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# STORMWATER MANAGEMENT REPORT

for

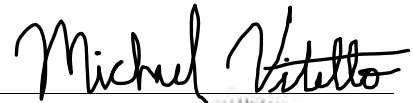
**BEACON UNIVERSALIST CHURCH**  
**695 SPRINGFIELD AVENUE**  
**BLOCK No. 1702, LOT No. 47**  
**CITY OF SUMMIT, UNION COUNTY, NEW JERSEY**

*Prepared For:*

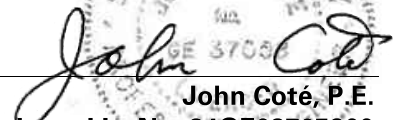
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## **LANGAN**

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## **EXECUTIVE SUMMARY**

The proposed stormwater management and conveyance systems for the proposed Beacon Universalist Church project have been designed in accordance with the New Jersey Department of Environmental Protection stormwater rules (NJAC 7:8), and the City of Summit stormwater regulations.

The proposed redevelopment includes the construction of:

- A 2-story building consisting of 18,024± Gross SF (11,795± SF footprint);
- Four solar canopy structures
- Associated driveways, sidewalks, parking areas, stormwater and utility infrastructure, and landscaping.

The proposed redevelopment disturbs more than one acre of land; therefore, this project is considered a “major development” from a stormwater management perspective, and the proposed design is required to address stormwater quantity, quality, and groundwater recharge requirements. The proposed stormwater management system consists of the following:

- A subsurface conveyance system consisting of inlets, manholes, and pipes to convey stormwater runoff from the 25-year design storm event;
- 2 small-scale underground infiltration basins;
- 1 rain garden;
- 3 porous asphalt pavement systems;
- Contech StormFilter manufactured treatment devices (SFMH48, Peak Diversion Stormfilter); and,
- Contech Filterra Bioscape Vault manufactured treatment device.

By using the stormwater management measures identified above and reviewing the results of the detailed calculations provided in this report, the stormwater management design is in accordance with the City of Summit and NJDEP stormwater rules, regulations, and ordinance requirements in effect at the time of the preparation of this report.

### **1.0 INTRODUCTION**

This report addresses the engineering design of the stormwater conveyance and management system for the proposed redevelopment of an existing 2-story office building located at 695 Springfield Avenue in Summit, New Jersey. The proposed stormwater management system is designed in accordance with:

- New Jersey Department of Environmental Protection (NJDEP) stormwater rules (NJAC 7:8), last amended July 17, 2023;

- New Jersey Standards for Soil Erosion and Sediment Control;
- City of Summit, Development Regulations, Part III Environmental Requirements, Article XV Stormwater Management Requirements.

## **2.0 PROJECT DESCRIPTION**

### **2.1 Existing Site Description**

The project site is comprised of Block No. 1702, Lot No. 47 in the City of Summit, Union County, New Jersey. The 1.74± acre tract consists of a 2-story office building, detached garage building, and parking areas. Areas within the eastern portion of the site are covered mostly by grass with some trees and vegetation. The site is bound by Wilson Park to the west, Wilson Primary School and baseball field to the north, undeveloped City owned property to the east and Springfield Avenue (CR 512) to the south; refer to Figure 1 – Site Location Map. The site topography generally slopes from a high point near the center of the site toward the northeast and toward the south. Existing grades at the site generally range from approximately EL. 350 to EL. 356.

### **2.2 Subsurface Conditions**

According to the United States Department of Agriculture (USDA) Natural Resources Conservation Service Soil Survey Map for Union County, New Jersey, the site soils are Boonton-Urban Land-Haledon Complex (BovB). A brief description of the soil type is provided below.

- Boonton-Urban Land-Haledon Complex (BovB): These areas are typically covered by pavement, concrete, buildings, and other structures underlain by disturbed and natural soil material. The natural soil typically consists of loam to gravelly fine sandy loam to silt loam to sandy loam to gravelly loam. When not covered by pavement, concrete, buildings, and other structures, the soil mapping unit is reported to be Hydrologic Soil Group C.

### **2.3 Flood Hazard Area**

Based on a review of the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) for Union County, Map #34039C0008F, dated effective September 20, 2006, the subject property is located outside of the 100-year flood hazard area (Zone X). Refer to Figure 2.

## 2.4 Proposed Development

The proposed redevelopment at the project site will consist of the following improvements:

- A 2-story building consisting of 18,024± Gross SF (11,795± SF footprint);
- Four solar canopy structures;
- Associated driveways, sidewalks, parking areas, utility infrastructure, and landscaping;
- A proposed stormwater management system consisting of the following:
  - A subsurface conveyance system consisting of inlets, manholes, and pipes to convey stormwater runoff from the 25-year design storm event;
  - 2 small-scale underground infiltration basins;
  - 1 rain garden;
  - 3 porous asphalt pavement systems;
  - Contech StormFilter manufactured treatment devices (SFMH48, Peak Diversion Stormfilter); and,
  - Contech Filterra Bioscape Vault manufactured treatment device.

## 3.0 STORMWATER MANAGEMENT

The proposed redevelopment disturbs over 1 acre of land; therefore, this project is considered a major development as defined by the NJDEP stormwater rules (NJAC 7:8). Projects that qualify as major developments are required to design stormwater management systems that address:

- Stormwater quantity;
- Stormwater quality;
- Groundwater recharge; and,
- Nonstructural measures

The following sections provided additional detail regarding each of the stormwater design regulations.

### 3.1 Stormwater Quantity Design

#### 3.1.1 Design Criteria

In accordance with N.J.A.C. 7:8-5.6.(b).3, stormwater management measures are to be designed so that the post-construction peak runoff rates for the 2-, 10-, and 100-year design storm events are 50, 75, and 80%, respectively, of the pre-construction runoff rates for the portion of the site on which the proposed development is to be constructed. The portions of the project site that are to remain undisturbed in the post-construction condition are not subject to rate control measures.

Alternatively, in accordance with N.J.A.C. 7:8-5.6.(b).1, it can be demonstrated through hydrologic

and hydraulic analyses that the post-construction runoff hydrographs for the 2-, 10-, and 100-year design storm events do not exceed, at any point in time, the pre-construction runoff hydrographs for the same storm events.

The proposed redevelopment results in each point of analysis varying in terms of realizing an increase in post-construction peak runoff rates when compared to pre-construction peak runoff rates. Therefore, it shall be demonstrated in accordance with N.J.A.C. 7:8-5.6.(b).3 that the post-construction peak runoff rates for the 2-, 10-, and 100-year design storm events are 50, 75, and 80%, respectively, of the pre-construction runoff rates for the portion of the site on which the redevelopment is to take place and quantity control through the implementation of BMPs is required. For the points of analysis where there are no quantity control BMPs being implemented, and the total watershed area contributing to a point of analysis decreases in the post-construction condition, it shall be demonstrated in accordance with N.J.A.C. 7:8-5.6.(b).1 that the post-construction runoff hydrographs for the 2-, 10-, and 100-year design storm events do not exceed, at any point in time, the pre-construction runoff hydrographs for the same storm events.

Regardless of the applicable quantity control design criteria, in accordance with N.J.A.C. 7:8-5.7, the 2-, 10-, and 100-year design storm events must be analyzed for both the “current” and “future” rainfall events.

### 3.1.2 Design Methodology

This study was prepared utilizing the Natural Resources Conservation Service (NRCS - formerly SCS) method to analyze the pre- and post-development stormwater runoff rates and volumes. This methodology meets the NJDEP stormwater calculation requirements presented in Section 7:8-5.7.(a).1 of the New Jersey Administrative Code (N.J.A.C.) recognizing existing conditions. Stormwater hydrographs were developed utilizing the NOAA Atlas 14 Region D 24-hour storm distribution, and precipitation depths are referenced from the NOAA Atlas 14, Volume 2, Version 3 Point Precipitation Frequency Estimates Table for Summit, New Jersey, accessed on June 8, 2023, for the 2-, 10-, 25-, and 100-year return periods. The table below summarizes the rainfall event totals.

| <b>2-yr<br/>(in)</b> | <b>10-yr<br/>(in)</b> | <b>25-yr<br/>(in)</b> | <b>100-yr<br/>(in)</b> |
|----------------------|-----------------------|-----------------------|------------------------|
| 3.43                 | 5.22                  | 6.47                  | 8.74                   |

In accordance with N.J.A.C. 7:8-5.7.(c), the precipitation depths from NOAA Atlas 14 shall be

modified for the “current” storm events using the following precipitation adjustment factors, which are based on the project site’s location within Union County.

| <b>Table 2 – Current Precipitation Adjustment Factors for Union County</b> |              |              |               |
|--|--------------|--------------|---------------|
| <b>2-yr</b>  | <b>10-yr</b> | <b>25-yr</b> | <b>100-yr</b> |
| 1.01   | 1.03         | 1.04         | 1.06          |

*Note: The adjustment factor for the 25-year storm event was found using a weighted average of the 10-year and 100-year storm event adjustment factors. The purpose of determining the 25-year storm event adjustment factor is for inputting basin-routed discharge rates into the conveyance network design software, as the proposed conveyance networks are designed for the 25-year design storm event.*

| <b>Table 3 – Current Precipitation Summary for 24-Hour Storm Events</b> |                   |                   |                    |
|---|-------------------|-------------------|--------------------|
| <b>2-yr (in)</b>  | <b>10-yr (in)</b> | <b>25-yr (in)</b> | <b>100-yr (in)</b> |
| 3.46  | 5.38              | 6.73              | 9.26               |

In accordance with N.J.A.C. 7:8-5.7.(d), the precipitation depths from NOAA Atlas 14 shall be modified for the “future” storm events using the following precipitation adjustment factors, which are based on the project site’s location within Union County.

| <b>Table 4 – Future Precipitation Adjustment Factors for Union County</b> |              |              |               |
|---|--------------|--------------|---------------|
| <b>2-yr</b>   | <b>10-yr</b> | <b>25-yr</b> | <b>100-yr</b> |
| 1.20  | 1.23         | 1.27         | 1.35          |

*Note: The adjustment factor for the 25-year storm event was found using a weighted average of the 10-year and 100-year storm event adjustment factors. The purpose of determining the 25-year storm event adjustment factor is for inputting basin-routed discharge rates into the conveyance network design software, as the proposed conveyance networks are designed for the 25-year design storm event.*

| <b>Table 5 – Future Precipitation Summary for 24-Hour Storm Events</b> |                   |                   |                    |
|--|-------------------|-------------------|--------------------|
| <b>2-yr (in)</b>   | <b>10-yr (in)</b> | <b>25-yr (in)</b> | <b>100-yr (in)</b> |
| 4.12   | 6.42              | 8.23              | 11.80              |



A time of concentration was calculated for each watershed. The time of concentration is defined as the time for runoff to travel from the hydraulically most remote point of the watershed to the point of interest. Values of the time of concentration were determined for existing and proposed conditions based on land cover and slope of the flow path using methods described in TR-55 and Chapter 5 of the New Jersey Best Management Practices (BMP) Manual. A time of concentration calculation was performed for both the pervious and impervious land coverage areas within each watershed in order to more accurately model peak runoff rates. For the post-construction time of concentration calculations, the McCuen-Spiess limitation is applied to the sheet flow travel time portion of the calculation. Due to technical limitations of the hydrologic software used to develop hydrographs, the minimum time of concentration is 2 minutes.

A runoff curve number (CN) was selected based upon the land cover type and underlying soil hydrologic classification within each watershed. In accordance with Chapter 5 of the New Jersey BMP Manual, peak runoff rates are calculated for each individual land cover type within the watershed and then hydraulically added together to determine the peak runoff rate of the watershed, rather than using the weighted runoff curve number (CN) methodology. Runoff curve numbers are referenced from Tables 2-2a and 2-2c of TR-55: Urban Hydrology for Small Watersheds.

### 3.1.3 Points of Analysis

All stormwater runoff generated from the project site discharges to three points of analysis described below:

Point of Analysis 1 (POA-1) refers to an existing catch basin located along Springfield Avenue which is located to the southwest of the project site.

Point of Analysis 2 (POA-2) refers to an existing low point on the neighboring property located to the northeast of the site. Runoff is conveyed via overland flow to the POA and includes runoff from offsite areas to the north and west of the site which are conveyed through the site to POA-2.

Point of Analysis 3 (POA-3) refers to an existing catch basin located to the west of POA-1 along Springfield Avenue.

### 3.1.4 Existing Watersheds

The existing watersheds are depicted on Figure 4 – Existing Watershed Map.

Watershed EX-1 is approximately 0.51± acres and consists of portions of the existing office building, driveway, and landscape areas that are proposed to be disturbed in the post-construction condition. This watershed is conveyed via overland flow to the existing stormwater conveyance system in Springfield Avenue to Point of Analysis 1 (POA-1).

Watershed EX-2A is approximately 1.22± acres and consists of existing office building, garage, woods, landscaped areas, and pavement areas in the northern portion of the subject property that are proposed to be disturbed in the post-construction condition. This watershed is conveyed primarily via overland flow to the northeast, discharging to Point of Analysis 2 (POA-2).

Watershed EX-2B is approximately 0.75± acres and consists of existing off-site areas including a baseball field and other landscaped areas which are located to the north of the subject property, and which are proposed to remain undisturbed in the post-construction condition. This watershed is conveyed via overland flow through the northern portion of the site, discharging to Point of Analysis 2 (POA-2).

Watershed EX-3 is approximately 0.05± acres and consists of existing landscaped areas in the southwestern portion of the subject property. This watershed is conveyed primarily via overland flow to an existing catch basin located on Springfield Avenue, discharging to Point of Analysis 3 (POA-3).

A summary of the existing watershed characteristics and peak flows are presented in the table on the following page; refer to Appendix A for weighted curve number (CN) calculation worksheets and supporting hydrologic calculations.

| <b>Watershed</b> | <b>2-yr Storm Event Peak Flow (CFS)</b> | <b>10-yr Storm Event Peak Flow (CFS)</b> | <b>100-yr Storm Event Peak Flow (CFS)</b> |
|------------------|---|--|---|
| EX-1             | 0.83                                    | 1.63                                     | 3.38                                      |
| EX-2A            | 1.88                                    | 3.42                                     | 6.84                                      |
| EX-2B            | 0.64                                    | 1.45                                     | 3.29                                      |
| EX-3             | 0.05                                    | 0.11                                     | 0.27                                      |

| <b>Table 7 – Summary of Future Storm Event Existing Peak Discharges</b> |   |  |   |
|---|---|--|---|
| <b>Watershed</b>  | <b>2-yr Storm Event Peak Flow (CFS)</b> | <b>10-yr Storm Event Peak Flow (CFS)</b> | <b>100-yr Storm Event Peak Flow (CFS)</b> |
| EX-1  | 1.09                                    | 2.09                                     | 4.55                                      |
| EX-2A   | 2.39                                    | 4.32                                     | 9.13                                      |
| EX-2B   | 0.91                                    | 1.93                                     | 4.54                                      |
| EX-3  | 0.07                                    | 0.15                                     | 0.38                                      |

### 3.1.5 Allowable Peak Discharges

The proposed redevelopment increases the amount of impervious coverage compared to the existing condition, causing post-construction peak runoff rates to exceed pre-construction peak runoff rates within the watersheds with the most concentrated areas of development. Therefore, it shall be demonstrated in accordance with N.J.A.C. 7:8-5.6.(b).3 that the post-construction peak runoff rates for the 2-, 10-, and 100-year design storm events are 50, 75, and 80%, respectively, of the pre-construction runoff rates for the portions of the site on which the proposed development is to be constructed and quantity control BMPs are required to be implemented.

For the points of analysis where there are no quantity control BMPs being implemented and the total watershed area contributing to a point of analysis decreases, it shall be demonstrated in accordance with N.J.A.C. 7:8-5.6.(b).1 that the post-construction runoff hydrographs for the 2-, 10-, and 100-year design storm events do not exceed, at any point in time, the pre-construction runoff hydrographs for the same storm events.

Watersheds noted as being “disturbed” in the watershed descriptions in Section 3.1.4 of this report represent the areas on the project site that are to be disturbed as part of the proposed redevelopment and are therefore subject to post-construction peak rate reductions if post-construction peak runoff rates exceed pre-construction peak runoff rates and quantity control BMP’s are required to be implemented.

Watersheds noted as being “undisturbed” in the watershed descriptions in Section 3.1.4 of this report represent the areas on the project site that are to remain undisturbed as part of the proposed redevelopment and are therefore not subject to peak rate reductions.

The following section summarizes the quantity control criteria being established for each point of analysis, which watersheds are subject to peak rate reductions, and the allowable peak discharges for each point of analysis.

- Point of Analysis 1 (POA-1): The proposed redevelopment within this watershed results in peak runoff rates increasing in the proposed condition, and quantity control BMPs are required to be implemented. Therefore, it shall be demonstrated in accordance with N.J.A.C. 7:8-5.6.(b).3 that the post-construction peak runoff rates for both the current and future 2-, 10-, and 100-year design storm events are 50, 75, and 80%, respectively, of the pre-construction runoff rates for the disturbed portions of the overall watershed.

| <b>Table 8 – POA-1 Allowable Peak Discharges (Current)</b> |                                      |                                       |
|--|--------------------------------------|---------------------------------------|
| <b>Design Storm Event</b>                                  | <b>Existing Peak Discharge (CFS)</b> | <b>Allowable Peak Discharge (CFS)</b> |
| <b>2-Year</b>  | 0.83                                 | 0.41                                  |
| <b>10-Year</b>   | 1.63                                 | 1.22                                  |
| <b>100-Year</b>  | 3.38                                 | 2.70                                  |

*Note: Total Allowable Peak Discharges are calculated by hydraulically adding runoff hydrographs and may not reflect the direct addition of peak discharge rates. Refer to the hydrograph report calculations in Appendix A.*

| <b>Table 9 – POA-1 Allowable Peak Discharges (Future)</b> |                                      |                                       |
|---|--------------------------------------|---------------------------------------|
| <b>Design Storm Event</b>                                 | <b>Existing Peak Discharge (CFS)</b> | <b>Allowable Peak Discharge (CFS)</b> |
| <b>2-Year</b>   | 1.09                                 | 0.55                                  |
| <b>10-Year</b>  | 2.09                                 | 1.57                                  |
| <b>100-Year</b>   | 4.56                                 | 3.64                                  |

*Note: Total Allowable Peak Discharges are calculated by hydraulically adding runoff hydrographs and may not reflect the direct addition of peak discharge rates. Refer to the hydrograph report calculations in Appendix A.*

- Point of Analysis 2 (POA-2): The proposed redevelopment within this watershed results in peak runoff rates increasing in the proposed condition, and quantity control BMPs are required to be implemented. Therefore, it shall be demonstrated in accordance with N.J.A.C. 7:8-5.6.(b).3 that the post-construction peak runoff rates for both the current and future 2-, 10-, and 100-year design storm events are 50, 75, and 80%, respectively, of the pre-construction runoff rates for the disturbed portions of the overall watershed.

| <b>Table 10 – POA-2 Allowable Peak Discharges (Current)</b> |                                      |                                       |
|---|--------------------------------------|---------------------------------------|
| <b>Design Storm Event</b>                                   | <b>Existing Peak Discharge (CFS)</b> | <b>Allowable Peak Discharge (CFS)</b> |
| <b>2-Year</b>   | 2.31                                 | 1.39                                  |
| <b>10-Year</b>  | 4.50                                 | 3.64                                  |
| <b>100-Year</b>   | 9.37                                 | 8.00                                  |

*Note: Total Allowable Peak Discharges are calculated by hydraulically adding runoff hydrographs and may not reflect the direct addition of peak discharge rates. Refer to the hydrograph report calculations in Appendix A.*

| <b>Table 11 – POA-2 Allowable Peak Discharges (Future)</b> |                                      |                                       |
|--|--------------------------------------|---------------------------------------|
| <b>Design Storm Event</b>                                  | <b>Existing Peak Discharge (CFS)</b> | <b>Allowable Peak Discharge (CFS)</b> |
| <b>2-Year</b>  | 3.03                                 | 1.85                                  |
| <b>10-Year</b>   | 5.77                                 | 4.69                                  |
| <b>100-Year</b>  | 12.65                                | 10.83                                 |

*Note: Total Allowable Peak Discharges are calculated by hydraulically adding runoff hydrographs and may not reflect the direct addition of peak discharge rates. Refer to the hydrograph report calculations in Appendix A.*

- Point of Analysis 3 (POA-3): The total contributing watershed area is being reduced in the post-construction condition. Therefore, it shall be demonstrated in accordance with N.J.A.C. 7:8-5.6.(b).1 that the post-construction runoff hydrographs for both the current and future 2-, 10-, and 100-year design storm events do not exceed, at any point in time, the pre-construction runoff hydrographs for the same storm events.

| <b>Table 12 – POA-3 Allowable Peak Discharges (Current)</b> |                                      |                                       |
|---|--------------------------------------|---------------------------------------|
| <b>Design Storm Event</b>                                   | <b>Existing Peak Discharge (CFS)</b> | <b>Allowable Peak Discharge (CFS)</b> |
| <b>2-Year</b>   | 0.05                                 | 0.05                                  |
| <b>10-Year</b>  | 0.11                                 | 0.11                                  |
| <b>100-Year</b>   | 0.27                                 | 0.27                                  |

*Note: Total Allowable Peak Discharges are calculated by hydraulically adding runoff hydrographs and may not reflect the direct addition of peak discharge rates. Refer to the hydrograph report calculations in Appendix A.*

| <b>Table 13 – POA-3 Allowable Peak Discharges (Future)</b> |                                      |                                       |
|--|--------------------------------------|---------------------------------------|
| <b>Design Storm Event</b>                                  | <b>Existing Peak Discharge (CFS)</b> | <b>Allowable Peak Discharge (CFS)</b> |
| <b>2-Year</b>  | 0.07                                 | 0.07                                  |
| <b>10-Year</b>   | 0.15                                 | 0.15                                  |
| <b>100-Year</b>  | 0.38                                 | 0.38                                  |

*Note: Total Allowable Peak Discharges are calculated by hydraulically adding runoff hydrographs and may not reflect the direct addition of peak discharge rates. Refer to the hydrograph report calculations in Appendix A.*

### 3.1.6 Proposed Watersheds

The proposed watersheds are depicted on Figure 5 – Proposed Watershed Map.

Watershed PR-1A is approximately 0.24± acres and consists of portions of the proposed building roof area, pavement areas, and pervious landscape areas. Stormwater runoff is conveyed via overland flow and a proposed subsurface conveyance system to Small-Scale Underground Infiltration Basin 1-1 (UGD-INF1-1). The watershed is then ultimately conveyed to POA-1.

Watershed PR-1B is approximately 0.22± acres and consists of portions of the proposed building roof area, the proposed sidewalk, and pervious landscape areas. Stormwater runoff is conveyed via overland flow and a proposed subsurface conveyance system to Small-Scale Underground Infiltration Basin 1-2 (UGD-INF1-2). The watershed is then ultimately conveyed to POA-1.

Watershed PR-1C is approximately 0.05± acres and consists of portions of the proposed paver walkway and pervious landscape areas. Stormwater runoff is conveyed via overland flow to the Rain Garden. The watershed is then conveyed to UGD-INF1-2, ultimately discharging to POA-1.

Watershed PR-1D is approximately 0.17± acres and consists of portions of the proposed sidewalk, unit paver walkway, drive aisles, and pervious landscape areas. Stormwater runoff is conveyed via overland flow and a proposed subsurface conveyance system to Contech Peak Diversion StormFilter and to UGD-INF1-2. The watershed is ultimately conveyed to POA-1.

Watershed PR-1E is approximately 0.19± acres and consists of portions of proposed sidewalk and pervious landscape areas. Stormwater runoff is conveyed via overland flow to POA-1.

Watershed PR-2A is approximately 0.24± acres and consists of pervious landscaped areas and portions of the pavement areas consisting of both standard duty pavement and porous asphalt pavement. Stormwater runoff is conveyed via overland flow to Porous Asphalt Pavement

System 1. The watershed is then ultimately conveyed to POA-2.

Watershed PR-2B is approximately 0.12± acres and consists of pervious landscaped areas and sidewalk. Stormwater runoff is conveyed via overland flow and proposed subsurface conveyance system to Porous Asphalt Pavement System 3. The watershed is then ultimately conveyed to POA-2.

Watershed PR-2C is approximately 0.10± acres and consists of pervious landscaped areas and the porous asphalt pavement. Stormwater runoff is conveyed via overland flow to Porous Asphalt Pavement System 2. The watershed is then ultimately conveyed to POA-2.

Watershed PR-2D is approximately 0.66± acres and consists of offsite watershed to the north of the site and generally consists of pervious landscaped areas, existing baseball field and impervious walkways. Stormwater runoff is conveyed via overland flow to POA-2.

Watershed PR-2E is approximately 0.14± acres and consists of undetained pervious landscaped areas and sidewalk. Stormwater runoff is conveyed via overland flow and a proposed subsurface conveyance system to POA-2.

Watershed PR-2F is approximately 0.08± acres and consists of undetained offsite watershed to the west of the site and generally consists of pervious landscaped areas, and impervious walkways. Stormwater runoff is conveyed via overland flow and a proposed subsurface conveyance system to POA-2.

Watershed PR-2G is approximately 0.18± acres and consists of onsite undetained areas at the north end of the site and generally consists of pervious landscaped areas. Stormwater runoff is conveyed via overland flow to POA-2.

Watershed PR-2H is approximately 0.08 ± acres and consists of pervious landscaped areas, porous asphalt pavement, and sidewalk. Stormwater runoff is conveyed via overland flow to Porous Asphalt Pavement System 3. The watershed is then ultimately conveyed to POA-2.

Watershed PR-3 is approximately 0.03± acres and consists of onsite undetained areas at the southwest portion of the site and generally consists of pervious landscaped areas. Stormwater runoff is conveyed via overland flow to POA-3.

A summary of the existing watershed characteristics and peak flows are presented in the table below; refer to Appendix B for runoff curve number (CN) calculation worksheets and supporting hydrologic calculations.

| <b>Table 14 – Summary of Current Storm Event Proposed Peak Discharges</b> |                                   |                                    |                                    |                                     |
|---|-----------------------------------|------------------------------------|------------------------------------|-------------------------------------|
| <b>Watershed</b>  | <b>2-yr Storm Peak Flow (CFS)</b> | <b>10-yr Storm Peak Flow (CFS)</b> | <b>25-yr Storm Peak Flow (CFS)</b> | <b>100-yr Storm Peak Flow (CFS)</b> |
| PR-1A   | 0.81                              | 1.27                               | 1.59                               | 2.19                                |
| PR-1B   | 0.56                              | 0.94                               | 1.22                               | 1.75                                |
| PR-1C   | 0.11                              | 0.21                               | 0.27                               | 0.40                                |
| PR-1D   | 0.46                              | 0.77                               | 1.00                               | 1.43                                |
| PR-1E   | 0.35                              | 0.70                               | 0.96                               | 1.45                                |
| PR-2A   | 0.77                              | 1.23                               | 1.55                               | 2.16                                |
| PR-2B   | 0.24                              | 0.44                               | 0.58                               | 0.85                                |
| PR-2C   | 0.27                              | 0.46                               | 0.59                               | 0.85                                |
| PR-2D   | 0.59                              | 1.34                               | 1.92                               | 3.05                                |
| PR-2E   | 0.20                              | 0.40                               | 0.55                               | 0.84                                |
| PR-2F   | 0.11                              | 0.22                               | 0.30                               | 0.46                                |
| PR-2G   | 0.23                              | 0.54                               | 0.78                               | 1.25                                |
| PR-2H   | 0.23                              | 0.38                               | 0.49                               | 0.69                                |
| PR-3  | 0.04                              | 0.10                               | 0.14                               | 0.22                                |

| <b>Table 15 – Summary of Future Storm Event Proposed Peak Discharges</b> |                                   |                                    |                                    |                                     |
|--|-----------------------------------|------------------------------------|------------------------------------|-------------------------------------|
| <b>Watershed</b>   | <b>2-yr Storm Peak Flow (CFS)</b> | <b>10-yr Storm Peak Flow (CFS)</b> | <b>25-yr Storm Peak Flow (CFS)</b> | <b>100-yr Storm Peak Flow (CFS)</b> |
| PR-1A  | 0.97                              | 1.52                               | 1.95                               | 2.79                                |
| PR-1B  | 0.70                              | 1.19                               | 1.57                               | 2.35                                |
| PR-1C  | 0.14                              | 0.26                               | 0.35                               | 0.53                                |
| PR-1D  | 0.56                              | 0.95                               | 1.25                               | 1.86                                |
| PR-1E  | 0.46                              | 0.88                               | 1.22                               | 1.91                                |
| PR-2A  | 0.93                              | 1.48                               | 1.91                               | 2.77                                |
| PR-2B  | 0.31                              | 0.55                               | 0.74                               | 1.13                                |
| PR-2C  | 0.32                              | 0.55                               | 0.73                               | 1.08                                |
| PR-2D  | 0.86                              | 1.85                               | 2.68                               | 4.36                                |
| PR-2E  | 0.29                              | 0.55                               | 0.77                               | 1.20                                |
| PR-2F  | 0.15                              | 0.30                               | 0.42                               | 0.66                                |
| PR-2G  | 0.33                              | 0.73                               | 1.06                               | 1.72                                |
| PR-2H  | 0.28                              | 0.46                               | 0.61                               | 0.89                                |
| PR-3   | 0.06                              | 0.13                               | 0.18                               | 0.30                                |

### 3.1.7 Proposed Detention Routing

Two small-scale underground infiltration basins, three porous asphalt pavement systems, and one rain garden are proposed in order to meet the stormwater quantity requirements. According to N.J.A.C. 7:8-5.2.(f), small-scale infiltration basins, rain gardens and porous asphalt pavement systems qualify as green infrastructure BMP's that may be utilized for stormwater quantity,



stormwater runoff quality, and groundwater recharge requirements without a waiver or variance.

Routing calculations have been provided in order to demonstrate that the basins have adequate storage capacity to safely convey storm events up to the 100-year design storm for both the current and future rainfall events; refer to Appendix C for supporting calculations.

The total proposed peak discharge rate for the point of analysis can then be calculated by adding together the peak outflow from the proposed rain garden, small-scale underground infiltration basins, and porous asphalt pavement systems, along with the peak discharges from the undetained, undisturbed, and offsite watersheds.

| <b>Table 16 – Total Current Storm Event Proposed Peak Discharges</b> |                     |                      |                       |
|--|---------------------|----------------------|-----------------------|
| <b>Point of Analysis</b>   | <b>2-Year Storm</b> | <b>10-Year Storm</b> | <b>100-Year Storm</b> |
| <b>POA-1</b>   | 0.36                | 0.90                 | 2.58                  |
| <b>POA-2</b>   | 1.28                | 2.69                 | 7.00                  |
| <b>POA-3</b>   | 0.04                | 0.10                 | 0.22                  |

*Note: Total Proposed Peak Discharges are calculated by hydraulically adding runoff hydrographs and may not reflect the direct addition of peak discharge rates. Refer to hydrograph report calculations in Appendix B.*

| <b>Table 17 – Total Future Storm Event Proposed Peak Discharges</b> |                     |                      |                       |
|---|---------------------|----------------------|-----------------------|
| <b>Point of Analysis</b>  | <b>2-Year Storm</b> | <b>10-Year Storm</b> | <b>100-Year Storm</b> |
| <b>POA-1</b>  | 0.54                | 1.15                 | 3.54                  |
| <b>POA-2</b>  | 1.79                | 3.81                 | 9.77                  |
| <b>POA-3</b>  | 0.06                | 0.13                 | 0.30                  |

*Note: Total Proposed Peak Discharges are calculated by hydraulically adding runoff hydrographs and may not reflect the direct addition of peak discharge rates. Refer to hydrograph report calculations in Appendix B.*

### 3.1.8 Quantity Control BMP Design Summary

For small-scale underground infiltration basins, the following parameters must be met as part of the system design as per Chapter 9.8 of the New Jersey BMP Manual; all design criteria have been met – refer to calculations in the appendices of this report as well as the design drawings:

- Maximum contributory drainage area: 2.5 acres
- Minimum distance between basin bottom and seasonal high groundwater/bedrock: 2 feet

- Maximum water quality design storm event water depth: 24 inches
- Maximum design storm drain time: 72 hours

Per the NJDEP stormwater rules, credit can be taken for any runoff volume that is infiltrated into the subsoil (exfiltration) during the basin routing period. Refer to Section 3.3.3 for details regarding the exfiltration rate calculation as it relates to the quantity control analysis.

For the Rain Garden (under-drained small-scale bioretention basin), the following parameters must be met as part of the system design as per Chapter 9.7 of the New Jersey BMP Manual; all design criteria have been met – refer to calculations in the appendices of this report as well as the design drawings:

Rea

- Maximum contributory drainage area: 2.5 acres
- Minimum distance between basin bottom and seasonal high groundwater/bedrock: 1 foot
- Maximum water quality design storm event water depth: 12 inches
- Maximum design storm drain time: 72 hours

Porous asphalt pavement systems are proposed to meet the stormwater quantity requirements. The underlying stone storage bed has been sized in order to attenuate the 2-, 10-, and 100-year design storm events. The following parameters must be met as part of the system design as per Chapter 9.6 of the New Jersey BMP Manual; all design criteria has been met – refer to calculations in the appendices of this report as well as the design drawings:

- Maximum area of additional inflow: 3 times the porous pavement area
- Minimum distance between basin bottom and seasonal high groundwater/bedrock (under-drained systems): 1 foot
- Maximum design storm drain time: 72 hours

| <b>Table 18 – Proposed BMP Design Summary</b> |  |                              |  |                                      |                                    |
|---|--|------------------------------|--|--------------------------------------|------------------------------------|
| <b>BMP</b>                                    | <b>Contributory Drainage Area<sup>1</sup> (AC)</b> | <b>WQDS Water Depth (FT)</b> | <b>Test Pits &amp; Borings<sup>2</sup></b> | <b>Bottom of BMP EL.<sup>3</sup></b> | <b>Groundwater or Mottling EL.</b> |
| UGD-INF1-1                                    | 0.24   | 348.77                       | TP-5                                       | 348.00                               | 342.00 <sup>4</sup>                |
| UGD-INF1-2                                    | 0.27   | 344.53                       | TP-1, TP-2, TP-3, TP-4                     | 344.00                               | 338.00 <sup>4</sup>                |
| Rain Garden                                   | 0.04   | 355.31                       | TP-5                                       | 351.50                               | 342.00 <sup>4</sup>                |
| Porous Asphalt System 1                       | 0.24   | 354.41                       | TP-6, TP-7                                 | 354.10                               | 346.00                             |
| Porous Asphalt System 2                       | 0.10   | 355.26                       | TP-7                                       | 355.10                               | 346.00                             |
| Porous Asphalt System 3                       | 0.08   | 354.39                       | TP-7                                       | 354.10                               | 346.00                             |

Notes:

1. *Contributory drainage area is the inflow drainage area to a BMP that excludes the area of the BMP itself in the case of a surface BMP.*
2. *Refer to the drainage plan, drawing CG102, for BMP locations. Refer to Appendix G for supporting geotechnical investigation information including test pit and boring logs.*
3. *The bottom of BMP elevation is either the bottom of the underdrain gravel layer for an under-drained bioretention basin or the bottom of the underlying gravel layer for subsurface infiltration basins and porous asphalt pavement systems.*
4. *If groundwater or soil mottling was not encountered, the depth of the deepest test pit or boring was assumed to be the groundwater elevation as a conservative measure.*

### 3.1.9 Stormwater Quantity Summary

A summary for each point of analysis, detailing the existing, allowable, and proposed peak discharge rates, is outlined in the table below.

| <b>Table 19 – POA-1 Peak Discharge Summary – Current Storm Events</b> |                                      |                                       |                                      |
|---|--------------------------------------|---------------------------------------|--------------------------------------|
| <b>Design Storm Event</b>   | <b>POA-1</b>                         |                                       |                                      |
|   | <b>Existing Peak Discharge (CFS)</b> | <b>Allowable Peak Discharge (CFS)</b> | <b>Proposed Peak Discharge (CFS)</b> |
| <b>2-Year</b>   | 0.83                                 | 0.41                                  | 0.36                                 |
| <b>10-Year</b>  | 1.63                                 | 1.22                                  | 0.90                                 |
| <b>100-Year</b>   | 3.38                                 | 2.70                                  | 2.58                                 |

| <b>Table 20 – POA-1 Peak Discharge Summary – Future Storm Events</b> |                                      |                                       |                                      |
|--|--------------------------------------|---------------------------------------|--------------------------------------|
| <b>Design Storm Event</b>  | <b>POA-1</b>                         |                                       |                                      |
|  | <b>Existing Peak Discharge (CFS)</b> | <b>Allowable Peak Discharge (CFS)</b> | <b>Proposed Peak Discharge (CFS)</b> |
| <b>2-Year</b>  | 1.09                                 | 0.55                                  | 0.54                                 |
| <b>10-Year</b>   | 2.09                                 | 1.57                                  | 1.15                                 |
| <b>100-Year</b>  | 4.56                                 | 3.64                                  | 3.54                                 |

| <b>Table 21 – POA-2 Peak Discharge Summary – Current Storm Events</b> |                                      |                                       |                                      |
|---|--------------------------------------|---------------------------------------|--------------------------------------|
| <b>Design Storm Event</b>   | <b>POA-2</b>                         |                                       |                                      |
|   | <b>Existing Peak Discharge (CFS)</b> | <b>Allowable Peak Discharge (CFS)</b> | <b>Proposed Peak Discharge (CFS)</b> |
| <b>2-Year</b>   | 2.31                                 | 1.39                                  | 1.28                                 |
| <b>10-Year</b>  | 4.50                                 | 3.64                                  | 2.69                                 |
| <b>100-Year</b>   | 9.37                                 | 8.00                                  | 7.00                                 |

| <b>Table 22 – POA-2 Peak Discharge Summary – Future Storm Events</b> |                                      |                                       |                                      |
|--|--------------------------------------|---------------------------------------|--------------------------------------|
| <b>Design Storm Event</b>  | <b>POA-2</b>                         |                                       |                                      |
|  | <b>Existing Peak Discharge (CFS)</b> | <b>Allowable Peak Discharge (CFS)</b> | <b>Proposed Peak Discharge (CFS)</b> |
| <b>2-Year</b>  | 3.03                                 | 1.85                                  | 1.79                                 |
| <b>10-Year</b>   | 5.77                                 | 4.69                                  | 3.81                                 |
| <b>100-Year</b>  | 12.65                                | 10.83                                 | 9.77                                 |

| <b>Table 23 – POA-3 Peak Discharge Summary – Current Storm Events</b> |                                      |                                       |                                      |
|---|--------------------------------------|---------------------------------------|--------------------------------------|
| <b>Design Storm Event</b>   | <b>POA-3</b>                         |                                       |                                      |
|   | <b>Existing Peak Discharge (CFS)</b> | <b>Allowable Peak Discharge (CFS)</b> | <b>Proposed Peak Discharge (CFS)</b> |
| <b>2-Year</b>   | 0.05                                 | 0.05                                  | 0.04                                 |
| <b>10-Year</b>  | 0.11                                 | 0.11                                  | 0.10                                 |
| <b>100-Year</b>   | 0.27                                 | 0.27                                  | 0.22                                 |

| <b>Table 24 – POA-3 Peak Discharge Summary – Future Storm Events</b> |                                      |                                       |                                      |
|--|--------------------------------------|---------------------------------------|--------------------------------------|
| <b>Design Storm Event</b>  | <b>POA-3</b>                         |                                       |                                      |
|  | <b>Existing Peak Discharge (CFS)</b> | <b>Allowable Peak Discharge (CFS)</b> | <b>Proposed Peak Discharge (CFS)</b> |
| <b>2-Year</b>  | 0.07                                 | 0.07                                  | 0.06                                 |
| <b>10-Year</b>   | 0.15                                 | 0.15                                  | 0.13                                 |
| <b>100-Year</b>  | 0.38                                 | 0.38                                  | 0.30                                 |

### **3.2 Stormwater Quality Design**

#### 3.2.1 Design Criteria

The project site is not subject to water quality treatment requirements as the development results in a net zero change in regulated motor vehicle surface coverage. In accordance with N.J.A.C. 7:8-5.5.(a), major developments are subject to providing water quality treatment when the development results in an increase of one-quarter acre or more of regulated motor vehicle surface. In the existing condition, there is approximately 0.41± acres of regulated motor surface, and in the post-construction condition, there is approximately 0.42± acres of regulated motor vehicle surface; refer to Figure 7 – Existing Regulated Motor Vehicle Surface Map and Figure 8 – Proposed Regulated Motor Vehicle Surface Map for delineations.

Although the project is not subject to providing water quality treatment, the stormwater BMPs for the project site must nevertheless be designed in accordance with the standards and regulations set forth in Chapter 9 and Chapter 11 of the BMP Manual in order to provide effective water quality treatment.

#### 3.2.2 Design Methodology

The proposed stormwater quality BMPs that have been chosen for the project design consist of small-scale underground infiltration basins, porous asphalt pavement systems, and mechanical treatment devices. Each of these BMPs achieves 80% TSS removal according to Chapter 9 and Chapter 11 of the BMP Manual.

The small-scale subsurface infiltration basins have been designed to achieve 80% TSS removal, meaning that they have been designed to store the entire water quality design storm event runoff volume below the first orifice opening of the outlet control structures, with the water surface elevations not exceeding 24 inches. The basins meet the criteria set forth in Chapter 9.8 of the BMP Manual for receiving TSS removal credit; refer to calculations in Appendix E.

In accordance with Chapter 9.8 of the BMP Manual, all non-roof generated runoff that is conveyed to a subsurface infiltration basin must be pretreated to remove 80% of total suspended solids (TSS) by any BMP in Chapter 9 or Chapter 11 of the BMP Manual. Manufactured treatment devices (MTDs), the Contech Filterra (a Chapter 9 green infrastructure MTD) and the Contech StormFilter (a Chapter 11 NJDEP-certified 80% TSS MTD), are utilized to provide pretreatment of non-roof generated runoff to both Small-Scale Underground Infiltration Basin 1-1 and Small-Scale Underground Infiltration Basin 1-2. These manufactured treatment devices have been adequately sized to treat the NJDEP water quality design storm event, and effectively bypass larger storm events; refer to the manufactured treatment device sizing calculations in Appendix E of this report.

The proposed porous pavement systems have also been designed to achieve 80% TSS removal. These systems consist of a porous asphalt surface course, a choker course that will filter pollutants, and an underlying stone storage bed subbase. The stone storage bed layer of the porous pavement system has been adequately sized to route the 100-year design storm event; therefore, there is more than adequate capacity to store the water quality storm event runoff volume, thus meeting the criteria to achieve 80% TSS removal. The porous asphalt pavement systems meet all of the design criteria set forth in Chapter 9.6 of the BMP Manual.

### 3.2.3 Design Summary

Although water quality treatment is not required according to the stormwater rules in N.J.A.C. 7:8, by virtue of the BMPs selected to provide quantity control measures, almost all of the regulated motor vehicle surface on the subject site will be treated either by the small-scale underground infiltration basins, porous asphalt pavement systems, and manufactured treatment devices, thus providing 80% TSS removal for the project site.

### 3.2.4 Trash and Waste

Catch basins are proposed to have Type N Eco curb pieces to prevent trash and floatables from entering the proposed conveyance systems. The BMP outlet control structures will also be fixed with trash racks and rock screens to prevent debris and floatables from entering the downstream conveyance systems.

## **3.3 Groundwater Recharge**

### 3.3.1 Design Criteria

The subject site is located within the Metropolitan Planning area PA-1 as defined by the New

Jersey State Planning Area Map; however, portions of the project site are undeveloped, with wooded areas proposed to be removed in the post-construction condition. Therefore, per N.J.A.C. 7:8-5.4.(b).1.i, one hundred percent (100%) of the average annual pre-construction groundwater recharge volume for the disturbed area of the project site must be maintained in the post-construction condition.

### 3.3.2 Design Methodology

The groundwater recharge volume analysis has been performed using the NJDEP New Jersey Groundwater Recharge Spreadsheet (NJGRS), which is based on the data and computational procedures outlined in New Jersey Geological Survey Report GSR-32. The spreadsheet compares the pre-construction and post-construction land cover types within the property's native underlying soil classifications to develop the total annual recharge volume across the project site in both the pre-construction and post-construction conditions.

The post-development annual groundwater recharge deficit for the project site is calculated to be 21,784 cubic feet. This deficit must be rectified via the implementation of BMPs that provide infiltration.

### 3.3.3 BMP Design

Two small-scale underground infiltration basins (UGD-INF1-1 and UGD-INF1-2) have been designed to meet the recharge volume requirement for the project site.

The small-scale underground infiltration basins are designed with either perforated HDPE pipes, or a structural arch chamber system (Cultec), encased within a gravel storage layer that is designed with a minimum 40% void ratio. The first orifice opening within each basin is set high enough above the system invert to ensure that the NJDEP water quality design storm volume is recharged into the native underlying soils. Test pits and infiltration tests performed within the basin footprints indicate that groundwater is at a sufficient depth to enable infiltration. A summary of the test pit and infiltration test results are summarized below:

| <b>Table 25 – Small-Scale Underground Infiltration Basin 1-1<br/>Design Infiltration Rate Calculation</b> |   |                         |   |
|---|---|-------------------------|---|
| <b>Exploration</b>  | <b>Permeability<br/>Test Result<br/>(in/hr)</b> | <b>Factor of Safety</b> | <b>Design<br/>Infiltration<br/>Rate (in/hr)</b> |
| TP-5  | 9.4   | 2                       | 4.7   |

| <b>Table 26 – Small-Scale Underground Infiltration Basin 1-2 Design Infiltration Rate Calculation</b> |   |                         |   |
|---|---|-------------------------|---|
| <b>Exploration</b>  | <b>Permeability Test Result (in/hr)</b> | <b>Factor of Safety</b> | <b>Design Infiltration Rate (in/hr)</b> |
| TP-1  | 15.1                                    | 2                       | 6.65                                    |
| TP-2  | 13.3                                    |                         |   |

Notes:

1. Infiltration tests were performed at TP-3 and TP-4, which are also located within the footprint of Small-Scale Underground Infiltration 1-2. However, these tests were performed within a different soil layer at an elevation well above the bottom of the proposed BMP. These tests have therefore been discounted, as the infiltration tests performed at TP-1 and TP-2 are within the soil stratum that the basin will be recharging into.

The NJGRS spreadsheet utilizes what is referred to as the BMP effective depth while calculating the annual recharge volume that a given BMP provides. Each underground infiltration basin is comprised of structural storage (e.g. pipes and Cultec arch chambers) with a 100% void ratio encased within a gravel storage bed with a 40% void ratio. For a basin with 100% void space, the distance from the bottom of the BMP to the first orifice opening is the effective BMP depth. Calculations have been performed to determine the average void ratio, which is then used as a multiplier to calculate the effective BMP depth; these calculations are provided in Appendix E of this report.

A groundwater mounding analysis, utilizing the NJDEP Hantush Excel Spreadsheet, was performed for each infiltration BMP as outlined in Chapter 13 of the BMP Manual. Each basin has been designed so that the maximum groundwater mounding height occurs below the respective bottom of the gravel storage; refer the basin design summary in the tables below. The maximum mounding height produced by the Hantush spreadsheet occurs at the geometric center of the basin, with lower mounding heights occurring at the perimeter.

| <b>Table 27 – Infiltration BMP Design Summary</b> |                                   |                                |                                  |                                |
|---|-----------------------------------|--------------------------------|----------------------------------|--------------------------------|
| <b>Infiltration Basin</b>                         | <b>Max. Groundwater Elevation</b> | <b>Bottom of BMP Elevation</b> | <b>Max. Mounding Height (FT)</b> | <b>Max. Mounding Elevation</b> |
| 1-1   | 342.00                            | 348.00                         | 5.98                             | 347.98                         |
| 1-2   | 338.00                            | 344.00                         | 5.13                             | 343.13                         |

Exfiltration credit will be taken toward the peak rate reduction requirements for the 2-, 10-, and 100-year design storm events; therefore, according to Chapter 13 of the BMP Manual, the duration of the infiltration period for the groundwater mounding analysis must reflect the



discarded volume via exfiltration for the respective storm event. Per guidance in Chapter 13 of the BMP manual, the recharge rate in the Hantush spreadsheet (which correlates to the exfiltration rate in the routing calculations) can be reduced, and the duration of the infiltration period proportionally increased, in order to show groundwater mounding staying at or below the bottom of the BMP.

The 100-year design storm event results in the most discarded runoff volume via exfiltration; therefore, the infiltration period and recharge rate that will be utilized for the groundwater mounding analysis will be calculated for this design storm event. Moreover, the calculated 100-year storm recharge rate will then be utilized as the exfiltration rate for the routing calculations for all storm events, which is a conservative measure considering that higher exfiltration rates could be utilized for smaller design storm events. The table below summarizes the reduction from the field-measured infiltration rates, to the design infiltration rates utilized for the basin routing (exfiltration) in order to demonstrate that groundwater mounding will be sufficiently below the bottom of the BMP:

| <b>Table 28 – Design Infiltration Rate (Exfiltration Rate) Summary</b> |   |                         |   |  |
|--|---|-------------------------|---|--|
| <b>Infiltration Basin</b>  | <b>Field-Tested Infiltration Rate (in/hr)</b> | <b>Factor of Safety</b> | <b>Design Infiltration Rate (in/hr)</b> | <b>Design Exfiltration Rate Per Groundwater Mounding (in/hr)</b> |
| 1-1  | 9.4   | 2                       | 4.70                                    | 1.50   |
| 1-2  | 13.3  | 2                       | 6.65                                    | 1.50   |

Refer to Appendix E for the groundwater mounding, infiltration period, and exfiltration calculations.

### 3.3.4 Design Summary

For the project site, the combined proposed annual post-construction groundwater recharge volume between Small-Scale Underground Infiltration Basin 1-1 and Small-Scale Underground Infiltration Basin 1-2 was calculated to be approximately 56,141 cubic feet, which exceeds the post-development annual groundwater recharge volume deficit of 22,336 cubic feet.

### **3.4 Non-Structural Stormwater Management Strategies**

Nonstructural strategies were analyzed and implemented to the maximum extent practical for this project.

As per NJAC 7:8-5.3(b), there are nine nonstructural strategies:

1. Protect areas that provide water quality or are susceptible to erosion;
2. Minimize, break up and/or disconnect impervious surfaces;
3. Maximize protection of natural drainage features and vegetation;
4. Minimize decrease in time of concentration;
5. Minimize land disturbance, clearing and grading;
6. Minimize soil compaction;
7. Provide low maintenance vegetation;
8. Provide vegetated conveyance systems; and,
9. Provide pollutant source controls.

### **3.5 Stormwater Conveyance Design**

#### 3.5.1 Design Criteria

The on-site subsurface collection and conveyance system is designed to convey the 25-year design storm event. The conveyance systems conveying discharge from quantity control BMPs have been designed to convey the 100-year design storm event.

#### 3.5.2 Design Methodology

The conveyance system was analyzed using the rational method for estimating runoff for the 25-year design storm event. The project site was divided into subareas based upon topography to determine the contributing runoff to each individual inlet or roof drain. Weighted runoff coefficients were calculated based upon the land cover type within each delineated sub-area. A runoff coefficient (C) was selected in accordance with Table 10-4: Recommended Coefficient of Runoff Values for Various Selected Land Uses from Section 10 of the 2015 New Jersey Department of Transportation (NJDOT) Roadway Design Manual. Values of time of concentration were chosen based on land cover and slope of the flow path from the hydraulically most distant point in the subarea to the appropriate inlet. Unless otherwise specified, the minimum time of concentration used for each on-site inlet is 5 minutes. Rainfall intensities were taken from the National Oceanic and Atmospheric Administration (NOAA) Precipitation Frequency Data Server for the project site; refer to Appendix D.

The proposed conveyance systems have been analyzed utilizing a starting tailwater elevation corresponding to the maximum design water elevation for the 25-year design storm event for the respective BMP that each conveyance network discharges into.

Detailed design calculations for the stormwater conveyance system are included in Appendix D of this report.

#### **4.0 SOIL EROSION AND SEDIMENT CONTROL**

Soil erosion and sediment control measures have been designed and located within the project site to minimize the amount of sediment carried by stormwater runoff, both during and after construction of the project. The SESC design was completed in accordance with the New Jersey Standards for Soil Erosion and Sediment Control.

#### **5.0 STORMWATER MAINTENANCE PLAN**

The stormwater management systems for the proposed development area are intended to collect, convey and detain the stormwater runoff. Regular maintenance procedures are required to verify the consistent and proper operation of the stormwater management facilities and prevent problems and malfunctions. The maintenance program provides the stormwater maintenance procedures for the site, which can be found under separate cover.

#### **6.0 CONCLUSION**

The stormwater management systems have been designed so that the post-construction peak runoff rates either meet the required peak rate reductions, or do not exceed at any point in time the pre-construction peak runoff rates, for the 2-, 10-, and 100-year design storm events, depending on the design criteria governing each point of analysis. The proposed rain garden (small-scale bioretention basin); small-scale underground infiltration basins and porous asphalt pavement systems have been designed in accordance with the BMP Manual in order to achieve the required quantity control for the 2-, 10-, and 100-year design storm events, while simultaneously providing 80% TSS removal for water quality treatment, even though water quality treatment is not required for the project site according to the stormwater rules in N.J.A.C. 7:8. The small-scale underground infiltration basins have been designed to satisfy the annual groundwater recharge requirements. The proposed stormwater conveyance systems have been designed to safely and effectively convey the runoff generated from the 25-year design storm event. Therefore, the engineering design of the stormwater management systems has been performed in accordance with and meets the regulations specified under the City of Summit Code of Ordinances and the NJDEP stormwater rules.

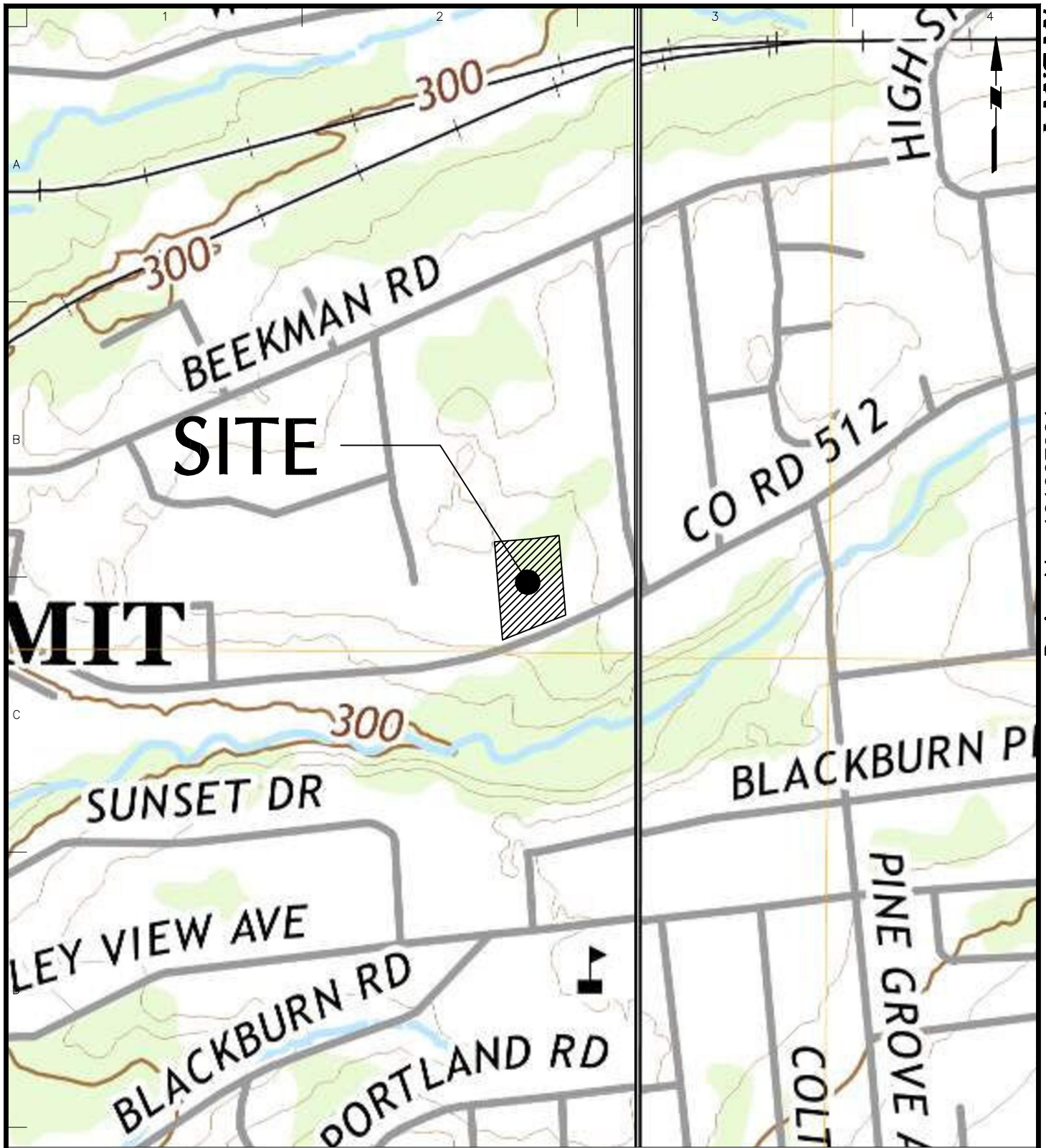
#### **7.0 REFERENCES**

1. Hydrology Studio. [Hydrology Studio 2022 v 3.0.0.26](#).
2. Hydrology Studio. [Stormwater Studio 2022 v 3.0.0.29](#).
3. Urban Hydrology for Small Watersheds, Technical Release No. 55, USDA Soil Conservation Service Publication, June 1986.

4. New Jersey Stormwater Best Management Practices Manual, New Jersey Department of Environmental Protection, Division of Watershed Management, April 2004, last revised July 2023.
5. Summit – Chapter 26 Stormwater Management Regulations and Chapter 35 Development Regulations.
6. The Standards for Soil Erosion and Sediment Control in New Jersey, New Jersey Department of Agriculture, revised July 2017.
7. New Jersey Department of Transportation 2015 Roadway Design Manual, last revised July 13, 2022.

\\langan.com\data\PAR\data2\101007201\Project Data\_Discipline\Site Civil\Reports\Stormwater\2024-02-21 Stormwater Management Report\2024-07-18 Beacon Church Stormwater Management Report.docx

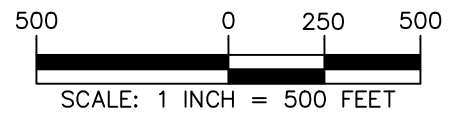
# FIGURES



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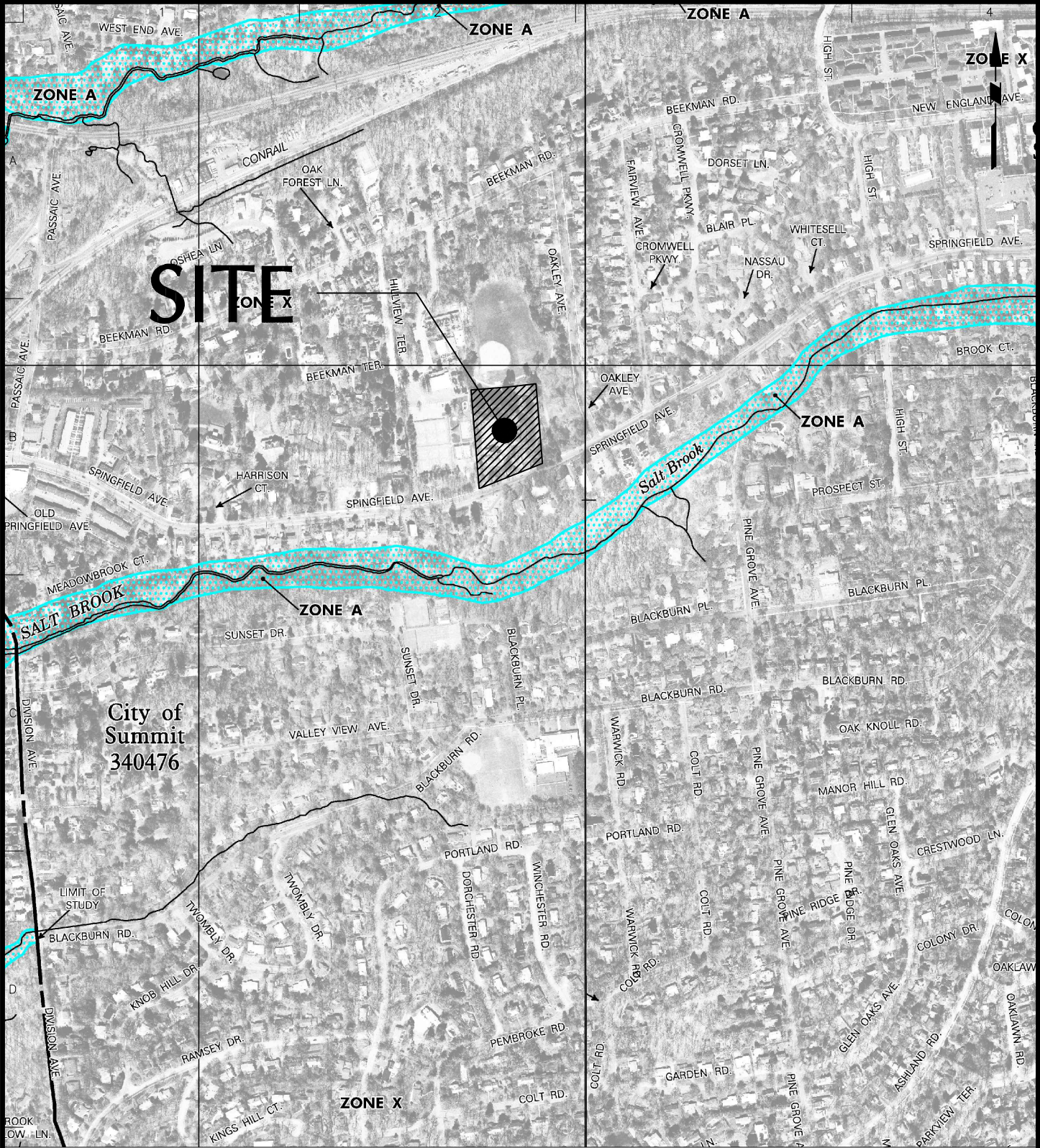
Project No. 101007201

REFERENCE: CHATHAM, NJ USGS QUADRANGLE DATED 2019  
 ROSELLE, NJ USGS QUADRANGLE DATED 2019

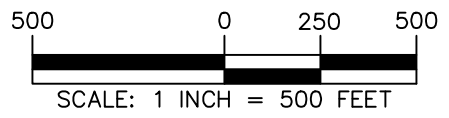


|   |   |  |                                 |                       |
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|   | Date<br><b>FEBRUARY 9, 2024</b>   | Drawn By<br><b>SM</b>                                  | Checked By<br><b>MV</b>         | Sheet 1 of 1          |

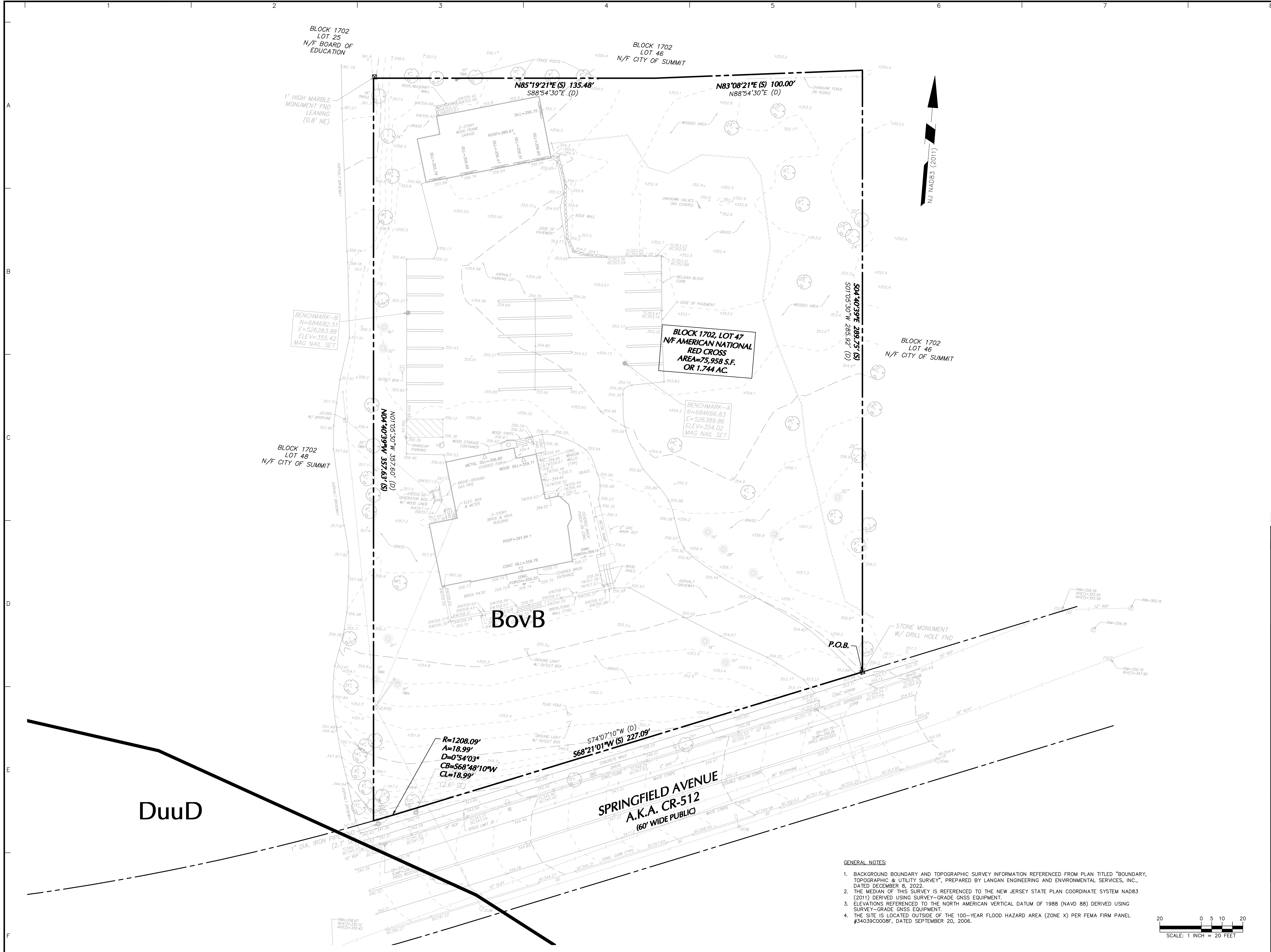
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REFERENCE: FEMA FLOOD INSURANCE RATE MAP OF UNION COUNTY, NEW JERSEY, MAP NUMBER 34039C0008F AND 34039C0009F, EFFECTIVE DATE SEPTEMBER 20, 2006.



|  |  |                |                          |                  |
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|  | BEACON UNITARIAN<br>UNIVERSALIST<br>CHURCH | FEMA FLOOD MAP | 101007201                | FG02             |
|  | SUMMIT                                     |                | Date<br>FEBRUARY 9, 2024 |                  |
|  | UNION COUNTY NEW JERSEY                    |                | Drawn By<br>SM           | Checked By<br>MV |
|  |  |                | Sheet 1 of 1             |                  |



BLOCK 1702  
LOT 25  
N/F BOARD OF  
EDUCATION

BLOCK 1702  
LOT 46  
N/F CITY OF SUMMIT

BLOCK 1702, LOT 47  
N/F AMERICAN NATIONAL  
RED CROSS  
AREA=75,958 S.F.  
OR 1.744 AC.

BLOCK 1702  
LOT 48  
N/F CITY OF SUMMIT

$R=1208.09'$   
 $A=18.99'$   
 $D=0^{\circ}54'03''$   
 $CB=568^{\circ}48'10''W$   
 $CL=18.99'$   
(2.6'-SE)

$S74^{\circ}07'10''W$  (D)  
 $S68^{\circ}21'01''W$  (S) 227.09'

DuuD

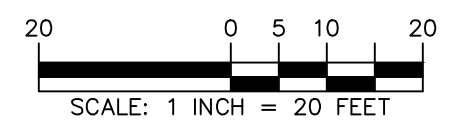
BovB

P.O.B.

SPRINGFIELD AVENUE  
A.K.A. CR-512  
(60' WIDE PUBLIC)

GENERAL NOTES:

- BACKGROUND BOUNDARY AND TOPOGRAPHIC SURVEY INFORMATION REFERENCED FROM PLAN TITLED "BOUNDARY, TOPOGRAPHIC & UTILITY SURVEY", PREPARED BY LANGAN ENGINEERING AND ENVIRONMENTAL SERVICES, INC., DATED DECEMBER 8, 2022.
- THE MEDIAN OF THIS SURVEY IS REFERENCED TO THE NEW JERSEY STATE PLAN COORDINATE SYSTEM NAD83 (2011) DERIVED USING SURVEY-GRADE GNSS EQUIPMENT.
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- THE SITE IS LOCATED OUTSIDE OF THE 100-YEAR FLOOD HAZARD AREA (ZONE X) PER FEMA FIRM PANEL #34039C0008F, DATED SEPTEMBER 20, 2006.



| Date      | Description | No. |
|-----------|-------------|-----|
| Revisions |             |     |

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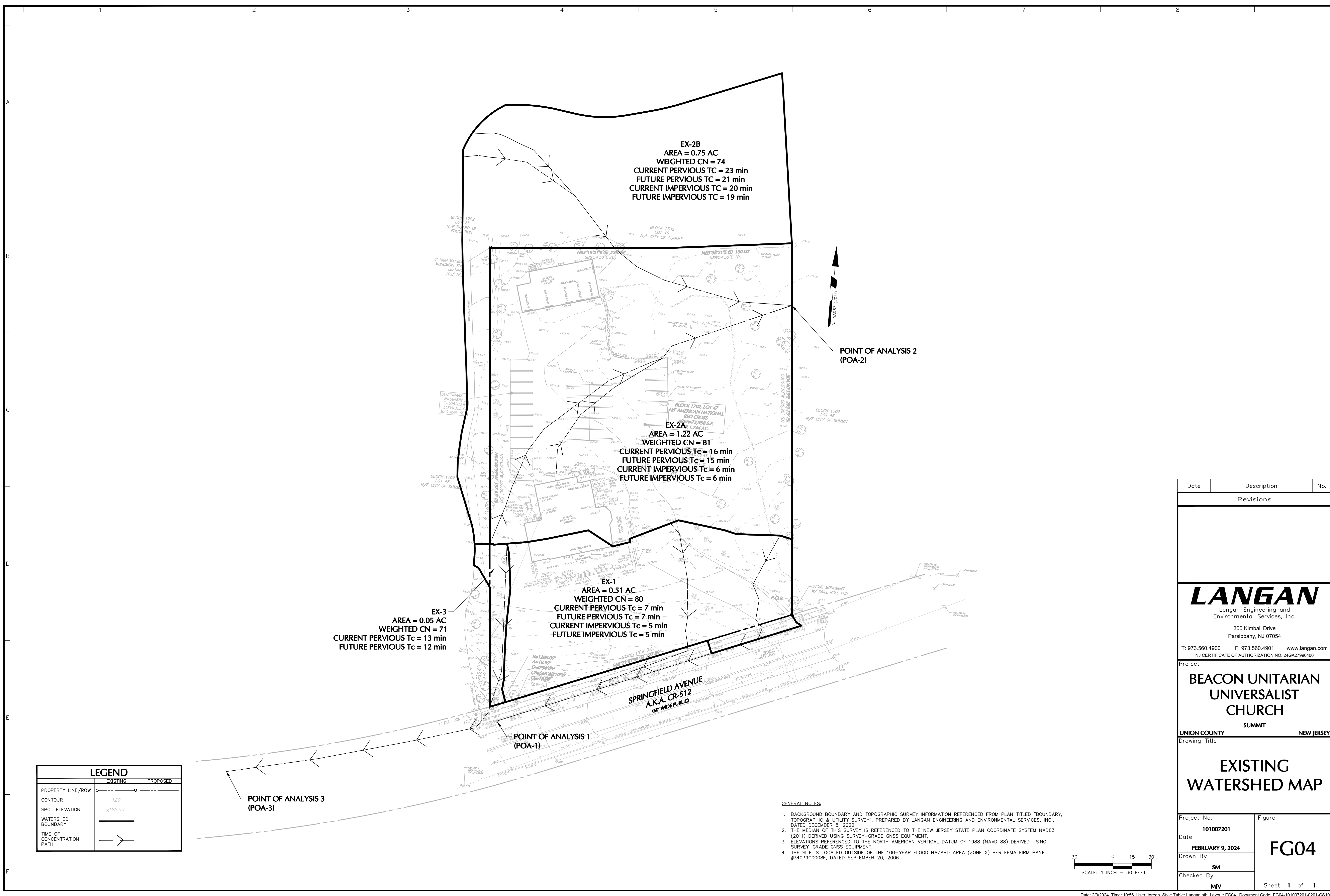
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NJ CERTIFICATE OF AUTHORIZATION NO. 24GA27996400

Project  
**BEACON UNITARIAN  
UNIVERSALIST  
CHURCH**  
SUMMIT NEW JERSEY

Drawing Title  
**SOILS MAP**

|                                 |                       |
|---------------------------------|-----------------------|
| Project No.<br><b>101007201</b> | Figure<br><b>FG03</b> |
| Date<br><b>FEBRUARY 9, 2024</b> |                       |
| Drawn By<br><b>SM</b>           |                       |
| Checked By<br><b>MJV</b>        |                       |
| Sheet 1 of 1                    |                       |





**EX-2B**  
 AREA = 0.75 AC  
 WEIGHTED CN = 74  
 CURRENT PERVIOUS TC = 23 min  
 FUTURE PERVIOUS TC = 21 min  
 CURRENT IMPERVIOUS TC = 20 min  
 FUTURE IMPERVIOUS TC = 19 min

**EX-2A**  
 AREA = 1.22 AC  
 WEIGHTED CN = 81  
 CURRENT PERVIOUS Tc = 16 min  
 FUTURE PERVIOUS Tc = 15 min  
 CURRENT IMPERVIOUS Tc = 6 min  
 FUTURE IMPERVIOUS Tc = 6 min

**EX-3**  
 AREA = 0.05 AC  
 WEIGHTED CN = 71  
 CURRENT PERVIOUS Tc = 13 min  
 FUTURE PERVIOUS Tc = 12 min

**EX-1**  
 AREA = 0.51 AC  
 WEIGHTED CN = 80  
 CURRENT PERVIOUS Tc = 7 min  
 FUTURE PERVIOUS Tc = 7 min  
 CURRENT IMPERVIOUS Tc = 5 min  
 FUTURE IMPERVIOUS Tc = 5 min

POINT OF ANALYSIS 2  
(POA-2)

POINT OF ANALYSIS 1  
(POA-1)

POINT OF ANALYSIS 3  
(POA-3)

SPRINGFIELD AVENUE  
 A.K.A. CR-512  
 (60' WIDE PUBLIC)

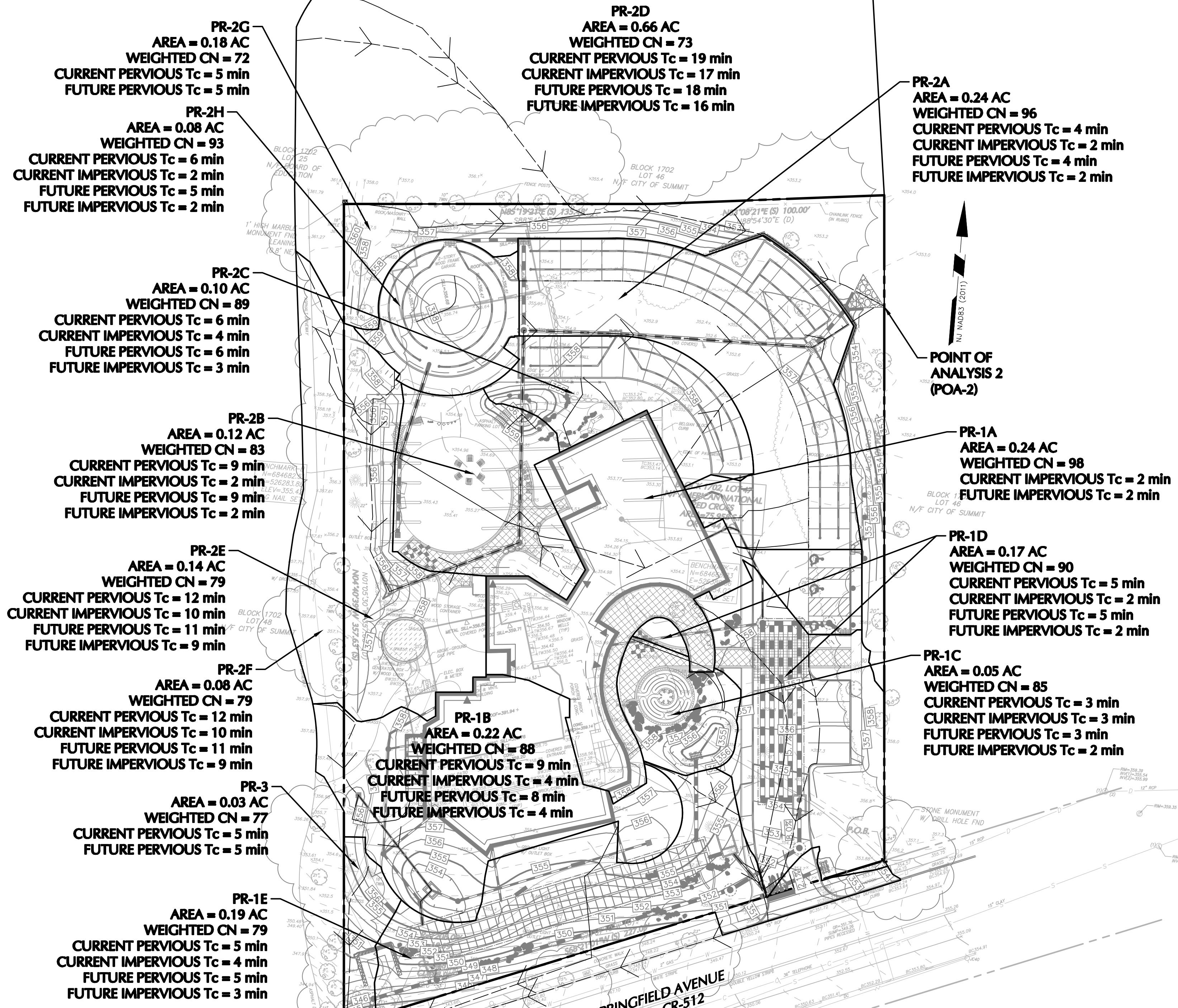
| LEGEND                     |          |
|----------------------------|----------|
| EXISTING                   | PROPOSED |
| PROPERTY LINE/ROW          | ○        |
| CONTOUR                    | —120—    |
| SPOT ELEVATION             | ×122.53  |
| WATERSHED BOUNDARY         | —        |
| TIME OF CONCENTRATION PATH | —>       |

GENERAL NOTES:

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|--|------------------|-----|
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| Project  |                  |     |
| <b>BEACON UNITARIAN<br/>UNIVERSALIST<br/>CHURCH</b>  |                  |     |
| SUMMIT NEW JERSEY  |                  |     |
| Drawing Title  |                  |     |
| <b>EXISTING<br/>WATERSHED MAP</b>  |                  |     |
| Project No.  | Figure           |     |
| 101007201  | FG04             |     |
| Date   | FEBRUARY 9, 2024 |     |
| Drawn By   | SM               |     |
| Checked By   | MV               |     |
| Sheet 1 of 1   |                  |     |



POINT OF ANALYSIS 2 (POA-2)

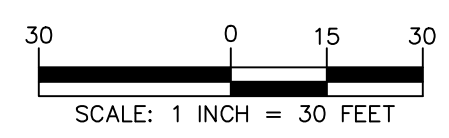
POINT OF ANALYSIS 1 (POA-1)

POINT OF ANALYSIS 3 (POA-3)

SPRINGFIELD AVENUE  
A.K.A. CR-512  
(60' WIDE PUBLIC)

| LEGEND                     |           |
|----------------------------|-----------|
| EXISTING                   | PROPOSED  |
| PROPERTY LINE/ROW          | ---       |
| CONTOUR                    | ---118--- |
| SPOT ELEVATION             | ×122.53   |
| WATERSHED BOUNDARY         | ---       |
| TIME OF CONCENTRATION PATH | ---       |

- GENERAL NOTES:
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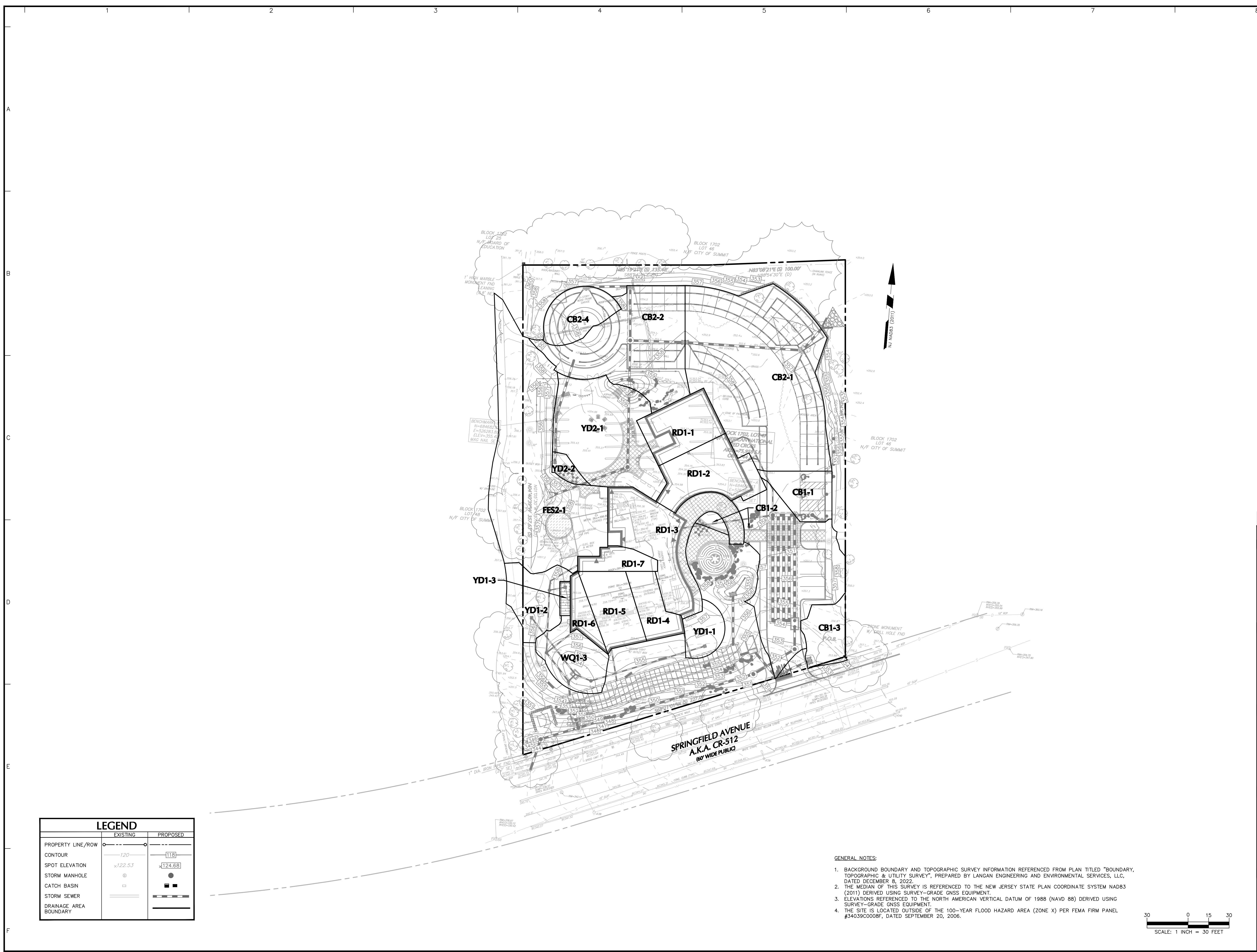
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Project  
**BEACON UNITARIAN UNIVERSALIST CHURCH**  
SUMMIT NEW JERSEY  
Drawing Title

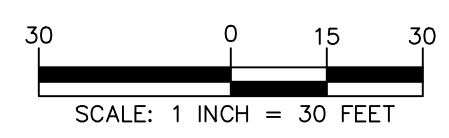
**PROPOSED WATERSHED MAP**

|                                 |                       |
|---------------------------------|-----------------------|
| Project No.<br><b>101007201</b> | Figure<br><b>FG05</b> |
| Date<br><b>FEBRUARY 9, 2024</b> |                       |
| Drawn By<br><b>SM</b>           |                       |
| Checked By<br><b>MJV</b>        |                       |
| Sheet <b>1</b> of <b>1</b>      |                       |



| LEGEND                 |          |
|------------------------|----------|
| EXISTING               | PROPOSED |
| PROPERTY LINE/ROW      | ○        |
| CONTOUR                | 120      |
| SPOT ELEVATION         | x122.53  |
| STORM MANHOLE          | ⊙        |
| CATCH BASIN            | □        |
| STORM SEWER            | —        |
| DRAINAGE AREA BOUNDARY | —        |

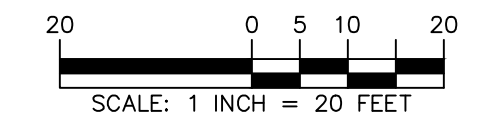
- GENERAL NOTES:
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| Project   |                  |        |
| <b>BEACON UNITARIAN UNIVERSALIST CHURCH</b><br>SUMMIT NEW JERSEY  |                  |        |
| Drawing Title   |                  |        |
| <b>PROPOSED DRAINAGE SUBAREA MAP</b>  |                  |        |
| Project No.   | Figure           |        |
| 101007201   | FG06             |        |
| Date  | FEBRUARY 9, 2024 |        |
| Drawn By  | SM               |        |
| Checked By  | MVV              |        |
| Sheet   |                  | 1 of 1 |



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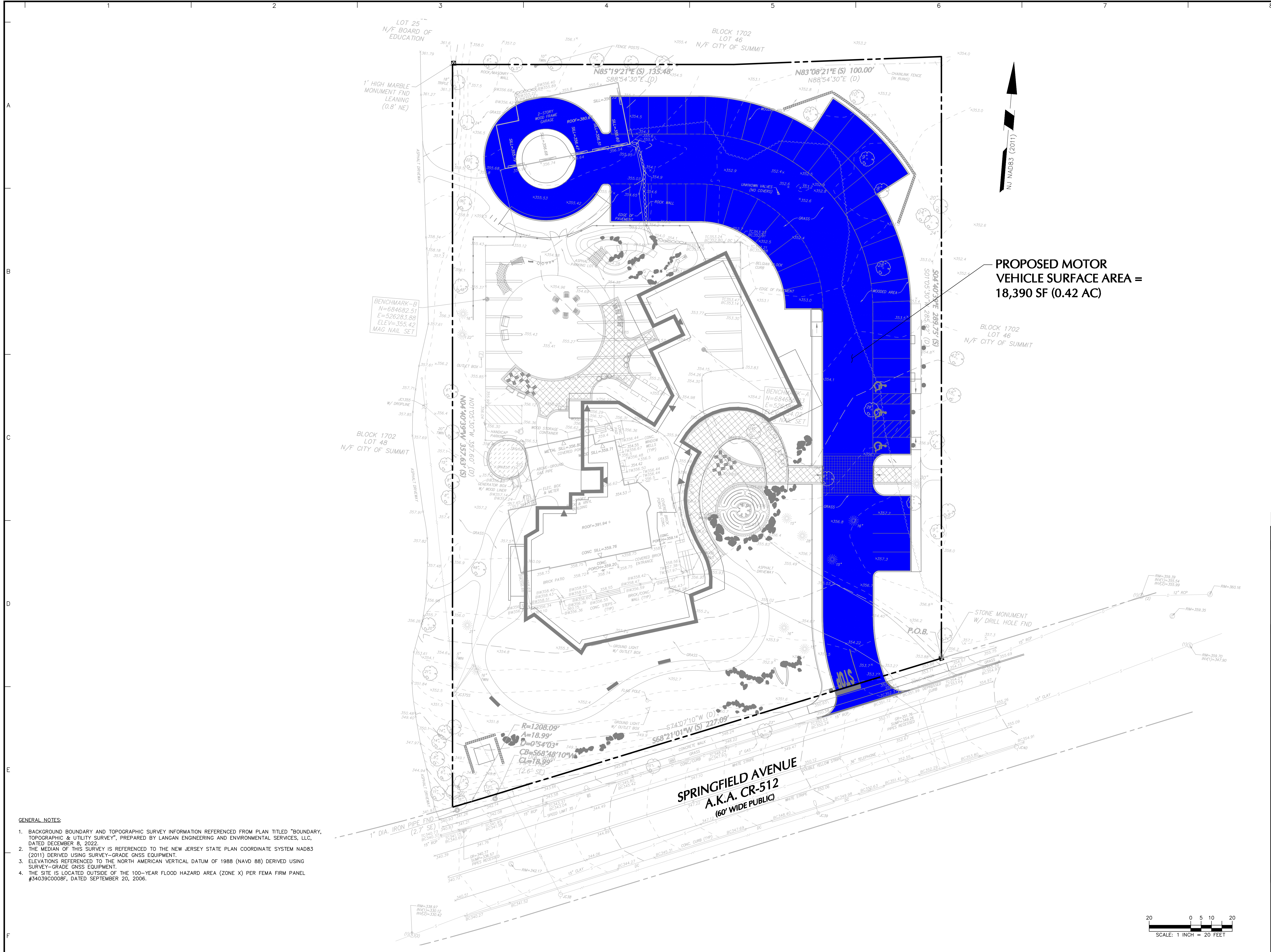
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Project  
**BEACON UNITARIAN  
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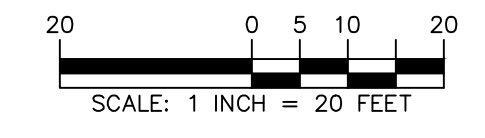
Drawing Title  
**EXISTING  
 REGULATED  
 MOTOR VEHICLE  
 SURFACE MAP**

|                                 |                       |
|---------------------------------|-----------------------|
| Project No.<br><b>101007201</b> | Figure<br><b>FG07</b> |
| Date<br><b>FEBRUARY 9, 2024</b> |                       |
| Drawn By<br><b>TEG</b>          |                       |
| Checked By<br><b>MJV</b>        |                       |
| Sheet 1 of 1                    |                       |



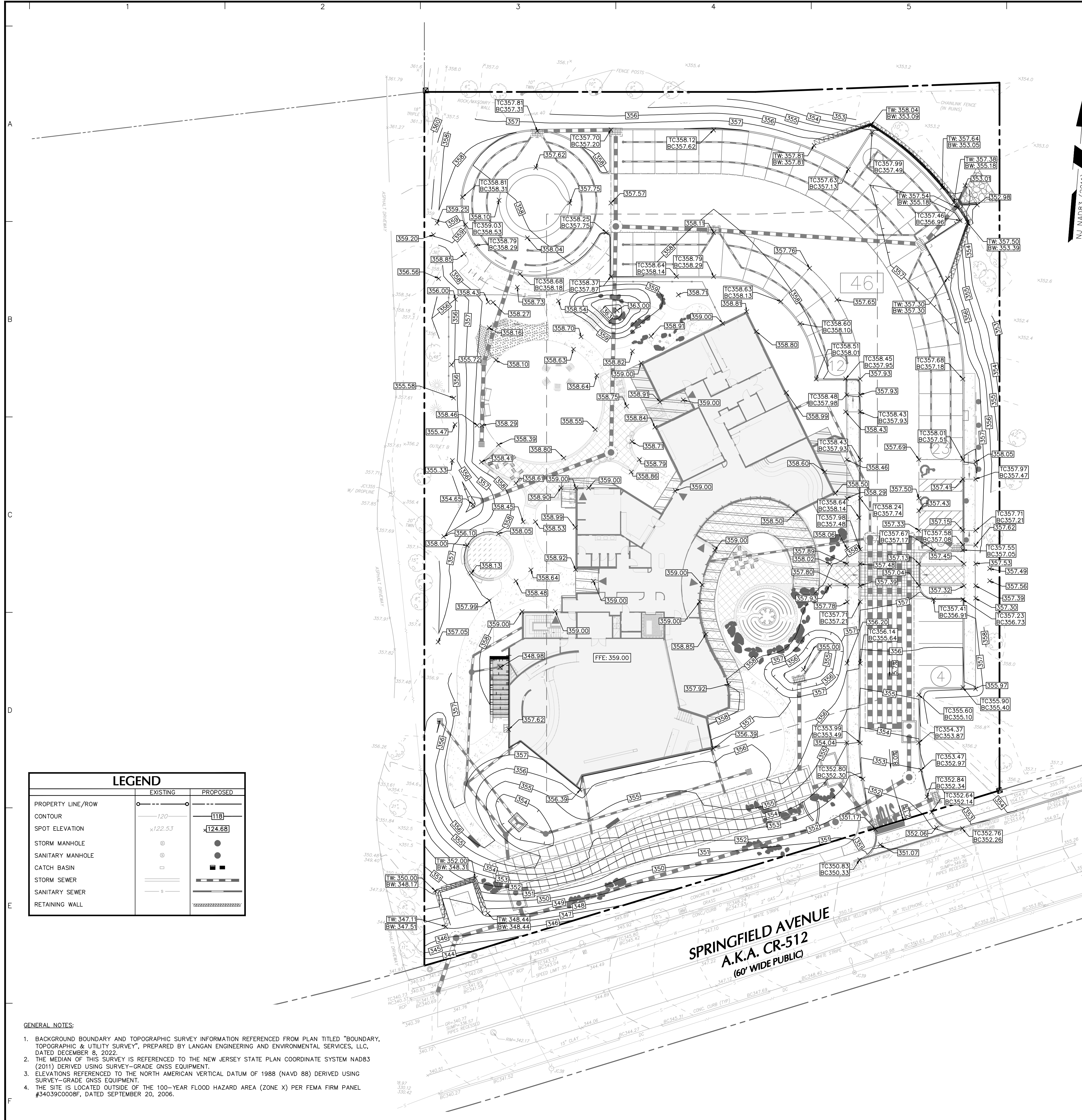
**PROPOSED MOTOR VEHICLE SURFACE AREA = 18,390 SF (0.42 AC)**

- GENERAL NOTES:**
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| <b>PROPOSED REGULATED MOTOR VEHICLE SURFACE MAP</b>  |                  |     |
| Project No.  | Figure           |     |
| 101007201  | FG08             |     |
| Date   | FEBRUARY 9, 2024 |     |
| Drawn By   | TEG              |     |
| Checked By   | MVJ              |     |
| Sheet 1 of 1   |                  |     |

# **DRAWINGS**



**GRADING AND DRAINAGE PLAN NOTES:**

1. THE CONTRACTOR IS SPECIFICALLY CAUTIONED THAT THE LOCATION AND / OR ELEVATION OF EXISTING UTILITIES AS SHOWN ON THESE PLANS IS BASED ON RECORDS OF VARIOUS UTILITY COMPANIES AND, WHERE POSSIBLE MEASUREMENTS TAKEN IN THE FIELD. THE INFORMATION IS NOT TO BE RELIED ON AS BEING EXACT OR COMPLETE. THE CONTRACTOR MUST CALL THE APPROPRIATE UTILITY COMPANY AT LEAST 48 HOURS BEFORE ANY EXCAVATION TO REQUEST EXACT FIELD LOCATION OF UTILITIES. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO RELOCATE ALL EXISTING UTILITIES, WHICH CONFLICT WITH THE PROPOSED IMPROVEMENTS SHOWN ON THE PLANS.
2. CONTRACTOR SHALL REFER TO ARCHITECTURAL PLANS AND SPECIFICATIONS FOR ACTUAL LOCATIONS OF ALL UTILITY ENTRANCES TO INCLUDE SANITARY SEWER LATERALS, DOMESTIC WATER SERVICE, ELECTRICAL TELEPHONE AND GAS SERVICE. CONTRACTOR SHALL COORDINATE INSTALLATION OF UTILITIES IN SUCH A MANNER AS TO AVOID CONFLICTS AND TO ENSURE PROPER DEPTHS ARE ACHIEVED AS WELL AS COORDINATING WITH THE UTILITY COMPANIES AS TO LOCATION AND SCHEDULING OF CONNECTIONS TO THEIR FACILITIES.
3. PVC = POLYVINYL CHLORIDE PIPE  
HDPE = HIGH DENSITY POLYETHYLENE PIPE  
RCP = REINFORCED CONCRETE PIPE
4. STORM DRAINAGE PIPING TO UTILIZE WATER TIGHT JOINTS.
5. COMPACTION CRITERIA FOR FILL PLACEMENT IN THE FOLLOWING AREAS SHALL MEET OR EXCEED THE FOLLOWING MINIMUM PERCENTAGE OF MAXIMUM MODIFIED PROCTOR DRY DENSITY AS DETERMINED BY ASTM D-1557 USED ON REPRESENTATIVE SOIL SAMPLES, UNLESS MORE STRINGENT CRITERIA GIVEN ELSEWHERE:
 

| FILL AREA             | PERCENT OF MAXIMUM MODIFIED PROCTOR DRY DENSITY |
|-----------------------|---|
| BUILDING FOOTPRINT    | 95%   |
| PAVEMENT AND ROADWAYS | 98%   |
| SIDEWALKS             | 95%   |
| LANDSCAPE AREAS       | 90%   |
| TRENCH BACKFILL       | 95%   |
6. PROTECT SUBGRADE FROM EXCESSIVE WHEEL LOADING DURING CONSTRUCTION, INCLUDING CONCRETE TRUCKS AND DUMP TRUCKS.
7. REMOVE AREAS OF FINISHED SUBGRADE FOUND TO HAVE INSUFFICIENT COMPACTION DENSITY TO DEPTH NECESSARY AND REPLACE IN A MANNER THAT WILL COMPLY WITH COMPACTION REQUIREMENTS BY USE OF MATERIAL EQUAL TO OR BETTER THAN BEST SUBGRADE MATERIAL ON SITE. SURFACE OF SUBGRADE AFTER COMPACTION SHALL BE HARD, UNIFORM, SMOOTH, STABLE, AND TRUE TO GRADE AND CROSS SECTION.
8. ALL CONCRETE, UNLESS OTHERWISE NOTED OR SPECIFIED BY REGULATORY AUTHORITIES, SHALL BE A MINIMUM OF 4,000 PSI.
9. THE CONTRACTOR SHALL REVIEW THE STORM DRAINAGE CONNECTIONS TO THE INLETS, MANHOLES, ETC. AND PROVIDE THE APPROPRIATE BOX SIZE, MANHOLES SIZE, TOP PIECES, ETC. AS NECESSARY TO ACCOMMODATE THE PROPOSED INLET AND OUTLET PIPES.
10. CONTRACTOR TO PROVIDE A SHOP DRAWING FOR REVIEW AND APPROVAL BY THE OWNER'S ENGINEER FOR EACH CATCH BASIN, MANHOLE, AND OTHER PRECAST STORM STRUCTURES DETAILING STRUCTURE DIMENSIONS, LOCATION OF STEPS, PIPE CONNECTIONS AND OPENINGS, AND RIM/GRATE/INVERT ELEVATIONS. A SHOP DRAWING, SIGNED AND SEALED BY A PROFESSIONAL ENGINEER LICENSED IN THE STATE OF NEW JERSEY, SHALL BE PROVIDED FOR EACH TYPE OF PRECAST CONCRETE STRUCTURE THAT DETAILS THE STRUCTURAL DESIGN. ALL PRECAST STRUCTURES AND FRAMES/GRATES SHALL MEET H-20 TRAFFIC LOADING REQUIREMENTS. CATCH BASINS, MANHOLES, AND DETENTION SYSTEM PIPING SHALL BE CONSTRUCTED IN A MANNER THAT WILL PREVENT FLOATION DUE TO GROUNDWATER. CONTRACTOR SHALL SUBMIT METHODOLOGY AND SUPPORTING BUOYANCY CALCULATIONS PREPARED BY AND SIGNED/SEALED BY A PROFESSIONAL ENGINEER LICENSED IN THE STATE OF NEW JERSEY FOR ANTI-FLOATION OF THE STORM STRUCTURES IF THEY ARE TO BE LOCATED WITHIN THE GROUNDWATER TABLE.
11. THE CONTRACTOR SHALL PROVIDE A RETAINING WALL DESIGN FOR EACH PROPOSED WALL PREPARED BY A PROFESSIONAL ENGINEER LICENSED IN THE STATE OF NEW JERSEY FOR REVIEW BY THE OWNER'S ENGINEER PRIOR TO INSTALLATION. THE CONTRACTOR AND THE RETAINING WALL DESIGNER SHALL SPECIFICALLY NOTE ANY EXISTING OR PROPOSED STRUCTURES THAT ARE LOCATED IN OR NEAR THE WALL (INLETS, LIGHT POLES, FENCES, STORM PIPES, UTILITIES, GUIDE RAILS, AND OTHER FEATURES) AND SHALL COORDINATE DESIGN AND INSTALLATION OF RETAINING WALL SUCH THAT THE FEATURES ARE ACCOMMODATED IN THE DESIGN AS APPROPRIATE.
12. PIPE LENGTHS PROVIDED ARE MEASURED FROM CENTER OF STRUCTURE TO CENTER OF STRUCTURE.
13. CONTRACTOR SHALL CLEAR EXISTING STORM PIPES OF ANY DEBRIS OR SEDIMENT.
14. TRENCH DEPTH REQUIREMENTS MEASURED FROM FINISHED GRADE OR PAVED SURFACE SHALL MEET THE FOLLOWING REQUIREMENTS OR APPLICABLE CODES AND ORDINANCES:
  - a. SANITARY SEWER: DEPTHS, ELEVATIONS AND GRADES AS INDICATED ON DRAWINGS.
  - b. STORM SEWER: DEPTHS, ELEVATIONS, AND GRADES AS SHOWN ON DRAWINGS.
  - c. ELECTRICAL CONDUITS: 24 INCHES MINIMUM TO TOP OF CONDUIT OR AS REQUIRED BY NEC 300-5, NEC 710-36 CODES, OR THE LOCAL UTILITY COMPANY REQUIREMENTS, WHICHEVER IS DEEPER.
  - d. TV CONDUITS: 18 INCHES MINIMUM TO TOP OF CONDUIT OR AS REQUIRED BY THE LOCAL UTILITY COMPANY, WHICHEVER IS DEEPER.
  - e. TELEPHONE CONDUITS: 18 INCHES MINIMUM TO TOP OF CONDUIT OR AS REQUIRED BY THE LOCAL UTILITY COMPANY, WHICHEVER IS DEEPER.
  - f. GAS MAINS AND SERVICE: 30 INCHES MINIMUM TO TOP OF PIPE, OR AS REQUIRED BY THE LOCAL UTILITY COMPANY, WHICHEVER IS DEEPER.
15. SITE GRADING SHALL NOT PROCEED UNTIL ALL EROSION CONTROL MEASURES HAVE BEEN INSTALLED.
16. CONTRACTOR SHALL PROVIDE WRITTEN REQUESTS FOR INFORMATION TO THE OWNER AND OWNER'S ENGINEER PRIOR TO THE CONSTRUCTION OF ANY SPECIFIC SITEMARK ITEM IF ANY SPECIFIC SITEMARK ITEM DEPICTED ON THE PLANS WARRANTS ADDITIONAL INFORMATION REQUIRED FOR CONSTRUCTION AND IS NOT RELATED TO MEANS AND METHODS OF CONSTRUCTION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR SPECIFIC SITE WORK ITEMS INSTALLED DIFFERENTLY THAN INTENDED AS DEPICTED ON THE PLANS IN THE ABSENCE OF SUBMITTING AND ADDRESSING WRITTEN REQUESTS FOR INFORMATION.
17. PROPOSED SIDEWALKS SHALL BE CONSTRUCTED WITH CROSS-SLOPES THAT DO NOT EXCEED 1.5%.

| Date     | Description               | No. |
|----------|---------------------------|-----|
| 5/22/25  | REVISED PER CITY COMMENTS | 2   |
| 07/18/24 | REVISED PER TRC COMMENTS  | 1   |

**Revisions**

Digitally signed by  
**John C Cote**  
 Date: 2025.07.02  
 09:35:31-04'00'

SIGNATURE: JOHN COTE DATE: \_\_\_\_\_  
 PROFESSIONAL ENGINEER NJ Lic. No. 24GE03705800

**LANGAN**  
 Langan Engineering and Environmental Services, LLC  
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 NJ CERTIFICATE OF AUTHORIZATION NO. 24GA27996400

Project: **BEACON UNITARIAN UNIVERSALIST CONGREGATION**  
 SUMMIT NEW JERSEY

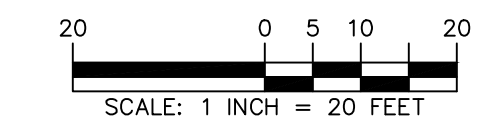
**GRADING PLAN**

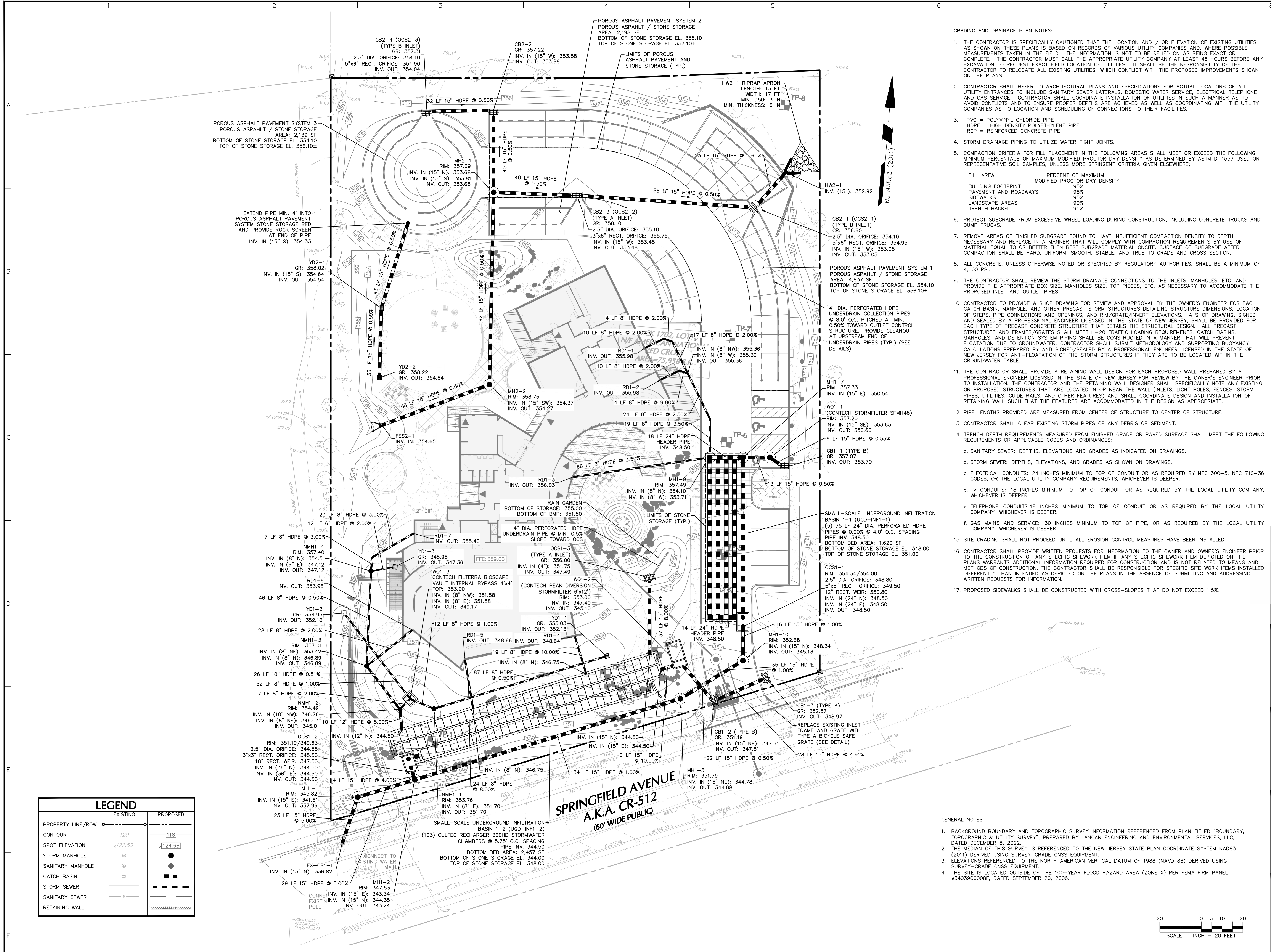
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| Project No. | 101007201        | Drawing No. | <b>CG101</b> |         |
| Date        | FEBRUARY 9, 2024 | Sheet       |              | 7 of 19 |
| Drawn By    | SM               |             |              |         |
| Checked By  | TH               |             |              |         |

**LEGEND**

|                   | EXISTING | PROPOSED |
|-------------------|----------|----------|
| PROPERTY LINE/ROW | —        | —        |
| CONTOUR           | 120      | 118      |
| SPOT ELEVATION    | 122.53   | 124.68   |
| STORM MANHOLE     | ○        | ●        |
| SANITARY MANHOLE  | ○        | ●        |
| CATCH BASIN       | □        | ■        |
| STORM SEWER       | —        | —        |
| SANITARY SEWER    | —        | —        |
| RETAINING WALL    | —        | —        |

- GENERAL NOTES:**
1. BACKGROUND BOUNDARY AND TOPOGRAPHIC SURVEY INFORMATION REFERENCED FROM PLAN TITLED "BOUNDARY, TOPOGRAPHIC & UTILITY SURVEY", PREPARED BY LANGAN ENGINEERING AND ENVIRONMENTAL SERVICES, LLC, DATED DECEMBER 8, 2022.
  2. THE MEDIAN OF THIS SURVEY IS REFERENCED TO THE NEW JERSEY STATE PLAN COORDINATE SYSTEM NAD83 (2011) DERIVED USING SURVEY-GRADE GNSS EQUIPMENT.
  3. ELEVATIONS REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88) DERIVED USING SURVEY-GRADE GNSS EQUIPMENT.
  4. THE SITE IS LOCATED OUTSIDE OF THE 100-YEAR FLOOD HAZARD AREA (ZONE X) PER FEMA FIRM PANEL #34039C0008F, DATED SEPTEMBER 20, 2006.





- GRADING AND DRAINAGE PLAN NOTES:**
- THE CONTRACTOR IS SPECIFICALLY CAUTIONED THAT THE LOCATION AND / OR ELEVATION OF EXISTING UTILITIES AS SHOWN ON THESE PLANS IS BASED ON RECORDS OF VARIOUS UTILITY COMPANIES AND, WHERE POSSIBLE MEASUREMENTS TAKEN IN THE FIELD. THE INFORMATION IS NOT TO BE RELIED ON AS BEING EXACT OR COMPLETE. THE CONTRACTOR MUST CALL THE APPROPRIATE UTILITY COMPANY AT LEAST 48 HOURS BEFORE ANY EXCAVATION TO REQUEST EXACT FIELD LOCATION OF UTILITIES. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO RELOCATE ALL EXISTING UTILITIES, WHICH CONFLICT WITH THE PROPOSED IMPROVEMENTS SHOWN ON THE PLANS.
  - CONTRACTOR SHALL REFER TO ARCHITECTURAL PLANS AND SPECIFICATIONS FOR ACTUAL LOCATIONS OF ALL UTILITY ENTRANCES TO INCLUDE SANITARY SEWER LATERALS, DOMESTIC WATER SERVICE, ELECTRICAL TELEPHONE AND GAS SERVICE. CONTRACTOR SHALL COORDINATE INSTALLATION OF UTILITIES IN SUCH A MANNER AS TO AVOID CONFLICTS AND TO ENSURE PROPER DEPTHS ARE ACHIEVED AS WELL AS COORDINATING WITH THE UTILITY COMPANIES AS TO LOCATION AND SCHEDULING OF CONNECTIONS TO THEIR FACILITIES.
  - PVC = POLYVINYL CHLORIDE PIPE  
HDPE = HIGH DENSITY POLYETHYLENE PIPE  
RCP = REINFORCED CONCRETE PIPE
  - STORM DRAINAGE PIPING TO UTILIZE WATER TIGHT JOINTS.
  - COMPACTION CRITERIA FOR FILL PLACEMENT IN THE FOLLOWING AREAS SHALL MEET OR EXCEED THE FOLLOWING MINIMUM PERCENTAGE OF MAXIMUM MODIFIED PROCTOR DRY DENSITY AS DETERMINED BY ASTM D-1557 USED ON REPRESENTATIVE SOIL SAMPLES, UNLESS MORE STRINGENT CRITERIA GIVEN ELSEWHERE:
 

| FILL AREA             | PERCENT OF MAXIMUM MODIFIED PROCTOR DRY DENSITY |
|-----------------------|---|
| BUILDING FOOTPRINT    | 95%   |
| PAVEMENT AND ROADWAYS | 98%   |
| SIDEWALKS             | 95%   |
| LANDSCAPE AREAS       | 90%   |
| TRENCH BACKFILL       | 95%   |
  - PROTECT SUBGRADE FROM EXCESSIVE WHEEL LOADING DURING CONSTRUCTION, INCLUDING CONCRETE TRUCKS AND DUMP TRUCKS.
  - REMOVE AREAS OF FINISHED SUBGRADE FOUND TO HAVE INSUFFICIENT COMPACTION DENSITY TO DEPTH NECESSARY AND REPLACE IN A MANNER THAT WILL COMPLY WITH COMPACTION REQUIREMENTS BY USE OF MATERIAL EQUAL TO OR BETTER THAN BEST SUBGRADE MATERIAL ON SITE. SURFACE OF SUBGRADE AFTER COMPACTION SHALL BE HARD, UNIFORM, SMOOTH, STABLE, AND TRUE TO GRADE AND CROSS SECTION.
  - ALL CONCRETE, UNLESS OTHERWISE NOTED OR SPECIFIED BY REGULATORY AUTHORITIES, SHALL BE A MINIMUM OF 4,000 PSI.
  - THE CONTRACTOR SHALL REVIEW THE STORM DRAINAGE CONNECTIONS TO THE INLETS, MANHOLES, ETC. AND PROVIDE THE APPROPRIATE BOX SIZE, MANHOLES SIZE, TOP PIECES, ETC. AS NECESSARY TO ACCOMMODATE THE PROPOSED INLET AND OUTLET PIPES.
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  - PROPOSED SIDEWALKS SHALL BE CONSTRUCTED WITH CROSS-SLOPES THAT DO NOT EXCEED 1.5%.

| Date     | Description               | No. |
|----------|---------------------------|-----|
| 7/01/25  | REVISED PER CITY COMMENTS | 3   |
| 5/22/25  | REVISED PER CITY COMMENTS | 2   |
| 07/18/24 | REVISED PER TRC COMMENTS  | 1   |

Revisions

Digitally signed by  
John C Cote  
Date: 2025.07.02  
09:35:34-04'00'

SIGNATURE JOHN COTE DATE  
PROFESSIONAL ENGINEER NJ Lic. No. 24GE03705800

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NJ CERTIFICATE OF AUTHORIZATION NO. 24GA27996400

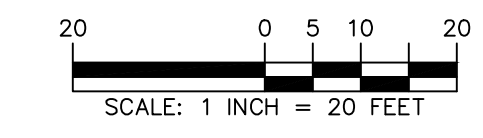
Project  
**BEACON UNITARIAN UNIVERSALIST CONGREGATION**  
SUMMIT NEW JERSEY

Drawing Title  
**DRAINAGE PLAN**

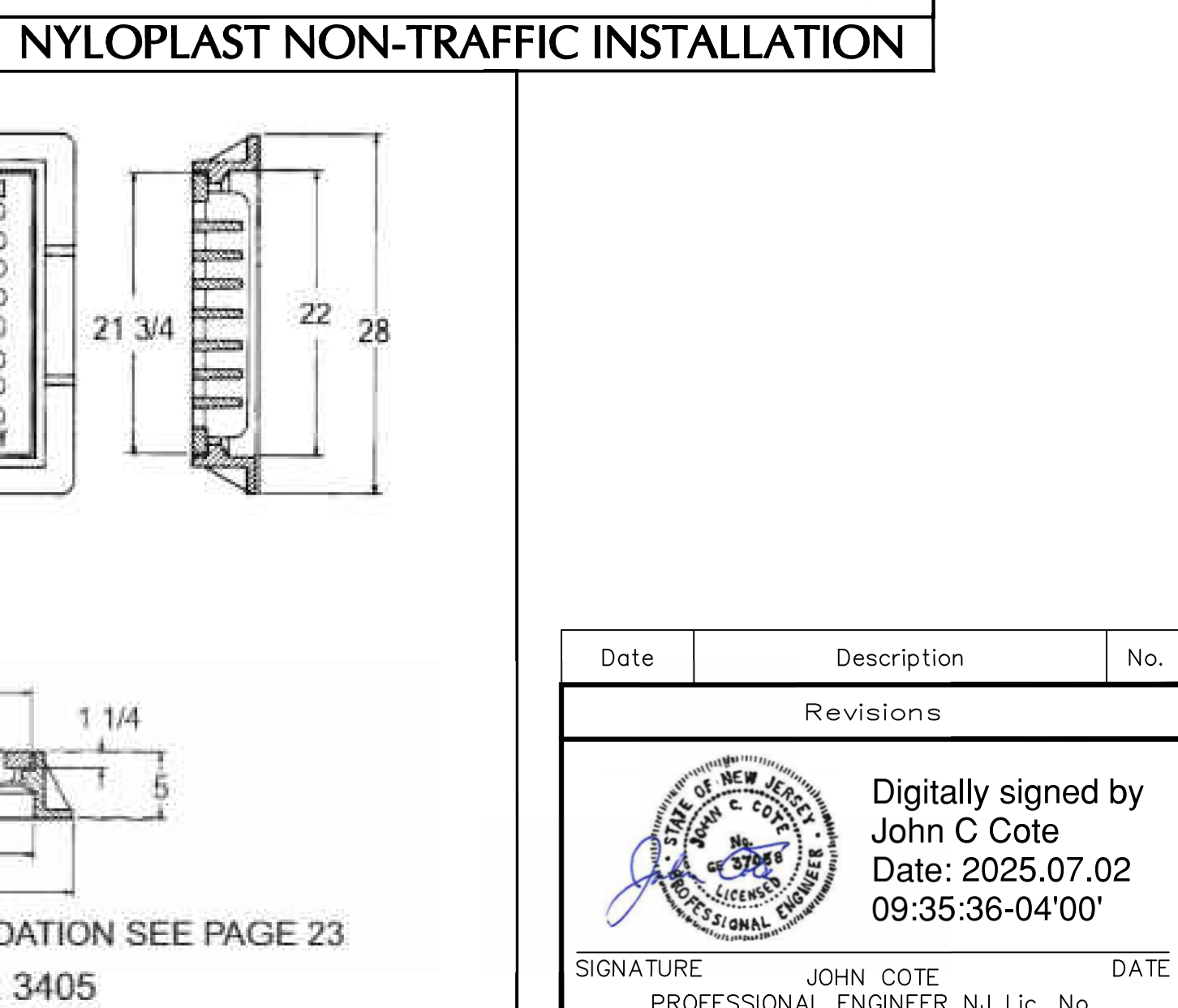
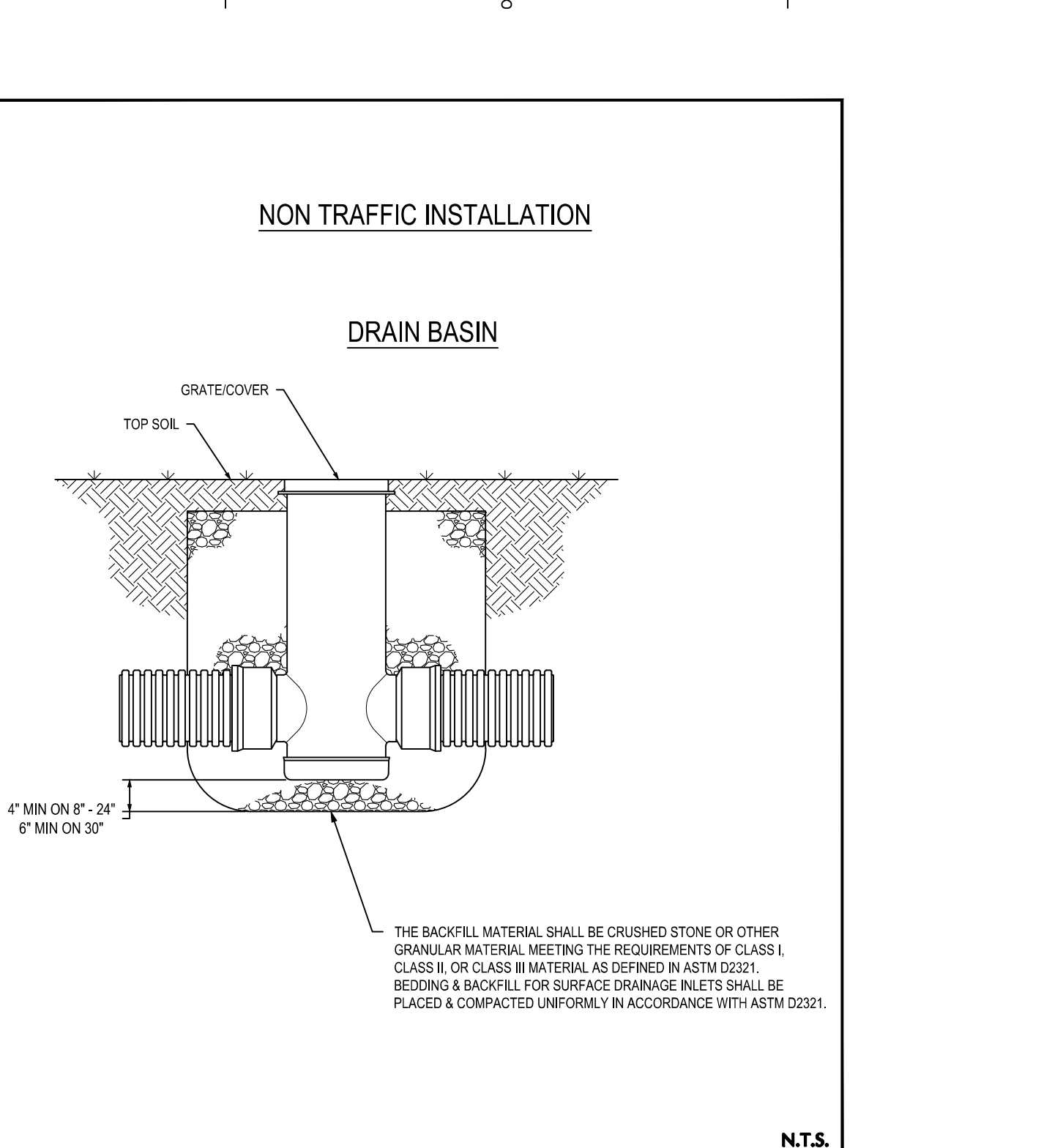
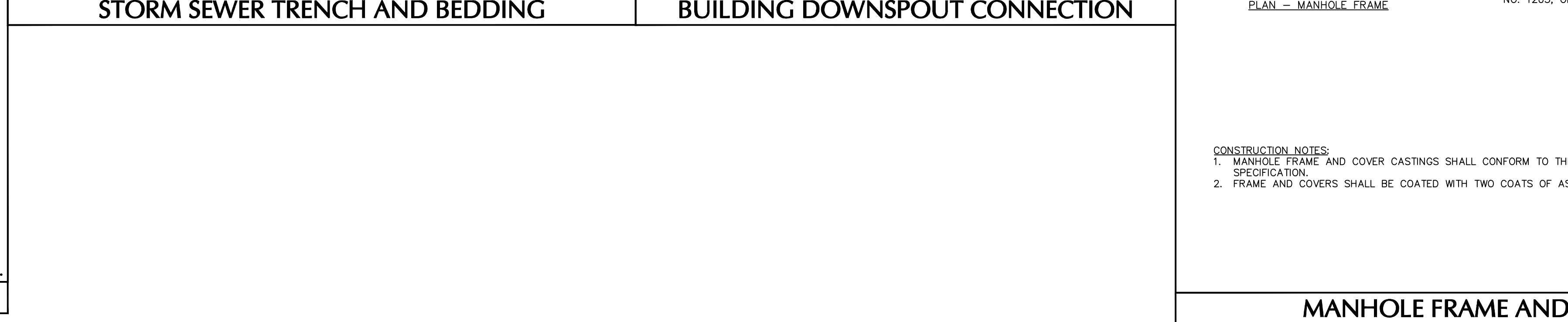
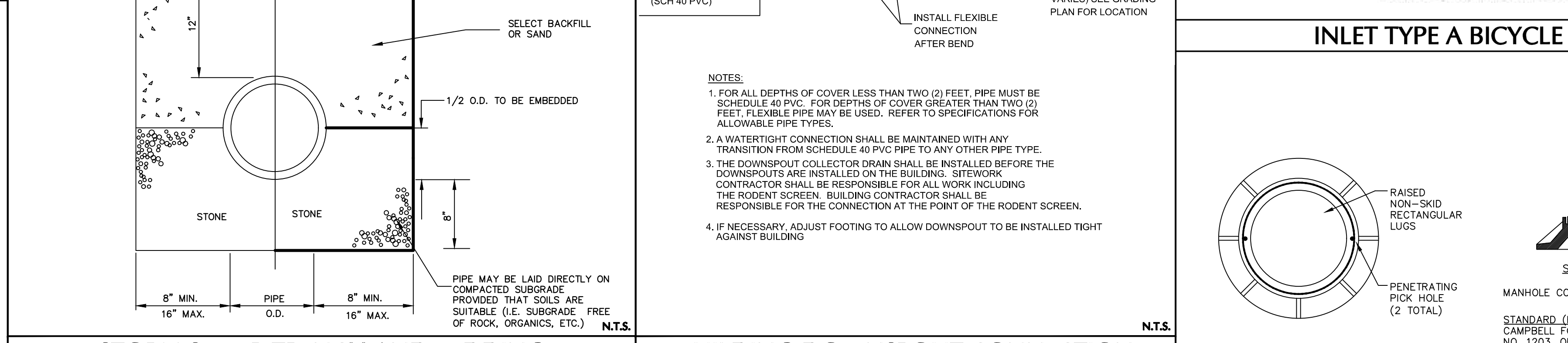
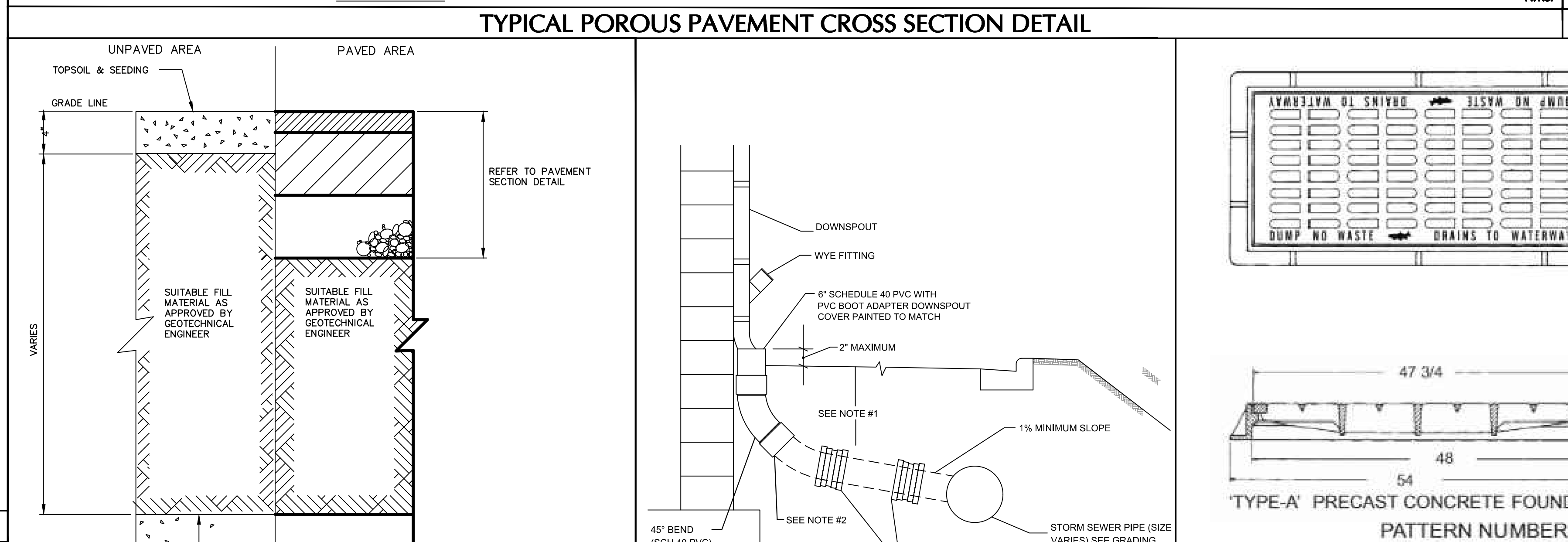
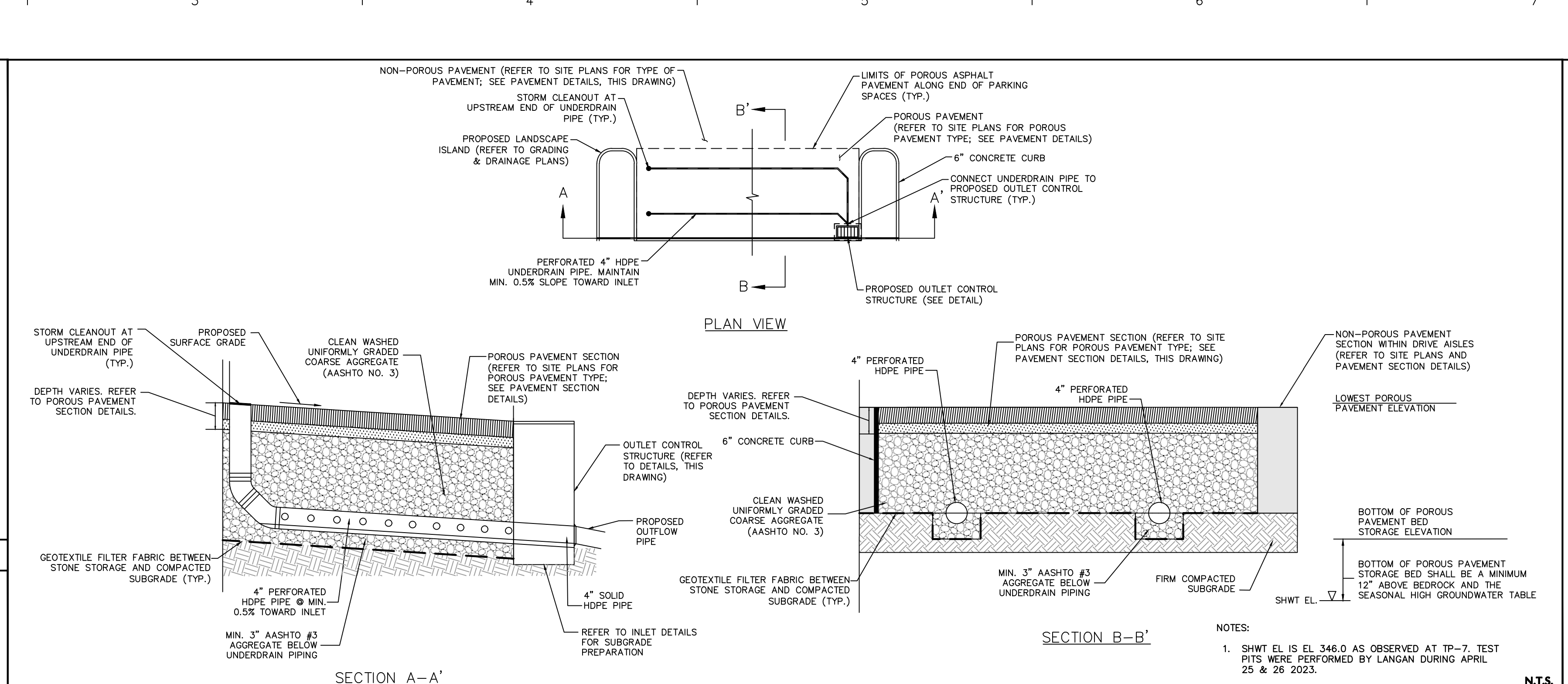
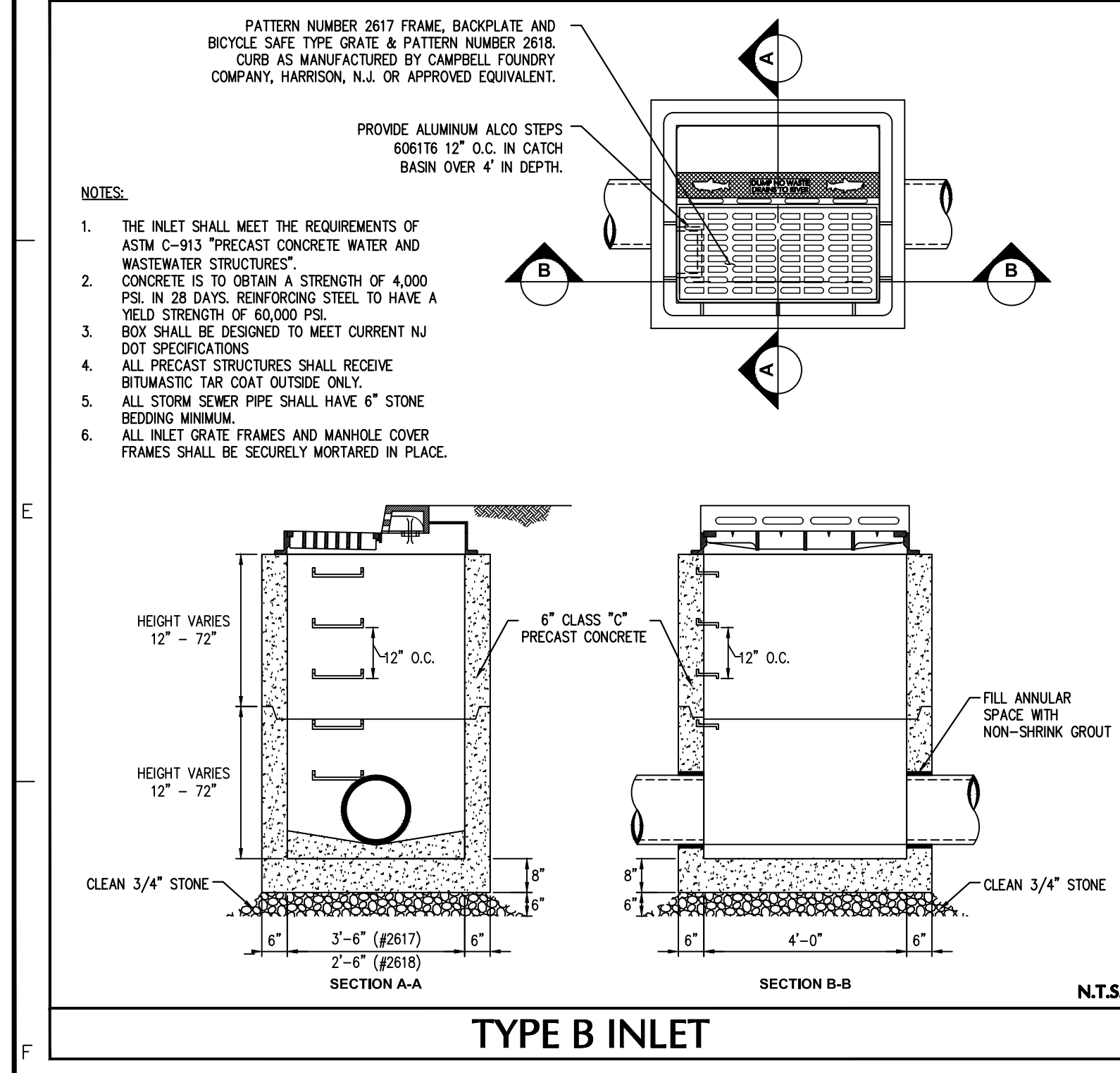
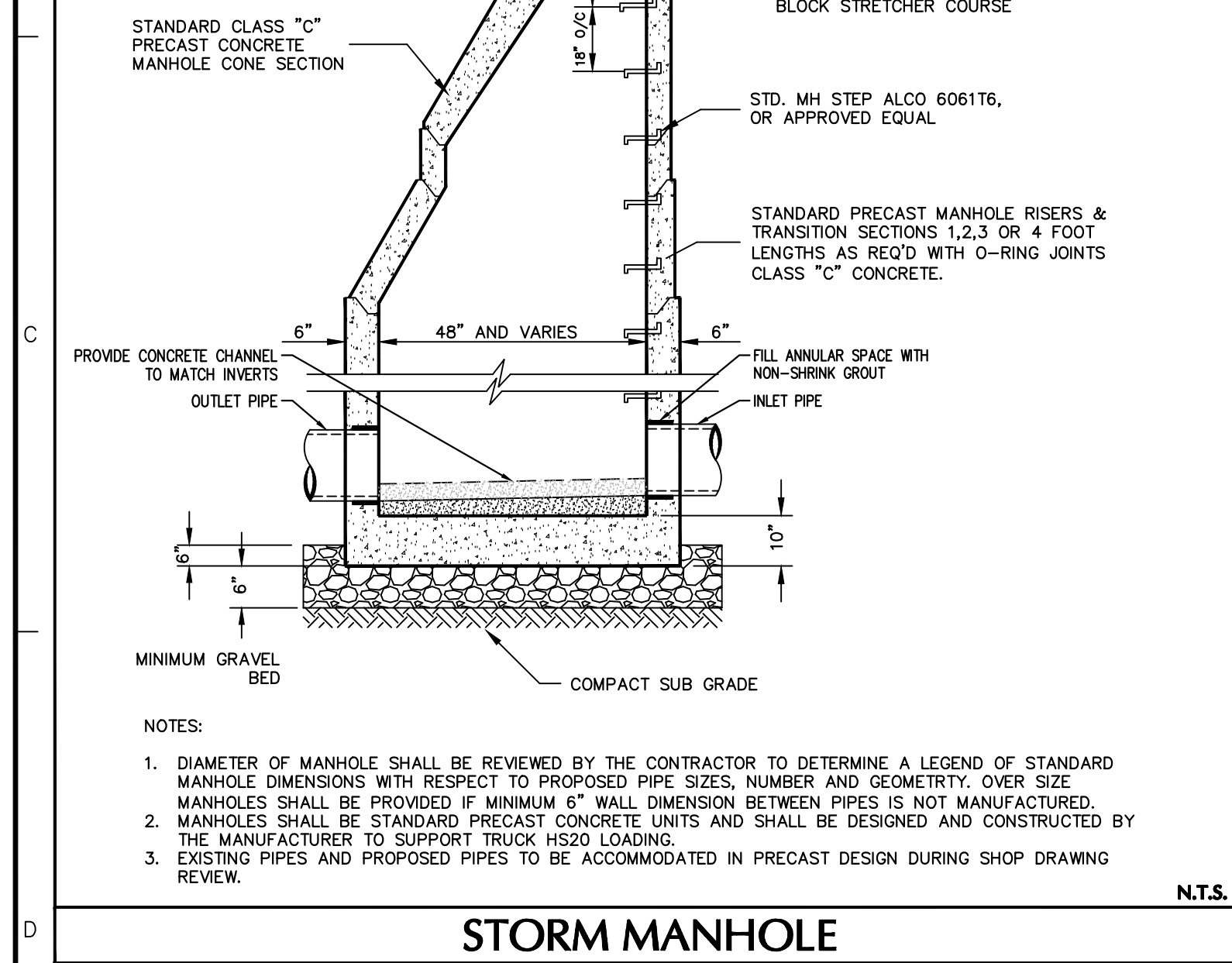
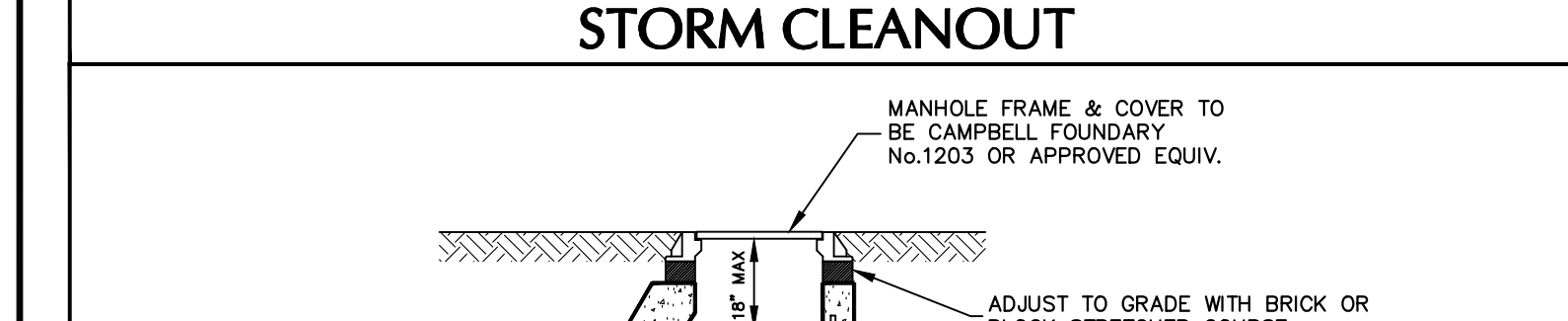
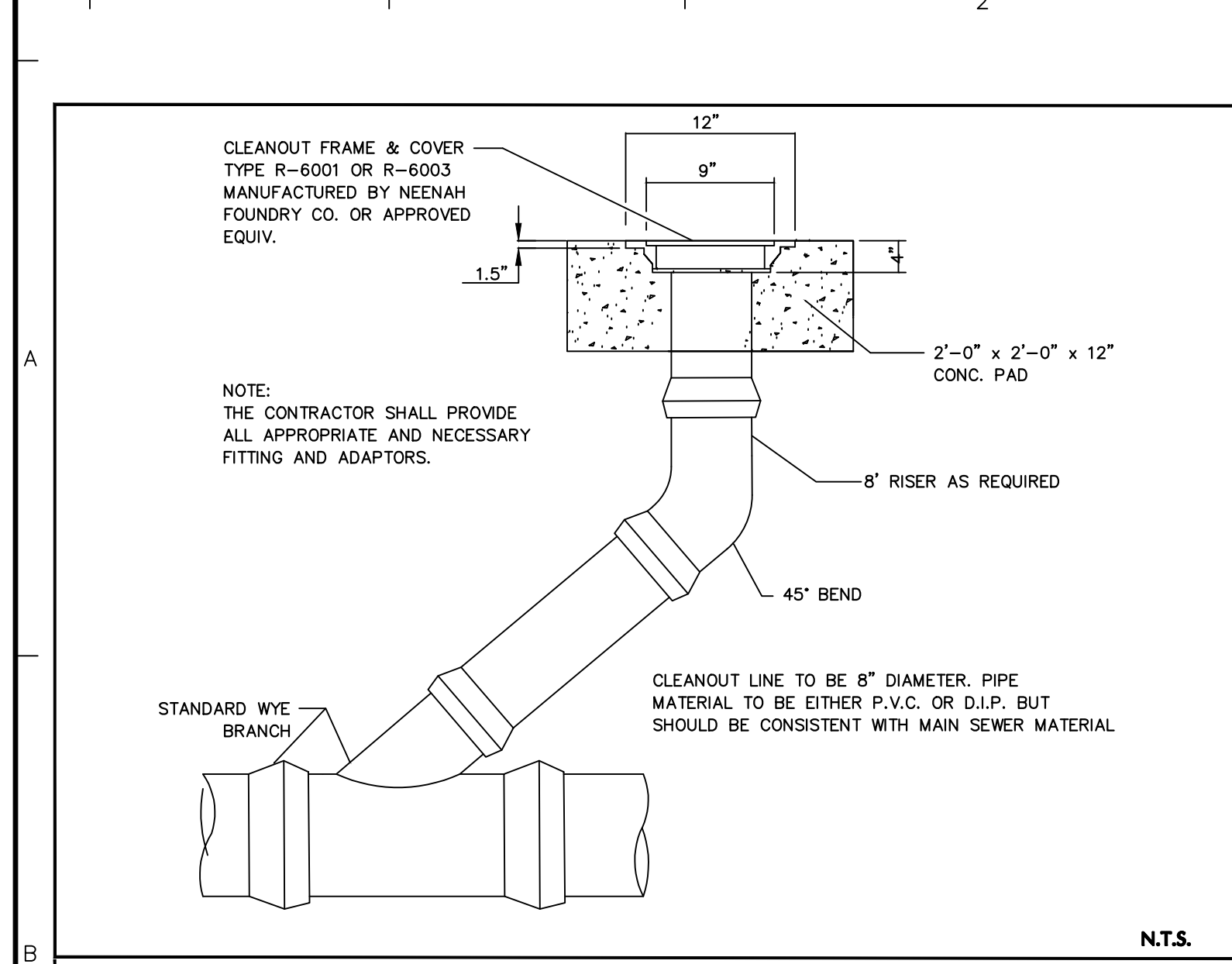
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Date FEBRUARY 9, 2024  
Drawn By SM  
Checked By TH  
Sheet 8 of 19

**LEGEND**

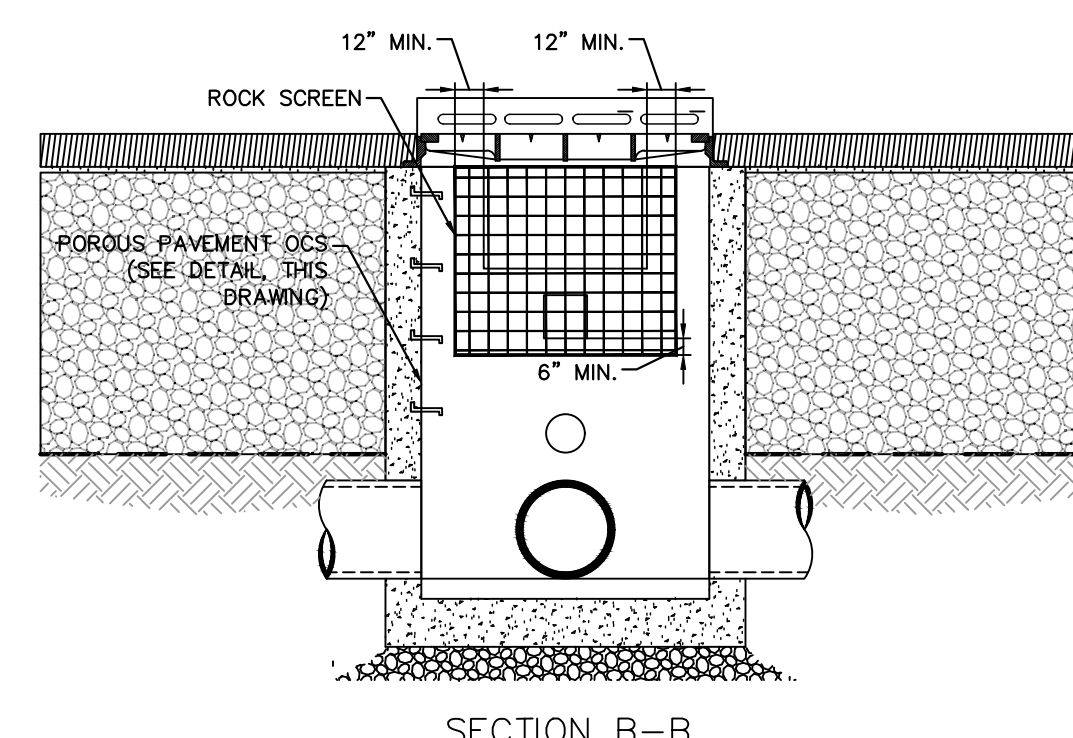
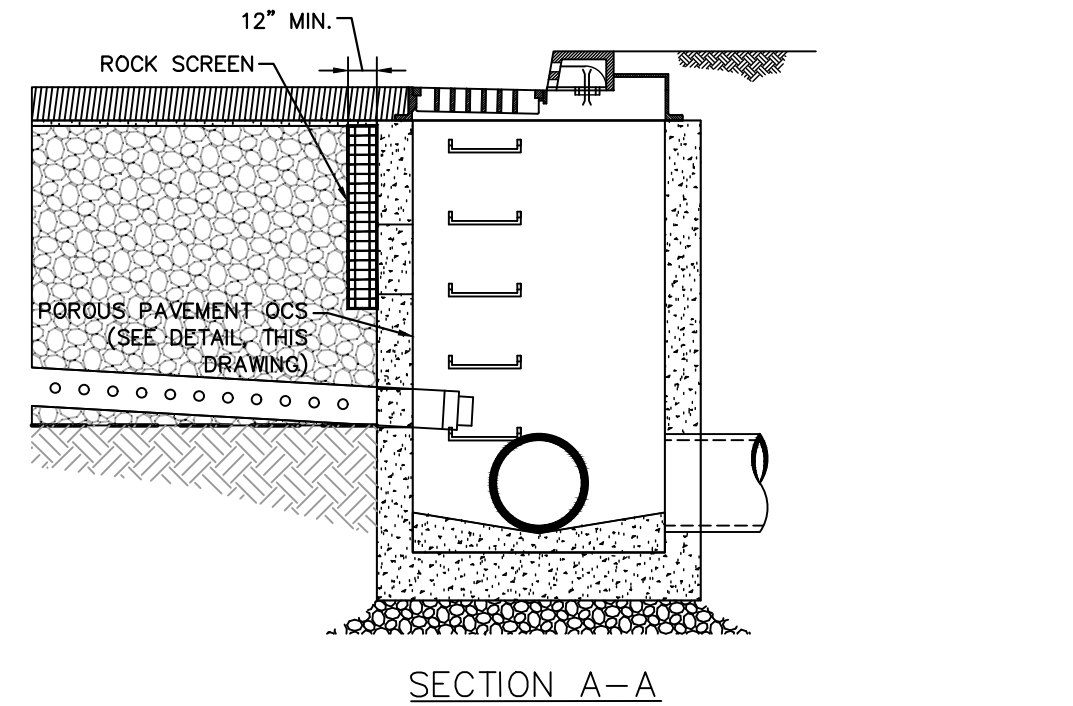
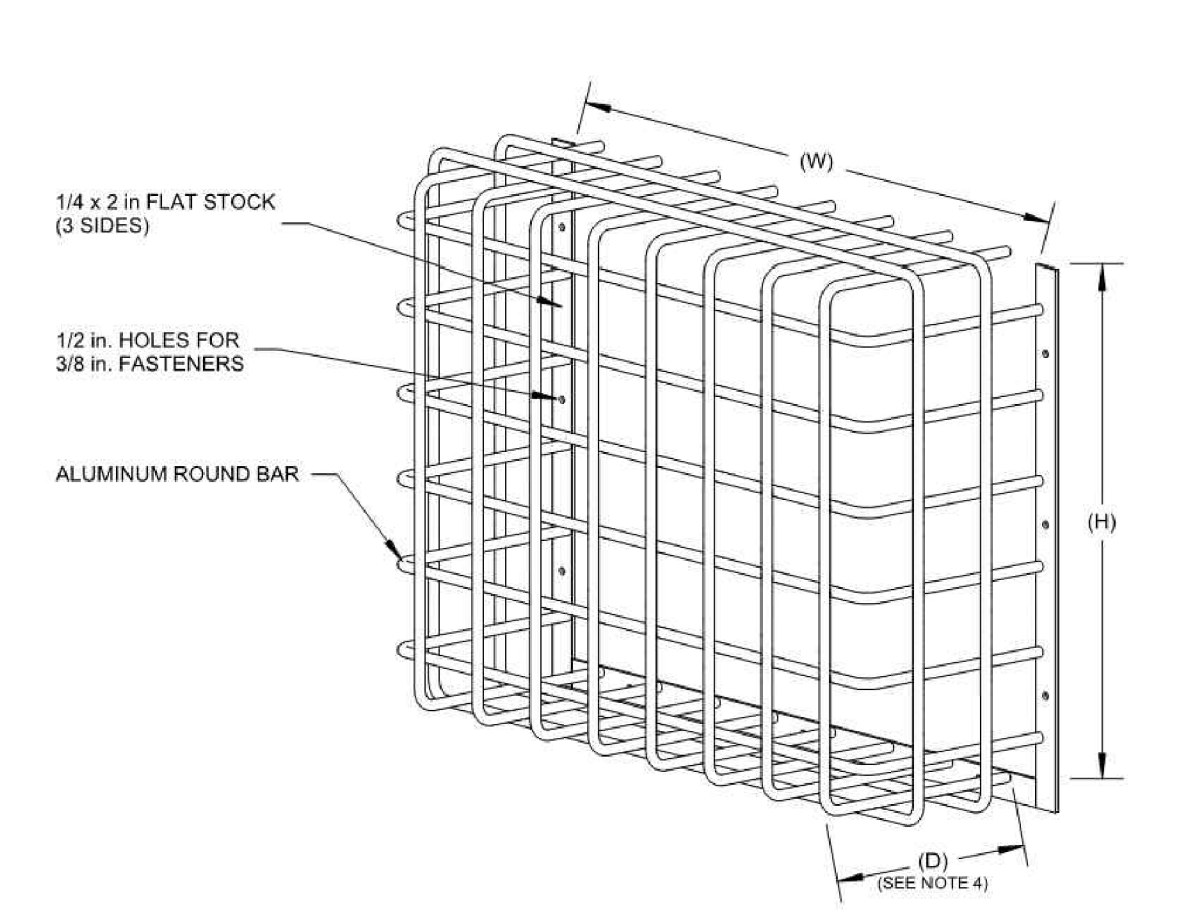
|                   | EXISTING | PROPOSED |
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| PROPERTY LINE/ROW | —        | —        |
| CONTOUR           | 120      | 118      |
| SPOT ELEVATION    | 122.53   | 124.68   |
| STORM MANHOLE     | ○        | ●        |
| SANITARY MANHOLE  | ○        | ●        |
| CATCH BASIN       | □        | ■        |
| STORM SEWER       | —        | —        |
| SANITARY SEWER    | —        | —        |
| RETAINING WALL    | —        | —        |







| Date  | Description      | No.            |
|---|------------------|----------------|
| Revisions   |                  |                |
|   |                  |                |
| Digitally signed by<br>John C Cote<br>Date: 2025.07.02<br>09:35:36-04'00' |                  |                |
| SIGNATURE   | JOHN COTE        | DATE           |
| PROFESSIONAL ENGINEER NJ Lic. No.   |                  |                |
| 24GE03705800  |                  |                |
| <b>LANGAN</b>   |                  |                |
| Langan Engineering and<br>Environmental Services, LLC                     |                  |                |
| 300 Kimball Drive<br>Parsippany, NJ 07054                                 |                  |                |
| T: 973.560.4900   | F: 973.560.4901  | www.langan.com |
| NJ CERTIFICATE OF AUTHORIZATION NO. 24GA27996400                          |                  |                |
| Project   |                  |                |
| <b>BEACON UNITARIAN<br/>UNIVERSALIST<br/>CONGREGATION</b>                 |                  |                |
| SUMMIT NEW JERSEY   |                  |                |
| UNION COUNTY  |                  |                |
| Drawing Title   |                  |                |
| <b>DRAINAGE DETAILS</b>   |                  |                |
| Project No.   | Drawing No.      |                |
| 101007201   | CG501            |                |
| Date  | FEBRUARY 9, 2024 |                |
| Drawn By  | SM               |                |
| Checked By  | TH               |                |
| Sheet 9 of 19   |                  |                |



- NOTES:**
1. ALL MATERIALS TO BE ALUMINUM 6061-T6 ALLOY.
  2. WELD ALL INTERSECTIONS.
  3. FASTEN TO CONCRETE STRUCTURE WITH 3/8 in. x 3 in. STAINLESS STEEL CONCRETE WEDGE ANCHORS AT 18 in. MAX. SPACING. MINIMUM OF (4).
  4. DEPTH TO O.D. OF RACK. IF THE CONCRETE WEIR EXTENDS TO THE TOP OF THE STRUCTURE, THE DEPTH OF THE TOP BARS WILL EXTEND TO MEET TOP GRATING OR FRAME OF STRUCTURE SO THERE IS NO GAP.
  5. OVERALL RACK WIDTH = (W) + 4 INCHES.
  6. OVERALL RACK HEIGHT = (H) + BAR DIAMETER + 2 INCHES.
  7. OPTIONAL - 10g STAINLESS STEEL WIRE MESH WITH 1 in. GRID TO COVER RACK.

| TRASH RACK INFORMATION      |  |
|-----------------------------|--|
| RACK WIDTH (D. (W))         |  |
| RACK HEIGHT (D. (H))        |  |
| RACK DEPTH (D. (D))         |  |
| BAR DIAMETER (1/2" OR 3/4") |  |
| BAR CENTERLINE SPACING      |  |
| STRUCTURE OPENING W         |  |
| STRUCTURE OPENING H         |  |
| WEIR EXTENDS TO TOP?        |  |
| FASTENERS (QTY)             |  |
| WIRE MESH?                  |  |
| NOTES:                      |  |

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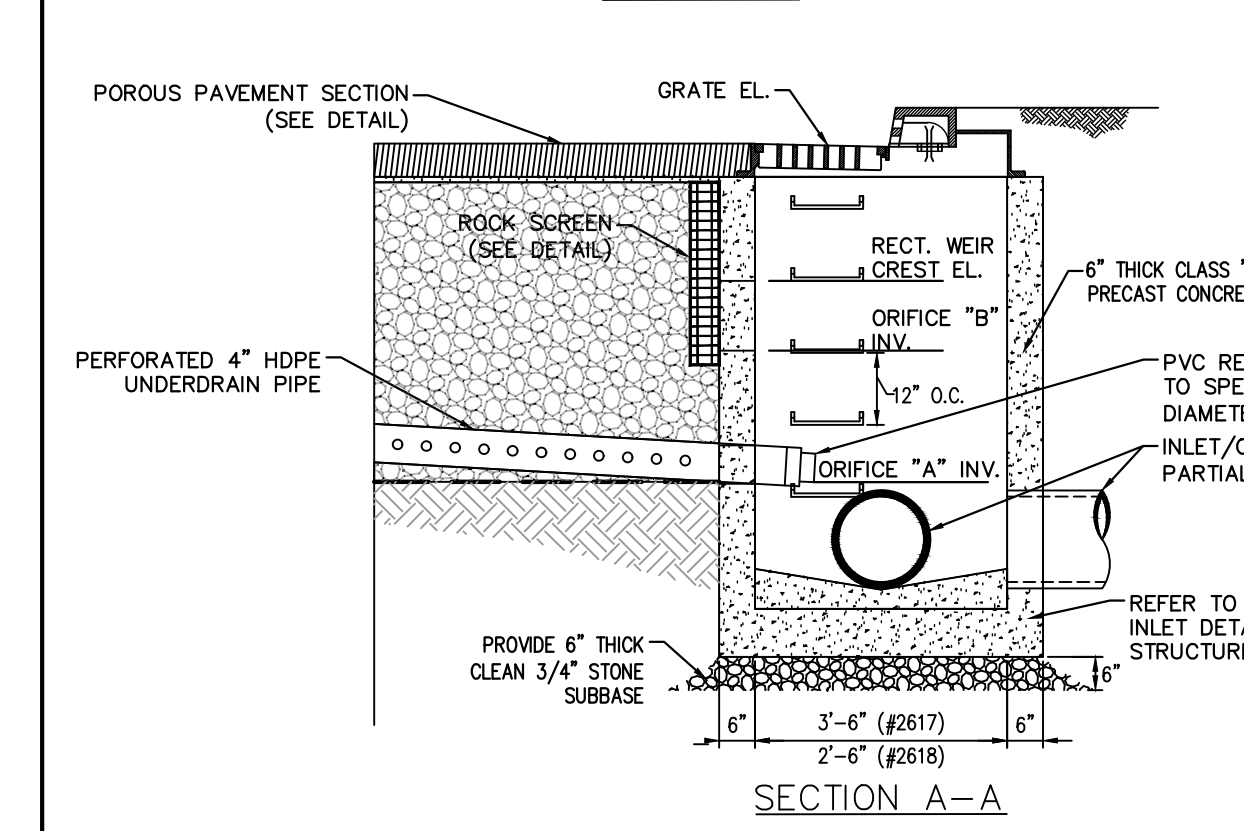
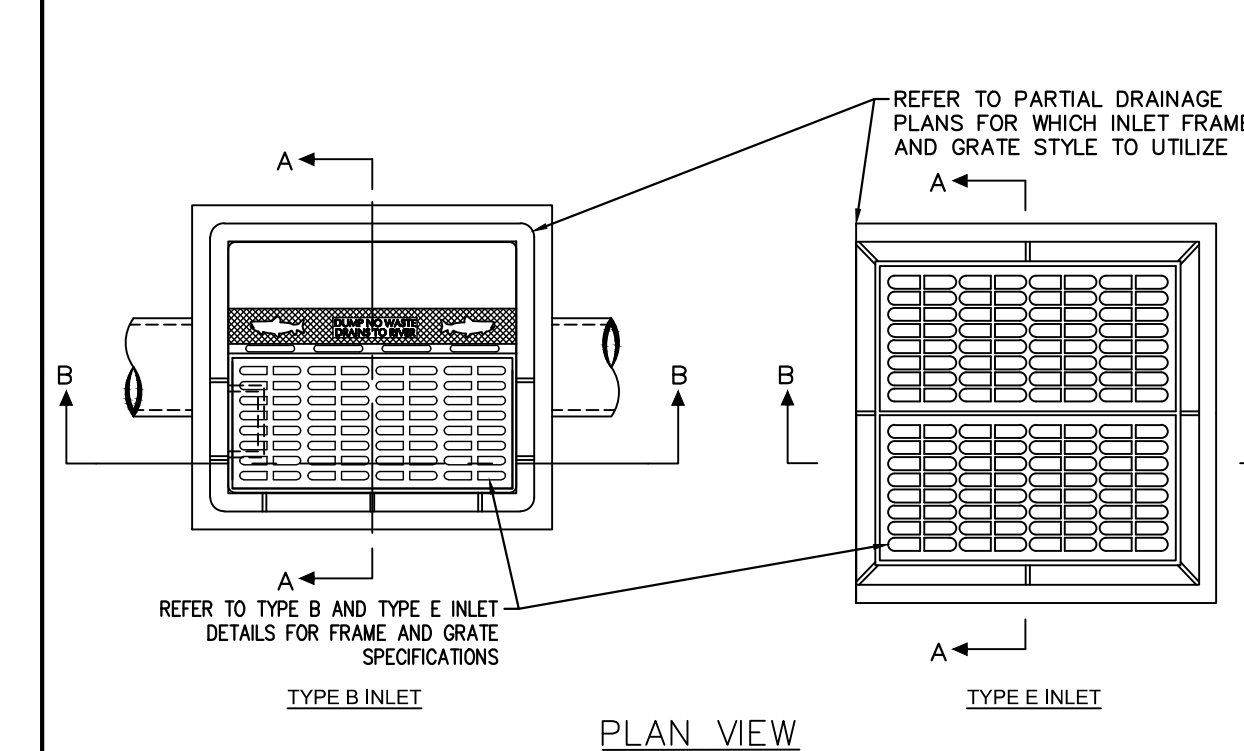
**Effluent Design & Fabrication, LLC**  
 6 William Martin Way  
 Flemington, NJ 08822  
 Phone: 908.458.9220  
 Fax: 908.458.9930  
 www.effluentdesign.com

PROJECT: ALUMINUM BOXED SERIES AIR RACK  
 DATE: \_\_\_\_\_  
 SCALE: \_\_\_\_\_  
 DRAWN BY: \_\_\_\_\_

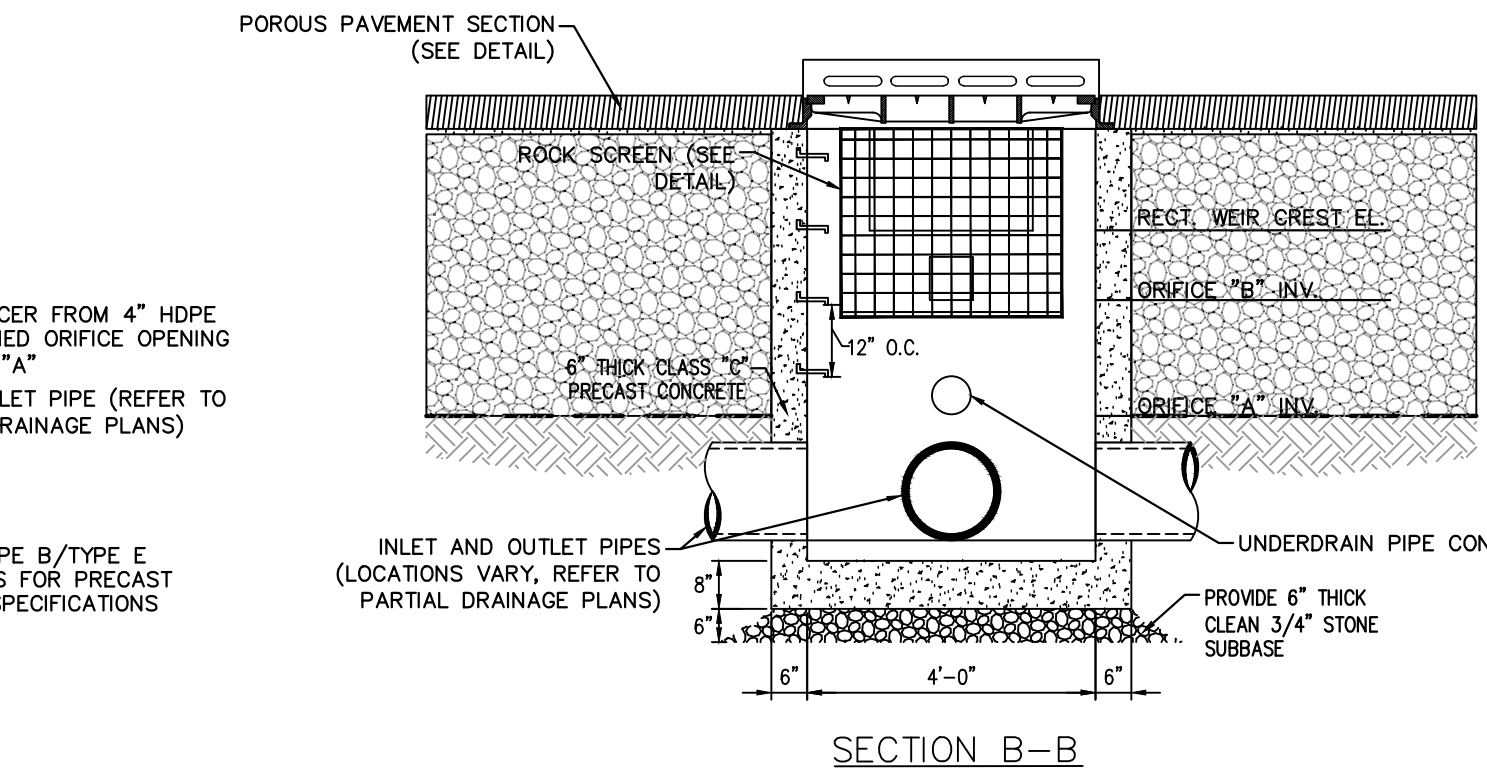
- NOTES:**
1. MAX OPENING BETWEEN PARALLEL BARS TO BE 3"
  2. ROCK SCREEN TO EXTEND MIN. 12" IN BOTH DIRECTIONS BEYOND WIDTH OF RECTANGULAR WEIR, MIN 6" BELOW RECTANGULAR WEIR INVERT, AND MIN. 12" OUT FROM FACE OF OUTLET CONTROL STRUCTURE

N.T.S.

**POROUS PAVEMENT OUTLET CONTROL STRUCTURE ALUMINUM ROCK SCREEN**

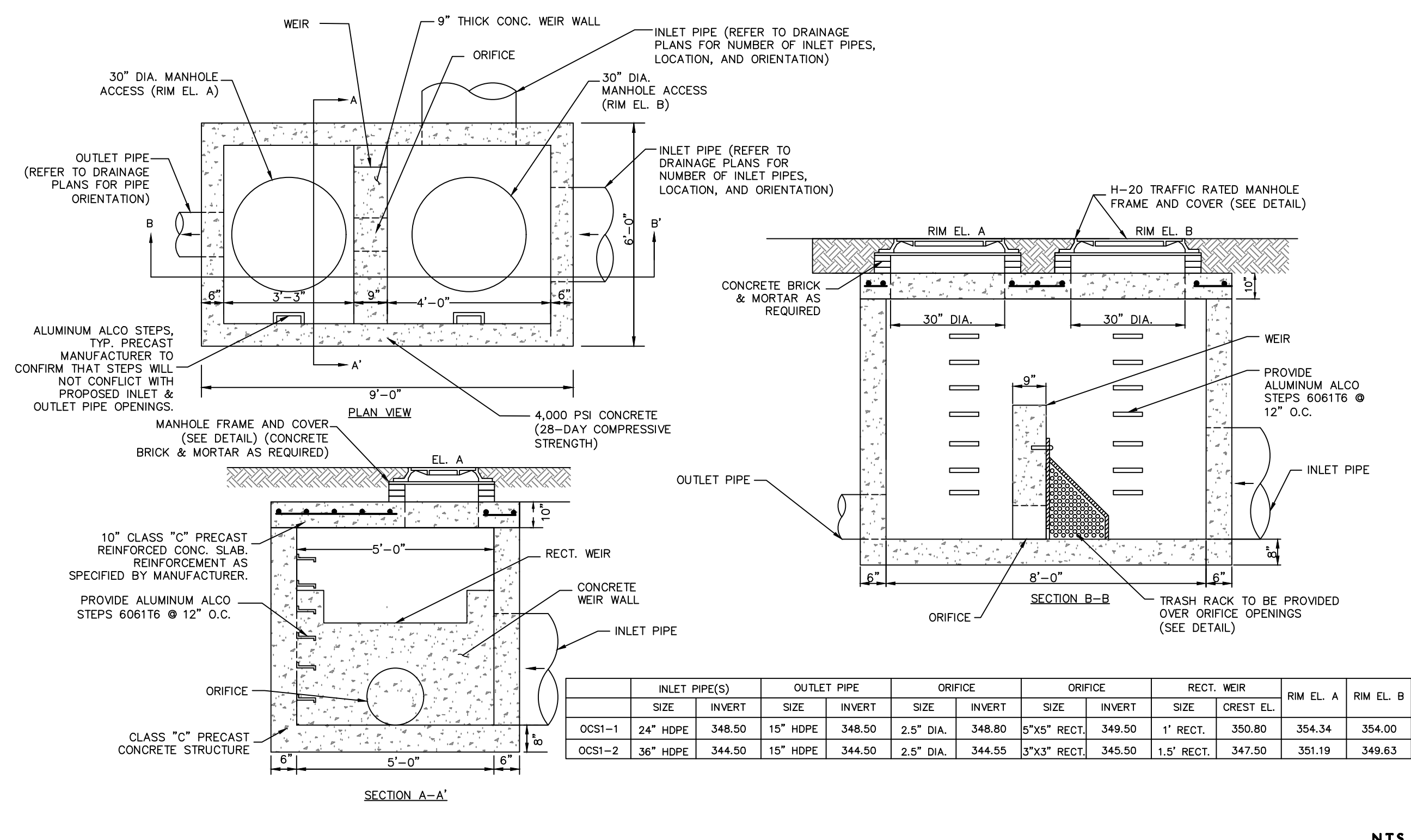


|        | ORIFICE "A" |        | ORIFICE "B" |        | RECT. WEIR |           | INLET PIPE |        | OUTLET PIPE |        | GRATE EL. |
|--------|-------------|--------|-------------|--------|------------|-----------|------------|--------|-------------|--------|-----------|
|        | SIZE        | INVERT | SIZE        | INVERT | LENGTH     | CREST EL. | SIZE       | INVERT | SIZE        | INVERT |           |
| OCS2-1 | 2.5" DIA.   | 354.10 | 5"x6"       | 354.95 | -          | -         | N/A        | N/A    | 15" HDPE    | 353.05 | 356.60    |
| OCS2-2 | 2.5" DIA.   | 355.10 | 3"x6"       | 355.75 | -          | -         | 15"        | HDPE   | 353.48      | 353.48 | 358.10    |
| OCS2-3 | 2.5" DIA.   | 354.10 | 5"x6"       | 354.90 | -          | -         | N/A        | N/A    | 15" HDPE    | 354.04 | 357.31    |



**POROUS PAVEMENT SYSTEM OUTLET CONTROL STRUCTURE**

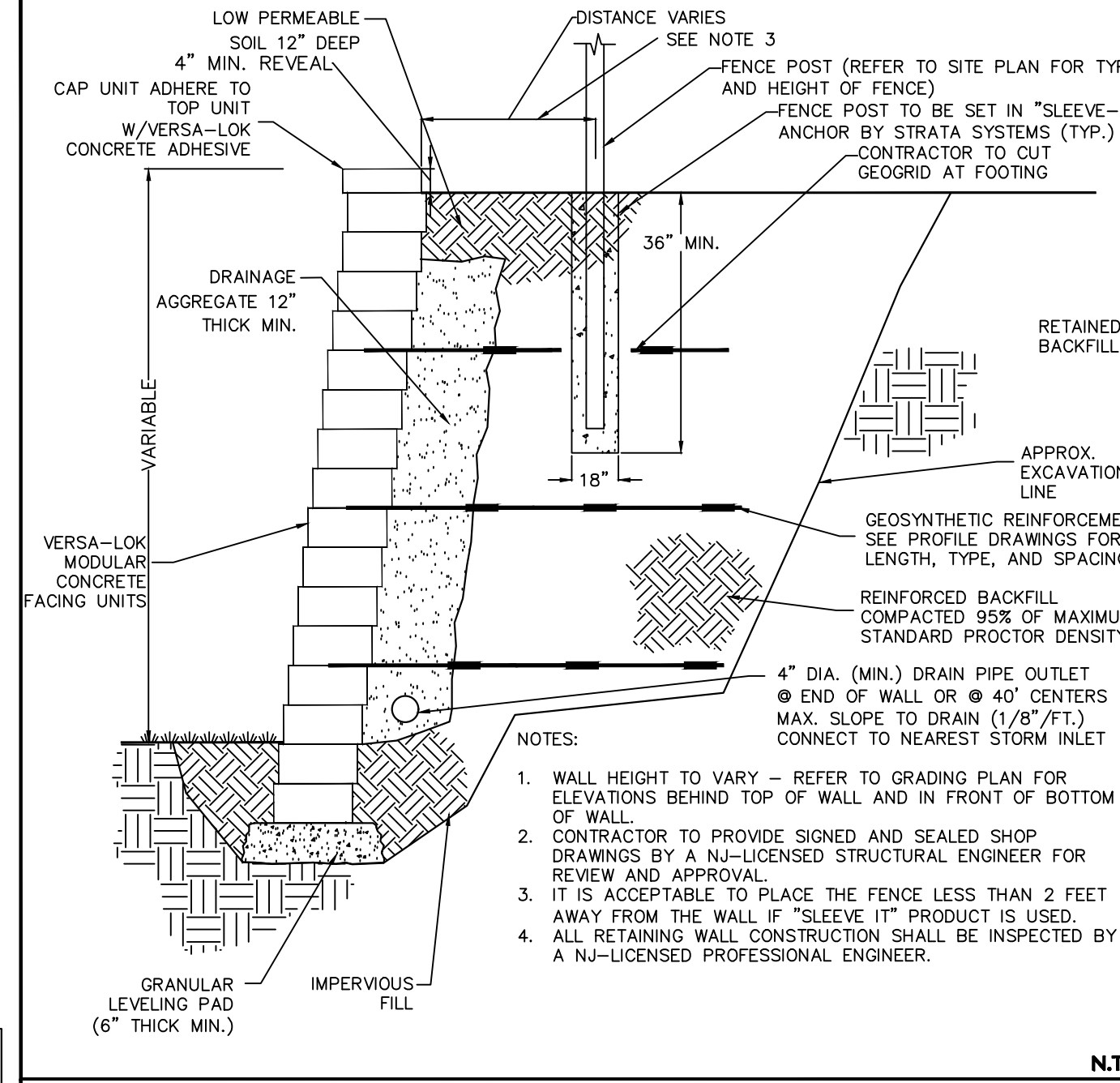
N.T.S.



|        | INLET PIPE(S) |        | OUTLET PIPE |        | ORIFICE   |        | ORIFICE     |        | RECT. WEIR |           | RIM EL. A | RIM EL. B |
|--------|---------------|--------|-------------|--------|-----------|--------|-------------|--------|------------|-----------|-----------|-----------|
|        | SIZE          | INVERT | SIZE        | INVERT | SIZE      | INVERT | SIZE        | INVERT | SIZE       | CREST EL. |           |           |
| OCS1-1 | 24" HDPE      | 348.50 | 15" HDPE    | 348.50 | 2.5" DIA. | 348.80 | 5"x5" RECT. | 349.50 | 1' RECT.   | 350.80    | 354.34    | 354.00    |
| OCS1-2 | 36" HDPE      | 344.50 | 15" HDPE    | 344.50 | 2.5" DIA. | 344.55 | 5"x5" RECT. | 345.50 | 1.5" RECT. | 347.50    | 351.19    | 349.63    |

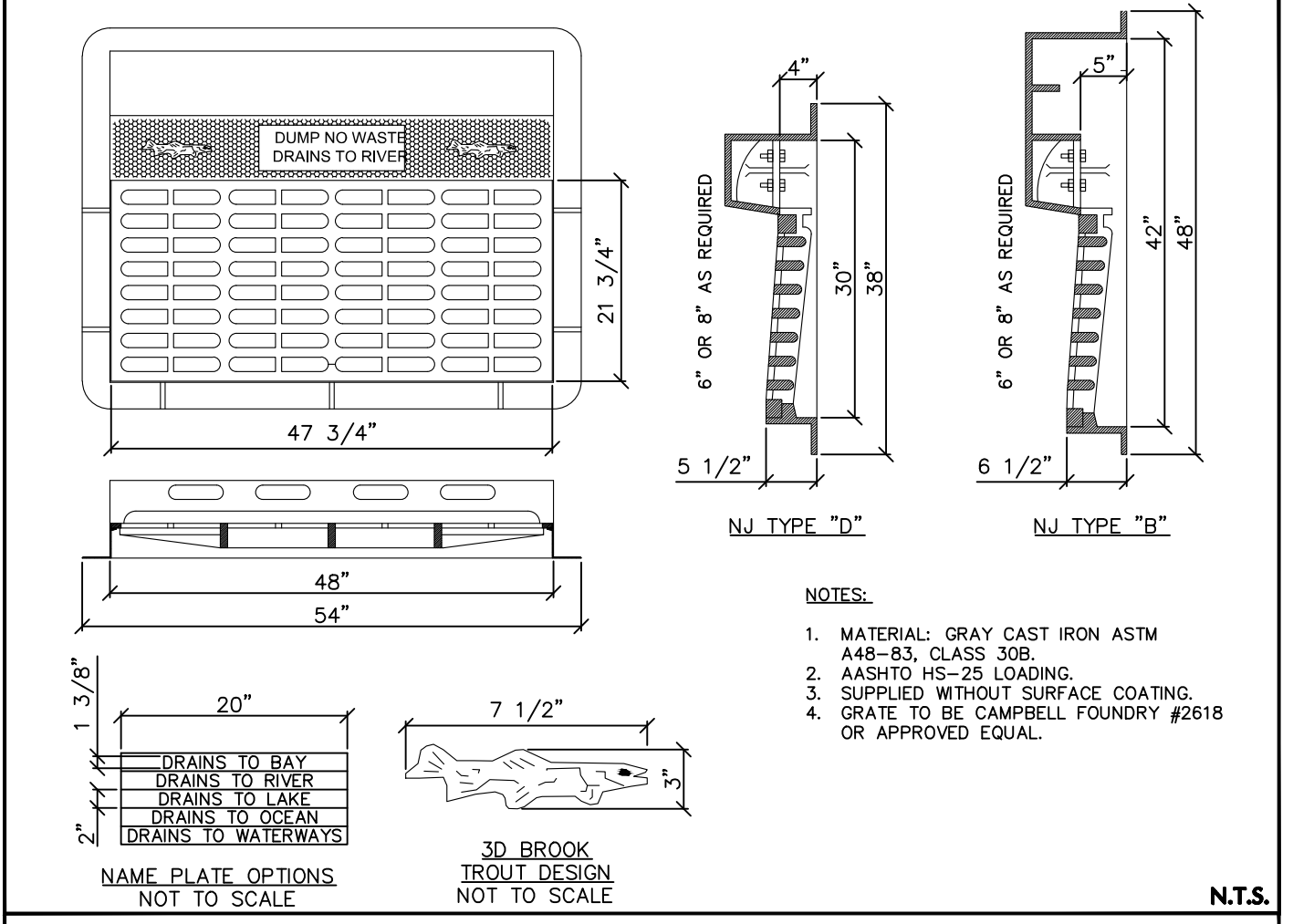
N.T.S.

**UNDERGROUND INFILTRATION BASIN OUTLET CONTROL STRUCTURES**



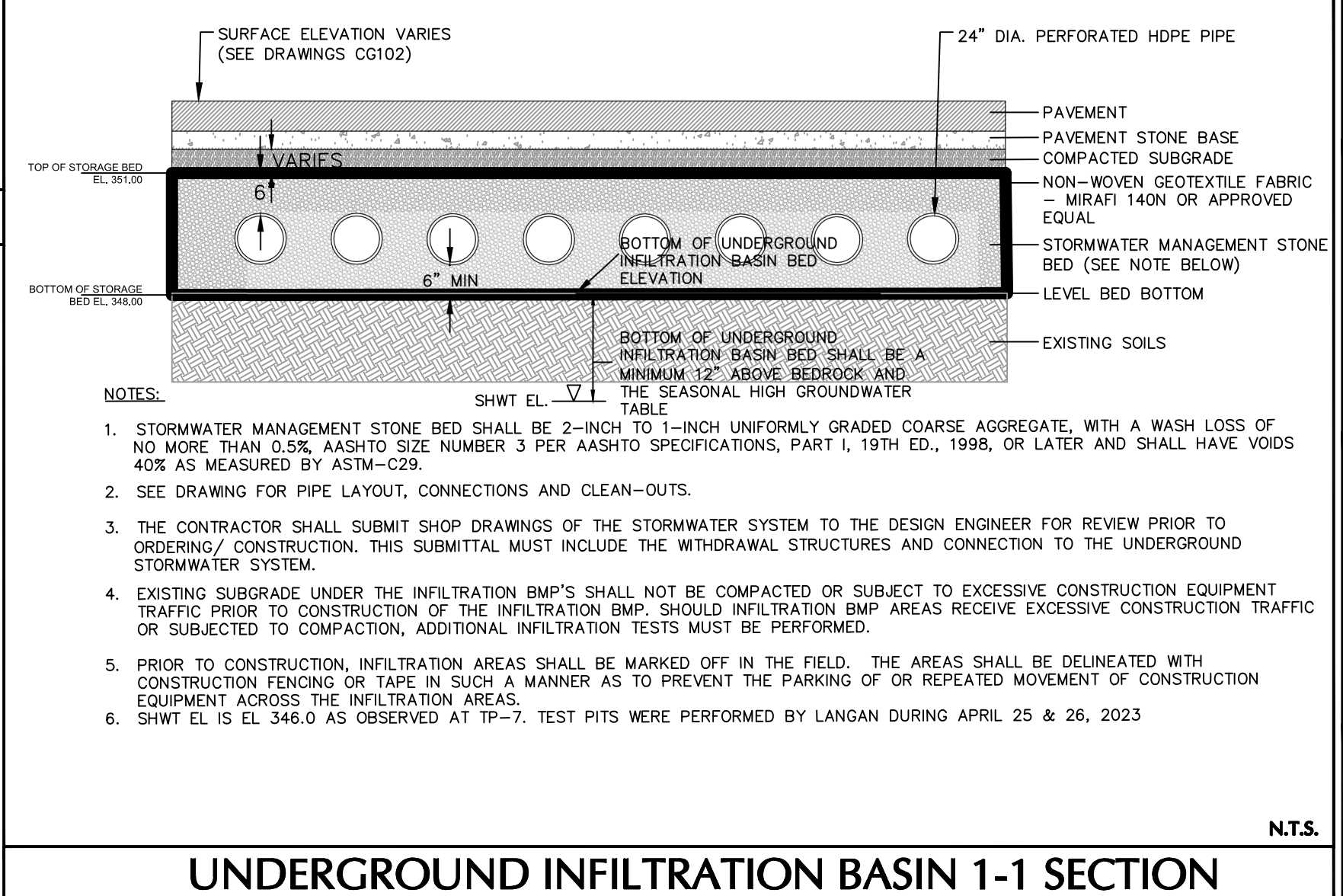
**TYPICAL REINFORCED MODULAR WALL**

N.T.S.



**TYPE B INLET BICYCLE SAFE GRATE WITH TYPE "N-ECO" CURB PIECE**

N.T.S.



**UNDERGROUND INFILTRATION BASIN 1-1 SECTION**

N.T.S.

| Date     | Description               | No. |
|----------|---------------------------|-----|
| 7/01/25  | REVISED PER CITY COMMENTS | 2   |
| 07/18/24 | REVISED PER TRC COMMENTS  | 1   |

**Revisions**

Digitally signed by John C Cote  
 Date: 2025.07.02 09:35:39-04'00'

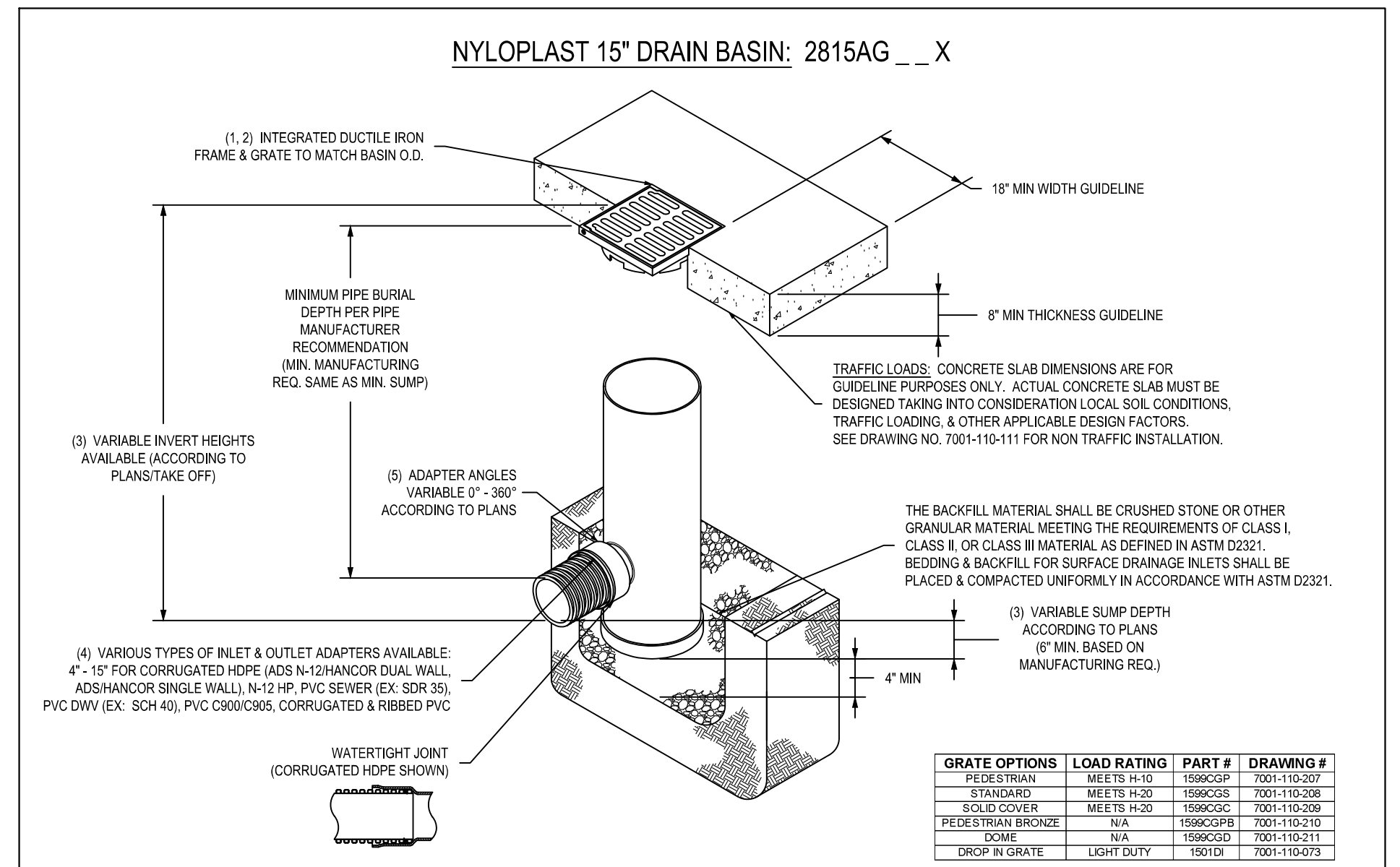
SIGNATURE: JOHN COTE  
 PROFESSIONAL ENGINEER NJ Lic. No. 24GE03705800

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 NJ CERTIFICATE OF AUTHORIZATION NO. 24GA27996400

Project: **BEACON UNITARIAN UNIVERSALIST CONGREGATION**  
 SUMMIT NEW JERSEY  
 Drawing Title

**DRAINAGE DETAILS**

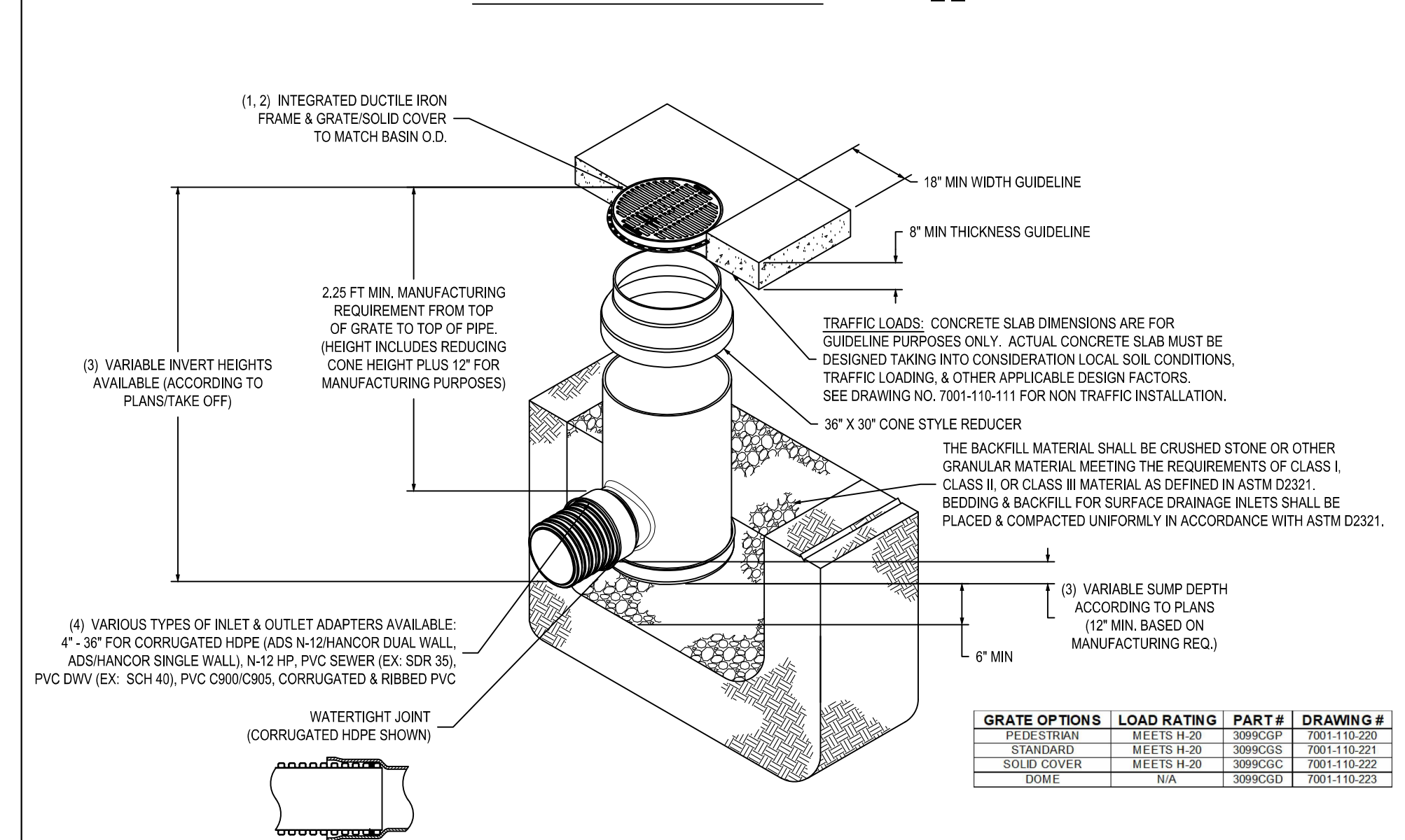
Project No. 101007201  
 Drawing No. CG502  
 Date: FEBRUARY 9, 2024  
 Drawn By: SM  
 Checked By: TH  
 Sheet 10 of 19



| GRATE OPTIONS     | LOAD RATING | PART #  | DRAWING #    |
|-------------------|-------------|---------|--------------|
| PEDESTRIAN        | MEETS H-20  | 3096GDP | 7001-110-207 |
| STANDARD          | MEETS H-20  | 3096GSC | 7001-110-208 |
| SOLID COVER       | MEETS H-20  | 3096GSC | 7001-110-209 |
| PEDESTRIAN BRIDGE | N/A         | 3096GFB | 7001-110-210 |
| DOMES             | N/A         | 3096GDD | 7001-110-211 |
| CRIP N GRATE      | LIGHT DUTY  | 1551G   | 7001-110-212 |

1. INLET GRATE STYLE AND COLOR TO BE COORDINATED WITH LANDSCAPE ARCHITECT.  
 2. INLET GRATES SHALL HAVE SAFETY LOCK.  
 3. REFER TO NYLOPLAST NON-TRAFFIC INSTALLATION DETAIL FOR YARD INLETS TO BE INSTALLED OUTSIDE OF DRIVEWAY LIMITS.

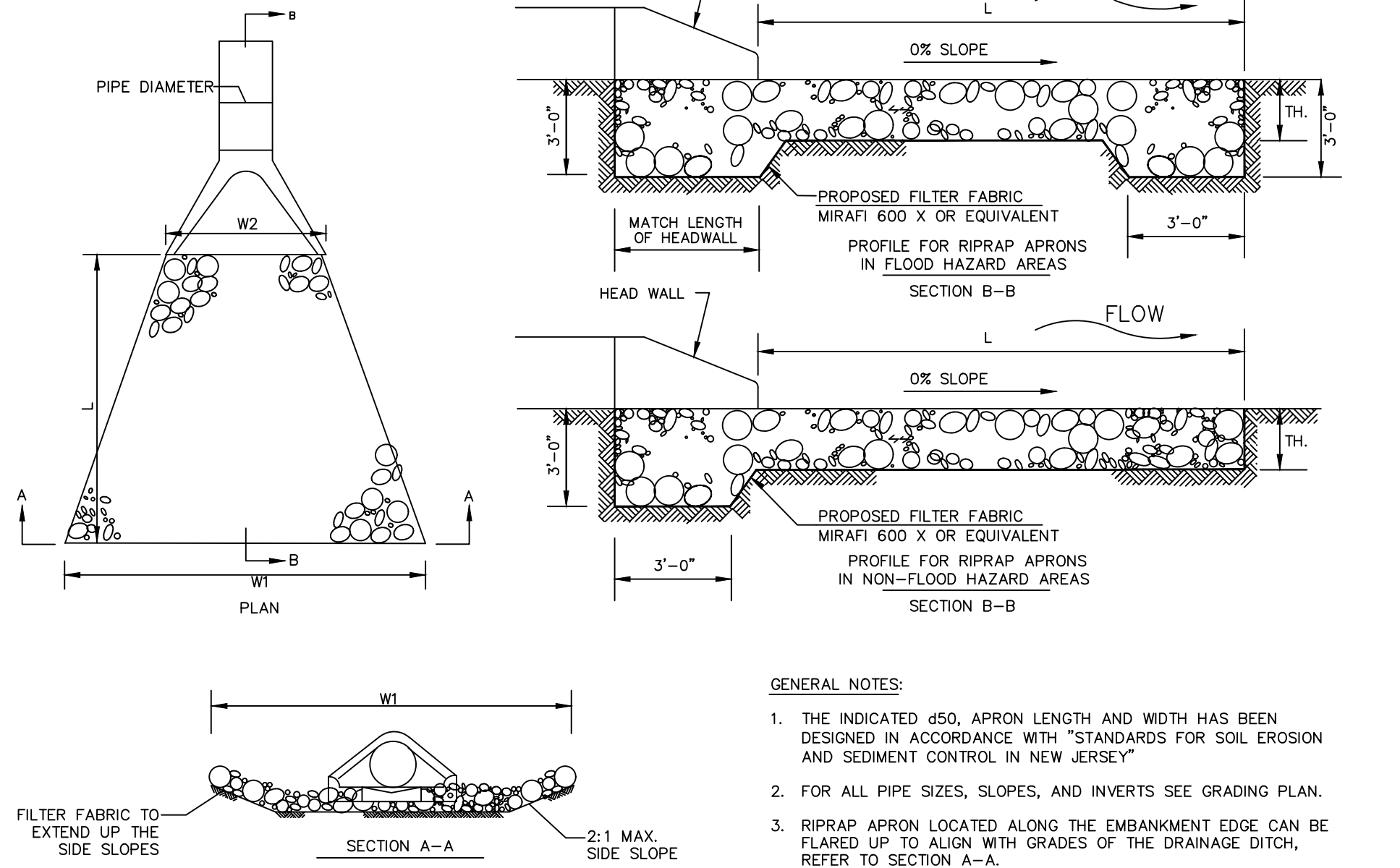
**NYLOPLAST YARD INLET**



| GRATE OPTIONS | LOAD RATING | PART #  | DRAWING #    |
|---------------|-------------|---------|--------------|
| PEDESTRIAN    | MEETS H-20  | 3096GDP | 7001-110-220 |
| STANDARD      | MEETS H-20  | 3096GSC | 7001-110-221 |
| SOLID COVER   | MEETS H-20  | 3096GSC | 7001-110-222 |
| DOMES         | N/A         | 3096GDD | 7001-110-223 |

1. STORM MANHOLES SHALL HAVE A SOLID, LOCKABLE COVER. COVER STYLE AND COLOR TO BE COORDINATED WITH THE LANDSCAPE ARCHITECT.  
 2. POLYPROPYLENE STEPS OR LADDER SHALL BE REQUIRED WHEN THE STRUCTURE DEPTH EXCEEDS 3 FEET. FOLLOW MANUFACTURER RECOMMENDATIONS FOR INSTALLATION.  
 3. REFER TO NYLOPLAST NON-TRAFFIC INSTALLATION DETAIL FOR MANHOLES TO BE INSTALLED OUTSIDE OF DRIVEWAY LIMITS.

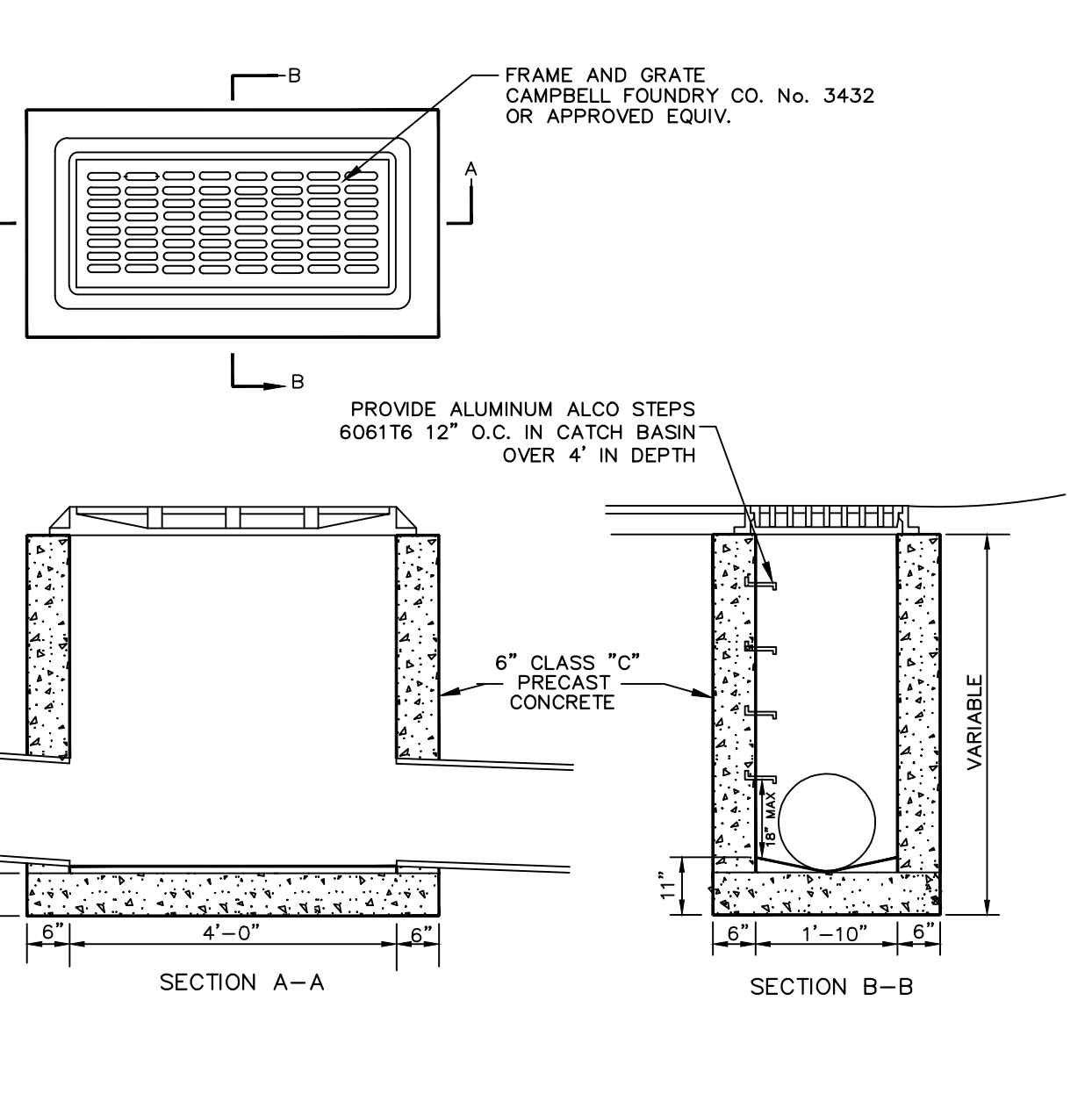
**NYLOPLAST STORM MANHOLE**



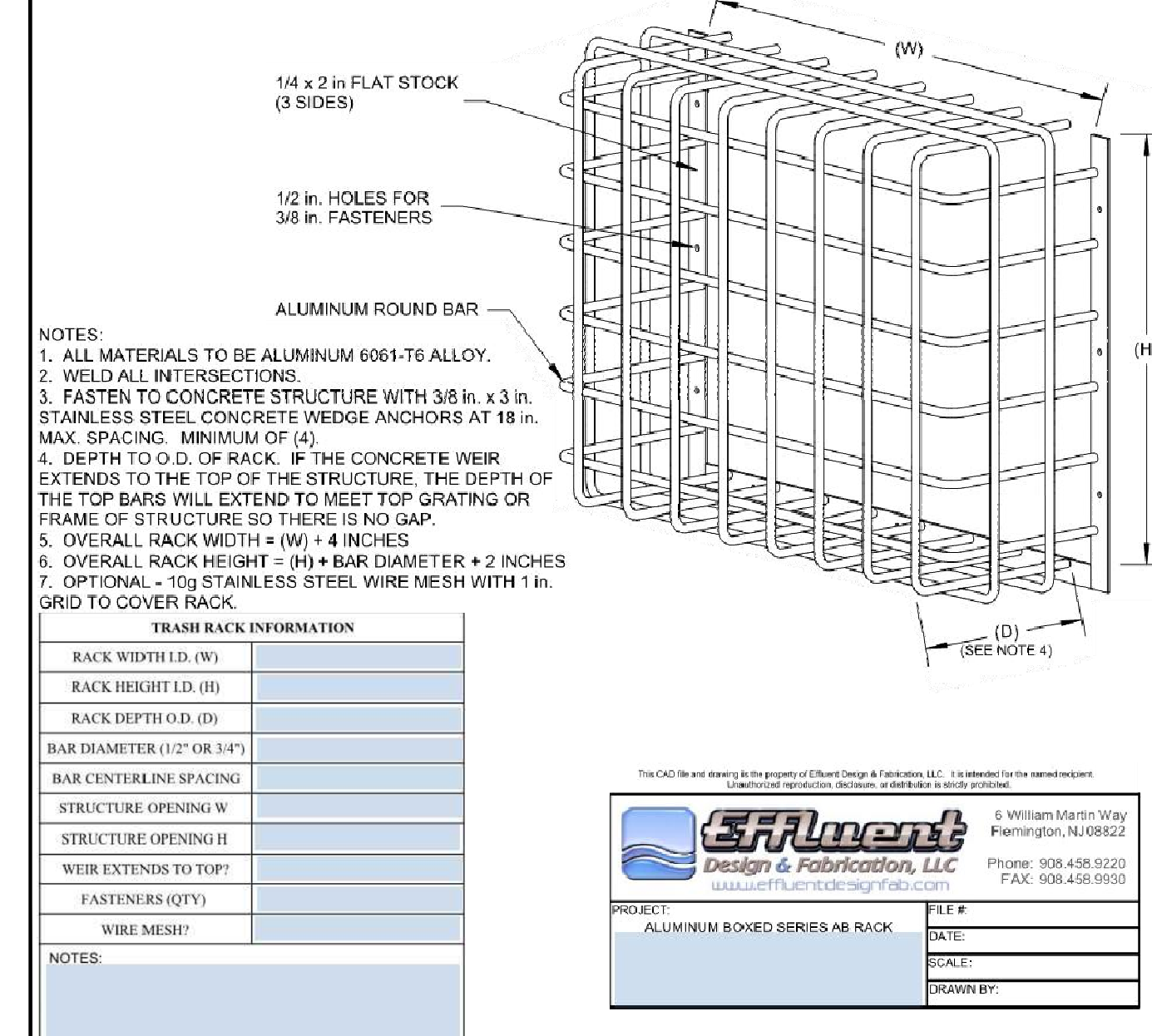
| OUTLET | LENGTH | d50  | W1    | W2    | THICKNESS |
|--------|--------|------|-------|-------|-----------|
| HW2-1  | 13.0'  | 3.0" | 17.0' | 3.75' | 6"        |

1. THE INDICATED d50, APRON LENGTH AND WIDTH HAS BEEN DESIGNED IN ACCORDANCE WITH "STANDARDS FOR SOIL EROSION AND SEDIMENT CONTROL IN NEW JERSEY"  
 2. FOR ALL PIPE SIZES, SLOPES, AND INVERTS SEE GRADING PLAN.  
 3. RIPRAP APRON LOCATED ALONG THE EMBANKMENT EDGE CAN BE FLARED UP TO ALIGN WITH GRADES OF THE DRAINAGE DITCH, REFER TO SECTION A-A.

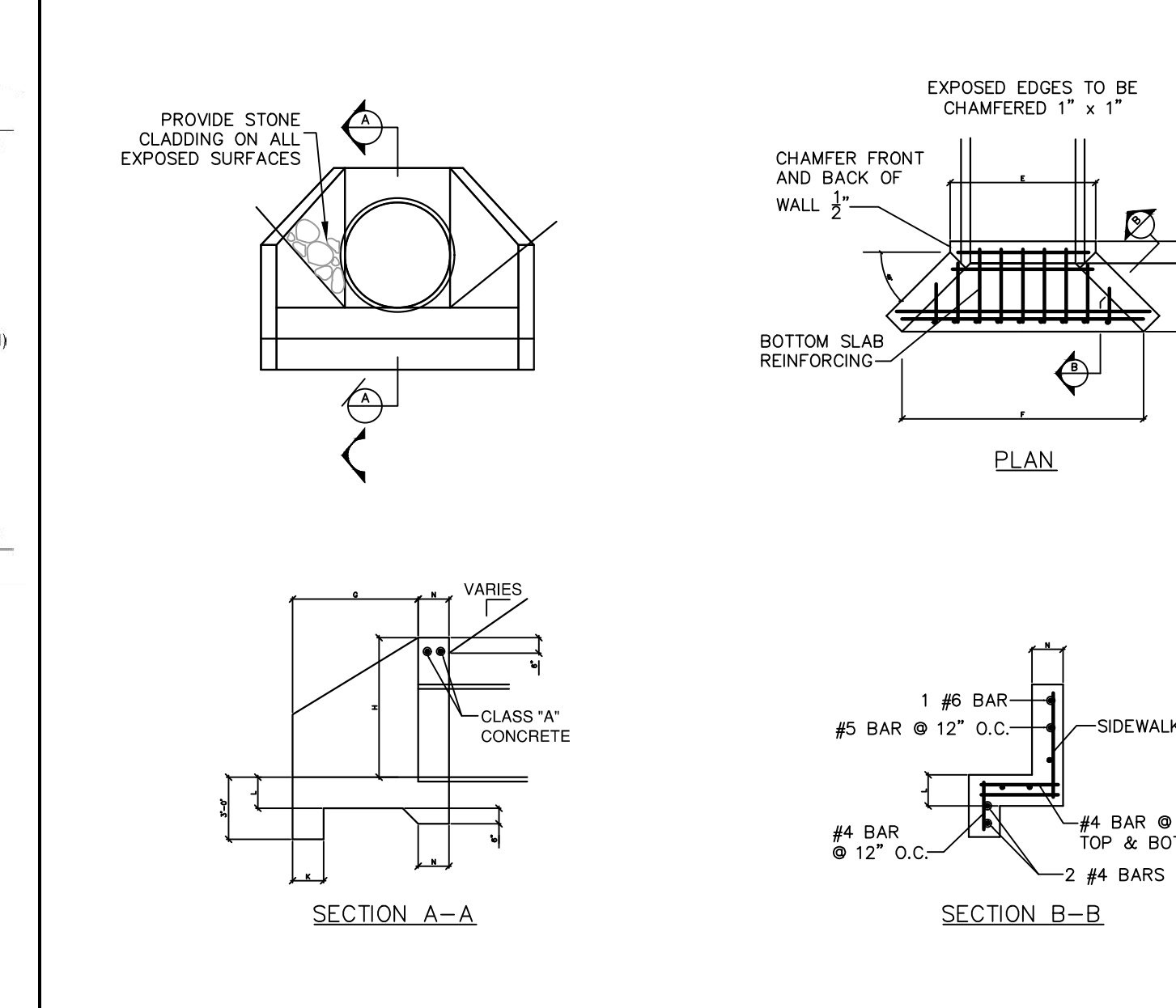
**RIPRAP APRON**



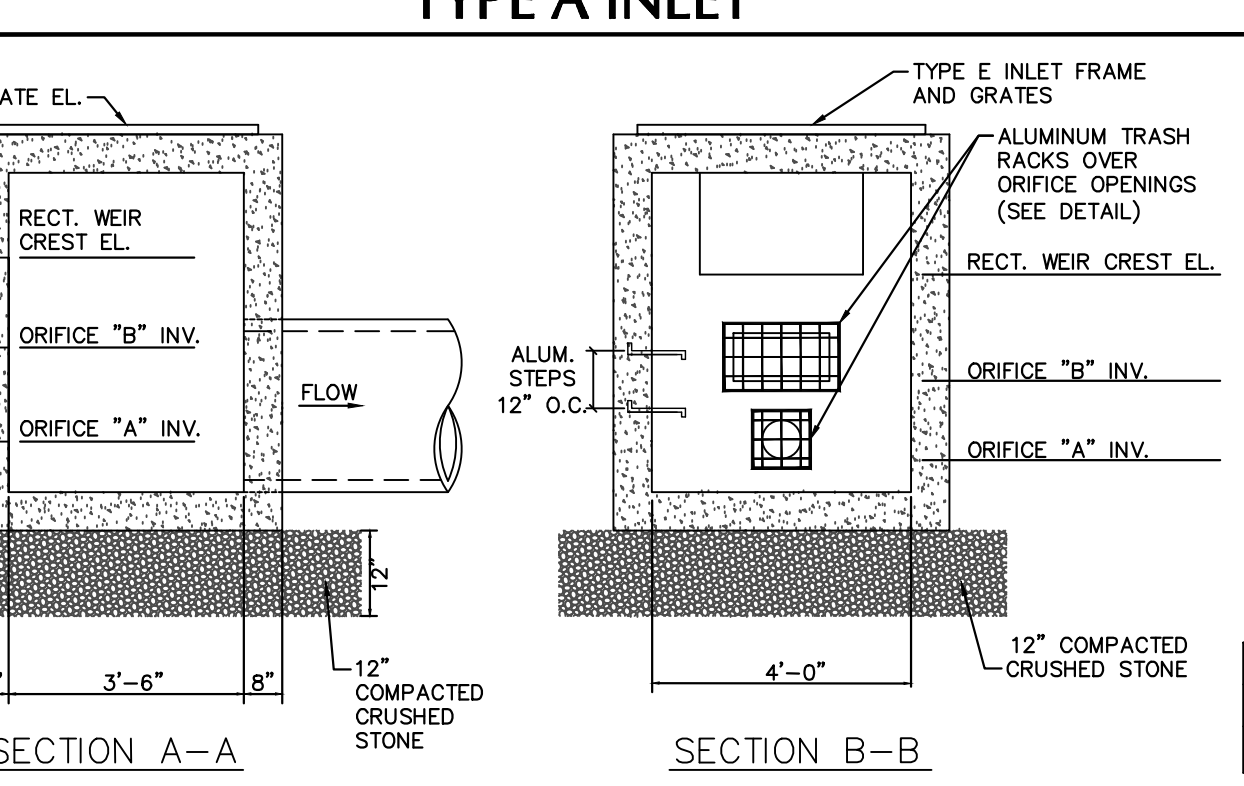
**TYPE A INLET**



**ALUMINUM TRASH RACK**



**CONCRETE HEADWALL**



**RAIN GARDEN OUTLET CONTROL STRUCTURE**

| ORIFICE "A" | ORIFICE "B" | RECT. WEIR | OUTLET PIPE | GRATE EL. |
|-------------|-------------|------------|-------------|-----------|
| SIZE        | INVERT      | SIZE       | INVERT      | LENGTH    |
| 4" DIA      | 351.75      | -          | -           | 15" HDPE  |
|             |             |            |             | 347.49    |
|             |             |            |             | 356.00    |

**RAIN GARDEN OUTLET CONTROL STRUCTURE**

| Date    | Description               | No. |
|---------|---------------------------|-----|
| 7/01/25 | REVISED PER CITY COMMENTS | 1   |

Digitally signed by John C Cote  
 Date: 2025.07.02 09:35:41-04'00'

SIGNATURE JOHN COTE DATE  
 PROFESSIONAL ENGINEER NJ Lic. No. 24GE03705800

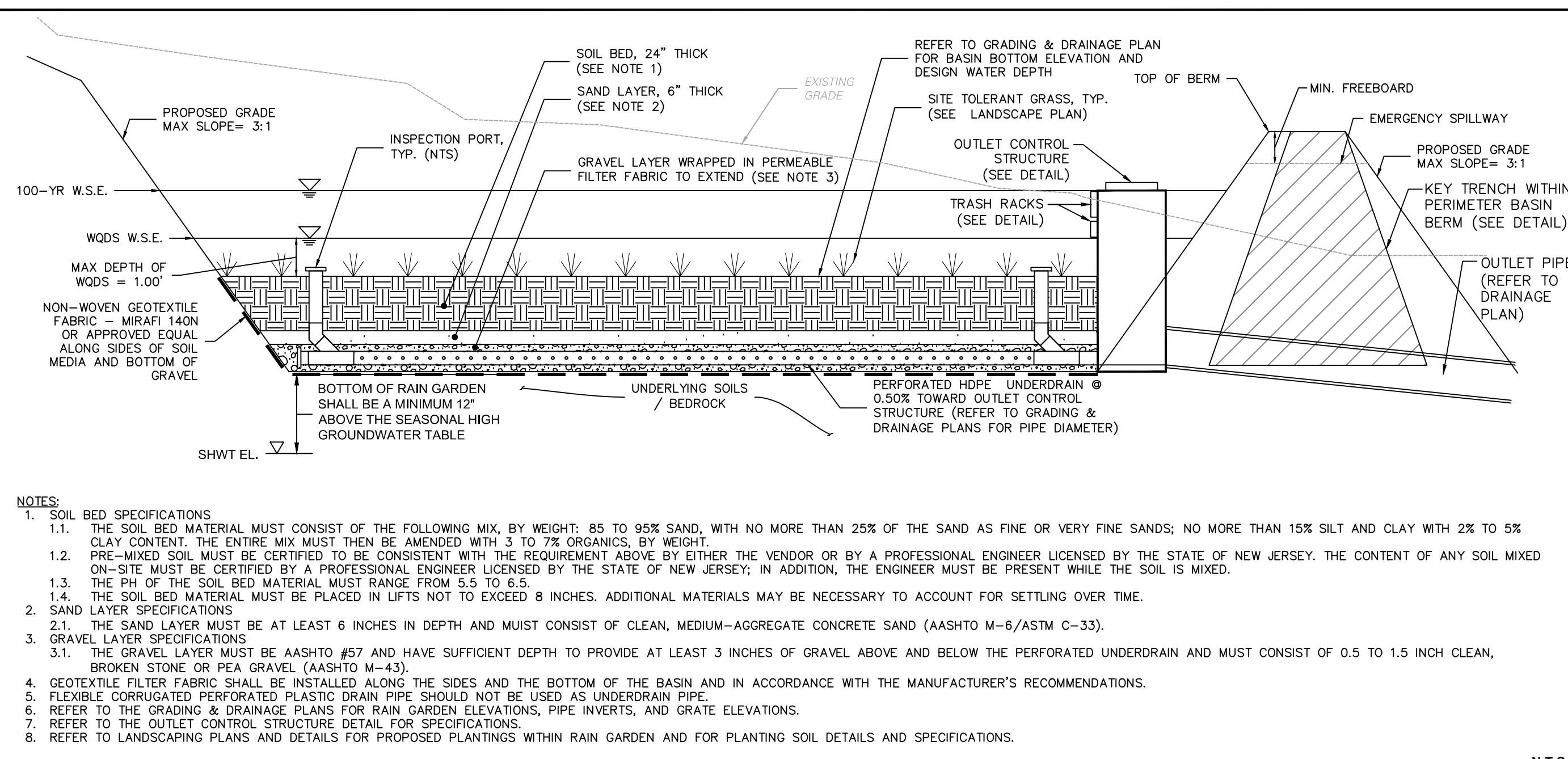
**LANGAN**  
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 Parsippany, NJ 07054  
 T: 973.560.4900 F: 973.560.4901 www.langan.com  
 NJ CERTIFICATE OF AUTHORIZATION NO. 24GA27996400

Project **BEACON UNITARIAN UNIVERSALIST CONGREGATION**  
 SUMMIT NEW JERSEY

UNION COUNTY  
 Drawing Title **DRAINAGE DETAILS**

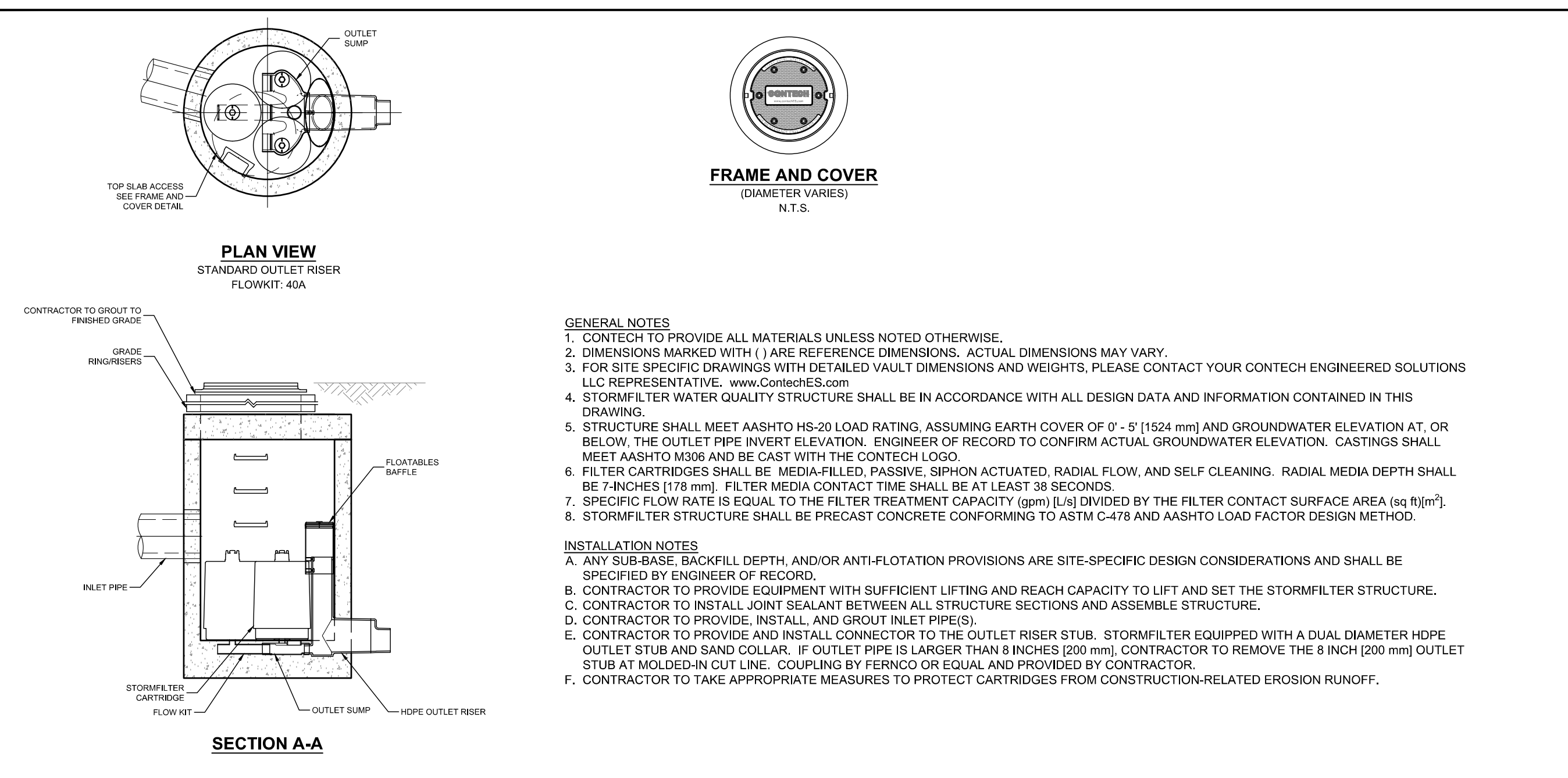
|             |                  |
|-------------|------------------|
| Project No. | Drawing No.      |
| 101007201   | CG503            |
| Date        | FEBRUARY 9, 2024 |
| Drawn By    | SS               |
| Checked By  | TH               |
|             | Sheet 11 of 19   |





- NOTES:**
- SOIL BED SPECIFICATIONS
    - THE SOIL BED MATERIAL MUST CONSIST OF THE FOLLOWING MIX, BY WEIGHT: 85 TO 95% SAND, WITH NO MORE THAN 25% OF THE SAND AS FINE OR VERY FINE SANDS; NO MORE THAN 15% SILT AND CLAY WITH 2% TO 5% CLAY CONTENT. THE ENTIRE MIX MUST THEN BE AMENDED WITH 3 TO 7% ORGANICS, BY WEIGHT.
    - PRE-MIXED SOIL MUST BE CERTIFIED TO BE CONSISTENT WITH THE REQUIREMENT ABOVE BY EITHER THE VENDOR OR BY A PROFESSIONAL ENGINEER LICENSED BY THE STATE OF NEW JERSEY. THE CONTENT OF ANY SOIL MIXED ON-SITE MUST BE CERTIFIED BY A PROFESSIONAL ENGINEER LICENSED BY THE STATE OF NEW JERSEY. IN ADDITION, THE ENGINEER MUST BE PRESENT WHILE THE SOIL IS MIXED.
    - THE PH OF THE SOIL BED MATERIAL MUST RANGE FROM 5.5 TO 6.5.
    - THE SOIL BED MATERIAL MUST BE PLACED IN LIFTS NOT TO EXCEED 8 INCHES. ADDITIONAL MATERIALS MAY BE NECESSARY TO ACCOUNT FOR SETTLING OVER TIME.
  - SAND LAYER SPECIFICATIONS
    - THE SAND LAYER MUST BE AT LEAST 6 INCHES IN DEPTH AND MUST CONSIST OF CLEAN, MEDIUM-AGGREGATE CONCRETE SAND (AASHTO M-6/ASTM C-33).
  - GRAVEL LAYER SPECIFICATIONS
    - THE GRAVEL LAYER MUST BE AASHTO #57 AND HAVE SUFFICIENT DEPTH TO PROVIDE AT LEAST 3 INCHES OF GRAVEL ABOVE AND BELOW THE PERFORATED UNDERDRAIN AND MUST CONSIST OF 0.5 TO 1.5 INCH CLEAN, BROKEN STONE OR PEA GRAVEL (AASHTO M-43).
  - GEOTEXTILE FILTER FABRIC SHALL BE INSTALLED ALONG THE SIDES AND THE BOTTOM OF THE BASIN AND IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
  - FLEXIBLE CORRUGATED PERFORATED PLASTIC DRAIN PIPE SHOULD NOT BE USED AS UNDERDRAIN PIPE.
  - REFER TO THE GRADING & DRAINAGE PLANS FOR RAIN GARDEN ELEVATIONS, PIPE INVERTS, AND GRATE ELEVATIONS.
  - REFER TO THE OUTLET CONTROL STRUCTURE DETAIL FOR SPECIFICATIONS.
  - REFER TO LANDSCAPING PLANS AND DETAILS FOR PROPOSED PLANTINGS WITHIN RAIN GARDEN AND FOR PLANTING SOIL DETAILS AND SPECIFICATIONS.

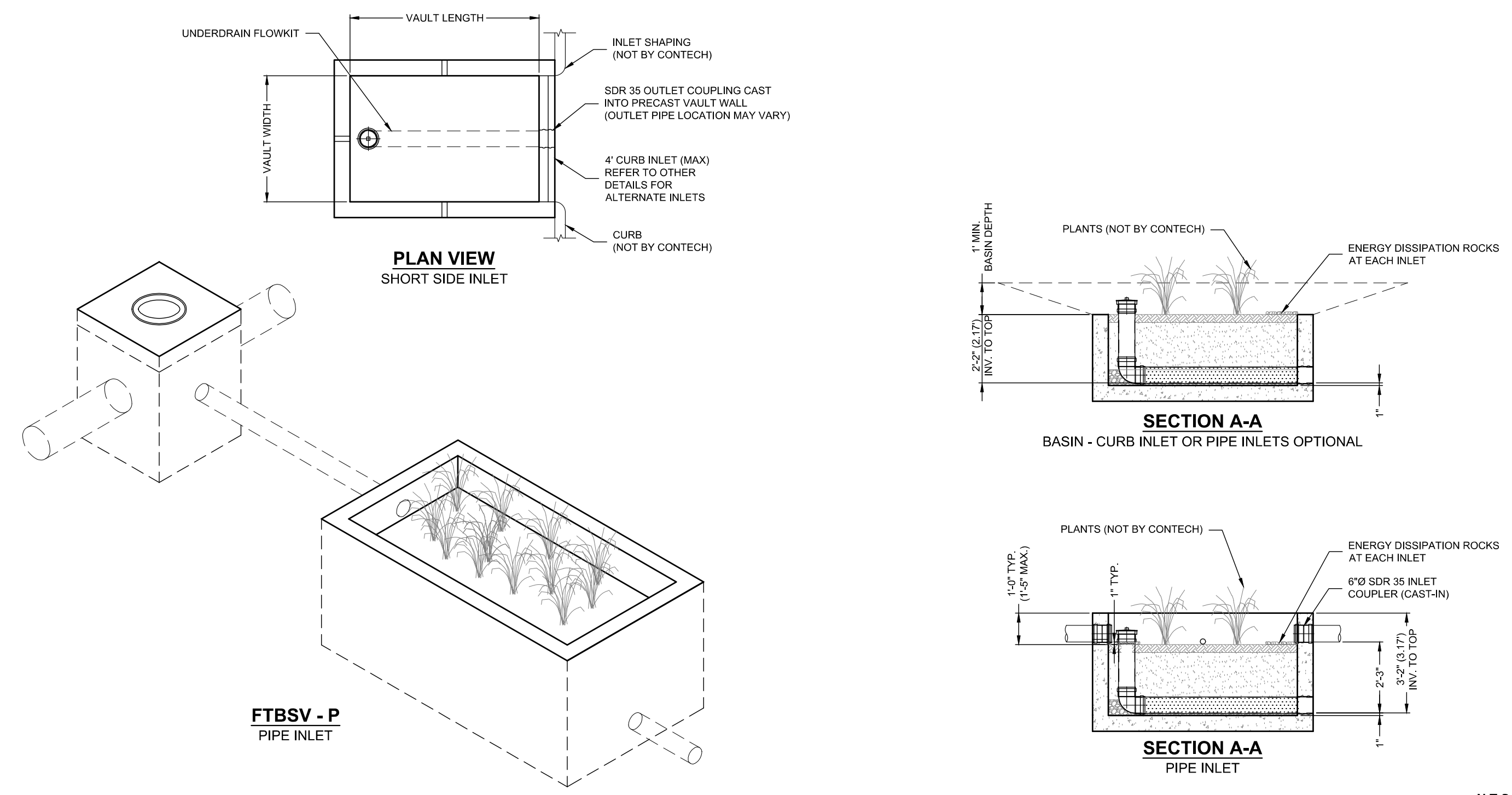
N.T.S.



- GENERAL NOTES**
- CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
  - DIMENSIONS MARKED WITH ( ) ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
  - FOR SITE SPECIFIC DRAWINGS WITH DETAILED VAULT DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. [www.ContechES.com](http://www.ContechES.com)
  - STORMFILTER WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
  - STRUCTURE SHALL MEET AASHTO HS-20 LOAD RATING, ASSUMING EARTH COVER OF 0' - 5' (1524 mm) AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 AND BE CAST WITH THE CONTECH LOGO.
  - FILTER CARTRIDGES SHALL BE MEDIA-FILLED, PASSIVE, SIPHON ACTUATED, RADIAL FLOW, AND SELF CLEANING. RADIAL MEDIA DEPTH SHALL BE 7-INCHES (178 mm). FILTER MEDIA CONTACT TIME SHALL BE AT LEAST 38 SECONDS.
  - SPECIFIC FLOW RATE IS EQUAL TO THE FILTER TREATMENT CAPACITY (gpm) [L/s] DIVIDED BY THE FILTER CONTACT SURFACE AREA (sq ft) [m<sup>2</sup>].
  - STORMFILTER STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C-478 AND AASHTO LOAD FACTOR DESIGN METHOD.
- INSTALLATION NOTES**
- ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
  - CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STORMFILTER STRUCTURE.
  - CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS AND ASSEMBLY STRUCTURE.
  - CONTRACTOR TO PROVIDE, INSTALL, AND GROUT INLET PIPE(S).
  - CONTRACTOR TO PROVIDE AND INSTALL CONNECTOR TO THE OUTLET RISER STUB. STORMFILTER EQUIPPED WITH A DUAL DIAMETER HDPE OUTLET STUB AND SAND COLLAR. IF OUTLET PIPE IS LARGER THAN 8 INCHES (200 mm), CONTRACTOR TO REMOVE THE 8 INCH (200 mm) OUTLET STUB AT MOLDED-IN OUTLINE. COUPLINGS BY FERROD OR EQUAL AND PROVIDED BY CONTRACTOR.
  - CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT CARTRIDGES FROM CONSTRUCTION-RELATED EROSION RUNOFF.

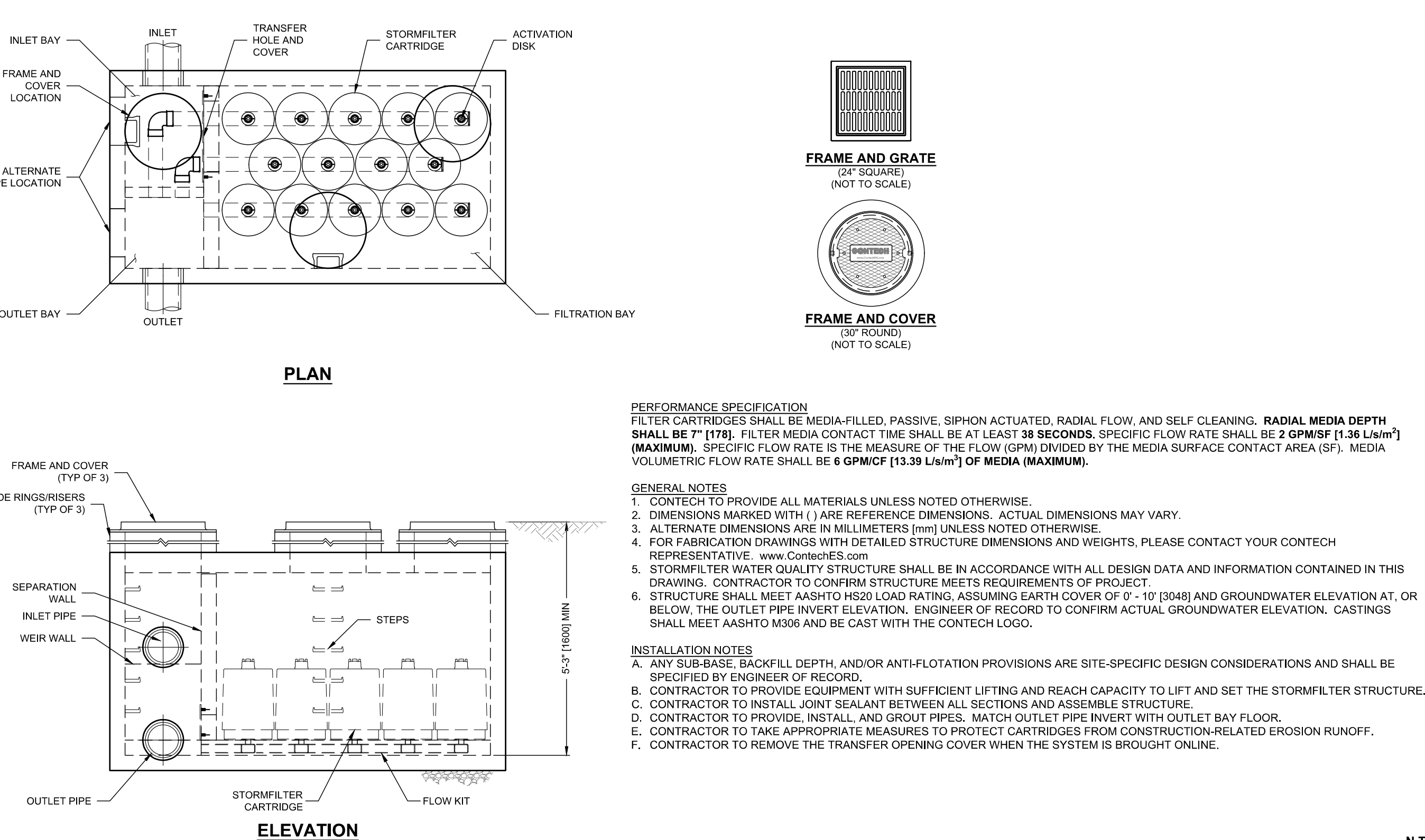
N.T.S.

**UNDERDRAINED RAIN GARDEN TYPICAL CROSS SECTION**



N.T.S.

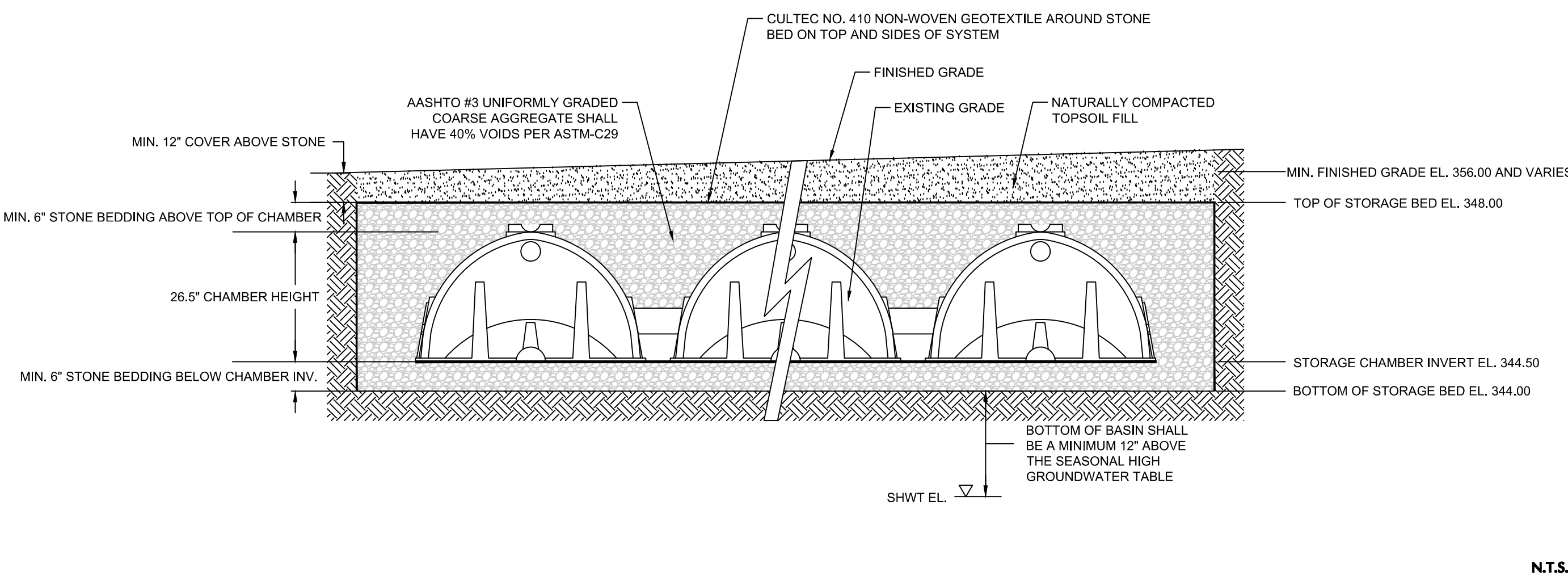
**CONTECH STORMFILTER 48" MANHOLE**



- PERFORMANCE SPECIFICATION**
- FILTER CARTRIDGES SHALL BE MEDIA-FILLED, PASSIVE, SIPHON ACTUATED, RADIAL FLOW, AND SELF CLEANING. RADIAL MEDIA DEPTH SHALL BE 7" (178). FILTER MEDIA CONTACT TIME SHALL BE AT LEAST 38 SECONDS. SPECIFIC FLOW RATE SHALL BE 2 GPM/SF (1.36 L/s/m<sup>2</sup>) (MAXIMUM). SPECIFIC FLOW RATE IS THE MEASURE OF THE FLOW (GPM) DIVIDED BY THE MEDIA SURFACE CONTACT AREA (SF). MEDIA VOLUMETRIC FLOW RATE SHALL BE 6 GPM/CF (13.39 L/s/m<sup>3</sup>) OF MEDIA (MAXIMUM).
- GENERAL NOTES**
- CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
  - DIMENSIONS MARKED WITH ( ) ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
  - ALTERNATE DIMENSIONS ARE IN MILLIMETERS (mm) UNLESS NOTED OTHERWISE.
  - FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH REPRESENTATIVE. [www.ContechES.com](http://www.ContechES.com)
  - STORMFILTER WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
  - STRUCTURE SHALL MEET AASHTO HS20 LOAD RATING, ASSUMING EARTH COVER OF 0' - 10' (3048) AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 AND BE CAST WITH THE CONTECH LOGO.
- INSTALLATION NOTES**
- ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
  - CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STORMFILTER STRUCTURE.
  - CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL SECTIONS AND ASSEMBLY STRUCTURE.
  - CONTRACTOR TO PROVIDE, INSTALL, AND GROUT PIPES. MATCH OUTLET PIPE INVERT WITH OUTLET BAY FLOOR.
  - CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT CARTRIDGES FROM CONSTRUCTION-RELATED EROSION RUNOFF.
  - CONTRACTOR TO REMOVE THE TRANSFER OPENING COVER WHEN THE SYSTEM IS BROUGHT ONLINE.

N.T.S.

**CONTECH FILTERRA**



N.T.S.

**CONTECH STORMFILTER PEAK DIVERSION 6' X 12'**



| Date   | Description | No.  |
|--|-------------|------|
| Revisions  |             |      |
|  |             |      |
| Digitally signed by<br><b>John C Cote</b><br>Date: 2025.07.02<br>09:35:47-04'00' |             |      |
| SIGNATURE  | JOHN COTE   | DATE |
| PROFESSIONAL ENGINEER NJ Lic. No.<br>24GE03705800                                |             |      |

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Environmental Services, LLC

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Parsippany, NJ 07054

T: 973.560.4900 F: 973.560.4901 [www.langan.com](http://www.langan.com)  
NJ CERTIFICATE OF AUTHORIZATION NO. 24GA27996400

Project  
**BEACON UNITARIAN  
UNIVERSALIST  
CONGREGATION**  
SUMMIT NEW JERSEY

Drawing Title  
**DRAINAGE DETAILS**

|                                 |                             |
|---------------------------------|-----------------------------|
| Project No.<br><b>101007201</b> | Drawing No.<br><b>CG505</b> |
| Date<br><b>FEBRUARY 9, 2024</b> | <b>CG505</b>                |
| Drawn By<br><b>SS</b>           |                             |
| Checked By<br><b>TH</b>         |                             |
| Sheet 13 of 19                  |                             |

# **APPENDIX A**

## **Existing Stormwater Discharge Calculations**

**APPENDIX A  
TABLE OF CONTENTS**

**NOAA RAINFALL PRECIPITATION DATA**

**NOAA REGION D RAINFALL DISTRIBUTION**

**EXISTING RUNOFF CURVE NUMBER CALCULATIONS**

**CURRENT HYDROGRAPH CALCULATIONS**

**EX-1 WATERSHED (TOTAL EXISTING FLOW TO POA-1)**

**Time of Concentration Calculation**

**2 Year Design Storm Event**

**10 Year Design Storm Event**

**100 Year Design Storm Event**

**TOTAL ALLOWABLE FLOW TO POA-1**

**2 Year Design Storm Event**

**10 Year Design Storm Event**

**100 Year Design Storm Event**

**EX-2A WATERSHED**

**Time of Concentration Calculation**

**2 Year Design Storm Event**

**10 Year Design Storm Event**

**100 Year Design Storm Event**

**EX-2A WATERSHED ALLOWABLE PEAK DISCHARGE**

**2 Year Design Storm Event**

**10 Year Design Storm Event**

**100 Year Design Storm Event**

**EX-2B WATERSHED**

**Time of Concentration Calculation**

**2 Year Design Storm Event**

**10 Year Design Storm Event**

**100 Year Design Storm Event**

**TOTAL EXISTING FLOW TO POA-2**

**2 Year Design Storm Event**

**10 Year Design Storm Event**

**100 Year Design Storm Event**

**TOTAL ALLOWABLE FLOW TO POA-2**

**2 Year Design Storm Event**

**10 Year Design Storm Event**

**100 Year Design Storm Event**

**EX-3 WATERSHED (TOTAL EXISTING FLOW TO POA-3)**

**Time of Concentration Calculation**

**2 Year Design Storm Event**

**10 Year Design Storm Event**

**100 Year Design Storm Event**

**SUMMARY OF EXISTING PEAK DISCHARGES**

**FUTURE HYDROGRAPH CALCULATIONS**

**EX-1 WATERSHED (TOTAL EXISTING FLOW TO POA-1)**

**Time of Concentration Calculation**

**2 Year Design Storm Event**

**10 Year Design Storm Event**

**100 Year Design Storm Event**

**TOTAL ALLOWABLE FLOW TO POA-1**

**2 Year Design Storm Event**

**10 Year Design Storm Event**

**100 Year Design Storm Event**

**EX-2A WATERSHED**

**Time of Concentration Calculation**

**2 Year Design Storm Event**

**10 Year Design Storm Event**

**100 Year Design Storm Event**

**EX-2A WATERSHED ALLOWABLE PEAK DISCHARGE**

**2 Year Design Storm Event**

**10 Year Design Storm Event**

**100 Year Design Storm Event**

**EX-2B WATERSHED**

**Time of Concentration Calculation**

**2 Year Design Storm Event**

**10 Year Design Storm Event**

**100 Year Design Storm Event**

**TOTAL EXISTING FLOW TO POA-2**

**2 Year Design Storm Event**

**10 Year Design Storm Event**

**100 Year Design Storm Event**

**TOTAL ALLOWABLE FLOW TO POA-2**

**2 Year Design Storm Event**

**10 Year Design Storm Event**

**100 Year Design Storm Event**



**EX-3 WATERSHED (TOTAL EXISTING FLOW TO POA-3)**

**Time of Concentration Calculation**

**2 Year Design Storm Event**

**10 Year Design Storm Event**

**100 Year Design Storm Event**

**SUMMARY OF EXISTING PEAK DISCHARGES**

# **NOAA RAINFALL PRECIPITATION DATA**



**NOAA Atlas 14, Volume 2, Version 3**  
**Location name: Summit, New Jersey, USA\***  
**Latitude: 40.7128°, Longitude: -74.3766°**  
**Elevation: 357 ft\*\***  
 \* source: ESRI Maps  
 \*\* source: USGS



**POINT PRECIPITATION FREQUENCY ESTIMATES**

G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M.Yekta, and D. Riley

NOAA, National Weather Service, Silver Spring, Maryland

[PF\\_tabular](#) | [PF\\_graphical](#) | [Maps & aerials](#)

**PF tabular**

| <b>PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)<sup>1</sup></b> |                                     |                        |                        |                        |                        |                        |                        |                        |                        |                        |
|--|-------------------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| Duration   | Average recurrence interval (years) |                        |                        |                        |                        |                        |                        |                        |                        |                        |
|  | 1                                   | 2                      | 5                      | 10                     | 25                     | 50                     | 100                    | 200                    | 500                    | 1000                   |
| 5-min  | 0.336<br>(0.307-0.369)              | 0.400<br>(0.366-0.439) | 0.473<br>(0.431-0.520) | 0.525<br>(0.478-0.577) | 0.590<br>(0.535-0.647) | 0.634<br>(0.573-0.695) | 0.679<br>(0.609-0.743) | 0.718<br>(0.641-0.787) | 0.770<br>(0.681-0.846) | 0.806<br>(0.708-0.887) |
| 10-min   | 0.536<br>(0.490-0.589)              | 0.639<br>(0.585-0.702) | 0.757<br>(0.690-0.831) | 0.839<br>(0.764-0.922) | 0.938<br>(0.851-1.03)  | 1.01<br>(0.911-1.11)   | 1.08<br>(0.967-1.18)   | 1.14<br>(1.01-1.24)    | 1.21<br>(1.07-1.33)    | 1.26<br>(1.11-1.39)    |
| 15-min   | 0.669<br>(0.612-0.735)              | 0.803<br>(0.735-0.882) | 0.957<br>(0.872-1.05)  | 1.06<br>(0.966-1.17)   | 1.19<br>(1.08-1.30)    | 1.28<br>(1.15-1.40)    | 1.36<br>(1.22-1.49)    | 1.44<br>(1.28-1.57)    | 1.53<br>(1.35-1.68)    | 1.58<br>(1.39-1.74)    |
| 30-min   | 0.917<br>(0.838-1.01)               | 1.11<br>(1.01-1.22)    | 1.36<br>(1.24-1.49)    | 1.54<br>(1.40-1.69)    | 1.76<br>(1.60-1.93)    | 1.92<br>(1.73-2.11)    | 2.08<br>(1.87-2.28)    | 2.23<br>(1.99-2.44)    | 2.42<br>(2.14-2.66)    | 2.56<br>(2.25-2.82)    |
| 60-min   | 1.14<br>(1.04-1.26)                 | 1.39<br>(1.27-1.53)    | 1.74<br>(1.59-1.91)    | 2.00<br>(1.82-2.20)    | 2.34<br>(2.12-2.57)    | 2.60<br>(2.35-2.85)    | 2.86<br>(2.57-3.14)    | 3.12<br>(2.79-3.42)    | 3.47<br>(3.07-3.81)    | 3.73<br>(3.28-4.11)    |
| 2-hr   | 1.40<br>(1.27-1.54)                 | 1.70<br>(1.55-1.88)    | 2.16<br>(1.96-2.39)    | 2.51<br>(2.27-2.78)    | 3.00<br>(2.70-3.31)    | 3.41<br>(3.05-3.76)    | 3.82<br>(3.39-4.21)    | 4.26<br>(3.75-4.69)    | 4.86<br>(4.23-5.36)    | 5.34<br>(4.61-5.90)    |
| 3-hr   | 1.56<br>(1.42-1.73)                 | 1.90<br>(1.74-2.11)    | 2.42<br>(2.20-2.68)    | 2.82<br>(2.55-3.11)    | 3.37<br>(3.04-3.72)    | 3.82<br>(3.42-4.21)    | 4.28<br>(3.81-4.72)    | 4.77<br>(4.21-5.26)    | 5.44<br>(4.75-6.01)    | 5.98<br>(5.17-6.62)    |
| 6-hr   | 2.01<br>(1.83-2.23)                 | 2.44<br>(2.23-2.70)    | 3.10<br>(2.81-3.41)    | 3.63<br>(3.28-3.98)    | 4.38<br>(3.93-4.81)    | 5.02<br>(4.47-5.49)    | 5.69<br>(5.03-6.23)    | 6.42<br>(5.62-7.02)    | 7.46<br>(6.44-8.17)    | 8.33<br>(7.10-9.12)    |
| 12-hr  | 2.51<br>(2.29-2.77)                 | 3.05<br>(2.78-3.37)    | 3.88<br>(3.54-4.28)    | 4.59<br>(4.16-5.04)    | 5.62<br>(5.05-6.15)    | 6.51<br>(5.80-7.11)    | 7.48<br>(6.58-8.15)    | 8.55<br>(7.43-9.32)    | 10.1<br>(8.64-11.0)    | 11.5<br>(9.65-12.5)    |
| 24-hr  | 2.84<br>(2.62-3.08)                 | 3.43<br>(3.18-3.74)    | 4.40<br>(4.07-4.79)    | 5.22<br>(4.81-5.68)    | 6.47<br>(5.91-7.02)    | 7.55<br>(6.85-8.18)    | 8.74<br>(7.86-9.48)    | 10.1<br>(8.95-11.0)    | 12.1<br>(10.6-13.2)    | 13.8<br>(11.9-15.1)    |
| 2-day  | 3.35<br>(3.08-3.65)                 | 4.05<br>(3.73-4.42)    | 5.17<br>(4.76-5.64)    | 6.11<br>(5.60-6.66)    | 7.48<br>(6.82-8.15)    | 8.65<br>(7.84-9.42)    | 9.93<br>(8.92-10.8)    | 11.3<br>(10.1-12.4)    | 13.4<br>(11.7-14.7)    | 15.1<br>(13.0-16.7)    |
| 3-day  | 3.52<br>(3.25-3.84)                 | 4.26<br>(3.93-4.64)    | 5.42<br>(4.99-5.90)    | 6.38<br>(5.86-6.94)    | 7.77<br>(7.10-8.44)    | 8.94<br>(8.12-9.72)    | 10.2<br>(9.19-11.1)    | 11.6<br>(10.3-12.6)    | 13.6<br>(11.9-14.9)    | 15.3<br>(13.2-16.8)    |
| 4-day  | 3.70<br>(3.42-4.02)                 | 4.48<br>(4.14-4.86)    | 5.66<br>(5.23-6.16)    | 6.64<br>(6.11-7.22)    | 8.05<br>(7.37-8.73)    | 9.23<br>(8.40-10.0)    | 10.5<br>(9.47-11.4)    | 11.8<br>(10.6-12.9)    | 13.8<br>(12.2-15.1)    | 15.4<br>(13.5-17.0)    |
| 7-day  | 4.38<br>(4.06-4.74)                 | 5.25<br>(4.88-5.69)    | 6.52<br>(6.05-7.06)    | 7.58<br>(7.00-8.19)    | 9.08<br>(8.34-9.83)    | 10.3<br>(9.43-11.2)    | 11.7<br>(10.6-12.6)    | 13.1<br>(11.8-14.2)    | 15.1<br>(13.4-16.5)    | 16.8<br>(14.7-18.4)    |
| 10-day   | 5.02<br>(4.68-5.42)                 | 6.00<br>(5.59-6.47)    | 7.34<br>(6.83-7.91)    | 8.44<br>(7.83-9.10)    | 10.0<br>(9.23-10.8)    | 11.3<br>(10.4-12.2)    | 12.6<br>(11.5-13.6)    | 14.0<br>(12.7-15.2)    | 16.0<br>(14.3-17.4)    | 17.6<br>(15.6-19.3)    |
| 20-day   | 6.79<br>(6.37-7.26)                 | 8.06<br>(7.56-8.62)    | 9.62<br>(9.01-10.3)    | 10.8<br>(10.1-11.6)    | 12.5<br>(11.6-13.4)    | 13.8<br>(12.8-14.8)    | 15.1<br>(14.0-16.2)    | 16.4<br>(15.1-17.6)    | 18.2<br>(16.6-19.6)    | 19.6<br>(17.7-21.2)    |
| 30-day   | 8.46<br>(8.00-8.95)                 | 9.98<br>(9.44-10.6)    | 11.7<br>(11.0-12.3)    | 13.0<br>(12.2-13.7)    | 14.6<br>(13.8-15.5)    | 15.9<br>(14.9-16.8)    | 17.2<br>(16.1-18.2)    | 18.4<br>(17.1-19.5)    | 19.9<br>(18.4-21.2)    | 21.1<br>(19.4-22.5)    |
| 45-day   | 10.7<br>(10.2-11.3)                 | 12.6<br>(12.0-13.3)    | 14.6<br>(13.8-15.4)    | 16.0<br>(15.2-16.9)    | 17.9<br>(16.9-18.9)    | 19.3<br>(18.2-20.4)    | 20.7<br>(19.4-21.8)    | 22.0<br>(20.6-23.2)    | 23.6<br>(22.0-25.0)    | 24.8<br>(23.0-26.4)    |
| 60-day   | 12.9<br>(12.3-13.5)                 | 15.1<br>(14.4-15.9)    | 17.3<br>(16.4-18.1)    | 18.9<br>(17.9-19.8)    | 20.9<br>(19.8-22.0)    | 22.3<br>(21.1-23.5)    | 23.7<br>(22.4-25.0)    | 24.9<br>(23.5-26.4)    | 26.5<br>(24.9-28.1)    | 27.6<br>(25.8-29.3)    |

<sup>1</sup> Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values. Please refer to NOAA Atlas 14 document for more information.

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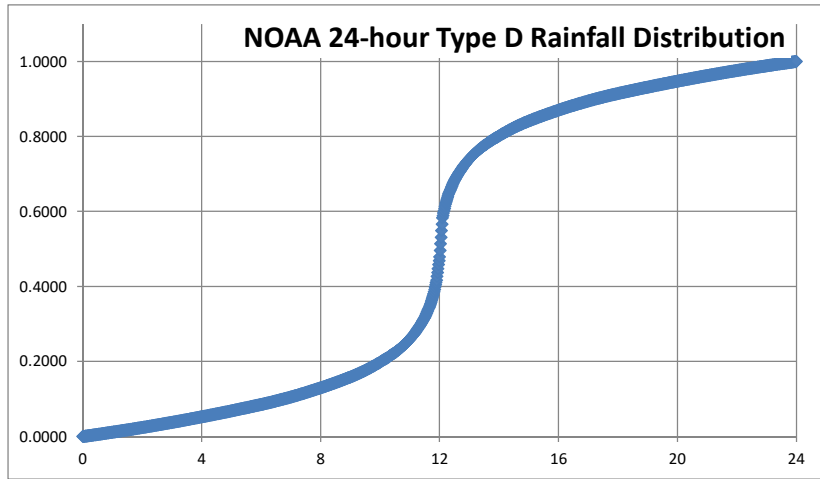
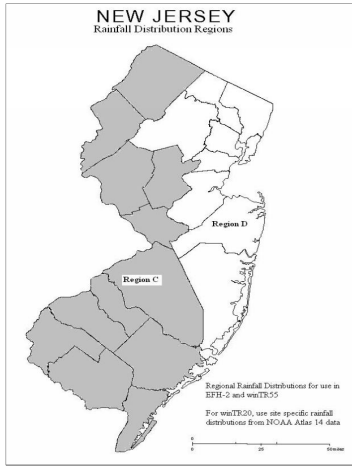
**PF graphical**

| Frequency of Storms  | NOAA NWS PFDS 24-Hour Rainfall Depth (inches) | Current Precipitation Adjustment Factor for Union County | Current Rainfall Depth (inches) | Future Precipitation Adjustment Factor for Union County | Future Rainfall Depth (inches) |
|----------------------|---|--|---------------------------------|---|--------------------------------|
| 2-Year               | 3.43  | 1.01   | 3.46                            | 1.20  | 4.12                           |
| 10-Year              | 5.22  | 1.03   | 5.38                            | 1.23  | 6.42                           |
| 25-Year <sup>1</sup> | 6.47  | 1.04   | 6.73                            | 1.27  | 8.23                           |
| 100-Year             | 8.74  | 1.06   | 9.26                            | 1.35  | 11.80                          |

Notes:

1. The adjustment factors for the current and future 25-year storms was found using a weighted average of the 10- and 100-year adjustment factors.

## **NOAA REGION D RAINFALL DISTRIBUTION**



| Time (hrs) | Cumulative Rainfall (%) | Time (hrs) | Cumulative Rainfall (%) | Time (hrs) | Cumulative Rainfall (%) | Time (hrs) | Cumulative Rainfall (%) | Time (hrs) | Cumulative Rainfall (%) | Time (hrs) | Cumulative Rainfall (%) |
|------------|-------------------------|------------|-------------------------|------------|-------------------------|------------|-------------------------|------------|-------------------------|------------|-------------------------|
| 0          | 0.0000                  | 4          | 0.0489                  | 8          | 0.1198                  | 12         | 0.4766                  | 16         | 0.8802                  | 20         | 0.9511                  |
| 0.1        | 0.0013                  | 4.1        | 0.0504                  | 8.1        | 0.1222                  | 12.1       | 0.5933                  | 16.1       | 0.8826                  | 20.1       | 0.9525                  |
| 0.2        | 0.0023                  | 4.2        | 0.0518                  | 8.2        | 0.1247                  | 12.2       | 0.6338                  | 16.2       | 0.885                   | 20.2       | 0.9539                  |
| 0.3        | 0.0033                  | 4.3        | 0.0532                  | 8.3        | 0.1273                  | 12.3       | 0.663                   | 16.3       | 0.8873                  | 20.3       | 0.9553                  |
| 0.4        | 0.0044                  | 4.4        | 0.0547                  | 8.4        | 0.1298                  | 12.4       | 0.6843                  | 16.4       | 0.8896                  | 20.4       | 0.9566                  |
| 0.5        | 0.0055                  | 4.5        | 0.0562                  | 8.5        | 0.1324                  | 12.5       | 0.7045                  | 16.5       | 0.8918                  | 20.5       | 0.958                   |
| 0.6        | 0.0065                  | 4.6        | 0.0576                  | 8.6        | 0.1351                  | 12.6       | 0.7175                  | 16.6       | 0.894                   | 20.6       | 0.9594                  |
| 0.7        | 0.0076                  | 4.7        | 0.0591                  | 8.7        | 0.1378                  | 12.7       | 0.7298                  | 16.7       | 0.8962                  | 20.7       | 0.9607                  |
| 0.8        | 0.0087                  | 4.8        | 0.0606                  | 8.8        | 0.1405                  | 12.8       | 0.7409                  | 16.8       | 0.8983                  | 20.8       | 0.9621                  |
| 0.9        | 0.0098                  | 4.9        | 0.0621                  | 8.9        | 0.1432                  | 12.9       | 0.751                   | 16.9       | 0.9004                  | 20.9       | 0.9634                  |
| 1          | 0.0109                  | 5          | 0.0636                  | 9          | 0.1461                  | 13         | 0.76                    | 17         | 0.9025                  | 21         | 0.9647                  |
| 1.1        | 0.0121                  | 5.1        | 0.0651                  | 9.1        | 0.149                   | 13.1       | 0.7679                  | 17.1       | 0.9045                  | 21.1       | 0.966                   |
| 1.2        | 0.0132                  | 5.2        | 0.0667                  | 9.2        | 0.1521                  | 13.2       | 0.7753                  | 17.2       | 0.9064                  | 21.2       | 0.9673                  |
| 1.3        | 0.0143                  | 5.3        | 0.0682                  | 9.3        | 0.1554                  | 13.3       | 0.7821                  | 17.3       | 0.9084                  | 21.3       | 0.9686                  |
| 1.4        | 0.0155                  | 5.4        | 0.0697                  | 9.4        | 0.1588                  | 13.4       | 0.7883                  | 17.4       | 0.9103                  | 21.4       | 0.9699                  |
| 1.5        | 0.0167                  | 5.5        | 0.0713                  | 9.5        | 0.1623                  | 13.5       | 0.7939                  | 17.5       | 0.9121                  | 21.5       | 0.9712                  |
| 1.6        | 0.0178                  | 5.6        | 0.0729                  | 9.6        | 0.166                   | 13.6       | 0.799                   | 17.6       | 0.9139                  | 21.6       | 0.9724                  |
| 1.7        | 0.019                   | 5.7        | 0.0745                  | 9.7        | 0.1699                  | 13.7       | 0.8039                  | 17.7       | 0.9157                  | 21.7       | 0.9737                  |
| 1.8        | 0.0202                  | 5.8        | 0.076                   | 9.8        | 0.1739                  | 13.8       | 0.8086                  | 17.8       | 0.9174                  | 21.8       | 0.9749                  |
| 1.9        | 0.0214                  | 5.9        | 0.0776                  | 9.9        | 0.178                   | 13.9       | 0.8132                  | 17.9       | 0.9191                  | 21.9       | 0.9762                  |
| 2          | 0.0226                  | 6          | 0.0793                  | 10         | 0.1823                  | 14         | 0.8177                  | 18         | 0.9208                  | 22         | 0.9774                  |
| 2.1        | 0.0238                  | 6.1        | 0.0809                  | 10.1       | 0.1868                  | 14.1       | 0.822                   | 18.1       | 0.9224                  | 22.1       | 0.9786                  |
| 2.2        | 0.0251                  | 6.2        | 0.0826                  | 10.2       | 0.1914                  | 14.2       | 0.8261                  | 18.2       | 0.924                   | 22.2       | 0.9798                  |
| 2.3        | 0.0263                  | 6.3        | 0.0843                  | 10.3       | 0.1961                  | 14.3       | 0.8301                  | 18.3       | 0.9255                  | 22.3       | 0.981                   |
| 2.4        | 0.0276                  | 6.4        | 0.0861                  | 10.4       | 0.201                   | 14.4       | 0.834                   | 18.4       | 0.9271                  | 22.4       | 0.9822                  |
| 2.5        | 0.0288                  | 6.5        | 0.0879                  | 10.5       | 0.2061                  | 14.5       | 0.8377                  | 18.5       | 0.9287                  | 22.5       | 0.9833                  |
| 2.6        | 0.0301                  | 6.6        | 0.0897                  | 10.6       | 0.2117                  | 14.6       | 0.8412                  | 18.6       | 0.9303                  | 22.6       | 0.9845                  |
| 2.7        | 0.0314                  | 6.7        | 0.0916                  | 10.7       | 0.2179                  | 14.7       | 0.8446                  | 18.7       | 0.9318                  | 22.7       | 0.9857                  |
| 2.8        | 0.0327                  | 6.8        | 0.0936                  | 10.8       | 0.2247                  | 14.8       | 0.8479                  | 18.8       | 0.9334                  | 22.8       | 0.9868                  |
| 2.9        | 0.034                   | 6.9        | 0.0955                  | 10.9       | 0.2321                  | 14.9       | 0.851                   | 18.9       | 0.9349                  | 22.9       | 0.9879                  |
| 3          | 0.0353                  | 7          | 0.0975                  | 11         | 0.24                    | 15         | 0.854                   | 19         | 0.9364                  | 23         | 0.9891                  |
| 3.1        | 0.0366                  | 7.1        | 0.0996                  | 11.1       | 0.249                   | 15.1       | 0.8568                  | 19.1       | 0.9379                  | 23.1       | 0.9902                  |
| 3.2        | 0.0379                  | 7.2        | 0.1017                  | 11.2       | 0.2591                  | 15.2       | 0.8595                  | 19.2       | 0.9394                  | 23.2       | 0.9913                  |
| 3.3        | 0.0393                  | 7.3        | 0.1038                  | 11.3       | 0.2702                  | 15.3       | 0.8622                  | 19.3       | 0.9409                  | 23.3       | 0.9924                  |
| 3.4        | 0.0406                  | 7.4        | 0.106                   | 11.4       | 0.2824                  | 15.4       | 0.8649                  | 19.4       | 0.9424                  | 23.4       | 0.9935                  |
| 3.5        | 0.042                   | 7.5        | 0.1082                  | 11.5       | 0.2955                  | 15.5       | 0.8676                  | 19.5       | 0.9438                  | 23.5       | 0.9945                  |
| 3.6        | 0.0434                  | 7.6        | 0.1104                  | 11.6       | 0.3157                  | 15.6       | 0.8702                  | 19.6       | 0.9453                  | 23.6       | 0.9956                  |
| 3.7        | 0.0447                  | 7.7        | 0.1127                  | 11.7       | 0.337                   | 15.7       | 0.8727                  | 19.7       | 0.9468                  | 23.7       | 0.9966                  |
| 3.8        | 0.0461                  | 7.8        | 0.115                   | 11.8       | 0.3662                  | 15.8       | 0.8753                  | 19.8       | 0.9482                  | 23.8       | 0.9977                  |
| 3.9        | 0.0475                  | 7.9        | 0.1174                  | 11.9       | 0.4067                  | 15.9       | 0.8777                  | 19.9       | 0.9496                  | 23.9       | 0.9987                  |
|            |                         |            |                         |            |                         |            |                         |            |                         | 24         | 1.0000                  |

Reference: USDA Natural Resources Conservation Service New Jersey, Engineering Guidelines

## **EXISTING RUNOFF CURVE NUMBER CALCULATIONS**

**EXISTING RUNOFF CURVE NUMBER CALCULATIONS  
 BEACON UNITARIAN UNIVERSALIST CHURCH  
 LANGAN PROJECT #101007201**

**EXISTING CONDITIONS**

| <b>EXISTING WATERSHED AREAS</b> | <b>OPEN SPACE HSGC C CN = 74 (SF)</b> | <b>OPEN SPACE HSGC C CN = 74 (AC)</b> | <b>WOODS HSGC C CN = 70 (SF)</b> | <b>WOODS HSGC C CN = 70 (AC)</b> | <b>IMPERVIOUS AREA CN = 98 (SF)</b> | <b>IMPERVIOUS AREA CN = 98 (AC)</b> | <b>TOTAL AREA (SF)</b> | <b>TOTAL AREA (AC)</b> | <b>CURVE NUMBER CN (Weighted)</b> |
|---------------------------------|---------------------------------------|---------------------------------------|----------------------------------|----------------------------------|-------------------------------------|-------------------------------------|------------------------|------------------------|-----------------------------------|
| <b>POA-1</b>                    |                                       |                                       |                                  |                                  |                                     |                                     |                        |                        |                                   |
| EX-1                            | 12,042                                | 0.28                                  | 4,356                            | 0.10                             | 5,850                               | 0.13                                | 22,248                 | 0.51                   | 80                                |
| <b>POA-2</b>                    |                                       |                                       |                                  |                                  |                                     |                                     |                        |                        |                                   |
| EX-2A                           | 13,690                                | 0.32                                  | 19,816                           | 0.46                             | 19,295                              | 0.44                                | 52,801                 | 1.22                   | 81                                |
| EX-2B                           | 7,672                                 | 0.18                                  | 21,802                           | 0.50                             | 3,168                               | 0.07                                | 32,643                 | 0.75                   | 74                                |
| <b>POA-3</b>                    |                                       |                                       |                                  |                                  |                                     |                                     |                        |                        |                                   |
| EX-3                            | 289                                   | 0.01                                  | 1,645                            | 0.04                             | 0                                   | 0.00                                | 1,934                  | 0.05                   | 71                                |

**NOTES:**

1. Runoff curve numbers referenced from Technical Release 55 (TR-55) Table 2-2a: Runoff Curve Numbers for Urban Areas and Table 2-2c: Runoff Curve Numbers for Other Agricultural Lands. Pervious areas are assumed to be in good hydrologic condition.



## **CURRENT HYDROGRAPH CALCULATIONS**

**EX-1 WATERSHED (TOTAL EXISTING FLOW TO POA-1)**

Project: Beacon Unitarian Universalist Church

By: SM

Date: 11/29/2023

Location: Summit, NJ

Checked By: MJV

Date Checked: 11/29/2023

Circle One: Present Developed

Current Existing Watershed EX-1 Impervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Flow Length, L (total L < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. Compute T<sub>t</sub>

$$T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} s^{0.4}}$$

|            |                        |                      |  |
|------------|------------------------|----------------------|--|
| Segment ID | <b>1</b>               | <b>2</b>             |  |
|            | <b>Smooth Surfaces</b> | <b>Dense Grasses</b> |  |
|            | <b>0.011</b>           | <b>0.24</b>          |  |
| ft         | <b>51</b>              | <b>49</b>            |  |
| in         | <b>3.46</b>            | <b>3.46</b>          |  |
| ft/ft      | <b>0.024</b>           | <b>0.093</b>         |  |
| hr         | <b>0.011</b>           | <b>0.070</b>         |  |

Sheet Flow Sub-Total **0.080 hours**

**Shallow Concentrated Flow**

7. Surface Description
8. Flow Length, L
9. Watercourse Slope, s
10. Average Velocity, V (NEH table 15-3)
11. Compute T<sub>t</sub>

$$T_t = \frac{L}{3600 V}$$

|            |                 |  |  |
|------------|-----------------|--|--|
| Segment ID | <b>3</b>        |  |  |
|            | <b>Pavement</b> |  |  |
| ft         | <b>163</b>      |  |  |
| ft/ft      | <b>0.059</b>    |  |  |
| ft/s       | <b>4.93</b>     |  |  |
| hr         | <b>0.009</b>    |  |  |

Shallow Conc. Flow Sub-Total **0.009 hours**

**Channel Flow**

12. Flow Length, L
13. Cross Sectional flow area, a
14. Wetted Perimeter, P<sub>w</sub>
15. Hydraulic Radius, r
16. Channel Slope, s
17. Manning's Roughness Coeff., n
18. Velocity, V
19. Compute T<sub>t</sub>

$$r = a / P_w$$

$$V = (1.49 r^{2/3} s^{1/2}) / n$$

$$T_t = \frac{L}{3600 V}$$

|                 |  |  |  |
|-----------------|--|--|--|
| Segment ID      |  |  |  |
| ft              |  |  |  |
| ft <sup>2</sup> |  |  |  |
| ft              |  |  |  |
| ft              |  |  |  |
| ft/ft           |  |  |  |
| ft/s            |  |  |  |
| hr              |  |  |  |

Channel Flow Sub-Total **0.000 hours**

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>

(Add Sub-Total T<sub>t</sub> from prior steps)

|                                  |                    |
|----------------------------------|--------------------|
| Total T <sub>c</sub> (hours) =   | <b>0.090 hours</b> |
| Total T <sub>c</sub> (minutes) = | <b>5 minutes</b>   |

Project: Beacon Unitarian Universalist Church

By: SM

Date: 11/29/2023

Location: Summit, NJ

Checked By: MJV

Date Checked: 11/29/2023

Circle One: Present Developed

Current Existing Watershed EX-1 Pervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Flow Length, L (total L < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. Compute T<sub>t</sub>

$$T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} s^{0.4}}$$

|            |                               |                        |  |
|------------|-------------------------------|------------------------|--|
| Segment ID | <b>1</b>                      | <b>2</b>               |  |
|            | <b>Woods Dense Underbrush</b> | <b>Smooth Surfaces</b> |  |
|            | <b>0.40</b>                   | <b>0.011</b>           |  |
| ft         | <b>44</b>                     | <b>29</b>              |  |
| in         | <b>3.46</b>                   | <b>3.46</b>            |  |
| ft/ft      | <b>0.080</b>                  | <b>0.043</b>           |  |
| hr         | <b>0.102</b>                  | <b>0.005</b>           |  |

Sheet Flow Sub-Total **0.107 hours**

**Shallow Concentrated Flow**

7. Surface Description
8. Flow Length, L
9. Watercourse Slope, s
10. Average Velocity, V (NEH table 15-3)
11. Compute T<sub>t</sub>

$$T_t = \frac{L}{3600 V}$$

|            |                 |  |  |
|------------|-----------------|--|--|
| Segment ID | <b>3</b>        |  |  |
|            | <b>Pavement</b> |  |  |
| ft         | <b>230</b>      |  |  |
| ft/ft      | <b>0.054</b>    |  |  |
| ft/s       | <b>4.74</b>     |  |  |
| hr         | <b>0.013</b>    |  |  |

Shallow Conc. Flow Sub-Total **0.013 hours**

**Channel Flow**

12. Flow Length, L
13. Cross Sectional flow area, a
14. Wetted Perimeter, P<sub>w</sub>
15. Hydraulic Radius, r
16. Channel Slope, s
17. Manning's Roughness Coeff., n
18. Velocity, V
19. Compute T<sub>t</sub>

$$r = a / P_w$$

$$V = (1.49 r^{2/3} s^{1/2}) / n$$

$$T_t = \frac{L}{3600 V}$$

|                 |  |  |  |
|-----------------|--|--|--|
| Segment ID      |  |  |  |
| ft              |  |  |  |
| ft <sup>2</sup> |  |  |  |
| ft              |  |  |  |
| ft              |  |  |  |
| ft/ft           |  |  |  |
| ft/s            |  |  |  |
| hr              |  |  |  |

Channel Flow Sub-Total **0.000 hours**

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>

(Add Sub-Total T<sub>t</sub> from prior steps)

|                                  |                    |
|----------------------------------|--------------------|
| Total T <sub>c</sub> (hours) =   | <b>0.121 hours</b> |
| Total T <sub>c</sub> (minutes) = | <b>7 minutes</b>   |

# Hydrograph Report

Project Name:

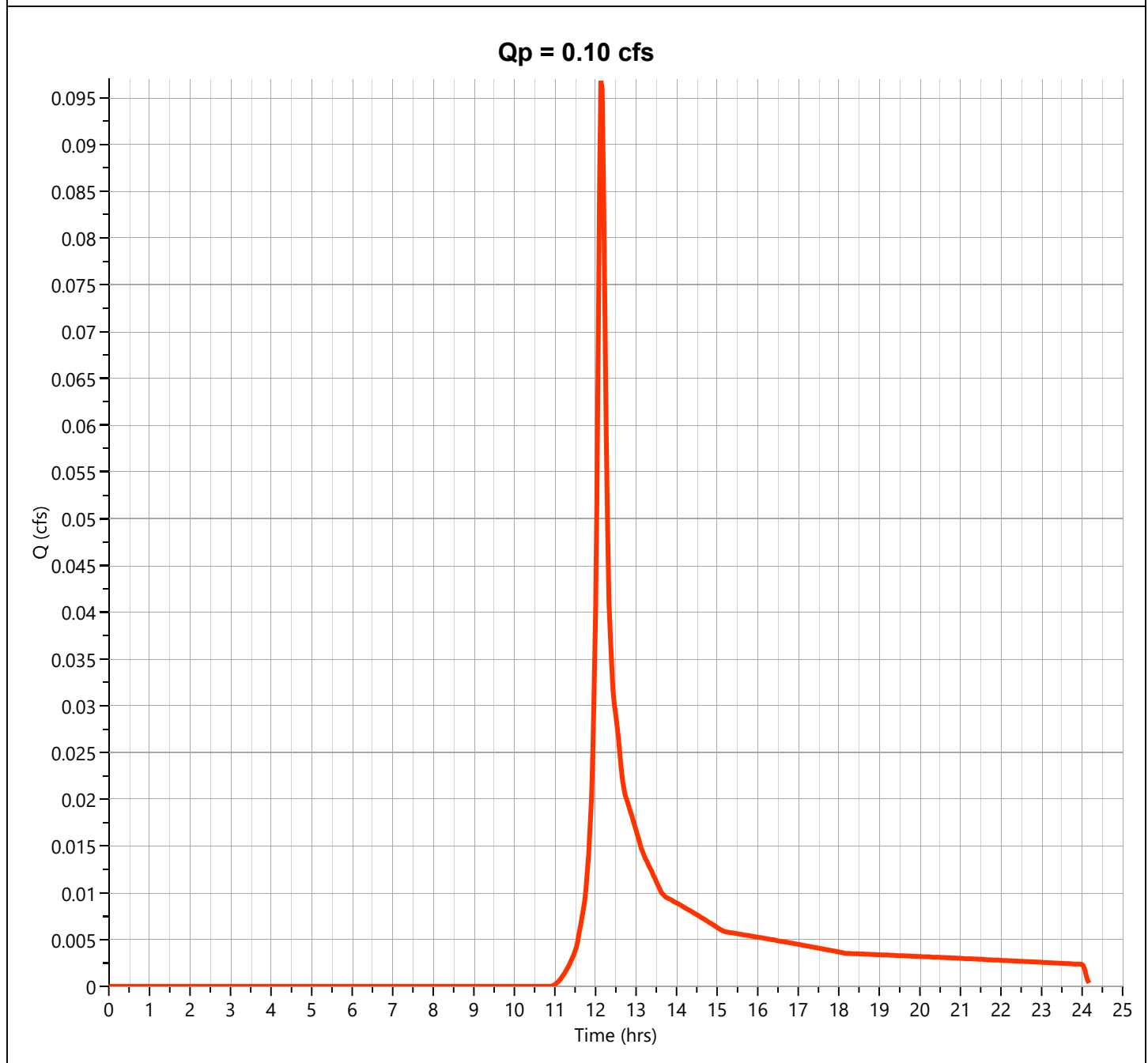
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-1 Woods C

## Hyd. No. 1

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.097 cfs |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.13 hrs |
| Time Interval   | = 2 min       | Runoff Volume      | = 357 cuft  |
| Drainage Area   | = 0.1 ac      | Curve Number       | = 70        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 7.0 min   |
| Total Rainfall  | = 3.46 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

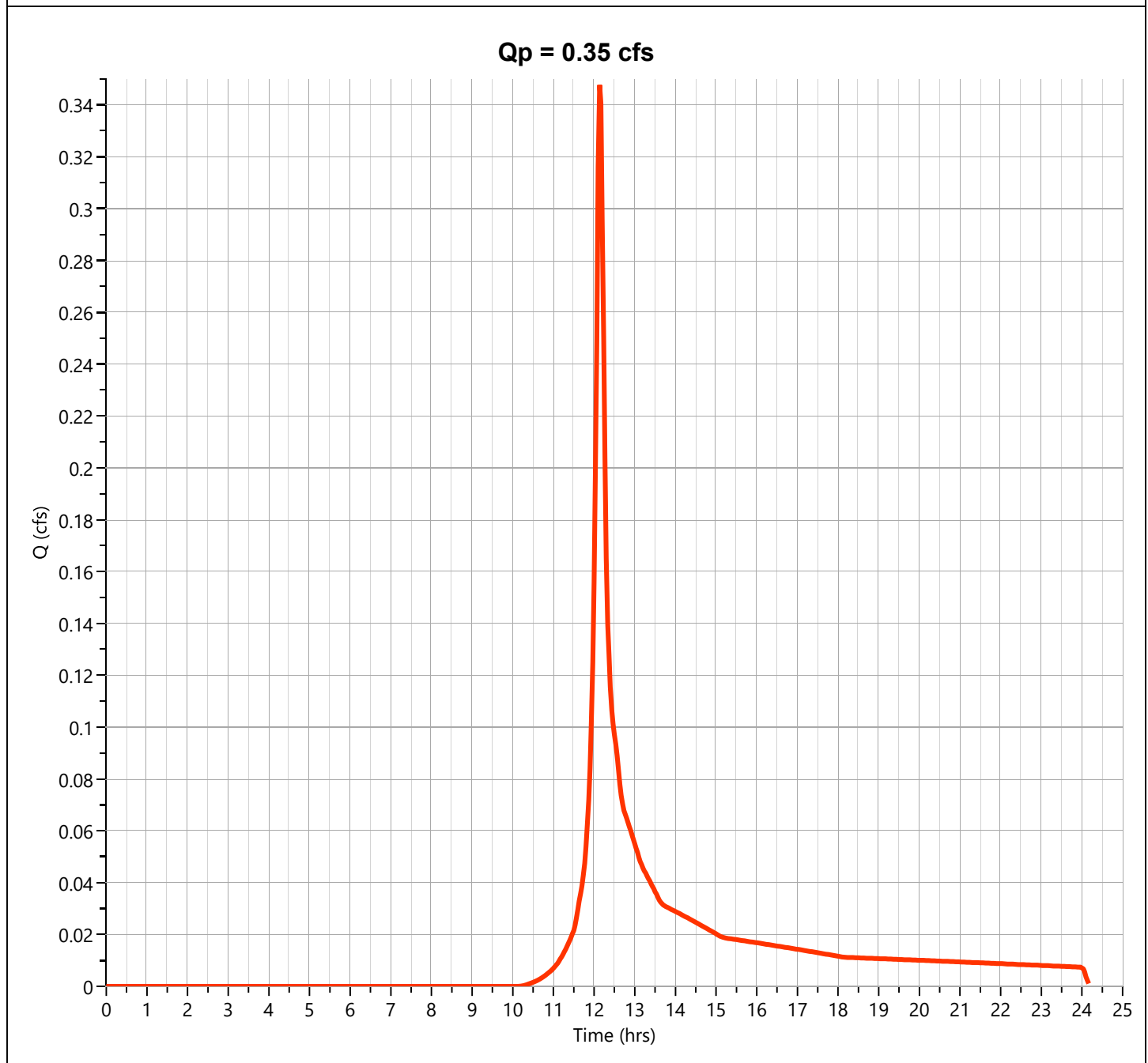
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-1 Grass C

## Hyd. No. 2

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.348 cfs  |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.13 hrs  |
| Time Interval   | = 2 min       | Runoff Volume      | = 1,232 cuft |
| Drainage Area   | = 0.28 ac     | Curve Number       | = 74         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 7.0 min    |
| Total Rainfall  | = 3.46 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

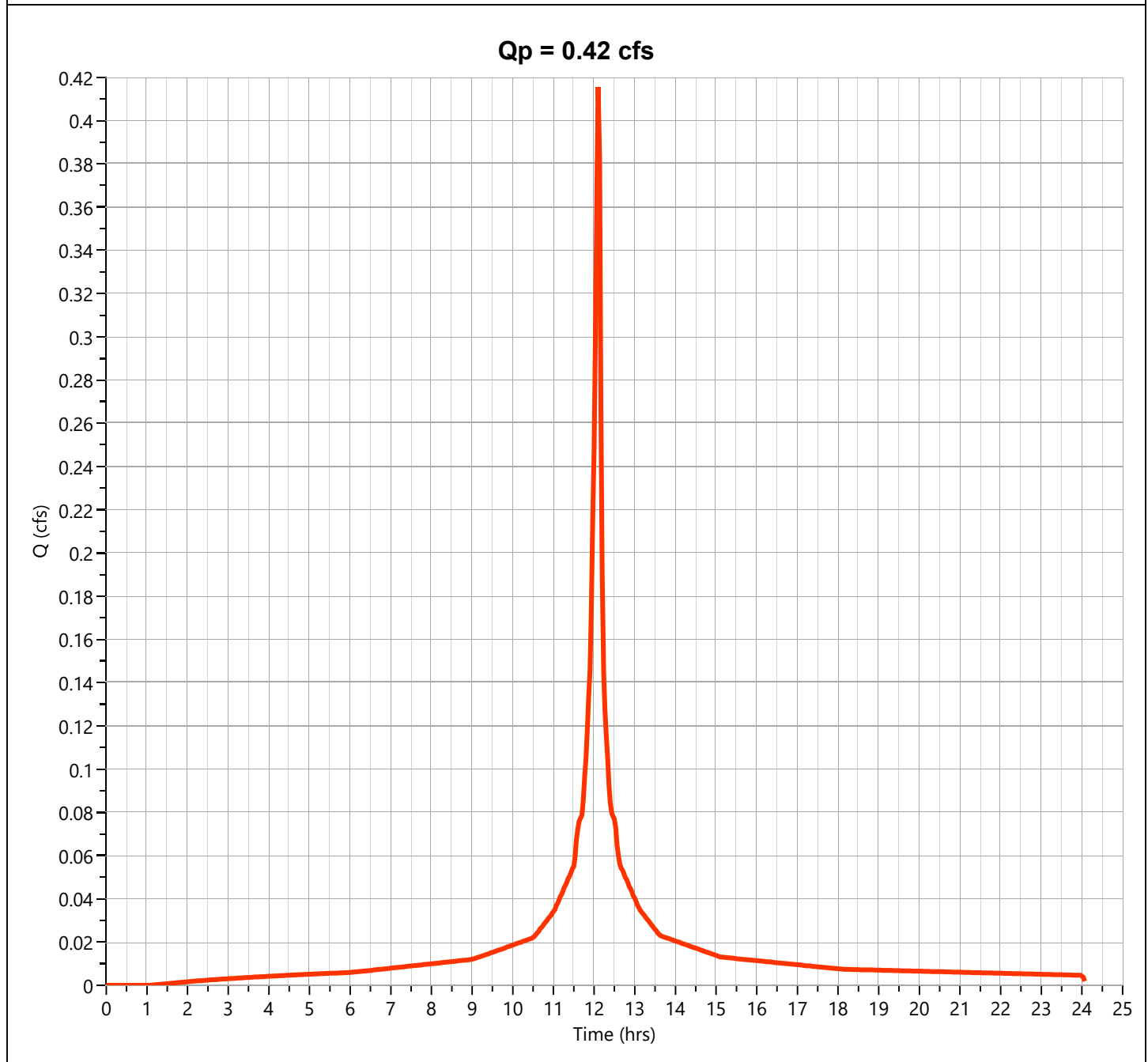
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-1 Impervious

## Hyd. No. 3

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.416 cfs  |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 2 min       | Runoff Volume      | = 1,427 cuft |
| Drainage Area   | = 0.13 ac     | Curve Number       | = 98         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 5.0 min    |
| Total Rainfall  | = 3.46 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

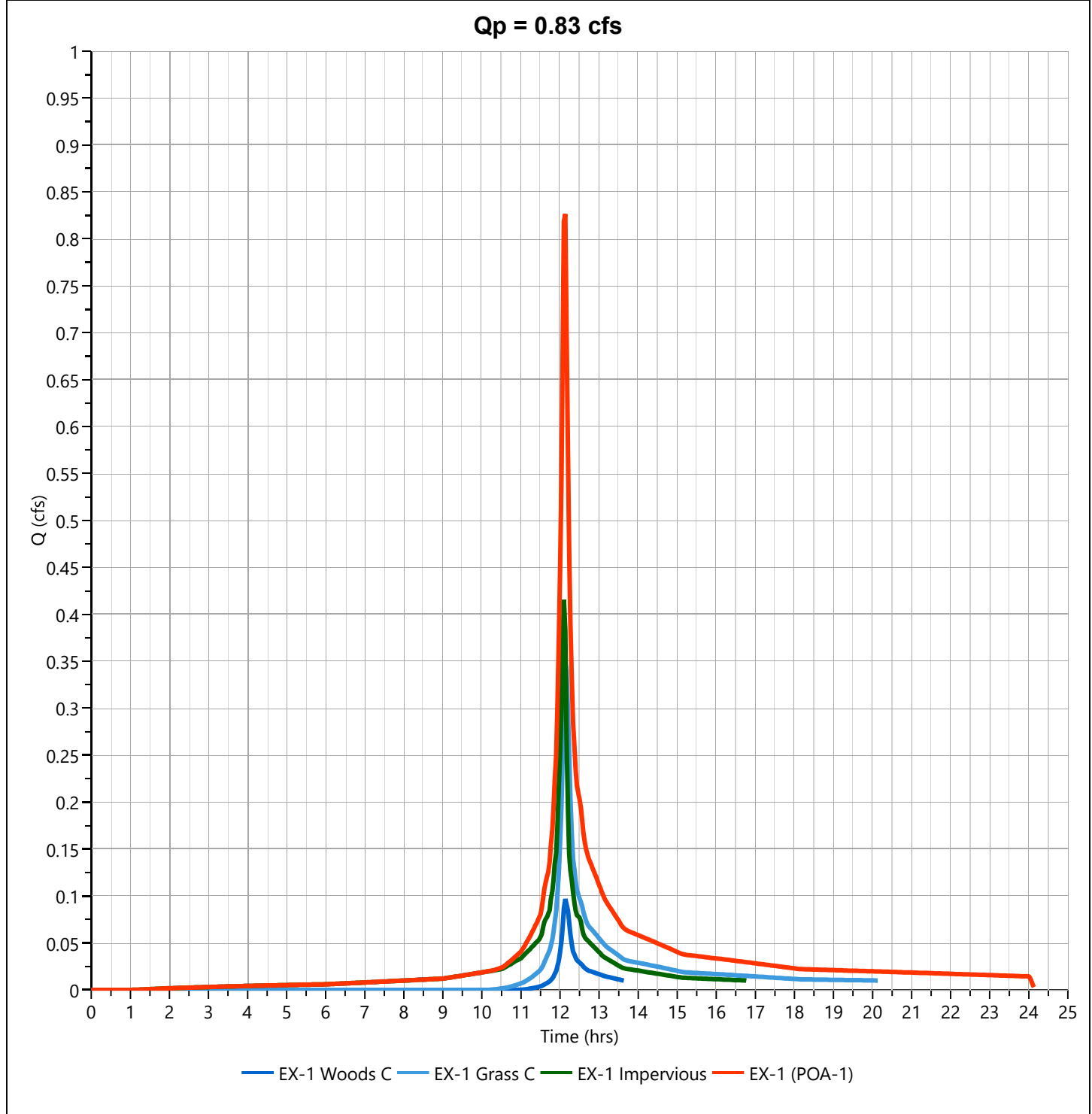
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-1 (POA-1)

## Hyd. No. 4

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.826 cfs  |
| Storm Frequency    | = 2-yr     | Time to Peak        | = 12.13 hrs  |
| Time Interval      | = 2 min    | Hydrograph Volume   | = 3,017 cuft |
| Inflow Hydrographs | = 1, 2, 3  | Total Contrib. Area | = 0.51 ac    |





# Hydrograph Report

Project Name:

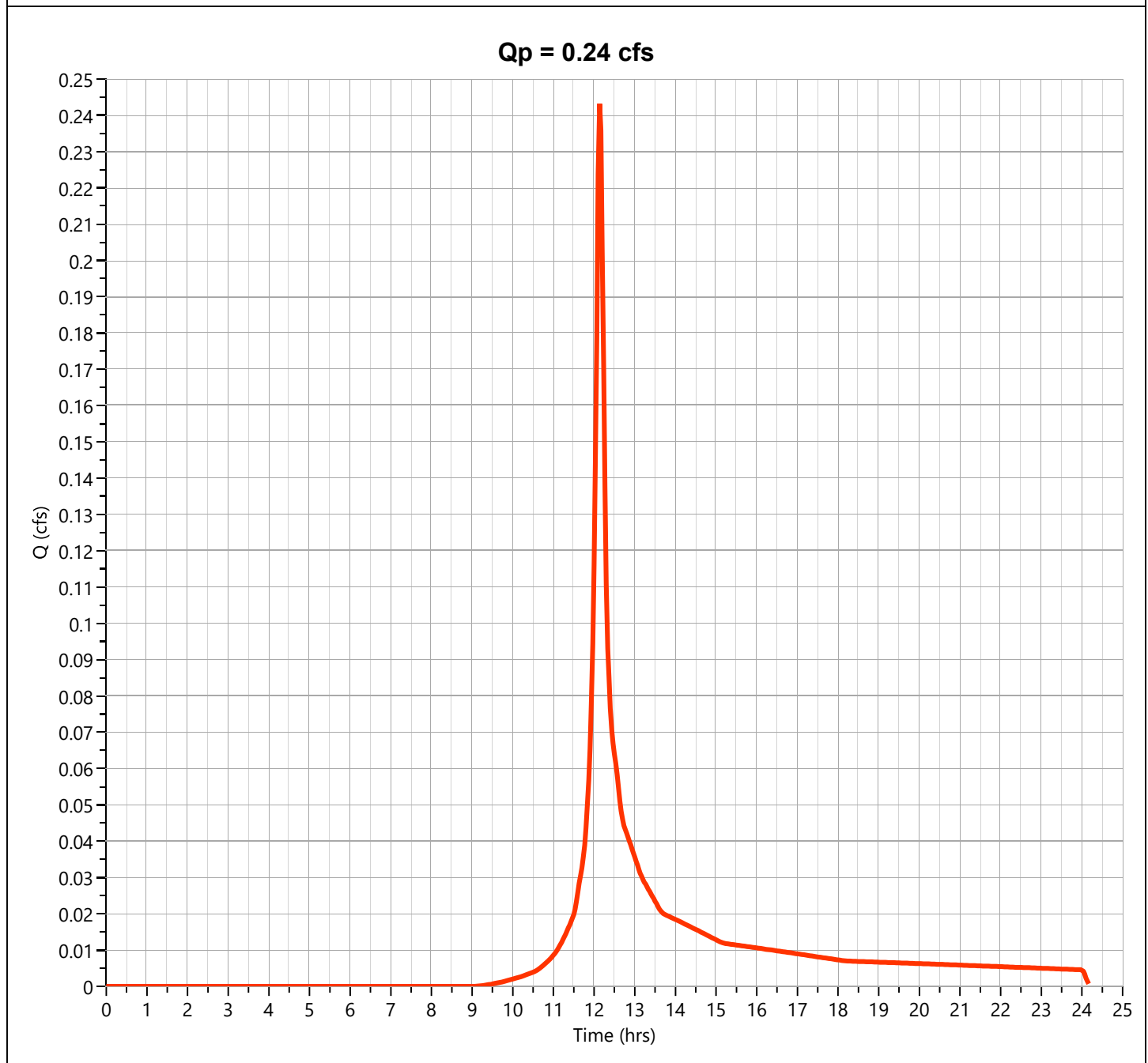
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-1 Woods C

## Hyd. No. 1

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.243 cfs |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.13 hrs |
| Time Interval   | = 2 min       | Runoff Volume      | = 843 cuft  |
| Drainage Area   | = 0.1 ac      | Curve Number       | = 70        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 7.0 min   |
| Total Rainfall  | = 5.38 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

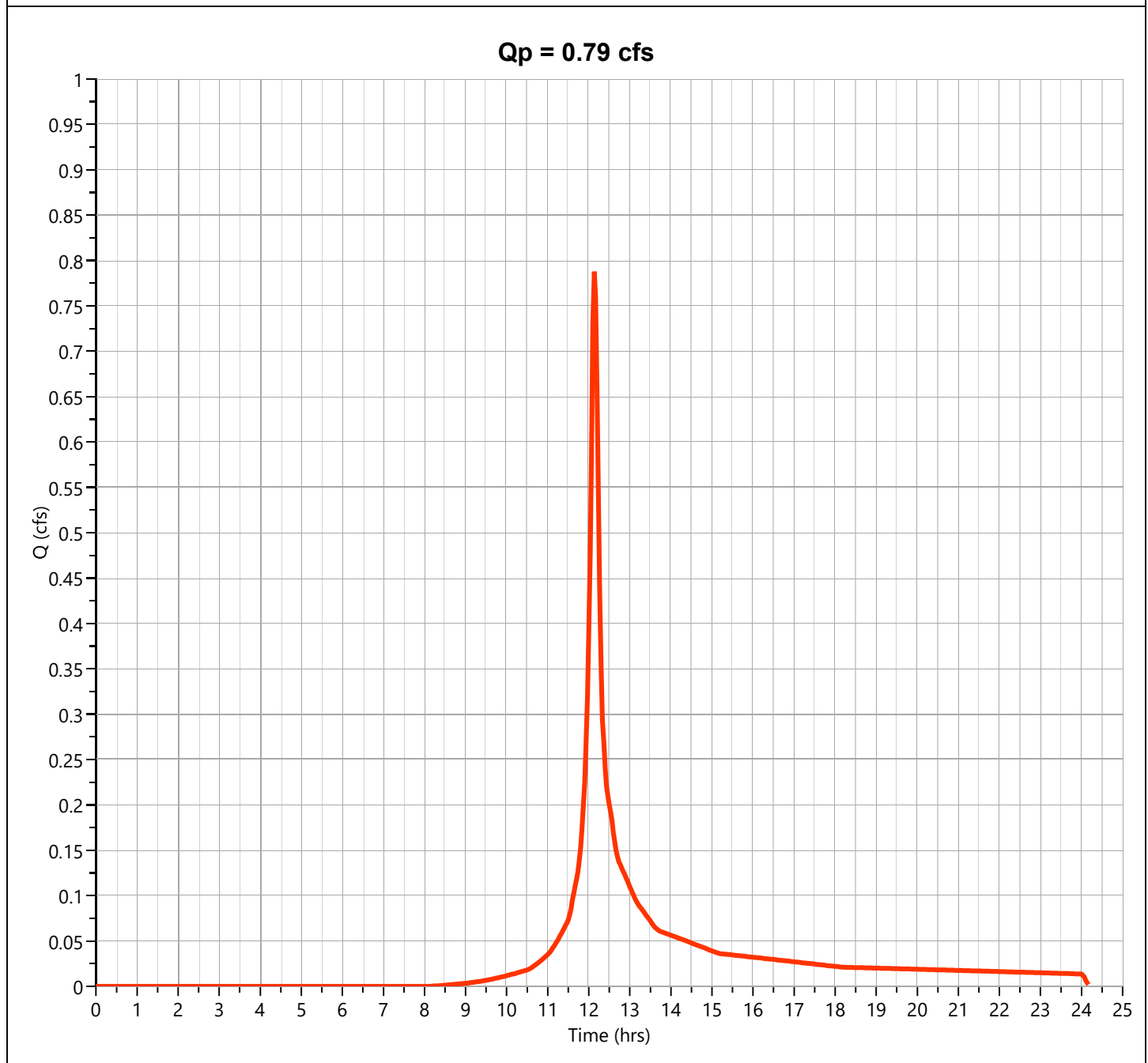
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-1 Grass C

## Hyd. No. 2

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.788 cfs  |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.13 hrs  |
| Time Interval   | = 2 min       | Runoff Volume      | = 2,715 cuft |
| Drainage Area   | = 0.28 ac     | Curve Number       | = 74         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 7.0 min    |
| Total Rainfall  | = 5.38 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

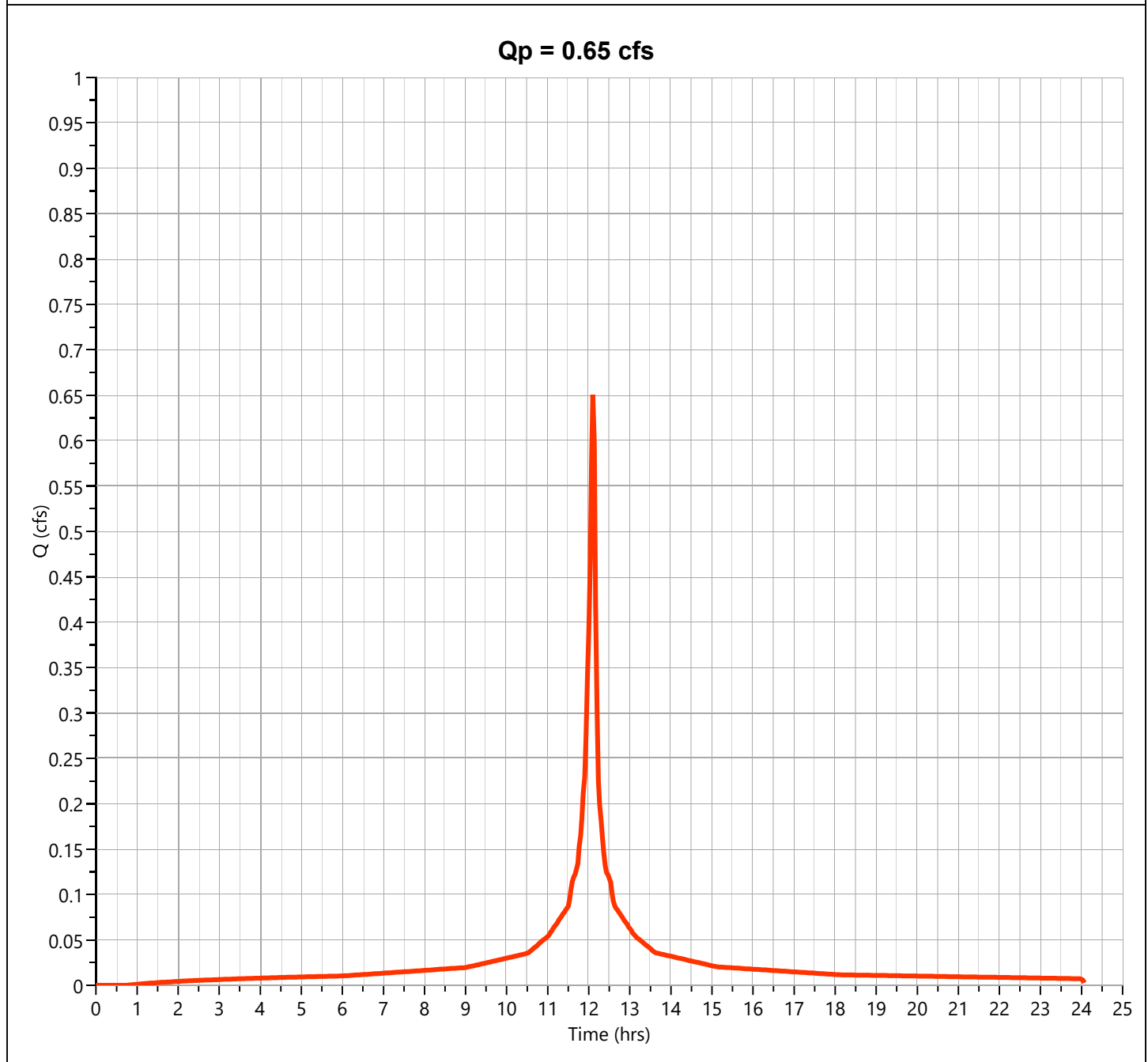
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-1 Impervious

## Hyd. No. 3

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.650 cfs  |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 2 min       | Runoff Volume      | = 2,275 cuft |
| Drainage Area   | = 0.13 ac     | Curve Number       | = 98         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 5.0 min    |
| Total Rainfall  | = 5.38 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

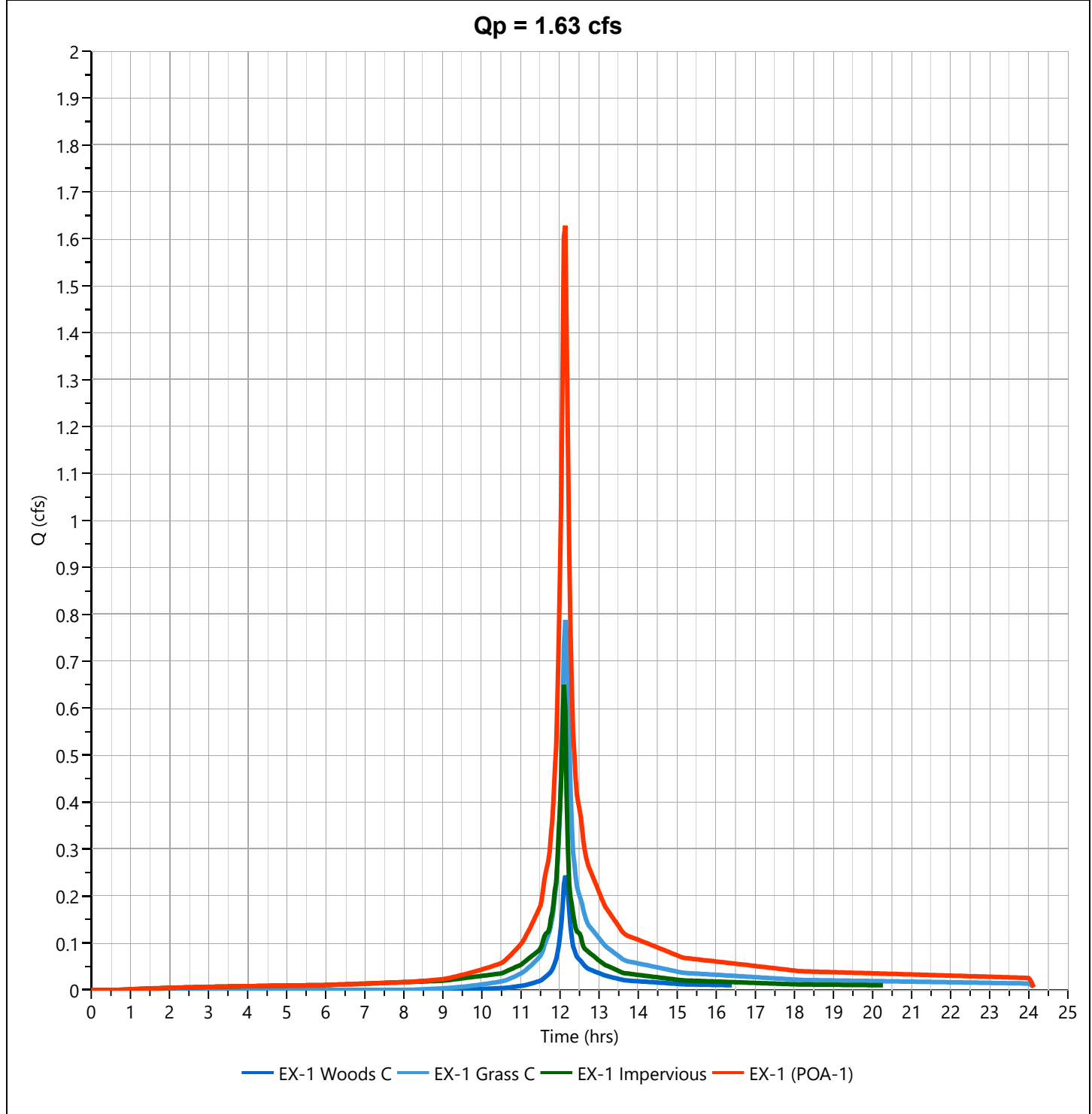
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-1 (POA-1)

## Hyd. No. 4

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 1.628 cfs  |
| Storm Frequency    | = 10-yr    | Time to Peak        | = 12.13 hrs  |
| Time Interval      | = 2 min    | Hydrograph Volume   | = 5,833 cuft |
| Inflow Hydrographs | = 1, 2, 3  | Total Contrib. Area | = 0.51 ac    |



# Hydrograph Report

Project Name:

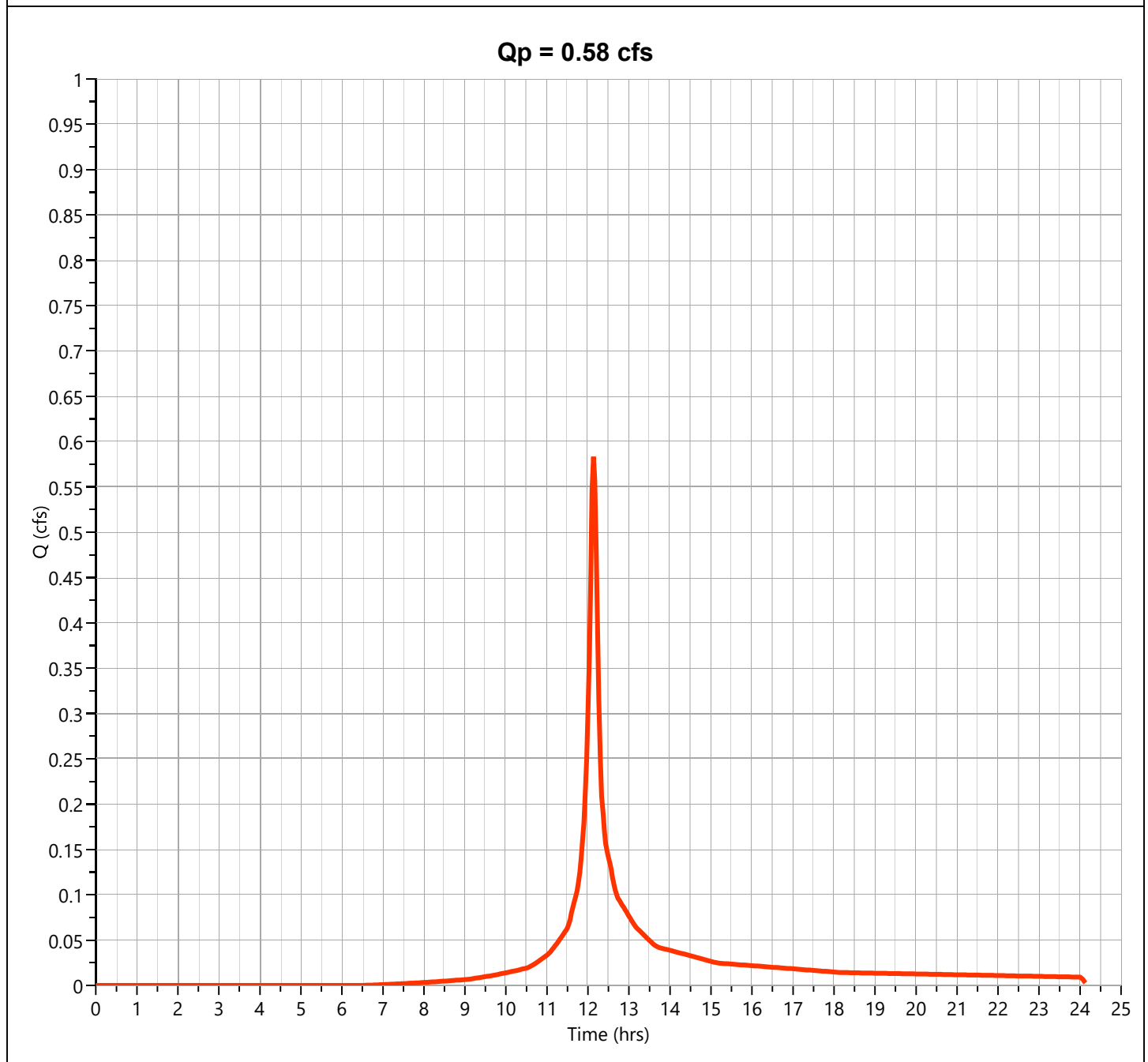
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-1 Woods C

## Hyd. No. 1

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.583 cfs  |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.13 hrs  |
| Time Interval   | = 2 min       | Runoff Volume      | = 2,020 cuft |
| Drainage Area   | = 0.1 ac      | Curve Number       | = 70         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 7.0 min    |
| Total Rainfall  | = 9.26 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

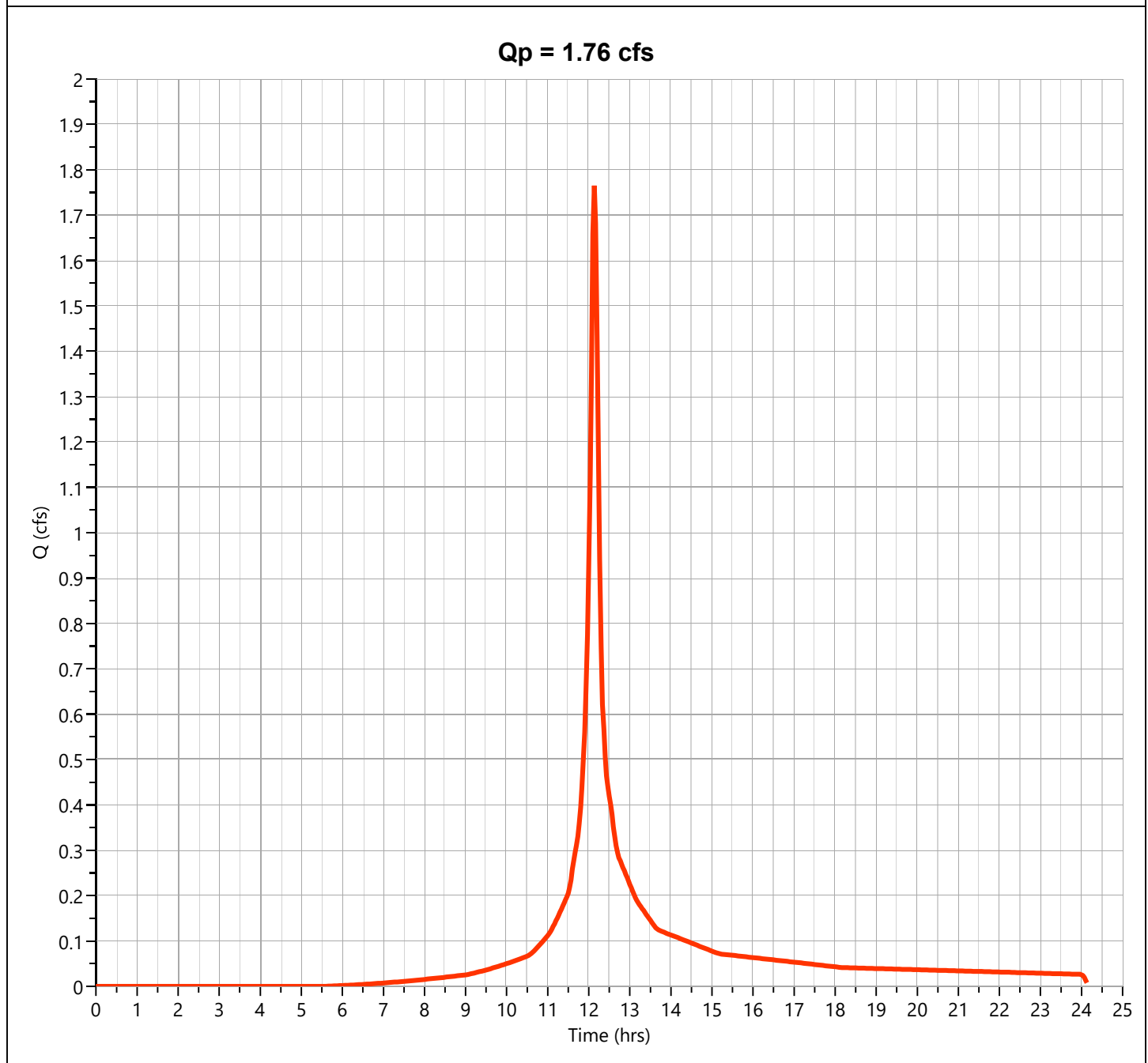
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-1 Grass C

## Hyd. No. 2

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 1.765 cfs  |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.13 hrs  |
| Time Interval   | = 2 min       | Runoff Volume      | = 6,166 cuft |
| Drainage Area   | = 0.28 ac     | Curve Number       | = 74         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 7.0 min    |
| Total Rainfall  | = 9.26 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

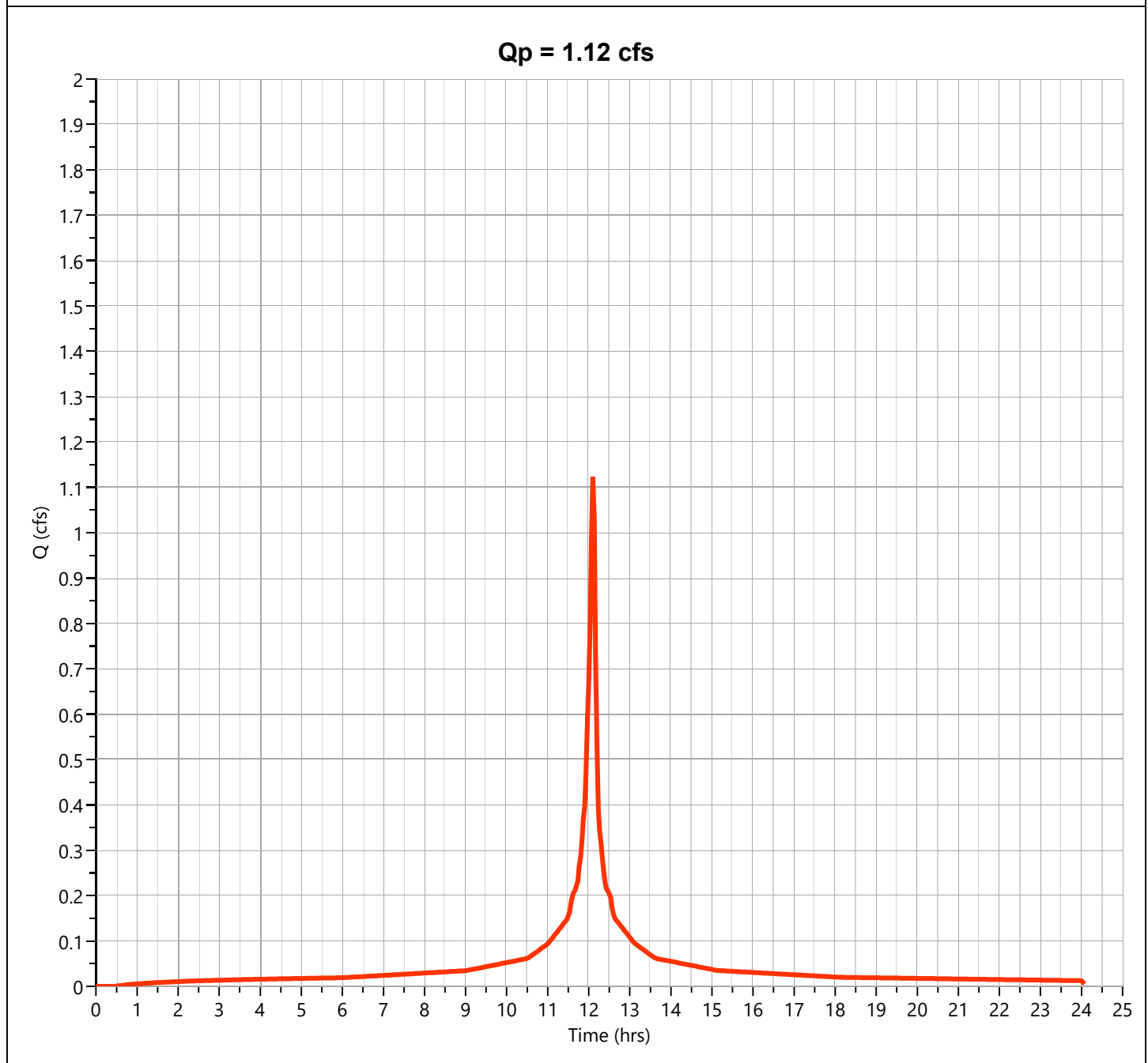
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-1 Impervious

## Hyd. No. 3

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 1.122 cfs  |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 2 min       | Runoff Volume      | = 3,990 cuft |
| Drainage Area   | = 0.13 ac     | Curve Number       | = 98         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 5.0 min    |
| Total Rainfall  | = 9.26 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

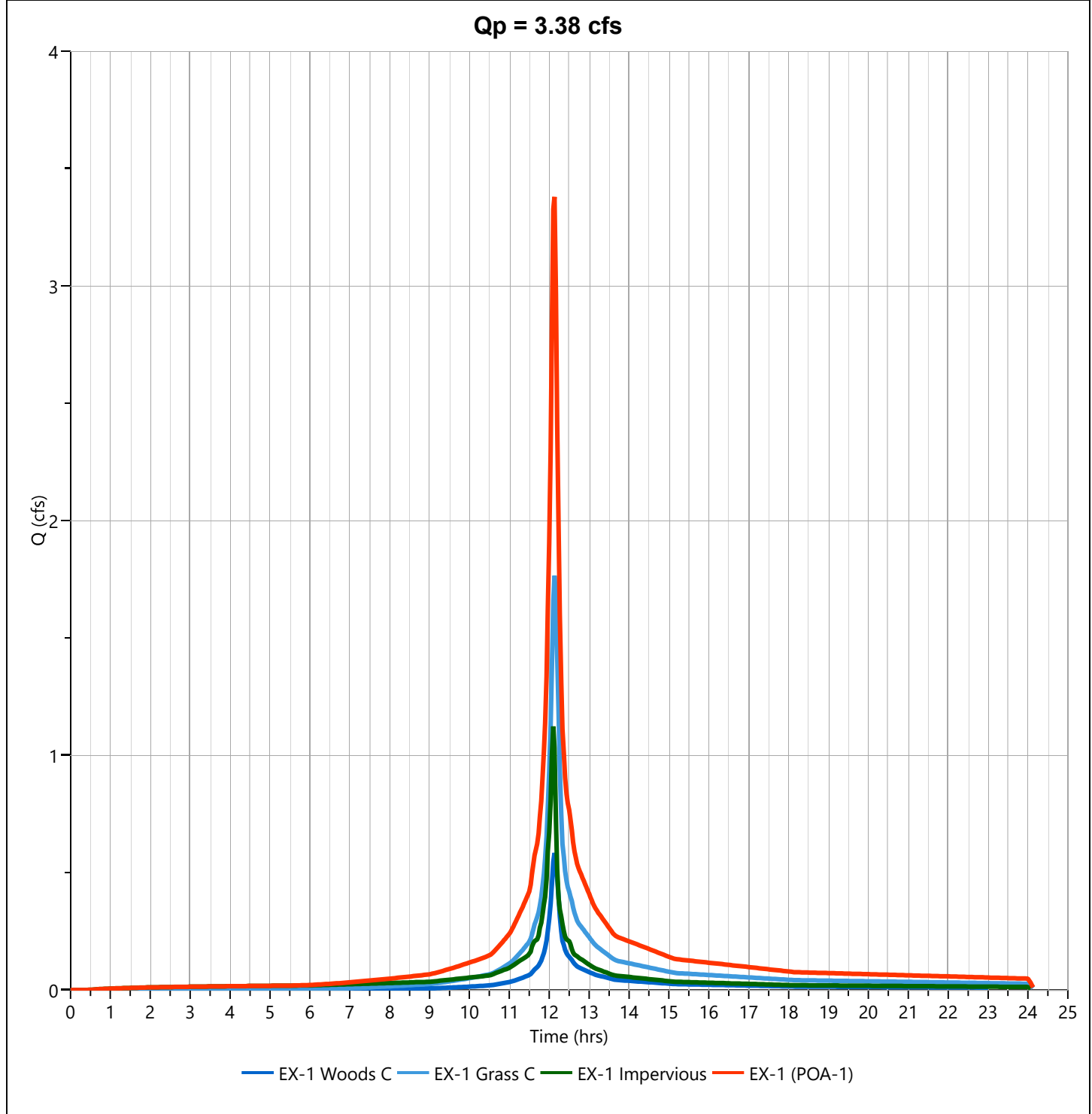
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-1 (POA-1)

## Hyd. No. 4

|                    |            |                     |               |
|--------------------|------------|---------------------|---------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 3.379 cfs   |
| Storm Frequency    | = 100-yr   | Time to Peak        | = 12.13 hrs   |
| Time Interval      | = 2 min    | Hydrograph Volume   | = 12,176 cuft |
| Inflow Hydrographs | = 1, 2, 3  | Total Contrib. Area | = 0.51 ac     |





**TOTAL ALLOWABLE FLOW TO POA-1**

# Hydrograph Report

Project Name:

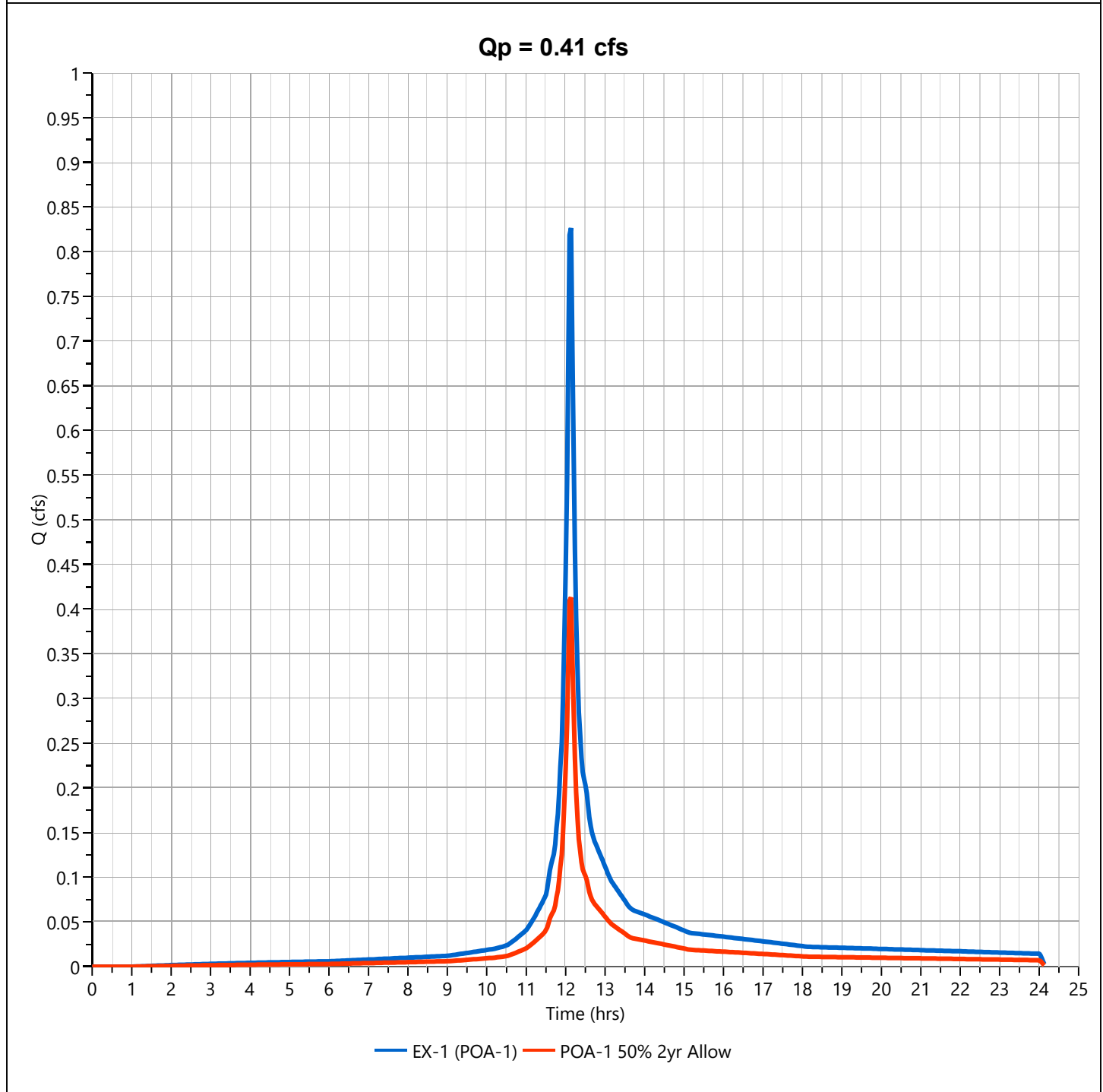
Hydrology Studio v 3.0.0.29

11-29-2023

## POA-1 50% 2yr Allow

## Hyd. No. 5

|                   |                    |                   |              |
|-------------------|--------------------|-------------------|--------------|
| Hydrograph Type   | = Diversion        | Peak Flow         | = 0.413 cfs  |
| Storm Frequency   | = 2-yr             | Time to Peak      | = 12.13 hrs  |
| Time Interval     | = 2 min            | Hydrograph Volume | = 1,508 cuft |
| Inflow Hydrograph | = 4 - EX-1 (POA-1) | Diversion Method  | = Flow Ratio |
| Companion Hyd     | = 6 - <name>       | Flow Ratio        | = 0.5        |



# Hydrograph Report

Project Name:

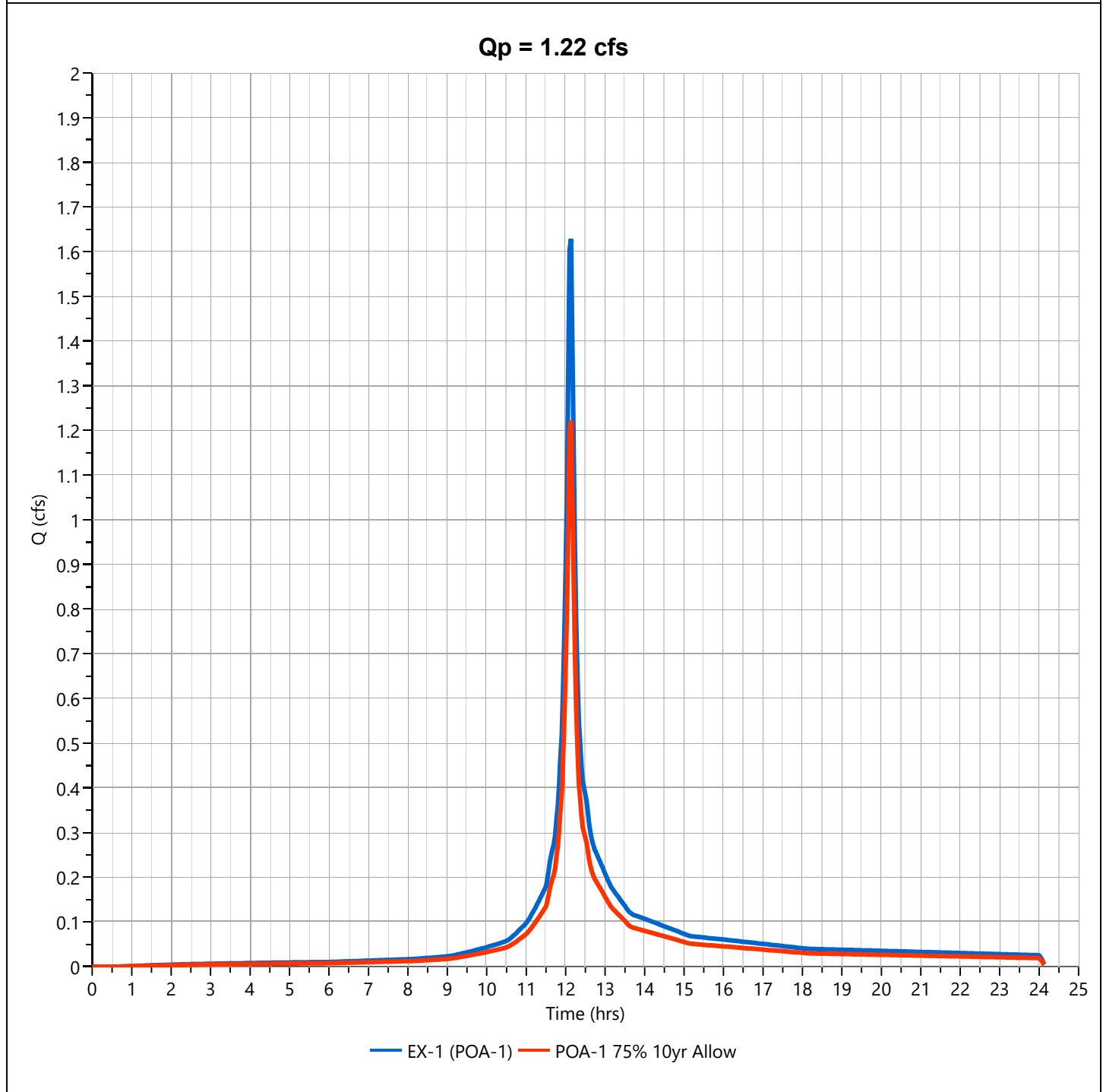
Hydrology Studio v 3.0.0.29

11-29-2023

## POA-1 75% 10yr Allow

## Hyd. No. 7

|                   |                    |                   |              |
|-------------------|--------------------|-------------------|--------------|
| Hydrograph Type   | = Diversion        | Peak Flow         | = 1.221 cfs  |
| Storm Frequency   | = 10-yr            | Time to Peak      | = 12.13 hrs  |
| Time Interval     | = 2 min            | Hydrograph Volume | = 4,375 cuft |
| Inflow Hydrograph | = 4 - EX-1 (POA-1) | Diversion Method  | = Flow Ratio |
| Companion Hyd     | = 8 - <name>       | Flow Ratio        | = 0.75       |



# Hydrograph Report

Project Name:

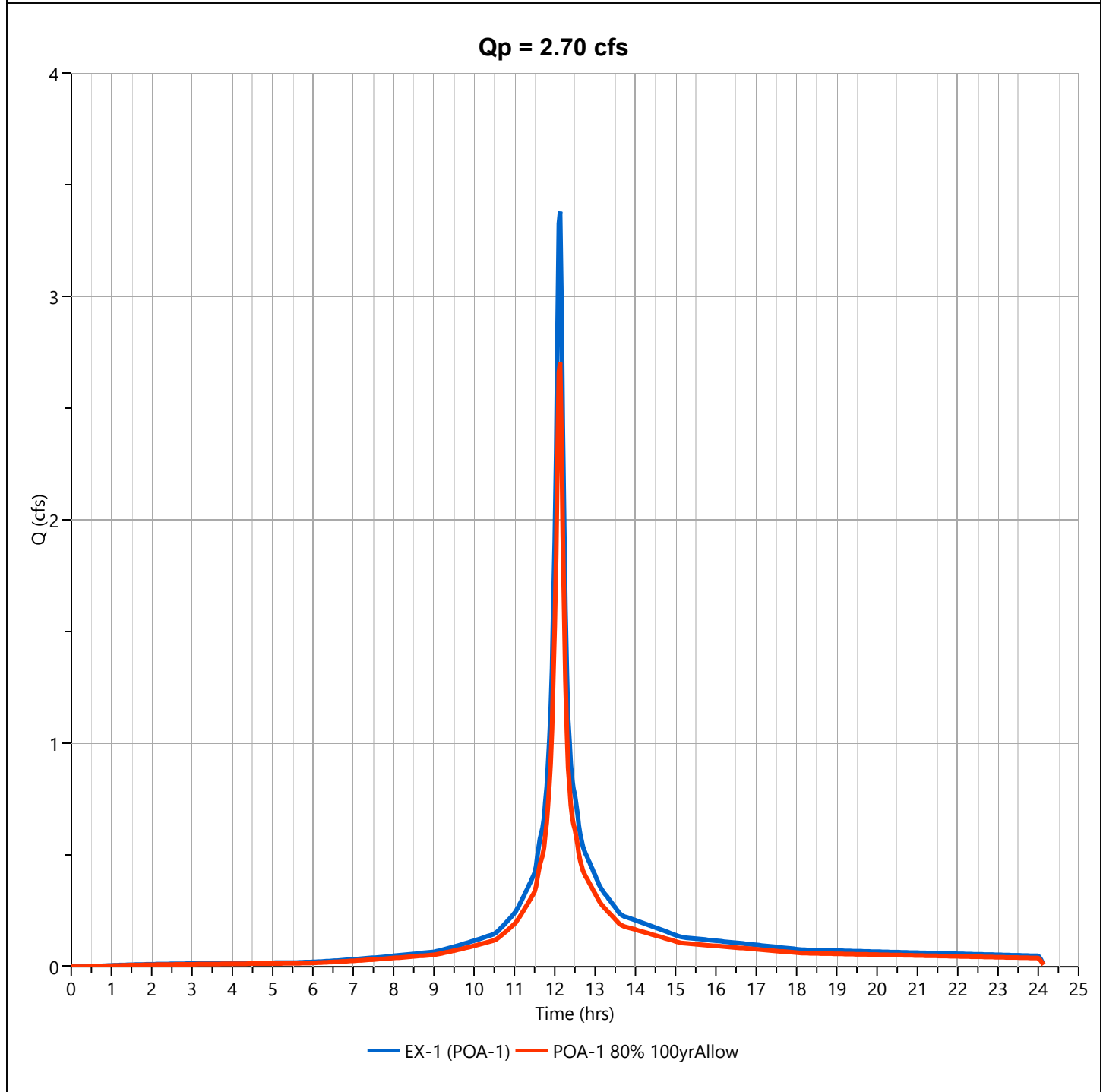
Hydrology Studio v 3.0.0.29

11-29-2023

## POA-1 80% 100yrAllow

## Hyd. No. 9

|                   |                    |                   |              |
|-------------------|--------------------|-------------------|--------------|
| Hydrograph Type   | = Diversion        | Peak Flow         | = 2.703 cfs  |
| Storm Frequency   | = 100-yr           | Time to Peak      | = 12.13 hrs  |
| Time Interval     | = 2 min            | Hydrograph Volume | = 9,741 cuft |
| Inflow Hydrograph | = 4 - EX-1 (POA-1) | Diversion Method  | = Flow Ratio |
| Companion Hyd     | = 10 - <name>      | Flow Ratio        | = 0.8        |



## **EX-2A WATERSHED**

Project: Beacon Unitarian Universalist Church

By: SM

Date: 11/29/2023

Location: Summit, NJ

Checked By: MJV

Date Checked: 11/29/2023

Circle One: Present Developed

Current Existing Watershed EX-2A Impervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Flow Length, L (total L < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. Compute T<sub>t</sub>

$$T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} s^{0.4}}$$

|            |                        |   |  |
|------------|------------------------|---|--|
| Segment ID | 1                      |   |  |
|            | <b>Smooth Surfaces</b> |   |  |
|            | <b>0.011</b>           |   |  |
| ft         | <b>100</b>             |   |  |
| in         | <b>3.46</b>            |   |  |
| ft/ft      | <b>0.028</b>           |   |  |
| hr         | <b>0.017</b>           | + |  |

Sheet Flow Sub-Total **0.017 hours**

**Shallow Concentrated Flow**

7. Surface Description
8. Flow Length, L
9. Watercourse Slope, s
10. Average Velocity, V (NEH table 15-3)
11. Compute T<sub>t</sub>

$$T_t = \frac{L}{3600 V}$$

|            |                 |                          |                  |
|------------|-----------------|--------------------------|------------------|
| Segment ID | 2               | 3                        | 4                |
|            | <b>Pavement</b> | <b>Grassed Waterways</b> | <b>Woodlands</b> |
| ft         | <b>35</b>       | <b>60</b>                | <b>49</b>        |
| ft/ft      | <b>0.016</b>    | <b>0.003</b>             | <b>0.003</b>     |
| ft/s       | <b>2.55</b>     | <b>0.83</b>              | <b>0.26</b>      |
| hr         | <b>0.004</b>    | <b>0.020</b>             | <b>0.053</b>     |

Shallow Conc. Flow Sub-Total **0.076 hours**

**Channel Flow**

12. Flow Length, L
13. Cross Sectional flow area, a
14. Wetted Perimeter, P<sub>w</sub>
15. Hydraulic Radius, r
16. Channel Slope, s
17. Manning's Roughness Coeff., n
18. Velocity, V
19. Compute T<sub>t</sub>

$$r = a / P_w$$

$$V = (1.49 r^{2/3} s^{1/2}) / n$$

$$T_t = \frac{L}{3600 V}$$

|                 |  |  |  |
|-----------------|--|--|--|
| Segment ID      |  |  |  |
| ft              |  |  |  |
| ft <sup>2</sup> |  |  |  |
| ft              |  |  |  |
| ft              |  |  |  |
| ft/ft           |  |  |  |
| ft/s            |  |  |  |
| hr              |  |  |  |

Channel Flow Sub-Total **0.000 hours**

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>

(Add Sub-Total T<sub>t</sub> from prior steps)

|                                  |                    |
|----------------------------------|--------------------|
| Total T <sub>c</sub> (hours) =   | <b>0.093 hours</b> |
| Total T <sub>c</sub> (minutes) = | <b>6 minutes</b>   |

Project: Beacon Unitarian Universalist Church

By: SM

Date: 11/29/2023

Location: Summit, NJ

Checked By: MJV

Date Checked: 11/29/2023

Circle One: Present Developed

Current Existing Watershed EX-2A Pervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Flow Length, L (total L < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. Compute T<sub>t</sub>

$$T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} s^{0.4}}$$

|                      |                               |                        |                    |
|----------------------|-------------------------------|------------------------|--------------------|
| Segment ID           | <b>1</b>                      | <b>2</b>               |                    |
|                      | <b>Woods Light Underbrush</b> | <b>Smooth Surfaces</b> |                    |
|                      | <b>0.40</b>                   | <b>0.011</b>           |                    |
| ft                   | <b>48</b>                     | <b>52</b>              |                    |
| in                   | <b>3.46</b>                   | <b>3.46</b>            |                    |
| ft/ft                | <b>0.026</b>                  | <b>0.020</b>           |                    |
| hr                   | <b>0.172</b>                  | <b>0.012</b>           |                    |
| Sheet Flow Sub-Total |                               |                        | <b>0.184 hours</b> |

**Shallow Concentrated Flow**

7. Surface Description
8. Flow Length, L
9. Watercourse Slope, s
10. Average Velocity, V (NEH table 15-3)
11. Compute T<sub>t</sub>

$$T_t = \frac{L}{3600 V}$$

|                              |                 |                          |                    |
|------------------------------|-----------------|--------------------------|--------------------|
| Segment ID                   | <b>3</b>        | <b>4</b>                 | <b>5</b>           |
|                              | <b>Pavement</b> | <b>Grassed Waterways</b> | <b>Woodlands</b>   |
| ft                           | <b>109</b>      | <b>60</b>                | <b>49</b>          |
| ft/ft                        | <b>0.022</b>    | <b>0.003</b>             | <b>0.003</b>       |
| ft/s                         | <b>2.99</b>     | <b>0.83</b>              | <b>0.26</b>        |
| hr                           | <b>0.010</b>    | <b>0.020</b>             | <b>0.053</b>       |
| Shallow Conc. Flow Sub-Total |                 |                          | <b>0.083 hours</b> |

**Channel Flow**

12. Flow Length, L
13. Cross Sectional flow area, a
14. Wetted Perimeter, P<sub>w</sub>
15. Hydraulic Radius, r
16. Channel Slope, s
17. Manning's Roughness Coeff., n
18. Velocity, V
19. Compute T<sub>t</sub>

$$r = a / P_w$$

$$V = (1.49 r^{2/3} s^{1/2}) / n$$

$$T_t = \frac{L}{3600 V}$$

|                        |  |  |                    |
|------------------------|--|--|--------------------|
| Segment ID             |  |  |                    |
| ft                     |  |  |                    |
| ft <sup>2</sup>        |  |  |                    |
| ft                     |  |  |                    |
| ft                     |  |  |                    |
| ft/ft                  |  |  |                    |
| ft/s                   |  |  |                    |
| hr                     |  |  |                    |
| Channel Flow Sub-Total |  |  | <b>0.000 hours</b> |

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>

(Add Sub-Total T<sub>t</sub> from prior steps)

|  |                                  |                    |
|--|----------------------------------|--------------------|
|  | Total T <sub>c</sub> (hours) =   | <b>0.266 hours</b> |
|  | Total T <sub>c</sub> (minutes) = | <b>16 minutes</b>  |

# Hydrograph Report

Project Name:

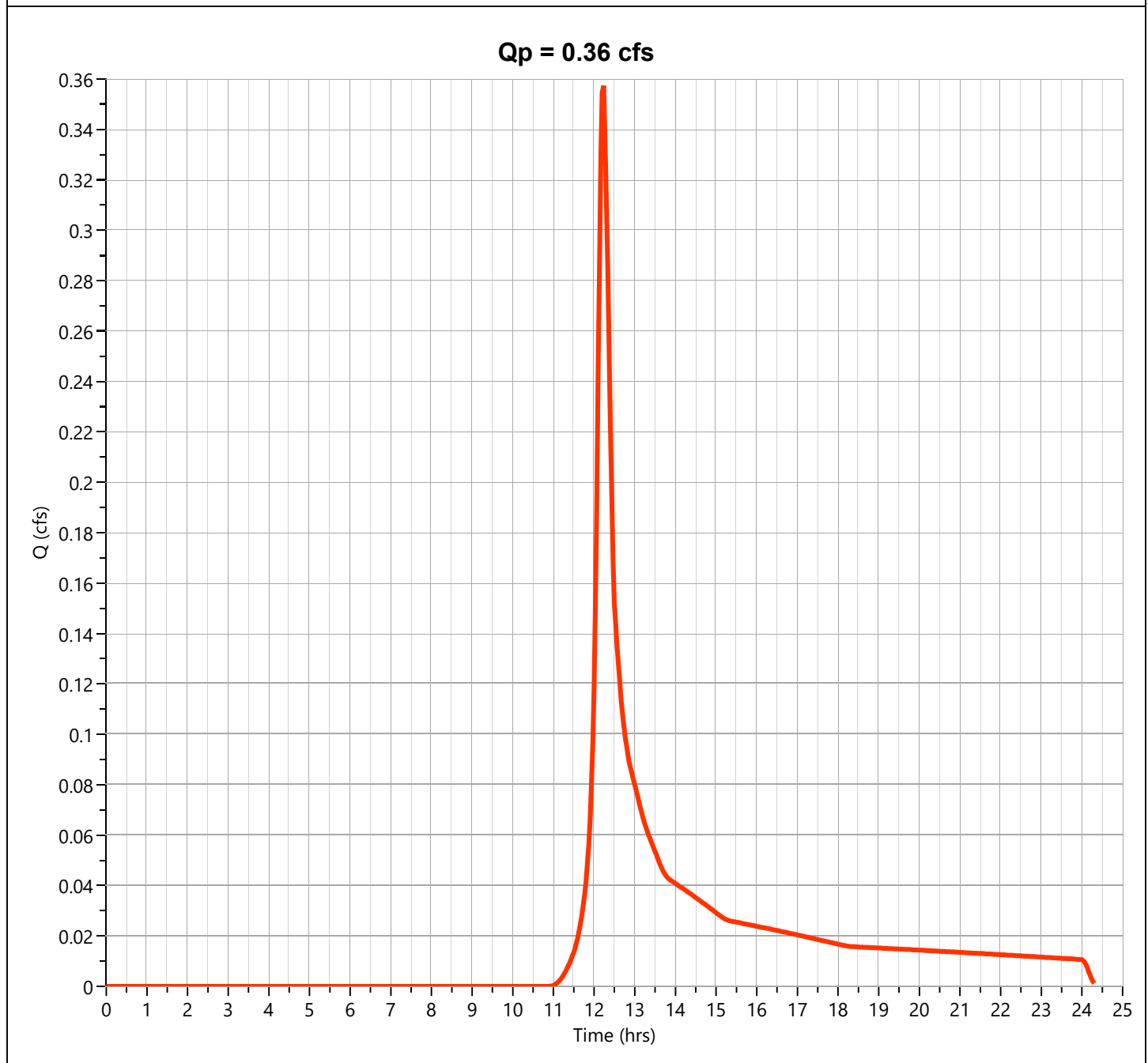
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-2A Woods C

## Hyd. No. 12

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.357 cfs  |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.23 hrs  |
| Time Interval   | = 2 min       | Runoff Volume      | = 1,601 cuft |
| Drainage Area   | = 0.46 ac     | Curve Number       | = 70         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 16.0 min   |
| Total Rainfall  | = 3.46 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |





# Hydrograph Report

Project Name:

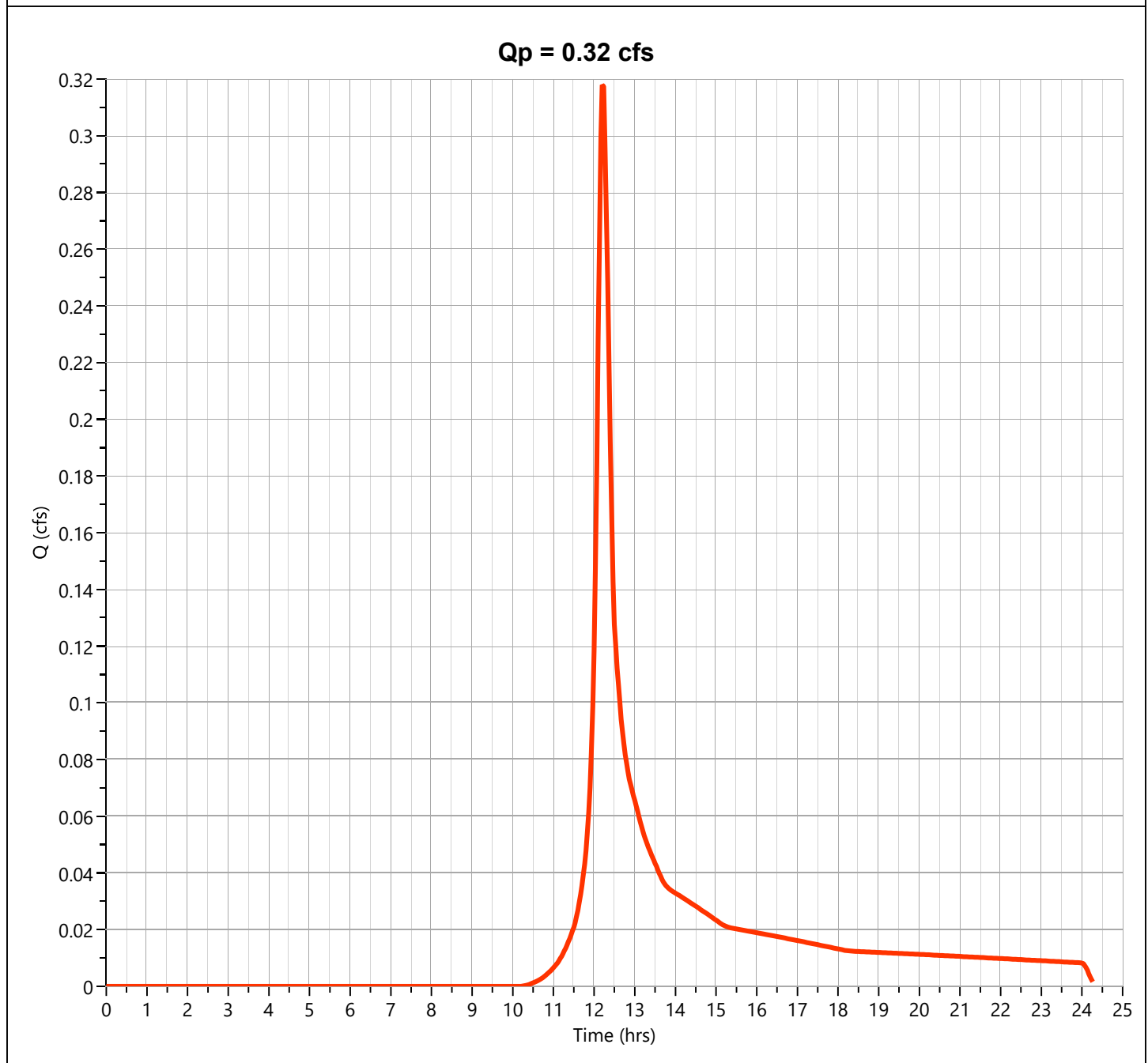
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-2A Grass C

## Hyd. No. 13

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.318 cfs  |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.20 hrs  |
| Time Interval   | = 2 min       | Runoff Volume      | = 1,373 cuft |
| Drainage Area   | = 0.32 ac     | Curve Number       | = 74         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 16.0 min   |
| Total Rainfall  | = 3.46 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

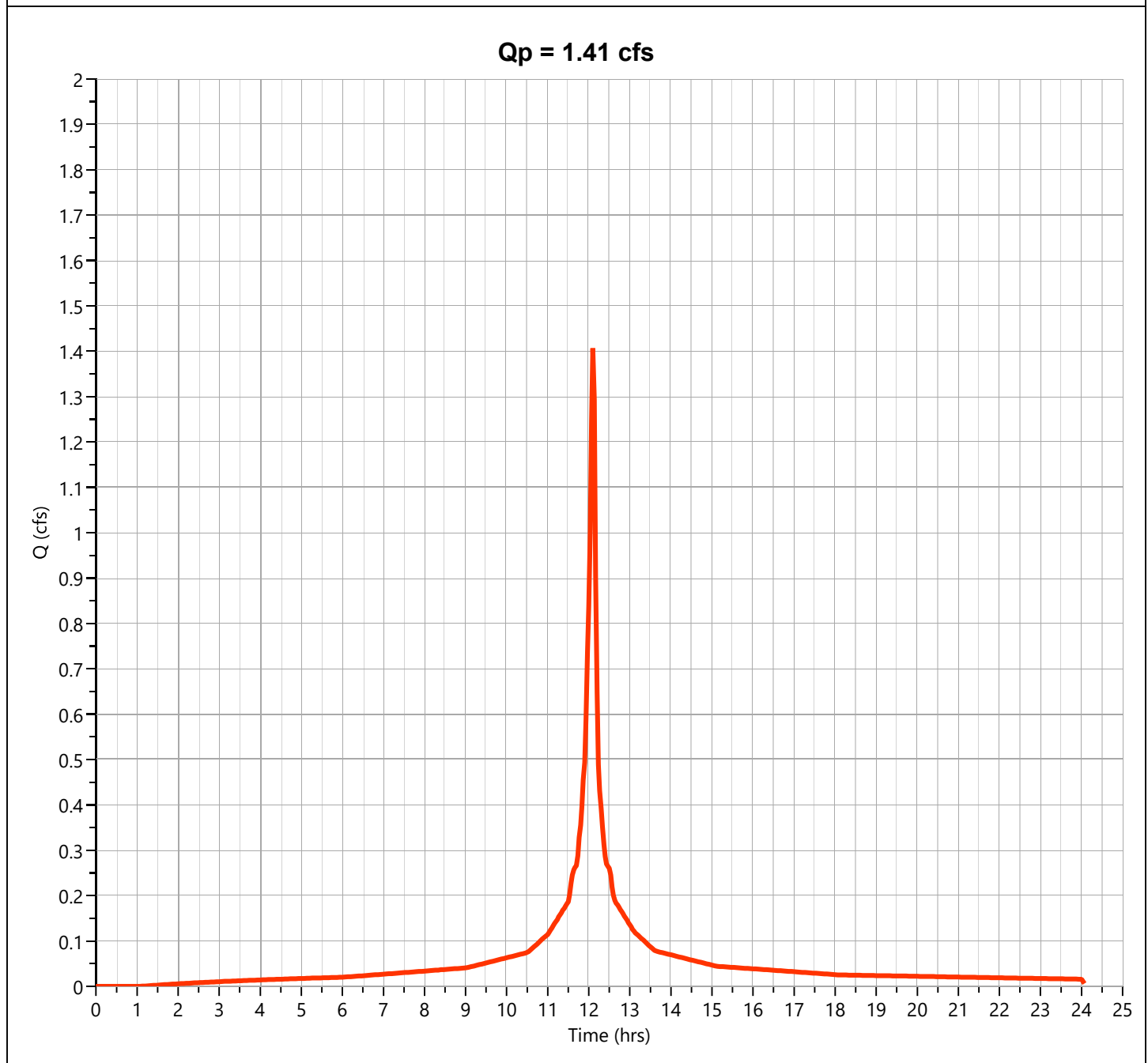
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-2A Impervious

## Hyd. No. 14

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 1.406 cfs  |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 2 min       | Runoff Volume      | = 4,831 cuft |
| Drainage Area   | = 0.44 ac     | Curve Number       | = 98         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 6.0 min    |
| Total Rainfall  | = 3.46 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

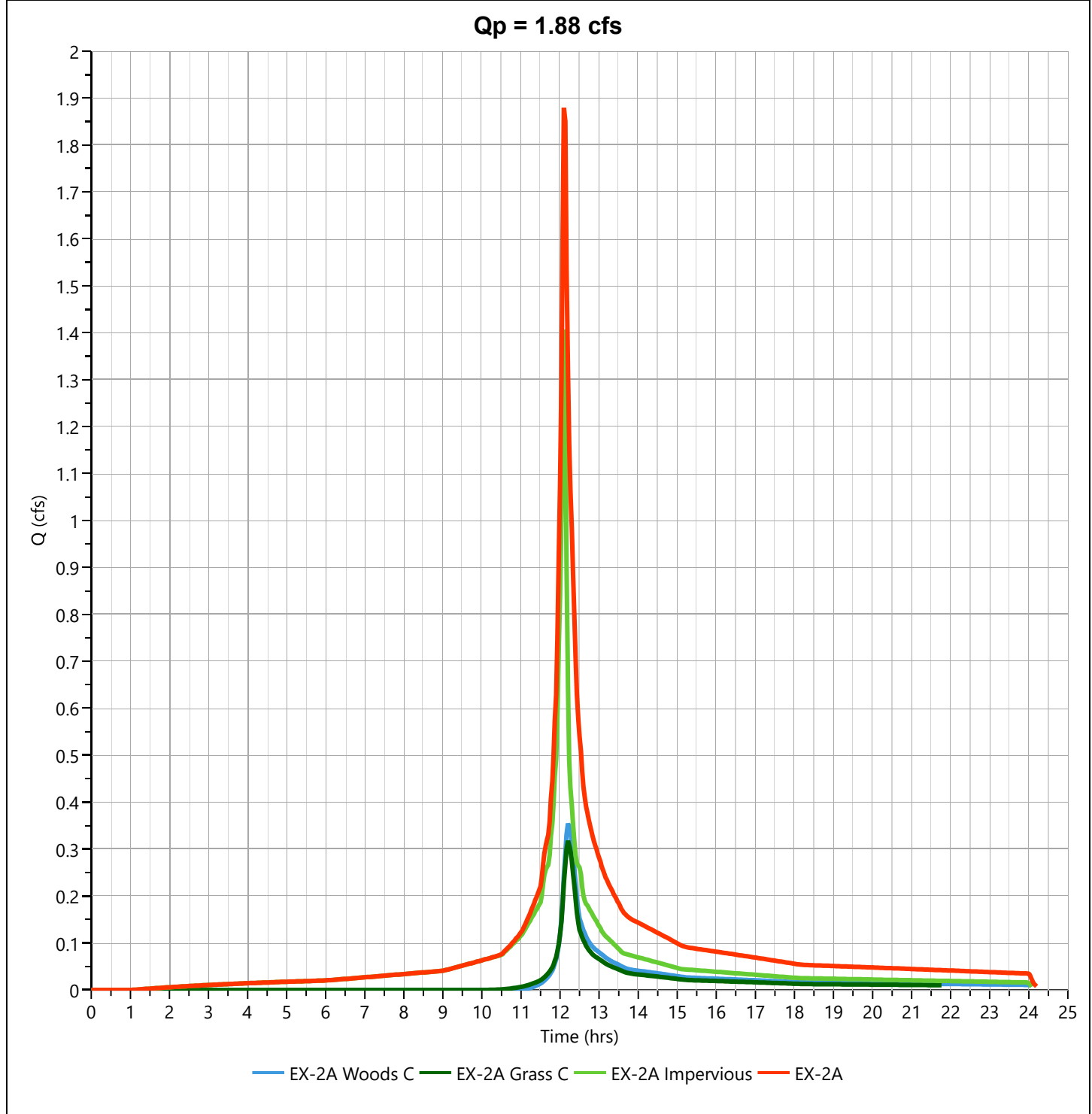
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-2A

## Hyd. No. 15

|                    |              |                     |              |
|--------------------|--------------|---------------------|--------------|
| Hydrograph Type    | = Junction   | Peak Flow           | = 1.879 cfs  |
| Storm Frequency    | = 2-yr       | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 2 min      | Hydrograph Volume   | = 7,806 cuft |
| Inflow Hydrographs | = 12, 13, 14 | Total Contrib. Area | = 1.22 ac    |



# Hydrograph Report

Project Name:

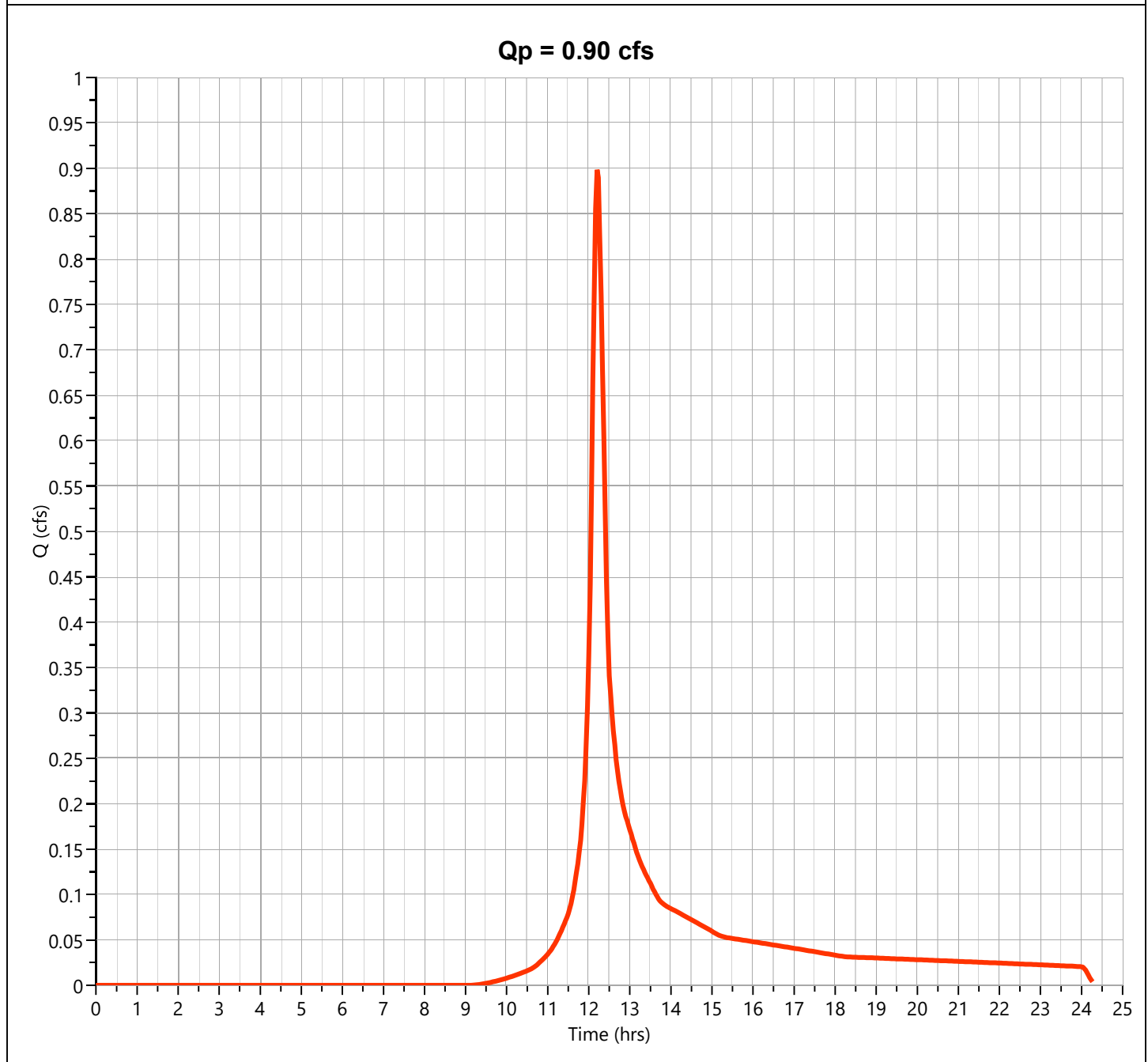
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-2A Woods C

## Hyd. No. 12

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.898 cfs  |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.20 hrs  |
| Time Interval   | = 2 min       | Runoff Volume      | = 3,781 cuft |
| Drainage Area   | = 0.46 ac     | Curve Number       | = 70         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 16.0 min   |
| Total Rainfall  | = 5.38 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

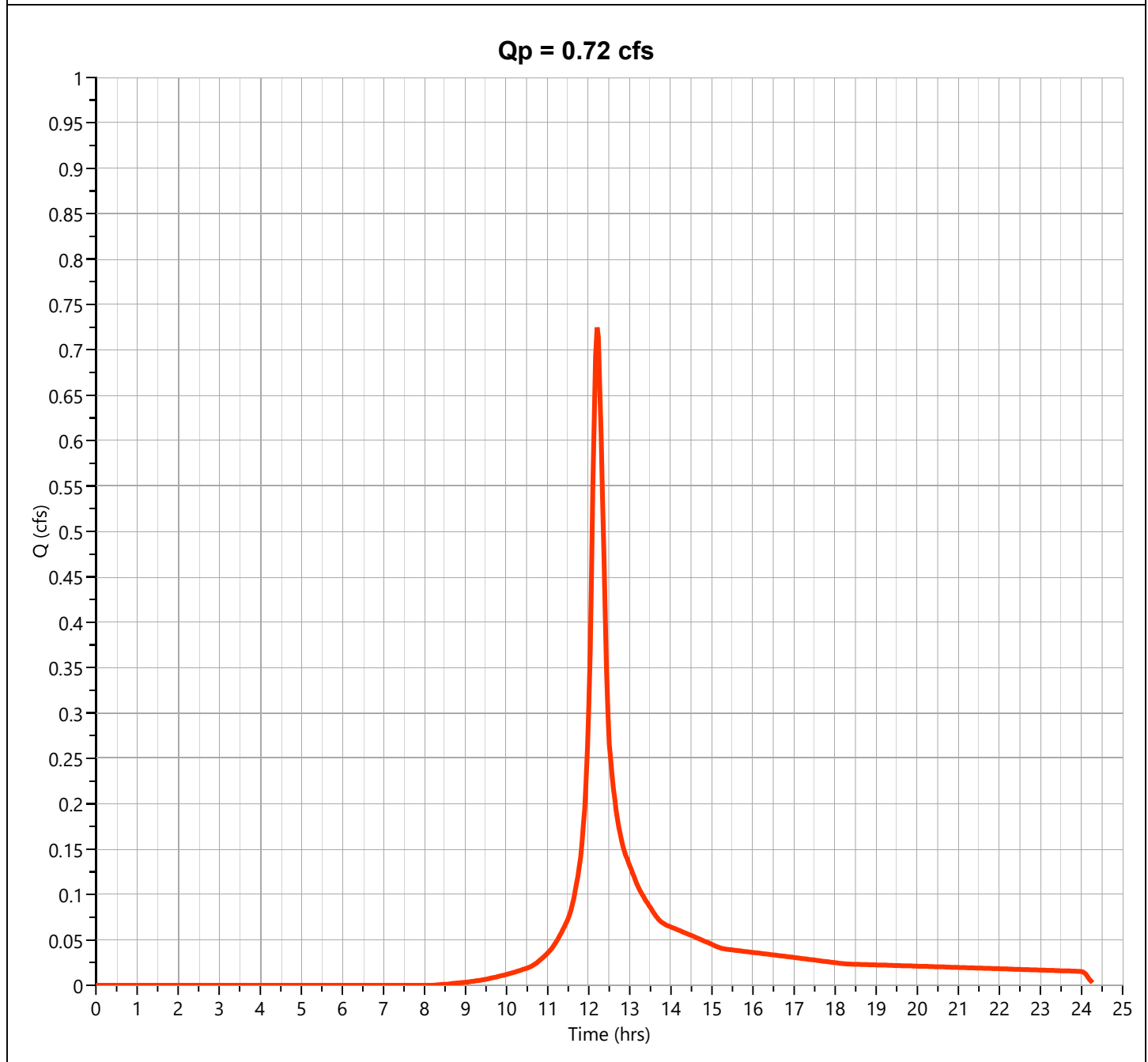
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-2A Grass C

## Hyd. No. 13

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.725 cfs  |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.20 hrs  |
| Time Interval   | = 2 min       | Runoff Volume      | = 3,025 cuft |
| Drainage Area   | = 0.32 ac     | Curve Number       | = 74         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 16.0 min   |
| Total Rainfall  | = 5.38 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

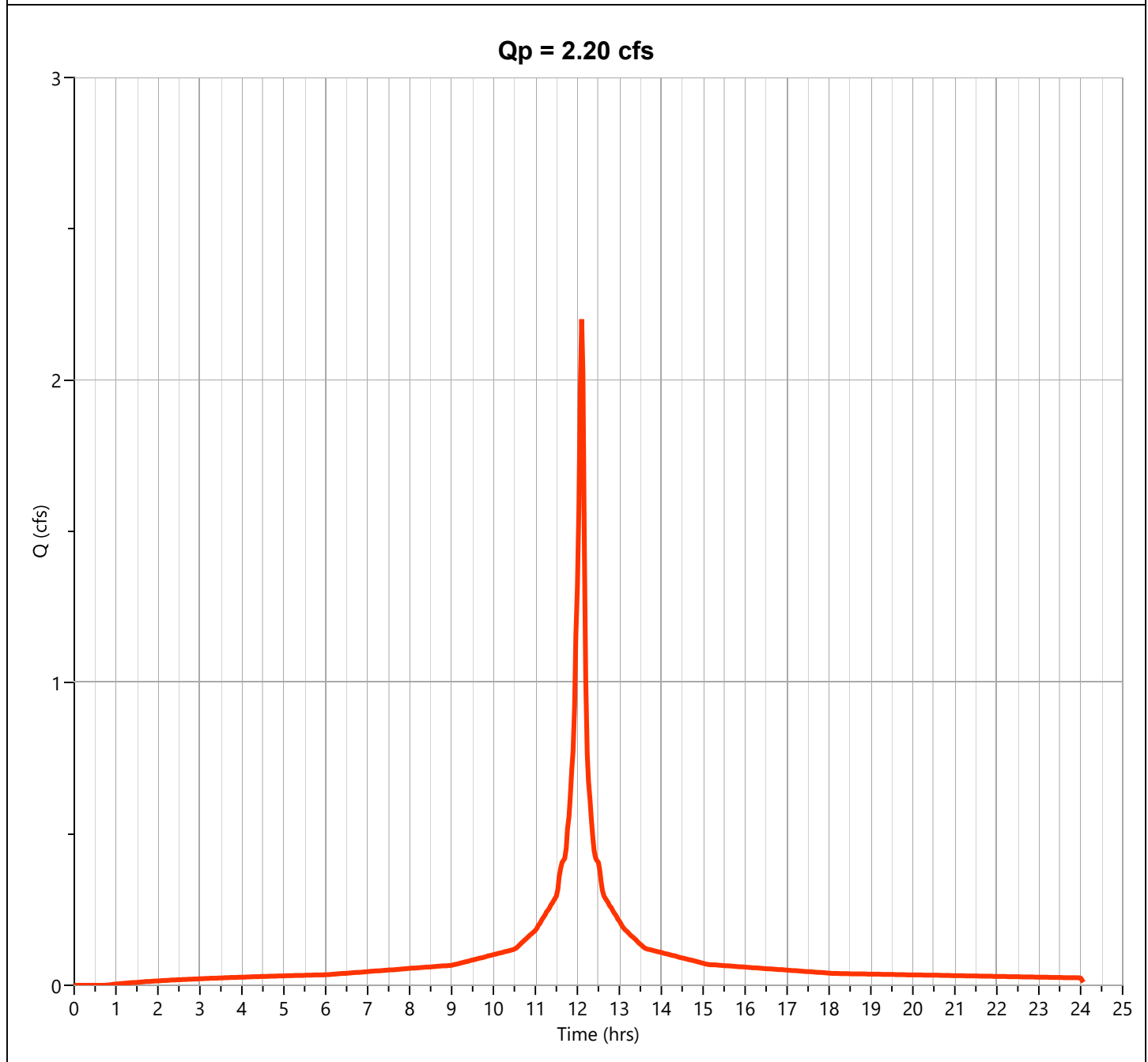
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-2A Impervious

## Hyd. No. 14

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 2.200 cfs  |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 2 min       | Runoff Volume      | = 7,700 cuft |
| Drainage Area   | = 0.44 ac     | Curve Number       | = 98         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 6.0 min    |
| Total Rainfall  | = 5.38 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

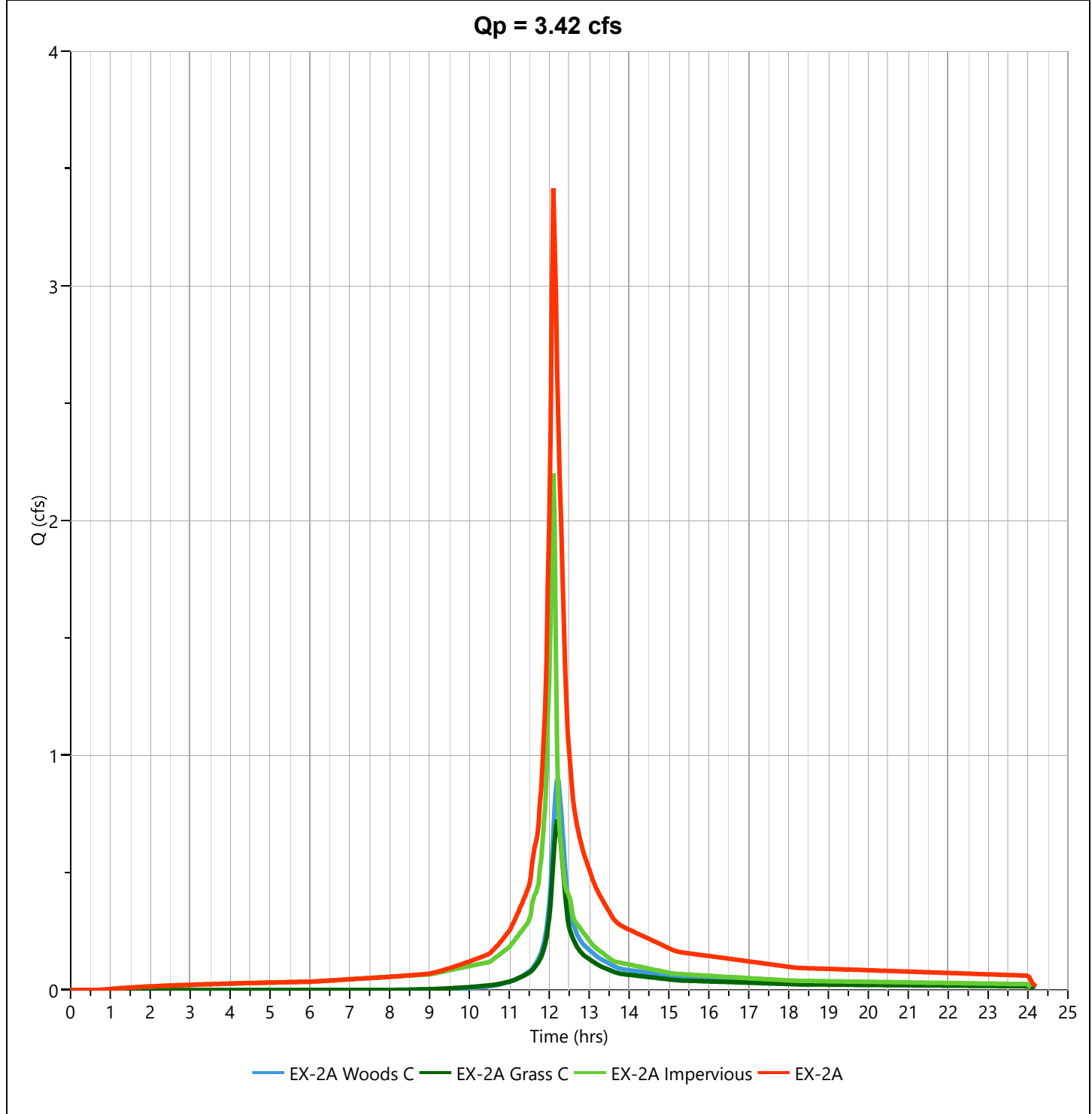
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-2A

## Hyd. No. 15

|                    |              |                     |               |
|--------------------|--------------|---------------------|---------------|
| Hydrograph Type    | = Junction   | Peak Flow           | = 3.418 cfs   |
| Storm Frequency    | = 10-yr      | Time to Peak        | = 12.13 hrs   |
| Time Interval      | = 2 min      | Hydrograph Volume   | = 14,506 cuft |
| Inflow Hydrographs | = 12, 13, 14 | Total Contrib. Area | = 1.22 ac     |



# Hydrograph Report

Project Name:

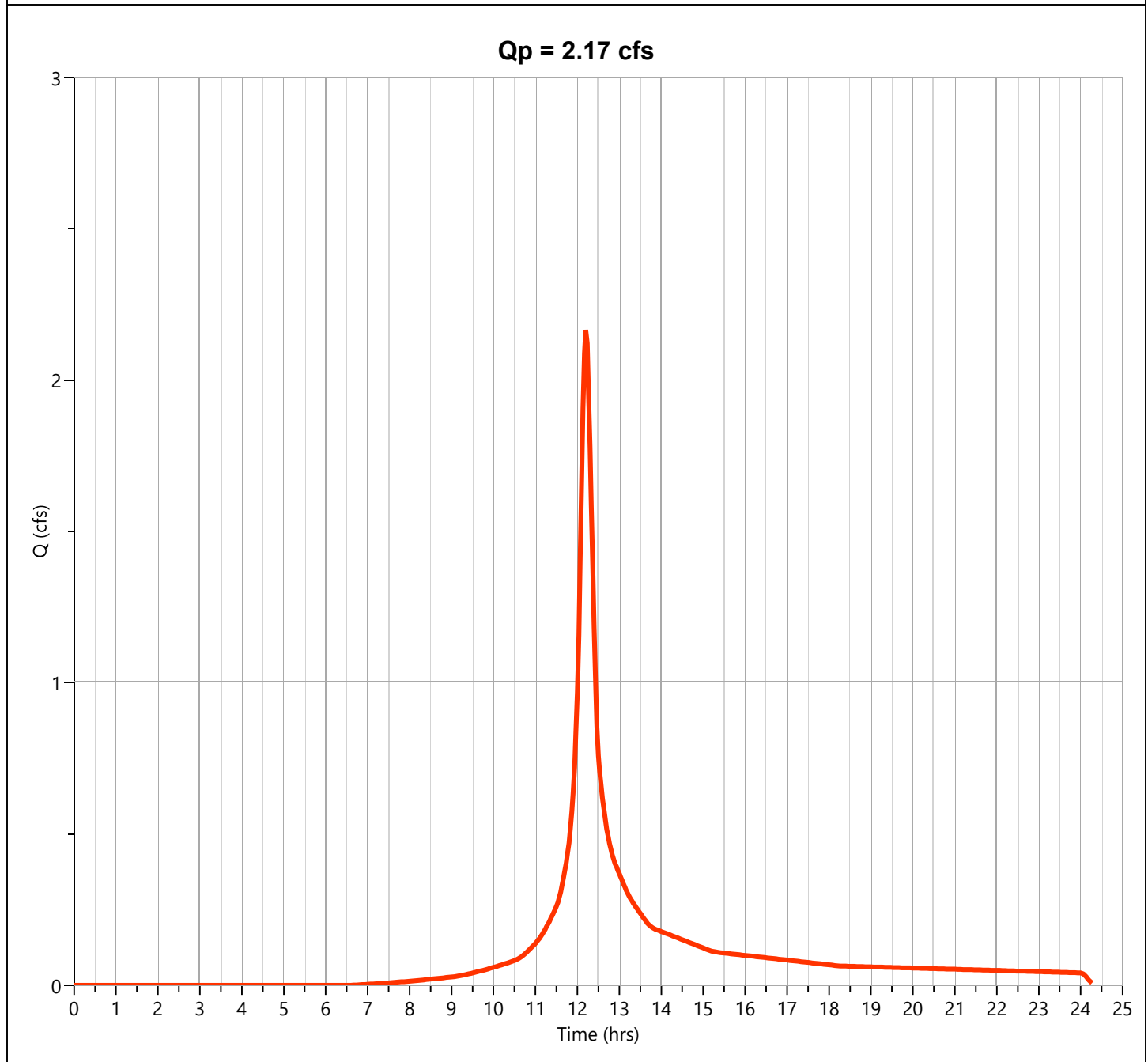
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-2A Woods C

## Hyd. No. 12

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 2.166 cfs  |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.20 hrs  |
| Time Interval   | = 2 min       | Runoff Volume      | = 9,060 cuft |
| Drainage Area   | = 0.46 ac     | Curve Number       | = 70         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 16.0 min   |
| Total Rainfall  | = 9.26 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |





# Hydrograph Report

Project Name:

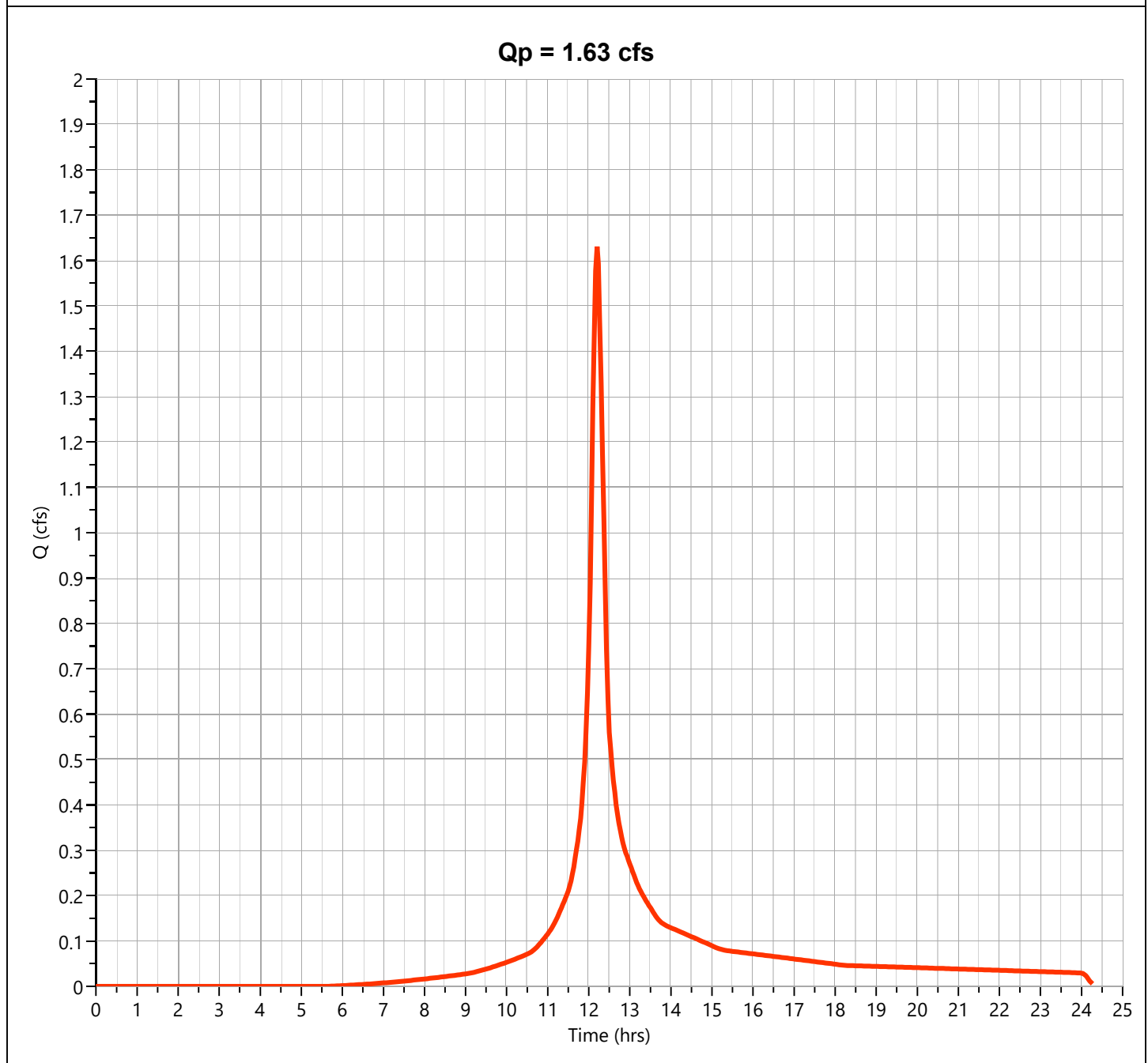
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-2A Grass C

## Hyd. No. 13

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 1.631 cfs  |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.20 hrs  |
| Time Interval   | = 2 min       | Runoff Volume      | = 6,871 cuft |
| Drainage Area   | = 0.32 ac     | Curve Number       | = 74         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 16.0 min   |
| Total Rainfall  | = 9.26 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

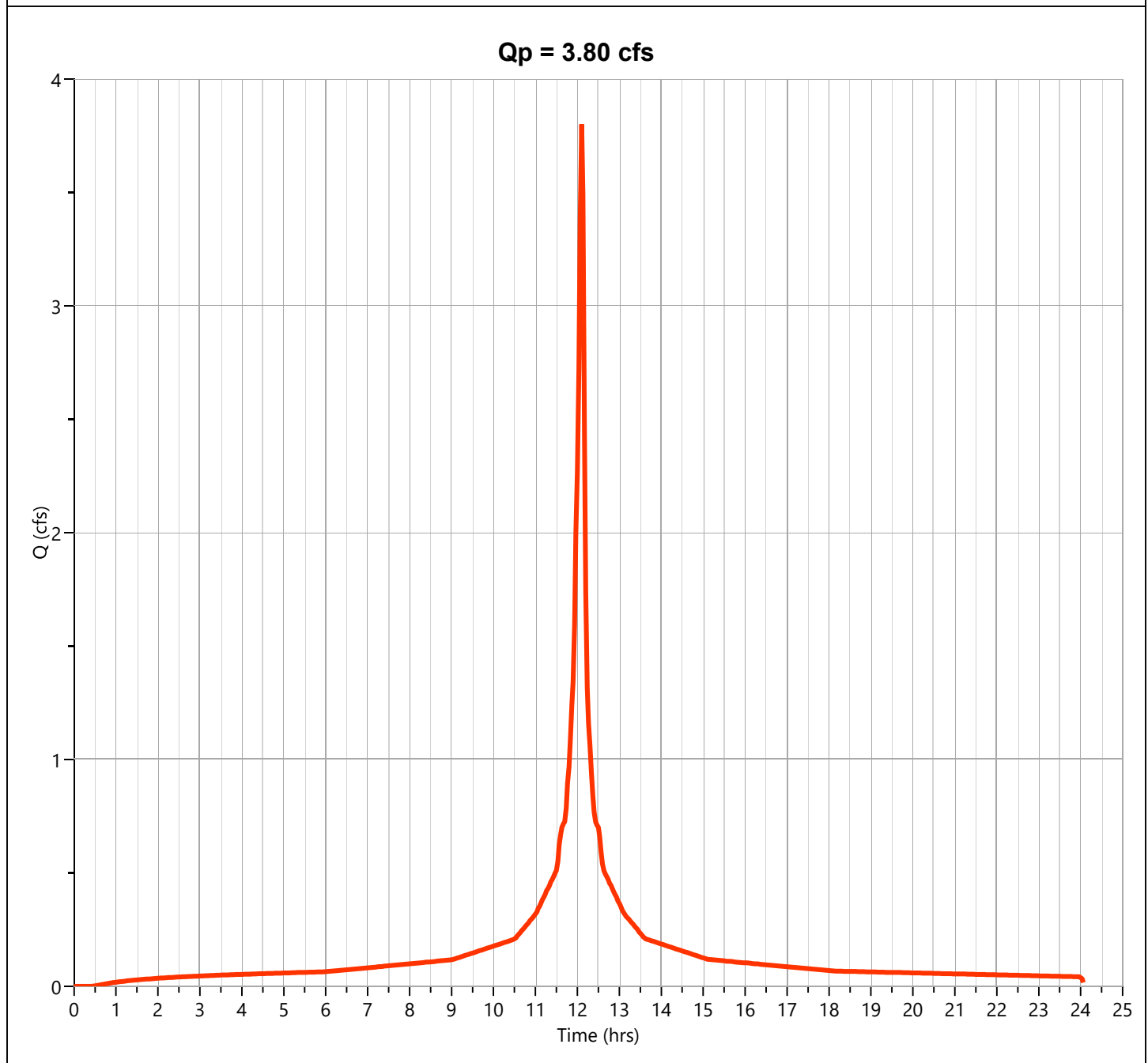
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-2A Impervious

## Hyd. No. 14

|                 |               |                    |               |
|-----------------|---------------|--------------------|---------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 3.799 cfs   |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.10 hrs   |
| Time Interval   | = 2 min       | Runoff Volume      | = 13,506 cuft |
| Drainage Area   | = 0.44 ac     | Curve Number       | = 98          |
| Tc Method       | = User        | Time of Conc. (Tc) | = 6.0 min     |
| Total Rainfall  | = 9.26 in     | Design Storm       | = NOAA-D      |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484         |



# Hydrograph Report

Project Name:

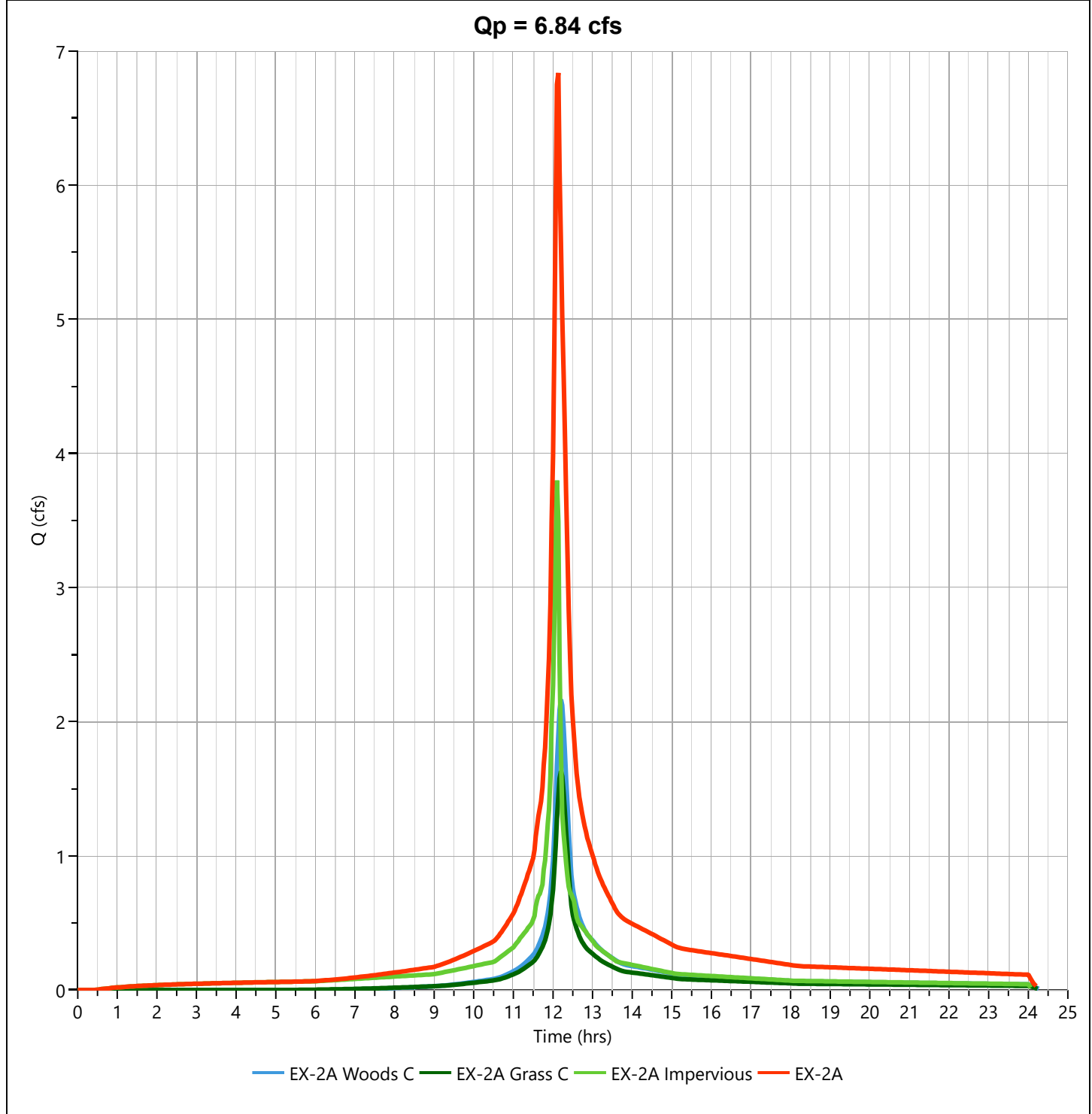
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-2A

## Hyd. No. 15

|                    |              |                     |               |
|--------------------|--------------|---------------------|---------------|
| Hydrograph Type    | = Junction   | Peak Flow           | = 6.836 cfs   |
| Storm Frequency    | = 100-yr     | Time to Peak        | = 12.13 hrs   |
| Time Interval      | = 2 min      | Hydrograph Volume   | = 29,436 cuft |
| Inflow Hydrographs | = 12, 13, 14 | Total Contrib. Area | = 1.22 ac     |



**EX-2A WATERSHED ALLOWABLE PEAK DISCHARGE**

# Hydrograph Report

Project Name:

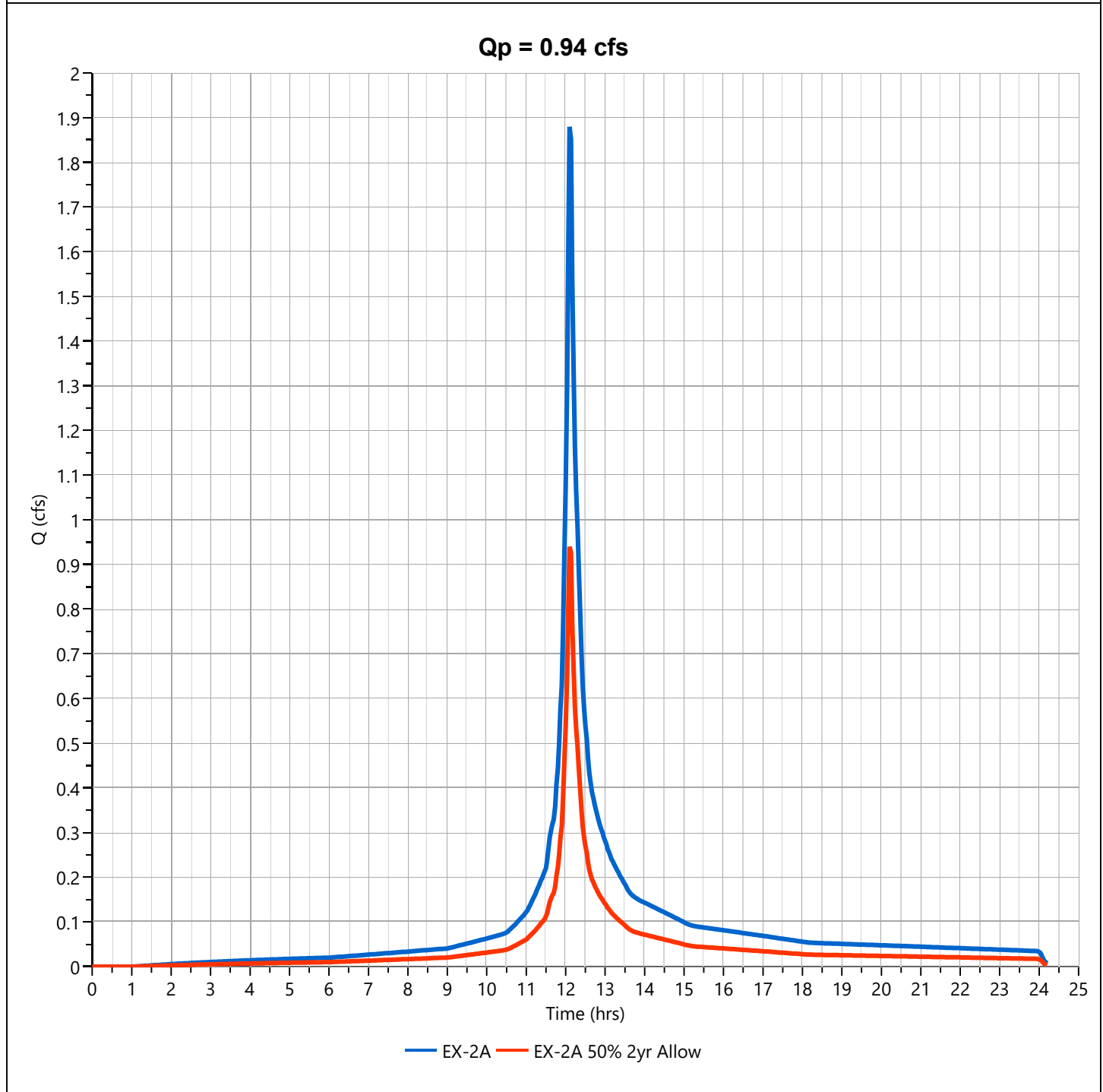
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-2A 50% 2yr Allow

## Hyd. No. 16

|                   |               |                   |              |
|-------------------|---------------|-------------------|--------------|
| Hydrograph Type   | = Diversion   | Peak Flow         | = 0.940 cfs  |
| Storm Frequency   | = 2-yr        | Time to Peak      | = 12.10 hrs  |
| Time Interval     | = 2 min       | Hydrograph Volume | = 3,903 cuft |
| Inflow Hydrograph | = 15 - EX-2A  | Diversion Method  | = Flow Ratio |
| Companion Hyd     | = 17 - <name> | Flow Ratio        | = 0.5        |



# Hydrograph Report

Project Name:

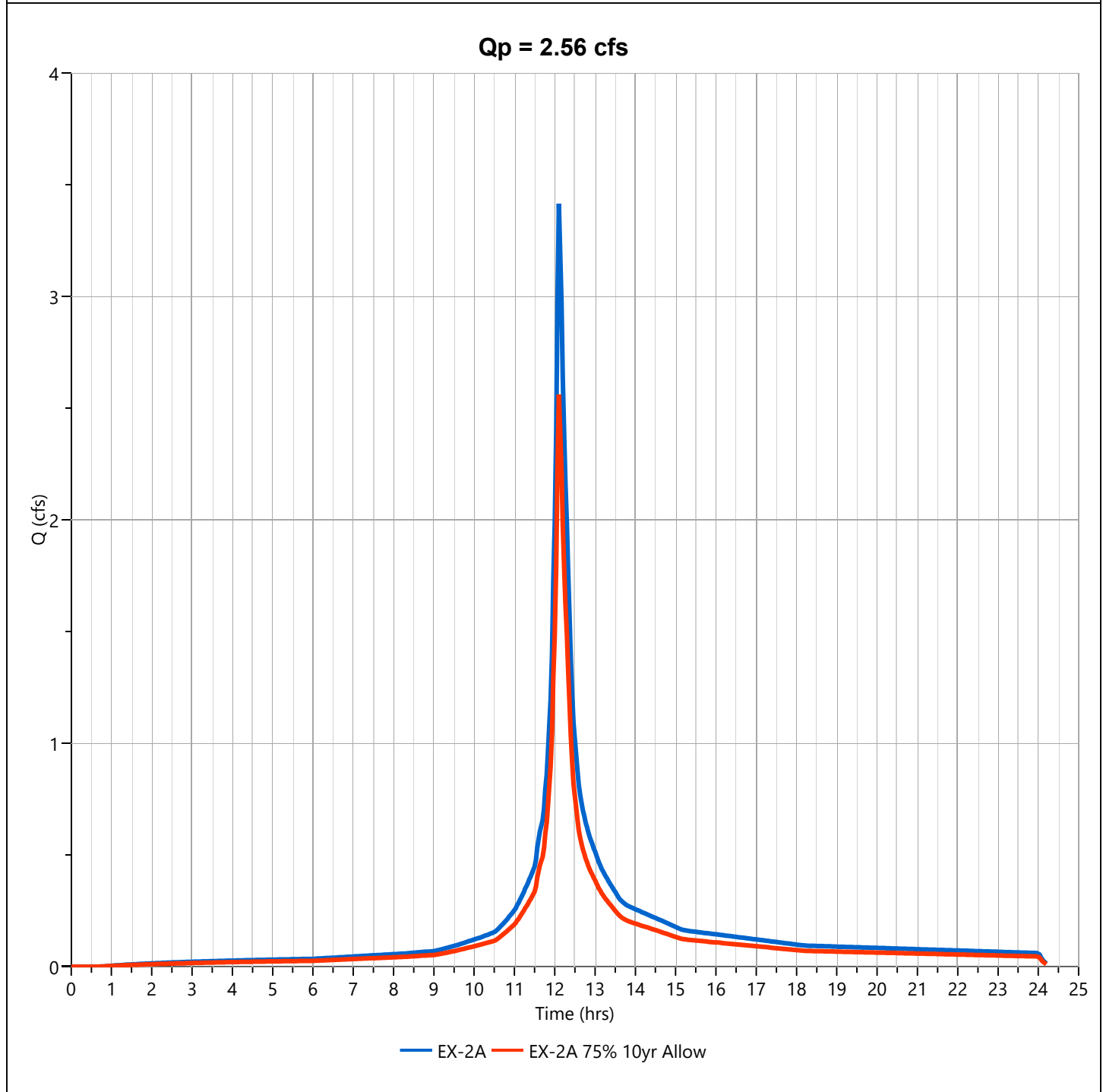
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-2A 75% 10yr Allow

## Hyd. No. 18

|                   |               |                   |               |
|-------------------|---------------|-------------------|---------------|
| Hydrograph Type   | = Diversion   | Peak Flow         | = 2.564 cfs   |
| Storm Frequency   | = 10-yr       | Time to Peak      | = 12.13 hrs   |
| Time Interval     | = 2 min       | Hydrograph Volume | = 10,880 cuft |
| Inflow Hydrograph | = 15 - EX-2A  | Diversion Method  | = Flow Ratio  |
| Companion Hyd     | = 19 - <name> | Flow Ratio        | = 0.75        |



# Hydrograph Report

Project Name:

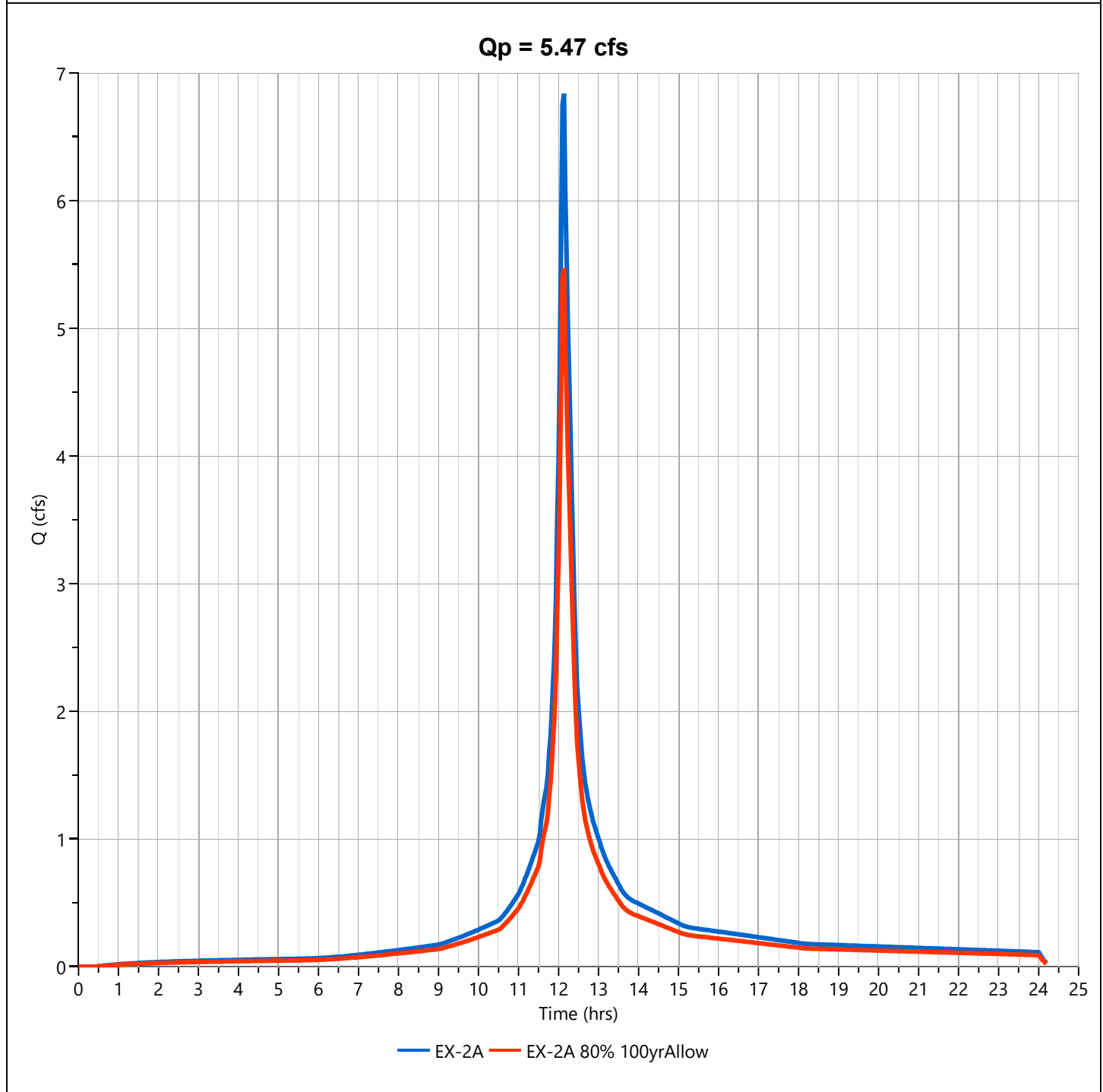
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-2A 80% 100yrAllow

## Hyd. No. 20

|                   |               |                   |               |
|-------------------|---------------|-------------------|---------------|
| Hydrograph Type   | = Diversion   | Peak Flow         | = 5.469 cfs   |
| Storm Frequency   | = 100-yr      | Time to Peak      | = 12.13 hrs   |
| Time Interval     | = 2 min       | Hydrograph Volume | = 23,549 cuft |
| Inflow Hydrograph | = 15 - EX-2A  | Diversion Method  | = Flow Ratio  |
| Companion Hyd     | = 21 - <name> | Flow Ratio        | = 0.8         |



**EX-2B WATERSHED**



Project: Beacon Unitarian Universalist Church

By: SM

Date: 11/29/2023

Location: Summit, NJ

Checked By: MJV

Date Checked: 11/29/2023

Circle One: Present Developed

Current Existing Watershed EX-2B Impervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Flow Length, L (total L < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. Compute T<sub>t</sub>

$$T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} s^{0.4}}$$

|            |                        |                               |  |
|------------|------------------------|-------------------------------|--|
| Segment ID | <b>1</b>               | <b>2</b>                      |  |
|            | <b>Smooth Surfaces</b> | <b>Woods Light Underbrush</b> |  |
|            | <b>0.011</b>           | <b>0.40</b>                   |  |
| ft         | <b>6</b>               | <b>94</b>                     |  |
| in         | <b>3.46</b>            | <b>3.46</b>                   |  |
| ft/ft      | <b>0.050</b>           | <b>0.046</b>                  |  |
| hr         | <b>0.001</b>           | <b>0.235</b>                  |  |

Sheet Flow Sub-Total **0.237 hours**

**Shallow Concentrated Flow**

7. Surface Description
8. Flow Length, L
9. Watercourse Slope, s
10. Average Velocity, V (NEH table 15-3)
11. Compute T<sub>t</sub>

$$T_t = \frac{L}{3600 V}$$

|            |                  |                  |  |
|------------|------------------|------------------|--|
| Segment ID | <b>3</b>         | <b>4</b>         |  |
|            | <b>Woodlands</b> | <b>Woodlands</b> |  |
| ft         | <b>69</b>        | <b>126</b>       |  |
| ft/ft      | <b>0.028</b>     | <b>0.008</b>     |  |
| ft/s       | <b>0.84</b>      | <b>0.46</b>      |  |
| hr         | <b>0.023</b>     | <b>0.076</b>     |  |

Shallow Conc. Flow Sub-Total **0.099 hours**

**Channel Flow**

12. Flow Length, L
13. Cross Sectional flow area, a
14. Wetted Perimeter, P<sub>w</sub>
15. Hydraulic Radius, r
16. Channel Slope, s
17. Manning's Roughness Coeff., n
18. Velocity, V
19. Compute T<sub>t</sub>

$$r = a / P_w$$

$$V = (1.49 r^{2/3} s^{1/2}) / n$$

$$T_t = \frac{L}{3600 V}$$

|                 |  |  |  |
|-----------------|--|--|--|
| Segment ID      |  |  |  |
| ft              |  |  |  |
| ft <sup>2</sup> |  |  |  |
| ft              |  |  |  |
| ft              |  |  |  |
| ft/ft           |  |  |  |
| ft/s            |  |  |  |
| hr              |  |  |  |

Channel Flow Sub-Total **0.000 hours**

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>

(Add Sub-Total T<sub>t</sub> from prior steps)

|                                  |                    |
|----------------------------------|--------------------|
| Total T <sub>c</sub> (hours) =   | <b>0.336 hours</b> |
| Total T <sub>c</sub> (minutes) = | <b>20 minutes</b>  |

Project: Beacon Unitarian Universalist Church

By: SM

Date: 11/29/2023

Location: Summit, NJ

Checked By: MJV

Date Checked: 11/29/2023

Circle One: Present Developed

Current Existing Watershed EX-2B Pervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Flow Length, L (total L < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. Compute T<sub>t</sub>

$$T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} s^{0.4}}$$

|            |                      |                               |  |
|------------|----------------------|-------------------------------|--|
| Segment ID | <b>1</b>             | <b>2</b>                      |  |
|            | <b>Dense Grasses</b> | <b>Woods Light Underbrush</b> |  |
|            | <b>0.24</b>          | <b>0.40</b>                   |  |
| ft         | <b>37</b>            | <b>63</b>                     |  |
| in         | <b>3.46</b>          | <b>3.46</b>                   |  |
| ft/ft      | <b>0.065</b>         | <b>0.025</b>                  |  |
| hr         | <b>0.064</b>         | <b>0.216</b>                  |  |

Sheet Flow Sub-Total **0.281 hours**

**Shallow Concentrated Flow**

7. Surface Description
8. Flow Length, L
9. Watercourse Slope, s
10. Average Velocity, V (NEH table 15-3)
11. Compute T<sub>t</sub>

$$T_t = \frac{L}{3600 V}$$

|            |                  |                  |  |
|------------|------------------|------------------|--|
| Segment ID | <b>3</b>         | <b>4</b>         |  |
|            | <b>Woodlands</b> | <b>Woodlands</b> |  |
| ft         | <b>69</b>        | <b>126</b>       |  |
| ft/ft      | <b>0.028</b>     | <b>0.008</b>     |  |
| ft/s       | <b>0.84</b>      | <b>0.46</b>      |  |
| hr         | <b>0.023</b>     | <b>0.076</b>     |  |

Shallow Conc. Flow Sub-Total **0.099 hours**

**Channel Flow**

12. Flow Length, L
13. Cross Sectional flow area, a
14. Wetted Perimeter, P<sub>w</sub>
15. Hydraulic Radius, r
16. Channel Slope, s
17. Manning's Roughness Coeff., n
18. Velocity, V
19. Compute T<sub>t</sub>

$$r = a / P_w$$

$$V = (1.49 r^{2/3} s^{1/2}) / n$$

$$T_t = \frac{L}{3600 V}$$

|                 |  |  |  |
|-----------------|--|--|--|
| Segment ID      |  |  |  |
| ft              |  |  |  |
| ft <sup>2</sup> |  |  |  |
| ft              |  |  |  |
| ft              |  |  |  |
| ft/ft           |  |  |  |
|                 |  |  |  |
| ft/s            |  |  |  |
| hr              |  |  |  |

Channel Flow Sub-Total **0.000 hours**

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>

(Add Sub-Total T<sub>t</sub> from prior steps)

|                                  |                    |
|----------------------------------|--------------------|
| Total T <sub>c</sub> (hours) =   | <b>0.380 hours</b> |
| Total T <sub>c</sub> (minutes) = | <b>23 minutes</b>  |

# Hydrograph Report

Project Name:

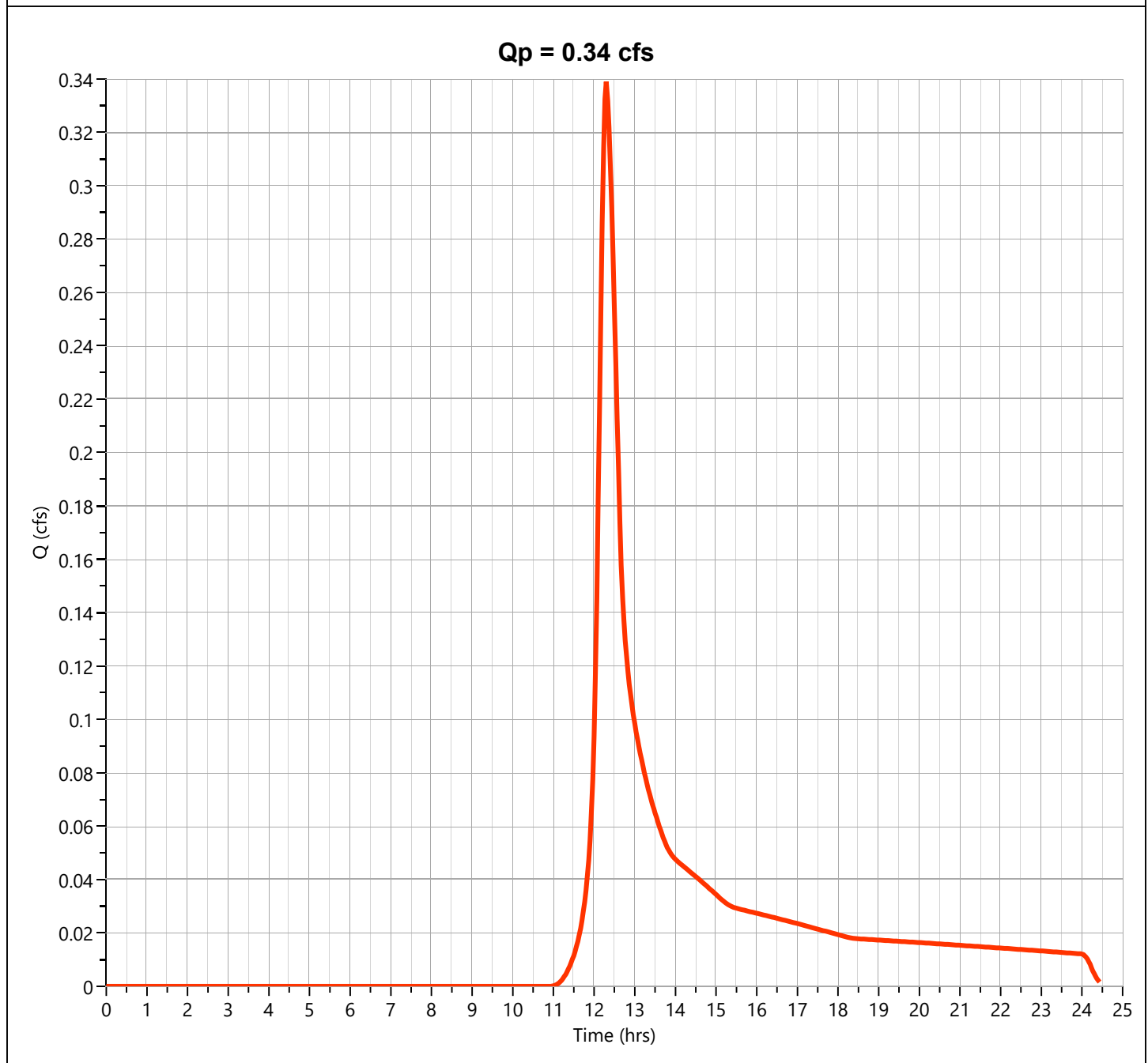
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-2B Woods C

## Hyd. No. 23

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.339 cfs  |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.30 hrs  |
| Time Interval   | = 2 min       | Runoff Volume      | = 1,817 cuft |
| Drainage Area   | = 0.5 ac      | Curve Number       | = 70         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 23.0 min   |
| Total Rainfall  | = 3.46 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

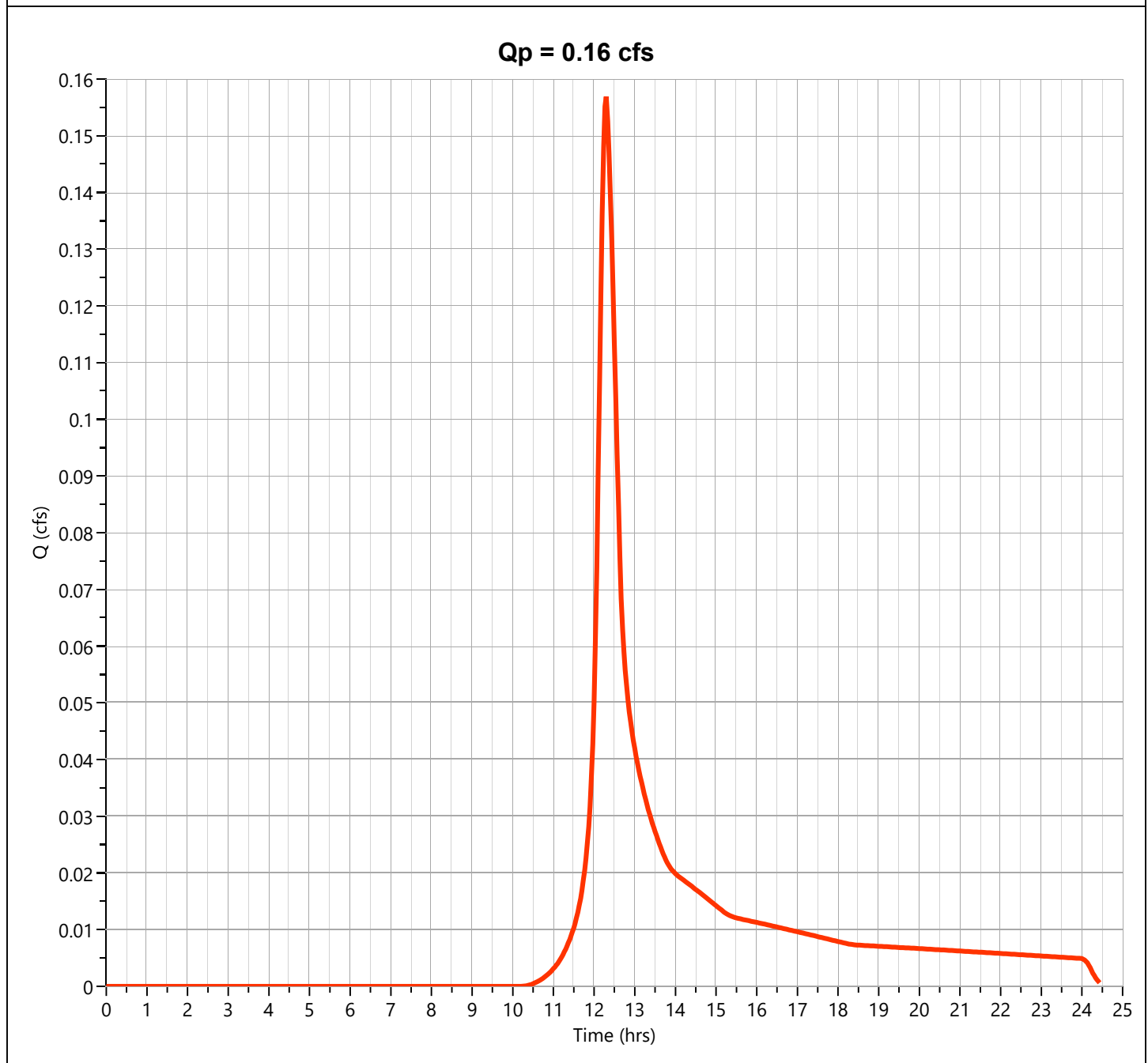
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-2B Grass C

## Hyd. No. 24

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.157 cfs |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.30 hrs |
| Time Interval   | = 2 min       | Runoff Volume      | = 806 cuft  |
| Drainage Area   | = 0.18 ac     | Curve Number       | = 74        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 23.0 min  |
| Total Rainfall  | = 3.46 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

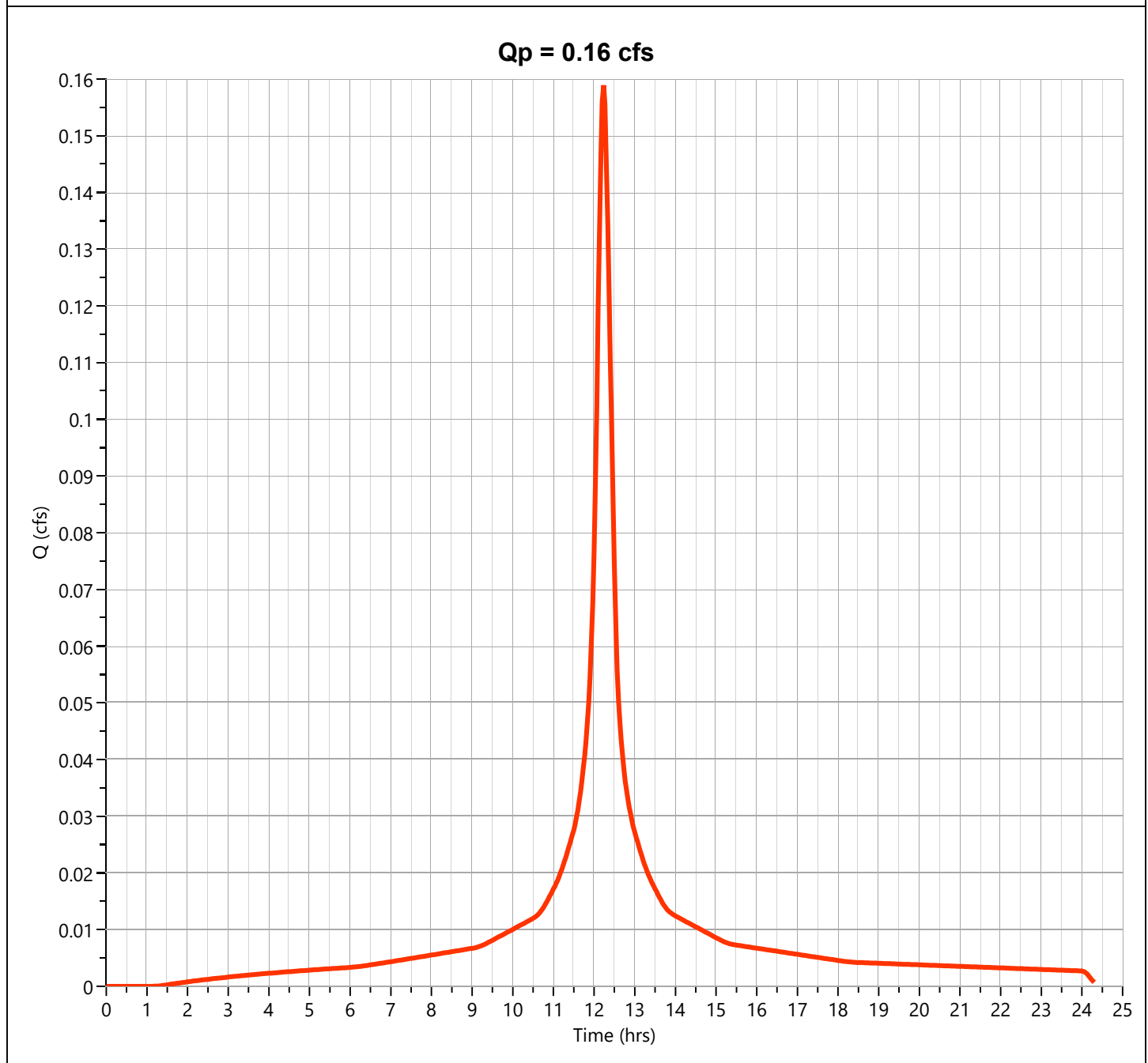
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-2B Impervious

## Hyd. No. 25

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.159 cfs |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.23 hrs |
| Time Interval   | = 2 min       | Runoff Volume      | = 820 cuft  |
| Drainage Area   | = 0.07 ac     | Curve Number       | = 98        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 20.0 min  |
| Total Rainfall  | = 3.46 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

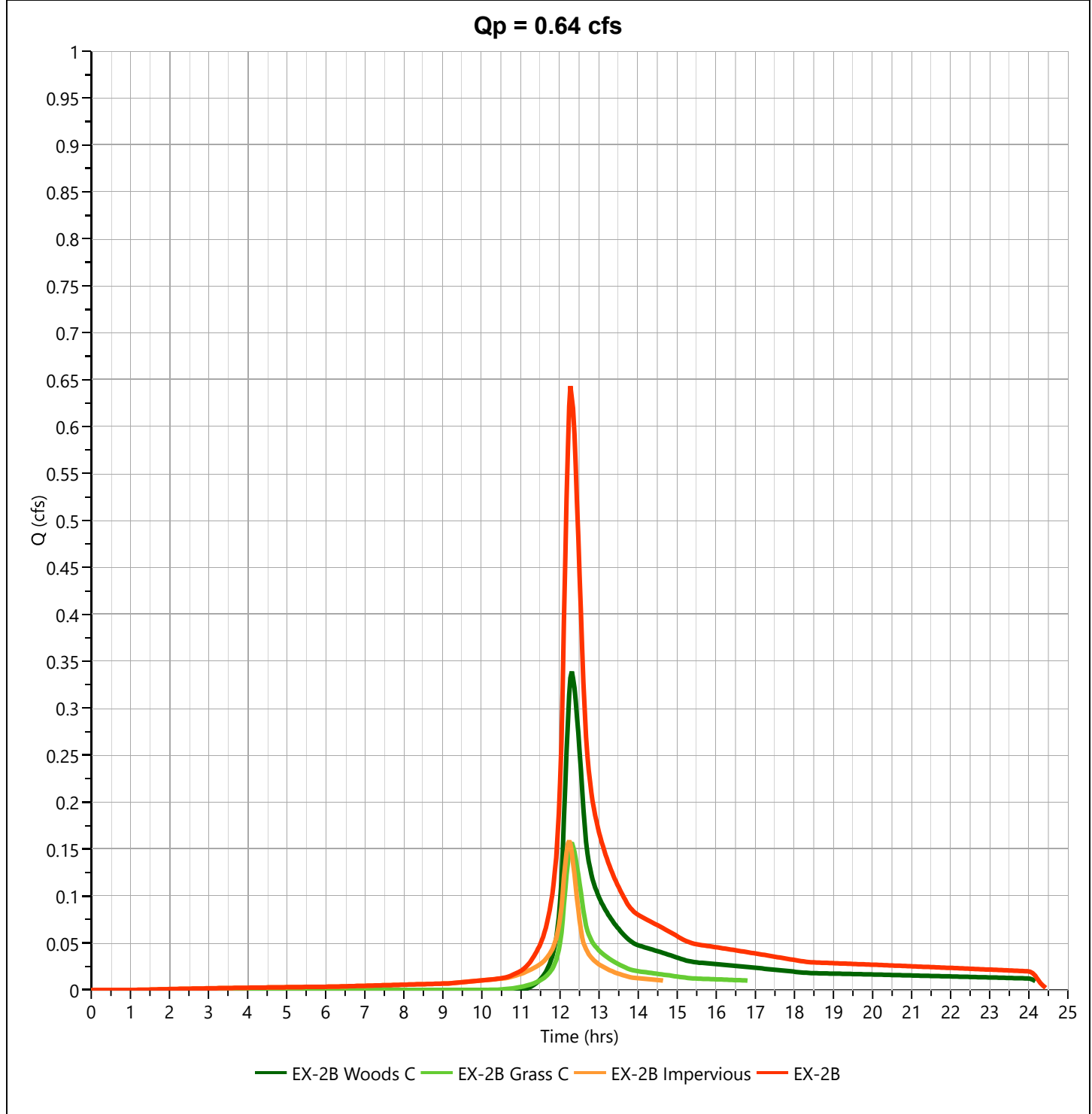
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-2B

## Hyd. No. 26

|                    |              |                     |              |
|--------------------|--------------|---------------------|--------------|
| Hydrograph Type    | = Junction   | Peak Flow           | = 0.643 cfs  |
| Storm Frequency    | = 2-yr       | Time to Peak        | = 12.27 hrs  |
| Time Interval      | = 2 min      | Hydrograph Volume   | = 3,443 cuft |
| Inflow Hydrographs | = 23, 24, 25 | Total Contrib. Area | = 0.75 ac    |



# Hydrograph Report

Project Name:

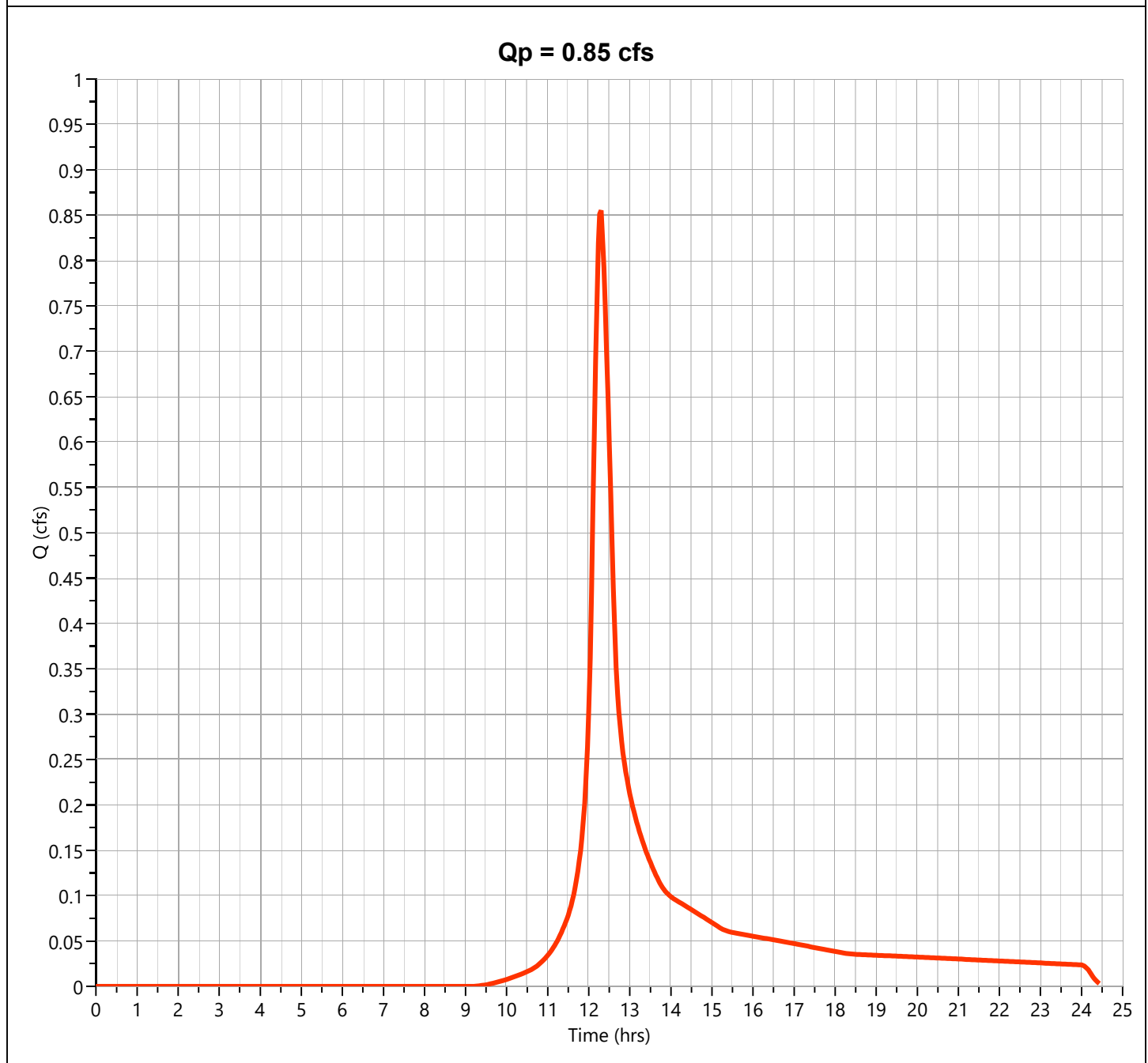
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-2B Woods C

## Hyd. No. 23

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.855 cfs  |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.30 hrs  |
| Time Interval   | = 2 min       | Runoff Volume      | = 4,290 cuft |
| Drainage Area   | = 0.5 ac      | Curve Number       | = 70         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 23.0 min   |
| Total Rainfall  | = 5.38 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

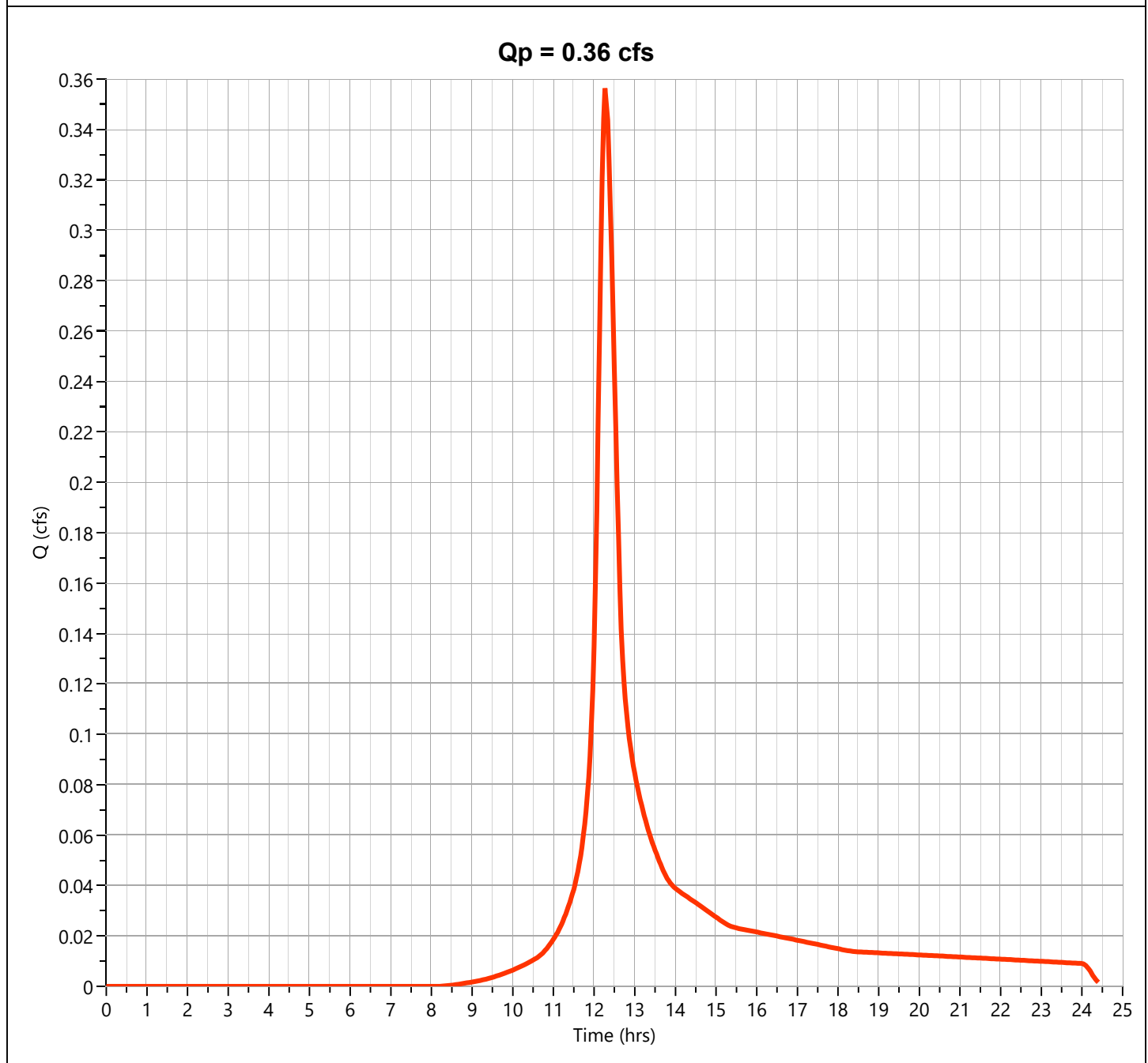
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-2B Grass C

## Hyd. No. 24

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.357 cfs  |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.30 hrs  |
| Time Interval   | = 2 min       | Runoff Volume      | = 1,776 cuft |
| Drainage Area   | = 0.18 ac     | Curve Number       | = 74         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 23.0 min   |
| Total Rainfall  | = 5.38 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |





# Hydrograph Report

Project Name:

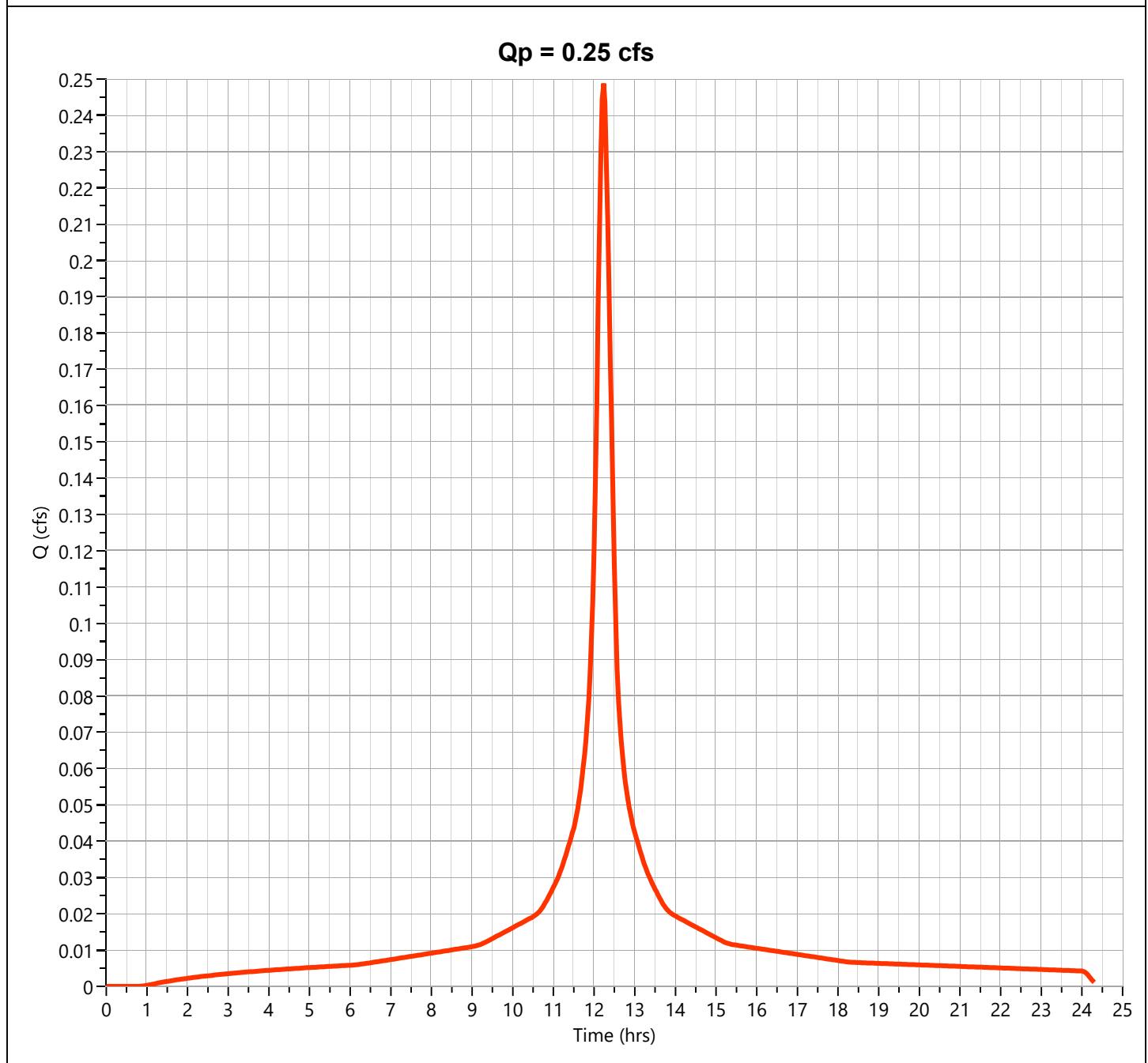
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-2B Impervious

## Hyd. No. 25

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.249 cfs  |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.23 hrs  |
| Time Interval   | = 2 min       | Runoff Volume      | = 1,307 cuft |
| Drainage Area   | = 0.07 ac     | Curve Number       | = 98         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 20.0 min   |
| Total Rainfall  | = 5.38 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

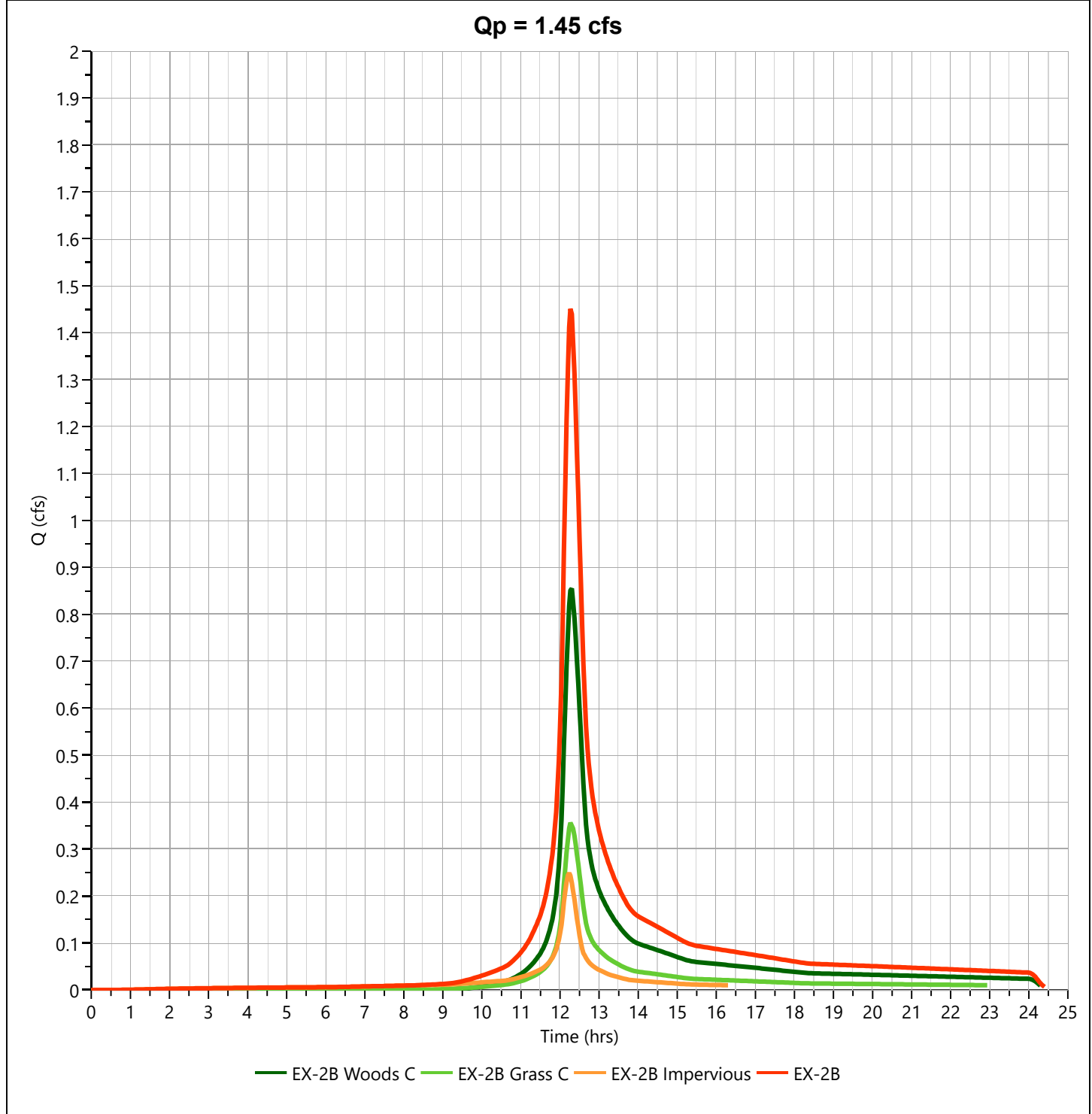
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-2B

## Hyd. No. 26

|                    |              |                     |              |
|--------------------|--------------|---------------------|--------------|
| Hydrograph Type    | = Junction   | Peak Flow           | = 1.451 cfs  |
| Storm Frequency    | = 10-yr      | Time to Peak        | = 12.27 hrs  |
| Time Interval      | = 2 min      | Hydrograph Volume   | = 7,373 cuft |
| Inflow Hydrographs | = 23, 24, 25 | Total Contrib. Area | = 0.75 ac    |



# Hydrograph Report

Project Name:

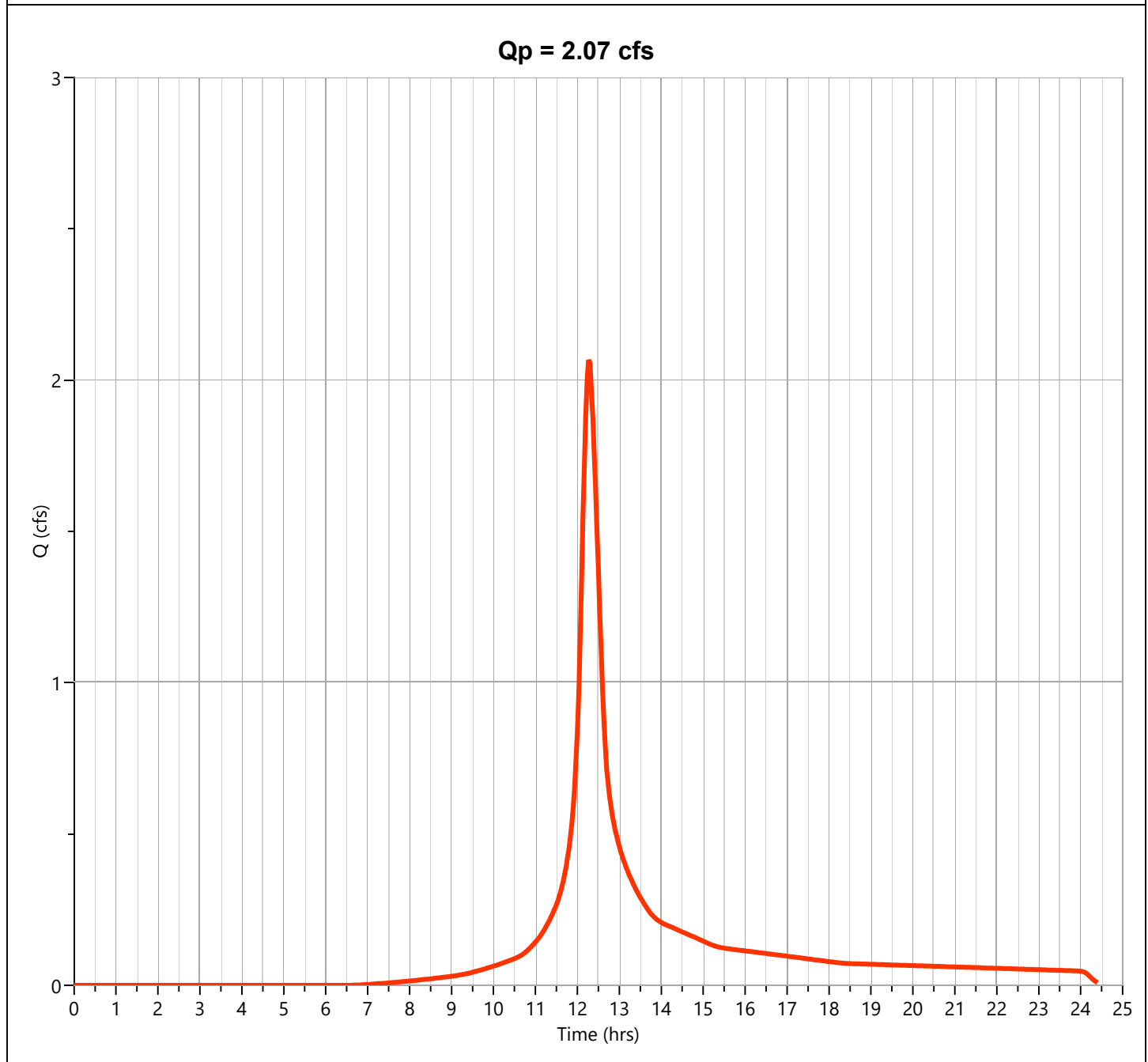
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-2B Woods C

## Hyd. No. 23

|                 |               |                    |               |
|-----------------|---------------|--------------------|---------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 2.066 cfs   |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.27 hrs   |
| Time Interval   | = 2 min       | Runoff Volume      | = 10,280 cuft |
| Drainage Area   | = 0.5 ac      | Curve Number       | = 70          |
| Tc Method       | = User        | Time of Conc. (Tc) | = 23.0 min    |
| Total Rainfall  | = 9.26 in     | Design Storm       | = NOAA-D      |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484         |



# Hydrograph Report

Project Name:

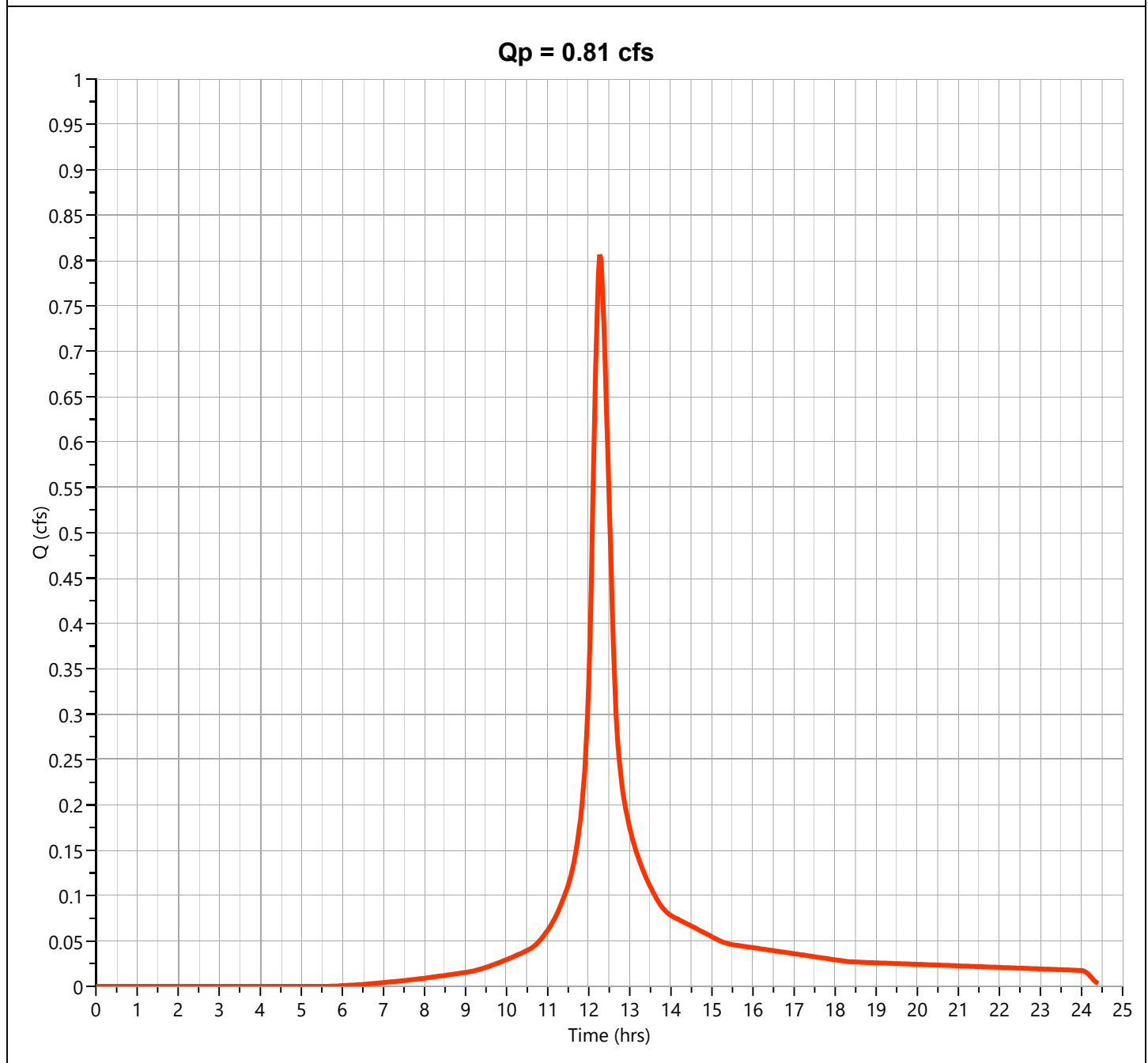
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-2B Grass C

## Hyd. No. 24

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.806 cfs  |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.27 hrs  |
| Time Interval   | = 2 min       | Runoff Volume      | = 4,035 cuft |
| Drainage Area   | = 0.18 ac     | Curve Number       | = 74         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 23.0 min   |
| Total Rainfall  | = 9.26 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

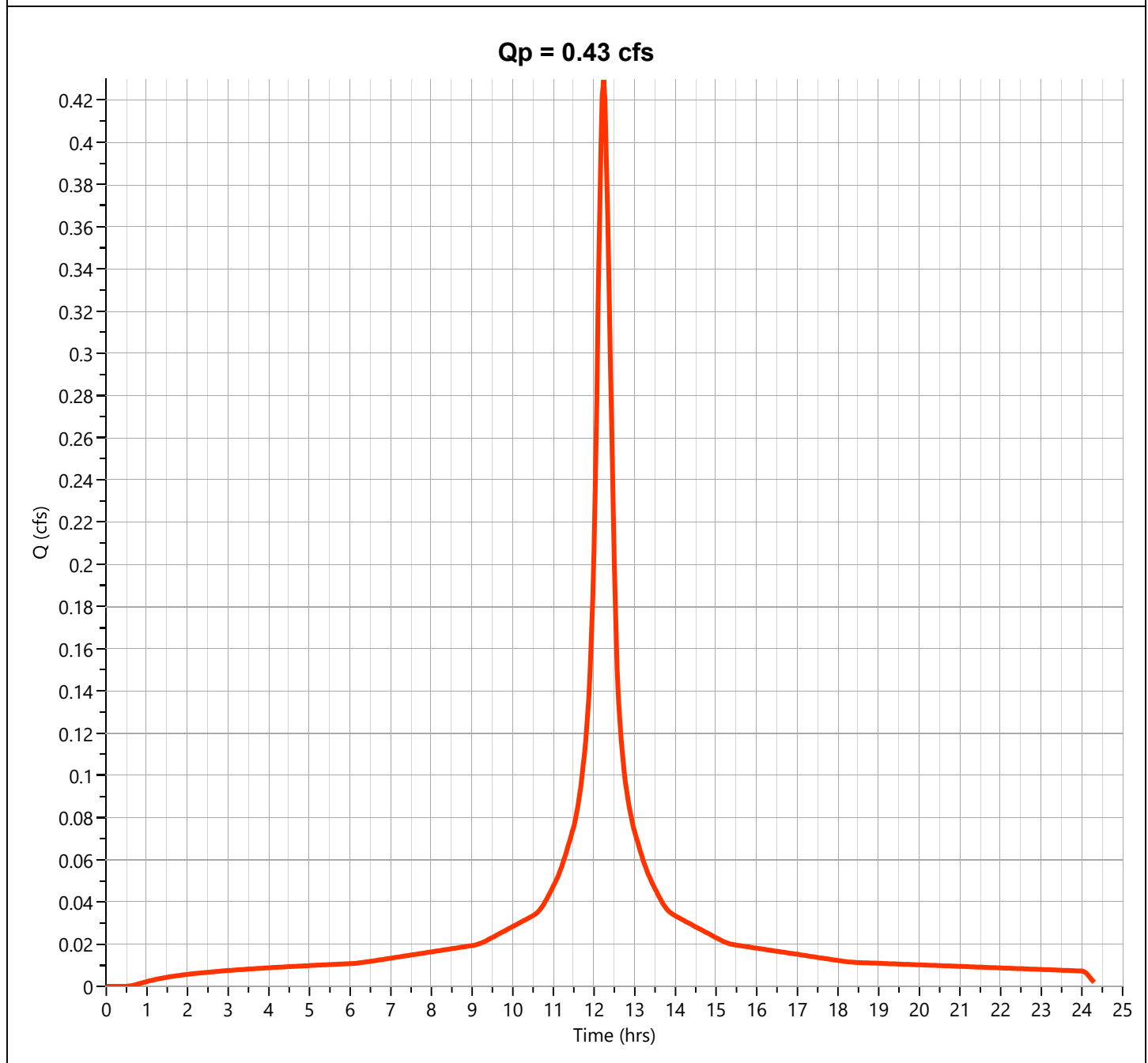
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-2B Impervious

## Hyd. No. 25

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.430 cfs  |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.23 hrs  |
| Time Interval   | = 2 min       | Runoff Volume      | = 2,292 cuft |
| Drainage Area   | = 0.07 ac     | Curve Number       | = 98         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 20.0 min   |
| Total Rainfall  | = 9.26 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

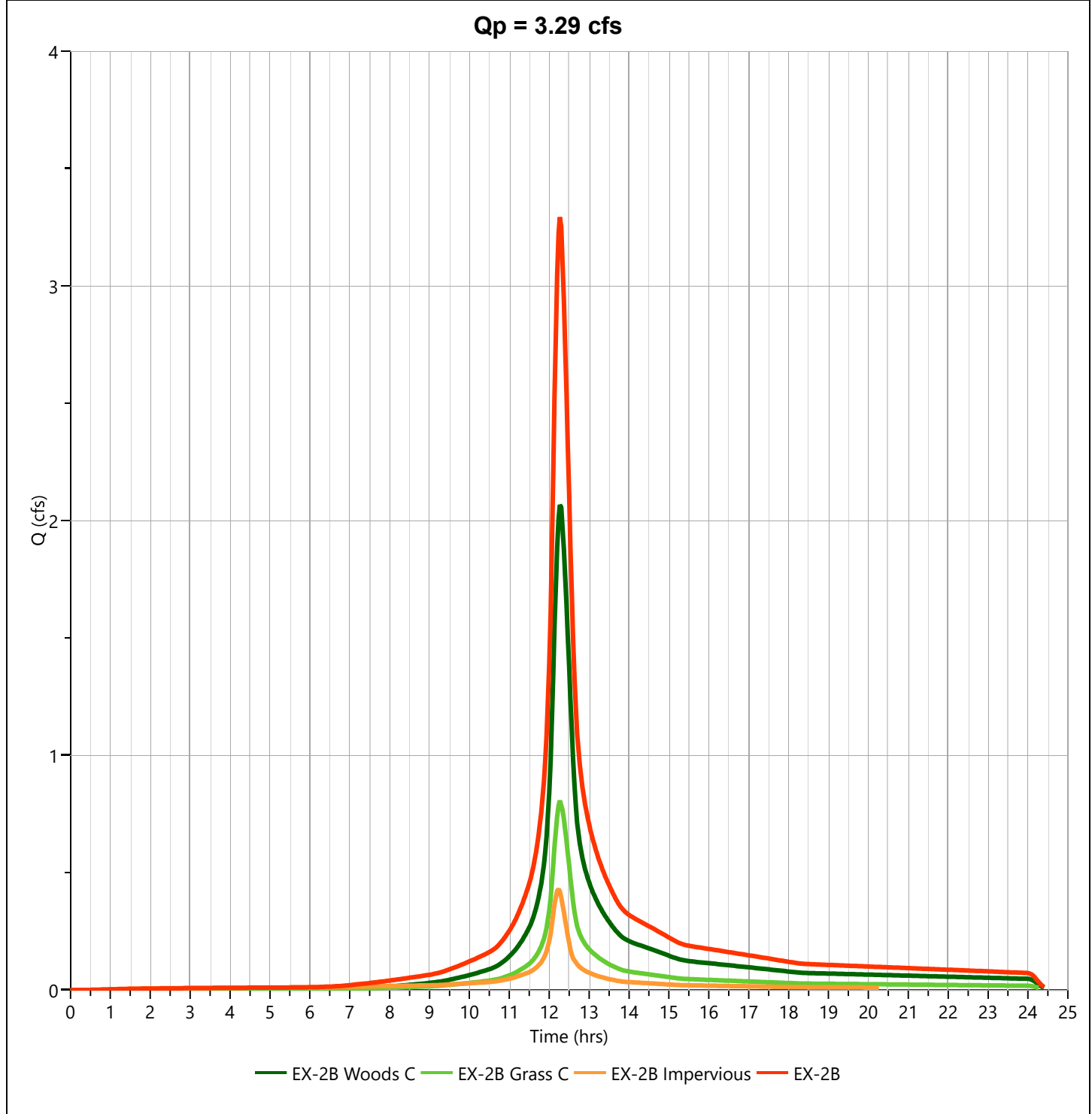
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-2B

## Hyd. No. 26

|                    |              |                     |               |
|--------------------|--------------|---------------------|---------------|
| Hydrograph Type    | = Junction   | Peak Flow           | = 3.292 cfs   |
| Storm Frequency    | = 100-yr     | Time to Peak        | = 12.27 hrs   |
| Time Interval      | = 2 min      | Hydrograph Volume   | = 16,607 cuft |
| Inflow Hydrographs | = 23, 24, 25 | Total Contrib. Area | = 0.75 ac     |



**TOTAL EXISTING FLOW TO POA-2**

# Hydrograph Report

Project Name:

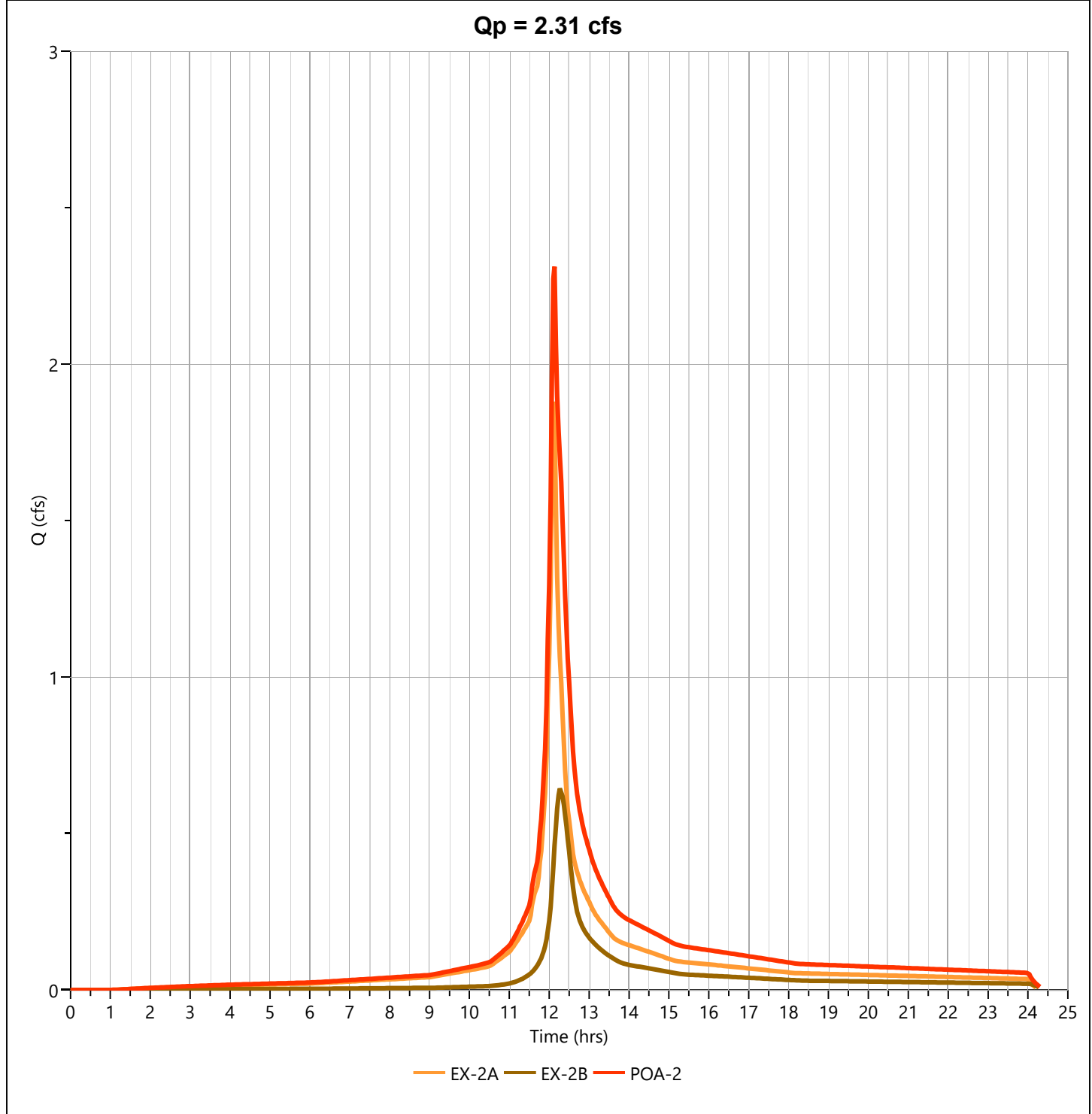
Hydrology Studio v 3.0.0.29

11-29-2023

## POA-2

## Hyd. No. 28

|                    |            |                     |               |
|--------------------|------------|---------------------|---------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 2.311 cfs   |
| Storm Frequency    | = 2-yr     | Time to Peak        | = 12.13 hrs   |
| Time Interval      | = 2 min    | Hydrograph Volume   | = 11,249 cuft |
| Inflow Hydrographs | = 15, 26   | Total Contrib. Area | = 1.97 ac     |





# Hydrograph Report

Project Name:

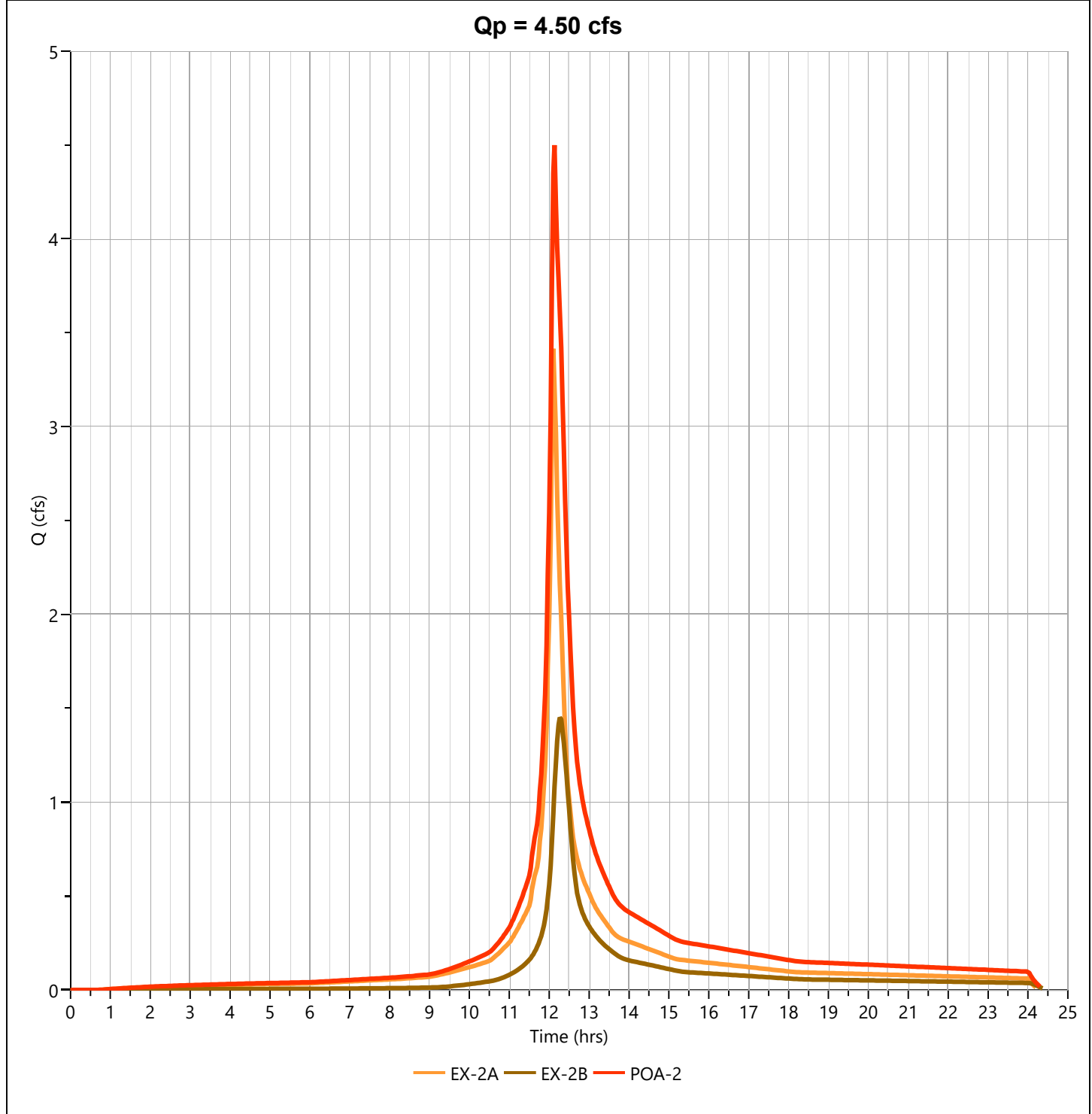
Hydrology Studio v 3.0.0.29

11-29-2023

## POA-2

## Hyd. No. 28

|                    |            |                     |               |
|--------------------|------------|---------------------|---------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 4.499 cfs   |
| Storm Frequency    | = 10-yr    | Time to Peak        | = 12.13 hrs   |
| Time Interval      | = 2 min    | Hydrograph Volume   | = 21,880 cuft |
| Inflow Hydrographs | = 15, 26   | Total Contrib. Area | = 1.97 ac     |



# Hydrograph Report

Project Name:

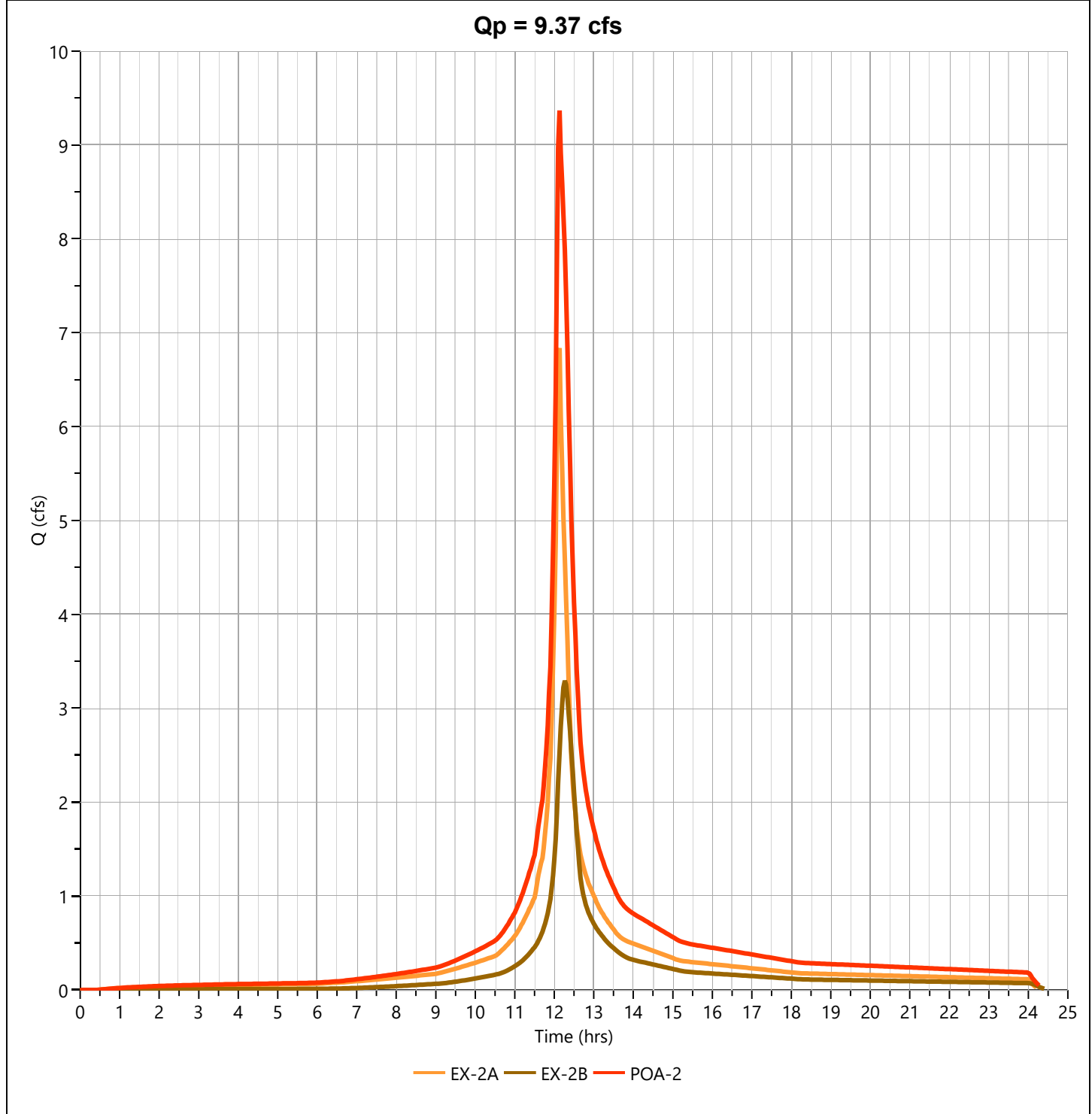
Hydrology Studio v 3.0.0.29

11-29-2023

## POA-2

## Hyd. No. 28

|                    |            |                     |               |
|--------------------|------------|---------------------|---------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 9.365 cfs   |
| Storm Frequency    | = 100-yr   | Time to Peak        | = 12.13 hrs   |
| Time Interval      | = 2 min    | Hydrograph Volume   | = 46,043 cuft |
| Inflow Hydrographs | = 15, 26   | Total Contrib. Area | = 1.97 ac     |



**TOTAL ALLOWABLE FLOW TO POA-2**

# Hydrograph Report

Project Name:

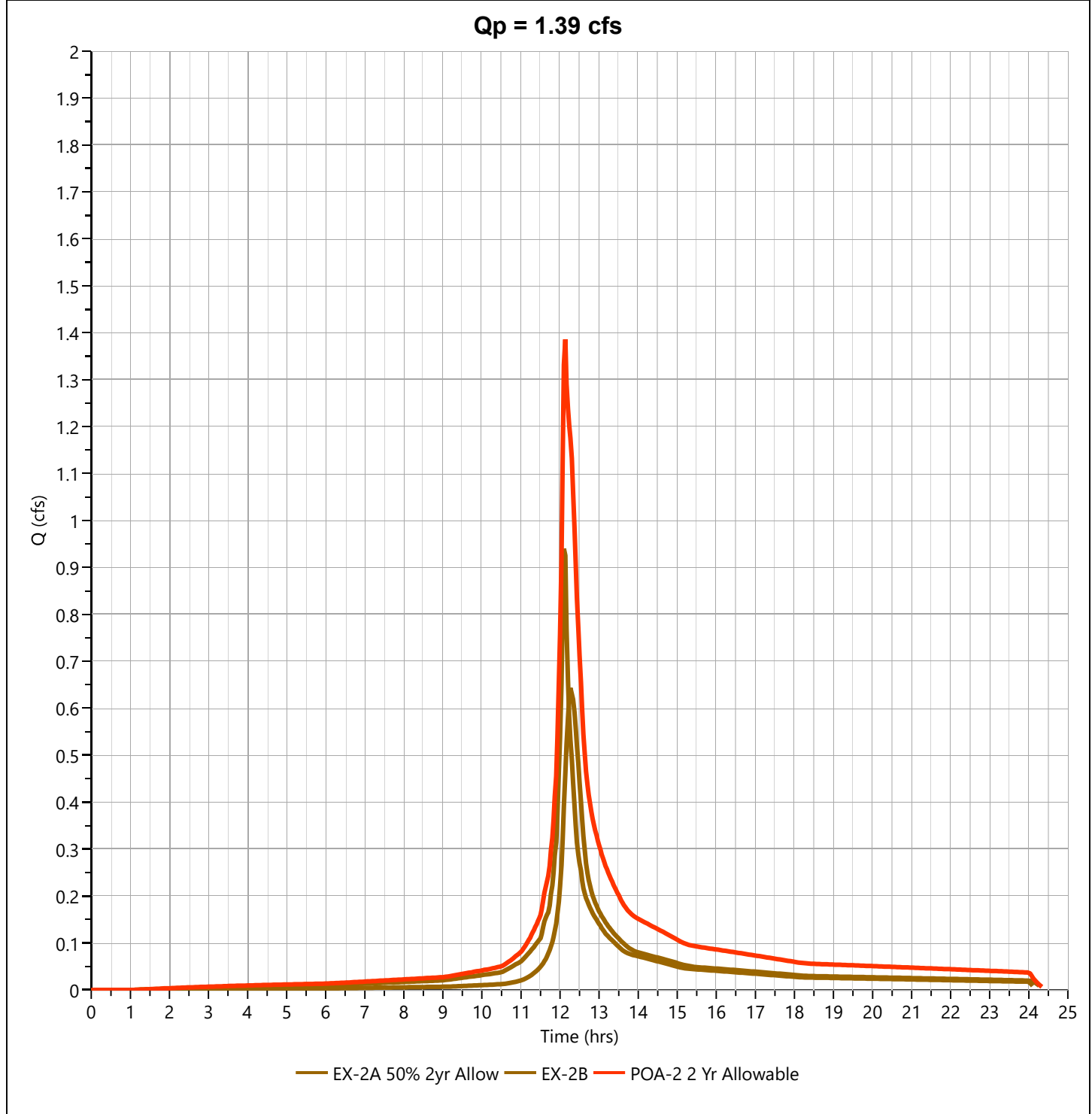
Hydrology Studio v 3.0.0.29

11-29-2023

## POA-2 2 Yr Allowable

## Hyd. No. 29

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 1.386 cfs  |
| Storm Frequency    | = 2-yr     | Time to Peak        | = 12.13 hrs  |
| Time Interval      | = 2 min    | Hydrograph Volume   | = 7,346 cuft |
| Inflow Hydrographs | = 16, 26   | Total Contrib. Area | = 0.75 ac    |



# Hydrograph Report

Project Name:

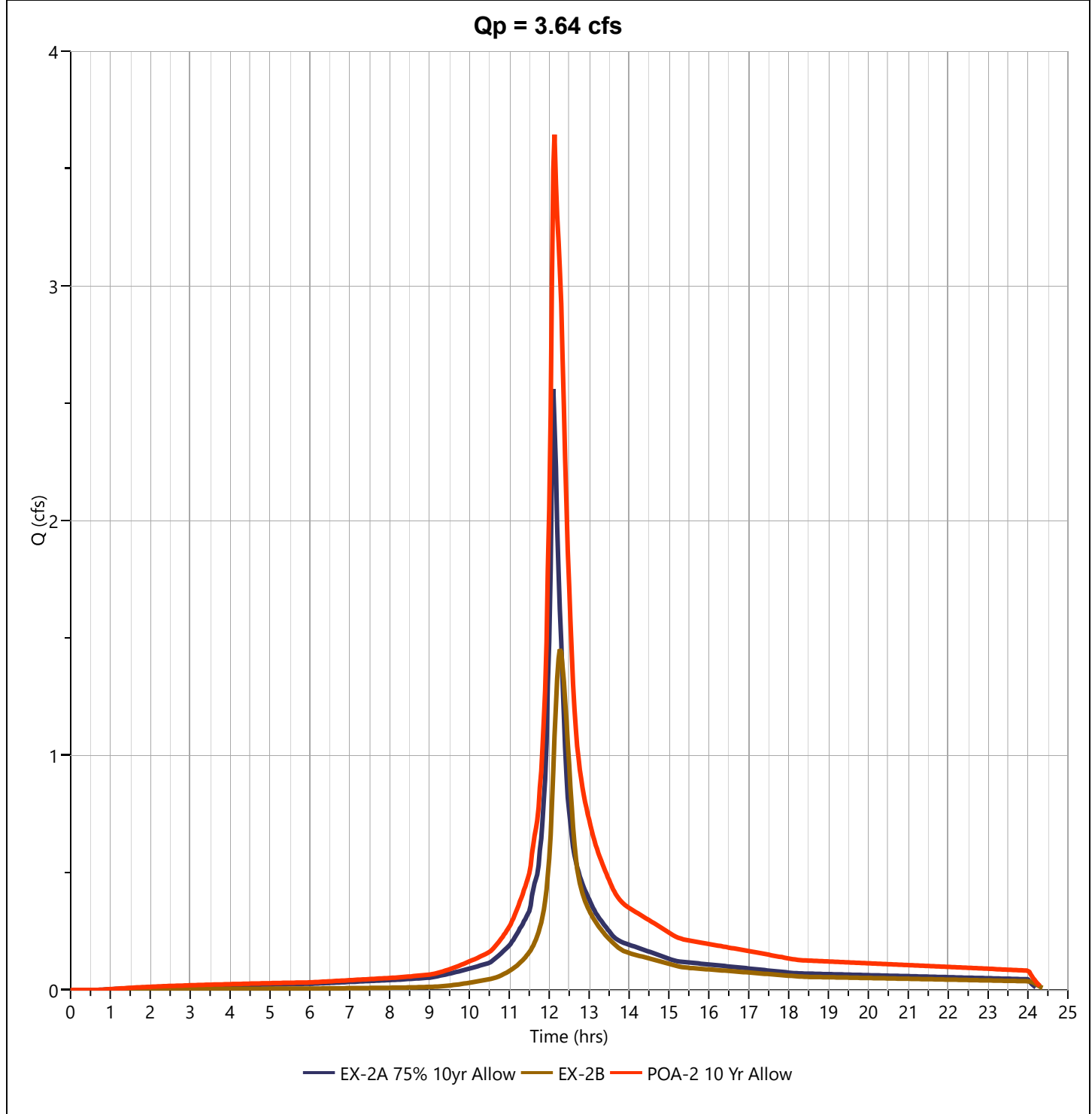
Hydrology Studio v 3.0.0.29

11-29-2023

## POA-2 10 Yr Allow

## Hyd. No. 30

|                    |            |                     |               |
|--------------------|------------|---------------------|---------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 3.644 cfs   |
| Storm Frequency    | = 10-yr    | Time to Peak        | = 12.13 hrs   |
| Time Interval      | = 2 min    | Hydrograph Volume   | = 18,253 cuft |
| Inflow Hydrographs | = 18, 26   | Total Contrib. Area | = 0.75 ac     |



# Hydrograph Report

Project Name:

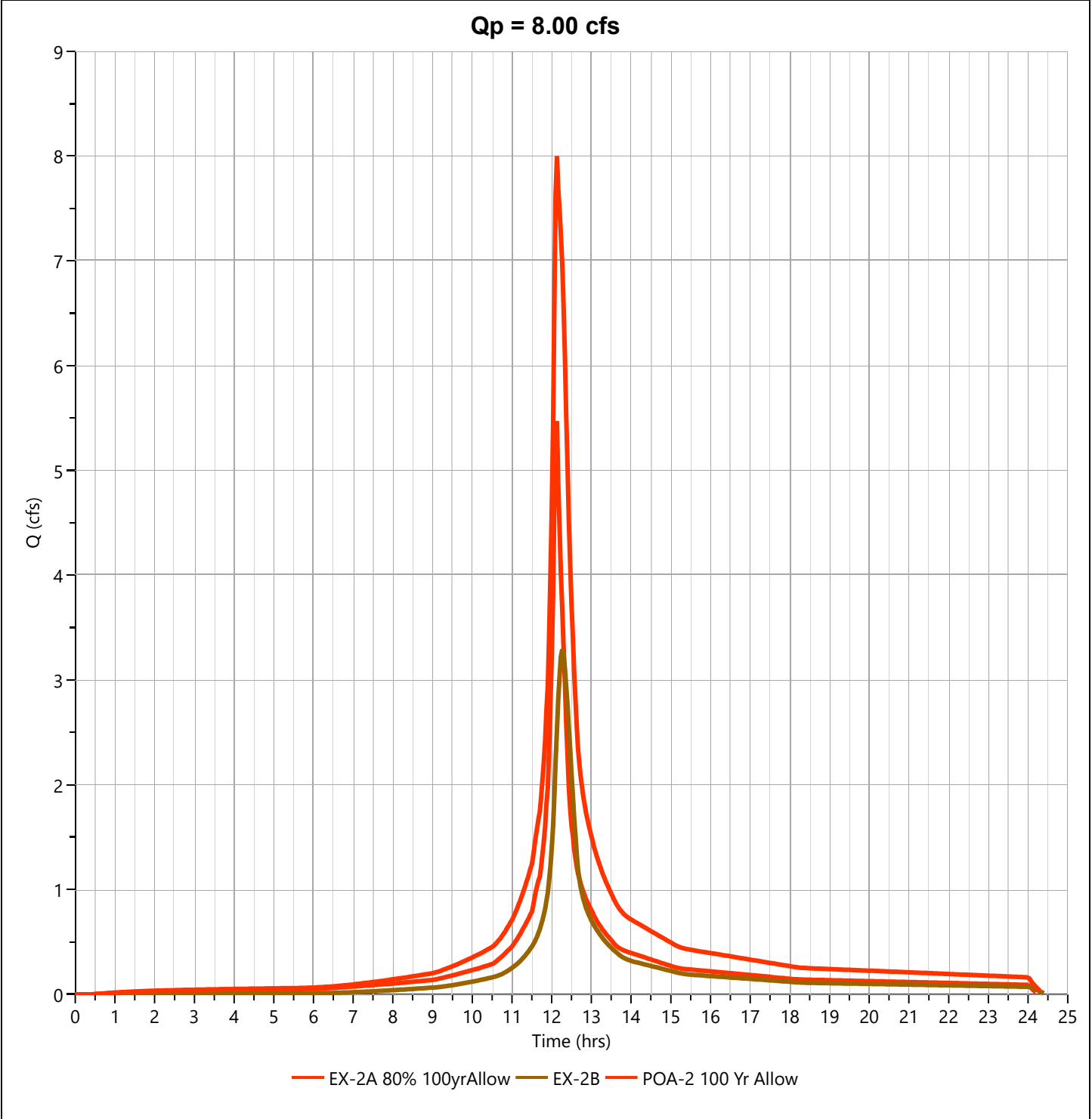
Hydrology Studio v 3.0.0.29

11-29-2023

## POA-2 100 Yr Allow

## Hyd. No. 31

|                    |            |                     |               |
|--------------------|------------|---------------------|---------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 7.998 cfs   |
| Storm Frequency    | = 100-yr   | Time to Peak        | = 12.13 hrs   |
| Time Interval      | = 2 min    | Hydrograph Volume   | = 40,155 cuft |
| Inflow Hydrographs | = 20, 26   | Total Contrib. Area | = 0.75 ac     |



**EX-3 WATERSHED (TOTAL EXISTING FLOW TO POA-3)**

Project: Beacon Unitarian Universalist Church

By: SM

Date: 11/29/2023

Location: Summit, NJ

Checked By: MJV

Date Checked: 11/29/2023

Circle One: Present Developed

Current Existing Watershed EX-3 Pervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Flow Length, L (total L < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. Compute T<sub>t</sub>

$$T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} s^{0.4}}$$

|            |                               |   |  |
|------------|-------------------------------|---|--|
| Segment ID | <b>1</b>                      |   |  |
|            | <b>Woods Dense Underbrush</b> |   |  |
|            | <b>0.40</b>                   |   |  |
| ft         | <b>100</b>                    |   |  |
| in         | <b>3.46</b>                   |   |  |
| ft/ft      | <b>0.077</b>                  |   |  |
| hr         | <b>0.201</b>                  | + |  |

Sheet Flow Sub-Total **0.201 hours**

**Shallow Concentrated Flow**

7. Surface Description
8. Flow Length, L
9. Watercourse Slope, s
10. Average Velocity, V (NEH table 15-3)
11. Compute T<sub>t</sub>

$$T_t = \frac{L}{3600 V}$$

|            |                  |                 |   |
|------------|------------------|-----------------|---|
| Segment ID | <b>2</b>         | <b>3</b>        |   |
|            | <b>Woodlands</b> | <b>Pavement</b> |   |
| ft         | <b>29</b>        | <b>217</b>      |   |
| ft/ft      | <b>0.241</b>     | <b>0.059</b>    |   |
| ft/s       | <b>2.47</b>      | <b>4.95</b>     |   |
| hr         | <b>0.003</b>     | <b>0.012</b>    | + |

Shallow Conc. Flow Sub-Total **0.015 hours**

**Channel Flow**

12. Flow Length, L
13. Cross Sectional flow area, a
14. Wetted Perimeter, P<sub>w</sub>
15. Hydraulic Radius, r
16. Channel Slope, s
17. Manning's Roughness Coeff., n
18. Velocity, V
19. Compute T<sub>t</sub>

$$r = a / P_w$$

$$V = (1.49 r^{2/3} s^{1/2}) / n$$

$$T_t = \frac{L}{3600 V}$$

|                 |  |  |   |
|-----------------|--|--|---|
| Segment ID      |  |  |   |
| ft              |  |  |   |
| ft <sup>2</sup> |  |  |   |
| ft              |  |  |   |
| ft              |  |  |   |
| ft/ft           |  |  |   |
| ft/s            |  |  |   |
| hr              |  |  | + |

Channel Flow Sub-Total **0.000 hours**

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>

(Add Sub-Total T<sub>t</sub> from prior steps)

|                                  |                    |
|----------------------------------|--------------------|
| Total T <sub>c</sub> (hours) =   | <b>0.217 hours</b> |
| Total T <sub>c</sub> (minutes) = | <b>13 minutes</b>  |



# Hydrograph Report

Project Name:

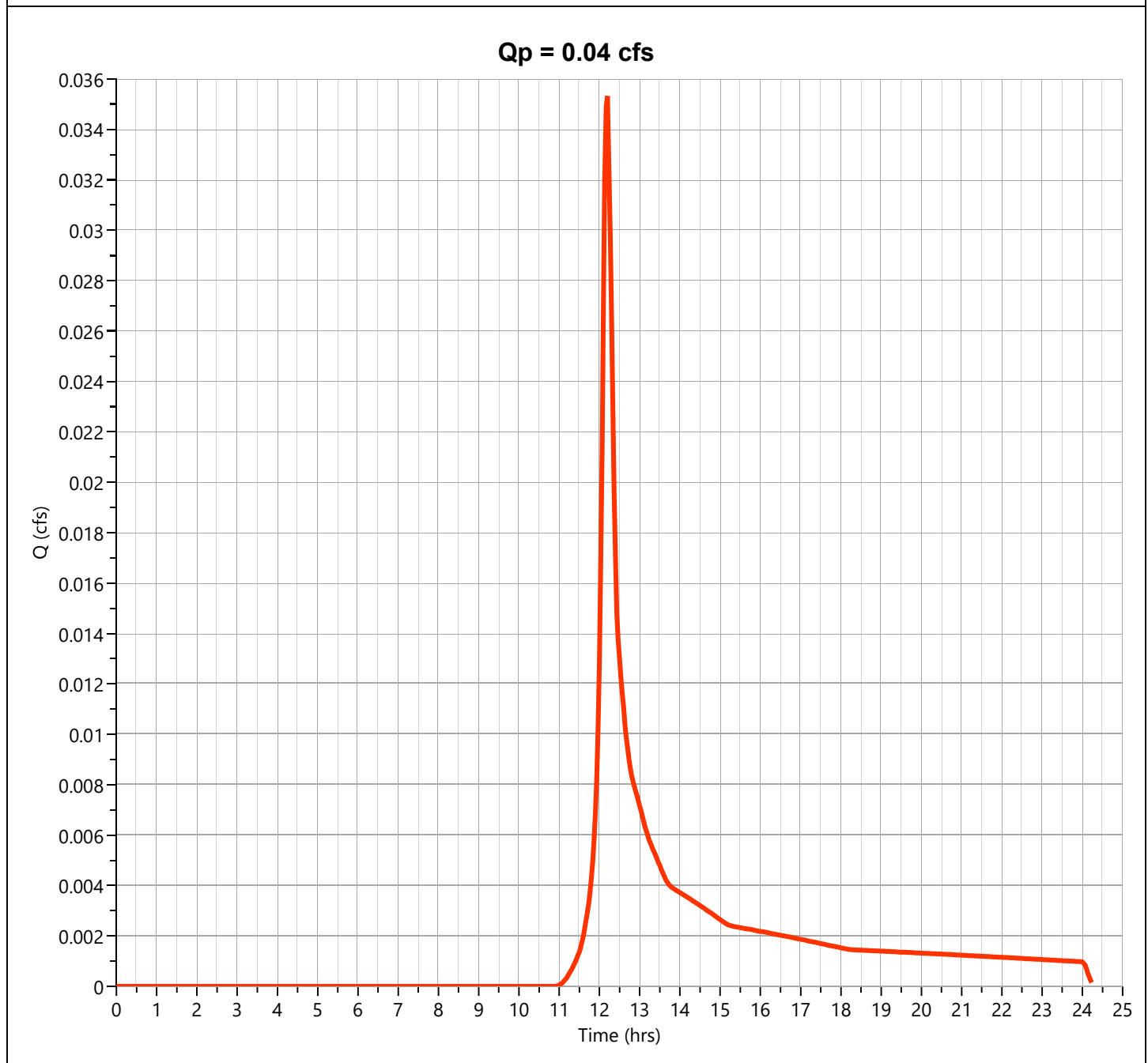
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-3 Woods C

## Hyd. No. 33

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.035 cfs |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.20 hrs |
| Time Interval   | = 2 min       | Runoff Volume      | = 147 cuft  |
| Drainage Area   | = 0.04 ac     | Curve Number       | = 70        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 13.0 min  |
| Total Rainfall  | = 3.46 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

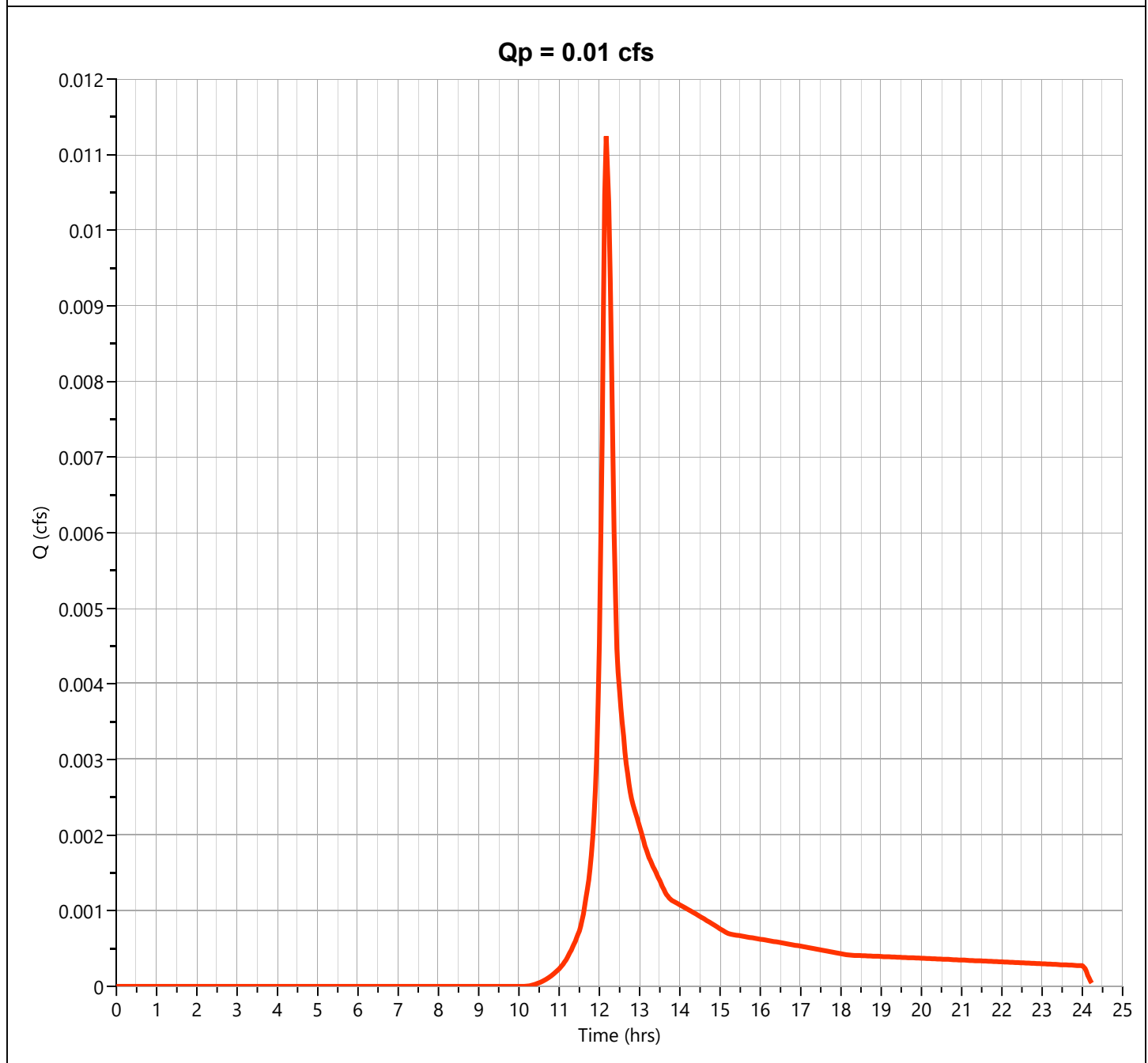
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-3 Grass C

## Hyd. No. 34

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.011 cfs |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.20 hrs |
| Time Interval   | = 2 min       | Runoff Volume      | = 45.4 cuft |
| Drainage Area   | = 0.01 ac     | Curve Number       | = 74        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 13.0 min  |
| Total Rainfall  | = 3.46 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

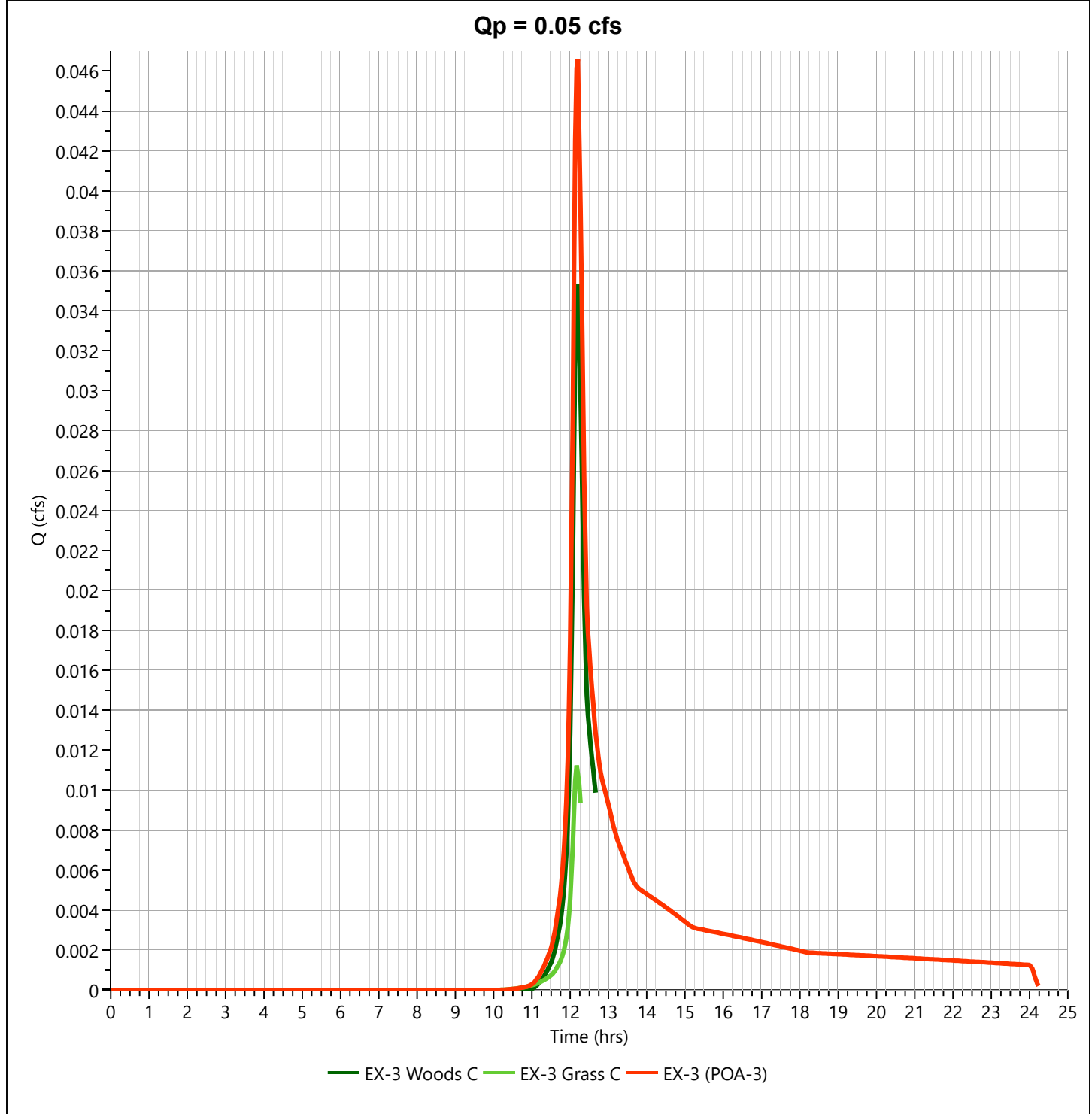
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-3 (POA-3)

## Hyd. No. 35

|                    |            |                     |             |
|--------------------|------------|---------------------|-------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.047 cfs |
| Storm Frequency    | = 2-yr     | Time to Peak        | = 12.20 hrs |
| Time Interval      | = 2 min    | Hydrograph Volume   | = 193 cuft  |
| Inflow Hydrographs | = 33, 34   | Total Contrib. Area | = 0.05 ac   |



# Hydrograph Report

Project Name:

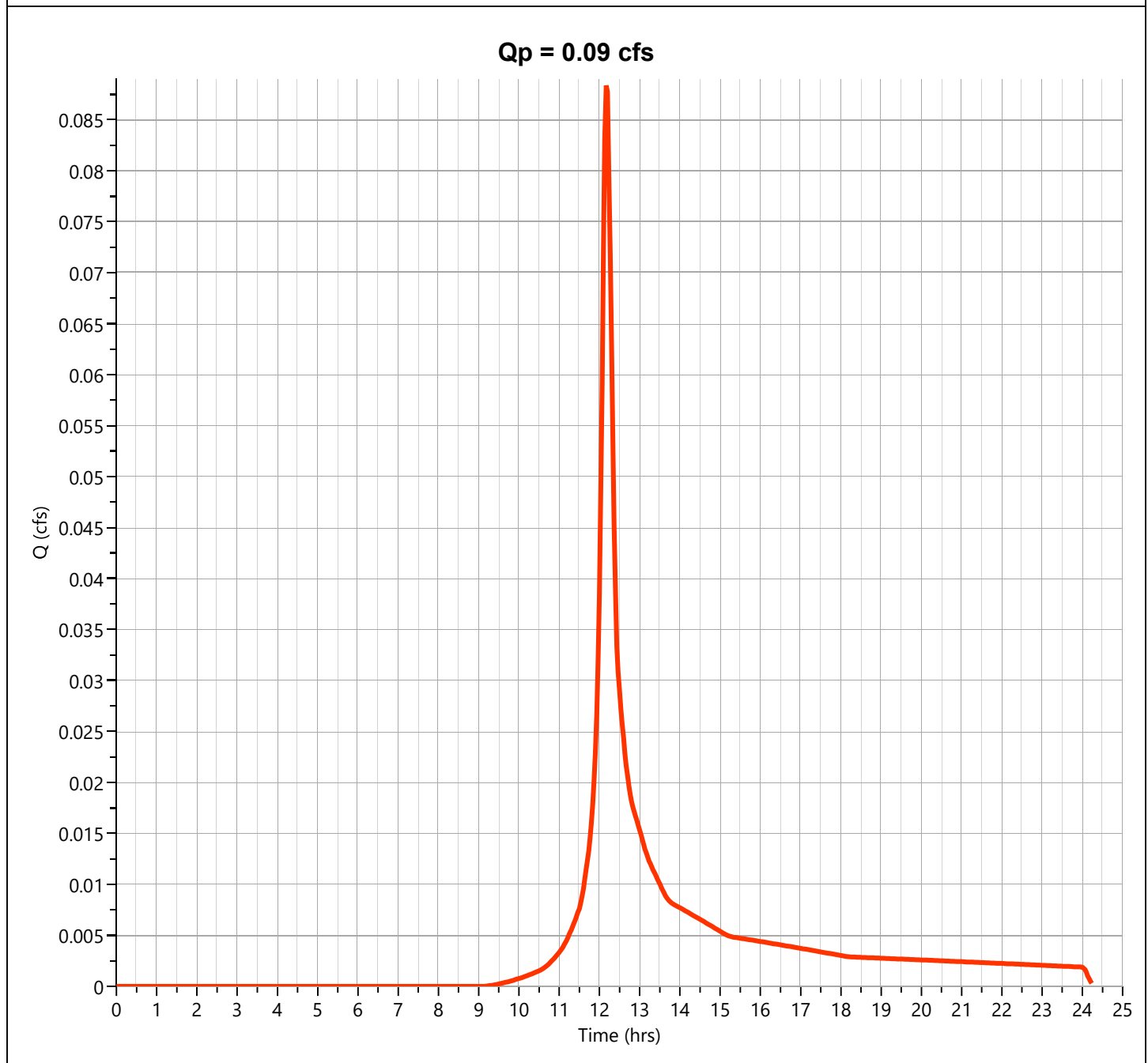
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-3 Woods C

## Hyd. No. 33

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.088 cfs |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.17 hrs |
| Time Interval   | = 2 min       | Runoff Volume      | = 348 cuft  |
| Drainage Area   | = 0.04 ac     | Curve Number       | = 70        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 13.0 min  |
| Total Rainfall  | = 5.38 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

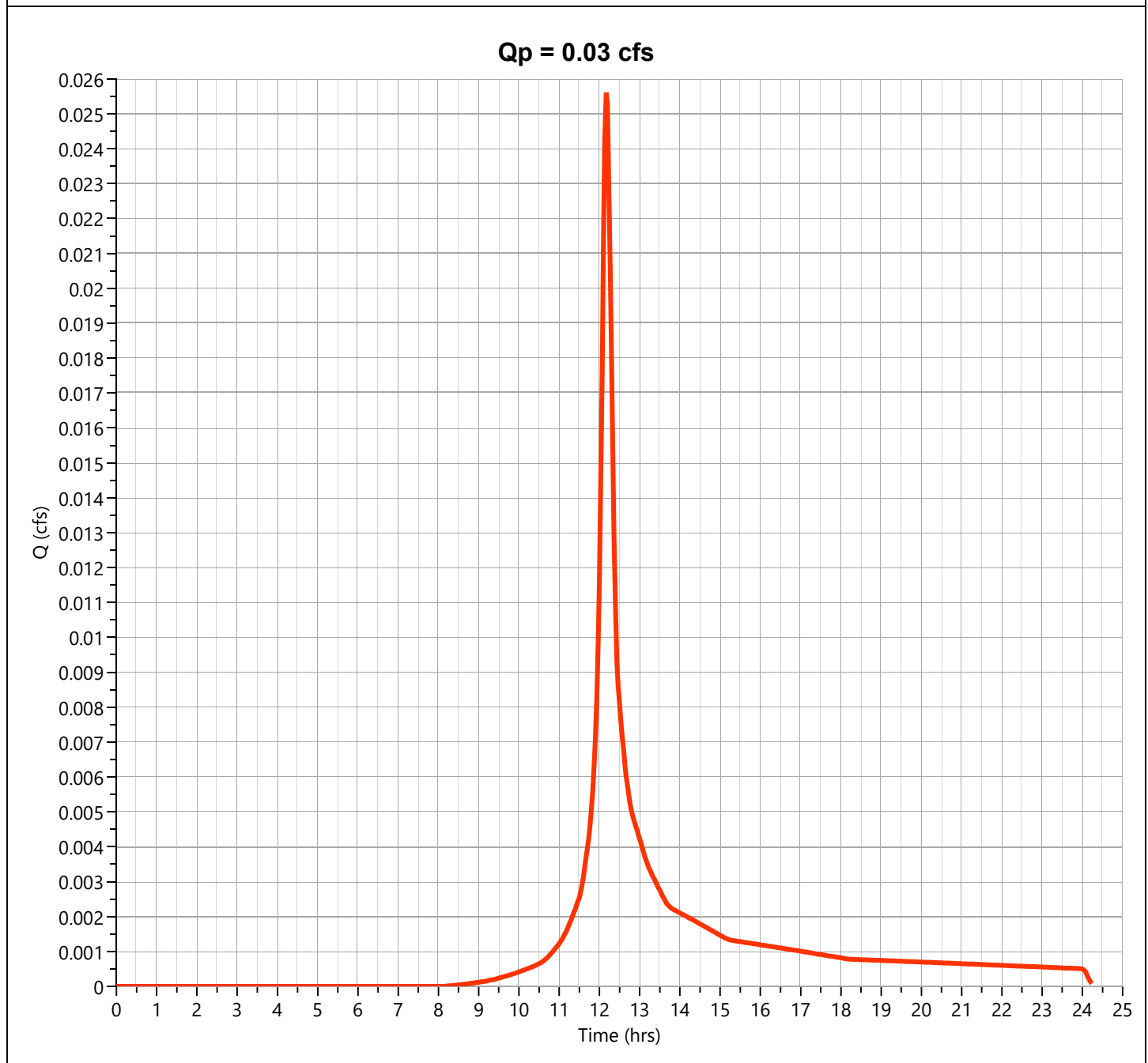
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-3 Grass C

## Hyd. No. 34

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.026 cfs  |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.17 hrs  |
| Time Interval   | = 2 min       | Runoff Volume      | = 100.0 cuft |
| Drainage Area   | = 0.01 ac     | Curve Number       | = 74         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 13.0 min   |
| Total Rainfall  | = 5.38 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

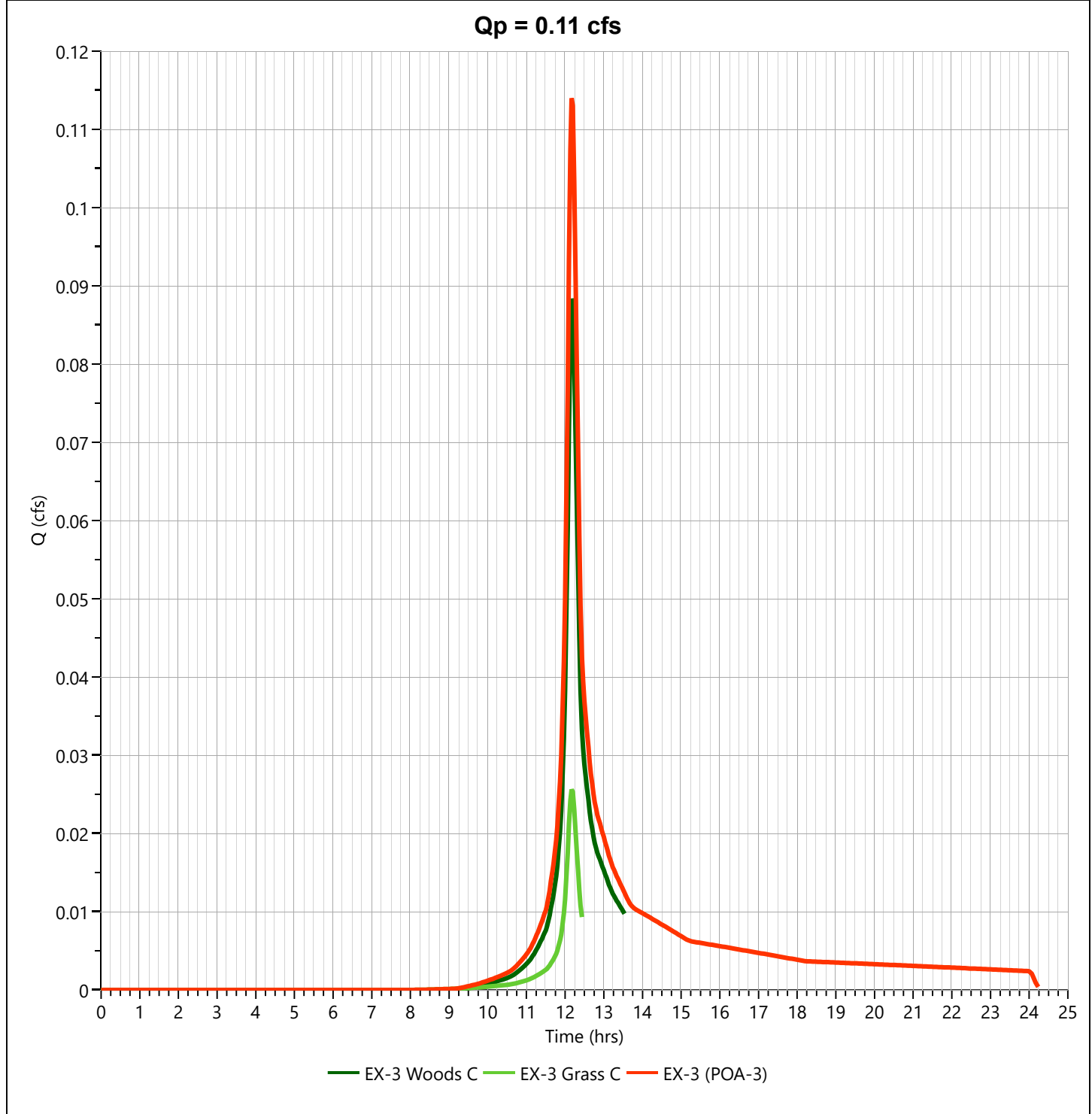
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-3 (POA-3)

## Hyd. No. 35

|                    |            |                     |             |
|--------------------|------------|---------------------|-------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.114 cfs |
| Storm Frequency    | = 10-yr    | Time to Peak        | = 12.17 hrs |
| Time Interval      | = 2 min    | Hydrograph Volume   | = 448 cuft  |
| Inflow Hydrographs | = 33, 34   | Total Contrib. Area | = 0.05 ac   |



# Hydrograph Report

Project Name:

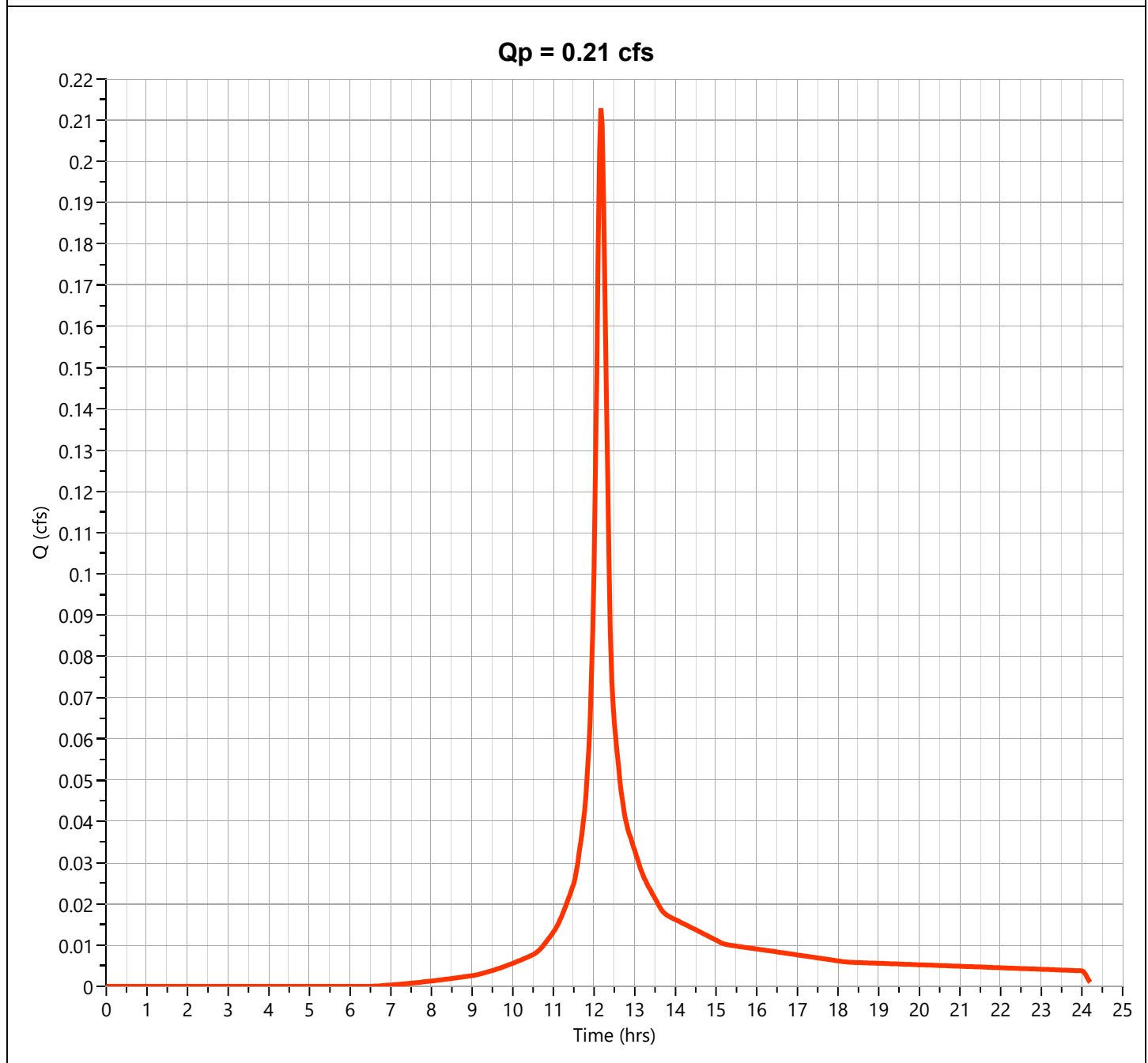
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-3 Woods C

## Hyd. No. 33

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.213 cfs |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.17 hrs |
| Time Interval   | = 2 min       | Runoff Volume      | = 833 cuft  |
| Drainage Area   | = 0.04 ac     | Curve Number       | = 70        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 13.0 min  |
| Total Rainfall  | = 9.26 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

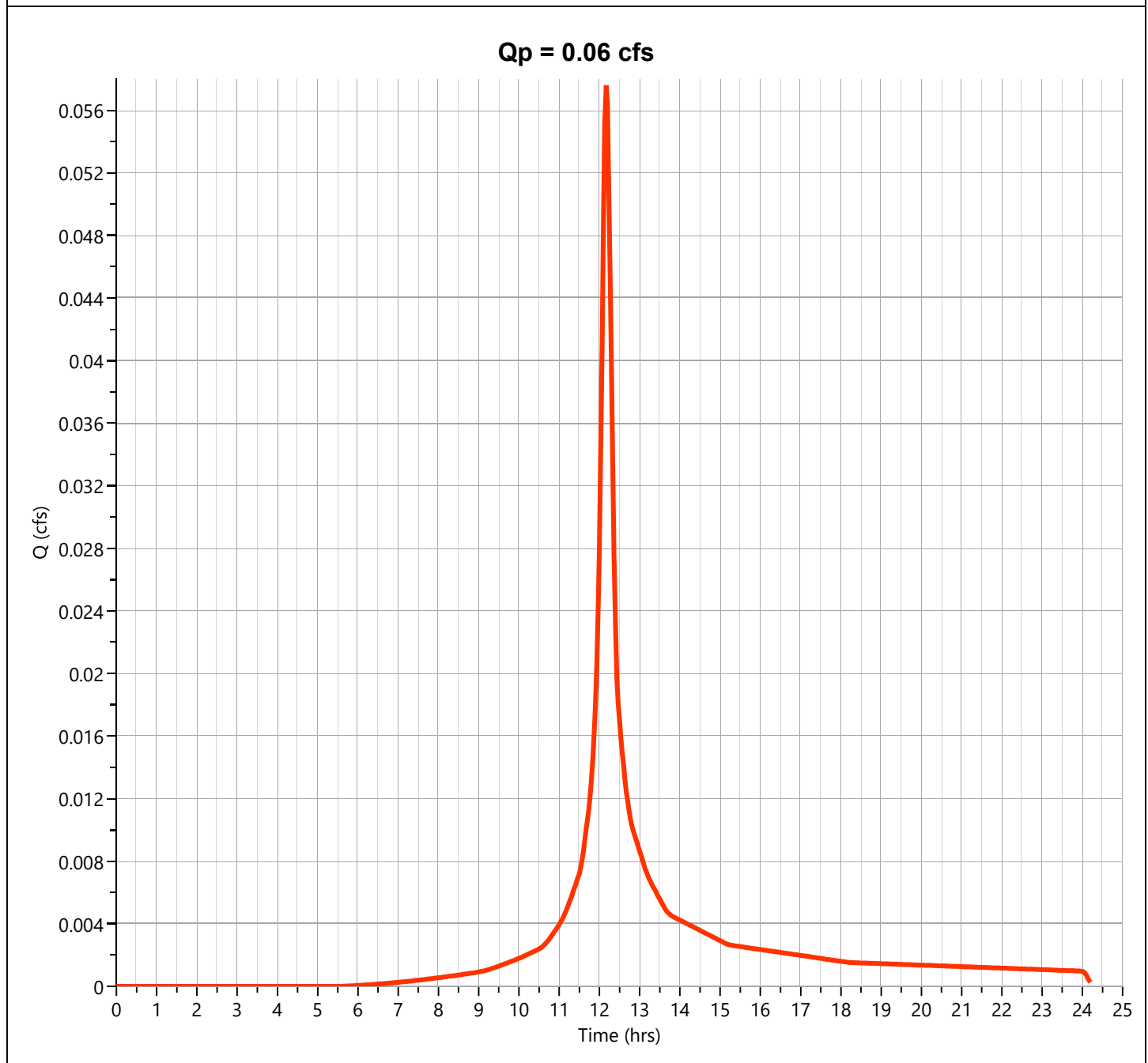
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-3 Grass C

## Hyd. No. 34

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.058 cfs |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.17 hrs |
| Time Interval   | = 2 min       | Runoff Volume      | = 227 cuft  |
| Drainage Area   | = 0.01 ac     | Curve Number       | = 74        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 13.0 min  |
| Total Rainfall  | = 9.26 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |





# Hydrograph Report

Project Name:

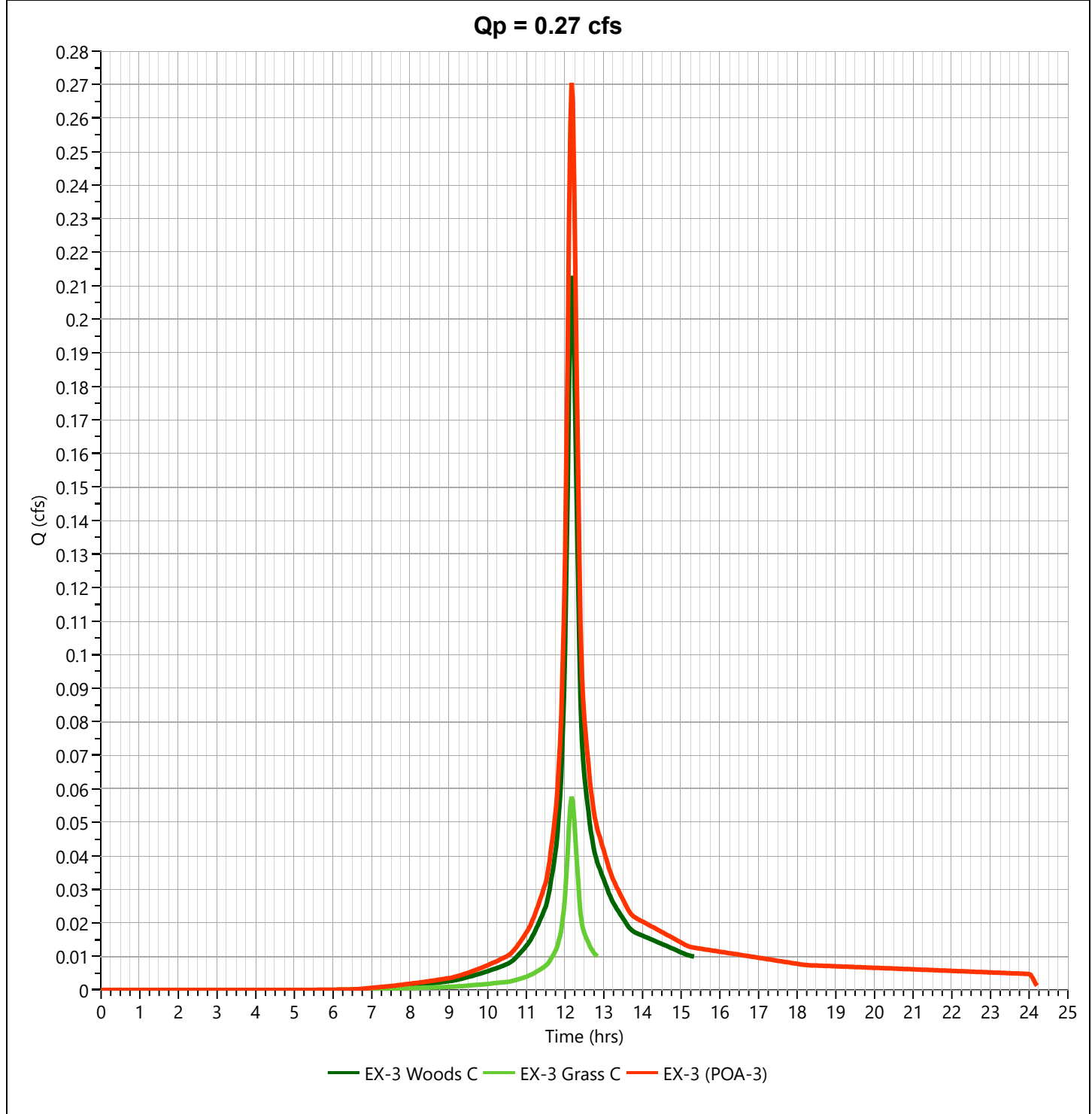
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-3 (POA-3)

## Hyd. No. 35

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.271 cfs  |
| Storm Frequency    | = 100-yr   | Time to Peak        | = 12.17 hrs  |
| Time Interval      | = 2 min    | Hydrograph Volume   | = 1,060 cuft |
| Inflow Hydrographs | = 33, 34   | Total Contrib. Area | = 0.05 ac    |



## **SUMMARY OF EXISTING PEAK DISCHARGES**

# Hydrograph 2-yr Summary

Project Name:

Hydrology Studio v 3.0.0.29

11-29-2023

| 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     | EX-1 Woods C         | 0.097           | 12.13              | 357                      | ---           |                        |                        |
| 2        | NRCS Runoff     | EX-1 Grass C         | 0.348           | 12.13              | 1,232                    | ---           |                        |                        |
| 3        | NRCS Runoff     | EX-1 Impervious      | 0.416           | 12.10              | 1,427                    | ---           |                        |                        |
| 4        | Junction        | EX-1 (POA-1)         | 0.826           | 12.13              | 3,017                    | 1, 2, 3       |                        |                        |
| 5        | Diversion1      | POA-1 50% 2yr Allow  | 0.413           | 12.13              | 1,508                    | 4             |                        |                        |
| 6        | Diversion2      | <name>               | 0.413           | 12.13              | 1,508                    | 4             |                        |                        |
| 7        | Diversion1      | POA-1 75% 10yr Allow | 0.620           | 12.13              | 2,263                    | 4             |                        |                        |
| 8        | Diversion2      | <name>               | 0.207           | 12.13              | 754                      | 4             |                        |                        |
| 9        | Diversion1      | POA-1 80% 100yrAllow | 0.661           | 12.13              | 2,413                    | 4             |                        |                        |
| 10       | Diversion2      | <name>               | 0.165           | 12.13              | 603                      | 4             |                        |                        |
| 12       | NRCS Runoff     | EX-2A Woods C        | 0.357           | 12.23              | 1,601                    | ---           |                        |                        |
| 13       | NRCS Runoff     | EX-2A Grass C        | 0.318           | 12.20              | 1,373                    | ---           |                        |                        |
| 14       | NRCS Runoff     | EX-2A Impervious     | 1.406           | 12.10              | 4,831                    | ---           |                        |                        |
| 15       | Junction        | EX-2A                | 1.879           | 12.10              | 7,806                    | 12, 13, 14    |                        |                        |
| 16       | Diversion1      | EX-2A 50% 2yr Allow  | 0.940           | 12.10              | 3,903                    | 15            |                        |                        |
| 17       | Diversion2      | <name>               | 0.940           | 12.10              | 3,903                    | 15            |                        |                        |
| 18       | Diversion1      | EX-2A 75% 10yr Allow | 1.409           | 12.10              | 5,854                    | 15            |                        |                        |
| 19       | Diversion2      | <name>               | 0.470           | 12.10              | 1,951                    | 15            |                        |                        |
| 20       | Diversion1      | EX-2A 80% 100yrAllow | 1.503           | 12.10              | 6,245                    | 15            |                        |                        |
| 21       | Diversion2      | <name>               | 0.376           | 12.10              | 1,561                    | 15            |                        |                        |
| 23       | NRCS Runoff     | EX-2B Woods C        | 0.339           | 12.30              | 1,817                    | ---           |                        |                        |
| 24       | NRCS Runoff     | EX-2B Grass C        | 0.157           | 12.30              | 806                      | ---           |                        |                        |
| 25       | NRCS Runoff     | EX-2B Impervious     | 0.159           | 12.23              | 820                      | ---           |                        |                        |
| 26       | Junction        | EX-2B                | 0.643           | 12.27              | 3,443                    | 23, 24, 25    |                        |                        |
| 28       | Junction        | POA-2                | 2.311           | 12.13              | 11,249                   | 15, 26        |                        |                        |
| 29       | Junction        | POA-2 2 Yr Allowable | 1.386           | 12.13              | 7,346                    | 16, 26        |                        |                        |
| 30       | Junction        | POA-2 10 Yr Allow    | 1.848           | 12.13              | 9,297                    | 18, 26        |                        |                        |
| 31       | Junction        | POA-2 100 Yr Allow   | 1.941           | 12.13              | 9,688                    | 20, 26        |                        |                        |
| 33       | NRCS Runoff     | EX-3 Woods C         | 0.035           | 12.20              | 147                      | ---           |                        |                        |
| 34       | NRCS Runoff     | EX-3 Grass C         | 0.011           | 12.20              | 45.4                     | ---           |                        |                        |
| 35       | Junction        | EX-3 (POA-3)         | 0.047           | 12.20              | 193                      | 33, 34        |                        |                        |

# Hydrograph 10-yr Summary

Project Name:

Hydrology Studio v 3.0.0.29

11-29-2023

| 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     | EX-1 Woods C         | 0.243           | 12.13              | 843                      | ---           |                        |                        |
| 2        | NRCS Runoff     | EX-1 Grass C         | 0.788           | 12.13              | 2,715                    | ---           |                        |                        |
| 3        | NRCS Runoff     | EX-1 Impervious      | 0.650           | 12.10              | 2,275                    | ---           |                        |                        |
| 4        | Junction        | EX-1 (POA-1)         | 1.628           | 12.13              | 5,833                    | 1, 2, 3       |                        |                        |
| 5        | Diversion1      | POA-1 50% 2yr Allow  | 0.814           | 12.13              | 2,916                    | 4             |                        |                        |
| 6        | Diversion2      | <name>               | 0.814           | 12.13              | 2,916                    | 4             |                        |                        |
| 7        | Diversion1      | POA-1 75% 10yr Allow | 1.221           | 12.13              | 4,375                    | 4             |                        |                        |
| 8        | Diversion2      | <name>               | 0.407           | 12.13              | 1,458                    | 4             |                        |                        |
| 9        | Diversion1      | POA-1 80% 100yrAllow | 1.303           | 12.13              | 4,666                    | 4             |                        |                        |
| 10       | Diversion2      | <name>               | 0.326           | 12.13              | 1,167                    | 4             |                        |                        |
| 12       | NRCS Runoff     | EX-2A Woods C        | 0.898           | 12.20              | 3,781                    | ---           |                        |                        |
| 13       | NRCS Runoff     | EX-2A Grass C        | 0.725           | 12.20              | 3,025                    | ---           |                        |                        |
| 14       | NRCS Runoff     | EX-2A Impervious     | 2.200           | 12.10              | 7,700                    | ---           |                        |                        |
| 15       | Junction        | EX-2A                | 3.418           | 12.13              | 14,506                   | 12, 13, 14    |                        |                        |
| 16       | Diversion1      | EX-2A 50% 2yr Allow  | 1.709           | 12.13              | 7,253                    | 15            |                        |                        |
| 17       | Diversion2      | <name>               | 1.709           | 12.13              | 7,253                    | 15            |                        |                        |
| 18       | Diversion1      | EX-2A 75% 10yr Allow | 2.564           | 12.13              | 10,880                   | 15            |                        |                        |
| 19       | Diversion2      | <name>               | 0.855           | 12.13              | 3,627                    | 15            |                        |                        |
| 20       | Diversion1      | EX-2A 80% 100yrAllow | 2.735           | 12.13              | 11,605                   | 15            |                        |                        |
| 21       | Diversion2      | <name>               | 0.684           | 12.13              | 2,901                    | 15            |                        |                        |
| 23       | NRCS Runoff     | EX-2B Woods C        | 0.855           | 12.30              | 4,290                    | ---           |                        |                        |
| 24       | NRCS Runoff     | EX-2B Grass C        | 0.357           | 12.30              | 1,776                    | ---           |                        |                        |
| 25       | NRCS Runoff     | EX-2B Impervious     | 0.249           | 12.23              | 1,307                    | ---           |                        |                        |
| 26       | Junction        | EX-2B                | 1.451           | 12.27              | 7,373                    | 23, 24, 25    |                        |                        |
| 28       | Junction        | POA-2                | 4.499           | 12.13              | 21,880                   | 15, 26        |                        |                        |
| 29       | Junction        | POA-2 2 Yr Allowable | 2.790           | 12.13              | 14,626                   | 16, 26        |                        |                        |
| 30       | Junction        | POA-2 10 Yr Allow    | 3.644           | 12.13              | 18,253                   | 18, 26        |                        |                        |
| 31       | Junction        | POA-2 100 Yr Allow   | 3.815           | 12.13              | 18,978                   | 20, 26        |                        |                        |
| 33       | NRCS Runoff     | EX-3 Woods C         | 0.088           | 12.17              | 348                      | ---           |                        |                        |
| 34       | NRCS Runoff     | EX-3 Grass C         | 0.026           | 12.17              | 100.0                    | ---           |                        |                        |
| 35       | Junction        | EX-3 (POA-3)         | 0.114           | 12.17              | 448                      | 33, 34        |                        |                        |

# Hydrograph 100-yr Summary

Project Name:

Hydrology Studio v 3.0.0.29

11-29-2023

| 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     | EX-1 Woods C         | 0.583           | 12.13              | 2,020                    | ---           |                        |                        |
| 2        | NRCS Runoff     | EX-1 Grass C         | 1.765           | 12.13              | 6,166                    | ---           |                        |                        |
| 3        | NRCS Runoff     | EX-1 Impervious      | 1.122           | 12.10              | 3,990                    | ---           |                        |                        |
| 4        | Junction        | EX-1 (POA-1)         | 3.379           | 12.13              | 12,176                   | 1, 2, 3       |                        |                        |
| 5        | Diversion1      | POA-1 50% 2yr Allow  | 1.689           | 12.13              | 6,088                    | 4             |                        |                        |
| 6        | Diversion2      | <name>               | 1.689           | 12.13              | 6,088                    | 4             |                        |                        |
| 7        | Diversion1      | POA-1 75% 10yr Allow | 2.534           | 12.13              | 9,132                    | 4             |                        |                        |
| 8        | Diversion2      | <name>               | 0.845           | 12.13              | 3,044                    | 4             |                        |                        |
| 9        | Diversion1      | POA-1 80% 100yrAllow | 2.703           | 12.13              | 9,741                    | 4             |                        |                        |
| 10       | Diversion2      | <name>               | 0.676           | 12.13              | 2,435                    | 4             |                        |                        |
| 12       | NRCS Runoff     | EX-2A Woods C        | 2.166           | 12.20              | 9,060                    | ---           |                        |                        |
| 13       | NRCS Runoff     | EX-2A Grass C        | 1.631           | 12.20              | 6,871                    | ---           |                        |                        |
| 14       | NRCS Runoff     | EX-2A Impervious     | 3.799           | 12.10              | 13,506                   | ---           |                        |                        |
| 15       | Junction        | EX-2A                | 6.836           | 12.13              | 29,436                   | 12, 13, 14    |                        |                        |
| 16       | Diversion1      | EX-2A 50% 2yr Allow  | 3.418           | 12.13              | 14,718                   | 15            |                        |                        |
| 17       | Diversion2      | <name>               | 3.418           | 12.13              | 14,718                   | 15            |                        |                        |
| 18       | Diversion1      | EX-2A 75% 10yr Allow | 5.127           | 12.13              | 22,077                   | 15            |                        |                        |
| 19       | Diversion2      | <name>               | 1.709           | 12.13              | 7,359                    | 15            |                        |                        |
| 20       | Diversion1      | EX-2A 80% 100yrAllow | 5.469           | 12.13              | 23,549                   | 15            |                        |                        |
| 21       | Diversion2      | <name>               | 1.367           | 12.13              | 5,887                    | 15            |                        |                        |
| 23       | NRCS Runoff     | EX-2B Woods C        | 2.066           | 12.27              | 10,280                   | ---           |                        |                        |
| 24       | NRCS Runoff     | EX-2B Grass C        | 0.806           | 12.27              | 4,035                    | ---           |                        |                        |
| 25       | NRCS Runoff     | EX-2B Impervious     | 0.430           | 12.23              | 2,292                    | ---           |                        |                        |
| 26       | Junction        | EX-2B                | 3.292           | 12.27              | 16,607                   | 23, 24, 25    |                        |                        |
| 28       | Junction        | POA-2                | 9.365           | 12.13              | 46,043                   | 15, 26        |                        |                        |
| 29       | Junction        | POA-2 2 Yr Allowable | 5.947           | 12.13              | 31,325                   | 16, 26        |                        |                        |
| 30       | Junction        | POA-2 10 Yr Allow    | 7.656           | 12.13              | 38,684                   | 18, 26        |                        |                        |
| 31       | Junction        | POA-2 100 Yr Allow   | 7.998           | 12.13              | 40,155                   | 20, 26        |                        |                        |
| 33       | NRCS Runoff     | EX-3 Woods C         | 0.213           | 12.17              | 833                      | ---           |                        |                        |
| 34       | NRCS Runoff     | EX-3 Grass C         | 0.058           | 12.17              | 227                      | ---           |                        |                        |
| 35       | Junction        | EX-3 (POA-3)         | 0.271           | 12.17              | 1,060                    | 33, 34        |                        |                        |

## **FUTURE HYDROGRAPH CALCULATIONS**

**EX-1 WATERSHED (TOTAL EXISTING FLOW TO POA-1)**

Project: Beacon Unitarian Universalist Church

By: SM

Date: 11/29/2023

Location: Summit, NJ

Checked By: MJV

Date Checked: 11/29/2023

Circle One: Present Developed

Future Existing Watershed EX-1 Impervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Flow Length, L (total L < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. Compute T<sub>t</sub>

$$T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} s^{0.4}}$$

|            |                 |               |  |
|------------|-----------------|---------------|--|
| Segment ID | 1               | 2             |  |
|            | Smooth Surfaces | Dense Grasses |  |
|            | 0.011           | 0.24          |  |
| ft         | 51              | 49            |  |
| in         | 4.12            | 4.12          |  |
| ft/ft      | 0.024           | 0.093         |  |
| hr         | 0.010           | 0.064         |  |

Sheet Flow Sub-Total **0.074 hours**

**Shallow Concentrated Flow**

7. Surface Description
8. Flow Length, L
9. Watercourse Slope, s
10. Average Velocity, V (NEH table 15-3)
11. Compute T<sub>t</sub>

$$T_t = \frac{L}{3600 V}$$

|            |          |  |  |
|------------|----------|--|--|
| Segment ID | 3        |  |  |
|            | Pavement |  |  |
| ft         | 163      |  |  |
| ft/ft      | 0.059    |  |  |
| ft/s       | 4.93     |  |  |
| hr         | 0.009    |  |  |

Shallow Conc. Flow Sub-Total **0.009 hours**

**Channel Flow**

12. Flow Length, L
13. Cross Sectional flow area, a
14. Wetted Perimeter, P<sub>w</sub>
15. Hydraulic Radius, r
16. Channel Slope, s
17. Manning's Roughness Coeff., n
18. Velocity, V
19. Compute T<sub>t</sub>

$$r = a / P_w$$

$$V = (1.49 r^{2/3} s^{1/2}) / n$$

$$T_t = \frac{L}{3600 V}$$

|                 |  |  |  |
|-----------------|--|--|--|
| Segment ID      |  |  |  |
| ft              |  |  |  |
| ft <sup>2</sup> |  |  |  |
| ft              |  |  |  |
| ft              |  |  |  |
| ft/ft           |  |  |  |
| ft/s            |  |  |  |
| hr              |  |  |  |

Channel Flow Sub-Total **0.000 hours**

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>

(Add Sub-Total T<sub>t</sub> from prior steps)

|                                  |                    |
|----------------------------------|--------------------|
| Total T <sub>c</sub> (hours) =   | <b>0.083 hours</b> |
| Total T <sub>c</sub> (minutes) = | <b>5 minutes</b>   |



Project: Beacon Unitarian Universalist Church

By: SM

Date: 11/29/2023

Location: Summit, NJ

Checked By: MJV

Date Checked: 11/29/2023

Circle One: Present Developed

Future Existing Watershed EX-1 Pervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Flow Length, L (total L < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. Compute T<sub>t</sub>

$$T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} s^{0.4}}$$

|            |                               |                        |  |
|------------|-------------------------------|------------------------|--|
| Segment ID | <b>1</b>                      | <b>2</b>               |  |
|            | <b>Woods Dense Underbrush</b> | <b>Smooth Surfaces</b> |  |
|            | <b>0.40</b>                   | <b>0.011</b>           |  |
| ft         | <b>44</b>                     | <b>29</b>              |  |
| in         | <b>4.12</b>                   | <b>4.12</b>            |  |
| ft/ft      | <b>0.080</b>                  | <b>0.043</b>           |  |
| hr         | <b>0.093</b>                  | <b>0.005</b>           |  |

Sheet Flow Sub-Total **0.098 hours**

**Shallow Concentrated Flow**

7. Surface Description
8. Flow Length, L
9. Watercourse Slope, s
10. Average Velocity, V (NEH table 15-3)
11. Compute T<sub>t</sub>

$$T_t = \frac{L}{3600 V}$$

|            |                 |  |  |
|------------|-----------------|--|--|
| Segment ID | <b>3</b>        |  |  |
|            | <b>Pavement</b> |  |  |
| ft         | <b>230</b>      |  |  |
| ft/ft      | <b>0.054</b>    |  |  |
| ft/s       | <b>4.74</b>     |  |  |
| hr         | <b>0.013</b>    |  |  |

Shallow Conc. Flow Sub-Total **0.013 hours**

**Channel Flow**

12. Flow Length, L
13. Cross Sectional flow area, a
14. Wetted Perimeter, P<sub>w</sub>
15. Hydraulic Radius, r
16. Channel Slope, s
17. Manning's Roughness Coeff., n
18. Velocity, V
19. Compute T<sub>t</sub>

$$r = a / P_w$$

$$V = (1.49 r^{2/3} s^{1/2}) / n$$

$$T_t = \frac{L}{3600 V}$$

|                 |  |  |  |
|-----------------|--|--|--|
| Segment ID      |  |  |  |
| ft              |  |  |  |
| ft <sup>2</sup> |  |  |  |
| ft              |  |  |  |
| ft              |  |  |  |
| ft/ft           |  |  |  |
| ft/s            |  |  |  |
| hr              |  |  |  |

Channel Flow Sub-Total **0.000 hours**

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>

(Add Sub-Total T<sub>t</sub> from prior steps)

|                                  |                    |
|----------------------------------|--------------------|
| Total T <sub>c</sub> (hours) =   | <b>0.112 hours</b> |
| Total T <sub>c</sub> (minutes) = | <b>7 minutes</b>   |

# Hydrograph Report

Project Name:

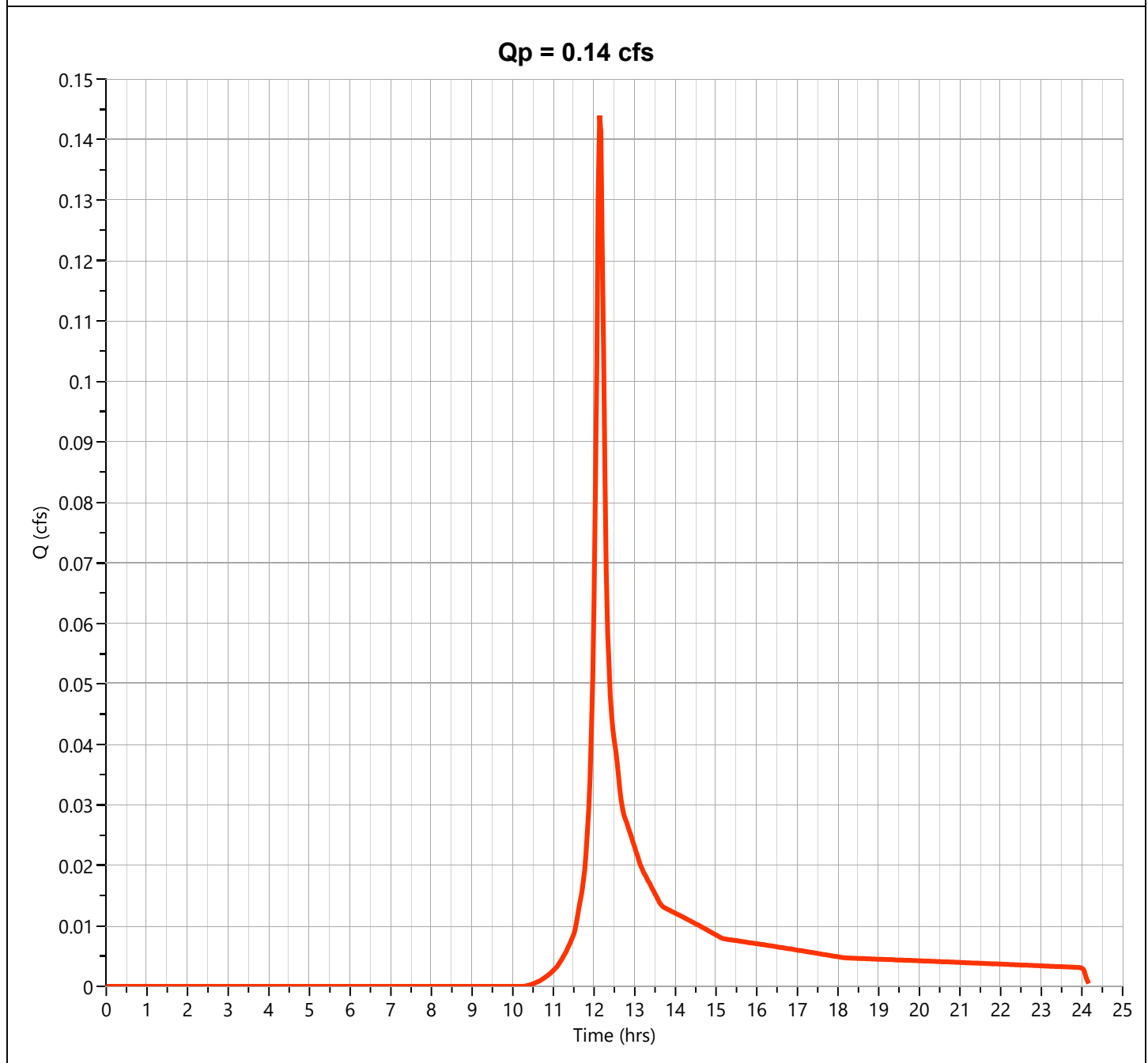
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-1 Woods C

## Hyd. No. 1

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.144 cfs |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.13 hrs |
| Time Interval   | = 2 min       | Runoff Volume      | = 512 cuft  |
| Drainage Area   | = 0.1 ac      | Curve Number       | = 70        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 7.0 min   |
| Total Rainfall  | = 4.12 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

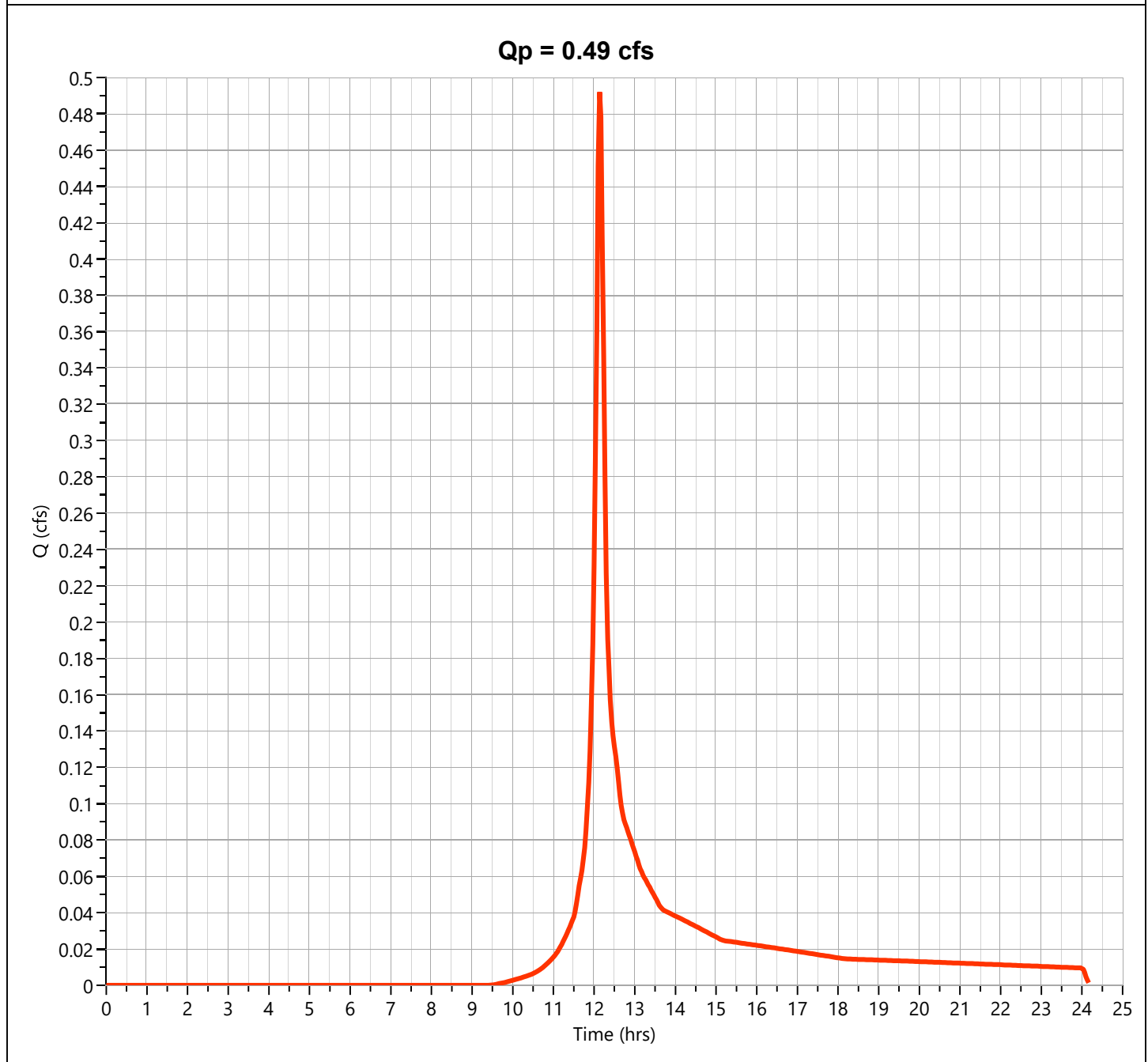
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-1 Grass C

## Hyd. No. 2

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.492 cfs  |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.13 hrs  |
| Time Interval   | = 2 min       | Runoff Volume      | = 1,713 cuft |
| Drainage Area   | = 0.28 ac     | Curve Number       | = 74         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 7.0 min    |
| Total Rainfall  | = 4.12 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

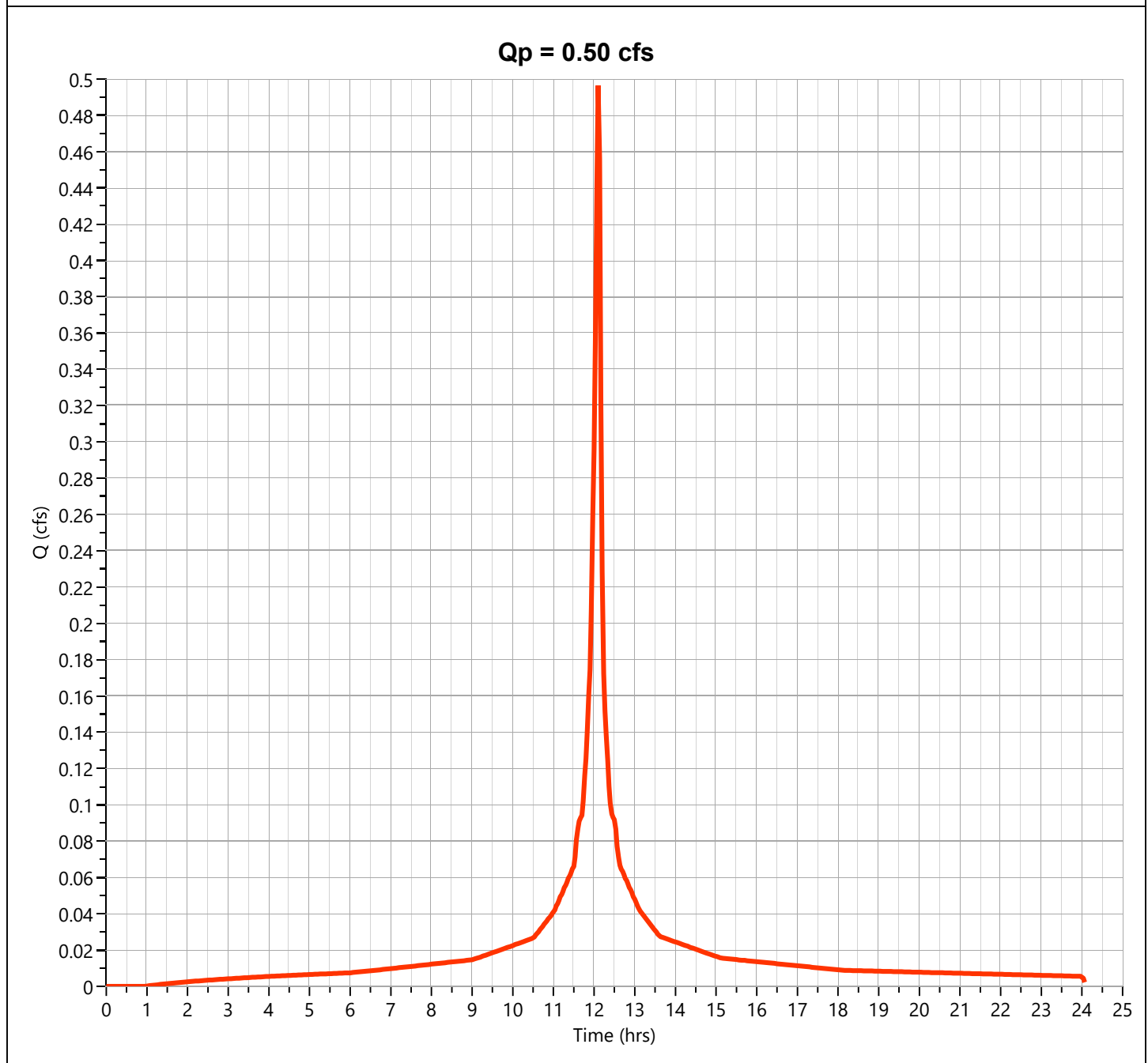
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-1 Impervious

## Hyd. No. 3

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.496 cfs  |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 2 min       | Runoff Volume      | = 1,719 cuft |
| Drainage Area   | = 0.13 ac     | Curve Number       | = 98         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 5.0 min    |
| Total Rainfall  | = 4.12 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

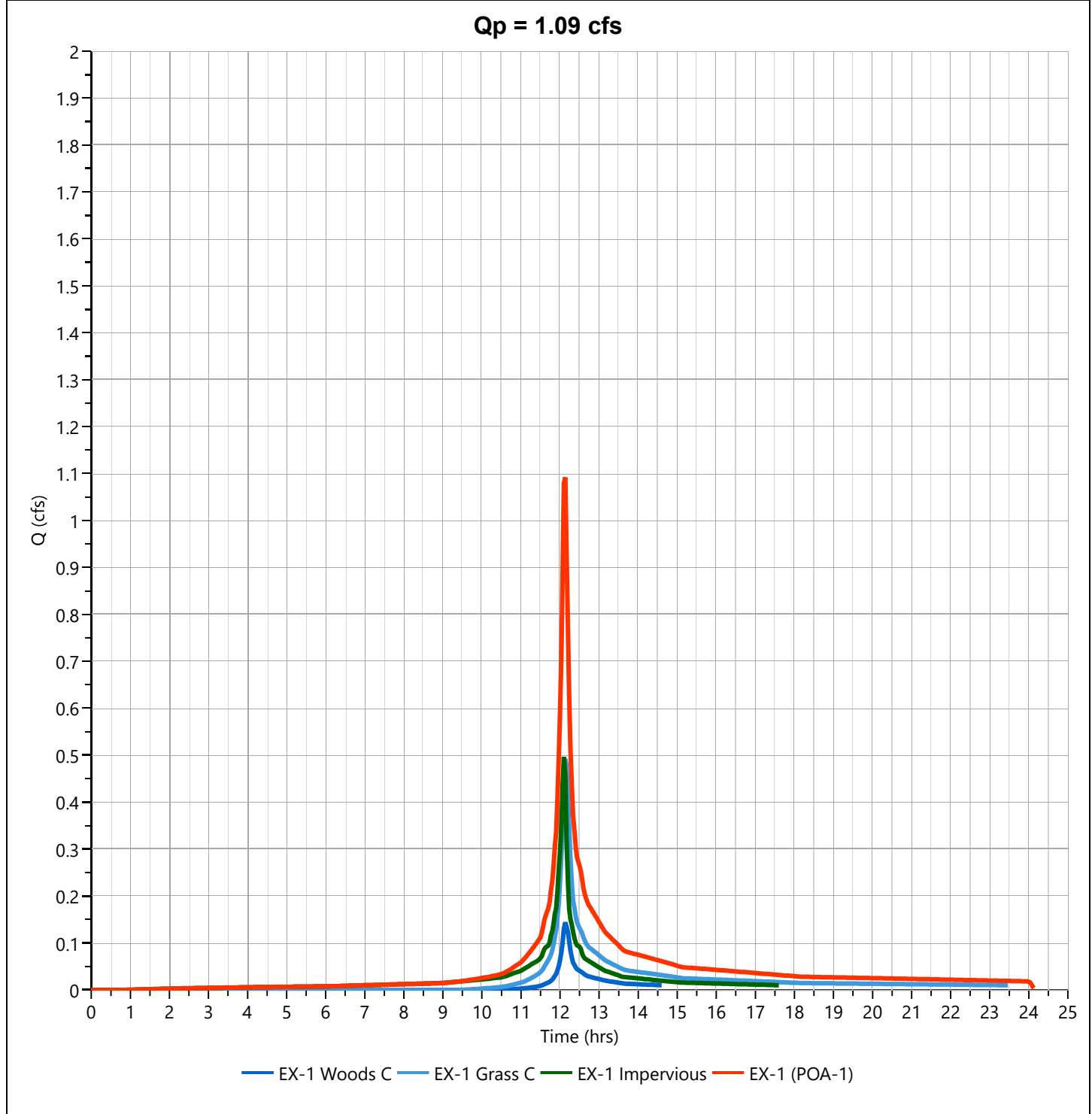
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-1 (POA-1)

## Hyd. No. 4

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 1.092 cfs  |
| Storm Frequency    | = 2-yr     | Time to Peak        | = 12.13 hrs  |
| Time Interval      | = 2 min    | Hydrograph Volume   | = 3,943 cuft |
| Inflow Hydrographs | = 1, 2, 3  | Total Contrib. Area | = 0.51 ac    |



# Hydrograph Report

Project Name:

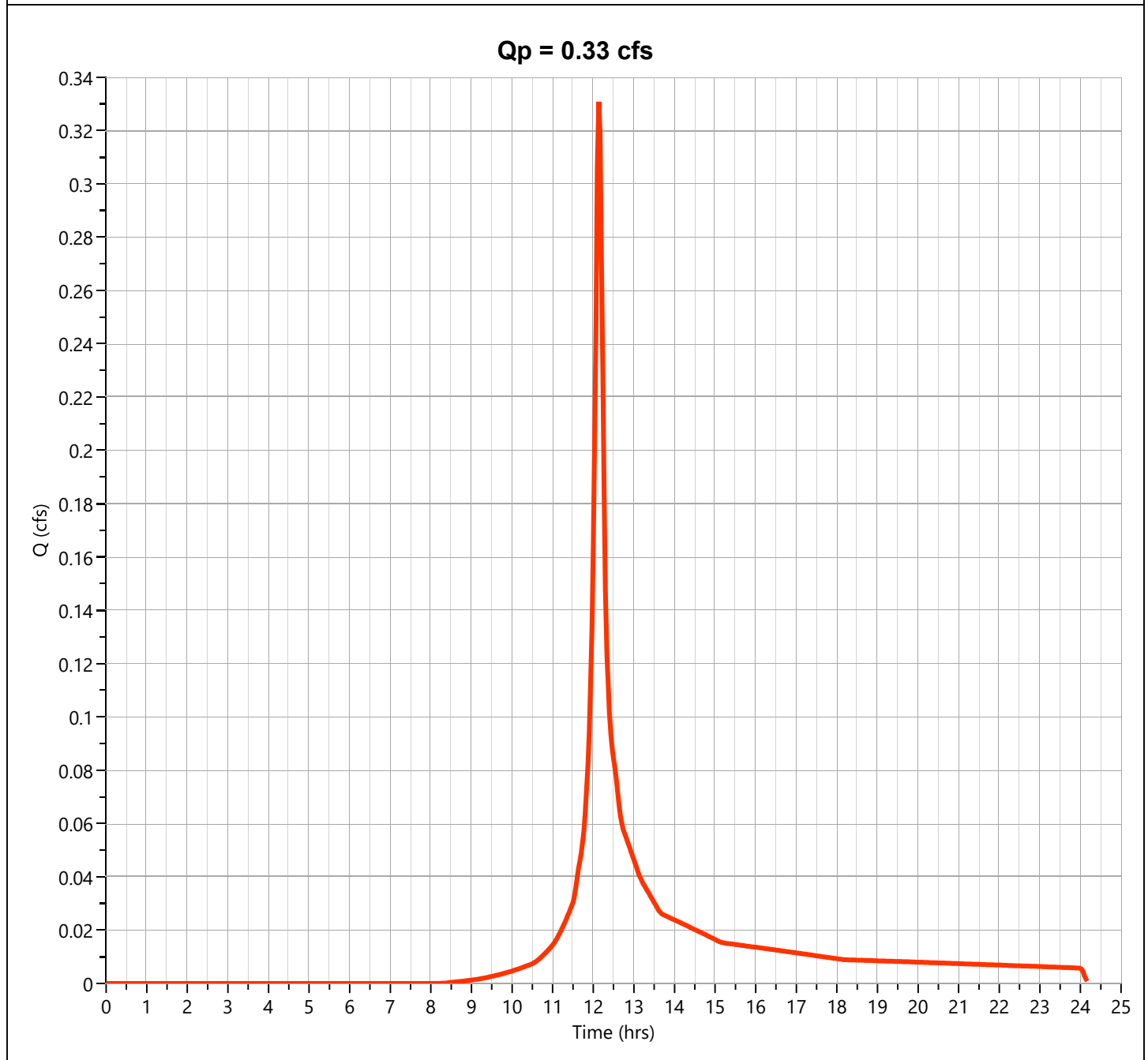
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-1 Woods C

## Hyd. No. 1

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.331 cfs  |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.13 hrs  |
| Time Interval   | = 2 min       | Runoff Volume      | = 1,141 cuft |
| Drainage Area   | = 0.1 ac      | Curve Number       | = 70         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 7.0 min    |
| Total Rainfall  | = 6.42 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

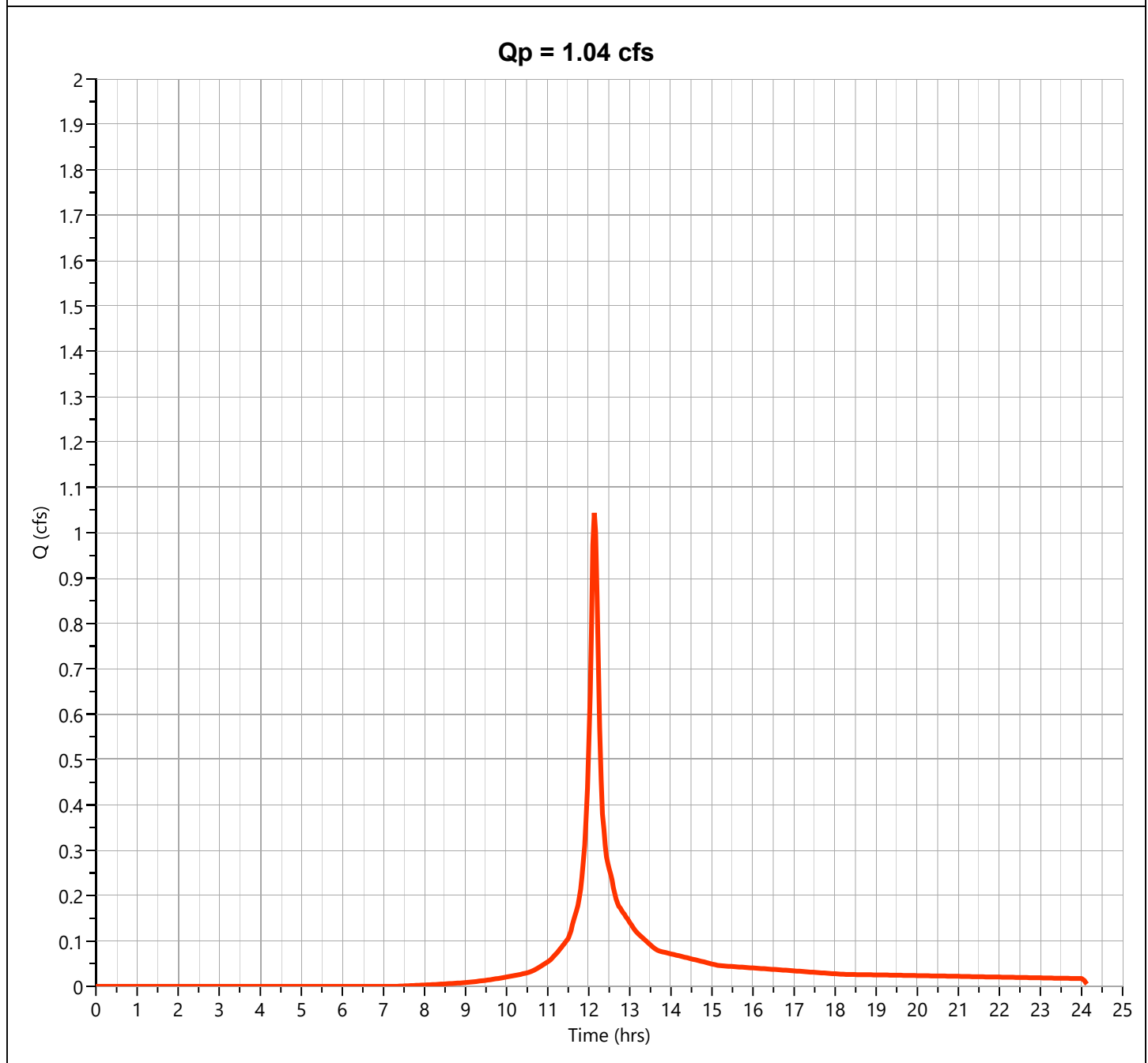
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-1 Grass C

## Hyd. No. 2

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 1.043 cfs  |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.13 hrs  |
| Time Interval   | = 2 min       | Runoff Volume      | = 3,599 cuft |
| Drainage Area   | = 0.28 ac     | Curve Number       | = 74         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 7.0 min    |
| Total Rainfall  | = 6.42 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

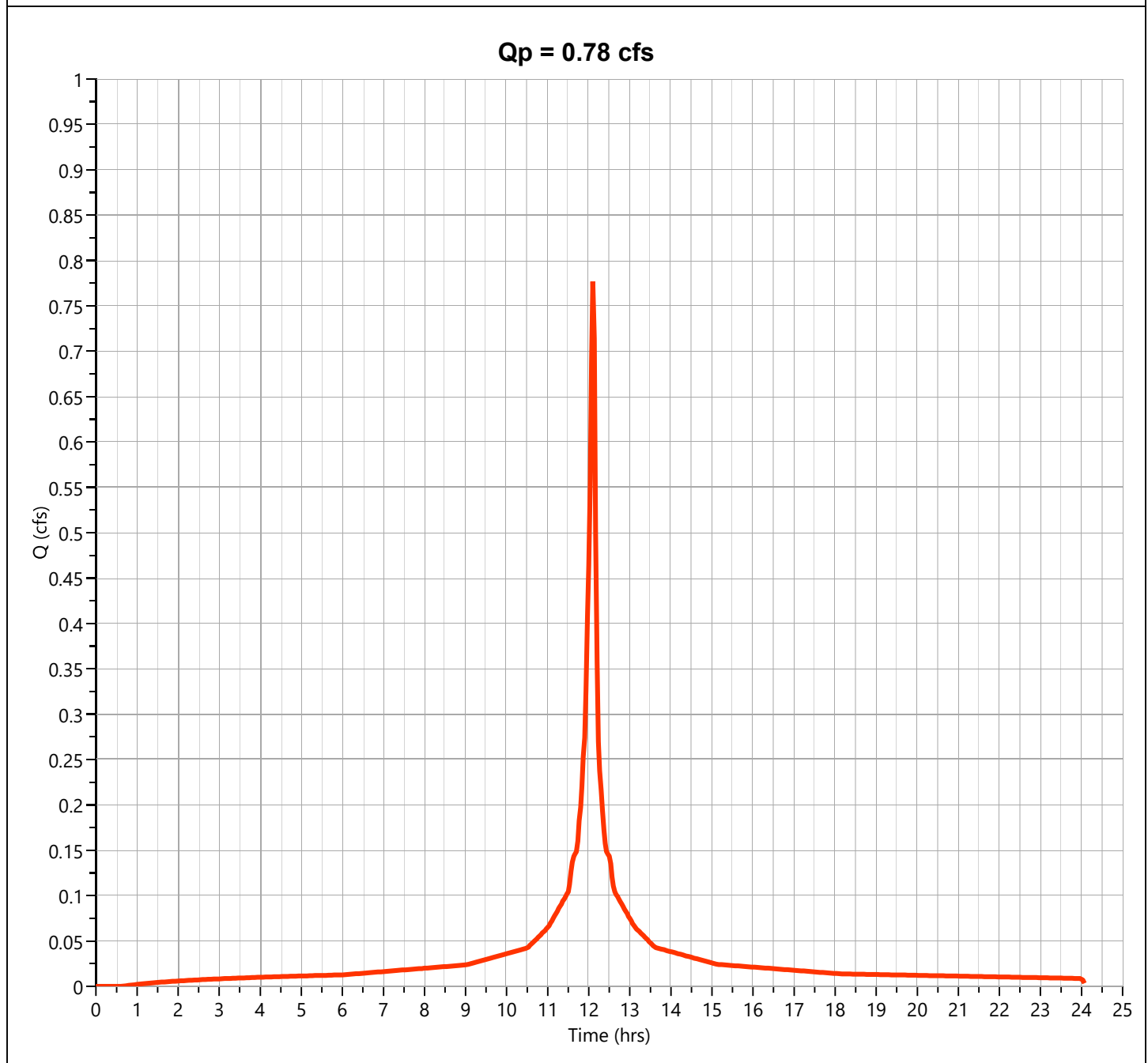
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-1 Impervious

## Hyd. No. 3

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.777 cfs  |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 2 min       | Runoff Volume      | = 2,735 cuft |
| Drainage Area   | = 0.13 ac     | Curve Number       | = 98         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 5.0 min    |
| Total Rainfall  | = 6.42 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |





# Hydrograph Report

Project Name:

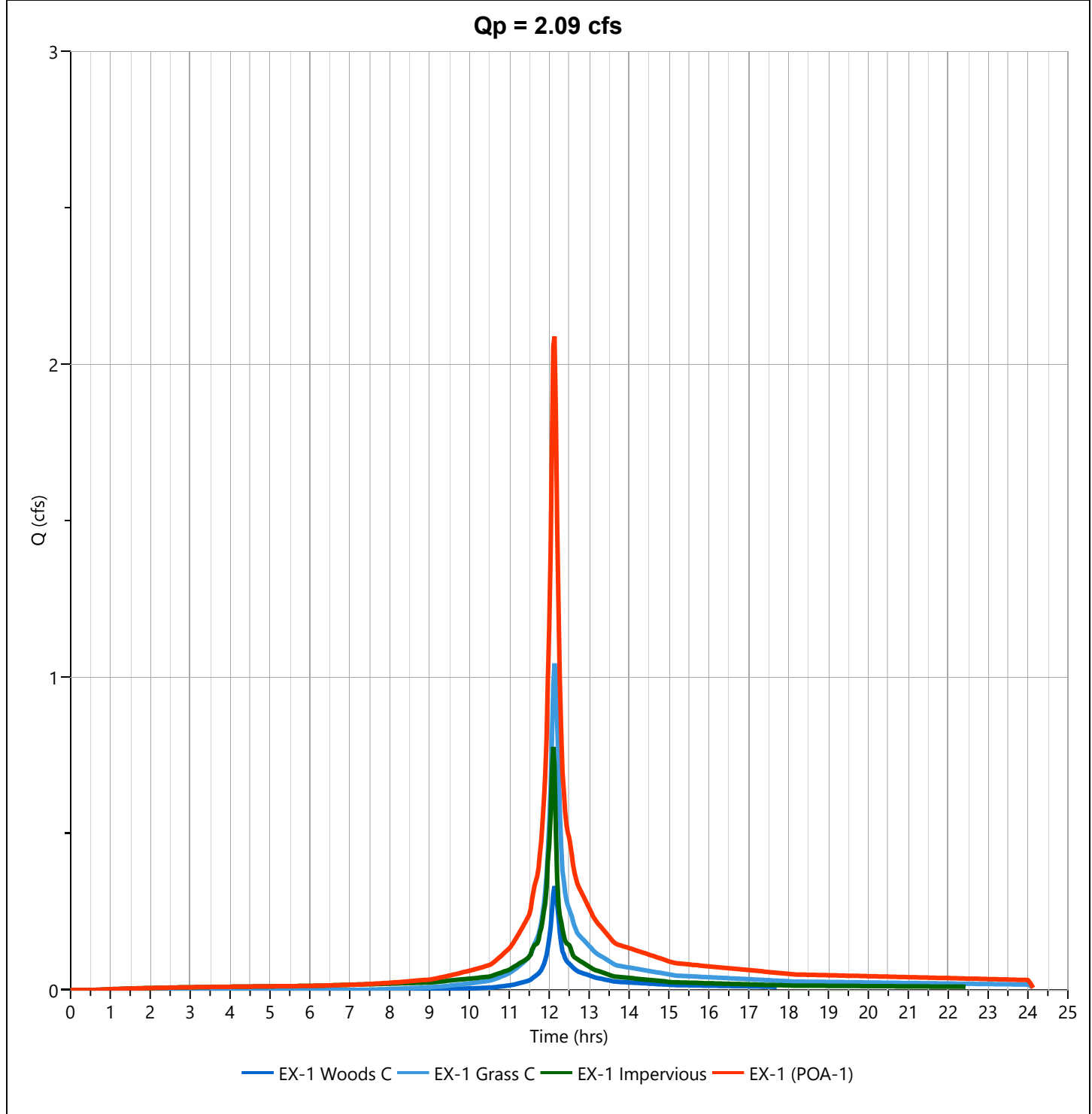
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-1 (POA-1)

## Hyd. No. 4

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 2.088 cfs  |
| Storm Frequency    | = 10-yr    | Time to Peak        | = 12.13 hrs  |
| Time Interval      | = 2 min    | Hydrograph Volume   | = 7,474 cuft |
| Inflow Hydrographs | = 1, 2, 3  | Total Contrib. Area | = 0.51 ac    |



# Hydrograph Report

Project Name:

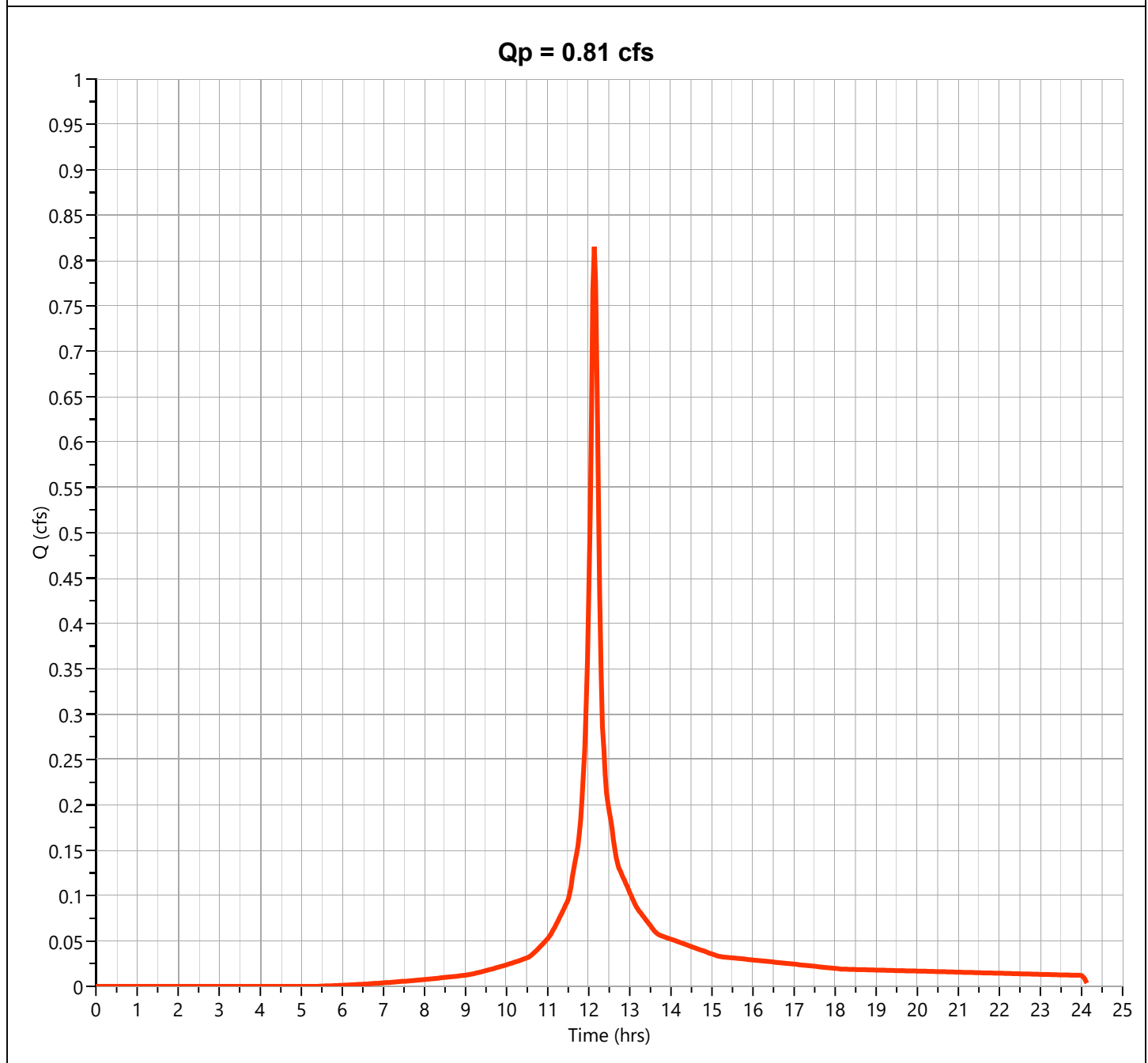
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-1 Woods C

## Hyd. No. 1

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.815 cfs  |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.13 hrs  |
| Time Interval   | = 2 min       | Runoff Volume      | = 2,854 cuft |
| Drainage Area   | = 0.1 ac      | Curve Number       | = 70         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 7.0 min    |
| Total Rainfall  | = 11.80 in    | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

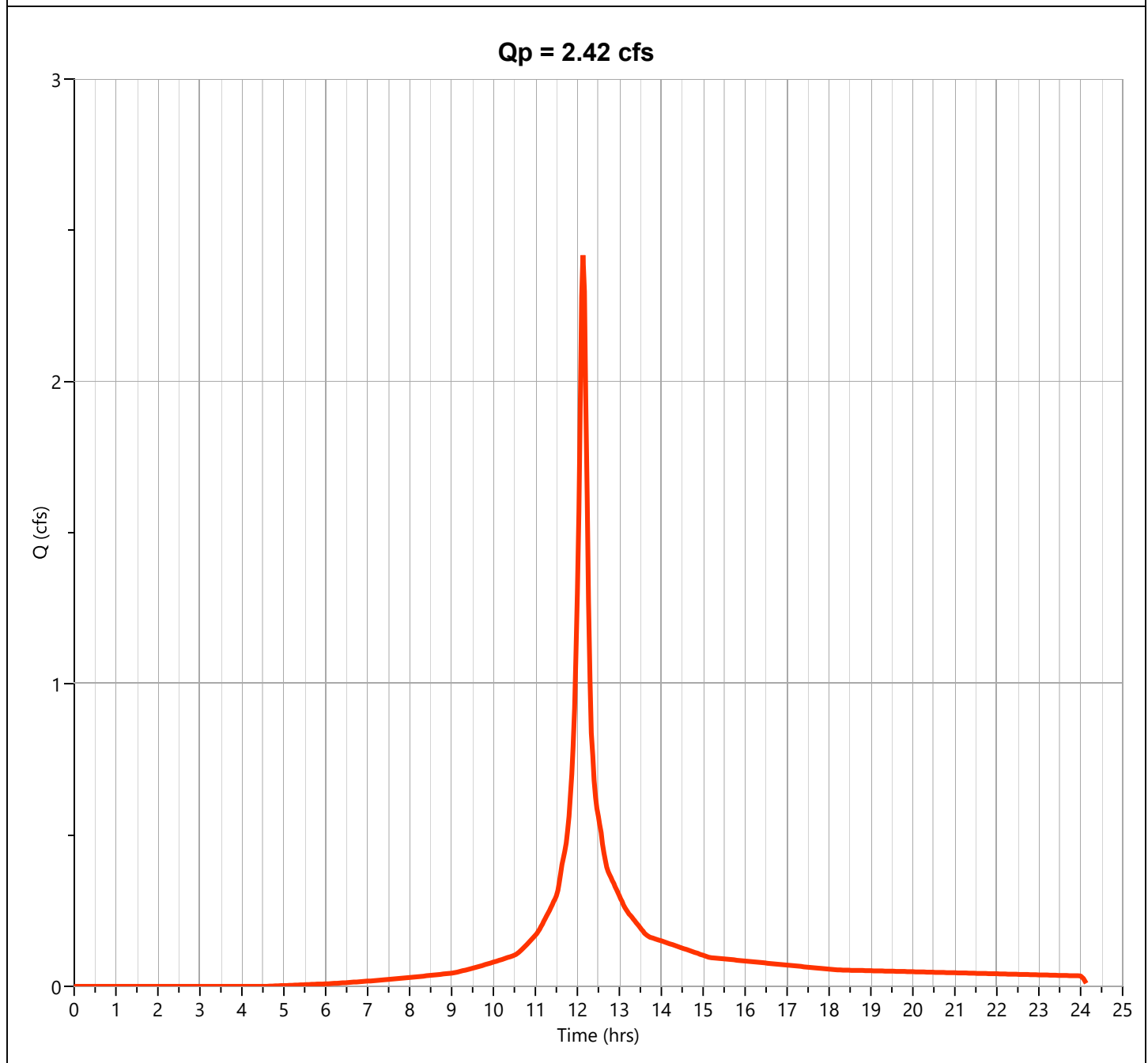
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-1 Grass C

## Hyd. No. 2

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 2.417 cfs  |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.13 hrs  |
| Time Interval   | = 2 min       | Runoff Volume      | = 8,567 cuft |
| Drainage Area   | = 0.28 ac     | Curve Number       | = 74         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 7.0 min    |
| Total Rainfall  | = 11.80 in    | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

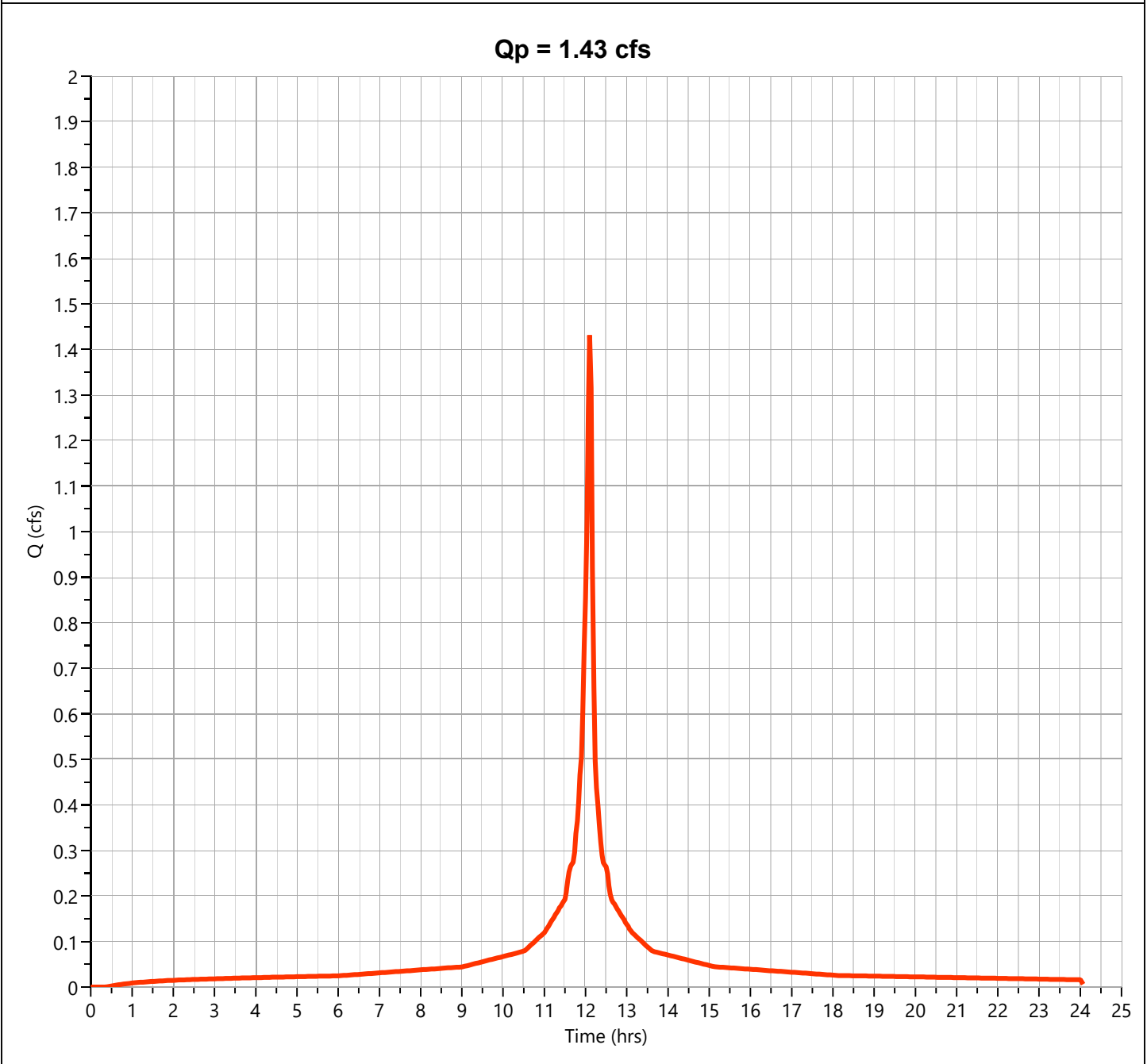
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-1 Impervious

## Hyd. No. 3

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 1.431 cfs  |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 2 min       | Runoff Volume      | = 5,114 cuft |
| Drainage Area   | = 0.13 ac     | Curve Number       | = 98         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 5.0 min    |
| Total Rainfall  | = 11.80 in    | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

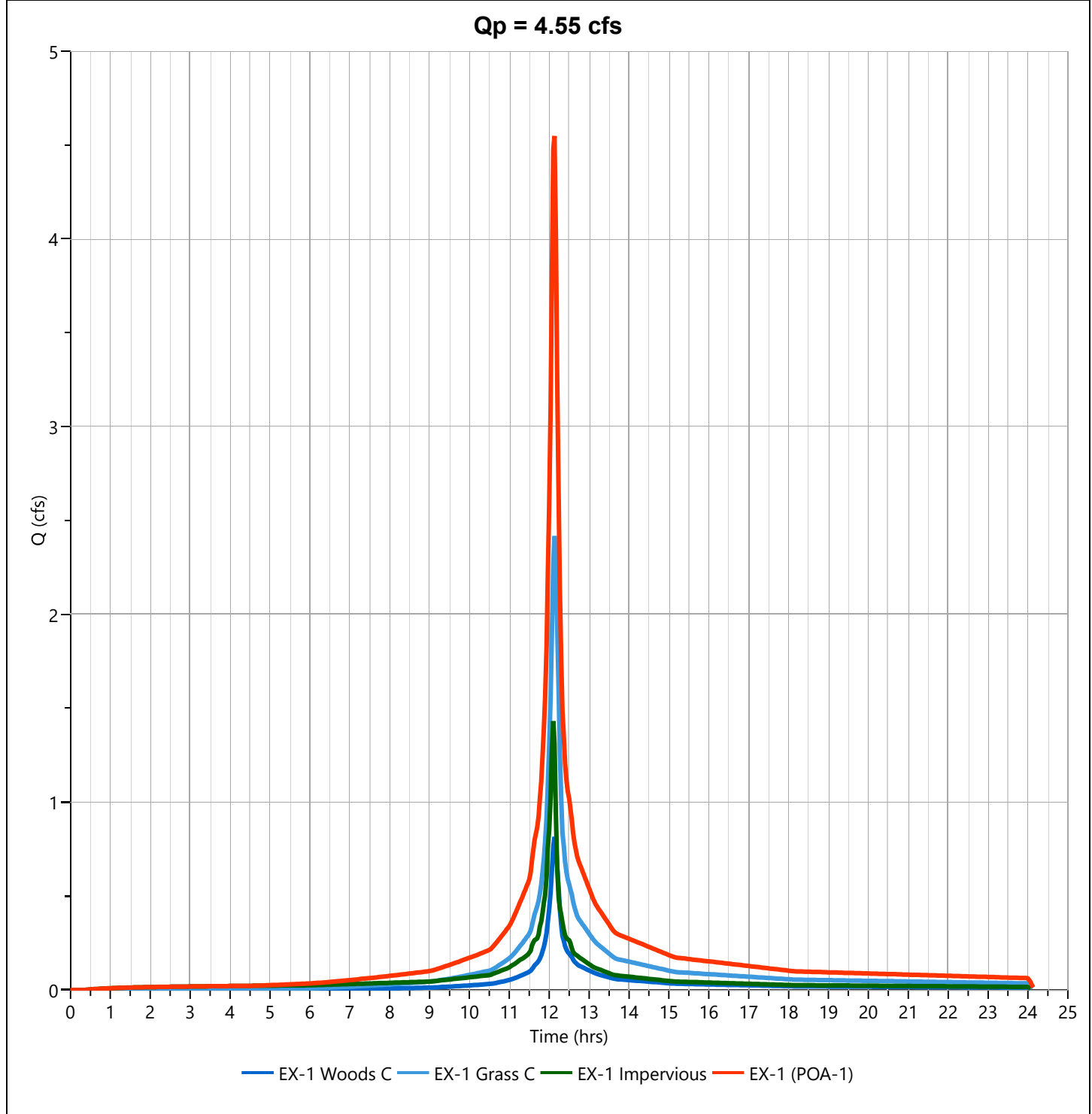
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-1 (POA-1)

## Hyd. No. 4

|                    |            |                     |               |
|--------------------|------------|---------------------|---------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 4.547 cfs   |
| Storm Frequency    | = 100-yr   | Time to Peak        | = 12.13 hrs   |
| Time Interval      | = 2 min    | Hydrograph Volume   | = 16,535 cuft |
| Inflow Hydrographs | = 1, 2, 3  | Total Contrib. Area | = 0.51 ac     |



**TOTAL ALLOWABLE FLOW TO POA-1**

# Hydrograph Report

Project Name:

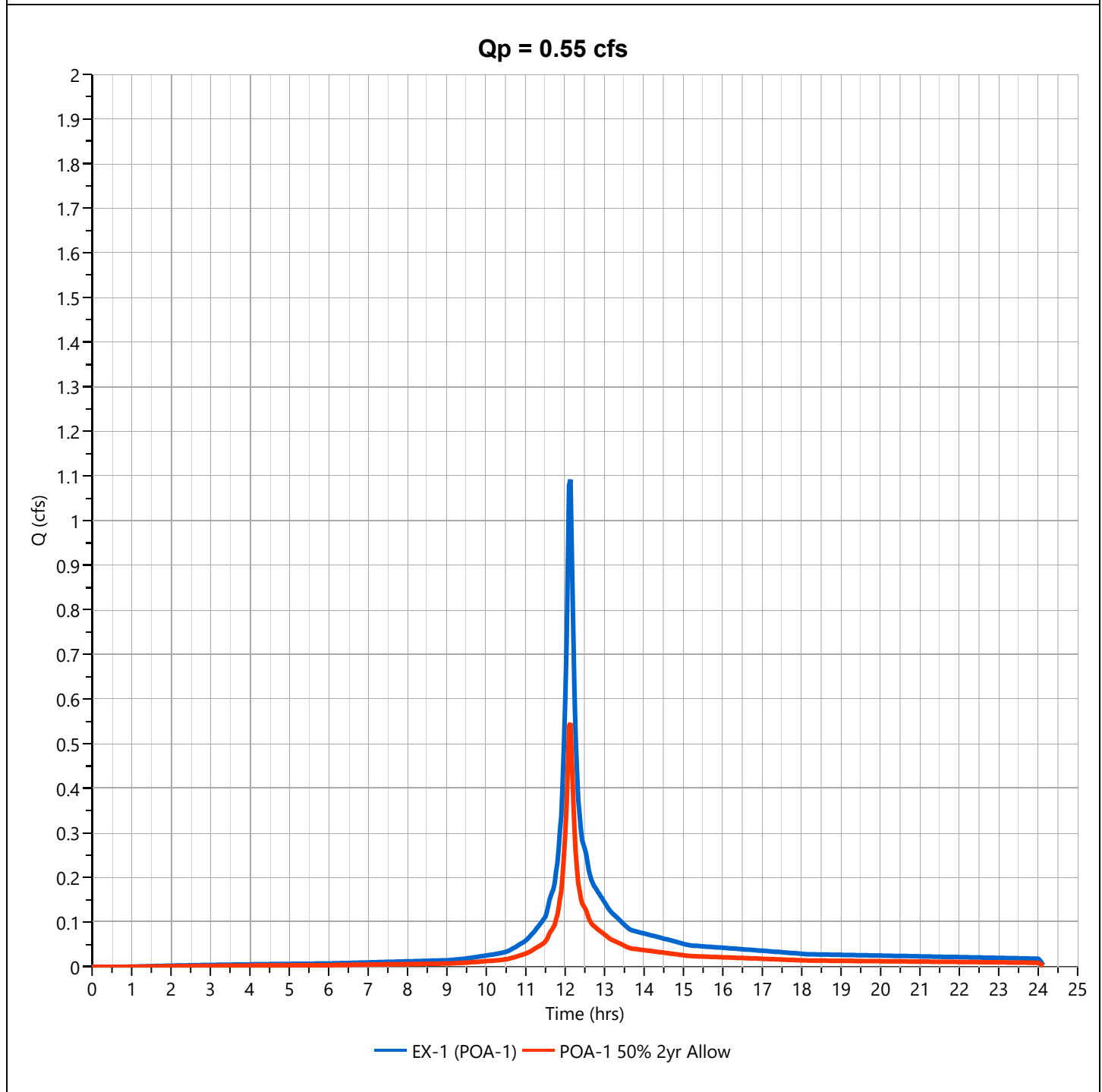
Hydrology Studio v 3.0.0.29

11-29-2023

## POA-1 50% 2yr Allow

## Hyd. No. 5

|                   |                    |                   |              |
|-------------------|--------------------|-------------------|--------------|
| Hydrograph Type   | = Diversion        | Peak Flow         | = 0.546 cfs  |
| Storm Frequency   | = 2-yr             | Time to Peak      | = 12.13 hrs  |
| Time Interval     | = 2 min            | Hydrograph Volume | = 1,972 cuft |
| Inflow Hydrograph | = 4 - EX-1 (POA-1) | Diversion Method  | = Flow Ratio |
| Companion Hyd     | = 6 - <name>       | Flow Ratio        | = 0.5        |



# Hydrograph Report

Project Name:

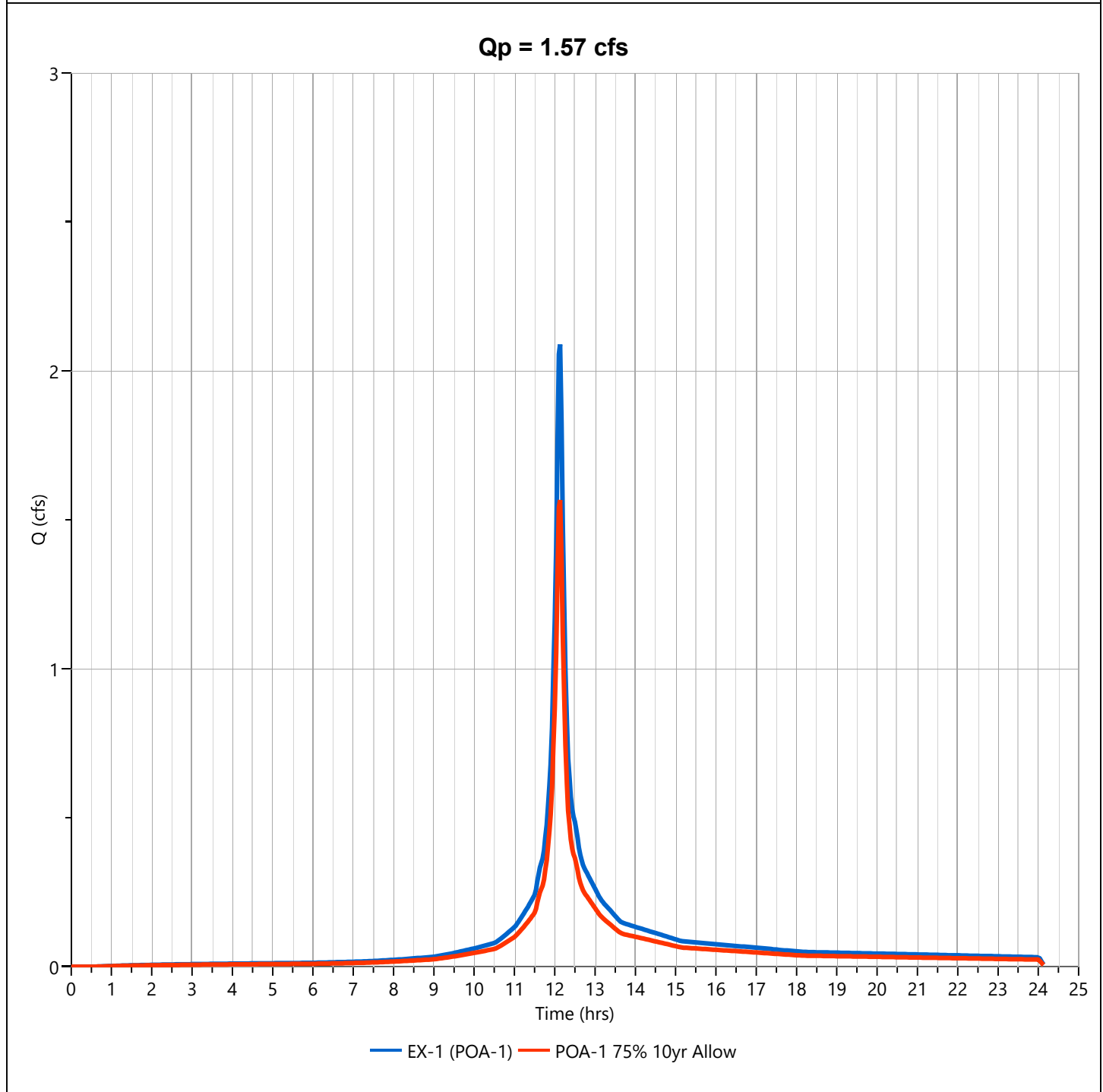
Hydrology Studio v 3.0.0.29

11-29-2023

## POA-1 75% 10yr Allow

## Hyd. No. 7

|                   |                    |                   |              |
|-------------------|--------------------|-------------------|--------------|
| Hydrograph Type   | = Diversion        | Peak Flow         | = 1.566 cfs  |
| Storm Frequency   | = 10-yr            | Time to Peak      | = 12.13 hrs  |
| Time Interval     | = 2 min            | Hydrograph Volume | = 5,606 cuft |
| Inflow Hydrograph | = 4 - EX-1 (POA-1) | Diversion Method  | = Flow Ratio |
| Companion Hyd     | = 8 - <name>       | Flow Ratio        | = 0.75       |





# Hydrograph Report

Project Name:

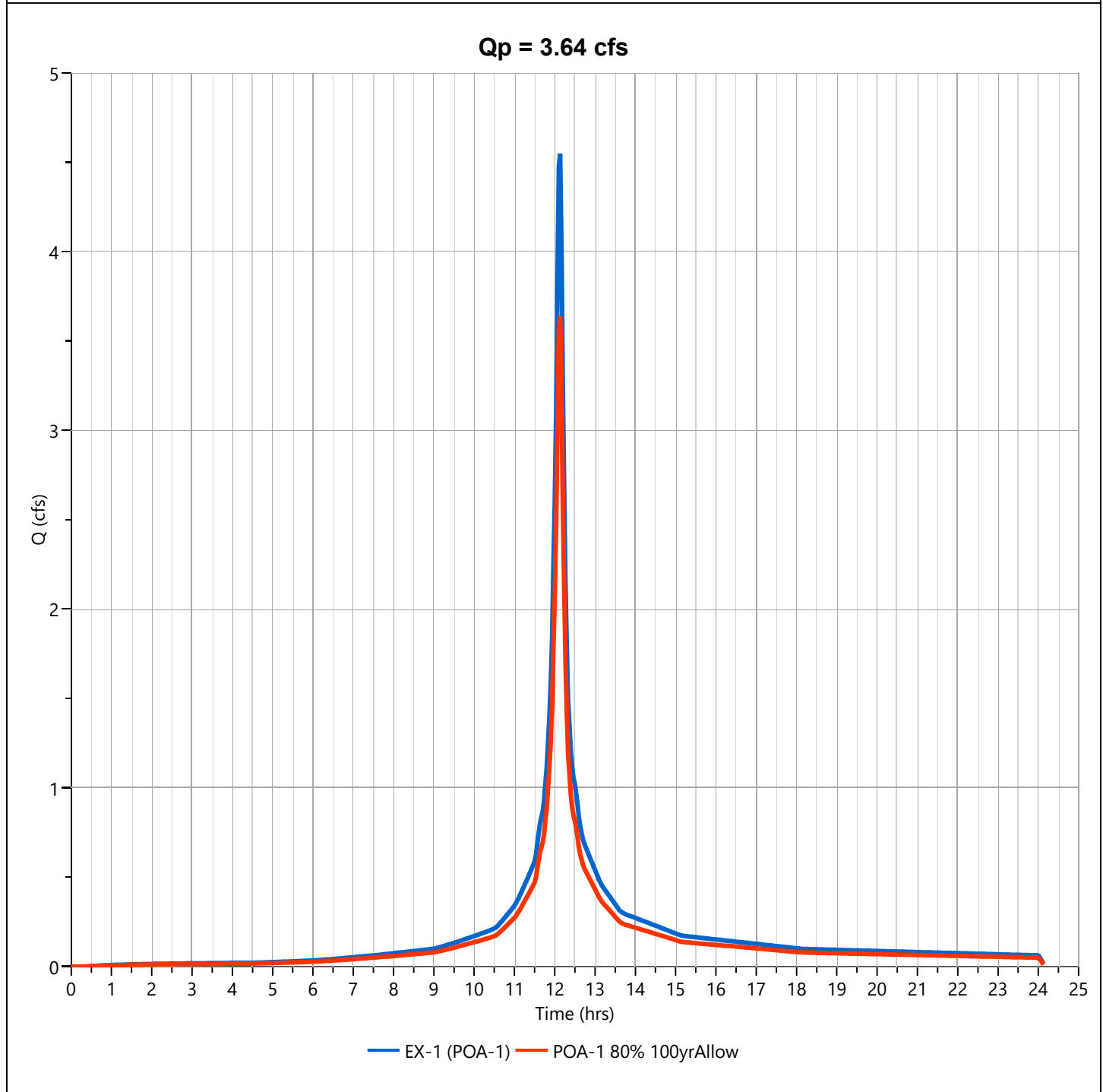
Hydrology Studio v 3.0.0.29

11-29-2023

## POA-1 80% 100yrAllow

## Hyd. No. 9

|                   |                    |                   |               |
|-------------------|--------------------|-------------------|---------------|
| Hydrograph Type   | = Diversion        | Peak Flow         | = 3.638 cfs   |
| Storm Frequency   | = 100-yr           | Time to Peak      | = 12.13 hrs   |
| Time Interval     | = 2 min            | Hydrograph Volume | = 13,228 cuft |
| Inflow Hydrograph | = 4 - EX-1 (POA-1) | Diversion Method  | = Flow Ratio  |
| Companion Hyd     | = 10 - <name>      | Flow Ratio        | = 0.8         |



## **EX-2A WATERSHED**

Project: Beacon Unitarian Universalist Church

By: SM

Date: 11/29/2023

Location: Summit, NJ

Checked By: MJV

Date Checked: 11/29/2023

Circle One: Present Developed

Future Existing Watershed EX-2A Impervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Flow Length, L (total L < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. Compute T<sub>t</sub>

$$T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} s^{0.4}}$$

|            |                        |   |  |
|------------|------------------------|---|--|
| Segment ID | 1                      |   |  |
|            | <b>Smooth Surfaces</b> |   |  |
|            | <b>0.011</b>           |   |  |
| ft         | <b>100</b>             |   |  |
| in         | <b>4.12</b>            |   |  |
| ft/ft      | <b>0.028</b>           |   |  |
| hr         | <b>0.015</b>           | + |  |

Sheet Flow Sub-Total **0.015 hours**

**Shallow Concentrated Flow**

7. Surface Description
8. Flow Length, L
9. Watercourse Slope, s
10. Average Velocity, V (NEH table 15-3)
11. Compute T<sub>t</sub>

$$T_t = \frac{L}{3600 V}$$

|            |                 |                          |                  |
|------------|-----------------|--------------------------|------------------|
| Segment ID | 2               | 3                        | 4                |
|            | <b>Pavement</b> | <b>Grassed Waterways</b> | <b>Woodlands</b> |
| ft         | <b>35</b>       | <b>60</b>                | <b>49</b>        |
| ft/ft      | <b>0.016</b>    | <b>0.003</b>             | <b>0.003</b>     |
| ft/s       | <b>2.55</b>     | <b>0.83</b>              | <b>0.26</b>      |
| hr         | <b>0.004</b>    | <b>0.020</b>             | <b>0.053</b>     |

Shallow Conc. Flow Sub-Total **0.076 hours**

**Channel Flow**

12. Flow Length, L
13. Cross Sectional flow area, a
14. Wetted Perimeter, P<sub>w</sub>
15. Hydraulic Radius, r
16. Channel Slope, s
17. Manning's Roughness Coeff., n
18. Velocity, V
19. Compute T<sub>t</sub>

$$r = a / P_w$$

$$V = (1.49 r^{2/3} s^{1/2}) / n$$

$$T_t = \frac{L}{3600 V}$$

|                 |  |  |  |
|-----------------|--|--|--|
| Segment ID      |  |  |  |
| ft              |  |  |  |
| ft <sup>2</sup> |  |  |  |
| ft              |  |  |  |
| ft              |  |  |  |
| ft/ft           |  |  |  |
|                 |  |  |  |
| ft/s            |  |  |  |
| hr              |  |  |  |

Channel Flow Sub-Total **0.000 hours**

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>

(Add Sub-Total T<sub>t</sub> from prior steps)

|                                  |                    |
|----------------------------------|--------------------|
| Total T <sub>c</sub> (hours) =   | <b>0.092 hours</b> |
| Total T <sub>c</sub> (minutes) = | <b>6 minutes</b>   |

Project: Beacon Unitarian Universalist Church

By: SM

Date: 11/29/2023

Location: Summit, NJ

Checked By: MJV

Date Checked: 11/29/2023

Circle One: Present Developed

Future Existing Watershed EX-2A Pervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Flow Length, L (total L < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. Compute T<sub>t</sub>

$$T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} s^{0.4}}$$

|            |                               |                        |  |
|------------|-------------------------------|------------------------|--|
| Segment ID | <b>1</b>                      | <b>2</b>               |  |
|            | <b>Woods Light Underbrush</b> | <b>Smooth Surfaces</b> |  |
|            | <b>0.40</b>                   | <b>0.011</b>           |  |
| ft         | <b>48</b>                     | <b>52</b>              |  |
| in         | <b>4.12</b>                   | <b>4.12</b>            |  |
| ft/ft      | <b>0.026</b>                  | <b>0.020</b>           |  |
| hr         | <b>0.158</b>                  | <b>0.011</b>           |  |

Sheet Flow Sub-Total **0.168 hours**

**Shallow Concentrated Flow**

7. Surface Description
8. Flow Length, L
9. Watercourse Slope, s
10. Average Velocity, V (NEH table 15-3)
11. Compute T<sub>t</sub>

$$T_t = \frac{L}{3600 V}$$

|            |                 |                          |                  |
|------------|-----------------|--------------------------|------------------|
| Segment ID | <b>3</b>        | <b>4</b>                 | <b>5</b>         |
|            | <b>Pavement</b> | <b>Grassed Waterways</b> | <b>Woodlands</b> |
| ft         | <b>109</b>      | <b>60</b>                | <b>49</b>        |
| ft/ft      | <b>0.022</b>    | <b>0.003</b>             | <b>0.003</b>     |
| ft/s       | <b>2.99</b>     | <b>0.83</b>              | <b>0.26</b>      |
| hr         | <b>0.010</b>    | <b>0.020</b>             | <b>0.053</b>     |

Shallow Conc. Flow Sub-Total **0.083 hours**

**Channel Flow**

12. Flow Length, L
13. Cross Sectional flow area, a
14. Wetted Perimeter, P<sub>w</sub>
15. Hydraulic Radius, r
16. Channel Slope, s
17. Manning's Roughness Coeff., n
18. Velocity, V
19. Compute T<sub>t</sub>

$$r = a / P_w$$

$$V = (1.49 r^{2/3} s^{1/2}) / n$$

$$T_t = \frac{L}{3600 V}$$

|                 |  |  |  |
|-----------------|--|--|--|
| Segment ID      |  |  |  |
| ft              |  |  |  |
| ft <sup>2</sup> |  |  |  |
| ft              |  |  |  |
| ft              |  |  |  |
| ft/ft           |  |  |  |
|                 |  |  |  |
| ft/s            |  |  |  |
| hr              |  |  |  |

Channel Flow Sub-Total **0.000 hours**

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>

(Add Sub-Total T<sub>t</sub> from prior steps)

|                                  |                    |
|----------------------------------|--------------------|
| Total T <sub>c</sub> (hours) =   | <b>0.251 hours</b> |
| Total T <sub>c</sub> (minutes) = | <b>15 minutes</b>  |

# Hydrograph Report

Project Name:

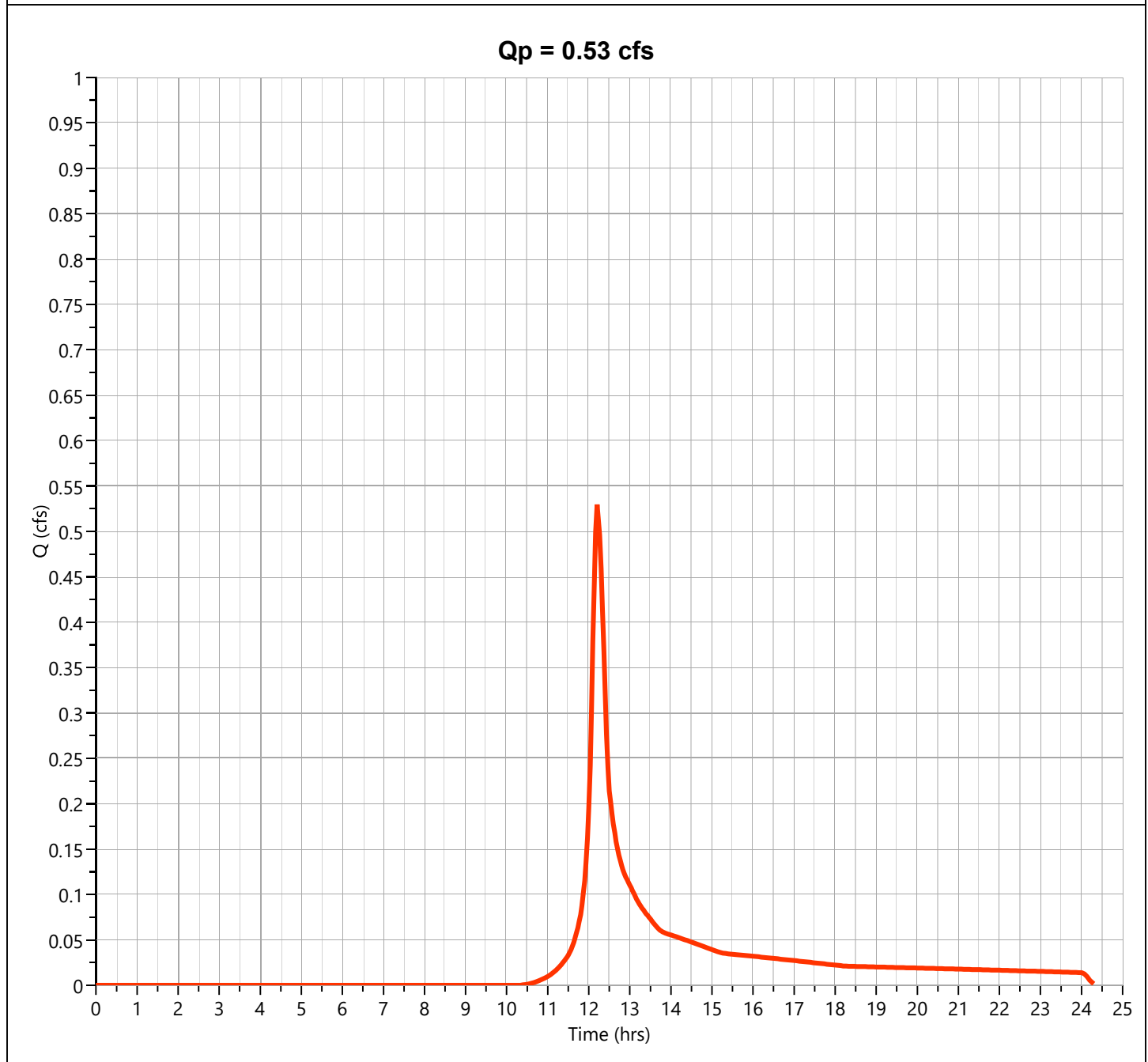
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-2A Woods C

## Hyd. No. 12

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.529 cfs  |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.20 hrs  |
| Time Interval   | = 2 min       | Runoff Volume      | = 2,296 cuft |
| Drainage Area   | = 0.46 ac     | Curve Number       | = 70         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 15.0 min   |
| Total Rainfall  | = 4.12 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

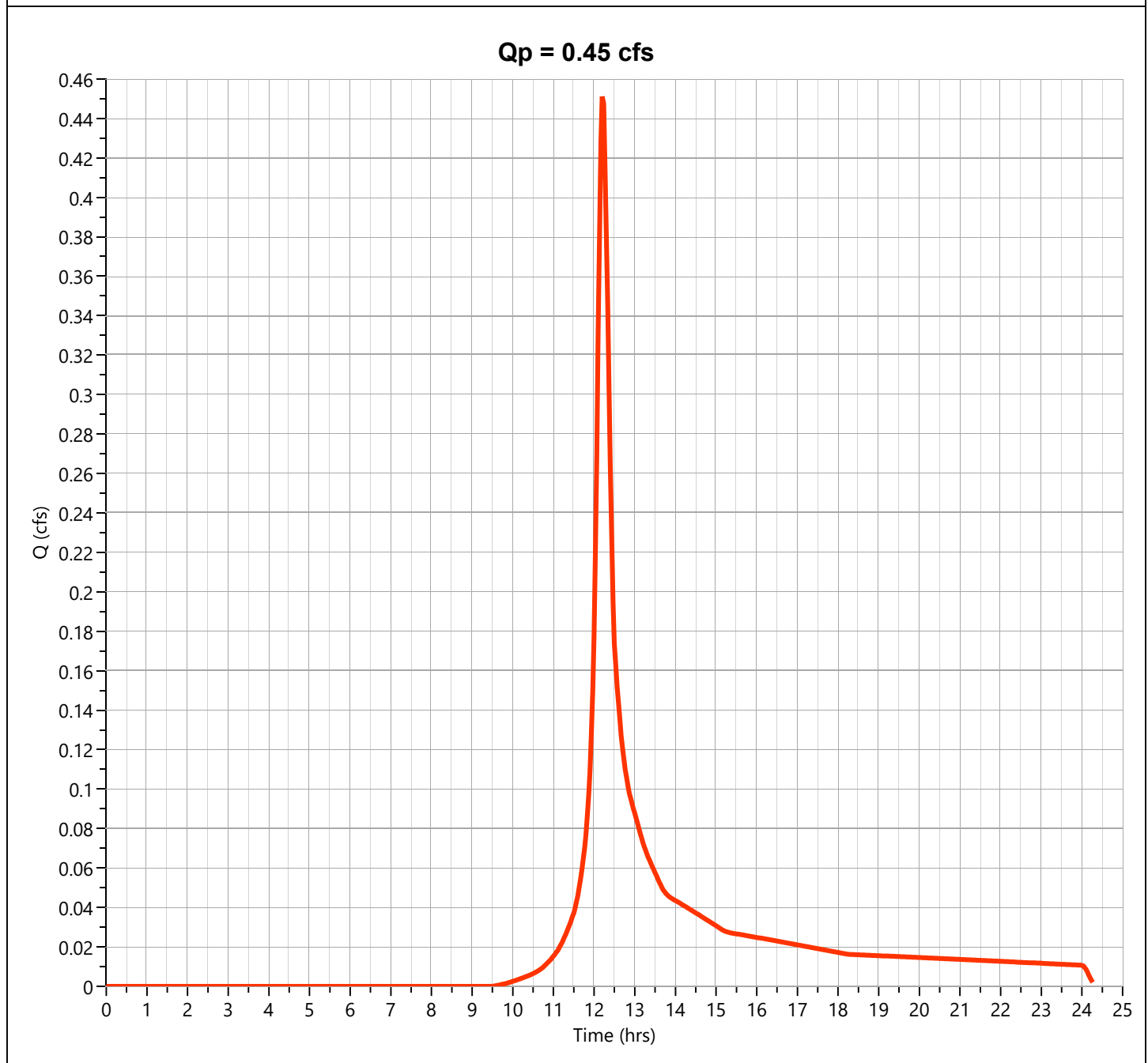
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-2A Grass C

## Hyd. No. 13

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.451 cfs  |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.20 hrs  |
| Time Interval   | = 2 min       | Runoff Volume      | = 1,908 cuft |
| Drainage Area   | = 0.32 ac     | Curve Number       | = 74         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 15.0 min   |
| Total Rainfall  | = 4.12 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

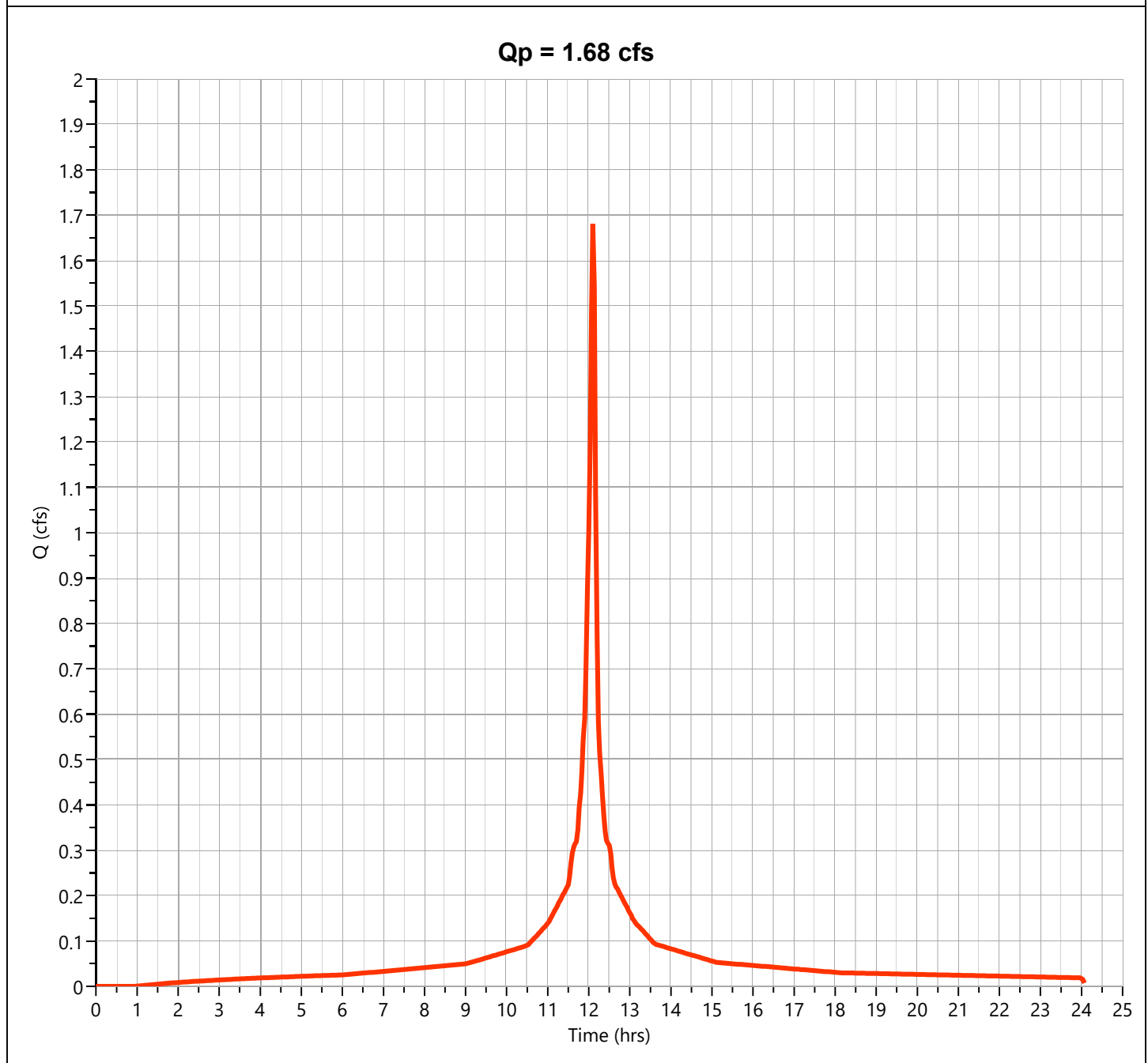
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-2A Impervious

## Hyd. No. 14

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 1.680 cfs  |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 2 min       | Runoff Volume      | = 5,817 cuft |
| Drainage Area   | = 0.44 ac     | Curve Number       | = 98         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 6.0 min    |
| Total Rainfall  | = 4.12 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

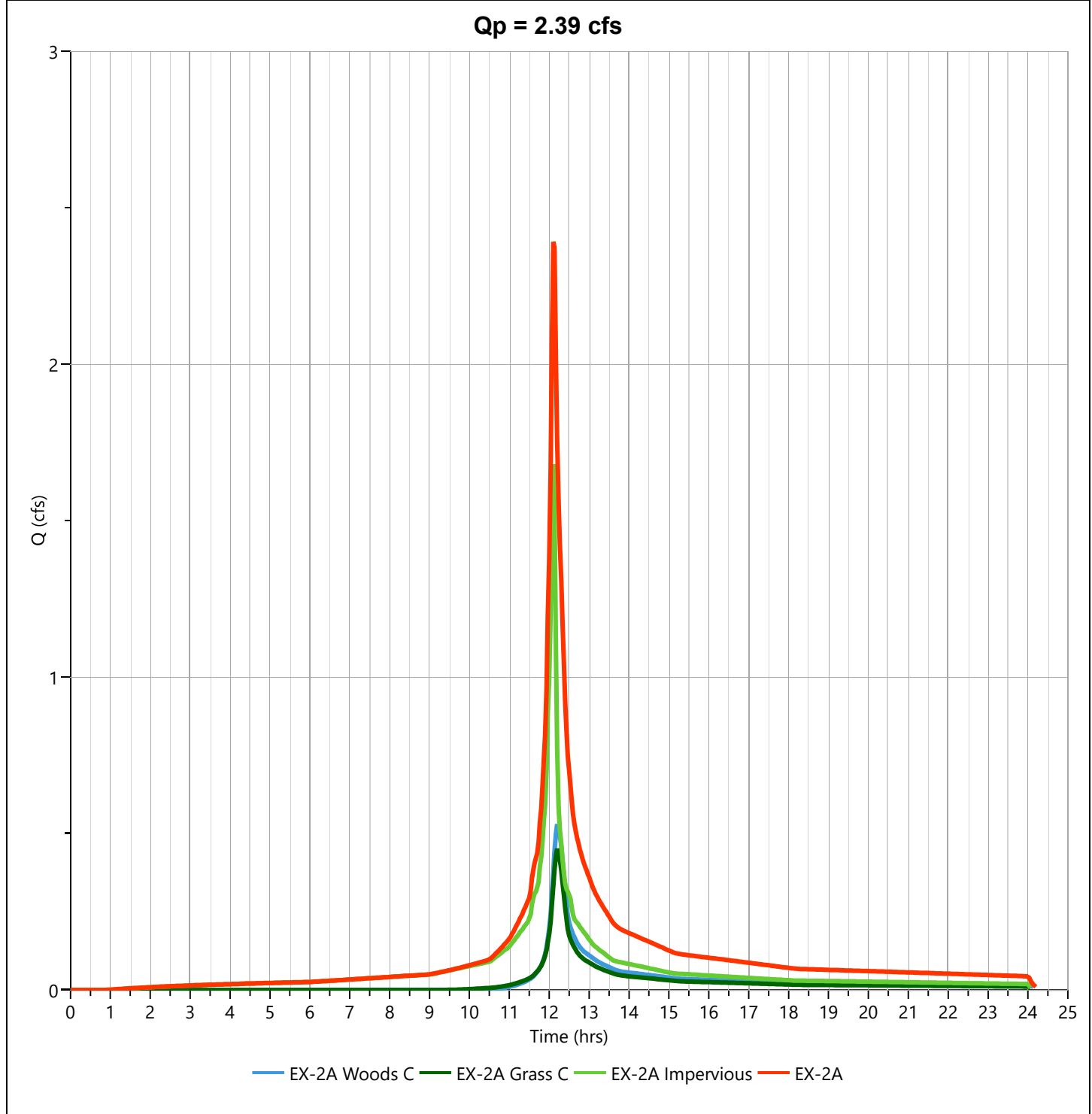
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-2A

## Hyd. No. 15

|                    |              |                     |               |
|--------------------|--------------|---------------------|---------------|
| Hydrograph Type    | = Junction   | Peak Flow           | = 2.390 cfs   |
| Storm Frequency    | = 2-yr       | Time to Peak        | = 12.10 hrs   |
| Time Interval      | = 2 min      | Hydrograph Volume   | = 10,021 cuft |
| Inflow Hydrographs | = 12, 13, 14 | Total Contrib. Area | = 1.22 ac     |





# Hydrograph Report

Project Name:

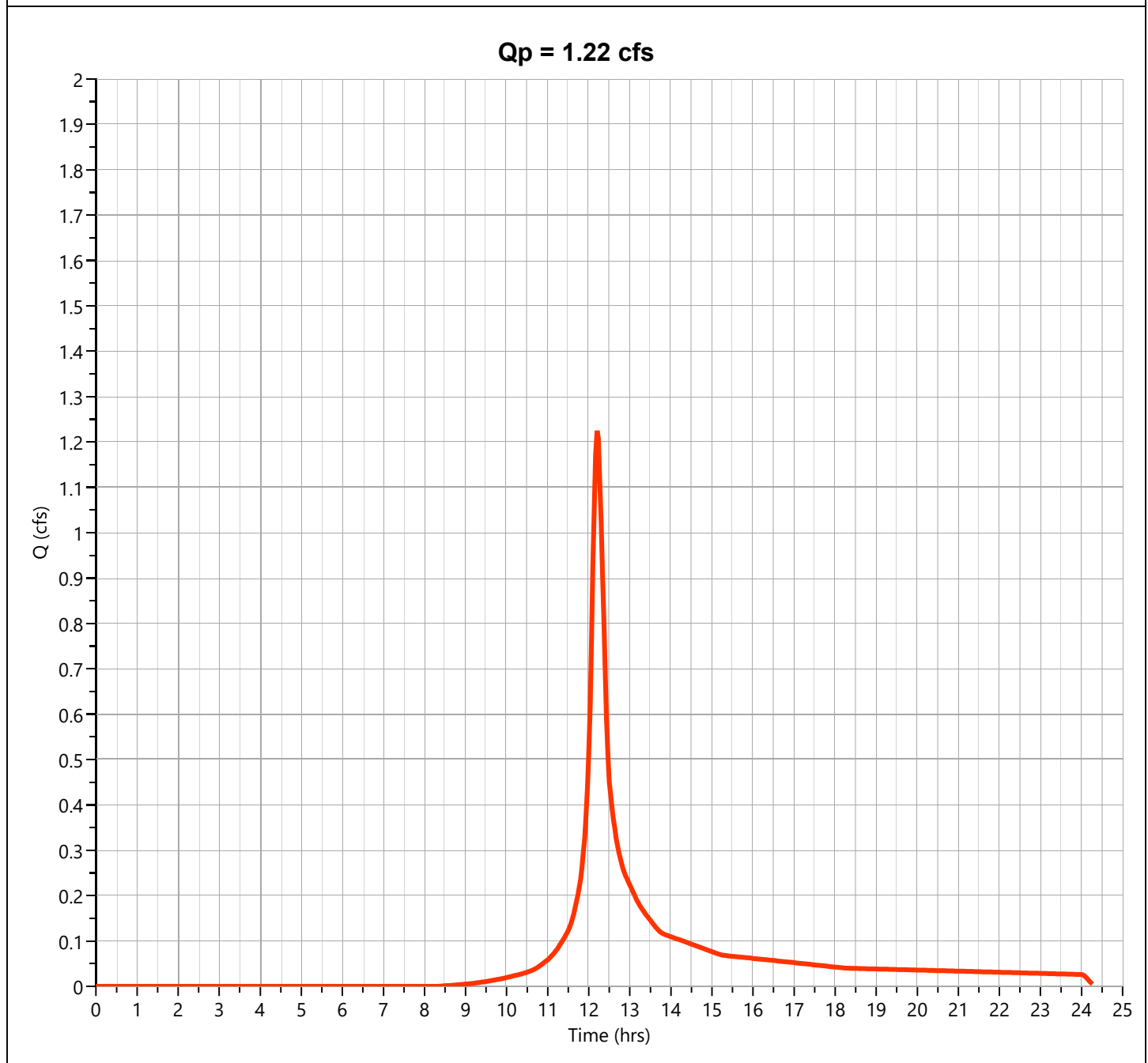
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-2A Woods C

## Hyd. No. 12

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 1.225 cfs  |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.20 hrs  |
| Time Interval   | = 2 min       | Runoff Volume      | = 5,116 cuft |
| Drainage Area   | = 0.46 ac     | Curve Number       | = 70         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 15.0 min   |
| Total Rainfall  | = 6.42 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

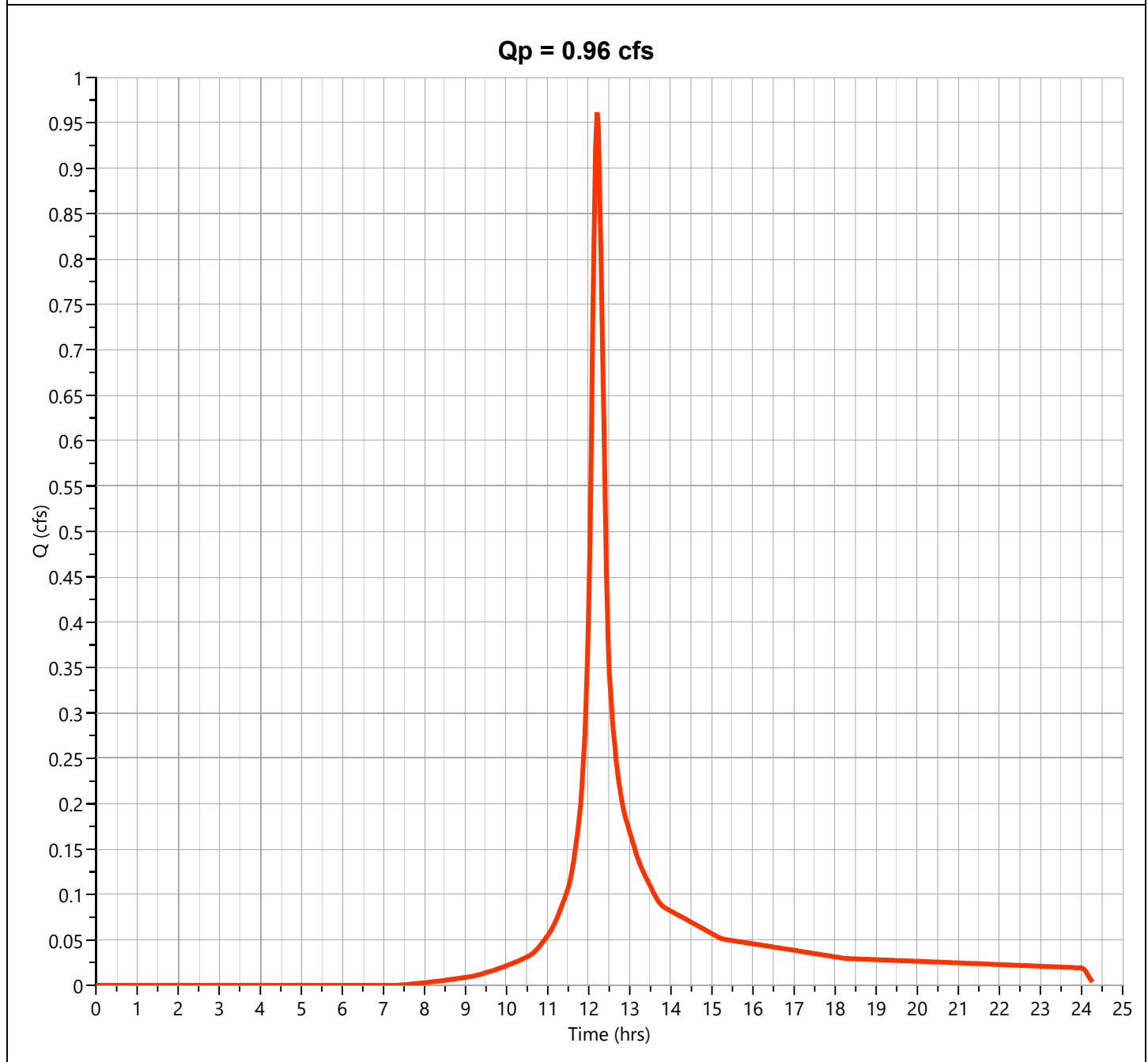
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-2A Grass C

## Hyd. No. 13

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.962 cfs  |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.20 hrs  |
| Time Interval   | = 2 min       | Runoff Volume      | = 4,011 cuft |
| Drainage Area   | = 0.32 ac     | Curve Number       | = 74         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 15.0 min   |
| Total Rainfall  | = 6.42 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

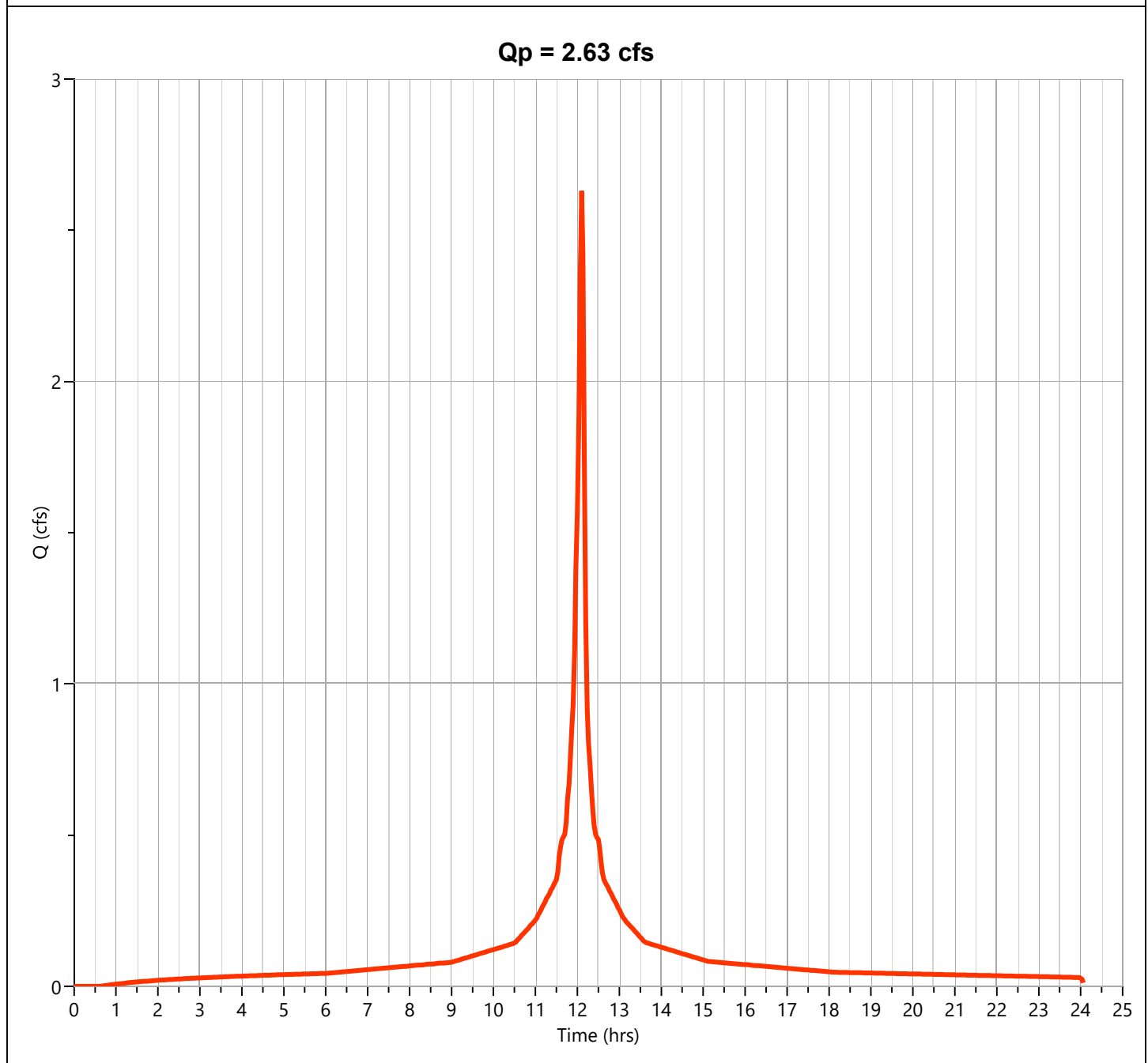
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-2A Impervious

## Hyd. No. 14

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 2.629 cfs  |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 2 min       | Runoff Volume      | = 9,256 cuft |
| Drainage Area   | = 0.44 ac     | Curve Number       | = 98         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 6.0 min    |
| Total Rainfall  | = 6.42 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

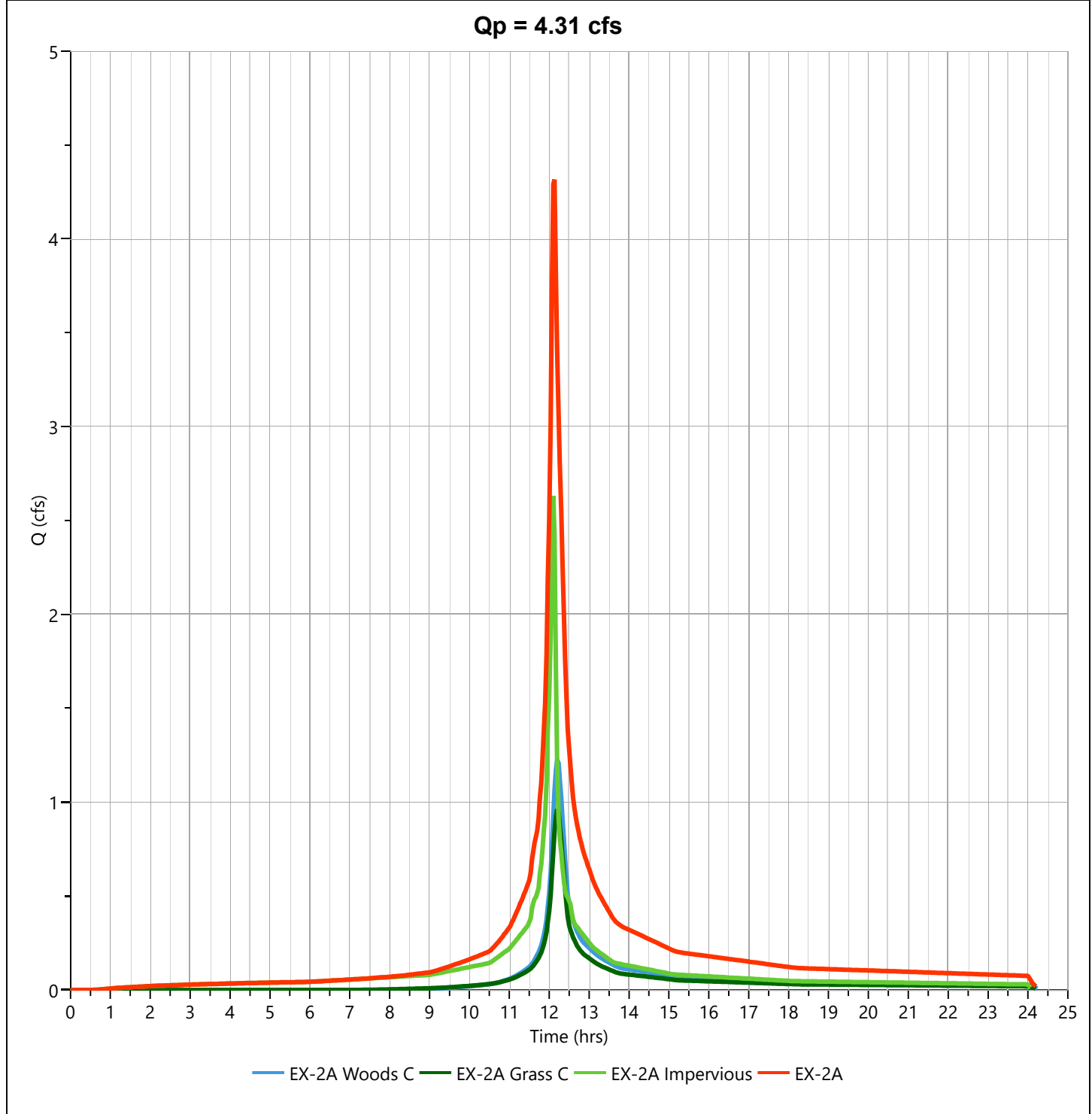
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-2A

## Hyd. No. 15

|                    |              |                     |               |
|--------------------|--------------|---------------------|---------------|
| Hydrograph Type    | = Junction   | Peak Flow           | = 4.315 cfs   |
| Storm Frequency    | = 10-yr      | Time to Peak        | = 12.13 hrs   |
| Time Interval      | = 2 min      | Hydrograph Volume   | = 18,382 cuft |
| Inflow Hydrographs | = 12, 13, 14 | Total Contrib. Area | = 1.22 ac     |



# Hydrograph Report

Project Name:

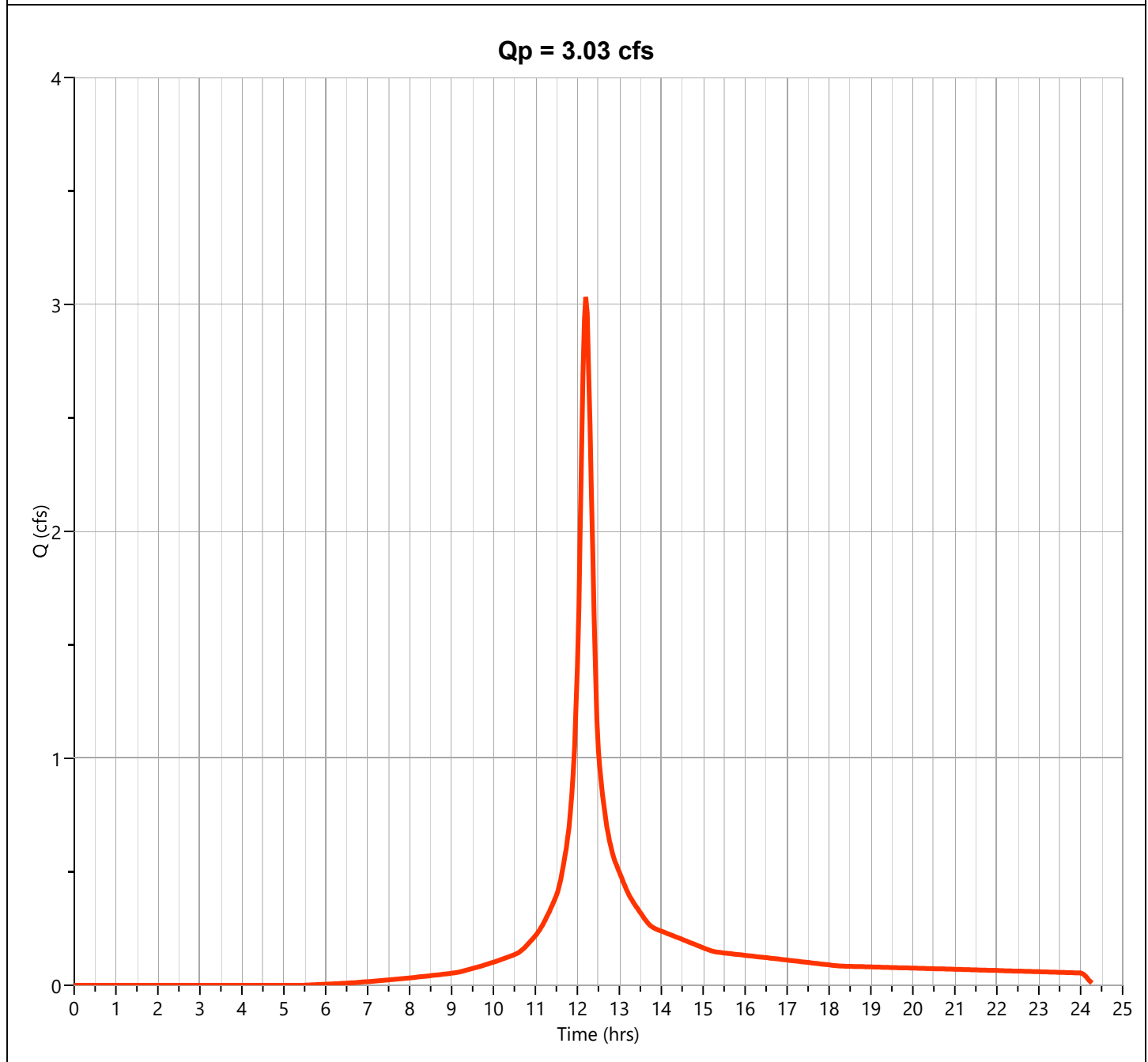
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-2A Woods C

## Hyd. No. 12

|                 |               |                    |               |
|-----------------|---------------|--------------------|---------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 3.032 cfs   |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.20 hrs   |
| Time Interval   | = 2 min       | Runoff Volume      | = 12,802 cuft |
| Drainage Area   | = 0.46 ac     | Curve Number       | = 70          |
| Tc Method       | = User        | Time of Conc. (Tc) | = 15.0 min    |
| Total Rainfall  | = 11.80 in    | Design Storm       | = NOAA-D      |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484         |



# Hydrograph Report

Project Name:

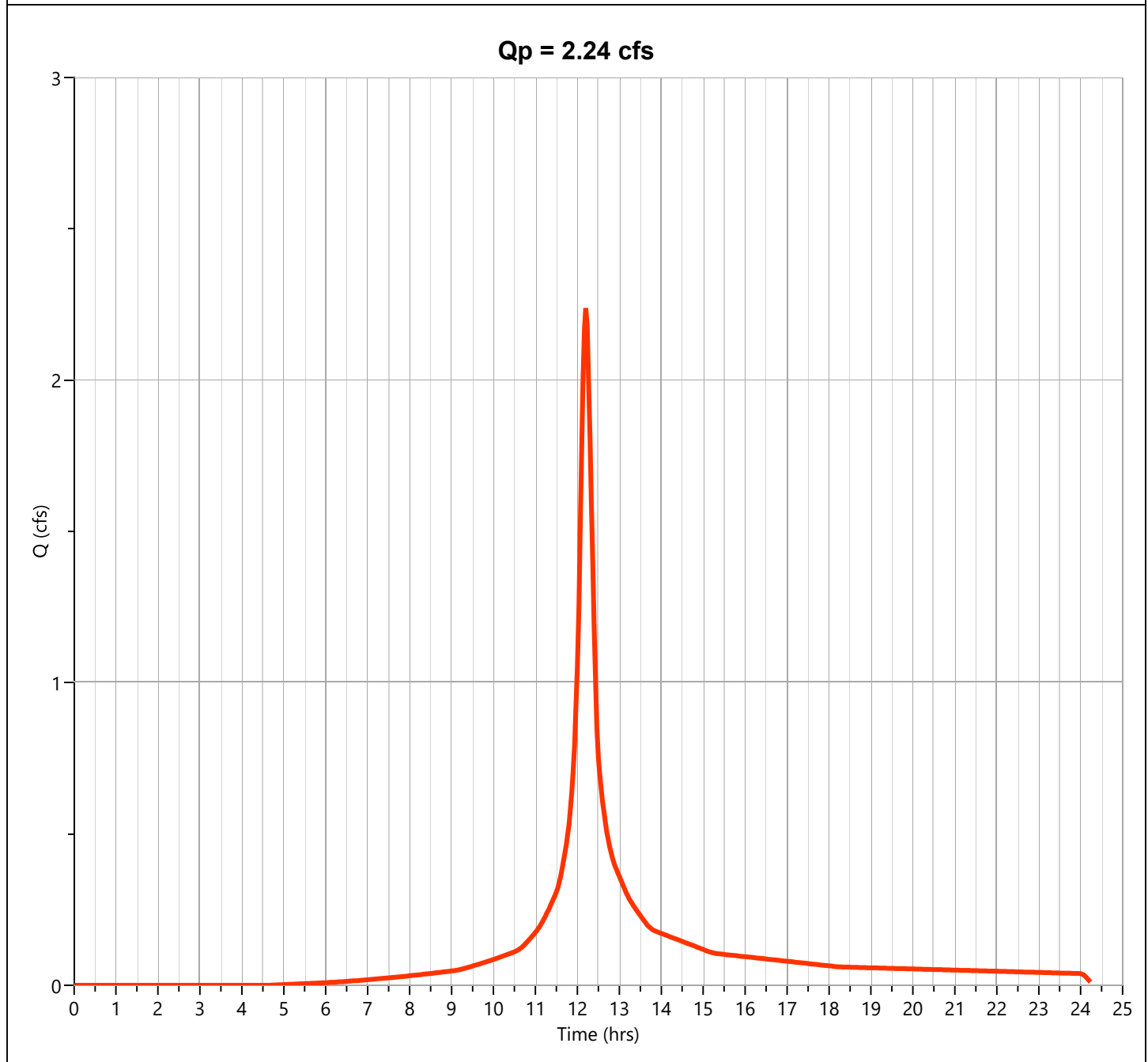
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-2A Grass C

## Hyd. No. 13

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 2.237 cfs  |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.20 hrs  |
| Time Interval   | = 2 min       | Runoff Volume      | = 9,546 cuft |
| Drainage Area   | = 0.32 ac     | Curve Number       | = 74         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 15.0 min   |
| Total Rainfall  | = 11.80 in    | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

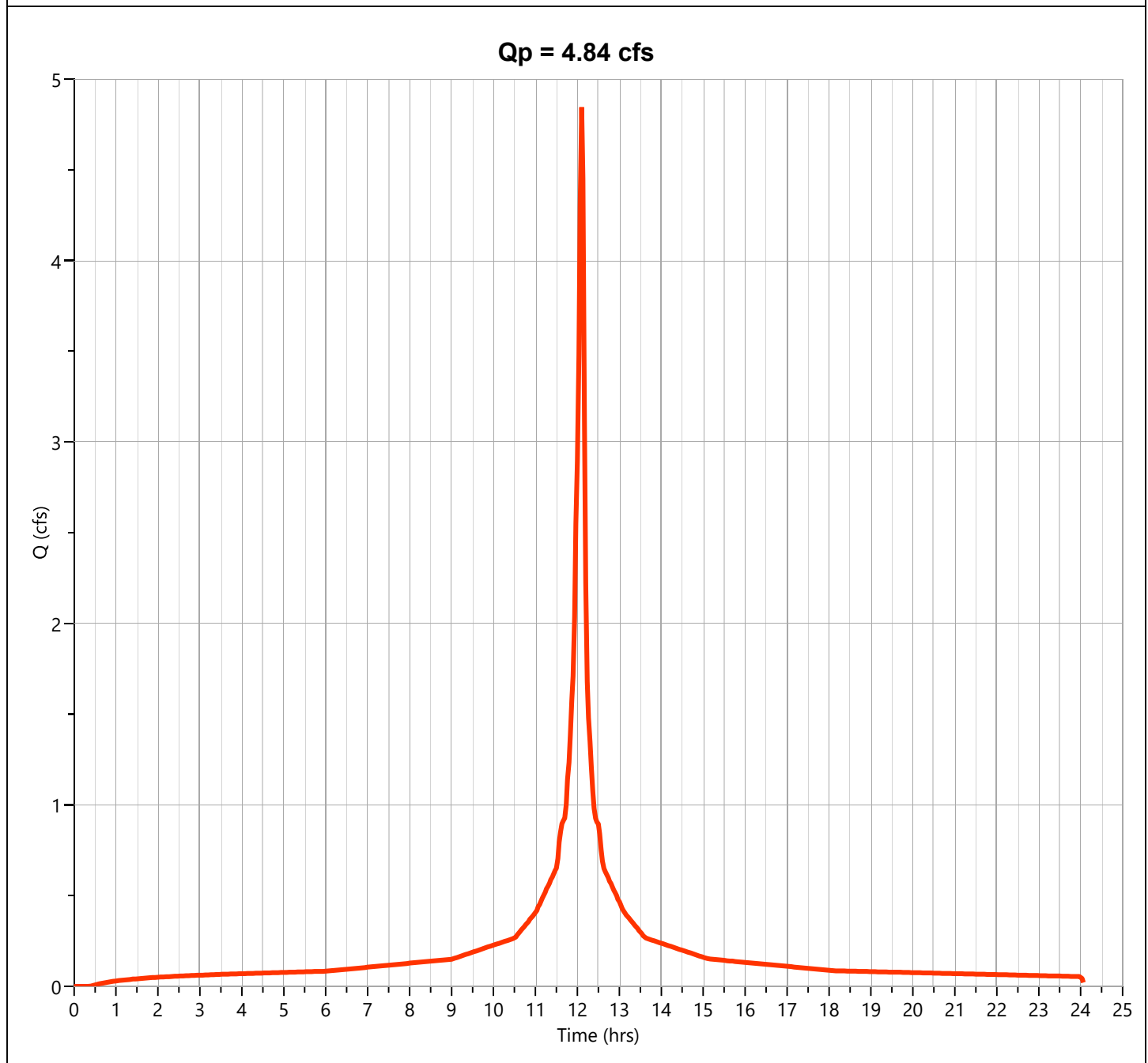
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-2A Impervious

## Hyd. No. 14

|                 |               |                    |               |
|-----------------|---------------|--------------------|---------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 4.844 cfs   |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.10 hrs   |
| Time Interval   | = 2 min       | Runoff Volume      | = 17,308 cuft |
| Drainage Area   | = 0.44 ac     | Curve Number       | = 98          |
| Tc Method       | = User        | Time of Conc. (Tc) | = 6.0 min     |
| Total Rainfall  | = 11.80 in    | Design Storm       | = NOAA-D      |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484         |



# Hydrograph Report

Project Name:

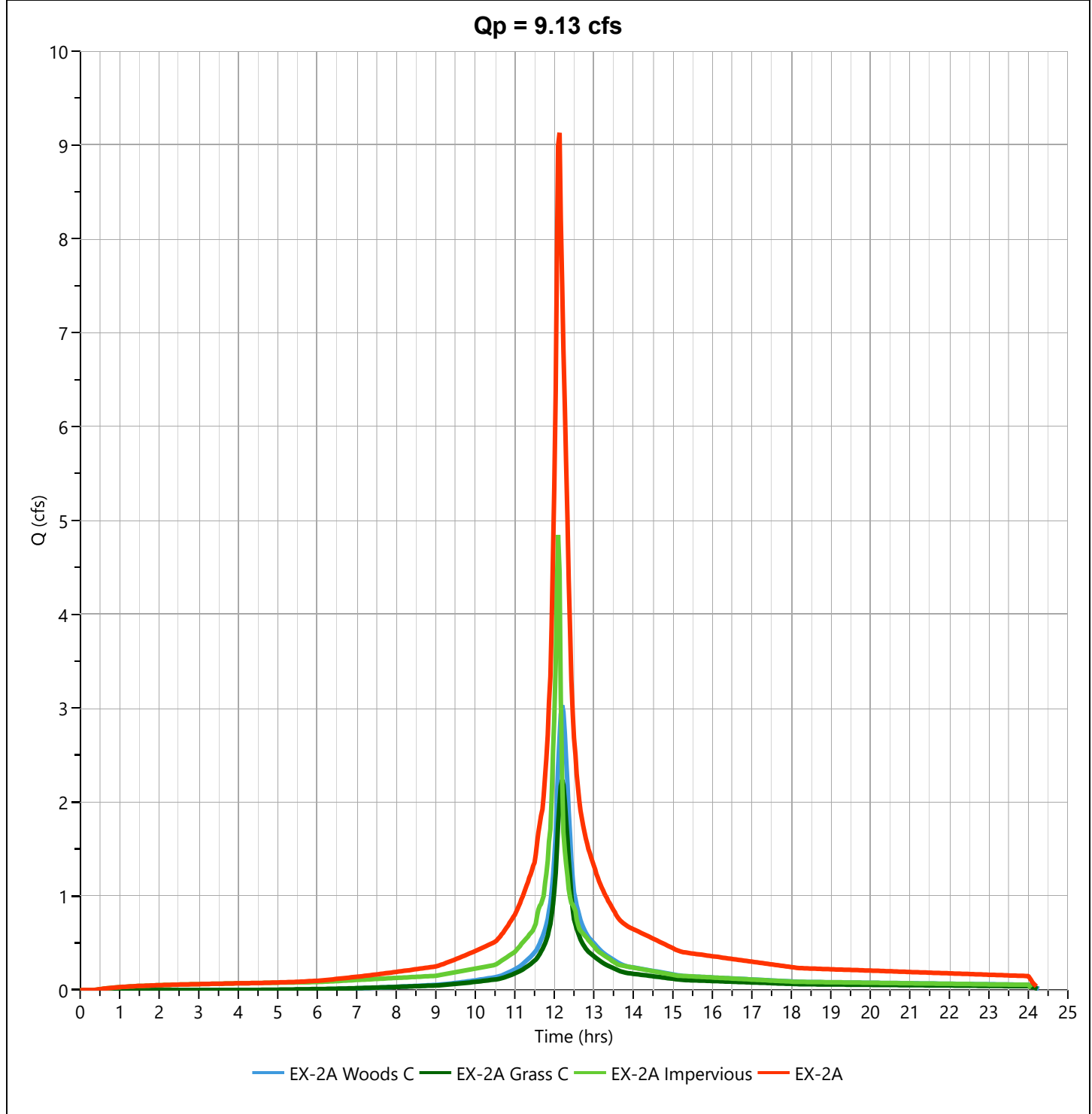
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-2A

## Hyd. No. 15

|                    |              |                     |               |
|--------------------|--------------|---------------------|---------------|
| Hydrograph Type    | = Junction   | Peak Flow           | = 9.128 cfs   |
| Storm Frequency    | = 100-yr     | Time to Peak        | = 12.13 hrs   |
| Time Interval      | = 2 min      | Hydrograph Volume   | = 39,655 cuft |
| Inflow Hydrographs | = 12, 13, 14 | Total Contrib. Area | = 1.22 ac     |





**EX-2A WATERSHED ALLOWABLE PEAK DISCHARGE**

# Hydrograph Report

Project Name:

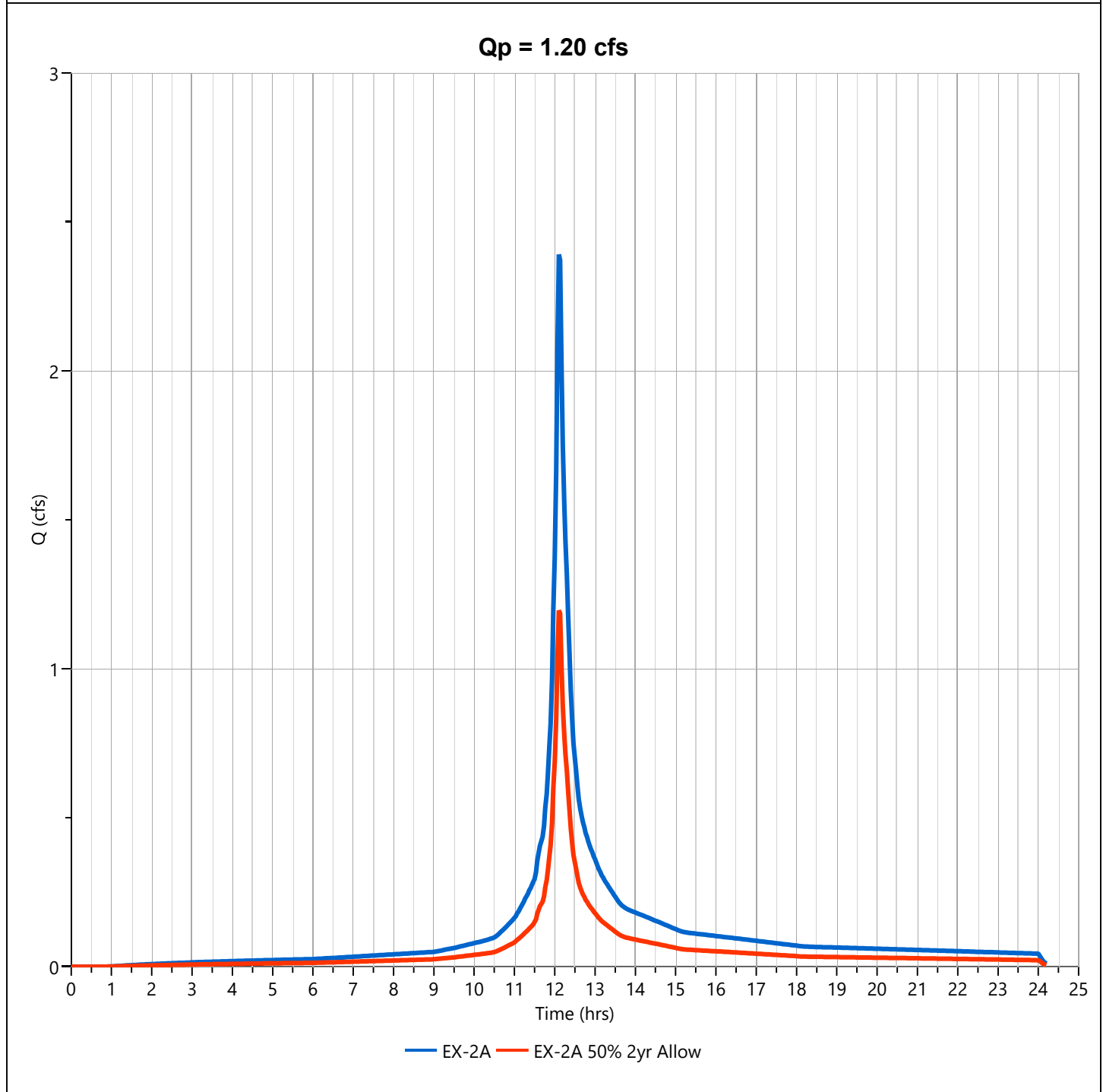
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-2A 50% 2yr Allow

## Hyd. No. 16

|                   |               |                   |              |
|-------------------|---------------|-------------------|--------------|
| Hydrograph Type   | = Diversion   | Peak Flow         | = 1.195 cfs  |
| Storm Frequency   | = 2-yr        | Time to Peak      | = 12.10 hrs  |
| Time Interval     | = 2 min       | Hydrograph Volume | = 5,011 cuft |
| Inflow Hydrograph | = 15 - EX-2A  | Diversion Method  | = Flow Ratio |
| Companion Hyd     | = 17 - <name> | Flow Ratio        | = 0.5        |



# Hydrograph Report

Project Name:

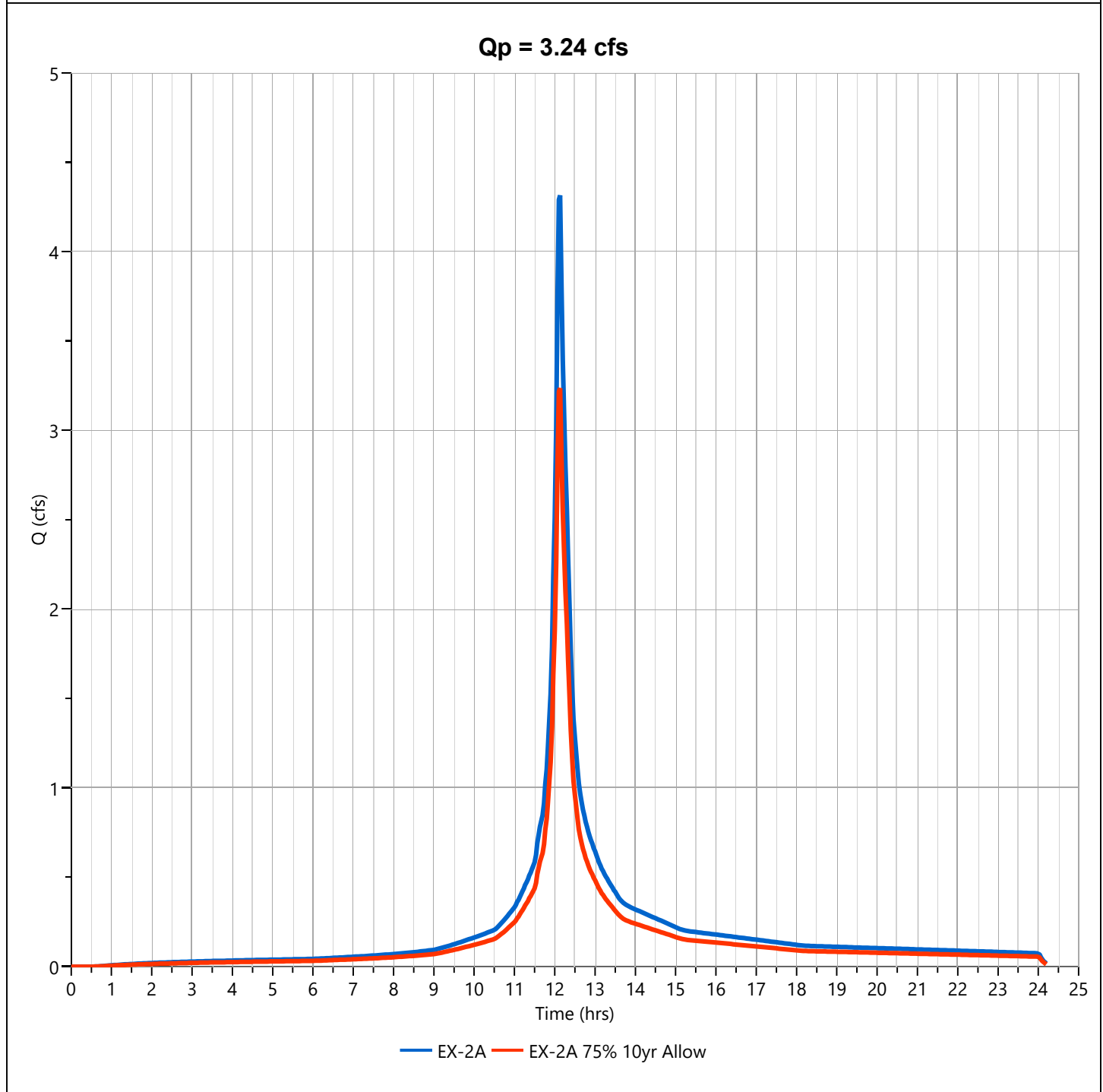
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-2A 75% 10yr Allow

## Hyd. No. 18

|                   |               |                   |               |
|-------------------|---------------|-------------------|---------------|
| Hydrograph Type   | = Diversion   | Peak Flow         | = 3.236 cfs   |
| Storm Frequency   | = 10-yr       | Time to Peak      | = 12.13 hrs   |
| Time Interval     | = 2 min       | Hydrograph Volume | = 13,786 cuft |
| Inflow Hydrograph | = 15 - EX-2A  | Diversion Method  | = Flow Ratio  |
| Companion Hyd     | = 19 - <name> | Flow Ratio        | = 0.75        |



# Hydrograph Report

Project Name:

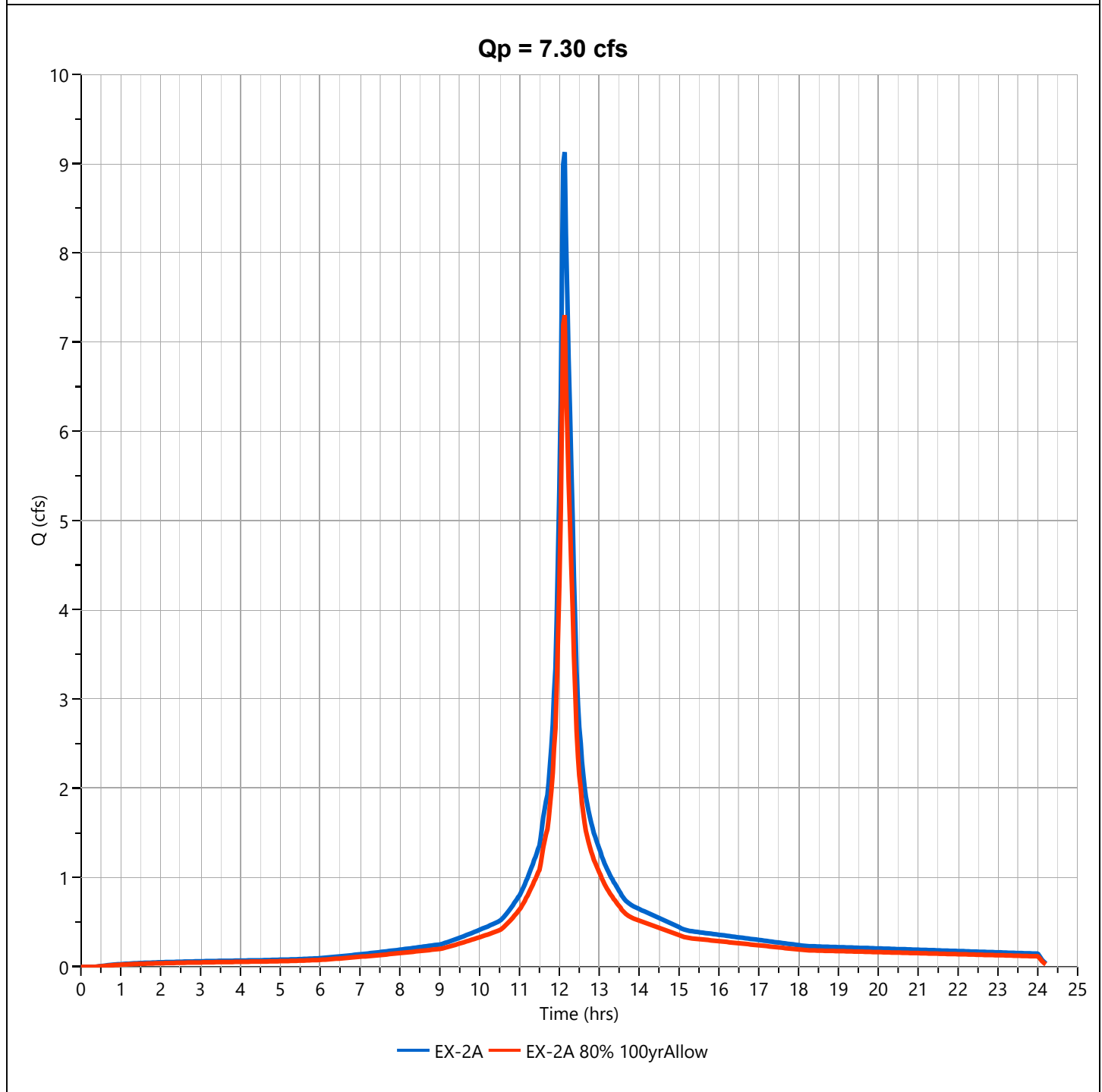
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-2A 80% 100yrAllow

## Hyd. No. 20

|                   |               |                   |               |
|-------------------|---------------|-------------------|---------------|
| Hydrograph Type   | = Diversion   | Peak Flow         | = 7.302 cfs   |
| Storm Frequency   | = 100-yr      | Time to Peak      | = 12.13 hrs   |
| Time Interval     | = 2 min       | Hydrograph Volume | = 31,724 cuft |
| Inflow Hydrograph | = 15 - EX-2A  | Diversion Method  | = Flow Ratio  |
| Companion Hyd     | = 21 - <name> | Flow Ratio        | = 0.8         |



**EX-2B WATERSHED**

Project: Beacon Unitarian Universalist Church

By: SM

Date: 11/29/2023

Location: Summit, NJ

Checked By: MJV

Date Checked: 11/29/2023

Circle One: Present Developed

Future Existing Watershed EX-2B Impervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Flow Length, L (total L < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. Compute T<sub>t</sub>

$$T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} s^{0.4}}$$

|            |                        |                               |  |
|------------|------------------------|-------------------------------|--|
| Segment ID | <b>1</b>               | <b>2</b>                      |  |
|            | <b>Smooth Surfaces</b> | <b>Woods Light Underbrush</b> |  |
|            | <b>0.011</b>           | <b>0.40</b>                   |  |
| ft         | <b>6</b>               | <b>94</b>                     |  |
| in         | <b>4.12</b>            | <b>4.12</b>                   |  |
| ft/ft      | <b>0.050</b>           | <b>0.046</b>                  |  |
| hr         | <b>0.001</b>           | <b>0.216</b>                  |  |

Sheet Flow Sub-Total **0.217 hours**

**Shallow Concentrated Flow**

7. Surface Description
8. Flow Length, L
9. Watercourse Slope, s
10. Average Velocity, V (NEH table 15-3)
11. Compute T<sub>t</sub>

$$T_t = \frac{L}{3600 V}$$

|            |                  |                  |  |
|------------|------------------|------------------|--|
| Segment ID | <b>3</b>         | <b>4</b>         |  |
|            | <b>Woodlands</b> | <b>Woodlands</b> |  |
| ft         | <b>69</b>        | <b>126</b>       |  |
| ft/ft      | <b>0.028</b>     | <b>0.008</b>     |  |
| ft/s       | <b>0.84</b>      | <b>0.46</b>      |  |
| hr         | <b>0.023</b>     | <b>0.076</b>     |  |

Shallow Conc. Flow Sub-Total **0.099 hours**

**Channel Flow**

12. Flow Length, L
13. Cross Sectional flow area, a
14. Wetted Perimeter, P<sub>w</sub>
15. Hydraulic Radius, r
16. Channel Slope, s
17. Manning's Roughness Coeff., n
18. Velocity, V
19. Compute T<sub>t</sub>

$$r = a / P_w$$

$$V = (1.49 r^{2/3} s^{1/2}) / n$$

$$T_t = \frac{L}{3600 V}$$

|                 |  |  |  |
|-----------------|--|--|--|
| Segment ID      |  |  |  |
| ft              |  |  |  |
| ft <sup>2</sup> |  |  |  |
| ft              |  |  |  |
| ft              |  |  |  |
| ft/ft           |  |  |  |
| ft/s            |  |  |  |
| hr              |  |  |  |

Channel Flow Sub-Total **0.000 hours**

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>

(Add Sub-Total T<sub>t</sub> from prior steps)

|                                  |                    |
|----------------------------------|--------------------|
| Total T <sub>c</sub> (hours) =   | <b>0.316 hours</b> |
| Total T <sub>c</sub> (minutes) = | <b>19 minutes</b>  |

Project: Beacon Unitarian Universalist Church

By: SM

Date: 11/29/2023

Location: Summit, NJ

Checked By: MJV

Date Checked: 11/29/2023

Circle One: Present Developed

Future Existing Watershed EX-2B Pervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Flow Length, L (total L < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. Compute T<sub>t</sub>

$$T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} s^{0.4}}$$

|            |                      |                               |  |
|------------|----------------------|-------------------------------|--|
| Segment ID | <b>1</b>             | <b>2</b>                      |  |
|            | <b>Dense Grasses</b> | <b>Woods Light Underbrush</b> |  |
|            | <b>0.24</b>          | <b>0.40</b>                   |  |
| ft         | <b>37</b>            | <b>63</b>                     |  |
| in         | <b>4.12</b>          | <b>4.12</b>                   |  |
| ft/ft      | <b>0.065</b>         | <b>0.025</b>                  |  |
| hr         | <b>0.059</b>         | <b>0.198</b>                  |  |

Sheet Flow Sub-Total **0.257 hours**

**Shallow Concentrated Flow**

7. Surface Description
8. Flow Length, L
9. Watercourse Slope, s
10. Average Velocity, V (NEH table 15-3)
11. Compute T<sub>t</sub>

$$T_t = \frac{L}{3600 V}$$

|            |                  |                  |  |
|------------|------------------|------------------|--|
| Segment ID | <b>3</b>         | <b>4</b>         |  |
|            | <b>Woodlands</b> | <b>Woodlands</b> |  |
| ft         | <b>69</b>        | <b>126</b>       |  |
| ft/ft      | <b>0.028</b>     | <b>0.008</b>     |  |
| ft/s       | <b>0.84</b>      | <b>0.46</b>      |  |
| hr         | <b>0.023</b>     | <b>0.076</b>     |  |

Shallow Conc. Flow Sub-Total **0.099 hours**

**Channel Flow**

12. Flow Length, L
13. Cross Sectional flow area, a
14. Wetted Perimeter, P<sub>w</sub>
15. Hydraulic Radius, r
16. Channel Slope, s
17. Manning's Roughness Coeff., n
18. Velocity, V
19. Compute T<sub>t</sub>

$$r = a / P_w$$

$$V = (1.49 r^{2/3} s^{1/2}) / n$$

$$T_t = \frac{L}{3600 V}$$

|                 |  |  |  |
|-----------------|--|--|--|
| Segment ID      |  |  |  |
| ft              |  |  |  |
| ft <sup>2</sup> |  |  |  |
| ft              |  |  |  |
| ft              |  |  |  |
| ft/ft           |  |  |  |
| ft/s            |  |  |  |
| hr              |  |  |  |

Channel Flow Sub-Total **0.000 hours**

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>

(Add Sub-Total T<sub>t</sub> from prior steps)

|                                  |                    |
|----------------------------------|--------------------|
| Total T <sub>c</sub> (hours) =   | <b>0.356 hours</b> |
| Total T <sub>c</sub> (minutes) = | <b>21 minutes</b>  |

# Hydrograph Report

Project Name:

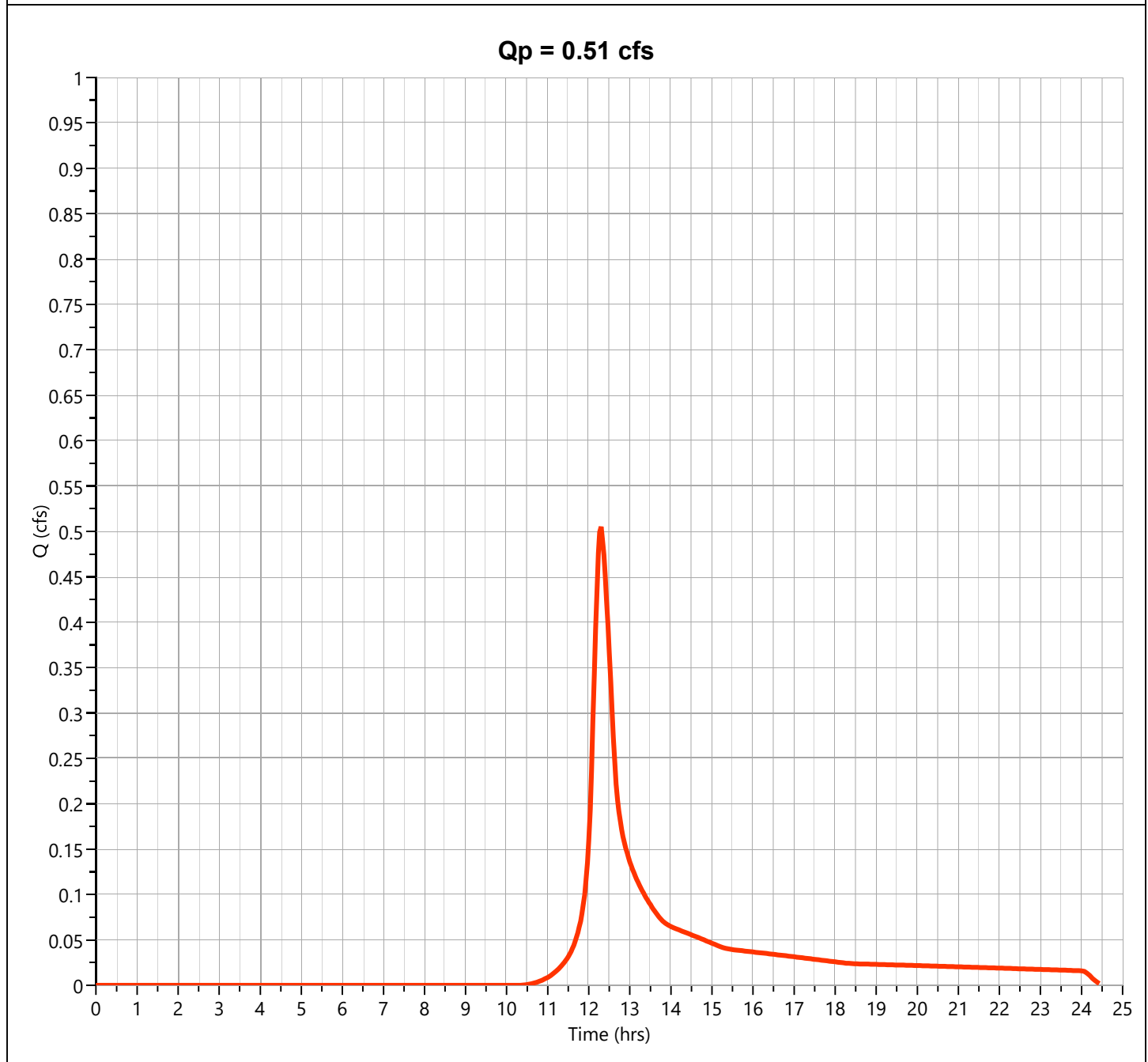
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-2B Woods C

## Hyd. No. 23

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.505 cfs  |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.30 hrs  |
| Time Interval   | = 2 min       | Runoff Volume      | = 2,606 cuft |
| Drainage Area   | = 0.5 ac      | Curve Number       | = 70         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 21.0 min   |
| Total Rainfall  | = 4.12 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |





# Hydrograph Report

Project Name:

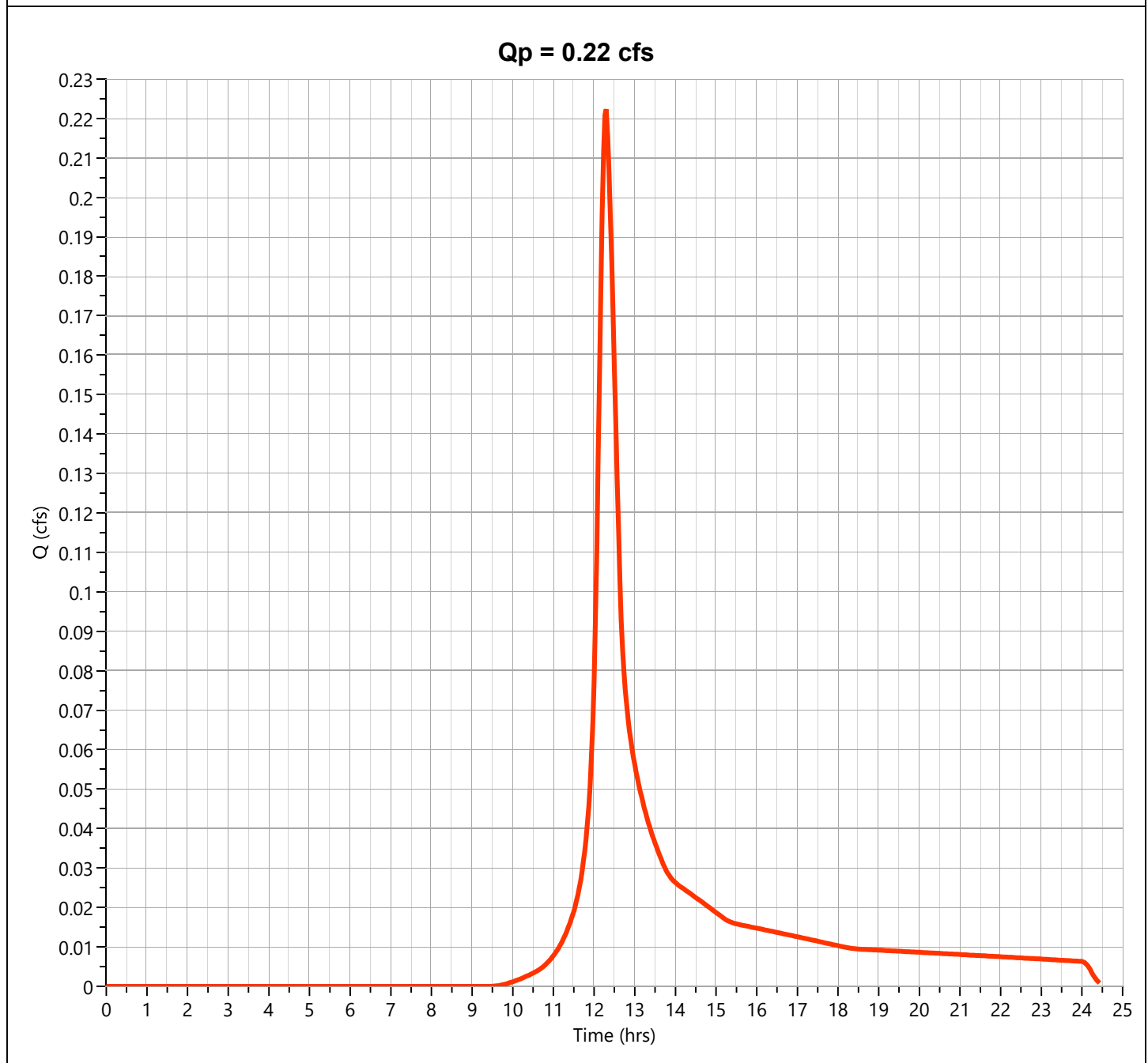
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-2B Grass C

## Hyd. No. 24

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.222 cfs  |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.30 hrs  |
| Time Interval   | = 2 min       | Runoff Volume      | = 1,121 cuft |
| Drainage Area   | = 0.18 ac     | Curve Number       | = 74         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 21.0 min   |
| Total Rainfall  | = 4.12 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

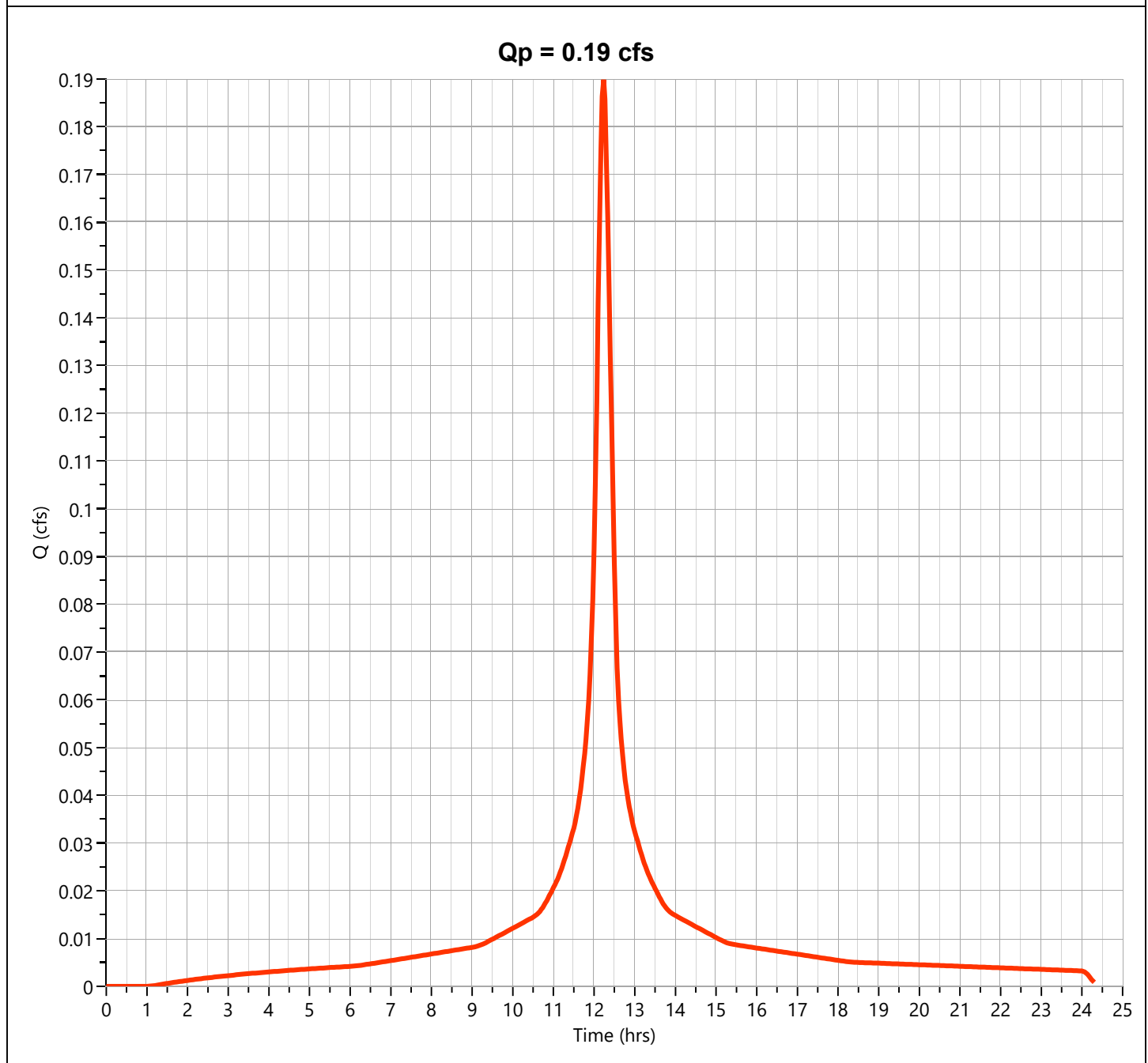
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-2B Impervious

## Hyd. No. 25

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.190 cfs |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.23 hrs |
| Time Interval   | = 2 min       | Runoff Volume      | = 987 cuft  |
| Drainage Area   | = 0.07 ac     | Curve Number       | = 98        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 19.0 min  |
| Total Rainfall  | = 4.12 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

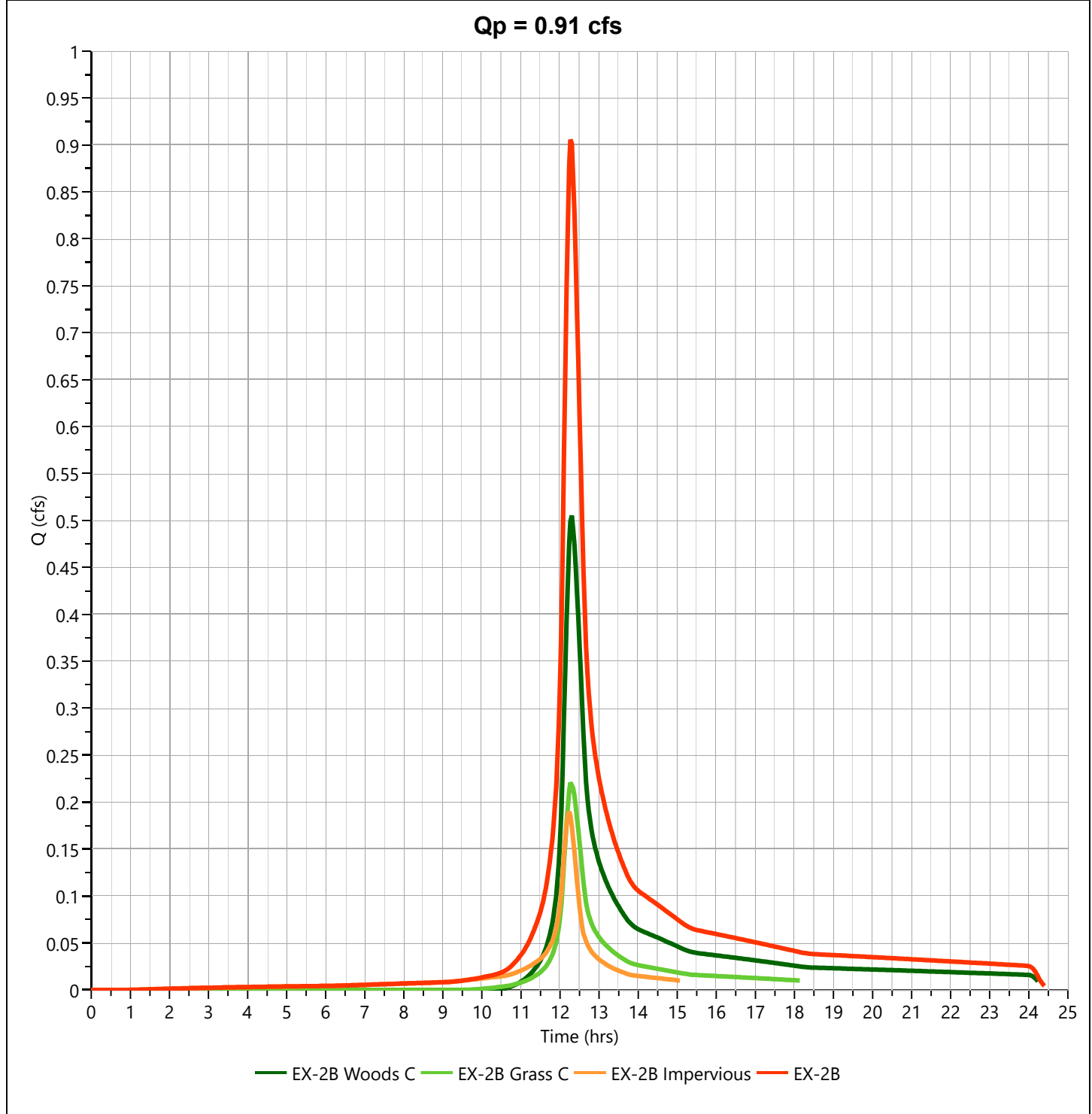
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-2B

## Hyd. No. 26

|                    |              |                     |              |
|--------------------|--------------|---------------------|--------------|
| Hydrograph Type    | = Junction   | Peak Flow           | = 0.906 cfs  |
| Storm Frequency    | = 2-yr       | Time to Peak        | = 12.27 hrs  |
| Time Interval      | = 2 min      | Hydrograph Volume   | = 4,713 cuft |
| Inflow Hydrographs | = 23, 24, 25 | Total Contrib. Area | = 0.75 ac    |



# Hydrograph Report

Project Name:

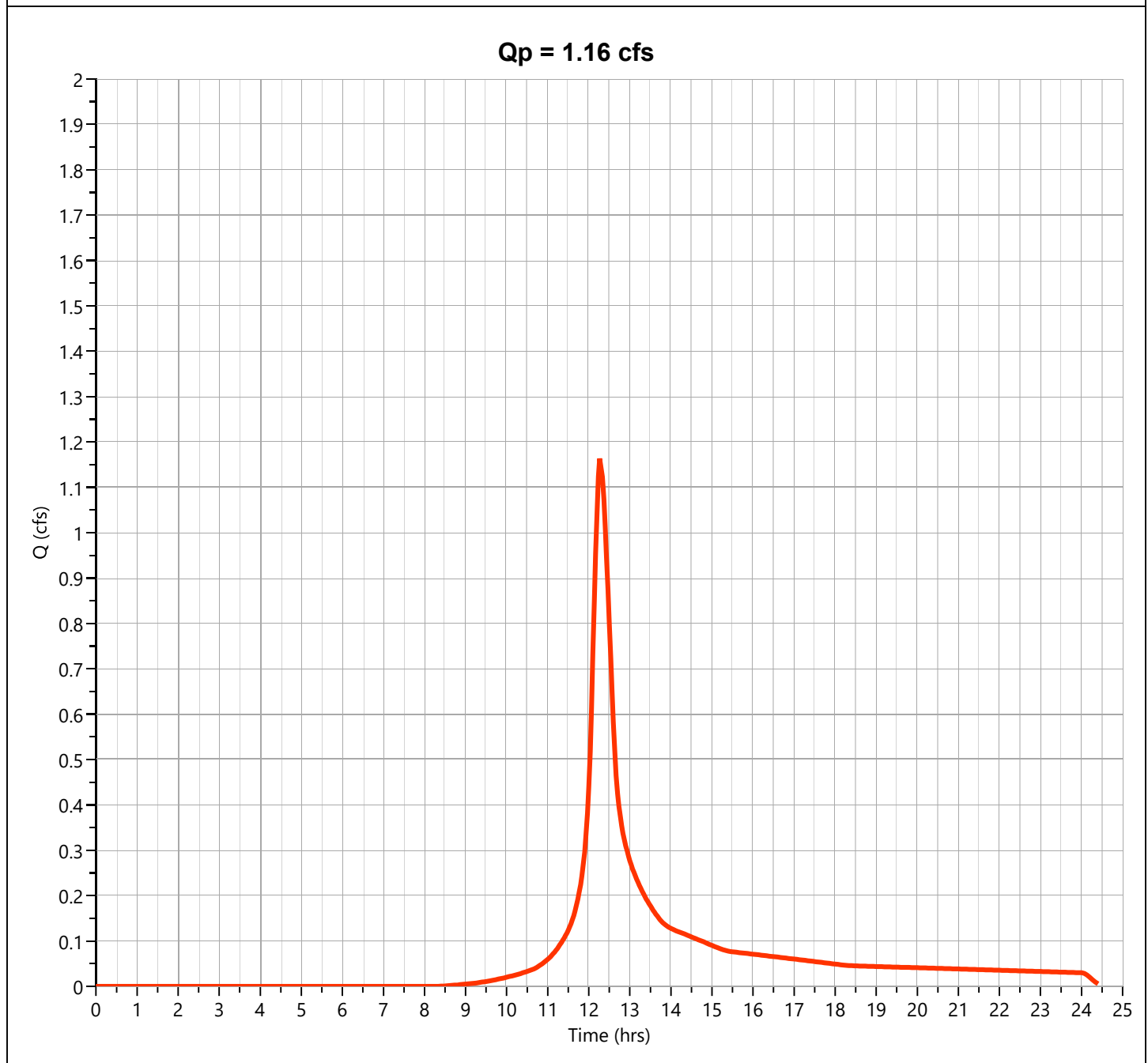
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-2B Woods C

## Hyd. No. 23

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 1.165 cfs  |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.30 hrs  |
| Time Interval   | = 2 min       | Runoff Volume      | = 5,805 cuft |
| Drainage Area   | = 0.5 ac      | Curve Number       | = 70         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 21.0 min   |
| Total Rainfall  | = 6.42 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

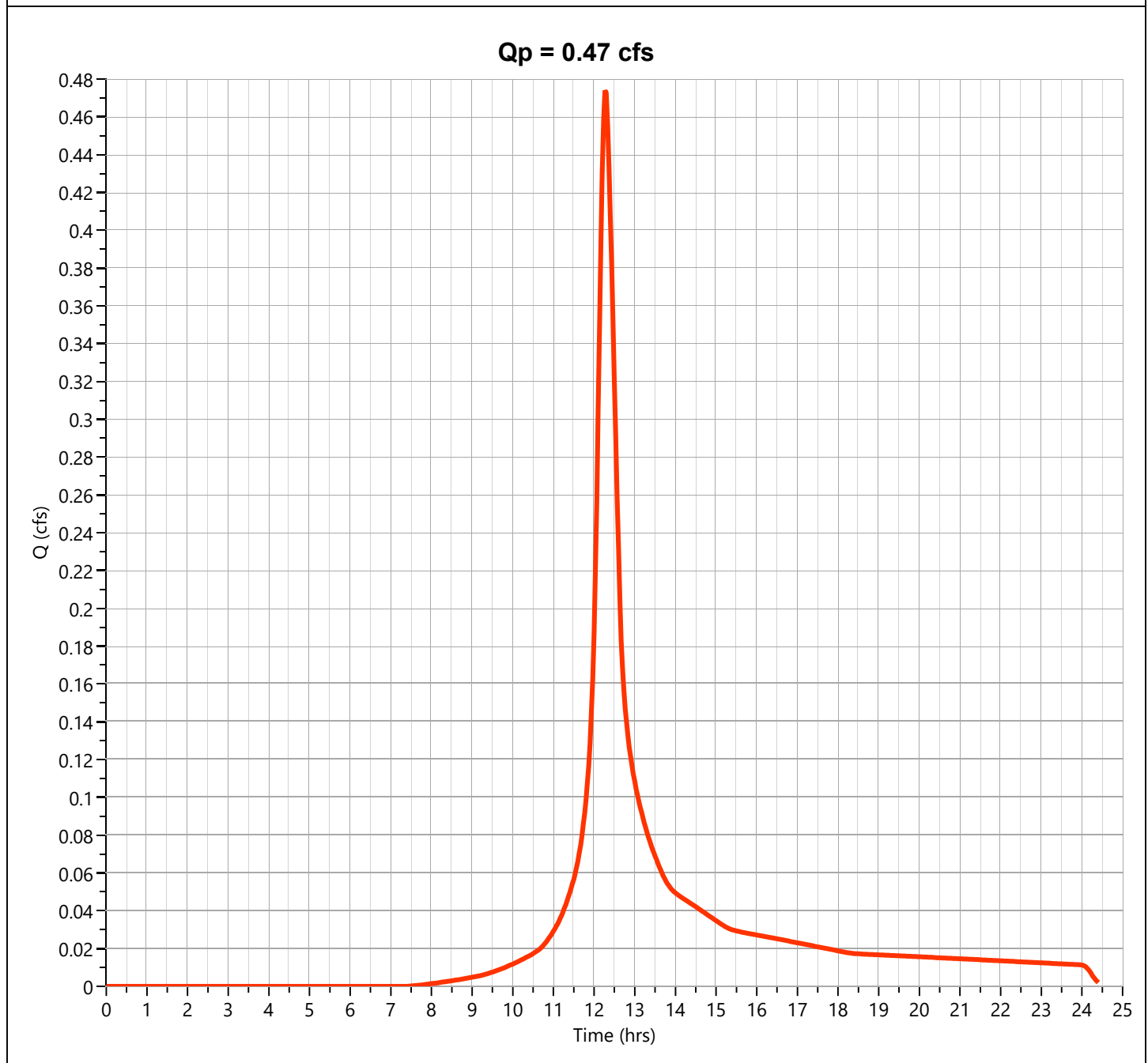
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-2B Grass C

## Hyd. No. 24

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.474 cfs  |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.27 hrs  |
| Time Interval   | = 2 min       | Runoff Volume      | = 2,355 cuft |
| Drainage Area   | = 0.18 ac     | Curve Number       | = 74         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 21.0 min   |
| Total Rainfall  | = 6.42 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

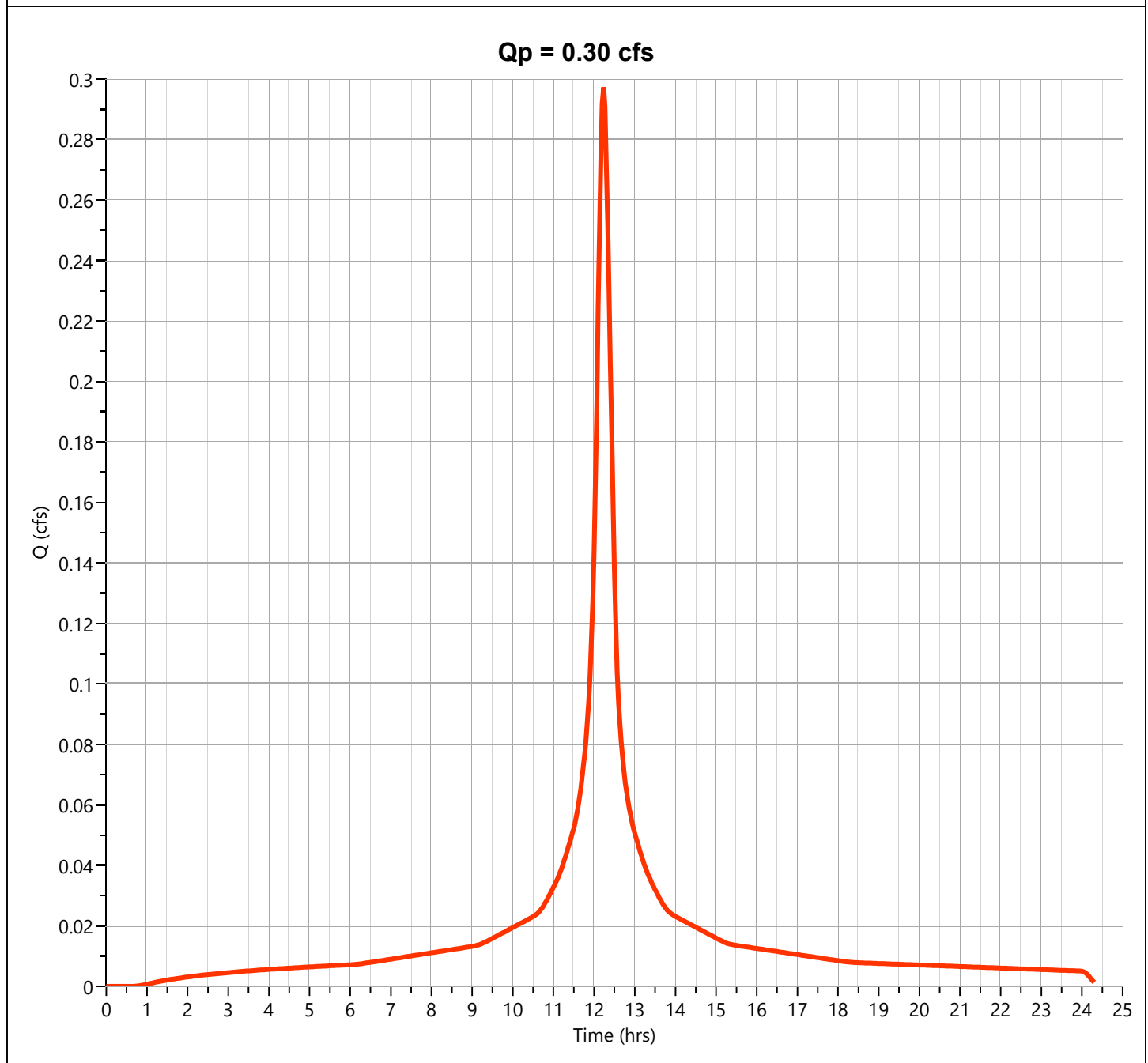
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-2B Impervious

## Hyd. No. 25

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.297 cfs  |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.23 hrs  |
| Time Interval   | = 2 min       | Runoff Volume      | = 1,571 cuft |
| Drainage Area   | = 0.07 ac     | Curve Number       | = 98         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 19.0 min   |
| Total Rainfall  | = 6.42 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

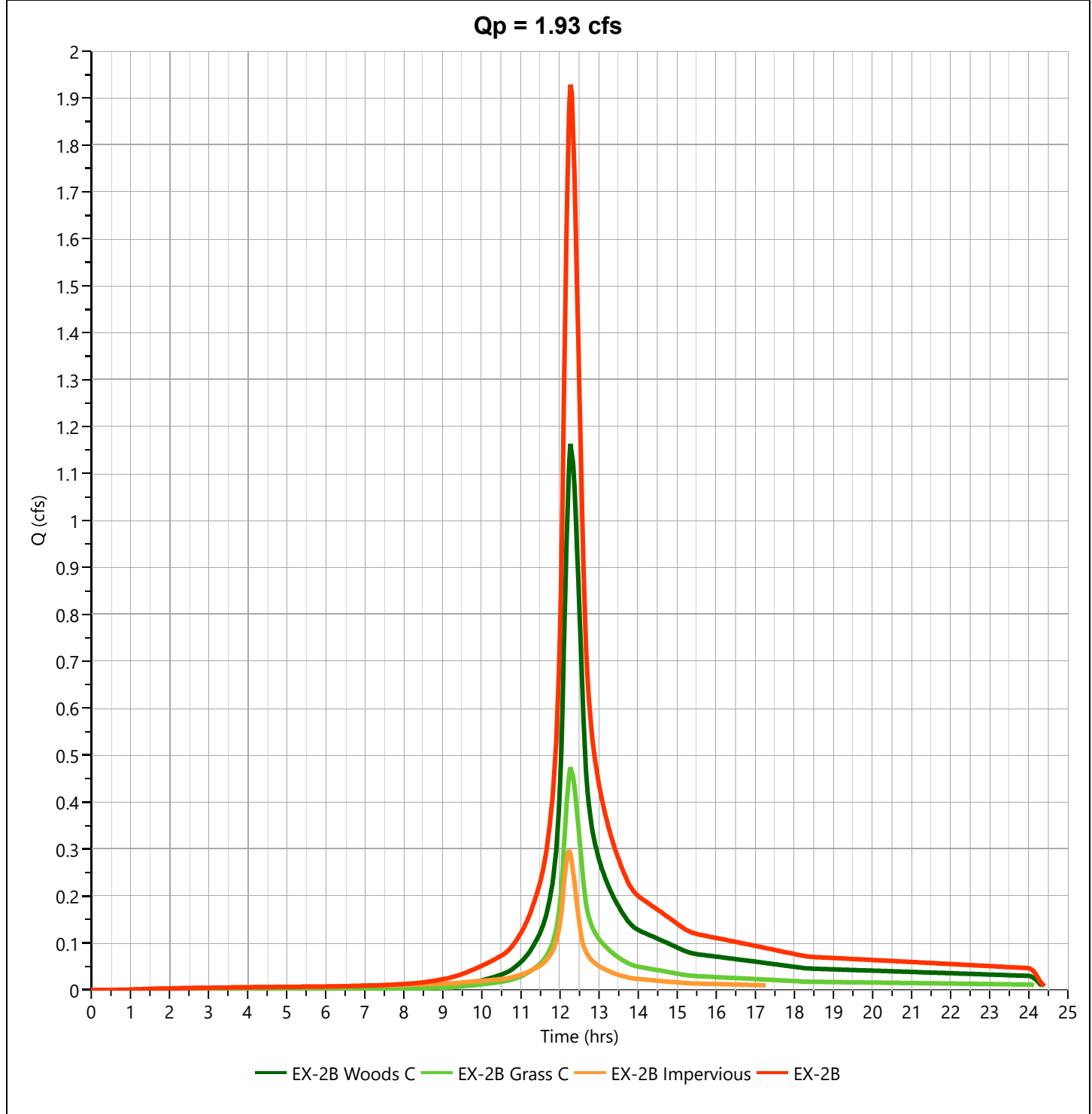
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-2B

## Hyd. No. 26

|                    |              |                     |              |
|--------------------|--------------|---------------------|--------------|
| Hydrograph Type    | = Junction   | Peak Flow           | = 1.928 cfs  |
| Storm Frequency    | = 10-yr      | Time to Peak        | = 12.27 hrs  |
| Time Interval      | = 2 min      | Hydrograph Volume   | = 9,731 cuft |
| Inflow Hydrographs | = 23, 24, 25 | Total Contrib. Area | = 0.75 ac    |



# Hydrograph Report

Project Name:

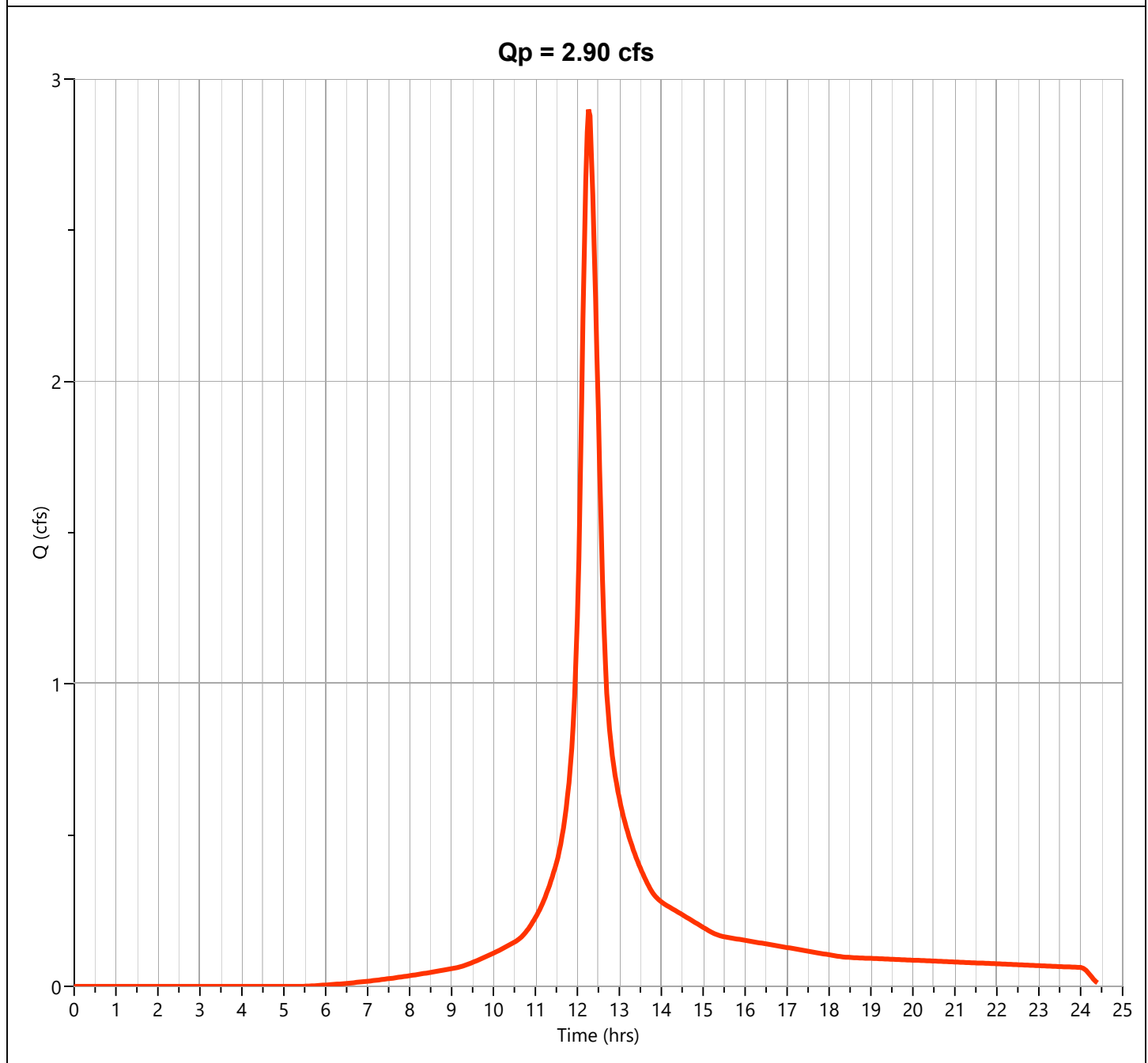
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-2B Woods C

## Hyd. No. 23

|                 |               |                    |               |
|-----------------|---------------|--------------------|---------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 2.898 cfs   |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.27 hrs   |
| Time Interval   | = 2 min       | Runoff Volume      | = 14,527 cuft |
| Drainage Area   | = 0.5 ac      | Curve Number       | = 70          |
| Tc Method       | = User        | Time of Conc. (Tc) | = 21.0 min    |
| Total Rainfall  | = 11.80 in    | Design Storm       | = NOAA-D      |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484         |





# Hydrograph Report

Project Name:

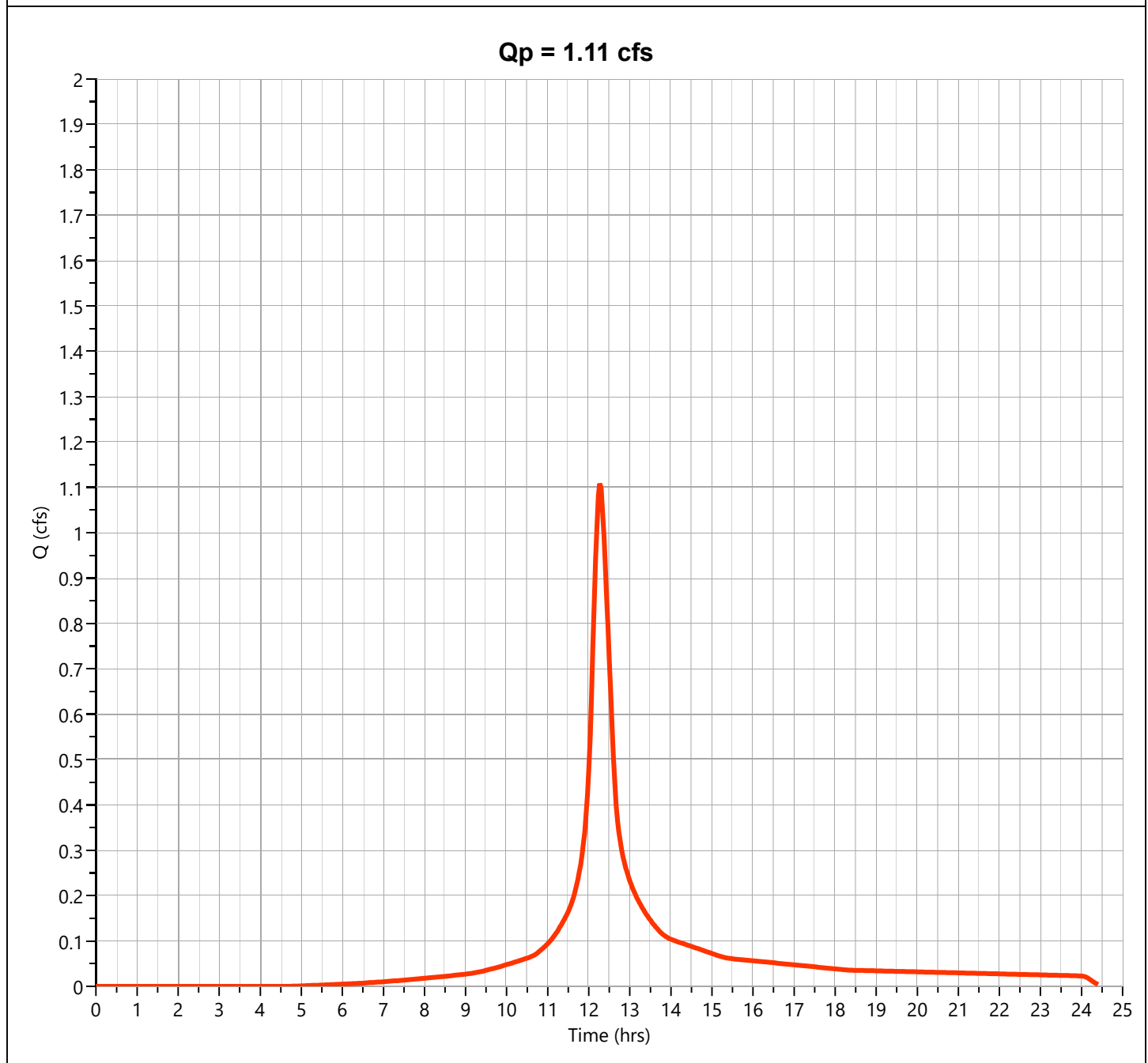
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-2B Grass C

## Hyd. No. 24

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 1.108 cfs  |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.27 hrs  |
| Time Interval   | = 2 min       | Runoff Volume      | = 5,606 cuft |
| Drainage Area   | = 0.18 ac     | Curve Number       | = 74         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 21.0 min   |
| Total Rainfall  | = 11.80 in    | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

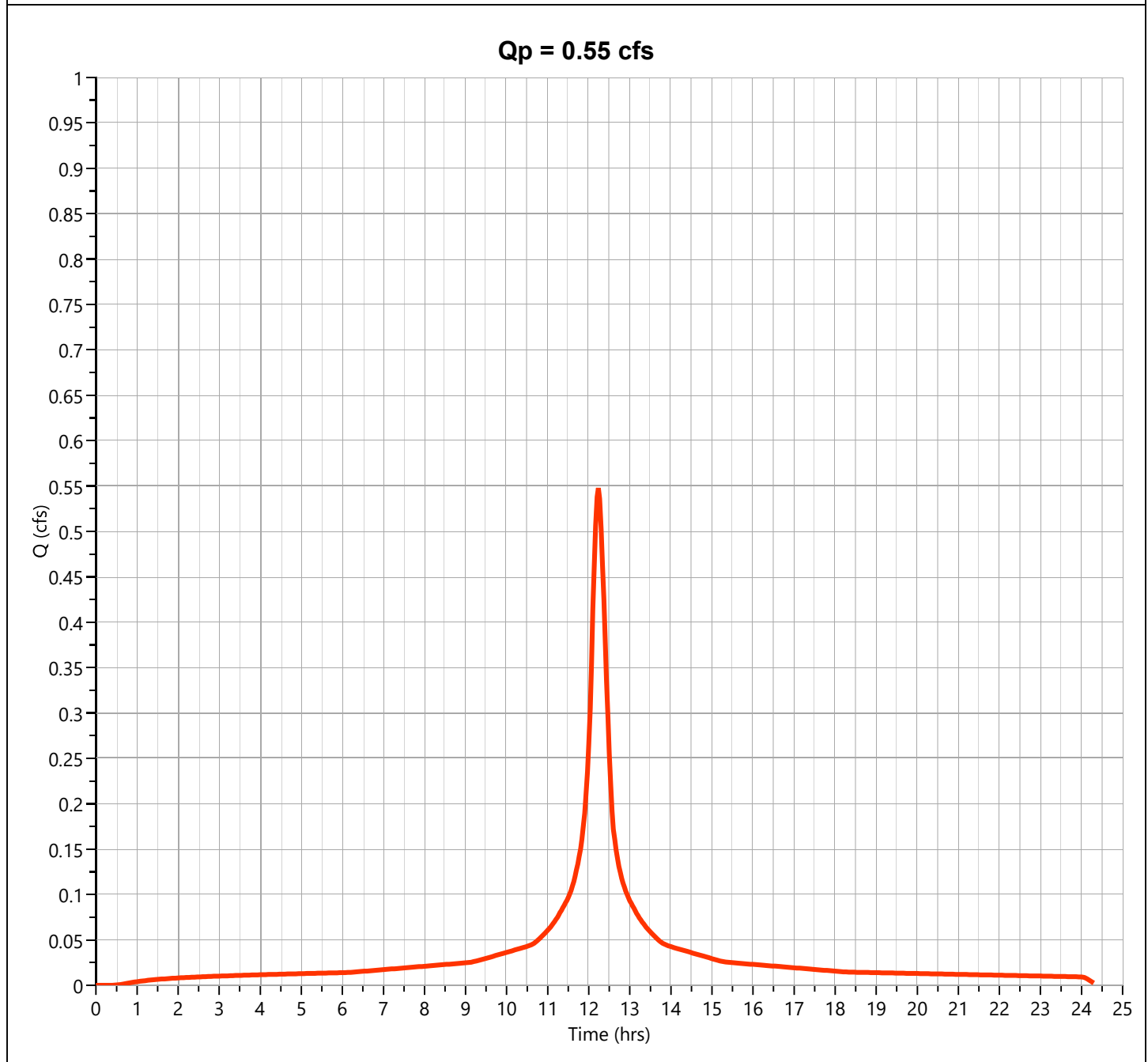
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-2B Impervious

## Hyd. No. 25

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.548 cfs  |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.23 hrs  |
| Time Interval   | = 2 min       | Runoff Volume      | = 2,937 cuft |
| Drainage Area   | = 0.07 ac     | Curve Number       | = 98         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 19.0 min   |
| Total Rainfall  | = 11.80 in    | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

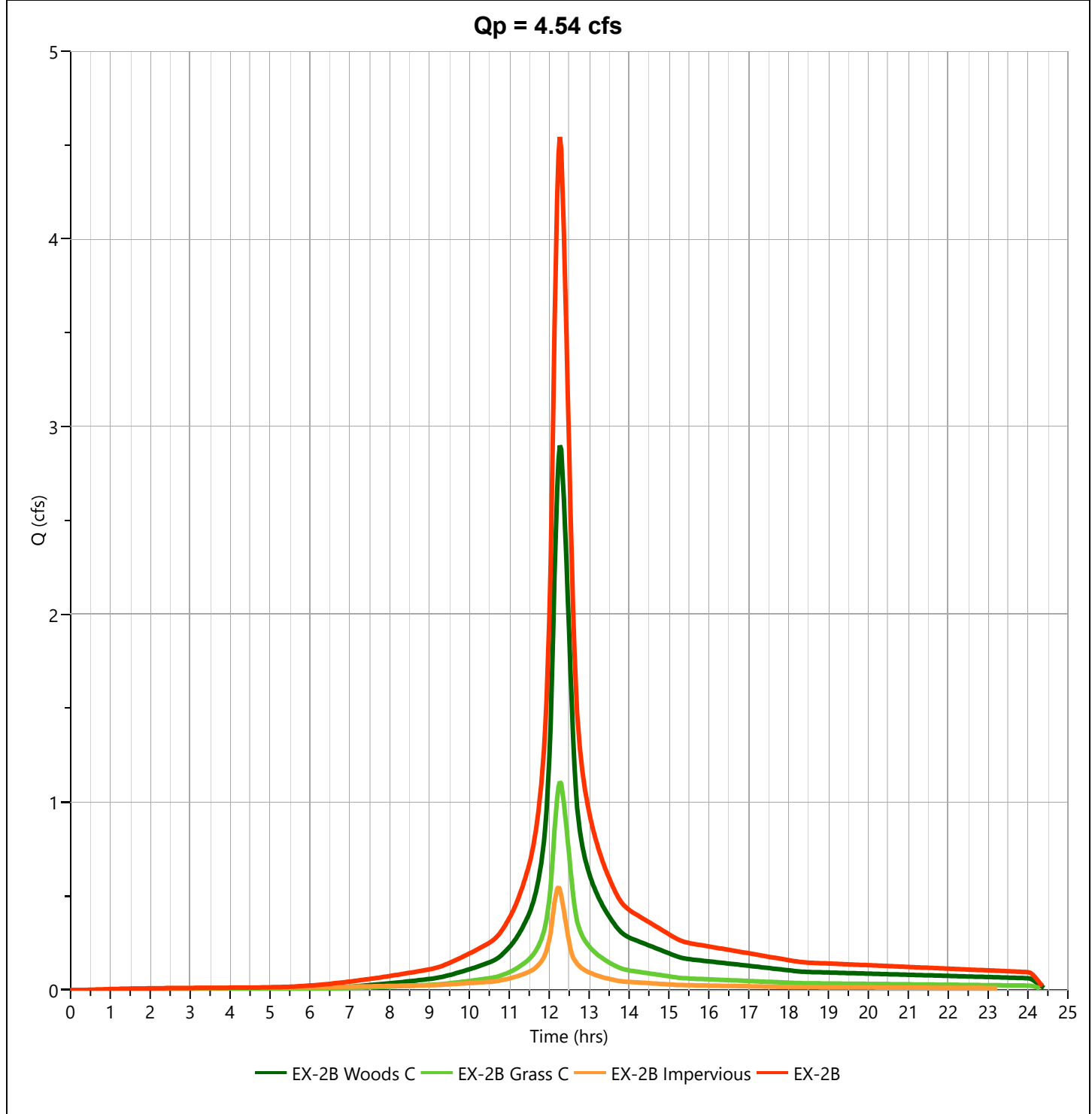
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-2B

## Hyd. No. 26

|                    |              |                     |               |
|--------------------|--------------|---------------------|---------------|
| Hydrograph Type    | = Junction   | Peak Flow           | = 4.542 cfs   |
| Storm Frequency    | = 100-yr     | Time to Peak        | = 12.27 hrs   |
| Time Interval      | = 2 min      | Hydrograph Volume   | = 23,069 cuft |
| Inflow Hydrographs | = 23, 24, 25 | Total Contrib. Area | = 0.75 ac     |



**TOTAL EXISTING FLOW TO POA-2**

# Hydrograph Report

Project Name:

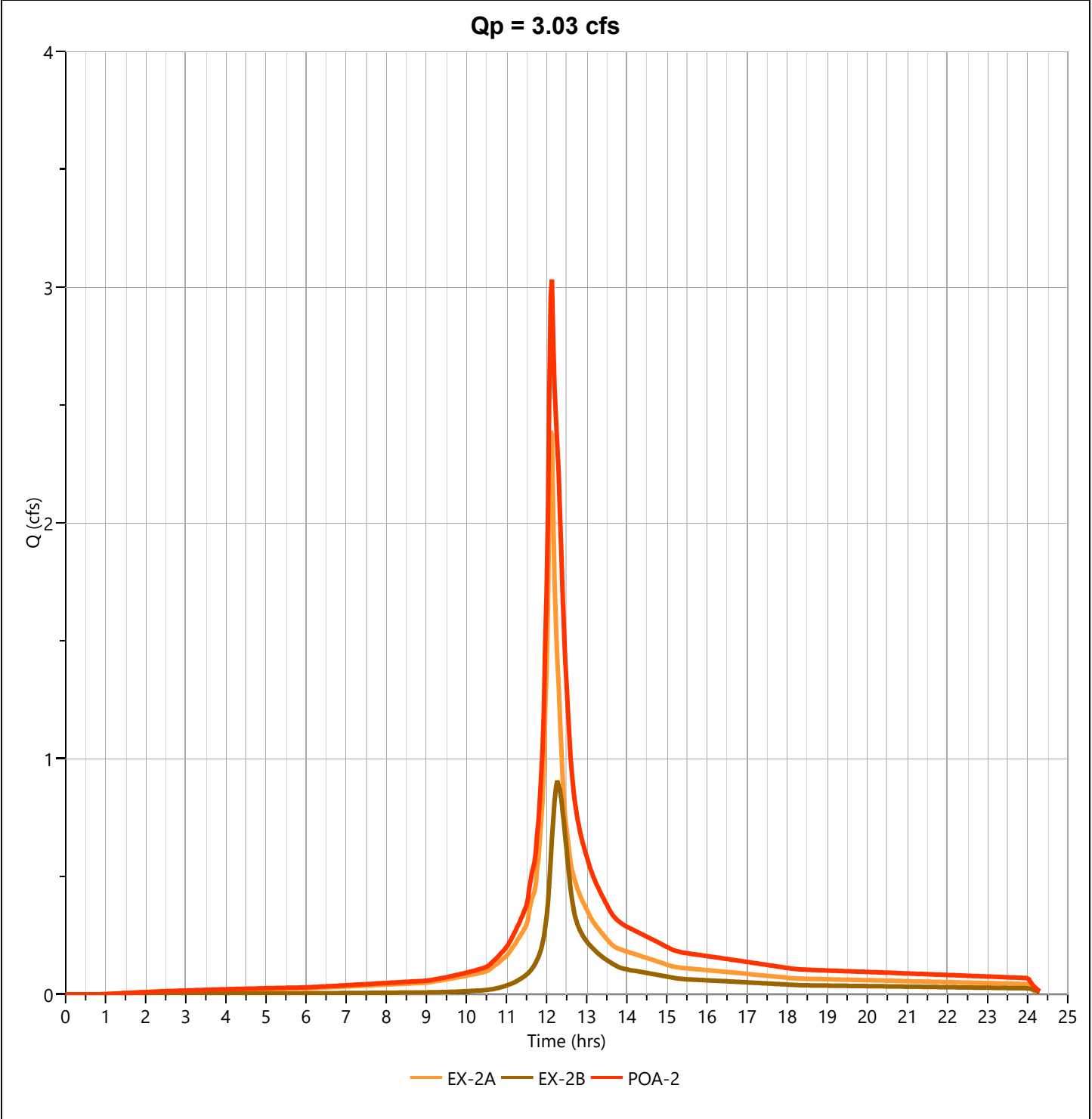
Hydrology Studio v 3.0.0.29

11-29-2023

## POA-2

## Hyd. No. 28

|                    |            |                     |               |
|--------------------|------------|---------------------|---------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 3.032 cfs   |
| Storm Frequency    | = 2-yr     | Time to Peak        | = 12.13 hrs   |
| Time Interval      | = 2 min    | Hydrograph Volume   | = 14,735 cuft |
| Inflow Hydrographs | = 15, 26   | Total Contrib. Area | = 1.97 ac     |



# Hydrograph Report

Project Name:

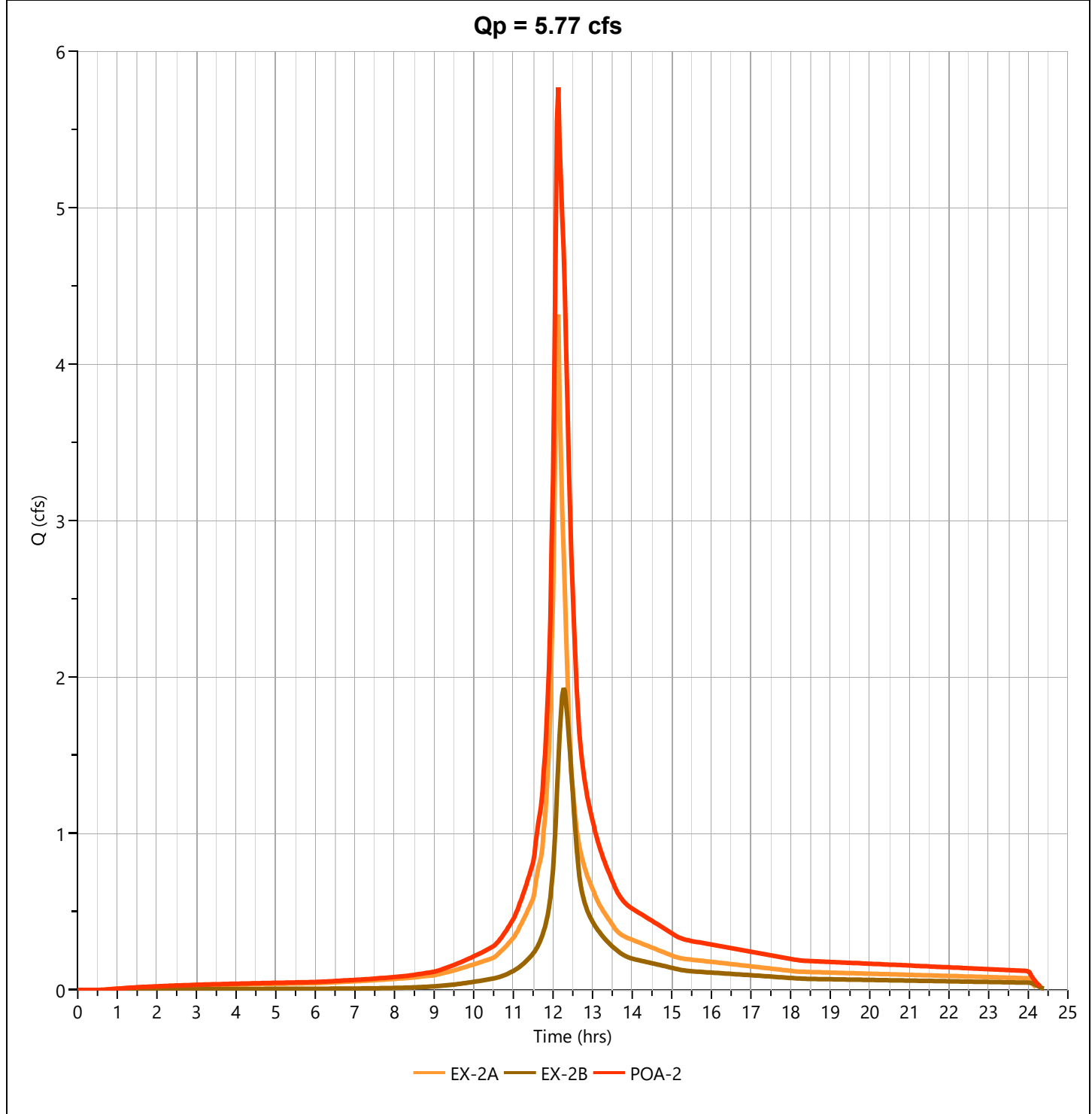
Hydrology Studio v 3.0.0.29

11-29-2023

## POA-2

## Hyd. No. 28

|                    |            |                     |               |
|--------------------|------------|---------------------|---------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 5.768 cfs   |
| Storm Frequency    | = 10-yr    | Time to Peak        | = 12.13 hrs   |
| Time Interval      | = 2 min    | Hydrograph Volume   | = 28,113 cuft |
| Inflow Hydrographs | = 15, 26   | Total Contrib. Area | = 1.97 ac     |



# Hydrograph Report

Project Name:

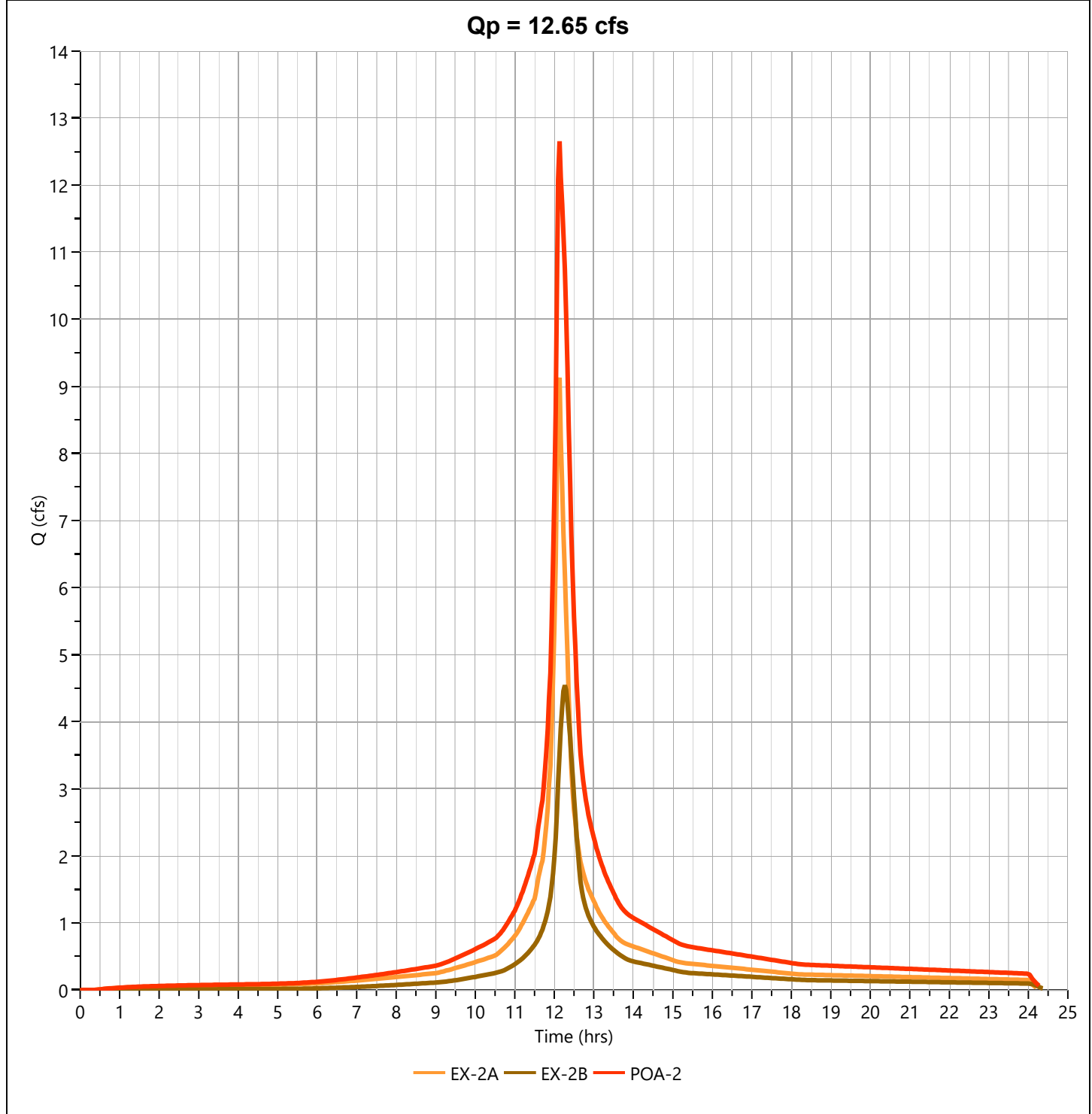
Hydrology Studio v 3.0.0.29

11-29-2023

## POA-2

## Hyd. No. 28

|                    |            |                     |               |
|--------------------|------------|---------------------|---------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 12.65 cfs   |
| Storm Frequency    | = 100-yr   | Time to Peak        | = 12.13 hrs   |
| Time Interval      | = 2 min    | Hydrograph Volume   | = 62,725 cuft |
| Inflow Hydrographs | = 15, 26   | Total Contrib. Area | = 1.97 ac     |



**TOTAL ALLOWABLE FLOW TO POA-2**



# Hydrograph Report

Project Name:

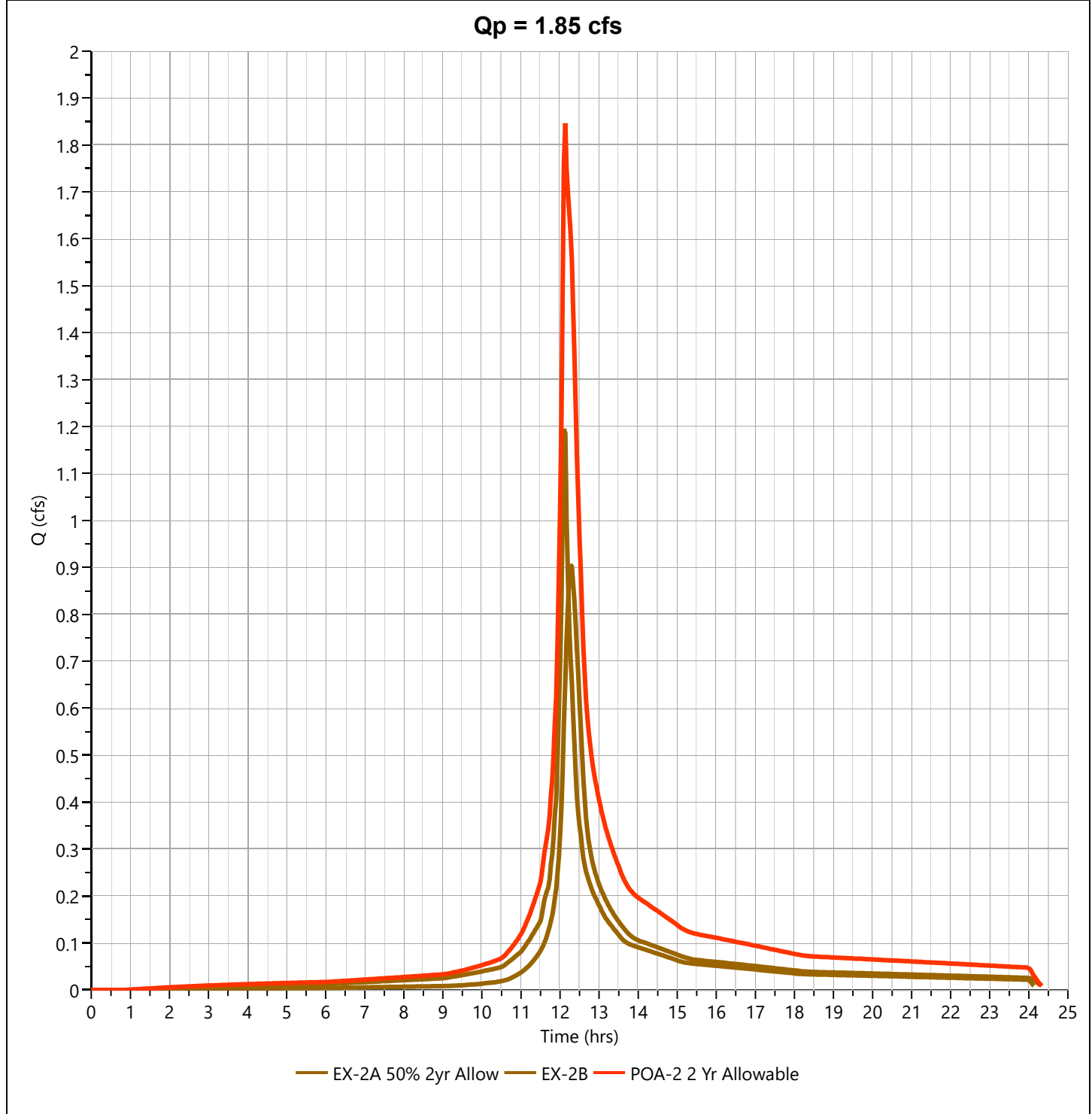
Hydrology Studio v 3.0.0.29

11-29-2023

## POA-2 2 Yr Allowable

## Hyd. No. 29

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 1.846 cfs  |
| Storm Frequency    | = 2-yr     | Time to Peak        | = 12.13 hrs  |
| Time Interval      | = 2 min    | Hydrograph Volume   | = 9,724 cuft |
| Inflow Hydrographs | = 16, 26   | Total Contrib. Area | = 0.75 ac    |



# Hydrograph Report

Project Name:

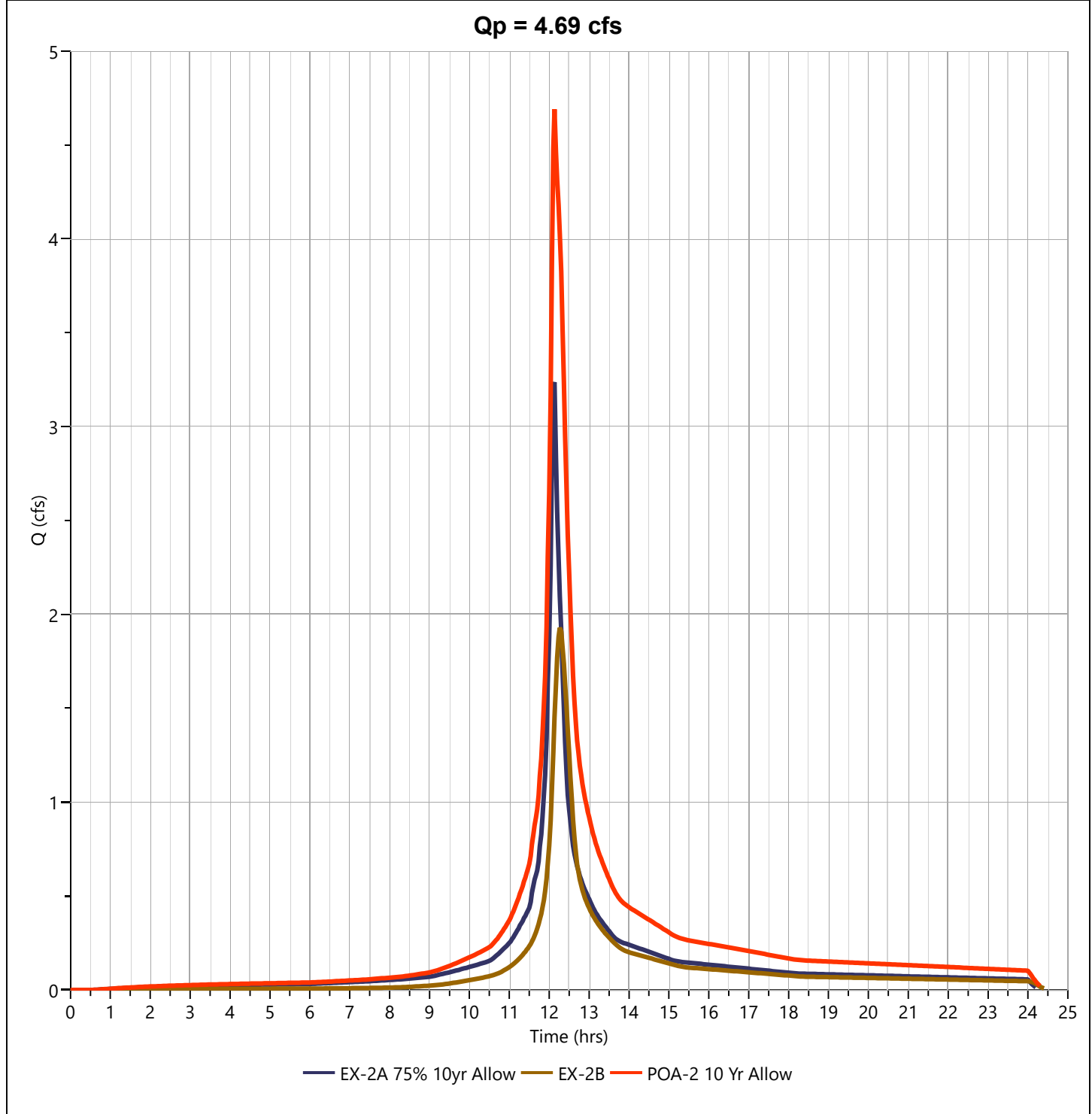
Hydrology Studio v 3.0.0.29

11-29-2023

## POA-2 10 Yr Allow

## Hyd. No. 30

|                    |            |                     |               |
|--------------------|------------|---------------------|---------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 4.689 cfs   |
| Storm Frequency    | = 10-yr    | Time to Peak        | = 12.13 hrs   |
| Time Interval      | = 2 min    | Hydrograph Volume   | = 23,517 cuft |
| Inflow Hydrographs | = 18, 26   | Total Contrib. Area | = 0.75 ac     |



# Hydrograph Report

Project Name:

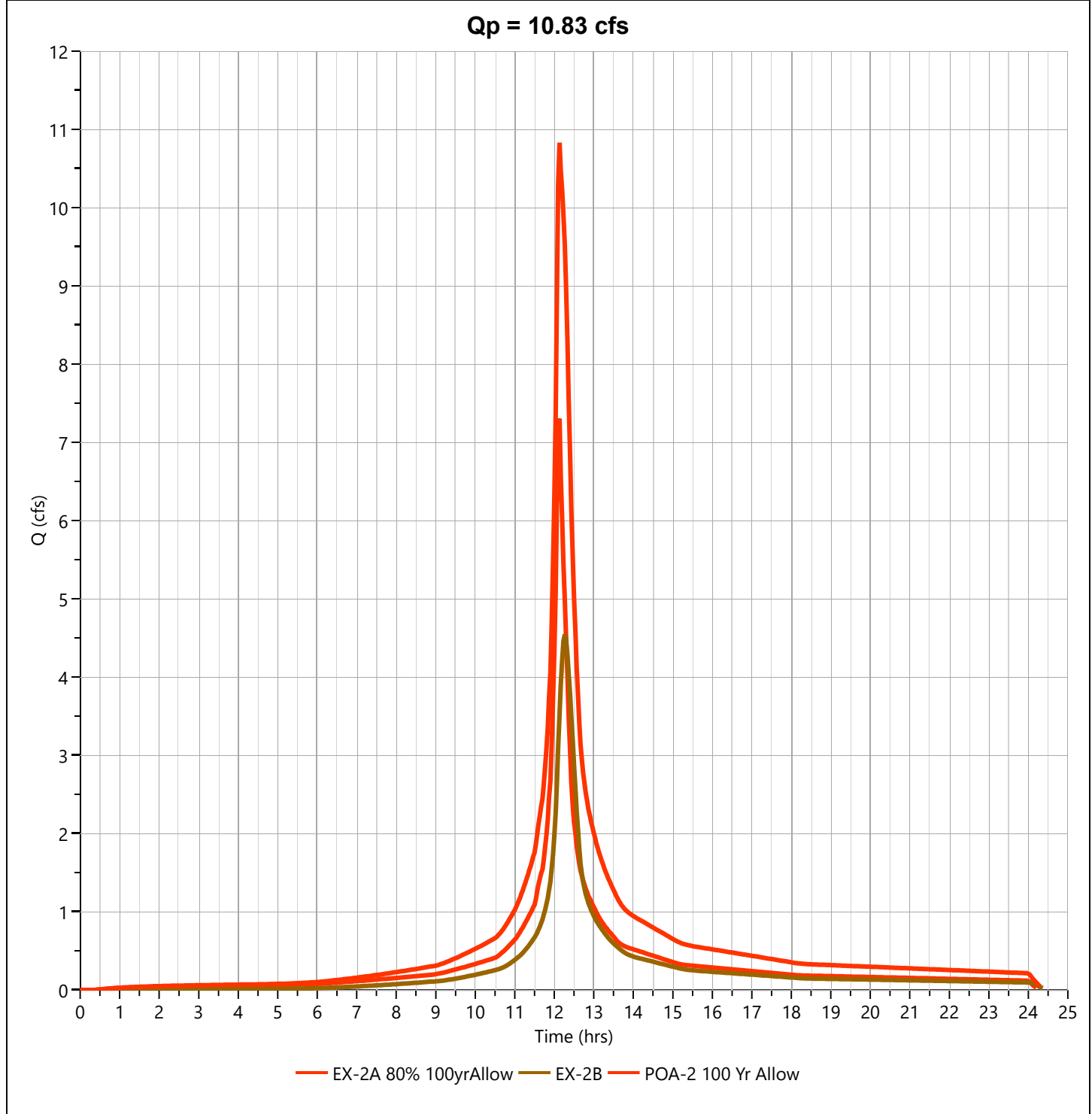
Hydrology Studio v 3.0.0.29

11-29-2023

## POA-2 100 Yr Allow

## Hyd. No. 31

|                    |            |                     |               |
|--------------------|------------|---------------------|---------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 10.83 cfs   |
| Storm Frequency    | = 100-yr   | Time to Peak        | = 12.13 hrs   |
| Time Interval      | = 2 min    | Hydrograph Volume   | = 54,794 cuft |
| Inflow Hydrographs | = 20, 26   | Total Contrib. Area | = 0.75 ac     |



**EX-3 WATERSHED (TOTAL EXISTING FLOW TO POA-3)**

Project: Beacon Unitarian Universalist Church

By: SM

Date: 11/29/2023

Location: Summit, NJ

Checked By: MJV

Date Checked: 11/29/2023

Circle One: Present Developed

Future Existing Watershed EX-3 Pervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Flow Length, L (total L < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. Compute T<sub>t</sub>

$$T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} s^{0.4}}$$

|            |                               |   |  |
|------------|-------------------------------|---|--|
| Segment ID | <b>1</b>                      |   |  |
|            | <b>Woods Dense Underbrush</b> |   |  |
|            | <b>0.40</b>                   |   |  |
| ft         | <b>100</b>                    |   |  |
| in         | <b>4.12</b>                   |   |  |
| ft/ft      | <b>0.077</b>                  |   |  |
| hr         | <b>0.184</b>                  | + |  |

Sheet Flow Sub-Total **0.184 hours**

**Shallow Concentrated Flow**

7. Surface Description
8. Flow Length, L
9. Watercourse Slope, s
10. Average Velocity, V (NEH table 15-3)
11. Compute T<sub>t</sub>

$$T_t = \frac{L}{3600 V}$$

|            |                  |                 |   |
|------------|------------------|-----------------|---|
| Segment ID | <b>2</b>         | <b>3</b>        |   |
|            | <b>Woodlands</b> | <b>Pavement</b> |   |
| ft         | <b>29</b>        | <b>217</b>      |   |
| ft/ft      | <b>0.241</b>     | <b>0.059</b>    |   |
| ft/s       | <b>2.47</b>      | <b>4.95</b>     |   |
| hr         | <b>0.003</b>     | <b>0.012</b>    | + |

Shallow Conc. Flow Sub-Total **0.015 hours**

**Channel Flow**

12. Flow Length, L
13. Cross Sectional flow area, a
14. Wetted Perimeter, P<sub>w</sub>
15. Hydraulic Radius, r
16. Channel Slope, s
17. Manning's Roughness Coeff., n
18. Velocity, V
19. Compute T<sub>t</sub>

$$r = a / P_w$$

$$V = (1.49 r^{2/3} s^{1/2}) / n$$

$$T_t = \frac{L}{3600 V}$$

|                 |  |  |   |
|-----------------|--|--|---|
| Segment ID      |  |  |   |
| ft              |  |  |   |
| ft <sup>2</sup> |  |  |   |
| ft              |  |  |   |
| ft              |  |  |   |
| ft/ft           |  |  |   |
|                 |  |  |   |
| ft/s            |  |  |   |
| hr              |  |  | + |

Channel Flow Sub-Total **0.000 hours**

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>

(Add Sub-Total T<sub>t</sub> from prior steps)

|                                  |                    |
|----------------------------------|--------------------|
| Total T <sub>c</sub> (hours) =   | <b>0.200 hours</b> |
| Total T <sub>c</sub> (minutes) = | <b>12 minutes</b>  |

# Hydrograph Report

Project Name:

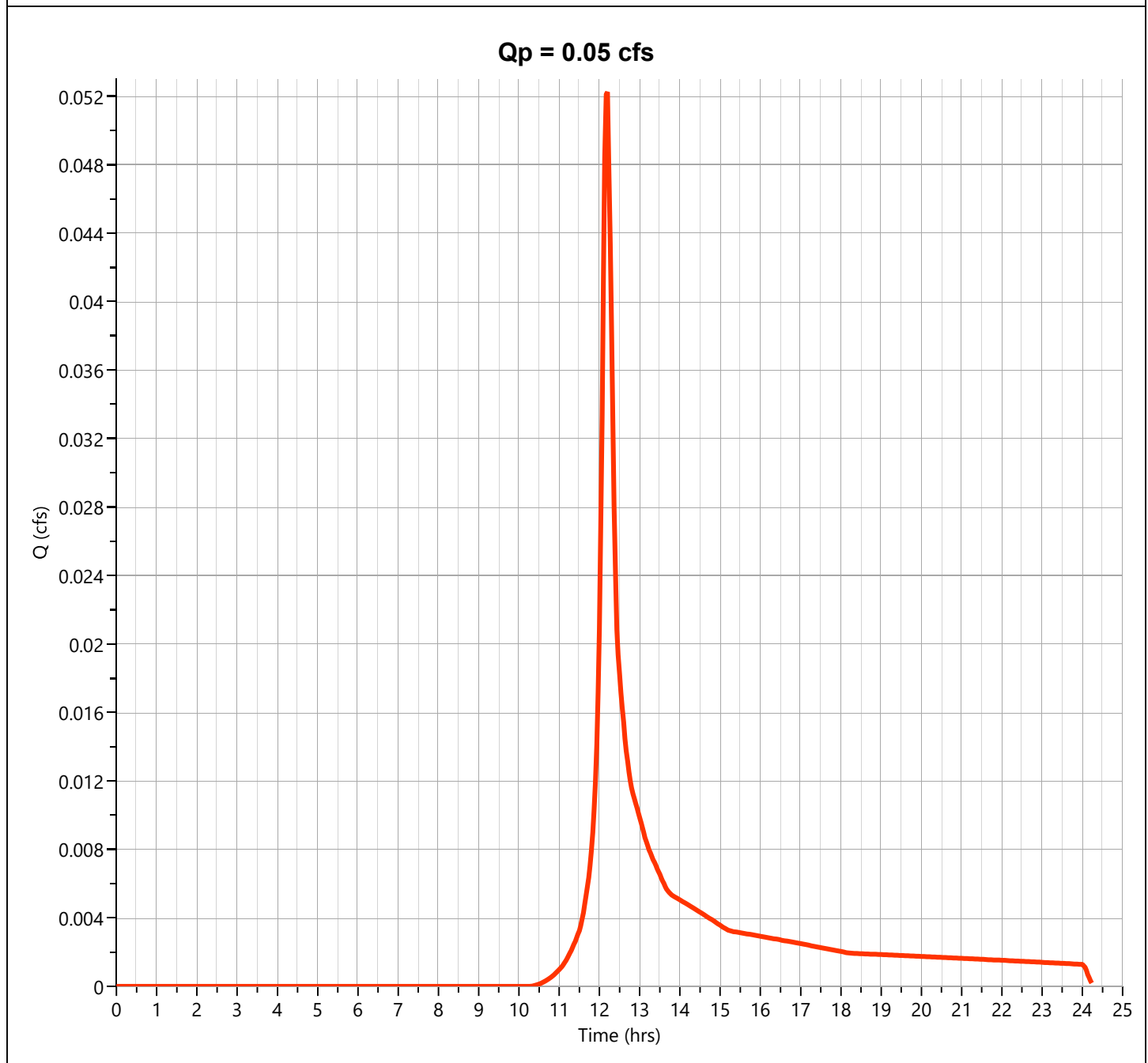
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-3 Woods C

## Hyd. No. 33

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.052 cfs |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.20 hrs |
| Time Interval   | = 2 min       | Runoff Volume      | = 211 cuft  |
| Drainage Area   | = 0.04 ac     | Curve Number       | = 70        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 12.0 min  |
| Total Rainfall  | = 4.12 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

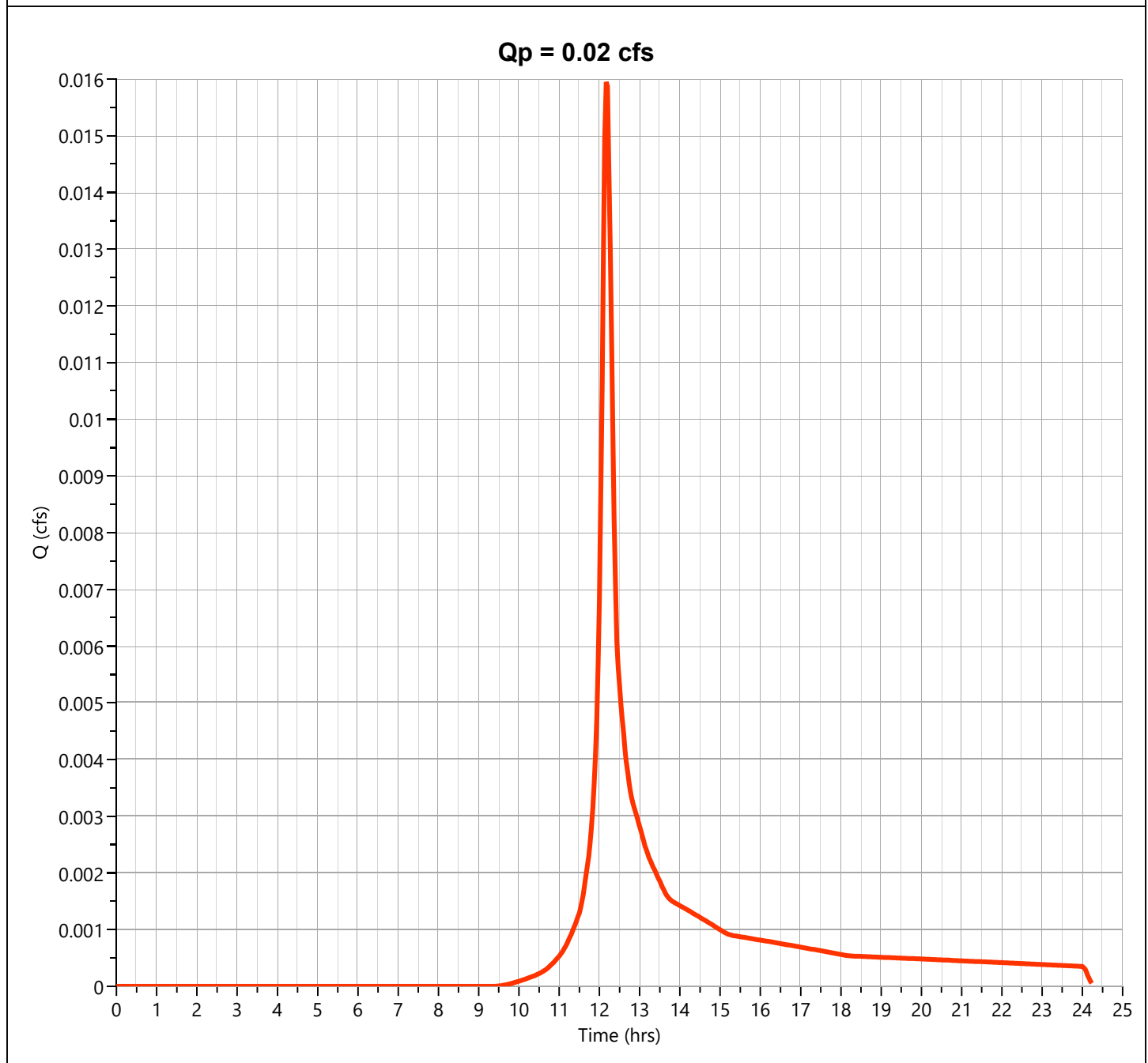
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-3 Grass C

## Hyd. No. 34

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.016 cfs |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.17 hrs |
| Time Interval   | = 2 min       | Runoff Volume      | = 63.1 cuft |
| Drainage Area   | = 0.01 ac     | Curve Number       | = 74        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 12.0 min  |
| Total Rainfall  | = 4.12 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

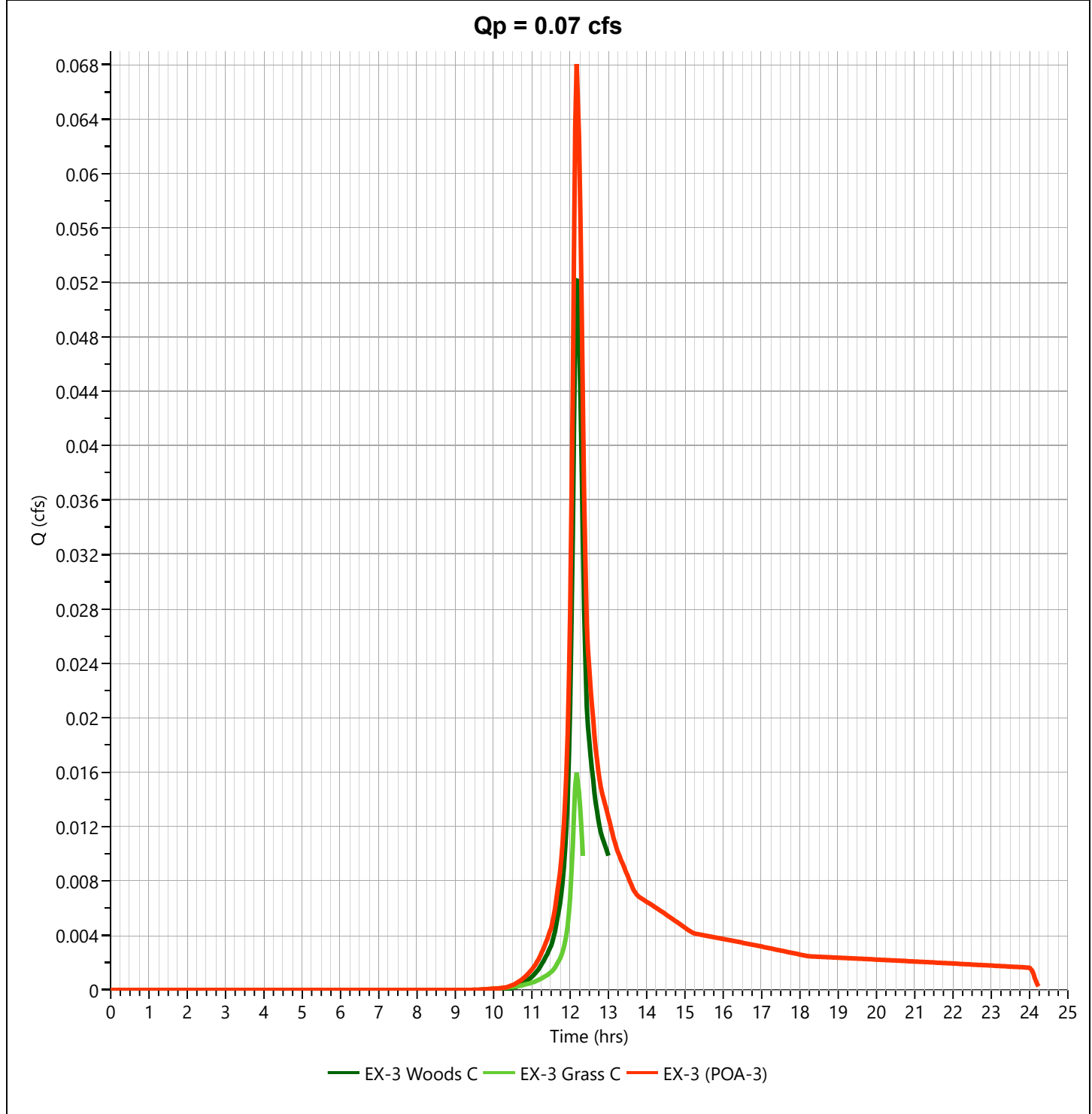
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-3 (POA-3)

## Hyd. No. 35

|                    |            |                     |             |
|--------------------|------------|---------------------|-------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.068 cfs |
| Storm Frequency    | = 2-yr     | Time to Peak        | = 12.20 hrs |
| Time Interval      | = 2 min    | Hydrograph Volume   | = 274 cuft  |
| Inflow Hydrographs | = 33, 34   | Total Contrib. Area | = 0.05 ac   |





# Hydrograph Report

Project Name:

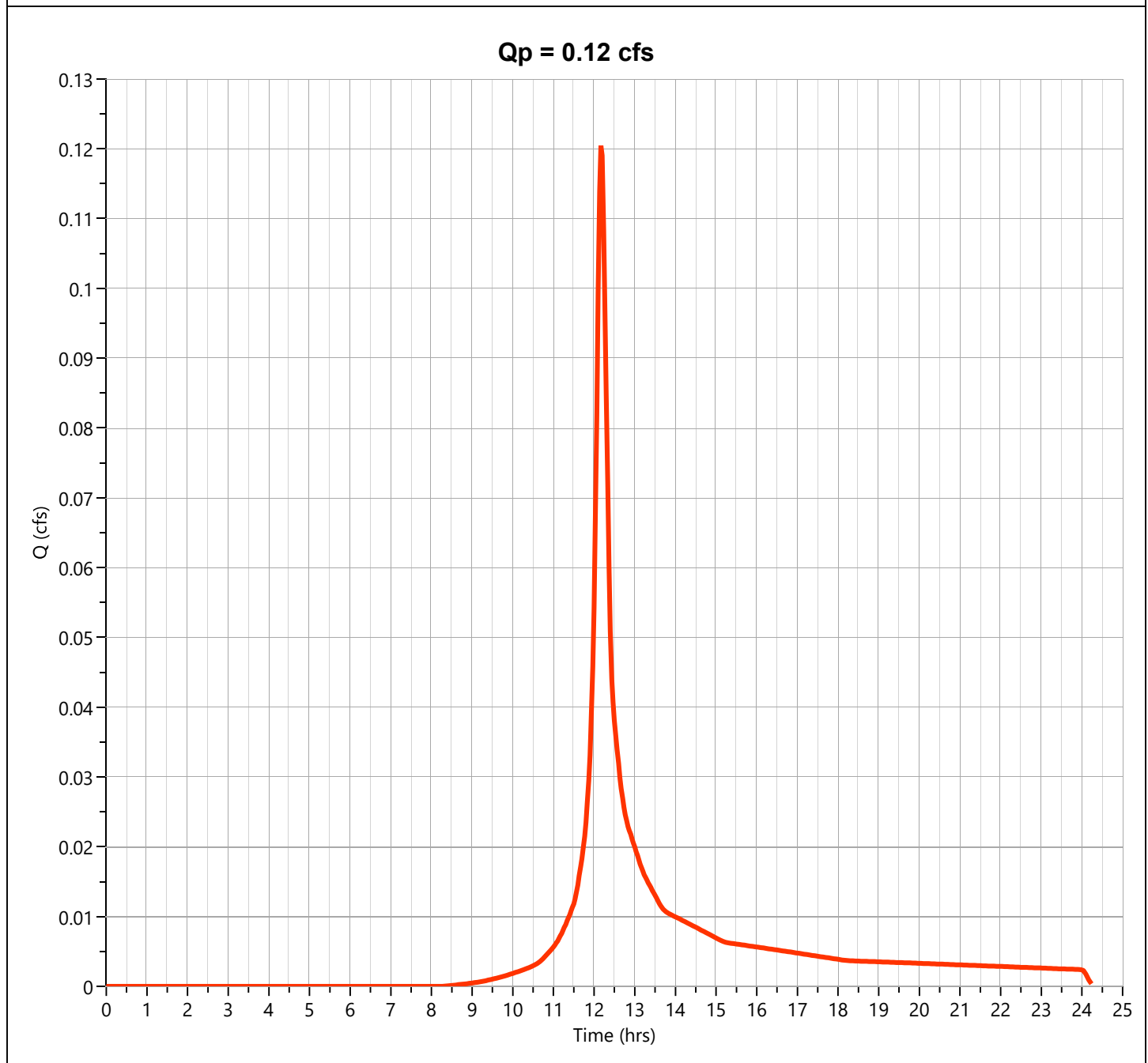
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-3 Woods C

## Hyd. No. 33

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.120 cfs |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.17 hrs |
| Time Interval   | = 2 min       | Runoff Volume      | = 470 cuft  |
| Drainage Area   | = 0.04 ac     | Curve Number       | = 70        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 12.0 min  |
| Total Rainfall  | = 6.42 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

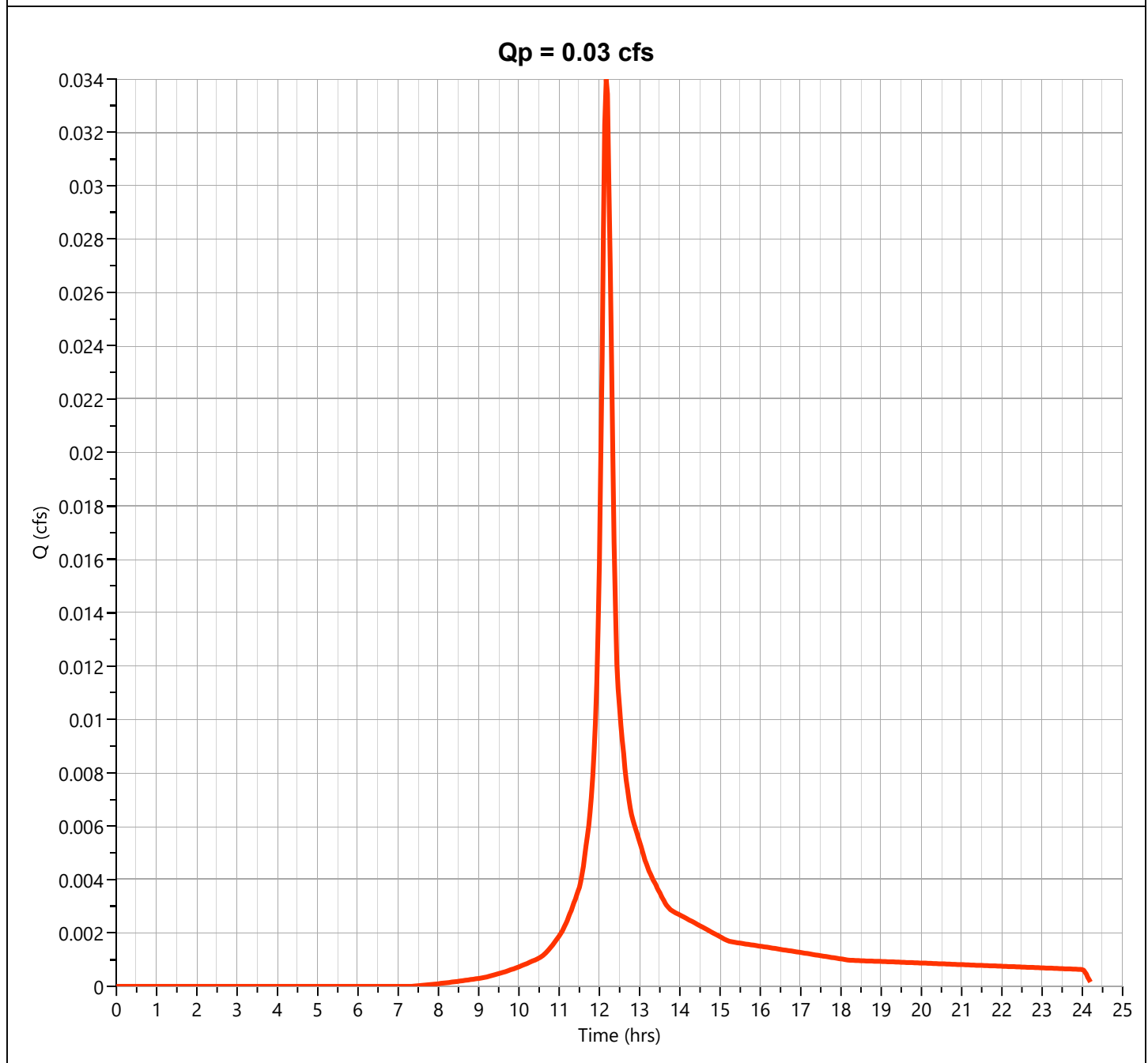
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-3 Grass C

## Hyd. No. 34

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.034 cfs |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.17 hrs |
| Time Interval   | = 2 min       | Runoff Volume      | = 133 cuft  |
| Drainage Area   | = 0.01 ac     | Curve Number       | = 74        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 12.0 min  |
| Total Rainfall  | = 6.42 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

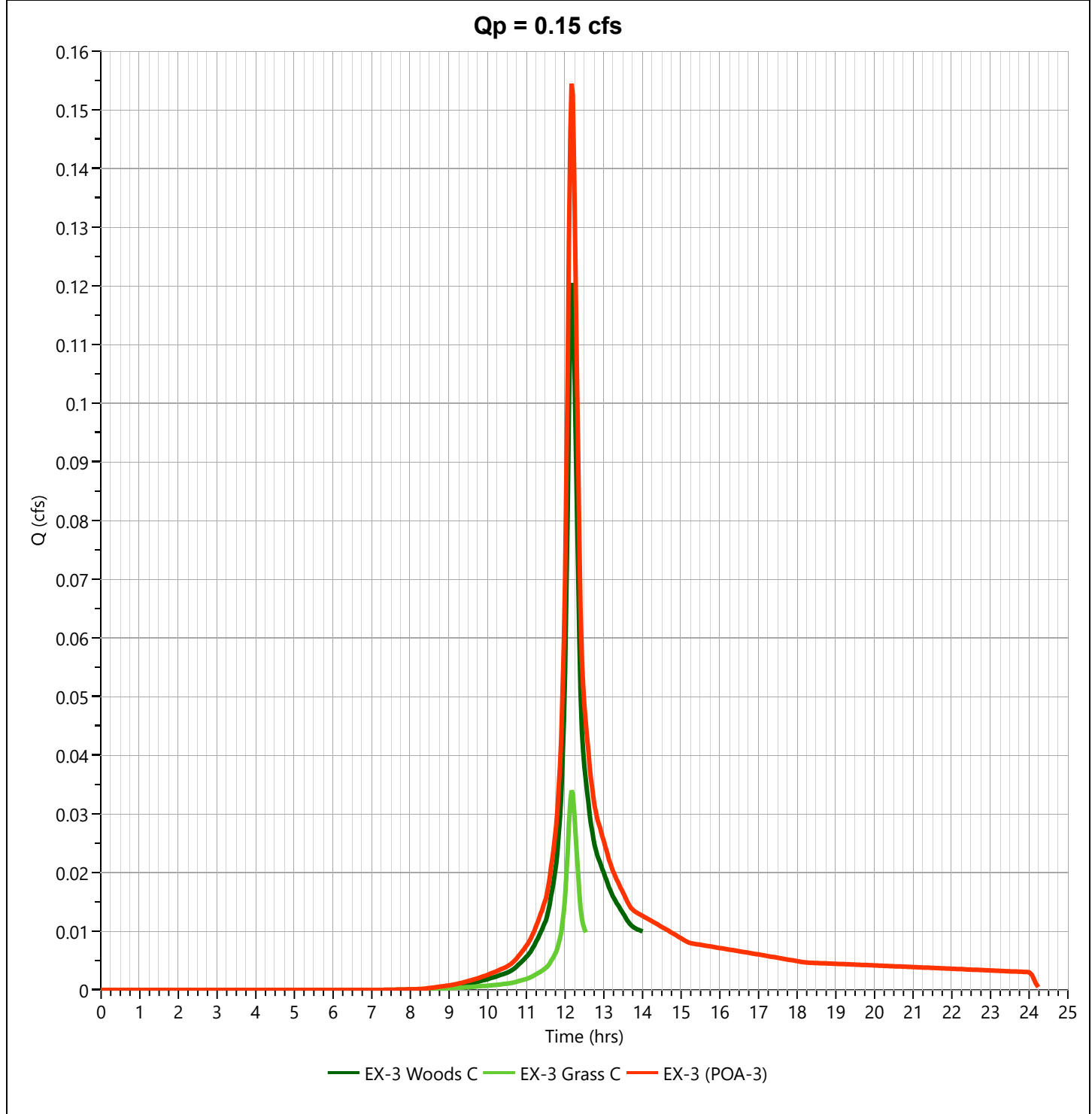
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-3 (POA-3)

## Hyd. No. 35

|                    |            |                     |             |
|--------------------|------------|---------------------|-------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.154 cfs |
| Storm Frequency    | = 10-yr    | Time to Peak        | = 12.17 hrs |
| Time Interval      | = 2 min    | Hydrograph Volume   | = 603 cuft  |
| Inflow Hydrographs | = 33, 34   | Total Contrib. Area | = 0.05 ac   |



# Hydrograph Report

Project Name:

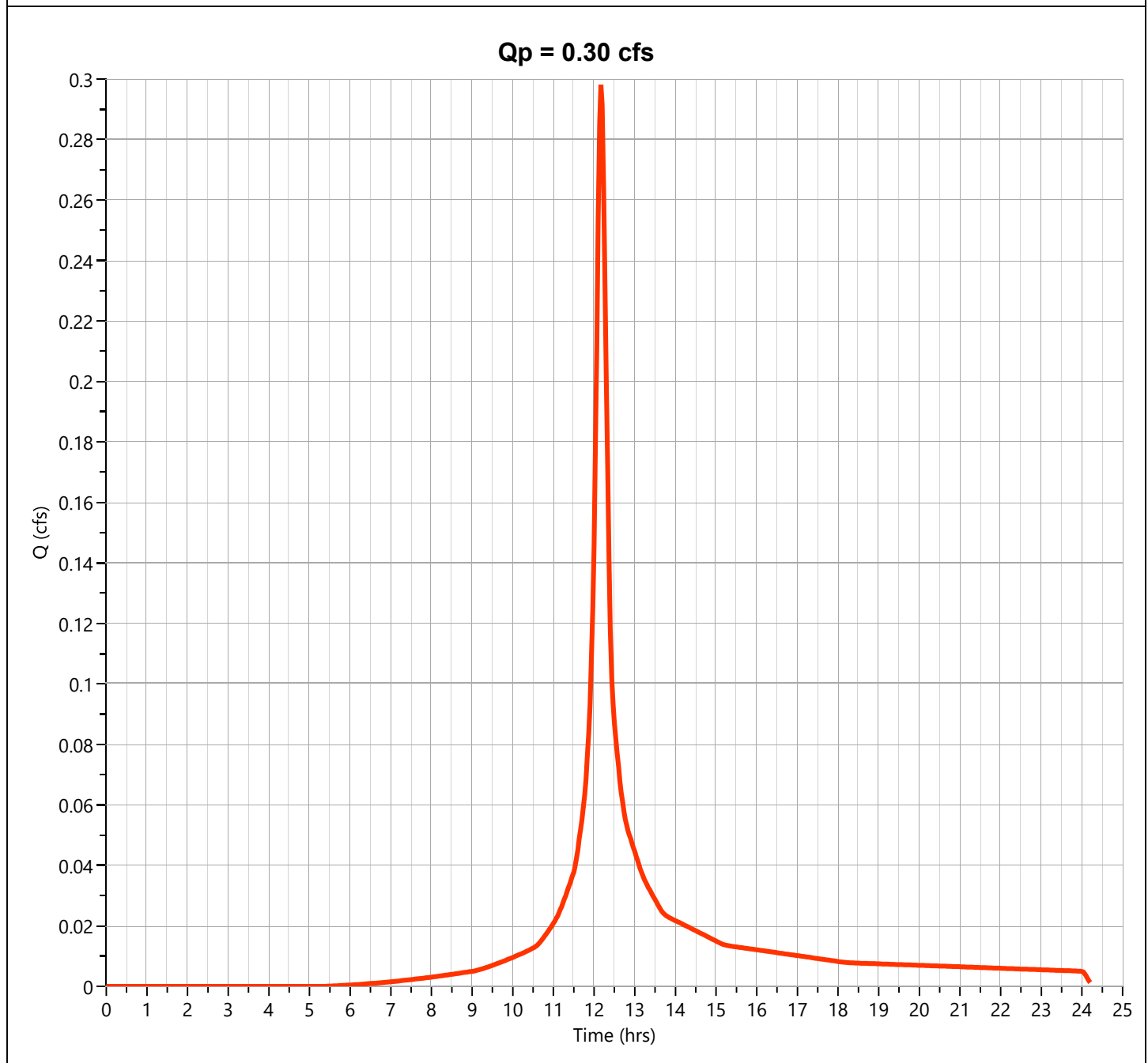
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-3 Woods C

## Hyd. No. 33

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.298 cfs  |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.17 hrs  |
| Time Interval   | = 2 min       | Runoff Volume      | = 1,177 cuft |
| Drainage Area   | = 0.04 ac     | Curve Number       | = 70         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 12.0 min   |
| Total Rainfall  | = 11.80 in    | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

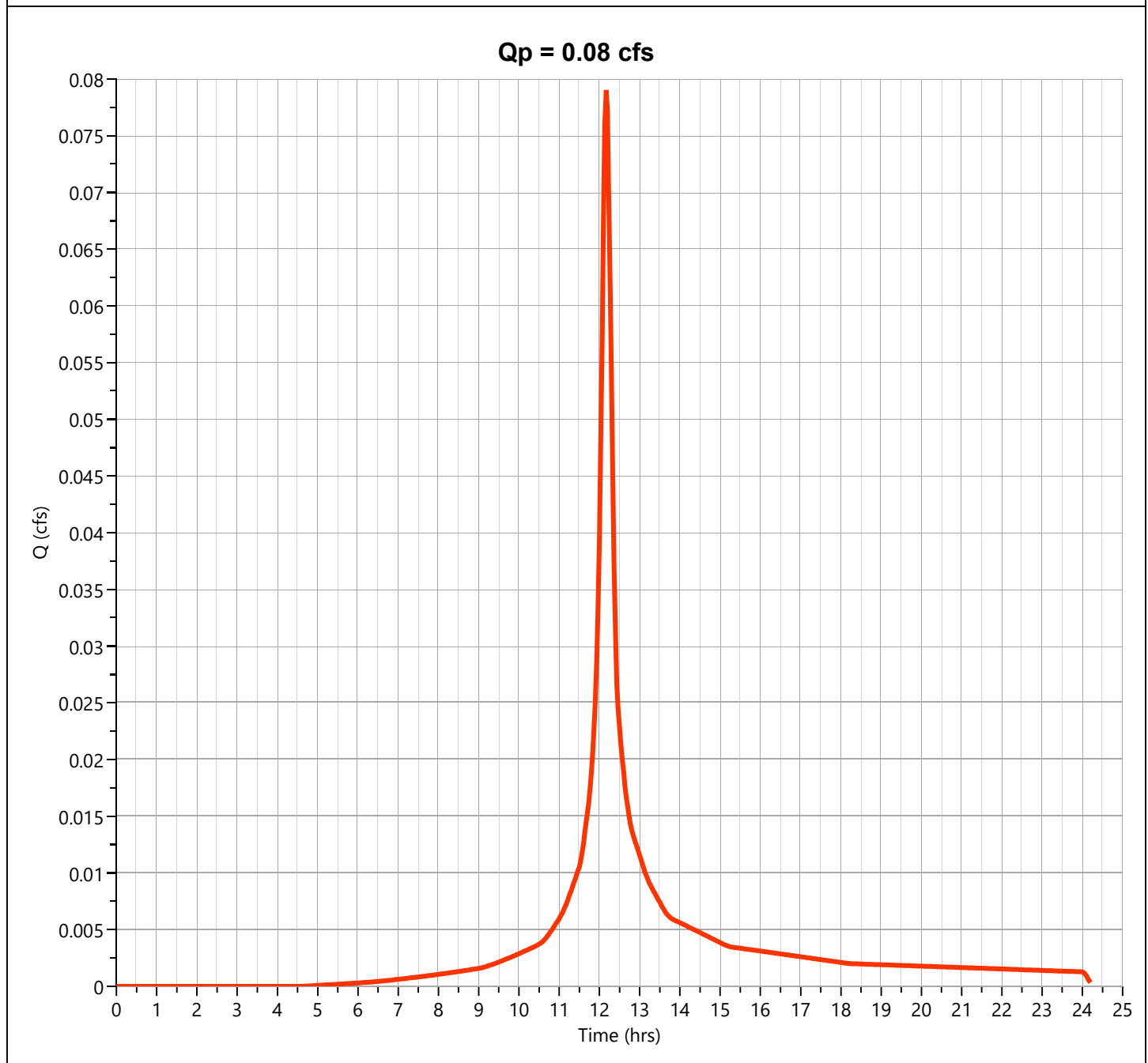
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-3 Grass C

## Hyd. No. 34

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.079 cfs |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.17 hrs |
| Time Interval   | = 2 min       | Runoff Volume      | = 316 cuft  |
| Drainage Area   | = 0.01 ac     | Curve Number       | = 74        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 12.0 min  |
| Total Rainfall  | = 11.80 in    | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

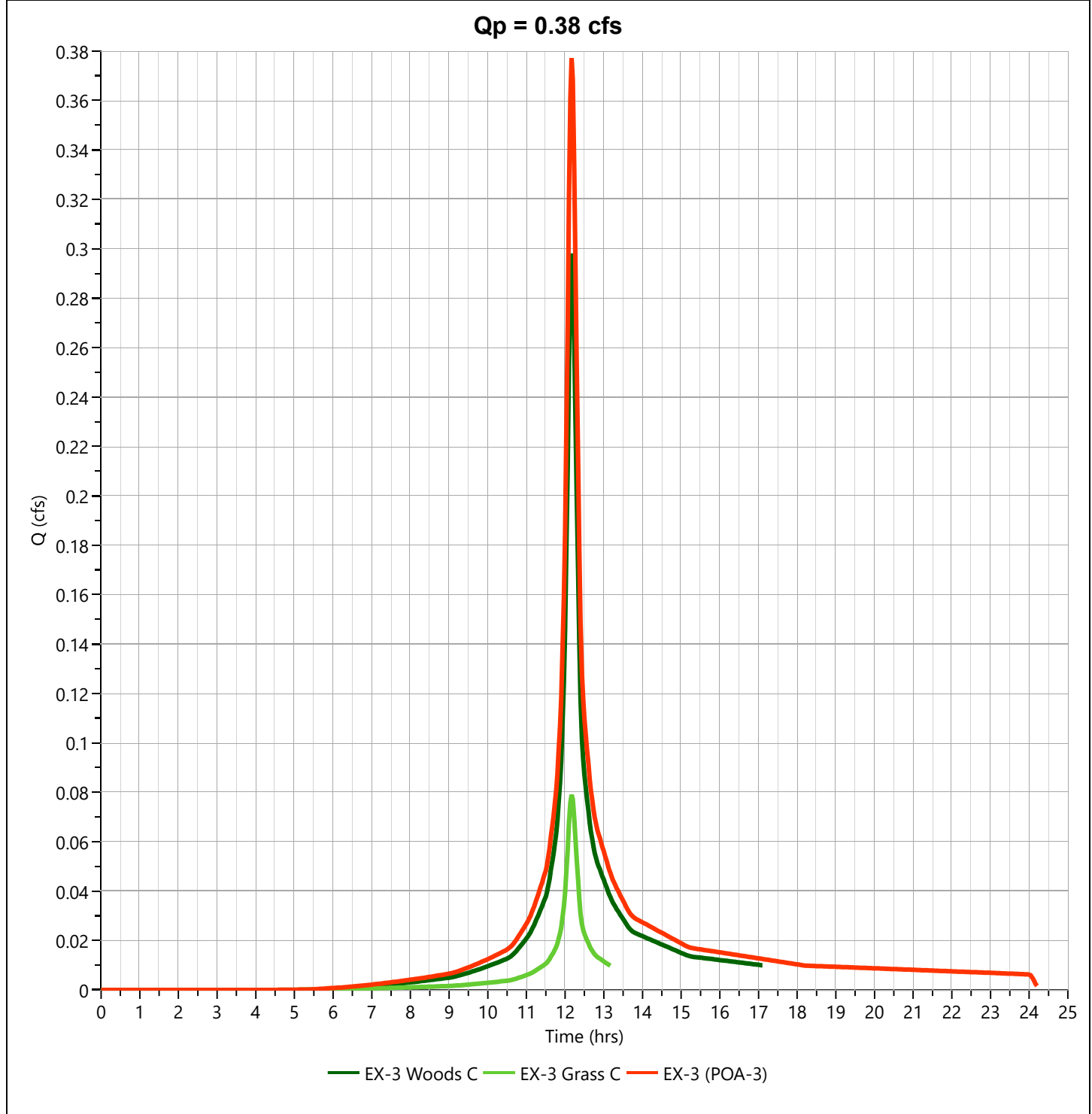
Hydrology Studio v 3.0.0.29

11-29-2023

## EX-3 (POA-3)

## Hyd. No. 35

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.377 cfs  |
| Storm Frequency    | = 100-yr   | Time to Peak        | = 12.17 hrs  |
| Time Interval      | = 2 min    | Hydrograph Volume   | = 1,493 cuft |
| Inflow Hydrographs | = 33, 34   | Total Contrib. Area | = 0.05 ac    |



## **SUMMARY OF EXISTING PEAK DISCHARGES**

# Hydrograph 2-yr Summary

Project Name:

Hydrology Studio v 3.0.0.29

11-29-2023

| 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     | EX-1 Woods C         | 0.144           | 12.13              | 512                      | ---           |                        |                        |
| 2        | NRCS Runoff     | EX-1 Grass C         | 0.492           | 12.13              | 1,713                    | ---           |                        |                        |
| 3        | NRCS Runoff     | EX-1 Impervious      | 0.496           | 12.10              | 1,719                    | ---           |                        |                        |
| 4        | Junction        | EX-1 (POA-1)         | 1.092           | 12.13              | 3,943                    | 1, 2, 3       |                        |                        |
| 5        | Diversion1      | POA-1 50% 2yr Allow  | 0.546           | 12.13              | 1,972                    | 4             |                        |                        |
| 6        | Diversion2      | <name>               | 0.546           | 12.13              | 1,972                    | 4             |                        |                        |
| 7        | Diversion1      | POA-1 75% 10yr Allow | 0.819           | 12.13              | 2,957                    | 4             |                        |                        |
| 8        | Diversion2      | <name>               | 0.273           | 12.13              | 986                      | 4             |                        |                        |
| 9        | Diversion1      | POA-1 80% 100yrAllow | 0.874           | 12.13              | 3,155                    | 4             |                        |                        |
| 10       | Diversion2      | <name>               | 0.218           | 12.13              | 789                      | 4             |                        |                        |
| 12       | NRCS Runoff     | EX-2A Woods C        | 0.529           | 12.20              | 2,296                    | ---           |                        |                        |
| 13       | NRCS Runoff     | EX-2A Grass C        | 0.451           | 12.20              | 1,908                    | ---           |                        |                        |
| 14       | NRCS Runoff     | EX-2A Impervious     | 1.680           | 12.10              | 5,817                    | ---           |                        |                        |
| 15       | Junction        | EX-2A                | 2.390           | 12.10              | 10,021                   | 12, 13, 14    |                        |                        |
| 16       | Diversion1      | EX-2A 50% 2yr Allow  | 1.195           | 12.10              | 5,011                    | 15            |                        |                        |
| 17       | Diversion2      | <name>               | 1.195           | 12.10              | 5,011                    | 15            |                        |                        |
| 18       | Diversion1      | EX-2A 75% 10yr Allow | 1.793           | 12.10              | 7,516                    | 15            |                        |                        |
| 19       | Diversion2      | <name>               | 0.598           | 12.10              | 2,505                    | 15            |                        |                        |
| 20       | Diversion1      | EX-2A 80% 100yrAllow | 1.912           | 12.10              | 8,017                    | 15            |                        |                        |
| 21       | Diversion2      | <name>               | 0.478           | 12.10              | 2,004                    | 15            |                        |                        |
| 23       | NRCS Runoff     | EX-2B Woods C        | 0.505           | 12.30              | 2,606                    | ---           |                        |                        |
| 24       | NRCS Runoff     | EX-2B Grass C        | 0.222           | 12.30              | 1,121                    | ---           |                        |                        |
| 25       | NRCS Runoff     | EX-2B Impervious     | 0.190           | 12.23              | 987                      | ---           |                        |                        |
| 26       | Junction        | EX-2B                | 0.906           | 12.27              | 4,713                    | 23, 24, 25    |                        |                        |
| 28       | Junction        | POA-2                | 3.032           | 12.13              | 14,735                   | 15, 26        |                        |                        |
| 29       | Junction        | POA-2 2 Yr Allowable | 1.846           | 12.13              | 9,724                    | 16, 26        |                        |                        |
| 30       | Junction        | POA-2 10 Yr Allow    | 2.439           | 12.13              | 12,229                   | 18, 26        |                        |                        |
| 31       | Junction        | POA-2 100 Yr Allow   | 2.558           | 12.13              | 12,730                   | 20, 26        |                        |                        |
| 33       | NRCS Runoff     | EX-3 Woods C         | 0.052           | 12.20              | 211                      | ---           |                        |                        |
| 34       | NRCS Runoff     | EX-3 Grass C         | 0.016           | 12.17              | 63.1                     | ---           |                        |                        |
| 35       | Junction        | EX-3 (POA-3)         | 0.068           | 12.20              | 274                      | 33, 34        |                        |                        |



# Hydrograph 10-yr Summary

Project Name:

Hydrology Studio v 3.0.0.29

11-29-2023

| 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     | EX-1 Woods C         | 0.331           | 12.13              | 1,141                    | ---           |                        |                        |
| 2        | NRCS Runoff     | EX-1 Grass C         | 1.043           | 12.13              | 3,599                    | ---           |                        |                        |
| 3        | NRCS Runoff     | EX-1 Impervious      | 0.777           | 12.10              | 2,735                    | ---           |                        |                        |
| 4        | Junction        | EX-1 (POA-1)         | 2.088           | 12.13              | 7,474                    | 1, 2, 3       |                        |                        |
| 5        | Diversion1      | POA-1 50% 2yr Allow  | 1.044           | 12.13              | 3,737                    | 4             |                        |                        |
| 6        | Diversion2      | <name>               | 1.044           | 12.13              | 3,737                    | 4             |                        |                        |
| 7        | Diversion1      | POA-1 75% 10yr Allow | 1.566           | 12.13              | 5,606                    | 4             |                        |                        |
| 8        | Diversion2      | <name>               | 0.522           | 12.13              | 1,869                    | 4             |                        |                        |
| 9        | Diversion1      | POA-1 80% 100yrAllow | 1.670           | 12.13              | 5,980                    | 4             |                        |                        |
| 10       | Diversion2      | <name>               | 0.418           | 12.13              | 1,495                    | 4             |                        |                        |
| 12       | NRCS Runoff     | EX-2A Woods C        | 1.225           | 12.20              | 5,116                    | ---           |                        |                        |
| 13       | NRCS Runoff     | EX-2A Grass C        | 0.962           | 12.20              | 4,011                    | ---           |                        |                        |
| 14       | NRCS Runoff     | EX-2A Impervious     | 2.629           | 12.10              | 9,256                    | ---           |                        |                        |
| 15       | Junction        | EX-2A                | 4.315           | 12.13              | 18,382                   | 12, 13, 14    |                        |                        |
| 16       | Diversion1      | EX-2A 50% 2yr Allow  | 2.157           | 12.13              | 9,191                    | 15            |                        |                        |
| 17       | Diversion2      | <name>               | 2.157           | 12.13              | 9,191                    | 15            |                        |                        |
| 18       | Diversion1      | EX-2A 75% 10yr Allow | 3.236           | 12.13              | 13,786                   | 15            |                        |                        |
| 19       | Diversion2      | <name>               | 1.079           | 12.13              | 4,596                    | 15            |                        |                        |
| 20       | Diversion1      | EX-2A 80% 100yrAllow | 3.452           | 12.13              | 14,706                   | 15            |                        |                        |
| 21       | Diversion2      | <name>               | 0.863           | 12.13              | 3,676                    | 15            |                        |                        |
| 23       | NRCS Runoff     | EX-2B Woods C        | 1.165           | 12.30              | 5,805                    | ---           |                        |                        |
| 24       | NRCS Runoff     | EX-2B Grass C        | 0.474           | 12.27              | 2,355                    | ---           |                        |                        |
| 25       | NRCS Runoff     | EX-2B Impervious     | 0.297           | 12.23              | 1,571                    | ---           |                        |                        |
| 26       | Junction        | EX-2B                | 1.928           | 12.27              | 9,731                    | 23, 24, 25    |                        |                        |
| 28       | Junction        | POA-2                | 5.768           | 12.13              | 28,113                   | 15, 26        |                        |                        |
| 29       | Junction        | POA-2 2 Yr Allowable | 3.610           | 12.13              | 18,922                   | 16, 26        |                        |                        |
| 30       | Junction        | POA-2 10 Yr Allow    | 4.689           | 12.13              | 23,517                   | 18, 26        |                        |                        |
| 31       | Junction        | POA-2 100 Yr Allow   | 4.905           | 12.13              | 24,436                   | 20, 26        |                        |                        |
| 33       | NRCS Runoff     | EX-3 Woods C         | 0.120           | 12.17              | 470                      | ---           |                        |                        |
| 34       | NRCS Runoff     | EX-3 Grass C         | 0.034           | 12.17              | 133                      | ---           |                        |                        |
| 35       | Junction        | EX-3 (POA-3)         | 0.154           | 12.17              | 603                      | 33, 34        |                        |                        |

# Hydrograph 100-yr Summary

Project Name:

Hydrology Studio v 3.0.0.29

11-29-2023

| 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     | EX-1 Woods C         | 0.815           | 12.13              | 2,854                    | ---           |                        |                        |
| 2        | NRCS Runoff     | EX-1 Grass C         | 2.417           | 12.13              | 8,567                    | ---           |                        |                        |
| 3        | NRCS Runoff     | EX-1 Impervious      | 1.431           | 12.10              | 5,114                    | ---           |                        |                        |
| 4        | Junction        | EX-1 (POA-1)         | 4.547           | 12.13              | 16,535                   | 1, 2, 3       |                        |                        |
| 5        | Diversion1      | POA-1 50% 2yr Allow  | 2.274           | 12.13              | 8,267                    | 4             |                        |                        |
| 6        | Diversion2      | <name>               | 2.274           | 12.13              | 8,267                    | 4             |                        |                        |
| 7        | Diversion1      | POA-1 75% 10yr Allow | 3.410           | 12.13              | 12,401                   | 4             |                        |                        |
| 8        | Diversion2      | <name>               | 1.137           | 12.13              | 4,134                    | 4             |                        |                        |
| 9        | Diversion1      | POA-1 80% 100yrAllow | 3.638           | 12.13              | 13,228                   | 4             |                        |                        |
| 10       | Diversion2      | <name>               | 0.909           | 12.13              | 3,307                    | 4             |                        |                        |
| 12       | NRCS Runoff     | EX-2A Woods C        | 3.032           | 12.20              | 12,802                   | ---           |                        |                        |
| 13       | NRCS Runoff     | EX-2A Grass C        | 2.237           | 12.20              | 9,546                    | ---           |                        |                        |
| 14       | NRCS Runoff     | EX-2A Impervious     | 4.844           | 12.10              | 17,308                   | ---           |                        |                        |
| 15       | Junction        | EX-2A                | 9.128           | 12.13              | 39,655                   | 12, 13, 14    |                        |                        |
| 16       | Diversion1      | EX-2A 50% 2yr Allow  | 4.564           | 12.13              | 19,828                   | 15            |                        |                        |
| 17       | Diversion2      | <name>               | 4.564           | 12.13              | 19,828                   | 15            |                        |                        |
| 18       | Diversion1      | EX-2A 75% 10yr Allow | 6.846           | 12.13              | 29,741                   | 15            |                        |                        |
| 19       | Diversion2      | <name>               | 2.282           | 12.13              | 9,914                    | 15            |                        |                        |
| 20       | Diversion1      | EX-2A 80% 100yrAllow | 7.302           | 12.13              | 31,724                   | 15            |                        |                        |
| 21       | Diversion2      | <name>               | 1.826           | 12.13              | 7,931                    | 15            |                        |                        |
| 23       | NRCS Runoff     | EX-2B Woods C        | 2.898           | 12.27              | 14,527                   | ---           |                        |                        |
| 24       | NRCS Runoff     | EX-2B Grass C        | 1.108           | 12.27              | 5,606                    | ---           |                        |                        |
| 25       | NRCS Runoff     | EX-2B Impervious     | 0.548           | 12.23              | 2,937                    | ---           |                        |                        |
| 26       | Junction        | EX-2B                | 4.542           | 12.27              | 23,069                   | 23, 24, 25    |                        |                        |
| 28       | Junction        | POA-2                | 12.65           | 12.13              | 62,725                   | 15, 26        |                        |                        |
| 29       | Junction        | POA-2 2 Yr Allowable | 8.088           | 12.13              | 42,897                   | 16, 26        |                        |                        |
| 30       | Junction        | POA-2 10 Yr Allow    | 10.37           | 12.13              | 52,811                   | 18, 26        |                        |                        |
| 31       | Junction        | POA-2 100 Yr Allow   | 10.83           | 12.13              | 54,794                   | 20, 26        |                        |                        |
| 33       | NRCS Runoff     | EX-3 Woods C         | 0.298           | 12.17              | 1,177                    | ---           |                        |                        |
| 34       | NRCS Runoff     | EX-3 Grass C         | 0.079           | 12.17              | 316                      | ---           |                        |                        |
| 35       | Junction        | EX-3 (POA-3)         | 0.377           | 12.17              | 1,493                    | 33, 34        |                        |                        |

# **APPENDIX B**

## **Proposed Stormwater Discharge Calculations**

**APPENDIX B  
TABLE OF CONTENTS**

**NOAA RAINFALL PRECIPITATION DATA**

**NOAA REGION D RAINFALL DISTRIBUTION**

**PROPOSED RUNOFF CURVE NUMBER CALCULATIONS**

**CURRENT HYDROGRAPH CALCULATIONS**

**PR-1A WATERSHED**

- Time of Concentration Calculation**
- 2 Year Design Storm Event**
- 10 Year Design Storm Event**
- 25 Year Design Storm Event**
- 100 Year Design Storm Event**

**PR-1B WATERSHED**

- Time of Concentration Calculation**
- 2 Year Design Storm Event**
- 10 Year Design Storm Event**
- 25 Year Design Storm Event**
- 100 Year Design Storm Event**

**PR-1C WATERSHED**

- Time of Concentration Calculation**
- 2 Year Design Storm Event**
- 10 Year Design Storm Event**
- 25 Year Design Storm Event**
- 100 Year Design Storm Event**

**PR-1D WATERSHED**

- Time of Concentration Calculation**
- 2 Year Design Storm Event**
- 10 Year Design Storm Event**
- 25 Year Design Storm Event**
- 100 Year Design Storm Event**

**COMBINED PROPOSED FLOW TO UDG-INF1-2**

- 2 Year Design Storm Event**
- 10 Year Design Storm Event**
- 25 Year Design Storm Event**
- 100 Year Design Storm Event**

**PR-1E WATERSHED**

- Time of Concentration Calculation**
- 2 Year Design Storm Event**
- 10 Year Design Storm Event**
- 25 Year Design Storm Event**
- 100 Year Design Storm Event**

**COMBINED PROPOSED FLOW TO POA-1**

**2 Year Design Storm Event  
10 Year Design Storm Event  
25 Year Design Storm Event  
100 Year Design Storm Event**

**PR-2A WATERSHED**

**Time of Concentration Calculation  
2 Year Design Storm Event  
10 Year Design Storm Event  
25 Year Design Storm Event  
100 Year Design Storm Event**

**PR-2B WATERSHED**

**Time of Concentration Calculation  
2 Year Design Storm Event  
10 Year Design Storm Event  
25 Year Design Storm Event  
100 Year Design Storm Event**

**PR-2C WATERSHED**

**Time of Concentration Calculation  
2 Year Design Storm Event  
10 Year Design Storm Event  
25 Year Design Storm Event  
100 Year Design Storm Event**

**PR-2D WATERSHED**

**Time of Concentration Calculation  
2 Year Design Storm Event  
10 Year Design Storm Event  
25 Year Design Storm Event  
100 Year Design Storm Event**

**PR-2E WATERSHED**

**Time of Concentration Calculation  
2 Year Design Storm Event  
10 Year Design Storm Event  
25 Year Design Storm Event  
100 Year Design Storm Event**

**PR-2F WATERSHED**

**Time of Concentration Calculation  
2 Year Design Storm Event  
10 Year Design Storm Event  
25 Year Design Storm Event  
100 Year Design Storm Event**

**PR-2G WATERSHED**

Time of Concentration Calculation  
2 Year Design Storm Event  
10 Year Design Storm Event  
25 Year Design Storm Event  
100 Year Design Storm Event

**PR-2H WATERSHED**

Time of Concentration Calculation  
2 Year Design Storm Event  
10 Year Design Storm Event  
25 Year Design Storm Event  
100 Year Design Storm Event

**COMBINED PR-2B + PR-2H WATERSHED**

2 Year Design Storm Event  
10 Year Design Storm Event  
25 Year Design Storm Event  
100 Year Design Storm Event

**COMBINED PROPOSED FLOW TO POA-2**

2 Year Design Storm Event  
10 Year Design Storm Event  
25 Year Design Storm Event  
100 Year Design Storm Event

**PR-3 WATERSHED (TOTAL PROPOSED FLOW TO POA-3)**

Time of Concentration Calculation  
2 Year Design Storm Event  
10 Year Design Storm Event  
25 Year Design Storm Event  
100 Year Design Storm Event

**SUMMARY OF PROPOSED PEAK DISCHARGES**

**FUTURE HYDROGRAPH CALCULATIONS**

**PR-1A WATERSHED**

Time of Concentration Calculation  
2 Year Design Storm Event  
10 Year Design Storm Event  
25 Year Design Storm Event  
100 Year Design Storm Event

**PR-1B WATERSHED**

Time of Concentration Calculation  
2 Year Design Storm Event  
10 Year Design Storm Event  
25 Year Design Storm Event  
100 Year Design Storm Event

**PR-1C WATERSHED**

**Time of Concentration Calculation  
2 Year Design Storm Event  
10 Year Design Storm Event  
25 Year Design Storm Event  
100 Year Design Storm Event**

**PR-1D WATERSHED**

**Time of Concentration Calculation  
2 Year Design Storm Event  
10 Year Design Storm Event  
25 Year Design Storm Event  
100 Year Design Storm Event**

**COMBINED PROPOSED FLOW TO UDG-INF1-2**

**2 Year Design Storm Event  
10 Year Design Storm Event  
25 Year Design Storm Event  
100 Year Design Storm Event**

**PR-1E WATERSHED**

**Time of Concentration Calculation  
2 Year Design Storm Event  
10 Year Design Storm Event  
25 Year Design Storm Event  
100 Year Design Storm Event**

**COMBINED PROPOSED FLOW TO POA-1**

**2 Year Design Storm Event  
10 Year Design Storm Event  
25 Year Design Storm Event  
100 Year Design Storm Event**

**PR-2A WATERSHED**

**Time of Concentration Calculation  
2 Year Design Storm Event  
10 Year Design Storm Event  
25 Year Design Storm Event  
100 Year Design Storm Event**

**PR-2B WATERSHED**

**Time of Concentration Calculation  
2 Year Design Storm Event  
10 Year Design Storm Event  
25 Year Design Storm Event  
100 Year Design Storm Event**

**PR-2C WATERSHED**

**Time of Concentration Calculation**  
**2 Year Design Storm Event**  
**10 Year Design Storm Event**  
**25 Year Design Storm Event**  
**100 Year Design Storm Event**

**PR-2D WATERSHED**

**Time of Concentration Calculation**  
**2 Year Design Storm Event**  
**10 Year Design Storm Event**  
**25 Year Design Storm Event**  
**100 Year Design Storm Event**

**PR-2E WATERSHED**

**Time of Concentration Calculation**  
**2 Year Design Storm Event**  
**10 Year Design Storm Event**  
**25 Year Design Storm Event**  
**100 Year Design Storm Event**

**PR-2F WATERSHED**

**Time of Concentration Calculation**  
**2 Year Design Storm Event**  
**10 Year Design Storm Event**  
**25 Year Design Storm Event**  
**100 Year Design Storm Event**

**PR-2G WATERSHED**

**Time of Concentration Calculation**  
**2 Year Design Storm Event**  
**10 Year Design Storm Event**  
**25 Year Design Storm Event**  
**100 Year Design Storm Event**

**PR-2H WATERSHED**

**Time of Concentration Calculation**  
**2 Year Design Storm Event**  
**10 Year Design Storm Event**  
**25 Year Design Storm Event**  
**100 Year Design Storm Event**

**COMBINED PR-2B + PR-2H WATERSHED**

**2 Year Design Storm Event**  
**10 Year Design Storm Event**  
**25 Year Design Storm Event**  
**100 Year Design Storm Event**



**COMBINED PROPOSED FLOW TO POA-2**

**2 Year Design Storm Event**

**10 Year Design Storm Event**

**25 Year Design Storm Event**

**100 Year Design Storm Event**

**PR-3 WATERSHED (TOTAL PROPOSED FLOW TO POA-3)**

**Time of Concentration Calculation**

**2 Year Design Storm Event**

**10 Year Design Storm Event**

**25 Year Design Storm Event**

**100 Year Design Storm Event**

**SUMMARY OF PROPOSED PEAK DISCHARGES**

# **NOAA RAINFALL PRECIPITATION DATA**



**NOAA Atlas 14, Volume 2, Version 3**  
**Location name: Summit, New Jersey, USA\***  
**Latitude: 40.7128°, Longitude: -74.3766°**  
**Elevation: 357 ft\*\***  
 \* source: ESRI Maps  
 \*\* source: USGS



**POINT PRECIPITATION FREQUENCY ESTIMATES**

G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M.Yekta, and D. Riley

NOAA, National Weather Service, Silver Spring, Maryland

[PF\\_tabular](#) | [PF\\_graphical](#) | [Maps & aerials](#)

**PF tabular**

| <b>PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)<sup>1</sup></b> |  |                               |                               |                               |                               |                               |                               |                               |                               |                               |
|--|--|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|
| <b>Duration</b>  | <b>Average recurrence interval (years)</b> |                               |                               |                               |                               |                               |                               |                               |                               |                               |
|  | <b>1</b>                                   | <b>2</b>                      | <b>5</b>                      | <b>10</b>                     | <b>25</b>                     | <b>50</b>                     | <b>100</b>                    | <b>200</b>                    | <b>500</b>                    | <b>1000</b>                   |
| <b>5-min</b>   | <b>0.336</b><br>(0.307-0.369)              | <b>0.400</b><br>(0.366-0.439) | <b>0.473</b><br>(0.431-0.520) | <b>0.525</b><br>(0.478-0.577) | <b>0.590</b><br>(0.535-0.647) | <b>0.634</b><br>(0.573-0.695) | <b>0.679</b><br>(0.609-0.743) | <b>0.718</b><br>(0.641-0.787) | <b>0.770</b><br>(0.681-0.846) | <b>0.806</b><br>(0.708-0.887) |
| <b>10-min</b>  | <b>0.536</b><br>(0.490-0.589)              | <b>0.639</b><br>(0.585-0.702) | <b>0.757</b><br>(0.690-0.831) | <b>0.839</b><br>(0.764-0.922) | <b>0.938</b><br>(0.851-1.03)  | <b>1.01</b><br>(0.911-1.11)   | <b>1.08</b><br>(0.967-1.18)   | <b>1.14</b><br>(1.01-1.24)    | <b>1.21</b><br>(1.07-1.33)    | <b>1.26</b><br>(1.11-1.39)    |
| <b>15-min</b>  | <b>0.669</b><br>(0.612-0.735)              | <b>0.803</b><br>(0.735-0.882) | <b>0.957</b><br>(0.872-1.05)  | <b>1.06</b><br>(0.966-1.17)   | <b>1.19</b><br>(1.08-1.30)    | <b>1.28</b><br>(1.15-1.40)    | <b>1.36</b><br>(1.22-1.49)    | <b>1.44</b><br>(1.28-1.57)    | <b>1.53</b><br>(1.35-1.68)    | <b>1.58</b><br>(1.39-1.74)    |
| <b>30-min</b>  | <b>0.917</b><br>(0.838-1.01)               | <b>1.11</b><br>(1.01-1.22)    | <b>1.36</b><br>(1.24-1.49)    | <b>1.54</b><br>(1.40-1.69)    | <b>1.76</b><br>(1.60-1.93)    | <b>1.92</b><br>(1.73-2.11)    | <b>2.08</b><br>(1.87-2.28)    | <b>2.23</b><br>(1.99-2.44)    | <b>2.42</b><br>(2.14-2.66)    | <b>2.56</b><br>(2.25-2.82)    |
| <b>60-min</b>  | <b>1.14</b><br>(1.04-1.26)                 | <b>1.39</b><br>(1.27-1.53)    | <b>1.74</b><br>(1.59-1.91)    | <b>2.00</b><br>(1.82-2.20)    | <b>2.34</b><br>(2.12-2.57)    | <b>2.60</b><br>(2.35-2.85)    | <b>2.86</b><br>(2.57-3.14)    | <b>3.12</b><br>(2.79-3.42)    | <b>3.47</b><br>(3.07-3.81)    | <b>3.73</b><br>(3.28-4.11)    |
| <b>2-hr</b>  | <b>1.40</b><br>(1.27-1.54)                 | <b>1.70</b><br>(1.55-1.88)    | <b>2.16</b><br>(1.96-2.39)    | <b>2.51</b><br>(2.27-2.78)    | <b>3.00</b><br>(2.70-3.31)    | <b>3.41</b><br>(3.05-3.76)    | <b>3.82</b><br>(3.39-4.21)    | <b>4.26</b><br>(3.75-4.69)    | <b>4.86</b><br>(4.23-5.36)    | <b>5.34</b><br>(4.61-5.90)    |
| <b>3-hr</b>  | <b>1.56</b><br>(1.42-1.73)                 | <b>1.90</b><br>(1.74-2.11)    | <b>2.42</b><br>(2.20-2.68)    | <b>2.82</b><br>(2.55-3.11)    | <b>3.37</b><br>(3.04-3.72)    | <b>3.82</b><br>(3.42-4.21)    | <b>4.28</b><br>(3.81-4.72)    | <b>4.77</b><br>(4.21-5.26)    | <b>5.44</b><br>(4.75-6.01)    | <b>5.98</b><br>(5.17-6.62)    |
| <b>6-hr</b>  | <b>2.01</b><br>(1.83-2.23)                 | <b>2.44</b><br>(2.23-2.70)    | <b>3.10</b><br>(2.81-3.41)    | <b>3.63</b><br>(3.28-3.98)    | <b>4.38</b><br>(3.93-4.81)    | <b>5.02</b><br>(4.47-5.49)    | <b>5.69</b><br>(5.03-6.23)    | <b>6.42</b><br>(5.62-7.02)    | <b>7.46</b><br>(6.44-8.17)    | <b>8.33</b><br>(7.10-9.12)    |
| <b>12-hr</b>   | <b>2.51</b><br>(2.29-2.77)                 | <b>3.05</b><br>(2.78-3.37)    | <b>3.88</b><br>(3.54-4.28)    | <b>4.59</b><br>(4.16-5.04)    | <b>5.62</b><br>(5.05-6.15)    | <b>6.51</b><br>(5.80-7.11)    | <b>7.48</b><br>(6.58-8.15)    | <b>8.55</b><br>(7.43-9.32)    | <b>10.1</b><br>(8.64-11.0)    | <b>11.5</b><br>(9.65-12.5)    |
| <b>24-hr</b>   | <b>2.84</b><br>(2.62-3.08)                 | <b>3.43</b><br>(3.18-3.74)    | <b>4.40</b><br>(4.07-4.79)    | <b>5.22</b><br>(4.81-5.68)    | <b>6.47</b><br>(5.91-7.02)    | <b>7.55</b><br>(6.85-8.18)    | <b>8.74</b><br>(7.86-9.48)    | <b>10.1</b><br>(8.95-11.0)    | <b>12.1</b><br>(10.6-13.2)    | <b>13.8</b><br>(11.9-15.1)    |
| <b>2-day</b>   | <b>3.35</b><br>(3.08-3.65)                 | <b>4.05</b><br>(3.73-4.42)    | <b>5.17</b><br>(4.76-5.64)    | <b>6.11</b><br>(5.60-6.66)    | <b>7.48</b><br>(6.82-8.15)    | <b>8.65</b><br>(7.84-9.42)    | <b>9.93</b><br>(8.92-10.8)    | <b>11.3</b><br>(10.1-12.4)    | <b>13.4</b><br>(11.7-14.7)    | <b>15.1</b><br>(13.0-16.7)    |
| <b>3-day</b>   | <b>3.52</b><br>(3.25-3.84)                 | <b>4.26</b><br>(3.93-4.64)    | <b>5.42</b><br>(4.99-5.90)    | <b>6.38</b><br>(5.86-6.94)    | <b>7.77</b><br>(7.10-8.44)    | <b>8.94</b><br>(8.12-9.72)    | <b>10.2</b><br>(9.19-11.1)    | <b>11.6</b><br>(10.3-12.6)    | <b>13.6</b><br>(11.9-14.9)    | <b>15.3</b><br>(13.2-16.8)    |
| <b>4-day</b>   | <b>3.70</b><br>(3.42-4.02)                 | <b>4.48</b><br>(4.14-4.86)    | <b>5.66</b><br>(5.23-6.16)    | <b>6.64</b><br>(6.11-7.22)    | <b>8.05</b><br>(7.37-8.73)    | <b>9.23</b><br>(8.40-10.0)    | <b>10.5</b><br>(9.47-11.4)    | <b>11.8</b><br>(10.6-12.9)    | <b>13.8</b><br>(12.2-15.1)    | <b>15.4</b><br>(13.5-17.0)    |
| <b>7-day</b>   | <b>4.38</b><br>(4.06-4.74)                 | <b>5.25</b><br>(4.88-5.69)    | <b>6.52</b><br>(6.05-7.06)    | <b>7.58</b><br>(7.00-8.19)    | <b>9.08</b><br>(8.34-9.83)    | <b>10.3</b><br>(9.43-11.2)    | <b>11.7</b><br>(10.6-12.6)    | <b>13.1</b><br>(11.8-14.2)    | <b>15.1</b><br>(13.4-16.5)    | <b>16.8</b><br>(14.7-18.4)    |
| <b>10-day</b>  | <b>5.02</b><br>(4.68-5.42)                 | <b>6.00</b><br>(5.59-6.47)    | <b>7.34</b><br>(6.83-7.91)    | <b>8.44</b><br>(7.83-9.10)    | <b>10.0</b><br>(9.23-10.8)    | <b>11.3</b><br>(10.4-12.2)    | <b>12.6</b><br>(11.5-13.6)    | <b>14.0</b><br>(12.7-15.2)    | <b>16.0</b><br>(14.3-17.4)    | <b>17.6</b><br>(15.6-19.3)    |
| <b>20-day</b>  | <b>6.79</b><br>(6.37-7.26)                 | <b>8.06</b><br>(7.56-8.62)    | <b>9.62</b><br>(9.01-10.3)    | <b>10.8</b><br>(10.1-11.6)    | <b>12.5</b><br>(11.6-13.4)    | <b>13.8</b><br>(12.8-14.8)    | <b>15.1</b><br>(14.0-16.2)    | <b>16.4</b><br>(15.1-17.6)    | <b>18.2</b><br>(16.6-19.6)    | <b>19.6</b><br>(17.7-21.2)    |
| <b>30-day</b>  | <b>8.46</b><br>(8.00-8.95)                 | <b>9.98</b><br>(9.44-10.6)    | <b>11.7</b><br>(11.0-12.3)    | <b>13.0</b><br>(12.2-13.7)    | <b>14.6</b><br>(13.8-15.5)    | <b>15.9</b><br>(14.9-16.8)    | <b>17.2</b><br>(16.1-18.2)    | <b>18.4</b><br>(17.1-19.5)    | <b>19.9</b><br>(18.4-21.2)    | <b>21.1</b><br>(19.4-22.5)    |
| <b>45-day</b>  | <b>10.7</b><br>(10.2-11.3)                 | <b>12.6</b><br>(12.0-13.3)    | <b>14.6</b><br>(13.8-15.4)    | <b>16.0</b><br>(15.2-16.9)    | <b>17.9</b><br>(16.9-18.9)    | <b>19.3</b><br>(18.2-20.4)    | <b>20.7</b><br>(19.4-21.8)    | <b>22.0</b><br>(20.6-23.2)    | <b>23.6</b><br>(22.0-25.0)    | <b>24.8</b><br>(23.0-26.4)    |
| <b>60-day</b>  | <b>12.9</b><br>(12.3-13.5)                 | <b>15.1</b><br>(14.4-15.9)    | <b>17.3</b><br>(16.4-18.1)    | <b>18.9</b><br>(17.9-19.8)    | <b>20.9</b><br>(19.8-22.0)    | <b>22.3</b><br>(21.1-23.5)    | <b>23.7</b><br>(22.4-25.0)    | <b>24.9</b><br>(23.5-26.4)    | <b>26.5</b><br>(24.9-28.1)    | <b>27.6</b><br>(25.8-29.3)    |

<sup>1</sup> Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values. Please refer to NOAA Atlas 14 document for more information.

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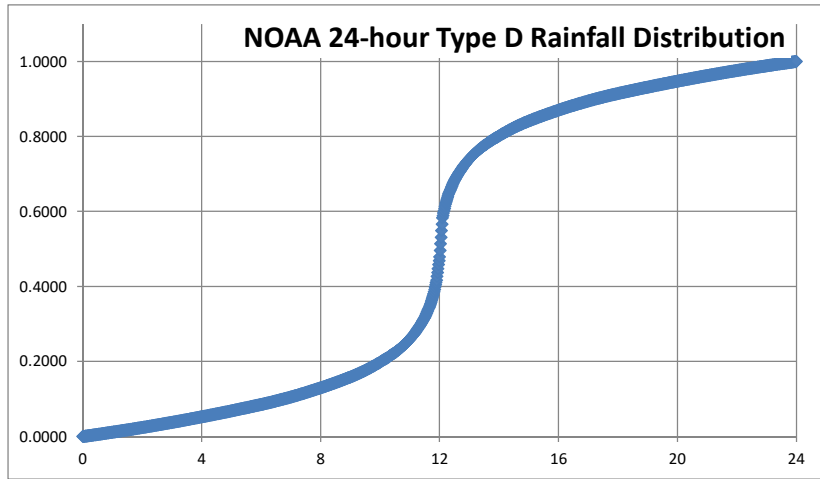
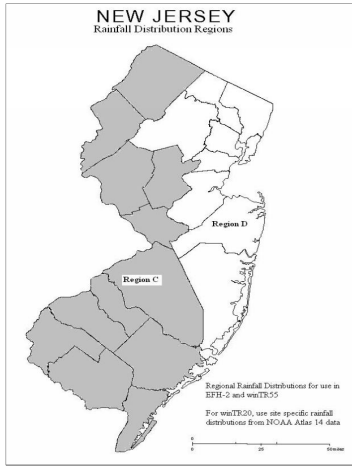
**PF graphical**

| Frequency of Storms  | NOAA NWS PFDS 24-Hour Rainfall Depth (inches) | Current Precipitation Adjustment Factor for Union County | Current Rainfall Depth (inches) | Future Precipitation Adjustment Factor for Union County | Future Rainfall Depth (inches) |
|----------------------|---|--|---------------------------------|---|--------------------------------|
| 2-Year               | 3.43  | 1.01   | 3.46                            | 1.20  | 4.12                           |
| 10-Year              | 5.22  | 1.03   | 5.38                            | 1.23  | 6.42                           |
| 25-Year <sup>1</sup> | 6.47  | 1.04   | 6.73                            | 1.27  | 8.23                           |
| 100-Year             | 8.74  | 1.06   | 9.26                            | 1.35  | 11.80                          |

Notes:

1. The adjustment factors for the current and future 25-year storms was found using a weighted average of the 10- and 100-year adjustment factors.

# **NOAA REGION D RAINFALL DISTRIBUTION**



| Time (hrs) | Cumulative Rainfall (%) | Time (hrs) | Cumulative Rainfall (%) | Time (hrs) | Cumulative Rainfall (%) | Time (hrs) | Cumulative Rainfall (%) | Time (hrs) | Cumulative Rainfall (%) | Time (hrs) | Cumulative Rainfall (%) |
|------------|-------------------------|------------|-------------------------|------------|-------------------------|------------|-------------------------|------------|-------------------------|------------|-------------------------|
| 0          | 0.0000                  | 4          | 0.0489                  | 8          | 0.1198                  | 12         | 0.4766                  | 16         | 0.8802                  | 20         | 0.9511                  |
| 0.1        | 0.0013                  | 4.1        | 0.0504                  | 8.1        | 0.1222                  | 12.1       | 0.5933                  | 16.1       | 0.8826                  | 20.1       | 0.9525                  |
| 0.2        | 0.0023                  | 4.2        | 0.0518                  | 8.2        | 0.1247                  | 12.2       | 0.6338                  | 16.2       | 0.885                   | 20.2       | 0.9539                  |
| 0.3        | 0.0033                  | 4.3        | 0.0532                  | 8.3        | 0.1273                  | 12.3       | 0.663                   | 16.3       | 0.8873                  | 20.3       | 0.9553                  |
| 0.4        | 0.0044                  | 4.4        | 0.0547                  | 8.4        | 0.1298                  | 12.4       | 0.6843                  | 16.4       | 0.8896                  | 20.4       | 0.9566                  |
| 0.5        | 0.0055                  | 4.5        | 0.0562                  | 8.5        | 0.1324                  | 12.5       | 0.7045                  | 16.5       | 0.8918                  | 20.5       | 0.958                   |
| 0.6        | 0.0065                  | 4.6        | 0.0576                  | 8.6        | 0.1351                  | 12.6       | 0.7175                  | 16.6       | 0.894                   | 20.6       | 0.9594                  |
| 0.7        | 0.0076                  | 4.7        | 0.0591                  | 8.7        | 0.1378                  | 12.7       | 0.7298                  | 16.7       | 0.8962                  | 20.7       | 0.9607                  |
| 0.8        | 0.0087                  | 4.8        | 0.0606                  | 8.8        | 0.1405                  | 12.8       | 0.7409                  | 16.8       | 0.8983                  | 20.8       | 0.9621                  |
| 0.9        | 0.0098                  | 4.9        | 0.0621                  | 8.9        | 0.1432                  | 12.9       | 0.751                   | 16.9       | 0.9004                  | 20.9       | 0.9634                  |
| 1          | 0.0109                  | 5          | 0.0636                  | 9          | 0.1461                  | 13         | 0.76                    | 17         | 0.9025                  | 21         | 0.9647                  |
| 1.1        | 0.0121                  | 5.1        | 0.0651                  | 9.1        | 0.149                   | 13.1       | 0.7679                  | 17.1       | 0.9045                  | 21.1       | 0.966                   |
| 1.2        | 0.0132                  | 5.2        | 0.0667                  | 9.2        | 0.1521                  | 13.2       | 0.7753                  | 17.2       | 0.9064                  | 21.2       | 0.9673                  |
| 1.3        | 0.0143                  | 5.3        | 0.0682                  | 9.3        | 0.1554                  | 13.3       | 0.7821                  | 17.3       | 0.9084                  | 21.3       | 0.9686                  |
| 1.4        | 0.0155                  | 5.4        | 0.0697                  | 9.4        | 0.1588                  | 13.4       | 0.7883                  | 17.4       | 0.9103                  | 21.4       | 0.9699                  |
| 1.5        | 0.0167                  | 5.5        | 0.0713                  | 9.5        | 0.1623                  | 13.5       | 0.7939                  | 17.5       | 0.9121                  | 21.5       | 0.9712                  |
| 1.6        | 0.0178                  | 5.6        | 0.0729                  | 9.6        | 0.166                   | 13.6       | 0.799                   | 17.6       | 0.9139                  | 21.6       | 0.9724                  |
| 1.7        | 0.019                   | 5.7        | 0.0745                  | 9.7        | 0.1699                  | 13.7       | 0.8039                  | 17.7       | 0.9157                  | 21.7       | 0.9737                  |
| 1.8        | 0.0202                  | 5.8        | 0.076                   | 9.8        | 0.1739                  | 13.8       | 0.8086                  | 17.8       | 0.9174                  | 21.8       | 0.9749                  |
| 1.9        | 0.0214                  | 5.9        | 0.0776                  | 9.9        | 0.178                   | 13.9       | 0.8132                  | 17.9       | 0.9191                  | 21.9       | 0.9762                  |
| 2          | 0.0226                  | 6          | 0.0793                  | 10         | 0.1823                  | 14         | 0.8177                  | 18         | 0.9208                  | 22         | 0.9774                  |
| 2.1        | 0.0238                  | 6.1        | 0.0809                  | 10.1       | 0.1868                  | 14.1       | 0.822                   | 18.1       | 0.9224                  | 22.1       | 0.9786                  |
| 2.2        | 0.0251                  | 6.2        | 0.0826                  | 10.2       | 0.1914                  | 14.2       | 0.8261                  | 18.2       | 0.924                   | 22.2       | 0.9798                  |
| 2.3        | 0.0263                  | 6.3        | 0.0843                  | 10.3       | 0.1961                  | 14.3       | 0.8301                  | 18.3       | 0.9255                  | 22.3       | 0.981                   |
| 2.4        | 0.0276                  | 6.4        | 0.0861                  | 10.4       | 0.201                   | 14.4       | 0.834                   | 18.4       | 0.9271                  | 22.4       | 0.9822                  |
| 2.5        | 0.0288                  | 6.5        | 0.0879                  | 10.5       | 0.2061                  | 14.5       | 0.8377                  | 18.5       | 0.9287                  | 22.5       | 0.9833                  |
| 2.6        | 0.0301                  | 6.6        | 0.0897                  | 10.6       | 0.2117                  | 14.6       | 0.8412                  | 18.6       | 0.9303                  | 22.6       | 0.9845                  |
| 2.7        | 0.0314                  | 6.7        | 0.0916                  | 10.7       | 0.2179                  | 14.7       | 0.8446                  | 18.7       | 0.9318                  | 22.7       | 0.9857                  |
| 2.8        | 0.0327                  | 6.8        | 0.0936                  | 10.8       | 0.2247                  | 14.8       | 0.8479                  | 18.8       | 0.9334                  | 22.8       | 0.9868                  |
| 2.9        | 0.034                   | 6.9        | 0.0955                  | 10.9       | 0.2321                  | 14.9       | 0.851                   | 18.9       | 0.9349                  | 22.9       | 0.9879                  |
| 3          | 0.0353                  | 7          | 0.0975                  | 11         | 0.24                    | 15         | 0.854                   | 19         | 0.9364                  | 23         | 0.9891                  |
| 3.1        | 0.0366                  | 7.1        | 0.0996                  | 11.1       | 0.249                   | 15.1       | 0.8568                  | 19.1       | 0.9379                  | 23.1       | 0.9902                  |
| 3.2        | 0.0379                  | 7.2        | 0.1017                  | 11.2       | 0.2591                  | 15.2       | 0.8595                  | 19.2       | 0.9394                  | 23.2       | 0.9913                  |
| 3.3        | 0.0393                  | 7.3        | 0.1038                  | 11.3       | 0.2702                  | 15.3       | 0.8622                  | 19.3       | 0.9409                  | 23.3       | 0.9924                  |
| 3.4        | 0.0406                  | 7.4        | 0.106                   | 11.4       | 0.2824                  | 15.4       | 0.8649                  | 19.4       | 0.9424                  | 23.4       | 0.9935                  |
| 3.5        | 0.042                   | 7.5        | 0.1082                  | 11.5       | 0.2955                  | 15.5       | 0.8676                  | 19.5       | 0.9438                  | 23.5       | 0.9945                  |
| 3.6        | 0.0434                  | 7.6        | 0.1104                  | 11.6       | 0.3157                  | 15.6       | 0.8702                  | 19.6       | 0.9453                  | 23.6       | 0.9956                  |
| 3.7        | 0.0447                  | 7.7        | 0.1127                  | 11.7       | 0.337                   | 15.7       | 0.8727                  | 19.7       | 0.9468                  | 23.7       | 0.9966                  |
| 3.8        | 0.0461                  | 7.8        | 0.115                   | 11.8       | 0.3662                  | 15.8       | 0.8753                  | 19.8       | 0.9482                  | 23.8       | 0.9977                  |
| 3.9        | 0.0475                  | 7.9        | 0.1174                  | 11.9       | 0.4067                  | 15.9       | 0.8777                  | 19.9       | 0.9496                  | 23.9       | 0.9987                  |
|            |                         |            |                         |            |                         |            |                         |            |                         | 24         | 1.0000                  |

Reference: USDA Natural Resources Conservation Service New Jersey, Engineering Guidelines

## **PROPOSED RUNOFF CURVE NUMBER CALCULATIONS**

**PROPOSED RUNOFF CURVE NUMBER CALCULATIONS  
BEACON UNITARIAN UNIVERSALIST CHURCH  
LANGAN PROJECT #101007201**

**PROPOSED CONDITIONS**

| <b>PROPOSED WATERSHED AREAS</b> | <b>OPEN SPACE HSGC C CN = 74 (SF)</b> | <b>OPEN SPACE HSGC C CN = 74 (AC)</b> | <b>WOODS HSGC C CN = 70 (SF)</b> | <b>WOODS HSGC C CN = 70 (AC)</b> | <b>IMPERVIOUS AREA CN = 98 (SF)</b> | <b>IMPERVIOUS AREA CN = 98 (AC)</b> | <b>TOTAL AREA (SF)</b> | <b>TOTAL AREA (AC)</b> | <b>CURVE NUMBER CN (Weighted)</b> |
|---------------------------------|---------------------------------------|---------------------------------------|----------------------------------|----------------------------------|-------------------------------------|-------------------------------------|------------------------|------------------------|-----------------------------------|
| <b>POA-1</b>                    |                                       |                                       |                                  |                                  |                                     |                                     |                        |                        |                                   |
| PR-1A                           | 32                                    | 0.00                                  | 0                                | 0.00                             | 10,292                              | 0.24                                | 10,325                 | 0.24                   | 98                                |
| PR-1B                           | 4,057                                 | 0.09                                  | 0                                | 0.00                             | 5,380                               | 0.13                                | 9,437                  | 0.22                   | 88                                |
| PR-1C                           | 1,269                                 | 0.03                                  | 0                                | 0.00                             | 1,034                               | 0.02                                | 2,303                  | 0.05                   | 85                                |
| PR-1D                           | 2,586                                 | 0.06                                  | 0                                | 0.00                             | 5,018                               | 0.11                                | 7,604                  | 0.17                   | 90                                |
| PR-1E                           | 6,704                                 | 0.15                                  | 0                                | 0.00                             | 1,721                               | 0.04                                | 8,425                  | 0.19                   | 79                                |
| <b>POA-2</b>                    |                                       |                                       |                                  |                                  |                                     |                                     |                        |                        |                                   |
| PR-2A                           | 914                                   | 0.02                                  | 0                                | 0.00                             | 9,753                               | 0.22                                | 10,667                 | 0.24                   | 96                                |
| PR-2B                           | 3,345                                 | 0.07                                  | 0                                | 0.00                             | 2,073                               | 0.05                                | 5,418                  | 0.12                   | 83                                |
| PR-2C                           | 1,579                                 | 0.04                                  | 0                                | 0.00                             | 2,771                               | 0.06                                | 4,350                  | 0.10                   | 89                                |
| PR-2D                           | 7,585                                 | 0.17                                  | 19,084                           | 0.44                             | 2,121                               | 0.05                                | 28,790                 | 0.66                   | 73                                |
| PR-2E                           | 4,646                                 | 0.11                                  | 0                                | 0.00                             | 1,271                               | 0.03                                | 5,917                  | 0.14                   | 79                                |
| PR-2F                           | 0                                     | 0.00                                  | 2,547                            | 0.06                             | 1,143                               | 0.02                                | 3,690                  | 0.08                   | 79                                |
| PR-2G                           | 3,947                                 | 0.09                                  | 3,906                            | 0.09                             | 119                                 | 0.00                                | 7,971                  | 0.18                   | 72                                |
| PR-2H                           | 783                                   | 0.02                                  | 0                                | 0.00                             | 2,765                               | 0.06                                | 3,548                  | 0.08                   | 93                                |
| <b>POA-3</b>                    |                                       |                                       |                                  |                                  |                                     |                                     |                        |                        |                                   |
| PR-3                            | 1,127                                 | 0.03                                  | 0                                | 0.00                             | 142                                 | 0.00                                | 1,269                  | 0.03                   | 77                                |

**NOTES:**

1. Runoff curve numbers referenced from Technical Release 55 (TR-55) Table 2-2a: Runoff Curve Numbers for Urban Areas and Table 2-2c: Runoff Curve Numbers for Other Agricultural Lands.



## **CURRENT HYDROGRAPH CALCULATIONS**

## **PR-1A WATERSHED**

Project: Beacon Unitarian Universalist Church

By: TEG

Date: 11/29/2023

Location: Summit, NJ

Checked By: MJV

Date Checked: 11/29/2023

Circle One: Present Developed

Current Proposed Watershed PR-1A - Impervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Design Flow Length, L<sub>des</sub> (Total L<sub>des</sub> < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. McCuen-Spiess Limit, L<sub>mcs</sub> (max. 100 ft)
7. Compute T<sub>t</sub>

$$T_t = \frac{0.007 (n L_{des})^{0.8}}{P_2^{0.5} s^{0.4}}$$

$$L_{mcs} = (100 s^{0.5})/n$$

|            |                        |   |  |
|------------|------------------------|---|--|
| Segment ID | 1                      |   |  |
|            | <b>Smooth Surfaces</b> |   |  |
|            | <b>0.011</b>           |   |  |
| ft         | <b>64</b>              |   |  |
| in         | <b>3.46</b>            |   |  |
| ft/ft      | <b>0.020</b>           |   |  |
| ft         | <b>100</b>             |   |  |
| hr         | <b>0.014</b>           | + |  |

Sheet Flow Sub-Total **0.014 hours**

**Shallow Concentrated Flow**

8. Surface Description
9. Flow Length, L
10. Watercourse Slope, s
11. Average Velocity, V (NEH table 15-3)
12. Compute T<sub>t</sub>

$$T_t = \frac{L}{3600 V}$$

|            |  |   |  |
|------------|--|---|--|
| Segment ID |  |   |  |
| ft         |  |   |  |
| ft/ft      |  |   |  |
| ft/s       |  |   |  |
| hr         |  | + |  |

Shallow Conc. Flow Sub-Total **0.000 hours**

**Channel Flow**

13. Flow Length, L
14. Cross Sectional flow area, a
15. Wetted Perimeter, P<sub>w</sub>
16. Hydraulic Radius, r
17. Channel Slope, s
18. Manning's Roughness Coeff., n
19. Velocity, V
20. Compute T<sub>t</sub>

$$r = a / P_w$$

$$V = (1.49 r^{2/3} s^{1/2}) / n$$

$$T_t = \frac{L}{3600 V}$$

|                 |              |   |  |
|-----------------|--------------|---|--|
| Segment ID      | 2            |   |  |
| ft              | <b>56</b>    |   |  |
| ft <sup>2</sup> | <b>0.17</b>  |   |  |
| ft              | <b>1.00</b>  |   |  |
| ft              | <b>0.17</b>  |   |  |
| ft/ft           | <b>0.020</b> |   |  |
|                 | <b>0.012</b> |   |  |
| ft/s            | <b>5.39</b>  |   |  |
| hr              | <b>0.003</b> | + |  |

Channel Flow Sub-Total **0.003 hours**

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>

(Add Sub-Total T<sub>t</sub> from prior steps)

|   |                    |
|---|--------------------|
| Total T <sub>c</sub> (hours) =                        | <b>0.016 hours</b> |
| Software Limitations Require Minimum T <sub>c</sub> = | <b>2 minutes</b>   |

# Hydrograph Report

Hydrology Studio v 3.0.0.38

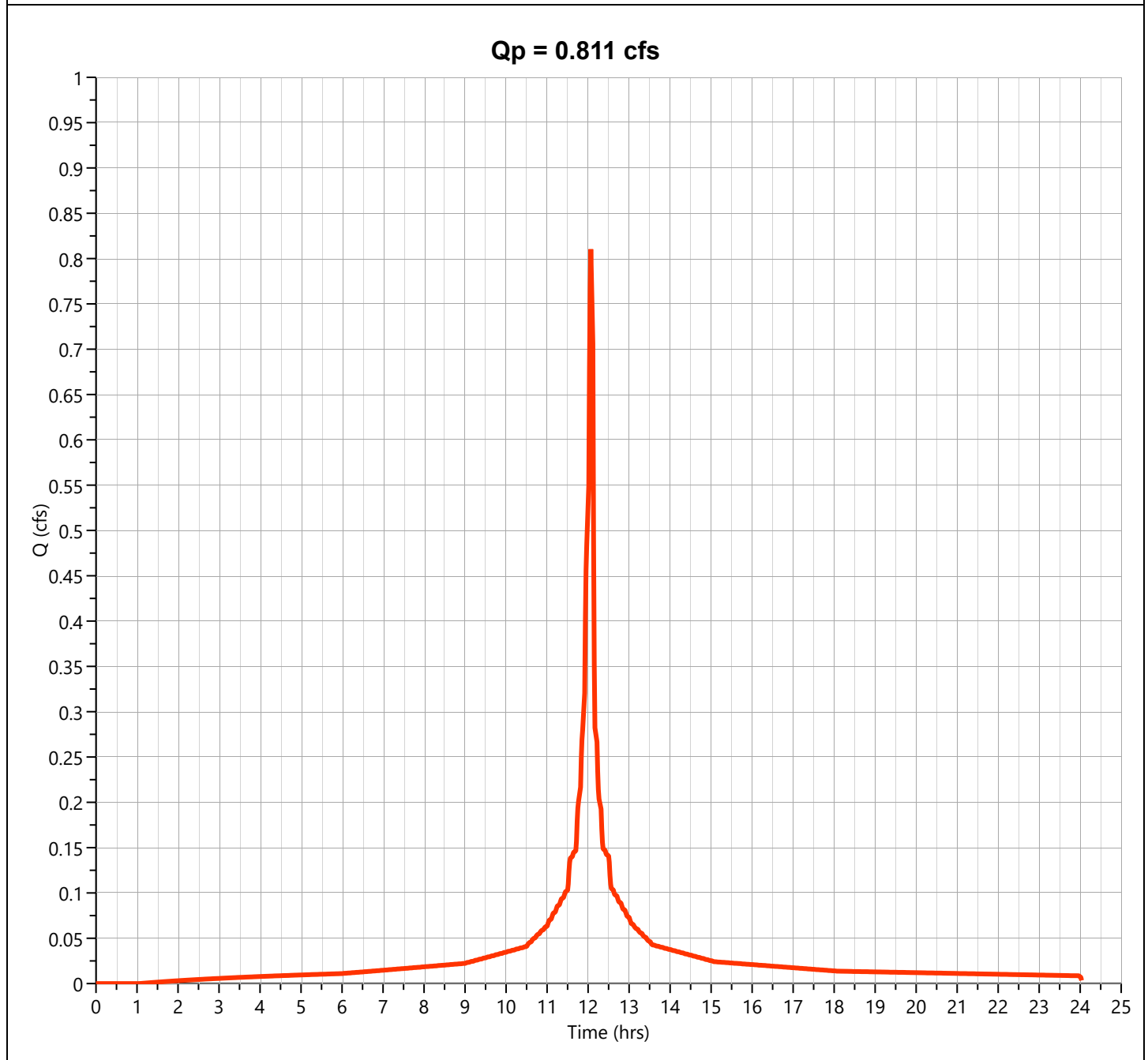
File: Current Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

**PR-1A**

**Hyd. No. 1**

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.811 cfs  |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 2,635 cuft |
| Drainage Area   | = 0.24 ac     | Curve Number       | = 98.00      |
| Tc Method       | = User        | Time of Conc. (Tc) | = 2.0 min    |
| Total Rainfall  | = 3.46 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

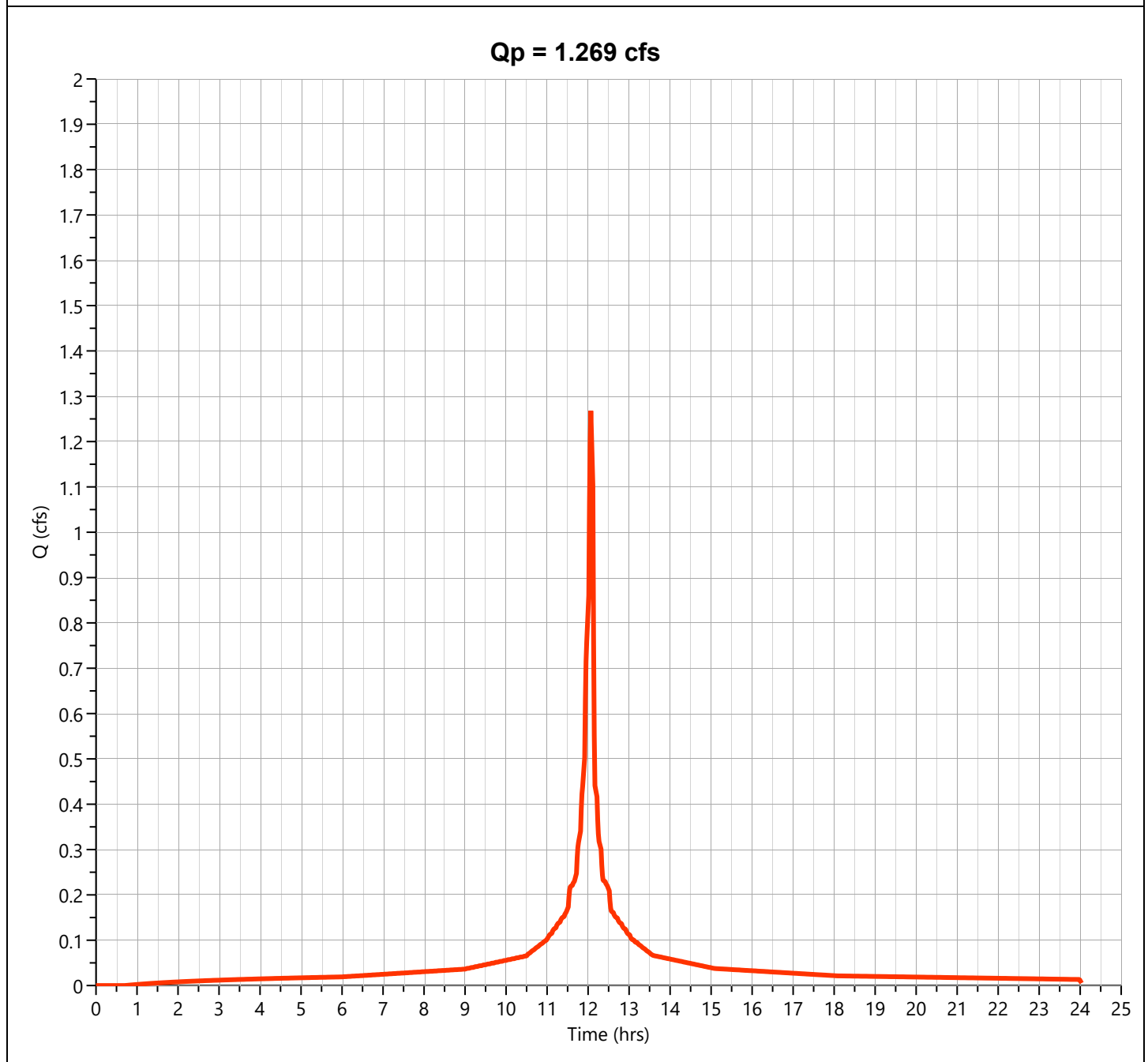
File: Current Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

**PR-1A**

**Hyd. No. 1**

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 1.269 cfs  |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 4,200 cuft |
| Drainage Area   | = 0.24 ac     | Curve Number       | = 98.00      |
| Tc Method       | = User        | Time of Conc. (Tc) | = 2.0 min    |
| Total Rainfall  | = 5.38 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

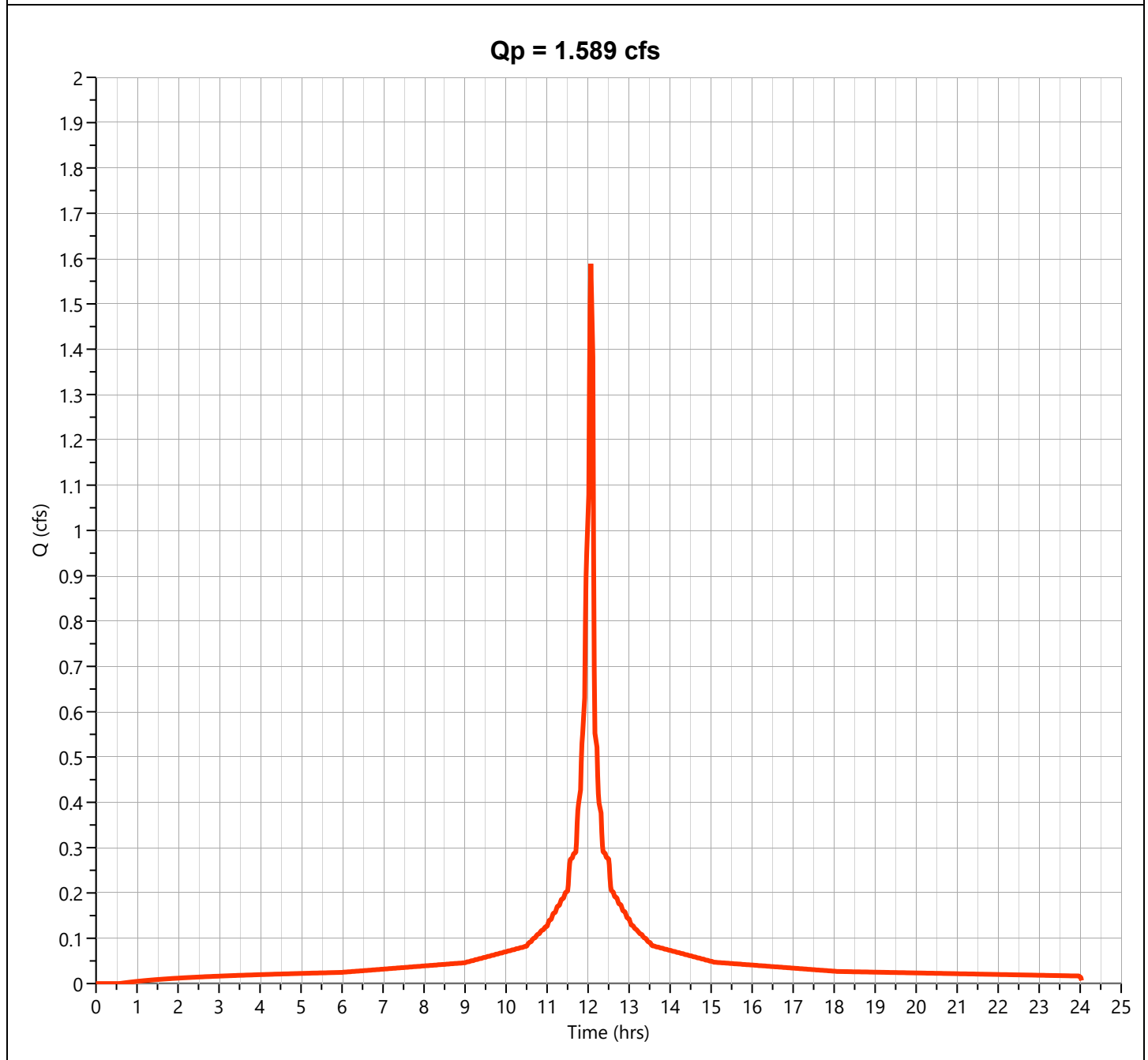
File: Current Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

**PR-1A**

**Hyd. No. 1**

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 1.589 cfs  |
| Storm Frequency | = 25-yr       | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 5,302 cuft |
| Drainage Area   | = 0.24 ac     | Curve Number       | = 98.00      |
| Tc Method       | = User        | Time of Conc. (Tc) | = 2.0 min    |
| Total Rainfall  | = 6.73 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

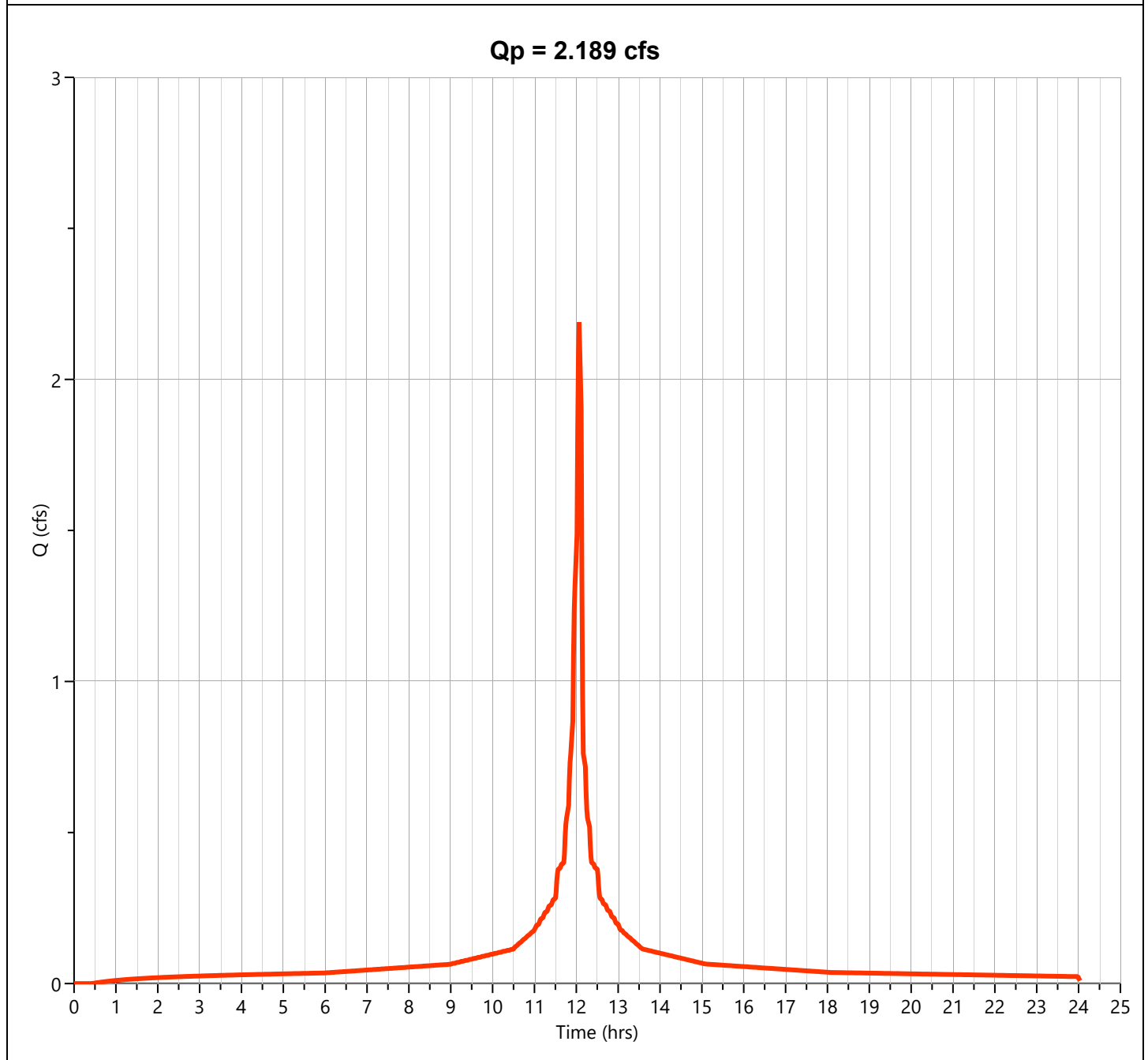
File: Current Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

**PR-1A**

**Hyd. No. 1**

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 2.189 cfs  |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 7,367 cuft |
| Drainage Area   | = 0.24 ac     | Curve Number       | = 98.00      |
| Tc Method       | = User        | Time of Conc. (Tc) | = 2.0 min    |
| Total Rainfall  | = 9.26 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



## **PR-1B WATERSHED**



Project: Beacon Unitarian Universalist Church

By: TEG

Date: 11/29/2023

Location: Summit, NJ

Checked By: MJV

Date Checked: 11/29/2023

Circle One: Present Developed

Current Proposed Watershed PR-1B - Impervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Design Flow Length, L<sub>des</sub> (Total L<sub>des</sub> < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. McCuen-Spiess Limit, L<sub>mcs</sub> (max. 100 ft)
7. Compute T<sub>t</sub>

$$T_t = \frac{0.007 (n L_{des})^{0.8}}{P_2^{0.5} s^{0.4}}$$

$$L_{mcs} = (100 s^{0.5})/n$$

| Segment ID | 1                      | 2                    | 3                    |
|------------|------------------------|----------------------|----------------------|
|            | <b>Smooth Surfaces</b> | <b>Dense Grasses</b> | <b>Dense Grasses</b> |
|            | <b>0.011</b>           | <b>0.24</b>          | <b>0.24</b>          |
| ft         | <b>24</b>              | <b>7</b>             | <b>11</b>            |
| in         | <b>3.46</b>            | <b>3.46</b>          | <b>3.46</b>          |
| ft/ft      | <b>0.014</b>           | <b>0.334</b>         | <b>0.010</b>         |
| ft         | <b>100</b>             | <b>100</b>           | <b>42</b>            |
| hr         | <b>0.007</b>           | <b>0.009</b>         | <b>0.052</b>         |

Sheet Flow Sub-Total **0.067 hours**

**Shallow Concentrated Flow**

8. Surface Description
9. Flow Length, L
10. Watercourse Slope, s
11. Average Velocity, V (NEH table 15-3)
12. Compute T<sub>t</sub>

$$T_t = \frac{L}{3600 V}$$

| Segment ID |  |  |  |
|------------|--|--|--|
|            |  |  |  |
| ft         |  |  |  |
| ft/ft      |  |  |  |
| ft/s       |  |  |  |
| hr         |  |  |  |

Shallow Conc. Flow Sub-Total **0.000 hours**

**Channel Flow**

13. Flow Length, L
14. Cross Sectional flow area, a
15. Wetted Perimeter, P<sub>w</sub>
16. Hydraulic Radius, r
17. Channel Slope, s
18. Manning's Roughness Coeff., n
19. Velocity, V
20. Compute T<sub>t</sub>

$$r = a / P_w$$

$$V = (1.49 r^{2/3} s^{1/2}) / n$$

$$T_t = \frac{L}{3600 V}$$

| Segment ID      | 4            |  |  |
|-----------------|--------------|--|--|
| ft              | <b>69</b>    |  |  |
| ft <sup>2</sup> | <b>0.39</b>  |  |  |
| ft              | <b>1.60</b>  |  |  |
| ft              | <b>0.24</b>  |  |  |
| ft/ft           | <b>0.010</b> |  |  |
|                 | <b>0.012</b> |  |  |
| ft/s            | <b>4.85</b>  |  |  |
| hr              | <b>0.004</b> |  |  |

Channel Flow Sub-Total **0.004 hours**

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>

(Add Sub-Total T<sub>t</sub> from prior steps)

|                                  |                    |
|----------------------------------|--------------------|
| Total T <sub>c</sub> (hours) =   | <b>0.071 hours</b> |
| Total T <sub>c</sub> (minutes) = | <b>4 minutes</b>   |

Project: Beacon Unitarian Universalist Church

By: TEG

Date: 11/29/2023

Location: Summit, NJ

Checked By: MJV

Date Checked: 11/29/2023

Circle One: Present Developed

Current Proposed Watershed PR-1B - Pervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Design Flow Length, L<sub>des</sub> (Total L<sub>des</sub> < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. McCuen-Spiess Limit, L<sub>mcs</sub> (max. 100 ft)
7. Compute T<sub>t</sub>

$$L_{mcs} = (100 s^{0.5})/n$$

$$T_t = \frac{0.007 (n L_{des})^{0.8}}{P_2^{0.5} s^{0.4}}$$

|            |                               |   |  |
|------------|-------------------------------|---|--|
| Segment ID | 1                             |   |  |
|            | <b>Woods Dense Underbrush</b> |   |  |
|            | <b>0.40</b>                   |   |  |
| ft         | <b>42</b>                     |   |  |
| in         | <b>3.46</b>                   |   |  |
| ft/ft      | <b>0.029</b>                  |   |  |
| ft         | <b>42</b>                     |   |  |
| hr         | <b>0.149</b>                  | + |  |

Sheet Flow Sub-Total **0.149 hours**

**Shallow Concentrated Flow**

8. Surface Description
9. Flow Length, L
10. Watercourse Slope, s
11. Average Velocity, V (NEH table 15-3)
12. Compute T<sub>t</sub>

$$T_t = \frac{L}{3600 V}$$

|            |                          |                 |                          |
|------------|--------------------------|-----------------|--------------------------|
| Segment ID | 2                        | 3               | 4                        |
|            | <b>Grassed Waterways</b> | <b>Pavement</b> | <b>Grassed Waterways</b> |
| ft         | <b>4</b>                 | <b>5</b>        | <b>6</b>                 |
| ft/ft      | <b>0.037</b>             | <b>0.018</b>    | <b>0.275</b>             |
| ft/s       | <b>3.10</b>              | <b>2.73</b>     | <b>8.45</b>              |
| hr         | <b>0.000</b>             | <b>0.001</b>    | <b>0.000</b>             |

Shallow Conc. Flow Sub-Total **0.001 hours**

**Channel Flow**

13. Flow Length, L
14. Cross Sectional flow area, a
15. Wetted Perimeter, P<sub>w</sub>
16. Hydraulic Radius, r
17. Channel Slope, s
18. Manning's Roughness Coeff., n
19. Velocity, V
20. Compute T<sub>t</sub>

$$r = a / P_w$$

$$V = (1.49 r^{2/3} s^{1/2}) / n$$

$$T_t = \frac{L}{3600 V}$$

|                 |              |   |  |
|-----------------|--------------|---|--|
| Segment ID      | 5            |   |  |
| ft              | <b>69</b>    |   |  |
| ft <sup>2</sup> | <b>0.39</b>  |   |  |
| ft              | <b>1.60</b>  |   |  |
| ft              | <b>0.24</b>  |   |  |
| ft/ft           | <b>0.010</b> |   |  |
|                 | <b>0.012</b> |   |  |
| ft/s            | <b>4.85</b>  |   |  |
| hr              | <b>0.004</b> | + |  |

Channel Flow Sub-Total **0.004 hours**

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>

(Add Sub-Total T<sub>t</sub> from prior steps)

|                                  |                    |
|----------------------------------|--------------------|
| Total T <sub>c</sub> (hours) =   | <b>0.154 hours</b> |
| Total T <sub>c</sub> (minutes) = | <b>9 minutes</b>   |

# Hydrograph Report

Hydrology Studio v 3.0.0.38

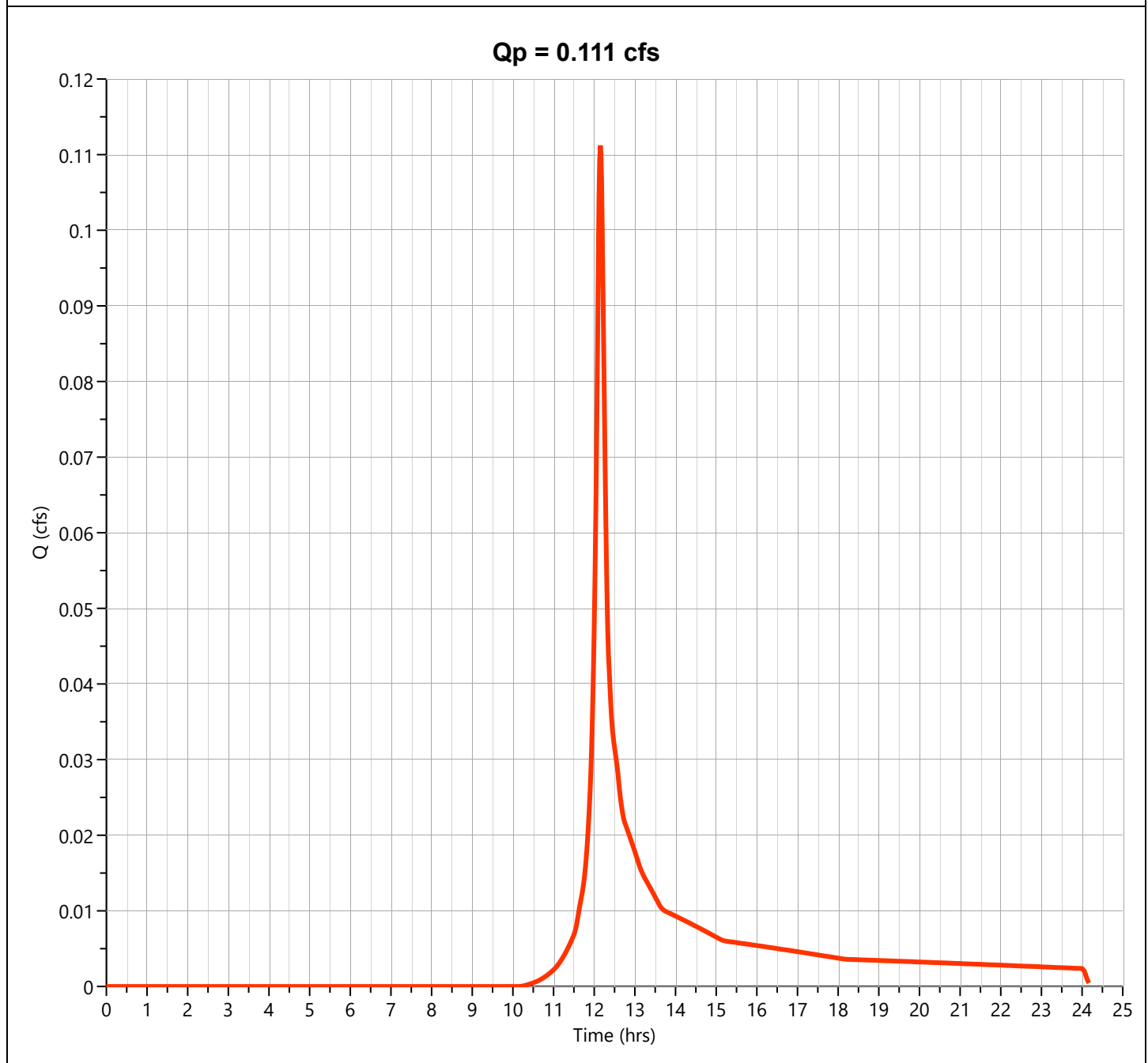
File: Current Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

## PR-1B Grass HSGC C

Hyd. No. 4

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.111 cfs |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.15 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 396 cuft  |
| Drainage Area   | = 0.09 ac     | Curve Number       | = 74.00     |
| Tc Method       | = User        | Time of Conc. (Tc) | = 9.0 min   |
| Total Rainfall  | = 3.46 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

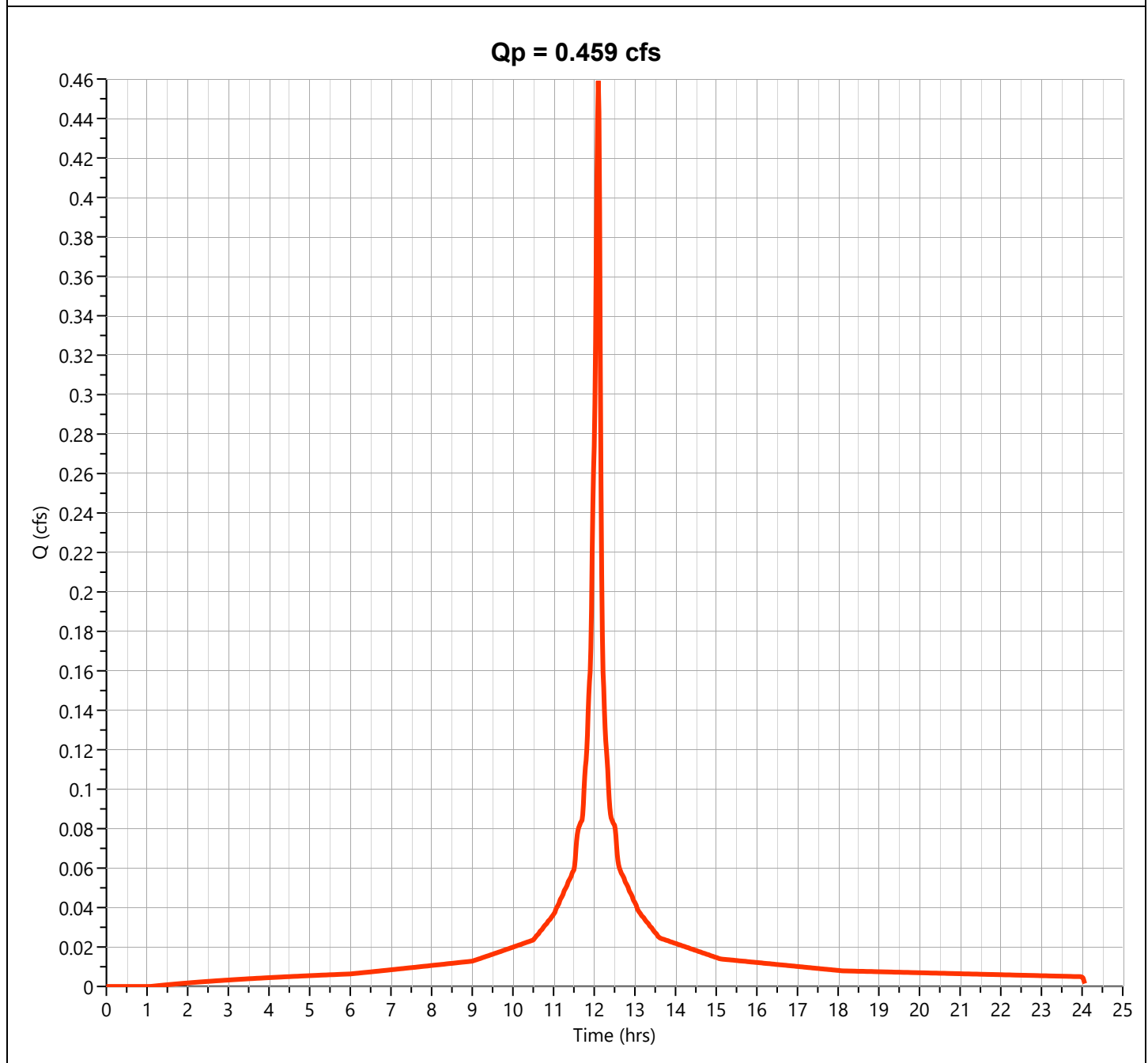
File: Current Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

## PR-1B Impervious

## Hyd. No. 5

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.459 cfs  |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 1,523 cuft |
| Drainage Area   | = 0.13 ac     | Curve Number       | = 98.00      |
| Tc Method       | = User        | Time of Conc. (Tc) | = 4.0 min    |
| Total Rainfall  | = 3.46 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

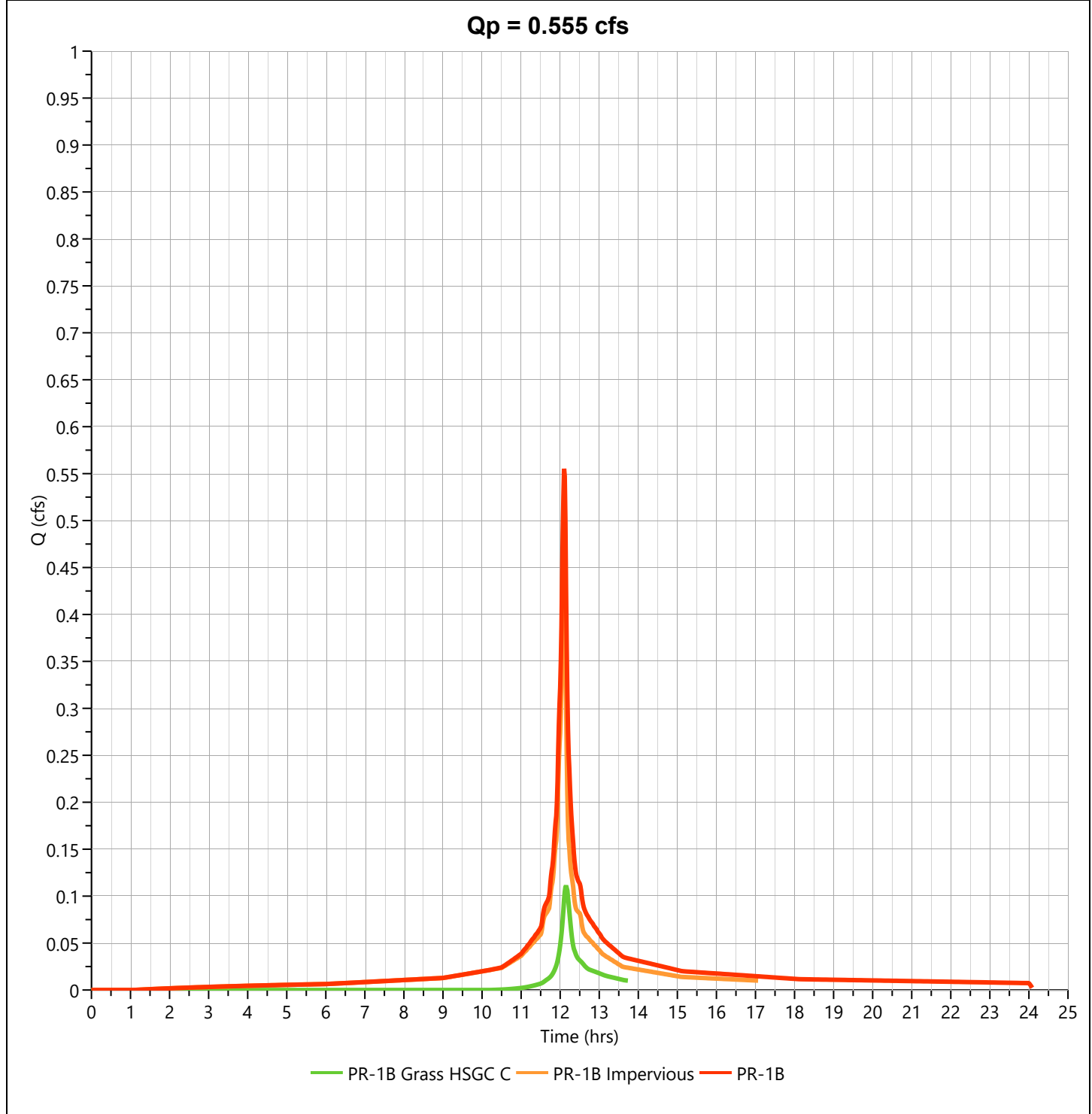
File: Current Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

## PR-1B

## Hyd. No. 6

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.555 cfs  |
| Storm Frequency    | = 2-yr     | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 1,919 cuft |
| Inflow Hydrographs | = 4, 5     | Total Contrib. Area | = 0.22 ac    |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

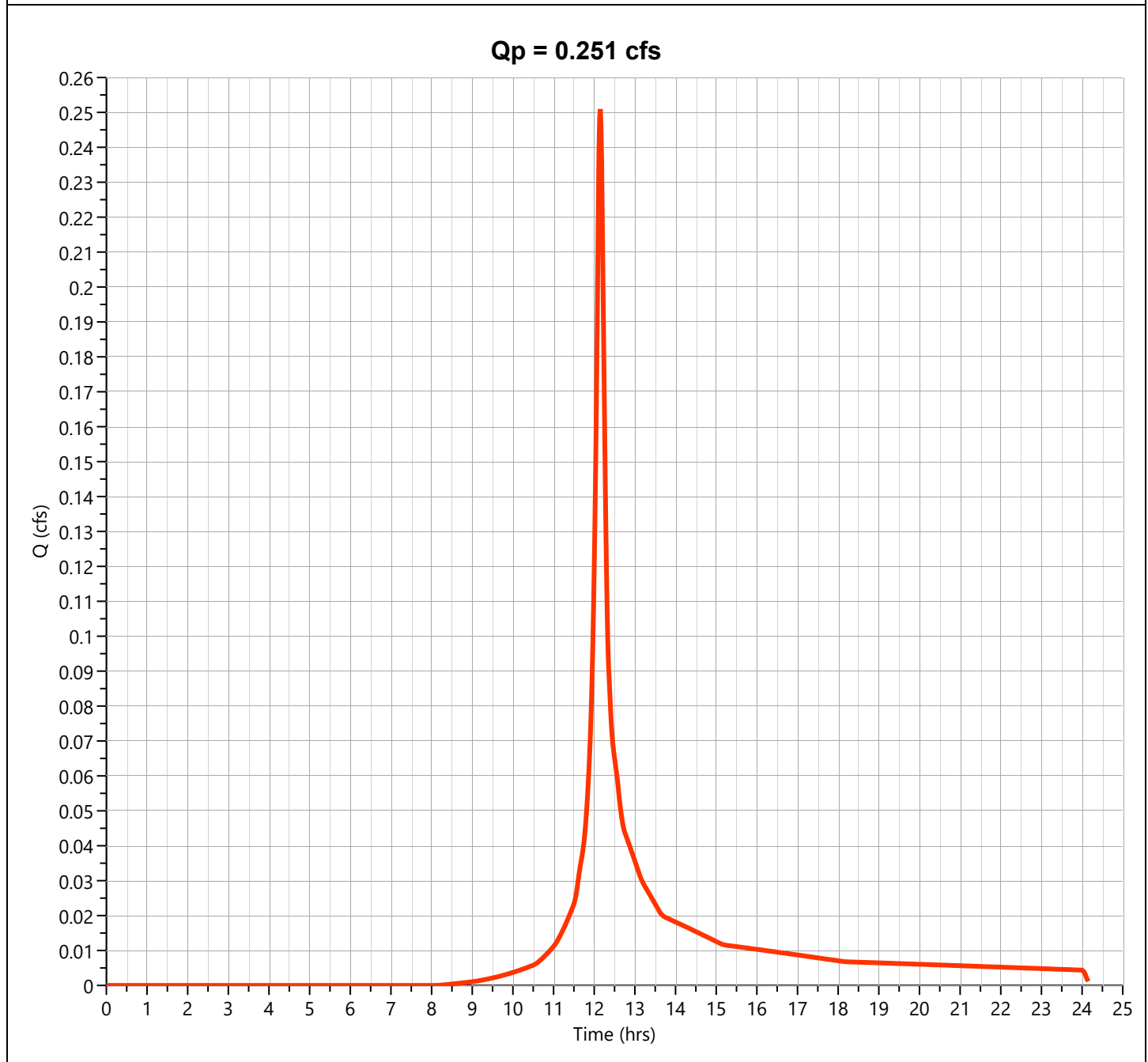
File: Current Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

## PR-1B Grass HSGC C

Hyd. No. 4

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.251 cfs |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.15 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 873 cuft  |
| Drainage Area   | = 0.09 ac     | Curve Number       | = 74.00     |
| Tc Method       | = User        | Time of Conc. (Tc) | = 9.0 min   |
| Total Rainfall  | = 5.38 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

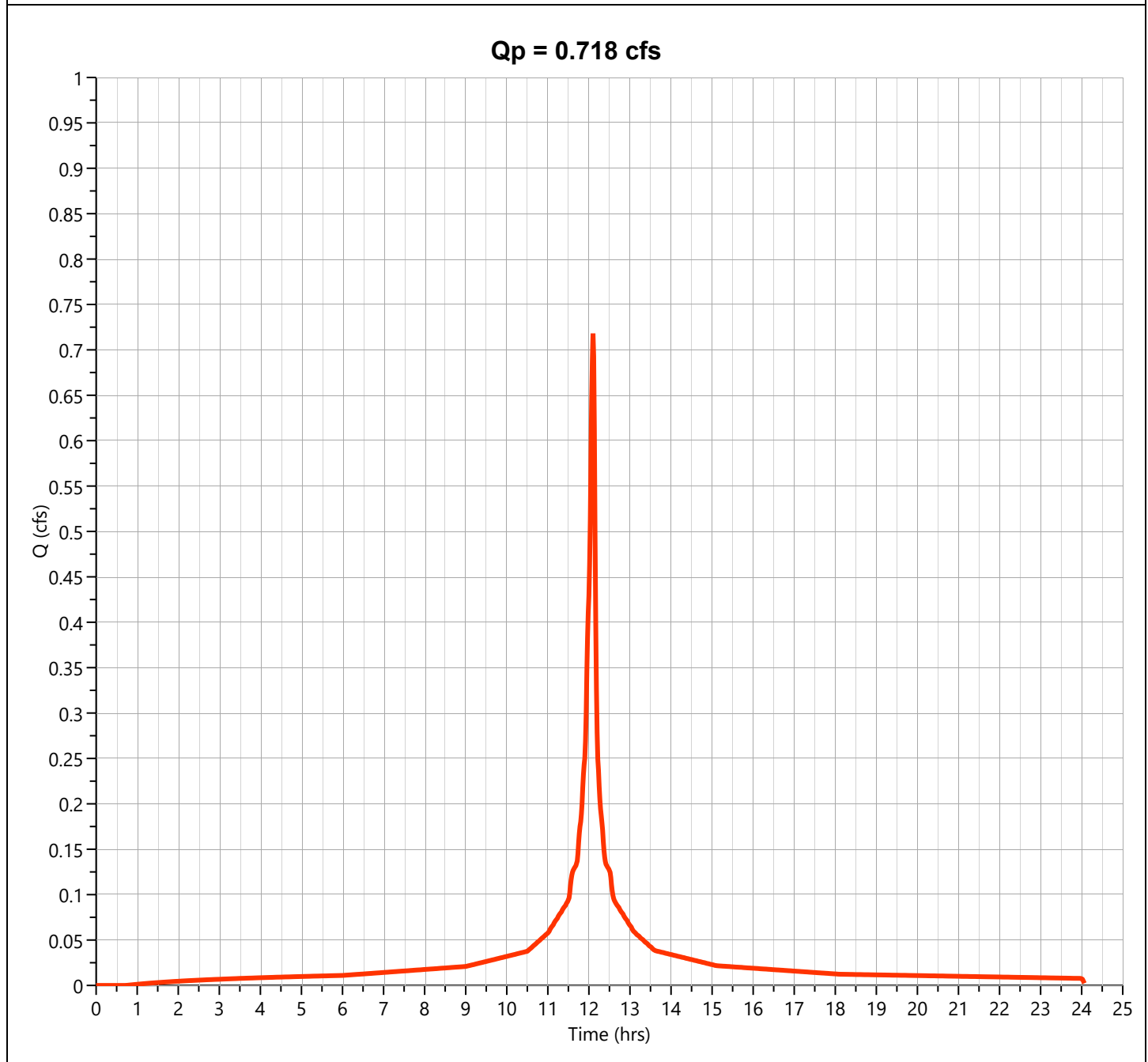
File: Current Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

## PR-1B Impervious

## Hyd. No. 5

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.718 cfs  |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 2,427 cuft |
| Drainage Area   | = 0.13 ac     | Curve Number       | = 98.00      |
| Tc Method       | = User        | Time of Conc. (Tc) | = 4.0 min    |
| Total Rainfall  | = 5.38 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

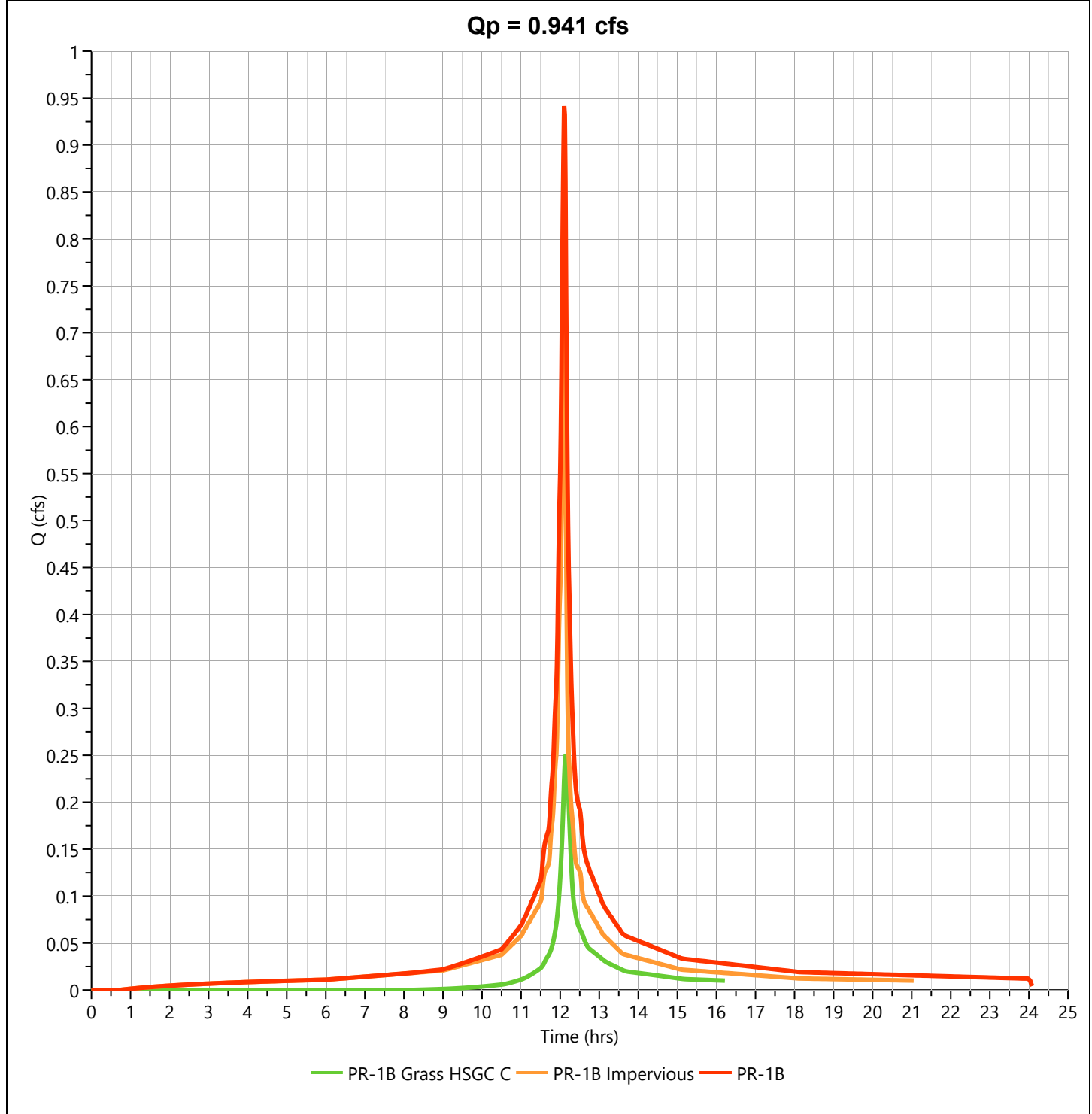
File: Current Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

## PR-1B

## Hyd. No. 6

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.941 cfs  |
| Storm Frequency    | = 10-yr    | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 3,299 cuft |
| Inflow Hydrographs | = 4, 5     | Total Contrib. Area | = 0.22 ac    |





# Hydrograph Report

Hydrology Studio v 3.0.0.38

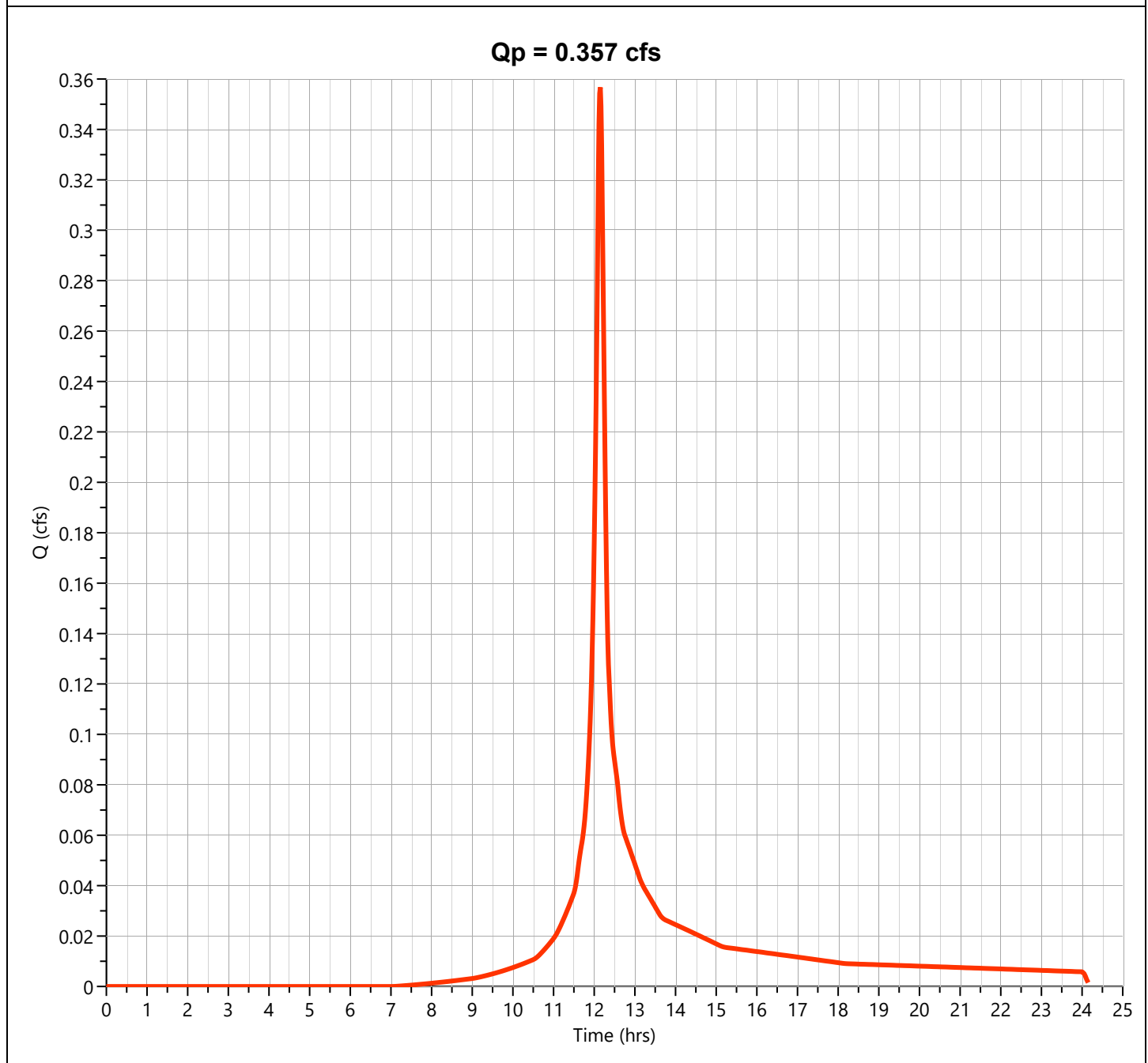
File: Current Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

## PR-1B Grass HSGC C

## Hyd. No. 4

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.357 cfs  |
| Storm Frequency | = 25-yr       | Time to Peak       | = 12.15 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 1,244 cuft |
| Drainage Area   | = 0.09 ac     | Curve Number       | = 74.00      |
| Tc Method       | = User        | Time of Conc. (Tc) | = 9.0 min    |
| Total Rainfall  | = 6.73 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

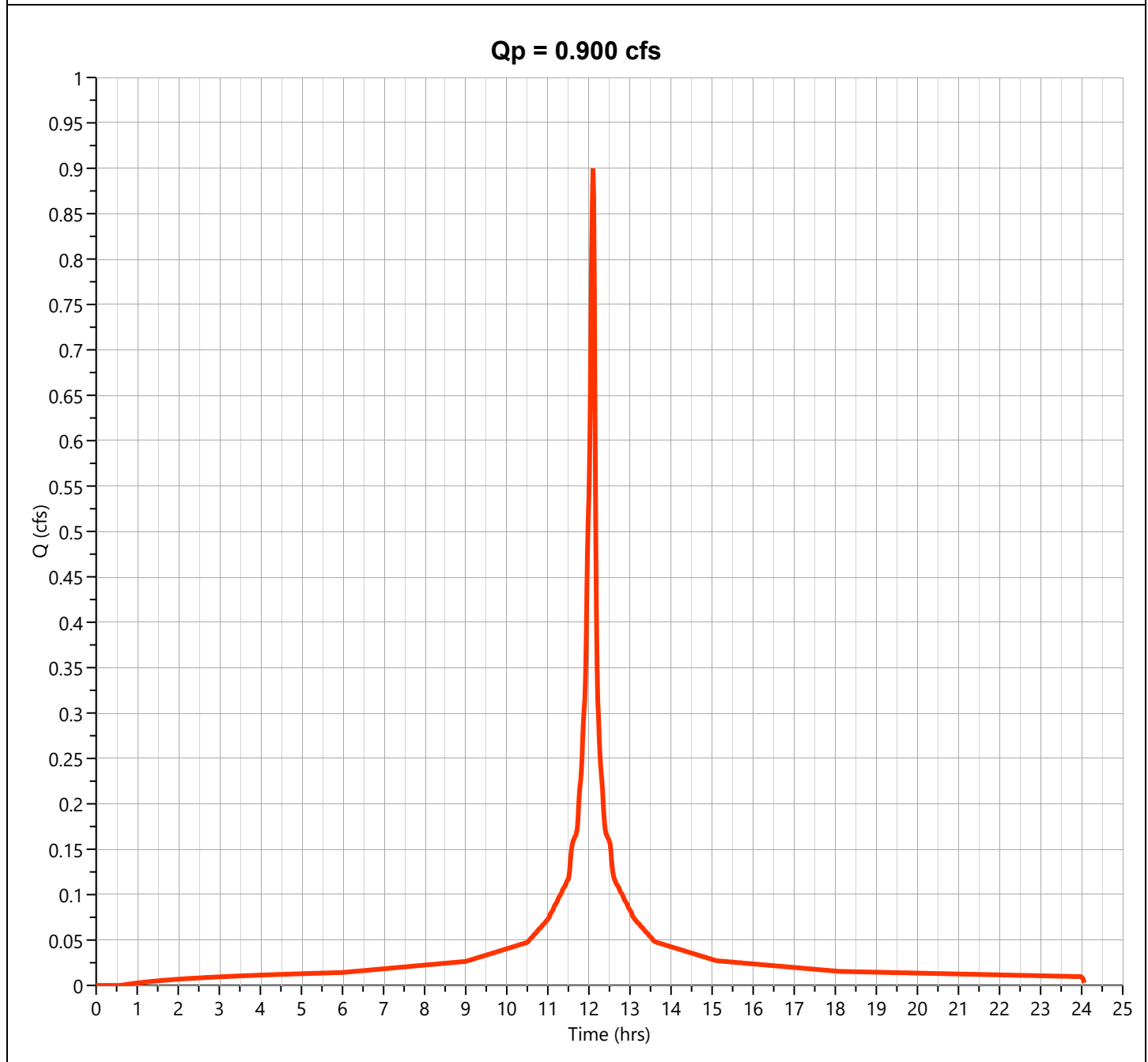
File: Current Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

## PR-1B Impervious

## Hyd. No. 5

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.900 cfs  |
| Storm Frequency | = 25-yr       | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 3,063 cuft |
| Drainage Area   | = 0.13 ac     | Curve Number       | = 98.00      |
| Tc Method       | = User        | Time of Conc. (Tc) | = 4.0 min    |
| Total Rainfall  | = 6.73 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

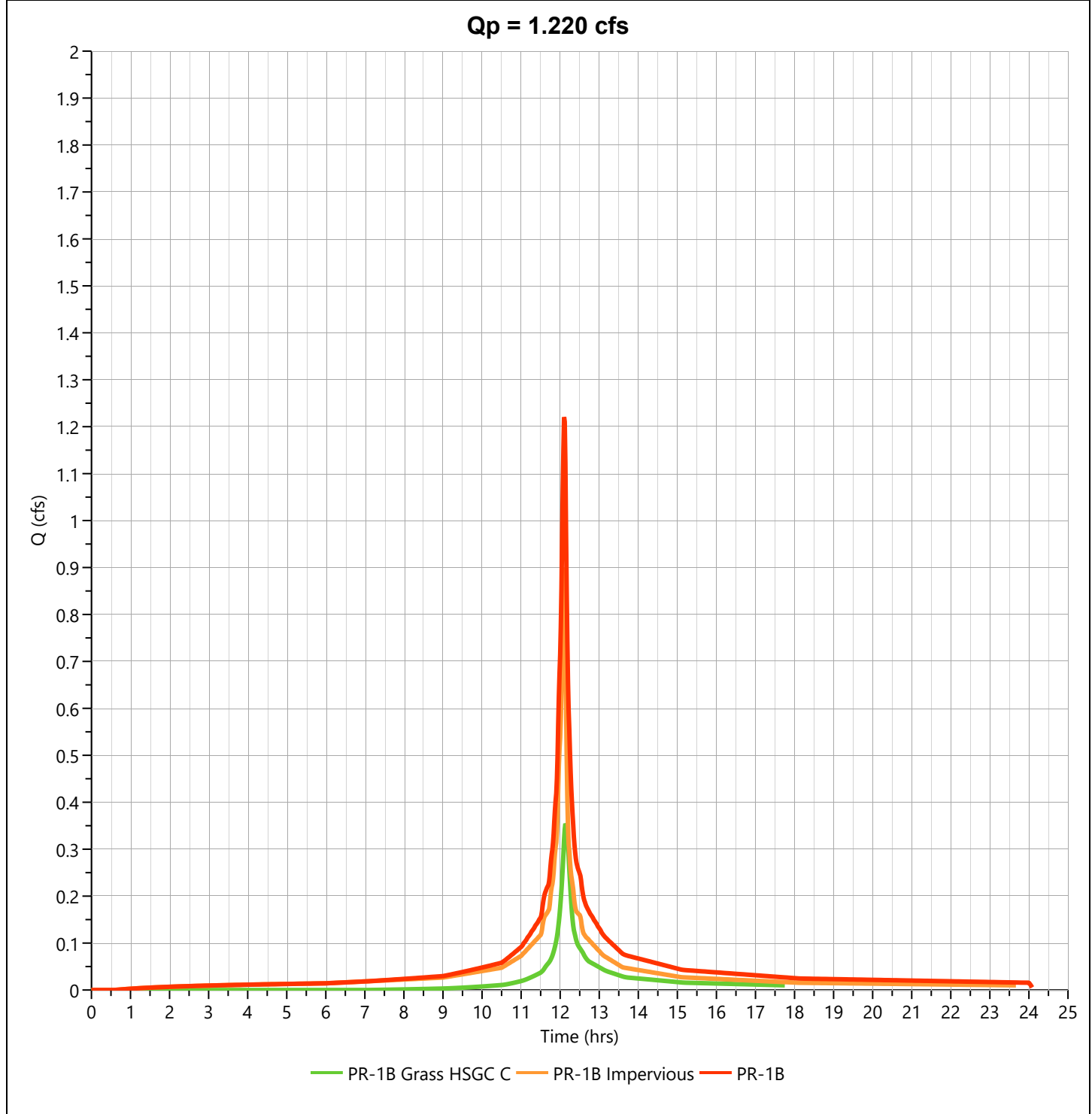
File: Current Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

## PR-1B

## Hyd. No. 6

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 1.220 cfs  |
| Storm Frequency    | = 25-yr    | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 4,307 cuft |
| Inflow Hydrographs | = 4, 5     | Total Contrib. Area | = 0.22 ac    |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

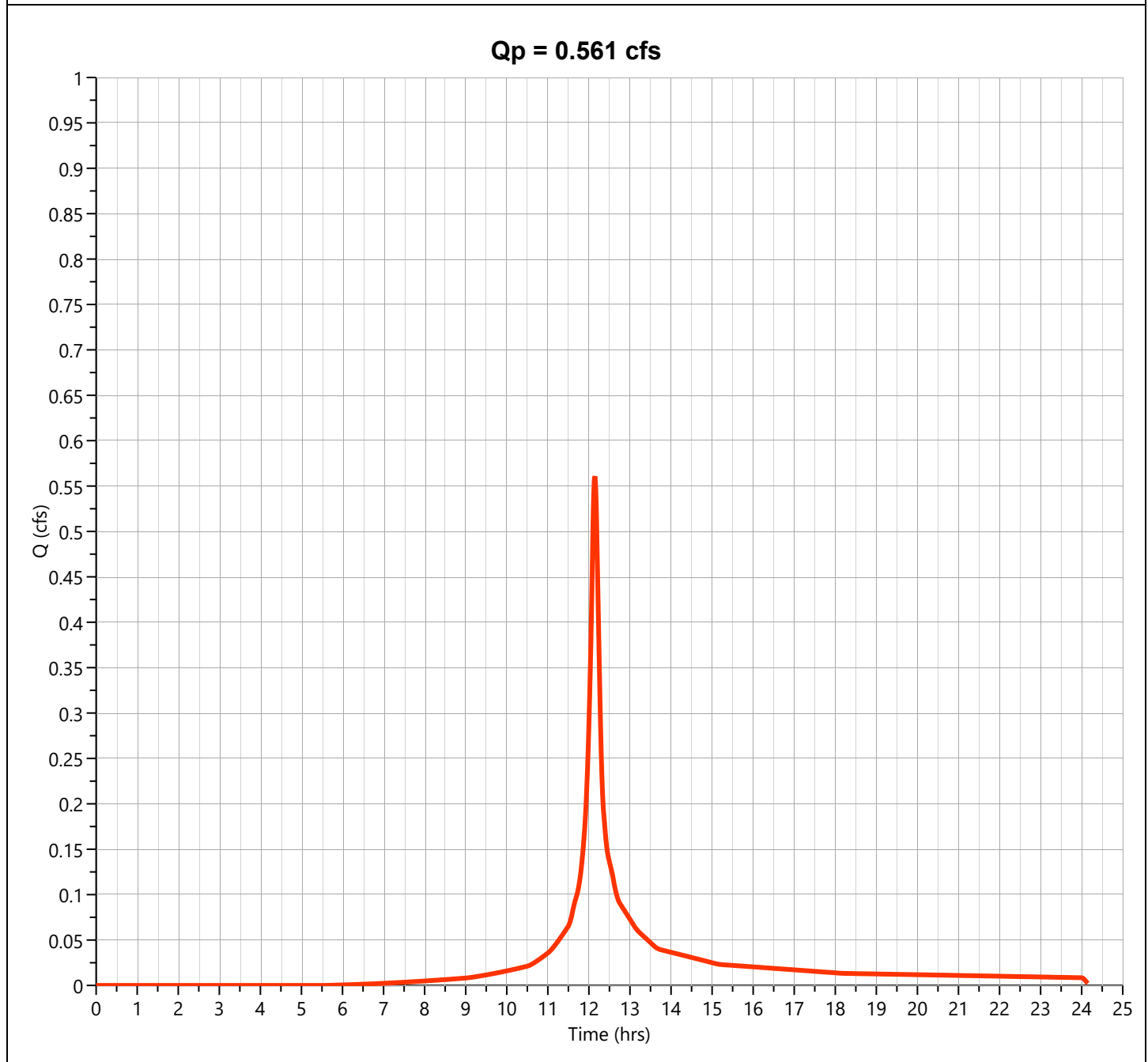
File: Current Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

## PR-1B Grass HSGC C

Hyd. No. 4

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.561 cfs  |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.15 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 1,982 cuft |
| Drainage Area   | = 0.09 ac     | Curve Number       | = 74.00      |
| Tc Method       | = User        | Time of Conc. (Tc) | = 9.0 min    |
| Total Rainfall  | = 9.26 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

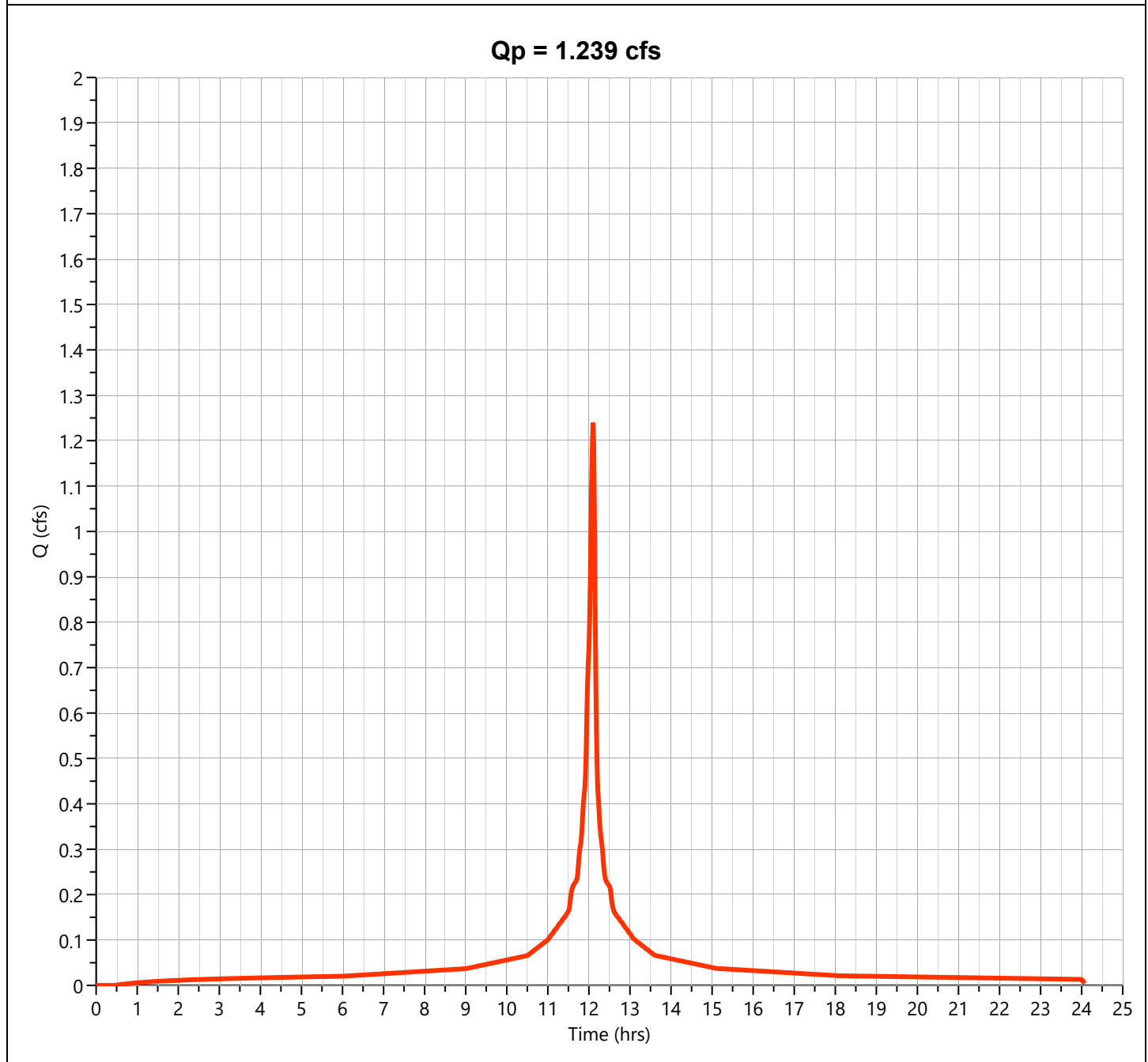
File: Current Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

## PR-1B Impervious

## Hyd. No. 5

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 1.239 cfs  |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 4,256 cuft |
| Drainage Area   | = 0.13 ac     | Curve Number       | = 98.00      |
| Tc Method       | = User        | Time of Conc. (Tc) | = 4.0 min    |
| Total Rainfall  | = 9.26 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

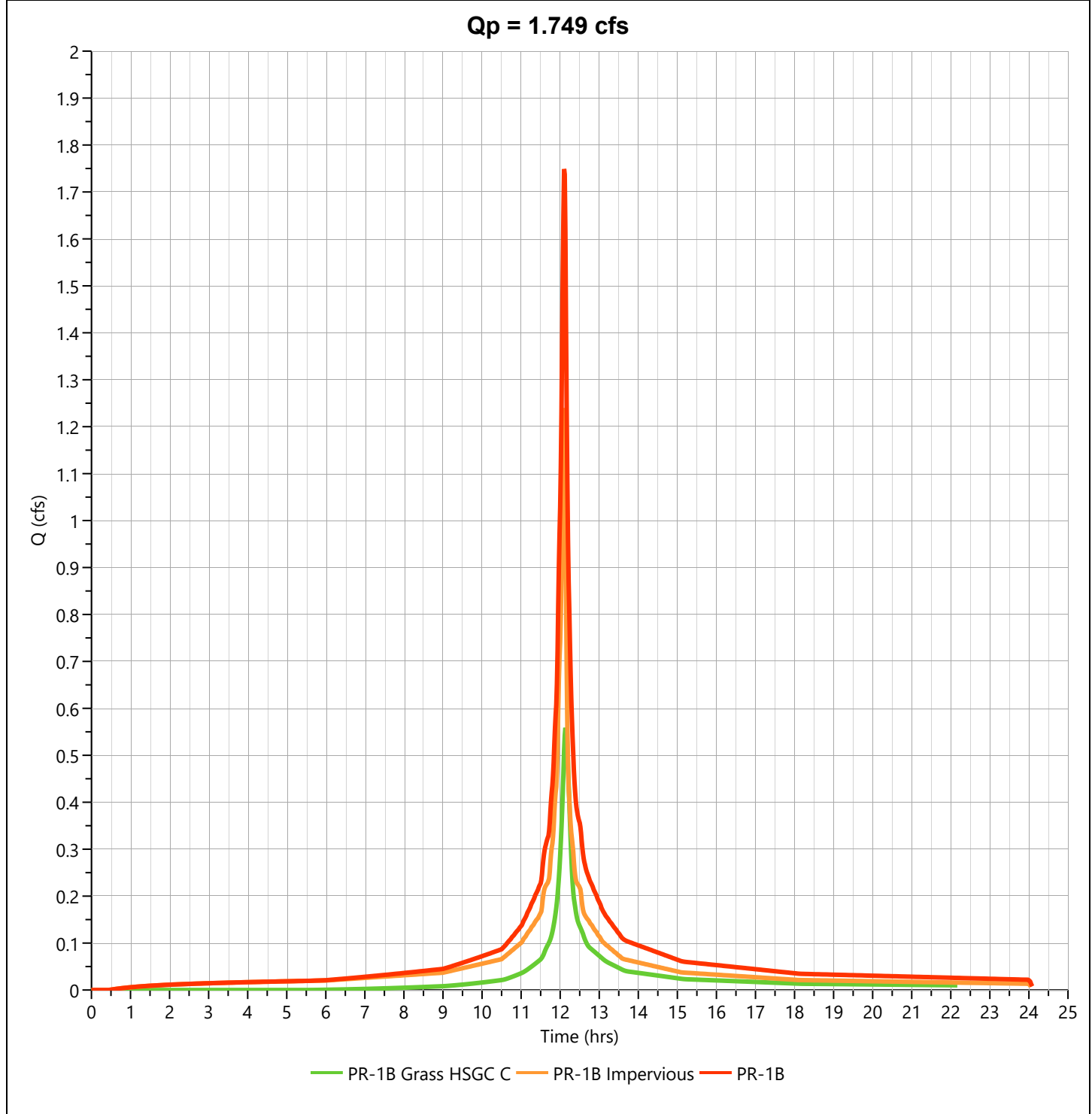
File: Current Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

## PR-1B

## Hyd. No. 6

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 1.749 cfs  |
| Storm Frequency    | = 100-yr   | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 6,238 cuft |
| Inflow Hydrographs | = 4, 5     | Total Contrib. Area | = 0.22 ac    |



## **PR-1C WATERSHED**

Project: Beacon Unitarian Universalist Church

By: TEG

Date: 11/29/2023

Location: Summit, NJ

Checked By: MJV

Date Checked: 11/29/2023

Circle One: Present Developed

Current Proposed Watershed PR-1C - Impervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Design Flow Length, L<sub>des</sub> (Total L<sub>des</sub> < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. McCuen-Spiess Limit, L<sub>mcs</sub> (max. 100 ft)
7. Compute T<sub>t</sub>

$$L_{mcs} = (100 s^{0.5})/n$$

$$T_t = \frac{0.007 (n L_{des})^{0.8}}{P_2^{0.5} s^{0.4}}$$

| Segment ID | 1                      | 2                    |   |
|------------|------------------------|----------------------|---|
|            | <b>Smooth Surfaces</b> | <b>Dense Grasses</b> |   |
|            | <b>0.011</b>           | <b>0.24</b>          |   |
| ft         | <b>39</b>              | <b>17</b>            |   |
| in         | <b>3.46</b>            | <b>3.46</b>          |   |
| ft/ft      | <b>0.021</b>           | <b>0.062</b>         |   |
| ft         | <b>100</b>             | <b>100</b>           |   |
| hr         | <b>0.009</b>           | <b>0.035</b>         | + |

Sheet Flow Sub-Total **0.044 hours**

**Shallow Concentrated Flow**

8. Surface Description
9. Flow Length, L
10. Watercourse Slope, s
11. Average Velocity, V (NEH table 15-3)
12. Compute T<sub>t</sub>

$$T_t = \frac{L}{3600 V}$$

| Segment ID |  |  |   |
|------------|--|--|---|
| ft         |  |  |   |
| ft/ft      |  |  |   |
| ft/s       |  |  |   |
| hr         |  |  | + |

Shallow Conc. Flow Sub-Total **0.000 hours**

**Channel Flow**

13. Flow Length, L
14. Cross Sectional flow area, a
15. Wetted Perimeter, P<sub>w</sub>
16. Hydraulic Radius, r
17. Channel Slope, s
18. Manning's Roughness Coeff., n
19. Velocity, V
20. Compute T<sub>t</sub>

$$r = a / P_w$$

$$V = (1.49 r^{2/3} s^{1/2}) / n$$

$$T_t = \frac{L}{3600 V}$$

| Segment ID      |  |  |   |
|-----------------|--|--|---|
| ft              |  |  |   |
| ft <sup>2</sup> |  |  |   |
| ft              |  |  |   |
| ft              |  |  |   |
| ft/ft           |  |  |   |
| ft/s            |  |  |   |
| hr              |  |  | + |

Channel Flow Sub-Total **0.000 hours**

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>

(Add Sub-Total T<sub>t</sub> from prior steps)

|                      |                    |
|----------------------|--------------------|
| Total Tc (hours) =   | <b>0.044 hours</b> |
| Total Tc (minutes) = | <b>3 minutes</b>   |



Project: Beacon Unitarian Universalist Church

By: TEG

Date: 11/29/2023

Location: Summit, NJ

Checked By: MJV

Date Checked: 11/29/2023

Circle One: Present Developed

Current Proposed Watershed PR-1C - Pervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Design Flow Length, L<sub>des</sub> (Total L<sub>des</sub> < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. McCuen-Spiess Limit, L<sub>mcs</sub> (max. 100 ft)
7. Compute T<sub>t</sub>

$$L_{mcs} = (100 s^{0.5})/n$$

$$T_t = \frac{0.007 (n L_{des})^{0.8}}{P_2^{0.5} s^{0.4}}$$

|            |               |   |  |
|------------|---------------|---|--|
| Segment ID | 1             |   |  |
|            | Dense Grasses |   |  |
|            | 0.24          |   |  |
| ft         | 27            |   |  |
| in         | 3.46          |   |  |
| ft/ft      | 0.047         |   |  |
| ft         | 91            |   |  |
| hr         | 0.058         | + |  |

Sheet Flow Sub-Total **0.058 hours**

**Shallow Concentrated Flow**

8. Surface Description
9. Flow Length, L
10. Watercourse Slope, s
11. Average Velocity, V (NEH table 15-3)
12. Compute T<sub>t</sub>

$$T_t = \frac{L}{3600 V}$$

|            |  |   |  |
|------------|--|---|--|
| Segment ID |  |   |  |
| ft         |  |   |  |
| ft/ft      |  |   |  |
| ft/s       |  |   |  |
| hr         |  | + |  |

Shallow Conc. Flow Sub-Total **0.000 hours**

**Channel Flow**

13. Flow Length, L
14. Cross Sectional flow area, a
15. Wetted Perimeter, P<sub>w</sub>
16. Hydraulic Radius, r
17. Channel Slope, s
18. Manning's Roughness Coeff., n
19. Velocity, V
20. Compute T<sub>t</sub>

$$r = a / P_w$$

$$V = (1.49 r^{2/3} s^{1/2}) / n$$

$$T_t = \frac{L}{3600 V}$$

|                 |  |   |  |
|-----------------|--|---|--|
| Segment ID      |  |   |  |
| ft              |  |   |  |
| ft <sup>2</sup> |  |   |  |
| ft              |  |   |  |
| ft              |  |   |  |
| ft/ft           |  |   |  |
| ft/s            |  |   |  |
| hr              |  | + |  |

Channel Flow Sub-Total **0.000 hours**

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>

(Add Sub-Total T<sub>t</sub> from prior steps)

|                      |                    |
|----------------------|--------------------|
| Total Tc (hours) =   | <b>0.058 hours</b> |
| Total Tc (minutes) = | <b>3 minutes</b>   |

# Hydrograph Report

Project Name:

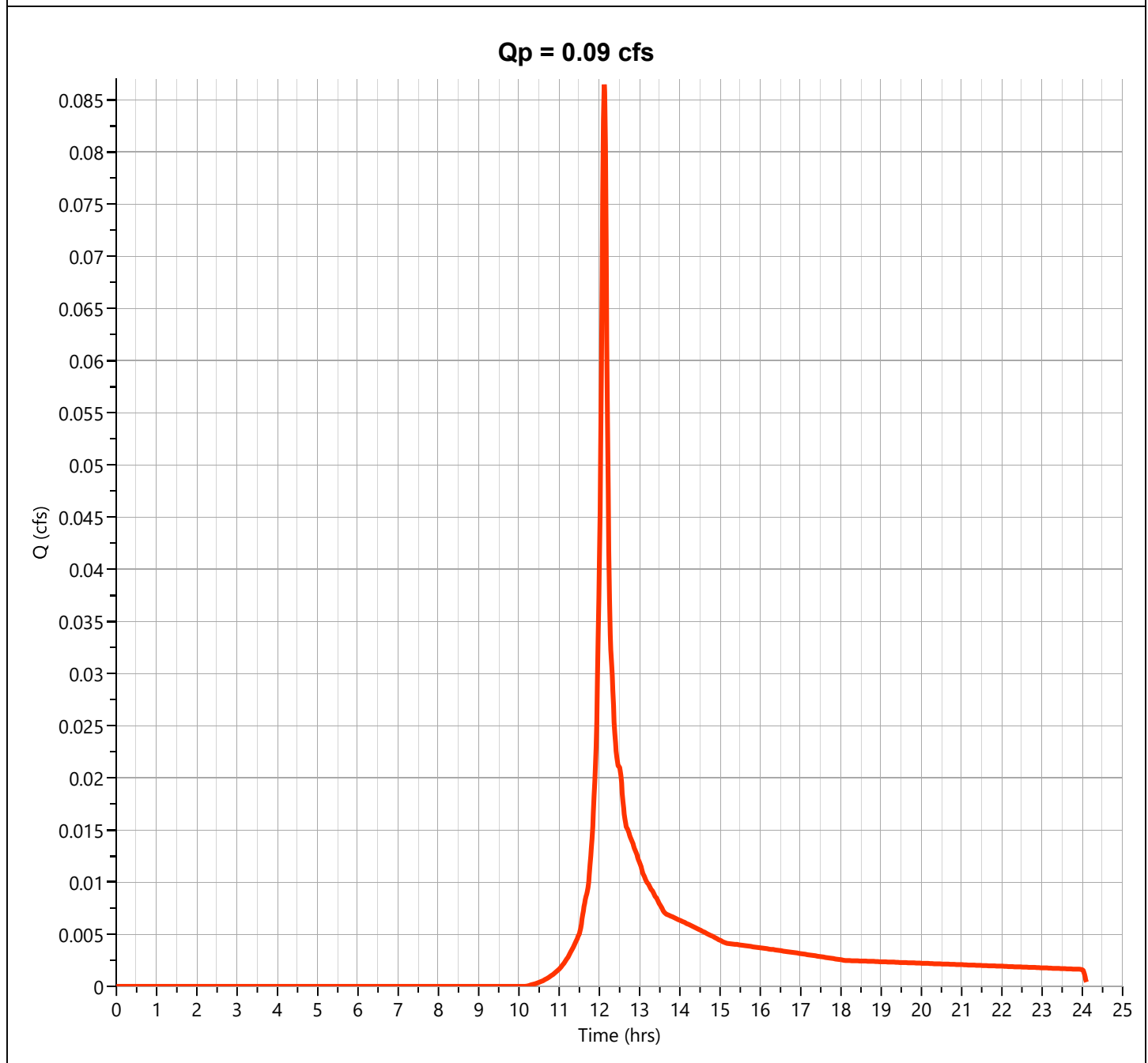
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-1D Grass HSGC C

## Hyd. No. 14

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.086 cfs |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.12 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 272 cuft  |
| Drainage Area   | = 0.06 ac     | Curve Number       | = 74        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 5.0 min   |
| Total Rainfall  | = 3.46 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

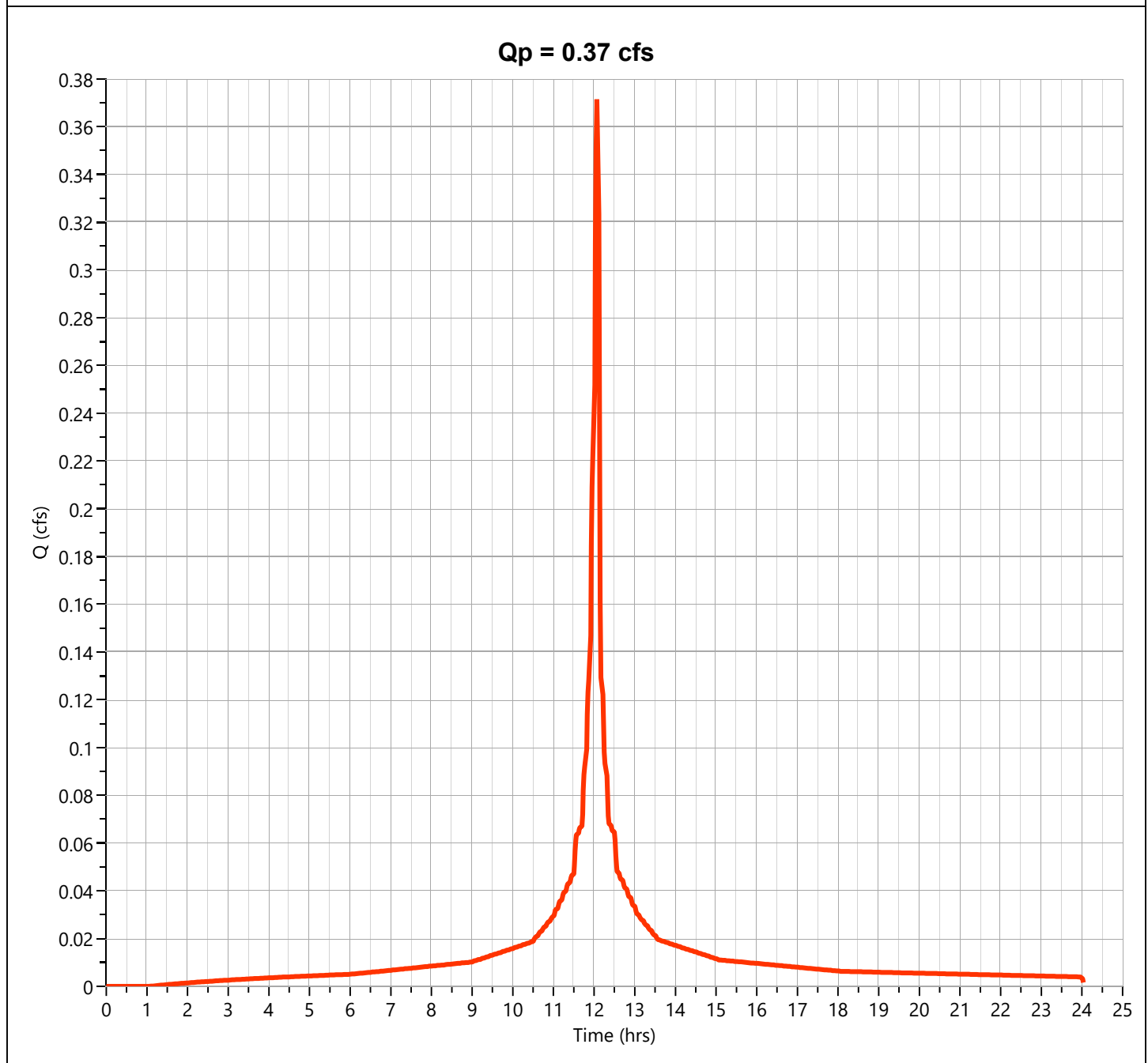
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-1D Impervious

## Hyd. No. 15

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.372 cfs  |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 1,208 cuft |
| Drainage Area   | = 0.11 ac     | Curve Number       | = 98         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 2.0 min    |
| Total Rainfall  | = 3.46 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

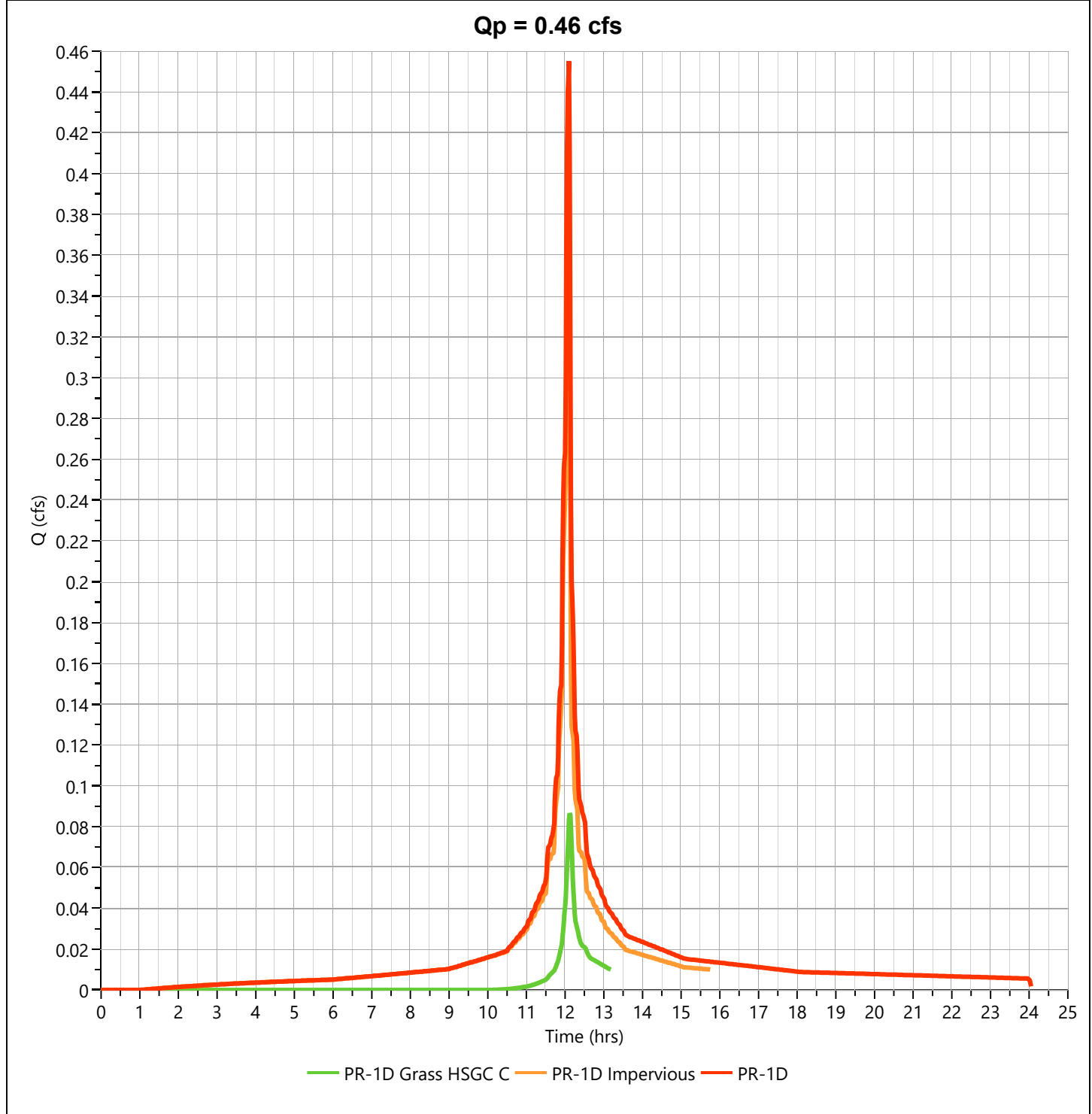
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-1D

## Hyd. No. 16

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.455 cfs  |
| Storm Frequency    | = 2-yr     | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 1,480 cuft |
| Inflow Hydrographs | = 14, 15   | Total Contrib. Area | = 0.17 ac    |



# Hydrograph Report

Project Name:

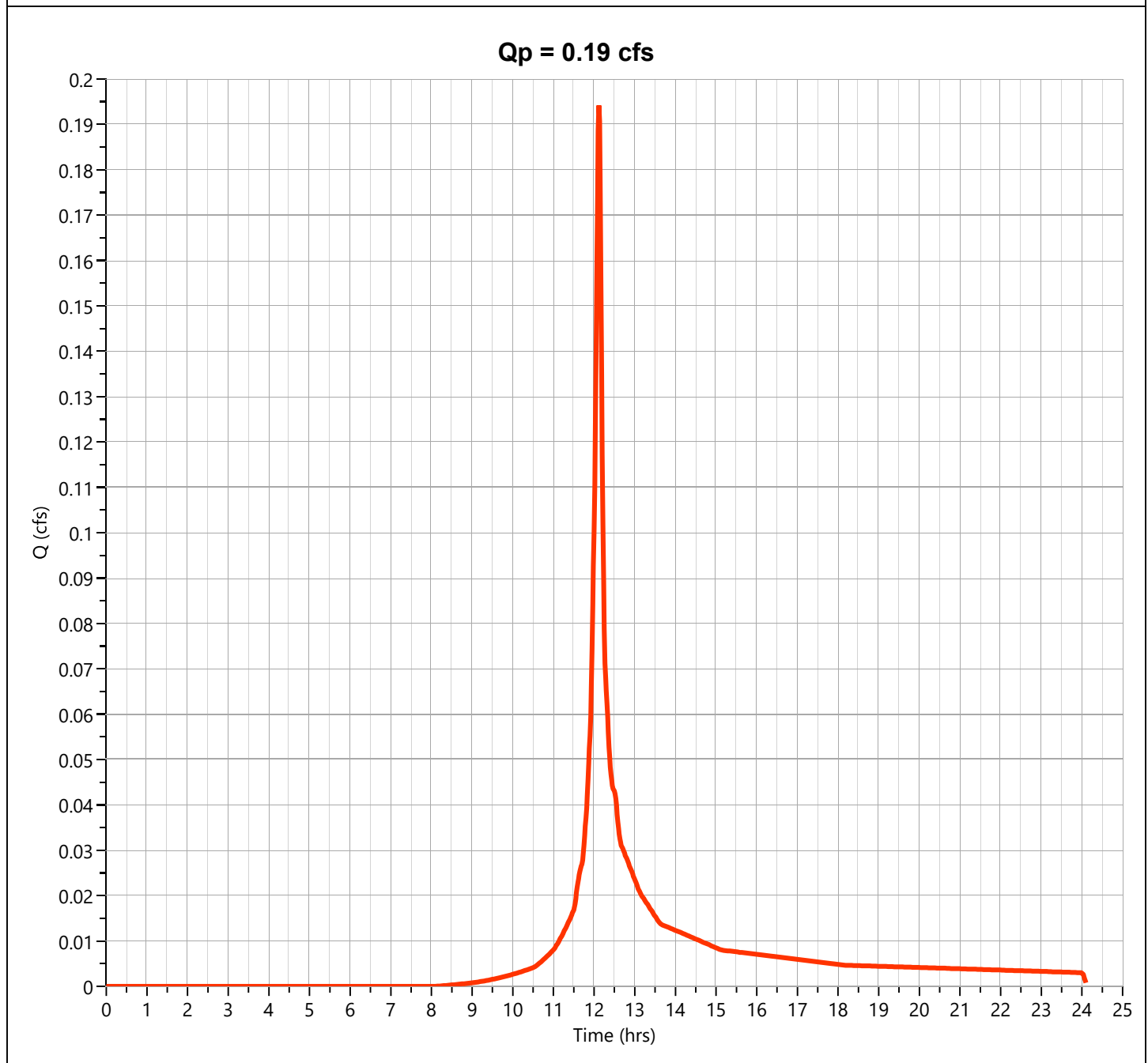
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-1D Grass HSGC C

## Hyd. No. 14

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.194 cfs |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.12 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 600 cuft  |
| Drainage Area   | = 0.06 ac     | Curve Number       | = 74        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 5.0 min   |
| Total Rainfall  | = 5.38 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

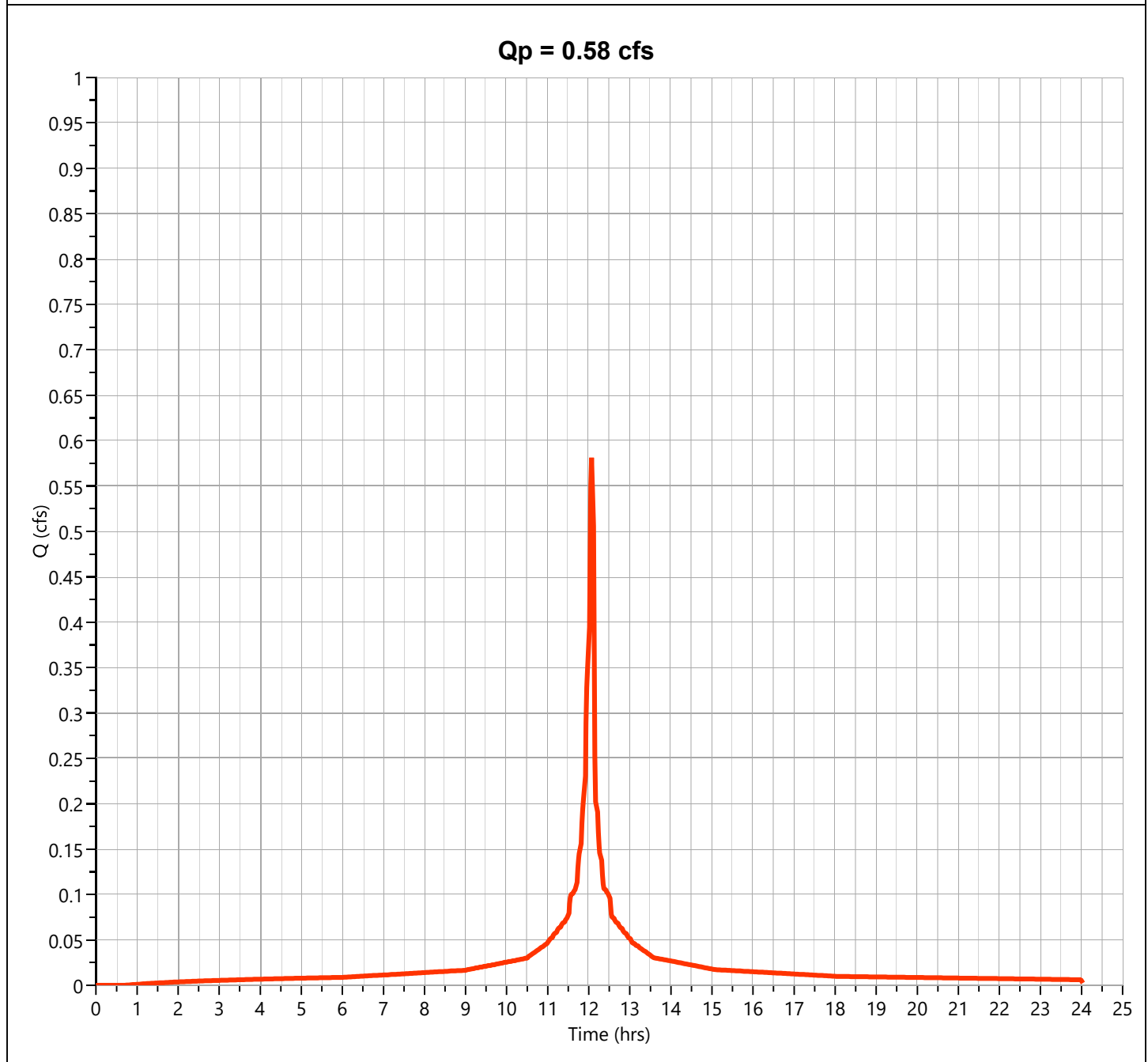
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-1D Impervious

## Hyd. No. 15

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.581 cfs  |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 1,925 cuft |
| Drainage Area   | = 0.11 ac     | Curve Number       | = 98         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 2.0 min    |
| Total Rainfall  | = 5.38 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

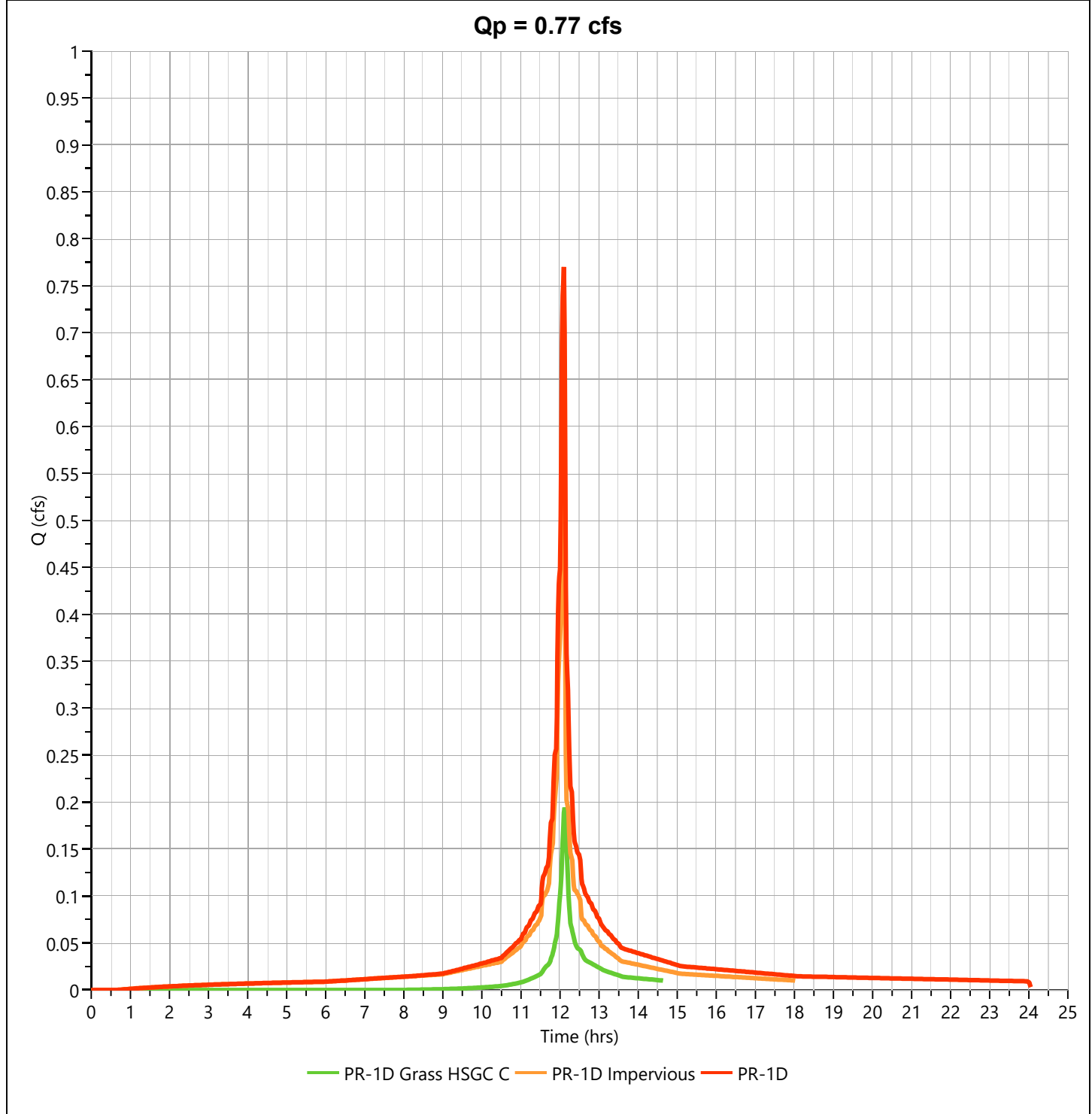
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-1D

## Hyd. No. 16

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.770 cfs  |
| Storm Frequency    | = 10-yr    | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 2,525 cuft |
| Inflow Hydrographs | = 14, 15   | Total Contrib. Area | = 0.17 ac    |



# Hydrograph Report

Project Name:

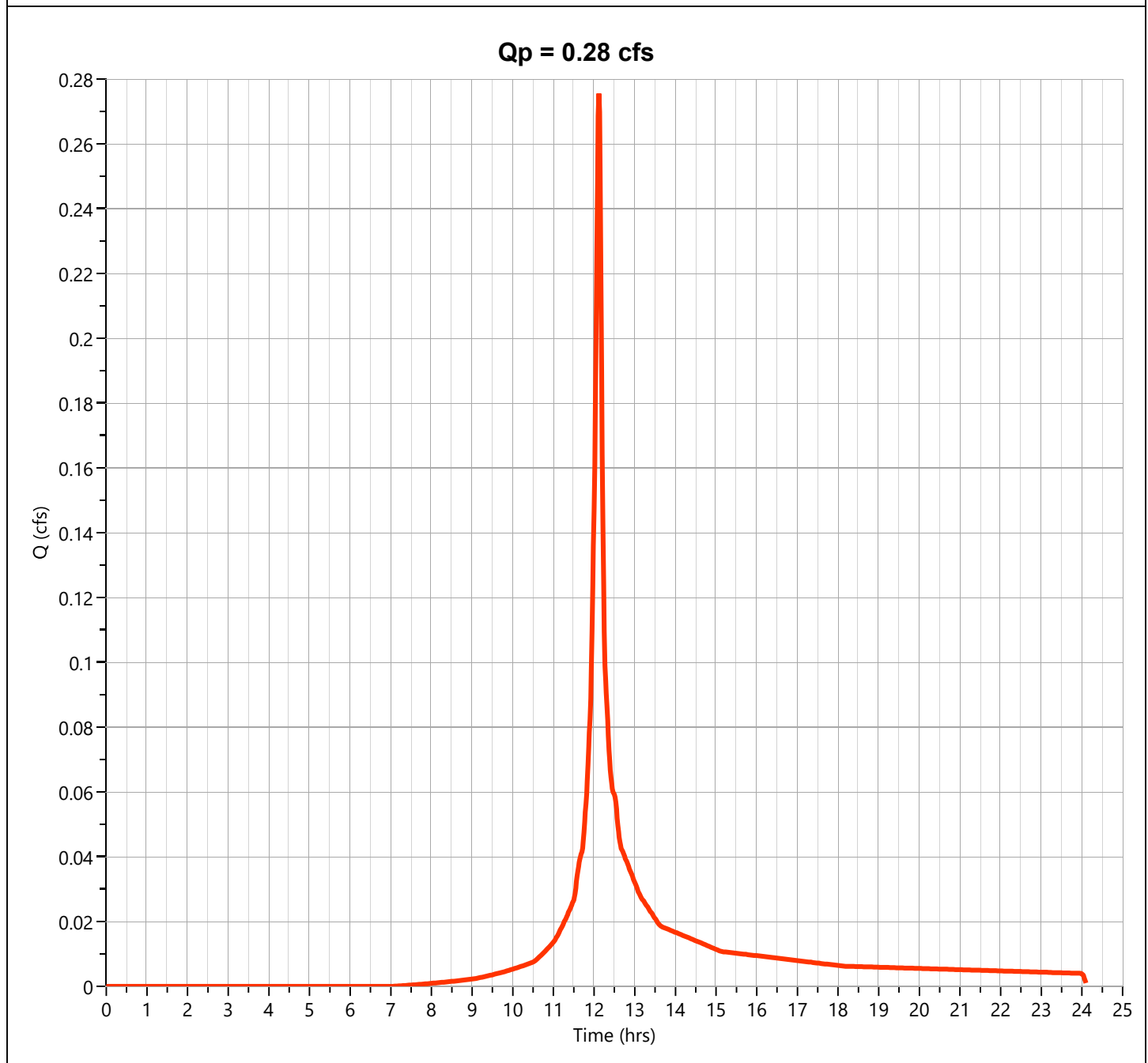
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-1D Grass HSGC C

## Hyd. No. 14

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.275 cfs |
| Storm Frequency | = 25-yr       | Time to Peak       | = 12.12 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 855 cuft  |
| Drainage Area   | = 0.06 ac     | Curve Number       | = 74        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 5.0 min   |
| Total Rainfall  | = 6.73 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |





# Hydrograph Report

Project Name:

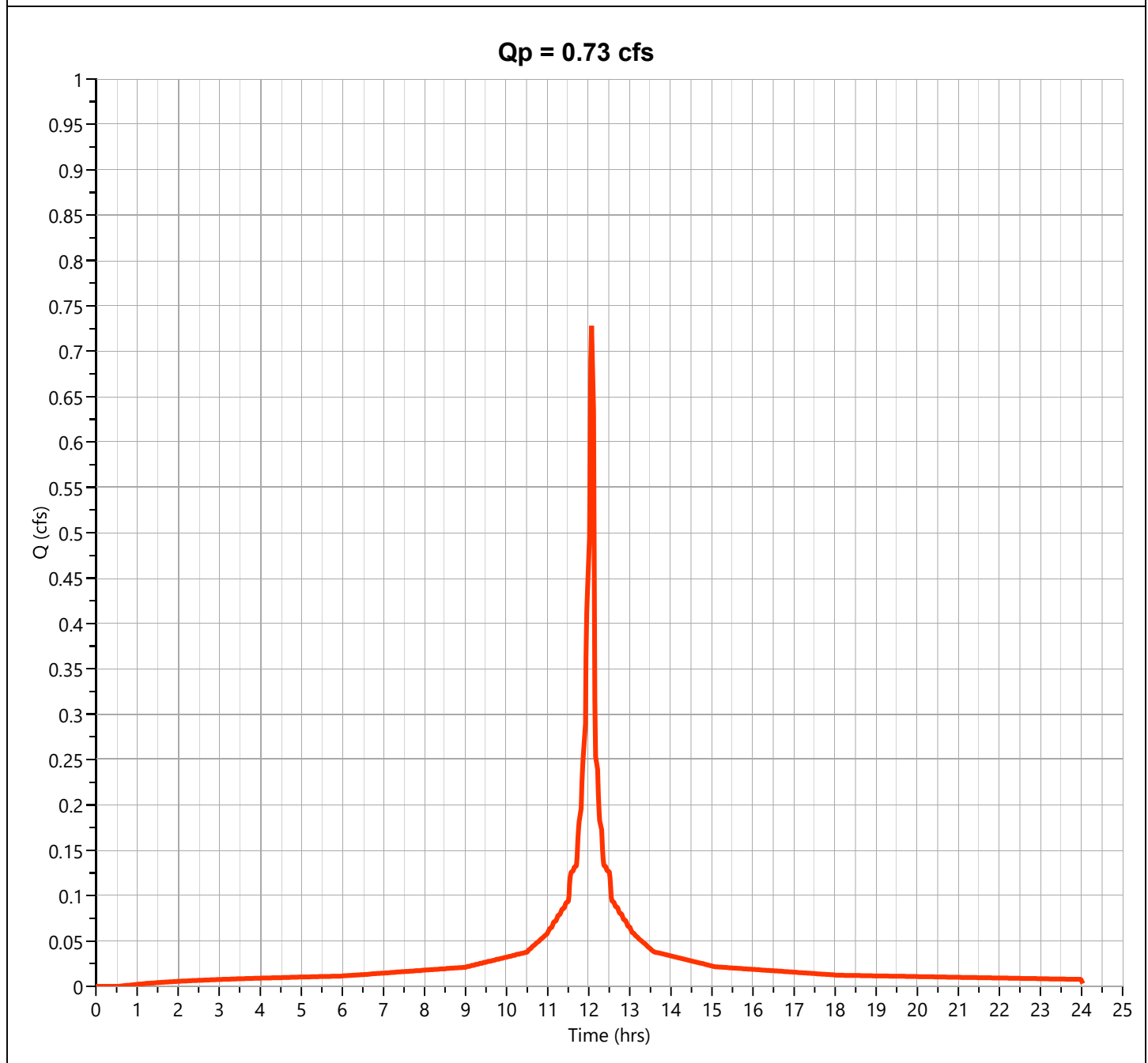
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-1D Impervious

## Hyd. No. 15

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.728 cfs  |
| Storm Frequency | = 25-yr       | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 2,430 cuft |
| Drainage Area   | = 0.11 ac     | Curve Number       | = 98         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 2.0 min    |
| Total Rainfall  | = 6.73 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

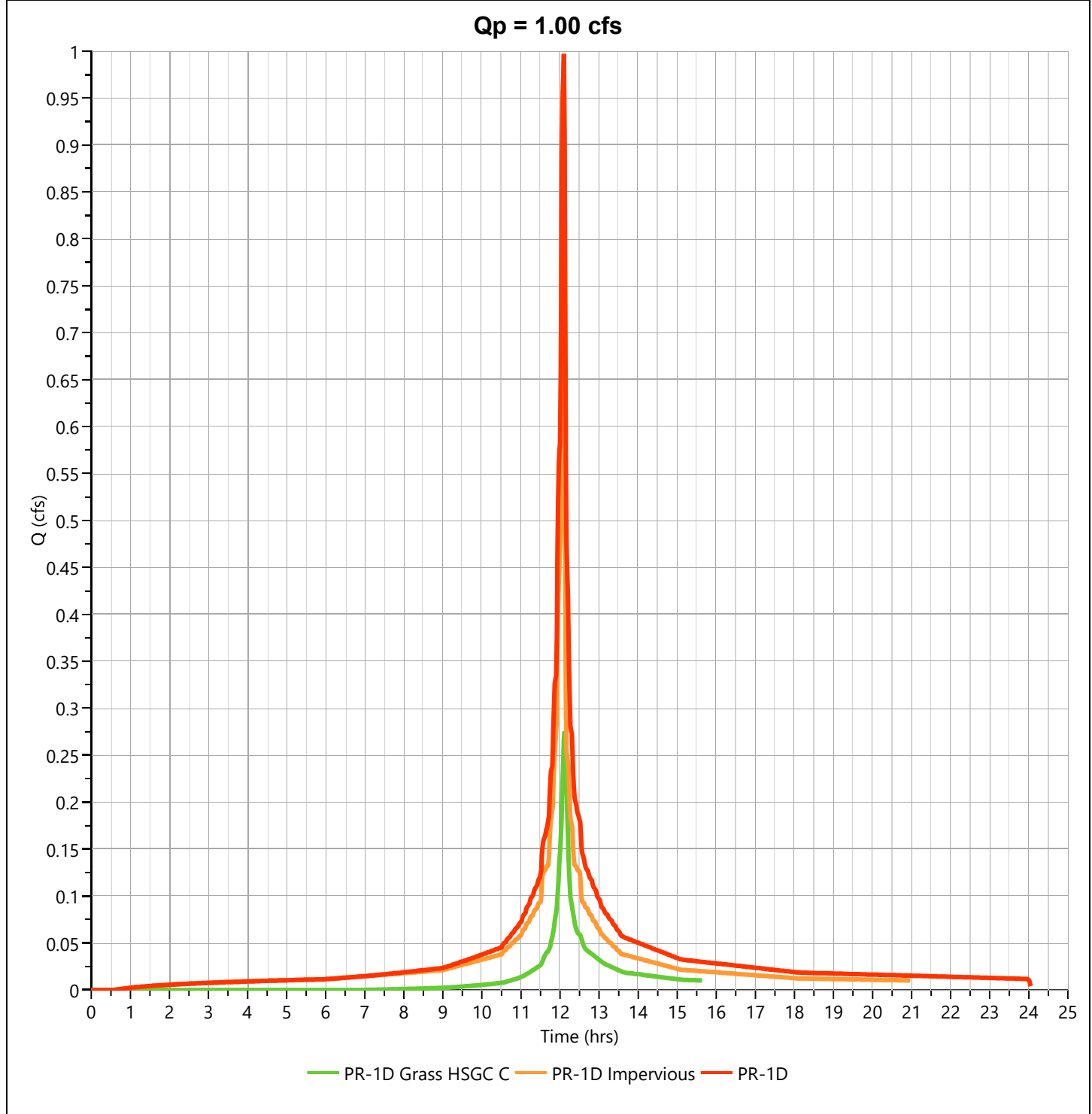
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-1D

## Hyd. No. 16

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.997 cfs  |
| Storm Frequency    | = 25-yr    | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 3,285 cuft |
| Inflow Hydrographs | = 14, 15   | Total Contrib. Area | = 0.17 ac    |



# Hydrograph Report

Project Name:

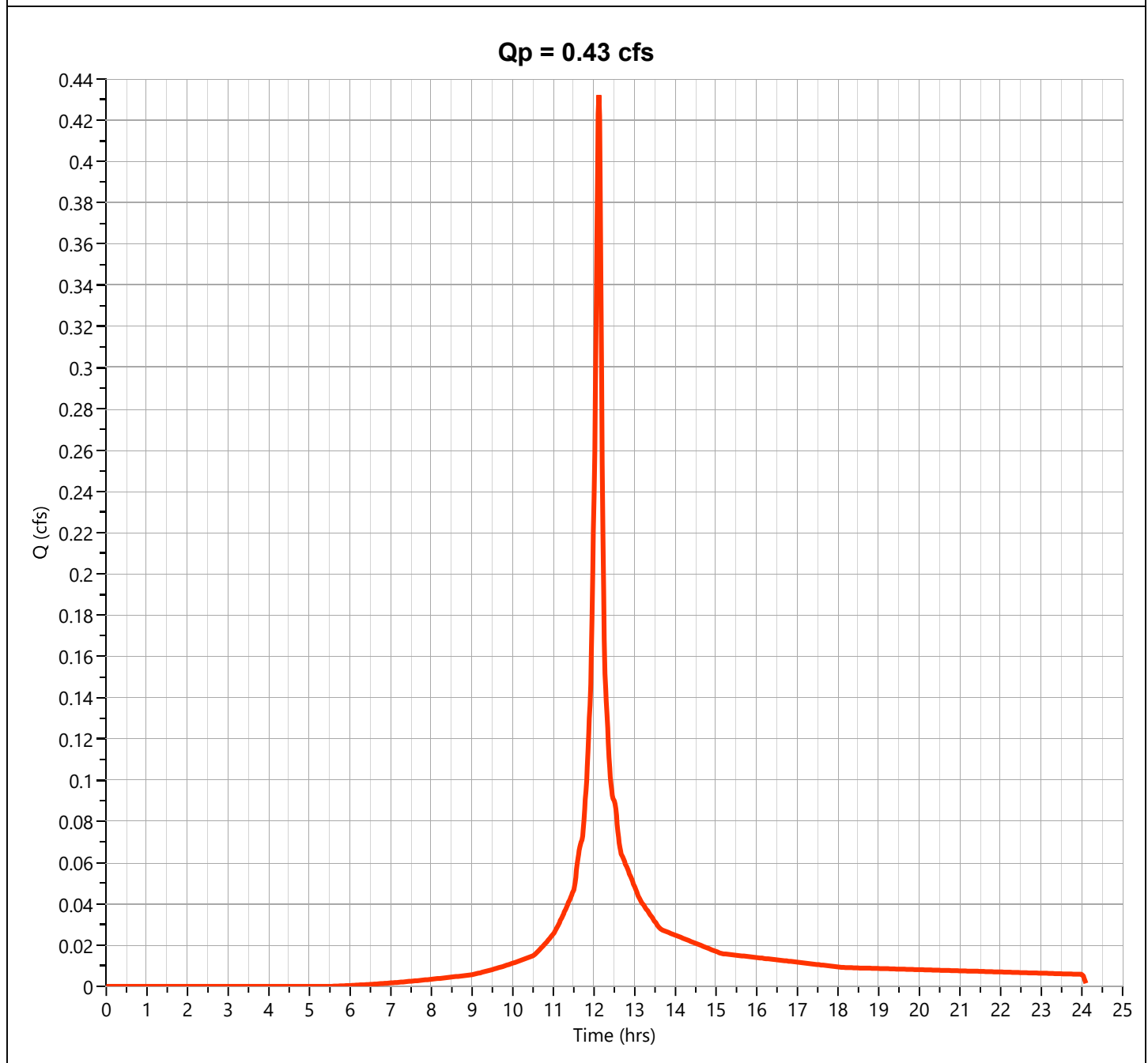
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-1D Grass HSGC C

## Hyd. No. 14

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.432 cfs  |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.12 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 1,363 cuft |
| Drainage Area   | = 0.06 ac     | Curve Number       | = 74         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 5.0 min    |
| Total Rainfall  | = 9.26 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

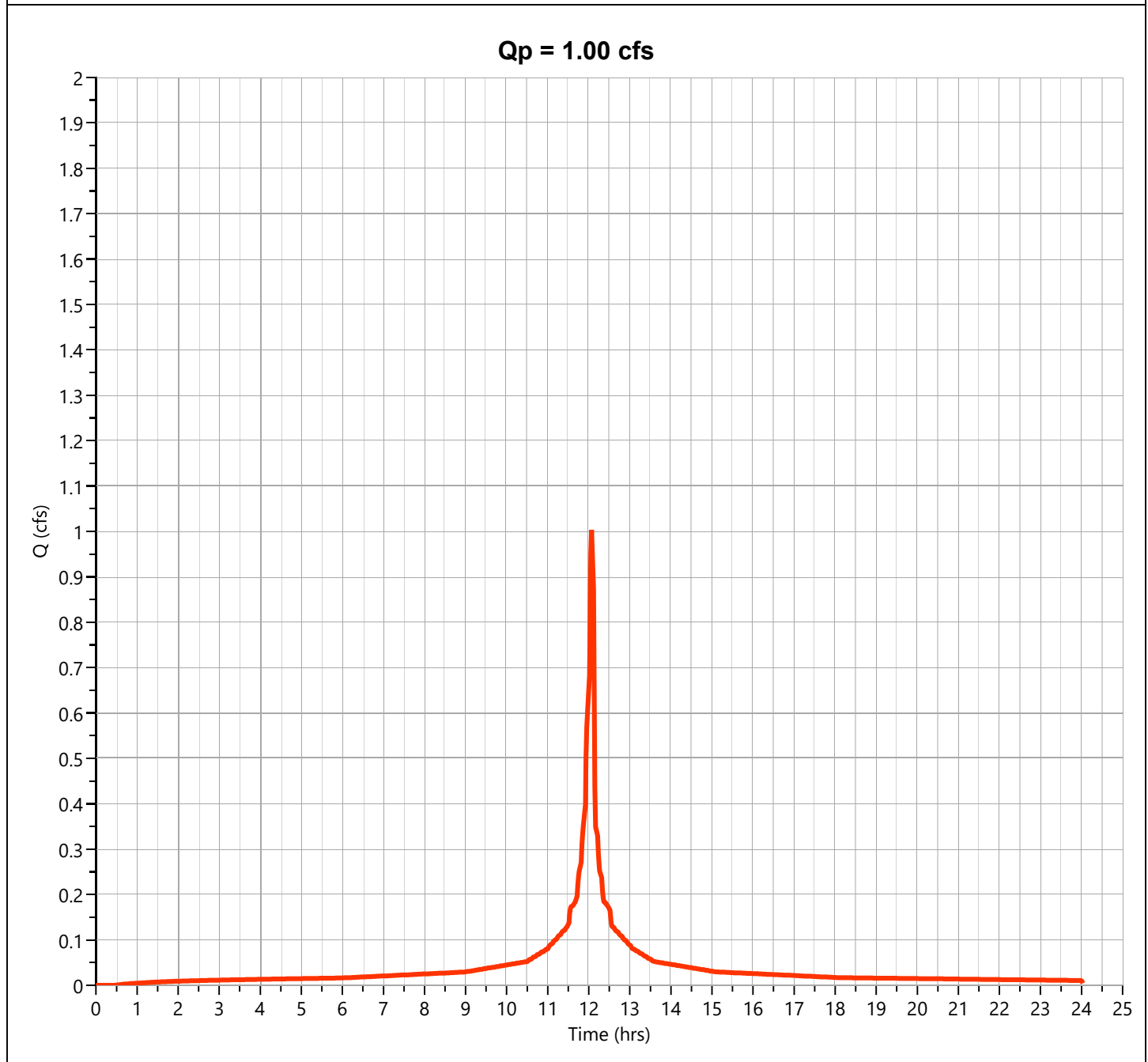
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-1D Impervious

## Hyd. No. 15

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 1.003 cfs  |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 3,376 cuft |
| Drainage Area   | = 0.11 ac     | Curve Number       | = 98         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 2.0 min    |
| Total Rainfall  | = 9.26 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

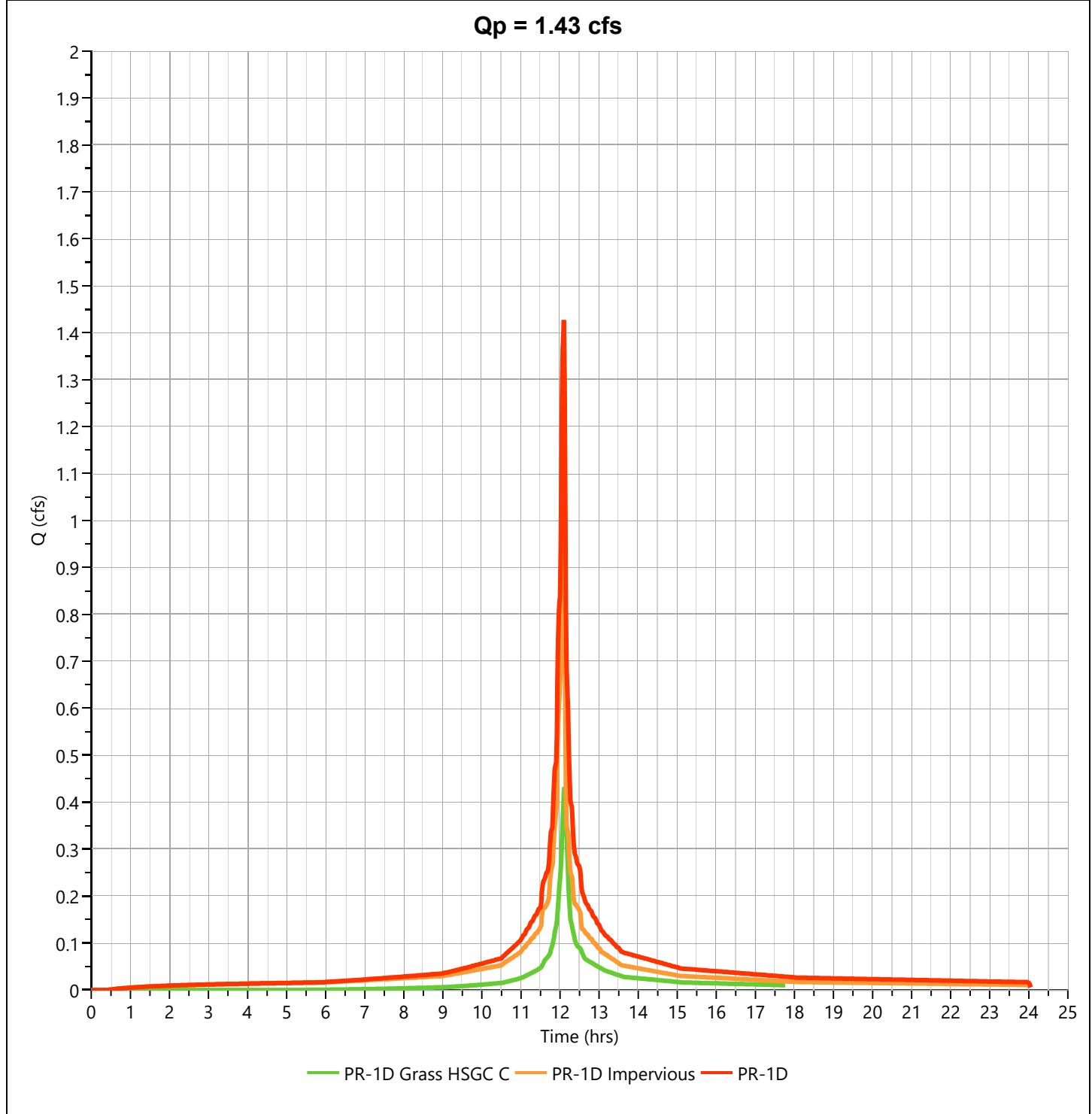
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-1D

## Hyd. No. 16

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 1.426 cfs  |
| Storm Frequency    | = 100-yr   | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 4,739 cuft |
| Inflow Hydrographs | = 14, 15   | Total Contrib. Area | = 0.17 ac    |



## **PR-1D WATERSHED**

Project: Beacon Unitarian Universalist Church

By: TEG

Date: 2/6/2024

Location: Summit, NJ

Checked By: MJV

Date Checked: 2/6/2024

Circle One: Present Developed

Current Proposed Watershed PR-1D - Impervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Design Flow Length, L<sub>des</sub> (Total L<sub>des</sub> < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. McCuen-Spiess Limit, L<sub>mcs</sub> (max. 100 ft)
7. Compute T<sub>t</sub>

$$T_t = \frac{0.007 (n L_{des})^{0.8}}{P_2^{0.5} s^{0.4}}$$

$$L_{mcs} = (100 s^{0.5})/n$$

|            |                        |   |  |
|------------|------------------------|---|--|
| Segment ID | <b>1</b>               |   |  |
|            | <b>Smooth Surfaces</b> |   |  |
|            | <b>0.011</b>           |   |  |
| ft         | <b>88</b>              |   |  |
| in         | <b>3.46</b>            |   |  |
| ft/ft      | <b>0.026</b>           |   |  |
| ft         | <b>100</b>             |   |  |
| hr         | <b>0.016</b>           | + |  |

Sheet Flow Sub-Total **0.016 hours**

**Shallow Concentrated Flow**

8. Surface Description
9. Flow Length, L
10. Watercourse Slope, s
11. Average Velocity, V (NEH table 15-3)
12. Compute T<sub>t</sub>

$$T_t = \frac{L}{3600 V}$$

|            |                 |   |  |
|------------|-----------------|---|--|
| Segment ID | <b>2</b>        |   |  |
|            | <b>Pavement</b> |   |  |
| ft         | <b>68</b>       |   |  |
| ft/ft      | <b>0.064</b>    |   |  |
| ft/s       | <b>5.15</b>     |   |  |
| hr         | <b>0.004</b>    | + |  |

Shallow Conc. Flow Sub-Total **0.004 hours**

**Channel Flow**

13. Flow Length, L
14. Cross Sectional flow area, a
15. Wetted Perimeter, P<sub>w</sub>
16. Hydraulic Radius, r
17. Channel Slope, s
18. Manning's Roughness Coeff., n
19. Velocity, V
20. Compute T<sub>t</sub>

$$r = a / P_w$$

$$V = (1.49 r^{2/3} s^{1/2}) / n$$

$$T_t = \frac{L}{3600 V}$$

|                 |              |   |  |
|-----------------|--------------|---|--|
| Segment ID      | <b>3</b>     |   |  |
| ft              | <b>22</b>    |   |  |
| ft <sup>2</sup> | <b>0.88</b>  |   |  |
| ft              | <b>2.40</b>  |   |  |
| ft              | <b>0.37</b>  |   |  |
| ft/ft           | <b>0.005</b> |   |  |
|                 | <b>0.012</b> |   |  |
| ft/s            | <b>4.50</b>  |   |  |
| hr              | <b>0.001</b> | + |  |

Channel Flow Sub-Total **0.001 hours**

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>

(Add Sub-Total T<sub>t</sub> from prior steps)

|   |                    |
|---|--------------------|
| Total T <sub>c</sub> (hours) =                        | <b>0.021 hours</b> |
| Software Limitations Require Minimum T <sub>c</sub> = | <b>2 minutes</b>   |

Project: Beacon Unitarian Universalist Church

By: TEG

Date: 2/6/2024

Location: Summit, NJ

Checked By: MJV

Date Checked: 2/6/2024

Circle One: Present Developed

Current Proposed Watershed PR-1D - Pervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Design Flow Length, L<sub>des</sub> (Total L<sub>des</sub> < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. McCuen-Spiess Limit, L<sub>mcs</sub> (max. 100 ft)
7. Compute T<sub>t</sub>

$$L_{mcs} = (100 s^{0.5})/n$$

$$T_t = \frac{0.007 (n L_{des})^{0.8}}{P_2^{0.5} s^{0.4}}$$

| Segment ID | 1                    | 2                      |  |
|------------|----------------------|------------------------|--|
|            | <b>Dense Grasses</b> | <b>Smooth Surfaces</b> |  |
|            | <b>0.24</b>          | <b>0.011</b>           |  |
| ft         | <b>33</b>            | <b>55</b>              |  |
| in         | <b>3.46</b>          | <b>3.46</b>            |  |
| ft/ft      | <b>0.032</b>         | <b>0.043</b>           |  |
| ft         | <b>74</b>            | <b>100</b>             |  |
| hr         | <b>0.078</b>         | <b>0.009</b>           |  |

Sheet Flow Sub-Total **0.087 hours**

**Shallow Concentrated Flow**

8. Surface Description
9. Flow Length, L
10. Watercourse Slope, s
11. Average Velocity, V (NEH table 15-3)
12. Compute T<sub>t</sub>

$$T_t = \frac{L}{3600 V}$$

| Segment ID | 3               | 4               | 5               |
|------------|-----------------|-----------------|-----------------|
|            | <b>Pavement</b> | <b>Pavement</b> | <b>Pavement</b> |
| ft         | <b>17</b>       | <b>30</b>       | <b>10</b>       |
| ft/ft      | <b>0.058</b>    | <b>0.083</b>    | <b>0.040</b>    |
| ft/s       | <b>4.91</b>     | <b>5.87</b>     | <b>4.07</b>     |
| hr         | <b>0.001</b>    | <b>0.001</b>    | <b>0.001</b>    |

Shallow Conc. Flow Sub-Total **0.003 hours**

**Channel Flow**

13. Flow Length, L
14. Cross Sectional flow area, a
15. Wetted Perimeter, P<sub>w</sub>
16. Hydraulic Radius, r
17. Channel Slope, s
18. Manning's Roughness Coeff., n
19. Velocity, V
20. Compute T<sub>t</sub>

$$r = a / P_w$$

$$V = (1.49 r^{2/3} s^{1/2}) / n$$

$$T_t = \frac{L}{3600 V}$$

| Segment ID      | 6            |  |  |
|-----------------|--------------|--|--|
| ft              | <b>22</b>    |  |  |
| ft <sup>2</sup> | <b>0.88</b>  |  |  |
| ft              | <b>2.40</b>  |  |  |
| ft              | <b>0.37</b>  |  |  |
| ft/ft           | <b>0.005</b> |  |  |
|                 | <b>0.012</b> |  |  |
| ft/s            | <b>4.55</b>  |  |  |
| hr              | <b>0.001</b> |  |  |

Channel Flow Sub-Total **0.001 hours**

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>

(Add Sub-Total T<sub>t</sub> from prior steps)

|                                  |                    |
|----------------------------------|--------------------|
| Total T <sub>c</sub> (hours) =   | <b>0.091 hours</b> |
| Total T <sub>c</sub> (minutes) = | <b>5 minutes</b>   |



# Hydrograph Report

Project Name:

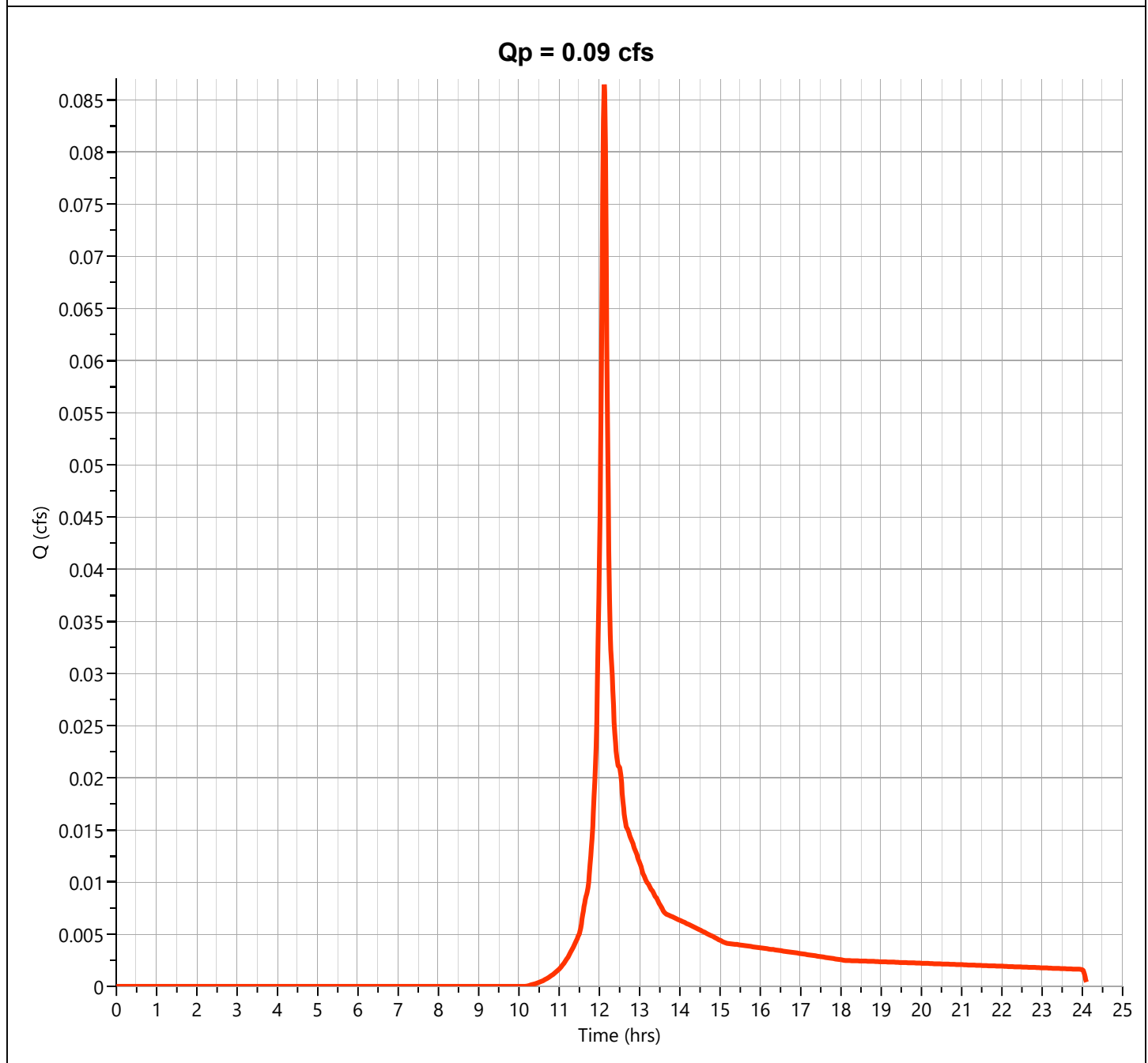
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-1D Grass HSGC C

## Hyd. No. 14

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.086 cfs |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.12 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 272 cuft  |
| Drainage Area   | = 0.06 ac     | Curve Number       | = 74        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 5.0 min   |
| Total Rainfall  | = 3.46 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

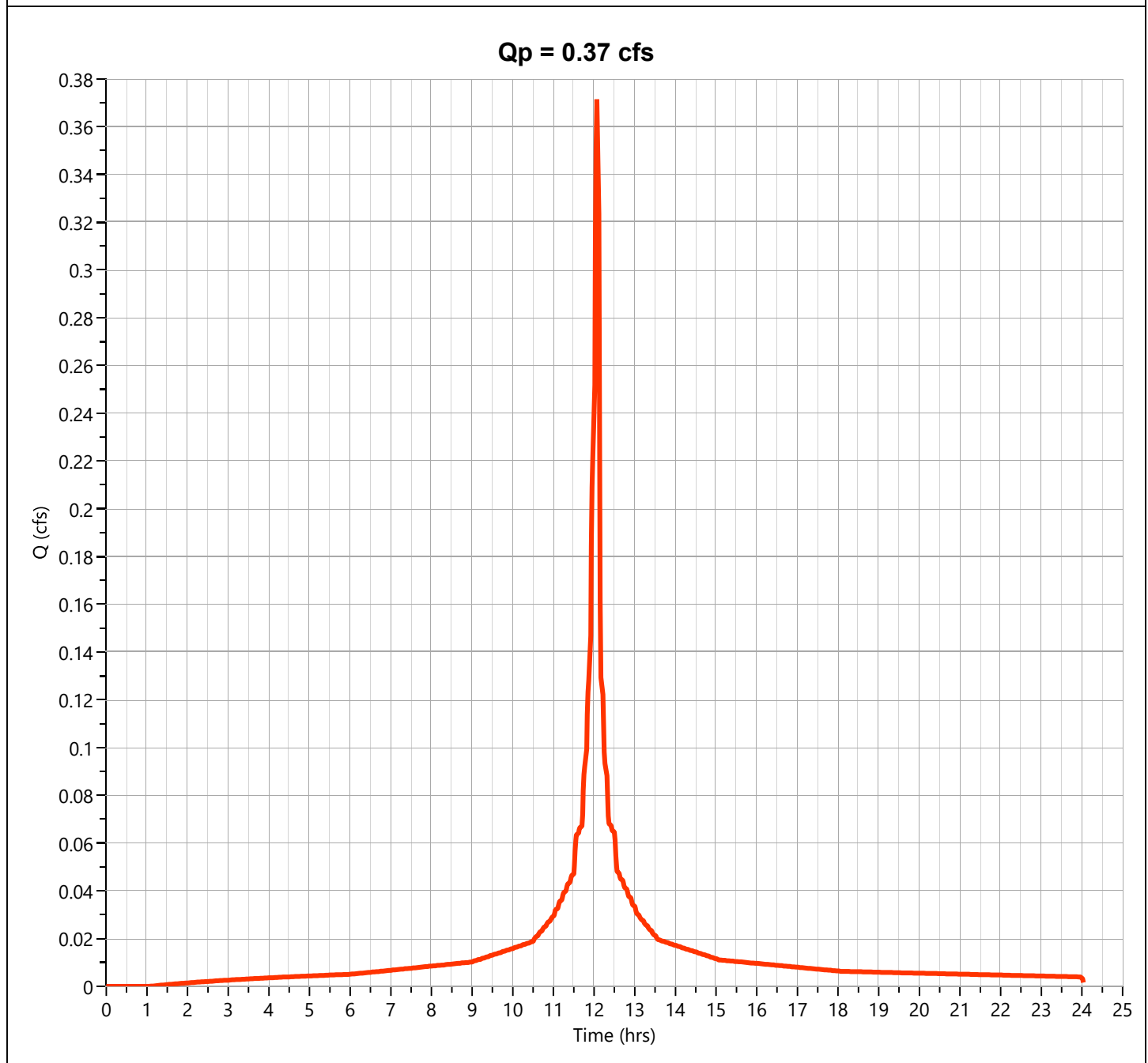
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-1D Impervious

## Hyd. No. 15

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.372 cfs  |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 1,208 cuft |
| Drainage Area   | = 0.11 ac     | Curve Number       | = 98         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 2.0 min    |
| Total Rainfall  | = 3.46 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

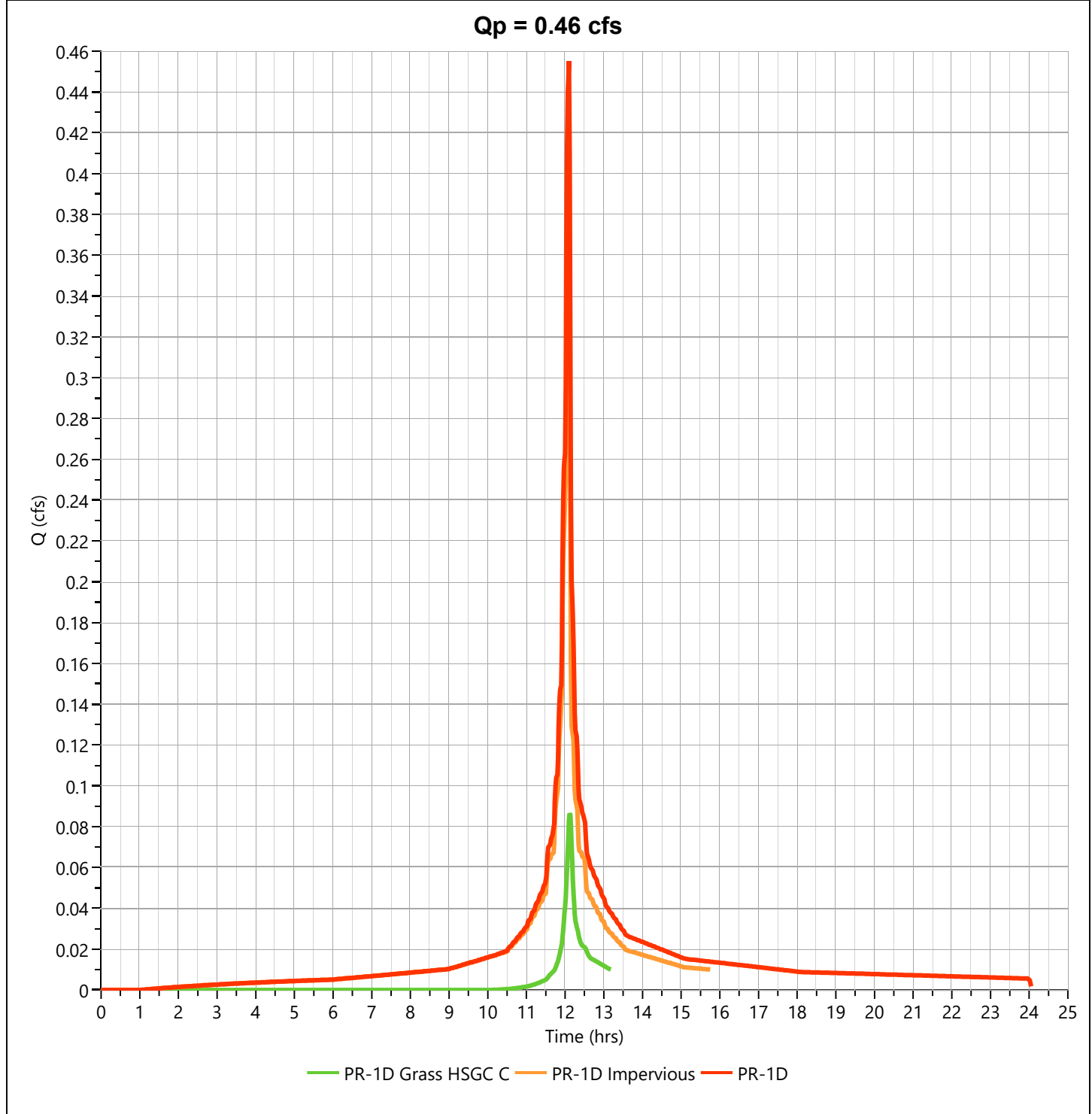
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-1D

## Hyd. No. 16

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.455 cfs  |
| Storm Frequency    | = 2-yr     | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 1,480 cuft |
| Inflow Hydrographs | = 14, 15   | Total Contrib. Area | = 0.17 ac    |



# Hydrograph Report

Project Name:

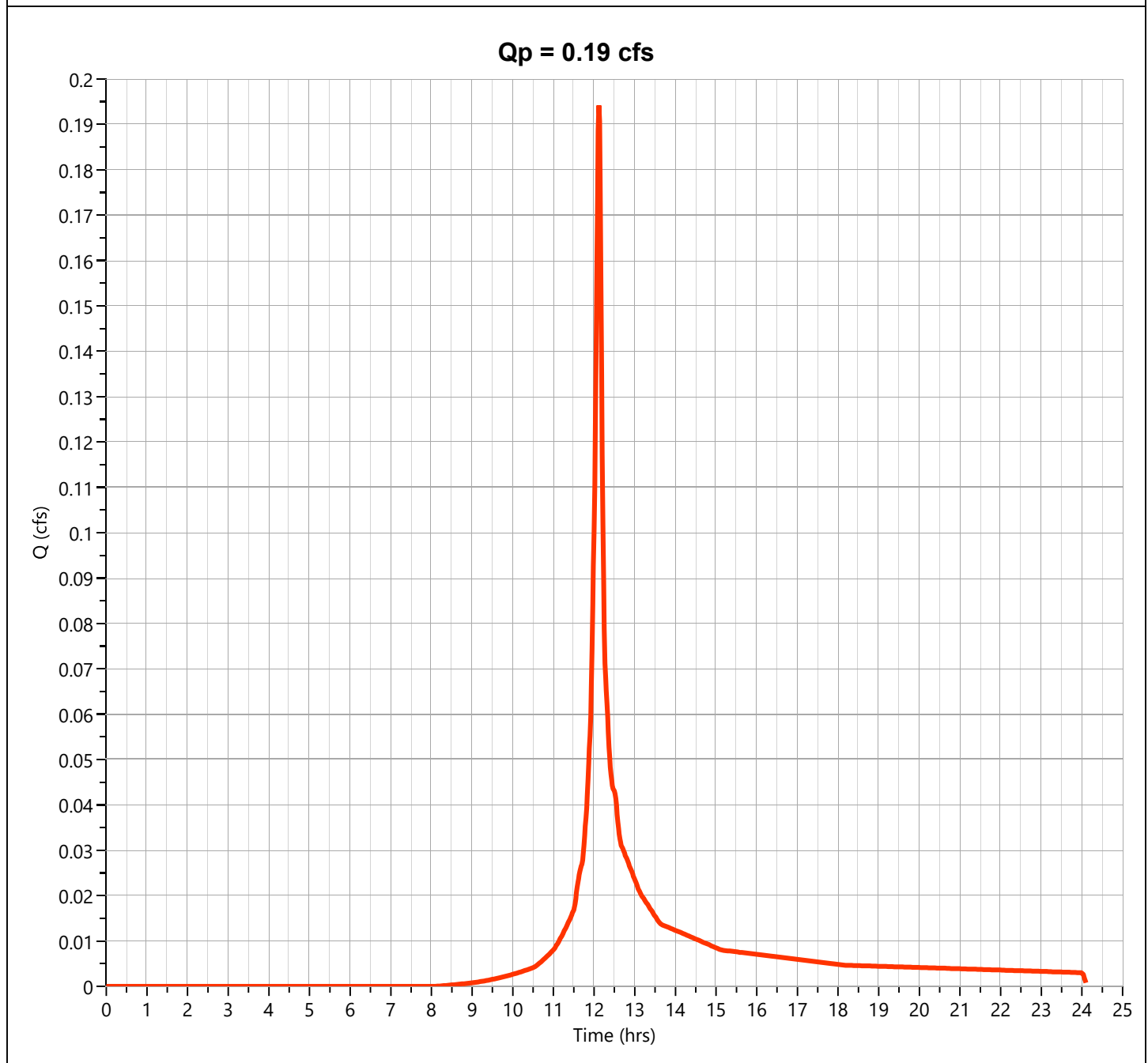
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-1D Grass HSGC C

## Hyd. No. 14

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.194 cfs |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.12 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 600 cuft  |
| Drainage Area   | = 0.06 ac     | Curve Number       | = 74        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 5.0 min   |
| Total Rainfall  | = 5.38 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

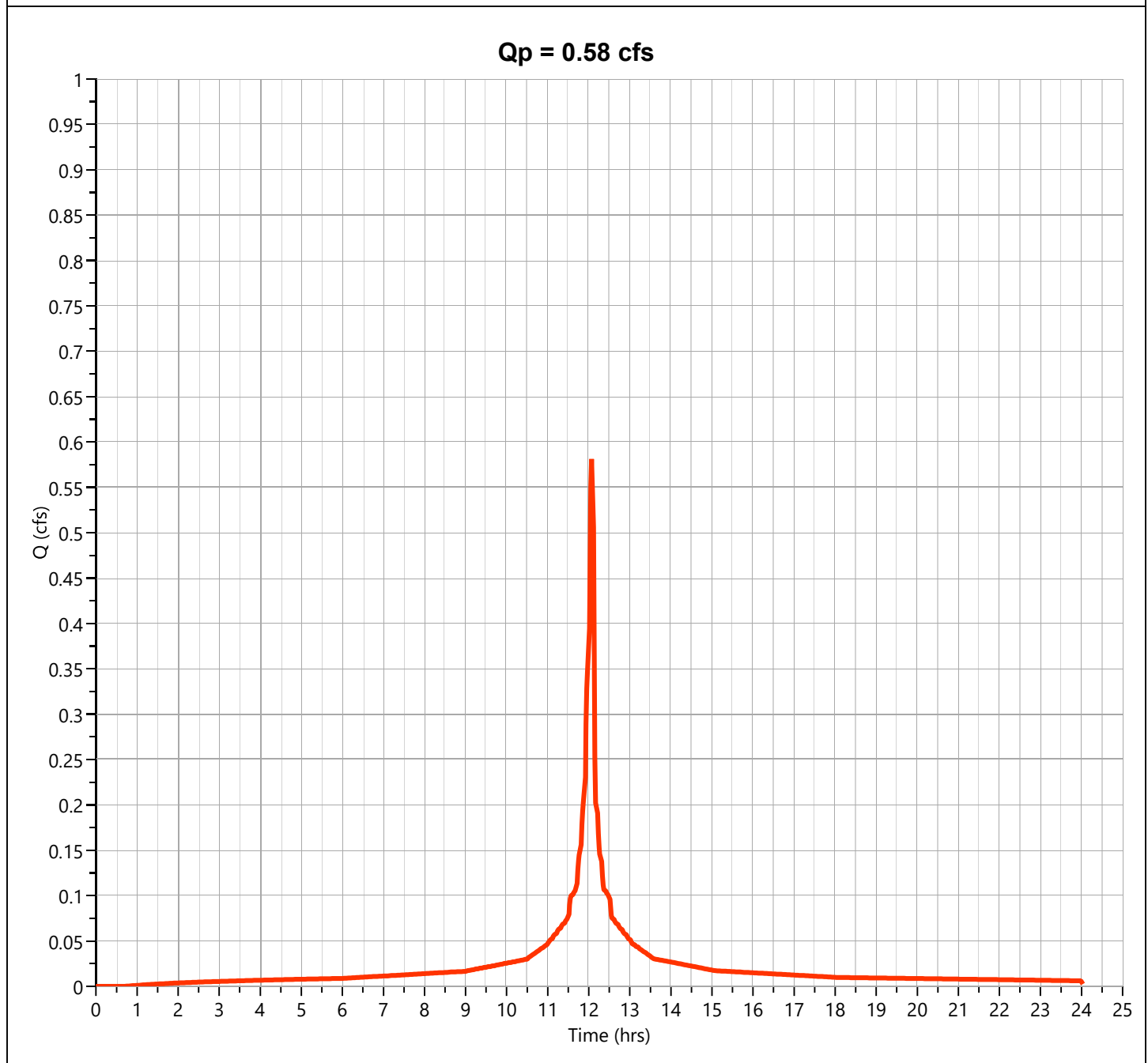
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-1D Impervious

## Hyd. No. 15

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.581 cfs  |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 1,925 cuft |
| Drainage Area   | = 0.11 ac     | Curve Number       | = 98         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 2.0 min    |
| Total Rainfall  | = 5.38 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

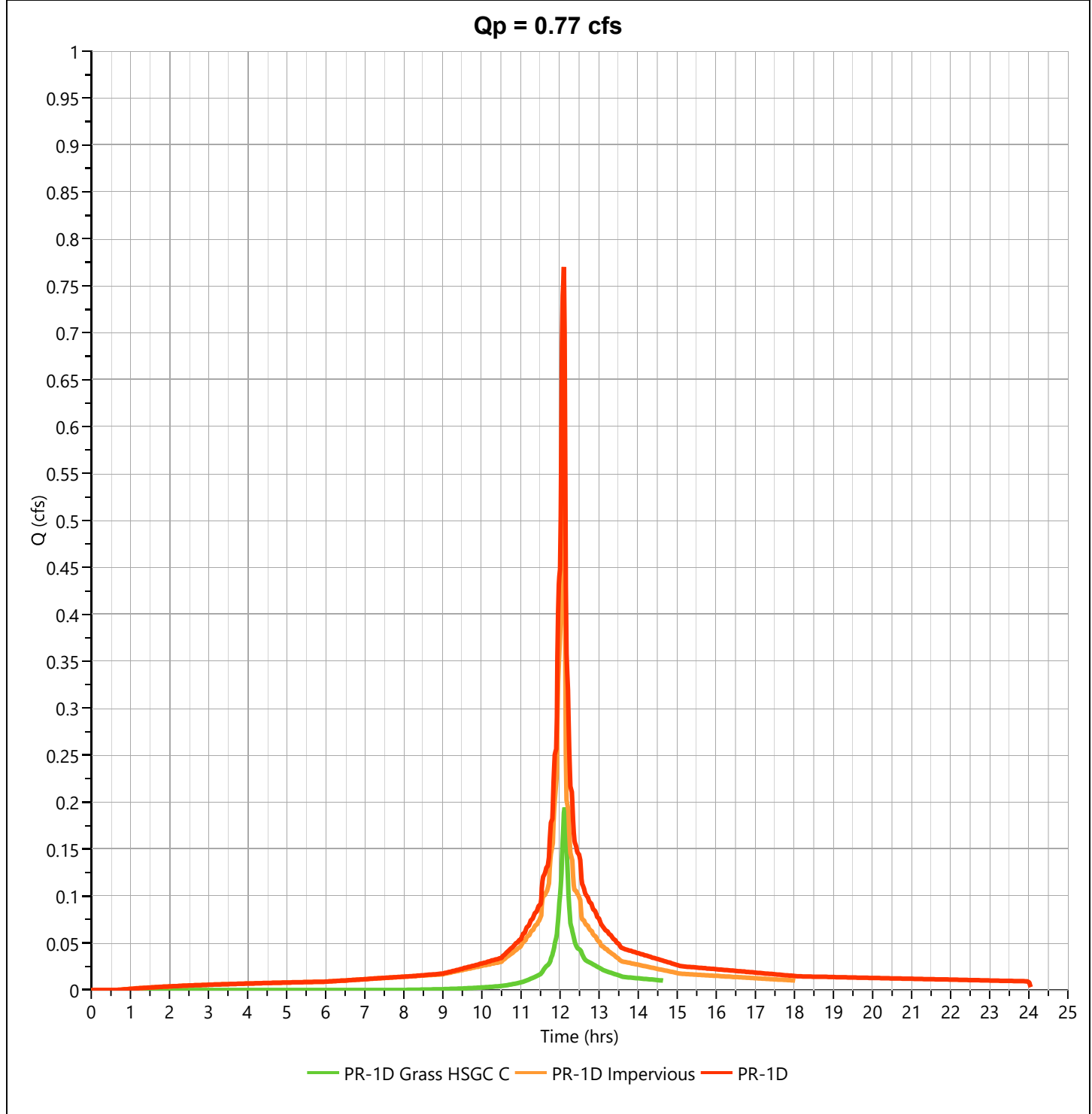
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-1D

## Hyd. No. 16

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.770 cfs  |
| Storm Frequency    | = 10-yr    | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 2,525 cuft |
| Inflow Hydrographs | = 14, 15   | Total Contrib. Area | = 0.17 ac    |



# Hydrograph Report

Project Name:

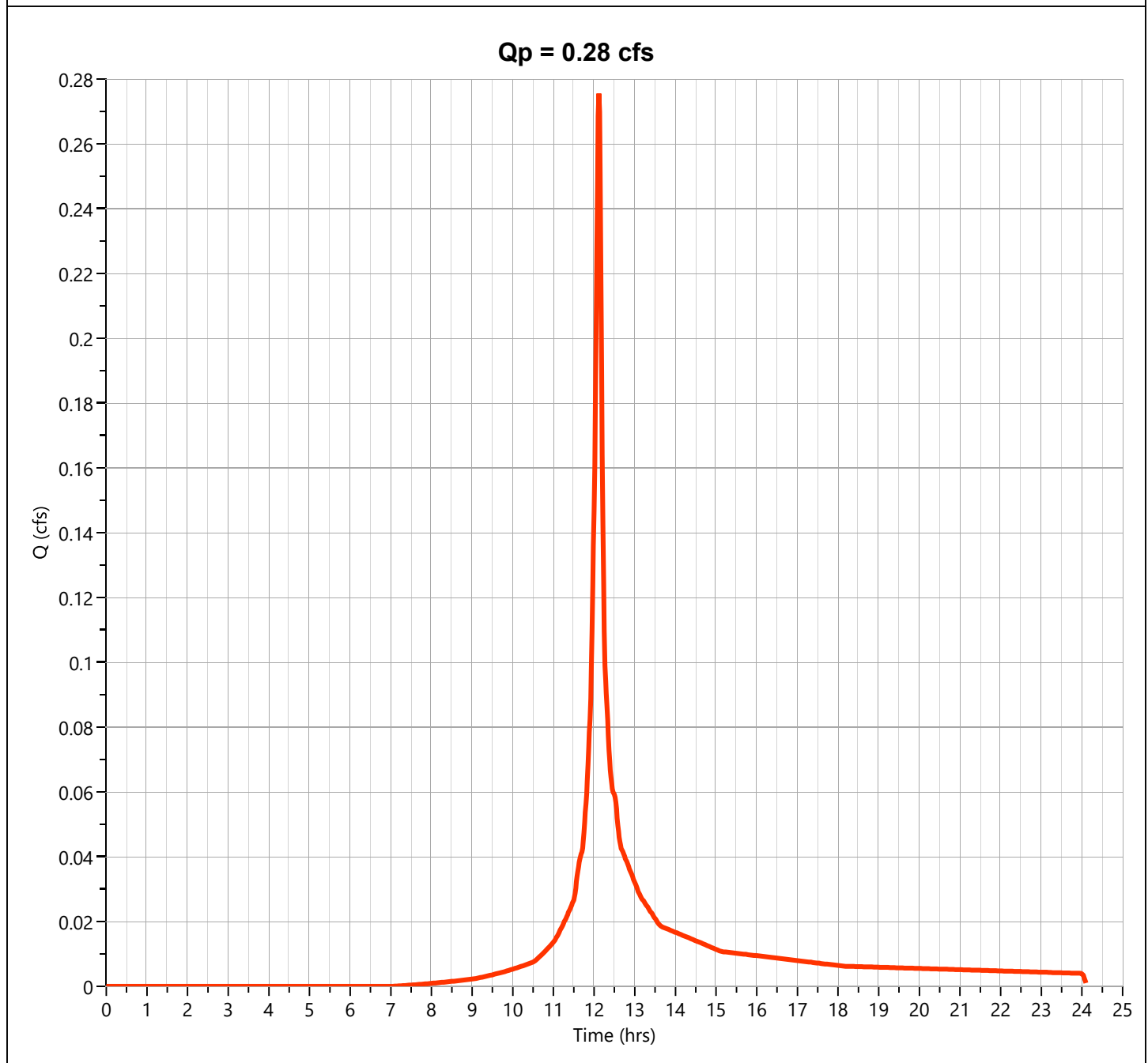
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-1D Grass HSGC C

## Hyd. No. 14

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.275 cfs |
| Storm Frequency | = 25-yr       | Time to Peak       | = 12.12 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 855 cuft  |
| Drainage Area   | = 0.06 ac     | Curve Number       | = 74        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 5.0 min   |
| Total Rainfall  | = 6.73 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

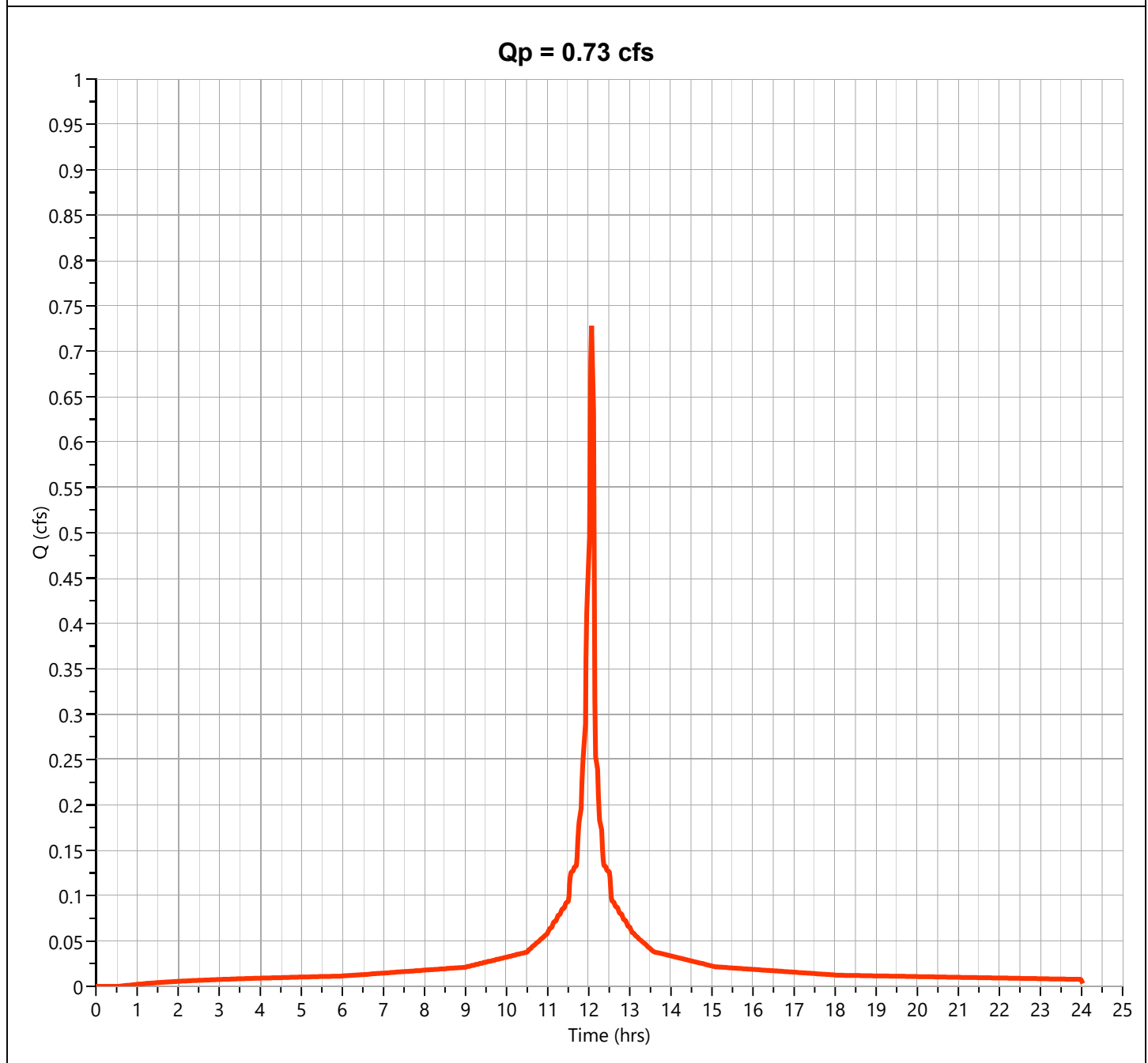
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-1D Impervious

## Hyd. No. 15

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.728 cfs  |
| Storm Frequency | = 25-yr       | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 2,430 cuft |
| Drainage Area   | = 0.11 ac     | Curve Number       | = 98         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 2.0 min    |
| Total Rainfall  | = 6.73 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |





# Hydrograph Report

Project Name:

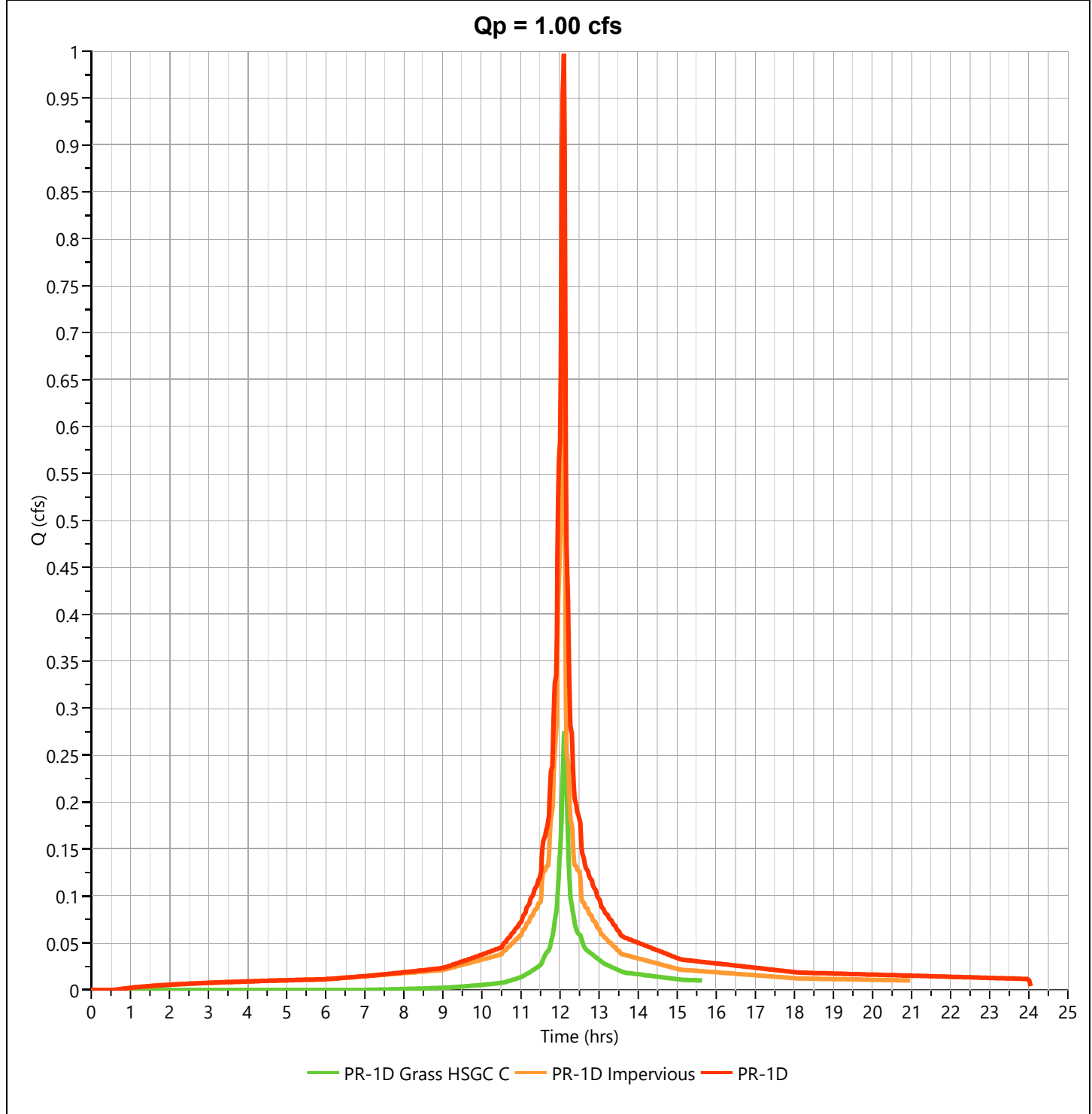
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-1D

## Hyd. No. 16

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.997 cfs  |
| Storm Frequency    | = 25-yr    | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 3,285 cuft |
| Inflow Hydrographs | = 14, 15   | Total Contrib. Area | = 0.17 ac    |



# Hydrograph Report

Project Name:

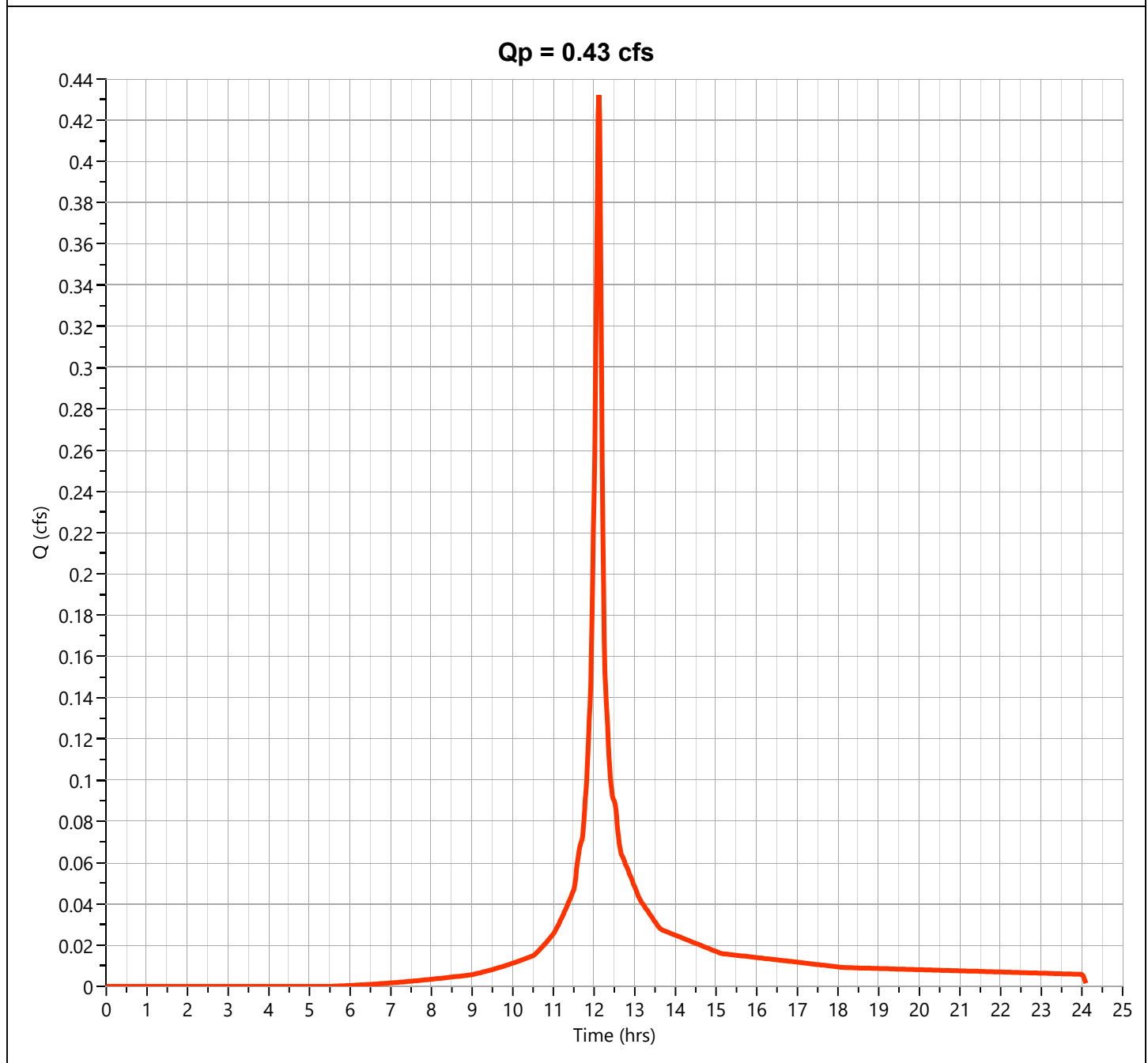
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-1D Grass HSGC C

## Hyd. No. 14

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.432 cfs  |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.12 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 1,363 cuft |
| Drainage Area   | = 0.06 ac     | Curve Number       | = 74         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 5.0 min    |
| Total Rainfall  | = 9.26 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

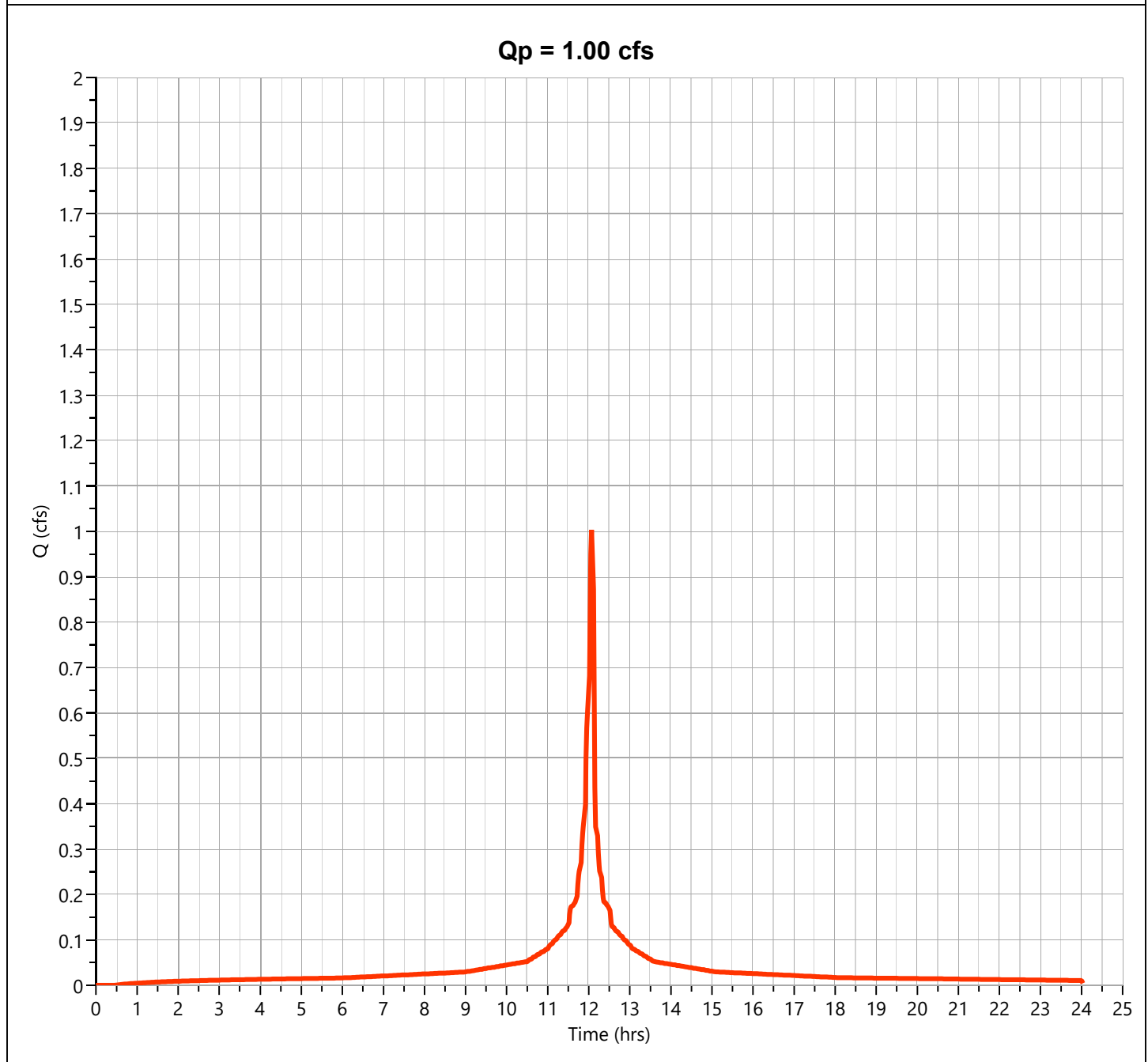
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-1D Impervious

## Hyd. No. 15

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 1.003 cfs  |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 3,376 cuft |
| Drainage Area   | = 0.11 ac     | Curve Number       | = 98         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 2.0 min    |
| Total Rainfall  | = 9.26 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

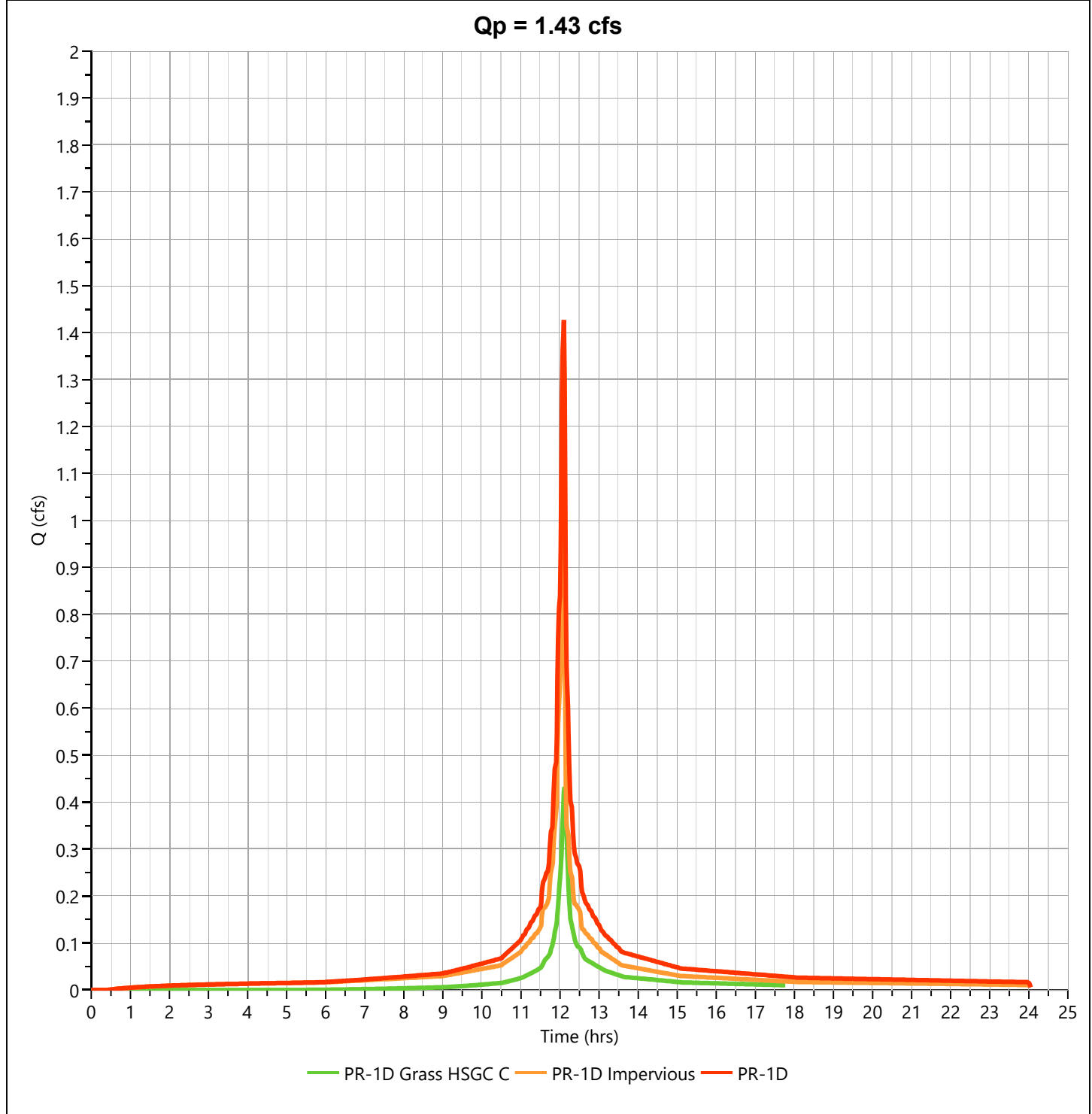
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-1D

## Hyd. No. 16

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 1.426 cfs  |
| Storm Frequency    | = 100-yr   | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 4,739 cuft |
| Inflow Hydrographs | = 14, 15   | Total Contrib. Area | = 0.17 ac    |



**COMBINED PROPOSED FLOW TO UDG-INF1-2  
WATERSHED**

# Hydrograph Report

Hydrology Studio v 3.0.0.38

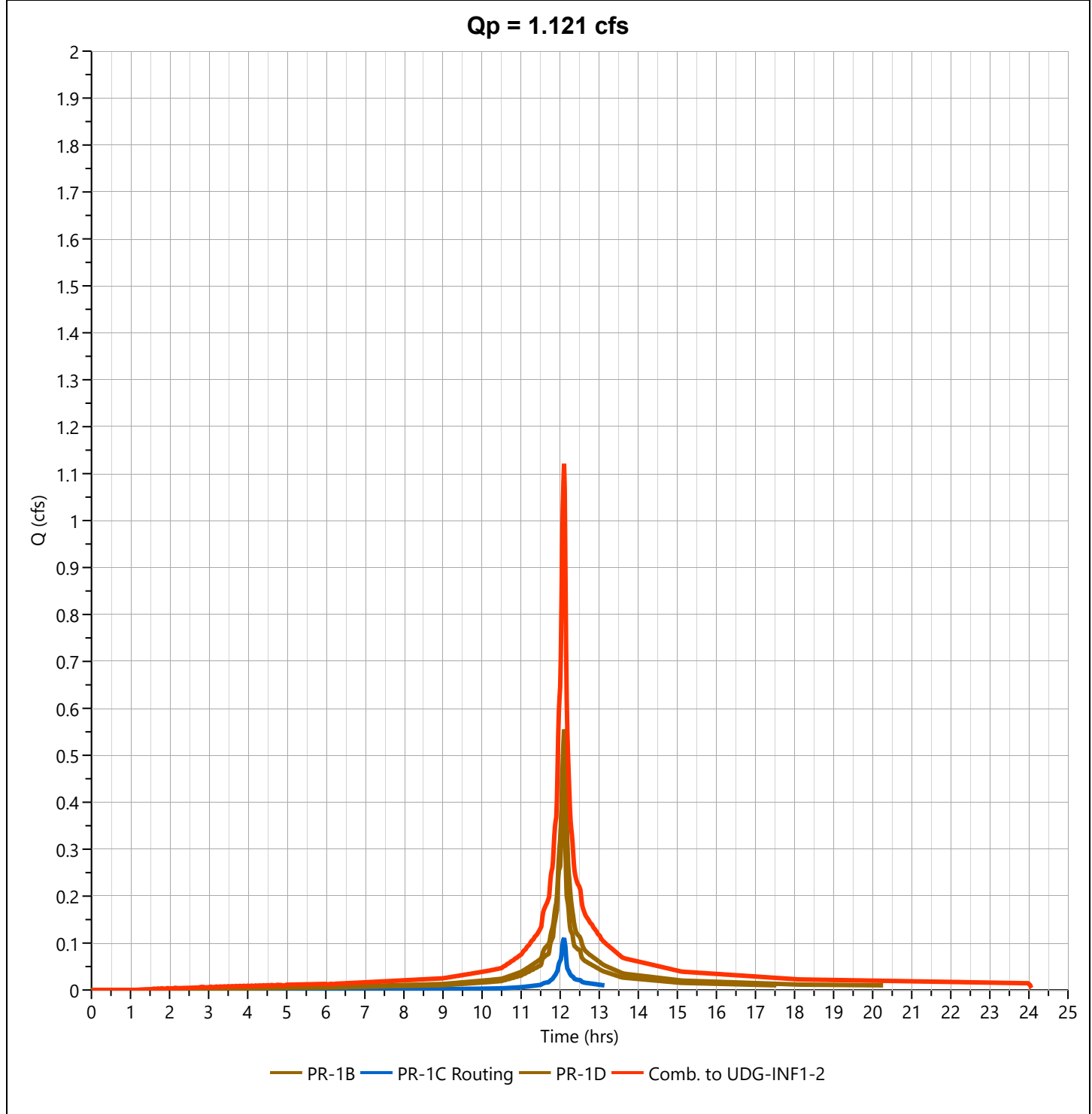
File: Current Beacon Church Proposed - POA-1 & POA-3.hys

07-01-2025

## Comb. to UDG-INF1-2

## Hyd. No. 18

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 1.121 cfs  |
| Storm Frequency    | = 2-yr     | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 3,742 cuft |
| Inflow Hydrographs |            | Total Contrib. Area | = 0.0 ac     |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

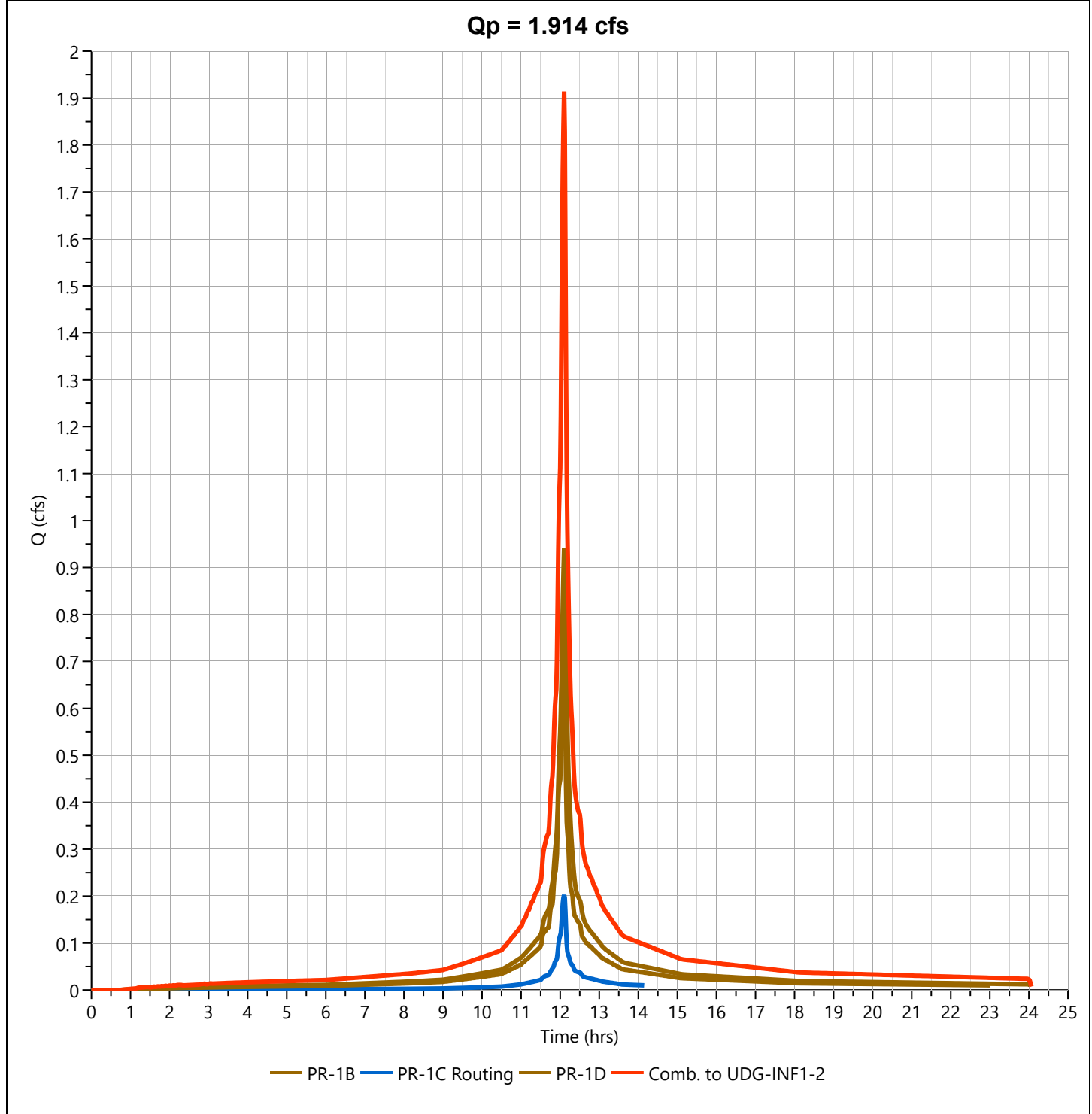
File: Current Beacon Church Proposed - POA-1 & POA-3.hys

07-01-2025

## Comb. to UDG-INF1-2

## Hyd. No. 18

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 1.914 cfs  |
| Storm Frequency    | = 10-yr    | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 6,447 cuft |
| Inflow Hydrographs |            | Total Contrib. Area | = 0.0 ac     |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

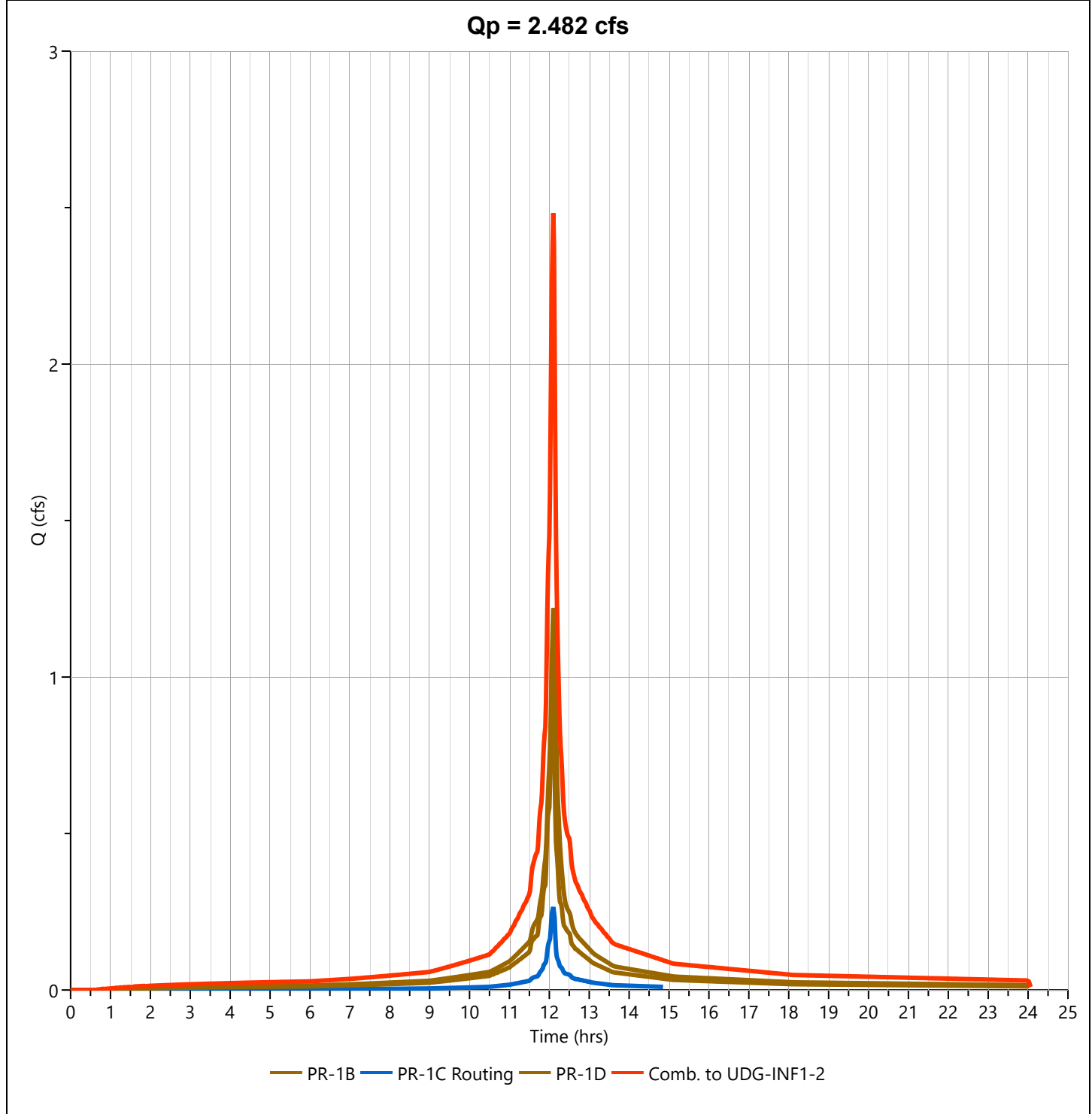
File: Current Beacon Church Proposed - POA-1 & POA-3.hys

07-01-2025

## Comb. to UDG-INF1-2

## Hyd. No. 18

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 2.482 cfs  |
| Storm Frequency    | = 25-yr    | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 8,423 cuft |
| Inflow Hydrographs |            | Total Contrib. Area | = 0.0 ac     |





# Hydrograph Report

Hydrology Studio v 3.0.0.38

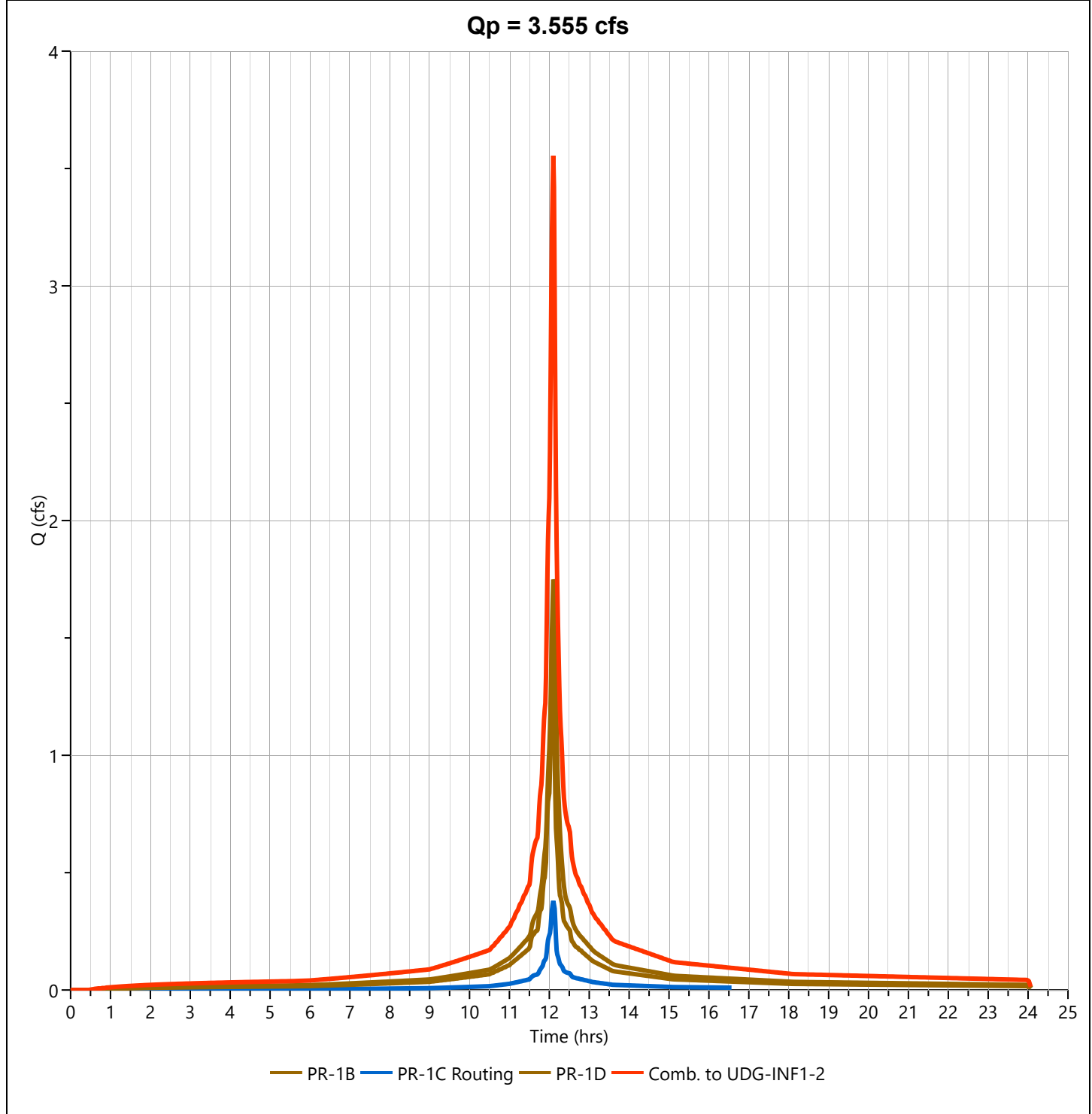
File: Current Beacon Church Proposed - POA-1 & POA-3.hys

07-01-2025

## Comb. to UDG-INF1-2

## Hyd. No. 18

|                    |            |                     |               |
|--------------------|------------|---------------------|---------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 3.555 cfs   |
| Storm Frequency    | = 100-yr   | Time to Peak        | = 12.10 hrs   |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 12,210 cuft |
| Inflow Hydrographs |            | Total Contrib. Area | = 0.0 ac      |



## **PR-1E WATERSHED**

Project: Beacon Unitarian Universalist Church

By: TEG

Date: 2/6/2024

Location: Summit, NJ

Checked By: MJV

Date Checked: 2/6/2024

Circle One: Present Developed

Current Proposed Watershed PR-1E - Impervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Design Flow Length, L<sub>des</sub> (Total L<sub>des</sub> < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. McCuen-Spiess Limit, L<sub>mcs</sub> (max. 100 ft)
7. Compute T<sub>t</sub>

$$L_{mcs} = (100 s^{0.5})/n$$

$$T_t = \frac{0.007 (n L_{des})^{0.8}}{P_2^{0.5} s^{0.4}}$$

| Segment ID | 1                      | 2                    | 3                      |
|------------|------------------------|----------------------|------------------------|
|            | <b>Smooth Surfaces</b> | <b>Dense Grasses</b> | <b>Smooth Surfaces</b> |
|            | <b>0.011</b>           | <b>0.24</b>          | <b>0.011</b>           |
| ft         | <b>18</b>              | <b>29</b>            | <b>47</b>              |
| in         | <b>3.46</b>            | <b>3.46</b>          | <b>3.46</b>            |
| ft/ft      | <b>0.049</b>           | <b>0.114</b>         | <b>0.073</b>           |
| ft         | <b>100</b>             | <b>100</b>           | <b>100</b>             |
| hr         | <b>0.003</b>           | <b>0.042</b>         | <b>0.006</b>           |

Sheet Flow Sub-Total **0.051 hours**

**Shallow Concentrated Flow**

8. Surface Description
9. Flow Length, L
10. Watercourse Slope, s
11. Average Velocity, V (NEH table 15-3)
12. Compute T<sub>t</sub>

$$T_t = \frac{L}{3600 V}$$

| Segment ID | 4               |  |  |
|------------|-----------------|--|--|
|            | <b>Pavement</b> |  |  |
| ft         | <b>187</b>      |  |  |
| ft/ft      | <b>0.053</b>    |  |  |
| ft/s       | <b>4.67</b>     |  |  |
| hr         | <b>0.011</b>    |  |  |

Shallow Conc. Flow Sub-Total **0.011 hours**

**Channel Flow**

13. Flow Length, L
14. Cross Sectional flow area, a
15. Wetted Perimeter, P<sub>w</sub>
16. Hydraulic Radius, r
17. Channel Slope, s
18. Manning's Roughness Coeff., n
19. Velocity, V
20. Compute T<sub>t</sub>

$$r = a / P_w$$

$$V = (1.49 r^{2/3} s^{1/2}) / n$$

$$T_t = \frac{L}{3600 V}$$

| Segment ID      |  |  |  |
|-----------------|--|--|--|
| ft              |  |  |  |
| ft <sup>2</sup> |  |  |  |
| ft              |  |  |  |
| ft              |  |  |  |
| ft/ft           |  |  |  |
| ft/s            |  |  |  |
| hr              |  |  |  |

Channel Flow Sub-Total **0.000 hours**

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>

(Add Sub-Total T<sub>t</sub> from prior steps)

|                      |                    |
|----------------------|--------------------|
| Total Tc (hours) =   | <b>0.063 hours</b> |
| Total Tc (minutes) = | <b>4 minutes</b>   |

Project: Beacon Unitarian Universalist Church

By: TEG

Date: 11/29/2023

Location: Summit, NJ

Checked By: MJV

Date Checked: 11/29/2023

Circle One: Present Developed

Current Proposed Watershed PR-1E - Pervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Design Flow Length, L<sub>des</sub> (Total L<sub>des</sub> < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. McCuen-Spiess Limit, L<sub>mcs</sub> (max. 100 ft)
7. Compute T<sub>t</sub>

$$L_{mcs} = (100 s^{0.5})/n$$

$$T_t = \frac{0.007 (n L_{des})^{0.8}}{P_2^{0.5} s^{0.4}}$$

| Segment ID | 1                    | 2                      | 3                    |
|------------|----------------------|------------------------|----------------------|
|            | <b>Dense Grasses</b> | <b>Smooth Surfaces</b> | <b>Dense Grasses</b> |
|            | <b>0.24</b>          | <b>0.011</b>           | <b>0.24</b>          |
| ft         | <b>19</b>            | <b>10</b>              | <b>35</b>            |
| in         | <b>3.46</b>          | <b>3.46</b>            | <b>3.46</b>          |
| ft/ft      | <b>0.053</b>         | <b>0.026</b>           | <b>0.217</b>         |
| ft         | <b>96</b>            | <b>100</b>             | <b>100</b>           |
| hr         | <b>0.041</b>         | <b>0.003</b>           | <b>0.038</b>         |

Sheet Flow Sub-Total **0.082 hours**

**Shallow Concentrated Flow**

8. Surface Description
9. Flow Length, L
10. Watercourse Slope, s
11. Average Velocity, V (NEH table 15-3)
12. Compute T<sub>t</sub>

$$T_t = \frac{L}{3600 V}$$

| Segment ID | 4               |  |  |
|------------|-----------------|--|--|
|            | <b>Pavement</b> |  |  |
| ft         | <b>110</b>      |  |  |
| ft/ft      | <b>0.058</b>    |  |  |
| ft/s       | <b>4.90</b>     |  |  |
| hr         | <b>0.006</b>    |  |  |

Shallow Conc. Flow Sub-Total **0.006 hours**

**Channel Flow**

13. Flow Length, L
14. Cross Sectional flow area, a
15. Wetted Perimeter, P<sub>w</sub>
16. Hydraulic Radius, r
17. Channel Slope, s
18. Manning's Roughness Coeff., n
19. Velocity, V
20. Compute T<sub>t</sub>

$$r = a / P_w$$

$$V = (1.49 r^{2/3} s^{1/2}) / n$$

$$T_t = \frac{L}{3600 V}$$

| Segment ID      |  |  |  |
|-----------------|--|--|--|
| ft              |  |  |  |
| ft <sup>2</sup> |  |  |  |
| ft              |  |  |  |
| ft              |  |  |  |
| ft/ft           |  |  |  |
| ft/s            |  |  |  |
| hr              |  |  |  |

Channel Flow Sub-Total **0.000 hours**

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>

(Add Sub-Total T<sub>t</sub> from prior steps)

|                      |                    |
|----------------------|--------------------|
| Total Tc (hours) =   | <b>0.088 hours</b> |
| Total Tc (minutes) = | <b>5 minutes</b>   |

# Hydrograph Report

Hydrology Studio v 3.0.0.38

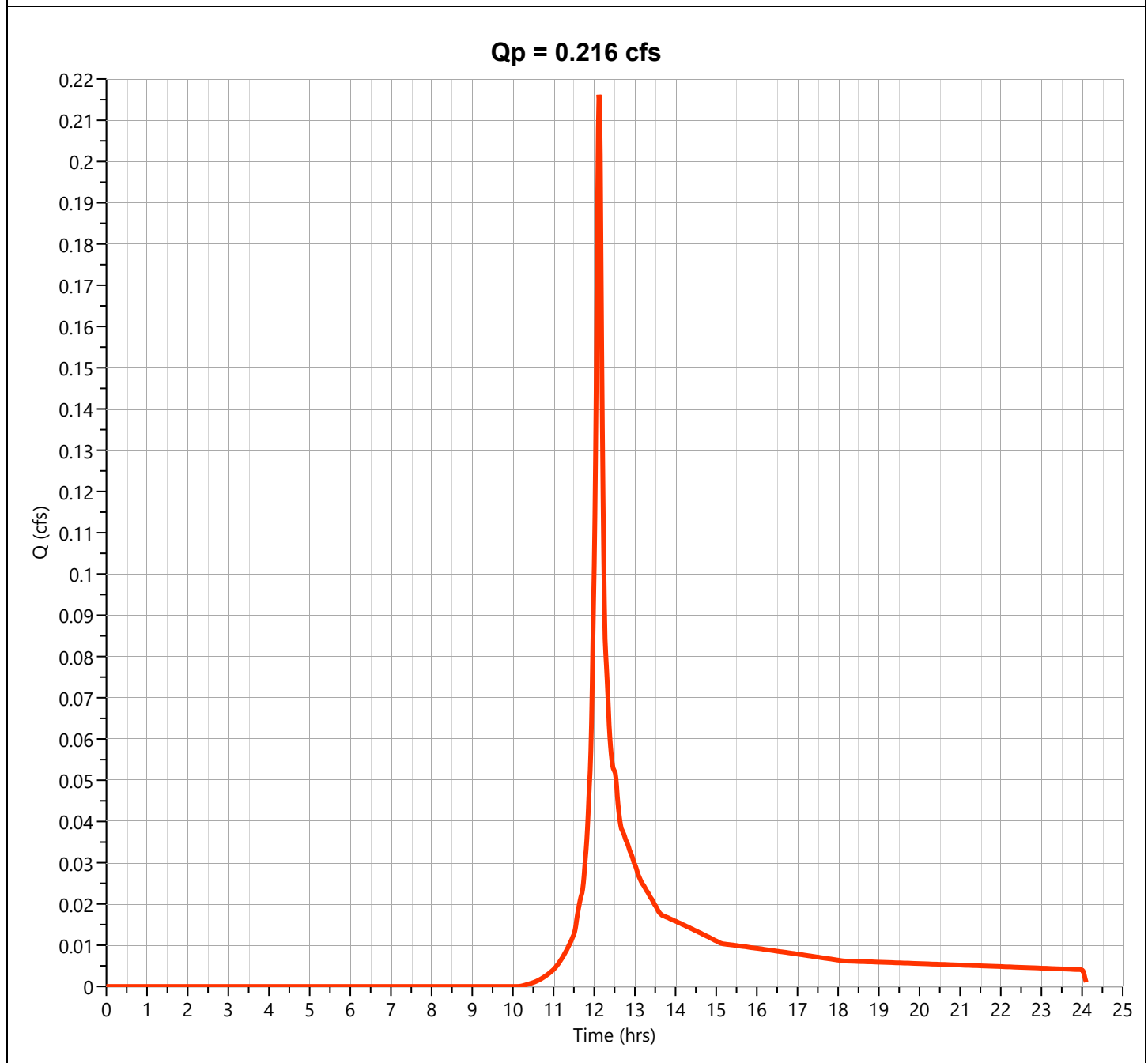
File: Current Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

## PR-1E Grass HSGC C

## Hyd. No. 22

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.216 cfs |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.12 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 681 cuft  |
| Drainage Area   | = 0.15 ac     | Curve Number       | = 74.00     |
| Tc Method       | = User        | Time of Conc. (Tc) | = 5.0 min   |
| Total Rainfall  | = 3.46 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

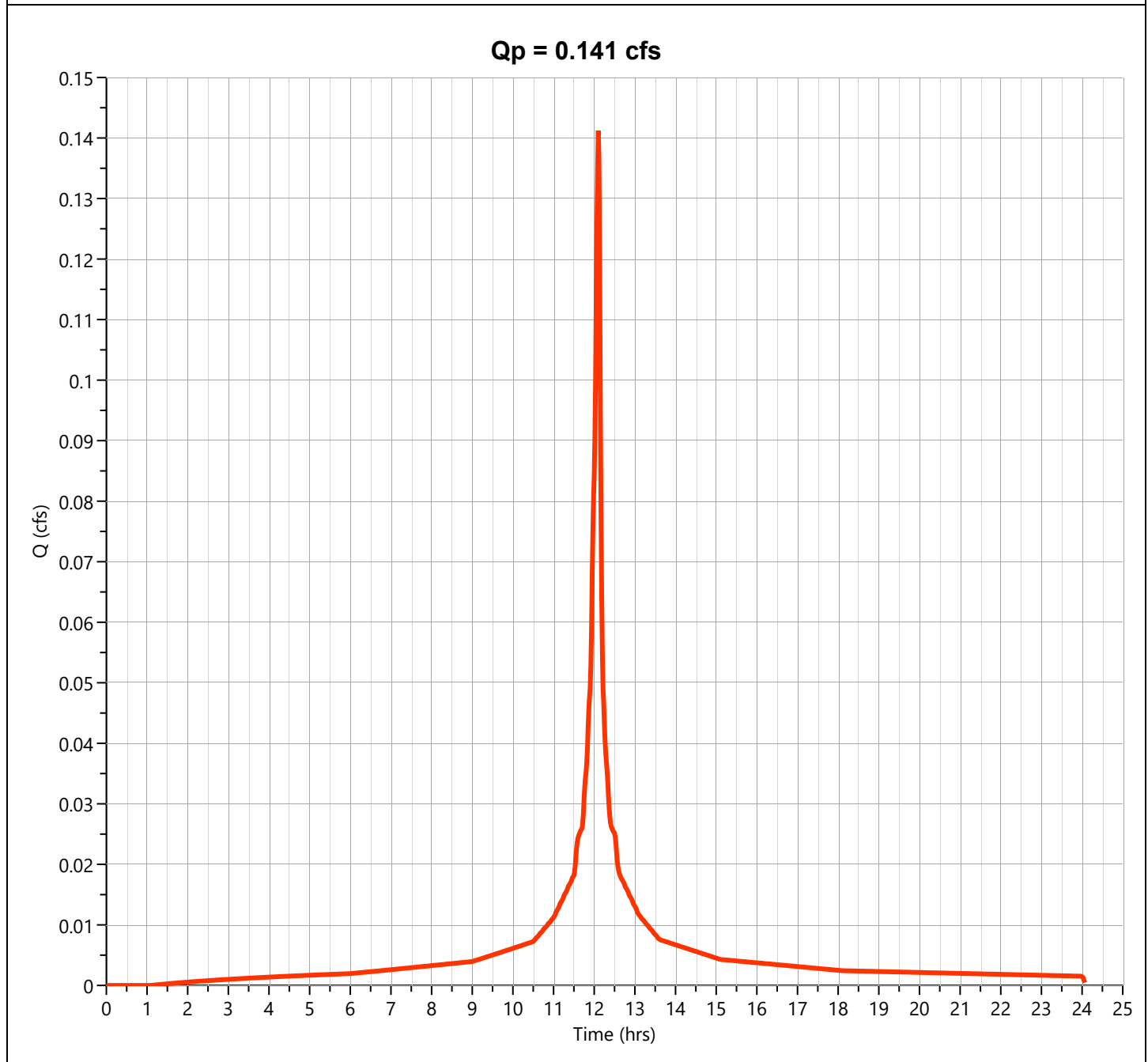
File: Current Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

## PR-1E Impervious

## Hyd. No. 23

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.141 cfs |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.10 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 469 cuft  |
| Drainage Area   | = 0.04 ac     | Curve Number       | = 98.00     |
| Tc Method       | = User        | Time of Conc. (Tc) | = 4.0 min   |
| Total Rainfall  | = 3.46 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

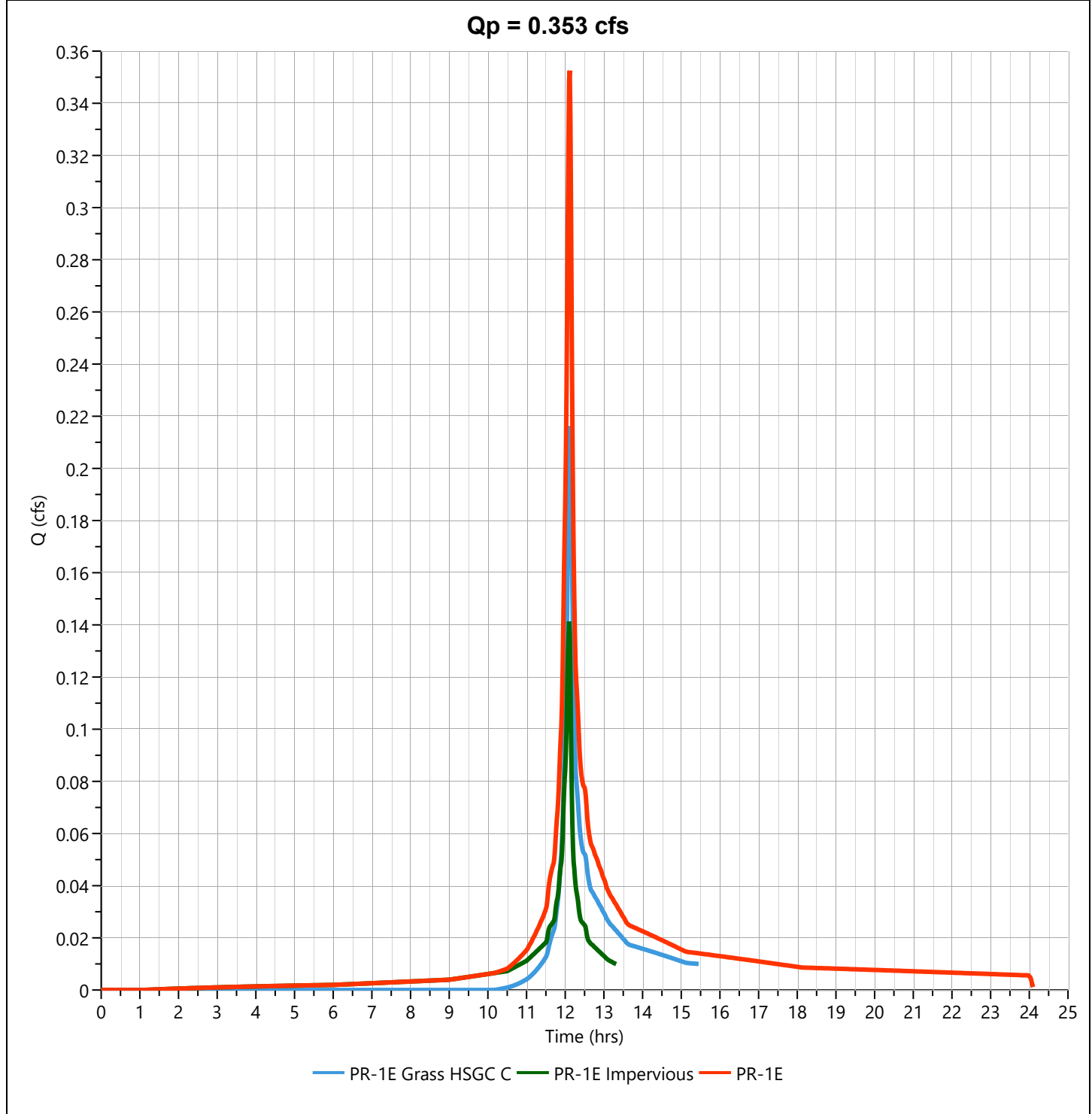
File: Current Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

## PR-1E

## Hyd. No. 24

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.353 cfs  |
| Storm Frequency    | = 2-yr     | Time to Peak        | = 12.12 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 1,149 cuft |
| Inflow Hydrographs | = 22, 23   | Total Contrib. Area | = 0.19 ac    |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

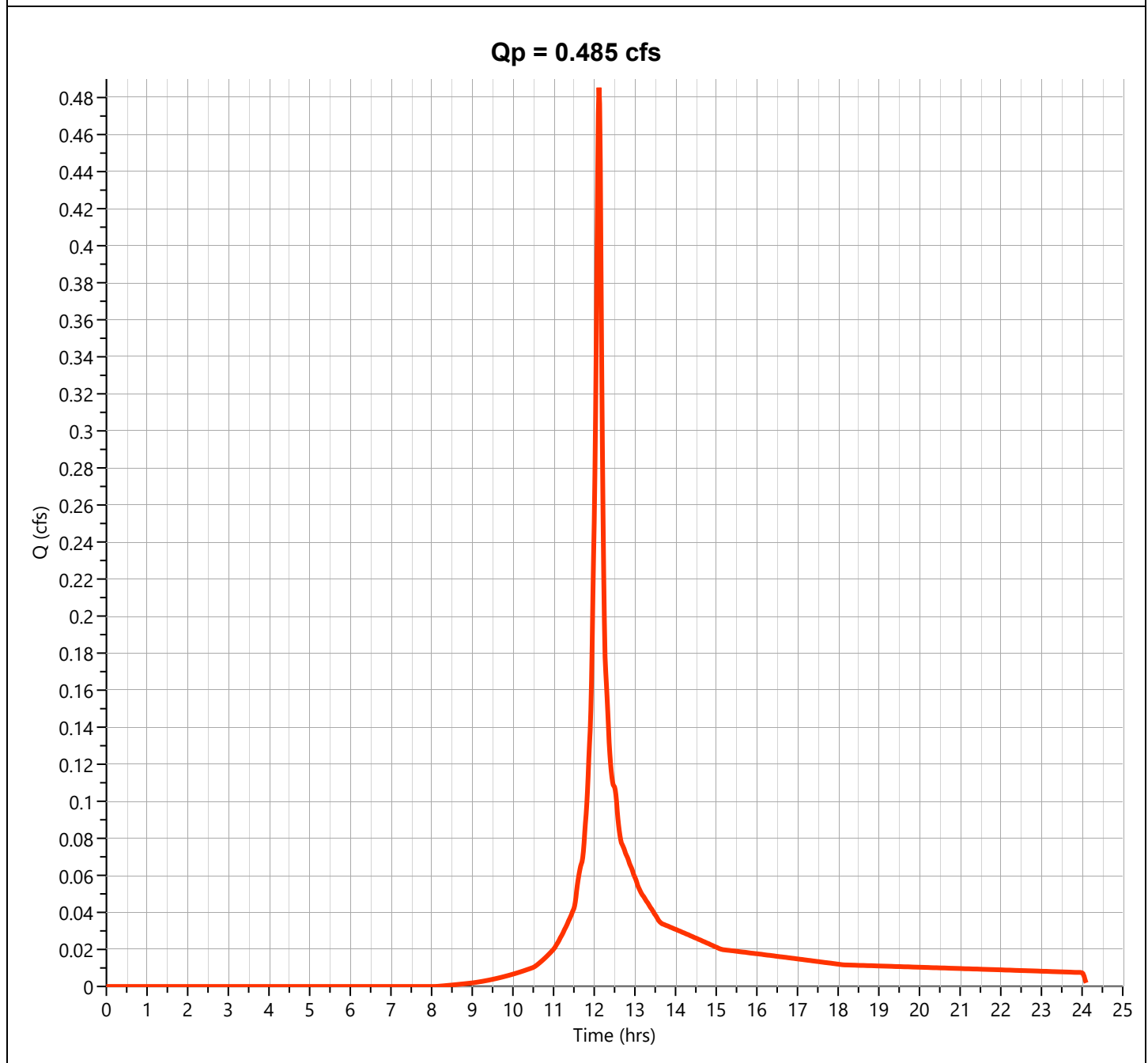
File: Current Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

## PR-1E Grass HSGC C

## Hyd. No. 22

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.485 cfs  |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.12 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 1,500 cuft |
| Drainage Area   | = 0.15 ac     | Curve Number       | = 74.00      |
| Tc Method       | = User        | Time of Conc. (Tc) | = 5.0 min    |
| Total Rainfall  | = 5.38 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |





# Hydrograph Report

Hydrology Studio v 3.0.0.38

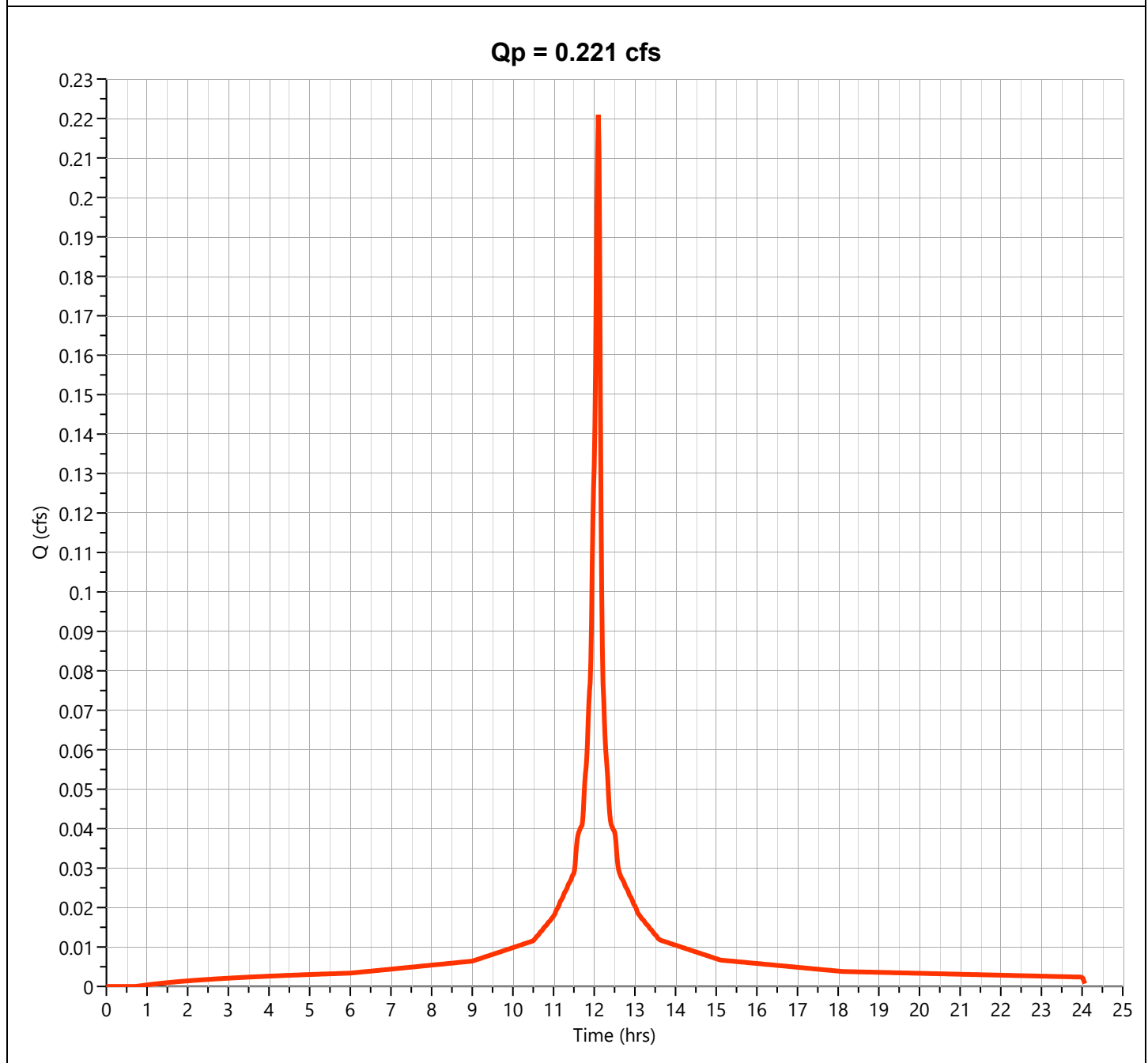
File: Current Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

## PR-1E Impervious

## Hyd. No. 23

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.221 cfs |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.10 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 747 cuft  |
| Drainage Area   | = 0.04 ac     | Curve Number       | = 98.00     |
| Tc Method       | = User        | Time of Conc. (Tc) | = 4.0 min   |
| Total Rainfall  | = 5.38 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

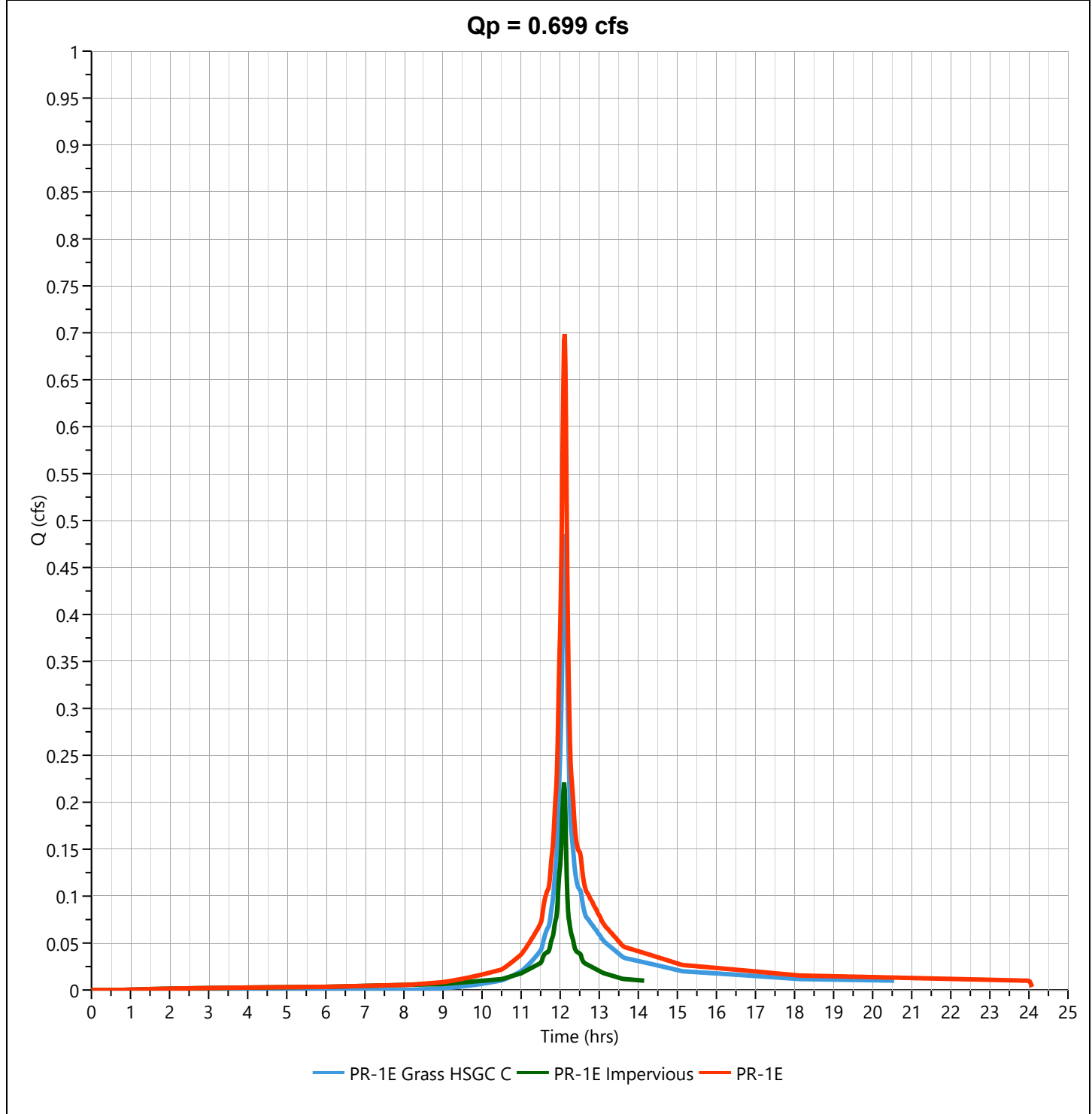
File: Current Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

## PR-1E

## Hyd. No. 24

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.699 cfs  |
| Storm Frequency    | = 10-yr    | Time to Peak        | = 12.12 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 2,246 cuft |
| Inflow Hydrographs | = 22, 23   | Total Contrib. Area | = 0.19 ac    |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

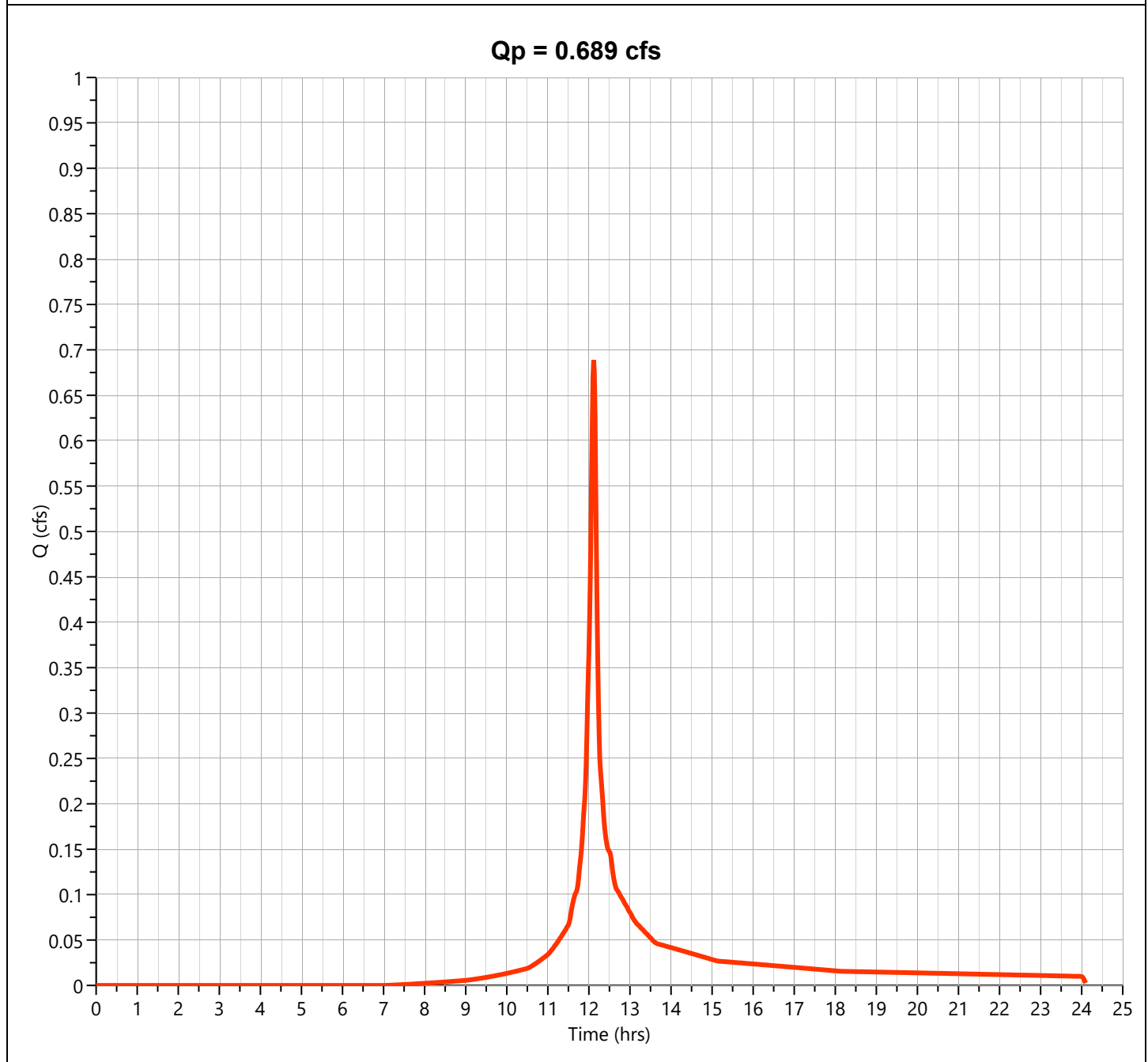
File: Current Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

## PR-1E Grass HSGC C

## Hyd. No. 22

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.689 cfs  |
| Storm Frequency | = 25-yr       | Time to Peak       | = 12.12 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 2,138 cuft |
| Drainage Area   | = 0.15 ac     | Curve Number       | = 74.00      |
| Tc Method       | = User        | Time of Conc. (Tc) | = 5.0 min    |
| Total Rainfall  | = 6.73 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

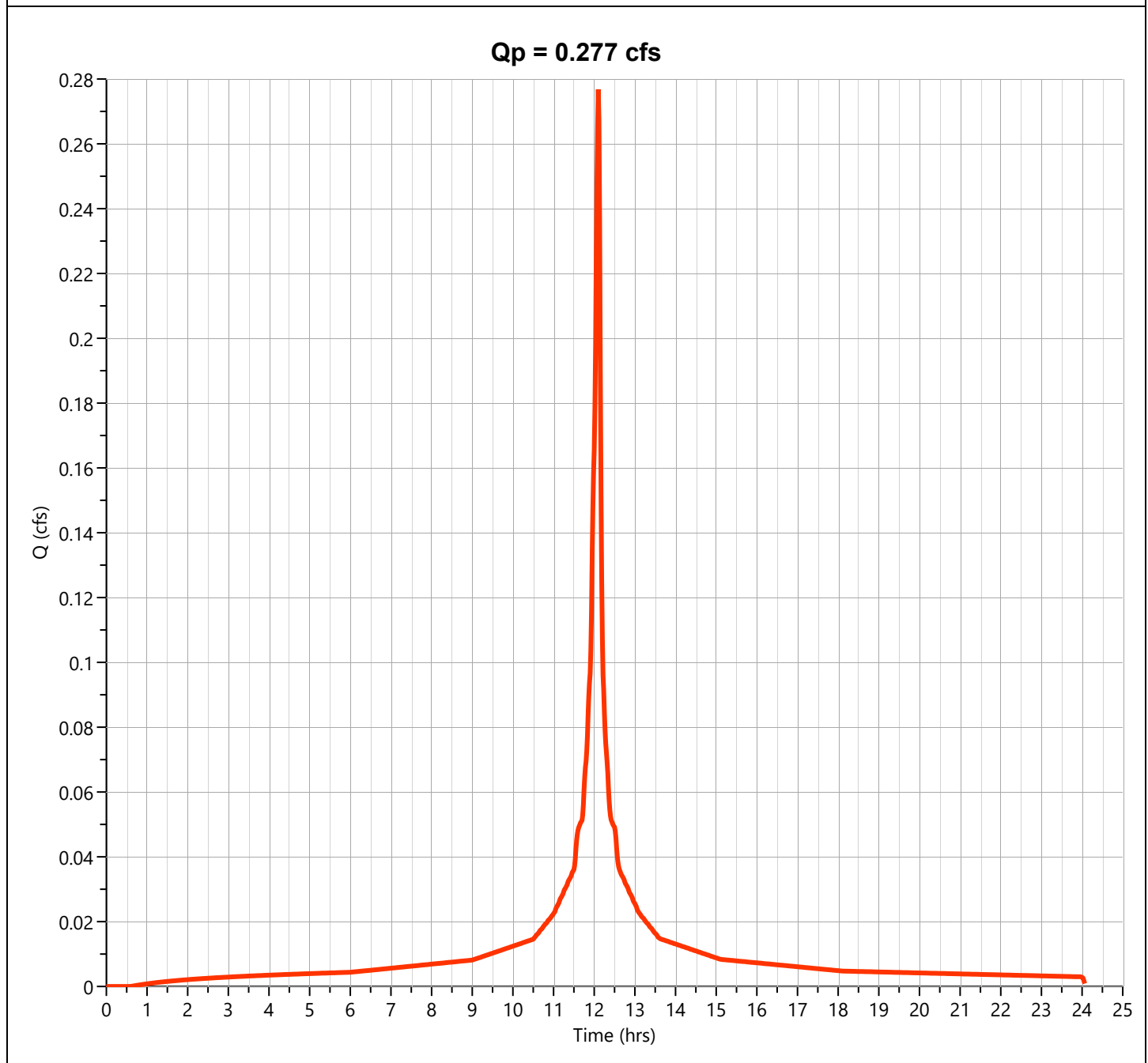
File: Current Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

## PR-1E Impervious

## Hyd. No. 23

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.277 cfs |
| Storm Frequency | = 25-yr       | Time to Peak       | = 12.10 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 943 cuft  |
| Drainage Area   | = 0.04 ac     | Curve Number       | = 98.00     |
| Tc Method       | = User        | Time of Conc. (Tc) | = 4.0 min   |
| Total Rainfall  | = 6.73 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

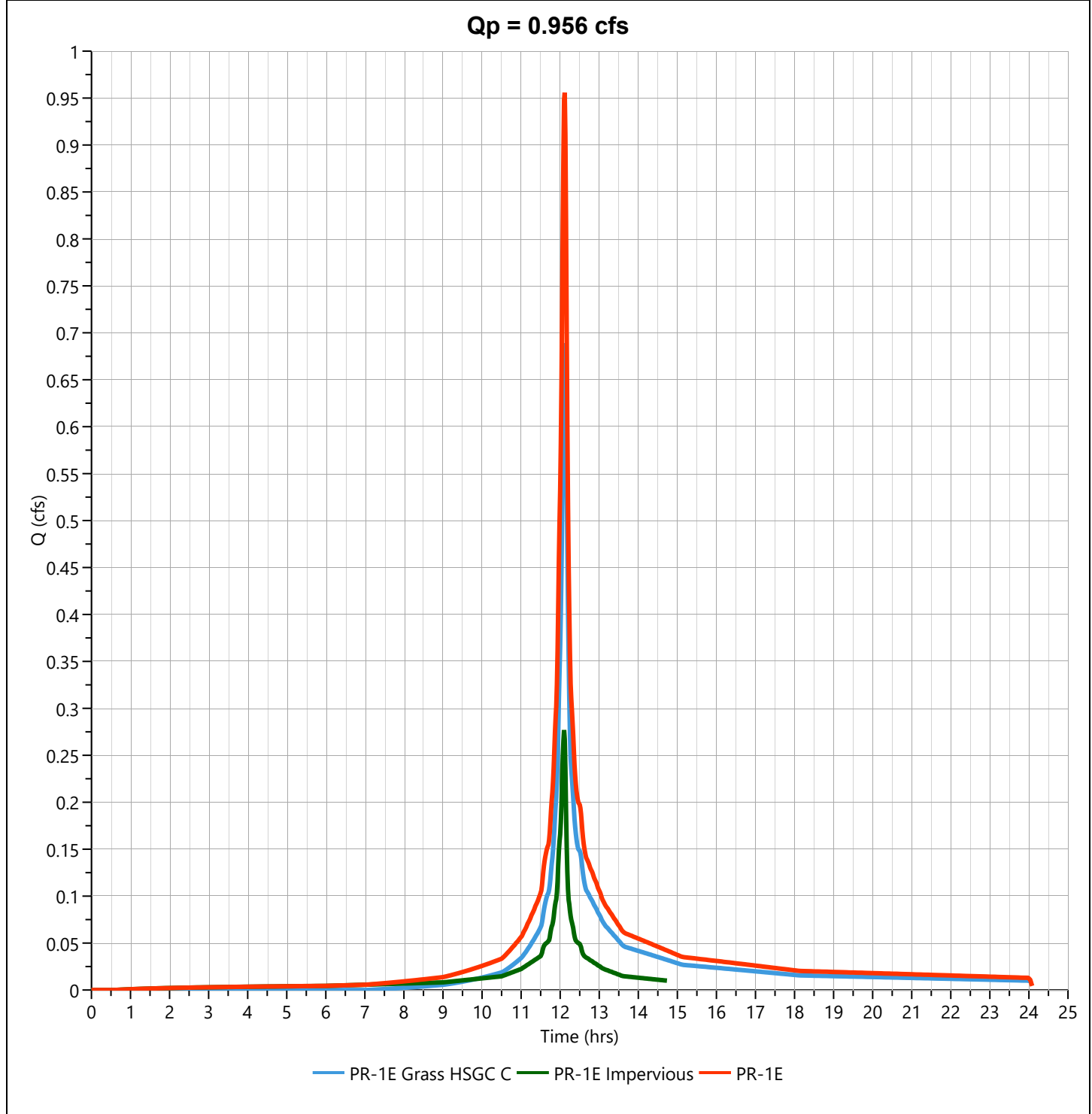
File: Current Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

## PR-1E

## Hyd. No. 24

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.956 cfs  |
| Storm Frequency    | = 25-yr    | Time to Peak        | = 12.12 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 3,081 cuft |
| Inflow Hydrographs | = 22, 23   | Total Contrib. Area | = 0.19 ac    |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

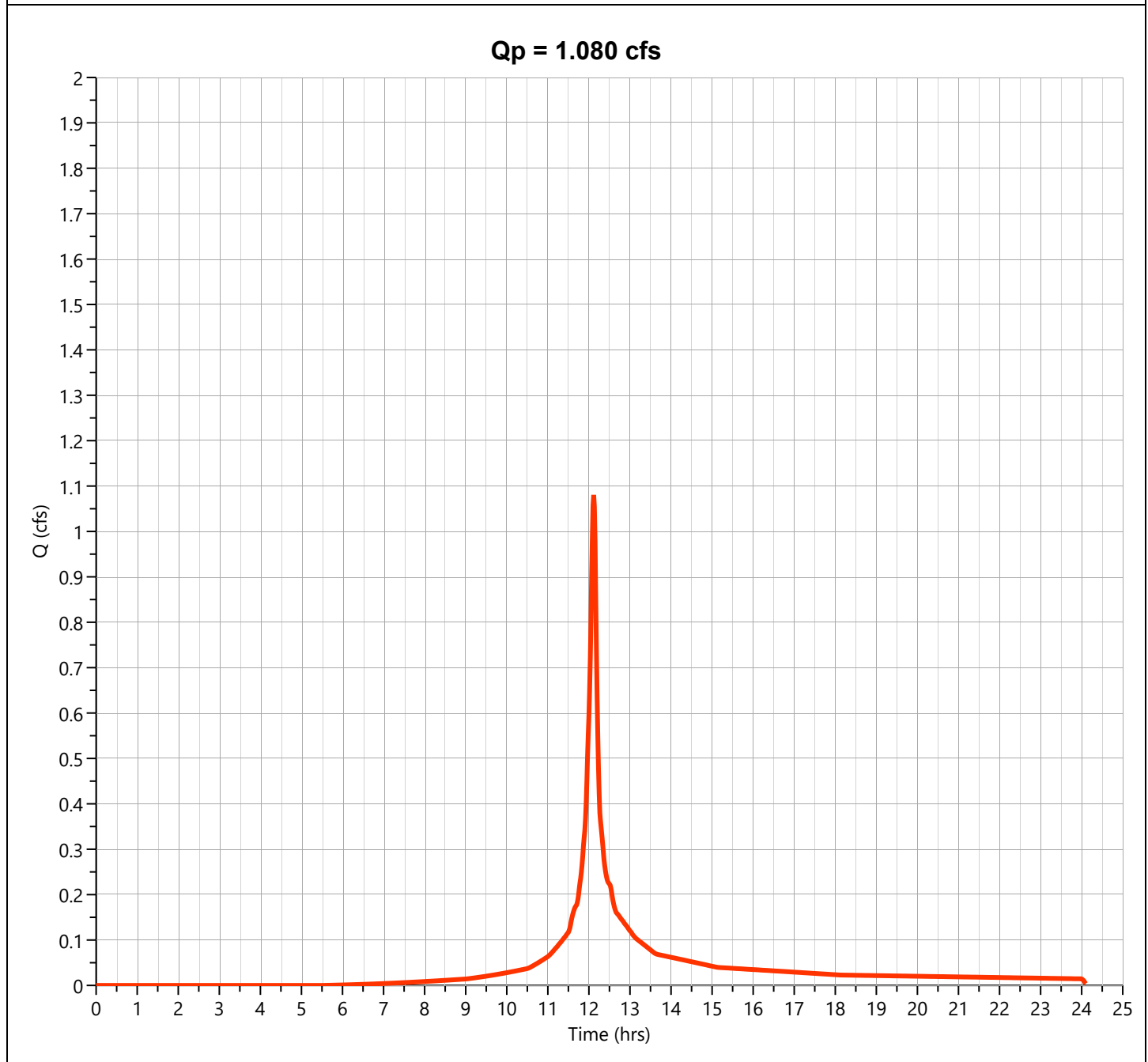
File: Current Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

## PR-1E Grass HSGC C

## Hyd. No. 22

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 1.080 cfs  |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.12 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 3,406 cuft |
| Drainage Area   | = 0.15 ac     | Curve Number       | = 74.00      |
| Tc Method       | = User        | Time of Conc. (Tc) | = 5.0 min    |
| Total Rainfall  | = 9.26 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

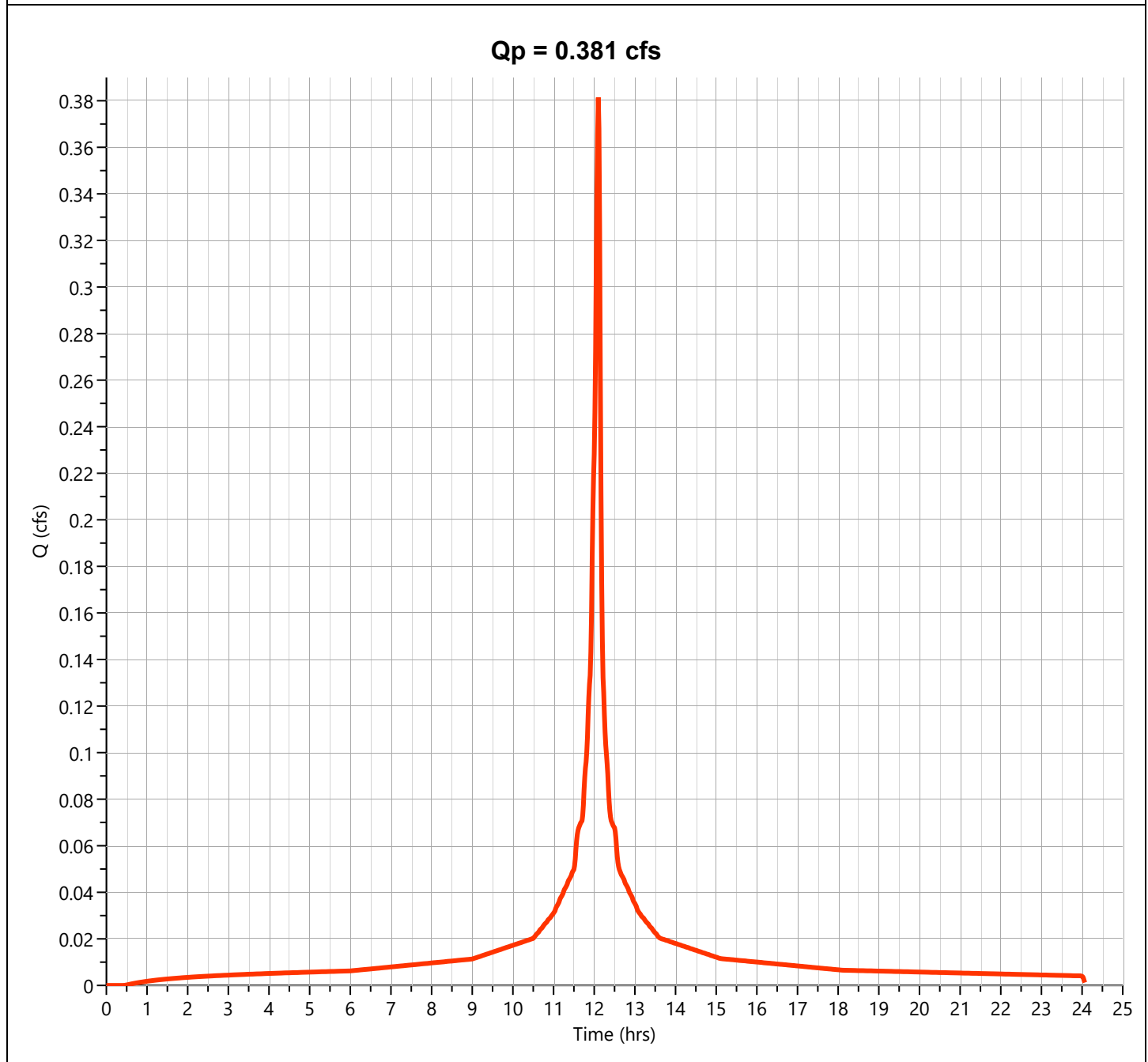
File: Current Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

## PR-1E Impervious

## Hyd. No. 23

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.381 cfs  |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 1,310 cuft |
| Drainage Area   | = 0.04 ac     | Curve Number       | = 98.00      |
| Tc Method       | = User        | Time of Conc. (Tc) | = 4.0 min    |
| Total Rainfall  | = 9.26 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

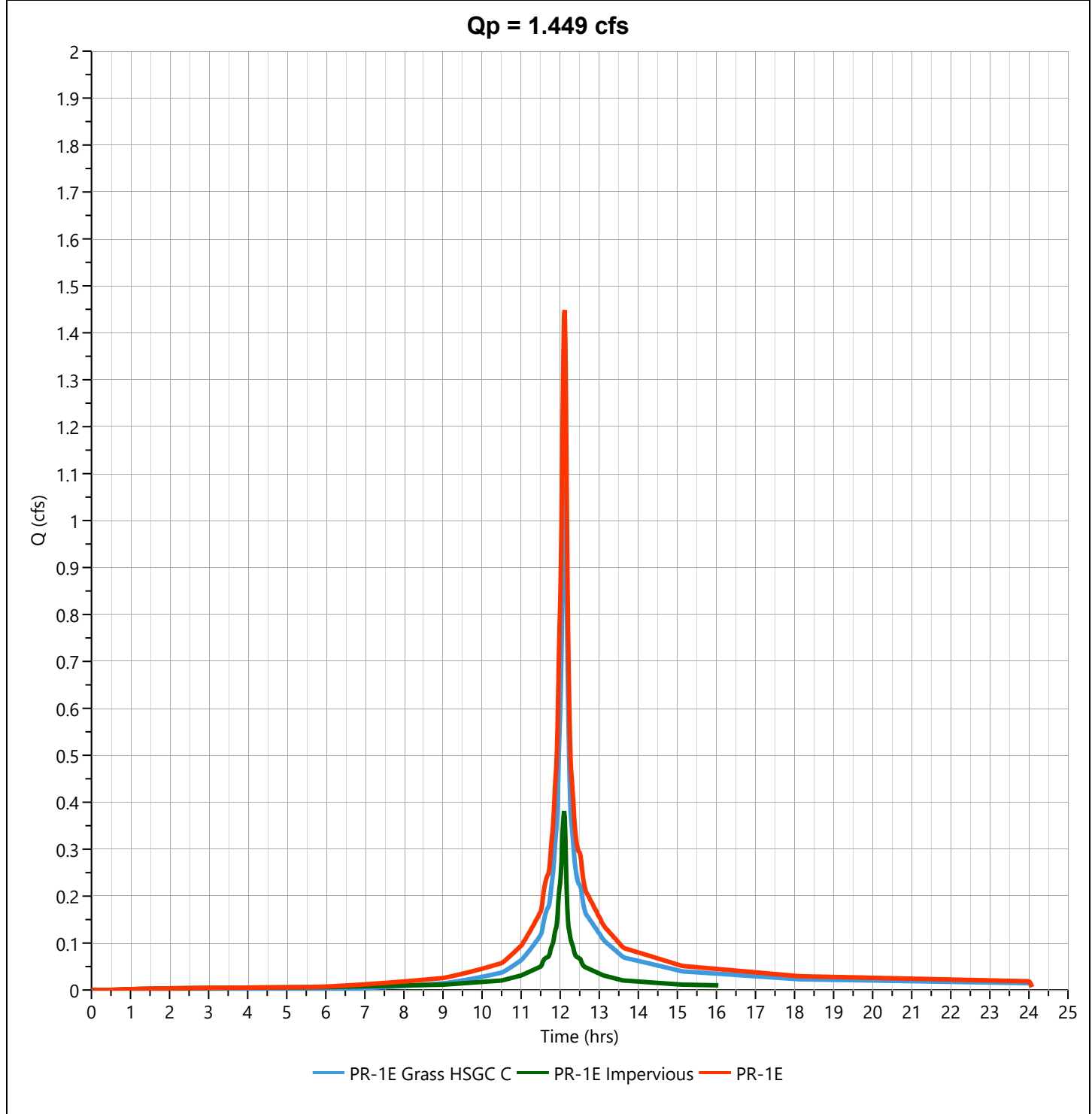
File: Current Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

## PR-1E

## Hyd. No. 24

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 1.449 cfs  |
| Storm Frequency    | = 100-yr   | Time to Peak        | = 12.12 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 4,716 cuft |
| Inflow Hydrographs | = 22, 23   | Total Contrib. Area | = 0.19 ac    |





## **COMBINED PROPOSED FLOW TO POA-1**

# Hydrograph Report

Hydrology Studio v 3.0.0.38

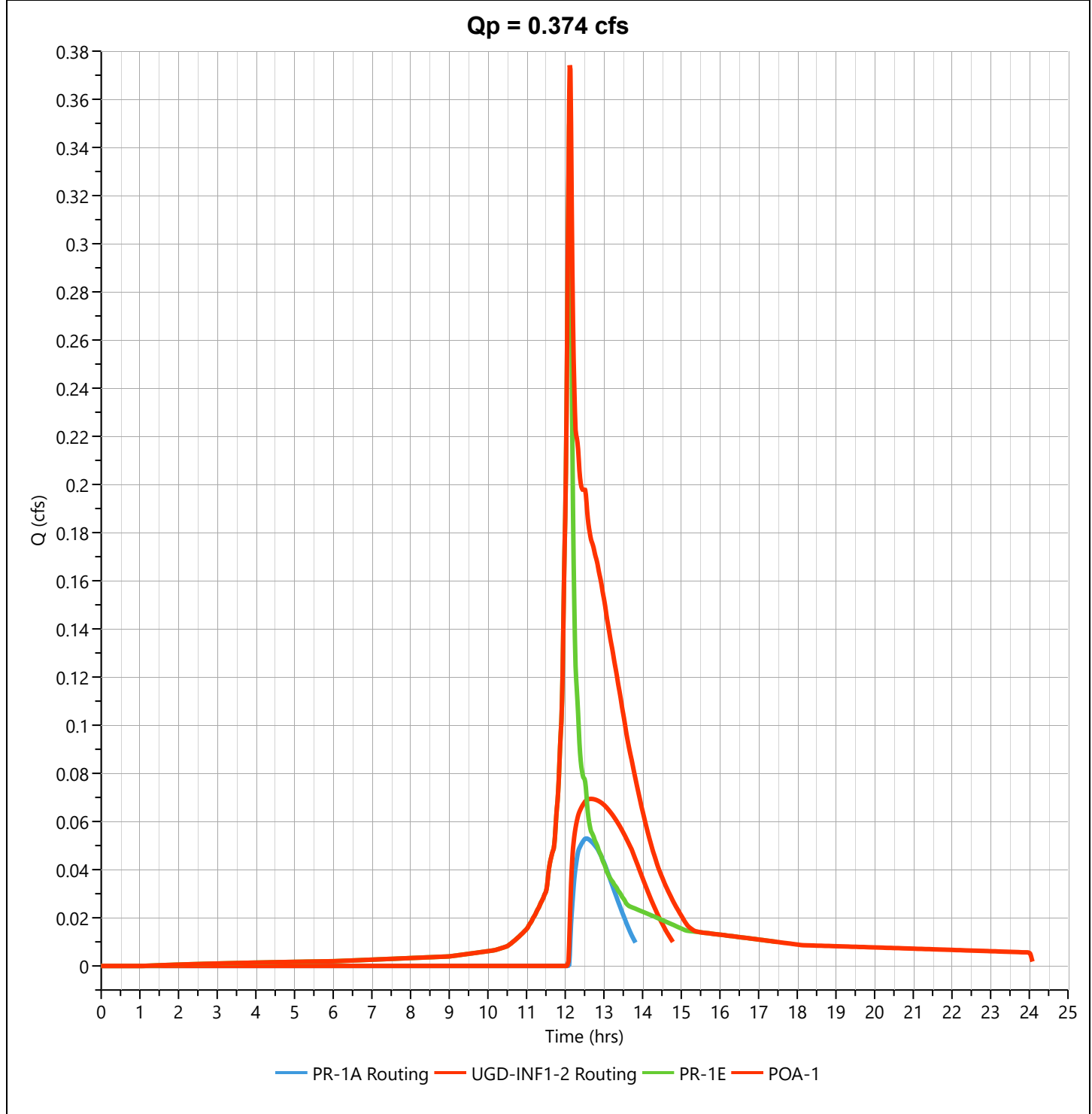
File: Current Beacon Church Proposed - POA-1 & POA-3.hys

07-01-2025

## POA-1

## Hyd. No. 26

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.374 cfs  |
| Storm Frequency    | = 2-yr     | Time to Peak        | = 12.12 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 1,845 cuft |
| Inflow Hydrographs |            | Total Contrib. Area | = 0.0 ac     |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

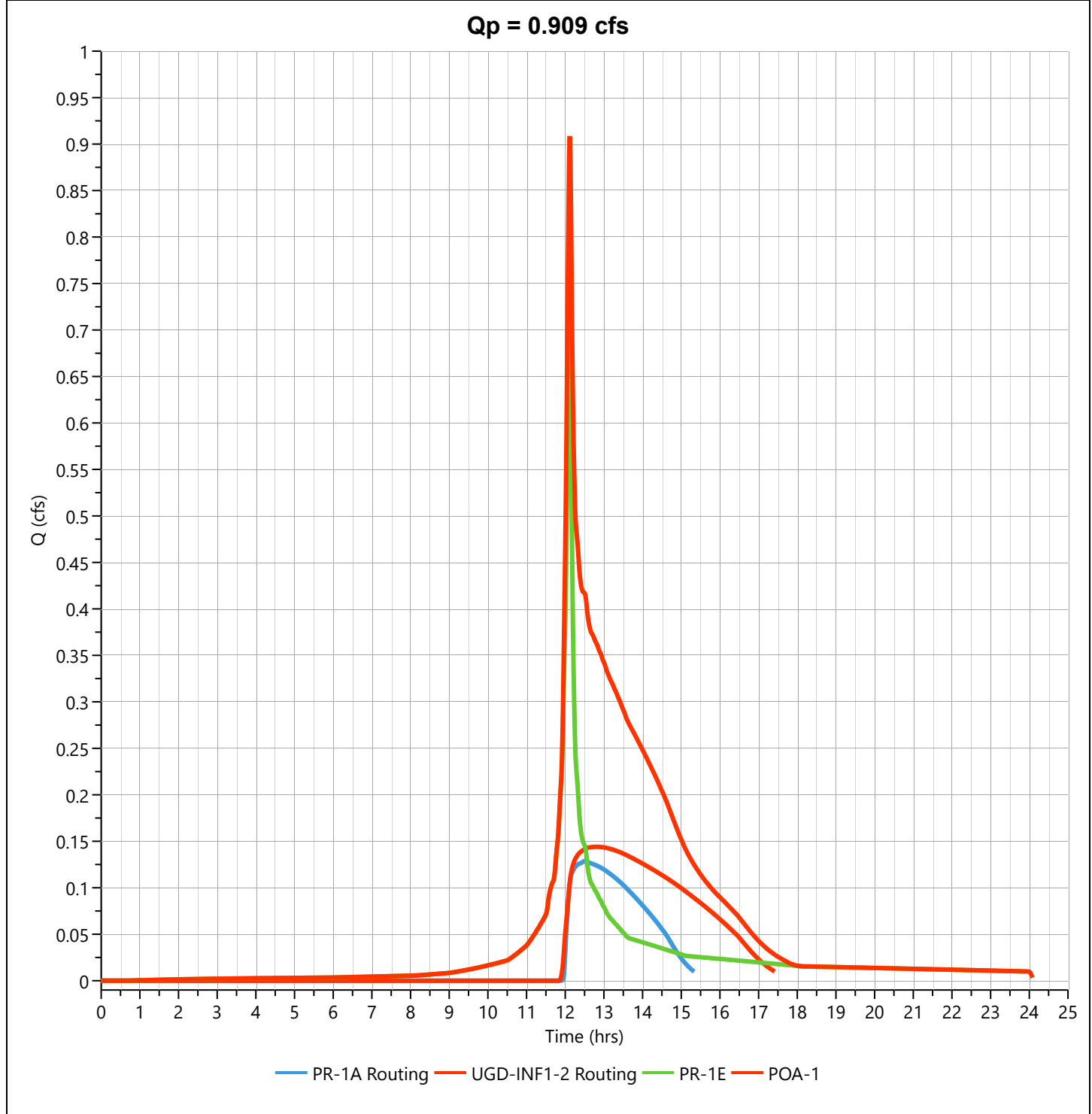
File: Current Beacon Church Proposed - POA-1 & POA-3.hys

07-01-2025

## POA-1

## Hyd. No. 26

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.909 cfs  |
| Storm Frequency    | = 10-yr    | Time to Peak        | = 12.12 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 5,139 cuft |
| Inflow Hydrographs |            | Total Contrib. Area | = 0.0 ac     |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

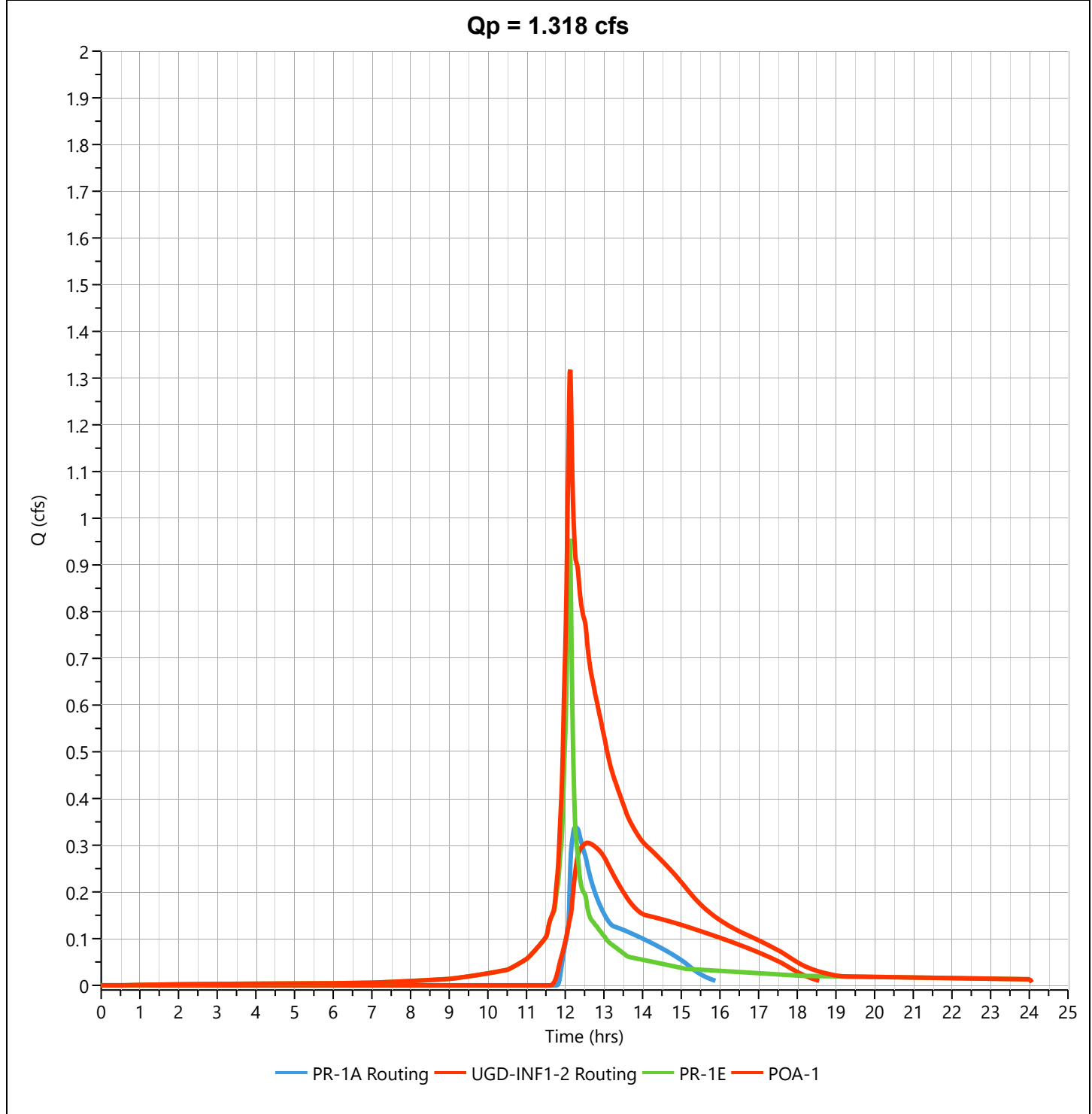
File: Current Beacon Church Proposed - POA-1 & POA-3.hys

07-01-2025

## POA-1

## Hyd. No. 26

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 1.318 cfs  |
| Storm Frequency    | = 25-yr    | Time to Peak        | = 12.13 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 7,959 cuft |
| Inflow Hydrographs |            | Total Contrib. Area | = 0.0 ac     |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

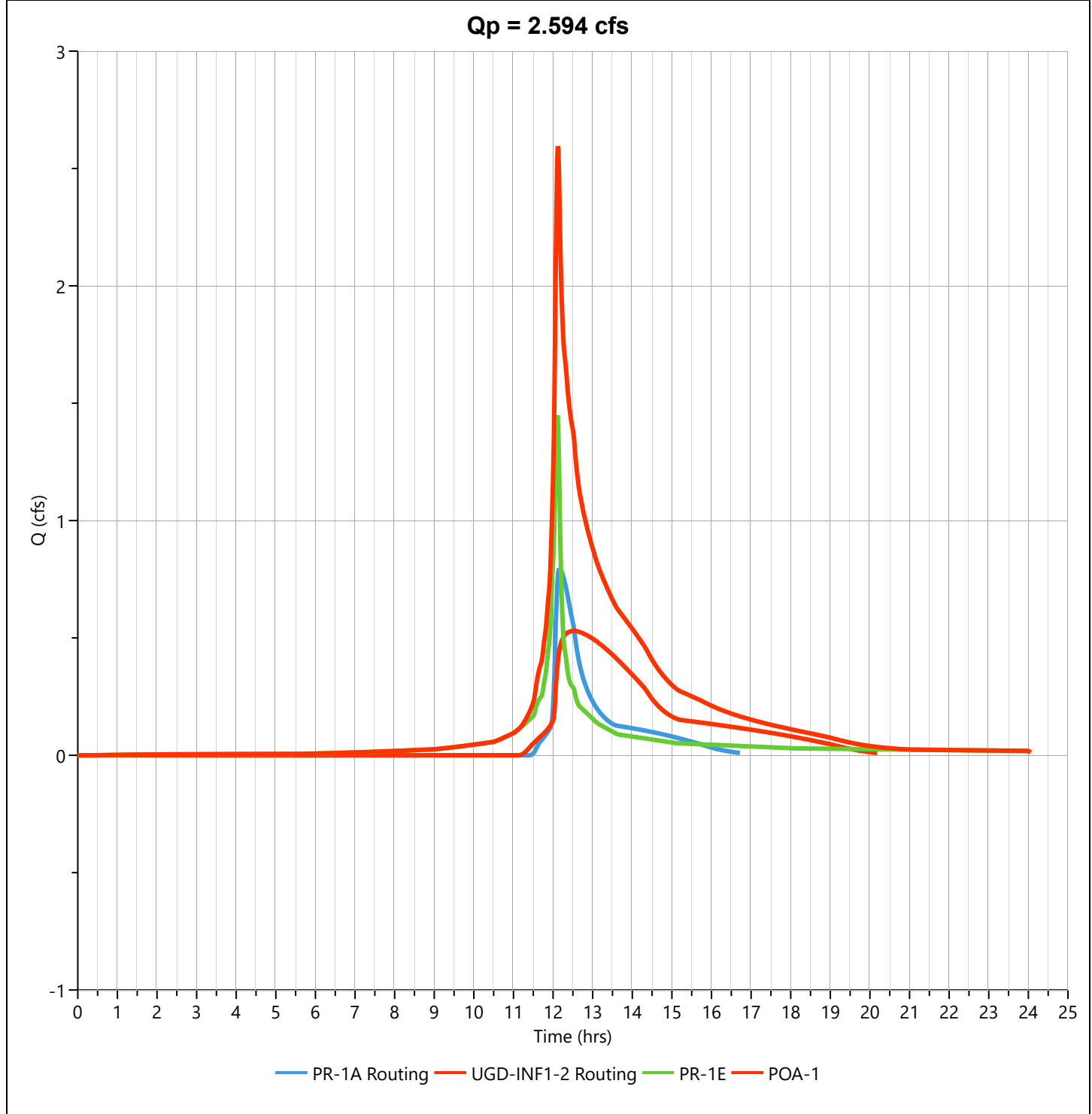
File: Current Beacon Church Proposed - POA-1 & POA-3.hys

07-01-2025

## POA-1

## Hyd. No. 26

|                    |            |                     |               |
|--------------------|------------|---------------------|---------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 2.594 cfs   |
| Storm Frequency    | = 100-yr   | Time to Peak        | = 12.12 hrs   |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 13,839 cuft |
| Inflow Hydrographs |            | Total Contrib. Area | = 0.0 ac      |



## **PR-2A WATERSHED**

Project: Beacon Unitarian Universalist Church

By: TEG

Date: 2/6/2024

Location: Summit, NJ

Checked By: MJV

Date Checked: 2/6/2024

Circle One: Present Developed

Current Proposed Watershed PR-2A - Impervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Design Flow Length, L<sub>des</sub> (Total L<sub>des</sub> < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. McCuen-Spiess Limit, L<sub>mcs</sub> (max. 100 ft)
7. Compute T<sub>t</sub>

$$L_{mcs} = (100 s^{0.5})/n$$

$$T_t = \frac{0.007 (n L_{des})^{0.8}}{P_2^{0.5} s^{0.4}}$$

|            |                        |   |  |
|------------|------------------------|---|--|
| Segment ID | 1                      |   |  |
|            | <b>Smooth Surfaces</b> |   |  |
|            | <b>0.011</b>           |   |  |
| ft         | <b>30</b>              |   |  |
| in         | <b>3.46</b>            |   |  |
| ft/ft      | <b>0.026</b>           |   |  |
| ft         | <b>100</b>             |   |  |
| hr         | <b>0.007</b>           | + |  |

Sheet Flow Sub-Total **0.007 hours**

**Shallow Concentrated Flow**

8. Surface Description
9. Flow Length, L
10. Watercourse Slope, s
11. Average Velocity, V (NEH table 15-3)
12. Compute T<sub>t</sub>

$$T_t = \frac{L}{3600 V}$$

|            |  |   |  |
|------------|--|---|--|
| Segment ID |  |   |  |
| ft         |  |   |  |
| ft/ft      |  |   |  |
| ft/s       |  |   |  |
| hr         |  | + |  |

Shallow Conc. Flow Sub-Total **0.000 hours**

**Channel Flow**

13. Flow Length, L
14. Cross Sectional flow area, a
15. Wetted Perimeter, P<sub>w</sub>
16. Hydraulic Radius, r
17. Channel Slope, s
18. Manning's Roughness Coeff., n
19. Velocity, V
20. Compute T<sub>t</sub>

$$r = a / P_w$$

$$V = (1.49 r^{2/3} s^{1/2}) / n$$

$$T_t = \frac{L}{3600 V}$$

|                 |  |   |  |
|-----------------|--|---|--|
| Segment ID      |  |   |  |
| ft              |  |   |  |
| ft <sup>2</sup> |  |   |  |
| ft              |  |   |  |
| ft              |  |   |  |
| ft/ft           |  |   |  |
| ft/s            |  |   |  |
| hr              |  | + |  |

Channel Flow Sub-Total **0.000 hours**

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>

(Add Sub-Total T<sub>t</sub> from prior steps)

|   |                    |
|---|--------------------|
| Total T <sub>c</sub> (hours) =                        | <b>0.007 hours</b> |
| Software Limitations Require Minimum T <sub>c</sub> = | <b>2 minutes</b>   |

Project: Beacon Unitarian Universalist Church

By: TEG

Date: 2/6/2024

Location: Summit, NJ

Checked By: MJV

Date Checked: 2/6/2024

Circle One: Present Developed

Current Proposed Watershed PR-2A - Pervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Design Flow Length, L<sub>des</sub> (Total L<sub>des</sub> < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. McCuen-Spiess Limit, L<sub>mcs</sub> (max. 100 ft)
7. Compute T<sub>t</sub>

$$L_{mcs} = (100 s^{0.5})/n$$

$$T_t = \frac{0.007 (n L_{des})^{0.8}}{P_2^{0.5} s^{0.4}}$$

| Segment ID | 1                    | 2                      |   |
|------------|----------------------|------------------------|---|
|            | <b>Dense Grasses</b> | <b>Smooth Surfaces</b> |   |
|            | <b>0.24</b>          | <b>0.011</b>           |   |
| ft         | <b>19</b>            | <b>31</b>              |   |
| in         | <b>3.46</b>          | <b>3.46</b>            |   |
| ft/ft      | <b>0.022</b>         | <b>0.028</b>           |   |
| ft         | <b>61</b>            | <b>100</b>             |   |
| hr         | <b>0.060</b>         | <b>0.007</b>           | + |

Sheet Flow Sub-Total **0.067 hours**

**Shallow Concentrated Flow**

8. Surface Description
9. Flow Length, L
10. Watercourse Slope, s
11. Average Velocity, V (NEH table 15-3)
12. Compute T<sub>t</sub>

$$T_t = \frac{L}{3600 V}$$

| Segment ID |  |  |   |
|------------|--|--|---|
| ft         |  |  |   |
| ft/ft      |  |  |   |
| ft/s       |  |  |   |
| hr         |  |  | + |

Shallow Conc. Flow Sub-Total **0.000 hours**

**Channel Flow**

13. Flow Length, L
14. Cross Sectional flow area, a
15. Wetted Perimeter, P<sub>w</sub>
16. Hydraulic Radius, r
17. Channel Slope, s
18. Manning's Roughness Coeff., n
19. Velocity, V
20. Compute T<sub>t</sub>

$$r = a / P_w$$

$$V = (1.49 r^{2/3} s^{1/2}) / n$$

$$T_t = \frac{L}{3600 V}$$

| Segment ID      |  |  |   |
|-----------------|--|--|---|
| ft              |  |  |   |
| ft <sup>2</sup> |  |  |   |
| ft              |  |  |   |
| ft              |  |  |   |
| ft/ft           |  |  |   |
| ft/s            |  |  |   |
| hr              |  |  | + |

Channel Flow Sub-Total **0.000 hours**

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>

(Add Sub-Total T<sub>t</sub> from prior steps)

|                      |                    |
|----------------------|--------------------|
| Total Tc (hours) =   | <b>0.067 hours</b> |
| Total Tc (minutes) = | <b>4 minutes</b>   |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

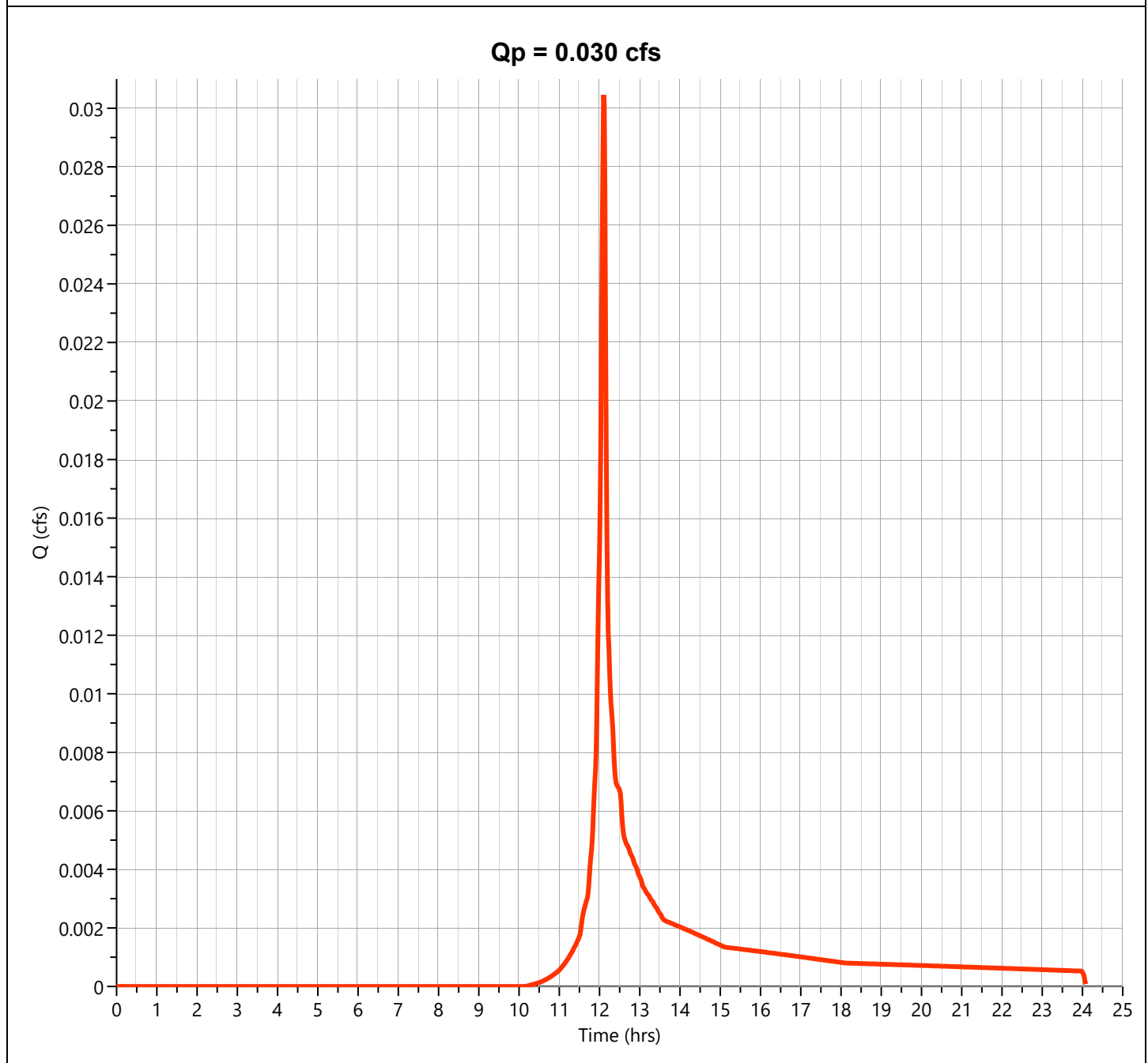
File: Current Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2A Grass HSGC C

## Hyd. No. 1

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.030 cfs |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.10 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 88.0 cuft |
| Drainage Area   | = 0.02 ac     | Curve Number       | = 74.00     |
| Tc Method       | = User        | Time of Conc. (Tc) | = 4.0 min   |
| Total Rainfall  | = 3.46 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

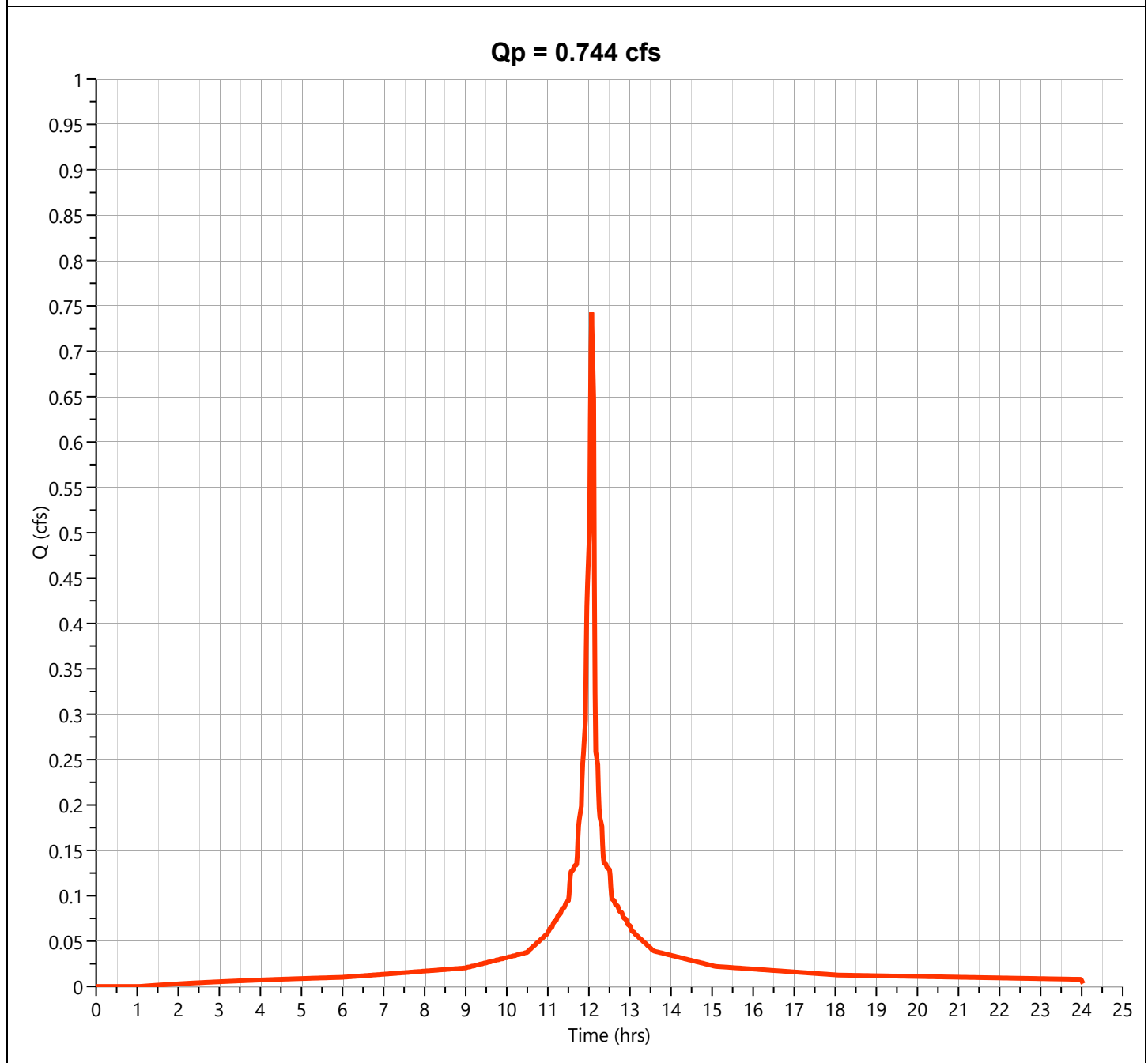
File: Current Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2A Impervious

## Hyd. No. 2

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.744 cfs  |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 2,416 cuft |
| Drainage Area   | = 0.22 ac     | Curve Number       | = 98.00      |
| Tc Method       | = User        | Time of Conc. (Tc) | = 2.0 min    |
| Total Rainfall  | = 3.46 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

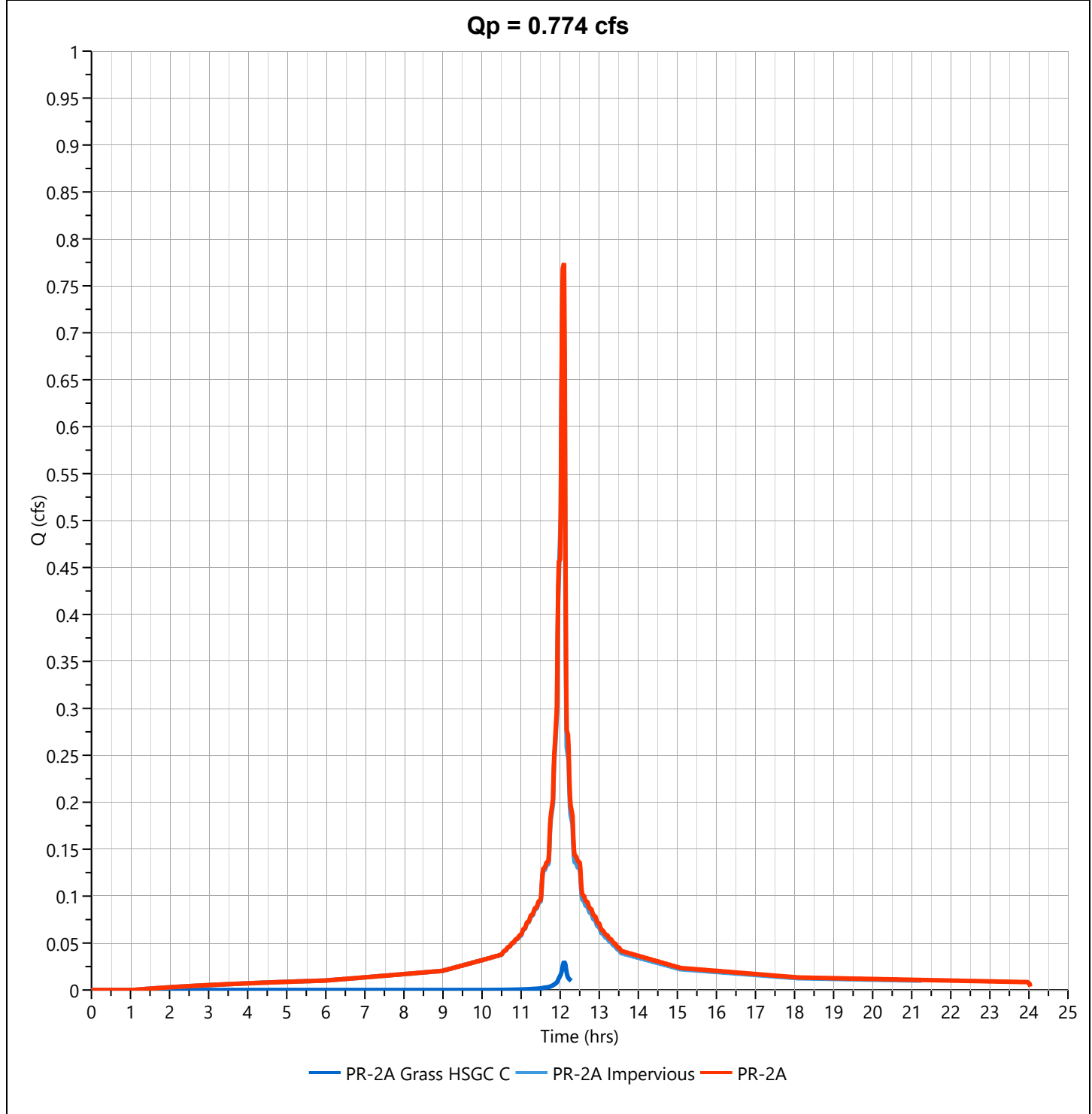
File: Current Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2A

## Hyd. No. 3

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.774 cfs  |
| Storm Frequency    | = 2-yr     | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 2,504 cuft |
| Inflow Hydrographs | = 1, 2     | Total Contrib. Area | = 0.24 ac    |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

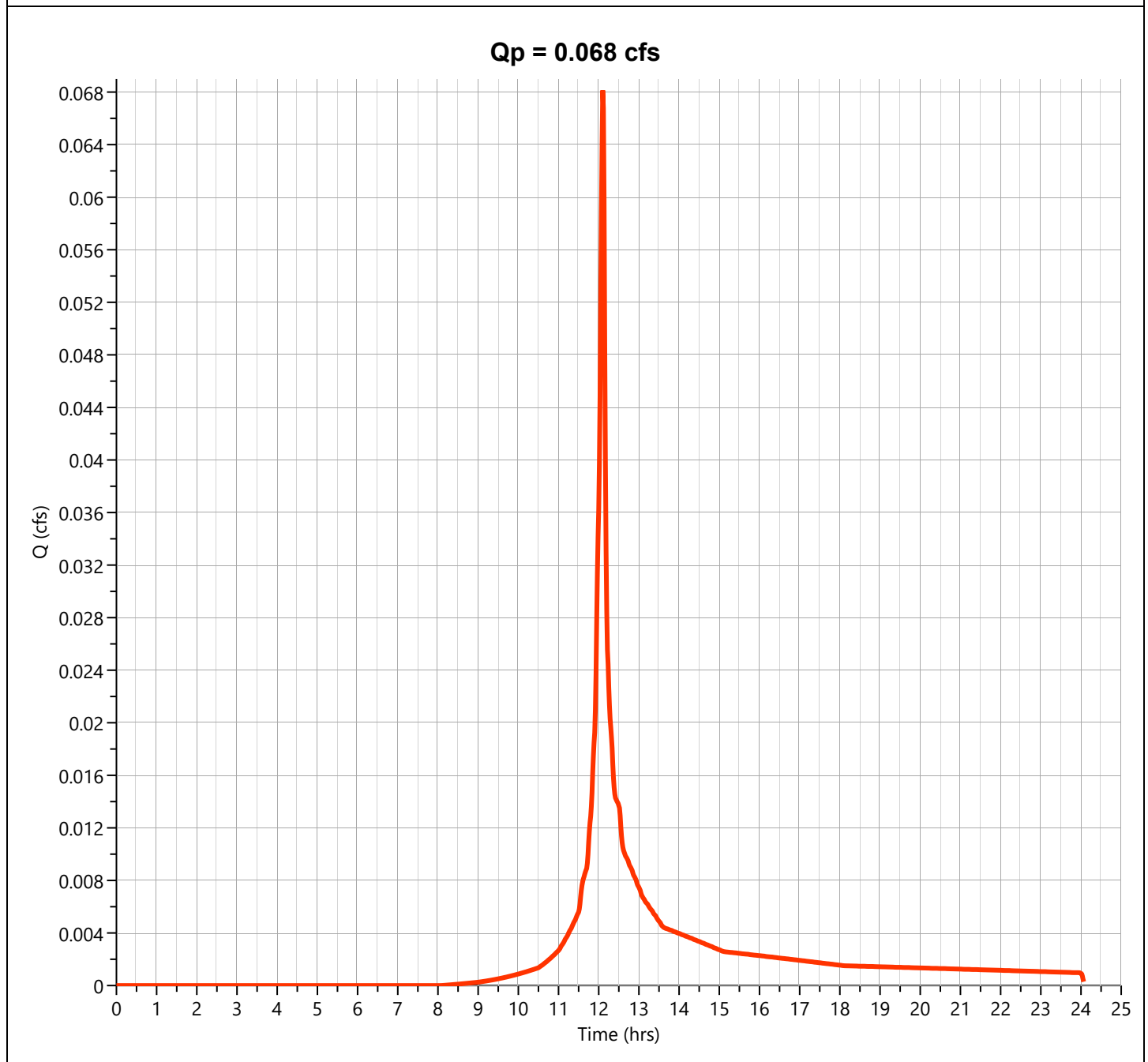
File: Current Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2A Grass HSGC C

Hyd. No. 1

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.068 cfs |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.10 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 194 cuft  |
| Drainage Area   | = 0.02 ac     | Curve Number       | = 74.00     |
| Tc Method       | = User        | Time of Conc. (Tc) | = 4.0 min   |
| Total Rainfall  | = 5.38 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

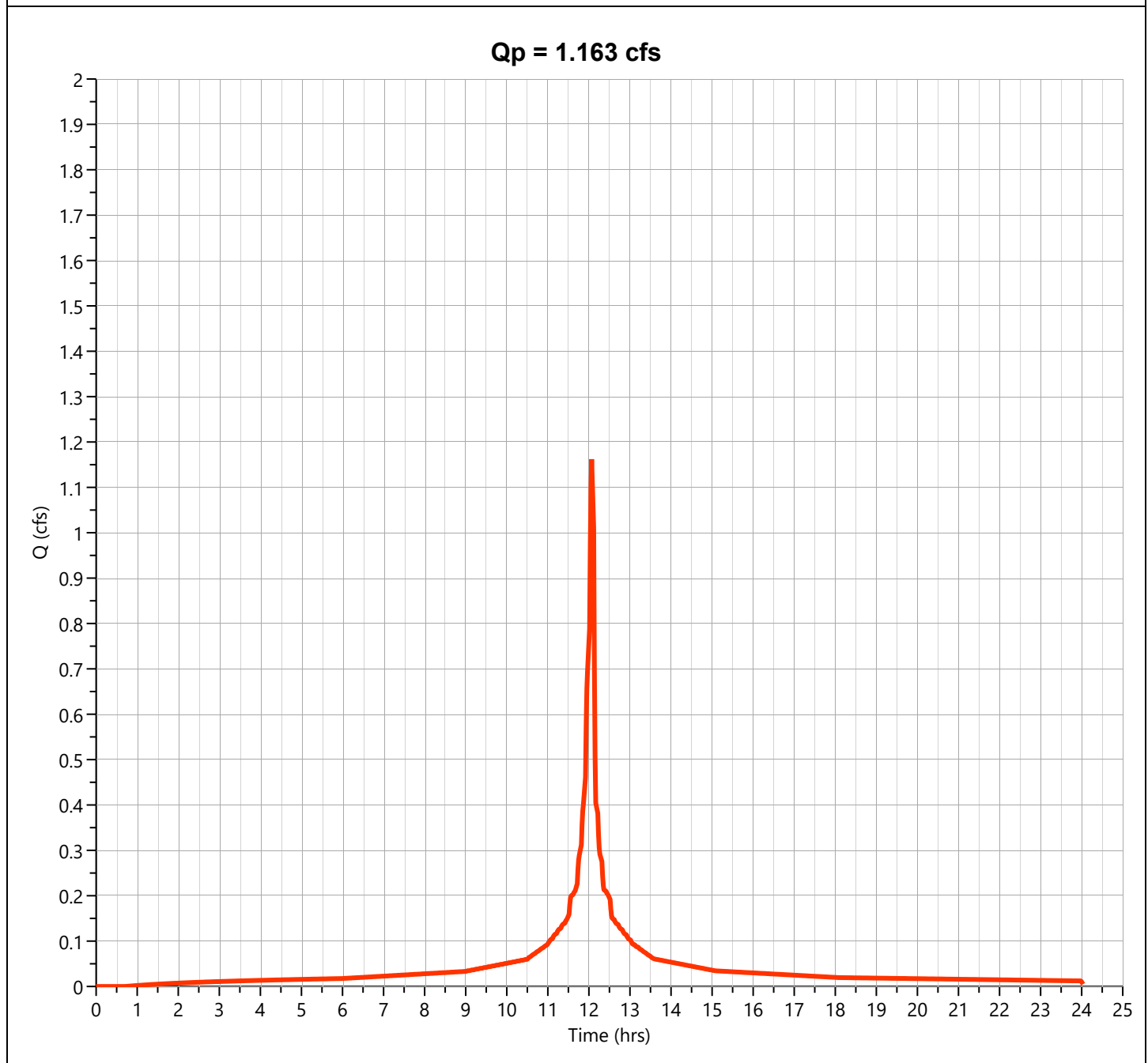
File: Current Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2A Impervious

## Hyd. No. 2

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 1.163 cfs  |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 3,850 cuft |
| Drainage Area   | = 0.22 ac     | Curve Number       | = 98.00      |
| Tc Method       | = User        | Time of Conc. (Tc) | = 2.0 min    |
| Total Rainfall  | = 5.38 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

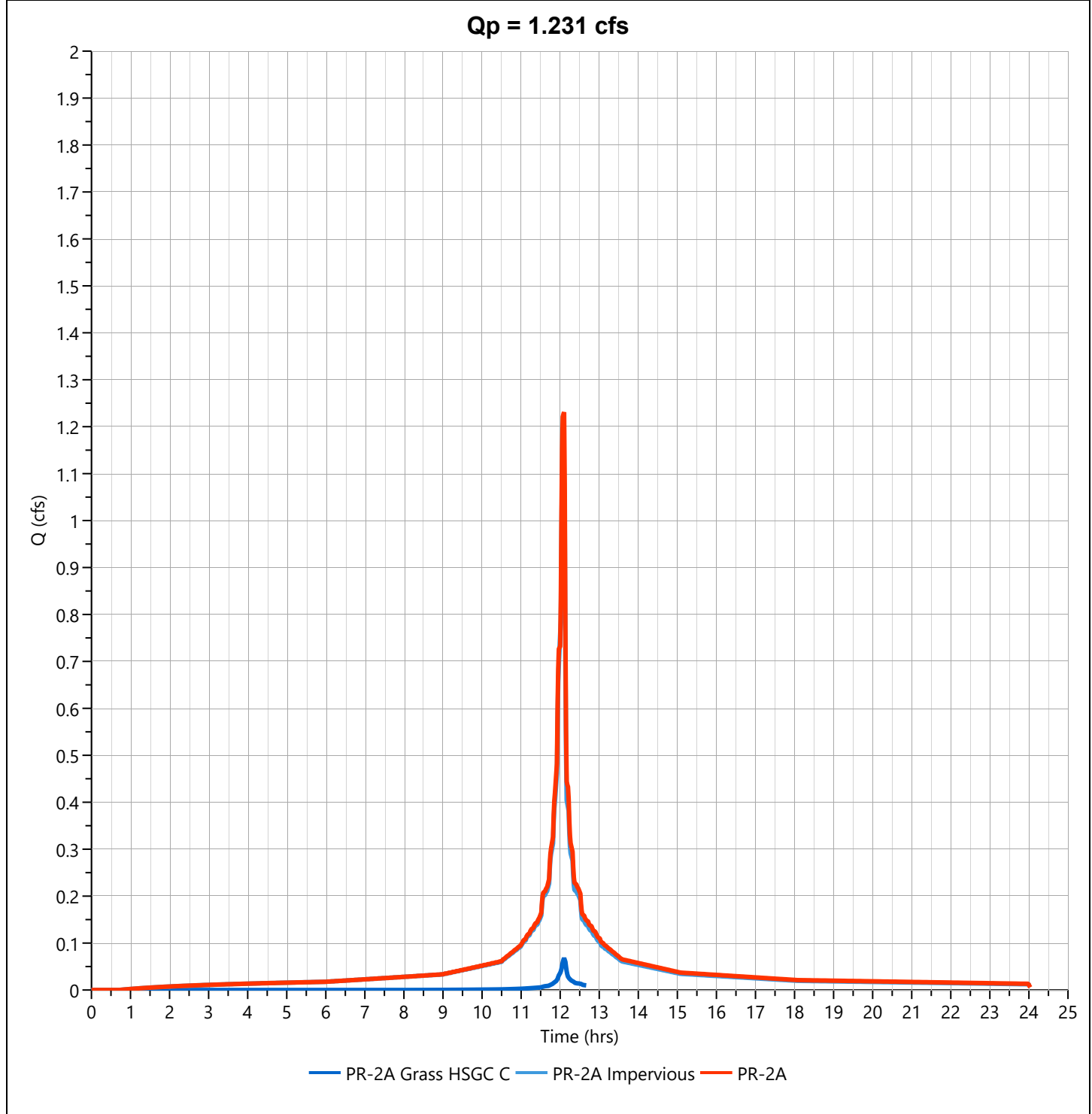
File: Current Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2A

## Hyd. No. 3

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 1.231 cfs  |
| Storm Frequency    | = 10-yr    | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 4,044 cuft |
| Inflow Hydrographs | = 1, 2     | Total Contrib. Area | = 0.24 ac    |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

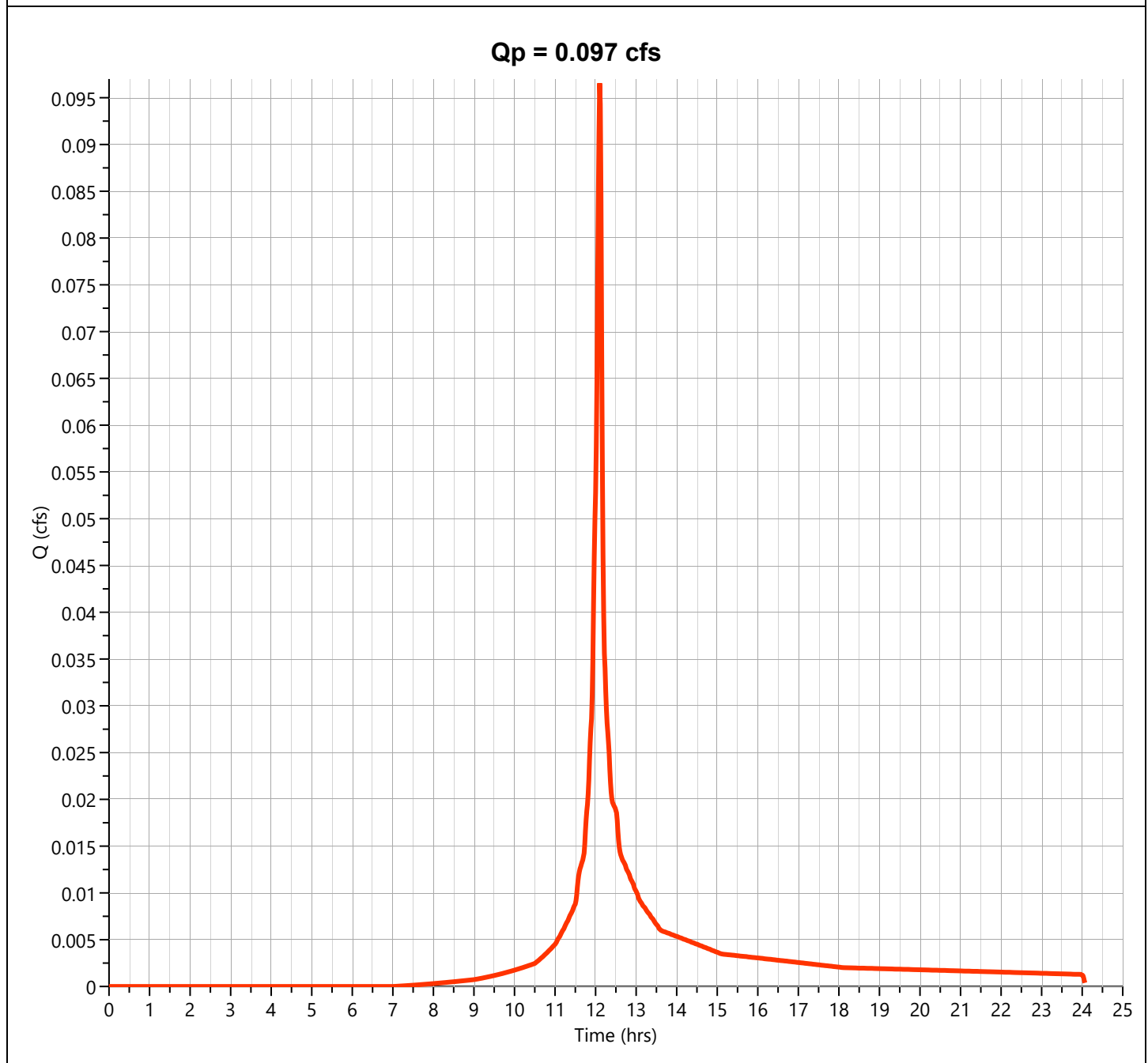
File: Current Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2A Grass HSGC C

Hyd. No. 1

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.097 cfs |
| Storm Frequency | = 25-yr       | Time to Peak       | = 12.10 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 276 cuft  |
| Drainage Area   | = 0.02 ac     | Curve Number       | = 74.00     |
| Tc Method       | = User        | Time of Conc. (Tc) | = 4.0 min   |
| Total Rainfall  | = 6.73 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

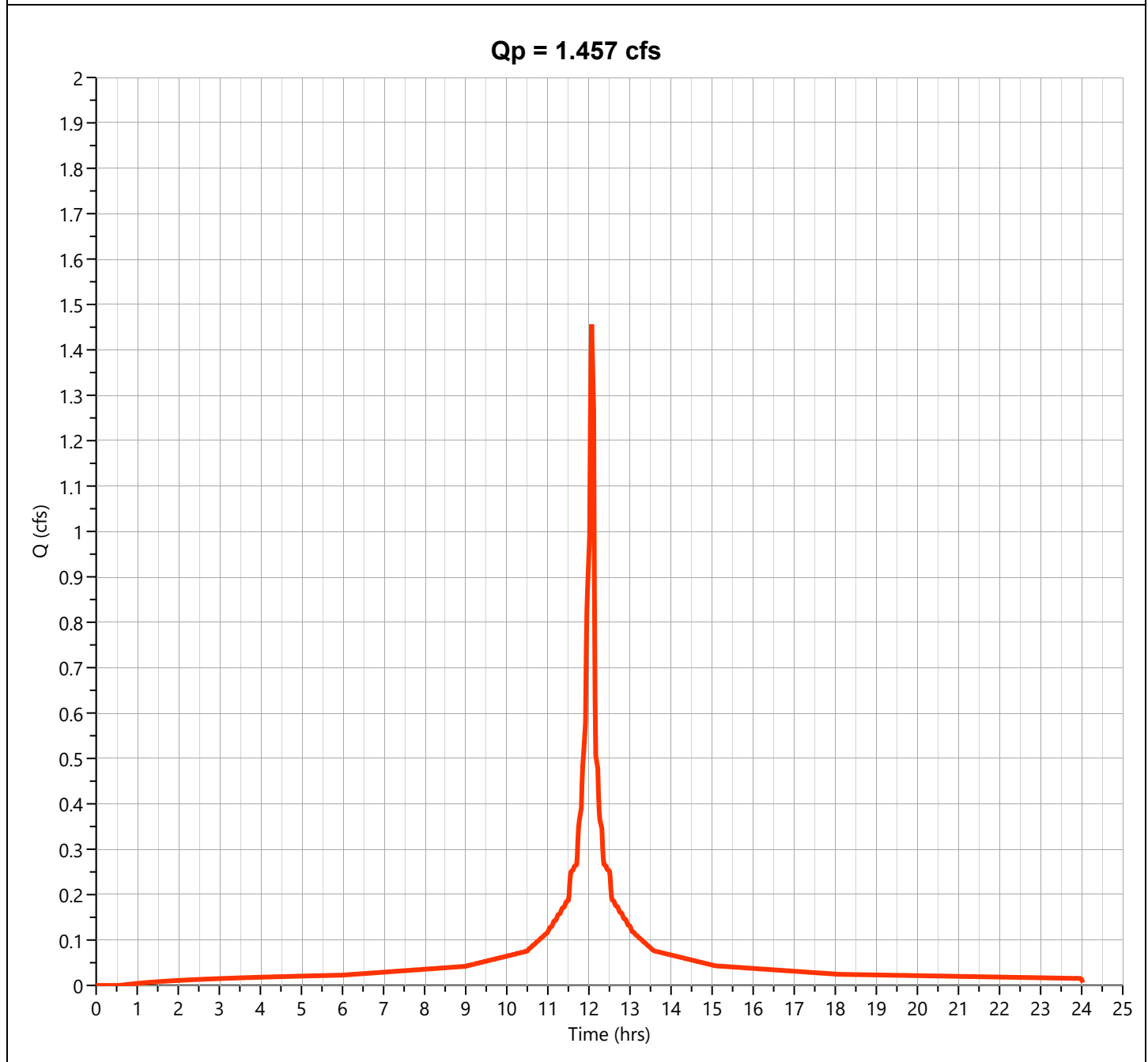
File: Current Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2A Impervious

## Hyd. No. 2

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 1.457 cfs  |
| Storm Frequency | = 25-yr       | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 4,860 cuft |
| Drainage Area   | = 0.22 ac     | Curve Number       | = 98.00      |
| Tc Method       | = User        | Time of Conc. (Tc) | = 2.0 min    |
| Total Rainfall  | = 6.73 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |





# Hydrograph Report

Hydrology Studio v 3.0.0.38

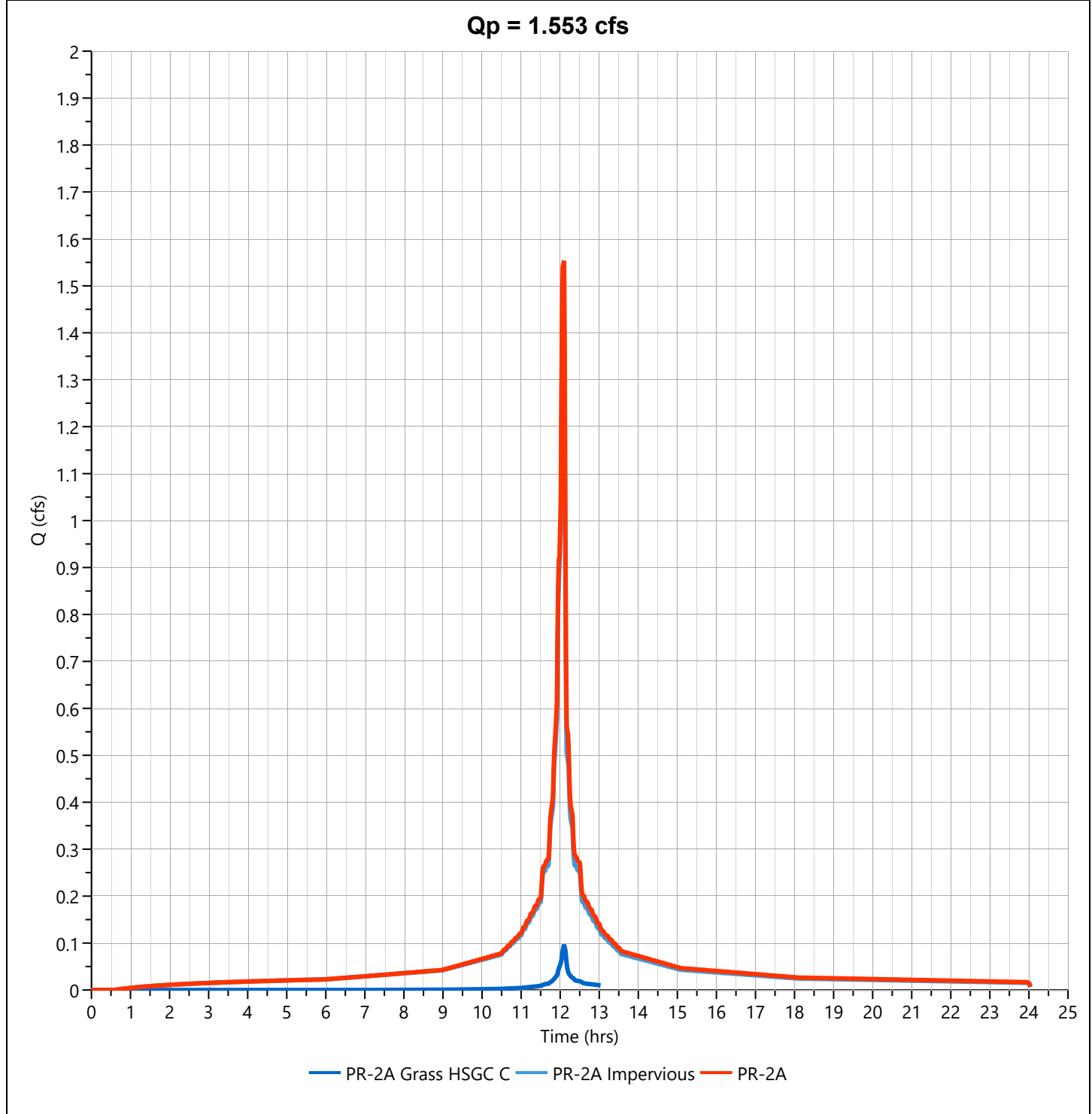
File: Current Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2A

## Hyd. No. 3

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 1.553 cfs  |
| Storm Frequency    | = 25-yr    | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 5,136 cuft |
| Inflow Hydrographs | = 1, 2     | Total Contrib. Area | = 0.24 ac    |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

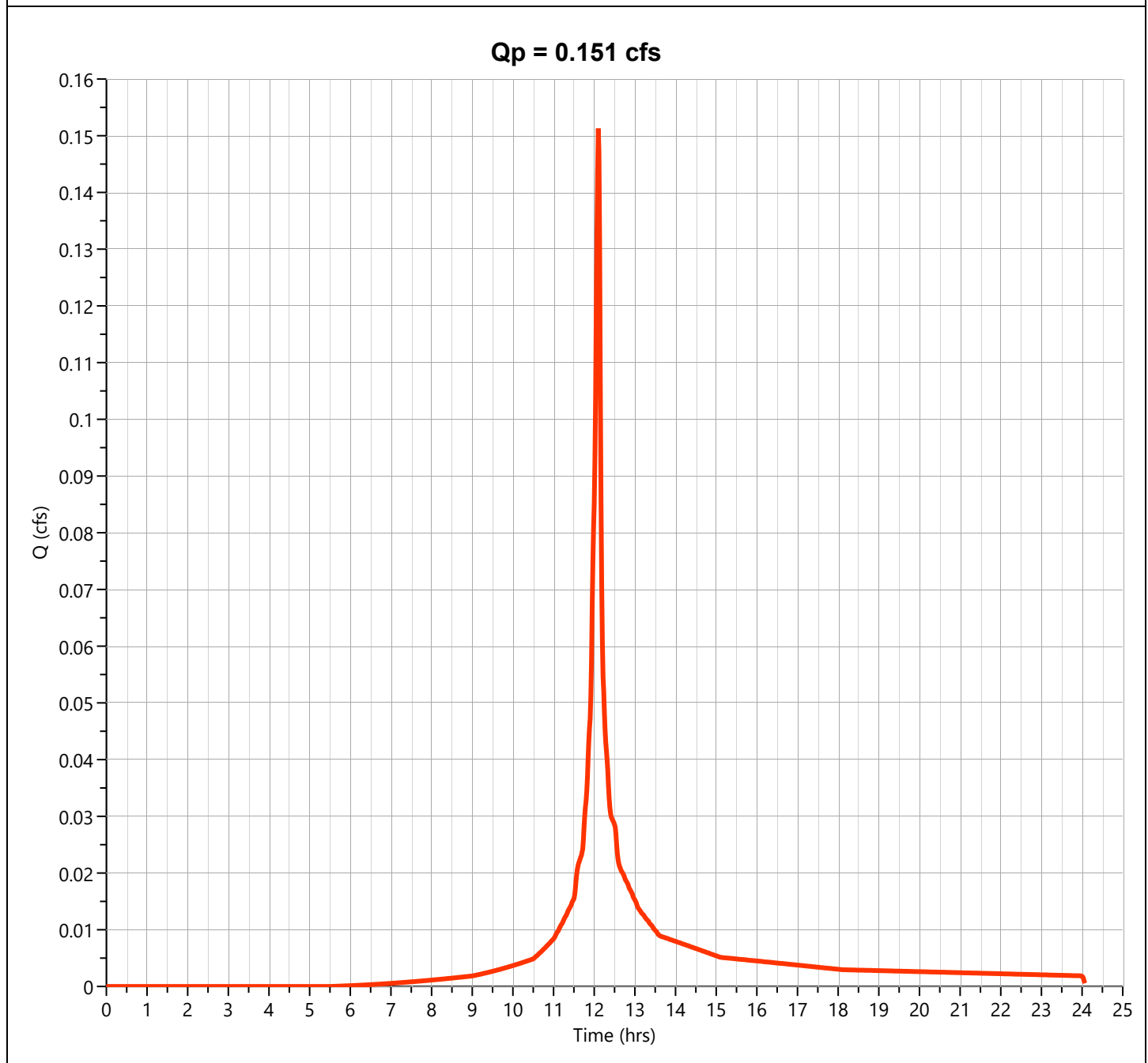
File: Current Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2A Grass HSGC C

Hyd. No. 1

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.151 cfs |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.10 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 440 cuft  |
| Drainage Area   | = 0.02 ac     | Curve Number       | = 74.00     |
| Tc Method       | = User        | Time of Conc. (Tc) | = 4.0 min   |
| Total Rainfall  | = 9.26 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

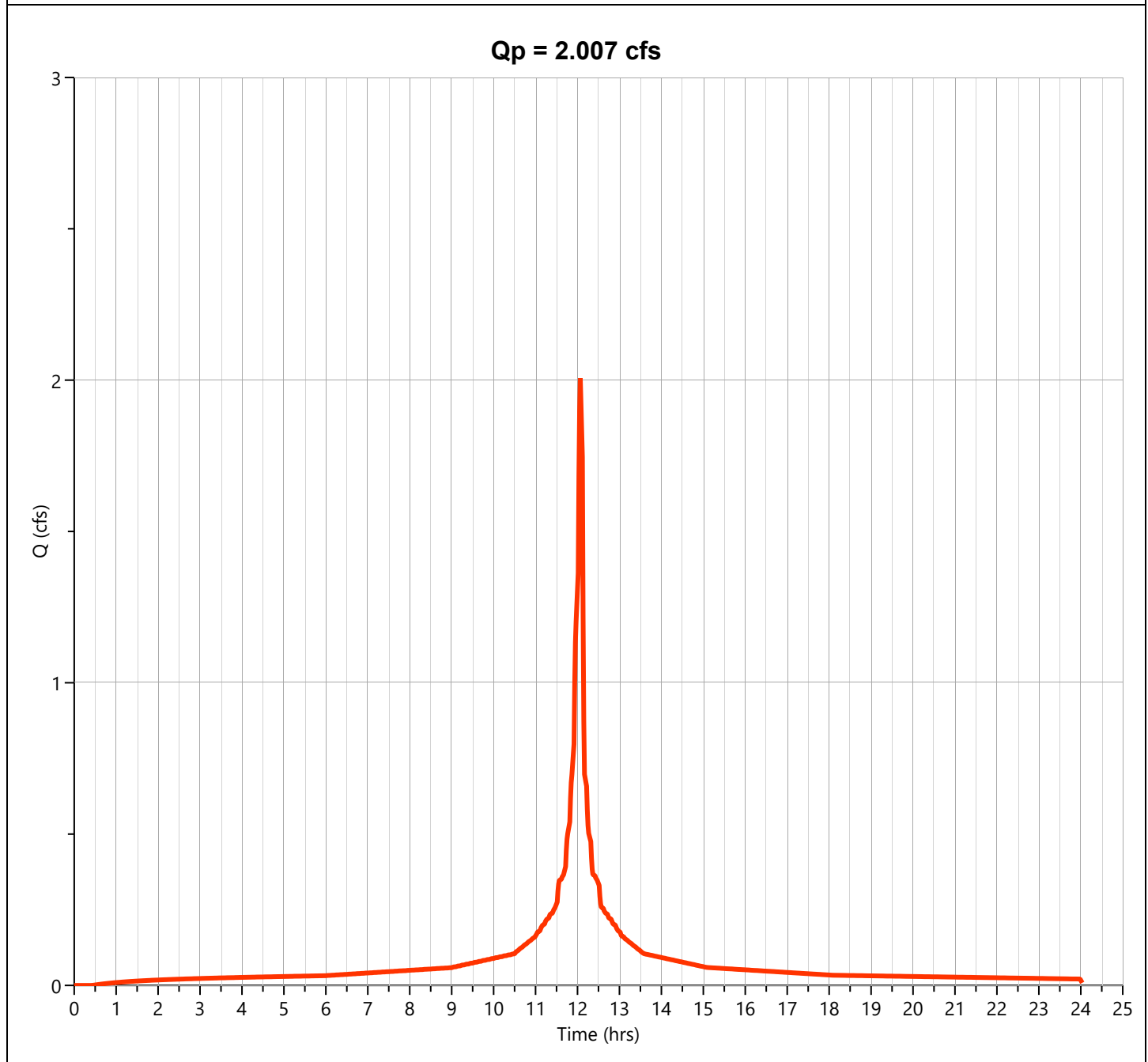
File: Current Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2A Impervious

## Hyd. No. 2

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 2.007 cfs  |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 6,753 cuft |
| Drainage Area   | = 0.22 ac     | Curve Number       | = 98.00      |
| Tc Method       | = User        | Time of Conc. (Tc) | = 2.0 min    |
| Total Rainfall  | = 9.26 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

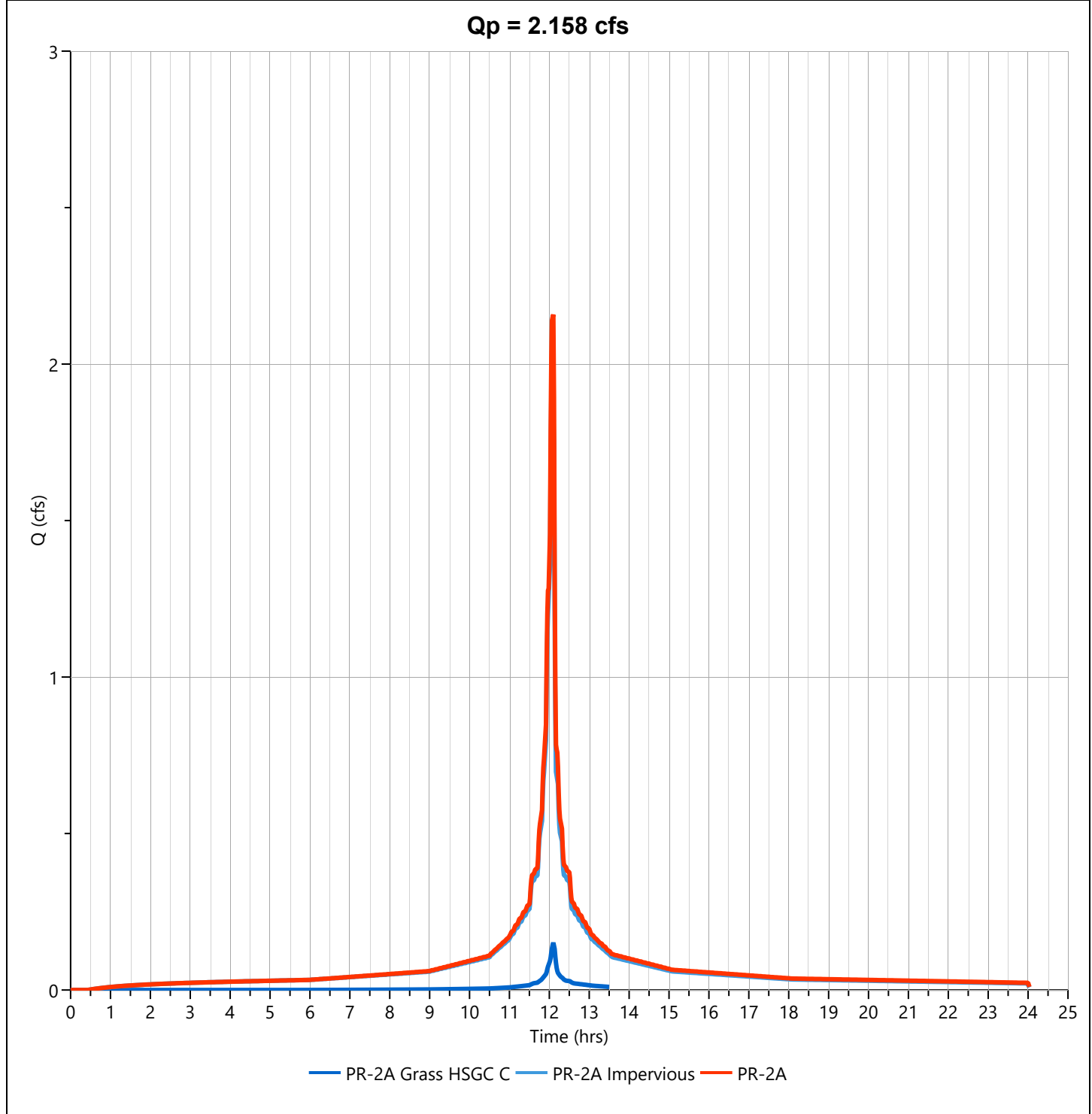
File: Current Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2A

## Hyd. No. 3

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 2.158 cfs  |
| Storm Frequency    | = 100-yr   | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 7,193 cuft |
| Inflow Hydrographs | = 1, 2     | Total Contrib. Area | = 0.24 ac    |



## **PR-2B WATERSHED**

Project: Beacon Unitarian Universalist Church

By: TEG

Date: 2/6/2024

Location: Summit, NJ

Checked By: MJV

Date Checked: 2/6/2024

Circle One: Present Developed

Current Proposed Watershed PR-2B - Impervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Design Flow Length, L<sub>des</sub> (Total L<sub>des</sub> < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. McCuen-Spiess Limit, L<sub>mcs</sub> (max. 100 ft)
7. Compute T<sub>t</sub>

$$T_t = \frac{0.007 (n L_{des})^{0.8}}{P_2^{0.5} s^{0.4}}$$

$$L_{mcs} = (100 s^{0.5})/n$$

|            |                        |   |  |
|------------|------------------------|---|--|
| Segment ID | <b>1</b>               |   |  |
|            | <b>Smooth Surfaces</b> |   |  |
|            | <b>0.011</b>           |   |  |
| ft         | <b>44</b>              |   |  |
| in         | <b>3.46</b>            |   |  |
| ft/ft      | <b>0.010</b>           |   |  |
| ft         | <b>100</b>             |   |  |
| hr         | <b>0.013</b>           | + |  |

Sheet Flow Sub-Total **0.013 hours**

**Shallow Concentrated Flow**

8. Surface Description
9. Flow Length, L
10. Watercourse Slope, s
11. Average Velocity, V (NEH table 15-3)
12. Compute T<sub>t</sub>

$$T_t = \frac{L}{3600 V}$$

|            |                          |   |  |
|------------|--------------------------|---|--|
| Segment ID | <b>2</b>                 |   |  |
|            | <b>Grassed Waterways</b> |   |  |
| ft         | <b>53</b>                |   |  |
| ft/ft      | <b>0.010</b>             |   |  |
| ft/s       | <b>1.61</b>              |   |  |
| hr         | <b>0.009</b>             | + |  |

Shallow Conc. Flow Sub-Total **0.009 hours**

**Channel Flow**

13. Flow Length, L
14. Cross Sectional flow area, a
15. Wetted Perimeter, P<sub>w</sub>
16. Hydraulic Radius, r
17. Channel Slope, s
18. Manning's Roughness Coeff., n
19. Velocity, V
20. Compute T<sub>t</sub>

$$r = a / P_w$$

$$V = (1.49 r^{2/3} s^{1/2}) / n$$

$$T_t = \frac{L}{3600 V}$$

|                 |              |   |  |
|-----------------|--------------|---|--|
| Segment ID      | <b>3</b>     |   |  |
| ft              | <b>40</b>    |   |  |
| ft <sup>2</sup> | <b>0.61</b>  |   |  |
| ft              | <b>2.00</b>  |   |  |
| ft              | <b>0.31</b>  |   |  |
| ft/ft           | <b>0.005</b> |   |  |
|                 | <b>0.012</b> |   |  |
| ft/s            | <b>3.98</b>  |   |  |
| hr              | <b>0.003</b> | + |  |

Channel Flow Sub-Total **0.003 hours**

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>

(Add Sub-Total T<sub>t</sub> from prior steps)

|   |                    |
|---|--------------------|
| Total T <sub>c</sub> (hours) =                        | <b>0.025 hours</b> |
| Software Limitations Require Minimum T <sub>c</sub> = | <b>2 minutes</b>   |

Project: Beacon Unitarian Universalist Church

By: TEG

Date: 2/6/2024

Location: Summit, NJ

Checked By: MJV

Date Checked: 2/6/2024

Circle One: Present Developed

Current Proposed Watershed PR-2B - Pervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Design Flow Length, L<sub>des</sub> (Total L<sub>des</sub> < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. McCuen-Spiess Limit, L<sub>mcs</sub> (max. 100 ft)  $L_{mcs} = (100 s^{0.5})/n$
7. Compute T<sub>t</sub>  $T_t = \frac{0.007 (nL_{des})^{0.8}}{P_2^{0.5} s^{0.4}}$

| Segment ID | 1                    | 2                      | 3                    |
|------------|----------------------|------------------------|----------------------|
|            | <b>Dense Grasses</b> | <b>Smooth Surfaces</b> | <b>Dense Grasses</b> |
|            | <b>0.24</b>          | <b>0.011</b>           | <b>0.24</b>          |
| ft         | <b>14</b>            | <b>17</b>              | <b>23</b>            |
| in         | <b>3.46</b>          | <b>3.46</b>            | <b>3.46</b>          |
| ft/ft      | <b>0.019</b>         | <b>0.011</b>           | <b>0.010</b>         |
| ft         | <b>58</b>            | <b>100</b>             | <b>41</b>            |
| hr         | <b>0.048</b>         | <b>0.006</b>           | <b>0.095</b>         |

Sheet Flow Sub-Total **0.149 hours**

**Shallow Concentrated Flow**

8. Surface Description
9. Flow Length, L
10. Watercourse Slope, s
11. Average Velocity, V (NEH table 15-3)
12. Compute T<sub>t</sub>  $T_t = \frac{L}{3600 V}$

| Segment ID | 4                        |  |  |
|------------|--------------------------|--|--|
|            | <b>Grassed Waterways</b> |  |  |
| ft         | <b>30</b>                |  |  |
| ft/ft      | <b>0.010</b>             |  |  |
| ft/s       | <b>1.64</b>              |  |  |
| hr         | <b>0.005</b>             |  |  |

Shallow Conc. Flow Sub-Total **0.005 hours**

**Channel Flow**

13. Flow Length, L
14. Cross Sectional flow area, a
15. Wetted Perimeter, P<sub>w</sub>
16. Hydraulic Radius, r  $r = a / P_w$
17. Channel Slope, s
18. Manning's Roughness Coeff., n
19. Velocity, V  $V = (1.49 r^{2/3} s^{1/2}) / n$
20. Compute T<sub>t</sub>  $T_t = \frac{L}{3600 V}$

| Segment ID      | 5            |  |  |
|-----------------|--------------|--|--|
| ft              | <b>40</b>    |  |  |
| ft <sup>2</sup> | <b>0.61</b>  |  |  |
| ft              | <b>2.00</b>  |  |  |
| ft              | <b>0.31</b>  |  |  |
| ft/ft           | <b>0.005</b> |  |  |
|                 | <b>0.012</b> |  |  |
| ft/s            | <b>3.98</b>  |  |  |
| hr              | <b>0.003</b> |  |  |

Channel Flow Sub-Total **0.003 hours**

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>

(Add Sub-Total T<sub>t</sub> from prior steps)

|                      |                    |
|----------------------|--------------------|
| Total Tc (hours) =   | <b>0.157 hours</b> |
| Total Tc (minutes) = | <b>9 minutes</b>   |

# Hydrograph Report

Project Name:

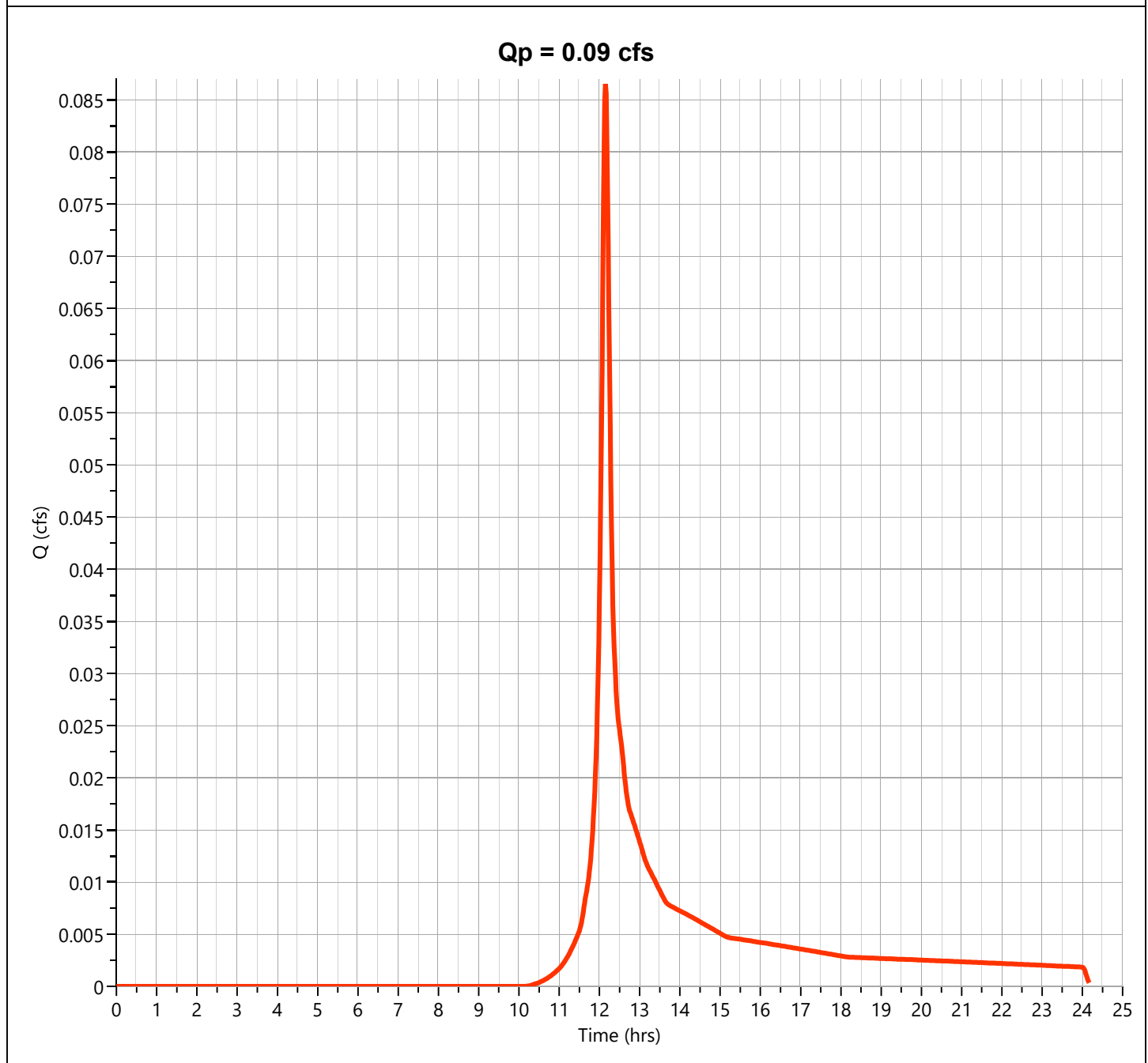
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2B Grass HSGC C

## Hyd. No. 6

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.087 cfs |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.15 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 308 cuft  |
| Drainage Area   | = 0.07 ac     | Curve Number       | = 74        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 9.0 min   |
| Total Rainfall  | = 3.46 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |





# Hydrograph Report

Project Name:

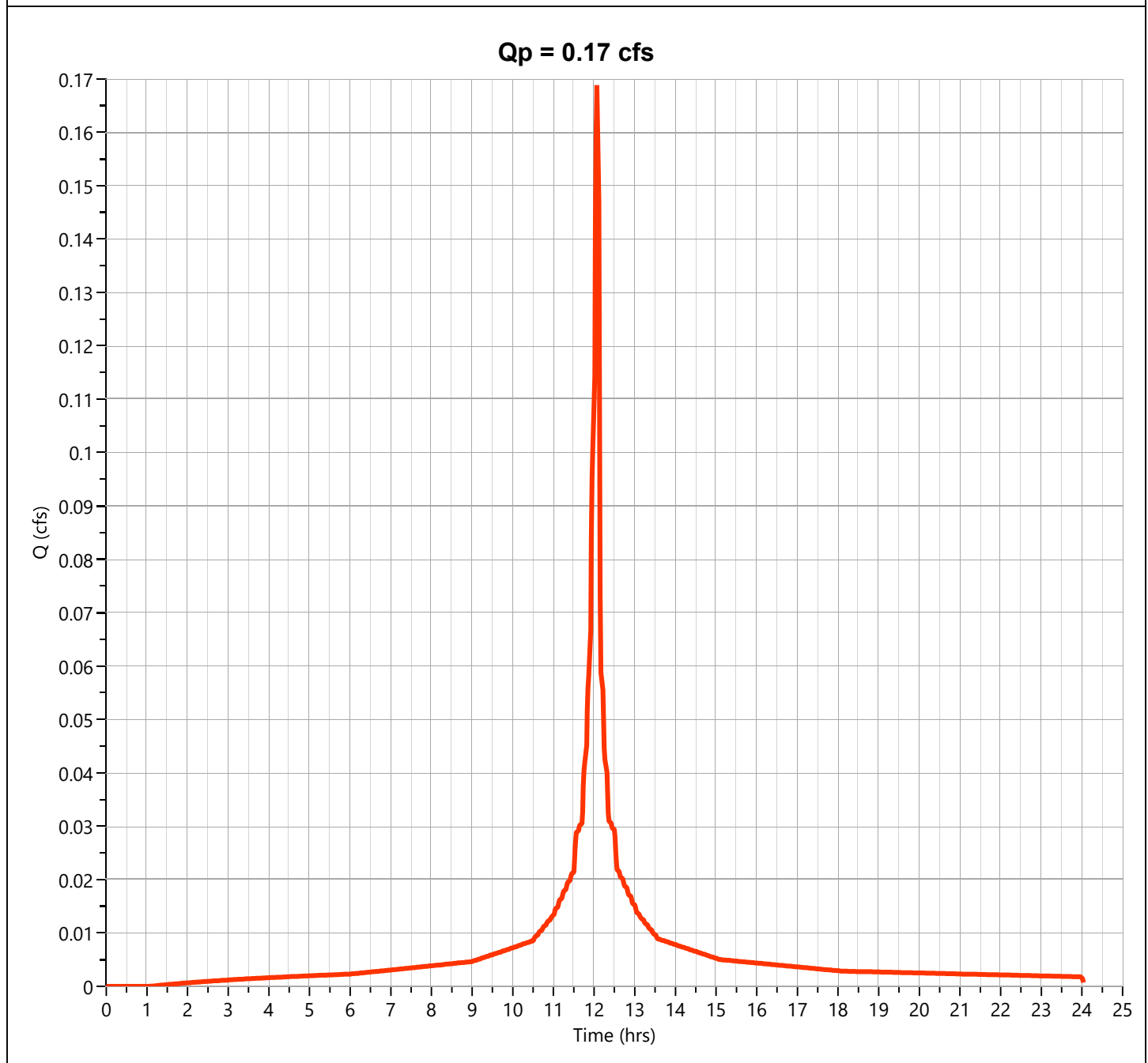
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2B Impervious

## Hyd. No. 7

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.169 cfs |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.10 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 549 cuft  |
| Drainage Area   | = 0.05 ac     | Curve Number       | = 98        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 2.0 min   |
| Total Rainfall  | = 3.46 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

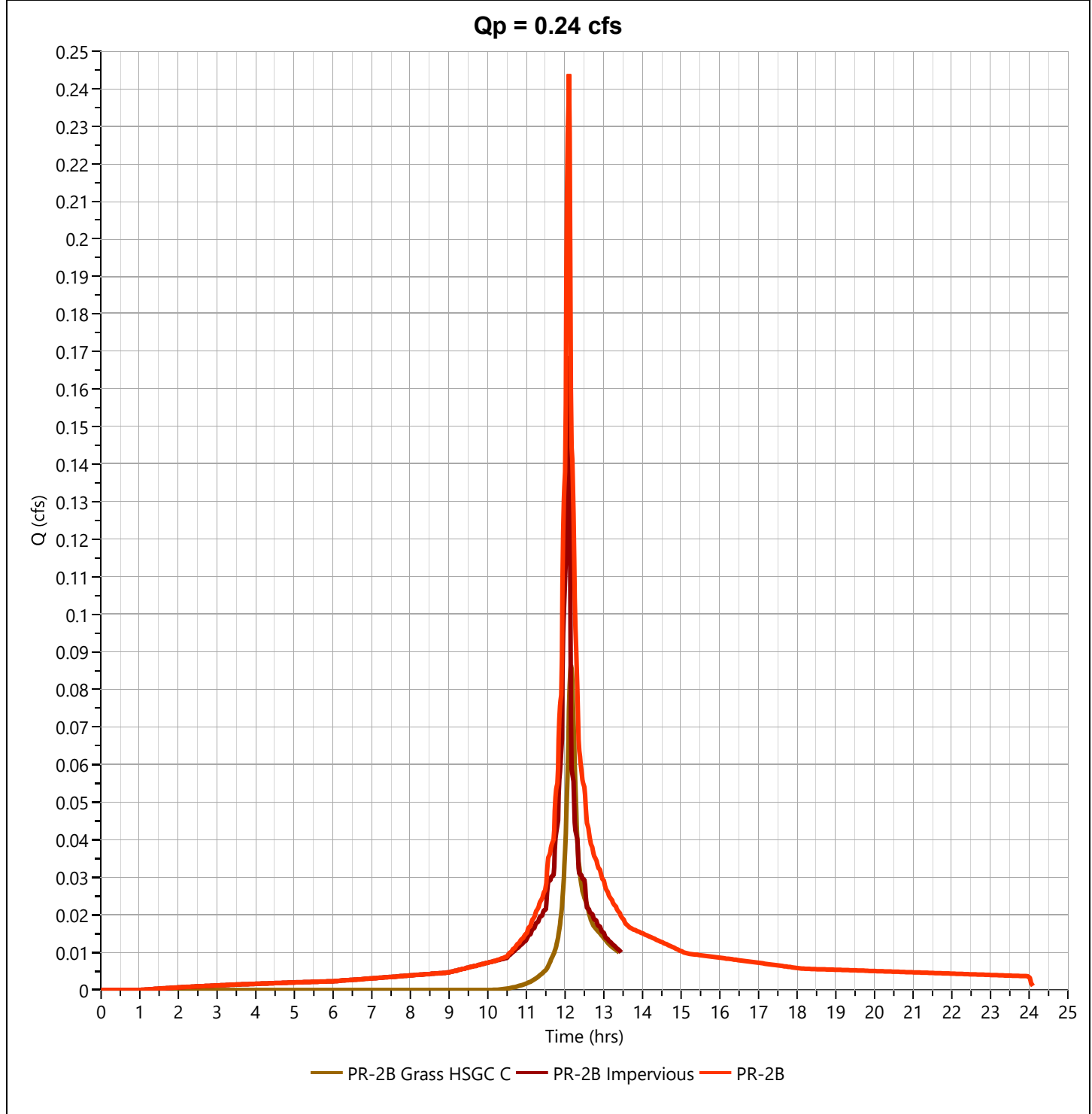
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2B

## Hyd. No. 8

|                    |            |                     |             |
|--------------------|------------|---------------------|-------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.244 cfs |
| Storm Frequency    | = 2-yr     | Time to Peak        | = 12.10 hrs |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 857 cuft  |
| Inflow Hydrographs | = 6, 7     | Total Contrib. Area | = 0.12 ac   |



# Hydrograph Report

Project Name:

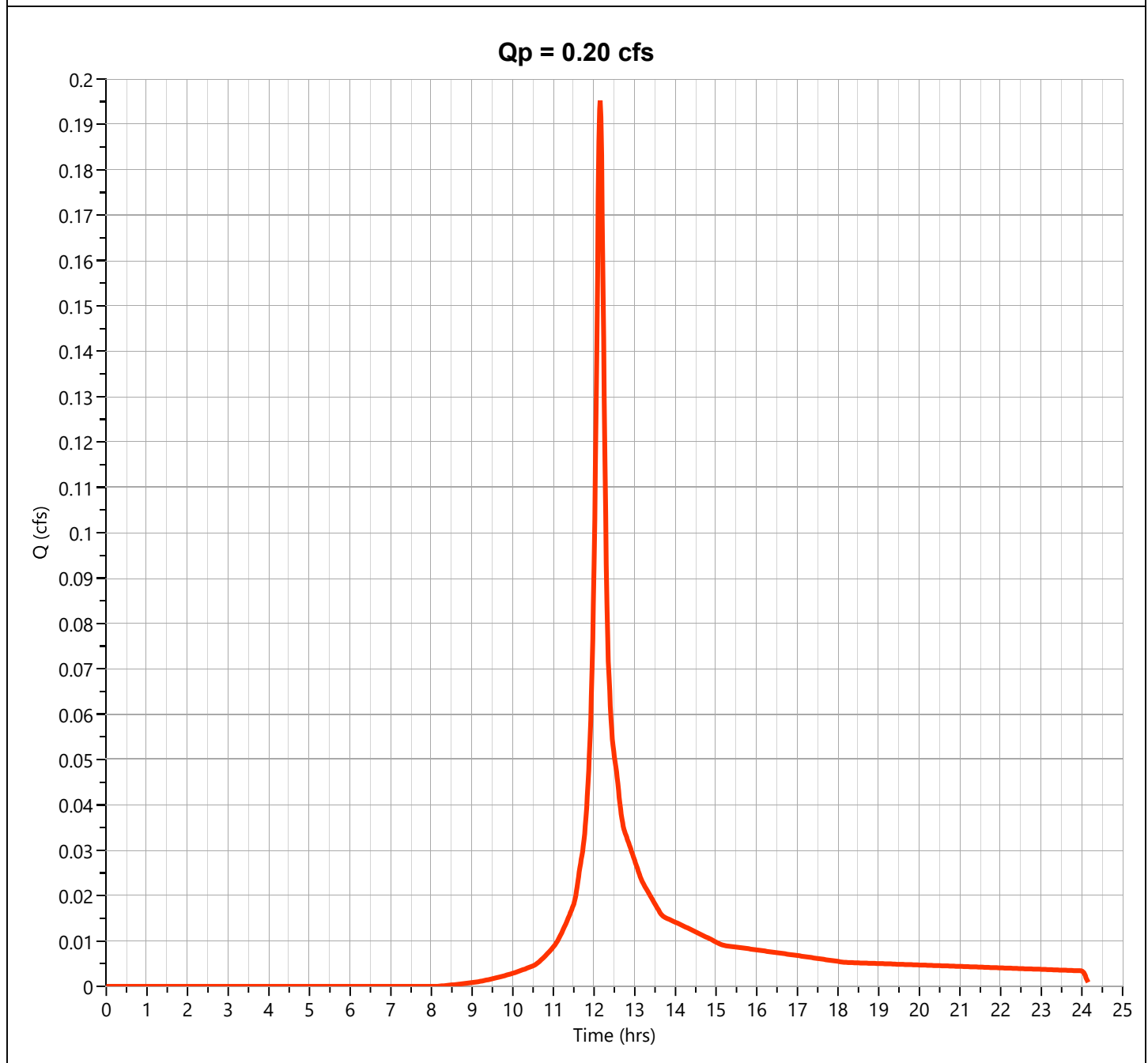
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2B Grass HSGC C

## Hyd. No. 6

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.195 cfs |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.15 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 679 cuft  |
| Drainage Area   | = 0.07 ac     | Curve Number       | = 74        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 9.0 min   |
| Total Rainfall  | = 5.38 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

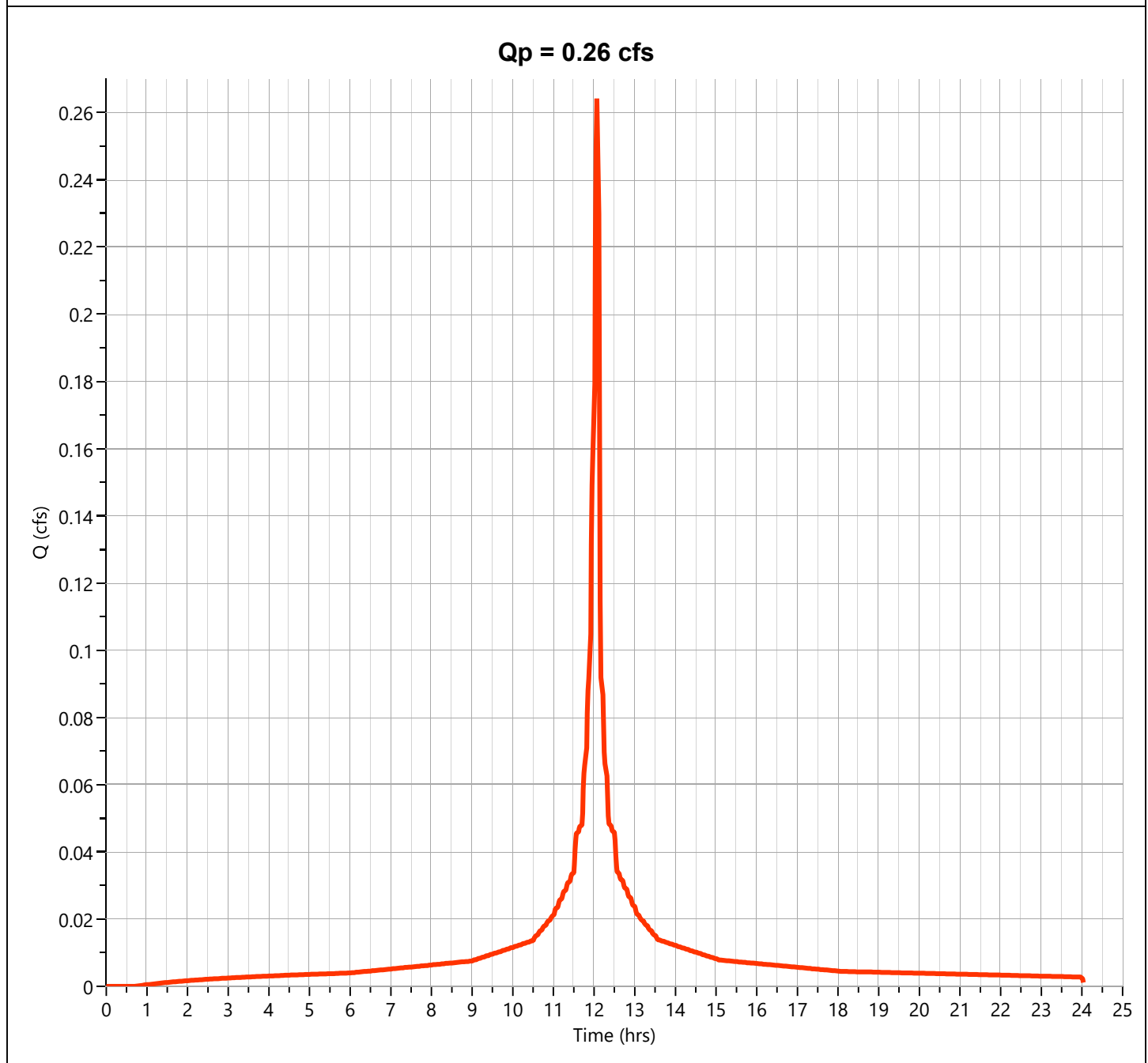
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2B Impervious

## Hyd. No. 7

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.264 cfs |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.10 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 875 cuft  |
| Drainage Area   | = 0.05 ac     | Curve Number       | = 98        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 2.0 min   |
| Total Rainfall  | = 5.38 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

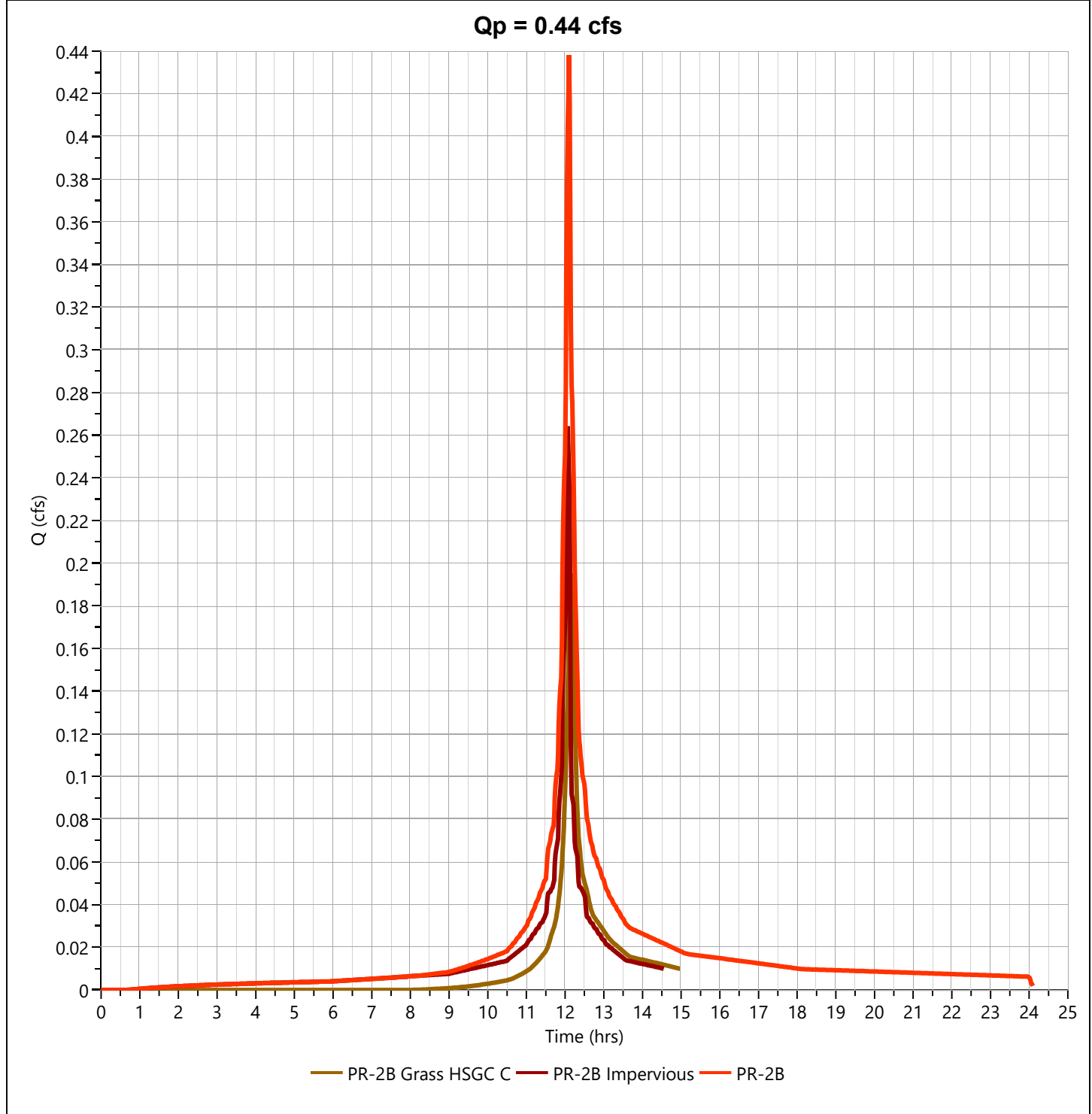
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2B

## Hyd. No. 8

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.438 cfs  |
| Storm Frequency    | = 10-yr    | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 1,554 cuft |
| Inflow Hydrographs | = 6, 7     | Total Contrib. Area | = 0.12 ac    |



# Hydrograph Report

Project Name:

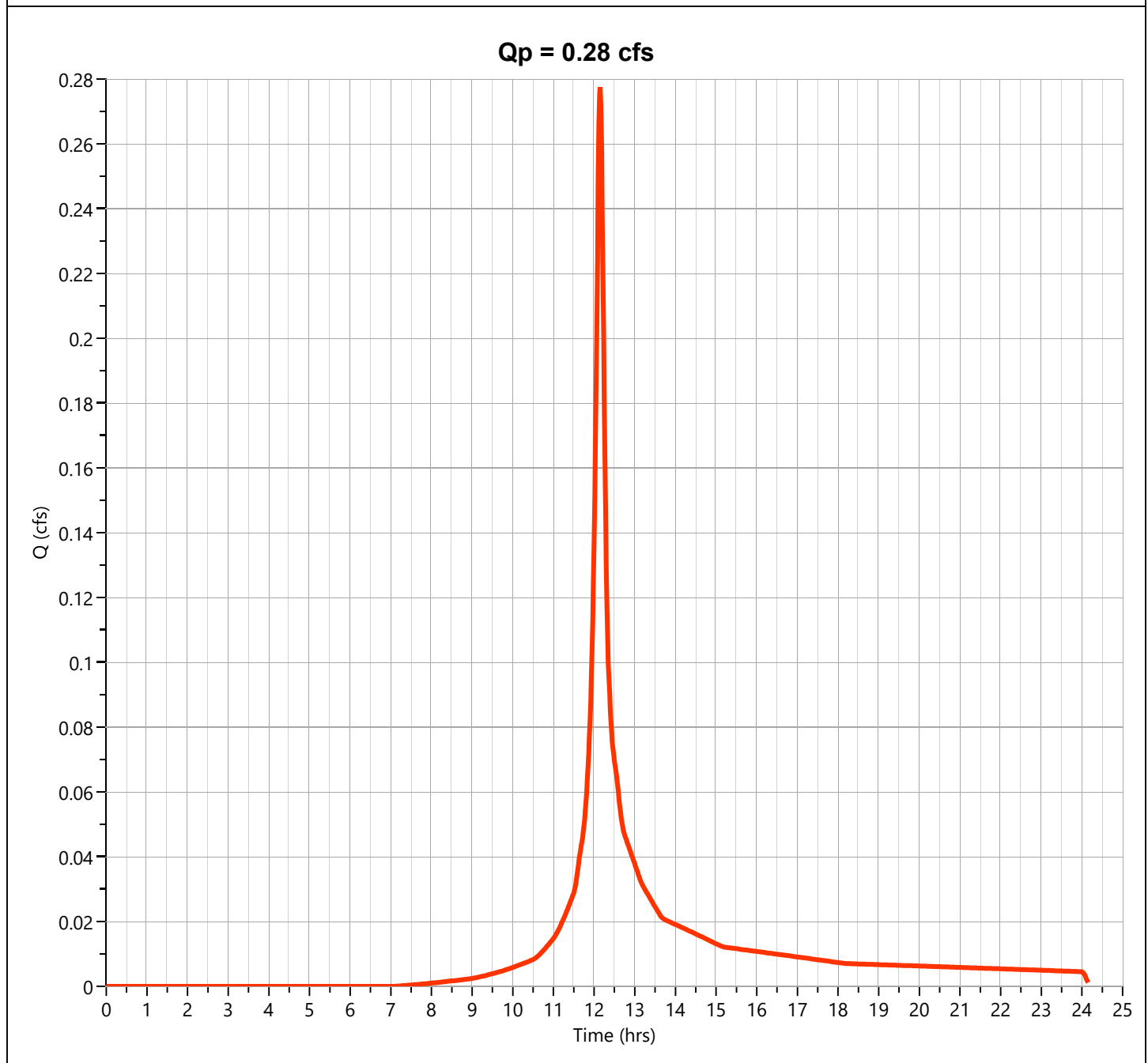
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2B Grass HSGC C

## Hyd. No. 6

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.277 cfs |
| Storm Frequency | = 25-yr       | Time to Peak       | = 12.15 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 968 cuft  |
| Drainage Area   | = 0.07 ac     | Curve Number       | = 74        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 9.0 min   |
| Total Rainfall  | = 6.73 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

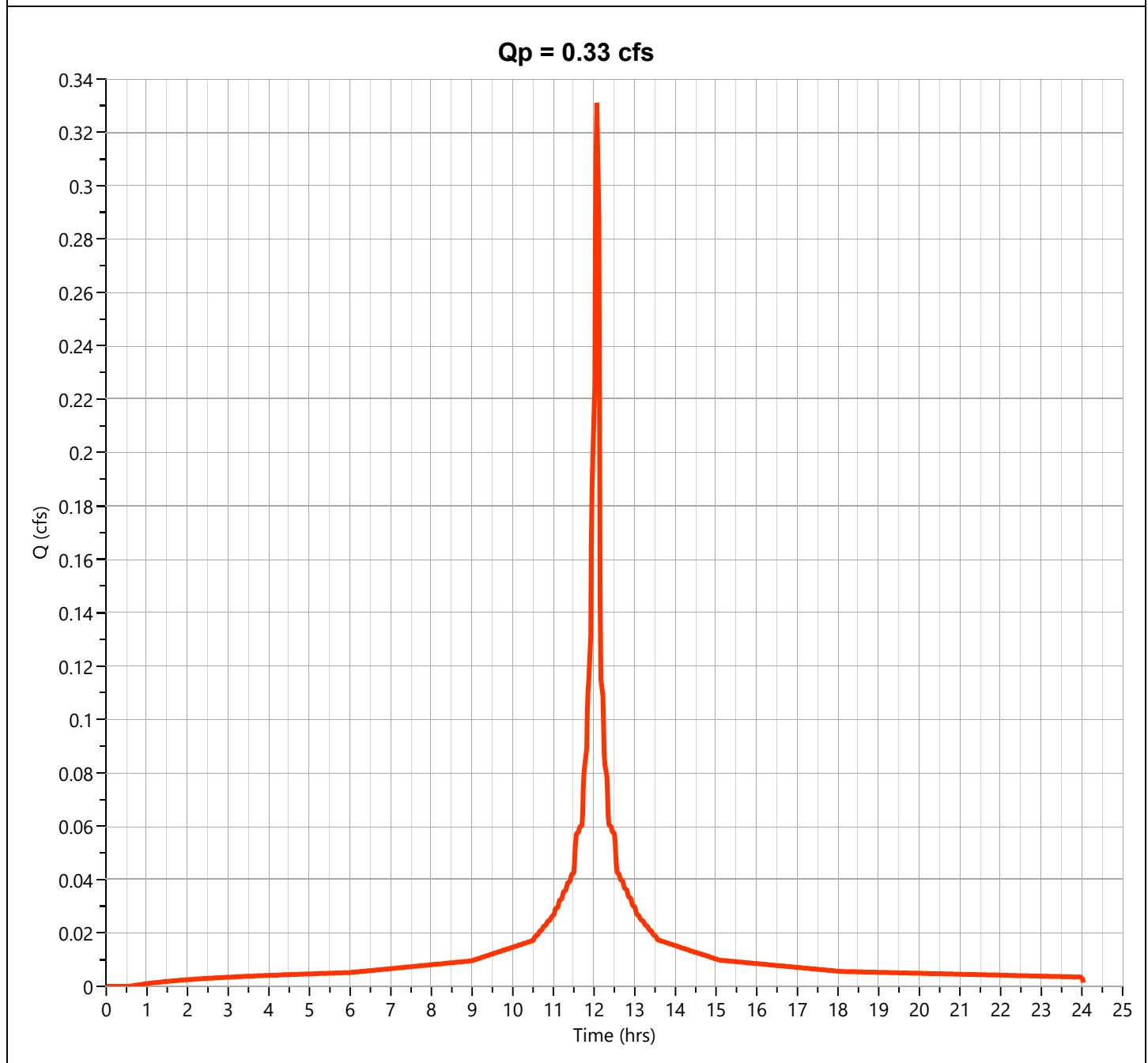
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2B Impervious

## Hyd. No. 7

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.331 cfs  |
| Storm Frequency | = 25-yr       | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 1,105 cuft |
| Drainage Area   | = 0.05 ac     | Curve Number       | = 98         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 2.0 min    |
| Total Rainfall  | = 6.73 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

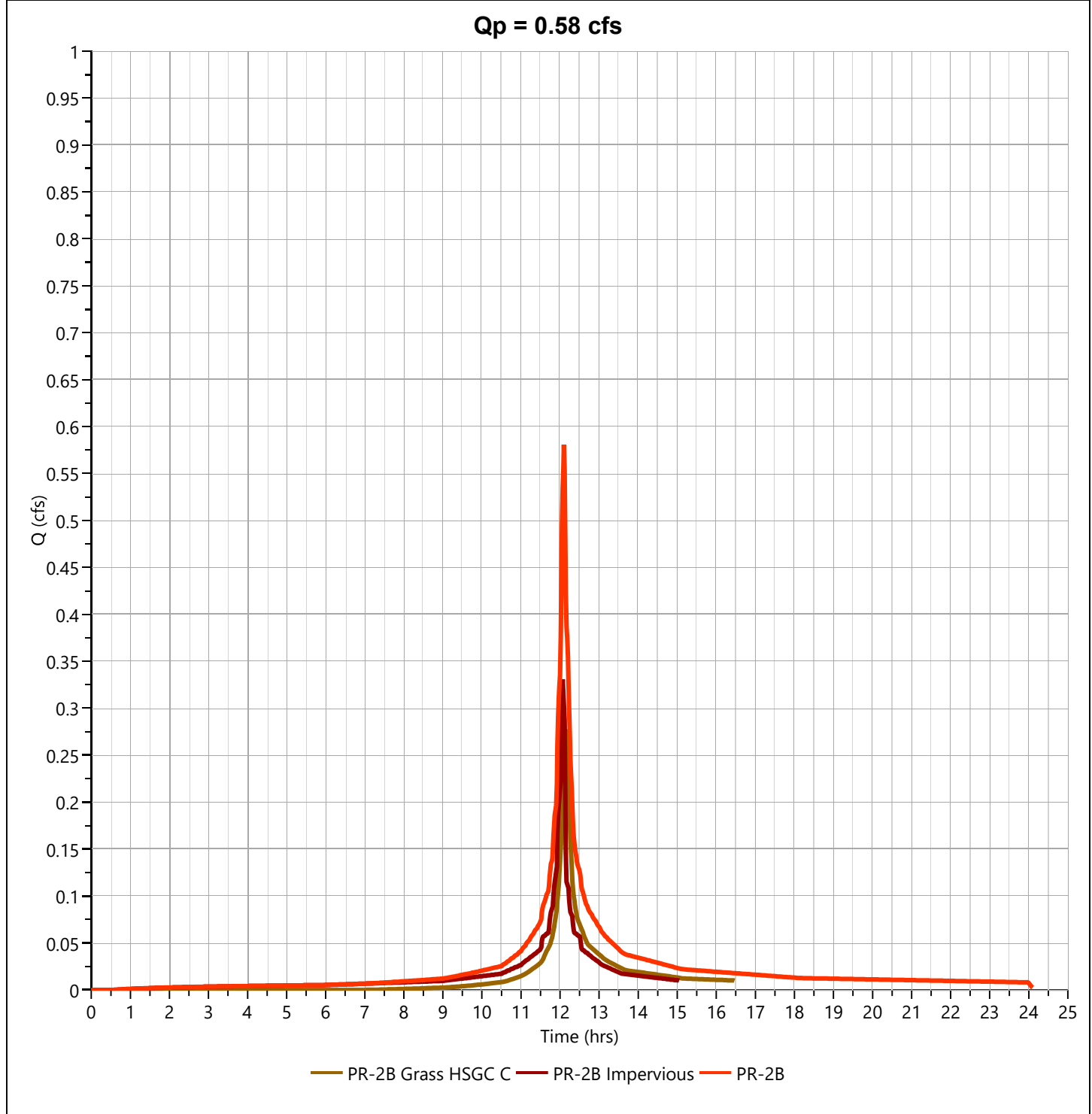
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2B

## Hyd. No. 8

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.581 cfs  |
| Storm Frequency    | = 25-yr    | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 2,072 cuft |
| Inflow Hydrographs | = 6, 7     | Total Contrib. Area | = 0.12 ac    |





# Hydrograph Report

Project Name:

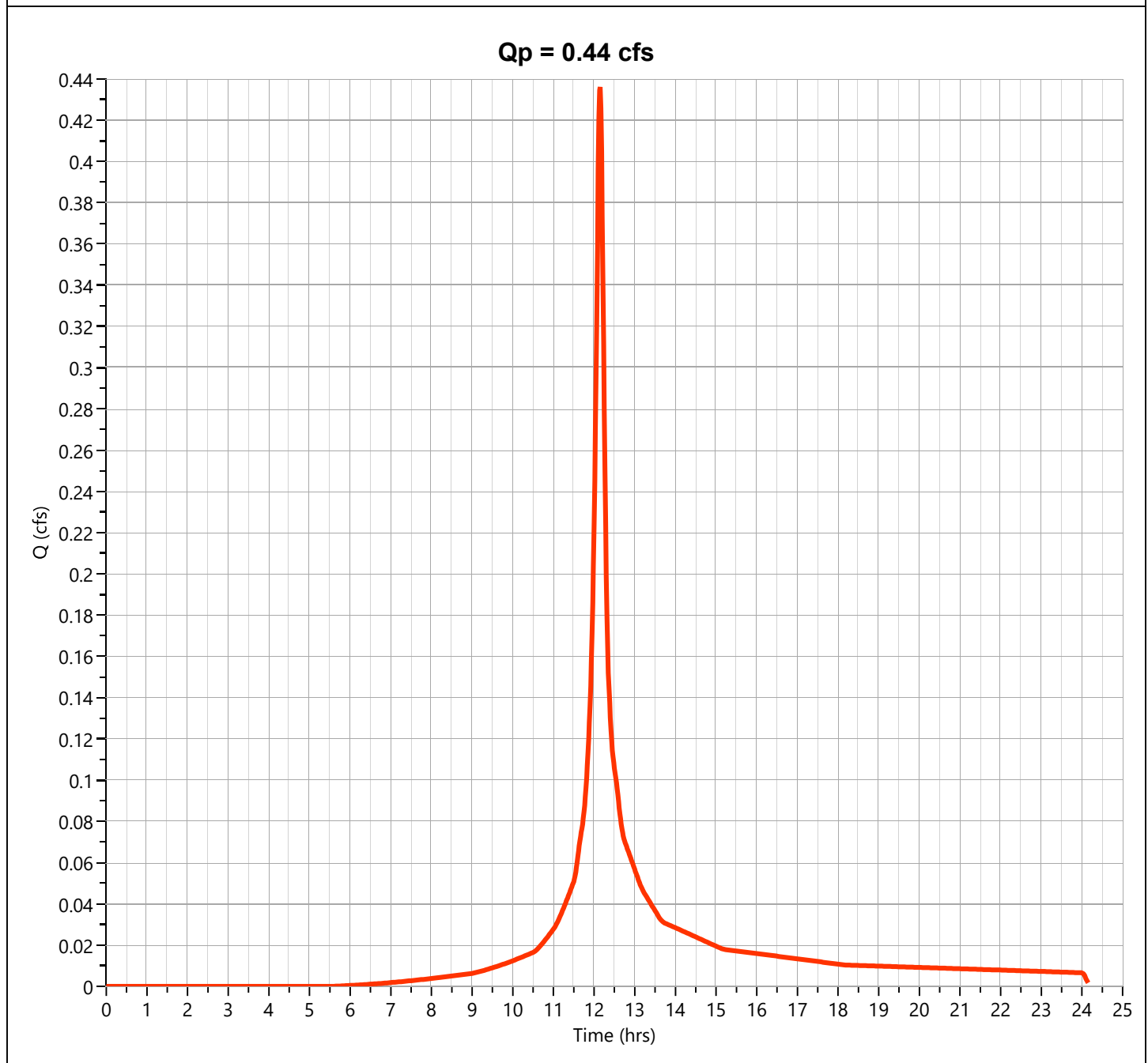
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2B Grass HSGC C

## Hyd. No. 6

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.436 cfs  |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.15 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 1,541 cuft |
| Drainage Area   | = 0.07 ac     | Curve Number       | = 74         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 9.0 min    |
| Total Rainfall  | = 9.26 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

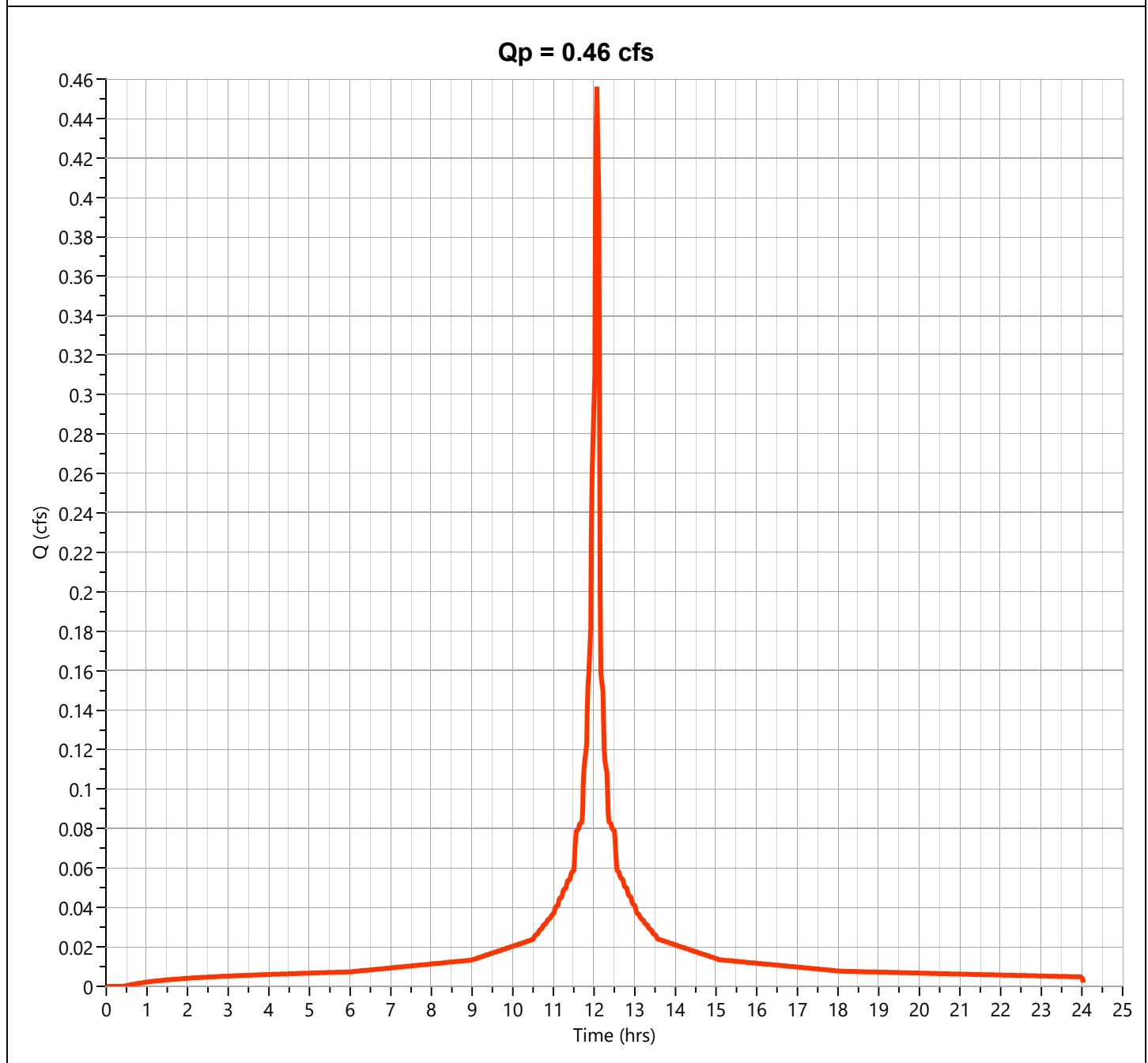
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2B Impervious

## Hyd. No. 7

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.456 cfs  |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 1,535 cuft |
| Drainage Area   | = 0.05 ac     | Curve Number       | = 98         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 2.0 min    |
| Total Rainfall  | = 9.26 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

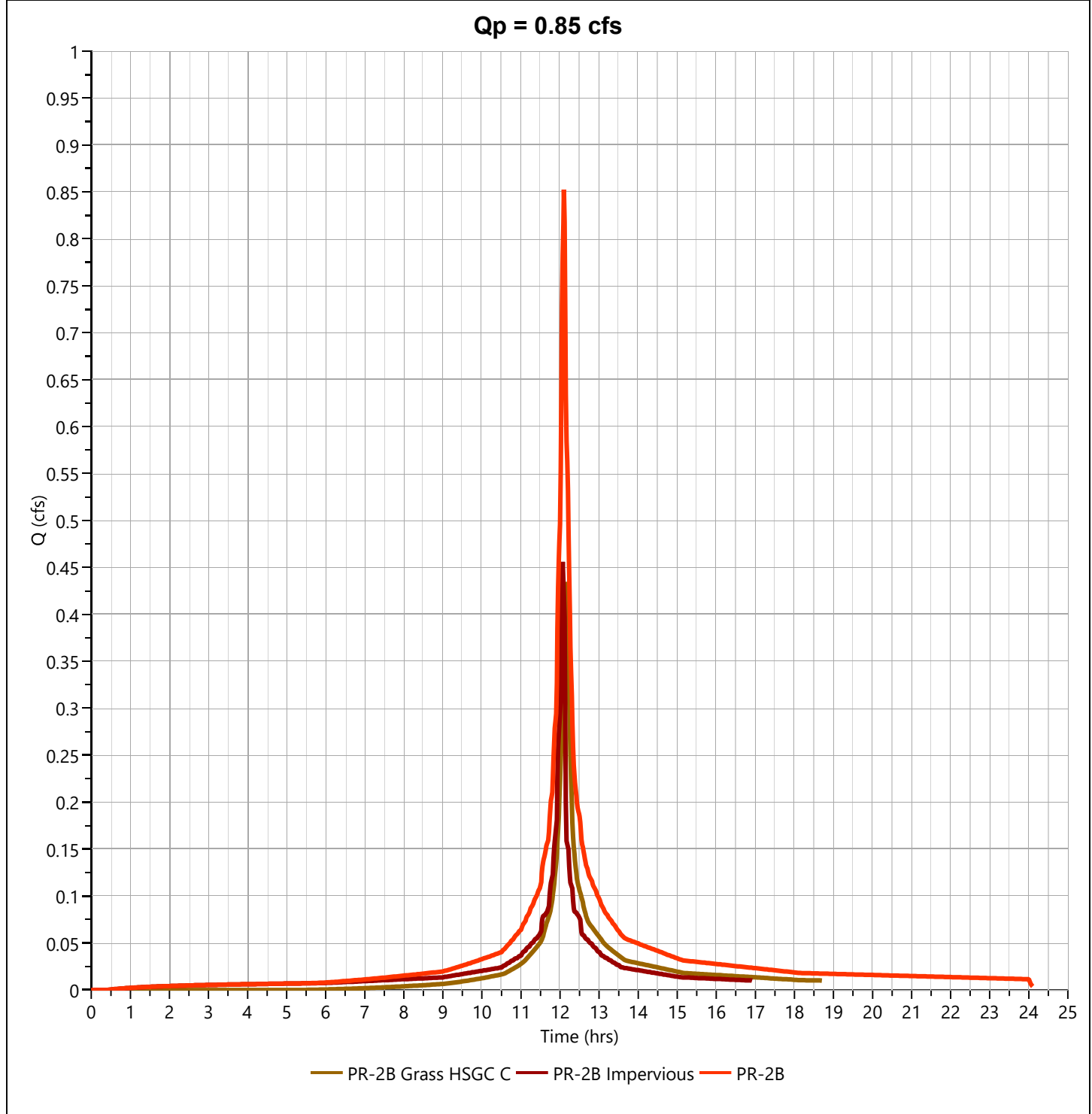
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2B

## Hyd. No. 8

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.852 cfs  |
| Storm Frequency    | = 100-yr   | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 3,076 cuft |
| Inflow Hydrographs | = 6, 7     | Total Contrib. Area | = 0.12 ac    |



## **PR-2C WATERSHED**

Project: Beacon Unitarian Universalist Church

By: TEG

Date: 2/6/2024

Location: Summit, NJ

Checked By: MJV

Date Checked: 2/6/2024

Circle One: Present Developed

Current Proposed Watershed PR-2C - Impervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Design Flow Length, L<sub>des</sub> (Total L<sub>des</sub> < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. McCuen-Spiess Limit, L<sub>mcs</sub> (max. 100 ft)
7. Compute T<sub>t</sub>

$$L_{mcs} = (100 s^{0.5})/n$$

$$T_t = \frac{0.007 (n L_{des})^{0.8}}{P_2^{0.5} s^{0.4}}$$

| Segment ID | 1                      | 2                    |  |
|------------|------------------------|----------------------|--|
|            | <b>Smooth Surfaces</b> | <b>Dense Grasses</b> |  |
|            | <b>0.011</b>           | <b>0.24</b>          |  |
| ft         | <b>19</b>              | <b>13</b>            |  |
| in         | <b>3.46</b>            | <b>3.46</b>          |  |
| ft/ft      | <b>0.012</b>           | <b>0.010</b>         |  |
| ft         | <b>100</b>             | <b>42</b>            |  |
| hr         | <b>0.006</b>           | <b>0.056</b>         |  |

Sheet Flow Sub-Total **0.063 hours**

**Shallow Concentrated Flow**

8. Surface Description
9. Flow Length, L
10. Watercourse Slope, s
11. Average Velocity, V (NEH table 15-3)
12. Compute T<sub>t</sub>

$$T_t = \frac{L}{3600 V}$$

| Segment ID |  |  |  |
|------------|--|--|--|
| ft         |  |  |  |
| ft/ft      |  |  |  |
| ft/s       |  |  |  |
| hr         |  |  |  |

Shallow Conc. Flow Sub-Total **0.000 hours**

**Channel Flow**

13. Flow Length, L
14. Cross Sectional flow area, a
15. Wetted Perimeter, P<sub>w</sub>
16. Hydraulic Radius, r
17. Channel Slope, s
18. Manning's Roughness Coeff., n
19. Velocity, V
20. Compute T<sub>t</sub>

$$r = a / P_w$$

$$V = (1.49 r^{2/3} s^{1/2}) / n$$

$$T_t = \frac{L}{3600 V}$$

| Segment ID      |  |  |  |
|-----------------|--|--|--|
| ft              |  |  |  |
| ft <sup>2</sup> |  |  |  |
| ft              |  |  |  |
| ft              |  |  |  |
| ft/ft           |  |  |  |
| ft/s            |  |  |  |
| hr              |  |  |  |

Channel Flow Sub-Total **0.000 hours**

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>

(Add Sub-Total T<sub>t</sub> from prior steps)

|                      |                    |
|----------------------|--------------------|
| Total Tc (hours) =   | <b>0.063 hours</b> |
| Total Tc (minutes) = | <b>4 minutes</b>   |

Project: Beacon Unitarian Universalist Church

By: TEG

Date: 2/6/2024

Location: Summit, NJ

Checked By: MJV

Date Checked: 2/6/2024

Circle One: Present Developed

Current Proposed Watershed PR-2C - Pervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Design Flow Length, L<sub>des</sub> (Total L<sub>des</sub> < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. McCuen-Spiess Limit, L<sub>mcs</sub> (max. 100 ft)
7. Compute T<sub>t</sub>

$$L_{mcs} = (100 s^{0.5})/n$$

$$T_t = \frac{0.007 (n L_{des})^{0.8}}{P_2^{0.5} s^{0.4}}$$

|            |               |   |   |
|------------|---------------|---|---|
| Segment ID | 1             |   |   |
|            | Dense Grasses |   |   |
|            | 0.24          |   |   |
| ft         | 28            |   |   |
| in         | 3.46          |   |   |
| ft/ft      | 0.012         |   |   |
| ft         | 46            |   |   |
| hr         | 0.101         | + | + |

Sheet Flow Sub-Total **0.101 hours**

**Shallow Concentrated Flow**

8. Surface Description
9. Flow Length, L
10. Watercourse Slope, s
11. Average Velocity, V (NEH table 15-3)
12. Compute T<sub>t</sub>

$$T_t = \frac{L}{3600 V}$$

|            |  |   |   |
|------------|--|---|---|
| Segment ID |  |   |   |
| ft         |  |   |   |
| ft/ft      |  |   |   |
| ft/s       |  |   |   |
| hr         |  | + | + |

Shallow Conc. Flow Sub-Total **0.000 hours**

**Channel Flow**

13. Flow Length, L
14. Cross Sectional flow area, a
15. Wetted Perimeter, P<sub>w</sub>
16. Hydraulic Radius, r
17. Channel Slope, s
18. Manning's Roughness Coeff., n
19. Velocity, V
20. Compute T<sub>t</sub>

$$r = a / P_w$$

$$V = (1.49 r^{2/3} s^{1/2}) / n$$

$$T_t = \frac{L}{3600 V}$$

|                 |  |   |   |
|-----------------|--|---|---|
| Segment ID      |  |   |   |
| ft              |  |   |   |
| ft <sup>2</sup> |  |   |   |
| ft              |  |   |   |
| ft              |  |   |   |
| ft/ft           |  |   |   |
| ft/s            |  |   |   |
| hr              |  | + | + |

Channel Flow Sub-Total **0.000 hours**

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>

(Add Sub-Total T<sub>t</sub> from prior steps)

|                      |                    |
|----------------------|--------------------|
| Total Tc (hours) =   | <b>0.101 hours</b> |
| Total Tc (minutes) = | <b>6 minutes</b>   |

# Hydrograph Report

Project Name:

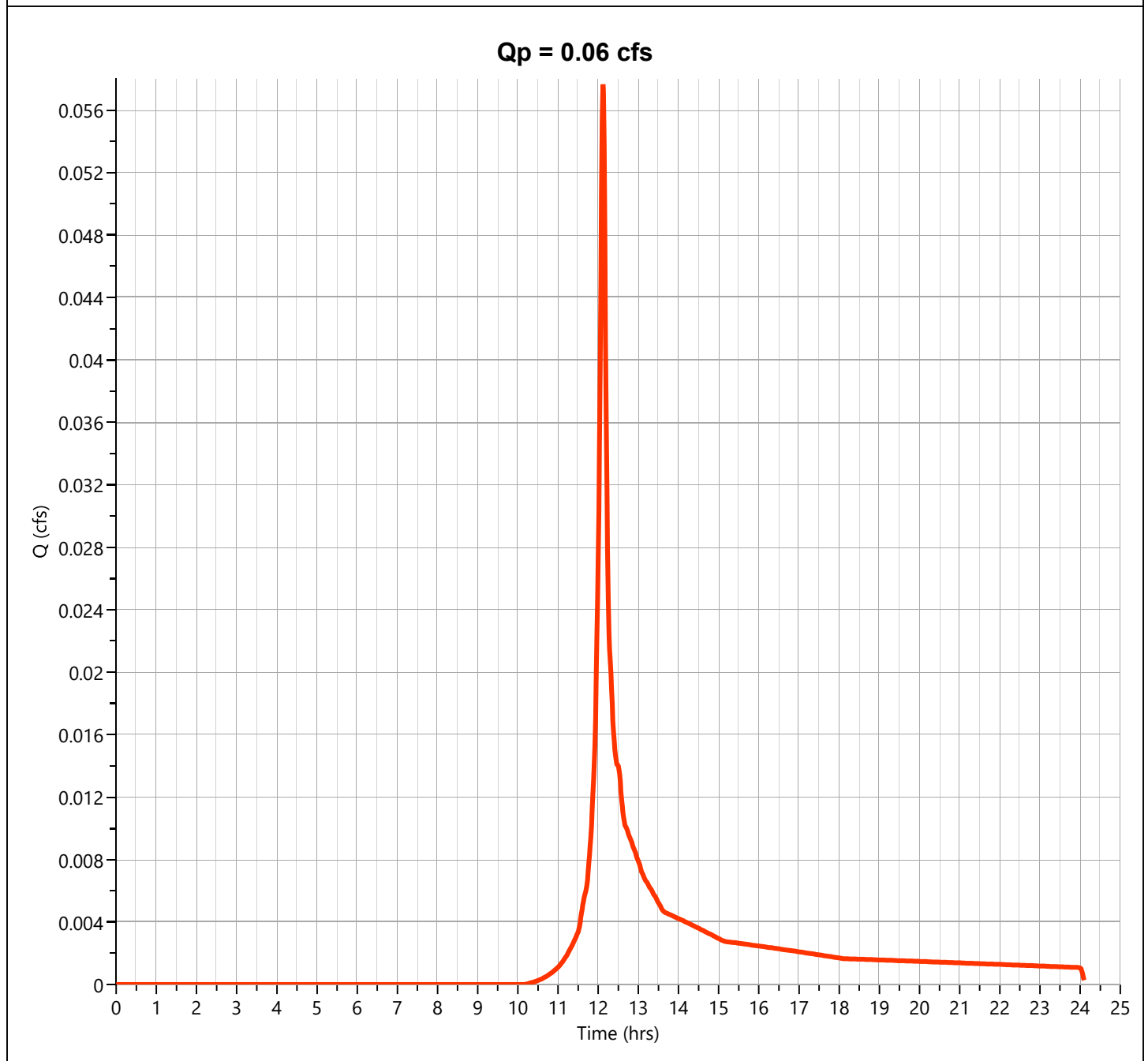
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2C Grass HSGC C

## Hyd. No. 11

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.058 cfs |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.12 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 182 cuft  |
| Drainage Area   | = 0.04 ac     | Curve Number       | = 74        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 6.0 min   |
| Total Rainfall  | = 3.46 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

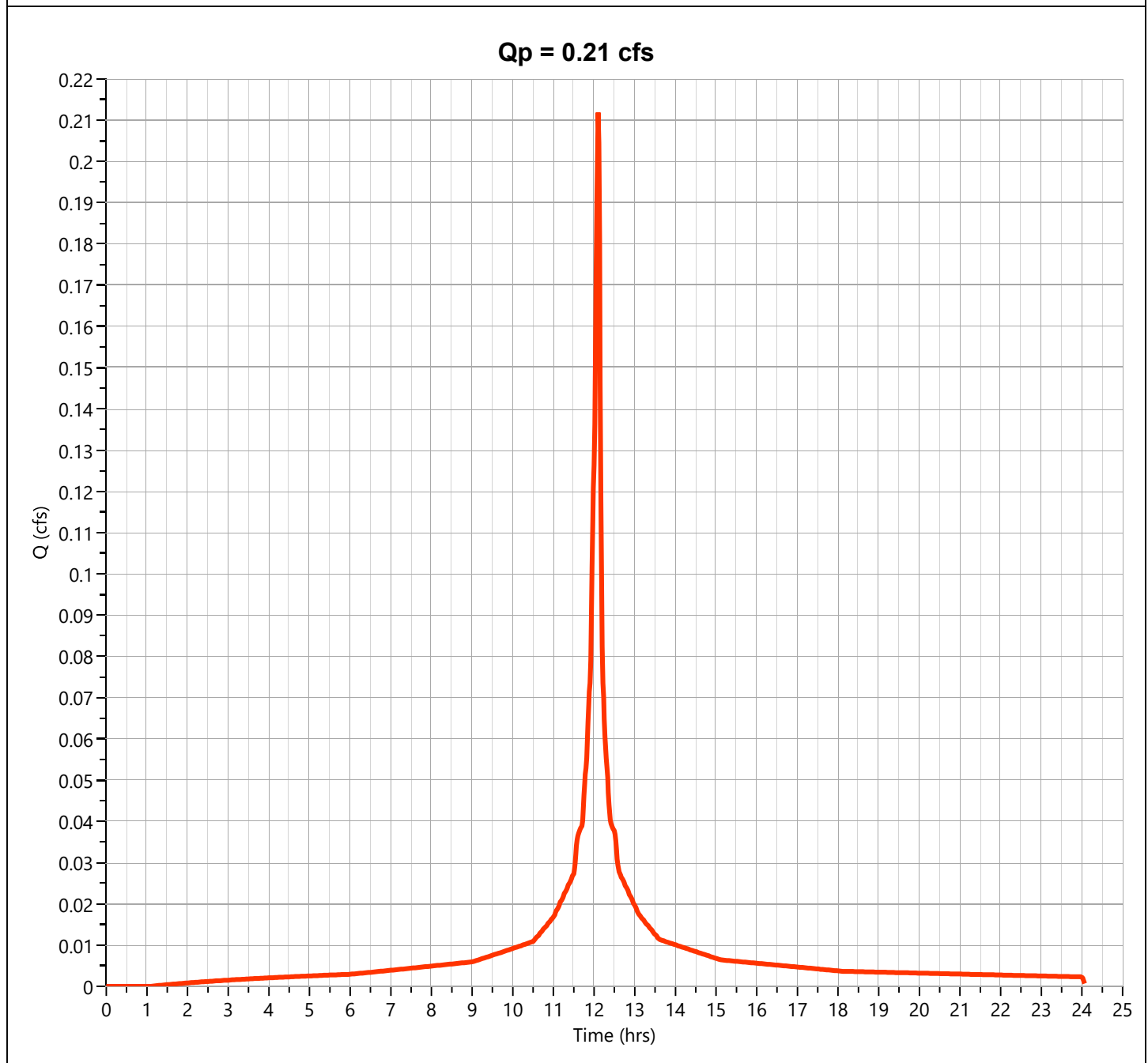
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2C Impervious

## Hyd. No. 12

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.212 cfs |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.10 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 703 cuft  |
| Drainage Area   | = 0.06 ac     | Curve Number       | = 98        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 4.0 min   |
| Total Rainfall  | = 3.46 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |





# Hydrograph Report

Project Name:

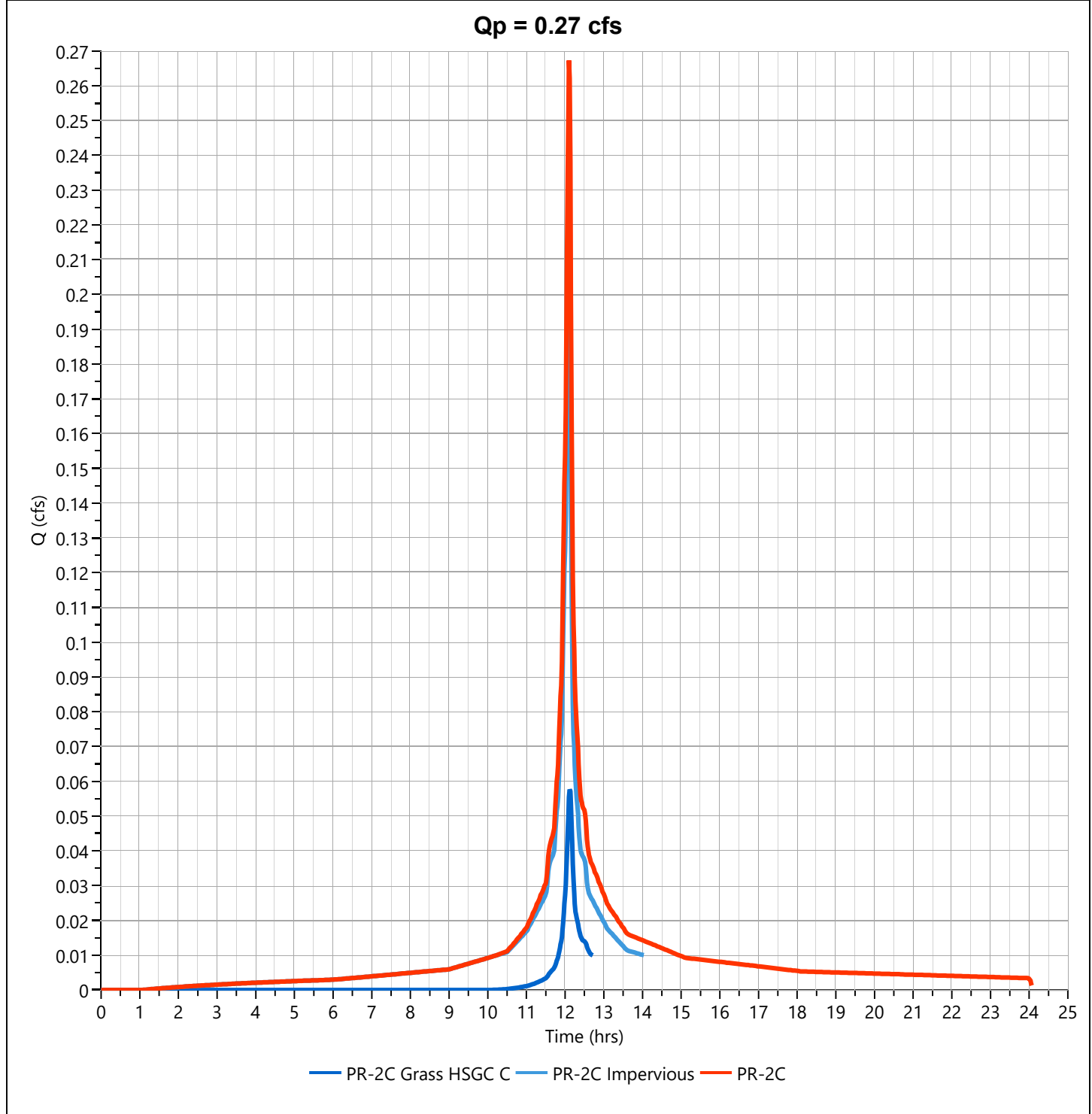
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2C

## Hyd. No. 13

|                    |            |                     |             |
|--------------------|------------|---------------------|-------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.267 cfs |
| Storm Frequency    | = 2-yr     | Time to Peak        | = 12.10 hrs |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 884 cuft  |
| Inflow Hydrographs | = 11, 12   | Total Contrib. Area | = 0.1 ac    |



# Hydrograph Report

Project Name:

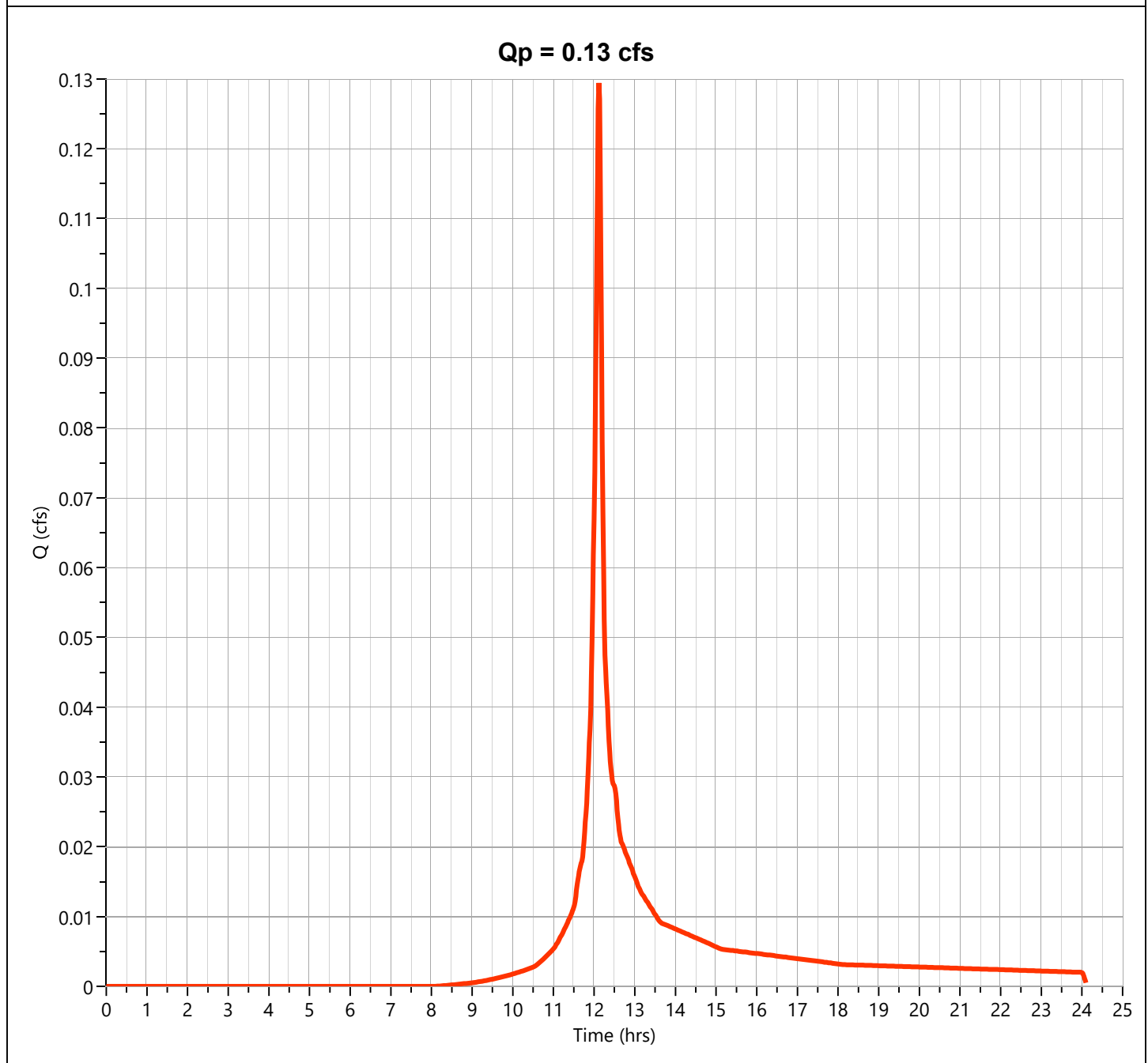
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2C Grass HSGC C

## Hyd. No. 11

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.129 cfs |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.12 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 400 cuft  |
| Drainage Area   | = 0.04 ac     | Curve Number       | = 74        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 6.0 min   |
| Total Rainfall  | = 5.38 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

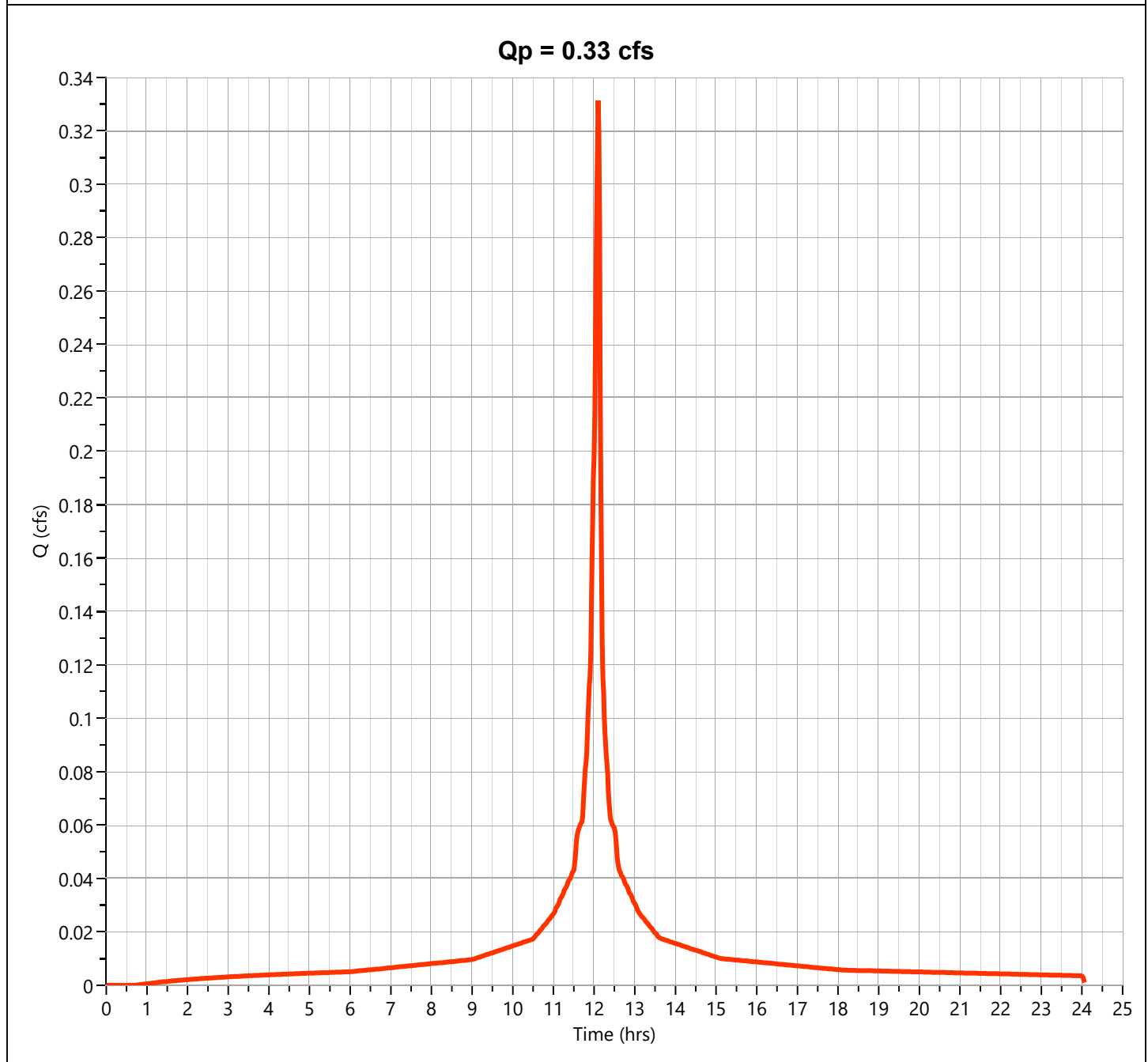
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2C Impervious

## Hyd. No. 12

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.331 cfs  |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 1,120 cuft |
| Drainage Area   | = 0.06 ac     | Curve Number       | = 98         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 4.0 min    |
| Total Rainfall  | = 5.38 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

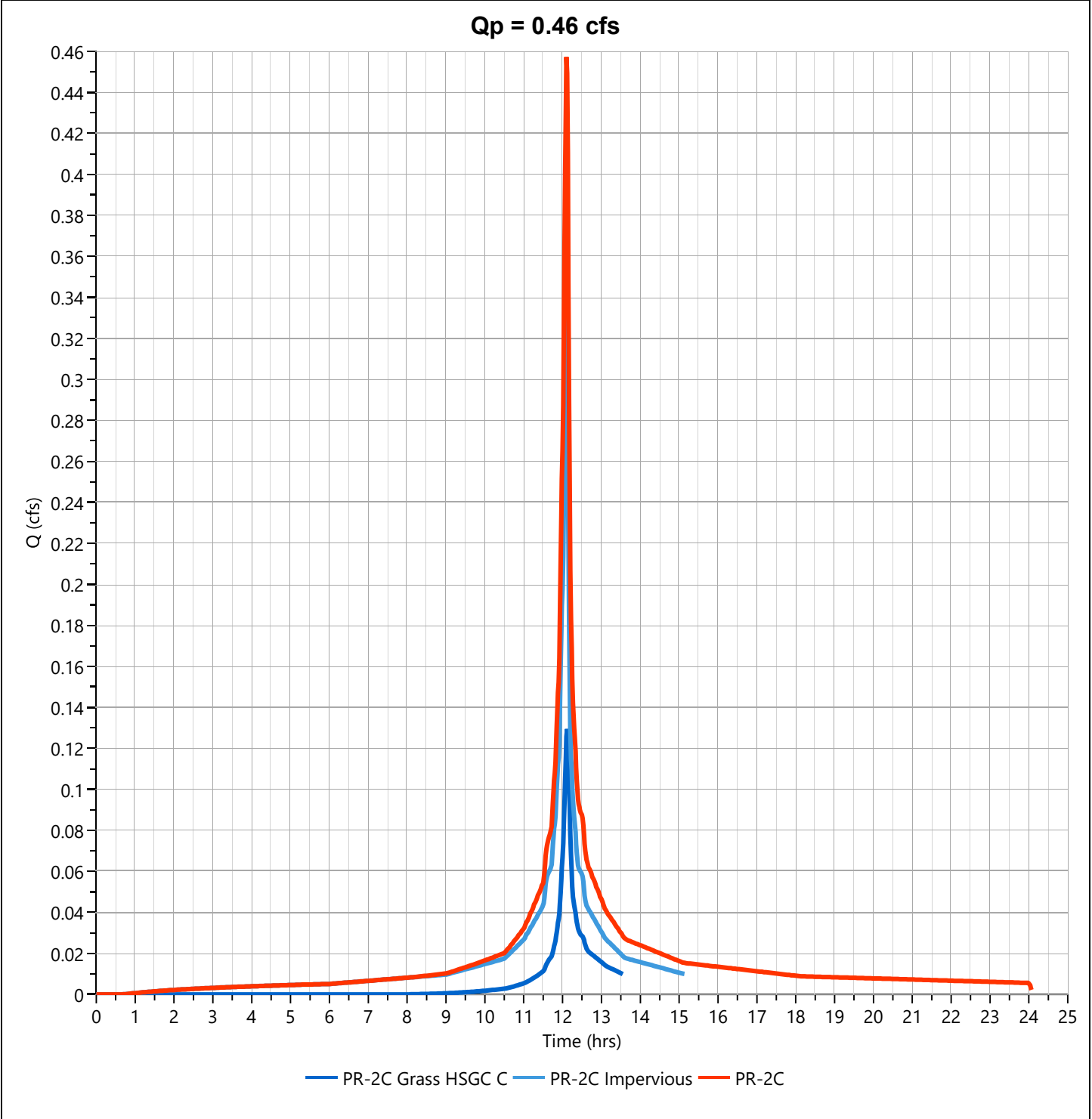
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2C

## Hyd. No. 13

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.457 cfs  |
| Storm Frequency    | = 10-yr    | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 1,520 cuft |
| Inflow Hydrographs | = 11, 12   | Total Contrib. Area | = 0.1 ac     |



# Hydrograph Report

Project Name:

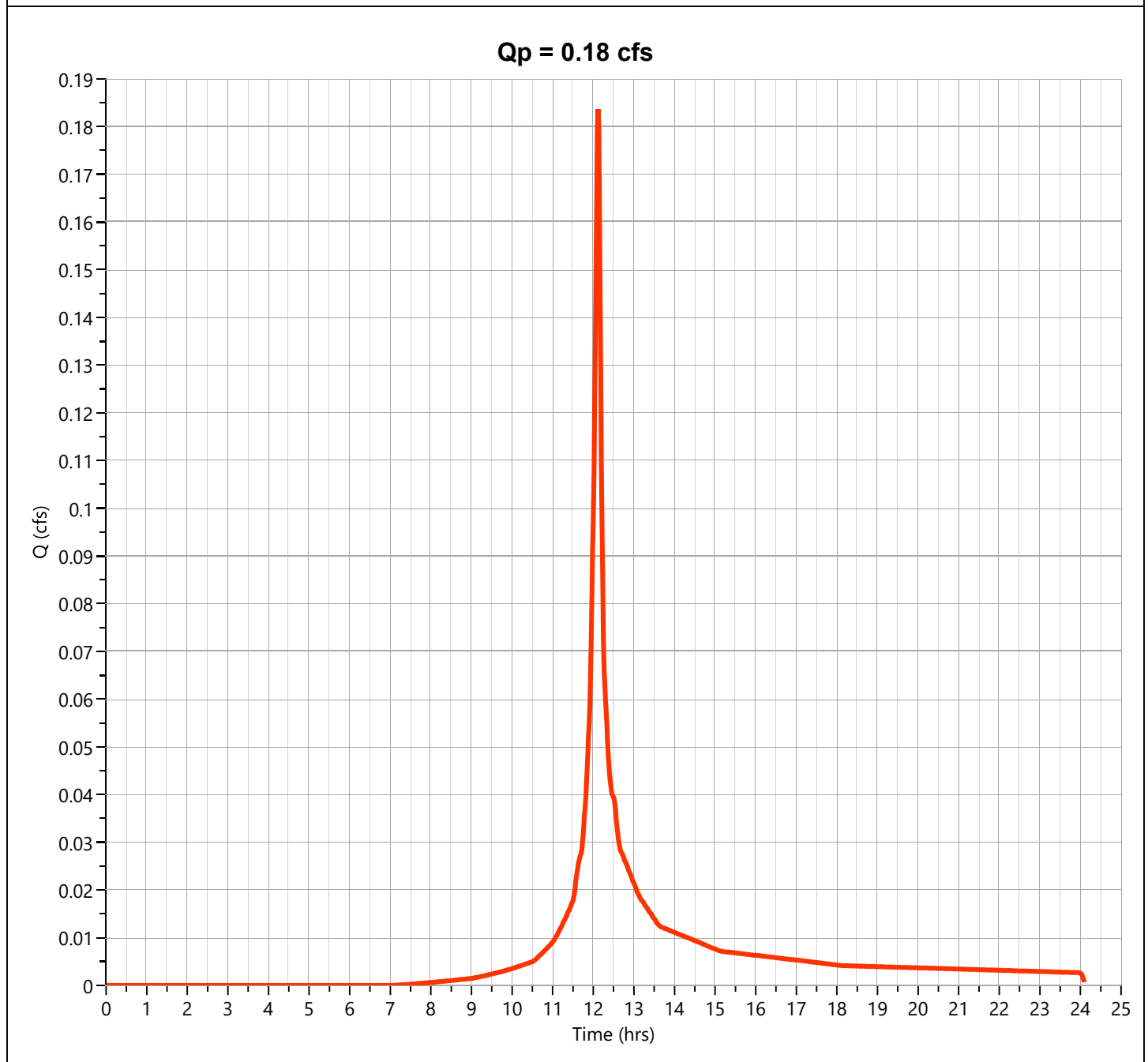
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2C Grass HSGC C

## Hyd. No. 11

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.184 cfs |
| Storm Frequency | = 25-yr       | Time to Peak       | = 12.12 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 570 cuft  |
| Drainage Area   | = 0.04 ac     | Curve Number       | = 74        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 6.0 min   |
| Total Rainfall  | = 6.73 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

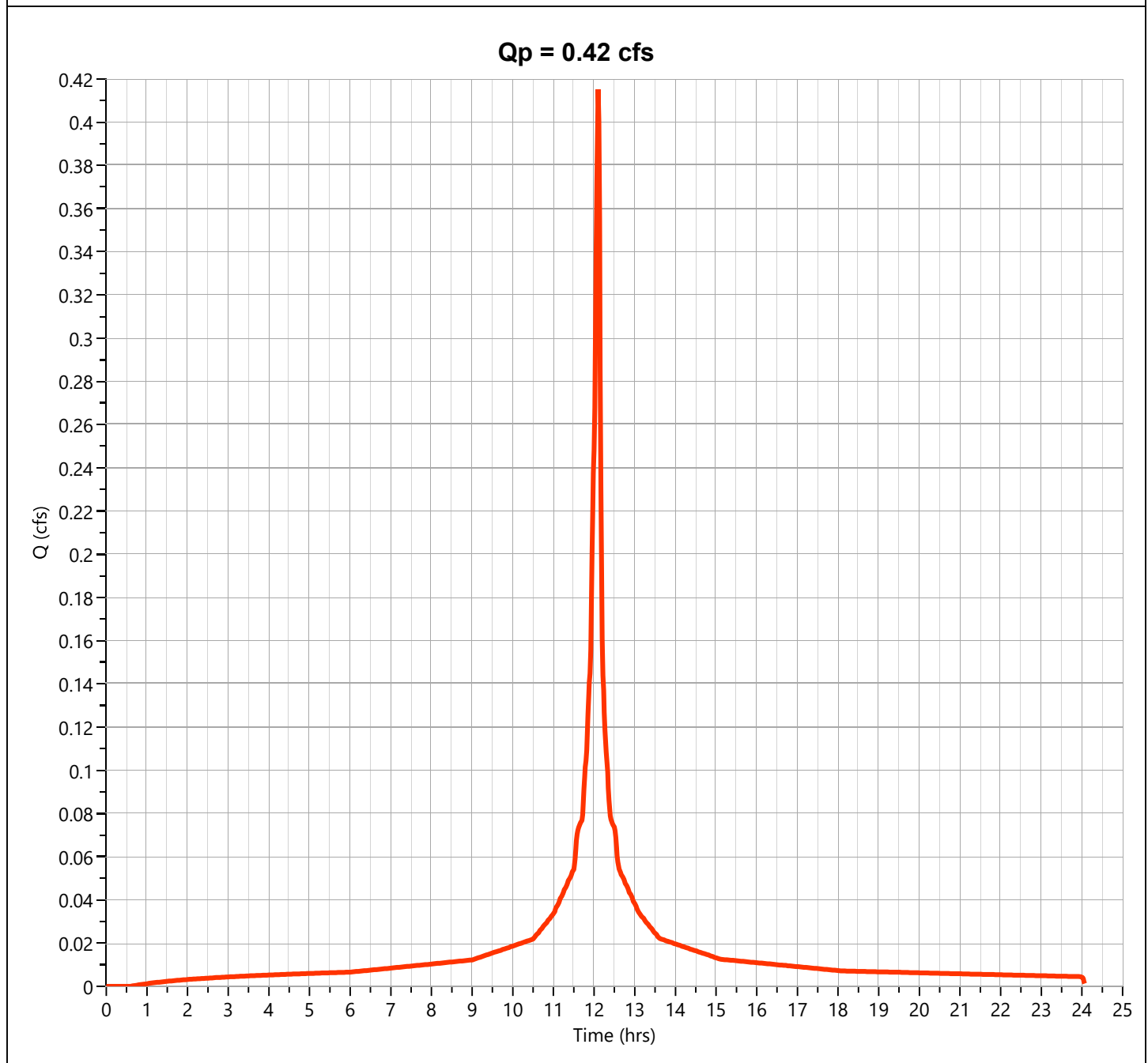
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2C Impervious

## Hyd. No. 12

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.415 cfs  |
| Storm Frequency | = 25-yr       | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 1,414 cuft |
| Drainage Area   | = 0.06 ac     | Curve Number       | = 98         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 4.0 min    |
| Total Rainfall  | = 6.73 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

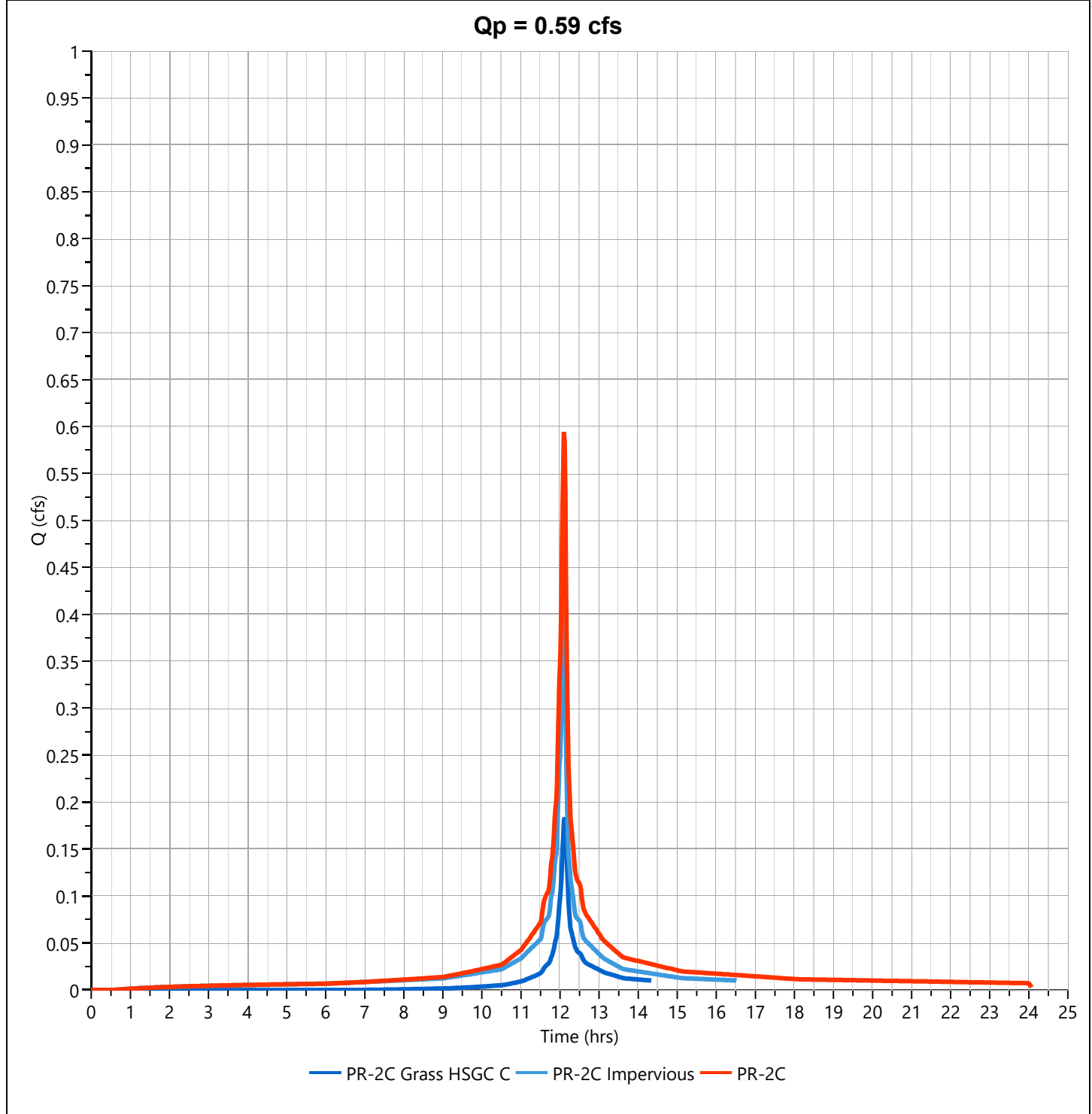
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2C

## Hyd. No. 13

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.594 cfs  |
| Storm Frequency    | = 25-yr    | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 1,984 cuft |
| Inflow Hydrographs | = 11, 12   | Total Contrib. Area | = 0.1 ac     |



# Hydrograph Report

Project Name:

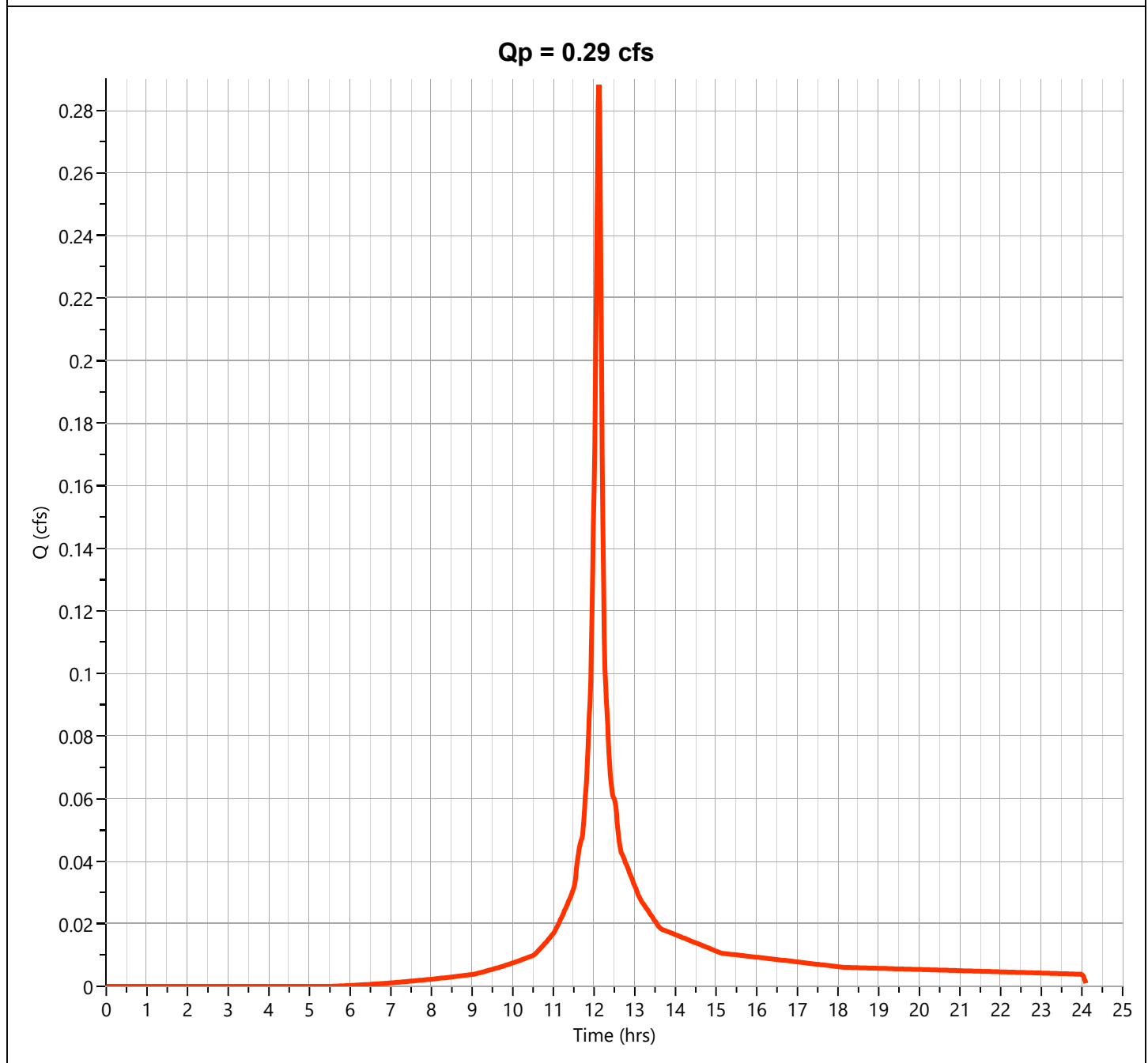
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2C Grass HSGC C

## Hyd. No. 11

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.288 cfs |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.12 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 908 cuft  |
| Drainage Area   | = 0.04 ac     | Curve Number       | = 74        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 6.0 min   |
| Total Rainfall  | = 9.26 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |





# Hydrograph Report

Project Name:

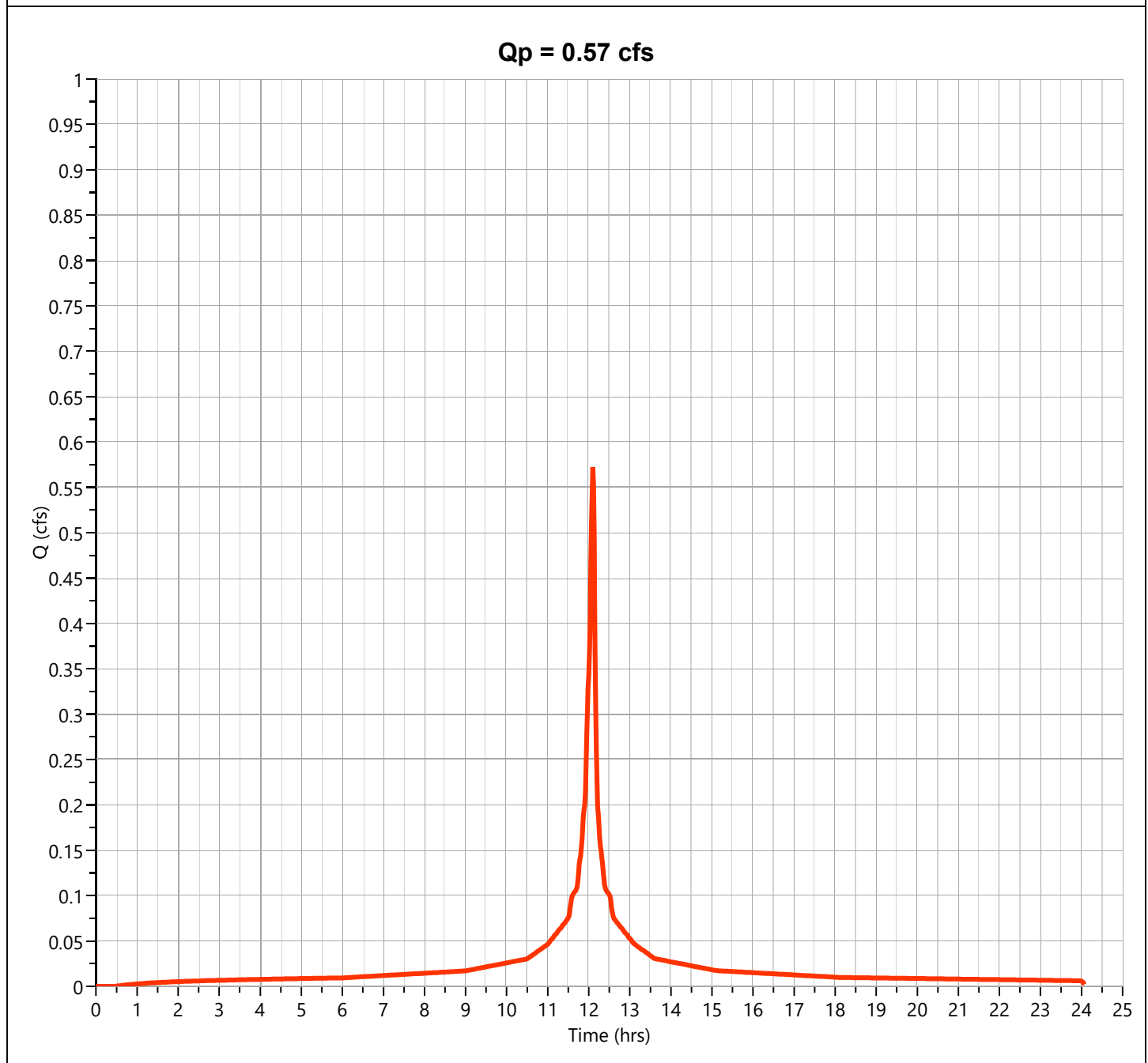
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2C Impervious

## Hyd. No. 12

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.572 cfs  |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 1,964 cuft |
| Drainage Area   | = 0.06 ac     | Curve Number       | = 98         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 4.0 min    |
| Total Rainfall  | = 9.26 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

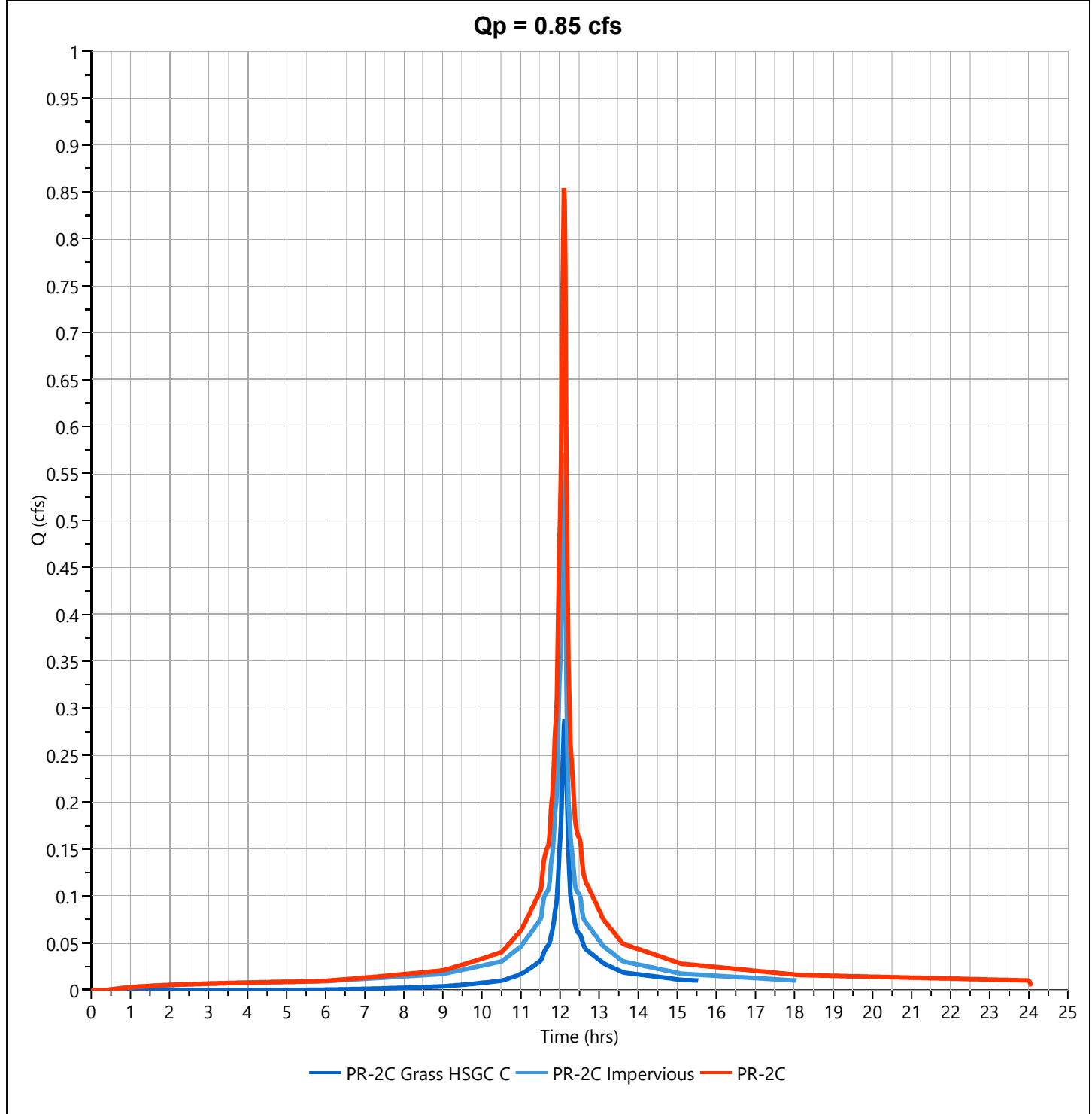
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2C

## Hyd. No. 13

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.854 cfs  |
| Storm Frequency    | = 100-yr   | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 2,873 cuft |
| Inflow Hydrographs | = 11, 12   | Total Contrib. Area | = 0.1 ac     |



## **PR-2D WATERSHED**

Project: Beacon Unitarian Universalist Church

By: SM

Date: 11/29/2023

Location: Summit, NJ

Checked By: MJV

Date Checked: 11/29/2023

Circle One: Present Developed

Current Proposed Watershed PR-2D Impervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Flow Length, L (total L < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. Compute T<sub>t</sub>

$$T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} s^{0.4}}$$

|            |                        |                               |  |
|------------|------------------------|-------------------------------|--|
| Segment ID | <b>1</b>               | <b>2</b>                      |  |
|            | <b>Smooth Surfaces</b> | <b>Woods Light Underbrush</b> |  |
|            | <b>0.011</b>           | <b>0.40</b>                   |  |
| ft         | <b>6</b>               | <b>94</b>                     |  |
| in         | <b>3.46</b>            | <b>3.46</b>                   |  |
| ft/ft      | <b>0.050</b>           | <b>0.046</b>                  |  |
| hr         | <b>0.001</b>           | <b>0.235</b>                  |  |

Sheet Flow Sub-Total **0.237 hours**

**Shallow Concentrated Flow**

7. Surface Description
8. Flow Length, L
9. Watercourse Slope, s
10. Average Velocity, V (NEH table 15-3)
11. Compute T<sub>t</sub>

$$T_t = \frac{L}{3600 V}$$

|            |                  |                          |  |
|------------|------------------|--------------------------|--|
| Segment ID | <b>3</b>         | <b>4</b>                 |  |
|            | <b>Woodlands</b> | <b>Grassed Waterways</b> |  |
| ft         | <b>56</b>        | <b>140</b>               |  |
| ft/ft      | <b>0.025</b>     | <b>0.011</b>             |  |
| ft/s       | <b>0.80</b>      | <b>1.72</b>              |  |
| hr         | <b>0.019</b>     | <b>0.023</b>             |  |

Shallow Conc. Flow Sub-Total **0.042 hours**

**Channel Flow**

12. Flow Length, L
13. Cross Sectional flow area, a
14. Wetted Perimeter, P<sub>w</sub>
15. Hydraulic Radius, r
16. Channel Slope, s
17. Manning's Roughness Coeff., n
18. Velocity, V
19. Compute T<sub>t</sub>

$$r = a / P_w$$

$$V = (1.49 r^{2/3} s^{1/2}) / n$$

$$T_t = \frac{L}{3600 V}$$

|                 |  |  |  |
|-----------------|--|--|--|
| Segment ID      |  |  |  |
| ft              |  |  |  |
| ft <sup>2</sup> |  |  |  |
| ft              |  |  |  |
| ft              |  |  |  |
| ft/ft           |  |  |  |
| ft/s            |  |  |  |
| hr              |  |  |  |

Channel Flow Sub-Total **0.000 hours**

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>

(Add Sub-Total T<sub>t</sub> from prior steps)

|                                  |                    |
|----------------------------------|--------------------|
| Total T <sub>c</sub> (hours) =   | <b>0.279 hours</b> |
| Total T <sub>c</sub> (minutes) = | <b>17 minutes</b>  |

Project: Beacon Unitarian Universalist Church

By: SM

Date: 11/29/2023

Location: Summit, NJ

Checked By: MJV

Date Checked: 11/29/2023

Circle One: Present Developed

Current Proposed Watershed PR-2D Pervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Flow Length, L (total L < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. Compute T<sub>t</sub>

$$T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} s^{0.4}}$$

|            |                      |                               |  |
|------------|----------------------|-------------------------------|--|
| Segment ID | <b>1</b>             | <b>2</b>                      |  |
|            | <b>Dense Grasses</b> | <b>Woods Light Underbrush</b> |  |
|            | <b>0.24</b>          | <b>0.40</b>                   |  |
| ft         | <b>37</b>            | <b>63</b>                     |  |
| in         | <b>3.46</b>          | <b>3.46</b>                   |  |
| ft/ft      | <b>0.065</b>         | <b>0.025</b>                  |  |
| hr         | <b>0.064</b>         | <b>0.216</b>                  |  |

Sheet Flow Sub-Total **0.281 hours**

**Shallow Concentrated Flow**

7. Surface Description
8. Flow Length, L
9. Watercourse Slope, s
10. Average Velocity, V (NEH table 15-3)
11. Compute T<sub>t</sub>

$$T_t = \frac{L}{3600 V}$$

|            |                  |                          |  |
|------------|------------------|--------------------------|--|
| Segment ID | <b>3</b>         | <b>4</b>                 |  |
|            | <b>Woodlands</b> | <b>Grassed Waterways</b> |  |
| ft         | <b>56</b>        | <b>140</b>               |  |
| ft/ft      | <b>0.025</b>     | <b>0.011</b>             |  |
| ft/s       | <b>0.80</b>      | <b>1.72</b>              |  |
| hr         | <b>0.020</b>     | <b>0.023</b>             |  |

Shallow Conc. Flow Sub-Total **0.042 hours**

**Channel Flow**

12. Flow Length, L
13. Cross Sectional flow area, a
14. Wetted Perimeter, P<sub>w</sub>
15. Hydraulic Radius, r
16. Channel Slope, s
17. Manning's Roughness Coeff., n
18. Velocity, V
19. Compute T<sub>t</sub>

$$r = a / P_w$$

$$V = (1.49 r^{2/3} s^{1/2}) / n$$

$$T_t = \frac{L}{3600 V}$$

|                 |  |  |  |
|-----------------|--|--|--|
| Segment ID      |  |  |  |
| ft              |  |  |  |
| ft <sup>2</sup> |  |  |  |
| ft              |  |  |  |
| ft              |  |  |  |
| ft/ft           |  |  |  |
| ft/s            |  |  |  |
| hr              |  |  |  |

Channel Flow Sub-Total **0.000 hours**

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>

(Add Sub-Total T<sub>t</sub> from prior steps)

|                                  |                    |
|----------------------------------|--------------------|
| Total T <sub>c</sub> (hours) =   | <b>0.323 hours</b> |
| Total T <sub>c</sub> (minutes) = | <b>19 minutes</b>  |

# Hydrograph Report

Project Name:

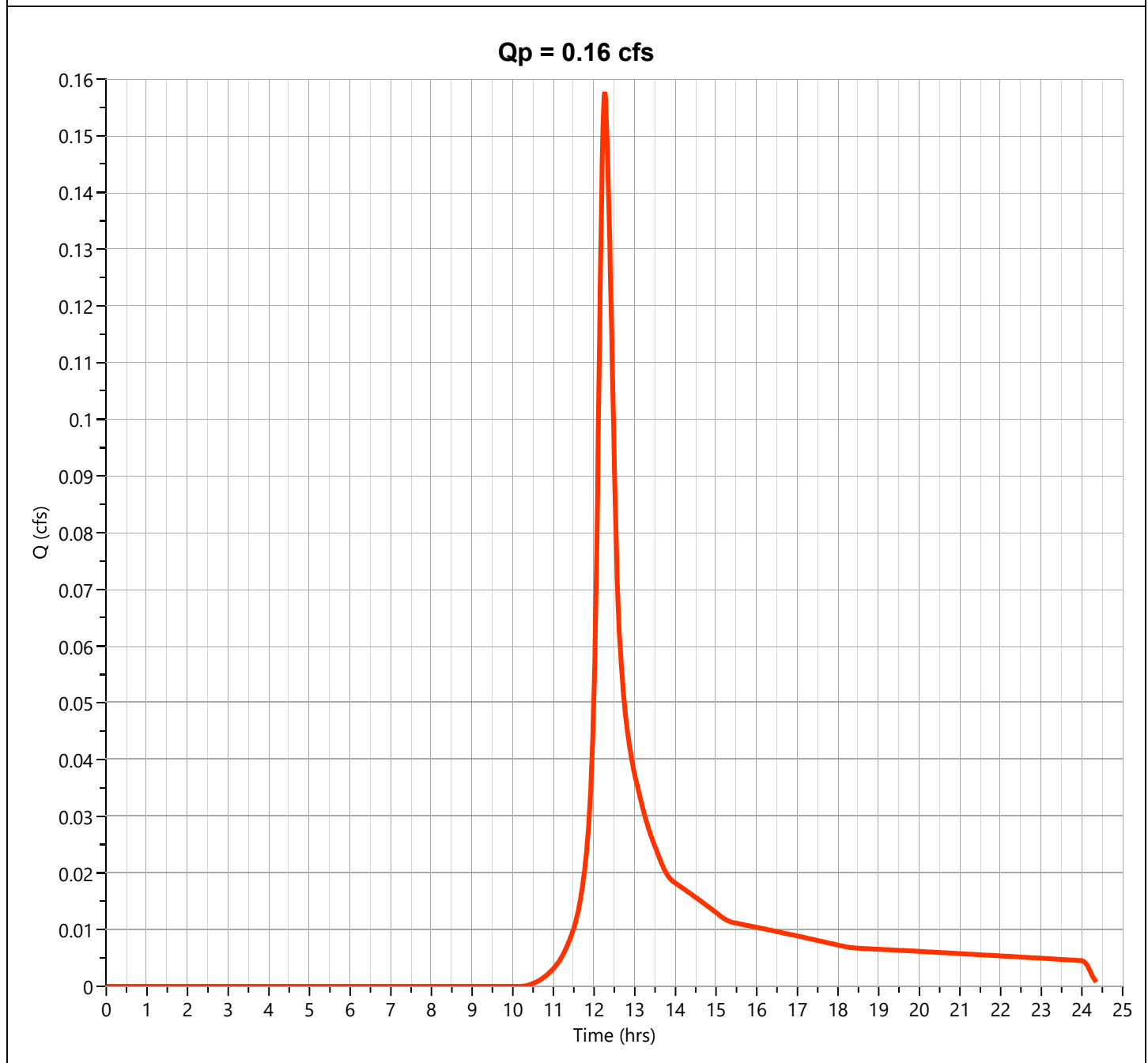
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2D Grass HSGC C

## Hyd. No. 21

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.158 cfs |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.27 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 748 cuft  |
| Drainage Area   | = 0.17 ac     | Curve Number       | = 74        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 19.0 min  |
| Total Rainfall  | = 3.46 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

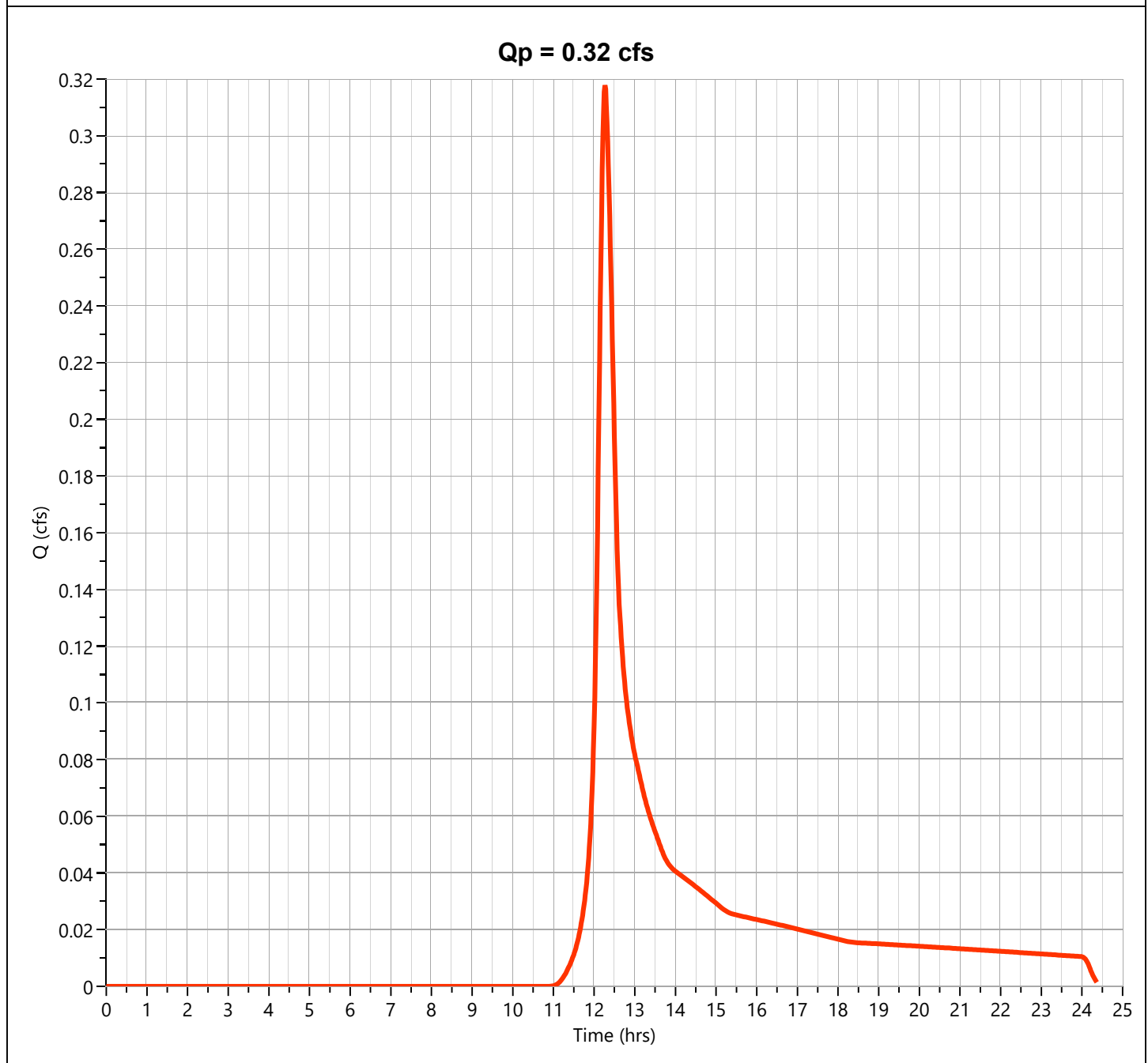
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2D Woods HSGC C

## Hyd. No. 22

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.318 cfs  |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.27 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 1,571 cuft |
| Drainage Area   | = 0.44 ac     | Curve Number       | = 70         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 19.0 min   |
| Total Rainfall  | = 3.46 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

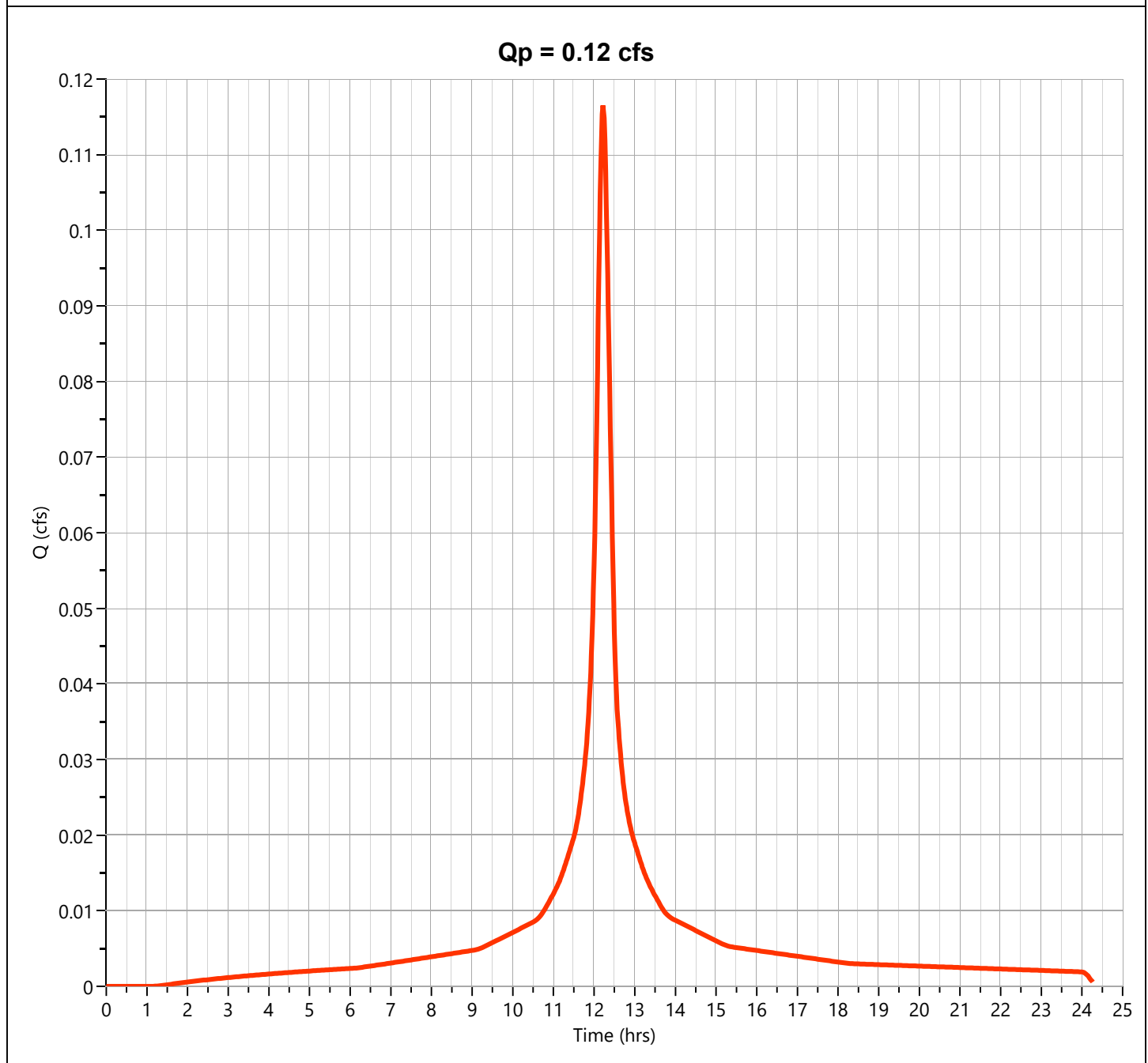
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2D Impervious

## Hyd. No. 23

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.116 cfs |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.22 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 579 cuft  |
| Drainage Area   | = 0.05 ac     | Curve Number       | = 98        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 17.0 min  |
| Total Rainfall  | = 3.46 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |





# Hydrograph Report

Project Name:

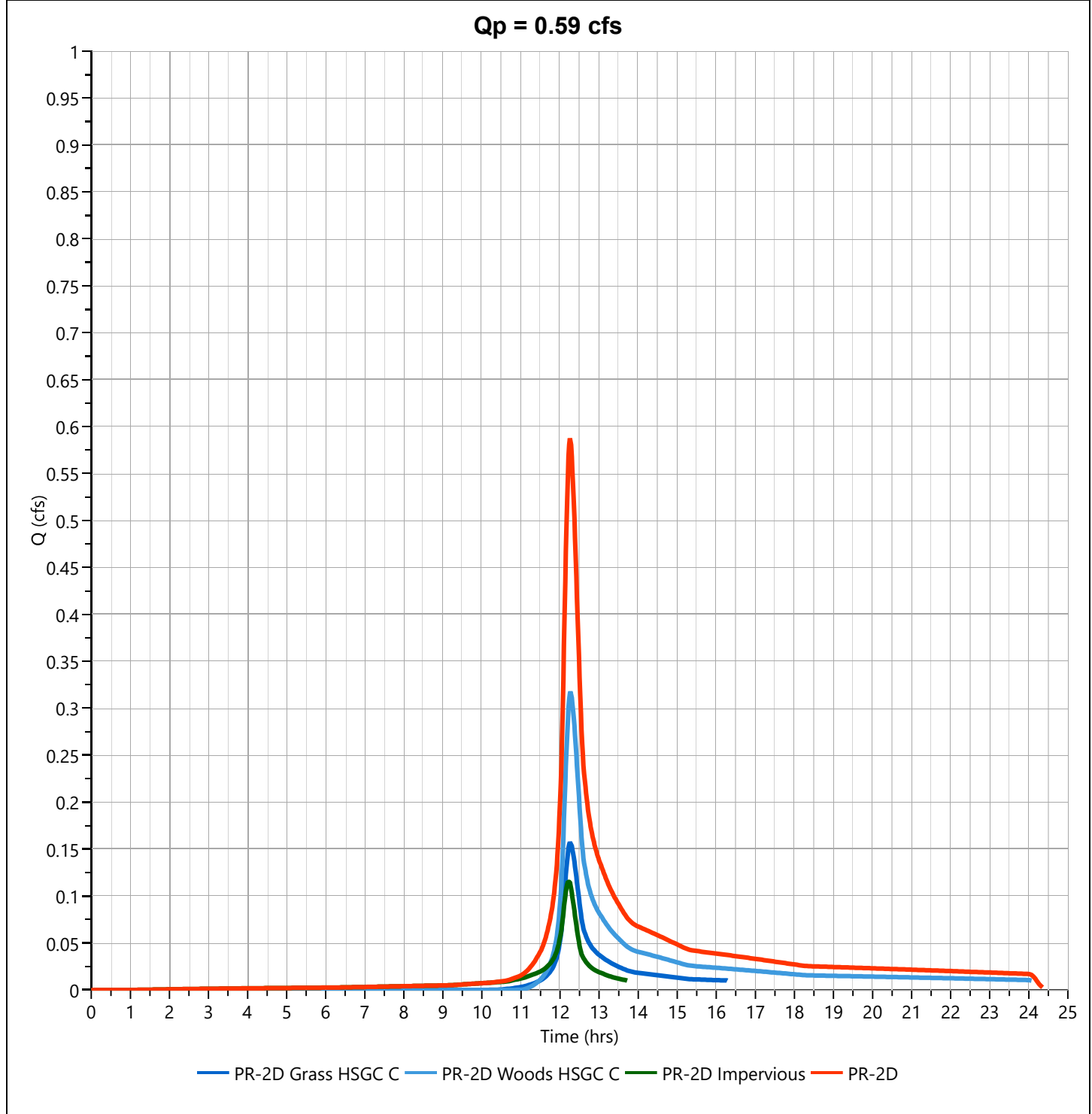
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2D

## Hyd. No. 24

|                    |              |                     |              |
|--------------------|--------------|---------------------|--------------|
| Hydrograph Type    | = Junction   | Peak Flow           | = 0.587 cfs  |
| Storm Frequency    | = 2-yr       | Time to Peak        | = 12.25 hrs  |
| Time Interval      | = 1 min      | Hydrograph Volume   | = 2,898 cuft |
| Inflow Hydrographs | = 21, 22, 23 | Total Contrib. Area | = 0.66 ac    |



# Hydrograph Report

Project Name:

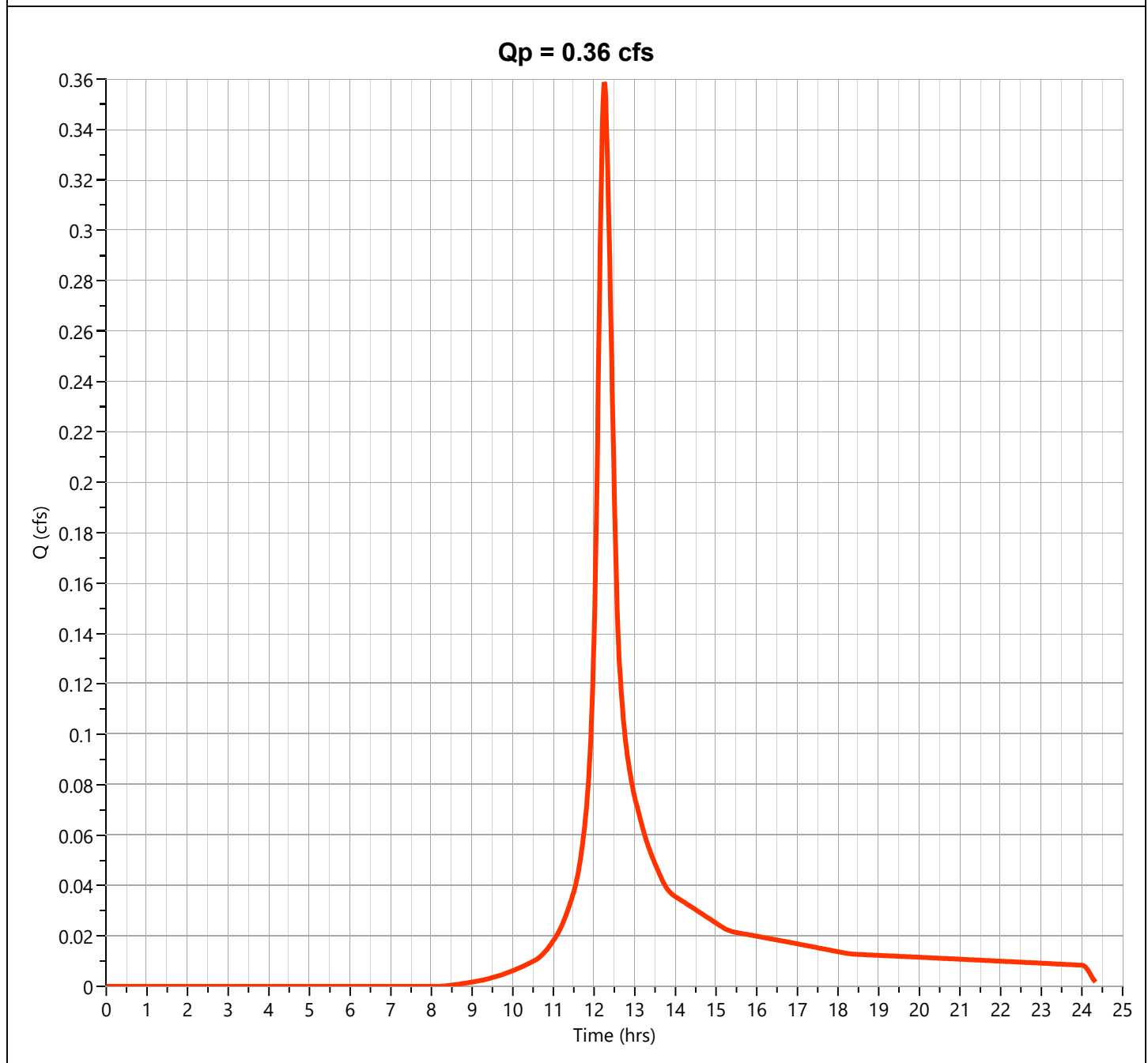
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2D Grass HSGC C

## Hyd. No. 21

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.359 cfs  |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.25 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 1,648 cuft |
| Drainage Area   | = 0.17 ac     | Curve Number       | = 74         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 19.0 min   |
| Total Rainfall  | = 5.38 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

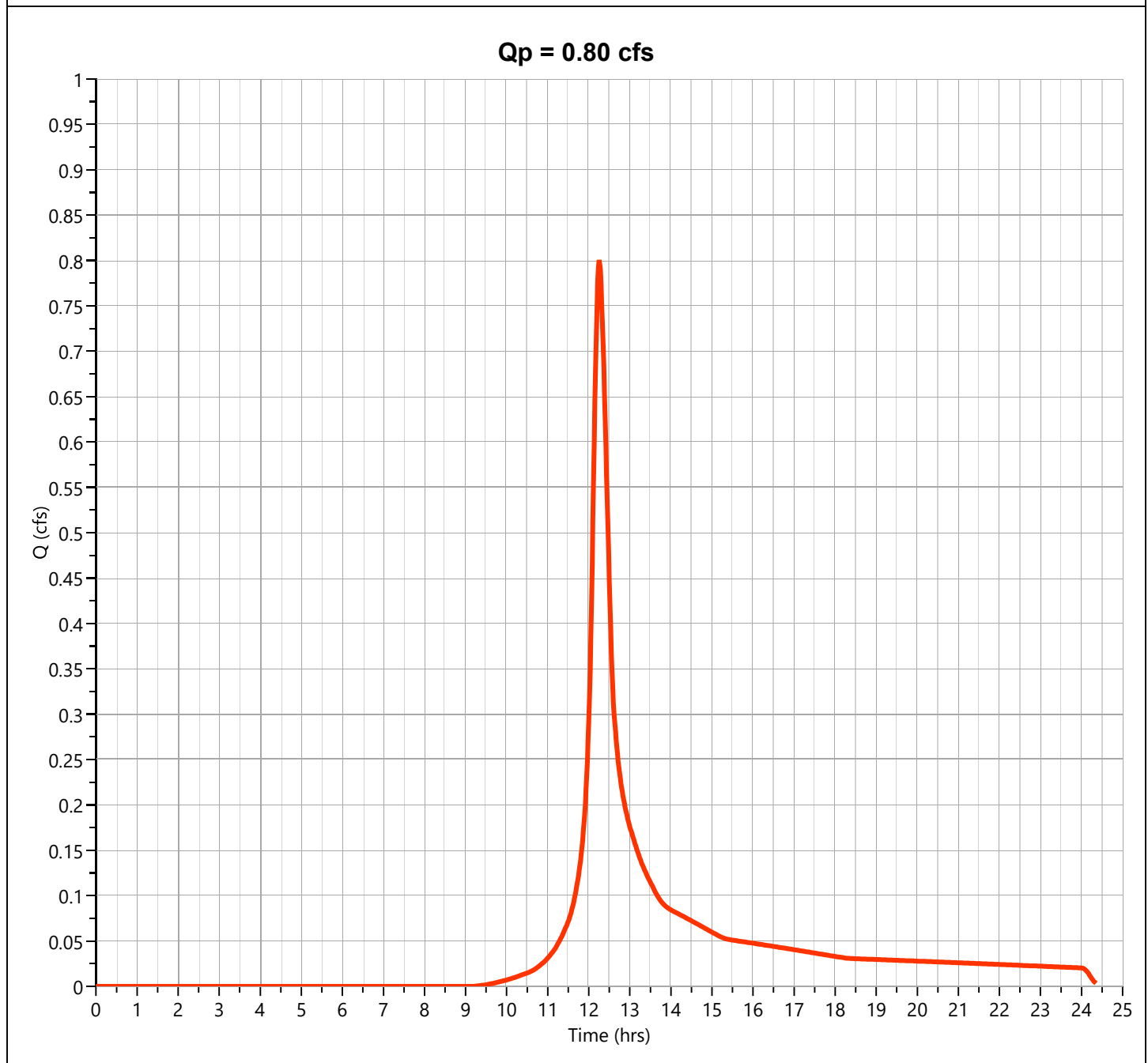
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2D Woods HSGC C

## Hyd. No. 22

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.800 cfs  |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.25 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 3,709 cuft |
| Drainage Area   | = 0.44 ac     | Curve Number       | = 70         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 19.0 min   |
| Total Rainfall  | = 5.38 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

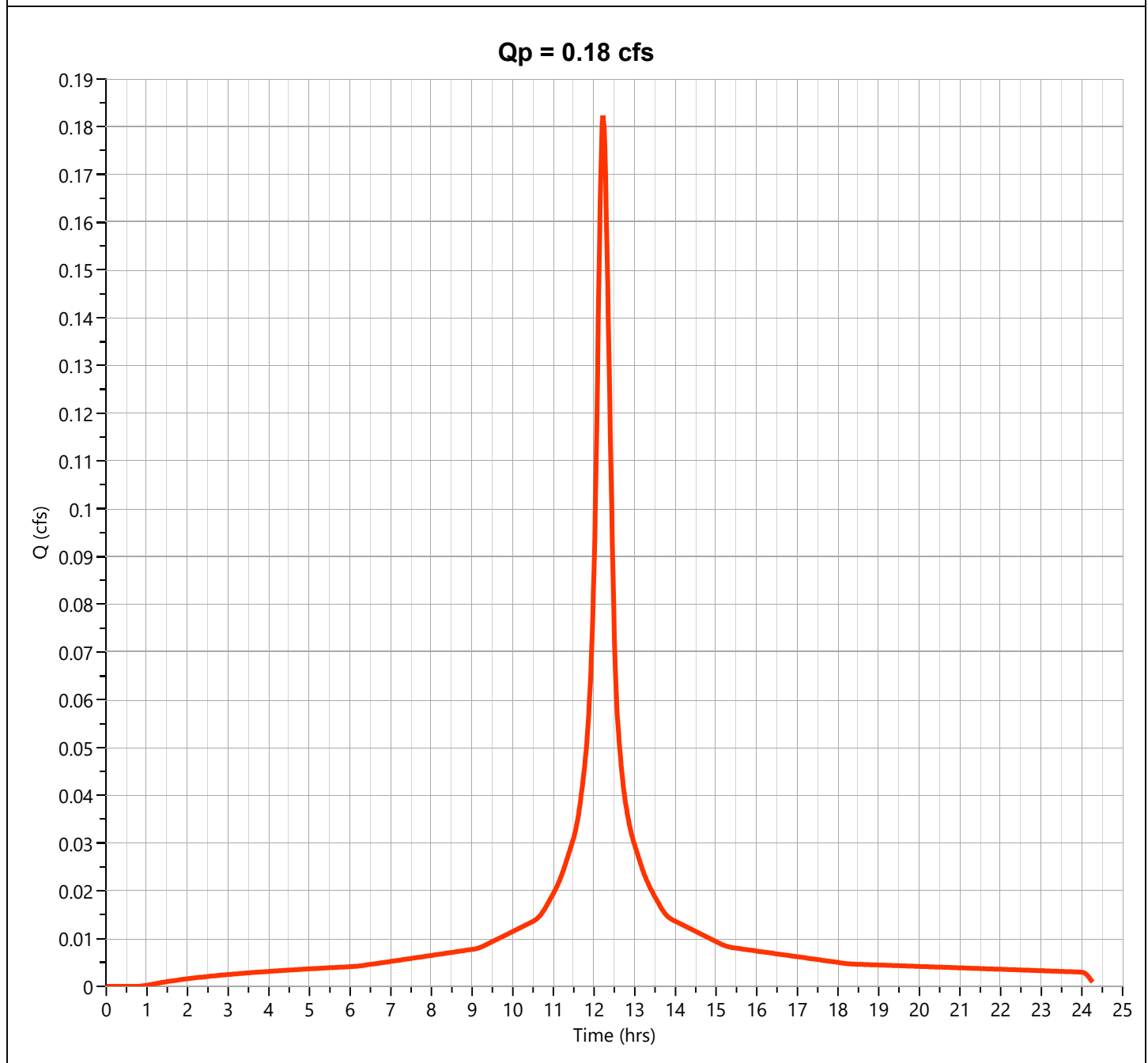
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2D Impervious

## Hyd. No. 23

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.182 cfs |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.22 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 923 cuft  |
| Drainage Area   | = 0.05 ac     | Curve Number       | = 98        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 17.0 min  |
| Total Rainfall  | = 5.38 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

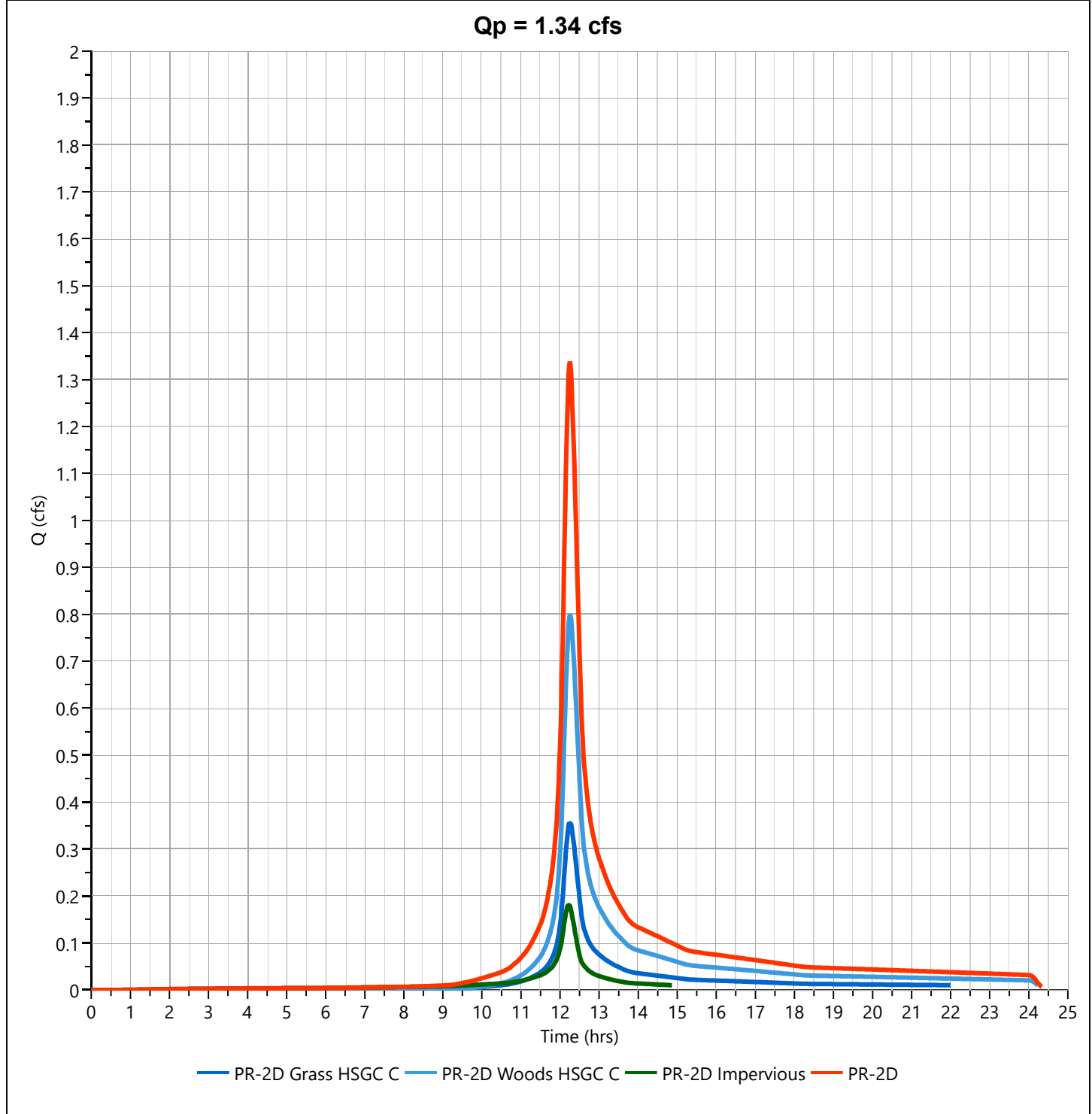
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2D

## Hyd. No. 24

|                    |              |                     |              |
|--------------------|--------------|---------------------|--------------|
| Hydrograph Type    | = Junction   | Peak Flow           | = 1.339 cfs  |
| Storm Frequency    | = 10-yr      | Time to Peak        | = 12.25 hrs  |
| Time Interval      | = 1 min      | Hydrograph Volume   | = 6,280 cuft |
| Inflow Hydrographs | = 21, 22, 23 | Total Contrib. Area | = 0.66 ac    |



# Hydrograph Report

Project Name:

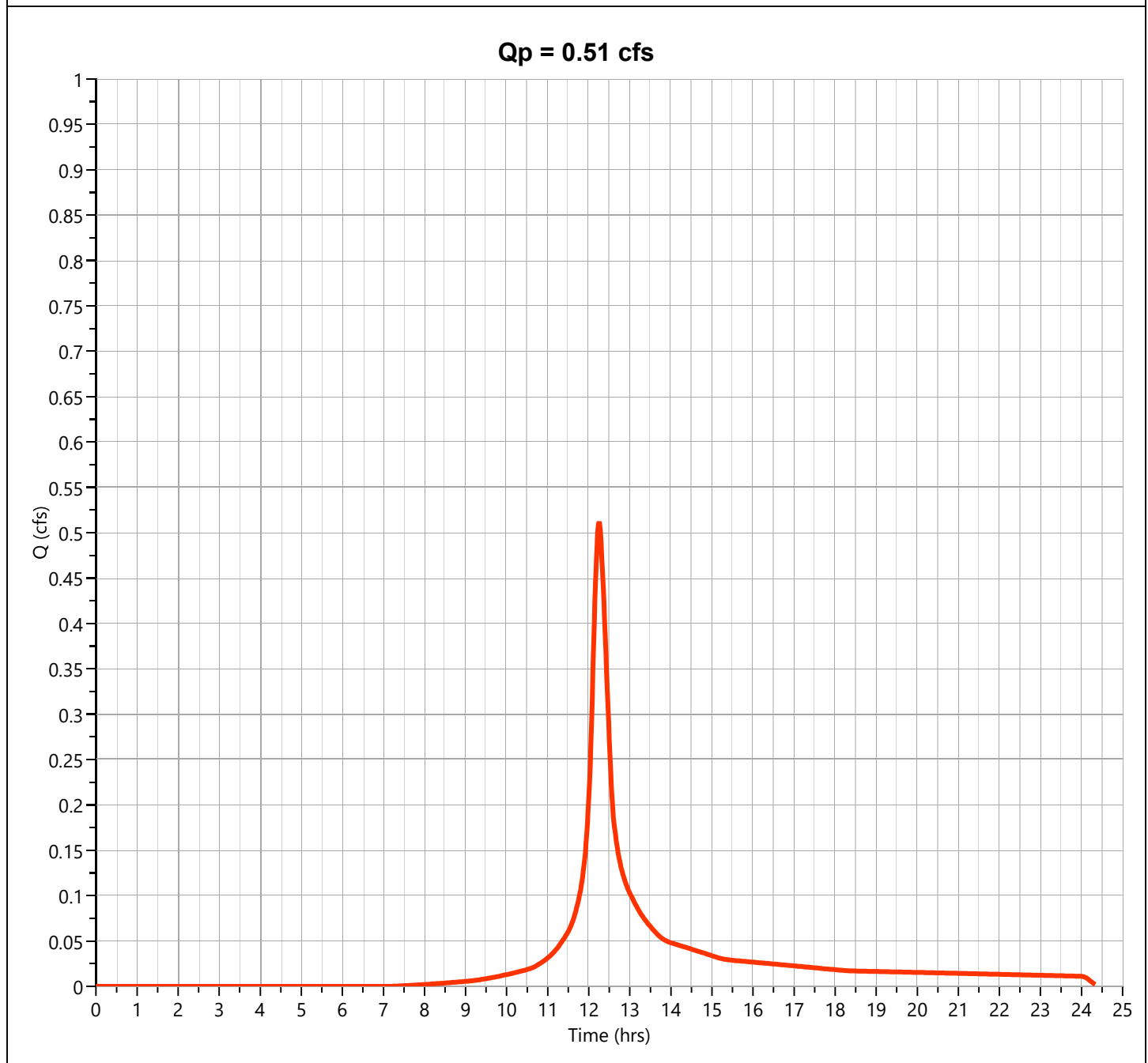
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2D Grass HSGC C

## Hyd. No. 21

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.512 cfs  |
| Storm Frequency | = 25-yr       | Time to Peak       | = 12.25 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 2,350 cuft |
| Drainage Area   | = 0.17 ac     | Curve Number       | = 74         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 19.0 min   |
| Total Rainfall  | = 6.73 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

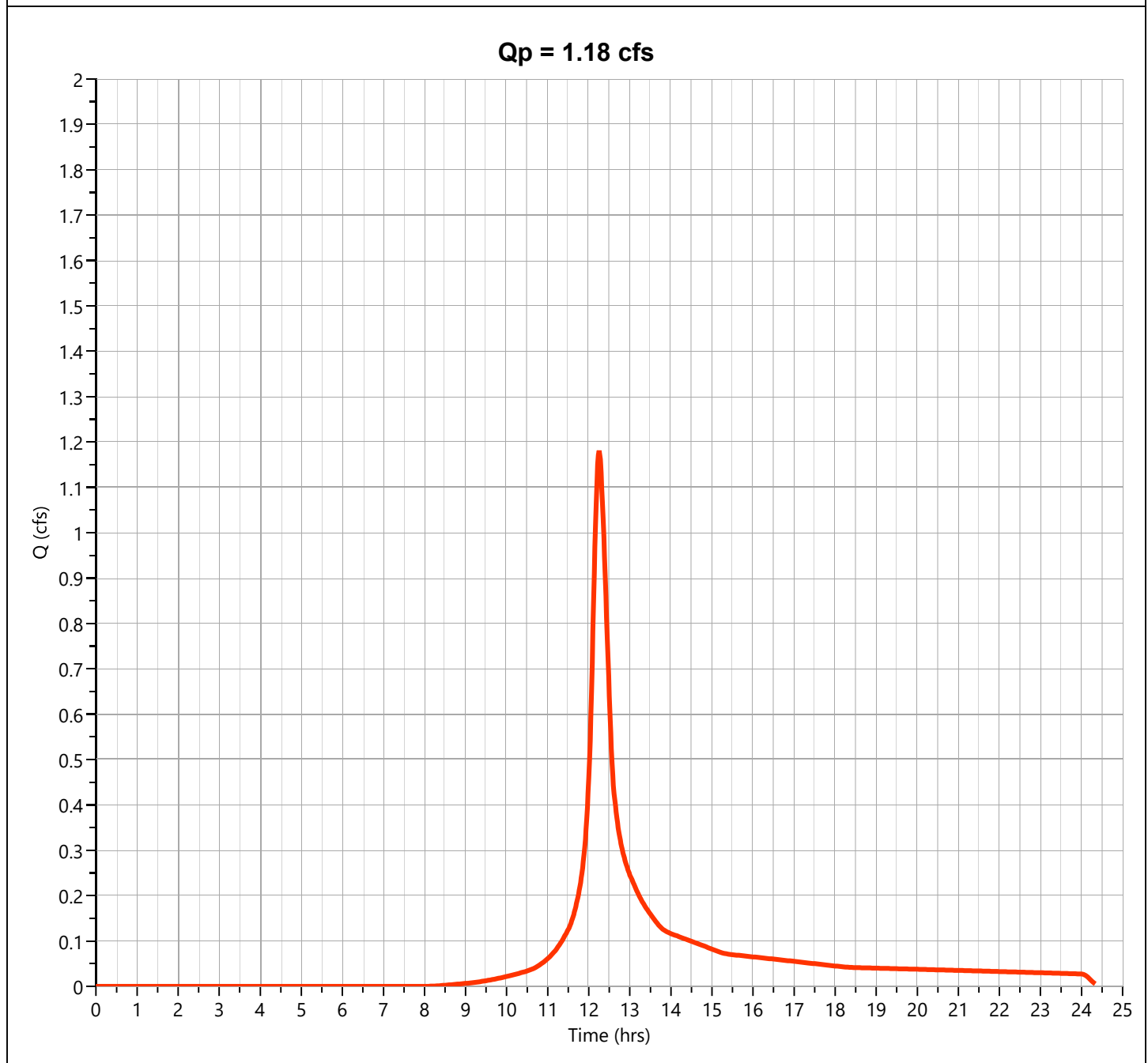
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2D Woods HSGC C

## Hyd. No. 22

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 1.181 cfs  |
| Storm Frequency | = 25-yr       | Time to Peak       | = 12.25 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 5,423 cuft |
| Drainage Area   | = 0.44 ac     | Curve Number       | = 70         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 19.0 min   |
| Total Rainfall  | = 6.73 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

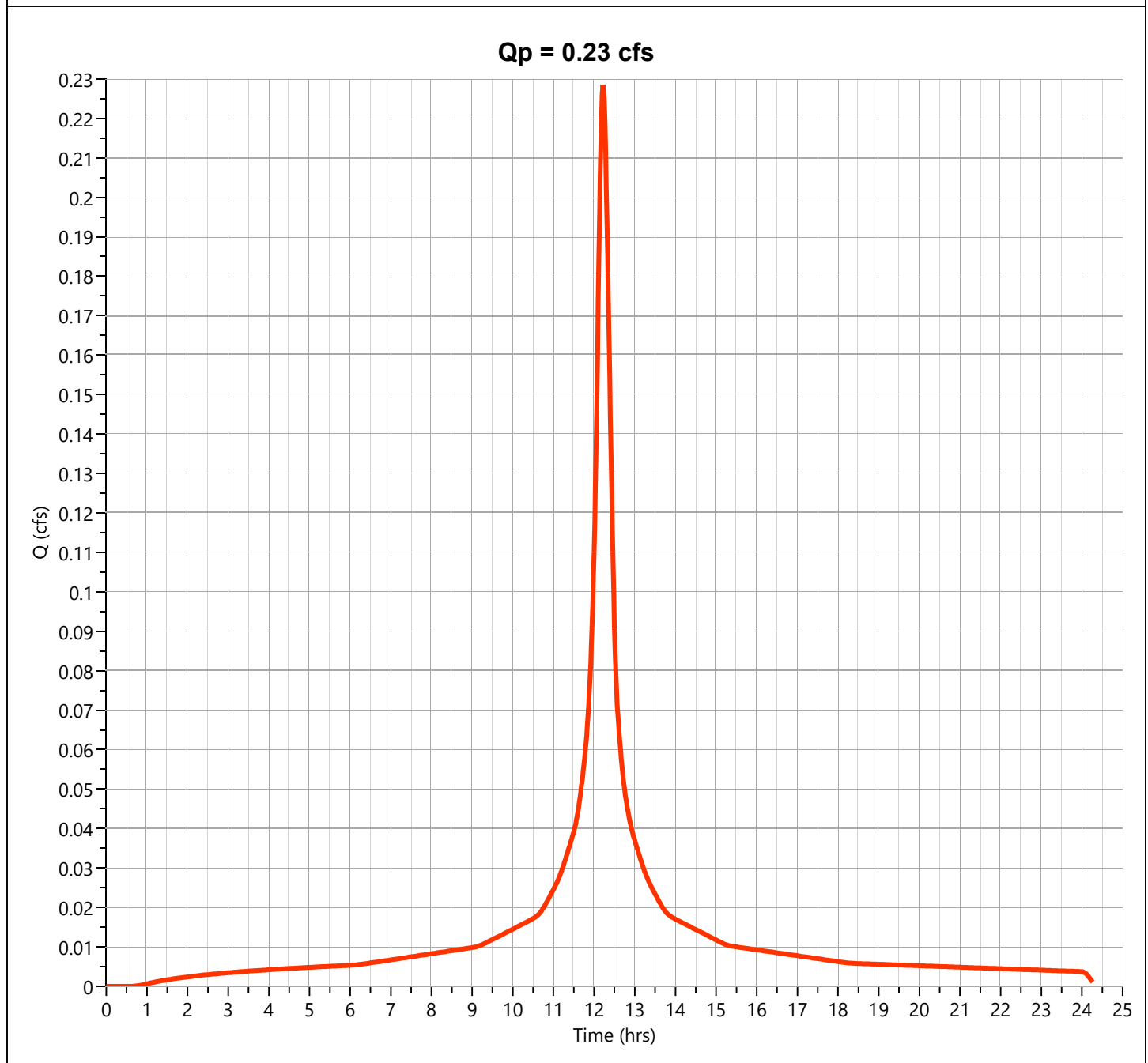
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2D Impervious

## Hyd. No. 23

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.229 cfs  |
| Storm Frequency | = 25-yr       | Time to Peak       | = 12.22 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 1,165 cuft |
| Drainage Area   | = 0.05 ac     | Curve Number       | = 98         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 17.0 min   |
| Total Rainfall  | = 6.73 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |





# Hydrograph Report

Project Name:

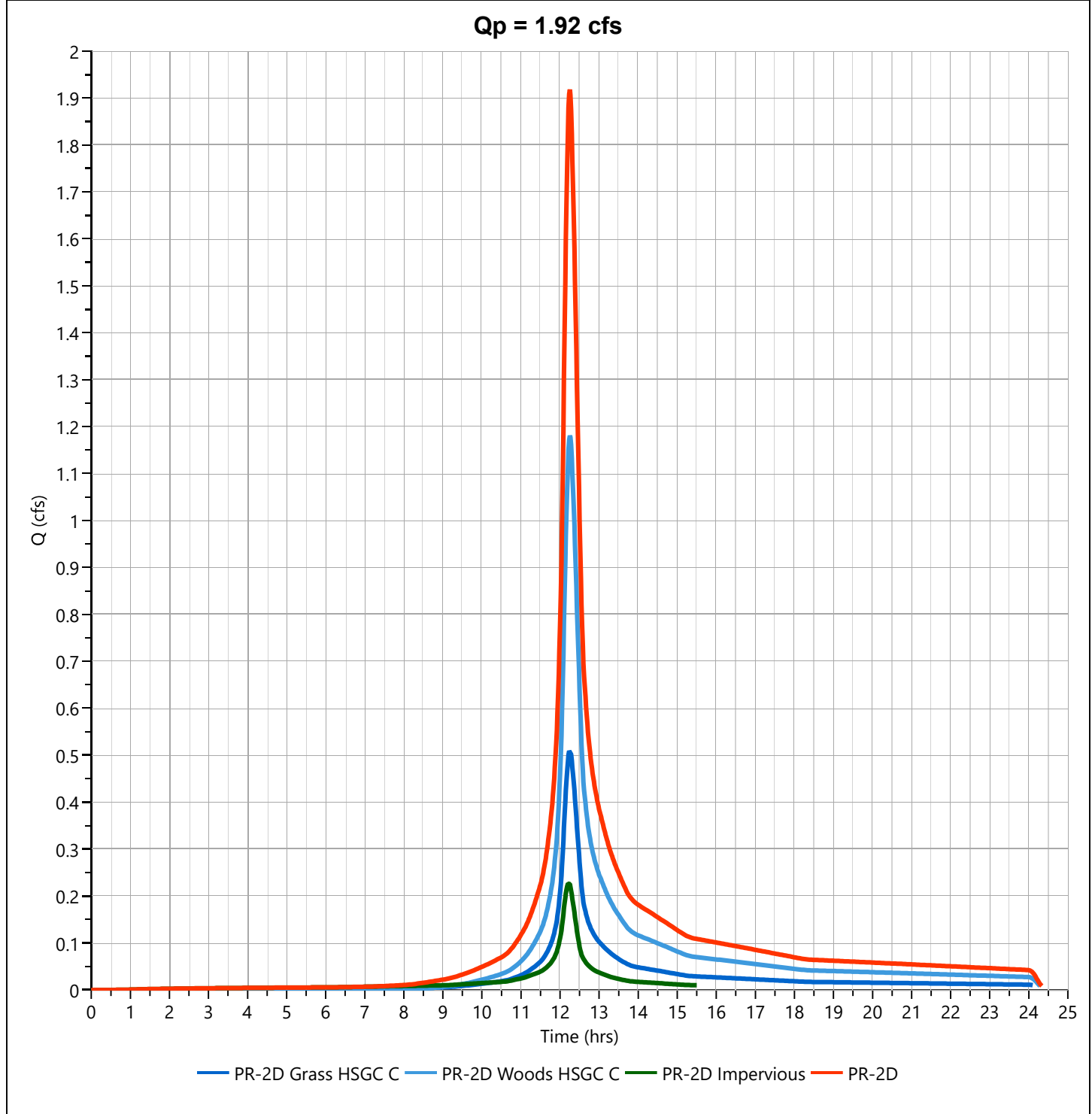
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2D

## Hyd. No. 24

|                    |              |                     |              |
|--------------------|--------------|---------------------|--------------|
| Hydrograph Type    | = Junction   | Peak Flow           | = 1.918 cfs  |
| Storm Frequency    | = 25-yr      | Time to Peak        | = 12.25 hrs  |
| Time Interval      | = 1 min      | Hydrograph Volume   | = 8,937 cuft |
| Inflow Hydrographs | = 21, 22, 23 | Total Contrib. Area | = 0.66 ac    |



# Hydrograph Report

Project Name:

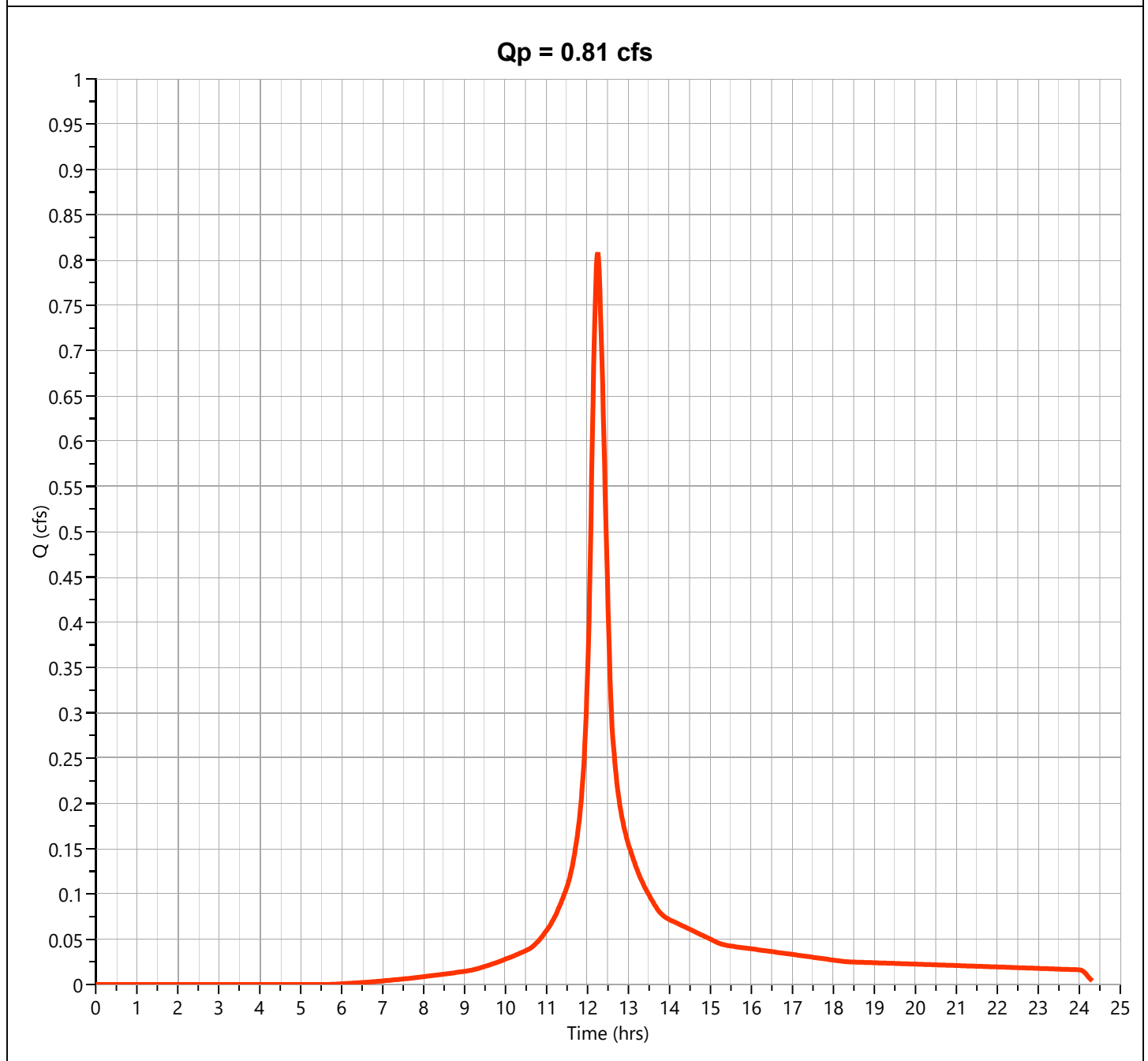
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2D Grass HSGC C

## Hyd. No. 21

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.808 cfs  |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.25 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 3,744 cuft |
| Drainage Area   | = 0.17 ac     | Curve Number       | = 74         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 19.0 min   |
| Total Rainfall  | = 9.26 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

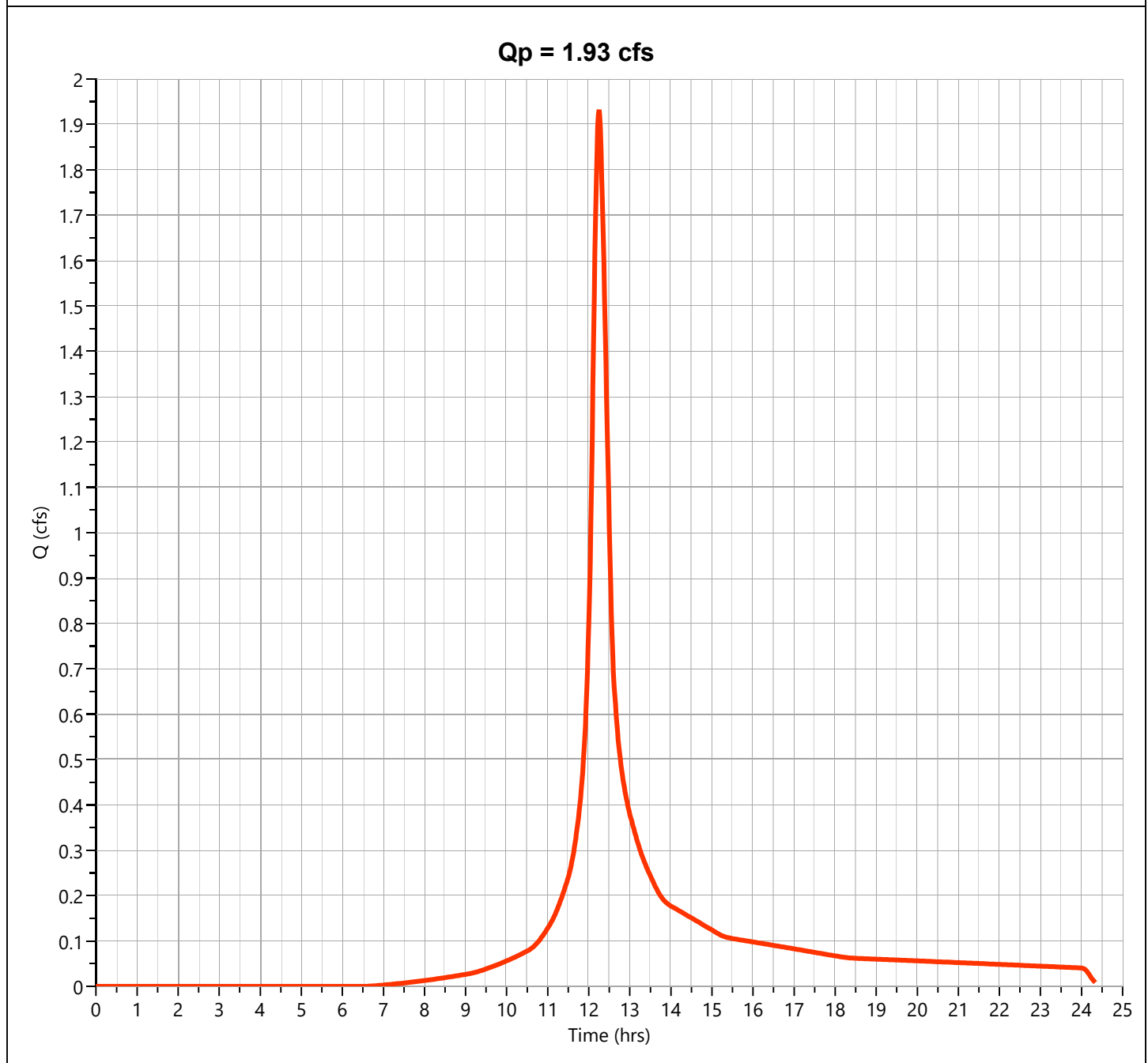
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2D Woods HSGC C

## Hyd. No. 22

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 1.932 cfs  |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.25 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 8,888 cuft |
| Drainage Area   | = 0.44 ac     | Curve Number       | = 70         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 19.0 min   |
| Total Rainfall  | = 9.26 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

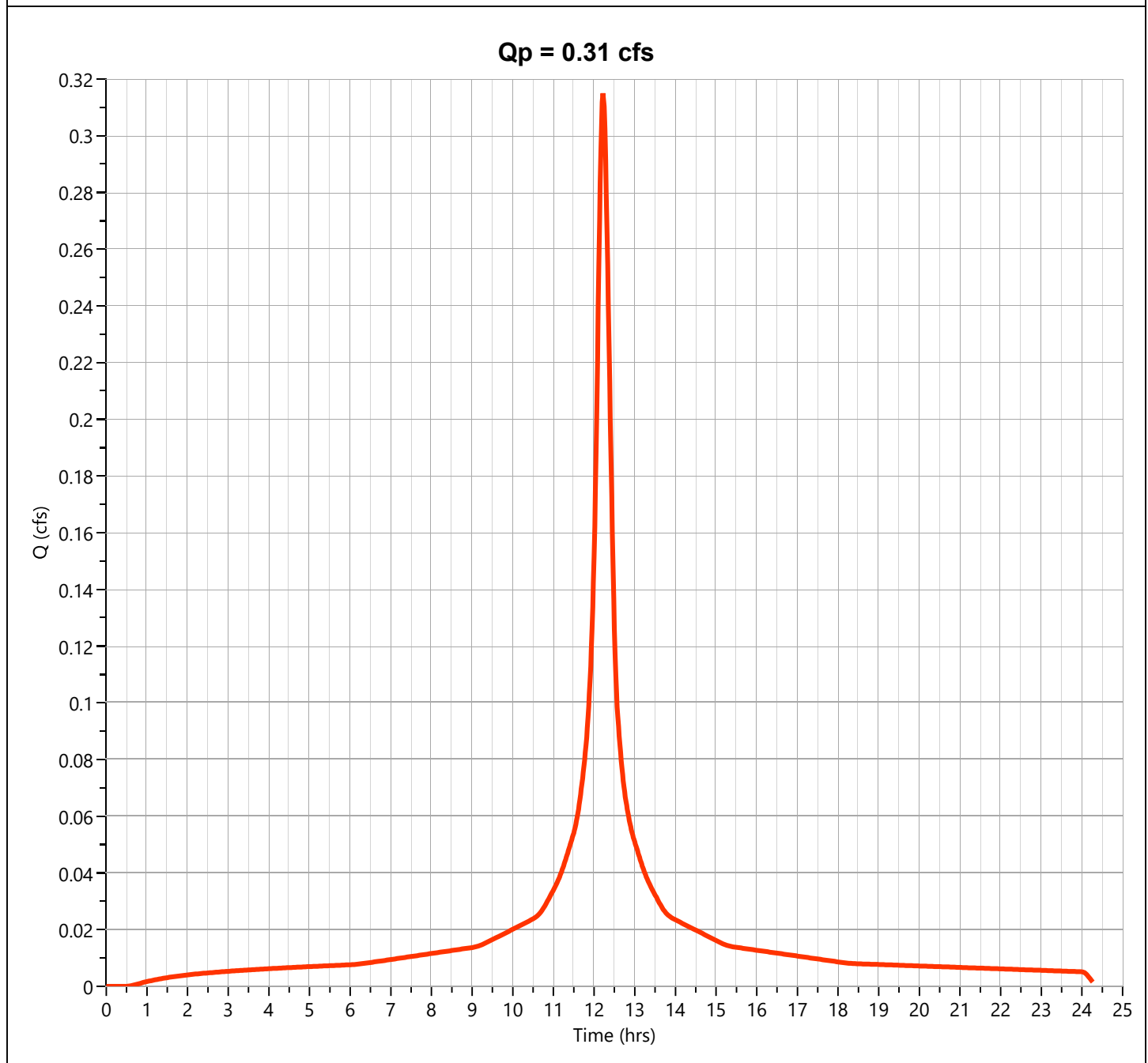
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2D Impervious

## Hyd. No. 23

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.315 cfs  |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.22 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 1,618 cuft |
| Drainage Area   | = 0.05 ac     | Curve Number       | = 98         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 17.0 min   |
| Total Rainfall  | = 9.26 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

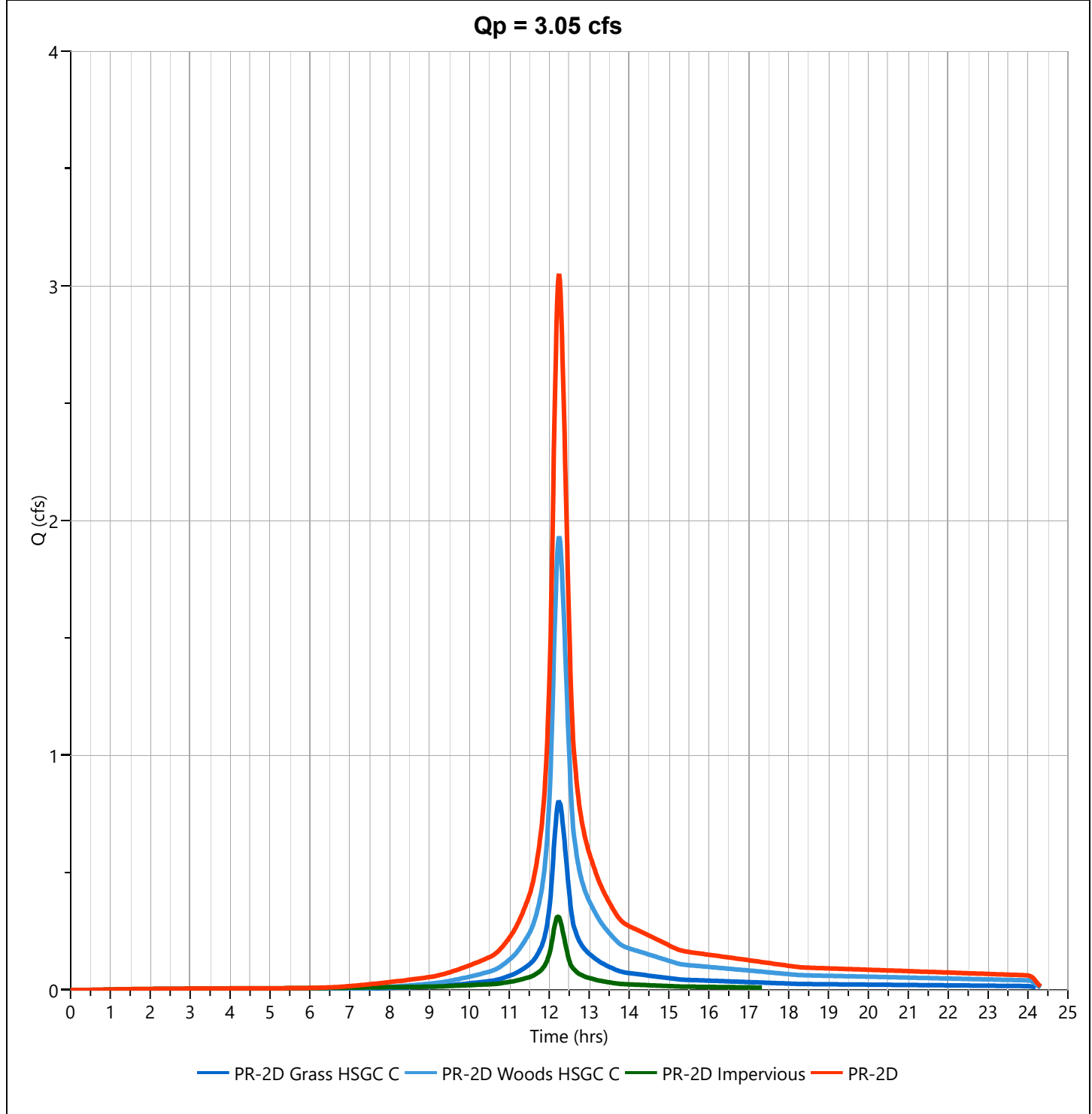
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2D

## Hyd. No. 24

|                    |              |                     |               |
|--------------------|--------------|---------------------|---------------|
| Hydrograph Type    | = Junction   | Peak Flow           | = 3.050 cfs   |
| Storm Frequency    | = 100-yr     | Time to Peak        | = 12.25 hrs   |
| Time Interval      | = 1 min      | Hydrograph Volume   | = 14,250 cuft |
| Inflow Hydrographs | = 21, 22, 23 | Total Contrib. Area | = 0.66 ac     |



## **PR-2E WATERSHED**

Project: Beacon Unitarian Universalist Church

By: TEG

Date: 2/6/2024

Location: Summit, NJ

Checked By: MJV

Date Checked: 2/6/2024

Circle One: Present Developed

Current Proposed Watershed PR-2E - Impervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Design Flow Length, L<sub>des</sub> (Total L<sub>des</sub> < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. McCuen-Spiess Limit, L<sub>mcs</sub> (max. 100 ft)
7. Compute T<sub>t</sub>

$$T_t = \frac{0.007 (n L_{des})^{0.8}}{P_2^{0.5} s^{0.4}}$$

$$L_{mcs} = (100 s^{0.5})/n$$

| Segment ID | 1                      | 2                    | 3                    |
|------------|------------------------|----------------------|----------------------|
|            | <b>Smooth Surfaces</b> | <b>Dense Grasses</b> | <b>Dense Grasses</b> |
|            | <b>0.011</b>           | <b>0.24</b>          | <b>0.24</b>          |
| ft         | <b>8</b>               | <b>11</b>            | <b>32</b>            |
| in         | <b>3.46</b>            | <b>3.46</b>          | <b>3.46</b>          |
| ft/ft      | <b>0.023</b>           | <b>0.238</b>         | <b>0.010</b>         |
| ft         | <b>100</b>             | <b>100</b>           | <b>42</b>            |
| hr         | <b>0.002</b>           | <b>0.014</b>         | <b>0.120</b>         |

Sheet Flow Sub-Total **0.136 hours**

**Shallow Concentrated Flow**

8. Surface Description
9. Flow Length, L
10. Watercourse Slope, s
11. Average Velocity, V (NEH table 15-3)
12. Compute T<sub>t</sub>

$$T_t = \frac{L}{3600 V}$$

| Segment ID | 4                        | 5                        |  |
|------------|--------------------------|--------------------------|--|
|            | <b>Grassed Waterways</b> | <b>Grassed Waterways</b> |  |
| ft         | <b>26</b>                | <b>25</b>                |  |
| ft/ft      | <b>0.013</b>             | <b>0.027</b>             |  |
| ft/s       | <b>1.85</b>              | <b>2.66</b>              |  |
| hr         | <b>0.004</b>             | <b>0.003</b>             |  |

Shallow Conc. Flow Sub-Total **0.007 hours**

**Channel Flow**

13. Flow Length, L
14. Cross Sectional flow area, a
15. Wetted Perimeter, P<sub>w</sub>
16. Hydraulic Radius, r
17. Channel Slope, s
18. Manning's Roughness Coeff., n
19. Velocity, V
20. Compute T<sub>t</sub>

$$r = a / P_w$$

$$V = (1.49 r^{2/3} s^{1/2}) / n$$

$$T_t = \frac{L}{3600 V}$$

| Segment ID      | 6            |  |  |
|-----------------|--------------|--|--|
| ft              | <b>291</b>   |  |  |
| ft <sup>2</sup> | <b>0.61</b>  |  |  |
| ft              | <b>2.00</b>  |  |  |
| ft              | <b>0.31</b>  |  |  |
| ft/ft           | <b>0.005</b> |  |  |
|                 | <b>0.012</b> |  |  |
| ft/s            | <b>3.97</b>  |  |  |
| hr              | <b>0.020</b> |  |  |

Channel Flow Sub-Total **0.020 hours**

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>

(Add Sub-Total T<sub>t</sub> from prior steps)

|                                  |                    |
|----------------------------------|--------------------|
| Total T <sub>c</sub> (hours) =   | <b>0.163 hours</b> |
| Total T <sub>c</sub> (minutes) = | <b>10 minutes</b>  |

Project: Beacon Unitarian Universalist Church

By: TEG

Date: 2/6/2024

Location: Summit, NJ

Checked By: MJV

Date Checked: 2/6/2024

Circle One: Present Developed

Current Proposed Watershed PR-2E - Pervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Design Flow Length, L<sub>des</sub> (Total L<sub>des</sub> < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. McCuen-Spiess Limit, L<sub>mcs</sub> (max. 100 ft)  $L_{mcs} = (100 s^{0.5})/n$
7. Compute T<sub>t</sub>  $T_t = \frac{0.007 (nL_{des})^{0.8}}{P_2^{0.5} s^{0.4}}$

| Segment ID | 1                    | 2                    |   |
|------------|----------------------|----------------------|---|
|            | <b>Dense Grasses</b> | <b>Dense Grasses</b> |   |
|            | <b>0.24</b>          | <b>0.24</b>          |   |
| ft         | <b>16</b>            | <b>34</b>            |   |
| in         | <b>3.46</b>          | <b>3.46</b>          |   |
| ft/ft      | <b>0.054</b>         | <b>0.010</b>         |   |
| ft         | <b>97</b>            | <b>41</b>            |   |
| hr         | <b>0.036</b>         | <b>0.129</b>         | + |

Sheet Flow Sub-Total **0.164 hours**

**Shallow Concentrated Flow**

8. Surface Description
9. Flow Length, L
10. Watercourse Slope, s
11. Average Velocity, V (NEH table 15-3)
12. Compute T<sub>t</sub>  $T_t = \frac{L}{3600 V}$

| Segment ID | 3                        | 4                        |   |
|------------|--------------------------|--------------------------|---|
|            | <b>Grassed Waterways</b> | <b>Grassed Waterways</b> |   |
| ft         | <b>26</b>                | <b>25</b>                |   |
| ft/ft      | <b>0.009</b>             | <b>0.027</b>             |   |
| ft/s       | <b>1.50</b>              | <b>2.64</b>              |   |
| hr         | <b>0.005</b>             | <b>0.003</b>             | + |

Shallow Conc. Flow Sub-Total **0.008 hours**

**Channel Flow**

13. Flow Length, L
14. Cross Sectional flow area, a
15. Wetted Perimeter, P<sub>w</sub>
16. Hydraulic Radius, r  $r = a / P_w$
17. Channel Slope, s
18. Manning's Roughness Coeff., n
19. Velocity, V  $V = (1.49 r^{2/3} s^{1/2}) / n$
20. Compute T<sub>t</sub>  $T_t = \frac{L}{3600 V}$

| Segment ID      | 5            |   |  |
|-----------------|--------------|---|--|
| ft              | <b>291</b>   |   |  |
| ft <sup>2</sup> | <b>0.61</b>  |   |  |
| ft              | <b>2.00</b>  |   |  |
| ft              | <b>0.31</b>  |   |  |
| ft/ft           | <b>0.005</b> |   |  |
|                 | <b>0.012</b> |   |  |
| ft/s            | <b>3.97</b>  |   |  |
| hr              | <b>0.020</b> | + |  |

Channel Flow Sub-Total **0.020 hours**

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>

(Add Sub-Total T<sub>t</sub> from prior steps)

|                                  |                    |
|----------------------------------|--------------------|
| Total T <sub>c</sub> (hours) =   | <b>0.192 hours</b> |
| Total T <sub>c</sub> (minutes) = | <b>12 minutes</b>  |



# Hydrograph Report

Project Name:

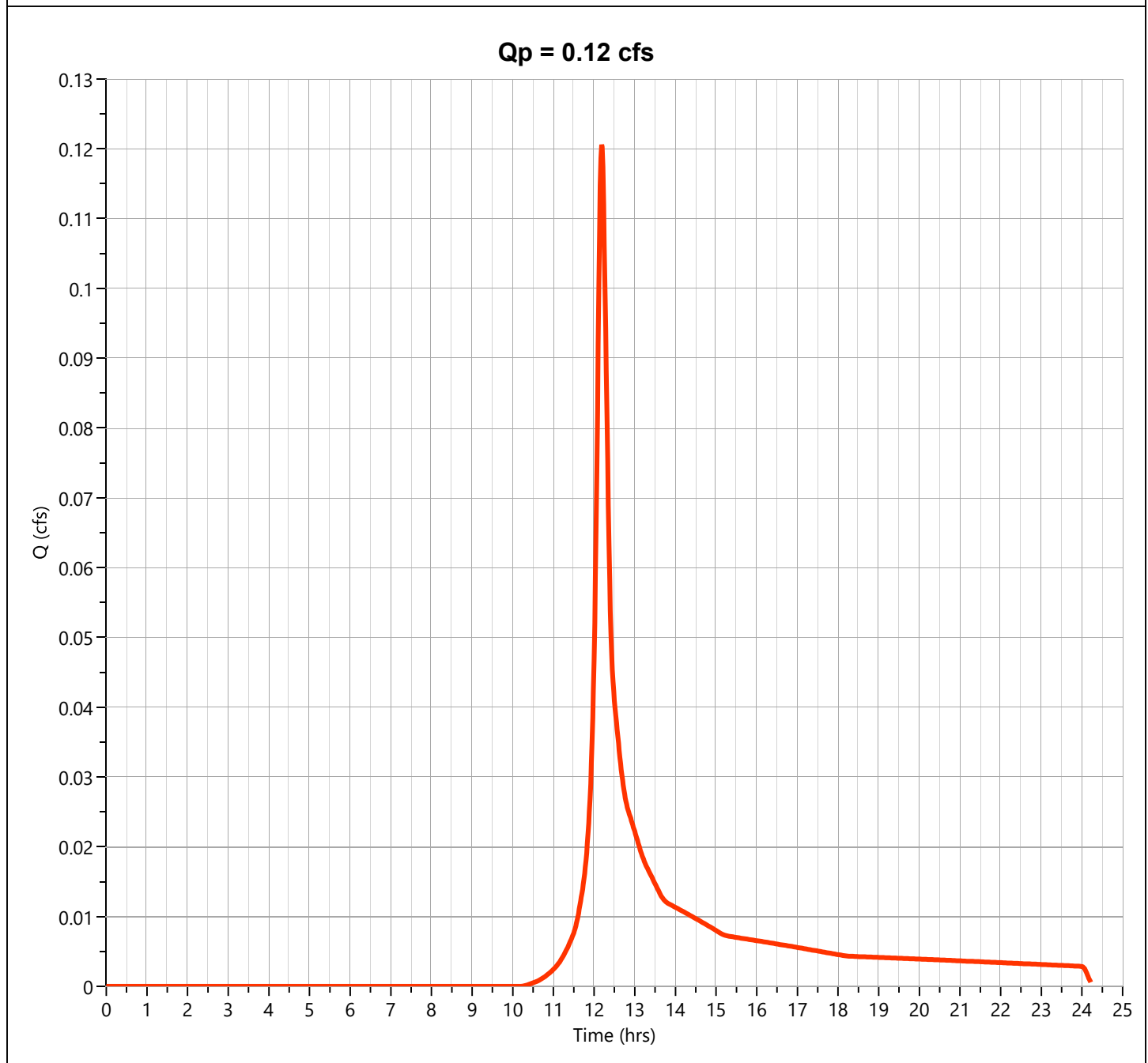
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2E Grass HSGC C

## Hyd. No. 26

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.121 cfs |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.18 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 477 cuft  |
| Drainage Area   | = 0.11 ac     | Curve Number       | = 74        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 12.0 min  |
| Total Rainfall  | = 3.46 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

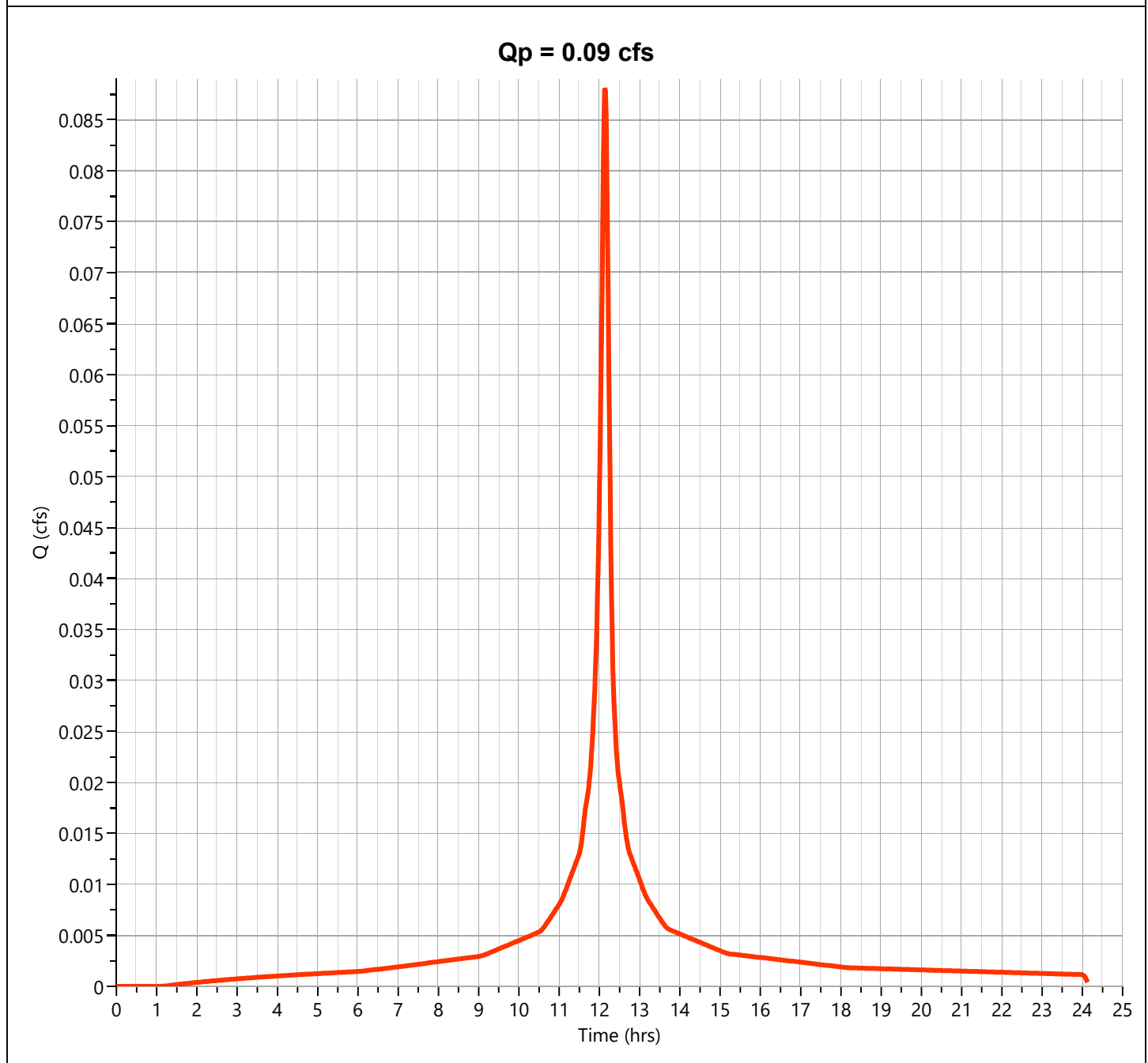
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2E Impervious

## Hyd. No. 27

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.088 cfs |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.13 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 351 cuft  |
| Drainage Area   | = 0.03 ac     | Curve Number       | = 98        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 10.0 min  |
| Total Rainfall  | = 3.46 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

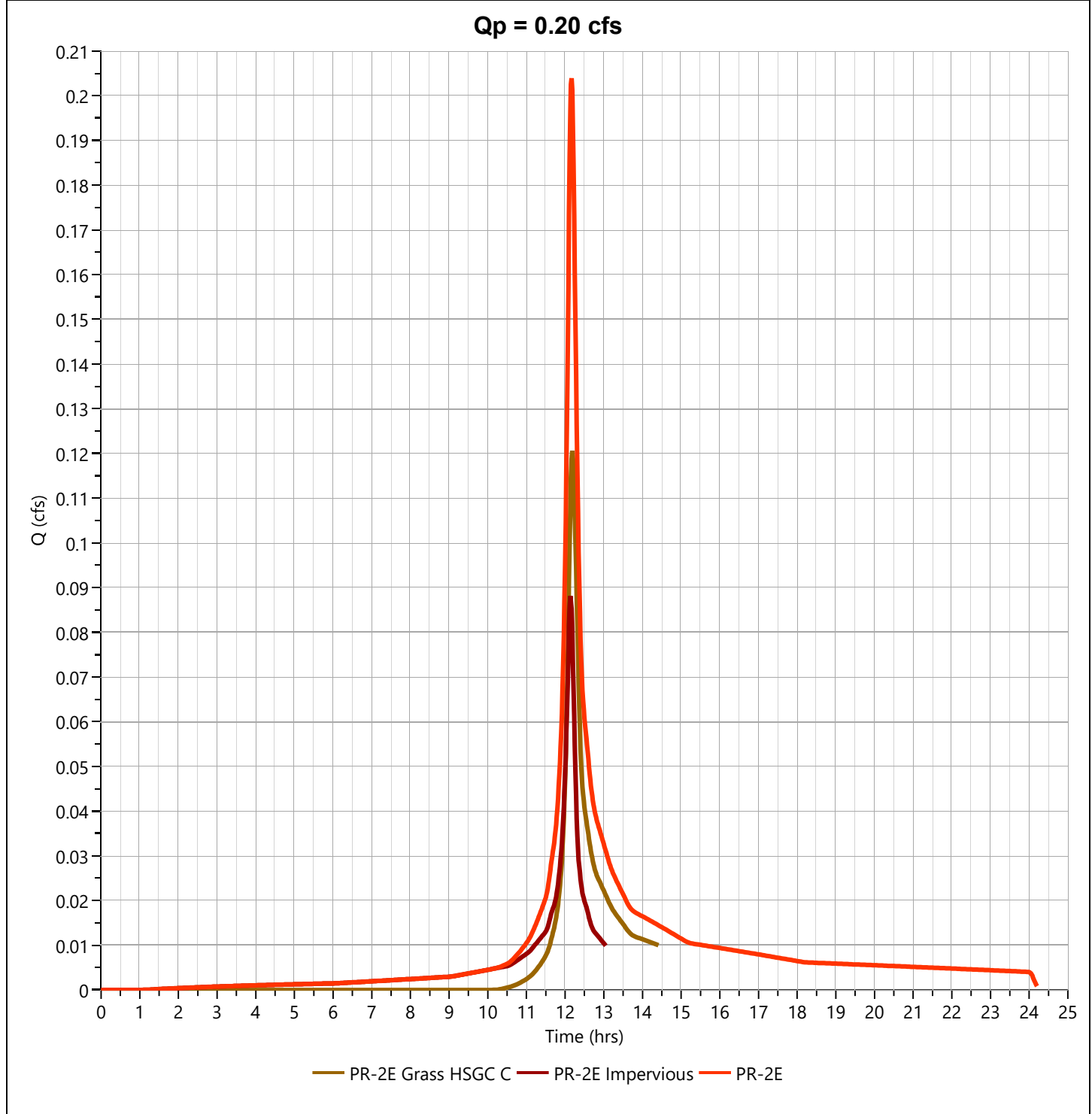
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2E

## Hyd. No. 28

|                    |            |                     |             |
|--------------------|------------|---------------------|-------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.204 cfs |
| Storm Frequency    | = 2-yr     | Time to Peak        | = 12.17 hrs |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 828 cuft  |
| Inflow Hydrographs | = 26, 27   | Total Contrib. Area | = 0.14 ac   |



# Hydrograph Report

Project Name:

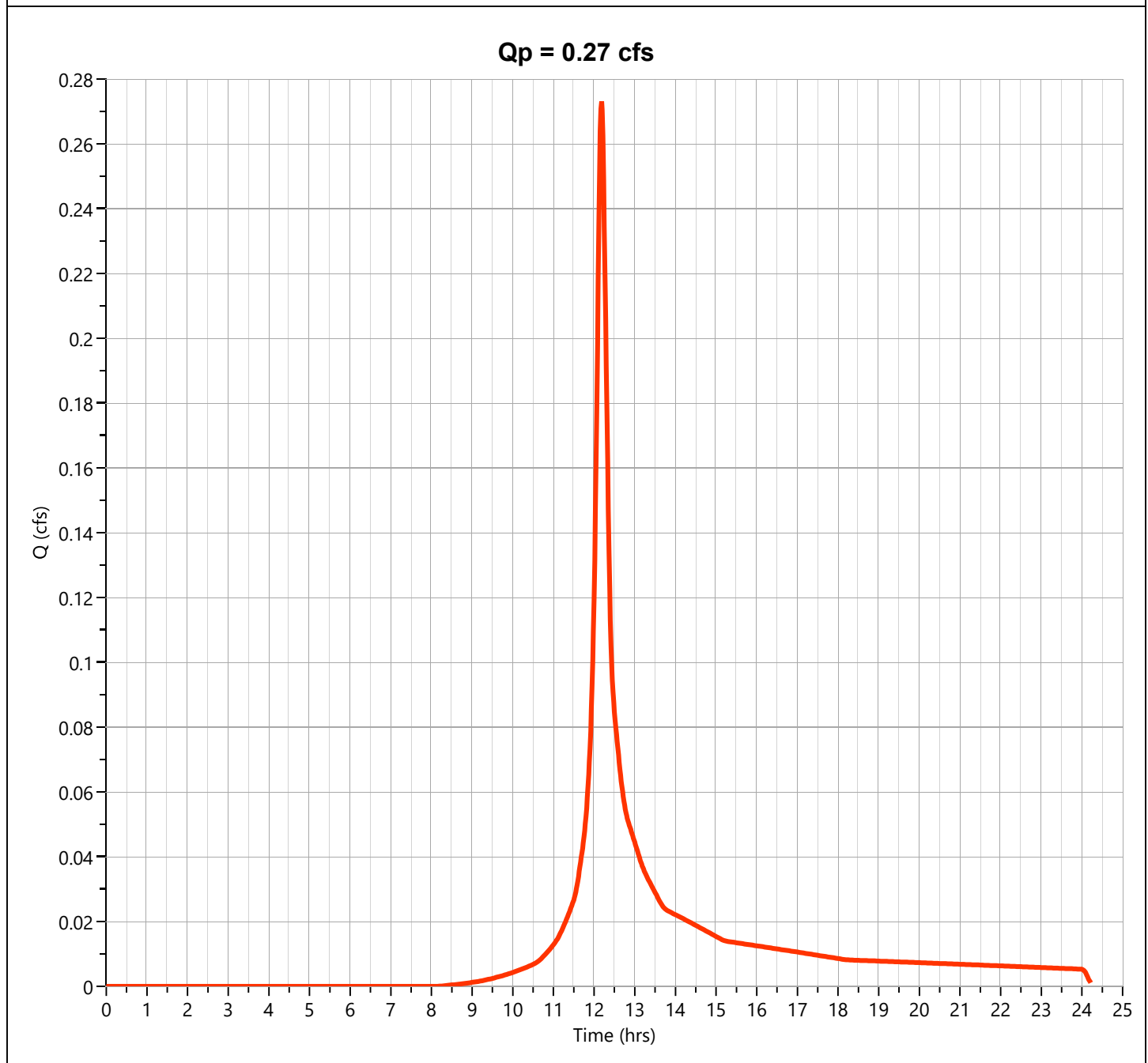
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2E Grass HSGC C

## Hyd. No. 26

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.273 cfs  |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.18 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 1,050 cuft |
| Drainage Area   | = 0.11 ac     | Curve Number       | = 74         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 12.0 min   |
| Total Rainfall  | = 5.38 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

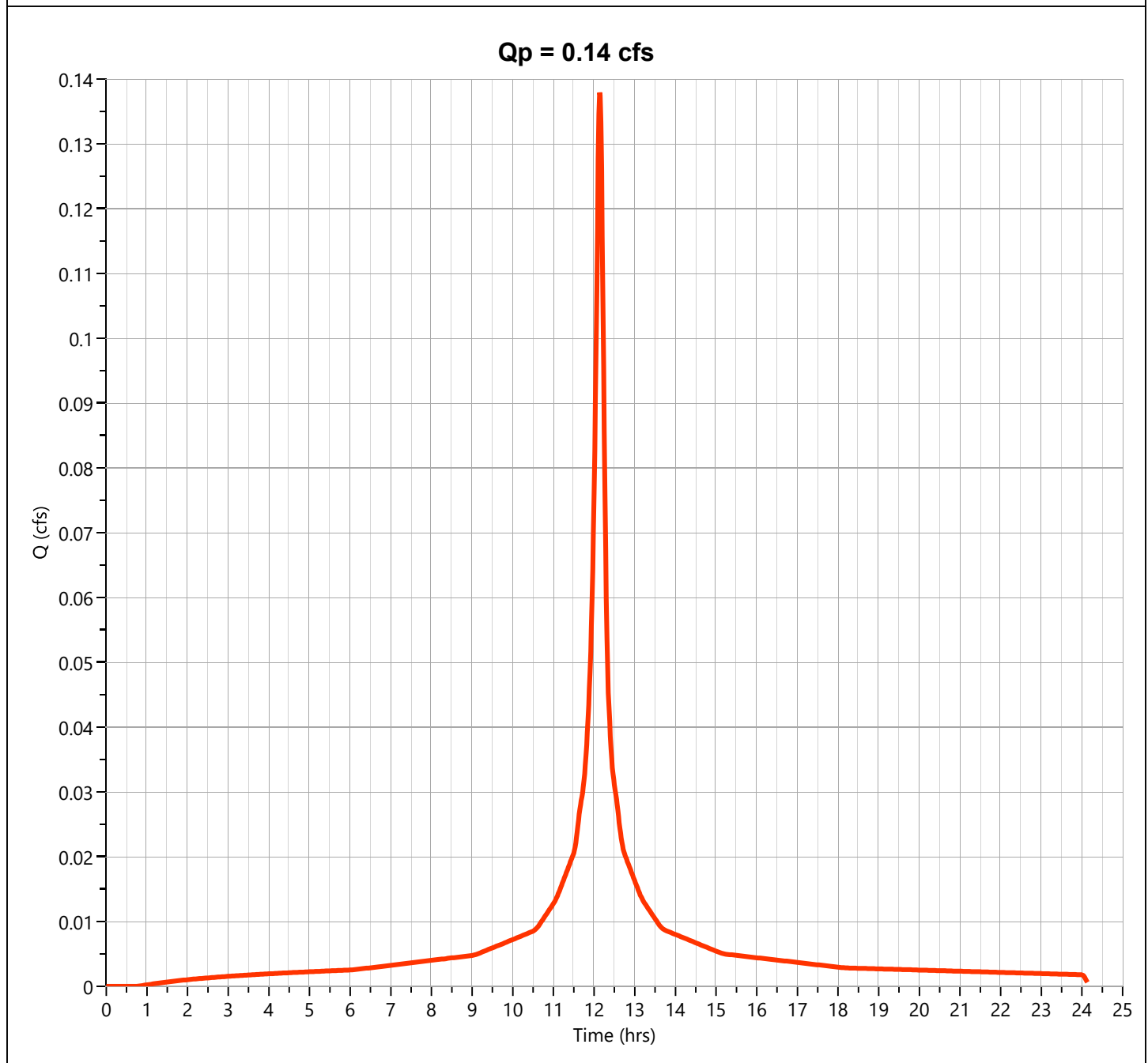
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2E Impervious

## Hyd. No. 27

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.138 cfs |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.13 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 560 cuft  |
| Drainage Area   | = 0.03 ac     | Curve Number       | = 98        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 10.0 min  |
| Total Rainfall  | = 5.38 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

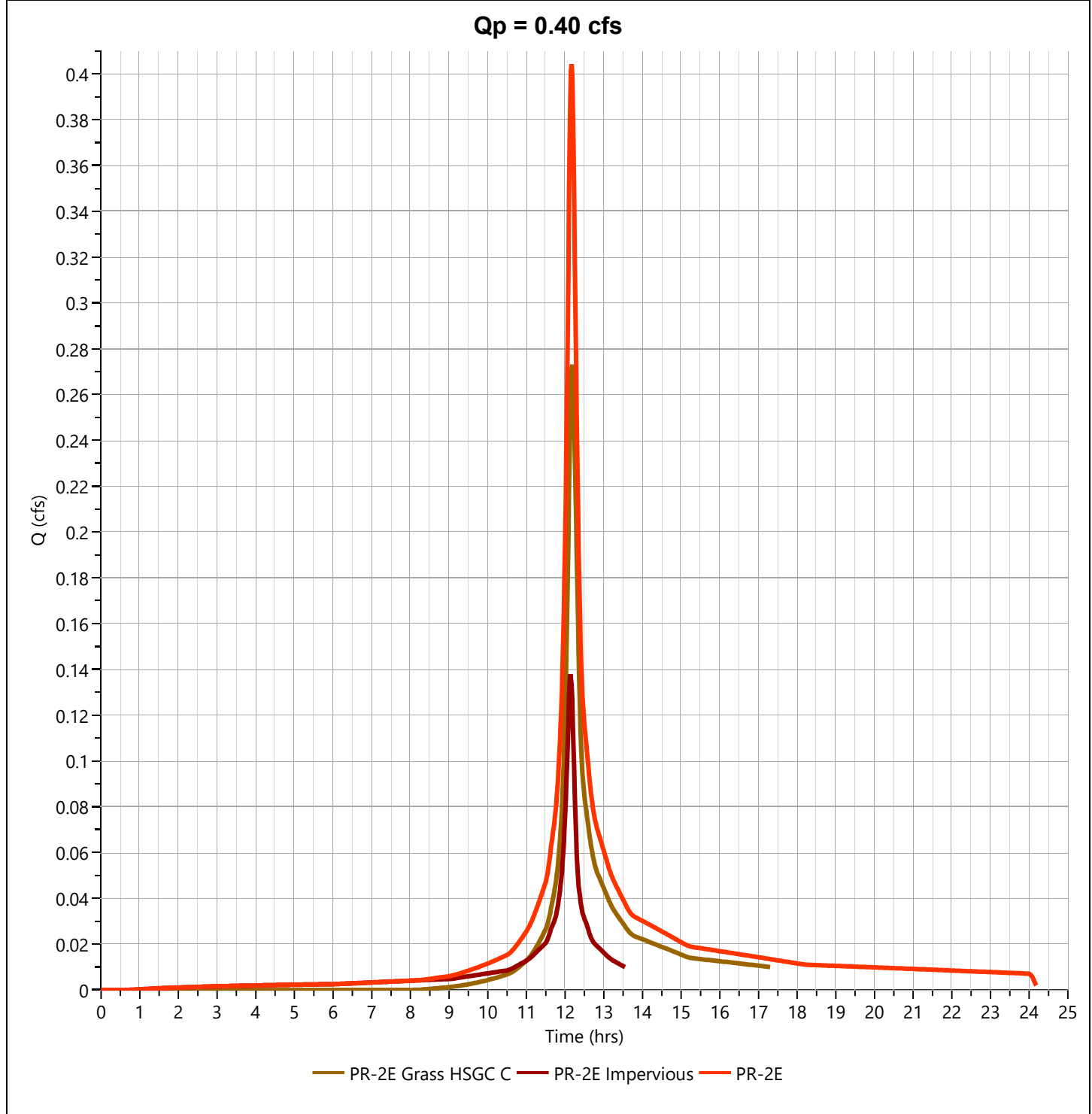
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2E

## Hyd. No. 28

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.404 cfs  |
| Storm Frequency    | = 10-yr    | Time to Peak        | = 12.17 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 1,610 cuft |
| Inflow Hydrographs | = 26, 27   | Total Contrib. Area | = 0.14 ac    |



# Hydrograph Report

Project Name:

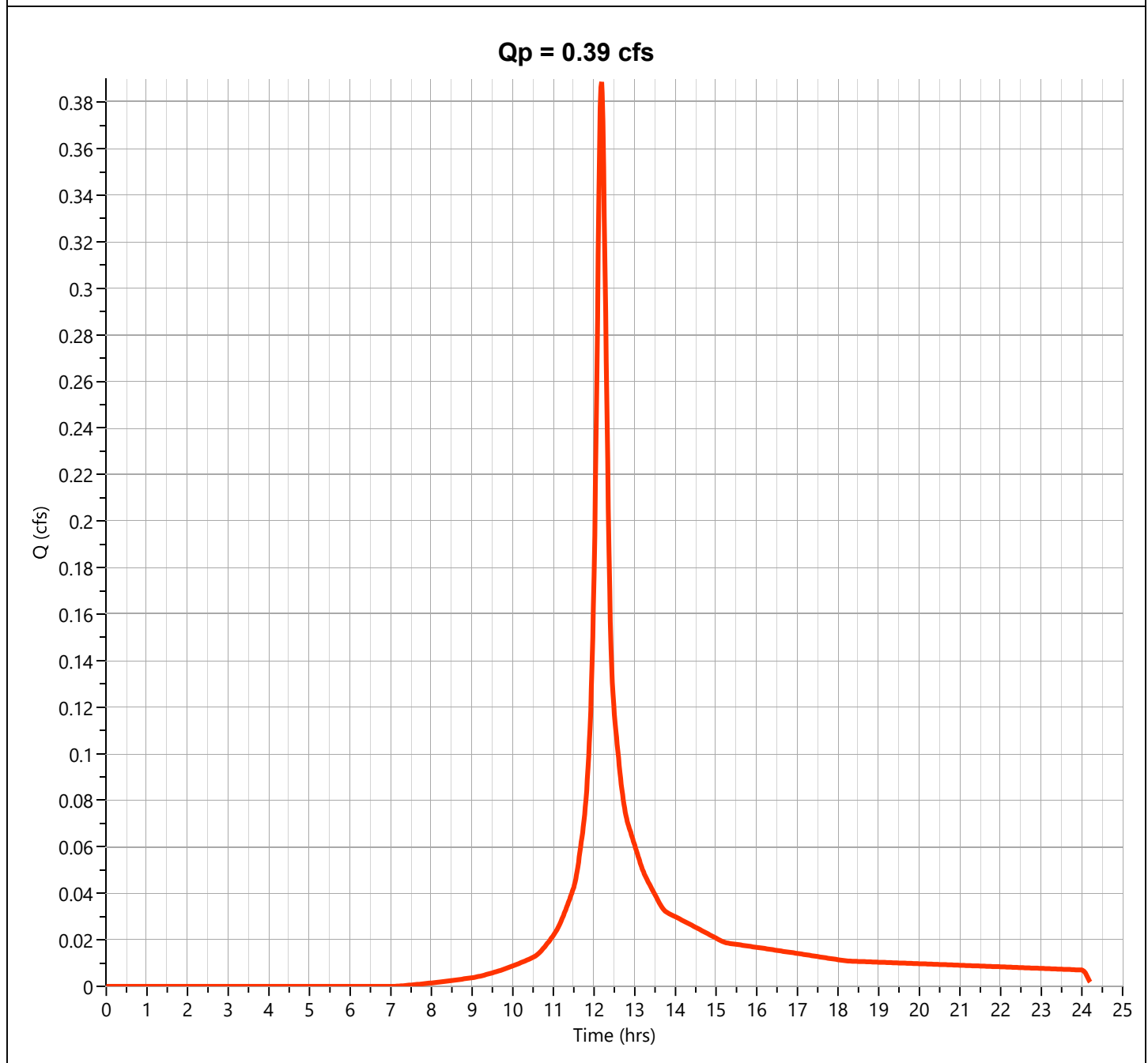
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2E Grass HSGC C

## Hyd. No. 26

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.389 cfs  |
| Storm Frequency | = 25-yr       | Time to Peak       | = 12.18 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 1,497 cuft |
| Drainage Area   | = 0.11 ac     | Curve Number       | = 74         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 12.0 min   |
| Total Rainfall  | = 6.73 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

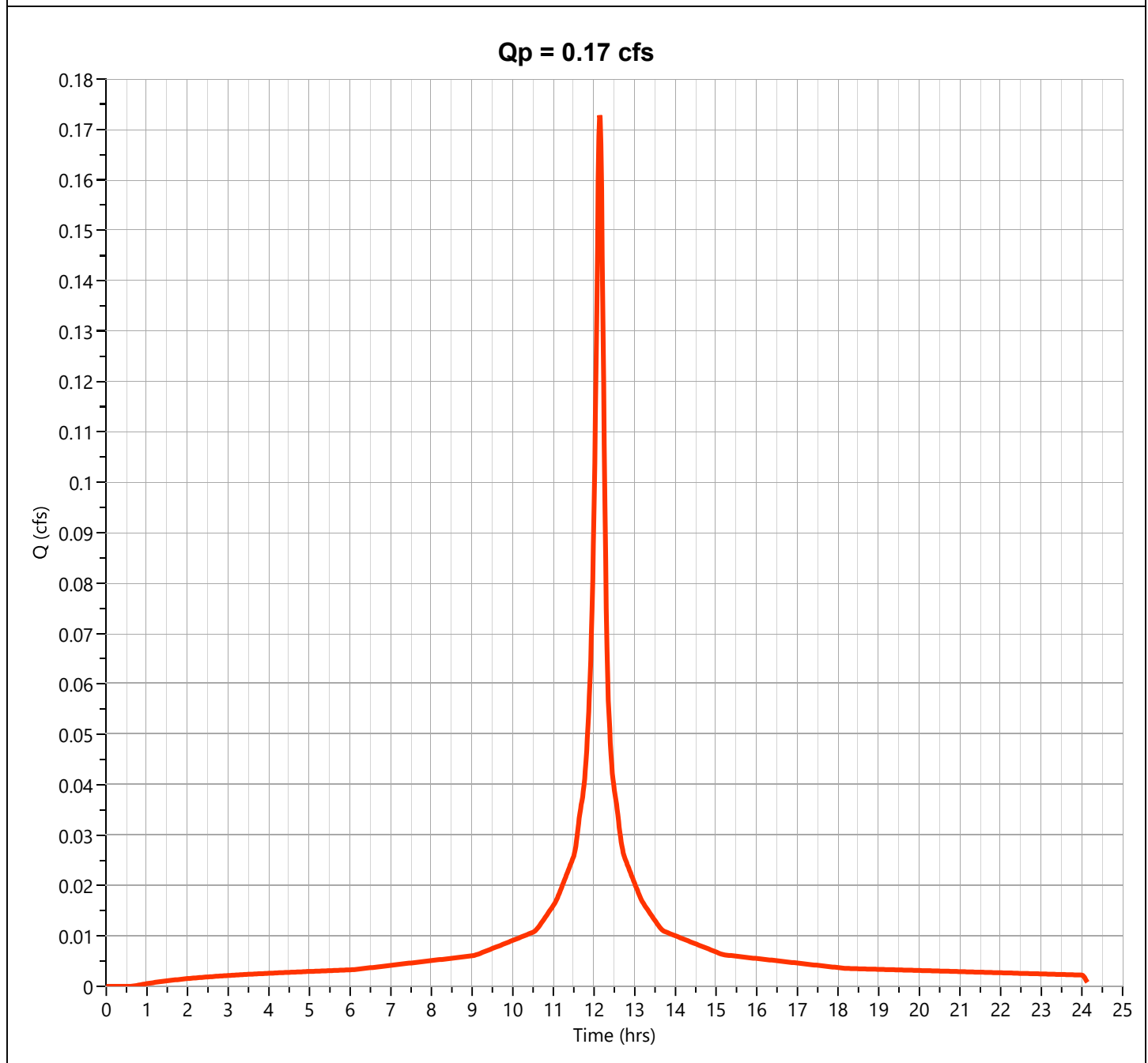
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2E Impervious

## Hyd. No. 27

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.173 cfs |
| Storm Frequency | = 25-yr       | Time to Peak       | = 12.13 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 707 cuft  |
| Drainage Area   | = 0.03 ac     | Curve Number       | = 98        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 10.0 min  |
| Total Rainfall  | = 6.73 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |





# Hydrograph Report

Project Name:

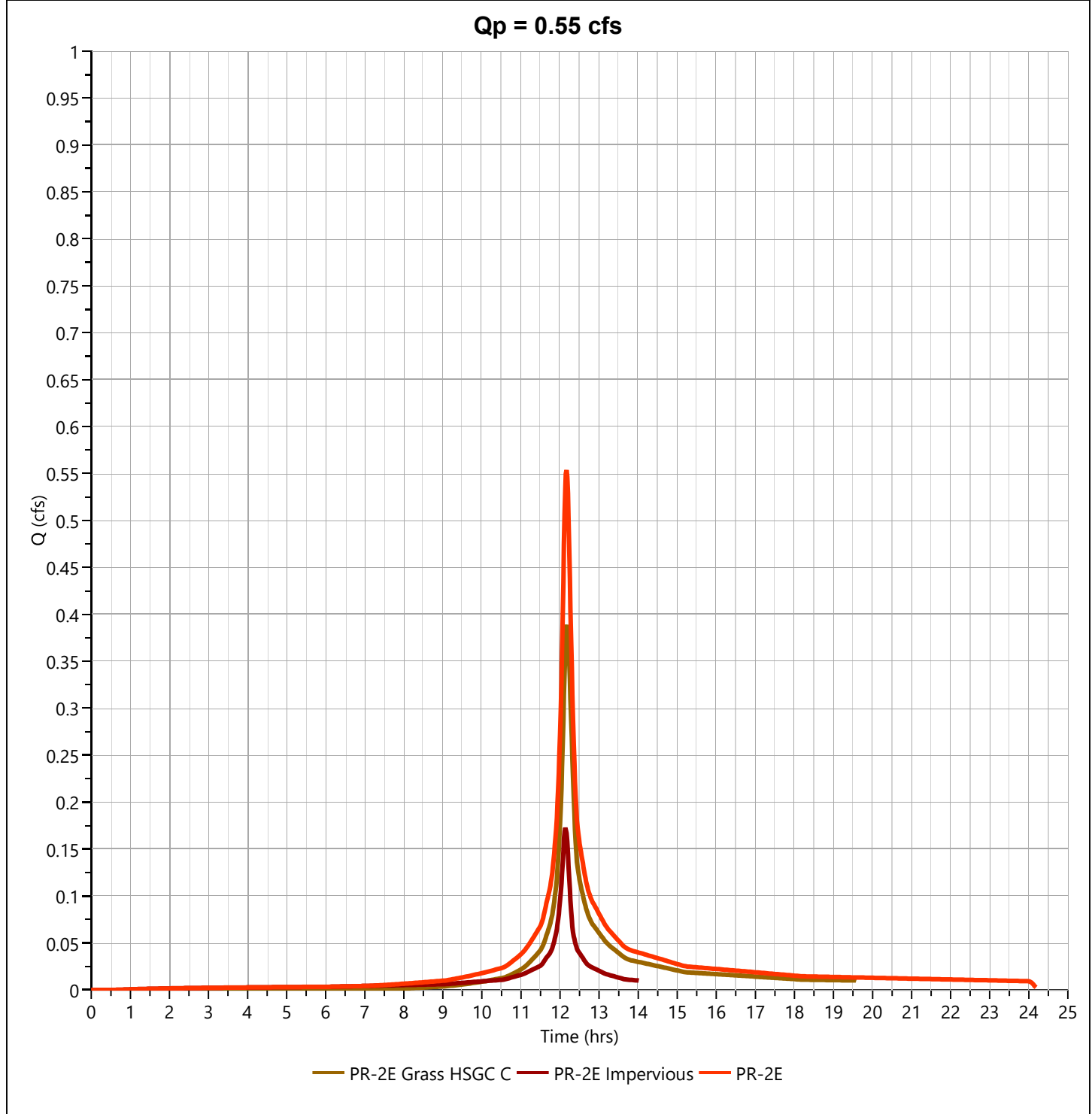
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2E

## Hyd. No. 28

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.554 cfs  |
| Storm Frequency    | = 25-yr    | Time to Peak        | = 12.17 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 2,204 cuft |
| Inflow Hydrographs | = 26, 27   | Total Contrib. Area | = 0.14 ac    |



# Hydrograph Report

Project Name:

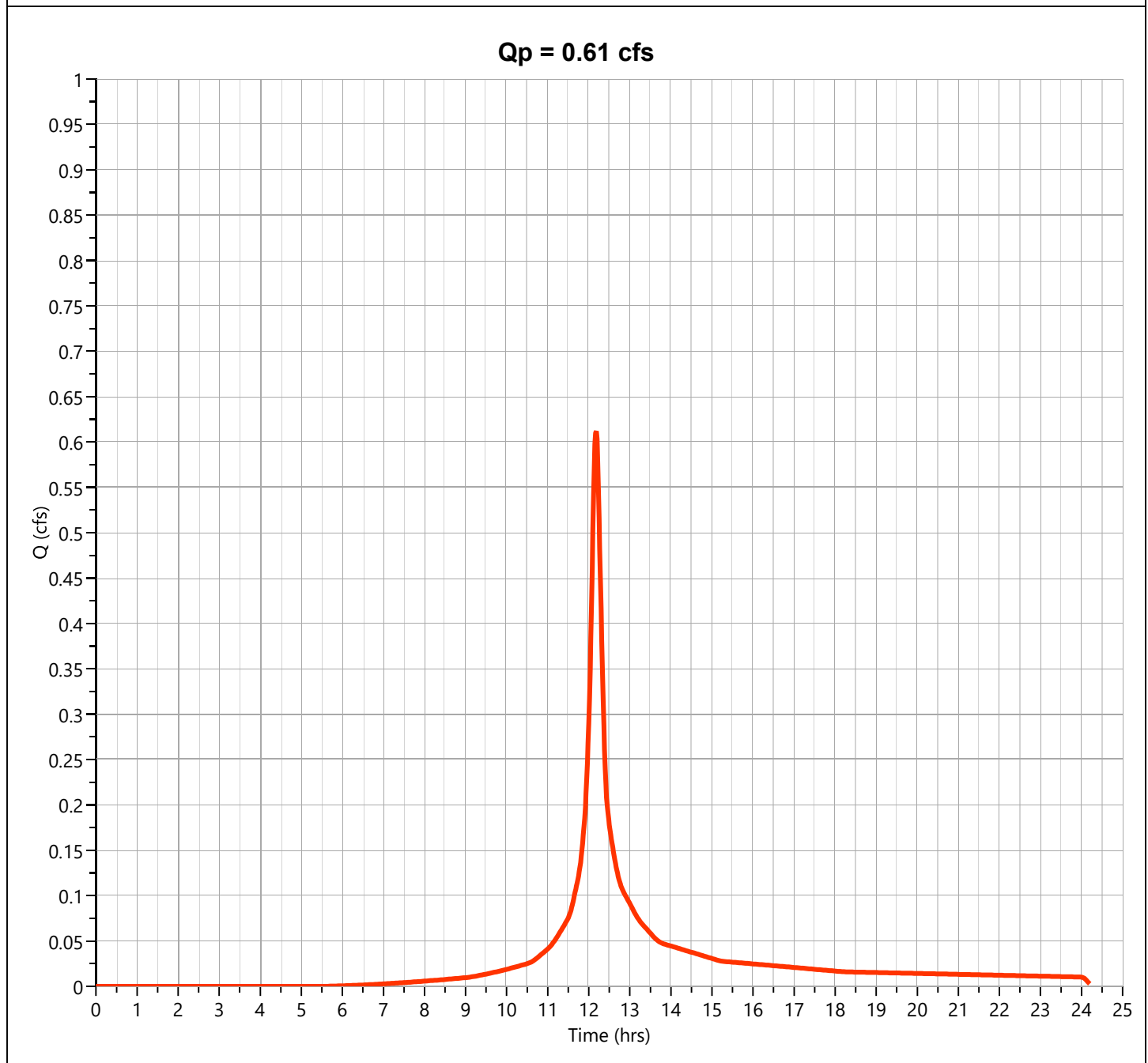
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2E Grass HSGC C

## Hyd. No. 26

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.612 cfs  |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.18 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 2,384 cuft |
| Drainage Area   | = 0.11 ac     | Curve Number       | = 74         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 12.0 min   |
| Total Rainfall  | = 9.26 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

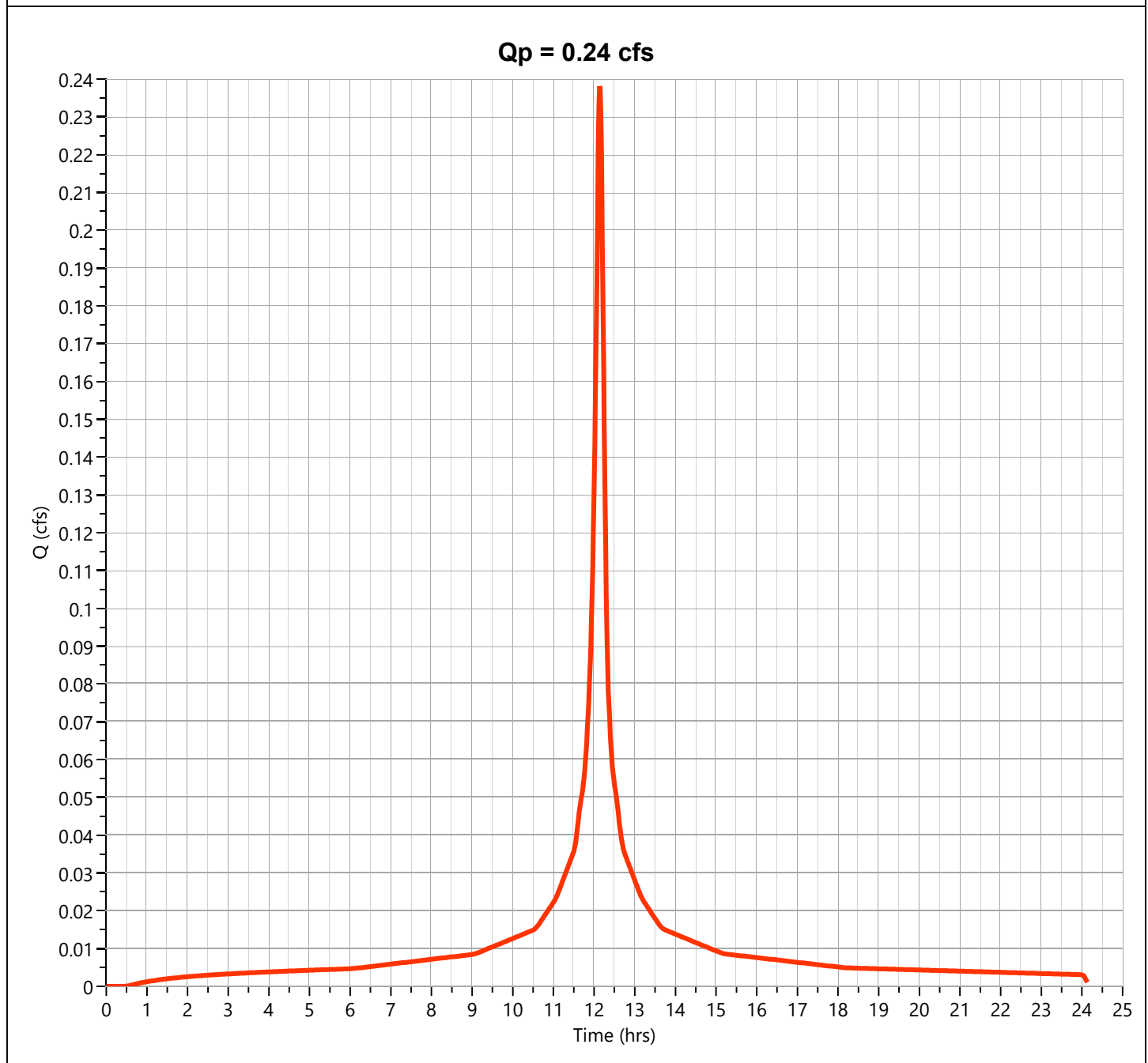
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2E Impervious

## Hyd. No. 27

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.238 cfs |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.13 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 982 cuft  |
| Drainage Area   | = 0.03 ac     | Curve Number       | = 98        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 10.0 min  |
| Total Rainfall  | = 9.26 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

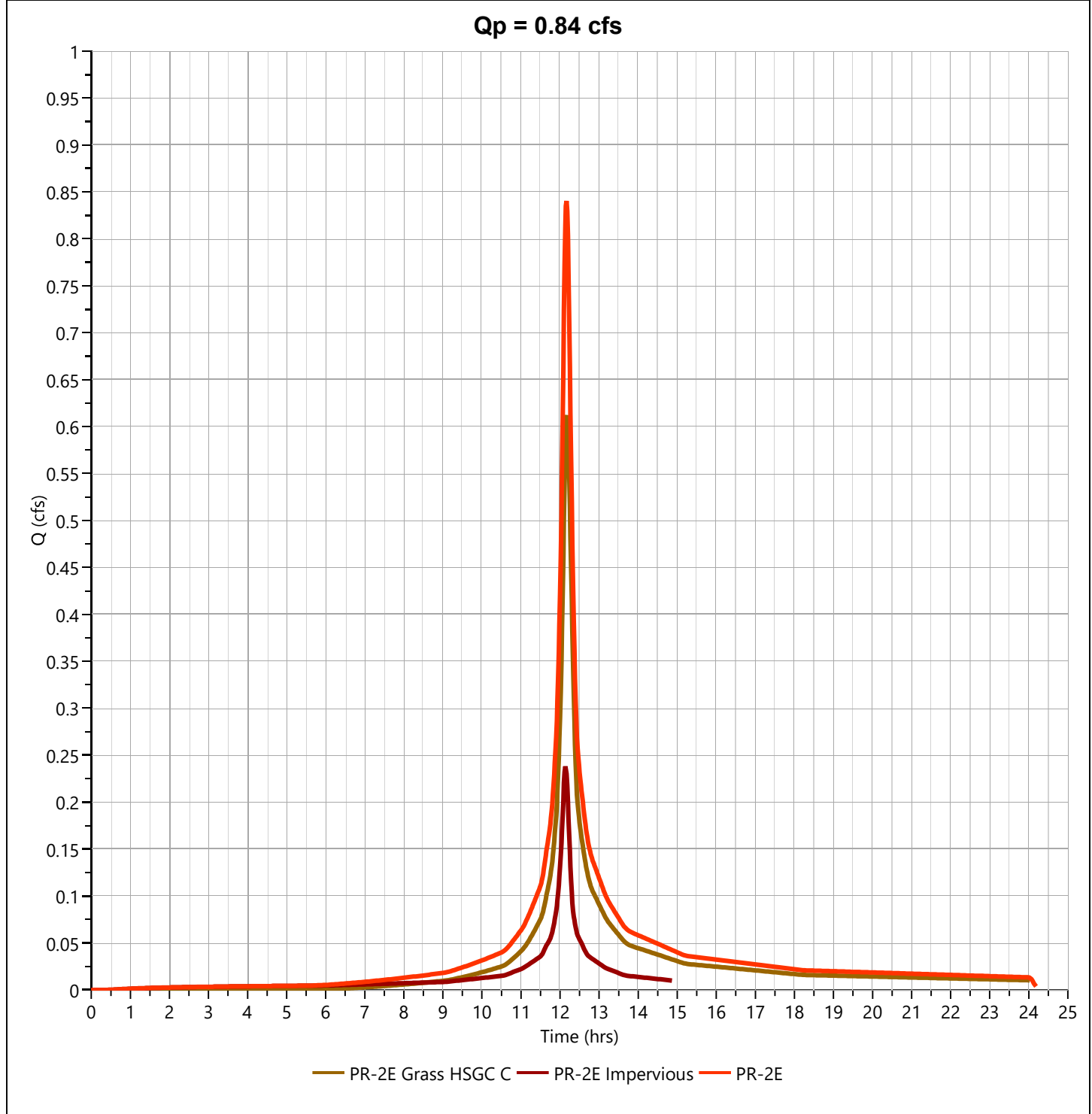
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2E

## Hyd. No. 28

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.840 cfs  |
| Storm Frequency    | = 100-yr   | Time to Peak        | = 12.17 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 3,367 cuft |
| Inflow Hydrographs | = 26, 27   | Total Contrib. Area | = 0.14 ac    |



## **PR-2F WATERSHED**

Project: Beacon Unitarian Universalist Church

By: TEG

Date: 2/6/2024

Location: Summit, NJ

Checked By: MJV

Date Checked: 2/6/2024

Circle One: Present Developed

Current Proposed Watershed PR-2F - Impervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Design Flow Length, L<sub>des</sub> (Total L<sub>des</sub> < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. McCuen-Spiess Limit, L<sub>mcs</sub> (max. 100 ft)
7. Compute T<sub>t</sub>

$$L_{mcs} = (100 s^{0.5})/n$$

$$T_t = \frac{0.007 (n L_{des})^{0.8}}{P_2^{0.5} s^{0.4}}$$

| Segment ID | 1                      | 2                             |   |
|------------|------------------------|-------------------------------|---|
|            | <b>Smooth Surfaces</b> | <b>Woods Light Underbrush</b> |   |
|            | <b>0.011</b>           | <b>0.40</b>                   |   |
| ft         | <b>14</b>              | <b>51</b>                     |   |
| in         | <b>3.46</b>            | <b>3.46</b>                   |   |
| ft/ft      | <b>0.021</b>           | <b>0.057</b>                  |   |
| ft         | <b>100</b>             | <b>60</b>                     |   |
| hr         | <b>0.004</b>           | <b>0.132</b>                  | + |

Sheet Flow Sub-Total **0.136 hours**

**Shallow Concentrated Flow**

8. Surface Description
9. Flow Length, L
10. Watercourse Slope, s
11. Average Velocity, V (NEH table 15-3)
12. Compute T<sub>t</sub>

$$T_t = \frac{L}{3600 V}$$

| Segment ID | 3                        | 4                        | 5                        |
|------------|--------------------------|--------------------------|--------------------------|
|            | <b>Grassed Waterways</b> | <b>Grassed Waterways</b> | <b>Grassed Waterways</b> |
| ft         | <b>19</b>                | <b>54</b>                | <b>25</b>                |
| ft/ft      | <b>0.091</b>             | <b>0.010</b>             | <b>0.027</b>             |
| ft/s       | <b>4.85</b>              | <b>1.63</b>              | <b>2.66</b>              |
| hr         | <b>0.001</b>             | <b>0.009</b>             | <b>0.003</b>             |

Shallow Conc. Flow Sub-Total **0.013 hours**

**Channel Flow**

13. Flow Length, L
14. Cross Sectional flow area, a
15. Wetted Perimeter, P<sub>w</sub>
16. Hydraulic Radius, r
17. Channel Slope, s
18. Manning's Roughness Coeff., n
19. Velocity, V
20. Compute T<sub>t</sub>

$$r = a / P_w$$

$$V = (1.49 r^{2/3} s^{1/2}) / n$$

$$T_t = \frac{L}{3600 V}$$

| Segment ID      | 6            |   |   |
|-----------------|--------------|---|---|
| ft              | <b>291</b>   |   |   |
| ft <sup>2</sup> | <b>0.61</b>  |   |   |
| ft              | <b>2.00</b>  |   |   |
| ft              | <b>0.31</b>  |   |   |
| ft/ft           | <b>0.005</b> |   |   |
|                 | <b>0.012</b> |   |   |
| ft/s            | <b>3.97</b>  |   |   |
| hr              | <b>0.020</b> | + | + |

Channel Flow Sub-Total **0.020 hours**

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>

(Add Sub-Total T<sub>t</sub> from prior steps)

|                                  |                    |
|----------------------------------|--------------------|
| Total T <sub>c</sub> (hours) =   | <b>0.170 hours</b> |
| Total T <sub>c</sub> (minutes) = | <b>10 minutes</b>  |

Project: Beacon Unitarian Universalist Church

By: TEG

Date: 2/6/2024

Location: Summit, NJ

Checked By: MJV

Date Checked: 2/6/2024

Circle One: Present Developed

Current Proposed Watershed PR-2F - Pervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Design Flow Length, L<sub>des</sub> (Total L<sub>des</sub> < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. McCuen-Spiess Limit, L<sub>mcs</sub> (max. 100 ft)
7. Compute T<sub>t</sub>

$$L_{mcs} = (100 s^{0.5})/n$$

$$T_t = \frac{0.007 (n L_{des})^{0.8}}{P_2^{0.5} s^{0.4}}$$

| Segment ID | 1                             | 2                    |  |
|------------|-------------------------------|----------------------|--|
|            | <b>Woods Light Underbrush</b> | <b>Dense Grasses</b> |  |
|            | <b>0.40</b>                   | <b>0.24</b>          |  |
| ft         | <b>41</b>                     | <b>16</b>            |  |
| in         | <b>3.46</b>                   | <b>3.46</b>          |  |
| ft/ft      | <b>0.087</b>                  | <b>0.008</b>         |  |
| ft         | <b>74</b>                     | <b>37</b>            |  |
| hr         | <b>0.094</b>                  | <b>0.075</b>         |  |

Sheet Flow Sub-Total **0.169 hours**

**Shallow Concentrated Flow**

8. Surface Description
9. Flow Length, L
10. Watercourse Slope, s
11. Average Velocity, V (NEH table 15-3)
12. Compute T<sub>t</sub>

$$T_t = \frac{L}{3600 V}$$

| Segment ID | 3                        | 4                        |  |
|------------|--------------------------|--------------------------|--|
|            | <b>Grassed Waterways</b> | <b>Grassed Waterways</b> |  |
| ft         | <b>54</b>                | <b>25</b>                |  |
| ft/ft      | <b>0.010</b>             | <b>0.027</b>             |  |
| ft/s       | <b>1.63</b>              | <b>2.66</b>              |  |
| hr         | <b>0.009</b>             | <b>0.003</b>             |  |

Shallow Conc. Flow Sub-Total **0.012 hours**

**Channel Flow**

13. Flow Length, L
14. Cross Sectional flow area, a
15. Wetted Perimeter, P<sub>w</sub>
16. Hydraulic Radius, r
17. Channel Slope, s
18. Manning's Roughness Coeff., n
19. Velocity, V
20. Compute T<sub>t</sub>

$$r = a / P_w$$

$$V = (1.49 r^{2/3} s^{1/2}) / n$$

$$T_t = \frac{L}{3600 V}$$

| Segment ID      | 5            |  |  |
|-----------------|--------------|--|--|
| ft              | <b>291</b>   |  |  |
| ft <sup>2</sup> | <b>0.61</b>  |  |  |
| ft              | <b>2.00</b>  |  |  |
| ft              | <b>0.31</b>  |  |  |
| ft/ft           | <b>0.005</b> |  |  |
|                 | <b>0.012</b> |  |  |
| ft/s            | <b>3.97</b>  |  |  |
| hr              | <b>0.020</b> |  |  |

Channel Flow Sub-Total **0.020 hours**

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>

(Add Sub-Total T<sub>t</sub> from prior steps)

|                                  |                    |
|----------------------------------|--------------------|
| Total T <sub>c</sub> (hours) =   | <b>0.201 hours</b> |
| Total T <sub>c</sub> (minutes) = | <b>12 minutes</b>  |

# Hydrograph Report

Project Name:

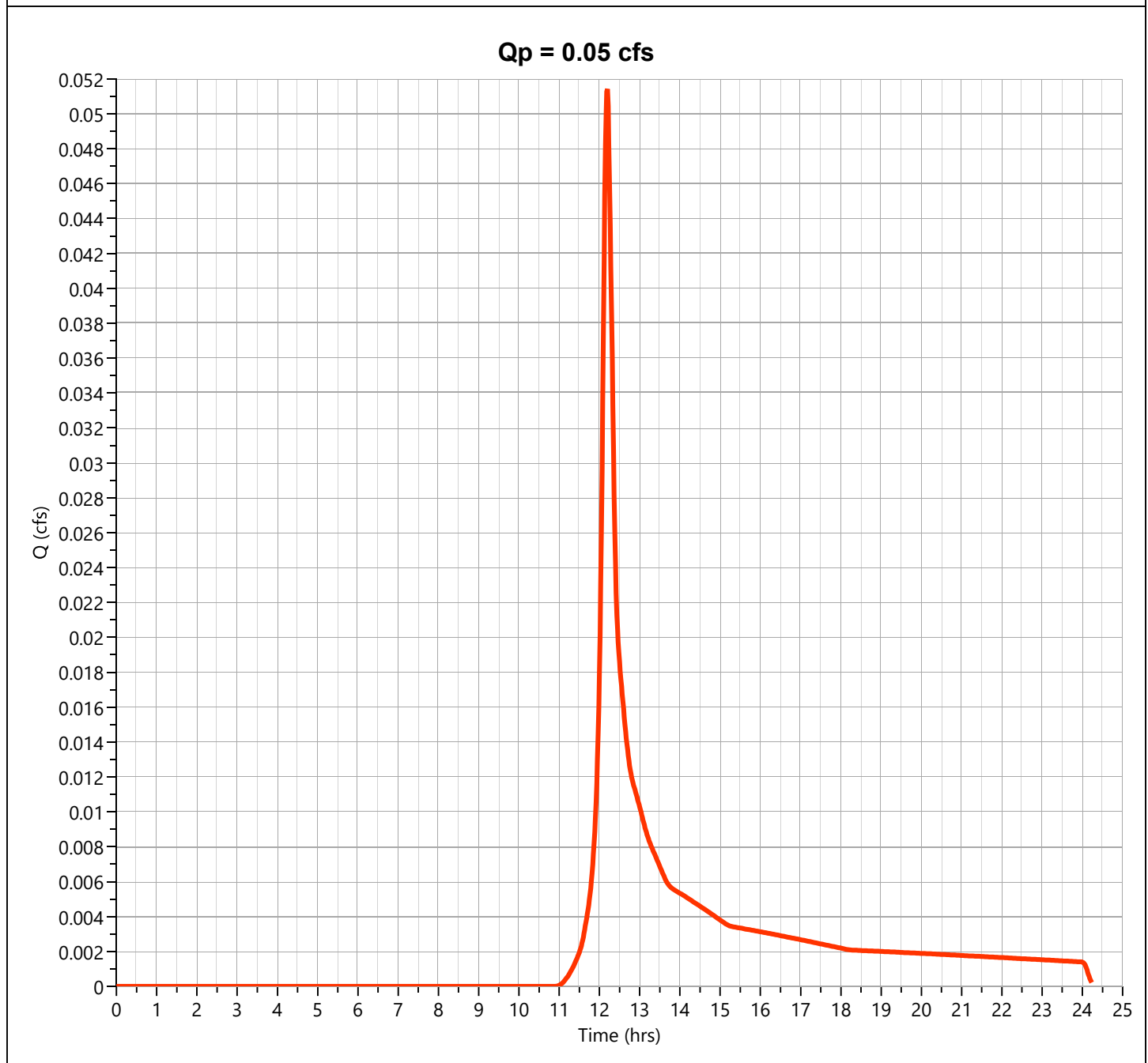
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2F Woods HSGC C

## Hyd. No. 30

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.051 cfs |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.20 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 211 cuft  |
| Drainage Area   | = 0.06 ac     | Curve Number       | = 70        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 12.0 min  |
| Total Rainfall  | = 3.46 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |





# Hydrograph Report

Project Name:

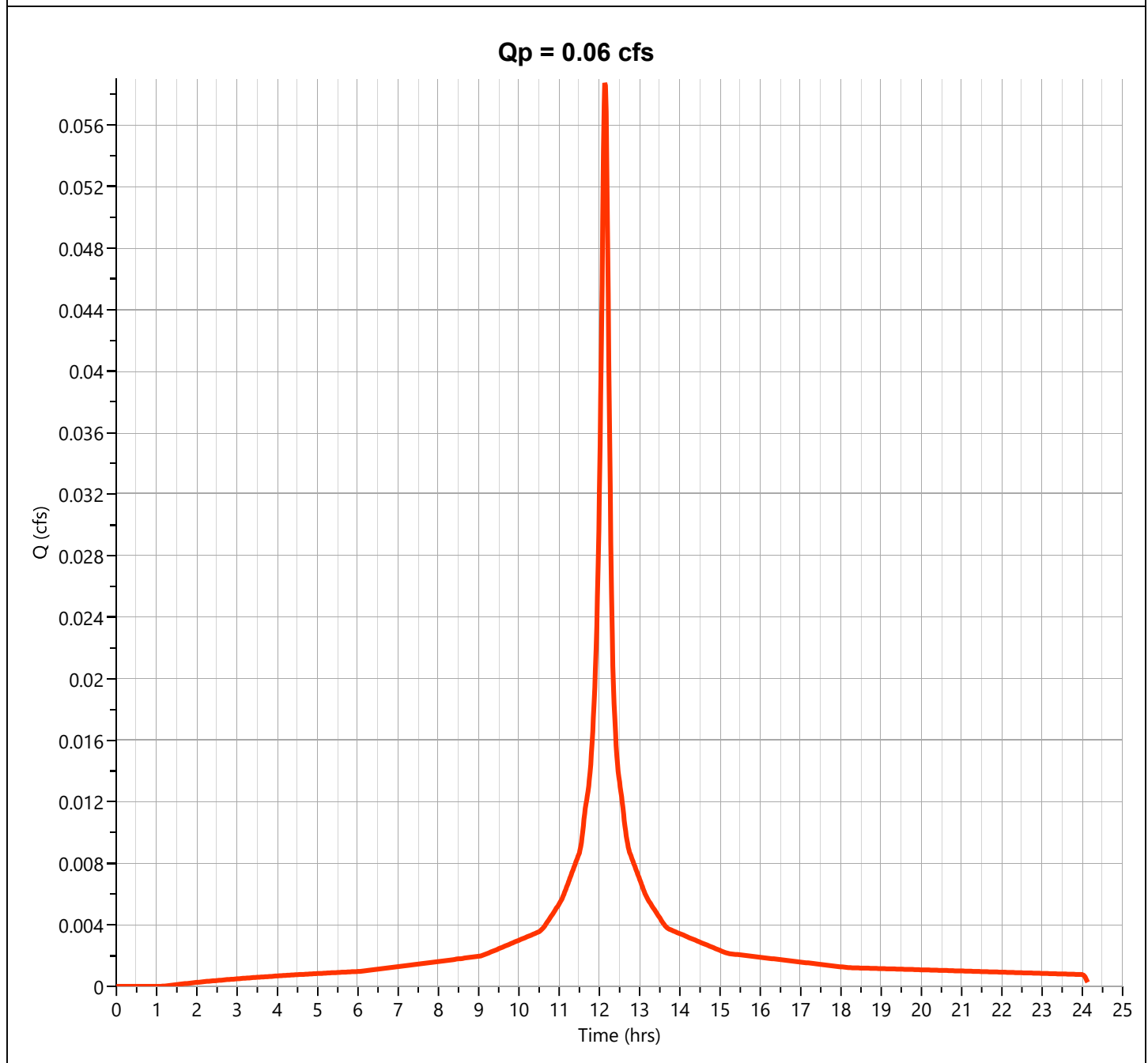
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2F Impervious

## Hyd. No. 31

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.059 cfs |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.13 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 234 cuft  |
| Drainage Area   | = 0.02 ac     | Curve Number       | = 98        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 10.0 min  |
| Total Rainfall  | = 3.46 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

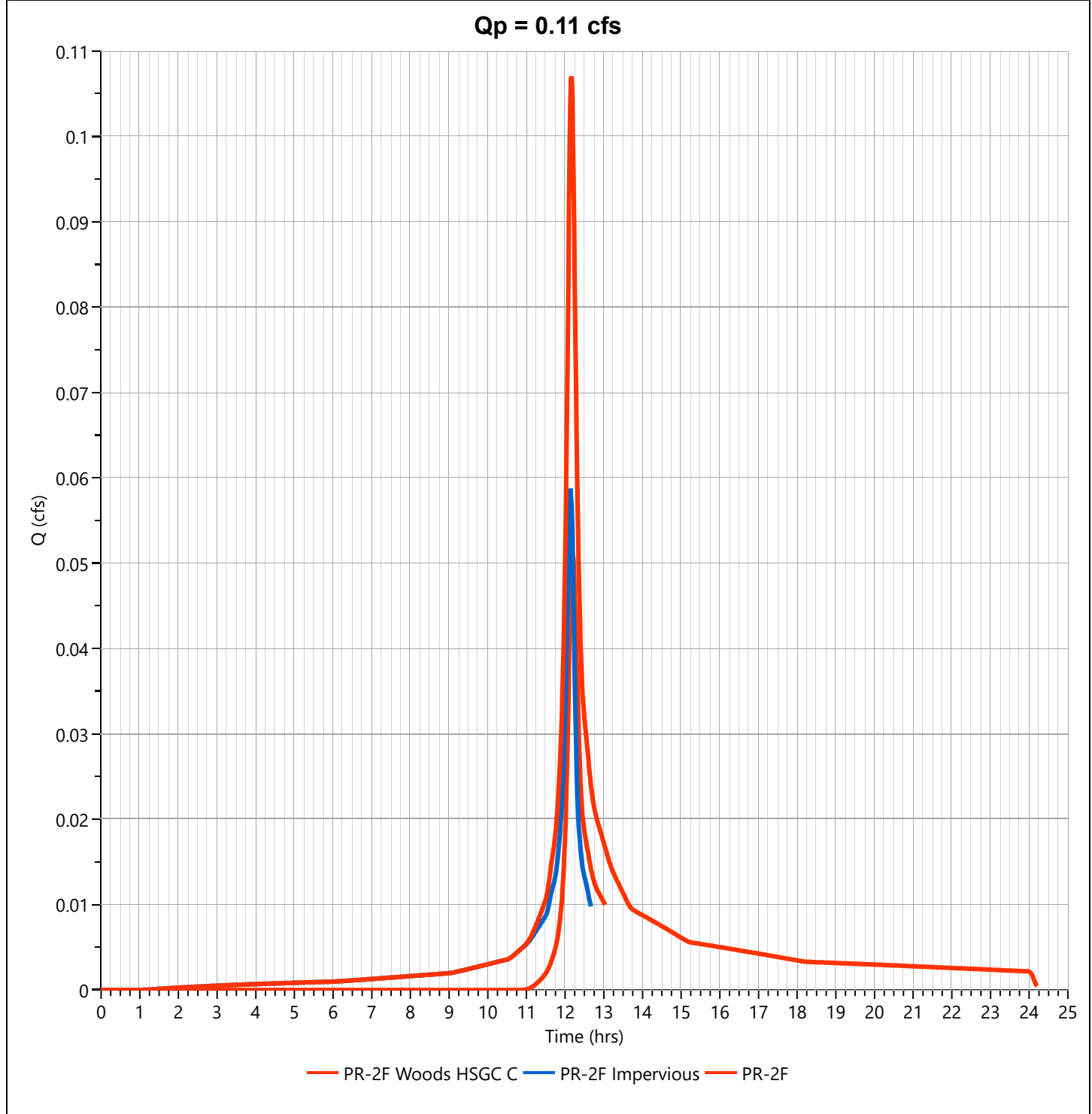
Hydrology Studio v 3.0.0.31

02-08-2024

**PR-2F**

**Hyd. No. 32**

|                    |            |                     |             |
|--------------------|------------|---------------------|-------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.107 cfs |
| Storm Frequency    | = 2-yr     | Time to Peak        | = 12.17 hrs |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 445 cuft  |
| Inflow Hydrographs | = 30, 31   | Total Contrib. Area | = 0.08 ac   |



# Hydrograph Report

Project Name:

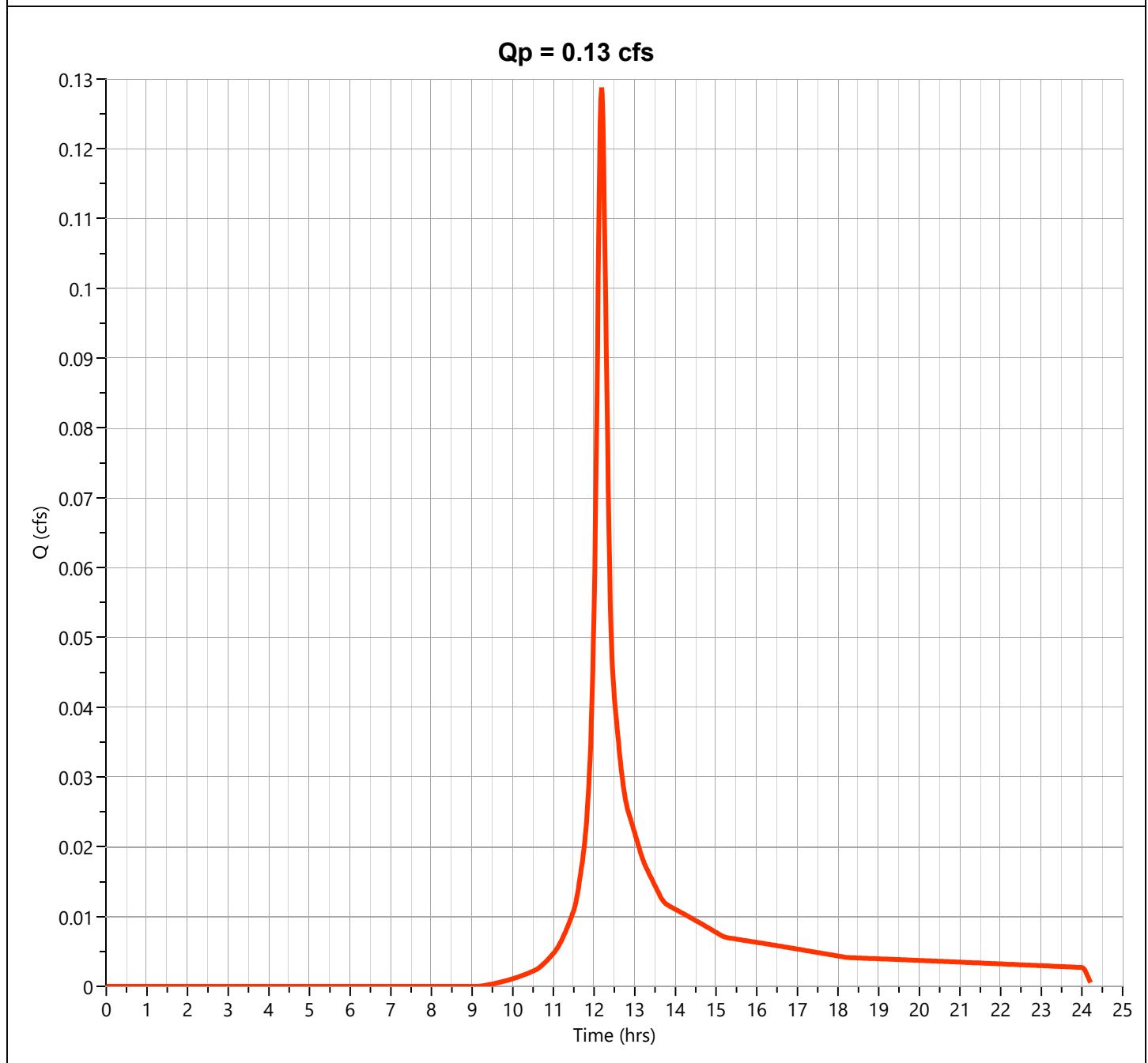
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2F Woods HSGC C

## Hyd. No. 30

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.129 cfs |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.18 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 498 cuft  |
| Drainage Area   | = 0.06 ac     | Curve Number       | = 70        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 12.0 min  |
| Total Rainfall  | = 5.38 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

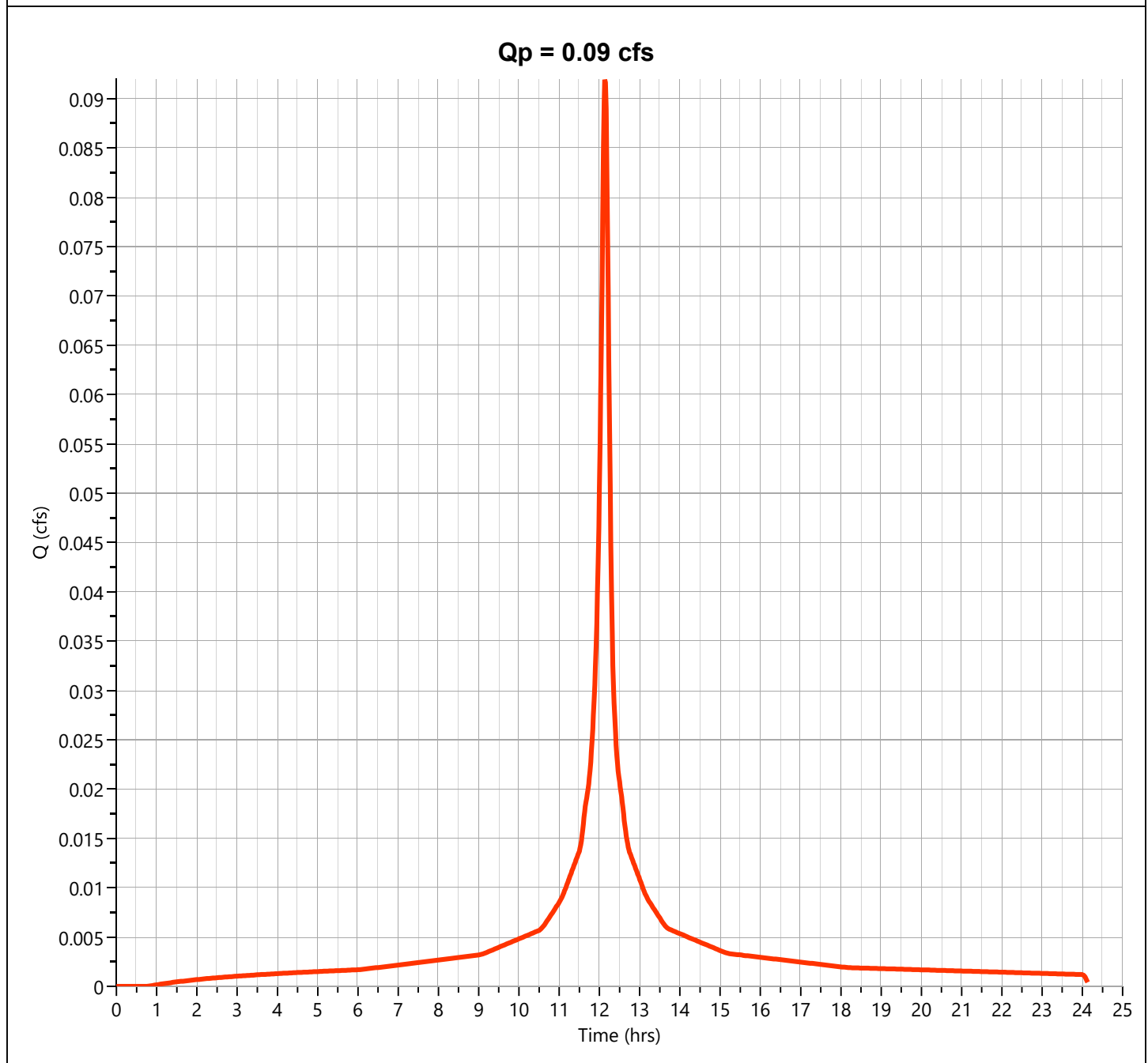
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2F Impervious

## Hyd. No. 31

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.092 cfs |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.13 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 373 cuft  |
| Drainage Area   | = 0.02 ac     | Curve Number       | = 98        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 10.0 min  |
| Total Rainfall  | = 5.38 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

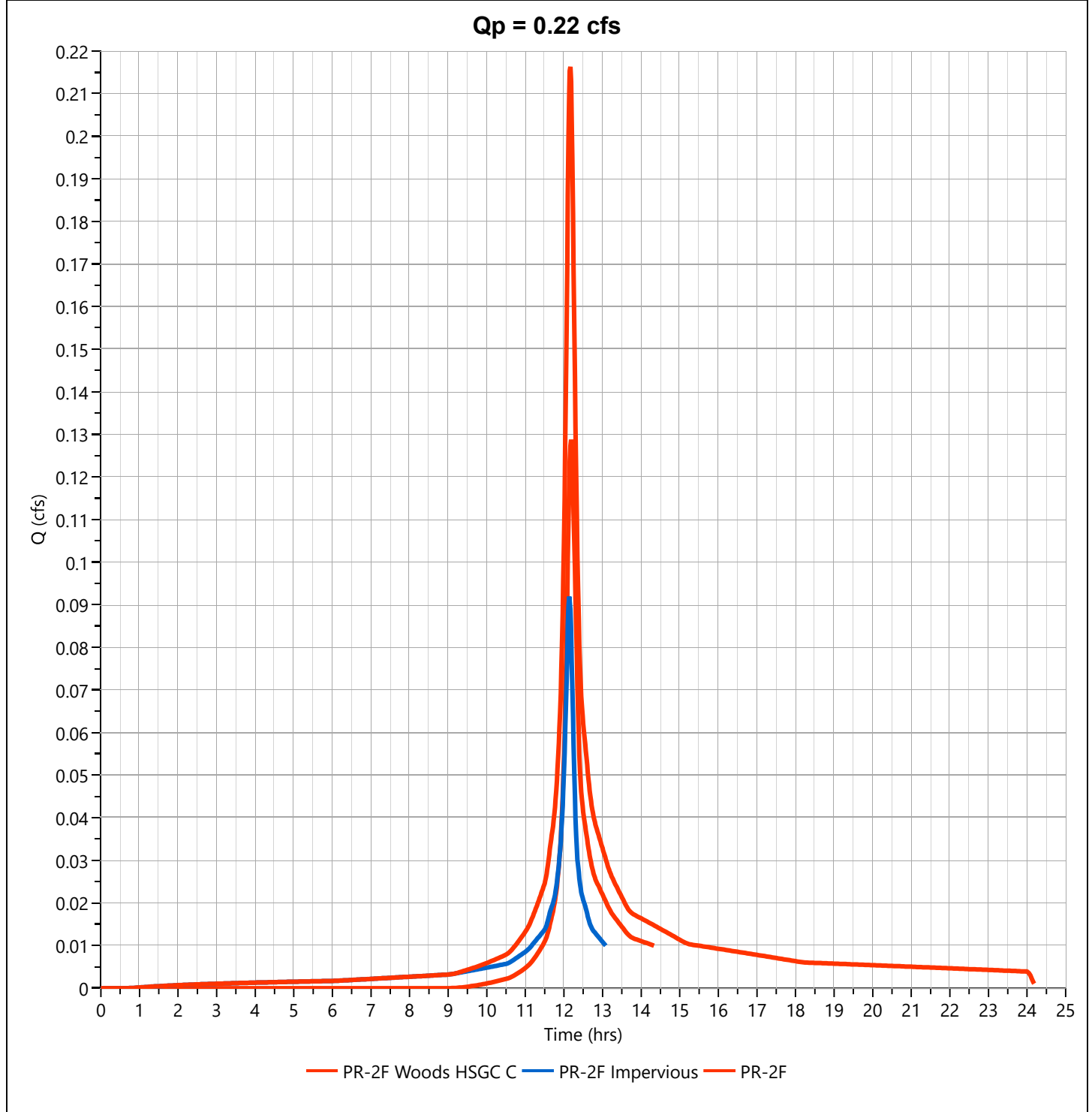
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2F

## Hyd. No. 32

|                    |            |                     |             |
|--------------------|------------|---------------------|-------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.216 cfs |
| Storm Frequency    | = 10-yr    | Time to Peak        | = 12.17 hrs |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 871 cuft  |
| Inflow Hydrographs | = 30, 31   | Total Contrib. Area | = 0.08 ac   |



# Hydrograph Report

Project Name:

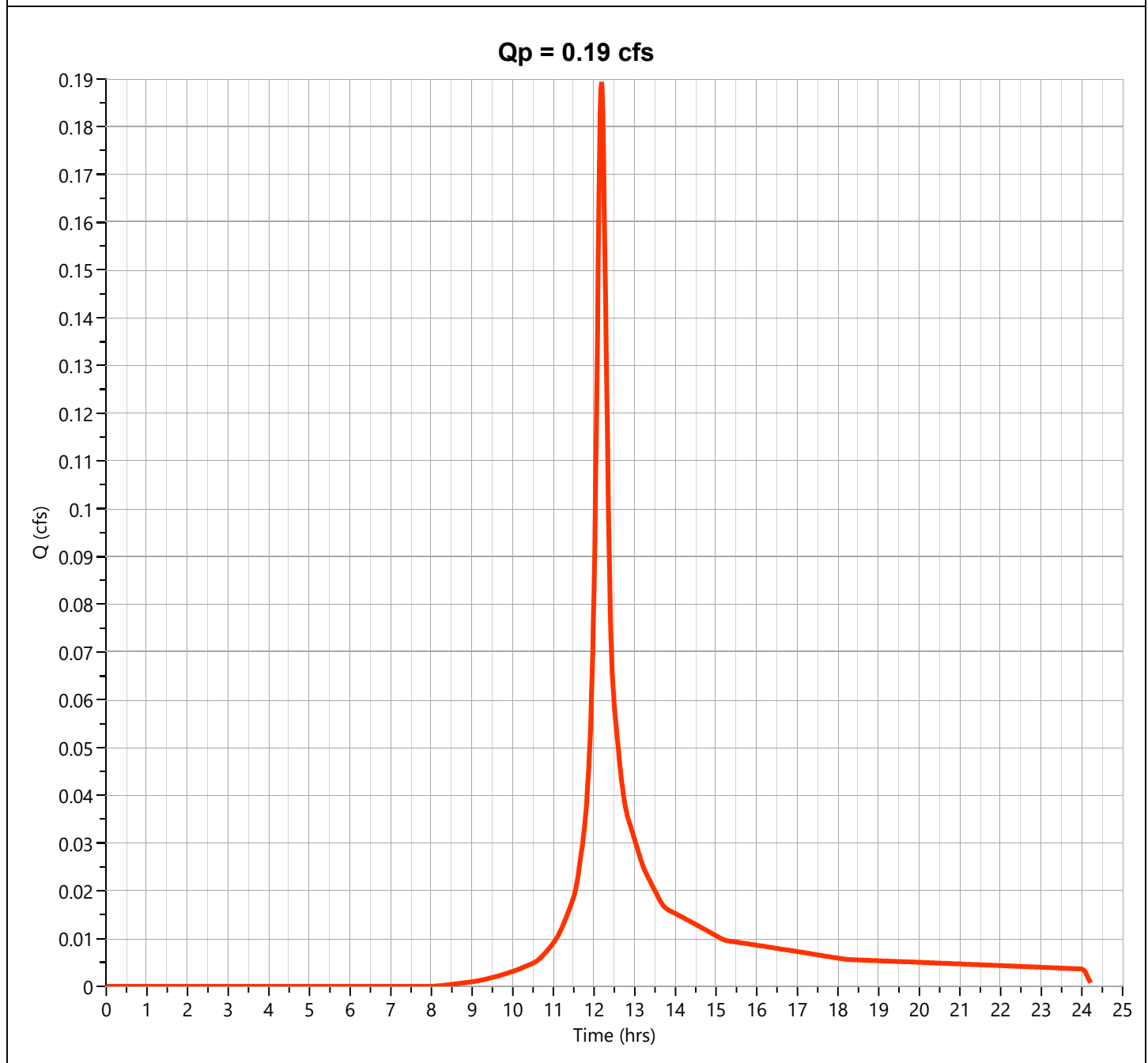
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2F Woods HSGC C

## Hyd. No. 30

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.189 cfs |
| Storm Frequency | = 25-yr       | Time to Peak       | = 12.18 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 728 cuft  |
| Drainage Area   | = 0.06 ac     | Curve Number       | = 70        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 12.0 min  |
| Total Rainfall  | = 6.73 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

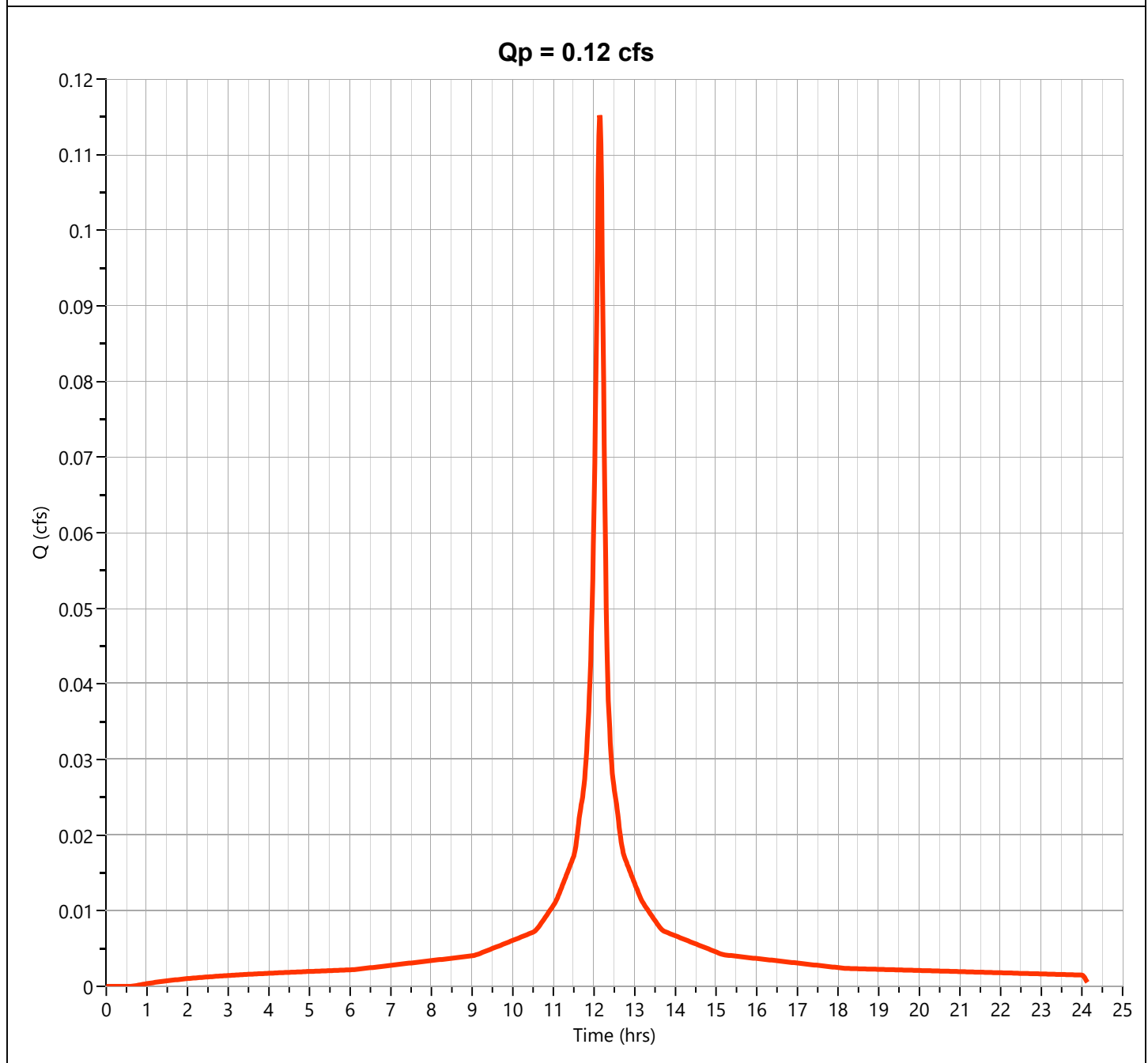
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2F Impervious

## Hyd. No. 31

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.115 cfs |
| Storm Frequency | = 25-yr       | Time to Peak       | = 12.13 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 471 cuft  |
| Drainage Area   | = 0.02 ac     | Curve Number       | = 98        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 10.0 min  |
| Total Rainfall  | = 6.73 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

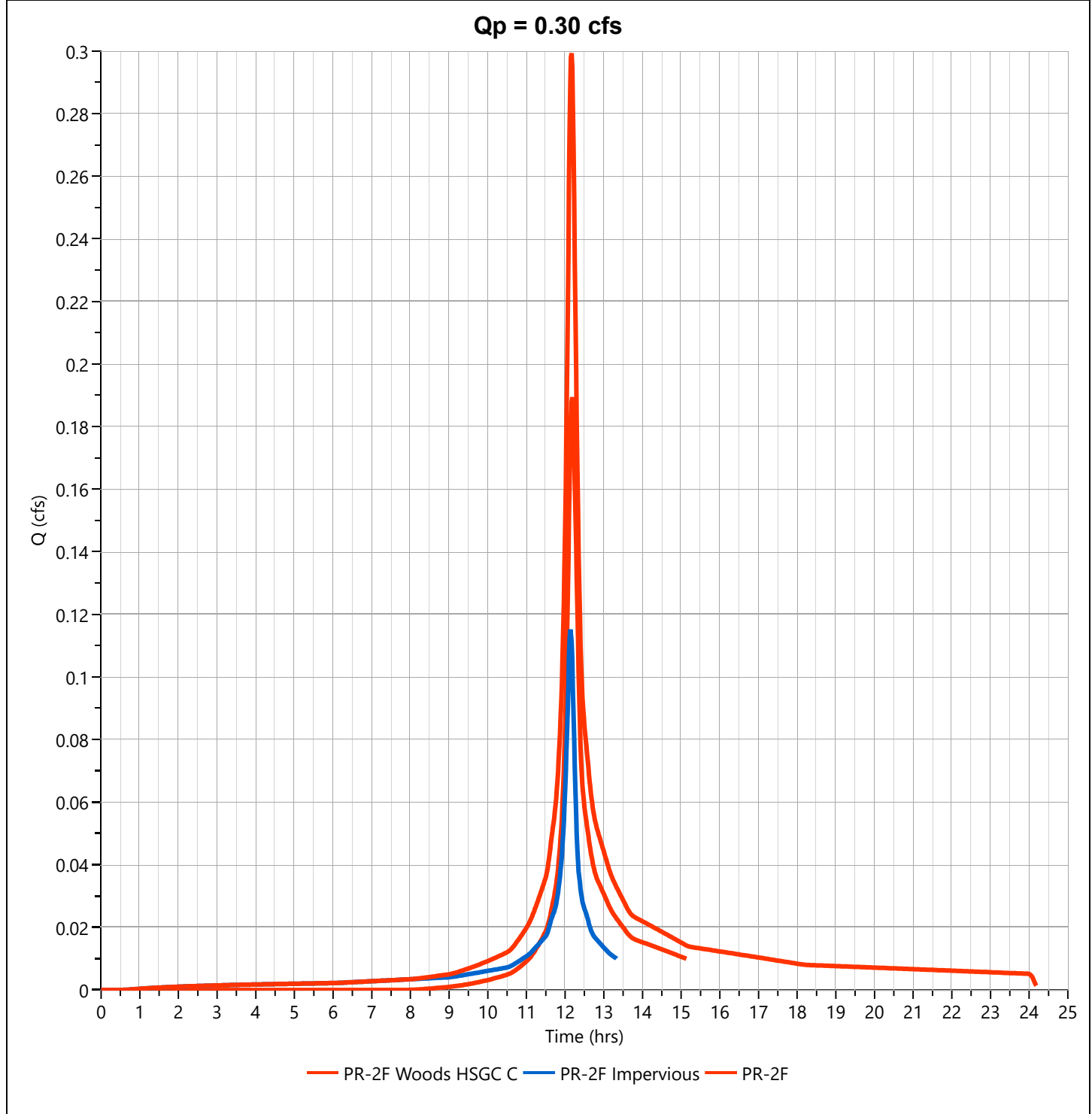
Hydrology Studio v 3.0.0.31

02-08-2024

**PR-2F**

**Hyd. No. 32**

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.299 cfs  |
| Storm Frequency    | = 25-yr    | Time to Peak        | = 12.17 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 1,199 cuft |
| Inflow Hydrographs | = 30, 31   | Total Contrib. Area | = 0.08 ac    |





# Hydrograph Report

Project Name:

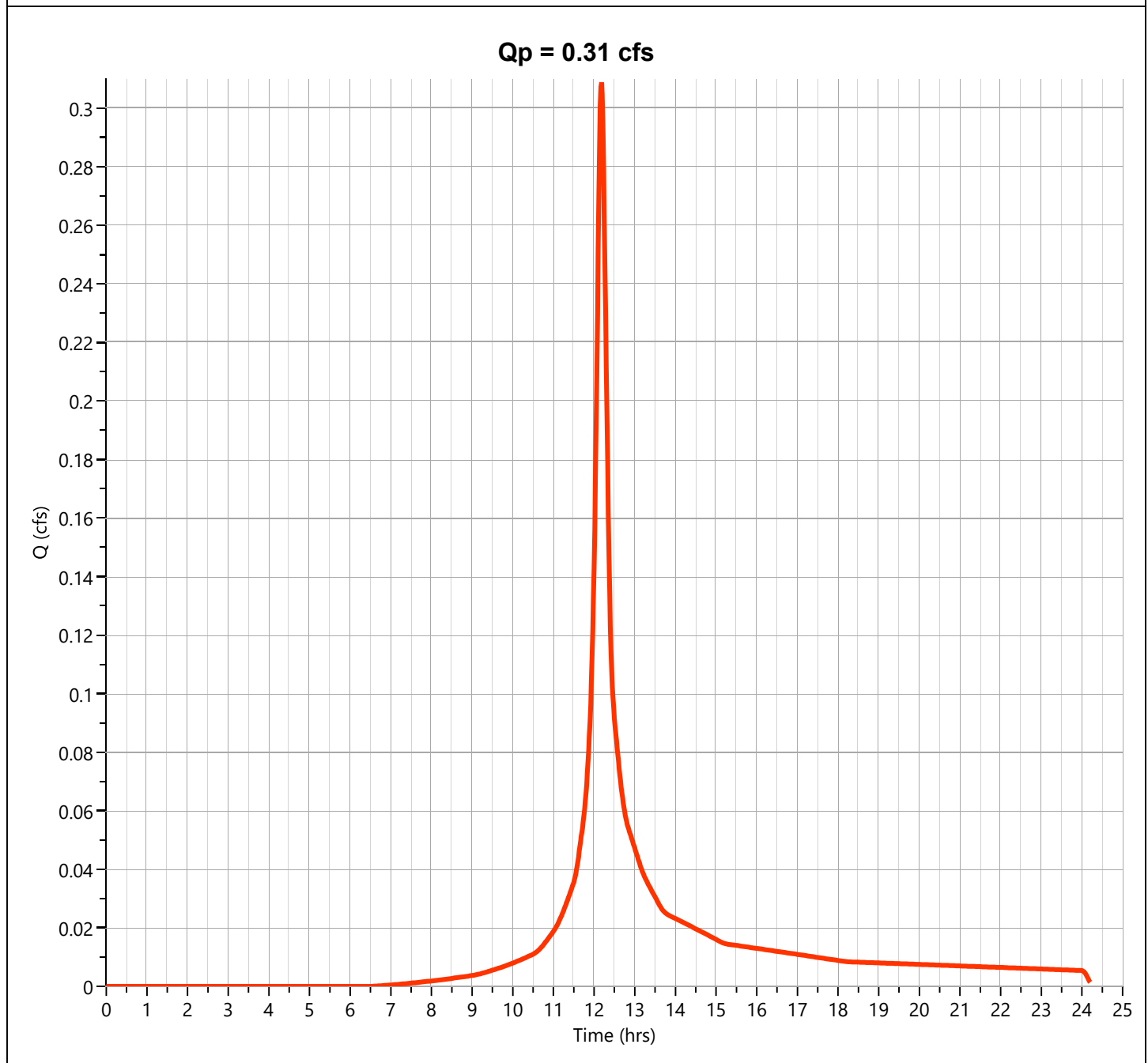
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2F Woods HSGC C

## Hyd. No. 30

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.309 cfs  |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.18 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 1,193 cuft |
| Drainage Area   | = 0.06 ac     | Curve Number       | = 70         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 12.0 min   |
| Total Rainfall  | = 9.26 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

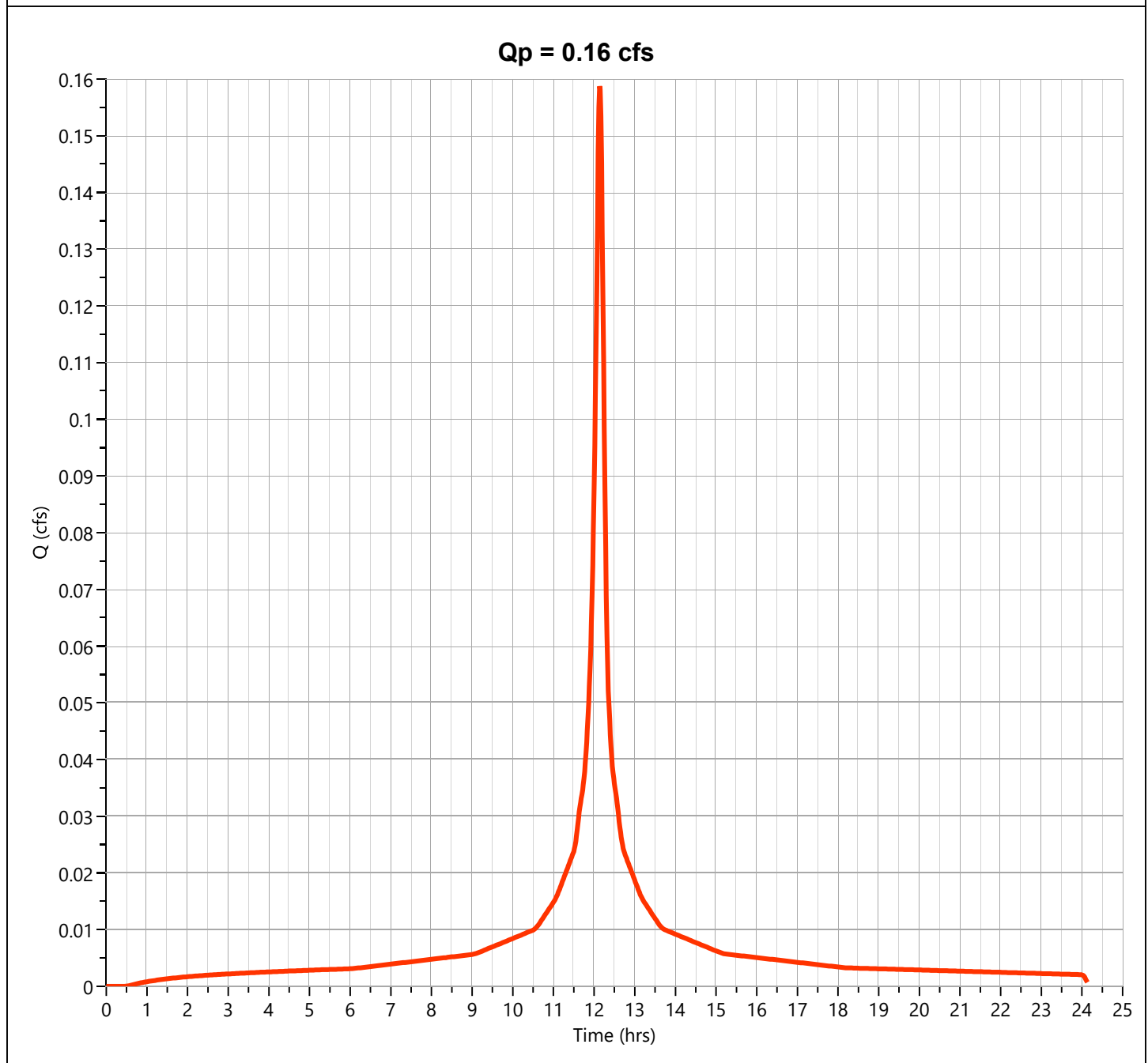
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2F Impervious

## Hyd. No. 31

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.159 cfs |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.13 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 655 cuft  |
| Drainage Area   | = 0.02 ac     | Curve Number       | = 98        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 10.0 min  |
| Total Rainfall  | = 9.26 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

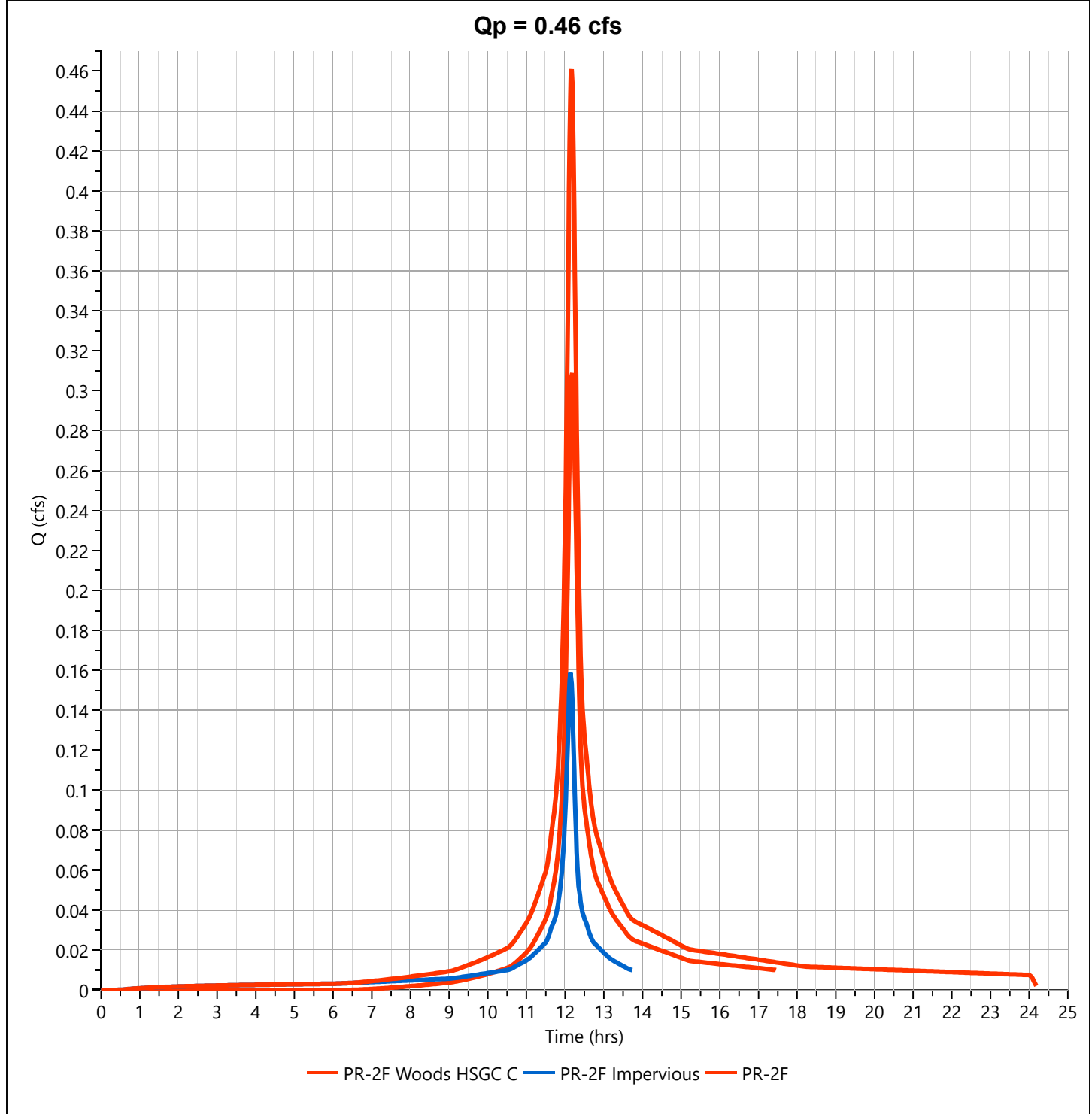
Hydrology Studio v 3.0.0.31

02-08-2024

**PR-2F**

**Hyd. No. 32**

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.461 cfs  |
| Storm Frequency    | = 100-yr   | Time to Peak        | = 12.17 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 1,848 cuft |
| Inflow Hydrographs | = 30, 31   | Total Contrib. Area | = 0.08 ac    |



## **PR-2G WATERSHED**

Project: Beacon Unitarian Universalist Church

By: TEG

Date: 11/29/2023

Location: Summit, NJ

Checked By: MJV

Date Checked: 11/29/2023

Circle One: Present Developed

Current Proposed Watershed PR-2G - Pervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Design Flow Length, L<sub>des</sub> (Total L<sub>des</sub> < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. McCuen-Spiess Limit, L<sub>mcs</sub> (max. 100 ft)  $L_{mcs} = (100 s^{0.5})/n$
7. Compute T<sub>t</sub>  $T_t = \frac{0.007 (n L_{des})^{0.8}}{P_2^{0.5} s^{0.4}}$

|            |                      |   |  |
|------------|----------------------|---|--|
| Segment ID | 1                    |   |  |
|            | <b>Dense Grasses</b> |   |  |
|            | <b>0.24</b>          |   |  |
| ft         | <b>29</b>            |   |  |
| in         | <b>3.46</b>          |   |  |
| ft/ft      | <b>0.045</b>         |   |  |
| ft         | <b>88</b>            |   |  |
| hr         | <b>0.062</b>         | + |  |

Sheet Flow Sub-Total **0.062 hours**

**Shallow Concentrated Flow**

8. Surface Description
9. Flow Length, L
10. Watercourse Slope, s
11. Average Velocity, V (NEH table 15-3)
12. Compute T<sub>t</sub>  $T_t = \frac{L}{3600 V}$

|            |                          |                          |   |
|------------|--------------------------|--------------------------|---|
| Segment ID | 2                        | 3                        |   |
|            | <b>Grassed Waterways</b> | <b>Grassed Waterways</b> |   |
| ft         | <b>73</b>                | <b>140</b>               |   |
| ft/ft      | <b>0.030</b>             | <b>0.011</b>             |   |
| ft/s       | <b>2.80</b>              | <b>1.72</b>              |   |
| hr         | <b>0.007</b>             | <b>0.023</b>             | + |

Shallow Conc. Flow Sub-Total **0.030 hours**

**Channel Flow**

13. Flow Length, L
14. Cross Sectional flow area, a
15. Wetted Perimeter, P<sub>w</sub>
16. Hydraulic Radius, r  $r = a / P_w$
17. Channel Slope, s
18. Manning's Roughness Coeff., n
19. Velocity, V  $V = (1.49 r^{2/3} s^{1/2}) / n$
20. Compute T<sub>t</sub>  $T_t = \frac{L}{3600 V}$

|                 |  |  |   |
|-----------------|--|--|---|
| Segment ID      |  |  |   |
| ft              |  |  |   |
| ft <sup>2</sup> |  |  |   |
| ft              |  |  |   |
| ft              |  |  |   |
| ft/ft           |  |  |   |
| ft/s            |  |  |   |
| hr              |  |  | + |

Channel Flow Sub-Total **0.000 hours**

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>

(Add Sub-Total T<sub>t</sub> from prior steps)

|                                  |                    |
|----------------------------------|--------------------|
| Total T <sub>c</sub> (hours) =   | <b>0.091 hours</b> |
| Total T <sub>c</sub> (minutes) = | <b>5 minutes</b>   |

# Hydrograph Report

Hydrology Studio v 3.0.0.38

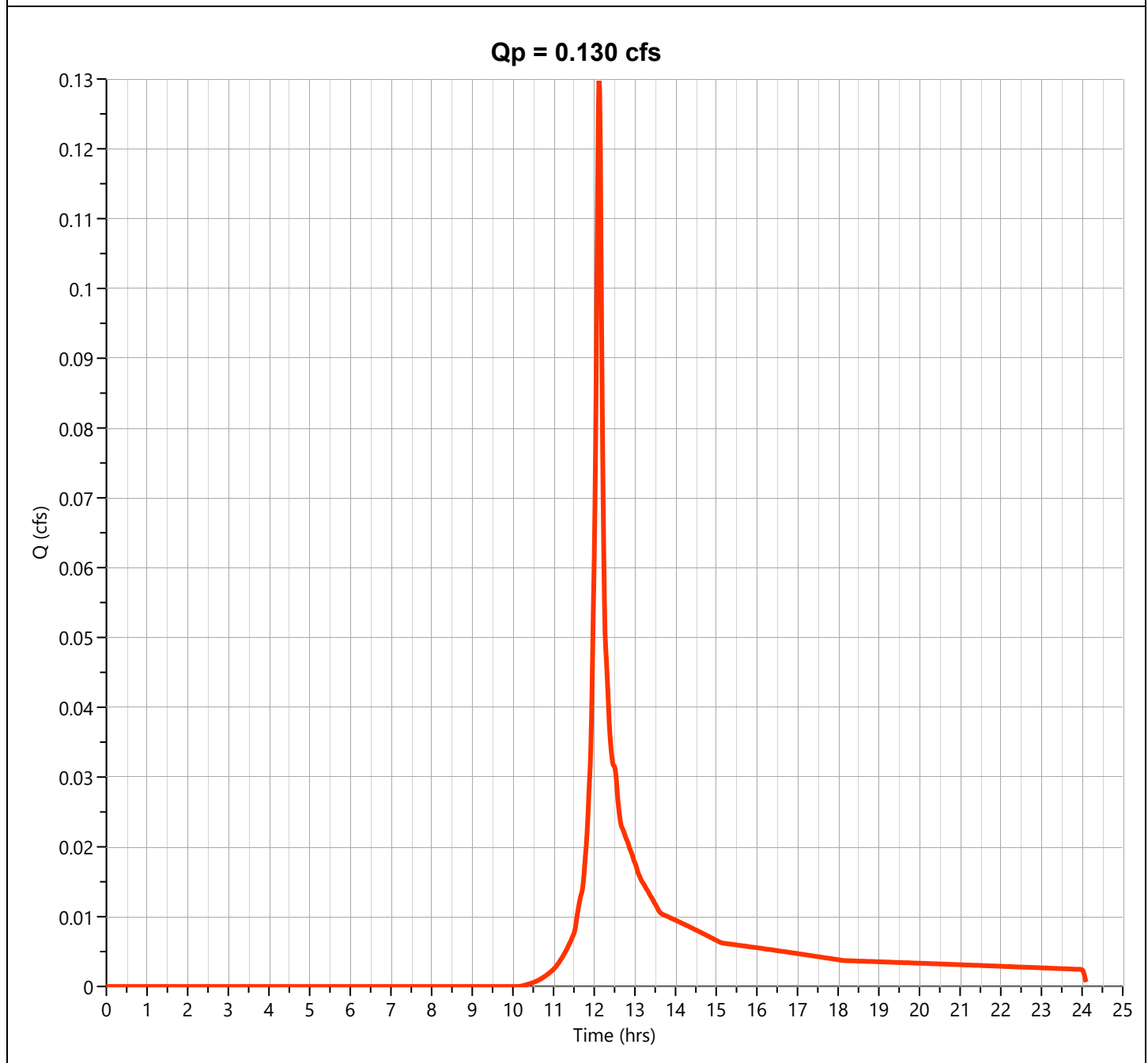
File: Current Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2G Grass HSGC C

## Hyd. No. 17

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.130 cfs |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.12 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 408 cuft  |
| Drainage Area   | = 0.09 ac     | Curve Number       | = 74.00     |
| Tc Method       | = User        | Time of Conc. (Tc) | = 5.0 min   |
| Total Rainfall  | = 3.46 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

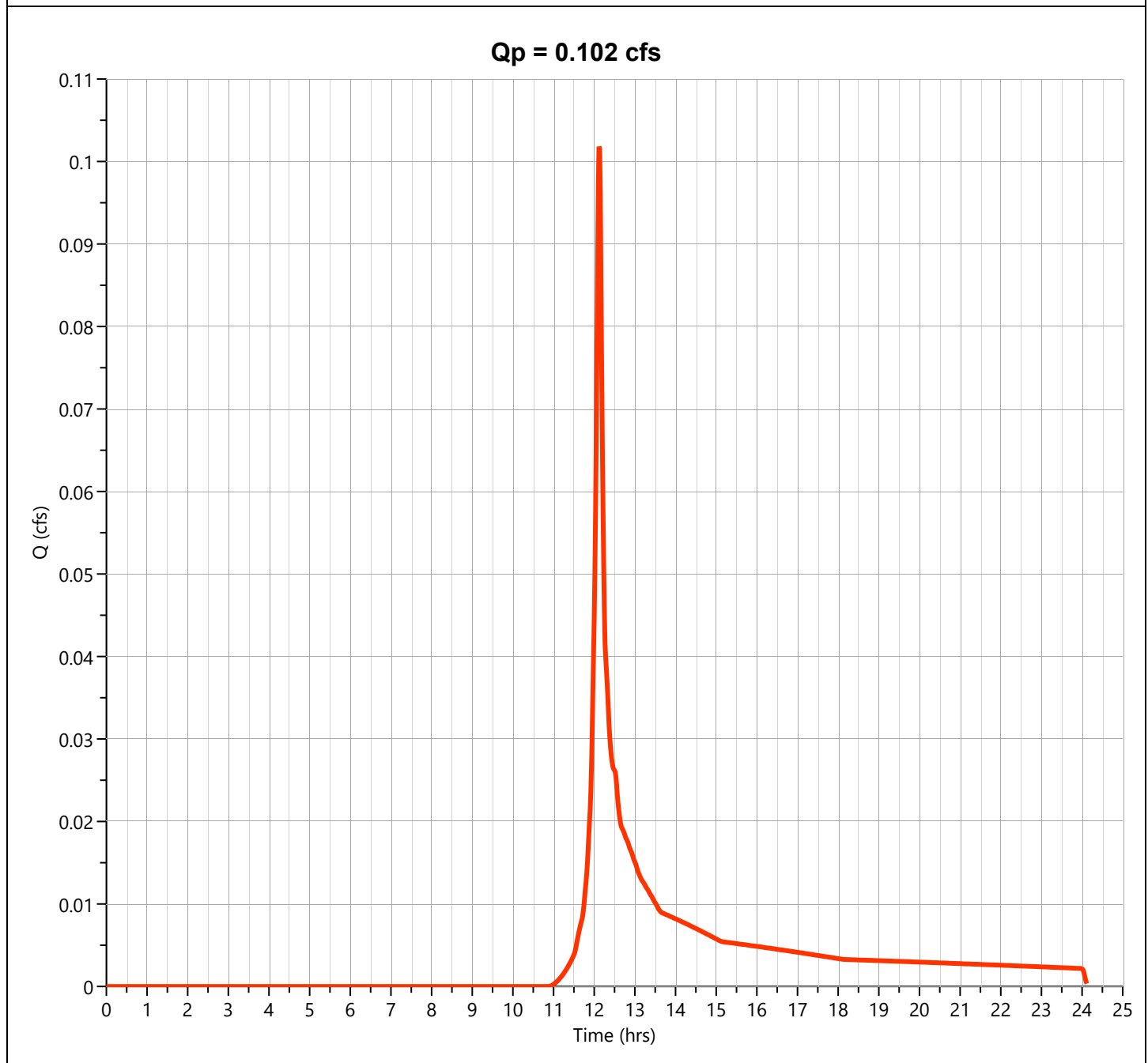
File: Current Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2G Woods HSGC C

## Hyd. No. 18

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.102 cfs |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.12 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 331 cuft  |
| Drainage Area   | = 0.09 ac     | Curve Number       | = 70.00     |
| Tc Method       | = User        | Time of Conc. (Tc) | = 5.0 min   |
| Total Rainfall  | = 3.46 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

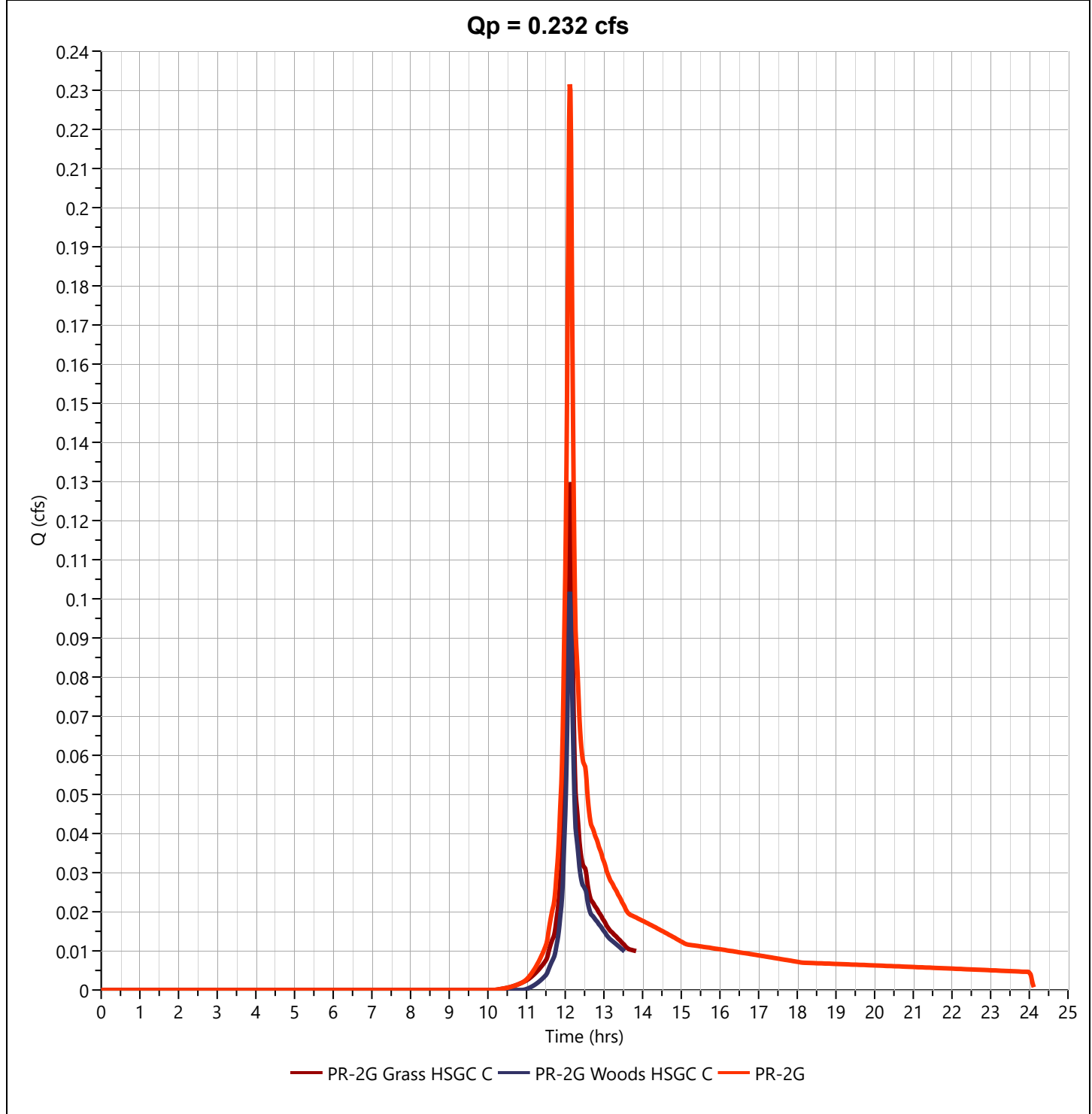
File: Current Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2G

## Hyd. No. 19

|                    |            |                     |             |
|--------------------|------------|---------------------|-------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.232 cfs |
| Storm Frequency    | = 2-yr     | Time to Peak        | = 12.12 hrs |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 740 cuft  |
| Inflow Hydrographs | = 17, 18   | Total Contrib. Area | = 0.18 ac   |





# Hydrograph Report

Hydrology Studio v 3.0.0.38

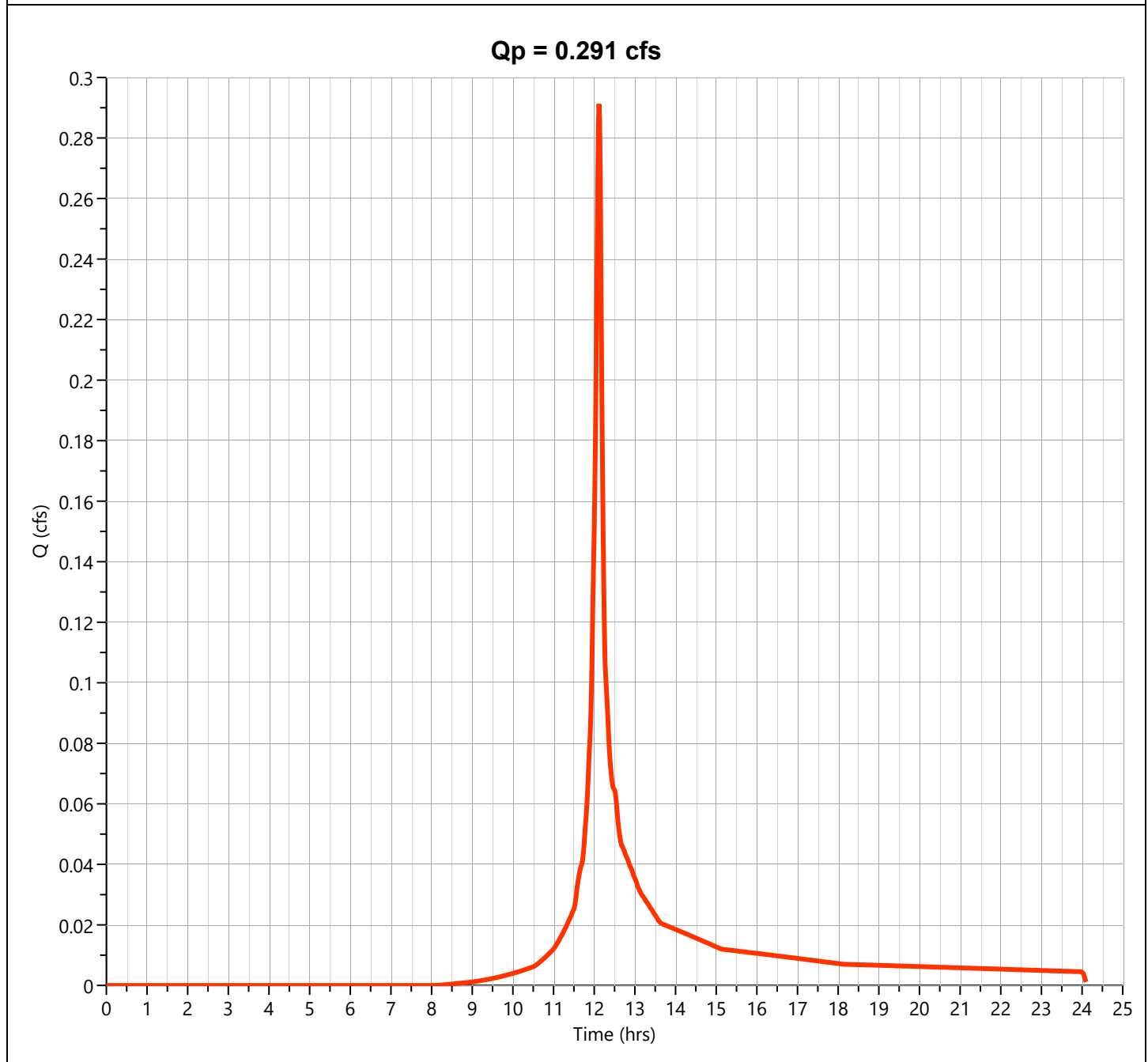
File: Current Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2G Grass HSGC C

## Hyd. No. 17

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.291 cfs |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.12 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 900 cuft  |
| Drainage Area   | = 0.09 ac     | Curve Number       | = 74.00     |
| Tc Method       | = User        | Time of Conc. (Tc) | = 5.0 min   |
| Total Rainfall  | = 5.38 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

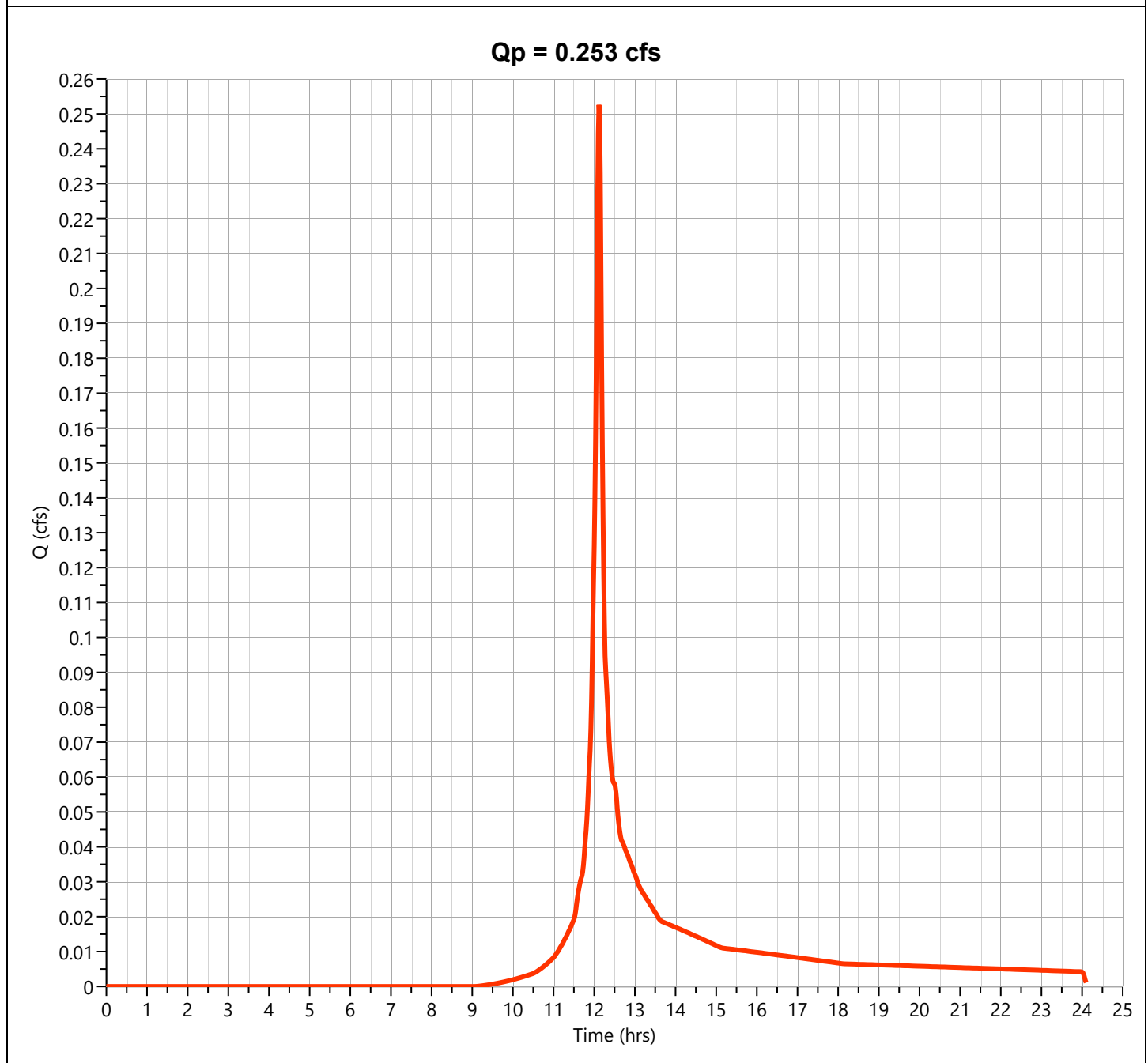
File: Current Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2G Woods HSGC C

## Hyd. No. 18

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.253 cfs |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.12 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 782 cuft  |
| Drainage Area   | = 0.09 ac     | Curve Number       | = 70.00     |
| Tc Method       | = User        | Time of Conc. (Tc) | = 5.0 min   |
| Total Rainfall  | = 5.38 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

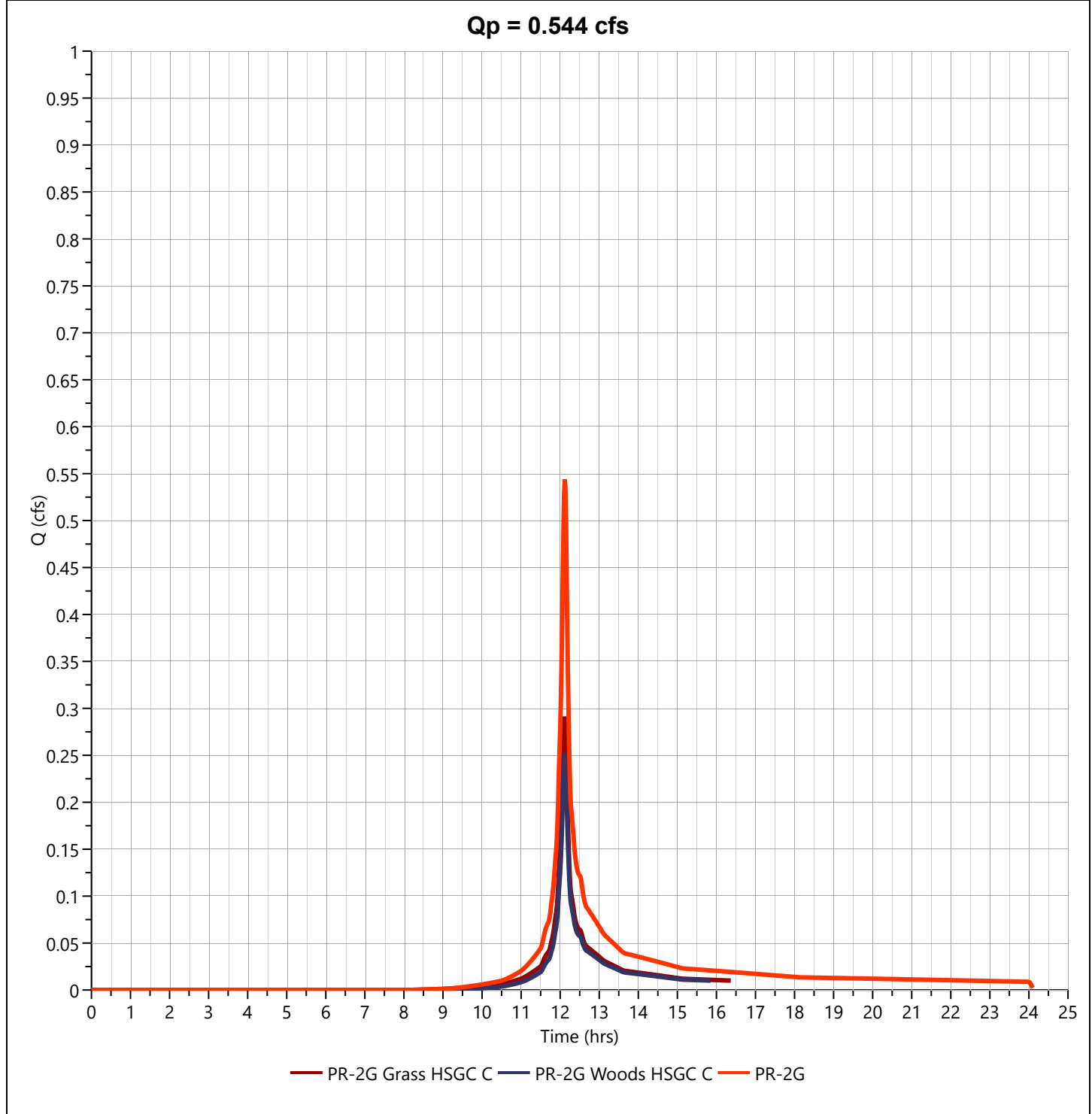
File: Current Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2G

## Hyd. No. 19

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.544 cfs  |
| Storm Frequency    | = 10-yr    | Time to Peak        | = 12.12 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 1,682 cuft |
| Inflow Hydrographs | = 17, 18   | Total Contrib. Area | = 0.18 ac    |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

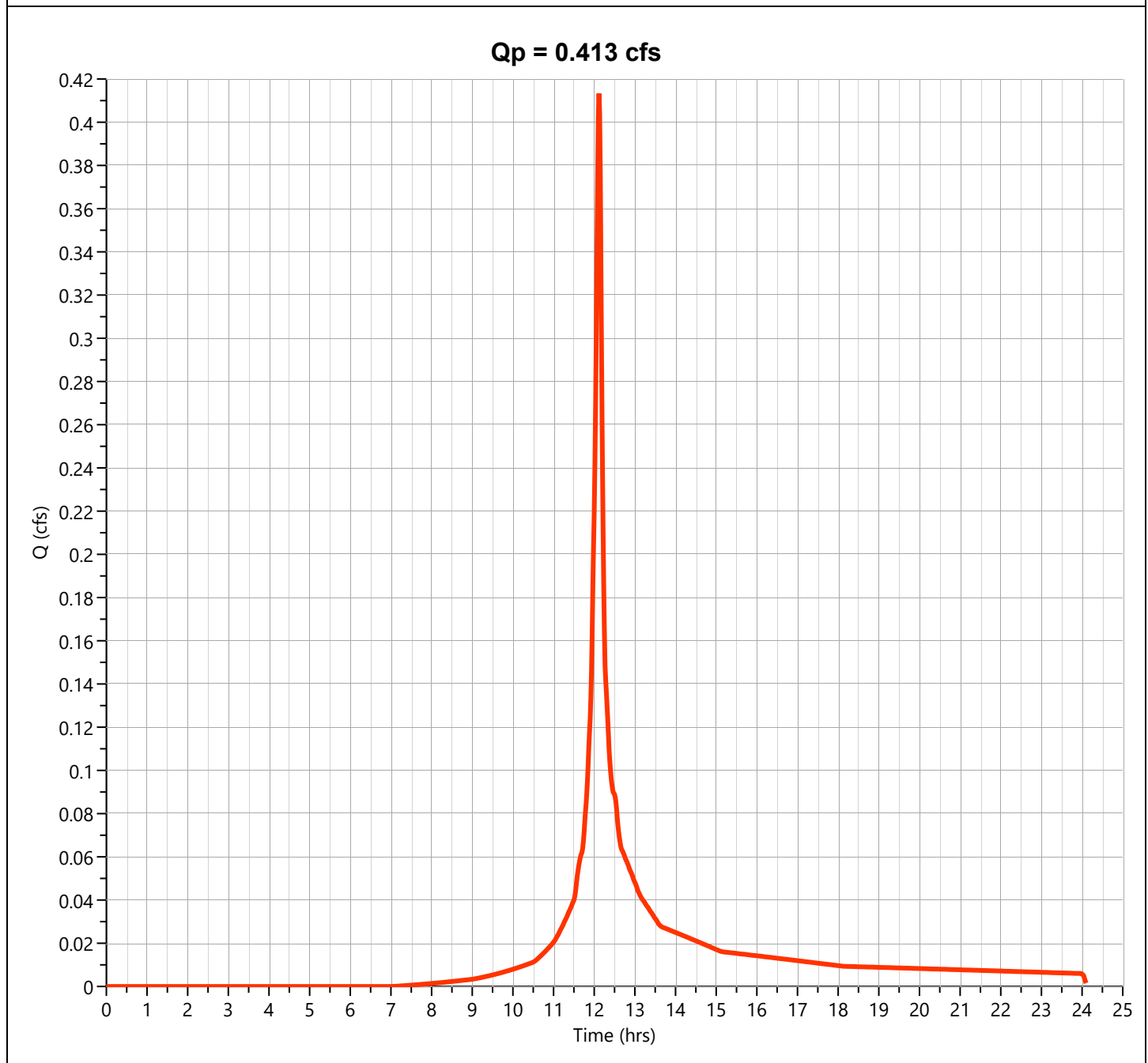
File: Current Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2G Grass HSGC C

## Hyd. No. 17

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.413 cfs  |
| Storm Frequency | = 25-yr       | Time to Peak       | = 12.12 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 1,283 cuft |
| Drainage Area   | = 0.09 ac     | Curve Number       | = 74.00      |
| Tc Method       | = User        | Time of Conc. (Tc) | = 5.0 min    |
| Total Rainfall  | = 6.73 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

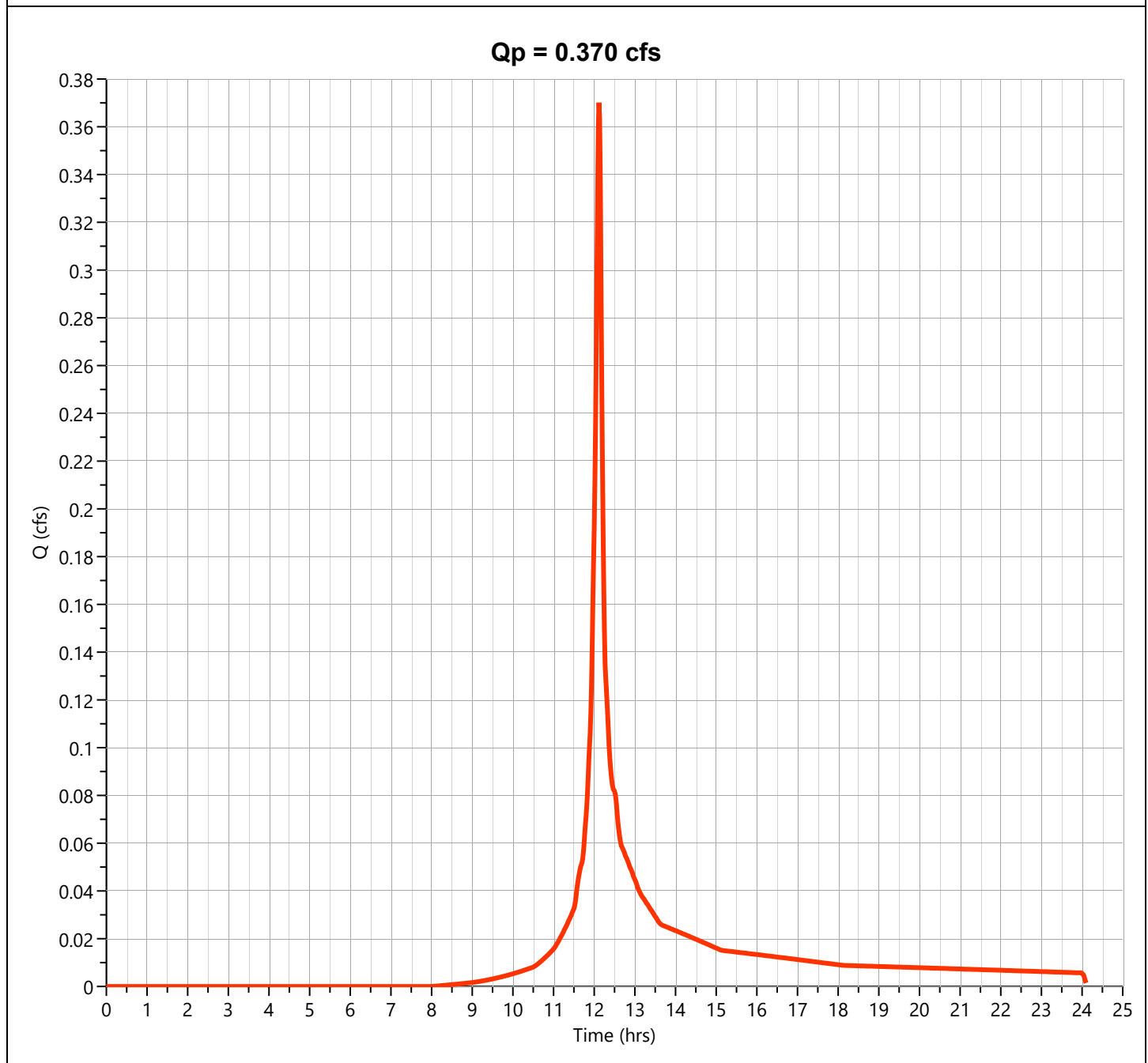
File: Current Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2G Woods HSGC C

## Hyd. No. 18

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.370 cfs  |
| Storm Frequency | = 25-yr       | Time to Peak       | = 12.12 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 1,144 cuft |
| Drainage Area   | = 0.09 ac     | Curve Number       | = 70.00      |
| Tc Method       | = User        | Time of Conc. (Tc) | = 5.0 min    |
| Total Rainfall  | = 6.73 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

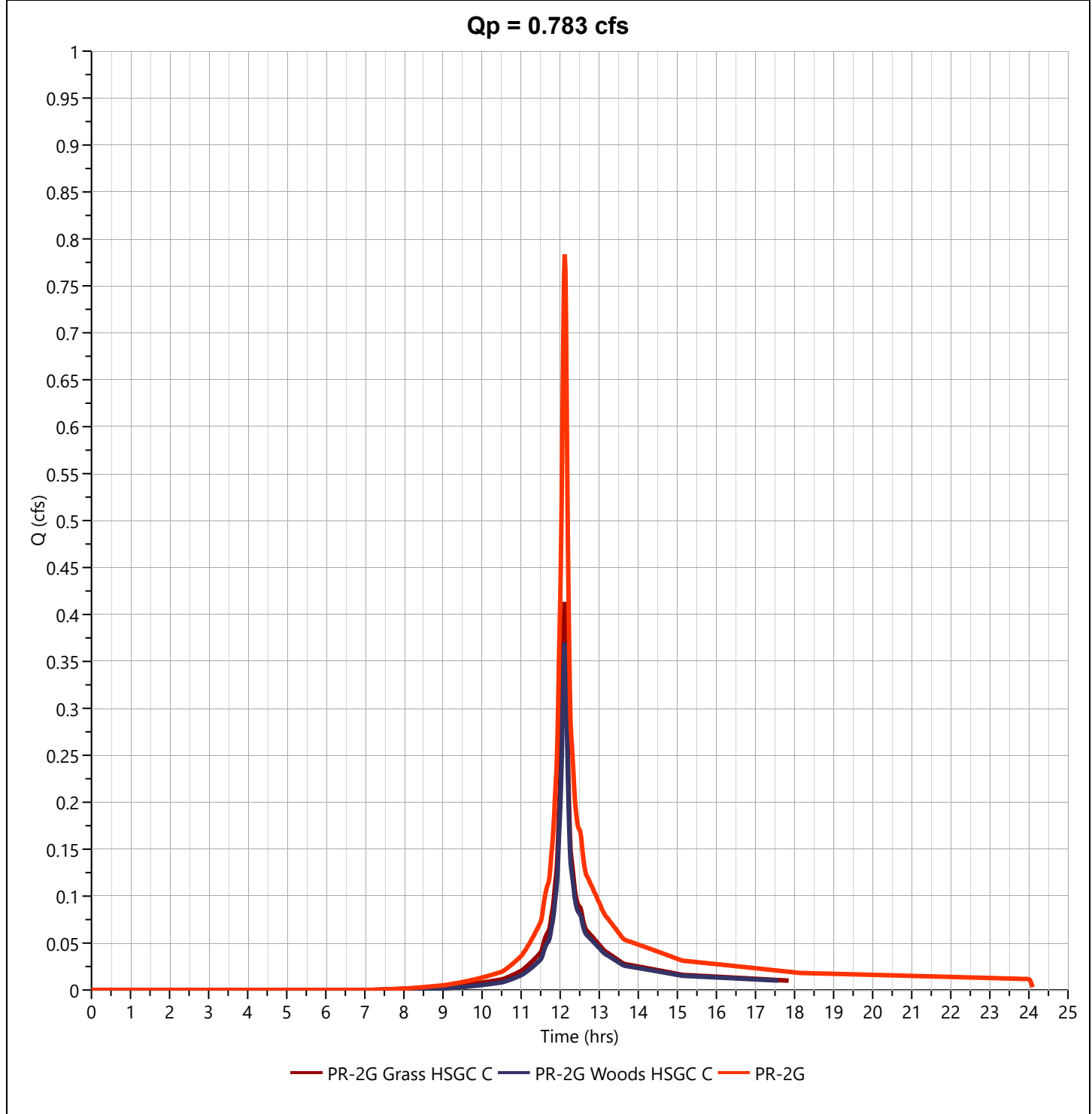
File: Current Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2G

## Hyd. No. 19

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.783 cfs  |
| Storm Frequency    | = 25-yr    | Time to Peak        | = 12.12 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 2,427 cuft |
| Inflow Hydrographs | = 17, 18   | Total Contrib. Area | = 0.18 ac    |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

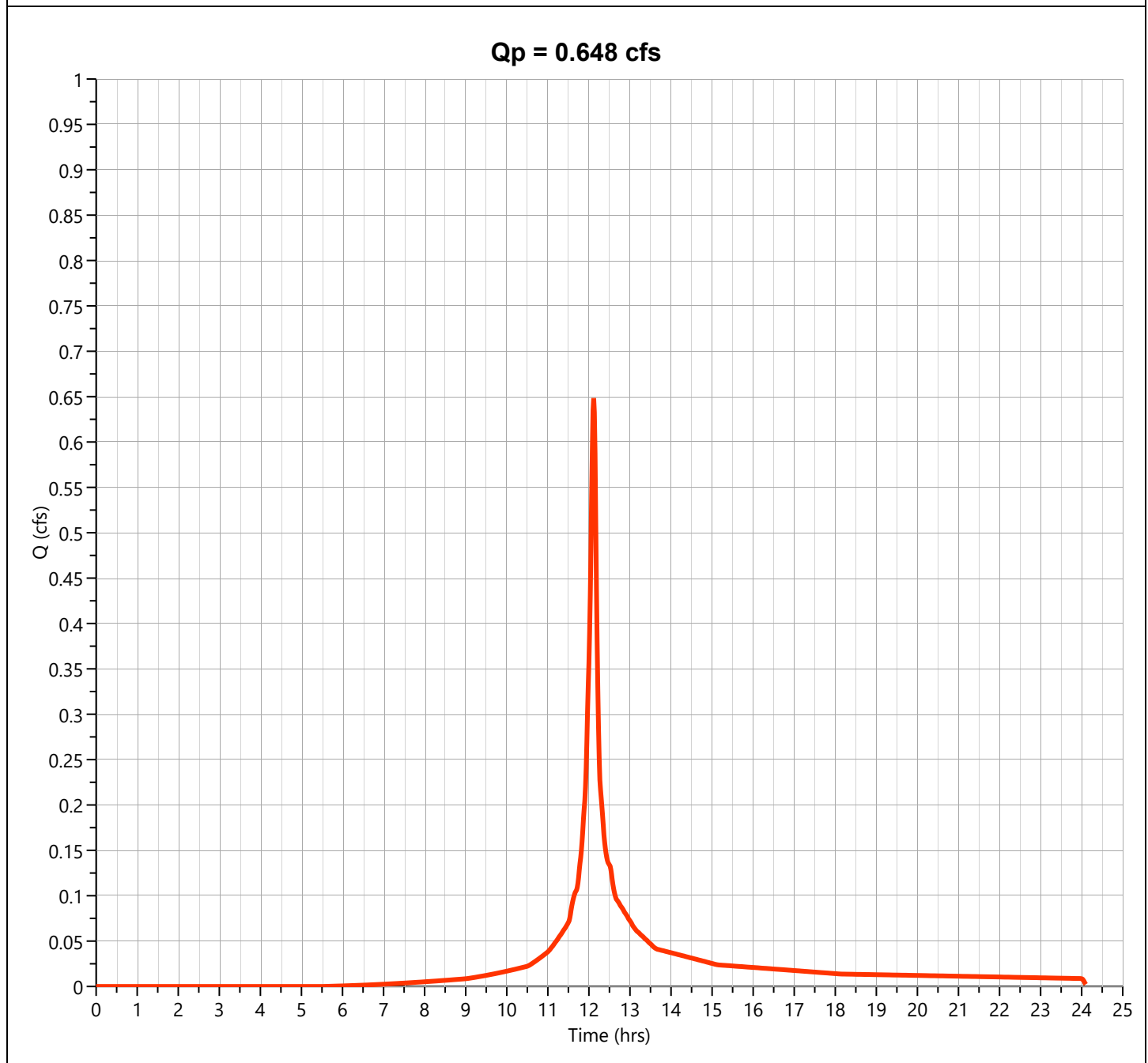
File: Current Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2G Grass HSGC C

## Hyd. No. 17

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.648 cfs  |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.12 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 2,044 cuft |
| Drainage Area   | = 0.09 ac     | Curve Number       | = 74.00      |
| Tc Method       | = User        | Time of Conc. (Tc) | = 5.0 min    |
| Total Rainfall  | = 9.26 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

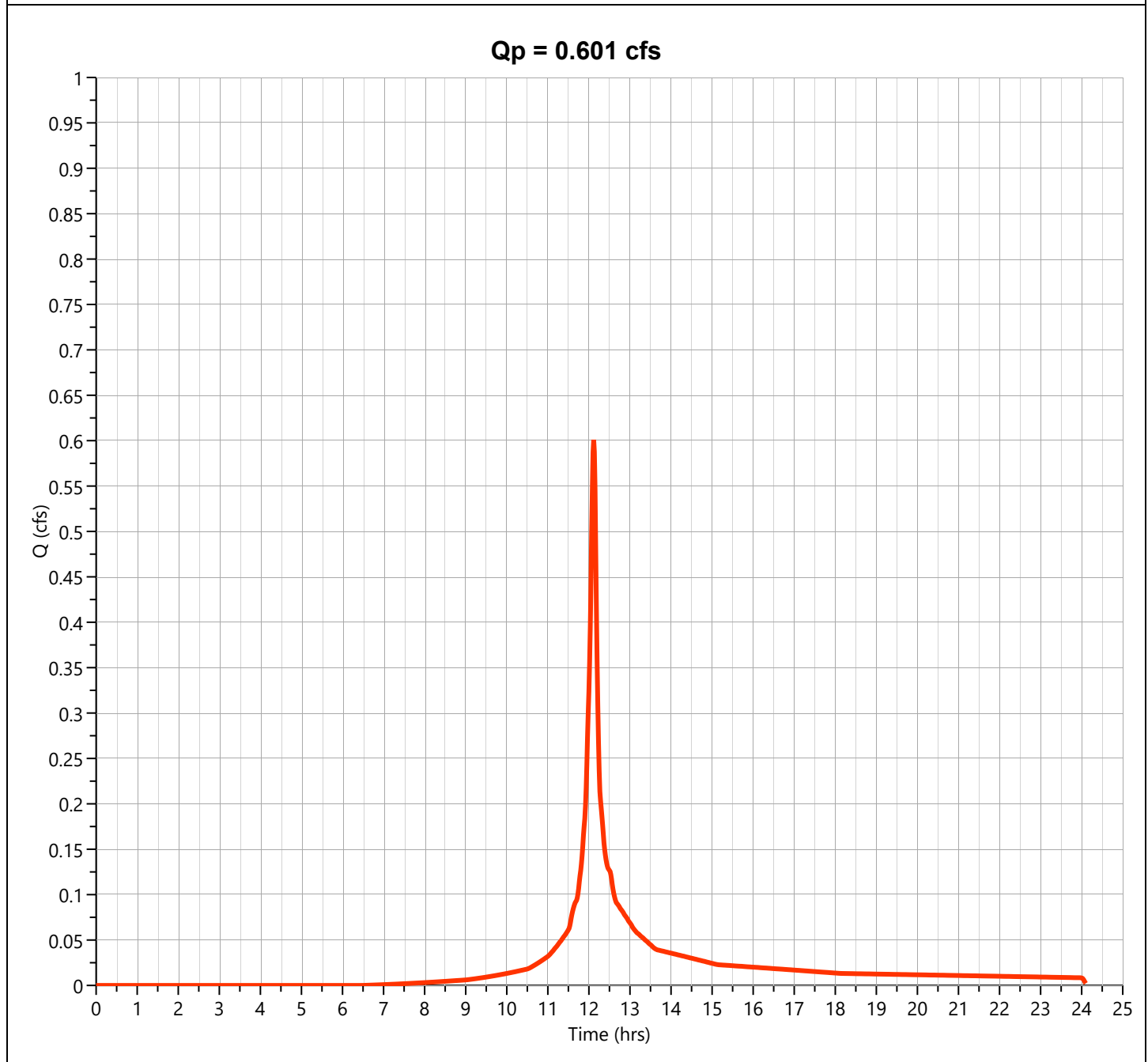
File: Current Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2G Woods HSGC C

## Hyd. No. 18

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.601 cfs  |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.12 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 1,875 cuft |
| Drainage Area   | = 0.09 ac     | Curve Number       | = 70.00      |
| Tc Method       | = User        | Time of Conc. (Tc) | = 5.0 min    |
| Total Rainfall  | = 9.26 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |





# Hydrograph Report

Hydrology Studio v 3.0.0.38

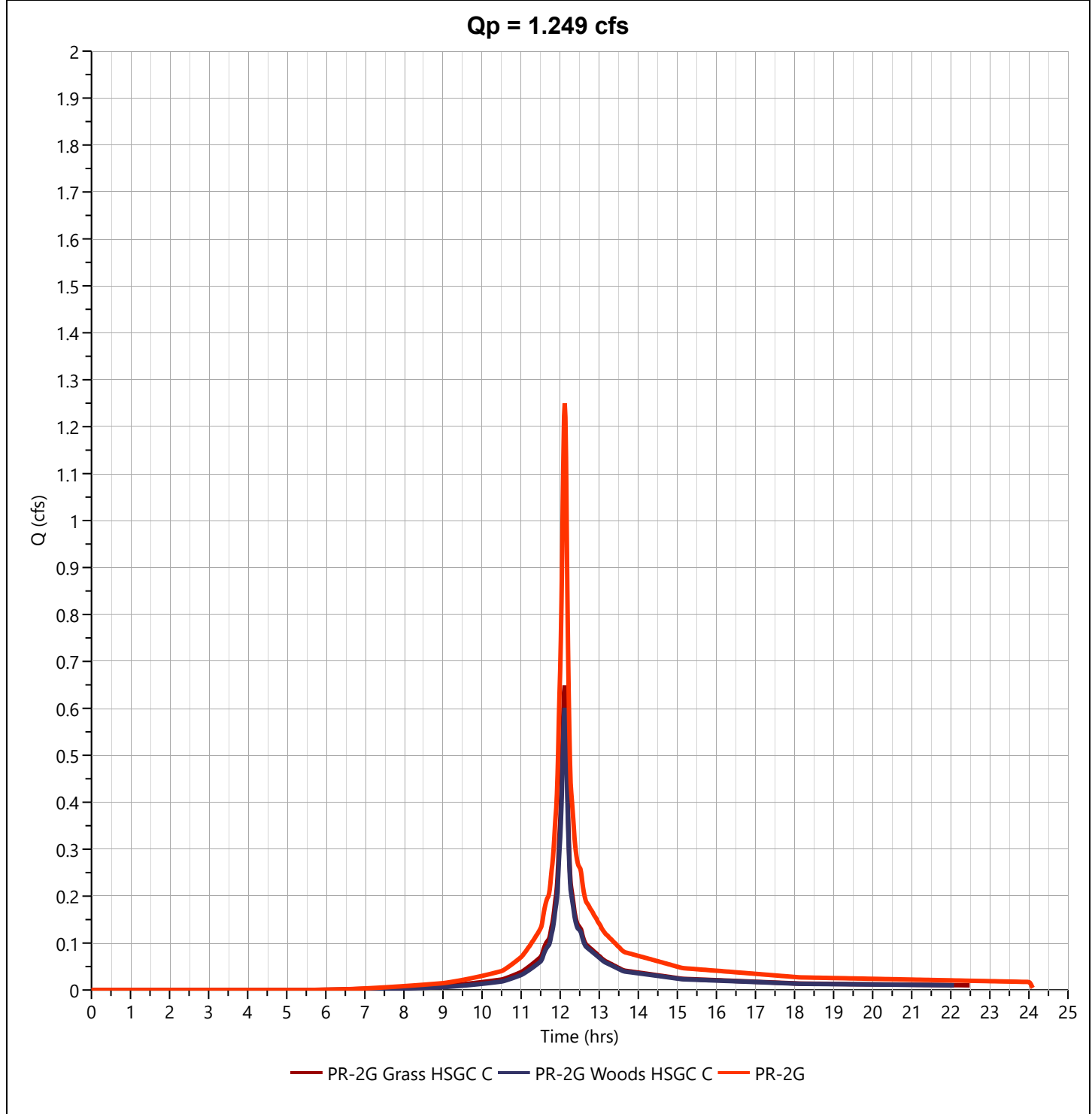
File: Current Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2G

## Hyd. No. 19

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 1.249 cfs  |
| Storm Frequency    | = 100-yr   | Time to Peak        | = 12.12 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 3,919 cuft |
| Inflow Hydrographs | = 17, 18   | Total Contrib. Area | = 0.18 ac    |



## **PR-2H WATERSHED**

Project: Beacon Unitarian Universalist Church

By: TEG

Date: 2/7/2024

Location: Summit, NJ

Checked By: MJV

Date Checked: 2/7/2024

Circle One: Present Developed

Current Proposed Watershed PR-2H - Impervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Design Flow Length, L<sub>des</sub> (Total L<sub>des</sub> < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. McCuen-Spiess Limit, L<sub>mcs</sub> (max. 100 ft)
7. Compute T<sub>t</sub>

$$L_{mcs} = (100 s^{0.5})/n$$

$$T_t = \frac{0.007 (n L_{des})^{0.8}}{P_2^{0.5} s^{0.4}}$$

|            |                        |   |  |
|------------|------------------------|---|--|
| Segment ID | 1                      |   |  |
|            | <b>Smooth Surfaces</b> |   |  |
|            | <b>0.011</b>           |   |  |
| ft         | <b>23</b>              |   |  |
| in         | <b>3.46</b>            |   |  |
| ft/ft      | <b>0.021</b>           |   |  |
| ft         | <b>100</b>             |   |  |
| hr         | <b>0.006</b>           | + |  |

Sheet Flow Sub-Total **0.006 hours**

**Shallow Concentrated Flow**

8. Surface Description
9. Flow Length, L
10. Watercourse Slope, s
11. Average Velocity, V (NEH table 15-3)
12. Compute T<sub>t</sub>

$$T_t = \frac{L}{3600 V}$$

|            |  |   |  |
|------------|--|---|--|
| Segment ID |  |   |  |
| ft         |  |   |  |
| ft/ft      |  |   |  |
| ft/s       |  |   |  |
| hr         |  | + |  |

Shallow Conc. Flow Sub-Total **0.000 hours**

**Channel Flow**

13. Flow Length, L
14. Cross Sectional flow area, a
15. Wetted Perimeter, P<sub>w</sub>
16. Hydraulic Radius, r
17. Channel Slope, s
18. Manning's Roughness Coeff., n
19. Velocity, V
20. Compute T<sub>t</sub>

$$r = a / P_w$$

$$V = (1.49 r^{2/3} s^{1/2}) / n$$

$$T_t = \frac{L}{3600 V}$$

|                 |  |   |  |
|-----------------|--|---|--|
| Segment ID      |  |   |  |
| ft              |  |   |  |
| ft <sup>2</sup> |  |   |  |
| ft              |  |   |  |
| ft              |  |   |  |
| ft/ft           |  |   |  |
| ft/s            |  |   |  |
| hr              |  | + |  |

Channel Flow Sub-Total **0.000 hours**

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>

(Add Sub-Total T<sub>t</sub> from prior steps)

|   |                    |
|---|--------------------|
| Total T <sub>c</sub> (hours) =                        | <b>0.006 hours</b> |
| Software Limitations Require Minimum T <sub>c</sub> = | <b>2 minutes</b>   |

Project: Beacon Unitarian Universalist Church

By: TEG

Date: 2/7/2024

Location: Summit, NJ

Checked By: MJV

Date Checked: 2/7/2024

Circle One: Present Developed

Current Proposed Watershed PR-2H - Pervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Design Flow Length, L<sub>des</sub> (Total L<sub>des</sub> < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. McCuen-Spiess Limit, L<sub>mcs</sub> (max. 100 ft)
7. Compute T<sub>t</sub>

$$L_{mcs} = (100 s^{0.5})/n$$

$$T_t = \frac{0.007 (n L_{des})^{0.8}}{P_2^{0.5} s^{0.4}}$$

|            |               |   |  |
|------------|---------------|---|--|
| Segment ID | 1             |   |  |
|            | Dense Grasses |   |  |
|            | 0.24          |   |  |
| ft         | 31            |   |  |
| in         | 3.46          |   |  |
| ft/ft      | 0.016         |   |  |
| ft         | 53            |   |  |
| hr         | 0.097         | + |  |

Sheet Flow Sub-Total **0.097 hours**

**Shallow Concentrated Flow**

8. Surface Description
9. Flow Length, L
10. Watercourse Slope, s
11. Average Velocity, V (NEH table 15-3)
12. Compute T<sub>t</sub>

$$T_t = \frac{L}{3600 V}$$

|            |  |   |  |
|------------|--|---|--|
| Segment ID |  |   |  |
| ft         |  |   |  |
| ft/ft      |  |   |  |
| ft/s       |  |   |  |
| hr         |  | + |  |

Shallow Conc. Flow Sub-Total **0.000 hours**

**Channel Flow**

13. Flow Length, L
14. Cross Sectional flow area, a
15. Wetted Perimeter, P<sub>w</sub>
16. Hydraulic Radius, r
17. Channel Slope, s
18. Manning's Roughness Coeff., n
19. Velocity, V
20. Compute T<sub>t</sub>

$$r = a / P_w$$

$$V = (1.49 r^{2/3} s^{1/2}) / n$$

$$T_t = \frac{L}{3600 V}$$

|                 |  |   |  |
|-----------------|--|---|--|
| Segment ID      |  |   |  |
| ft              |  |   |  |
| ft <sup>2</sup> |  |   |  |
| ft              |  |   |  |
| ft              |  |   |  |
| ft/ft           |  |   |  |
| ft/s            |  |   |  |
| hr              |  | + |  |

Channel Flow Sub-Total **0.000 hours**

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>

(Add Sub-Total T<sub>t</sub> from prior steps)

|                      |                    |
|----------------------|--------------------|
| Total Tc (hours) =   | <b>0.097 hours</b> |
| Total Tc (minutes) = | <b>6 minutes</b>   |

# Hydrograph Report

Project Name:

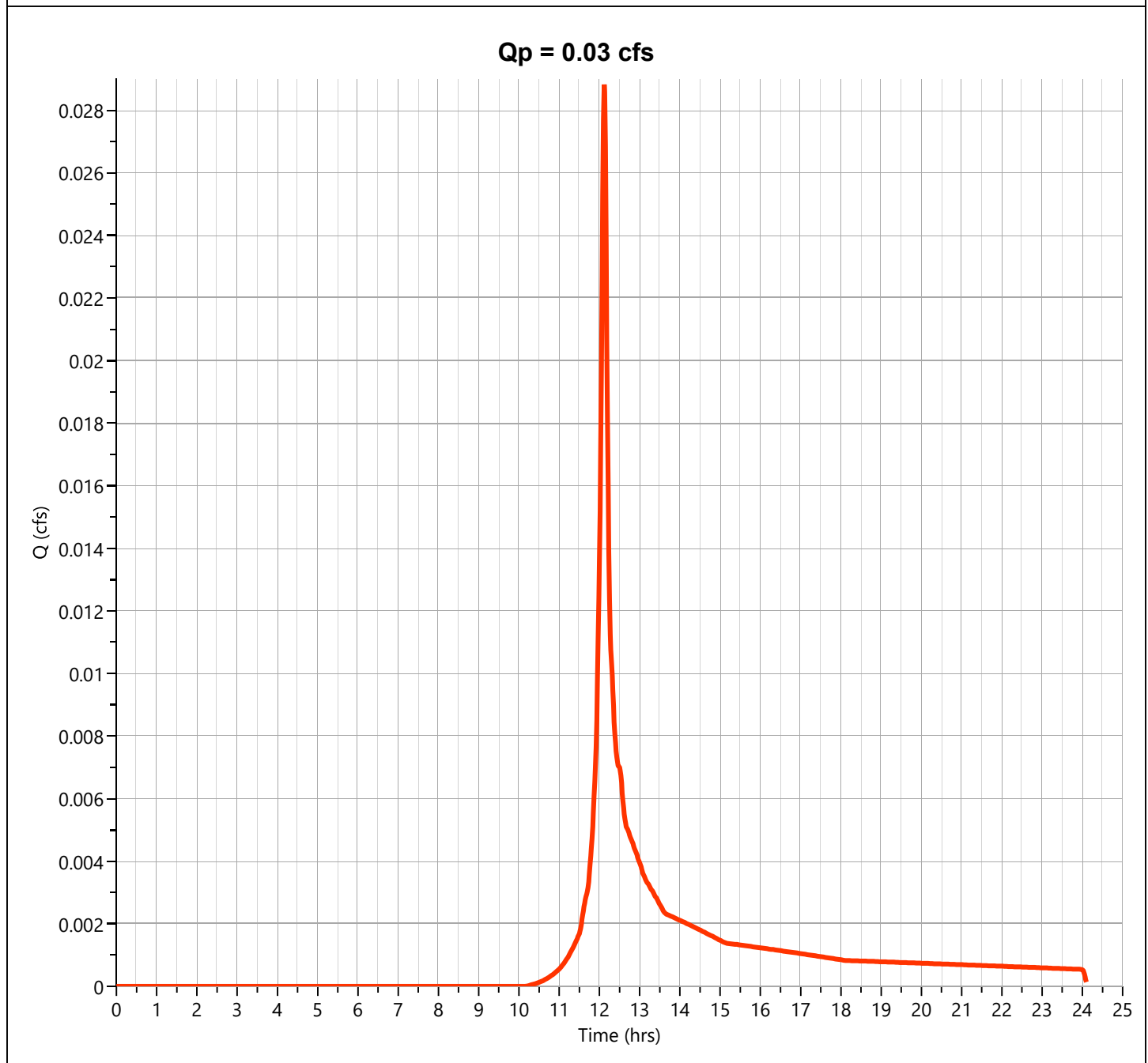
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2H Grass HSGC C

## Hyd. No. 34

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.029 cfs |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.12 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 90.8 cuft |
| Drainage Area   | = 0.02 ac     | Curve Number       | = 74        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 6.0 min   |
| Total Rainfall  | = 3.46 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

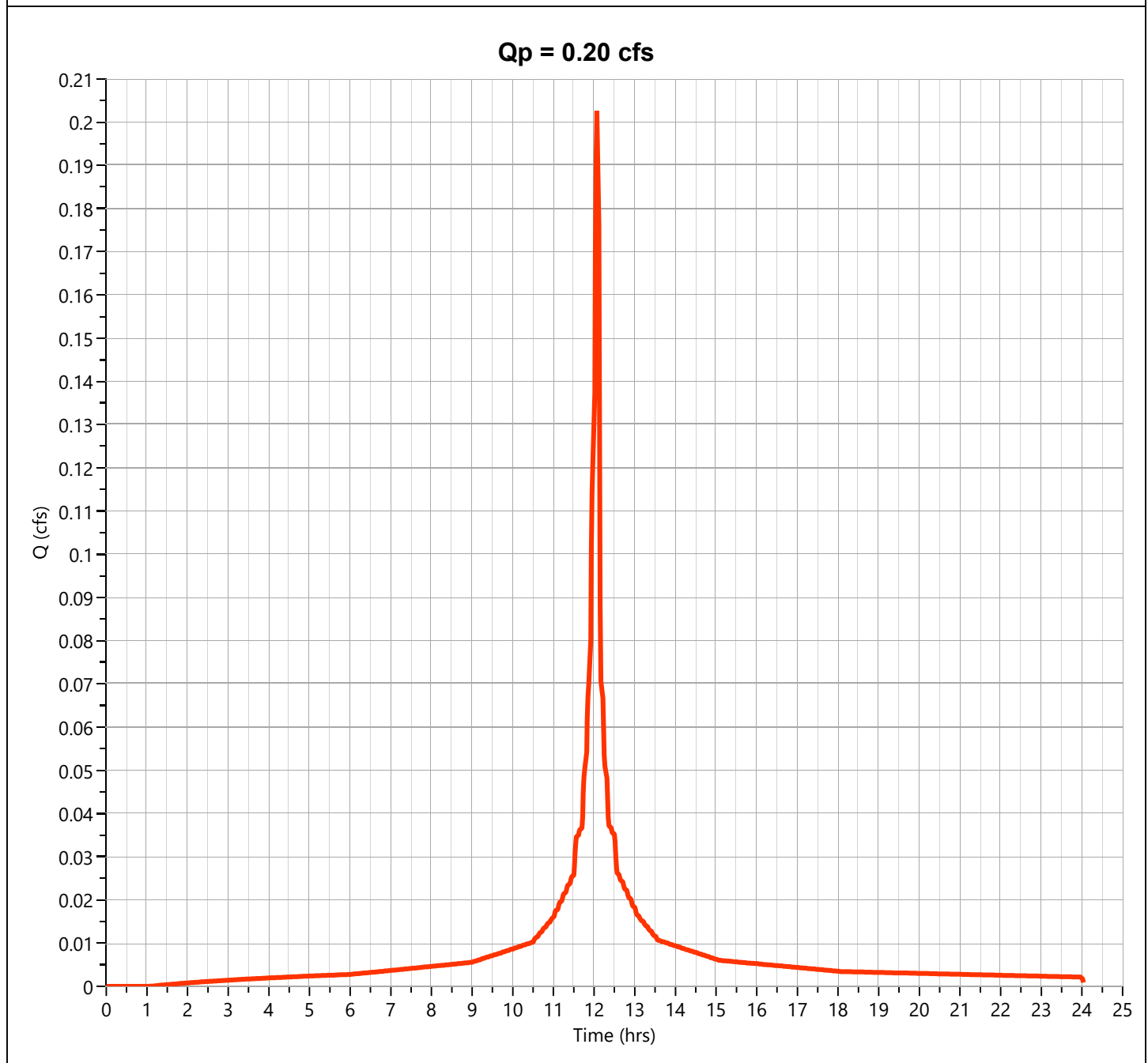
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2H Impervious

## Hyd. No. 35

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.203 cfs |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.10 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 659 cuft  |
| Drainage Area   | = 0.06 ac     | Curve Number       | = 98        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 2.0 min   |
| Total Rainfall  | = 3.46 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

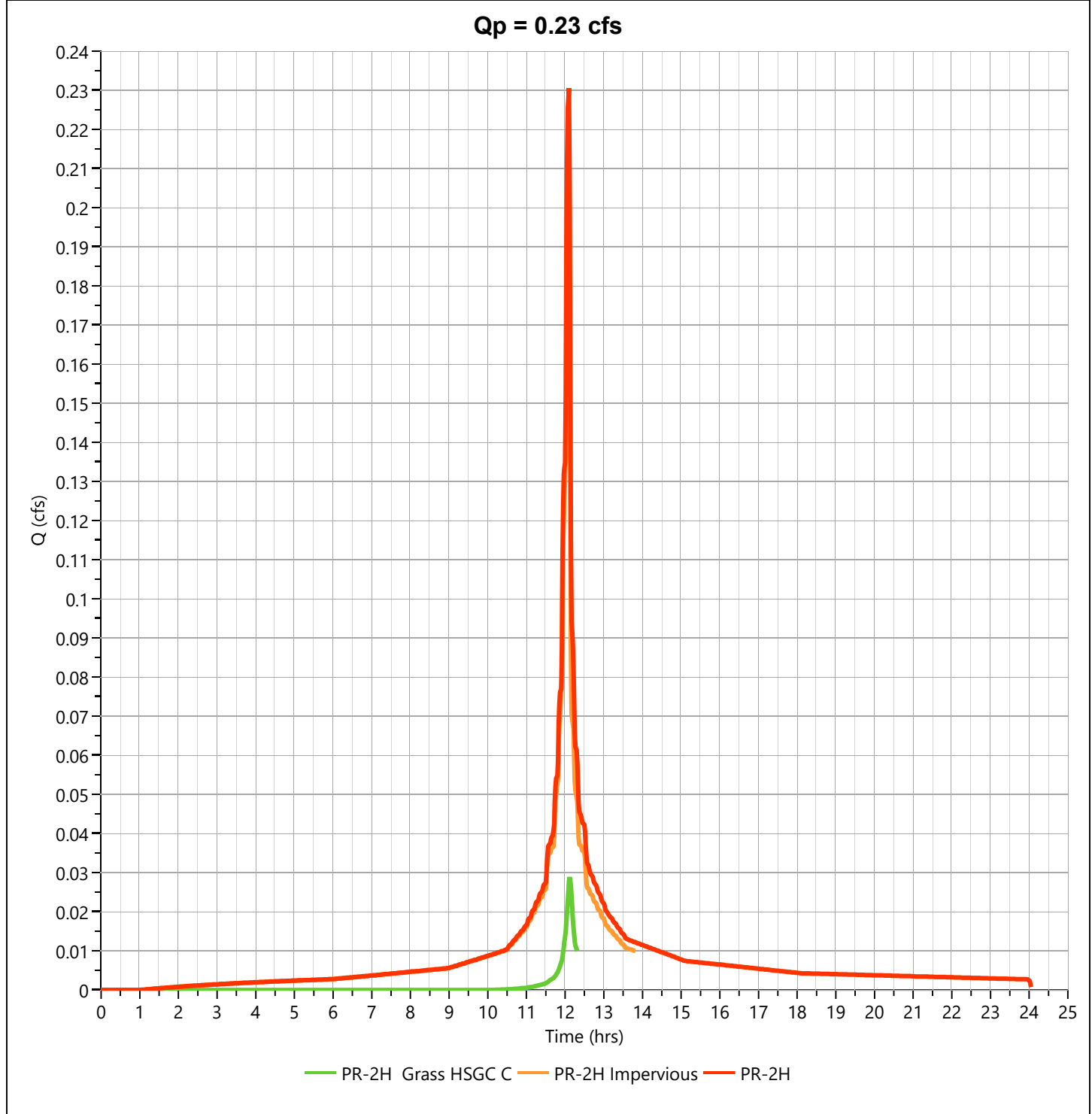
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2H

## Hyd. No. 36

|                    |            |                     |             |
|--------------------|------------|---------------------|-------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.231 cfs |
| Storm Frequency    | = 2-yr     | Time to Peak        | = 12.10 hrs |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 750 cuft  |
| Inflow Hydrographs | = 34, 35   | Total Contrib. Area | = 0.08 ac   |



# Hydrograph Report

Project Name:

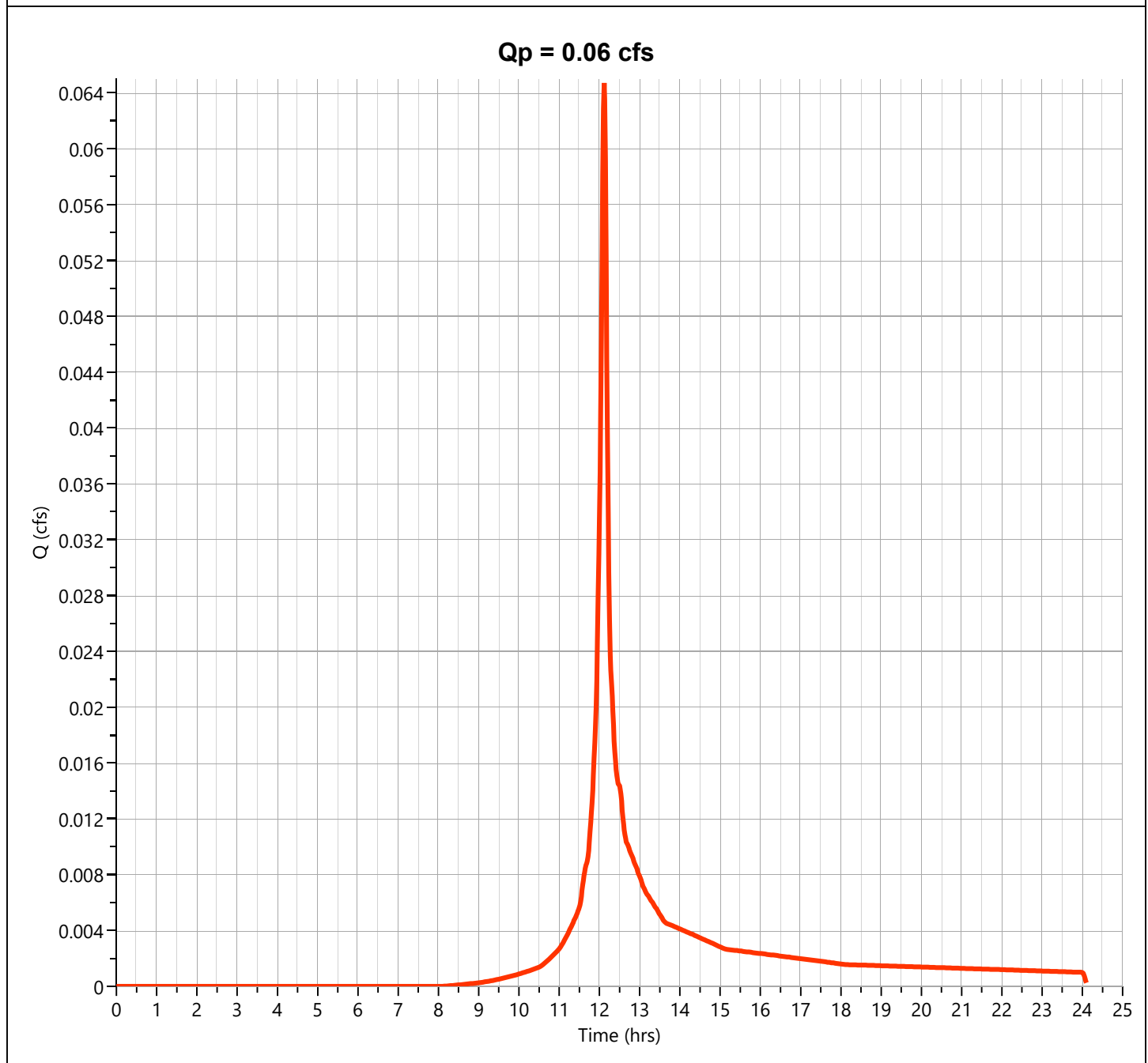
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2H Grass HSGC C

## Hyd. No. 34

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.065 cfs |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.12 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 200 cuft  |
| Drainage Area   | = 0.02 ac     | Curve Number       | = 74        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 6.0 min   |
| Total Rainfall  | = 5.38 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |





# Hydrograph Report

Project Name:

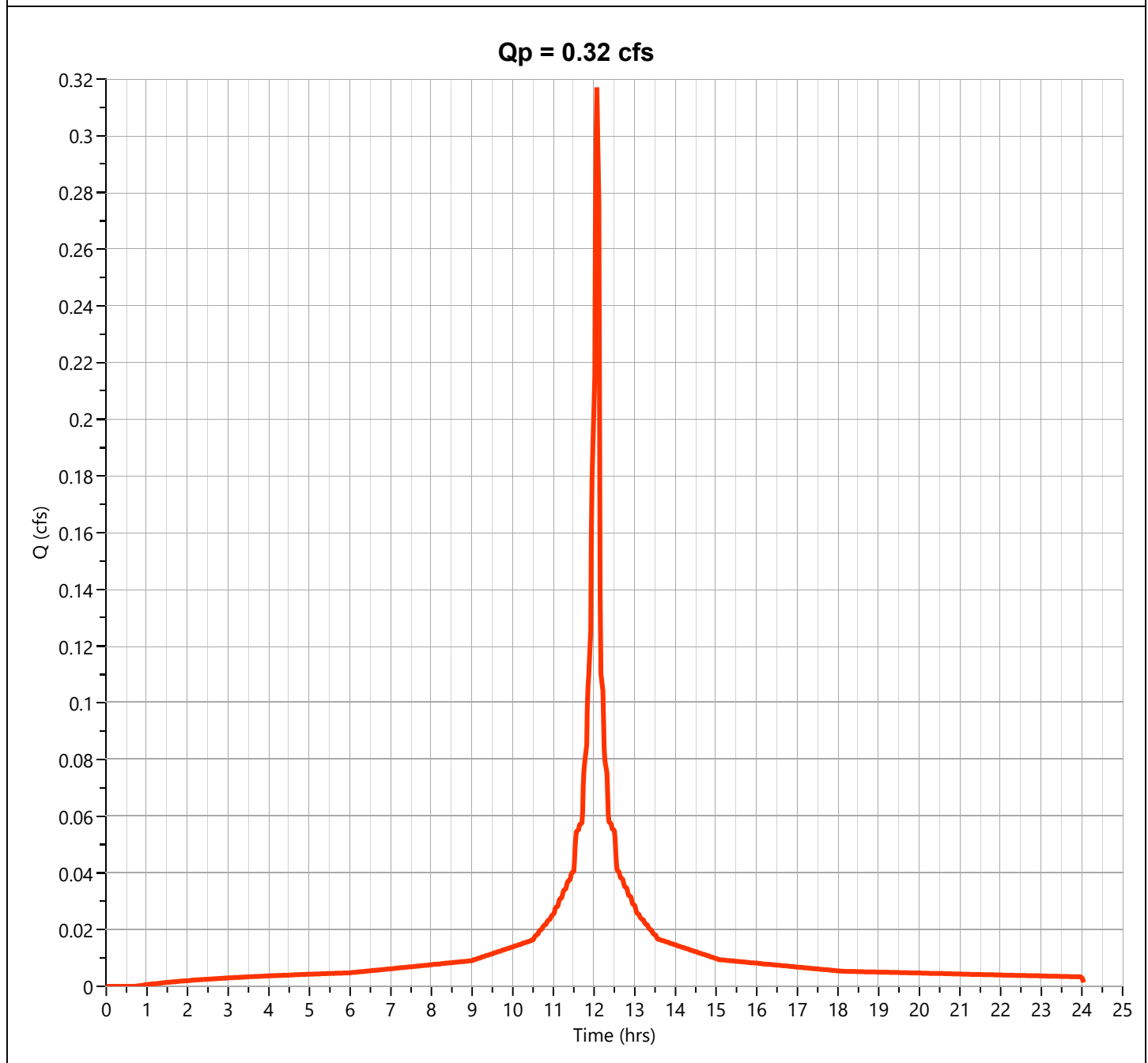
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2H Impervious

## Hyd. No. 35

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.317 cfs  |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 1,050 cuft |
| Drainage Area   | = 0.06 ac     | Curve Number       | = 98         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 2.0 min    |
| Total Rainfall  | = 5.38 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

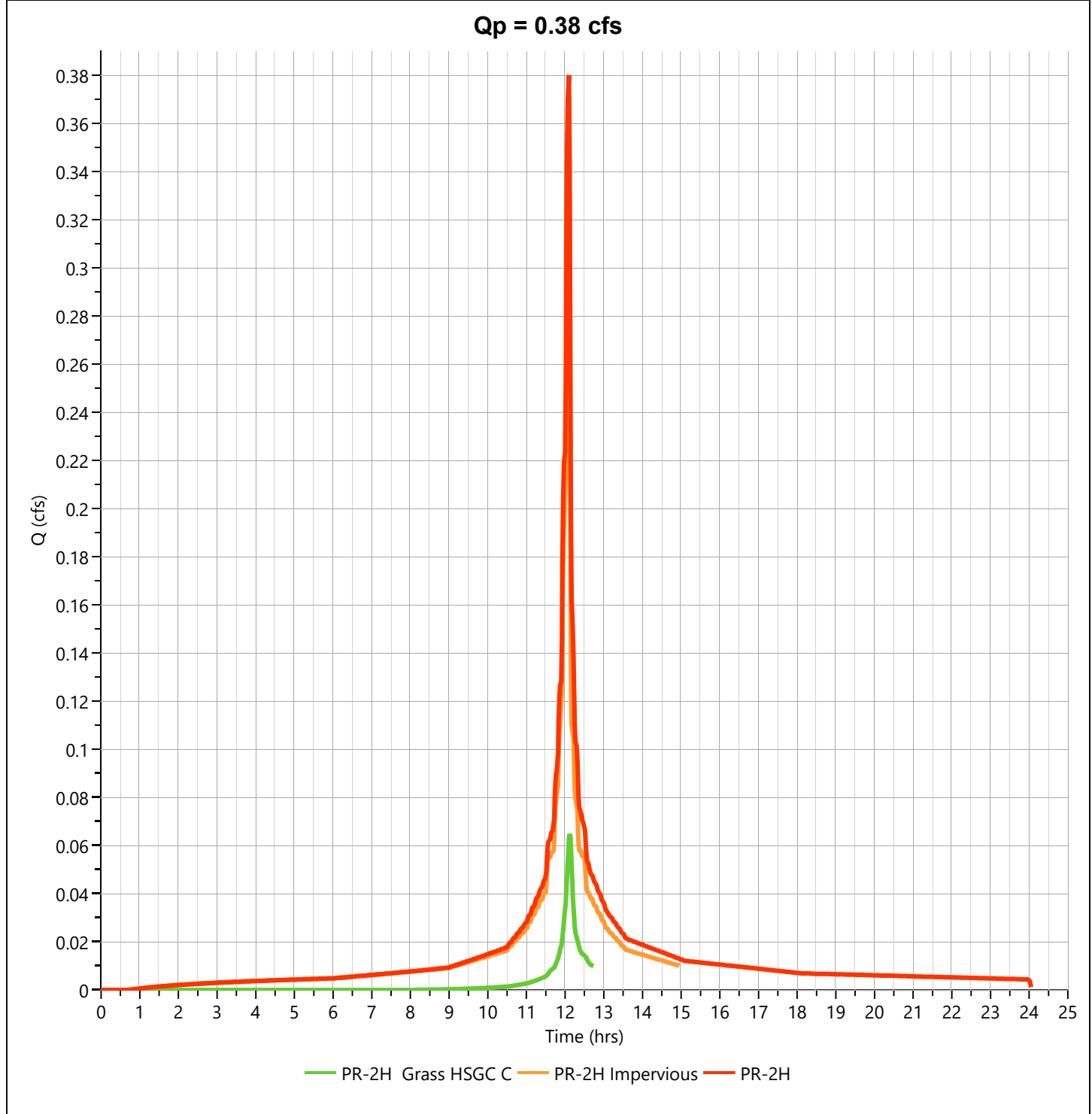
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2H

## Hyd. No. 36

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.380 cfs  |
| Storm Frequency    | = 10-yr    | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 1,250 cuft |
| Inflow Hydrographs | = 34, 35   | Total Contrib. Area | = 0.08 ac    |



# Hydrograph Report

Project Name:

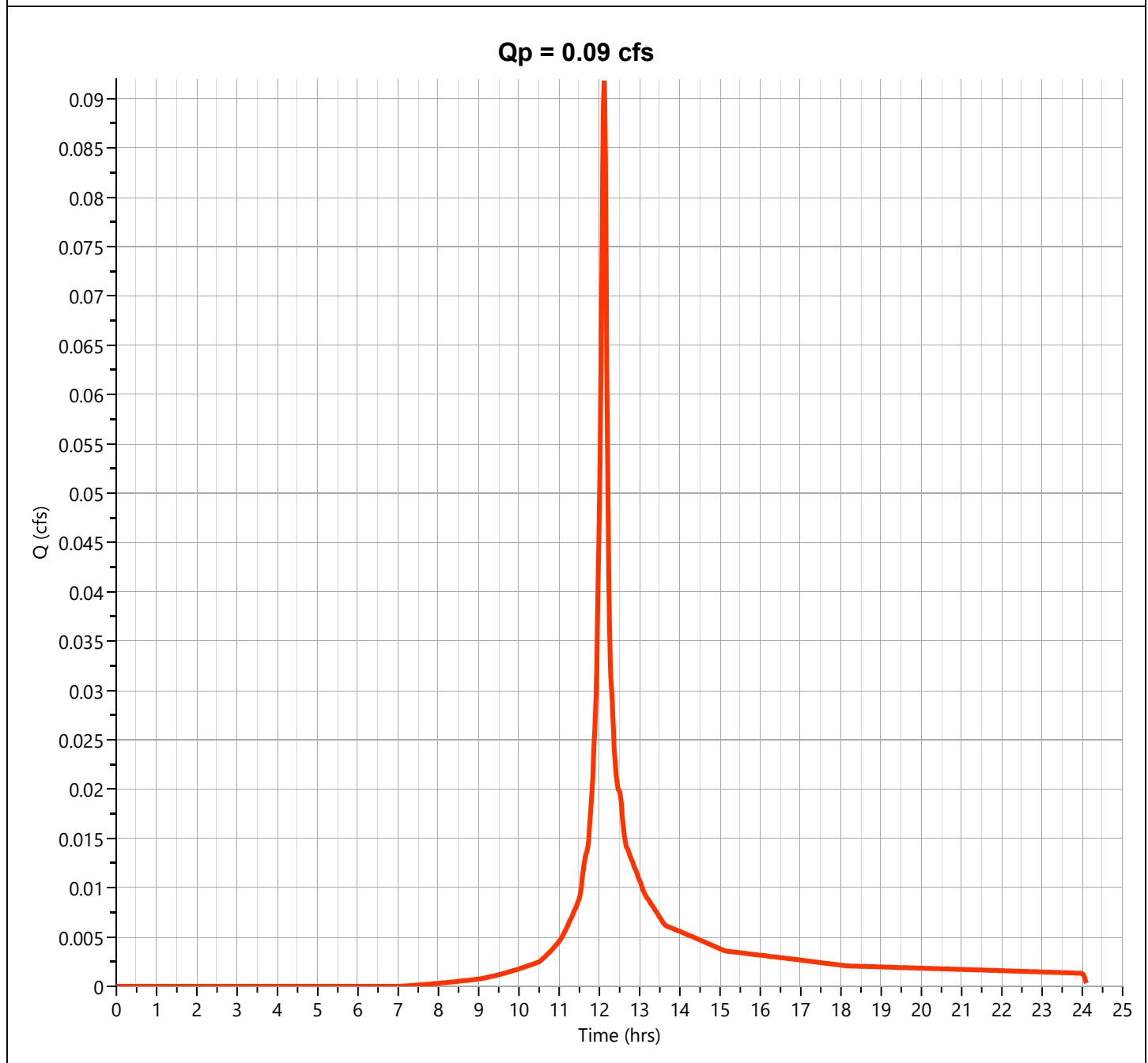
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2H Grass HSGC C

## Hyd. No. 34

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.092 cfs |
| Storm Frequency | = 25-yr       | Time to Peak       | = 12.12 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 285 cuft  |
| Drainage Area   | = 0.02 ac     | Curve Number       | = 74        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 6.0 min   |
| Total Rainfall  | = 6.73 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

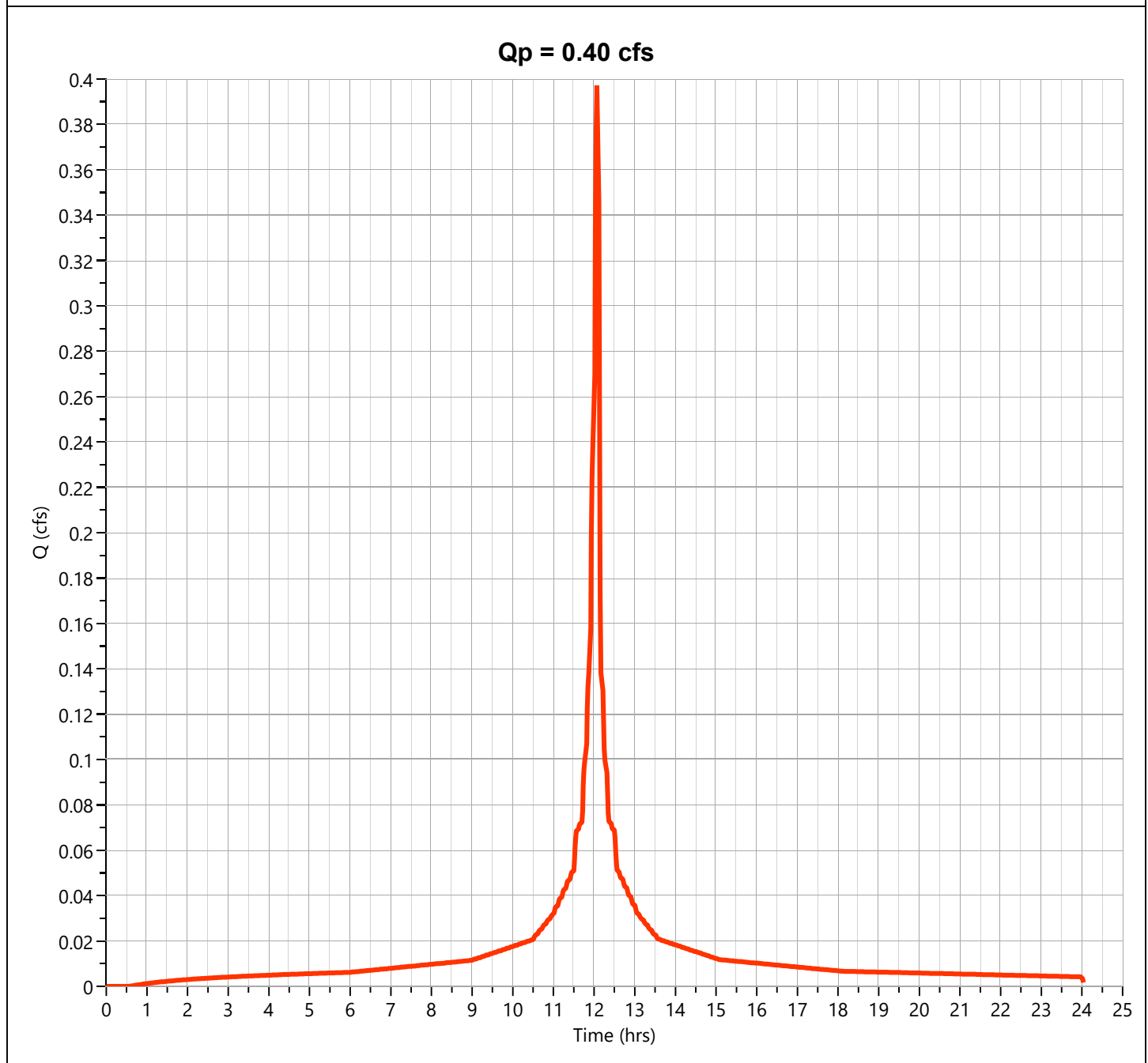
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2H Impervious

## Hyd. No. 35

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.397 cfs  |
| Storm Frequency | = 25-yr       | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 1,325 cuft |
| Drainage Area   | = 0.06 ac     | Curve Number       | = 98         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 2.0 min    |
| Total Rainfall  | = 6.73 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

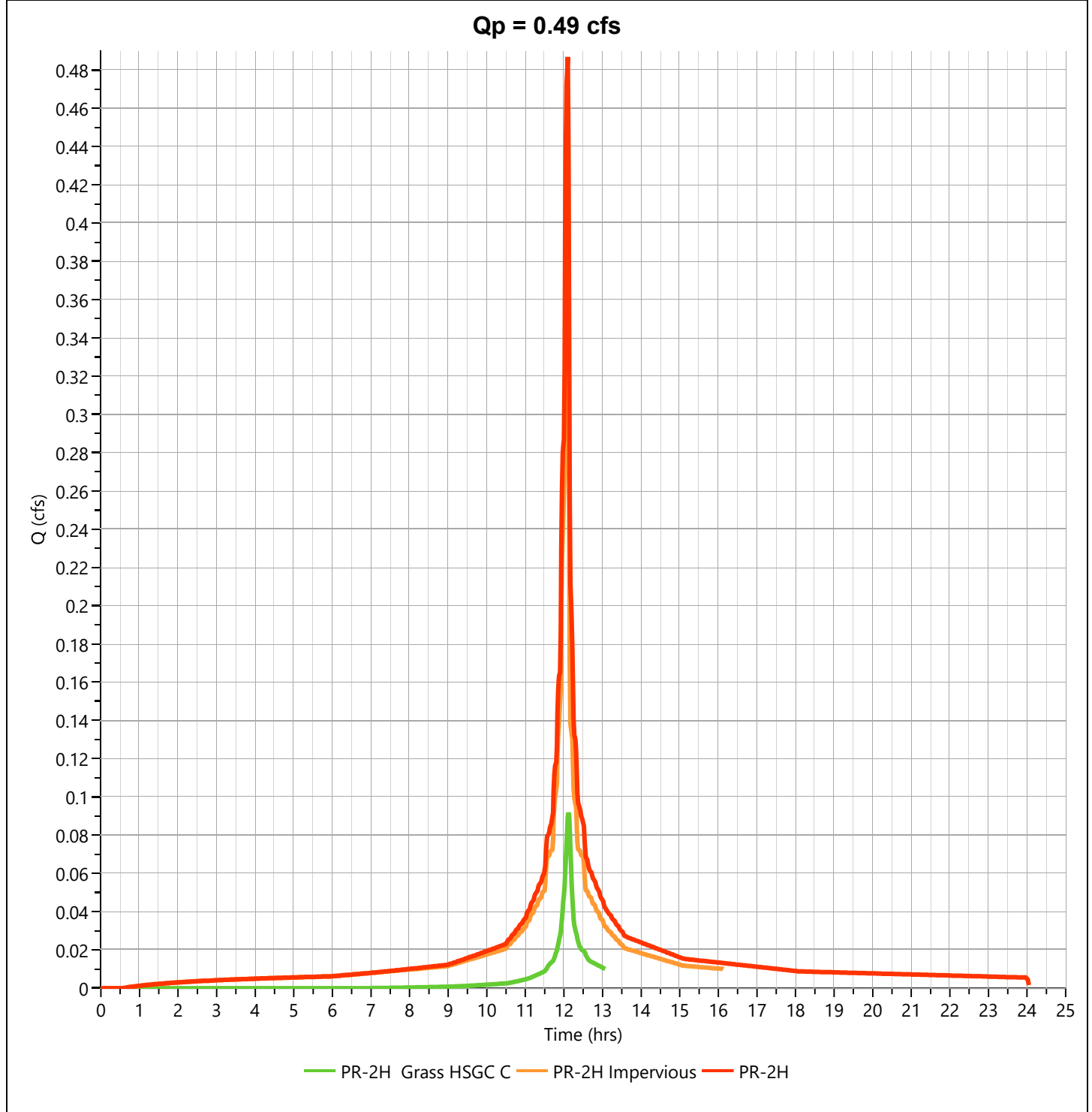
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2H

## Hyd. No. 36

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.487 cfs  |
| Storm Frequency    | = 25-yr    | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 1,610 cuft |
| Inflow Hydrographs | = 34, 35   | Total Contrib. Area | = 0.08 ac    |



# Hydrograph Report

Project Name:

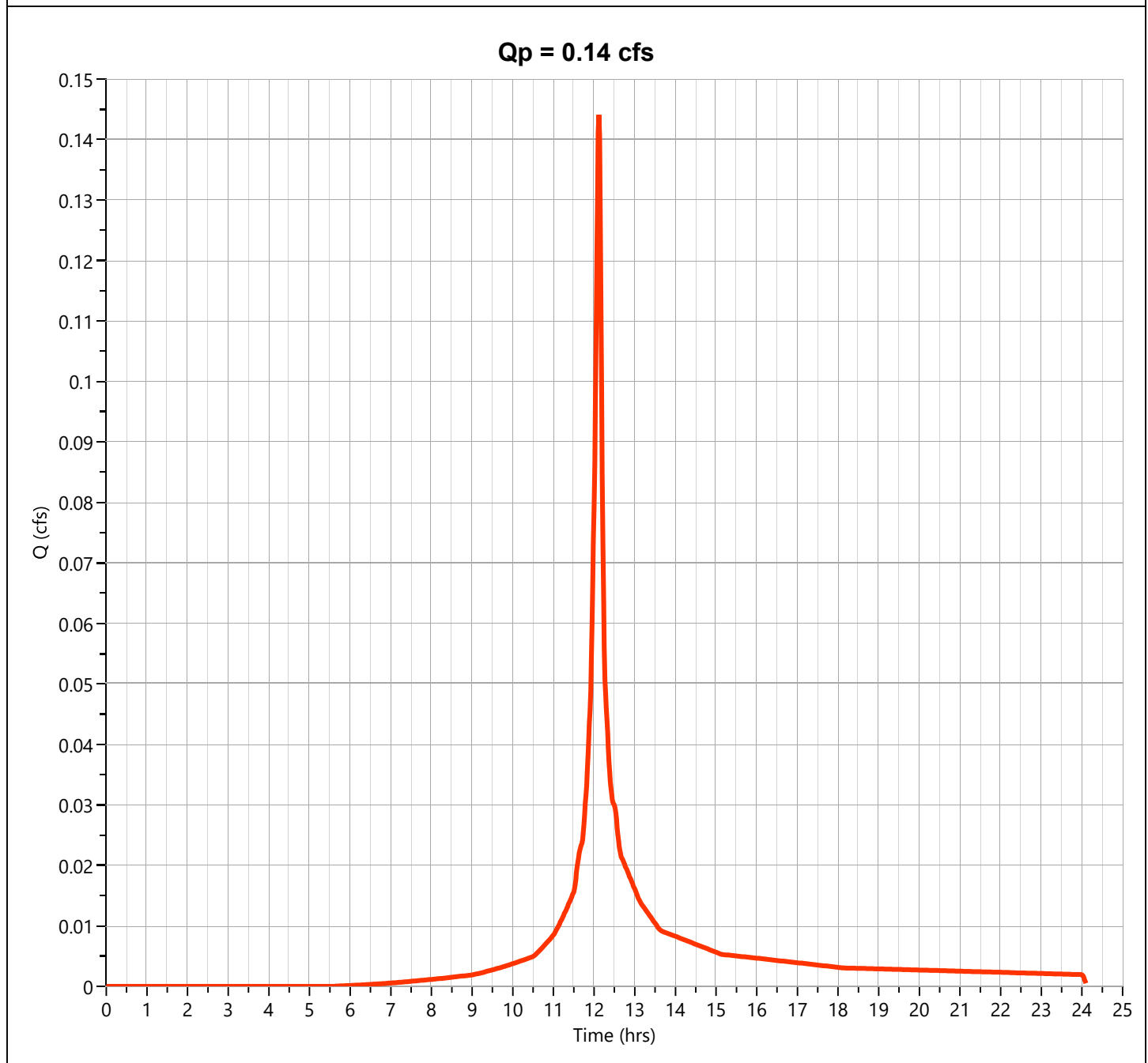
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2H Grass HSGC C

## Hyd. No. 34

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.144 cfs |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.12 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 454 cuft  |
| Drainage Area   | = 0.02 ac     | Curve Number       | = 74        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 6.0 min   |
| Total Rainfall  | = 9.26 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

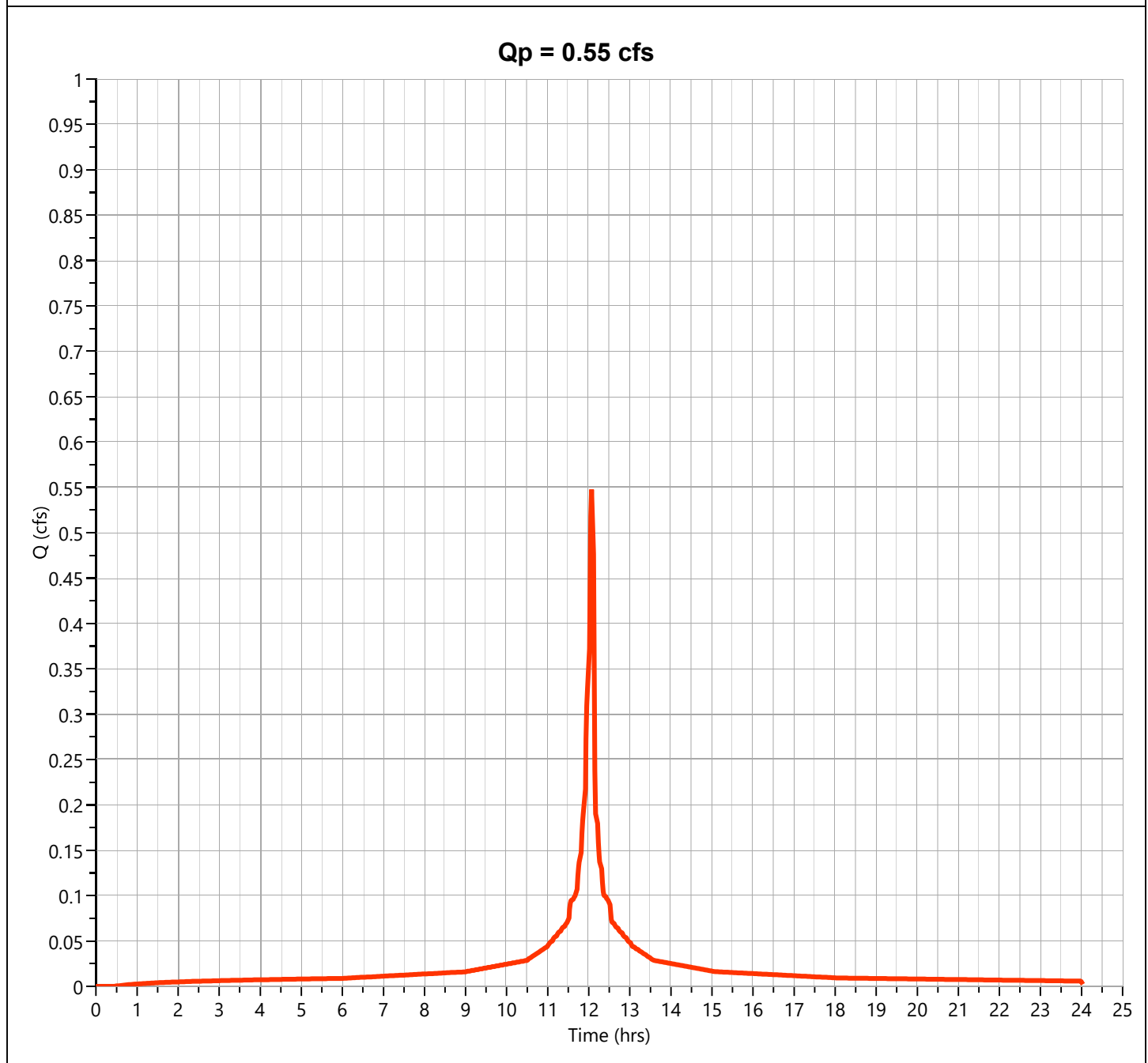
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2H Impervious

## Hyd. No. 35

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.547 cfs  |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 1,842 cuft |
| Drainage Area   | = 0.06 ac     | Curve Number       | = 98         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 2.0 min    |
| Total Rainfall  | = 9.26 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

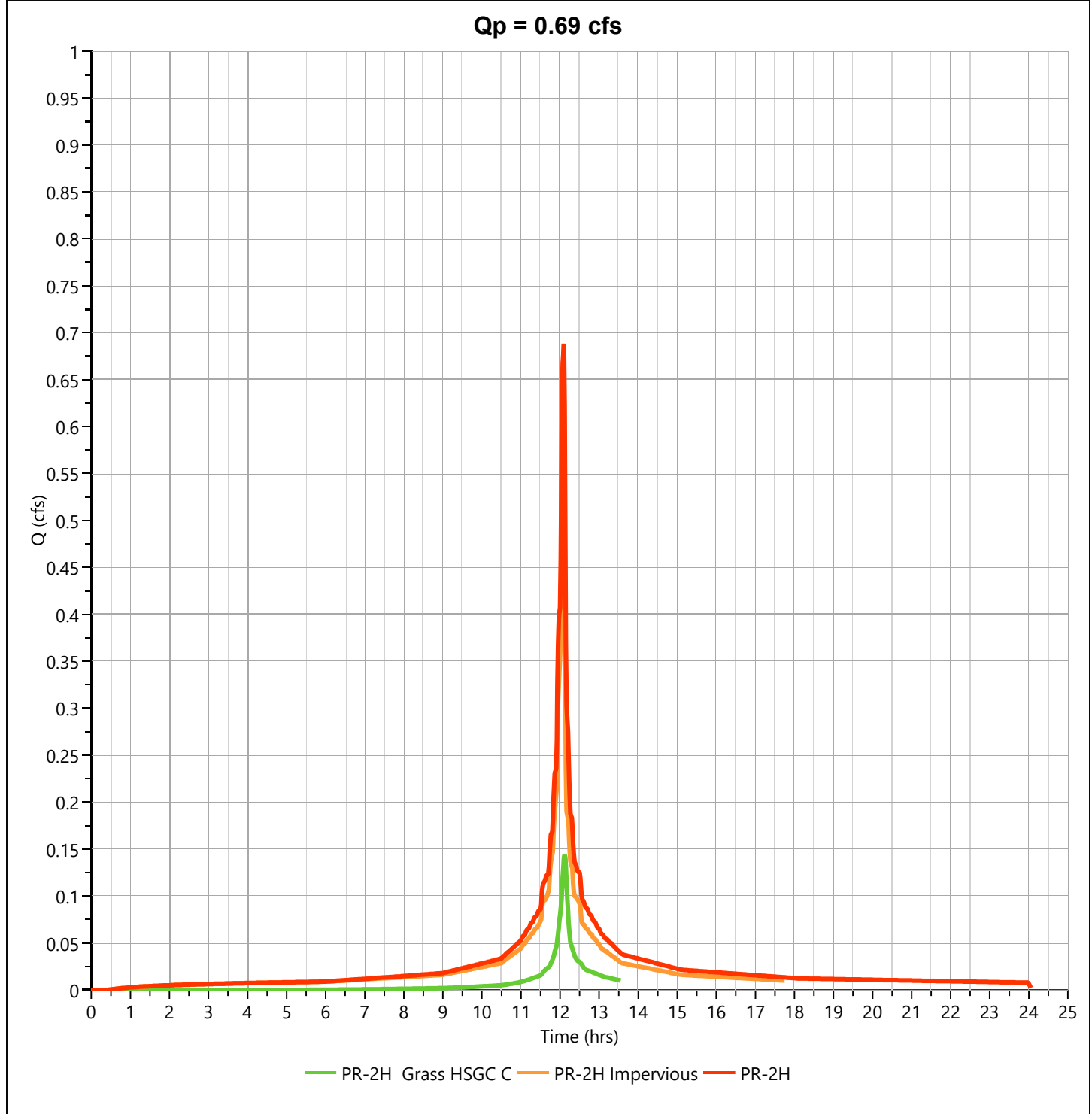
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2H

## Hyd. No. 36

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.688 cfs  |
| Storm Frequency    | = 100-yr   | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 2,296 cuft |
| Inflow Hydrographs | = 34, 35   | Total Contrib. Area | = 0.08 ac    |





**COMBINED PR-2B + PR-2H WATERSHED**

# Hydrograph Report

Hydrology Studio v 3.0.0.38

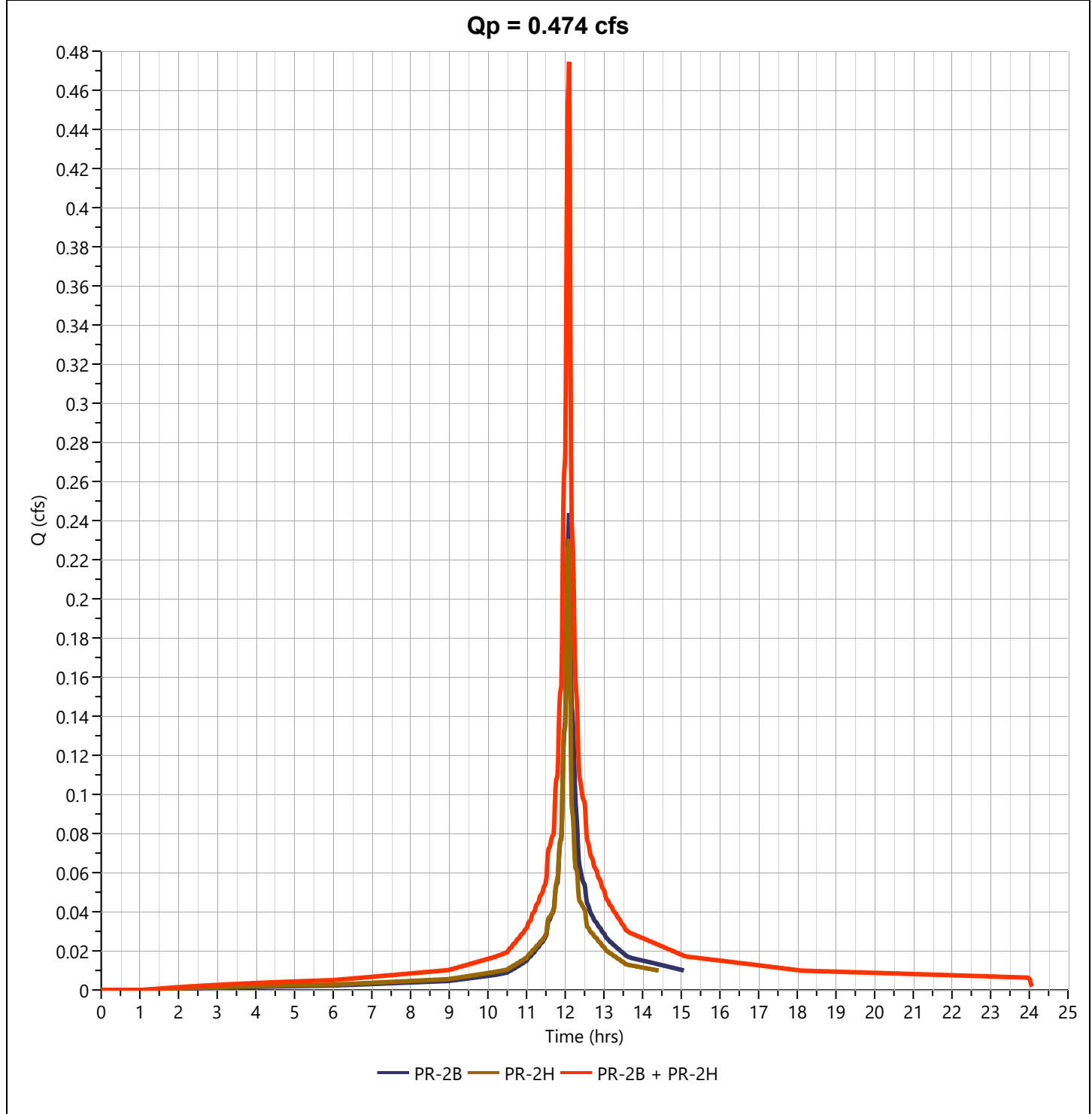
File: Current Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2B + PR-2H

## Hyd. No. 38

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.474 cfs  |
| Storm Frequency    | = 2-yr     | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 1,607 cuft |
| Inflow Hydrographs |            | Total Contrib. Area | = 0.0 ac     |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

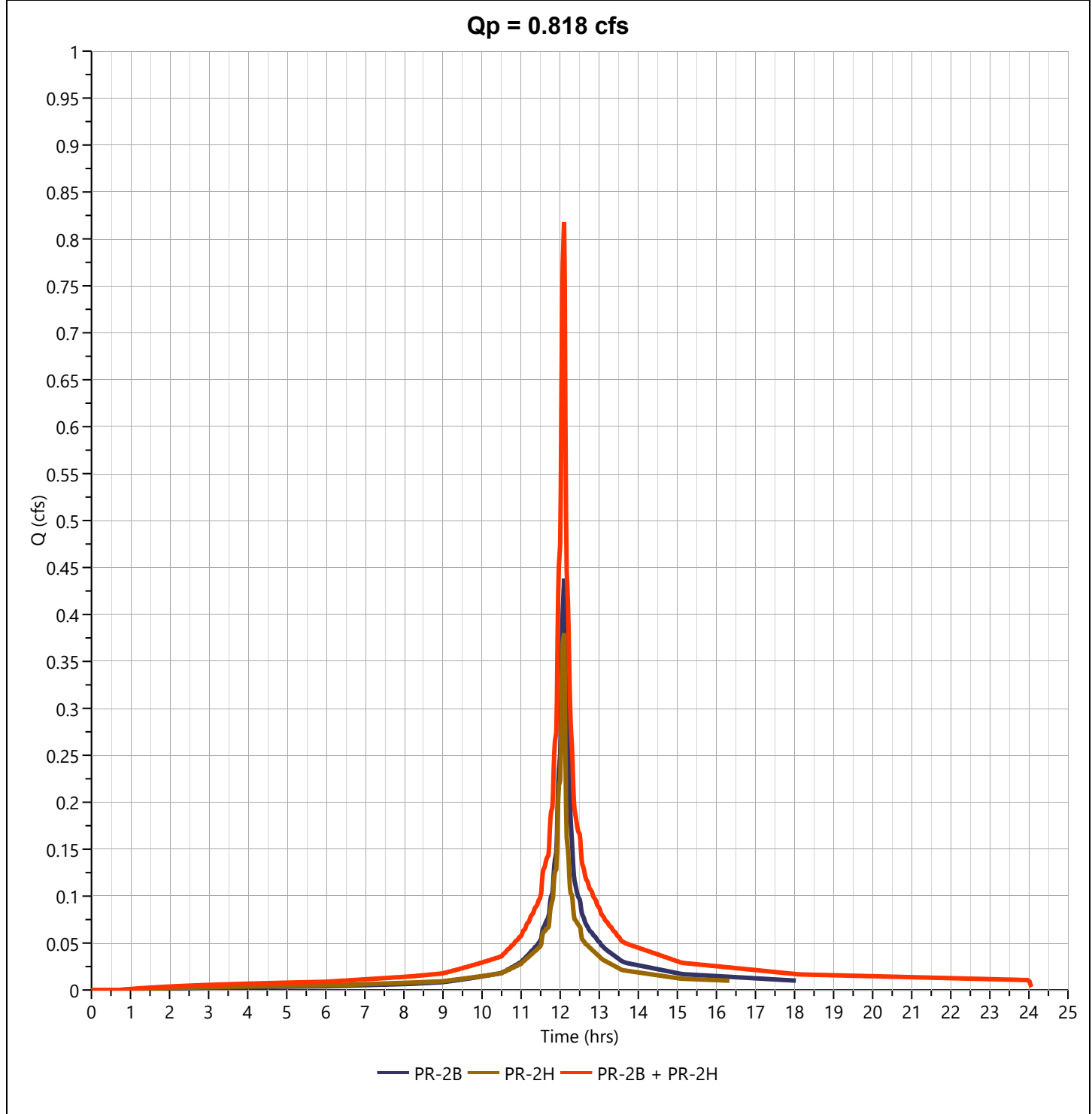
File: Current Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2B + PR-2H

## Hyd. No. 38

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.818 cfs  |
| Storm Frequency    | = 10-yr    | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 2,804 cuft |
| Inflow Hydrographs |            | Total Contrib. Area | = 0.0 ac     |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

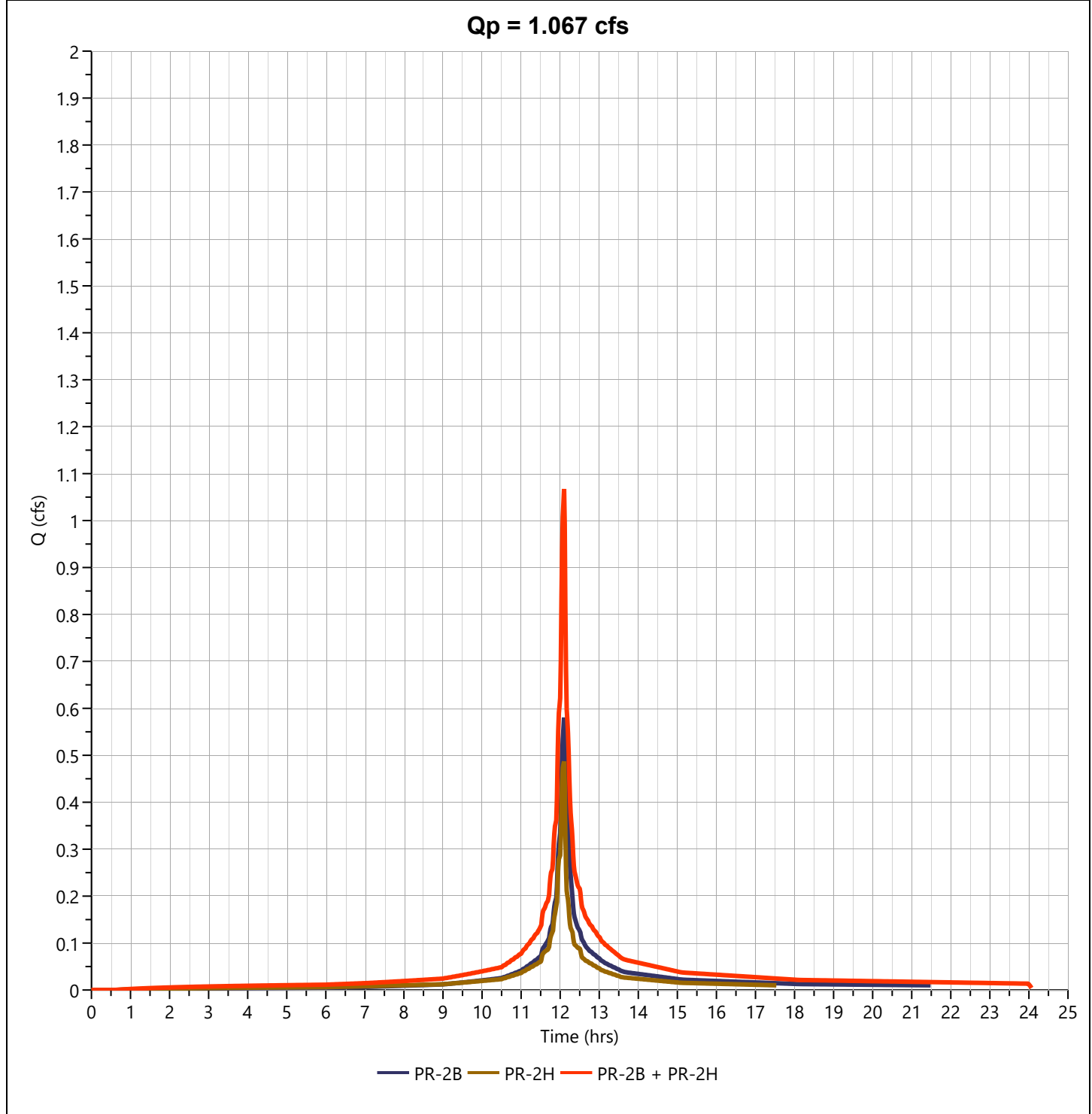
File: Current Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2B + PR-2H

## Hyd. No. 38

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 1.067 cfs  |
| Storm Frequency    | = 25-yr    | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 3,683 cuft |
| Inflow Hydrographs |            | Total Contrib. Area | = 0.0 ac     |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

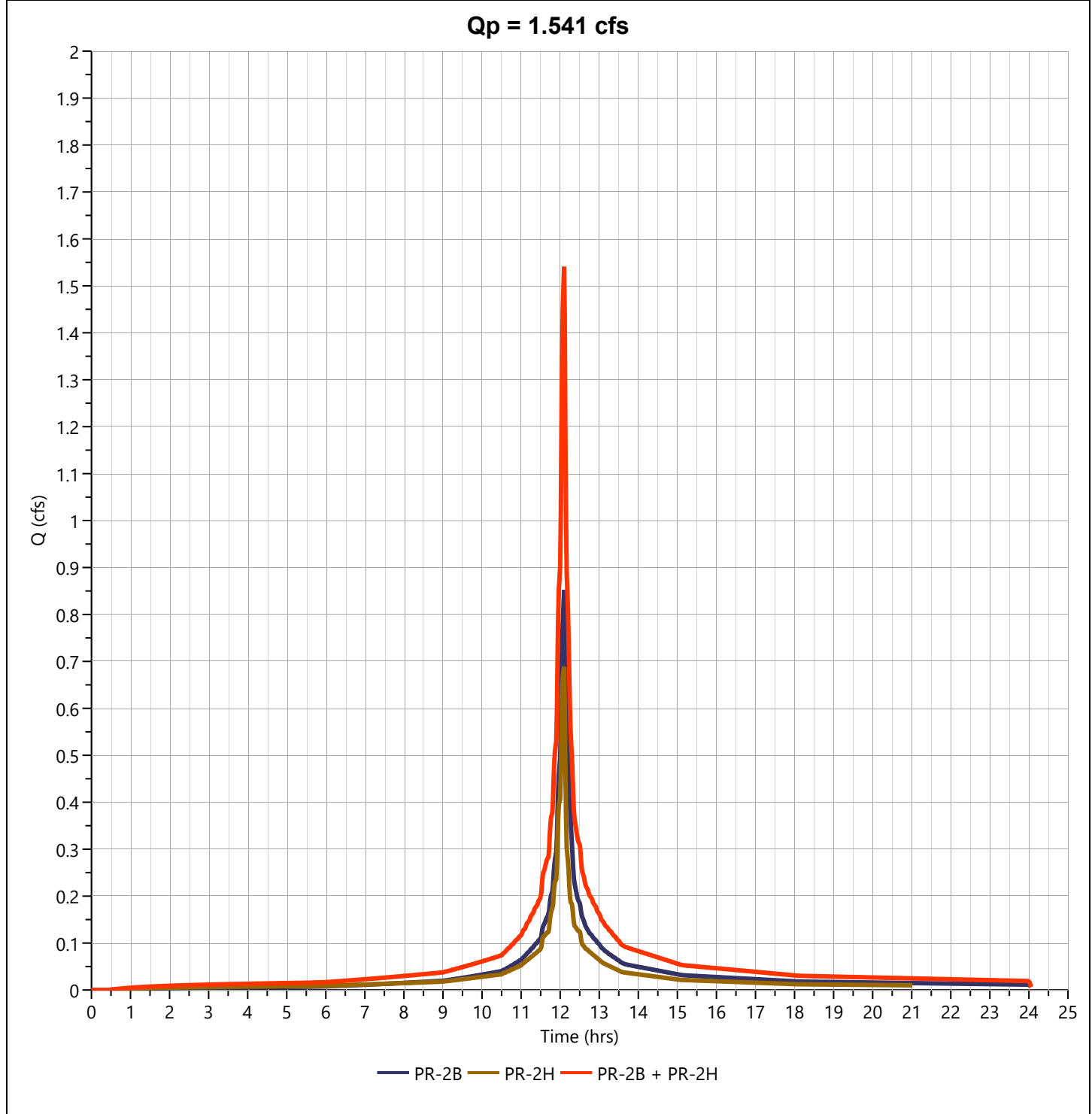
File: Current Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2B + PR-2H

## Hyd. No. 38

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 1.541 cfs  |
| Storm Frequency    | = 100-yr   | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 5,372 cuft |
| Inflow Hydrographs |            | Total Contrib. Area | = 0.0 ac     |



**COMBINED PROPOSED FLOW TO POA-2**

# Hydrograph Report

Hydrology Studio v 3.0.0.38

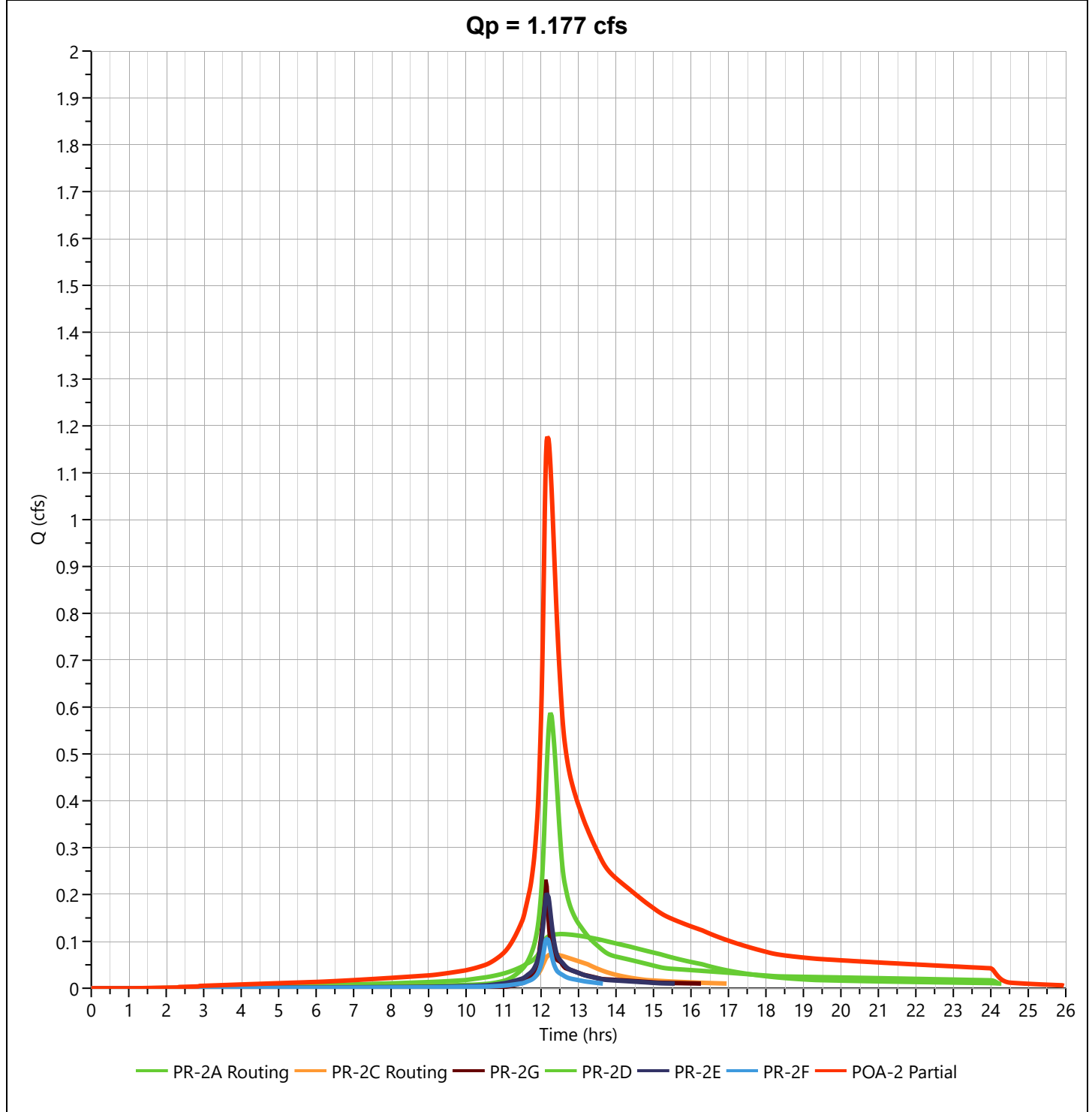
File: Current Beacon Church Proposed - POA-2.hys

05-16-2025

## POA-2 Partial

## Hyd. No. 41

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 1.177 cfs  |
| Storm Frequency    | = 2-yr     | Time to Peak        | = 12.18 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 8,285 cuft |
| Inflow Hydrographs |            | Total Contrib. Area | = 0.0 ac     |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

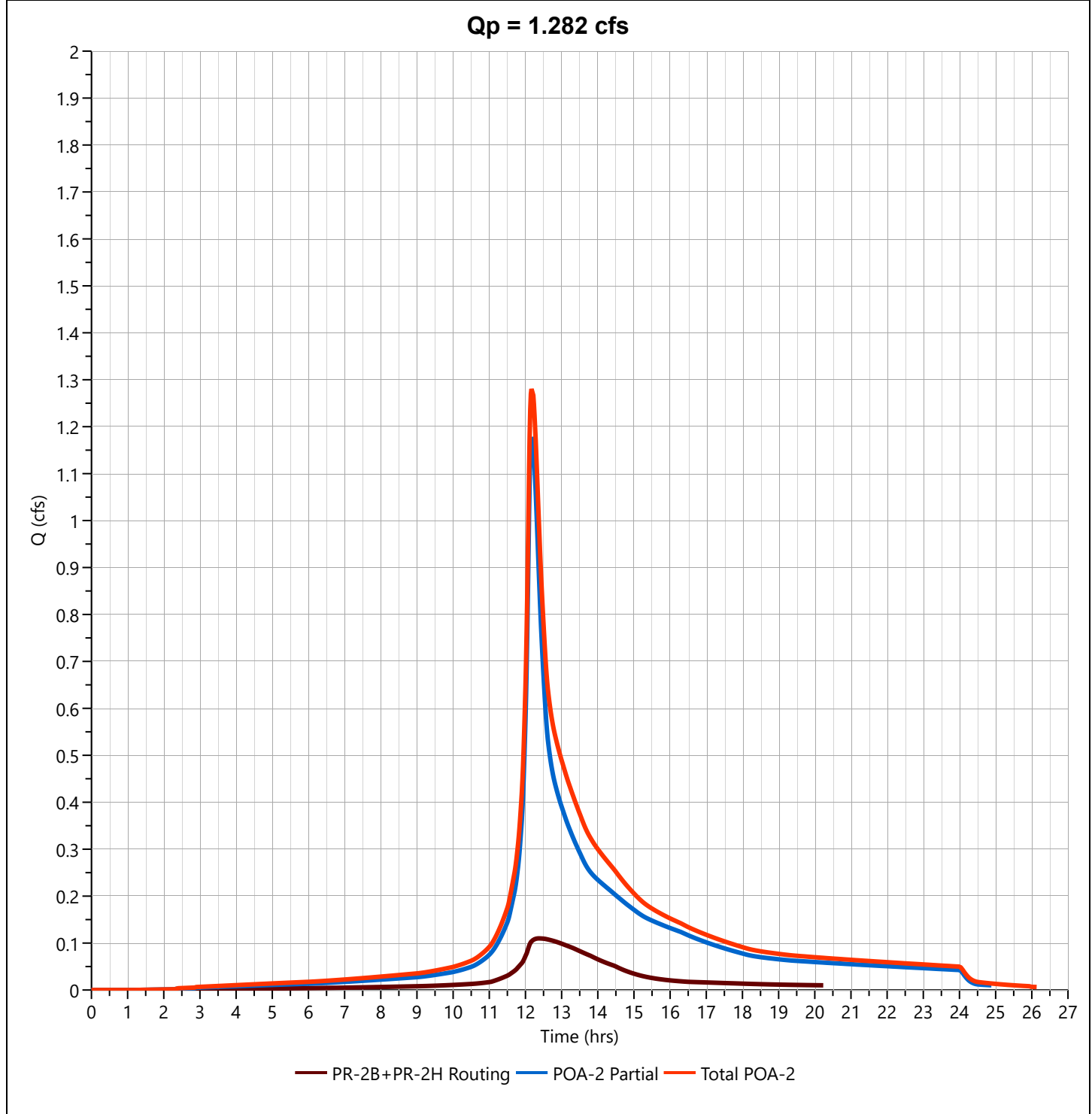
File: Current Beacon Church Proposed - POA-2.hys

05-16-2025

## Total POA-2

## Hyd. No. 42

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 1.282 cfs  |
| Storm Frequency    | = 2-yr     | Time to Peak        | = 12.18 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 9,886 cuft |
| Inflow Hydrographs |            | Total Contrib. Area | = 0.0 ac     |





# Hydrograph Report

Hydrology Studio v 3.0.0.38

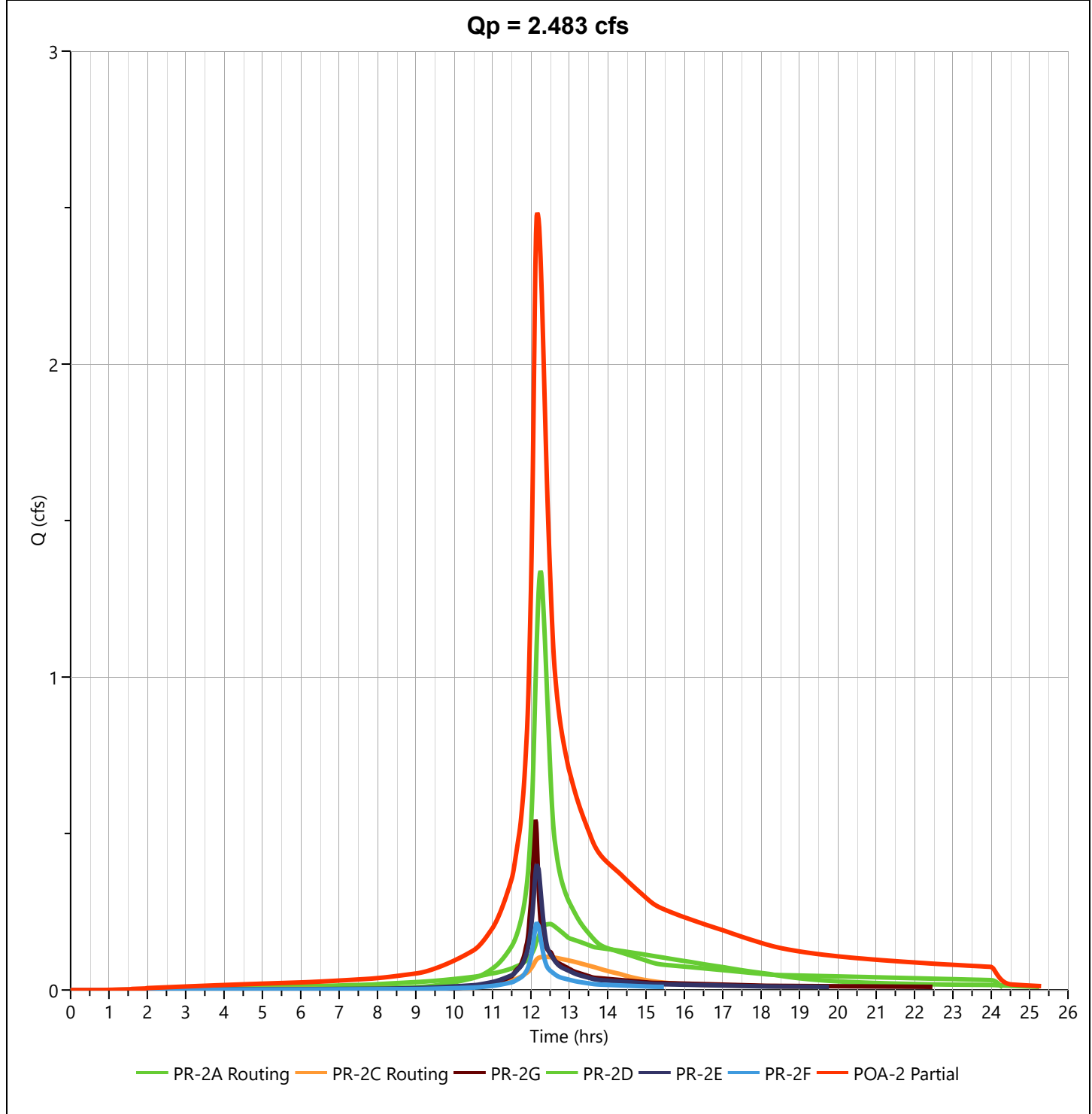
File: Current Beacon Church Proposed - POA-2.hys

05-16-2025

## POA-2 Partial

## Hyd. No. 41

|                    |            |                     |               |
|--------------------|------------|---------------------|---------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 2.483 cfs   |
| Storm Frequency    | = 10-yr    | Time to Peak        | = 12.17 hrs   |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 15,993 cuft |
| Inflow Hydrographs |            | Total Contrib. Area | = 0.0 ac      |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

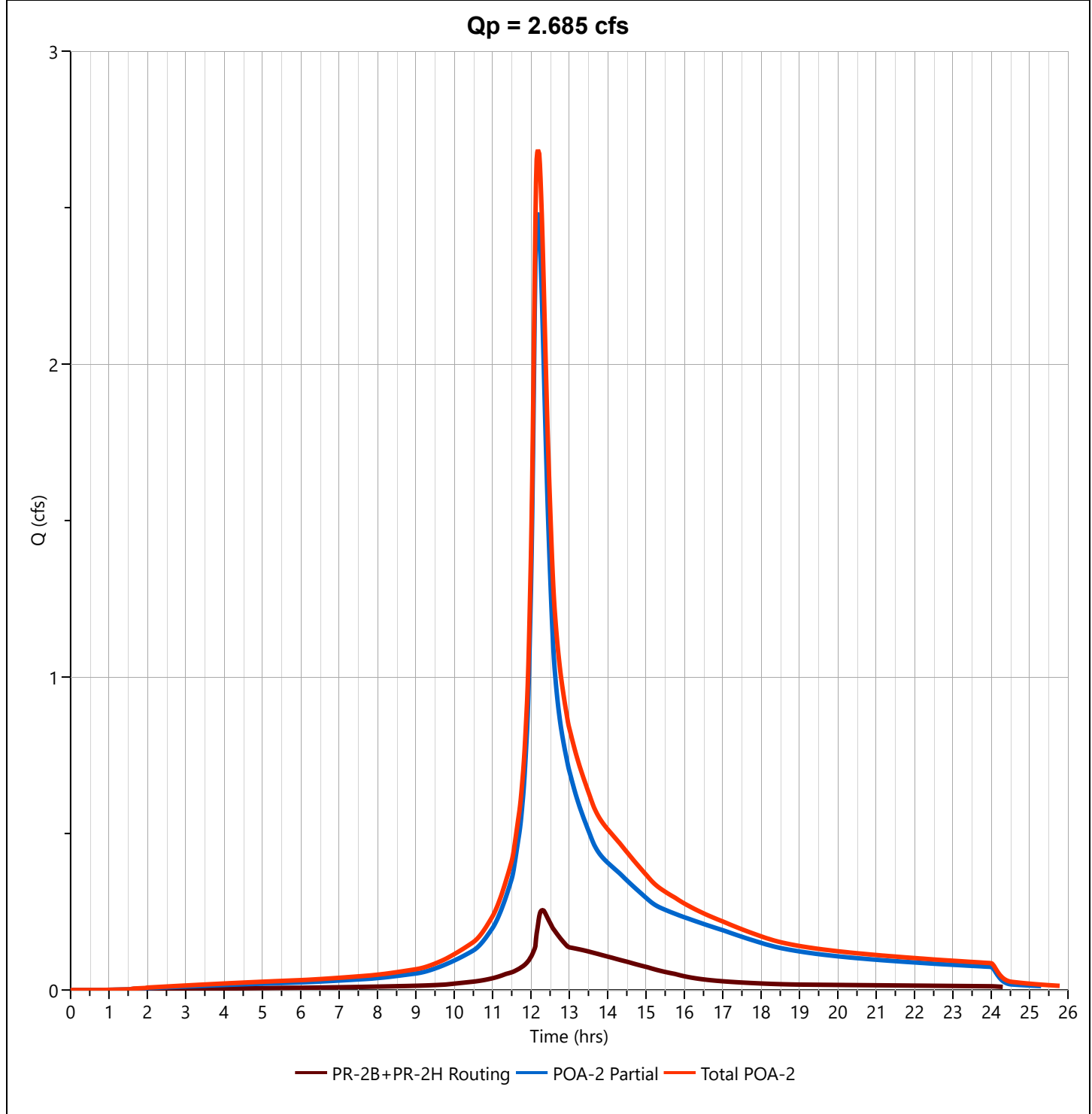
File: Current Beacon Church Proposed - POA-2.hys

05-16-2025

## Total POA-2

## Hyd. No. 42

|                    |            |                     |               |
|--------------------|------------|---------------------|---------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 2.685 cfs   |
| Storm Frequency    | = 10-yr    | Time to Peak        | = 12.20 hrs   |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 18,792 cuft |
| Inflow Hydrographs |            | Total Contrib. Area | = 0.0 ac      |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

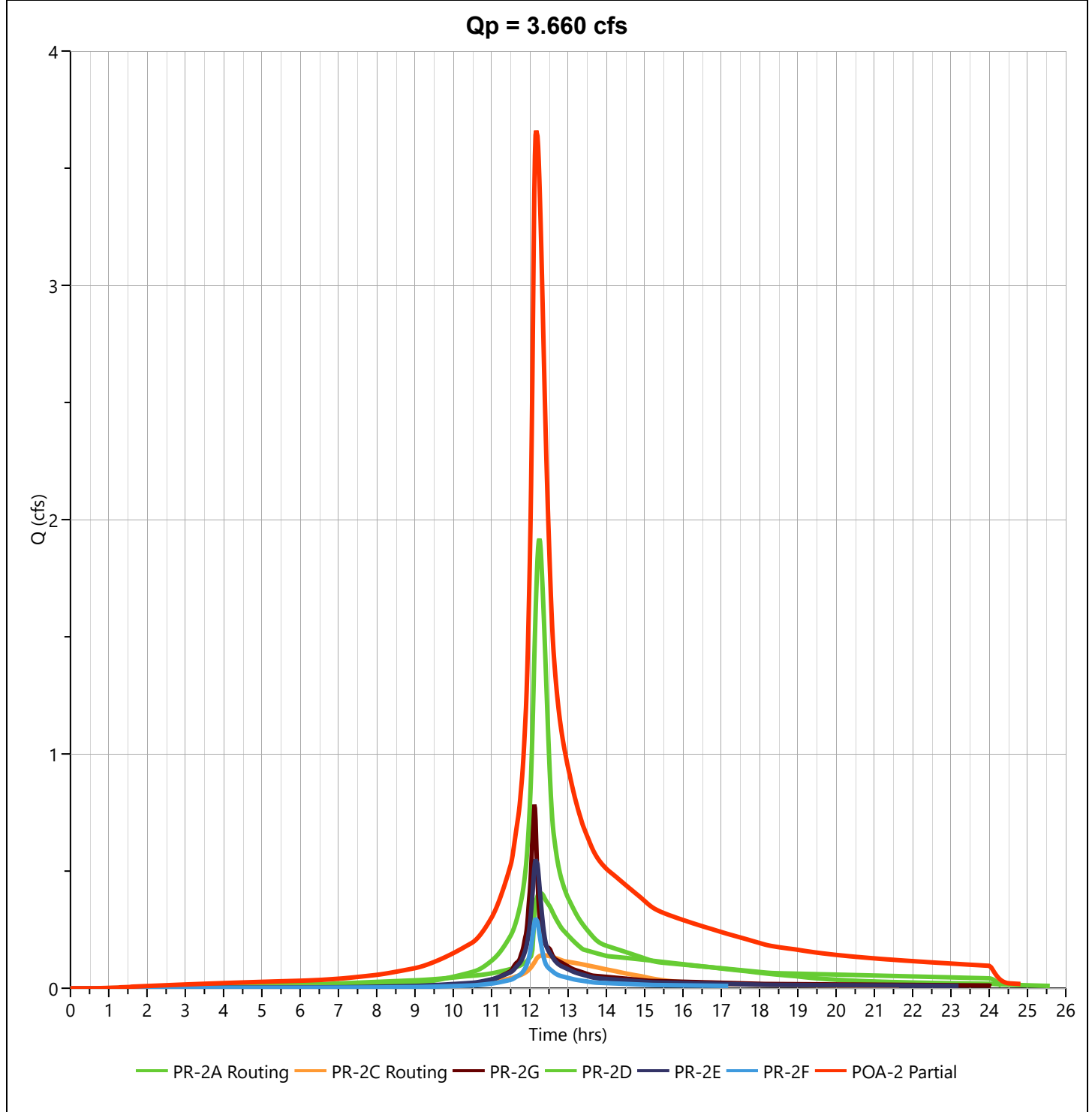
File: Current Beacon Church Proposed - POA-2.hys

05-16-2025

## POA-2 Partial

## Hyd. No. 41

|                    |            |                     |               |
|--------------------|------------|---------------------|---------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 3.660 cfs   |
| Storm Frequency    | = 25-yr    | Time to Peak        | = 12.17 hrs   |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 21,873 cuft |
| Inflow Hydrographs |            | Total Contrib. Area | = 0.0 ac      |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

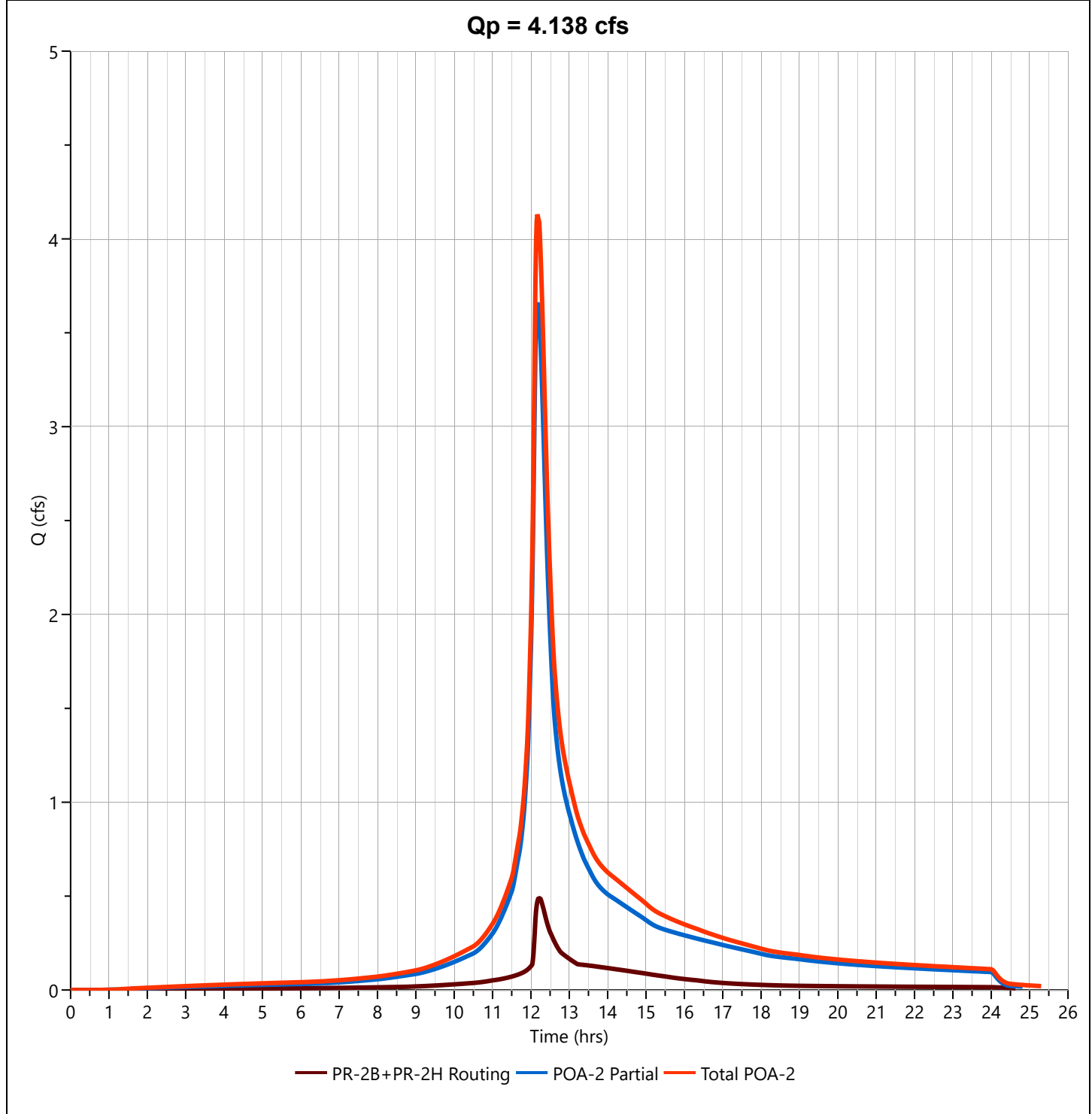
File: Current Beacon Church Proposed - POA-2.hys

05-16-2025

## Total POA-2

## Hyd. No. 42

|                    |            |                     |               |
|--------------------|------------|---------------------|---------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 4.138 cfs   |
| Storm Frequency    | = 25-yr    | Time to Peak        | = 12.18 hrs   |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 25,550 cuft |
| Inflow Hydrographs |            | Total Contrib. Area | = 0.0 ac      |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

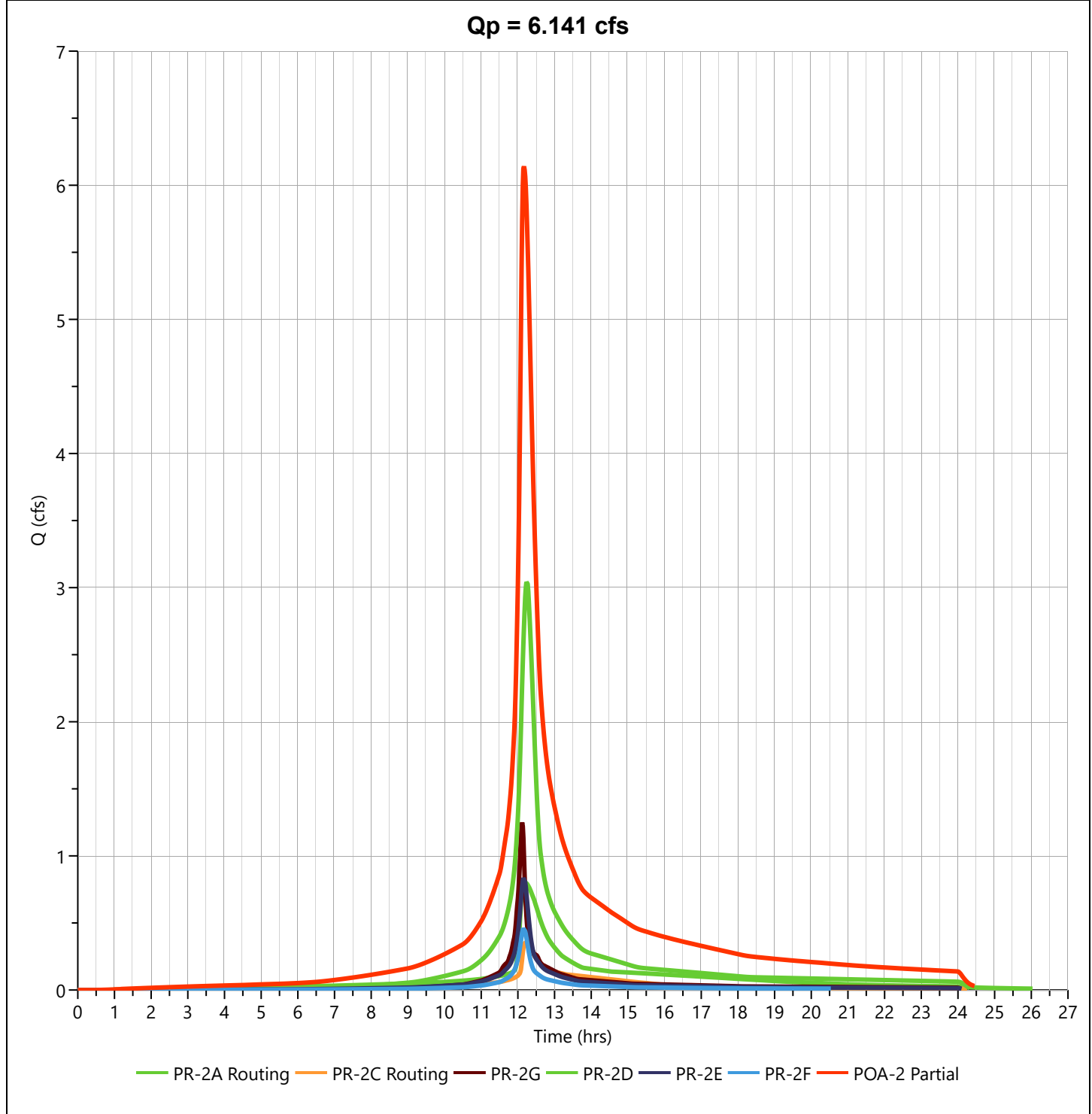
File: Current Beacon Church Proposed - POA-2.hys

05-16-2025

## POA-2 Partial

## Hyd. No. 41

|                    |            |                     |               |
|--------------------|------------|---------------------|---------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 6.141 cfs   |
| Storm Frequency    | = 100-yr   | Time to Peak        | = 12.17 hrs   |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 33,435 cuft |
| Inflow Hydrographs |            | Total Contrib. Area | = 0.0 ac      |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

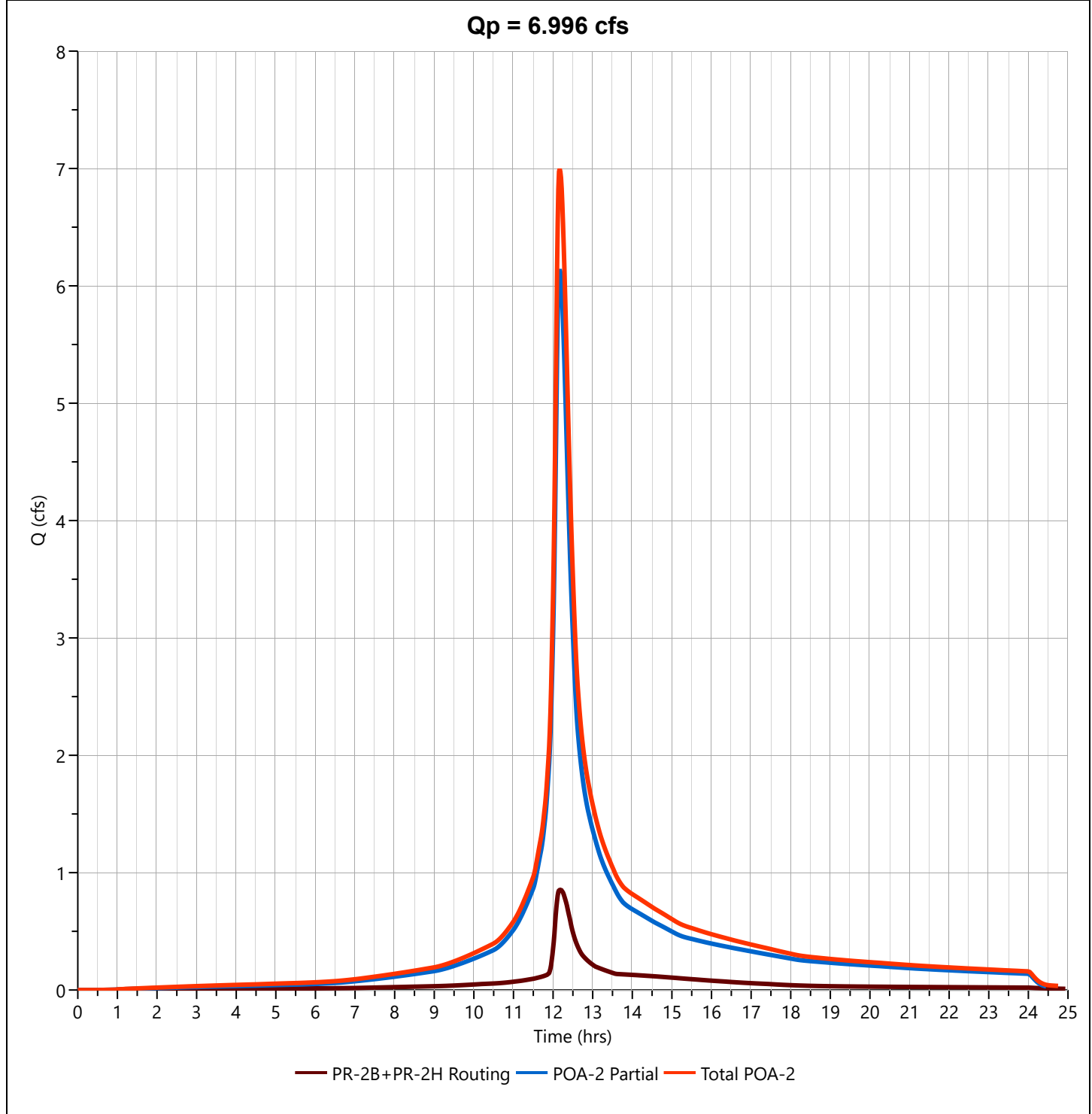
File: Current Beacon Church Proposed - POA-2.hys

05-16-2025

## Total POA-2

## Hyd. No. 42

|                    |            |                     |               |
|--------------------|------------|---------------------|---------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 6.996 cfs   |
| Storm Frequency    | = 100-yr   | Time to Peak        | = 12.17 hrs   |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 38,802 cuft |
| Inflow Hydrographs |            | Total Contrib. Area | = 0.0 ac      |



**PR-3 WATERSHED (TOTAL PROPOSED FLOW TO POA-3)**

Project: Beacon Unitarian Universalist Church

By: TEG

Date: 11/29/2023

Location: Summit, NJ

Checked By: MJV

Date Checked: 11/29/2023

Circle One: Present Developed

Current Proposed Watershed PR-3 - Pervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Design Flow Length, L<sub>des</sub> (Total L<sub>des</sub> < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. McCuen-Spiess Limit, L<sub>mcs</sub> (max. 100 ft)
7. Compute T<sub>t</sub>

$$L_{mcs} = (100 s^{0.5})/n$$

$$T_t = \frac{0.007 (n L_{des})^{0.8}}{P_2^{0.5} s^{0.4}}$$

|            |               |   |  |
|------------|---------------|---|--|
| Segment ID | 1             |   |  |
|            | Dense Grasses |   |  |
|            | 0.24          |   |  |
| ft         | 72            |   |  |
| in         | 3.46          |   |  |
| ft/ft      | 0.198         |   |  |
| ft         | 100           |   |  |
| hr         | 0.070         | + |  |

Sheet Flow Sub-Total **0.070 hours**

**Shallow Concentrated Flow**

8. Surface Description
9. Flow Length, L
10. Watercourse Slope, s
11. Average Velocity, V (NEH table 15-3)
12. Compute T<sub>t</sub>

$$T_t = \frac{L}{3600 V}$$

|            |          |   |  |
|------------|----------|---|--|
| Segment ID | 2        |   |  |
|            | Pavement |   |  |
| ft         | 217      |   |  |
| ft/ft      | 0.059    |   |  |
| ft/s       | 4.95     |   |  |
| hr         | 0.012    | + |  |

Shallow Conc. Flow Sub-Total **0.012 hours**

**Channel Flow**

13. Flow Length, L
14. Cross Sectional flow area, a
15. Wetted Perimeter, P<sub>w</sub>
16. Hydraulic Radius, r
17. Channel Slope, s
18. Manning's Roughness Coeff., n
19. Velocity, V
20. Compute T<sub>t</sub>

$$r = a / P_w$$

$$V = (1.49 r^{2/3} s^{1/2}) / n$$

$$T_t = \frac{L}{3600 V}$$

|                 |  |   |  |
|-----------------|--|---|--|
| Segment ID      |  |   |  |
| ft              |  |   |  |
| ft <sup>2</sup> |  |   |  |
| ft              |  |   |  |
| ft              |  |   |  |
| ft/ft           |  |   |  |
| ft/s            |  |   |  |
| hr              |  | + |  |

Channel Flow Sub-Total **0.000 hours**

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>

(Add Sub-Total T<sub>t</sub> from prior steps)

|                      |                    |
|----------------------|--------------------|
| Total Tc (hours) =   | <b>0.083 hours</b> |
| Total Tc (minutes) = | <b>5 minutes</b>   |



# Hydrograph Report

Project Name:

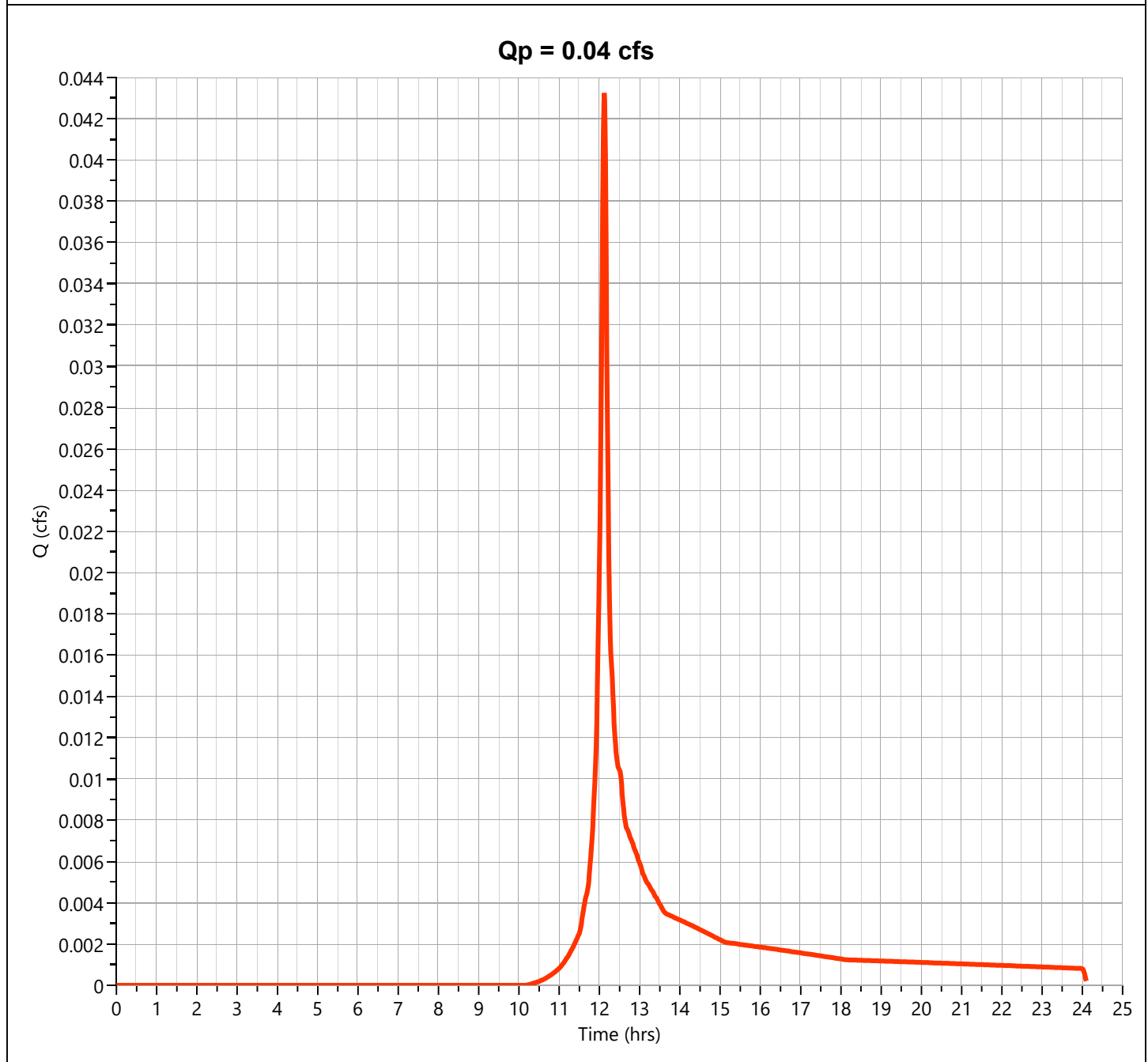
Hydrology Studio v 3.0.0.29

11-29-2023

## PR-3 (POA-3)

## Hyd. No. 28

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.043 cfs |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.12 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 136 cuft  |
| Drainage Area   | = 0.03 ac     | Curve Number       | = 74        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 5.0 min   |
| Total Rainfall  | = 3.46 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

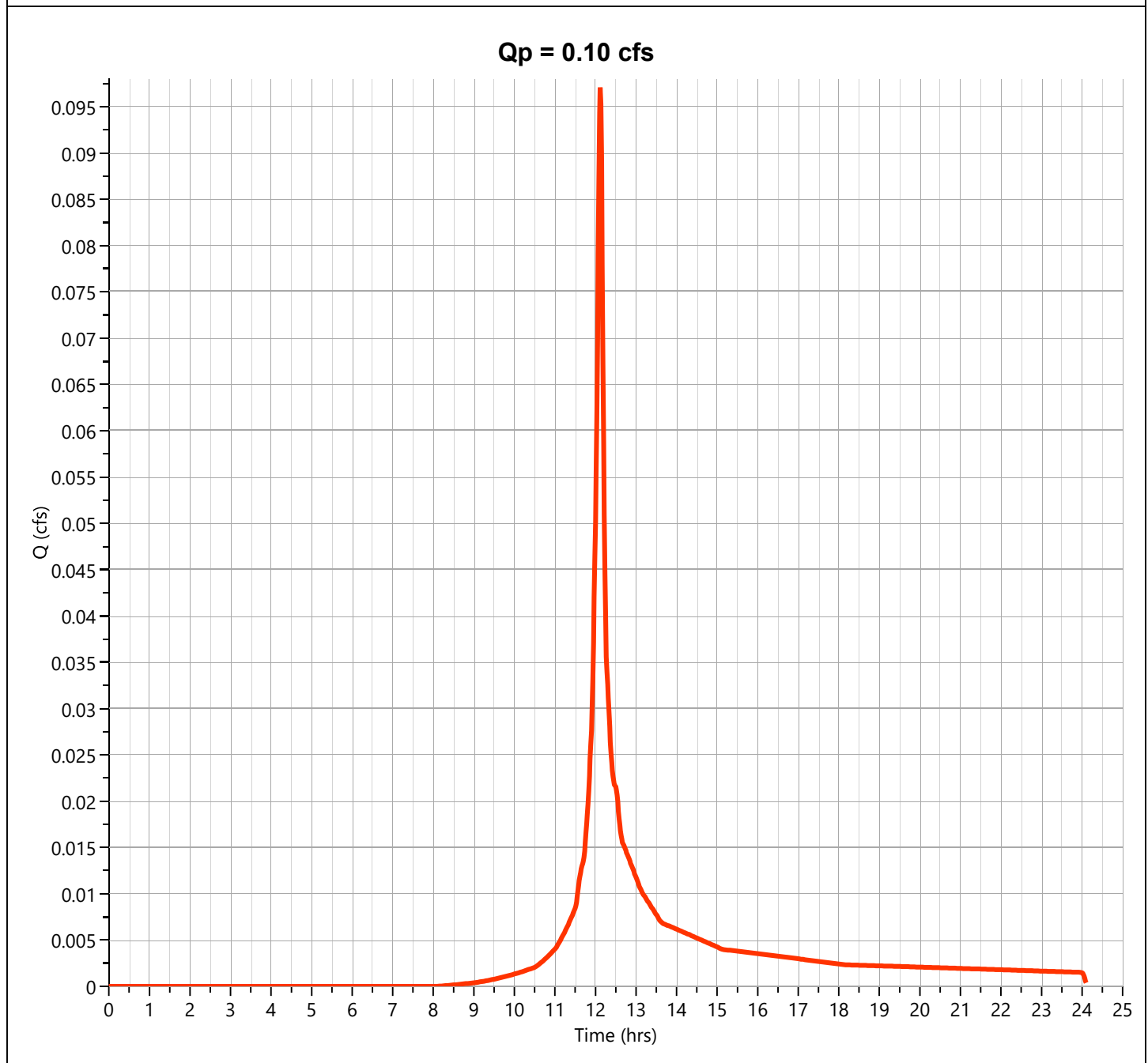
Hydrology Studio v 3.0.0.29

11-29-2023

## PR-3 (POA-3)

## Hyd. No. 28

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.097 cfs |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.12 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 300 cuft  |
| Drainage Area   | = 0.03 ac     | Curve Number       | = 74        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 5.0 min   |
| Total Rainfall  | = 5.38 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

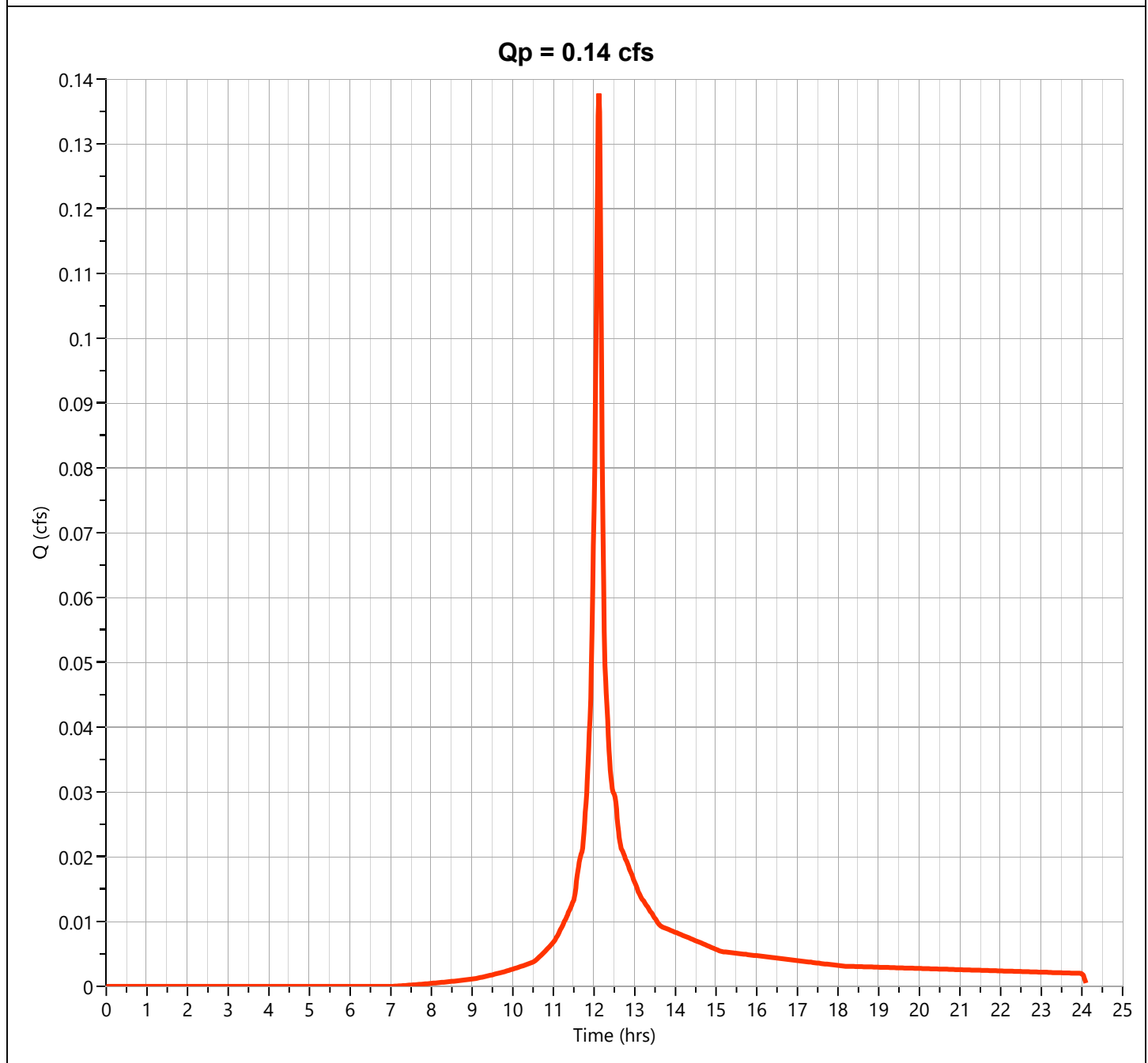
Hydrology Studio v 3.0.0.29

11-29-2023

## PR-3 (POA-3)

## Hyd. No. 28

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.138 cfs |
| Storm Frequency | = 25-yr       | Time to Peak       | = 12.12 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 428 cuft  |
| Drainage Area   | = 0.03 ac     | Curve Number       | = 74        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 5.0 min   |
| Total Rainfall  | = 6.73 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

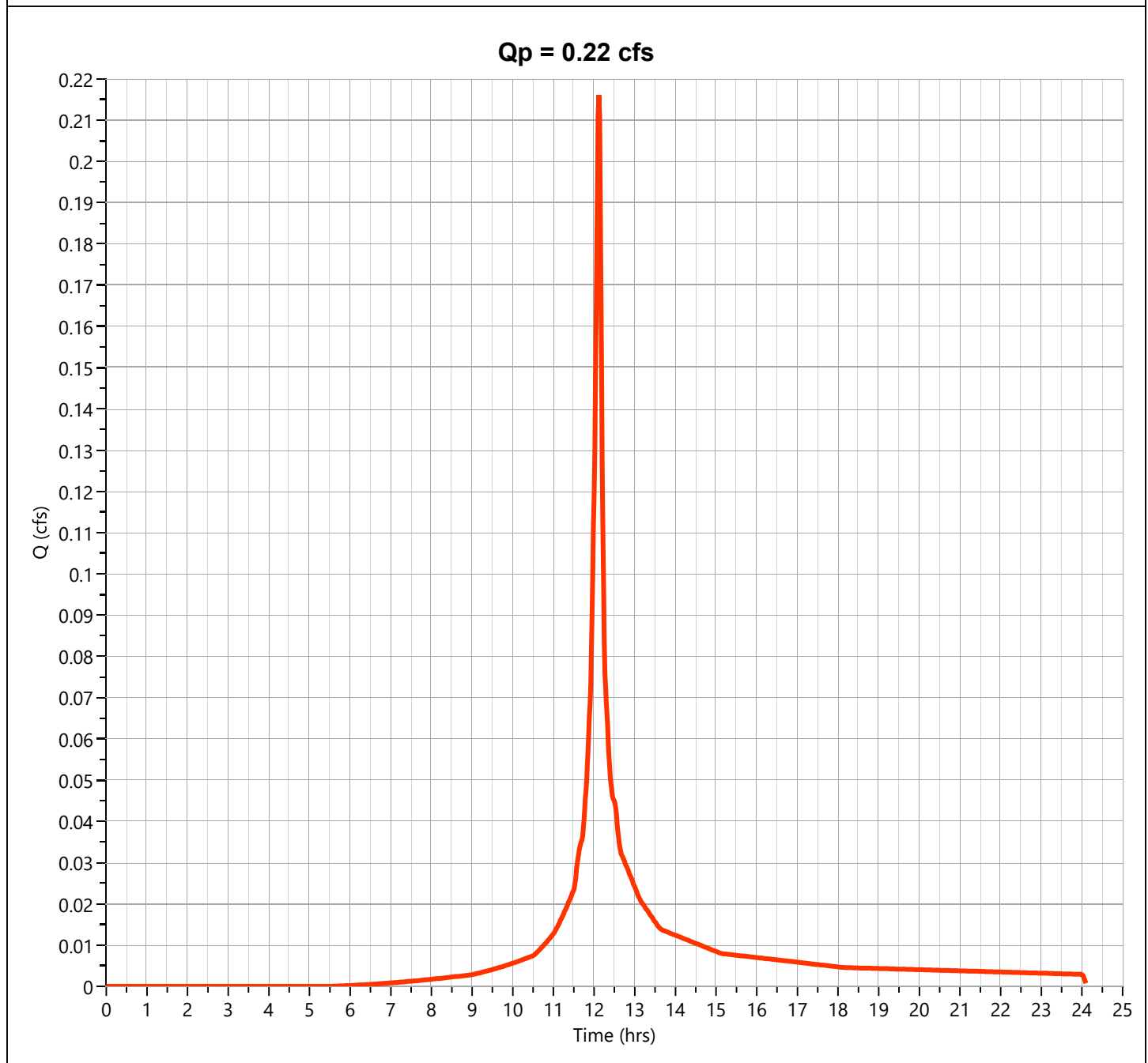
Hydrology Studio v 3.0.0.29

11-29-2023

## PR-3 (POA-3)

## Hyd. No. 28

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.216 cfs |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.12 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 681 cuft  |
| Drainage Area   | = 0.03 ac     | Curve Number       | = 74        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 5.0 min   |
| Total Rainfall  | = 9.26 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



## **SUMMARY OF PROPOSED PEAK DISCHARGES**

# Hydrograph 2-yr Summary

Hydrology Studio v 3.0.0.38

File: Current Beacon Church Proposed - POA-1 & POA-3.hys

07-01-2025

| 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     | PR-1A               | 0.811           | 12.10              | 2,635                    | ---           |                        |                        |
| 2        | Pond Route      | PR-1A Routing       | 0.053           | 12.53              | 228                      | 1             | 349.01                 | 809                    |
| 4        | NRCS Runoff     | PR-1B Grass HSGC C  | 0.111           | 12.15              | 396                      | ---           |                        |                        |
| 5        | NRCS Runoff     | PR-1B Impervious    | 0.459           | 12.10              | 1,523                    | ---           |                        |                        |
| 6        | Junction        | PR-1B               | 0.555           | 12.10              | 1,919                    | 4, 5          |                        |                        |
| 8        | NRCS Runoff     | PR-1C Grass HSGC C  | 0.046           | 12.10              | 124                      | ---           |                        |                        |
| 9        | NRCS Runoff     | PR-1C Impervious    | 0.068           | 12.10              | 220                      | ---           |                        |                        |
| 10       | Junction        | PR-1C               | 0.113           | 12.10              | 343                      | 8, 9          |                        |                        |
| 11       | Pond Route      | PR-1C Routing       | 0.111           | 12.10              | 343                      | 10            | 352.73                 | 6.94                   |
| 14       | NRCS Runoff     | PR-1D Grass HSGC C  | 0.086           | 12.12              | 272                      | ---           |                        |                        |
| 15       | NRCS Runoff     | PR-1D Impervious    | 0.372           | 12.10              | 1,208                    | ---           |                        |                        |
| 16       | Junction        | PR-1D               | 0.455           | 12.10              | 1,480                    | 14, 15        |                        |                        |
| 18       | Junction        | Comb. to UDG-INF1-2 | 1.121           | 12.10              | 3,742                    | 6, 11, 16     |                        |                        |
| 20       | Pond Route      | UGD-INF1-2 Routing  | 0.069           | 12.67              | 468                      | 18            | 344.83                 | 1,121                  |
| 22       | NRCS Runoff     | PR-1E Grass HSGC C  | 0.216           | 12.12              | 681                      | ---           |                        |                        |
| 23       | NRCS Runoff     | PR-1E Impervious    | 0.141           | 12.10              | 469                      | ---           |                        |                        |
| 24       | Junction        | PR-1E               | 0.353           | 12.12              | 1,149                    | 22, 23        |                        |                        |
| 26       | Junction        | POA-1               | 0.374           | 12.12              | 1,845                    | 2, 20, 24     |                        |                        |
| 28       | NRCS Runoff     | PR-3 (POA-3)        | 0.043           | 12.12              | 136                      | ---           |                        |                        |

# Hydrograph 2-yr Summary

Hydrology Studio v 3.0.0.38

File: Current Beacon Church Proposed - POA-2.hys

05-16-2025

| 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     | PR-2A Grass HSGC C | 0.030           | 12.10              | 88.0                     | ---           |                        |                        |
| 2        | NRCS Runoff     | PR-2A Impervious   | 0.744           | 12.10              | 2,416                    | ---           |                        |                        |
| 3        | Junction        | PR-2A              | 0.774           | 12.10              | 2,504                    | 1, 2          |                        |                        |
| 4        | Pond Route      | PR-2A Routing      | 0.116           | 12.53              | 2,495                    | 3             | 354.70                 | 963                    |
| 6        | NRCS Runoff     | PR-2B Grass HSGC C | 0.087           | 12.15              | 308                      | ---           |                        |                        |
| 7        | NRCS Runoff     | PR-2B Impervious   | 0.169           | 12.10              | 549                      | ---           |                        |                        |
| 8        | Junction        | PR-2B              | 0.244           | 12.10              | 857                      | 6, 7          |                        |                        |
| 11       | NRCS Runoff     | PR-2C Grass HSGC C | 0.058           | 12.12              | 182                      | ---           |                        |                        |
| 12       | NRCS Runoff     | PR-2C Impervious   | 0.212           | 12.10              | 703                      | ---           |                        |                        |
| 13       | Junction        | PR-2C              | 0.267           | 12.10              | 884                      | 11, 12        |                        |                        |
| 15       | Pond Route      | PR-2C Routing      | 0.072           | 12.32              | 879                      | 13            | 355.40                 | 262                    |
| 17       | NRCS Runoff     | PR-2G Grass HSGC C | 0.130           | 12.12              | 408                      | ---           |                        |                        |
| 18       | NRCS Runoff     | PR-2G Woods HSGC C | 0.102           | 12.12              | 331                      | ---           |                        |                        |
| 19       | Junction        | PR-2G              | 0.232           | 12.12              | 740                      | 17, 18        |                        |                        |
| 21       | NRCS Runoff     | PR-2D Grass HSGC C | 0.158           | 12.27              | 748                      | ---           |                        |                        |
| 22       | NRCS Runoff     | PR-2D Woods HSGC C | 0.318           | 12.27              | 1,571                    | ---           |                        |                        |
| 23       | NRCS Runoff     | PR-2D Impervious   | 0.116           | 12.22              | 579                      | ---           |                        |                        |
| 24       | Junction        | PR-2D              | 0.587           | 12.25              | 2,898                    | 21, 22, 23    |                        |                        |
| 26       | NRCS Runoff     | PR-2E Grass HSGC C | 0.121           | 12.18              | 477                      | ---           |                        |                        |
| 27       | NRCS Runoff     | PR-2E Impervious   | 0.088           | 12.13              | 351                      | ---           |                        |                        |
| 28       | Junction        | PR-2E              | 0.204           | 12.17              | 828                      | 26, 27        |                        |                        |
| 30       | NRCS Runoff     | PR-2F Woods HSGC C | 0.051           | 12.20              | 211                      | ---           |                        |                        |
| 31       | NRCS Runoff     | PR-2F Impervious   | 0.059           | 12.13              | 234                      | ---           |                        |                        |
| 32       | Junction        | PR-2F              | 0.107           | 12.17              | 445                      | 30, 31        |                        |                        |
| 34       | NRCS Runoff     | PR-2H Grass HSGC C | 0.029           | 12.12              | 90.8                     | ---           |                        |                        |
| 35       | NRCS Runoff     | PR-2H Impervious   | 0.203           | 12.10              | 659                      | ---           |                        |                        |
| 36       | Junction        | PR-2H              | 0.231           | 12.10              | 750                      | 34, 35        |                        |                        |

# Hydrograph 2-yr Summary

Hydrology Studio v 3.0.0.38

File: Current Beacon Church Proposed - POA-2.hys

05-16-2025

| 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) |
|----------|-----------------|---------------------|-----------------|--------------------|--------------------------|-----------------------|------------------------|------------------------|
| 38       | Junction        | PR-2B + PR-2H       | 0.474           | 12.10              | 1,607                    | 8, 36                 |                        |                        |
| 39       | Pond Route      | PR-2B+PR-2H Routing | 0.110           | 12.37              | 1,602                    | 38                    | 354.65                 | 474                    |
| 41       | Junction        | POA-2 Partial       | 1.177           | 12.18              | 8,285                    | 4, 15, 19, 24, 28, 32 |                        |                        |
| 42       | Junction        | Total POA-2         | 1.282           | 12.18              | 9,886                    | 39, 41                |                        |                        |



# Hydrograph 10-yr Summary

File: Current Beacon Church Proposed - POA-1 & POA-3.hys

Hydrology Studio v 3.0.0.38

07-01-2025

| 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     | PR-1A               | 1.269           | 12.10              | 4,200                    | ---           |                        |                        |
| 2        | Pond Route      | PR-1A Routing       | 0.129           | 12.53              | 1,017                    | 1             | 349.51                 | 1,370                  |
| 4        | NRCS Runoff     | PR-1B Grass HSGC C  | 0.251           | 12.15              | 873                      | ---           |                        |                        |
| 5        | NRCS Runoff     | PR-1B Impervious    | 0.718           | 12.10              | 2,427                    | ---           |                        |                        |
| 6        | Junction        | PR-1B               | 0.941           | 12.10              | 3,299                    | 4, 5          |                        |                        |
| 8        | NRCS Runoff     | PR-1C Grass HSGC C  | 0.100           | 12.10              | 273                      | ---           |                        |                        |
| 9        | NRCS Runoff     | PR-1C Impervious    | 0.106           | 12.10              | 350                      | ---           |                        |                        |
| 10       | Junction        | PR-1C               | 0.206           | 12.10              | 623                      | 8, 9          |                        |                        |
| 11       | Pond Route      | PR-1C Routing       | 0.202           | 12.10              | 623                      | 10            | 352.92                 | 12.5                   |
| 14       | NRCS Runoff     | PR-1D Grass HSGC C  | 0.194           | 12.12              | 600                      | ---           |                        |                        |
| 15       | NRCS Runoff     | PR-1D Impervious    | 0.581           | 12.10              | 1,925                    | ---           |                        |                        |
| 16       | Junction        | PR-1D               | 0.770           | 12.10              | 2,525                    | 14, 15        |                        |                        |
| 18       | Junction        | Comb. to UDG-INF1-2 | 1.914           | 12.10              | 6,447                    | 6, 11, 16     |                        |                        |
| 20       | Pond Route      | UGD-INF1-2 Routing  | 0.144           | 12.82              | 1,876                    | 18            | 345.43                 | 2,253                  |
| 22       | NRCS Runoff     | PR-1E Grass HSGC C  | 0.485           | 12.12              | 1,500                    | ---           |                        |                        |
| 23       | NRCS Runoff     | PR-1E Impervious    | 0.221           | 12.10              | 747                      | ---           |                        |                        |
| 24       | Junction        | PR-1E               | 0.699           | 12.12              | 2,246                    | 22, 23        |                        |                        |
| 26       | Junction        | POA-1               | 0.909           | 12.12              | 5,139                    | 2, 20, 24     |                        |                        |
| 28       | NRCS Runoff     | PR-3 (POA-3)        | 0.097           | 12.12              | 300                      | ---           |                        |                        |

# Hydrograph 10-yr Summary

Hydrology Studio v 3.0.0.38

File: Current Beacon Church Proposed - POA-2.hys

05-16-2025

| 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     | PR-2A Grass HSGC C | 0.068           | 12.10              | 194                      | ---           |                        |                        |
| 2        | NRCS Runoff     | PR-2A Impervious   | 1.163           | 12.10              | 3,850                    | ---           |                        |                        |
| 3        | Junction        | PR-2A              | 1.231           | 12.10              | 4,044                    | 1, 2          |                        |                        |
| 4        | Pond Route      | PR-2A Routing      | 0.211           | 12.50              | 4,035                    | 3             | 355.05                 | 1,524                  |
| 6        | NRCS Runoff     | PR-2B Grass HSGC C | 0.195           | 12.15              | 679                      | ---           |                        |                        |
| 7        | NRCS Runoff     | PR-2B Impervious   | 0.264           | 12.10              | 875                      | ---           |                        |                        |
| 8        | Junction        | PR-2B              | 0.438           | 12.10              | 1,554                    | 6, 7          |                        |                        |
| 11       | NRCS Runoff     | PR-2C Grass HSGC C | 0.129           | 12.12              | 400                      | ---           |                        |                        |
| 12       | NRCS Runoff     | PR-2C Impervious   | 0.331           | 12.10              | 1,120                    | ---           |                        |                        |
| 13       | Junction        | PR-2C              | 0.457           | 12.10              | 1,520                    | 11, 12        |                        |                        |
| 15       | Pond Route      | PR-2C Routing      | 0.106           | 12.37              | 1,515                    | 13            | 355.62                 | 459                    |
| 17       | NRCS Runoff     | PR-2G Grass HSGC C | 0.291           | 12.12              | 900                      | ---           |                        |                        |
| 18       | NRCS Runoff     | PR-2G Woods HSGC C | 0.253           | 12.12              | 782                      | ---           |                        |                        |
| 19       | Junction        | PR-2G              | 0.544           | 12.12              | 1,682                    | 17, 18        |                        |                        |
| 21       | NRCS Runoff     | PR-2D Grass HSGC C | 0.359           | 12.25              | 1,648                    | ---           |                        |                        |
| 22       | NRCS Runoff     | PR-2D Woods HSGC C | 0.800           | 12.25              | 3,709                    | ---           |                        |                        |
| 23       | NRCS Runoff     | PR-2D Impervious   | 0.182           | 12.22              | 923                      | ---           |                        |                        |
| 24       | Junction        | PR-2D              | 1.339           | 12.25              | 6,280                    | 21, 22, 23    |                        |                        |
| 26       | NRCS Runoff     | PR-2E Grass HSGC C | 0.273           | 12.18              | 1,050                    | ---           |                        |                        |
| 27       | NRCS Runoff     | PR-2E Impervious   | 0.138           | 12.13              | 560                      | ---           |                        |                        |
| 28       | Junction        | PR-2E              | 0.404           | 12.17              | 1,610                    | 26, 27        |                        |                        |
| 30       | NRCS Runoff     | PR-2F Woods HSGC C | 0.129           | 12.18              | 498                      | ---           |                        |                        |
| 31       | NRCS Runoff     | PR-2F Impervious   | 0.092           | 12.13              | 373                      | ---           |                        |                        |
| 32       | Junction        | PR-2F              | 0.216           | 12.17              | 871                      | 30, 31        |                        |                        |
| 34       | NRCS Runoff     | PR-2H Grass HSGC C | 0.065           | 12.12              | 200                      | ---           |                        |                        |
| 35       | NRCS Runoff     | PR-2H Impervious   | 0.317           | 12.10              | 1,050                    | ---           |                        |                        |
| 36       | Junction        | PR-2H              | 0.380           | 12.10              | 1,250                    | 34, 35        |                        |                        |

# Hydrograph 10-yr Summary

Hydrology Studio v 3.0.0.38

File: Current Beacon Church Proposed - POA-2.hys

05-16-2025

| 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) |
|----------|-----------------|---------------------|-----------------|--------------------|--------------------------|-----------------------|------------------------|------------------------|
| 38       | Junction        | PR-2B + PR-2H       | 0.818           | 12.10              | 2,804                    | 8, 36                 |                        |                        |
| 39       | Pond Route      | PR-2B+PR-2H Routing | 0.256           | 12.30              | 2,799                    | 38                    | 355.05                 | 815                    |
| 41       | Junction        | POA-2 Partial       | 2.483           | 12.17              | 15,993                   | 4, 15, 19, 24, 28, 32 |                        |                        |
| 42       | Junction        | Total POA-2         | 2.685           | 12.20              | 18,792                   | 39, 41                |                        |                        |

# Hydrograph 25-yr Summary

File: Current Beacon Church Proposed - POA-1 & POA-3.hys

Hydrology Studio v 3.0.0.38

07-01-2025

| 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     | PR-1A               | 1.589           | 12.10              | 5,302                    | ---           |                        |                        |
| 2        | Pond Route      | PR-1A Routing       | 0.339           | 12.27              | 1,702                    | 1             | 349.76                 | 1,654                  |
| 4        | NRCS Runoff     | PR-1B Grass HSGC C  | 0.357           | 12.15              | 1,244                    | ---           |                        |                        |
| 5        | NRCS Runoff     | PR-1B Impervious    | 0.900           | 12.10              | 3,063                    | ---           |                        |                        |
| 6        | Junction        | PR-1B               | 1.220           | 12.10              | 4,307                    | 4, 5          |                        |                        |
| 8        | NRCS Runoff     | PR-1C Grass HSGC C  | 0.141           | 12.10              | 389                      | ---           |                        |                        |
| 9        | NRCS Runoff     | PR-1C Impervious    | 0.132           | 12.10              | 442                      | ---           |                        |                        |
| 10       | Junction        | PR-1C               | 0.274           | 12.10              | 831                      | 8, 9          |                        |                        |
| 11       | Pond Route      | PR-1C Routing       | 0.265           | 12.10              | 830                      | 10            | 353.08                 | 17.1                   |
| 14       | NRCS Runoff     | PR-1D Grass HSGC C  | 0.275           | 12.12              | 855                      | ---           |                        |                        |
| 15       | NRCS Runoff     | PR-1D Impervious    | 0.728           | 12.10              | 2,430                    | ---           |                        |                        |
| 16       | Junction        | PR-1D               | 0.997           | 12.10              | 3,285                    | 14, 15        |                        |                        |
| 18       | Junction        | Comb. to UDG-INF1-2 | 2.482           | 12.10              | 8,423                    | 6, 11, 16     |                        |                        |
| 20       | Pond Route      | UGD-INF1-2 Routing  | 0.305           | 12.57              | 3,177                    | 18            | 345.81                 | 2,968                  |
| 22       | NRCS Runoff     | PR-1E Grass HSGC C  | 0.689           | 12.12              | 2,138                    | ---           |                        |                        |
| 23       | NRCS Runoff     | PR-1E Impervious    | 0.277           | 12.10              | 943                      | ---           |                        |                        |
| 24       | Junction        | PR-1E               | 0.956           | 12.12              | 3,081                    | 22, 23        |                        |                        |
| 26       | Junction        | POA-1               | 1.318           | 12.13              | 7,959                    | 2, 20, 24     |                        |                        |
| 28       | NRCS Runoff     | PR-3 (POA-3)        | 0.138           | 12.12              | 428                      | ---           |                        |                        |

# Hydrograph 25-yr Summary

Hydrology Studio v 3.0.0.38

File: Current Beacon Church Proposed - POA-2.hys

05-16-2025

| 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     | PR-2A Grass HSGC C | 0.097           | 12.10              | 276                      | ---           |                        |                        |
| 2        | NRCS Runoff     | PR-2A Impervious   | 1.457           | 12.10              | 4,860                    | ---           |                        |                        |
| 3        | Junction        | PR-2A              | 1.553           | 12.10              | 5,136                    | 1, 2          |                        |                        |
| 4        | Pond Route      | PR-2A Routing      | 0.406           | 12.25              | 5,127                    | 3             | 355.22                 | 1,795                  |
| 6        | NRCS Runoff     | PR-2B Grass HSGC C | 0.277           | 12.15              | 968                      | ---           |                        |                        |
| 7        | NRCS Runoff     | PR-2B Impervious   | 0.331           | 12.10              | 1,105                    | ---           |                        |                        |
| 8        | Junction        | PR-2B              | 0.581           | 12.10              | 2,072                    | 6, 7          |                        |                        |
| 11       | NRCS Runoff     | PR-2C Grass HSGC C | 0.184           | 12.12              | 570                      | ---           |                        |                        |
| 12       | NRCS Runoff     | PR-2C Impervious   | 0.415           | 12.10              | 1,414                    | ---           |                        |                        |
| 13       | Junction        | PR-2C              | 0.594           | 12.10              | 1,984                    | 11, 12        |                        |                        |
| 15       | Pond Route      | PR-2C Routing      | 0.141           | 12.35              | 1,979                    | 13            | 355.78                 | 602                    |
| 17       | NRCS Runoff     | PR-2G Grass HSGC C | 0.413           | 12.12              | 1,283                    | ---           |                        |                        |
| 18       | NRCS Runoff     | PR-2G Woods HSGC C | 0.370           | 12.12              | 1,144                    | ---           |                        |                        |
| 19       | Junction        | PR-2G              | 0.783           | 12.12              | 2,427                    | 17, 18        |                        |                        |
| 21       | NRCS Runoff     | PR-2D Grass HSGC C | 0.512           | 12.25              | 2,350                    | ---           |                        |                        |
| 22       | NRCS Runoff     | PR-2D Woods HSGC C | 1.181           | 12.25              | 5,423                    | ---           |                        |                        |
| 23       | NRCS Runoff     | PR-2D Impervious   | 0.229           | 12.22              | 1,165                    | ---           |                        |                        |
| 24       | Junction        | PR-2D              | 1.918           | 12.25              | 8,937                    | 21, 22, 23    |                        |                        |
| 26       | NRCS Runoff     | PR-2E Grass HSGC C | 0.389           | 12.18              | 1,497                    | ---           |                        |                        |
| 27       | NRCS Runoff     | PR-2E Impervious   | 0.173           | 12.13              | 707                      | ---           |                        |                        |
| 28       | Junction        | PR-2E              | 0.554           | 12.17              | 2,204                    | 26, 27        |                        |                        |
| 30       | NRCS Runoff     | PR-2F Woods HSGC C | 0.189           | 12.18              | 728                      | ---           |                        |                        |
| 31       | NRCS Runoff     | PR-2F Impervious   | 0.115           | 12.13              | 471                      | ---           |                        |                        |
| 32       | Junction        | PR-2F              | 0.299           | 12.17              | 1,199                    | 30, 31        |                        |                        |
| 34       | NRCS Runoff     | PR-2H Grass HSGC C | 0.092           | 12.12              | 285                      | ---           |                        |                        |
| 35       | NRCS Runoff     | PR-2H Impervious   | 0.397           | 12.10              | 1,325                    | ---           |                        |                        |
| 36       | Junction        | PR-2H              | 0.487           | 12.10              | 1,610                    | 34, 35        |                        |                        |

# Hydrograph 25-yr Summary

Hydrology Studio v 3.0.0.38

File: Current Beacon Church Proposed - POA-2.hys  
05-16-2025

| 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) |
|----------|-----------------|---------------------|-----------------|--------------------|--------------------------|-----------------------|------------------------|------------------------|
| 38       | Junction        | PR-2B + PR-2H       | 1.067           | 12.10              | 3,683                    | 8, 36                 |                        |                        |
| 39       | Pond Route      | PR-2B+PR-2H Routing | 0.494           | 12.22              | 3,678                    | 38                    | 355.23                 | 968                    |
| 41       | Junction        | POA-2 Partial       | 3.660           | 12.17              | 21,873                   | 4, 15, 19, 24, 28, 32 |                        |                        |
| 42       | Junction        | Total POA-2         | 4.138           | 12.18              | 25,550                   | 39, 41                |                        |                        |

# Hydrograph 100-yr Summary

File: Current Beacon Church Proposed - POA-1 & POA-3.hys

Hydrology Studio v 3.0.0.38

07-01-2025

| 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     | PR-1A               | 2.189           | 12.10              | 7,367                    | ---           |                        |                        |
| 2        | Pond Route      | PR-1A Routing       | 0.795           | 12.15              | 3,121                    | 1             | 350.24                 | 2,160                  |
| 4        | NRCS Runoff     | PR-1B Grass HSGC C  | 0.561           | 12.15              | 1,982                    | ---           |                        |                        |
| 5        | NRCS Runoff     | PR-1B Impervious    | 1.239           | 12.10              | 4,256                    | ---           |                        |                        |
| 6        | Junction        | PR-1B               | 1.749           | 12.10              | 6,238                    | 4, 5          |                        |                        |
| 8        | NRCS Runoff     | PR-1C Grass HSGC C  | 0.220           | 12.10              | 619                      | ---           |                        |                        |
| 9        | NRCS Runoff     | PR-1C Impervious    | 0.182           | 12.10              | 614                      | ---           |                        |                        |
| 10       | Junction        | PR-1C               | 0.403           | 12.10              | 1,233                    | 8, 9          |                        |                        |
| 11       | Pond Route      | PR-1C Routing       | 0.379           | 12.10              | 1,233                    | 10            | 353.51                 | 29.5                   |
| 14       | NRCS Runoff     | PR-1D Grass HSGC C  | 0.432           | 12.12              | 1,363                    | ---           |                        |                        |
| 15       | NRCS Runoff     | PR-1D Impervious    | 1.003           | 12.10              | 3,376                    | ---           |                        |                        |
| 16       | Junction        | PR-1D               | 1.426           | 12.10              | 4,739                    | 14, 15        |                        |                        |
| 18       | Junction        | Comb. to UDG-INF1-2 | 3.555           | 12.10              | 12,210                   | 6, 11, 16     |                        |                        |
| 20       | Pond Route      | UGD-INF1-2 Routing  | 0.531           | 12.53              | 6,002                    | 18            | 346.62                 | 4,394                  |
| 22       | NRCS Runoff     | PR-1E Grass HSGC C  | 1.080           | 12.12              | 3,406                    | ---           |                        |                        |
| 23       | NRCS Runoff     | PR-1E Impervious    | 0.381           | 12.10              | 1,310                    | ---           |                        |                        |
| 24       | Junction        | PR-1E               | 1.449           | 12.12              | 4,716                    | 22, 23        |                        |                        |
| 26       | Junction        | POA-1               | 2.594           | 12.12              | 13,839                   | 2, 20, 24     |                        |                        |
| 28       | NRCS Runoff     | PR-3 (POA-3)        | 0.216           | 12.12              | 681                      | ---           |                        |                        |

# Hydrograph 100-yr Summary

Hydrology Studio v 3.0.0.38

File: Current Beacon Church Proposed - POA-2.hys

05-16-2025

| 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     | PR-2A Grass HSGC C | 0.151           | 12.10              | 440                      | ---           |                        |                        |
| 2        | NRCS Runoff     | PR-2A Impervious   | 2.007           | 12.10              | 6,753                    | ---           |                        |                        |
| 3        | Junction        | PR-2A              | 2.158           | 12.10              | 7,193                    | 1, 2          |                        |                        |
| 4        | Pond Route      | PR-2A Routing      | 0.807           | 12.17              | 7,184                    | 3             | 355.54                 | 2,305                  |
| 6        | NRCS Runoff     | PR-2B Grass HSGC C | 0.436           | 12.15              | 1,541                    | ---           |                        |                        |
| 7        | NRCS Runoff     | PR-2B Impervious   | 0.456           | 12.10              | 1,535                    | ---           |                        |                        |
| 8        | Junction        | PR-2B              | 0.852           | 12.10              | 3,076                    | 6, 7          |                        |                        |
| 11       | NRCS Runoff     | PR-2C Grass HSGC C | 0.288           | 12.12              | 908                      | ---           |                        |                        |
| 12       | NRCS Runoff     | PR-2C Impervious   | 0.572           | 12.10              | 1,964                    | ---           |                        |                        |
| 13       | Junction        | PR-2C              | 0.854           | 12.10              | 2,873                    | 11, 12        |                        |                        |
| 15       | Pond Route      | PR-2C Routing      | 0.356           | 12.22              | 2,868                    | 13            | 356.00                 | 789                    |
| 17       | NRCS Runoff     | PR-2G Grass HSGC C | 0.648           | 12.12              | 2,044                    | ---           |                        |                        |
| 18       | NRCS Runoff     | PR-2G Woods HSGC C | 0.601           | 12.12              | 1,875                    | ---           |                        |                        |
| 19       | Junction        | PR-2G              | 1.249           | 12.12              | 3,919                    | 17, 18        |                        |                        |
| 21       | NRCS Runoff     | PR-2D Grass HSGC C | 0.808           | 12.25              | 3,744                    | ---           |                        |                        |
| 22       | NRCS Runoff     | PR-2D Woods HSGC C | 1.932           | 12.25              | 8,888                    | ---           |                        |                        |
| 23       | NRCS Runoff     | PR-2D Impervious   | 0.315           | 12.22              | 1,618                    | ---           |                        |                        |
| 24       | Junction        | PR-2D              | 3.050           | 12.25              | 14,250                   | 21, 22, 23    |                        |                        |
| 26       | NRCS Runoff     | PR-2E Grass HSGC C | 0.612           | 12.18              | 2,384                    | ---           |                        |                        |
| 27       | NRCS Runoff     | PR-2E Impervious   | 0.238           | 12.13              | 982                      | ---           |                        |                        |
| 28       | Junction        | PR-2E              | 0.840           | 12.17              | 3,367                    | 26, 27        |                        |                        |
| 30       | NRCS Runoff     | PR-2F Woods HSGC C | 0.309           | 12.18              | 1,193                    | ---           |                        |                        |
| 31       | NRCS Runoff     | PR-2F Impervious   | 0.159           | 12.13              | 655                      | ---           |                        |                        |
| 32       | Junction        | PR-2F              | 0.461           | 12.17              | 1,848                    | 30, 31        |                        |                        |
| 34       | NRCS Runoff     | PR-2H Grass HSGC C | 0.144           | 12.12              | 454                      | ---           |                        |                        |
| 35       | NRCS Runoff     | PR-2H Impervious   | 0.547           | 12.10              | 1,842                    | ---           |                        |                        |
| 36       | Junction        | PR-2H              | 0.688           | 12.10              | 2,296                    | 34, 35        |                        |                        |



# Hydrograph 100-yr Summary

File: Current Beacon Church Proposed - POA-2.hys

Hydrology Studio v 3.0.0.38

05-16-2025

| 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) |
|----------|-----------------|---------------------|-----------------|--------------------|--------------------------|-----------------------|------------------------|------------------------|
| 38       | Junction        | PR-2B + PR-2H       | 1.541           | 12.10              | 5,372                    | 8, 36                 |                        |                        |
| 39       | Pond Route      | PR-2B+PR-2H Routing | 0.857           | 12.18              | 5,367                    | 38                    | 355.55                 | 1,241                  |
| 41       | Junction        | POA-2 Partial       | 6.141           | 12.17              | 33,435                   | 4, 15, 19, 24, 28, 32 |                        |                        |
| 42       | Junction        | Total POA-2         | 6.996           | 12.17              | 38,802                   | 39, 41                |                        |                        |

## **FUTURE HYDROGRAPH CALCULATIONS**

## **PR-1A WATERSHED**

Project: Beacon Unitarian Universalist Church

By: TEG

Date: 11/29/2023

Location: Summit, NJ

Checked By: MJV

Date Checked: 11/29/2023

Circle One: Present Developed

Future Proposed Watershed PR-1A - Impervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Design Flow Length, L<sub>des</sub> (Total L<sub>des</sub> < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. McCuen-Spiess Limit, L<sub>mcs</sub> (max. 100 ft)
7. Compute T<sub>t</sub>

$$L_{mcs} = (100 s^{0.5})/n$$

$$T_t = \frac{0.007 (n L_{des})^{0.8}}{P_2^{0.5} s^{0.4}}$$

|            |                        |   |  |
|------------|------------------------|---|--|
| Segment ID | 1                      |   |  |
|            | <b>Smooth Surfaces</b> |   |  |
|            | <b>0.011</b>           |   |  |
| ft         | <b>64</b>              |   |  |
| in         | <b>4.12</b>            |   |  |
| ft/ft      | <b>0.020</b>           |   |  |
| ft         | <b>100</b>             |   |  |
| hr         | <b>0.012</b>           | + |  |

Sheet Flow Sub-Total **0.012 hours**

**Shallow Concentrated Flow**

8. Surface Description
9. Flow Length, L
10. Watercourse Slope, s
11. Average Velocity, V (NEH table 15-3)
12. Compute T<sub>t</sub>

$$T_t = \frac{L}{3600 V}$$

|            |  |   |  |
|------------|--|---|--|
| Segment ID |  |   |  |
| ft         |  |   |  |
| ft/ft      |  |   |  |
| ft/s       |  |   |  |
| hr         |  | + |  |

Shallow Conc. Flow Sub-Total **0.000 hours**

**Channel Flow**

13. Flow Length, L
14. Cross Sectional flow area, a
15. Wetted Perimeter, P<sub>w</sub>
16. Hydraulic Radius, r
17. Channel Slope, s
18. Manning's Roughness Coeff., n
19. Velocity, V
20. Compute T<sub>t</sub>

$$r = a / P_w$$

$$V = (1.49 r^{2/3} s^{1/2}) / n$$

$$T_t = \frac{L}{3600 V}$$

|                 |              |   |  |
|-----------------|--------------|---|--|
| Segment ID      | 2            |   |  |
| ft              | <b>56</b>    |   |  |
| ft <sup>2</sup> | <b>0.17</b>  |   |  |
| ft              | <b>1.00</b>  |   |  |
| ft              | <b>0.17</b>  |   |  |
| ft/ft           | <b>0.020</b> |   |  |
|                 | <b>0.012</b> |   |  |
| ft/s            | <b>5.39</b>  |   |  |
| hr              | <b>0.003</b> | + |  |

Channel Flow Sub-Total **0.003 hours**

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>

(Add Sub-Total T<sub>t</sub> from prior steps)

|   |                    |
|---|--------------------|
| Total T <sub>c</sub> (hours) =                        | <b>0.015 hours</b> |
| Software Limitations Require Minimum T <sub>c</sub> = | <b>2 minutes</b>   |

# Hydrograph Report

Hydrology Studio v 3.0.0.38

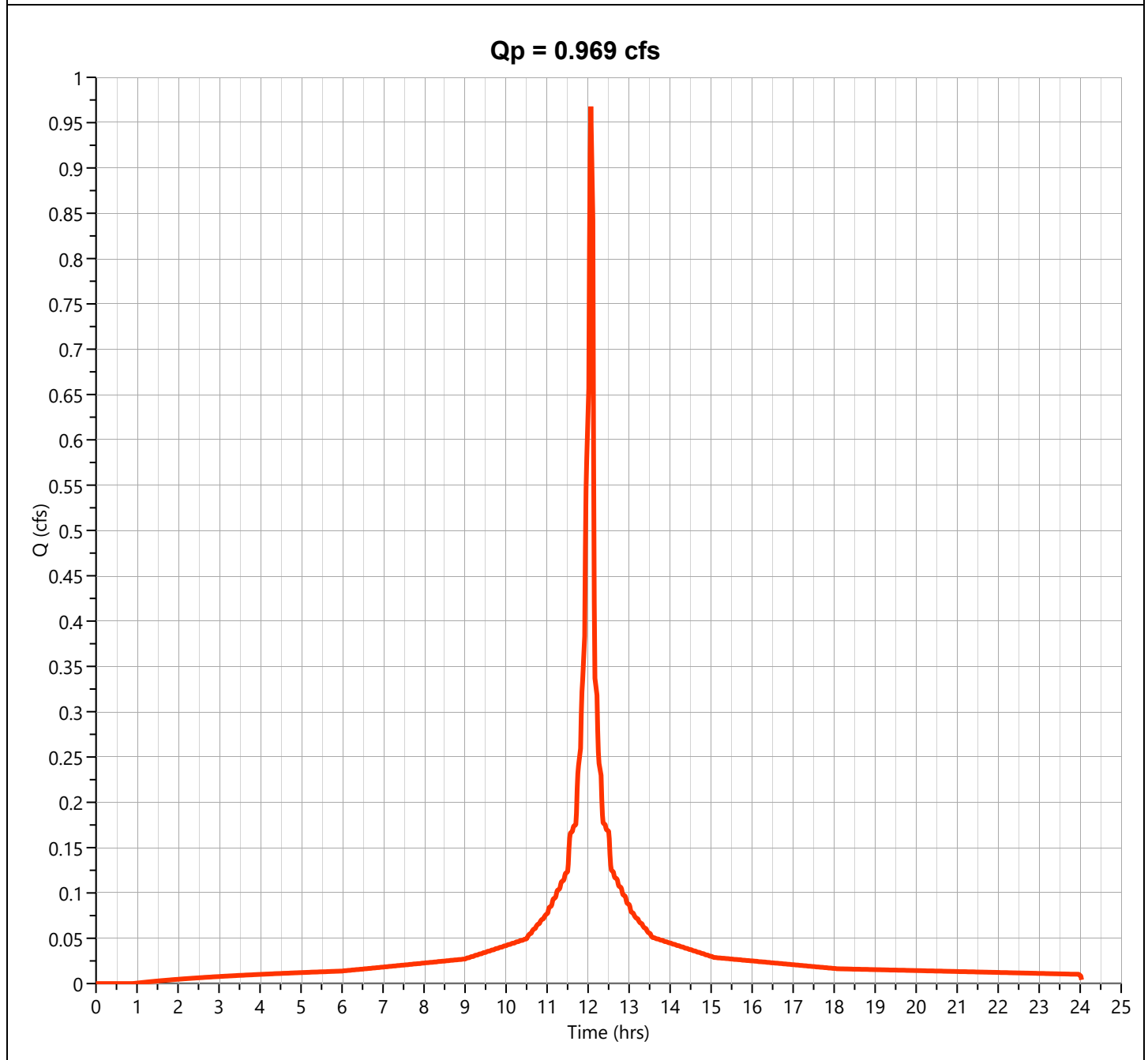
File: Future Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

**PR-1A**

**Hyd. No. 1**

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.969 cfs  |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 3,173 cuft |
| Drainage Area   | = 0.24 ac     | Curve Number       | = 98.00      |
| Tc Method       | = User        | Time of Conc. (Tc) | = 2.0 min    |
| Total Rainfall  | = 4.12 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

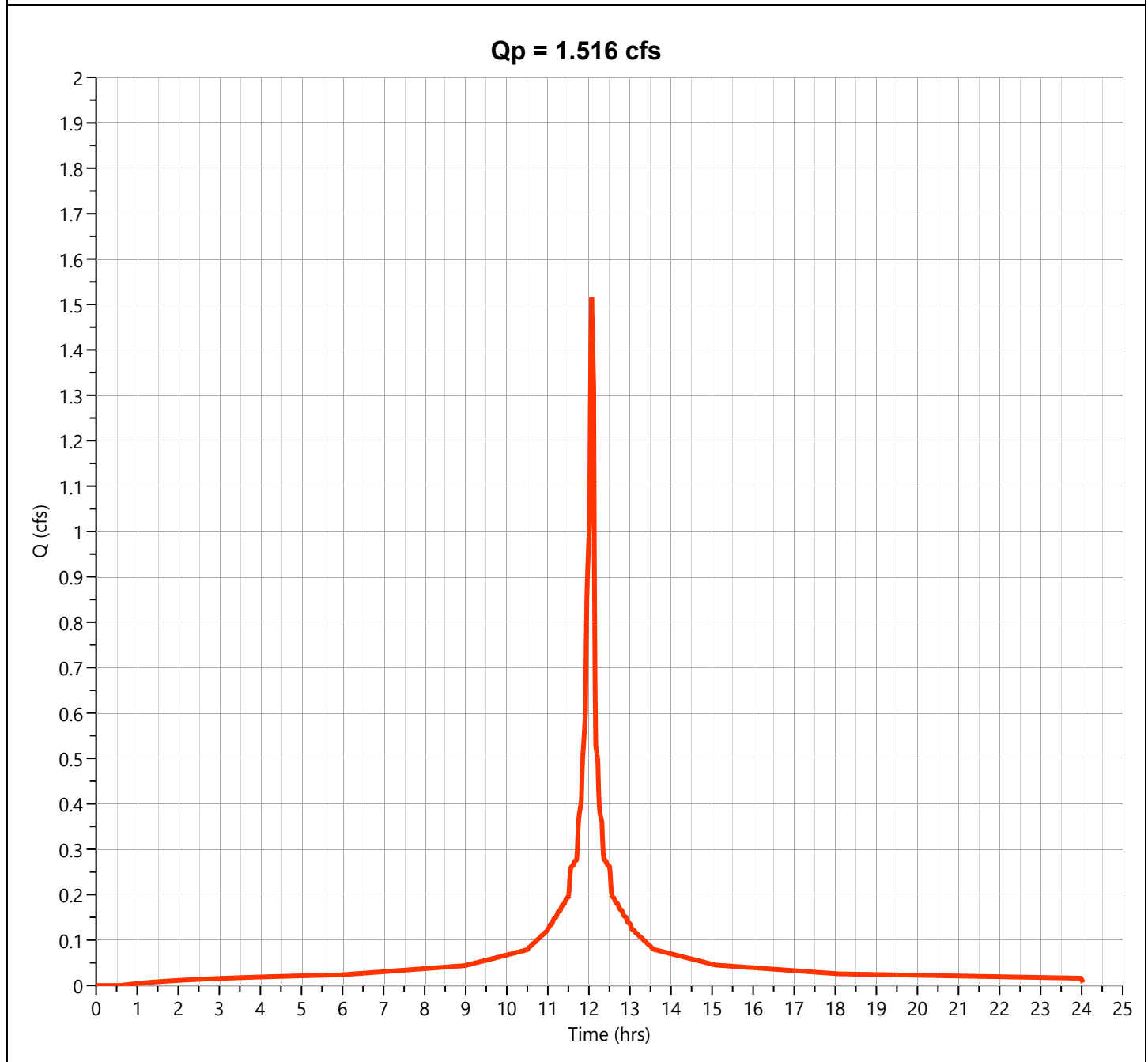
File: Future Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

**PR-1A**

**Hyd. No. 1**

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 1.516 cfs  |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 5,049 cuft |
| Drainage Area   | = 0.24 ac     | Curve Number       | = 98.00      |
| Tc Method       | = User        | Time of Conc. (Tc) | = 2.0 min    |
| Total Rainfall  | = 6.42 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

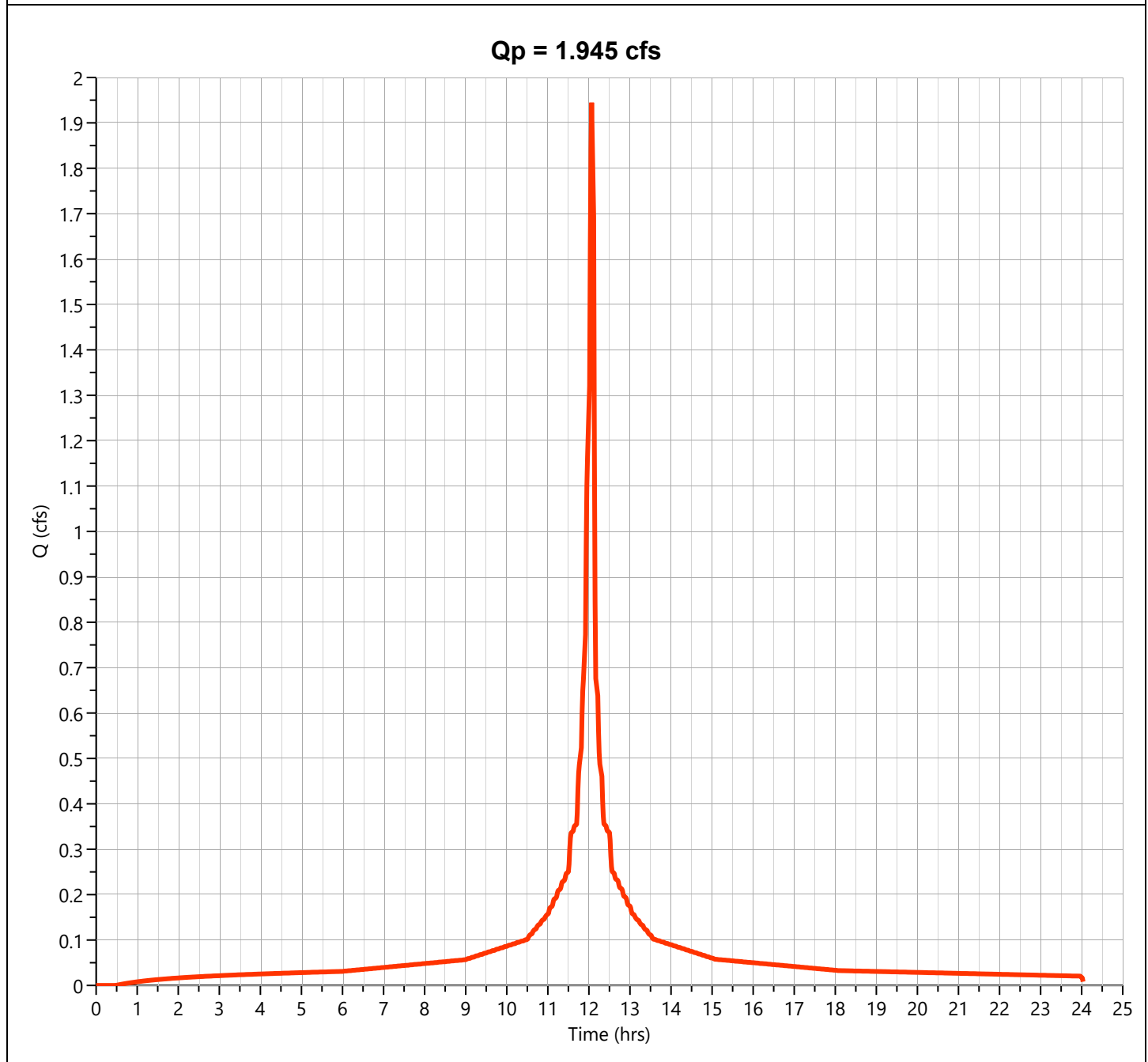
File: Future Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

**PR-1A**

**Hyd. No. 1**

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 1.945 cfs  |
| Storm Frequency | = 25-yr       | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 6,526 cuft |
| Drainage Area   | = 0.24 ac     | Curve Number       | = 98.00      |
| Tc Method       | = User        | Time of Conc. (Tc) | = 2.0 min    |
| Total Rainfall  | = 8.23 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

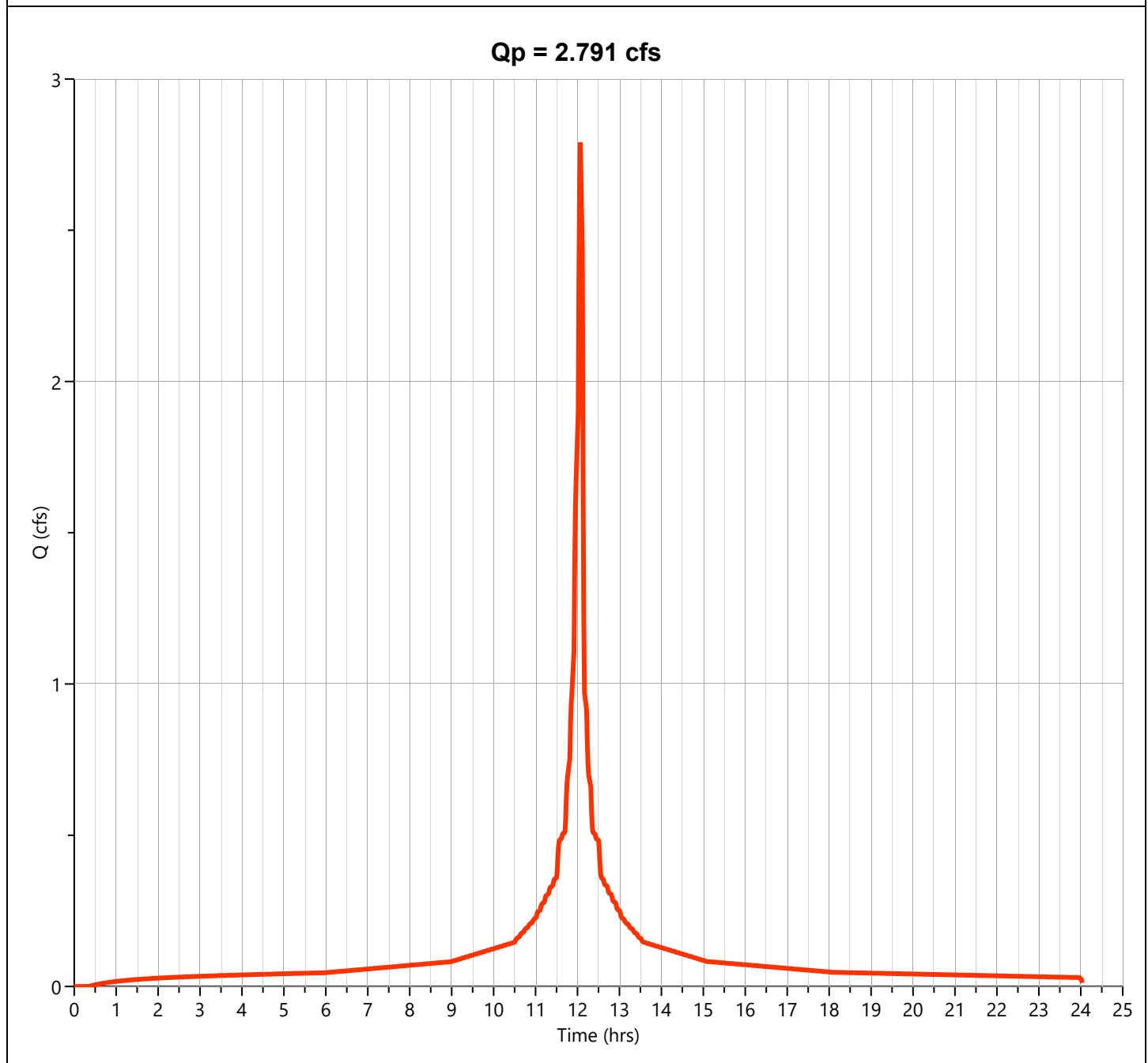
File: Future Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

**PR-1A**

**Hyd. No. 1**

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 2.791 cfs  |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 9,440 cuft |
| Drainage Area   | = 0.24 ac     | Curve Number       | = 98.00      |
| Tc Method       | = User        | Time of Conc. (Tc) | = 2.0 min    |
| Total Rainfall  | = 11.80 in    | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |





## **PR-1B WATERSHED**

Project: Beacon Unitarian Universalist Church

By: TEG

Date: 11/29/2023

Location: Summit, NJ

Checked By: MJV

Date Checked: 11/29/2023

Circle One: Present Developed

Future Proposed Watershed PR-1B - Impervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Design Flow Length, L<sub>des</sub> (Total L<sub>des</sub> < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. McCuen-Spiess Limit, L<sub>mcs</sub> (max. 100 ft)
7. Compute T<sub>t</sub>

$$L_{mcs} = (100 s^{0.5})/n$$

$$T_t = \frac{0.007 (n L_{des})^{0.8}}{P_2^{0.5} s^{0.4}}$$

| Segment ID | 1                      | 2                    | 3                    |
|------------|------------------------|----------------------|----------------------|
|            | <b>Smooth Surfaces</b> | <b>Dense Grasses</b> | <b>Dense Grasses</b> |
|            | <b>0.011</b>           | <b>0.24</b>          | <b>0.24</b>          |
| ft         | <b>24</b>              | <b>7</b>             | <b>11</b>            |
| in         | <b>4.12</b>            | <b>4.12</b>          | <b>4.12</b>          |
| ft/ft      | <b>0.014</b>           | <b>0.334</b>         | <b>0.010</b>         |
| ft         | <b>100</b>             | <b>100</b>           | <b>42</b>            |
| hr         | <b>0.007</b>           | <b>0.008</b>         | <b>0.047</b>         |

Sheet Flow Sub-Total **0.062 hours**

**Shallow Concentrated Flow**

8. Surface Description
9. Flow Length, L
10. Watercourse Slope, s
11. Average Velocity, V (NEH table 15-3)
12. Compute T<sub>t</sub>

$$T_t = \frac{L}{3600 V}$$

| Segment ID |  |  |  |
|------------|--|--|--|
|            |  |  |  |
| ft         |  |  |  |
| ft/ft      |  |  |  |
| ft/s       |  |  |  |
| hr         |  |  |  |

Shallow Conc. Flow Sub-Total **0.000 hours**

**Channel Flow**

13. Flow Length, L
14. Cross Sectional flow area, a
15. Wetted Perimeter, P<sub>w</sub>
16. Hydraulic Radius, r
17. Channel Slope, s
18. Manning's Roughness Coeff., n
19. Velocity, V
20. Compute T<sub>t</sub>

$$r = a / P_w$$

$$V = (1.49 r^{2/3} s^{1/2}) / n$$

$$T_t = \frac{L}{3600 V}$$

| Segment ID      | 4            |  |  |
|-----------------|--------------|--|--|
| ft              | <b>69</b>    |  |  |
| ft <sup>2</sup> | <b>0.39</b>  |  |  |
| ft              | <b>1.60</b>  |  |  |
| ft              | <b>0.24</b>  |  |  |
| ft/ft           | <b>0.010</b> |  |  |
|                 | <b>0.012</b> |  |  |
| ft/s            | <b>4.85</b>  |  |  |
| hr              | <b>0.004</b> |  |  |

Channel Flow Sub-Total **0.004 hours**

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>

(Add Sub-Total T<sub>t</sub> from prior steps)

|                                  |                    |
|----------------------------------|--------------------|
| Total T <sub>c</sub> (hours) =   | <b>0.066 hours</b> |
| Total T <sub>c</sub> (minutes) = | <b>4 minutes</b>   |

Project: Beacon Unitarian Universalist Church

By: TEG

Date: 11/29/2023

Location: Summit, NJ

Checked By: MJV

Date Checked: 11/29/2023

Circle One: Present Developed

Future Proposed Watershed PR-1B - Pervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Design Flow Length, L<sub>des</sub> (Total L<sub>des</sub> < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. McCuen-Spiess Limit, L<sub>mcs</sub> (max. 100 ft)
7. Compute T<sub>t</sub>

$$L_{mcs} = (100 s^{0.5})/n$$

$$T_t = \frac{0.007 (n L_{des})^{0.8}}{P_2^{0.5} s^{0.4}}$$

|            |                               |   |  |
|------------|-------------------------------|---|--|
| Segment ID | 1                             |   |  |
|            | <b>Woods Dense Underbrush</b> |   |  |
|            | <b>0.40</b>                   |   |  |
| ft         | <b>42</b>                     |   |  |
| in         | <b>4.12</b>                   |   |  |
| ft/ft      | <b>0.029</b>                  |   |  |
| ft         | <b>42</b>                     |   |  |
| hr         | <b>0.137</b>                  | + |  |

Sheet Flow Sub-Total **0.137 hours**

**Shallow Concentrated Flow**

8. Surface Description
9. Flow Length, L
10. Watercourse Slope, s
11. Average Velocity, V (NEH table 15-3)
12. Compute T<sub>t</sub>

$$T_t = \frac{L}{3600 V}$$

|            |                          |                 |                          |
|------------|--------------------------|-----------------|--------------------------|
| Segment ID | 2                        | 3               | 4                        |
|            | <b>Grassed Waterways</b> | <b>Pavement</b> | <b>Grassed Waterways</b> |
| ft         | <b>4</b>                 | <b>5</b>        | <b>6</b>                 |
| ft/ft      | <b>0.037</b>             | <b>0.018</b>    | <b>0.275</b>             |
| ft/s       | <b>3.10</b>              | <b>2.73</b>     | <b>8.45</b>              |
| hr         | <b>0.000</b>             | <b>0.001</b>    | <b>0.000</b>             |

Shallow Conc. Flow Sub-Total **0.001 hours**

**Channel Flow**

13. Flow Length, L
14. Cross Sectional flow area, a
15. Wetted Perimeter, P<sub>w</sub>
16. Hydraulic Radius, r
17. Channel Slope, s
18. Manning's Roughness Coeff., n
19. Velocity, V
20. Compute T<sub>t</sub>

$$r = a / P_w$$

$$V = (1.49 r^{2/3} s^{1/2}) / n$$

$$T_t = \frac{L}{3600 V}$$

|                 |              |   |  |
|-----------------|--------------|---|--|
| Segment ID      | 5            |   |  |
| ft              | <b>69</b>    |   |  |
| ft <sup>2</sup> | <b>0.39</b>  |   |  |
| ft              | <b>1.60</b>  |   |  |
| ft              | <b>0.24</b>  |   |  |
| ft/ft           | <b>0.010</b> |   |  |
|                 | <b>0.012</b> |   |  |
| ft/s            | <b>4.85</b>  |   |  |
| hr              | <b>0.004</b> | + |  |

Channel Flow Sub-Total **0.004 hours**

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>

(Add Sub-Total T<sub>t</sub> from prior steps)

|                      |                    |
|----------------------|--------------------|
| Total Tc (hours) =   | <b>0.142 hours</b> |
| Total Tc (minutes) = | <b>8 minutes</b>   |

# Hydrograph Report

Hydrology Studio v 3.0.0.38

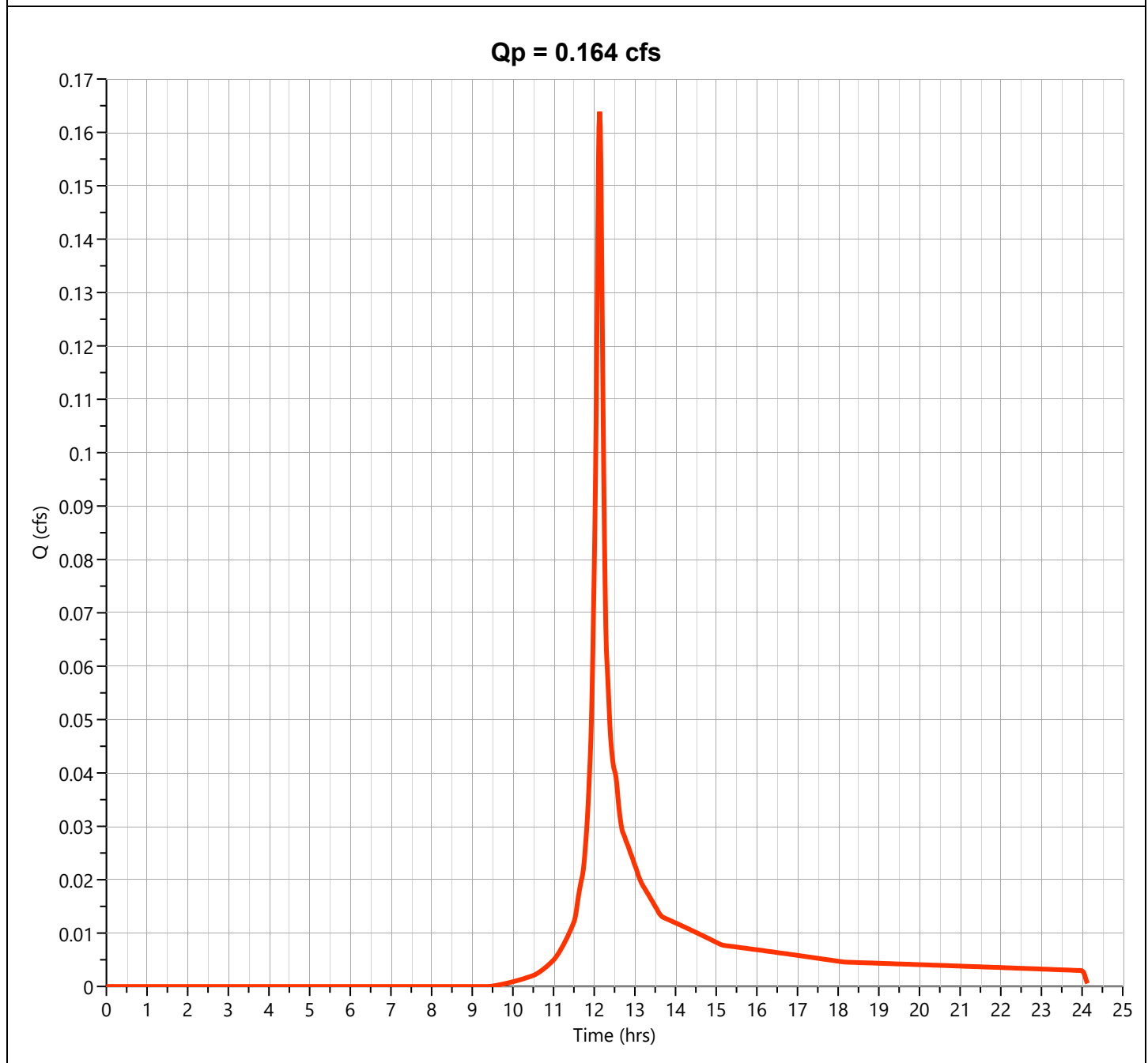
File: Future Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

## PR-1B Grass HSGC C

## Hyd. No. 4

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.164 cfs |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.13 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 537 cuft  |
| Drainage Area   | = 0.09 ac     | Curve Number       | = 74.00     |
| Tc Method       | = User        | Time of Conc. (Tc) | = 8.0 min   |
| Total Rainfall  | = 4.12 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

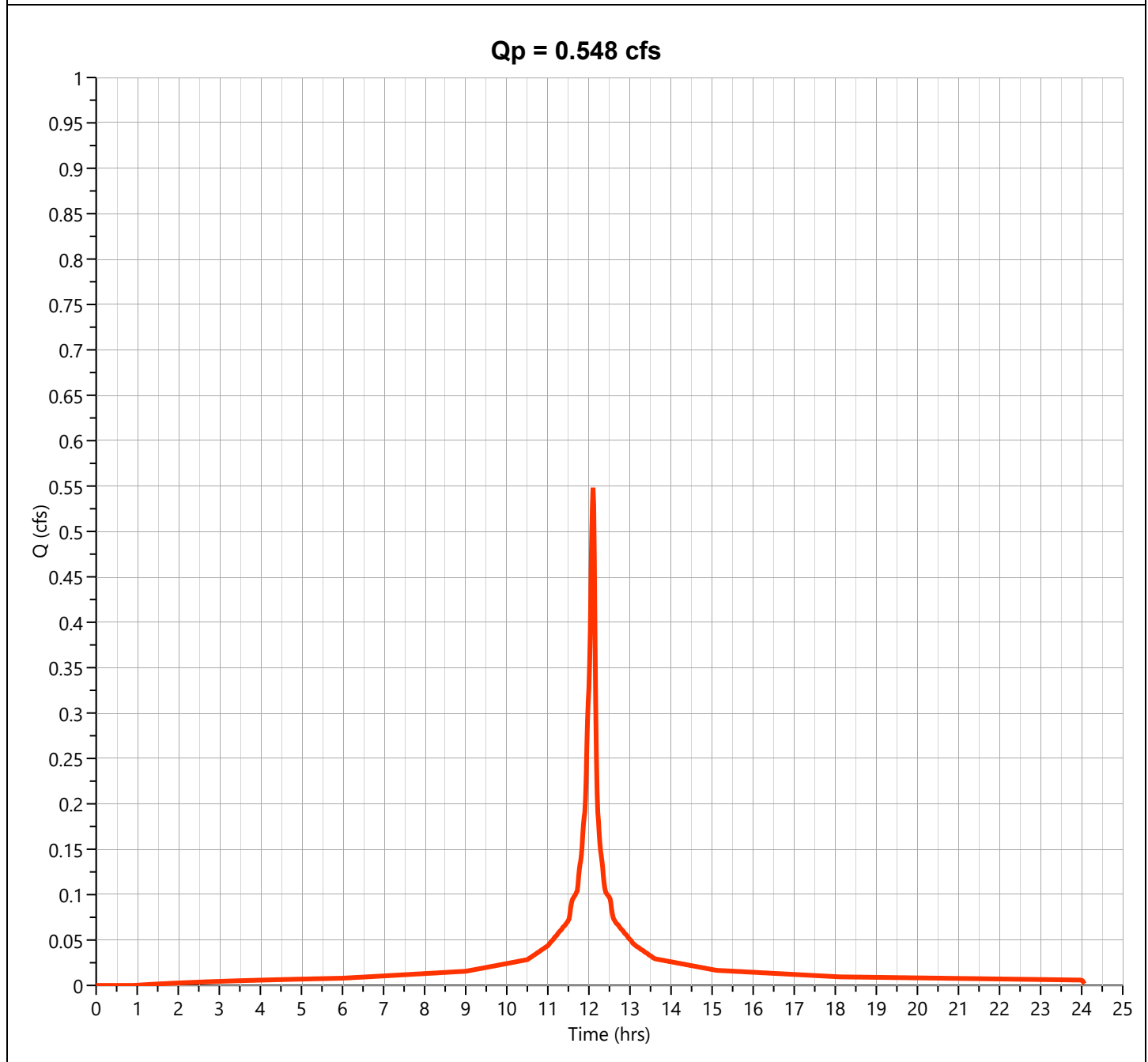
File: Future Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

## PR-1B Impervious

## Hyd. No. 5

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.548 cfs  |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 1,833 cuft |
| Drainage Area   | = 0.13 ac     | Curve Number       | = 98.00      |
| Tc Method       | = User        | Time of Conc. (Tc) | = 4.0 min    |
| Total Rainfall  | = 4.12 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

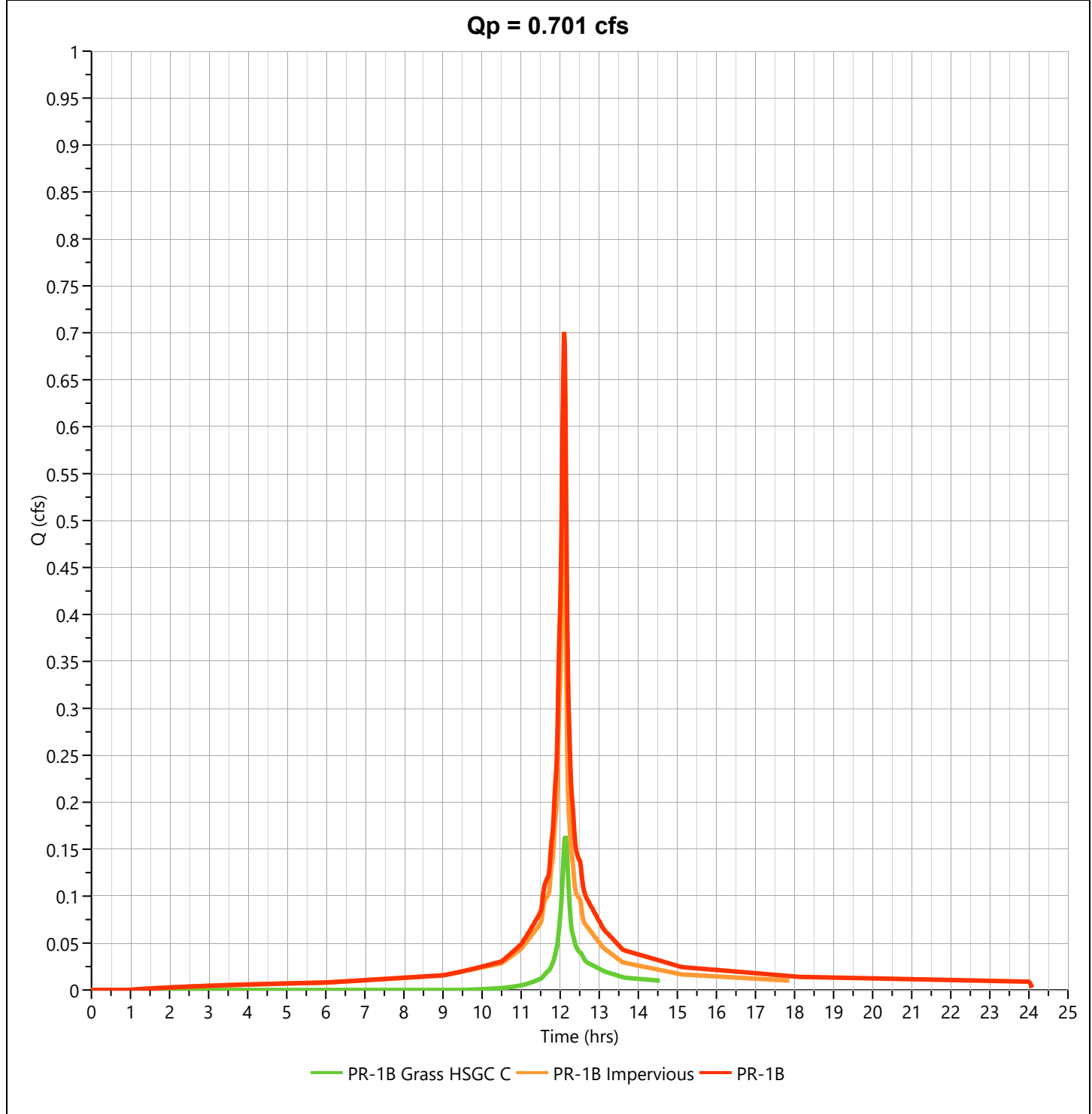
File: Future Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

## PR-1B

## Hyd. No. 6

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.701 cfs  |
| Storm Frequency    | = 2-yr     | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 2,370 cuft |
| Inflow Hydrographs | = 4, 5     | Total Contrib. Area | = 0.22 ac    |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

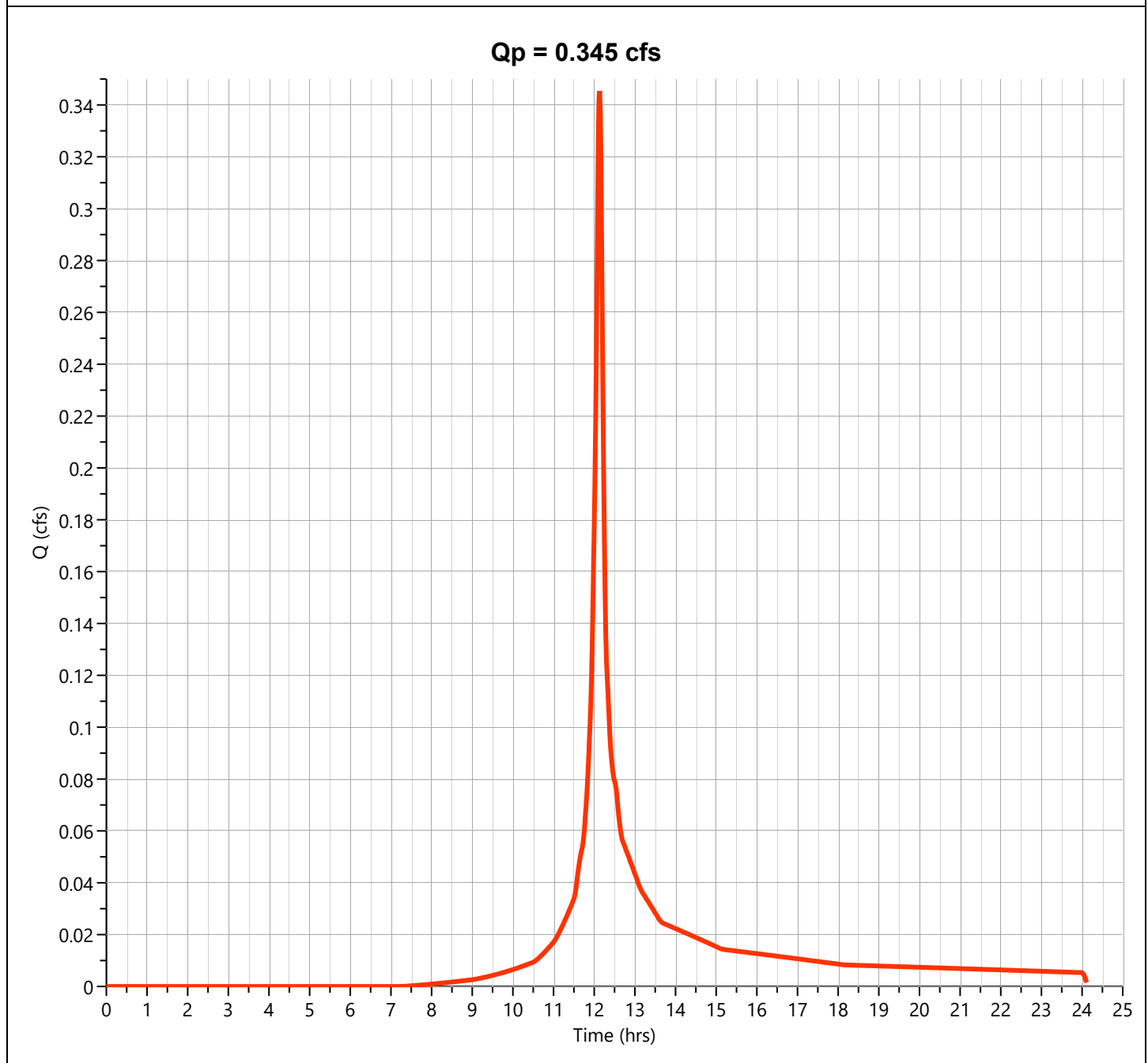
File: Future Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

## PR-1B Grass HSGC C

Hyd. No. 4

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.345 cfs  |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.13 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 1,128 cuft |
| Drainage Area   | = 0.09 ac     | Curve Number       | = 74.00      |
| Tc Method       | = User        | Time of Conc. (Tc) | = 8.0 min    |
| Total Rainfall  | = 6.42 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

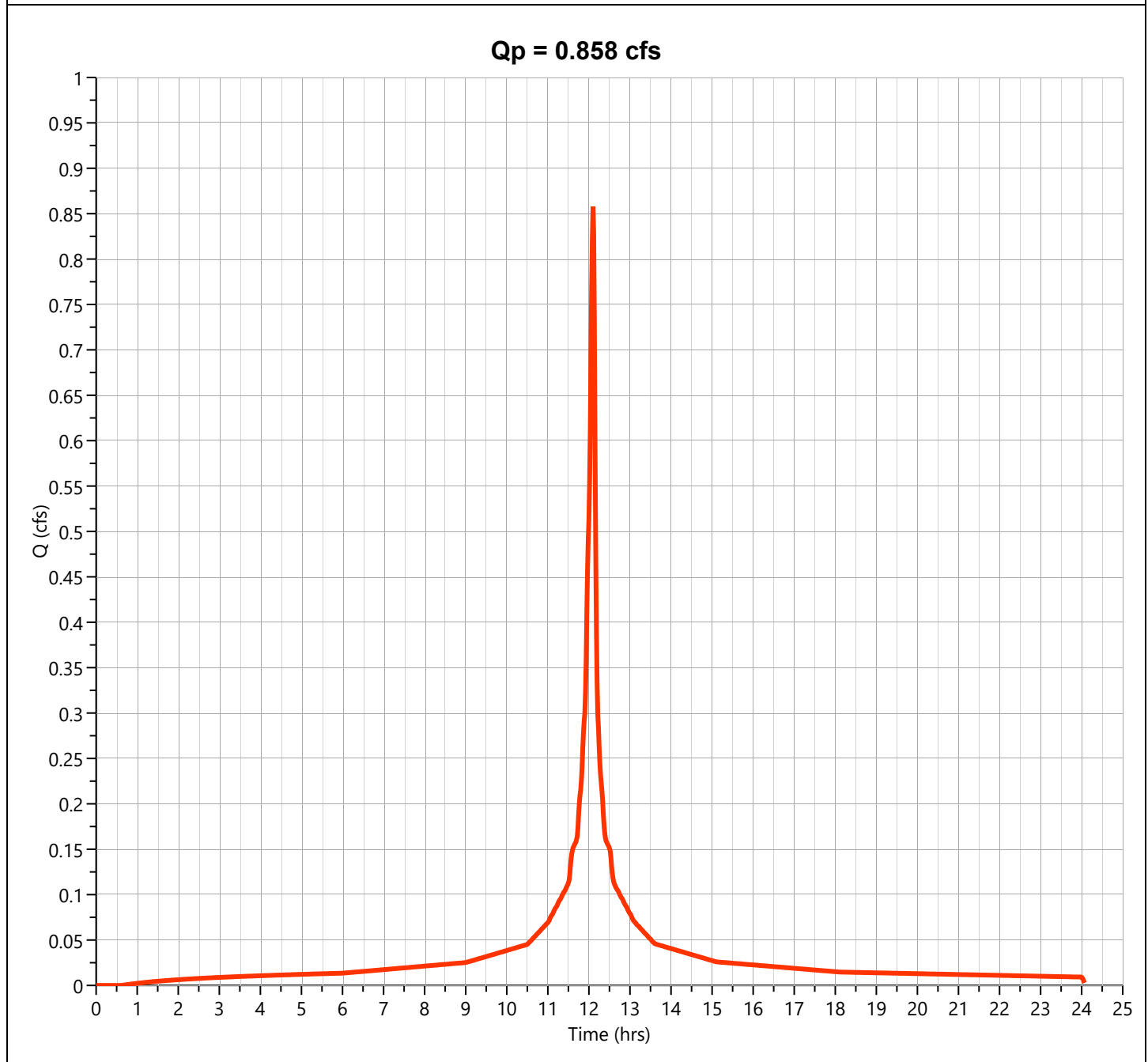
File: Future Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

## PR-1B Impervious

## Hyd. No. 5

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.858 cfs  |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 2,917 cuft |
| Drainage Area   | = 0.13 ac     | Curve Number       | = 98.00      |
| Tc Method       | = User        | Time of Conc. (Tc) | = 4.0 min    |
| Total Rainfall  | = 6.42 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |





# Hydrograph Report

Hydrology Studio v 3.0.0.38

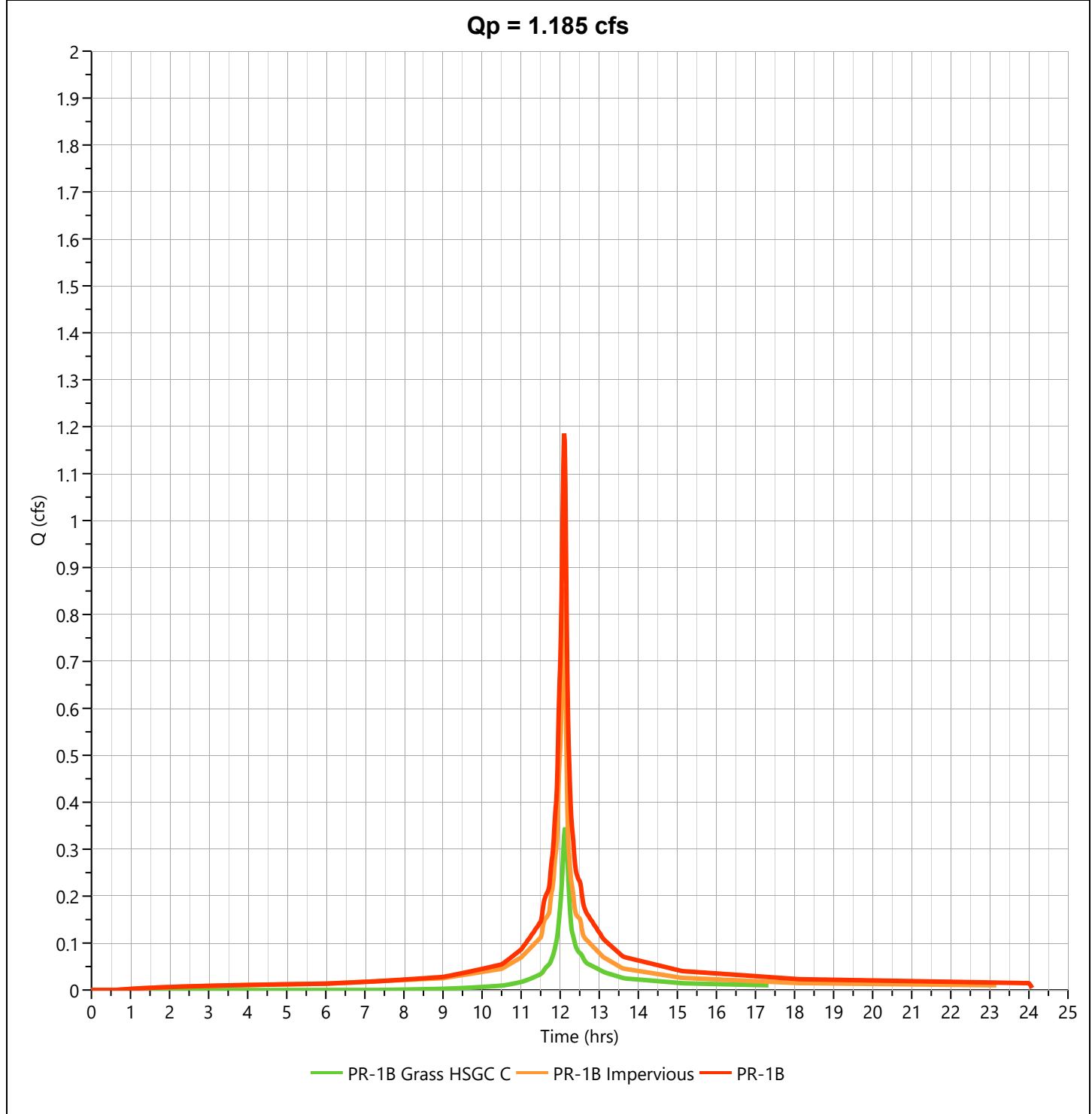
File: Future Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

## PR-1B

## Hyd. No. 6

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 1.185 cfs  |
| Storm Frequency    | = 10-yr    | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 4,045 cuft |
| Inflow Hydrographs | = 4, 5     | Total Contrib. Area | = 0.22 ac    |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

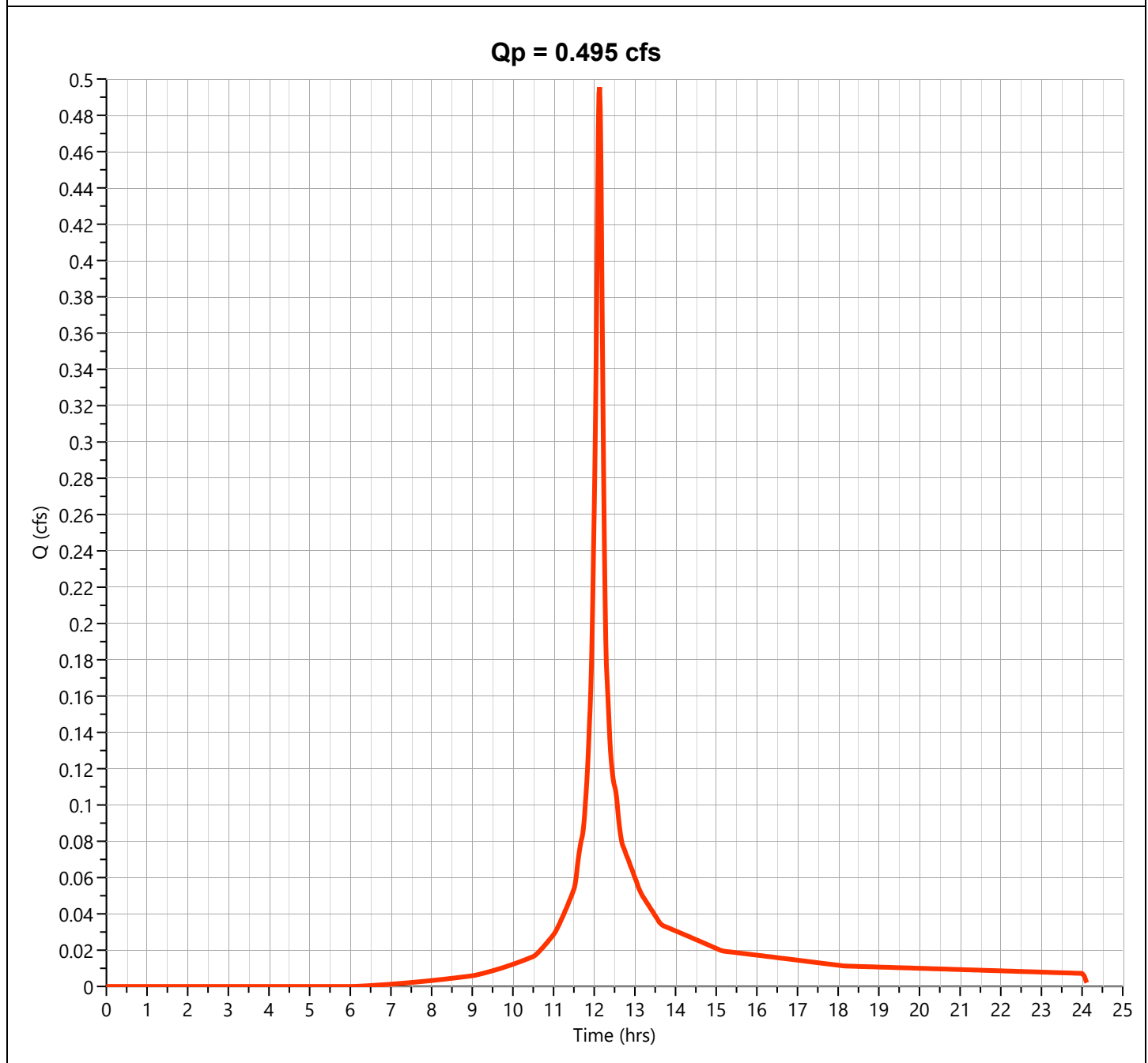
File: Future Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

## PR-1B Grass HSGC C

## Hyd. No. 4

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.495 cfs  |
| Storm Frequency | = 25-yr       | Time to Peak       | = 12.13 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 1,635 cuft |
| Drainage Area   | = 0.09 ac     | Curve Number       | = 74.00      |
| Tc Method       | = User        | Time of Conc. (Tc) | = 8.0 min    |
| Total Rainfall  | = 8.23 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

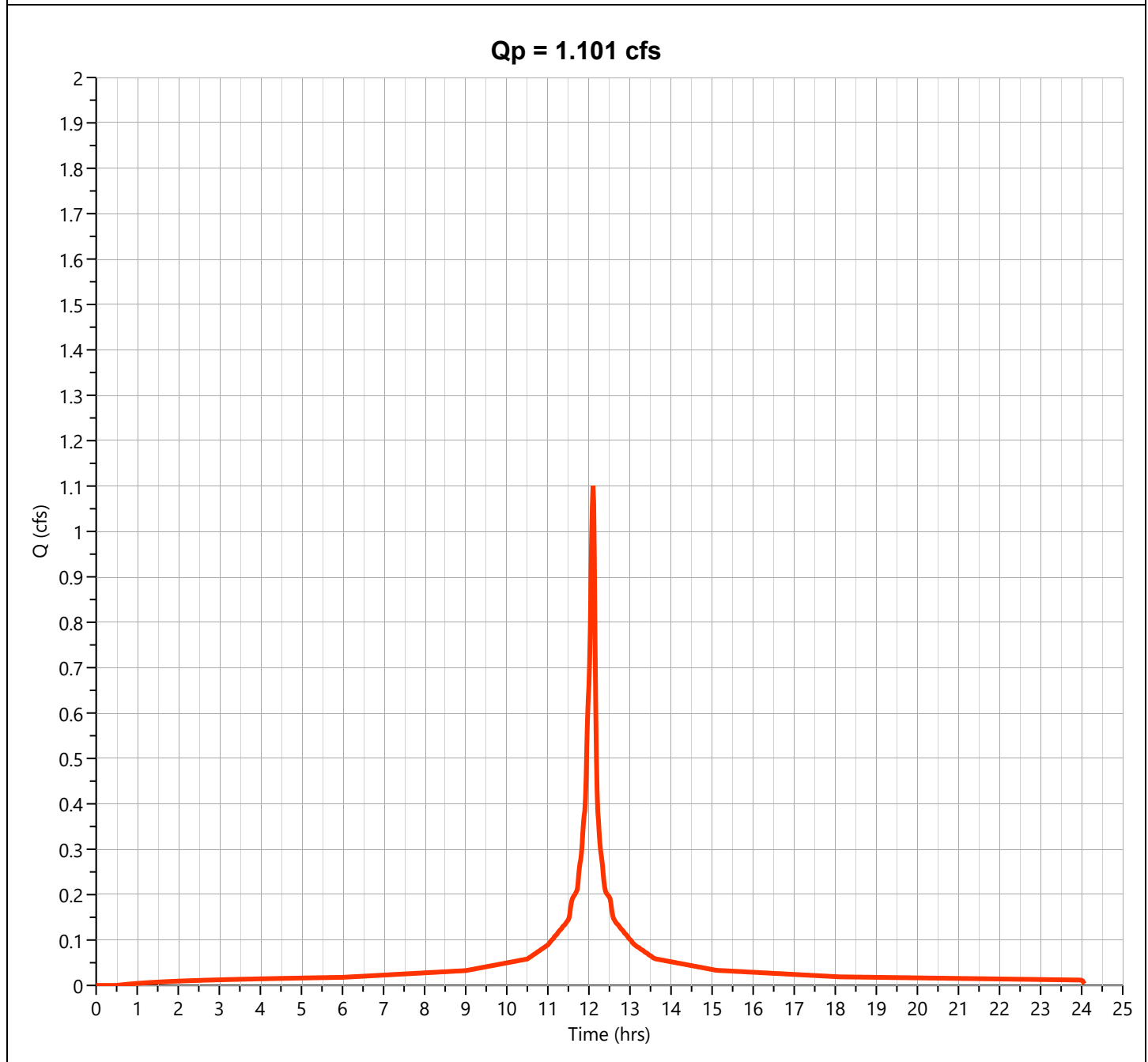
File: Future Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

## PR-1B Impervious

## Hyd. No. 5

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 1.101 cfs  |
| Storm Frequency | = 25-yr       | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 3,771 cuft |
| Drainage Area   | = 0.13 ac     | Curve Number       | = 98.00      |
| Tc Method       | = User        | Time of Conc. (Tc) | = 4.0 min    |
| Total Rainfall  | = 8.23 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

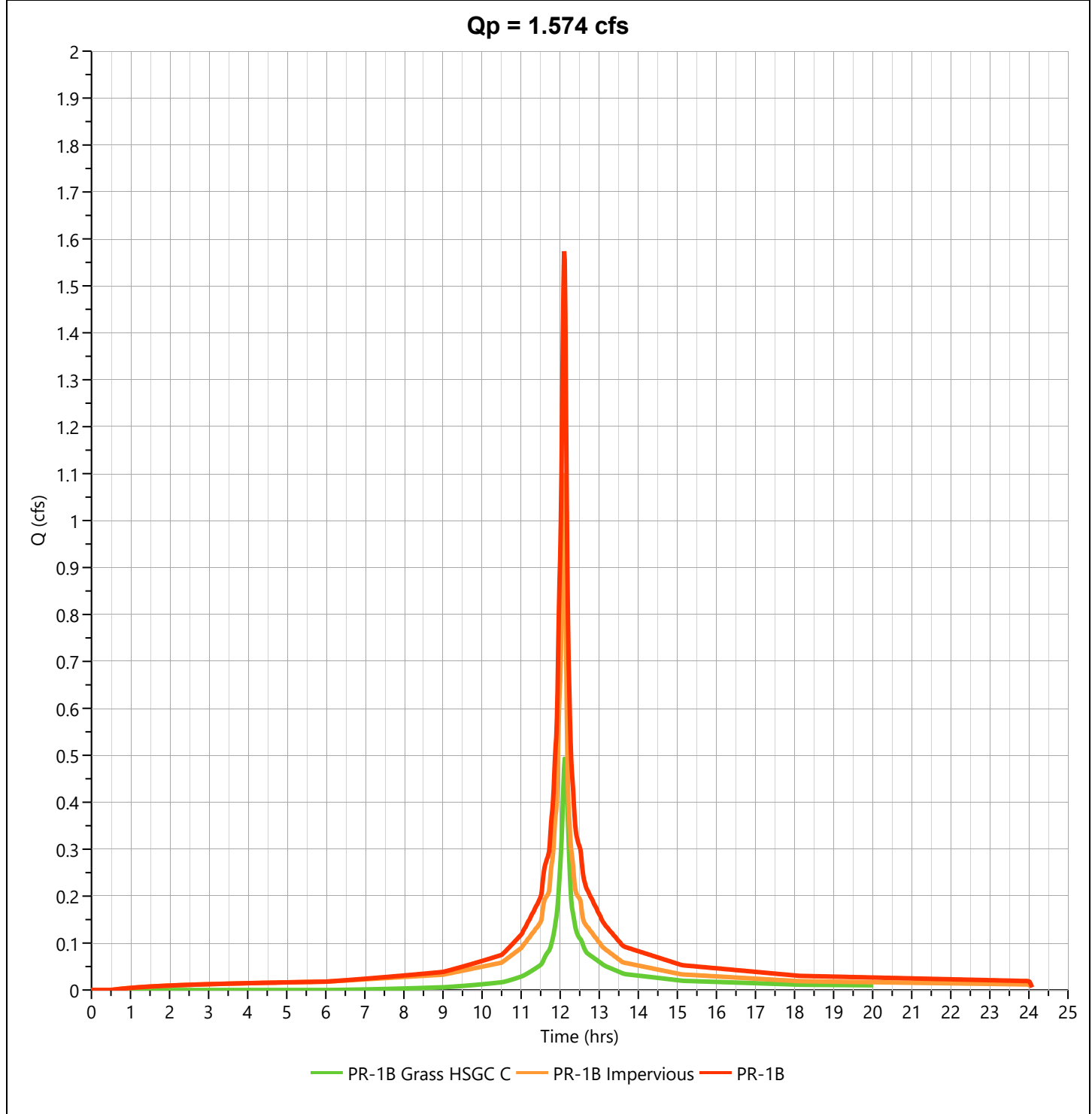
File: Future Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

## PR-1B

## Hyd. No. 6

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 1.574 cfs  |
| Storm Frequency    | = 25-yr    | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 5,405 cuft |
| Inflow Hydrographs | = 4, 5     | Total Contrib. Area | = 0.22 ac    |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

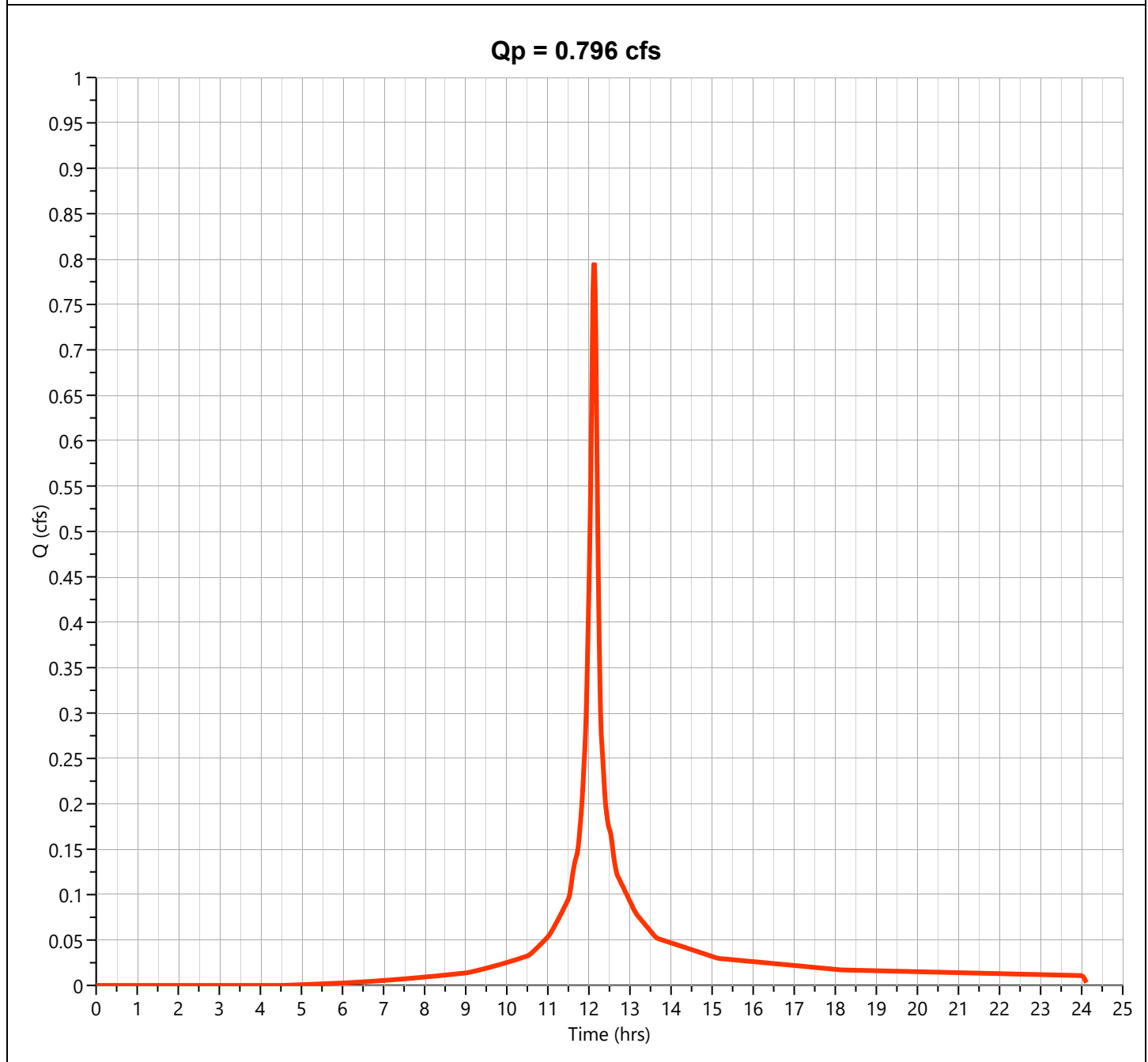
File: Future Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

## PR-1B Grass HSGC C

Hyd. No. 4

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.796 cfs  |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.13 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 2,685 cuft |
| Drainage Area   | = 0.09 ac     | Curve Number       | = 74.00      |
| Tc Method       | = User        | Time of Conc. (Tc) | = 8.0 min    |
| Total Rainfall  | = 11.80 in    | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

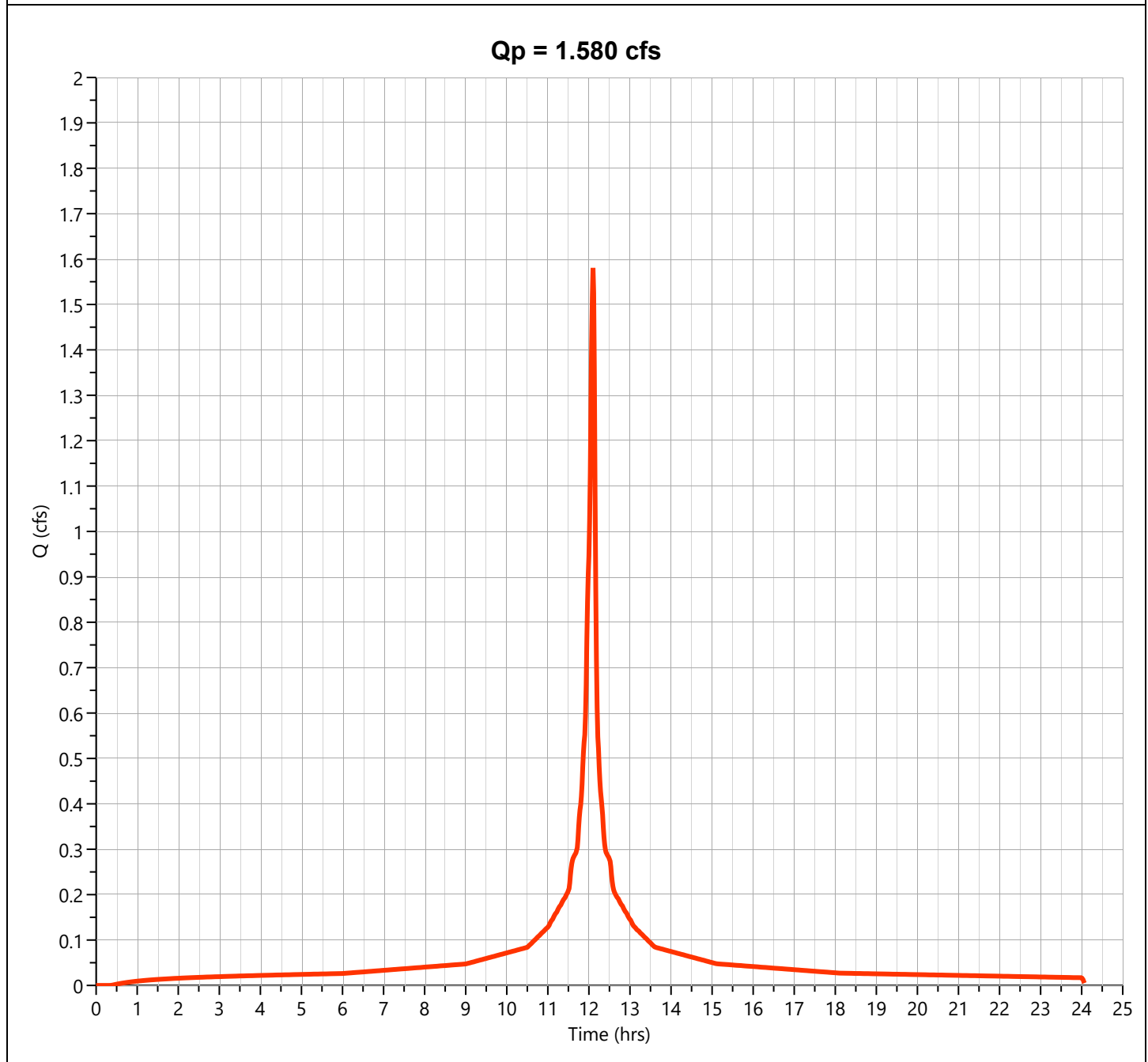
File: Future Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

## PR-1B Impervious

## Hyd. No. 5

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 1.580 cfs  |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 5,455 cuft |
| Drainage Area   | = 0.13 ac     | Curve Number       | = 98.00      |
| Tc Method       | = User        | Time of Conc. (Tc) | = 4.0 min    |
| Total Rainfall  | = 11.80 in    | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

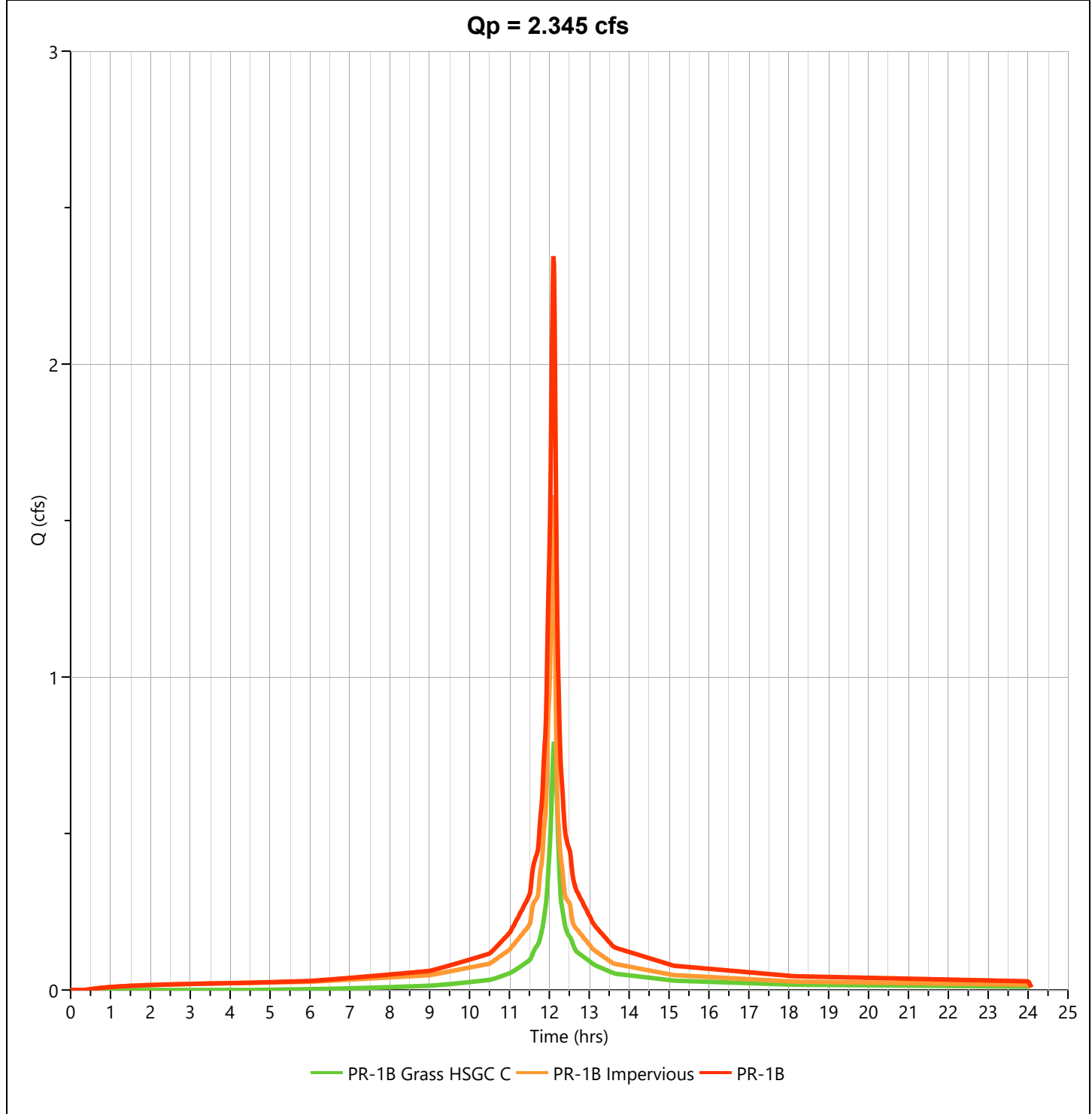
File: Future Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

## PR-1B

## Hyd. No. 6

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 2.345 cfs  |
| Storm Frequency    | = 100-yr   | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 8,139 cuft |
| Inflow Hydrographs | = 4, 5     | Total Contrib. Area | = 0.22 ac    |



## **PR-1C WATERSHED**



Project: Beacon Unitarian Universalist Church

By: TEG

Date: 11/29/2023

Location: Summit, NJ

Checked By: MJV

Date Checked: 11/29/2023

Circle One: Present Developed

Future Proposed Watershed PR-1C - Impervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Design Flow Length, L<sub>des</sub> (Total L<sub>des</sub> < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. McCuen-Spiess Limit, L<sub>mcs</sub> (max. 100 ft)
7. Compute T<sub>t</sub>

$$T_t = \frac{0.007 (nL_{des})^{0.8}}{P_2^{0.5} s^{0.4}}$$

$$L_{mcs} = (100 s^{0.5})/n$$

| Segment ID | 1                      | 2                    |   |
|------------|------------------------|----------------------|---|
|            | <b>Smooth Surfaces</b> | <b>Dense Grasses</b> |   |
|            | <b>0.011</b>           | <b>0.24</b>          |   |
| ft         | <b>39</b>              | <b>17</b>            |   |
| in         | <b>4.12</b>            | <b>4.12</b>          |   |
| ft/ft      | <b>0.021</b>           | <b>0.062</b>         |   |
| ft         | <b>100</b>             | <b>100</b>           |   |
| hr         | <b>0.008</b>           | <b>0.032</b>         | + |

Sheet Flow Sub-Total **0.041 hours**

**Shallow Concentrated Flow**

8. Surface Description
9. Flow Length, L
10. Watercourse Slope, s
11. Average Velocity, V (NEH table 15-3)
12. Compute T<sub>t</sub>

$$T_t = \frac{L}{3600 V}$$

| Segment ID |  |  |   |
|------------|--|--|---|
|            |  |  |   |
| ft         |  |  |   |
| ft/ft      |  |  |   |
| ft/s       |  |  |   |
| hr         |  |  | + |

Shallow Conc. Flow Sub-Total **0.000 hours**

**Channel Flow**

13. Flow Length, L
14. Cross Sectional flow area, a
15. Wetted Perimeter, P<sub>w</sub>
16. Hydraulic Radius, r
17. Channel Slope, s
18. Manning's Roughness Coeff., n
19. Velocity, V
20. Compute T<sub>t</sub>

$$r = a / P_w$$

$$V = (1.49 r^{2/3} s^{1/2}) / n$$

$$T_t = \frac{L}{3600 V}$$

| Segment ID      |  |  |   |
|-----------------|--|--|---|
|                 |  |  |   |
| ft              |  |  |   |
| ft <sup>2</sup> |  |  |   |
| ft              |  |  |   |
| ft              |  |  |   |
| ft/ft           |  |  |   |
|                 |  |  |   |
| ft/s            |  |  |   |
| hr              |  |  | + |

Channel Flow Sub-Total **0.000 hours**

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>

(Add Sub-Total T<sub>t</sub> from prior steps)

|                                  |                    |
|----------------------------------|--------------------|
| Total T <sub>c</sub> (hours) =   | <b>0.041 hours</b> |
| Total T <sub>c</sub> (minutes) = | <b>2 minutes</b>   |

Project: Beacon Unitarian Universalist Church

By: TEG

Date: 11/29/2023

Location: Summit, NJ

Checked By: MJV

Date Checked: 11/29/2023

Circle One: Present Developed

Future Proposed Watershed PR-1C - Pervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Design Flow Length, L<sub>des</sub> (Total L<sub>des</sub> < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. McCuen-Spiess Limit, L<sub>mcs</sub> (max. 100 ft)
7. Compute T<sub>t</sub>

$$T_t = \frac{0.007 (n L_{des})^{0.8}}{P_2^{0.5} s^{0.4}}$$

$$L_{mcs} = (100 s^{0.5})/n$$

|            |               |   |  |
|------------|---------------|---|--|
| Segment ID | 1             |   |  |
|            | Dense Grasses |   |  |
|            | 0.24          |   |  |
| ft         | 27            |   |  |
| in         | 4.12          |   |  |
| ft/ft      | 0.047         |   |  |
| ft         | 91            |   |  |
| hr         | 0.053         | + |  |

Sheet Flow Sub-Total **0.053 hours**

**Shallow Concentrated Flow**

8. Surface Description
9. Flow Length, L
10. Watercourse Slope, s
11. Average Velocity, V (NEH table 15-3)
12. Compute T<sub>t</sub>

$$T_t = \frac{L}{3600 V}$$

|            |  |   |  |
|------------|--|---|--|
| Segment ID |  |   |  |
| ft         |  |   |  |
| ft/ft      |  |   |  |
| ft/s       |  |   |  |
| hr         |  | + |  |

Shallow Conc. Flow Sub-Total **0.000 hours**

**Channel Flow**

13. Flow Length, L
14. Cross Sectional flow area, a
15. Wetted Perimeter, P<sub>w</sub>
16. Hydraulic Radius, r
17. Channel Slope, s
18. Manning's Roughness Coeff., n
19. Velocity, V
20. Compute T<sub>t</sub>

$$r = a / P_w$$

$$V = (1.49 r^{2/3} s^{1/2}) / n$$

$$T_t = \frac{L}{3600 V}$$

|                 |  |   |  |
|-----------------|--|---|--|
| Segment ID      |  |   |  |
| ft              |  |   |  |
| ft <sup>2</sup> |  |   |  |
| ft              |  |   |  |
| ft              |  |   |  |
| ft/ft           |  |   |  |
| ft/s            |  |   |  |
| hr              |  | + |  |

Channel Flow Sub-Total **0.000 hours**

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>

(Add Sub-Total T<sub>t</sub> from prior steps)

|                      |                    |
|----------------------|--------------------|
| Total Tc (hours) =   | <b>0.053 hours</b> |
| Total Tc (minutes) = | <b>3 minutes</b>   |

# Hydrograph Report

Project Name:

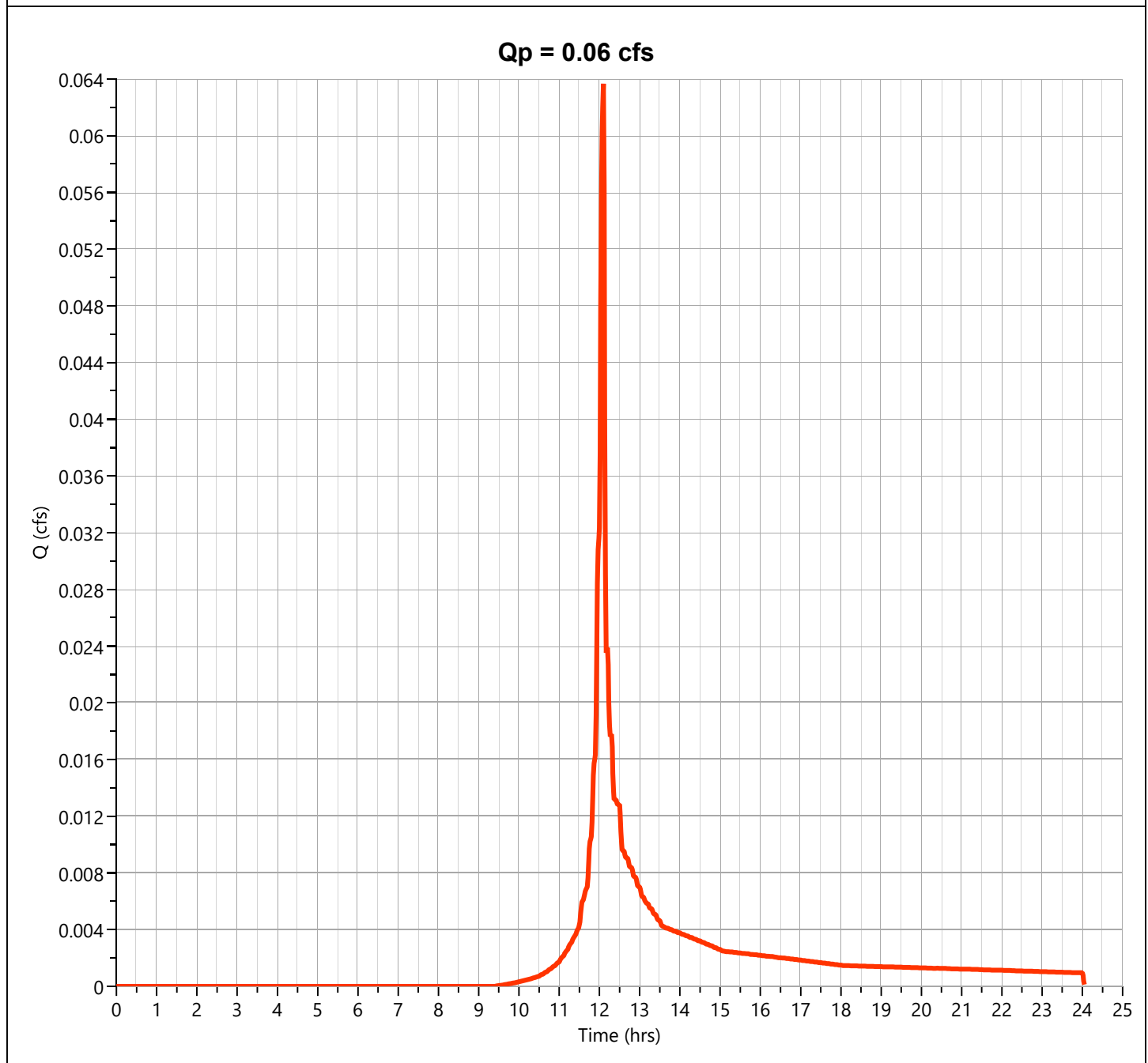
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-1C Grass HSGC C

## Hyd. No. 8

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.064 cfs |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.10 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 172 cuft  |
| Drainage Area   | = 0.03 ac     | Curve Number       | = 74        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 3.0 min   |
| Total Rainfall  | = 4.12 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

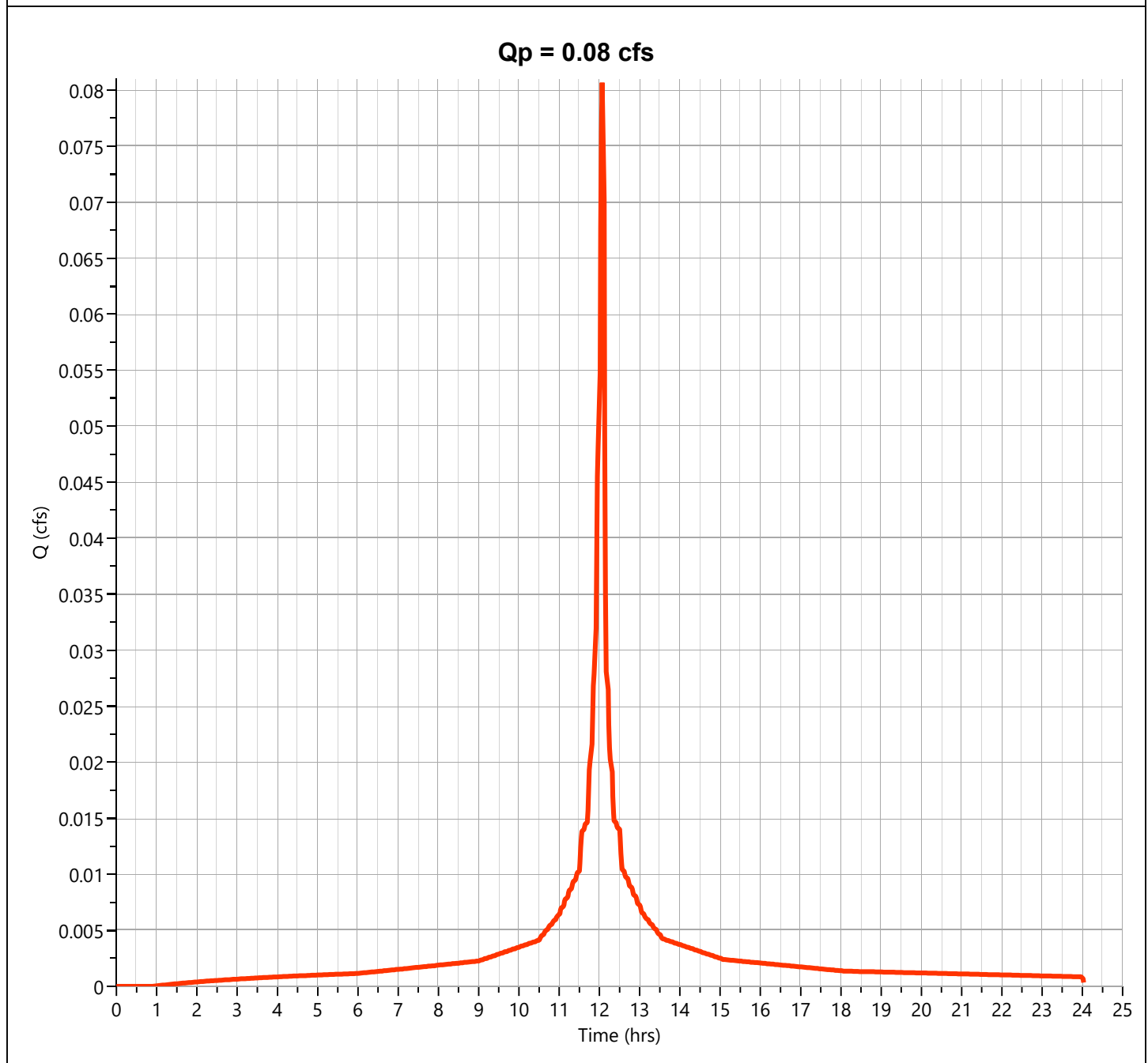
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-1C Impervious

## Hyd. No. 9

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.081 cfs |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.10 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 264 cuft  |
| Drainage Area   | = 0.02 ac     | Curve Number       | = 98        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 2.0 min   |
| Total Rainfall  | = 4.12 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

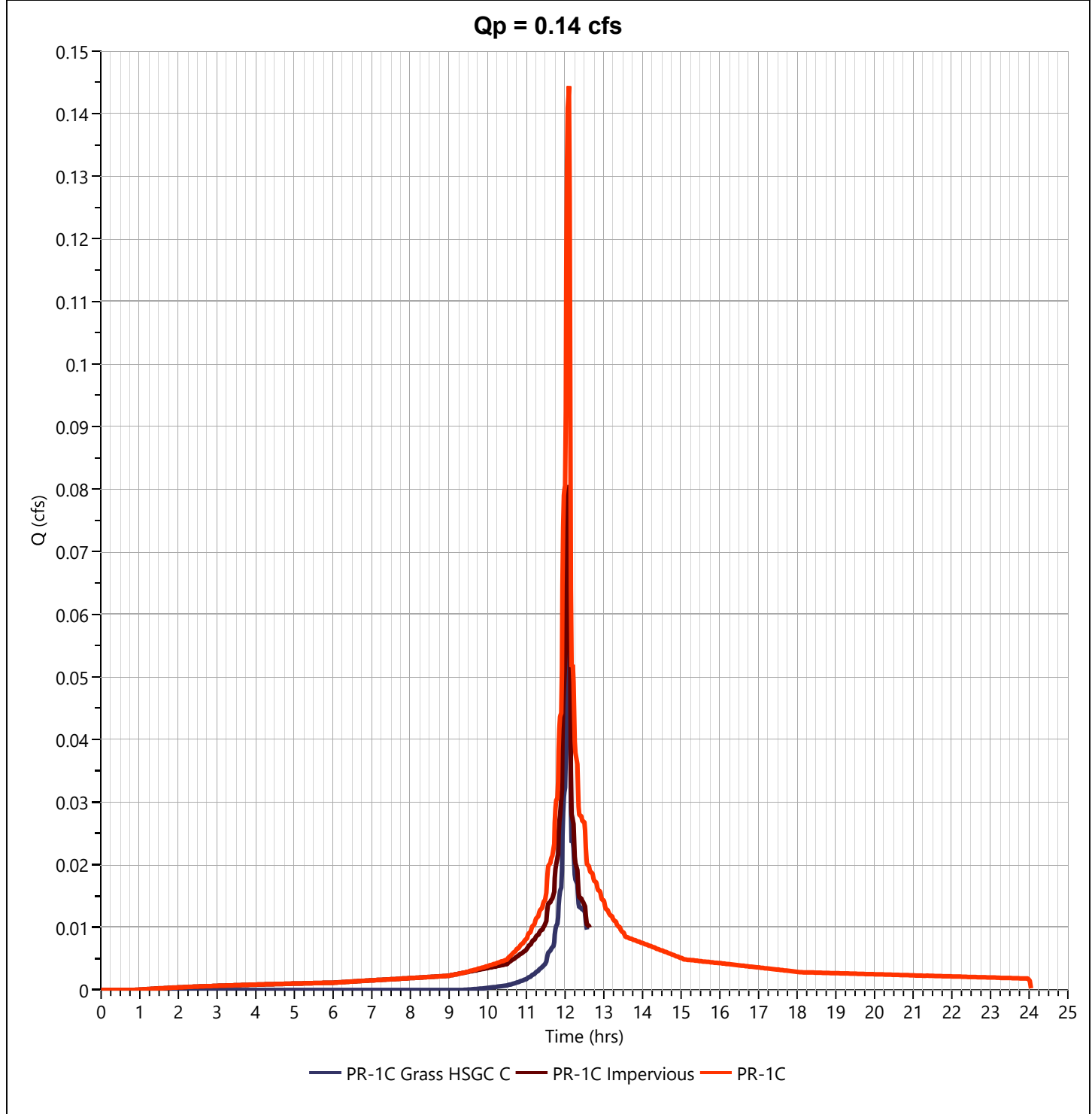
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-1C

## Hyd. No. 10

|                    |            |                     |             |
|--------------------|------------|---------------------|-------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.144 cfs |
| Storm Frequency    | = 2-yr     | Time to Peak        | = 12.10 hrs |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 436 cuft  |
| Inflow Hydrographs | = 8, 9     | Total Contrib. Area | = 0.05 ac   |



# Hydrograph Report

Project Name:

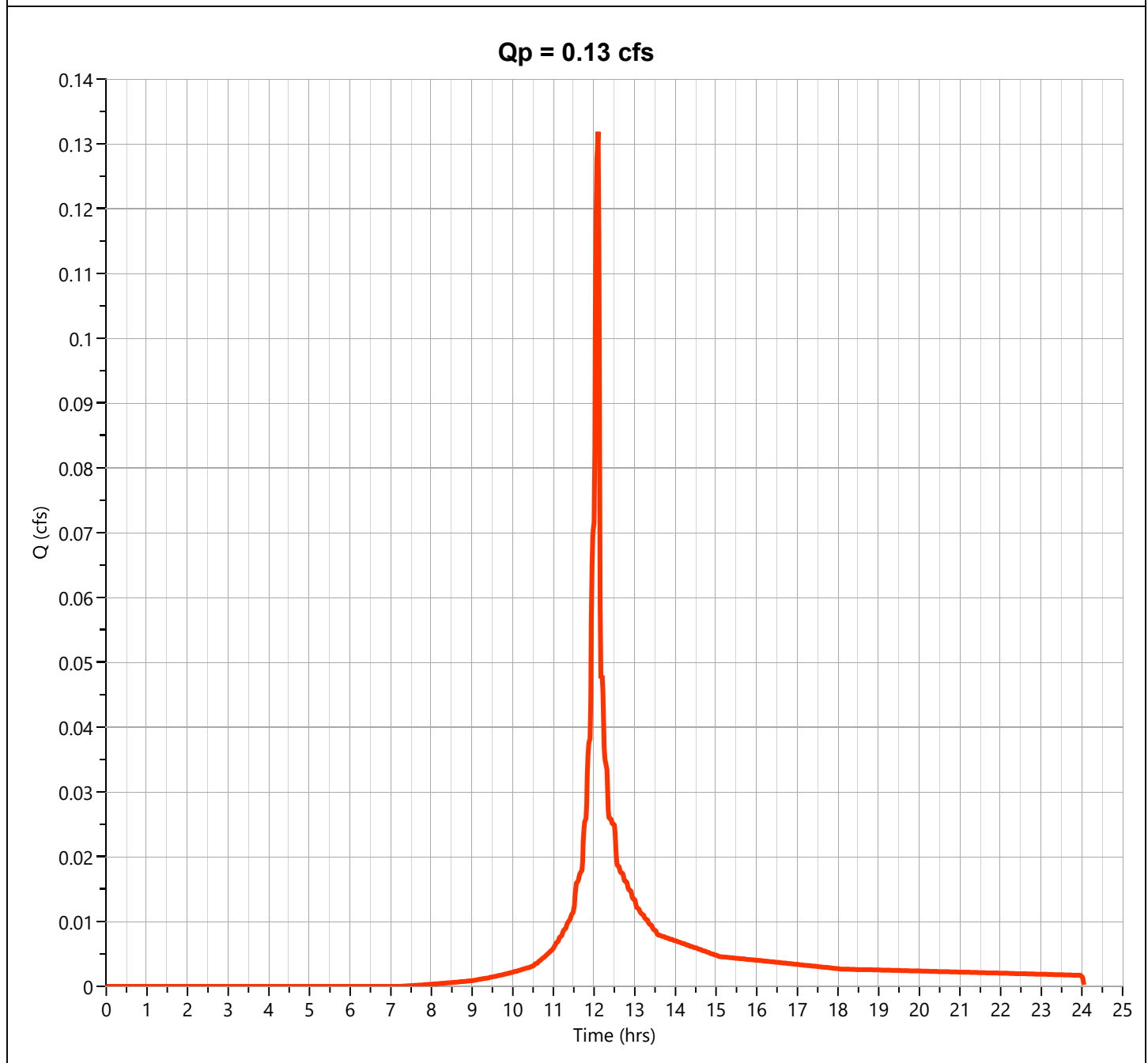
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-1C Grass HSGC C

## Hyd. No. 8

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.132 cfs |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.10 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 362 cuft  |
| Drainage Area   | = 0.03 ac     | Curve Number       | = 74        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 3.0 min   |
| Total Rainfall  | = 6.42 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

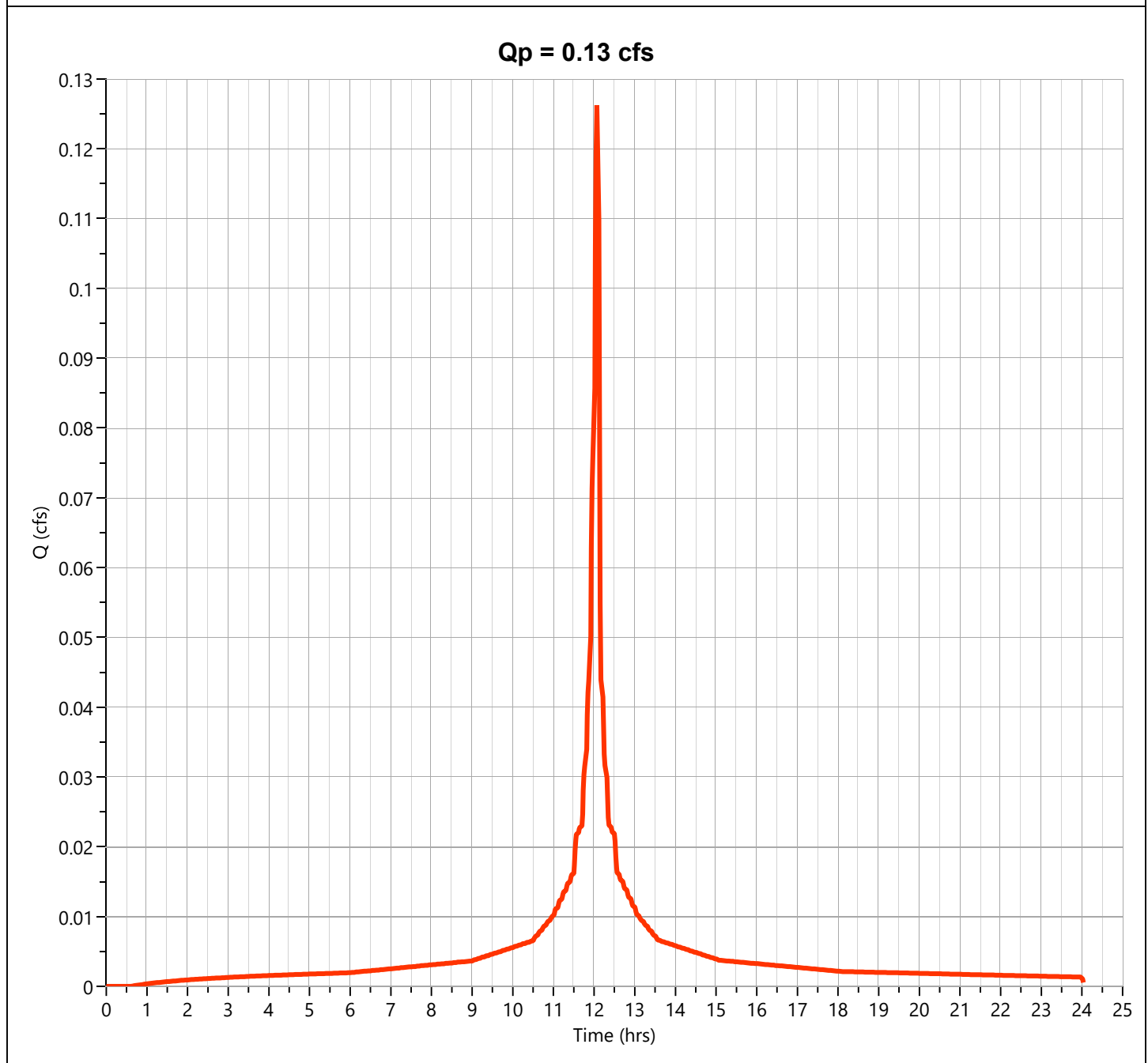
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-1C Impervious

## Hyd. No. 9

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.126 cfs |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.10 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 421 cuft  |
| Drainage Area   | = 0.02 ac     | Curve Number       | = 98        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 2.0 min   |
| Total Rainfall  | = 6.42 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

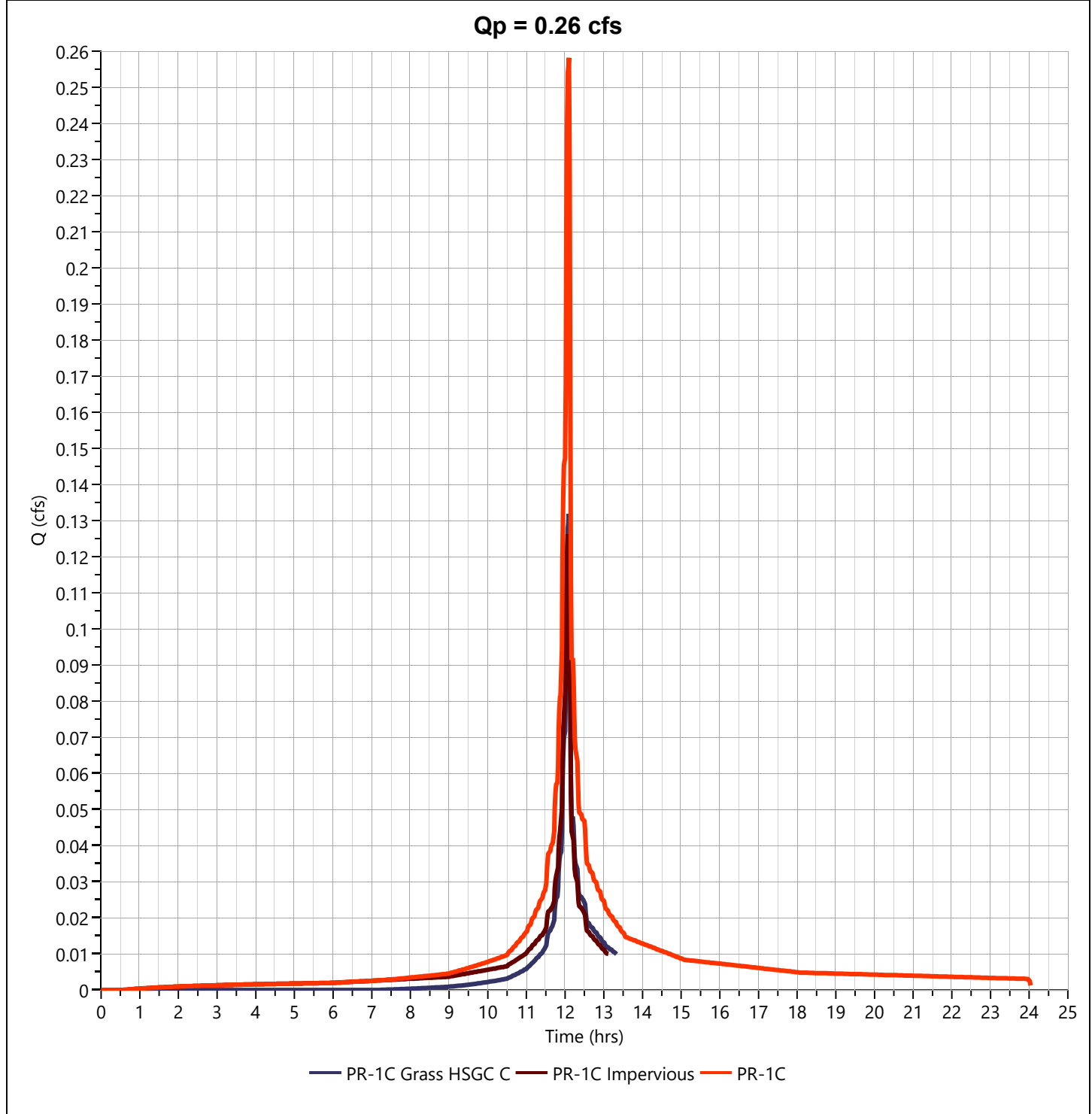
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-1C

## Hyd. No. 10

|                    |            |                     |             |
|--------------------|------------|---------------------|-------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.258 cfs |
| Storm Frequency    | = 10-yr    | Time to Peak        | = 12.10 hrs |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 782 cuft  |
| Inflow Hydrographs | = 8, 9     | Total Contrib. Area | = 0.05 ac   |





# Hydrograph Report

Project Name:

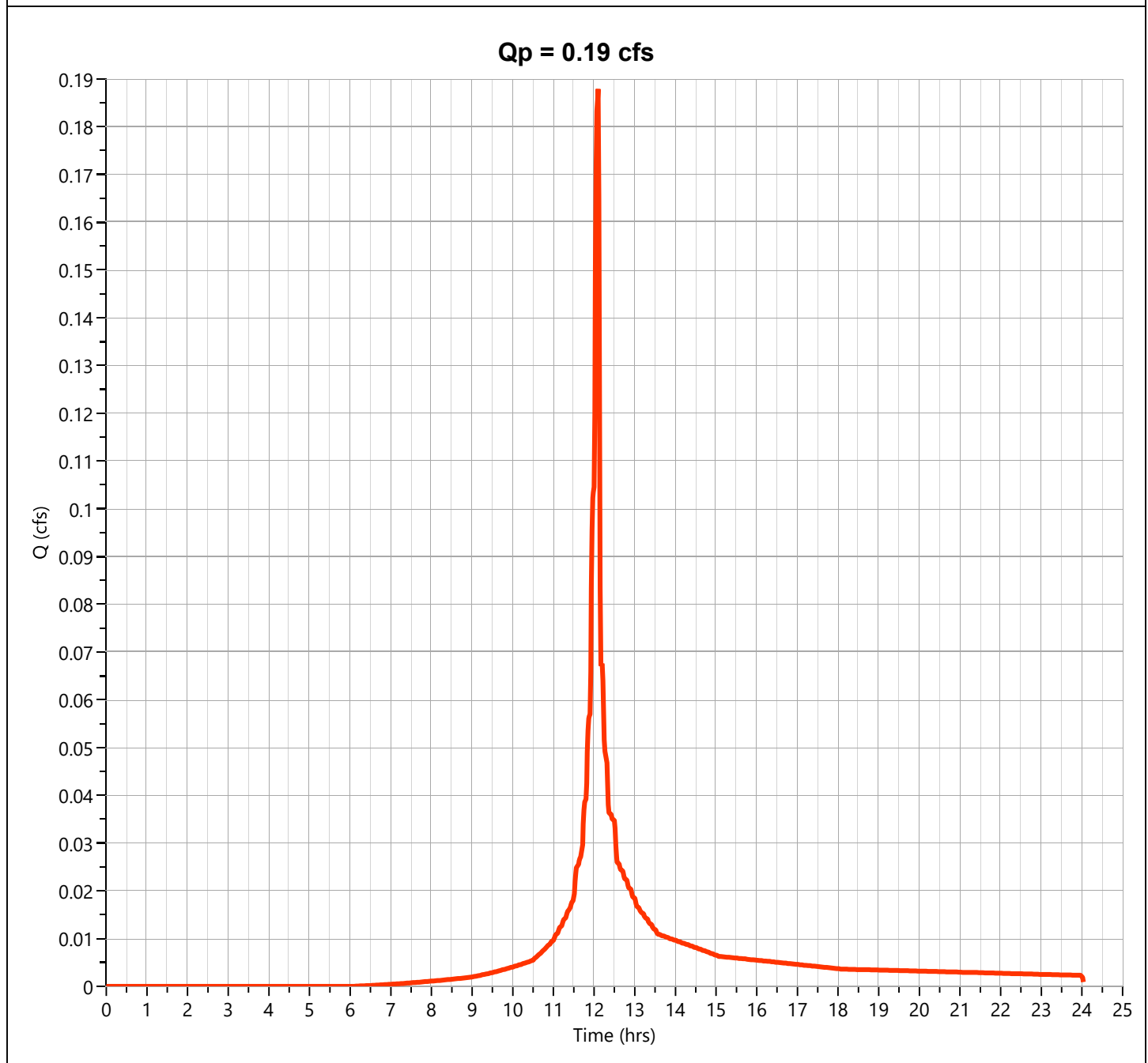
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-1C Grass HSGC C

## Hyd. No. 8

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.188 cfs |
| Storm Frequency | = 25-yr       | Time to Peak       | = 12.10 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 524 cuft  |
| Drainage Area   | = 0.03 ac     | Curve Number       | = 74        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 3.0 min   |
| Total Rainfall  | = 8.23 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

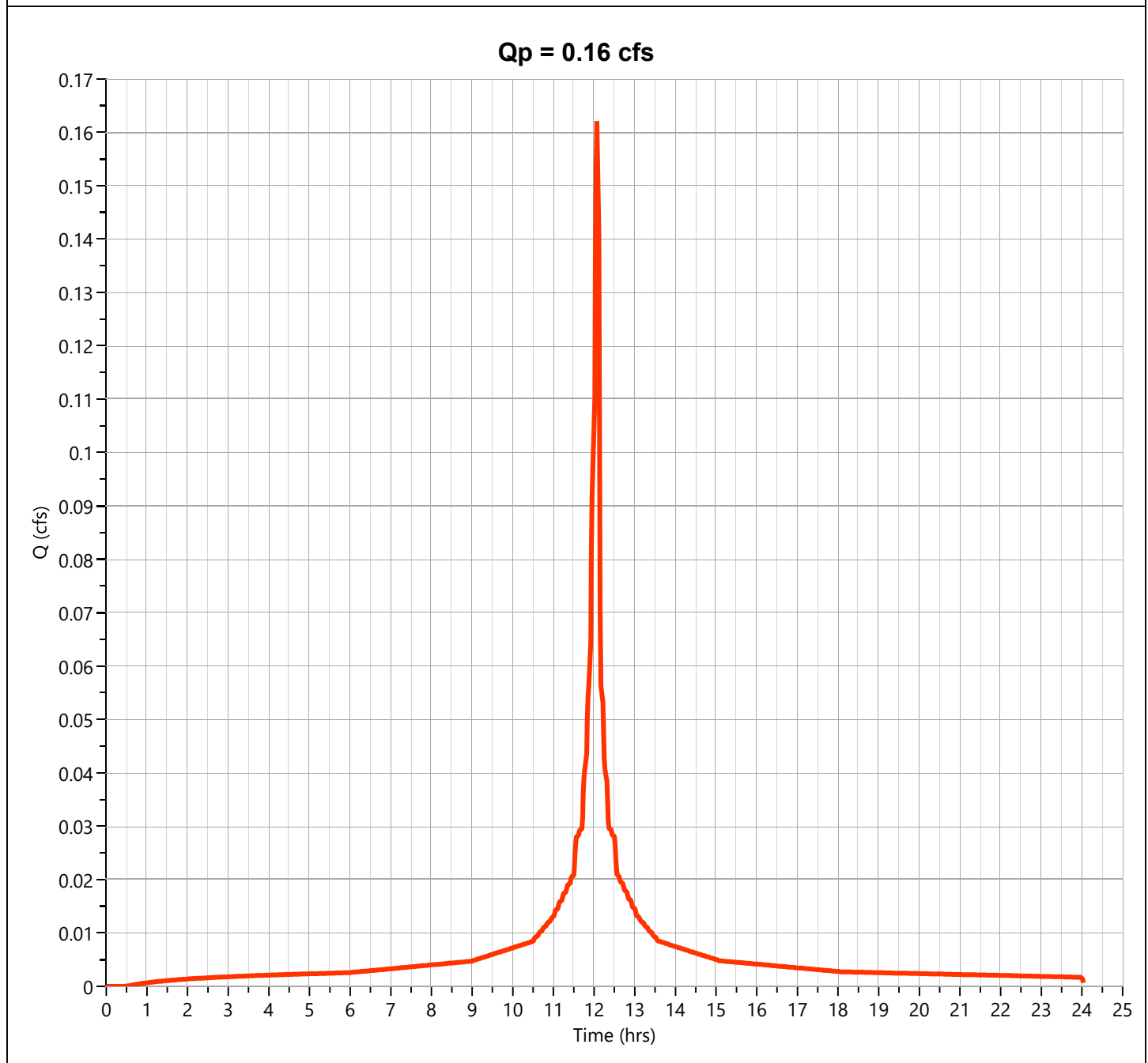
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-1C Impervious

## Hyd. No. 9

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.162 cfs |
| Storm Frequency | = 25-yr       | Time to Peak       | = 12.10 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 544 cuft  |
| Drainage Area   | = 0.02 ac     | Curve Number       | = 98        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 2.0 min   |
| Total Rainfall  | = 8.23 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

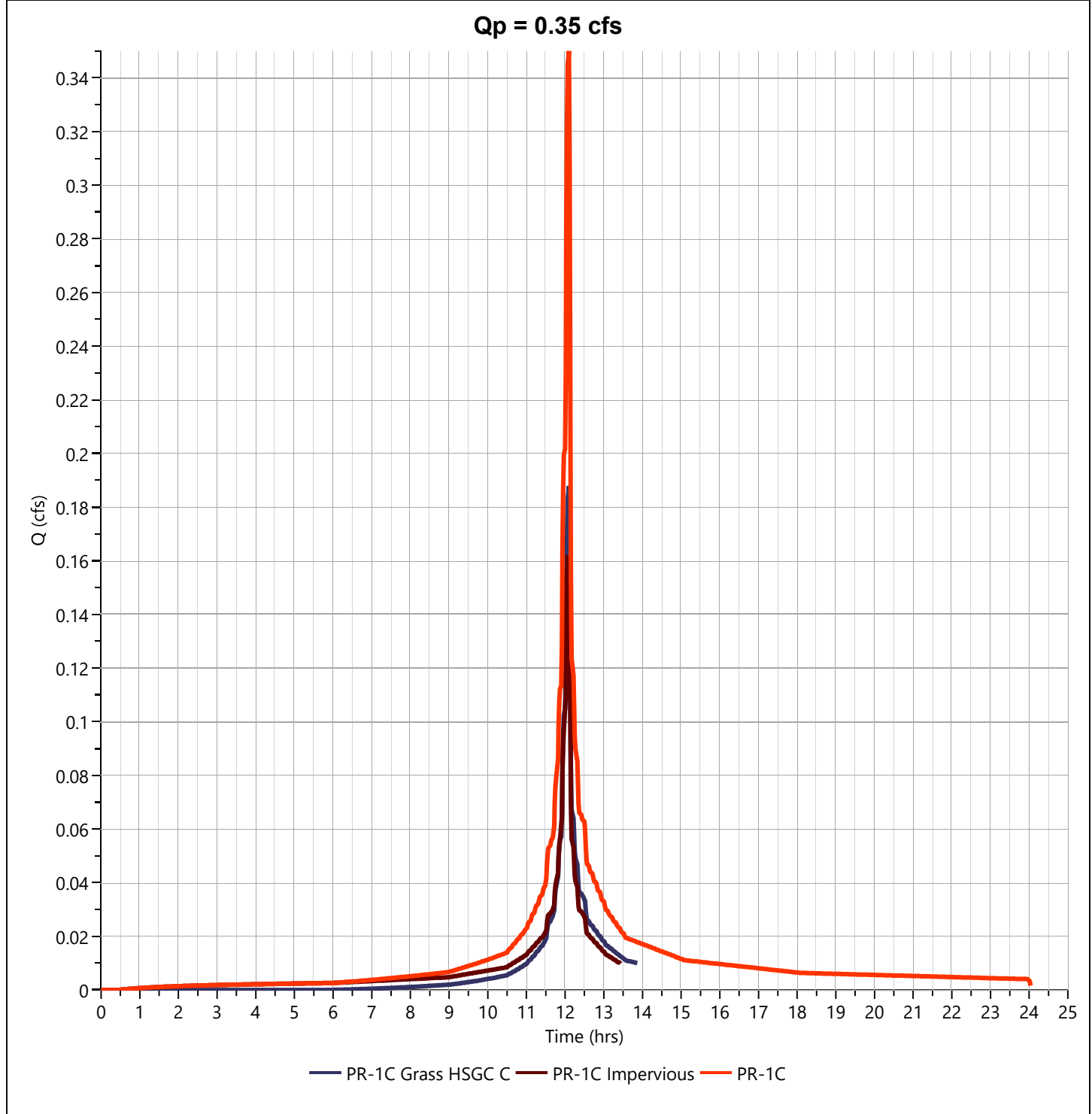
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-1C

## Hyd. No. 10

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.350 cfs  |
| Storm Frequency    | = 25-yr    | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 1,068 cuft |
| Inflow Hydrographs | = 8, 9     | Total Contrib. Area | = 0.05 ac    |



# Hydrograph Report

Project Name:

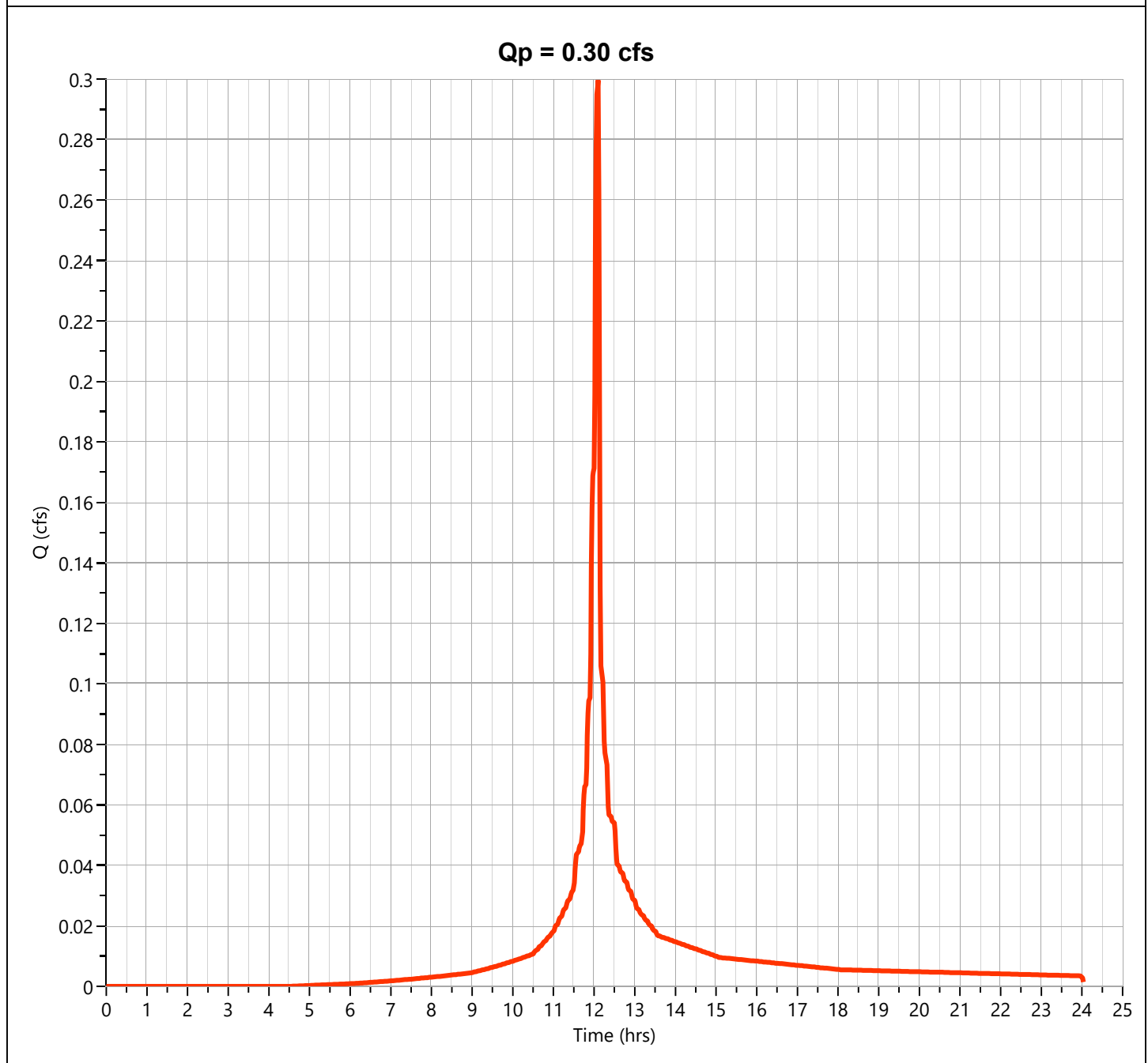
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-1C Grass HSGC C

## Hyd. No. 8

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.300 cfs |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.10 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 861 cuft  |
| Drainage Area   | = 0.03 ac     | Curve Number       | = 74        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 3.0 min   |
| Total Rainfall  | = 11.80 in    | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

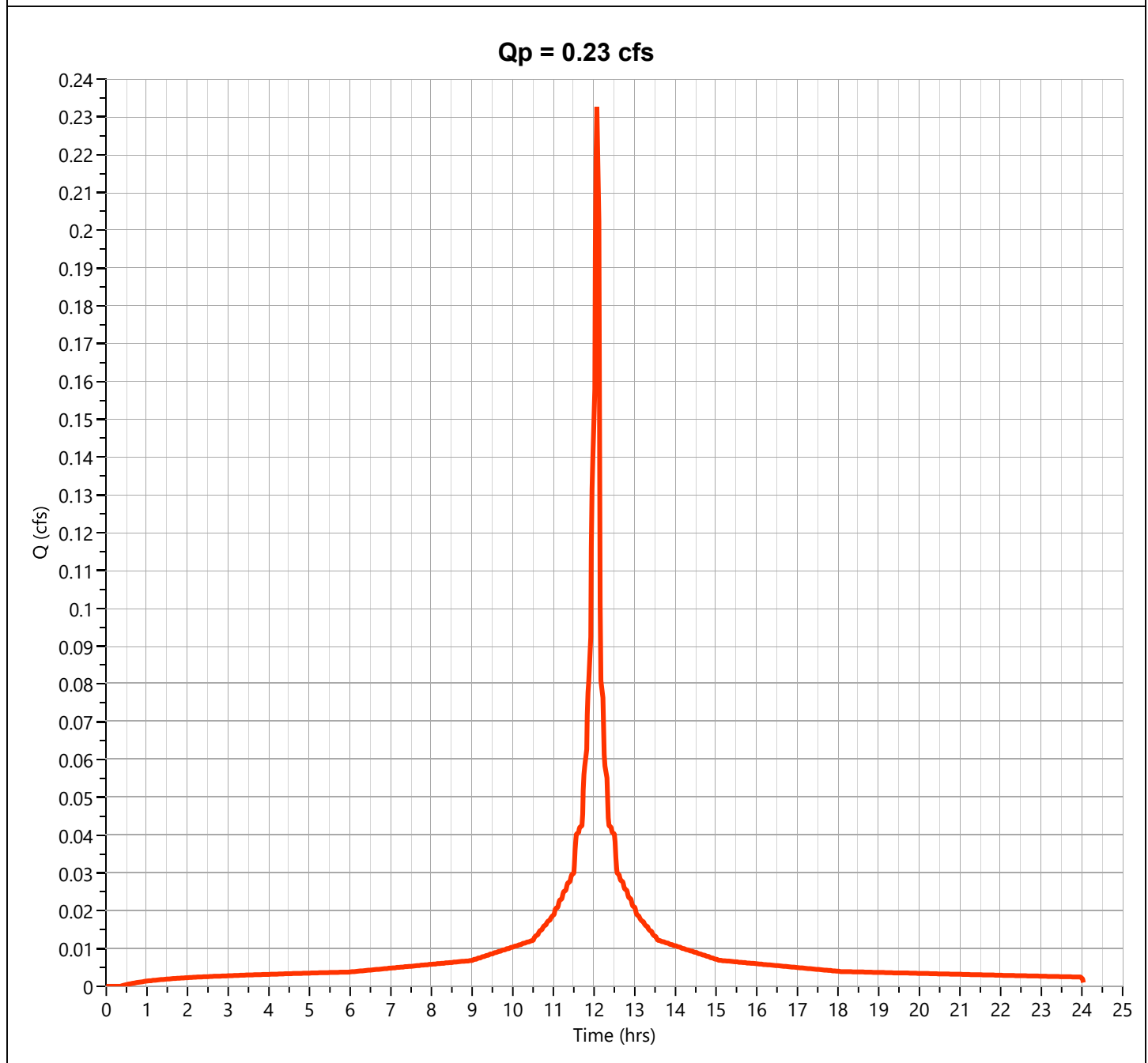
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-1C Impervious

## Hyd. No. 9

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.233 cfs |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.10 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 787 cuft  |
| Drainage Area   | = 0.02 ac     | Curve Number       | = 98        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 2.0 min   |
| Total Rainfall  | = 11.80 in    | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

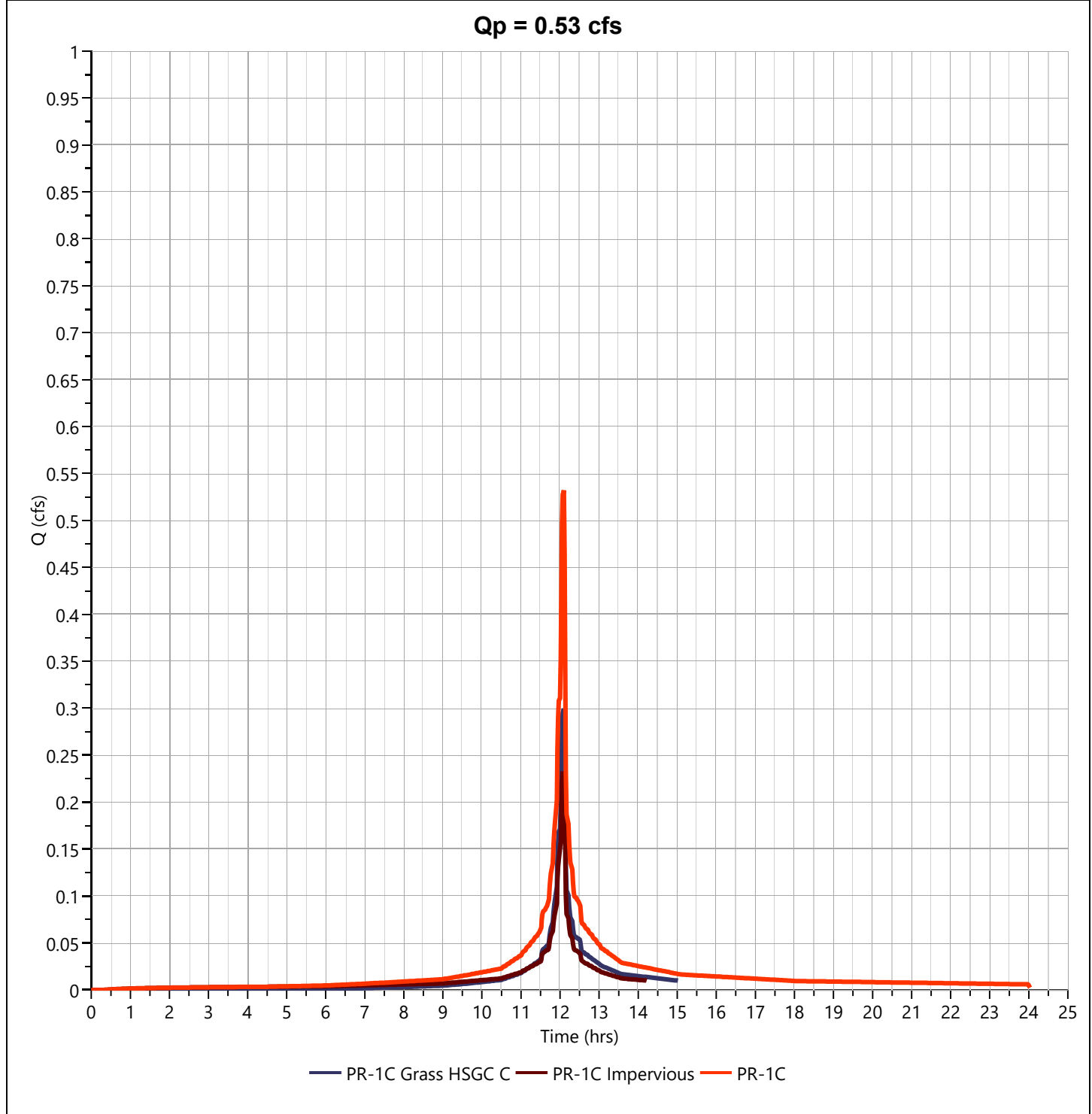
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-1C

## Hyd. No. 10

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.532 cfs  |
| Storm Frequency    | = 100-yr   | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 1,647 cuft |
| Inflow Hydrographs | = 8, 9     | Total Contrib. Area | = 0.05 ac    |



## **PR-1D WATERSHED**

Project: Beacon Unitarian Universalist Church

By: TEG

Date: 2/6/2024

Location: Summit, NJ

Checked By: MJV

Date Checked: 2/6/2024

Circle One: Present Developed

Future Proposed Watershed PR-1D - Impervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Design Flow Length, L<sub>des</sub> (Total L<sub>des</sub> < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. McCuen-Spiess Limit, L<sub>mcs</sub> (max. 100 ft)
7. Compute T<sub>t</sub>

$$T_t = \frac{0.007 (n L_{des})^{0.8}}{P_2^{0.5} s^{0.4}}$$

$$L_{mcs} = (100 s^{0.5})/n$$

|            |                        |   |  |
|------------|------------------------|---|--|
| Segment ID | <b>1</b>               |   |  |
|            | <b>Smooth Surfaces</b> |   |  |
|            | <b>0.011</b>           |   |  |
| ft         | <b>88</b>              |   |  |
| in         | <b>4.12</b>            |   |  |
| ft/ft      | <b>0.026</b>           |   |  |
| ft         | <b>100</b>             |   |  |
| hr         | <b>0.015</b>           | + |  |

Sheet Flow Sub-Total **0.015 hours**

**Shallow Concentrated Flow**

8. Surface Description
9. Flow Length, L
10. Watercourse Slope, s
11. Average Velocity, V (NEH table 15-3)
12. Compute T<sub>t</sub>

$$T_t = \frac{L}{3600 V}$$

|            |                 |   |  |
|------------|-----------------|---|--|
| Segment ID | <b>2</b>        |   |  |
|            | <b>Pavement</b> |   |  |
| ft         | <b>68</b>       |   |  |
| ft/ft      | <b>0.064</b>    |   |  |
| ft/s       | <b>5.15</b>     |   |  |
| hr         | <b>0.004</b>    | + |  |

Shallow Conc. Flow Sub-Total **0.004 hours**

**Channel Flow**

13. Flow Length, L
14. Cross Sectional flow area, a
15. Wetted Perimeter, P<sub>w</sub>
16. Hydraulic Radius, r
17. Channel Slope, s
18. Manning's Roughness Coeff., n
19. Velocity, V
20. Compute T<sub>t</sub>

$$r = a / P_w$$

$$V = (1.49 r^{2/3} s^{1/2}) / n$$

$$T_t = \frac{L}{3600 V}$$

|                 |              |   |  |
|-----------------|--------------|---|--|
| Segment ID      | <b>3</b>     |   |  |
| ft              | <b>22</b>    |   |  |
| ft <sup>2</sup> | <b>0.88</b>  |   |  |
| ft              | <b>2.40</b>  |   |  |
| ft              | <b>0.37</b>  |   |  |
| ft/ft           | <b>0.005</b> |   |  |
|                 | <b>0.012</b> |   |  |
| ft/s            | <b>4.50</b>  |   |  |
| hr              | <b>0.001</b> | + |  |

Channel Flow Sub-Total **0.001 hours**

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>

(Add Sub-Total T<sub>t</sub> from prior steps)

|   |                    |
|---|--------------------|
| Total T <sub>c</sub> (hours) =                        | <b>0.020 hours</b> |
| Software Limitations Require Minimum T <sub>c</sub> = | <b>2 minutes</b>   |



Project: Beacon Unitarian Universalist Church

By: TEG

Date: 2/6/2024

Location: Summit, NJ

Checked By: MJV

Date Checked: 2/6/2024

Circle One: Present Developed

Future Proposed Watershed PR-1D - Pervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Design Flow Length, L<sub>des</sub> (Total L<sub>des</sub> < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. McCuen-Spiess Limit, L<sub>mcs</sub> (max. 100 ft)
7. Compute T<sub>t</sub>

$$L_{mcs} = (100 s^{0.5})/n$$

$$T_t = \frac{0.007 (n L_{des})^{0.8}}{P_2^{0.5} s^{0.4}}$$

| Segment ID | 1                    | 2                      |   |
|------------|----------------------|------------------------|---|
|            | <b>Dense Grasses</b> | <b>Smooth Surfaces</b> |   |
|            | <b>0.24</b>          | <b>0.011</b>           |   |
| ft         | <b>33</b>            | <b>55</b>              |   |
| in         | <b>4.12</b>          | <b>4.12</b>            |   |
| ft/ft      | <b>0.032</b>         | <b>0.043</b>           |   |
| ft         | <b>74</b>            | <b>100</b>             |   |
| hr         | <b>0.073</b>         | <b>0.008</b>           | + |

Sheet Flow Sub-Total **0.081 hours**

**Shallow Concentrated Flow**

8. Surface Description
9. Flow Length, L
10. Watercourse Slope, s
11. Average Velocity, V (NEH table 15-3)
12. Compute T<sub>t</sub>

$$T_t = \frac{L}{3600 V}$$

| Segment ID | 3               | 4               | 5               |
|------------|-----------------|-----------------|-----------------|
|            | <b>Pavement</b> | <b>Pavement</b> | <b>Pavement</b> |
| ft         | <b>17</b>       | <b>30</b>       | <b>10</b>       |
| ft/ft      | <b>0.058</b>    | <b>0.083</b>    | <b>0.040</b>    |
| ft/s       | <b>4.91</b>     | <b>5.87</b>     | <b>4.07</b>     |
| hr         | <b>0.001</b>    | <b>0.001</b>    | <b>0.001</b>    |

Shallow Conc. Flow Sub-Total **0.003 hours**

**Channel Flow**

13. Flow Length, L
14. Cross Sectional flow area, a
15. Wetted Perimeter, P<sub>w</sub>
16. Hydraulic Radius, r
17. Channel Slope, s
18. Manning's Roughness Coeff., n
19. Velocity, V
20. Compute T<sub>t</sub>

$$r = a / P_w$$

$$V = (1.49 r^{2/3} s^{1/2}) / n$$

$$T_t = \frac{L}{3600 V}$$

| Segment ID      | 6            |   |   |
|-----------------|--------------|---|---|
| ft              | <b>22</b>    |   |   |
| ft <sup>2</sup> | <b>0.88</b>  |   |   |
| ft              | <b>2.40</b>  |   |   |
| ft              | <b>0.37</b>  |   |   |
| ft/ft           | <b>0.005</b> |   |   |
|                 | <b>0.012</b> |   |   |
| ft/s            | <b>4.50</b>  |   |   |
| hr              | <b>0.001</b> | + | + |

Channel Flow Sub-Total **0.001 hours**

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>

(Add Sub-Total T<sub>t</sub> from prior steps)

|                                  |                    |
|----------------------------------|--------------------|
| Total T <sub>c</sub> (hours) =   | <b>0.085 hours</b> |
| Total T <sub>c</sub> (minutes) = | <b>5 minutes</b>   |

# Hydrograph Report

Project Name:

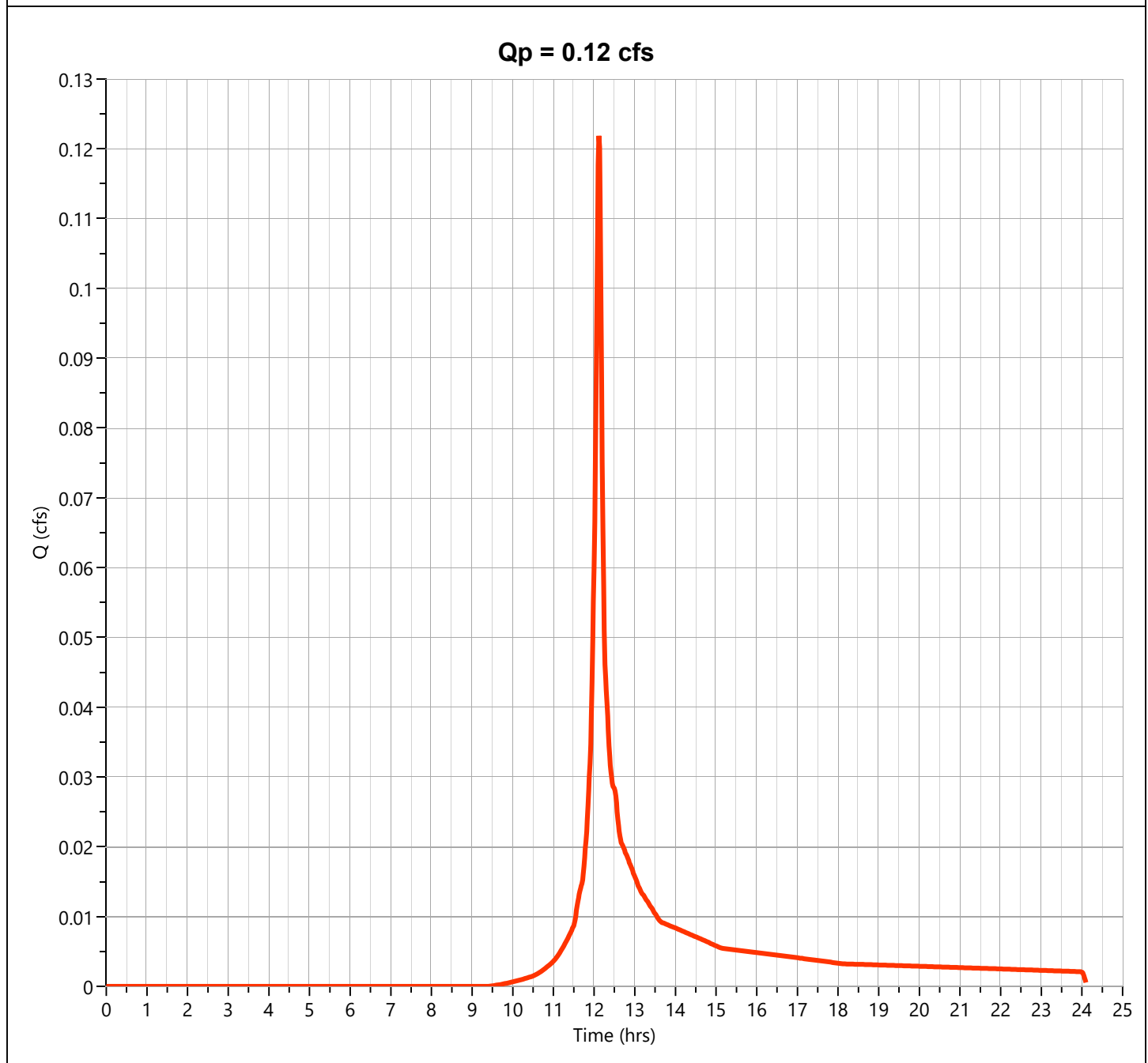
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-1D Grass HSGC C

## Hyd. No. 14

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.122 cfs |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.12 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 378 cuft  |
| Drainage Area   | = 0.06 ac     | Curve Number       | = 74        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 5.0 min   |
| Total Rainfall  | = 4.12 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

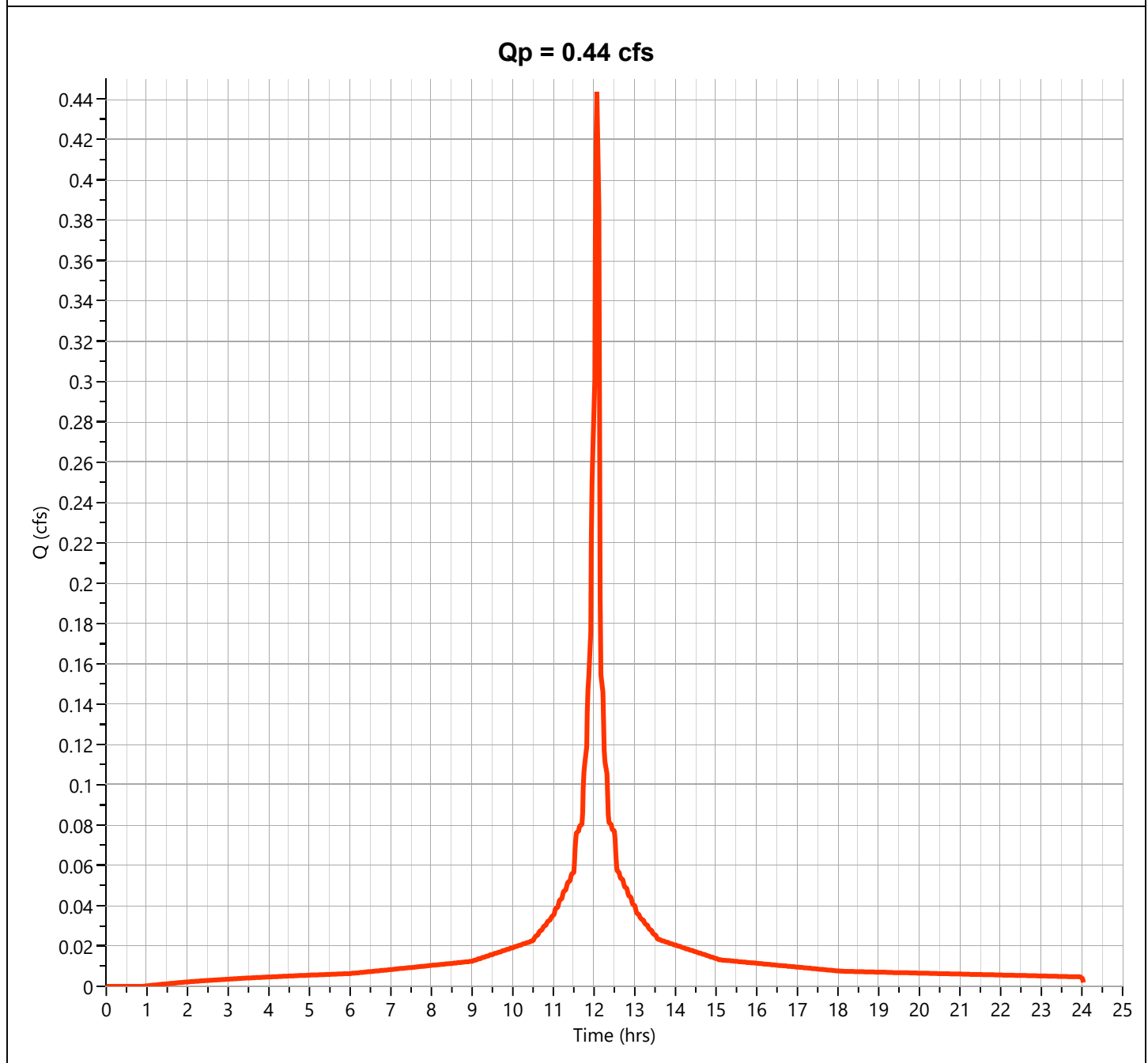
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-1D Impervious

## Hyd. No. 15

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.444 cfs  |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 1,454 cuft |
| Drainage Area   | = 0.11 ac     | Curve Number       | = 98         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 2.0 min    |
| Total Rainfall  | = 4.12 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

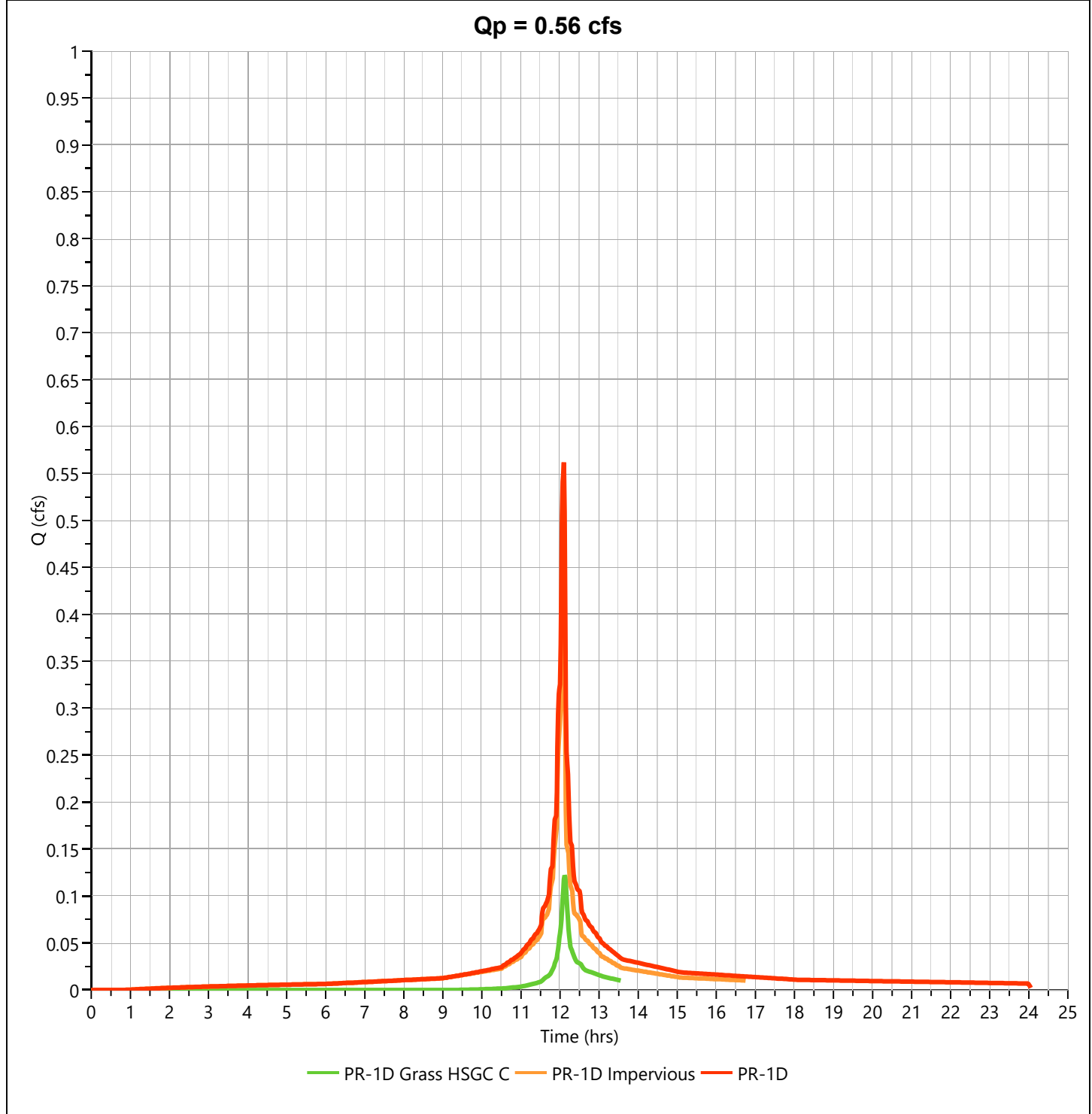
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-1D

## Hyd. No. 16

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.562 cfs  |
| Storm Frequency    | = 2-yr     | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 1,833 cuft |
| Inflow Hydrographs | = 14, 15   | Total Contrib. Area | = 0.17 ac    |



# Hydrograph Report

Project Name:

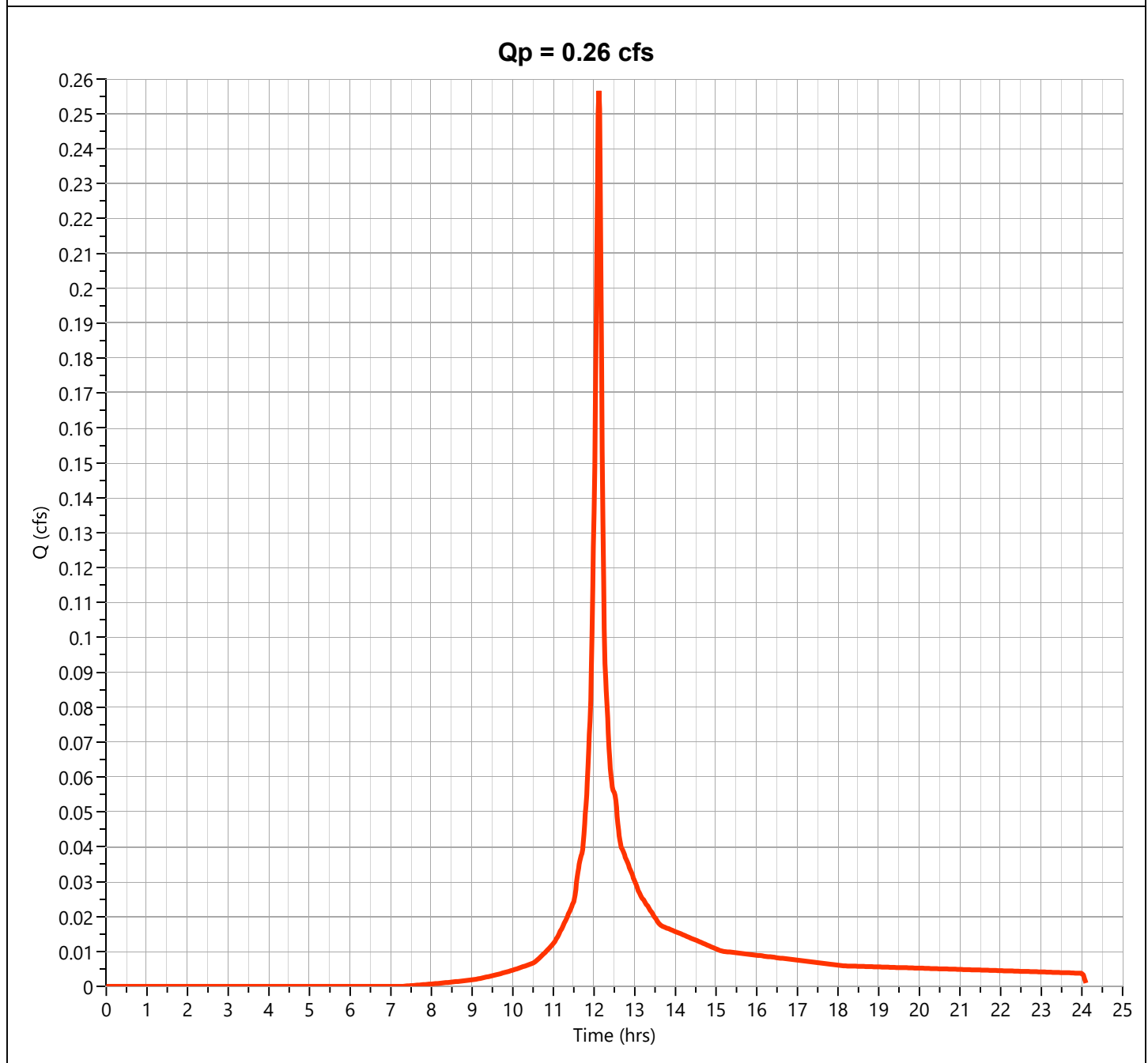
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-1D Grass HSGC C

## Hyd. No. 14

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.257 cfs |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.12 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 795 cuft  |
| Drainage Area   | = 0.06 ac     | Curve Number       | = 74        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 5.0 min   |
| Total Rainfall  | = 6.42 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

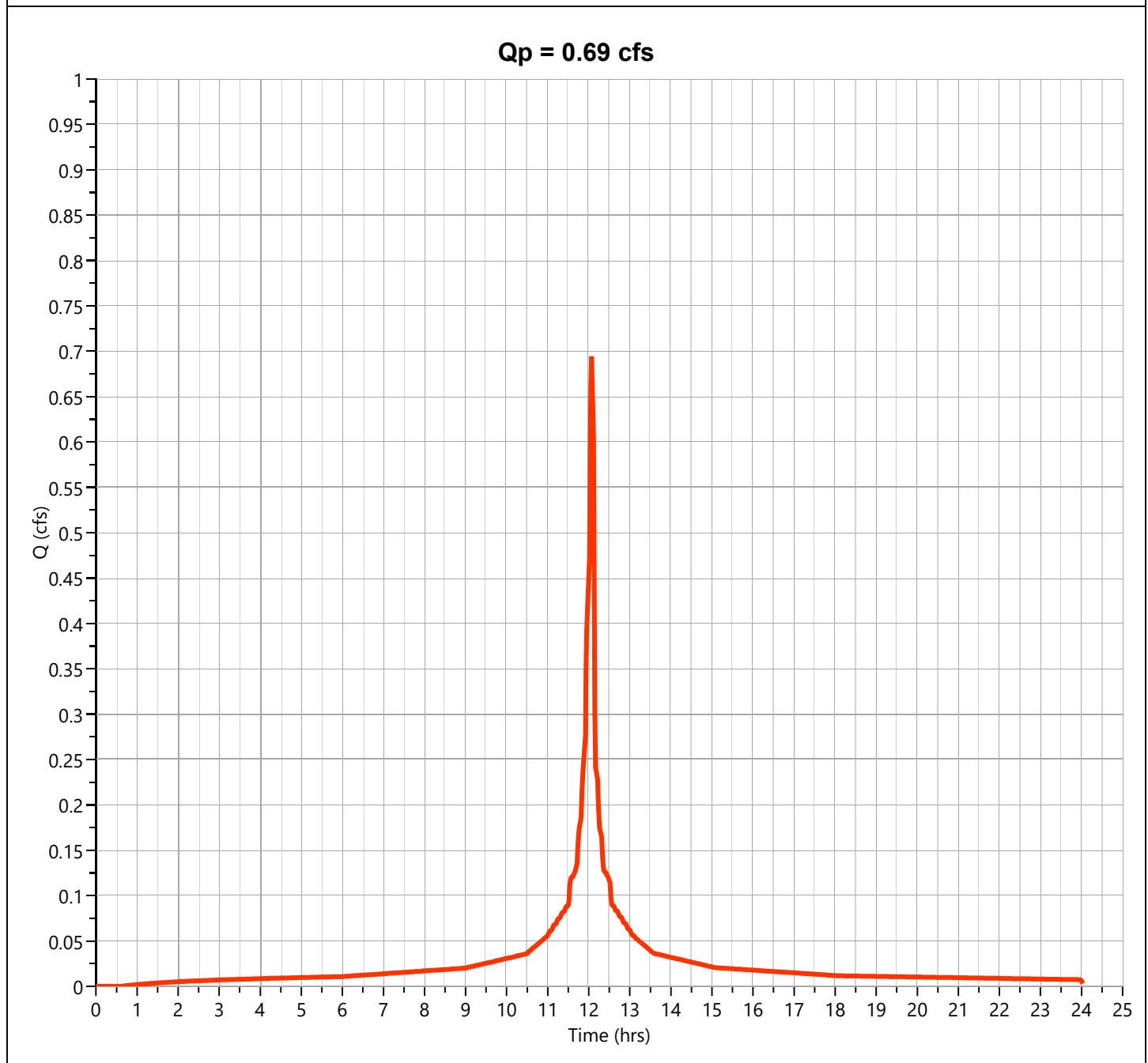
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-1D Impervious

## Hyd. No. 15

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.695 cfs  |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 2,314 cuft |
| Drainage Area   | = 0.11 ac     | Curve Number       | = 98         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 2.0 min    |
| Total Rainfall  | = 6.42 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

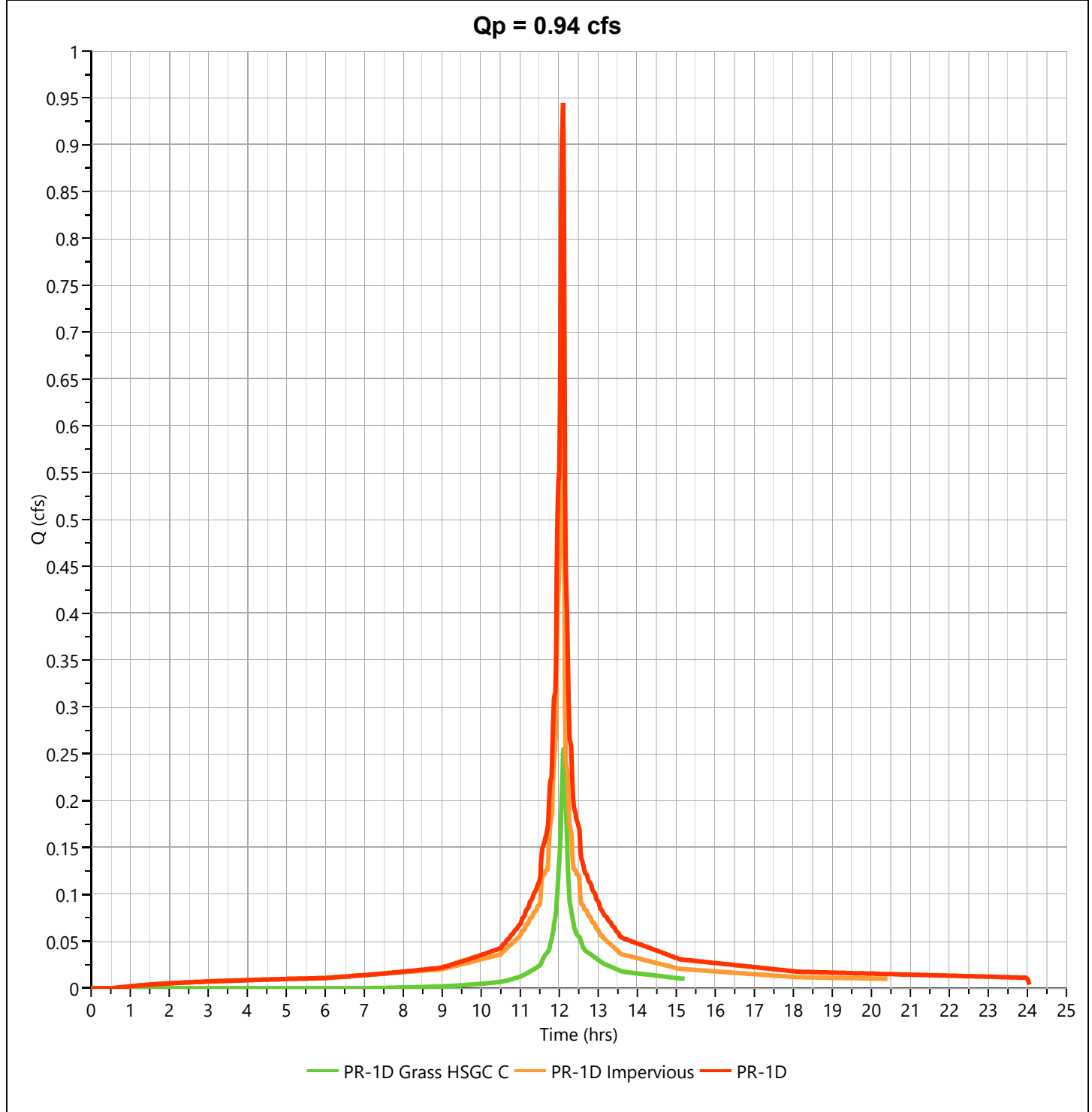
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-1D

## Hyd. No. 16

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.945 cfs  |
| Storm Frequency    | = 10-yr    | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 3,109 cuft |
| Inflow Hydrographs | = 14, 15   | Total Contrib. Area | = 0.17 ac    |



# Hydrograph Report

Project Name:

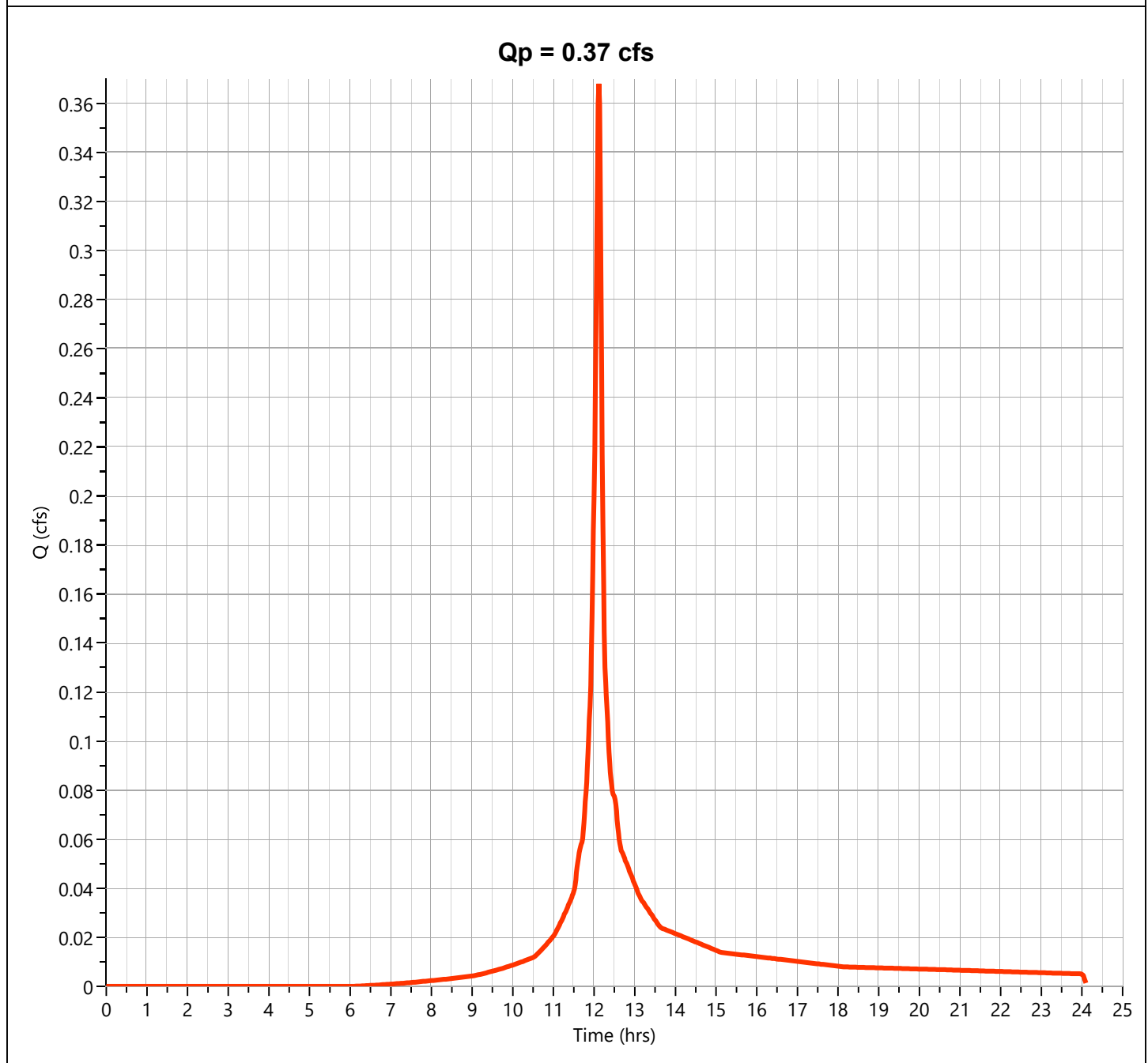
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-1D Grass HSGC C

## Hyd. No. 14

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.368 cfs  |
| Storm Frequency | = 25-yr       | Time to Peak       | = 12.12 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 1,153 cuft |
| Drainage Area   | = 0.06 ac     | Curve Number       | = 74         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 5.0 min    |
| Total Rainfall  | = 8.23 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |





# Hydrograph Report

Project Name:

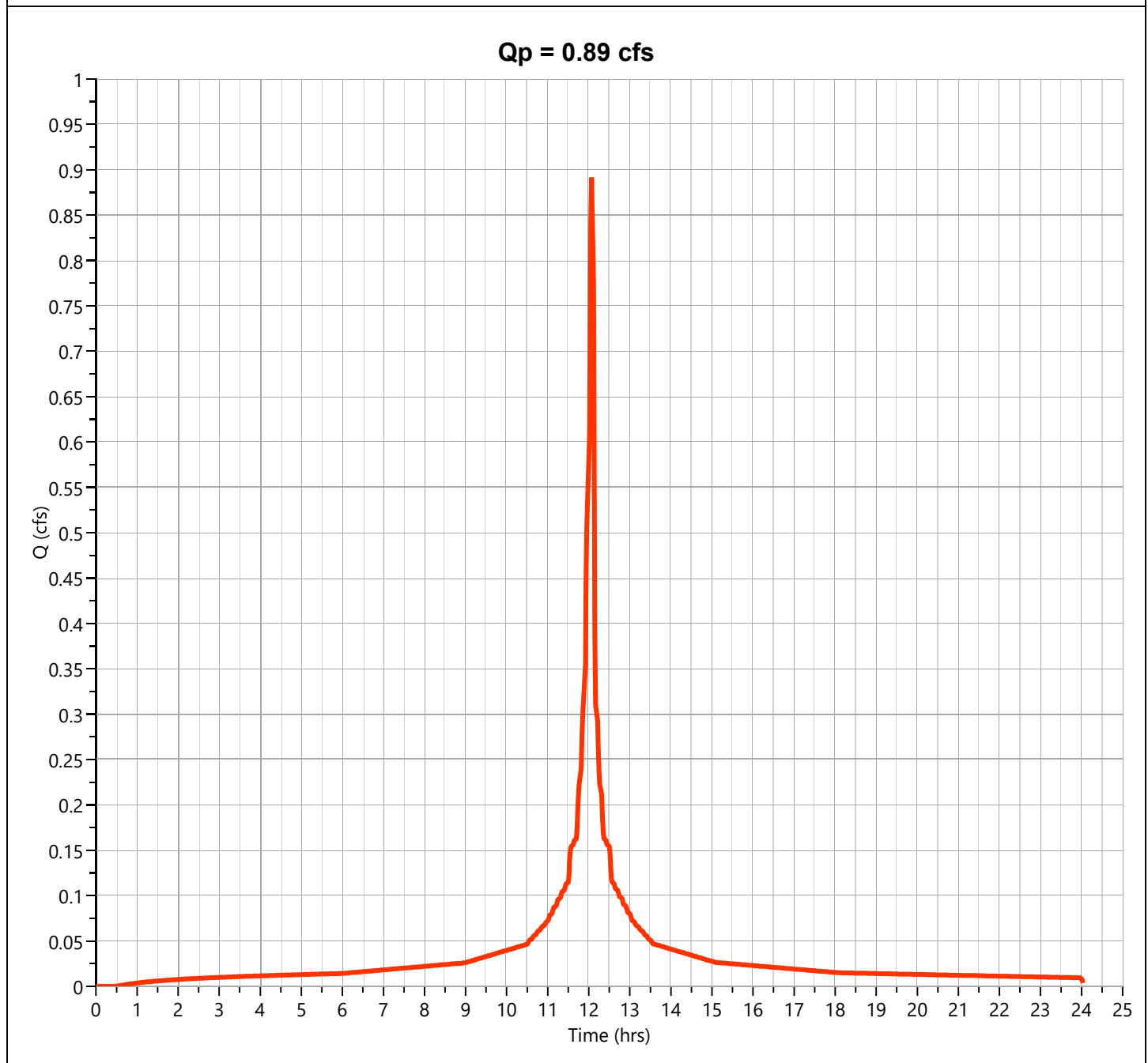
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-1D Impervious

## Hyd. No. 15

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.892 cfs  |
| Storm Frequency | = 25-yr       | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 2,991 cuft |
| Drainage Area   | = 0.11 ac     | Curve Number       | = 98         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 2.0 min    |
| Total Rainfall  | = 8.23 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

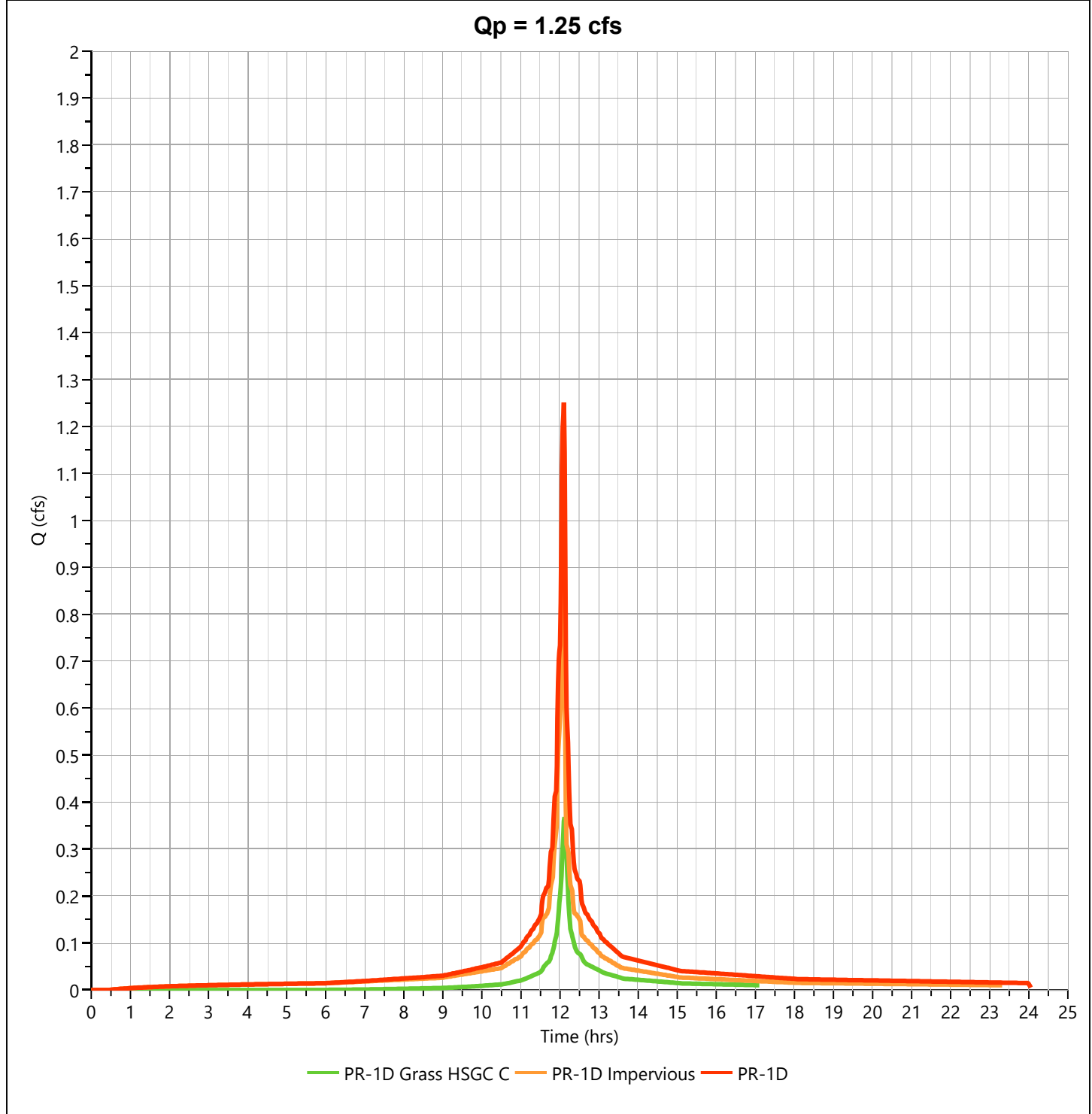
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-1D

## Hyd. No. 16

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 1.251 cfs  |
| Storm Frequency    | = 25-yr    | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 4,144 cuft |
| Inflow Hydrographs | = 14, 15   | Total Contrib. Area | = 0.17 ac    |



# Hydrograph Report

Project Name:

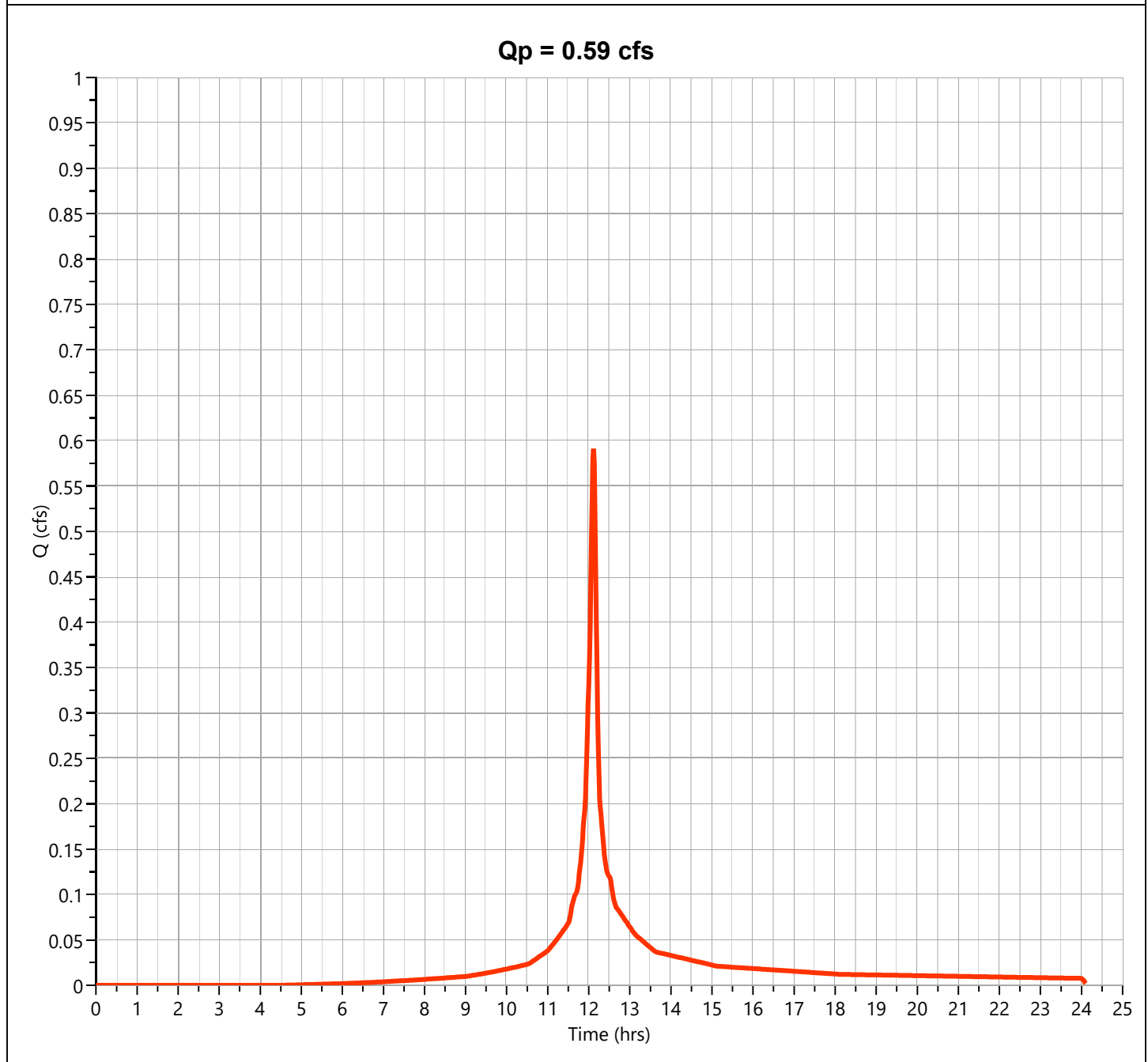
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-1D Grass HSGC C

## Hyd. No. 14

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.591 cfs  |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.12 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 1,893 cuft |
| Drainage Area   | = 0.06 ac     | Curve Number       | = 74         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 5.0 min    |
| Total Rainfall  | = 11.80 in    | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

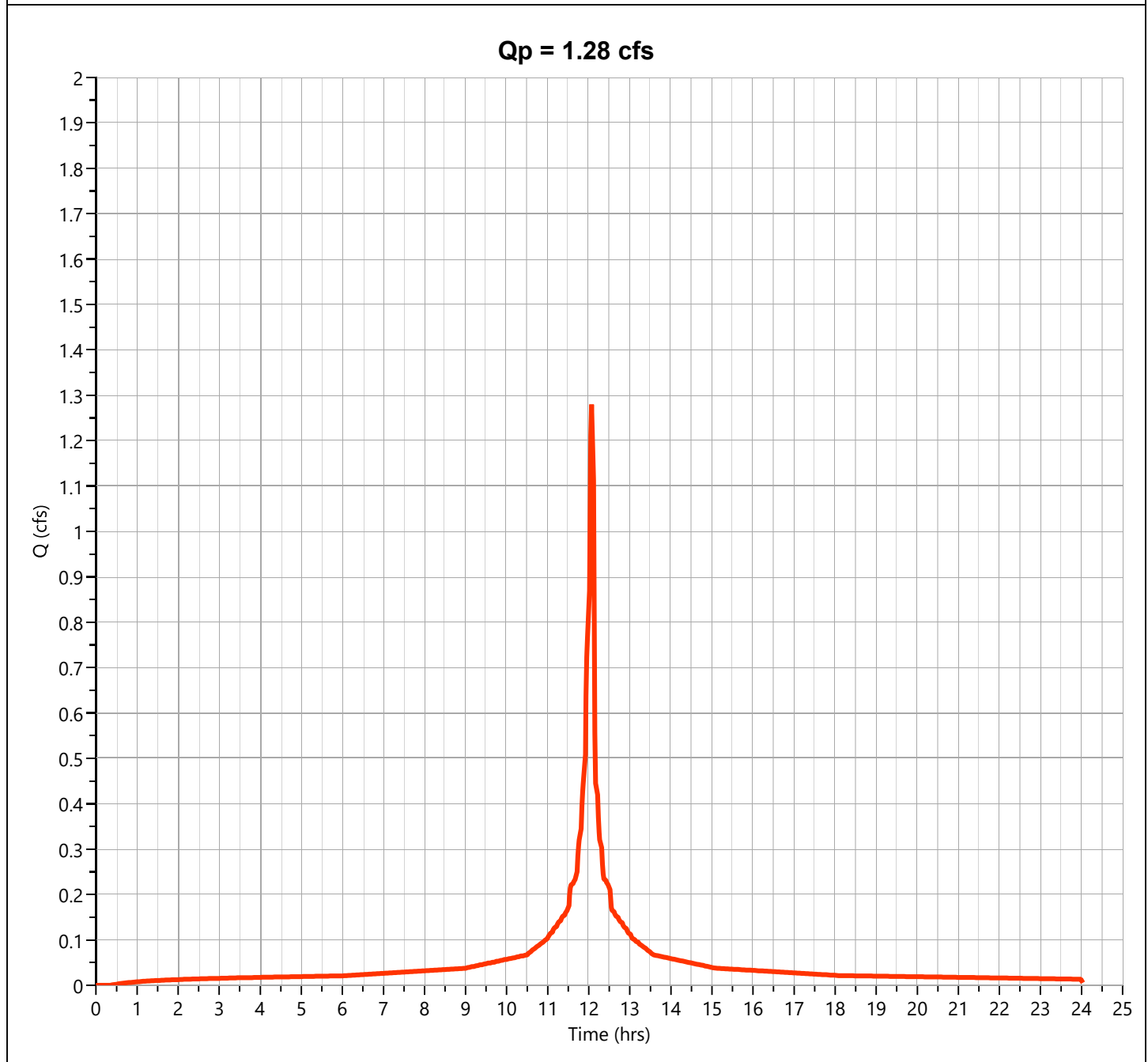
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-1D Impervious

## Hyd. No. 15

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 1.279 cfs  |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 4,327 cuft |
| Drainage Area   | = 0.11 ac     | Curve Number       | = 98         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 2.0 min    |
| Total Rainfall  | = 11.80 in    | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

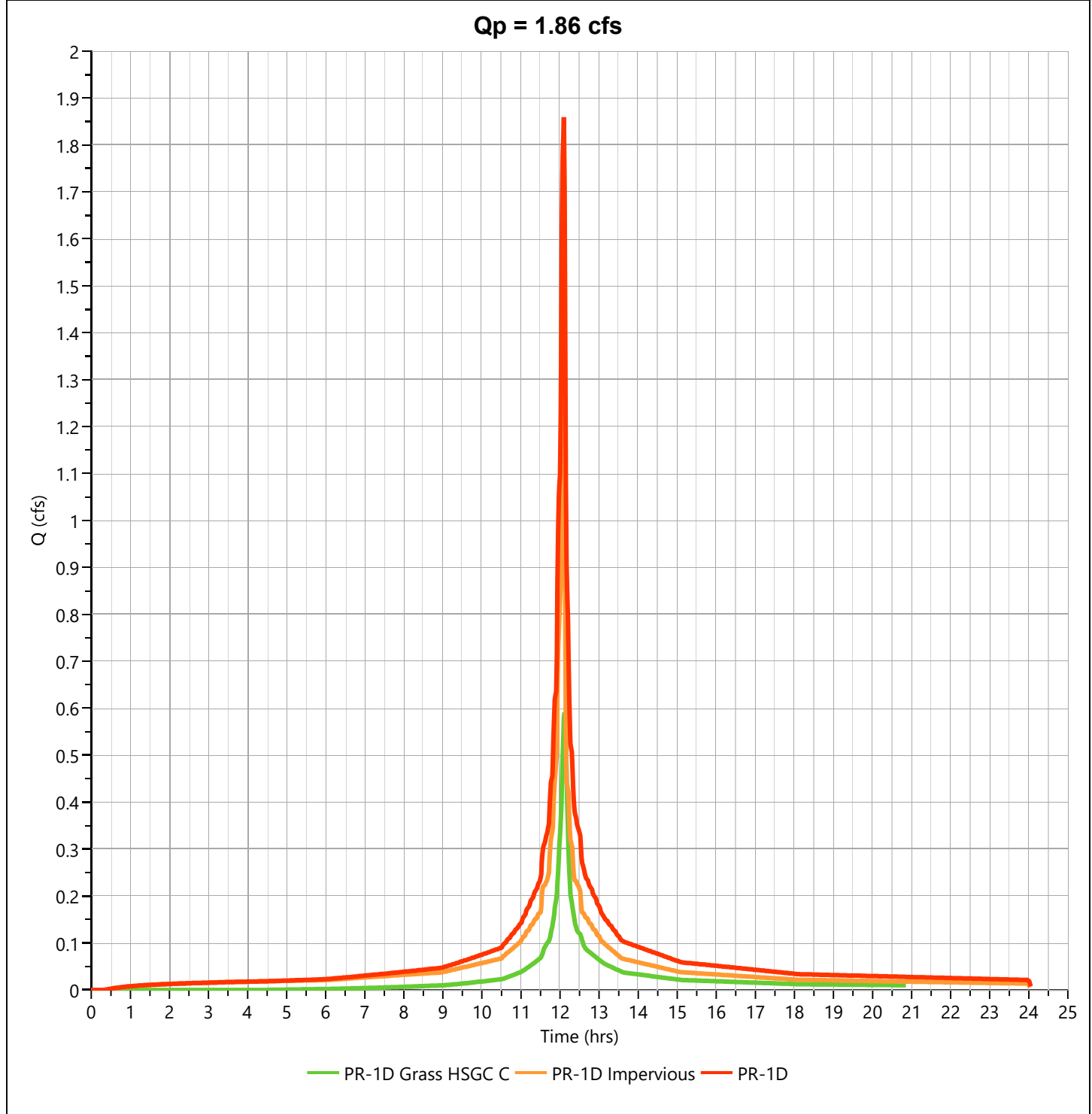
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-1D

## Hyd. No. 16

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 1.859 cfs  |
| Storm Frequency    | = 100-yr   | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 6,220 cuft |
| Inflow Hydrographs | = 14, 15   | Total Contrib. Area | = 0.17 ac    |



**COMBINED PROPOSED FLOW TO UDG-INF1-2  
WATERSHED**

# Hydrograph Report

Hydrology Studio v 3.0.0.38

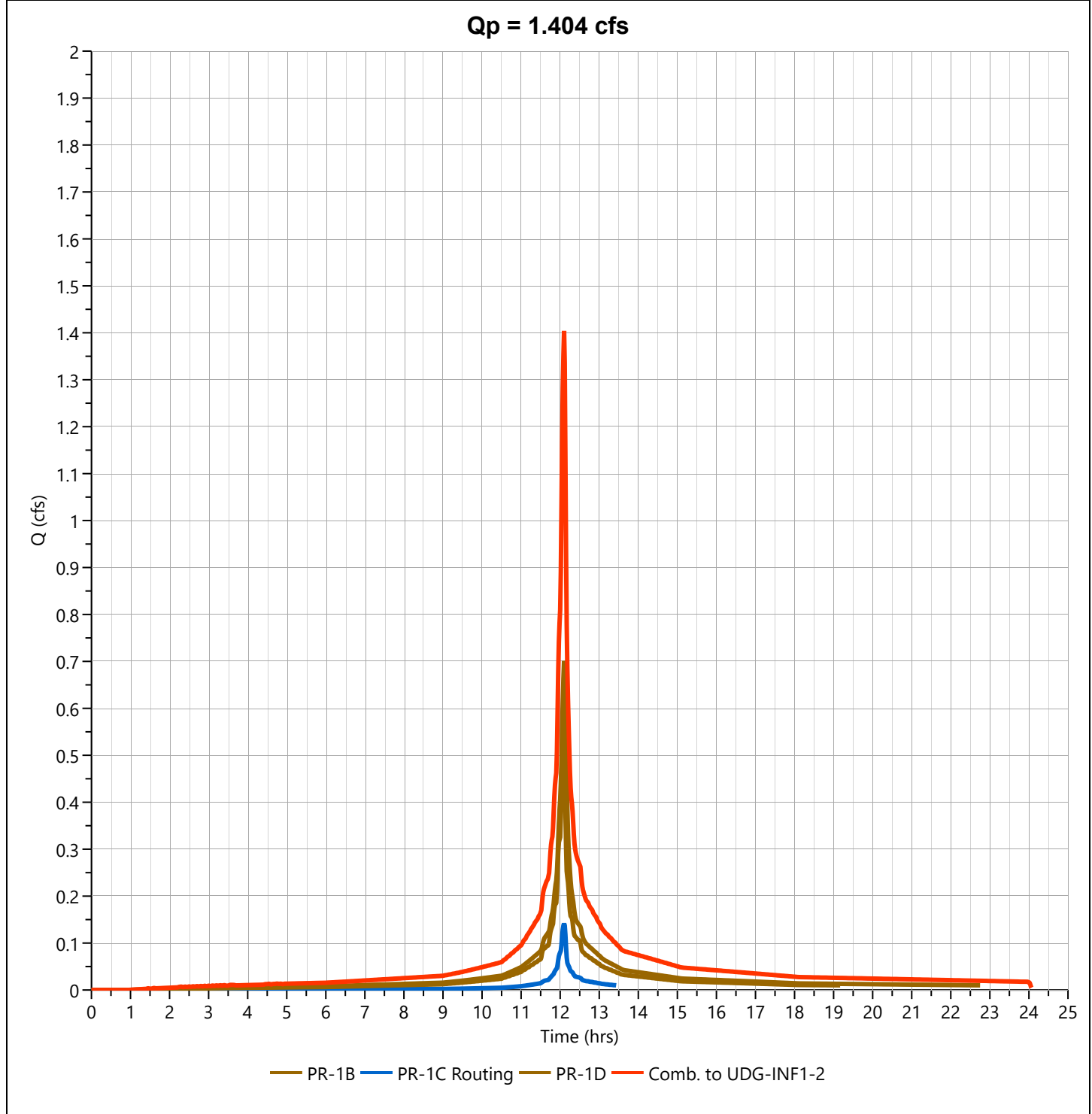
File: Future Beacon Church Proposed - POA-1 & POA-3.hys

07-01-2025

## Comb. to UDG-INF1-2

## Hyd. No. 18

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 1.404 cfs  |
| Storm Frequency    | = 2-yr     | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 4,639 cuft |
| Inflow Hydrographs |            | Total Contrib. Area | = 0.0 ac     |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

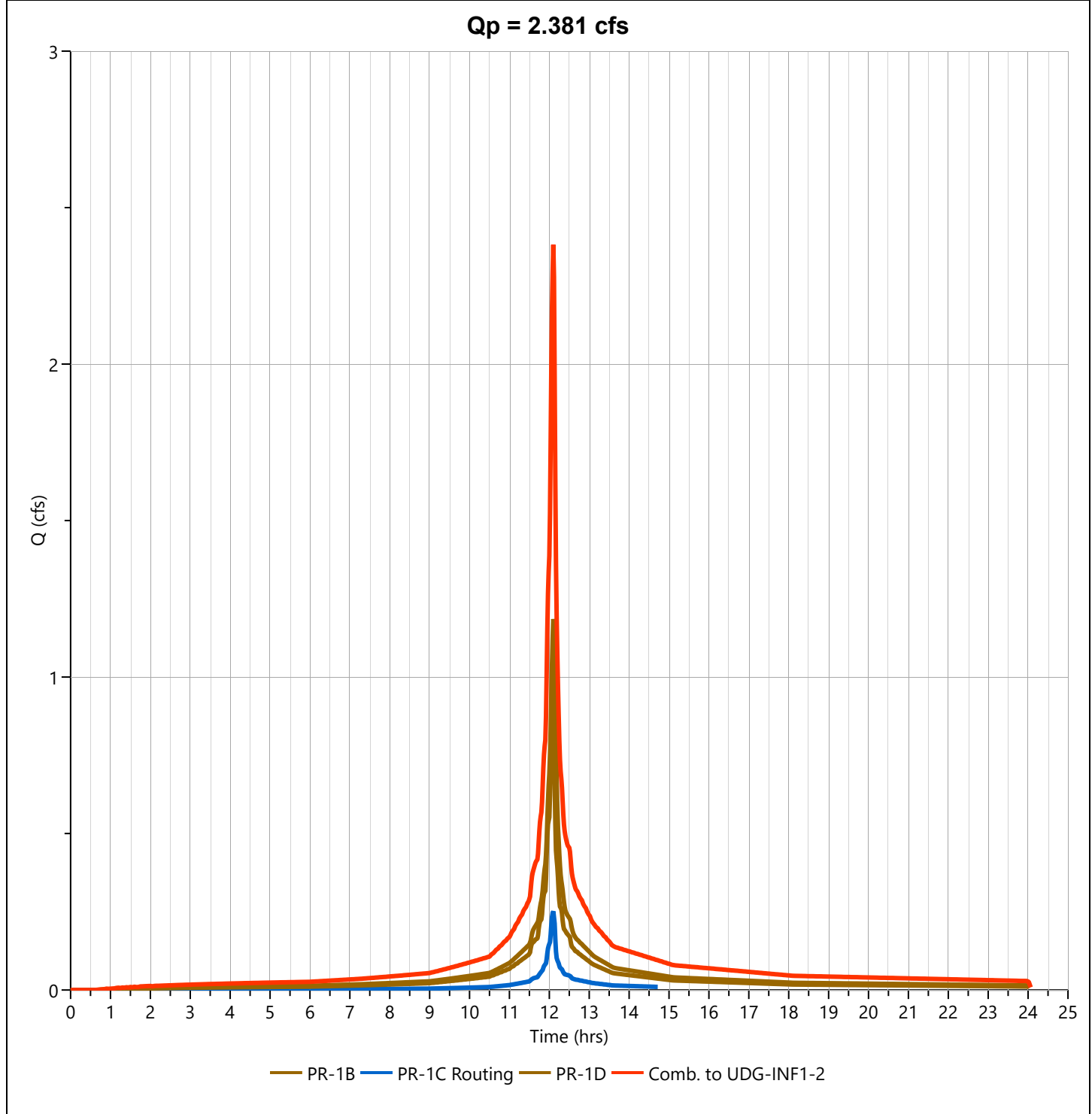
File: Future Beacon Church Proposed - POA-1 & POA-3.hys

07-01-2025

## Comb. to UDG-INF1-2

## Hyd. No. 18

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 2.381 cfs  |
| Storm Frequency    | = 10-yr    | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 7,937 cuft |
| Inflow Hydrographs |            | Total Contrib. Area | = 0.0 ac     |





# Hydrograph Report

Hydrology Studio v 3.0.0.38

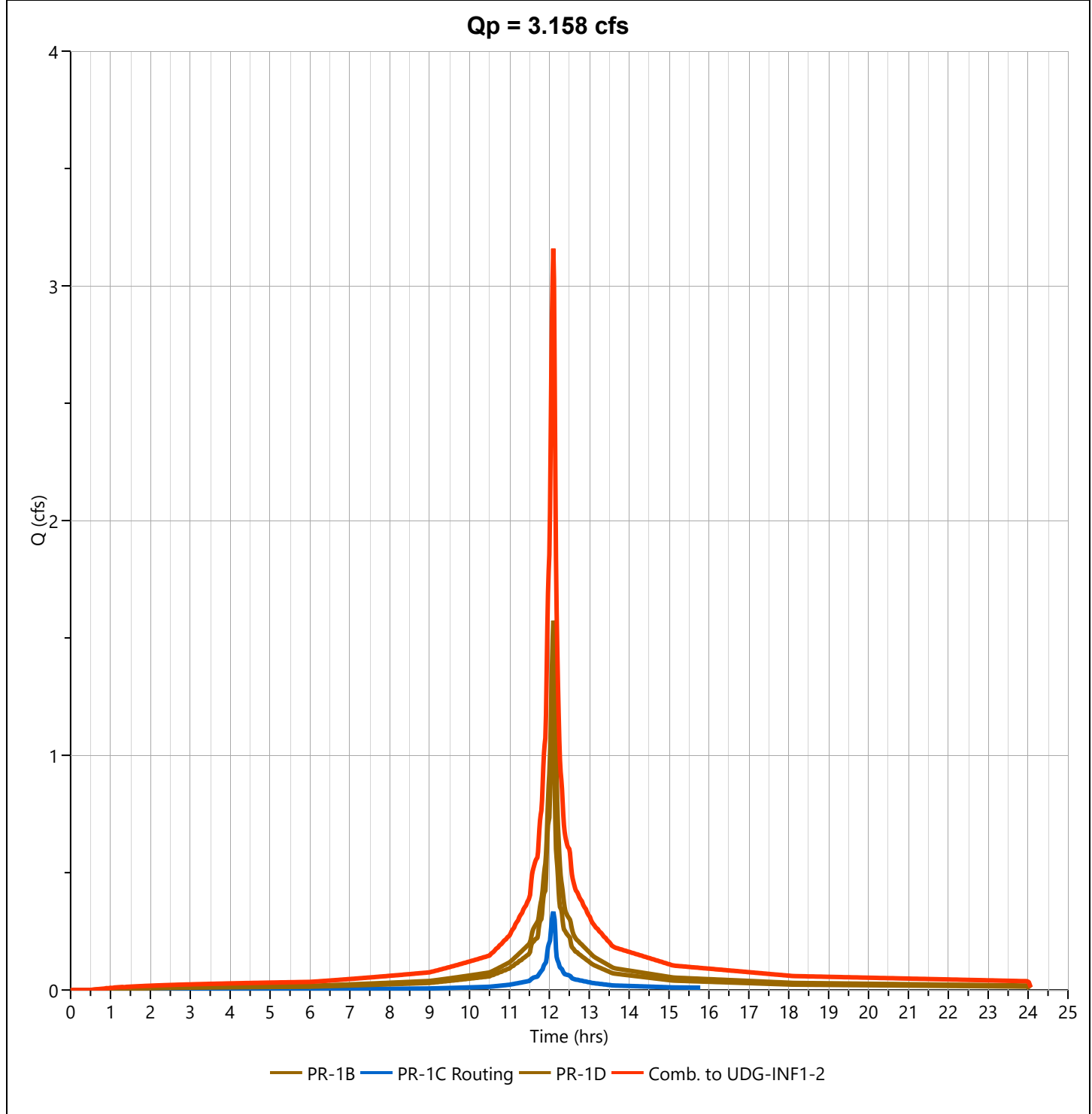
File: Future Beacon Church Proposed - POA-1 & POA-3.hys

07-01-2025

## Comb. to UDG-INF1-2

## Hyd. No. 18

|                    |            |                     |               |
|--------------------|------------|---------------------|---------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 3.158 cfs   |
| Storm Frequency    | = 25-yr    | Time to Peak        | = 12.10 hrs   |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 10,617 cuft |
| Inflow Hydrographs |            | Total Contrib. Area | = 0.0 ac      |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

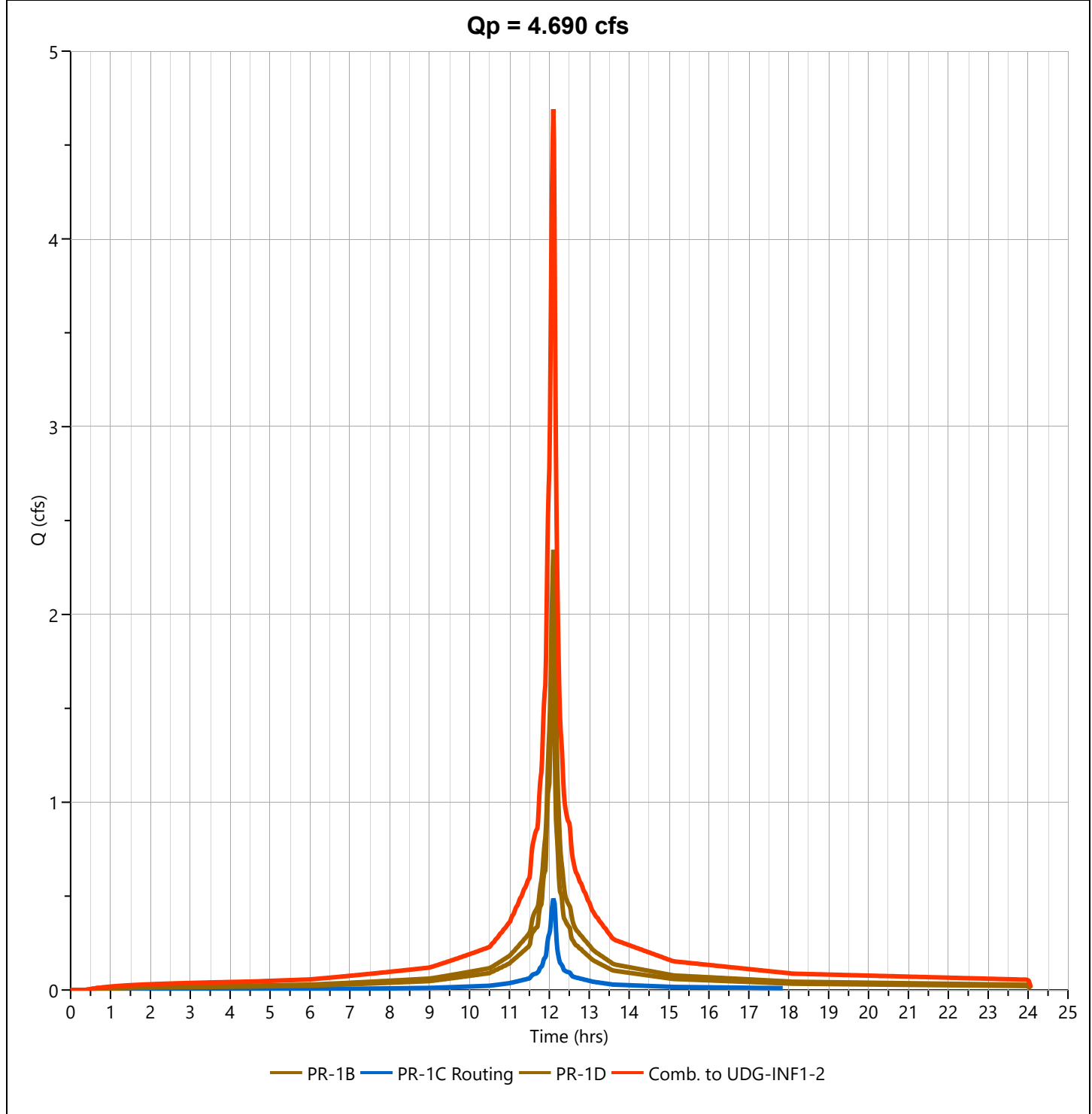
File: Future Beacon Church Proposed - POA-1 & POA-3.hys

07-01-2025

## Comb. to UDG-INF1-2

## Hyd. No. 18

|                    |            |                     |               |
|--------------------|------------|---------------------|---------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 4.690 cfs   |
| Storm Frequency    | = 100-yr   | Time to Peak        | = 12.10 hrs   |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 16,007 cuft |
| Inflow Hydrographs |            | Total Contrib. Area | = 0.0 ac      |



## **PR-1E WATERSHED**

Project: Beacon Unitarian Universalist Church

By: TEG

Date: 2/6/2024

Location: Summit, NJ

Checked By: MJV

Date Checked: 2/6/2024

Circle One: Present Developed

Future Proposed Watershed PR-1E - Impervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Design Flow Length, L<sub>des</sub> (Total L<sub>des</sub> < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. McCuen-Spiess Limit, L<sub>mcs</sub> (max. 100 ft)
7. Compute T<sub>t</sub>

$$L_{mcs} = (100 s^{0.5})/n$$

$$T_t = \frac{0.007 (n L_{des})^{0.8}}{P_2^{0.5} s^{0.4}}$$

| Segment ID | 1                      | 2                    | 3                      |
|------------|------------------------|----------------------|------------------------|
|            | <b>Smooth Surfaces</b> | <b>Dense Grasses</b> | <b>Smooth Surfaces</b> |
|            | <b>0.011</b>           | <b>0.24</b>          | <b>0.011</b>           |
| ft         | <b>18</b>              | <b>29</b>            | <b>47</b>              |
| in         | <b>4.12</b>            | <b>4.12</b>          | <b>4.12</b>            |
| ft/ft      | <b>0.049</b>           | <b>0.114</b>         | <b>0.073</b>           |
| ft         | <b>100</b>             | <b>100</b>           | <b>100</b>             |
| hr         | <b>0.003</b>           | <b>0.038</b>         | <b>0.006</b>           |

Sheet Flow Sub-Total **0.047 hours**

**Shallow Concentrated Flow**

8. Surface Description
9. Flow Length, L
10. Watercourse Slope, s
11. Average Velocity, V (NEH table 15-3)
12. Compute T<sub>t</sub>

$$T_t = \frac{L}{3600 V}$$

| Segment ID | 4               |  |  |
|------------|-----------------|--|--|
|            | <b>Pavement</b> |  |  |
| ft         | <b>187</b>      |  |  |
| ft/ft      | <b>0.053</b>    |  |  |
| ft/s       | <b>4.67</b>     |  |  |
| hr         | <b>0.011</b>    |  |  |

Shallow Conc. Flow Sub-Total **0.011 hours**

**Channel Flow**

13. Flow Length, L
14. Cross Sectional flow area, a
15. Wetted Perimeter, P<sub>w</sub>
16. Hydraulic Radius, r
17. Channel Slope, s
18. Manning's Roughness Coeff., n
19. Velocity, V
20. Compute T<sub>t</sub>

$$r = a / P_w$$

$$V = (1.49 r^{2/3} s^{1/2}) / n$$

$$T_t = \frac{L}{3600 V}$$

| Segment ID      |  |  |  |
|-----------------|--|--|--|
| ft              |  |  |  |
| ft <sup>2</sup> |  |  |  |
| ft              |  |  |  |
| ft              |  |  |  |
| ft/ft           |  |  |  |
| ft/s            |  |  |  |
| hr              |  |  |  |

Channel Flow Sub-Total **0.000 hours**

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>

(Add Sub-Total T<sub>t</sub> from prior steps)

|                      |                    |
|----------------------|--------------------|
| Total Tc (hours) =   | <b>0.058 hours</b> |
| Total Tc (minutes) = | <b>3 minutes</b>   |

Project: Beacon Unitarian Universalist Church

By: TEG

Date: 11/29/2023

Location: Summit, NJ

Checked By: MJV

Date Checked: 11/29/2023

Circle One: Present Developed

Future Proposed Watershed PR-1E - Pervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Design Flow Length, L<sub>des</sub> (Total L<sub>des</sub> < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. McCuen-Spiess Limit, L<sub>mcs</sub> (max. 100 ft)
7. Compute T<sub>t</sub>

$$L_{mcs} = (100 s^{0.5})/n$$

$$T_t = \frac{0.007 (n L_{des})^{0.8}}{P_2^{0.5} s^{0.4}}$$

| Segment ID | 1                    | 2                      | 3                    |
|------------|----------------------|------------------------|----------------------|
|            | <b>Dense Grasses</b> | <b>Smooth Surfaces</b> | <b>Dense Grasses</b> |
|            | <b>0.24</b>          | <b>0.011</b>           | <b>0.24</b>          |
| ft         | <b>19</b>            | <b>10</b>              | <b>35</b>            |
| in         | <b>4.12</b>          | <b>4.12</b>            | <b>4.12</b>          |
| ft/ft      | <b>0.053</b>         | <b>0.026</b>           | <b>0.217</b>         |
| ft         | <b>96</b>            | <b>100</b>             | <b>100</b>           |
| hr         | <b>0.038</b>         | <b>0.003</b>           | <b>0.035</b>         |

Sheet Flow Sub-Total **0.075 hours**

**Shallow Concentrated Flow**

8. Surface Description
9. Flow Length, L
10. Watercourse Slope, s
11. Average Velocity, V (NEH table 15-3)
12. Compute T<sub>t</sub>

$$T_t = \frac{L}{3600 V}$$

| Segment ID | 4               |  |  |
|------------|-----------------|--|--|
|            | <b>Pavement</b> |  |  |
| ft         | <b>110</b>      |  |  |
| ft/ft      | <b>0.058</b>    |  |  |
| ft/s       | <b>4.90</b>     |  |  |
| hr         | <b>0.006</b>    |  |  |

Shallow Conc. Flow Sub-Total **0.006 hours**

**Channel Flow**

13. Flow Length, L
14. Cross Sectional flow area, a
15. Wetted Perimeter, P<sub>w</sub>
16. Hydraulic Radius, r
17. Channel Slope, s
18. Manning's Roughness Coeff., n
19. Velocity, V
20. Compute T<sub>t</sub>

$$r = a / P_w$$

$$V = (1.49 r^{2/3} s^{1/2}) / n$$

$$T_t = \frac{L}{3600 V}$$

| Segment ID      |  |  |  |
|-----------------|--|--|--|
| ft              |  |  |  |
| ft <sup>2</sup> |  |  |  |
| ft              |  |  |  |
| ft              |  |  |  |
| ft/ft           |  |  |  |
| ft/s            |  |  |  |
| hr              |  |  |  |

Channel Flow Sub-Total **0.000 hours**

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>

(Add Sub-Total T<sub>t</sub> from prior steps)

|                                  |                    |
|----------------------------------|--------------------|
| Total T <sub>c</sub> (hours) =   | <b>0.081 hours</b> |
| Total T <sub>c</sub> (minutes) = | <b>5 minutes</b>   |

# Hydrograph Report

Hydrology Studio v 3.0.0.38

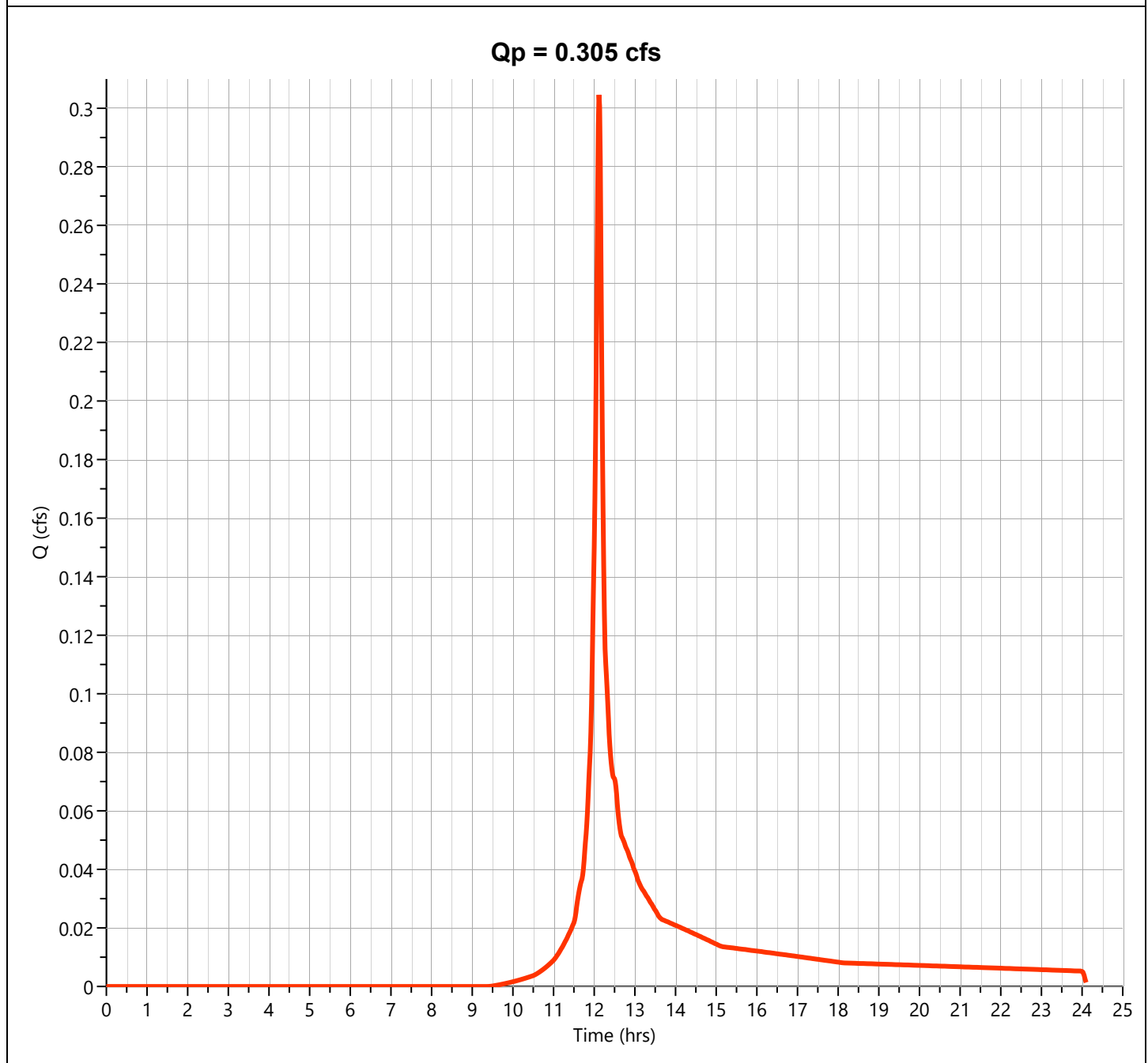
File: Future Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

## PR-1E Grass HSGC C

## Hyd. No. 22

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.305 cfs |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.12 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 946 cuft  |
| Drainage Area   | = 0.15 ac     | Curve Number       | = 74.00     |
| Tc Method       | = User        | Time of Conc. (Tc) | = 5.0 min   |
| Total Rainfall  | = 4.12 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

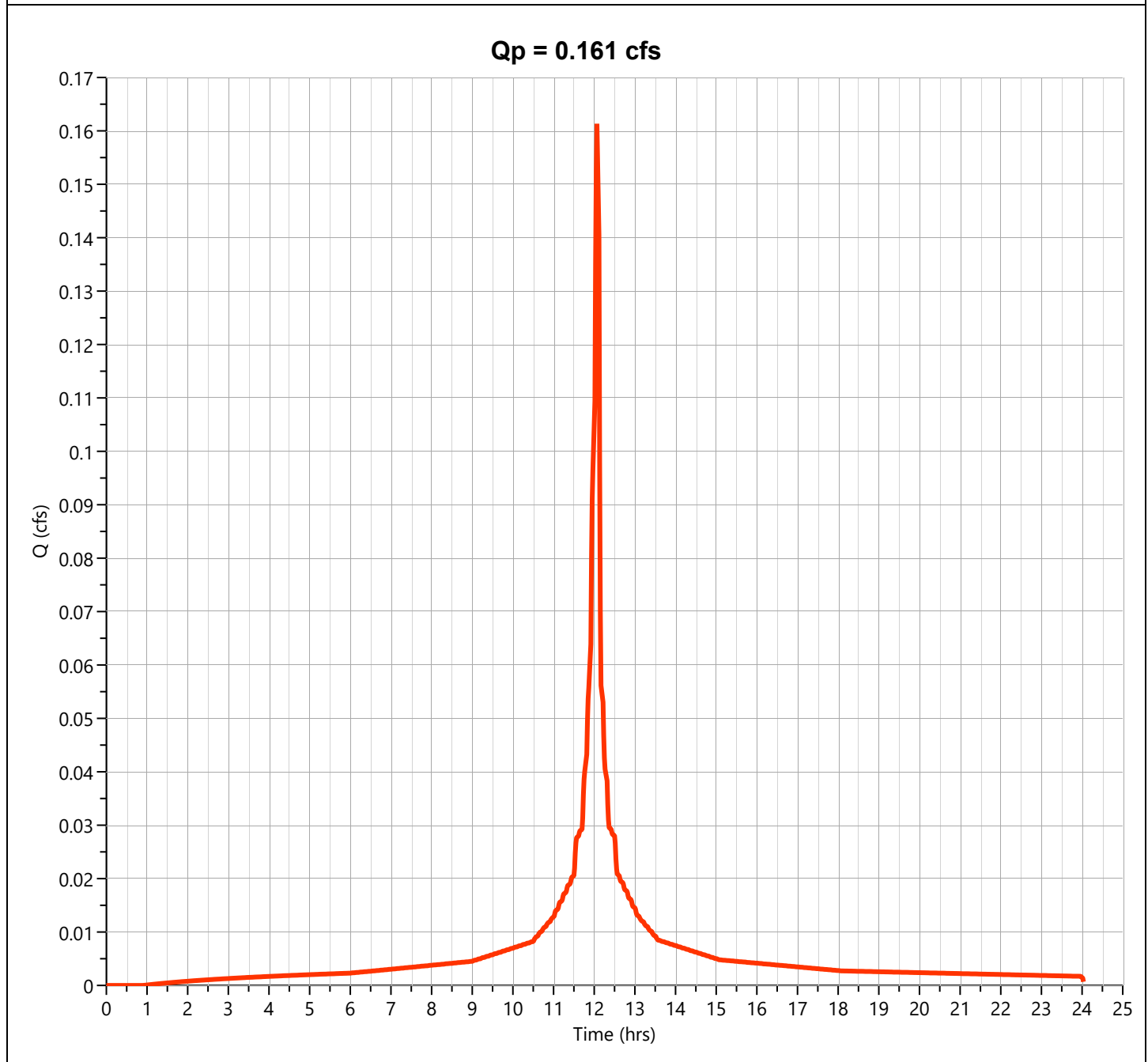
File: Future Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

## PR-1E Impervious

## Hyd. No. 23

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.161 cfs |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.10 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 529 cuft  |
| Drainage Area   | = 0.04 ac     | Curve Number       | = 98.00     |
| Tc Method       | = User        | Time of Conc. (Tc) | = 3.0 min   |
| Total Rainfall  | = 4.12 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

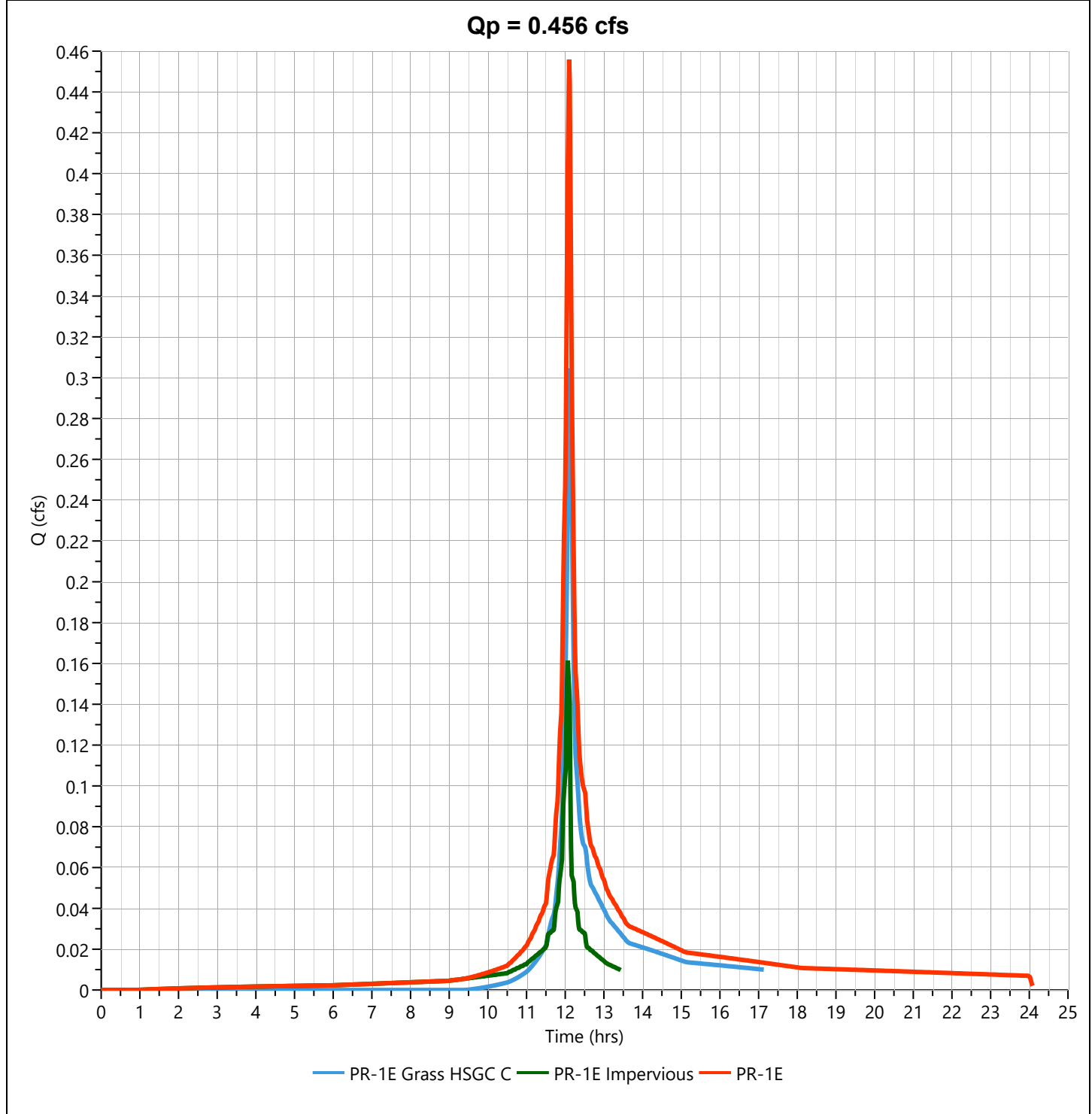
File: Future Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

## PR-1E

## Hyd. No. 24

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.456 cfs  |
| Storm Frequency    | = 2-yr     | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 1,475 cuft |
| Inflow Hydrographs | = 22, 23   | Total Contrib. Area | = 0.19 ac    |





# Hydrograph Report

Hydrology Studio v 3.0.0.38

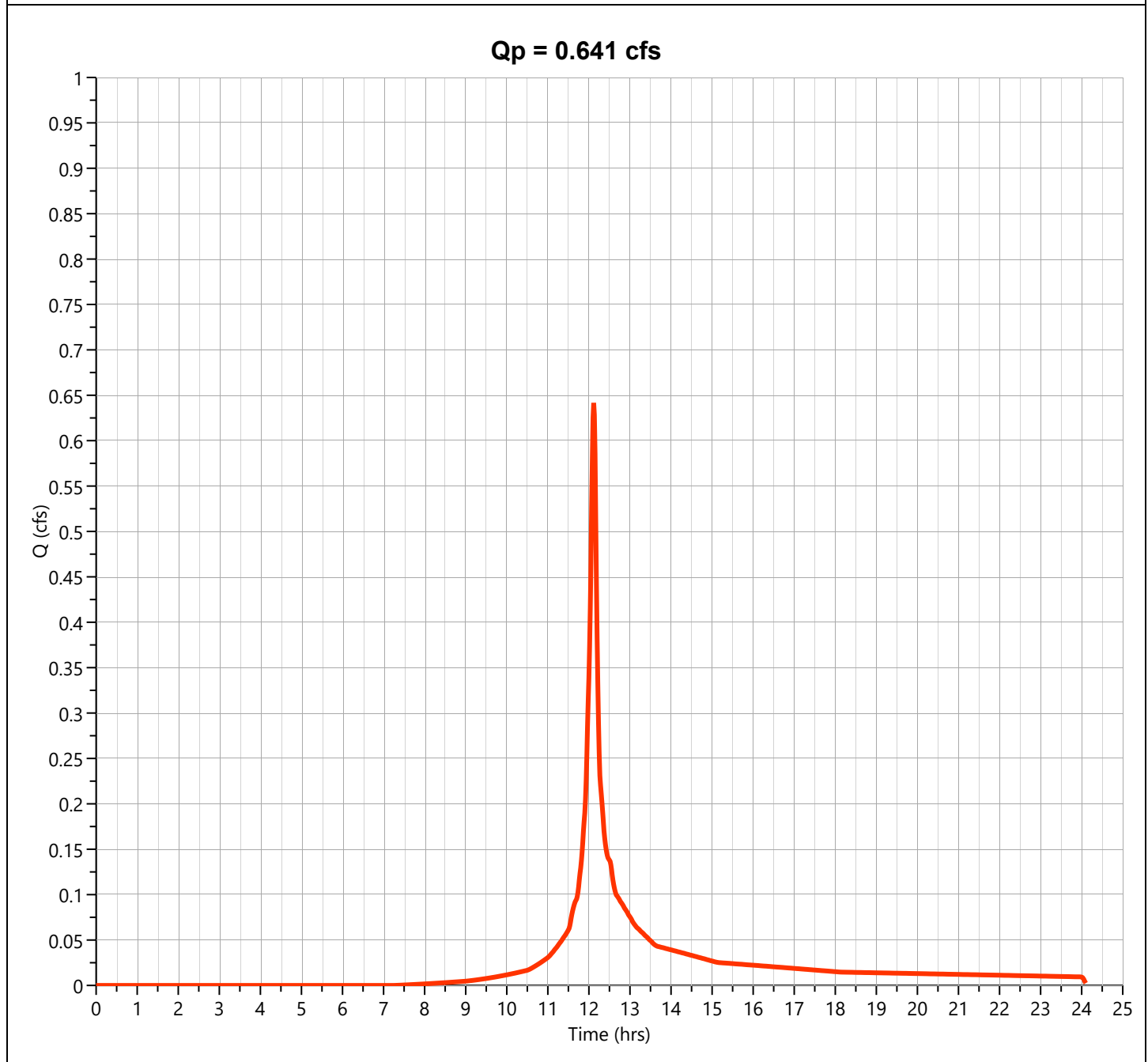
File: Future Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

## PR-1E Grass HSGC C

## Hyd. No. 22

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.641 cfs  |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.12 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 1,988 cuft |
| Drainage Area   | = 0.15 ac     | Curve Number       | = 74.00      |
| Tc Method       | = User        | Time of Conc. (Tc) | = 5.0 min    |
| Total Rainfall  | = 6.42 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

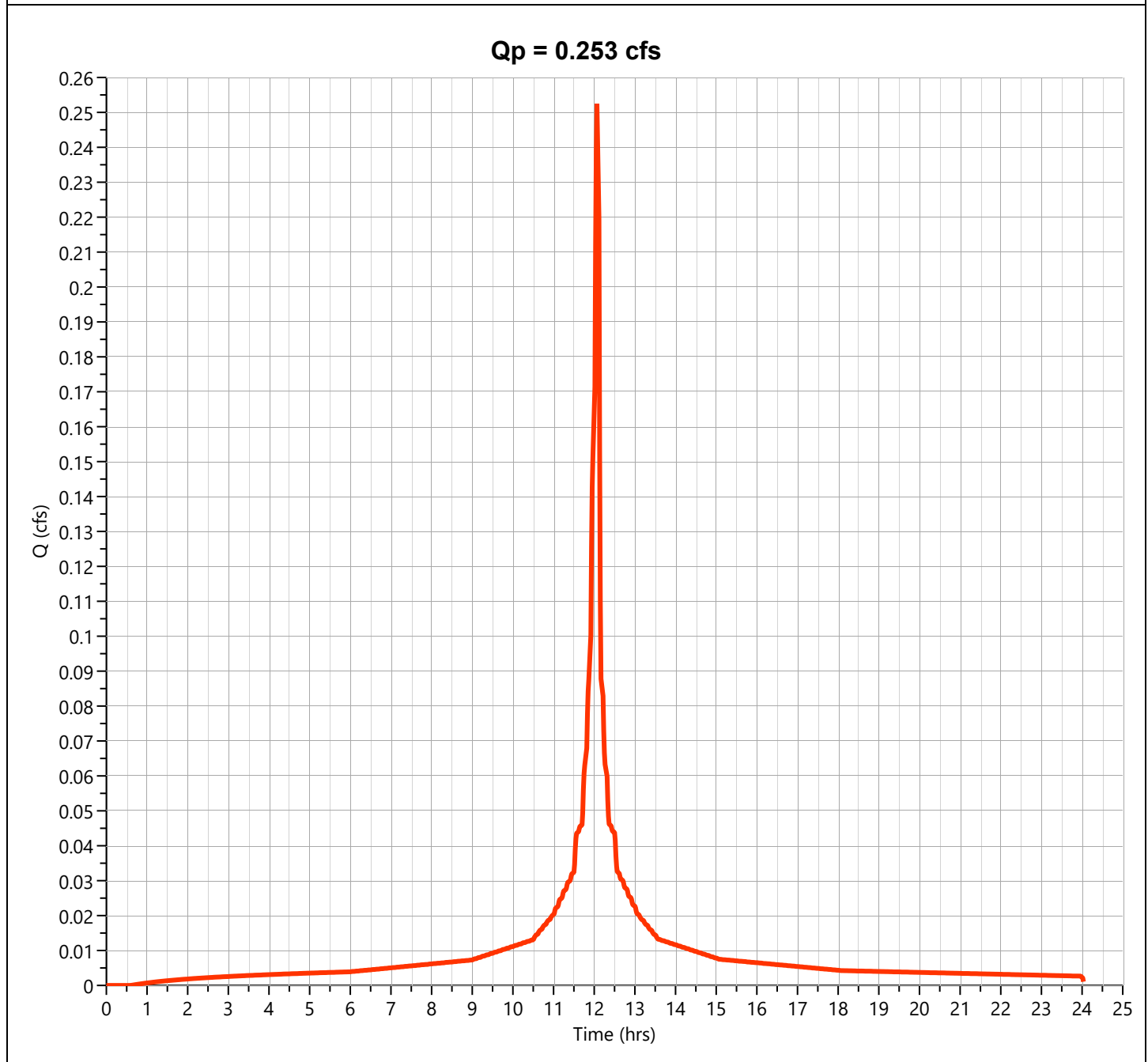
File: Future Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

## PR-1E Impervious

## Hyd. No. 23

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.253 cfs |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.10 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 841 cuft  |
| Drainage Area   | = 0.04 ac     | Curve Number       | = 98.00     |
| Tc Method       | = User        | Time of Conc. (Tc) | = 3.0 min   |
| Total Rainfall  | = 6.42 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

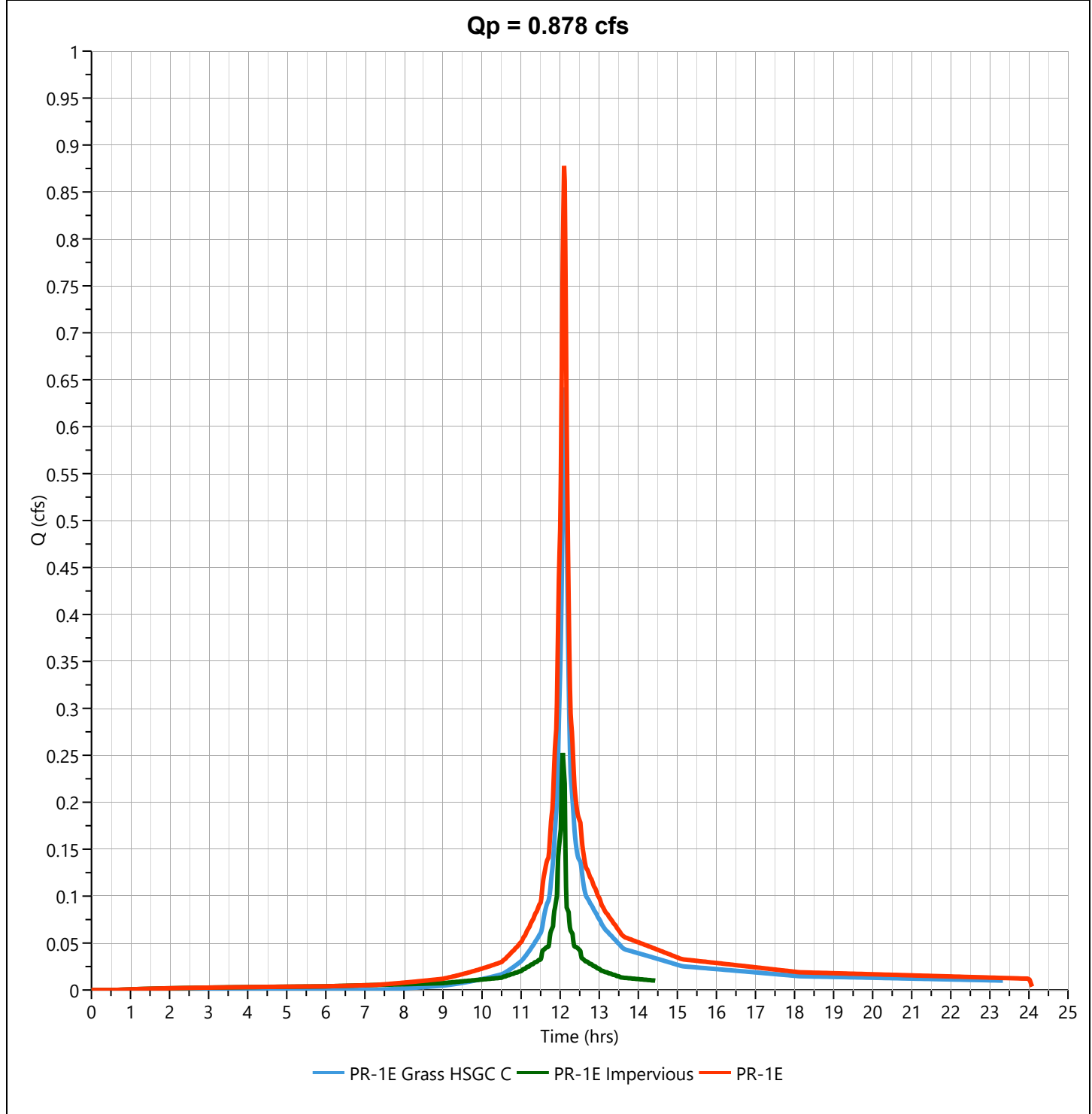
File: Future Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

## PR-1E

## Hyd. No. 24

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.878 cfs  |
| Storm Frequency    | = 10-yr    | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 2,830 cuft |
| Inflow Hydrographs | = 22, 23   | Total Contrib. Area | = 0.19 ac    |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

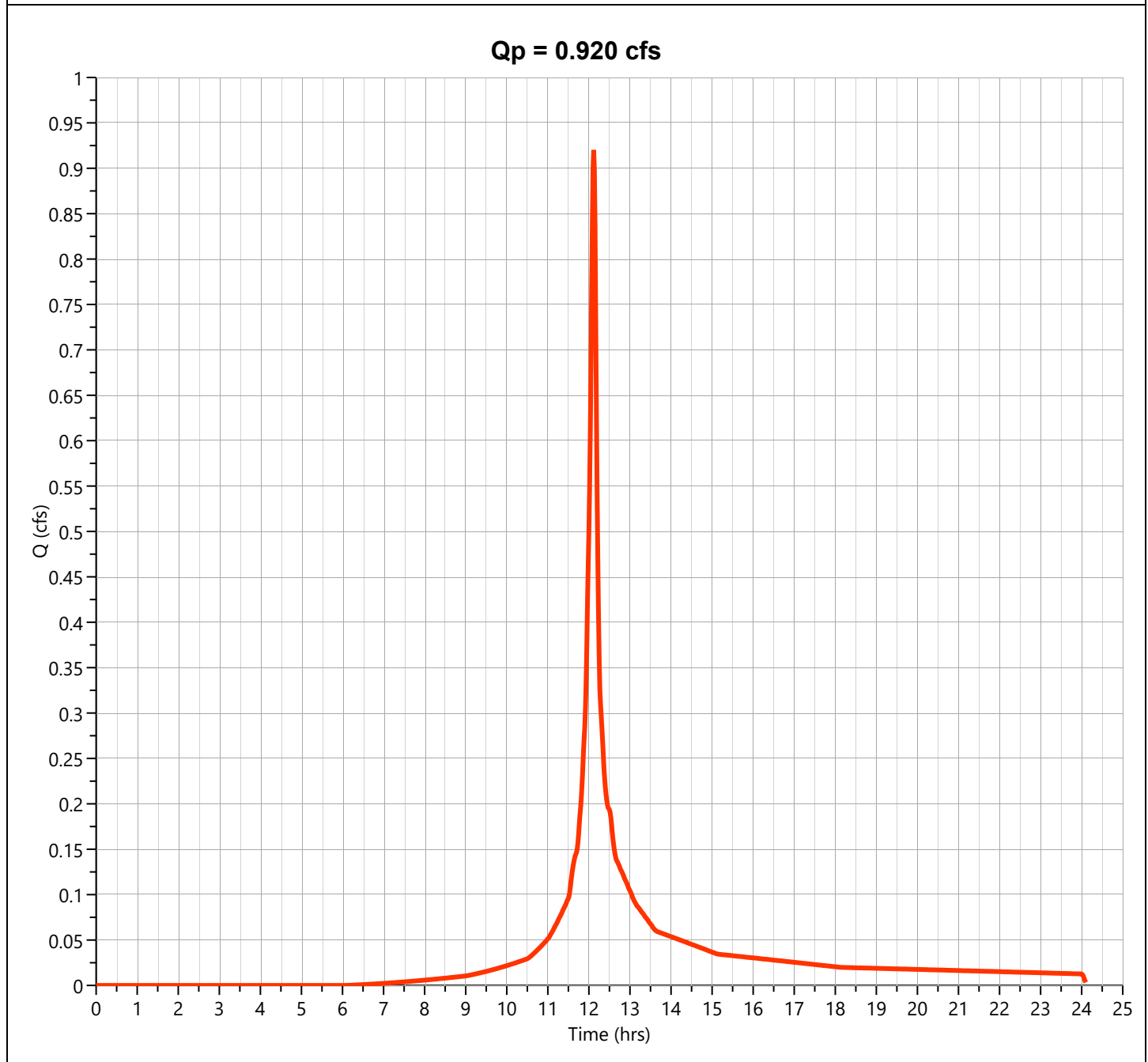
File: Future Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

## PR-1E Grass HSGC C

## Hyd. No. 22

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.920 cfs  |
| Storm Frequency | = 25-yr       | Time to Peak       | = 12.12 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 2,882 cuft |
| Drainage Area   | = 0.15 ac     | Curve Number       | = 74.00      |
| Tc Method       | = User        | Time of Conc. (Tc) | = 5.0 min    |
| Total Rainfall  | = 8.23 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

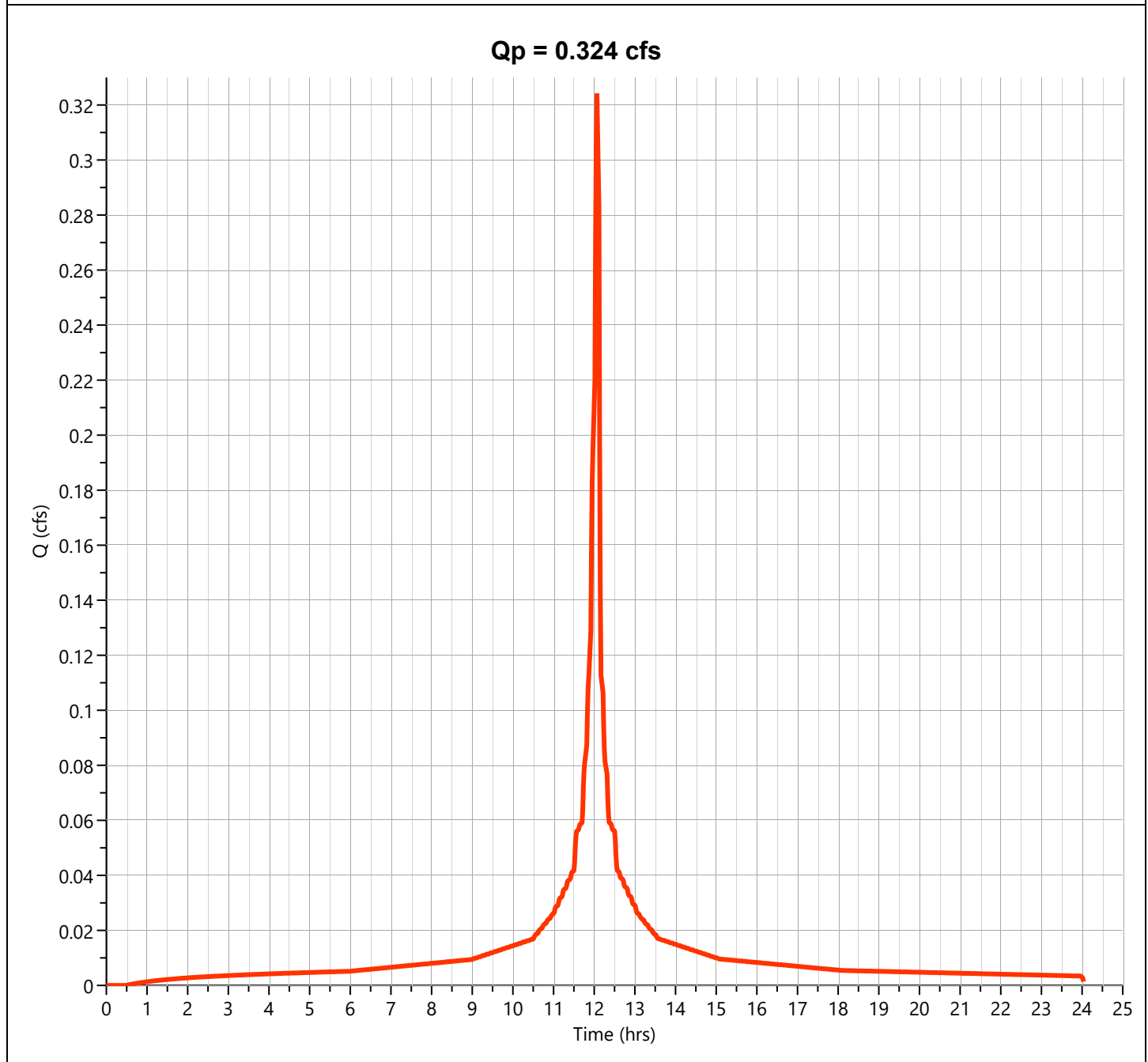
File: Future Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

## PR-1E Impervious

## Hyd. No. 23

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.324 cfs  |
| Storm Frequency | = 25-yr       | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 1,088 cuft |
| Drainage Area   | = 0.04 ac     | Curve Number       | = 98.00      |
| Tc Method       | = User        | Time of Conc. (Tc) | = 3.0 min    |
| Total Rainfall  | = 8.23 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

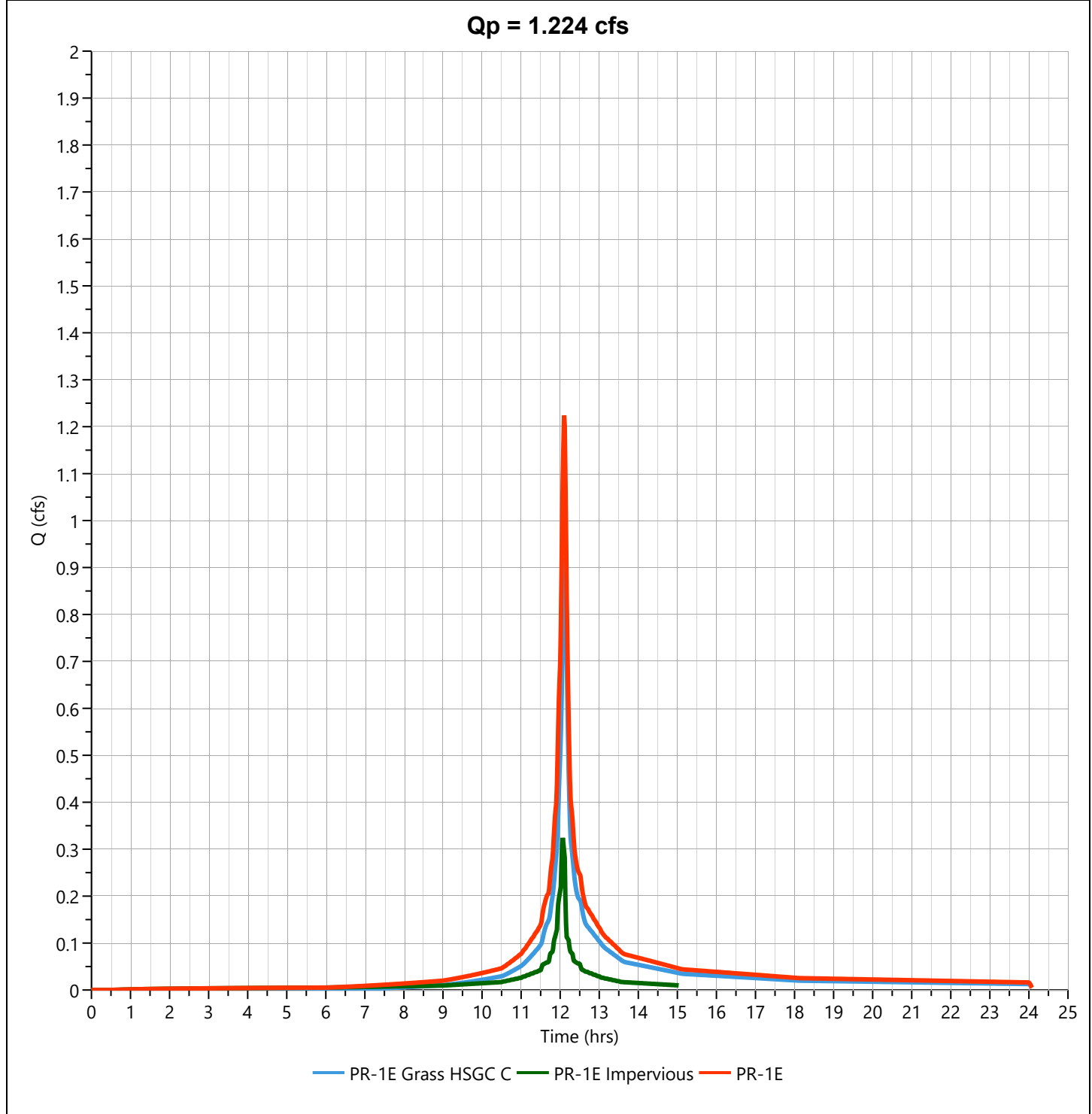
File: Future Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

## PR-1E

## Hyd. No. 24

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 1.224 cfs  |
| Storm Frequency    | = 25-yr    | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 3,969 cuft |
| Inflow Hydrographs | = 22, 23   | Total Contrib. Area | = 0.19 ac    |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

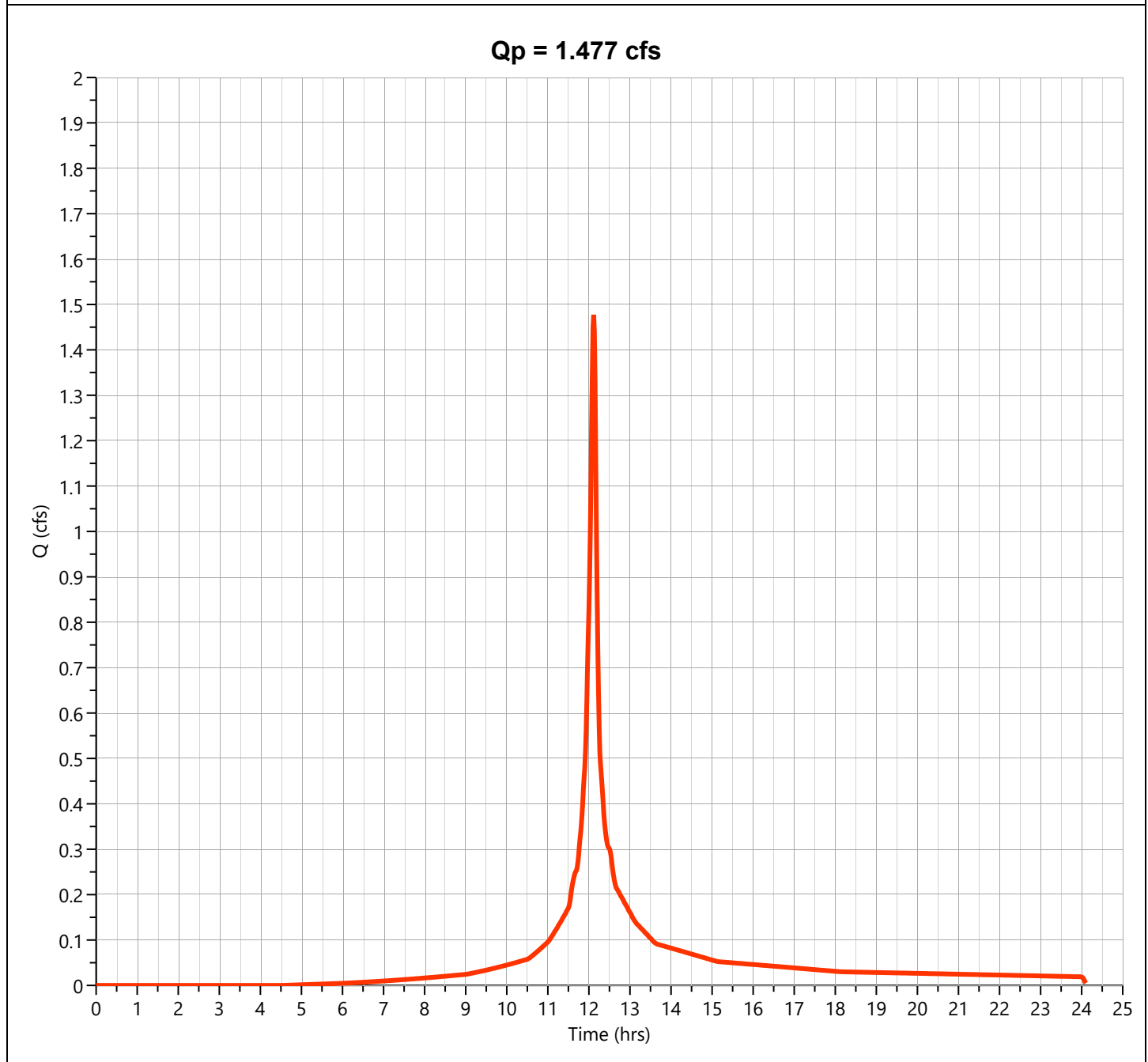
File: Future Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

## PR-1E Grass HSGC C

## Hyd. No. 22

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 1.477 cfs  |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.12 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 4,733 cuft |
| Drainage Area   | = 0.15 ac     | Curve Number       | = 74.00      |
| Tc Method       | = User        | Time of Conc. (Tc) | = 5.0 min    |
| Total Rainfall  | = 11.80 in    | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

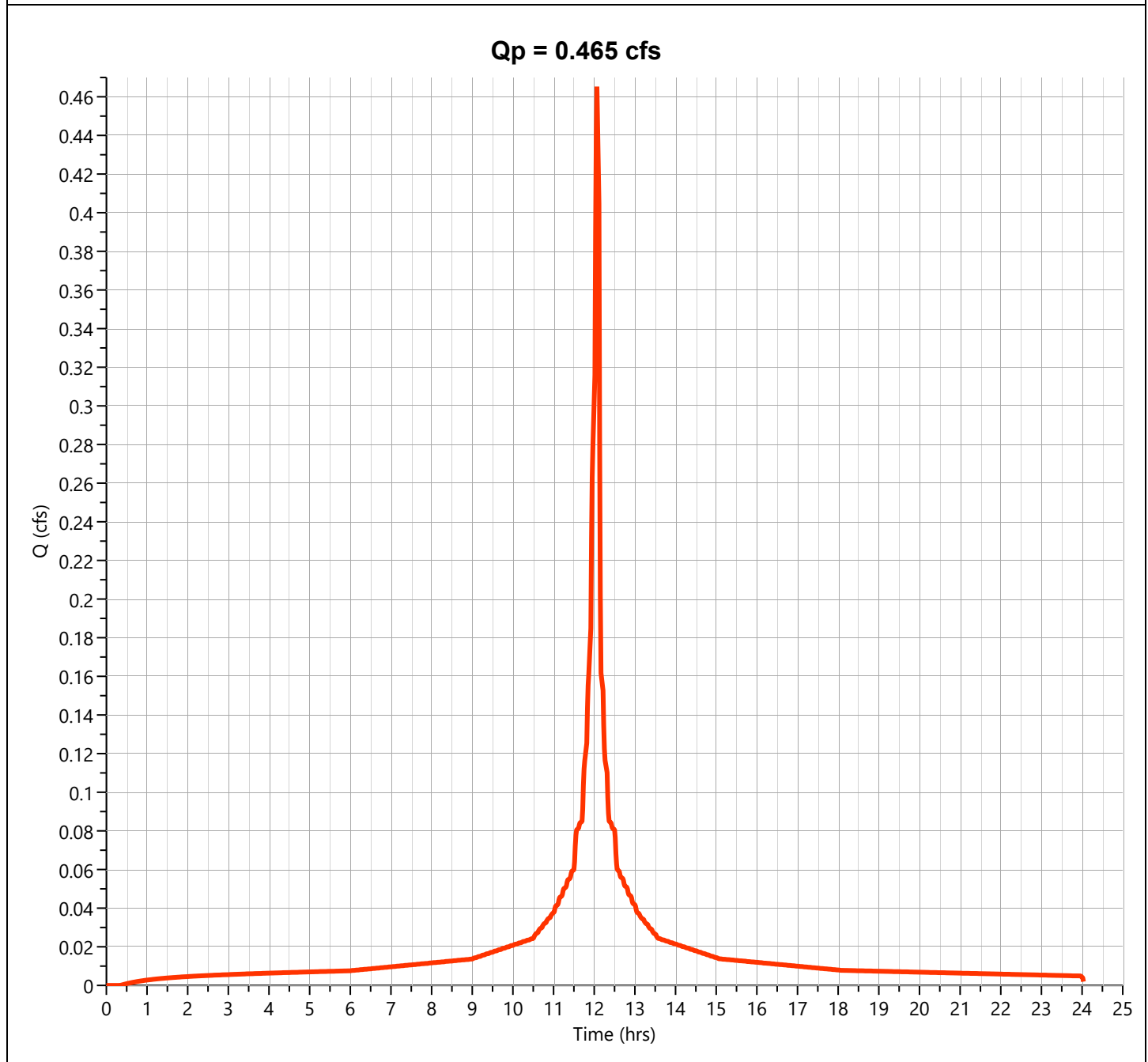
File: Future Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

## PR-1E Impervious

## Hyd. No. 23

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.465 cfs  |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 1,573 cuft |
| Drainage Area   | = 0.04 ac     | Curve Number       | = 98.00      |
| Tc Method       | = User        | Time of Conc. (Tc) | = 3.0 min    |
| Total Rainfall  | = 11.80 in    | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |





# Hydrograph Report

Hydrology Studio v 3.0.0.38

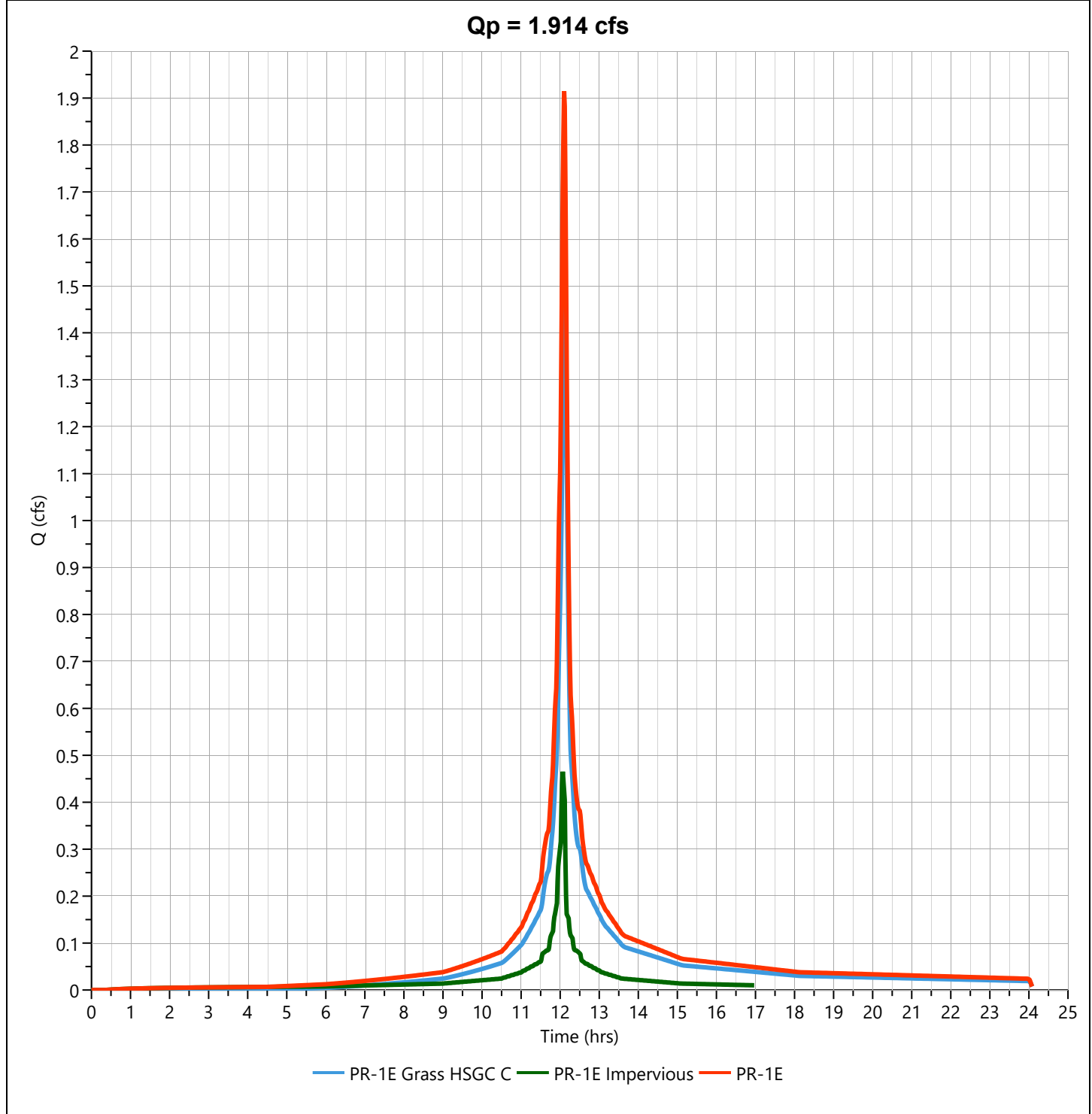
File: Future Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

## PR-1E

## Hyd. No. 24

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 1.914 cfs  |
| Storm Frequency    | = 100-yr   | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 6,306 cuft |
| Inflow Hydrographs | = 22, 23   | Total Contrib. Area | = 0.19 ac    |



## **COMBINED PROPOSED FLOW TO POA-1**

# Hydrograph Report

Hydrology Studio v 3.0.0.38

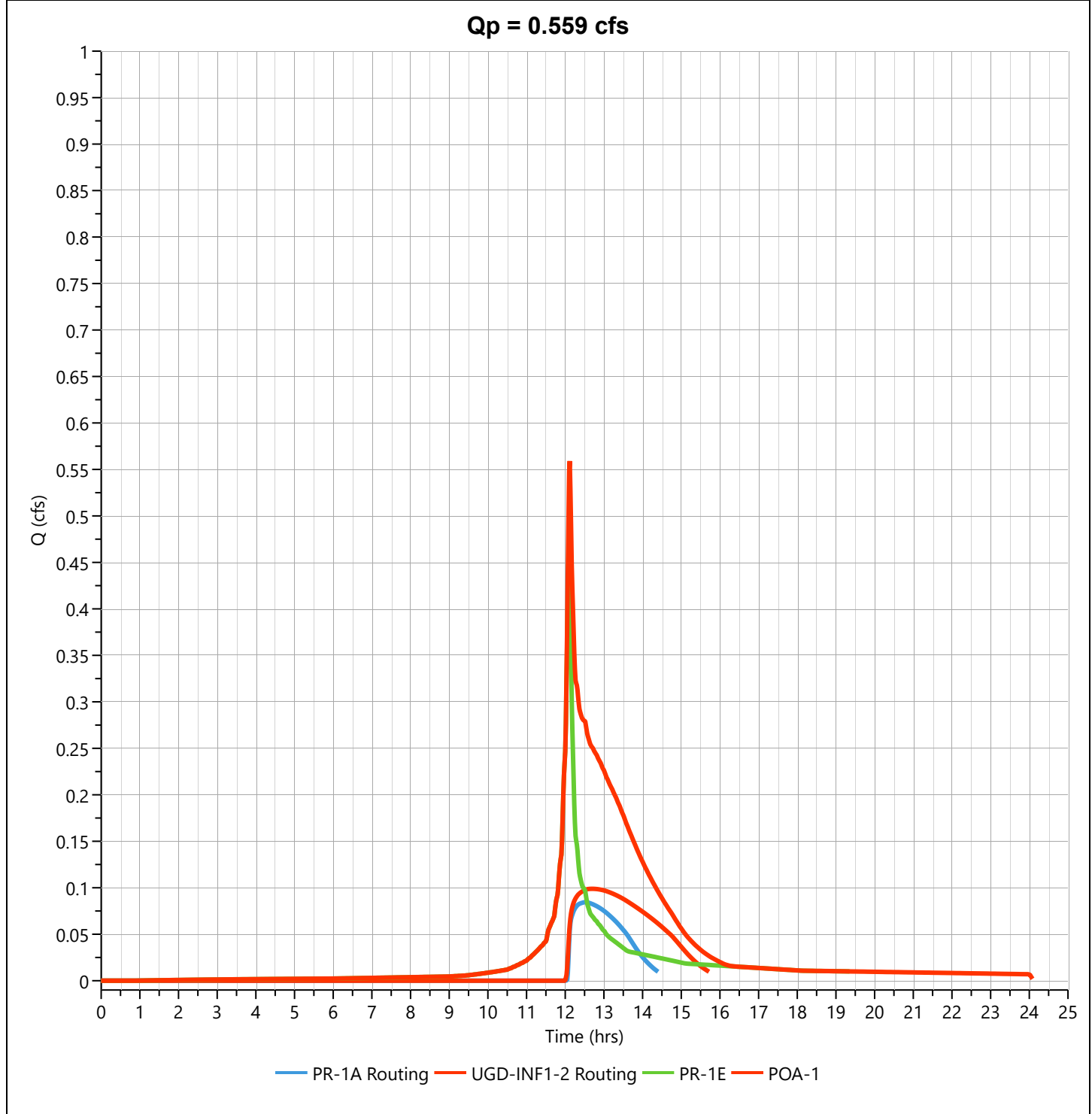
File: Future Beacon Church Proposed - POA-1 & POA-3.hys

07-01-2025

## POA-1

## Hyd. No. 26

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.559 cfs  |
| Storm Frequency    | = 2-yr     | Time to Peak        | = 12.12 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 2,849 cuft |
| Inflow Hydrographs |            | Total Contrib. Area | = 0.0 ac     |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

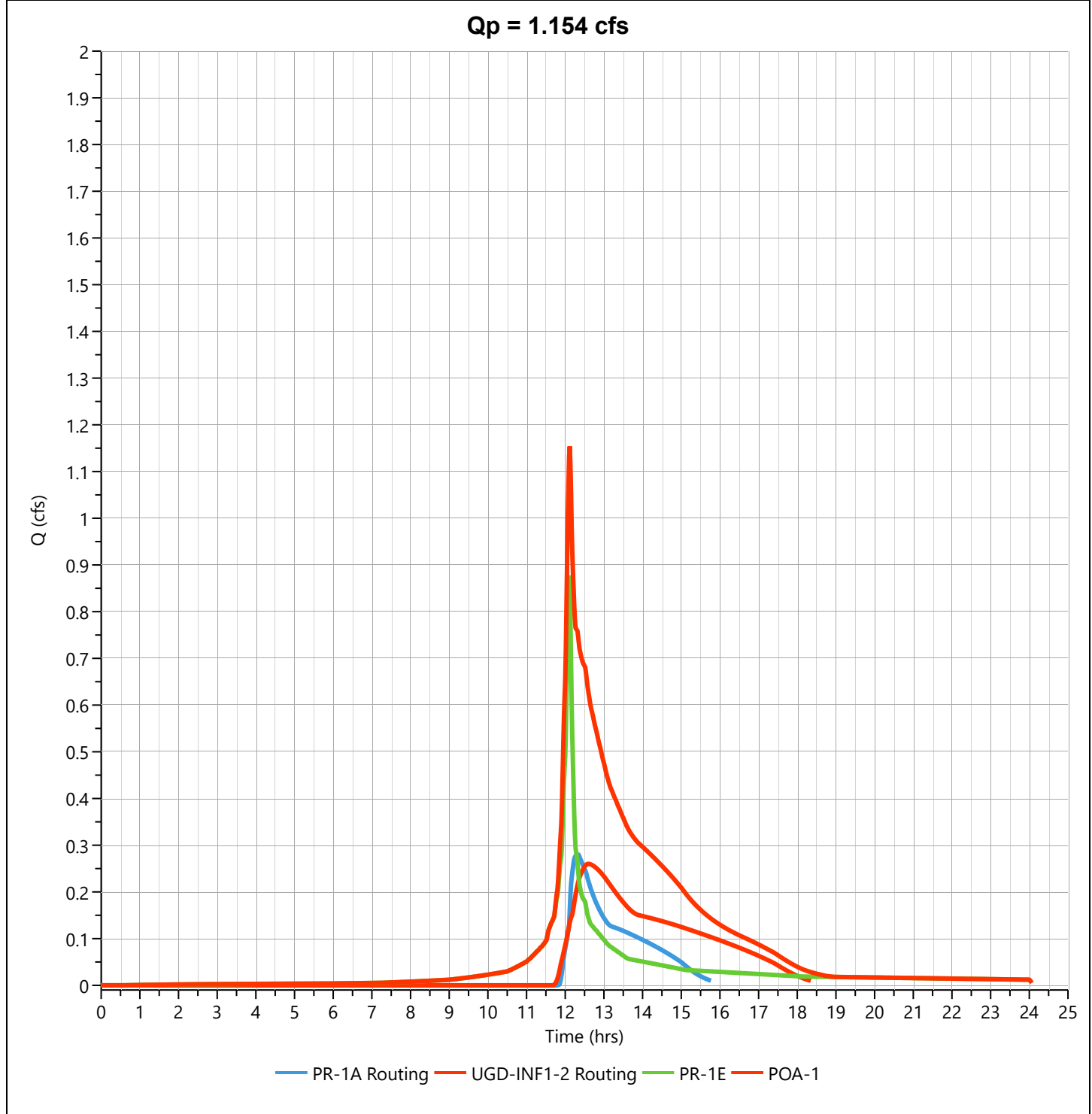
File: Future Beacon Church Proposed - POA-1 & POA-3.hys

07-01-2025

## POA-1

## Hyd. No. 26

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 1.154 cfs  |
| Storm Frequency    | = 10-yr    | Time to Peak        | = 12.12 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 7,201 cuft |
| Inflow Hydrographs |            | Total Contrib. Area | = 0.0 ac     |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

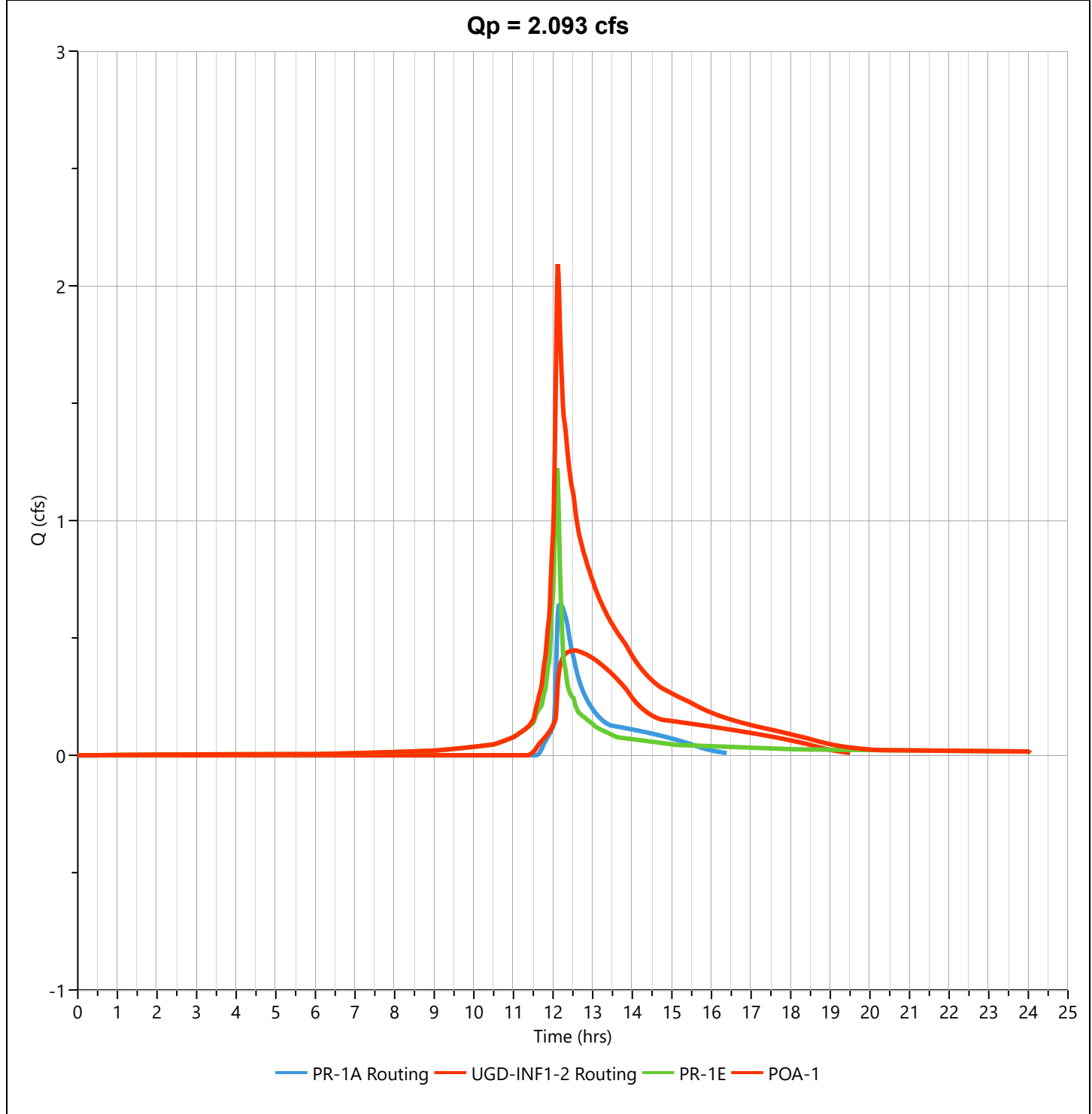
File: Future Beacon Church Proposed - POA-1 & POA-3.hys

07-01-2025

## POA-1

## Hyd. No. 26

|                    |            |                     |               |
|--------------------|------------|---------------------|---------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 2.093 cfs   |
| Storm Frequency    | = 25-yr    | Time to Peak        | = 12.12 hrs   |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 11,276 cuft |
| Inflow Hydrographs |            | Total Contrib. Area | = 0.0 ac      |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

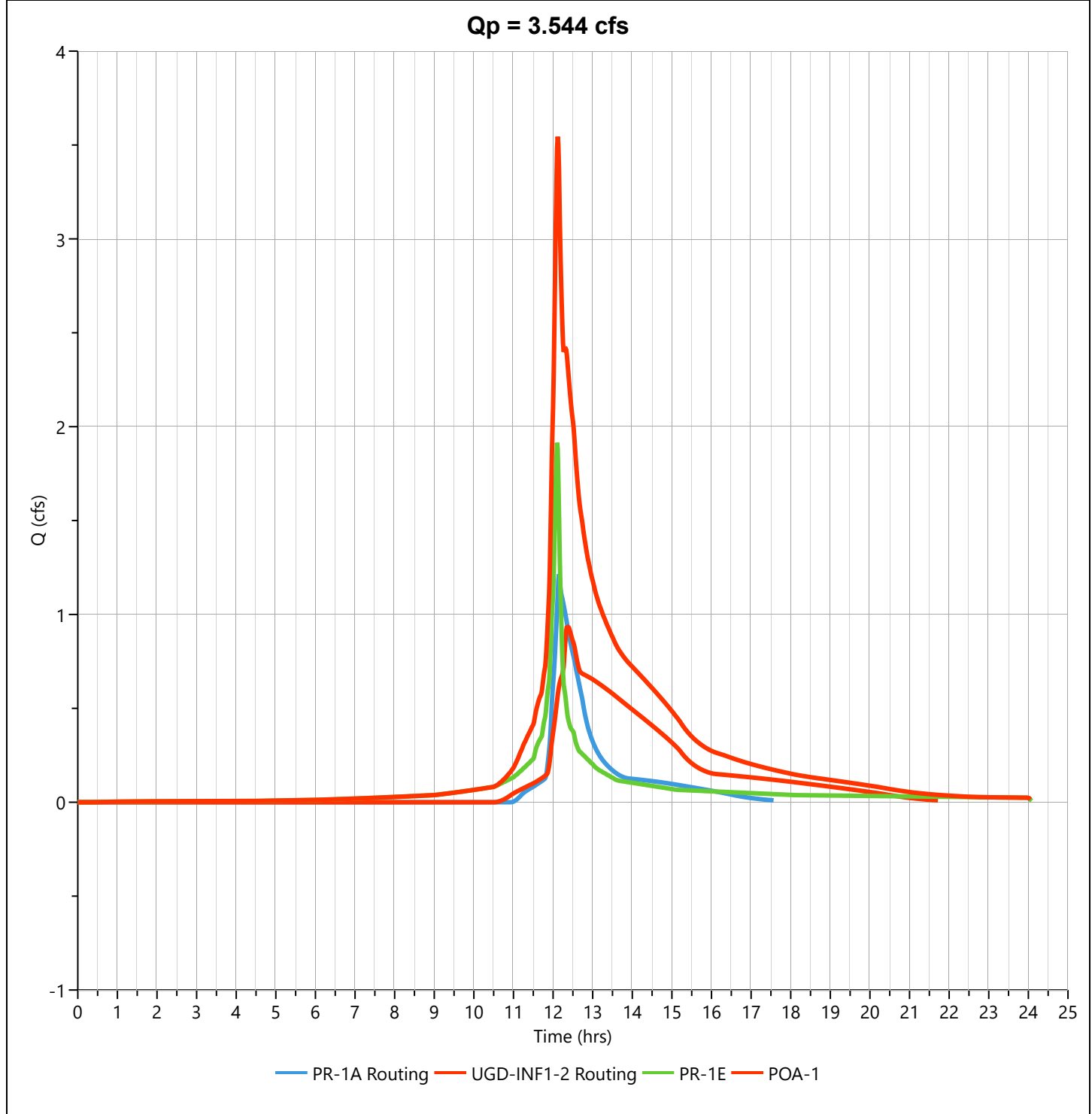
File: Future Beacon Church Proposed - POA-1 & POA-3.hys

07-01-2025

## POA-1

## Hyd. No. 26

|                    |            |                     |               |
|--------------------|------------|---------------------|---------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 3.544 cfs   |
| Storm Frequency    | = 100-yr   | Time to Peak        | = 12.12 hrs   |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 20,073 cuft |
| Inflow Hydrographs |            | Total Contrib. Area | = 0.0 ac      |



## **PR-2A WATERSHED**

Project: Beacon Unitarian Universalist Church

By: TEG

Date: 2/6/2024

Location: Summit, NJ

Checked By: MJV

Date Checked: 2/6/2024

Circle One: Present Developed

Future Proposed Watershed PR-2A - Impervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Design Flow Length, L<sub>des</sub> (Total L<sub>des</sub> < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. McCuen-Spiess Limit, L<sub>mcs</sub> (max. 100 ft)
7. Compute T<sub>t</sub>

$$L_{mcs} = (100 s^{0.5})/n$$

$$T_t = \frac{0.007 (n L_{des})^{0.8}}{P_2^{0.5} s^{0.4}}$$

|            |                        |   |  |
|------------|------------------------|---|--|
| Segment ID | 1                      |   |  |
|            | <b>Smooth Surfaces</b> |   |  |
|            | <b>0.011</b>           |   |  |
| ft         | <b>30</b>              |   |  |
| in         | <b>4.12</b>            |   |  |
| ft/ft      | <b>0.026</b>           |   |  |
| ft         | <b>100</b>             |   |  |
| hr         | <b>0.006</b>           | + |  |

Sheet Flow Sub-Total **0.006 hours**

**Shallow Concentrated Flow**

8. Surface Description
9. Flow Length, L
10. Watercourse Slope, s
11. Average Velocity, V (NEH table 15-3)
12. Compute T<sub>t</sub>

$$T_t = \frac{L}{3600 V}$$

|            |  |   |  |
|------------|--|---|--|
| Segment ID |  |   |  |
| ft         |  |   |  |
| ft/ft      |  |   |  |
| ft/s       |  |   |  |
| hr         |  | + |  |

Shallow Conc. Flow Sub-Total **0.000 hours**

**Channel Flow**

13. Flow Length, L
14. Cross Sectional flow area, a
15. Wetted Perimeter, P<sub>w</sub>
16. Hydraulic Radius, r
17. Channel Slope, s
18. Manning's Roughness Coeff., n
19. Velocity, V
20. Compute T<sub>t</sub>

$$r = a / P_w$$

$$V = (1.49 r^{2/3} s^{1/2}) / n$$

$$T_t = \frac{L}{3600 V}$$

|                 |  |   |  |
|-----------------|--|---|--|
| Segment ID      |  |   |  |
| ft              |  |   |  |
| ft <sup>2</sup> |  |   |  |
| ft              |  |   |  |
| ft              |  |   |  |
| ft/ft           |  |   |  |
| ft/s            |  |   |  |
| hr              |  | + |  |

Channel Flow Sub-Total **0.000 hours**

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>  
(Add Sub-Total T<sub>t</sub> from prior steps)

|   |                    |
|---|--------------------|
| Total T <sub>c</sub> (hours) =                        | <b>0.006 hours</b> |
| Software Limitations Require Minimum T <sub>c</sub> = | <b>2 minutes</b>   |



Project: Beacon Unitarian Universalist Church

By: TEG

Date: 2/6/2024

Location: Summit, NJ

Checked By: MJV

Date Checked: 2/6/2024

Circle One: Present Developed

Future Proposed Watershed PR-2A - Pervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Design Flow Length, L<sub>des</sub> (Total L<sub>des</sub> < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. McCuen-Spiess Limit, L<sub>mcs</sub> (max. 100 ft)
7. Compute T<sub>t</sub>

$$L_{mcs} = (100 s^{0.5})/n$$

$$T_t = \frac{0.007 (n L_{des})^{0.8}}{P_2^{0.5} s^{0.4}}$$

| Segment ID | 1                    | 2                      |   |
|------------|----------------------|------------------------|---|
|            | <b>Dense Grasses</b> | <b>Smooth Surfaces</b> |   |
|            | <b>0.24</b>          | <b>0.011</b>           |   |
| ft         | <b>19</b>            | <b>31</b>              |   |
| in         | <b>4.12</b>          | <b>4.12</b>            |   |
| ft/ft      | <b>0.022</b>         | <b>0.028</b>           |   |
| ft         | <b>61</b>            | <b>100</b>             |   |
| hr         | <b>0.055</b>         | <b>0.006</b>           | + |

Sheet Flow Sub-Total **0.061 hours**

**Shallow Concentrated Flow**

8. Surface Description
9. Flow Length, L
10. Watercourse Slope, s
11. Average Velocity, V (NEH table 15-3)
12. Compute T<sub>t</sub>

$$T_t = \frac{L}{3600 V}$$

| Segment ID |  |  |   |
|------------|--|--|---|
| ft         |  |  |   |
| ft/ft      |  |  |   |
| ft/s       |  |  |   |
| hr         |  |  | + |

Shallow Conc. Flow Sub-Total **0.000 hours**

**Channel Flow**

13. Flow Length, L
14. Cross Sectional flow area, a
15. Wetted Perimeter, P<sub>w</sub>
16. Hydraulic Radius, r
17. Channel Slope, s
18. Manning's Roughness Coeff., n
19. Velocity, V
20. Compute T<sub>t</sub>

$$r = a / P_w$$

$$V = (1.49 r^{2/3} s^{1/2}) / n$$

$$T_t = \frac{L}{3600 V}$$

| Segment ID      |  |  |   |
|-----------------|--|--|---|
| ft              |  |  |   |
| ft <sup>2</sup> |  |  |   |
| ft              |  |  |   |
| ft              |  |  |   |
| ft/ft           |  |  |   |
| ft/s            |  |  |   |
| hr              |  |  | + |

Channel Flow Sub-Total **0.000 hours**

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>

(Add Sub-Total T<sub>t</sub> from prior steps)

|                      |                    |
|----------------------|--------------------|
| Total Tc (hours) =   | <b>0.061 hours</b> |
| Total Tc (minutes) = | <b>4 minutes</b>   |

# Hydrograph Report

Hydrology Studio v 3.0.0.38

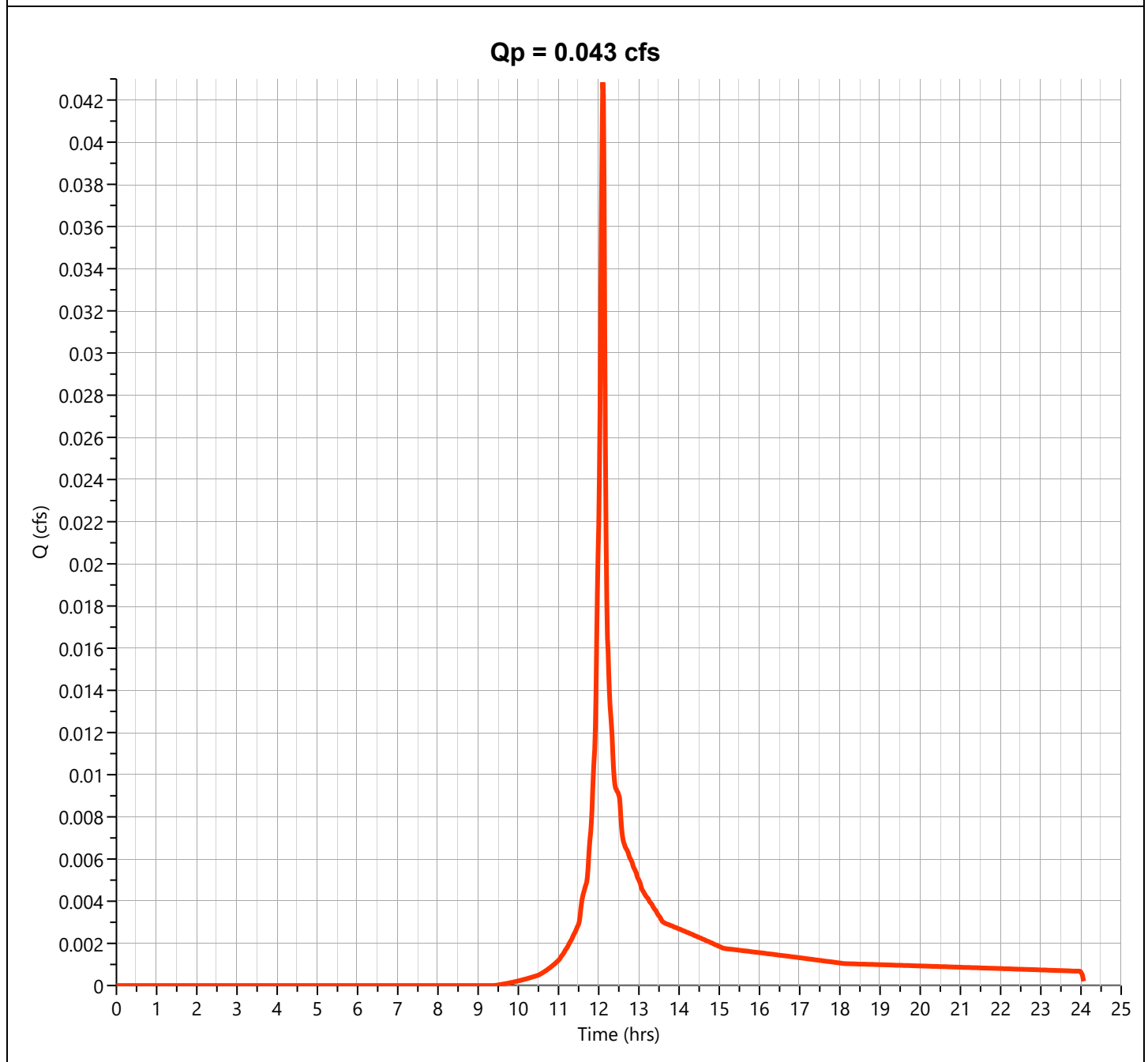
File: Future Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2A Grass HSGC C

Hyd. No. 1

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.043 cfs |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.10 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 122 cuft  |
| Drainage Area   | = 0.02 ac     | Curve Number       | = 74.00     |
| Tc Method       | = User        | Time of Conc. (Tc) | = 4.0 min   |
| Total Rainfall  | = 4.12 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

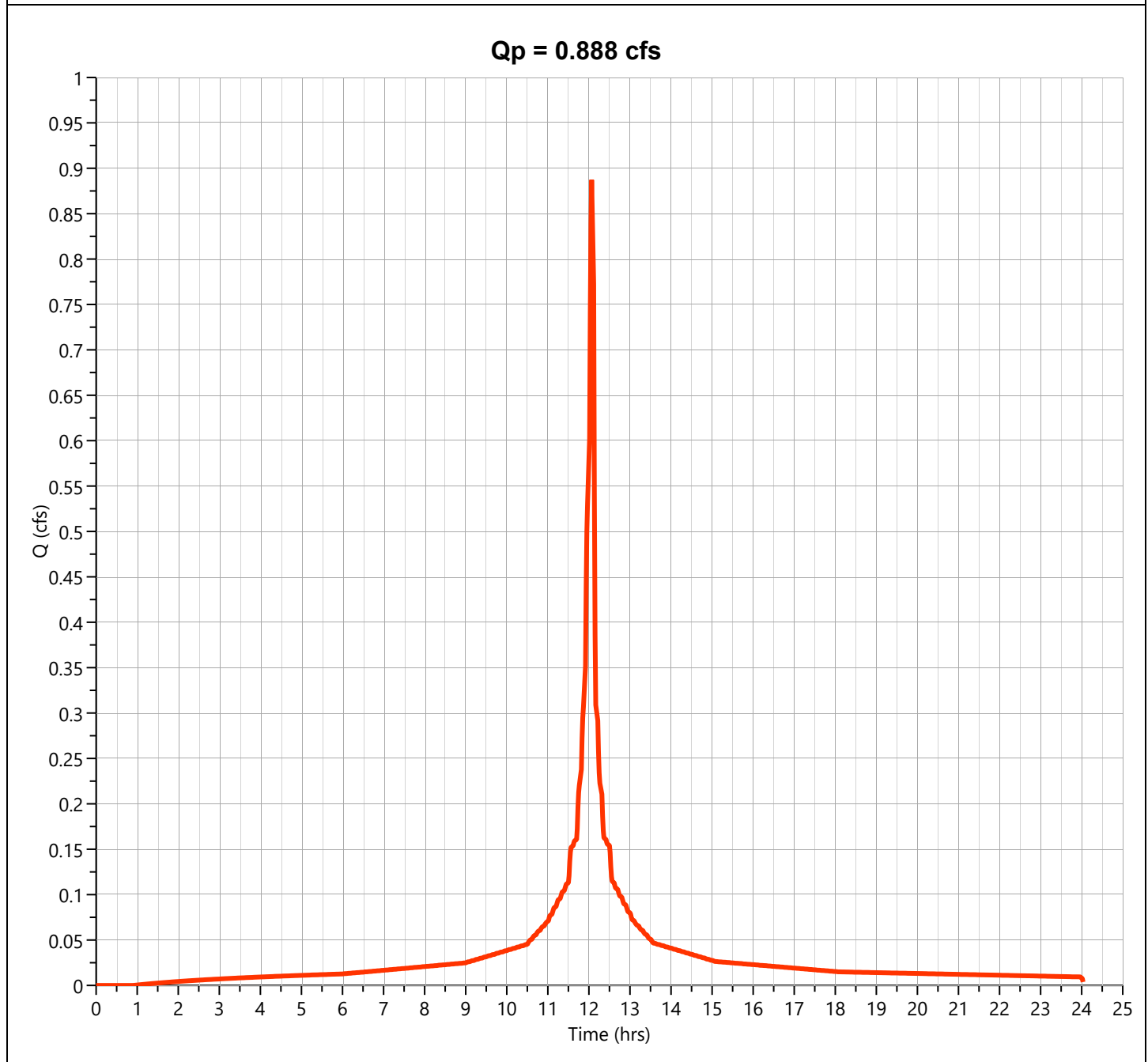
File: Future Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2A Impervious

## Hyd. No. 2

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.888 cfs  |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 2,909 cuft |
| Drainage Area   | = 0.22 ac     | Curve Number       | = 98.00      |
| Tc Method       | = User        | Time of Conc. (Tc) | = 2.0 min    |
| Total Rainfall  | = 4.12 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

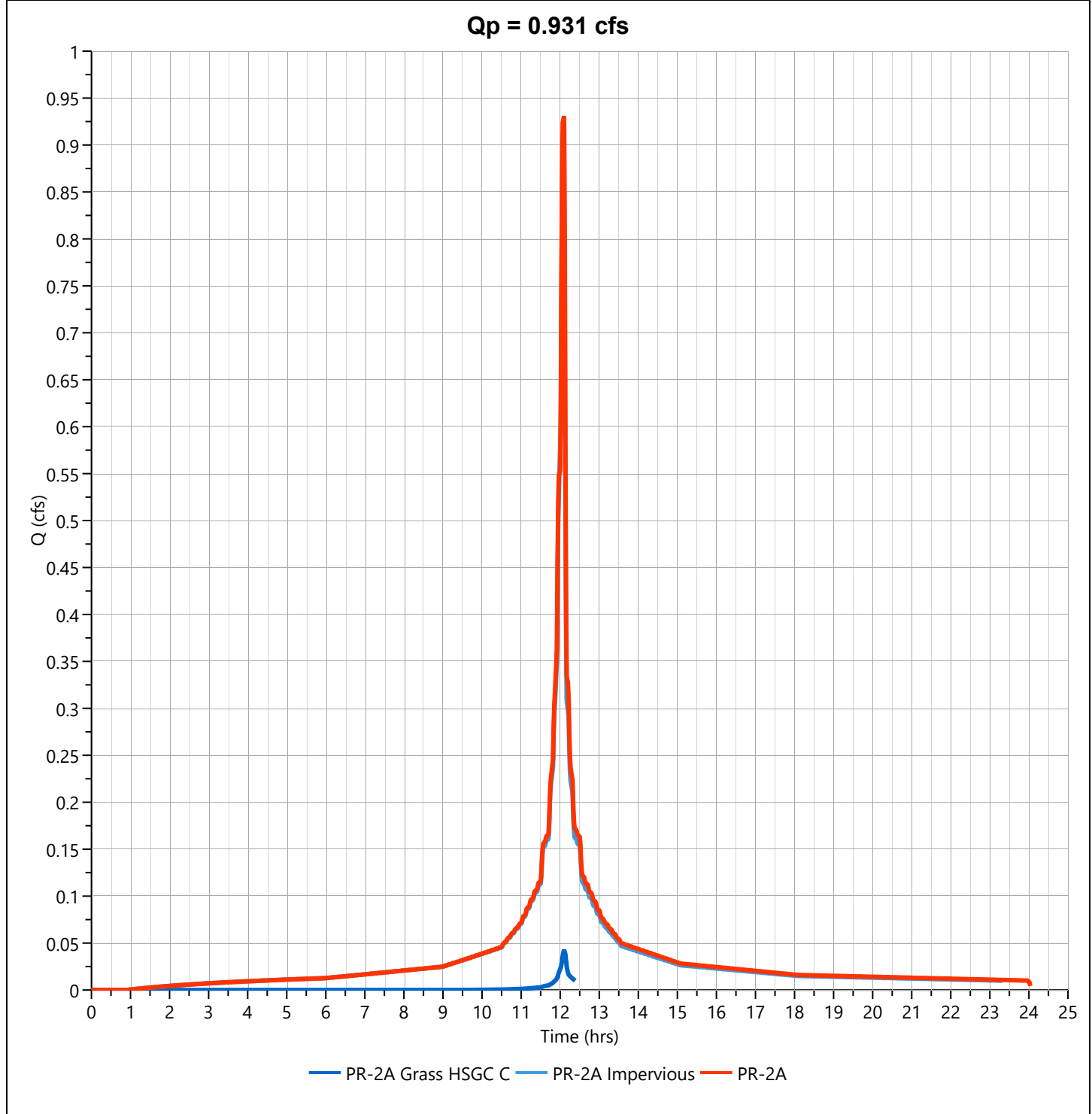
File: Future Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2A

## Hyd. No. 3

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.931 cfs  |
| Storm Frequency    | = 2-yr     | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 3,031 cuft |
| Inflow Hydrographs | = 1, 2     | Total Contrib. Area | = 0.24 ac    |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

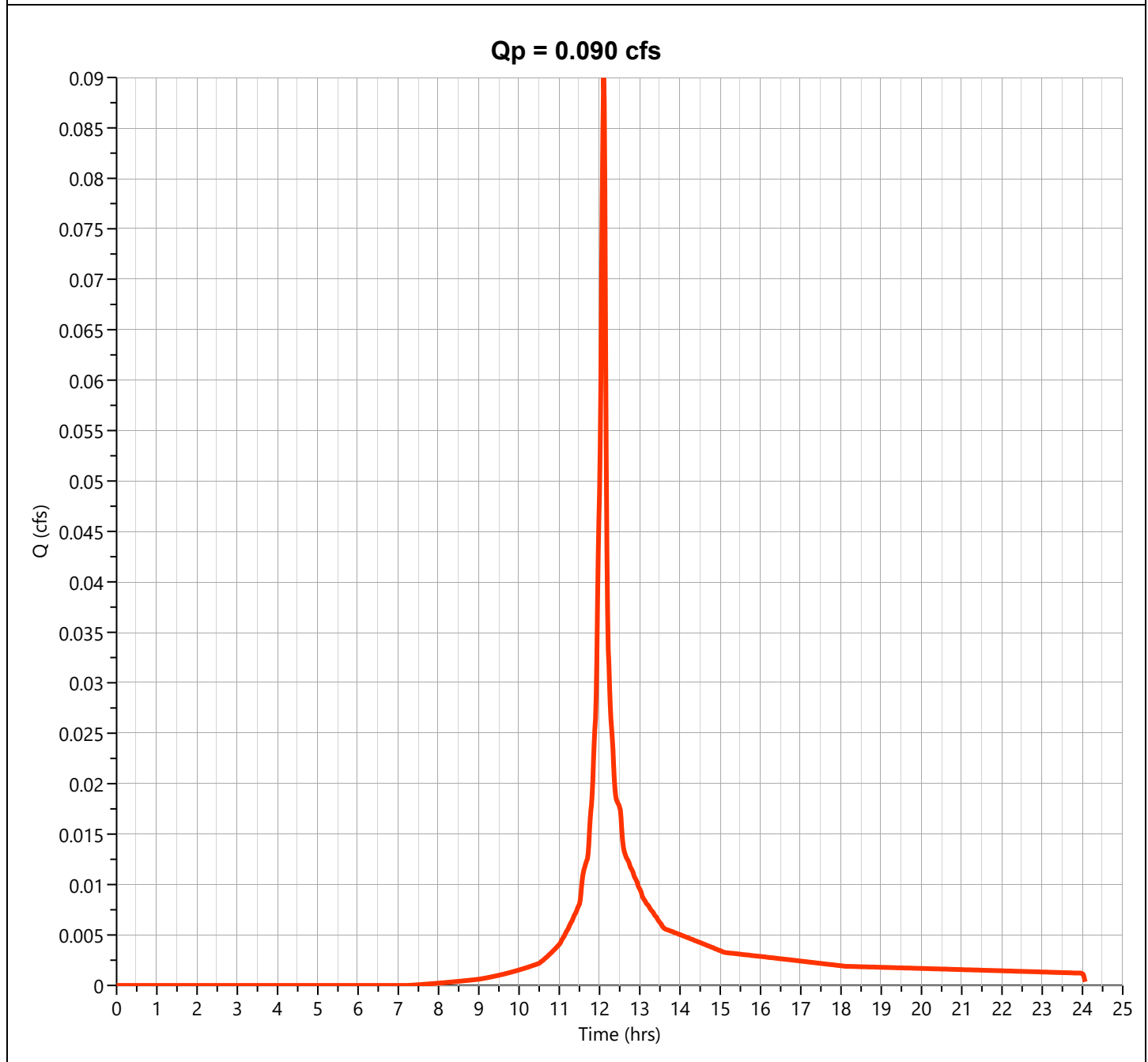
File: Future Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2A Grass HSGC C

## Hyd. No. 1

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.090 cfs |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.10 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 257 cuft  |
| Drainage Area   | = 0.02 ac     | Curve Number       | = 74.00     |
| Tc Method       | = User        | Time of Conc. (Tc) | = 4.0 min   |
| Total Rainfall  | = 6.42 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

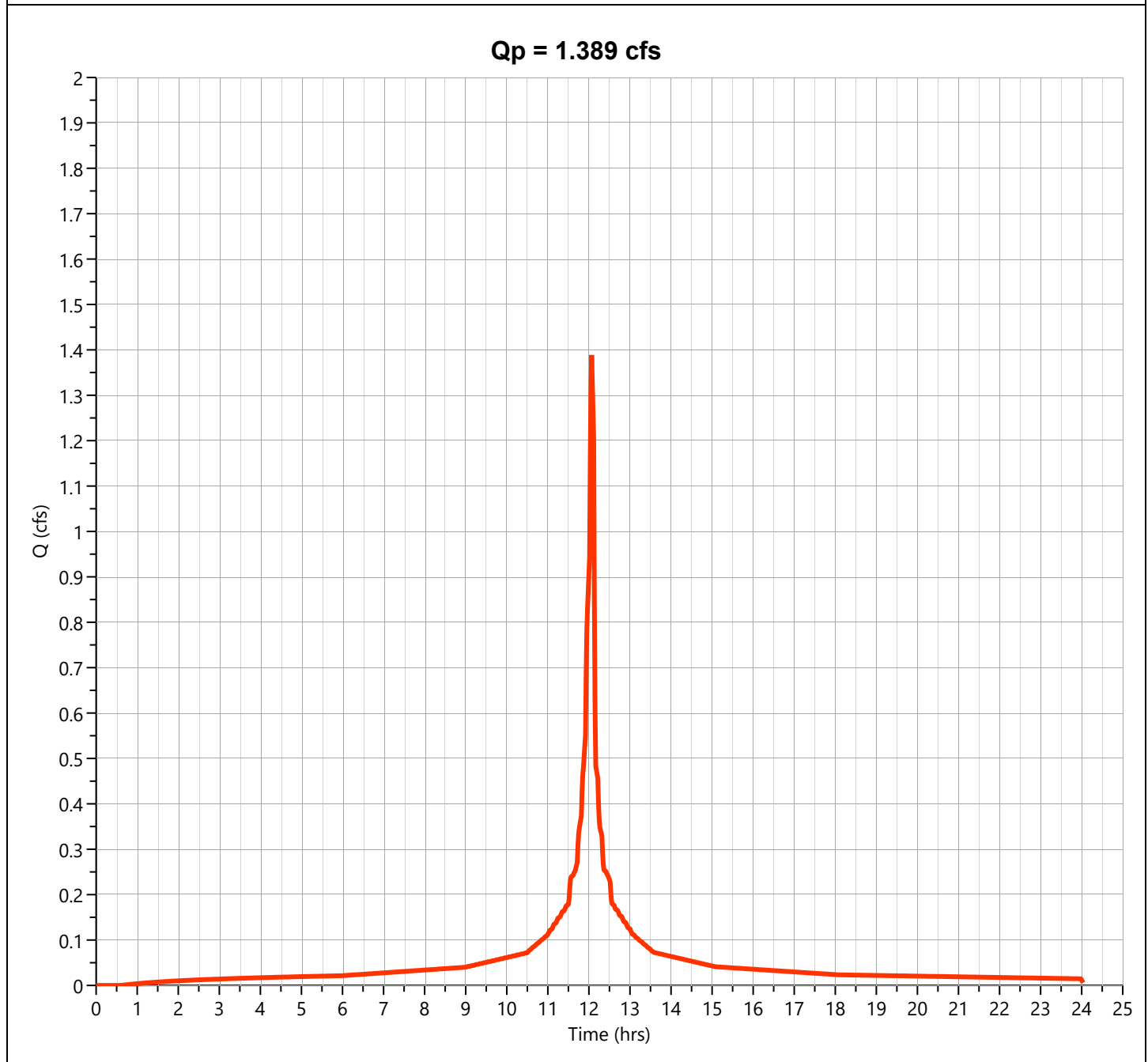
File: Future Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2A Impervious

## Hyd. No. 2

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 1.389 cfs  |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 4,628 cuft |
| Drainage Area   | = 0.22 ac     | Curve Number       | = 98.00      |
| Tc Method       | = User        | Time of Conc. (Tc) | = 2.0 min    |
| Total Rainfall  | = 6.42 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

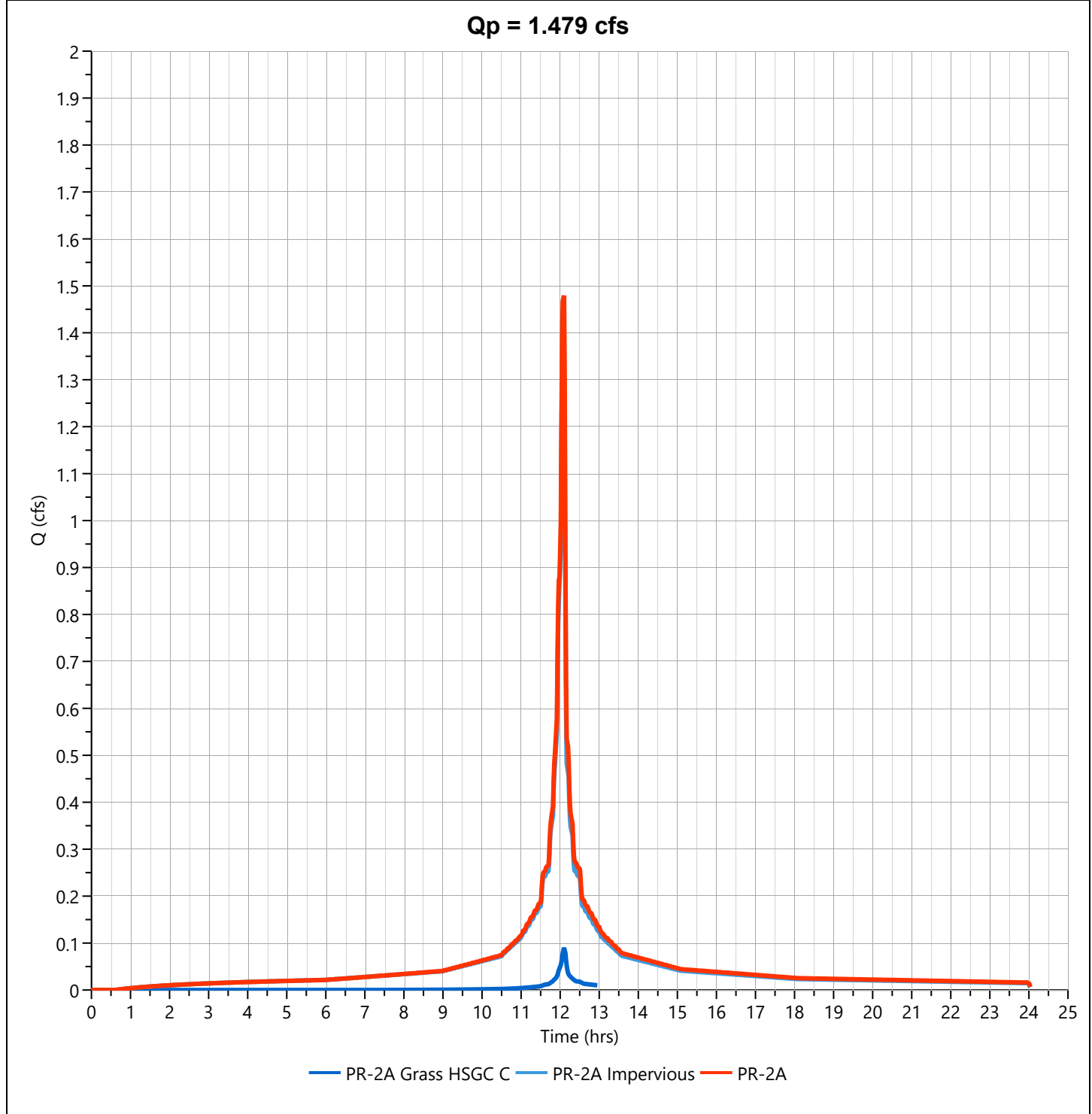
File: Future Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2A

## Hyd. No. 3

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 1.479 cfs  |
| Storm Frequency    | = 10-yr    | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 4,885 cuft |
| Inflow Hydrographs | = 1, 2     | Total Contrib. Area | = 0.24 ac    |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

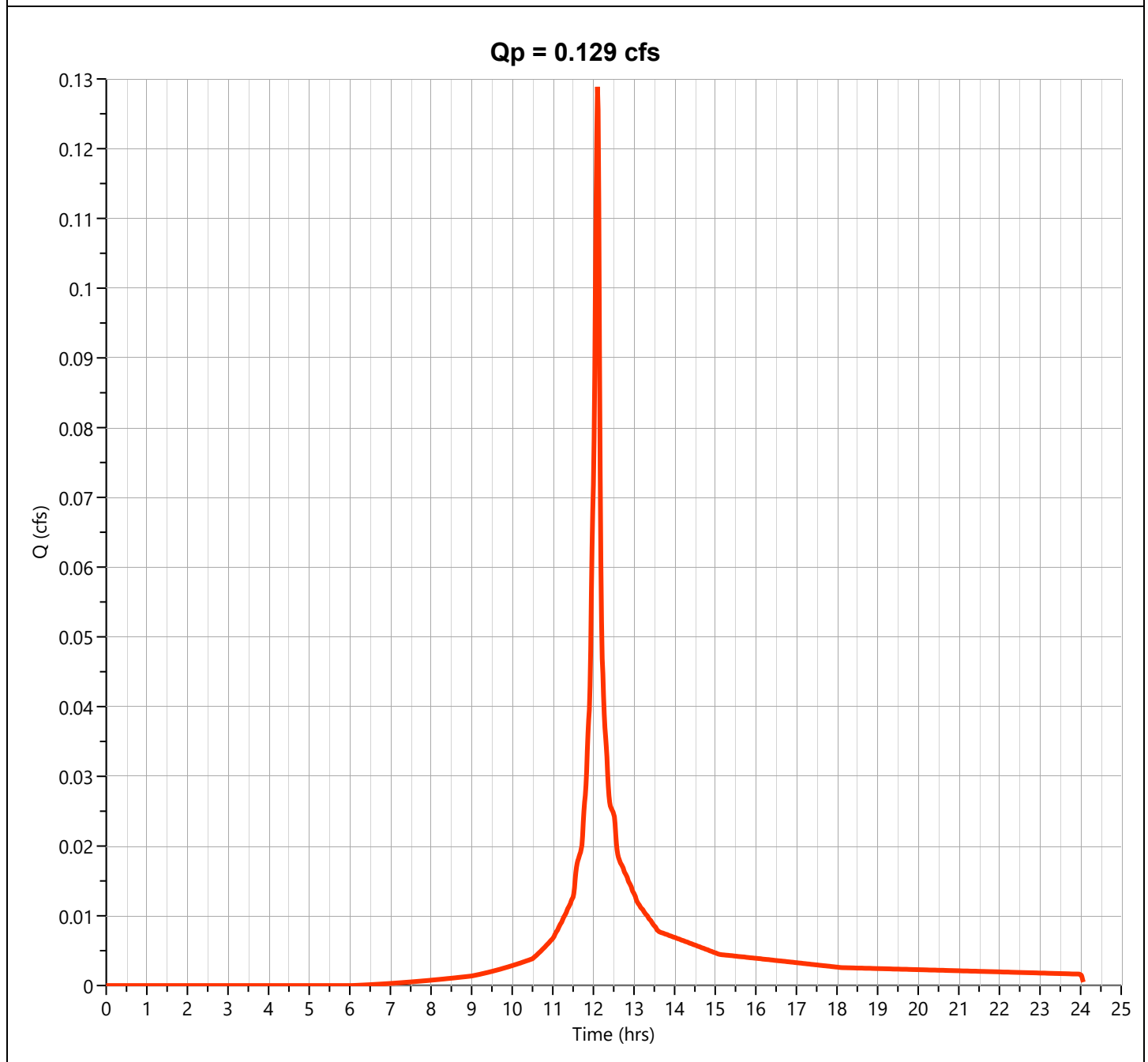
File: Future Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2A Grass HSGC C

Hyd. No. 1

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.129 cfs |
| Storm Frequency | = 25-yr       | Time to Peak       | = 12.10 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 373 cuft  |
| Drainage Area   | = 0.02 ac     | Curve Number       | = 74.00     |
| Tc Method       | = User        | Time of Conc. (Tc) | = 4.0 min   |
| Total Rainfall  | = 8.23 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |





# Hydrograph Report

Hydrology Studio v 3.0.0.38

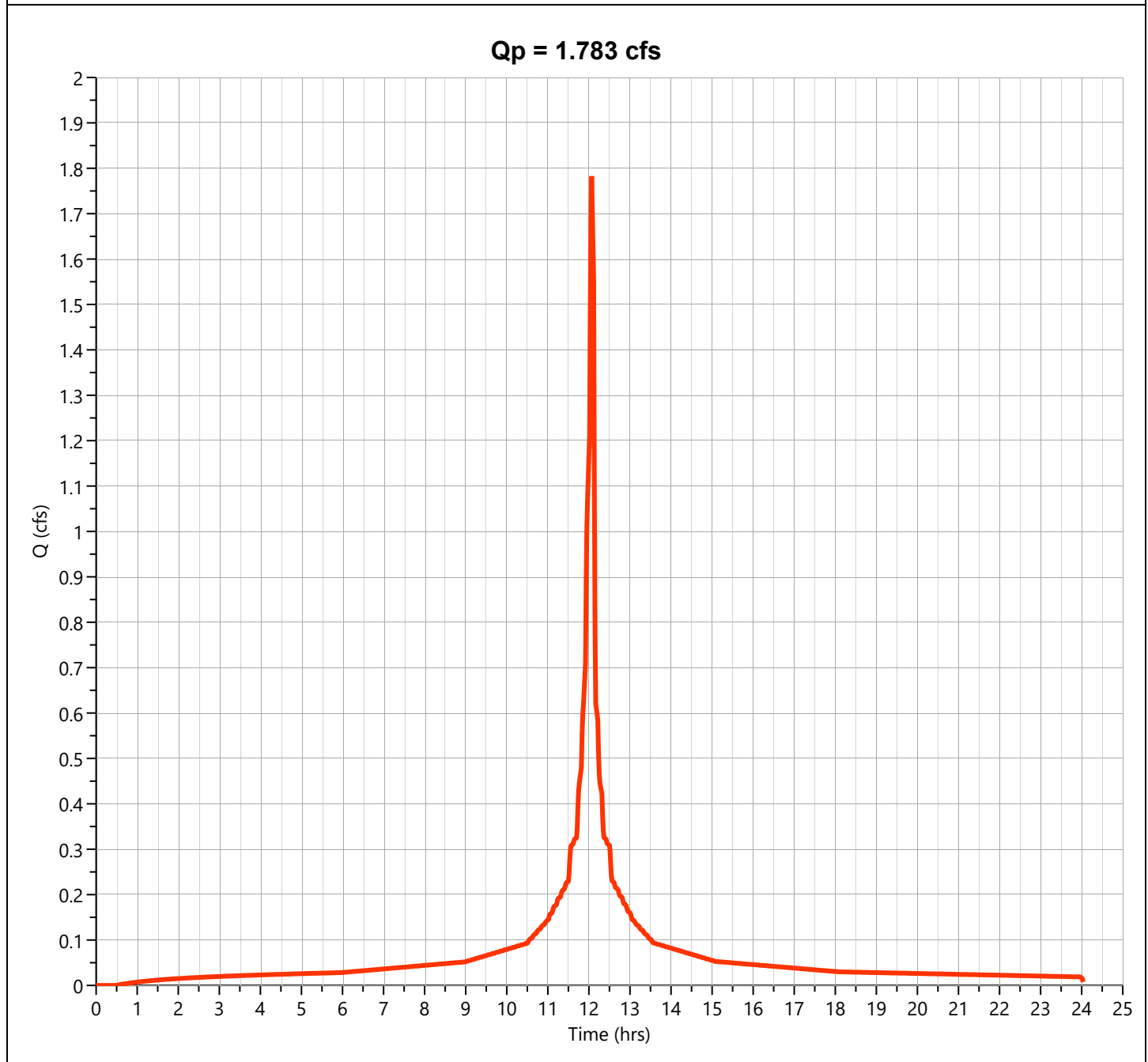
File: Future Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2A Impervious

## Hyd. No. 2

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 1.783 cfs  |
| Storm Frequency | = 25-yr       | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 5,982 cuft |
| Drainage Area   | = 0.22 ac     | Curve Number       | = 98.00      |
| Tc Method       | = User        | Time of Conc. (Tc) | = 2.0 min    |
| Total Rainfall  | = 8.23 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

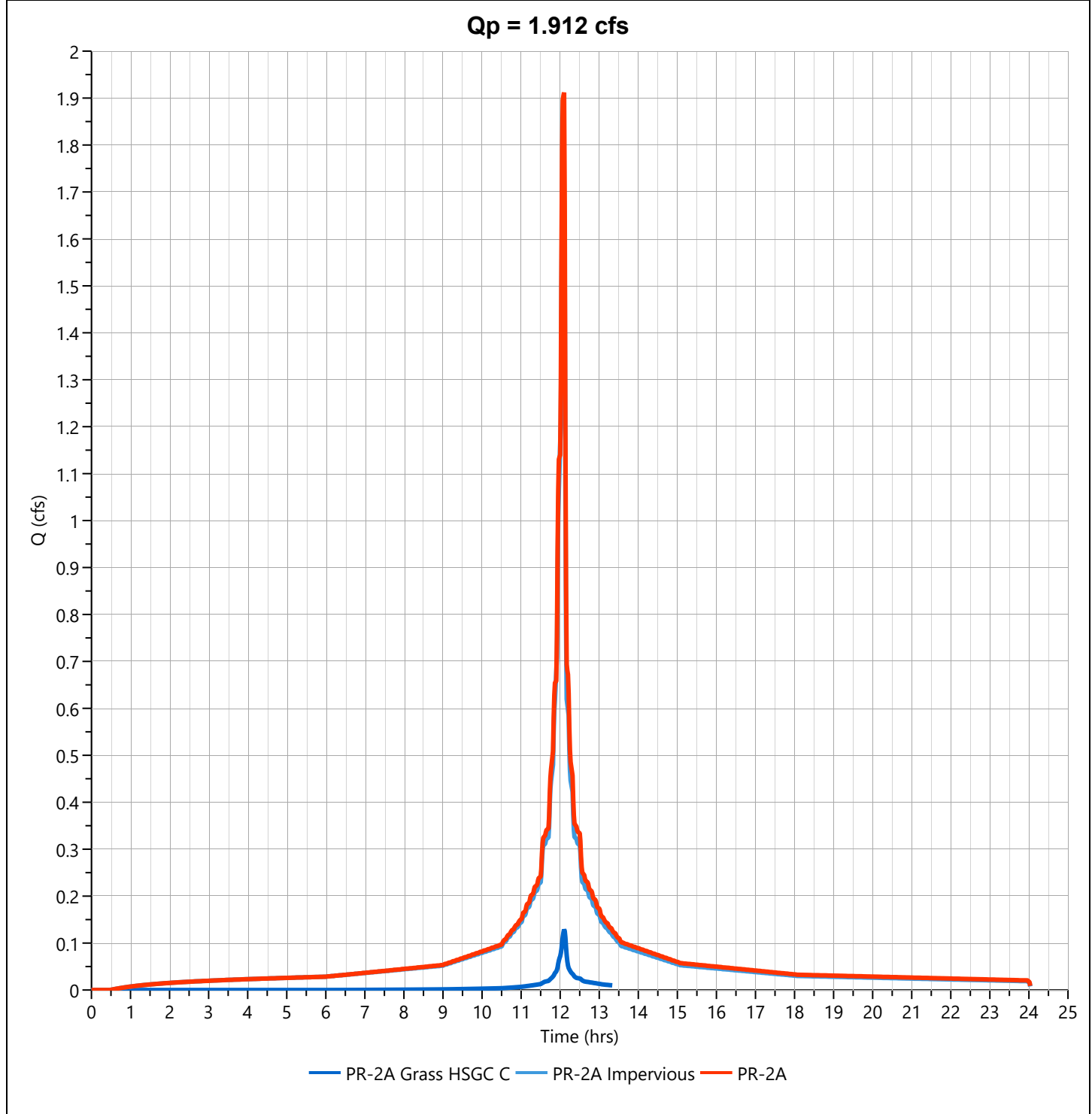
File: Future Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2A

## Hyd. No. 3

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 1.912 cfs  |
| Storm Frequency    | = 25-yr    | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 6,355 cuft |
| Inflow Hydrographs | = 1, 2     | Total Contrib. Area | = 0.24 ac    |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

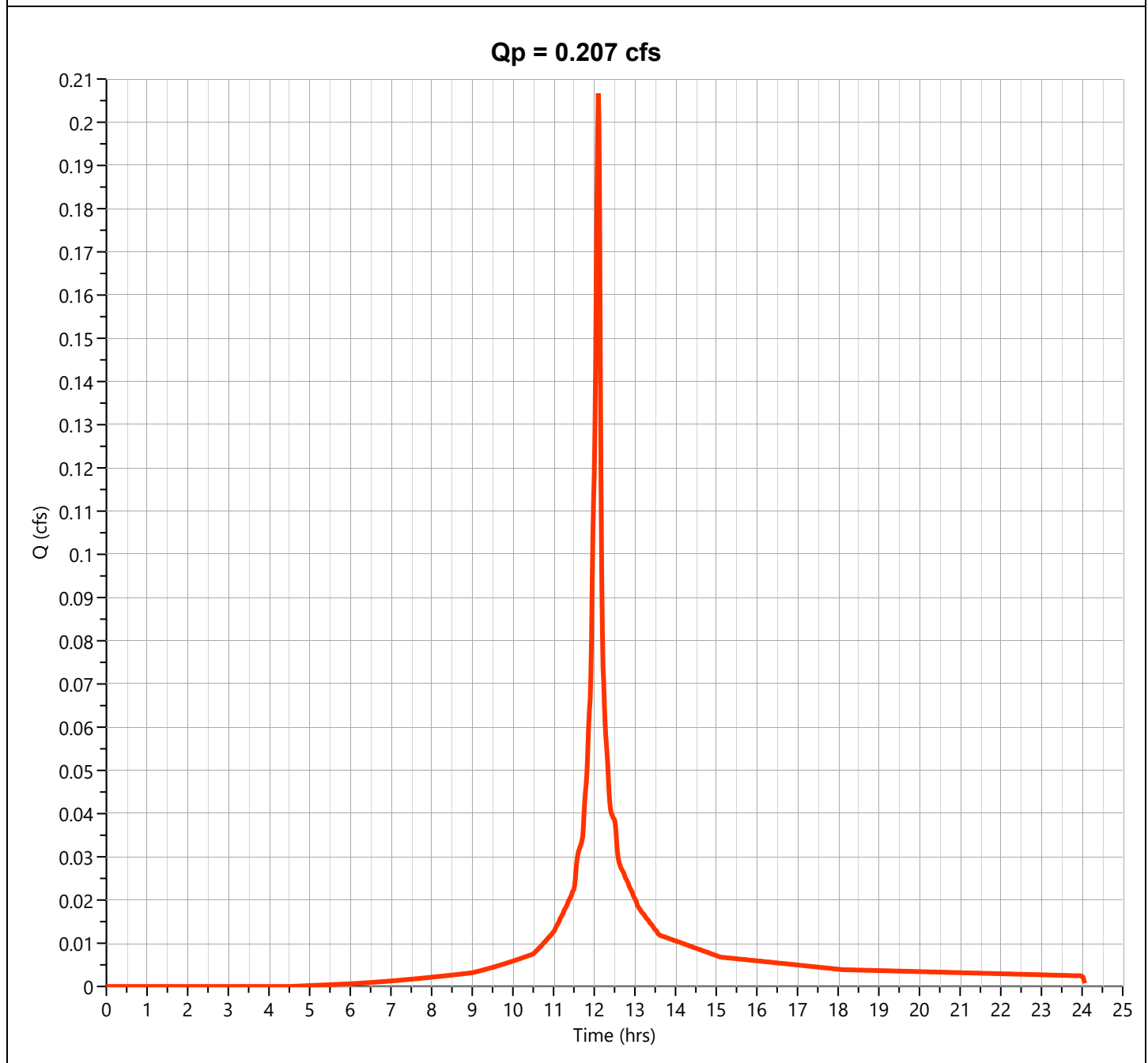
File: Future Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2A Grass HSGC C

Hyd. No. 1

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.207 cfs |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.10 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 612 cuft  |
| Drainage Area   | = 0.02 ac     | Curve Number       | = 74.00     |
| Tc Method       | = User        | Time of Conc. (Tc) | = 4.0 min   |
| Total Rainfall  | = 11.80 in    | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

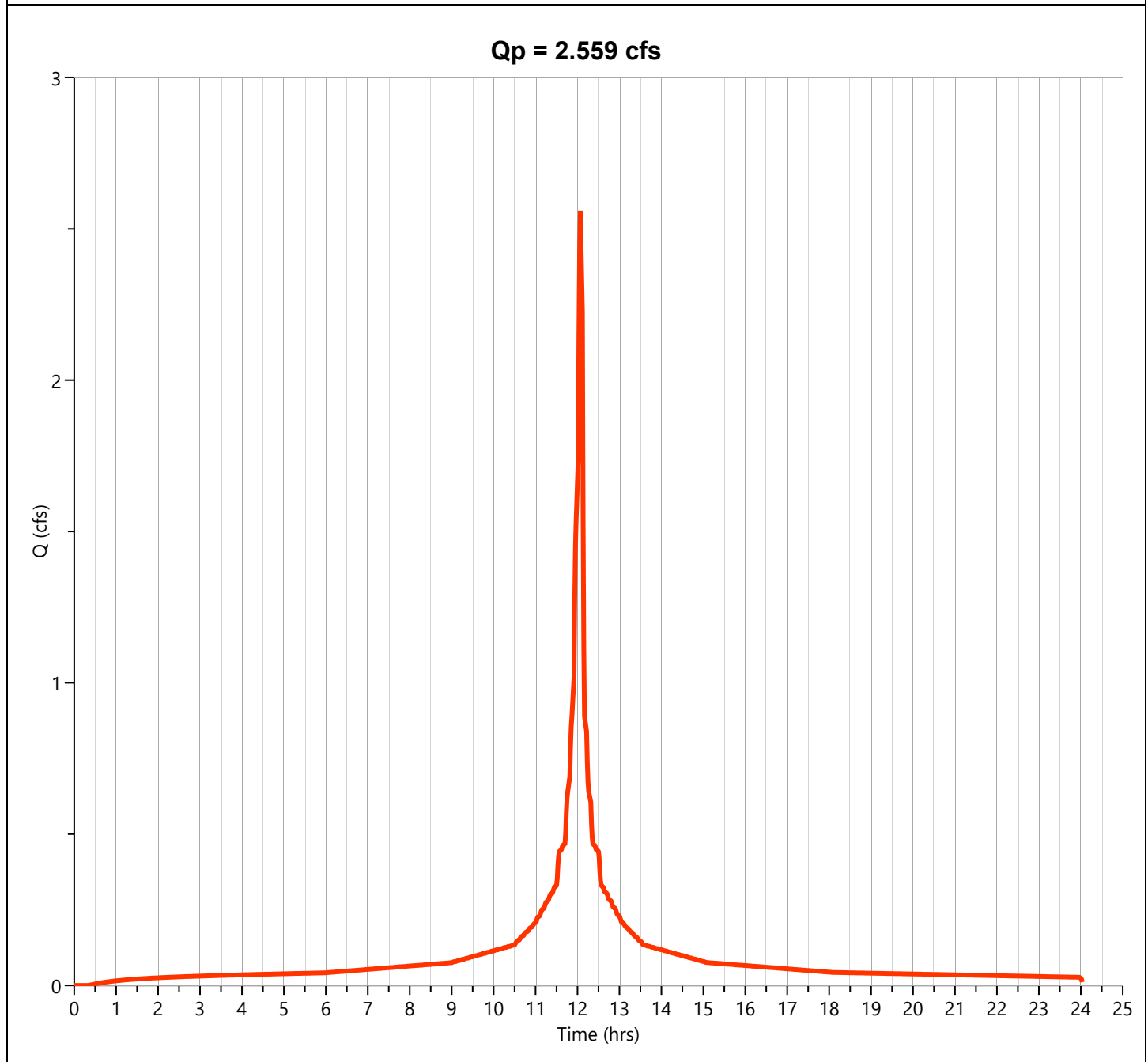
File: Future Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2A Impervious

## Hyd. No. 2

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 2.559 cfs  |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 8,654 cuft |
| Drainage Area   | = 0.22 ac     | Curve Number       | = 98.00      |
| Tc Method       | = User        | Time of Conc. (Tc) | = 2.0 min    |
| Total Rainfall  | = 11.80 in    | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

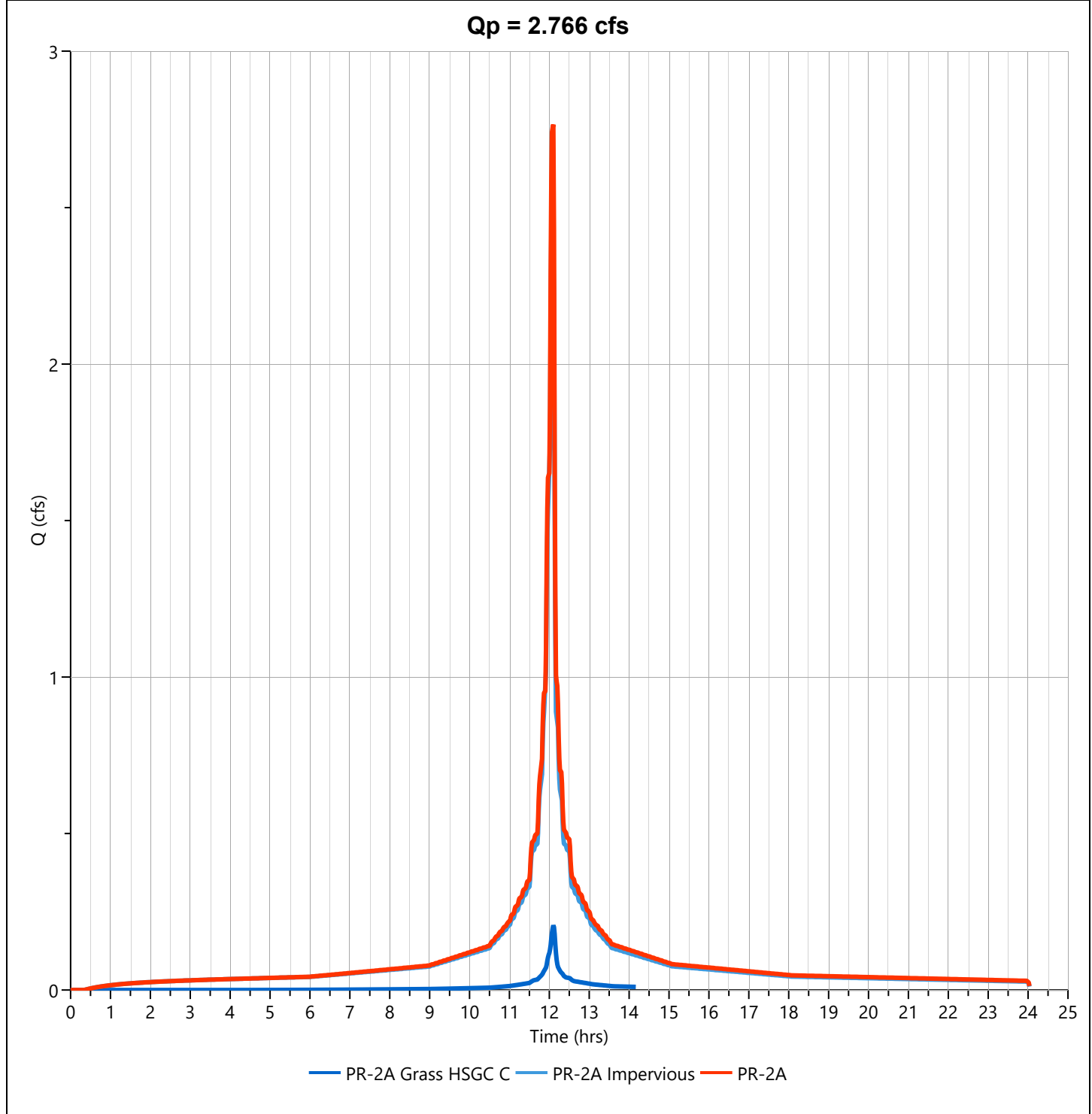
File: Future Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2A

## Hyd. No. 3

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 2.766 cfs  |
| Storm Frequency    | = 100-yr   | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 9,266 cuft |
| Inflow Hydrographs | = 1, 2     | Total Contrib. Area | = 0.24 ac    |



## **PR-2B WATERSHED**

Project: Beacon Unitarian Universalist Church

By: TEG

Date: 2/6/2024

Location: Summit, NJ

Checked By: MJV

Date Checked: 2/6/2024

Circle One: Present Developed

Future Proposed Watershed PR-2B - Impervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Design Flow Length, L<sub>des</sub> (Total L<sub>des</sub> < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. McCuen-Spiess Limit, L<sub>mcs</sub> (max. 100 ft)  $L_{mcs} = (100 s^{0.5})/n$
7. Compute T<sub>t</sub>  $T_t = \frac{0.007 (n L_{des})^{0.8}}{P_2^{0.5} s^{0.4}}$

|            |                        |   |  |
|------------|------------------------|---|--|
| Segment ID | <b>1</b>               |   |  |
|            | <b>Smooth Surfaces</b> |   |  |
|            | <b>0.011</b>           |   |  |
| ft         | <b>44</b>              |   |  |
| in         | <b>4.12</b>            |   |  |
| ft/ft      | <b>0.010</b>           |   |  |
| ft         | <b>100</b>             |   |  |
| hr         | <b>0.012</b>           | + |  |

Sheet Flow Sub-Total **0.012 hours**

**Shallow Concentrated Flow**

8. Surface Description
9. Flow Length, L
10. Watercourse Slope, s
11. Average Velocity, V (NEH table 15-3)
12. Compute T<sub>t</sub>  $T_t = \frac{L}{3600 V}$

|            |                          |   |  |
|------------|--------------------------|---|--|
| Segment ID | <b>2</b>                 |   |  |
|            | <b>Grassed Waterways</b> |   |  |
| ft         | <b>53</b>                |   |  |
| ft/ft      | <b>0.010</b>             |   |  |
| ft/s       | <b>1.61</b>              |   |  |
| hr         | <b>0.009</b>             | + |  |

Shallow Conc. Flow Sub-Total **0.009 hours**

**Channel Flow**

13. Flow Length, L
14. Cross Sectional flow area, a
15. Wetted Perimeter, P<sub>w</sub>
16. Hydraulic Radius, r  $r = a / P_w$
17. Channel Slope, s
18. Manning's Roughness Coeff., n
19. Velocity, V  $V = (1.49 r^{2/3} s^{1/2}) / n$
20. Compute T<sub>t</sub>  $T_t = \frac{L}{3600 V}$

|                 |              |   |  |
|-----------------|--------------|---|--|
| Segment ID      | <b>3</b>     |   |  |
| ft              | <b>40</b>    |   |  |
| ft <sup>2</sup> | <b>0.61</b>  |   |  |
| ft              | <b>2.00</b>  |   |  |
| ft              | <b>0.31</b>  |   |  |
| ft/ft           | <b>0.005</b> |   |  |
|                 | <b>0.012</b> |   |  |
| ft/s            | <b>3.98</b>  |   |  |
| hr              | <b>0.003</b> | + |  |

Channel Flow Sub-Total **0.003 hours**

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>

(Add Sub-Total T<sub>t</sub> from prior steps)

|   |                    |
|---|--------------------|
| Total T <sub>c</sub> (hours) =                        | <b>0.024 hours</b> |
| Software Limitations Require Minimum T <sub>c</sub> = | <b>2 minutes</b>   |

Project: Beacon Unitarian Universalist Church

By: TEG

Date: 2/6/2024

Location: Summit, NJ

Checked By: MJV

Date Checked: 2/6/2024

Circle One: Present Developed

Future Proposed Watershed PR-2B - Pervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Design Flow Length, L<sub>des</sub> (Total L<sub>des</sub> < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. McCuen-Spiess Limit, L<sub>mcs</sub> (max. 100 ft)
7. Compute T<sub>t</sub>

$$L_{mcs} = (100 s^{0.5})/n$$

$$T_t = \frac{0.007 (n L_{des})^{0.8}}{P_2^{0.5} s^{0.4}}$$

| Segment ID | 1                    | 2                      | 3                    |
|------------|----------------------|------------------------|----------------------|
|            | <b>Dense Grasses</b> | <b>Smooth Surfaces</b> | <b>Dense Grasses</b> |
|            | <b>0.24</b>          | <b>0.011</b>           | <b>0.24</b>          |
| ft         | <b>14</b>            | <b>17</b>              | <b>23</b>            |
| in         | <b>4.12</b>          | <b>4.12</b>            | <b>4.12</b>          |
| ft/ft      | <b>0.019</b>         | <b>0.011</b>           | <b>0.010</b>         |
| ft         | <b>58</b>            | <b>100</b>             | <b>41</b>            |
| hr         | <b>0.044</b>         | <b>0.005</b>           | <b>0.087</b>         |

Sheet Flow Sub-Total **0.136 hours**

**Shallow Concentrated Flow**

8. Surface Description
9. Flow Length, L
10. Watercourse Slope, s
11. Average Velocity, V (NEH table 15-3)
12. Compute T<sub>t</sub>

$$T_t = \frac{L}{3600 V}$$

| Segment ID | 4                        |  |  |
|------------|--------------------------|--|--|
|            | <b>Grassed Waterways</b> |  |  |
| ft         | <b>30</b>                |  |  |
| ft/ft      | <b>0.010</b>             |  |  |
| ft/s       | <b>1.64</b>              |  |  |
| hr         | <b>0.005</b>             |  |  |

Shallow Conc. Flow Sub-Total **0.005 hours**

**Channel Flow**

13. Flow Length, L
14. Cross Sectional flow area, a
15. Wetted Perimeter, P<sub>w</sub>
16. Hydraulic Radius, r
17. Channel Slope, s
18. Manning's Roughness Coeff., n
19. Velocity, V
20. Compute T<sub>t</sub>

$$r = a / P_w$$

$$V = (1.49 r^{2/3} s^{1/2}) / n$$

$$T_t = \frac{L}{3600 V}$$

| Segment ID      | 5            |  |  |
|-----------------|--------------|--|--|
| ft              | <b>40</b>    |  |  |
| ft <sup>2</sup> | <b>0.61</b>  |  |  |
| ft              | <b>2.00</b>  |  |  |
| ft              | <b>0.31</b>  |  |  |
| ft/ft           | <b>0.005</b> |  |  |
|                 | <b>0.012</b> |  |  |
| ft/s            | <b>3.98</b>  |  |  |
| hr              | <b>0.003</b> |  |  |

Channel Flow Sub-Total **0.003 hours**

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>

(Add Sub-Total T<sub>t</sub> from prior steps)

|                                  |                    |
|----------------------------------|--------------------|
| Total T <sub>c</sub> (hours) =   | <b>0.144 hours</b> |
| Total T <sub>c</sub> (minutes) = | <b>9 minutes</b>   |



# Hydrograph Report

Project Name:

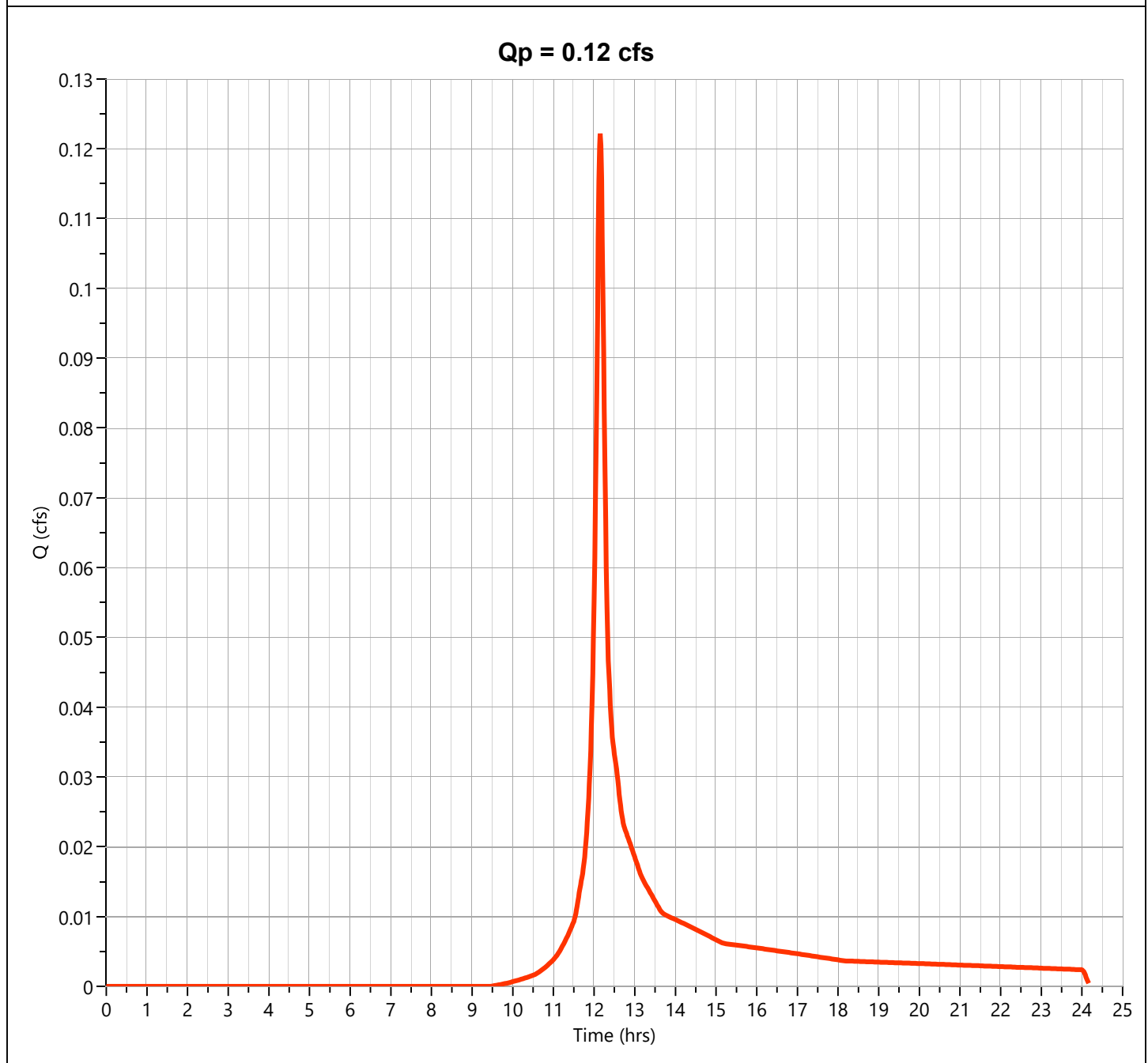
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2B Grass HSGC C

## Hyd. No. 6

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.122 cfs |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.15 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 428 cuft  |
| Drainage Area   | = 0.07 ac     | Curve Number       | = 74        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 9.0 min   |
| Total Rainfall  | = 4.12 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

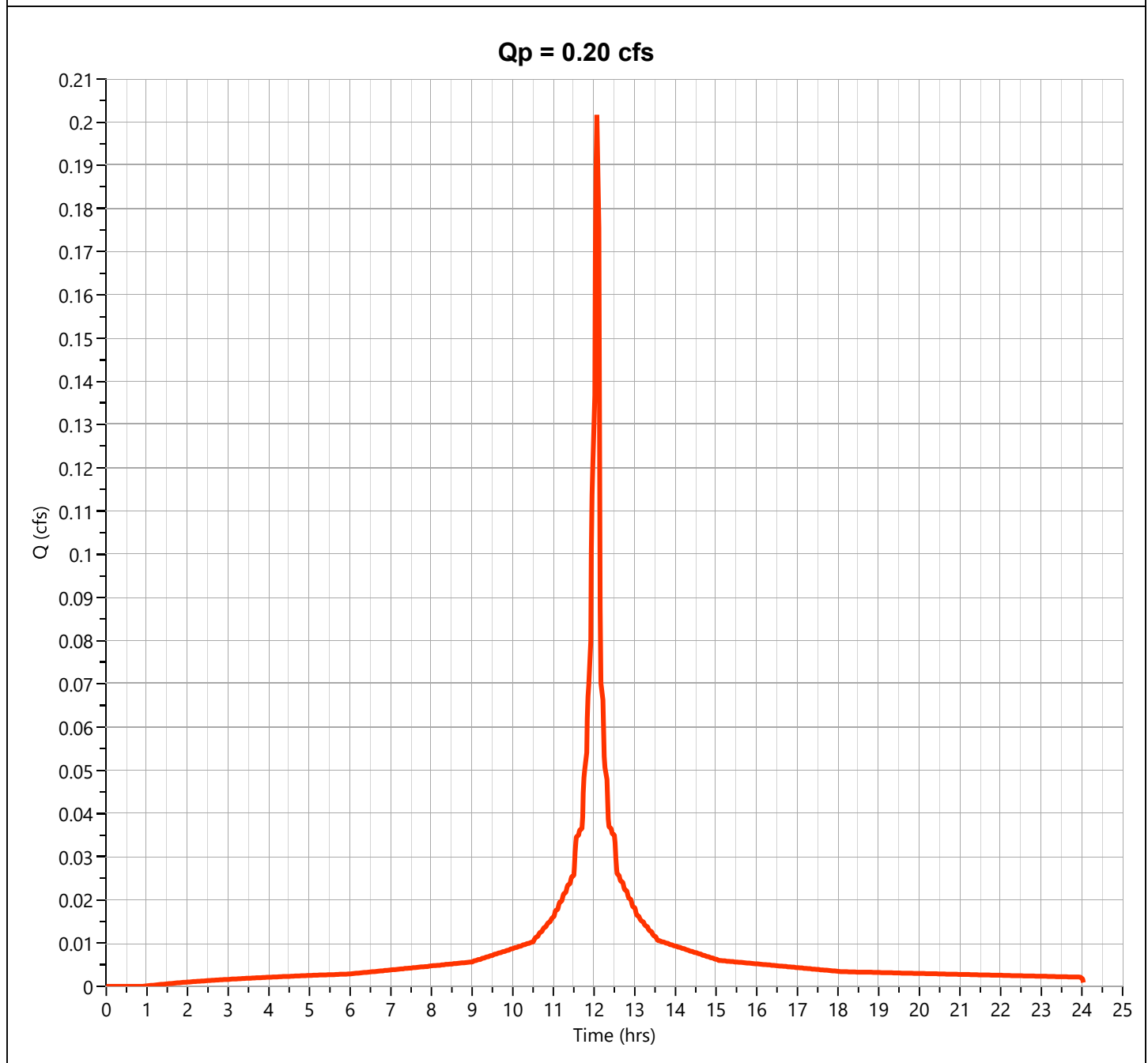
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2B Impervious

## Hyd. No. 7

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.202 cfs |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.10 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 661 cuft  |
| Drainage Area   | = 0.05 ac     | Curve Number       | = 98        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 2.0 min   |
| Total Rainfall  | = 4.12 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

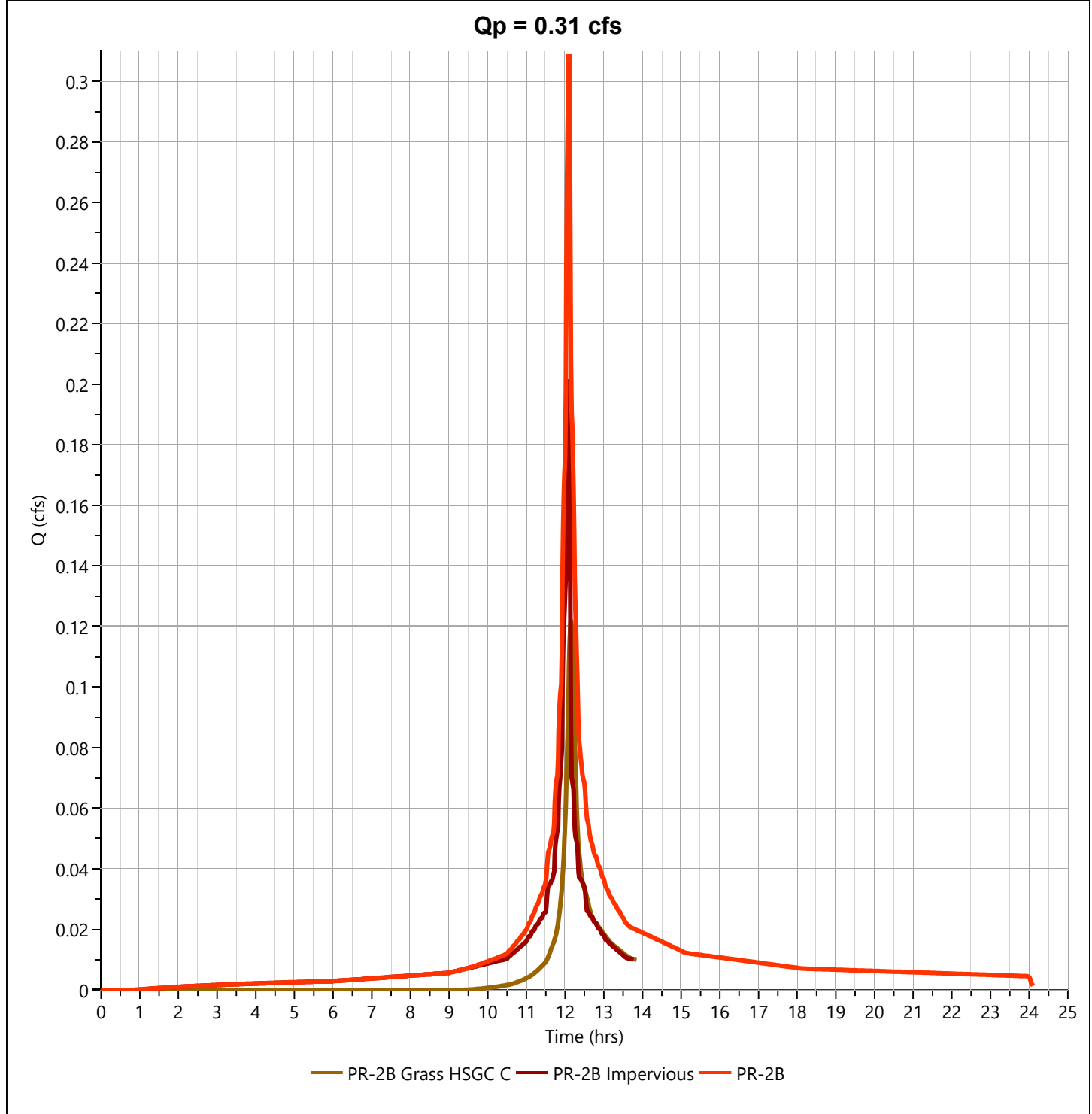
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2B

## Hyd. No. 8

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.309 cfs  |
| Storm Frequency    | = 2-yr     | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 1,089 cuft |
| Inflow Hydrographs | = 6, 7     | Total Contrib. Area | = 0.12 ac    |



# Hydrograph Report

Project Name:

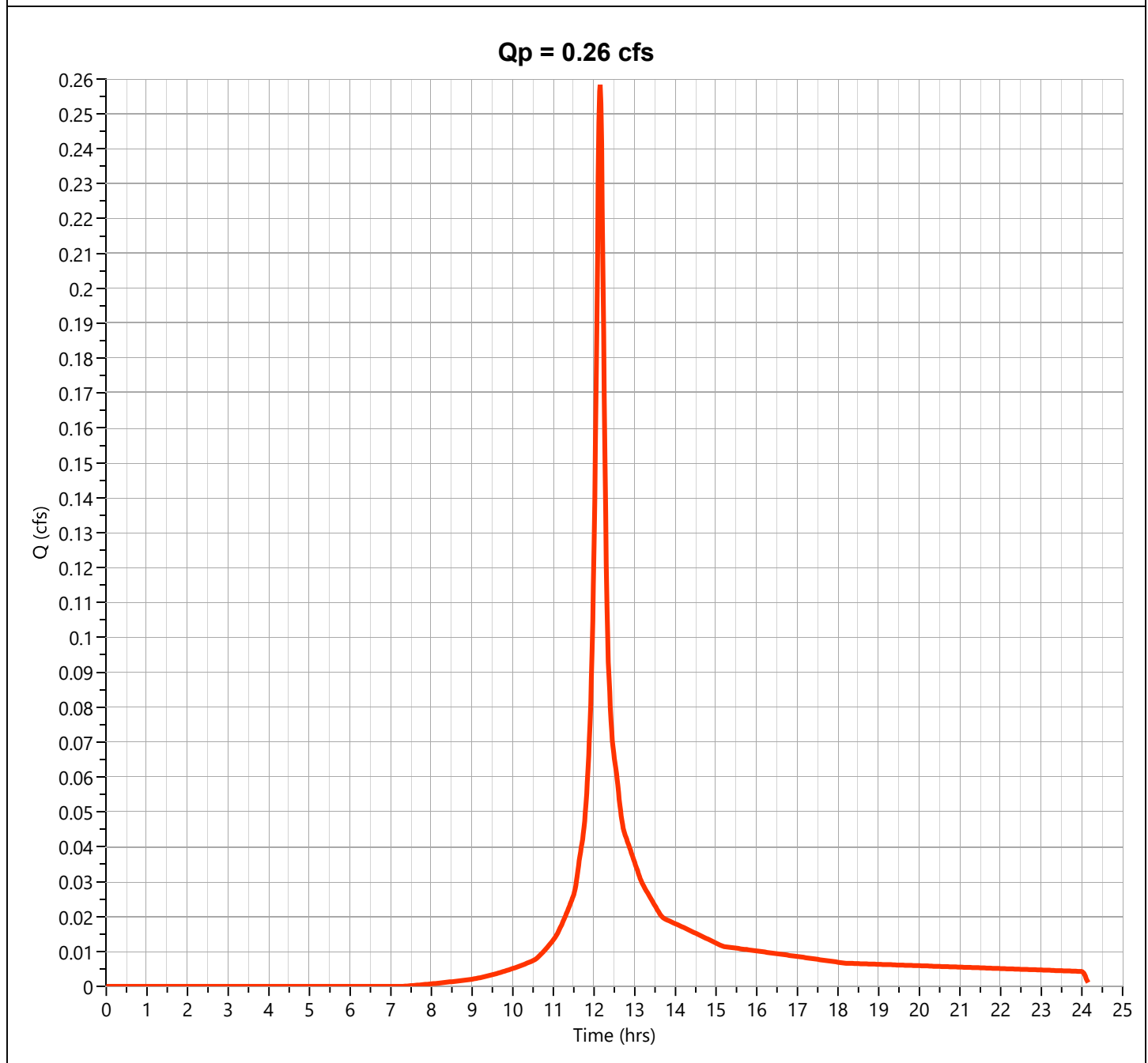
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2B Grass HSGC C

## Hyd. No. 6

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.258 cfs |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.15 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 900 cuft  |
| Drainage Area   | = 0.07 ac     | Curve Number       | = 74        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 9.0 min   |
| Total Rainfall  | = 6.42 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

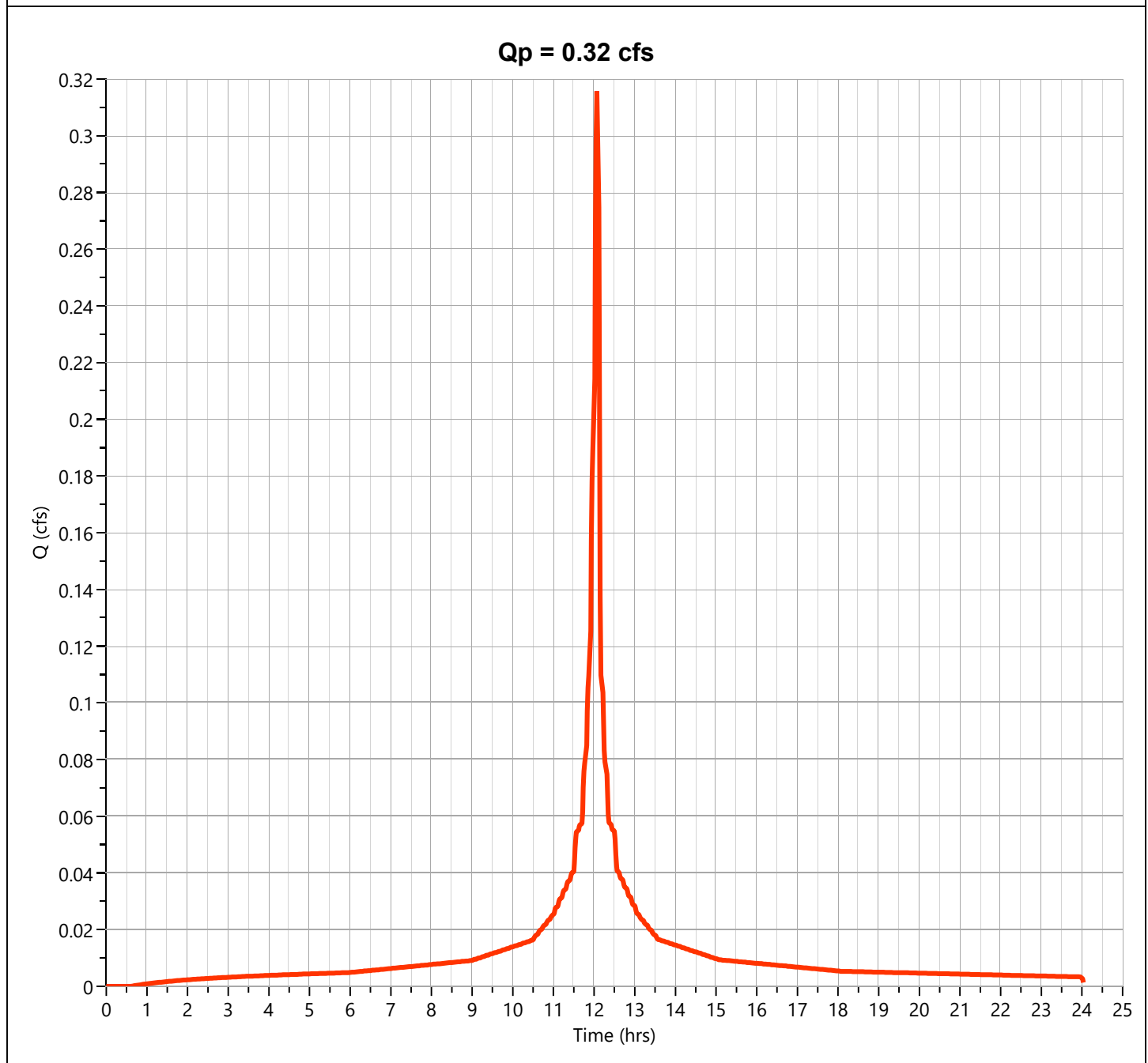
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2B Impervious

## Hyd. No. 7

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.316 cfs  |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 1,052 cuft |
| Drainage Area   | = 0.05 ac     | Curve Number       | = 98         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 2.0 min    |
| Total Rainfall  | = 6.42 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

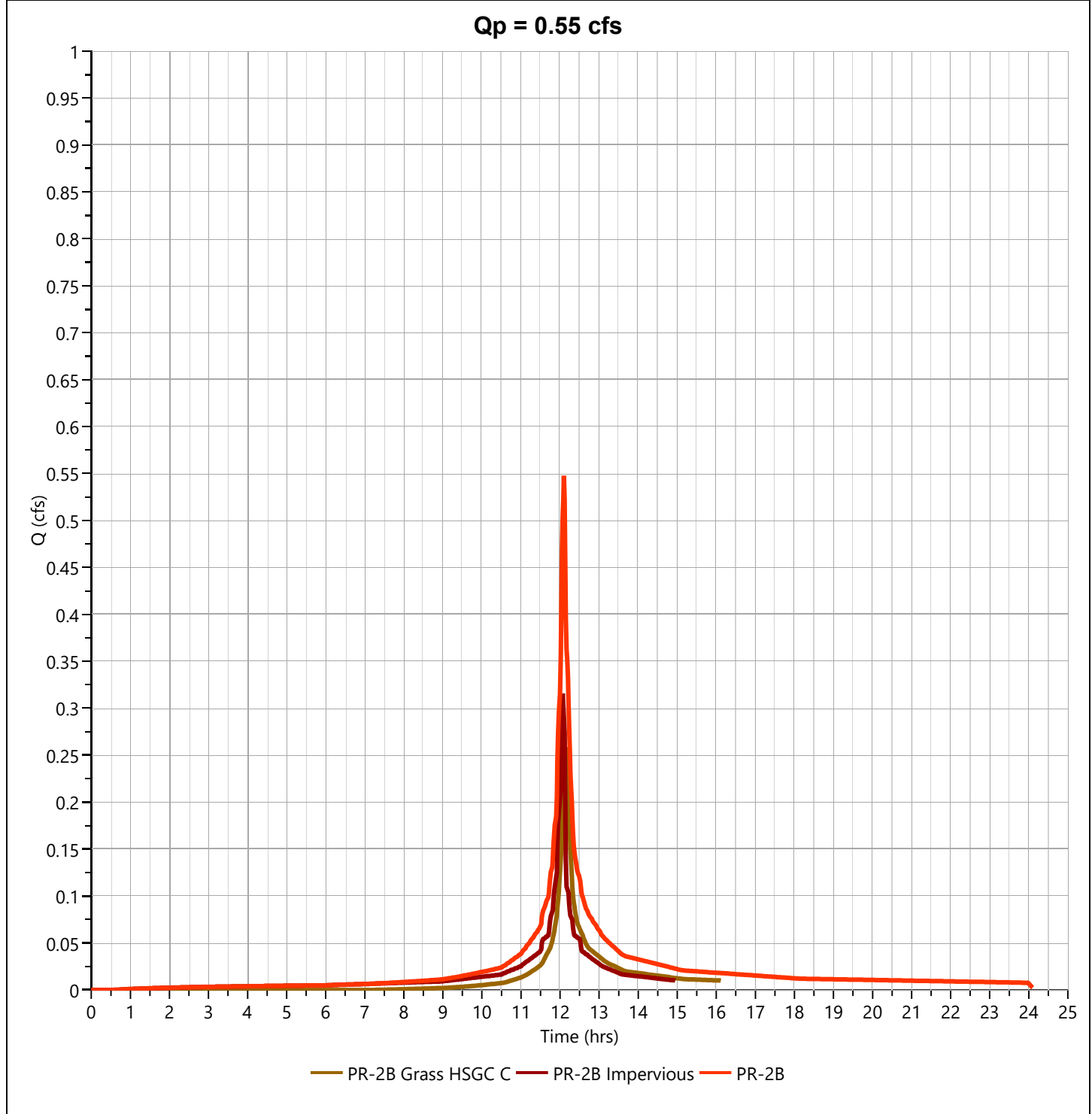
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2B

## Hyd. No. 8

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.548 cfs  |
| Storm Frequency    | = 10-yr    | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 1,952 cuft |
| Inflow Hydrographs | = 6, 7     | Total Contrib. Area | = 0.12 ac    |



# Hydrograph Report

Project Name:

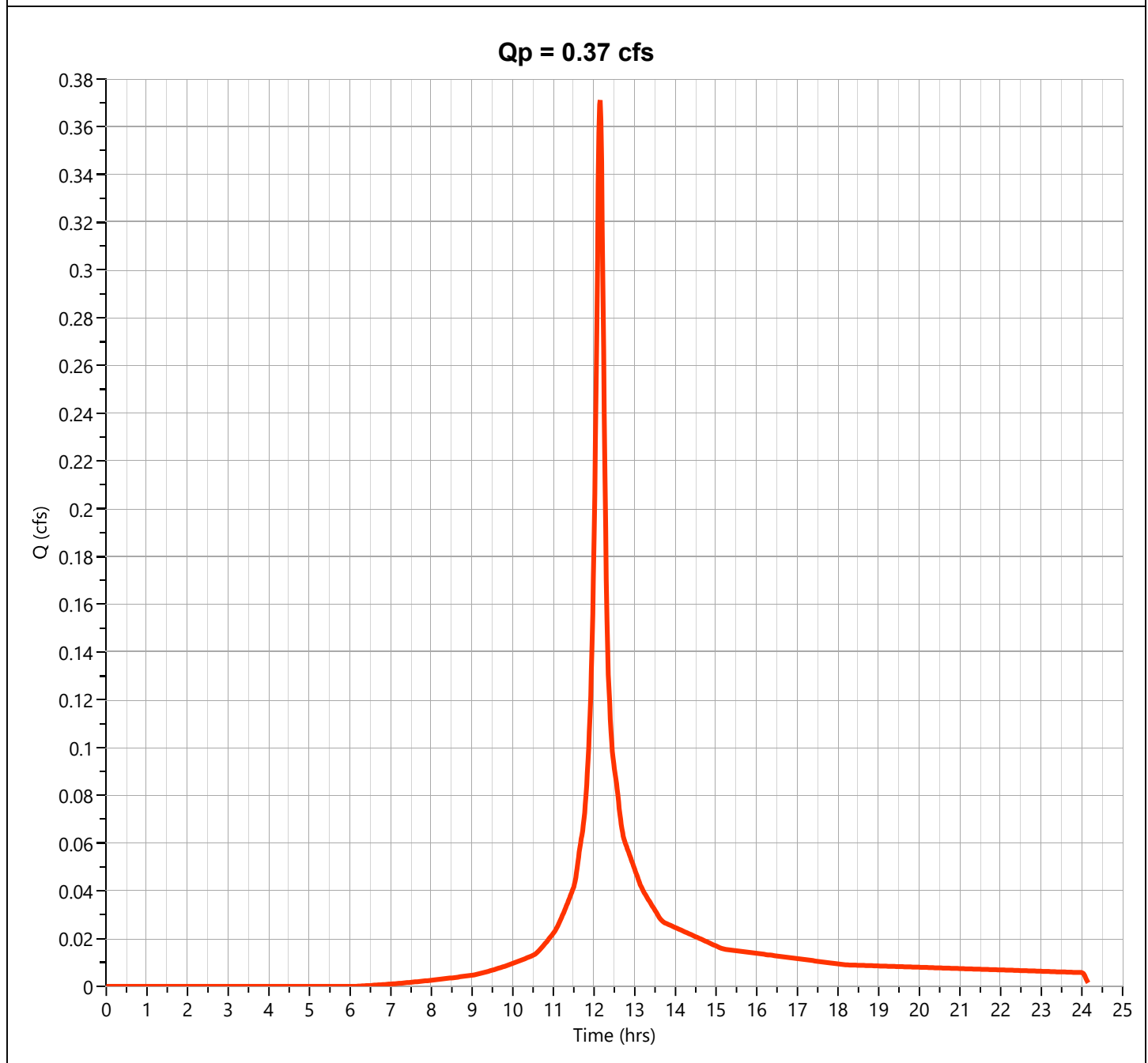
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2B Grass HSGC C

## Hyd. No. 6

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.371 cfs  |
| Storm Frequency | = 25-yr       | Time to Peak       | = 12.15 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 1,304 cuft |
| Drainage Area   | = 0.07 ac     | Curve Number       | = 74         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 9.0 min    |
| Total Rainfall  | = 8.23 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

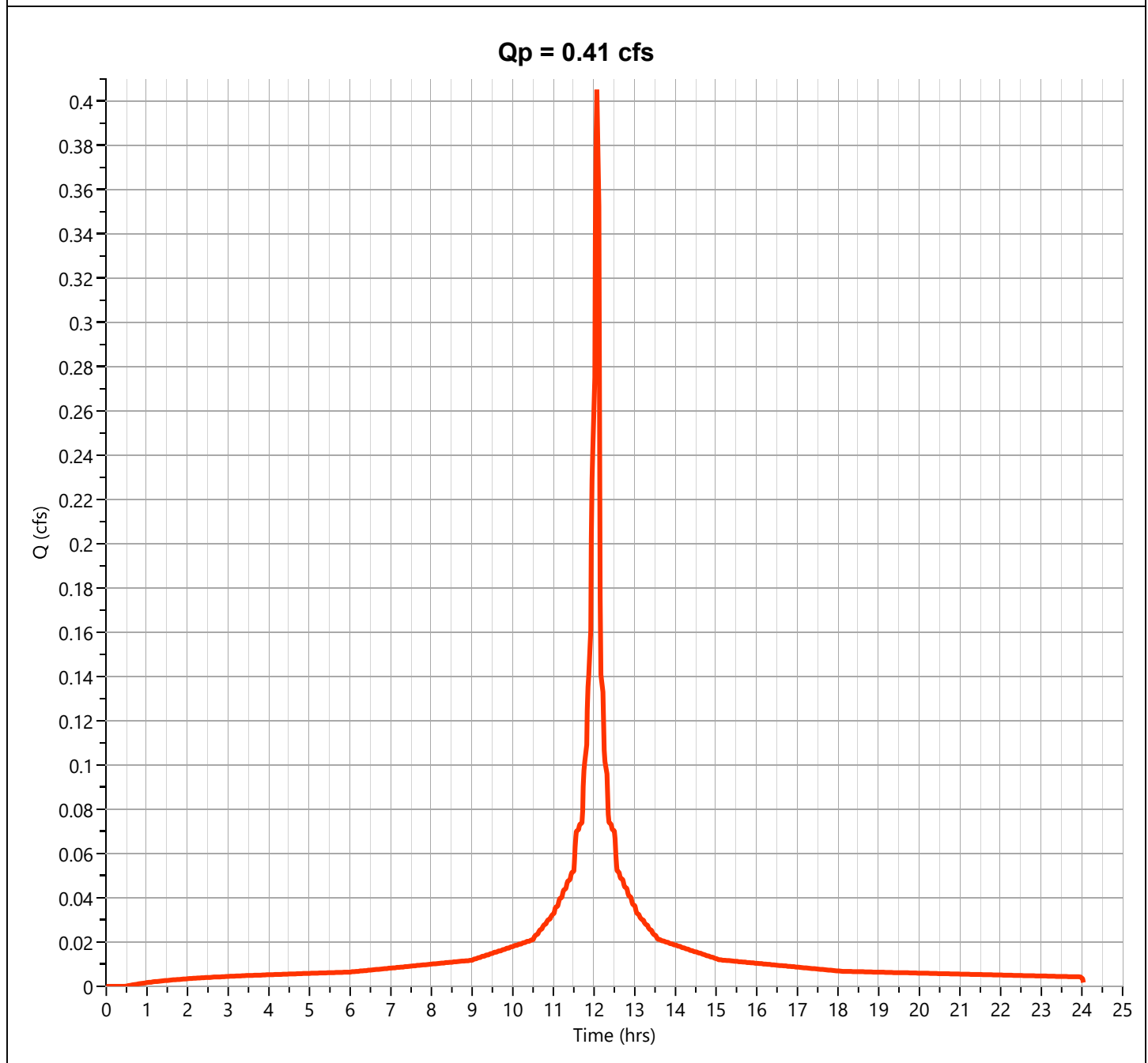
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2B Impervious

## Hyd. No. 7

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.405 cfs  |
| Storm Frequency | = 25-yr       | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 1,360 cuft |
| Drainage Area   | = 0.05 ac     | Curve Number       | = 98         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 2.0 min    |
| Total Rainfall  | = 8.23 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |





# Hydrograph Report

Project Name:

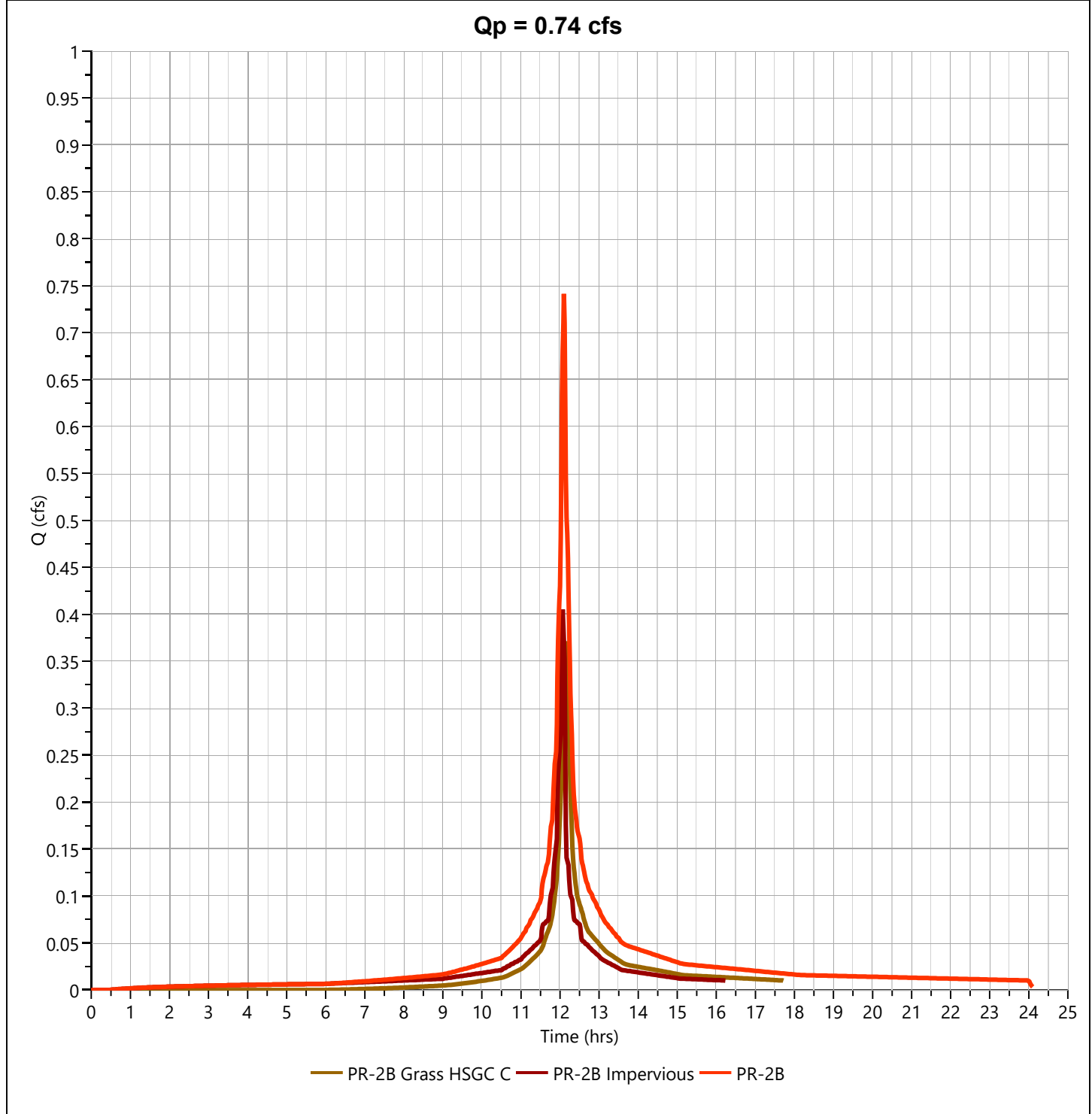
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2B

## Hyd. No. 8

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.741 cfs  |
| Storm Frequency    | = 25-yr    | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 2,664 cuft |
| Inflow Hydrographs | = 6, 7     | Total Contrib. Area | = 0.12 ac    |



# Hydrograph Report

Project Name:

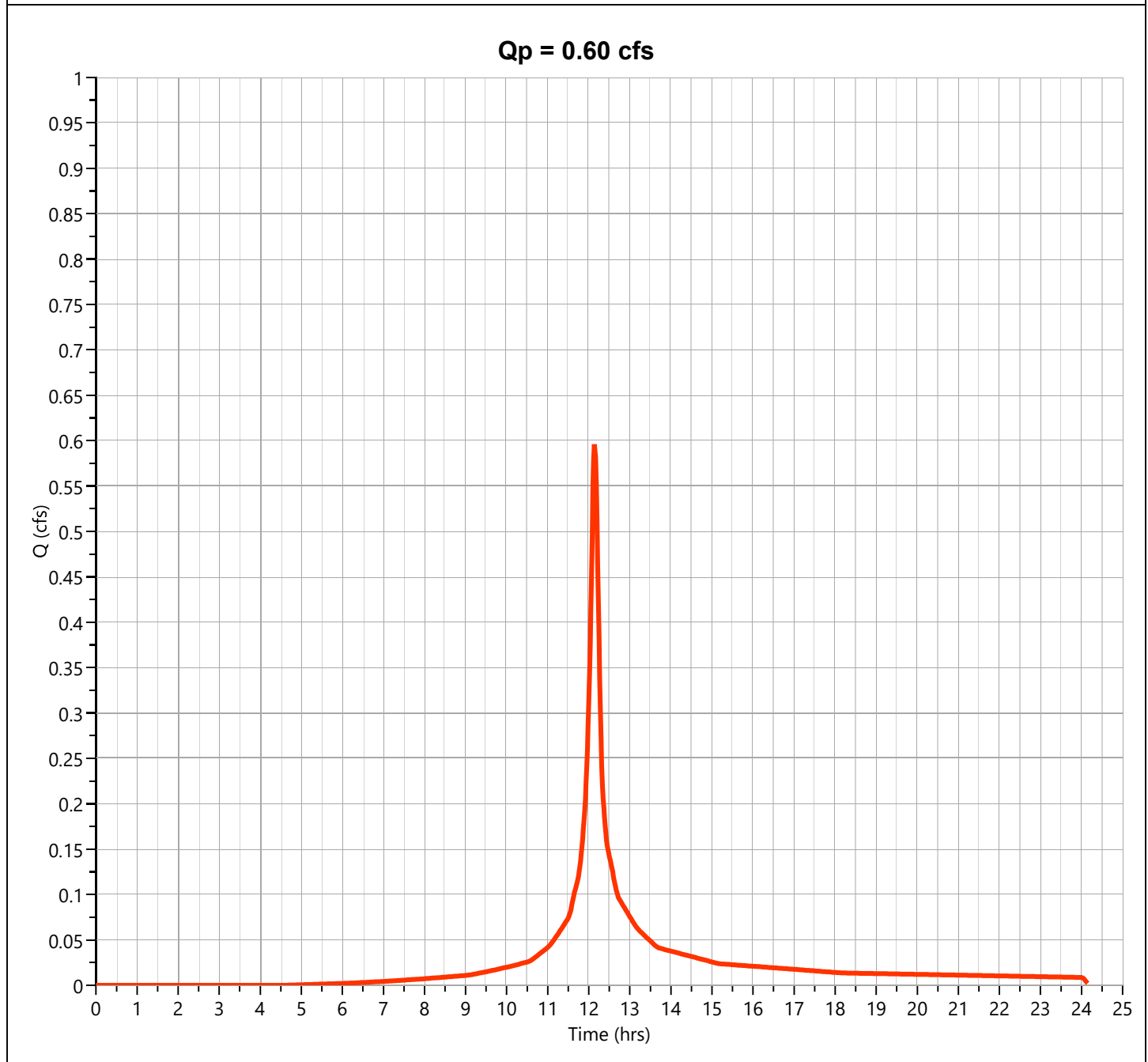
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2B Grass HSGC C

## Hyd. No. 6

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.597 cfs  |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.15 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 2,142 cuft |
| Drainage Area   | = 0.07 ac     | Curve Number       | = 74         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 9.0 min    |
| Total Rainfall  | = 11.80 in    | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

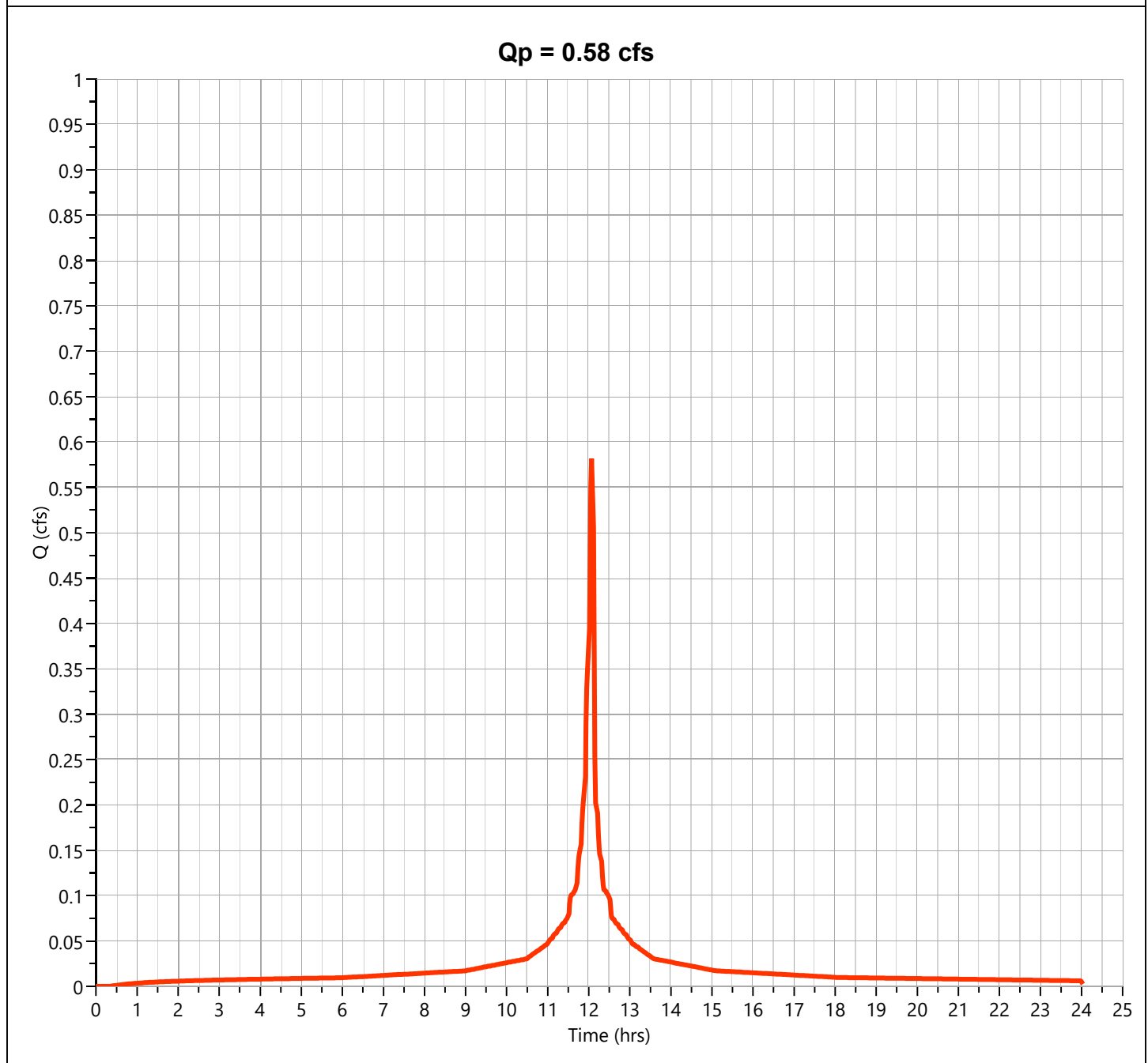
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2B Impervious

## Hyd. No. 7

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.582 cfs  |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 1,967 cuft |
| Drainage Area   | = 0.05 ac     | Curve Number       | = 98         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 2.0 min    |
| Total Rainfall  | = 11.80 in    | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

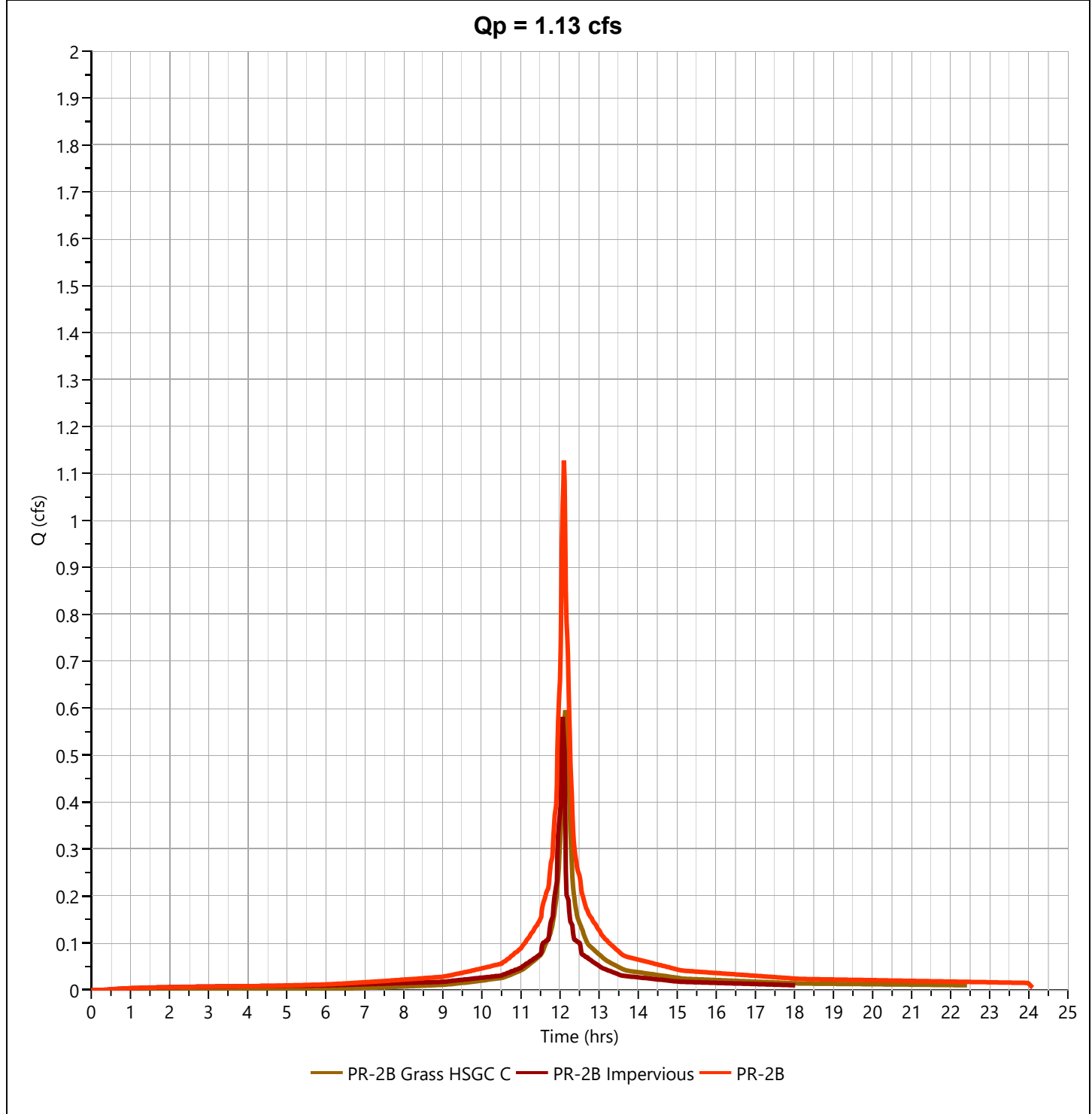
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2B

## Hyd. No. 8

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 1.127 cfs  |
| Storm Frequency    | = 100-yr   | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 4,108 cuft |
| Inflow Hydrographs | = 6, 7     | Total Contrib. Area | = 0.12 ac    |



## **PR-2C WATERSHED**

Project: Beacon Unitarian Universalist Church

By: TEG

Date: 2/6/2024

Location: Summit, NJ

Checked By: MJV

Date Checked: 2/6/2024

Circle One: Present Developed

Future Proposed Watershed PR-2C - Impervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Design Flow Length, L<sub>des</sub> (Total L<sub>des</sub> < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. McCuen-Spiess Limit, L<sub>mcs</sub> (max. 100 ft)
7. Compute T<sub>t</sub>

$$T_t = \frac{0.007 (n L_{des})^{0.8}}{P_2^{0.5} s^{0.4}}$$

$$L_{mcs} = (100 s^{0.5}) / n$$

| Segment ID | 1                      | 2                    |   |
|------------|------------------------|----------------------|---|
|            | <b>Smooth Surfaces</b> | <b>Dense Grasses</b> |   |
|            | <b>0.011</b>           | <b>0.24</b>          |   |
| ft         | <b>19</b>              | <b>13</b>            |   |
| in         | <b>4.12</b>            | <b>4.12</b>          |   |
| ft/ft      | <b>0.012</b>           | <b>0.010</b>         |   |
| ft         | <b>100</b>             | <b>42</b>            |   |
| hr         | <b>0.006</b>           | <b>0.052</b>         | + |

Sheet Flow Sub-Total **0.057 hours**

**Shallow Concentrated Flow**

8. Surface Description
9. Flow Length, L
10. Watercourse Slope, s
11. Average Velocity, V (NEH table 15-3)
12. Compute T<sub>t</sub>

$$T_t = \frac{L}{3600 V}$$

| Segment ID |  |  |   |
|------------|--|--|---|
| ft         |  |  |   |
| ft/ft      |  |  |   |
| ft/s       |  |  |   |
| hr         |  |  | + |

Shallow Conc. Flow Sub-Total **0.000 hours**

**Channel Flow**

13. Flow Length, L
14. Cross Sectional flow area, a
15. Wetted Perimeter, P<sub>w</sub>
16. Hydraulic Radius, r
17. Channel Slope, s
18. Manning's Roughness Coeff., n
19. Velocity, V
20. Compute T<sub>t</sub>

$$r = a / P_w$$

$$V = (1.49 r^{2/3} s^{1/2}) / n$$

$$T_t = \frac{L}{3600 V}$$

| Segment ID      |  |  |   |
|-----------------|--|--|---|
| ft              |  |  |   |
| ft <sup>2</sup> |  |  |   |
| ft              |  |  |   |
| ft              |  |  |   |
| ft/ft           |  |  |   |
| ft/s            |  |  |   |
| hr              |  |  | + |

Channel Flow Sub-Total **0.000 hours**

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>

(Add Sub-Total T<sub>t</sub> from prior steps)

|                                  |                    |
|----------------------------------|--------------------|
| Total T <sub>c</sub> (hours) =   | <b>0.057 hours</b> |
| Total T <sub>c</sub> (minutes) = | <b>3 minutes</b>   |

Project: Beacon Unitarian Universalist Church

By: TEG

Date: 2/6/2024

Location: Summit, NJ

Checked By: MJV

Date Checked: 2/6/2024

Circle One: Present Developed

Future Proposed Watershed PR-2C - Pervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Design Flow Length, L<sub>des</sub> (Total L<sub>des</sub> < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. McCuen-Spiess Limit, L<sub>mcs</sub> (max. 100 ft)
7. Compute T<sub>t</sub>

$$L_{mcs} = (100 s^{0.5})/n$$

$$T_t = \frac{0.007 (n L_{des})^{0.8}}{P_2^{0.5} s^{0.4}}$$

|            |               |   |   |
|------------|---------------|---|---|
| Segment ID | 1             |   |   |
|            | Dense Grasses |   |   |
|            | 0.24          |   |   |
| ft         | 28            |   |   |
| in         | 4.12          |   |   |
| ft/ft      | 0.012         |   |   |
| ft         | 46            |   |   |
| hr         | 0.092         | + | + |

Sheet Flow Sub-Total **0.092 hours**

**Shallow Concentrated Flow**

8. Surface Description
9. Flow Length, L
10. Watercourse Slope, s
11. Average Velocity, V (NEH table 15-3)
12. Compute T<sub>t</sub>

$$T_t = \frac{L}{3600 V}$$

|            |  |   |   |
|------------|--|---|---|
| Segment ID |  |   |   |
| ft         |  |   |   |
| ft/ft      |  |   |   |
| ft/s       |  |   |   |
| hr         |  | + | + |

Shallow Conc. Flow Sub-Total **0.000 hours**

**Channel Flow**

13. Flow Length, L
14. Cross Sectional flow area, a
15. Wetted Perimeter, P<sub>w</sub>
16. Hydraulic Radius, r
17. Channel Slope, s
18. Manning's Roughness Coeff., n
19. Velocity, V
20. Compute T<sub>t</sub>

$$r = a / P_w$$

$$V = (1.49 r^{2/3} s^{1/2}) / n$$

$$T_t = \frac{L}{3600 V}$$

|                 |  |   |   |
|-----------------|--|---|---|
| Segment ID      |  |   |   |
| ft              |  |   |   |
| ft <sup>2</sup> |  |   |   |
| ft              |  |   |   |
| ft              |  |   |   |
| ft/ft           |  |   |   |
| ft/s            |  |   |   |
| hr              |  | + | + |

Channel Flow Sub-Total **0.000 hours**

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>

(Add Sub-Total T<sub>t</sub> from prior steps)

|                      |                    |
|----------------------|--------------------|
| Total Tc (hours) =   | <b>0.092 hours</b> |
| Total Tc (minutes) = | <b>6 minutes</b>   |

# Hydrograph Report

Project Name:

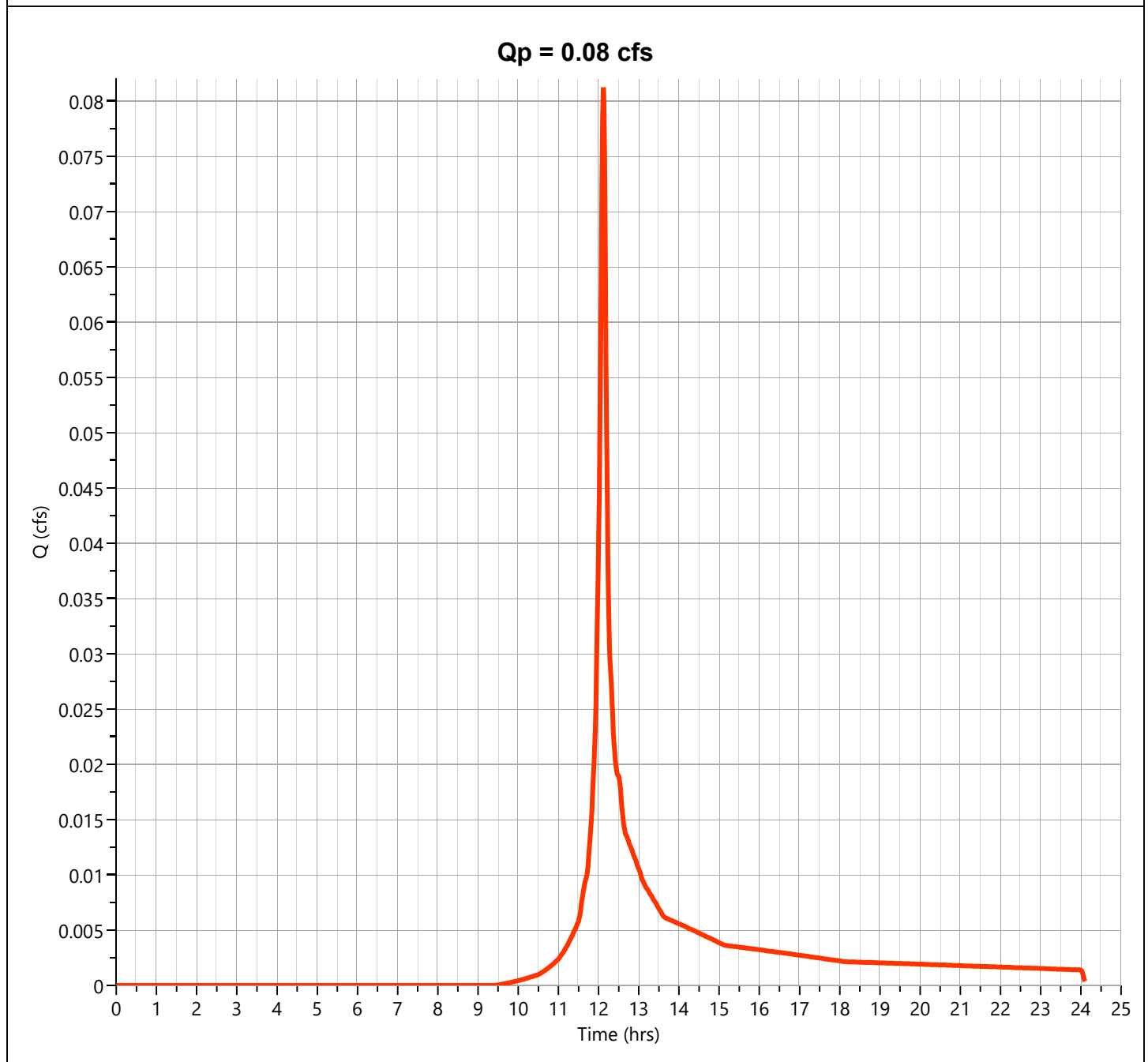
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2C Grass HSGC C

## Hyd. No. 11

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.081 cfs |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.12 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 252 cuft  |
| Drainage Area   | = 0.04 ac     | Curve Number       | = 74        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 6.0 min   |
| Total Rainfall  | = 4.12 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |





# Hydrograph Report

Project Name:

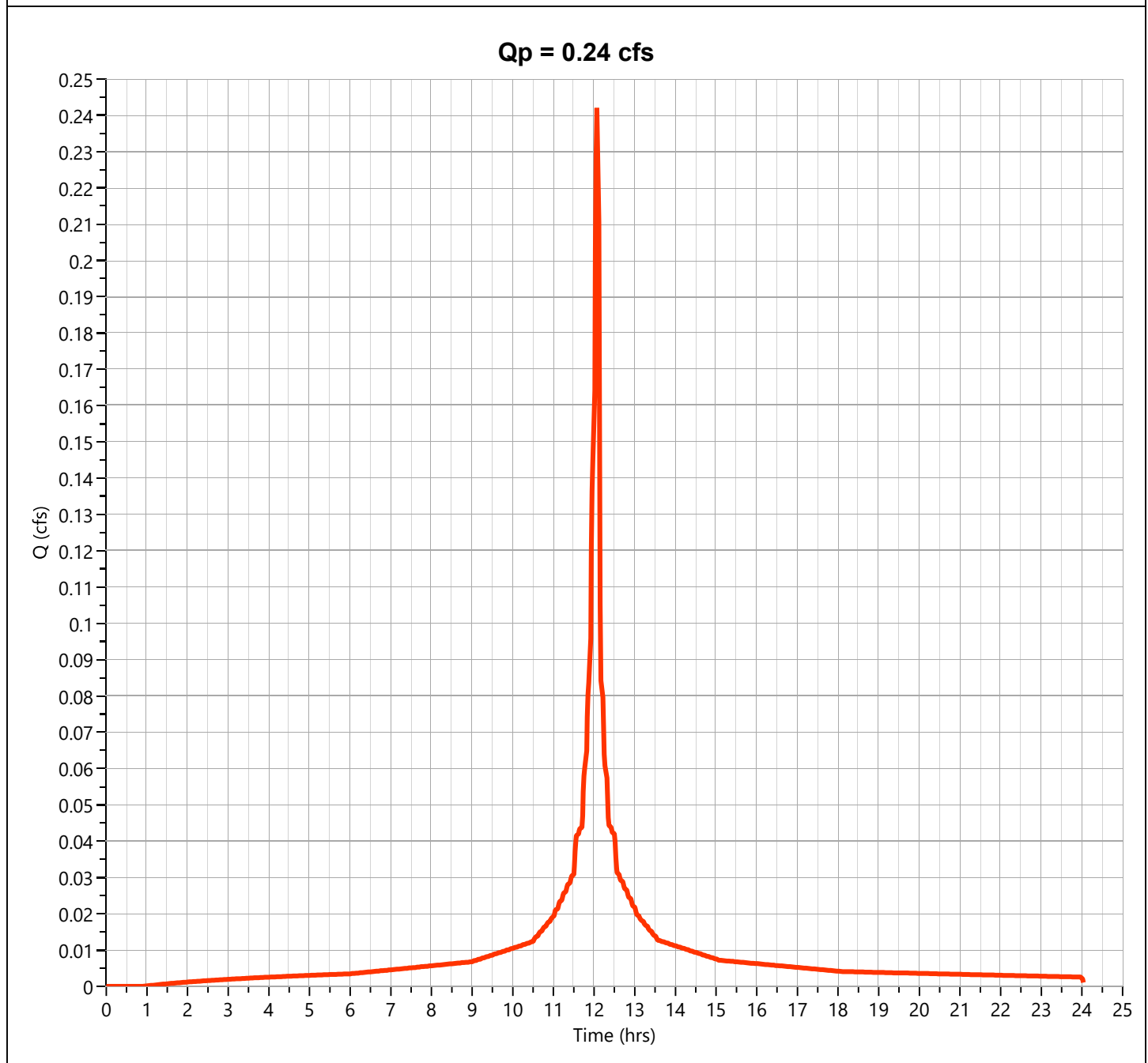
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2C Impervious

## Hyd. No. 12

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.242 cfs |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.10 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 793 cuft  |
| Drainage Area   | = 0.06 ac     | Curve Number       | = 98        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 3.0 min   |
| Total Rainfall  | = 4.12 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

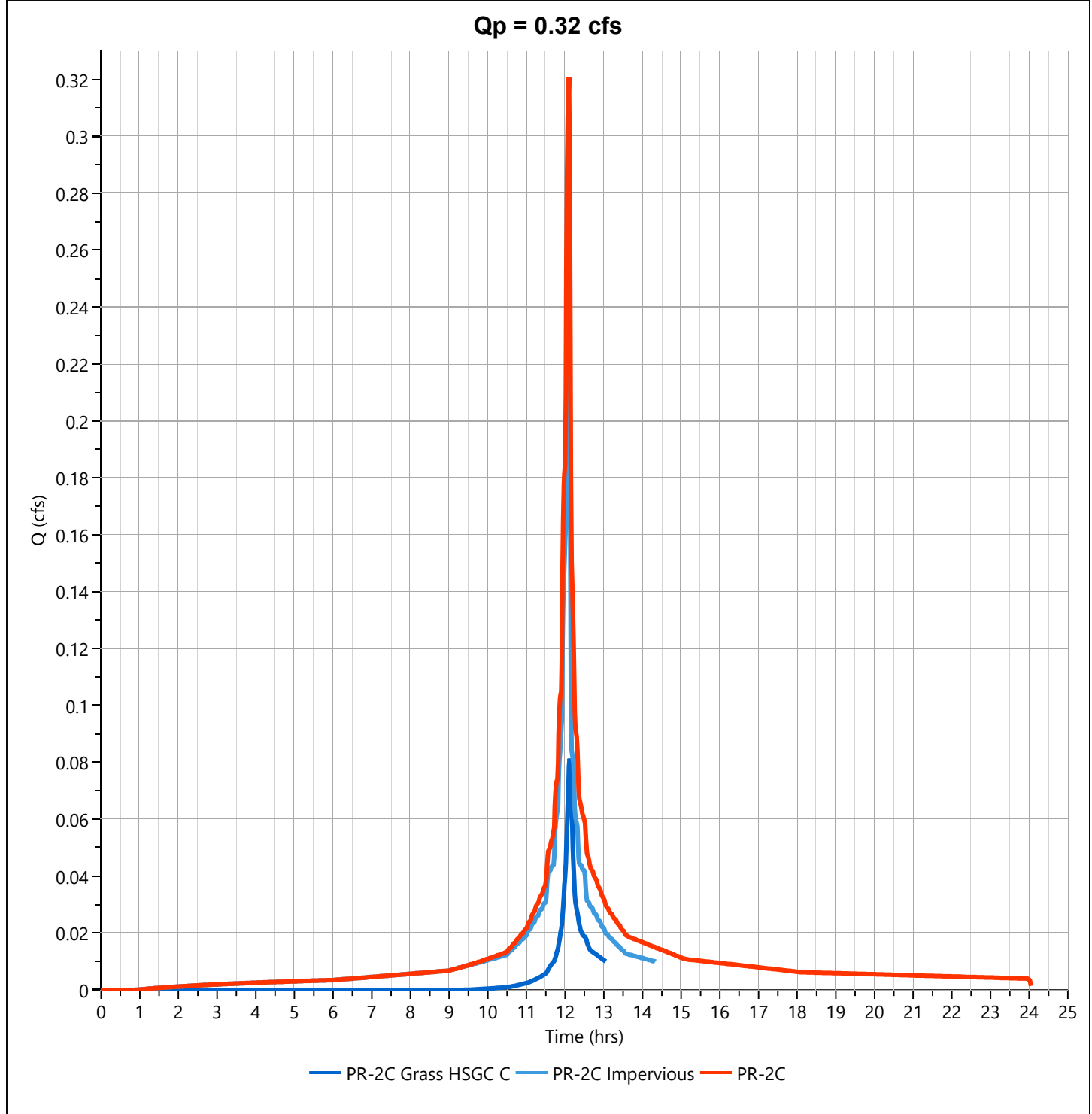
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2C

## Hyd. No. 13

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.321 cfs  |
| Storm Frequency    | = 2-yr     | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 1,046 cuft |
| Inflow Hydrographs | = 11, 12   | Total Contrib. Area | = 0.1 ac     |



# Hydrograph Report

Project Name:

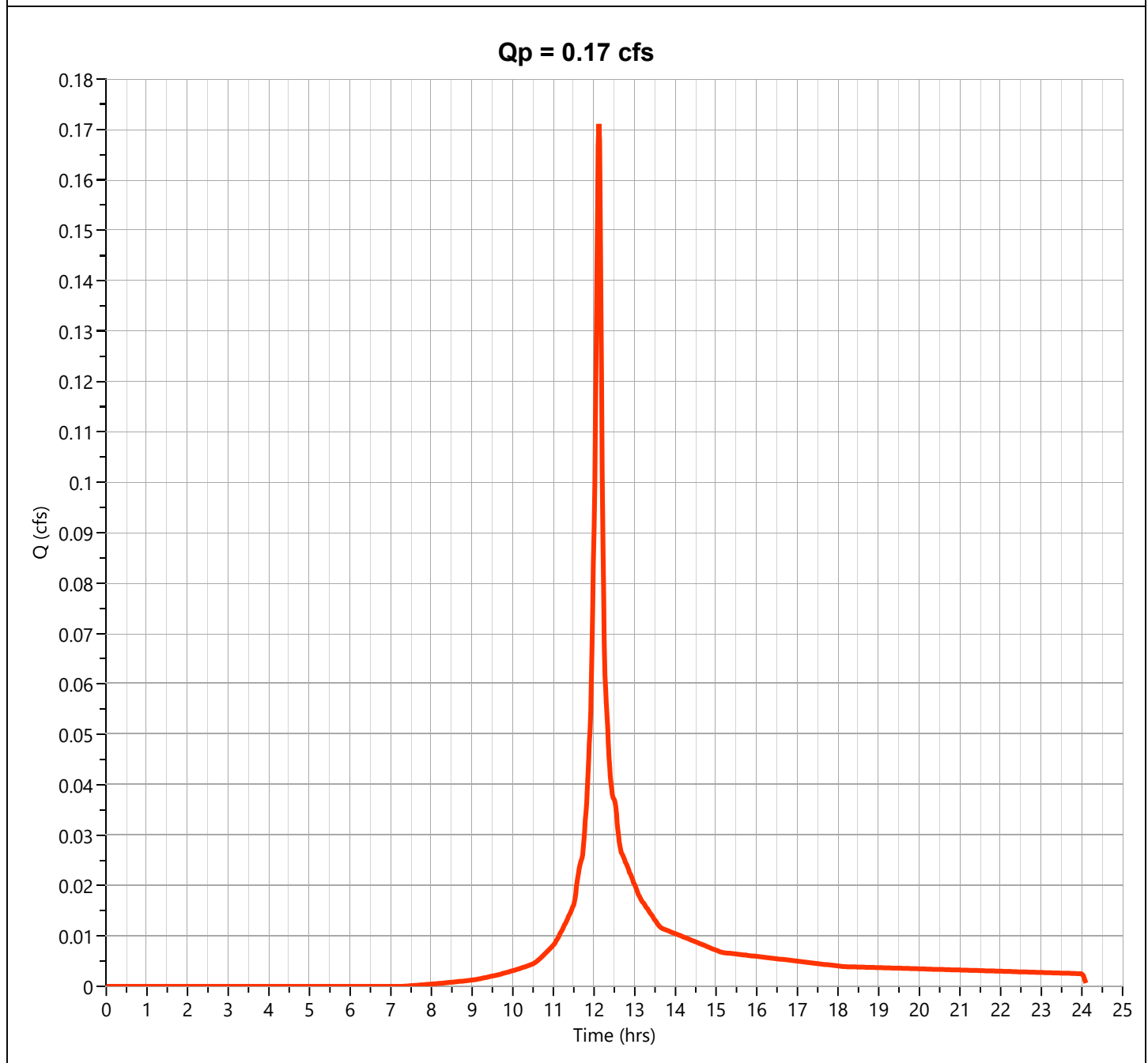
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2C Grass HSGC C

## Hyd. No. 11

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.171 cfs |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.12 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 530 cuft  |
| Drainage Area   | = 0.04 ac     | Curve Number       | = 74        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 6.0 min   |
| Total Rainfall  | = 6.42 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

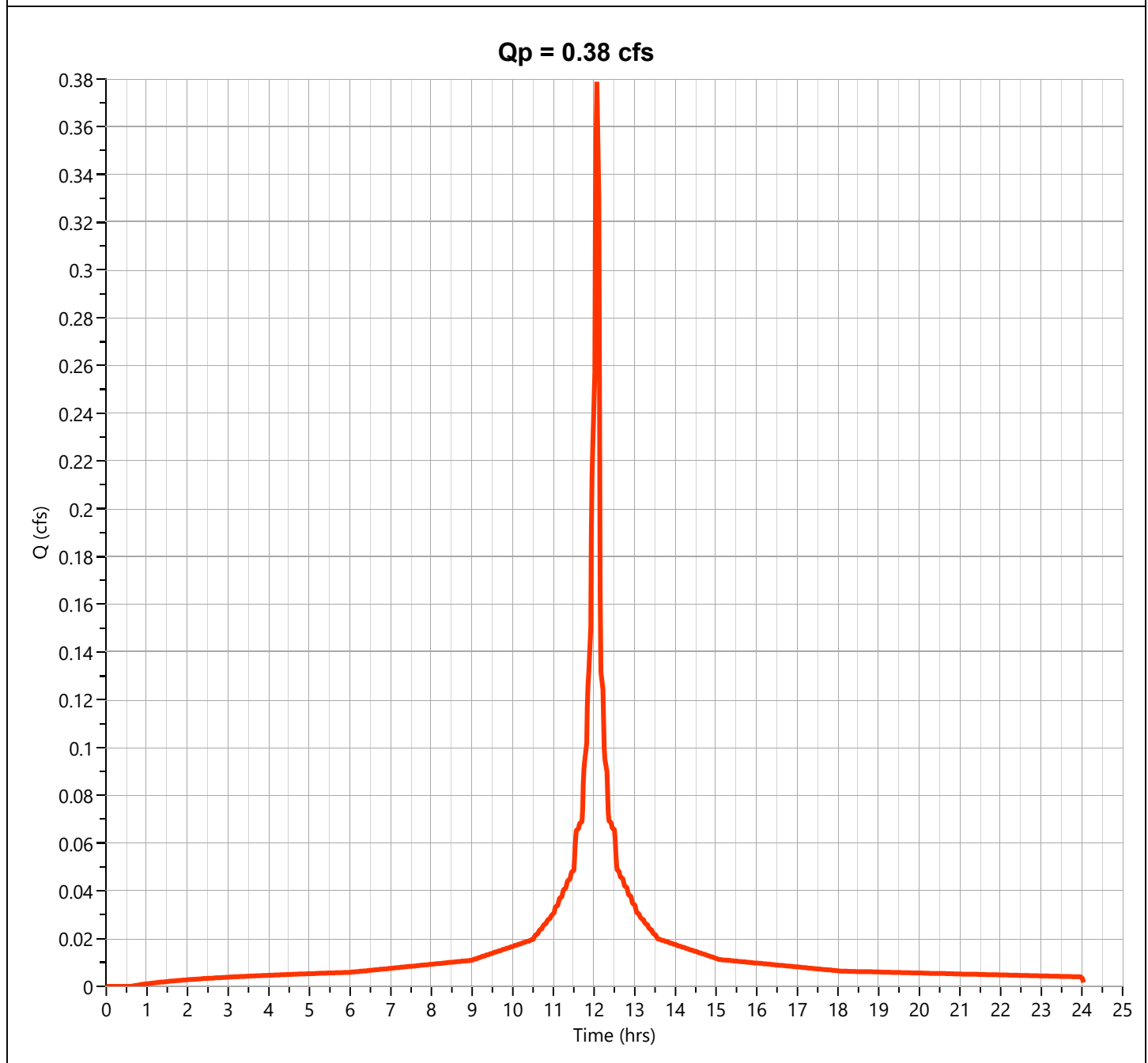
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2C Impervious

## Hyd. No. 12

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.379 cfs  |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 1,262 cuft |
| Drainage Area   | = 0.06 ac     | Curve Number       | = 98         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 3.0 min    |
| Total Rainfall  | = 6.42 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

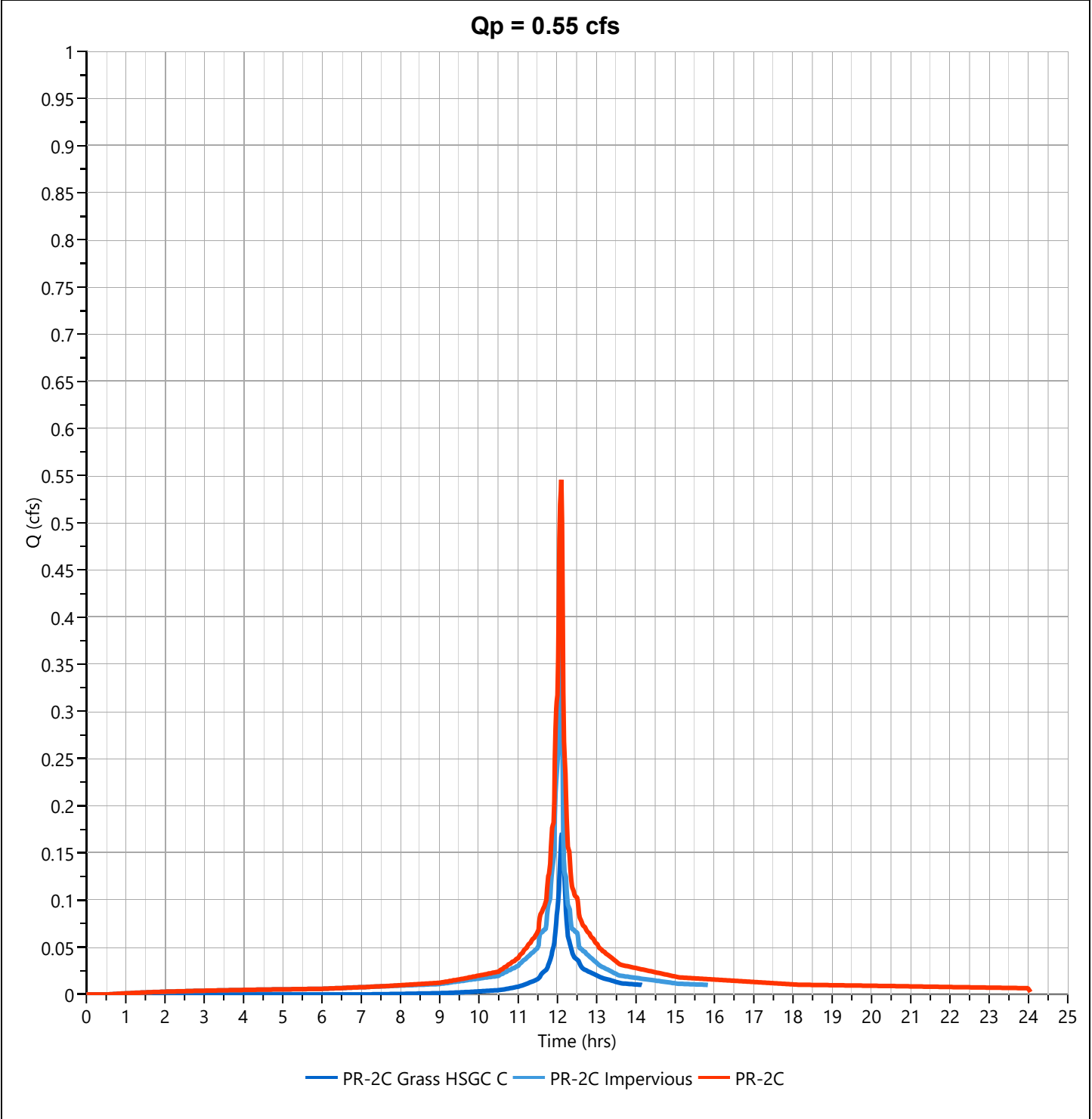
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2C

## Hyd. No. 13

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.546 cfs  |
| Storm Frequency    | = 10-yr    | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 1,792 cuft |
| Inflow Hydrographs | = 11, 12   | Total Contrib. Area | = 0.1 ac     |



# Hydrograph Report

Project Name:

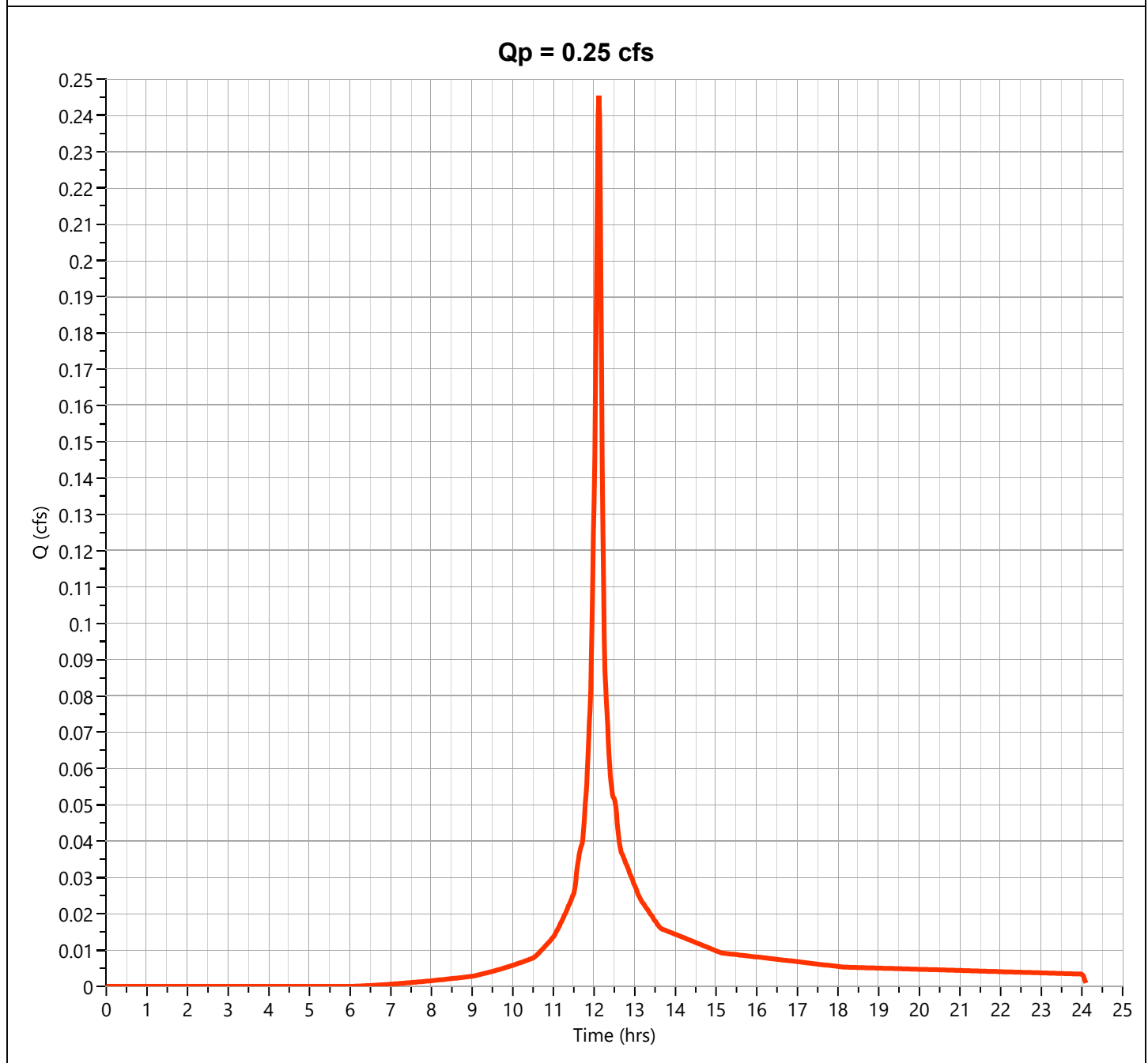
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2C Grass HSGC C

## Hyd. No. 11

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.245 cfs |
| Storm Frequency | = 25-yr       | Time to Peak       | = 12.12 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 768 cuft  |
| Drainage Area   | = 0.04 ac     | Curve Number       | = 74        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 6.0 min   |
| Total Rainfall  | = 8.23 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

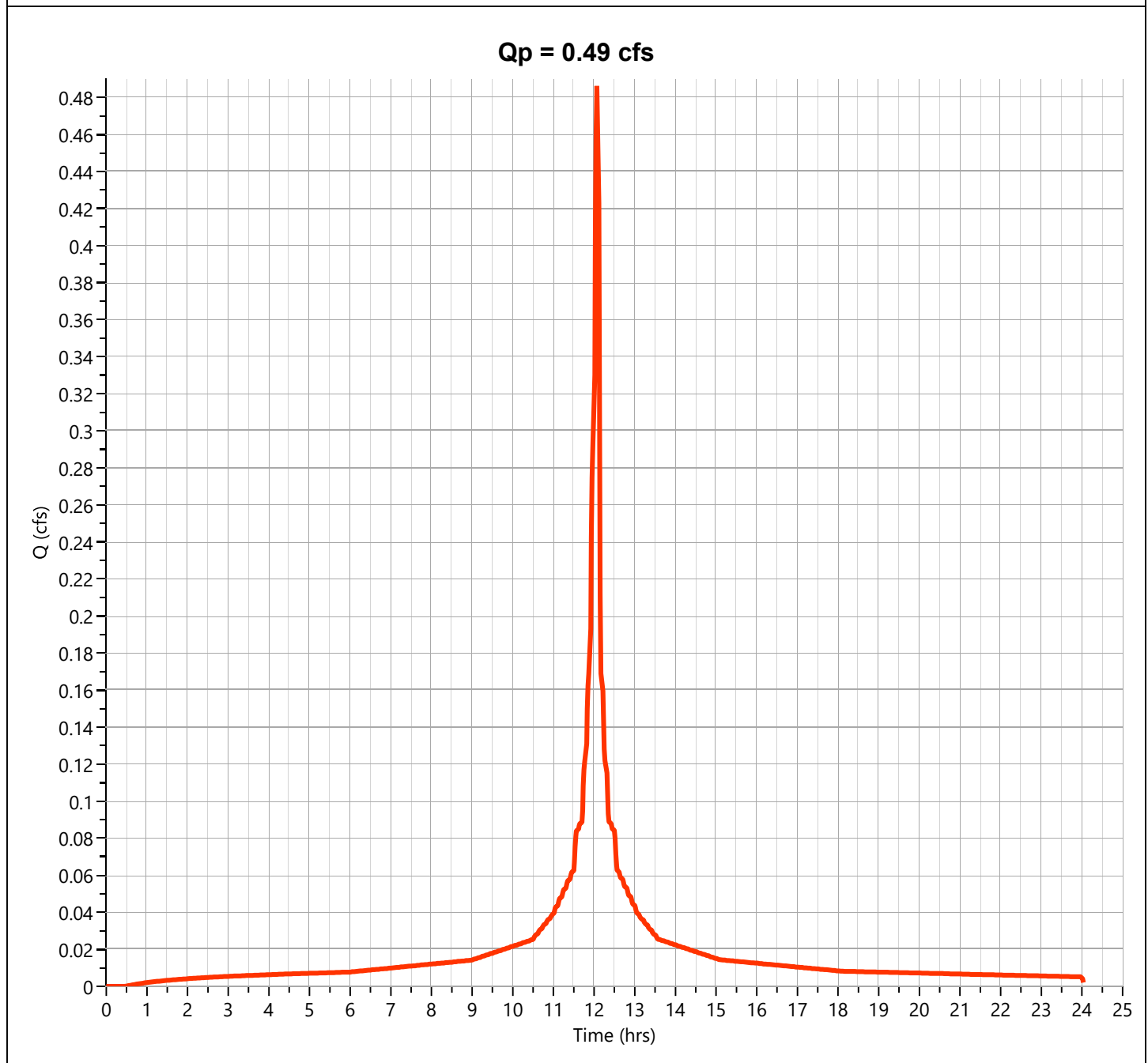
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2C Impervious

## Hyd. No. 12

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.486 cfs  |
| Storm Frequency | = 25-yr       | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 1,631 cuft |
| Drainage Area   | = 0.06 ac     | Curve Number       | = 98         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 3.0 min    |
| Total Rainfall  | = 8.23 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

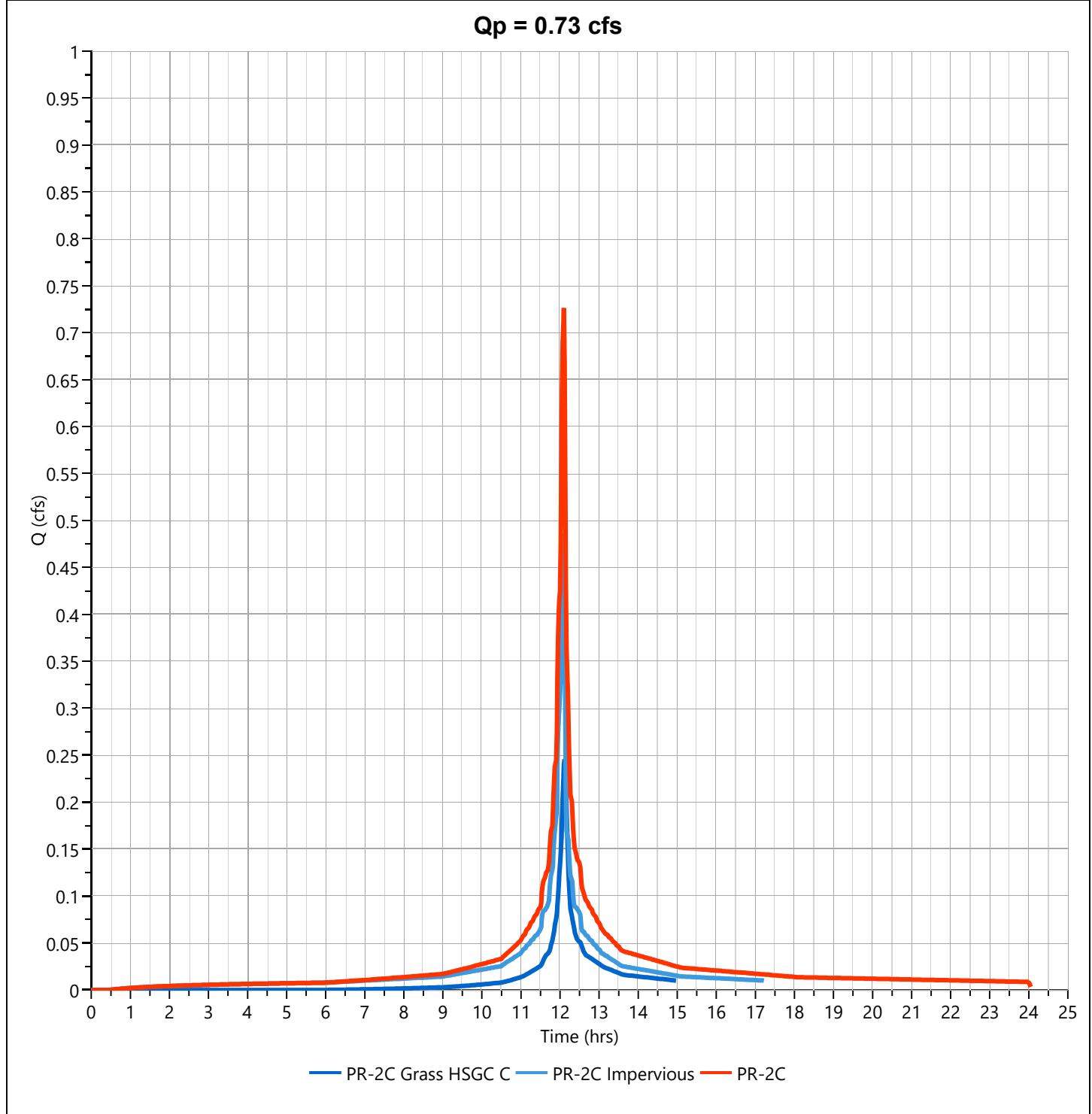
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2C

## Hyd. No. 13

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.726 cfs  |
| Storm Frequency    | = 25-yr    | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 2,400 cuft |
| Inflow Hydrographs | = 11, 12   | Total Contrib. Area | = 0.1 ac     |





# Hydrograph Report

Project Name:

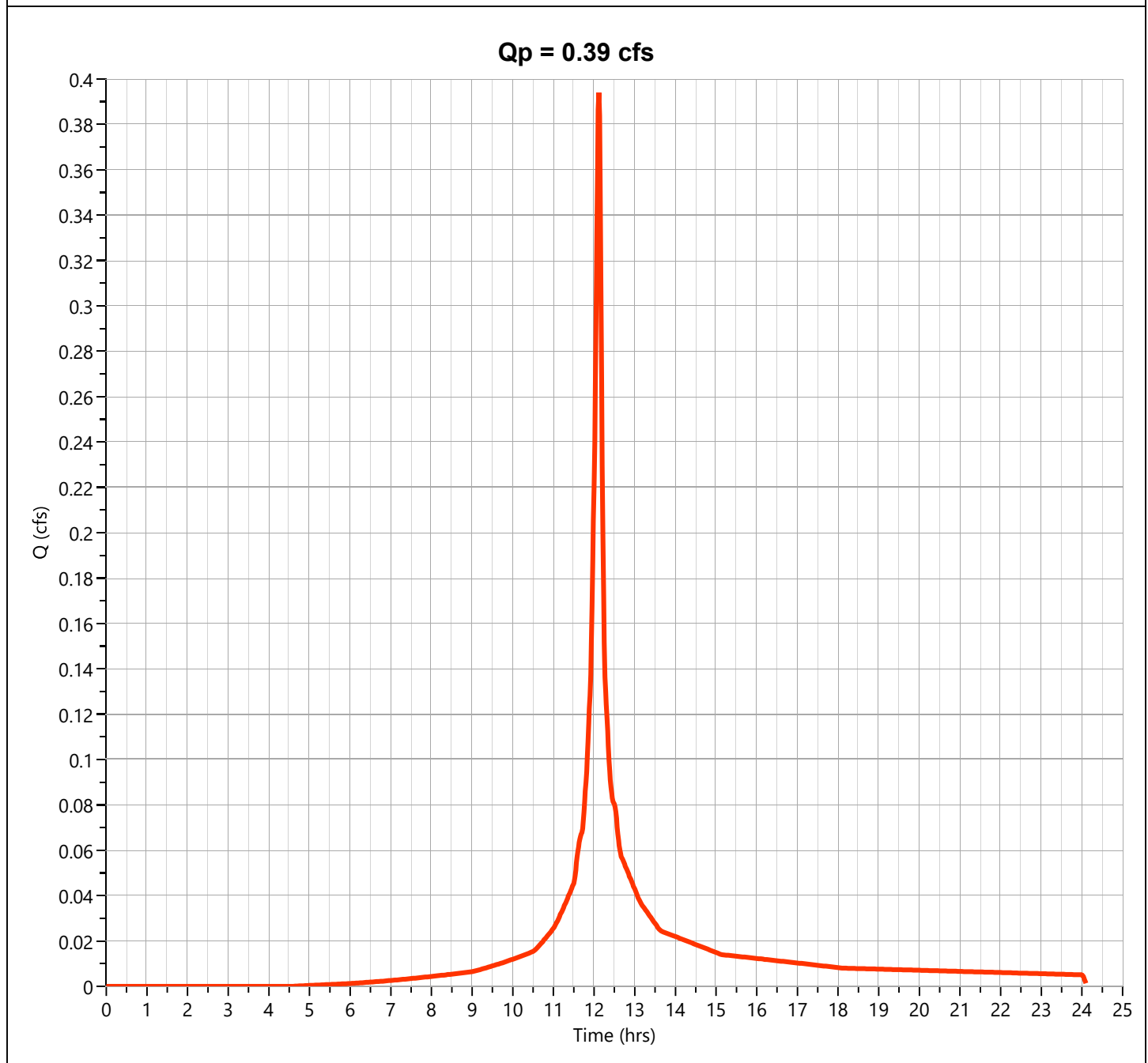
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2C Grass HSGC C

## Hyd. No. 11

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.394 cfs  |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.12 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 1,262 cuft |
| Drainage Area   | = 0.04 ac     | Curve Number       | = 74         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 6.0 min    |
| Total Rainfall  | = 11.80 in    | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

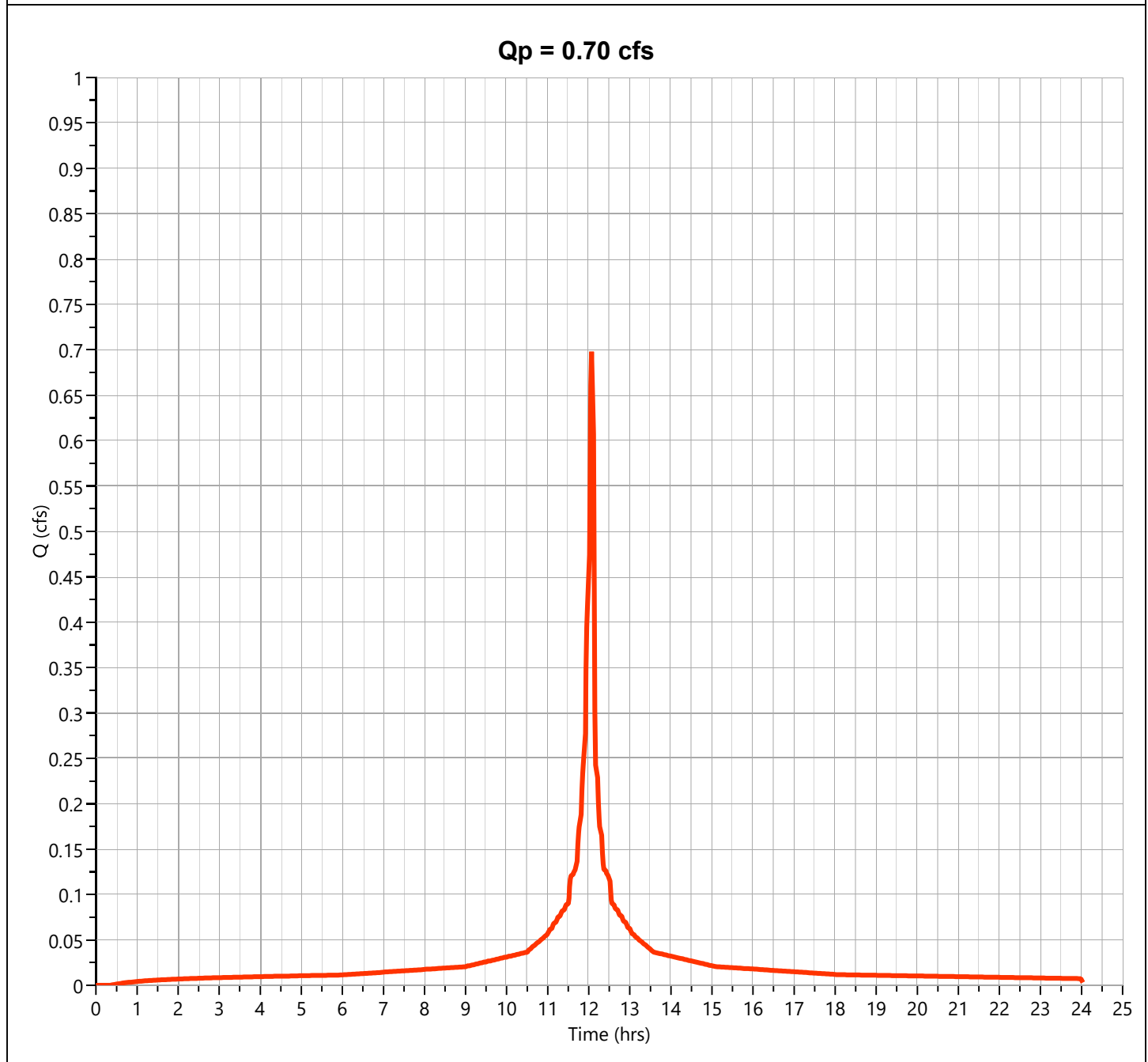
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2C Impervious

## Hyd. No. 12

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.698 cfs  |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 2,360 cuft |
| Drainage Area   | = 0.06 ac     | Curve Number       | = 98         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 3.0 min    |
| Total Rainfall  | = 11.80 in    | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

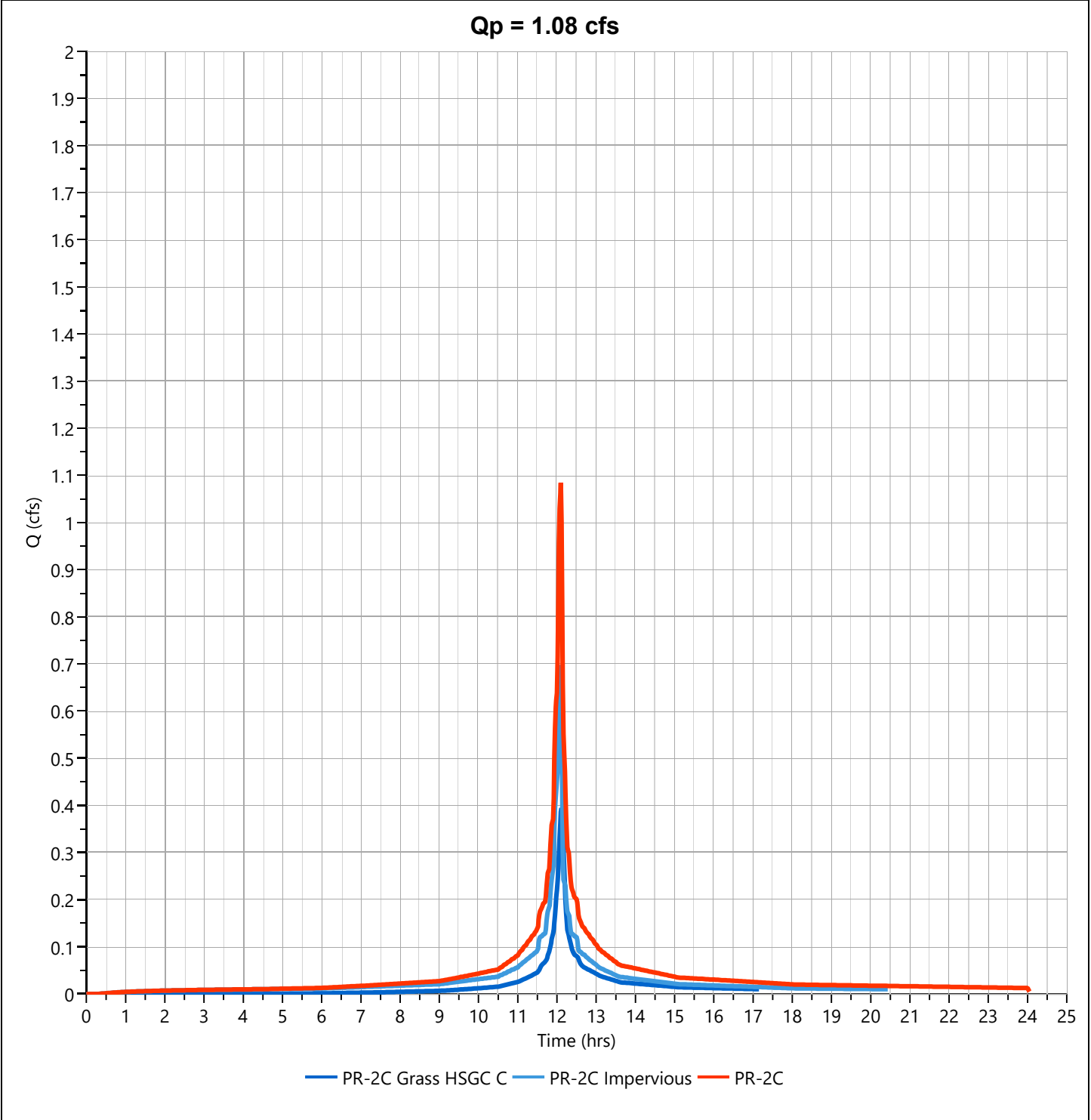
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2C

## Hyd. No. 13

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 1.084 cfs  |
| Storm Frequency    | = 100-yr   | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 3,622 cuft |
| Inflow Hydrographs | = 11, 12   | Total Contrib. Area | = 0.1 ac     |



## **PR-2D WATERSHED**

Project: Beacon Unitarian Universalist Church

By: SM

Date: 11/29/2023

Location: Summit, NJ

Checked By: MJV

Date Checked: 11/29/2023

Circle One: Present Developed

Future Proposed Watershed PR-2D Impervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Flow Length, L (total L < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. Compute T<sub>t</sub>

$$T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} s^{0.4}}$$

|            |                        |                               |  |
|------------|------------------------|-------------------------------|--|
| Segment ID | <b>1</b>               | <b>2</b>                      |  |
|            | <b>Smooth Surfaces</b> | <b>Woods Light Underbrush</b> |  |
|            | <b>0.011</b>           | <b>0.40</b>                   |  |
| ft         | <b>6</b>               | <b>94</b>                     |  |
| in         | <b>4.12</b>            | <b>4.12</b>                   |  |
| ft/ft      | <b>0.050</b>           | <b>0.046</b>                  |  |
| hr         | <b>0.001</b>           | <b>0.216</b>                  |  |

Sheet Flow Sub-Total **0.217 hours**

**Shallow Concentrated Flow**

7. Surface Description
8. Flow Length, L
9. Watercourse Slope, s
10. Average Velocity, V (NEH table 15-3)
11. Compute T<sub>t</sub>

$$T_t = \frac{L}{3600 V}$$

|            |                  |                          |  |
|------------|------------------|--------------------------|--|
| Segment ID | <b>3</b>         | <b>4</b>                 |  |
|            | <b>Woodlands</b> | <b>Grassed Waterways</b> |  |
| ft         | <b>56</b>        | <b>140</b>               |  |
| ft/ft      | <b>0.025</b>     | <b>0.011</b>             |  |
| ft/s       | <b>0.80</b>      | <b>1.72</b>              |  |
| hr         | <b>0.019</b>     | <b>0.023</b>             |  |

Shallow Conc. Flow Sub-Total **0.042 hours**

**Channel Flow**

12. Flow Length, L
13. Cross Sectional flow area, a
14. Wetted Perimeter, P<sub>w</sub>
15. Hydraulic Radius, r
16. Channel Slope, s
17. Manning's Roughness Coeff., n
18. Velocity, V
19. Compute T<sub>t</sub>

$$r = a / P_w$$

$$V = (1.49 r^{2/3} s^{1/2}) / n$$

$$T_t = \frac{L}{3600 V}$$

|                 |  |  |  |
|-----------------|--|--|--|
| Segment ID      |  |  |  |
| ft              |  |  |  |
| ft <sup>2</sup> |  |  |  |
| ft              |  |  |  |
| ft              |  |  |  |
| ft/ft           |  |  |  |
| ft/s            |  |  |  |
| hr              |  |  |  |

Channel Flow Sub-Total **0.000 hours**

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>

(Add Sub-Total T<sub>t</sub> from prior steps)

|                                  |                    |
|----------------------------------|--------------------|
| Total T <sub>c</sub> (hours) =   | <b>0.259 hours</b> |
| Total T <sub>c</sub> (minutes) = | <b>16 minutes</b>  |

Project: Beacon Unitarian Universalist Church

By: SM

Date: 11/29/2023

Location: Summit, NJ

Checked By: MJV

Date Checked: 11/29/2023

Circle One: Present Developed

Future Proposed Watershed PR-2D Pervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Flow Length, L (total L < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. Compute T<sub>t</sub>

$$T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} s^{0.4}}$$

|            |                      |                               |  |
|------------|----------------------|-------------------------------|--|
| Segment ID | <b>1</b>             | <b>2</b>                      |  |
|            | <b>Dense Grasses</b> | <b>Woods Light Underbrush</b> |  |
|            | <b>0.24</b>          | <b>0.40</b>                   |  |
| ft         | <b>37</b>            | <b>63</b>                     |  |
| in         | <b>4.12</b>          | <b>4.12</b>                   |  |
| ft/ft      | <b>0.065</b>         | <b>0.025</b>                  |  |
| hr         | <b>0.059</b>         | <b>0.198</b>                  |  |

Sheet Flow Sub-Total **0.257 hours**

**Shallow Concentrated Flow**

7. Surface Description
8. Flow Length, L
9. Watercourse Slope, s
10. Average Velocity, V (NEH table 15-3)
11. Compute T<sub>t</sub>

$$T_t = \frac{L}{3600 V}$$

|            |                  |                          |  |
|------------|------------------|--------------------------|--|
| Segment ID | <b>3</b>         | <b>4</b>                 |  |
|            | <b>Woodlands</b> | <b>Grassed Waterways</b> |  |
| ft         | <b>56</b>        | <b>140</b>               |  |
| ft/ft      | <b>0.025</b>     | <b>0.011</b>             |  |
| ft/s       | <b>0.80</b>      | <b>1.72</b>              |  |
| hr         | <b>0.020</b>     | <b>0.023</b>             |  |

Shallow Conc. Flow Sub-Total **0.042 hours**

**Channel Flow**

12. Flow Length, L
13. Cross Sectional flow area, a
14. Wetted Perimeter, P<sub>w</sub>
15. Hydraulic Radius, r
16. Channel Slope, s
17. Manning's Roughness Coeff., n
18. Velocity, V
19. Compute T<sub>t</sub>

$$r = a / P_w$$

$$V = (1.49 r^{2/3} s^{1/2}) / n$$

$$T_t = \frac{L}{3600 V}$$

|                 |  |  |  |
|-----------------|--|--|--|
| Segment ID      |  |  |  |
| ft              |  |  |  |
| ft <sup>2</sup> |  |  |  |
| ft              |  |  |  |
| ft              |  |  |  |
| ft/ft           |  |  |  |
|                 |  |  |  |
| ft/s            |  |  |  |
| hr              |  |  |  |

Channel Flow Sub-Total **0.000 hours**

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>

(Add Sub-Total T<sub>t</sub> from prior steps)

|                                  |                    |
|----------------------------------|--------------------|
| Total T <sub>c</sub> (hours) =   | <b>0.299 hours</b> |
| Total T <sub>c</sub> (minutes) = | <b>18 minutes</b>  |

# Hydrograph Report

Project Name:

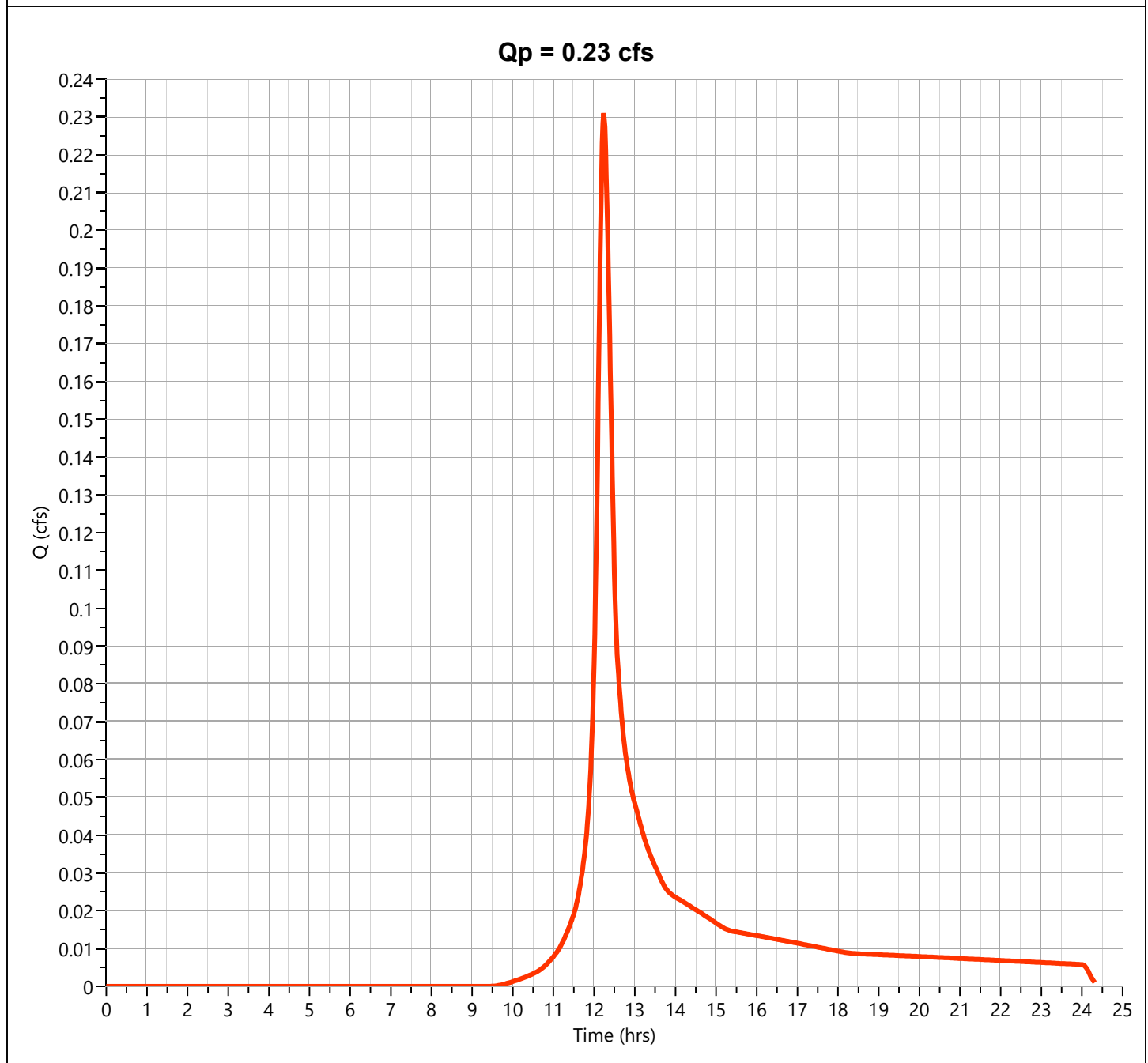
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2D Grass HSGC C

## Hyd. No. 21

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.231 cfs  |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.23 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 1,028 cuft |
| Drainage Area   | = 0.17 ac     | Curve Number       | = 74         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 18.0 min   |
| Total Rainfall  | = 4.12 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

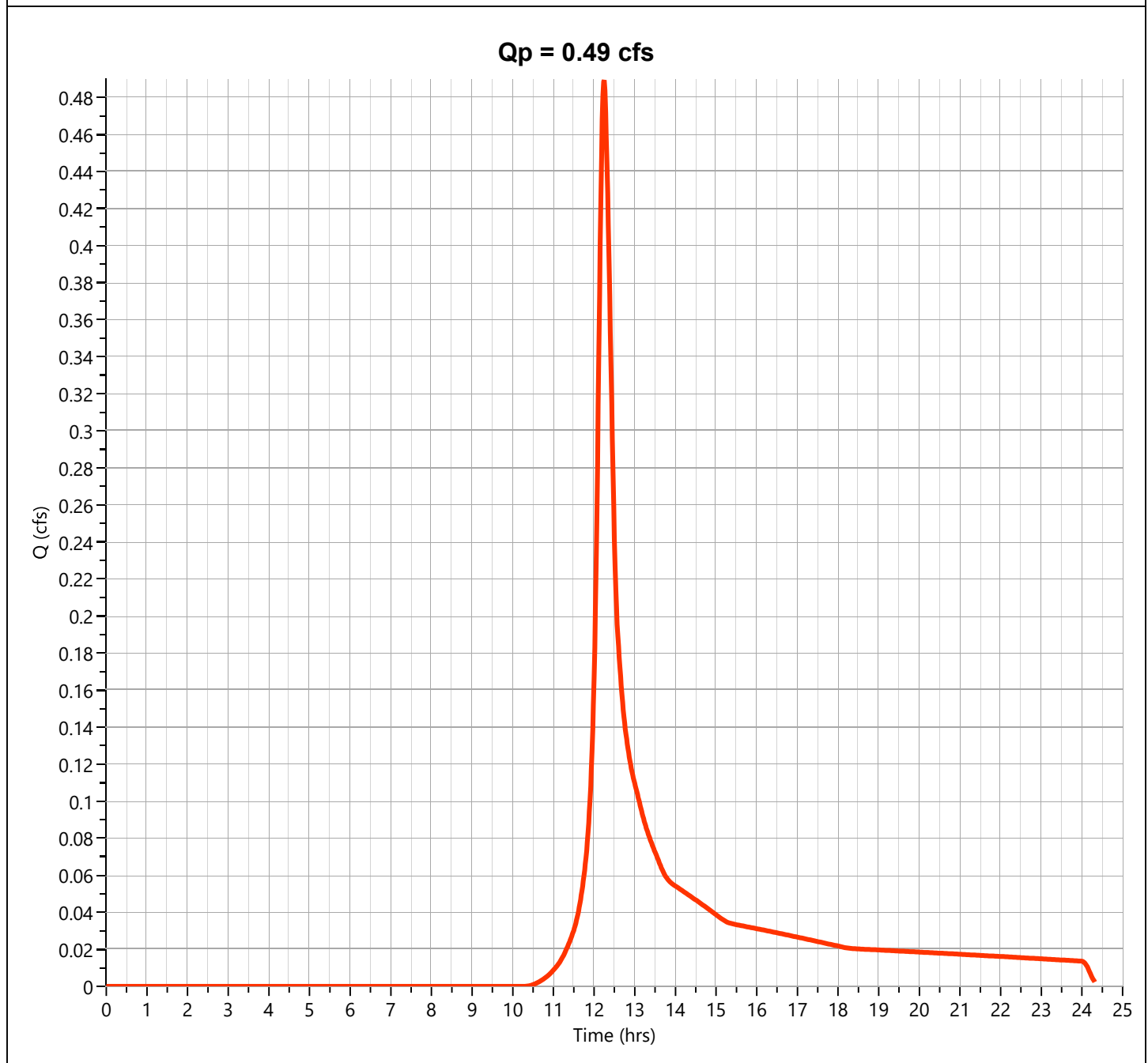
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2D Woods HSGC C

## Hyd. No. 22

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.489 cfs  |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.25 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 2,227 cuft |
| Drainage Area   | = 0.44 ac     | Curve Number       | = 70         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 18.0 min   |
| Total Rainfall  | = 4.12 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |





# Hydrograph Report

Project Name:

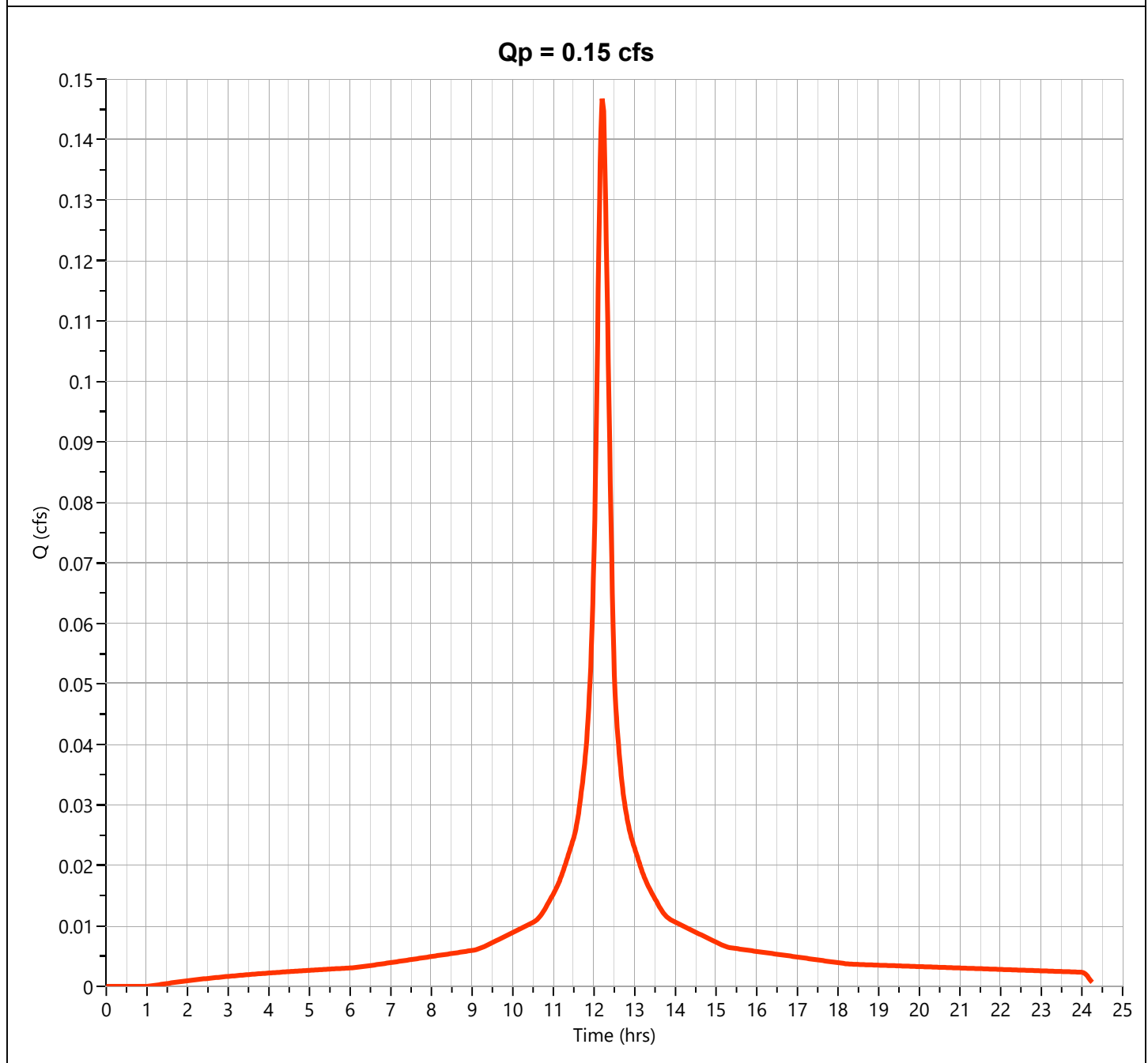
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2D Impervious

## Hyd. No. 23

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.147 cfs |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.20 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 714 cuft  |
| Drainage Area   | = 0.05 ac     | Curve Number       | = 98        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 16.0 min  |
| Total Rainfall  | = 4.12 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

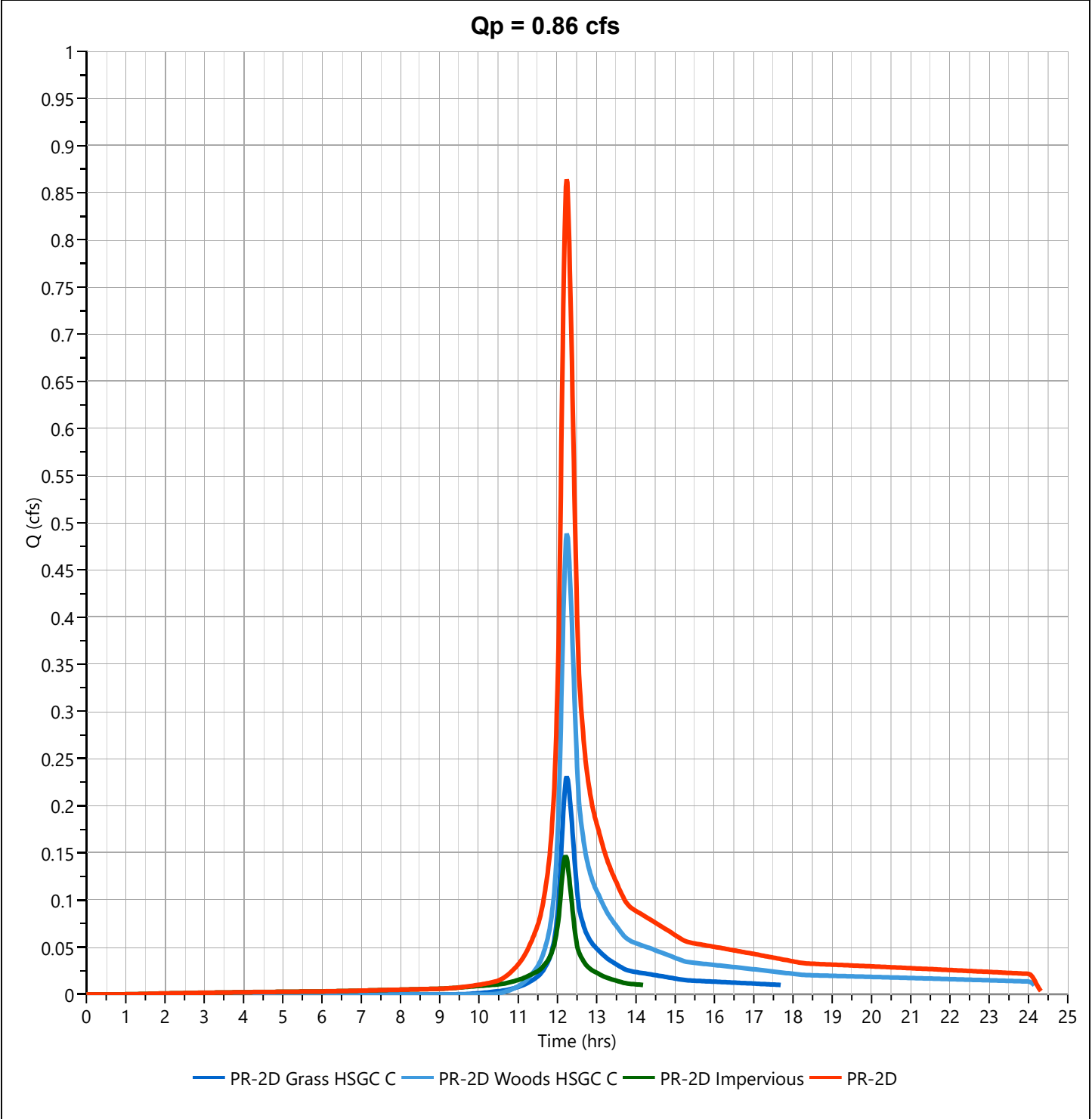
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2D

## Hyd. No. 24

|                    |              |                     |              |
|--------------------|--------------|---------------------|--------------|
| Hydrograph Type    | = Junction   | Peak Flow           | = 0.864 cfs  |
| Storm Frequency    | = 2-yr       | Time to Peak        | = 12.23 hrs  |
| Time Interval      | = 1 min      | Hydrograph Volume   | = 3,969 cuft |
| Inflow Hydrographs | = 21, 22, 23 | Total Contrib. Area | = 0.66 ac    |



# Hydrograph Report

Project Name:

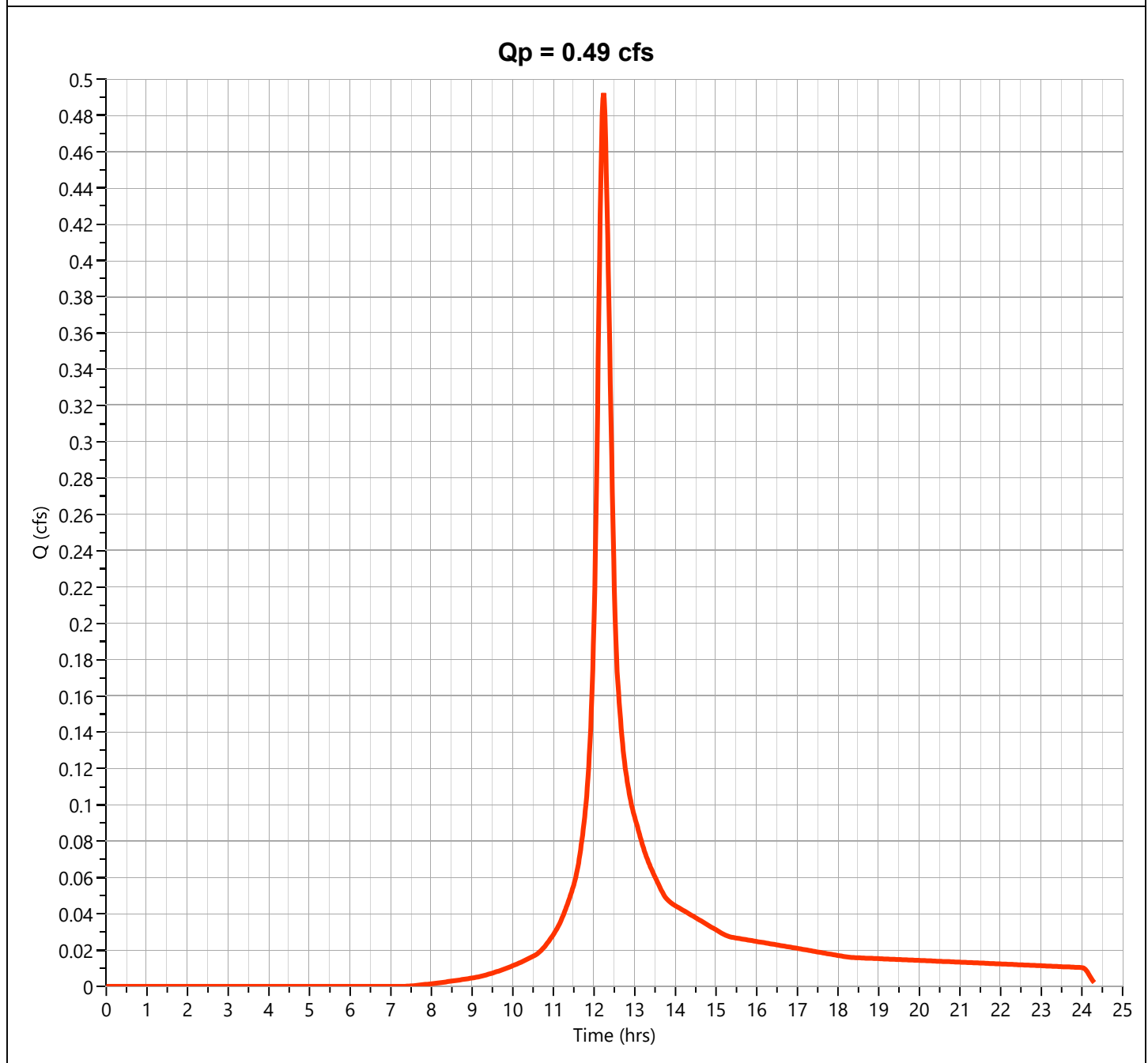
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2D Grass HSGC C

## Hyd. No. 21

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.492 cfs  |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.23 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 2,160 cuft |
| Drainage Area   | = 0.17 ac     | Curve Number       | = 74         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 18.0 min   |
| Total Rainfall  | = 6.42 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

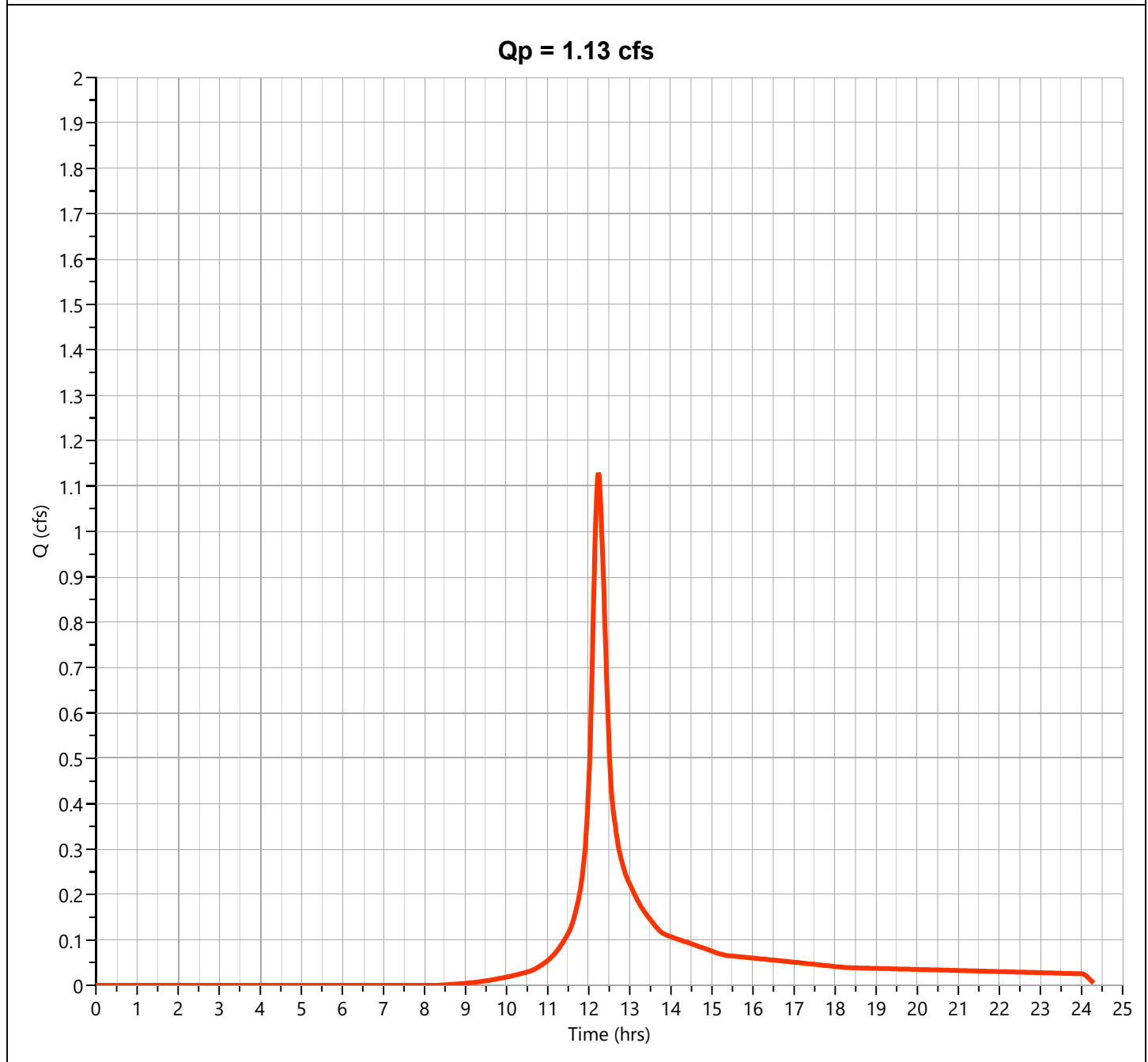
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2D Woods HSGC C

## Hyd. No. 22

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 1.129 cfs  |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.23 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 4,962 cuft |
| Drainage Area   | = 0.44 ac     | Curve Number       | = 70         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 18.0 min   |
| Total Rainfall  | = 6.42 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

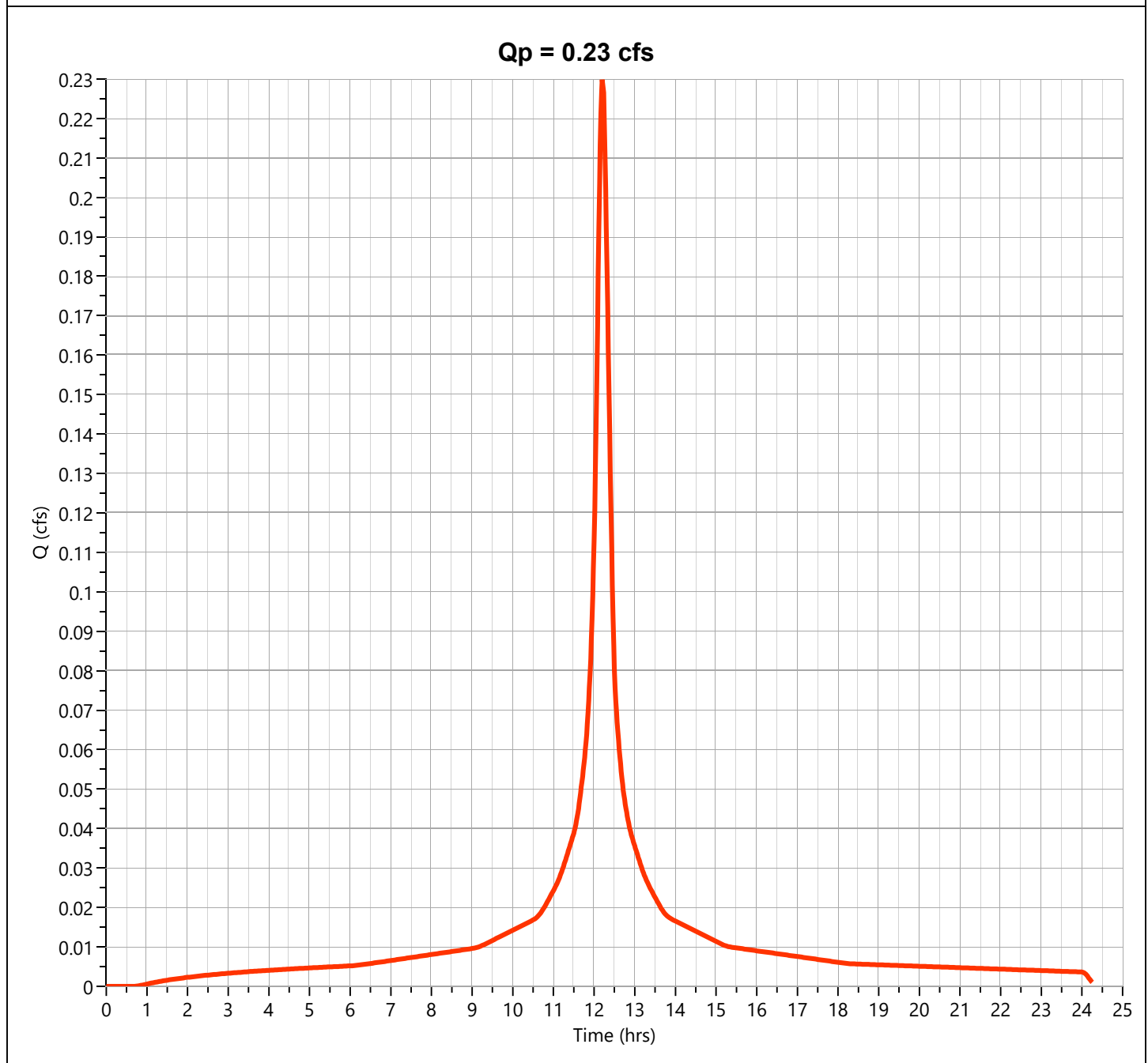
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2D Impervious

## Hyd. No. 23

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.230 cfs  |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.20 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 1,136 cuft |
| Drainage Area   | = 0.05 ac     | Curve Number       | = 98         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 16.0 min   |
| Total Rainfall  | = 6.42 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

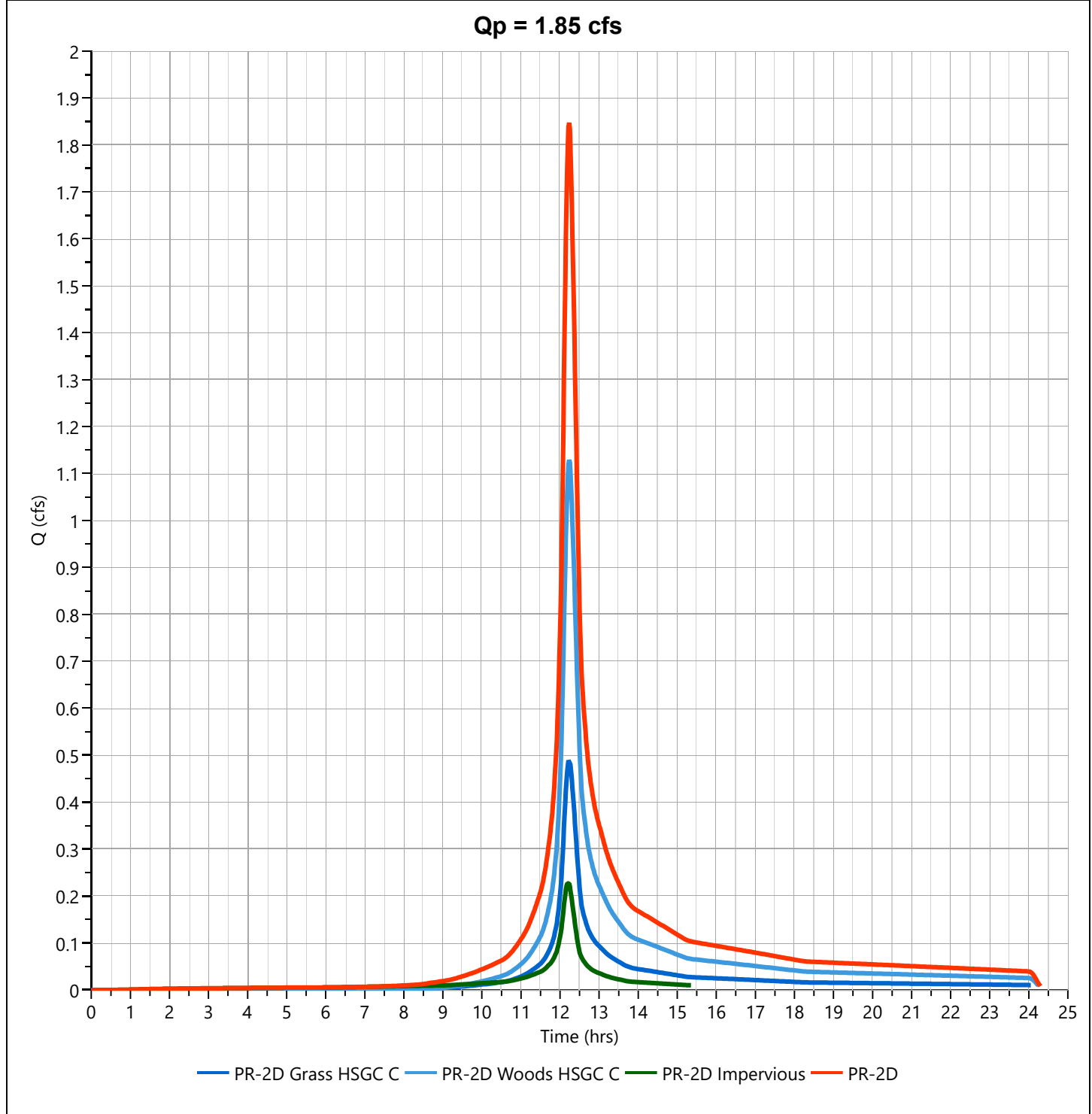
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2D

## Hyd. No. 24

|                    |              |                     |              |
|--------------------|--------------|---------------------|--------------|
| Hydrograph Type    | = Junction   | Peak Flow           | = 1.847 cfs  |
| Storm Frequency    | = 10-yr      | Time to Peak        | = 12.23 hrs  |
| Time Interval      | = 1 min      | Hydrograph Volume   | = 8,258 cuft |
| Inflow Hydrographs | = 21, 22, 23 | Total Contrib. Area | = 0.66 ac    |



# Hydrograph Report

Project Name:

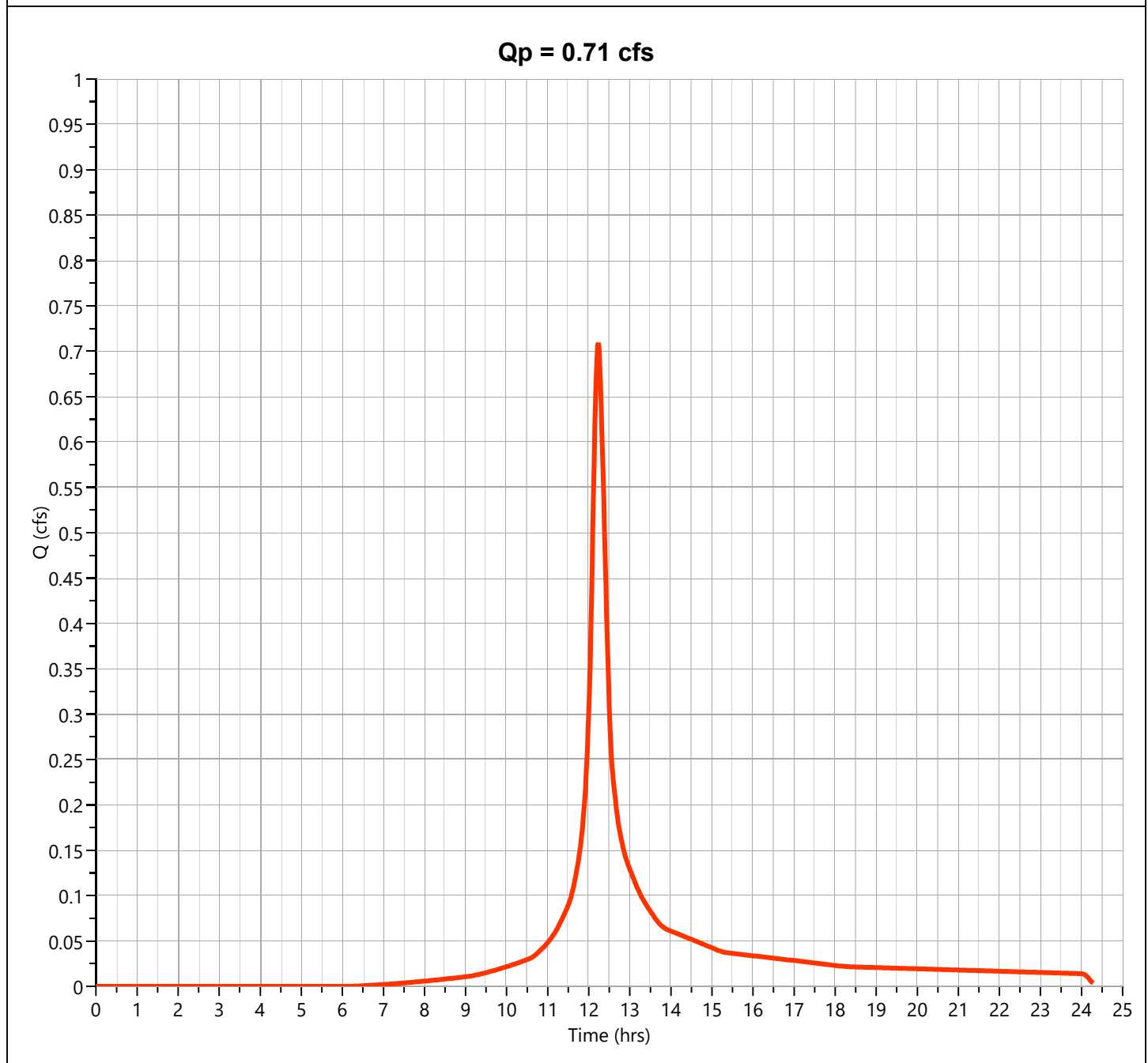
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2D Grass HSGC C

## Hyd. No. 21

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.709 cfs  |
| Storm Frequency | = 25-yr       | Time to Peak       | = 12.23 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 3,131 cuft |
| Drainage Area   | = 0.17 ac     | Curve Number       | = 74         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 18.0 min   |
| Total Rainfall  | = 8.23 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

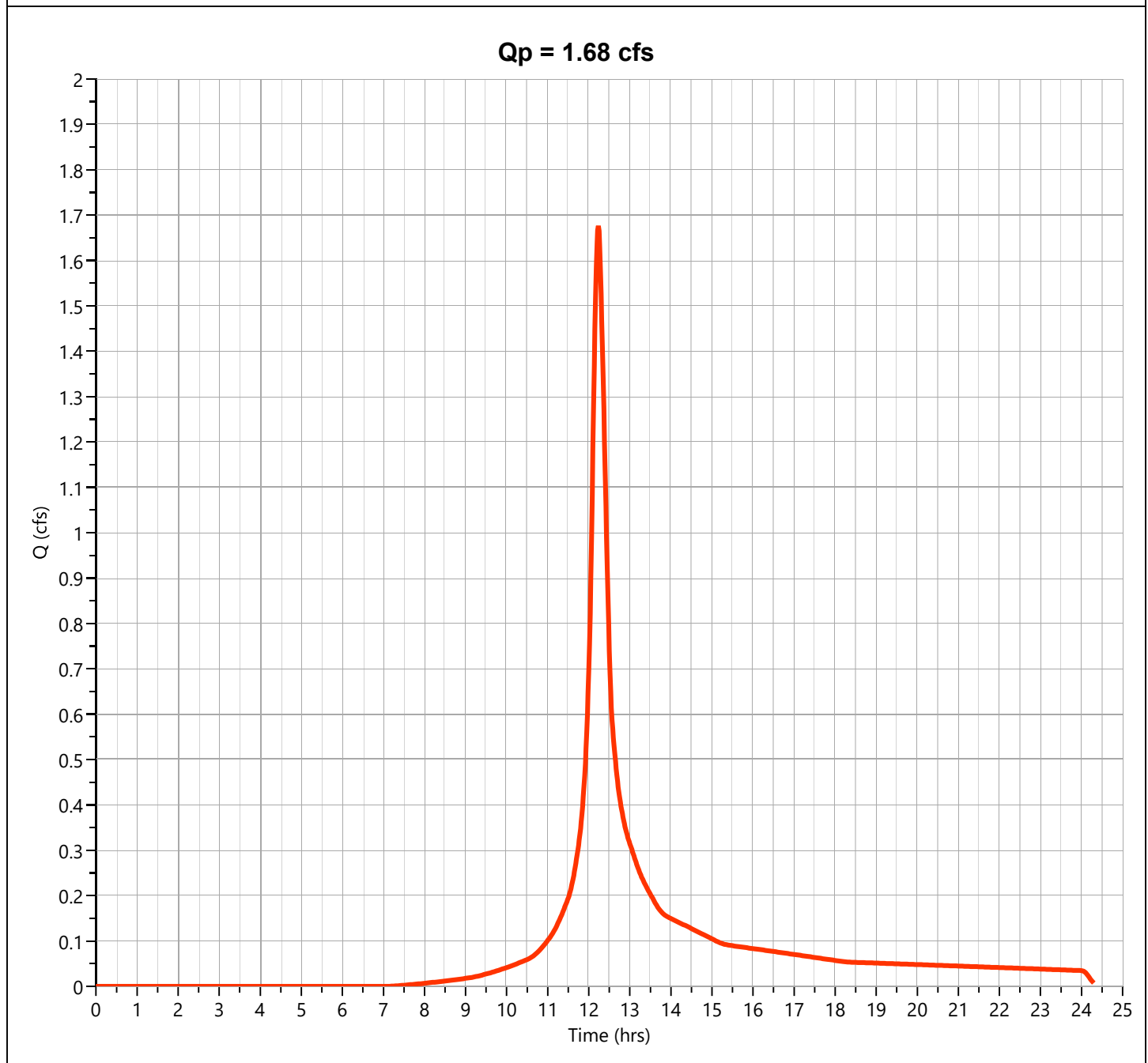
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2D Woods HSGC C

## Hyd. No. 22

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 1.676 cfs  |
| Storm Frequency | = 25-yr       | Time to Peak       | = 12.23 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 7,362 cuft |
| Drainage Area   | = 0.44 ac     | Curve Number       | = 70         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 18.0 min   |
| Total Rainfall  | = 8.23 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |





# Hydrograph Report

Project Name:

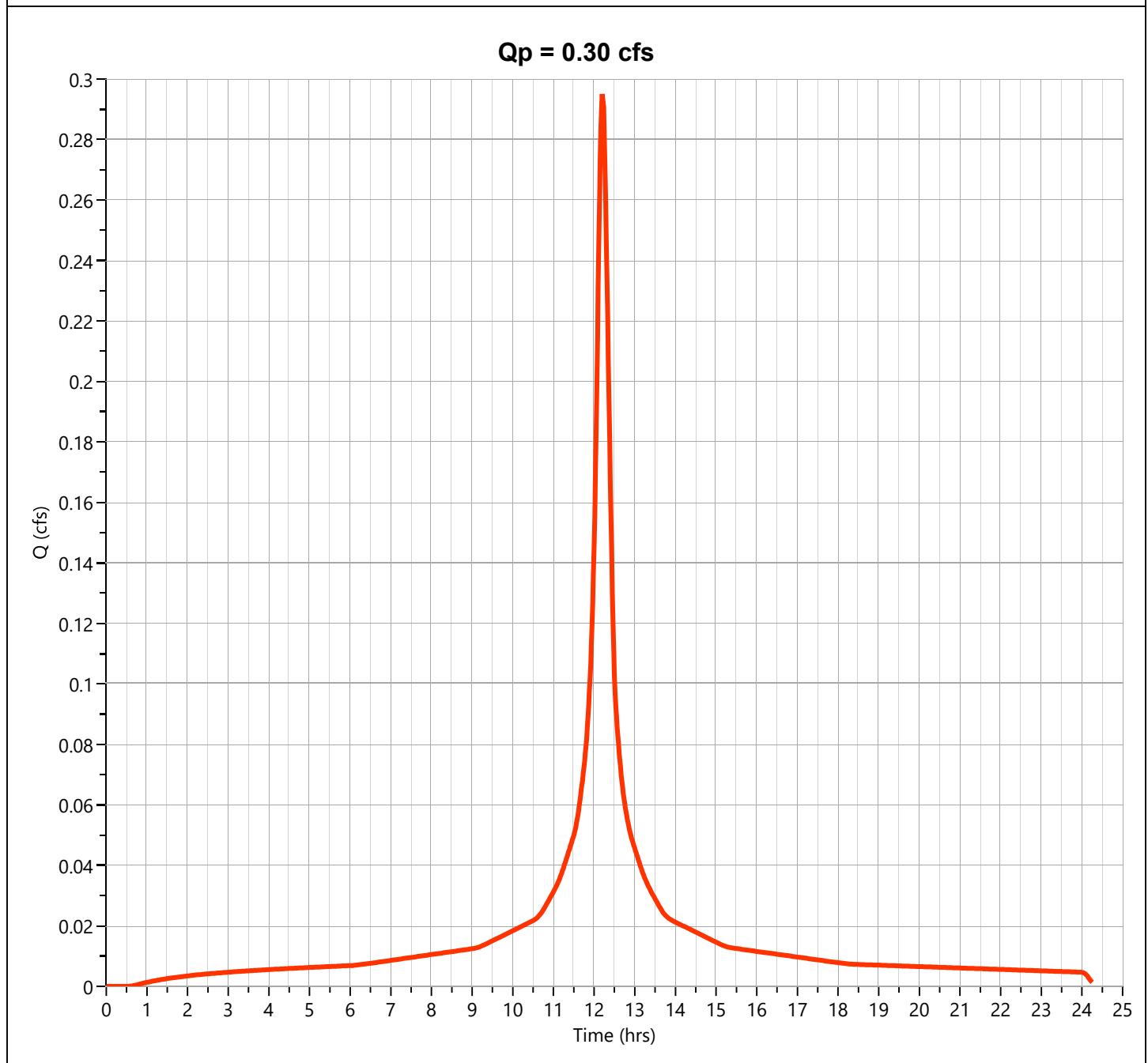
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2D Impervious

## Hyd. No. 23

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.295 cfs  |
| Storm Frequency | = 25-yr       | Time to Peak       | = 12.20 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 1,468 cuft |
| Drainage Area   | = 0.05 ac     | Curve Number       | = 98         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 16.0 min   |
| Total Rainfall  | = 8.23 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

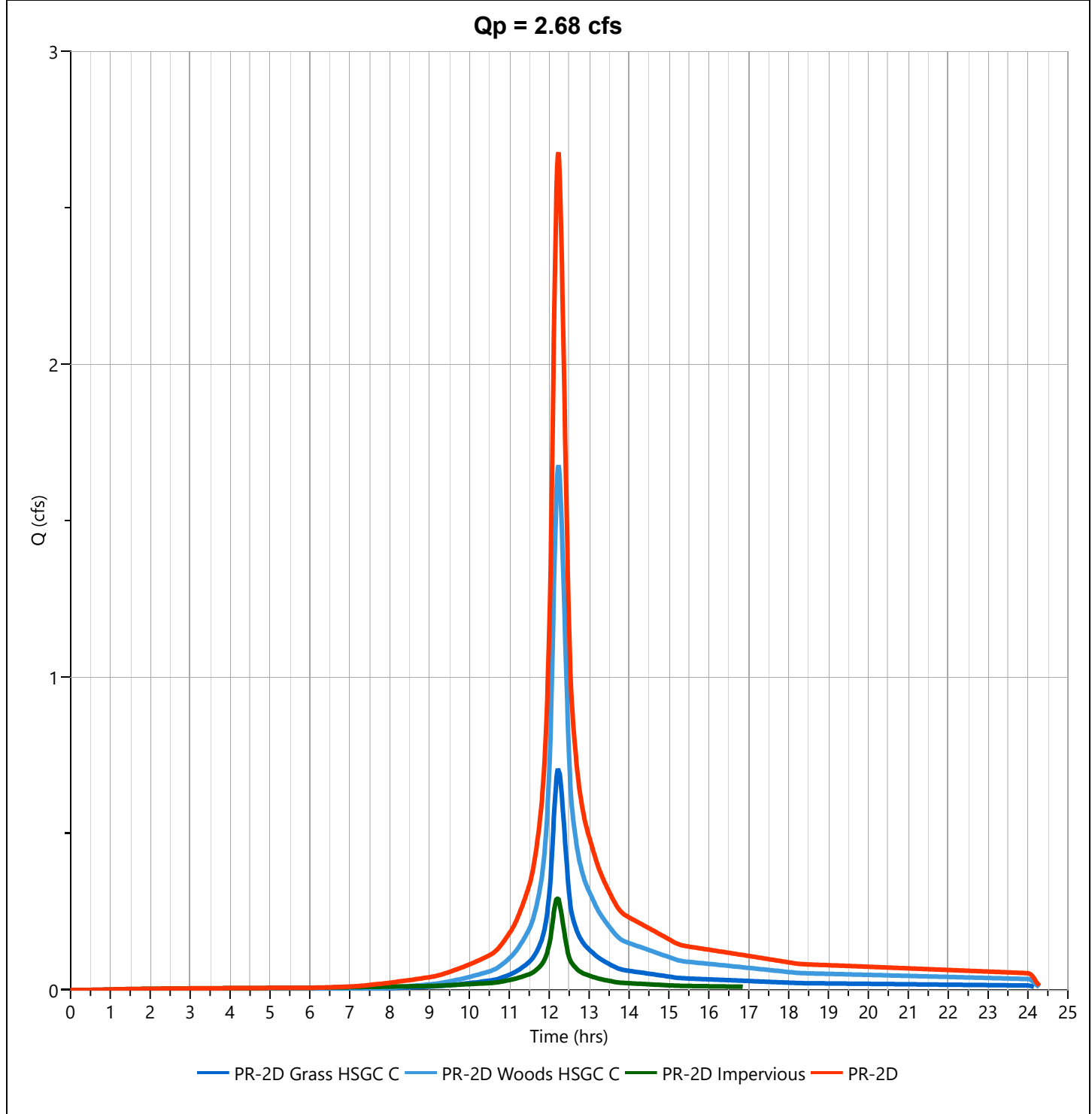
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2D

## Hyd. No. 24

|                    |              |                     |               |
|--------------------|--------------|---------------------|---------------|
| Hydrograph Type    | = Junction   | Peak Flow           | = 2.676 cfs   |
| Storm Frequency    | = 25-yr      | Time to Peak        | = 12.23 hrs   |
| Time Interval      | = 1 min      | Hydrograph Volume   | = 11,962 cuft |
| Inflow Hydrographs | = 21, 22, 23 | Total Contrib. Area | = 0.66 ac     |



# Hydrograph Report

Project Name:

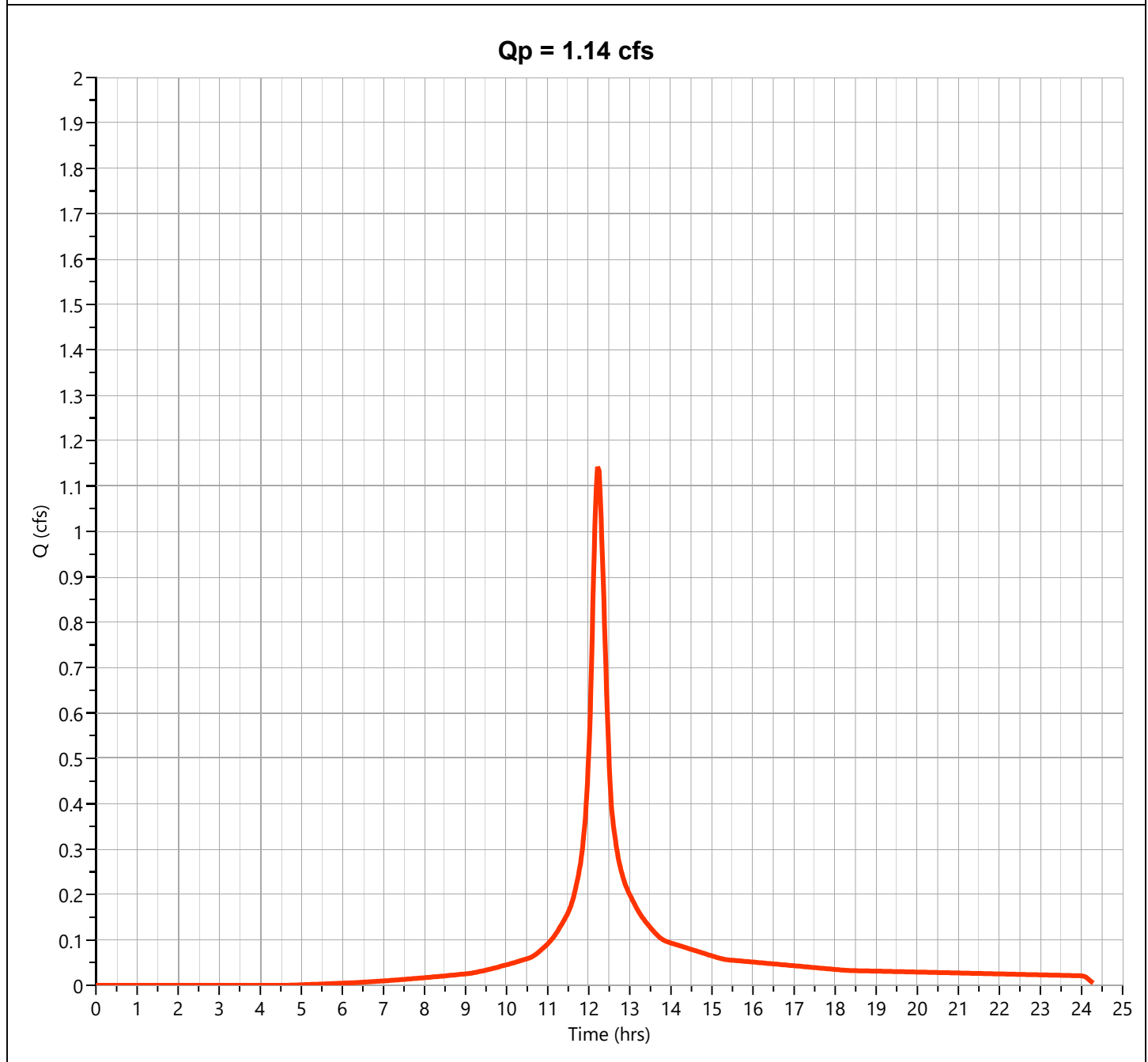
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2D Grass HSGC C

## Hyd. No. 21

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 1.144 cfs  |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.23 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 5,142 cuft |
| Drainage Area   | = 0.17 ac     | Curve Number       | = 74         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 18.0 min   |
| Total Rainfall  | = 11.80 in    | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

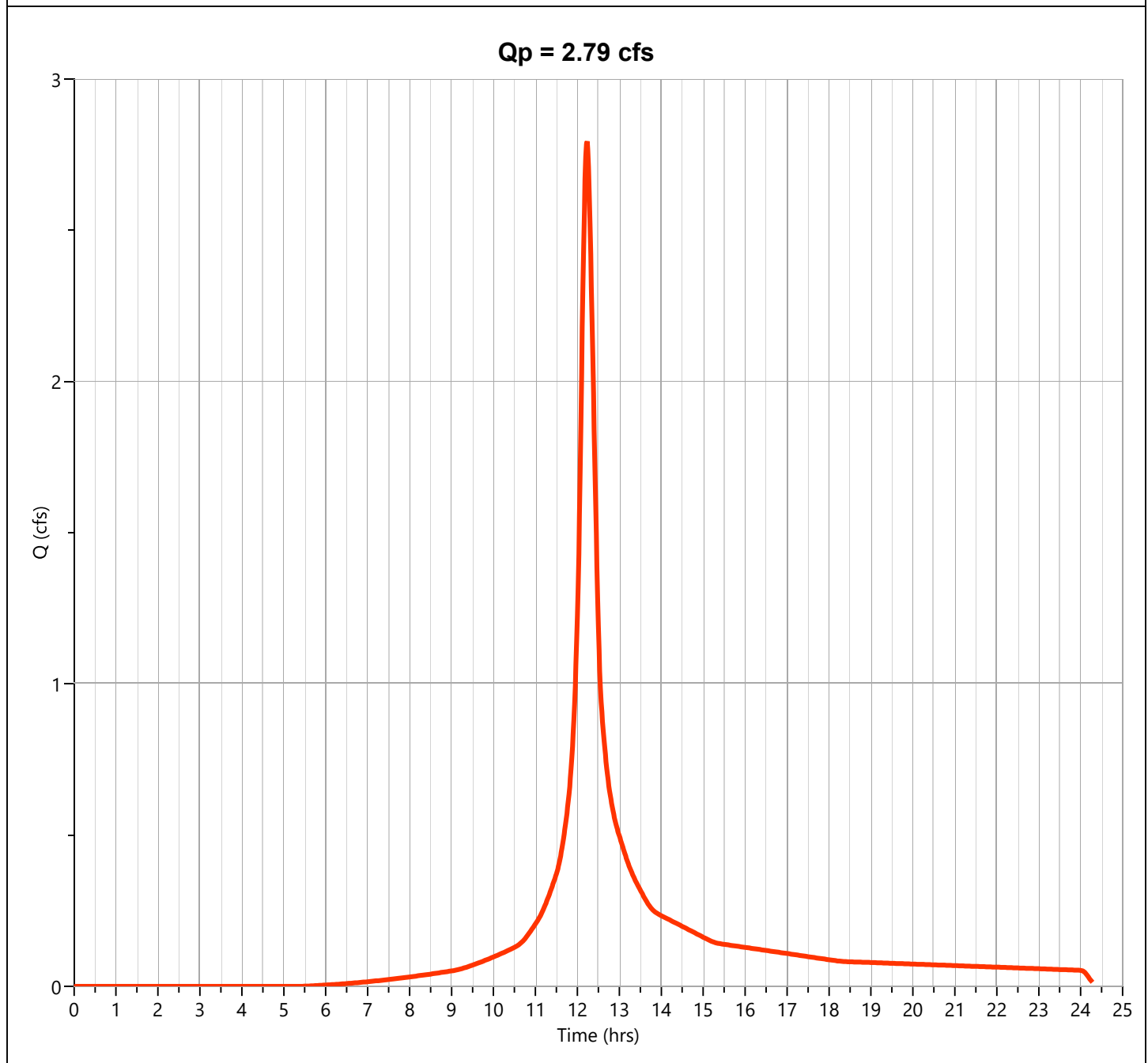
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2D Woods HSGC C

## Hyd. No. 22

|                 |               |                    |               |
|-----------------|---------------|--------------------|---------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 2.793 cfs   |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.23 hrs   |
| Time Interval   | = 1 min       | Runoff Volume      | = 12,416 cuft |
| Drainage Area   | = 0.44 ac     | Curve Number       | = 70          |
| Tc Method       | = User        | Time of Conc. (Tc) | = 18.0 min    |
| Total Rainfall  | = 11.80 in    | Design Storm       | = NOAA-D      |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484         |



# Hydrograph Report

Project Name:

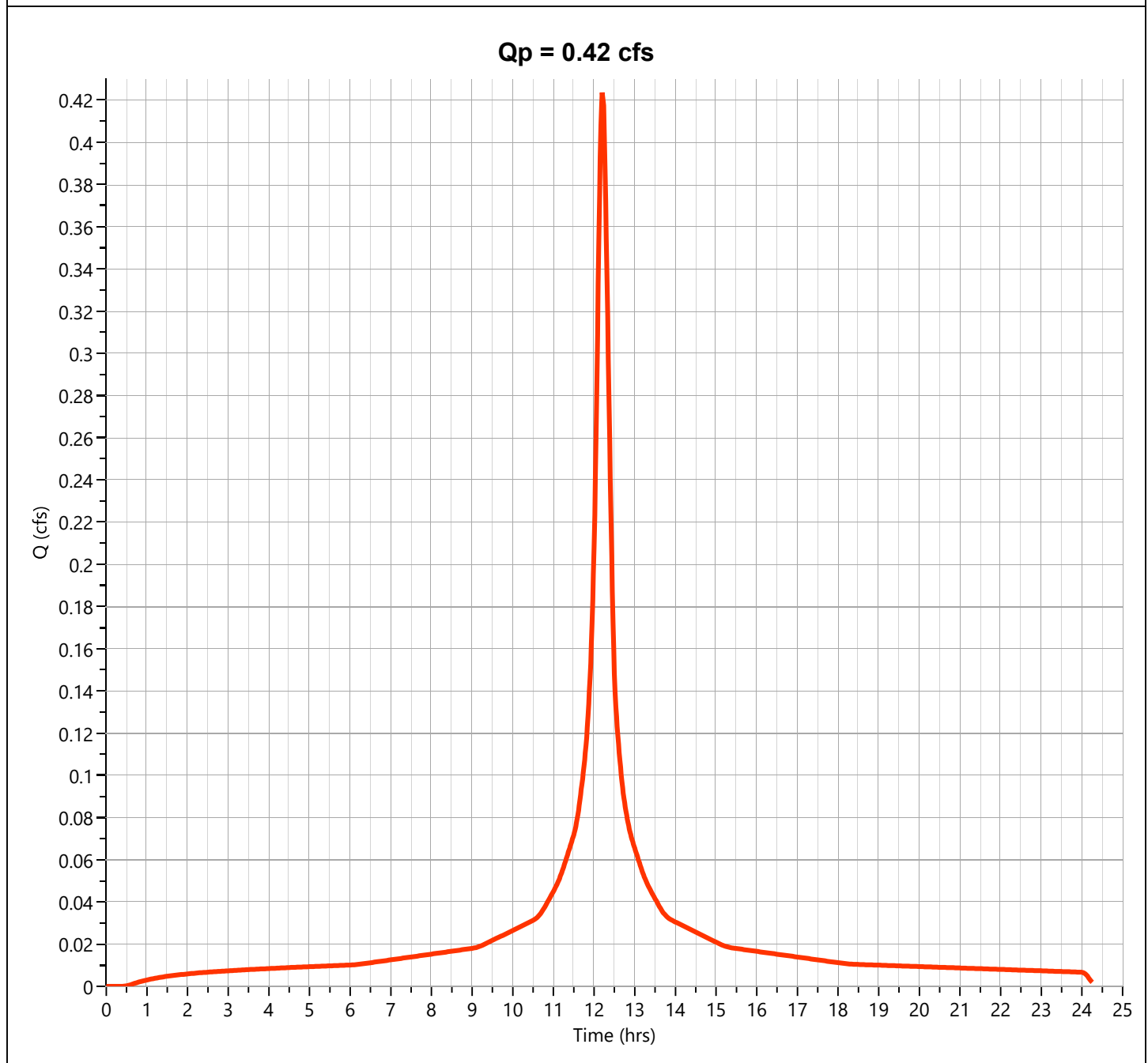
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2D Impervious

## Hyd. No. 23

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.423 cfs  |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.20 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 2,124 cuft |
| Drainage Area   | = 0.05 ac     | Curve Number       | = 98         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 16.0 min   |
| Total Rainfall  | = 11.80 in    | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

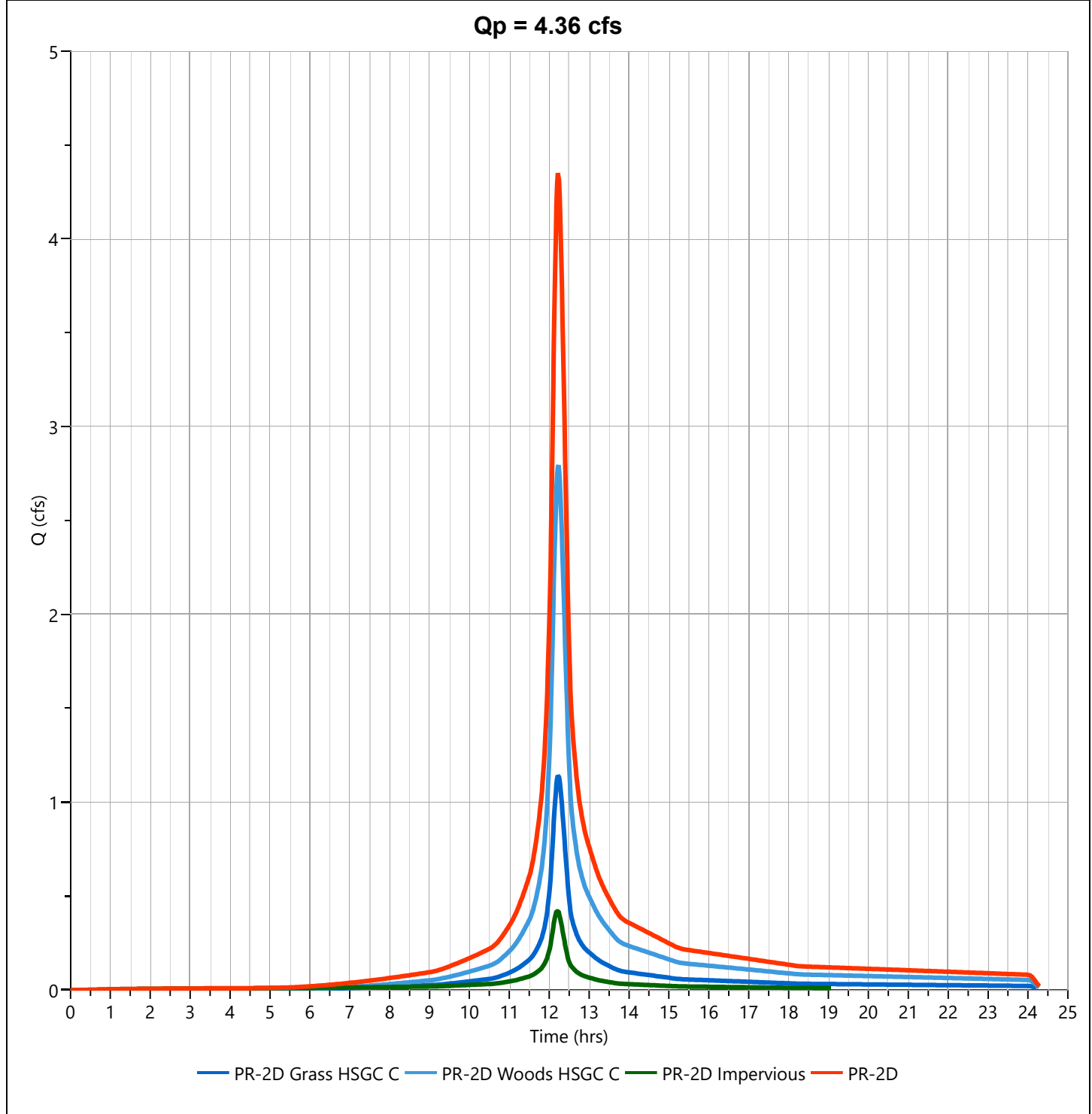
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2D

## Hyd. No. 24

|                    |              |                     |               |
|--------------------|--------------|---------------------|---------------|
| Hydrograph Type    | = Junction   | Peak Flow           | = 4.355 cfs   |
| Storm Frequency    | = 100-yr     | Time to Peak        | = 12.23 hrs   |
| Time Interval      | = 1 min      | Hydrograph Volume   | = 19,683 cuft |
| Inflow Hydrographs | = 21, 22, 23 | Total Contrib. Area | = 0.66 ac     |



## **PR-2E WATERSHED**

Project: Beacon Unitarian Universalist Church

By: TEG

Date: 2/6/2024

Location: Summit, NJ

Checked By: MJV

Date Checked: 2/6/2024

Circle One: Present Developed

Future Proposed Watershed PR-2E - Impervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Design Flow Length, L<sub>des</sub> (Total L<sub>des</sub> < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. McCuen-Spiess Limit, L<sub>mcs</sub> (max. 100 ft)
7. Compute T<sub>t</sub>

$$L_{mcs} = (100 s^{0.5})/n$$

$$T_t = \frac{0.007 (n L_{des})^{0.8}}{P_2^{0.5} s^{0.4}}$$

| Segment ID | 1                      | 2                    | 3                    |
|------------|------------------------|----------------------|----------------------|
|            | <b>Smooth Surfaces</b> | <b>Dense Grasses</b> | <b>Dense Grasses</b> |
|            | <b>0.011</b>           | <b>0.24</b>          | <b>0.24</b>          |
| ft         | <b>8</b>               | <b>11</b>            | <b>32</b>            |
| in         | <b>4.12</b>            | <b>4.12</b>          | <b>4.12</b>          |
| ft/ft      | <b>0.023</b>           | <b>0.238</b>         | <b>0.010</b>         |
| ft         | <b>100</b>             | <b>100</b>           | <b>42</b>            |
| hr         | <b>0.002</b>           | <b>0.013</b>         | <b>0.110</b>         |

Sheet Flow Sub-Total **0.125 hours**

**Shallow Concentrated Flow**

8. Surface Description
9. Flow Length, L
10. Watercourse Slope, s
11. Average Velocity, V (NEH table 15-3)
12. Compute T<sub>t</sub>

$$T_t = \frac{L}{3600 V}$$

| Segment ID | 4                        | 5                        |  |
|------------|--------------------------|--------------------------|--|
|            | <b>Grassed Waterways</b> | <b>Grassed Waterways</b> |  |
| ft         | <b>26</b>                | <b>25</b>                |  |
| ft/ft      | <b>0.013</b>             | <b>0.027</b>             |  |
| ft/s       | <b>1.85</b>              | <b>2.66</b>              |  |
| hr         | <b>0.004</b>             | <b>0.003</b>             |  |

Shallow Conc. Flow Sub-Total **0.007 hours**

**Channel Flow**

13. Flow Length, L
14. Cross Sectional flow area, a
15. Wetted Perimeter, P<sub>w</sub>
16. Hydraulic Radius, r
17. Channel Slope, s
18. Manning's Roughness Coeff., n
19. Velocity, V
20. Compute T<sub>t</sub>

$$r = a / P_w$$

$$V = (1.49 r^{2/3} s^{1/2}) / n$$

$$T_t = \frac{L}{3600 V}$$

| Segment ID      | 6            |  |  |
|-----------------|--------------|--|--|
| ft              | <b>291</b>   |  |  |
| ft <sup>2</sup> | <b>0.61</b>  |  |  |
| ft              | <b>2.00</b>  |  |  |
| ft              | <b>0.31</b>  |  |  |
| ft/ft           | <b>0.005</b> |  |  |
|                 | <b>0.012</b> |  |  |
| ft/s            | <b>3.97</b>  |  |  |
| hr              | <b>0.020</b> |  |  |

Channel Flow Sub-Total **0.020 hours**

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>

(Add Sub-Total T<sub>t</sub> from prior steps)

|                                  |                    |
|----------------------------------|--------------------|
| Total T <sub>c</sub> (hours) =   | <b>0.152 hours</b> |
| Total T <sub>c</sub> (minutes) = | <b>9 minutes</b>   |



Project: Beacon Unitarian Universalist Church

By: TEG

Date: 2/6/2024

Location: Summit, NJ

Checked By: MJV

Date Checked: 2/6/2024

Circle One: Present Developed

Future Proposed Watershed PR-2E - Pervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Design Flow Length, L<sub>des</sub> (Total L<sub>des</sub> < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. McCuen-Spiess Limit, L<sub>mcs</sub> (max. 100 ft)
7. Compute T<sub>t</sub>

$$L_{mcs} = (100 s^{0.5})/n$$

$$T_t = \frac{0.007 (n L_{des})^{0.8}}{P_2^{0.5} s^{0.4}}$$

| Segment ID | 1                    | 2                    |   |
|------------|----------------------|----------------------|---|
|            | <b>Dense Grasses</b> | <b>Dense Grasses</b> |   |
|            | <b>0.24</b>          | <b>0.24</b>          |   |
| ft         | <b>16</b>            | <b>34</b>            |   |
| in         | <b>4.12</b>          | <b>4.12</b>          |   |
| ft/ft      | <b>0.054</b>         | <b>0.010</b>         |   |
| ft         | <b>97</b>            | <b>41</b>            |   |
| hr         | <b>0.033</b>         | <b>0.118</b>         | + |

Sheet Flow Sub-Total **0.151 hours**

**Shallow Concentrated Flow**

8. Surface Description
9. Flow Length, L
10. Watercourse Slope, s
11. Average Velocity, V (NEH table 15-3)
12. Compute T<sub>t</sub>

$$T_t = \frac{L}{3600 V}$$

| Segment ID | 3                        | 4                        |   |
|------------|--------------------------|--------------------------|---|
|            | <b>Grassed Waterways</b> | <b>Grassed Waterways</b> |   |
| ft         | <b>26</b>                | <b>25</b>                |   |
| ft/ft      | <b>0.009</b>             | <b>0.027</b>             |   |
| ft/s       | <b>1.50</b>              | <b>2.64</b>              |   |
| hr         | <b>0.005</b>             | <b>0.003</b>             | + |

Shallow Conc. Flow Sub-Total **0.008 hours**

**Channel Flow**

13. Flow Length, L
14. Cross Sectional flow area, a
15. Wetted Perimeter, P<sub>w</sub>
16. Hydraulic Radius, r
17. Channel Slope, s
18. Manning's Roughness Coeff., n
19. Velocity, V
20. Compute T<sub>t</sub>

$$r = a / P_w$$

$$V = (1.49 r^{2/3} s^{1/2}) / n$$

$$T_t = \frac{L}{3600 V}$$

| Segment ID      | 5            |   |  |
|-----------------|--------------|---|--|
| ft              | <b>291</b>   |   |  |
| ft <sup>2</sup> | <b>0.61</b>  |   |  |
| ft              | <b>2.00</b>  |   |  |
| ft              | <b>0.31</b>  |   |  |
| ft/ft           | <b>0.005</b> |   |  |
|                 | <b>0.012</b> |   |  |
| ft/s            | <b>3.97</b>  |   |  |
| hr              | <b>0.020</b> | + |  |

Channel Flow Sub-Total **0.020 hours**

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>

(Add Sub-Total T<sub>t</sub> from prior steps)

|                                  |                    |
|----------------------------------|--------------------|
| Total T <sub>c</sub> (hours) =   | <b>0.179 hours</b> |
| Total T <sub>c</sub> (minutes) = | <b>11 minutes</b>  |

# Hydrograph Report

Project Name:

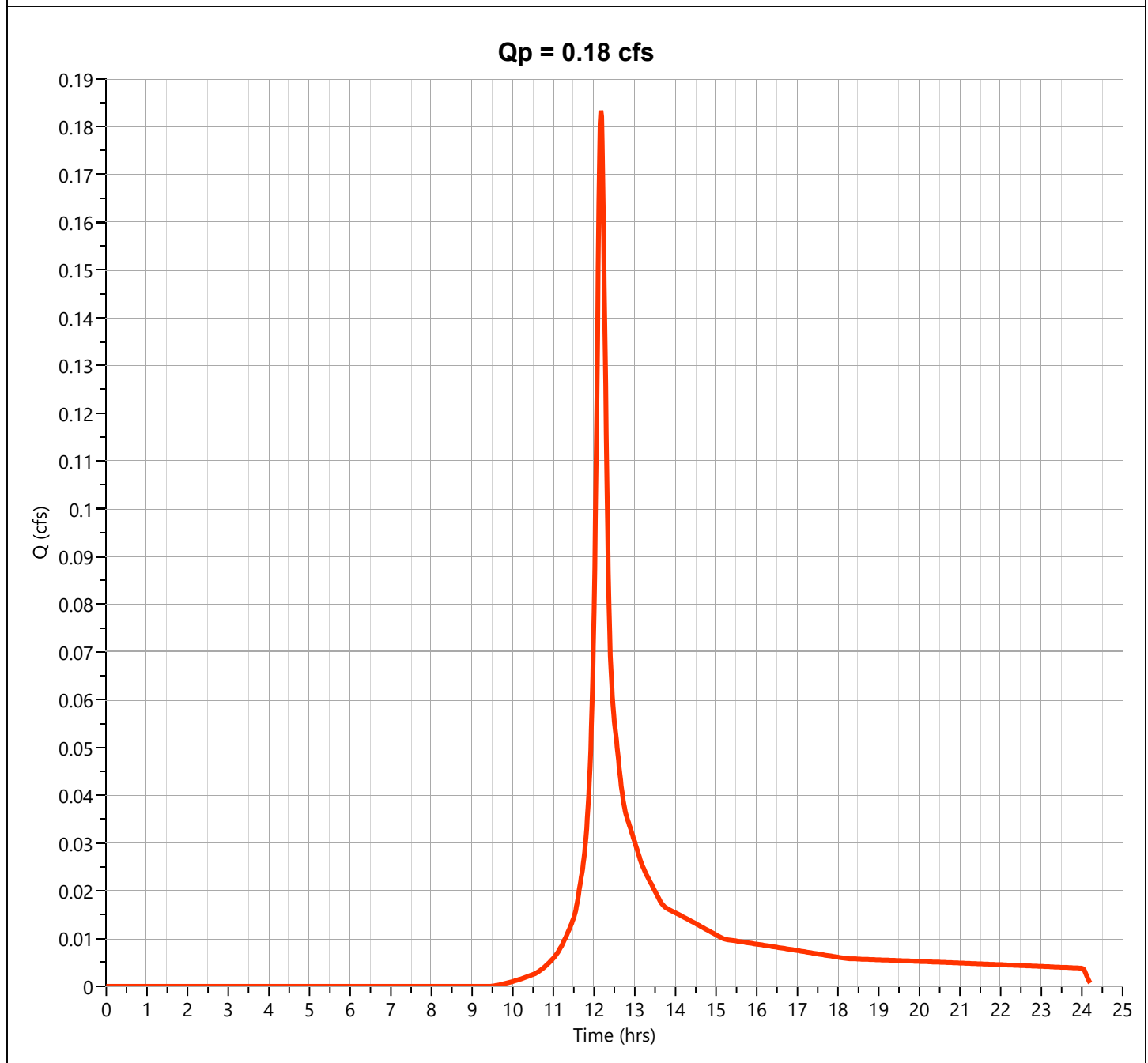
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2E Grass HSGC C

## Hyd. No. 26

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.183 cfs |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.17 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 685 cuft  |
| Drainage Area   | = 0.11 ac     | Curve Number       | = 74        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 11.0 min  |
| Total Rainfall  | = 4.12 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

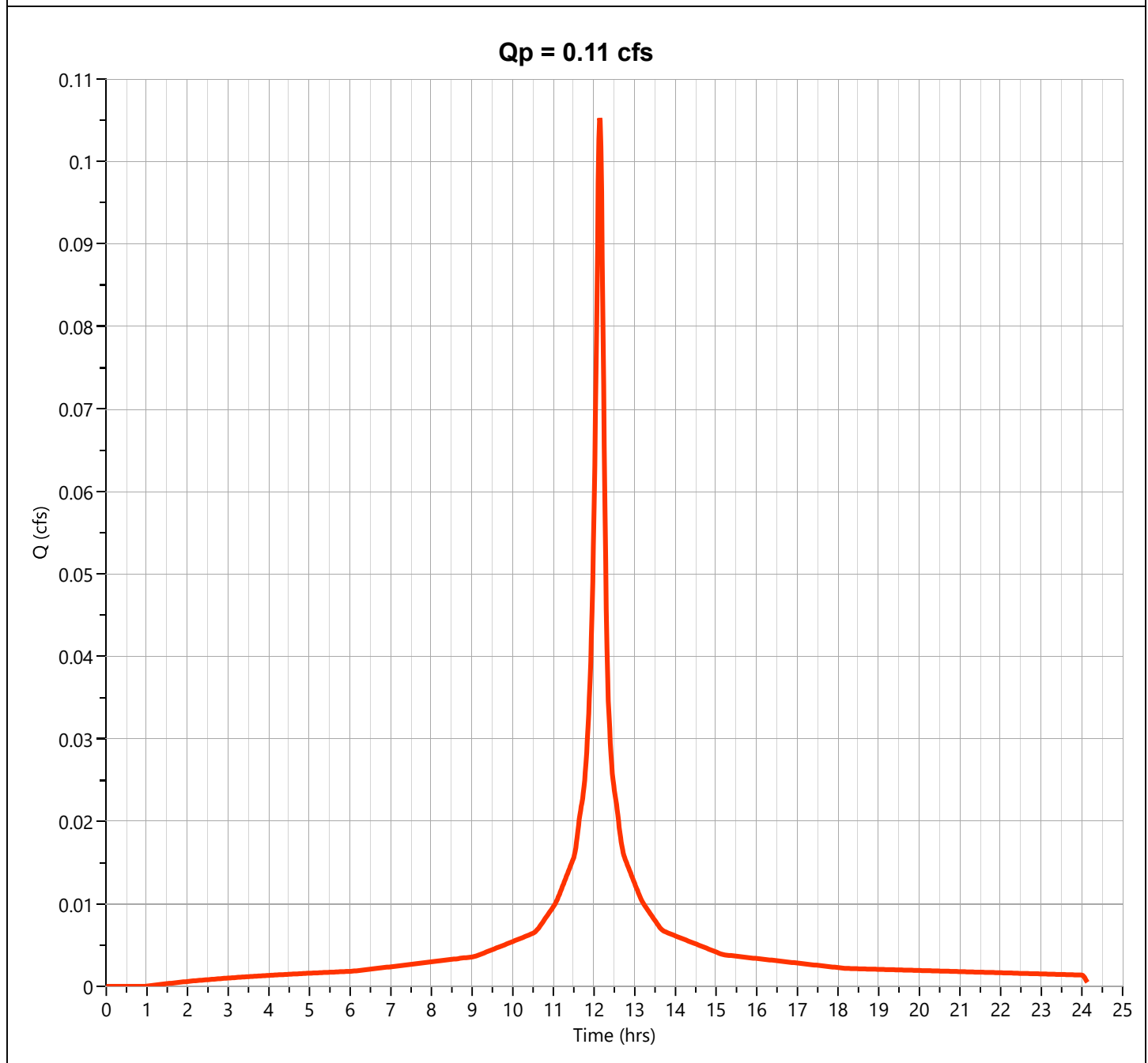
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2E Impervious

## Hyd. No. 27

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.105 cfs |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.13 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 423 cuft  |
| Drainage Area   | = 0.03 ac     | Curve Number       | = 98        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 9.0 min   |
| Total Rainfall  | = 4.12 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

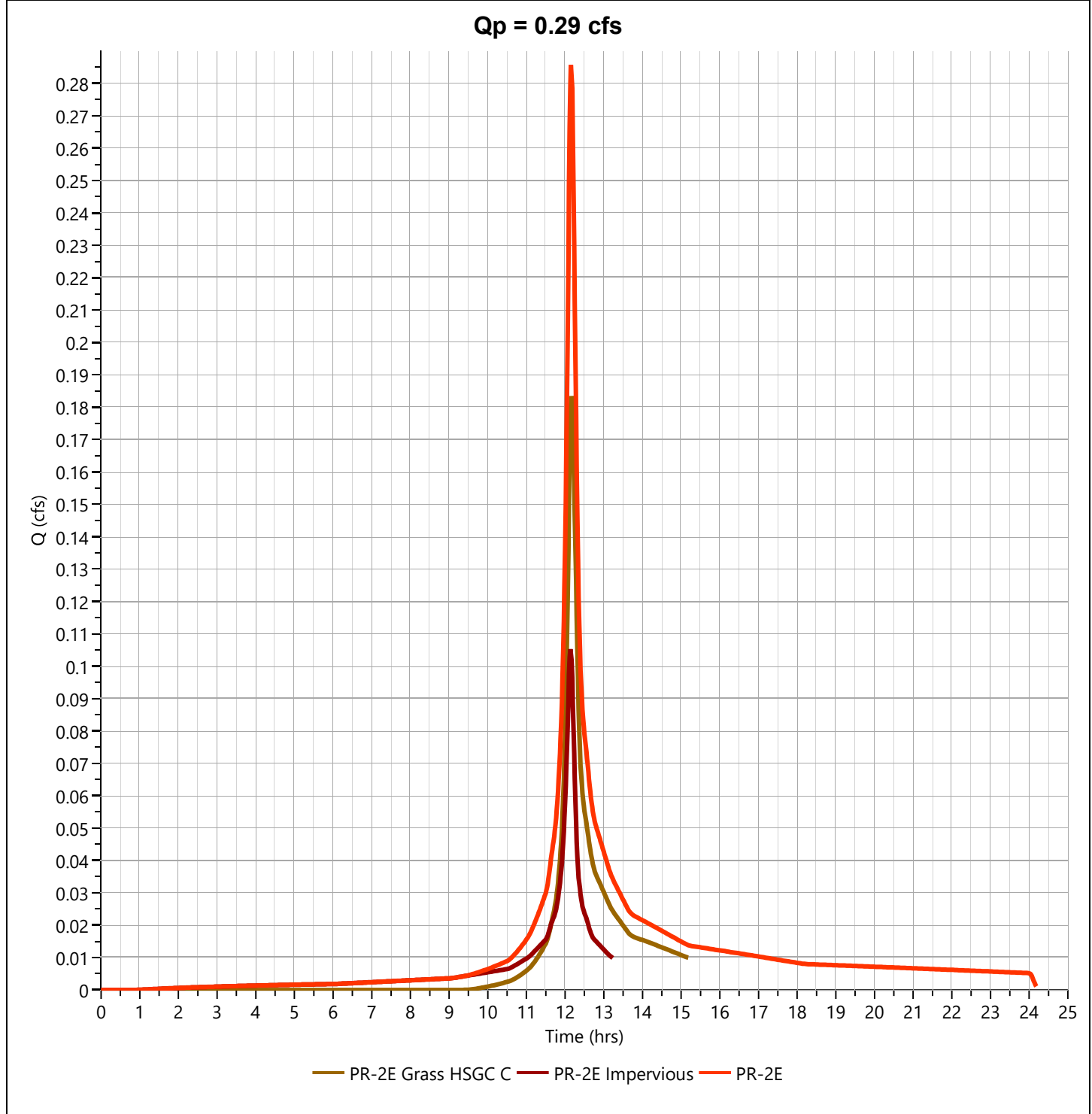
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2E

## Hyd. No. 28

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.286 cfs  |
| Storm Frequency    | = 2-yr     | Time to Peak        | = 12.15 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 1,108 cuft |
| Inflow Hydrographs | = 26, 27   | Total Contrib. Area | = 0.14 ac    |



# Hydrograph Report

Project Name:

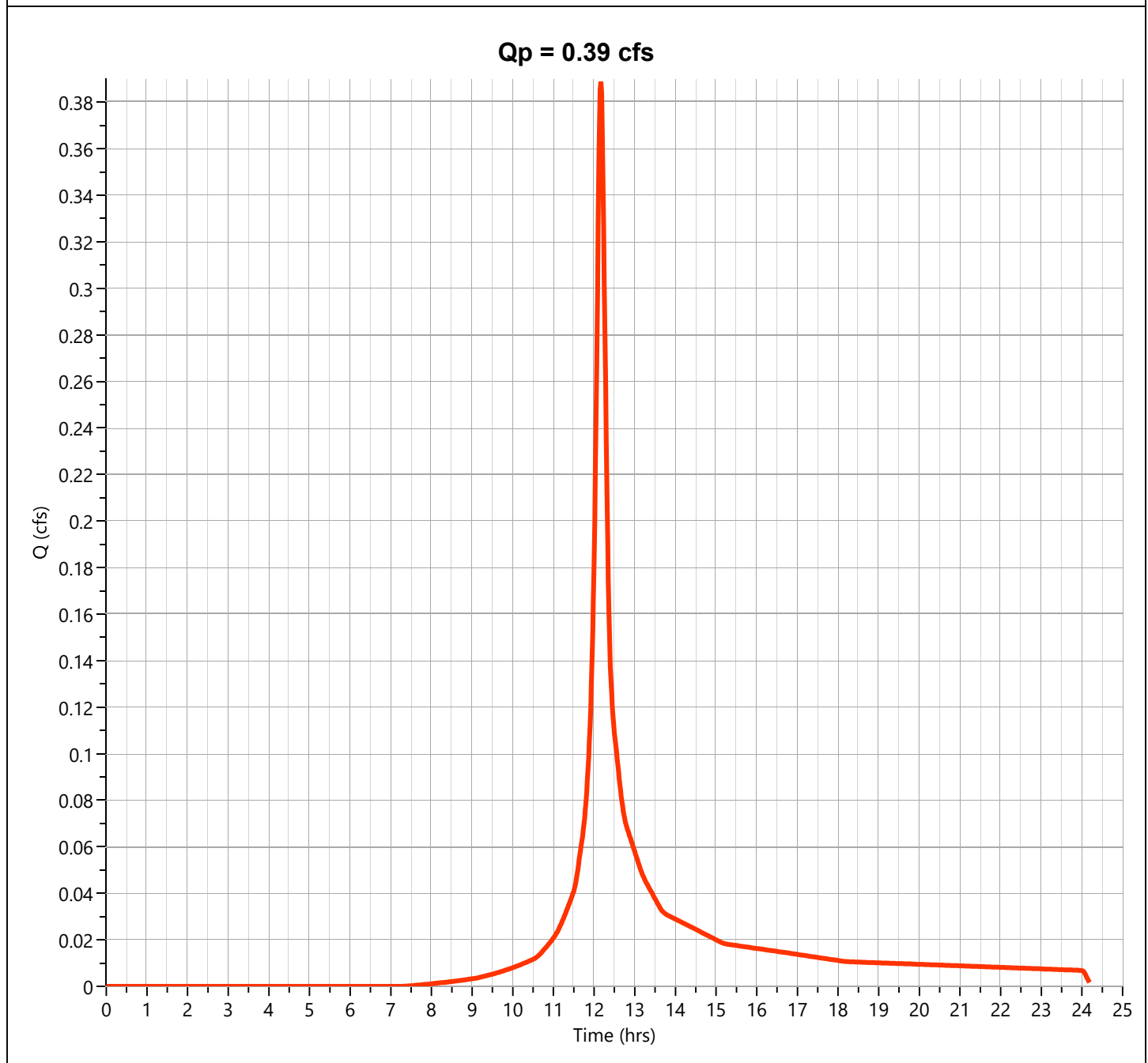
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2E Grass HSGC C

## Hyd. No. 26

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.389 cfs  |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.17 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 1,439 cuft |
| Drainage Area   | = 0.11 ac     | Curve Number       | = 74         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 11.0 min   |
| Total Rainfall  | = 6.42 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

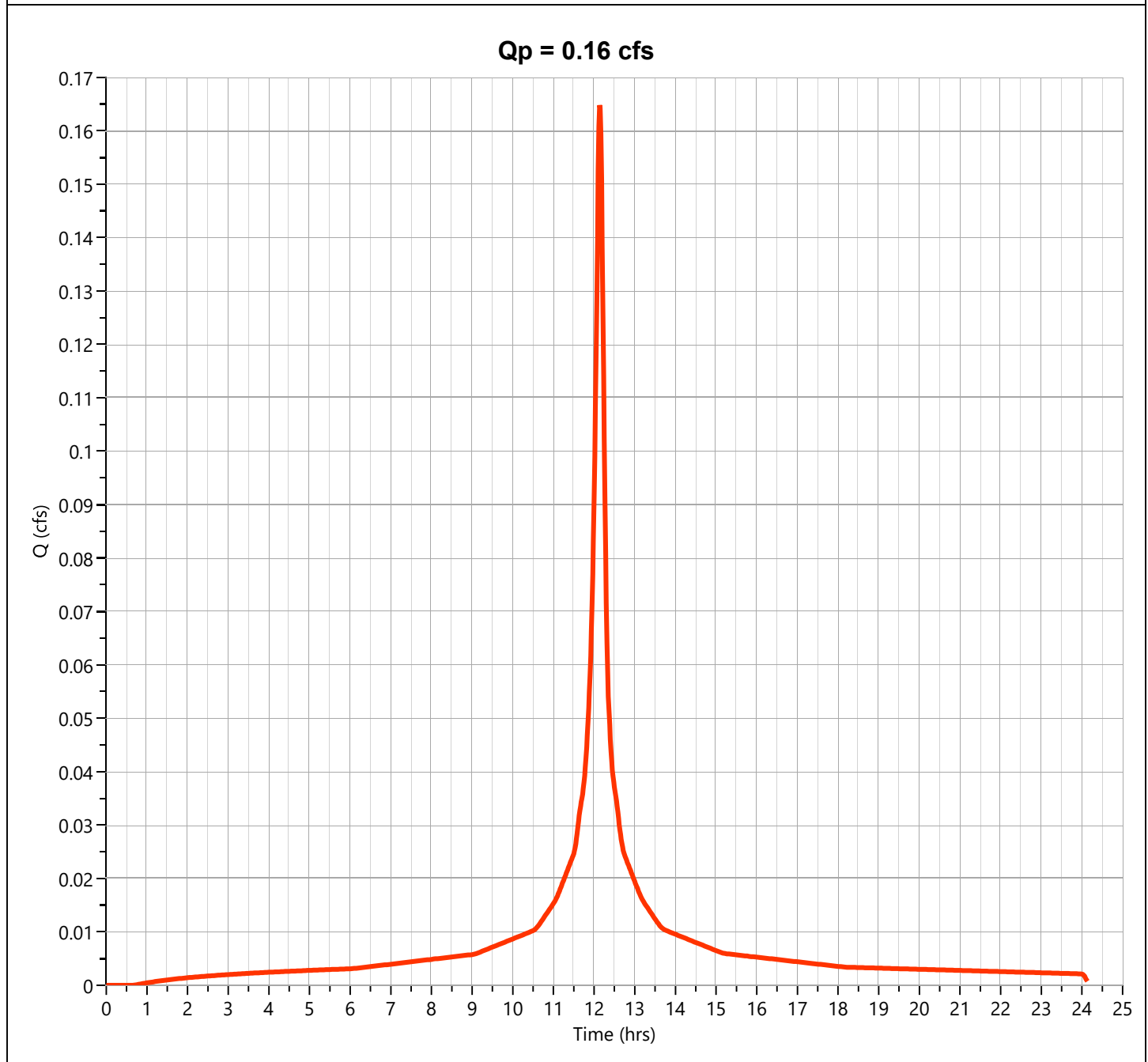
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2E Impervious

## Hyd. No. 27

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.165 cfs |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.13 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 673 cuft  |
| Drainage Area   | = 0.03 ac     | Curve Number       | = 98        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 9.0 min   |
| Total Rainfall  | = 6.42 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

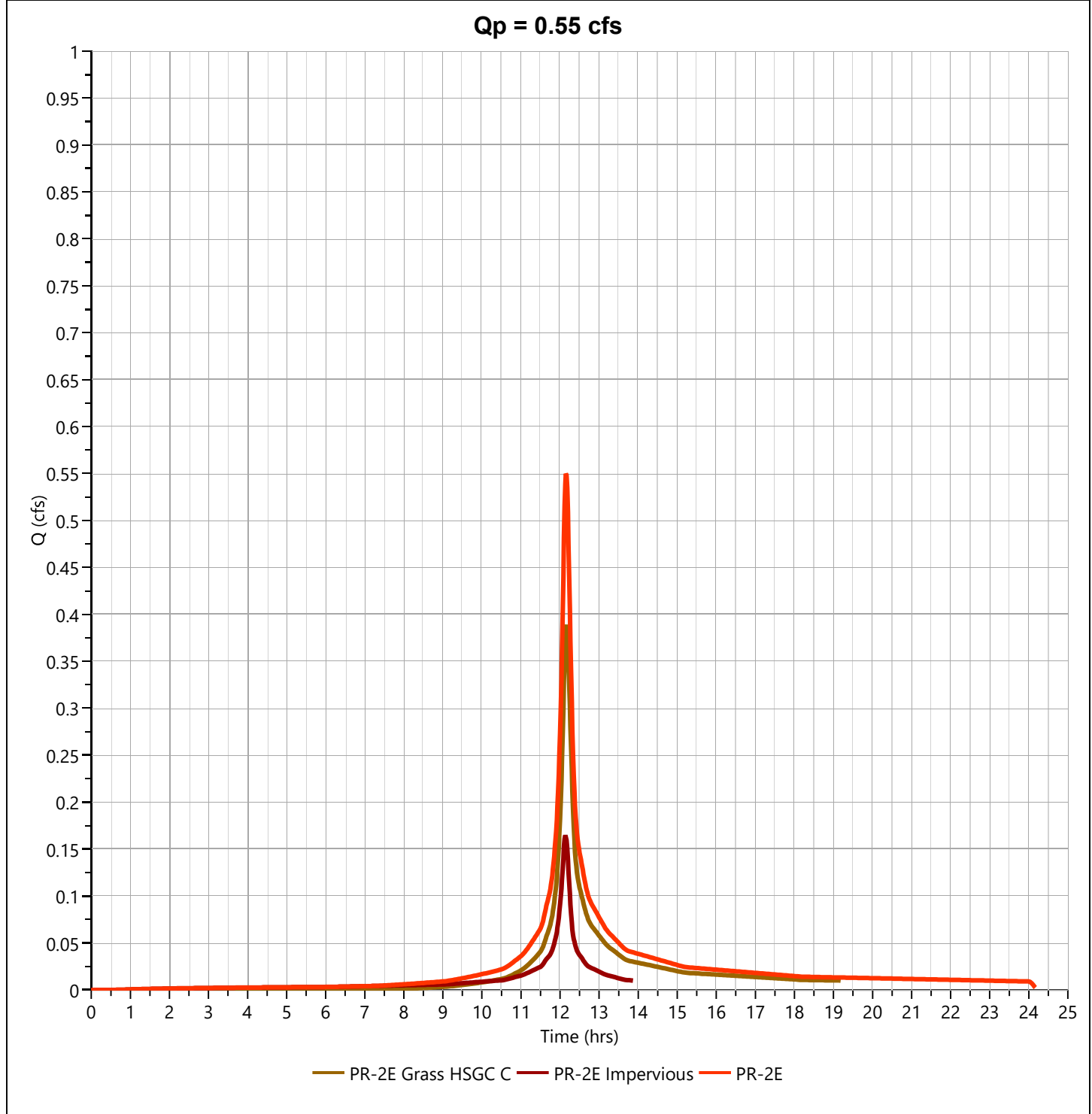
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2E

## Hyd. No. 28

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.550 cfs  |
| Storm Frequency    | = 10-yr    | Time to Peak        | = 12.15 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 2,112 cuft |
| Inflow Hydrographs | = 26, 27   | Total Contrib. Area | = 0.14 ac    |



# Hydrograph Report

Project Name:

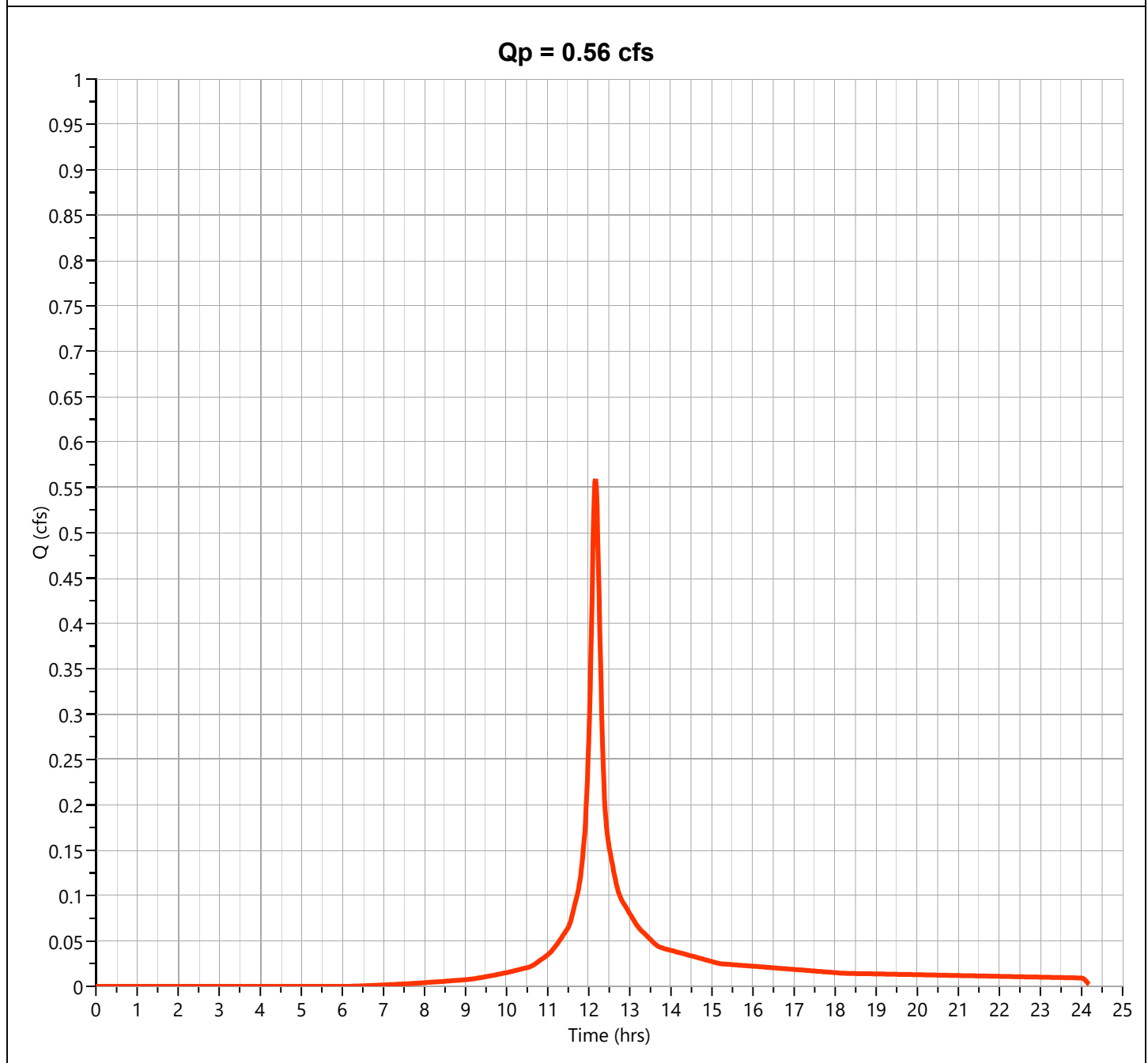
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2E Grass HSGC C

## Hyd. No. 26

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.559 cfs  |
| Storm Frequency | = 25-yr       | Time to Peak       | = 12.17 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 2,086 cuft |
| Drainage Area   | = 0.11 ac     | Curve Number       | = 74         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 11.0 min   |
| Total Rainfall  | = 8.23 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |





# Hydrograph Report

Project Name:

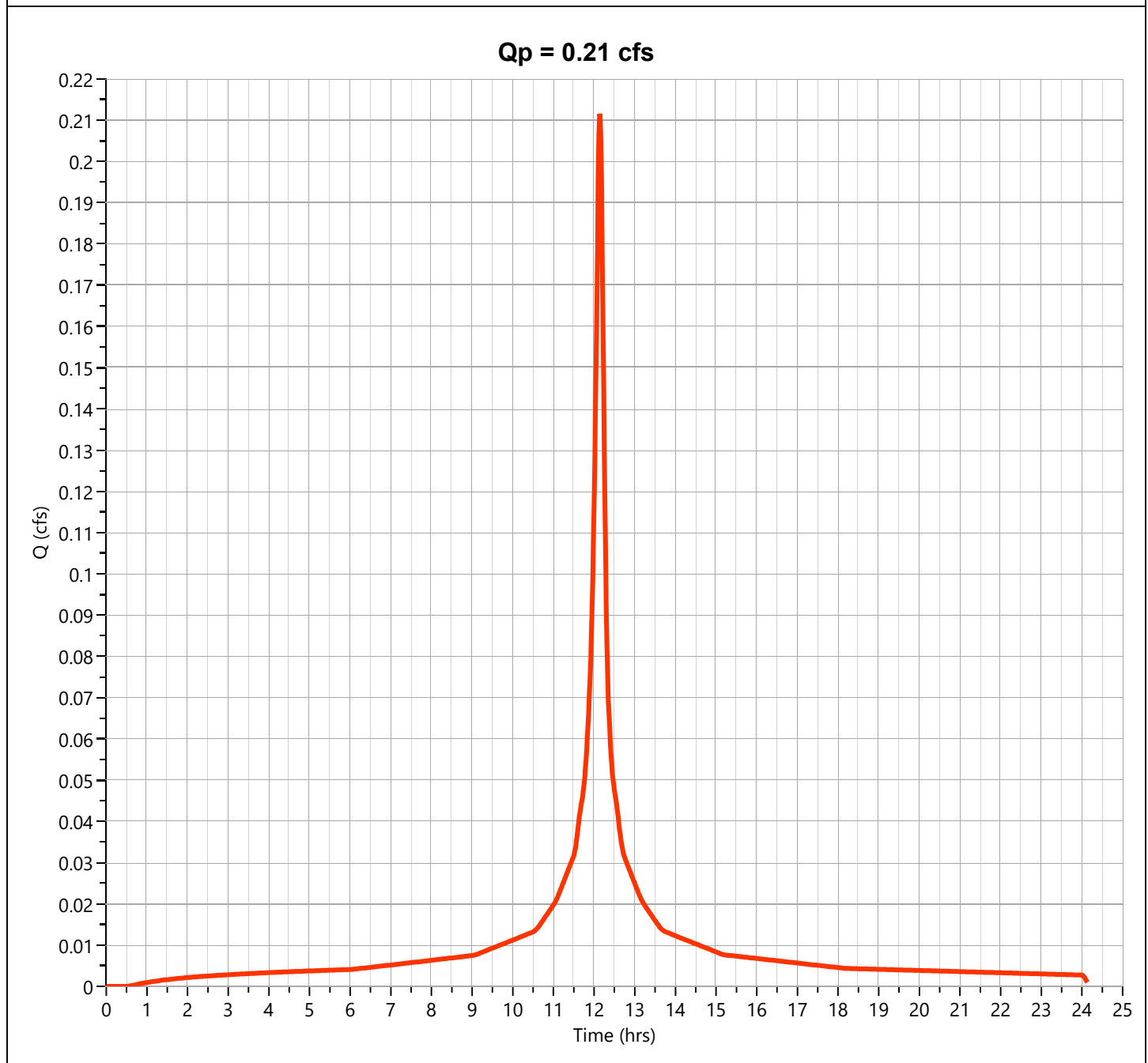
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2E Impervious

## Hyd. No. 27

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.212 cfs |
| Storm Frequency | = 25-yr       | Time to Peak       | = 12.13 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 870 cuft  |
| Drainage Area   | = 0.03 ac     | Curve Number       | = 98        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 9.0 min   |
| Total Rainfall  | = 8.23 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

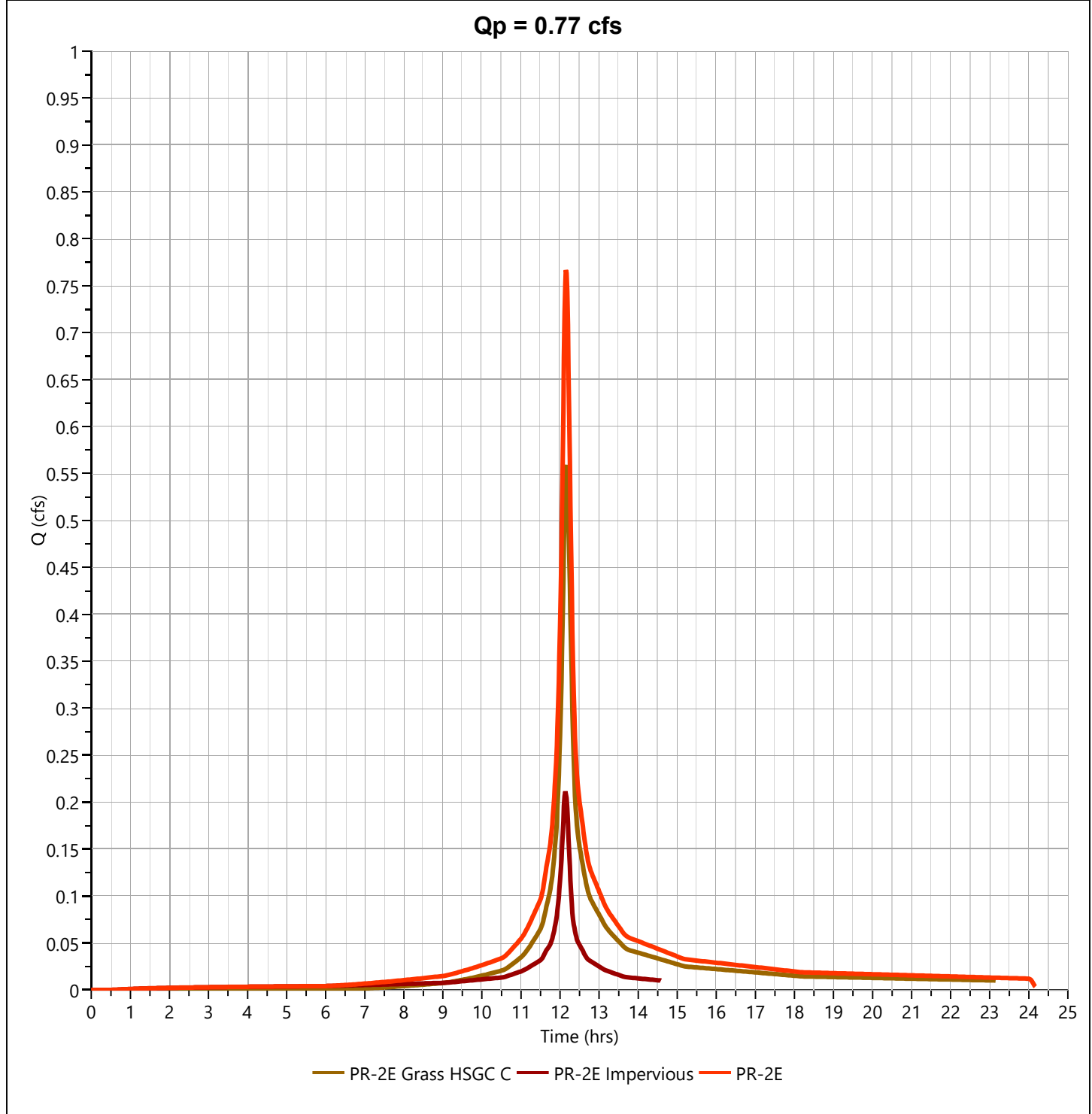
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2E

## Hyd. No. 28

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.767 cfs  |
| Storm Frequency    | = 25-yr    | Time to Peak        | = 12.15 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 2,956 cuft |
| Inflow Hydrographs | = 26, 27   | Total Contrib. Area | = 0.14 ac    |



# Hydrograph Report

Project Name:

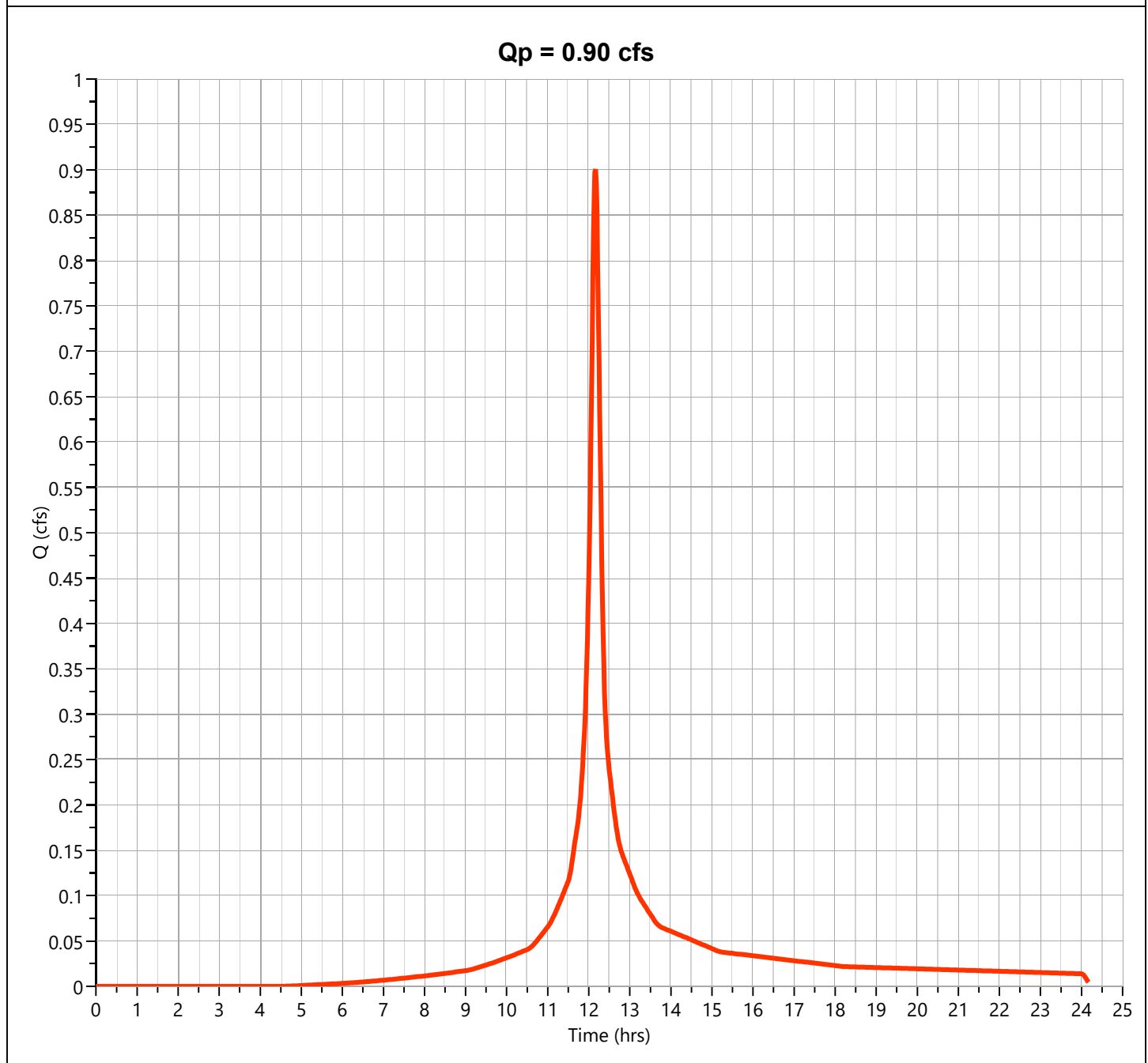
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2E Grass HSGC C

## Hyd. No. 26

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.900 cfs  |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.17 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 3,426 cuft |
| Drainage Area   | = 0.11 ac     | Curve Number       | = 74         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 11.0 min   |
| Total Rainfall  | = 11.80 in    | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

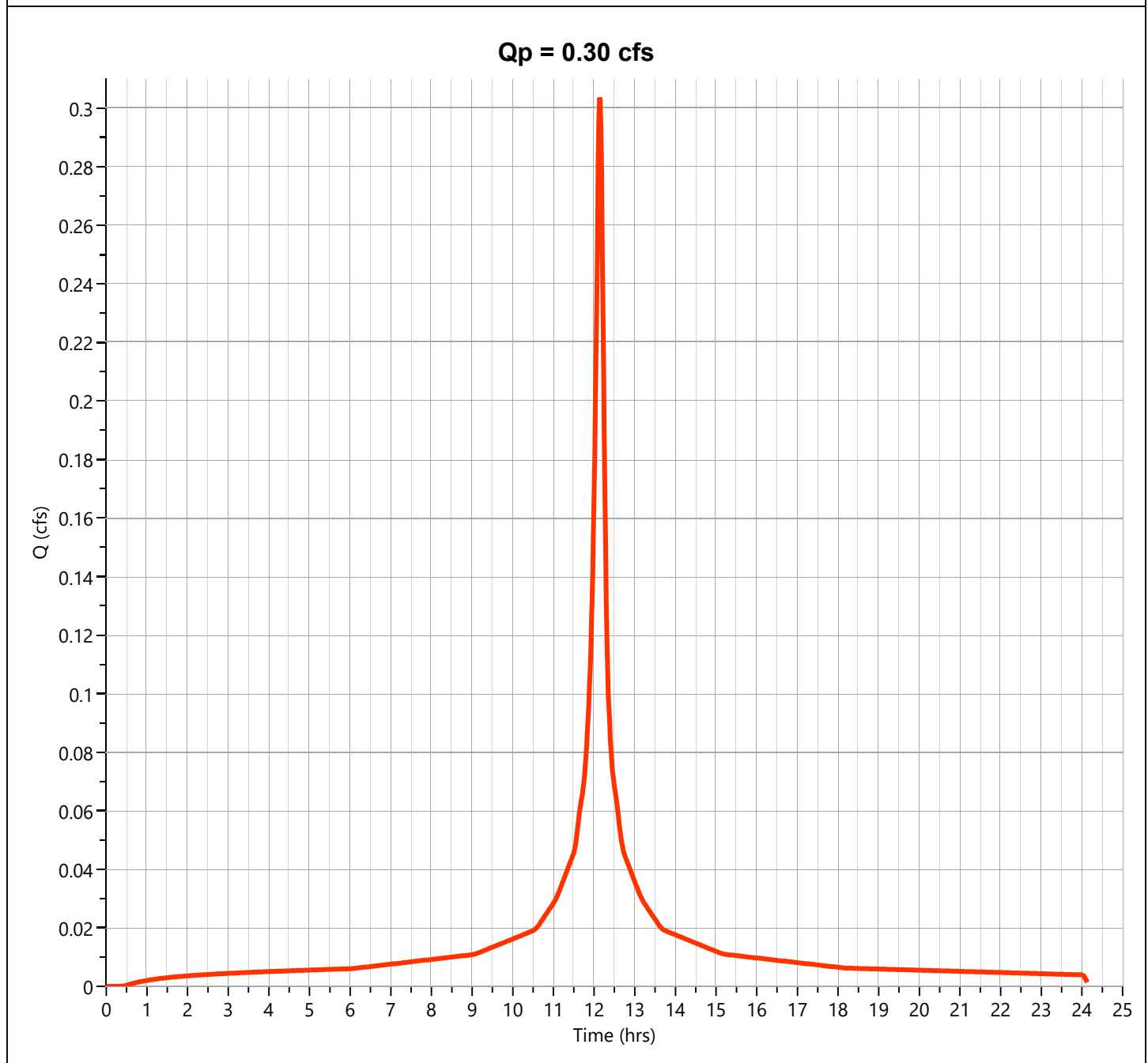
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2E Impervious

## Hyd. No. 27

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.304 cfs  |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.13 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 1,259 cuft |
| Drainage Area   | = 0.03 ac     | Curve Number       | = 98         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 9.0 min    |
| Total Rainfall  | = 11.80 in    | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

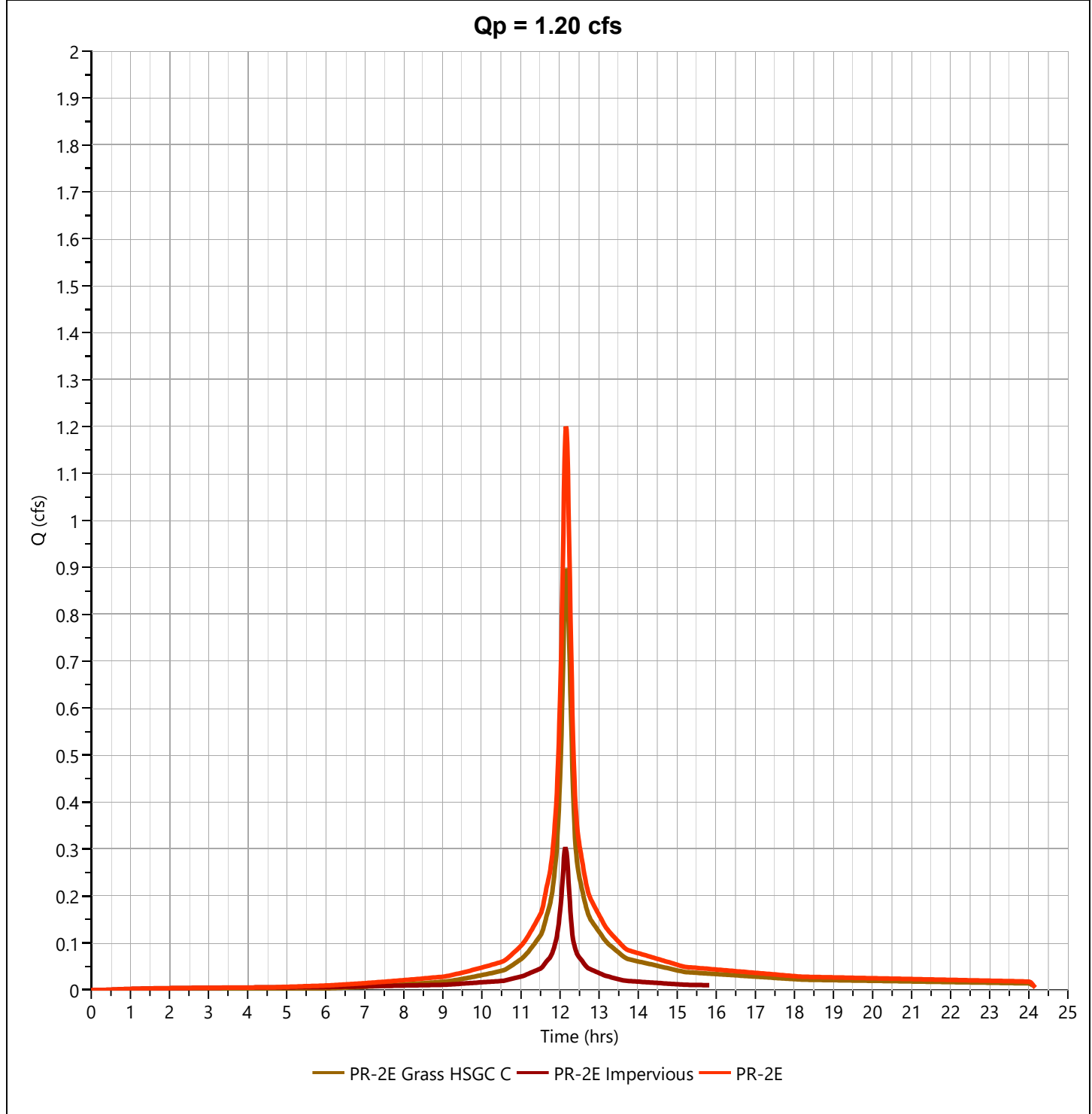
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2E

## Hyd. No. 28

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 1.200 cfs  |
| Storm Frequency    | = 100-yr   | Time to Peak        | = 12.15 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 4,684 cuft |
| Inflow Hydrographs | = 26, 27   | Total Contrib. Area | = 0.14 ac    |



## **PR-2F WATERSHED**

Project: Beacon Unitarian Universalist Church

By: TEG

Date: 2/6/2024

Location: Summit, NJ

Checked By: MJV

Date Checked: 2/6/2024

Circle One: Present Developed

Future Proposed Watershed PR-2F - Impervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Design Flow Length, L<sub>des</sub> (Total L<sub>des</sub> < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. McCuen-Spiess Limit, L<sub>mcs</sub> (max. 100 ft)
7. Compute T<sub>t</sub>

$$L_{mcs} = (100 s^{0.5})/n$$

$$T_t = \frac{0.007 (n L_{des})^{0.8}}{P_2^{0.5} s^{0.4}}$$

| Segment ID | 1                      | 2                             |   |
|------------|------------------------|-------------------------------|---|
|            | <b>Smooth Surfaces</b> | <b>Woods Light Underbrush</b> |   |
|            | <b>0.011</b>           | <b>0.40</b>                   |   |
| ft         | <b>14</b>              | <b>51</b>                     |   |
| in         | <b>4.12</b>            | <b>4.12</b>                   |   |
| ft/ft      | <b>0.021</b>           | <b>0.057</b>                  |   |
| ft         | <b>100</b>             | <b>60</b>                     |   |
| hr         | <b>0.004</b>           | <b>0.121</b>                  | + |

Sheet Flow Sub-Total **0.125 hours**

**Shallow Concentrated Flow**

8. Surface Description
9. Flow Length, L
10. Watercourse Slope, s
11. Average Velocity, V (NEH table 15-3)
12. Compute T<sub>t</sub>

$$T_t = \frac{L}{3600 V}$$

| Segment ID | 3                        | 4                        | 5                        |
|------------|--------------------------|--------------------------|--------------------------|
|            | <b>Grassed Waterways</b> | <b>Grassed Waterways</b> | <b>Grassed Waterways</b> |
| ft         | <b>19</b>                | <b>54</b>                | <b>25</b>                |
| ft/ft      | <b>0.091</b>             | <b>0.010</b>             | <b>0.027</b>             |
| ft/s       | <b>4.85</b>              | <b>1.63</b>              | <b>2.66</b>              |
| hr         | <b>0.001</b>             | <b>0.009</b>             | <b>0.003</b>             |

Shallow Conc. Flow Sub-Total **0.013 hours**

**Channel Flow**

13. Flow Length, L
14. Cross Sectional flow area, a
15. Wetted Perimeter, P<sub>w</sub>
16. Hydraulic Radius, r
17. Channel Slope, s
18. Manning's Roughness Coeff., n
19. Velocity, V
20. Compute T<sub>t</sub>

$$r = a / P_w$$

$$V = (1.49 r^{2/3} s^{1/2}) / n$$

$$T_t = \frac{L}{3600 V}$$

| Segment ID      | 6            |   |   |
|-----------------|--------------|---|---|
| ft              | <b>291</b>   |   |   |
| ft <sup>2</sup> | <b>0.61</b>  |   |   |
| ft              | <b>2.00</b>  |   |   |
| ft              | <b>0.31</b>  |   |   |
| ft/ft           | <b>0.005</b> |   |   |
|                 | <b>0.012</b> |   |   |
| ft/s            | <b>3.97</b>  |   |   |
| hr              | <b>0.020</b> | + | + |

Channel Flow Sub-Total **0.020 hours**

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>

(Add Sub-Total T<sub>t</sub> from prior steps)

|                                  |                    |
|----------------------------------|--------------------|
| Total T <sub>c</sub> (hours) =   | <b>0.158 hours</b> |
| Total T <sub>c</sub> (minutes) = | <b>9 minutes</b>   |

Project: Beacon Unitarian Universalist Church

By: TEG

Date: 2/6/2024

Location: Summit, NJ

Checked By: MJV

Date Checked: 2/6/2024

Circle One: Present Developed

Future Proposed Watershed PR-2F - Pervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Design Flow Length, L<sub>des</sub> (Total L<sub>des</sub> < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. McCuen-Spiess Limit, L<sub>mcs</sub> (max. 100 ft)
7. Compute T<sub>t</sub>

$$L_{mcs} = (100 s^{0.5})/n$$

$$T_t = \frac{0.007 (n L_{des})^{0.8}}{P_2^{0.5} s^{0.4}}$$

| Segment ID | 1                             | 2                    |   |
|------------|-------------------------------|----------------------|---|
|            | <b>Woods Light Underbrush</b> | <b>Dense Grasses</b> |   |
|            | <b>0.40</b>                   | <b>0.24</b>          |   |
| ft         | <b>41</b>                     | <b>16</b>            |   |
| in         | <b>4.12</b>                   | <b>4.12</b>          |   |
| ft/ft      | <b>0.087</b>                  | <b>0.008</b>         |   |
| ft         | <b>74</b>                     | <b>37</b>            |   |
| hr         | <b>0.086</b>                  | <b>0.069</b>         | + |

Sheet Flow Sub-Total **0.155 hours**

**Shallow Concentrated Flow**

8. Surface Description
9. Flow Length, L
10. Watercourse Slope, s
11. Average Velocity, V (NEH table 15-3)
12. Compute T<sub>t</sub>

$$T_t = \frac{L}{3600 V}$$

| Segment ID | 3                        | 4                        |   |
|------------|--------------------------|--------------------------|---|
|            | <b>Grassed Waterways</b> | <b>Grassed Waterways</b> |   |
| ft         | <b>54</b>                | <b>25</b>                |   |
| ft/ft      | <b>0.010</b>             | <b>0.027</b>             |   |
| ft/s       | <b>1.63</b>              | <b>2.66</b>              |   |
| hr         | <b>0.009</b>             | <b>0.003</b>             | + |

Shallow Conc. Flow Sub-Total **0.012 hours**

**Channel Flow**

13. Flow Length, L
14. Cross Sectional flow area, a
15. Wetted Perimeter, P<sub>w</sub>
16. Hydraulic Radius, r
17. Channel Slope, s
18. Manning's Roughness Coeff., n
19. Velocity, V
20. Compute T<sub>t</sub>

$$r = a / P_w$$

$$V = (1.49 r^{2/3} s^{1/2}) / n$$

$$T_t = \frac{L}{3600 V}$$

| Segment ID      | 5            |   |  |
|-----------------|--------------|---|--|
| ft              | <b>291</b>   |   |  |
| ft <sup>2</sup> | <b>0.61</b>  |   |  |
| ft              | <b>2.00</b>  |   |  |
| ft              | <b>0.31</b>  |   |  |
| ft/ft           | <b>0.005</b> |   |  |
|                 | <b>0.012</b> |   |  |
| ft/s            | <b>3.97</b>  |   |  |
| hr              | <b>0.020</b> | + |  |

Channel Flow Sub-Total **0.020 hours**

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>

(Add Sub-Total T<sub>t</sub> from prior steps)

|                                  |                    |
|----------------------------------|--------------------|
| Total T <sub>c</sub> (hours) =   | <b>0.187 hours</b> |
| Total T <sub>c</sub> (minutes) = | <b>11 minutes</b>  |



# Hydrograph Report

Project Name:

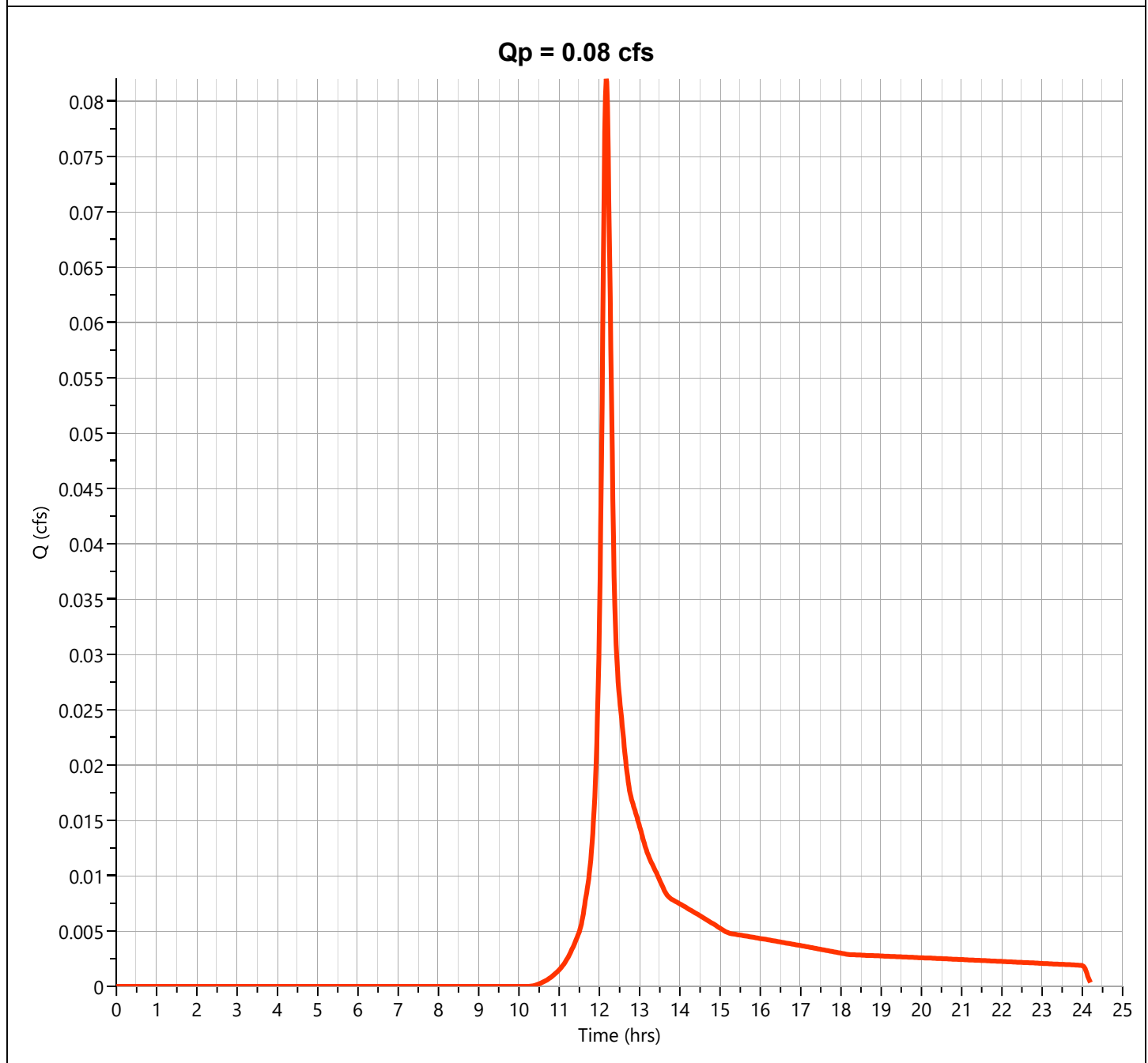
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2F Woods HSGC C

## Hyd. No. 30

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.082 cfs |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.17 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 313 cuft  |
| Drainage Area   | = 0.06 ac     | Curve Number       | = 70        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 11.0 min  |
| Total Rainfall  | = 4.12 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

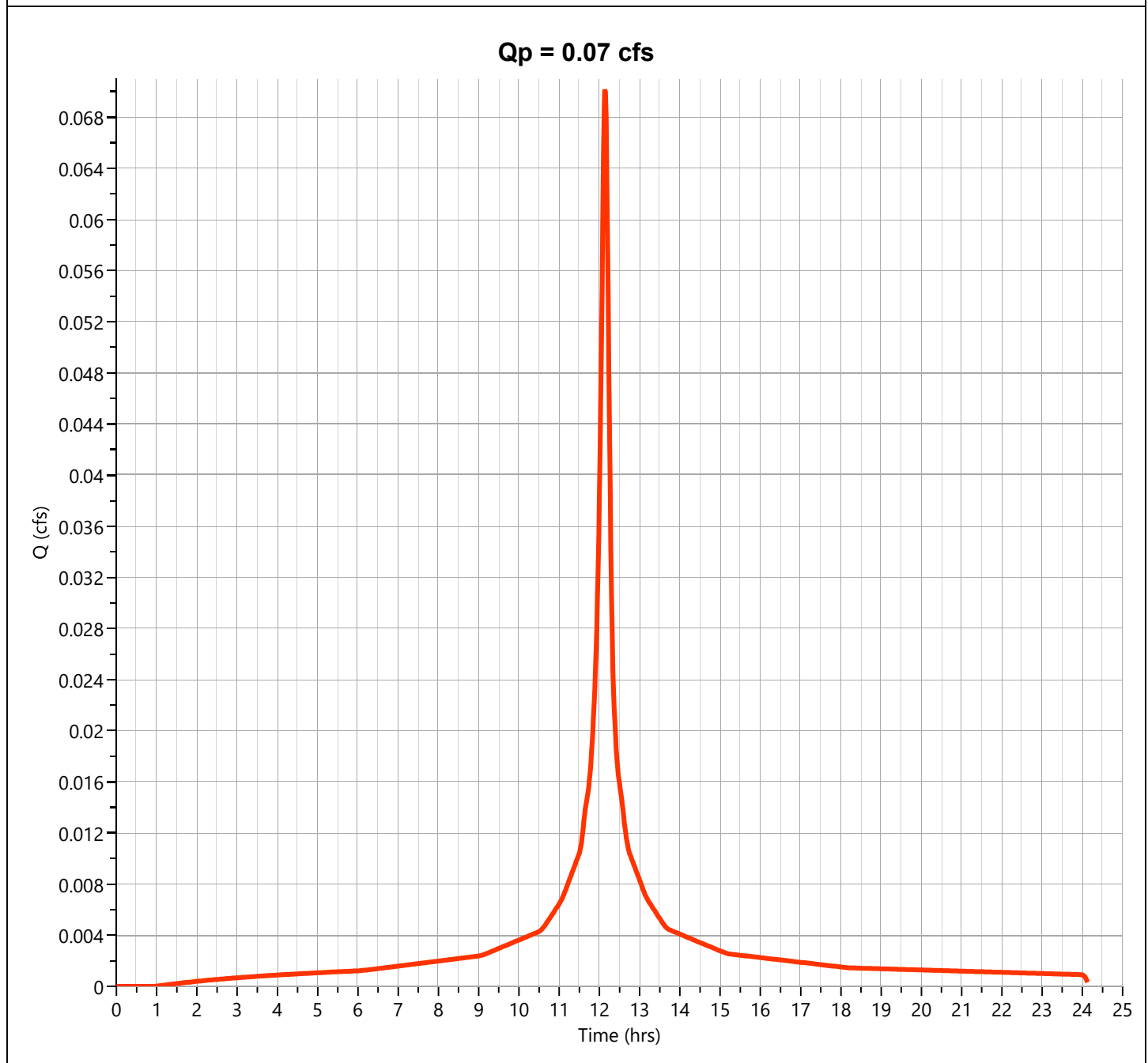
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2F Impervious

## Hyd. No. 31

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.070 cfs |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.13 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 282 cuft  |
| Drainage Area   | = 0.02 ac     | Curve Number       | = 98        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 9.0 min   |
| Total Rainfall  | = 4.12 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

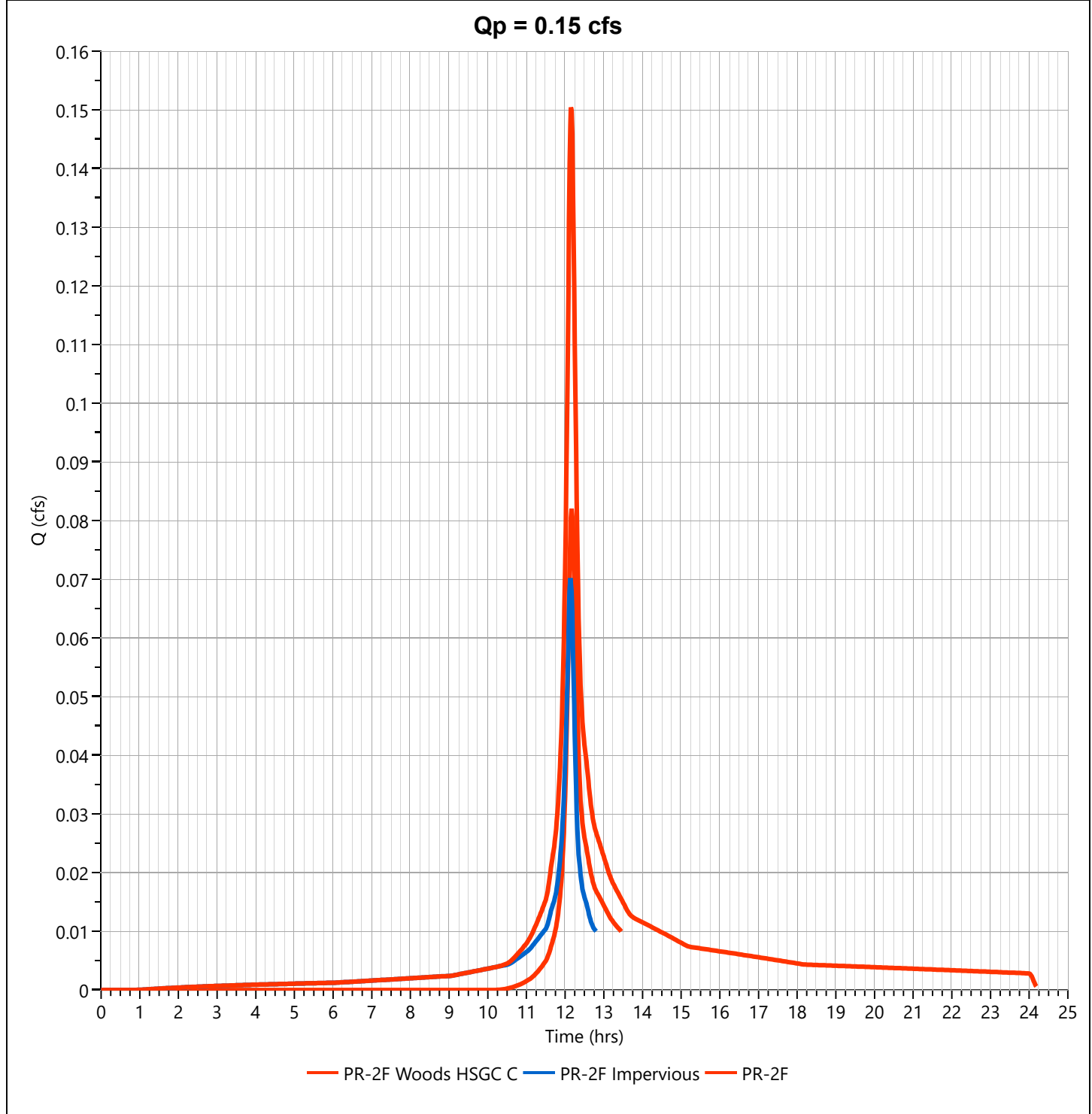
Hydrology Studio v 3.0.0.31

02-08-2024

**PR-2F**

**Hyd. No. 32**

|                    |            |                     |             |
|--------------------|------------|---------------------|-------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.150 cfs |
| Storm Frequency    | = 2-yr     | Time to Peak        | = 12.15 hrs |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 595 cuft  |
| Inflow Hydrographs | = 30, 31   | Total Contrib. Area | = 0.08 ac   |



# Hydrograph Report

Project Name:

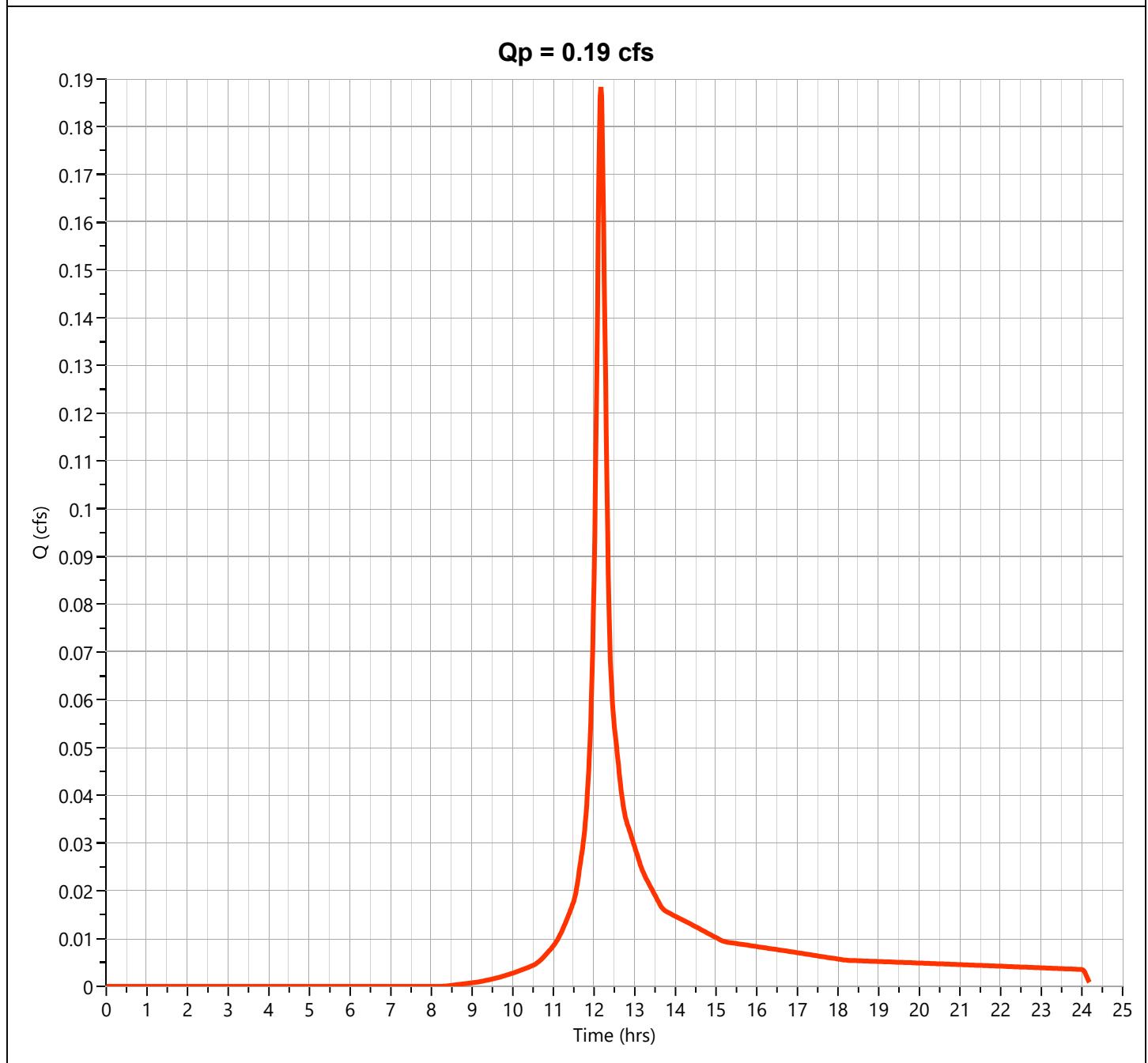
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2F Woods HSGC C

## Hyd. No. 30

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.188 cfs |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.17 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 697 cuft  |
| Drainage Area   | = 0.06 ac     | Curve Number       | = 70        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 11.0 min  |
| Total Rainfall  | = 6.42 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

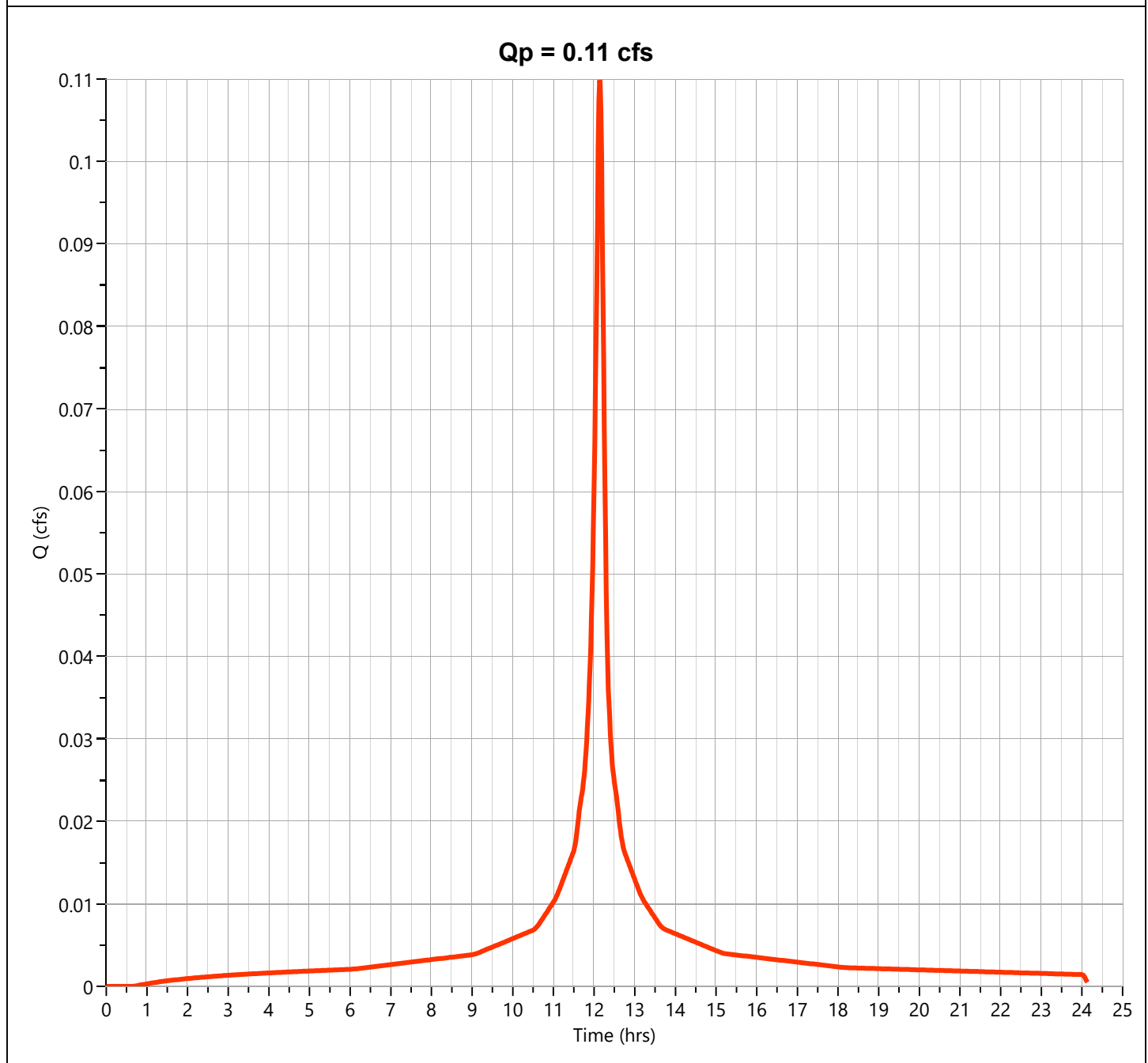
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2F Impervious

## Hyd. No. 31

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.110 cfs |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.13 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 449 cuft  |
| Drainage Area   | = 0.02 ac     | Curve Number       | = 98        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 9.0 min   |
| Total Rainfall  | = 6.42 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

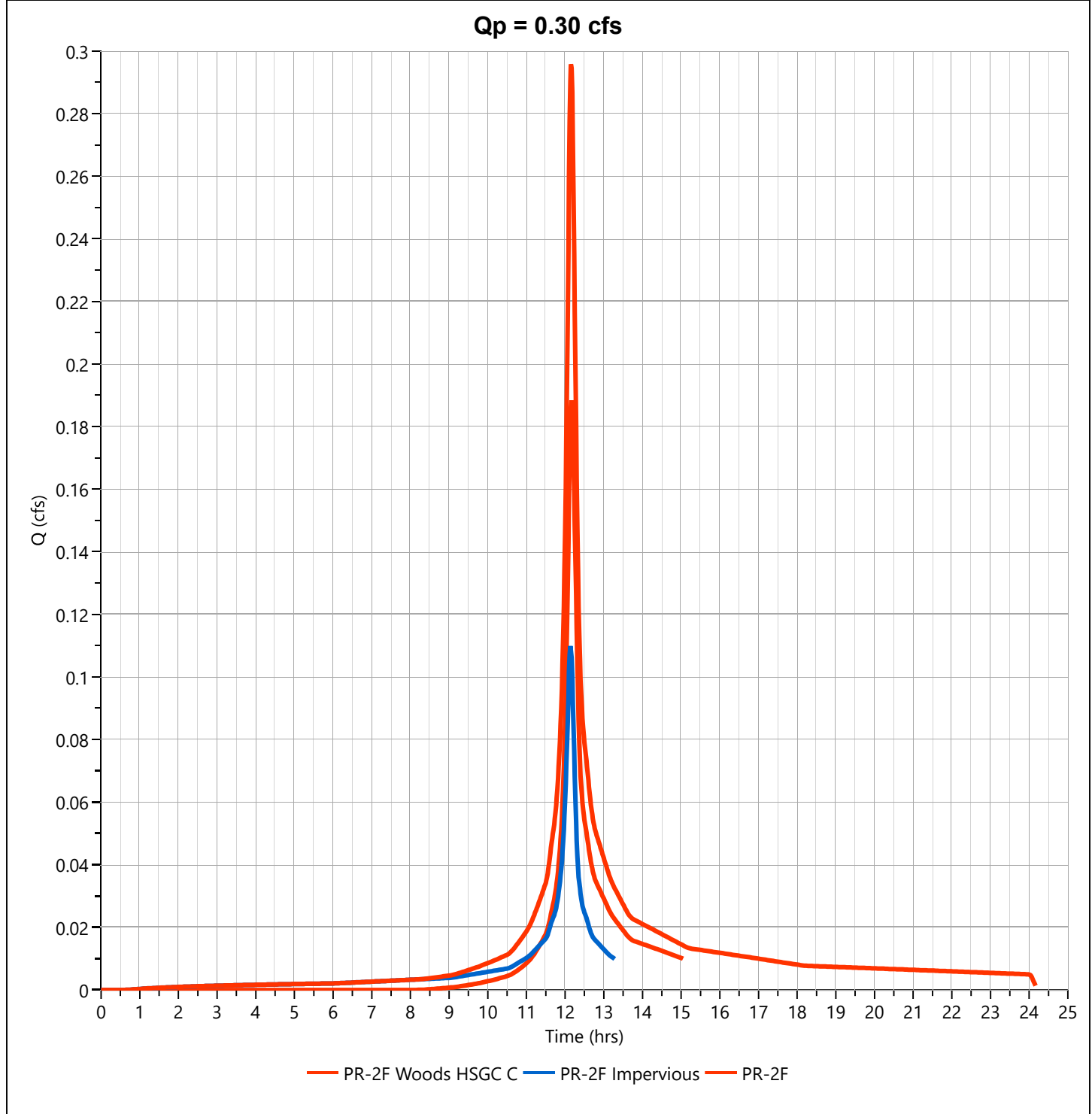
Hydrology Studio v 3.0.0.31

02-08-2024

**PR-2F**

**Hyd. No. 32**

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.296 cfs  |
| Storm Frequency    | = 10-yr    | Time to Peak        | = 12.15 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 1,145 cuft |
| Inflow Hydrographs | = 30, 31   | Total Contrib. Area | = 0.08 ac    |



# Hydrograph Report

Project Name:

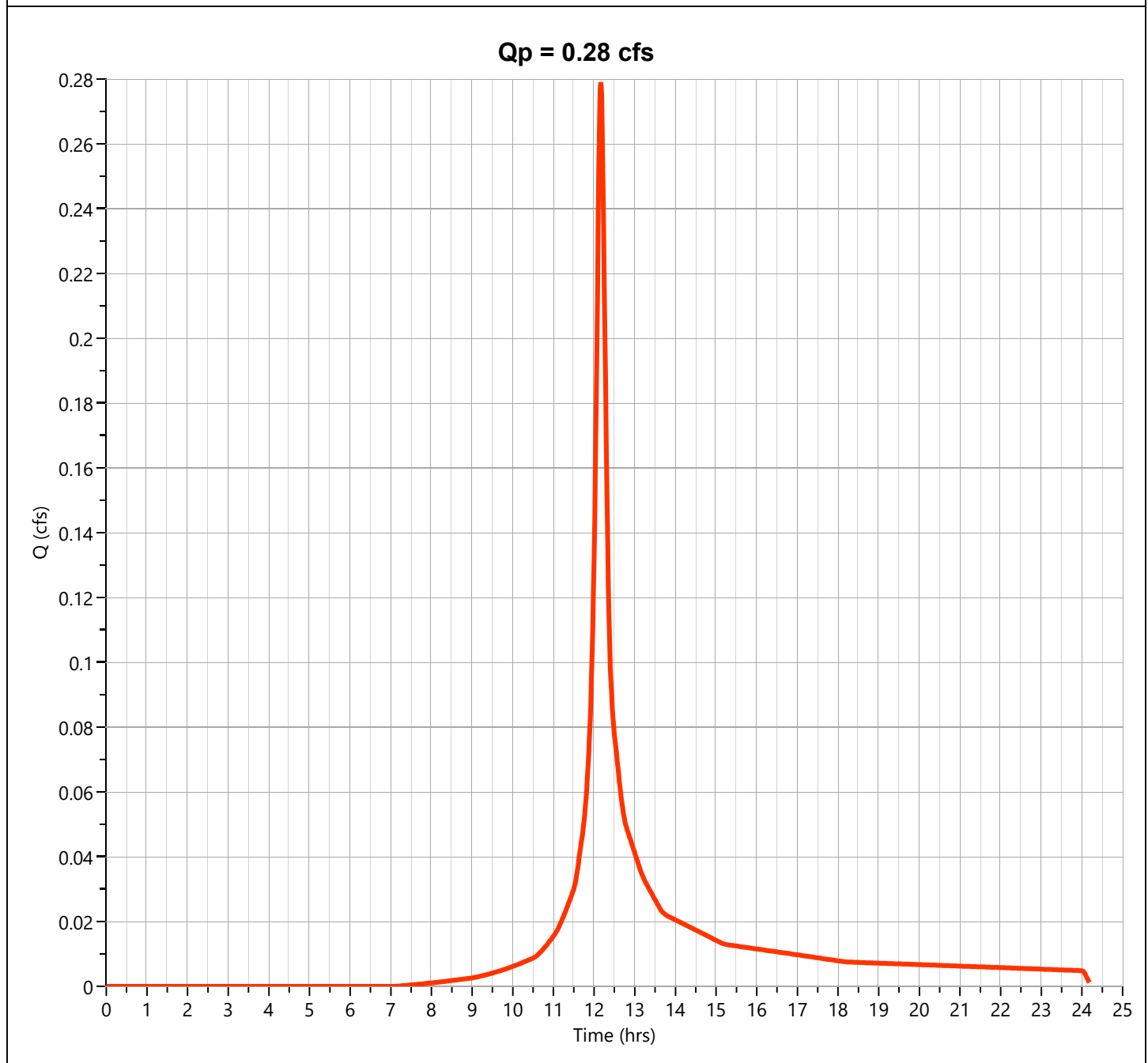
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2F Woods HSGC C

## Hyd. No. 30

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.279 cfs  |
| Storm Frequency | = 25-yr       | Time to Peak       | = 12.17 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 1,034 cuft |
| Drainage Area   | = 0.06 ac     | Curve Number       | = 70         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 11.0 min   |
| Total Rainfall  | = 8.23 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

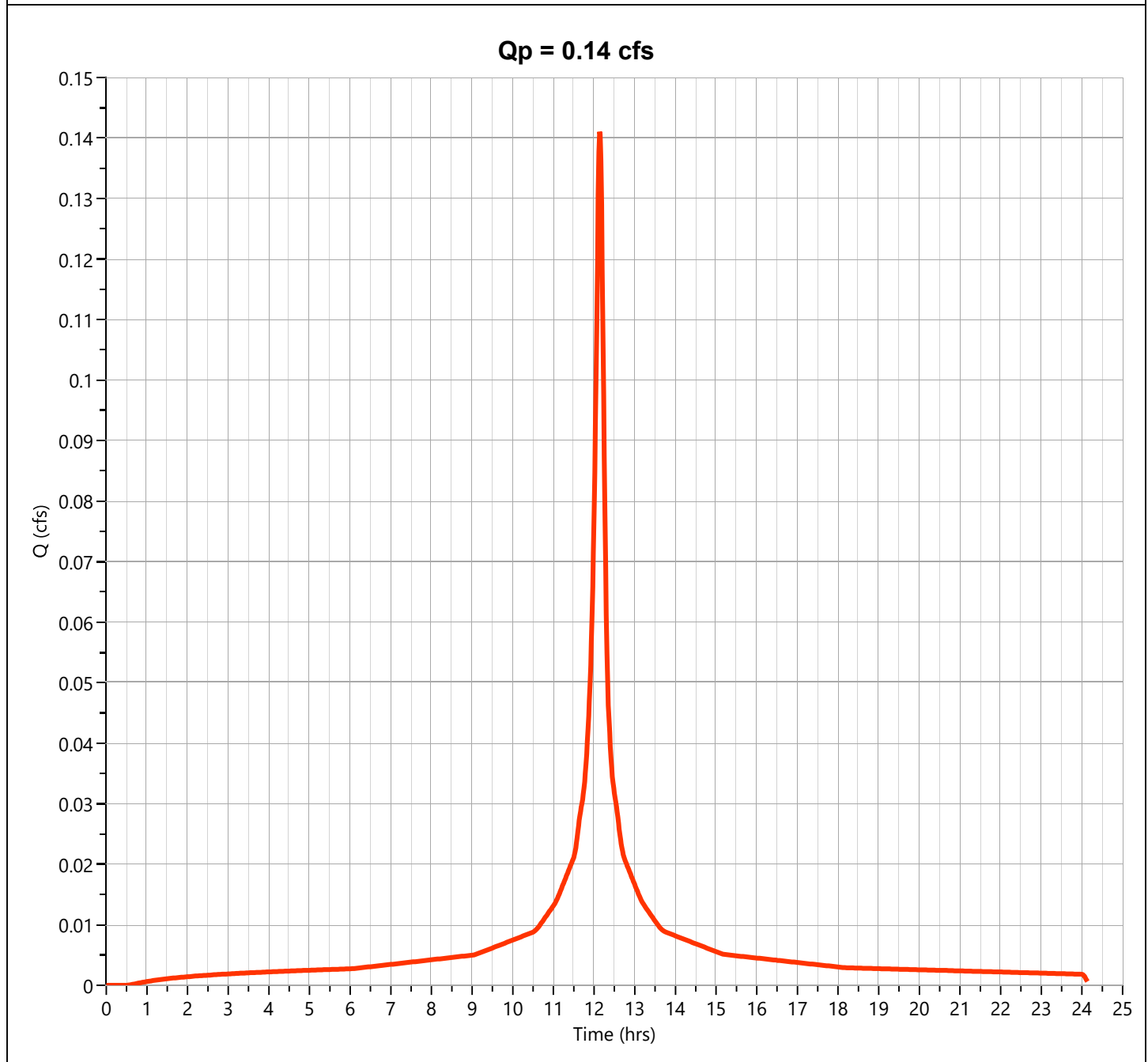
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2F Impervious

## Hyd. No. 31

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.141 cfs |
| Storm Frequency | = 25-yr       | Time to Peak       | = 12.13 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 580 cuft  |
| Drainage Area   | = 0.02 ac     | Curve Number       | = 98        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 9.0 min   |
| Total Rainfall  | = 8.23 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |





# Hydrograph Report

Project Name:

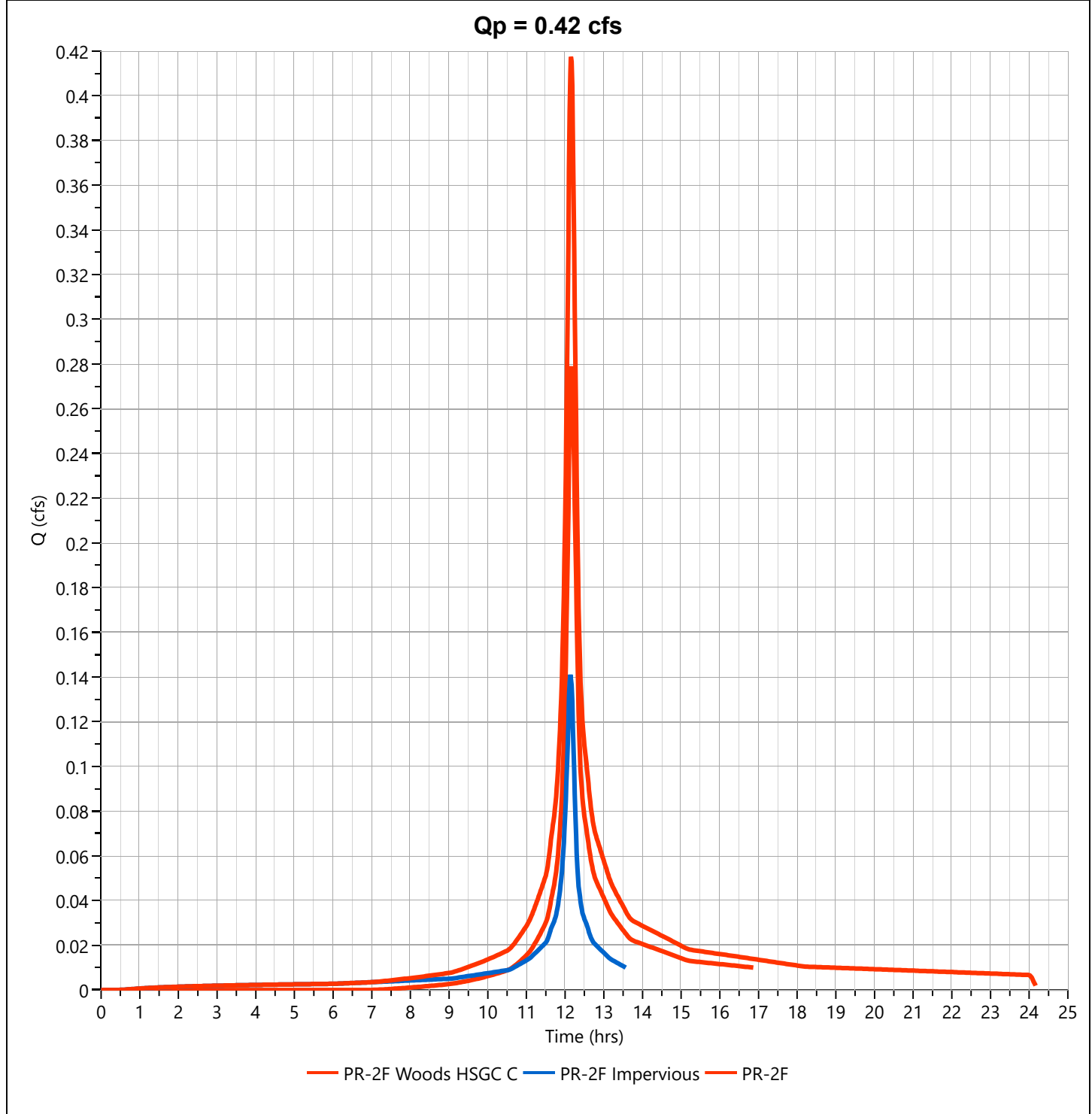
Hydrology Studio v 3.0.0.31

02-08-2024

**PR-2F**

**Hyd. No. 32**

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.417 cfs  |
| Storm Frequency    | = 25-yr    | Time to Peak        | = 12.15 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 1,614 cuft |
| Inflow Hydrographs | = 30, 31   | Total Contrib. Area | = 0.08 ac    |



# Hydrograph Report

Project Name:

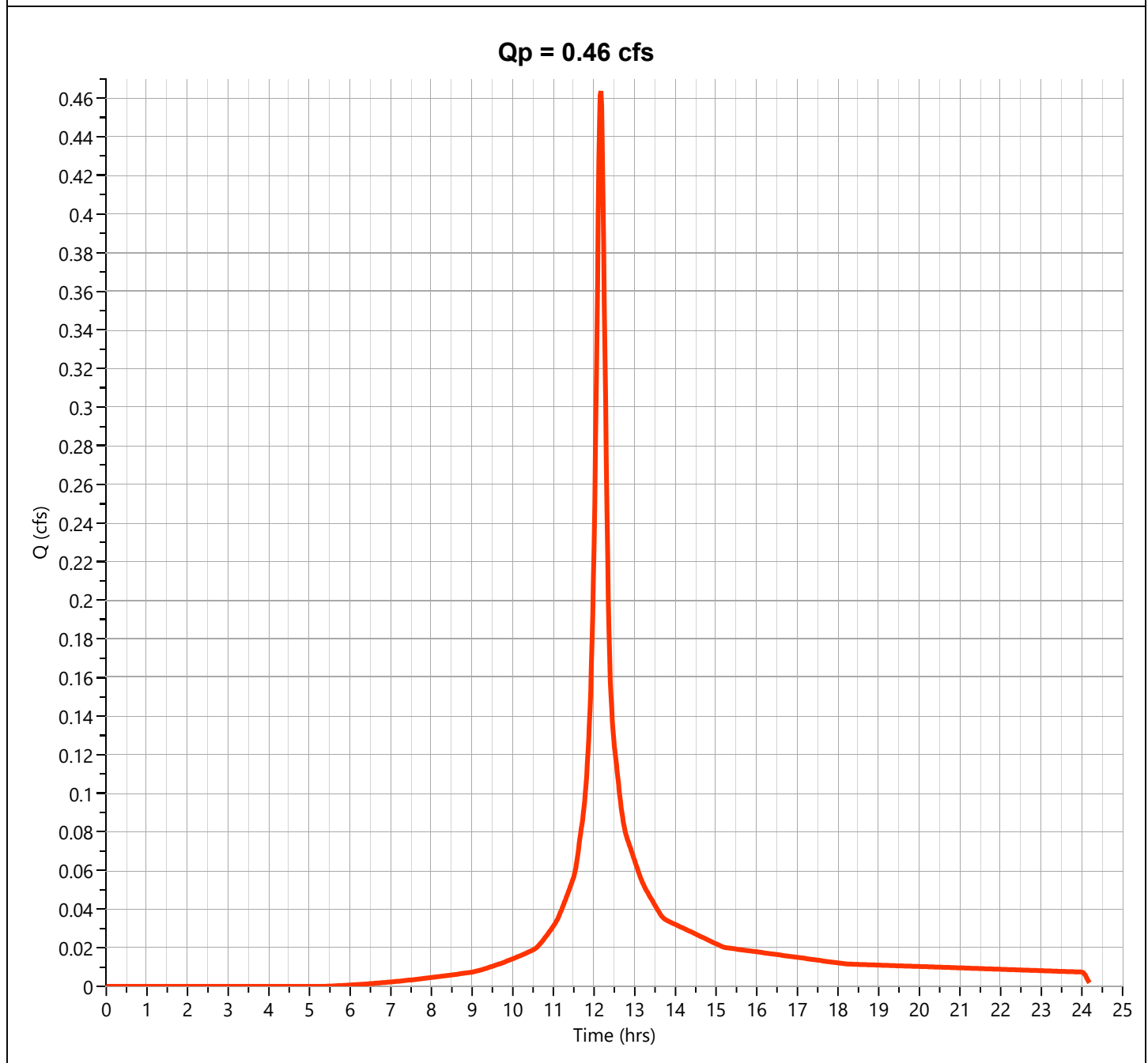
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2F Woods HSGC C

## Hyd. No. 30

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.464 cfs  |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.17 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 1,743 cuft |
| Drainage Area   | = 0.06 ac     | Curve Number       | = 70         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 11.0 min   |
| Total Rainfall  | = 11.80 in    | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

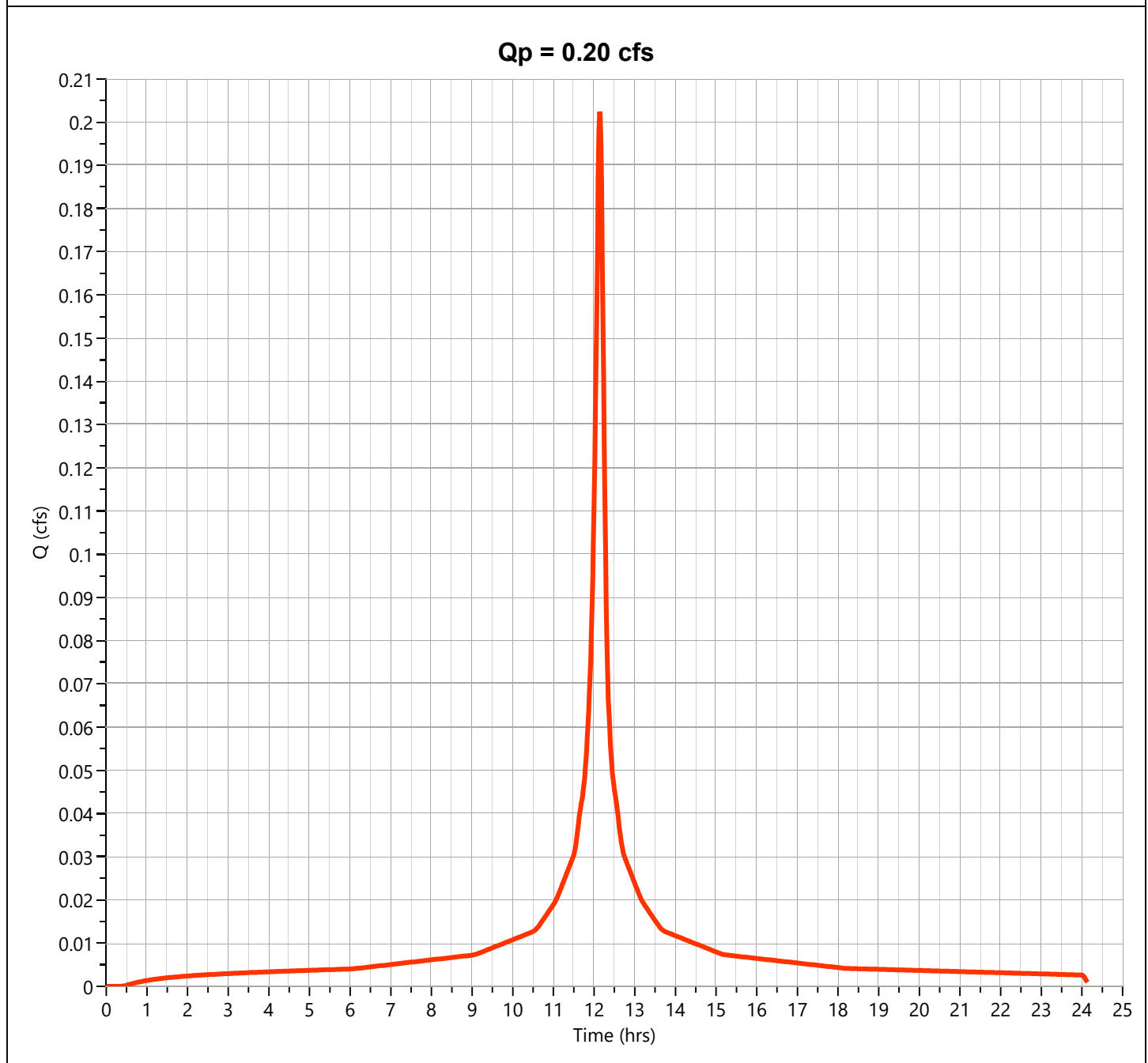
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2F Impervious

## Hyd. No. 31

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.202 cfs |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.13 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 839 cuft  |
| Drainage Area   | = 0.02 ac     | Curve Number       | = 98        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 9.0 min   |
| Total Rainfall  | = 11.80 in    | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

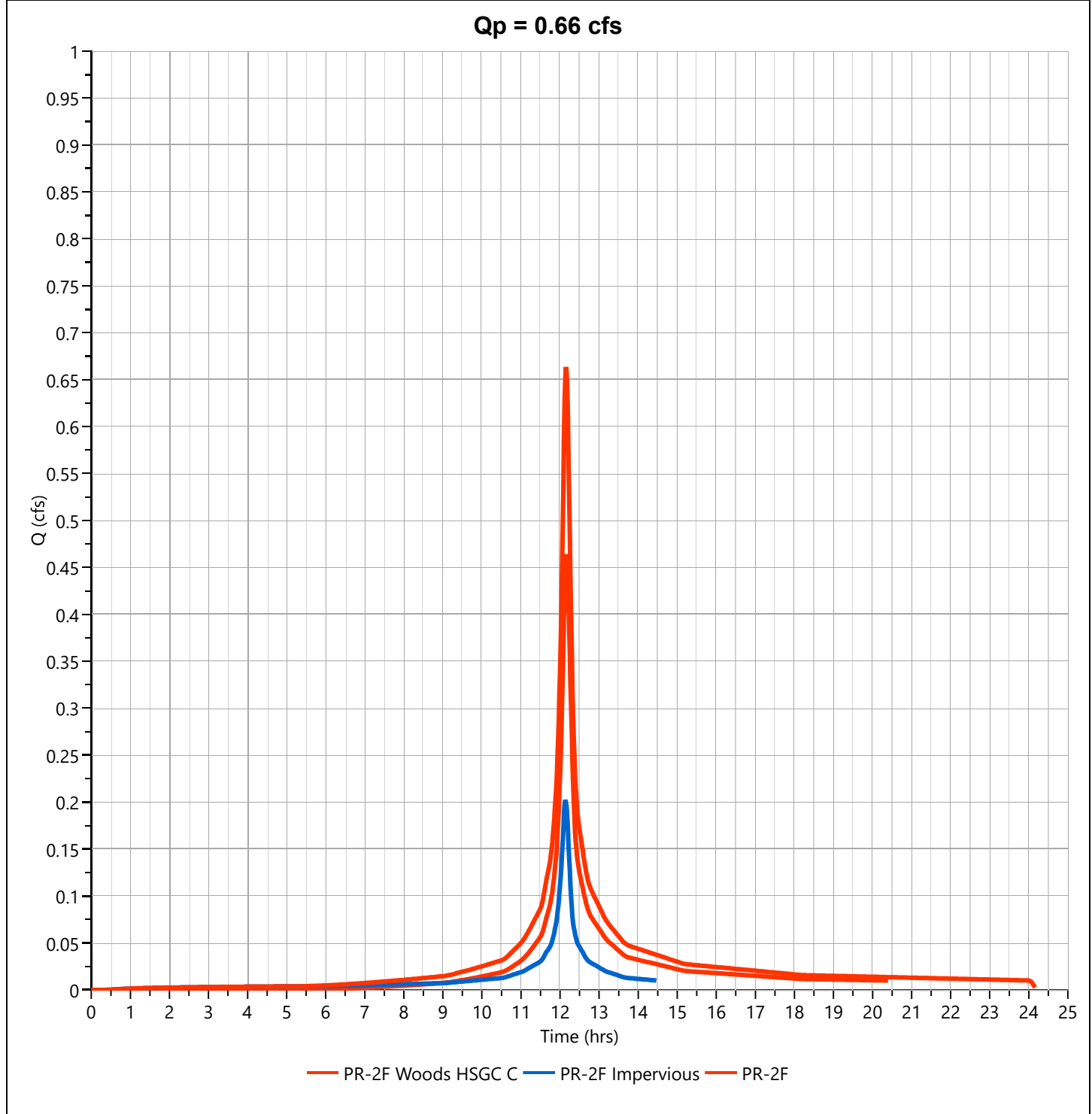
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2F

## Hyd. No. 32

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.663 cfs  |
| Storm Frequency    | = 100-yr   | Time to Peak        | = 12.15 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 2,582 cuft |
| Inflow Hydrographs | = 30, 31   | Total Contrib. Area | = 0.08 ac    |



## **PR-2G WATERSHED**

Project: Beacon Unitarian Universalist Church

By: TEG

Date: 11/29/2023

Location: Summit, NJ

Checked By: MJV

Date Checked: 11/29/2023

Circle One: Present Developed

Future Proposed Watershed PR-2G - Pervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Design Flow Length, L<sub>des</sub> (Total L<sub>des</sub> < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. McCuen-Spiess Limit, L<sub>mcs</sub> (max. 100 ft)  $L_{mcs} = (100 s^{0.5})/n$
7. Compute T<sub>t</sub>  $T_t = \frac{0.007 (n L_{des})^{0.8}}{P_2^{0.5} s^{0.4}}$

|            |                      |   |  |
|------------|----------------------|---|--|
| Segment ID | 1                    |   |  |
|            | <b>Dense Grasses</b> |   |  |
|            | <b>0.24</b>          |   |  |
| ft         | <b>29</b>            |   |  |
| in         | <b>4.12</b>          |   |  |
| ft/ft      | <b>0.045</b>         |   |  |
| ft         | <b>88</b>            |   |  |
| hr         | <b>0.056</b>         | + |  |

Sheet Flow Sub-Total **0.056 hours**

**Shallow Concentrated Flow**

8. Surface Description
9. Flow Length, L
10. Watercourse Slope, s
11. Average Velocity, V (NEH table 15-3)
12. Compute T<sub>t</sub>  $T_t = \frac{L}{3600 V}$

|            |                          |                          |   |
|------------|--------------------------|--------------------------|---|
| Segment ID | 2                        | 3                        |   |
|            | <b>Grassed Waterways</b> | <b>Grassed Waterways</b> |   |
| ft         | <b>73</b>                | <b>140</b>               |   |
| ft/ft      | <b>0.030</b>             | <b>0.011</b>             |   |
| ft/s       | <b>2.80</b>              | <b>1.72</b>              |   |
| hr         | <b>0.007</b>             | <b>0.023</b>             | + |

Shallow Conc. Flow Sub-Total **0.030 hours**

**Channel Flow**

13. Flow Length, L
14. Cross Sectional flow area, a
15. Wetted Perimeter, P<sub>w</sub>
16. Hydraulic Radius, r  $r = a / P_w$
17. Channel Slope, s
18. Manning's Roughness Coeff., n
19. Velocity, V  $V = (1.49 r^{2/3} s^{1/2}) / n$
20. Compute T<sub>t</sub>  $T_t = \frac{L}{3600 V}$

|                 |  |  |   |
|-----------------|--|--|---|
| Segment ID      |  |  |   |
| ft              |  |  |   |
| ft <sup>2</sup> |  |  |   |
| ft              |  |  |   |
| ft              |  |  |   |
| ft/ft           |  |  |   |
| ft/s            |  |  |   |
| hr              |  |  | + |

Channel Flow Sub-Total **0.000 hours**

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>

(Add Sub-Total T<sub>t</sub> from prior steps)

|                      |                    |
|----------------------|--------------------|
| Total Tc (hours) =   | <b>0.086 hours</b> |
| Total Tc (minutes) = | <b>5 minutes</b>   |

# Hydrograph Report

Hydrology Studio v 3.0.0.38

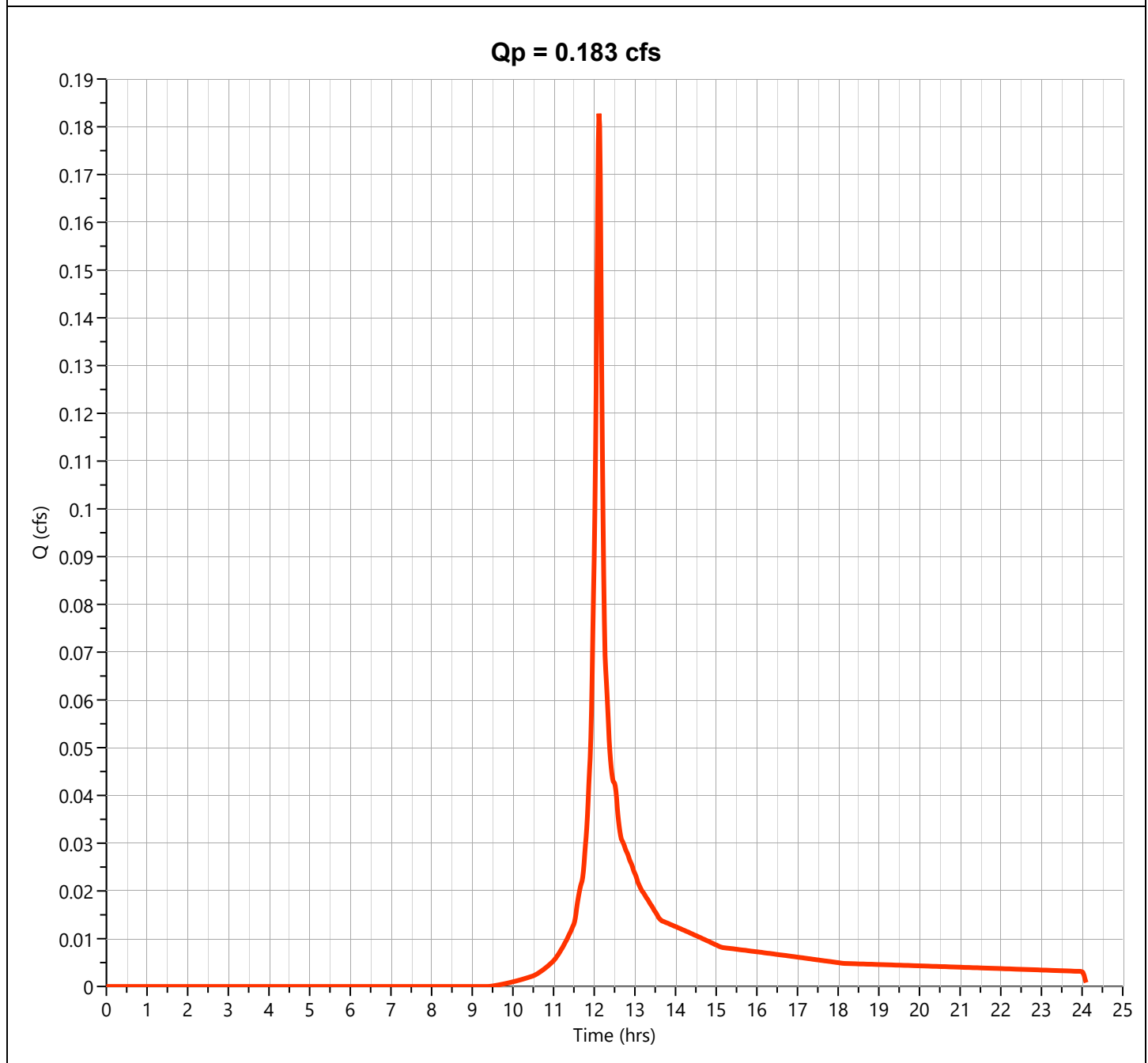
File: Future Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2G Grass HSGC C

## Hyd. No. 17

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.183 cfs |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.12 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 568 cuft  |
| Drainage Area   | = 0.09 ac     | Curve Number       | = 74.00     |
| Tc Method       | = User        | Time of Conc. (Tc) | = 5.0 min   |
| Total Rainfall  | = 4.12 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

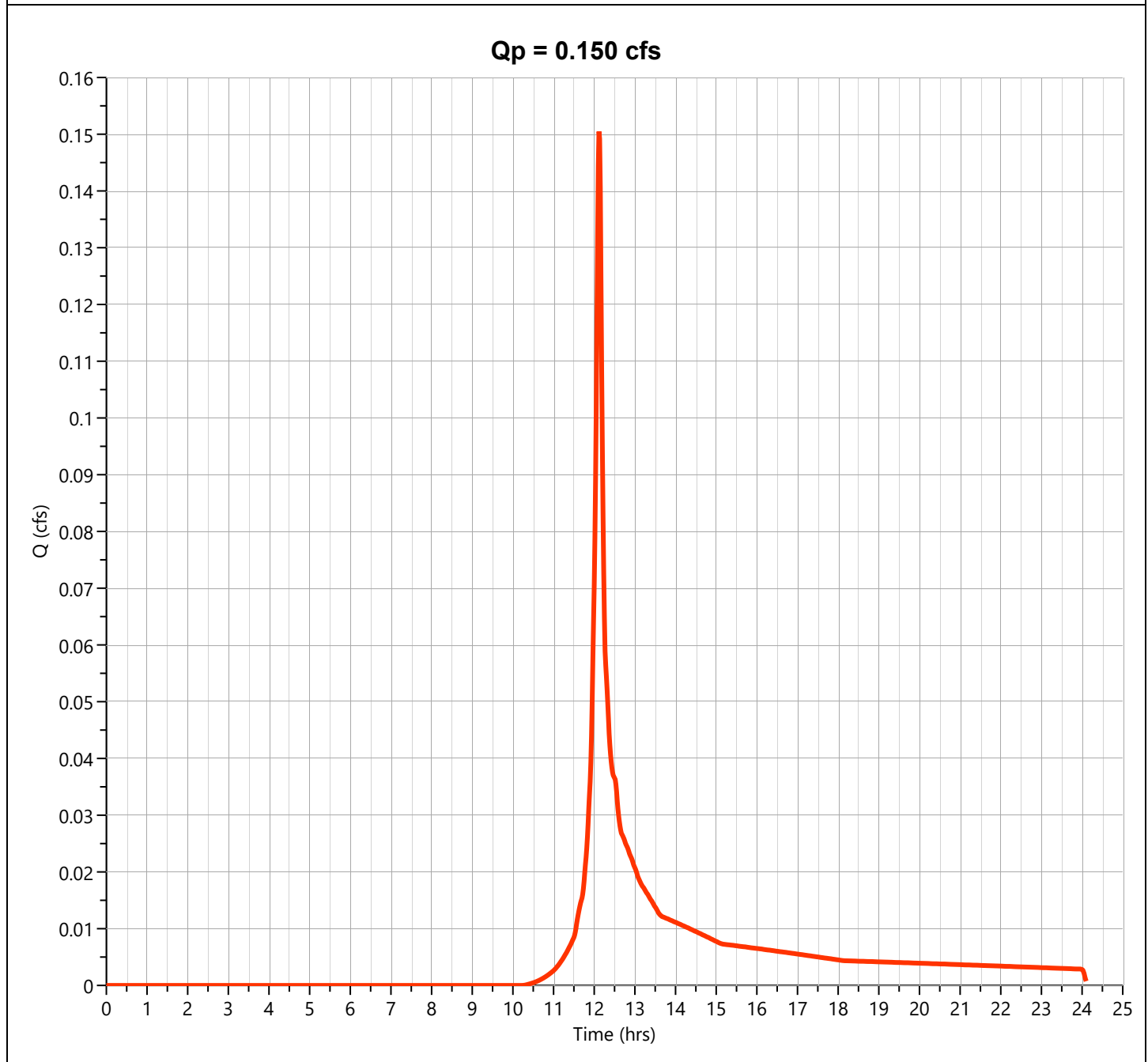
File: Future Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2G Woods HSGC C

## Hyd. No. 18

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.150 cfs |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.12 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 475 cuft  |
| Drainage Area   | = 0.09 ac     | Curve Number       | = 70.00     |
| Tc Method       | = User        | Time of Conc. (Tc) | = 5.0 min   |
| Total Rainfall  | = 4.12 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |





# Hydrograph Report

Hydrology Studio v 3.0.0.38

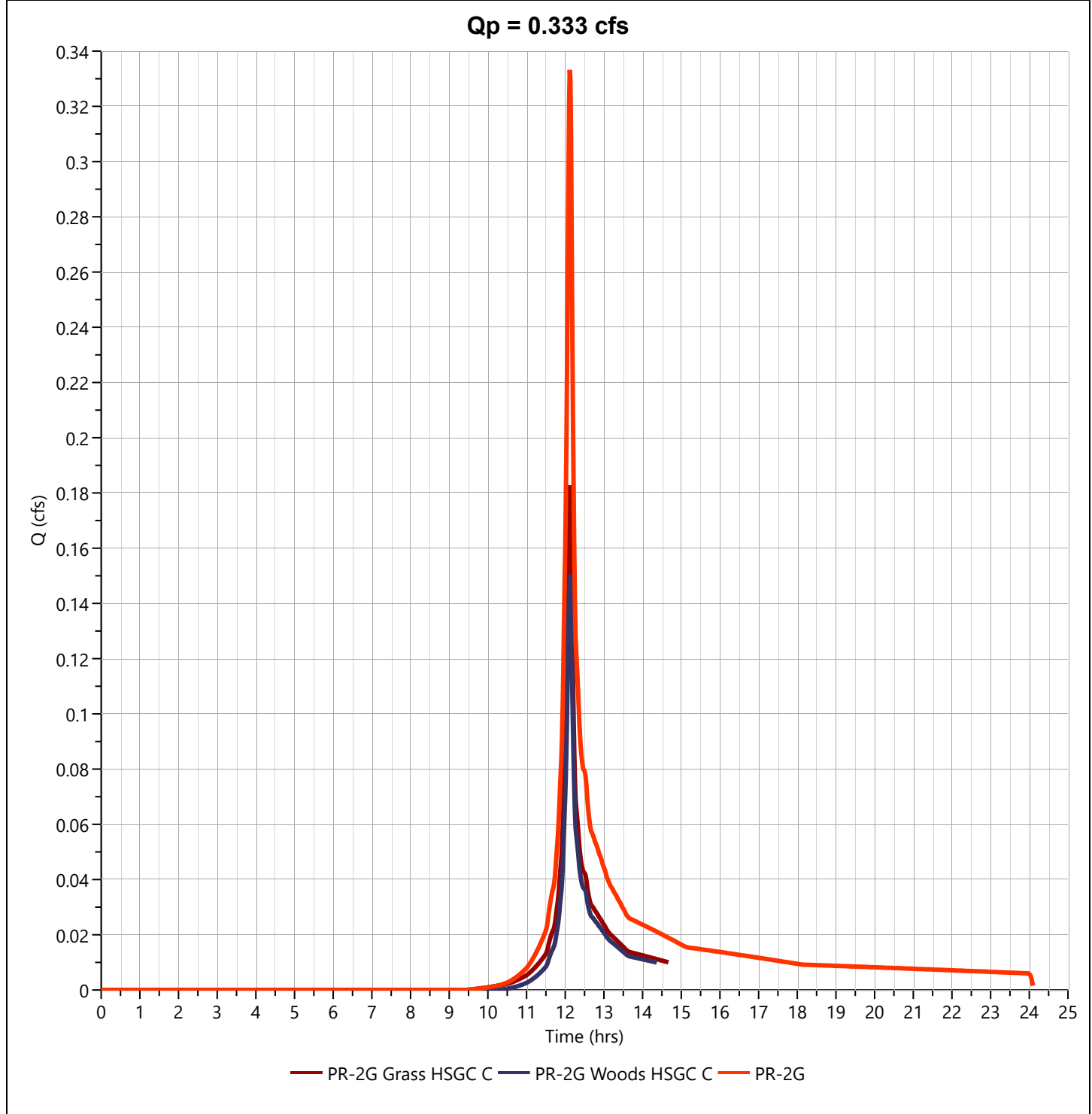
File: Future Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2G

## Hyd. No. 19

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.333 cfs  |
| Storm Frequency    | = 2-yr     | Time to Peak        | = 12.12 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 1,043 cuft |
| Inflow Hydrographs | = 17, 18   | Total Contrib. Area | = 0.18 ac    |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

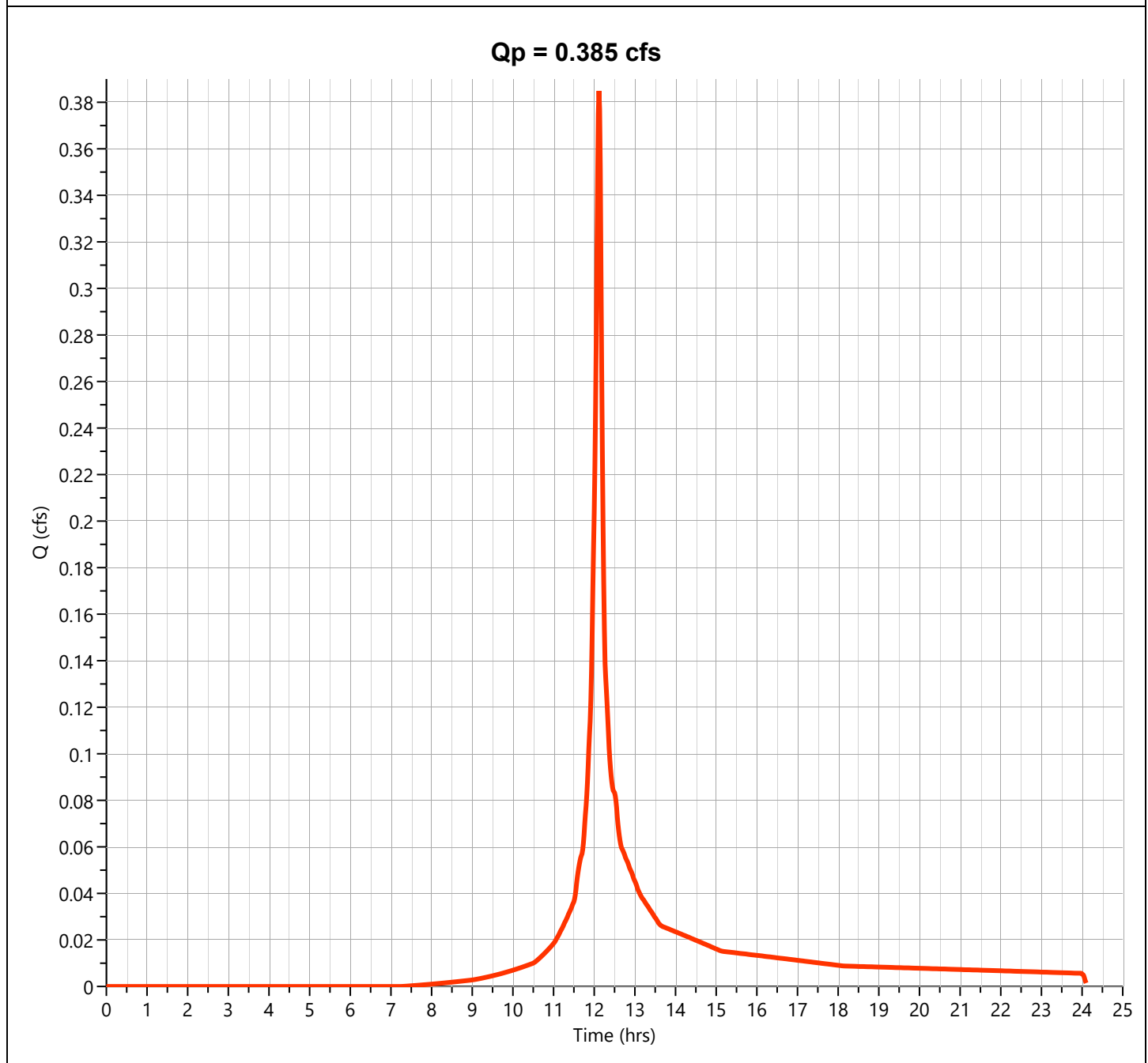
File: Future Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2G Grass HSGC C

## Hyd. No. 17

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.385 cfs  |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.12 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 1,193 cuft |
| Drainage Area   | = 0.09 ac     | Curve Number       | = 74.00      |
| Tc Method       | = User        | Time of Conc. (Tc) | = 5.0 min    |
| Total Rainfall  | = 6.42 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

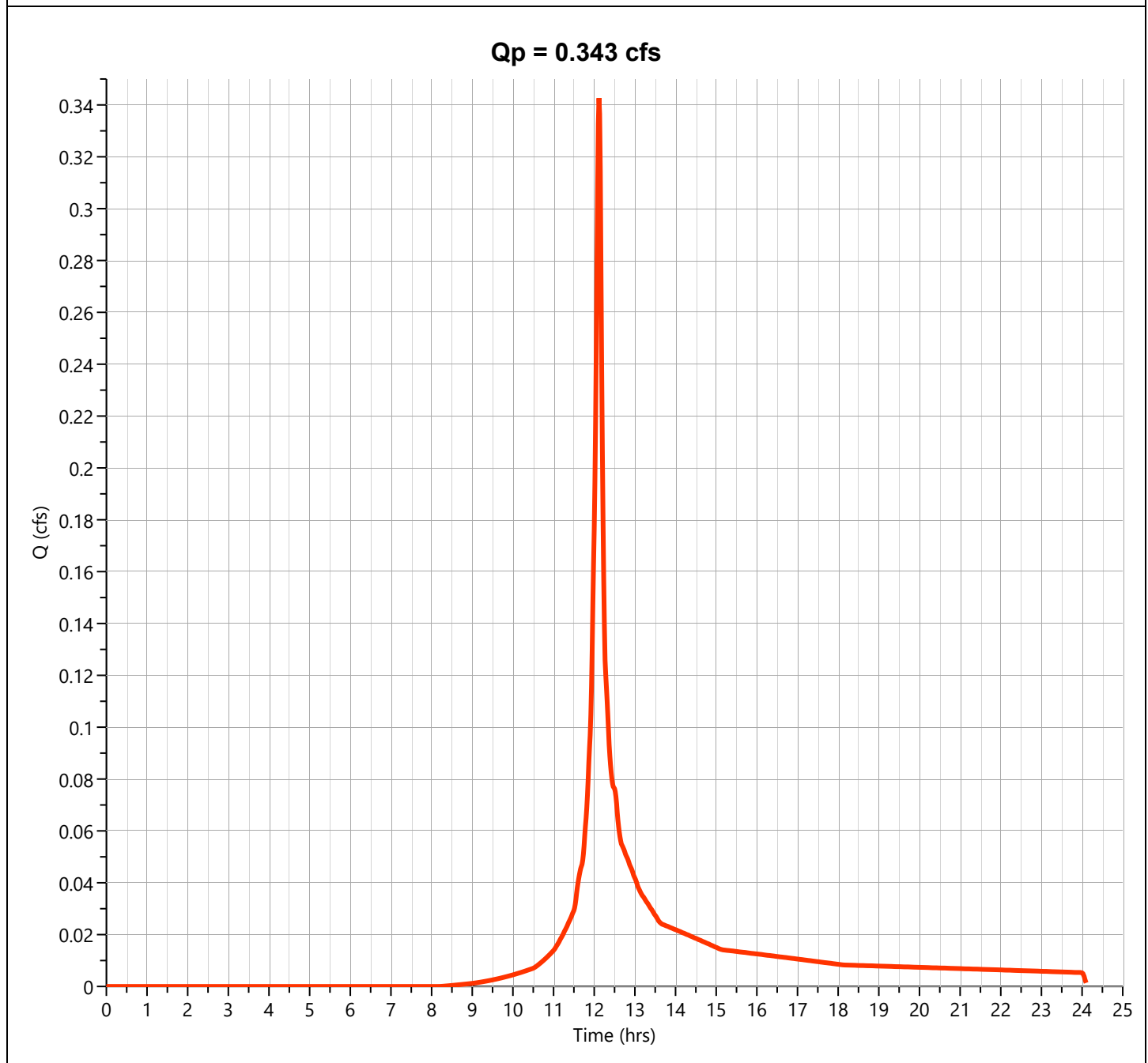
File: Future Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2G Woods HSGC C

## Hyd. No. 18

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.343 cfs  |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.12 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 1,059 cuft |
| Drainage Area   | = 0.09 ac     | Curve Number       | = 70.00      |
| Tc Method       | = User        | Time of Conc. (Tc) | = 5.0 min    |
| Total Rainfall  | = 6.42 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

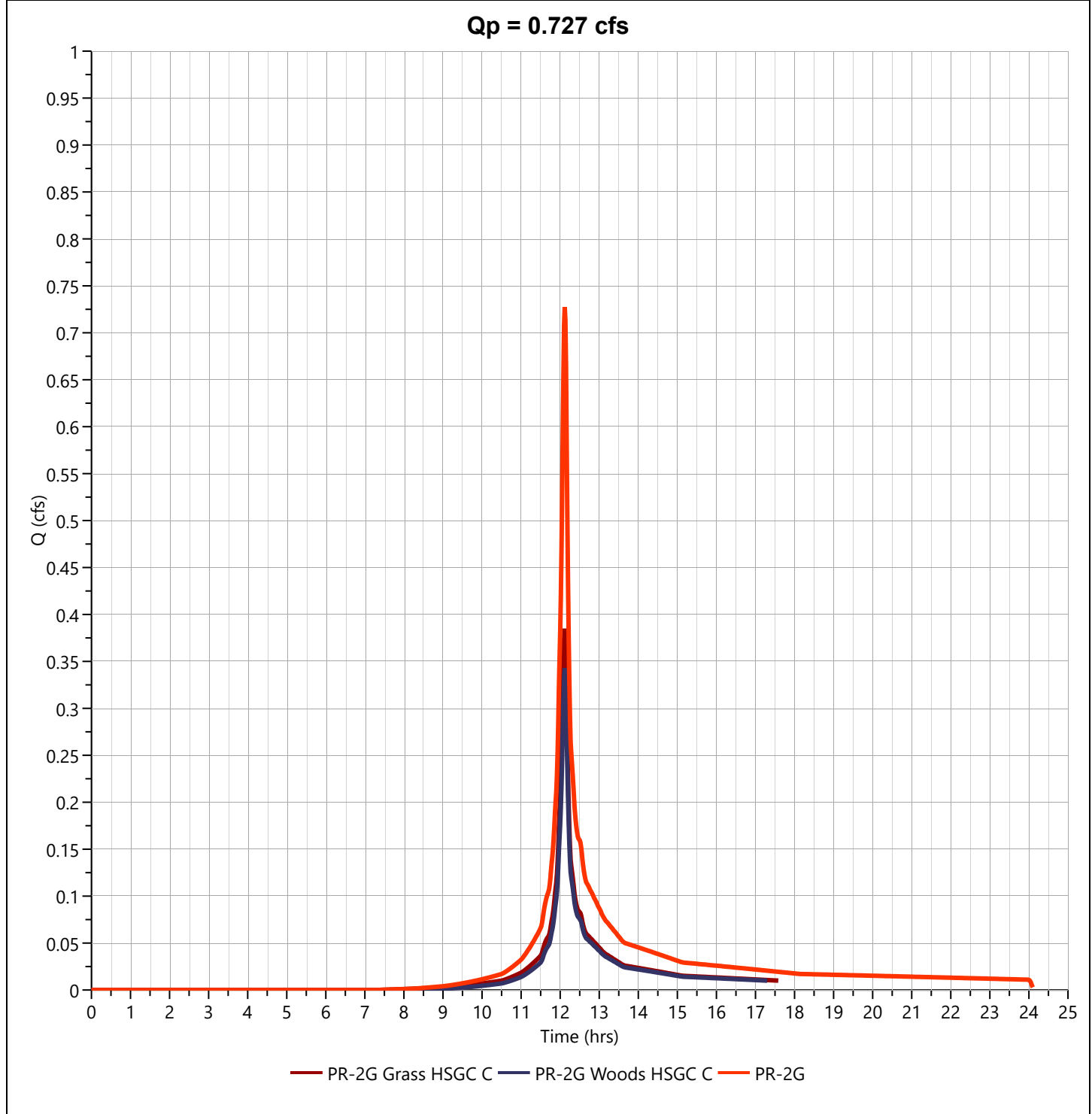
File: Future Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2G

## Hyd. No. 19

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.727 cfs  |
| Storm Frequency    | = 10-yr    | Time to Peak        | = 12.12 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 2,252 cuft |
| Inflow Hydrographs | = 17, 18   | Total Contrib. Area | = 0.18 ac    |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

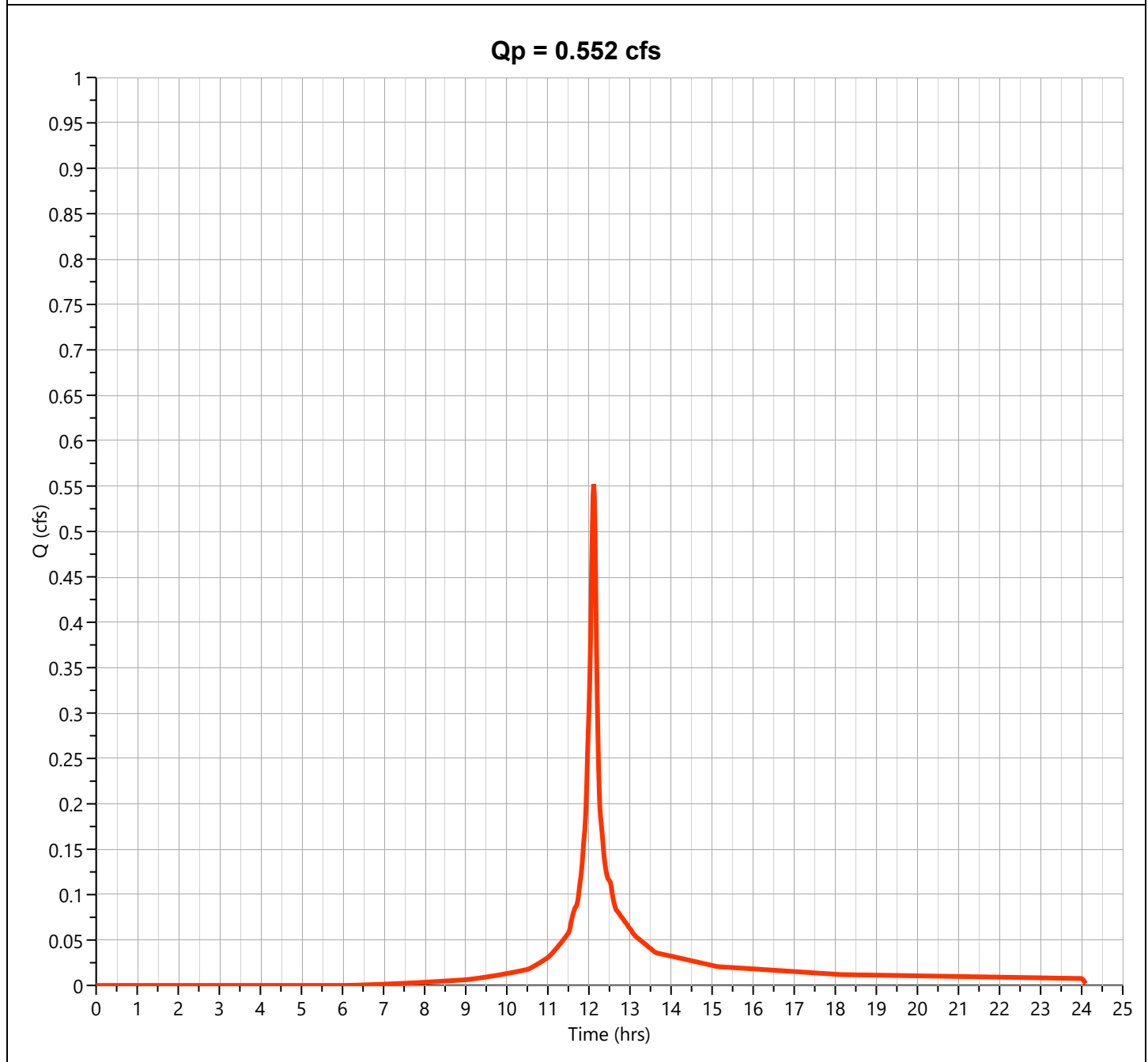
File: Future Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2G Grass HSGC C

## Hyd. No. 17

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.552 cfs  |
| Storm Frequency | = 25-yr       | Time to Peak       | = 12.12 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 1,729 cuft |
| Drainage Area   | = 0.09 ac     | Curve Number       | = 74.00      |
| Tc Method       | = User        | Time of Conc. (Tc) | = 5.0 min    |
| Total Rainfall  | = 8.23 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

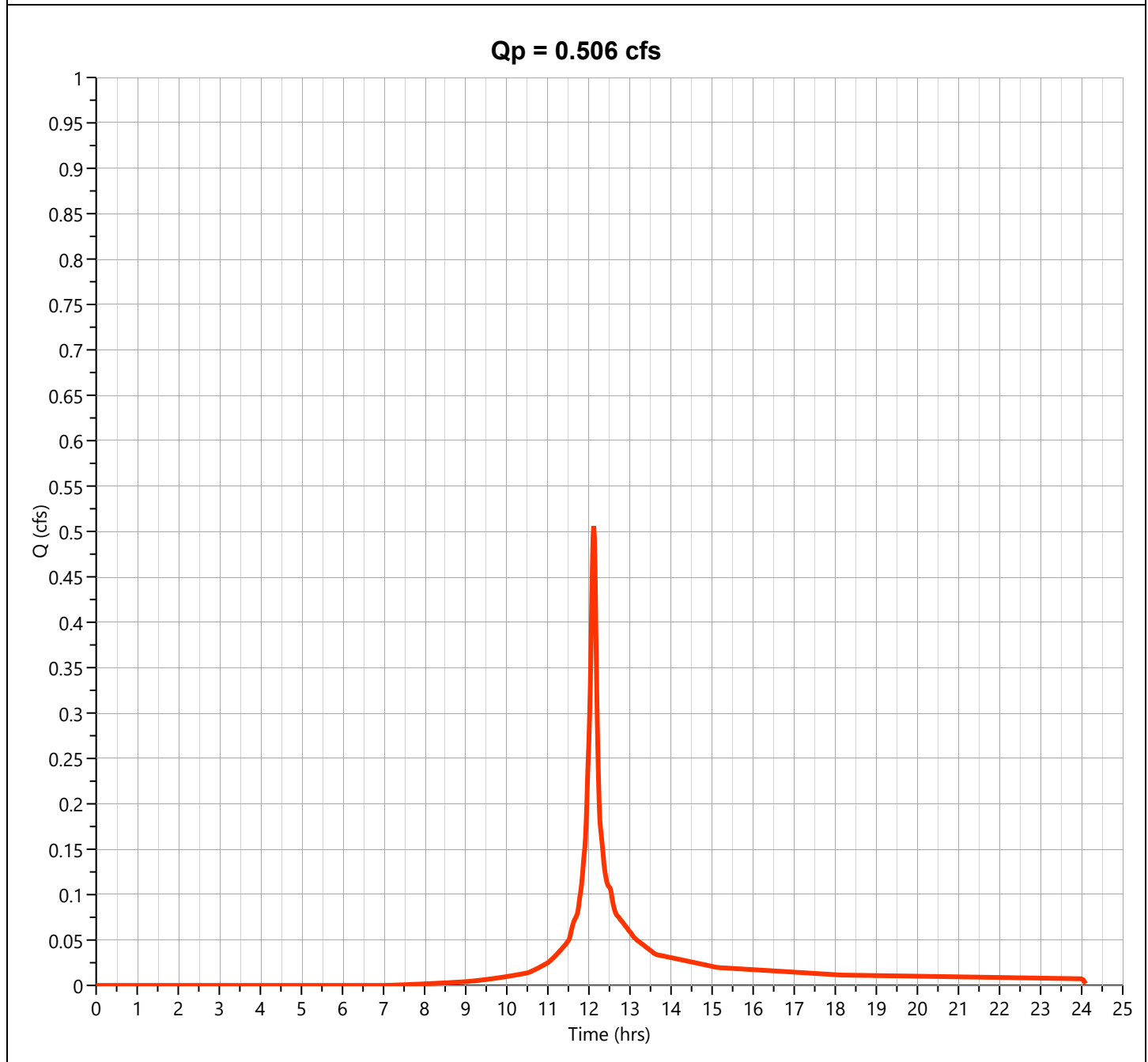
File: Future Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2G Woods HSGC C

## Hyd. No. 18

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.506 cfs  |
| Storm Frequency | = 25-yr       | Time to Peak       | = 12.12 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 1,571 cuft |
| Drainage Area   | = 0.09 ac     | Curve Number       | = 70.00      |
| Tc Method       | = User        | Time of Conc. (Tc) | = 5.0 min    |
| Total Rainfall  | = 8.23 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

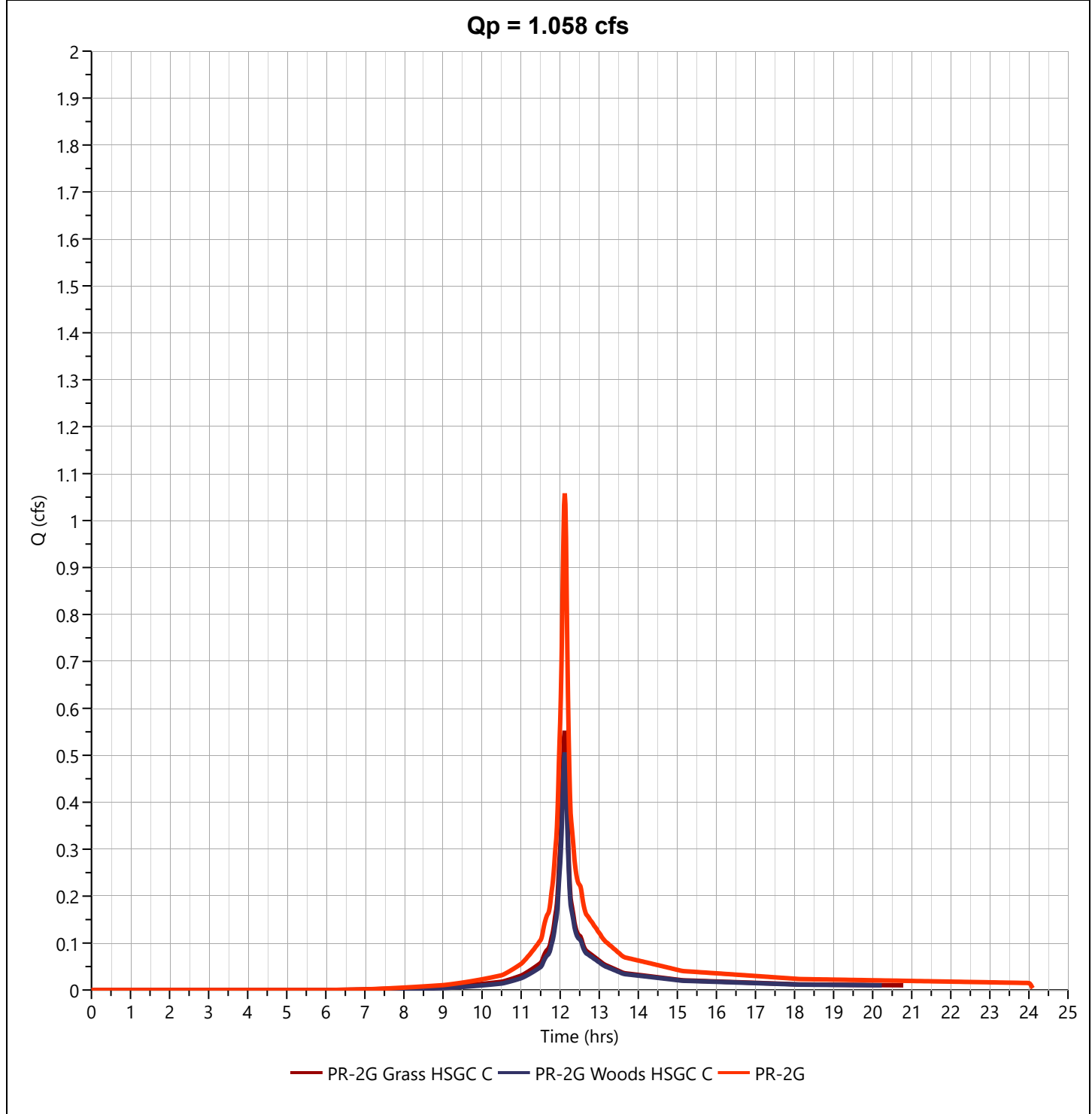
File: Future Beacon Church Proposed - POA-2.hys

05-16-2025

**PR-2G**

**Hyd. No. 19**

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 1.058 cfs  |
| Storm Frequency    | = 25-yr    | Time to Peak        | = 12.12 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 3,300 cuft |
| Inflow Hydrographs | = 17, 18   | Total Contrib. Area | = 0.18 ac    |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

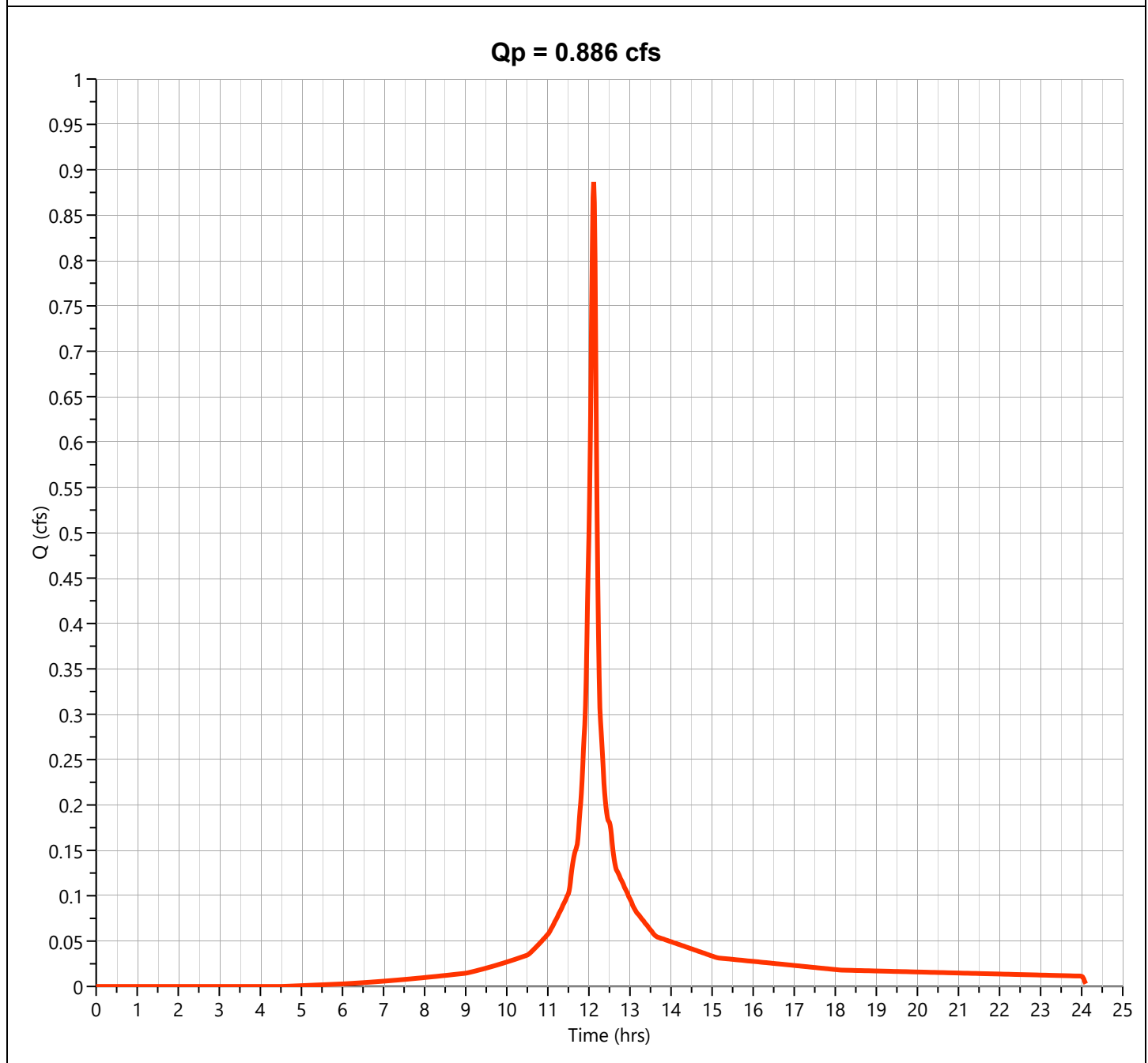
File: Future Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2G Grass HSGC C

## Hyd. No. 17

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.886 cfs  |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.12 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 2,840 cuft |
| Drainage Area   | = 0.09 ac     | Curve Number       | = 74.00      |
| Tc Method       | = User        | Time of Conc. (Tc) | = 5.0 min    |
| Total Rainfall  | = 11.80 in    | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |





# Hydrograph Report

Hydrology Studio v 3.0.0.38

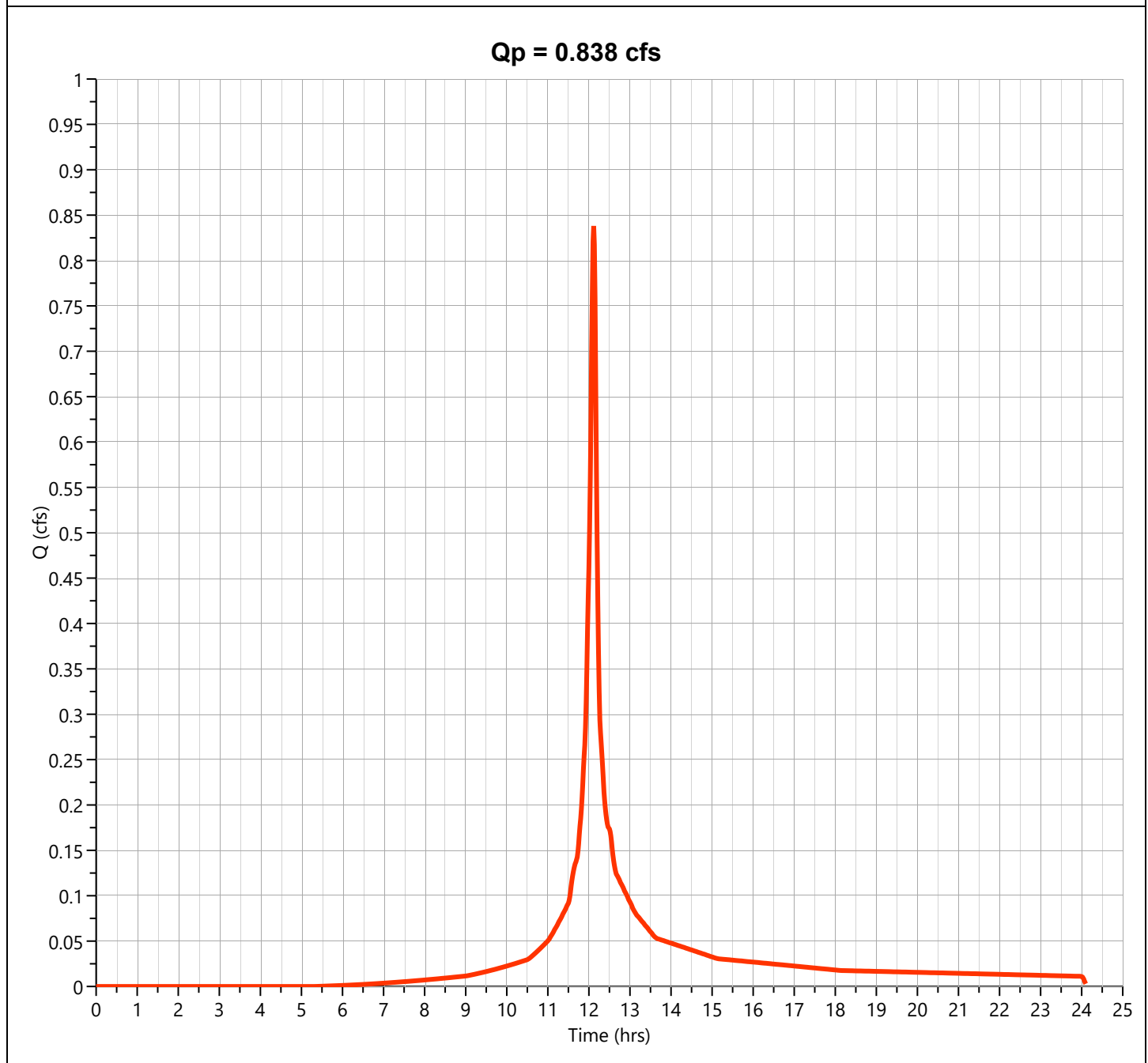
File: Future Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2G Woods HSGC C

## Hyd. No. 18

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.838 cfs  |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.12 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 2,649 cuft |
| Drainage Area   | = 0.09 ac     | Curve Number       | = 70.00      |
| Tc Method       | = User        | Time of Conc. (Tc) | = 5.0 min    |
| Total Rainfall  | = 11.80 in    | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

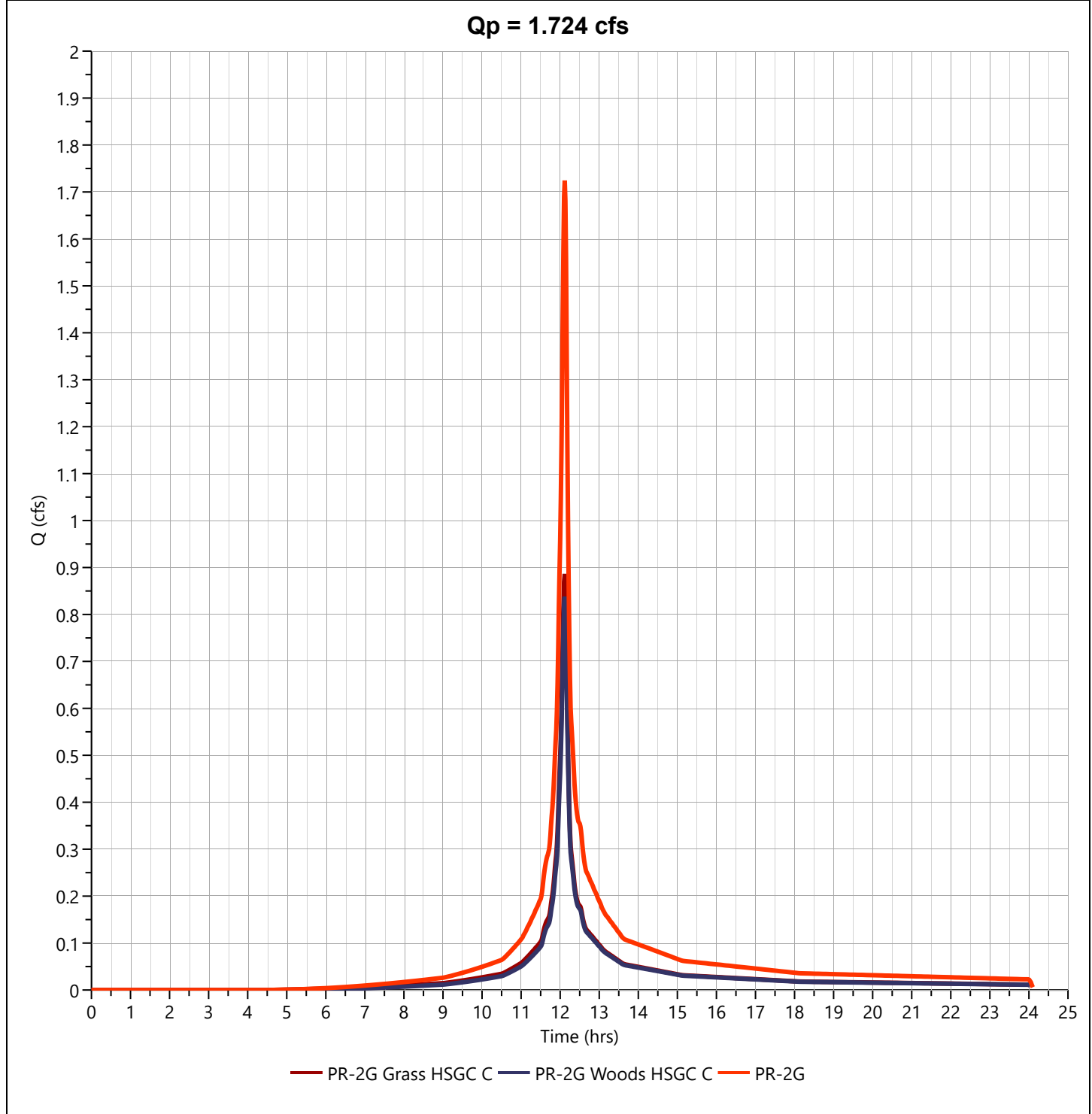
File: Future Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2G

## Hyd. No. 19

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 1.724 cfs  |
| Storm Frequency    | = 100-yr   | Time to Peak        | = 12.12 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 5,489 cuft |
| Inflow Hydrographs | = 17, 18   | Total Contrib. Area | = 0.18 ac    |



## **PR-2H WATERSHED**

Project: Beacon Unitarian Universalist Church

By: TEG

Date: 2/7/2024

Location: Summit, NJ

Checked By: MJV

Date Checked: 2/7/2024

Circle One: Present Developed

Future Proposed Watershed PR-2H - Impervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Design Flow Length, L<sub>des</sub> (Total L<sub>des</sub> < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. McCuen-Spiess Limit, L<sub>mcs</sub> (max. 100 ft)
7. Compute T<sub>t</sub>

$$T_t = \frac{0.007 (n L_{des})^{0.8}}{P_2^{0.5} s^{0.4}}$$

$$L_{mcs} = (100 s^{0.5})/n$$

|            |                        |   |  |
|------------|------------------------|---|--|
| Segment ID | 1                      |   |  |
|            | <b>Smooth Surfaces</b> |   |  |
|            | <b>0.011</b>           |   |  |
| ft         | <b>23</b>              |   |  |
| in         | <b>4.12</b>            |   |  |
| ft/ft      | <b>0.021</b>           |   |  |
| ft         | <b>100</b>             |   |  |
| hr         | <b>0.005</b>           | + |  |

Sheet Flow Sub-Total **0.005 hours**

**Shallow Concentrated Flow**

8. Surface Description
9. Flow Length, L
10. Watercourse Slope, s
11. Average Velocity, V (NEH table 15-3)
12. Compute T<sub>t</sub>

$$T_t = \frac{L}{3600 V}$$

|            |  |   |  |
|------------|--|---|--|
| Segment ID |  |   |  |
| ft         |  |   |  |
| ft/ft      |  |   |  |
| ft/s       |  |   |  |
| hr         |  | + |  |

Shallow Conc. Flow Sub-Total **0.000 hours**

**Channel Flow**

13. Flow Length, L
14. Cross Sectional flow area, a
15. Wetted Perimeter, P<sub>w</sub>
16. Hydraulic Radius, r
17. Channel Slope, s
18. Manning's Roughness Coeff., n
19. Velocity, V
20. Compute T<sub>t</sub>

$$r = a / P_w$$

$$V = (1.49 r^{2/3} s^{1/2}) / n$$

$$T_t = \frac{L}{3600 V}$$

|                 |  |   |  |
|-----------------|--|---|--|
| Segment ID      |  |   |  |
| ft              |  |   |  |
| ft <sup>2</sup> |  |   |  |
| ft              |  |   |  |
| ft              |  |   |  |
| ft/ft           |  |   |  |
| ft/s            |  |   |  |
| hr              |  | + |  |

Channel Flow Sub-Total **0.000 hours**

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>  
(Add Sub-Total T<sub>t</sub> from prior steps)

|   |                    |
|---|--------------------|
| Total T <sub>c</sub> (hours) =                        | <b>0.005 hours</b> |
| Software Limitations Require Minimum T <sub>c</sub> = | <b>2 minutes</b>   |

Project: Beacon Unitarian Universalist Church

By: TEG

Date: 2/7/2024

Location: Summit, NJ

Checked By: MJV

Date Checked: 2/7/2024

Circle One: Present Developed

Future Proposed Watershed PR-2H - Pervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Design Flow Length, L<sub>des</sub> (Total L<sub>des</sub> < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. McCuen-Spiess Limit, L<sub>mcs</sub> (max. 100 ft)
7. Compute T<sub>t</sub>

$$L_{mcs} = (100 s^{0.5})/n$$

$$T_t = \frac{0.007 (n L_{des})^{0.8}}{P_2^{0.5} s^{0.4}}$$

|            |               |   |   |
|------------|---------------|---|---|
| Segment ID | 1             |   |   |
|            | Dense Grasses |   |   |
|            | 0.24          |   |   |
| ft         | 31            |   |   |
| in         | 4.12          |   |   |
| ft/ft      | 0.017         |   |   |
| ft         | 54            |   |   |
| hr         | 0.087         | + | + |

Sheet Flow Sub-Total **0.087 hours**

**Shallow Concentrated Flow**

8. Surface Description
9. Flow Length, L
10. Watercourse Slope, s
11. Average Velocity, V (NEH table 15-3)
12. Compute T<sub>t</sub>

$$T_t = \frac{L}{3600 V}$$

|            |  |   |   |
|------------|--|---|---|
| Segment ID |  |   |   |
| ft         |  |   |   |
| ft/ft      |  |   |   |
| ft/s       |  |   |   |
| hr         |  | + | + |

Shallow Conc. Flow Sub-Total **0.000 hours**

**Channel Flow**

13. Flow Length, L
14. Cross Sectional flow area, a
15. Wetted Perimeter, P<sub>w</sub>
16. Hydraulic Radius, r
17. Channel Slope, s
18. Manning's Roughness Coeff., n
19. Velocity, V
20. Compute T<sub>t</sub>

$$r = a / P_w$$

$$V = (1.49 r^{2/3} s^{1/2}) / n$$

$$T_t = \frac{L}{3600 V}$$

|                 |  |   |   |
|-----------------|--|---|---|
| Segment ID      |  |   |   |
| ft              |  |   |   |
| ft <sup>2</sup> |  |   |   |
| ft              |  |   |   |
| ft              |  |   |   |
| ft/ft           |  |   |   |
| ft/s            |  |   |   |
| hr              |  | + | + |

Channel Flow Sub-Total **0.000 hours**

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>

(Add Sub-Total T<sub>t</sub> from prior steps)

|                      |                    |
|----------------------|--------------------|
| Total Tc (hours) =   | <b>0.087 hours</b> |
| Total Tc (minutes) = | <b>5 minutes</b>   |

# Hydrograph Report

Project Name:

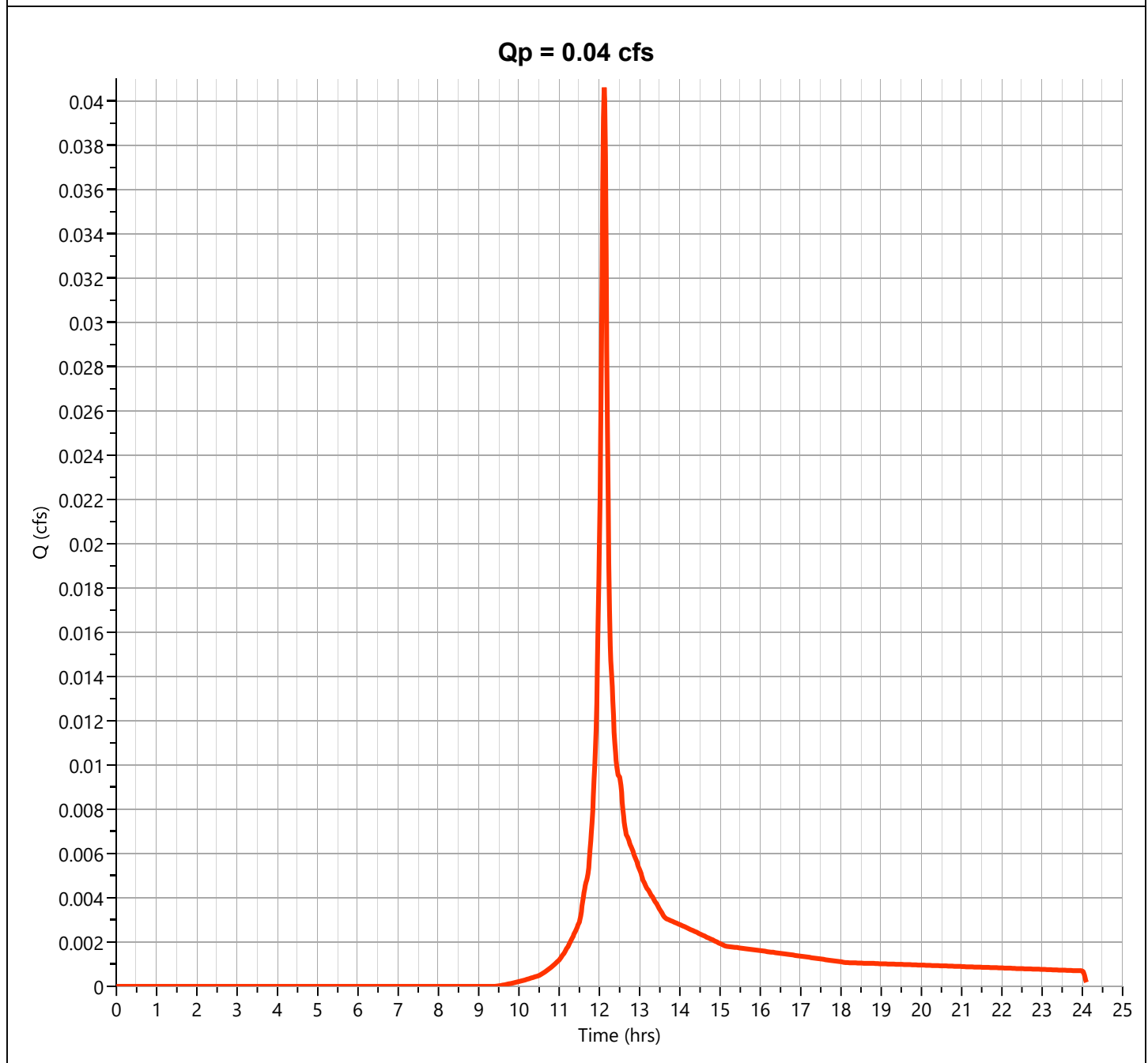
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2H Grass HSGC C

## Hyd. No. 34

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.041 cfs |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.12 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 126 cuft  |
| Drainage Area   | = 0.02 ac     | Curve Number       | = 74        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 5.0 min   |
| Total Rainfall  | = 4.12 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

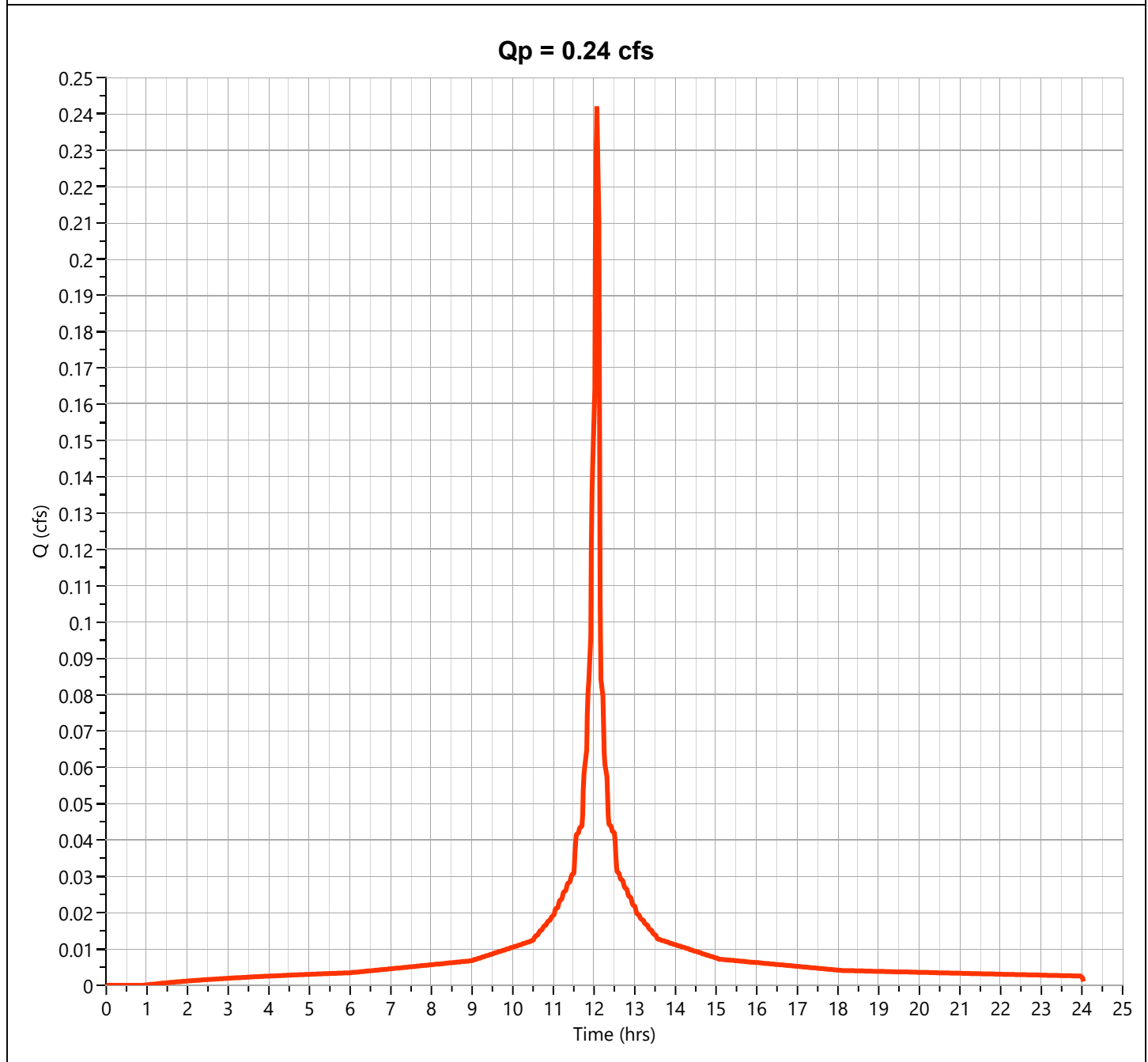
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2H Impervious

## Hyd. No. 35

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.242 cfs |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.10 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 793 cuft  |
| Drainage Area   | = 0.06 ac     | Curve Number       | = 98        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 2.0 min   |
| Total Rainfall  | = 4.12 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

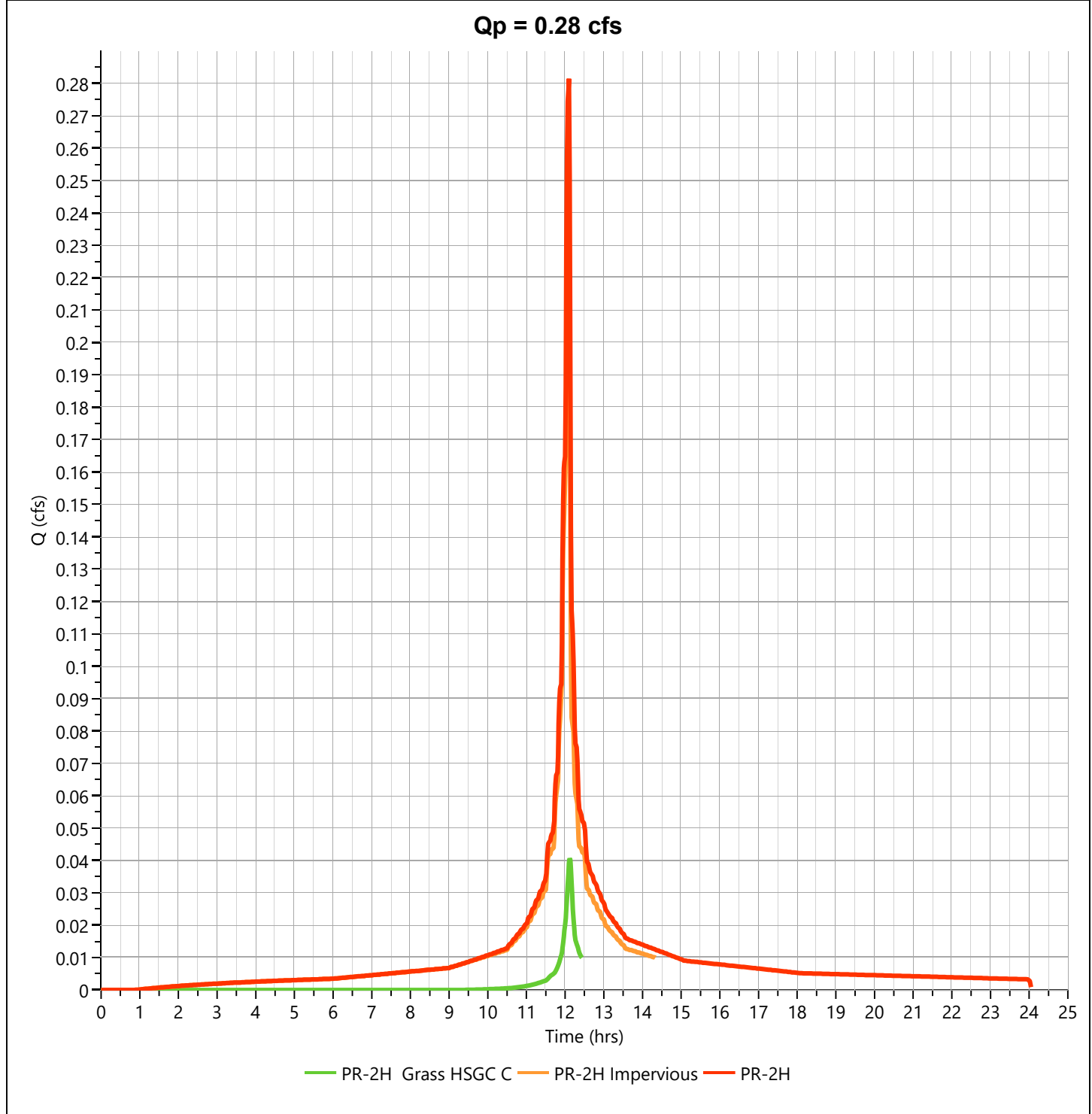
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2H

## Hyd. No. 36

|                    |            |                     |             |
|--------------------|------------|---------------------|-------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.281 cfs |
| Storm Frequency    | = 2-yr     | Time to Peak        | = 12.10 hrs |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 919 cuft  |
| Inflow Hydrographs | = 34, 35   | Total Contrib. Area | = 0.08 ac   |





# Hydrograph Report

Project Name:

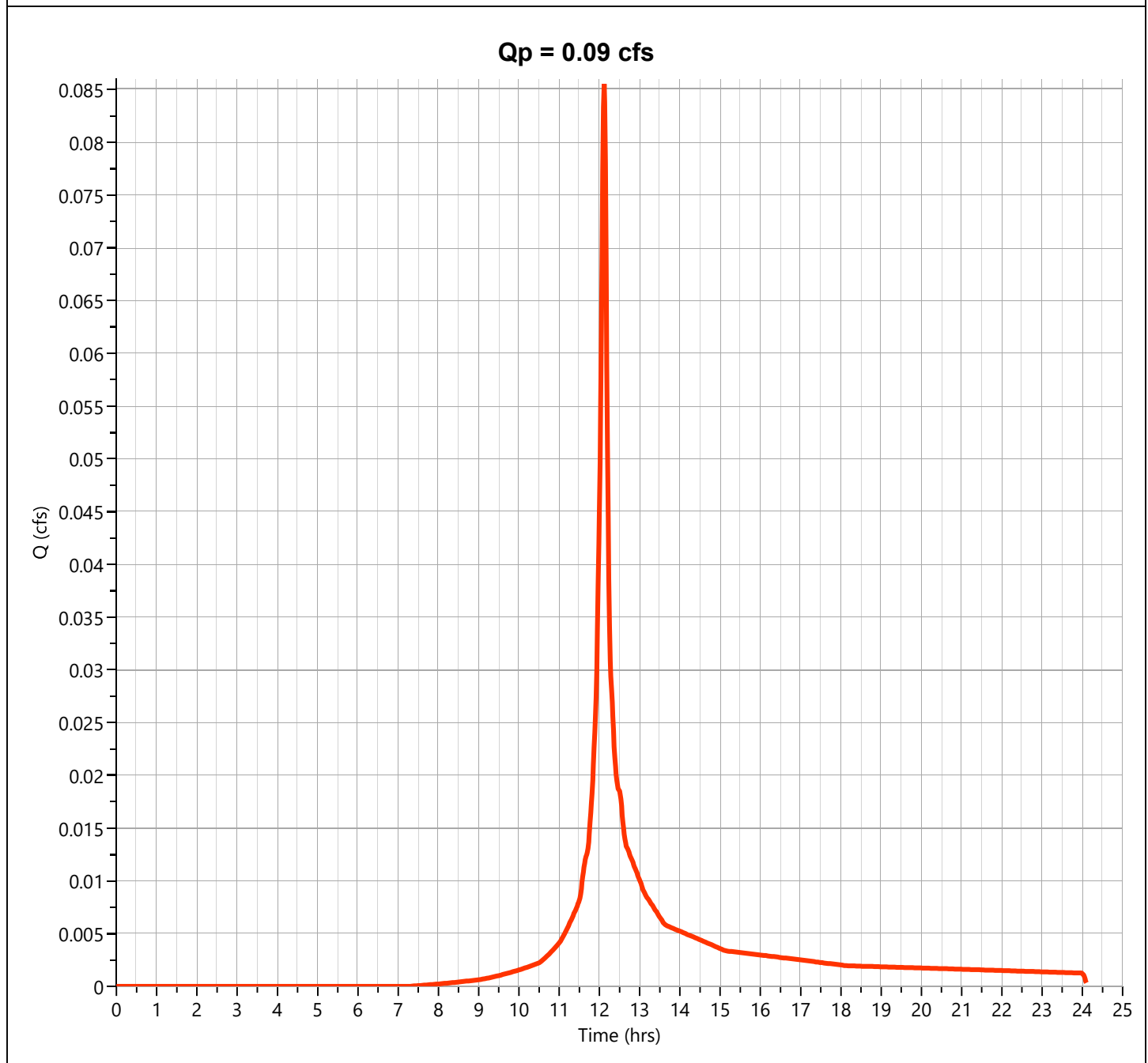
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2H Grass HSGC C

## Hyd. No. 34

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.086 cfs |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.12 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 265 cuft  |
| Drainage Area   | = 0.02 ac     | Curve Number       | = 74        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 5.0 min   |
| Total Rainfall  | = 6.42 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

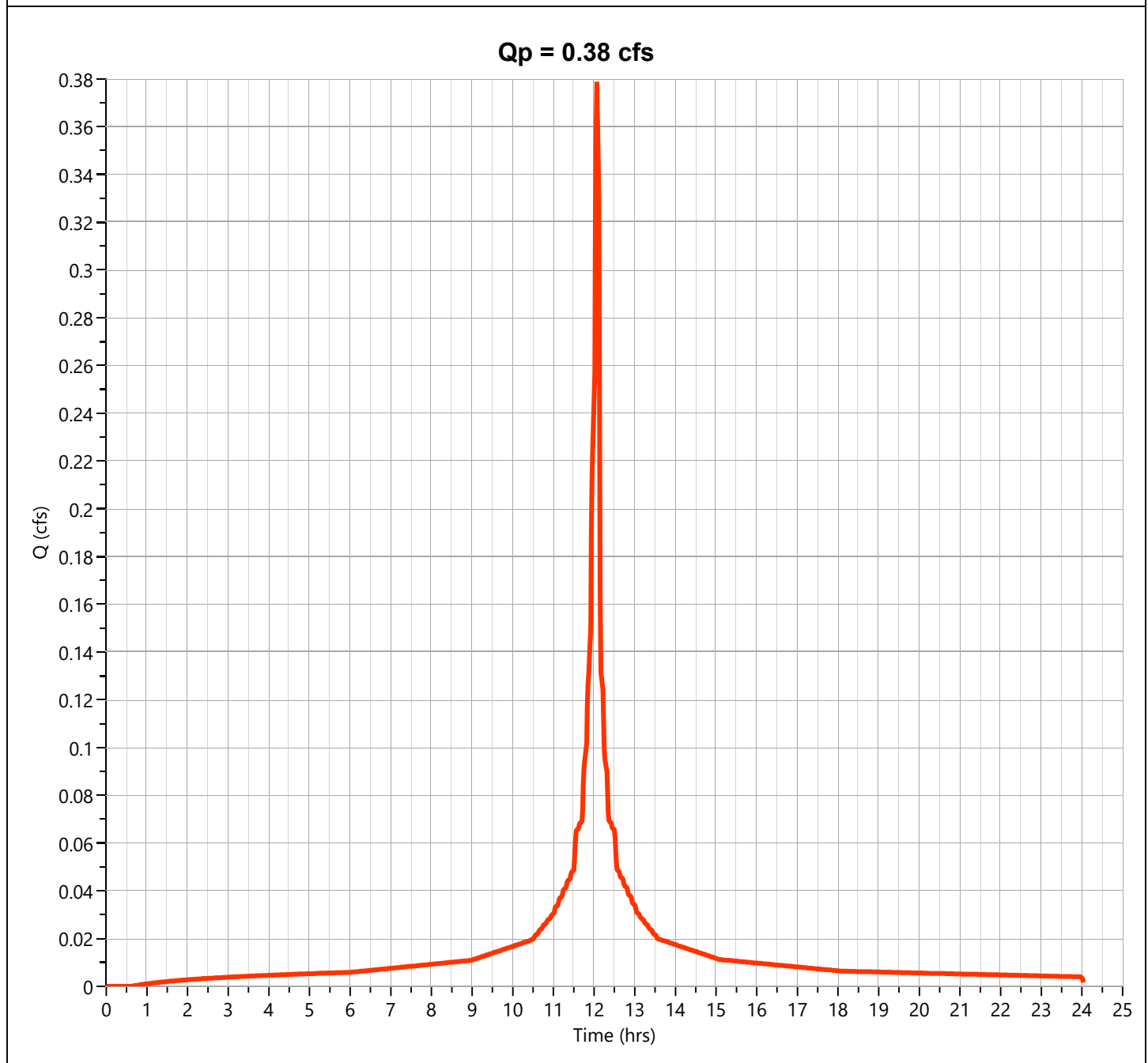
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2H Impervious

## Hyd. No. 35

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.379 cfs  |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 1,262 cuft |
| Drainage Area   | = 0.06 ac     | Curve Number       | = 98         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 2.0 min    |
| Total Rainfall  | = 6.42 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

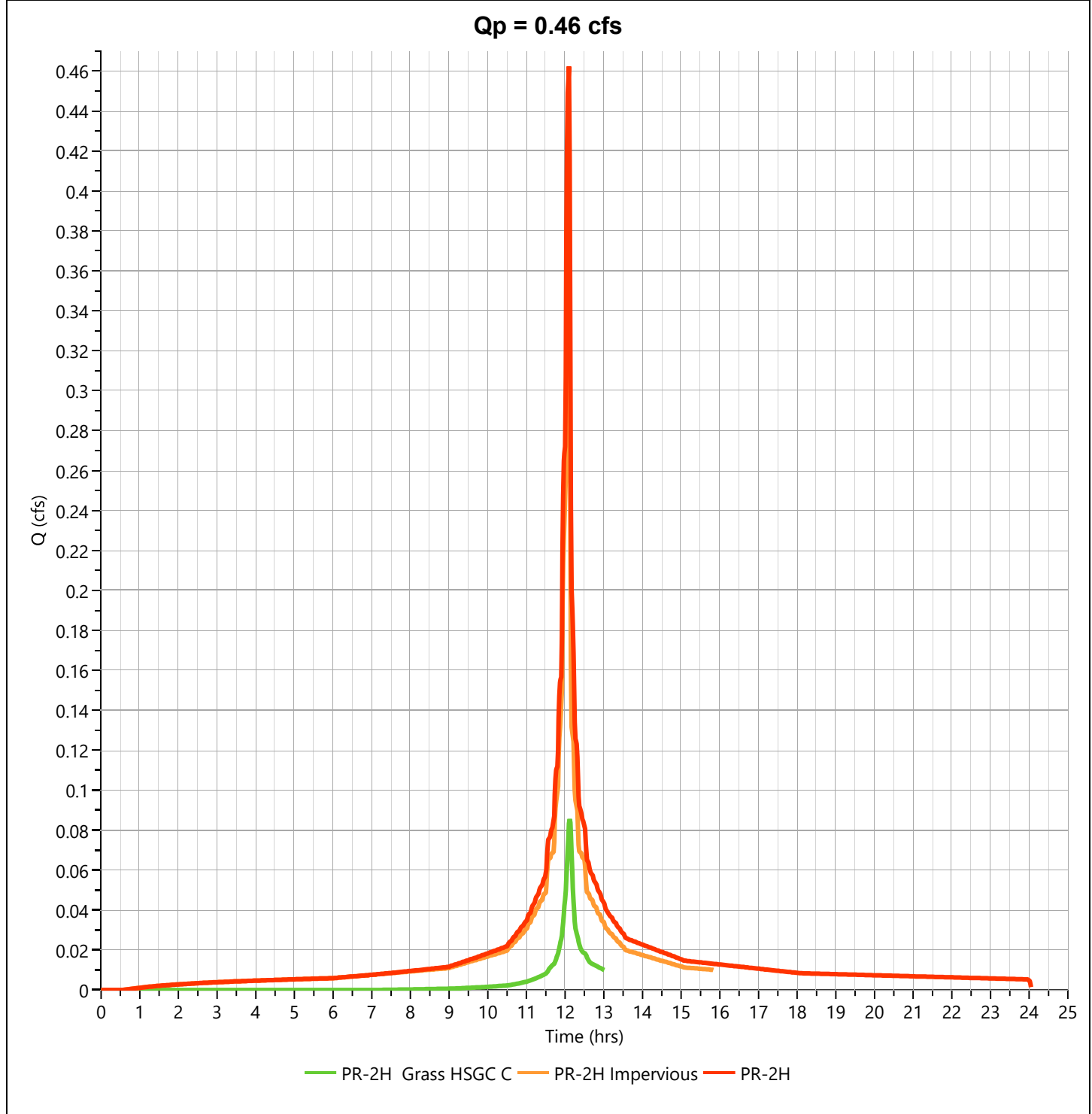
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2H

## Hyd. No. 36

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.462 cfs  |
| Storm Frequency    | = 10-yr    | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 1,527 cuft |
| Inflow Hydrographs | = 34, 35   | Total Contrib. Area | = 0.08 ac    |



# Hydrograph Report

Project Name:

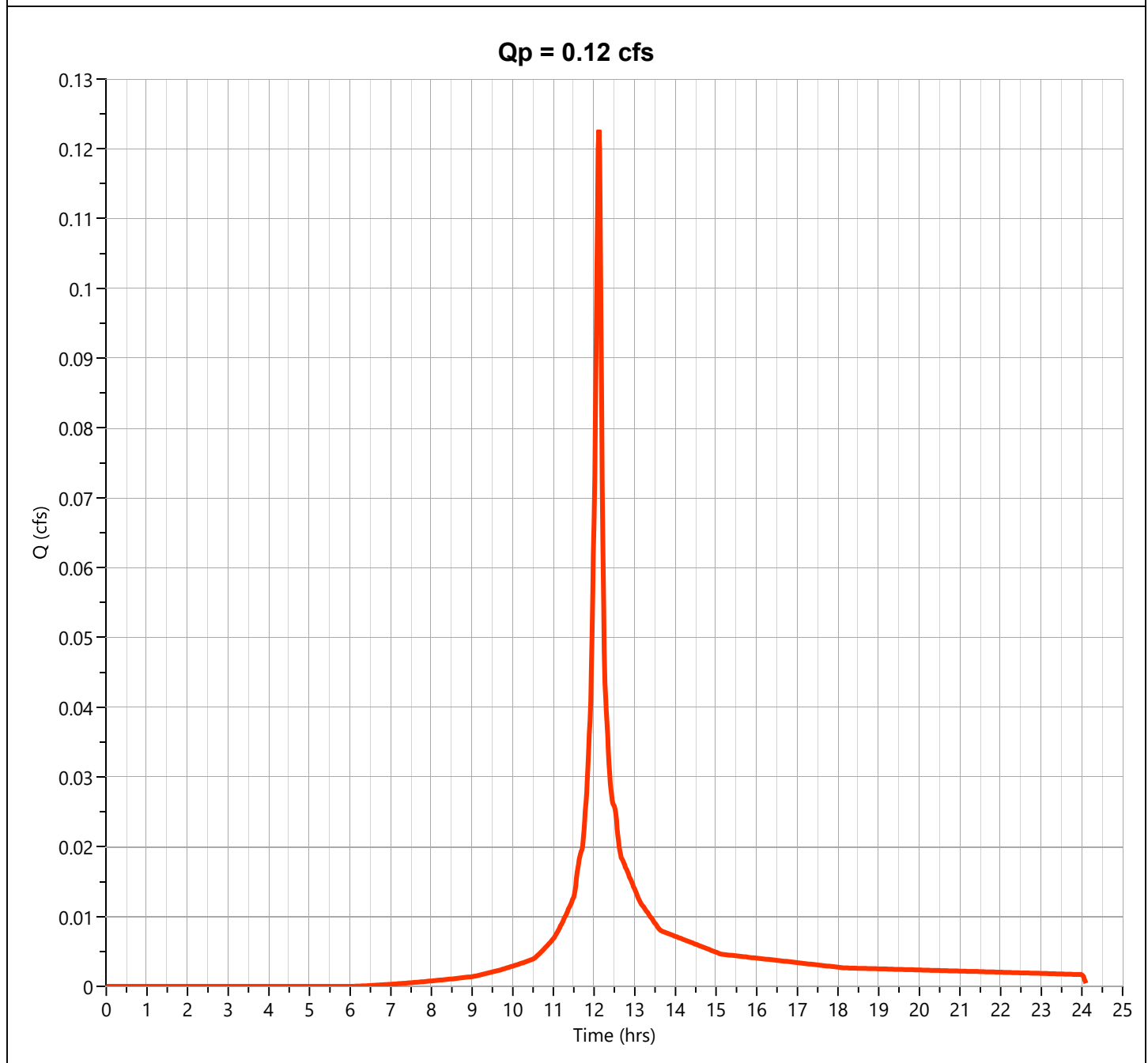
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2H Grass HSGC C

## Hyd. No. 34

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.123 cfs |
| Storm Frequency | = 25-yr       | Time to Peak       | = 12.12 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 384 cuft  |
| Drainage Area   | = 0.02 ac     | Curve Number       | = 74        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 5.0 min   |
| Total Rainfall  | = 8.23 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

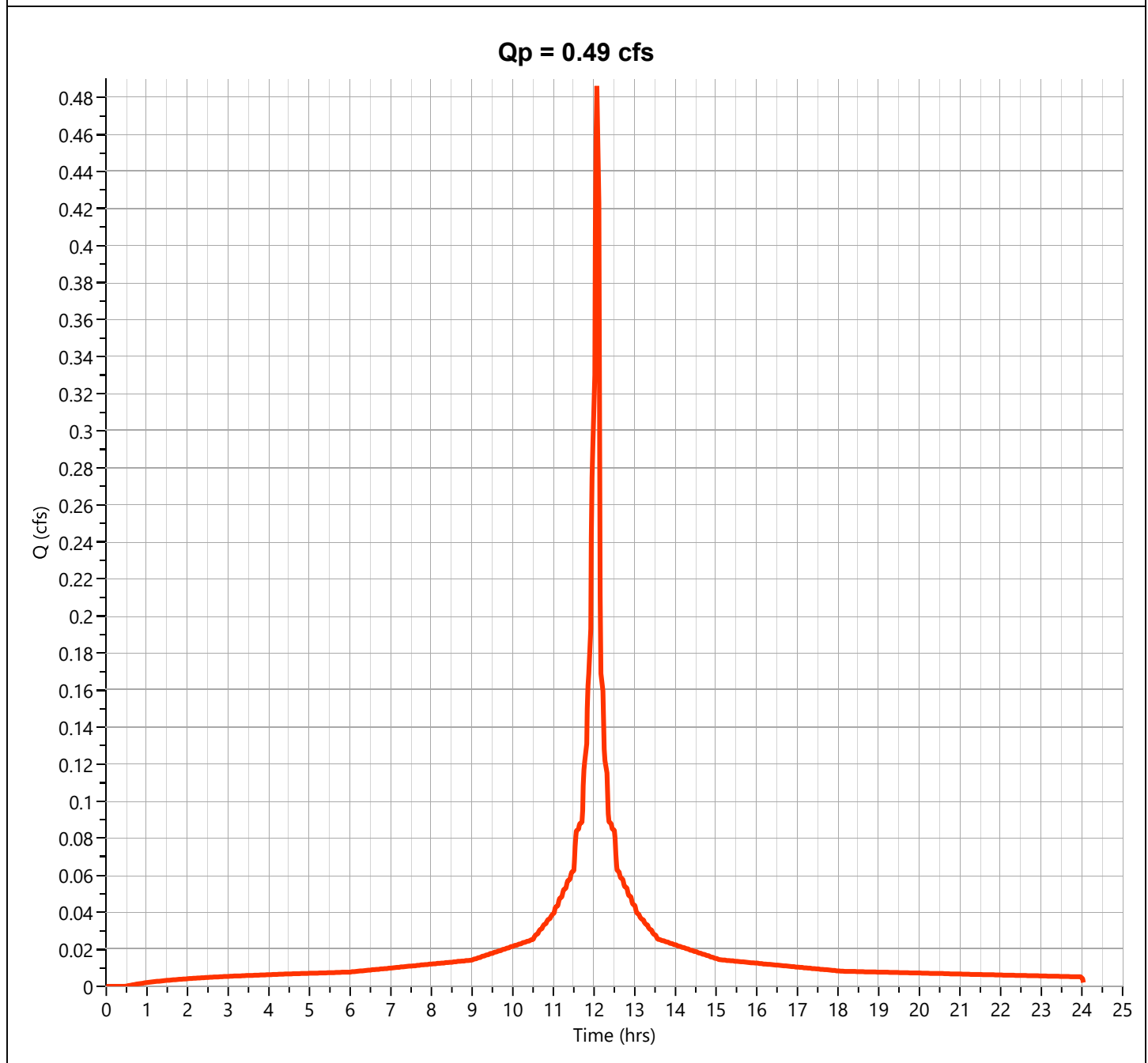
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2H Impervious

## Hyd. No. 35

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.486 cfs  |
| Storm Frequency | = 25-yr       | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 1,631 cuft |
| Drainage Area   | = 0.06 ac     | Curve Number       | = 98         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 2.0 min    |
| Total Rainfall  | = 8.23 in     | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |



# Hydrograph Report

Project Name:

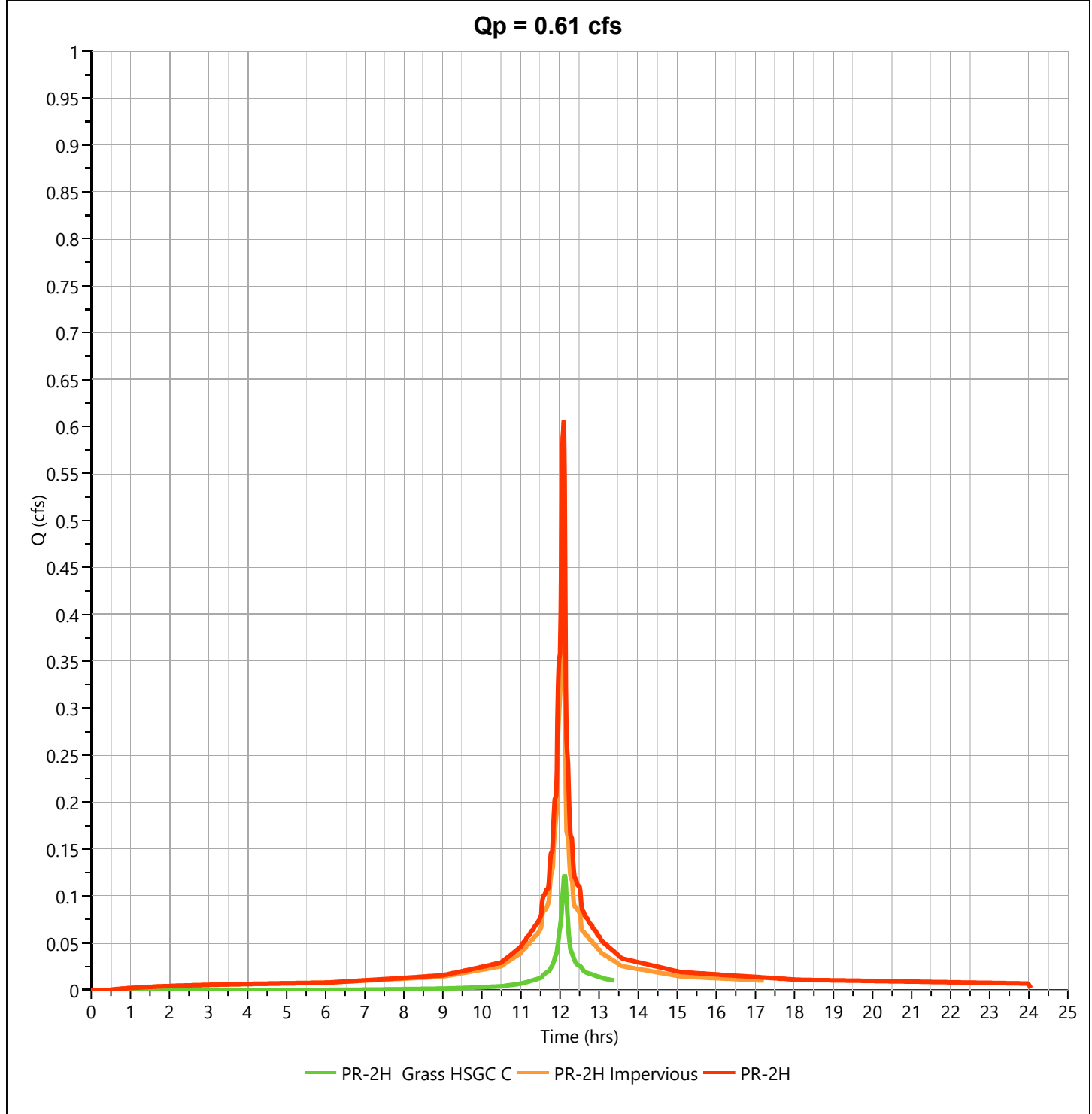
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2H

## Hyd. No. 36

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.606 cfs  |
| Storm Frequency    | = 25-yr    | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 2,016 cuft |
| Inflow Hydrographs | = 34, 35   | Total Contrib. Area | = 0.08 ac    |



# Hydrograph Report

Project Name:

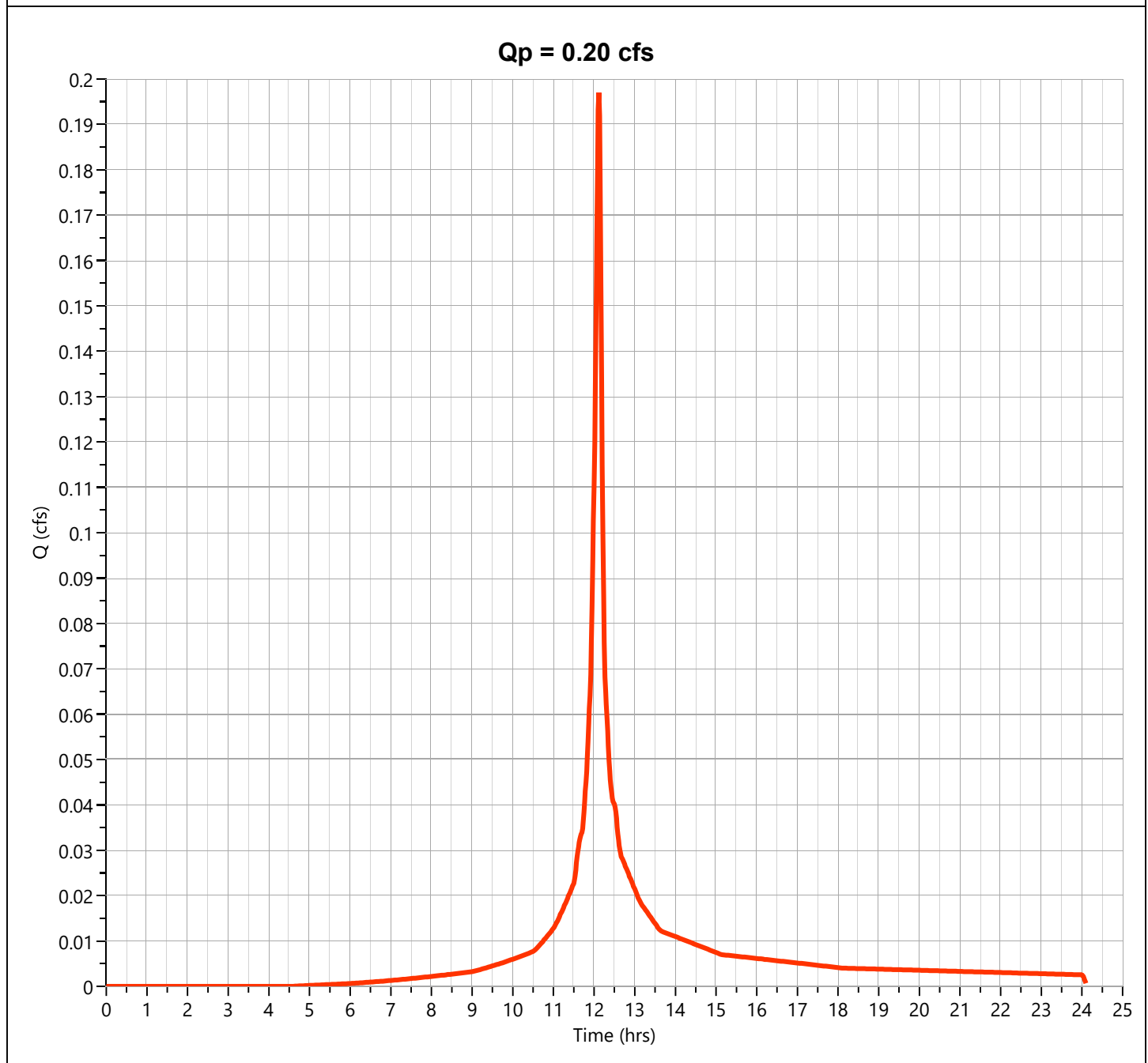
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2H Grass HSGC C

## Hyd. No. 34

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.197 cfs |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.12 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 631 cuft  |
| Drainage Area   | = 0.02 ac     | Curve Number       | = 74        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 5.0 min   |
| Total Rainfall  | = 11.80 in    | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

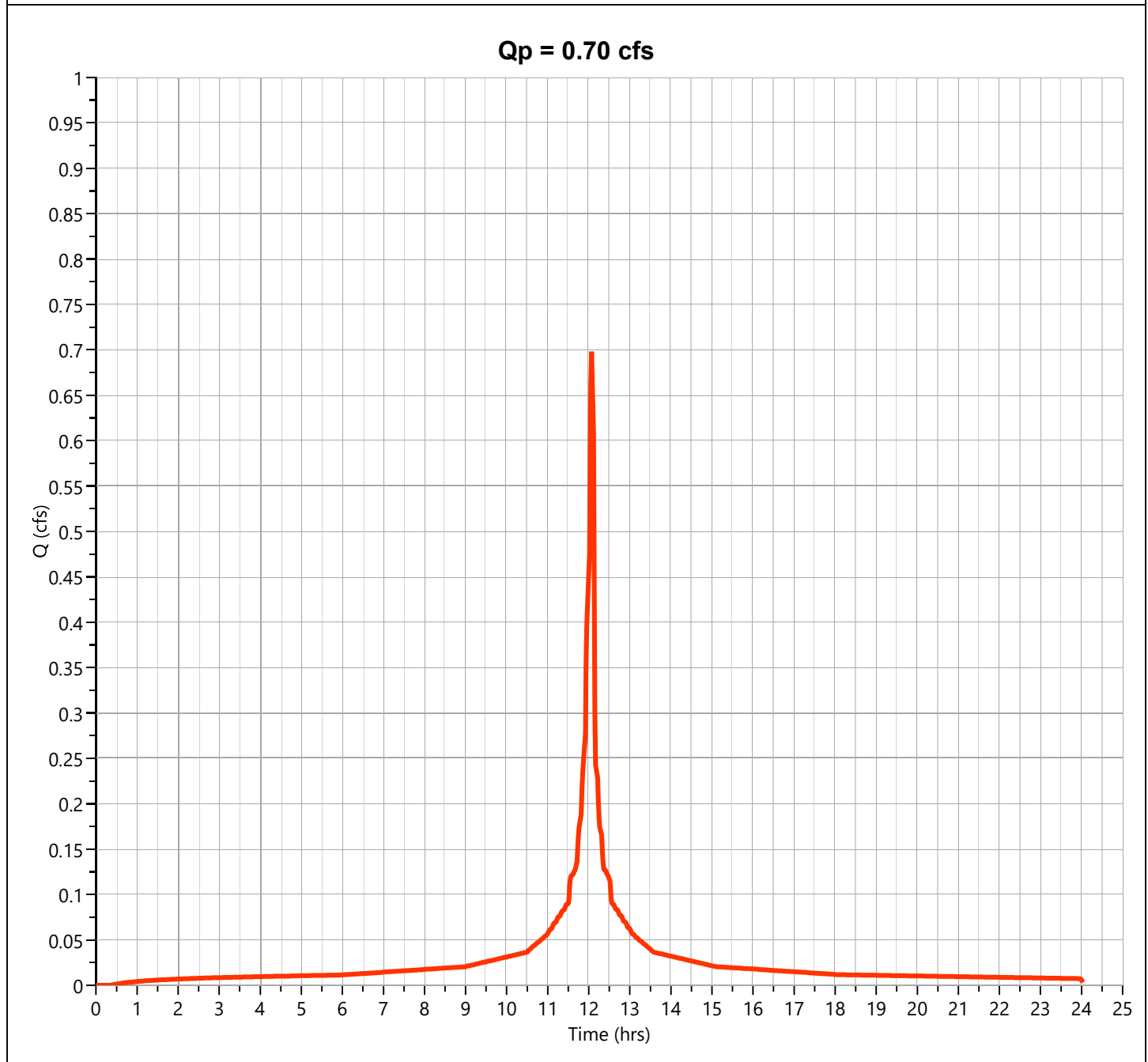
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2H Impervious

## Hyd. No. 35

|                 |               |                    |              |
|-----------------|---------------|--------------------|--------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.698 cfs  |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.10 hrs  |
| Time Interval   | = 1 min       | Runoff Volume      | = 2,360 cuft |
| Drainage Area   | = 0.06 ac     | Curve Number       | = 98         |
| Tc Method       | = User        | Time of Conc. (Tc) | = 2.0 min    |
| Total Rainfall  | = 11.80 in    | Design Storm       | = NOAA-D     |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484        |





# Hydrograph Report

Project Name:

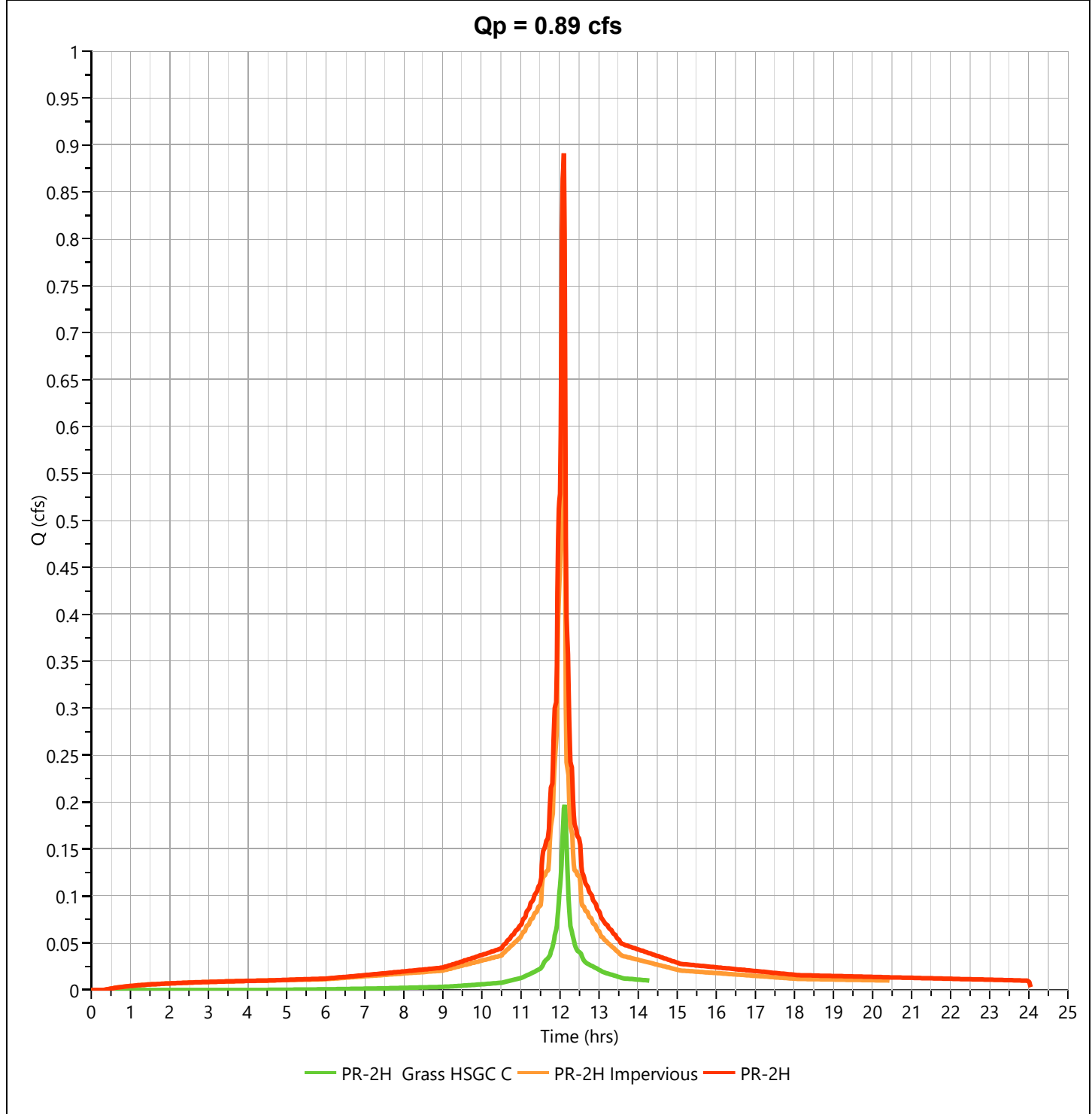
Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2H

## Hyd. No. 36

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.891 cfs  |
| Storm Frequency    | = 100-yr   | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 2,991 cuft |
| Inflow Hydrographs | = 34, 35   | Total Contrib. Area | = 0.08 ac    |



**COMBINED PR-2B + PR-2H WATERSHED**

# Hydrograph Report

Hydrology Studio v 3.0.0.38

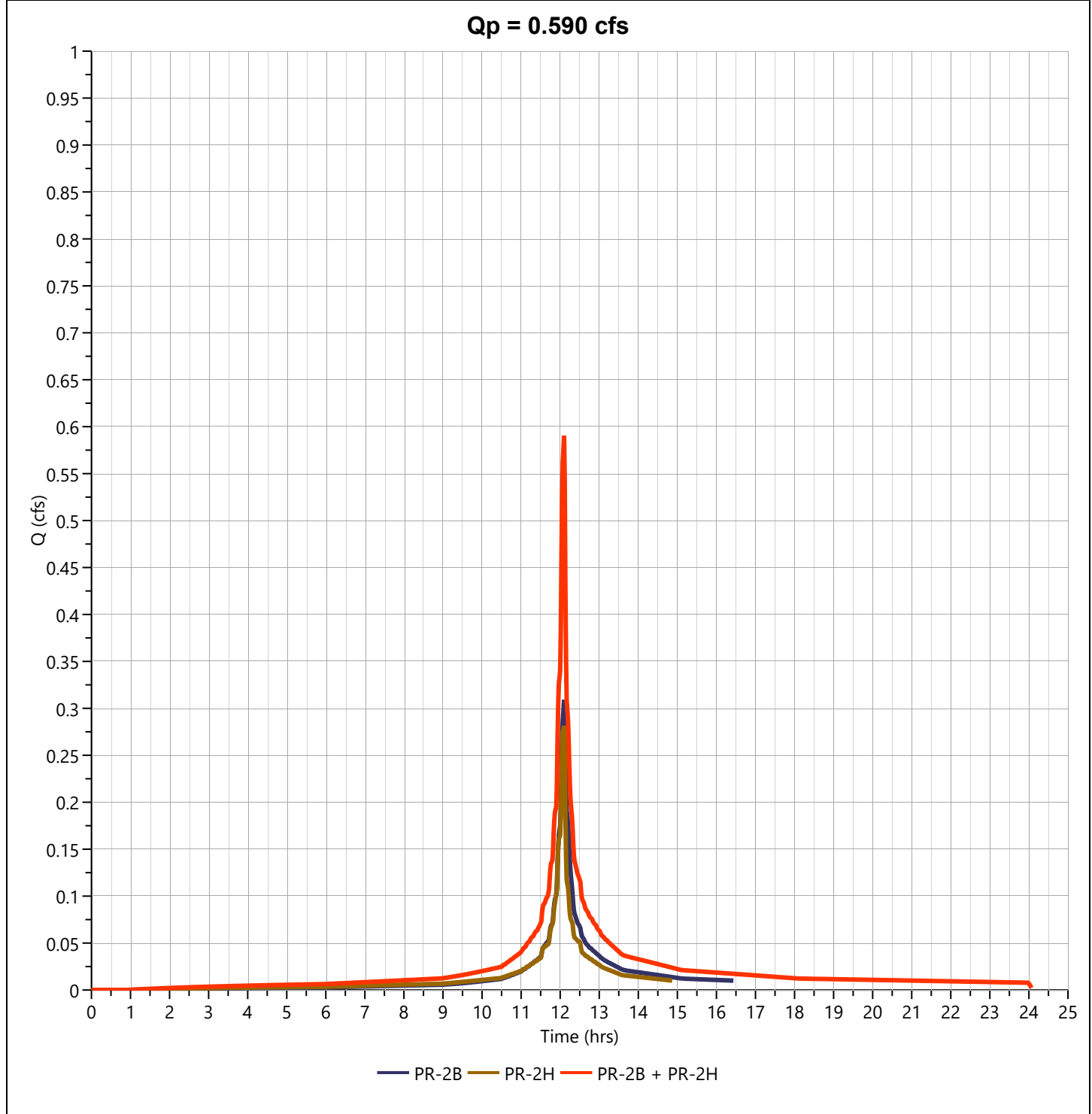
File: Future Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2B + PR-2H

## Hyd. No. 38

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.590 cfs  |
| Storm Frequency    | = 2-yr     | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 2,009 cuft |
| Inflow Hydrographs |            | Total Contrib. Area | = 0.0 ac     |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

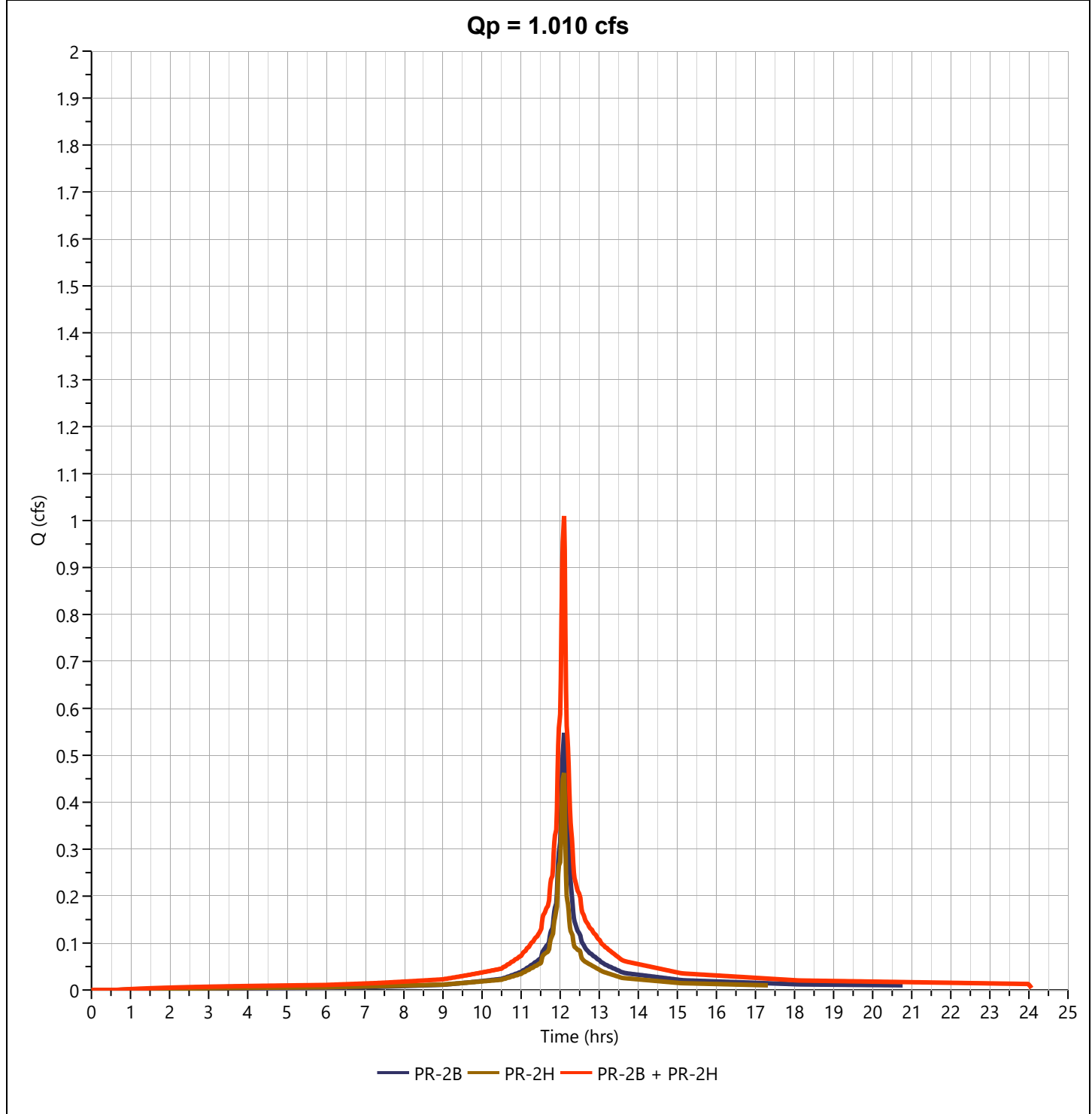
File: Future Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2B + PR-2H

## Hyd. No. 38

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 1.010 cfs  |
| Storm Frequency    | = 10-yr    | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 3,479 cuft |
| Inflow Hydrographs |            | Total Contrib. Area | = 0.0 ac     |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

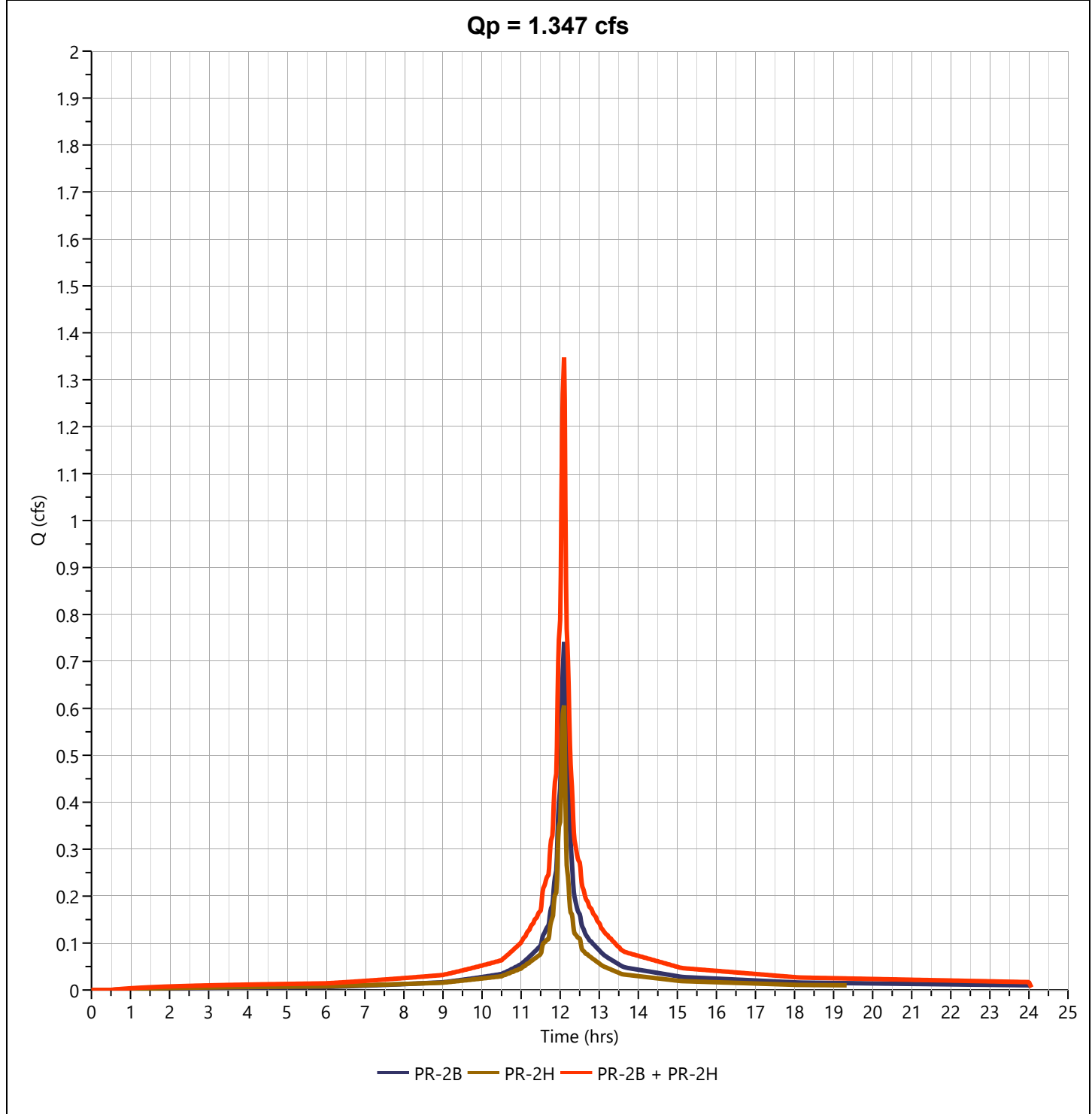
File: Future Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2B + PR-2H

## Hyd. No. 38

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 1.347 cfs  |
| Storm Frequency    | = 25-yr    | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 4,679 cuft |
| Inflow Hydrographs |            | Total Contrib. Area | = 0.0 ac     |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

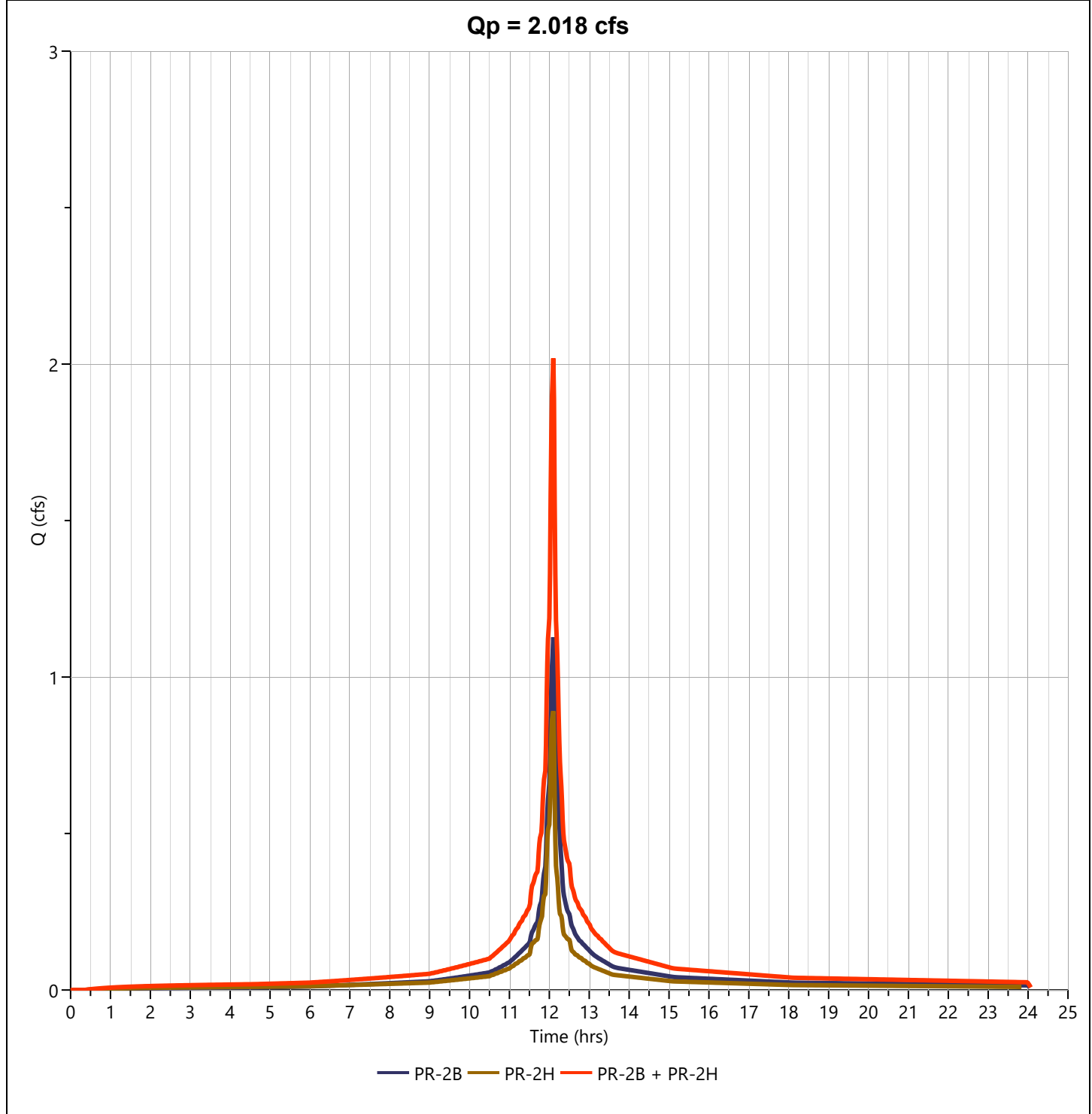
File: Future Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2B + PR-2H

## Hyd. No. 38

|                    |            |                     |              |
|--------------------|------------|---------------------|--------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 2.018 cfs  |
| Storm Frequency    | = 100-yr   | Time to Peak        | = 12.10 hrs  |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 7,100 cuft |
| Inflow Hydrographs |            | Total Contrib. Area | = 0.0 ac     |



**COMBINED PROPOSED FLOW TO POA-2**

# Hydrograph Report

Hydrology Studio v 3.0.0.38

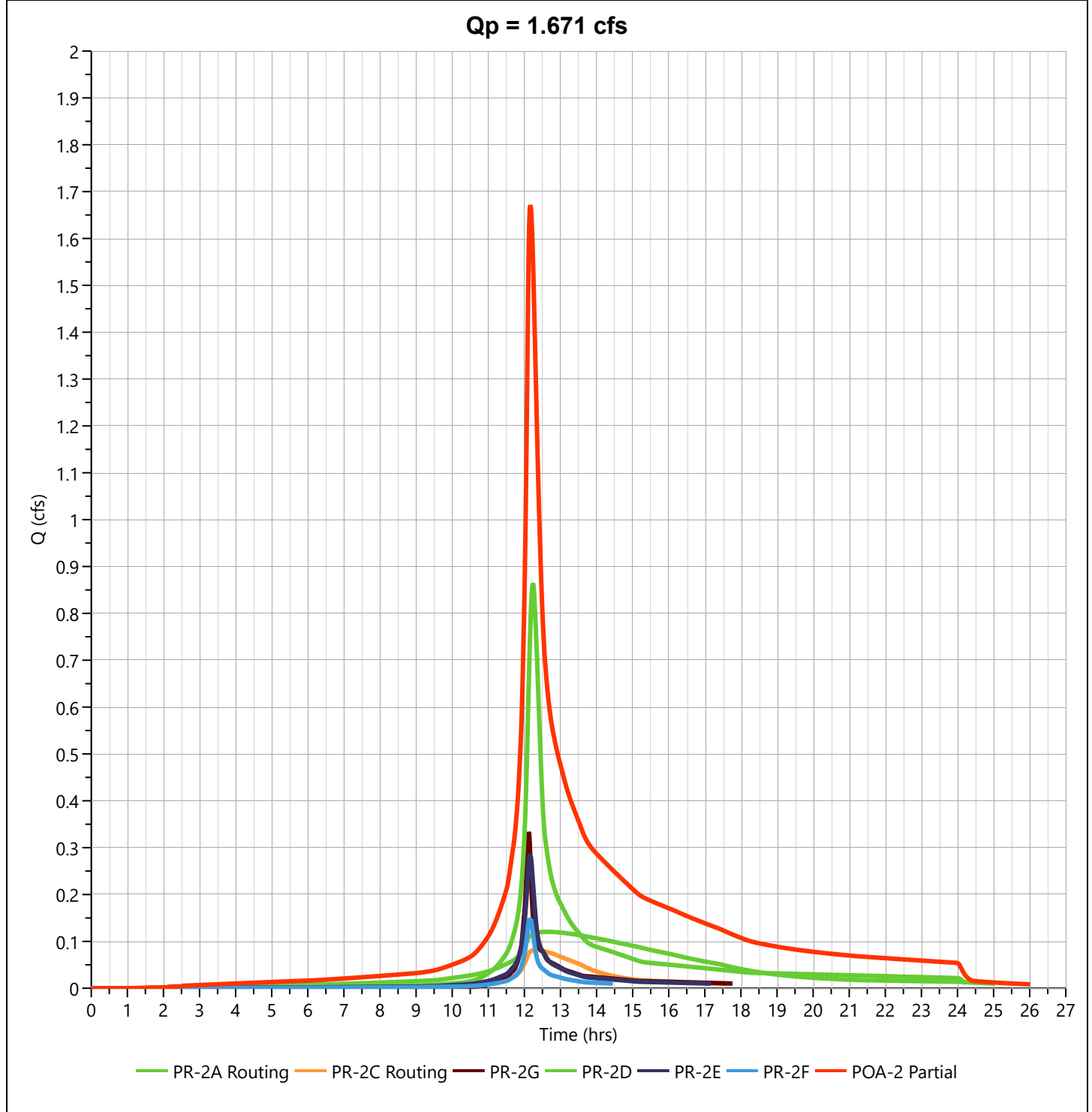
File: Future Beacon Church Proposed - POA-2.hys

05-16-2025

## POA-2 Partial

## Hyd. No. 41

|                    |            |                     |               |
|--------------------|------------|---------------------|---------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 1.671 cfs   |
| Storm Frequency    | = 2-yr     | Time to Peak        | = 12.17 hrs   |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 10,775 cuft |
| Inflow Hydrographs |            | Total Contrib. Area | = 0.0 ac      |





# Hydrograph Report

Hydrology Studio v 3.0.0.38

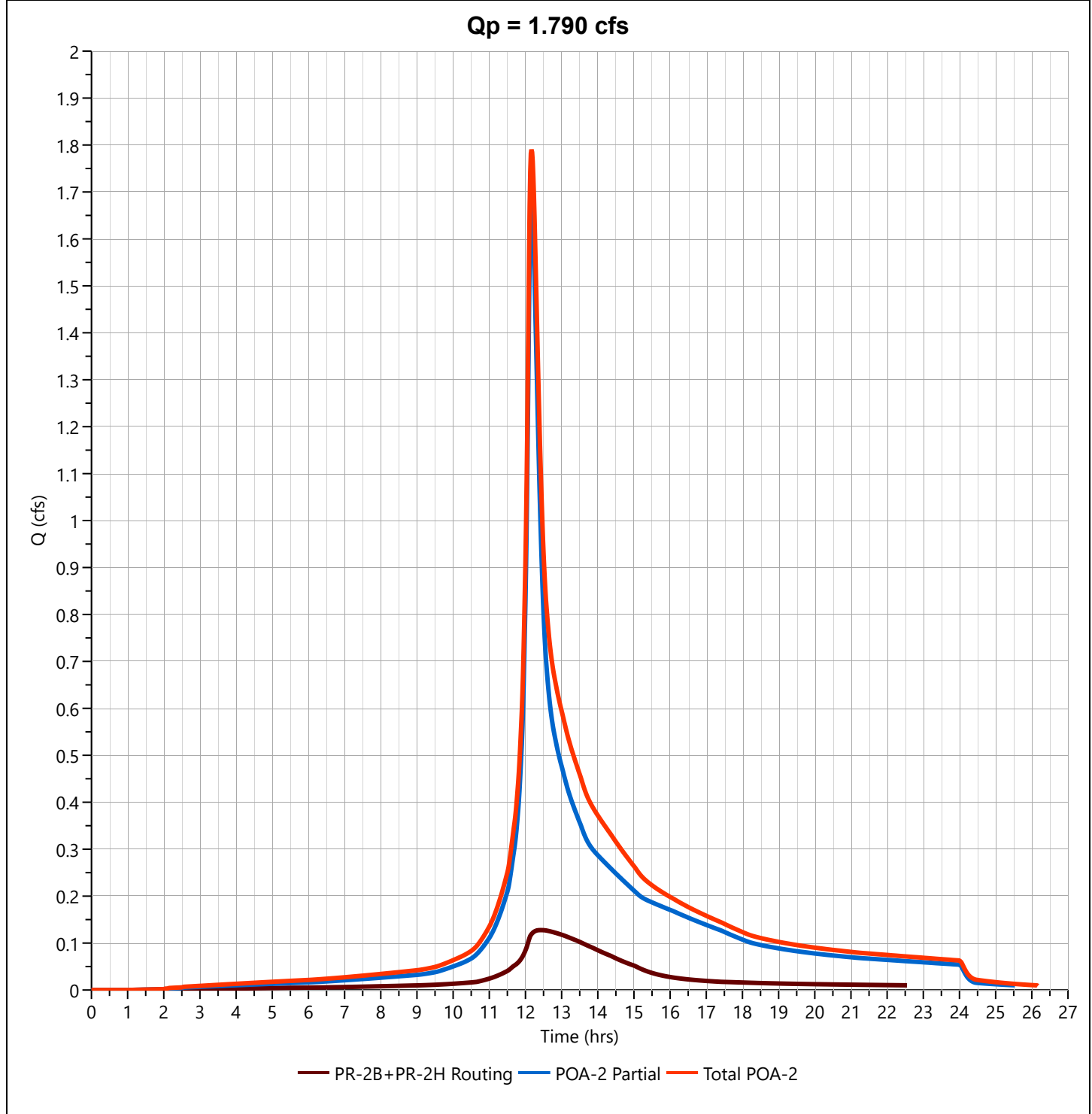
File: Future Beacon Church Proposed - POA-2.hys

05-16-2025

## Total POA-2

## Hyd. No. 42

|                    |            |                     |               |
|--------------------|------------|---------------------|---------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 1.790 cfs   |
| Storm Frequency    | = 2-yr     | Time to Peak        | = 12.17 hrs   |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 12,778 cuft |
| Inflow Hydrographs |            | Total Contrib. Area | = 0.0 ac      |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

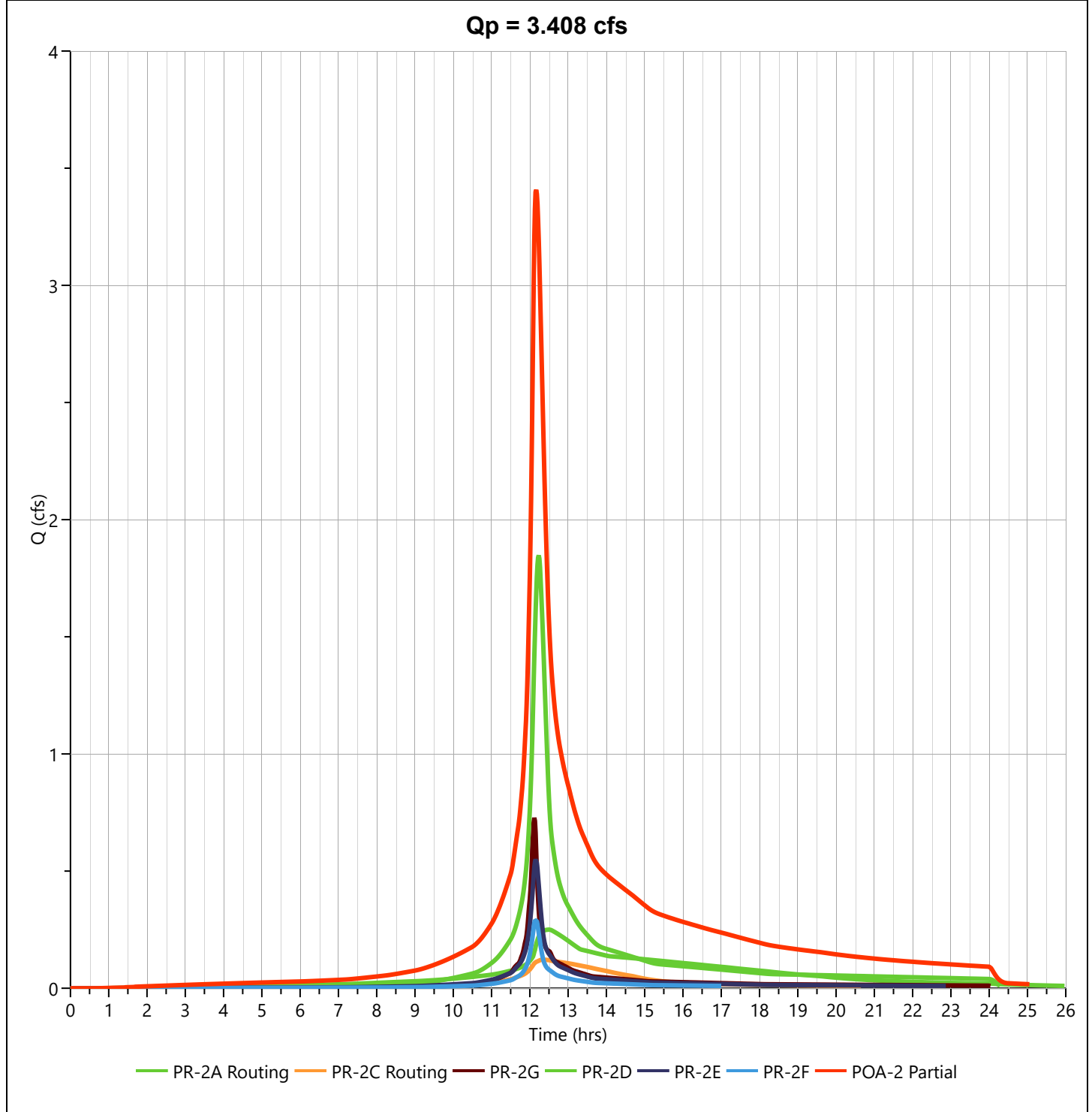
File: Future Beacon Church Proposed - POA-2.hys

05-16-2025

## POA-2 Partial

## Hyd. No. 41

|                    |            |                     |               |
|--------------------|------------|---------------------|---------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 3.408 cfs   |
| Storm Frequency    | = 10-yr    | Time to Peak        | = 12.17 hrs   |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 20,429 cuft |
| Inflow Hydrographs |            | Total Contrib. Area | = 0.0 ac      |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

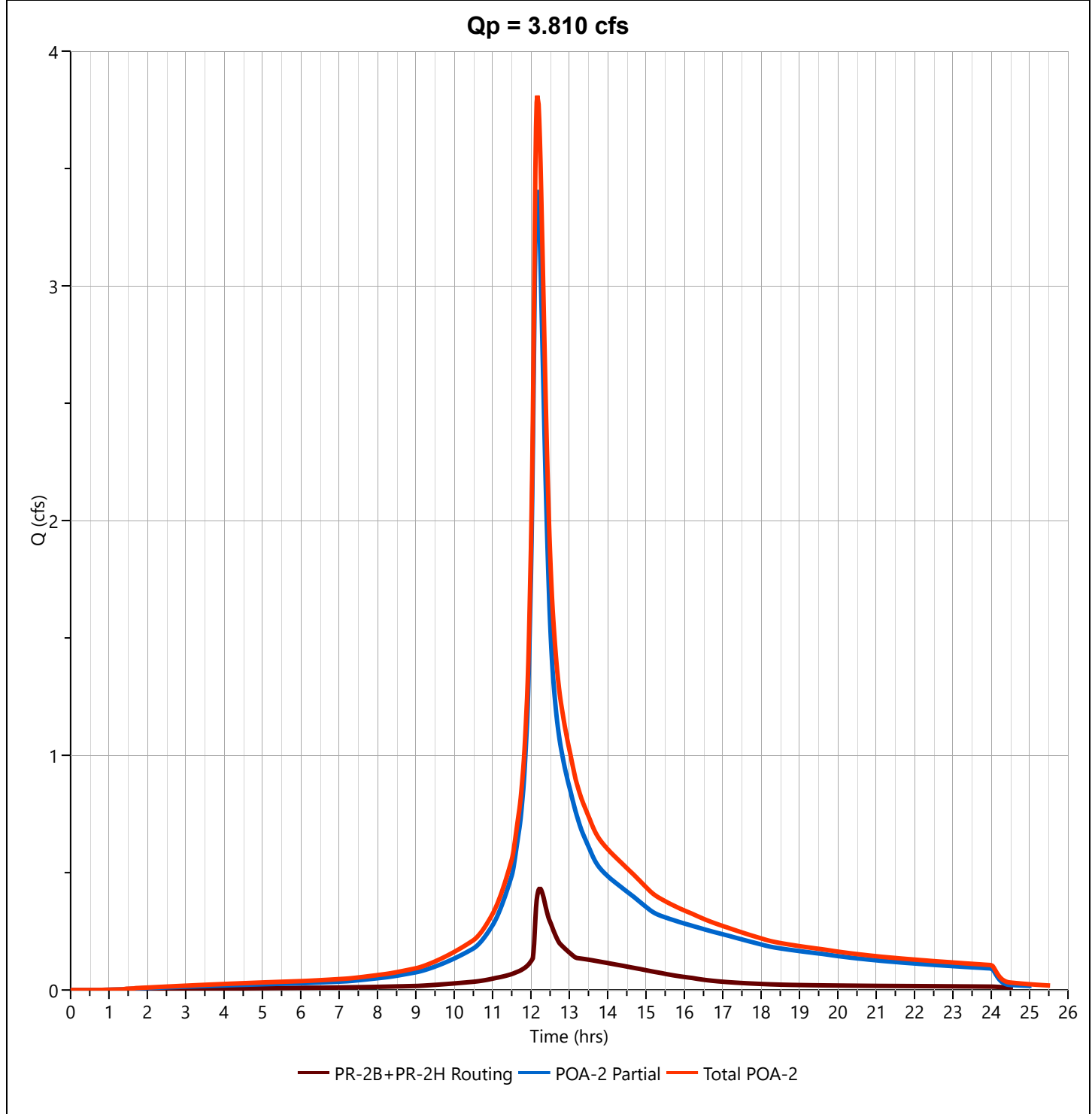
File: Future Beacon Church Proposed - POA-2.hys

05-16-2025

## Total POA-2

## Hyd. No. 42

|                    |            |                     |               |
|--------------------|------------|---------------------|---------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 3.810 cfs   |
| Storm Frequency    | = 10-yr    | Time to Peak        | = 12.17 hrs   |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 23,903 cuft |
| Inflow Hydrographs |            | Total Contrib. Area | = 0.0 ac      |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

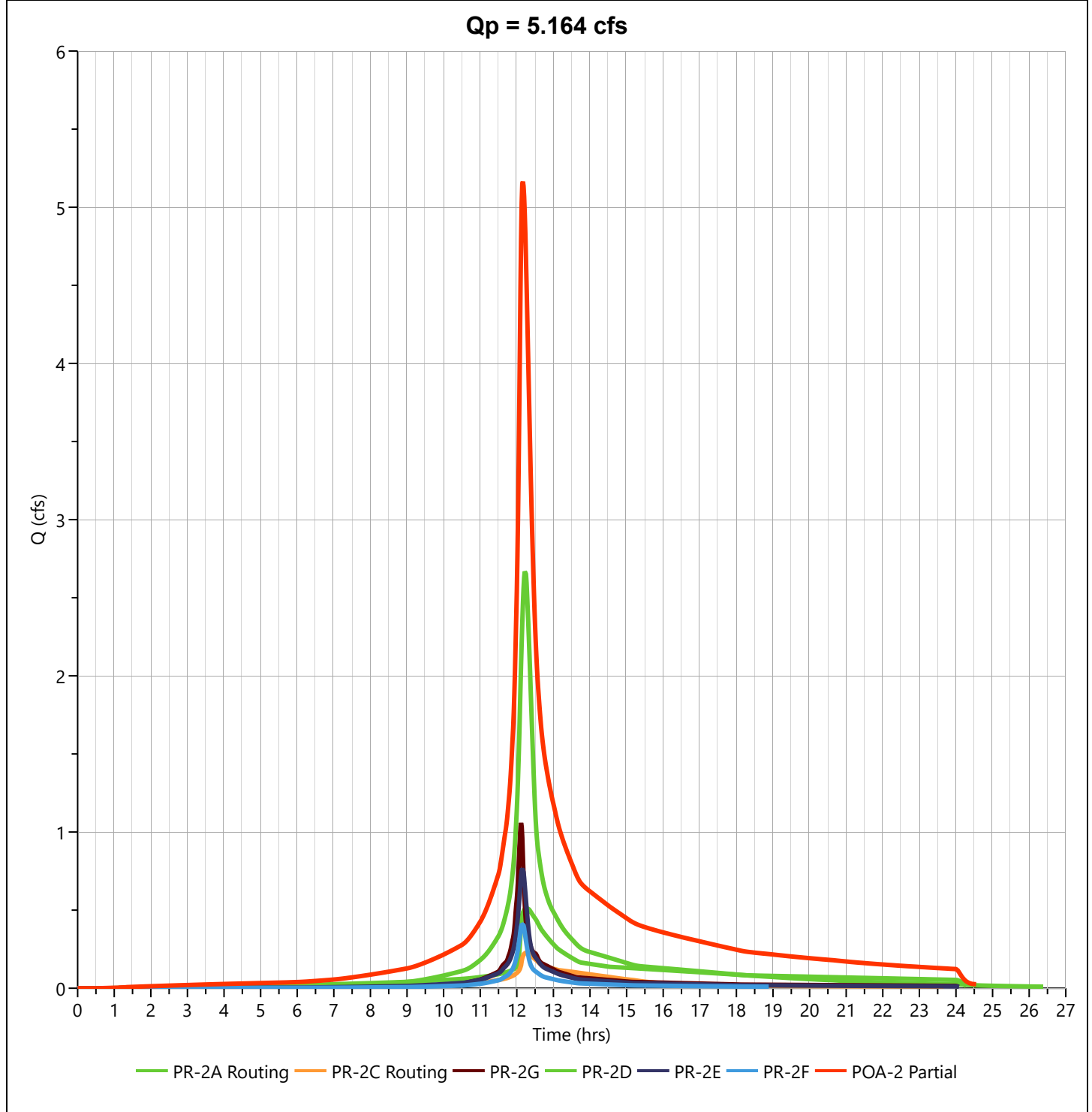
File: Future Beacon Church Proposed - POA-2.hys

05-16-2025

## POA-2 Partial

## Hyd. No. 41

|                    |            |                     |               |
|--------------------|------------|---------------------|---------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 5.164 cfs   |
| Storm Frequency    | = 25-yr    | Time to Peak        | = 12.17 hrs   |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 28,570 cuft |
| Inflow Hydrographs |            | Total Contrib. Area | = 0.0 ac      |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

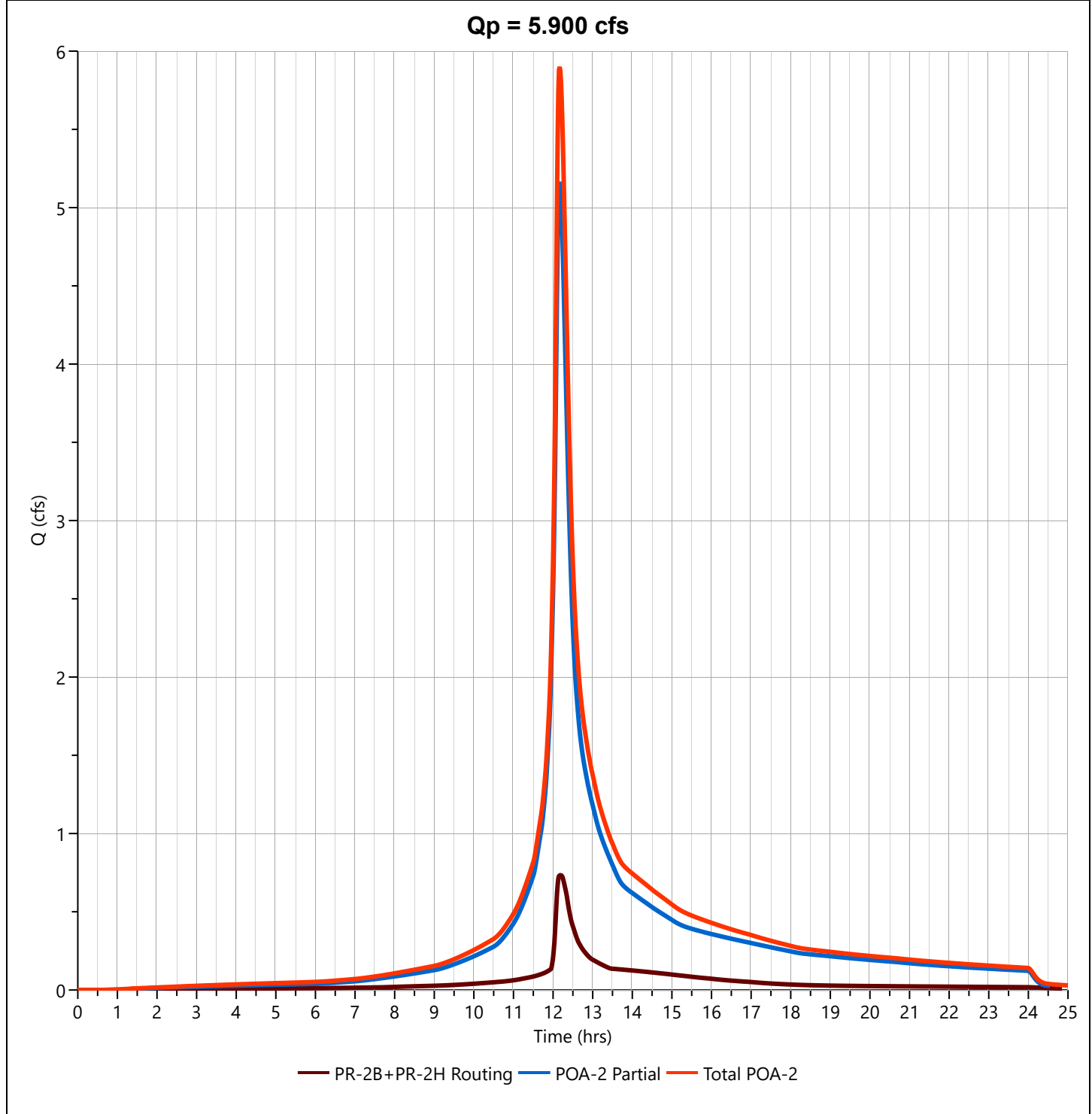
File: Future Beacon Church Proposed - POA-2.hys

05-16-2025

## Total POA-2

## Hyd. No. 42

|                    |            |                     |               |
|--------------------|------------|---------------------|---------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 5.900 cfs   |
| Storm Frequency    | = 25-yr    | Time to Peak        | = 12.17 hrs   |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 33,244 cuft |
| Inflow Hydrographs |            | Total Contrib. Area | = 0.0 ac      |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

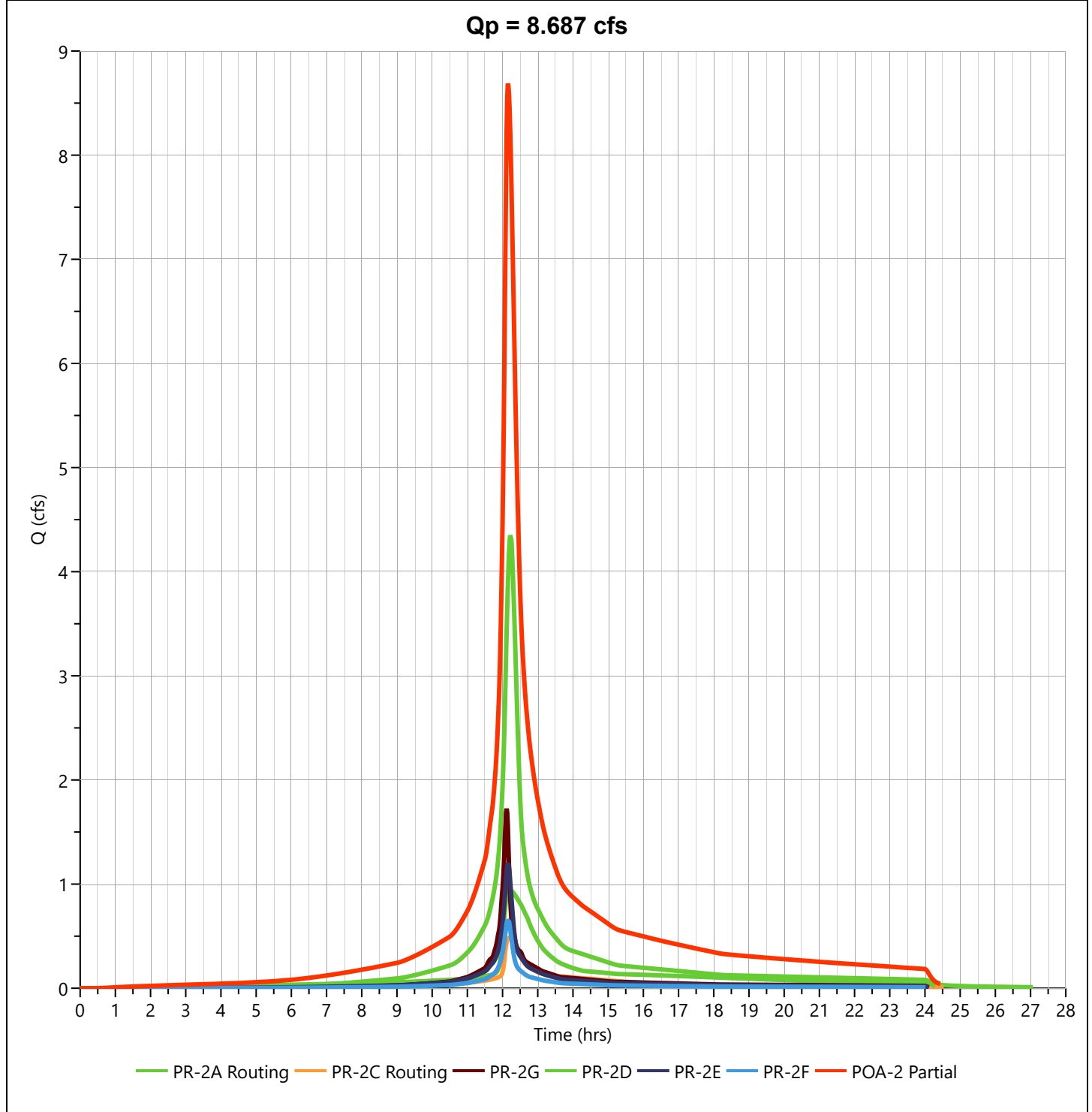
File: Future Beacon Church Proposed - POA-2.hys

05-16-2025

## POA-2 Partial

## Hyd. No. 41

|                    |            |                     |               |
|--------------------|------------|---------------------|---------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 8.687 cfs   |
| Storm Frequency    | = 100-yr   | Time to Peak        | = 12.15 hrs   |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 45,310 cuft |
| Inflow Hydrographs |            | Total Contrib. Area | = 0.0 ac      |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

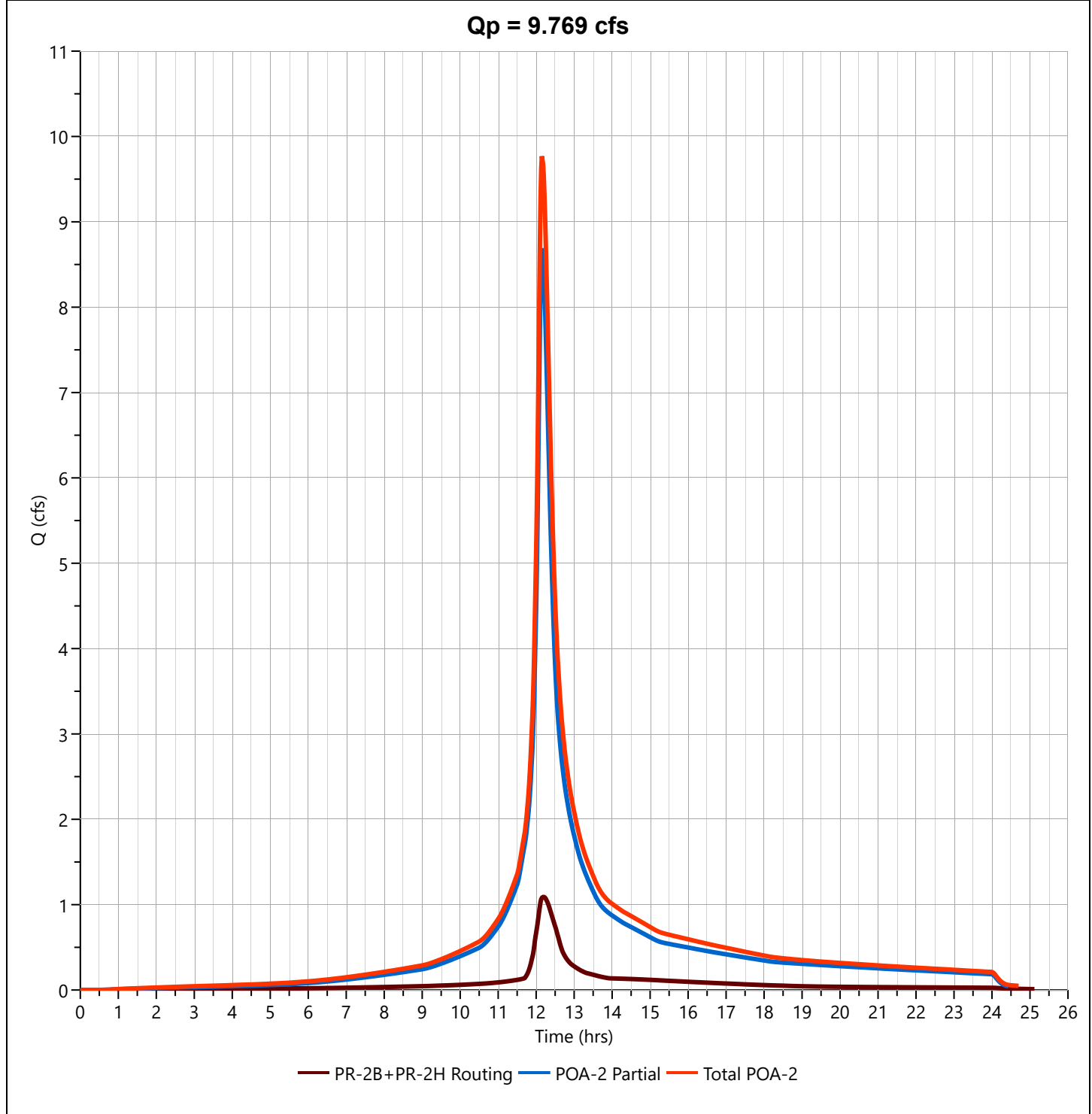
File: Future Beacon Church Proposed - POA-2.hys

05-16-2025

## Total POA-2

## Hyd. No. 42

|                    |            |                     |               |
|--------------------|------------|---------------------|---------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 9.769 cfs   |
| Storm Frequency    | = 100-yr   | Time to Peak        | = 12.15 hrs   |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 52,405 cuft |
| Inflow Hydrographs |            | Total Contrib. Area | = 0.0 ac      |



**PR-3 WATERSHED (TOTAL PROPOSED FLOW TO POA-3)**



Project: Beacon Unitarian Universalist Church

By: TEG

Date: 11/29/2023

Location: Summit, NJ

Checked By: MJV

Date Checked: 11/29/2023

Circle One: Present Developed

Future Proposed Watershed PR-3 - Pervious

Circle One: T<sub>c</sub> T<sub>t</sub> through subarea

Include a map, schematic, or description of flow segments.

**Sheet Flow** (Applicable to T<sub>c</sub> Only)

1. Surface Description (NEH table 15-1)
2. Manning's Roughness Coeff., n (NEH table 15-1)
3. Design Flow Length, L<sub>des</sub> (Total L<sub>des</sub> < 100 ft)
4. Two-year 24-hr rainfall, P<sub>2</sub>
5. Land Slope, s
6. McCuen-Spiess Limit, L<sub>mcs</sub> (max. 100 ft)
7. Compute T<sub>t</sub>

$$L_{mcs} = (100 s^{0.5})/n$$

$$T_t = \frac{0.007 (n L_{des})^{0.8}}{P_2^{0.5} s^{0.4}}$$

|            |               |   |  |
|------------|---------------|---|--|
| Segment ID | 1             |   |  |
|            | Dense Grasses |   |  |
|            | 0.24          |   |  |
| ft         | 72            |   |  |
| in         | 4.12          |   |  |
| ft/ft      | 0.198         |   |  |
| ft         | 100           |   |  |
| hr         | 0.064         | + |  |

Sheet Flow Sub-Total **0.064 hours**

**Shallow Concentrated Flow**

8. Surface Description
9. Flow Length, L
10. Watercourse Slope, s
11. Average Velocity, V (NEH table 15-3)
12. Compute T<sub>t</sub>

$$T_t = \frac{L}{3600 V}$$

|            |          |   |  |
|------------|----------|---|--|
| Segment ID | 2        |   |  |
|            | Pavement |   |  |
| ft         | 217      |   |  |
| ft/ft      | 0.059    |   |  |
| ft/s       | 4.95     |   |  |
| hr         | 0.012    | + |  |

Shallow Conc. Flow Sub-Total **0.012 hours**

**Channel Flow**

13. Flow Length, L
14. Cross Sectional flow area, a
15. Wetted Perimeter, P<sub>w</sub>
16. Hydraulic Radius, r
17. Channel Slope, s
18. Manning's Roughness Coeff., n
19. Velocity, V
20. Compute T<sub>t</sub>

$$r = a / P_w$$

$$V = (1.49 r^{2/3} s^{1/2}) / n$$

$$T_t = \frac{L}{3600 V}$$

|                 |  |   |  |
|-----------------|--|---|--|
| Segment ID      |  |   |  |
| ft              |  |   |  |
| ft <sup>2</sup> |  |   |  |
| ft              |  |   |  |
| ft              |  |   |  |
| ft/ft           |  |   |  |
| ft/s            |  |   |  |
| hr              |  | + |  |

Channel Flow Sub-Total **0.000 hours**

Watershed or subarea T<sub>c</sub> or T<sub>t</sub>

(Add Sub-Total T<sub>t</sub> from prior steps)

|                      |                    |
|----------------------|--------------------|
| Total Tc (hours) =   | <b>0.077 hours</b> |
| Total Tc (minutes) = | <b>5 minutes</b>   |

# Hydrograph Report

Project Name:

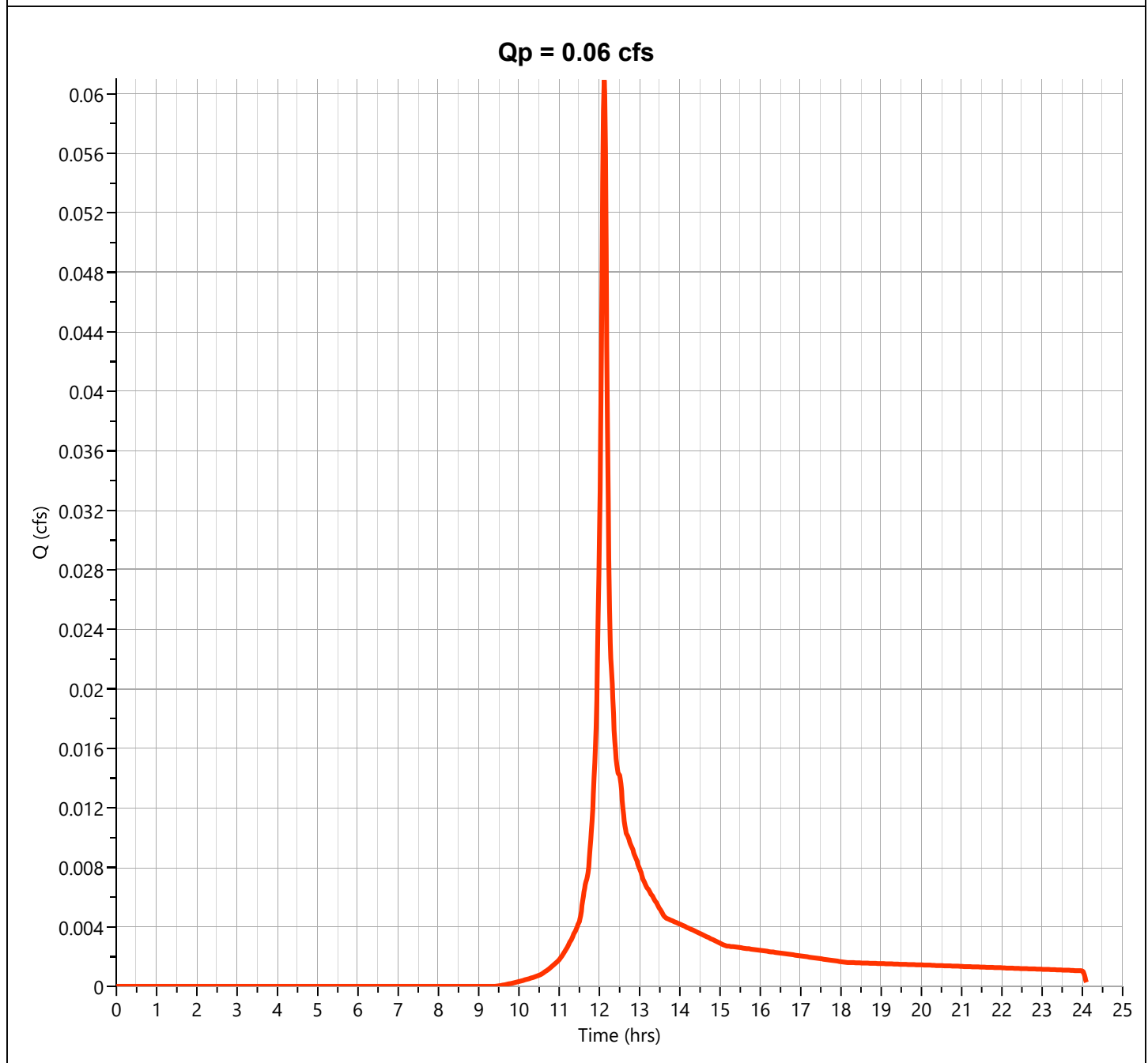
Hydrology Studio v 3.0.0.29

11-29-2023

## PR-3 (POA-3)

## Hyd. No. 28

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.061 cfs |
| Storm Frequency | = 2-yr        | Time to Peak       | = 12.12 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 189 cuft  |
| Drainage Area   | = 0.03 ac     | Curve Number       | = 74        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 5.0 min   |
| Total Rainfall  | = 4.12 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

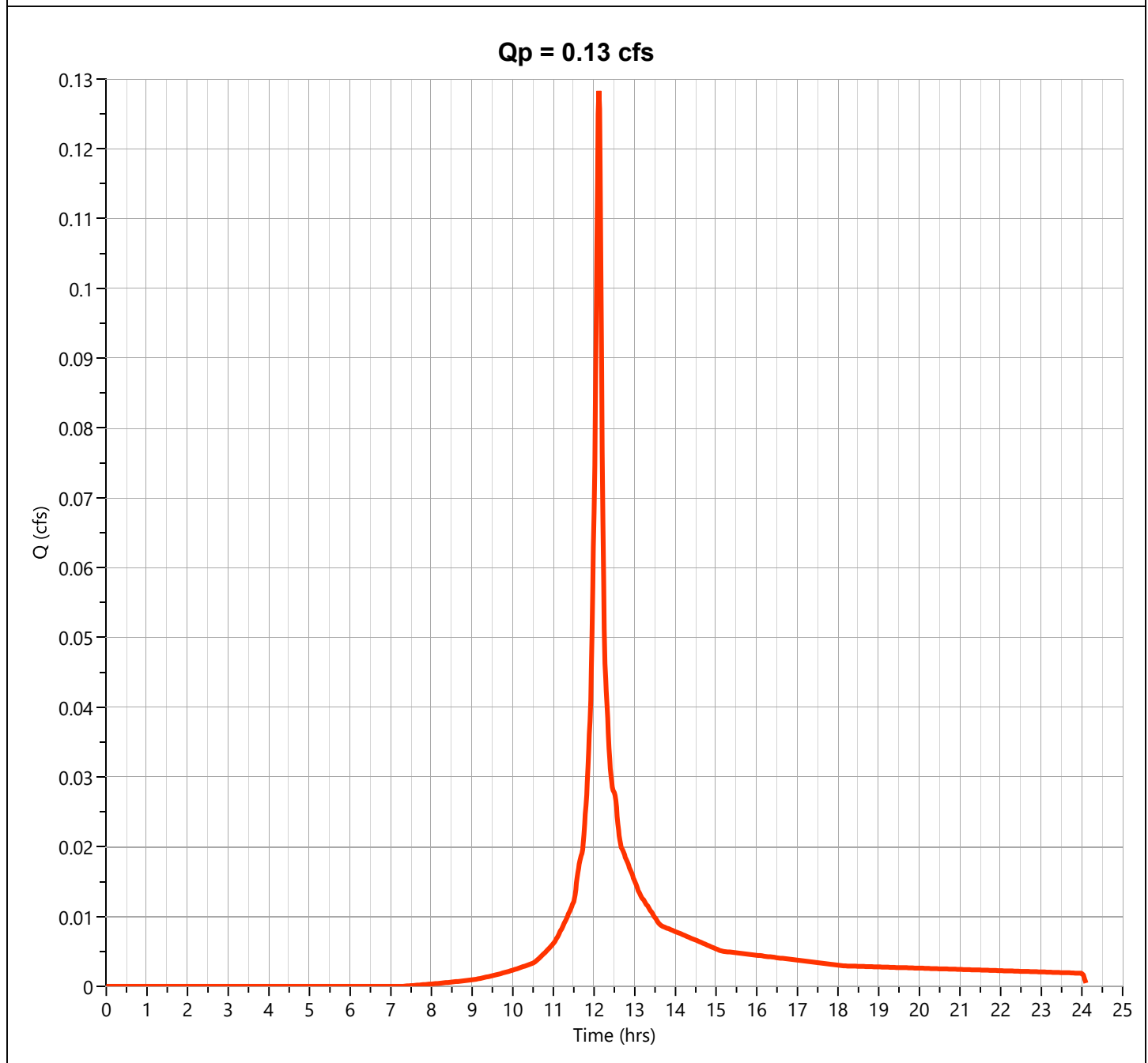
Hydrology Studio v 3.0.0.29

11-29-2023

## PR-3 (POA-3)

## Hyd. No. 28

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.128 cfs |
| Storm Frequency | = 10-yr       | Time to Peak       | = 12.12 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 398 cuft  |
| Drainage Area   | = 0.03 ac     | Curve Number       | = 74        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 5.0 min   |
| Total Rainfall  | = 6.42 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

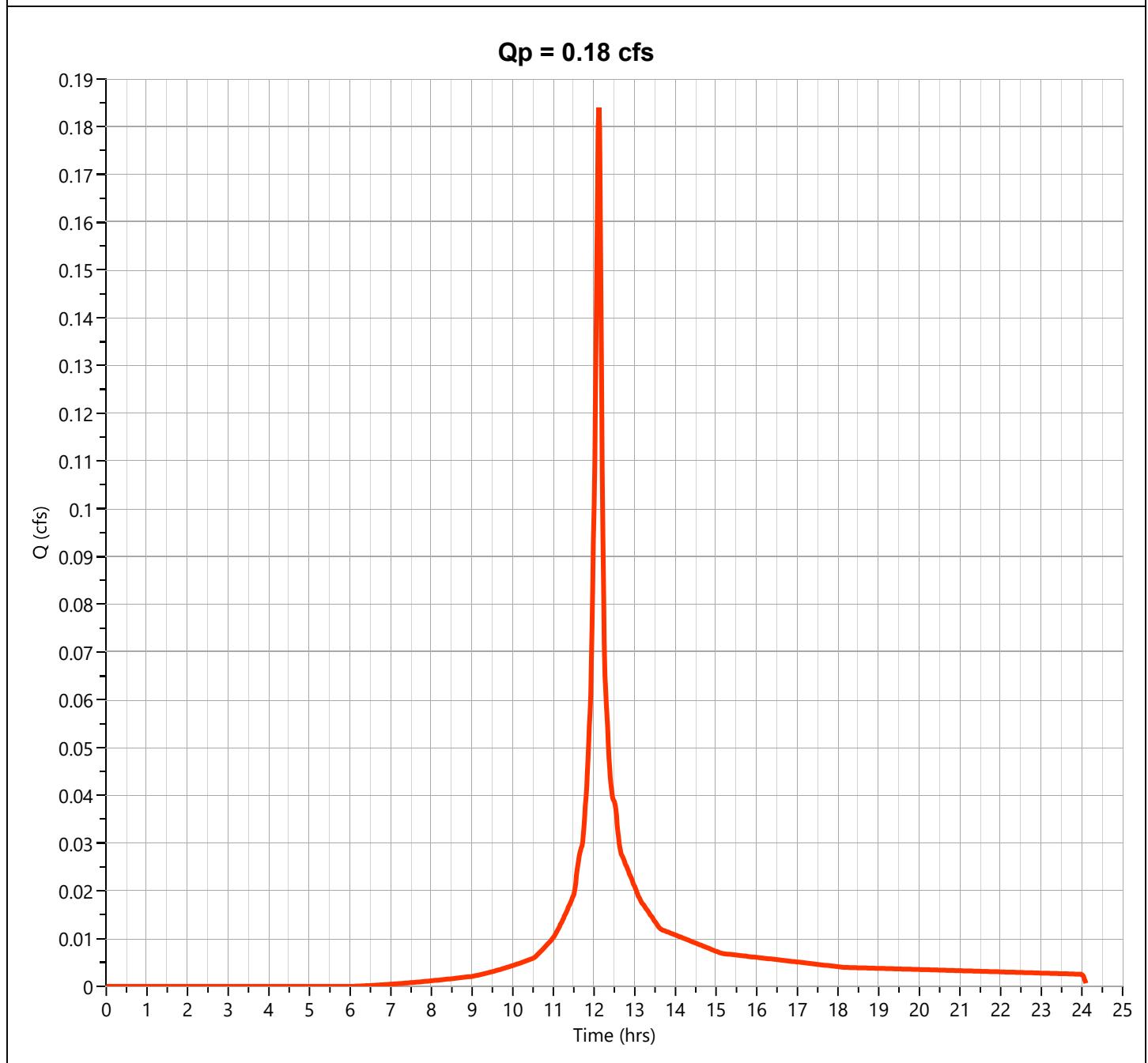
Hydrology Studio v 3.0.0.29

11-29-2023

## PR-3 (POA-3)

## Hyd. No. 28

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.184 cfs |
| Storm Frequency | = 25-yr       | Time to Peak       | = 12.12 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 576 cuft  |
| Drainage Area   | = 0.03 ac     | Curve Number       | = 74        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 5.0 min   |
| Total Rainfall  | = 8.23 in     | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



# Hydrograph Report

Project Name:

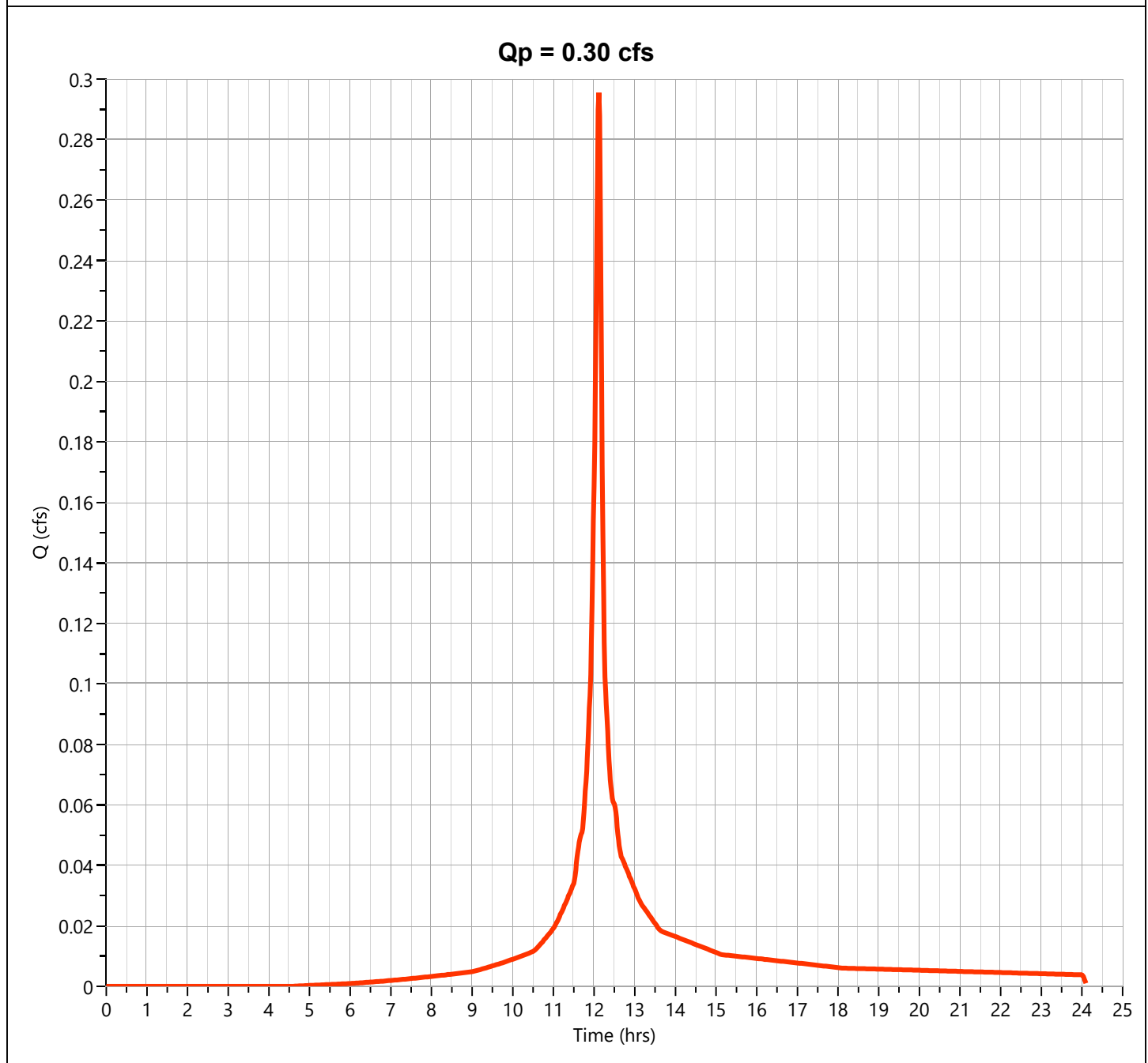
Hydrology Studio v 3.0.0.29

11-29-2023

## PR-3 (POA-3)

## Hyd. No. 28

|                 |               |                    |             |
|-----------------|---------------|--------------------|-------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.295 cfs |
| Storm Frequency | = 100-yr      | Time to Peak       | = 12.12 hrs |
| Time Interval   | = 1 min       | Runoff Volume      | = 947 cuft  |
| Drainage Area   | = 0.03 ac     | Curve Number       | = 74        |
| Tc Method       | = User        | Time of Conc. (Tc) | = 5.0 min   |
| Total Rainfall  | = 11.80 in    | Design Storm       | = NOAA-D    |
| Storm Duration  | = 24 hrs      | Shape Factor       | = 484       |



## **SUMMARY OF PROPOSED PEAK DISCHARGES**

# Hydrograph 2-yr Summary

Hydrology Studio v 3.0.0.38

File: Future Beacon Church Proposed - POA-1 & POA-3.hys

07-01-2025

| 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     | PR-1A               | 0.969           | 12.10              | 3,173                    | ---           |                        |                        |
| 2        | Pond Route      | PR-1A Routing       | 0.085           | 12.53              | 482                      | 1             | 349.17                 | 987                    |
| 4        | NRCS Runoff     | PR-1B Grass HSGC C  | 0.164           | 12.13              | 537                      | ---           |                        |                        |
| 5        | NRCS Runoff     | PR-1B Impervious    | 0.548           | 12.10              | 1,833                    | ---           |                        |                        |
| 6        | Junction        | PR-1B               | 0.701           | 12.10              | 2,370                    | 4, 5          |                        |                        |
| 8        | NRCS Runoff     | PR-1C Grass HSGC C  | 0.064           | 12.10              | 172                      | ---           |                        |                        |
| 9        | NRCS Runoff     | PR-1C Impervious    | 0.081           | 12.10              | 264                      | ---           |                        |                        |
| 10       | Junction        | PR-1C               | 0.144           | 12.10              | 436                      | 8, 9          |                        |                        |
| 11       | Pond Route      | PR-1C Routing       | 0.141           | 12.10              | 436                      | 10            | 352.80                 | 8.83                   |
| 14       | NRCS Runoff     | PR-1D Grass HSGC C  | 0.122           | 12.12              | 378                      | ---           |                        |                        |
| 15       | NRCS Runoff     | PR-1D Impervious    | 0.444           | 12.10              | 1,454                    | ---           |                        |                        |
| 16       | Junction        | PR-1D               | 0.562           | 12.10              | 1,833                    | 14, 15        |                        |                        |
| 18       | Junction        | Comb. to UDG-INF1-2 | 1.404           | 12.10              | 4,639                    | 6, 11, 16     |                        |                        |
| 20       | Pond Route      | UGD-INF1-2 Routing  | 0.099           | 12.70              | 892                      | 18            | 345.02                 | 1,476                  |
| 22       | NRCS Runoff     | PR-1E Grass HSGC C  | 0.305           | 12.12              | 946                      | ---           |                        |                        |
| 23       | NRCS Runoff     | PR-1E Impervious    | 0.161           | 12.10              | 529                      | ---           |                        |                        |
| 24       | Junction        | PR-1E               | 0.456           | 12.10              | 1,475                    | 22, 23        |                        |                        |
| 26       | Junction        | POA-1               | 0.559           | 12.12              | 2,849                    | 2, 20, 24     |                        |                        |
| 28       | NRCS Runoff     | PR-3 (POA-3)        | 0.061           | 12.12              | 189                      | ---           |                        |                        |

# Hydrograph 2-yr Summary

Hydrology Studio v 3.0.0.38

File: Future Beacon Church Proposed - POA-2.hys

05-16-2025

| 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     | PR-2A Grass HSGC C | 0.043           | 12.10              | 122                      | ---           |                        |                        |
| 2        | NRCS Runoff     | PR-2A Impervious   | 0.888           | 12.10              | 2,909                    | ---           |                        |                        |
| 3        | Junction        | PR-2A              | 0.931           | 12.10              | 3,031                    | 1, 2          |                        |                        |
| 4        | Pond Route      | PR-2A Routing      | 0.120           | 12.62              | 3,020                    | 3             | 354.74                 | 1,244                  |
| 6        | NRCS Runoff     | PR-2B Grass HSGC C | 0.122           | 12.15              | 428                      | ---           |                        |                        |
| 7        | NRCS Runoff     | PR-2B Impervious   | 0.202           | 12.10              | 661                      | ---           |                        |                        |
| 8        | Junction        | PR-2B              | 0.309           | 12.10              | 1,089                    | 6, 7          |                        |                        |
| 11       | NRCS Runoff     | PR-2C Grass HSGC C | 0.081           | 12.12              | 252                      | ---           |                        |                        |
| 12       | NRCS Runoff     | PR-2C Impervious   | 0.242           | 12.10              | 793                      | ---           |                        |                        |
| 13       | Junction        | PR-2C              | 0.321           | 12.10              | 1,046                    | 11, 12        |                        |                        |
| 15       | Pond Route      | PR-2C Routing      | 0.082           | 12.32              | 1,040                    | 13            | 355.45                 | 311                    |
| 17       | NRCS Runoff     | PR-2G Grass HSGC C | 0.183           | 12.12              | 568                      | ---           |                        |                        |
| 18       | NRCS Runoff     | PR-2G Woods HSGC C | 0.150           | 12.12              | 475                      | ---           |                        |                        |
| 19       | Junction        | PR-2G              | 0.333           | 12.12              | 1,043                    | 17, 18        |                        |                        |
| 21       | NRCS Runoff     | PR-2D Grass HSGC C | 0.231           | 12.23              | 1,028                    | ---           |                        |                        |
| 22       | NRCS Runoff     | PR-2D Woods HSGC C | 0.489           | 12.25              | 2,227                    | ---           |                        |                        |
| 23       | NRCS Runoff     | PR-2D Impervious   | 0.147           | 12.20              | 714                      | ---           |                        |                        |
| 24       | Junction        | PR-2D              | 0.864           | 12.23              | 3,969                    | 21, 22, 23    |                        |                        |
| 26       | NRCS Runoff     | PR-2E Grass HSGC C | 0.183           | 12.17              | 685                      | ---           |                        |                        |
| 27       | NRCS Runoff     | PR-2E Impervious   | 0.105           | 12.13              | 423                      | ---           |                        |                        |
| 28       | Junction        | PR-2E              | 0.286           | 12.15              | 1,108                    | 26, 27        |                        |                        |
| 30       | NRCS Runoff     | PR-2F Woods HSGC C | 0.082           | 12.17              | 313                      | ---           |                        |                        |
| 31       | NRCS Runoff     | PR-2F Impervious   | 0.070           | 12.13              | 282                      | ---           |                        |                        |
| 32       | Junction        | PR-2F              | 0.150           | 12.15              | 595                      | 30, 31        |                        |                        |
| 34       | NRCS Runoff     | PR-2H Grass HSGC C | 0.041           | 12.12              | 126                      | ---           |                        |                        |
| 35       | NRCS Runoff     | PR-2H Impervious   | 0.242           | 12.10              | 793                      | ---           |                        |                        |
| 36       | Junction        | PR-2H              | 0.281           | 12.10              | 919                      | 34, 35        |                        |                        |



# Hydrograph 2-yr Summary

Hydrology Studio v 3.0.0.38

File: Future Beacon Church Proposed - POA-2.hys

05-16-2025

| 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) |
|----------|-----------------|---------------------|-----------------|--------------------|--------------------------|-----------------------|------------------------|------------------------|
| 38       | Junction        | PR-2B + PR-2H       | 0.590           | 12.10              | 2,009                    | 8, 36                 |                        |                        |
| 39       | Pond Route      | PR-2B+PR-2H Routing | 0.128           | 12.42              | 2,004                    | 38                    | 354.81                 | 607                    |
| 41       | Junction        | POA-2 Partial       | 1.671           | 12.17              | 10,775                   | 4, 15, 19, 24, 28, 32 |                        |                        |
| 42       | Junction        | Total POA-2         | 1.790           | 12.17              | 12,778                   | 39, 41                |                        |                        |

# Hydrograph 10-yr Summary

File: Future Beacon Church Proposed - POA-1 & POA-3.hys

Hydrology Studio v 3.0.0.38

07-01-2025

| 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     | PR-1A               | 1.516           | 12.10              | 5,049                    | ---           |                        |                        |
| 2        | Pond Route      | PR-1A Routing       | 0.282           | 12.32              | 1,538                    | 1             | 349.71                 | 1,596                  |
| 4        | NRCS Runoff     | PR-1B Grass HSGC C  | 0.345           | 12.13              | 1,128                    | ---           |                        |                        |
| 5        | NRCS Runoff     | PR-1B Impervious    | 0.858           | 12.10              | 2,917                    | ---           |                        |                        |
| 6        | Junction        | PR-1B               | 1.185           | 12.10              | 4,045                    | 4, 5          |                        |                        |
| 8        | NRCS Runoff     | PR-1C Grass HSGC C  | 0.132           | 12.10              | 362                      | ---           |                        |                        |
| 9        | NRCS Runoff     | PR-1C Impervious    | 0.126           | 12.10              | 421                      | ---           |                        |                        |
| 10       | Junction        | PR-1C               | 0.258           | 12.10              | 782                      | 8, 9          |                        |                        |
| 11       | Pond Route      | PR-1C Routing       | 0.251           | 12.10              | 782                      | 10            | 353.03                 | 15.8                   |
| 14       | NRCS Runoff     | PR-1D Grass HSGC C  | 0.257           | 12.12              | 795                      | ---           |                        |                        |
| 15       | NRCS Runoff     | PR-1D Impervious    | 0.695           | 12.10              | 2,314                    | ---           |                        |                        |
| 16       | Junction        | PR-1D               | 0.945           | 12.10              | 3,109                    | 14, 15        |                        |                        |
| 18       | Junction        | Comb. to UDG-INF1-2 | 2.381           | 12.10              | 7,937                    | 6, 11, 16     |                        |                        |
| 20       | Pond Route      | UGD-INF1-2 Routing  | 0.260           | 12.60              | 2,834                    | 18            | 345.72                 | 2,812                  |
| 22       | NRCS Runoff     | PR-1E Grass HSGC C  | 0.641           | 12.12              | 1,988                    | ---           |                        |                        |
| 23       | NRCS Runoff     | PR-1E Impervious    | 0.253           | 12.10              | 841                      | ---           |                        |                        |
| 24       | Junction        | PR-1E               | 0.878           | 12.10              | 2,830                    | 22, 23        |                        |                        |
| 26       | Junction        | POA-1               | 1.154           | 12.12              | 7,201                    | 2, 20, 24     |                        |                        |
| 28       | NRCS Runoff     | PR-3 (POA-3)        | 0.128           | 12.12              | 398                      | ---           |                        |                        |

# Hydrograph 10-yr Summary

Hydrology Studio v 3.0.0.38

File: Future Beacon Church Proposed - POA-2.hys

05-16-2025

| 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     | PR-2A Grass HSGC C | 0.090           | 12.10              | 257                      | ---           |                        |                        |
| 2        | NRCS Runoff     | PR-2A Impervious   | 1.389           | 12.10              | 4,628                    | ---           |                        |                        |
| 3        | Junction        | PR-2A              | 1.479           | 12.10              | 4,885                    | 1, 2          |                        |                        |
| 4        | Pond Route      | PR-2A Routing      | 0.250           | 12.52              | 4,874                    | 3             | 355.10                 | 1,926                  |
| 6        | NRCS Runoff     | PR-2B Grass HSGC C | 0.258           | 12.15              | 900                      | ---           |                        |                        |
| 7        | NRCS Runoff     | PR-2B Impervious   | 0.316           | 12.10              | 1,052                    | ---           |                        |                        |
| 8        | Junction        | PR-2B              | 0.548           | 12.10              | 1,952                    | 6, 7          |                        |                        |
| 11       | NRCS Runoff     | PR-2C Grass HSGC C | 0.171           | 12.12              | 530                      | ---           |                        |                        |
| 12       | NRCS Runoff     | PR-2C Impervious   | 0.379           | 12.10              | 1,262                    | ---           |                        |                        |
| 13       | Junction        | PR-2C              | 0.546           | 12.10              | 1,792                    | 11, 12        |                        |                        |
| 15       | Pond Route      | PR-2C Routing      | 0.122           | 12.35              | 1,787                    | 13            | 355.72                 | 546                    |
| 17       | NRCS Runoff     | PR-2G Grass HSGC C | 0.385           | 12.12              | 1,193                    | ---           |                        |                        |
| 18       | NRCS Runoff     | PR-2G Woods HSGC C | 0.343           | 12.12              | 1,059                    | ---           |                        |                        |
| 19       | Junction        | PR-2G              | 0.727           | 12.12              | 2,252                    | 17, 18        |                        |                        |
| 21       | NRCS Runoff     | PR-2D Grass HSGC C | 0.492           | 12.23              | 2,160                    | ---           |                        |                        |
| 22       | NRCS Runoff     | PR-2D Woods HSGC C | 1.129           | 12.23              | 4,962                    | ---           |                        |                        |
| 23       | NRCS Runoff     | PR-2D Impervious   | 0.230           | 12.20              | 1,136                    | ---           |                        |                        |
| 24       | Junction        | PR-2D              | 1.847           | 12.23              | 8,258                    | 21, 22, 23    |                        |                        |
| 26       | NRCS Runoff     | PR-2E Grass HSGC C | 0.389           | 12.17              | 1,439                    | ---           |                        |                        |
| 27       | NRCS Runoff     | PR-2E Impervious   | 0.165           | 12.13              | 673                      | ---           |                        |                        |
| 28       | Junction        | PR-2E              | 0.550           | 12.15              | 2,112                    | 26, 27        |                        |                        |
| 30       | NRCS Runoff     | PR-2F Woods HSGC C | 0.188           | 12.17              | 697                      | ---           |                        |                        |
| 31       | NRCS Runoff     | PR-2F Impervious   | 0.110           | 12.13              | 449                      | ---           |                        |                        |
| 32       | Junction        | PR-2F              | 0.296           | 12.15              | 1,145                    | 30, 31        |                        |                        |
| 34       | NRCS Runoff     | PR-2H Grass HSGC C | 0.086           | 12.12              | 265                      | ---           |                        |                        |
| 35       | NRCS Runoff     | PR-2H Impervious   | 0.379           | 12.10              | 1,262                    | ---           |                        |                        |
| 36       | Junction        | PR-2H              | 0.462           | 12.10              | 1,527                    | 34, 35        |                        |                        |

# Hydrograph 10-yr Summary

Hydrology Studio v 3.0.0.38

File: Future Beacon Church Proposed - POA-2.hys

05-16-2025

| 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) |
|----------|-----------------|---------------------|-----------------|--------------------|--------------------------|-----------------------|------------------------|------------------------|
| 38       | Junction        | PR-2B + PR-2H       | 1.010           | 12.10              | 3,479                    | 8, 36                 |                        |                        |
| 39       | Pond Route      | PR-2B+PR-2H Routing | 0.435           | 12.23              | 3,474                    | 38                    | 355.19                 | 936                    |
| 41       | Junction        | POA-2 Partial       | 3.408           | 12.17              | 20,429                   | 4, 15, 19, 24, 28, 32 |                        |                        |
| 42       | Junction        | Total POA-2         | 3.810           | 12.17              | 23,903                   | 39, 41                |                        |                        |

# Hydrograph 25-yr Summary

File: Future Beacon Church Proposed - POA-1 & POA-3.hys

Hydrology Studio v 3.0.0.38

07-01-2025

| 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     | PR-1A               | 1.945           | 12.10              | 6,526                    | ---           |                        |                        |
| 2        | Pond Route      | PR-1A Routing       | 0.644           | 12.17              | 2,527                    | 1             | 350.03                 | 1,946                  |
| 4        | NRCS Runoff     | PR-1B Grass HSGC C  | 0.495           | 12.13              | 1,635                    | ---           |                        |                        |
| 5        | NRCS Runoff     | PR-1B Impervious    | 1.101           | 12.10              | 3,771                    | ---           |                        |                        |
| 6        | Junction        | PR-1B               | 1.574           | 12.10              | 5,405                    | 4, 5          |                        |                        |
| 8        | NRCS Runoff     | PR-1C Grass HSGC C  | 0.188           | 12.10              | 524                      | ---           |                        |                        |
| 9        | NRCS Runoff     | PR-1C Impervious    | 0.162           | 12.10              | 544                      | ---           |                        |                        |
| 10       | Junction        | PR-1C               | 0.350           | 12.10              | 1,068                    | 8, 9          |                        |                        |
| 11       | Pond Route      | PR-1C Routing       | 0.333           | 12.10              | 1,068                    | 10            | 353.32                 | 24.0                   |
| 14       | NRCS Runoff     | PR-1D Grass HSGC C  | 0.368           | 12.12              | 1,153                    | ---           |                        |                        |
| 15       | NRCS Runoff     | PR-1D Impervious    | 0.892           | 12.10              | 2,991                    | ---           |                        |                        |
| 16       | Junction        | PR-1D               | 1.251           | 12.10              | 4,144                    | 14, 15        |                        |                        |
| 18       | Junction        | Comb. to UDG-INF1-2 | 3.158           | 12.10              | 10,617                   | 6, 11, 16     |                        |                        |
| 20       | Pond Route      | UGD-INF1-2 Routing  | 0.447           | 12.53              | 4,780                    | 18            | 346.26                 | 3,773                  |
| 22       | NRCS Runoff     | PR-1E Grass HSGC C  | 0.920           | 12.12              | 2,882                    | ---           |                        |                        |
| 23       | NRCS Runoff     | PR-1E Impervious    | 0.324           | 12.10              | 1,088                    | ---           |                        |                        |
| 24       | Junction        | PR-1E               | 1.224           | 12.10              | 3,969                    | 22, 23        |                        |                        |
| 26       | Junction        | POA-1               | 2.093           | 12.12              | 11,276                   | 2, 20, 24     |                        |                        |
| 28       | NRCS Runoff     | PR-3 (POA-3)        | 0.184           | 12.12              | 576                      | ---           |                        |                        |

# Hydrograph 25-yr Summary

Hydrology Studio v 3.0.0.38

File: Future Beacon Church Proposed - POA-2.hys

05-16-2025

| 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     | PR-2A Grass HSGC C | 0.129           | 12.10              | 373                      | ---           |                        |                        |
| 2        | NRCS Runoff     | PR-2A Impervious   | 1.783           | 12.10              | 5,982                    | ---           |                        |                        |
| 3        | Junction        | PR-2A              | 1.912           | 12.10              | 6,355                    | 1, 2          |                        |                        |
| 4        | Pond Route      | PR-2A Routing      | 0.513           | 12.25              | 6,344                    | 3             | 355.29                 | 2,308                  |
| 6        | NRCS Runoff     | PR-2B Grass HSGC C | 0.371           | 12.15              | 1,304                    | ---           |                        |                        |
| 7        | NRCS Runoff     | PR-2B Impervious   | 0.405           | 12.10              | 1,360                    | ---           |                        |                        |
| 8        | Junction        | PR-2B              | 0.741           | 12.10              | 2,664                    | 6, 7          |                        |                        |
| 11       | NRCS Runoff     | PR-2C Grass HSGC C | 0.245           | 12.12              | 768                      | ---           |                        |                        |
| 12       | NRCS Runoff     | PR-2C Impervious   | 0.486           | 12.10              | 1,631                    | ---           |                        |                        |
| 13       | Junction        | PR-2C              | 0.726           | 12.10              | 2,400                    | 11, 12        |                        |                        |
| 15       | Pond Route      | PR-2C Routing      | 0.228           | 12.25              | 2,395                    | 13            | 355.89                 | 696                    |
| 17       | NRCS Runoff     | PR-2G Grass HSGC C | 0.552           | 12.12              | 1,729                    | ---           |                        |                        |
| 18       | NRCS Runoff     | PR-2G Woods HSGC C | 0.506           | 12.12              | 1,571                    | ---           |                        |                        |
| 19       | Junction        | PR-2G              | 1.058           | 12.12              | 3,300                    | 17, 18        |                        |                        |
| 21       | NRCS Runoff     | PR-2D Grass HSGC C | 0.709           | 12.23              | 3,131                    | ---           |                        |                        |
| 22       | NRCS Runoff     | PR-2D Woods HSGC C | 1.676           | 12.23              | 7,362                    | ---           |                        |                        |
| 23       | NRCS Runoff     | PR-2D Impervious   | 0.295           | 12.20              | 1,468                    | ---           |                        |                        |
| 24       | Junction        | PR-2D              | 2.676           | 12.23              | 11,962                   | 21, 22, 23    |                        |                        |
| 26       | NRCS Runoff     | PR-2E Grass HSGC C | 0.559           | 12.17              | 2,086                    | ---           |                        |                        |
| 27       | NRCS Runoff     | PR-2E Impervious   | 0.212           | 12.13              | 870                      | ---           |                        |                        |
| 28       | Junction        | PR-2E              | 0.767           | 12.15              | 2,956                    | 26, 27        |                        |                        |
| 30       | NRCS Runoff     | PR-2F Woods HSGC C | 0.279           | 12.17              | 1,034                    | ---           |                        |                        |
| 31       | NRCS Runoff     | PR-2F Impervious   | 0.141           | 12.13              | 580                      | ---           |                        |                        |
| 32       | Junction        | PR-2F              | 0.417           | 12.15              | 1,614                    | 30, 31        |                        |                        |
| 34       | NRCS Runoff     | PR-2H Grass HSGC C | 0.123           | 12.12              | 384                      | ---           |                        |                        |
| 35       | NRCS Runoff     | PR-2H Impervious   | 0.486           | 12.10              | 1,631                    | ---           |                        |                        |
| 36       | Junction        | PR-2H              | 0.606           | 12.10              | 2,016                    | 34, 35        |                        |                        |

# Hydrograph 25-yr Summary

File: Future Beacon Church Proposed - POA-2.hys

Hydrology Studio v 3.0.0.38

05-16-2025

| 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) |
|----------|-----------------|---------------------|-----------------|--------------------|--------------------------|-----------------------|------------------------|------------------------|
| 38       | Junction        | PR-2B + PR-2H       | 1.347           | 12.10              | 4,679                    | 8, 36                 |                        |                        |
| 39       | Pond Route      | PR-2B+PR-2H Routing | 0.737           | 12.18              | 4,674                    | 38                    | 355.42                 | 1,127                  |
| 41       | Junction        | POA-2 Partial       | 5.164           | 12.17              | 28,570                   | 4, 15, 19, 24, 28, 32 |                        |                        |
| 42       | Junction        | Total POA-2         | 5.900           | 12.17              | 33,244                   | 39, 41                |                        |                        |

# Hydrograph 100-yr Summary

File: Future Beacon Church Proposed - POA-1 & POA-3.hys

Hydrology Studio v 3.0.0.38

07-01-2025

| 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     | PR-1A               | 2,791           | 12.10              | 9,440                    | ---           |                        |                        |
| 2        | Pond Route      | PR-1A Routing       | 1,214           | 12.15              | 4,677                    | 1             | 350.89                 | 2,643                  |
| 4        | NRCS Runoff     | PR-1B Grass HSGC C  | 0.796           | 12.13              | 2,685                    | ---           |                        |                        |
| 5        | NRCS Runoff     | PR-1B Impervious    | 1,580           | 12.10              | 5,455                    | ---           |                        |                        |
| 6        | Junction        | PR-1B               | 2,345           | 12.10              | 8,139                    | 4, 5          |                        |                        |
| 8        | NRCS Runoff     | PR-1C Grass HSGC C  | 0.300           | 12.10              | 861                      | ---           |                        |                        |
| 9        | NRCS Runoff     | PR-1C Impervious    | 0.233           | 12.10              | 787                      | ---           |                        |                        |
| 10       | Junction        | PR-1C               | 0.532           | 12.10              | 1,647                    | 8, 9          |                        |                        |
| 11       | Pond Route      | PR-1C Routing       | 0.490           | 12.12              | 1,647                    | 10            | 354.06                 | 45.9                   |
| 14       | NRCS Runoff     | PR-1D Grass HSGC C  | 0.591           | 12.12              | 1,893                    | ---           |                        |                        |
| 15       | NRCS Runoff     | PR-1D Impervious    | 1,279           | 12.10              | 4,327                    | ---           |                        |                        |
| 16       | Junction        | PR-1D               | 1,859           | 12.10              | 6,220                    | 14, 15        |                        |                        |
| 18       | Junction        | Comb. to UDG-INF1-2 | 4,690           | 12.10              | 16,007                   | 6, 11, 16     |                        |                        |
| 20       | Pond Route      | UGD-INF1-2 Routing  | 0.942           | 12.37              | 9,090                    | 18            | 347.63                 | 5,795                  |
| 22       | NRCS Runoff     | PR-1E Grass HSGC C  | 1,477           | 12.12              | 4,733                    | ---           |                        |                        |
| 23       | NRCS Runoff     | PR-1E Impervious    | 0,465           | 12.10              | 1,573                    | ---           |                        |                        |
| 24       | Junction        | PR-1E               | 1,914           | 12.10              | 6,306                    | 22, 23        |                        |                        |
| 26       | Junction        | POA-1               | 3,544           | 12.12              | 20,073                   | 2, 20, 24     |                        |                        |
| 28       | NRCS Runoff     | PR-3 (POA-3)        | 0.295           | 12.12              | 947                      | ---           |                        |                        |



# Hydrograph 100-yr Summary

Hydrology Studio v 3.0.0.38

File: Future Beacon Church Proposed - POA-2.hys

05-16-2025

| 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     | PR-2A Grass HSGC C | 0.207           | 12.10              | 612                      | ---           |                        |                        |
| 2        | NRCS Runoff     | PR-2A Impervious   | 2.559           | 12.10              | 8,654                    | ---           |                        |                        |
| 3        | Junction        | PR-2A              | 2.766           | 12.10              | 9,266                    | 1, 2          |                        |                        |
| 4        | Pond Route      | PR-2A Routing      | 0.941           | 12.22              | 9,255                    | 3             | 355.70                 | 3,101                  |
| 6        | NRCS Runoff     | PR-2B Grass HSGC C | 0.597           | 12.15              | 2,142                    | ---           |                        |                        |
| 7        | NRCS Runoff     | PR-2B Impervious   | 0.582           | 12.10              | 1,967                    | ---           |                        |                        |
| 8        | Junction        | PR-2B              | 1.127           | 12.10              | 4,108                    | 6, 7          |                        |                        |
| 11       | NRCS Runoff     | PR-2C Grass HSGC C | 0.394           | 12.12              | 1,262                    | ---           |                        |                        |
| 12       | NRCS Runoff     | PR-2C Impervious   | 0.698           | 12.10              | 2,360                    | ---           |                        |                        |
| 13       | Junction        | PR-2C              | 1.084           | 12.10              | 3,622                    | 11, 12        |                        |                        |
| 15       | Pond Route      | PR-2C Routing      | 0.487           | 12.20              | 3,617                    | 13            | 356.17                 | 940                    |
| 17       | NRCS Runoff     | PR-2G Grass HSGC C | 0.886           | 12.12              | 2,840                    | ---           |                        |                        |
| 18       | NRCS Runoff     | PR-2G Woods HSGC C | 0.838           | 12.12              | 2,649                    | ---           |                        |                        |
| 19       | Junction        | PR-2G              | 1.724           | 12.12              | 5,489                    | 17, 18        |                        |                        |
| 21       | NRCS Runoff     | PR-2D Grass HSGC C | 1.144           | 12.23              | 5,142                    | ---           |                        |                        |
| 22       | NRCS Runoff     | PR-2D Woods HSGC C | 2.793           | 12.23              | 12,416                   | ---           |                        |                        |
| 23       | NRCS Runoff     | PR-2D Impervious   | 0.423           | 12.20              | 2,124                    | ---           |                        |                        |
| 24       | Junction        | PR-2D              | 4.355           | 12.23              | 19,683                   | 21, 22, 23    |                        |                        |
| 26       | NRCS Runoff     | PR-2E Grass HSGC C | 0.900           | 12.17              | 3,426                    | ---           |                        |                        |
| 27       | NRCS Runoff     | PR-2E Impervious   | 0.304           | 12.13              | 1,259                    | ---           |                        |                        |
| 28       | Junction        | PR-2E              | 1.200           | 12.15              | 4,684                    | 26, 27        |                        |                        |
| 30       | NRCS Runoff     | PR-2F Woods HSGC C | 0.464           | 12.17              | 1,743                    | ---           |                        |                        |
| 31       | NRCS Runoff     | PR-2F Impervious   | 0.202           | 12.13              | 839                      | ---           |                        |                        |
| 32       | Junction        | PR-2F              | 0.663           | 12.15              | 2,582                    | 30, 31        |                        |                        |
| 34       | NRCS Runoff     | PR-2H Grass HSGC C | 0.197           | 12.12              | 631                      | ---           |                        |                        |
| 35       | NRCS Runoff     | PR-2H Impervious   | 0.698           | 12.10              | 2,360                    | ---           |                        |                        |
| 36       | Junction        | PR-2H              | 0.891           | 12.10              | 2,991                    | 34, 35        |                        |                        |

# Hydrograph 100-yr Summary

File: Future Beacon Church Proposed - POA-2.hys

Hydrology Studio v 3.0.0.38

05-16-2025

| 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) |
|----------|-----------------|---------------------|-----------------|--------------------|--------------------------|-----------------------|------------------------|------------------------|
| 38       | Junction        | PR-2B + PR-2H       | 2,018           | 12.10              | 7,100                    | 8, 36                 |                        |                        |
| 39       | Pond Route      | PR-2B+PR-2H Routing | 1,093           | 12.20              | 7,095                    | 38                    | 355.88                 | 1,522                  |
| 41       | Junction        | POA-2 Partial       | 8,687           | 12.15              | 45,310                   | 4, 15, 19, 24, 28, 32 |                        |                        |
| 42       | Junction        | Total POA-2         | 9,769           | 12.15              | 52,405                   | 39, 41                |                        |                        |

# **APPENDIX C**

## **Pond Routing Calculations**

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## **CURRENT POND ROUTING CALCULATIONS**

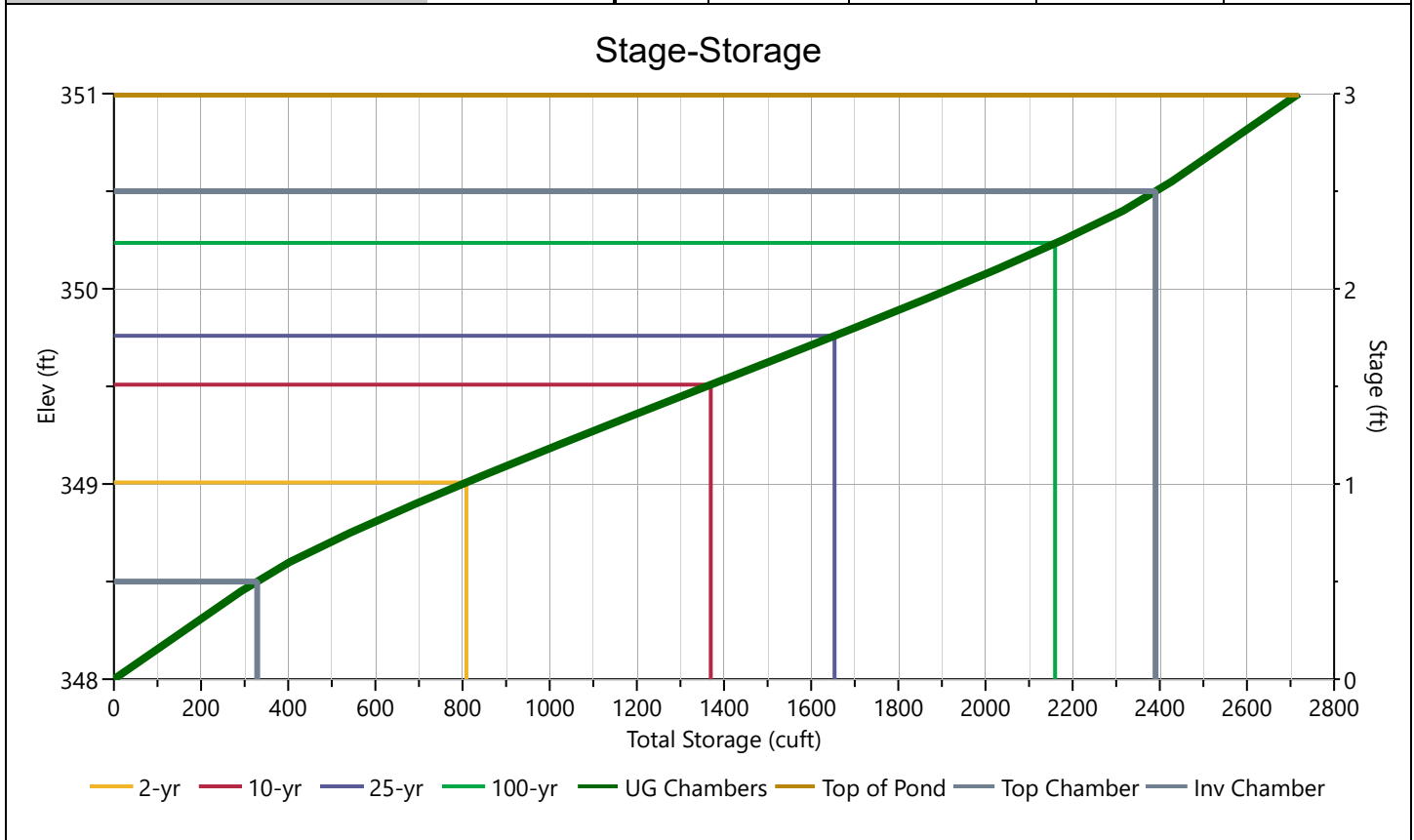
## **PR-1A WATERSHED POND ROUTING**

# Pond Report

## UGD-INF1-1

## Stage-Storage

| Underground Chambers             |          | Stage / Storage Table |                |                     |                      |                      |
|----------------------------------|----------|-----------------------|----------------|---------------------|----------------------|----------------------|
| Description                      | Input    | Stage (ft)            | Elevation (ft) | Contour Area (sqft) | Incr. Storage (cuft) | Total Storage (cuft) |
| Invert Elev Down, ft             | 348.50   | 0.00                  | 348.00         | 1,620               | 0.000                | 0.000                |
| Chamber Rise, ft                 | 2.00     | 0.15                  | 348.15         | 1,620               | 97.2                 | 97.2                 |
| Chamber Shape                    | Circular | 0.30                  | 348.30         | 1,620               | 97.2                 | 194                  |
| Chamber Span, ft                 | 2.00     | 0.45                  | 348.45         | 1,620               | 97.2                 | 292                  |
| Barrel Length, ft                | 75.00    | 0.60                  | 348.60         | 1,620               | 112                  | 403                  |
| No. Barrels                      | 5        | 0.75                  | 348.75         | 1,620               | 139                  | 542                  |
| Barrel Slope, %                  | 0.00     | 0.90                  | 348.90         | 1,620               | 152                  | 694                  |
| Headers, y/n                     | Yes      | 1.05                  | 349.05         | 1,620               | 160                  | 854                  |
| Stone Encasement, y/n            | Yes      | 1.20                  | 349.20         | 1,620               | 166                  | 1,020                |
| Encasement Bottom Elevation, ft  | 348.00   | 1.35                  | 349.35         | 1,620               | 169                  | 1,189                |
| Encasement Width per Chamber, ft | 4.00     | 1.50                  | 349.50         | 1,620               | 171                  | 1,360                |
| Encasement Depth, ft             | 3.00     | 1.65                  | 349.65         | 1,620               | 171                  | 1,531                |
| Encasement Voids, %              | 40.00    | 1.80                  | 349.80         | 1,620               | 169                  | 1,700                |
|                                  |          | 1.95                  | 349.95         | 1,620               | 166                  | 1,866                |
|                                  |          | 2.10                  | 350.10         | 1,620               | 160                  | 2,026                |
|                                  |          | 2.25                  | 350.25         | 1,620               | 152                  | 2,177                |
|                                  |          | 2.40                  | 350.40         | 1,620               | 139                  | 2,316                |
|                                  |          | 2.55                  | 350.55         | 1,620               | 112                  | 2,428                |
|                                  |          | 2.70                  | 350.70         | 1,620               | 97.2                 | 2,525                |
|                                  |          | 2.85                  | 350.85         | 1,620               | 97.2                 | 2,622                |
|                                  |          | 3.00                  | 351.00         | 1,620               | 97.2                 | 2,719                |





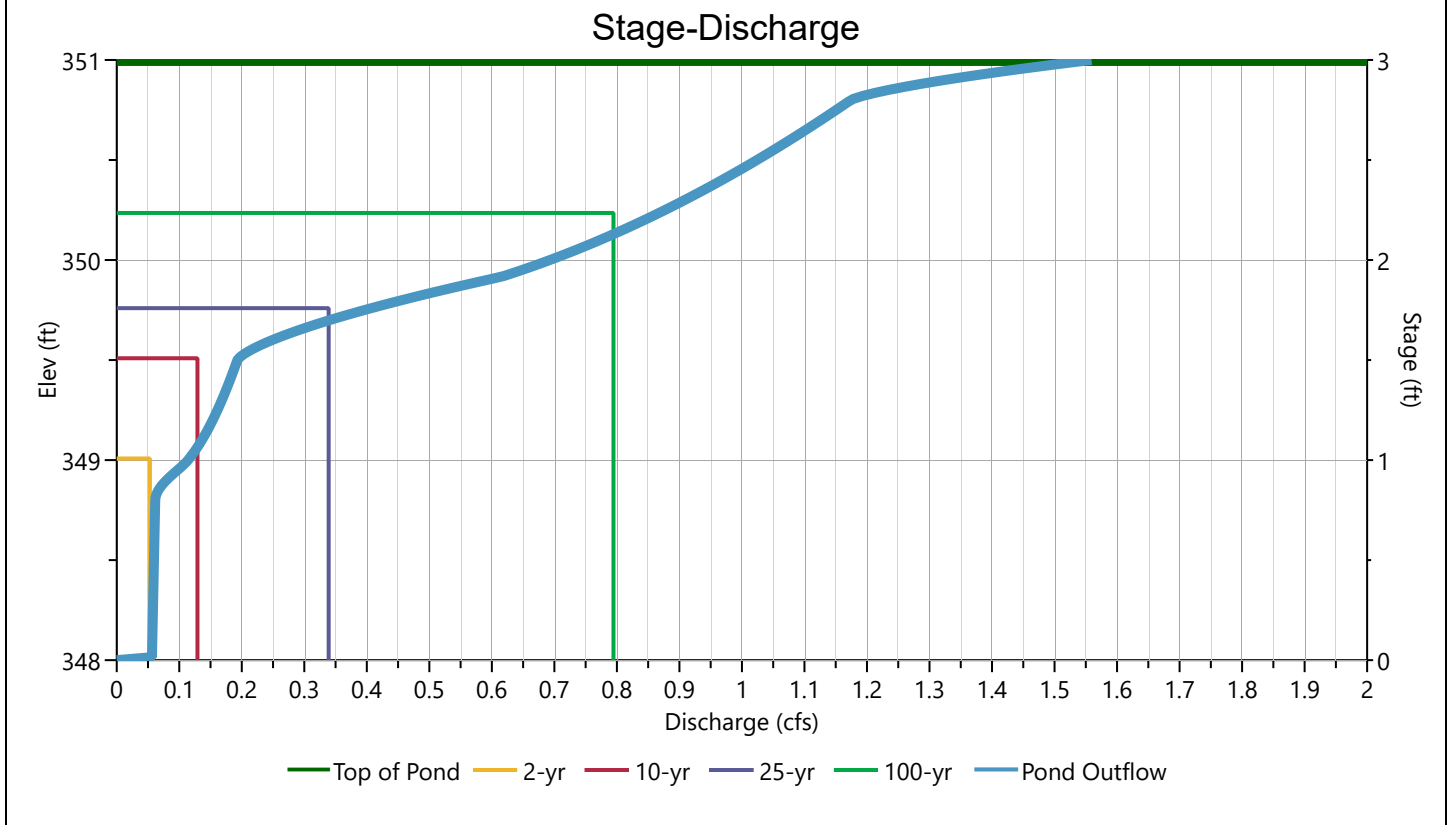
# Pond Report

## UGD-INF1-1

## Stage-Discharge

| Culvert / Orifices      | Cir Culvert | Orifice     |        |   | Perforated Riser        |
|-------------------------|-------------|-------------|--------|---|-------------------------|
|                         |             | 1 (i)       | 2 (i)  | 3 |                         |
| Rise, in                |             | 2.5         | 5      |   | Hole Diameter, in       |
| Span, in                |             | 2.5         | 5      |   | No. holes               |
| No. Barrels             |             | 1           | 1      |   | Invert Elevation, ft    |
| Invert Elevation, ft    |             | 348.80      | 349.50 |   | Height, ft              |
| Orifice Coefficient, Co |             | 0.60        | 0.60   |   | Orifice Coefficient, Co |
| Length, ft              |             |             |        |   |                         |
| Barrel Slope, %         |             |             |        |   |                         |
| N-Value, n              |             |             |        |   |                         |
| Weirs                   | Riser       | Weir        |        |   | Ancillary               |
| Shape / Type            |             | 1 (i)       | 2      | 3 | Exfiltration, in/hr     |
| Crest Elevation, ft     |             | Rectangular |        |   | 1.50**                  |
| Crest Length, ft        |             | 350.8       |        |   |                         |
| Angle, deg              |             | 1           |        |   |                         |
| Weir Coefficient, Cw    |             | 3.3         |        |   |                         |

m = Flows through Culvert, i = Independent \*\*Exfiltration extracted from outflow hydrograph. Rate applied to contours.



# Hydrograph Report

Hydrology Studio v 3.0.0.38

File: Current Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

## PR-1A Routing

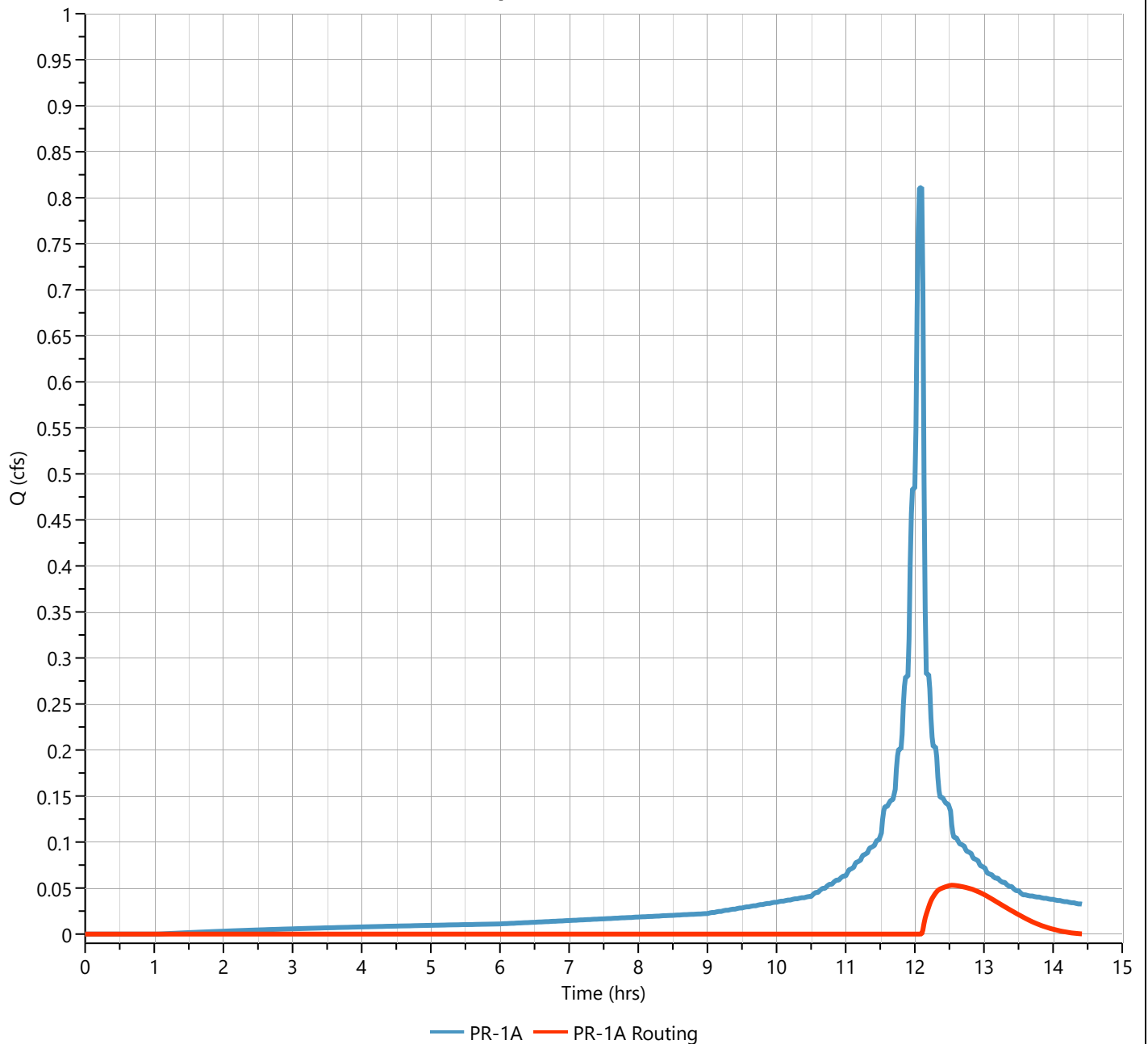
## Hyd. No. 2

|                   |              |                   |             |
|-------------------|--------------|-------------------|-------------|
| Hydrograph Type   | = Pond Route | Peak Flow         | = 0.053 cfs |
| Storm Frequency   | = 2-yr       | Time to Peak      | = 12.53 hrs |
| Time Interval     | = 1 min      | Hydrograph Volume | = 228 cuft  |
| Inflow Hydrograph | = 1 - PR-1A  | Max. Elevation    | = 349.01 ft |
| Pond Name         | = UGD-INF1-1 | Max. Storage      | = 809 cuft  |

Pond Routing by Storage Indication Method

Center of mass detention time = 20 min

**Qp = 0.053 cfs**



# Hydrograph Report

Hydrology Studio v 3.0.0.38

File: Current Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

## PR-1A Routing

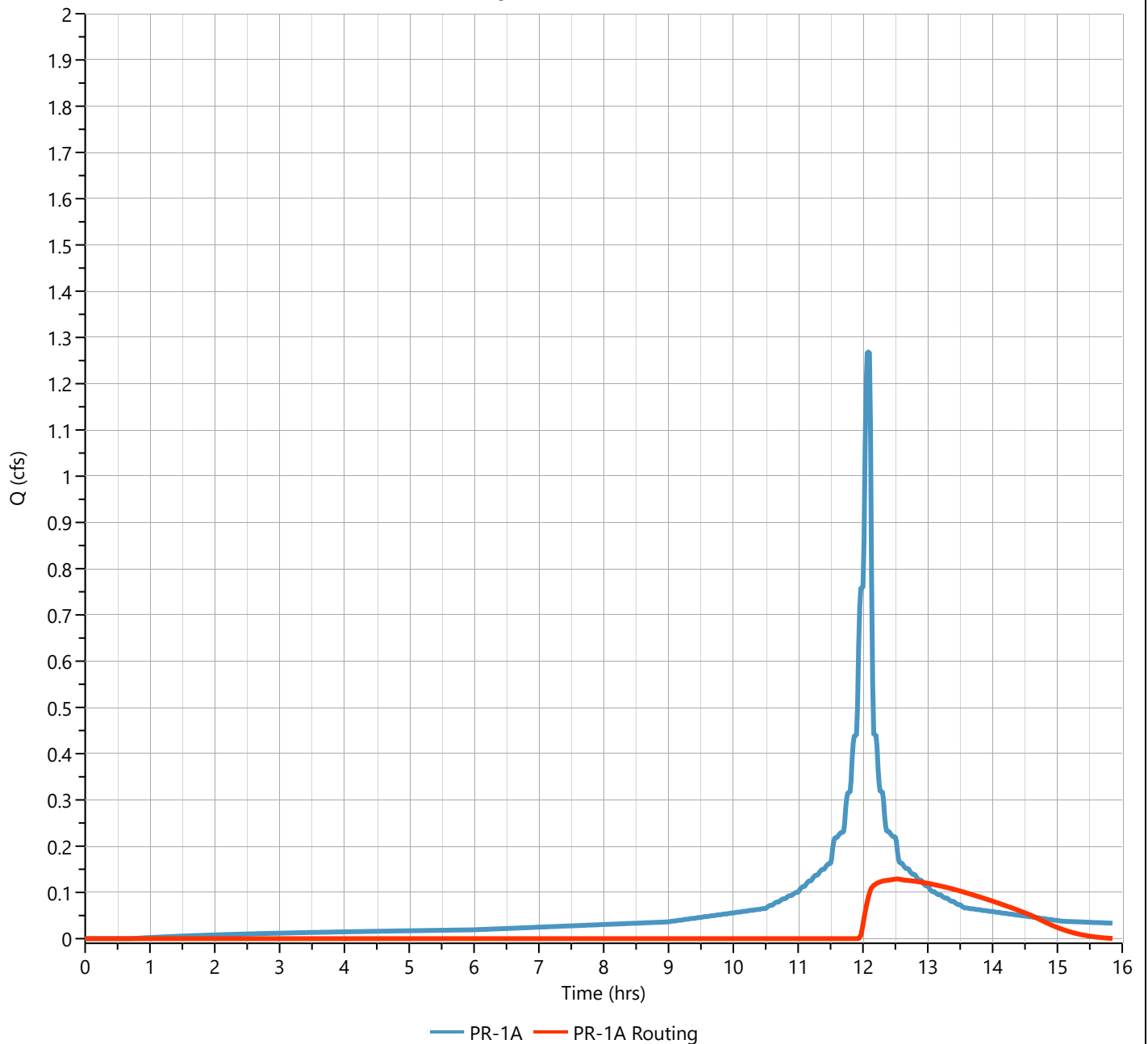
## Hyd. No. 2

|                   |              |                   |              |
|-------------------|--------------|-------------------|--------------|
| Hydrograph Type   | = Pond Route | Peak Flow         | = 0.129 cfs  |
| Storm Frequency   | = 10-yr      | Time to Peak      | = 12.53 hrs  |
| Time Interval     | = 1 min      | Hydrograph Volume | = 1,017 cuft |
| Inflow Hydrograph | = 1 - PR-1A  | Max. Elevation    | = 349.51 ft  |
| Pond Name         | = UGD-INF1-1 | Max. Storage      | = 1,370 cuft |

Pond Routing by Storage Indication Method

Center of mass detention time = 54 min

**Qp = 0.129 cfs**



# Hydrograph Report

Hydrology Studio v 3.0.0.38

File: Current Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

## PR-1A Routing

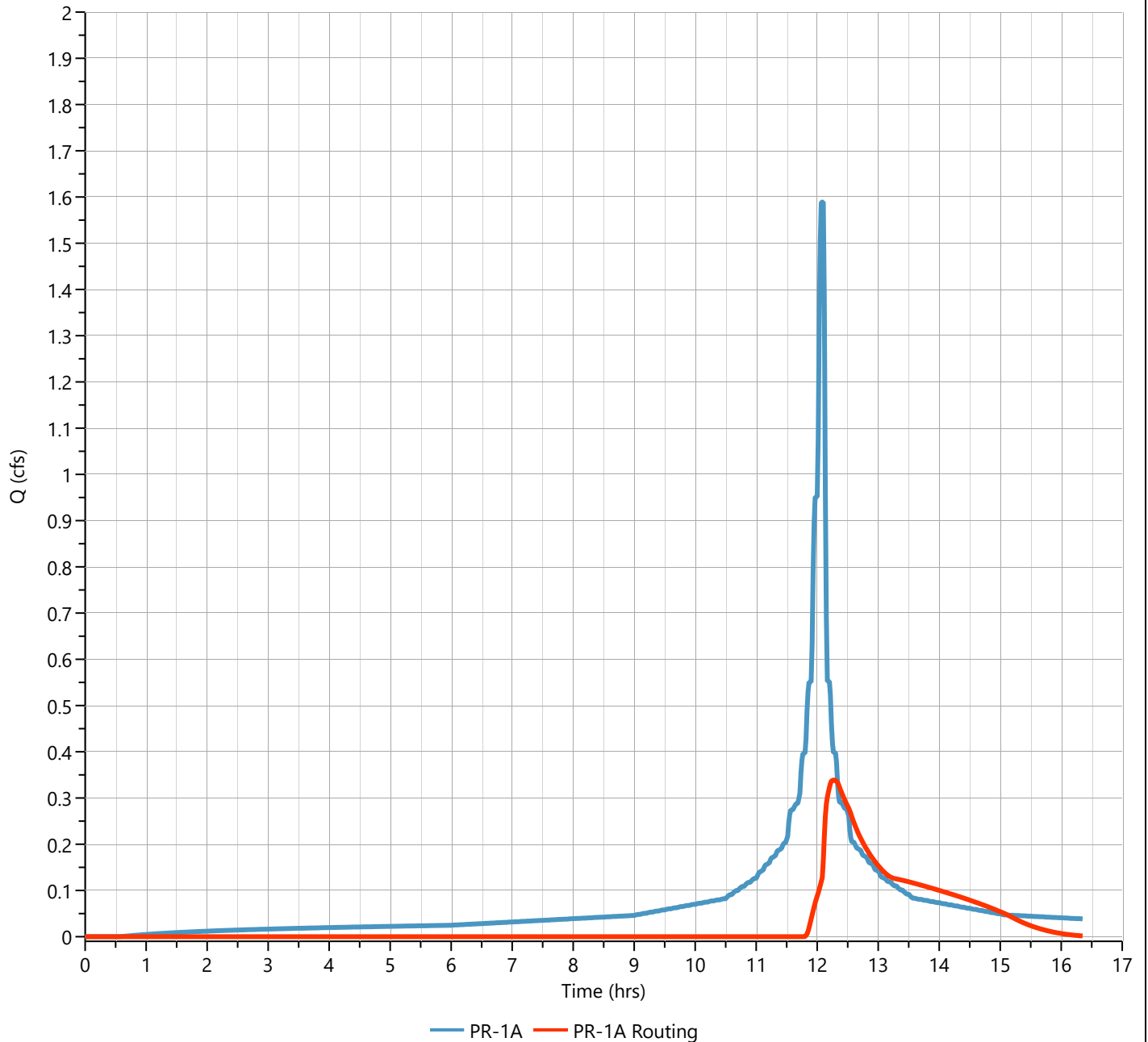
## Hyd. No. 2

|                   |              |                   |              |
|-------------------|--------------|-------------------|--------------|
| Hydrograph Type   | = Pond Route | Peak Flow         | = 0.339 cfs  |
| Storm Frequency   | = 25-yr      | Time to Peak      | = 12.27 hrs  |
| Time Interval     | = 1 min      | Hydrograph Volume | = 1,702 cuft |
| Inflow Hydrograph | = 1 - PR-1A  | Max. Elevation    | = 349.76 ft  |
| Pond Name         | = UGD-INF1-1 | Max. Storage      | = 1,654 cuft |

Pond Routing by Storage Indication Method

Center of mass detention time = 52 min

**Qp = 0.339 cfs**



# Hydrograph Report

Hydrology Studio v 3.0.0.38

File: Current Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

## PR-1A Routing

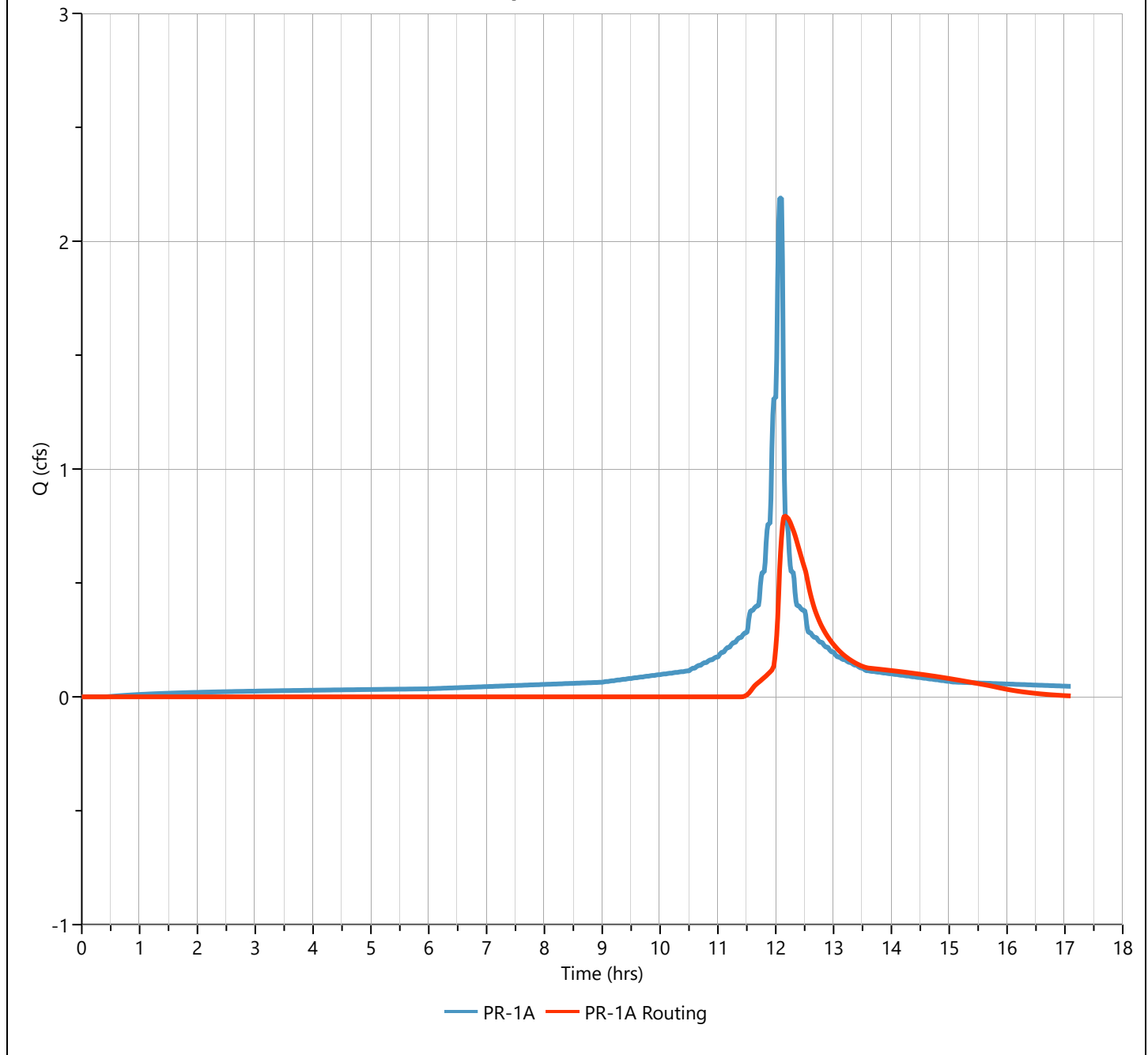
## Hyd. No. 2

|                   |              |                   |              |
|-------------------|--------------|-------------------|--------------|
| Hydrograph Type   | = Pond Route | Peak Flow         | = 0.795 cfs  |
| Storm Frequency   | = 100-yr     | Time to Peak      | = 12.15 hrs  |
| Time Interval     | = 1 min      | Hydrograph Volume | = 3,121 cuft |
| Inflow Hydrograph | = 1 - PR-1A  | Max. Elevation    | = 350.24 ft  |
| Pond Name         | = UGD-INF1-1 | Max. Storage      | = 2,160 cuft |

Pond Routing by Storage Indication Method

Center of mass detention time = 48 min

**Qp = 0.795 cfs**



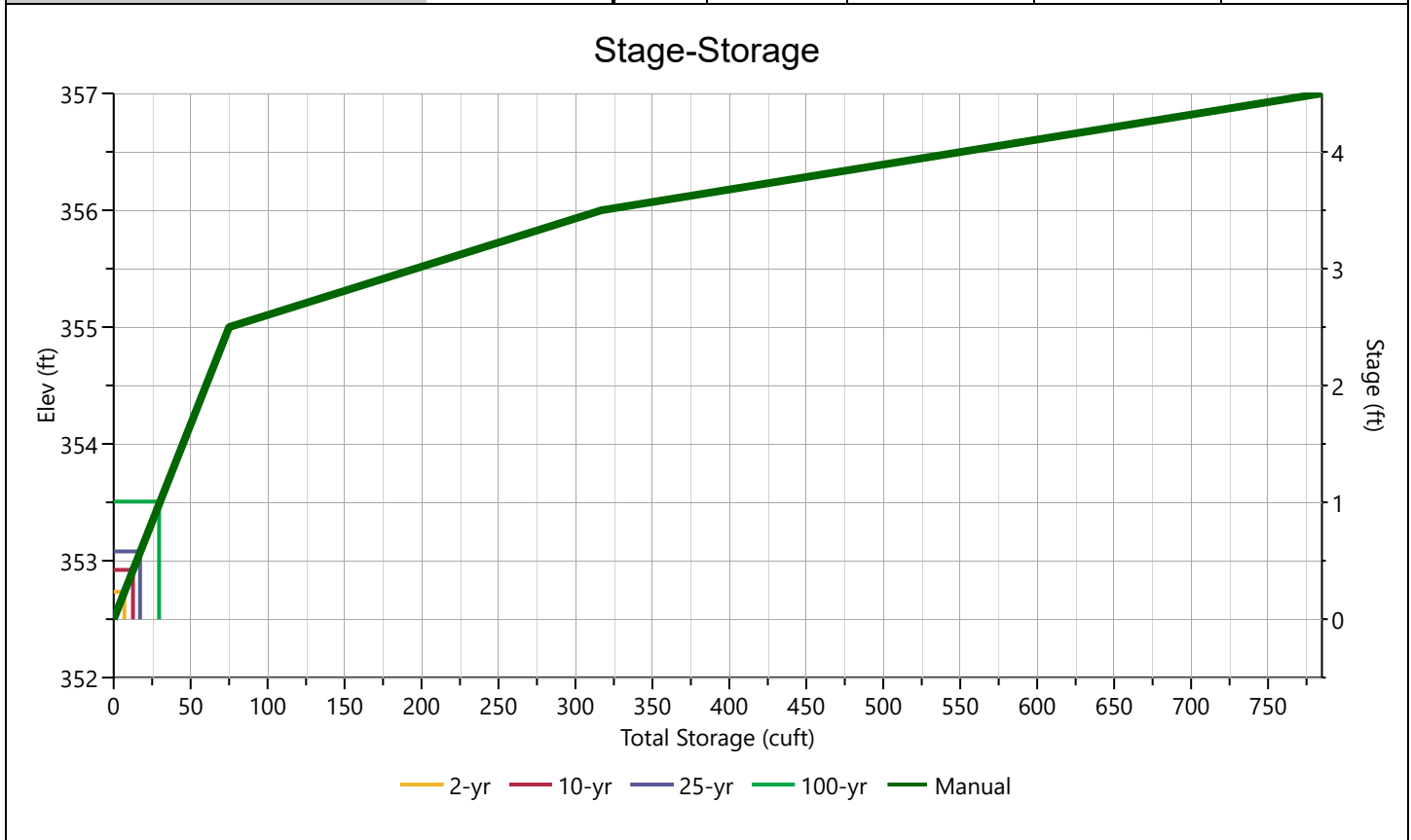
## **PR-1C WATERSHED POND ROUTING**

# Pond Report

## Rain Garden

## Stage-Storage

| User Defined Storage |        | Stage / Storage Table |                |                     |                      |                      |
|----------------------|--------|-----------------------|----------------|---------------------|----------------------|----------------------|
| Description          | Input  | Stage (ft)            | Elevation (ft) | Contour Area (sqft) | Incr. Storage (cuft) | Total Storage (cuft) |
| Bottom Elevation, ft | 352.50 | 0.00                  | 352.50         | n/a                 | 0.000                | 0.000                |
|                      |        | 2.50                  | 355.00         | n/a                 | 75.0                 | 75.0                 |
|                      |        | 3.50                  | 356.00         | n/a                 | 242                  | 317                  |
|                      |        | 4.50                  | 357.00         | n/a                 | 468                  | 785                  |
|                      |        |                       |                |                     |                      |                      |
|                      |        |                       |                |                     |                      |                      |
|                      |        |                       |                |                     |                      |                      |
|                      |        |                       |                |                     |                      |                      |
|                      |        |                       |                |                     |                      |                      |
|                      |        |                       |                |                     |                      |                      |
|                      |        |                       |                |                     |                      |                      |
|                      |        |                       |                |                     |                      |                      |
|                      |        |                       |                |                     |                      |                      |
|                      |        |                       |                |                     |                      |                      |
|                      |        |                       |                |                     |                      |                      |
|                      |        |                       |                |                     |                      |                      |



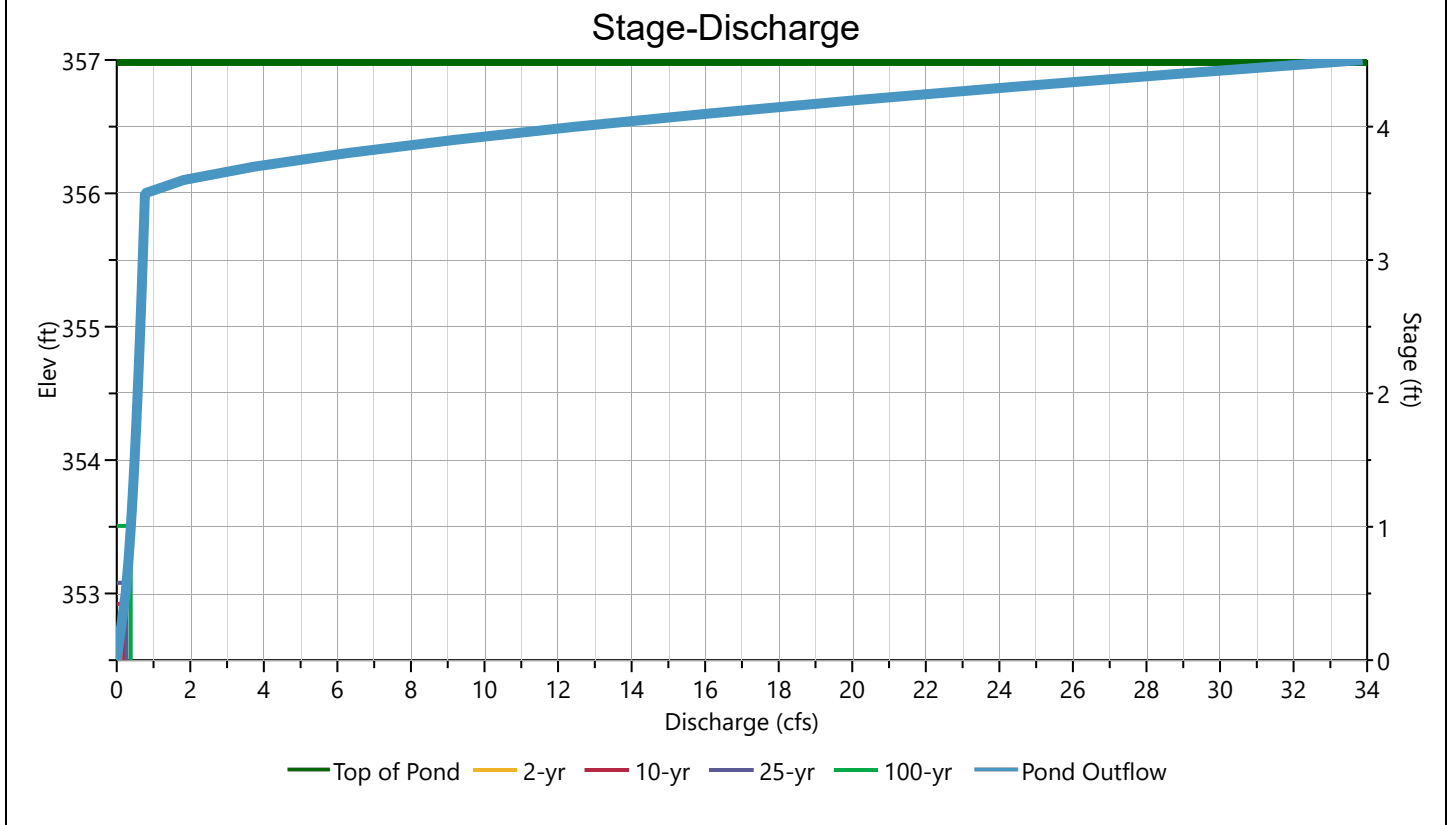
# Pond Report

## Rain Garden

## Stage-Discharge

| Culvert / Orifices      | Cir Culvert | Orifice       |   |   | Perforated Riser        |
|-------------------------|-------------|---------------|---|---|-------------------------|
|                         |             | 1 (i)         | 2 | 3 |                         |
| Rise, in                |             | 4             |   |   | Hole Diameter, in       |
| Span, in                |             | 4             |   |   | No. holes               |
| No. Barrels             |             | 1             |   |   | Invert Elevation, ft    |
| Invert Elevation, ft    |             | 352.50        |   |   | Height, ft              |
| Orifice Coefficient, Co |             | 0.60          |   |   | Orifice Coefficient, Co |
| Length, ft              |             |               |   |   |                         |
| Barrel Slope, %         |             |               |   |   |                         |
| N-Value, n              |             |               |   |   |                         |
| Weirs                   | Riser       | Weir          |   |   | Ancillary               |
|                         |             | 1 (i)         | 2 | 3 |                         |
| Shape / Type            |             | Broad Crested |   |   | Exfiltration, in/hr     |
| Crest Elevation, ft     |             | 356           |   |   |                         |
| Crest Length, ft        |             | 10            |   |   |                         |
| Angle, deg              |             |               |   |   |                         |
| Weir Coefficient, Cw    |             | 3.3           |   |   |                         |

*m = Flows through Culvert, i = Independent*





# Hydrograph Report

Hydrology Studio v 3.0.0.38

File: Current Beacon Church Proposed - POA-1 & POA-3.hys

07-01-2025

## PR-1C Routing

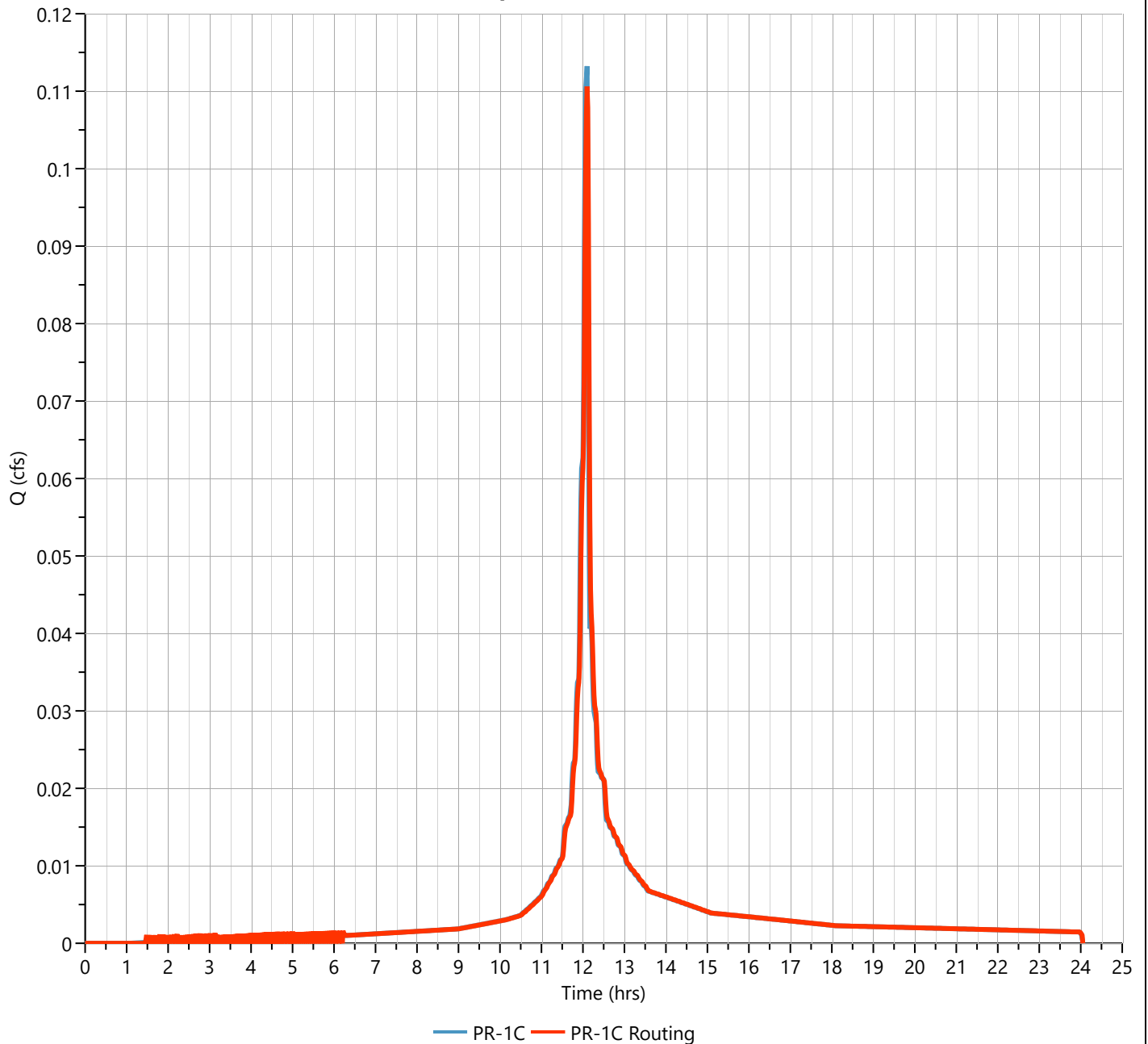
### Hyd. No. 11

|                   |               |                   |             |
|-------------------|---------------|-------------------|-------------|
| Hydrograph Type   | = Pond Route  | Peak Flow         | = 0.111 cfs |
| Storm Frequency   | = 2-yr        | Time to Peak      | = 12.10 hrs |
| Time Interval     | = 1 min       | Hydrograph Volume | = 343 cuft  |
| Inflow Hydrograph | = 10 - PR-1C  | Max. Elevation    | = 352.73 ft |
| Pond Name         | = Rain Garden | Max. Storage      | = 6.94 cuft |

Pond Routing by Storage Indication Method

Center of mass detention time = 1 min

**Qp = 0.111 cfs**



# Hydrograph Report

Hydrology Studio v 3.0.0.38

File: Current Beacon Church Proposed - POA-1 & POA-3.hys

07-01-2025

## PR-1C Routing

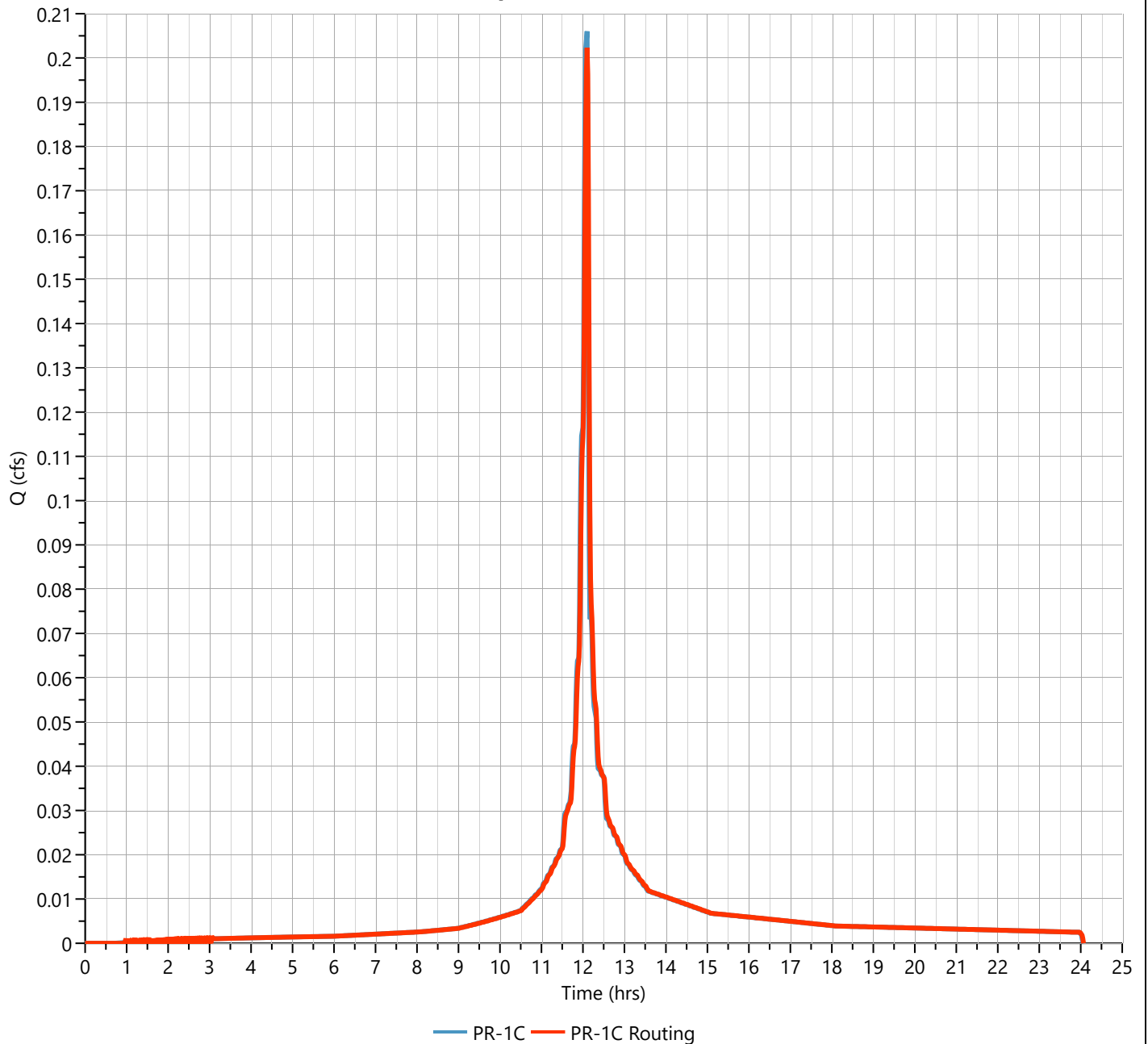
## Hyd. No. 11

|                   |               |                   |             |
|-------------------|---------------|-------------------|-------------|
| Hydrograph Type   | = Pond Route  | Peak Flow         | = 0.202 cfs |
| Storm Frequency   | = 10-yr       | Time to Peak      | = 12.10 hrs |
| Time Interval     | = 1 min       | Hydrograph Volume | = 623 cuft  |
| Inflow Hydrograph | = 10 - PR-1C  | Max. Elevation    | = 352.92 ft |
| Pond Name         | = Rain Garden | Max. Storage      | = 12.5 cuft |

Pond Routing by Storage Indication Method

Center of mass detention time = 1 min

**Qp = 0.202 cfs**



# Hydrograph Report

Hydrology Studio v 3.0.0.38

File: Current Beacon Church Proposed - POA-1 & POA-3.hys

07-01-2025

## PR-1C Routing

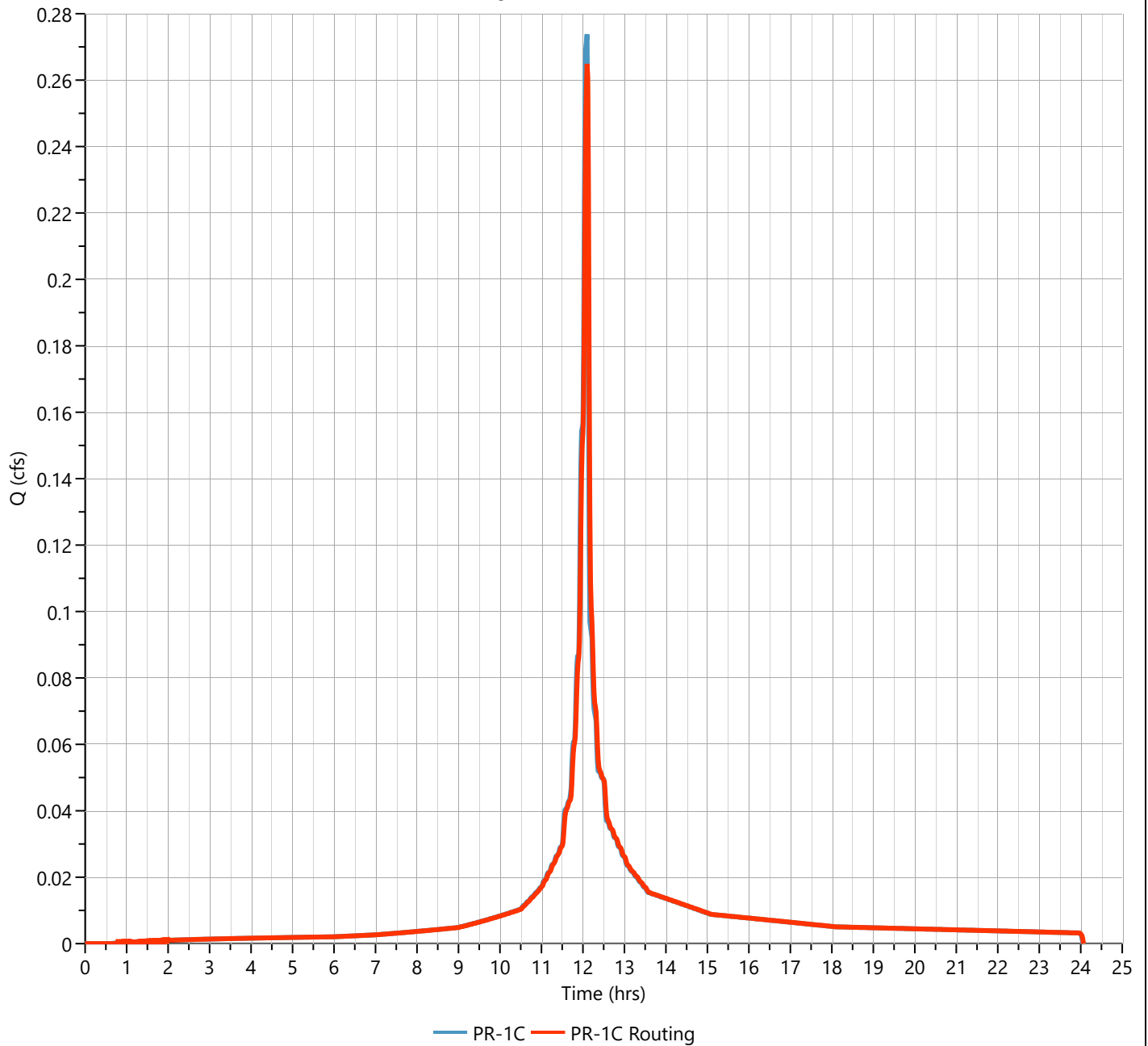
## Hyd. No. 11

|                   |               |                   |             |
|-------------------|---------------|-------------------|-------------|
| Hydrograph Type   | = Pond Route  | Peak Flow         | = 0.265 cfs |
| Storm Frequency   | = 25-yr       | Time to Peak      | = 12.10 hrs |
| Time Interval     | = 1 min       | Hydrograph Volume | = 830 cuft  |
| Inflow Hydrograph | = 10 - PR-1C  | Max. Elevation    | = 353.08 ft |
| Pond Name         | = Rain Garden | Max. Storage      | = 17.1 cuft |

Pond Routing by Storage Indication Method

Center of mass detention time = 1 min

**Qp = 0.265 cfs**



# Hydrograph Report

Hydrology Studio v 3.0.0.38

File: Current Beacon Church Proposed - POA-1 & POA-3.hys

07-01-2025

## PR-1C Routing

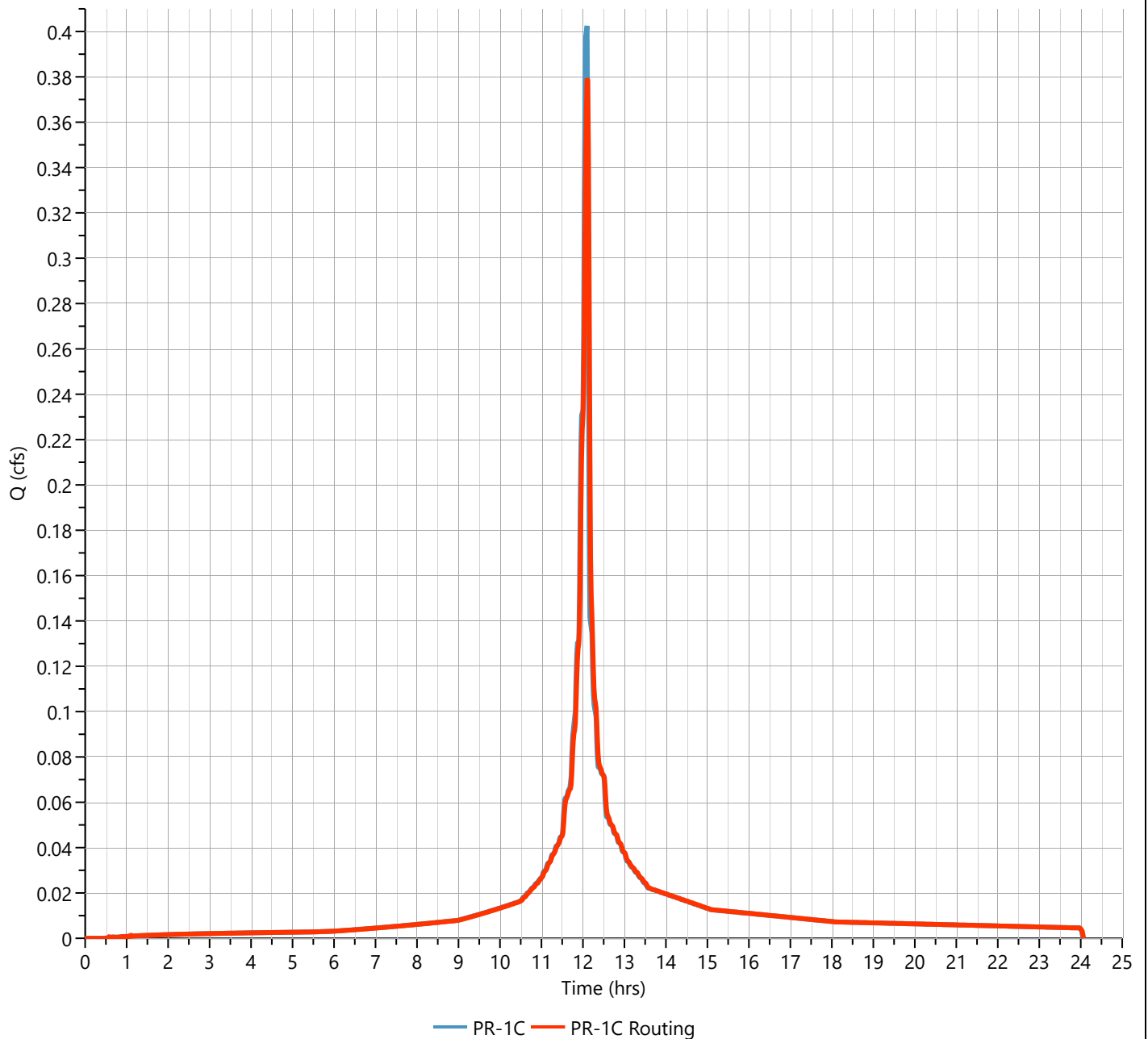
## Hyd. No. 11

|                   |               |                   |              |
|-------------------|---------------|-------------------|--------------|
| Hydrograph Type   | = Pond Route  | Peak Flow         | = 0.379 cfs  |
| Storm Frequency   | = 100-yr      | Time to Peak      | = 12.10 hrs  |
| Time Interval     | = 1 min       | Hydrograph Volume | = 1,233 cuft |
| Inflow Hydrograph | = 10 - PR-1C  | Max. Elevation    | = 353.51 ft  |
| Pond Name         | = Rain Garden | Max. Storage      | = 29.5 cuft  |

Pond Routing by Storage Indication Method

Center of mass detention time = 1 min

**Qp = 0.379 cfs**



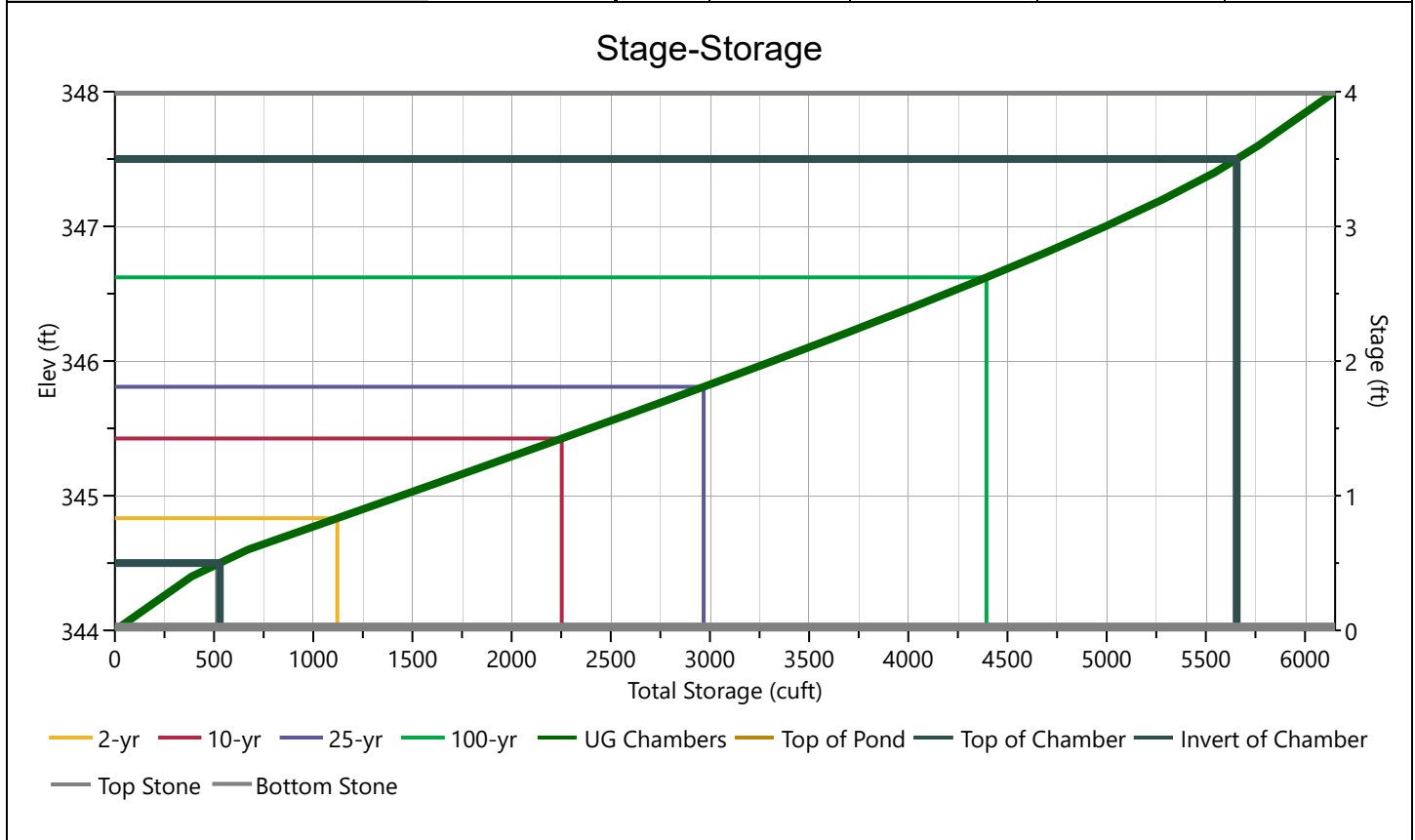
**COMBINED TO UNDERGROUND INFILTRATION BASIN 1-2  
POND ROUTING**

# Pond Report

## UGD-INF1-2

## Stage-Storage

| Cultec Recharger® 360HD Chamber |        | Stage / Storage Table |                |                     |                      |                      |
|---------------------------------|--------|-----------------------|----------------|---------------------|----------------------|----------------------|
| Description                     | Input  | Stage (in)            | Elevation (ft) | Contour Area (sqft) | Incr. Storage (cuft) | Total Storage (cuft) |
| Chamber Height, in              | 36     | 0.0                   | 344.00         | 2,414               | 0.000                | 0.000                |
| Chamber Shape                   | Arch   | 2.4                   | 344.20         | 2,414               | 193                  | 193                  |
| Chamber Width, in               | 60     | 4.8                   | 344.40         | 2,414               | 193                  | 386                  |
| Installed Length, ft            | 3.67   | 7.2                   | 344.60         | 2,414               | 285                  | 671                  |
| No. Chambers                    | 103    | 9.6                   | 344.80         | 2,414               | 387                  | 1,058                |
| Bare Chamber Stor, cuft         | 3,776  | 12.0                  | 345.00         | 2,414               | 385                  | 1,443                |
| No. Rows                        | 3      | 14.4                  | 345.20         | 2,414               | 383                  | 1,826                |
| Space Between Rows, in          | 9      | 16.8                  | 345.40         | 2,414               | 380                  | 2,206                |
| Stone Above, in                 | 6      | 19.2                  | 345.60         | 2,414               | 376                  | 2,582                |
| Stone Below, in                 | 6      | 21.6                  | 345.80         | 2,414               | 371                  | 2,953                |
| Stone Sides, in                 | 12     | 24.0                  | 346.00         | 2,414               | 365                  | 3,317                |
| Stone Ends, in                  | 12     | 26.4                  | 346.20         | 2,414               | 357                  | 3,674                |
| Encasement Voids, %             | 40.00  | 28.8                  | 346.40         | 2,414               | 348                  | 4,022                |
| Encasement Bottom Elevation, ft | 344.00 | 31.2                  | 346.60         | 2,414               | 338                  | 4,360                |
|                                 |        | 33.6                  | 346.80         | 2,414               | 325                  | 4,685                |
|                                 |        | 36.0                  | 347.00         | 2,414               | 309                  | 4,994                |
|                                 |        | 38.4                  | 347.20         | 2,414               | 290                  | 5,284                |
|                                 |        | 40.8                  | 347.40         | 2,414               | 262                  | 5,545                |
|                                 |        | 43.2                  | 347.60         | 2,414               | 220                  | 5,765                |
|                                 |        | 45.6                  | 347.80         | 2,414               | 193                  | 5,959                |
|                                 |        | 48.0                  | 348.00         | 2,414               | 193                  | 6,152                |



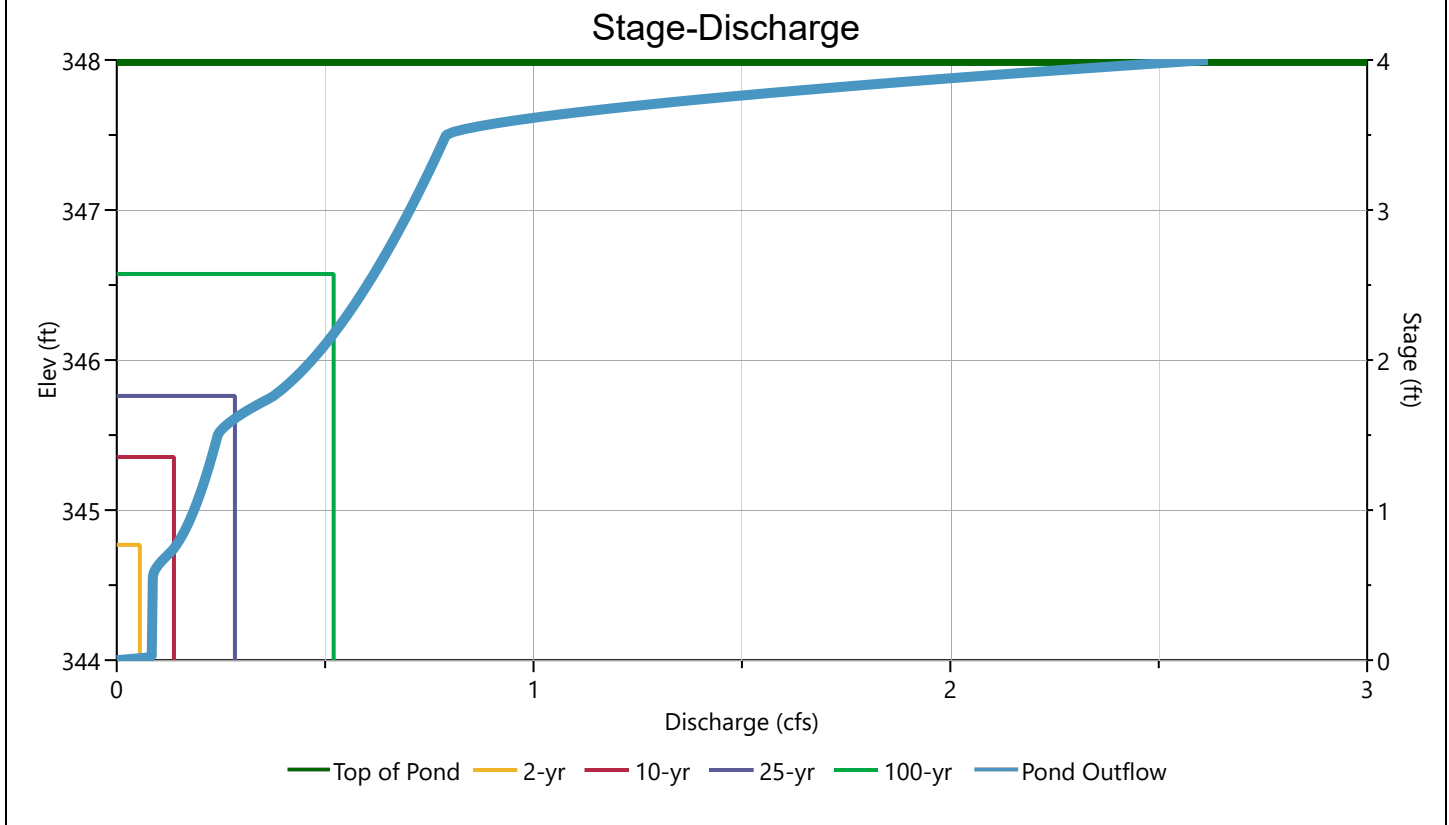
# Pond Report

## UGD-INF1-2

## Stage-Discharge

| Culvert / Orifices      | Cir Culvert | Orifice     |        |   | Perforated Riser        |
|-------------------------|-------------|-------------|--------|---|-------------------------|
|                         |             | 1 (i)       | 2 (i)  | 3 |                         |
| Rise, in                |             | 2.5         | 3      |   | Hole Diameter, in       |
| Span, in                |             | 2.5         | 3      |   | No. holes               |
| No. Barrels             |             | 1           | 1      |   | Invert Elevation, ft    |
| Invert Elevation, ft    |             | 344.55      | 345.50 |   | Height, ft              |
| Orifice Coefficient, Co |             | 0.60        | 0.60   |   | Orifice Coefficient, Co |
| Length, ft              |             |             |        |   |                         |
| Barrel Slope, %         |             |             |        |   |                         |
| N-Value, n              |             |             |        |   |                         |
| Weirs                   | Riser       | Weir        |        |   | Ancillary               |
| Shape / Type            |             | 1 (i)       | 2      | 3 | Exfiltration, in/hr     |
| Crest Elevation, ft     |             | Rectangular |        |   | 1.50**                  |
| Crest Length, ft        |             | 347.5       |        |   |                         |
| Angle, deg              |             | 1.5         |        |   |                         |
| Weir Coefficient, Cw    |             |             |        |   |                         |
|                         |             | 3.3         |        |   |                         |

m = Flows through Culvert, i = Independent \*\*Exfiltration extracted from outflow hydrograph. Rate applied to contours.



# Hydrograph Report

Hydrology Studio v 3.0.0.38

File: Current Beacon Church Proposed - POA-1 & POA-3.hys

07-01-2025

## UGD-INF1-2 Routing

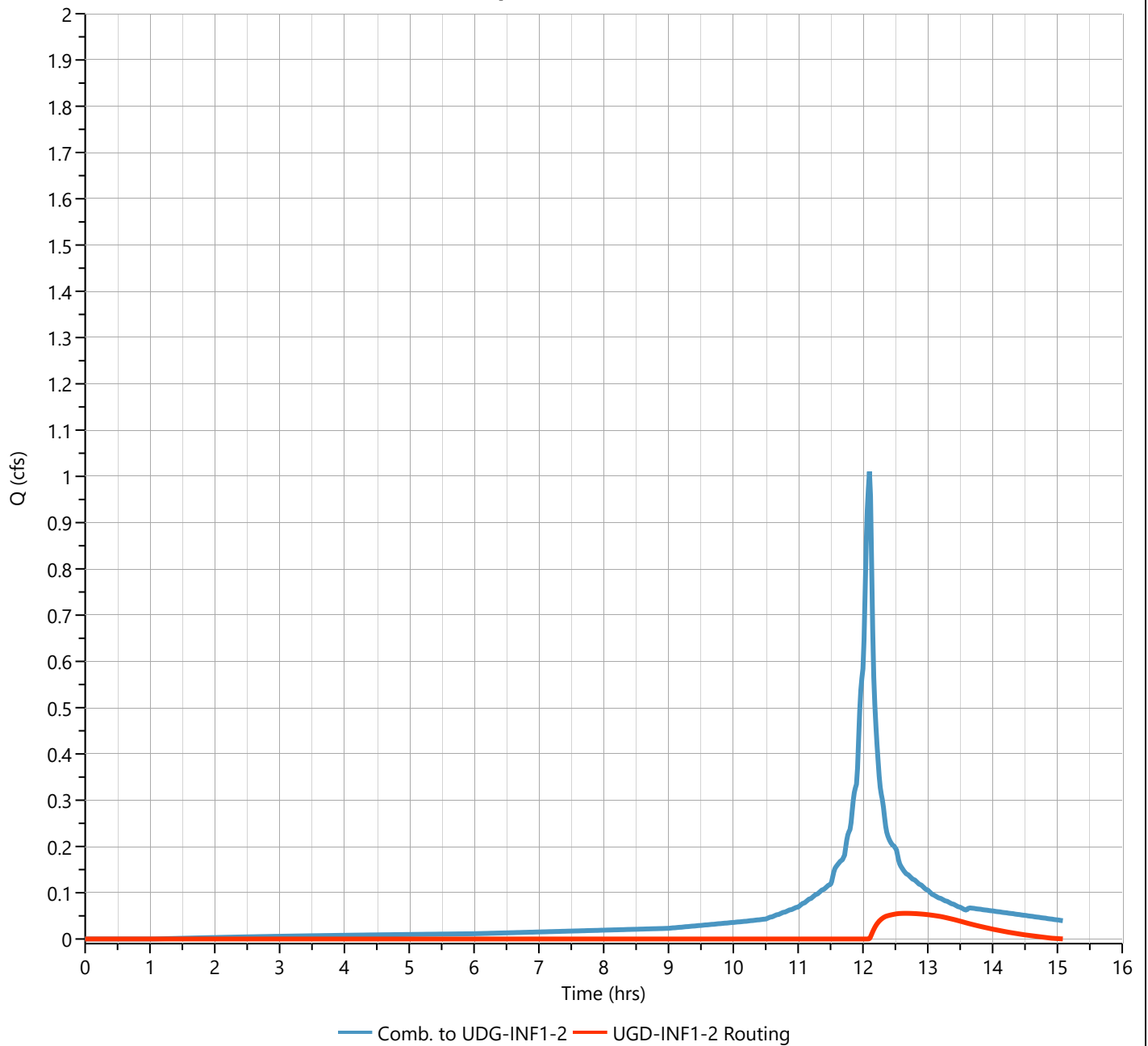
### Hyd. No. 20

|                   |                            |                   |             |
|-------------------|----------------------------|-------------------|-------------|
| Hydrograph Type   | = Pond Route               | Peak Flow         | = 0.055 cfs |
| Storm Frequency   | = 2-yr                     | Time to Peak      | = 12.65 hrs |
| Time Interval     | = 1 min                    | Hydrograph Volume | = 326 cuft  |
| Inflow Hydrograph | = 18 - Comb. to UDG-INF1-2 | Max. Elevation    | = 344.77 ft |
| Pond Name         | = UGD-INF1-2               | Max. Storage      | = 997 cuft  |

Pond Routing by Storage Indication Method

Center of mass detention time = 4 min

**Qp = 0.055 cfs**





# Hydrograph Report

Hydrology Studio v 3.0.0.38

File: Current Beacon Church Proposed - POA-1 & POA-3.hys

07-01-2025

## UGD-INF1-2 Routing

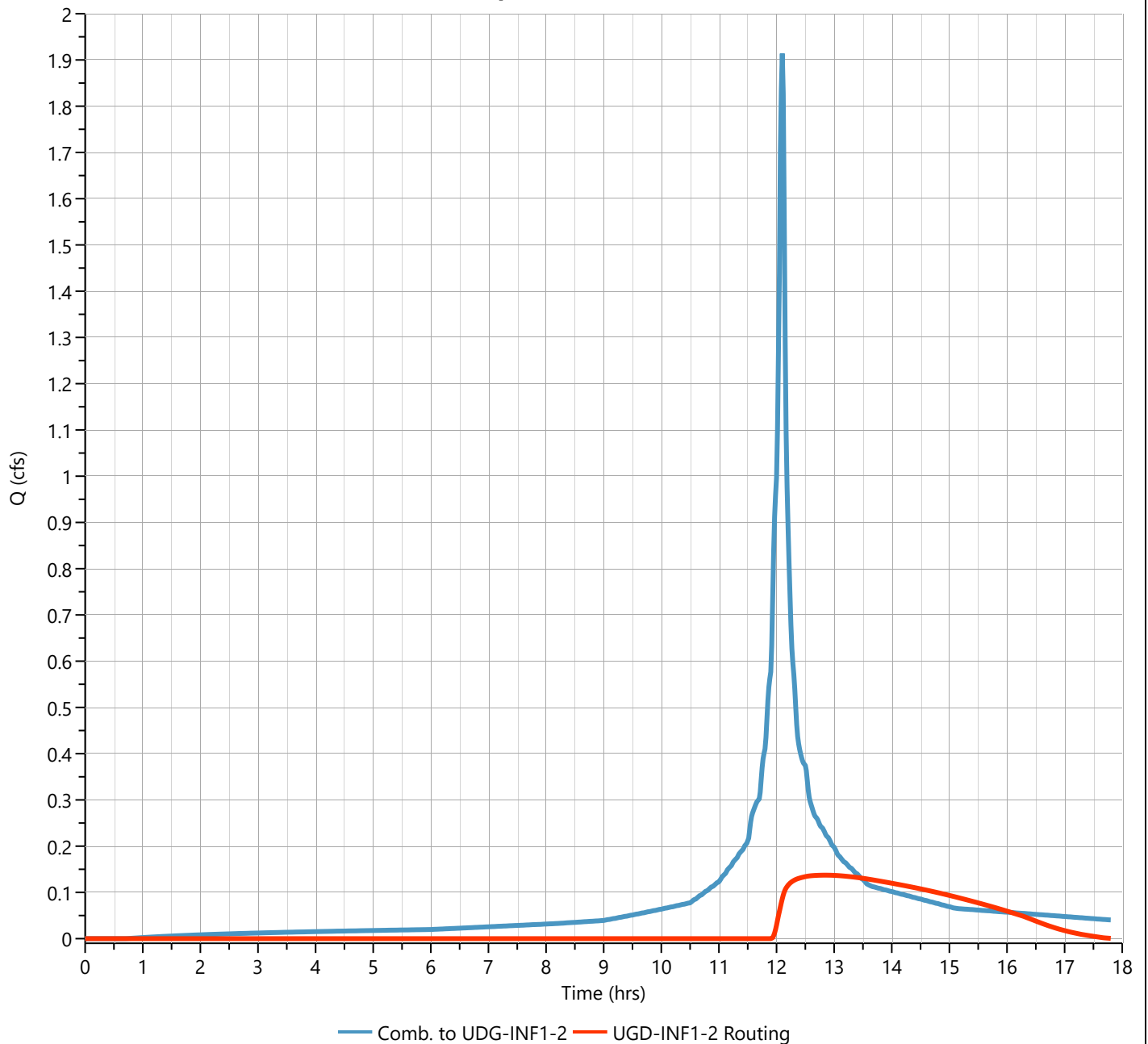
### Hyd. No. 20

|                   |                            |                   |              |
|-------------------|----------------------------|-------------------|--------------|
| Hydrograph Type   | = Pond Route               | Peak Flow         | = 0.137 cfs  |
| Storm Frequency   | = 10-yr                    | Time to Peak      | = 12.85 hrs  |
| Time Interval     | = 1 min                    | Hydrograph Volume | = 1,736 cuft |
| Inflow Hydrograph | = 18 - Comb. to UDG-INF1-2 | Max. Elevation    | = 345.35 ft  |
| Pond Name         | = UGD-INF1-2               | Max. Storage      | = 2,118 cuft |

Pond Routing by Storage Indication Method

Center of mass detention time = 1.11 hrs

**Qp = 0.137 cfs**



# Hydrograph Report

Hydrology Studio v 3.0.0.38

File: Current Beacon Church Proposed - POA-1 & POA-3.hys

07-01-2025

## UGD-INF1-2 Routing

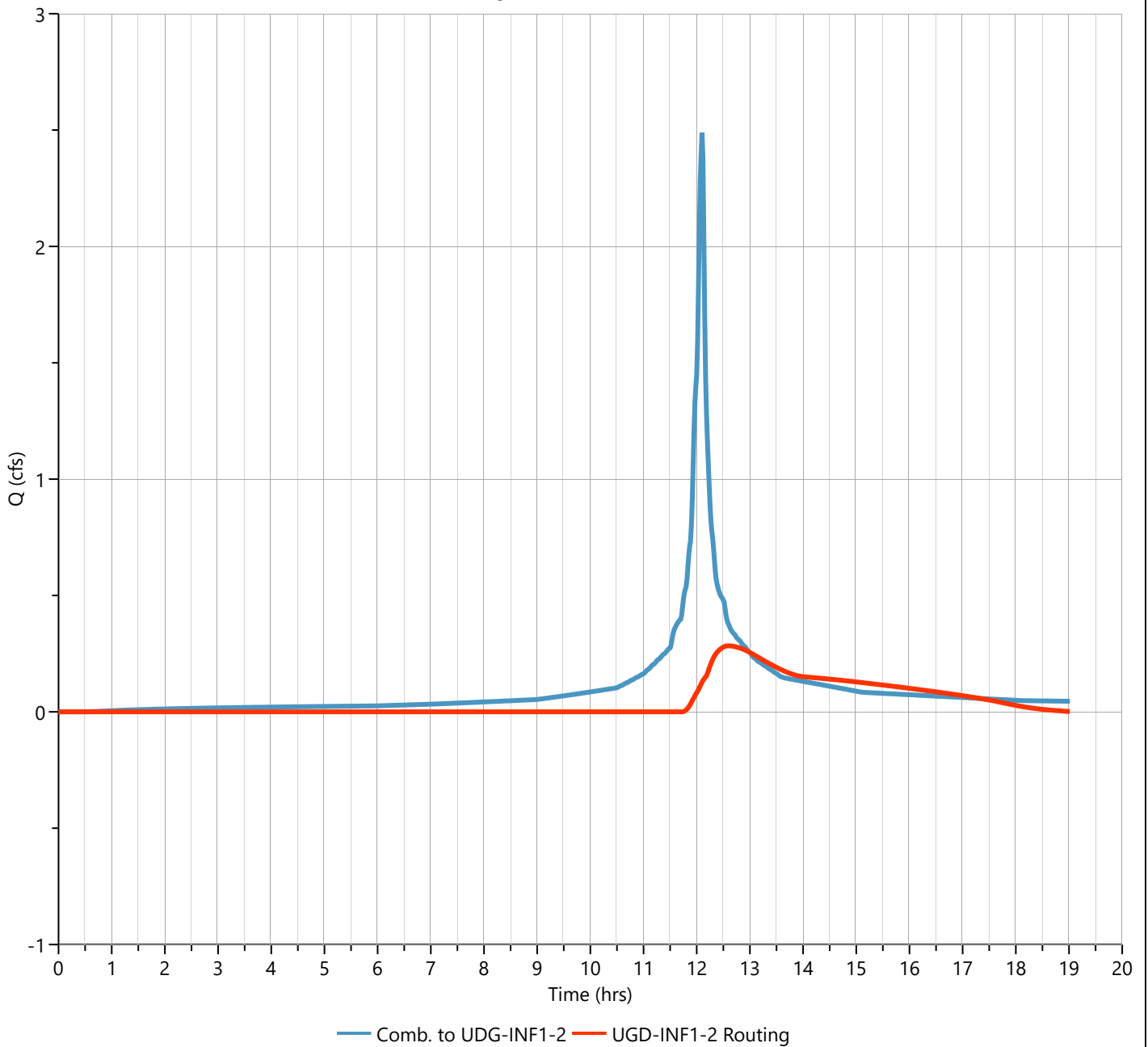
### Hyd. No. 20

|                   |                            |                   |              |
|-------------------|----------------------------|-------------------|--------------|
| Hydrograph Type   | = Pond Route               | Peak Flow         | = 0.284 cfs  |
| Storm Frequency   | = 25-yr                    | Time to Peak      | = 12.60 hrs  |
| Time Interval     | = 1 min                    | Hydrograph Volume | = 3,022 cuft |
| Inflow Hydrograph | = 18 - Comb. to UDG-INF1-2 | Max. Elevation    | = 345.76 ft  |
| Pond Name         | = UGD-INF1-2               | Max. Storage      | = 2,880 cuft |

Pond Routing by Storage Indication Method

Center of mass detention time = 1.36 hrs

**Qp = 0.284 cfs**



# Hydrograph Report

Hydrology Studio v 3.0.0.38

File: Current Beacon Church Proposed - POA-1 & POA-3.hys

07-01-2025

## UGD-INF1-2 Routing

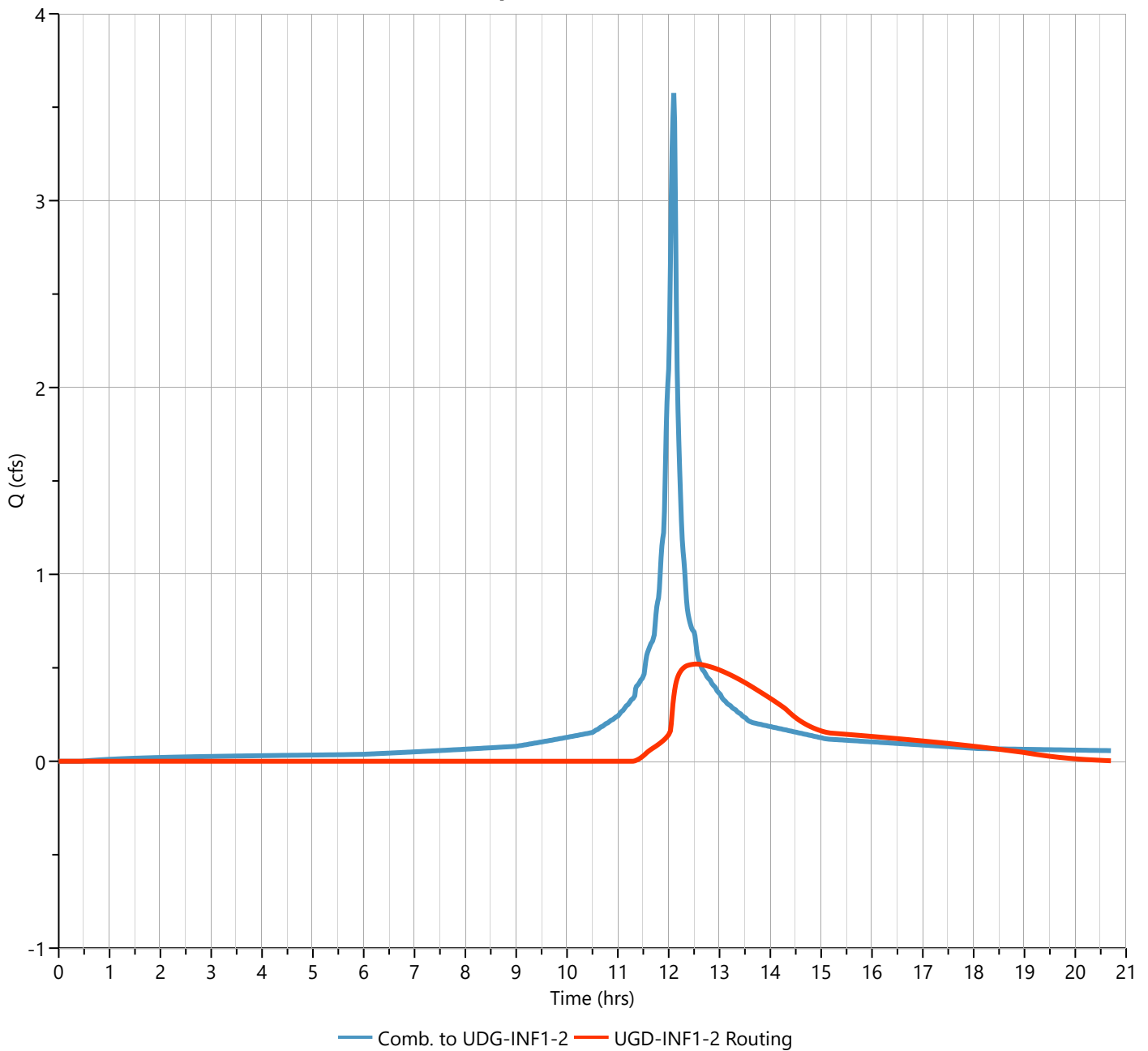
### Hyd. No. 20

|                   |                            |                   |              |
|-------------------|----------------------------|-------------------|--------------|
| Hydrograph Type   | = Pond Route               | Peak Flow         | = 0.520 cfs  |
| Storm Frequency   | = 100-yr                   | Time to Peak      | = 12.53 hrs  |
| Time Interval     | = 1 min                    | Hydrograph Volume | = 5,863 cuft |
| Inflow Hydrograph | = 18 - Comb. to UDG-INF1-2 | Max. Elevation    | = 346.57 ft  |
| Pond Name         | = UGD-INF1-2               | Max. Storage      | = 4,315 cuft |

Pond Routing by Storage Indication Method

Center of mass detention time = 1.45 hrs

**Qp = 0.520 cfs**



## **PR-2A WATERSHED POND ROUTING**



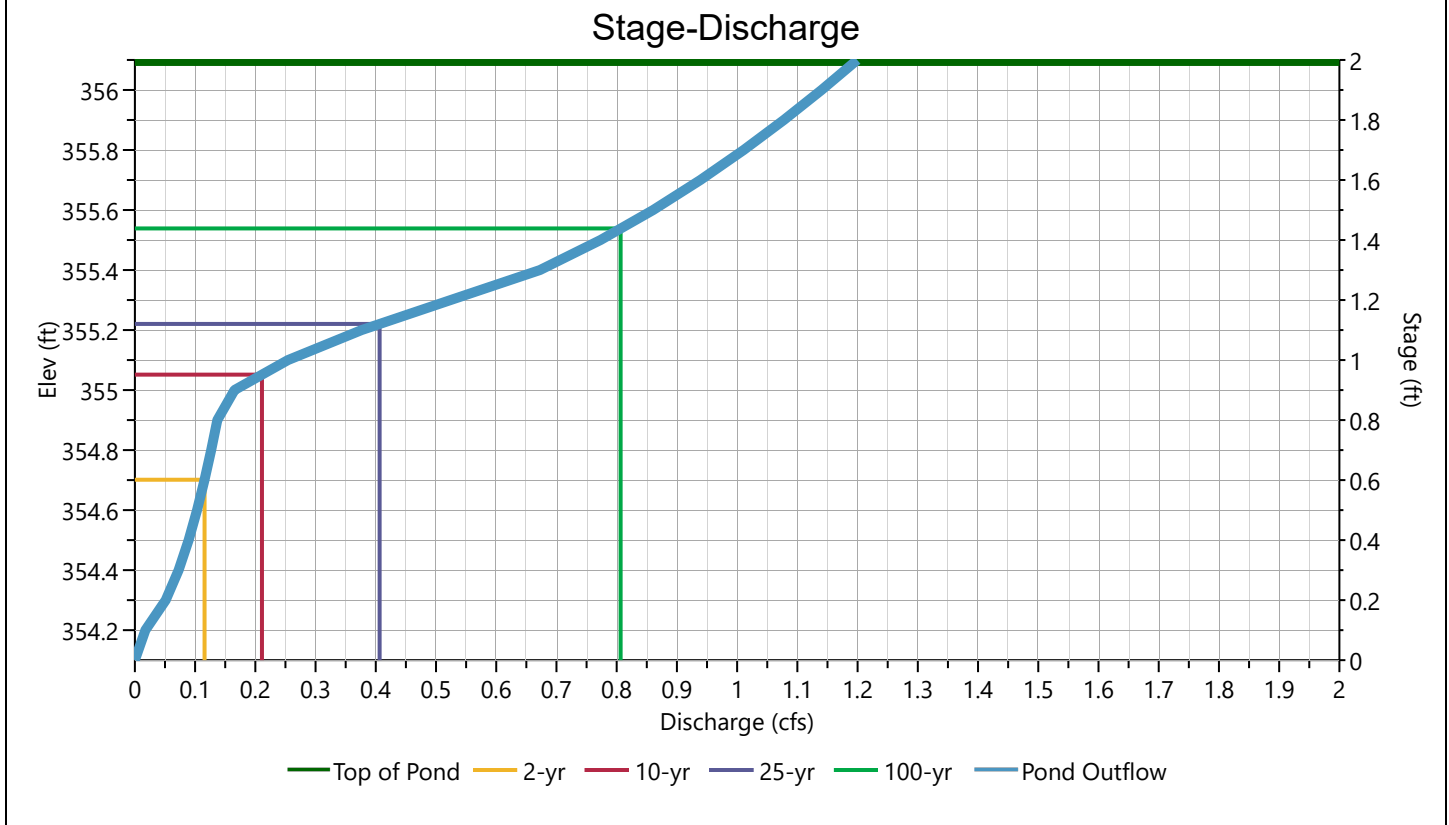
# Pond Report

## Porous Pavement System 1

## Stage-Discharge

| Culvert / Orifices      | Cir Culvert | Orifice |        |   | Perforated Riser        |
|-------------------------|-------------|---------|--------|---|-------------------------|
|                         |             | 1 (i)   | 2 (i)  | 3 |                         |
| Rise, in                |             | 2.5     | 5      |   | Hole Diameter, in       |
| Span, in                |             | 2.5     | 6      |   | No. holes               |
| No. Barrels             |             | 1       | 1      |   | Invert Elevation, ft    |
| Invert Elevation, ft    |             | 354.10  | 354.95 |   | Height, ft              |
| Orifice Coefficient, Co |             | 0.60    | 0.60   |   | Orifice Coefficient, Co |
| Length, ft              |             |         |        |   |                         |
| Barrel Slope, %         |             |         |        |   |                         |
| N-Value, n              |             |         |        |   |                         |
| Weirs                   | Riser       | Weir    |        |   | Ancillary               |
| Shape / Type            |             | 1       | 2      | 3 | Exfiltration, in/hr     |
| Crest Elevation, ft     |             |         |        |   |                         |
| Crest Length, ft        |             |         |        |   |                         |
| Angle, deg              |             |         |        |   |                         |
| Weir Coefficient, Cw    |             |         |        |   |                         |

*m = Flows through Culvert, i = Independent*



# Hydrograph Report

Hydrology Studio v 3.0.0.38

File: Current Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2A Routing

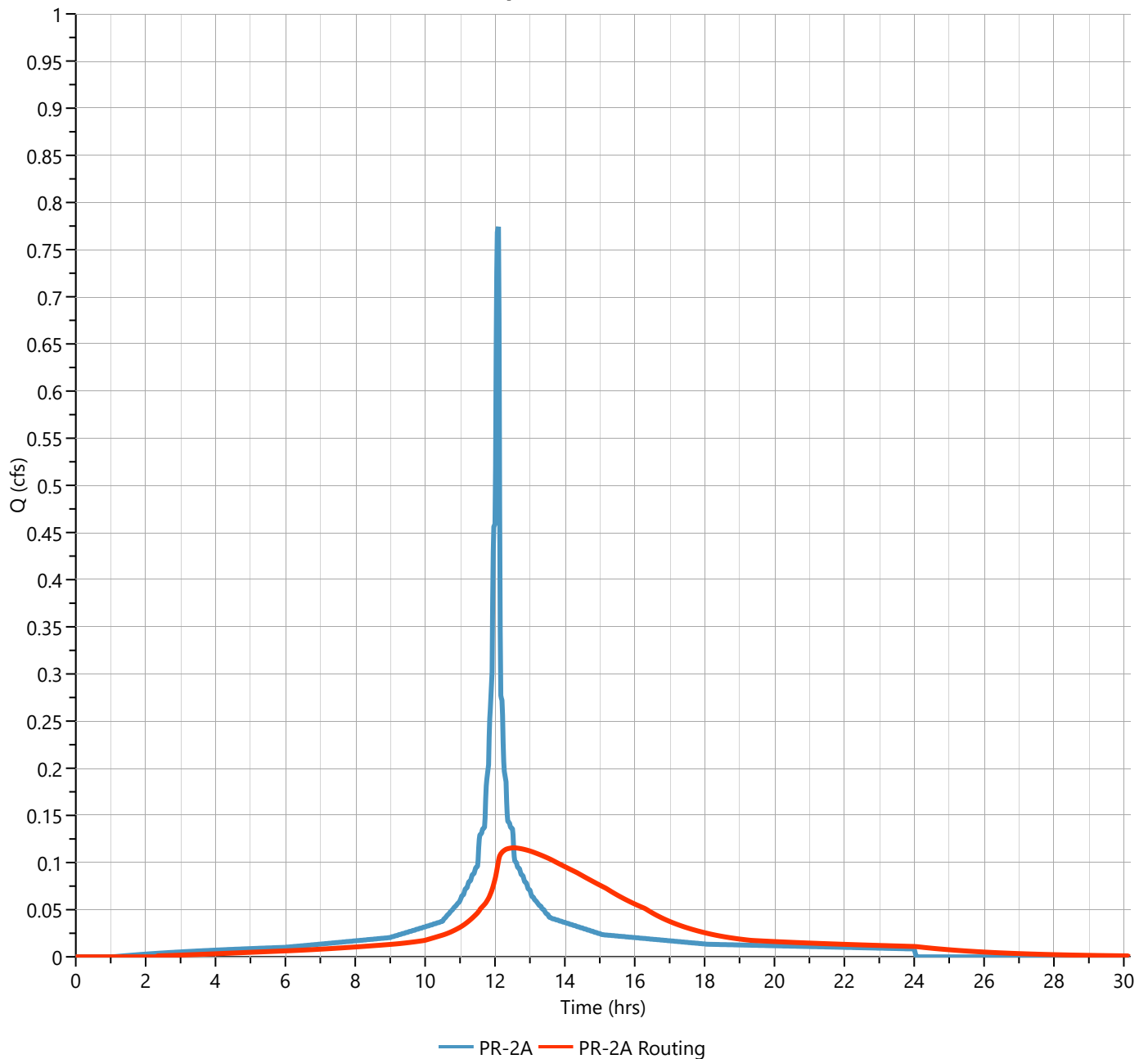
### Hyd. No. 4

|                   |                            |                   |              |
|-------------------|----------------------------|-------------------|--------------|
| Hydrograph Type   | = Pond Route               | Peak Flow         | = 0.116 cfs  |
| Storm Frequency   | = 2-yr                     | Time to Peak      | = 12.53 hrs  |
| Time Interval     | = 1 min                    | Hydrograph Volume | = 2,495 cuft |
| Inflow Hydrograph | = 3 - PR-2A                | Max. Elevation    | = 354.70 ft  |
| Pond Name         | = Porous Pavement System 1 | Max. Storage      | = 963 cuft   |

Pond Routing by Storage Indication Method

Center of mass detention time = 2.09 hrs

**Qp = 0.116 cfs**



# Hydrograph Report

Hydrology Studio v 3.0.0.38

File: Current Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2A Routing

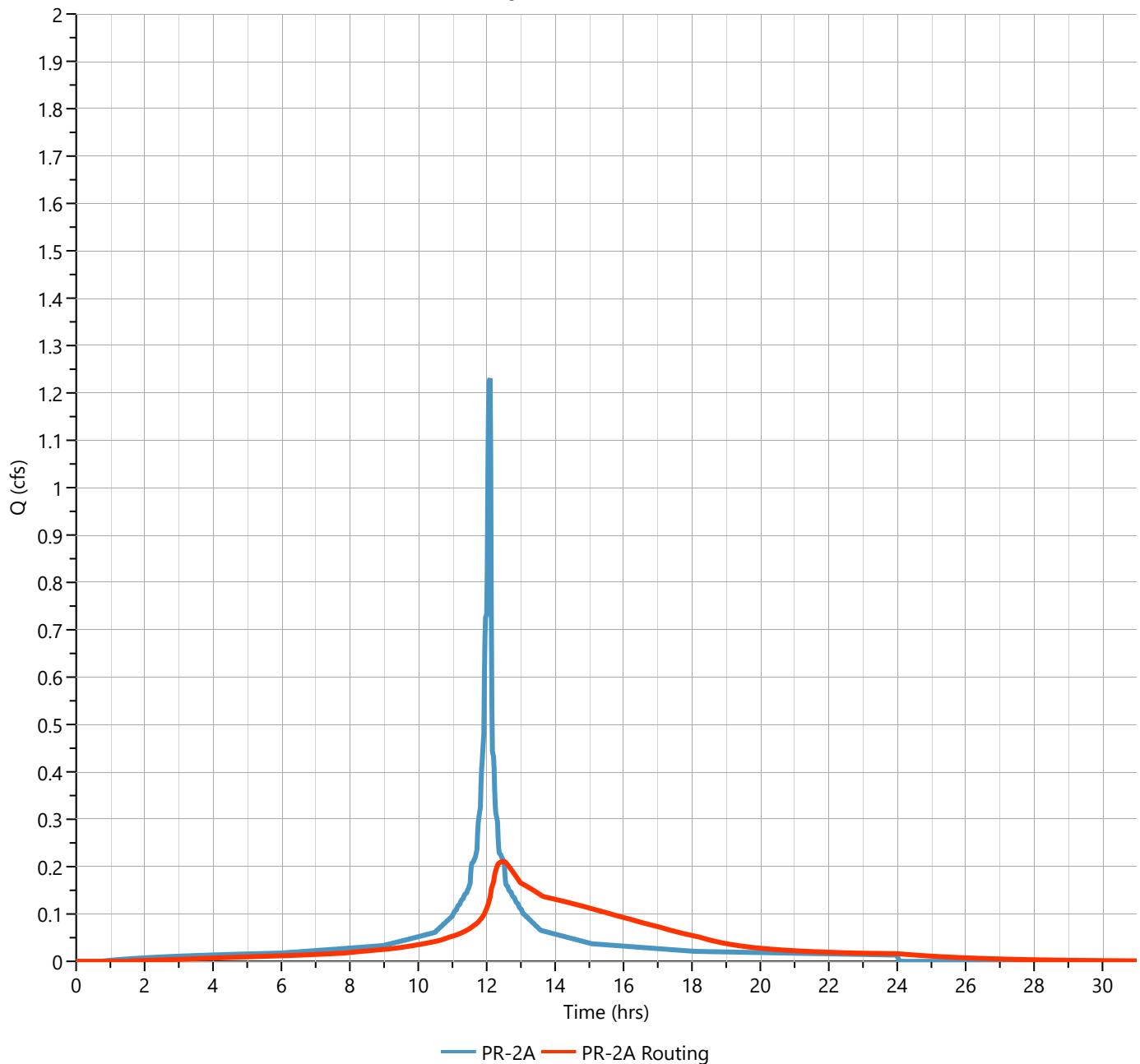
### Hyd. No. 4

|                   |                            |                   |              |
|-------------------|----------------------------|-------------------|--------------|
| Hydrograph Type   | = Pond Route               | Peak Flow         | = 0.211 cfs  |
| Storm Frequency   | = 10-yr                    | Time to Peak      | = 12.50 hrs  |
| Time Interval     | = 1 min                    | Hydrograph Volume | = 4,035 cuft |
| Inflow Hydrograph | = 3 - PR-2A                | Max. Elevation    | = 355.05 ft  |
| Pond Name         | = Porous Pavement System 1 | Max. Storage      | = 1,524 cuft |

Pond Routing by Storage Indication Method

Center of mass detention time = 2.12 hrs

**Qp = 0.211 cfs**





# Hydrograph Report

Hydrology Studio v 3.0.0.38

File: Current Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2A Routing

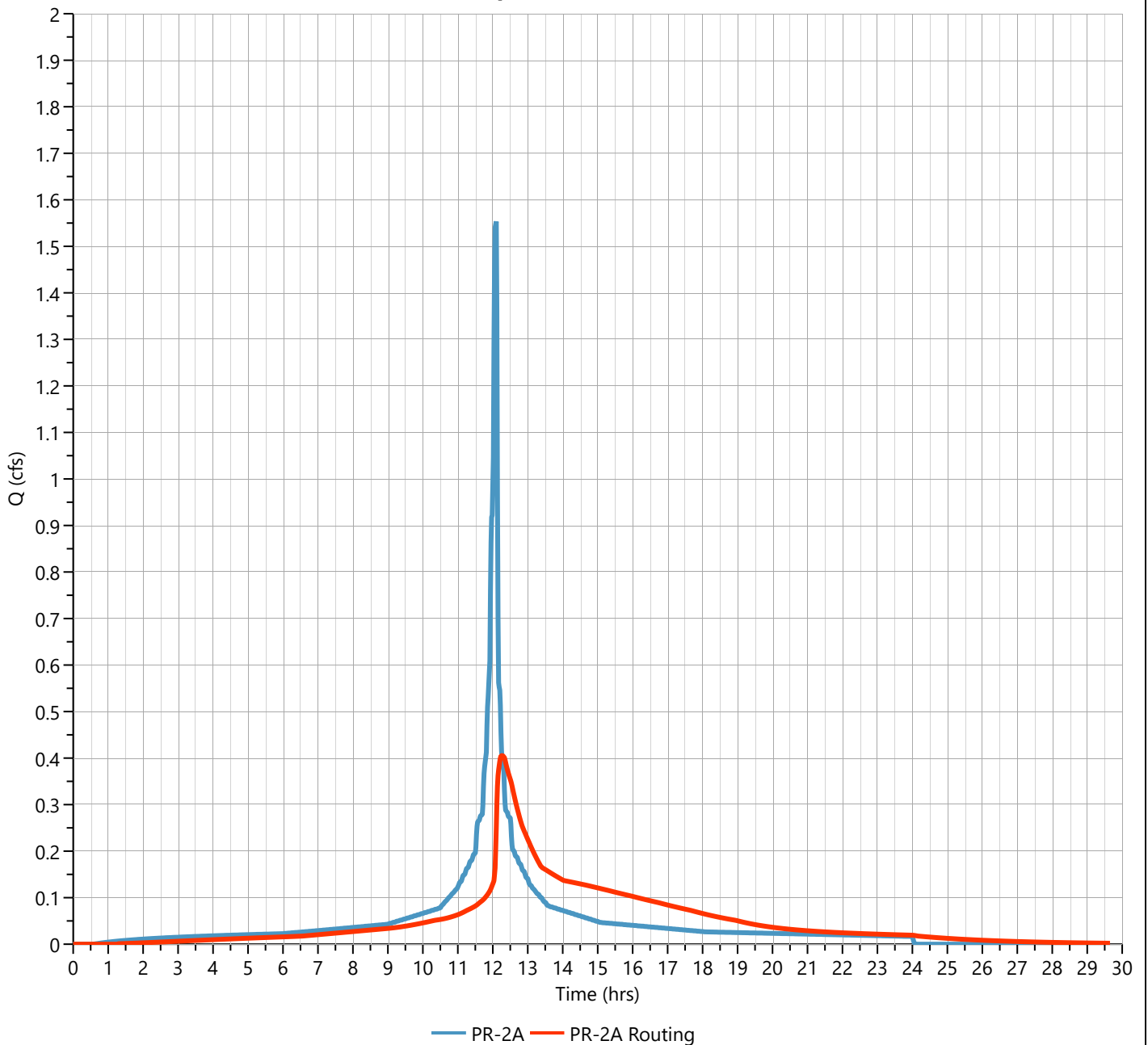
### Hyd. No. 4

|                   |                            |                   |              |
|-------------------|----------------------------|-------------------|--------------|
| Hydrograph Type   | = Pond Route               | Peak Flow         | = 0.406 cfs  |
| Storm Frequency   | = 25-yr                    | Time to Peak      | = 12.25 hrs  |
| Time Interval     | = 1 min                    | Hydrograph Volume | = 5,127 cuft |
| Inflow Hydrograph | = 3 - PR-2A                | Max. Elevation    | = 355.22 ft  |
| Pond Name         | = Porous Pavement System 1 | Max. Storage      | = 1,795 cuft |

Pond Routing by Storage Indication Method

Center of mass detention time = 1.91 hrs

**Qp = 0.406 cfs**



# Hydrograph Report

Hydrology Studio v 3.0.0.38

File: Current Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2A Routing

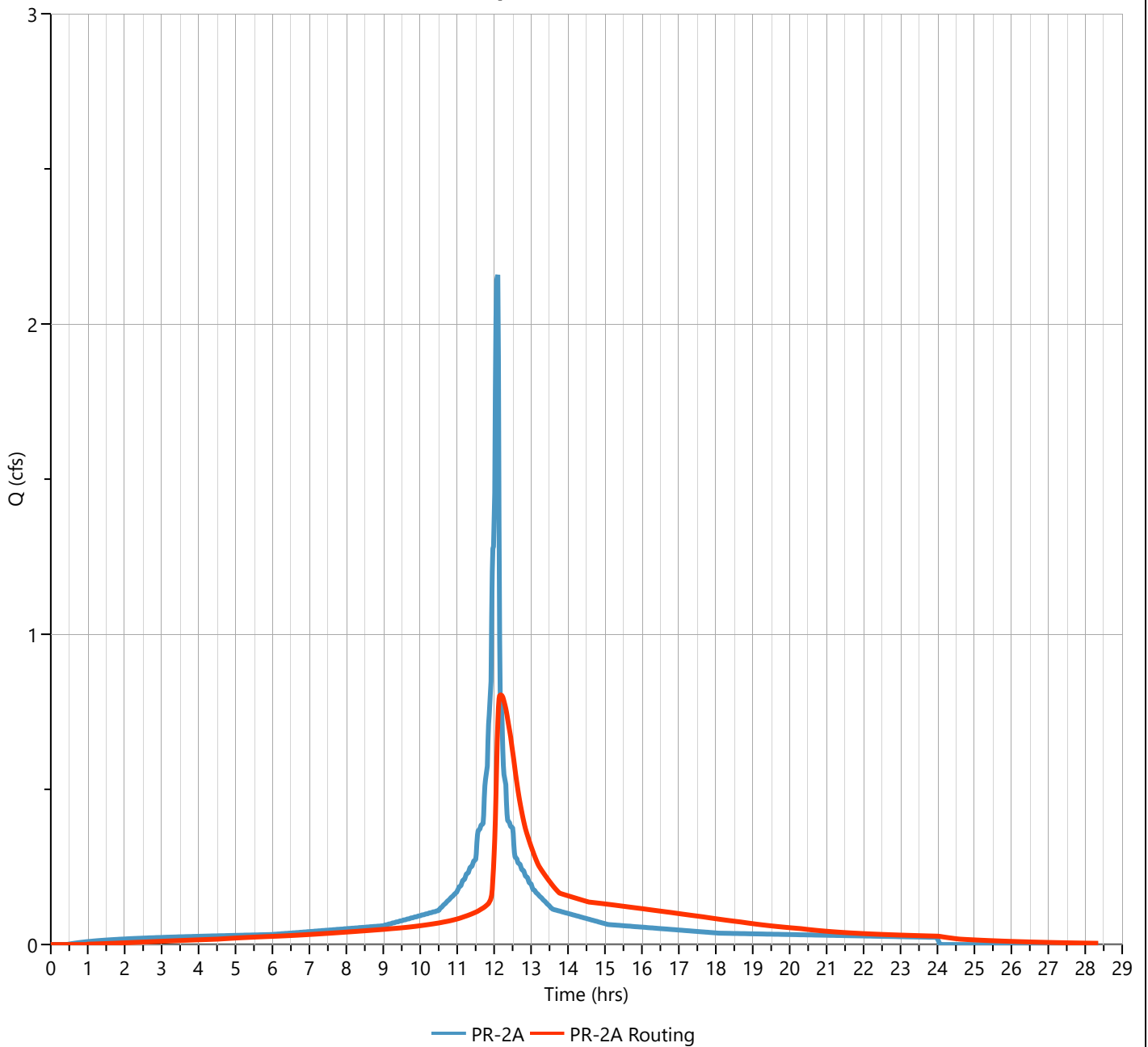
## Hyd. No. 4

|                   |                            |                   |              |
|-------------------|----------------------------|-------------------|--------------|
| Hydrograph Type   | = Pond Route               | Peak Flow         | = 0.807 cfs  |
| Storm Frequency   | = 100-yr                   | Time to Peak      | = 12.17 hrs  |
| Time Interval     | = 1 min                    | Hydrograph Volume | = 7,184 cuft |
| Inflow Hydrograph | = 3 - PR-2A                | Max. Elevation    | = 355.54 ft  |
| Pond Name         | = Porous Pavement System 1 | Max. Storage      | = 2,305 cuft |

Pond Routing by Storage Indication Method

Center of mass detention time = 1.64 hrs

**Qp = 0.807 cfs**



## **PR-2C WATERSHED POND ROUTING**

# Pond Report

Project Name:

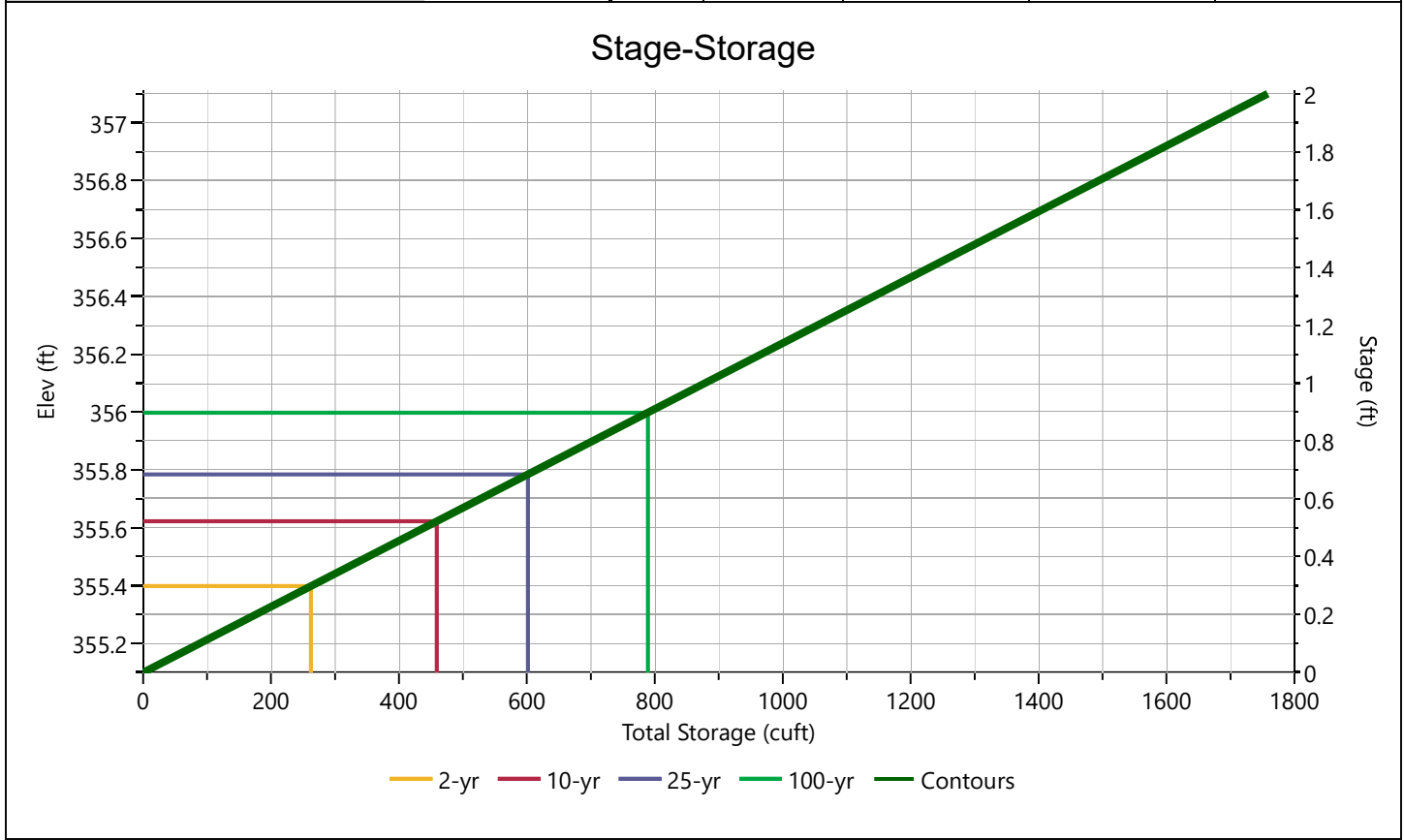
Hydrology Studio v 3.0.0.31

02-08-2024

## Porous Pavement System 2

## 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  | 355.10       | 0.00                  | 355.10         | 2,198               | 0.000                | 0.000                |
| Voids (%)             | 40.00        | 1.00                  | 356.10         | 2,198               | 879                  | 879                  |
| Volume Calc           | Ave End Area | 2.00                  | 357.10         | 2,198               | 879                  | 1,758                |
|                       |              |                       |                |                     |                      |                      |
|                       |              |                       |                |                     |                      |                      |
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# Pond Report

Project Name:

Hydrology Studio v 3.0.0.31

02-08-2024

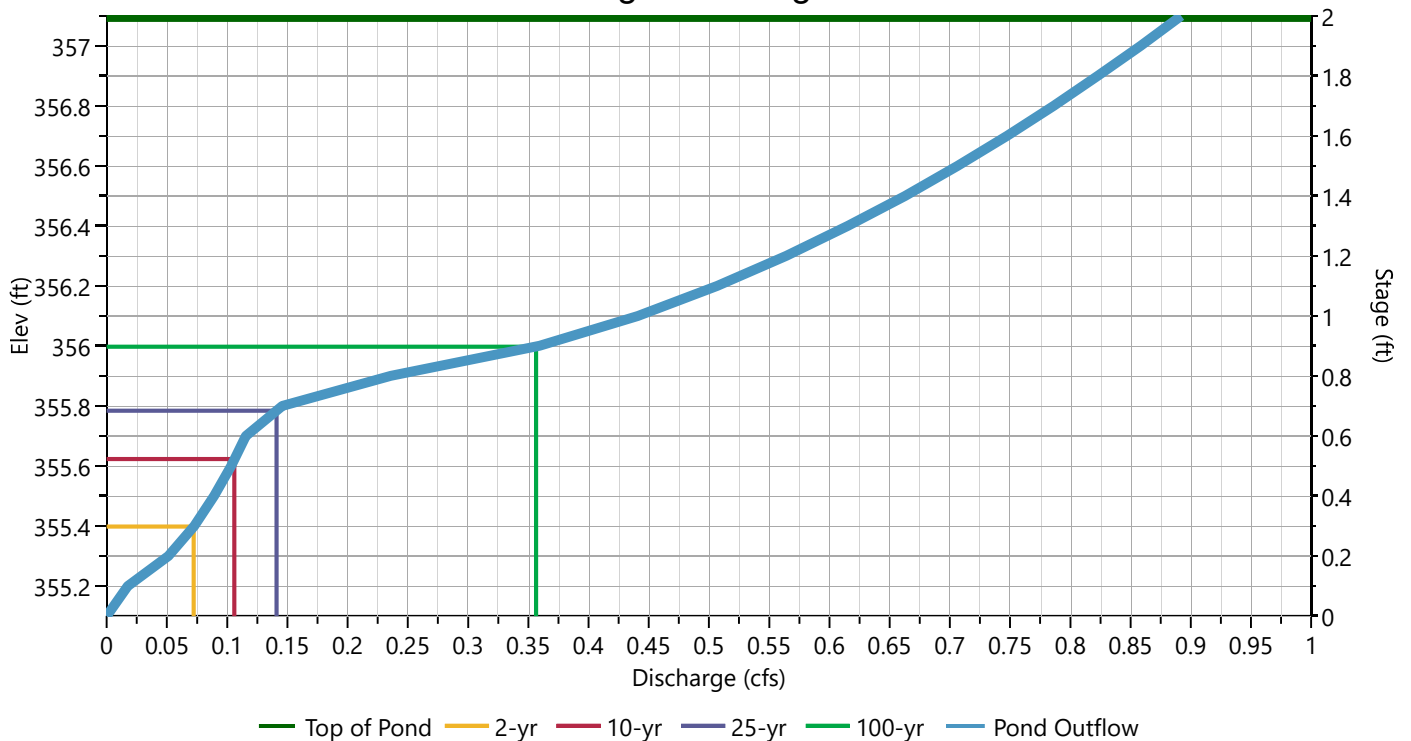
## Porous Pavement System 2

## Stage-Discharge

| Culvert / Orifices      | Culvert | Orifices |        |   | Perforated Riser        |
|-------------------------|---------|----------|--------|---|-------------------------|
|                         |         | 1        | 2      | 3 |                         |
| Rise, in                |         | 2.5      | 3      |   | Hole Diameter, in       |
| Span, in                |         | 2.5      | 6      |   | No. holes               |
| No. Barrels             |         | 1        | 1      |   | Invert Elevation, ft    |
| Invert Elevation, ft    |         | 355.10   | 355.75 |   | Height, ft              |
| Orifice Coefficient, Co |         | 0.60     | 0.60   |   | 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     |         |          |        |   |                         |
| Crest Length, ft        |         |          |        |   |                         |
| Angle, deg              |         |          |        |   |                         |
| Weir Coefficient, Cw    |         |          |        |   |                         |

\*Routes through Culvert.

### Stage-Discharge



# Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2C Routing

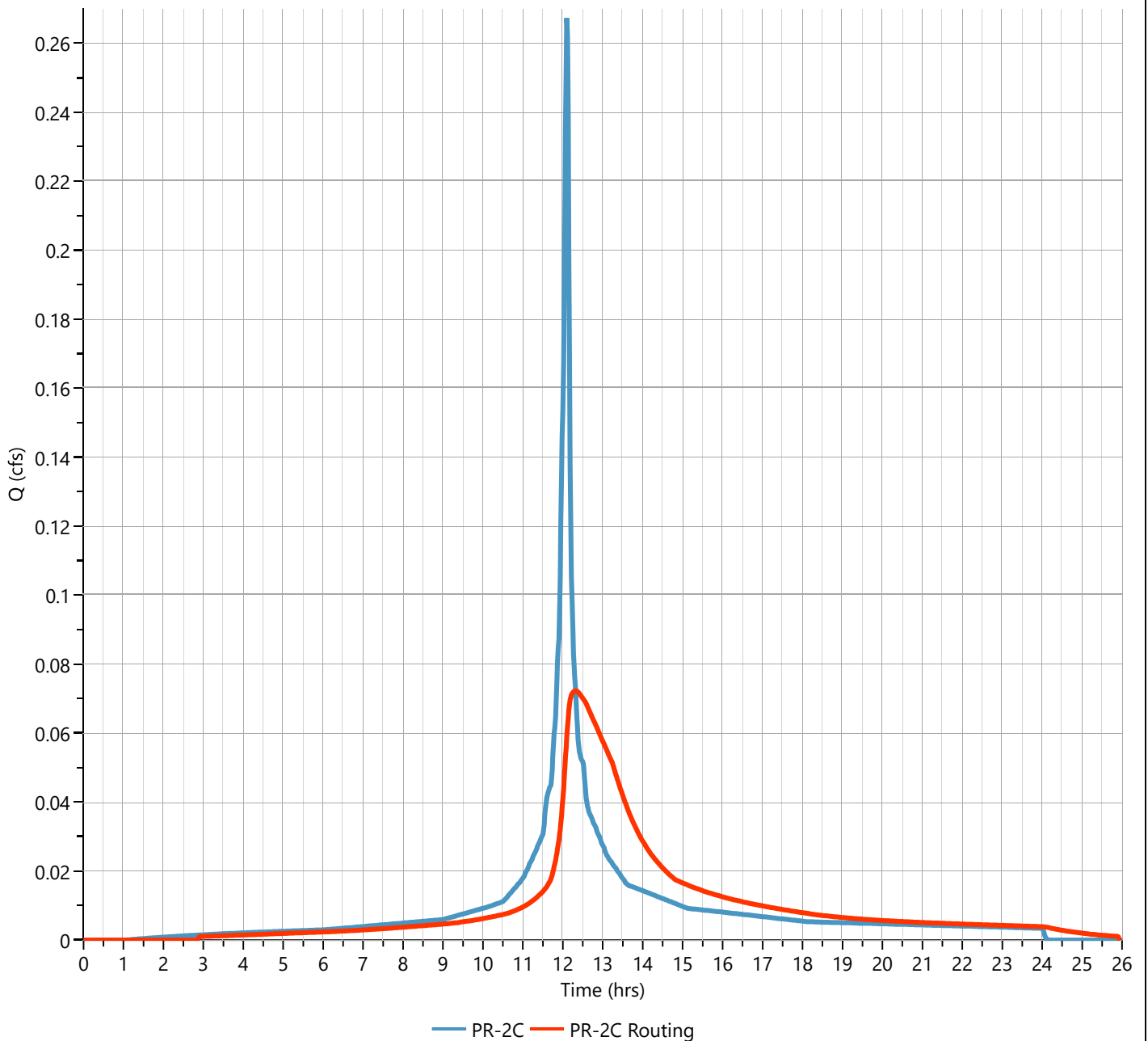
## Hyd. No. 15

|                   |                            |                   |             |
|-------------------|----------------------------|-------------------|-------------|
| Hydrograph Type   | = Pond Route               | Peak Flow         | = 0.072 cfs |
| Storm Frequency   | = 2-yr                     | Time to Peak      | = 12.32 hrs |
| Time Interval     | = 1 min                    | Hydrograph Volume | = 879 cuft  |
| Inflow Hydrograph | = 13 - PR-2C               | Max. Elevation    | = 355.40 ft |
| Pond Name         | = Porous Pavement System 2 | Max. Storage      | = 262 cuft  |

*Pond Routing by Storage Indication Method*

*Center of mass detention time = 1.14 hrs*

**Qp = 0.07 cfs**



# Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2C Routing

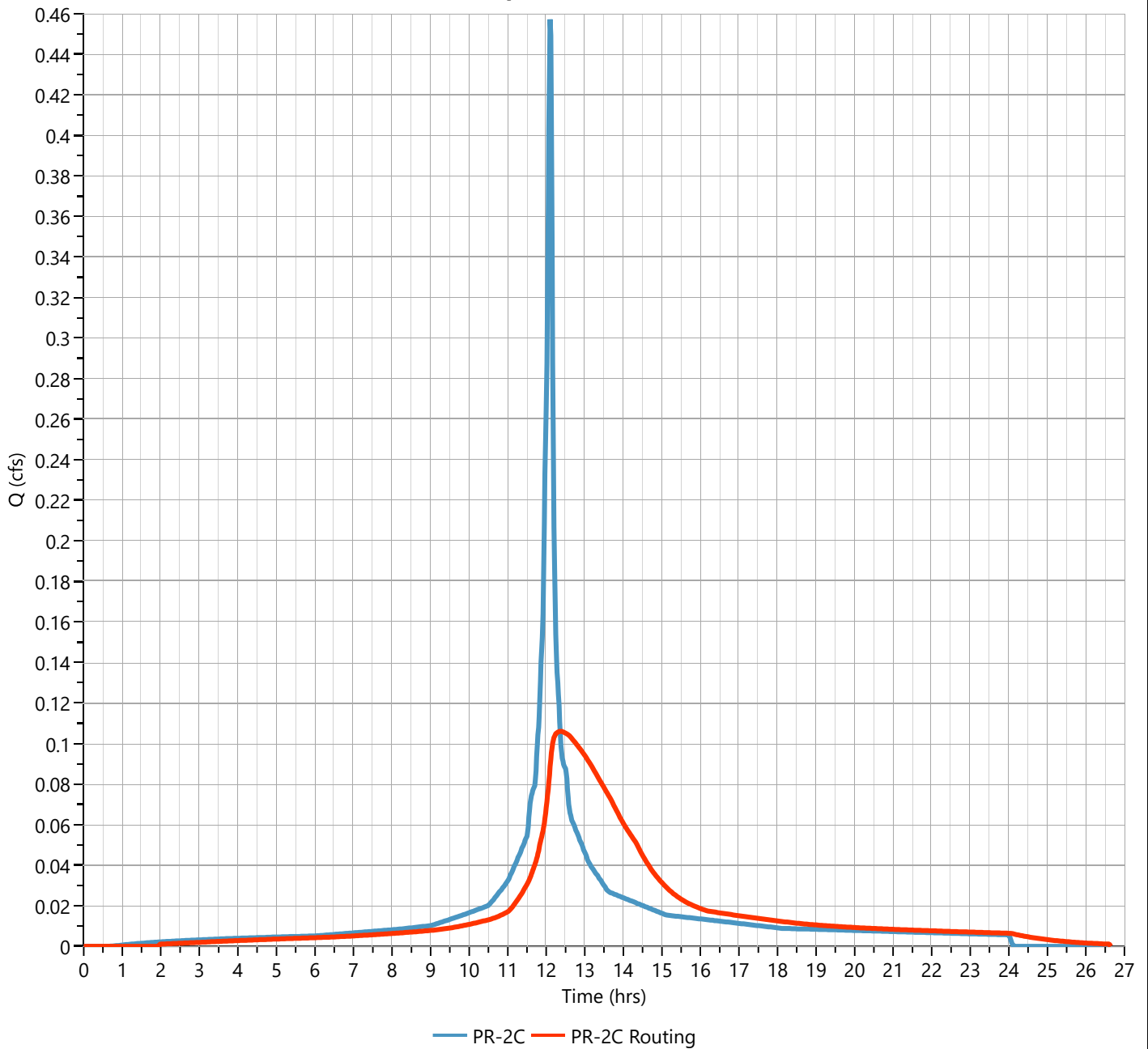
## Hyd. No. 15

|                   |                            |                   |              |
|-------------------|----------------------------|-------------------|--------------|
| Hydrograph Type   | = Pond Route               | Peak Flow         | = 0.106 cfs  |
| Storm Frequency   | = 10-yr                    | Time to Peak      | = 12.37 hrs  |
| Time Interval     | = 1 min                    | Hydrograph Volume | = 1,515 cuft |
| Inflow Hydrograph | = 13 - PR-2C               | Max. Elevation    | = 355.62 ft  |
| Pond Name         | = Porous Pavement System 2 | Max. Storage      | = 459 cuft   |

Pond Routing by Storage Indication Method

Center of mass detention time = 1.16 hrs

**Qp = 0.11 cfs**



# Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2C Routing

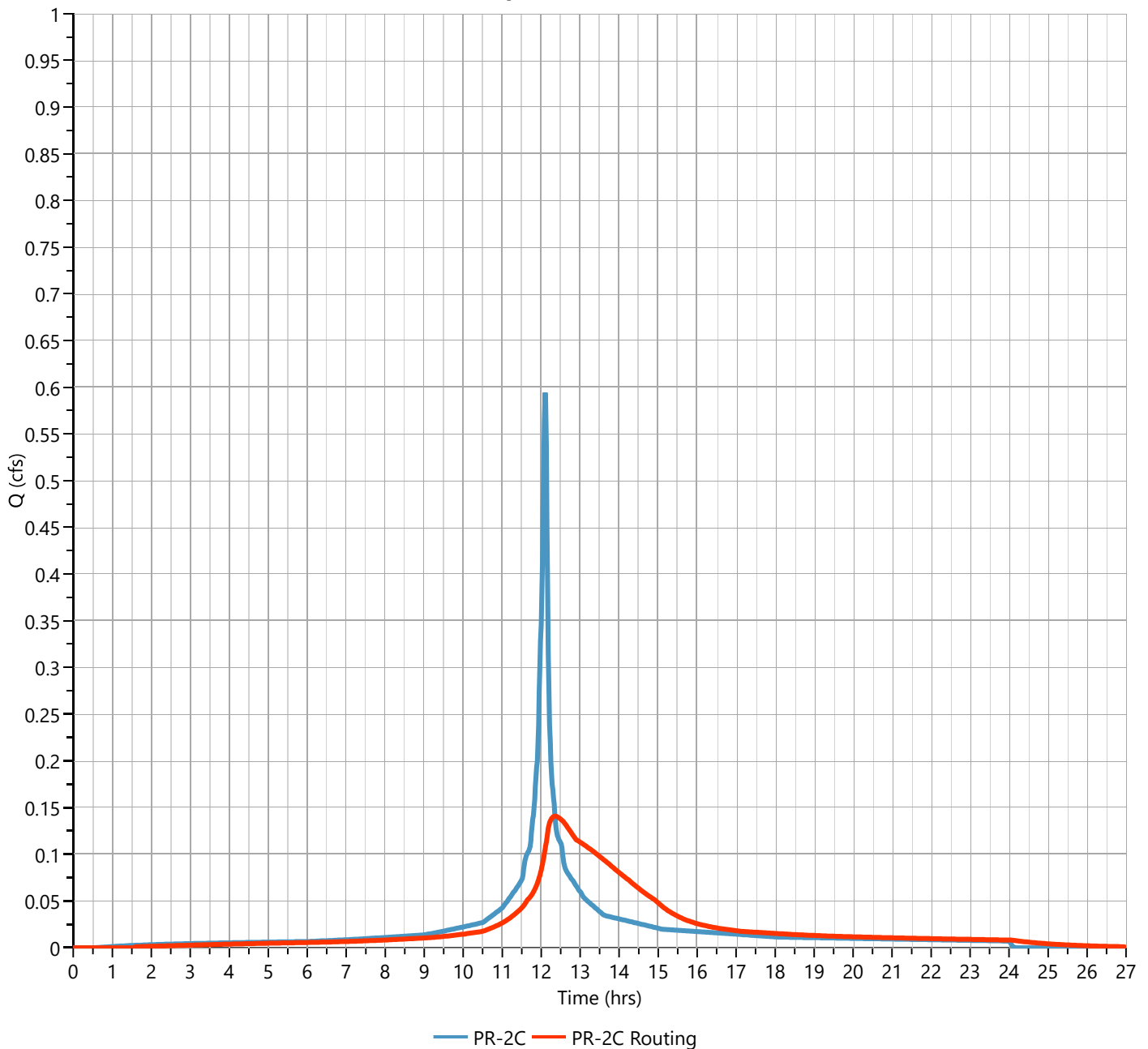
## Hyd. No. 15

|                   |                            |                   |              |
|-------------------|----------------------------|-------------------|--------------|
| Hydrograph Type   | = Pond Route               | Peak Flow         | = 0.141 cfs  |
| Storm Frequency   | = 25-yr                    | Time to Peak      | = 12.35 hrs  |
| Time Interval     | = 1 min                    | Hydrograph Volume | = 1,979 cuft |
| Inflow Hydrograph | = 13 - PR-2C               | Max. Elevation    | = 355.78 ft  |
| Pond Name         | = Porous Pavement System 2 | Max. Storage      | = 602 cuft   |

*Pond Routing by Storage Indication Method*

*Center of mass detention time = 1.16 hrs*

**Qp = 0.14 cfs**





# Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2C Routing

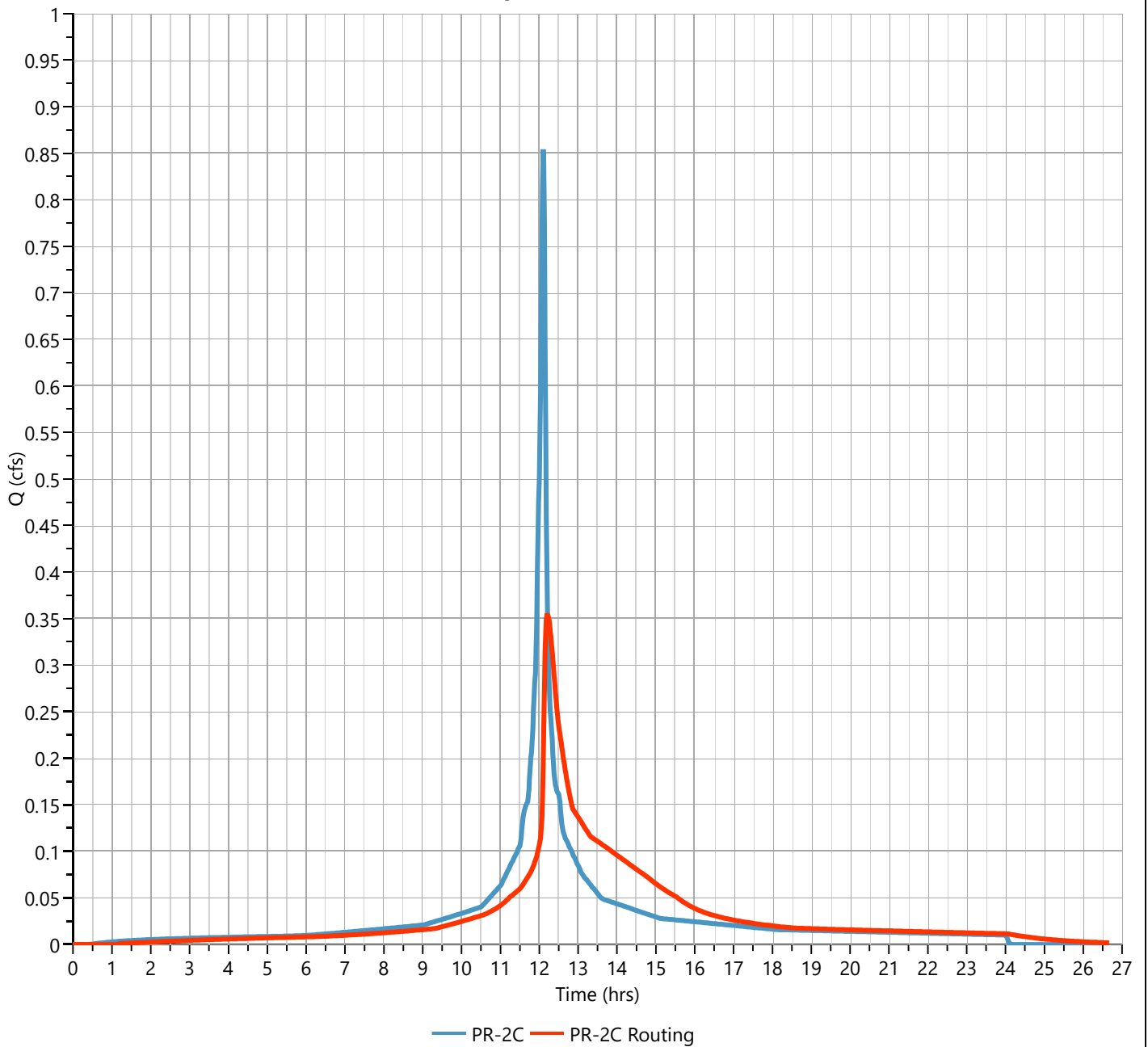
## Hyd. No. 15

|                   |                            |                   |              |
|-------------------|----------------------------|-------------------|--------------|
| Hydrograph Type   | = Pond Route               | Peak Flow         | = 0.356 cfs  |
| Storm Frequency   | = 100-yr                   | Time to Peak      | = 12.22 hrs  |
| Time Interval     | = 1 min                    | Hydrograph Volume | = 2,868 cuft |
| Inflow Hydrograph | = 13 - PR-2C               | Max. Elevation    | = 356.00 ft  |
| Pond Name         | = Porous Pavement System 2 | Max. Storage      | = 789 cuft   |

Pond Routing by Storage Indication Method

Center of mass detention time = 1.02 hrs

**Qp = 0.36 cfs**



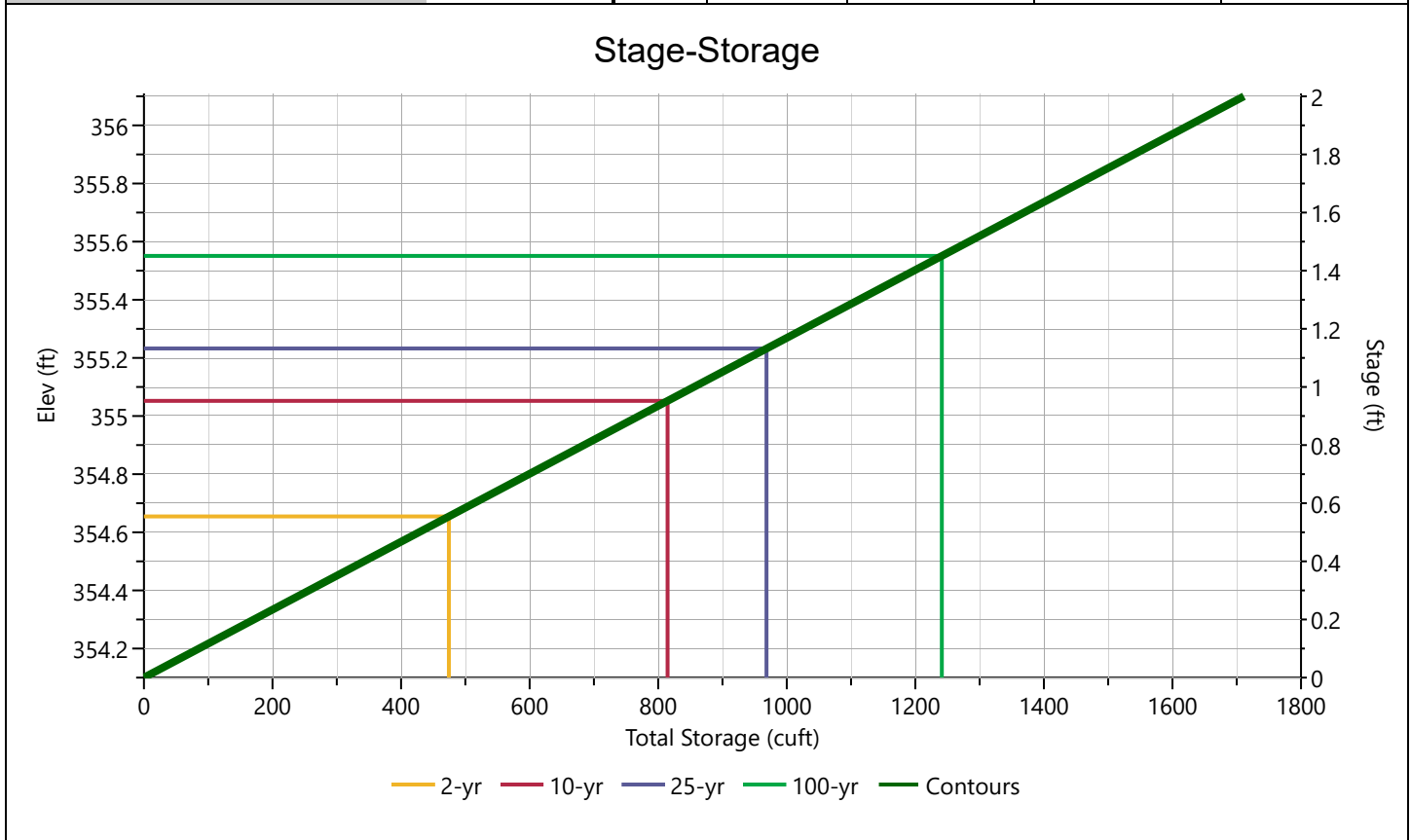
## **PR-2B + PR-2H WATERSHED POND ROUTING**

# Pond Report

## Porous Pavement System 3

## 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  | 354.10       | 0.00                  | 354.10         | 2,139               | 0.000                | 0.000                |
| Voids (%)             | 40.00        | 1.00                  | 355.10         | 2,139               | 856                  | 856                  |
| Volume Calc           | Ave End Area | 2.00                  | 356.10         | 2,139               | 856                  | 1,711                |
|                       |              |                       |                |                     |                      |                      |
|                       |              |                       |                |                     |                      |                      |
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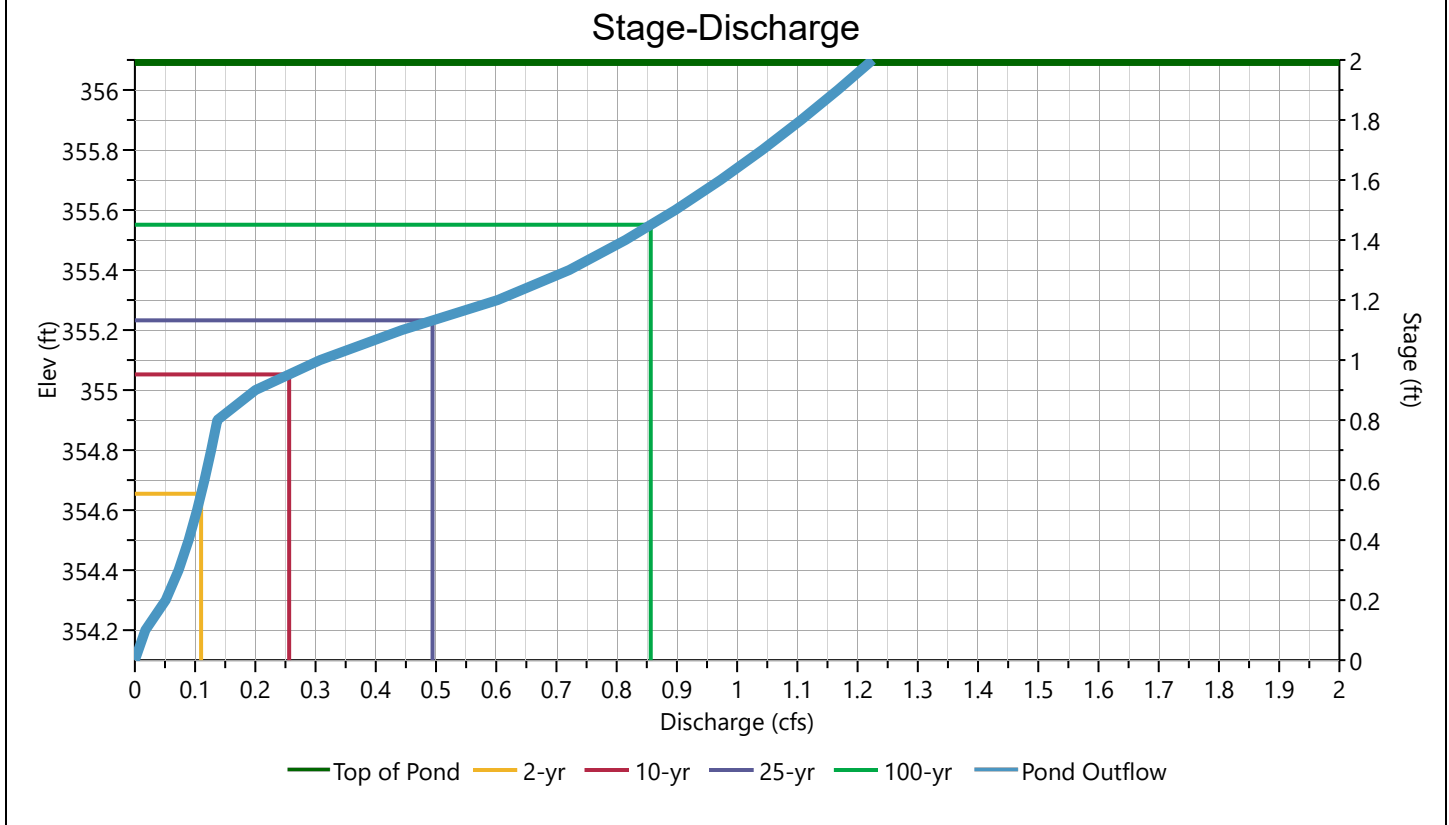
# Pond Report

## Porous Pavement System 3

## Stage-Discharge

| Culvert / Orifices      | Cir Culvert | Orifice |        |   | Perforated Riser        |
|-------------------------|-------------|---------|--------|---|-------------------------|
|                         |             | 1 (i)   | 2 (i)  | 3 |                         |
| Rise, in                |             | 2.5     | 5      |   | Hole Diameter, in       |
| Span, in                |             | 2.5     | 6      |   | No. holes               |
| No. Barrels             |             | 1       | 1      |   | Invert Elevation, ft    |
| Invert Elevation, ft    |             | 354.10  | 354.90 |   | Height, ft              |
| Orifice Coefficient, Co |             | 0.60    | 0.60   |   | Orifice Coefficient, Co |
| Length, ft              |             |         |        |   |                         |
| Barrel Slope, %         |             |         |        |   |                         |
| N-Value, n              |             |         |        |   |                         |
| Weirs                   | Riser       | Weir    |        |   | Ancillary               |
| Shape / Type            |             | 1       | 2      | 3 | Exfiltration, in/hr     |
| Crest Elevation, ft     |             |         |        |   |                         |
| Crest Length, ft        |             |         |        |   |                         |
| Angle, deg              |             |         |        |   |                         |
| Weir Coefficient, Cw    |             |         |        |   |                         |

*m = Flows through Culvert, i = Independent*



# Hydrograph Report

Hydrology Studio v 3.0.0.38

File: Current Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2B+PR-2H Routing

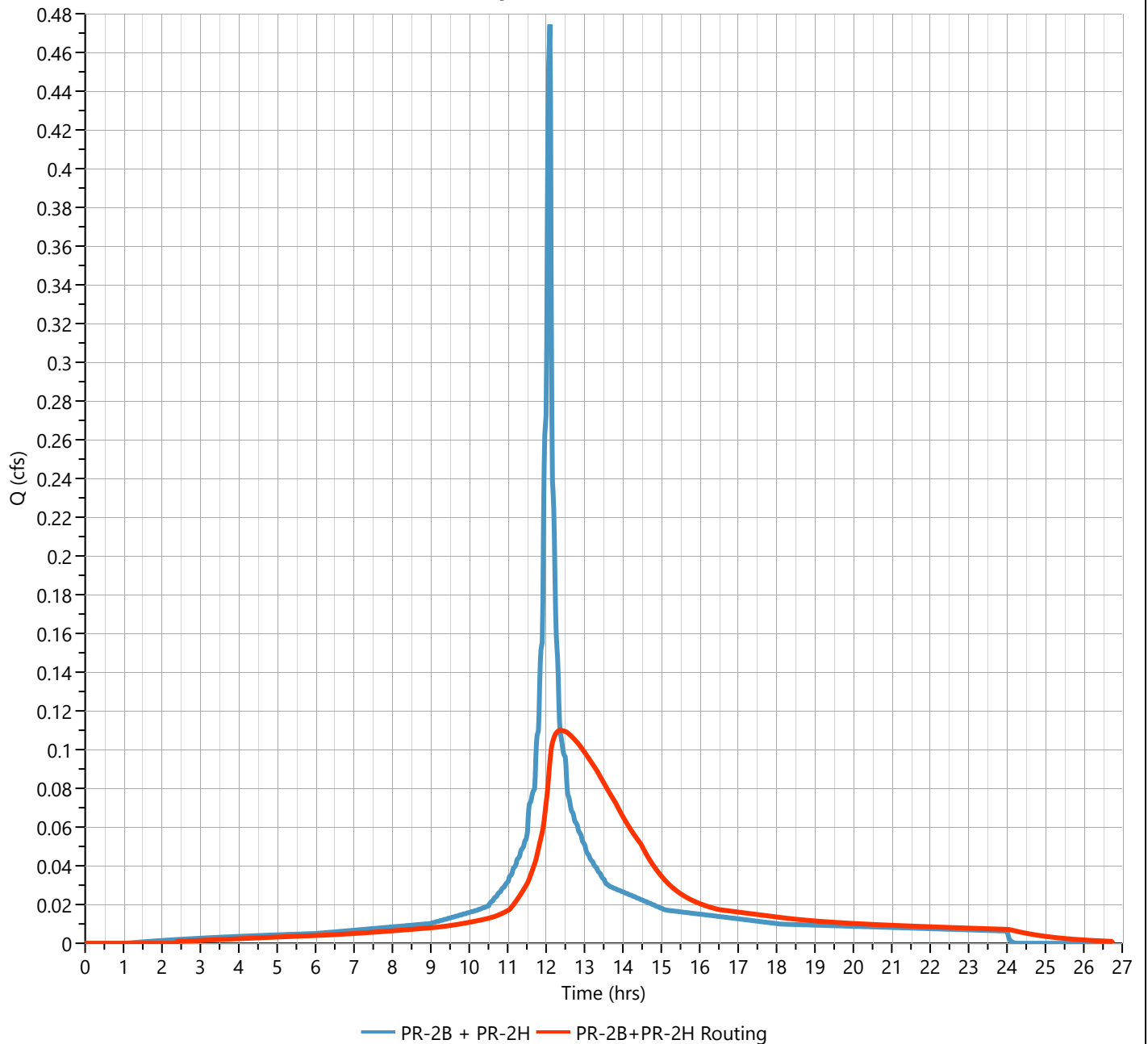
### Hyd. No. 39

|                   |                            |                   |              |
|-------------------|----------------------------|-------------------|--------------|
| Hydrograph Type   | = Pond Route               | Peak Flow         | = 0.110 cfs  |
| Storm Frequency   | = 2-yr                     | Time to Peak      | = 12.37 hrs  |
| Time Interval     | = 1 min                    | Hydrograph Volume | = 1,602 cuft |
| Inflow Hydrograph | = 38 - PR-2B + PR-2H       | Max. Elevation    | = 354.65 ft  |
| Pond Name         | = Porous Pavement System 3 | Max. Storage      | = 474 cuft   |

Pond Routing by Storage Indication Method

Center of mass detention time = 1.13 hrs

**Qp = 0.110 cfs**



# Hydrograph Report

Hydrology Studio v 3.0.0.38

File: Current Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2B+PR-2H Routing

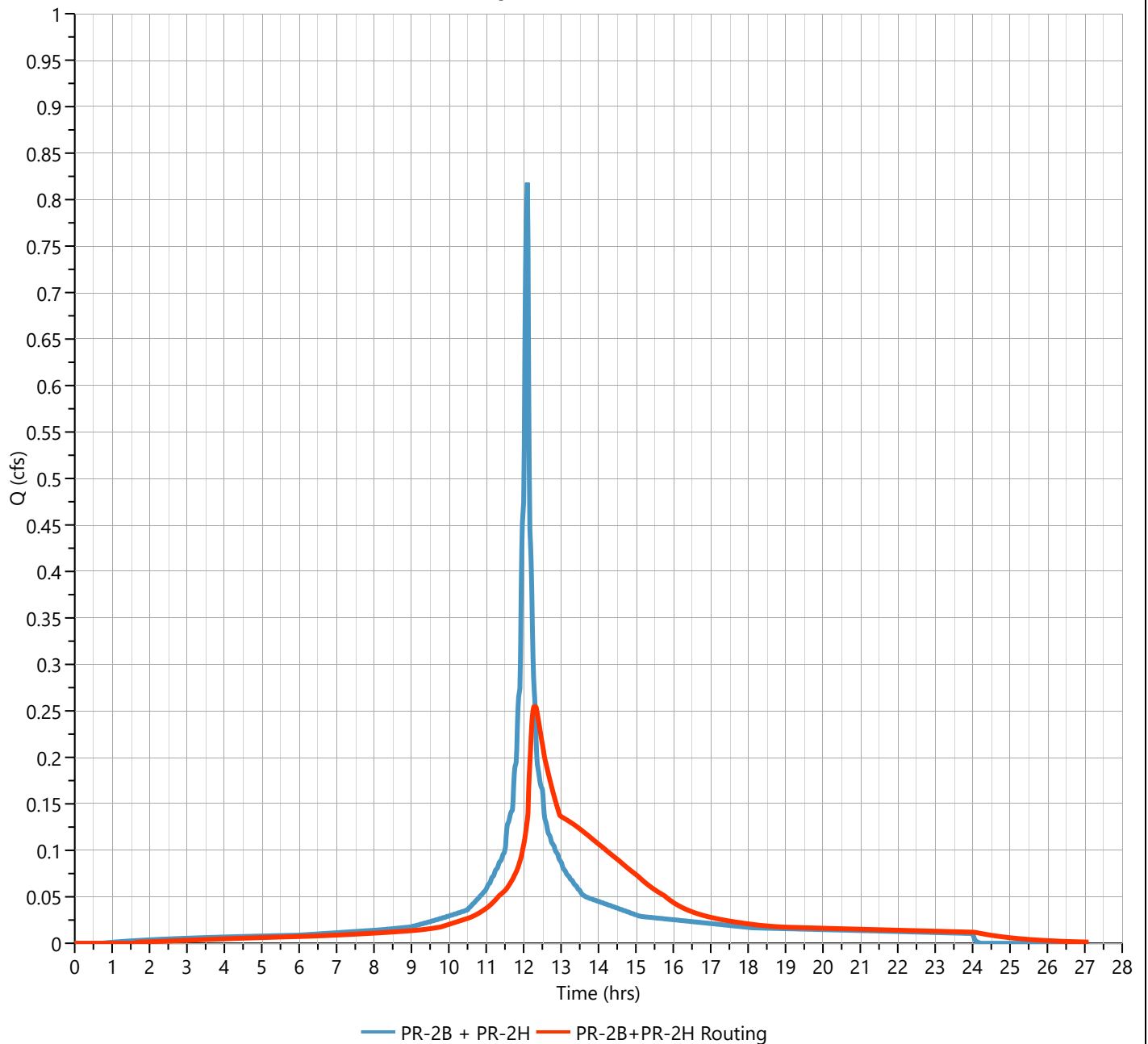
### Hyd. No. 39

|                   |                            |                   |              |
|-------------------|----------------------------|-------------------|--------------|
| Hydrograph Type   | = Pond Route               | Peak Flow         | = 0.256 cfs  |
| Storm Frequency   | = 10-yr                    | Time to Peak      | = 12.30 hrs  |
| Time Interval     | = 1 min                    | Hydrograph Volume | = 2,799 cuft |
| Inflow Hydrograph | = 38 - PR-2B + PR-2H       | Max. Elevation    | = 355.05 ft  |
| Pond Name         | = Porous Pavement System 3 | Max. Storage      | = 815 cuft   |

Pond Routing by Storage Indication Method

Center of mass detention time = 1.11 hrs

**Qp = 0.256 cfs**



# Hydrograph Report

Hydrology Studio v 3.0.0.38

File: Current Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2B+PR-2H Routing

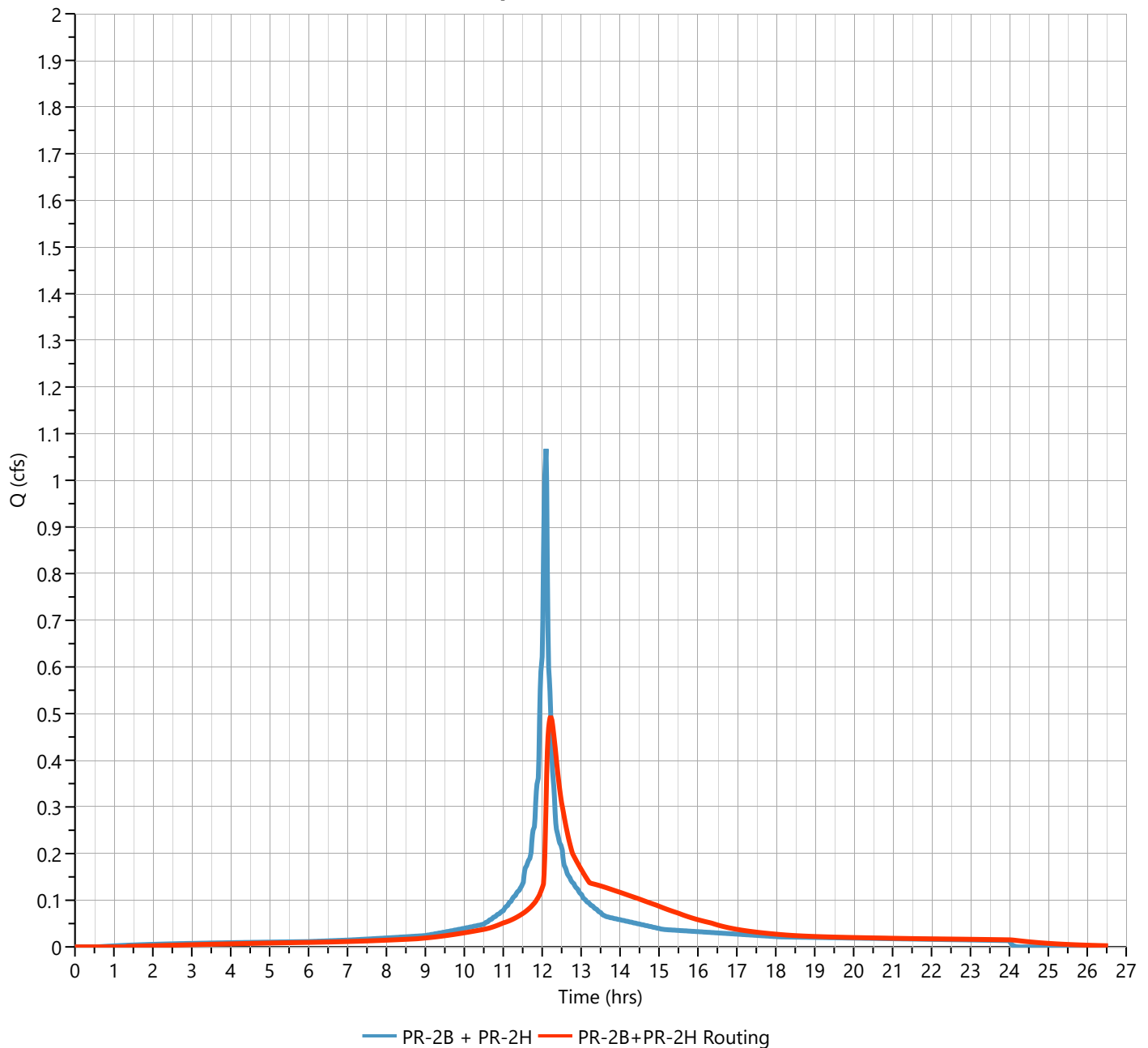
### Hyd. No. 39

|                   |                            |                   |              |
|-------------------|----------------------------|-------------------|--------------|
| Hydrograph Type   | = Pond Route               | Peak Flow         | = 0.494 cfs  |
| Storm Frequency   | = 25-yr                    | Time to Peak      | = 12.22 hrs  |
| Time Interval     | = 1 min                    | Hydrograph Volume | = 3,678 cuft |
| Inflow Hydrograph | = 38 - PR-2B + PR-2H       | Max. Elevation    | = 355.23 ft  |
| Pond Name         | = Porous Pavement System 3 | Max. Storage      | = 968 cuft   |

Pond Routing by Storage Indication Method

Center of mass detention time = 59 min

**Qp = 0.494 cfs**



# Hydrograph Report

Hydrology Studio v 3.0.0.38

File: Current Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2B+PR-2H Routing

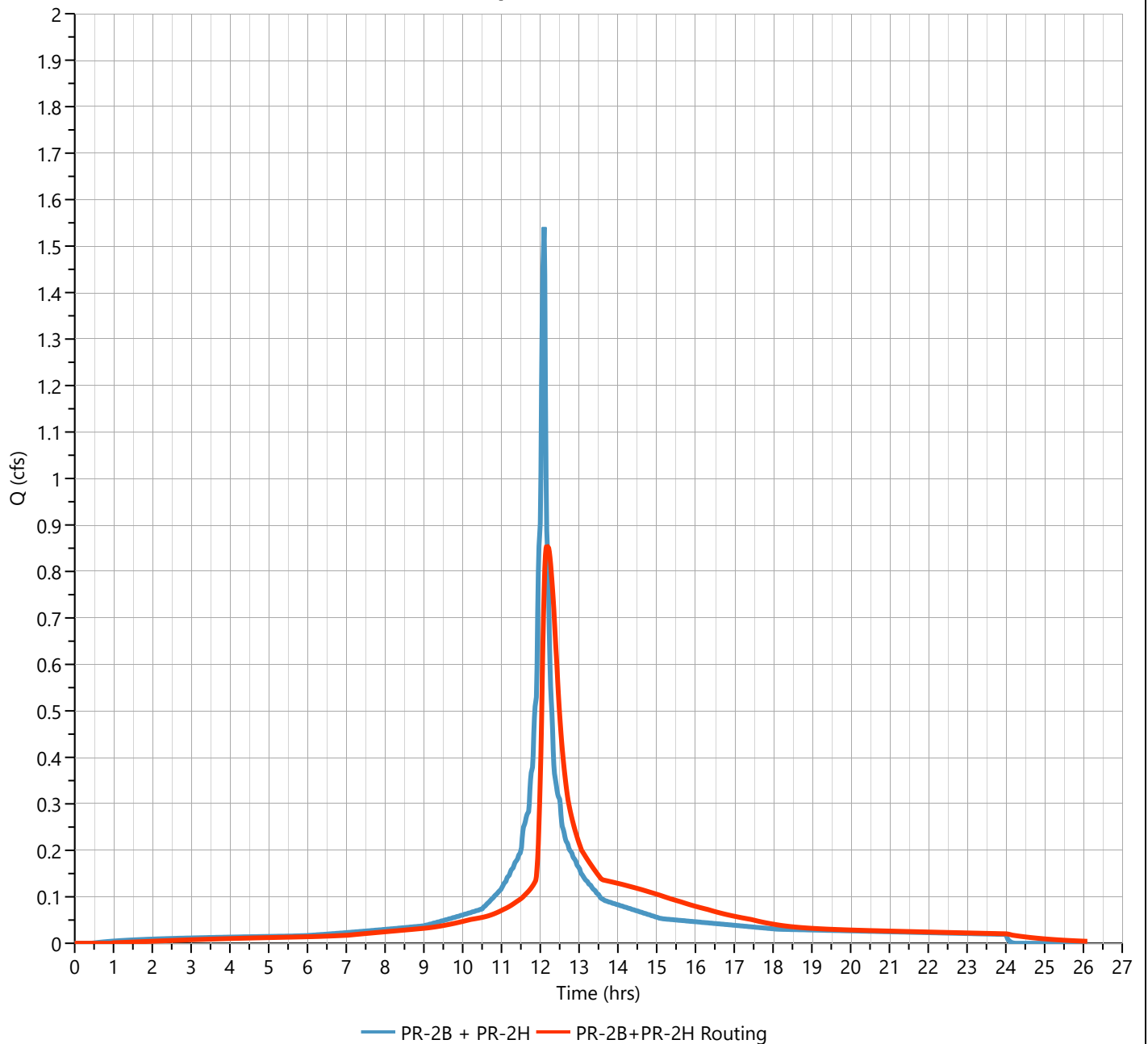
### Hyd. No. 39

|                   |                            |                   |              |
|-------------------|----------------------------|-------------------|--------------|
| Hydrograph Type   | = Pond Route               | Peak Flow         | = 0.857 cfs  |
| Storm Frequency   | = 100-yr                   | Time to Peak      | = 12.18 hrs  |
| Time Interval     | = 1 min                    | Hydrograph Volume | = 5,367 cuft |
| Inflow Hydrograph | = 38 - PR-2B + PR-2H       | Max. Elevation    | = 355.55 ft  |
| Pond Name         | = Porous Pavement System 3 | Max. Storage      | = 1,241 cuft |

Pond Routing by Storage Indication Method

Center of mass detention time = 51 min

**Qp = 0.857 cfs**





## **FUTURE POND ROUTING CALCULATIONS**

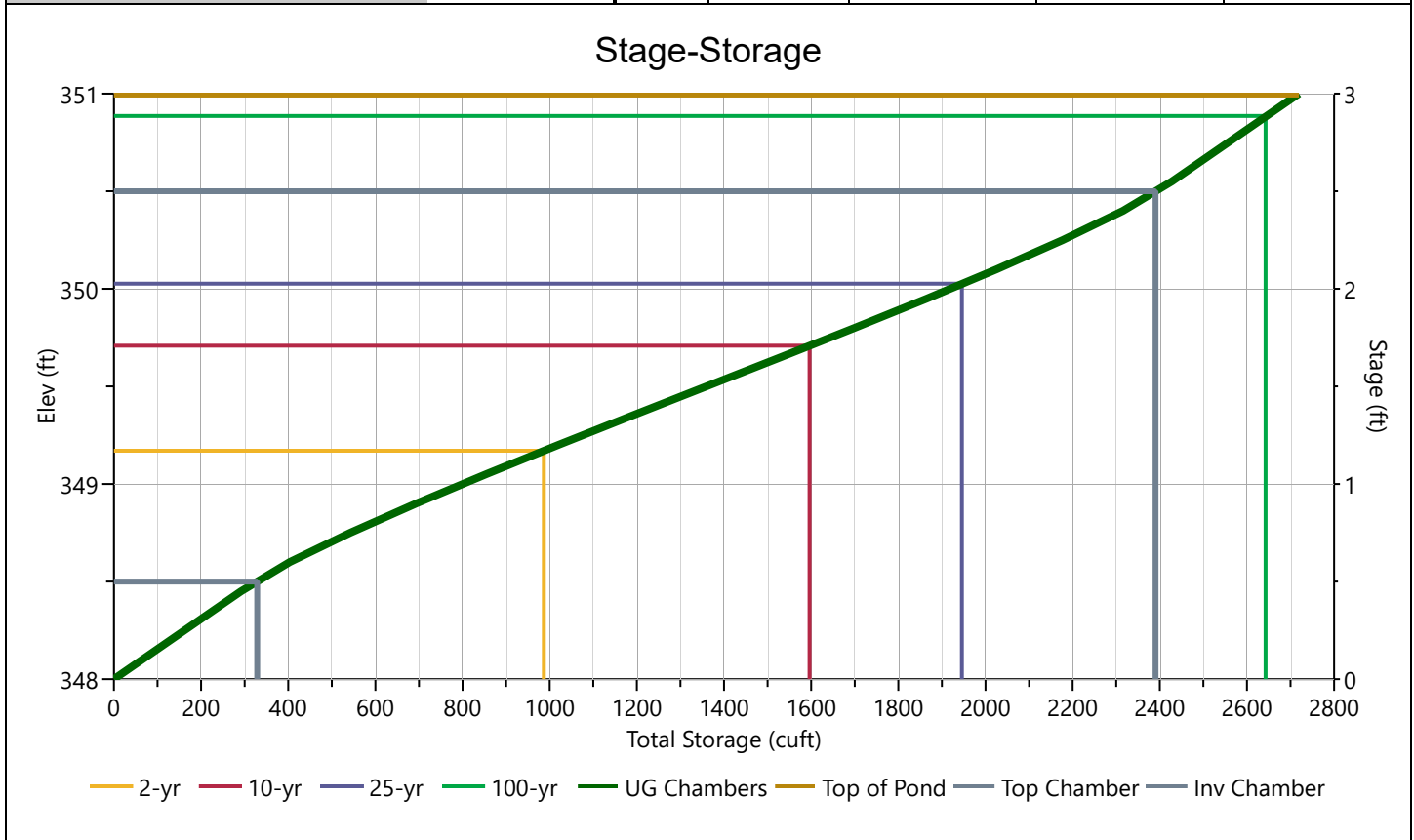
## **PR-1A WATERSHED POND ROUTING**

# Pond Report

## UGD-INF1-1

## Stage-Storage

| Underground Chambers             |          | Stage / Storage Table |                |                     |                      |                      |
|----------------------------------|----------|-----------------------|----------------|---------------------|----------------------|----------------------|
| Description                      | Input    | Stage (ft)            | Elevation (ft) | Contour Area (sqft) | Incr. Storage (cuft) | Total Storage (cuft) |
| Invert Elev Down, ft             | 348.50   | 0.00                  | 348.00         | 1,620               | 0.000                | 0.000                |
| Chamber Rise, ft                 | 2.00     | 0.15                  | 348.15         | 1,620               | 97.2                 | 97.2                 |
| Chamber Shape                    | Circular | 0.30                  | 348.30         | 1,620               | 97.2                 | 194                  |
| Chamber Span, ft                 | 2.00     | 0.45                  | 348.45         | 1,620               | 97.2                 | 292                  |
| Barrel Length, ft                | 75.00    | 0.60                  | 348.60         | 1,620               | 112                  | 403                  |
| No. Barrels                      | 5        | 0.75                  | 348.75         | 1,620               | 139                  | 542                  |
| Barrel Slope, %                  | 0.00     | 0.90                  | 348.90         | 1,620               | 152                  | 694                  |
| Headers, y/n                     | Yes      | 1.05                  | 349.05         | 1,620               | 160                  | 854                  |
| Stone Encasement, y/n            | Yes      | 1.20                  | 349.20         | 1,620               | 166                  | 1,020                |
| Encasement Bottom Elevation, ft  | 348.00   | 1.35                  | 349.35         | 1,620               | 169                  | 1,189                |
| Encasement Width per Chamber, ft | 4.00     | 1.50                  | 349.50         | 1,620               | 171                  | 1,360                |
| Encasement Depth, ft             | 3.00     | 1.65                  | 349.65         | 1,620               | 171                  | 1,531                |
| Encasement Voids, %              | 40.00    | 1.80                  | 349.80         | 1,620               | 169                  | 1,700                |
|                                  |          | 1.95                  | 349.95         | 1,620               | 166                  | 1,866                |
|                                  |          | 2.10                  | 350.10         | 1,620               | 160                  | 2,026                |
|                                  |          | 2.25                  | 350.25         | 1,620               | 152                  | 2,177                |
|                                  |          | 2.40                  | 350.40         | 1,620               | 139                  | 2,316                |
|                                  |          | 2.55                  | 350.55         | 1,620               | 112                  | 2,428                |
|                                  |          | 2.70                  | 350.70         | 1,620               | 97.2                 | 2,525                |
|                                  |          | 2.85                  | 350.85         | 1,620               | 97.2                 | 2,622                |
|                                  |          | 3.00                  | 351.00         | 1,620               | 97.2                 | 2,719                |



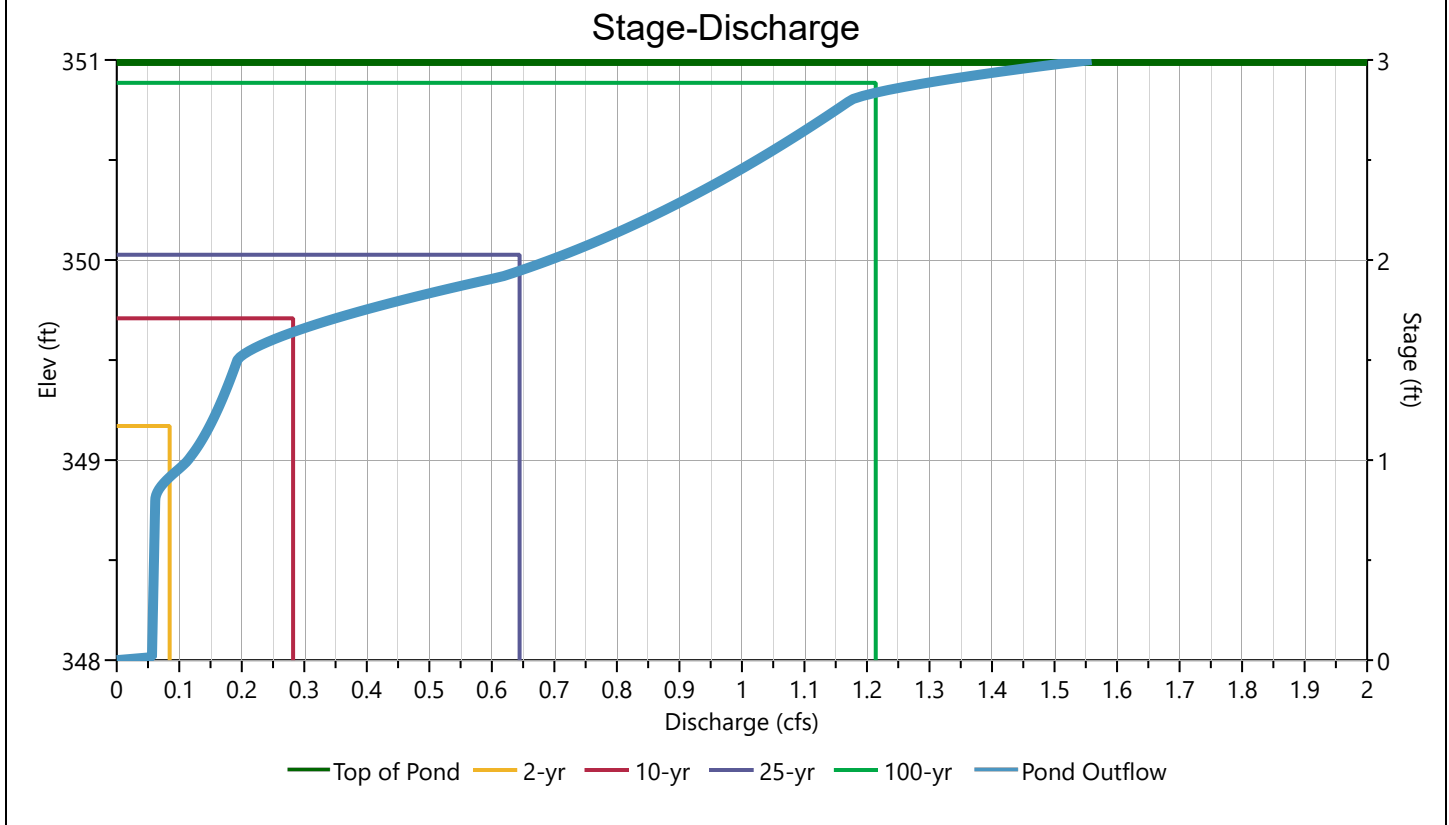
# Pond Report

## UGD-INF1-1

## Stage-Discharge

| Culvert / Orifices      | Cir Culvert | Orifice     |        |   | Perforated Riser        |
|-------------------------|-------------|-------------|--------|---|-------------------------|
|                         |             | 1 (i)       | 2 (i)  | 3 |                         |
| Rise, in                |             | 2.5         | 5      |   | Hole Diameter, in       |
| Span, in                |             | 2.5         | 5      |   | No. holes               |
| No. Barrels             |             | 1           | 1      |   | Invert Elevation, ft    |
| Invert Elevation, ft    |             | 348.80      | 349.50 |   | Height, ft              |
| Orifice Coefficient, Co |             | 0.60        | 0.60   |   | Orifice Coefficient, Co |
| Length, ft              |             |             |        |   |                         |
| Barrel Slope, %         |             |             |        |   |                         |
| N-Value, n              |             |             |        |   |                         |
| Weirs                   | Riser       | Weir        |        |   | Ancillary               |
| Shape / Type            |             | Rectangular |        |   | Exfiltration, in/hr     |
| Crest Elevation, ft     |             | 350.8       |        |   | 1.50**                  |
| Crest Length, ft        |             | 1           |        |   |                         |
| Angle, deg              |             |             |        |   |                         |
| Weir Coefficient, Cw    |             | 3.3         |        |   |                         |

m = Flows through Culvert, i = Independent \*\*Exfiltration extracted from outflow hydrograph. Rate applied to contours.



# Hydrograph Report

Hydrology Studio v 3.0.0.38

File: Future Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

## PR-1A Routing

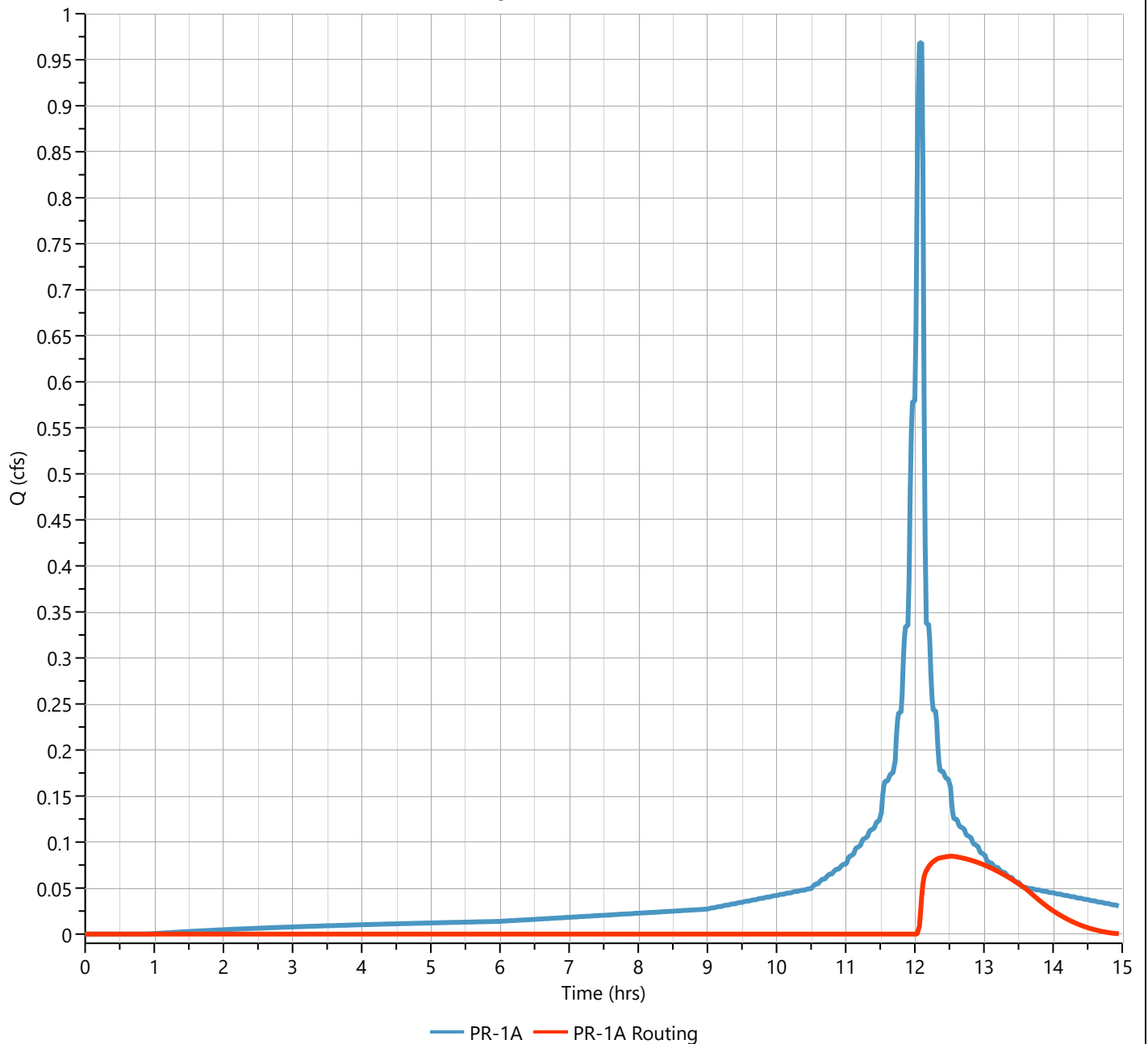
## Hyd. No. 2

|                   |              |                   |             |
|-------------------|--------------|-------------------|-------------|
| Hydrograph Type   | = Pond Route | Peak Flow         | = 0.085 cfs |
| Storm Frequency   | = 2-yr       | Time to Peak      | = 12.53 hrs |
| Time Interval     | = 1 min      | Hydrograph Volume | = 482 cuft  |
| Inflow Hydrograph | = 1 - PR-1A  | Max. Elevation    | = 349.17 ft |
| Pond Name         | = UGD-INF1-1 | Max. Storage      | = 987 cuft  |

Pond Routing by Storage Indication Method

Center of mass detention time = 31 min

**Qp = 0.085 cfs**



# Hydrograph Report

Hydrology Studio v 3.0.0.38

File: Future Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

## PR-1A Routing

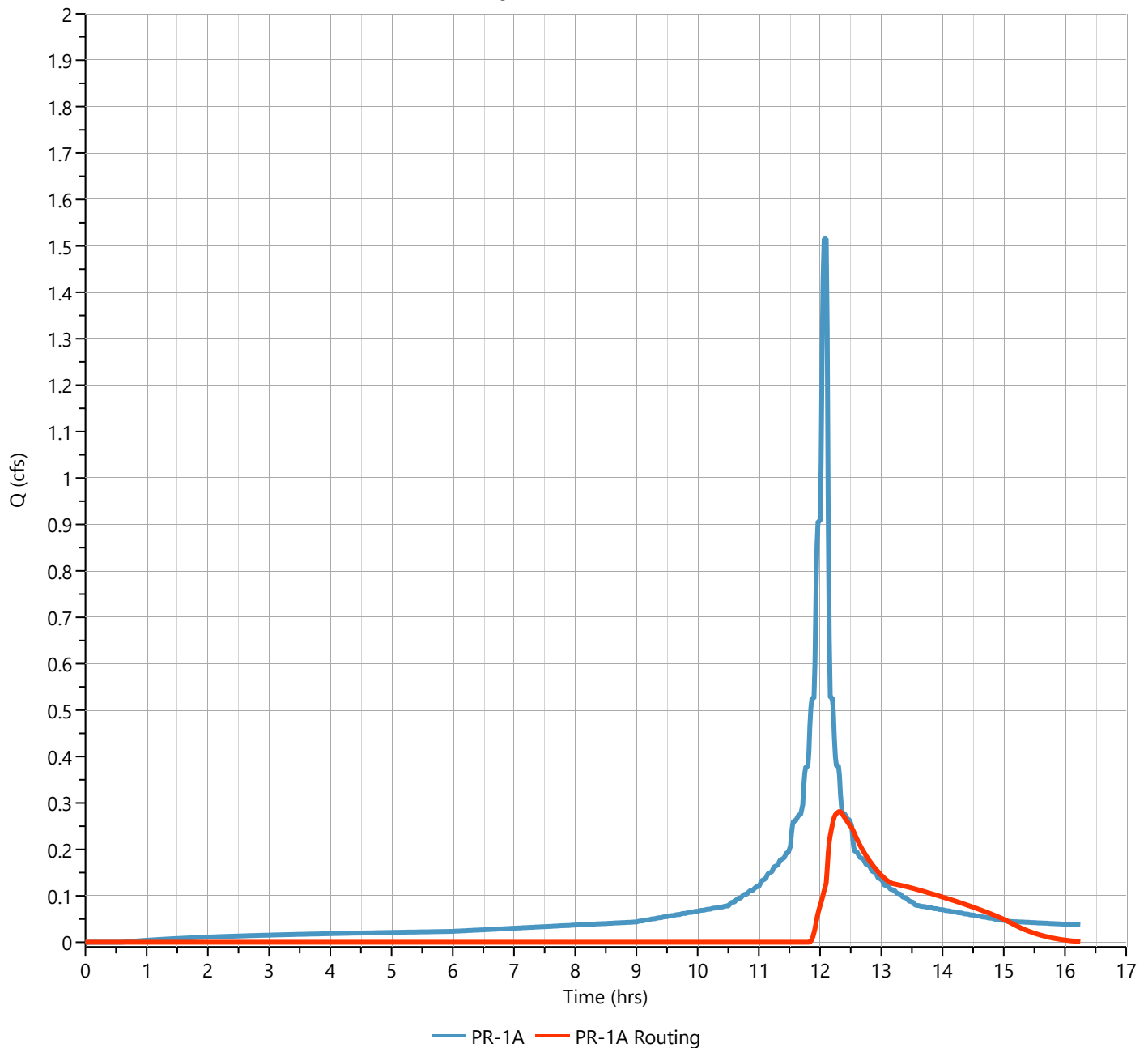
## Hyd. No. 2

|                   |              |                   |              |
|-------------------|--------------|-------------------|--------------|
| Hydrograph Type   | = Pond Route | Peak Flow         | = 0.282 cfs  |
| Storm Frequency   | = 10-yr      | Time to Peak      | = 12.32 hrs  |
| Time Interval     | = 1 min      | Hydrograph Volume | = 1,538 cuft |
| Inflow Hydrograph | = 1 - PR-1A  | Max. Elevation    | = 349.71 ft  |
| Pond Name         | = UGD-INF1-1 | Max. Storage      | = 1,596 cuft |

Pond Routing by Storage Indication Method

Center of mass detention time = 54 min

**Qp = 0.282 cfs**



# Hydrograph Report

Hydrology Studio v 3.0.0.38

File: Future Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

## PR-1A Routing

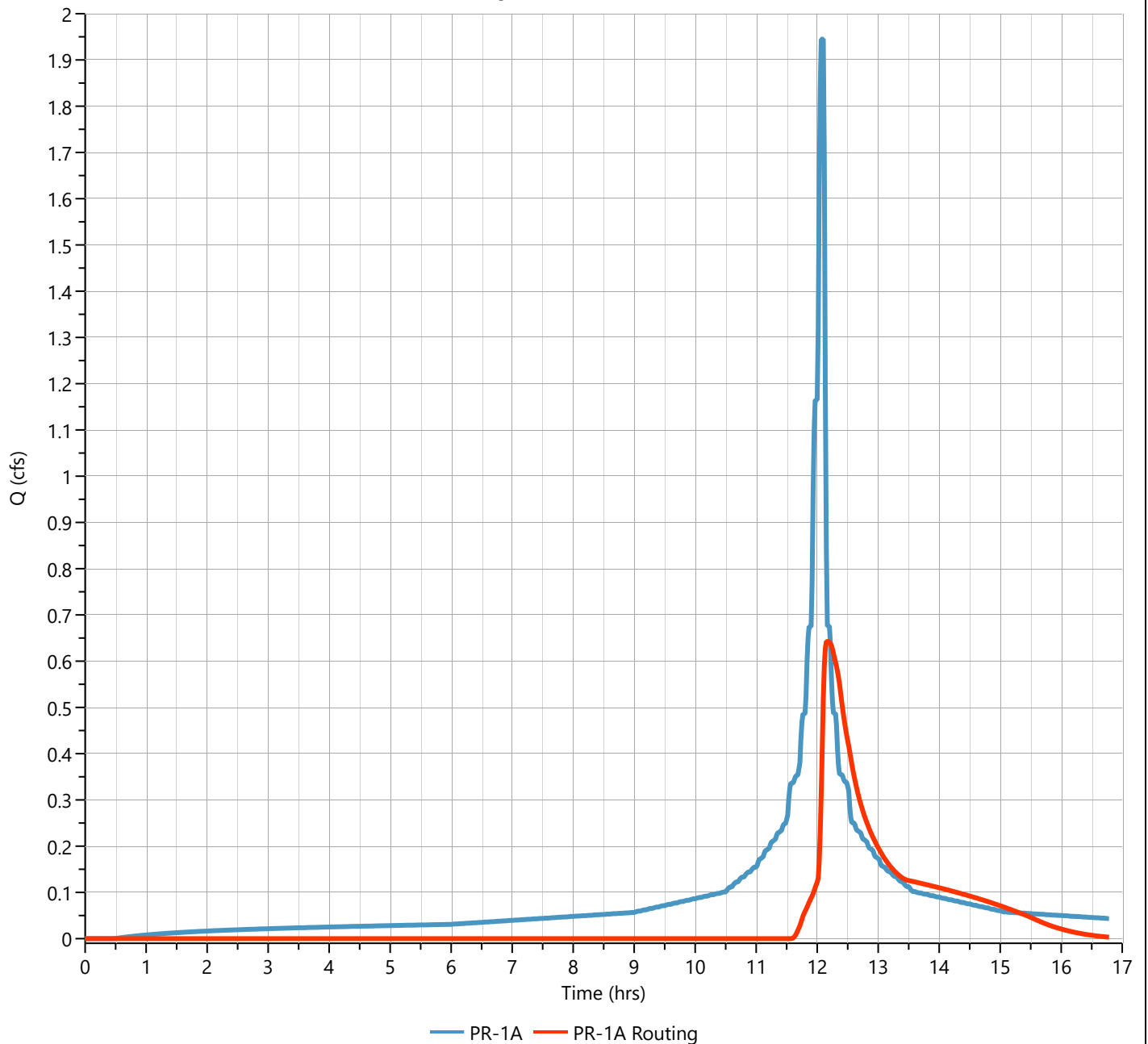
## Hyd. No. 2

|                   |              |                   |              |
|-------------------|--------------|-------------------|--------------|
| Hydrograph Type   | = Pond Route | Peak Flow         | = 0.644 cfs  |
| Storm Frequency   | = 25-yr      | Time to Peak      | = 12.17 hrs  |
| Time Interval     | = 1 min      | Hydrograph Volume | = 2,527 cuft |
| Inflow Hydrograph | = 1 - PR-1A  | Max. Elevation    | = 350.03 ft  |
| Pond Name         | = UGD-INF1-1 | Max. Storage      | = 1,946 cuft |

Pond Routing by Storage Indication Method

Center of mass detention time = 49 min

**Qp = 0.644 cfs**



# Hydrograph Report

Hydrology Studio v 3.0.0.38

File: Future Beacon Church Proposed - POA-1 & POA-3.hys

05-16-2025

## PR-1A Routing

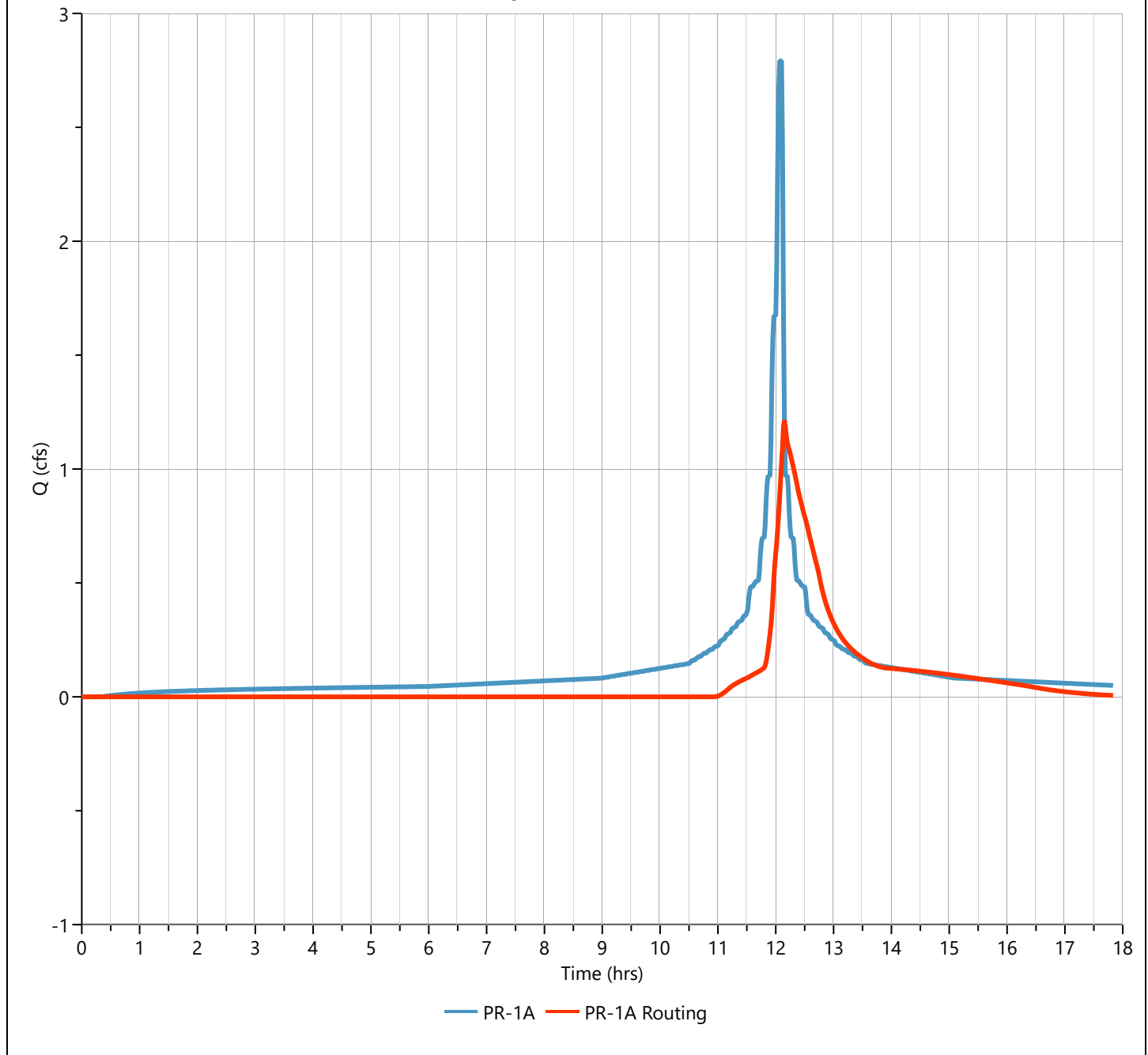
## Hyd. No. 2

|                   |              |                   |              |
|-------------------|--------------|-------------------|--------------|
| Hydrograph Type   | = Pond Route | Peak Flow         | = 1.214 cfs  |
| Storm Frequency   | = 100-yr     | Time to Peak      | = 12.15 hrs  |
| Time Interval     | = 1 min      | Hydrograph Volume | = 4,677 cuft |
| Inflow Hydrograph | = 1 - PR-1A  | Max. Elevation    | = 350.89 ft  |
| Pond Name         | = UGD-INF1-1 | Max. Storage      | = 2,643 cuft |

Pond Routing by Storage Indication Method

Center of mass detention time = 47 min

**Qp = 1.214 cfs**





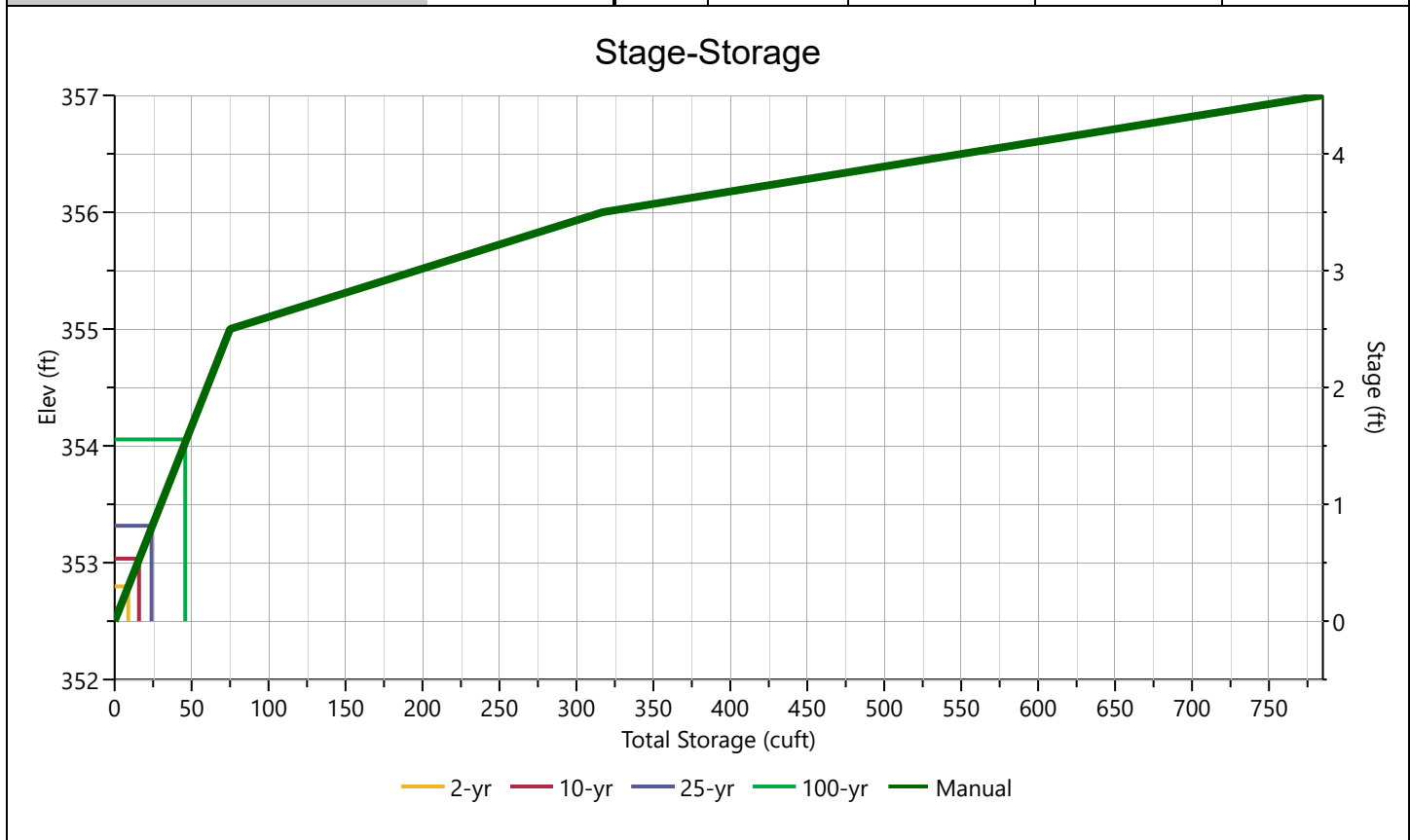
## **PR-1C WATERSHED POND ROUTING**

# Pond Report

## Rain Garden

## Stage-Storage

| User Defined Storage |        | Stage / Storage Table |                |                     |                      |                      |
|----------------------|--------|-----------------------|----------------|---------------------|----------------------|----------------------|
| Description          | Input  | Stage (ft)            | Elevation (ft) | Contour Area (sqft) | Incr. Storage (cuft) | Total Storage (cuft) |
| Bottom Elevation, ft | 352.50 | 0.00                  | 352.50         | n/a                 | 0.000                | 0.000                |
|                      |        | 2.50                  | 355.00         | n/a                 | 75.0                 | 75.0                 |
|                      |        | 3.50                  | 356.00         | n/a                 | 242                  | 317                  |
|                      |        | 4.50                  | 357.00         | n/a                 | 468                  | 785                  |
|                      |        |                       |                |                     |                      |                      |
|                      |        |                       |                |                     |                      |                      |
|                      |        |                       |                |                     |                      |                      |
|                      |        |                       |                |                     |                      |                      |
|                      |        |                       |                |                     |                      |                      |
|                      |        |                       |                |                     |                      |                      |
|                      |        |                       |                |                     |                      |                      |
|                      |        |                       |                |                     |                      |                      |
|                      |        |                       |                |                     |                      |                      |
|                      |        |                       |                |                     |                      |                      |
|                      |        |                       |                |                     |                      |                      |
|                      |        |                       |                |                     |                      |                      |
|                      |        |                       |                |                     |                      |                      |
|                      |        |                       |                |                     |                      |                      |
|                      |        |                       |                |                     |                      |                      |



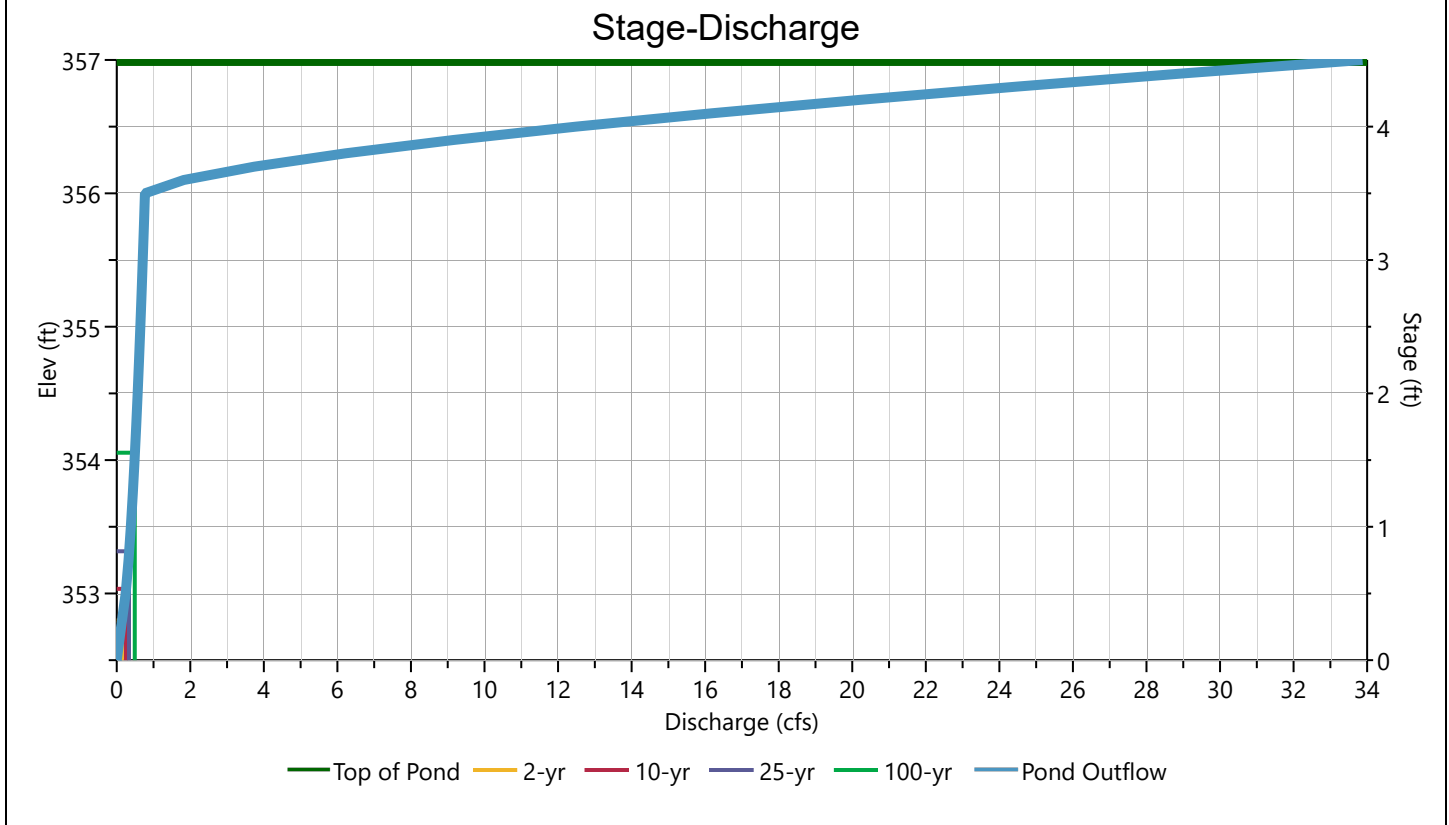
# Pond Report

## Rain Garden

## Stage-Discharge

| Culvert / Orifices      | Cir Culvert | Orifice       |   |   | Perforated Riser        |
|-------------------------|-------------|---------------|---|---|-------------------------|
|                         |             | 1 (i)         | 2 | 3 |                         |
| Rise, in                |             | 4             |   |   | Hole Diameter, in       |
| Span, in                |             | 4             |   |   | No. holes               |
| No. Barrels             |             | 1             |   |   | Invert Elevation, ft    |
| Invert Elevation, ft    |             | 352.50        |   |   | Height, ft              |
| Orifice Coefficient, Co |             | 0.60          |   |   | Orifice Coefficient, Co |
| Length, ft              |             |               |   |   |                         |
| Barrel Slope, %         |             |               |   |   |                         |
| N-Value, n              |             |               |   |   |                         |
| Weirs                   | Riser       | Weir          |   |   | Ancillary               |
| Shape / Type            |             | Broad Crested |   |   | Exfiltration, in/hr     |
| Crest Elevation, ft     |             | 356           |   |   |                         |
| Crest Length, ft        |             | 10            |   |   |                         |
| Angle, deg              |             |               |   |   |                         |
| Weir Coefficient, Cw    |             | 3.3           |   |   |                         |

*m = Flows through Culvert, i = Independent*



# Hydrograph Report

Hydrology Studio v 3.0.0.38

File: Future Beacon Church Proposed - POA-1 & POA-3.hys

07-01-2025

## PR-1C Routing

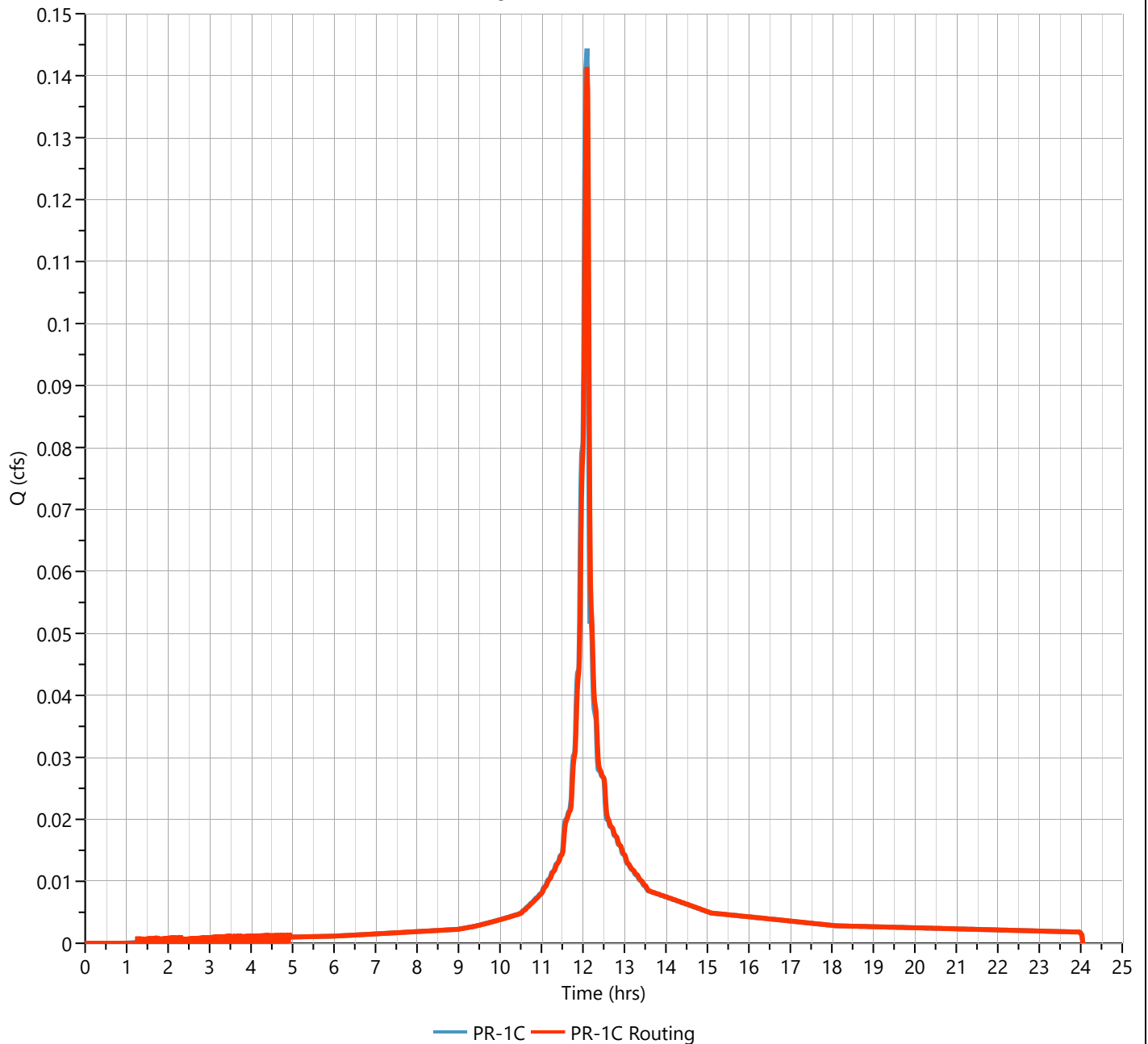
## Hyd. No. 11

|                   |               |                   |             |
|-------------------|---------------|-------------------|-------------|
| Hydrograph Type   | = Pond Route  | Peak Flow         | = 0.141 cfs |
| Storm Frequency   | = 2-yr        | Time to Peak      | = 12.10 hrs |
| Time Interval     | = 1 min       | Hydrograph Volume | = 436 cuft  |
| Inflow Hydrograph | = 10 - PR-1C  | Max. Elevation    | = 352.80 ft |
| Pond Name         | = Rain Garden | Max. Storage      | = 8.83 cuft |

Pond Routing by Storage Indication Method

Center of mass detention time = 1 min

**Qp = 0.141 cfs**



# Hydrograph Report

Hydrology Studio v 3.0.0.38

File: Future Beacon Church Proposed - POA-1 & POA-3.hys

07-01-2025

## PR-1C Routing

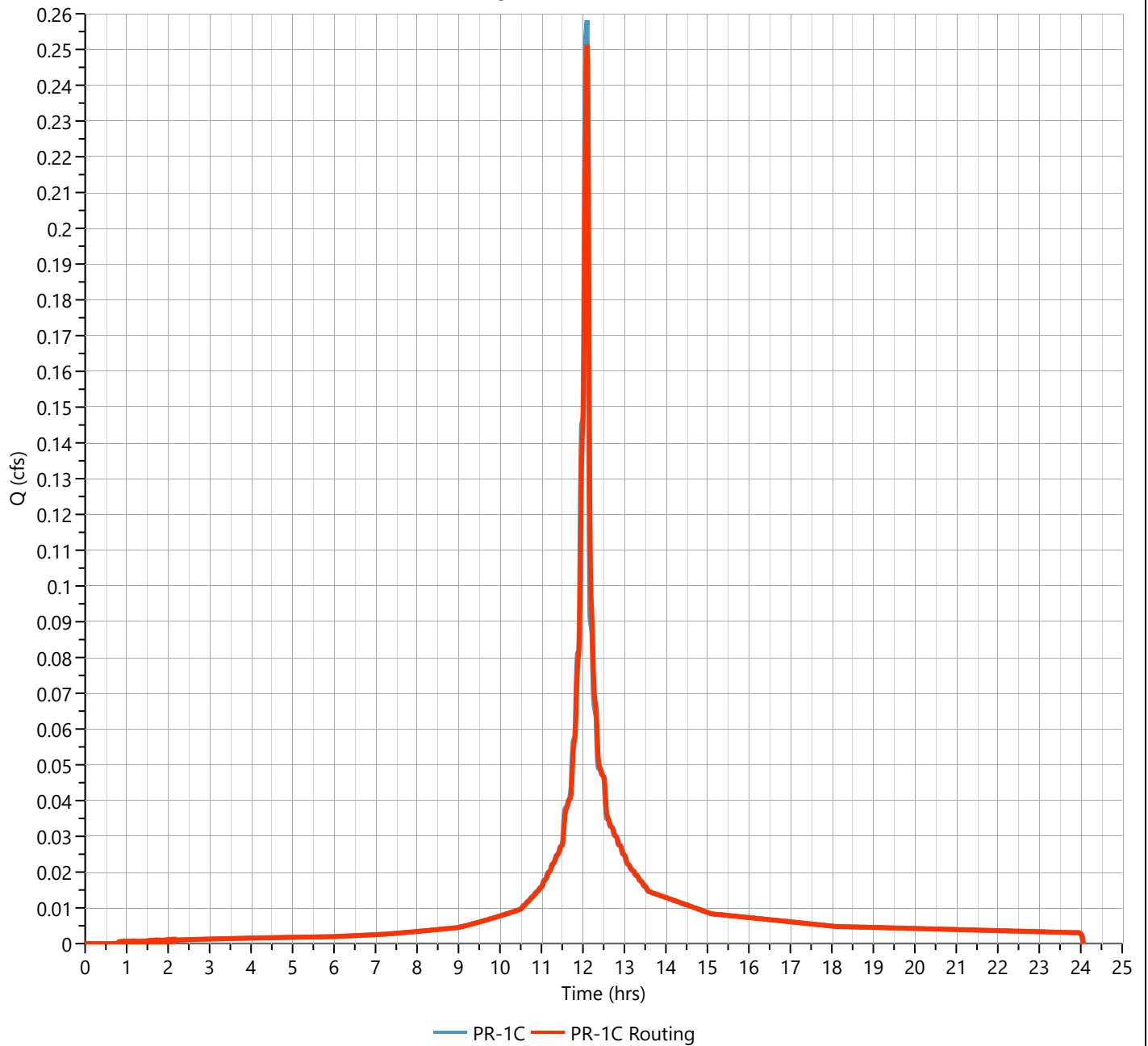
## Hyd. No. 11

|                   |               |                   |             |
|-------------------|---------------|-------------------|-------------|
| Hydrograph Type   | = Pond Route  | Peak Flow         | = 0.251 cfs |
| Storm Frequency   | = 10-yr       | Time to Peak      | = 12.10 hrs |
| Time Interval     | = 1 min       | Hydrograph Volume | = 782 cuft  |
| Inflow Hydrograph | = 10 - PR-1C  | Max. Elevation    | = 353.03 ft |
| Pond Name         | = Rain Garden | Max. Storage      | = 15.8 cuft |

Pond Routing by Storage Indication Method

Center of mass detention time = 1 min

**Qp = 0.251 cfs**



# Hydrograph Report

Hydrology Studio v 3.0.0.38

File: Future Beacon Church Proposed - POA-1 & POA-3.hys

07-01-2025

## PR-1C Routing

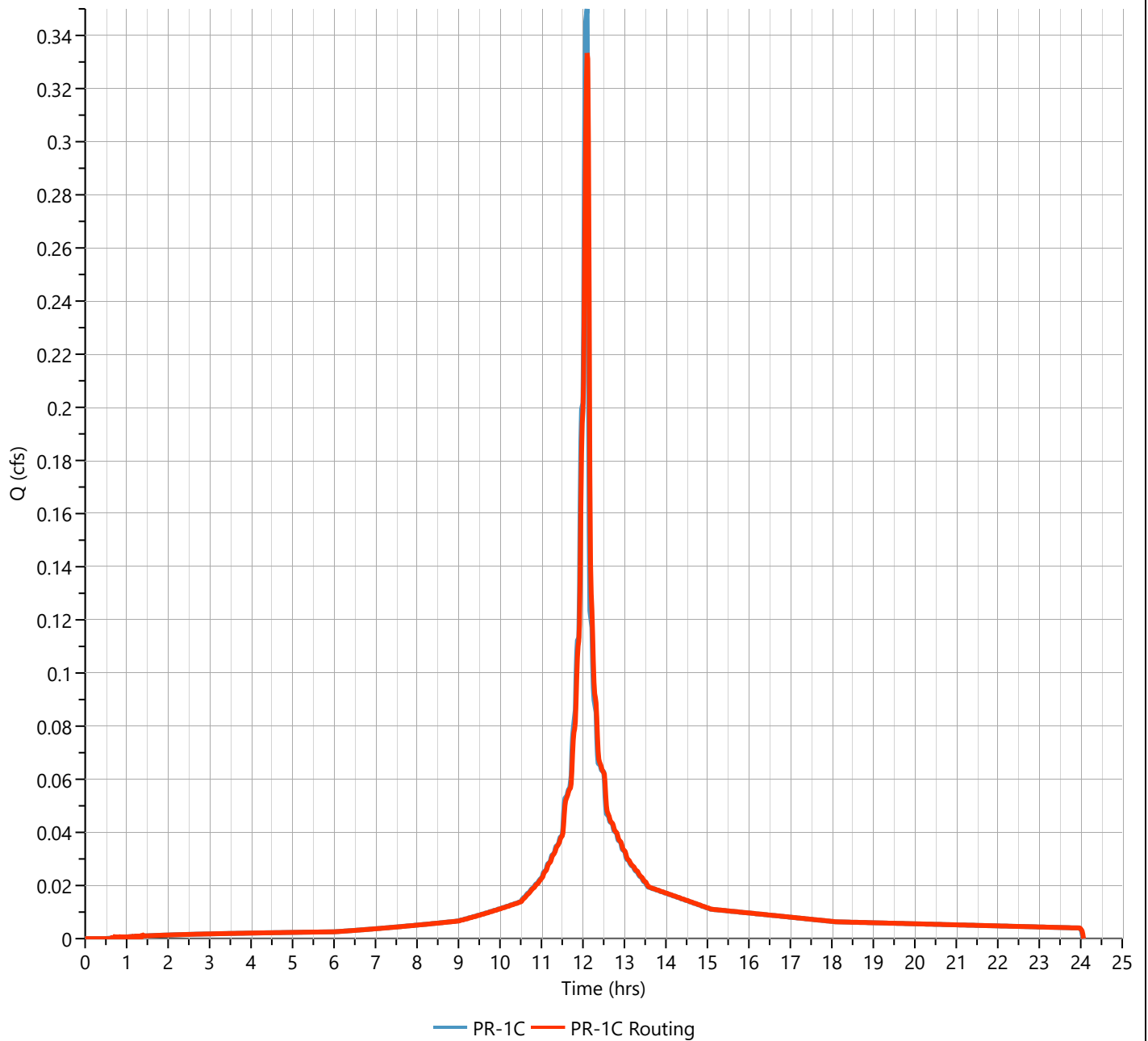
## Hyd. No. 11

|                   |               |                   |              |
|-------------------|---------------|-------------------|--------------|
| Hydrograph Type   | = Pond Route  | Peak Flow         | = 0.333 cfs  |
| Storm Frequency   | = 25-yr       | Time to Peak      | = 12.10 hrs  |
| Time Interval     | = 1 min       | Hydrograph Volume | = 1,068 cuft |
| Inflow Hydrograph | = 10 - PR-1C  | Max. Elevation    | = 353.32 ft  |
| Pond Name         | = Rain Garden | Max. Storage      | = 24.0 cuft  |

Pond Routing by Storage Indication Method

Center of mass detention time = 1 min

**Qp = 0.333 cfs**



# Hydrograph Report

Hydrology Studio v 3.0.0.38

File: Future Beacon Church Proposed - POA-1 & POA-3.hys

07-01-2025

## PR-1C Routing

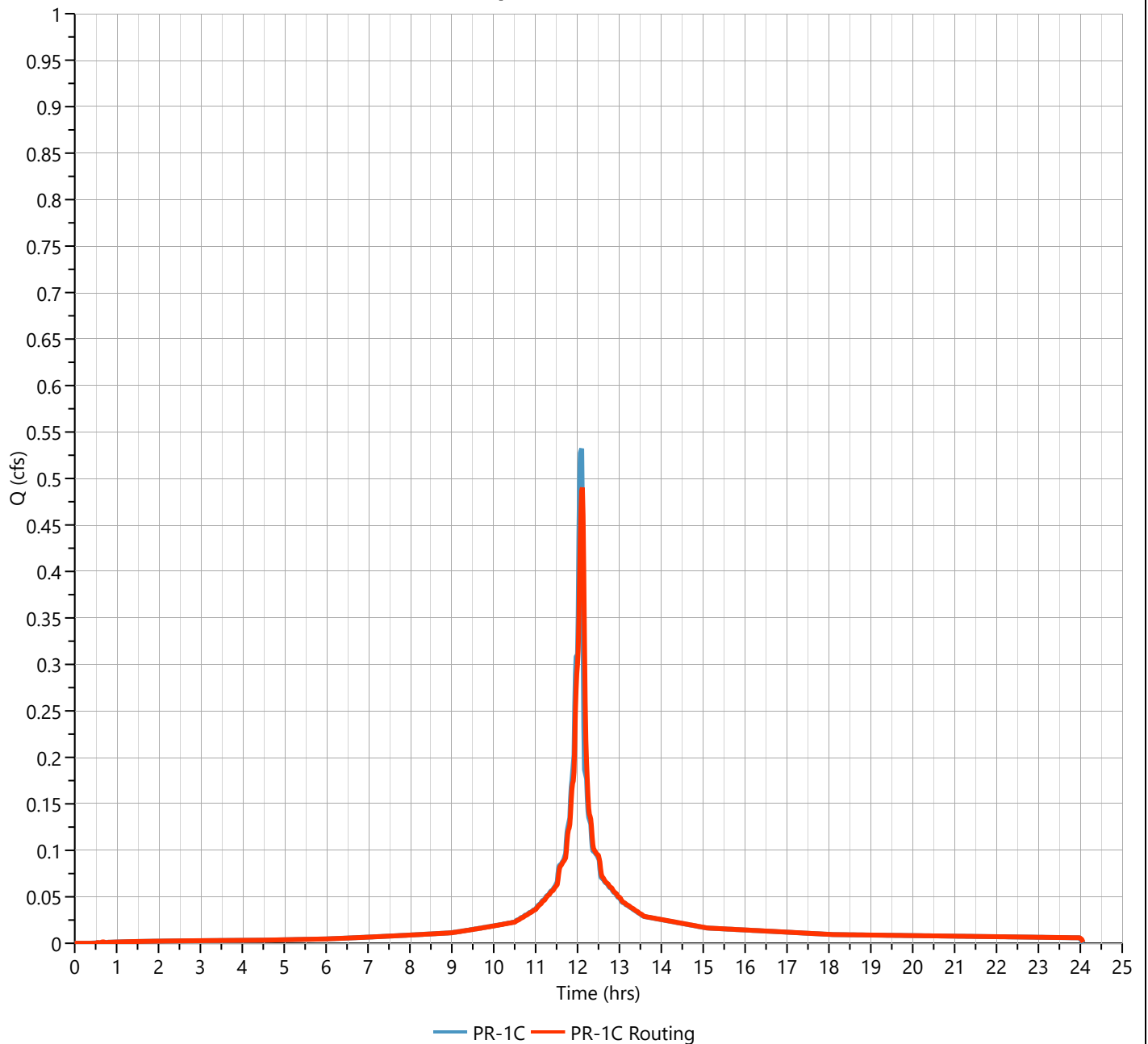
## Hyd. No. 11

|                   |               |                   |              |
|-------------------|---------------|-------------------|--------------|
| Hydrograph Type   | = Pond Route  | Peak Flow         | = 0.490 cfs  |
| Storm Frequency   | = 100-yr      | Time to Peak      | = 12.12 hrs  |
| Time Interval     | = 1 min       | Hydrograph Volume | = 1,647 cuft |
| Inflow Hydrograph | = 10 - PR-1C  | Max. Elevation    | = 354.06 ft  |
| Pond Name         | = Rain Garden | Max. Storage      | = 45.9 cuft  |

Pond Routing by Storage Indication Method

Center of mass detention time = 1 min

**Qp = 0.490 cfs**



**COMBINED TO UNDERGROUND INFILTRATION BASIN 1-2  
POND ROUTING**

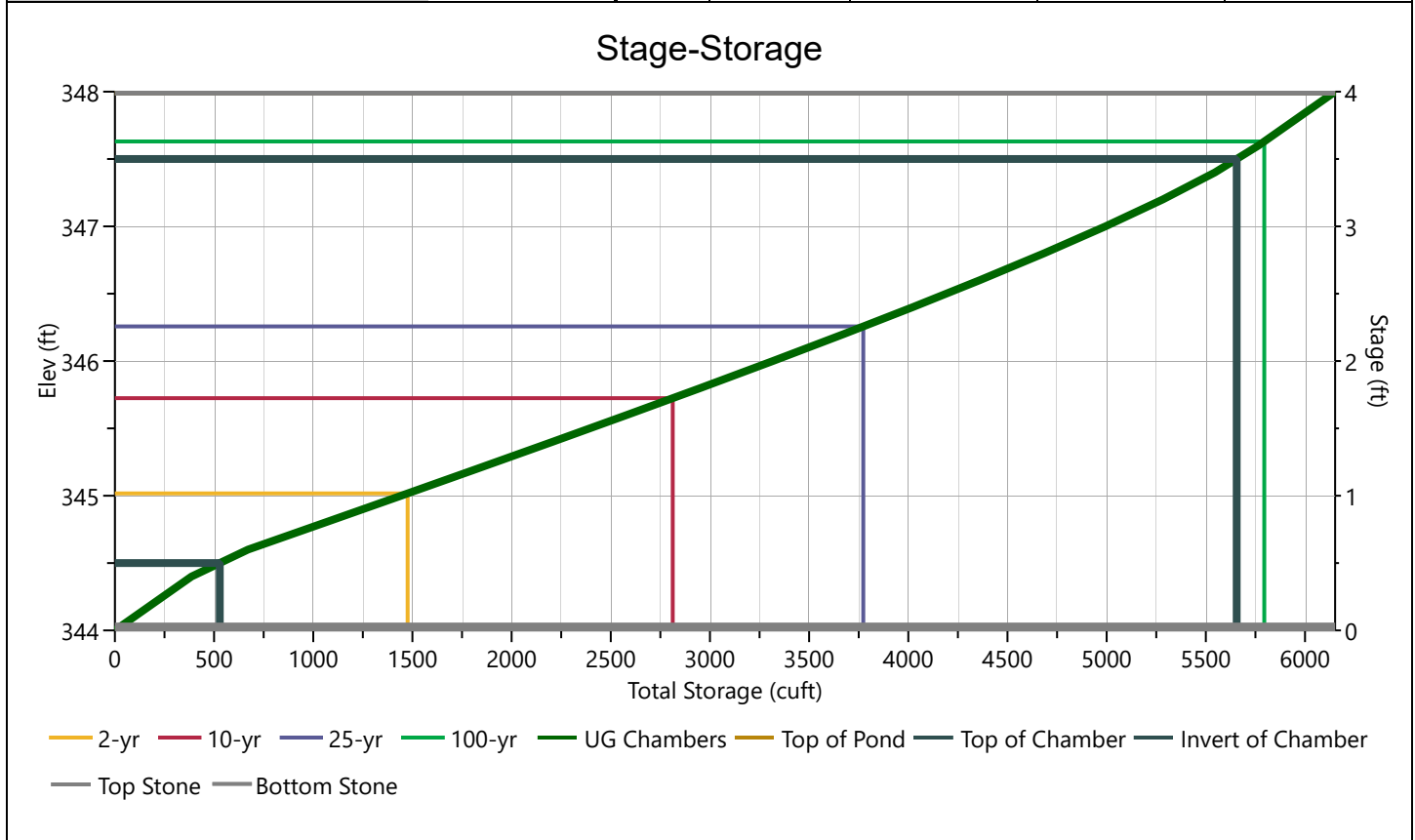


# Pond Report

## UGD-INF1-2

## Stage-Storage

| Cultec Recharger® 360HD Chamber |        | Stage / Storage Table |                |                     |                      |                      |
|---------------------------------|--------|-----------------------|----------------|---------------------|----------------------|----------------------|
| Description                     | Input  | Stage (in)            | Elevation (ft) | Contour Area (sqft) | Incr. Storage (cuft) | Total Storage (cuft) |
| Chamber Height, in              | 36     | 0.0                   | 344.00         | 2,414               | 0.000                | 0.000                |
| Chamber Shape                   | Arch   | 2.4                   | 344.20         | 2,414               | 193                  | 193                  |
| Chamber Width, in               | 60     | 4.8                   | 344.40         | 2,414               | 193                  | 386                  |
| Installed Length, ft            | 3.67   | 7.2                   | 344.60         | 2,414               | 285                  | 671                  |
| No. Chambers                    | 103    | 9.6                   | 344.80         | 2,414               | 387                  | 1,058                |
| Bare Chamber Stor, cuft         | 3,776  | 12.0                  | 345.00         | 2,414               | 385                  | 1,443                |
| No. Rows                        | 3      | 14.4                  | 345.20         | 2,414               | 383                  | 1,826                |
| Space Between Rows, in          | 9      | 16.8                  | 345.40         | 2,414               | 380                  | 2,206                |
| Stone Above, in                 | 6      | 19.2                  | 345.60         | 2,414               | 376                  | 2,582                |
| Stone Below, in                 | 6      | 21.6                  | 345.80         | 2,414               | 371                  | 2,953                |
| Stone Sides, in                 | 12     | 24.0                  | 346.00         | 2,414               | 365                  | 3,317                |
| Stone Ends, in                  | 12     | 26.4                  | 346.20         | 2,414               | 357                  | 3,674                |
| Encasement Voids, %             | 40.00  | 28.8                  | 346.40         | 2,414               | 348                  | 4,022                |
| Encasement Bottom Elevation, ft | 344.00 | 31.2                  | 346.60         | 2,414               | 338                  | 4,360                |
|                                 |        | 33.6                  | 346.80         | 2,414               | 325                  | 4,685                |
|                                 |        | 36.0                  | 347.00         | 2,414               | 309                  | 4,994                |
|                                 |        | 38.4                  | 347.20         | 2,414               | 290                  | 5,284                |
|                                 |        | 40.8                  | 347.40         | 2,414               | 262                  | 5,545                |
|                                 |        | 43.2                  | 347.60         | 2,414               | 220                  | 5,765                |
|                                 |        | 45.6                  | 347.80         | 2,414               | 193                  | 5,959                |
|                                 |        | 48.0                  | 348.00         | 2,414               | 193                  | 6,152                |



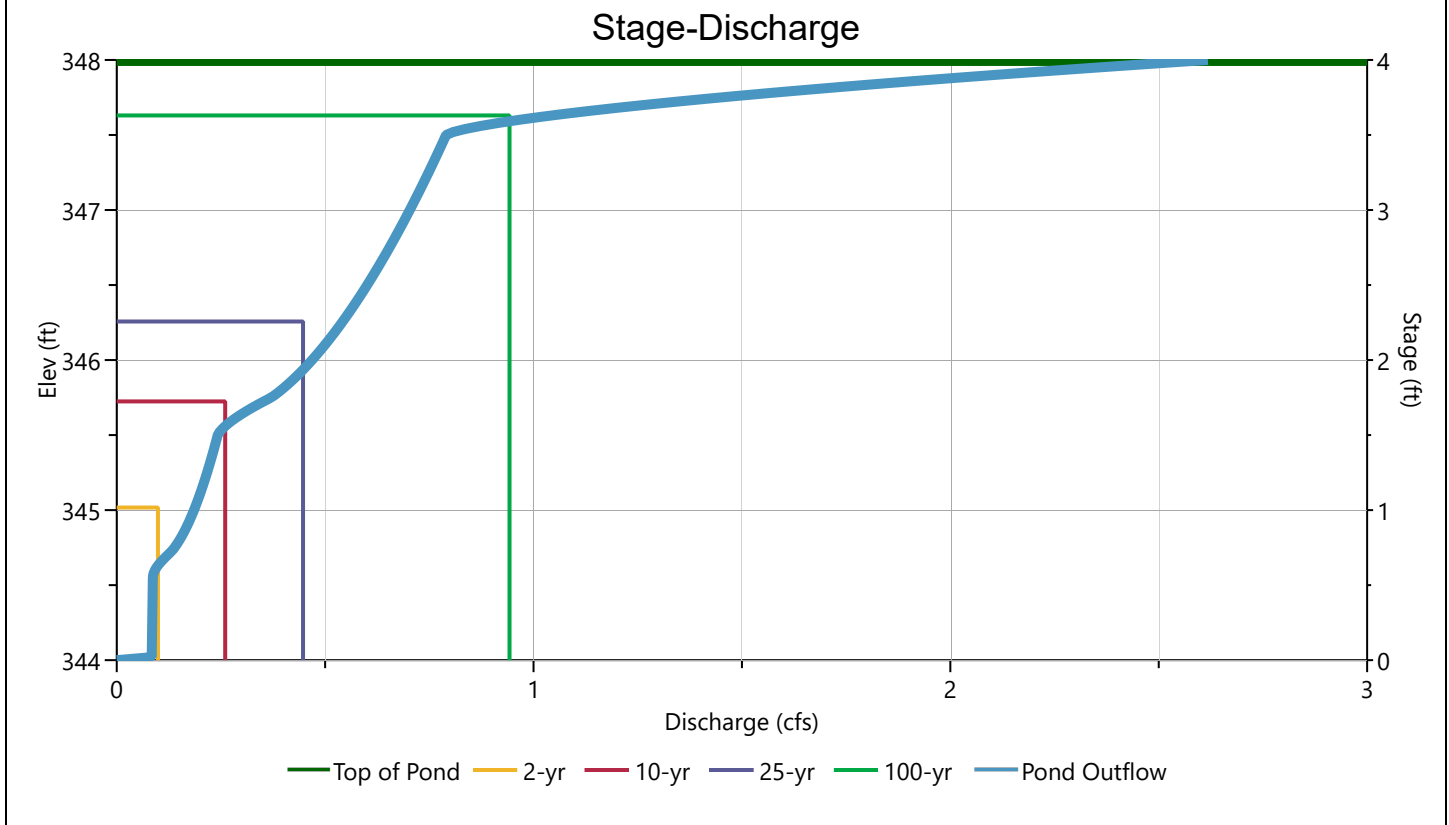
# Pond Report

## UGD-INF1-2

## Stage-Discharge

| Culvert / Orifices      | Cir Culvert | Orifice     |        |   | Perforated Riser        |
|-------------------------|-------------|-------------|--------|---|-------------------------|
|                         |             | 1 (i)       | 2 (i)  | 3 |                         |
| Rise, in                |             | 2.5         | 3      |   | Hole Diameter, in       |
| Span, in                |             | 2.5         | 3      |   | No. holes               |
| No. Barrels             |             | 1           | 1      |   | Invert Elevation, ft    |
| Invert Elevation, ft    |             | 344.55      | 345.50 |   | Height, ft              |
| Orifice Coefficient, Co |             | 0.60        | 0.60   |   | Orifice Coefficient, Co |
| Length, ft              |             |             |        |   |                         |
| Barrel Slope, %         |             |             |        |   |                         |
| N-Value, n              |             |             |        |   |                         |
| Weirs                   | Riser       | Weir        |        |   | Ancillary               |
| Shape / Type            |             | 1 (i)       | 2      | 3 | Exfiltration, in/hr     |
| Crest Elevation, ft     |             | Rectangular |        |   | 1.50**                  |
| Crest Length, ft        |             | 347.5       |        |   |                         |
| Angle, deg              |             | 1.5         |        |   |                         |
| Weir Coefficient, Cw    |             |             |        |   |                         |
|                         |             | 3.3         |        |   |                         |

m = Flows through Culvert, i = Independent \*\*Exfiltration extracted from outflow hydrograph. Rate applied to contours.



# Hydrograph Report

Hydrology Studio v 3.0.0.38

File: Future Beacon Church Proposed - POA-1 & POA-3.hys

07-01-2025

## UGD-INF1-2 Routing

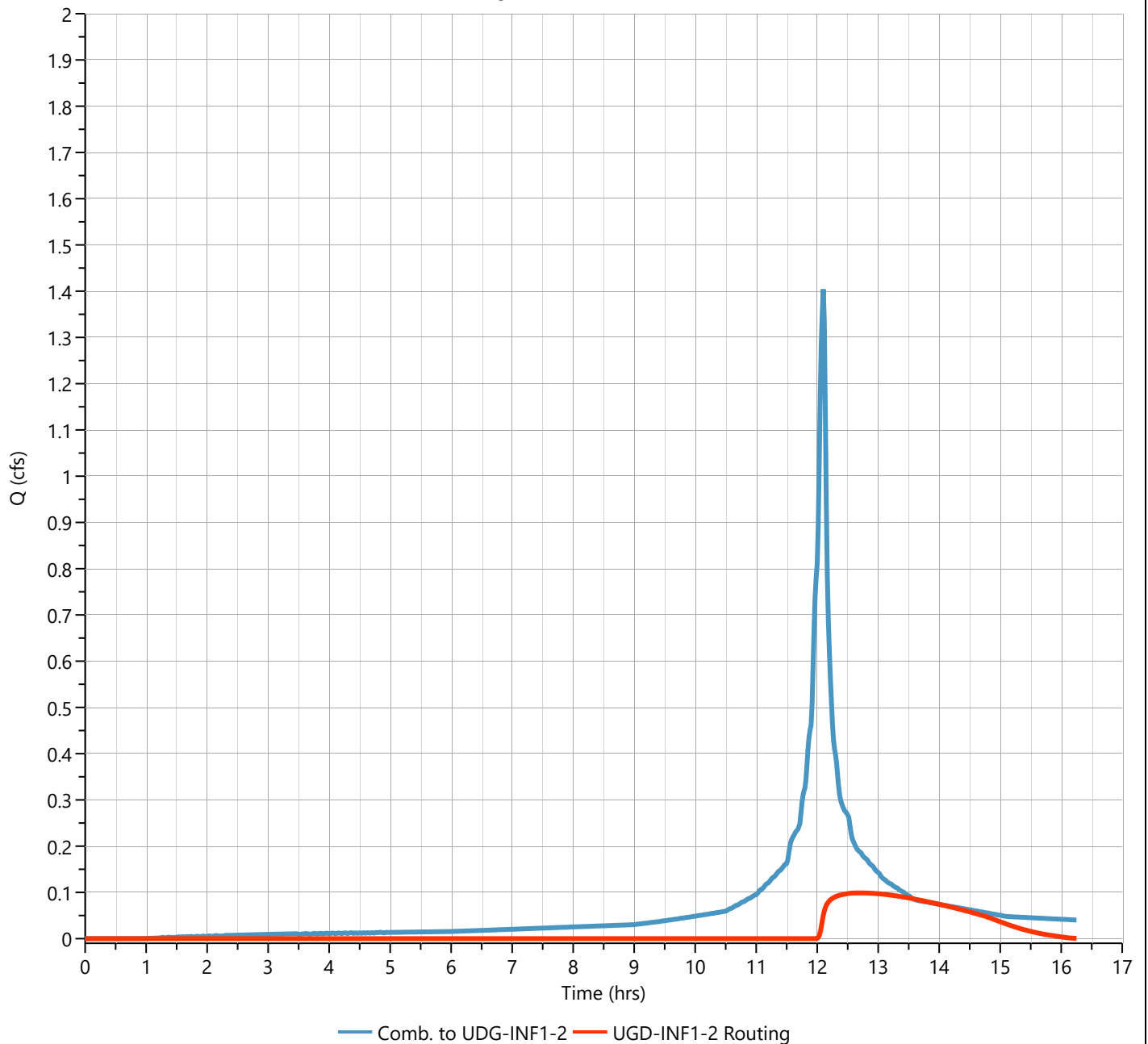
### Hyd. No. 20

|                   |                            |                   |              |
|-------------------|----------------------------|-------------------|--------------|
| Hydrograph Type   | = Pond Route               | Peak Flow         | = 0.099 cfs  |
| Storm Frequency   | = 2-yr                     | Time to Peak      | = 12.70 hrs  |
| Time Interval     | = 1 min                    | Hydrograph Volume | = 892 cuft   |
| Inflow Hydrograph | = 18 - Comb. to UDG-INF1-2 | Max. Elevation    | = 345.02 ft  |
| Pond Name         | = UGD-INF1-2               | Max. Storage      | = 1,476 cuft |

Pond Routing by Storage Indication Method

Center of mass detention time = 36 min

**Qp = 0.099 cfs**



# Hydrograph Report

Hydrology Studio v 3.0.0.38

File: Future Beacon Church Proposed - POA-1 & POA-3.hys

07-01-2025

## UGD-INF1-2 Routing

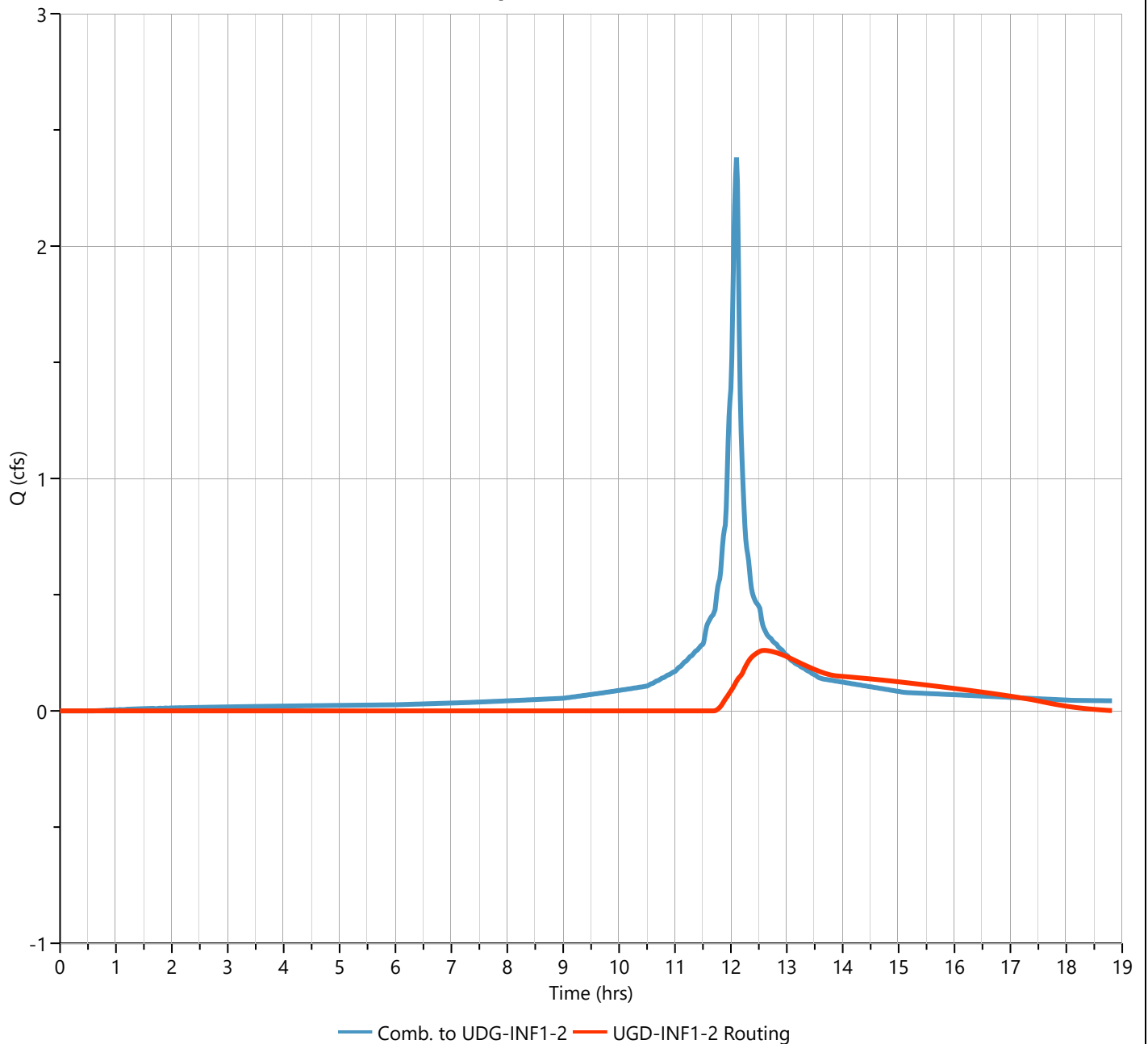
### Hyd. No. 20

|                   |                            |                   |              |
|-------------------|----------------------------|-------------------|--------------|
| Hydrograph Type   | = Pond Route               | Peak Flow         | = 0.260 cfs  |
| Storm Frequency   | = 10-yr                    | Time to Peak      | = 12.60 hrs  |
| Time Interval     | = 1 min                    | Hydrograph Volume | = 2,834 cuft |
| Inflow Hydrograph | = 18 - Comb. to UDG-INF1-2 | Max. Elevation    | = 345.72 ft  |
| Pond Name         | = UGD-INF1-2               | Max. Storage      | = 2,812 cuft |

Pond Routing by Storage Indication Method

Center of mass detention time = 1.41 hrs

**Qp = 0.260 cfs**



# Hydrograph Report

Hydrology Studio v 3.0.0.38

File: Future Beacon Church Proposed - POA-1 & POA-3.hys

07-01-2025

## UGD-INF1-2 Routing

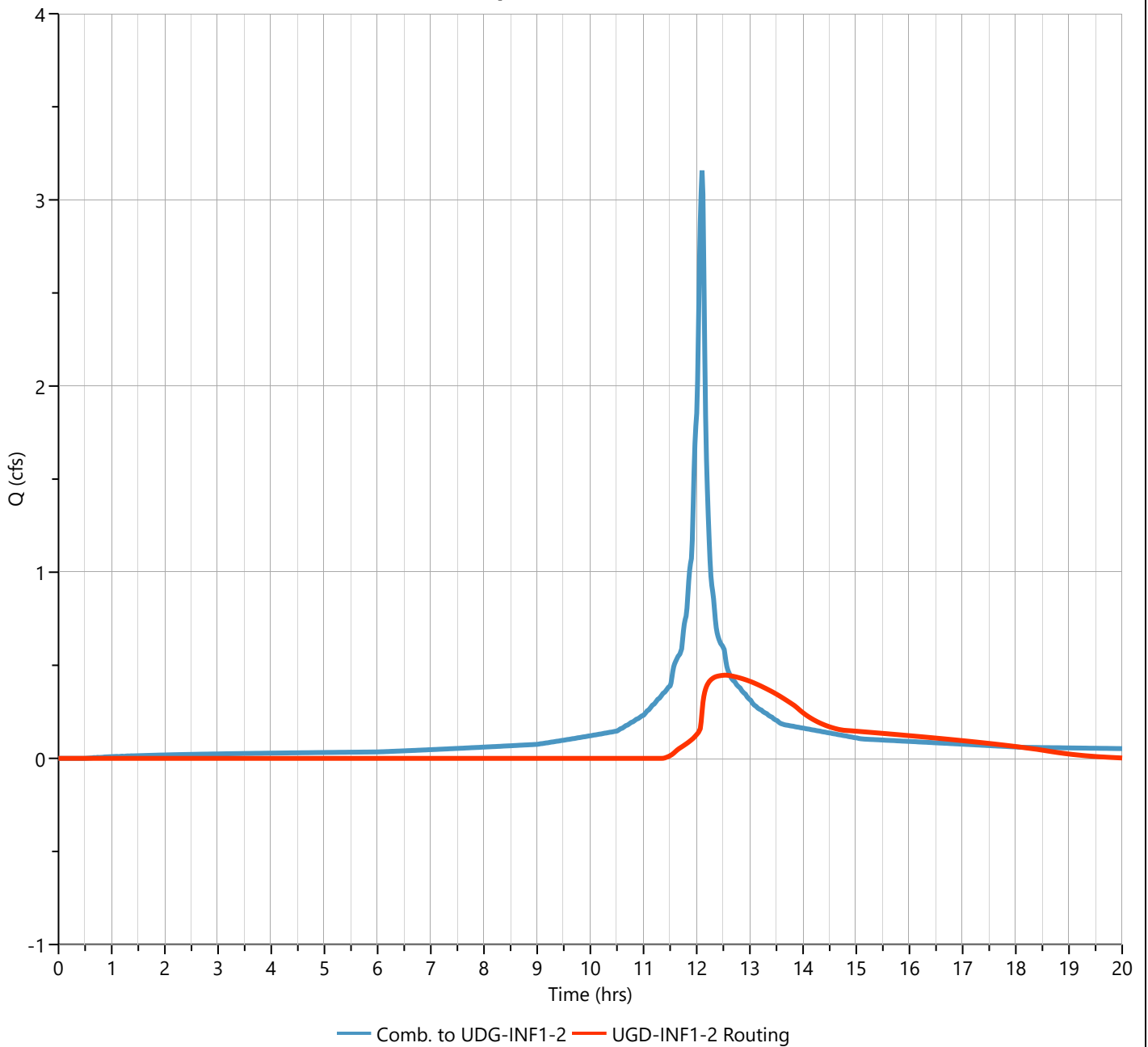
### Hyd. No. 20

|                   |                            |                   |              |
|-------------------|----------------------------|-------------------|--------------|
| Hydrograph Type   | = Pond Route               | Peak Flow         | = 0.447 cfs  |
| Storm Frequency   | = 25-yr                    | Time to Peak      | = 12.53 hrs  |
| Time Interval     | = 1 min                    | Hydrograph Volume | = 4,780 cuft |
| Inflow Hydrograph | = 18 - Comb. to UDG-INF1-2 | Max. Elevation    | = 346.26 ft  |
| Pond Name         | = UGD-INF1-2               | Max. Storage      | = 3,773 cuft |

Pond Routing by Storage Indication Method

Center of mass detention time = 1.43 hrs

**Qp = 0.447 cfs**



# Hydrograph Report

Hydrology Studio v 3.0.0.38

File: Future Beacon Church Proposed - POA-1 & POA-3.hys

07-01-2025

## UGD-INF1-2 Routing

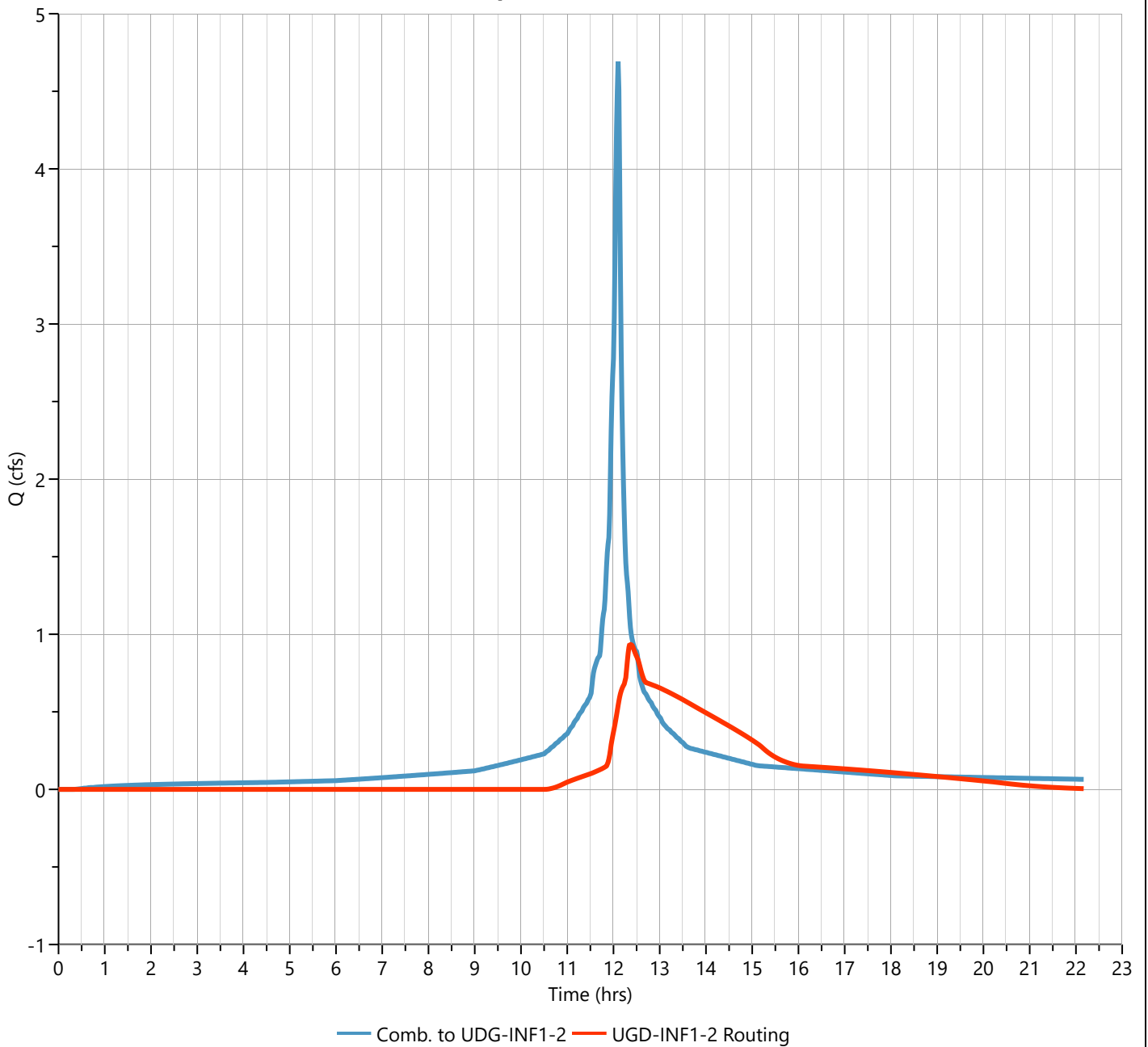
### Hyd. No. 20

|                   |                            |                   |              |
|-------------------|----------------------------|-------------------|--------------|
| Hydrograph Type   | = Pond Route               | Peak Flow         | = 0.942 cfs  |
| Storm Frequency   | = 100-yr                   | Time to Peak      | = 12.37 hrs  |
| Time Interval     | = 1 min                    | Hydrograph Volume | = 9,090 cuft |
| Inflow Hydrograph | = 18 - Comb. to UDG-INF1-2 | Max. Elevation    | = 347.63 ft  |
| Pond Name         | = UGD-INF1-2               | Max. Storage      | = 5,795 cuft |

Pond Routing by Storage Indication Method

Center of mass detention time = 1.65 hrs

**Qp = 0.942 cfs**



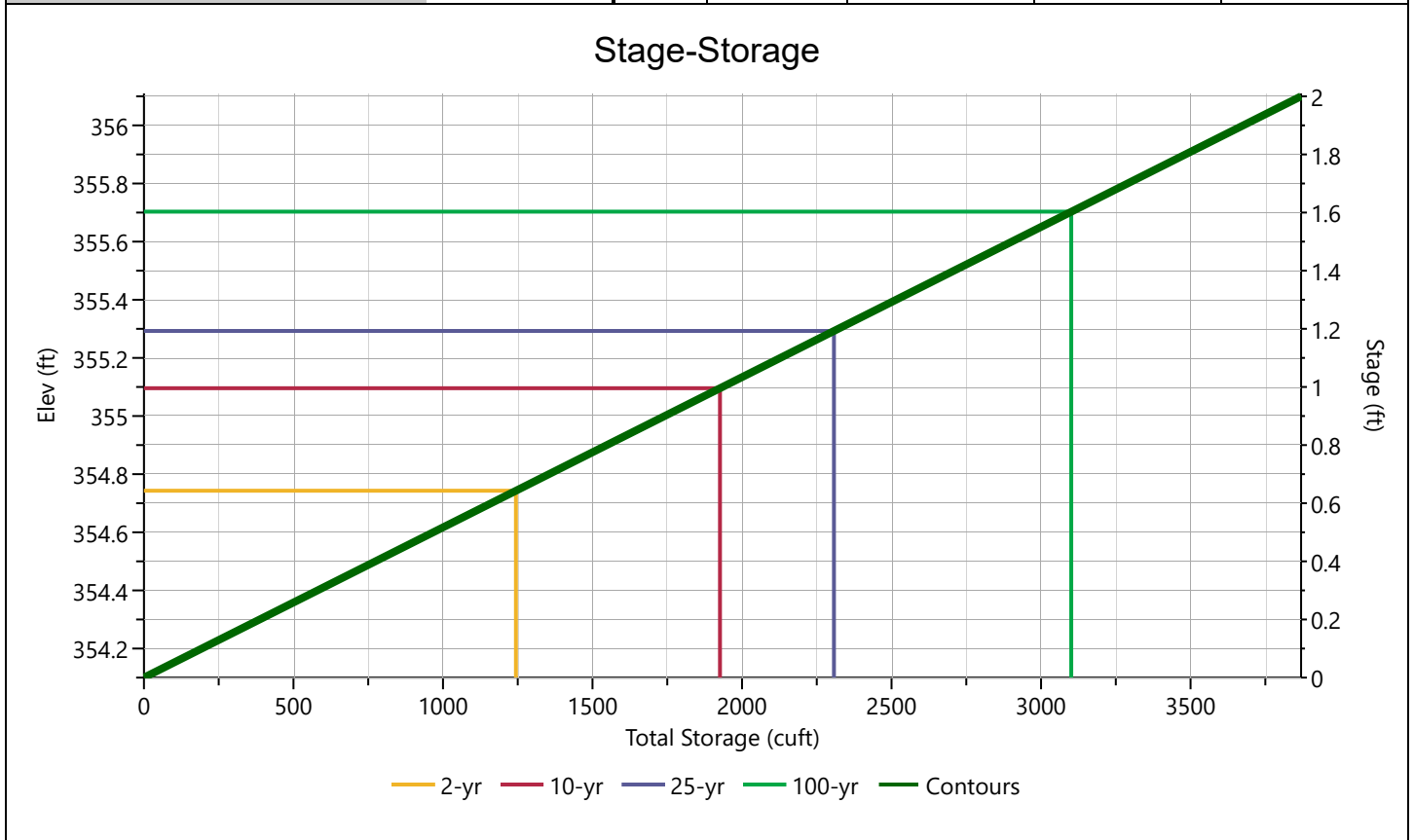
## **PR-2A WATERSHED POND ROUTING**

# Pond Report

## Porous Pavement System 1

## 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  | 354.10       | 0.00                  | 354.10         | 4,837               | 0.000                | 0.000                |
| Voids (%)             | 40.00        | 1.00                  | 355.10         | 4,837               | 1,935                | 1,935                |
| Volume Calc           | Ave End Area | 2.00                  | 356.10         | 4,837               | 1,935                | 3,870                |
|                       |              |                       |                |                     |                      |                      |
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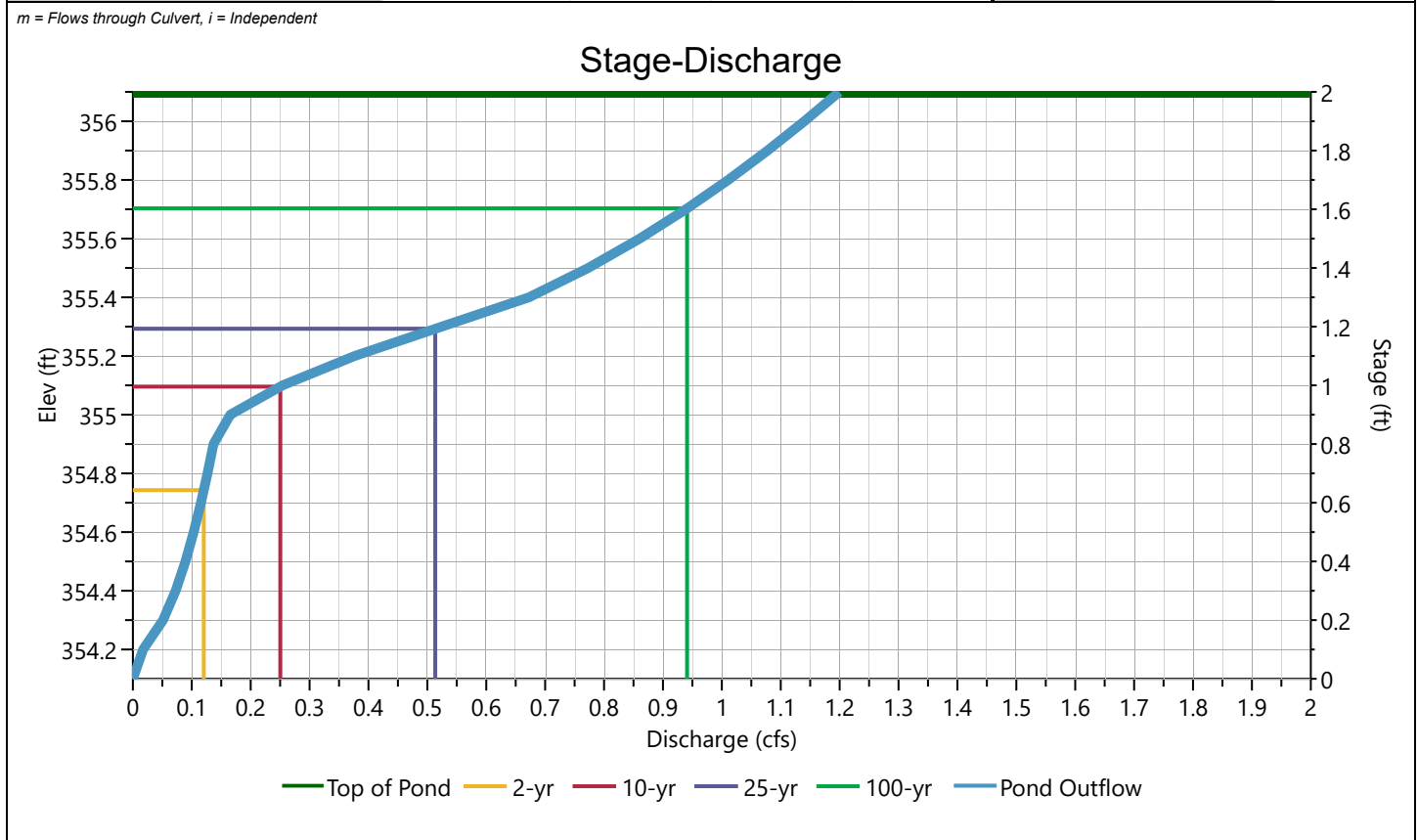
# Pond Report

## Porous Pavement System 1

## Stage-Discharge

| Culvert / Orifices      | Cir Culvert | Orifice |        |   | Perforated Riser        |
|-------------------------|-------------|---------|--------|---|-------------------------|
|                         |             | 1 (i)   | 2 (i)  | 3 |                         |
| Rise, in                |             | 2.5     | 5      |   | Hole Diameter, in       |
| Span, in                |             | 2.5     | 6      |   | No. holes               |
| No. Barrels             |             | 1       | 1      |   | Invert Elevation, ft    |
| Invert Elevation, ft    |             | 354.10  | 354.95 |   | Height, ft              |
| Orifice Coefficient, Co |             | 0.60    | 0.60   |   | Orifice Coefficient, Co |
| Length, ft              |             |         |        |   |                         |
| Barrel Slope, %         |             |         |        |   |                         |
| N-Value, n              |             |         |        |   |                         |
| Weirs                   | Riser       | Weir    |        |   | Ancillary               |
| Shape / Type            |             | 1       | 2      | 3 | Exfiltration, in/hr     |
| Crest Elevation, ft     |             |         |        |   |                         |
| Crest Length, ft        |             |         |        |   |                         |
| Angle, deg              |             |         |        |   |                         |
| Weir Coefficient, Cw    |             |         |        |   |                         |

*m = Flows through Culvert, i = Independent*



# Hydrograph Report

Hydrology Studio v 3.0.0.38

File: Future Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2A Routing

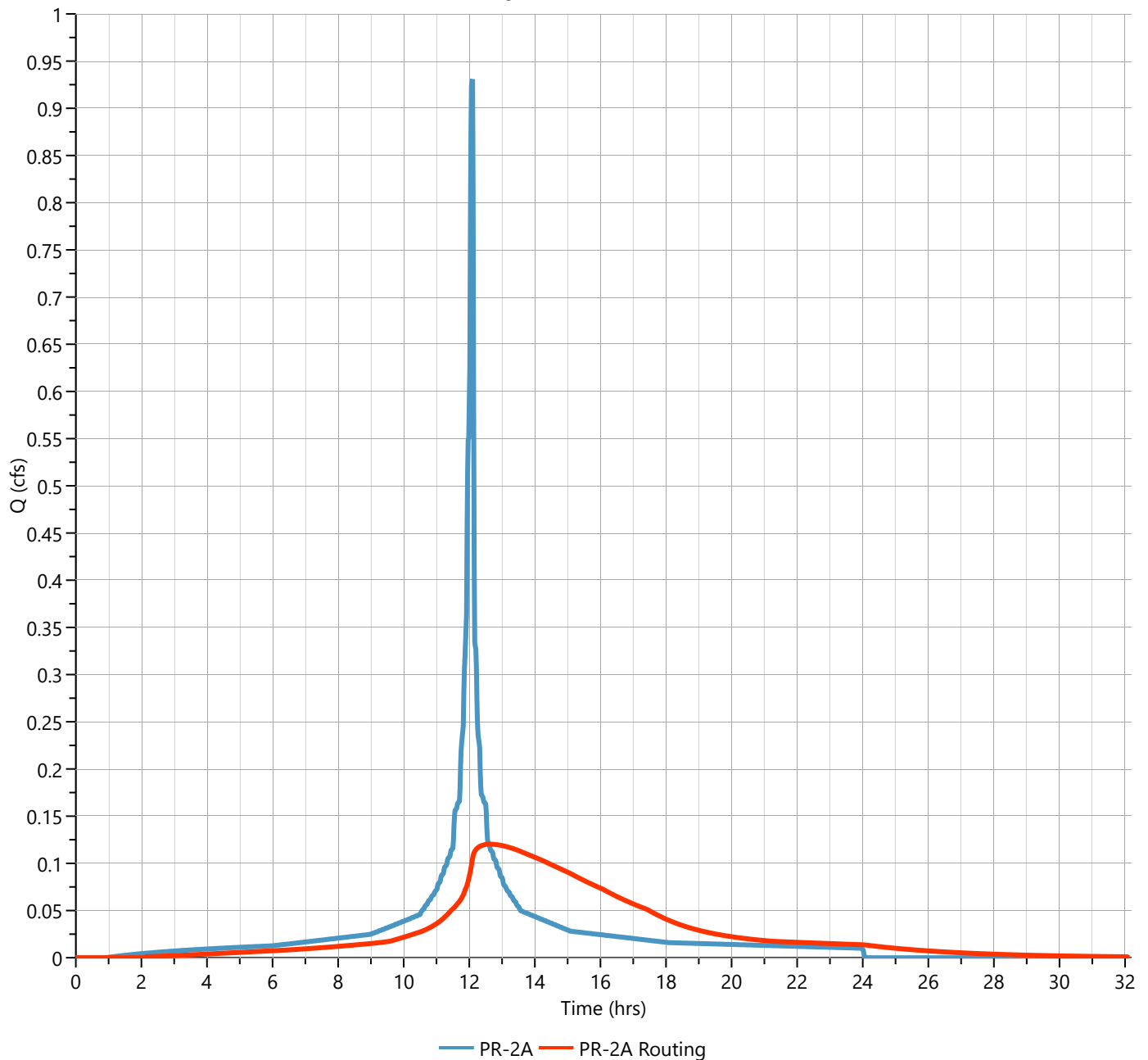
### Hyd. No. 4

|                   |                            |                   |              |
|-------------------|----------------------------|-------------------|--------------|
| Hydrograph Type   | = Pond Route               | Peak Flow         | = 0.120 cfs  |
| Storm Frequency   | = 2-yr                     | Time to Peak      | = 12.62 hrs  |
| Time Interval     | = 1 min                    | Hydrograph Volume | = 3,020 cuft |
| Inflow Hydrograph | = 3 - PR-2A                | Max. Elevation    | = 354.74 ft  |
| Pond Name         | = Porous Pavement System 1 | Max. Storage      | = 1,244 cuft |

Pond Routing by Storage Indication Method

Center of mass detention time = 2.53 hrs

**Qp = 0.120 cfs**



# Hydrograph Report

Hydrology Studio v 3.0.0.38

File: Future Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2A Routing

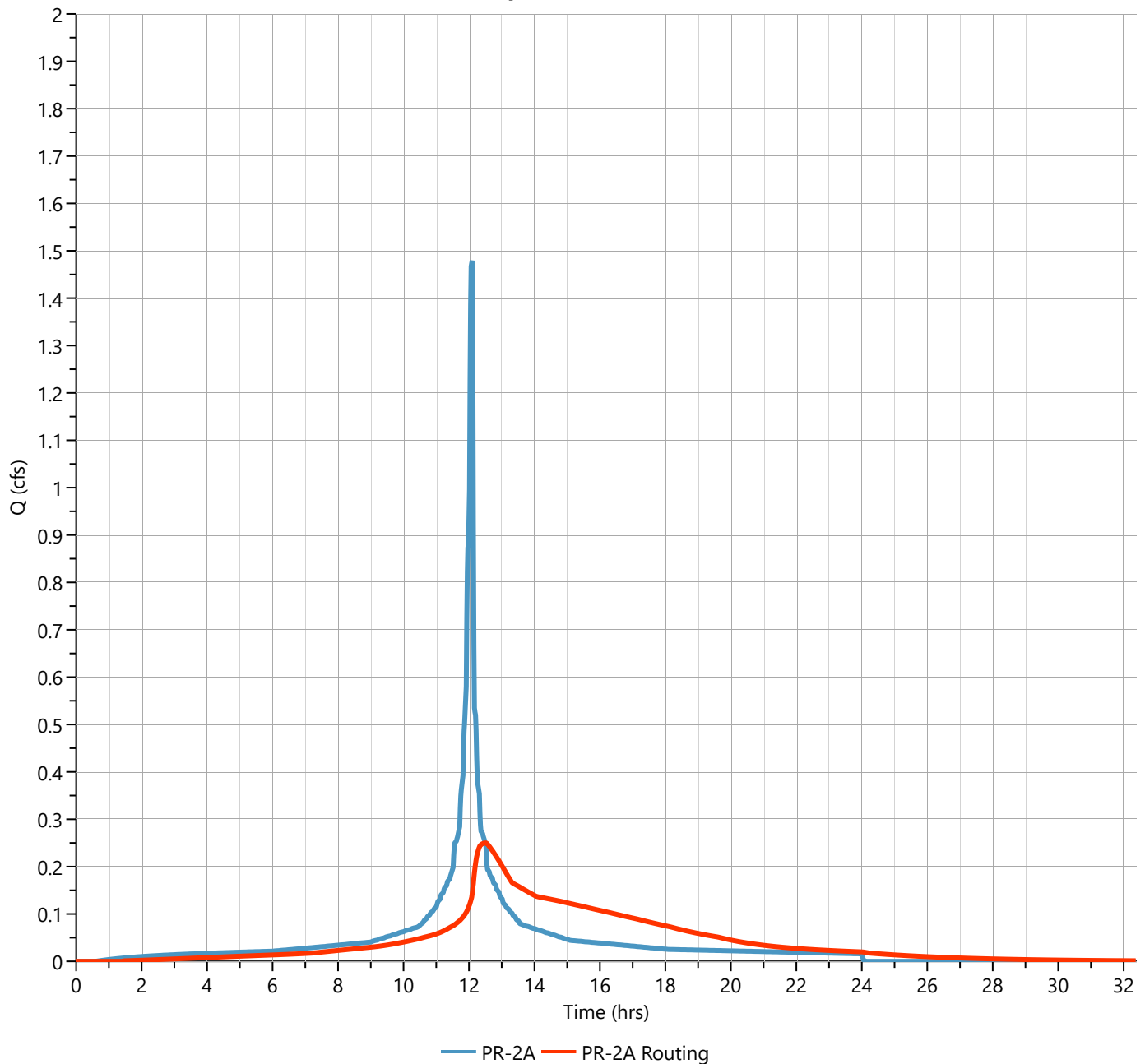
### Hyd. No. 4

|                   |                            |                   |              |
|-------------------|----------------------------|-------------------|--------------|
| Hydrograph Type   | = Pond Route               | Peak Flow         | = 0.250 cfs  |
| Storm Frequency   | = 10-yr                    | Time to Peak      | = 12.52 hrs  |
| Time Interval     | = 1 min                    | Hydrograph Volume | = 4,874 cuft |
| Inflow Hydrograph | = 3 - PR-2A                | Max. Elevation    | = 355.10 ft  |
| Pond Name         | = Porous Pavement System 1 | Max. Storage      | = 1,926 cuft |

Pond Routing by Storage Indication Method

Center of mass detention time = 2.49 hrs

**Qp = 0.250 cfs**



# Hydrograph Report

Hydrology Studio v 3.0.0.38

File: Future Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2A Routing

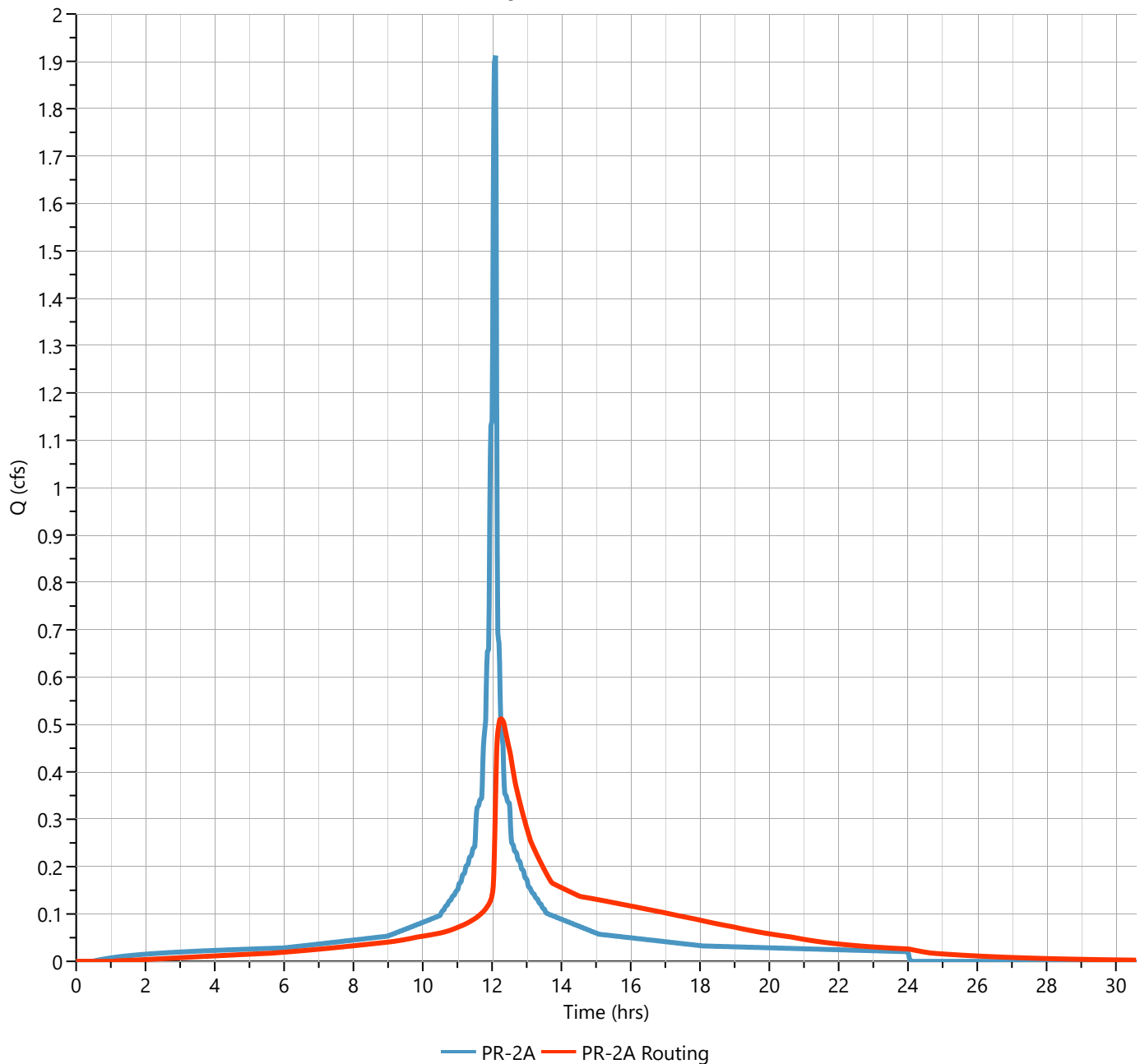
## Hyd. No. 4

|                   |                            |                   |              |
|-------------------|----------------------------|-------------------|--------------|
| Hydrograph Type   | = Pond Route               | Peak Flow         | = 0.513 cfs  |
| Storm Frequency   | = 25-yr                    | Time to Peak      | = 12.25 hrs  |
| Time Interval     | = 1 min                    | Hydrograph Volume | = 6,344 cuft |
| Inflow Hydrograph | = 3 - PR-2A                | Max. Elevation    | = 355.29 ft  |
| Pond Name         | = Porous Pavement System 1 | Max. Storage      | = 2,307 cuft |

Pond Routing by Storage Indication Method

Center of mass detention time = 2.20 hrs

**Qp = 0.513 cfs**



# Hydrograph Report

Hydrology Studio v 3.0.0.38

File: Future Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2A Routing

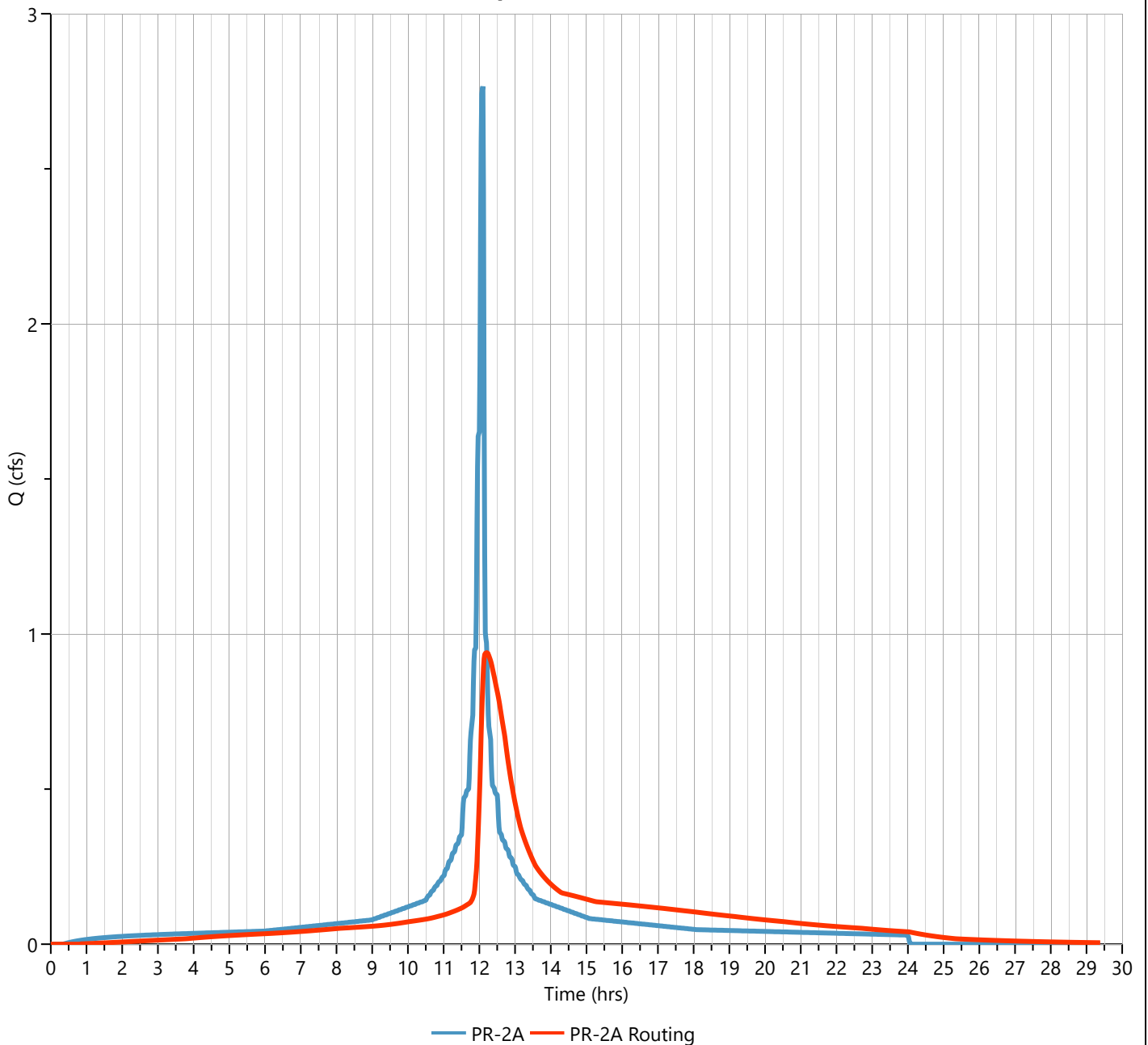
### Hyd. No. 4

|                   |                            |                   |              |
|-------------------|----------------------------|-------------------|--------------|
| Hydrograph Type   | = Pond Route               | Peak Flow         | = 0.941 cfs  |
| Storm Frequency   | = 100-yr                   | Time to Peak      | = 12.22 hrs  |
| Time Interval     | = 1 min                    | Hydrograph Volume | = 9,255 cuft |
| Inflow Hydrograph | = 3 - PR-2A                | Max. Elevation    | = 355.70 ft  |
| Pond Name         | = Porous Pavement System 1 | Max. Storage      | = 3,101 cuft |

Pond Routing by Storage Indication Method

Center of mass detention time = 1.87 hrs

**Qp = 0.941 cfs**



## **PR-2C WATERSHED POND ROUTING**

# Pond Report

Project Name:

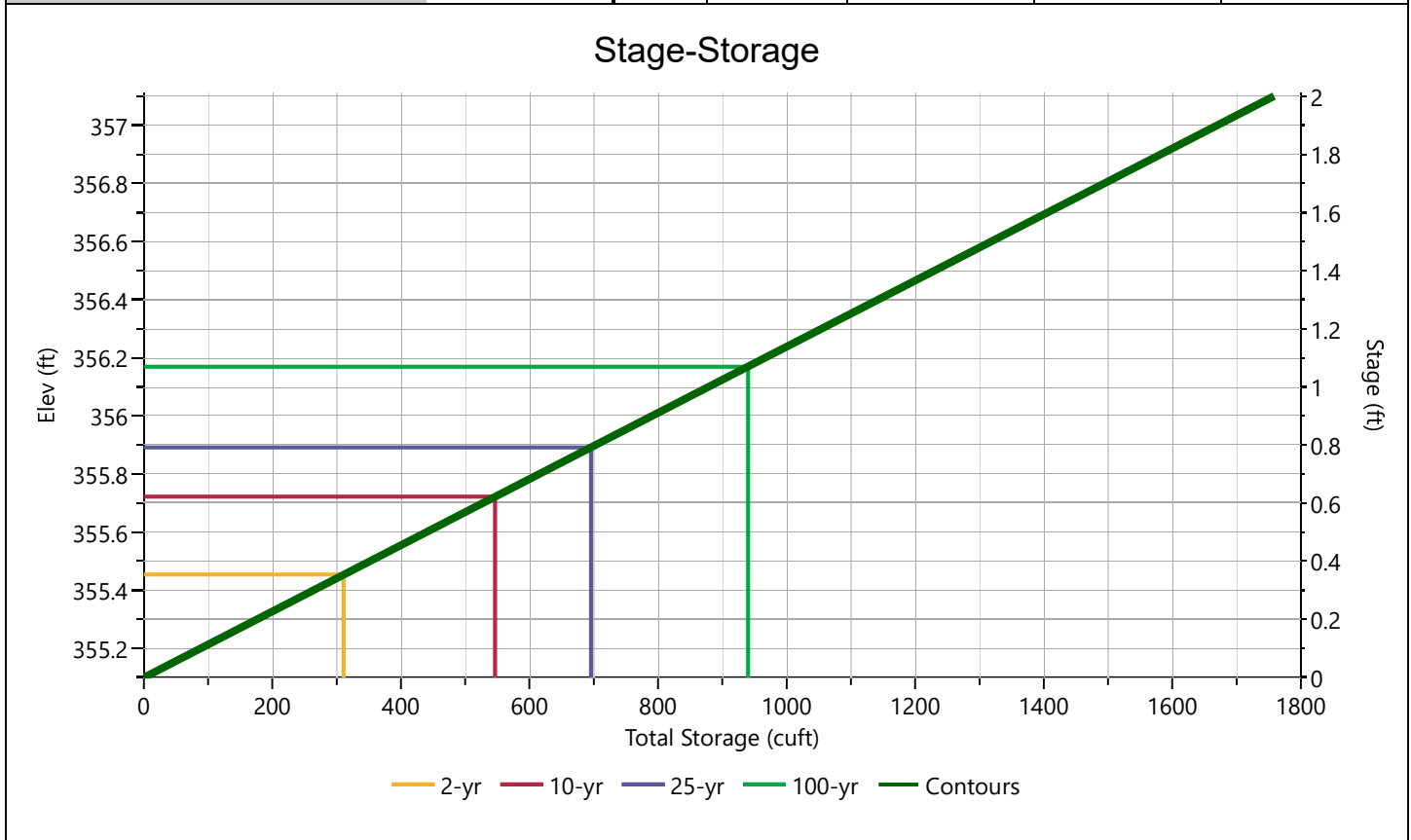
Hydrology Studio v 3.0.0.31

02-08-2024

## Porous Pavement System 2

## 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  | 355.10       | 0.00                  | 355.10         | 2,198               | 0.000                | 0.000                |
| Voids (%)             | 40.00        | 1.00                  | 356.10         | 2,198               | 879                  | 879                  |
| Volume Calc           | Ave End Area | 2.00                  | 357.10         | 2,198               | 879                  | 1,758                |
|                       |              |                       |                |                     |                      |                      |
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# Pond Report

Project Name:

Hydrology Studio v 3.0.0.31

02-08-2024

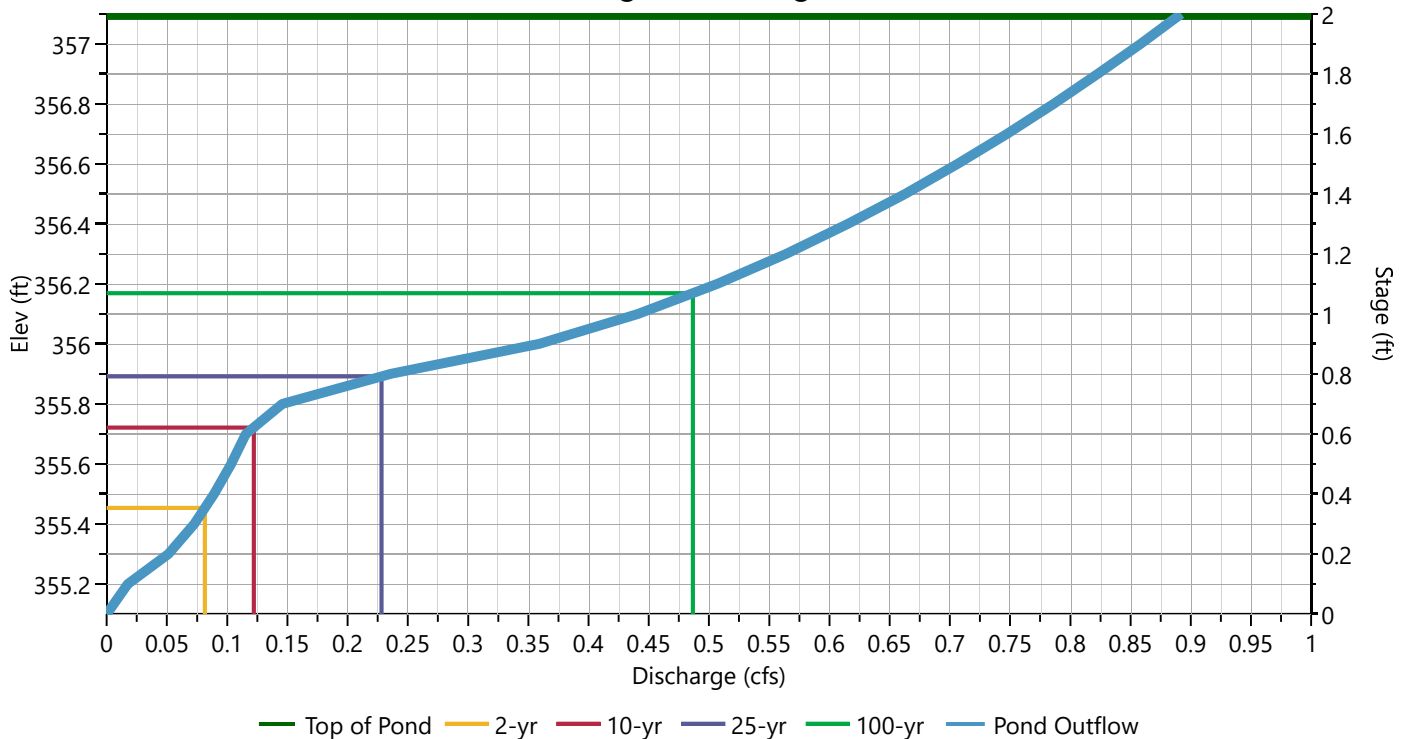
## Porous Pavement System 2

## Stage-Discharge

| Culvert / Orifices      | Culvert | Orifices |        |   | Perforated Riser        |
|-------------------------|---------|----------|--------|---|-------------------------|
|                         |         | 1        | 2      | 3 |                         |
| Rise, in                |         | 2.5      | 3      |   | Hole Diameter, in       |
| Span, in                |         | 2.5      | 6      |   | No. holes               |
| No. Barrels             |         | 1        | 1      |   | Invert Elevation, ft    |
| Invert Elevation, ft    |         | 355.10   | 355.75 |   | Height, ft              |
| Orifice Coefficient, Co |         | 0.60     | 0.60   |   | 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     |         |          |        |   |                         |
| Crest Length, ft        |         |          |        |   |                         |
| Angle, deg              |         |          |        |   |                         |
| Weir Coefficient, Cw    |         |          |        |   |                         |

\*Routes through Culvert.

### Stage-Discharge





# Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2C Routing

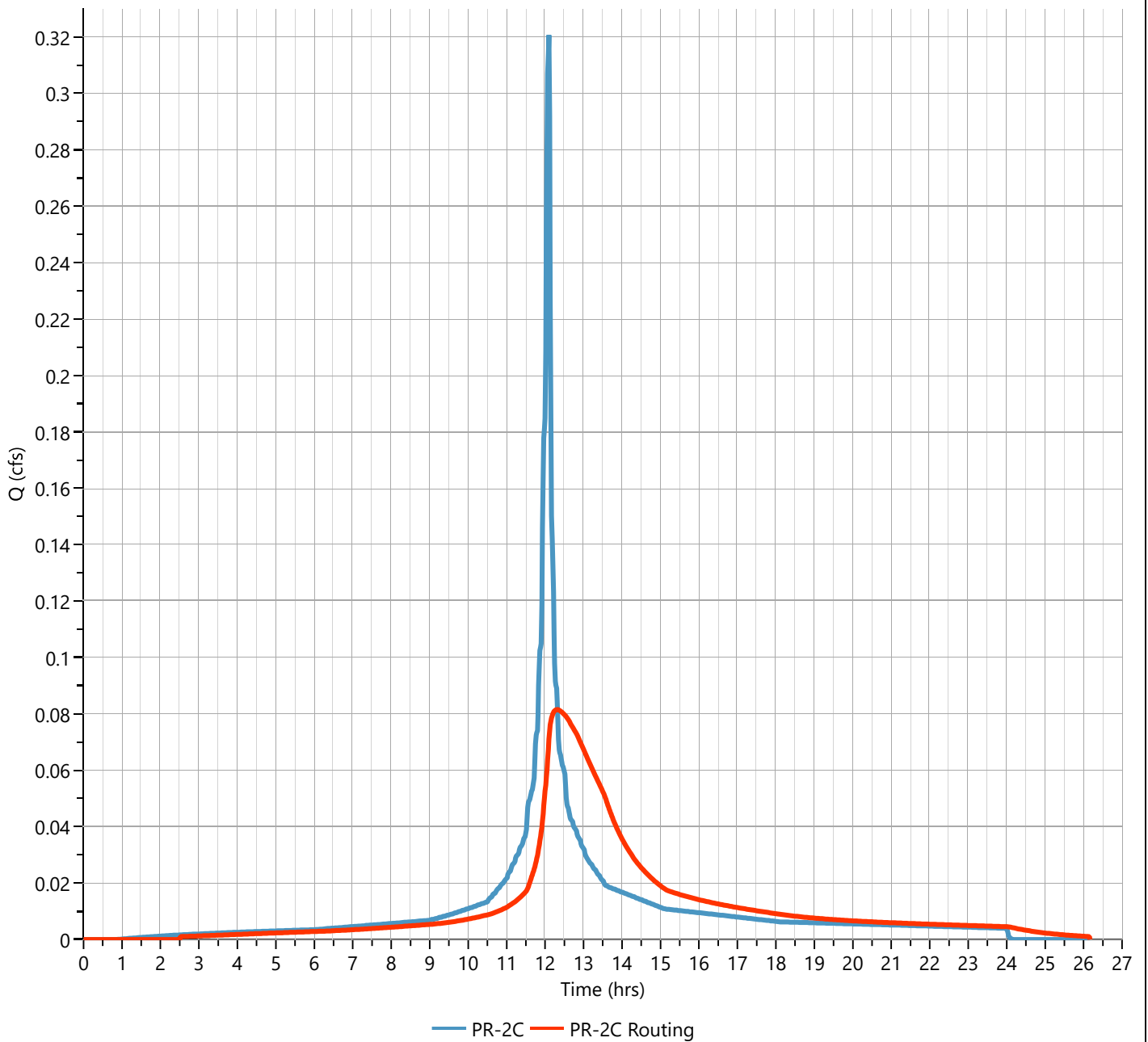
## Hyd. No. 15

|                   |                            |                   |              |
|-------------------|----------------------------|-------------------|--------------|
| Hydrograph Type   | = Pond Route               | Peak Flow         | = 0.082 cfs  |
| Storm Frequency   | = 2-yr                     | Time to Peak      | = 12.32 hrs  |
| Time Interval     | = 1 min                    | Hydrograph Volume | = 1,040 cuft |
| Inflow Hydrograph | = 13 - PR-2C               | Max. Elevation    | = 355.45 ft  |
| Pond Name         | = Porous Pavement System 2 | Max. Storage      | = 311 cuft   |

Pond Routing by Storage Indication Method

Center of mass detention time = 1.14 hrs

**Qp = 0.08 cfs**



# Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2C Routing

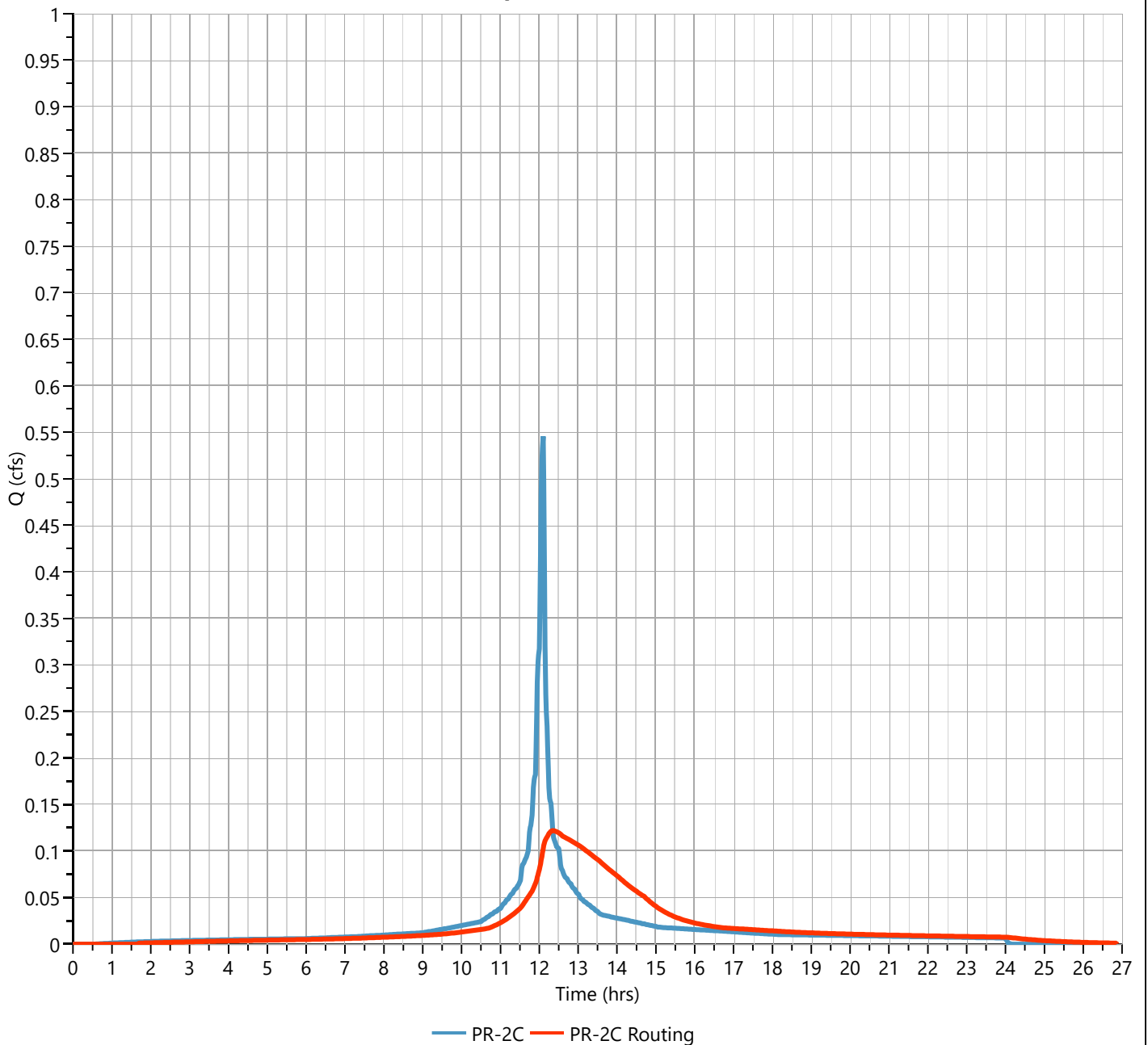
## Hyd. No. 15

|                   |                            |                   |              |
|-------------------|----------------------------|-------------------|--------------|
| Hydrograph Type   | = Pond Route               | Peak Flow         | = 0.122 cfs  |
| Storm Frequency   | = 10-yr                    | Time to Peak      | = 12.35 hrs  |
| Time Interval     | = 1 min                    | Hydrograph Volume | = 1,787 cuft |
| Inflow Hydrograph | = 13 - PR-2C               | Max. Elevation    | = 355.72 ft  |
| Pond Name         | = Porous Pavement System 2 | Max. Storage      | = 546 cuft   |

*Pond Routing by Storage Indication Method*

*Center of mass detention time = 1.17 hrs*

**Qp = 0.12 cfs**



# Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2C Routing

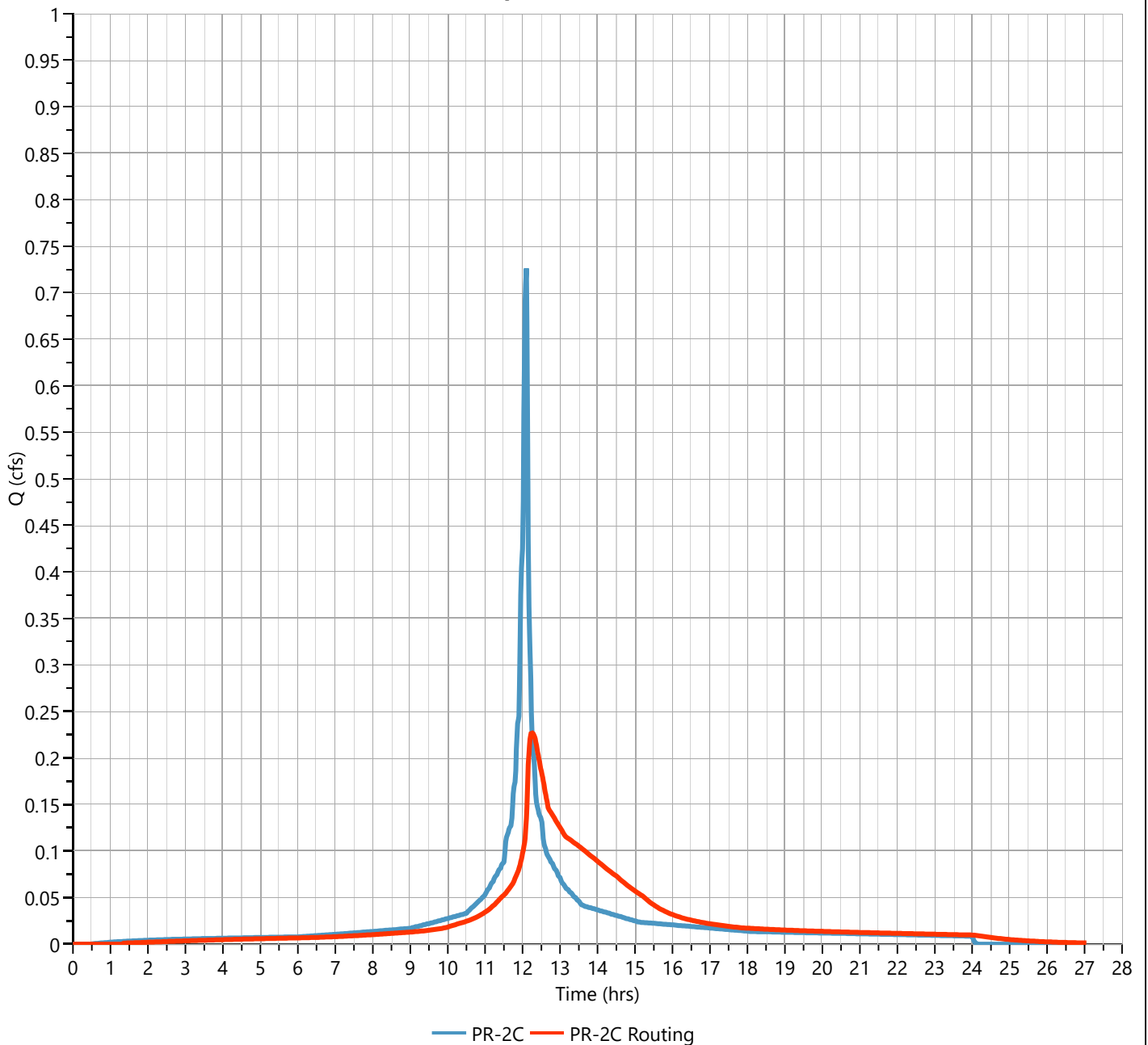
## Hyd. No. 15

|                   |                            |                   |              |
|-------------------|----------------------------|-------------------|--------------|
| Hydrograph Type   | = Pond Route               | Peak Flow         | = 0.228 cfs  |
| Storm Frequency   | = 25-yr                    | Time to Peak      | = 12.25 hrs  |
| Time Interval     | = 1 min                    | Hydrograph Volume | = 2,395 cuft |
| Inflow Hydrograph | = 13 - PR-2C               | Max. Elevation    | = 355.89 ft  |
| Pond Name         | = Porous Pavement System 2 | Max. Storage      | = 696 cuft   |

*Pond Routing by Storage Indication Method*

*Center of mass detention time = 1.10 hrs*

**Qp = 0.23 cfs**



# Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.31

02-08-2024

## PR-2C Routing

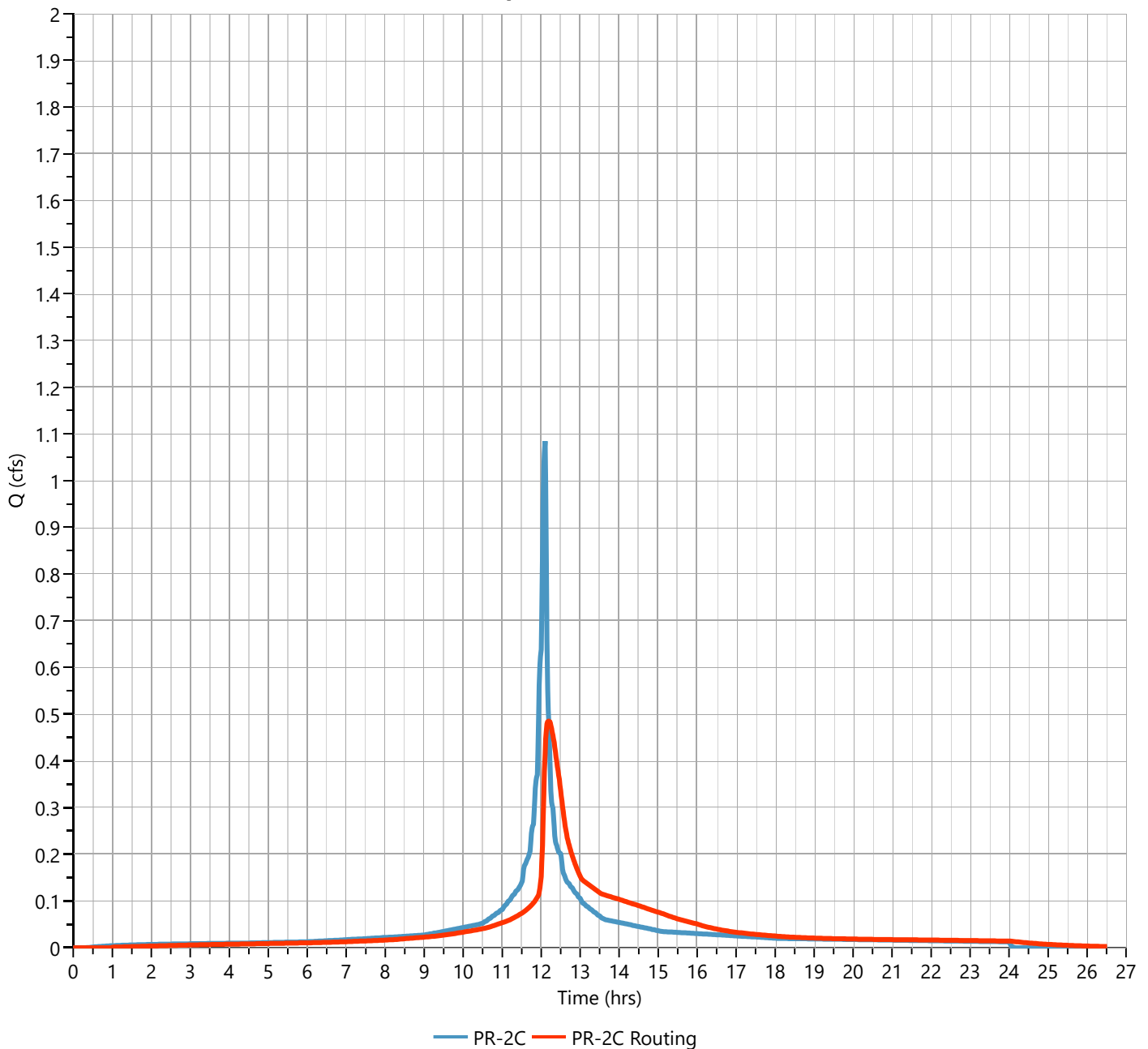
## Hyd. No. 15

|                   |                            |                   |              |
|-------------------|----------------------------|-------------------|--------------|
| Hydrograph Type   | = Pond Route               | Peak Flow         | = 0.487 cfs  |
| Storm Frequency   | = 100-yr                   | Time to Peak      | = 12.20 hrs  |
| Time Interval     | = 1 min                    | Hydrograph Volume | = 3,617 cuft |
| Inflow Hydrograph | = 13 - PR-2C               | Max. Elevation    | = 356.17 ft  |
| Pond Name         | = Porous Pavement System 2 | Max. Storage      | = 940 cuft   |

*Pond Routing by Storage Indication Method*

*Center of mass detention time = 57 min*

**Qp = 0.49 cfs**



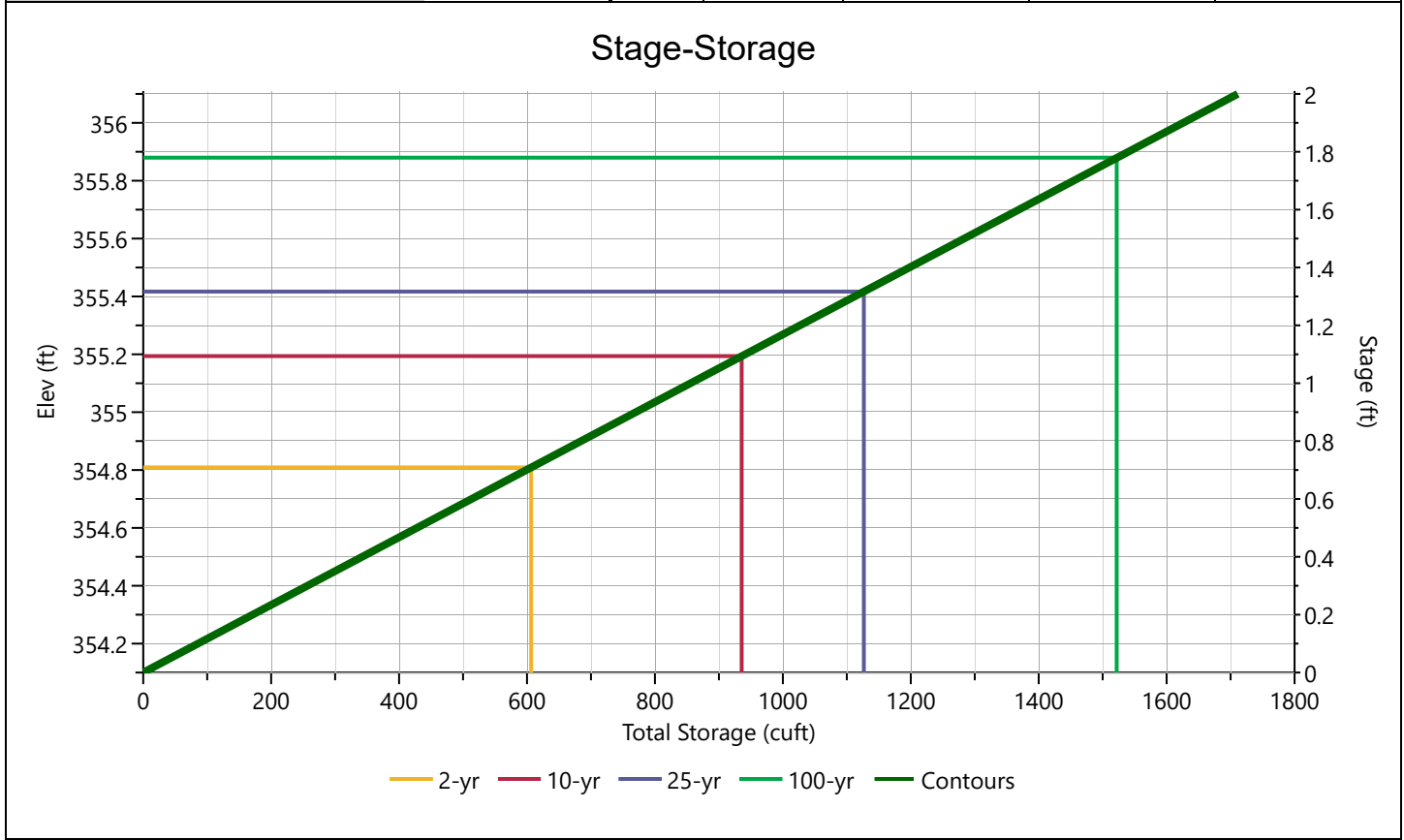
## **PR-2B + PR-2H WATERSHED POND ROUTING**

# Pond Report

## Porous Pavement System 3

## 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  | 354.10       | 0.00                  | 354.10         | 2,139               | 0.000                | 0.000                |
| Voids (%)             | 40.00        | 1.00                  | 355.10         | 2,139               | 856                  | 856                  |
| Volume Calc           | Ave End Area | 2.00                  | 356.10         | 2,139               | 856                  | 1,711                |
|                       |              |                       |                |                     |                      |                      |
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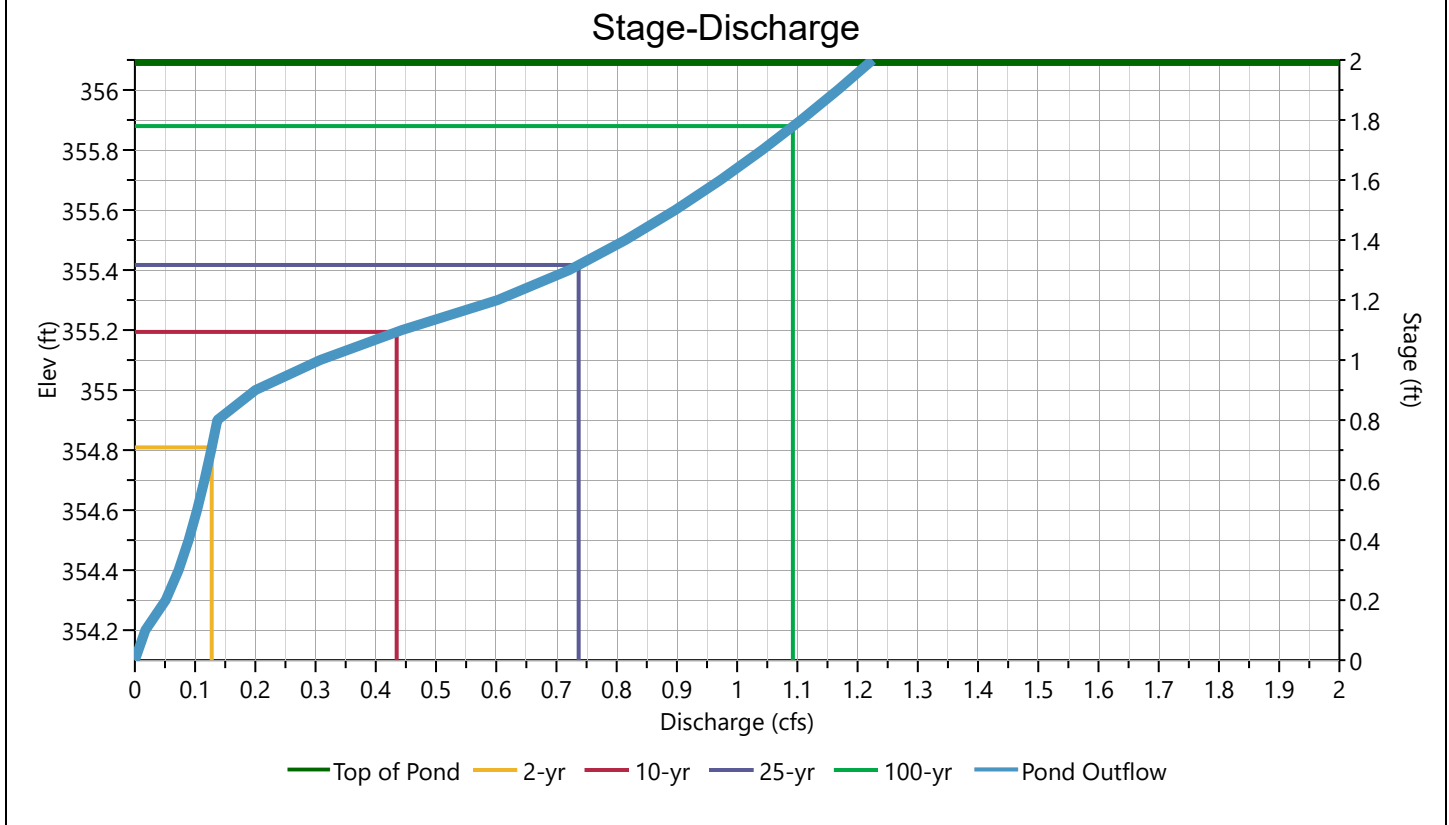
# Pond Report

## Porous Pavement System 3

## Stage-Discharge

| Culvert / Orifices      | Cir Culvert | Orifice |        |   | Perforated Riser        |
|-------------------------|-------------|---------|--------|---|-------------------------|
|                         |             | 1 (i)   | 2 (i)  | 3 |                         |
| Rise, in                |             | 2.5     | 5      |   | Hole Diameter, in       |
| Span, in                |             | 2.5     | 6      |   | No. holes               |
| No. Barrels             |             | 1       | 1      |   | Invert Elevation, ft    |
| Invert Elevation, ft    |             | 354.10  | 354.90 |   | Height, ft              |
| Orifice Coefficient, Co |             | 0.60    | 0.60   |   | Orifice Coefficient, Co |
| Length, ft              |             |         |        |   |                         |
| Barrel Slope, %         |             |         |        |   |                         |
| N-Value, n              |             |         |        |   |                         |
| Weirs                   | Riser       | Weir    |        |   | Ancillary               |
| Shape / Type            |             | 1       | 2      | 3 | Exfiltration, in/hr     |
| Crest Elevation, ft     |             |         |        |   |                         |
| Crest Length, ft        |             |         |        |   |                         |
| Angle, deg              |             |         |        |   |                         |
| Weir Coefficient, Cw    |             |         |        |   |                         |

*m = Flows through Culvert, i = Independent*



# Hydrograph Report

Hydrology Studio v 3.0.0.38

File: Future Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2B+PR-2H Routing

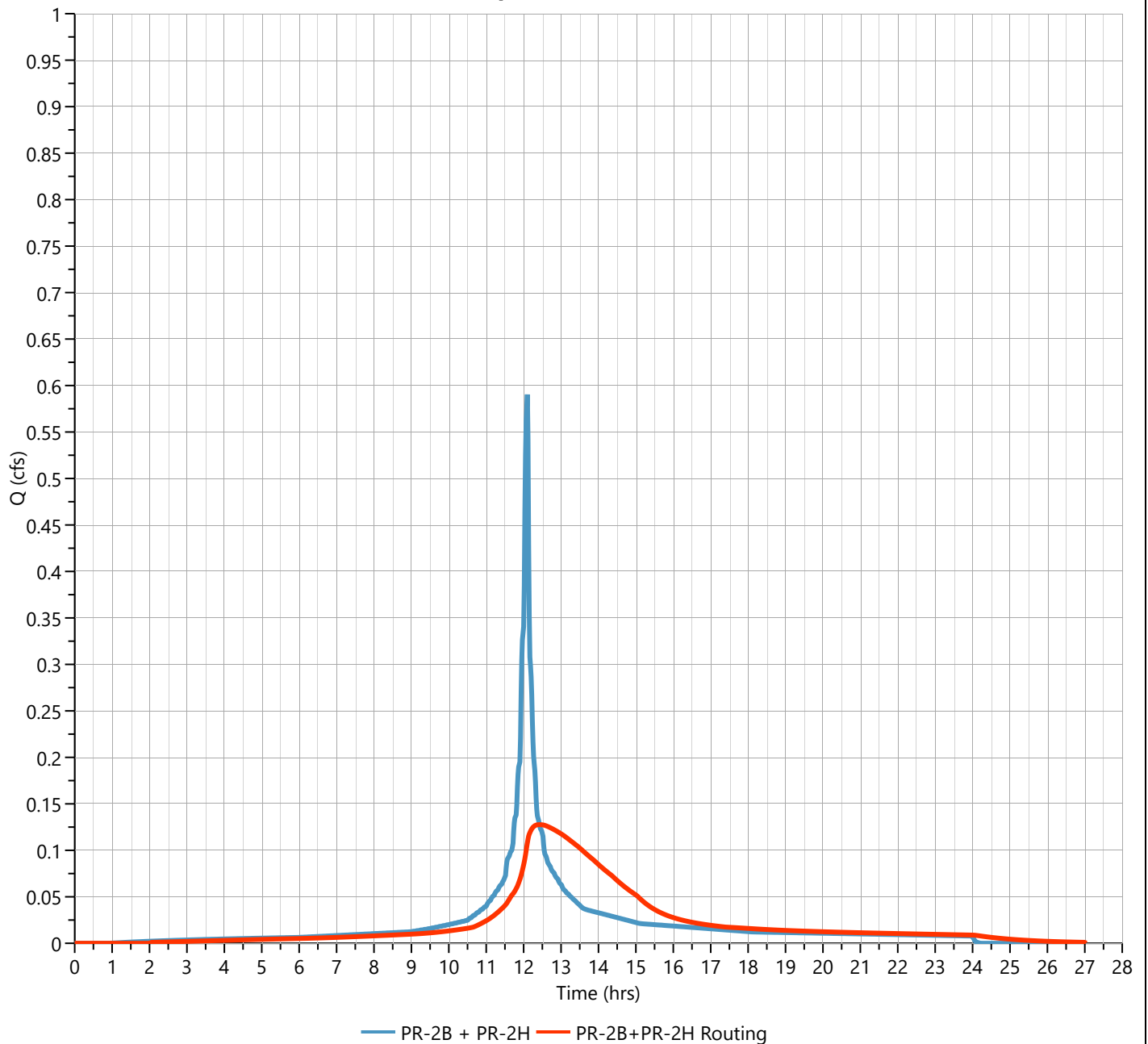
### Hyd. No. 39

|                   |                            |                   |              |
|-------------------|----------------------------|-------------------|--------------|
| Hydrograph Type   | = Pond Route               | Peak Flow         | = 0.128 cfs  |
| Storm Frequency   | = 2-yr                     | Time to Peak      | = 12.42 hrs  |
| Time Interval     | = 1 min                    | Hydrograph Volume | = 2,004 cuft |
| Inflow Hydrograph | = 38 - PR-2B + PR-2H       | Max. Elevation    | = 354.81 ft  |
| Pond Name         | = Porous Pavement System 3 | Max. Storage      | = 607 cuft   |

Pond Routing by Storage Indication Method

Center of mass detention time = 1.16 hrs

**Qp = 0.128 cfs**





# Hydrograph Report

Hydrology Studio v 3.0.0.38

File: Future Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2B+PR-2H Routing

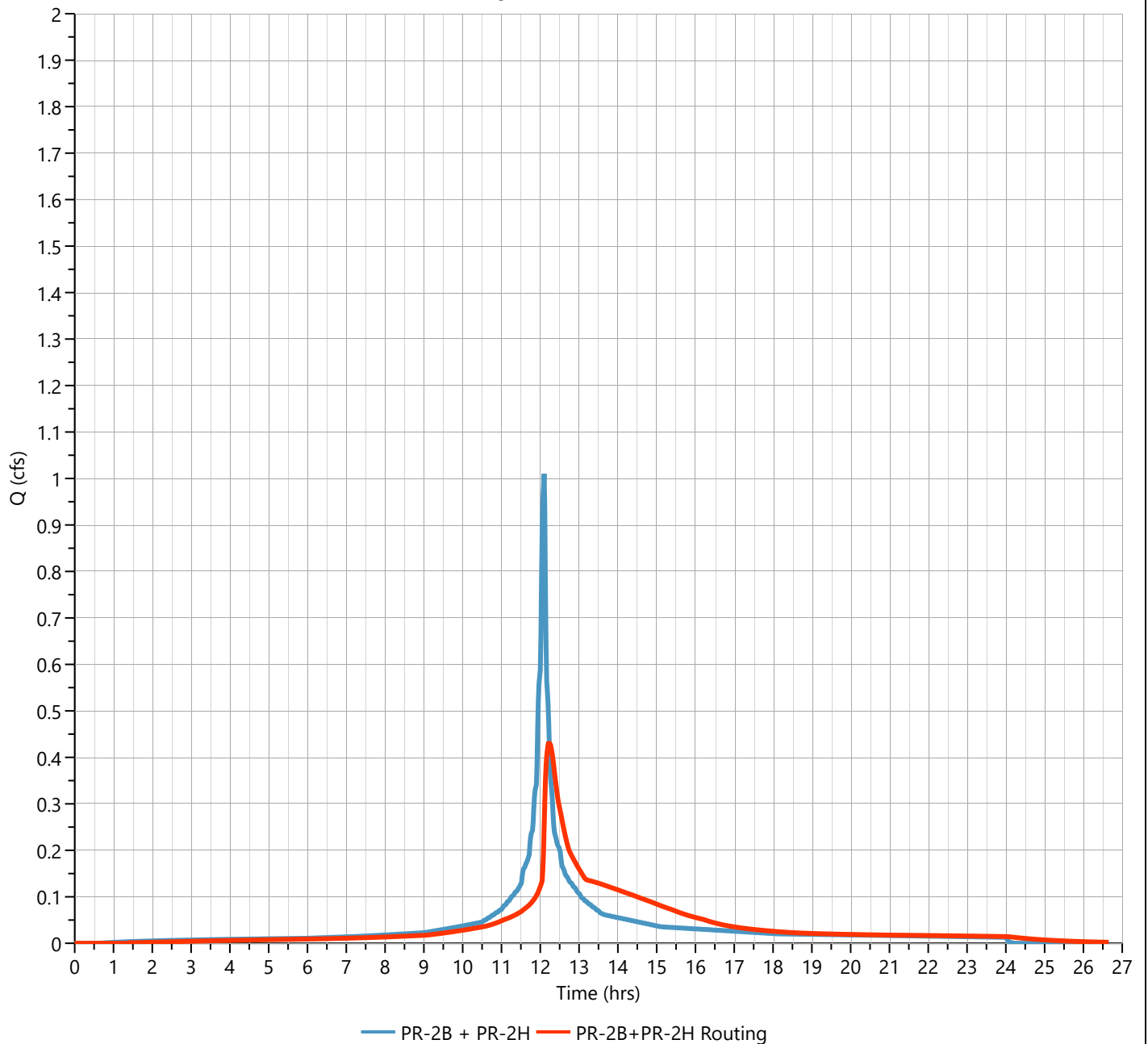
### Hyd. No. 39

|                   |                            |                   |              |
|-------------------|----------------------------|-------------------|--------------|
| Hydrograph Type   | = Pond Route               | Peak Flow         | = 0.435 cfs  |
| Storm Frequency   | = 10-yr                    | Time to Peak      | = 12.23 hrs  |
| Time Interval     | = 1 min                    | Hydrograph Volume | = 3,474 cuft |
| Inflow Hydrograph | = 38 - PR-2B + PR-2H       | Max. Elevation    | = 355.19 ft  |
| Pond Name         | = Porous Pavement System 3 | Max. Storage      | = 936 cuft   |

Pond Routing by Storage Indication Method

Center of mass detention time = 1.01 hrs

**Qp = 0.435 cfs**



# Hydrograph Report

Hydrology Studio v 3.0.0.38

File: Future Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2B+PR-2H Routing

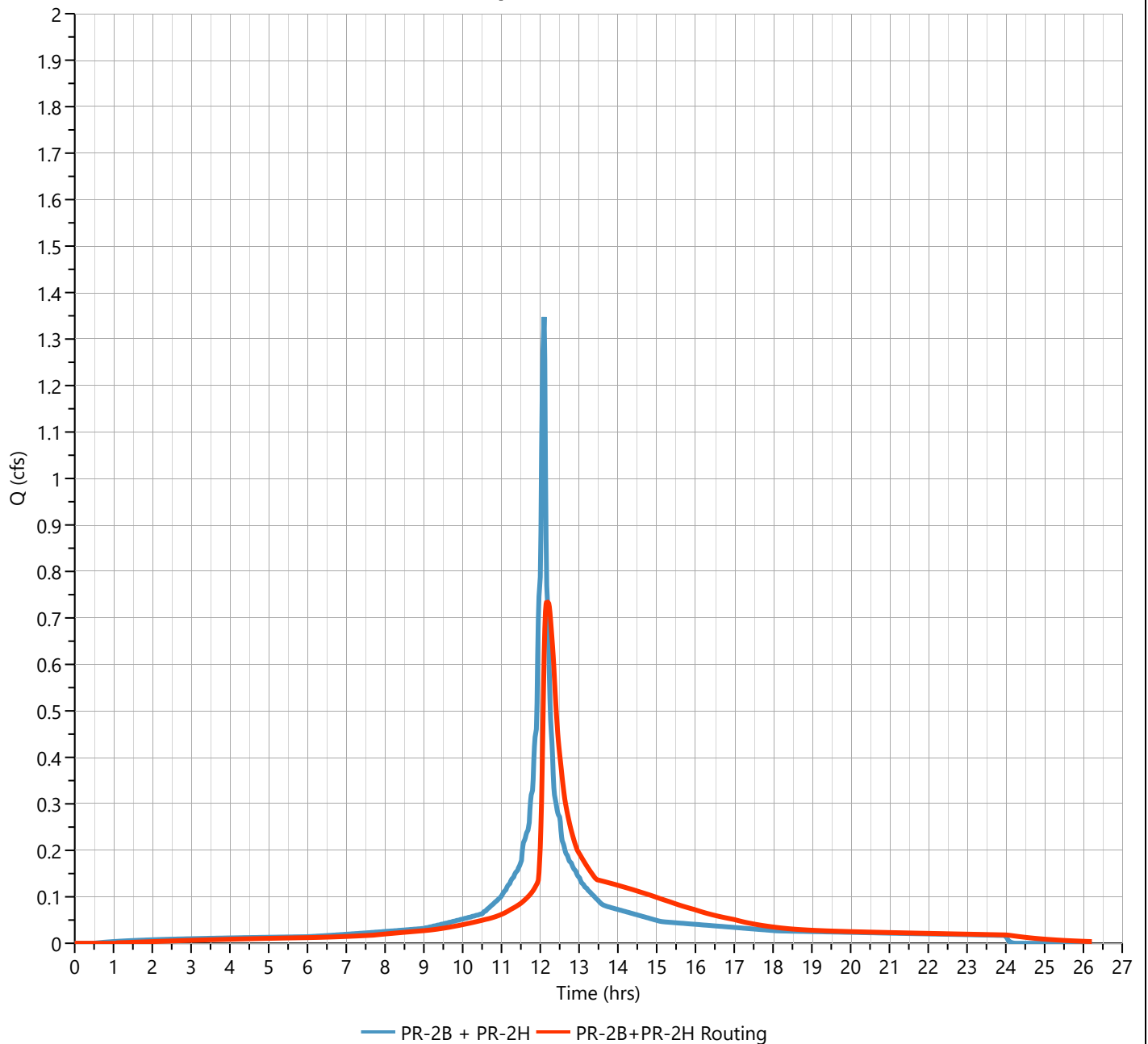
### Hyd. No. 39

|                   |                            |                   |              |
|-------------------|----------------------------|-------------------|--------------|
| Hydrograph Type   | = Pond Route               | Peak Flow         | = 0.737 cfs  |
| Storm Frequency   | = 25-yr                    | Time to Peak      | = 12.18 hrs  |
| Time Interval     | = 1 min                    | Hydrograph Volume | = 4,674 cuft |
| Inflow Hydrograph | = 38 - PR-2B + PR-2H       | Max. Elevation    | = 355.42 ft  |
| Pond Name         | = Porous Pavement System 3 | Max. Storage      | = 1,127 cuft |

Pond Routing by Storage Indication Method

Center of mass detention time = 53 min

**Qp = 0.737 cfs**



# Hydrograph Report

Hydrology Studio v 3.0.0.38

File: Future Beacon Church Proposed - POA-2.hys

05-16-2025

## PR-2B+PR-2H Routing

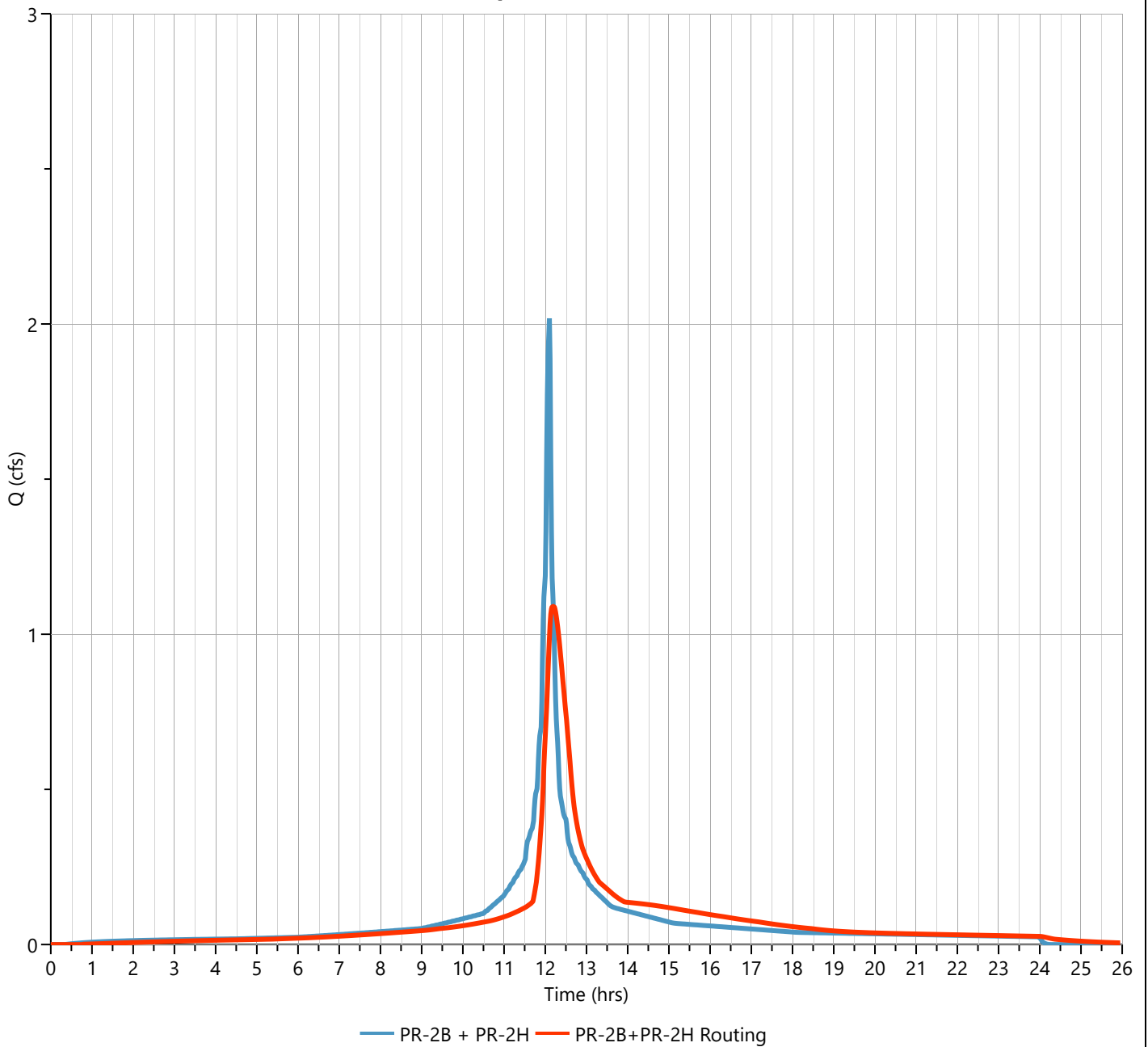
### Hyd. No. 39

|                   |                            |                   |              |
|-------------------|----------------------------|-------------------|--------------|
| Hydrograph Type   | = Pond Route               | Peak Flow         | = 1.093 cfs  |
| Storm Frequency   | = 100-yr                   | Time to Peak      | = 12.20 hrs  |
| Time Interval     | = 1 min                    | Hydrograph Volume | = 7,095 cuft |
| Inflow Hydrograph | = 38 - PR-2B + PR-2H       | Max. Elevation    | = 355.88 ft  |
| Pond Name         | = Porous Pavement System 3 | Max. Storage      | = 1,522 cuft |

Pond Routing by Storage Indication Method

Center of mass detention time = 47 min

**Qp = 1.093 cfs**



# **APPENDIX D**

## **Stormwater Conveyance Calculations**

**APPENDIX D  
TABLE OF CONTENTS**

**IDF CURVE RAINFALL INTENSITY DATA**

**ON-SITE CONVEYANCE SYSTEM DESIGN**

**SUBSURFACE CONVEYANCE NETWORK 1**

**WEIGHTED RUNOFF COEFFICIENT CALCULATIONS**

**HYDRAULIC REPORTS**

**25-YEAR DESIGN STORM EVENT**

**100-YEAR DESIGN STORM EVENT**

**SUBSURFACE CONVEYANCE NETWORK 2**

**WEIGHTED RUNOFF COEFFICIENT CALCULATIONS**

**HYDRAULIC REPORTS**

**25-YEAR DESIGN STORM EVENT**

**100-YEAR DESIGN STORM EVENT**

**RIPRAP APRON CALCULATIONS**

**HW2-1**

## **IDF CURVE RAINFALL INTENSITY DATA**



**NOAA Atlas 14, Volume 2, Version 3**  
**Location name: Summit, New Jersey, USA\***  
**Latitude: 40.7128°, Longitude: -74.3766°**  
**Elevation: 357 ft\*\***  
 \* source: ESRI Maps  
 \*\* source: USGS



**POINT PRECIPITATION FREQUENCY ESTIMATES**

G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M.Yekta, and D. Riley

NOAA, National Weather Service, Silver Spring, Maryland

[PF\\_tabular](#) | [PF\\_graphical](#) | [Maps & aerials](#)

**PF tabular**

| <b>PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)<sup>1</sup></b> |                                     |                        |                        |                        |                        |                        |                        |                        |                        |                        |
|---|-------------------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| Duration  | Average recurrence interval (years) |                        |                        |                        |                        |                        |                        |                        |                        |                        |
|   | 1                                   | 2                      | 5                      | 10                     | 25                     | 50                     | 100                    | 200                    | 500                    | 1000                   |
| 5-min   | 4.03<br>(3.68-4.43)                 | 4.80<br>(4.39-5.27)    | 5.68<br>(5.17-6.24)    | 6.30<br>(5.74-6.92)    | 7.08<br>(6.42-7.76)    | 7.61<br>(6.88-8.34)    | 8.15<br>(7.31-8.92)    | 8.62<br>(7.69-9.44)    | 9.24<br>(8.17-10.2)    | 9.67<br>(8.50-10.6)    |
| 10-min  | 3.22<br>(2.94-3.53)                 | 3.83<br>(3.51-4.21)    | 4.54<br>(4.14-4.99)    | 5.03<br>(4.58-5.53)    | 5.63<br>(5.11-6.17)    | 6.05<br>(5.47-6.64)    | 6.46<br>(5.80-7.08)    | 6.82<br>(6.08-7.47)    | 7.26<br>(6.43-7.98)    | 7.57<br>(6.65-8.33)    |
| 15-min  | 2.68<br>(2.45-2.94)                 | 3.21<br>(2.94-3.53)    | 3.83<br>(3.49-4.20)    | 4.24<br>(3.86-4.66)    | 4.76<br>(4.31-5.22)    | 5.11<br>(4.61-5.60)    | 5.45<br>(4.90-5.97)    | 5.74<br>(5.13-6.30)    | 6.10<br>(5.40-6.70)    | 6.34<br>(5.58-6.98)    |
| 30-min  | 1.83<br>(1.68-2.02)                 | 2.22<br>(2.03-2.44)    | 2.72<br>(2.48-2.98)    | 3.07<br>(2.80-3.38)    | 3.52<br>(3.19-3.86)    | 3.84<br>(3.47-4.21)    | 4.16<br>(3.74-4.56)    | 4.46<br>(3.98-4.89)    | 4.84<br>(4.28-5.32)    | 5.12<br>(4.50-5.63)    |
| 60-min  | 1.14<br>(1.04-1.26)                 | 1.39<br>(1.27-1.53)    | 1.74<br>(1.59-1.91)    | 2.00<br>(1.82-2.20)    | 2.34<br>(2.12-2.57)    | 2.60<br>(2.35-2.85)    | 2.86<br>(2.57-3.14)    | 3.12<br>(2.79-3.42)    | 3.47<br>(3.07-3.81)    | 3.73<br>(3.28-4.11)    |
| 2-hr  | 0.698<br>(0.634-0.771)              | 0.851<br>(0.774-0.940) | 1.08<br>(0.978-1.19)   | 1.26<br>(1.14-1.39)    | 1.50<br>(1.35-1.66)    | 1.70<br>(1.52-1.88)    | 1.91<br>(1.70-2.10)    | 2.13<br>(1.88-2.34)    | 2.43<br>(2.12-2.68)    | 2.67<br>(2.30-2.95)    |
| 3-hr  | 0.520<br>(0.474-0.576)              | 0.633<br>(0.578-0.702) | 0.804<br>(0.731-0.891) | 0.937<br>(0.850-1.04)  | 1.12<br>(1.01-1.24)    | 1.27<br>(1.14-1.40)    | 1.43<br>(1.27-1.57)    | 1.59<br>(1.40-1.75)    | 1.81<br>(1.58-2.00)    | 1.99<br>(1.72-2.20)    |
| 6-hr  | 0.335<br>(0.306-0.371)              | 0.408<br>(0.372-0.450) | 0.517<br>(0.469-0.569) | 0.605<br>(0.548-0.665) | 0.731<br>(0.656-0.802) | 0.837<br>(0.746-0.916) | 0.950<br>(0.839-1.04)  | 1.07<br>(0.938-1.17)   | 1.25<br>(1.08-1.36)    | 1.39<br>(1.19-1.52)    |
| 12-hr   | 0.208<br>(0.190-0.230)              | 0.253<br>(0.231-0.279) | 0.322<br>(0.293-0.355) | 0.380<br>(0.345-0.418) | 0.466<br>(0.418-0.510) | 0.540<br>(0.481-0.589) | 0.620<br>(0.546-0.676) | 0.709<br>(0.616-0.773) | 0.841<br>(0.717-0.916) | 0.953<br>(0.800-1.04)  |
| 24-hr   | 0.118<br>(0.109-0.128)              | 0.142<br>(0.132-0.155) | 0.183<br>(0.169-0.199) | 0.217<br>(0.200-0.236) | 0.269<br>(0.246-0.292) | 0.314<br>(0.285-0.340) | 0.364<br>(0.327-0.395) | 0.419<br>(0.372-0.456) | 0.503<br>(0.439-0.549) | 0.575<br>(0.495-0.629) |
| 2-day   | 0.069<br>(0.064-0.076)              | 0.084<br>(0.077-0.092) | 0.107<br>(0.099-0.117) | 0.127<br>(0.116-0.138) | 0.155<br>(0.142-0.169) | 0.180<br>(0.163-0.196) | 0.206<br>(0.185-0.225) | 0.235<br>(0.209-0.258) | 0.278<br>(0.243-0.306) | 0.314<br>(0.271-0.347) |
| 3-day   | 0.048<br>(0.045-0.053)              | 0.059<br>(0.054-0.064) | 0.075<br>(0.069-0.081) | 0.088<br>(0.081-0.096) | 0.107<br>(0.098-0.117) | 0.124<br>(0.112-0.134) | 0.141<br>(0.127-0.154) | 0.160<br>(0.143-0.175) | 0.188<br>(0.165-0.207) | 0.212<br>(0.183-0.234) |
| 4-day   | 0.038<br>(0.035-0.041)              | 0.046<br>(0.043-0.050) | 0.059<br>(0.054-0.064) | 0.069<br>(0.063-0.075) | 0.083<br>(0.076-0.090) | 0.096<br>(0.087-0.104) | 0.109<br>(0.098-0.118) | 0.123<br>(0.110-0.134) | 0.143<br>(0.126-0.157) | 0.160<br>(0.140-0.177) |
| 7-day   | 0.026<br>(0.024-0.028)              | 0.031<br>(0.029-0.033) | 0.038<br>(0.035-0.042) | 0.045<br>(0.041-0.048) | 0.054<br>(0.049-0.058) | 0.061<br>(0.056-0.066) | 0.069<br>(0.062-0.075) | 0.077<br>(0.069-0.084) | 0.089<br>(0.079-0.098) | 0.099<br>(0.087-0.109) |
| 10-day  | 0.020<br>(0.019-0.022)              | 0.025<br>(0.023-0.026) | 0.030<br>(0.028-0.032) | 0.035<br>(0.032-0.037) | 0.041<br>(0.038-0.044) | 0.046<br>(0.043-0.050) | 0.052<br>(0.047-0.056) | 0.058<br>(0.052-0.063) | 0.066<br>(0.059-0.072) | 0.073<br>(0.064-0.080) |
| 20-day  | 0.014<br>(0.013-0.015)              | 0.016<br>(0.015-0.017) | 0.020<br>(0.018-0.021) | 0.022<br>(0.021-0.024) | 0.026<br>(0.024-0.027) | 0.028<br>(0.026-0.030) | 0.031<br>(0.029-0.033) | 0.034<br>(0.031-0.036) | 0.037<br>(0.034-0.040) | 0.040<br>(0.036-0.044) |
| 30-day  | 0.011<br>(0.011-0.012)              | 0.013<br>(0.013-0.014) | 0.016<br>(0.015-0.017) | 0.017<br>(0.016-0.019) | 0.020<br>(0.019-0.021) | 0.022<br>(0.020-0.023) | 0.023<br>(0.022-0.025) | 0.025<br>(0.023-0.027) | 0.027<br>(0.025-0.029) | 0.029<br>(0.026-0.031) |
| 45-day  | 0.009<br>(0.009-0.010)              | 0.011<br>(0.011-0.012) | 0.013<br>(0.012-0.014) | 0.014<br>(0.014-0.015) | 0.016<br>(0.015-0.017) | 0.017<br>(0.016-0.018) | 0.019<br>(0.017-0.020) | 0.020<br>(0.019-0.021) | 0.021<br>(0.020-0.023) | 0.022<br>(0.021-0.024) |
| 60-day  | 0.008<br>(0.008-0.009)              | 0.010<br>(0.009-0.011) | 0.011<br>(0.011-0.012) | 0.013<br>(0.012-0.013) | 0.014<br>(0.013-0.015) | 0.015<br>(0.014-0.016) | 0.016<br>(0.015-0.017) | 0.017<br>(0.016-0.018) | 0.018<br>(0.017-0.019) | 0.019<br>(0.017-0.020) |

<sup>1</sup> Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values. Please refer to NOAA Atlas 14 document for more information.

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**PF graphical**

# **ON-SITE CONVEYANCE SYSTEM DESIGN**



# **SUBSURFACE CONVEYANCE NETWORK 1**

## **WEIGHTED RUNOFF COEFFICIENT CALCULATIONS**

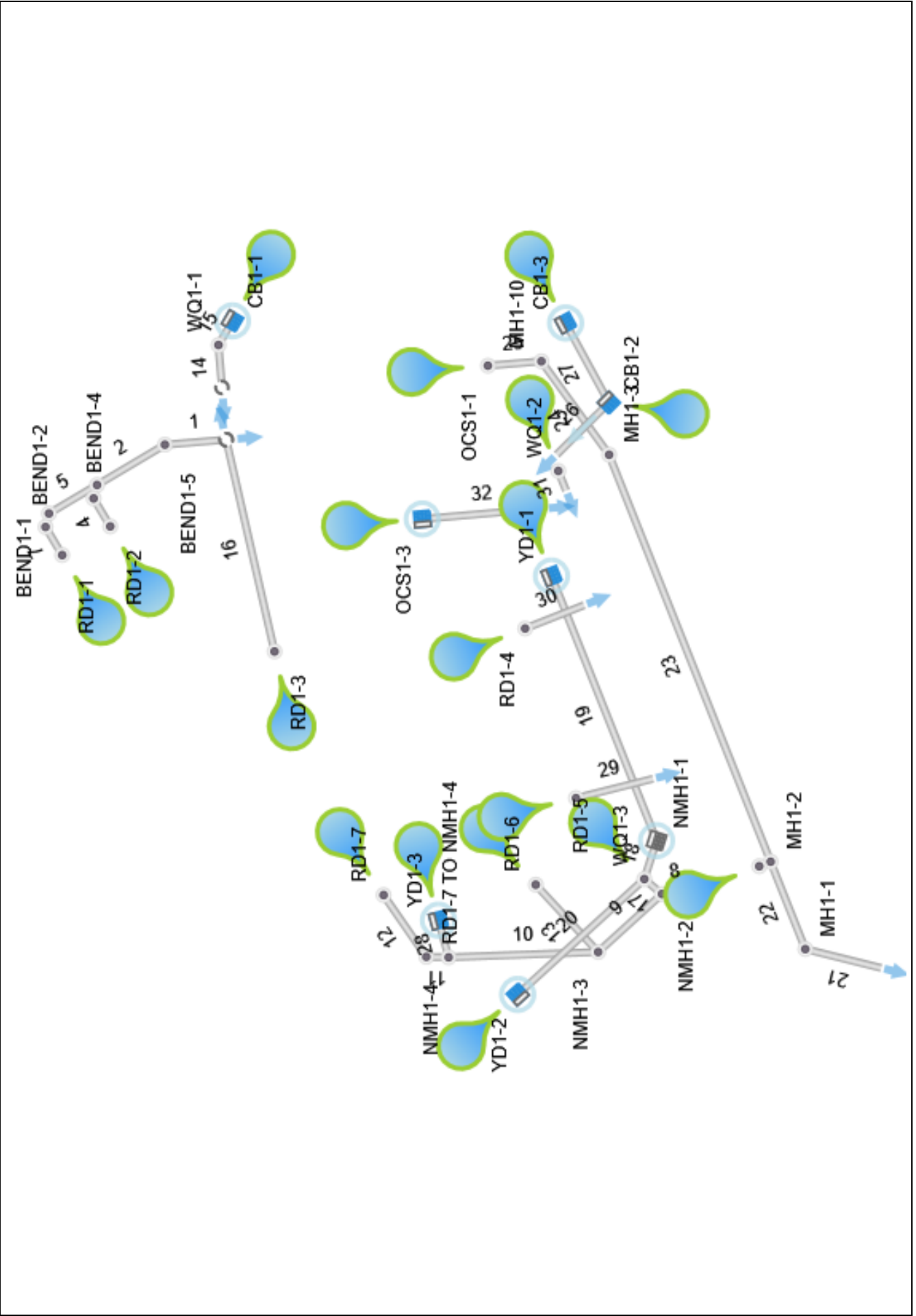
| DRAINAGE SUBAREA RUNOFF COEFFICIENT CALCULATIONS |                                   |                                     |                    |                    |                                       |                  |
|--|-----------------------------------|-------------------------------------|--------------------|--------------------|---------------------------------------|------------------|
| STORMWATER CONVEYANCE DESIGN                     |                                   |                                     |                    |                    |                                       |                  |
| BEACON UNITARIAN UNIVERSALIST CHURCH             |                                   |                                     |                    |                    |                                       |                  |
| LANGAN PROJECT #101007201                        |                                   |                                     |                    |                    |                                       |                  |
| PROPOSED CONVEYANCE SYSTEM                       |                                   |                                     |                    |                    |                                       |                  |
| SUB-DRAINAGE AREA                                | PERVIOUS AREA<br>C = 0.51<br>(SF) | IMPERVIOUS AREA<br>C = 0.99<br>(SF) | TOTAL AREA<br>(SF) | TOTAL AREA<br>(AC) | RUNOFF COEFFICIENT<br>C<br>(Weighted) | STRUCTURE TYPE   |
| <b>NETWORK 1</b>                                 |                                   |                                     |                    |                    |                                       |                  |
| CB1-1  | 4                                 | 1,417                               | 1,421              | 0.033              | 0.99                                  | GRATE INLET      |
| CB1-2  | 1,201                             | 5,103                               | 6,304              | 0.145              | 0.90                                  | GRATE INLET      |
| CB1-3  | 1,300                             | 0                                   | 1,300              | 0.030              | 0.51                                  | GRATE INLET      |
| RD1-1  | 0                                 | 2,003                               | 2,003              | 0.046              | 0.99                                  | ROOF DRAIN       |
| RD1-2  | 0                                 | 2,540                               | 2,540              | 0.058              | 0.99                                  | ROOF DRAIN       |
| RD1-3  | 0                                 | 4,361                               | 4,361              | 0.100              | 0.99                                  | ROOF DRAIN       |
| RD1-4  | 0                                 | 1,168                               | 1,168              | 0.027              | 0.99                                  | ROOF DRAIN       |
| RD1-5  | 0                                 | 1,802                               | 1,802              | 0.041              | 0.99                                  | ROOF DRAIN       |
| RD1-6  | 0                                 | 738                                 | 738                | 0.017              | 0.99                                  | ROOF DRAIN       |
| RD1-7  | 0                                 | 832                                 | 832                | 0.019              | 0.99                                  | ROOF DRAIN       |
| WQ1-3  | 1,589                             | 279                                 | 1,868              | 0.043              | 0.58                                  | TREATMENT DEVICE |
| YD1-1  | 929                               | 0                                   | 929                | 0.021              | 0.51                                  | YARD INLET       |
| YD1-2  | 1,404                             | 411                                 | 1,815              | 0.042              | 0.62                                  | YARD INLET       |
| YD1-3  | 0                                 | 189                                 | 189                | 0.004              | 0.99                                  | YARD INLET       |
|  |                                   |                                     |                    |                    |                                       |                  |
|  |                                   |                                     |                    |                    |                                       |                  |

**NOTES:**

- Runoff coefficients are referenced from Table 10.3-B: Recommended Coefficient of Runoff Values for Various Selected Land Uses from Section 10 of the 2015 New Jersey Department of Transportation (NJDOT) Roadway Design Manual.
- Pervious land cover is assumed to be in good hydrologic condition with good cover. The hydrologic soil group classification of the native soils in the area of the proposed redevelopment is predominantly Group A according to the NRCS Web Soil Survey. NJDOT Roadway Design Manual Table 10.3-B does not specify a runoff coefficient for Group A open spaces areas; therefore, a runoff coefficient of 0.25 was chosen as a conservative measure, which is the runoff coefficient for Group B open space areas.

**HYDRAULIC REPORTS  
25-YEAR STORM EVENT**

# Plan View



# Storm Sewer Tabulation

Project Name: NST0101  
07-01-2025

Stormwater Studio 2025 v 3.0.0.38

| Line ID              | Length (ft) | Drng Area |            | Rational | C x A |       | Tc          |            | Intensity (in/hr) | Total Q (cfs) | Capacity (cfs) | Velocity (ft/s) | Line      |           | Invert Elev |         | HGL Elev |         | Surface Elev |         | Line No |
|----------------------|-------------|-----------|------------|----------|-------|-------|-------------|------------|-------------------|---------------|----------------|-----------------|-----------|-----------|-------------|---------|----------|---------|--------------|---------|---------|
|                      |             | Incr (ac) | Total (ac) |          | Incr  | Total | Inlet (min) | Syst (min) |                   |               |                |                 | Size (in) | Slope (%) | Up (ft)     | Dn (ft) | Up (ft)  | Dn (ft) | Up (ft)      | Dn (ft) |         |
| RD1-1 TO MH1-9       | 18.80       | 0.000     | 0.104      | 0.00     | 0.10  | 0.00  | 0.10        | 5.23       | 7.00              | 0.72          | 1.73           | 2.51            | 12        | 0.20      | 352.73      | 352.69  | 353.17   | 353.05  | 357.73       | 357.65  | 1       |
| RD1-1 TO BEND1-5     | 24.09       | 0.000     | 0.104      | 0.00     | 0.10  | 0.00  | 0.10        | 5.16       | 7.02              | 0.72          | 7.12           | 3.84            | 12        | 3.40      | 353.55      | 352.73  | 353.91   | 352.97  | 358.55       | 357.73  | 2       |
| RD1-2 TO BEND1-4     | 4.24        | 0.000     | 0.058      | 0.00     | 0.06  | 0.00  | 0.06        | 5.03       | 7.07              | 0.41          | 4.19           | 1.21            | 12        | 1.18      | 353.60      | 353.55  | 354.02   | 354.02  | 358.60       | 358.55  | 3       |
| RD1-2 TO BEND1-3     | 9.94        | 0.058     | 0.058      | 0.99     | 0.06  | 0.06  | 0.06        | 5.00       | 7.08              | 0.41          | 7.74           | 1.80            | 12        | 4.02      | 354.00      | 353.60  | 354.27   | 354.04  | 359.00       | 358.60  | 4       |
| RD1-1 TO BEND1-4     | 17.08       | 0.000     | 0.046      | 0.00     | 0.05  | 0.00  | 0.05        | 5.06       | 7.06              | 0.32          | 3.49           | 1.14            | 12        | 0.82      | 353.69      | 353.55  | 354.02   | 354.03  | 358.69       | 358.55  | 5       |
| RD1-1 TO BEND1-2     | 4.24        | 0.000     | 0.046      | 0.00     | 0.05  | 0.00  | 0.05        | 5.04       | 7.06              | 0.32          | 4.96           | 1.61            | 12        | 1.65      | 353.76      | 353.69  | 354.02   | 354.05  | 358.76       | 358.69  | 6       |
| RD1-1 TO BEND1-1     | 9.98        | 0.046     | 0.046      | 0.99     | 0.05  | 0.05  | 0.05        | 5.00       | 7.08              | 0.32          | 5.98           | 1.83            | 12        | 2.40      | 354.00      | 353.76  | 354.24   | 354.09  | 359.00       | 358.76  | 7       |
| NMH1-2 TO UGD-INF1-2 | 10.20       | 0.000     | 0.142      | 0.00     | 0.10  | 0.00  | 0.10        | 6.07       | 6.74              | 0.67          | 1.72           | 0.85            | 12        | 0.20      | 343.81      | 343.79  | 346.23   | 346.23  | 354.49       | 355.52  | 8       |
| NMH1-3 TO NMH1-2     | 26.34       | 0.000     | 0.040      | 0.00     | 0.04  | 0.00  | 0.04        | 5.79       | 6.83              | 0.27          | 1.73           | 0.34            | 12        | 0.20      | 343.86      | 343.81  | 346.25   | 346.25  | 357.01       | 354.49  | 9       |
| NMH1-4 TO NMH1-3     | 45.71       | 0.000     | 0.023      | 0.00     | 0.02  | 0.00  | 0.02        | 5.24       | 7.00              | 0.16          | 1.73           | 0.20            | 12        | 0.20      | 343.95      | 343.86  | 346.25   | 346.25  | 357.50       | 357.01  | 10      |
| RD1-7 TO NMH1-4 2    | 6.80        | 0.000     | 0.019      | 0.00     | 0.02  | 0.00  | 0.02        | 5.09       | 7.05              | 0.13          | 1.72           | 1.30            | 12        | 0.20      | 352.43      | 352.42  | 352.62   | 352.60  | 357.43       | 357.50  | 11      |
| RD1-7 TO NMH1-4 1    | 22.93       | 0.019     | 0.019      | 0.99     | 0.02  | 0.02  | 0.02        | 5.00       | 7.08              | 0.13          | 10.10          | 2.85            | 12        | 6.85      | 354.00      | 352.43  | 354.15   | 352.52  | 359.00       | 357.43  | 12      |
| RD1-6 TO NMH1-3      | 28.03       | 0.017     | 0.017      | 0.99     | 0.02  | 0.02  | 0.02        | 5.00       | 7.08              | 0.12          | 5.10           | 2.06            | 12        | 1.75      | 352.50      | 352.01  | 352.65   | 352.12  | 357.50       | 357.01  | 13      |
| WQ1-1 TO MH1-7       | 13.00       | 0.000     | 0.033      | 0.00     | 0.03  | 0.00  | 0.03        | 5.09       | 7.05              | 0.23          | 1.73           | 1.77            | 12        | 0.20      | 352.05      | 352.03  | 352.30   | 352.23  | 357.20       | 357.33  | 14      |
| CB1-1 TO WQ1-1       | 8.53        | 0.033     | 0.033      | 0.99     | 0.03  | 0.03  | 0.03        | 5.00       | 7.08              | 0.23          | 1.73           | 1.34            | 12        | 0.20      | 352.07      | 352.05  | 352.34   | 352.33  | 357.07       | 357.20  | 15      |
| RD1-3 TO MH1-9       | 66.32       | 0.100     | 0.100      | 0.99     | 0.10  | 0.10  | 0.10        | 5.00       | 7.08              | 0.70          | 1.73           | 2.32            | 12        | 0.20      | 354.00      | 353.87  | 354.49   | 354.22  | 359.00       | 357.65  | 16      |
| WQ1-3 TO NMH1-2      | 7.06        | 0.043     | 0.102      | 0.58     | 0.06  | 0.02  | 0.06        | 5.72       | 6.85              | 0.41          | 1.72           | 1.80            | 12        | 0.20      | 347.45      | 347.44  | 347.78   | 347.77  | 353.00       | 354.49  | 17      |
| NMH1-1 TO WQ1-3      | 12.31       | 0.000     | 0.021      | 0.00     | 0.01  | 0.00  | 0.01        | 5.67       | 6.86              | 0.07          | 12.20          | 0.85            | 12        | 10.00     | 348.68      | 347.45  | 348.80   | 347.86  | 353.84       | 353.00  | 18      |
| YD1-1 TO NMH1-1      | 86.93       | 0.021     | 0.021      | 0.51     | 0.01  | 0.01  | 0.01        | 5.00       | 7.08              | 0.08          | 4.52           | 1.79            | 12        | 1.37      | 350.03      | 348.84  | 350.15   | 348.93  | 355.03       | 353.84  | 19      |
| YD1-2 TO WQ1-3       | 52.30       | 0.038     | 0.038      | 0.63     | 0.02  | 0.02  | 0.02        | 5.00       | 7.08              | 0.17          | 8.44           | 1.21            | 12        | 4.78      | 349.95      | 347.45  | 350.13   | 347.86  | 354.95       | 353.00  | 20      |
| MH1-1 TO EX-CB1-1    | 23.42       | 0.000     | 0.000      | 0.00     | 0.00  | 0.00  | 0.00        | 0.66       | 7.08              | 1.08          | 1.73           | 1.39            | 12        | 0.20      | 337.00      | 336.96  | 337.97   | 337.96  | 353.76       | 340.77  | 21      |
| MH1-2 TO MH1-1       | 28.70       | 0.000     | 0.000      | 0.00     | 0.00  | 0.00  | 0.00        | 0.45       | 7.08              | 1.08          | 1.73           | 1.39            | 12        | 0.20      | 337.06      | 337.00  | 338.02   | 338.00  | 347.53       | 353.76  | 22      |

Notes: IDF File = Summit.IDF, Return Period = 25-yrs. Project File: NST0101 25-Yr.sws

# Storm Sewer Tabulation

Project Name: NST0101

Stormwater Studio 2025 v 3.0.0.38

07-01-2025

| Line ID              | Length (ft) | Drng Area (ac) |       | Rational (C) | C x A |       | Tc (min) |      | Intensity (in/hr) | Total Q (cfs) | Capacity (cfs) | Velocity (ft/s) | Line      |           | Invert Elev (ft) |        | HGL Elev (ft) |        | Surface Elev (ft) |        | Line No |
|----------------------|-------------|----------------|-------|--------------|-------|-------|----------|------|-------------------|---------------|----------------|-----------------|-----------|-----------|------------------|--------|---------------|--------|-------------------|--------|---------|
|                      |             | Incr           | Total |              | Incr  | Total | Inlet    | Syst |                   |               |                |                 | Size (in) | Slope (%) | Up               | Dn     | Up            | Dn     | Up                | Dn     |         |
| MH1-3 TO MH1-2       | 133.70      | 0.000          | 0.000 | 0.00         | 0.00  | 0.00  | 0.00     | 0.15 | 7.08              | 0.64          | 10.41          | 1.78            | 346.79    | 337.06    | 347.13           | 338.06 | 351.79        | 347.53 | 351.79            | 347.53 | 23      |
| MH1-10 TO MH1-3      | 35.24       | 0.000          | 0.000 | 0.00         | 0.00  | 0.00  | 0.00     | 0.04 | 7.08              | 0.64          | 6.15           | 3.58            | 347.68    | 346.79    | 348.03           | 347.03 | 352.68        | 351.79 | 352.68            | 351.79 | 24      |
| OCS1-1 TO MH1-10     | 16.41       | 0.000          | 0.000 | 0.00         | 0.00  | 0.00  | 0.00     | 0.00 | 7.08              | 0.64          | 10.92          | 4.31            | 349.00    | 347.68    | 349.34           | 347.88 | 354.00        | 352.68 | 354.00            | 352.68 | 25      |
| CB1-2 TO WQ1-2       | 22.04       | 0.145          | 0.175 | 0.90         | 0.13  | 0.15  | 5.0      | 5.12 | 7.04              | 1.03          | 1.73           | 1.31            | 346.19    | 346.15    | 347.16           | 347.15 | 351.19        | 353.30 | 351.19            | 353.30 | 26      |
| CB1-3 TO CB1-2       | 27.70       | 0.030          | 0.030 | 0.51         | 0.02  | 0.02  | 5.0      | 5.00 | 7.08              | 0.11          | 8.60           | 0.88            | 347.57    | 346.19    | 347.71           | 347.20 | 352.57        | 351.19 | 352.57            | 351.19 | 27      |
| YD1-3 TO NMH1-4      | 11.74       | 0.004          | 0.004 | 0.99         | 0.00  | 0.00  | 5.0      | 5.00 | 7.08              | 0.03          | 1.73           | 0.04            | 343.98    | 343.95    | 346.25           | 346.25 | 348.98        | 357.50 | 348.98            | 357.50 | 28      |
| RD1-5 TO UGD-INF1-2  | 23.82       | 0.041          | 0.041 | 0.99         | 0.04  | 0.04  | 5.0      | 5.00 | 7.08              | 0.29          | 1.72           | 1.84            | 351.00    | 350.95    | 351.29           | 351.18 | 356.00        | 354.37 | 356.00            | 354.37 | 29      |
| RD1-4 TO UGD-INF1-2  | 18.92       | 0.027          | 0.027 | 0.99         | 0.03  | 0.03  | 5.0      | 5.00 | 7.08              | 0.19          | 1.72           | 1.64            | 351.00    | 350.96    | 351.23           | 351.15 | 356.00        | 355.30 | 356.00            | 355.30 | 30      |
| WQ1-2 TO MH1-6       | 6.00        | 0.000          | 0.000 | 0.00         | 0.00  | 0.00  | 0.0      | 0.00 | 7.08              | 0.96          | 1.57           | 2.88            | 348.93    | 348.92    | 349.40           | 349.34 | 353.00        | 354.41 | 353.00            | 354.41 | 31      |
| OCS1-3 TO UGD-INF1-2 | 37.34       | 0.000          | 0.000 | 0.00         | 0.00  | 0.00  | 0.0      | 0.00 | 7.08              | 0.35          | 1.73           | 1.92            | 350.00    | 349.93    | 350.33           | 350.18 | 356.00        | 355.78 | 356.00            | 355.78 | 32      |
| OCS1-2 TO MH1-2      | 3.75        | 0.000          | 0.000 | 0.00         | 0.00  | 0.00  | 0.0      | 0.00 | 7.08              | 0.44          | 12.20          | 0.70            | 337.44    | 337.06    | 338.06           | 338.07 | 349.00        | 347.53 | 349.00            | 347.53 | 33      |

Notes: IDF File = Summit.IDF, Return Period = 25-yrs.

Project File: NST0101 25-Yr.sws

**HYDRAULIC REPORTS  
100-YEAR STORM EVENT**

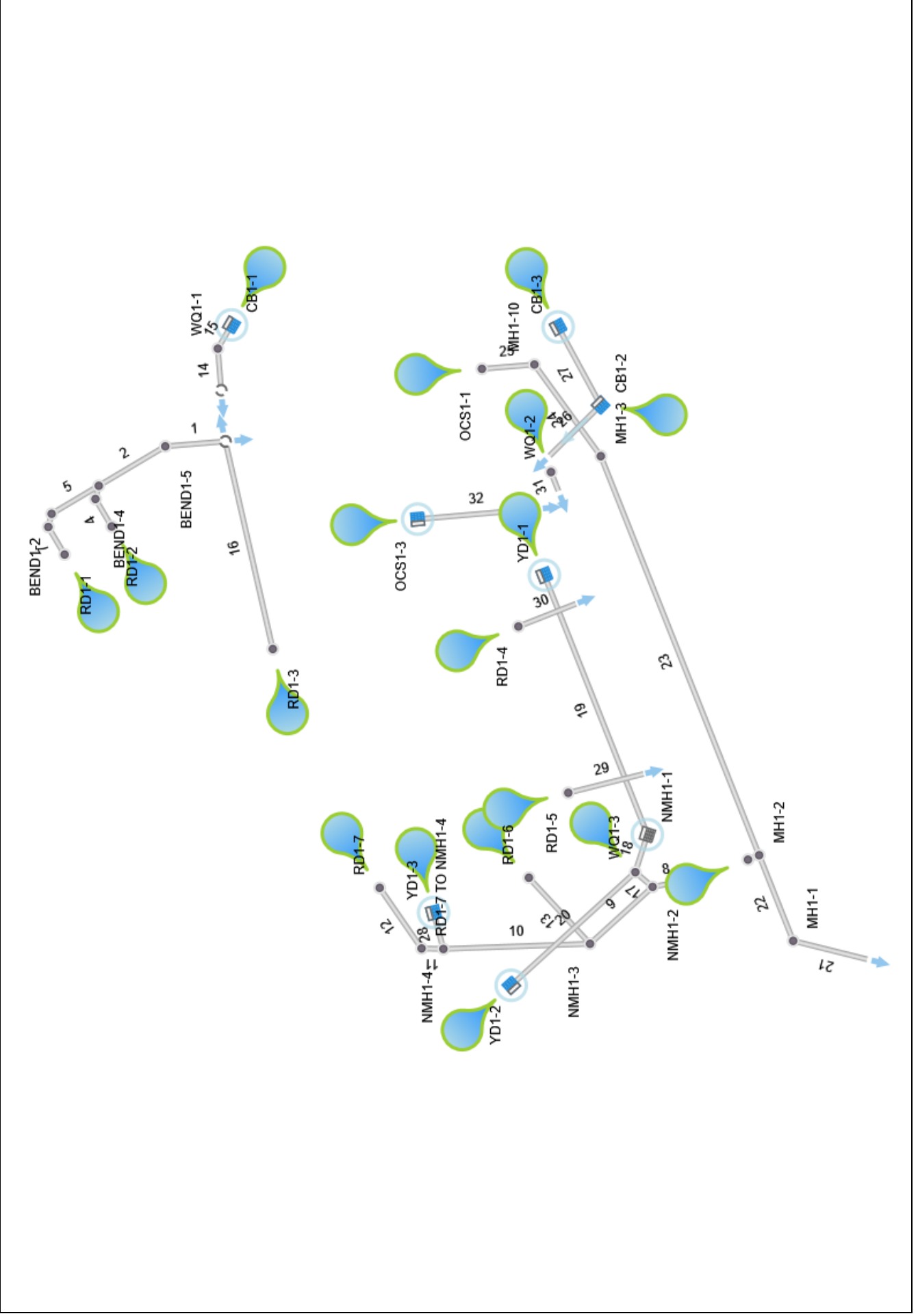


# Plan View

Project Name: NST0101

Stormwater Studio 2025 v 3.0.0.38

07-01-2025



# Storm Sewer Tabulation

Project Name: NST0101  
07-01-2025

Stormwater Studio 2025 v 3.0.0.38

| Line ID              | Length (ft) | Drng Area |            | Rational | C x A |       | Tc          |            | Intensity (in/hr) | Total Q (cfs) | Capacity (cfs) | Velocity (ft/s) | Line      |           | Invert Elev |         | HGL Elev |         | Surface Elev |         | Line No |
|----------------------|-------------|-----------|------------|----------|-------|-------|-------------|------------|-------------------|---------------|----------------|-----------------|-----------|-----------|-------------|---------|----------|---------|--------------|---------|---------|
|                      |             | Incr (ac) | Total (ac) |          | Incr  | Total | Inlet (min) | Syst (min) |                   |               |                |                 | Size (in) | Slope (%) | Up (ft)     | Dn (ft) | Up (ft)  | Dn (ft) | Up (ft)      | Dn (ft) |         |
| RD1-1 TO MH1-9       | 18.80       | 0.000     | 0.104      | 0.00     | 0.10  | 0.00  | 0.10        | 5.25       | 8.04              | 0.83          | 2.45           | 4.45            | 8         | 3.50      | 354.76      | 354.10  | 355.19   | 354.40  | 357.73       | 357.65  | 1       |
| RD1-1 TO BEND1-5     | 24.09       | 0.000     | 0.104      | 0.00     | 0.10  | 0.00  | 0.10        | 5.18       | 8.07              | 0.83          | 2.07           | 4.24            | 8         | 2.50      | 355.36      | 354.76  | 355.79   | 355.08  | 358.55       | 357.73  | 2       |
| RD1-2 TO BEND1-4     | 4.24        | 0.000     | 0.058      | 0.00     | 0.06  | 0.00  | 0.06        | 5.04       | 8.12              | 0.47          | 4.12           | 2.10            | 8         | 9.90      | 355.78      | 355.36  | 356.10   | 355.96  | 358.60       | 358.55  | 3       |
| RD1-2 TO BEND1-3     | 9.94        | 0.058     | 0.058      | 0.99     | 0.06  | 0.06  | 0.06        | 5.00       | 8.14              | 0.47          | 1.85           | 3.20            | 8         | 2.00      | 355.98      | 355.78  | 356.30   | 356.05  | 359.00       | 358.60  | 4       |
| RD1-1 TO BEND1-4     | 17.08       | 0.000     | 0.046      | 0.00     | 0.05  | 0.00  | 0.05        | 5.11       | 8.10              | 0.37          | 1.85           | 1.84            | 8         | 2.00      | 355.70      | 355.36  | 355.99   | 355.97  | 358.69       | 358.55  | 5       |
| RD1-1 TO BEND1-2     | 4.24        | 0.000     | 0.046      | 0.00     | 0.05  | 0.00  | 0.05        | 5.09       | 8.10              | 0.37          | 1.85           | 2.38            | 8         | 2.00      | 355.78      | 355.70  | 356.07   | 356.02  | 358.76       | 358.69  | 6       |
| RD1-1 TO BEND1-1     | 9.98        | 0.046     | 0.046      | 0.99     | 0.05  | 0.05  | 0.05        | 5.00       | 8.14              | 0.37          | 0.59           | 1.77            | 8         | 0.20      | 356.00      | 355.98  | 356.38   | 356.37  | 359.00       | 358.76  | 7       |
| NHM1-2 TO UGD-INF1-2 | 10.20       | 0.000     | 0.142      | 0.00     | 0.10  | 0.00  | 0.10        | 5.99       | 7.78              | 0.77          | 8.63           | 0.98            | 12        | 5.00      | 345.01      | 344.50  | 347.62   | 347.62  | 354.49       | 355.52  | 8       |
| NMH1-3 TO NMH1-2     | 26.34       | 0.000     | 0.040      | 0.00     | 0.04  | 0.00  | 0.04        | 5.50       | 7.95              | 0.31          | 1.70           | 0.59            | 10        | 0.51      | 346.89      | 346.76  | 347.65   | 347.64  | 357.01       | 354.49  | 9       |
| NMH1-4 TO NMH1-3     | 45.71       | 0.000     | 0.023      | 0.00     | 0.02  | 0.00  | 0.02        | 5.13       | 8.09              | 0.18          | 0.92           | 0.57            | 8         | 0.50      | 347.12      | 346.89  | 347.66   | 347.66  | 357.50       | 357.01  | 10      |
| RD1-7 TO NMH1-4 2    | 6.80        | 0.000     | 0.019      | 0.00     | 0.02  | 0.00  | 0.02        | 5.10       | 8.10              | 0.15          | 2.27           | 2.39            | 8         | 3.00      | 354.71      | 354.51  | 354.90   | 354.65  | 357.43       | 357.50  | 11      |
| RD1-7 TO NMH1-4 1    | 22.93       | 0.019     | 0.019      | 0.99     | 0.02  | 0.02  | 0.02        | 5.00       | 8.14              | 0.15          | 2.27           | 2.64            | 8         | 3.01      | 355.40      | 354.71  | 355.58   | 354.84  | 359.00       | 357.43  | 12      |
| RD1-6 TO NMH1-3      | 28.03       | 0.017     | 0.017      | 0.99     | 0.02  | 0.02  | 0.02        | 5.00       | 8.14              | 0.14          | 1.85           | 2.37            | 8         | 2.00      | 353.98      | 353.42  | 354.15   | 353.55  | 357.50       | 357.01  | 13      |
| WQ1-1 TO MH1-7       | 13.00       | 0.000     | 0.033      | 0.00     | 0.03  | 0.00  | 0.03        | 5.06       | 8.11              | 0.27          | 4.95           | 1.15            | 15        | 0.50      | 350.61      | 350.54  | 350.88   | 350.88  | 357.20       | 357.33  | 14      |
| CB1-1 TO WQ1-1       | 8.53        | 0.033     | 0.033      | 0.99     | 0.03  | 0.03  | 0.03        | 5.00       | 8.14              | 0.27          | 5.21           | 2.08            | 15        | 0.55      | 353.70      | 353.65  | 353.91   | 353.85  | 357.07       | 357.20  | 15      |
| RD1-3 TO MH1-9       | 66.32       | 0.100     | 0.100      | 0.99     | 0.10  | 0.10  | 0.10        | 5.00       | 8.14              | 0.81          | 2.45           | 4.69            | 8         | 3.49      | 356.03      | 353.71  | 356.45   | 353.99  | 359.00       | 357.65  | 16      |
| WQ1-3 TO NMH1-2      | 7.06        | 0.043     | 0.102      | 0.58     | 0.06  | 0.02  | 0.06        | 5.97       | 7.79              | 0.46          | 1.85           | 3.15            | 8         | 2.00      | 349.17      | 349.03  | 349.49   | 349.30  | 353.00       | 354.49  | 17      |
| NMH1-1 TO WQ1-3      | 12.31       | 0.000     | 0.021      | 0.00     | 0.01  | 0.00  | 0.01        | 5.87       | 7.82              | 0.08          | 1.31           | 1.80            | 8         | 1.00      | 351.70      | 351.58  | 351.84   | 351.70  | 353.84       | 353.00  | 18      |
| YD1-1 TO NMH1-1      | 86.93       | 0.021     | 0.021      | 0.51     | 0.01  | 0.01  | 0.01        | 5.00       | 8.14              | 0.09          | 0.93           | 1.54            | 8         | 0.50      | 352.13      | 351.70  | 352.27   | 351.85  | 355.03       | 353.84  | 19      |
| YD1-2 TO WQ1-3       | 52.30       | 0.038     | 0.038      | 0.63     | 0.02  | 0.02  | 0.02        | 5.00       | 8.14              | 0.19          | 1.31           | 2.35            | 8         | 1.00      | 352.10      | 351.58  | 352.31   | 351.76  | 354.95       | 353.00  | 20      |
| MH1-1 TO EX-CB1-1    | 23.42       | 0.000     | 0.000      | 0.00     | 0.00  | 0.00  | 0.00        | 0.78       | 8.14              | 2.12          | 15.64          | 2.75            | 15        | 5.00      | 337.99      | 336.82  | 338.57   | 338.07  | 353.76       | 340.77  | 21      |
| MH1-2 TO MH1-1       | 28.70       | 0.000     | 0.000      | 0.00     | 0.00  | 0.00  | 0.00        | 0.72       | 8.14              | 2.12          | 15.64          | 5.42            | 15        | 5.00      | 343.24      | 341.81  | 343.82   | 342.17  | 347.53       | 353.76  | 22      |

Notes: IDF File = Summit.IDF, Return Period = 100-yrs. Project File: NST0101 100-Yr.sws

# Storm Sewer Tabulation

Project Name: NST0101  
07-01-2025

Stormwater Studio 2025 v 3.0.0.38

| Line ID              | Length (ft) | Drng Area (ac) |       | Rational (C) | C x A |       | Tc (min) |      | Intensity (in/hr) | Total Q (cfs) | Capacity (cfs) | Velocity (ft/s) | Line |       | Invert Elev (ft) |        | HGL Elev (ft) |        | Surface Elev (ft) |        | Line No |    |
|----------------------|-------------|----------------|-------|--------------|-------|-------|----------|------|-------------------|---------------|----------------|-----------------|------|-------|------------------|--------|---------------|--------|-------------------|--------|---------|----|
|                      |             | Incr           | Total |              | Incr  | Total | Inlet    | Syst |                   |               |                |                 | Incr | Total | Up               | Dn     | Up            | Dn     | Up                | Dn     |         | Up |
| MH1-3 TO MH1-2       | 133.70      | 0.000          | 0.000 | 0.00         | 0.00  | 0.00  | 0.00     | 0.00 | 0.20              | 8.14          | 1.21           | 7.00            | 2.48 | 15    | 1.00             | 344.68 | 343.34        | 345.12 | 344.01            | 351.79 | 347.53  | 23 |
| MH1-10 TO MH1-3      | 35.24       | 0.000          | 0.000 | 0.00         | 0.00  | 0.00  | 0.00     | 0.00 | 0.06              | 8.14          | 1.21           | 7.00            | 3.49 | 15    | 1.00             | 345.13 | 344.78        | 345.57 | 345.16            | 352.68 | 351.79  | 24 |
| OCS1-1 TO MH1-10     | 16.41       | 0.000          | 0.000 | 0.00         | 0.00  | 0.00  | 0.00     | 0.00 | 0.00              | 8.14          | 1.21           | 7.00            | 3.39 | 15    | 1.00             | 348.50 | 348.34        | 348.94 | 348.73            | 354.00 | 352.68  | 25 |
| CB1-2 TO WQ1-2       | 22.04       | 0.145          | 0.175 | 0.90         | 0.13  | 0.15  | 0.13     | 5.12 | 5.12              | 8.09          | 1.18           | 4.94            | 0.98 | 15    | 0.50             | 347.51 | 347.40        | 348.65 | 348.65            | 351.19 | 353.30  | 26 |
| CB1-3 TO CB1-2       | 27.70       | 0.030          | 0.030 | 0.51         | 0.02  | 0.02  | 0.02     | 5.00 | 5.00              | 8.14          | 0.12           | 15.50           | 0.87 | 15    | 4.91             | 348.97 | 347.61        | 349.11 | 348.68            | 352.57 | 351.19  | 27 |
| YD1-3 TO NMH1-4      | 11.74       | 0.004          | 0.004 | 0.99         | 0.00  | 0.00  | 0.00     | 5.00 | 5.00              | 8.14          | 0.03           | 0.86            | 0.20 | 6     | 2.00             | 347.36 | 347.12        | 347.68 | 347.68            | 348.98 | 357.50  | 28 |
| RD1-5 TO UGD-INF1-2  | 23.82       | 0.041          | 0.041 | 0.99         | 0.04  | 0.04  | 0.04     | 5.00 | 5.00              | 8.14          | 0.33           | 3.70            | 1.71 | 8     | 8.00             | 348.66 | 346.75        | 348.93 | 347.62            | 356.00 | 354.37  | 29 |
| RD1-4 TO UGD-INF1-2  | 18.92       | 0.027          | 0.027 | 0.99         | 0.03  | 0.03  | 0.03     | 5.00 | 5.00              | 8.14          | 0.22           | 4.14            | 1.40 | 8     | 10.00            | 348.64 | 346.75        | 348.86 | 347.62            | 356.00 | 355.30  | 30 |
| WQ1-2 TO MH1-6       | 6.00        | 0.000          | 0.000 | 0.00         | 0.00  | 0.00  | 0.00     | 0.00 | 0.00              | 8.14          | 0.96           | 22.12           | 0.78 | 15    | 10.00            | 345.10 | 344.50        | 347.62 | 347.62            | 353.00 | 354.41  | 31 |
| OCS1-3 TO UGD-INF1-2 | 37.34       | 0.000          | 0.000 | 0.00         | 0.00  | 0.00  | 0.00     | 0.00 | 0.00              | 8.14          | 0.53           | 19.79           | 1.43 | 15    | 8.00             | 347.49 | 344.50        | 347.78 | 347.62            | 356.00 | 355.78  | 32 |
| OCS1-2 TO MH1-2      | 3.75        | 0.000          | 0.000 | 0.00         | 0.00  | 0.00  | 0.00     | 0.00 | 0.00              | 8.14          | 0.91           | 13.99           | 3.29 | 15    | 4.00             | 344.50 | 344.35        | 344.88 | 344.67            | 349.00 | 347.53  | 33 |

Notes: IDF File = Summit.IDF, Return Period = 100-yrs.

Project File: NST0101 100-Yr.sws

## **SUBSURFACE CONVEYANCE NETWORK 2**

## **WEIGHTED RUNOFF COEFFICIENT CALCULATIONS**

| DRAINAGE SUBAREA RUNOFF COEFFICIENT CALCULATIONS |                                   |                                     |                    |                    |                                       |                      |
|--|-----------------------------------|-------------------------------------|--------------------|--------------------|---------------------------------------|----------------------|
| STORMWATER CONVEYANCE DESIGN                     |                                   |                                     |                    |                    |                                       |                      |
| BEACON UNITARIAN UNIVERSALIST CHURCH             |                                   |                                     |                    |                    |                                       |                      |
| LANGAN PROJECT #101007201                        |                                   |                                     |                    |                    |                                       |                      |
| PROPOSED CONVEYANCE SYSTEM                       |                                   |                                     |                    |                    |                                       |                      |
| SUB-DRAINAGE AREA                                | PERVIOUS AREA<br>C = 0.51<br>(SF) | IMPERVIOUS AREA<br>C = 0.99<br>(SF) | TOTAL AREA<br>(SF) | TOTAL AREA<br>(AC) | RUNOFF COEFFICIENT<br>C<br>(Weighted) | STRUCTURE TYPE       |
| <b>NETWORK 2</b>                                 |                                   |                                     |                    |                    |                                       |                      |
| CB2-1  | 1,865                             | 9,354                               | 11,219             | 0.26               | 0.91                                  | GRATE INLET          |
| CB2-2  | 1,076                             | 4,658                               | 5,734              | 0.13               | 0.90                                  | GRATE INLET          |
| CB2-4  | 502                               | 1,110                               | 1,612              | 0.04               | 0.84                                  | GRATE INLET          |
| FES2-1   | 7,192                             | 2,414                               | 9,606              | 0.22               | 0.63                                  | FLARED END STRUCTURE |
| YD2-1  | 3,198                             | 1,876                               | 5,074              | 0.116              | 0.69                                  | YARD INLET           |
| YD2-2  | 147                               | 197                                 | 344                | 0.008              | 0.78                                  | YARD INLET           |
|  |                                   |                                     |                    |                    |                                       |                      |
|  |                                   |                                     |                    |                    |                                       |                      |

**NOTES:**

- Runoff coefficients are referenced from Table 10.3-B: Recommended Coefficient of Runoff Values for Various Selected Land Uses from Section 10 of the 2015 New Jersey Department of Transportation (NJDOT) Roadway Design Manual.
- Pervious land cover is assumed to be in good hydrologic condition with good cover. The hydrologic soil group classification of the native soils in the area of the proposed redevelopment is predominantly Group A according to the NRCS Web Soil Survey. NJDOT Roadway Design Manual Table 10.3-B does not specify a runoff coefficient for Group A open spaces areas; therefore, a runoff coefficient of 0.25 was chosen as a conservative measure, which is the runoff coefficient for Group B open space areas.

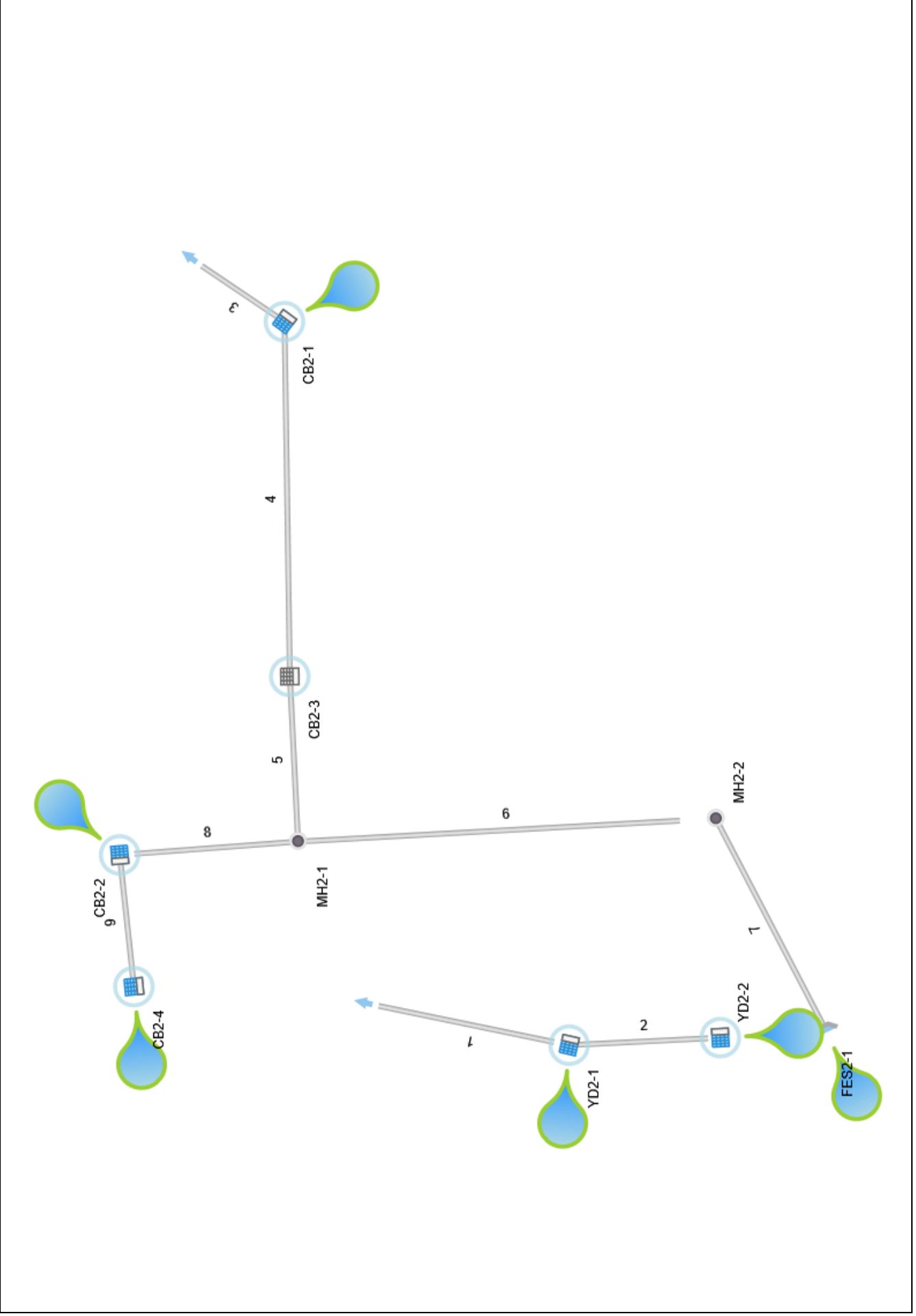
**HYDRAULIC REPORTS  
25-YEAR STORM EVENT**

# Plan View

Stormwater Studio 2025 v 3.0.0.38

Project Name: NST0102

05-19-2025





# Storm Sewer Tabulation

Project Name: NST0102

Stormwater Studio 2025 v 3.0.0.38

05-19-2025

| Line ID         | Length (ft) | Drng Area (ac) |       | Rational (C) | C x A |       | Tc (min) |      | Intensity (in/hr) | Total Q (cfs) | Capacity (cfs) | Velocity (ft/s) | Line      |           | Invert Elev (ft) |        | HGL Elev (ft) |        | Surface Elev (ft) |        | Line No |
|-----------------|-------------|----------------|-------|--------------|-------|-------|----------|------|-------------------|---------------|----------------|-----------------|-----------|-----------|------------------|--------|---------------|--------|-------------------|--------|---------|
|                 |             | Incr           | Total |              | Incr  | Total | Inlet    | Syst |                   |               |                |                 | Size (in) | Slope (%) | Up               | Dn     | Up            | Dn     | Up                | Dn     |         |
| YD2-1 TO PAPS-3 | 42.96       | 0.116          | 0.124 | 0.69         | 0.08  | 0.09  | 5.0      | 5.42 | 6.94              | 0.60          | 4.95           | 0.59            | 354.55    | 354.33    | 355.42           | 355.42 | 358.02        | 358.16 | 358.02            | 358.16 | 1       |
| YD2-2 TO YD2-1  | 33.45       | 0.008          | 0.008 | 0.78         | 0.01  | 0.01  | 5.0      | 5.00 | 7.08              | 0.04          | 5.37           | 0.07            | 354.84    | 354.65    | 355.43           | 355.43 | 358.22        | 358.22 | 358.22            | 358.02 | 2       |
| CB2-1 TO HW2-1  | 22.54       | 0.260          | 0.649 | 0.91         | 0.24  | 0.53  | 5.0      | 6.34 | 6.67              | 3.50          | 5.41           | 2.90            | 353.06    | 352.92    | 354.21           | 354.17 | 356.60        | 356.60 | 356.60            | 355.11 | 3       |
| CB2-3 TO CB2-1  | 85.99       | 0.000          | 0.389 | 0.00         | 0.00  | 0.29  | 0.0      | 5.96 | 6.78              | 1.95          | 4.95           | 1.77            | 353.48    | 353.05    | 354.43           | 354.38 | 358.10        | 358.10 | 358.10            | 356.60 | 4       |
| MH2-1 TO CB2-3  | 40.08       | 0.000          | 0.389 | 0.00         | 0.00  | 0.29  | 0.0      | 5.79 | 6.83              | 1.97          | 4.95           | 2.14            | 353.68    | 353.48    | 354.48           | 354.46 | 357.69        | 357.69 | 357.69            | 358.10 | 5       |
| MH2-2 TO MH2-1  | 92.49       | 0.000          | 0.221 | 0.00         | 0.00  | 0.14  | 0.0      | 5.29 | 6.98              | 0.97          | 4.95           | 1.88            | 354.27    | 353.81    | 354.70           | 354.63 | 358.75        | 358.75 | 358.75            | 357.69 | 6       |
| FES2-1 TO MH2-2 | 55.32       | 0.221          | 0.221 | 0.63         | 0.14  | 0.14  | 5.0      | 5.00 | 7.08              | 0.98          | 4.95           | 3.04            | 354.65    | 354.37    | 355.05           | 354.75 | 356.38        | 356.38 | 356.38            | 358.75 | 7       |
| CB2-2 TO MH2-1  | 39.54       | 0.132          | 0.169 | 0.90         | 0.12  | 0.15  | 5.0      | 5.26 | 6.99              | 1.05          | 4.95           | 1.19            | 353.88    | 353.68    | 354.63           | 354.63 | 357.22        | 357.22 | 357.22            | 357.69 | 8       |
| CB2-4 TO CB2-2  | 32.08       | 0.037          | 0.037 | 0.84         | 0.03  | 0.03  | 5.0      | 5.00 | 7.08              | 0.22          | 4.95           | 0.31            | 354.04    | 353.88    | 354.68           | 354.68 | 357.31        | 357.31 | 357.31            | 357.22 | 9       |

Notes: IDF File = Summit.IDF, Return Period = 25-yrs.

Project File: NST0102 25-Yr.sws

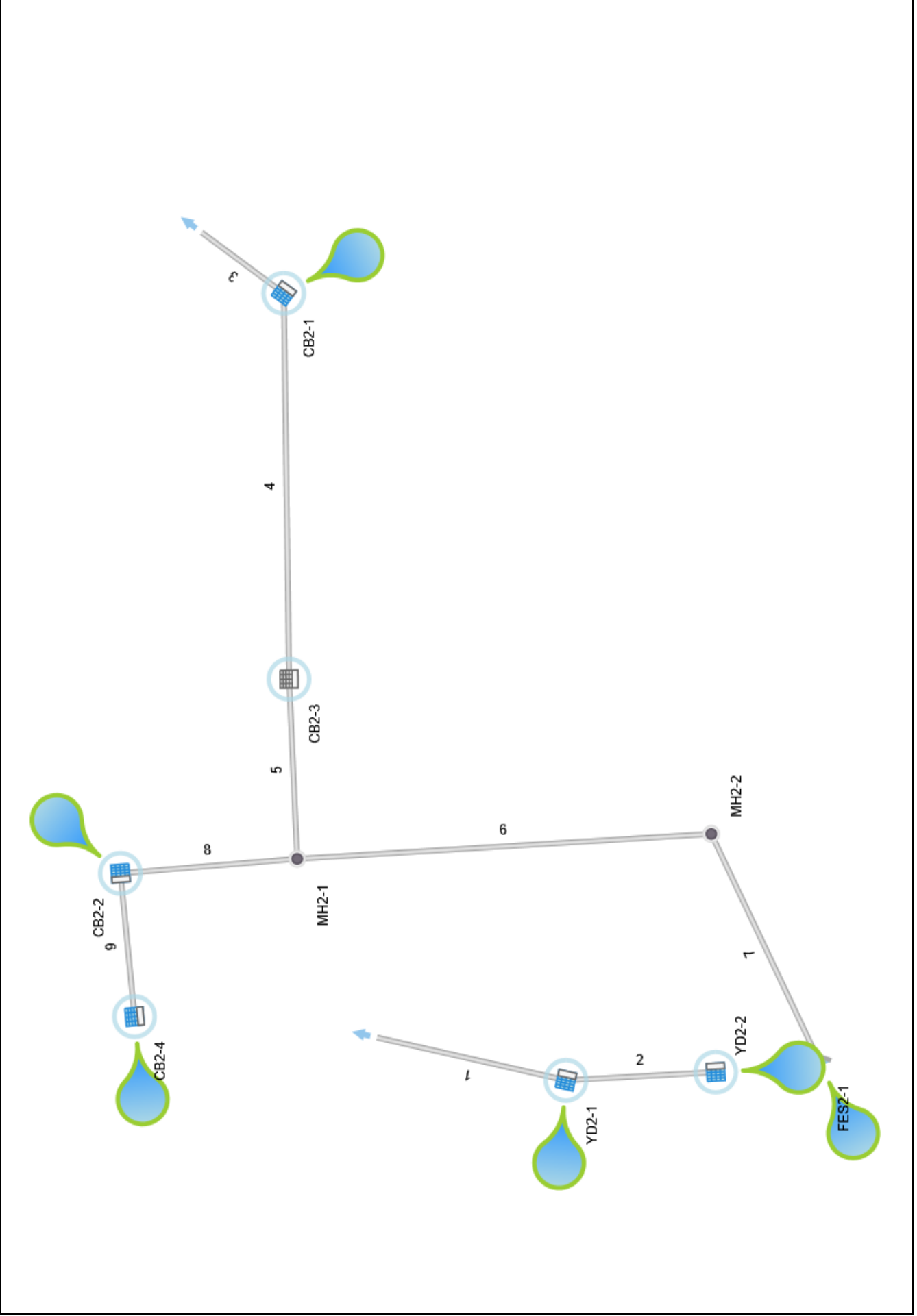
**HYDRAULIC REPORTS  
100-YEAR STORM EVENT**

# Plan View

Stormwater Studio 2025 v 3.0.0.38

Project Name: NST0102

05-19-2025



# Storm Sewer Tabulation

Project Name: NST0102  
05-19-2025

Stormwater Studio 2025 v 3.0.0.38

| Line ID         | Length (ft) | Drng Area (ac) |       | Rational (C) | C x A |       | Tc (min) |      | Intensity (in/hr) | Total Q (cfs) | Capacity (cfs) | Velocity (ft/s) | Line      |           | Invert Elev (ft) |        | HGL Elev (ft) |        | Surface Elev (ft) |        | Line No |
|-----------------|-------------|----------------|-------|--------------|-------|-------|----------|------|-------------------|---------------|----------------|-----------------|-----------|-----------|------------------|--------|---------------|--------|-------------------|--------|---------|
|                 |             | Incr           | Total |              | Incr  | Total | Inlet    | Syst |                   |               |                |                 | Size (in) | Slope (%) | Up               | Dn     | Up            | Dn     | Up                | Dn     |         |
| YD2-1 TO PAPS-3 | 42.96       | 0.116          | 0.124 | 0.69         | 0.08  | 0.09  | 5.0      | 5.41 | 7.99              | 0.69          | 4.95           | 0.56            | 354.55    | 354.33    | 355.88           | 355.88 | 358.02        | 358.16 | 358.02            | 358.16 | 1       |
| YD2-2 TO YD2-1  | 33.45       | 0.008          | 0.008 | 0.78         | 0.01  | 0.01  | 5.0      | 5.00 | 8.14              | 0.05          | 5.37           | 0.04            | 354.84    | 354.65    | 355.89           | 355.89 | 358.22        | 358.22 | 358.22            | 358.02 | 2       |
| CB2-1 TO HW2-1  | 22.54       | 0.260          | 0.649 | 0.91         | 0.24  | 0.53  | 5.0      | 6.29 | 7.68              | 4.03          | 5.42           | 3.33            | 353.06    | 352.92    | 354.23           | 354.17 | 356.60        | 356.60 | 356.60            | 355.11 | 3       |
| CB2-3 TO CB2-1  | 85.99       | 0.000          | 0.389 | 0.00         | 0.00  | 0.29  | 0.0      | 5.93 | 7.81              | 2.25          | 4.95           | 1.95            | 353.48    | 353.05    | 354.52           | 354.44 | 358.10        | 358.10 | 358.10            | 356.60 | 4       |
| MH2-1 TO CB2-3  | 40.08       | 0.000          | 0.389 | 0.00         | 0.00  | 0.29  | 0.0      | 5.76 | 7.86              | 2.27          | 4.95           | 2.22            | 353.68    | 353.48    | 354.57           | 354.55 | 357.69        | 357.69 | 357.69            | 358.10 | 5       |
| MH2-2 TO MH2-1  | 92.49       | 0.000          | 0.221 | 0.00         | 0.00  | 0.14  | 0.0      | 5.28 | 8.03              | 1.12          | 4.95           | 1.79            | 354.27    | 353.81    | 354.77           | 354.73 | 358.75        | 358.75 | 358.75            | 357.69 | 6       |
| FES2-1 TO MH2-2 | 55.32       | 0.221          | 0.221 | 0.63         | 0.14  | 0.14  | 5.0      | 5.00 | 8.14              | 1.13          | 4.95           | 2.96            | 354.65    | 354.37    | 355.08           | 354.82 | 356.38        | 356.38 | 356.38            | 358.75 | 7       |
| CB2-2 TO MH2-1  | 39.54       | 0.132          | 0.169 | 0.90         | 0.12  | 0.15  | 5.0      | 5.25 | 8.04              | 1.20          | 4.95           | 1.22            | 353.88    | 353.68    | 354.74           | 354.73 | 357.22        | 357.22 | 357.22            | 357.69 | 8       |
| CB2-4 TO CB2-2  | 32.08       | 0.037          | 0.037 | 0.84         | 0.03  | 0.03  | 5.0      | 5.00 | 8.14              | 0.25          | 4.95           | 0.30            | 354.04    | 353.88    | 354.78           | 354.78 | 357.31        | 357.31 | 357.31            | 357.22 | 9       |

Notes: IDF File = Summit.IDF, Return Period = 100-yrs.

Project File: NST0102 100-Yr.sws

## **RIPRAP APRON CALCULATIONS**

**HW2-1**

Based on "Standards for Soil Erosion and Sediment Control in New Jersey," dated 2017

TABLE 12-1 ALLOWABLE VELOCITIES FOR VARIOUS SOILS

| SOIL TEXTURE                                | ALLOWABLE VELOCITY<br>(ft./sec.) |
|---|----------------------------------|
| 1. Sand                                     | 1.8                              |
| 2. Sandy Loam                               | 2.5                              |
| 3. Silt loam (also high lime clay), loam    | 3.0                              |
| 4. Sandy clay loam                          | 3.5                              |
| 5. Clay loam                                | 4.0                              |
| 6. Clay, fine gravel, graded loam to gravel | 5.0                              |
| 7. Cobbles                                  | 5.5                              |
| 8. Shale (non-weathered)                    | 6.0                              |

Soil type where outfall is located = 2 (Note: Select number designating soil texture above)  
 allowable velocity = 2.5 ft/sec  
 $v$  (velocity) = 2.76 ft/sec  
 Rip Rap Apron required? 1 (1 = yes, 0 = no)

Given:

$D_o$  (max inside height) = 1.25 feet  
 $W_o$  (max inside width) = 1.25 feet  
 $Q$  (discharge) = 3.31 cfs (25 year storm)  
 $*q$  (unit discharge, =  $Q/W_o$ ) = 2.7 cfs / foot  
 $** T_w$  (tail water) = 0.25 feet

\* for the conduit design storm or the 25 year storm, whichever is greater

\*\* for areas where  $T_w$  cannot be computed, use  $T_w = 0.2 D_o$ . For discharge

into detention basins,  $T_w$  shall equal the 2 year storm elevation in the basin.

Riprap Apron Dimensions

I. The length of the apron,  $L$  (in feet), shall be determined from the formula:

$$L_a = \left(1.8 \frac{q}{D_o^{1/2}}\right) + 7D_o \quad T_w < \frac{1}{2} D_o \quad L_a = \boxed{13 \text{ feet}}$$

$$L_a = 3 \frac{q}{D_o^{1/2}} \quad T_w > \frac{1}{2} D_o \quad L_a = \boxed{0 \text{ feet}}$$

II. Where there is no well-defined channel immediately downstream of the apron, the width,  $W$ , of the outlet end of the apron shall be as follows:

For tailwater elevation greater than or equal to the elevation of the center of the pipe,

$$W = 3W_o + 0.4L_a \quad W = \boxed{0 \text{ feet}}$$

For tailwater elevation less than the elevation of the center of the pipe,

$$W = 3W_o + L_a \quad W = \boxed{17 \text{ feet}}$$

Where  $L_a$  is the length of the apron determined from the formula and  $W_o$  is the culvert width.

**LANGAN**

300 Kimball Drive  
 P: 973.560.4900

Parsippany, NJ  
 F: 973.560.4901

NJ Certificate of Authorization No: 24GA27996400

Project:

**HW2-1  
 RIP RAP APRON DESIGN**

**SUMMIT**

**NEW JERSEY**

Project No.  
 101007201

Date:  
 2/8/2024

By:  
 TEG

Ckd:  
 MJV

Sheet No.  
 1 of 2

Riprap Median Stone Diameter

The median stone diameter,  $D_{50}$ , in feet, shall be determined from the formula:

For Horizontal Apron: 
$$D_{50} = \frac{0.016}{T_w} q^{1.33}$$
 Where  $q = Q/D_o$

$D_{50} = 0.24 \text{ ft}$  OR  $D_{50} = 2.9 \text{ inches}$

**Use Min.  $D_{50} = 3.0 \text{ inches}$**

Note: For discharge into Detention Basins, analyze the hydraulic characteristics of the basin for the design storm to determine the combination of conduit discharge and tailwater that results in the largest required D50 stone size.

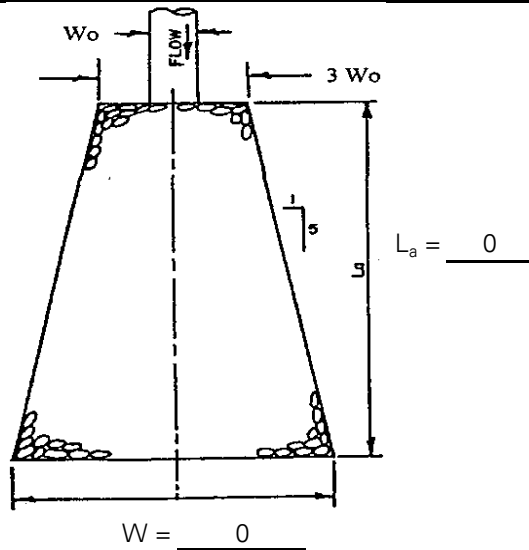
Riprap Lining Thickness

The thickness of riprap lining shall meet at least one of the following criteria:

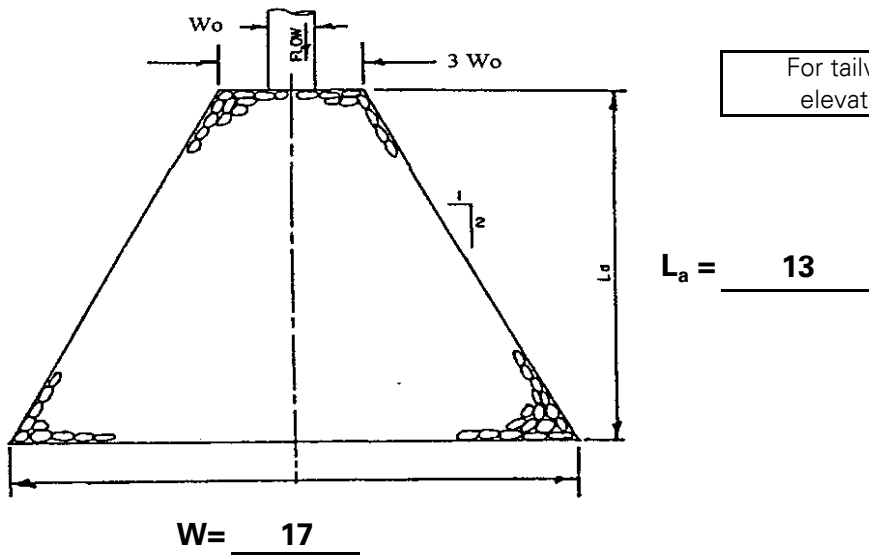
1. A thickness of at least three times the  $D_{50}$  size if a filter layer is not used. t = 8.6 inches
2. A thickness of at least two times the  $D_{50}$  size if a filter layer is used. t = 5.8 inches

\*Minimum required thickness is 6 inches.

**Use Min. t = 6.0 inches**



For tailwater elevation greater than or equal to the elevation of the center of the pipe



For tailwater elevation less than the elevation of the center of the pipe

**LANGAN**

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 P: 973.560.4900 F: 973.560.4901  
 NJ Certificate of Authorization No: 24GA27996400

Project:

**HW2-1  
 RIP RAP APRON DESIGN**

**SUMMIT**

**NEW JERSEY**

|                          |                   |            |             |                     |
|--------------------------|-------------------|------------|-------------|---------------------|
| Project No.<br>101007201 | Date:<br>2/8/2024 | By:<br>TEG | Ckd:<br>MJV | Sheet No.<br>2 of 2 |
|--------------------------|-------------------|------------|-------------|---------------------|



# **APPENDIX E**

## **Stormwater Quality & Groundwater Recharge Calculations**

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**UGD-INF1-1**

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## **WATER QUALITY CALCULATIONS**

# **NJDEP WATER QUALITY DESIGN STORM ROUTINGS**

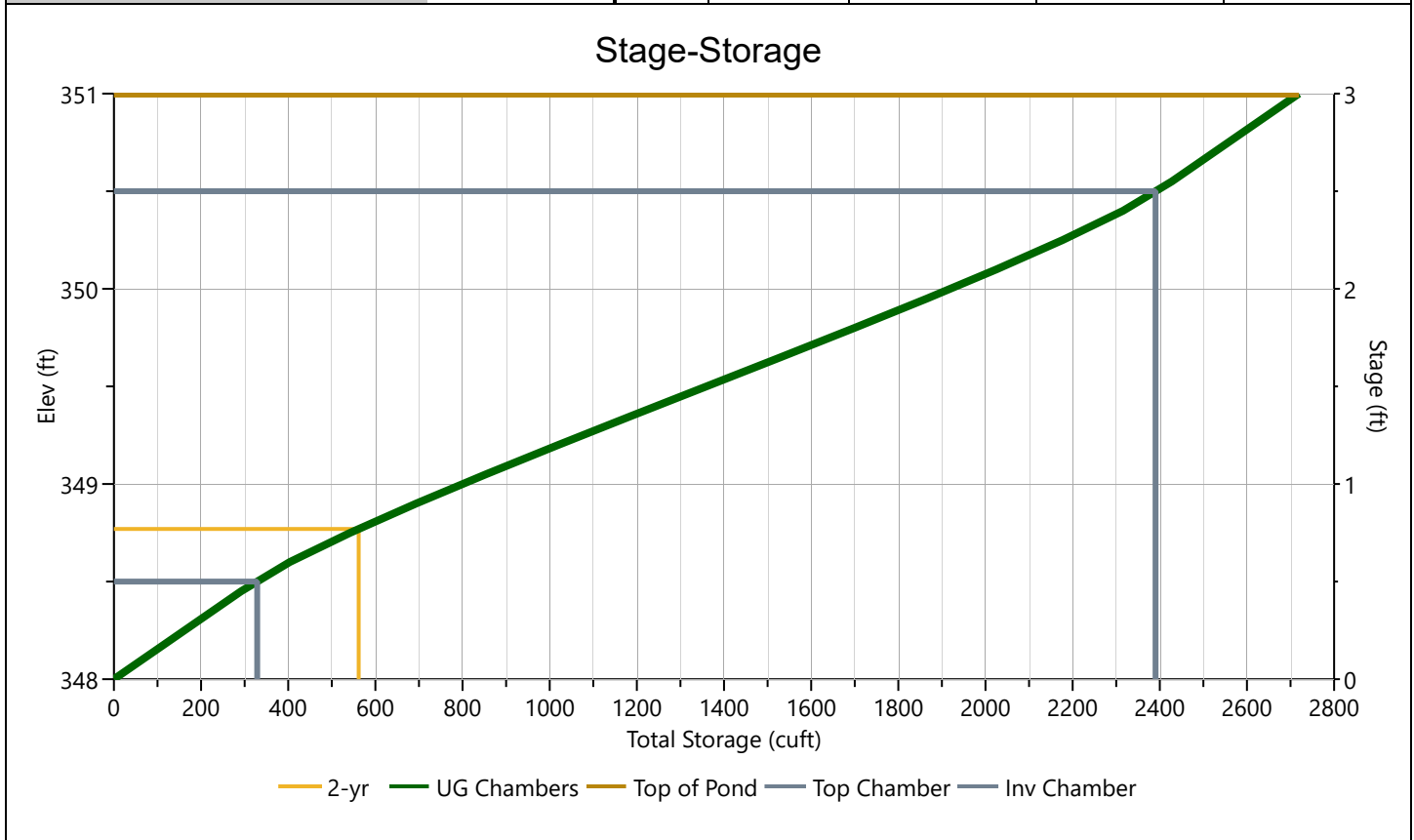
**UGD-INF1-1**

# Pond Report

## UGD-INF1-1

## Stage-Storage

| Underground Chambers             |          | Stage / Storage Table |                |                     |                      |                      |
|----------------------------------|----------|-----------------------|----------------|---------------------|----------------------|----------------------|
| Description                      | Input    | Stage (ft)            | Elevation (ft) | Contour Area (sqft) | Incr. Storage (cuft) | Total Storage (cuft) |
| Invert Elev Down, ft             | 348.50   | 0.00                  | 348.00         | 1,620               | 0.000                | 0.000                |
| Chamber Rise, ft                 | 2.00     | 0.15                  | 348.15         | 1,620               | 97.2                 | 97.2                 |
| Chamber Shape                    | Circular | 0.30                  | 348.30         | 1,620               | 97.2                 | 194                  |
| Chamber Span, ft                 | 2.00     | 0.45                  | 348.45         | 1,620               | 97.2                 | 292                  |
| Barrel Length, ft                | 75.00    | 0.60                  | 348.60         | 1,620               | 112                  | 403                  |
| No. Barrels                      | 5        | 0.75                  | 348.75         | 1,620               | 139                  | 542                  |
| Barrel Slope, %                  | 0.00     | 0.90                  | 348.90         | 1,620               | 152                  | 694                  |
| Headers, y/n                     | Yes      | 1.05                  | 349.05         | 1,620               | 160                  | 854                  |
| Stone Encasement, y/n            | Yes      | 1.20                  | 349.20         | 1,620               | 166                  | 1,020                |
| Encasement Bottom Elevation, ft  | 348.00   | 1.35                  | 349.35         | 1,620               | 169                  | 1,189                |
| Encasement Width per Chamber, ft | 4.00     | 1.50                  | 349.50         | 1,620               | 171                  | 1,360                |
| Encasement Depth, ft             | 3.00     | 1.65                  | 349.65         | 1,620               | 171                  | 1,531                |
| Encasement Voids, %              | 40.00    | 1.80                  | 349.80         | 1,620               | 169                  | 1,700                |
|                                  |          | 1.95                  | 349.95         | 1,620               | 166                  | 1,866                |
|                                  |          | 2.10                  | 350.10         | 1,620               | 160                  | 2,026                |
|                                  |          | 2.25                  | 350.25         | 1,620               | 152                  | 2,177                |
|                                  |          | 2.40                  | 350.40         | 1,620               | 139                  | 2,316                |
|                                  |          | 2.55                  | 350.55         | 1,620               | 112                  | 2,428                |
|                                  |          | 2.70                  | 350.70         | 1,620               | 97.2                 | 2,525                |
|                                  |          | 2.85                  | 350.85         | 1,620               | 97.2                 | 2,622                |
|                                  |          | 3.00                  | 351.00         | 1,620               | 97.2                 | 2,719                |



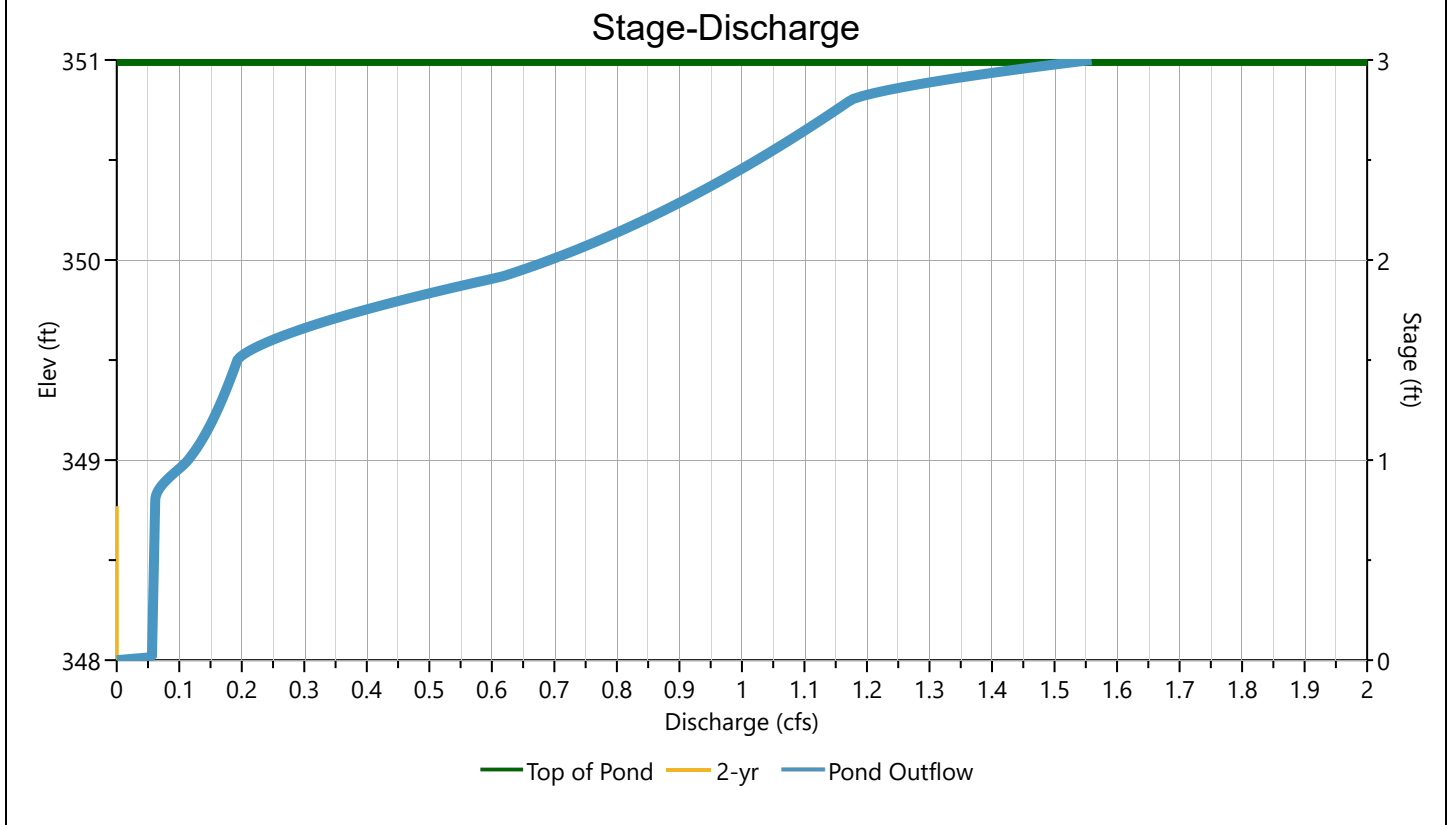
# Pond Report

## UGD-INF1-1

## Stage-Discharge

| Culvert / Orifices      | Cir Culvert | Orifice     |        |   | Perforated Riser        |
|-------------------------|-------------|-------------|--------|---|-------------------------|
|                         |             | 1 (i)       | 2 (i)  | 3 |                         |
| Rise, in                |             | 2.5         | 5      |   | Hole Diameter, in       |
| Span, in                |             | 2.5         | 5      |   | No. holes               |
| No. Barrels             |             | 1           | 1      |   | Invert Elevation, ft    |
| Invert Elevation, ft    |             | 348.80      | 349.50 |   | Height, ft              |
| Orifice Coefficient, Co |             | 0.60        | 0.60   |   | Orifice Coefficient, Co |
| Length, ft              |             |             |        |   |                         |
| Barrel Slope, %         |             |             |        |   |                         |
| N-Value, n              |             |             |        |   |                         |
| Weirs                   | Riser       | Weir        |        |   | Ancillary               |
| Shape / Type            |             | 1 (i)       | 2      | 3 | Exfiltration, in/hr     |
| Crest Elevation, ft     |             | Rectangular |        |   | 1.50**                  |
| Crest Length, ft        |             | 350.8       |        |   |                         |
| Angle, deg              |             | 1           |        |   |                         |
| Weir Coefficient, Cw    |             | 3.3         |        |   |                         |

m = Flows through Culvert, i = Independent \*\*Exfiltration extracted from outflow hydrograph. Rate applied to contours.





# Hydrograph Report

Hydrology Studio v 3.0.0.38

File: Future Beacon Church Proposed - POA-1 & POA-3.hys

05-20-2025

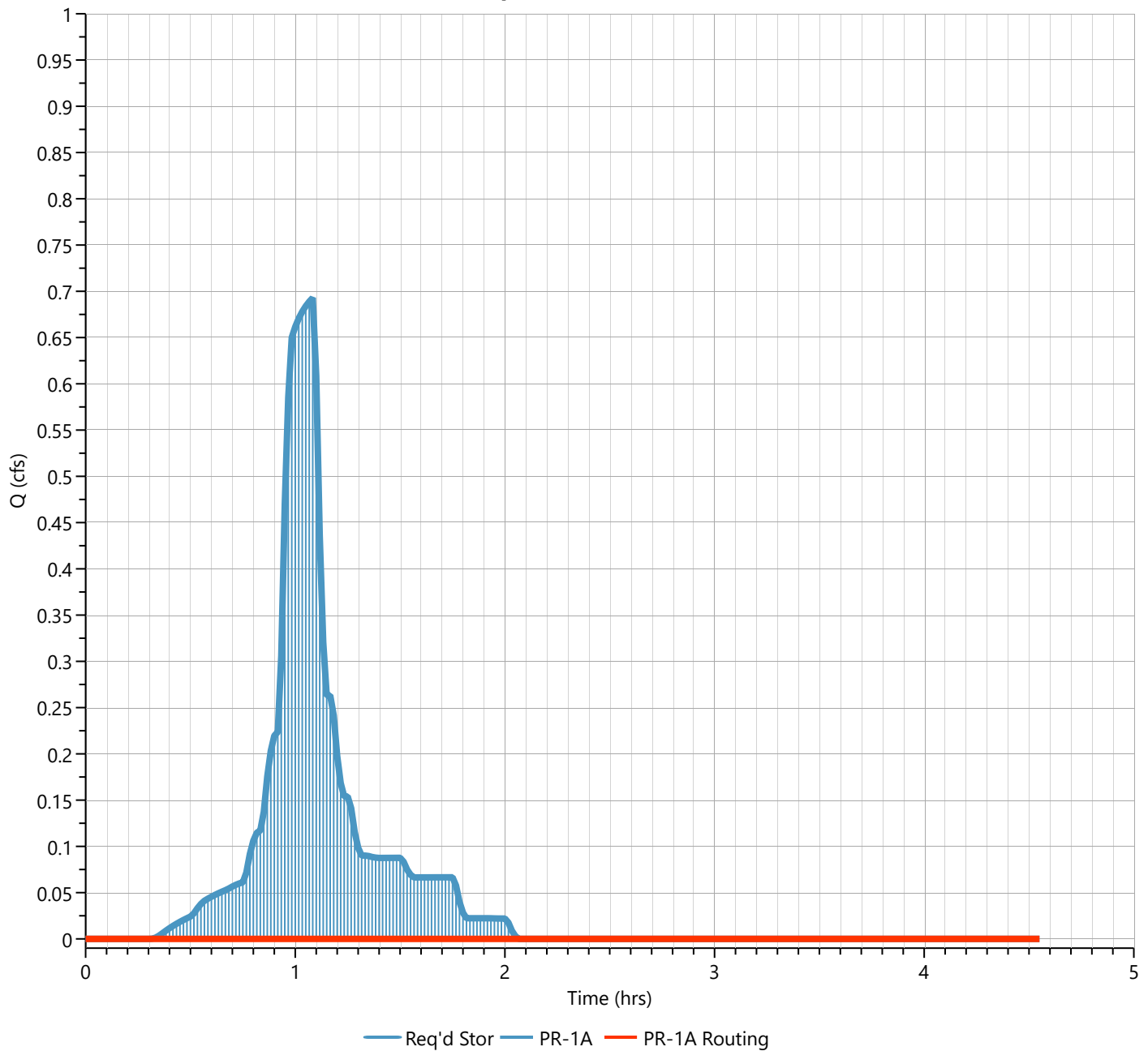
## PR-1A Routing

## Hyd. No. 2

|                   |              |                   |              |
|-------------------|--------------|-------------------|--------------|
| Hydrograph Type   | = Pond Route | Peak Flow         | = 0.000 cfs  |
| Storm Frequency   | = 2-yr       | Time to Peak      | = 272 min    |
| Time Interval     | = 1 min      | Hydrograph Volume | = 0.000 cuft |
| Inflow Hydrograph | = 1 - PR-1A  | Max. Elevation    | = 348.77 ft  |
| Pond Name         | = UGD-INF1-1 | Max. Storage      | = 562 cuft   |

*Pond Routing by Storage Indication Method*

**Qp = 0.000 cfs**



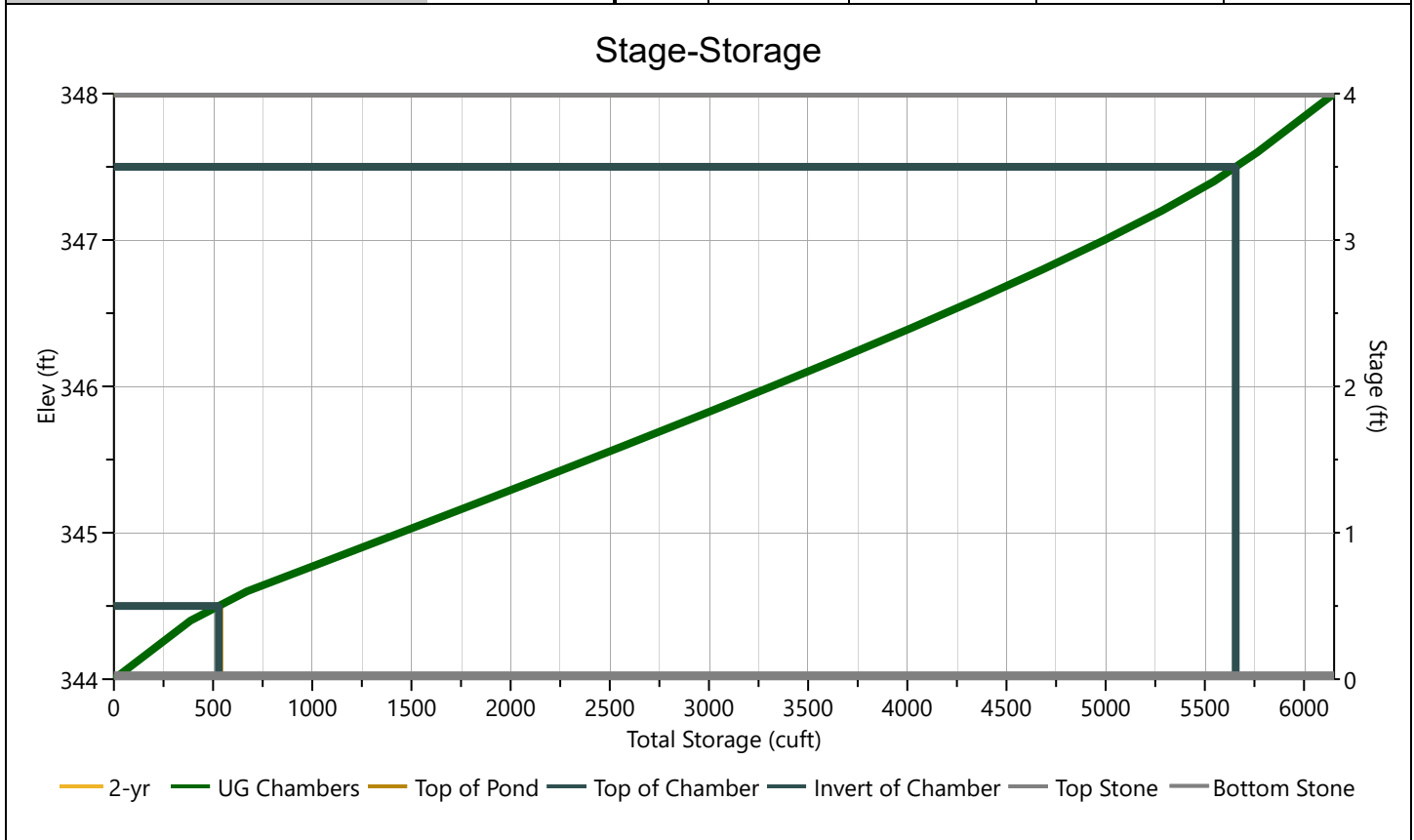
**UGD-INF1-2**

# Pond Report

## UGD-INF1-2

## Stage-Storage

| Cultec Recharger® 360HD Chamber |        | Stage / Storage Table |                |                     |                      |                      |
|---------------------------------|--------|-----------------------|----------------|---------------------|----------------------|----------------------|
| Description                     | Input  | Stage (in)            | Elevation (ft) | Contour Area (sqft) | Incr. Storage (cuft) | Total Storage (cuft) |
| Chamber Height, in              | 36     | 0.0                   | 344.00         | 2,414               | 0.000                | 0.000                |
| Chamber Shape                   | Arch   | 2.4                   | 344.20         | 2,414               | 193                  | 193                  |
| Chamber Width, in               | 60     | 4.8                   | 344.40         | 2,414               | 193                  | 386                  |
| Installed Length, ft            | 3.67   | 7.2                   | 344.60         | 2,414               | 285                  | 671                  |
| No. Chambers                    | 103    | 9.6                   | 344.80         | 2,414               | 387                  | 1,058                |
| Bare Chamber Stor, cuft         | 3,776  | 12.0                  | 345.00         | 2,414               | 385                  | 1,443                |
| No. Rows                        | 3      | 14.4                  | 345.20         | 2,414               | 383                  | 1,826                |
| Space Between Rows, in          | 9      | 16.8                  | 345.40         | 2,414               | 380                  | 2,206                |
| Stone Above, in                 | 6      | 19.2                  | 345.60         | 2,414               | 376                  | 2,582                |
| Stone Below, in                 | 6      | 21.6                  | 345.80         | 2,414               | 371                  | 2,953                |
| Stone Sides, in                 | 12     | 24.0                  | 346.00         | 2,414               | 365                  | 3,317                |
| Stone Ends, in                  | 12     | 26.4                  | 346.20         | 2,414               | 357                  | 3,674                |
| Encasement Voids, %             | 40.00  | 28.8                  | 346.40         | 2,414               | 348                  | 4,022                |
| Encasement Bottom Elevation, ft | 344.00 | 31.2                  | 346.60         | 2,414               | 338                  | 4,360                |
|                                 |        | 33.6                  | 346.80         | 2,414               | 325                  | 4,685                |
|                                 |        | 36.0                  | 347.00         | 2,414               | 309                  | 4,994                |
|                                 |        | 38.4                  | 347.20         | 2,414               | 290                  | 5,284                |
|                                 |        | 40.8                  | 347.40         | 2,414               | 262                  | 5,545                |
|                                 |        | 43.2                  | 347.60         | 2,414               | 220                  | 5,765                |
|                                 |        | 45.6                  | 347.80         | 2,414               | 193                  | 5,959                |
|                                 |        | 48.0                  | 348.00         | 2,414               | 193                  | 6,152                |



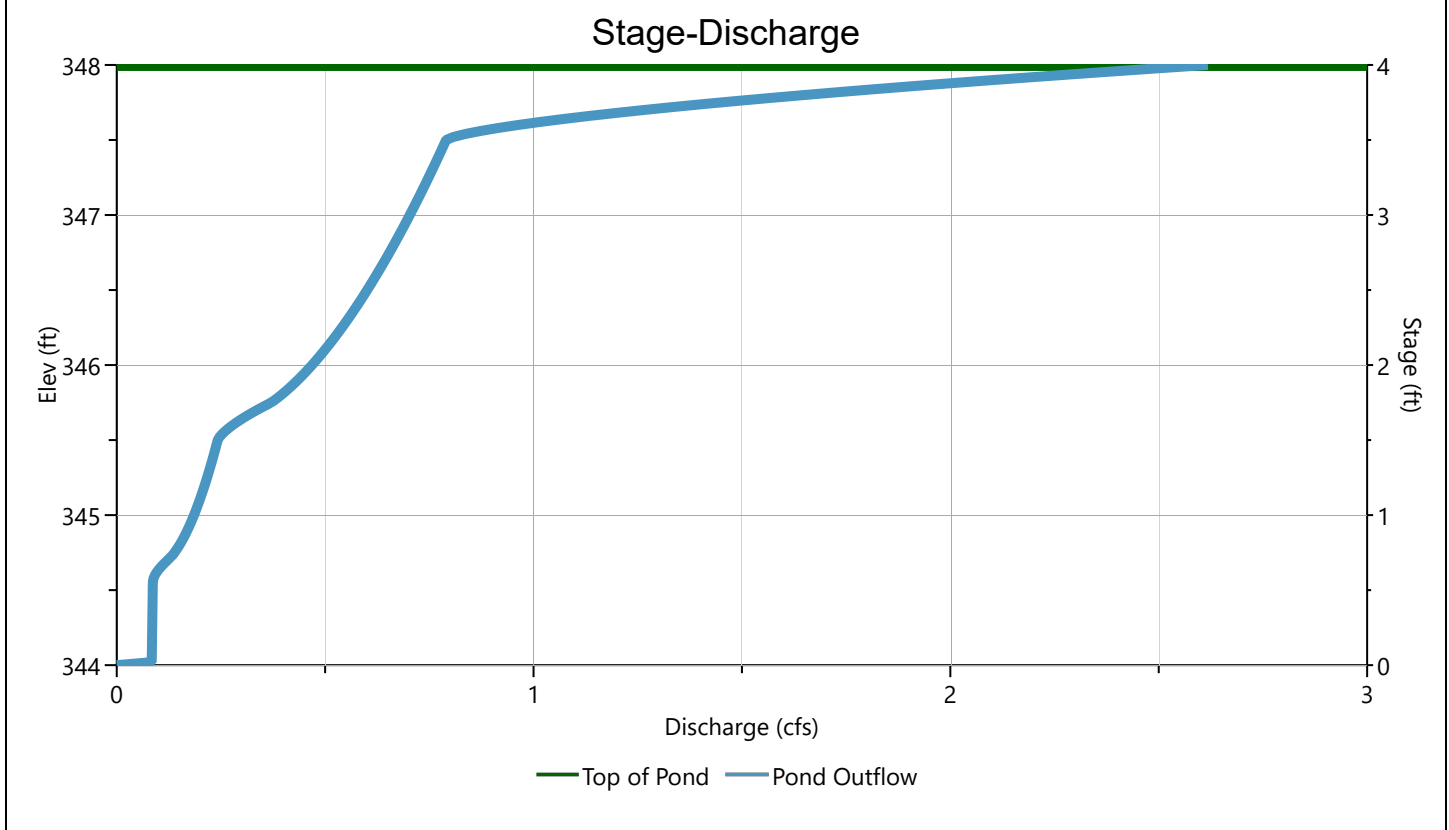
# Pond Report

## UGD-INF1-2

## Stage-Discharge

| Culvert / Orifices      | Cir Culvert | Orifice     |        |   | Perforated Riser        |
|-------------------------|-------------|-------------|--------|---|-------------------------|
|                         |             | 1 (i)       | 2 (i)  | 3 |                         |
| Rise, in                |             | 2.5         | 3      |   | Hole Diameter, in       |
| Span, in                |             | 2.5         | 3      |   | No. holes               |
| No. Barrels             |             | 1           | 1      |   | Invert Elevation, ft    |
| Invert Elevation, ft    |             | 344.55      | 345.50 |   | Height, ft              |
| Orifice Coefficient, Co |             | 0.60        | 0.60   |   | Orifice Coefficient, Co |
| Length, ft              |             |             |        |   |                         |
| Barrel Slope, %         |             |             |        |   |                         |
| N-Value, n              |             |             |        |   |                         |
| Weirs                   | Riser       | Weir        |        |   | Ancillary               |
| Shape / Type            |             | 1 (i)       | 2      | 3 | Exfiltration, in/hr     |
| Crest Elevation, ft     |             | Rectangular |        |   | 1.50**                  |
| Crest Length, ft        |             | 347.5       |        |   |                         |
| Angle, deg              |             | 1.5         |        |   |                         |
| Weir Coefficient, Cw    |             | 3.3         |        |   |                         |

m = Flows through Culvert, i = Independent \*\*Exfiltration extracted from outflow hydrograph. Rate applied to contours.



# Hydrograph Report

Hydrology Studio v 3.0.0.38

File: Future Beacon Church Proposed - POA-1 & POA-3.hys

05-20-2025

## UGD-INF1-2 Routing

**Hyd. No. 20**

|                   |                            |                   |              |
|-------------------|----------------------------|-------------------|--------------|
| Hydrograph Type   | = Pond Route               | Peak Flow         | = 0.000 cfs  |
| Storm Frequency   | = 2-yr                     | Time to Peak      | = 0 min      |
| Time Interval     | = 1 min                    | Hydrograph Volume | = 0.000 cuft |
| Inflow Hydrograph | = 18 - Comb. to UDG-INF1-2 | Max. Elevation    | = 344.51 ft  |
| Pond Name         | = UGD-INF1-2               | Max. Storage      | = 542 cuft   |

*Pond Routing by Storage Indication Method*

**Qp = 0.000 cfs**

# **RAIN GARDEN**



# Pond Report

Project Name:

Hydrology Studio v 3.0.0.31

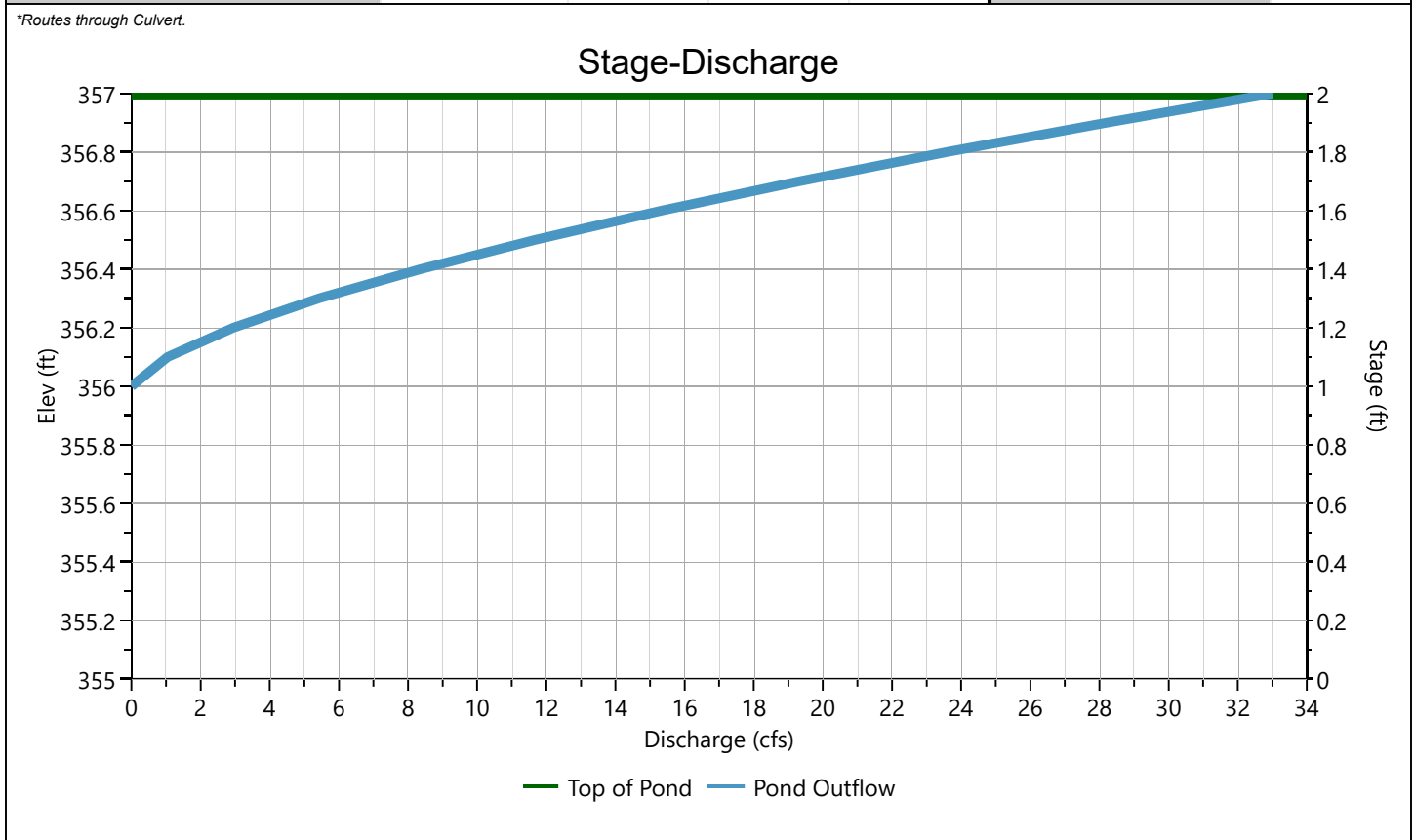
02-07-2024

## Rain Garden

## 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        |         | 356           |   |   |                         |
| Angle, deg              |         | 10            |   |   |                         |
| Weir Coefficient, Cw    |         | 3.3           |   |   |                         |

\*Routes through Culvert.





# Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.31

02-07-2024

## PR-1C Routing

**Hyd. No. 11**

|                   |               |                   |              |
|-------------------|---------------|-------------------|--------------|
| Hydrograph Type   | = Pond Route  | Peak Flow         | = 0.000 cfs  |
| Storm Frequency   | = 2-yr        | Time to Peak      | = 0 min      |
| Time Interval     | = 1 min       | Hydrograph Volume | = 0.000 cuft |
| Inflow Hydrograph | = 10 - PR-1C  | Max. Elevation    | = 355.31 ft  |
| Pond Name         | = Rain Garden | Max. Storage      | = 77.9 cuft  |

*Pond Routing by Storage Indication Method*

**Qp = 0.00 cfs**

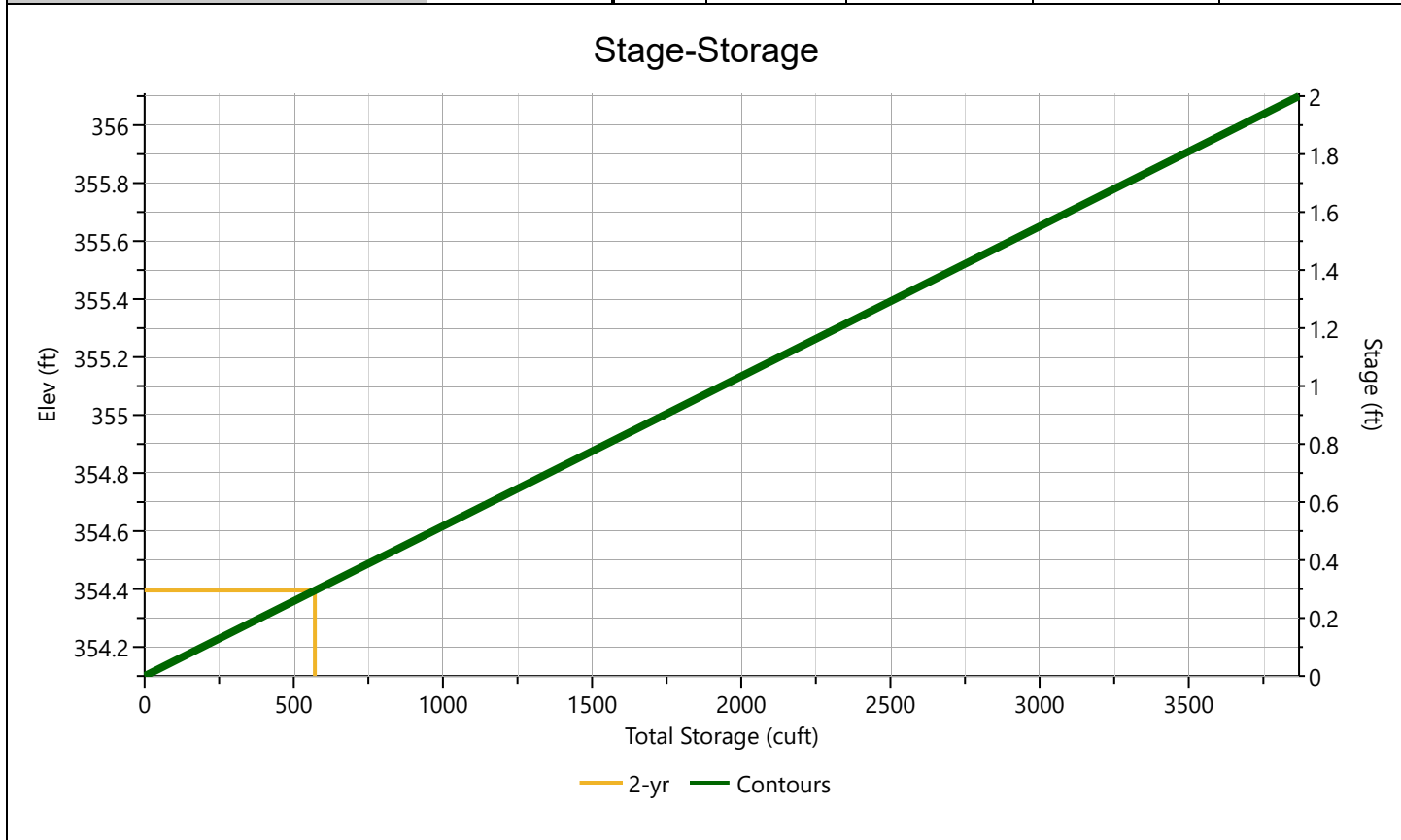
# **POROUS PAVEMENT SYSTEM 1**

# Pond Report

## Porous Pavement System 1

## 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  | 354.10       | 0.00                  | 354.10         | 4,837               | 0.000                | 0.000                |
| Voids (%)             | 40.00        | 1.00                  | 355.10         | 4,837               | 1,935                | 1,935                |
| Volume Calc           | Ave End Area | 2.00                  | 356.10         | 4,837               | 1,935                | 3,870                |
|                       |              |                       |                |                     |                      |                      |
|                       |              |                       |                |                     |                      |                      |
|                       |              |                       |                |                     |                      |                      |
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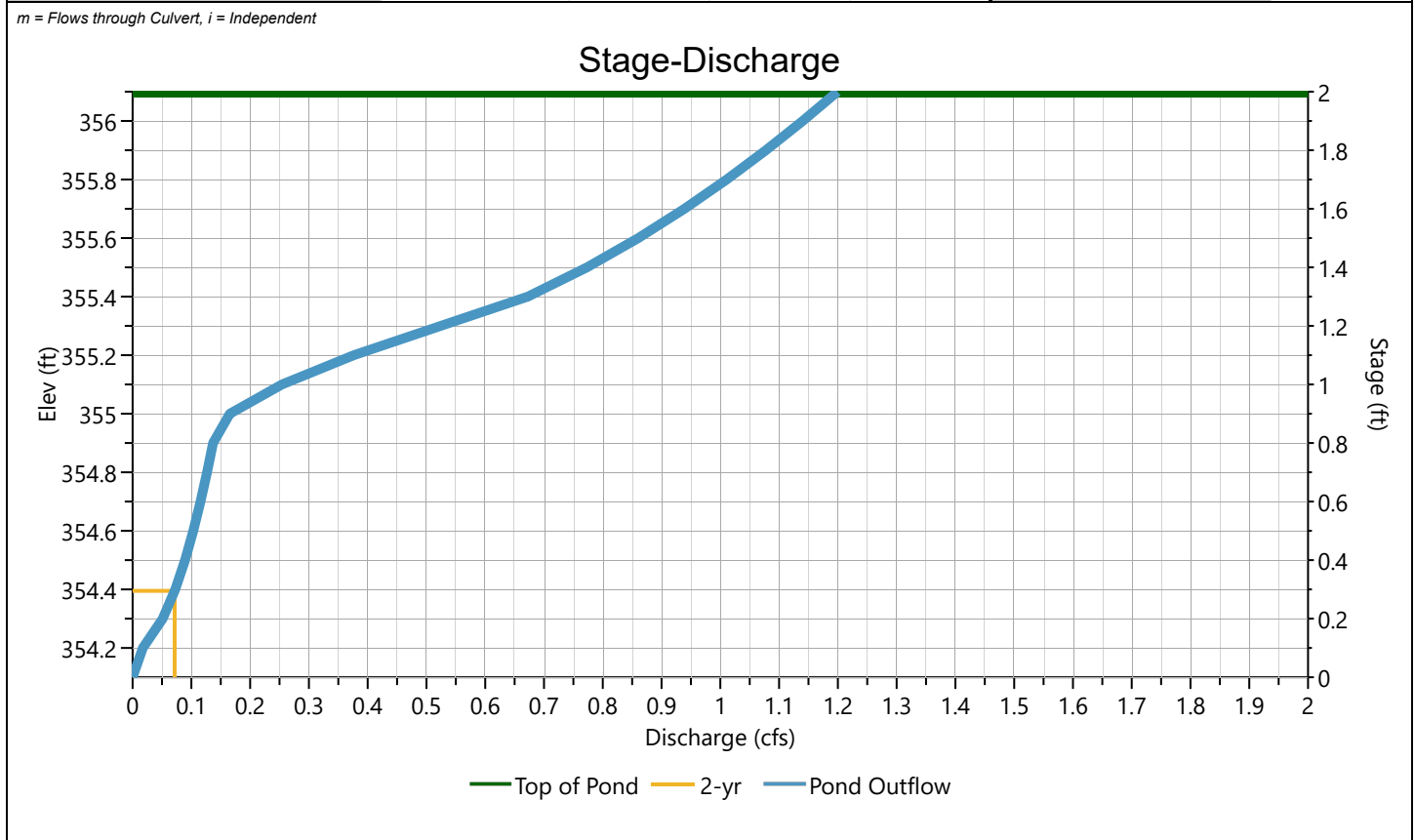
# Pond Report

## Porous Pavement System 1

## Stage-Discharge

| Culvert / Orifices      | Cir Culvert | Orifice |        |   | Perforated Riser        |
|-------------------------|-------------|---------|--------|---|-------------------------|
|                         |             | 1 (i)   | 2 (i)  | 3 |                         |
| Rise, in                |             | 2.5     | 5      |   | Hole Diameter, in       |
| Span, in                |             | 2.5     | 6      |   | No. holes               |
| No. Barrels             |             | 1       | 1      |   | Invert Elevation, ft    |
| Invert Elevation, ft    |             | 354.10  | 354.95 |   | Height, ft              |
| Orifice Coefficient, Co |             | 0.60    | 0.60   |   | Orifice Coefficient, Co |
| Length, ft              |             |         |        |   |                         |
| Barrel Slope, %         |             |         |        |   |                         |
| N-Value, n              |             |         |        |   |                         |
| Weirs                   | Riser       | Weir    |        |   | Ancillary               |
|                         |             | 1       | 2      | 3 |                         |
| Shape / Type            |             |         |        |   | Exfiltration, in/hr     |
| Crest Elevation, ft     |             |         |        |   |                         |
| Crest Length, ft        |             |         |        |   |                         |
| Angle, deg              |             |         |        |   |                         |
| Weir Coefficient, Cw    |             |         |        |   |                         |

*m = Flows through Culvert, i = Independent*



# Hydrograph Report

Hydrology Studio v 3.0.0.38

File: Future Beacon Church Proposed - POA-2.hys

05-19-2025

## PR-2A Routing

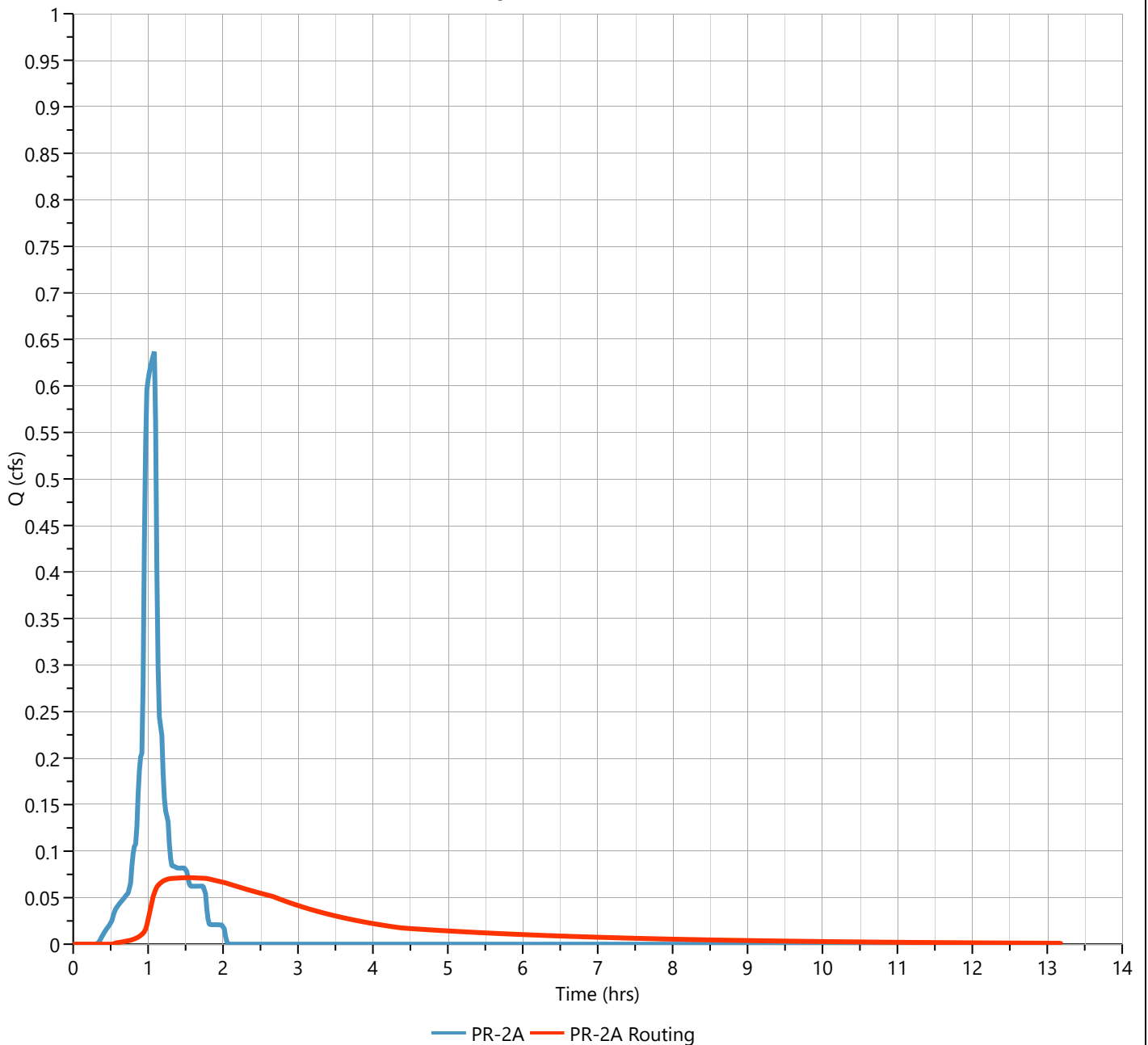
### Hyd. No. 4

|                   |                            |                   |             |
|-------------------|----------------------------|-------------------|-------------|
| Hydrograph Type   | = Pond Route               | Peak Flow         | = 0.072 cfs |
| Storm Frequency   | = 2-yr                     | Time to Peak      | = 92 min    |
| Time Interval     | = 1 min                    | Hydrograph Volume | = 769 cuft  |
| Inflow Hydrograph | = 3 - PR-2A                | Max. Elevation    | = 354.40 ft |
| Pond Name         | = Porous Pavement System 1 | Max. Storage      | = 571 cuft  |

Pond Routing by Storage Indication Method

Center of mass detention time = 2.30 hrs

**Qp = 0.072 cfs**



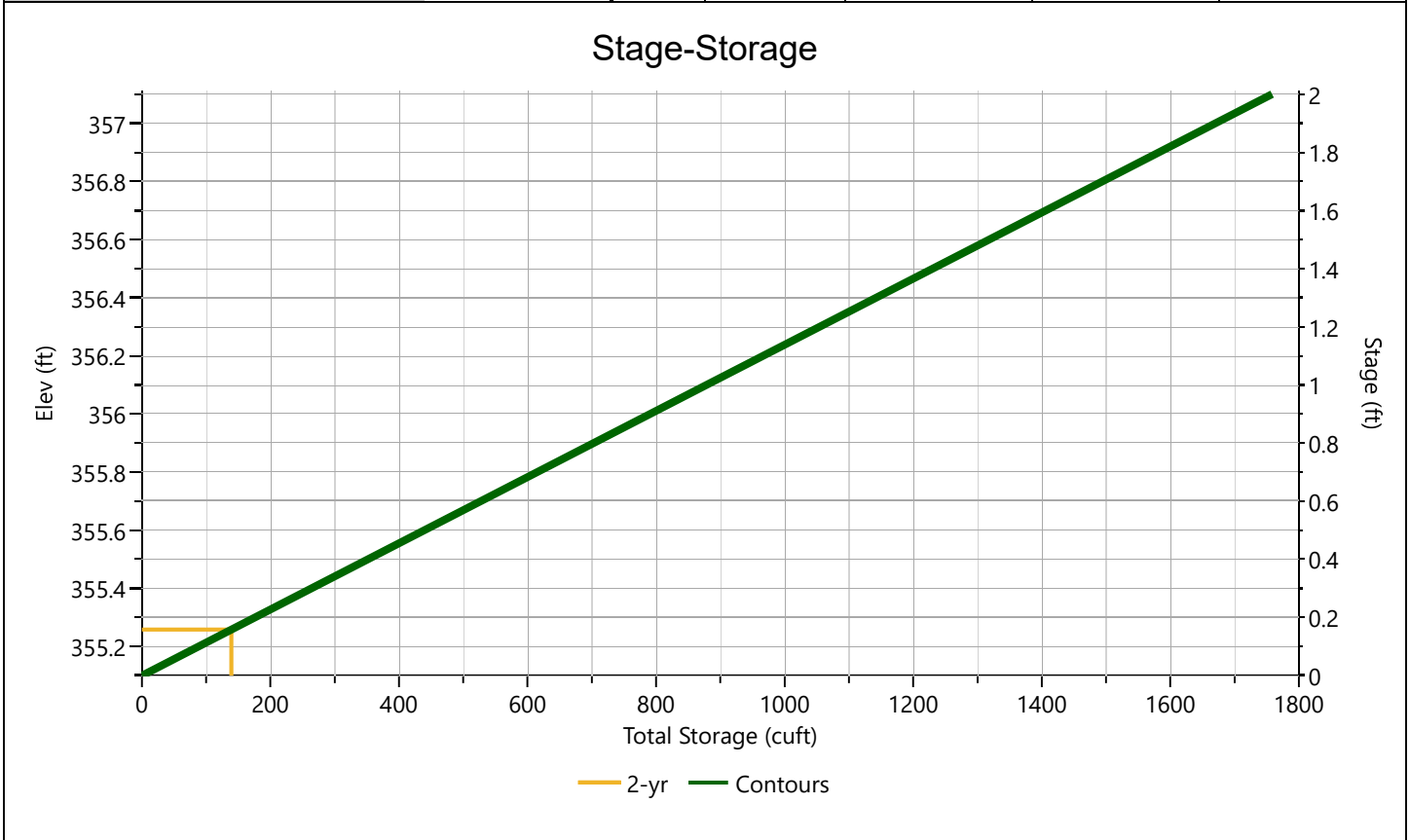
## **POROUS PAVEMENT SYSTEM 2**

# Pond Report

## Porous Pavement System 2

## 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  | 355.10       | 0.00                  | 355.10         | 2,198               | 0.000                | 0.000                |
| Voids (%)             | 40.00        | 1.00                  | 356.10         | 2,198               | 879                  | 879                  |
| Volume Calc           | Ave End Area | 2.00                  | 357.10         | 2,198               | 879                  | 1,758                |
|                       |              |                       |                |                     |                      |                      |
|                       |              |                       |                |                     |                      |                      |
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# Pond Report

Project Name:

Hydrology Studio v 3.0.0.31

02-07-2024

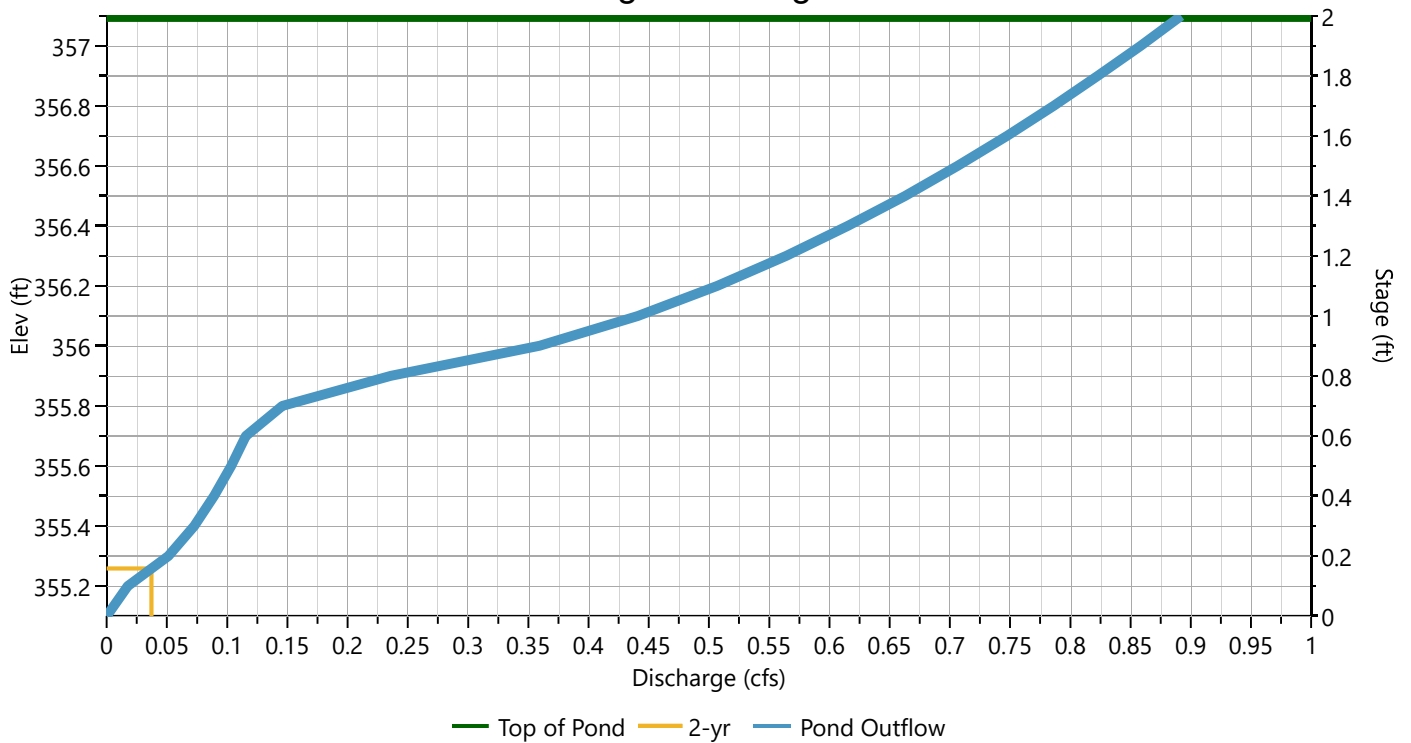
## Porous Pavement System 2

## Stage-Discharge

| Culvert / Orifices      | Culvert | Orifices |        |   | Perforated Riser        |
|-------------------------|---------|----------|--------|---|-------------------------|
|                         |         | 1        | 2      | 3 |                         |
| Rise, in                |         | 2.5      | 3      |   | Hole Diameter, in       |
| Span, in                |         | 2.5      | 6      |   | No. holes               |
| No. Barrels             |         | 1        | 1      |   | Invert Elevation, ft    |
| Invert Elevation, ft    |         | 355.10   | 355.75 |   | Height, ft              |
| Orifice Coefficient, Co |         | 0.60     | 0.60   |   | 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     |         |          |        |   |                         |
| Crest Length, ft        |         |          |        |   |                         |
| Angle, deg              |         |          |        |   |                         |
| Weir Coefficient, Cw    |         |          |        |   |                         |

\*Routes through Culvert.

### Stage-Discharge





# Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.31

02-07-2024

## PR-2C Routing

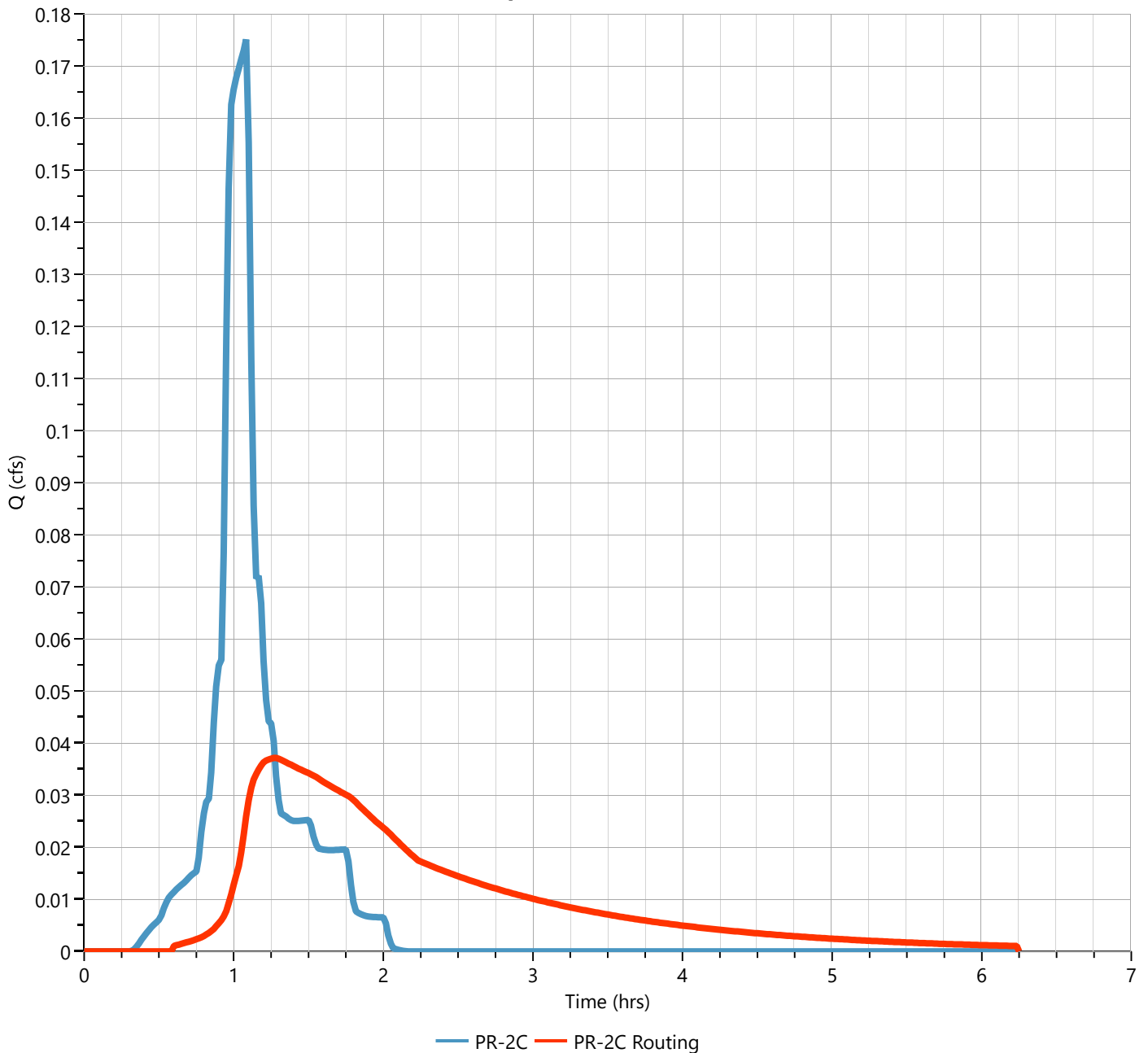
### Hyd. No. 15

|                   |                            |                   |             |
|-------------------|----------------------------|-------------------|-------------|
| Hydrograph Type   | = Pond Route               | Peak Flow         | = 0.037 cfs |
| Storm Frequency   | = 2-yr                     | Time to Peak      | = 76 min    |
| Time Interval     | = 1 min                    | Hydrograph Volume | = 217 cuft  |
| Inflow Hydrograph | = 13 - PR-2C               | Max. Elevation    | = 355.26 ft |
| Pond Name         | = Porous Pavement System 2 | Max. Storage      | = 139 cuft  |

Pond Routing by Storage Indication Method

Center of mass detention time = 1.12 hrs

**Qp = 0.04 cfs**

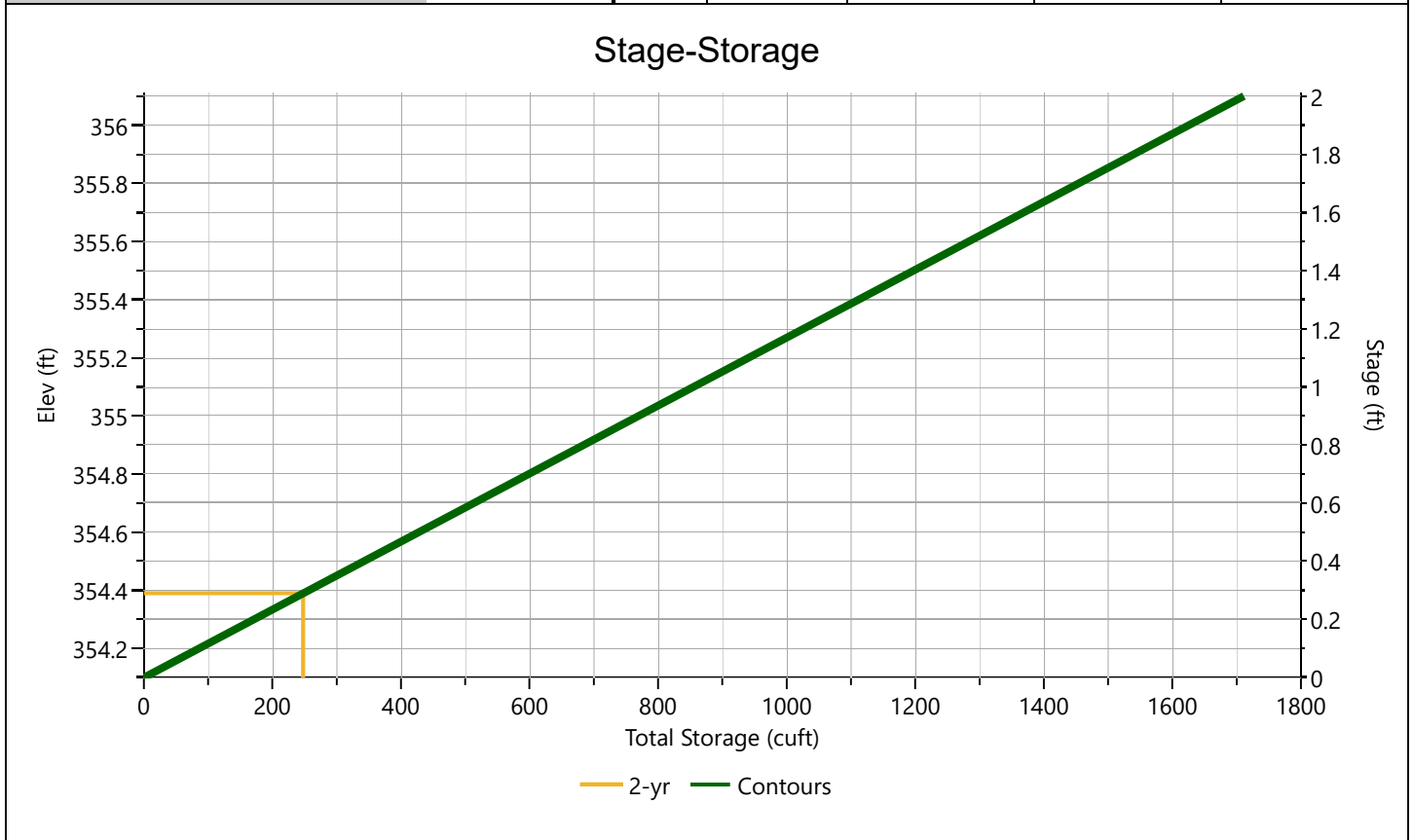


## **POROUS PAVEMENT SYSTEM 3**

## Porous Pavement System 3

## 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  | 354.10       | 0.00                  | 354.10         | 2,139               | 0.000                | 0.000                |
| Voids (%)             | 40.00        | 1.00                  | 355.10         | 2,139               | 856                  | 856                  |
| Volume Calc           | Ave End Area | 2.00                  | 356.10         | 2,139               | 856                  | 1,711                |
|                       |              |                       |                |                     |                      |                      |
|                       |              |                       |                |                     |                      |                      |
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# Pond Report

Project Name:

Hydrology Studio v 3.0.0.31

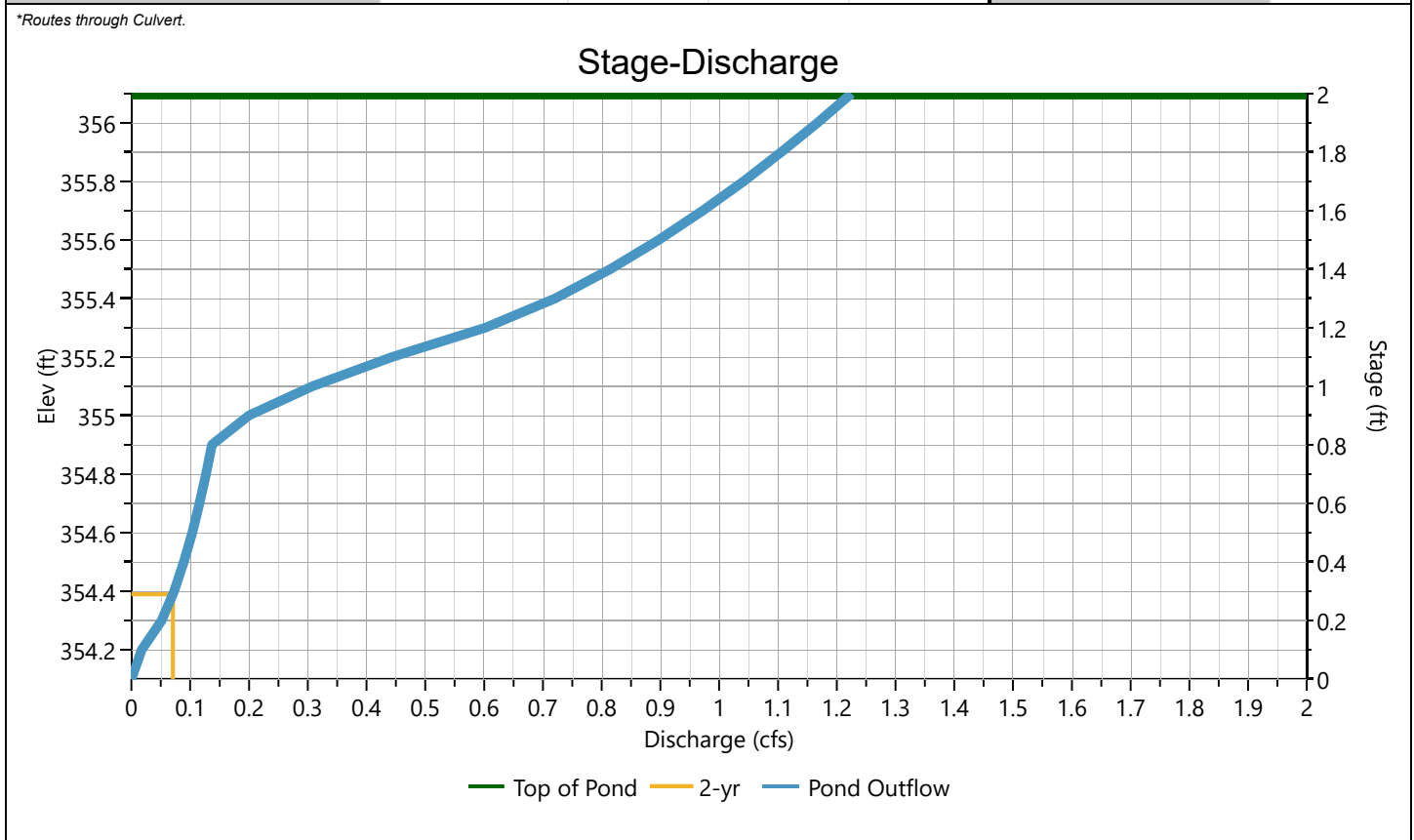
02-07-2024

## Porous Pavement System 3

## Stage-Discharge

| Culvert / Orifices      | Culvert | Orifices |        |   | Perforated Riser        |
|-------------------------|---------|----------|--------|---|-------------------------|
|                         |         | 1        | 2      | 3 |                         |
| Rise, in                |         | 2.5      | 5      |   | Hole Diameter, in       |
| Span, in                |         | 2.5      | 6      |   | No. holes               |
| No. Barrels             |         | 1        | 1      |   | Invert Elevation, ft    |
| Invert Elevation, ft    |         | 354.10   | 354.90 |   | Height, ft              |
| Orifice Coefficient, Co |         | 0.60     | 0.60   |   | 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     |         |          |        |   |                         |
| Crest Length, ft        |         |          |        |   |                         |
| Angle, deg              |         |          |        |   |                         |
| Weir Coefficient, Cw    |         |          |        |   |                         |

\*Routes through Culvert.



# Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.31

02-07-2024

## PR-2B+PR-2H Routing

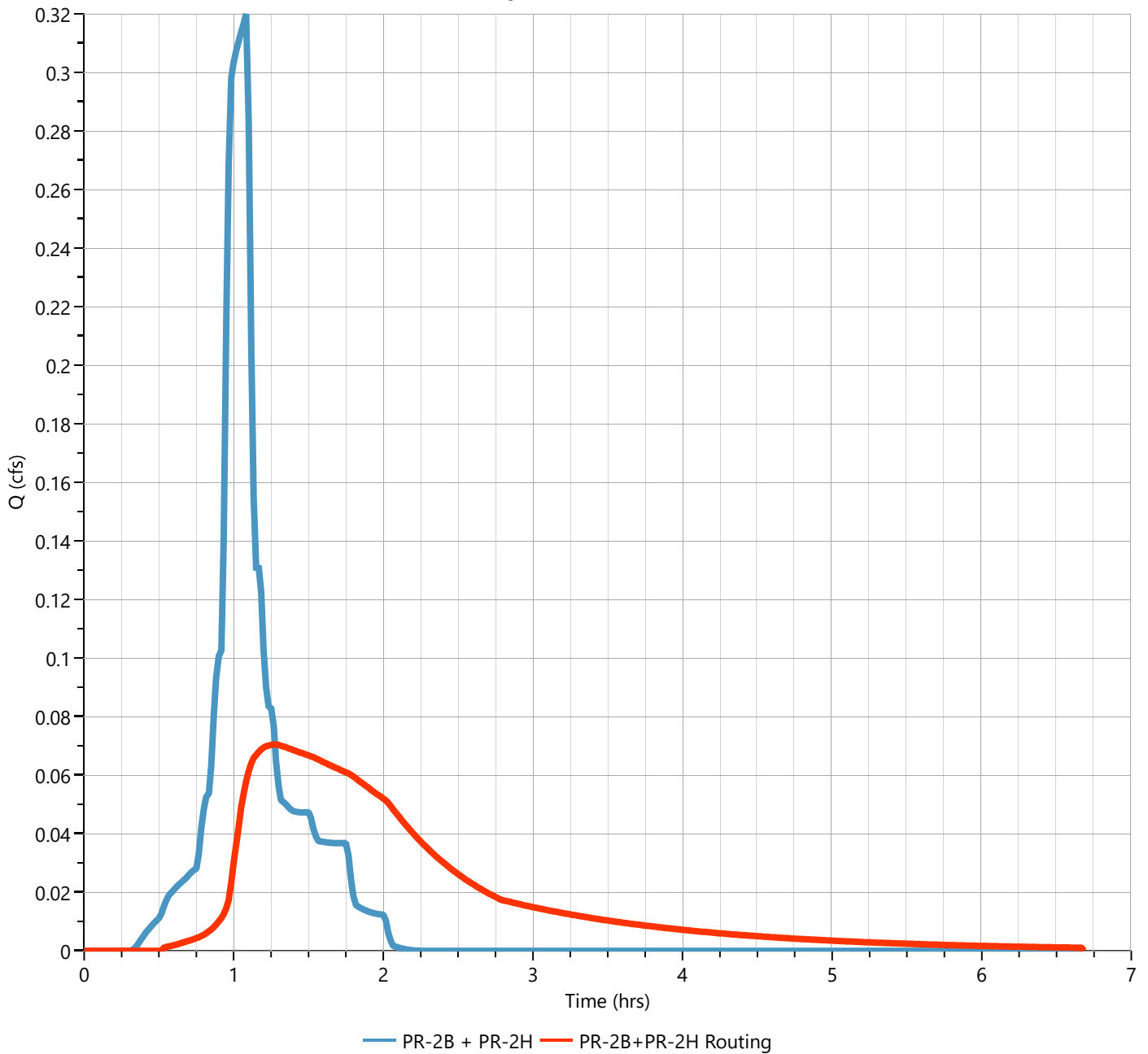
### Hyd. No. 39

|                   |                            |                   |             |
|-------------------|----------------------------|-------------------|-------------|
| Hydrograph Type   | = Pond Route               | Peak Flow         | = 0.070 cfs |
| Storm Frequency   | = 2-yr                     | Time to Peak      | = 77 min    |
| Time Interval     | = 1 min                    | Hydrograph Volume | = 407 cuft  |
| Inflow Hydrograph | = 38 - PR-2B + PR-2H       | Max. Elevation    | = 354.39 ft |
| Pond Name         | = Porous Pavement System 3 | Max. Storage      | = 248 cuft  |

Pond Routing by Storage Indication Method

Center of mass detention time = 1.01 hrs

**Qp = 0.07 cfs**



## **SUMMARY**

# Hydrograph 2-yr Summary

Hydrology Studio v 3.0.0.38

File: Future Beacon Church Proposed - POA-1 & POA-3.hys

05-19-2025

| Hyd. No. | Hydrograph Type | Hydrograph Name     | Peak Flow (cfs) | Time to Peak (min) | Hydrograph Volume (cuft) | Inflow Hyd(s) | Maximum Elevation (ft) | Maximum Storage (cuft) |
|----------|-----------------|---------------------|-----------------|--------------------|--------------------------|---------------|------------------------|------------------------|
| 1        | NRCS Runoff     | PR-1A               | 0.693           | 65                 | 845                      | ---           |                        |                        |
| 2        | Pond Route      | PR-1A Routing       | 0.000           | 272                | 0.000                    | 1             | 348.77                 | 562                    |
| 4        | NRCS Runoff     | PR-1B Grass HSGC C  | 0.013           | 73                 | 23.4                     | ---           |                        |                        |
| 5        | NRCS Runoff     | PR-1B Impervious    | 0.397           | 65                 | 488                      | ---           |                        |                        |
| 6        | Junction        | PR-1B               | 0.399           | 65                 | 512                      | 4, 5          |                        |                        |
| 8        | NRCS Runoff     | PR-1C Grass HSGC C  | 0.006           | 66                 | 7.51                     | ---           |                        |                        |
| 9        | NRCS Runoff     | PR-1C Impervious    | 0.058           | 65                 | 70.4                     | ---           |                        |                        |
| 10       | Junction        | PR-1C               | 0.062           | 65                 | 77.9                     | 8, 9          |                        |                        |
| 11       | Pond Route      | PR-1C Routing       | 0.000           | 0                  | 0.000                    | 10            | 355.31                 | 77.9                   |
| 14       | NRCS Runoff     | PR-1D Grass HSGC C  | 0.010           | 71                 | 16.5                     | ---           |                        |                        |
| 15       | NRCS Runoff     | PR-1D Impervious    | 0.318           | 65                 | 387                      | ---           |                        |                        |
| 16       | Junction        | PR-1D               | 0.320           | 65                 | 404                      | 14, 15        |                        |                        |
| 18       | Junction        | Comb. to UDG-INF1-2 | 0.720           | 65                 | 915                      | 6, 11, 16     |                        |                        |
| 20       | Pond Route      | UGD-INF1-2 Routing  | 0.000           | 0                  | 0.000                    | 18            | 344.51                 | 542                    |
| 22       | NRCS Runoff     | PR-1E Grass HSGC C  | 0.024           | 71                 | 41.3                     | ---           |                        |                        |
| 23       | NRCS Runoff     | PR-1E Impervious    | 0.115           | 65                 | 141                      | ---           |                        |                        |
| 24       | Junction        | PR-1E               | 0.122           | 65                 | 182                      | 22, 23        |                        |                        |
| 26       | Junction        | POA-1               | 0.122           | 65                 | 182                      | 2, 20, 24     |                        |                        |
| 28       | NRCS Runoff     | PR-3 (POA-3)        | 0.005           | 71                 | 8.26                     | ---           |                        |                        |

# Hydrograph 2-yr Summary

Hydrology Studio v 3.0.0.38

File: Future Beacon Church Proposed - POA-2.hys  
05-19-2025

| Hyd. No. | Hydrograph Type | Hydrograph Name    | Peak Flow (cfs) | Time to Peak (min) | Hydrograph Volume (cuft) | Inflow Hyd(s) | Maximum Elevation (ft) | Maximum Storage (cuft) |
|----------|-----------------|--------------------|-----------------|--------------------|--------------------------|---------------|------------------------|------------------------|
| 1        | NRCS Runoff     | PR-2A Grass HSGC C | 0.003           | 69                 | 5.34                     | ---           |                        |                        |
| 2        | NRCS Runoff     | PR-2A Impervious   | 0.635           | 65                 | 775                      | ---           |                        |                        |
| 3        | Junction        | PR-2A              | 0.637           | 65                 | 780                      | 1, 2          |                        |                        |
| 4        | Pond Route      | PR-2A Routing      | 0.072           | 92                 | 769                      | 3             | 354.40                 | 571                    |
| 6        | NRCS Runoff     | PR-2B Grass HSGC C | 0.010           | 75                 | 18.7                     | ---           |                        |                        |
| 7        | NRCS Runoff     | PR-2B Impervious   | 0.144           | 65                 | 176                      | ---           |                        |                        |
| 8        | Junction        | PR-2B              | 0.146           | 65                 | 195                      | 6, 7          |                        |                        |
| 11       | NRCS Runoff     | PR-2C Grass HSGC C | 0.006           | 71                 | 11.0                     | ---           |                        |                        |
| 12       | NRCS Runoff     | PR-2C Impervious   | 0.173           | 65                 | 211                      | ---           |                        |                        |
| 13       | Junction        | PR-2C              | 0.175           | 65                 | 222                      | 11, 12        |                        |                        |
| 15       | Pond Route      | PR-2C Routing      | 0.037           | 76                 | 217                      | 13            | 355.26                 | 139                    |
| 17       | NRCS Runoff     | PR-2G Grass HSGC C | 0.015           | 71                 | 24.8                     | ---           |                        |                        |
| 18       | NRCS Runoff     | PR-2G Woods HSGC C | 0.005           | 76                 | 11.1                     | ---           |                        |                        |
| 19       | Junction        | PR-2G              | 0.018           | 72                 | 35.9                     | 17, 18        |                        |                        |
| 21       | NRCS Runoff     | PR-2D Grass HSGC C | 0.018           | 83                 | 44.9                     | ---           |                        |                        |
| 22       | NRCS Runoff     | PR-2D Woods HSGC C | 0.019           | 93                 | 52.0                     | ---           |                        |                        |
| 23       | NRCS Runoff     | PR-2D Impervious   | 0.111           | 71                 | 190                      | ---           |                        |                        |
| 24       | Junction        | PR-2D              | 0.125           | 73                 | 287                      | 21, 22, 23    |                        |                        |
| 26       | NRCS Runoff     | PR-2E Grass HSGC C | 0.015           | 76                 | 29.9                     | ---           |                        |                        |
| 27       | NRCS Runoff     | PR-2E Impervious   | 0.082           | 67                 | 113                      | ---           |                        |                        |
| 28       | Junction        | PR-2E              | 0.087           | 68                 | 143                      | 26, 27        |                        |                        |
| 30       | NRCS Runoff     | PR-2F Woods HSGC C | 0.003           | 81                 | 7.29                     | ---           |                        |                        |
| 31       | NRCS Runoff     | PR-2F Impervious   | 0.055           | 67                 | 75.1                     | ---           |                        |                        |
| 32       | Junction        | PR-2F              | 0.055           | 67                 | 82.4                     | 30, 31        |                        |                        |
| 34       | NRCS Runoff     | PR-2H Grass HSGC C | 0.003           | 71                 | 5.51                     | ---           |                        |                        |
| 35       | NRCS Runoff     | PR-2H Impervious   | 0.173           | 65                 | 211                      | ---           |                        |                        |
| 36       | Junction        | PR-2H              | 0.174           | 65                 | 217                      | 34, 35        |                        |                        |



# Hydrograph 2-yr Summary

Hydrology Studio v 3.0.0.38

File: Future Beacon Church Proposed - POA-2.hys

05-19-2025

| Hyd. No. | Hydrograph Type | Hydrograph Name     | Peak Flow (cfs) | Time to Peak (min) | Hydrograph Volume (cuft) | Inflow Hyd(s)         | Maximum Elevation (ft) | Maximum Storage (cuft) |
|----------|-----------------|---------------------|-----------------|--------------------|--------------------------|-----------------------|------------------------|------------------------|
| 38       | Junction        | PR-2B + PR-2H       | 0.320           | 65                 | 411                      | 8, 36                 |                        |                        |
| 39       | Pond Route      | PR-2B+PR-2H Routing | 0.070           | 77                 | 407                      | 38                    | 354.39                 | 248                    |
| 41       | Junction        | POA-2 Partial       | 0.368           | 70                 | 1,534                    | 4, 15, 19, 24, 28, 32 |                        |                        |
| 42       | Junction        | Total POA-2         | 0.436           | 70                 | 1,940                    | 39, 41                |                        |                        |

**MANUFACTURED TREATMENT DEVICE SIZING  
CALCULATIONS**

## **SUMMARY TABLES**

**MANUFACTURED TREATMENT DEVICE WATERSHED CALCULATIONS**  
**BEACON UNITARIAN UNIVERSALIST CHURCH**  
**LANGAN PROJECT #101007201**

| <b>Proposed Watershed</b> | <b>Open Space HSGC C (CN = 74)</b> | <b>Open Space HSGC C (CN = 74)</b> | <b>Impervious (CN = 98) (SF)</b> | <b>Impervious (CN = 98) (AC)</b> | <b>Total Area (SF)</b> | <b>Total Area (AC)</b> | <b>Weighted CN</b> |
|---------------------------|------------------------------------|------------------------------------|----------------------------------|----------------------------------|------------------------|------------------------|--------------------|
| WQ1-1                     | 4                                  | 0.00                               | 1,417                            | 0.03                             | 1,421                  | 0.03                   | 98                 |
| WQ1-2                     | 2,586                              | 0.06                               | 5,018                            | 0.11                             | 7,604                  | 0.17                   | 90                 |
| WQ1-3                     | 3,930                              | 0.09                               | 689                              | 0.02                             | 4,619                  | 0.11                   | 78                 |

**CONTECH STORMFILTER SIZING CALCULATIONS  
 BEACON UNITARIAN UNIVERSALIST CHURCH  
 LANGAN PROJECT #101007201**

| <b>Proposed Device</b> | <b>Inflow Area (AC)</b> | <b>Peak Flow (CFS)</b> | <b>Peak Flow (GPM)</b> | <b>Stormfilter Cartridge Height</b> | <b>MTFR Per Cartridge (GPM)</b> | <b>Proposed # of Cartridges</b> | <b>Proposed Flow Capacity (GPM)</b> | <b>Proposed StormFilter Size</b> |
|------------------------|-------------------------|------------------------|------------------------|-------------------------------------|---------------------------------|---------------------------------|-------------------------------------|----------------------------------|
| WQ1-1                  | 0.03                    | 0.078                  | 35.0                   | 27"                                 | 22.5                            | 2                               | 45                                  | 48" Manhole                      |
| WQ1-2                  | 0.17                    | 0.327                  | 146.8                  | 18"                                 | 15.0                            | 10                              | 150                                 | 6' x 12'                         |

## **NJDEP WATER QUALITY STORM HYDROGRAPHS**

# Hydrograph 2-yr Summary

Hydrology Studio v 3.0.0.38

File: Beacon Church Proposed - WQ.hys

05-19-2025

| Hyd. No. | Hydrograph Type | Hydrograph Name    | Peak Flow (cfs) | Time to Peak (min) | Hydrograph Volume (cuft) | Inflow Hyd(s) | Maximum Elevation (ft) | Maximum Storage (cuft) |
|----------|-----------------|--------------------|-----------------|--------------------|--------------------------|---------------|------------------------|------------------------|
| 1        | NRCS Runoff     | WQ1-1              | 0.078           | 65                 | 87.8                     | ---           |                        |                        |
| 3        | NRCS Runoff     | WQ1-2 Open Space C | 0.011           | 66                 | 15.0                     | ---           |                        |                        |
| 4        | NRCS Runoff     | WQ1-2 Impervious   | 0.318           | 65                 | 387                      | ---           |                        |                        |
| 5        | Junction        | WQ1-2              | 0.327           | 65                 | 402                      | 2, 3, 4       |                        |                        |
| 7        | NRCS Runoff     | WQ1-3 Open Space C | 0.017           | 66                 | 22.5                     | ---           |                        |                        |
| 8        | NRCS Runoff     | WQ1-3 Impervious   | 0.058           | 65                 | 70.4                     | ---           |                        |                        |
| 9        | Junction        | WQ1-3              | 0.071           | 65                 | 93.0                     | 2, 7, 8       |                        |                        |

# Hydrograph Report

Hydrology Studio v 3.0.0.38

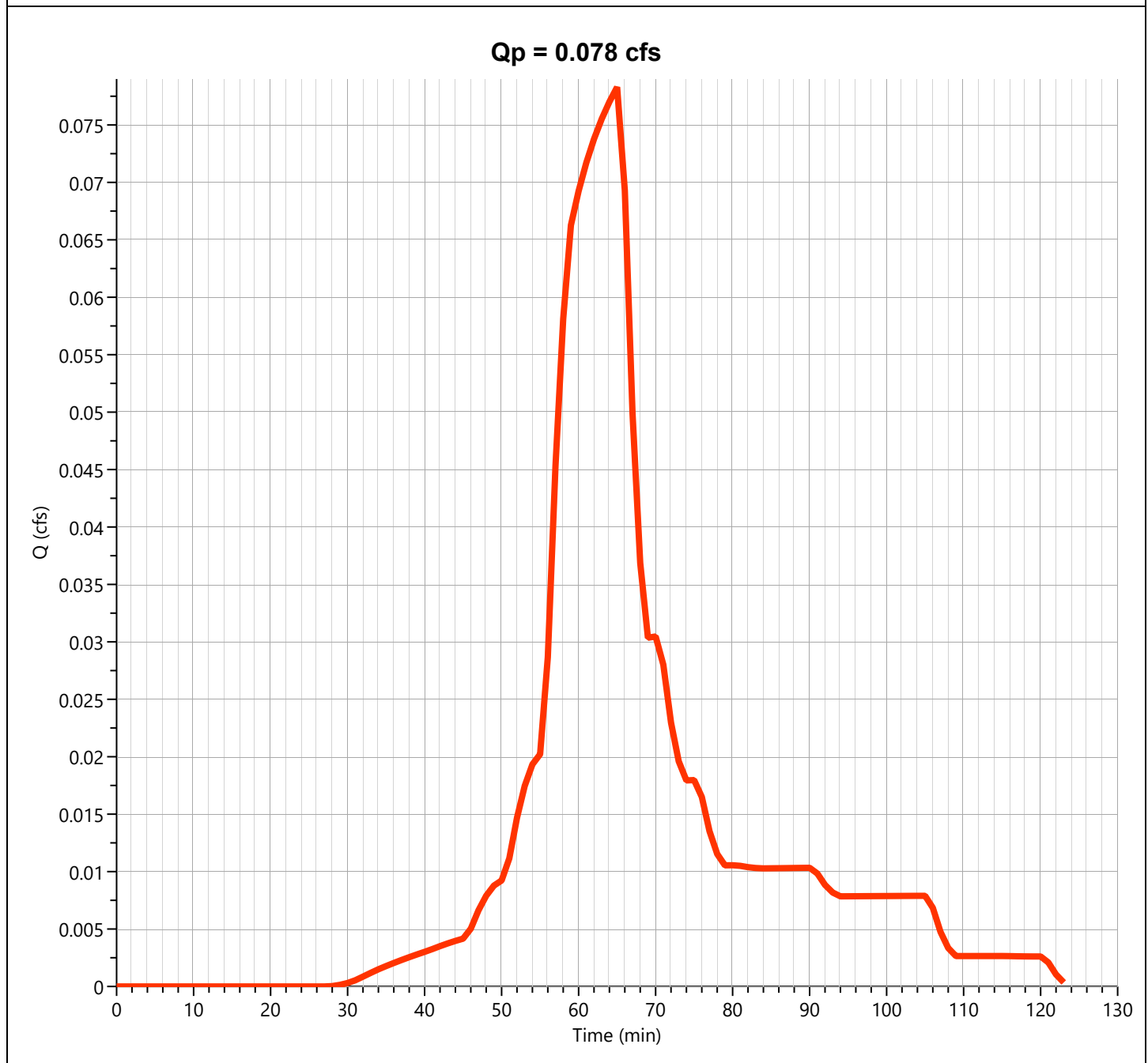
File: Beacon Church Proposed - WQ.hys

05-19-2025

## WQ1-1

## Hyd. No. 1

|                 |               |                    |               |
|-----------------|---------------|--------------------|---------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.078 cfs   |
| Storm Frequency | = 2-yr        | Time to Peak       | = 65 min      |
| Time Interval   | = 1 min       | Runoff Volume      | = 87.8 cuft   |
| Drainage Area   | = 0.03 ac     | Curve Number       | = 96.00       |
| Tc Method       | = User        | Time of Conc. (Tc) | = 2.0 min     |
| Total Rainfall  | = 1.25 in     | Design Storm       | = NJ WQ Storm |
| Storm Duration  | = 2 hrs       | Shape Factor       | = 484         |





# Hydrograph Report

Hydrology Studio v 3.0.0.38

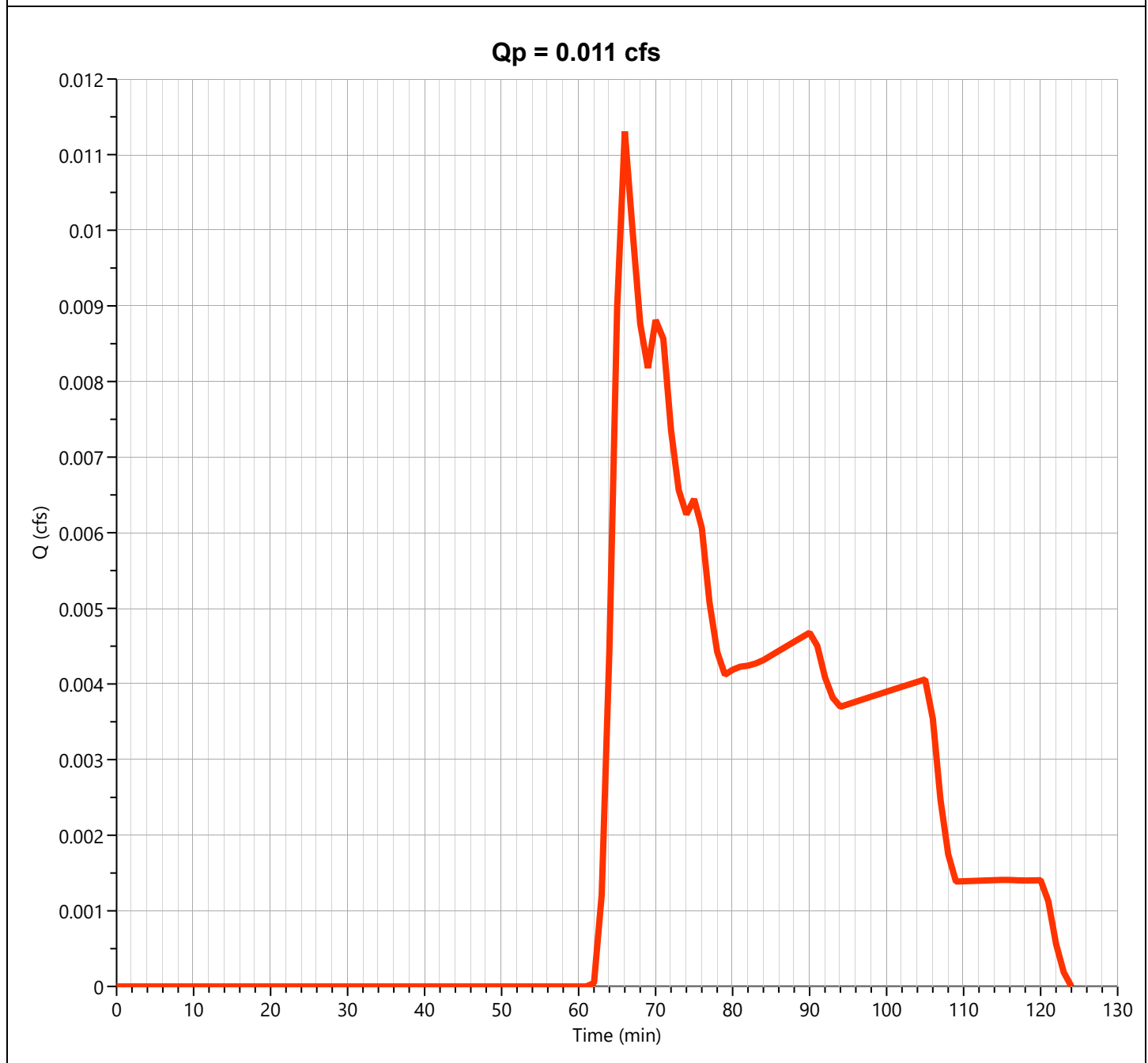
File: Beacon Church Proposed - WQ.hys

05-19-2025

## WQ1-2 Open Space C

## Hyd. No. 3

|                 |               |                    |               |
|-----------------|---------------|--------------------|---------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.011 cfs   |
| Storm Frequency | = 2-yr        | Time to Peak       | = 66 min      |
| Time Interval   | = 1 min       | Runoff Volume      | = 15.0 cuft   |
| Drainage Area   | = 0.06 ac     | Curve Number       | = 74.00       |
| Tc Method       | = User        | Time of Conc. (Tc) | = 2.0 min     |
| Total Rainfall  | = 1.25 in     | Design Storm       | = NJ WQ Storm |
| Storm Duration  | = 2 hrs       | Shape Factor       | = 484         |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

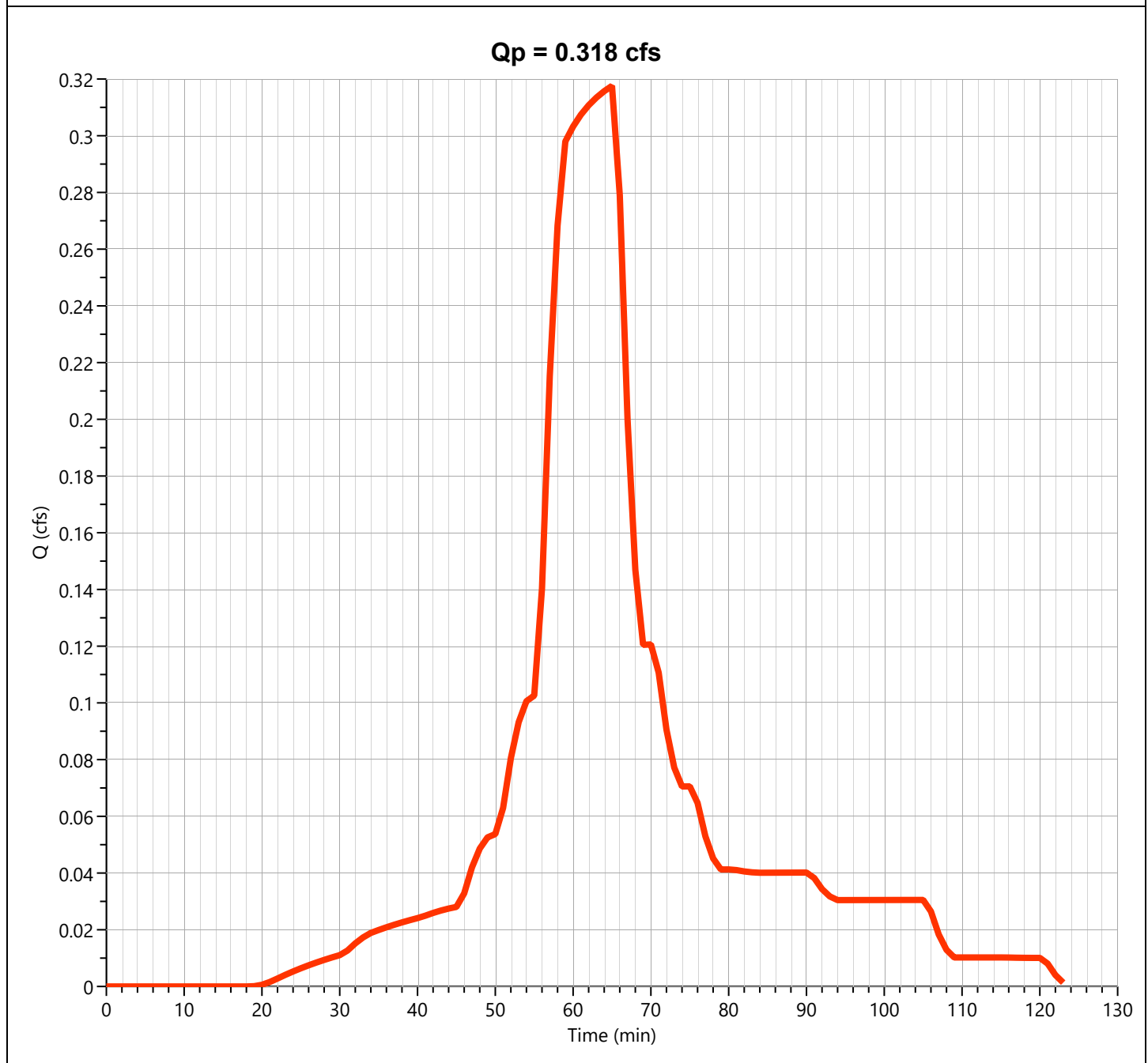
File: Beacon Church Proposed - WQ.hys

05-19-2025

## WQ1-2 Impervious

## Hyd. No. 4

|                 |               |                    |               |
|-----------------|---------------|--------------------|---------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.318 cfs   |
| Storm Frequency | = 2-yr        | Time to Peak       | = 65 min      |
| Time Interval   | = 1 min       | Runoff Volume      | = 387 cuft    |
| Drainage Area   | = 0.11 ac     | Curve Number       | = 98.00       |
| Tc Method       | = User        | Time of Conc. (Tc) | = 2.0 min     |
| Total Rainfall  | = 1.25 in     | Design Storm       | = NJ WQ Storm |
| Storm Duration  | = 2 hrs       | Shape Factor       | = 484         |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

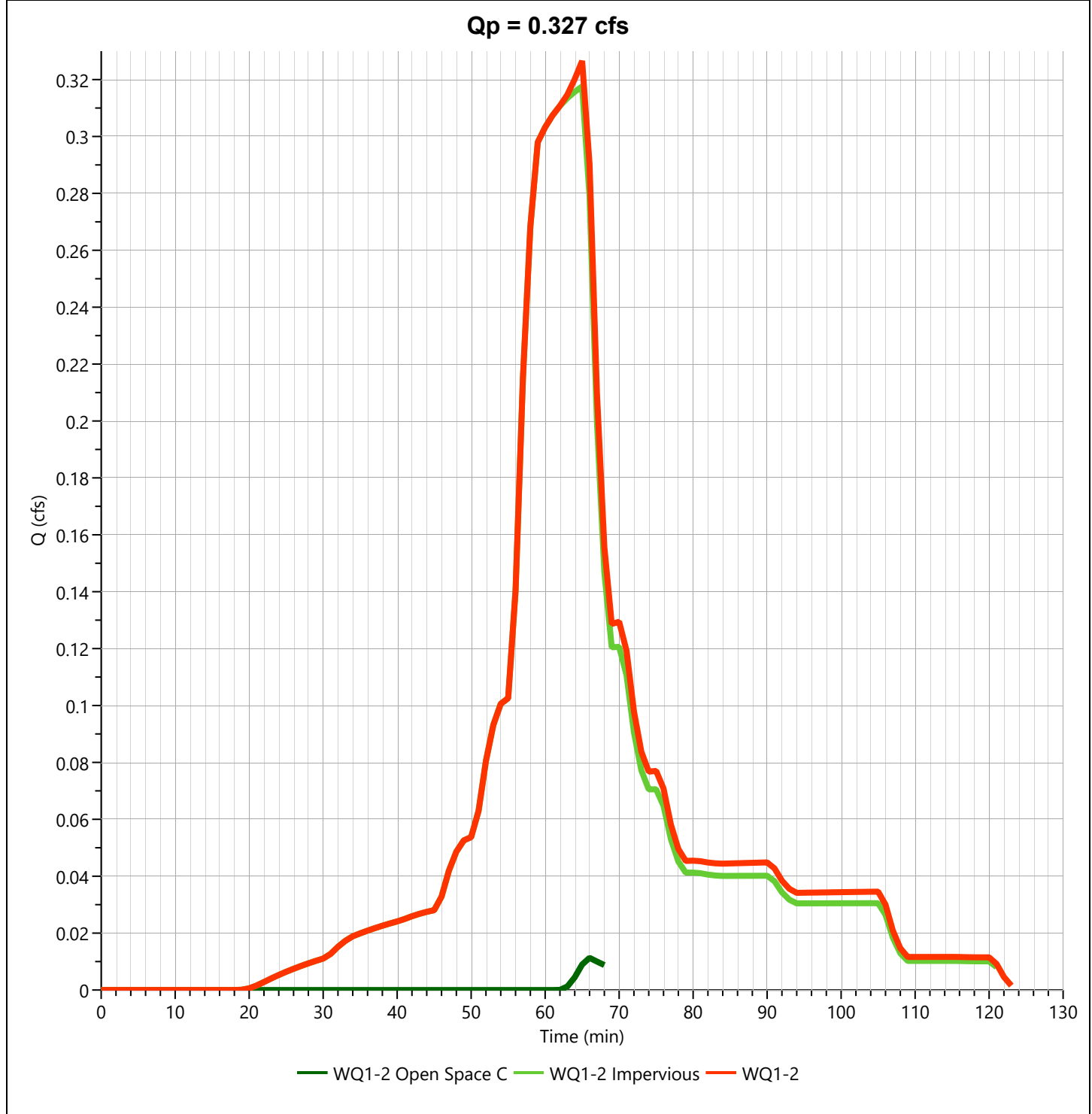
File: Beacon Church Proposed - WQ.hys

05-19-2025

## WQ1-2

## Hyd. No. 5

|                    |            |                     |             |
|--------------------|------------|---------------------|-------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.327 cfs |
| Storm Frequency    | = 2-yr     | Time to Peak        | = 65 min    |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 402 cuft  |
| Inflow Hydrographs | = 3, 4     | Total Contrib. Area | = 0.17 ac   |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

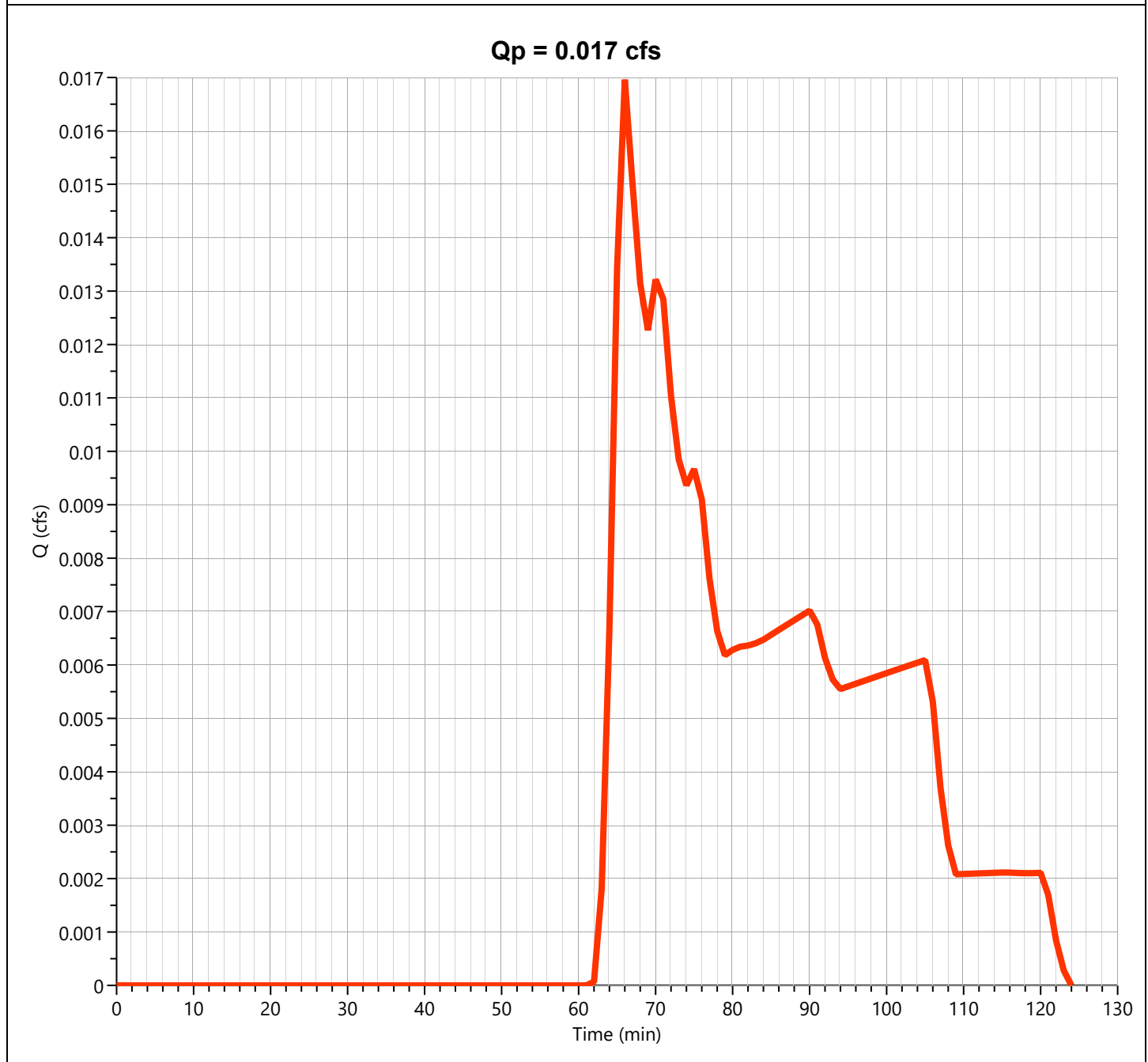
File: Beacon Church Proposed - WQ.hys

05-19-2025

## WQ1-3 Open Space C

## Hyd. No. 7

|                 |               |                    |               |
|-----------------|---------------|--------------------|---------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.017 cfs   |
| Storm Frequency | = 2-yr        | Time to Peak       | = 66 min      |
| Time Interval   | = 1 min       | Runoff Volume      | = 22.5 cuft   |
| Drainage Area   | = 0.09 ac     | Curve Number       | = 74.00       |
| Tc Method       | = User        | Time of Conc. (Tc) | = 2.0 min     |
| Total Rainfall  | = 1.25 in     | Design Storm       | = NJ WQ Storm |
| Storm Duration  | = 2 hrs       | Shape Factor       | = 484         |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

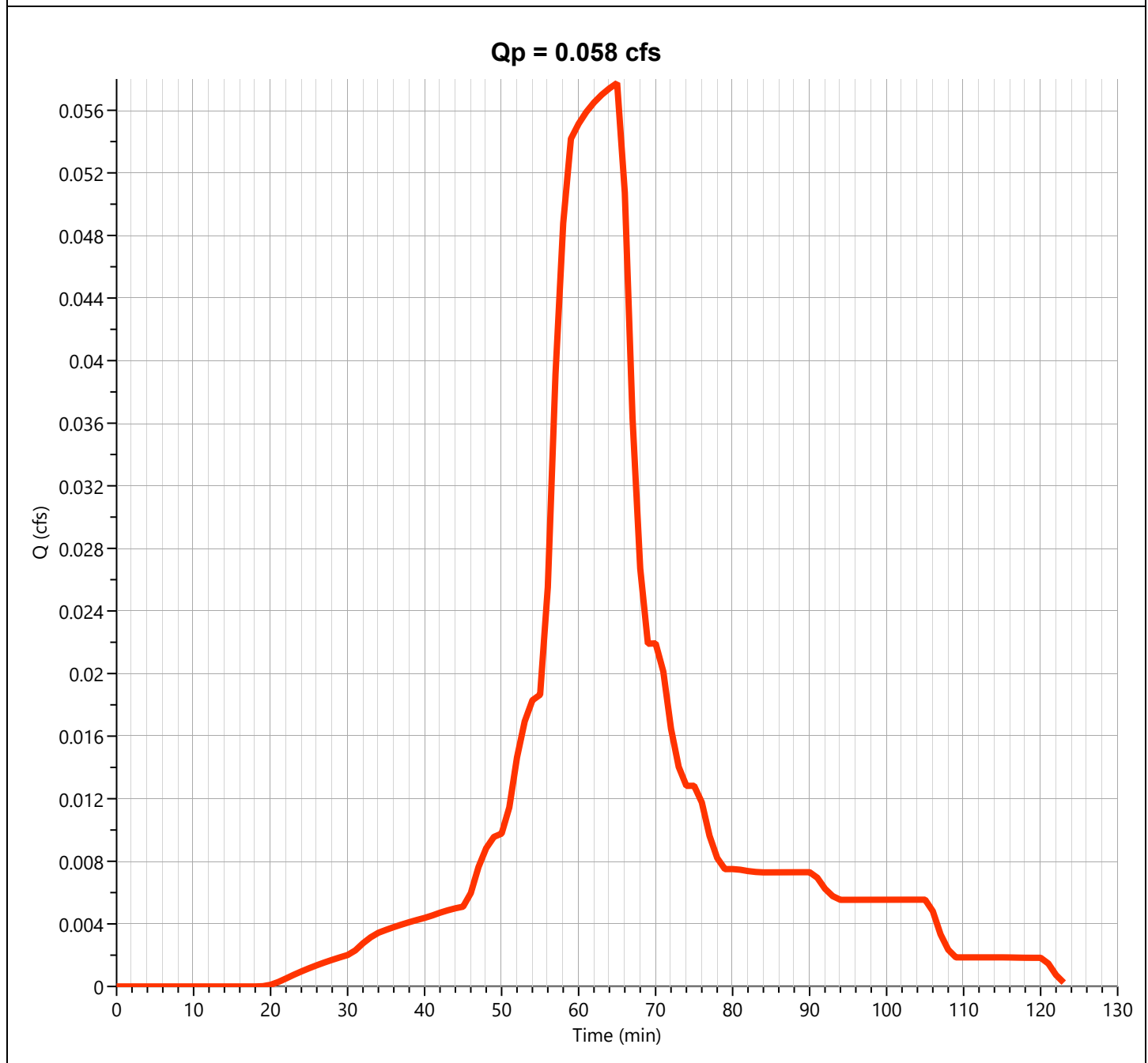
File: Beacon Church Proposed - WQ.hys

05-19-2025

## WQ1-3 Impervious

## Hyd. No. 8

|                 |               |                    |               |
|-----------------|---------------|--------------------|---------------|
| Hydrograph Type | = NRCS Runoff | Peak Flow          | = 0.058 cfs   |
| Storm Frequency | = 2-yr        | Time to Peak       | = 65 min      |
| Time Interval   | = 1 min       | Runoff Volume      | = 70.4 cuft   |
| Drainage Area   | = 0.02 ac     | Curve Number       | = 98.00       |
| Tc Method       | = User        | Time of Conc. (Tc) | = 2.0 min     |
| Total Rainfall  | = 1.25 in     | Design Storm       | = NJ WQ Storm |
| Storm Duration  | = 2 hrs       | Shape Factor       | = 484         |



# Hydrograph Report

Hydrology Studio v 3.0.0.38

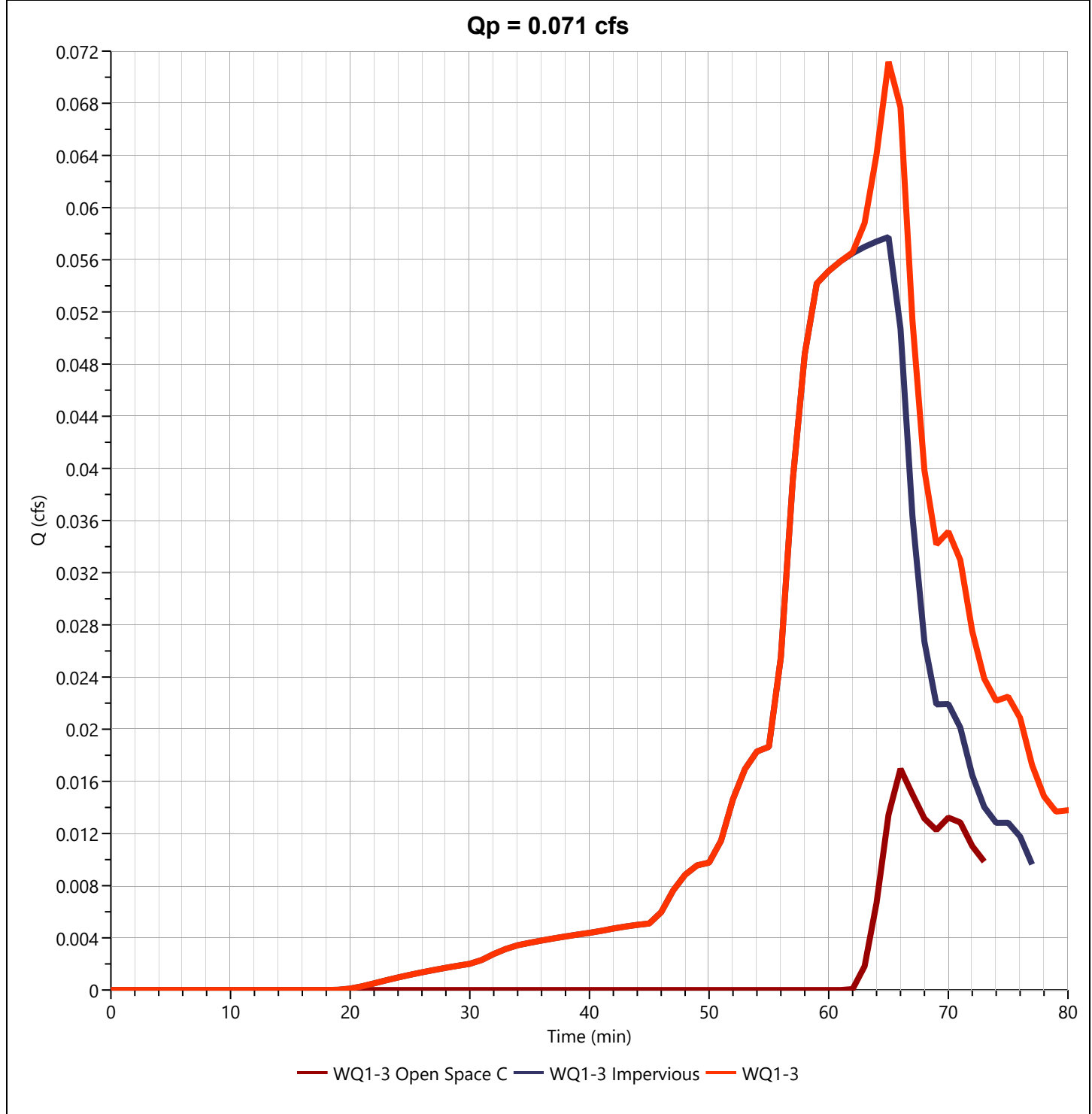
File: Beacon Church Proposed - WQ.hys

05-19-2025

## WQ1-3

## Hyd. No. 9

|                    |            |                     |             |
|--------------------|------------|---------------------|-------------|
| Hydrograph Type    | = Junction | Peak Flow           | = 0.071 cfs |
| Storm Frequency    | = 2-yr     | Time to Peak        | = 65 min    |
| Time Interval      | = 1 min    | Hydrograph Volume   | = 93.0 cuft |
| Inflow Hydrographs | = 7, 8     | Total Contrib. Area | = 0.11 ac   |



# **GROUNDWATER RECHARGE CALCULATIONS**

# **NJGRS SPREADSHEET**



## **SMALL-SCALE UNDERGROUND INFILTRATION BASIN 1-1**

New Jersey  
Groundwater  
Recharge  
Spreadsheet  
Version 2.0  
November 2003

## Annual Groundwater Recharge Analysis (based on GSR-32)

|                        |                       |                 |
|------------------------|-----------------------|-----------------|
| Select Township ↓      | Average Annual P (in) | Climatic Factor |
| UNION CO., SUMMIT CITY | 49.2                  | 1.69            |

|                |                                  |
|----------------|----------------------------------|
| Project Name:  | Beacon Unitarian Universalist Ch |
| Description:   | 101007201                        |
| Analysis Date: | 02/02/24                         |

| Pre-Developed Conditions |              |                  |         |                            |                               |
|--------------------------|--------------|------------------|---------|----------------------------|-------------------------------|
| Land Segment             | Area (acres) | TR-55 Land Cover | Soil    | Annual Recharge (in)       | Annual Recharge (cu.ft)       |
| 1                        | 0.58         | Impervious areas | Boonton | 0.0                        | -                             |
| 2                        | 0.6          | Woods            | Boonton | 15.9                       | 34,726                        |
| 3                        | 0.59         | Open space       | Boonton | 15.2                       | 32,590                        |
| 4                        |              |                  |         |                            |                               |
| 5                        |              |                  |         |                            |                               |
| 6                        |              |                  |         |                            |                               |
| 7                        | 0            |                  |         |                            |                               |
| 8                        | 0            |                  |         |                            |                               |
| 9                        | 0            |                  |         |                            |                               |
| 10                       | 0            |                  |         |                            |                               |
| 11                       | 0            |                  |         |                            |                               |
| 12                       | 0            |                  |         |                            |                               |
| 13                       | 0            |                  |         |                            |                               |
| 14                       | 0            |                  |         |                            |                               |
| 15                       | 0            |                  |         |                            |                               |
| Total =                  | 1.8          |                  |         | Total Annual Recharge (in) | Total Annual Recharge (cu-ft) |
|                          |              |                  |         | 10.5                       | 67,315                        |

| Post-Developed Conditions |              |                  |         |                            |                               |
|---------------------------|--------------|------------------|---------|----------------------------|-------------------------------|
| Land Segment              | Area (acres) | TR-55 Land Cover | Soil    | Annual Recharge (in)       | Annual Recharge (cu.ft)       |
| 1                         | 0.96         | Impervious areas | Boonton | 0.0                        | -                             |
| 2                         | 0.72         | Open space       | Boonton | 15.2                       | 39,770                        |
| 3                         | 0.09         | Woods            | Boonton | 15.9                       | 5,209                         |
| 4                         |              |                  |         |                            |                               |
| 5                         |              |                  |         |                            |                               |
| 6                         | 0            |                  |         |                            |                               |
| 7                         | 0            |                  |         |                            |                               |
| 8                         | 0            |                  |         |                            |                               |
| 9                         | 0            |                  |         |                            |                               |
| 10                        | 0            |                  |         |                            |                               |
| 11                        | 0            |                  |         |                            |                               |
| 12                        | 0            |                  |         |                            |                               |
| 13                        | 0            |                  |         |                            |                               |
| 14                        | 0            |                  |         |                            |                               |
| 15                        | 0            |                  |         |                            |                               |
| Total =                   | 1.8          |                  |         | Total Annual Recharge (in) | Total Annual Recharge (cu.ft) |
|                           |              |                  |         | 7.0                        | 44,979                        |

### Procedure to fill the Pre-Development and Post-Development Conditions Tables

For each land segment, first enter the area, then select TR-55 Land Cover, then select Soil. Start from the top of the table and proceed downward. Don't leave blank rows (with A=0) in between your segment entries. Rows with A=0 will not be displayed or used in calculations. For impervious areas outside of standard lots select "Impervious Areas" as the Land Cover. Soil type for impervious areas are only required if an infiltration facility will be built within these areas.

|  |               |                               |        |
|--|---------------|-------------------------------|--------|
| <b>Annual Recharge Requirements Calculation ↓</b>                  |               |                               |        |
| % of Pre-Developed Annual Recharge to Preserve =                   | 100%          | Total Impervious Area (sq.ft) | 41,818 |
| <b>Post-Development Annual Recharge Deficit=</b>                   | <b>22,336</b> | (cubic feet)                  |        |
| <b>Recharge Efficiency Parameters Calculations (area averages)</b> |               |                               |        |
| RWC= 3.49  | (in)          | DRWC= 0.00                    | (in)   |
| ERWC = 0.54  | (in)          | EDRWC= 0.00                   | (in)   |

| Project Name   |          | Description |          | Analysis Date                                      |        | BMP or LID Type                                |                                     |   |         |       |      |
|--|----------|-------------|----------|--|--------|--|-------------------------------------|---|---------|-------|------|
| Beacon Unitarian Universa  |          | 101007201   |          | 02/02/24   |        | Small-Scale Underground Infiltration Basin 1-1 |                                     |   |         |       |      |
| Recharge BMP Input Parameters  |          |             |          | Root Zone Water capacity Calculated Parameters     |        |  |                                     | Recharge Design Parameters  |         |       |      |
| Parameter  | Symbol   | Value       | Unit     | Parameter  | Symbol | Value  | Unit                                | Parameter   | Symbol  | Value | Unit |
| BMP Area   | ABMP     | 1620.0      | sq.ft    | Empty Portion of RWC under Post-D Natural Recharge | ERWC   | 0.52   | in                                  | Inches of Runoff to capture   | Qdesign | 0.73  | in   |
| BMP Effective Depth, this is the design variable   | dBMP     | 4.5         | in       | ERWC Modified to consider dEXC                     | EDRWC  | 0.00   | in                                  | Inches of Rainfall to capture   | Pdesign | 0.89  | in   |
| Upper level of the BMP surface (negative if above ground)  | dBMPu    | 34.8        | in       | Empty Portion of RWC under Infiltr. BMP            | RERWC  | 0.00   | in                                  | Recharge Provided Avg. over Imp. Area   |         | 28.9  | in   |
| Depth of lower surface of BMP, must be >= dBMPu  | dEXC     | 70.8        | in       |  |        |  |                                     | Runoff Captured Avg. over imp. Area   |         | 28.9  | in   |
| Post-development Land Segment Location of BMP, Input Zero if Location is distributed or undetermined   | SegBMP   | 1           | unitless |  |        |  |                                     |   |         |       |      |
|  |          |             |          | BMP Calculated Size Parameters                     |        |  |                                     | CALCULATION CHECK MESSAGES  |         |       |      |
|  |          |             |          | ABMP/Aimp  | Aratio | 0.16   | unitless                            | Volume Balance--> <b>Solve Problem to satisfy Annual Recharge</b><br>dBMP Check--> <b>OK</b><br>dEXC Check--> <b>OK</b><br><br>BMP Location--> <b>OK</b>  |         |       |      |
|  |          |             |          | BMP Volume   | VBMP   | 608  | cu.ft                               |   |         |       |      |
| Parameters from Annual Recharge Worksheet  |          |             |          | System Performance Calculated Parameters           |        |  |                                     |   |         |       |      |
| Post-D Deficit Recharge (or desired recharge volume)   | Vdef     | 22,336      | cu.ft    | Annual BMP Recharge Volume                         |        | 24,860   | cu.ft                               | <b>OTHER NOTES</b><br><br>Pdesign is accurate only after BMP dimensions are updated to make rech volume= deficit volume. The portion of BMP infiltration prior to filling and the area occupied by BMP are ignored in these calculations. Results are sensitive to dBMP, make sure dBMP selected is small enough for BMP to empty in less than 3 days. For land Segment Location of BMP if you select "impervious areas" RWC will be minimal but not zero as determined by the soil type and a shallow root zone for this Land Cover allowing consideration of lateral flow and other losses. |         |       |      |
| Post-D Impervious Area (or target Impervious Area)   | Aimp     | 10,321      | sq.ft    | Avg BMP Recharge Efficiency                        |        | 100.0%   | Represents % Infiltration Recharged |   |         |       |      |
| Root Zone Water Capacity   | RWC      | 3.33        | in       | %Rainfall became Runoff                            |        | 78.5%  | %                                   |   |         |       |      |
| RWC Modified to consider dEXC  | DRWC     | 0.00        | in       | %Runoff Infiltrated                                |        | 74.8%  | %                                   |   |         |       |      |
| Climatic Factor  | C-factor | 1.69        | no units | %Runoff Recharged                                  |        | 18.5%  | %                                   |   |         |       |      |
| Average Annual P   | Pavg     | 49.2        | in       | %Rainfall Recharged                                |        | 14.5%  | %                                   |   |         |       |      |
| Recharge Requirement over Imp. Area  | dr       | 6.4         | in       |  |        |  |                                     |   |         |       |      |
| <p><b>How to solve for different recharge volumes:</b> By default the spreadsheet assigns the values of total deficit recharge volume "Vdef" and total proposed impervious area "Aimp" from the "Annual Recharge" sheet to "Vdef" and "Aimp" on this page. This allows solution for a single BMP to handle the entire recharge requirement assuming the runoff from entire impervious area is available to the BMP. To solve for a smaller BMP or a LID-IMP to recharge only part of the recharge requirement, set Vdef to your target value and Aimp to impervious area directly connected to your infiltration facility and then solve for ABMP or dBMP. To go back to the default configuration click the "Default Vdef &amp; Aimp" button.</p> |          |             |          |  |        |  |                                     |   |         |       |      |

## **SMALL-SCALE UNDERGROUND INFILTRATION BASIN 1-2**

New Jersey  
Groundwater  
Recharge  
Spreadsheet  
Version 2.0  
November 2003

## Annual Groundwater Recharge Analysis (based on GSR-32)

|                        |                       |                 |
|------------------------|-----------------------|-----------------|
| Select Township ↓      | Average Annual P (in) | Climatic Factor |
| UNION CO., SUMMIT CITY | 49.2                  | 1.69            |

**Project Name:** Beacon Unitarian Universalist Ch

**Description:** 101007201

**Analysis Date:** 02/02/24

### Pre-Developed Conditions

| Land Segment   | Area (acres) | TR-55 Land Cover | Soil    | Annual Recharge (in)       | Annual Recharge (cu.ft)       |
|----------------|--------------|------------------|---------|----------------------------|-------------------------------|
| 1              | 0.58         | Impervious areas | Boonton | 0.0                        | -                             |
| 2              | 0.6          | Woods            | Boonton | 15.9                       | 34,726                        |
| 3              | 0.59         | Open space       | Boonton | 15.2                       | 32,590                        |
| 4              |              |                  |         |                            |                               |
| 5              |              |                  |         |                            |                               |
| 6              |              |                  |         |                            |                               |
| 7              | 0            |                  |         |                            |                               |
| 8              | 0            |                  |         |                            |                               |
| 9              | 0            |                  |         |                            |                               |
| 10             | 0            |                  |         |                            |                               |
| 11             | 0            |                  |         |                            |                               |
| 12             | 0            |                  |         |                            |                               |
| 13             | 0            |                  |         |                            |                               |
| 14             | 0            |                  |         |                            |                               |
| 15             | 0            |                  |         |                            |                               |
| <b>Total =</b> | <b>1.8</b>   |                  |         | Total Annual Recharge (in) | Total Annual Recharge (cu-ft) |
|                |              |                  |         | 10.5                       | 67,315                        |

### Post-Developed Conditions

| Land Segment   | Area (acres) | TR-55 Land Cover | Soil    | Annual Recharge (in)       | Annual Recharge (cu.ft)       |
|----------------|--------------|------------------|---------|----------------------------|-------------------------------|
| 1              | 0.96         | Impervious areas | Boonton | 0.0                        | -                             |
| 2              | 0.72         | Open space       | Boonton | 15.2                       | 39,770                        |
| 3              | 0.09         | Woods            | Boonton | 15.9                       | 5,209                         |
| 4              |              |                  |         |                            |                               |
| 5              |              |                  |         |                            |                               |
| 6              | 0            |                  |         |                            |                               |
| 7              | 0            |                  |         |                            |                               |
| 8              | 0            |                  |         |                            |                               |
| 9              | 0            |                  |         |                            |                               |
| 10             | 0            |                  |         |                            |                               |
| 11             | 0            |                  |         |                            |                               |
| 12             | 0            |                  |         |                            |                               |
| 13             | 0            |                  |         |                            |                               |
| 14             | 0            |                  |         |                            |                               |
| 15             | 0            |                  |         |                            |                               |
| <b>Total =</b> | <b>1.8</b>   |                  |         | Total Annual Recharge (in) | Total Annual Recharge (cu.ft) |
|                |              |                  |         | 7.0                        | 44,979                        |

### Annual Recharge Requirements Calculation ↓

|  |      |                               |        |
|--|------|-------------------------------|--------|
| % of Pre-Developed Annual Recharge to Preserve = | 100% | Total Impervious Area (sq.ft) | 41,818 |
|--|------|-------------------------------|--------|

**Post-Development Annual Recharge Deficit= 22,336** (cubic feet)

### Recharge Efficiency Parameters Calculations (area averages)

|             |      |             |      |
|-------------|------|-------------|------|
| RWC= 3.49   | (in) | DRWC= 0.00  | (in) |
| ERWC = 0.54 | (in) | EDRWC= 0.00 | (in) |

#### Procedure to fill the Pre-Development and Post-Development Conditions Tables

For each land segment, first enter the area, then select TR-55 Land Cover, then select Soil. Start from the top of the table and proceed downward. Don't leave blank rows (with A=0) in between your segment entries. Rows with A=0 will not be displayed or used in calculations. For impervious areas outside of standard lots select "Impervious Areas" as the Land Cover. Soil type for impervious areas are only required if an infiltration facility will be built within these areas.

| Project Name   |          | Description |          | Analysis Date                                      |        | BMP or LID Type                                |                                     |   |         |       |      |
|--|----------|-------------|----------|--|--------|--|-------------------------------------|---|---------|-------|------|
| Beacon Unitarian Universa  |          | 101007201   |          | 02/02/24   |        | Small-Scale Underground Infiltration Basin 1-2 |                                     |   |         |       |      |
| Recharge BMP Input Parameters  |          |             |          | Root Zone Water capacity Calculated Parameters     |        |  |                                     | Recharge Design Parameters  |         |       |      |
| Parameter  | Symbol   | Value       | Unit     | Parameter  | Symbol | Value  | Unit                                | Parameter   | Symbol  | Value | Unit |
| BMP Area   | ABMP     | 2457.4      | sq.ft    | Empty Portion of RWC under Post-D Natural Recharge | ERWC   | 0.57   | in                                  | Inches of Runoff to capture   | Qdesign | 0.90  | in   |
| BMP Effective Depth, this is the design variable   | dBMP     | 4.3         | in       | ERWC Modified to consider dEXC                     | EDRWC  | 0.00   | in                                  | Inches of Rainfall to capture   | Pdesign | 1.10  | in   |
| Upper level of the BMP surface (negative if above ground)  | dBMPu    | 20.6        | in       | Empty Portion of RWC under Infiltr. BMP            | RERWC  | 0.00   | in                                  | Recharge Provided Avg. over Imp. Area   |         | 31.5  | in   |
| Depth of lower surface of BMP, must be >= dBMPu  | dEXC     | 68.6        | in       |  |        |  |                                     | Runoff Captured Avg. over imp. Area   |         | 31.5  | in   |
| Post-development Land Segment Location of BMP, Input Zero if Location is distributed or undetermined   | SegBMP   | 2           | unitless |  |        |  |                                     |   |         |       |      |
|  |          |             |          | BMP Calculated Size Parameters                     |        |  |                                     | CALCULATION CHECK MESSAGES  |         |       |      |
|  |          |             |          | ABMP/Aimp  | Aratio | 0.21   | unitless                            | Volume Balance--> <b>Solve Problem to satisfy Annual Recharge</b><br>dBMP Check--> <b>OK</b><br>dEXC Check--> <b>OK</b><br><br>BMP Location--> <b>OK</b>  |         |       |      |
|  |          |             |          | BMP Volume   | VBMP   | 881  | cu.ft                               |   |         |       |      |
| Parameters from Annual Recharge Worksheet  |          |             |          | System Performance Calculated Parameters           |        |  |                                     |   |         |       |      |
| Post-D Deficit Recharge (or desired recharge volume)   | Vdef     | 22,336      | cu.ft    | Annual BMP Recharge Volume                         |        | 31,281   | cu.ft                               | <b>OTHER NOTES</b><br><br>Pdesign is accurate only after BMP dimensions are updated to make rech volume= deficit volume. The portion of BMP infiltration prior to filling and the area occupied by BMP are ignored in these calculations. Results are sensitive to dBMP, make sure dBMP selected is small enough for BMP to empty in less than 3 days. For land Segment Location of BMP if you select "impervious areas" RWC will be minimal but not zero as determined by the soil type and a shallow root zone for this Land Cover allowing consideration of lateral flow and other losses. |         |       |      |
| Post-D Impervious Area (or target Impervious Area)   | Aimp     | 11,917      | sq.ft    | Avg BMP Recharge Efficiency                        |        | 100.0%   | Represents % Infiltration Recharged |   |         |       |      |
| Root Zone Water Capacity   | RWC      | 3.69        | in       | %Rainfall became Runoff                            |        | 78.5%  | %                                   |   |         |       |      |
| RWC Modified to consider dEXC  | DRWC     | 0.00        | in       | %Runoff Infiltrated                                |        | 81.5%  | %                                   |   |         |       |      |
| Climatic Factor  | C-factor | 1.69        | no units | %Runoff Recharged                                  |        | 23.2%  | %                                   |   |         |       |      |
| Average Annual P   | Pavg     | 49.2        | in       | %Rainfall Recharged                                |        | 18.2%  | %                                   |   |         |       |      |
| Recharge Requirement over Imp. Area  | dr       | 6.4         | in       |  |        |  |                                     |   |         |       |      |
| <p><b>How to solve for different recharge volumes:</b> By default the spreadsheet assigns the values of total deficit recharge volume "Vdef" and total proposed impervious area "Aimp" from the "Annual Recharge" sheet to "Vdef" and "Aimp" on this page. This allows solution for a single BMP to handle the entire recharge requirement assuming the runoff from entire impervious area is available to the BMP. To solve for a smaller BMP or a LID-IMP to recharge only part of the recharge requirement, set Vdef to your target value and Aimp to impervious area directly connected to your infiltration facility and then solve for ABMP or dBMP. To go back to the default configuration click the "Default Vdef &amp; Aimp" button.</p> |          |             |          |  |        |  |                                     |   |         |       |      |

# **CURRENT GROUNDWATER MOUNDING ANALYSIS**

## **UNDERGROUND INFILTRATION BASIN 1-1**



**2-YEAR STORM EVENT**

Input Values

|        |
|--------|
| 1.50   |
| 0.150  |
| 4.70   |
| 10.000 |
| 40.500 |
| 11.89  |
| 10.00  |

**R** Recharge rate (permeability rate) (in/hr)  
**Sy** Specific yield, Sy (dimensionless)  
 default value is 0.15; max value is 0.2 provided that a lab test data is submitted  
**Kh** Horizontal hydraulic conductivity (in/hr)  
 Kh = 5xRecharge Rate (R) in the costal plan; Kh=R outside the coastal plan  
**x** 1/2 length of basin (x direction, in feet)  
**y** 1/2 width of basin (y direction, in feet)  
**t** Duration of infiltration period (hours)  
**hi(0)** Initial thickness of saturated zone (feet)

|        |
|--------|
| 14.402 |
| 4.402  |

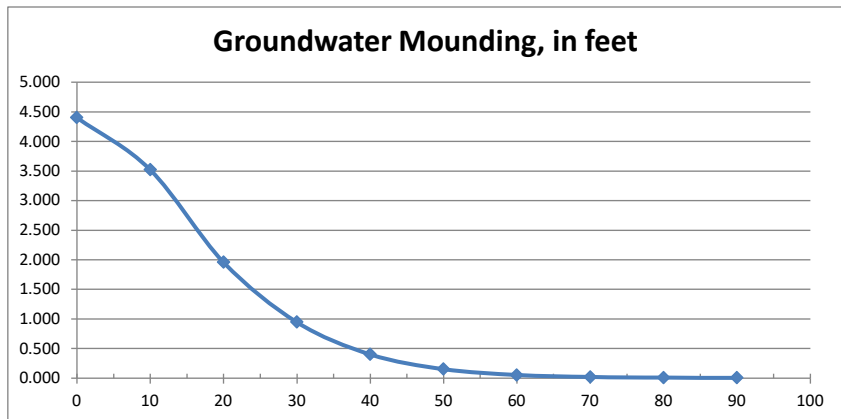
**h(max)** Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)  
**Δh(max)** Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Distance from  
 Ground-water center of basin in x  
 Mounding, in feet direction, in feet

|       |    |
|-------|----|
| 4.402 | 0  |
| 3.521 | 10 |
| 1.957 | 20 |
| 0.946 | 30 |
| 0.401 | 40 |
| 0.151 | 50 |
| 0.052 | 60 |
| 0.017 | 70 |
| 0.007 | 80 |
| 0.004 | 90 |



**Re-Calculate Now**



**Disclaimer**

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## **10-YEAR STORM EVENT**

Input Values

|        |
|--------|
| 1.50   |
| 0.150  |
| 4.70   |
| 10.000 |
| 40.500 |
| 15.72  |
| 10.00  |

**R** Recharge rate (permeability rate) (in/hr)  
**Sy** Specific yield, Sy (dimensionless)  
 default value is 0.15; max value is 0.2 provided that a lab test data is submitted  
**Kh** Horizontal hydraulic conductivity (in/hr)  
 Kh = 5xRecharge Rate (R) in the costal plan; Kh=R outside the coastal plan  
**x** 1/2 length of basin (x direction, in feet)  
**y** 1/2 width of basin (y direction, in feet)  
**t** Duration of infiltration period (hours)  
**hi(0)** Initial thickness of saturated zone (feet)

|        |
|--------|
| 15.038 |
| 5.038  |

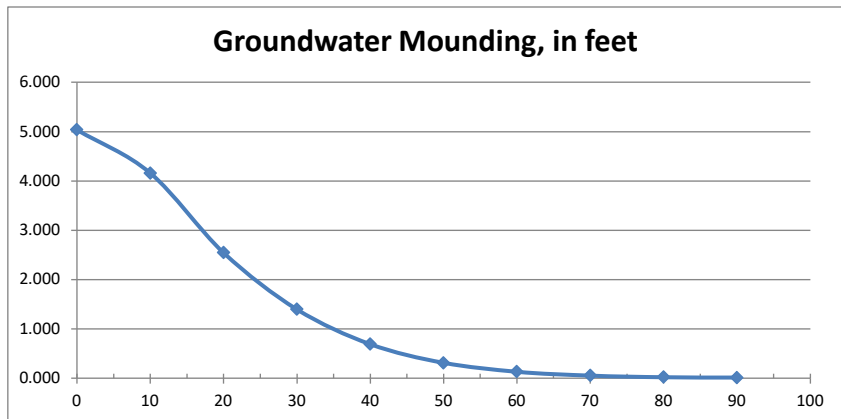
**h(max)** Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)  
**Δh(max)** Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Distance from  
 Ground-water center of basin in x  
 Mounding, in feet direction, in feet

|       |    |
|-------|----|
| 5.038 | 0  |
| 4.156 | 10 |
| 2.543 | 20 |
| 1.394 | 30 |
| 0.688 | 40 |
| 0.309 | 50 |
| 0.128 | 60 |
| 0.050 | 70 |
| 0.020 | 80 |
| 0.009 | 90 |



**Re-Calculate Now**



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**100-YEAR STORM EVENT**

Input Values

|        |
|--------|
| 1.50   |
| 0.150  |
| 4.70   |
| 10.000 |
| 40.500 |
| 22.30  |
| 10.00  |

**R** Recharge rate (permeability rate) (in/hr)  
**Sy** Specific yield, Sy (dimensionless)  
 default value is 0.15; max value is 0.2 provided that a lab test data is submitted  
**Kh** Horizontal hydraulic conductivity (in/hr)  
 Kh = 5xRecharge Rate (R) in the costal plan; Kh=R outside the coastal plan  
**x** 1/2 length of basin (x direction, in feet)  
**y** 1/2 width of basin (y direction, in feet)  
**t** Duration of infiltration period (hours)  
**hi(0)** Initial thickness of saturated zone (feet)

|        |
|--------|
| 15.858 |
| 5.858  |

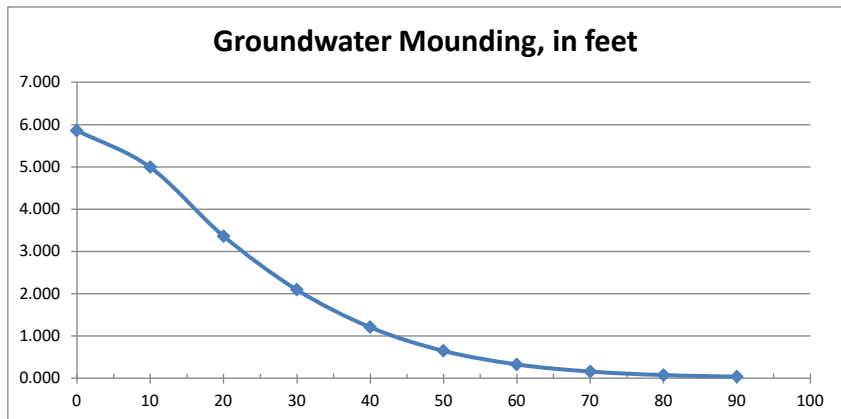
**h(max)** Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)  
**Δh(max)** Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Distance from  
 Ground-water center of basin in x  
 Mounding, in feet direction, in feet

|       |    |
|-------|----|
| 5.858 | 0  |
| 4.989 | 10 |
| 3.356 | 20 |
| 2.088 | 30 |
| 1.201 | 40 |
| 0.643 | 50 |
| 0.323 | 60 |
| 0.153 | 70 |
| 0.070 | 80 |
| 0.032 | 90 |



**Re-Calculate Now**



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## **WATER QUALITY STORM**

Input Values

|        |
|--------|
| 1.50   |
| 0.150  |
| 4.70   |
| 10.000 |
| 40.500 |
| 4.17   |
| 10.00  |

**R** Recharge rate (permeability rate) (in/hr)  
**Specific yield, Sy (dimensionless)**  
 default value is 0.15; max value is 0.2 provided that a lab test data is submitted  
**Horizontal hydraulic conductivity (in/hr)**  
 Kh = 5xRecharge Rate (R) in the costal plan; Kh=R outside the coastal plan  
**x** 1/2 length of basin (x direction, in feet)  
**y** 1/2 width of basin (y direction, in feet)  
**t** Duration of infiltration period (hours)  
**hi(0)** Initial thickness of saturated zone (feet)

|        |
|--------|
| 12.362 |
| 2.362  |

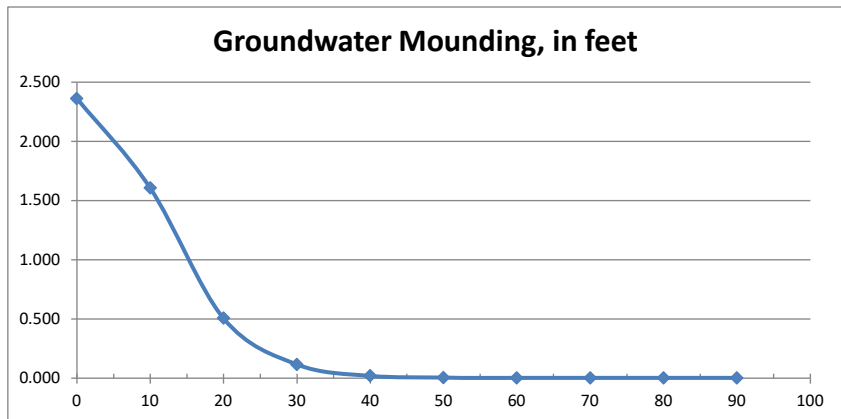
**h(max)** Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)  
**Δh(max)** Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Distance from  
 Ground-water center of basin in x  
 Mounding, in feet direction, in feet

|       |    |
|-------|----|
| 2.362 | 0  |
| 1.606 | 10 |
| 0.505 | 20 |
| 0.114 | 30 |
| 0.019 | 40 |
| 0.003 | 50 |
| 0.001 | 60 |
| 0.001 | 70 |
| 0.001 | 80 |
| 0.001 | 90 |



**Re-Calculate Now**



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## **UNDERGROUND INFILTRATION BASIN 1-2**

## **2-YEAR STORM EVENT**

Input Values

|        |
|--------|
| 1.50   |
| 0.150  |
| 6.65   |
| 9.250  |
| 66.420 |
| 10.48  |
| 10.00  |

**R** Recharge rate (permeability rate) (in/hr)  
**Sy** Specific yield, Sy (dimensionless)  
 default value is 0.15; max value is 0.2 provided that a lab test data is submitted  
**Kh** Horizontal hydraulic conductivity (in/hr)  
 Kh = 5xRecharge Rate (R) in the costal plan; Kh=R outside the coastal plan  
**x** 1/2 length of basin (x direction, in feet)  
**y** 1/2 width of basin (y direction, in feet)  
**t** Duration of infiltration period (hours)  
**hi(0)** Initial thickness of saturated zone (feet)

|        |
|--------|
| 13.504 |
| 3.504  |

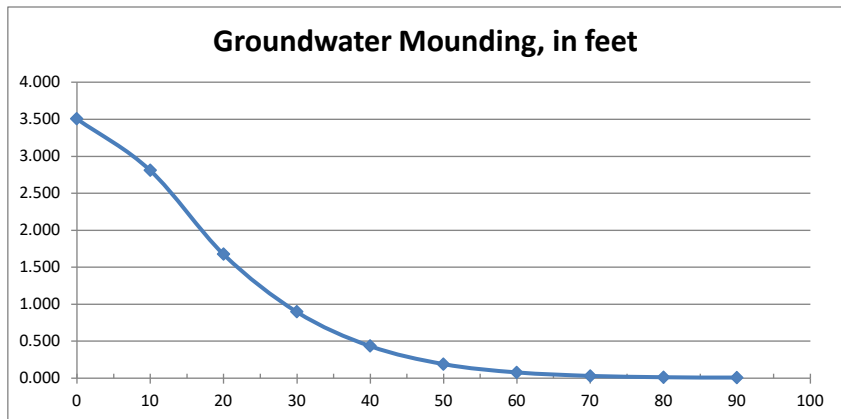
**h(max)** Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)  
**Δh(max)** Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Distance from  
 Ground-water center of basin in x  
 Mounding, in feet direction, in feet

|       |    |
|-------|----|
| 3.504 | 0  |
| 2.808 | 10 |
| 1.674 | 20 |
| 0.895 | 30 |
| 0.431 | 40 |
| 0.189 | 50 |
| 0.076 | 60 |
| 0.029 | 70 |
| 0.011 | 80 |
| 0.005 | 90 |



**Re-Calculate Now**



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## **10-YEAR STORM EVENT**

Input Values

|        |
|--------|
| 1.50   |
| 0.150  |
| 6.65   |
| 9.250  |
| 66.420 |
| 14.70  |
| 10.00  |

**R** Recharge rate (permeability rate) (in/hr)  
**Sy** Specific yield, Sy (dimensionless)  
 default value is 0.15; max value is 0.2 provided that a lab test data is submitted  
**Kh** Horizontal hydraulic conductivity (in/hr)  
 Kh = 5xRecharge Rate (R) in the costal plan; Kh=R outside the coastal plan  
**x** 1/2 length of basin (x direction, in feet)  
**y** 1/2 width of basin (y direction, in feet)  
**t** Duration of infiltration period (hours)  
**hi(0)** Initial thickness of saturated zone (feet)

|        |
|--------|
| 14.193 |
| 4.193  |

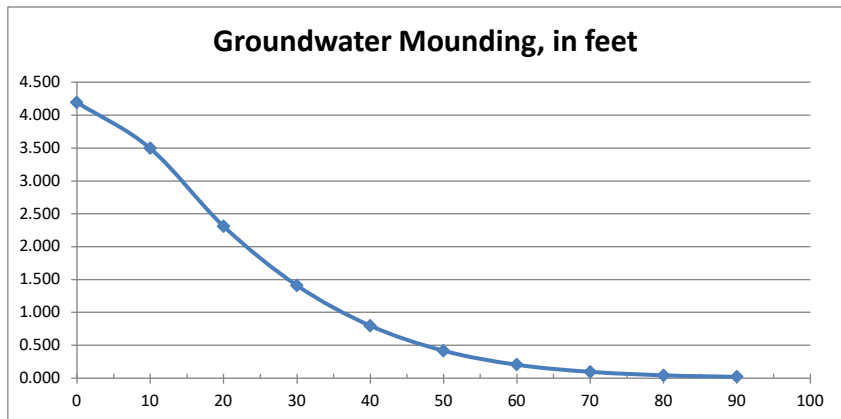
**h(max)** Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)  
**Δh(max)** Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Distance from  
 Ground-water center of basin in x  
 Mounding, in feet direction, in feet

|       |    |
|-------|----|
| 4.193 | 0  |
| 3.495 | 10 |
| 2.309 | 20 |
| 1.409 | 30 |
| 0.794 | 40 |
| 0.415 | 50 |
| 0.203 | 60 |
| 0.094 | 70 |
| 0.042 | 80 |
| 0.019 | 90 |



**Re-Calculate Now**



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**100-YEAR STORM EVENT**

Input Values

|        |
|--------|
| 1.50   |
| 0.150  |
| 6.65   |
| 9.250  |
| 66.420 |
| 20.02  |
| 10.00  |

**R** Recharge rate (permeability rate) (in/hr)  
**Specific yield, Sy (dimensionless)**  
 default value is 0.15; max value is 0.2 provided that a lab test data is submitted  
**Horizontal hydraulic conductivity (in/hr)**  
**Kh = 5xRecharge Rate (R) in the costal plan; Kh=R outside the coastal plan**  
**x** 1/2 length of basin (x direction, in feet)  
**y** 1/2 width of basin (y direction, in feet)  
**t** Duration of infiltration period (hours)  
**hi(0)** Initial thickness of saturated zone (feet)

|        |
|--------|
| 14.876 |
| 4.876  |

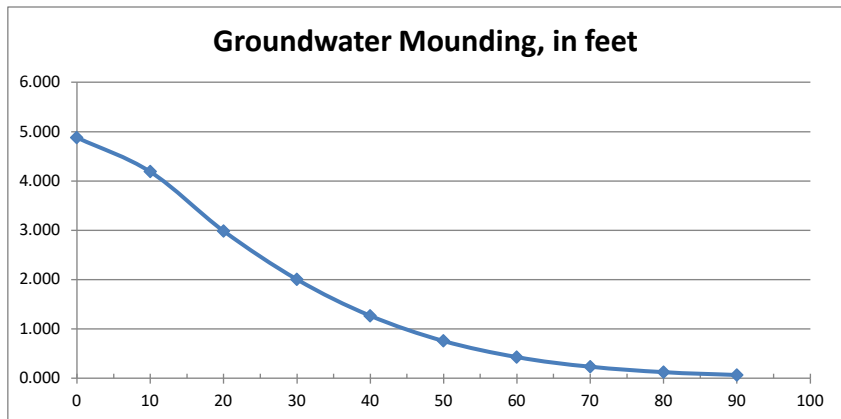
**h(max)** Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)  
**Δh(max)** Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Distance from  
 Ground-water center of basin in x  
 Mounding, in feet direction, in feet

|       |    |
|-------|----|
| 4.876 | 0  |
| 4.187 | 10 |
| 2.981 | 20 |
| 2.001 | 30 |
| 1.263 | 40 |
| 0.752 | 50 |
| 0.424 | 60 |
| 0.228 | 70 |
| 0.118 | 80 |
| 0.059 | 90 |



**Re-Calculate Now**



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## **WATER QUALITY STORM**



Input Values

|        |
|--------|
| 1.50   |
| 0.150  |
| 6.65   |
| 9.250  |
| 66.420 |
| 3.10   |
| 10.00  |

**R** Recharge rate (permeability rate) (in/hr)  
**Specific yield, Sy (dimensionless)**  
 default value is 0.15; max value is 0.2 provided that a lab test data is submitted  
**Horizontal hydraulic conductivity (in/hr)**  
 Kh = 5xRecharge Rate (R) in the costal plan; Kh=R outside the coastal plan  
**x** 1/2 length of basin (x direction, in feet)  
**y** 1/2 width of basin (y direction, in feet)  
**t** Duration of infiltration period (hours)  
**hi(0)** Initial thickness of saturated zone (feet)

|        |
|--------|
| 11.667 |
| 1.667  |

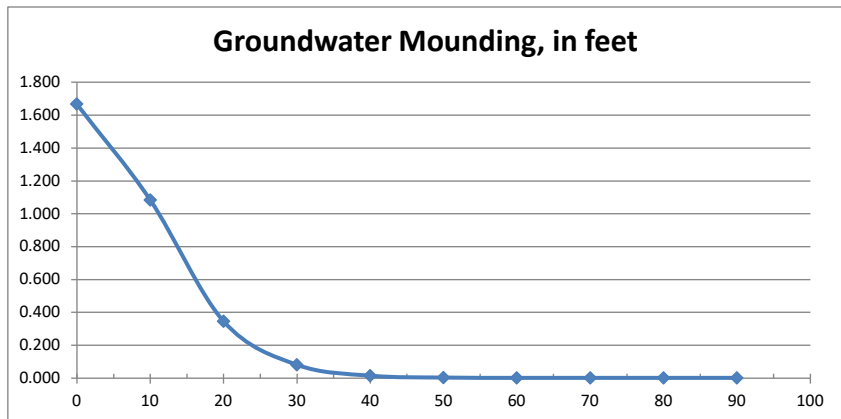
**h(max)** Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)  
**Δh(max)** Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Distance from  
 Ground-water center of basin in x  
 Mounding, in feet direction, in feet

|       |    |
|-------|----|
| 1.667 | 0  |
| 1.083 | 10 |
| 0.345 | 20 |
| 0.081 | 30 |
| 0.014 | 40 |
| 0.002 | 50 |
| 0.001 | 60 |
| 0.001 | 70 |
| 0.001 | 80 |
| 0.001 | 90 |



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## **FUTURE GROUNDWATER MOUNDING ANALYSIS**

## **UNDERGROUND INFILTRATION BASIN 1-1**

**2-YEAR STORM EVENT**

Input Values

|        |
|--------|
| 1.50   |
| 0.150  |
| 4.70   |
| 10.000 |
| 40.500 |
| 13.29  |
| 10.00  |

**R** Recharge rate (permeability rate) (in/hr)  
**Specific yield, Sy (dimensionless)**  
 default value is 0.15; max value is 0.2 provided that a lab test data is submitted  
**Horizontal hydraulic conductivity (in/hr)**  
 Kh = 5xRecharge Rate (R) in the costal plan; Kh=R outside the coastal plan  
**x** 1/2 length of basin (x direction, in feet)  
**y** 1/2 width of basin (y direction, in feet)  
**t** Duration of infiltration period (hours)  
**hi(0)** Initial thickness of saturated zone (feet)

|        |
|--------|
| 14.652 |
| 4.652  |

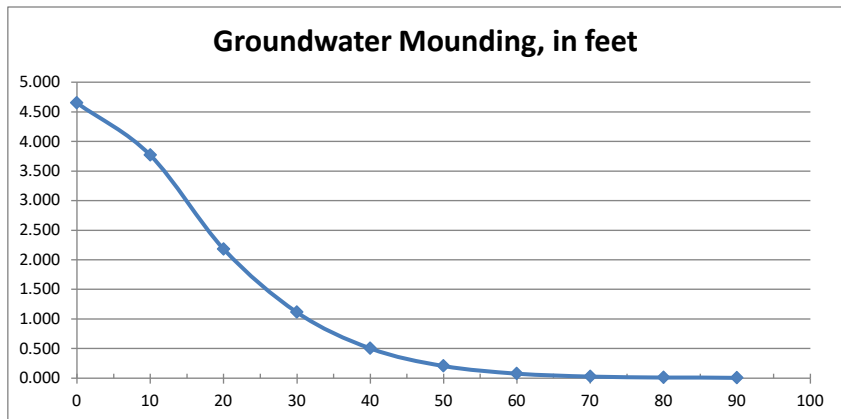
**h(max)** Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)  
**Δh(max)** Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Distance from  
 Ground-water center of basin in x  
 Mounding, in feet direction, in feet

|       |    |
|-------|----|
| 4.652 | 0  |
| 3.770 | 10 |
| 2.182 | 20 |
| 1.112 | 30 |
| 0.503 | 40 |
| 0.204 | 50 |
| 0.076 | 60 |
| 0.027 | 70 |
| 0.010 | 80 |
| 0.005 | 90 |



**Re-Calculate Now**



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## **10-YEAR STORM EVENT**

Input Values

|        |
|--------|
| 1.50   |
| 0.150  |
| 4.70   |
| 10.000 |
| 40.500 |
| 17.34  |
| 10.00  |

**R** Recharge rate (permeability rate) (in/hr)  
**Specific yield, Sy (dimensionless)**  
 default value is 0.15; max value is 0.2 provided that a lab test data is submitted  
**Horizontal hydraulic conductivity (in/hr)**  
 Kh = 5xRecharge Rate (R) in the costal plan; Kh=R outside the coastal plan  
**x** 1/2 length of basin (x direction, in feet)  
**y** 1/2 width of basin (y direction, in feet)  
**t** Duration of infiltration period (hours)  
**hi(0)** Initial thickness of saturated zone (feet)

|        |
|--------|
| 15.266 |
| 5.266  |

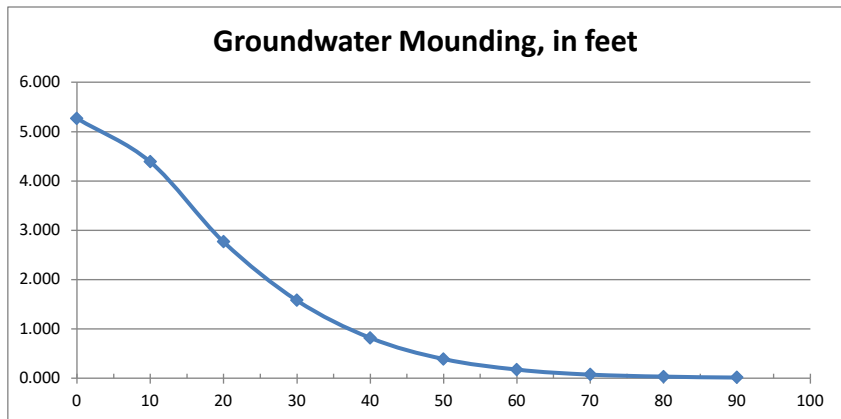
**h(max)** Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)  
**Δh(max)** Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Distance from  
 Ground-water center of basin in x  
 Mounding, in feet direction, in feet

|       |    |
|-------|----|
| 5.266 | 0  |
| 4.387 | 10 |
| 2.763 | 20 |
| 1.575 | 30 |
| 0.815 | 40 |
| 0.386 | 50 |
| 0.169 | 60 |
| 0.070 | 70 |
| 0.029 | 80 |
| 0.013 | 90 |



**Re-Calculate Now**



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**100-YEAR STORM EVENT**



Input Values

|        |
|--------|
| 1.50   |
| 0.150  |
| 4.70   |
| 10.000 |
| 40.500 |
| 23.52  |
| 10.00  |

**R** Recharge rate (permeability rate) (in/hr)  
**Specific yield, Sy (dimensionless)**  
 default value is 0.15; max value is 0.2 provided that a lab test data is submitted  
**Horizontal hydraulic conductivity (in/hr)**  
 Kh = 5xRecharge Rate (R) in the costal plan; Kh=R outside the coastal plan  
**x** 1/2 length of basin (x direction, in feet)  
**y** 1/2 width of basin (y direction, in feet)  
**t** Duration of infiltration period (hours)  
**hi(0)** Initial thickness of saturated zone (feet)

|        |
|--------|
| 15.984 |
| 5.984  |

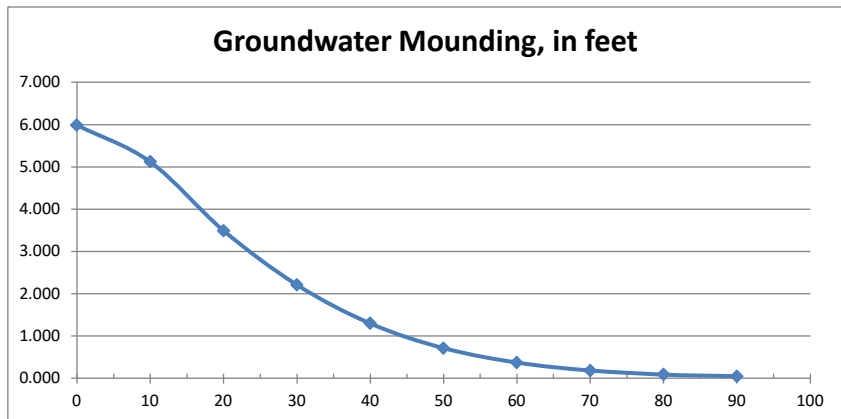
**h(max)** Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)  
**Δh(max)** Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Distance from  
 Ground-water center of basin in x  
 Mounding, in feet direction, in feet

|       |    |
|-------|----|
| 5.984 | 0  |
| 5.119 | 10 |
| 3.486 | 20 |
| 2.205 | 30 |
| 1.294 | 40 |
| 0.709 | 50 |
| 0.365 | 60 |
| 0.178 | 70 |
| 0.084 | 80 |
| 0.039 | 90 |



**Re-Calculate Now**



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## **WATER QUALITY STORM**

Input Values

|        |
|--------|
| 1.50   |
| 0.150  |
| 4.70   |
| 10.000 |
| 40.500 |
| 4.17   |
| 10.00  |

**R** Recharge rate (permeability rate) (in/hr)  
**Specific yield, Sy (dimensionless)**  
 default value is 0.15; max value is 0.2 provided that a lab test data is submitted  
**Horizontal hydraulic conductivity (in/hr)**  
 Kh = 5xRecharge Rate (R) in the costal plan; Kh=R outside the coastal plan  
**x** 1/2 length of basin (x direction, in feet)  
**y** 1/2 width of basin (y direction, in feet)  
**t** Duration of infiltration period (hours)  
**hi(0)** Initial thickness of saturated zone (feet)

|        |
|--------|
| 12.362 |
| 2.362  |

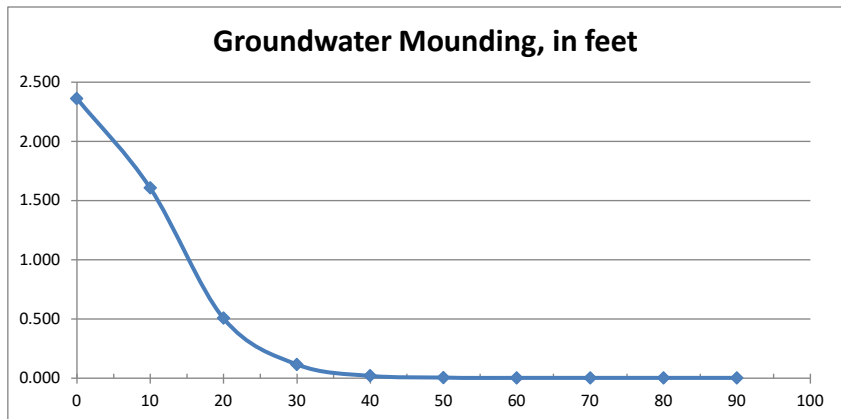
**h(max)** Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)  
**Δh(max)** Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Distance from  
 Ground-water center of basin in x  
 Mounding, in feet direction, in feet

|       |    |
|-------|----|
| 2.362 | 0  |
| 1.606 | 10 |
| 0.505 | 20 |
| 0.114 | 30 |
| 0.019 | 40 |
| 0.003 | 50 |
| 0.001 | 60 |
| 0.001 | 70 |
| 0.001 | 80 |
| 0.001 | 90 |



**Re-Calculate Now**



**Disclaimer**

This spreadsheet solving the Hantush (1967) equation for ground-water mounding beneath an infiltration basin is made available to the general public as a convenience for those wishing to replicate values documented in the USGS Scientific Investigations Report 2010-5102 "Groundwater mounding beneath hypothetical stormwater infiltration basins" or to calculate values based on user-specified site conditions. Any changes made to the spreadsheet (other than values identified as user-specified) after transmission from the USGS could have unintended, undesirable consequences. These consequences could include, but may not be limited to: erroneous output, numerical instabilities, and violations of underlying assumptions that are inherent in results presented in the accompanying USGS published report. The USGS assumes no responsibility for the consequences of any changes made to the spreadsheet. If changes are made to the spreadsheet, the user is responsible for documenting the changes and justifying the results and conclusions.

## **UNDERGROUND INFILTRATION BASIN 1-2**

## **2-YEAR STORM EVENT**

Input Values

|        |
|--------|
| 1.50   |
| 0.150  |
| 6.65   |
| 9.250  |
| 66.420 |
| 12.03  |
| 10.00  |

**R** Recharge rate (permeability rate) (in/hr)  
**Specific yield, Sy (dimensionless)**  
 default value is 0.15; max value is 0.2 provided that a lab test data is submitted  
**Horizontal hydraulic conductivity (in/hr)**  
 Kh = 5xRecharge Rate (R) in the costal plan; Kh=R outside the coastal plan  
**x** 1/2 length of basin (x direction, in feet)  
**y** 1/2 width of basin (y direction, in feet)  
**t** Duration of infiltration period (hours)  
**hi(0)** Initial thickness of saturated zone (feet)

|        |
|--------|
| 13.776 |
| 3.776  |

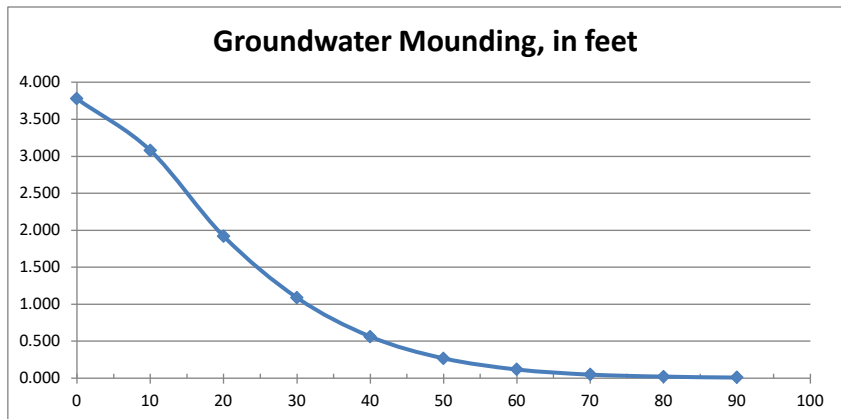
**h(max)** Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)  
**Δh(max)** Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Distance from  
 Ground-water center of basin in x  
 Mounding, in feet direction, in feet

|       |    |
|-------|----|
| 3.776 | 0  |
| 3.078 | 10 |
| 1.919 | 20 |
| 1.087 | 30 |
| 0.561 | 40 |
| 0.265 | 50 |
| 0.116 | 60 |
| 0.048 | 70 |
| 0.019 | 80 |
| 0.009 | 90 |



**Re-Calculate Now**



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## **10-YEAR STORM EVENT**

Input Values

|        |
|--------|
| 1.50   |
| 0.150  |
| 6.65   |
| 9.250  |
| 66.420 |
| 16.47  |
| 10.00  |

**R** Recharge rate (permeability rate) (in/hr)  
**Sy** Specific yield, Sy (dimensionless)  
 default value is 0.15; max value is 0.2 provided that a lab test data is submitted  
**Kh** Horizontal hydraulic conductivity (in/hr)  
 Kh = 5xRecharge Rate (R) in the costal plan; Kh=R outside the coastal plan  
**x** 1/2 length of basin (x direction, in feet)  
**y** 1/2 width of basin (y direction, in feet)  
**t** Duration of infiltration period (hours)  
**hi(0)** Initial thickness of saturated zone (feet)

|        |
|--------|
| 14.439 |
| 4.439  |

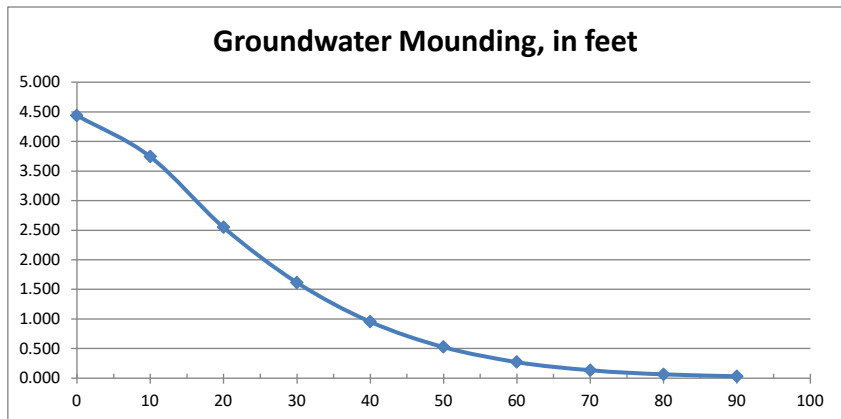
**h(max)** Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)  
**Δh(max)** Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Distance from  
 Ground-water center of basin in x  
 Mounding, in feet direction, in feet

|       |    |
|-------|----|
| 4.439 | 0  |
| 3.743 | 10 |
| 2.547 | 20 |
| 1.614 | 30 |
| 0.951 | 40 |
| 0.524 | 50 |
| 0.271 | 60 |
| 0.133 | 70 |
| 0.062 | 80 |
| 0.029 | 90 |



**Re-Calculate Now**



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**100-YEAR STORM EVENT**

Input Values

|        |
|--------|
| 1.50   |
| 0.150  |
| 6.65   |
| 9.250  |
| 66.420 |
| 22.34  |
| 10.00  |

**R** Recharge rate (permeability rate) (in/hr)  
**Specific yield, Sy (dimensionless)**  
 default value is 0.15; max value is 0.2 provided that a lab test data is submitted  
**Horizontal hydraulic conductivity (in/hr)**  
 Kh = 5xRecharge Rate (R) in the costal plan; Kh=R outside the coastal plan  
**x** 1/2 length of basin (x direction, in feet)  
**y** 1/2 width of basin (y direction, in feet)  
**t** Duration of infiltration period (hours)  
**hi(0)** Initial thickness of saturated zone (feet)

|        |
|--------|
| 15.129 |
| 5.129  |

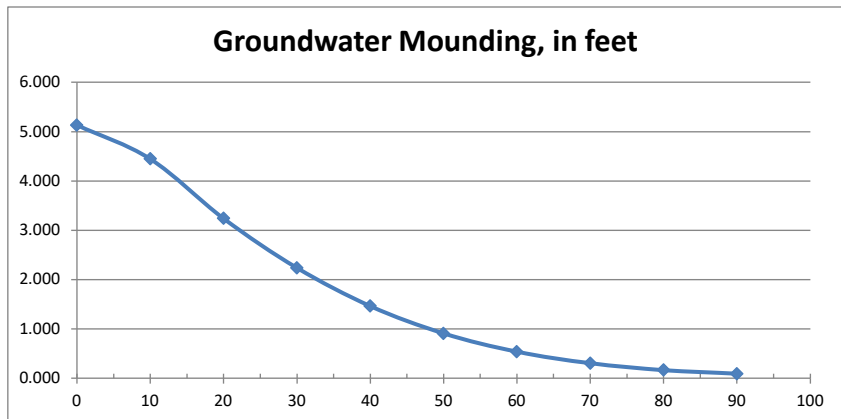
**h(max)** Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)  
**Δh(max)** Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Distance from  
 Ground-water center of basin in x  
 Mounding, in feet direction, in feet

|       |    |
|-------|----|
| 5.129 | 0  |
| 4.445 | 10 |
| 3.238 | 20 |
| 2.236 | 30 |
| 1.461 | 40 |
| 0.905 | 50 |
| 0.533 | 60 |
| 0.300 | 70 |
| 0.163 | 80 |
| 0.086 | 90 |



**Re-Calculate Now**



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## **WATER QUALITY STORM**

Input Values

|        |
|--------|
| 1.50   |
| 0.150  |
| 6.65   |
| 9.250  |
| 66.420 |
| 3.09   |
| 10.00  |

**R** Recharge rate (permeability rate) (in/hr)  
**Sy** Specific yield, Sy (dimensionless)  
 default value is 0.15; max value is 0.2 provided that a lab test data is submitted  
**Kh** Horizontal hydraulic conductivity (in/hr)  
 Kh = 5xRecharge Rate (R) in the costal plan; Kh=R outside the coastal plan  
**x** 1/2 length of basin (x direction, in feet)  
**y** 1/2 width of basin (y direction, in feet)  
**t** Duration of infiltration period (hours)  
**hi(0)** Initial thickness of saturated zone (feet)

|        |
|--------|
| 11.663 |
| 1.663  |

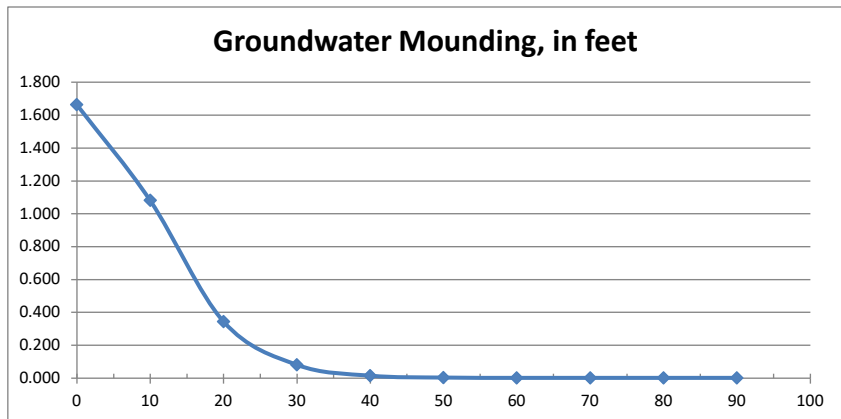
**h(max)** Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)  
**Δh(max)** Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Distance from  
 Ground-water center of basin in x  
 Mounding, in feet direction, in feet

|       |    |
|-------|----|
| 1.663 | 0  |
| 1.080 | 10 |
| 0.344 | 20 |
| 0.080 | 30 |
| 0.014 | 40 |
| 0.002 | 50 |
| 0.001 | 60 |
| 0.001 | 70 |
| 0.001 | 80 |
| 0.001 | 90 |



**Re-Calculate Now**



**Disclaimer**

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# **INFILTRATION BASIN DESIGN SUMMARY**

| INFILTRATION PERIOD AND EXFILTRATION RATE CALCULATIONS FOR GROUNDWATER MOUNDING ANALYSIS |  |  |                          |   |                         |
|--|--|--|--------------------------|---|-------------------------|
| SMALL-SCALE INFILTRATION BASIN   |  |  |                          |   |                         |
| BMP  | CHAMBER STORAGE (CF)<br>PER LINEAR FOOT OF<br>INSTALLATION | TOTAL STORAGE (CF)<br>PER LINEAR FOOT OF<br>INSTALLATION | EFFECTIVE<br>DEPTH RATIO | DESIGN DEPTH FROM<br>BOTTOM OF BMP TO<br>FIRST ORIFICE (IN) | EFFECTIVE<br>DEPTH (IN) |
| UGD-INF1-1   | 3.14   | 6.68   | 0.47                     | 9.6   | 4.5                     |
| UGD-INF1-2   | 10.00  | 15.20  | 0.66                     | 6.6   | 4.3                     |
|  |  |  |                          |   |                         |
|  |  |  |                          |   |                         |
|  |  |  |                          |   |                         |
|  |  |  |                          |   |                         |

**NOTES:**  
 1. Chamber Storage and total storage per linear foot of installation referenced from Cultec Recharger 360HD Stormwater Chamber submittal information provided by the manufacturer.

| INFILTRATION PERIOD AND EXFILTRATION RATE CALCULATIONS FOR GROUNDWATER MOUNDING ANALYSIS |  |                        |                           |                          |                                       |                       |                                     |
|--|--|------------------------|---------------------------|--------------------------|---------------------------------------|-----------------------|-------------------------------------|
| CURRENT STORM EVENTS   |  |                        |                           |                          |                                       |                       |                                     |
| SMALL-SCALE UNDERGROUND INFILTRATION BASIN 1-1   |  |                        |                           |                          |                                       |                       |                                     |
| DESIGN STORM EVENT   | DISCARDED VOLUME VIA EXFILTRATION (CF) | INFILTRATION AREA (SF) | EXFILTRATION RATE (IN/HR) | INFILTRATION PERIOD (HR) | MAX. GROUNDWATER MOUNDING HEIGHT (FT) | GROUNDWATER ELEVATION | MAX. GROUNDWATER MOUNDING ELEVATION |
| WQ Design Storm  | 845                                    | 1,620                  | 1.50                      | 4.17                     | 2.36                                  | 342.00                | 344.36                              |
| 2-year   | 2,407                                  | 1,620                  | 1.50                      | 11.89                    | 4.40                                  | 342.00                | 346.40                              |
| 10-year  | 3,183                                  | 1,620                  | 1.50                      | 15.72                    | 5.04                                  | 342.00                | 347.04                              |
| 100-year   | 4,516                                  | 1,620                  | 1.50                      | 22.30                    | 5.86                                  | 342.00                | 347.86                              |
|  |  |                        |                           |                          |                                       |                       |                                     |

**NOTES:**

- When exfiltration is used, the duration of infiltration is calculated as stated below and continued on the following page:
  - If the exfiltration volume and the exfiltration rate are known:
 
$$\text{Duration of infiltration period, } t \text{ (hr)} = \frac{\text{Discarded Volume via Exfiltration (cf)} \times 12 \text{ in/ft}}{\text{Infiltration area (sf)} \times \text{Exfiltration rate (in/hr)}}$$
- The discarded volume via exfiltration is referenced from Hydraflow Hydrographs and is calculated as the difference in runoff volume between the inflow hydrograph and the outflow hydrograph from the pond routing calculations.
- The exfiltration rate has been calculated through an iterative process which results in the maximum exfiltration rate while maintaining a maximum groundwater mounding height that remains below the bottom of the BMP for the future 100-year design storm event. This exfiltration rate has then been applied to the 2- and 10-year design storm events, and the infiltration periods subsequently calculated.

**INFILTRATION PERIOD AND EXFILTRATION RATE CALCULATIONS FOR GROUNDWATER MOUNDING ANALYSIS**

**CURRENT STORM EVENTS**

**SMALL-SCALE UNDERGROUND INFILTRATION BASIN 1-2**

| DESIGN STORM EVENT | DISCARDED VOLUME VIA EXFILTRATION (CF) | INFILTRATION AREA (SF) | EXFILTRATION RATE (IN/HR) | INFILTRATION PERIOD (HR) | MAX. GROUNDWATER MOUNDING HEIGHT (FT) | GROUNDWATER ELEVATION | MAX. GROUNDWATER MOUNDING ELEVATION |
|--------------------|--|------------------------|---------------------------|--------------------------|---------------------------------------|-----------------------|-------------------------------------|
| WQ Design Storm    | 951                                    | 2,457                  | 1.50                      | 3.10                     | 1.67                                  | 338.00                | 339.67                              |
| 2-year             | 3,219                                  | 2,457                  | 1.50                      | 10.48                    | 3.50                                  | 338.00                | 341.50                              |
| 10-year            | 4,517                                  | 2,457                  | 1.50                      | 14.70                    | 4.19                                  | 338.00                | 342.19                              |
| 100-year           | 6,151                                  | 2,457                  | 1.50                      | 20.02                    | 4.88                                  | 338.00                | 342.88                              |
|                    |  |                        |                           |                          |                                       |                       |                                     |

**NOTES:**

1. **When exfiltration is used, the duration of infiltration is calculated as stated below and continued on the following page:**

- If the exfiltration volume and the exfiltration rate are known:

$$\text{Duration of infiltration period, } t \text{ (hr)} = \frac{\text{Discarded Volume via Exfiltration (cf)} \times 12 \text{ in/ft}}{\text{Infiltration area (sf)} \times \text{Exfiltration rate (in/hr)}}$$

2. The discarded volume via exfiltration is referenced from Hydraflow Hydrographs and is calculated as the difference in runoff volume between the inflow hydrograph and the outflow hydrograph from the pond routing calculations.

3. The exfiltration rate has been calculated through an iterative process which results in the maximum exfiltration rate while maintaining a maximum groundwater mounding height that remains below the bottom of the BMP for the future 100-year design storm event. This exfiltration rate has then been applied to the 2- and 10-year design storm events, and the infiltration periods subsequently calculated.



| INFILTRATION PERIOD AND EXFILTRATION RATE CALCULATIONS FOR GROUNDWATER MOUNDING ANALYSIS |  |                        |                           |                          |                                       |                       |                                     |
|--|--|------------------------|---------------------------|--------------------------|---------------------------------------|-----------------------|-------------------------------------|
| FUTURE STORM EVENTS  |  |                        |                           |                          |                                       |                       |                                     |
| SMALL-SCALE UNDERGROUND INFILTRATION BASIN 1-1   |  |                        |                           |                          |                                       |                       |                                     |
| DESIGN STORM EVENT   | DISCARDED VOLUME VIA EXFILTRATION (CF) | INFILTRATION AREA (SF) | EXFILTRATION RATE (IN/HR) | INFILTRATION PERIOD (HR) | MAX. GROUNDWATER MOUNDING HEIGHT (FT) | GROUNDWATER ELEVATION | MAX. GROUNDWATER MOUNDING ELEVATION |
| WQ Design Storm  | 845                                    | 1,620                  | 1.50                      | 4.17                     | 2.36                                  | 342.00                | 344.36                              |
| 2-year   | 2,691                                  | 1,620                  | 1.50                      | 13.29                    | 4.65                                  | 342.00                | 346.65                              |
| 10-year  | 3,511                                  | 1,620                  | 1.50                      | 17.34                    | 5.27                                  | 342.00                | 347.27                              |
| 100-year   | 4,763                                  | 1,620                  | 1.50                      | 23.52                    | 5.98                                  | 342.00                | 347.98                              |

**NOTES:**

- When exfiltration is used, the duration of infiltration is calculated as stated below and continued on the following page:
  - If the exfiltration volume and the exfiltration rate are known:
 
$$\text{Duration of infiltration period, } t \text{ (hr)} = \frac{\text{Discarded Volume via Exfiltration (cf)} \times 12 \text{ in/ft}}{\text{Infiltration area (sf)} \times \text{Exfiltration rate (in/hr)}}$$
- The discarded volume via exfiltration is referenced from Hydraflow Hydrographs and is calculated as the difference in runoff volume between the inflow hydrograph and the outflow hydrograph from the pond routing calculations.
- The exfiltration rate has been calculated through an iterative process which results in the maximum exfiltration rate while maintaining a maximum groundwater mounding height that remains below the bottom of the BMP for the future 100-year design storm event. This exfiltration rate has then been applied to the 2- and 10-year design storm events, and the infiltration periods subsequently calculated.

**INFILTRATION PERIOD AND EXFILTRATION RATE CALCULATIONS FOR GROUNDWATER MOUNDING ANALYSIS**

**FUTURE STORM EVENTS**

**SMALL-SCALE UNDERGROUND INFILTRATION BASIN 1-2**

| DESIGN STORM EVENT | DISCARDED VOLUME VIA EXFILTRATION (CF) | INFILTRATION AREA (SF) | EXFILTRATION RATE (IN/HR) | INFILTRATION PERIOD (HR) | MAX. GROUNDWATER MOUNDING HEIGHT (FT) | GROUNDWATER ELEVATION | MAX. GROUNDWATER MOUNDING ELEVATION |
|--------------------|--|------------------------|---------------------------|--------------------------|---------------------------------------|-----------------------|-------------------------------------|
| WQ Design Storm    | 950                                    | 2,457                  | 1.50                      | 3.09                     | 1.66                                  | 338.00                | 339.66                              |
| 2-year             | 3,695                                  | 2,457                  | 1.50                      | 12.03                    | 3.78                                  | 338.00                | 341.78                              |
| 10-year            | 5,060                                  | 2,457                  | 1.50                      | 16.47                    | 4.44                                  | 338.00                | 342.44                              |
| 100-year           | 6,863                                  | 2,457                  | 1.50                      | 22.34                    | 5.13                                  | 338.00                | 343.13                              |
|                    |  |                        |                           |                          |                                       |                       |                                     |

**NOTES:**

1. **When exfiltration is used, the duration of infiltration is calculated as stated below and continued on the following page:**

- If the exfiltration volume and the exfiltration rate are known:

$$\text{Duration of infiltration period, } t \text{ (hr)} = \frac{\text{Discarded Volume via Exfiltration (cf)} \times 12 \text{ in/ft}}{\text{Infiltration area (sf)} \times \text{Exfiltration rate (in/hr)}}$$

2. The discarded volume via exfiltration is referenced from Hydraflow Hydrographs and is calculated as the difference in runoff volume between the inflow hydrograph and the outflow hydrograph from the pond routing calculations.

3. The exfiltration rate has been calculated through an iterative process which results in the maximum exfiltration rate while maintaining a maximum groundwater mounding height that remains below the bottom of the BMP for the future 100-year design storm event. This exfiltration rate has then been applied to the 2- and 10-year design storm events, and the infiltration periods subsequently calculated.

# **POROUS ASPHALT PAVEMENT DESIGN CALCULATIONS**

# POROUS PAVEMENT SYSTEM DESIGN CALCULATIONS

Design Notes and Standards:

1. The NJDEP water quality design storm event is 1.25 inches over a period of 2 hours.
2. The maximum ratio of additional inflow drainage area to surface area of the porous pavement system is 3:1.
3. The storage bed of the porous pavement system must drain within 72 hours.
4. The void space of the stone storage bed is assumed to be 40%.
5. The seasonal high water table or bedrock must be a minimum of 1 foot below the bottom of the storage bed.
6. The proposed porous pavement system has been designed to allow for additional storage capacity for quantity control measures for the larger storm events. An outlet control structure has been designed which will control the rate of discharge; the underdrain system has been provided to promote complete drainage of the system.

| POROUS PAVEMENT SYSTEM AREA | BED AREA (SF) | BED DEPTH (IN) | STORAGE VOLUME (CF) | WQ STORM RUNOFF VOLUME (CF) | MIN. UNDERDRAIN PIPE DIA. (IN) | MIN. UNDERDRAIN PIPE SLOPE (FT/FT) | UNDERDRAIN CAPACITY (CFS) |
|-----------------------------|---------------|----------------|---------------------|-----------------------------|--------------------------------|------------------------------------|---------------------------|
| 1                           | 4,837         | 24             | 3,870               | 846                         | 4                              | 0.005                              | 0.15                      |
| 2                           | 2,198         | 24             | 1,759               | 249                         | 4                              | 0.005                              | 0.15                      |
| 3                           | 2,139         | 24             | 1,711               | 243                         | 4                              | 0.005                              | 0.15                      |

| Pavement Area                                    | Cover Type       | Soil Type | Area (ac)  | Area (sf) | CN | S    | Q Runoff (in) | Runoff Volume (CF) |
|--|------------------|-----------|--|-----------|----|------|---------------|--------------------|
| 1  | Open Space/Grass | C         | 0.02   | 914       | 74 | 3.51 | 0.07          | 6                  |
|  | Impervious       | -         | 0.22   | 9,753     | 98 | 0.20 | 1.03          | 841                |
| TOTAL:   |                  |           | 0.24   | 10,667    |    |      |               | 846                |
| ADDITIONAL INFLOW DRAINAGE AREA RATIO (X:1) 1.21 |                  |           | ADDITIONAL INFLOW IMPERVIOUS AREA RATIO (X:1) 1.02 |           |    |      |               |                    |

| Pavement Area                                    | Cover Type       | Soil Type | Area (ac)  | Area (sf) | CN | S    | Q Runoff (in) | Runoff Volume (CF) |
|--|------------------|-----------|--|-----------|----|------|---------------|--------------------|
| 2  | Open Space/Grass | C         | 0.04   | 1,579     | 74 | 3.51 | 0.07          | 10                 |
|  | Impervious       | -         | 0.06   | 2,771     | 98 | 0.20 | 1.03          | 239                |
| TOTAL:   |                  |           | 0.10   | 4,350     |    |      |               | 249                |
| ADDITIONAL INFLOW DRAINAGE AREA RATIO (X:1) 0.98 |                  |           | ADDITIONAL INFLOW IMPERVIOUS AREA RATIO (X:1) 0.26 |           |    |      |               |                    |

| Pavement Area                                    | Cover Type       | Soil Type | Area (ac)  | Area (sf) | CN | S    | Q Runoff (in) | Runoff Volume (CF) |
|--|------------------|-----------|--|-----------|----|------|---------------|--------------------|
| 3  | Open Space/Grass | C         | 0.02   | 783       | 74 | 3.51 | 0.07          | 5                  |
|  | Impervious       | -         | 0.06   | 2,765     | 98 | 0.20 | 1.03          | 238                |
| TOTAL:   |                  |           | 0.08   | 3,548     |    |      |               | 243                |
| ADDITIONAL INFLOW DRAINAGE AREA RATIO (X:1) 0.66 |                  |           | ADDITIONAL INFLOW IMPERVIOUS AREA RATIO (X:1) 0.29 |           |    |      |               |                    |

# **APPENDIX F**

## **LOW IMPACT DEVELOPMENT CHECKLIST**

# New Jersey Stormwater Best Management Practices Manual

February 2004

<http://www.state.nj.us/dep/watershedmgt/bmpmanualfeb2004.htm>

## A P P E N D I X A

# Low Impact Development Checklist

A checklist for identifying nonstructural stormwater management strategies incorporated into proposed land development

According to the NJDEP Stormwater Management Rules at N.J.A.C. 7:8, the groundwater recharge, stormwater quality, and stormwater quantity standards established by the Rules for major land development projects must be met by incorporating nine specific nonstructural stormwater management strategies into the project's design to the maximum extent practicable.

To accomplish this, the Rules require an applicant seeking land development approval from a regulatory board or agency to identify those nonstructural strategies that have been incorporated into the project's design. In addition, if an applicant contends that it is not feasible to incorporate any of the specific strategies into the project's design, particularly for engineering, environmental, or safety reasons, the Rules further require that the applicant provide a basis for that contention.

This checklist has been prepared to assist applicants, site designers, and regulatory boards and agencies in ensuring that the nonstructural stormwater management requirements of the Rules are met. It provides an applicant with a means to identify both the nonstructural strategies incorporated into the development's design and the specific low impact development BMPs (LID-BMPs) that have been used to do so. It can also help an applicant explain the engineering, environmental, and/or safety reasons that a specific nonstructural strategy could not be incorporated into the development's design.

The checklist can also assist municipalities and other land development review agencies in the development of specific requirements for both nonstructural strategies and LID-BMPs in zoning and/or land use ordinances and regulations. As such, where requirements consistent with the Rules have been adopted, they may supersede this checklist.

Finally, the checklist can be used during a pre-design meeting between an applicant and pertinent review personnel to discuss local nonstructural strategies and LID-BMPs requirements in order to optimize the development's nonstructural stormwater management design.

Since this checklist is intended to promote the use of nonstructural stormwater management strategies and provide guidance in their incorporation in land development projects, municipalities are permitted to revise it as necessary to meet the goals and objectives of their specific stormwater management program and plan within the limits of N.J.A.C. 7:8.

# Low Impact Development Checklist

A checklist for identifying nonstructural stormwater management strategies incorporated into proposed land development

Municipality: Summit

County: Union County Date: February 9, 2024

Review board or agency: Summit Planning Board

Proposed land development name: Beacon Unitarian Universalist Church

Lot(s): 47 Block(s): 1702

Project or application number: 101007201

Applicant's name: Beacon Unitarian Universalist Congregation

Applicant's address: 4 Waldron Avenue, Summit, NJ 07901

Telephone: \_ Fax:

Email address:

Designer's name: Langan Engineering and Environmental Services (Contact: John Cote)

Designer's address: 300 Kimball Drive, Parsippany, NJ 07054

Telephone: 973-560-4900 Fax: \_\_\_\_\_

Email address: jcote@langan.com



## Part 1: Description of Nonstructural Approach to Site Design

In narrative form, provide an overall description of the nonstructural stormwater management approach and strategies incorporated into the proposed site's design. Attach additional pages as necessary. Details of each nonstructural strategy are provided in Part 3 below.

In accordance with the NJDEP stormwater rules outlined in N.J.A.C. 7:8, the project meets the requirements for stormwater quantity control, water quality treatment, and groundwater recharge.

The proposed development of the project site has been designed to maintain as many existing trees as possible. Trash racks and rock screens on outlet control structures will be used to prevent accumulation of trash and debris in stormwater drainage systems.

Part 2: Review of Local Stormwater Management Regulations

Title and date of stormwater management regulations used in development design:

Summit – Chapter 26 Stormwater Management Regulations and Chapter 35 Development Regulations.

Do regulations include nonstructural requirements?

Yes:  No:

If yes, briefly describe: Nonstructural stormwater management strategies.

List LID-BMPs prohibited by local regulations: None

Pre-design meeting held? Yes:  Date:  No:

Meeting held with:

Pre-design site walk held? Yes:  Date:  No:

Site walk held with:

Other agencies with stormwater review jurisdiction:

Name: Union County

Required approval: Somerset-Union Soil Conservation District, Union County Planning Board

Name:

Required approval:

Name:

Required approval:

Name:

Required approval:

# Part 3: Nonstructural Strategies and LID-BMPs in Design

## 3.1 Vegetation and Landscaping

Effective management of both existing and proposed site vegetation can reduce a development's adverse impacts on groundwater recharges and runoff quality and quantity. This section of the checklist helps identify the vegetation and landscaping strategies and nonstructural LID-BMPs that have been incorporated into the proposed development's design to help maintain existing recharge rates and/or minimize or prevent increases in runoff quantity and pollutant loading.

A. Has an inventory of existing site vegetation been performed?  
Yes:  No:

If yes, was this inventory a factor in the site's layout and design? Yes:  No:

B. Does the site design utilize any of the following nonstructural LID-BMPs?

Preservation of natural areas? Yes:  No:  
If yes, specify % of site: 0%

Native ground cover? Yes: No:   
If yes, specify % of site: 0%

Vegetated buffers? Yes: No:   
If yes, specify % of site: 0%

C. Do the land development regulations require these nonstructural LID-BMPs?

Preservation of natural areas? Yes: \_\_\_\_\_ No:   
If yes, specify % of site: \_\_\_\_\_

Native ground cover? Yes: \_\_\_\_\_ No:   
If yes, specify % of site: \_\_\_\_\_

Vegetated buffers? Yes: \_\_\_\_\_ No:   
If yes, specify % of site: \_\_\_\_\_

D. If vegetated filter strips or buffers are utilized, specify their functions:

Reduce runoff volume increases through lower runoff coefficient:  
Yes: \_\_\_\_\_ No: x

Reduce runoff pollutant loads through runoff treatment:  
Yes: \_\_\_\_\_ No: x

Maintain groundwater recharge by preserving natural areas:  
Yes: \_\_\_\_\_ No: x

### 3.2 Minimize Land Disturbance

Minimizing land disturbance is a nonstructural LID-BMP that can be applied during both the development's construction and post-construction phases. This section of the checklist helps identify those land disturbance strategies and nonstructural LID-BMPs that have been incorporated into the proposed development's design to minimize land disturbance and the resultant change in the site's hydrologic character.

A. Have inventories of existing site soils and slopes been performed?

Yes:  No:

If yes, were these inventories factors in the site's layout and design? Yes:  No:

B. Does the development's design utilize any of the following nonstructural LID-BMPs?

Restrict permanent site disturbance by land owners?

Yes: No:

If yes, how:

Restrict temporary site disturbance during construction?

Yes: No:

If yes, how:

Consider soils and slopes in selecting disturbance limits?

Yes:  No:

C. Specify percentage of site to be cleared: 95.0% Regraded: 95.0%

D. Specify percentage of cleared areas done so for buildings: 16.4%

For driveways and parking: 24.8% For roadways: 0.0%

E. What design criteria and/or site changes would be required to reduce the percentages in C and D above? N.A.

F. Specify site's hydrologic soil group (HSG) percentages:

HSG A: 0% HSG B: 0% HSG C: 100% HSG D: 0%

G. Specify percentage of each HSG that will be permanently disturbed:

HSG A: 0% HSG B: 0% HSG C: 95.0% HSG D: 0%

H. Locating site disturbance within areas with less permeable soils (HSG C and D) and minimizing disturbance within areas with greater permeable soils (HSG A and B) can help maintain groundwater recharge rates and reduce runoff volume increases. In light of the HSG percentages in F and G above, what other practical measures if any can be taken to achieve this?

The entire project site is located within HSGC C soil type.

I. Does the site include Karst topography? Yes: \_\_\_\_\_ No: x

If yes, discuss measures taken to limit Karst impacts:

\_\_\_\_\_

### 3.3 Impervious Area Management

New impervious surfaces at a development site can have the greatest adverse effect on groundwater recharge and stormwater quality and quantity. This section of the checklist helps identify those nonstructural strategies and LID-BMPs that have been incorporated into a proposed development's design to comprehensively manage the extent and impacts of new impervious surfaces.

A. Specify impervious cover at site: Existing: 30.1% Proposed: 39.9%

B. Specify maximum site impervious coverage allowed by regulations: 35% Impervious Coverage

C. Compare proposed street cartway widths with those required by regulations:

| Type of Street                                      | Proposed Cartway Width (feet) | Required Cartway Width (feet) |
|---|-------------------------------|-------------------------------|
| Residential access – low intensity                  |                               |                               |
| Residential access – medium intensity               |                               |                               |
| Residential access – high intensity with parking    |                               |                               |
| Residential access – high intensity without parking |                               |                               |
| Neighborhood  |                               |                               |
| Minor collector – low intensity without parking     |                               |                               |
| Minor collector – with one parking lane             |                               |                               |
| Minor collector – with two parking lanes            |                               |                               |
| Minor collector – without parking                   |                               |                               |
| Major collector                                     |                               |                               |

D. Compare proposed parking space dimensions with those required by regulations:

Proposed: 9 FT x 18 FT Regulations: 9 FT x 18 FT

E. Compare proposed number of parking spaces with those required by regulations:

Proposed: 42 Regulations: 100

F. Specify percentage of total site impervious cover created by buildings: 39.0%

By driveways and parking: 61.0% By roadways: 0.0%

G. What design criteria and/or site changes would be required to reduce the percentages in F above?

N.A.

H. Specify percentage of total impervious area that will be unconnected:

Total site: 0% Buildings: 0% Driveways and parking: 0% Roads: 0%

I. Specify percentage of total impervious area that will be porous:

Total site: 0% Buildings: 0% Driveways and parking: 24.1% Roads: 0%

J. Specify percentage of total building roof area that will be vegetated: 0%

K. Specify percentage of total parking area located beneath buildings: 0%

L. Specify percentage of total parking located within multi-level parking deck: 0%



### 3.4 Time of Concentration Modifications

Decreasing a site's time of concentration (Tc) can lead directly to increased site runoff rates which, in turn, can create new and/or aggravate existing erosion and flooding problems downstream. This section of the checklist helps identify those nonstructural strategies and LID-BMPs that have been incorporated into the proposed development's design to effectively minimize such Tc decreases.

When reviewing Tc modification strategies, it is important to remember that a drainage area's Tc should reflect the general conditions throughout the area. As a result, Tc modifications must generally be applied throughout a drainage area, not just along a specific Tc route.

A. Specify percentage of site's total stormwater conveyance system length that will be:

Storm sewer: 90% Vegetated swale: 0% Natural channel: 0%

Stormwater management facility: 10% Other: \_\_\_\_\_

Note: the total length of the stormwater conveyance system should be measured from the site's downstream property line to the downstream limit of sheet flow at the system's headwaters.

B. What design criteria and/or site changes would be required to reduce the storm sewer percentages and increase the vegetated swale and natural channel percentages in A above?

N.A.

C. In conveyance system subareas that have overland or sheet flow over impervious surfaces or turf grass, what practical and effective site changes can be made to: N.A.

Decrease overland flow slope: \_\_\_\_\_

Increase overland flow roughness: \_\_\_\_\_

### 3.5 Preventative Source Controls

The most effective way to address water quality concerns is by pollution prevention. This section of the checklist helps identify those nonstructural strategies and LID-BMPs that have been incorporated into the proposed development's design to reduce the exposure of pollutants to prevent their release into the stormwater runoff.

#### A. Trash Receptacles

Specify the number of trash receptacles provided: 0

Specify the spacing between the trash receptacles: 0

Compare trash receptacles proposed with those required by regulations:

Proposed: 0 Regulations: 0

#### B. Pet Waste Stations

Specify the number of pet waste stations provided: 0

Specify the spacing between the pet waste stations: 0

Compare pet waste stations proposed with those required by regulations:

Proposed: 0 Regulations: 0

#### C. Inlets, Trash Racks, and Other Devices that Prevent Discharge of Large Trash and Debris

Specify percentage of total inlets that comply with the NJPDES storm drain inlet criteria: 100%

#### D. Maintenance

Specify the frequency of the following maintenance activities:

Street sweeping: Proposed: 0 Regulations: 0

Litter collection: Proposed: 0 Regulations: 0

Identify other stormwater management measures on the site that prevent discharge of large trash and debris: Trash Racks on outlet control structure, water quality treatment devices.

E. Prevention and Containment of Spills

Identify locations where pollutants are located on the site, and the features that prevent these pollutants from being exposed to stormwater runoff:

Pollutant: \_\_\_\_ Location: \_\_\_\_\_

Feature utilized to prevent pollutant exposure, harmful accumulation, or contain spills:

Pollutant: \_\_\_\_\_ Location: \_\_\_\_\_

Feature utilized to prevent pollutant exposure, harmful accumulation, or contain spills:

Pollutant: \_\_\_\_\_ Location: \_\_\_\_\_

Feature utilized to prevent pollutant exposure, harmful accumulation, or contain spills:

Pollutant: \_\_\_\_\_ Location: \_\_\_\_\_

Feature utilized to prevent pollutant exposure, harmful accumulation, or contain spills:

Pollutant: \_\_\_\_\_ Location: \_\_\_\_\_

## Part 4: Compliance with Nonstructural Requirements of NJDEP Stormwater Management Rules

1. Based upon the checklist responses above, indicate which nonstructural strategies have been incorporated into the proposed development's design in accordance with N.J.A.C. 7:8-5.3(b):

| No. | Nonstructural Strategy   | Yes | No |
|-----|--|-----|----|
| 1.  | Protect areas that provide water quality benefits or areas particularly susceptible to erosion and sediment loss.  | x   |    |
| 2.  | Minimize impervious surfaces and break up or disconnect the flow of runoff over impervious surfaces.   |     | x  |
| 3.  | Maximize the protection of natural drainage features and vegetation.   | x   |    |
| 4.  | Minimize the decrease in the pre-construction time of concentration.   |     | x  |
| 5.  | Minimize land disturbance including clearing and grading.  |     | x  |
| 6.  | Minimize soil compaction.  |     | x  |
| 7.  | Provide low maintenance landscaping that encourages retention and planting of native vegetation and minimizes the use of lawns, fertilizers, and pesticides. |     | x  |
| 8.  | Provide vegetated open-channel conveyance systems discharge into and through stable vegetated areas.   |     | x  |
| 9.  | Provide preventative source controls.  |     | x  |

2. For those strategies that have not been incorporated into the proposed development's design, provide engineering, environmental, and/or safety reasons. Attached additional pages as necessary.

The other non-structural stormwater management strategies are not practicable based upon the existing site conditions and nature of the proposed project. The development of the site maintains the perimeter existing wooded areas to the maximum extent feasible.

# **APPENDIX G**

## **GEOTECHNICAL INVESTIGATION INFORMATION**

---

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---

**25To:** Louis Cherry / Louis Cherry Architecture

**From:** Arthur Roesler, P.E.  
Matthew Koch

**Info:** John Cote, Ted Herbert, Gregg Woodruff / Langan

**Date:** 11 August 2023

**Re:** Stormwater Management Investigation Report  
Beacon Unitarian Universalist Redevelopment Project  
695 Springfield Avenue  
Summit, New Jersey  
Langan Project No.: 101007201

---

This memorandum provides a summary of the findings from our Stormwater Management Investigation for the proposed Beacon Unitarian Universalist Church project located at 695 Springfield Avenue, Summit, New Jersey.

The purposes of this study were to: 1) review available information; 2) obtain subsurface information by performing test pits; 3) perform in-situ infiltration testing; and 4) perform laboratory testing.

All elevations given in this report are referenced to the North American Vertical Datum of 1988 (NAVD 88), unless otherwise noted. No environmental investigations or sampling were performed as part of this work.

## EXISTING CONDITIONS

The approximate 1.74-acre project site is located at 695 Springfield Avenue in Summit, Union County, New Jersey (designated as Block 1702, Lot 47); see Figures 1 and 2. The site is bounded by the following:

- Wilson Primary School and a baseball field to the north.
- Springfield Avenue to the south.
- A playground, basketball court, and tennis courts to the west.
- Grass and wooded areas to the east,

The project site is currently occupied by a two-story office building and a detached 2-story garage.

An asphalt pavement car parking lot exists between the office building and garage. Areas within the eastern portion of the site are covered mostly by grass with some trees and vegetation.

According to the 8 December 2022 Boundary and Topographic Survey prepared by Langan, existing grades at the site generally range from approximate el 350 to el 356.

## PROPOSED CONSTRUCTION

Based on the 22 June 2023 Site Plans prepared by our firm, we understand that the current development plan will consist of the following:

- Demolition of existing structures and associated site features.
- Construction of a two-story building with an approximate 11,800 SF building footprint.
- Construction of an asphalt parking lot and driveway; porous pavement will be utilized along the northern row of parking spaces.
- Construction of 2 underground stormwater management basins having bottom of basin elevations of approximate el 344 and el 348.

## REVIEW OF AVAILABLE INFORMATION

We reviewed available soil survey data, regional geologic information, and the FEMA Flood Maps for the site vicinity. Pertinent information obtained from our review of available information is summarized in the following paragraphs.

### Soil Survey Data

We reviewed the United States Department of Agriculture (USDA) Natural Resources Conservation Service Soil Survey Map for Essex County, New Jersey; see Figure 3. A brief description of the soil types found at the site and surrounding areas is provided below.

- *Boonton-Urban Land-Haledon Complex (NovB)*: These areas are typically covered by pavement, concrete, buildings, and other structures underlain by disturbed and natural soil material. The natural soil typically consists of loam to gravelly fine sandy loam to silt loam to sandy loam to gravelly loam. When not covered by pavement, concrete, buildings, and other structures, the soil mapping unit is reported to be Hydrologic Soil Group C.
- *Dunellen-Urban land Complex (DuuD)*: These areas are typically covered by pavement, concrete, buildings, and other structures underlain by disturbed and natural soil material. The natural soil typically consists of loam to stratified gravelly sand to sand to loamy sand. When not covered by pavement, concrete, buildings, and other structures, the soil mapping unit is reported to be Hydrologic Soil Group A.

## Regional Geology

We reviewed the 2007 New Jersey Geological Survey Open File Map 69 (OFM 69) entitled “Surficial Geology of the Chatham Quadrangle, Morris, Union, and Somerset Counties, New Jersey” and geologic data provided by the New Jersey Department of Environmental Protection (NJDEP); see Figure 4. A brief description of the surficial soils at the site and surrounding areas is provided below.

- Deltaic Deposits (Qpmd): These areas generally consist of fine to coarse sand and pebble to cobble gravel, with minor silt and very fine sand.
- Rahway Till (Qtmr): These areas generally consist of reddish brown to reddish yellow to yellowish brown silty sand to clayey sandy silt, locally clayey silt, containing some to many subrounded and subangular pebbles and cobbles and few subrounded boulders.

## Flood Map

We reviewed the current Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Panel Number 34039C0008F dated 20 September 2006; see Figure 5. According to this map, the project site lies outside the 100-year and 500-year floodplain.

## LANGAN GEOTECHNICAL INVESTIGATION FOR STORMWATER DESIGN

Langan performed a preliminary geotechnical investigation at the site consisting of the following:

- Excavating 8 test pits, identified as TP-1 through TP-8.
- Performing 9 single ring infiltration tests at the test pit locations.

Refer to Figure 2 for location of work. The test pits were performed in areas that were accessible at the time of our investigation.

The test pits and infiltration tests were completed under the full-time observation of a field engineer from our office acting under the direct supervision of our project Professional Engineer. Our field engineer laid out the test pit locations, maintained logs of the explorations, classified soil encountered, and obtained representative material samples. Surface elevations at the test pit locations were collected using survey-grade GPS equipment.

The attached Table 1 presents the findings from our investigation and the proposed bottom of basin elevations.

## Test Pits

The preliminary stormwater investigation test pits were excavated by Clear Ground Development, Inc. on 25 and 26 April 2023 using a Kubota KX 057-5 Mini Excavator.



The test pits were excavated to depths ranging from approximately 12 to 15 feet below existing grades. The test pits were backfilled with excavated material and lightly compacted with a bucket of the excavator upon completion.

Individual test pit logs are provided in Appendix A.

## **In-Situ Infiltration Testing**

### Single Ring Infiltration Tests

In-situ single ring infiltration testing was performed during the preliminary investigation at depths ranging from approximately 1 to 7 feet below existing grades, corresponding to approximate el 345 to el 352. The single ring infiltration testing was performed in accordance with the latest NJ Stormwater BMP Manual.

The results of the single ring infiltration testing are provided in Table 2 and Appendix B.

## **Laboratory Testing**

Soil samples from the geotechnical investigation were visually examined in the field and classifications were confirmed by re-examination in our Parsippany, New Jersey office. Select soil samples were sent to a specialty testing laboratory where the following tests were performed:

- Grain Size Distributions

The results of the geotechnical laboratory testing are provided in Appendix C.

## **SUBSURFACE CONDITIONS**

Based on the results of the test pits performed for this study, the site subsurface conditions generally consisted of surficial material overlying successive strata of fill and sand. The following sections provide a detailed description of the encountered subsurface strata and groundwater conditions.

For this study, all test pits were performed within the existing landscape areas.

### **Topsoil**

Topsoil typically consisting of dark brown silt with varying amounts of sand, gravel, clay, and roots was encountered at the surface of all test pits. The topsoil was found to be approximately 6 to 11 inches thick.

## **Fill**

A layer of fill typically consisting of brown, black, gray, orangish-brown, and reddish-brown silty sand with varying amounts of gravel, clay, cobbles, roots, and miscellaneous debris (i.e., terracotta fragments, metal, ceramic, glass, brick, plastic) was encountered beneath the topsoil in most test pits and extended to depths ranging from approximately 2 to 7.5 feet below existing grades, corresponding to approximate el 344.5 to el 353.3.

Laboratory testing of select samples from the fill layer resulted in fines contents ranging from approximately 26.8% to 43.9%.

The fill layer was found to be approximately 2 to 7 feet thick.

## **Sand**

A layer of brown to reddish brown fine to coarse sand with varying amounts of gravel, silt, clay, and cobbles was encountered beneath the fill or topsoil in all test pits. The sand layer was first encountered at depths ranging from approximately 0.5 to 6.5 feet below existing grades, corresponding to approximate el 344.5 to el 355.

Laboratory testing of select samples from the estuarine deposits resulted in fines contents ranging from approximately 2.7% to 45.2%.

All test pits were terminated in this stratum.

## **Groundwater**

Groundwater was only encountered in test pit TP-7 at a depth of approximately 7 feet below existing grades, corresponding to approximate el 346.

Trapped groundwater seepage was encountered in test pits TP-7 and TP-8 at depths ranging from approximately 3.3 to 4.7 feet below existing grades. The seepage stopped or significantly slowed down prior to backfilling these test pits.

The groundwater level is expected to fluctuate based on weather, seasonal conditions, and construction activity.

## **INFILTRATION TESTING**

As part of this study, in-situ single ring infiltration tests were performed within the existing fill soils and the sand layer.

## **In-Situ Infiltration Tests**

### Single Ring Infiltration Tests

In-situ single ring infiltration tests were performed within all 8 of the excavated test pits during the preliminary investigation. Field hydraulic conductivities ranging from less than 1 inch per hour to 15.1 inches per hour were recorded.

A summary of the single ring infiltration test results is provided in Table 2 and Appendix B.

## **CLOSURE**

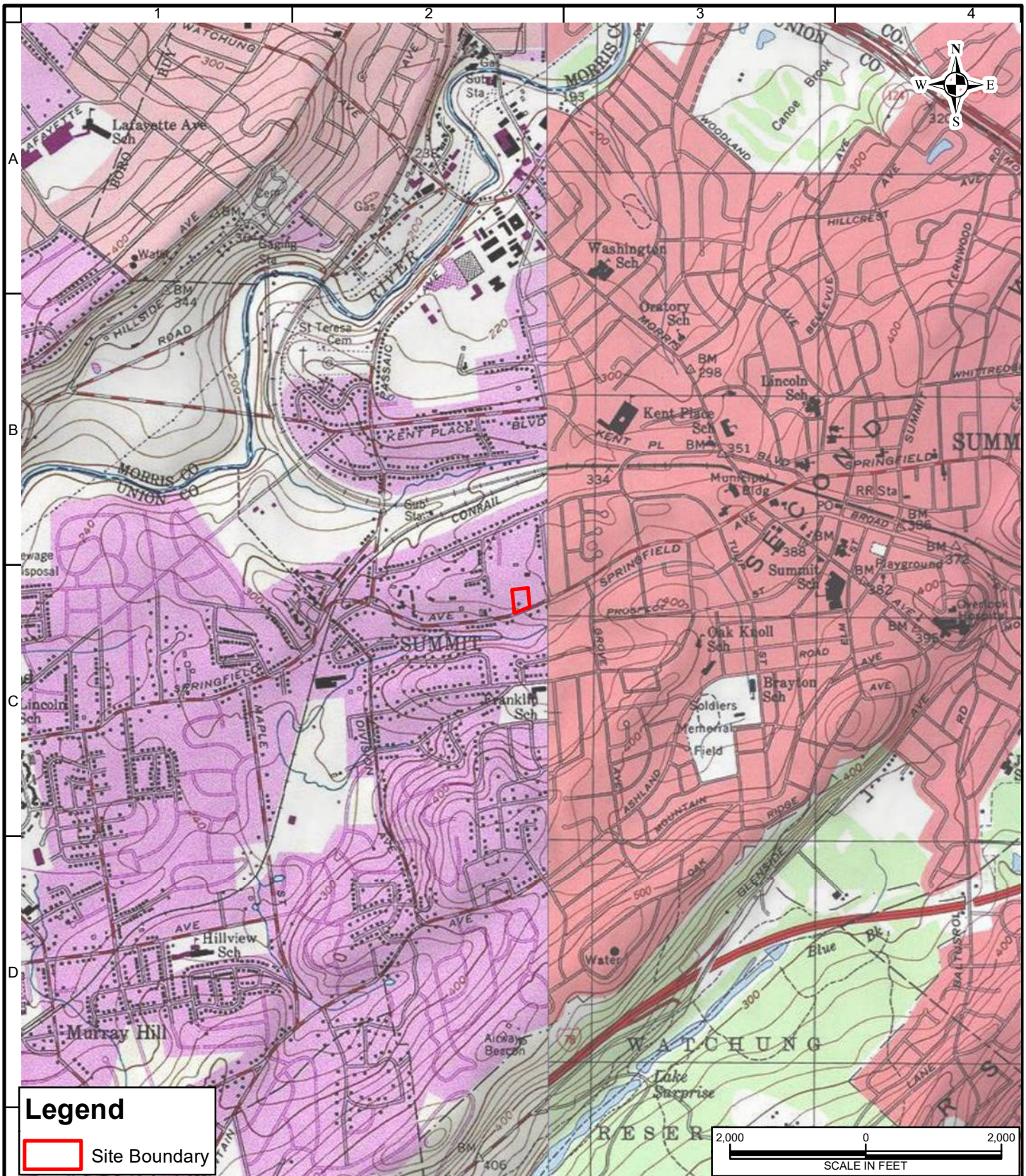
Our Stormwater Management Investigation was performed to assist our Site/Civil Engineers with the design of the proposed stormwater management system associated with the redevelopment project located at 695 Springfield Avenue in Summit, New Jersey.

## **ATTACHMENTS:**

- Figure 1 – Site Location Map
- Figure 2 – Location Plan
- Figure 3 – Soil Survey Map
- Figure 4 – Surficial Geology Map
- Figure 5 – FEMA Flood Map
  
- Table 1 – Basin Groundwater and Soil Mottling Summary
- Table 2 – Single Ring Infiltration Testing Summary
  
- Appendix A – Test Pit Logs
- Appendix B – Single Ring Infiltration Test Results
- Appendix C – Laboratory Testing Results

## **FIGURES**

|                 |                              |
|-----------------|------------------------------|
| <b>Figure 1</b> | <b>Site Location Map</b>     |
| <b>Figure 2</b> | <b>Location Plan</b>         |
| <b>Figure 3</b> | <b>Soil Survey Map</b>       |
| <b>Figure 4</b> | <b>Surficial Geology Map</b> |
| <b>Figure 5</b> | <b>FEMA Flood Map</b>        |



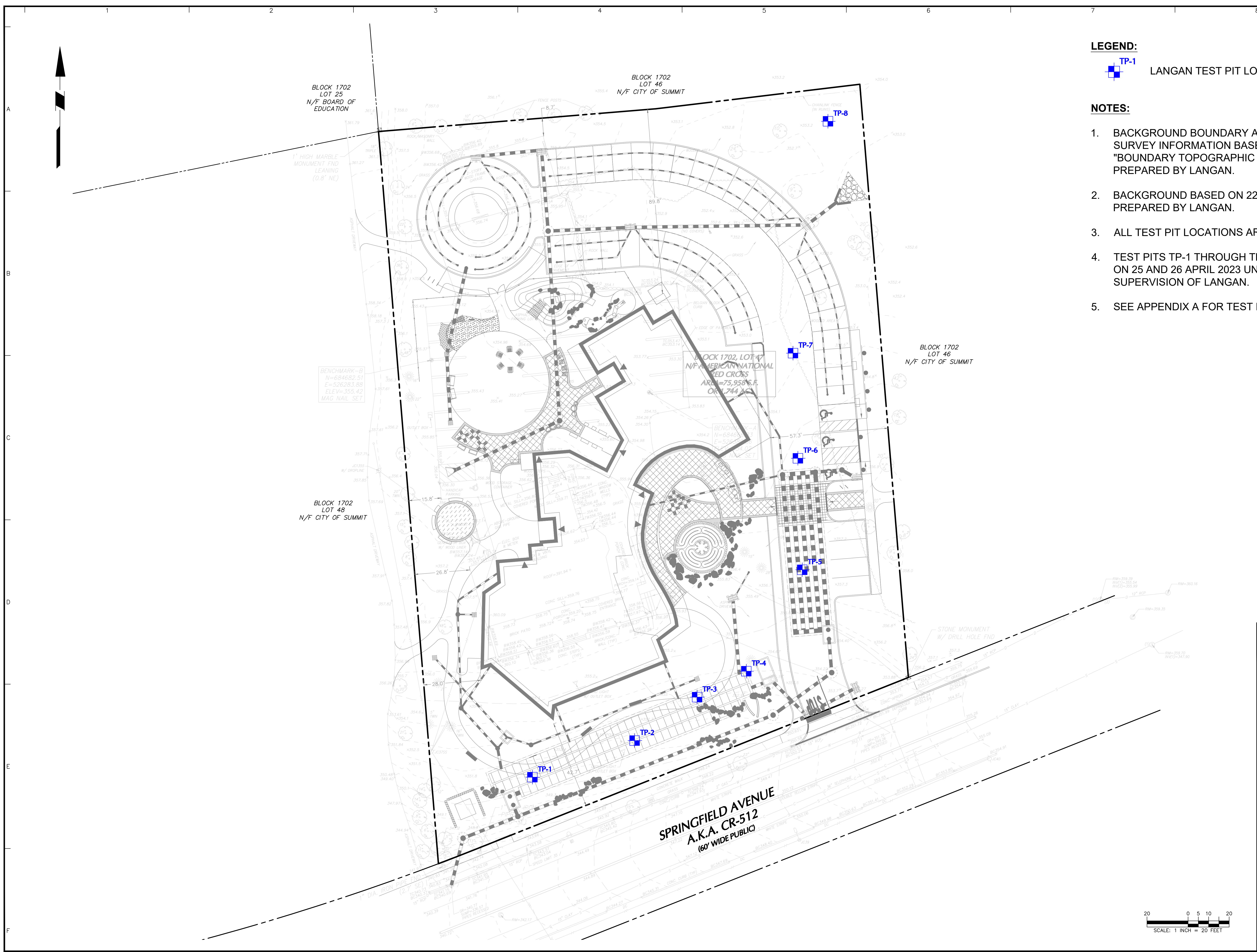
|  |   |  |  |                               |
|--|---|--|--|-------------------------------|
| <p><b>LANGAN</b></p> <p>300 Kimball Drive<br/>Parsippany, NJ 07054<br/>T: 973.560.4900 F: 973.560.4901 www.langan.com</p> <p>Langan Engineering &amp; Environmental Services, Inc.<br/>Langan Engineering, Environmental, Surveying and<br/>Landscape Architecture, D.P.C.<br/>Langan International LLC<br/>Collectively known as Langan</p> <p>NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400</p> | <p>Project</p> <p><b>BEACON<br/>UNIVERSALIST<br/>CHURCH - SUMMIT</b></p> <p>SUMMIT</p> <p>UNION COUNTY NEW JERSEY</p> | <p>Drawing Title</p> <p><b>SITE LOCATION<br/>MAP</b></p> | <p>Project No.<br/>101007201</p> <p>Date<br/>8/11/2023</p> <p>Scale<br/>1" = 2000'</p> <p>Drawn By<br/>IHB</p> | <p>Figure</p> <p><b>1</b></p> |
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**LEGEND:**

 TP-1  
LANGAN TEST PIT LOCATION

**NOTES:**

1. BACKGROUND BOUNDARY AND TOPOGRAPHIC SURVEY INFORMATION BASED ON 8 DECEMBER 2022 "BOUNDARY TOPOGRAPHIC & UTILITY SURVEY" PREPARED BY LANGAN.
2. BACKGROUND BASED ON 22 JUNE 2023 SITE PLAN PREPARED BY LANGAN.
3. ALL TEST PIT LOCATIONS ARE APPROXIMATE.
4. TEST PITS TP-1 THROUGH TP-8 WERE PERFORMED ON 25 AND 26 APRIL 2023 UNDER THE DIRECT SUPERVISION OF LANGAN.
5. SEE APPENDIX A FOR TEST PIT LOGS.

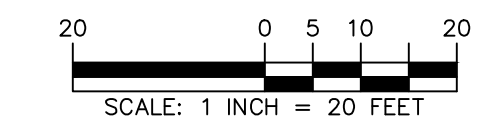


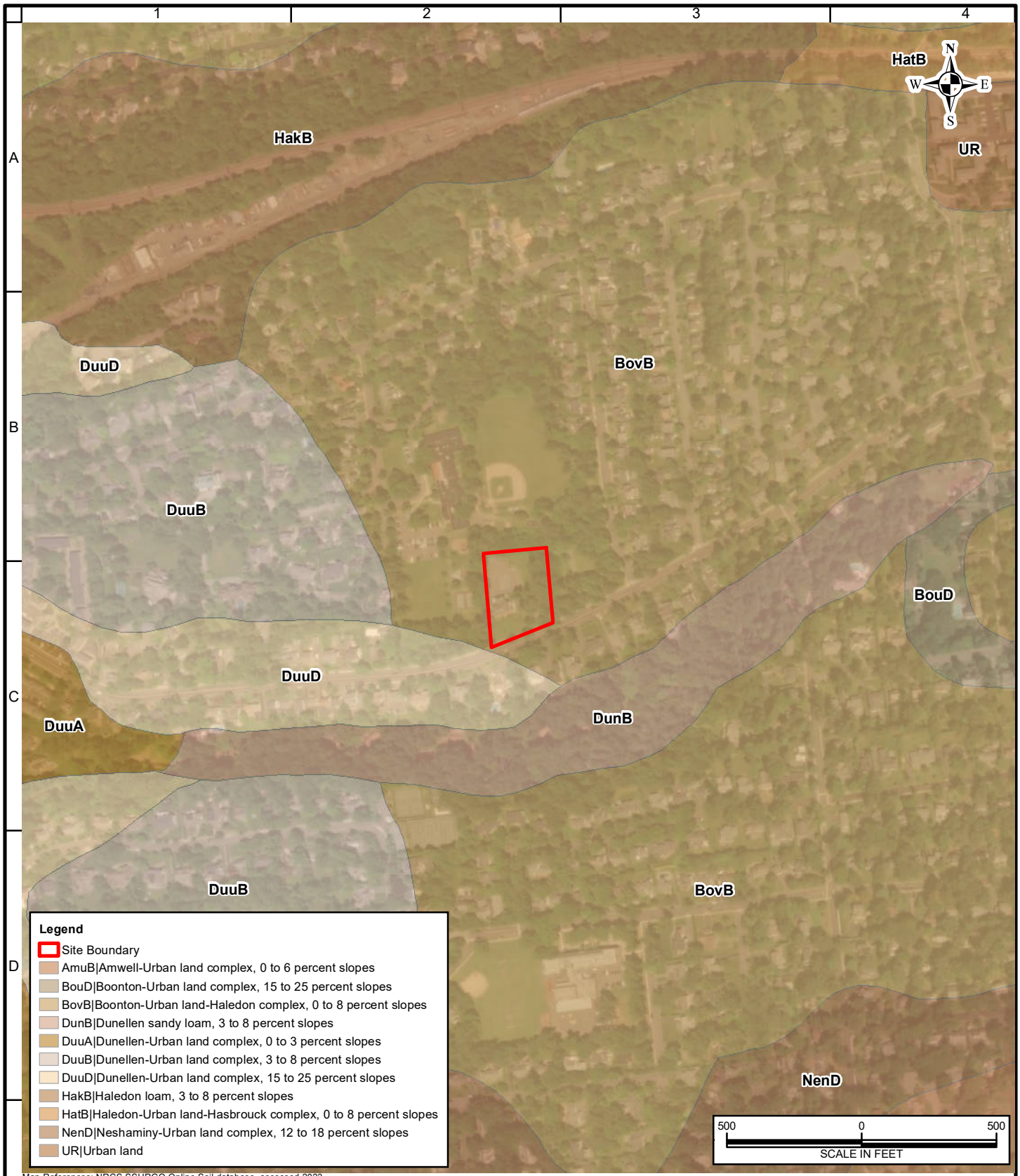
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 NJ CERTIFICATE OF AUTHORIZATION No. 246A27896400

Project  
**BEACON  
 UNIVERSALIST  
 CHURCH - SUMMIT**  
 695 SPRINGFIELD AVENUE  
 BLOCK No. 1702, LOT No. 47  
 CITY OF SUMMIT  
 UNION COUNTY NEW JERSEY

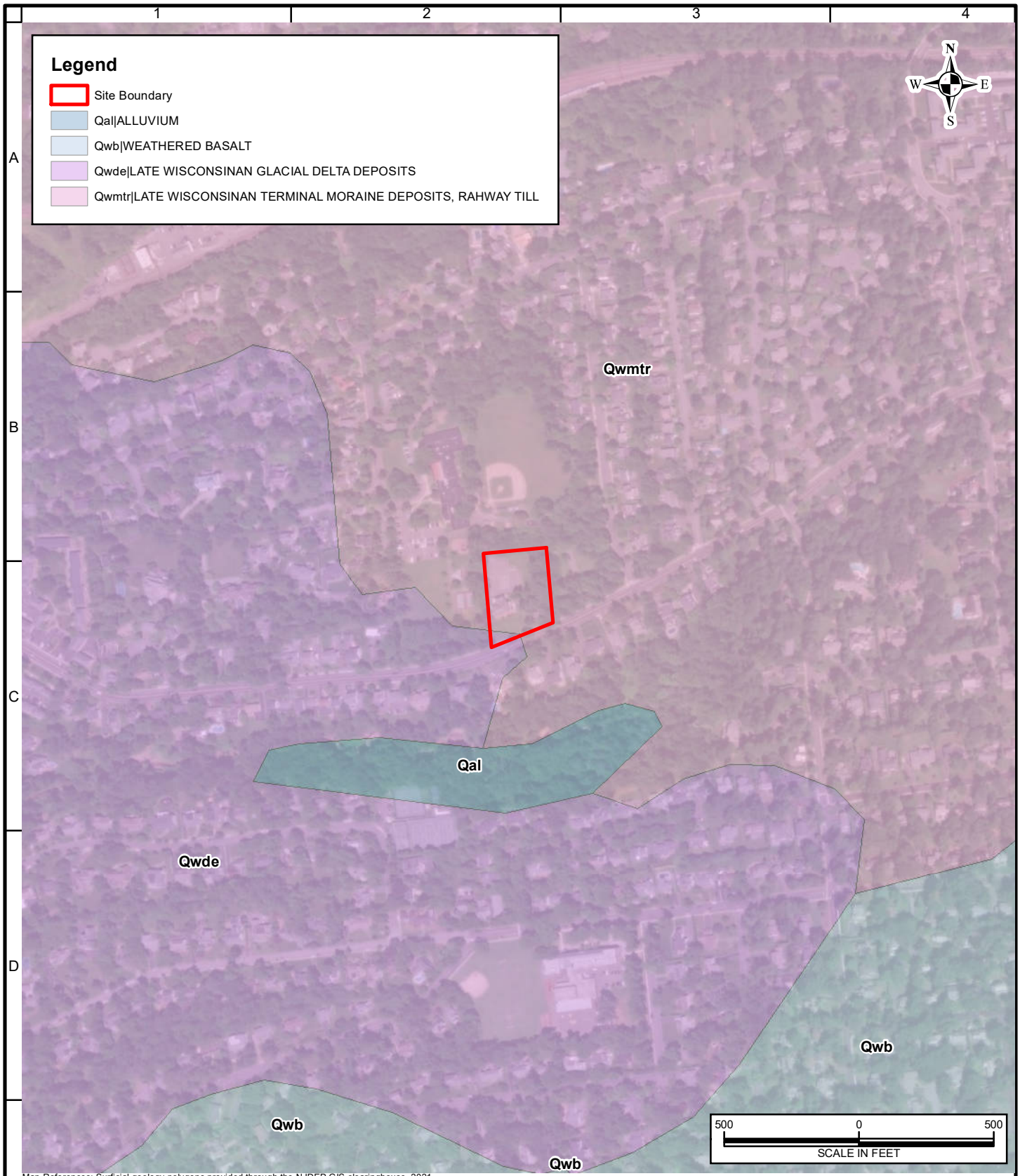
**LOCATION PLAN**

|                                 |                         |
|---------------------------------|-------------------------|
| Project No.<br><b>101007201</b> | Drawing No.<br><b>2</b> |
| Date<br><b>JUNE 28, 2023</b>    |                         |
| Drawn By<br><b>AC</b>           |                         |
| Checked By<br><b>MK</b>         |                         |





|   |   |  |   |                               |
|---|---|--|---|-------------------------------|
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|  |  |  |   |                               |
|--|--|--|---|-------------------------------|
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Map References: FEMA National Flood Hazard Layer

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 Langan International LLC  
 Collectively known as Langan

NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400

Project

**BEACON  
 UNIVERSALIST  
 CHURCH - SUMMIT**

SUMMIT

UNION COUNTY NEW JERSEY

Drawing Title

**FEMA  
 FLOOD MAP**

Project No.  
101007201

Date  
8/11/2023

Scale  
1" = 1000'

Drawn By  
IHB

Figure

**5**

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## **Tables**

**Table 1 Basin Groundwater and Soil Mottling Summary**

**Table 2 Single Ring Infiltration Testing Summary**

**Table 1 - Groundwater and Soil Mottling Summary**

| Test Pit Location | Basin Type            | Existing Elevation | Bottom of Basin Elevation | Design SHGW Elevation | Observed Groundwater (April 2023) |           | Observed Mottling |           | Bottom of Test Pit |           |
|-------------------|-----------------------|--------------------|---------------------------|-----------------------|-----------------------------------|-----------|-------------------|-----------|--------------------|-----------|
|                   |                       |                    |                           |                       | Depth                             | Elevation | Depth             | Elevation | Depth              | Elevation |
| TP-1              | Underground Retention | 351                | 344                       | N.E.                  | N.E.                              | -         | N.E.              | -         | 15                 | 336       |
| TP-2              |                       | 352                |                           | N.E.                  | N.E.                              | -         | N.E.              | -         | 15                 | 337       |
| TP-3              |                       | 352                |                           | N.E.                  | N.E.                              | -         | N.E.              | -         | 15                 | 337       |
| TP-4              |                       | 353                |                           | N.E.                  | N.E.                              | -         | N.E.              | -         | 15                 | 338       |
| TP-5              | Underground Retention | 357                | 348                       | N.E.                  | N.E.                              | -         | N.E.              | -         | 15                 | 342       |
| TP-6              |                       | 355.5              |                           | N.E.                  | N.E.                              | -         | N.E.              | -         | 15                 | 340.5     |
| TP-7              |                       | 353                |                           | 346                   | 7                                 | 346       | N.E.              | -         | 12                 | 341       |
| TP-8              | Infiltration          | 351                | 351                       | N.E.                  | N.E.                              | -         | N.E.              | -         | 14                 | 337       |

**TABLE 2: SINGLE RING INFILTRATION TEST RESULTS**

| Location | Surface Elevation (feet) | Test Depth (feet) | Test Elevation (feet) | Soil Description  | Field Measured Hydraulic Conductivity, K (inches/hour) |
|----------|--------------------------|-------------------|-----------------------|---|--|
| TP-1     | 351                      | 6                 | 345                   | f-c SAND, trace f-c gravel, trace silt, trace cobbles             | 15.1   |
| TP-2     | 352                      | 7                 | 345                   | Gravelly f-m SAND, trace silt, trace cobbles, trace boulders      | 13.3   |
| TP-3     | 352                      | 1                 | 351                   | FILL: Silty f-c SAND, some f-c gravel, trace clay, trace cobbles  | 1.2  |
| TP-4     | 353                      | 1                 | 352                   | FILL: Silty f-c SAND, trace clay, trace f-c gravel, trace cobbles | 0.4  |
| TP-5     | 357                      | 7                 | 350                   | Gravelly f-c SAND, trace silt, trace cobbles                      | 9.4  |
| TP-6     | 355.5                    | 5.5               | 350                   | Silty f-c SAND, some f-c gravel, trace cobbles                    | < 1  |
| TP-7     | 353                      | 3                 | 350                   | fine SAND, trace silt   | 0.8  |
| TP-8     | 351                      | 3                 | 348                   | fine SAND, trace silt   | < 1  |
| TP-8     | 351                      | 4.5               | 346.5                 | fine SAND, some silt  | < 1  |

# **APPENDIX A**

## **Test Pit Logs**

# LOG OF TEST PIT TP-1

|   |  |   |  |
|---|--|---|--|
| PROJECT NAME<br><b>Beacon Unitarian Universalist Church Redevelopment</b> |  | PROJECT NUMBER<br><b>101007201</b>          | DATE<br><b>4/25/2023</b>                           |
| LOCATION<br><b>Summit, New Jersey</b>                                     |  | ELEVATION<br><b>Approx. el 351 (NAVD88)</b> |  |
| EXCAVATION CONTRACTOR<br><b>Clear Ground Development, Inc.</b>            |  | DEPTH<br><b>15 ft</b>                       | WATER LEVEL - First<br><b>N.E.</b>                 |
| EQUIPMENT<br><b>Bobcat E88 Excavator</b>                                  |  | WATER LEVEL - Completion<br><b>-</b>        |  |
|   |  | FOREMAN<br><b>John Briessie</b>             | LANGAN PERSONNEL<br><b>Emmanuel Carreno Guzman</b> |

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| Symbol | ELEV (feet) | DESCRIPTION   | Depth Scale | SAMPLE |      | REMARKS  |
|--------|-------------|---|-------------|--------|------|--|
|        |             |   |             | Number | Type |  |
|        | +351.0      | Dark brown SILT, some f-c sand, trace roots, trace wood (moist)<br>[TOPSOIL - approx. 8" thick] | 0           | S-1    | GRAB | Started excavating at 8:15 AM on 4/25/2023.<br>Fine roots extend to 8'.<br>Large roots extend to 4'.<br>Wood pieces up to 2" in size, encountered from 1' to 2'. |
|        | +350.3      | Light brown Silty f-c SAND, trace f-c gravel, trace clay, trace roots (moist) [FILL]            | 1           | S-2    | GRAB |  |
|        | +348.3      | Reddish brown Silty f-c SAND, trace f-c gravel, trace clay, trace roots (moist)                 | 3           | S-3    | GRAB | Silty SAND extends from 2.7' to 5' on the western test pit sidewall.<br>Silty SAND extends from 2.7' to 7' on the eastern test pit sidewall.                     |
|        | +346.0      | Brown f-c SAND, trace f-c gravel, trace silt, trace cobbles (moist)                             | 5           | S-4    | GRAB |  |
|        | +342.0      | Brown Gravelly f-c SAND, trace silt, trace cobbles (moist)                                      | 9           | S-5    | GRAB | Multiple sidewall collapses from 11' to 15'.   |
|        | +337.5      | Brown f-c SAND, trace f-c gravel, trace cobbles (moist)   | 14          | S-6    | GRAB |  |
|        | +336.0      | End of Test Pit at 15'.   | 15          |        |      | Finished excavating at 8:57 AM on 4/25/2023.<br>Backfilled test pit with excavated material upon completion.   |
|        |             |   | 16          |        |      |  |
|        |             |   | 17          |        |      |  |

# LOG OF TEST PIT TP-2

|   |  |                                      |
|---|--|--------------------------------------|
| PROJECT NAME<br><b>Beacon Unitarian Universalist Church Redevelopment</b> | PROJECT NUMBER<br><b>101007201</b>                 | DATE<br><b>4/25/2023</b>             |
| LOCATION<br><b>Summit, New Jersey</b>                                     | ELEVATION<br><b>Approx. el 352 (NAVD88)</b>        |                                      |
| EXCAVATION CONTRACTOR<br><b>Clear Ground Development, Inc.</b>            | DEPTH<br><b>15 ft</b>                              | WATER LEVEL - First<br><b>N.E.</b>   |
| EQUIPMENT<br><b>Bobcat E88 Excavator</b>                                  | FOREMAN<br><b>John Briessie</b>                    | WATER LEVEL - Completion<br><b>-</b> |
|   | LANGAN PERSONNEL<br><b>Emmanuel Carreno Guzman</b> |                                      |

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| Symbol | ELEV (feet) | DESCRIPTION   | Depth Scale | SAMPLE |      | REMARKS   |
|--------|-------------|---|-------------|--------|------|---|
|        |             |   |             | Number | Type |   |
|        | +352.0      | Dark brown SILT, some f-c sand, trace fine gravel, trace roots (moist) [TOPSOIL - approx. 7" thick] | 0           | S-1    | GRAB | Started excavating at 9:10 AM on 4/25/2023. Fine roots extend to 7'. Large roots up to 0.25" in diameter extend to 2.5'.                    |
|        | +351.4      | Light brown Silty f-c SAND, some f-c gravel, trace clay, trace roots (moist) [FILL]                 | 1           | S-2    | GRAB |   |
|        | +349.9      | Reddish brown Silty f-c SAND, some f-c gravel, trace clay, trace roots (moist)                      | 2           |        |      |   |
|        |             |   | 3           | S-3    | GRAB |   |
|        |             |   | 4           |        |      |   |
|        |             |   | 5           |        |      |   |
|        | +346.8      | Brown f-c SAND, some f-c gravel, trace silt, trace cobbles, trace boulders, trace roots (moist)     | 6           | S-4    | GRAB | Sidewall collapses starting at 5'. Cobbles encountered from 5.5' to 15'. Boulder up to approximately 1.75' in diameter encountered at 5.5'. |
|        |             |   | 7           |        |      |   |
|        | +344.0      | Brown f-c SAND, trace f-c gravel, trace cobbles (moist)   | 8           | S-5    | GRAB |   |
|        |             |   | 9           |        |      |   |
|        |             |   | 10          |        |      |   |
|        |             |   | 11          |        |      |   |
|        |             |   | 12          |        |      |   |
|        |             | Brown f-c SAND, trace f-c gravel, trace cobbles (moist)   | 13          | S-6    | GRAB |   |
|        |             |   | 14          |        |      |   |
|        |             |   | 15          |        |      |   |
|        | +337.0      | End of Test Pit at 15'.   | 15          |        |      | Finished excavating at 9:46 AM on 4/25/2023. Backfilled with excavated material upon completion.  |
|        |             |   | 16          |        |      |   |
|        |             |   | 17          |        |      |   |

# LOG OF TEST PIT TP-3

|   |  |                                      |
|---|--|--------------------------------------|
| PROJECT NAME<br><b>Beacon Unitarian Universalist Church Redevelopment</b> | PROJECT NUMBER<br><b>101007201</b>                 | DATE<br><b>4/25/2023</b>             |
| LOCATION<br><b>Summit, New Jersey</b>                                     | ELEVATION<br><b>Approx. el 352 (NAVD88)</b>        |                                      |
| EXCAVATION CONTRACTOR<br><b>Clear Ground Development, Inc.</b>            | DEPTH<br><b>15 ft</b>                              | WATER LEVEL - First<br><b>N.E.</b>   |
| EQUIPMENT<br><b>Bobcat E88 Excavator</b>                                  | FOREMAN<br><b>John Briessie</b>                    | WATER LEVEL - Completion<br><b>-</b> |
|   | LANGAN PERSONNEL<br><b>Emmanuel Carreno Guzman</b> |                                      |

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| Symbol | ELEV (feet) | DESCRIPTION  | Depth Scale | SAMPLE |      | REMARKS   |
|--------|-------------|--|-------------|--------|------|---|
|        |             |  |             | Number | Type |   |
|        | +352.0      | Dark brown SILT, some f-c sand, trace clay, trace fine gravel, trace roots (moist) [TOPSOIL - approx. 6" thick]                  | 0           | S-1    | GRAB | Started excavating at 10:11 AM on 4/25/2023.<br>Fine roots extend to 10'.<br>Large roots up to 2" in diameter extend to 3'.<br>Tree stump encountered at the eastern sidewall at 0.5'.<br><br>Cobbles encountered from 2' to 15'.<br><br>Old abandoned 6" diameter terracotta pipe clogged with soil extending northeast to southwest encountered at 6'.<br><br>Sidewall collapses starting at 10.5'.<br><br>Finished excavating at 10:53 AM on 4/25/2023.<br>Backfilled with excavated material upon completion. |
|        | +351.5      |  | 1           |        |      |   |
|        |             | 2  |             |        |      |   |
|        | +349.4      | 3  |             |        |      |   |
|        |             | 4  |             |        |      |   |
|        |             | Light brown f-c SAND, some silt, some f-c gravel, some roots, trace clay, trace cobbles (moist) [FILL]                           | 5           | S-2    | GRAB |   |
|        |             |  | 6           |        |      |   |
|        |             | 7  |             |        |      |   |
|        | +344.5      | 8  |             |        |      |   |
|        |             | 9  |             |        |      |   |
|        |             | Reddish brown Silty f-c SAND, some f-c gravel, trace clay, trace cobbles, trace roots, trace terracotta fragments (moist) [FILL] | 10          | S-3    | GRAB |   |
|        |             |  | 11          |        |      |   |
|        |             | 12   |             |        |      |   |
|        | +341.5      | 13   |             |        |      |   |
|        |             | 14   |             |        |      |   |
|        |             | Brown f-c SAND, some f-c gravel, some silt, trace cobbles, trace roots (moist)   | 15          | S-4    | GRAB |   |
|        |             |  | 16          |        |      |   |
|        |             | 17   |             |        |      |   |
|        | +337.0      | 18   |             |        |      |   |
|        |             | 19   |             |        |      |   |
|        |             | Brown f-c SAND, trace f-c gravel, trace silt, trace cobbles (moist)  | 20          | S-5    | GRAB |   |
|        |             |  | 21          |        |      |   |
|        |             | 22   |             |        |      |   |
|        |             | 23   |             |        |      |   |
|        |             | 24   |             |        |      |   |
|        |             | End of Test Pit at 15'.  | 25          |        |      |   |



# LOG OF TEST PIT TP-4

|   |  |                                      |
|---|--|--------------------------------------|
| PROJECT NAME<br><b>Beacon Unitarian Universalist Church Redevelopment</b> | PROJECT NUMBER<br><b>101007201</b>                 | DATE<br><b>4/25/2023</b>             |
| LOCATION<br><b>Summit, New Jersey</b>                                     | ELEVATION<br><b>Approx. el 353 (NAVD88)</b>        |                                      |
| EXCAVATION CONTRACTOR<br><b>Clear Ground Development, Inc.</b>            | DEPTH<br><b>15 ft</b>                              | WATER LEVEL - First<br><b>N.E.</b>   |
| EQUIPMENT<br><b>Bobcat E88 Excavator</b>                                  | FOREMAN<br><b>John Briessie</b>                    | WATER LEVEL - Completion<br><b>-</b> |
|   | LANGAN PERSONNEL<br><b>Emmanuel Carreno Guzman</b> |                                      |

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| Symbol | ELEV (feet) | DESCRIPTION   | Depth Scale | SAMPLE |      | REMARKS  |
|--------|-------------|---|-------------|--------|------|--|
|        |             |   |             | Number | Type |  |
|        | +353.0      | Dark brown SILT, some f-c sand, trace roots (moist) [TOPSOIL - approx. 11" thick]   | 0           | S-1    | GRAB | Started excavating at 11:06 AM on 4/25/2023.<br>Fine roots extend to 8'.<br>Large roots up to 2" in diameter extend to 5.5'.<br>Cobbles encountered from 11" to 15'.<br><br>Ceramic fragments encountered at 2'.<br><br>Fragments of old rusty metal cans encountered from 4' to 5'.<br>Ceramic and glass fragments encountered from 4' to 5.5'.<br>Bricks encountered from 4' to 5.5'.<br><br>Sidewall collapses starting from 7' to 15'. |
|        | +352.1      | Light brown Silty f-c SAND, trace clay, trace f-c gravel, trace cobbles, trace roots, trace ceramic (moist) [FILL]  | 1           | S-2    | GRAB |  |
|        | +350.4      | Reddish brown Silty f-c SAND, trace clay, trace f-c gravel, trace cobbles, trace roots, trace metal, trace ceramic, trace glass, trace brick (moist) [FILL] | 2           |        |      |  |
|        |             |   | 3           |        |      |  |
|        |             |   | 4           | S-3    | GRAB |  |
|        |             |   | 5           |        |      |  |
|        | +347.5      | Reddish brown Silty f-c SAND, some f-c gravel, some cobbles, trace boulders, trace clay, trace roots (moist)  | 6           | S-4    | GRAB |  |
|        |             |   | 7           |        |      |  |
|        |             |   | 8           |        |      |  |
|        | +344.5      | Reddish brown f-c SAND, some f-c gravel, trace silt, trace cobbles (moist)  | 9           | S-5    | GRAB |  |
|        |             |   | 10          |        |      |  |
|        | +342.0      | Reddish brown f-c SAND, trace silt, trace f-c gravel (moist)  | 11          |        |      |  |
|        |             |   | 12          | S-6    | GRAB |  |
|        |             |   | 13          |        |      |  |
|        |             |   | 14          |        |      |  |
|        | +338.0      | End of Test Pit at 15'.   | 15          |        |      | Finished excavating at 11:52 AM on 4/25/2023.<br>Backfilled with excavated material upon completion.   |
|        |             |   | 16          |        |      |  |
|        |             |   | 17          |        |      |  |

# LOG OF TEST PIT TP-5

|   |  |                                      |
|---|--|--------------------------------------|
| PROJECT NAME<br><b>Beacon Unitarian Universalist Church Redevelopment</b> | PROJECT NUMBER<br><b>101007201</b>                 | DATE<br><b>4/25/2023</b>             |
| LOCATION<br><b>Summit, New Jersey</b>                                     | ELEVATION<br><b>Approx. el 357 (NAVD88)</b>        |                                      |
| EXCAVATION CONTRACTOR<br><b>Clear Ground Development, Inc.</b>            | DEPTH<br><b>15 ft</b>                              | WATER LEVEL - First<br><b>N.E.</b>   |
| EQUIPMENT<br><b>Bobcat E88 Excavator</b>                                  | FOREMAN<br><b>John Briessie</b>                    | WATER LEVEL - Completion<br><b>-</b> |
|   | LANGAN PERSONNEL<br><b>Emmanuel Carreno Guzman</b> |                                      |

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| Symbol | ELEV (feet) | DESCRIPTION   | Depth Scale | SAMPLE |      | REMARKS  |
|--------|-------------|---|-------------|--------|------|--|
|        |             |   |             | Number | Type |  |
|        | +357.0      | Dark brown Sandy SILT, trace f-c gravel, trace clay, trace roots (moist) [TOPSOIL - approx. 8" thick] | 0           | S-1    | GRAB | Started excavating at 12:00 PM on 4/25/2023. Fine roots extend to 6'. Large roots up to 4" in diameter extend to 1'. Cobbles encountered from 8" to 15'. |
|        | +356.3      | Reddish brown Silty f-c SAND, some f-c gravel, trace clay, trace cobbles, trace roots (moist) [FILL]  | 1           | S-2    | GRAB |  |
|        | +353.3      | Dark reddish brown Silty f-c SAND, some f-c gravel, trace clay, trace cobbles, trace roots (moist)    | 4           | S-3    | GRAB |  |
|        | +350.0      | Brown f-c GRAVEL, some f-c sand, trace silt, trace cobbles (moist)                                    | 7           | S-4    | GRAB |  |
|        | +346.0      | Brown Gravelly f-c SAND, trace silt, trace cobbles, trace boulders (moist)                            | 11          | S-5    | GRAB | Boulder up to approximately 1.5' in diameter encountered at 11'.   |
|        | +342.0      | End of Test Pit at 15'.   | 15          |        |      | Finished excavating at 12:30 PM on 4/25/2023. Backfilled with excavated material upon completion.  |

# LOG OF TEST PIT TP-6

|   |  |                                      |
|---|--|--------------------------------------|
| PROJECT NAME<br><b>Beacon Unitarian Universalist Church Redevelopment</b> | PROJECT NUMBER<br><b>101007201</b>                 | DATE<br><b>4/25/2023</b>             |
| LOCATION<br><b>Summit, New Jersey</b>                                     | ELEVATION<br><b>Approx. el 355.5 (NAVD88)</b>      |                                      |
| EXCAVATION CONTRACTOR<br><b>Clear Ground Development, Inc.</b>            | DEPTH<br><b>15 ft</b>                              | WATER LEVEL - First<br><b>N.E.</b>   |
| EQUIPMENT<br><b>Bobcat E88 Excavator</b>                                  | FOREMAN<br><b>John Briessie</b>                    | WATER LEVEL - Completion<br><b>-</b> |
|   | LANGAN PERSONNEL<br><b>Emmanuel Carreno Guzman</b> |                                      |

| Symbol | ELEV (feet) | DESCRIPTION   | Depth Scale | SAMPLE |      | REMARKS   |
|--------|-------------|---|-------------|--------|------|---|
|        |             |   |             | Number | Type |   |
|        | +355.5      | Dark brown Sandy SILT, trace clay, trace f-c gravel, trace roots (moist) [TOPSOIL - 7" thick] | 0           | S-1    | GRAB | Started excavating at 12:46 PM on 4/25/2023.<br>Fine roots extend to 5'.<br>Large roots up to 4" in diameter extend to 1'.<br>Cobbles encountered from 7" to 15'.   |
|        | +354.9      | Light orangish brown Silty f-c SAND, trace f-c gravel, trace cobbles, trace roots (moist)     | 1           | S-2    | GRAB |   |
|        | +352.5      | Reddish brown Sandy f-c GRAVEL, some silt, trace cobbles, trace roots (moist)                 | 3           | S-3    | GRAB |   |
|        | +349.5      | Reddish brown Gravelly f-c SAND, some silt, trace clay, trace cobbles (moist)                 | 6           | S-4    | GRAB |   |
|        | +346.0      | Brown f-c SAND, some f-c gravel, trace silt, trace cobbles, trace boulders (moist)            | 10          | S-5    | GRAB |   |
|        | +340.5      | Brown f-c SAND, some f-c gravel, trace silt, trace cobbles, trace boulders (moist)            | 14          | S-6    | GRAB |   |
|        | +340.5      | End of Test Pit at 15'.   | 15          |        |      | Sidewall collapses starting at 9.5'.<br><br>Boulder approximately 1.5' in diameter encountered at 12'.<br><br>Finished excavating at 1:25 PM on 4/25/2023.<br>Backfilled with excavated material upon completion. |
|        |             |   | 16          |        |      |   |
|        |             |   | 17          |        |      |   |

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# LOG OF TEST PIT TP-7

|   |  |   |  |
|---|--|---|--|
| PROJECT NAME<br><b>Beacon Unitarian Universalist Church Redevelopment</b> |  | PROJECT NUMBER<br><b>101007201</b>          | DATE<br><b>4/25/2023</b>                           |
| LOCATION<br><b>Summit, New Jersey</b>                                     |  | ELEVATION<br><b>Approx. el 353 (NAVD88)</b> |  |
| EXCAVATION CONTRACTOR<br><b>Clear Ground Development, Inc.</b>            |  | DEPTH<br><b>12 ft</b>                       | WATER LEVEL - First<br><b>7 ft</b>                 |
| EQUIPMENT<br><b>Bobcat E88 Excavator</b>                                  |  | FOREMAN<br><b>John Briessie</b>             | LANGAN PERSONNEL<br><b>Emmanuel Carreno Guzman</b> |

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| Symbol | ELEV (feet) | DESCRIPTION   | Depth Scale | SAMPLE |      | REMARKS   |
|--------|-------------|---|-------------|--------|------|---|
|        |             |   |             | Number | Type |   |
|        | +353.0      | Dark brown Sandy SILT, trace clay, trace f-c gravel, trace cobbles, trace roots (moist) [TOPSOIL - approx. 11" thick] | 0           | S-1    | GRAB | Started excavating at 1:28 PM on 4/25/2023. Fine roots extend to 3'. Large roots up to 4" in diameter extend to 1'.<br><br>Sidewall collapses starting at 3'.<br><br>Slow trapped groundwater seepage observed from all sides at 4.7'. Stopped prior to backfill.<br><br>Groundwater seepage observed from all sides at 7'.<br><br>Cobbles encountered from 8' to 12'. Boulders up to 1.5' in diameter encountered from 8' to 12'. Difficult digging from 8' to 12'. Multiple sidewall collapses starting at 12'. |
|        | +352.1      | Light yellowish brown fine SAND, trace silt, trace roots (moist)  | 1           | S-2    | GRAB |   |
|        | +350.7      | Light brown f-m SAND, some silt, trace roots (moist)  | 2           | S-3    | GRAB |   |
|        | +349.4      | Light orangish brown fine SAND, trace silt, trace roots (moist to wet)  | 3           | S-4    | GRAB |   |
|        | +345.0      | Light orangish brown fine SAND, trace silt, trace roots (wet)   | 4           | S-5    | GRAB |   |
|        | +341.0      | Light brown f-c SAND, some f-c gravel, trace cobbles, trace boulders (wet)  | 5           | S-6    | GRAB |   |
|        | +341.0      | End of Test Pit at 12'.   | 12          |        |      | Finished excavating at 2:01 PM on 4/25/2023. Backfilled with excavated material upon completion.  |
|        |             |   | 13          |        |      |   |
|        |             |   | 14          |        |      |   |
|        |             |   | 15          |        |      |   |

# LOG OF TEST PIT TP-8

|   |  |                                      |
|---|--|--------------------------------------|
| PROJECT NAME<br><b>Beacon Unitarian Universalist Church Redevelopment</b> | PROJECT NUMBER<br><b>101007201</b>                 | DATE<br><b>4/25/2023</b>             |
| LOCATION<br><b>Summit, New Jersey</b>                                     | ELEVATION<br><b>Approx. el 351 (NAVD88)</b>        |                                      |
| EXCAVATION CONTRACTOR<br><b>Clear Ground Development, Inc.</b>            | DEPTH<br><b>14 ft</b>                              | WATER LEVEL - First<br><b>N.E.</b>   |
| EQUIPMENT<br><b>Bobcat E88 Excavator</b>                                  | FOREMAN<br><b>John Briessie</b>                    | WATER LEVEL - Completion<br><b>-</b> |
|   | LANGAN PERSONNEL<br><b>Emmanuel Carreno Guzman</b> |                                      |

I:\LANGAN\COM\DATA\PAR\DATA2\101007201\PROJECT DATA\DISCIPLINE\GEO\TECHNICAL\GINTLOGS\101007201\_TEST\_PITS\_2023.GPJ ... 8/8/2023 5:17:39 PM ... Report: Log - LANGANTP

| Symbol | ELEV (feet) | DESCRIPTION   | Depth Scale | SAMPLE |      | REMARKS   |
|--------|-------------|---|-------------|--------|------|---|
|        |             |   |             | Number | Type |   |
|        | +351.0      | Dark brown Sandy SILT, trace f-c gravel, trace clay, trace roots (moist) [TOPSOIL - approx. 6" thick]             | 0           | S-1    | GRAB | Started excavating at 2:05 PM on 4/25/2023.<br>Fine roots extend to 4.5'.<br>Large roots extend to 2'.<br>Demo debris (concrete rubble up to 2" in size, metal pieces) encountered from 6" to 16".<br>Plastic and bricks encountered from 6" to 2.4'.<br><br>Slow trapped groundwater seepage observed from all sides at 3.3'.<br>Southeast seepage stopped prior to backfill.<br>Very slow seepage observed from northeast and west sidewalls prior to backfill.<br>Multiple sidewall collapses starting from 4' to 14'. |
|        | +350.5      | Brown f-c SAND, some debris (concrete, metal, brick, plastic), trace silt, trace clay, trace roots (moist) [FILL] | 1           | S-2    | GRAB |   |
|        | +349.7      | Dark reddish brown Silty f-c SAND, trace clay, trace f-c gravel, trace plastic, trace brick (moist) [FILL]        | 2           | S-3    | GRAB |   |
|        | +348.6      | Light brown Silty f-m SAND, trace roots (moist to wet)  | 3           |        |      |   |
|        | +346.8      | Light orangish brown Silty f-m SAND, some silt, trace roots (moist to wet)  | 4           | S-4    | GRAB |   |
|        | +344.0      | Reddish brown Silty f-c SAND, some f-c gravel, trace cobbles (moist)  | 7           | S-5    | GRAB |   |
|        | +339.0      | Dark reddish brown Gravelly f-c SAND, trace cobbles, trace silt (moist)   | 12          | S-6    | GRAB |   |
|        | +337.0      | End of Test Pit at 14'.   | 14          | S-7    | GRAB |   |
|        |             |   | 15          |        |      | Finished excavating at 2:46 PM on 4/25/2023.<br>Backfilled with excavated material upon completion.   |
|        |             |   | 16          |        |      |   |



# **APPENDIX B**

## **Single Ring Infiltration Test Results**

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Beacon Unitarian Universalist Church Redevelopment  
Summit, New Jersey

### FIELD SINGLE RING INFILTRATION TEST TP-1 at 6 ft

|          | Water Refill | Start Time | Water Level Reading (inches) | Elapse Time to Drop 1 inch (hr:min:sec) | Elapse Time To Drop 1 Inch (sec) |
|----------|--------------|------------|------------------------------|---|----------------------------------|
| PRE-SOAK | Fill         | 8:17 AM    | 3                            | -                                       | -                                |
|          |              | 8:22 AM    | 2                            | 0:00:52.7                               | 52.7                             |
|          |              | 8:30 AM    | 1                            | 0:00:40.7                               | 40.7                             |
|          |              | 8:38 AM    | 0                            | 0:00:42.7                               | 42.7                             |
| TEST #1  | Refill       | 8:38 AM    | 3                            | -                                       | -                                |
|          |              | 8:46 AM    | 2                            | 0:01:05.7                               | 65.7                             |
| TEST #2  | Refill       | 8:47 AM    | 3                            | -                                       | -                                |
|          |              | 8:57 AM    | 2                            | 0:01:28.8                               | 88.8                             |
| TEST #3  | Refill       | 8:58 AM    | 3                            | -                                       | -                                |
|          |              | 9:08 AM    | 2                            | 0:01:14.3                               | 74.3                             |
| TEST #4  | Refill       | 9:08 AM    | 3                            | -                                       | -                                |
|          |              | 9:18 AM    | 2                            | 0:01:19.9                               | 79.9                             |
| TEST #5  | Refill       | 9:18 AM    | 3                            | -                                       | -                                |
|          |              | 9:28 AM    | 2                            | 0:01:19.5                               | 79.5                             |
| TEST #6  | Refill       | 9:18 AM    | 3                            | -                                       | -                                |
|          |              | 9:28 AM    | 2                            | 0:01:21.0                               | 81.0                             |
| TEST #7  | Refill       | 9:18 AM    | 3                            | -                                       | -                                |
|          |              | 9:28 AM    | 2                            | 0:01:21.2                               | 81.2                             |

|   |      |
|---|------|
| Final Observed Field Intake Rate (sec/inch) | 81.2 |
|---|------|

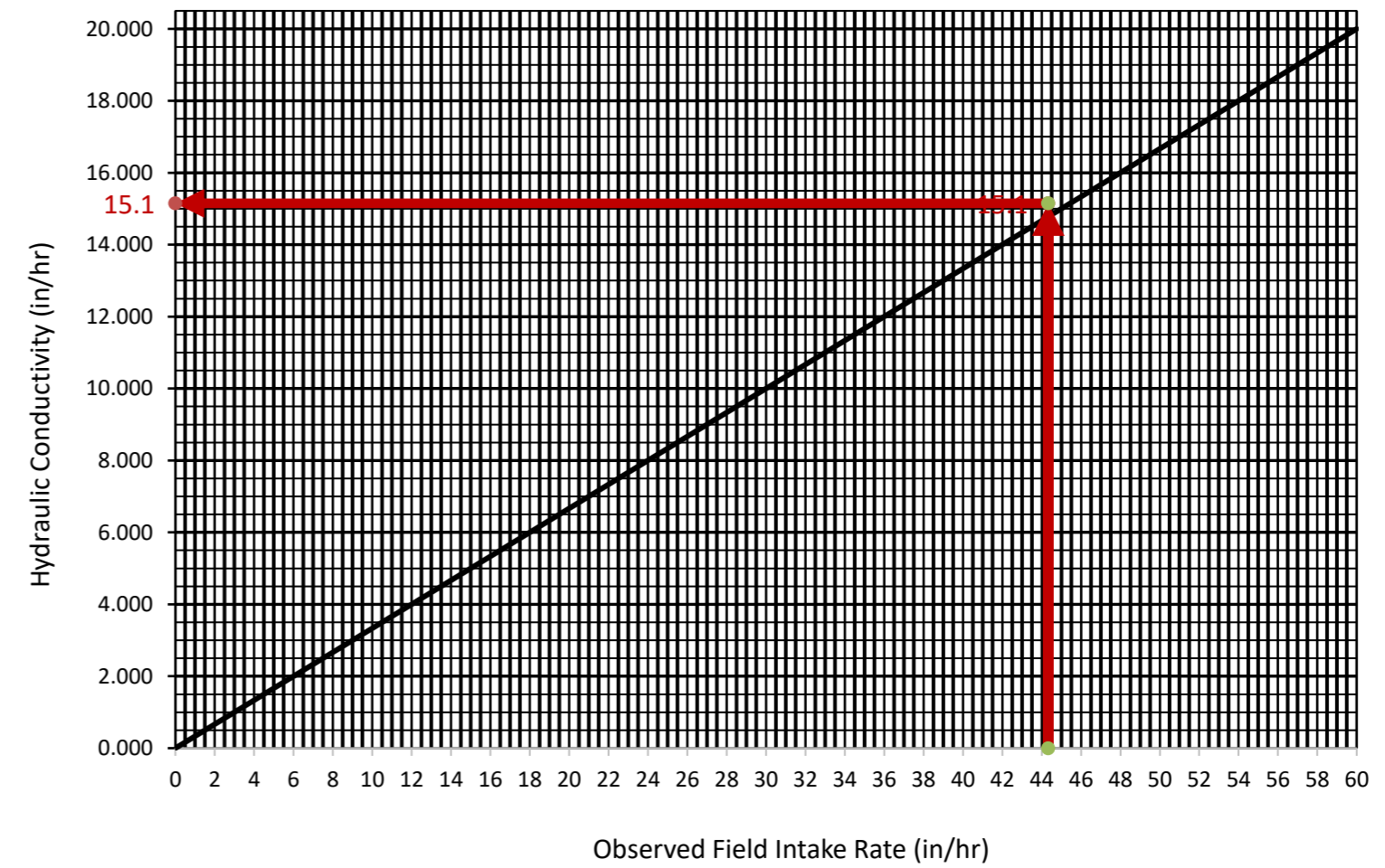
|  |      |
|--|------|
| Final Observed Field Intake Rate (inch/hr) | 44.3 |
|--|------|

|                                  |                         |
|----------------------------------|-------------------------|
| Hydraulic Conductivity (inch/hr) | <b>15.1</b> (see graph) |
|----------------------------------|-------------------------|

|                                   |                          |           |
|-----------------------------------|--------------------------|-----------|
| COORESPONDING PROFILE PIT         | <b>TP-1</b>              |           |
| DATE OF INFILTRATION TEST:        | <b>4/26/2023</b>         |           |
| WEATHER DURING INFILTRATION TEST: | <b>Clear, 60 degrees</b> |           |
| EXISTING SURFACE ELEVATION (el):  | <b>351.0</b>             |           |
| TEST DEPTH:                       | <b>6</b>                 | <b>ft</b> |
| TEST ELEVATION (el):              | <b>345.0</b>             |           |
| APPROXIMATE TOP OF RING (el):     | <b>345.3</b>             |           |
| APPROXIMATE TOP OF BOTTOM (el):   | <b>344.8</b>             |           |

input  
output  
result

Single Ring Test Conversion of  
Observed Field Intake Rate to Hydraulic Conductivity



When the observed field intake rate is greater than 60 in/hr, the hydraulic conductivity shall be reported as "greater than 20 in/hr." When the observed field intake rate is less than 1 in/hr, the hydraulic conductivity shall be reported as "less than 1 in/hr."

**NOTES:**

- 1 Test performed per Chapter 12, Subsection A5: Single Ring Infiltration Test of the November 2020 NJSBMP Manual

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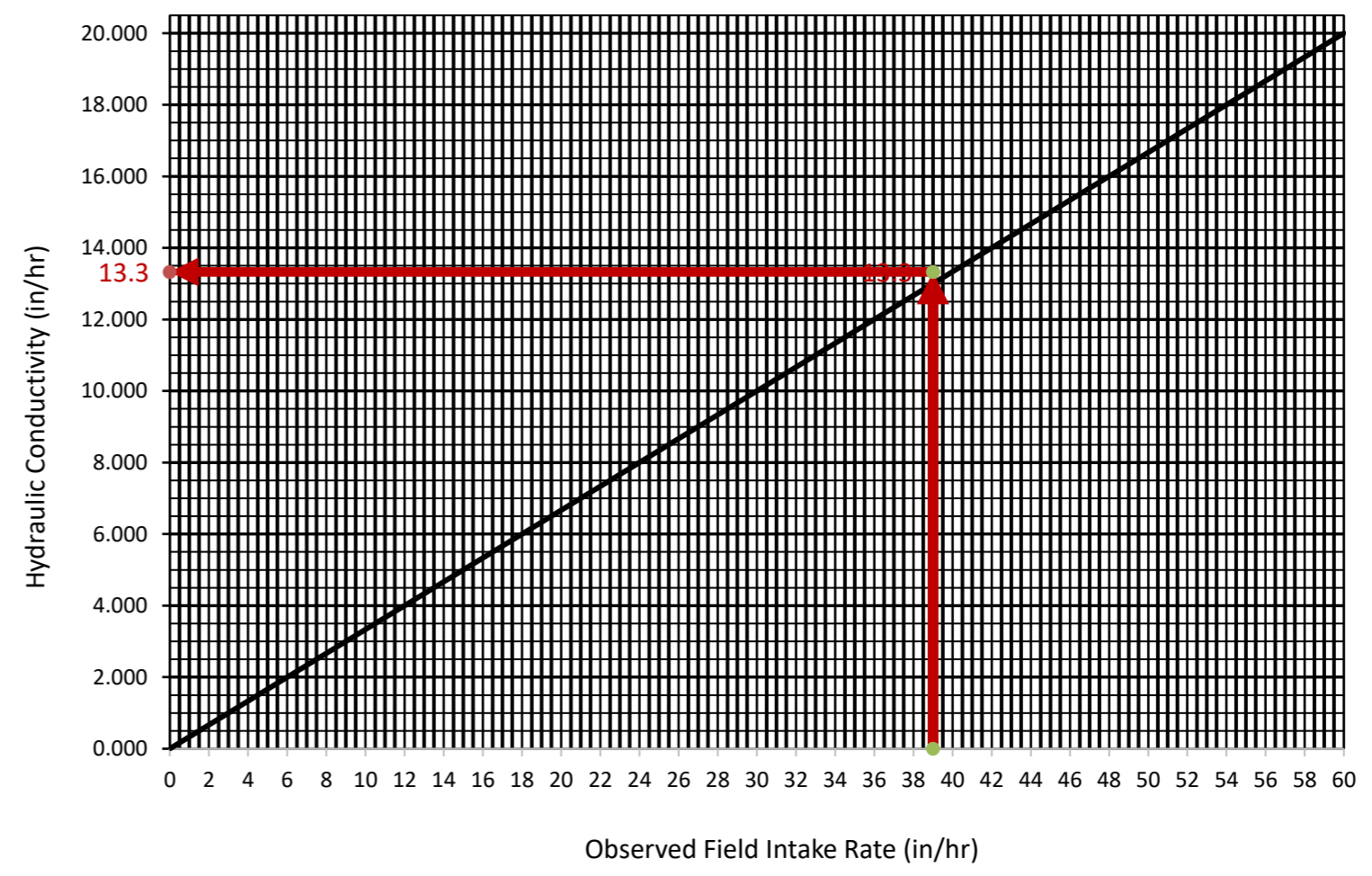
### FIELD SINGLE RING INFILTRATION TEST TP-2 at 7 ft

|          | Water Refill | Start Time | Water Level Reading (inches) | Elapse Time to Drop 1 inch (hr:min:sec) | Elapse Time To Drop 1 Inch (sec) |
|----------|--------------|------------|------------------------------|---|----------------------------------|
| PRE-SOAK | Fill         | 8:00 AM    | 3                            | -                                       | -                                |
|          |              | 8:01 AM    | 2                            | 0:01:26.8                               | 86.8                             |
|          |              | 8:03 AM    | 1                            | 0:01:37.7                               | 97.7                             |
|          |              | 8:04 AM    | 0                            | 0:01:36.6                               | 96.6                             |
| TEST #1  | Refill       | 8:05 AM    | 3                            | -                                       | -                                |
|          |              | 8:06 AM    | 2                            | 0:01:37.7                               | 97.7                             |
| TEST #2  | Refill       | 8:07 AM    | 3                            | -                                       | -                                |
|          |              | 8:08 AM    | 2                            | 0:01:36.9                               | 96.9                             |
| TEST #3  | Refill       | 8:09 AM    | 3                            | -                                       | -                                |
|          |              | 8:10 AM    | 2                            | 0:01:34.4                               | 94.4                             |
| TEST #4  | Refill       | 8:11 AM    | 3                            | -                                       | -                                |
|          |              | 8:12 AM    | 2                            | 0:01:32.6                               | 92.6                             |
| TEST #5  | Refill       | 8:13 AM    | 3                            | -                                       | -                                |
|          |              | 8:14 AM    | 2                            | 0:01:32.3                               | 92.3                             |
| TEST #6  |              |            |                              |   |                                  |
| TEST #7  |              |            |                              |   |                                  |

|                                   |                          |    |
|-----------------------------------|--------------------------|----|
| COORESPONDING PROFILE PIT         | <b>TP-2</b>              |    |
| DATE OF INFILTRATION TEST:        | <b>4/26/2023</b>         |    |
| WEATHER DURING INFILTRATION TEST: | <b>Clear, 60 degrees</b> |    |
| EXISTING SURFACE ELEVATION (el):  | <b>352.0</b>             |    |
| TEST DEPTH:                       | <b>7</b>                 | ft |
| TEST ELEVATION (el):              | <b>345.0</b>             |    |
| APPROXIMATE TOP OF RING (el):     | <b>345.3</b>             |    |
| APPROXIMATE TOP OF BOTTOM (el):   | <b>344.8</b>             |    |

input  
output  
result

Single Ring Test Conversion of Observed Field Intake Rate to Hydraulic Conductivity



|   |                         |
|---|-------------------------|
| Final Observed Field Intake Rate (sec/inch) | 92.3                    |
| Final Observed Field Intake Rate (inch/hr)  | 39.0                    |
| Hydraulic Conductivity (inch/hr)            | <b>13.3</b> (see graph) |

When the observed field intake rate is greater than 60 in/hr, the hydraulic conductivity shall be reported as "greater than 20 in/hr." When the observed field intake rate is less than 1 in/hr, the hydraulic conductivity shall be reported as "less than 1 in/hr."

**NOTES:**

1 Test performed per Chapter 12, Subsection A5: Single Ring Infiltration Test of the November 2020 NJSBMP Manual



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Summit, New Jersey

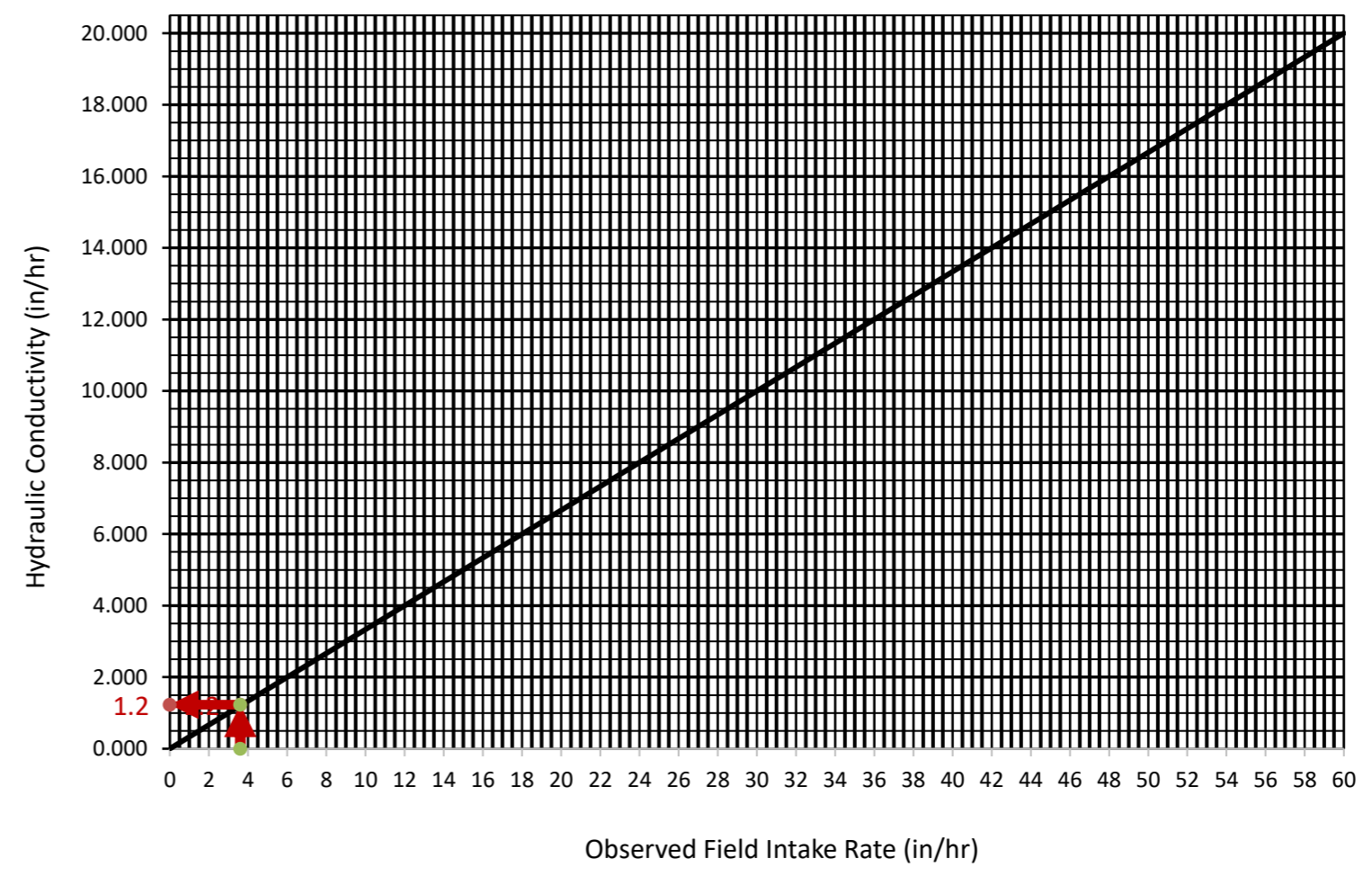
### FIELD SINGLE RING INFILTRATION TEST TP-3 at 1 ft

|          | Water Refill | Start Time | Water Level Reading (inches) | Elapse Time to Drop 1 inch (hr:min:sec) | Elapse Time To Drop 1 Inch (sec) |
|----------|--------------|------------|------------------------------|---|----------------------------------|
| PRE-SOAK | Fill         | 8:30 AM    | 3                            | -                                       | -                                |
|          |              | 8:30 AM    | 2                            | 0:10:13.2                               | 613.2                            |
|          |              | 8:30 AM    | 1                            | 0:12:10.1                               | 730.1                            |
|          |              | 9:07 AM    | 0                            | 0:14:46.7                               | 886.7                            |
| TEST #1  | Refill       | 9:07 AM    | 3                            | -                                       | -                                |
|          |              | 9:20 AM    | 2                            | 0:12:43.5                               | 763.5                            |
| TEST #2  | Refill       | 9:20 AM    | 3                            | -                                       | -                                |
|          |              | 9:35 AM    | 2                            | 0:15:11.7                               | 911.7                            |
| TEST #3  | Refill       | 9:35 AM    | 3                            | -                                       | -                                |
|          |              | 9:51 AM    | 2                            | 0:16:39.1                               | 999.1                            |
| TEST #4  | Refill       | 9:51 AM    | 3                            | -                                       | -                                |
|          |              | 10:08 AM   | 2                            | 0:16:39.6                               | 999.6                            |
| TEST #5  |              |            |                              |   |                                  |
| TEST #6  |              |            |                              |   |                                  |
| TEST #7  |              |            |                              |   |                                  |

|                                   |                          |    |
|-----------------------------------|--------------------------|----|
| COORESPONDING PROFILE PIT:        | <b>TP-3</b>              |    |
| DATE OF INFILTRATION TEST:        | <b>4/26/2023</b>         |    |
| WEATHER DURING INFILTRATION TEST: | <b>Clear, 60 degrees</b> |    |
| EXISTING SURFACE ELEVATION (el):  | <b>352.0</b>             |    |
| TEST DEPTH:                       | <b>1</b>                 | ft |
| TEST ELEVATION (el):              | <b>351.0</b>             |    |
| APPROXIMATE TOP OF RING (el):     | <b>351.3</b>             |    |
| APPROXIMATE TOP OF BOTTOM (el):   | <b>350.8</b>             |    |

input  
output  
result

Single Ring Test Conversion of Observed Field Intake Rate to Hydraulic Conductivity



|   |                        |
|---|------------------------|
| Final Observed Field Intake Rate (sec/inch) | 999.6                  |
| Final Observed Field Intake Rate (inch/hr)  | 3.6                    |
| Hydraulic Conductivity (inch/hr)            | <b>1.2</b> (see graph) |

When the observed field intake rate is greater than 60 in/hr, the hydraulic conductivity shall be reported as "greater than 20 in/hr." When the observed field intake rate is less than 1 in/hr, the hydraulic conductivity shall be reported as "less than 1 in/hr."

NOTES:  
1 Test performed per Chapter 12, Subsection A5: Single Ring Infiltration Test of the November 2020 NJSBMP Manual

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Summit, New Jersey

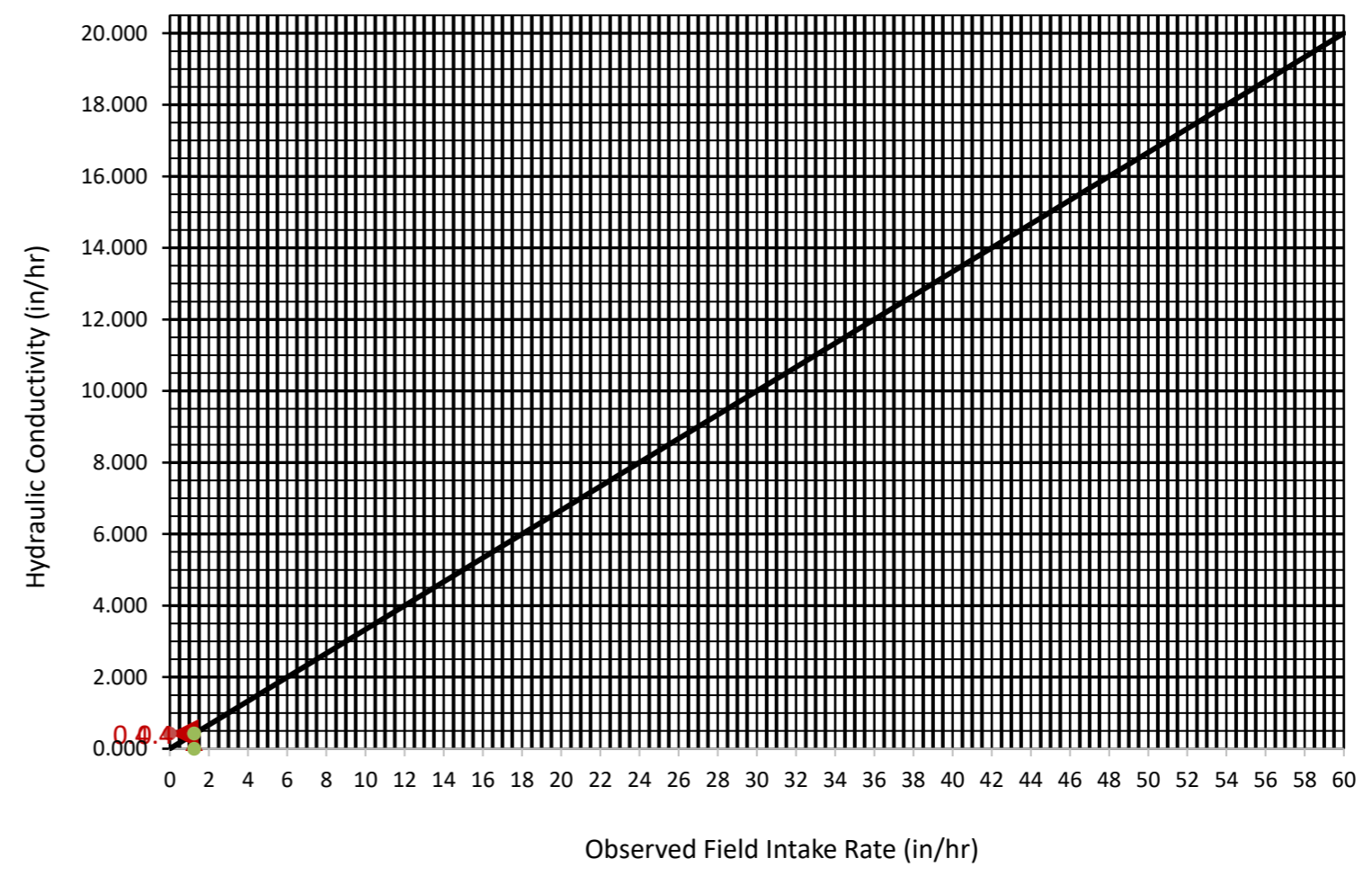
### FIELD SINGLE RING INFILTRATION TEST TP-4 at 1 ft

|          | Water Refill | Start Time | Water Level Reading (inches) | Elapse Time to Drop 1 inch (hr:min:sec) | Elapse Time To Drop 1 Inch (sec) |
|----------|--------------|------------|------------------------------|---|----------------------------------|
| PRE-SOAK | Fill         | 9:10 AM    | 3                            | -                                       | -                                |
|          |              | 9:50 AM    | 2                            | 0:40:40.3                               | 2440.3                           |
|          |              | 10:32 AM   | 1                            | 0:42:30.9                               | 2550.9                           |
|          |              | 11:14 AM   | 0                            | 0:44:50.1                               | 2690.1                           |
| TEST #1  | Refill       | 11:14 AM   | 3                            | -                                       | -                                |
|          |              | 12:02 PM   | 2                            | 0:48:24.2                               | 2904.2                           |
| TEST #2  | Refill       | 12:02 PM   | 3                            | -                                       | -                                |
|          |              | 12:50 PM   | 2                            | 0:48:23.7                               | 2903.7                           |
| TEST #3  | Refill       | 12:50 PM   | 3                            | -                                       | -                                |
|          |              | 1:38 PM    | 2                            | 0:48:23.1                               | 2903.1                           |
| TEST #4  |              |            |                              |   |                                  |
| TEST #5  |              |            |                              |   |                                  |
| TEST #6  |              |            |                              |   |                                  |
| TEST #7  |              |            |                              |   |                                  |

|                                   |                          |    |
|-----------------------------------|--------------------------|----|
| CORESPONDING PROFILE PIT          | <b>TP-4</b>              |    |
| DATE OF INFILTRATION TEST:        | <b>4/26/2023</b>         |    |
| WEATHER DURING INFILTRATION TEST: | <b>Clear, 60 degrees</b> |    |
| EXISTING SURFACE ELEVATION (el):  | <b>353.0</b>             |    |
| TEST DEPTH:                       | <b>1</b>                 | ft |
| TEST ELEVATION (el):              | <b>352.0</b>             |    |
| APPROXIMATE TOP OF RING (el):     | <b>352.3</b>             |    |
| APPROXIMATE TOP OF BOTTOM (el):   | <b>351.8</b>             |    |

input  
output  
result

Single Ring Test Conversion of Observed Field Intake Rate to Hydraulic Conductivity



|   |                        |
|---|------------------------|
| Final Observed Field Intake Rate (sec/inch) | 2903.1                 |
| Final Observed Field Intake Rate (inch/hr)  | 1.2                    |
| Hydraulic Conductivity (inch/hr)            | <b>0.4</b> (see graph) |

When the observed field intake rate is greater than 60 in/hr, the hydraulic conductivity shall be reported as "greater than 20 in/hr." When the observed field intake rate is less than 1 in/hr, the hydraulic conductivity shall be reported as "less than 1 in/hr."

**NOTES:**

1 Test performed per Chapter 12, Subsection A5: Single Ring Infiltration Test of the November 2020 NJSBMP Manual

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Summit, New Jersey

### FIELD SINGLE RING INFILTRATION TEST TP-5 at 7 ft

|          | Water Refill | Start Time | Water Level Reading (inches) | Elapse Time to Drop 1 inch (hr:min:sec) | Elapse Time To Drop 1 Inch (sec) |
|----------|--------------|------------|------------------------------|---|----------------------------------|
| PRE-SOAK | Fill         | 10:30 AM   | 3                            | -                                       | -                                |
|          |              | 10:31 AM   | 2                            | 0:01:15.0                               | 75.0                             |
|          |              | 10:33 AM   | 1                            | 0:01:30.6                               | 90.6                             |
|          |              | 10:35 AM   | 0                            | 0:02:04.9                               | 124.9                            |
| TEST #1  | Refill       | 10:35 AM   | 3                            | -                                       | -                                |
|          |              | 10:37 AM   | 2                            | 0:02:01.9                               | 121.9                            |
| TEST #2  | Refill       | 10:37 AM   | 3                            | -                                       | -                                |
|          |              | 10:39 AM   | 2                            | 0:02:10.6                               | 130.6                            |
| TEST #3  | Refill       | 10:40 AM   | 3                            | -                                       | -                                |
|          |              | 10:42 AM   | 2                            | 0:02:11.4                               | 131.4                            |
| TEST #4  | Refill       | 10:42 AM   | 3                            | -                                       | -                                |
|          |              | 10:44 AM   | 2                            | 0:02:11.3                               | 131.3                            |
| TEST #5  |              |            |                              |   |                                  |
| TEST #6  |              |            |                              |   |                                  |
| TEST #7  |              |            |                              |   |                                  |

|   |       |
|---|-------|
| Final Observed Field Intake Rate (sec/inch) | 131.3 |
|---|-------|

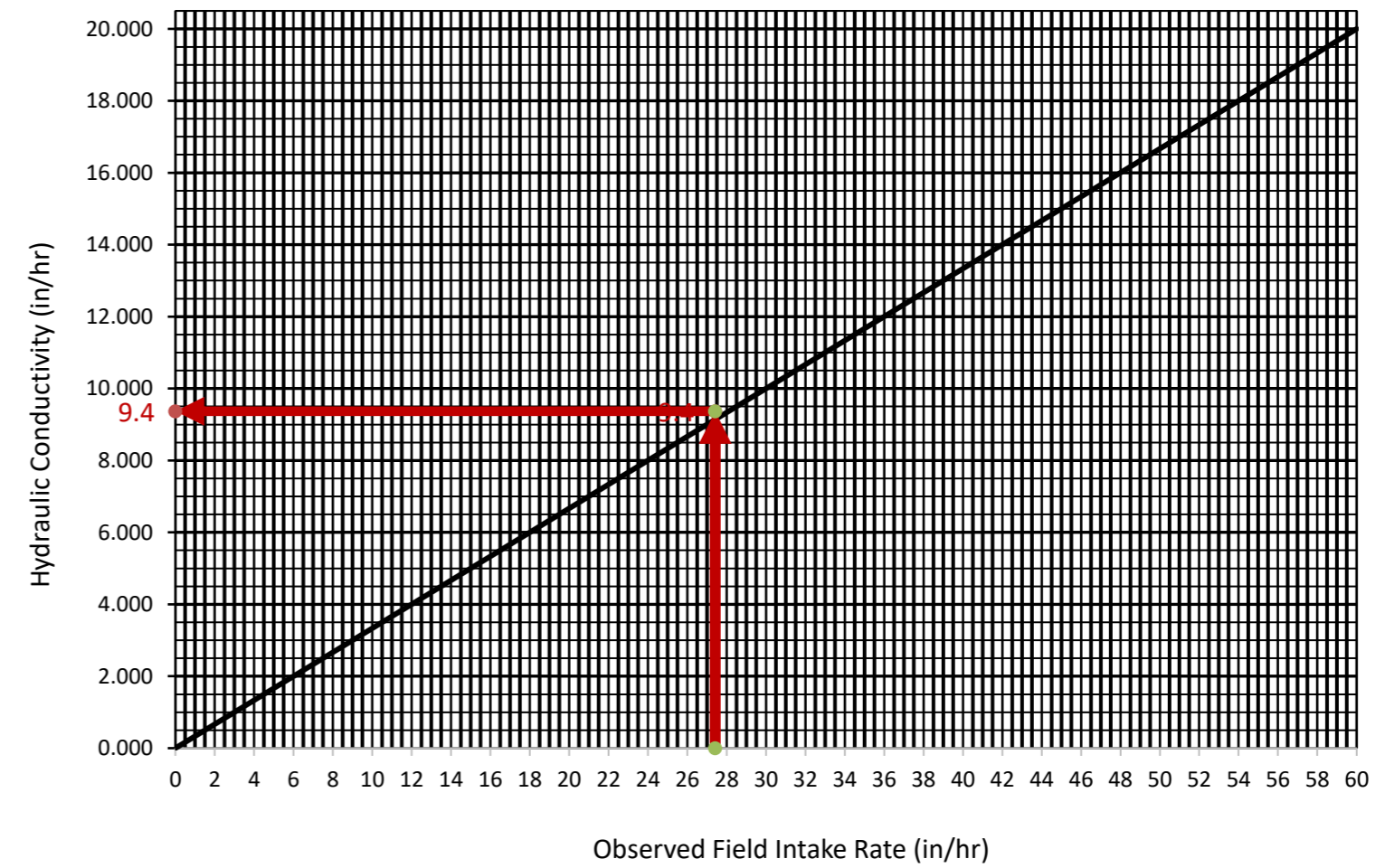
|  |      |
|--|------|
| Final Observed Field Intake Rate (inch/hr) | 27.4 |
|--|------|

|                                  |                        |
|----------------------------------|------------------------|
| Hydraulic Conductivity (inch/hr) | <b>9.4</b> (see graph) |
|----------------------------------|------------------------|

|                                   |                          |    |
|-----------------------------------|--------------------------|----|
| COORESPONDING PROFILE PIT         | <b>TP-5</b>              |    |
| DATE OF INFILTRATION TEST:        | <b>4/26/2023</b>         |    |
| WEATHER DURING INFILTRATION TEST: | <b>Clear, 60 degrees</b> |    |
| EXISTING SURFACE ELEVATION (el):  | <b>357.0</b>             |    |
| TEST DEPTH:                       | <b>7</b>                 | ft |
| TEST ELEVATION (el):              | <b>350.0</b>             |    |
| APPROXIMATE TOP OF RING (el):     | <b>350.3</b>             |    |
| APPROXIMATE TOP OF BOTTOM (el):   | <b>349.8</b>             |    |

input  
output  
result

Single Ring Test Conversion of  
Observed Field Intake Rate to Hydraulic Conductivity



When the observed field intake rate is greater than 60 in/hr, the hydraulic conductivity shall be reported as "greater than 20 in/hr." When the observed field intake rate is less than 1 in/hr, the hydraulic conductivity shall be reported as "less than 1 in/hr."

**NOTES:**

- 1 Test performed per Chapter 12, Subsection A5: Single Ring Infiltration Test of the November 2020 NJSBMP Manual

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Summit, New Jersey

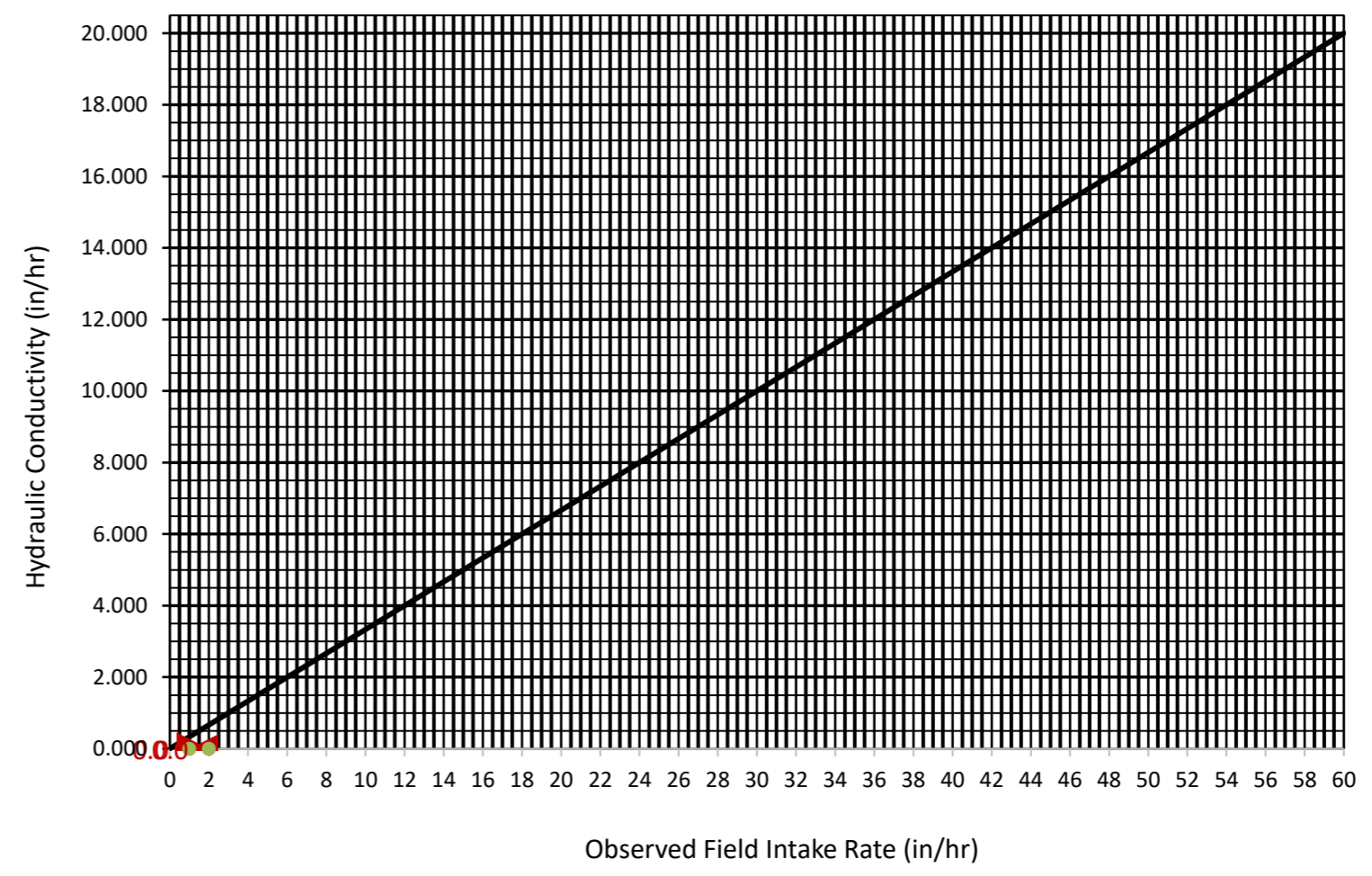
### FIELD SINGLE RING INFILTRATION TEST TP-6 at 5.5 ft

|          | Water Refill | Start Time | Water Level Reading (inches) | Elapse Time to Drop 1 inch (hr:min:sec) | Elapse Time To Drop 1 Inch (sec) |
|----------|--------------|------------|------------------------------|---|----------------------------------|
| PRE-SOAK | Fill         | 11:30 AM   | 3                            | -                                       | -                                |
|          |              | 12:30 PM   | 2.875                        | 1:00:00.0                               | 3600.0                           |
| TEST #1  | Refill       | 12:30 PM   | 3                            | -                                       | -                                |
|          |              | 1:30 PM    | 2.875                        | 1:00:00.0                               | 3600.0                           |
| TEST #2  | Refill       | 1:30 PM    | 3                            | -                                       | -                                |
|          |              | 2:30 PM    | 2.875                        | 1:00:00.0                               | 3600.0                           |
| TEST #3  |              |            |                              |   |                                  |
| TEST #4  |              |            |                              |   |                                  |
| TEST #5  |              |            |                              |   |                                  |
| TEST #6  |              |            |                              |   |                                  |
| TEST #7  |              |            |                              |   |                                  |

|                                   |                          |    |
|-----------------------------------|--------------------------|----|
| CORESPONDING PROFILE PIT          | <b>TP-6</b>              |    |
| DATE OF INFILTRATION TEST:        | <b>4/26/2023</b>         |    |
| WEATHER DURING INFILTRATION TEST: | <b>Clear, 60 degrees</b> |    |
| EXISTING SURFACE ELEVATION (el):  | <b>355.5</b>             |    |
| TEST DEPTH:                       | <b>5.5</b>               | ft |
| TEST ELEVATION (el):              | <b>350.0</b>             |    |
| APPROXIMATE TOP OF RING (el):     | <b>350.3</b>             |    |
| APPROXIMATE TOP OF BOTTOM (el):   | <b>349.8</b>             |    |

input  
output  
result

Single Ring Test Conversion of Observed Field Intake Rate to Hydraulic Conductivity



|   |                            |
|---|----------------------------|
| Final Observed Field Intake Rate (sec/inch) | N/A                        |
| Final Observed Field Intake Rate (inch/hr)  | N/A                        |
| Hydraulic Conductivity (inch/hr)            | <b>&lt;1.0</b> (see graph) |

When the observed field intake rate is greater than 60 in/hr, the hydraulic conductivity shall be reported as "greater than 20 in/hr." When the observed field intake rate is less than 1 in/hr, the hydraulic conductivity shall be reported as "less than 1 in/hr."

**NOTES:**

1 Test performed per Chapter 12, Subsection A5: Single Ring Infiltration Test of the November 2020 NJSBMP Manual

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Beacon Unitarian Universalist Church Redevelopment  
Summit, New Jersey

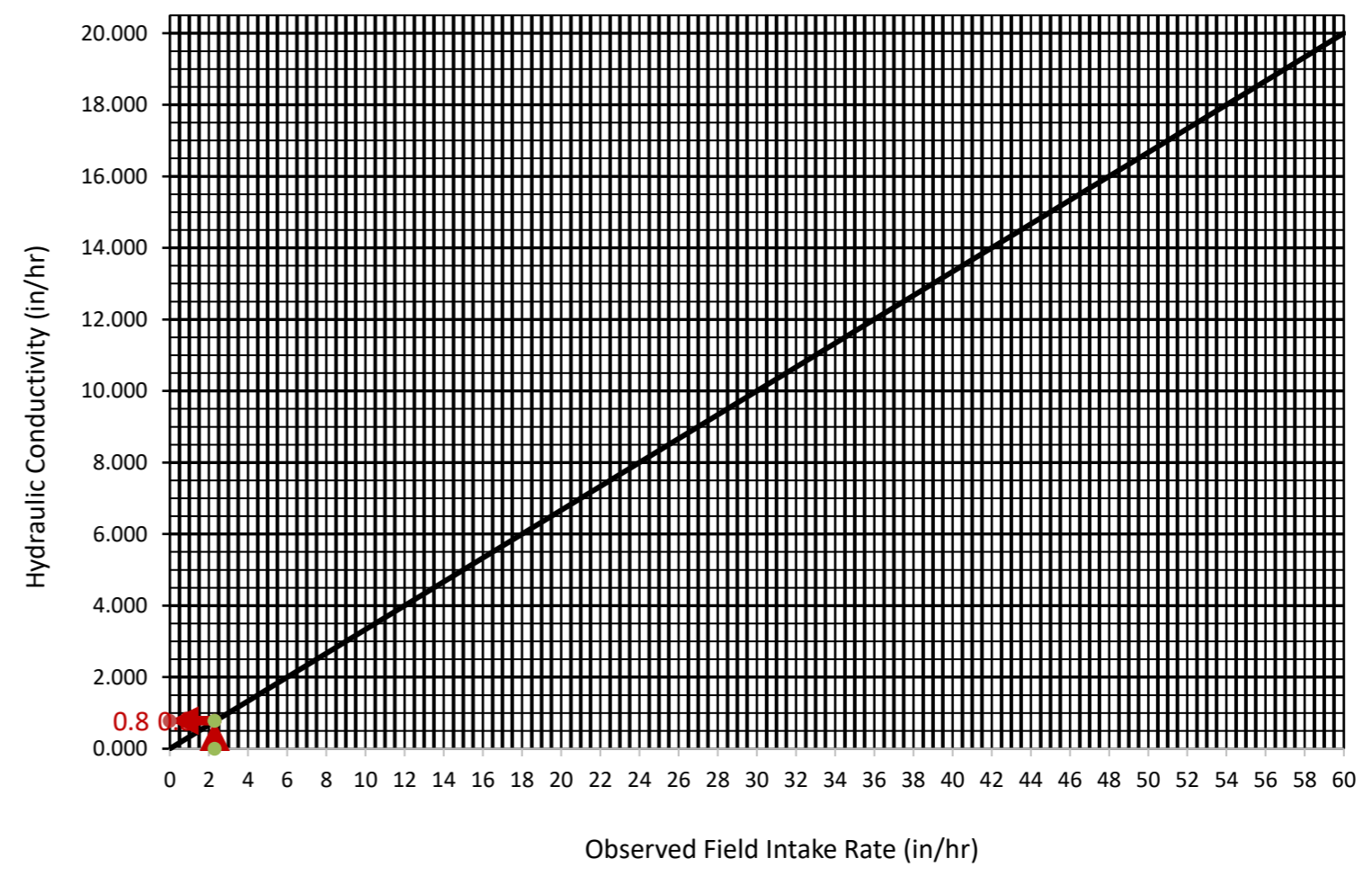
### FIELD SINGLE RING INFILTRATION TEST TP-7 at 3 ft

|          | Water Refill | Start Time | Water Level Reading (inches) | Elapse Time to Drop 1 inch (hr:min:sec) | Elapse Time To Drop 1 Inch (sec) |
|----------|--------------|------------|------------------------------|---|----------------------------------|
| PRE-SOAK | Fill         | 12:00 PM   | 3                            | -                                       | -                                |
|          |              | 12:20 PM   | 2                            | 0:29:46.1                               | 1786.1                           |
|          |              | 1:00 PM    | 1                            | 0:30:42.1                               | 1842.1                           |
|          |              | 1:30 PM    | 0                            | 0:30:54.9                               | 1854.9                           |
| TEST #1  | Refill       | 1:00 PM    | 3                            | -                                       | -                                |
|          |              | 1:26 PM    | 2                            | 0:26:05.4                               | 1565.4                           |
| TEST #2  | Refill       | 1:26 PM    | 3                            | -                                       | -                                |
|          |              | 1:52 PM    | 2                            | 0:26:09.2                               | 1569.2                           |
| TEST #3  | Refill       | 1:52 PM    | 3                            | -                                       | -                                |
|          |              | 2:18 PM    | 2                            | 0:26:09.1                               | 1569.1                           |
| TEST #4  |              |            |                              |   |                                  |
| TEST #5  |              |            |                              |   |                                  |
| TEST #6  |              |            |                              |   |                                  |
| TEST #7  |              |            |                              |   |                                  |

|                                   |                          |    |
|-----------------------------------|--------------------------|----|
| COORESPONDING PROFILE PIT         | <b>TP-7</b>              |    |
| DATE OF INFILTRATION TEST:        | <b>4/26/2023</b>         |    |
| WEATHER DURING INFILTRATION TEST: | <b>Clear, 60 degrees</b> |    |
| EXISTING SURFACE ELEVATION (el):  | <b>353.0</b>             |    |
| TEST DEPTH:                       | <b>3</b>                 | ft |
| TEST ELEVATION (el):              | <b>350.0</b>             |    |
| APPROXIMATE TOP OF RING (el):     | <b>350.3</b>             |    |
| APPROXIMATE TOP OF BOTTOM (el):   | <b>349.8</b>             |    |

input  
output  
result

Single Ring Test Conversion of Observed Field Intake Rate to Hydraulic Conductivity



|   |                        |
|---|------------------------|
| Final Observed Field Intake Rate (sec/inch) | 1569.1                 |
| Final Observed Field Intake Rate (inch/hr)  | 2.3                    |
| Hydraulic Conductivity (inch/hr)            | <b>0.8</b> (see graph) |

When the observed field intake rate is greater than 60 in/hr, the hydraulic conductivity shall be reported as "greater than 20 in/hr." When the observed field intake rate is less than 1 in/hr, the hydraulic conductivity shall be reported as "less than 1 in/hr."

NOTES:  
1 Test performed per Chapter 12, Subsection A5: Single Ring Infiltration Test of the November 2020 NJSBMP Manual

101007201

Beacon Unitarian Universalist Church Redevelopment  
Summit, New Jersey

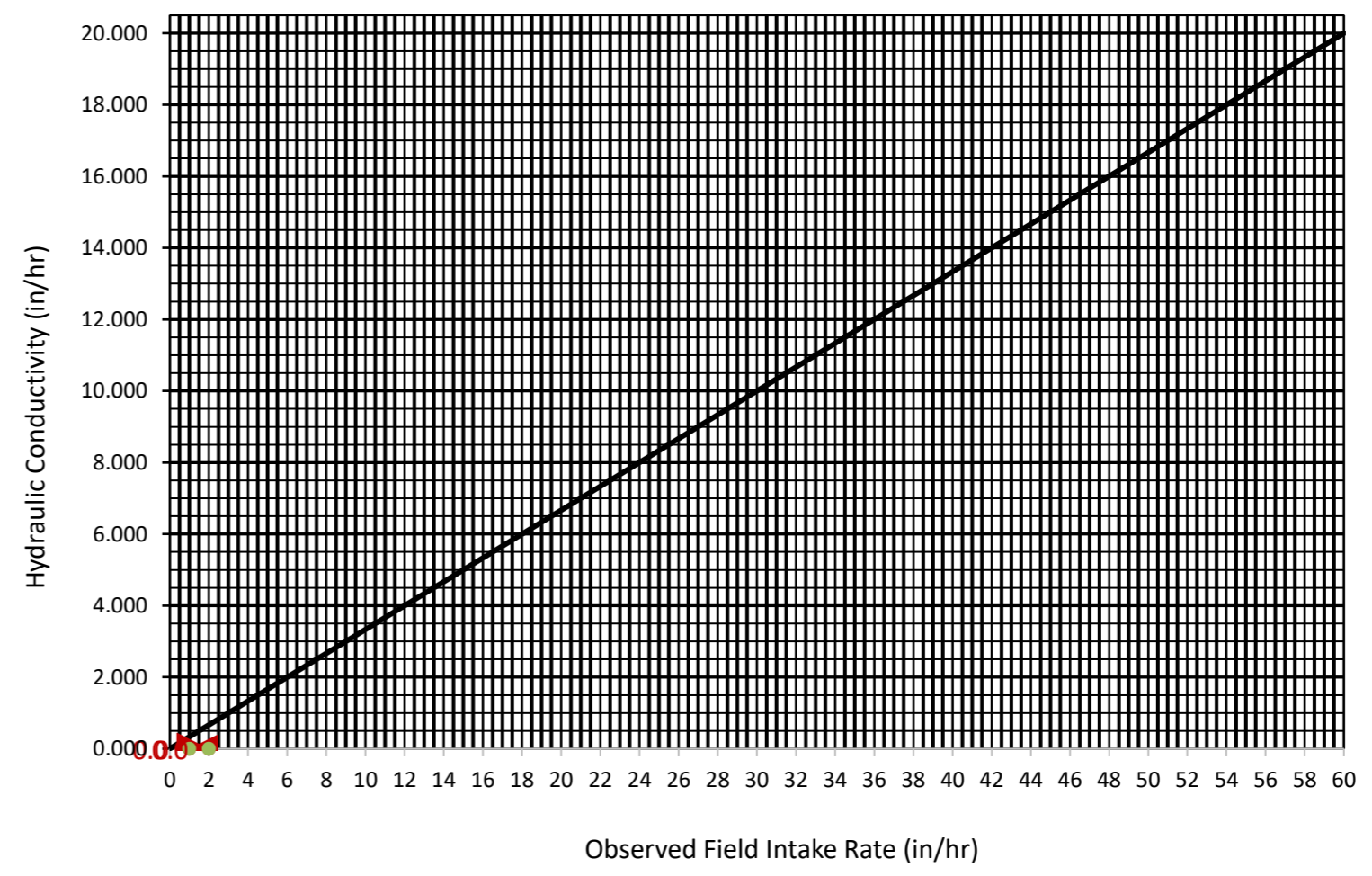
### FIELD SINGLE RING INFILTRATION TEST TP-8 at 3 ft

|          | Water Refill | Start Time | Water Level Reading (inches) | Elapse Time to Drop 1 inch (hr:min:sec) | Elapse Time To Drop 1 Inch (sec) |
|----------|--------------|------------|------------------------------|---|----------------------------------|
| PRE-SOAK | Fill         | 11:45 PM   | 3                            | -                                       | -                                |
|          |              | 12:45 PM   | 2.25                         | 1:00:00.0                               | 3600.0                           |
| TEST #1  | Refill       | 12:45 PM   | 3                            | -                                       | -                                |
|          |              | 1:45 PM    | 2.25                         | 1:00:00.0                               | 3600.0                           |
| TEST #2  | Refill       | 1:45 PM    | 3                            | -                                       | -                                |
|          |              | 2:45 PM    | 2.25                         | 1:00:00.0                               | 3600.0                           |
| TEST #3  |              |            |                              |   |                                  |
| TEST #4  |              |            |                              |   |                                  |
| TEST #5  |              |            |                              |   |                                  |
| TEST #6  |              |            |                              |   |                                  |
| TEST #7  |              |            |                              |   |                                  |

|                                   |                          |    |
|-----------------------------------|--------------------------|----|
| CORESPONDING PROFILE PIT          | <b>TP-8</b>              |    |
| DATE OF INFILTRATION TEST:        | <b>4/26/2023</b>         |    |
| WEATHER DURING INFILTRATION TEST: | <b>Clear, 60 degrees</b> |    |
| EXISTING SURFACE ELEVATION (el):  | <b>351.0</b>             |    |
| TEST DEPTH:                       | <b>3</b>                 | ft |
| TEST ELEVATION (el):              | <b>348.0</b>             |    |
| APPROXIMATE TOP OF RING (el):     | <b>348.3</b>             |    |
| APPROXIMATE TOP OF BOTTOM (el):   | <b>347.8</b>             |    |

input  
output  
result

Single Ring Test Conversion of Observed Field Intake Rate to Hydraulic Conductivity



|   |                            |
|---|----------------------------|
| Final Observed Field Intake Rate (sec/inch) | N/A                        |
| Final Observed Field Intake Rate (inch/hr)  | N/A                        |
| Hydraulic Conductivity (inch/hr)            | <b>&lt;1.0</b> (see graph) |

When the observed field intake rate is greater than 60 in/hr, the hydraulic conductivity shall be reported as "greater than 20 in/hr." When the observed field intake rate is less than 1 in/hr, the hydraulic conductivity shall be reported as "less than 1 in/hr."

NOTES:  
1 Test performed per Chapter 12, Subsection A5: Single Ring Infiltration Test of the November 2020 NJSBMP Manual

101007201

Beacon Unitarian Universalist Church Redevelopment  
Summit, New Jersey

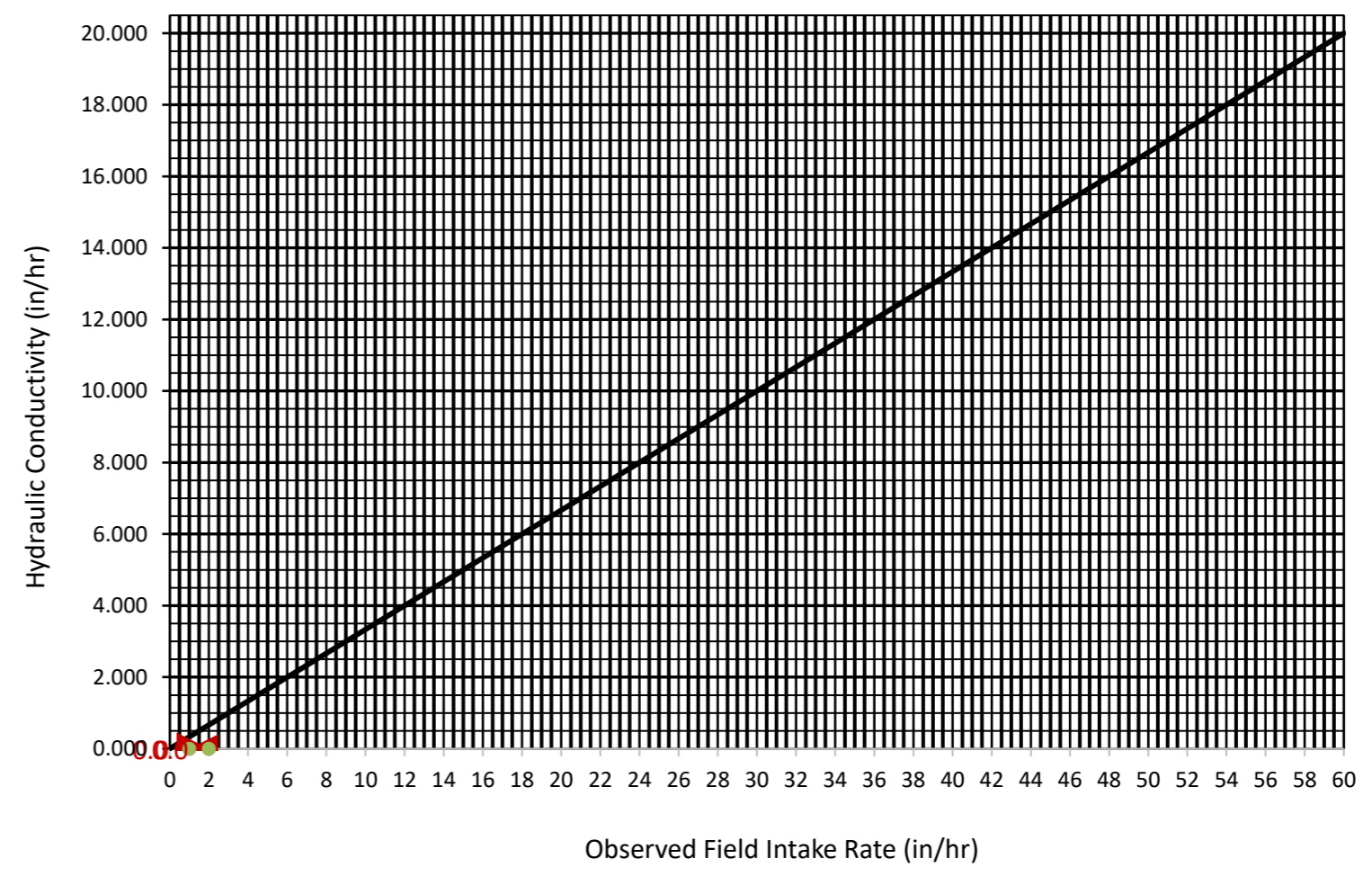
### FIELD SINGLE RING INFILTRATION TEST TP-8 at 4.5 ft

|          | Water Refill | Start Time | Water Level Reading (inches) | Elapse Time to Drop 1 inch (hr:min:sec) | Elapse Time To Drop 1 Inch (sec) |
|----------|--------------|------------|------------------------------|---|----------------------------------|
| PRE-SOAK | Fill         | 11:40 AM   | 3                            | -                                       | -                                |
|          |              | 12:40 PM   | 2.5                          | 1:00:00.0                               | 3600.0                           |
| TEST #1  | Fill         | 13:41 PM   | 3                            | -                                       | -                                |
|          |              | 12:41 PM   | 2.75                         | 1:00:00.0                               | 3600.0                           |
| TEST #2  |              |            |                              |   |                                  |
| TEST #3  |              |            |                              |   |                                  |
| TEST #4  |              |            |                              |   |                                  |
| TEST #5  |              |            |                              |   |                                  |
| TEST #6  |              |            |                              |   |                                  |
| TEST #7  |              |            |                              |   |                                  |

|                                   |                          |    |
|-----------------------------------|--------------------------|----|
| CORESPONDING PROFILE PIT          | <b>TP-8</b>              |    |
| DATE OF INFILTRATION TEST:        | <b>4/26/2023</b>         |    |
| WEATHER DURING INFILTRATION TEST: | <b>Clear, 60 degrees</b> |    |
| EXISTING SURFACE ELEVATION (el):  | <b>351.0</b>             |    |
| TEST DEPTH:                       | <b>4.5</b>               | ft |
| TEST ELEVATION (el):              | <b>346.5</b>             |    |
| APPROXIMATE TOP OF RING (el):     | <b>346.8</b>             |    |
| APPROXIMATE TOP OF BOTTOM (el):   | <b>346.3</b>             |    |

input  
output  
result

Single Ring Test Conversion of Observed Field Intake Rate to Hydraulic Conductivity



|   |                            |
|---|----------------------------|
| Final Observed Field Intake Rate (sec/inch) | N/A                        |
| Final Observed Field Intake Rate (inch/hr)  | N/A                        |
| Hydraulic Conductivity (inch/hr)            | <b>&lt;1.0</b> (see graph) |

When the observed field intake rate is greater than 60 in/hr, the hydraulic conductivity shall be reported as "greater than 20 in/hr." When the observed field intake rate is less than 1 in/hr, the hydraulic conductivity shall be reported as "less than 1 in/hr."

**NOTES:**

1 Test performed per Chapter 12, Subsection A5: Single Ring Infiltration Test of the November 2020 NJSBMP Manual

# **APPENDIX C**

## **Laboratory Testing Results**





1017 Greeley Ave N  
Union, NJ 07083  
908-964-0786  
www.RSAGEOLAB.com

**Letter of Transmittal**

Date: 7-3-23

Job No.: 869

Lab Log: 23-2713

Attention: Kristen Shetler  
Langan Engineering & Environmental Services  
300 Kimball Drive, 4<sup>th</sup> Floor  
Parsippany, NJ 07054

CC: Arthur Roesler, J. Villaverde

Re: Beacon Unitarian Universalist Church Redevelopment, Summit, NJ  
Proj. No. 101007201

Sample(s) ID: **TP-1 SR-1 thru TP-8 SR-2** (9 samples)

Dear Ms. Shetler,

Please find attached results for the samples referenced above. The following lab testing was performed:

- ASTM D422 Washed Sieve Analysis

Regards,  
RSA Geolab, LLC

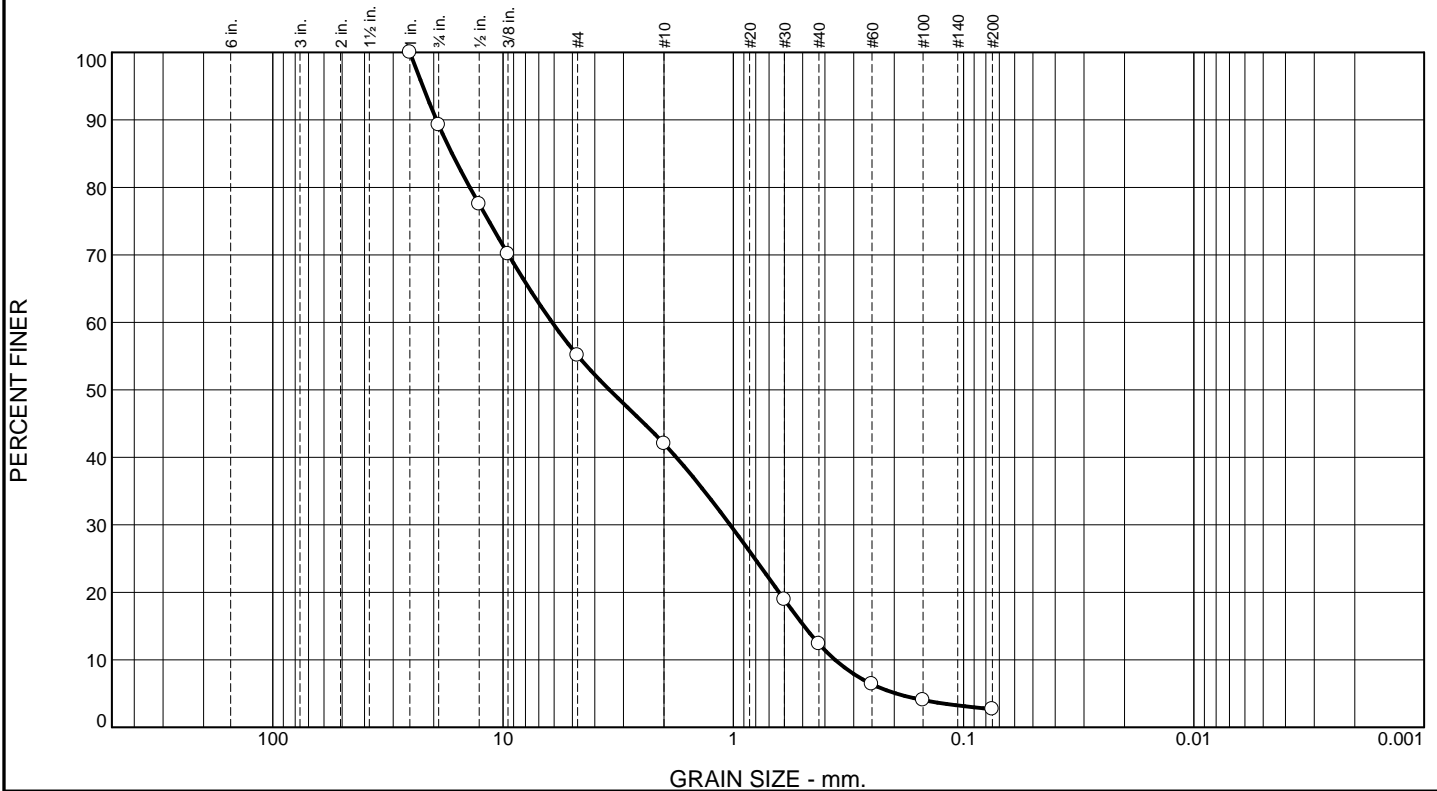
Remarks: If you have any questions, please call 908-964-0786.

Signed: \_\_\_\_\_

Dr. Raza S. Ahmed  
President RSA Geolab, LLC

RSA's Geolab's Geotechnical Laboratory testing was performed and results reported in accordance with ASTM standards and accepted industry standards. No other representations or warranties either express or implied are given. RSA Geolab, LLC neither accepts responsibility for nor makes claim to the final use and purpose of the material tested. RSA Geolab, LLC owns all rights, title and interest of the work product. This report is intended for client's sole and exclusive use and not for the benefit of others and may not be used or relied upon by others. These documents must be considered proprietary information and should not be reproduced without the written approval of RSA Geolab, LLC.

# Particle Size Distribution Report



| % +3" | % Gravel |      | % Sand |        |      | % Fines |      |
|-------|----------|------|--------|--------|------|---------|------|
|       | Coarse   | Fine | Coarse | Medium | Fine | Silt    | Clay |
| 0.0   | 10.7     | 34.2 | 13.1   | 29.6   | 9.7  | 2.7     |      |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|------------|---------------|----------------|--------------|
| 1          | 100.0         |                |              |
| .75        | 89.3          |                |              |
| .5         | 77.5          |                |              |
| .375       | 70.1          |                |              |
| #4         | 55.1          |                |              |
| #10        | 42.0          |                |              |
| #30        | 18.9          |                |              |
| #40        | 12.4          |                |              |
| #60        | 6.4           |                |              |
| #100       | 4.0           |                |              |
| #200       | 2.7           |                |              |

**Material Description**

Brown

PL=                      **Atterberg Limits**                      PI=

**Coefficients**

D<sub>90</sub>= 19.4622                      D<sub>85</sub>= 16.6547                      D<sub>60</sub>= 6.1245

D<sub>50</sub>= 3.4504                      D<sub>30</sub>= 1.0330                      D<sub>15</sub>= 0.4932

D<sub>10</sub>= 0.3617                      C<sub>u</sub>= 16.93                      C<sub>c</sub>= 0.48

USCS=                      **Classification**                      AASHTO=

**Remarks**

\* (no specification provided)

Sample Number: TP-1 SR-1 6'

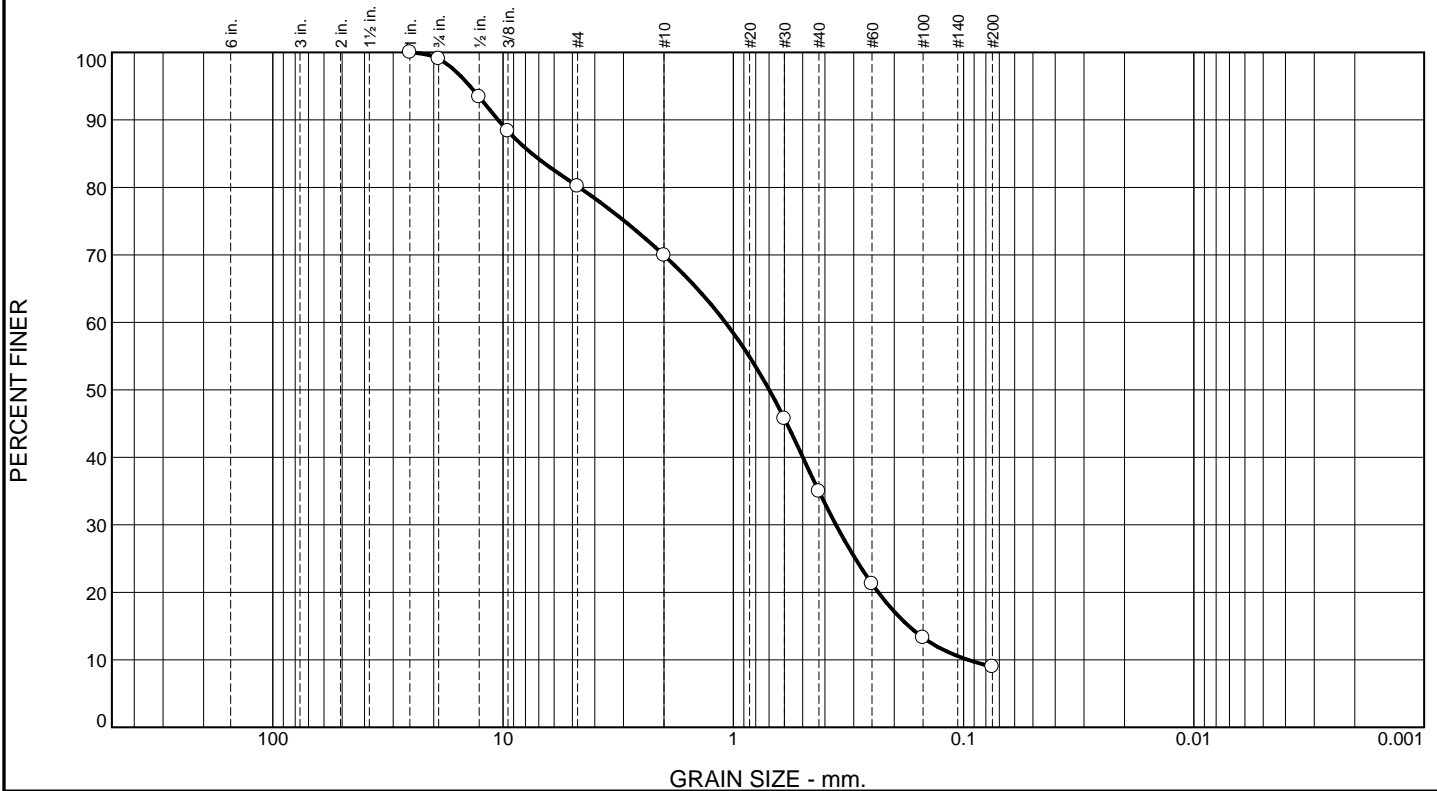
Date: 7-3-23

|  |  |
|--|--|
| <p><b>RSA Geolab</b></p> <p><b>Union, New Jersey</b></p> | <p><b>Client:</b> Langan Engineering</p> <p><b>Project:</b> Beacon Unitarian Universalist Church Redevelopment, Summit, NJ<br/>Project#101007201</p> <p><b>Project No:</b> 869</p> |
|--|--|

Figure

Tested By: AO                      Checked By: KP

# Particle Size Distribution Report



| % +3" | % Gravel |      | % Sand |        |      | % Fines |      |
|-------|----------|------|--------|--------|------|---------|------|
|       | Coarse   | Fine | Coarse | Medium | Fine | Silt    | Clay |
| 0.0   | 0.9      | 18.9 | 10.3   | 34.9   | 26.0 | 9.0     |      |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|------------|---------------|----------------|--------------|
| 1          | 100.0         |                |              |
| .75        | 99.1          |                |              |
| .5         | 93.4          |                |              |
| .375       | 88.3          |                |              |
| #4         | 80.2          |                |              |
| #10        | 69.9          |                |              |
| #30        | 45.7          |                |              |
| #40        | 35.0          |                |              |
| #60        | 21.3          |                |              |
| #100       | 13.3          |                |              |
| #200       | 9.0           |                |              |

**Material Description**

Strong Brown

PL=                      **Atterberg Limits**                      PI=

LL=

**Coefficients**

D<sub>90</sub>= 10.5133      D<sub>85</sub>= 7.4939                      D<sub>60</sub>= 1.0825

D<sub>50</sub>= 0.6982      D<sub>30</sub>= 0.3584                      D<sub>15</sub>= 0.1730

D<sub>10</sub>= 0.0955      C<sub>u</sub>= 11.33                      C<sub>c</sub>= 1.24

USCS=                      **Classification**                      AASHTO=

**Remarks**

\* (no specification provided)

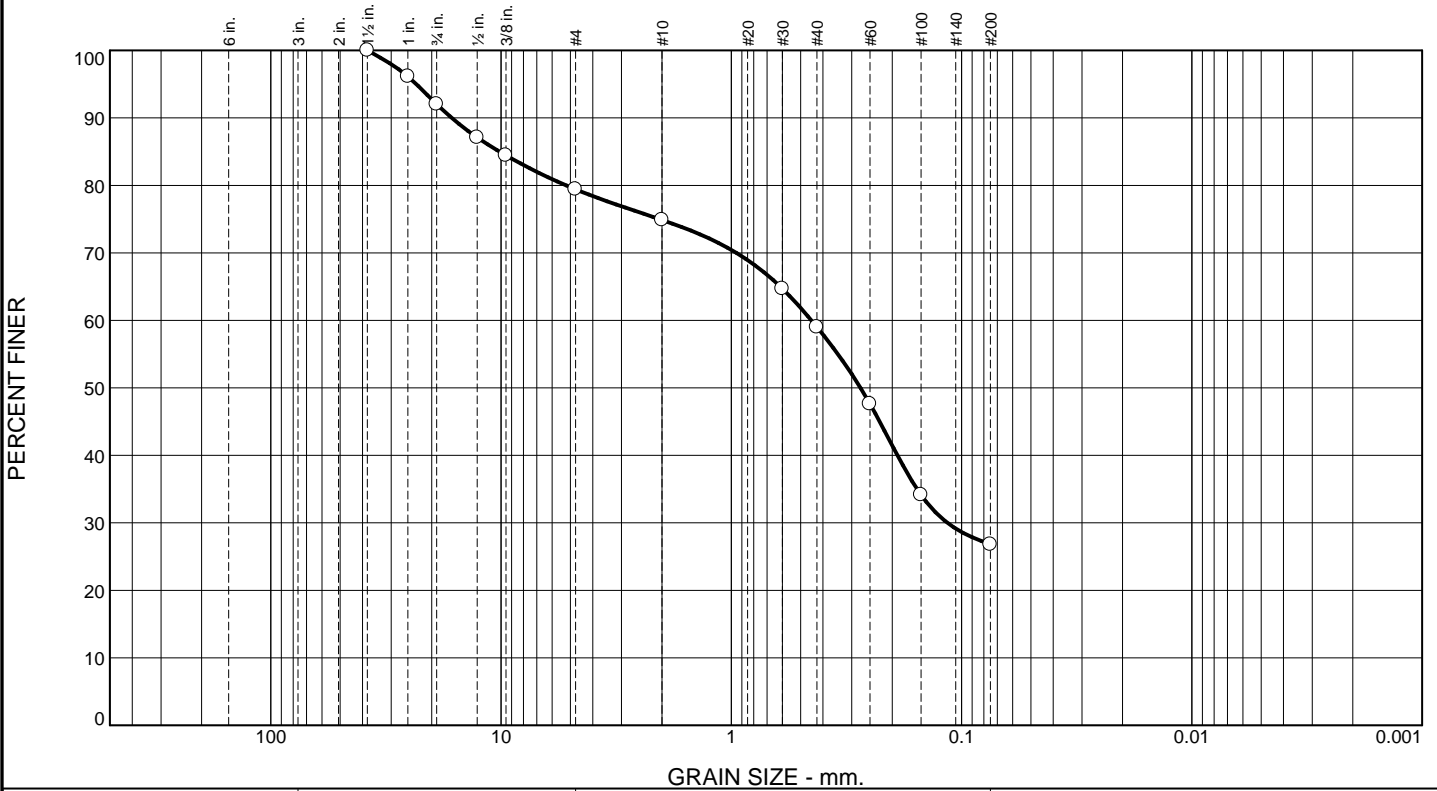
Sample Number: TP-2 SR-1 7'

Date: 7-3-23

|  |  |
|--|--|
| <p><b>RSA Geolab</b></p> <p><b>Union, New Jersey</b></p> | <p><b>Client:</b> Langan Engineering</p> <p><b>Project:</b> Beacon Unitarian Universalist Church Redevelopment, Summit, NJ<br/>Project#101007201</p> <p><b>Project No:</b> 869</p> <p style="text-align: right;"><b>Figure</b></p> |
|--|--|

Tested By: AO                      Checked By: KP

# Particle Size Distribution Report



| % +3" | % Gravel |      | % Sand |        |      | % Fines |      |
|-------|----------|------|--------|--------|------|---------|------|
|       | Coarse   | Fine | Coarse | Medium | Fine | Silt    | Clay |
| 0.0   | 8.0      | 12.6 | 4.5    | 15.9   | 32.2 | 26.8    |      |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|------------|---------------|----------------|--------------|
| 1.5        | 100.0         |                |              |
| 1          | 96.1          |                |              |
| .75        | 92.0          |                |              |
| .5         | 87.1          |                |              |
| .375       | 84.4          |                |              |
| #4         | 79.4          |                |              |
| #10        | 74.9          |                |              |
| #30        | 64.7          |                |              |
| #40        | 59.0          |                |              |
| #60        | 47.6          |                |              |
| #100       | 34.1          |                |              |
| #200       | 26.8          |                |              |

**Material Description**

Strong Brown

PL=                      **Atterberg Limits**                      PI=

**Coefficients**

D<sub>90</sub>= 16.3721                      D<sub>85</sub>= 10.1595                      D<sub>60</sub>= 0.4494

D<sub>50</sub>= 0.2748                      D<sub>30</sub>= 0.1153                      D<sub>15</sub>=

D<sub>10</sub>=                                      C<sub>u</sub>=                                      C<sub>c</sub>=

USCS=                      **Classification**                      AASHTO=

**Remarks**

\* (no specification provided)

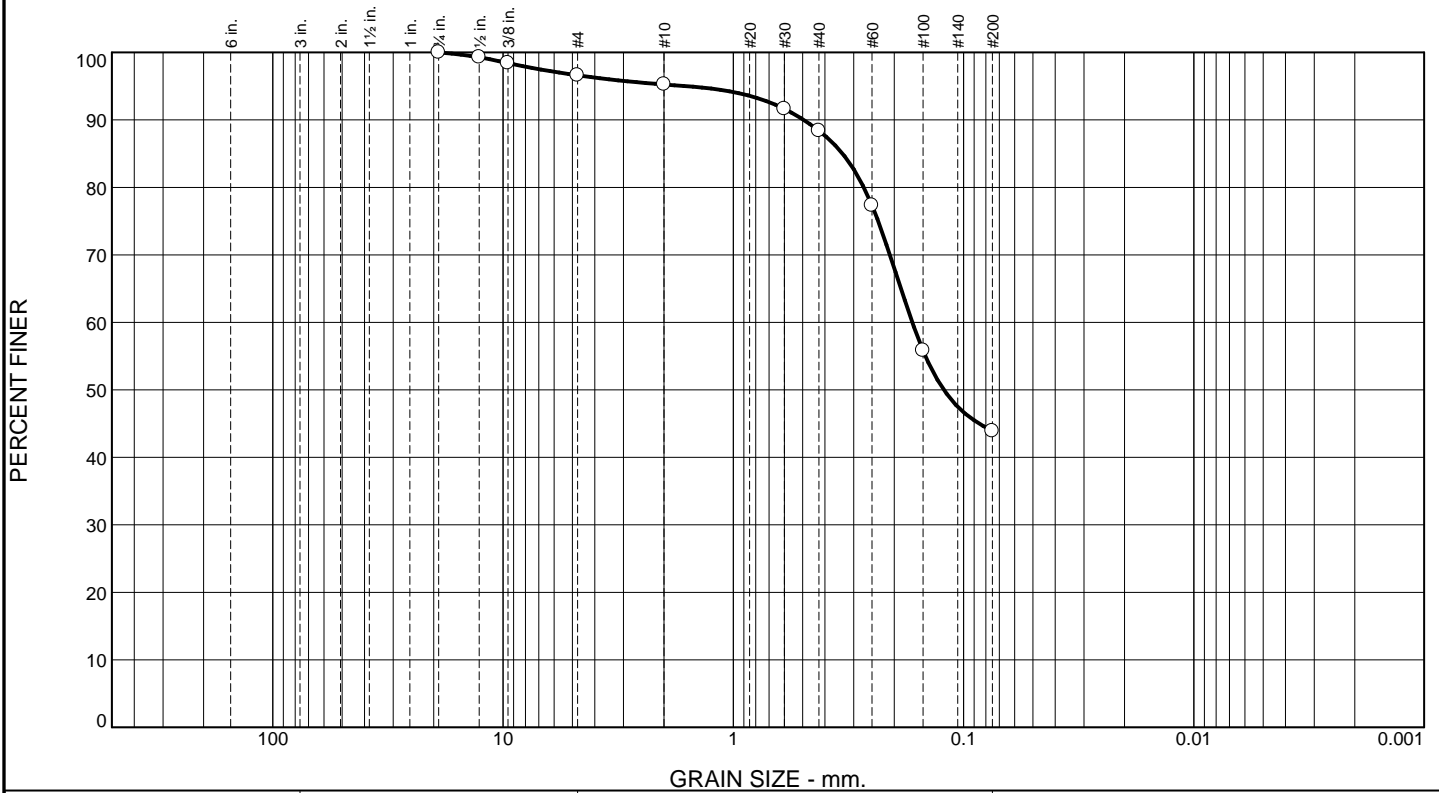
Sample Number: TP-3 SR-1 1'

Date: 7-3-23

|  |  |
|--|--|
| <p><b>RSA Geolab</b></p> <p><b>Union, New Jersey</b></p> | <p><b>Client:</b> Langan Engineering</p> <p><b>Project:</b> Beacon Unitarian Universalist Church Redevelopment, Summit, NJ<br/>Project#101007201</p> <p><b>Project No:</b> 869</p> <p style="text-align: right;"><b>Figure</b></p> |
|--|--|

Tested By: AO                      Checked By: KP

# Particle Size Distribution Report



| % +3" | % Gravel |      | % Sand |        |      | % Fines |      |
|-------|----------|------|--------|--------|------|---------|------|
|       | Coarse   | Fine | Coarse | Medium | Fine | Silt    | Clay |
| 0.0   | 0.0      | 3.4  | 1.4    | 6.8    | 44.5 | 43.9    |      |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|------------|---------------|----------------|--------------|
| .75        | 100.0         |                |              |
| .5         | 99.3          |                |              |
| .375       | 98.4          |                |              |
| #4         | 96.6          |                |              |
| #10        | 95.2          |                |              |
| #30        | 91.6          |                |              |
| #40        | 88.4          |                |              |
| #60        | 77.3          |                |              |
| #100       | 55.8          |                |              |
| #200       | 43.9          |                |              |

**Material Description**

Strong Brown

PL=                      **Atterberg Limits**                      PI=

LL=                      **Coefficients**                      D<sub>85</sub>= 0.3355                      D<sub>60</sub>= 0.1670

D<sub>90</sub>= 0.4949                      D<sub>30</sub>=                      D<sub>15</sub>=

D<sub>50</sub>= 0.1219                      C<sub>u</sub>=                      C<sub>c</sub>=

D<sub>10</sub>=                      **Classification**

USCS=                      AASHTO=

**Remarks**

\* (no specification provided)

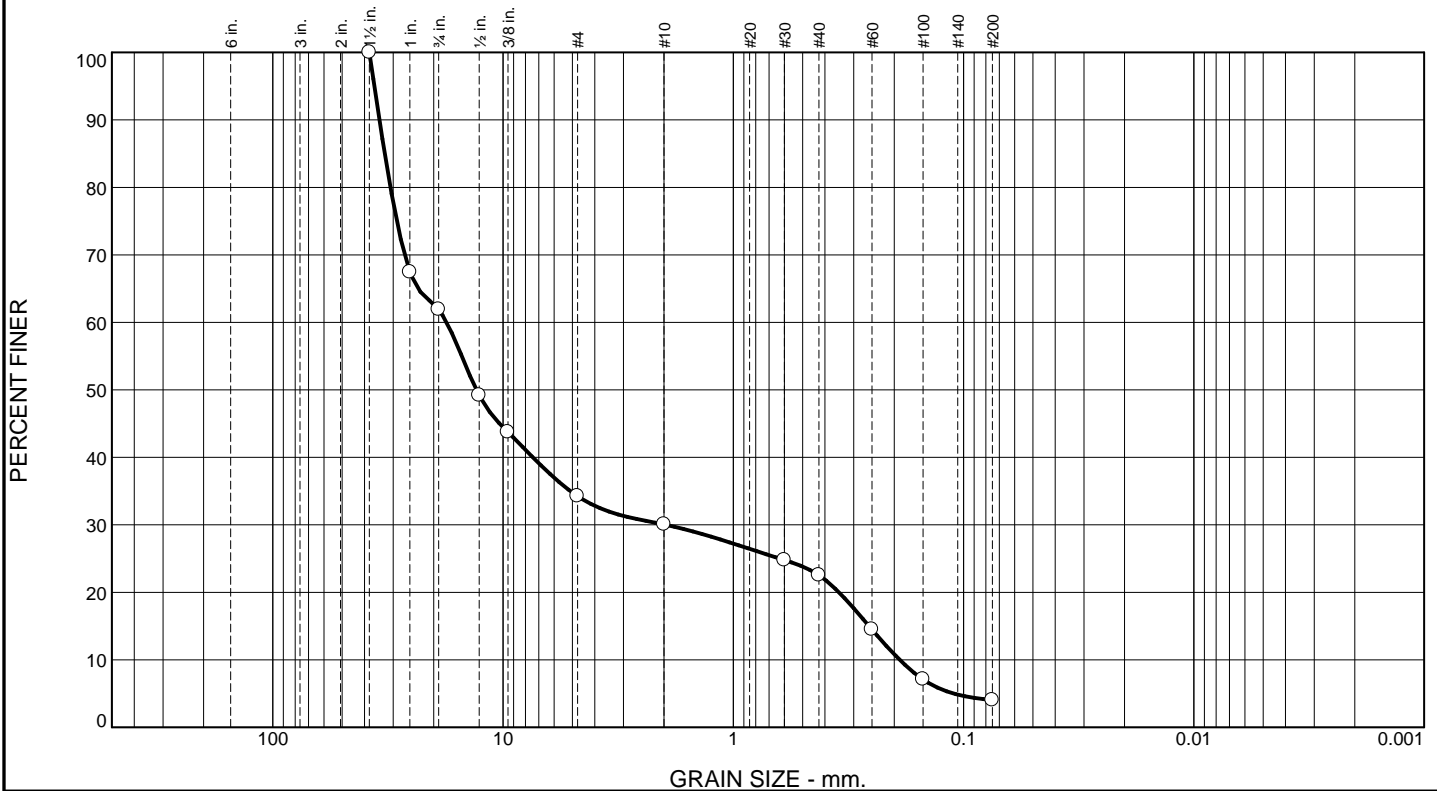
Sample Number: TP-4 SR-1 1'

Date: 7-3-23

|  |  |
|--|--|
| <p><b>RSA Geolab</b></p> <p><b>Union, New Jersey</b></p> | <p><b>Client:</b> Langan Engineering</p> <p><b>Project:</b> Beacon Unitarian Universalist Church Redevelopment, Summit, NJ<br/>Project#101007201</p> <p><b>Project No:</b> 869</p> <p style="text-align: right;"><b>Figure</b></p> |
|--|--|

Tested By: AO                      Checked By: KP

# Particle Size Distribution Report



| % +3" | % Gravel |      | % Sand |        |      | % Fines |      |
|-------|----------|------|--------|--------|------|---------|------|
|       | Coarse   | Fine | Coarse | Medium | Fine | Silt    | Clay |
| 0.0   | 38.1     | 27.7 | 4.1    | 7.6    | 18.5 | 4.0     |      |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|------------|---------------|----------------|--------------|
| 1.5        | 100.0         |                |              |
| 1          | 67.5          |                |              |
| .75        | 61.9          |                |              |
| .5         | 49.2          |                |              |
| .375       | 43.7          |                |              |
| #4         | 34.2          |                |              |
| #10        | 30.1          |                |              |
| #30        | 24.8          |                |              |
| #40        | 22.5          |                |              |
| #60        | 14.5          |                |              |
| #100       | 7.1           |                |              |
| #200       | 4.0           |                |              |

**Material Description**

Strong Brown

PL=                      **Atterberg Limits**                      PI=

LL=                      LL=                      PI=

**Coefficients**

|                           |                           |                           |
|---------------------------|---------------------------|---------------------------|
| D <sub>90</sub> = 34.4351 | D <sub>85</sub> = 32.6536 | D <sub>60</sub> = 17.5800 |
| D <sub>50</sub> = 13.0603 | D <sub>30</sub> = 1.9656  | D <sub>15</sub> = 0.2575  |
| D <sub>10</sub> = 0.1894  | C <sub>u</sub> = 92.83    | C <sub>c</sub> = 1.16     |

**Classification**

USCS= GW                      AASHTO=

**Remarks**

\* (no specification provided)

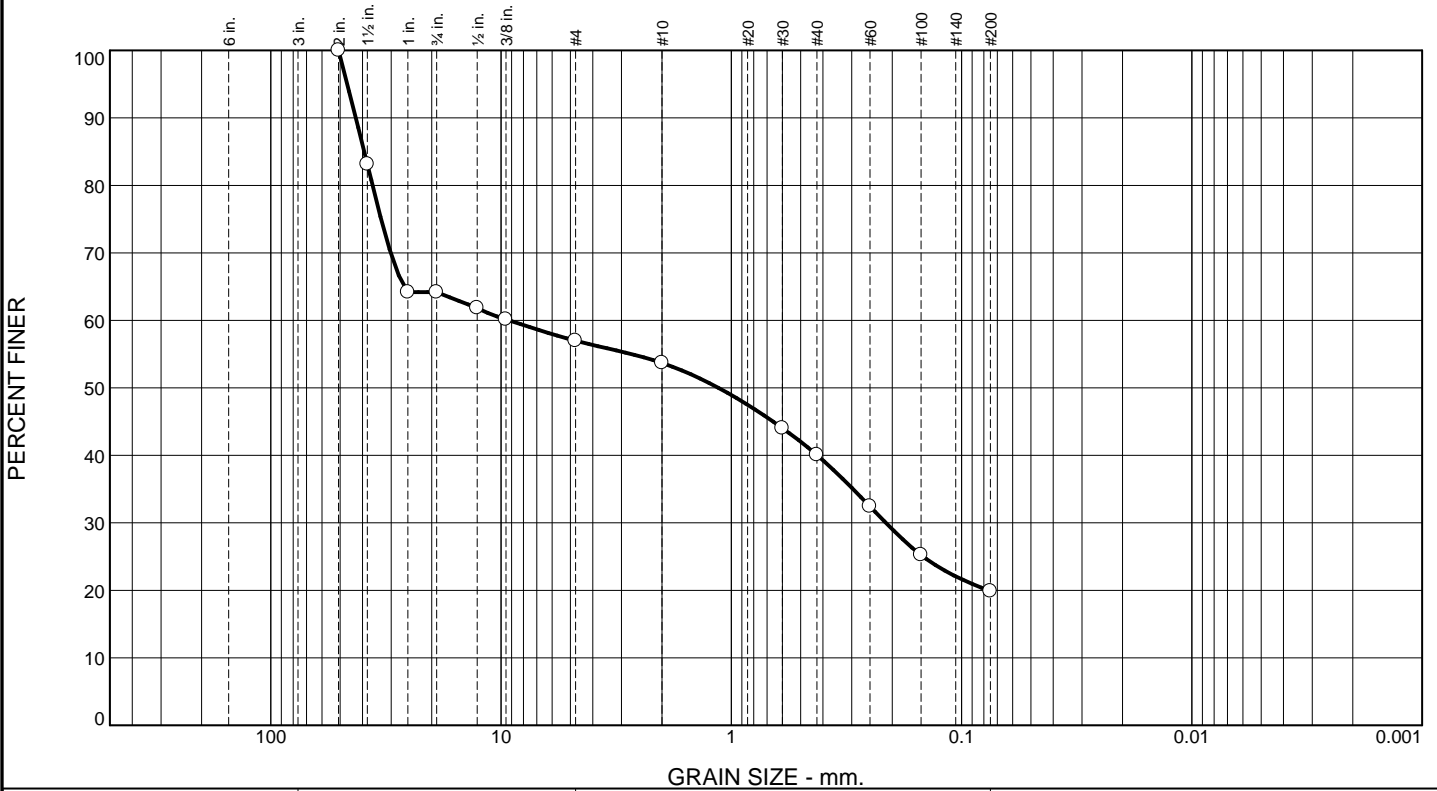
Sample Number: TP-5 SR-1 7'

Date: 7-3-23

|  |  |
|--|--|
| <p><b>RSA Geolab</b></p> <p><b>Union, New Jersey</b></p> | <p><b>Client:</b> Langan Engineering</p> <p><b>Project:</b> Beacon Unitarian Universalist Church Redevelopment, Summit, NJ<br/>Project#101007201</p> <p><b>Project No:</b> 869</p> |
| <p><b>Figure</b></p>                                     |  |

Tested By: AO                      Checked By: KP

# Particle Size Distribution Report



| % +3" | % Gravel |      | % Sand |        |      | % Fines |      |
|-------|----------|------|--------|--------|------|---------|------|
|       | Coarse   | Fine | Coarse | Medium | Fine | Silt    | Clay |
| 0.0   | 35.8     | 7.2  | 3.3    | 13.6   | 20.2 | 19.9    |      |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|------------|---------------|----------------|--------------|
| 2          | 100.0         |                |              |
| 1.5        | 83.1          |                |              |
| 1          | 64.2          |                |              |
| .75        | 64.2          |                |              |
| .5         | 61.8          |                |              |
| .375       | 60.1          |                |              |
| #4         | 57.0          |                |              |
| #10        | 53.7          |                |              |
| #30        | 44.0          |                |              |
| #40        | 40.1          |                |              |
| #60        | 32.4          |                |              |
| #100       | 25.2          |                |              |
| #200       | 19.9          |                |              |

**Material Description**

Strong Brown

PL=                      **Atterberg Limits**                      PI=

LL=                      LL=                      PI=

**Coefficients**

D<sub>90</sub>= 42.7834                      D<sub>85</sub>= 39.3118                      D<sub>60</sub>= 9.2394

D<sub>50</sub>= 1.1374                      D<sub>30</sub>= 0.2132                      D<sub>15</sub>=

D<sub>10</sub>=                      C<sub>u</sub>=                      C<sub>c</sub>=

USCS=                      **Classification**                      AASHTO=

**Remarks**

\* (no specification provided)

Sample Number: TP-6 SR-1 5.5'

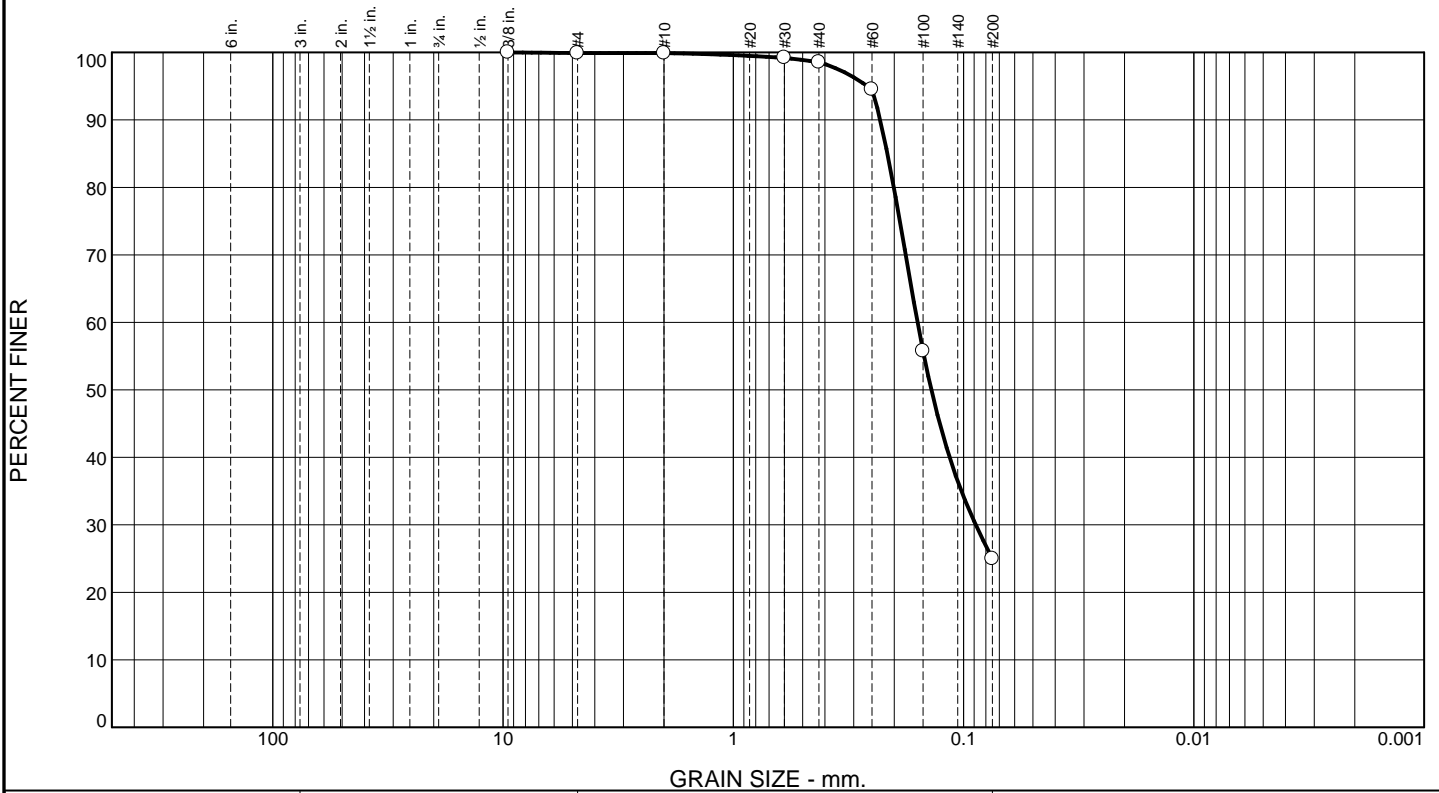
Date: 7-3-23

|  |  |
|--|--|
| <p><b>RSA Geolab</b></p> <p><b>Union, New Jersey</b></p> | <p><b>Client:</b> Langan Engineering</p> <p><b>Project:</b> Beacon Unitarian Universalist Church Redevelopment, Summit, NJ<br/>Project#101007201</p> <p><b>Project No:</b> 869</p> |
|--|--|

Figure

Tested By: AO                      Checked By: KP

# Particle Size Distribution Report



| % +3" | % Gravel |      | % Sand |        |      | % Fines |      |
|-------|----------|------|--------|--------|------|---------|------|
|       | Coarse   | Fine | Coarse | Medium | Fine | Silt    | Clay |
| 0.0   | 0.0      | 0.1  | 0.0    | 1.4    | 73.5 | 25.0    |      |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|------------|---------------|----------------|--------------|
| .375       | 100.0         |                |              |
| #4         | 99.9          |                |              |
| #10        | 99.9          |                |              |
| #30        | 99.2          |                |              |
| #40        | 98.5          |                |              |
| #60        | 94.5          |                |              |
| #100       | 55.7          |                |              |
| #200       | 25.0          |                |              |

**Material Description**

Very Light Brown

**Atterberg Limits**  
 PL=                      LL=                      PI=

**Coefficients**  
 D<sub>90</sub>= 0.2303      D<sub>85</sub>= 0.2142                      D<sub>60</sub>= 0.1585  
 D<sub>50</sub>= 0.1381      D<sub>30</sub>= 0.0886                      D<sub>15</sub>=  
 D<sub>10</sub>=                      C<sub>u</sub>=                                      C<sub>c</sub>=

**Classification**  
 USCS=                      AASHTO=

**Remarks**

\* (no specification provided)

Sample Number: TP-7 SR-1 3'

Date: 7-3-23

|   |  |
|---|--|
| <b>RSA Geolab</b><br><br><b>Union, New Jersey</b> | <b>Client:</b> Langan Engineering<br><b>Project:</b> Beacon Unitarian Universalist Church Redevelopment, Summit, NJ<br>Project#101007201<br><b>Project No:</b> 869 |
| <b>Figure</b>                                     |  |

Tested By: AO                      Checked By: KP



# Particle Size Distribution Report



| % +3" | % Gravel |      | % Sand |        |      | % Fines |      |
|-------|----------|------|--------|--------|------|---------|------|
|       | Coarse   | Fine | Coarse | Medium | Fine | Silt    | Clay |
|       |          |      |        | 2.3    | 55.1 |         | 42.6 |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|------------|---------------|----------------|--------------|
| #10        | 100.0         |                |              |
| #30        | 98.7          |                |              |
| #40        | 97.7          |                |              |
| #60        | 94.6          |                |              |
| #100       | 66.6          |                |              |
| #200       | 42.6          |                |              |

**Material Description**

Very Light Brown

PL=                      **Atterberg Limits**                      PI=

   LL=

**Coefficients**

D<sub>90</sub>= 0.2237                      D<sub>85</sub>= 0.2038                      D<sub>60</sub>= 0.1312

D<sub>50</sub>= 0.0995                      D<sub>30</sub>=                      D<sub>15</sub>=

D<sub>10</sub>=                      C<sub>u</sub>=                      C<sub>c</sub>=

USCS=                      **Classification**                      AASHTO=

**Remarks**

\* (no specification provided)

Sample Number: TP-8 SR-1 3'

Date: 7-3-23

|  |  |
|--|--|
| <p><b>RSA Geolab</b></p> <p><b>Union, New Jersey</b></p> | <p><b>Client:</b> Langan Engineering</p> <p><b>Project:</b> Beacon Unitarian Universalist Church Redevelopment, Summit, NJ<br/>Project#101007201</p> <p><b>Project No:</b> 869</p> |
|--|--|

Figure

Tested By: AO                      Checked By: KP

# Particle Size Distribution Report



| % +3" | % Gravel |      | % Sand |        |      | % Fines |      |
|-------|----------|------|--------|--------|------|---------|------|
|       | Coarse   | Fine | Coarse | Medium | Fine | Silt    | Clay |
|       |          |      |        | 7.8    | 47.0 |         | 45.2 |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|------------|---------------|----------------|--------------|
| #10        | 100.0         |                |              |
| #30        | 94.0          |                |              |
| #40        | 92.2          |                |              |
| #60        | 87.8          |                |              |
| #100       | 66.2          |                |              |
| #200       | 45.2          |                |              |

**Material Description**

Light Brown

**Atterberg Limits**  
 PL=                      LL=                      PI=

**Coefficients**  
 D<sub>85</sub>= 0.2288                      D<sub>60</sub>= 0.1279  
 D<sub>50</sub>= 0.0913                      D<sub>30</sub>=  
 D<sub>10</sub>=                      C<sub>u</sub>=                      C<sub>c</sub>=

**Classification**  
 USCS=                      AASHTO=

**Remarks**

\* (no specification provided)

Sample Number: TP-8 SR-2 4.5'

Date: 7-3-23

|   |  |
|---|--|
| <b>RSA Geolab</b><br><br><b>Union, New Jersey</b> | <b>Client:</b> Langan Engineering<br><b>Project:</b> Beacon Unitarian Universalist Church Redevelopment, Summit, NJ<br>Project#101007201<br><b>Project No:</b> 869 |
| <b>Figure</b>                                     |  |

Tested By: AO                      Checked By: KP