
STORMWATER MANAGEMENT REPORT

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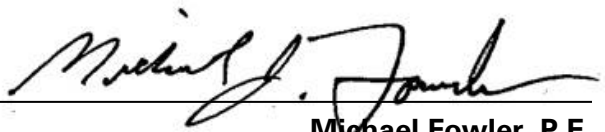
MONTCLAIR GOLF CLUB
HALFWAY HOUSE, GOLF BUILDING ADDITION,
AND PARKING LOT IMPROVEMENTS
Township of West Orange
Essex County, New Jersey

Prepared For:

MONTCLAIR GOLF CLUB
25 Prospect Avenue
West Orange, New Jersey

Prepared By:

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EXECUTIVE SUMMARY

Langan Engineering and Environmental Services has analyzed the stormwater runoff for the proposed halfway house, golf building expansion, and parking lot improvements at Montclair Golf Club in accordance with the New Jersey Department of Environmental Protection (NJDEP) stormwater regulations (NJAC 7:8) and Township of West Orange stormwater ordinances.

Montclair Golf Club is located at 25 Prospect Avenue in the Township of West Orange, Essex County, New Jersey. The 277-acre parcel consists of a 189-acre lot in West Orange identified as Block 151, Lot 1 and an 88-acre lot in Verona identified as Block 601, Lot 1. The site is bound by Prospect Avenue to the east; Residence Inn and residential houses to the south; Pleasant Valley Way to the west; and residential houses to the north. The Peckman River is located in the middle of the property. The site is currently used as a country club containing a 36-hole golf course, a clubhouse, maintenance facility, racquet facilities, a pool complex, and parking lots. The project proposes to:

- Demolish the old pool and locker rooms;
- Construct a new halfway house containing two bathrooms and a snack bar;
- Construct an expansion to the existing golf building; and
- Improvements to the parking lot, including: improved circulation, new parking spaces, new lighting, a decorative wall, and new landscaping.

All of the proposed improvements are located within an approximate 2-acre portion of the site located immediately adjacent to the clubhouse and entirely within the limits of Block 151, Lot 1 in West Orange.

The proposed project will increase impervious area by less than a $\frac{1}{4}$ acre but decrease the regulated motor vehicle surface area and will disturb more than 1 acre of soil. Therefore, the project will be considered a major development. The stormwater management analysis will need to address groundwater recharge, water quality, and water quantity regulations using green infrastructure best management practices. A small-scale subsurface infiltration basin and porous pavement are proposed to accommodate the improvements and to satisfy the stormwater regulations.

The stormwater analysis results for the proposed improvements indicate that the proposed stormwater management system satisfies the water quantity, water quality, and groundwater recharge requirements of the regulations.

1.0 INTRODUCTION

Langan Engineering and Environmental Services has analyzed the stormwater runoff for the Exterior Improvement Project at Montclair Golf Club in accordance with the New Jersey Department of Environmental Protection (NJDEP) stormwater regulations (NJAC 7:8) and Township of West Orange stormwater ordinances.

2.0 PROJECT DESCRIPTION/LOCATION

Montclair Golf Club is located at 25 Prospect Avenue in the Township of West Orange, Essex County, New Jersey. The 277-acre parcel consists of a 189-acre lot in West Orange identified as Block 151, Lot 1 and an 88-acre lot in Verona identified as Block 601, Lot 1. The site is bound by Prospect Avenue to the east; Residence Inn and residential houses to the south; Pleasant Valley Way to the west; and residential houses to the north. The Peckman River is located in the middle of the property. The site is currently used as a country club containing a 36-hole golf course, a clubhouse, maintenance facility, racquet facilities, a pool complex, and parking lots. The project proposes to:

- Demolish the old pool, locker rooms, and snack bar;
- Construct a new halfway house containing two bathrooms and a snack bar;
- Construct an expansion to the existing golf building;
- Provide a golf staging area; and
- Improvements to the parking lot, including: improved circulation, new parking spaces, new lighting, a decorative wall, and new landscaping.

All of the proposed improvements are located within an approximate 2-acre portion of the site located immediately adjacent to the clubhouse and entirely within the limits of Block 151, Lot 1 in West Orange.

3.0 EXISTING CONDITIONS

The stormwater runoff within the project limits has multiple discharge locations. The existing pool complex has a combination of sheet flow to the golf course and a limited collection system for the pool decking, roof leaders and existing paved areas. The parking lot adjacent to the clubhouse is tributary to the county system located in Prospect Avenue that ultimately discharges via a pipe to Eagle Rock Reservation.

4.0 FLOODPLAIN/FLOOD HAZARD AREA

According to the Federal Emergency Management Agency (FEMA) Preliminary Flood Insurance Rate Map (FIRM) Map Number 34013C0103G, with an effective date of June 4, 2007, there are no mapped floodplains within the project limits. Refer to Figure 5 in the Figures section of this report.

5.0 SUBSURFACE CONDITIONS

According to the Natural Resources Conservation Service (NRCS) Web Soil Survey, the soils in the project area consist of Udorthents with a Boonton substratum (UdbonB), which form a hydrologic soil group C (see Figure 2 – NRCS Web Soil Survey). The project area also has Boonton substratum (URBONB) but because there is no hydrologic soil group identified for this soil, a hydrologic soil group designation B was used for existing conditions stormwater analyses and a designation D was used in the proposed condition runoff analysis in accordance with the New Jersey Best Management Practices Manual.

6.0 PROPOSED CONDITIONS

The proposed improvements will generally maintain existing drainage patterns described in section 3.0 - Existing Conditions of this report to the maximum extent practicable. The proposed improvements will require approximately 1.1 acres of disturbance and result in a net increase of impervious area of approximately 0.27 acres but only an increase of 0.17 acres of regulated motor vehicle surface (see Figures 9 and 10 in the Figures section of this report). One small-scale subsurface infiltration basin and porous pavement is proposed to infiltrate and manage runoff from the proposed improvements to satisfy the requirements of the NJDEP stormwater rules.

7.0 STORMWATER MANAGEMENT DESIGN REQUIREMENTS

The proposed improvements will result in over 1 acre of disturbance; therefore, the project is considered a major development in accordance with N.J.A.C. 7:8 of the New Jersey Department of Environmental Protection (NJDEP) regulations. Pursuant to N.J.A.C. 7:8-5.2(a)(2), the minimum design and performance standards for groundwater recharge, stormwater runoff quality and stormwater runoff quantity shall be met by incorporating green infrastructure best management practices in accordance with N.J.A.C. 7:8-5.3. The green infrastructure measures require treatment of stormwater runoff through infiltration into subsoil, filtration by vegetation or soil, or storing stormwater runoff for reuse. The following sections of this report will address each of the minimum design performance standards described in N.J.A.C 7:8.

7.1 Stormwater Quantity Management

7.1.1 Design Criteria

In accordance with NJAC 7:8, all major developments must control potential stormwater runoff quantity impacts. This project proposes to address potential stormwater runoff quantity impacts using a combination of the following two methods:

- 1) Demonstrating through hydrologic and hydraulic analysis that for stormwater leaving the site, post-construction runoff hydrographs for the two-, 10-, and 100-year storm events, respectively, do not exceed, at any point in time, the pre-construction runoff hydrographs for the same storm events. This will be referred to as “curve under curve” in this report; and
- 2) Designing stormwater management measures that provide reductions for the existing peak runoff rates for the 2-year (50% Reduction), 10-year (25% Reduction) and 100-year (20% Reduction) storms under proposed conditions. These reductions only apply to the parts of the site which are disturbed and/or where development is proposed.

Using the NOAA 24-hour Type D rainfall distribution and a unit hydrograph with a shape factor of 484, the following design storms were analyzed:

- A 2-year, 24-hour storm consisting of 3.44 inches of rainfall.
- A 10-year, 24-hour storm consisting of 5.22 inches of rainfall.
- A 100-year, 24-hour storm consisting of 8.66 inches of rainfall.

Refer to Figures 7 and 8 in the Figures section of this report for the rainfall depths and rainfall distribution.

7.1.2 Design Methodology

To analyze the pre- and post-development rainfall runoff rates and volumes, this study was prepared using methods contained in the USDA Soil Conservation Service Publication TR-55 “Urban Hydrology for Small Watersheds”.

The watershed was simulated as a series of contributing sub-areas, channel reaches, and inflow and outflow structures. Area, curve number (CN), and time of concentration (TC) were calculated for each contributing sub-area.

The curve number is a land sensitive coefficient that dictates the relationship between total rainfall depth and direct storm runoff. Based on the coverage of soil groups and land use in the watershed, an average CN was determined for each sub-area for existing and proposed conditions.

Using the NRCS Soil Map (see Figure 6 – NRCS Soils Map in the Figures section of the report), the soils within the watershed were divided into hydrologic soil groups (A, B, C, and D). The SCS classification system evaluates the runoff potential of a soil according to its infiltration and transmission rates. “A” soils have the lowest runoff potential, while “D” soils have the greatest runoff potential.

The time of concentration (Tc) is defined as the time for runoff to travel from the hydraulically most distant point in 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 outlined in Chapter 5 of the New Jersey Best Management Practices (BMP) Manual. The minimum Tc used in this analysis is 0.03 hours (2 minutes), which is the minimum that can be used in the hydrologic software.

7.1.3 Existing (Allowable) Runoff Discharges

The existing hydrologic analysis consists of 3 watersheds that were delineated based on existing drainage patterns and pre-determined discharge points. The limits of these watersheds were strategically determined to assist with the proposed best management practices (BMPs) designs and to substantiate compliance with the stormwater management rules. Each of the 3 watersheds determined in the prior analysis were further divided into disturbed and undisturbed areas and into separate pervious and impervious watersheds. Required peak rate reductions are only applied to the disturbed portions of the watersheds. The allowable peak flow rates are determined by hydraulically adding the peak flow rates from undisturbed watershed areas and reduced peak flow rates from disturbed watershed areas for Watersheds A, C, D and E. Runoff from Watershed B will be analyzed using the curve under curve method and therefore no reductions will be applied. The watershed limits, watershed areas, curve numbers, analysis points and time of concentration paths for the existing conditions hydrologic analysis are located on drawings CG201, Existing Watershed Area Map. Table 1 below summarizes the allowable peak discharge rates for each of the watersheds.

Table 1 – Existing (Allowable) Peak Discharges

Watershed	Area (ac)	2-Year (cfs)	10-Year (cfs)	100-Year (cfs)
<u>Watersheds 1 and 3</u>				
Existing Watershed 1 (Disturbed)	0.61	1.280 <i>(50% reduction = 0.64)</i>	2.133 <i>(25% reduction = 1.60)</i>	3.899 <i>(20% reduction = 3.12)</i>
Existing Watershed 1 (Undisturbed)	0.58	1.56	2.51	4.40
Existing Watershed 1 Allowable Peak Discharges	1.19	2.15	3.97	7.27
Existing Watershed 3 (Undisturbed)	1.39	2.28	3.97	7.58
Existing Watershed 3 (Disturbed)	0	--	--	--
Existing Watershed 3 Allowable Peak Discharges	1.39	2.28	3.97	7.58
Watershed 1+3 Allowable Peak Discharges	2.58	4.43*	7.94*	14.85*
<u>Watershed 2</u>				
Existing Watershed 2 (Disturbed)	0.51	0.52 <i>(50% reduction = 0.26)</i>	1.11 <i>(25% reduction = 0.83)</i>	2.45 <i>(20% reduction = 1.96)</i>
Existing Watershed 2 (Undisturbed)	4.33	9.86	16.00	28.54
Watershed 2 Allowable Peak Discharges	4.84	10.13*	16.83*	30.50*

Notes: * Total Allowable Peak Discharges are calculated at each analysis point by hydraulically adding reduced runoff hydrographs from disturbed area and runoff hydrographs from undisturbed areas and may not reflect the direct addition of individual peak discharge rates from each of the contributing watershed areas.

Refer to Appendix A for supporting documentation and calculations including time of concentration and curve number calculation sheets as well as hydrograph input and output reports for the existing conditions analysis with reductions (allowable peak discharges).

7.1.4 Proposed Runoff Discharges

The proposed hydrologic analysis consists of 3 watersheds that were delineated based on a combination of existing and proposed drainage patterns and the same overall watershed limits as the existing conditions hydrologic analysis. The proposed watersheds were modeled as separate pervious and impervious watersheds and then hydraulically combined. Watersheds were also delineated into areas where runoff will be managed by proposed BMPs and areas where runoff will bypass the BMPs. The watershed limits, watershed areas, curve numbers, analysis points and time of concentration paths for the proposed conditions hydrologic analysis are located on drawing CG203, Proposed Watershed Area Map.

Table 2 below summarizes the proposed peak discharge rates for the watersheds at the predetermined analysis point locations.

Table 2 – Proposed Peak Discharges

Watershed	Area (ac)	2-Year (cfs)	10-Year (cfs)	100-Year (cfs)
<u>Watersheds 1 and 3</u>				
Proposed Watershed 1 (Undetained)	1.19	2.95	4.80	8.49
Proposed Watershed 3 (Detained)	1.39	2.28	3.97	7.58
Detention Basin - 1 (Underground Detention)	--	1.40	2.61	5.35
Proposed Watershed 1+3 Total	2.58	4.34*	7.42*	13.84*
<u>Watershed 2</u>				
Proposed Watershed 2 (Undetained)	4.24	9.91	16.30	29.39
Proposed Watershed 2 (Detained)	0.60	1.37	2.34	4.31
Detention Basin - 1 (Porous Pavement)	0.16	0.17	0.43	0.77
Proposed Watershed 2 Total	4.84	10.05*	16.54*	30.01*

Notes: * Total Proposed Discharges are calculated at each analysis point by hydraulically adding runoff hydrographs and may not reflect the direct addition of individual peak discharge rates from each of the contributing watershed areas.

Refer to Appendix B for supporting documentation and calculations including time of concentration and curve number calculation sheets as well as hydrograph input and output reports for the proposed watershed analysis.

7.1.5 Proposed Best Management Practices

There is one small-scale subsurface infiltration basin and a porous asphalt basin that are designed to meet the water quantity and groundwater recharge requirements of the stormwater rules for this project. Small-scale BMPs can manage runoff from watersheds with a maximum 2.5 acres. This maximum watershed area does not include the footprint of the BMP. Drawing CG203, Proposed Watershed Area Map indicates the watershed areas to the BMPs. Due to groundwater mounding restrictions, infiltration rates were not considered when performing the water quantity analysis. Table 3 below is a summary of the green infrastructure best management practices proposed for this project:

Table 3 – Green Infrastructure Best Management Practices

Basin	Basin Type	Invert El.	Max. Basin El.	Peak Water Surface Elevation		
				2-year	10-year	100-year
Basin 1	Subsurface Infiltration Basin (StormTech)	540.5 *	544.0*	541.56	542.27	543.90
Basin 2	Porous Asphalt	558.0 *	560.58 *	558.71	559.14	560.10

* Invert and maximum elevation represent bottom and top of stone in the StormTech system and porous pavement systems.

Planimetric basin details are located on drawings CG101 and CG102 and construction details are located on drawing CS501 and CS502. Groundwater mounding and basin drain time are addressed in the section 7.4 of this report.

7.1.6 Comparison of Existing (Allowable) and Proposed Discharge Rates

To satisfy the stormwater regulations for water quantity controls, the proposed discharge rates must not exceed the existing (allowable) peak discharge rates for the 2-year, 10-year and 100-year storm events. Table 4 below summarizes the existing (allowable) and proposed peak discharge rates for each of the watersheds.

Table 4 – Summary of Existing (Allowable) and Proposed Peak Discharges

Watershed	2-year (cfs)	10-year (cfs)	100-year (cfs)
Watershed 1+3 Allowable	4.43	7.94	14.85
Watershed 1+3 Proposed	4.34	7.42	13.84
Difference	0.09	0.22	1.01
Watershed 2 Allowable	10.13	16.83	30.50
Watershed 2 Proposed	10.05	16.54	30.01
Difference	0.08	0.29	0.49

The proposed peak runoff rates do not exceed the allowable peak discharge rates at any of the analysis points, therefore the proposed stormwater management design meets the water quantity requirements of the stormwater regulations.

7.2 Stormwater Quality Standards

7.2.1 Design Criteria

The NJDEP stormwater regulations require water quality measures if the major development results in an increase of ¼ acre or more of regulated motor vehicle surface. The required water quality requirement for new impervious areas is 80% total suspended solids (TSS) removal and for redeveloped pavement is 50% TSS removal. No water quality treatment is required for pavement areas that are being milled and overlaid. Small-scale green infrastructure best management practices are required to treat stormwater runoff.

Since the proposed improvements will not result in a net increase of motor vehicle surfaces that exceeds ¼ acres, a water quality design that meets the stormwater rules is not required. Calculation of existing and proposed motor vehicle surface areas for the project area is indicated on Figures 9 and 10 in the Figures section of this report.

7.3 Groundwater Recharge

7.3.1 Design Criteria

As per NJAC 7:8-5.4, to maintain groundwater recharge, the stormwater regulations require:

- Recharging 100% of the pre-developed annual average recharge amount, which can be demonstrated using the NJGRS Spreadsheet.
- OR
- Infiltrating the increase in 2-year runoff volume between pre- and post-development conditions.

The NJGRS spreadsheet is used to substantiate compliance with the groundwater recharge requirements for this project.

7.3.2 Groundwater Recharge Analysis

The existing and proposed groundwater recharge has been analyzed using the NJGRS spreadsheet and the small-scale subsurface infiltration basins are proposed to account for the post development deficit. The project is located in an area with soil types that provide no recharge values as calculated in the NJGRS spreadsheet. Therefore, the project will meet the annual groundwater recharge deficit and maintain the existing annual groundwater recharge

volume for the project area. The existing and proposed NJGRS spreadsheets as well as the BMP recharge calculations are provided in Appendix C and details of the infiltration basins are located on drawing CS502.

7.4 Groundwater Mounding Analysis

The design of the small-scale subsurface infiltration basin and porous pavement typically needs to consider groundwater mounding to determine if the basin will operate as designed and to determine potential adverse impacts to groundwater levels. The porous pavement will be installed with a liner and groundwater mounding does not need to be analyzed. The NJDEP Hantush Spreadsheet will be used to assess the groundwater mounding for the basins. Mounding analyses have been performed for the infiltration basins for the volume of water contained in the system below the first outlet device. The parameters used to calculate groundwater mounding using the NJDEP Hantush Spreadsheet are summarized in Table 6 below:

Table 6 – Infiltration Basin Parameters for Groundwater Mounding Calculations

Basin	Basin Type	Basin Area (sf)	Infiltration Rate ¹ (in/hr)	Design Infiltration Rate, R ² (in/hr)	Adjusted Infiltration Rate, R ³ (in/hr)	Horizontal Conductivity, Kh ⁴ (in/hr)	Basin Invert ⁵ (ft)	Design SHTW Elevation ⁶ (ft)
1 (Pond A)	Subsurface Infiltration (StormTech)	1,325	2	1	N/A	1	540.5	538.33

Table 6 Notes:

- 1) Infiltration rates were based on published infiltration rates from the NRCS (Web Soil Survey) (see Appendix F).
- 2) Design infiltration rate considers a factor of safety of 2 from the published infiltration rate.
- 3) Adjusted infiltration rate is based on the results of performing the groundwater mounding analysis in cases where the initial analysis resulted in a groundwater mound that would encroach into the basin. Iterations of adjusted rates were used until the groundwater mound did not encroach into the basin with a minimum R based on a maximum drain down time of 72 hours.
- 4) Horizontal conductivity, Kh, is equal to R outside the coastal plan and is 5 times R if the project is located in the coastal zone. This project is not located in the coastal plan therefore Kh is equal to R.
- 5) Basin invert is the elevation of the bottom of the 12-inch stone layer for the infiltration basins.
- 6) Supporting documentation for the seasonal high water table elevation located in Appendix F would suggest that the seasonal high water table is several feet below the bottom of the infiltration basins. However, for this analysis, it was assumed to be 2 feet below the basin invert.

The results of the groundwater mounding analyses are summarized in Table 7 below:

Table 7 - Groundwater Mounding Analysis Results

Basin	Exfiltration Volume (CF)	Groundwater Mounding Height (ft)	Seasonal High Water Table Elevation (ft) *	Groundwater Mounding Elevation (ft)	Basin Invert (ft)	Duration of Infiltration (Max 72 hrs) (hrs)
1 (Pond A)	265	1.38	538.33	539.71	540.5	2.4

* Supporting documentation for the seasonal high water table elevation located in Appendix F would suggest that the seasonal high water table is several feet below the bottom of the infiltration basins. However, for this analysis, it was assumed to be 2 feet below the basin invert.

The results of the groundwater mounding analyses indicate that the maximum calculated groundwater mounding height will not encroach into the infiltration basin and that the exfiltrated volume of water will drain from the basin within 72 hours. Supporting calculations for the groundwater mounding analyses are in Appendix D.

8.0 STORM SEWER COLLECTION SYSTEM DESIGN

8.1 Design Criteria

The storm sewer collection system is designed/analyzed for the 25-year storm event.

8.2 Design Methodology

The storm-sewer system was analyzed using the rational method for estimating runoff. The site was divided into sub-areas, each contributing runoff to an individual catch basin inlet drain. Values for area, time of concentration, and runoff coefficient (C) were calculated for each contributing sub-area (refer to drawing CG301, Proposed Catchment Area Map located in the Drawings section of this report).

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 sub-area to the appropriate inlet. The minimum time of concentration used in this analysis is 5 minutes. The average runoff coefficient is the ratio relating the amount of runoff to the amount of precipitation received. Runoff coefficients were based on values included on Figure 11 located in the Figures section of this report.

Rainfall intensities were obtained from the NOAA Atlas 14 Volume 2 (see Figure 12 in the Figures section of this report). Storm drainage pipes were then sized based on calculated flows using Manning's Equation and were verified by solving for the hydraulic grade line.

8.3 Storm Conveyance Design

The results of the proposed storm pipe conveyance analysis indicate that the hydraulic grade line elevation does not exceed any proposed structure grate/rim elevations and is contained within the system for the design storm evaluated. Supporting documentation and calculations for the storm pipe sizing are in Appendix E.

9.0 MAINTENANCE MANUAL

The Stormwater Maintenance Plan for this project includes preventative and corrective maintenance tasks and procedures to ensure effective and reliable performance of the stormwater management measures proposed for this project. The maintenance plan has been submitted under separate cover.

10.0 CONCLUSION

The proposed small-scale subsurface infiltration basin (Watersheds 1 and 3) and porous pavement (Watershed 2) and reduce the proposed peak stormwater discharges from the project area to rates that are below the allowable 2-, 10- and 100-year storm peak rates. The small-scale subsurface infiltration basins provide groundwater recharge and infiltrate enough water to maintain the calculated existing annual recharge for the project area. The designs of the small-scale subsurface infiltration basins are not impacted by groundwater mounding. Therefore, the engineering design of the stormwater management systems is in conformance with the NJDEP stormwater rules and Township of West Orange stormwater ordinance.

11.0 REFERENCES

- 1.) N.J.A.C. 7:8 NJDEP Stormwater Management Rules, last amended March 2, 2020
- 2.) Urban Hydrology for Small Watersheds, Technical Release No. 55, USDA Soil Conservation Service Publication, June 1986
- 3.) New Jersey Stormwater Best Management Practices Manual, New Jersey Department of Environmental Protection, Division of Watershed Management, April 2004, revised March 2021
- 4.) Hydrology Studio 2023 v 3.0.0.27
- 5.) Stormwater Studio 2023, version 3.0.0.31

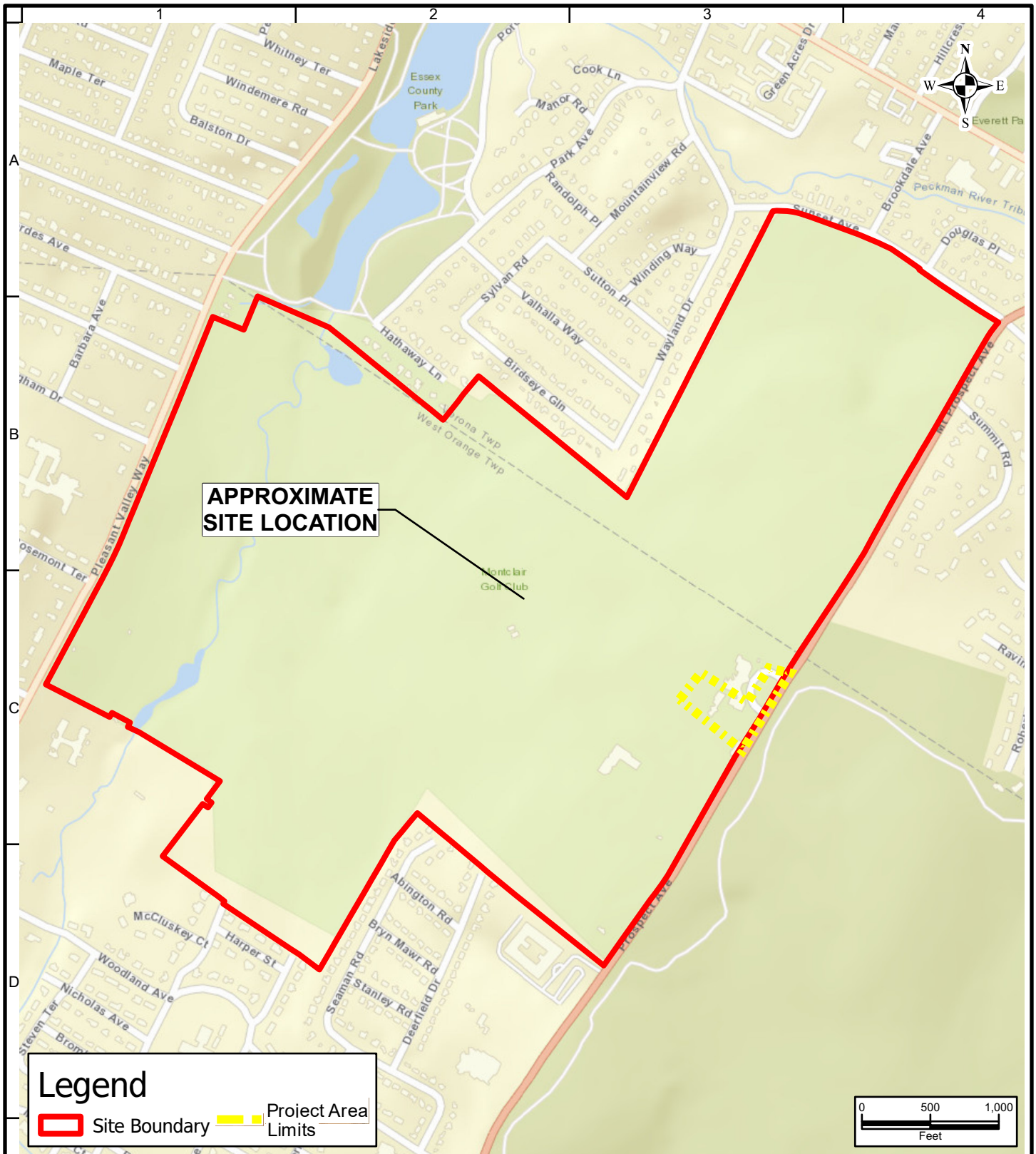
FIGURES



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			Scale 1:1,000	
			Drawn By Site Analyzer	Sheet 2 of 16
			Submission Date 01/12/2024	

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Langan International
Collectively known as Langan

Project
**MONTCLAIR GOLF CLUB
HALFWAY HOUSE, GOLF BUILDING
ADDITION, & PARKING LOT
IMPROVEMENTS**

BLOCK No. 151, LOT Nos. 1, 5, 7, 11,
14, 15.01, 23, 24, 37, 41, 45.01 & 49
WEST ORANGE
BLOCK No. 601, LOT Nos. 1
VERONA
ESSEX COUNTY NEW JERSEY

Drawing Title
VICINITY MAP

Project No.
001039208

Date
01/12/2024

Scale
1:1,000

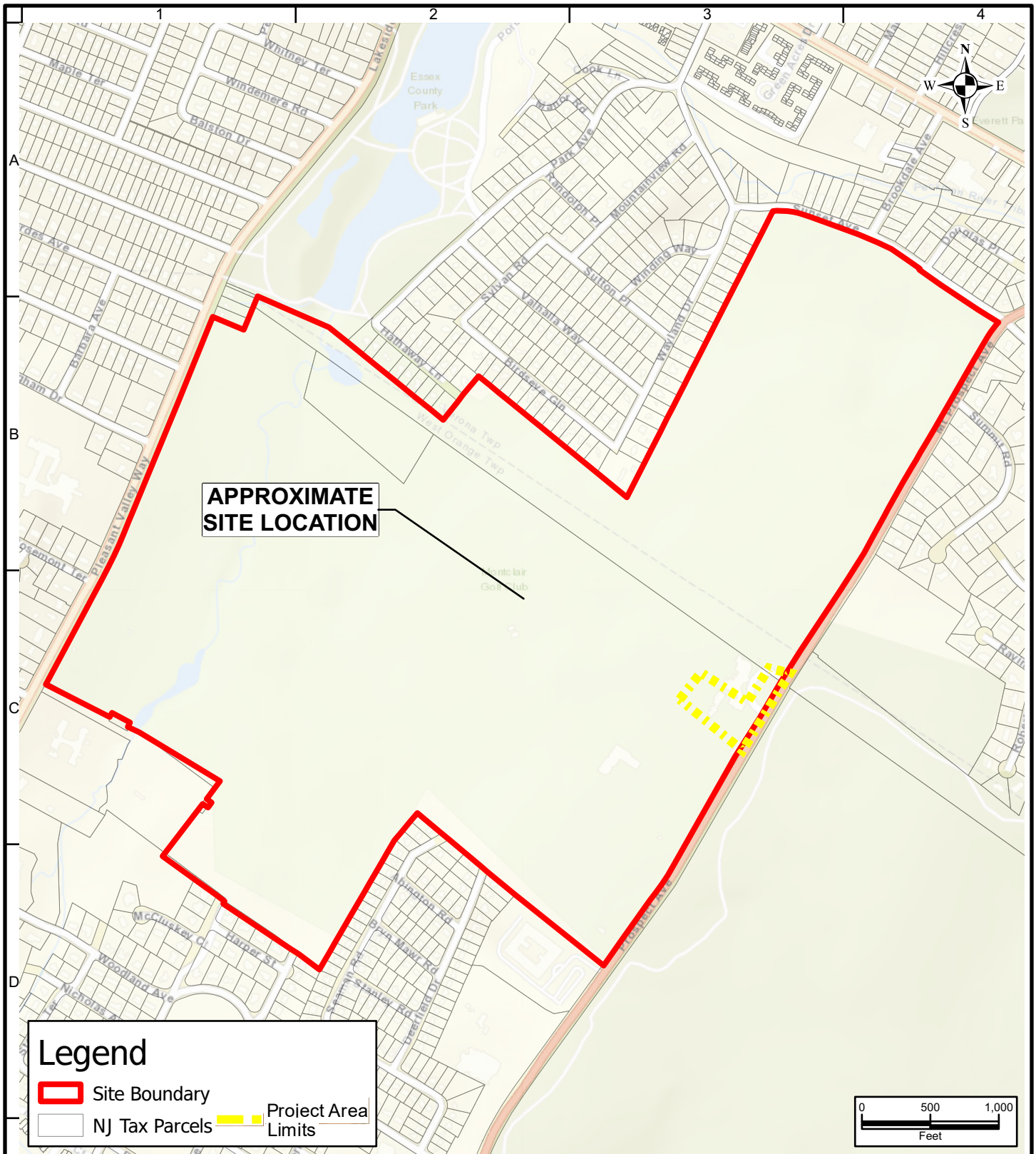
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Site Analyzer

Submission Date
01/12/2024

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Sheet 3 of 16



City of New York, State of New Jersey, Esri, HERE, Garmin, INCREMENT P, NGA, USGS; Civil Solutions, Inc.; Spatial Data Logic, Inc.; NJ Office of Information Technology, Office of Geographic Information Systems (NJ/OIT-OGIS),

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Langan International
Collectively known as Langan

Project
**MONTCLAIR GOLF CLUB
HALFWAY HOUSE, GOLF BUILDING
ADDITION, & PARKING LOT
IMPROVEMENTS**

BLOCK No. 151, LOT Nos. 1, 5, 7, 11,
14, 15.01, 23, 24, 37, 41, 45.01 & 49
WEST ORANGE
BLOCK No. 601, LOT Nos. 1
VERONA
ESSEX COUNTY NEW JERSEY

Drawing Title

TAX MAP

Project No.

001039208

Date

01/12/2024

Scale

1:1,000

Drawn By

Site Analyzer

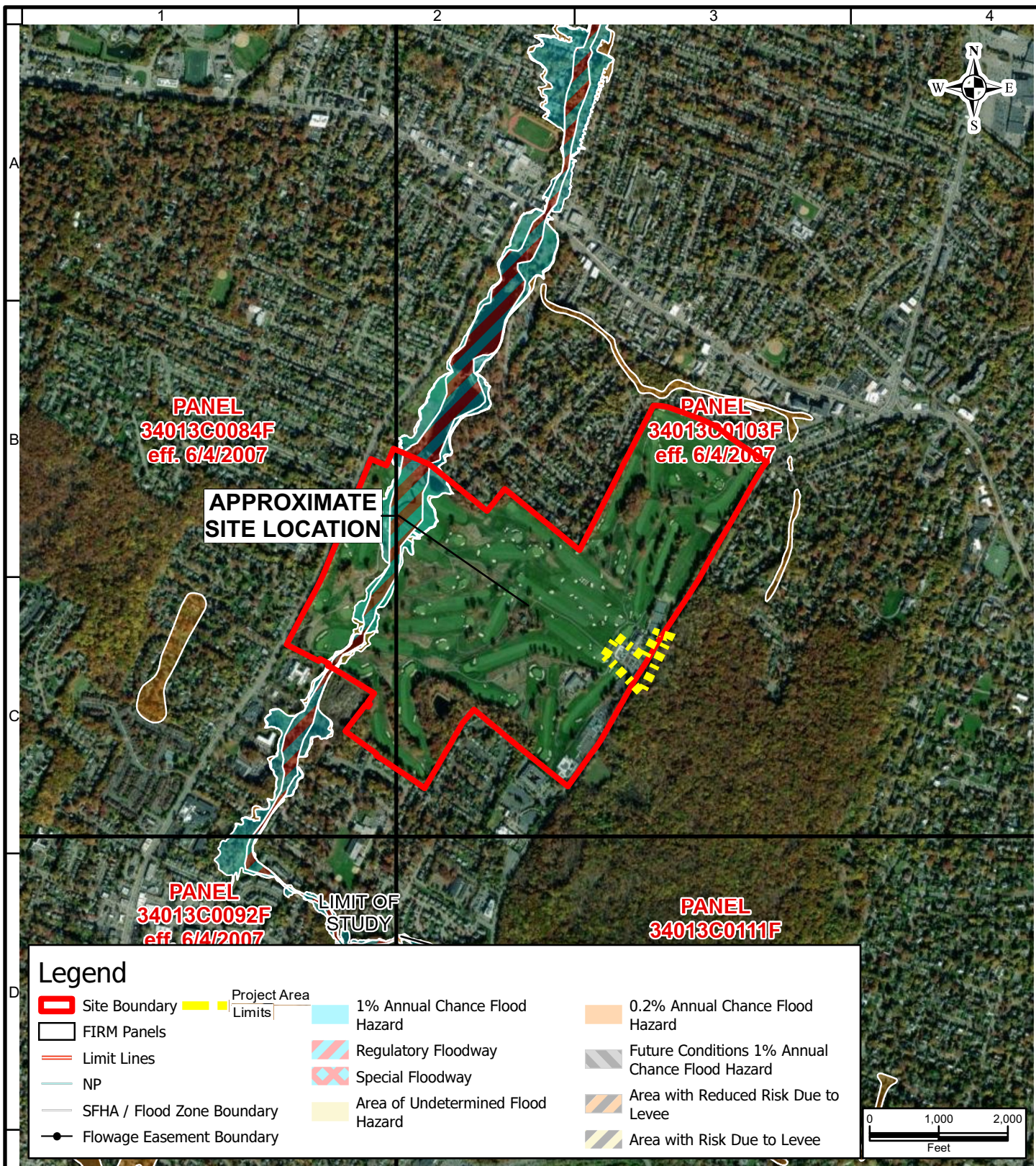
Submission Date

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Figure

4

Sheet 4 of 16



New York State, Earthstar Geographics; FEMA, FEMA RiskMap CDS

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BLOCK No. 601, LOT Nos. 1
VERONA

ESSEX COUNTY NEW JERSEY

Drawing Title
**EFFECTIVE FEMA
FIRM**

Project No.
001039208

Date
01/12/2024

Scale
1:2,000

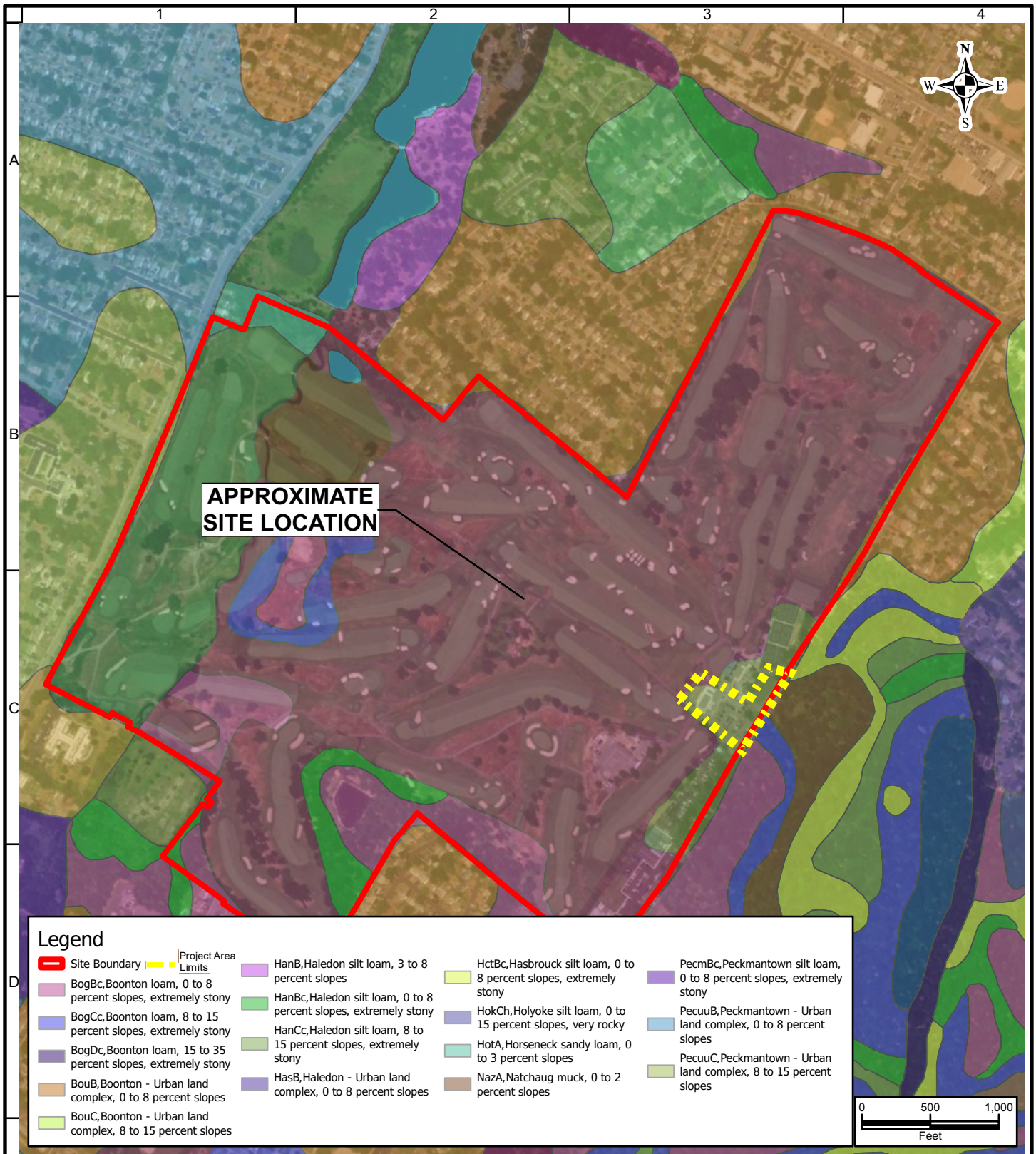
Drawn By
Site Analyzer

Submission Date
01/12/2024

Figure

5

Sheet 9 of 16



New York State, Maxar; NJ Department of Environmental Protection (NJDEP), Office of Information Resources Management (OIRM), Bureau of Geographic Information Systems (BGIS)

LANGAN 300 Kimball Drive 4th Floor Parsippany NJ 07054-2172 T: 973-560-4900 F: 973-560-4901 www.langan.com Langan Engineering & Environmental Services, Inc. Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C. Langan International Collectively known as Langan	Project MONTCLAIR GOLF CLUB HALFWAY HOUSE, GOLF BUILDING ADDITION, & PARKING LOT IMPROVEMENTS BLOCK No. 151, LOT Nos. 1, 5, 7, 11, 14, 15.01, 23, 24, 37, 41, 45.01 & 49 WEST ORANGE BLOCK No. 601, LOT Nos. 1 VERONA ESSEX COUNTY NEW JERSEY	Drawing Title NJ SOILS MAP	Project No. 001039208	Figure 6 Sheet 12 of 16
			Date 01/12/2024	
			Scale 1:1,000	
			Drawn By Site Analyzer Submission Date 01/12/2024	

Disclaimer: This information is produced by an automated system and may not be complete. The absence of a feature is not a confirmation that the feature is not present at the subject location. Information produced is in the public domain and unless noted has not been field verified or provided for any specific use. Users are also cautioned to confirm the information shown is suitable for their intended use.
 Spatial Reference: WGS 1984 Web Mercator Auxiliary Sphere

NEW JERSEY 24 HOUR RAINFALL FREQUENCY DATA

Rainfall amounts in Inches

County	1 year	2 year	5 year	10 year	25 year	50 year	100 year
Atlantic	2.72	3.31	4.30	5.16	6.46	7.61	8.90
Bergen	2.75	3.34	4.27	5.07	6.28	7.32	8.47
Burlington	2.77	3.36	4.34	5.18	6.45	7.56	8.81
Camden	2.73	3.31	4.25	5.06	6.28	7.34	8.52
Cape May	2.67	3.25	4.22	5.07	6.34	7.47	8.73
Cumberland	2.69	3.27	4.25	5.09	6.37	7.49	8.76
Essex	2.85	3.44	4.40	5.22	6.44	7.49	8.66
Gloucester	2.71	3.29	4.24	5.05	6.29	7.36	8.55
Hudson	2.73	3.31	4.23	5.02	6.19	7.20	8.31
Hunterdon	2.80	3.38	4.26	5.00	6.09	7.02	8.03
Mercer	2.74	3.31	4.23	5.01	6.19	7.20	8.33
Middlesex	2.76	3.35	4.30	5.12	6.36	7.43	8.63
Monmouth	2.79	3.38	4.38	5.23	6.53	7.66	8.94
Morris	2.94	3.54	4.47	5.24	6.37	7.32	8.35
Ocean	2.81	3.42	4.45	5.33	6.68	7.87	9.20
Passaic	2.87	3.47	4.42	5.23	6.43	7.47	8.62
Salem	2.69	3.26	4.20	5.00	6.22	7.28	8.45
Somerset	2.76	3.34	4.25	5.01	6.15	7.13	8.21
Sussex	2.68	3.22	4.02	4.70	5.72	6.60	7.58
Union	2.80	3.39	4.35	5.17	6.42	7.49	8.69
Warren	2.78	3.34	4.18	4.89	5.93	6.83	7.82

Notes: The average point rainfall amounts listed above were developed from data contained in NOAA Atlas 14 Volume 2.

Point rainfall estimates for specific locations may be obtained from the Precipitation Frequency Data Server located at <http://www.nws.noaa.gov/ohd/hdsc/>

For most hydrologic design procedures, the rainfall amounts listed above may be rounded to the nearest tenth of an inch.

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NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400

Project
MONTCLAIR GOLF CLUB

**HALFWAY HOUSE, GOLF BUILDING
ADDITION, & PARKING LOT
IMPROVEMENTS**

BLOCK No. 151, LOT Nos. 1, 5, 7, 11,
14, 15.01, 23, 24, 37, 41, 45.01 & 49

WEST ORANGE

BLOCK No. 601, LOT Nos. 1
VERONA

ESSEX COUNTY

NEW JERSEY

Drawing Title

**NRCS 24-HR
RAINFALL
DEPTHS**

Project No.
001039208

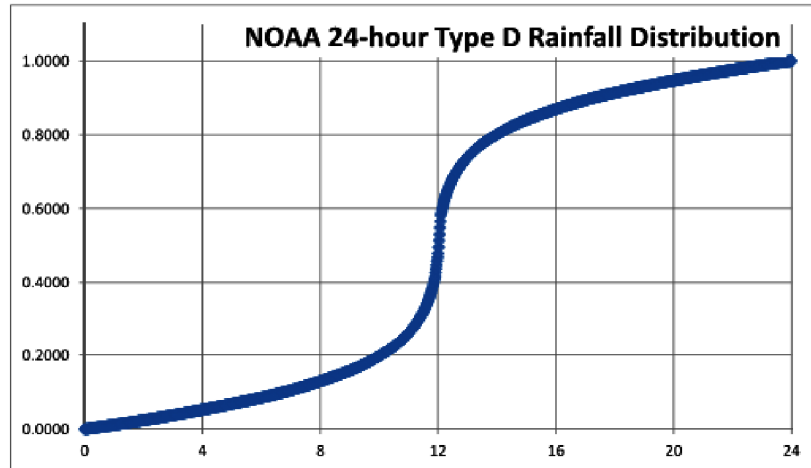
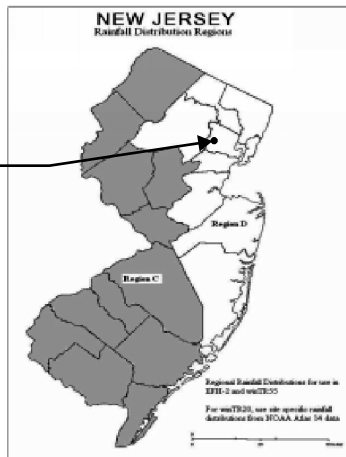
Date
01/12/2024

Scale
NTS

Drawn By
RB

Figure

7



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

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Project
MONTCLAIR GOLF CLUB

HALFWAY HOUSE, GOLF BUILDING
ADDITION, & PARKING LOT
IMPROVEMENTS

BLOCK No. 151, LOT Nos. 1, 5, 7, 11,
14, 15.01, 23, 24, 37, 41, 45.01 & 49
WEST ORANGE

BLOCK No. 601, LOT Nos. 1
VERONA

ESSEX COUNTY

NEW JERSEY

Drawing Title

**24-HOUR NOAA
TYPE D
DISTRIBUTION**

Project No.
001039208

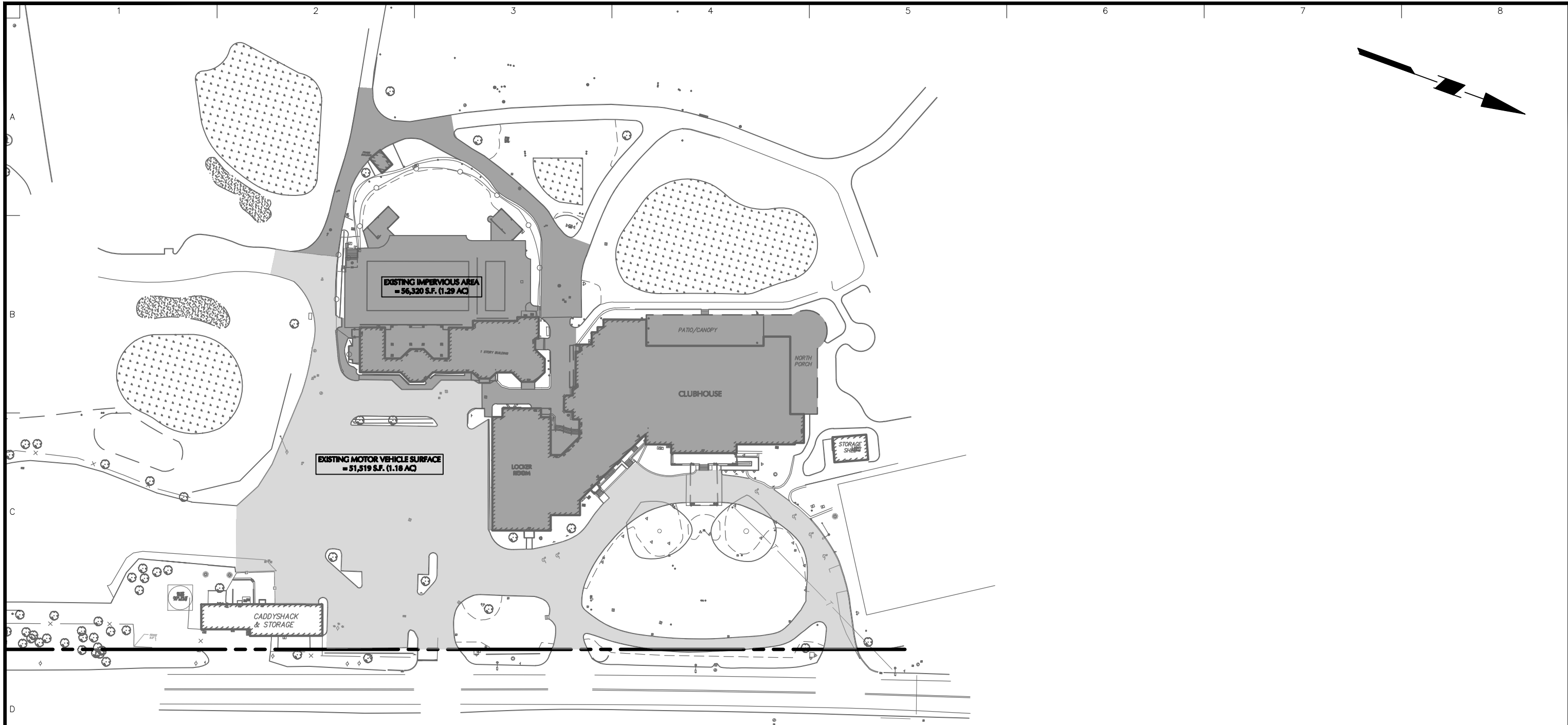
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Scale
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Drawn By
RB

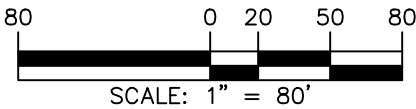
Figure

8



GENERAL NOTES:

- 1. EXISTING BOUNDARY AND TOPOGRAPHY IS BASED ON A PLAN TITLED” PARTIAL BOUNDARY AND TOPOGRAPHIC SURVEY FOR MONTCLAIR GOLF CLUB, BLOCK NO. 151, PORTION OF LOT NOS. 5, 7, 11 & 14, TOWNSHIP OF WEST ORANGE, ESSEX COUNTY, NJ” PREPARED BY LANGAN ENGINEERING AND ENVIRONMENTAL SERVICES, INC., DATED 12/19/2019.
- 2. THE MERIDIAN OF THIS SURVEY IS REFERENCED TO THE NEW JERSEY STATE PLANE COORDINATE SYSTEM NAD 83 (2011) DERIVED USING SURVEY-GRADE GNSS EQUIPMENT.



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Project

MONTCLAIR GOLF CLUB -
HALFWAY HOUSE,
GOLF BUILDING ADDITION, &
PARKING LOT IMPROVEMENTS

WEST ORANGE
ESSEX COUNTY NEW JERSEY

Drawing Title

EXISTING
IMPERVIOUS AREA
COVERAGE

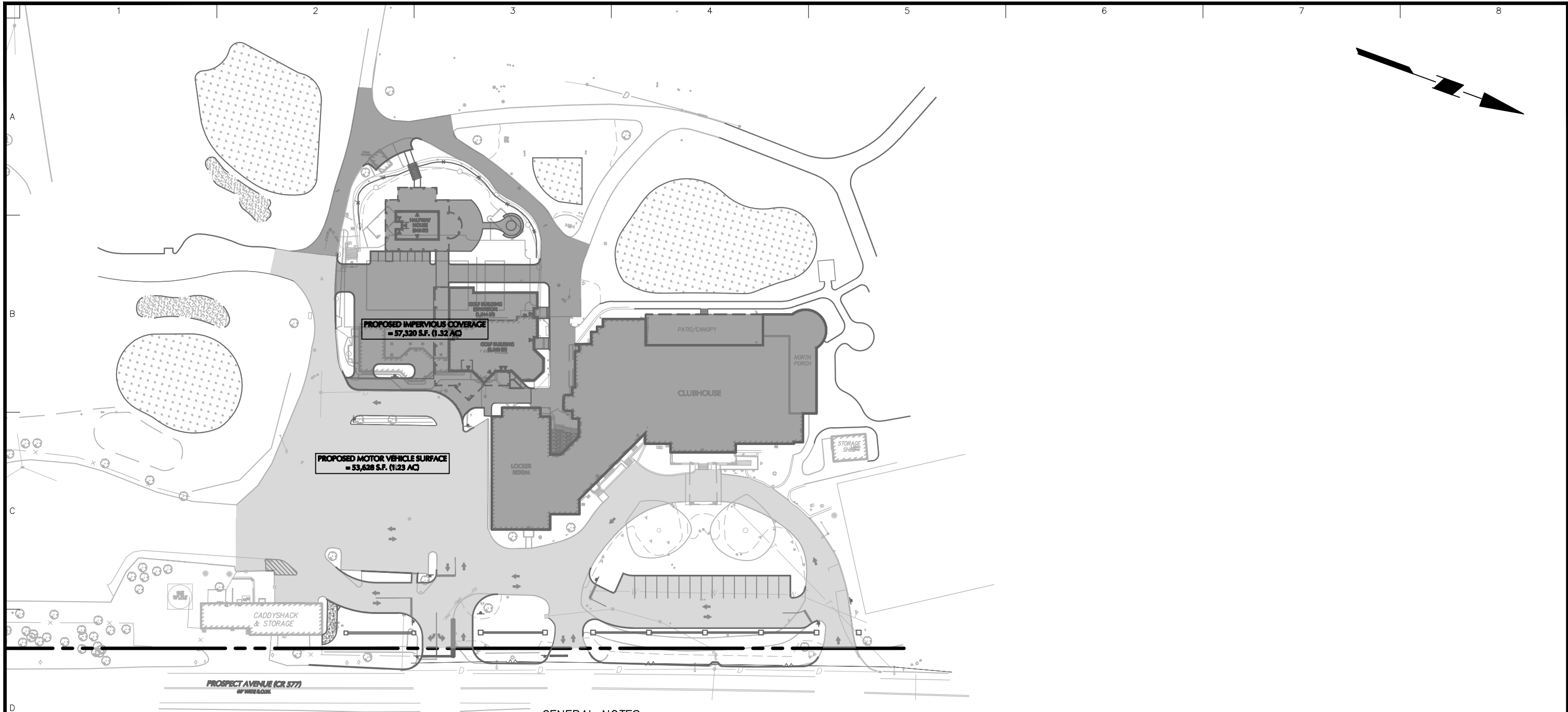
Project No.
001039208

Date
5/3/2024

Drawn By
RJB

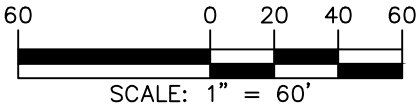
Checked By
TD

FG-9



GENERAL NOTES:

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LANGAN Langan Engineering and Environmental Services, Inc. 300 Kimball Drive Parsippany, NJ 07054 T: 973.560.4900 F: 973.560.4901 www.langan.com	Project MONTCLAIR GOLF CLUB - HALFWAY HOUSE, GOLF BUILDING ADDITION, & PARKING LOT IMPROVEMENTS WEST ORANGE ESSEX COUNTY NEW JERSEY	Drawing Title PROPOSED IMPERVIOUS AREA COVERAGE	Project No. 001039208	FG-10
			Date 5/3/2024	
			Drawn By RJB	
			Checked By TD	

Table 10.3-B
Recommended Coefficient of Runoff Values for Various Selected Land Uses

Land Use	Description	Hydrologic Soils Group			
		A	B	C	D
Cultivated Land	without conservation treatment with conservation treatment	0.49	0.67	0.81	0.88
		0.27	0.43	0.67	0.67
Pasture or Range Land Meadow	poor condition	0.38	0.63	0.78	0.84
	good condition	---	0.25	0.51	0.65
	good condition	---	---	0.41	0.61
Wood or Forest Land	thin stand, poor cover, no mulch	---	0.34	0.59	0.70
	good cover	---	---	0.45	0.59
Open Spaces, Lawns, Parks, Golf Courses, Cemeteries					
Good Condition Fair Condition	grass cover on 75% or more	---	0.25	0.51	0.65
	grass cover on 50% to 75%	---	0.45	0.63	0.74
Commercial and Business Area	85% impervious	0.84	0.90	0.93	0.96
Industrial Districts	72% impervious	0.67	0.81	0.88	0.92
Residential Average Lot Size (acres) 1/8 1/4 1/3 1/2 1	average % impervious				
	65	0.59	0.76	0.86	0.90
	38	0.29	0.55	0.70	0.80
	30	---	0.49	0.67	0.78
	25	---	0.45	0.65	0.76
	20	---	0.41	0.63	0.74
Paved Areas	parking lots, roofs, driveways, etc.	0.99	0.99	0.99	0.96
Streets and Roads	paved with curbs & storm	0.99	0.99	0.99	0.99
	sewers	0.57	0.76	0.84	0.88
	gravel	0.49	0.69	0.80	0.84
	dirt				

NOTE: Values are based on NRCS definitions and are average values. Source: Technical Manual Flood Hazard Area Control Act Rules, Bureaus of Inland and Coastal Regulations, NJDEP Flood Hazard Area Permits, New Jersey Department of Environmental Protection

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WEST ORANGE
BLOCK No. 601, LOT Nos. 1
VERONA

ESSEX COUNTY NEW JERSEY

Drawing Title

**RUNOFF
COEFFICIENTS**

Project No.
001039208

Date
01/12/2024

Scale
RB

Drawn By
TD

Figure

11



NOAA Atlas 14, Volume 2, Version 3
Location name: West Orange, New Jersey, USA*
Latitude: 40.8183°, Longitude: -74.2404°
Elevation: 564 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 & aerals](#)

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour) ¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	4.03 (3.68-4.43)	4.82 (4.40-5.29)	5.70 (5.20-6.25)	6.36 (5.78-6.96)	7.14 (6.48-7.82)	7.69 (6.95-8.42)	8.24 (7.40-9.02)	8.77 (7.84-9.60)	9.38 (8.30-10.3)	9.83 (8.64-10.8)
10-min	3.21 (2.93-3.52)	3.83 (3.51-4.21)	4.54 (4.15-4.99)	5.04 (4.58-5.53)	5.66 (5.13-6.20)	6.09 (5.50-6.67)	6.50 (5.84-7.12)	6.88 (6.14-7.53)	7.34 (6.49-8.06)	7.65 (6.72-8.42)
15-min	2.66 (2.43-2.92)	3.20 (2.93-3.51)	3.81 (3.48-4.18)	4.24 (3.86-4.64)	4.75 (4.31-5.21)	5.11 (4.62-5.60)	5.46 (4.91-5.98)	5.76 (5.14-6.31)	6.14 (5.44-6.75)	6.39 (5.62-7.04)
30-min	1.82 (1.66-1.99)	2.20 (2.01-2.41)	2.70 (2.46-2.96)	3.05 (2.77-3.34)	3.49 (3.17-3.83)	3.82 (3.45-4.18)	4.14 (3.72-4.54)	4.44 (3.97-4.86)	4.83 (4.27-5.31)	5.11 (4.49-5.62)
60-min	1.13 (1.03-1.24)	1.38 (1.26-1.51)	1.72 (1.57-1.89)	1.98 (1.80-2.17)	2.32 (2.10-2.54)	2.58 (2.33-2.82)	2.84 (2.55-3.11)	3.10 (2.77-3.39)	3.44 (3.05-3.78)	3.71 (3.26-4.08)
2-hr	0.692 (0.631-0.759)	0.842 (0.769-0.926)	1.07 (0.973-1.17)	1.24 (1.13-1.36)	1.48 (1.34-1.63)	1.68 (1.51-1.84)	1.89 (1.68-2.07)	2.10 (1.86-2.30)	2.40 (2.10-2.63)	2.64 (2.28-2.90)
3-hr	0.515 (0.471-0.565)	0.627 (0.573-0.688)	0.795 (0.726-0.873)	0.926 (0.844-1.02)	1.11 (1.00-1.21)	1.26 (1.13-1.37)	1.41 (1.26-1.54)	1.57 (1.39-1.72)	1.79 (1.57-1.96)	1.97 (1.71-2.16)
6-hr	0.333 (0.306-0.365)	0.405 (0.371-0.443)	0.513 (0.469-0.560)	0.600 (0.546-0.654)	0.724 (0.655-0.788)	0.828 (0.744-0.899)	0.939 (0.836-1.02)	1.06 (0.932-1.15)	1.23 (1.07-1.34)	1.37 (1.18-1.49)
12-hr	0.206 (0.188-0.227)	0.250 (0.229-0.276)	0.319 (0.291-0.351)	0.376 (0.342-0.412)	0.460 (0.414-0.502)	0.532 (0.475-0.580)	0.610 (0.538-0.664)	0.696 (0.607-0.758)	0.823 (0.704-0.896)	0.932 (0.784-1.02)
24-hr	0.117 (0.108-0.127)	0.142 (0.131-0.154)	0.182 (0.168-0.198)	0.216 (0.199-0.235)	0.268 (0.245-0.290)	0.312 (0.284-0.338)	0.362 (0.325-0.392)	0.417 (0.370-0.453)	0.501 (0.436-0.545)	0.573 (0.492-0.626)
2-day	0.069 (0.064-0.075)	0.084 (0.077-0.091)	0.107 (0.099-0.116)	0.126 (0.116-0.137)	0.155 (0.142-0.168)	0.179 (0.163-0.195)	0.206 (0.185-0.224)	0.235 (0.209-0.256)	0.278 (0.243-0.305)	0.314 (0.271-0.346)
3-day	0.048 (0.045-0.052)	0.058 (0.054-0.063)	0.074 (0.069-0.081)	0.088 (0.081-0.095)	0.107 (0.098-0.116)	0.123 (0.112-0.134)	0.141 (0.127-0.153)	0.160 (0.143-0.174)	0.188 (0.165-0.205)	0.211 (0.184-0.233)
4-day	0.038 (0.035-0.041)	0.046 (0.043-0.050)	0.058 (0.054-0.063)	0.068 (0.063-0.074)	0.083 (0.076-0.090)	0.095 (0.087-0.103)	0.108 (0.098-0.117)	0.122 (0.110-0.133)	0.143 (0.126-0.156)	0.160 (0.140-0.176)
7-day	0.025 (0.024-0.027)	0.031 (0.028-0.033)	0.038 (0.035-0.041)	0.044 (0.041-0.048)	0.053 (0.049-0.057)	0.061 (0.056-0.065)	0.069 (0.062-0.074)	0.077 (0.069-0.083)	0.089 (0.079-0.097)	0.099 (0.087-0.108)
10-day	0.020 (0.019-0.022)	0.024 (0.023-0.026)	0.030 (0.028-0.032)	0.034 (0.032-0.037)	0.041 (0.038-0.044)	0.046 (0.043-0.050)	0.052 (0.047-0.056)	0.058 (0.052-0.062)	0.066 (0.059-0.072)	0.073 (0.064-0.079)
20-day	0.014 (0.013-0.014)	0.016 (0.015-0.017)	0.019 (0.018-0.021)	0.022 (0.021-0.023)	0.025 (0.024-0.027)	0.028 (0.026-0.030)	0.031 (0.028-0.033)	0.033 (0.031-0.036)	0.037 (0.034-0.040)	0.040 (0.036-0.043)
30-day	0.011 (0.011-0.012)	0.013 (0.013-0.014)	0.016 (0.015-0.017)	0.017 (0.016-0.018)	0.020 (0.019-0.021)	0.021 (0.020-0.023)	0.023 (0.022-0.025)	0.025 (0.023-0.026)	0.027 (0.025-0.029)	0.029 (0.026-0.031)
45-day	0.009 (0.009-0.010)	0.011 (0.011-0.012)	0.013 (0.012-0.014)	0.014 (0.013-0.015)	0.016 (0.015-0.017)	0.017 (0.016-0.018)	0.019 (0.017-0.020)	0.020 (0.018-0.021)	0.021 (0.020-0.023)	0.022 (0.021-0.024)
60-day	0.008 (0.008-0.009)	0.010 (0.009-0.010)	0.011 (0.011-0.012)	0.013 (0.012-0.013)	0.014 (0.013-0.015)	0.015 (0.014-0.016)	0.016 (0.015-0.017)	0.017 (0.016-0.018)	0.018 (0.017-0.019)	0.019 (0.017-0.020)

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

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

Please refer to NOAA Atlas 14 document for more information.

LANGAN

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Langan Engineering, Environmental, Surveying,
Landscape Architecture and Geology, D.P.C.
Langan International LLC
Collectively known as Langan

NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400

Project
MONTCLAIR GOLF CLUB

HALFWAY HOUSE, GOLF BUILDING
ADDITION, & PARKING LOT
IMPROVEMENTS

BLOCK No. 151, LOT Nos. 1, 5, 7, 11,
14, 15.01, 23, 24, 37, 41, 45.01 & 49

WEST ORANGE
BLOCK No. 601, LOT Nos. 1
VERONA

ESSEX COUNTY NEW JERSEY

Drawing Title

NOAA IDF RAINFALL INTENSITIES

Project No.
001039208

Date
01/12/2024

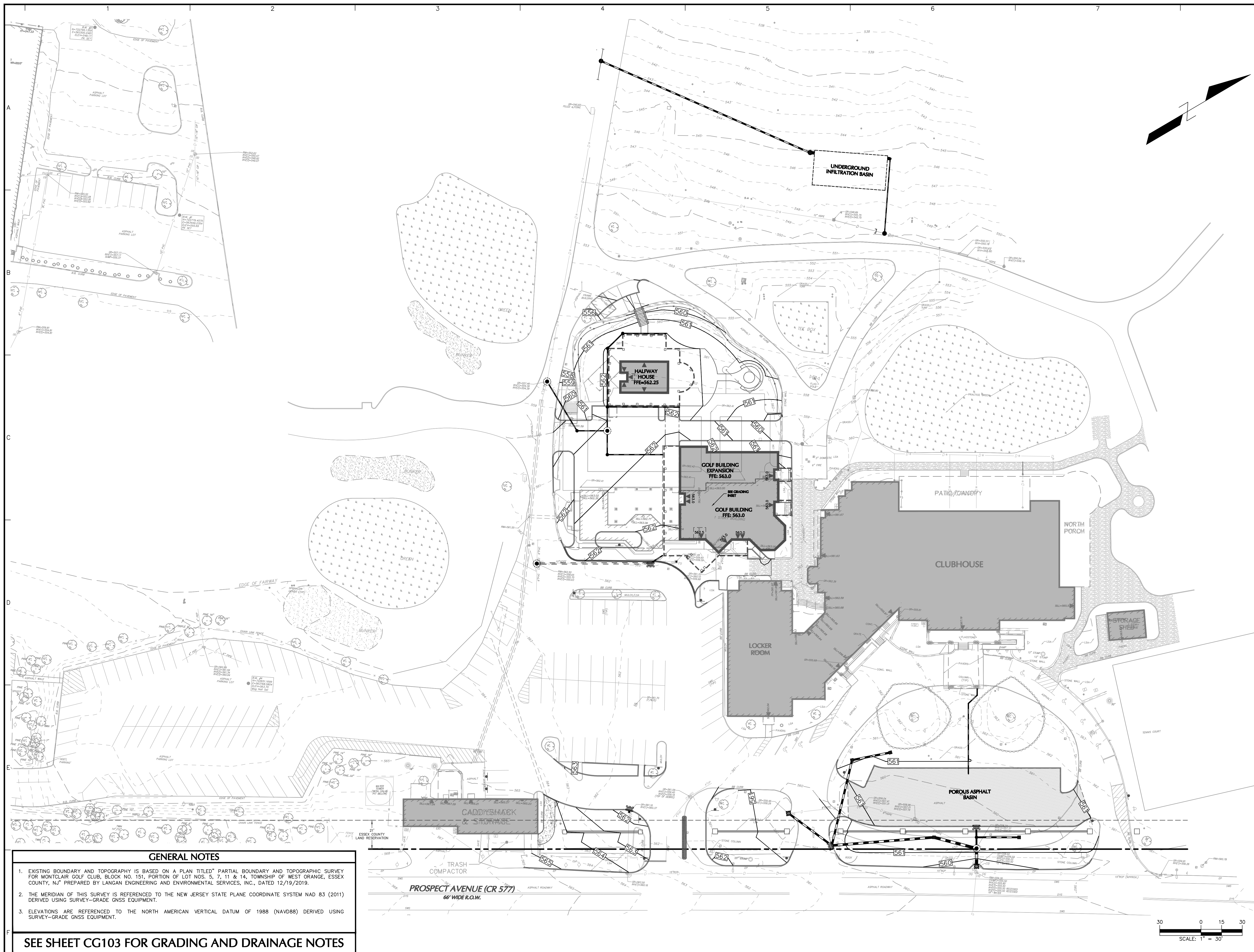
Scale
RB

Drawn By
TD

Figure

12

DRAWINGS



05/03/2024	REVISED PER TOWNSHIP COMMENTS AND DESIGN UPDATES	1.
Date	Description	No.

Revisions

 5/3/2024
SIGNATURE MICHAEL J. FOWLER DATE SIGNED
PROFESSIONAL ENGINEER NJ Lic. No.
24GE03239800

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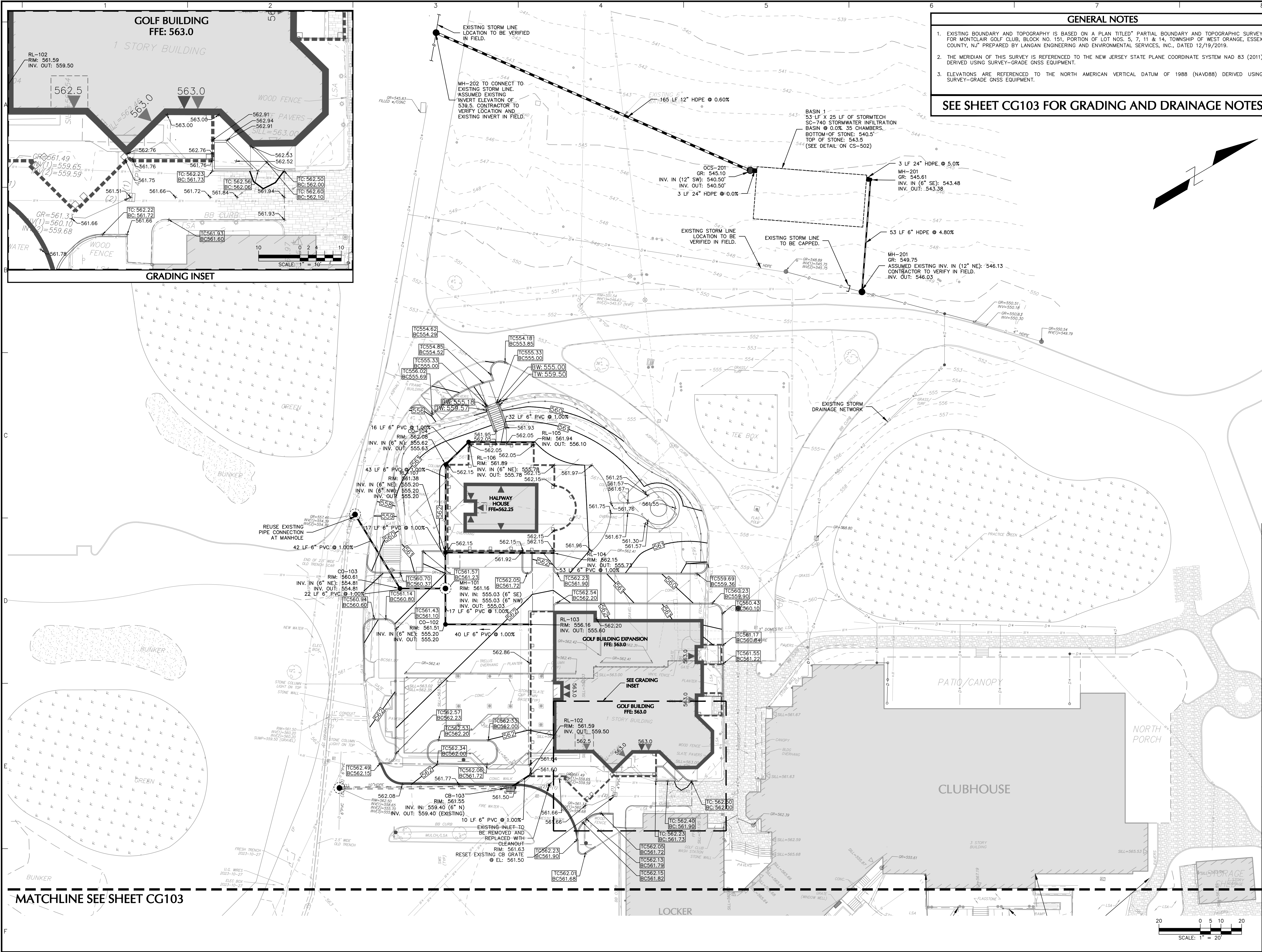
Project

**MONTCLAIR GOLF CLUB -
HALFWAY HOUSE,
GOLF BUILDING ADDITION, &
PARKING LOT IMPROVEMENTS**

WEST ORANGE
ESSEX COUNTY NEW JERSEY

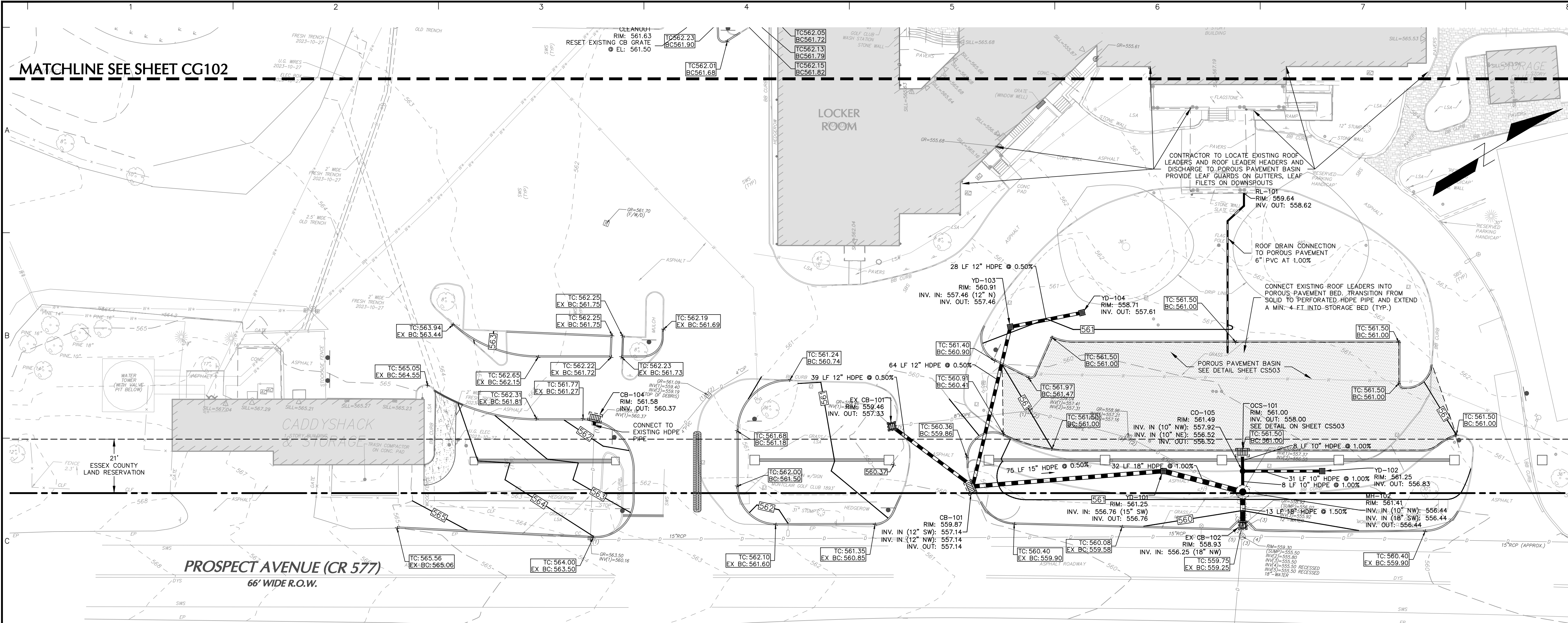
OVERALL GRADING & DRAINAGE PLAN

Project No.	CG101
001039208	
Date	
01/17/2024	
Drawn By	CG101
RB	
Checked By	
TD/GED	



05/03/2024	REVISED PER TOWNSHIP COMMENTS AND DESIGN UPDATES	1.
Date	Description	No.
Revisions		
 SIGNATURE MICHAEL J. FOWLER DATE SIGNED 5/3/2024 PROFESSIONAL ENGINEER NJ Lic. No. 24GE03239800		
LANGAN Langan Engineering and Environmental Services, LLC. 300 Kimball Drive Parsippany, NJ 07054 T: 973.560.4900 F: 973.560.4901 www.langan.com NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400		
Project		
MONTCLAIR GOLF CLUB - HALFWAY HOUSE, GOLF BUILDING ADDITION, & PARKING LOT IMPROVEMENTS		
WEST ORANGE		
NEW JERSEY		
ESSEX COUNTY		
Drawing Title		
GRADING & DRAINAGE PLAN I		
Project No.		
001039208		
Date		
01/17/2024		
Drawn By		
RB		
Checked By		
TD/GED		
CG102		

MATCHLINE SEE SHEET CG102



STORMWATER MANAGEMENT FACILITY MAINTENANCE TASKS AND SCHEDULE

NOTE: SEE THE STORMWATER MAINTENANCE PLAN LAST REVISED 8 APRIL 2020 FOR ADDITIONAL MAINTENANCE SCHEDULING AND TASKS.

UNDERGROUND EXTENDED DETENTION BASIN (STORMTRAP)

SHORT-TERM MEASURES (AT LEAST ONCE EVERY 3 MONTHS OR AFTER EACH STORM EXCEEDING 1 INCH OF RAINFALL UNTIL BASIN IS STABILIZED)

1. MAINTAIN CONTRIBUTING DRAINAGE AREA
2. INSPECT THE INLET STRUCTURES
3. INSPECT THE OUTLET STRUCTURE:

MEDIUM-TERM MEASURES (AT LEAST ONCE EVERY SIX MONTHS)

1. INSPECT THE INLET STRUCTURES
2. INSPECT THE OUTLET STRUCTURE

LONG-TERM MEASURES (AT LEAST ONCE EVERY YEAR)

1. REMOVE SEDIMENT FROM BASIN USING METHODS OUTLINES IN THE MANUFACTURER'S (STORMTRAP) MAINTENANCE MANUAL.

UNDERGROUND DETENTION BASIN (PIPE SYSTEM)

SHORT-TERM MEASURES (AT LEAST ONCE EVERY 3 MONTHS OR AFTER EACH STORM EXCEEDING 1 INCH OF RAINFALL UNTIL BASIN IS STABILIZED)

1. MEASURE THE SEDIMENT BUILDUP AT EACH MANHOLE. CLEANING SHOULD BE PERFORMED IF SEDIMENT BUILDUP IS GREATER THAN 2.4 INCHES.
2. A THOROUGH CLEANING OF THE SYSTEM (HEADERS AND LATERALS) CAN BE PERFORMED BY EITHER MANUAL METHODS OR BY A VACUUM TRUCK.
3. INSPECT THE INLET AND THE OUTLET STRUCTURES:

LONG-TERM MEASURES (AT LEAST ONCE EVERY YEAR)

1. REMOVE SEDIMENT FROM BASIN USING LIGHT WEIGHT CONSTRUCTION EQUIPMENT

STORMWATER CONVEYANCE SYSTEM

SHORT-TERM MEASURES (ONCE A YEAR OR AFTER A STORM EXCEEDING 1-INCH OF RAINFALL)

1. ALL CONVEYANCE SYSTEMS INCLUDING INLETS, MANHOLES, CONCRETE CHAMBERS AND PIPES ARE EXPECTED TO ACCUMULATE DEBRIS AND SEDIMENT OVER TIME.
2. A THOROUGH CLEANING OF THE SYSTEM CAN BE PERFORMED BY EITHER MANUAL METHODS OR BY A VACUUM TRUCK.
3. ALL STRUCTURAL COMPONENTS MUST BE INSPECTED FOR CRACKING, SUBSIDENCE, BREACHING, WEARING, AND DETERIORATION. THE CONDITION OF SURROUNDING AND ABOVE LYING MATERIALS SHALL BE INSPECTED FOR EVIDENCE OF POTENTIAL FAILURES OR DETERIORATION.

RESPONSIBLE PARTY

MONTCLAIR GOLF CLUB
ATTN: MICHAEL CAMPBELL, DIRECTOR OF GOLF COURSE OPERATIONS
25 PROSPECT AVENUE
WEST ORANGE, NEW JERSEY 07052
PHONE NUMBER: (973) 239-1800

GRADING & DRAINAGE NOTES

1. EXISTING BOUNDARY AND TOPOGRAPHY IS BASED ON A PLAN TITLED "PARTIAL BOUNDARY AND TOPOGRAPHIC SURVEY FOR MONTCLAIR GOLF CLUB, BLOCK NO. 151, PORTION OF LOT NOS. 5, 7, 11 & 14, TOWNSHIP OF WEST ORANGE, ESSEX COUNTY, NJ" PREPARED BY LANGAN ENGINEERING AND ENVIRONMENTAL SERVICES, INC., DATED 12/19/2019.
2. THE MERIDIAN OF THIS SURVEY IS REFERENCED TO THE NEW JERSEY STATE PLANE COORDINATE SYSTEM NAD 83 (2011) DERIVED USING SURVEY-GRADE GNSS EQUIPMENT.
3. ELEVATIONS ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88) DERIVED USING SURVEY-GRADE GNSS EQUIPMENT.
4. ONCE EXISTING UTILITIES TO REMAIN ARE LOCATED, ANY POTENTIAL CONFLICTS WITH OTHER UTILITIES, RELOCATED UTILITY POLES, ETC. SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER IMMEDIATELY.
5. THE CONTRACTOR IS SPECIFICALLY CAUTIONED THAT THE LOCATION AND/OR ELEVATION OF EXISTING UTILITIES AS SHOWN ON THESE PLANS IS BASED ON RECORDS OF THE 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 ALL THE APPROPRIATE UTILITY COMPANIES HAVING UNDERGROUND UTILITIES ON SITE OR IN RIGHT-OF-WAYS AT LEAST 72 HOURS BEFORE ANY EXCAVATION OR GRADING 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. THE CONTRACTOR SHALL VERIFY ALL EXISTING CONDITIONS, UTILITY LOCATIONS, DEPTHS AND INVERTS PRIOR TO CONSTRUCTION. ANY CONDITIONS FOUND TO DIFFER FROM THOSE SHOWN BY THESE DRAWINGS SHALL BE IMMEDIATELY BROUGHT TO THE ATTENTION OF LANGAN ENGINEERING. CALL BEFORE YOU DIG- 1-800-272-1000.
6. ADJUST ALL EXISTING AND PROPOSED UTILITY FRAMES, GRATES, MANHOLE COVERS, VALVE BOXES, ETC. TO BE FLUSH WITH THE PROPOSED SURFACE ELEVATIONS WITHIN THE LIMITS OF CONSTRUCTION.
7. ALL PROPOSED ON-SITE UTILITIES TO BE INSTALLED UNDERGROUND. ALL TRENCHING, PIPE LAYING, AND BACKFILLING SHALL BE IN ACCORDANCE WITH FEDERAL OSHA REGULATIONS.
8. ALL STORM DRAINAGE PIPES ARE TO BE AS SPECIFIED ON THE PLANS:
 - HIGH-DENSITY POLYETHYLENE PIPE (HDPE): AASHTO M294 TYPE S FOR PIPE AND FITTINGS. MATERIAL SHALL MEET ASTM D1298 TYPE III, CATEGORY 4, GRADE P33, CLASS C, OR ASTM D3350 CELL CLASSIFICATION 324420C. PIPE SHALL BE SURE-LOCK 10.8 PIPE MANUFACTURED BY ADS, INC. WITH WATER-TIGHT JOINTS ACCORDING TO THE REQUIREMENTS OF ASTM D3212 OR APPROVED EQUIVALENT. INSTALLATION SHALL BE IN ACCORDANCE WITH ASTM D2321.
7. ALL DRAINAGE STRUCTURES SHALL BE PRE-CAST UNLESS OTHERWISE NOTED.
8. ALL DRAINAGE STRUCTURES AND STORM SEWER PIPES SHALL MEET HEAVY DUTY TRAFFIC (HS20) LOADING AND BE INSTALLED ACCORDINGLY.
9. ALL PROPOSED ROOF LEADERS SHALL BE CONNECTED TO THE BELOW GRADE DETENTION BASIN-2.
10. SITE FILL SHALL CONSIST OF MATERIAL FROM APPROVED ONSITE SOURCES OR APPROVED OFFSITE MATERIAL. THE GEOTECHNICAL ENGINEER WILL REVIEW AND APPROVE ALL MATERIALS.

11. PROOF ROLL ALL CUT AREAS. PLACE AND COMPACT APPROVED FILL MATERIALS IN 12-INCH MAXIMUM LOOSE LIFTS USING AT LEAST 6 PASSES WITH, AT MINIMUM, A 5 TON STATIC DRUM WEIGHT VIBRATORY ROLLER. COMPACT TO AT LEAST 95% OF THE MAXIMUM DRY DENSITY AS DETERMINED BY ASTM D1557.
12. PARKING LOT SUBGRADES SHALL BE FIRM AND NON-YIELDING. SOFT AREAS AND UNSUITABLE MATERIAL SHALL BE REMOVED AND REPLACED WITH APPROVED MATERIALS AND AS DIRECTED BY THE GEOTECHNICAL ENGINEER.
13. PIPE BEDDING MATERIAL SHALL BE AASHTO NO. 67 PROCESSED SAND AND GRAVEL FREE FROM DEBRIS, CLAY LUMPS, ORGANIC, OR OTHER DELETERIOUS MATERIALS, AND COMPLYING WITH THE FOLLOWING GRADATION REQUIREMENTS:

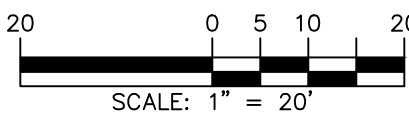
SIEVE SIZE PERCENT PASSING (BY WEIGHT)	
1" INCH	100
3/4" INCH	90-100
3/8" INCH	20-55
#4	0-10
#8	0-5

FILL SHALL BE CLEAN, WELL GRADED GRANULAR SOIL WHICH IS NON-EXPANSIVE AND NON-COLLAPSIBLE AND SHALL HAVE LESS THAN 20% BY WEIGHT PASSING THE #200 SIEVE. THE PORTION PASSING THE #200 SIEVE SHALL BE NON-PLASTIC.
14. THE SUBJECT PROJECT AREA IS LOCATED WITHIN ZONE X, OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN AREA AS PER EFFECTIVE FIRM FLOOD INSURANCE RATE MAP OF ESSEX COUNTY, NEW JERSEY, COMMUNITY MAP NUMBER 34013C0103F, PANEL 103 OF 200 - DATED JUNE 4, 2007.
15. ANY STORMWATER FACILITIES SHOWN TO REMAIN SHOULD BE INSPECTED, REPAIRED AND CLEANED AS NECESSARY.
16. STORMWATER MANAGEMENT FACILITIES SHALL BE MAINTAINED REGULARLY TO INSURE CONTINUAL FUNCTIONING OF THE SYSTEM AT DESIGN CAPACITY. SEE MAINTENANCE REPORT FOR MAINTENANCE SCHEDULE, INSTRUCTIONS AND PROCEDURES.
17. ABBREVIATIONS:

AD	= AREA DRAIN
BC	= BOTTOM OF CURB
BW	= BOTTOM OF WALL
CB	= CATCH BASIN
PFE	= FINISHED FLOOR ELEVATION
GR	= GRATE ELEVATION
HDPE	= HIGH DENSITY POLYETHYLENE PIPE
INV	= INVERT
LF	= LINEAR FEET
MH	= MANHOLE
OCS	= OUTLET CONTROL STRUCTURE
PVC	= POLYVINYL CHLORIDE PIPE
RL	= ROOF LEADER
TC	= TOP OF CURB
TW	= TOP OF WALL

LEGEND

- | | |
|--|---------------------------|
| | EXISTING MAJOR CONTOUR |
| | EXISTING MINOR CONTOUR |
| | PROPOSED MAJOR CONTOUR |
| | PROPOSED MINOR CONTOUR |
| | PROPOSED DRAINAGE PIPE |
| | PROPOSED CATCH BASIN |
| | PROPOSED AREA DRAIN |
| | PROPOSED DRAINAGE MANHOLE |
| | PROPOSED GRADE BREAK |



05/03/2024	REVISED PER TOWNSHIP COMMENTS AND DESIGN UPDATES	1.
Date	Description	No.

Revisions

SIGNATURE MICHAEL J. FOWLER DATE SIGNED 5/3/2024
PROFESSIONAL ENGINEER NJ Lic. No. 24GE03239800

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NJ CERTIFICATE OF AUTHORIZATION NO. 24GA27896400

Project

**MONTCLAIR GOLF CLUB -
HALFWAY HOUSE,
GOLF BUILDING ADDITION, &
PARKING LOT IMPROVEMENTS**

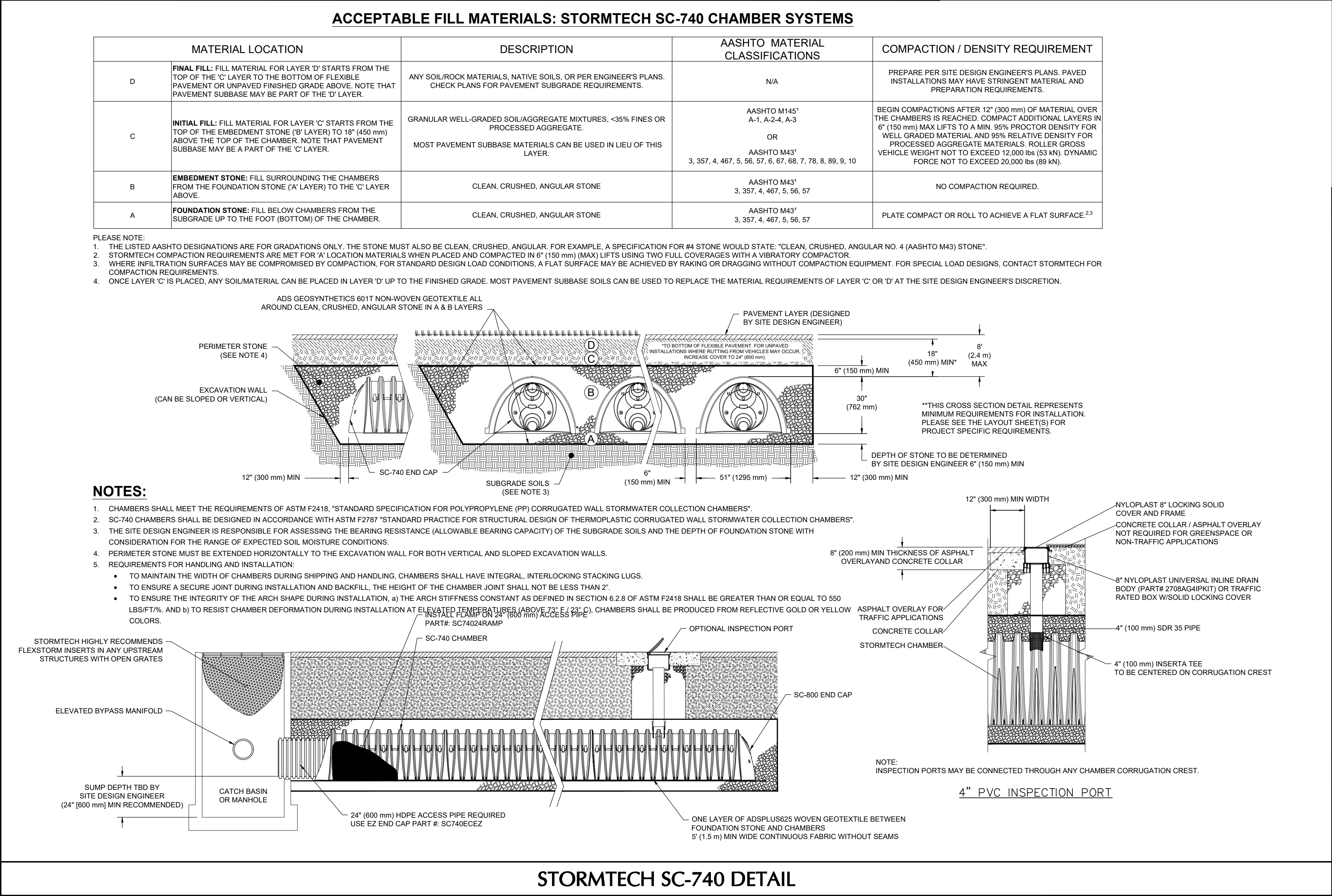
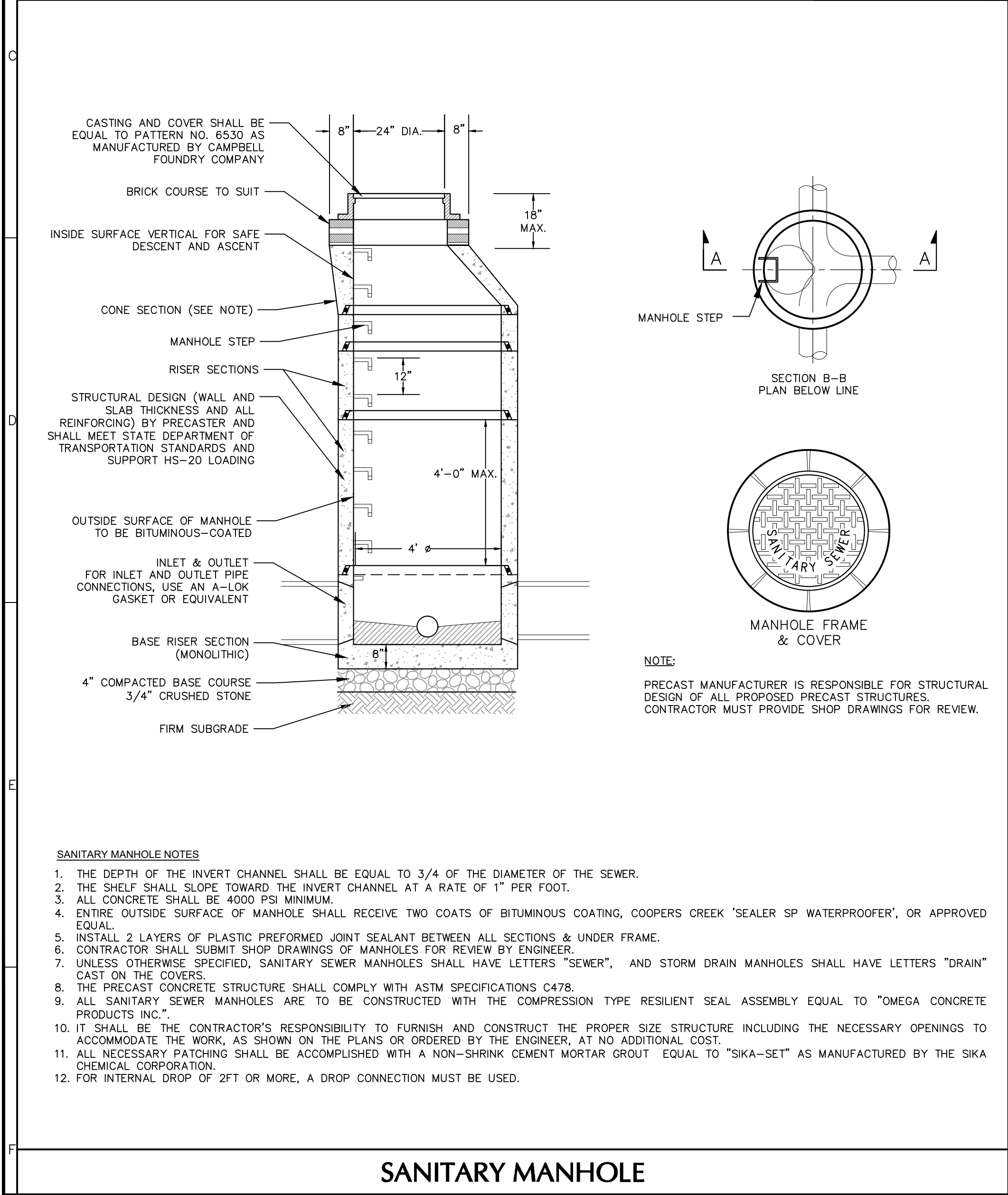
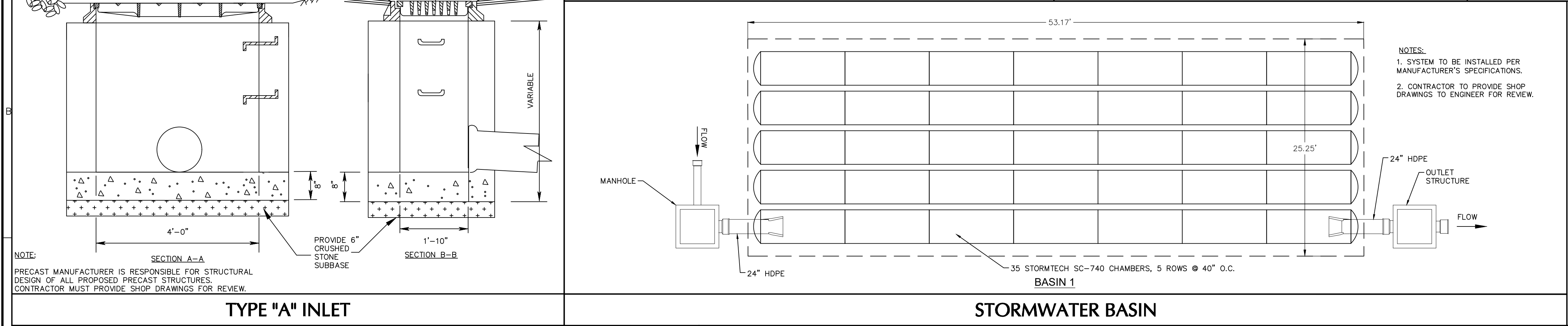
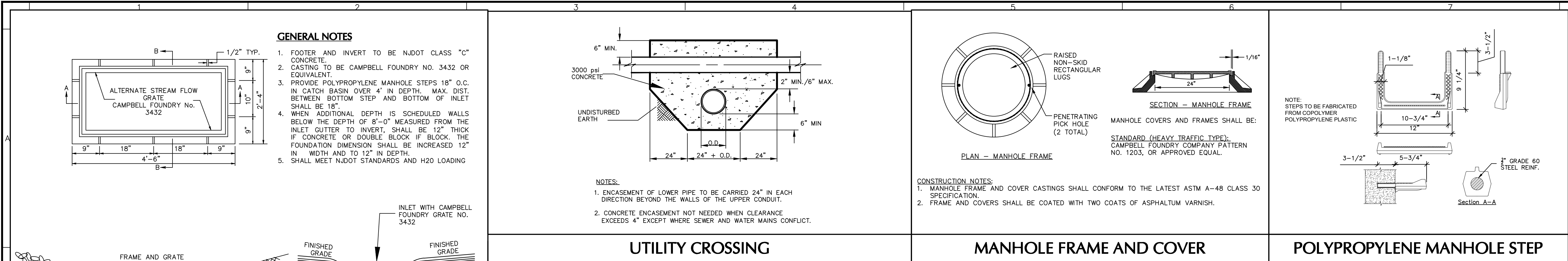
WEST ORANGE NEW JERSEY

ESSEX COUNTY

Drawing Title

**GRADING &
DRAINAGE PLAN II**

Project No.	001039208	CG103
Date	01/17/2024	
Drawn By	RB	
Checked By	TD/GED	



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PROJECT NO. 001039208

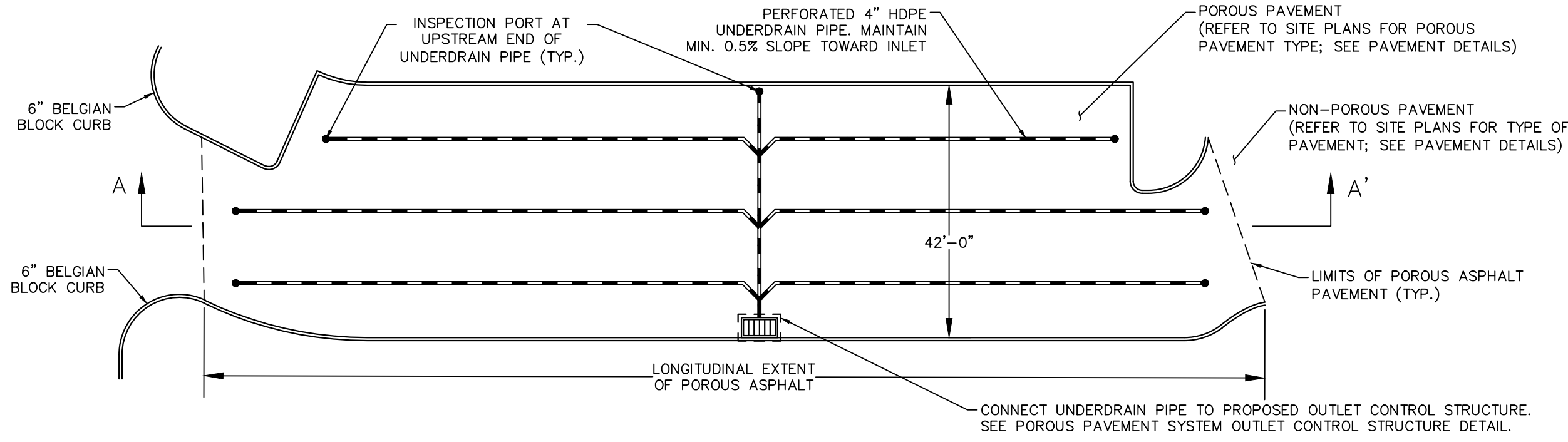
**MONTCLAIR GOLF CLUB -
HALFWAY HOUSE,
GOLF BUILDING ADDITION, &
PARKING LOT IMPROVEMENTS**

**WEST ORANGE
NEW JERSEY**

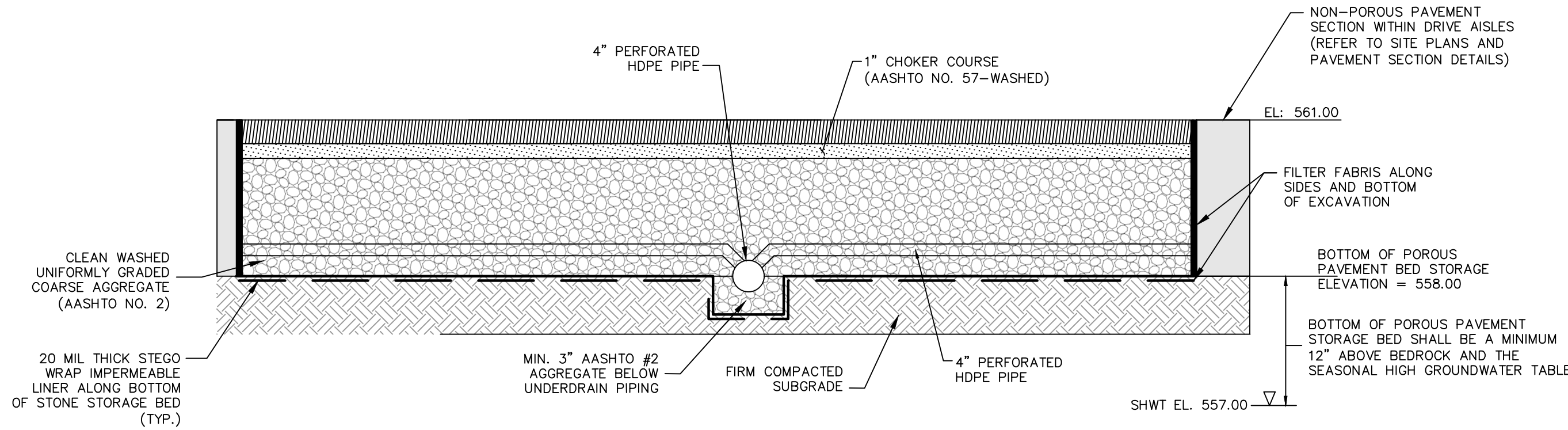
DETAILS II

Project No. **001039208**
Date **01/17/2024**
Drawn By **RB**
Checked By **TD/GED**

CS502



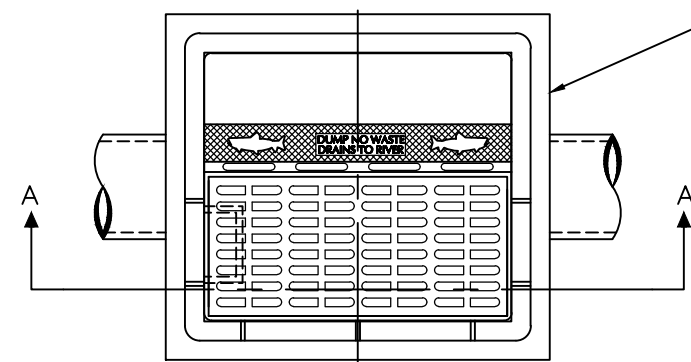
PLAN VIEW



SECTION A-A

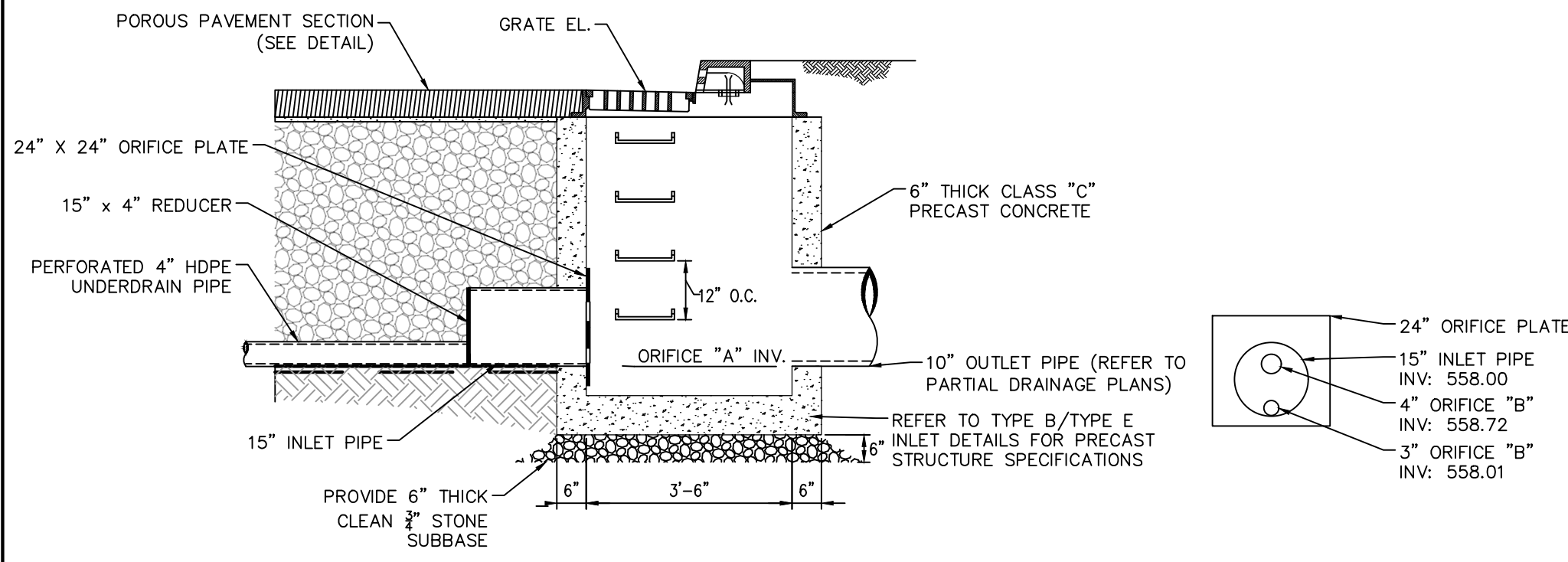
N.T.S.

TYPICAL POROUS PAVEMENT CROSS SECTION DETAIL



PLAN VIEW

	ORIFICE "A"		ORIFICE "B"		INLET PIPE		OUTLET PIPE		GRATE EL.
	SIZE	INVERT	SIZE	INVERT	SIZE	INVERT	SIZE	INVERT	
OCS-101	3" DIA.	558.01	4" DIA.	558.72	12" HDPE	558.00	18" HDPE	558.00	561.00

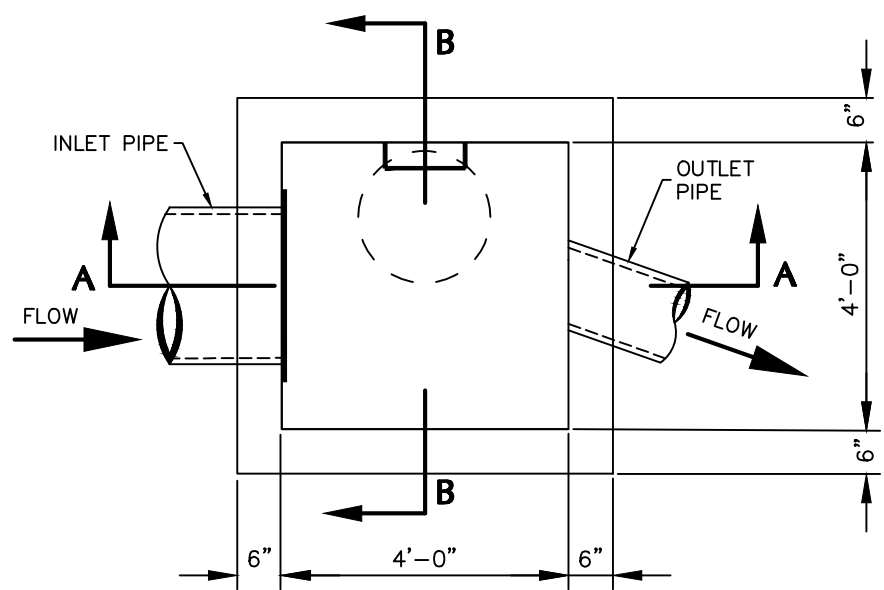


SECTION A-A

ORIFICE PLATE

N.T.S.

POROUS PAVEMENT SYSTEM OUTLET CONTROL STRUCTURE

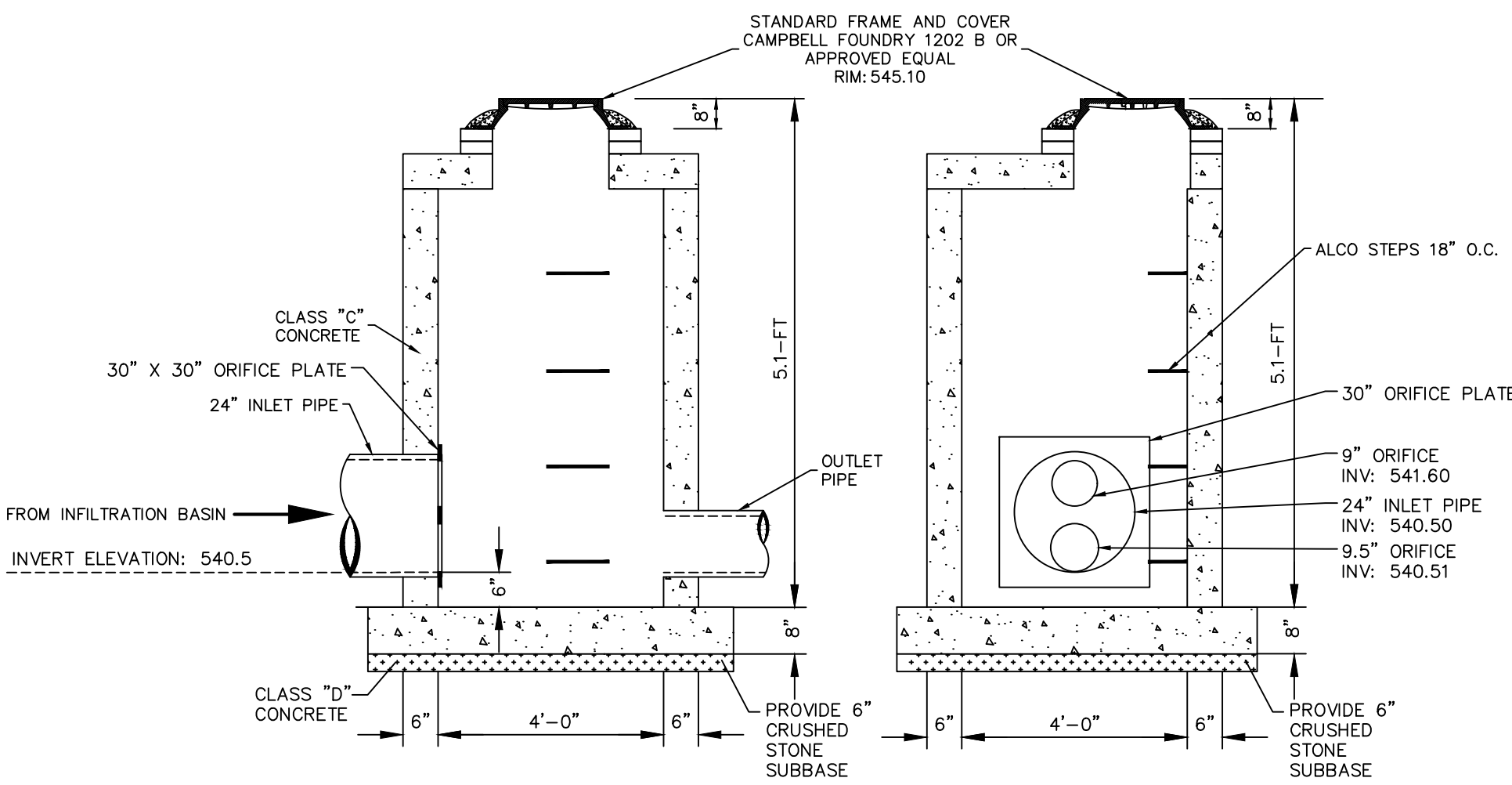


PLAN

GENERAL NOTES

- FOOTER AND INVERT TO BE NJDOT CLASS "C" CONCRETE.
- IF WALL CONSTRUCTION OTHER THAN CONCRETE THE WALLS SHALL BE PLASTERED BOTH INSIDE AND OUTSIDE WITH 1/2" THICK CEMENT PLASTER.
- CASTING TO BE CAMPBELL FOUNDRY NO. 1202B OR EQUIVALENT.
- PROVIDE ALUMINUM ALCO STEPS 6061T6 18" O.C. IN CATCH BASIN OVER 4' IN DEPTH. MAX. DIST. BETWEEN BOTTOM STEP AND BOTTOM OF INLET SHALL BE 18".
- WHEN ADDITIONAL DEPTH IS SCHEDULED WALLS BELOW THE DEPTH OF 8'-0" MEASURED FROM THE INLET OUTER TO INVERT, SHALL BE 12" THICK IF CONCRETE OR DOUBLE BLOCK IF BLOCK. THE FOUNDATION DIMENSION SHALL BE INCREASED 12" IN WIDTH AND TO 12" IN DEPTH.
- SHALL MEET NJDOT STANDARDS AND H20 LOADING

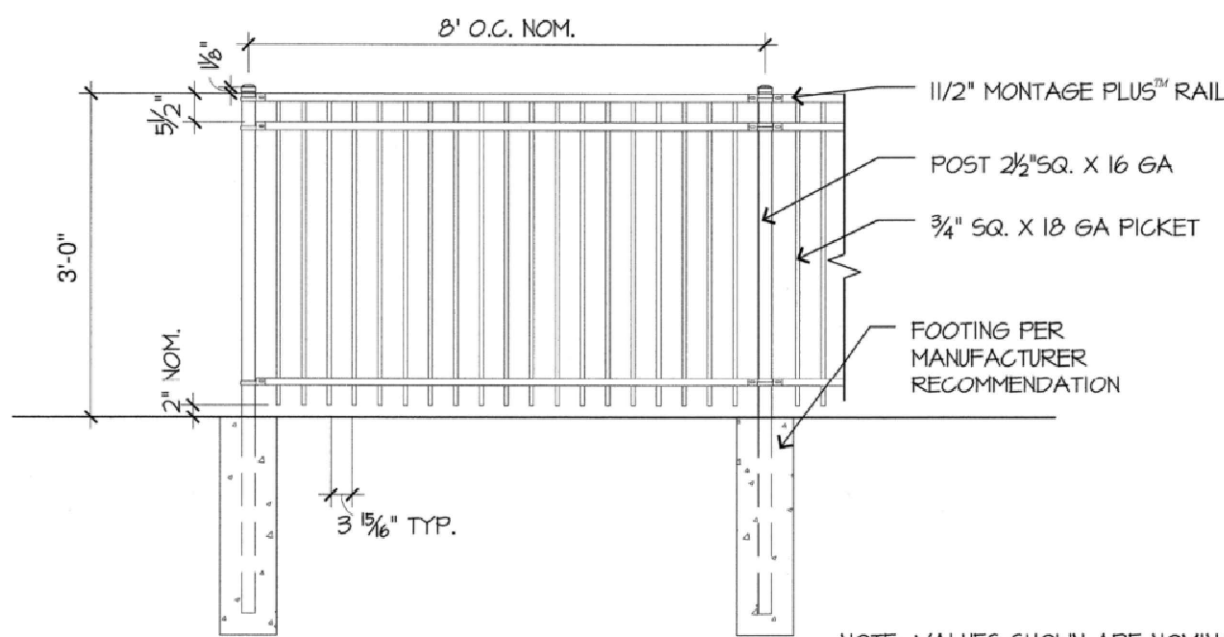
	ORIFICE "A"		ORIFICE "B"		INLET PIPE		OUTLET PIPE		GRATE EL.
	SIZE	INVERT	SIZE	INVERT	SIZE	INVERT	SIZE	INVERT	
OCS-201	9.5" HDPE	540.51	9" HDPE	541.60	24" HDPE	540.50	12" HDPE	540.50	545.10



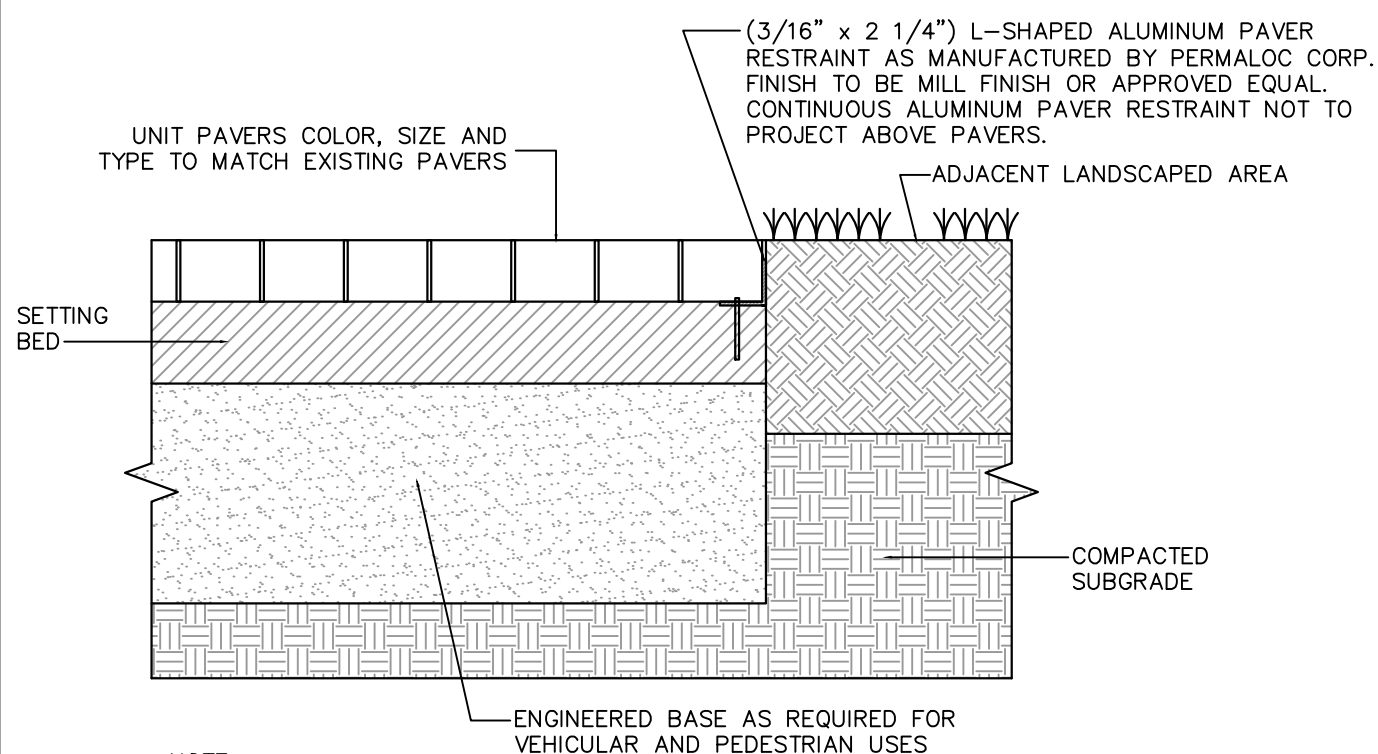
SECTION A-A

SECTION B-B

UNDERGROUND INFILTRATION BASIN OUTLET CONTROL STRUCTURE



3' HIGH METAL FENCE



NOTE:
PAVER EDGE RESTRAINT TO INCLUDE STEEL EDGING FLUSH CURB AND RAISED CURB.

PAVERS

05/03/2024	REVISED PER TOWNSHIP COMMENTS AND DESIGN UPDATES	1.
Date	Description	No.

Revisions

Michael J. Fowler 5/3/2024
SIGNATURE MICHAEL J. FOWLER DATE SIGNED
PROFESSIONAL ENGINEER NJ Lic. No. 24GE03239800

LANGAN
Langan Engineering and
Environmental Services, LLC.

300 Kimball Drive
Parsippany, NJ 07054

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NJ CERTIFICATE OF AUTHORIZATION No. 24GA27896400

Project
**MONTCLAIR GOLF CLUB -
HALFWAY HOUSE,
GOLF BUILDING ADDITION, &
PARKING LOT IMPROVEMENTS**

WEST ORANGE NEW JERSEY

ESSEX COUNTY

Drawing Title

DETAILS III

Project No.	CS503
001039208	
Date	
01/17/2024	
Drawn By	RB
Checked By	
TD/GED	

GENERAL NOTES

- EXISTING BOUNDARY AND TOPOGRAPHY IS BASED ON A PLAN TITLED "PARTIAL BOUNDARY AND TOPOGRAPHIC SURVEY FOR MONTCLAIR GOLF CLUB, BLOCK NO. 151, PORTION OF LOT NOS. 5, 7, 11 & 14, TOWNSHIP OF WEST ORANGE, ESSEX COUNTY, NJ" PREPARED BY LANGAN ENGINEERING AND ENVIRONMENTAL SERVICES, INC., DATED 12/19/2019.
- THE MERIDIAN OF THIS SURVEY IS REFERENCED TO THE NEW JERSEY STATE PLANE COORDINATE SYSTEM NAD 83 (2011) DERIVED USING SURVEY-GRADE GNSS EQUIPMENT.
- ELEVATIONS ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88) DERIVED USING SURVEY-GRADE GNSS EQUIPMENT.
- WATERSHED LIMITS SHOWN ARE BASED ON PROPOSED LIMITS OF WORK FOR THIS PROJECT.
- SOIL BOUNDARY AND SOILS INFORMATION BASED ON INFORMATION OBTAINED FROM USDA WEB SOIL SURVEY.

ANALYSIS POINT 1
(SHEET FLOW)

ANALYSIS POINT 2

EXISTING WATERSHED 1
(DISTURBED)
TOTAL AREA = 0.62 AC
A_{PERVIOUS} = 0.21 AC
C_N_{PERVIOUS} = 61
T_C_{PERVIOUS} = 9 MIN.
A_{IMPERVIOUS} = 0.41 AC
C_N_{IMPERVIOUS} = 98
T_C_{IMPERVIOUS} = 9 MIN.

EXISTING WATERSHED 1
(UNDISTURBED)
TOTAL AREA = 0.59 AC
A_{PERVIOUS} = 0.14 AC
C_N_{PERVIOUS} = 61
T_C_{PERVIOUS} = 8 MIN.
A_{IMPERVIOUS} = 0.45 AC
C_N_{IMPERVIOUS} = 98
T_C_{IMPERVIOUS} = 2 MIN.

EXISTING WATERSHED 3
(UNDISTURBED)
TOTAL AREA = 1.39 AC
A_{PERVIOUS} = 0.76 AC
C_N_{PERVIOUS} = 61
T_C_{PERVIOUS} = 12 MIN.
A_{IMPERVIOUS} = 0.63 AC
C_N_{IMPERVIOUS} = 98
T_C_{IMPERVIOUS} = 3 MIN.

EXISTING WATERSHED 2
(UNDISTURBED)
TOTAL AREA = 4.33 AC
A_{PERVIOUS} = 1.49 AC
C_N_{PERVIOUS} = 61
T_C_{PERVIOUS} = 12 MIN.
A_{IMPERVIOUS} = 2.84 AC
C_N_{IMPERVIOUS} = 98
T_C_{IMPERVIOUS} = 3 MIN.

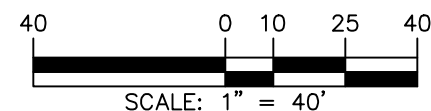
EXISTING WATERSHED 2
(DISTURBED)
TOTAL AREA = 0.51 AC
A_{PERVIOUS} = 0.39 AC
C_N_{PERVIOUS} = 61
T_C_{PERVIOUS} = 9 MIN.
A_{IMPERVIOUS} = 0.12 AC
C_N_{IMPERVIOUS} = 98
T_C_{IMPERVIOUS} = 2 MIN.

SOIL LEGEND

BogBc BOONTON LOAM
UdbonB UDORTHENTS (BOONTON)
URBONB URBAN LAND (BOONTON)

LEGEND

--- SOIL BOUNDARY LINE
---566--- EXISTING MINOR CONTOUR
---565--- EXISTING MAJOR CONTOUR
---566--- EXISTING MINOR CONTOUR
---565--- EXISTING MAJOR CONTOUR
--- WATERSHED BOUNDARY LINE
--- TIME OF CONCENTRATION LINE



Date	Description	No.
------	-------------	-----

Revisions

SIGNATURE MICHAEL J. FOWLER DATE SIGNED
PROFESSIONAL ENGINEER NJ Lic. No.
24GE03239800

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NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400

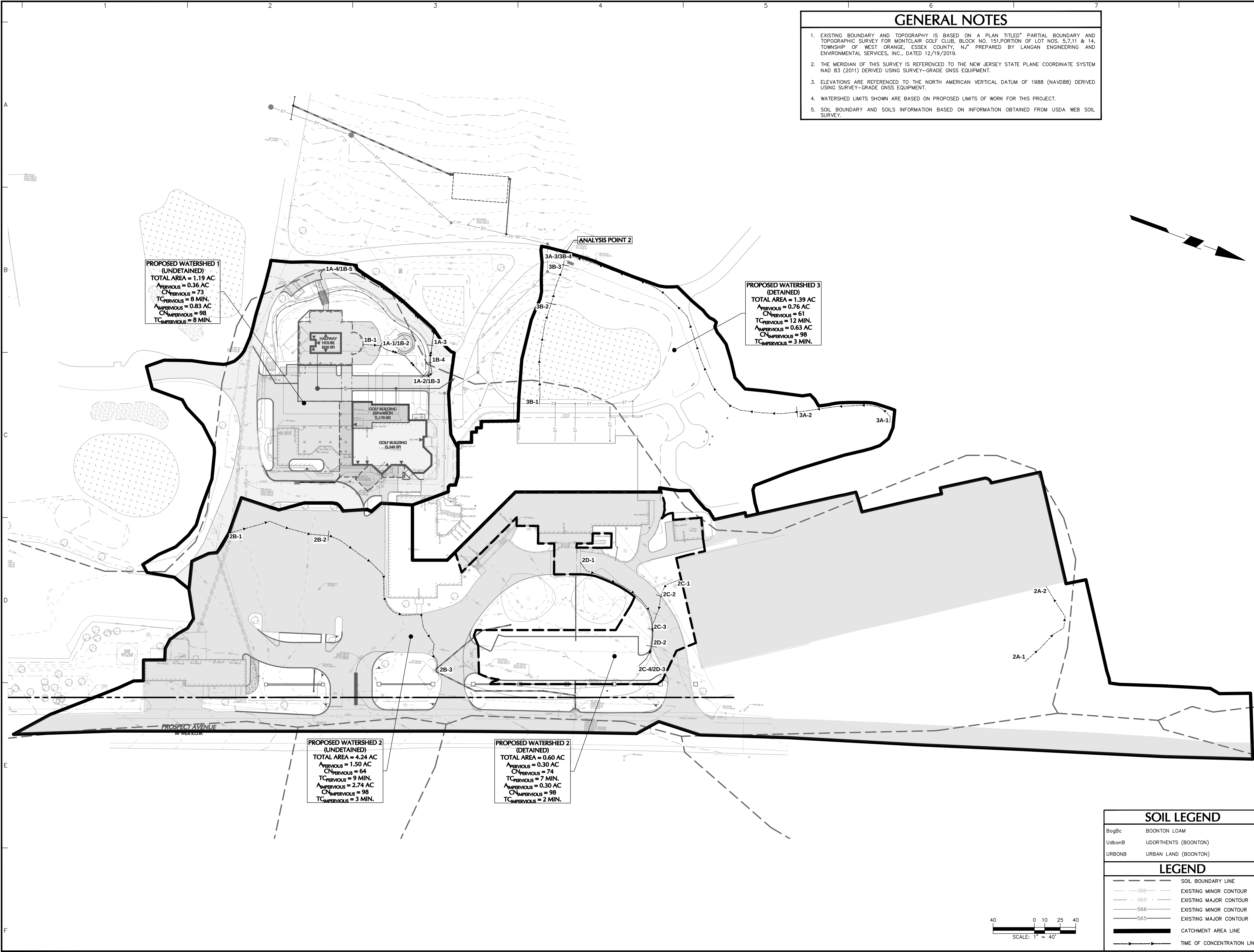
Project
MONTCLAIR GOLF CLUB -
HALFWAY HOUSE,
GOLF BUILDING ADDITION, &
PARKING LOT IMPROVEMENTS

ESSEX COUNTY NEW JERSEY

Drawing Title

EXISTING
WATERSHED AREA
MAP

Project No. 001039208	CG201
Date 01/12/2024	
Drawn By RB	
Checked By TD	



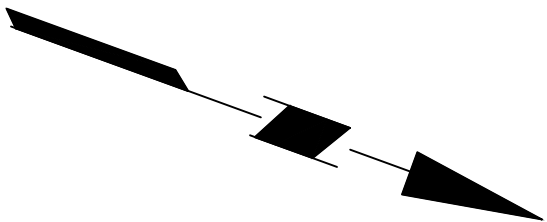
- GENERAL NOTES
1. EXISTING BOUNDARY AND TOPOGRAPHY IS BASED ON A PLAN TITLED "PARTIAL BOUNDARY AND TOPOGRAPHIC SURVEY FOR MONTCLAIR GOLF CLUB, BLOCK NO. 151, PORTION OF LOT NOS. 5, 7, 11 & 14, TOWNSHIP OF WEST ORANGE, ESSEX COUNTY, NJ" PREPARED BY LANGAN ENGINEERING AND ENVIRONMENTAL SERVICES, INC., DATED 12/19/2019.

2. THE MERIDIAN OF THIS SURVEY IS REFERENCED TO THE NEW JERSEY STATE PLANE COORDINATE SYSTEM NAD 83 (2011) DERIVED USING SURVEY-GRADE GNSS EQUIPMENT.

3. ELEVATIONS ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88) DERIVED USING SURVEY-GRADE GNSS EQUIPMENT.

4. WATERSHED LIMITS SHOWN ARE BASED ON PROPOSED LIMITS OF WORK FOR THIS PROJECT.

5. SOIL BOUNDARY AND SOILS INFORMATION BASED ON INFORMATION OBTAINED FROM USDA WEB SOIL SURVEY.



PROPOSED WATERSHED 1
(UNDETAINED)
TOTAL AREA = 1.19 AC
A_{PERVIOUS} = 0.36 AC
C_N_{PERVIOUS} = 73
T_C_{PERVIOUS} = 8 MIN.
A_{IMPERVIOUS} = 0.83 AC
C_N_{IMPERVIOUS} = 98
T_C_{IMPERVIOUS} = 9 MIN.

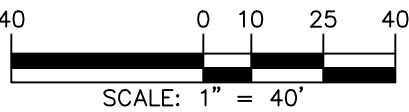
PROPOSED WATERSHED 3
(DETAINED)
TOTAL AREA = 1.39 AC
A_{PERVIOUS} = 0.76 AC
C_N_{PERVIOUS} = 61
T_C_{PERVIOUS} = 12 MIN.
A_{IMPERVIOUS} = 0.63 AC
C_N_{IMPERVIOUS} = 98
T_C_{IMPERVIOUS} = 3 MIN.

PROPOSED WATERSHED 2
(UNDETAINED)
TOTAL AREA = 4.24 AC
A_{PERVIOUS} = 1.50 AC
C_N_{PERVIOUS} = 64
T_C_{PERVIOUS} = 9 MIN.
A_{IMPERVIOUS} = 2.74 AC
C_N_{IMPERVIOUS} = 98
T_C_{IMPERVIOUS} = 3 MIN.

PROPOSED WATERSHED 2
(DETAINED)
TOTAL AREA = 0.60 AC
A_{PERVIOUS} = 0.30 AC
C_N_{PERVIOUS} = 74
T_C_{PERVIOUS} = 7 MIN.
A_{IMPERVIOUS} = 0.30 AC
C_N_{IMPERVIOUS} = 98
T_C_{IMPERVIOUS} = 2 MIN.

SOIL LEGEND	
BogBc	BOONTON LOAM
UdbonB	UDORTHENTS (BOONTON)
URBONB	URBAN LAND (BOONTON)

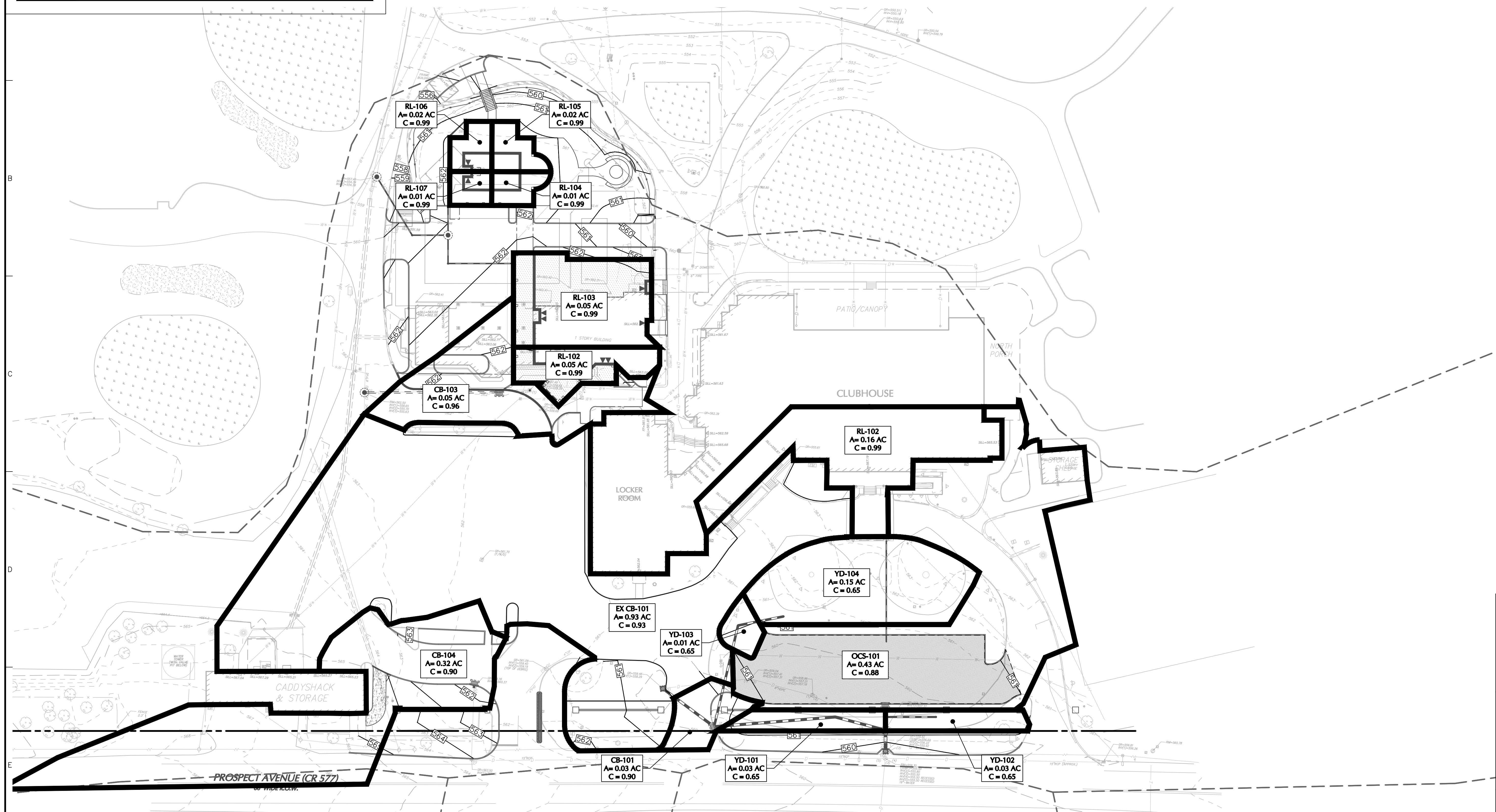
LEGEND	
	SOIL BOUNDARY LINE
	EXISTING MINOR CONTOUR
	EXISTING MAJOR CONTOUR
	EXISTING MINOR CONTOUR
	EXISTING MAJOR CONTOUR
	CATCHMENT AREA LINE
	TIME OF CONCENTRATION LINE



Date	Description	No.
Revisions		
SIGNATURE MICHAEL J. FOWLER DATE SIGNED		
PROFESSIONAL ENGINEER NJ Lic. No. 24GE03239800		
LANGAN Langan Engineering and Environmental Services, Inc. 300 Kimball Drive Parsippany, NJ 07054 T: 973.560.4900 F: 973.560.4901 www.langan.com NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400		
Project		
MONTCLAIR GOLF CLUB - HALFWAY HOUSE, GOLF BUILDING ADDITION, & PARKING LOT IMPROVEMENTS WEST ORANGE ESSEX COUNTY NEW JERSEY Drawing Title		
PROPOSED WATERSHED MAP		

GENERAL NOTES

- EXISTING BOUNDARY AND TOPOGRAPHY IS BASED ON A PLAN TITLED "PARTIAL BOUNDARY AND TOPOGRAPHIC SURVEY FOR MONTCLAIR GOLF CLUB, BLOCK NO. 151, PORTION OF LOT NOS. 5, 7, 11 & 14, TOWNSHIP OF WEST ORANGE, ESSEX COUNTY, NJ" PREPARED BY LANEAN ENGINEERING AND ENVIRONMENTAL SERVICES, INC., DATED 12/19/2019.
- THE MERIDIAN OF THIS SURVEY IS REFERENCED TO THE NEW JERSEY STATE PLANE COORDINATE SYSTEM NAD 83 (2011) DERIVED USING SURVEY-GRADE GNSS EQUIPMENT.
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- WATERSHED LIMITS SHOWN ARE BASED ON PROPOSED LIMITS OF WORK FOR THIS PROJECT.
- SOIL BOUNDARY AND SOILS INFORMATION BASED ON INFORMATION OBTAINED FROM USDA WEB SOIL SURVEY.



SOIL LEGEND

BogBc	BOONTON LOAM
UdbonB	UDORTHENTS (BOONTON)
URBONB	URBAN LAND (BOONTON)

LEGEND

---	SOIL BOUNDARY LINE
- - - - -	EXISTING MINOR CONTOUR
- - - - -	EXISTING MAJOR CONTOUR
- - - - -	EXISTING MINOR CONTOUR
- - - - -	EXISTING MAJOR CONTOUR
---	WATERSHED BOUNDARY LINE
---	TIME OF CONCENTRATION LINE

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NJ CERTIFICATE OF AUTHORIZATION No. 24GA27896400

Project

**MONTCLAIR GOLF CLUB -
HALFWAY HOUSE,
GOLF BUILDING ADDITION, &
PARKING LOT IMPROVEMENTS**

ESSEX COUNTY NEW JERSEY

Drawing Title

**PROPOSED
CATCHMENT AREA
MAP**

Project No.

001039208

Date

05/03/2024

Drawn By

JN

Checked By

LM**CG301**

APPENDIX A

EXISTING (ALLOWABLE) STORMWATER RUNOFF CALCULATIONS

CN and Tc CALCULATION SHEETS

Project MGC - Halfway House & Clubhouse Parking By: NG Date: 1/15/2024
 Location West Orange, NJ Checked By: TD Date Checked: 1/15/2024
 Circle one: Present Developed Existing Watershed 1 - Halfway House (Undisturbed)
 Include a map, schematic, or description of coverage areas.

Runoff Curve Number (CN)

Soil Name and hydrologic group (Appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN ^{*2}			Area x acres mi² %	Product of CN x Area
		Table 2-2	Fig. 2-3	Fig. 2-4		
B	Impervious	98			0.45	44.10
Totals =					0.45	44.10

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{44.10}{0.45} = 98.00 \quad \text{Use CN} = \boxed{98}$$

Project MGC - Halfway House & Clubhouse ParkingBy: NGDate: 1/15/2024Location West Orange, NJChecked By: TDDate Checked: 1/15/2024Circle one: Present DevelopedExisting Watershed 1 - Halfway House (Undisturbed)

Include a map, schematic, or description of coverage areas.

Runoff Curve Number (CN)

Soil Name and hydrologic group (Appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN ^{*2}			Area x acres mi² %	Product of CN x Area
		Table 2-2	Fig. 2-3	Fig. 2-4		
B	Open Space, Good Cond.	61			0.14	8.54
Totals =					0.14	8.54

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{8.54}{0.14} = 61.00 \quad \text{Use CN} =$$

61

Project MGC - Halfway House & Clubhouse Parking By: NG Date: 1/15/2024
 Location West Orange, NJ Checked By: TD Date Checked: 1/15/2024
 Circle one: Present Developed Existing Watershed 1 - Halfway House (Disturbed)
 Include a map, schematic, or description of coverage areas.

Runoff Curve Number (CN)

Soil Name and hydrologic group (Appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN ^{*2}			Area x acres mi² %	Product of CN x Area
		Table 2-2	Fig. 2-3	Fig. 2-4		
B	Impervious	98			0.41	40.18
Totals =					0.41	40.18

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{40.18}{0.41} = 98.00$ Use CN = **98**

Project MGC - Halfway House & Clubhouse Parking By: NG Date: 1/15/2024
 Location West Orange, NJ Checked By: TD Date Checked: 1/15/2024
 Circle one: Present Developed Existing Watershed 1 - Halfway House (Disturbed)
 Include a map, schematic, or description of coverage areas.

Runoff Curve Number (CN)

Soil Name and hydrologic group (Appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN ^{*2}			Area x acres mi² %	Product of CN x Area
		Table 2-2	Fig. 2-3	Fig. 2-4		
B	Open Space, Good Cond.	61			0.21	12.81
Totals =					0.21	12.81

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{12.81}{0.21} = 61.00$ Use CN = **61**

Project: Montclair GC - Parking Lot Expansion
Location: West Orange, NJ

By: NG

Date: 12/22/2023

Checked By: _____

Date Checked: _____

Circle One: Present Developed

Watershed 1 - Undisturbed - Pervious

Circle One: T_c T_t through subarea

1A-1 through 1A-4

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

Sheet Flow (Applicable to T_c Only)

- Surface Description (NEH table 15-1)
- Manning's Roughness Coeff., n (NEH table 15-1)
- Flow Length, L (total L < 100 ft)
- Two-year 24-hr rainfall, P₂
- Land Slope, s
- Compute T_t

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

Segment ID	1	2	
	Dense Grasses	Smooth Surfaces	
	0.24	0.011	
ft	37	63	
in	3.44	3.44	
ft/ft	0.016	0.017	
hr	0.112	0.014	+

Sheet Flow Sub-Total **0.126 hours**

Shallow Concentrated Flow

- Surface Description
- Flow Length, L
- Watercourse Slope, s
- Average Velocity, V (NEH table 15-3)
- Compute T_t

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

Segment ID	3		
	Pavement		
ft	163		
ft/ft	0.032		
ft/s	3.66		
hr	0.012	+	+

Shallow Conc. Flow Sub-Total **0.012 hours**

Channel Flow

- Flow Length, L
- Cross Sectional flow area, a
- Wetted Perimeter, P_w
- Hydraulic Radius, r
- Channel Slope, s
- Manning's Roughness Coeff., n
- Velocity, V
- Compute T_t

$$r = a / P_w$$

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

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

Segment ID			
ft			
ft ²			
ft			
ft			
ft/ft			
ft/s			
hr		+	+

Channel Flow Sub-Total **0.000 hours**

Watershed or subarea T_c or T_t
(Add Sub-Total T_t from prior steps)

Total T _c (hours) =	0.139 hours
Total T _c (minutes) =	8 minutes

Project: Montclair GC - Parking Lot Expansion
Location: West Orange, NJ

By: NG

Date: 12/22/2023

Checked By: _____ Date Checked: _____

Circle One: Present Developed

Watershed 1 - Undisturbed - Impervious

Circle One: T_c T_t through subarea

1B-1 through 1B-3

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

Sheet Flow (Applicable to T_c Only)

- Surface Description (NEH table 15-1)
- Manning's Roughness Coeff., n (NEH table 15-1)
- Flow Length, L (total L < 100 ft)
- Two-year 24-hr rainfall, P₂
- Land Slope, s
- Compute T_t

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

Segment ID	1		
	Smooth Surfaces		
	0.011		
ft	100		
in	3.44		
ft/ft	0.024		
hr	0.018	+	

Sheet Flow Sub-Total **0.018 hours**

Shallow Concentrated Flow

- Surface Description
- Flow Length, L
- Watercourse Slope, s
- Average Velocity, V (NEH table 15-3)
- Compute T_t

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

Segment ID	2		
	Pavement		
ft	165		
ft/ft	0.041		
ft/s	4.11		
hr	0.011	+	

Shallow Conc. Flow Sub-Total **0.011 hours**

Channel Flow

- Flow Length, L
- Cross Sectional flow area, a
- Wetted Perimeter, P_w
- Hydraulic Radius, r $r = a / P_w$
- Channel Slope, s
- Manning's Roughness Coeff., n
- Velocity, V $V = (1.49 r^{2/3} s^{1/2}) / n$
- Compute T_t

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

Segment ID			
ft			
ft ²			
ft			
ft			
ft/ft			
ft/s			
hr		+	

Channel Flow Sub-Total **0.000 hours**

Watershed or subarea T_c or T_t
(Add Sub-Total T_t from prior steps)

Total T _c (hours) =	0.029 hours
Software Limitations Require Minimum T _c =	2 minutes

Project: Montclair GC - Parking Lot Expansion
Location: West Orange, NJ

By: NG

Date: 12/22/2023

Checked By: _____

Date Checked: _____

Circle One: Present Developed

Watershed 1 - Disturbed - Pervious

Circle One: T_c T_t through subarea

1C-1 through 1C-4

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

Sheet Flow (Applicable to T_c Only)

- Surface Description (NEH table 15-1)
- Manning's Roughness Coeff., n (NEH table 15-1)
- Flow Length, L (total L < 100 ft)
- Two-year 24-hr rainfall, P₂
- Land Slope, s
- Compute T_t

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

Segment ID	1	2	
	Dense Grasses	Dense Grasses	
	0.24	0.24	
ft	61	15	
in	3.44	3.44	
ft/ft	0.041	0.052	
hr	0.115	0.034	+

Sheet Flow Sub-Total **0.150 hours**

Shallow Concentrated Flow

- Surface Description
- Flow Length, L
- Watercourse Slope, s
- Average Velocity, V (NEH table 15-3)
- Compute T_t

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

Segment ID	3		
	Pavement		
ft	12		
ft/ft	0.053		
ft/s	4.69		
hr	0.001	+	+

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

Channel Flow

- Flow Length, L
- Cross Sectional flow area, a
- Wetted Perimeter, P_w
- Hydraulic Radius, r
- Channel Slope, s
- Manning's Roughness Coeff., n
- Velocity, V
- Compute T_t

$$r = a / P_w$$

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

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

Segment ID			
ft			
ft ²			
ft			
ft			
ft/ft			
ft/s			
hr		+	+

Channel Flow Sub-Total **0.000 hours**

Watershed or subarea T_c or T_t
(Add Sub-Total T_t from prior steps)

Total T _c (hours) =	0.150 hours
Total T _c (minutes) =	9 minutes

Project: Montclair GC - Parking Lot Expansion
Location: West Orange, NJ

By: NG

Date: 12/22/2023

Checked By: _____

Date Checked: _____

Circle One: Present Developed

Watershed 1 - Disturbed - Impervious

Circle One: T_c T_t through subarea

1D-1 through 1D-5

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

Sheet Flow (Applicable to T_c Only)

- Surface Description (NEH table 15-1)
- Manning's Roughness Coeff., n (NEH table 15-1)
- Flow Length, L (total L < 100 ft)
- Two-year 24-hr rainfall, P₂
- Land Slope, s
- Compute T_t

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

Segment ID	1	2	3
	Smooth Surfaces	Dense Grasses	Dense Grasses
	0.011	0.24	0.24
ft	21	61	15
in	3.44	3.44	3.44
ft/ft	0.023	0.041	0.052
hr	0.005	0.115	0.034

Sheet Flow Sub-Total **0.155 hours**

Shallow Concentrated Flow

- Surface Description
- Flow Length, L
- Watercourse Slope, s
- Average Velocity, V (NEH table 15-3)
- Compute T_t

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

Segment ID	4		
	Pavement		
ft	12		
ft/ft	0.053		
ft/s	4.69		
hr	0.001		

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

Channel Flow

- Flow Length, L
- Cross Sectional flow area, a
- Wetted Perimeter, P_w
- Hydraulic Radius, r
- Channel Slope, s
- Manning's Roughness Coeff., n
- Velocity, V
- Compute T_t

$$r = a / P_w$$

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

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

Segment ID			
ft			
ft ²			
ft			
ft			
ft/ft			
ft/s			
hr			

Channel Flow Sub-Total **0.000 hours**

Watershed or subarea T_c or T_t
(Add Sub-Total T_t from prior steps)

Total T _c (hours) =	0.156 hours
Total T _c (minutes) =	9 minutes

Project MGC - Halfway House & Clubhouse Parking By: NG Date: 1/15/2024
 Location West Orange, NJ Checked By: TD Date Checked: 1/15/2024
 Circle one: Present Developed Ex Watershed 2 - Clubhouse Parking (Undisturbed)
 Include a map, schematic, or description of coverage areas.

Runoff Curve Number (CN)

Soil Name and hydrologic group (Appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN ^{*2}			Area x acres mi² %	Product of CN x Area
		Table 2-2	Fig. 2-3	Fig. 2-4		
B	Impervious	98			2.84	278.32
Totals =					2.84	278.32

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{278.32}{2.84} = 98.00$ Use CN = **98**

Project MGC - Halfway House & Clubhouse Parking By: NG Date: 1/15/2024
 Location West Orange, NJ Checked By: TD Date Checked: 1/15/2024
 Circle one: Present Developed Ex Watershed 2 - Clubhouse Parking (Undisturbed)
 Include a map, schematic, or description of coverage areas.

Runoff Curve Number (CN)

Soil Name and hydrologic group (Appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN ^{*2}			Area x acres mi² %	Product of CN x Area
		Table 2-2	Fig. 2-3	Fig. 2-4		
B	Open Space, Good Cond.	61			1.49	90.89
Totals =					1.49	90.89

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{90.89}{1.49} = 61.00$ Use CN = **61**

Project MGC - Halfway House & Clubhouse Parking By: NG Date: 1/15/2024
 Location West Orange, NJ Checked By: TD Date Checked: 1/15/2024
 Circle one: Present Developed Ex Watershed 2 - Clubhouse Parking (Disturbed)
 Include a map, schematic, or description of coverage areas.

Runoff Curve Number (CN)

Soil Name and hydrologic group (Appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN ^{*2}			Area	Product of CN x Area
		Table 2-2	Fig. 2-3	Fig. 2-4	x acres mi² %	
B	Impervious	98			0.12	11.76
Totals =					0.12	11.76

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{11.76}{0.12} = 98.00$ Use CN = **98**

Project MGC - Halfway House & Clubhouse Parking By: NG Date: 1/15/2024
 Location West Orange, NJ Checked By: TD Date Checked: 1/15/2024
 Circle one: Present Developed Ex Watershed 2 - Clubhouse Parking (Disturbed)
 Include a map, schematic, or description of coverage areas.

Runoff Curve Number (CN)

Soil Name and hydrologic group (Appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN ^{*2}			Area x acres mi² %	Product of CN x Area
		Table 2-2	Fig. 2-3	Fig. 2-4		
B	Open Space, Good Cond.	61			0.39	23.79
Totals =					0.39	23.79

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{23.79}{0.39} = 61.00$ Use CN = **61**

Project: Montclair GC - Parking Lot Expansion
Location: West Orange, NJ

By: NG

Date: 12/22/2023

Checked By: _____

Date Checked: _____

Circle One: Present Developed

Watershed 2 - Undisturbed - Pervious

Circle One: T_c T_t through subarea

2A-1 through 2A-2

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

Sheet Flow (Applicable to T_c Only)

- Surface Description (NEH table 15-1)
- Manning's Roughness Coeff., n (NEH table 15-1)
- Flow Length, L (total L < 100 ft)
- Two-year 24-hr rainfall, P₂
- Land Slope, s
- Compute T_t

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

Segment ID	1		
	Dense Grasses		
	0.24		
ft	96		
in	3.44		
ft/ft	0.029		
hr	0.192	+	

Sheet Flow Sub-Total **0.192 hours**

Shallow Concentrated Flow

- Surface Description
- Flow Length, L
- Watercourse Slope, s
- Average Velocity, V (NEH table 15-3)
- Compute T_t

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

Segment ID			
ft			
ft/ft			
ft/s			
hr		+	

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

Channel Flow

- Flow Length, L
- Cross Sectional flow area, a
- Wetted Perimeter, P_w
- Hydraulic Radius, r
- Channel Slope, s
- Manning's Roughness Coeff., n
- Velocity, V
- Compute T_t

$$r = a / P_w$$

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

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

Segment ID			
ft			
ft ²			
ft			
ft			
ft/ft			
ft/s			
hr		+	

Channel Flow Sub-Total **0.000 hours**

Watershed or subarea T_c or T_t
(Add Sub-Total T_t from prior steps)

Total T _c (hours) =	0.192 hours
Total T _c (minutes) =	12 minutes

Project: Montclair GC - Parking Lot Expansion
Location: West Orange, NJ

By: NG

Date: 12/22/2023

Checked By: _____

Date Checked: _____

Circle One: Present Developed

Watershed 2 - Undisturbed - Impervious

Circle One: T_c T_t through subarea

2B-1 through 2B-4

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

Sheet Flow (Applicable to T_c Only)

- Surface Description (NEH table 15-1)
- Manning's Roughness Coeff., n (NEH table 15-1)
- Flow Length, L (total L < 100 ft)
- Two-year 24-hr rainfall, P₂
- Land Slope, s
- Compute T_t

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

Segment ID	1		
	Smooth Surfaces		
	0.011		
ft	100		
in	3.44		
ft/ft	0.012		
hr	0.024	+	

Sheet Flow Sub-Total **0.024 hours**

Shallow Concentrated Flow

- Surface Description
- Flow Length, L
- Watercourse Slope, s
- Average Velocity, V (NEH table 15-3)
- Compute T_t

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

Segment ID	2		
	Pavement		
ft	194		
ft/ft	0.013		
ft/s	2.28		
hr	0.024	+	

Shallow Conc. Flow Sub-Total **0.024 hours**

Channel Flow

- Flow Length, L
- Cross Sectional flow area, a
- Wetted Perimeter, P_w
- Hydraulic Radius, r
- Channel Slope, s
- Manning's Roughness Coeff., n
- Velocity, V
- Compute T_t

$$r = a / P_w$$

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

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

Segment ID			
ft			
ft ²			
ft			
ft			
ft/ft			
ft/s			
hr		+	

Channel Flow Sub-Total **0.000 hours**

Watershed or subarea T_c or T_t
(Add Sub-Total T_t from prior steps)

Total T _c (hours) =	0.048 hours
Total T _c (minutes) =	3 minutes

Project: Montclair GC - Parking Lot Expansion
Location: West Orange, NJ

By: NG

Date: 12/22/2023

Checked By: _____

Date Checked: _____

Circle One: Present Developed

Watershed 2 - Disturbed - Pervious

Circle One: T_c T_t through subarea

2C-1 through 2C-3

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

Sheet Flow (Applicable to T_c Only)

- Surface Description (NEH table 15-1)
- Manning's Roughness Coeff., n (NEH table 15-1)
- Flow Length, L (total L < 100 ft)
- Two-year 24-hr rainfall, P₂
- Land Slope, s
- Compute T_t

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

Segment ID	1	2	
	Dense Grasses	Smooth Surfaces	
	0.24	0.011	
ft	63	9	
in	3.44	3.44	
ft/ft	0.026	0.059	
hr	0.143	0.002	+

Sheet Flow Sub-Total **0.145 hours**

Shallow Concentrated Flow

- Surface Description
- Flow Length, L
- Watercourse Slope, s
- Average Velocity, V (NEH table 15-3)
- Compute T_t

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

Segment ID			
ft			
ft/ft			
ft/s			
hr			+

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

Channel Flow

- Flow Length, L
- Cross Sectional flow area, a
- Wetted Perimeter, P_w
- Hydraulic Radius, r $r = a / P_w$
- Channel Slope, s
- Manning's Roughness Coeff., n
- Velocity, V $V = (1.49 r^{2/3} s^{1/2}) / n$
- Compute T_t

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

Segment ID			
ft			
ft ²			
ft			
ft			
ft/ft			
ft/s			
hr			+

Channel Flow Sub-Total **0.000 hours**

Watershed or subarea T_c or T_t
(Add Sub-Total T_t from prior steps)

Total T _c (hours) =	0.145 hours
Total T _c (minutes) =	9 minutes

Project: Montclair GC - Parking Lot Expansion
Location: West Orange, NJ

By: NG

Date: 12/22/2023

Checked By: _____

Date Checked: _____

Circle One: Present Developed

Watershed 2 - Disturbed - Impervious

Circle One: T_c T_t through subarea

2D-1 through 2D-3

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

Sheet Flow (Applicable to T_c Only)

- Surface Description (NEH table 15-1)
- Manning's Roughness Coeff., n (NEH table 15-1)
- Flow Length, L (total L < 100 ft)
- Two-year 24-hr rainfall, P₂
- Land Slope, s
- Compute T_t

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

Segment ID	1		
	Smooth Surfaces		
	0.011		
ft	100		
in	3.44		
ft/ft	0.007		
hr	0.030	+	

Sheet Flow Sub-Total **0.030 hours**

Shallow Concentrated Flow

- Surface Description
- Flow Length, L
- Watercourse Slope, s
- Average Velocity, V (NEH table 15-3)
- Compute T_t

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

Segment ID	2		
	Pavement		
ft	96		
ft/ft	0.017		
ft/s	2.69		
hr	0.010	+	

Shallow Conc. Flow Sub-Total **0.010 hours**

Channel Flow

- Flow Length, L
- Cross Sectional flow area, a
- Wetted Perimeter, P_w
- Hydraulic Radius, r
- Channel Slope, s
- Manning's Roughness Coeff., n
- Velocity, V
- Compute T_t

$$r = a / P_w$$

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

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

Segment ID			
ft			
ft ²			
ft			
ft			
ft/ft			
ft/s			
hr		+	

Channel Flow Sub-Total **0.000 hours**

Watershed or subarea T_c or T_t
(Add Sub-Total T_t from prior steps)

Total T _c (hours) =	0.040 hours
Total T _c (minutes) =	2 minutes

Project MGC - Halfway House & Clubhouse ParkingBy: NGDate: 1/15/2024Location West Orange, NJChecked By: TDDate Checked: 1/15/2024Circle one: Present DevelopedWatershed 3 - Clubhouse/Practice Green

Include a map, schematic, or description of coverage areas.

Runoff Curve Number (CN)

Soil Name and hydrologic group (Appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN ^{*2}			Area	Product of CN x Area
		Table 2-2	Fig. 2-3	Fig. 2-4	x acres mi² %	
B	Impervious	98			0.63	61.74
Totals =					0.63	61.74

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{61.74}{0.63} = 98.00$$

Use CN =

98

Project MGC - Halfway House & Clubhouse ParkingBy: NGDate: 1/15/2024Location West Orange, NJChecked By: TDDate Checked: 1/15/2024Circle one: Present DevelopedWatershed 3 - Clubhouse/Practice Green

Include a map, schematic, or description of coverage areas.

Runoff Curve Number (CN)

Soil Name and hydrologic group (Appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN ^{*2}			Area x acres mi² %	Product of CN x Area
		Table 2-2	Fig. 2-3	Fig. 2-4		
B	Open Space, Good Cond.	61			0.76	46.36
Totals =					0.76	46.36

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{46.36}{0.76} = 61.00$$

Use CN =

61

Project: Montclair GC - Parking Lot Expansion
Location: West Orange, NJ

By: NG

Date: 12/22/2023

Checked By: _____

Date Checked: _____

Circle One: Present Developed

Watershed 3 - Undisturbed - Pervious

Circle One: T_c T_t through subarea

3A-1 through 3A-3

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

Sheet Flow (Applicable to T_c Only)

- Surface Description (NEH table 15-1)
- Manning's Roughness Coeff., n (NEH table 15-1)
- Flow Length, L (total L < 100 ft)
- Two-year 24-hr rainfall, P₂
- Land Slope, s
- Compute T_t

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

Segment ID	1		
	Dense Grasses		
	0.24		
ft	100		
in	3.44		
ft/ft	0.030		
hr	0.194	+	

Sheet Flow Sub-Total **0.194 hours**

Shallow Concentrated Flow

- Surface Description
- Flow Length, L
- Watercourse Slope, s
- Average Velocity, V (NEH table 15-3)
- Compute T_t

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

Segment ID	2	3	
	Short-Grass Pasture	Pavement	
ft	39	13	
ft/ft	0.144	0.085	
ft/s	2.64	5.91	
hr	0.004	0.001	+

Shallow Conc. Flow Sub-Total **0.005 hours**

Channel Flow

- Flow Length, L
- Cross Sectional flow area, a
- Wetted Perimeter, P_w
- Hydraulic Radius, r
- Channel Slope, s
- Manning's Roughness Coeff., n
- Velocity, V
- Compute T_t

$$r = a / P_w$$

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

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

Segment ID			
ft			
ft ²			
ft			
ft			
ft/ft			
ft/s			
hr			+

Channel Flow Sub-Total **0.000 hours**

Watershed or subarea T_c or T_t
(Add Sub-Total T_t from prior steps)

Total T _c (hours) =	0.199 hours
Total T _c (minutes) =	12 minutes

Project: Montclair GC - Parking Lot Expansion
Location: West Orange, NJ

By: NG

Date: 12/22/2023

Checked By: _____

Date Checked: _____

Circle One: Present Developed

Watershed 3 - Undisturbed - Impervious

Circle One: T_c T_t through subarea

3B-1 through 3B-4

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

Sheet Flow (Applicable to T_c Only)

- Surface Description (NEH table 15-1)
- Manning's Roughness Coeff., n (NEH table 15-1)
- Flow Length, L (total L < 100 ft)
- Two-year 24-hr rainfall, P₂
- Land Slope, s
- Compute T_t

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

Segment ID	1		
	Smooth Surfaces		
	0.011		
ft	100		
in	3.44		
ft/ft	0.011		
hr	0.025	+	

Sheet Flow Sub-Total **0.025 hours**

Shallow Concentrated Flow

- Surface Description
- Flow Length, L
- Watercourse Slope, s
- Average Velocity, V (NEH table 15-3)
- Compute T_t

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

Segment ID	2		
	Pavement		
ft	299		
ft/ft	0.027		
ft/s	3.33		
hr	0.025	+	

Shallow Conc. Flow Sub-Total **0.025 hours**

Channel Flow

- Flow Length, L
- Cross Sectional flow area, a
- Wetted Perimeter, P_w
- Hydraulic Radius, r $r = a / P_w$
- Channel Slope, s
- Manning's Roughness Coeff., n
- Velocity, V $V = (1.49 r^{2/3} s^{1/2}) / n$
- Compute T_t

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

Segment ID			
ft			
ft ²			
ft			
ft			
ft/ft			
ft/s			
hr		+	

Channel Flow Sub-Total **0.000 hours**

Watershed or subarea T_c or T_t
(Add Sub-Total T_t from prior steps)

Total T _c (hours) =	0.050 hours
Total T _c (minutes) =	3 minutes

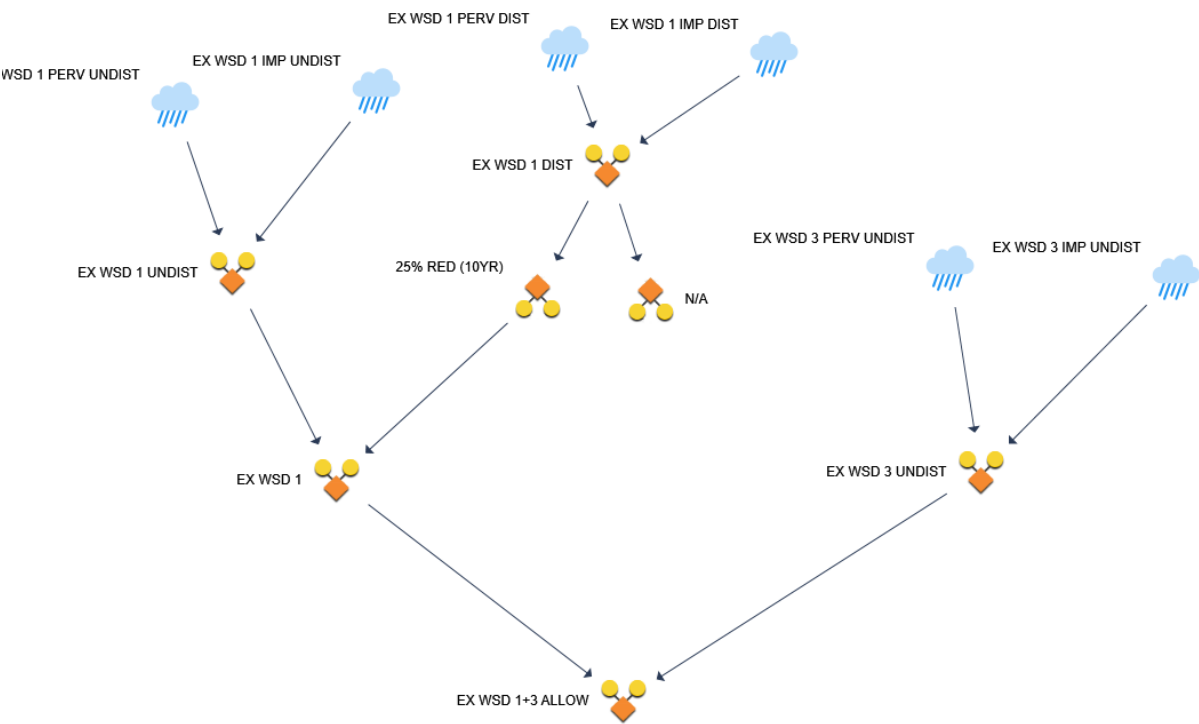
**EXISTING (ALLOWABLE) RUNOFF HYDROGRAPHS
2-YEAR**

Basin Model

Hydrology Studio v 3.0.0.29

Project Name:

01-15-2024



Hydrograph 2-yr Summary

Project Name:

Hydrology Studio v 3.0.0.29

01-15-2024

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 WSD 1 PERV UNDIST	0.063	12.15	271	----		
2	NRCS Runoff	EX WSD 1 IMP UNDIST	1.512	12.10	4,911	----		
3	Junction	EX WSD 1 UNDIST	1.564	12.10	5,181	1, 2		
4	NRCS Runoff	EX WSD 1 PERV DIST	0.090	12.17	416	----		
5	NRCS Runoff	EX WSD 1 IMP DIST	1.197	12.13	4,772	----		
6	Junction	EX WSD 1 DIST	1.281	12.15	5,189	4, 5		
7	Diversion1	50% RED (2YR)	0.640	12.15	2,594	6		
8	Diversion2	N/A	0.640	12.15	2,594	6		
9	Junction	EX WSD 1	2.150	12.10	7,776	3, 7		
11	NRCS Runoff	EX WSD 3 PERV UNDIST	0.285	12.22	1,483	----		
12	NRCS Runoff	EX WSD 3 IMP UNDIST	2.117	12.10	6,875	----		
13	Junction	EX WSD 3 UNDIST	2.281	12.10	8,358	11, 12		
15	Junction	EX WSD 1+3 ALLOW	4.431	12.10	16,133	9, 13		

Hydrograph Report

Project Name:

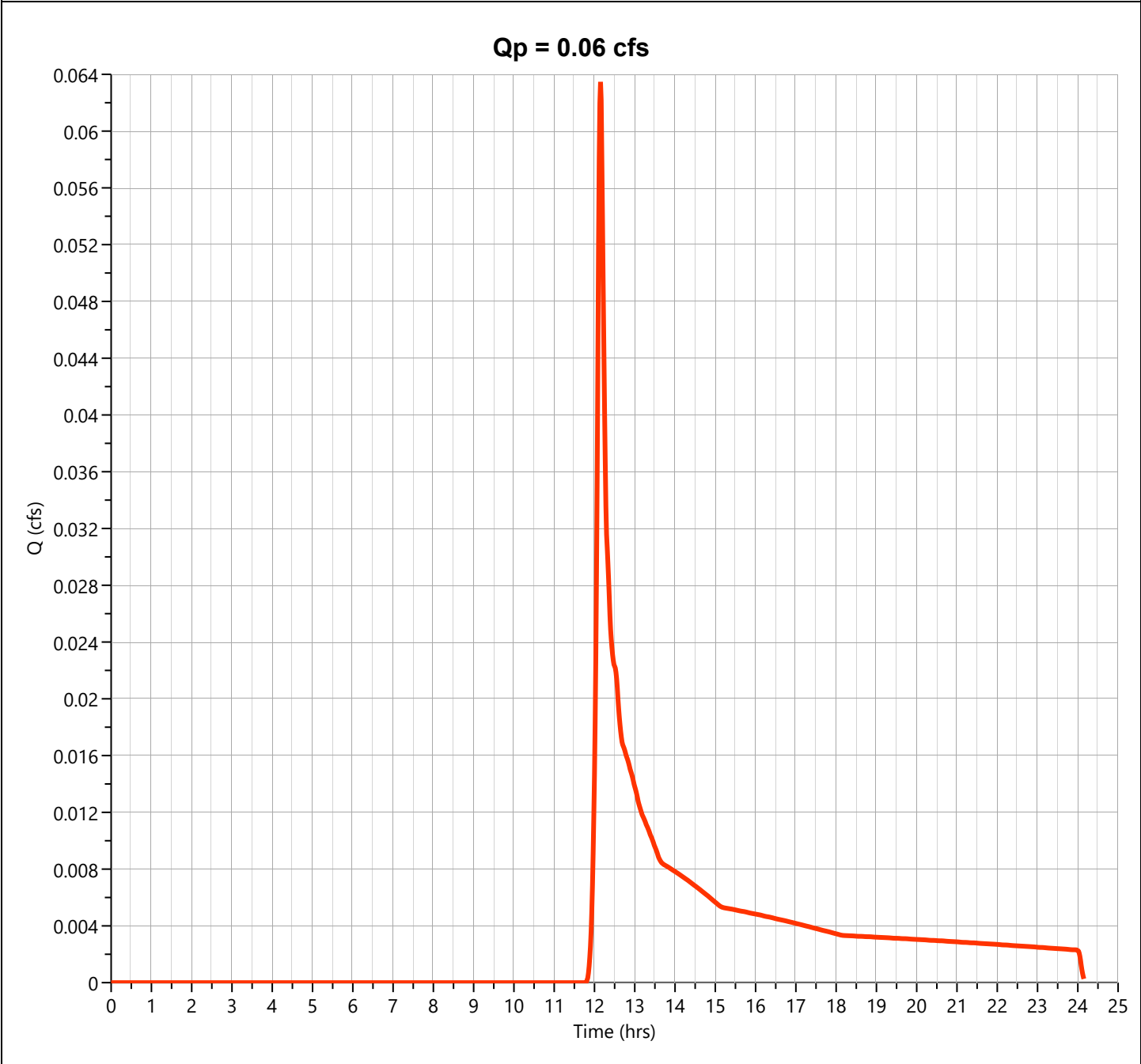
Hydrology Studio v 3.0.0.29

01-15-2024

EX WSD 1 PERV UNDIST

Hyd. No. 1

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.063 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.15 hrs
Time Interval	= 1 min	Runoff Volume	= 271 cuft
Drainage Area	= 0.14 ac	Curve Number	= 61
Tc Method	= User	Time of Conc. (Tc)	= 8.0 min
Total Rainfall	= 3.44 in	Design Storm	= NOAA-D
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

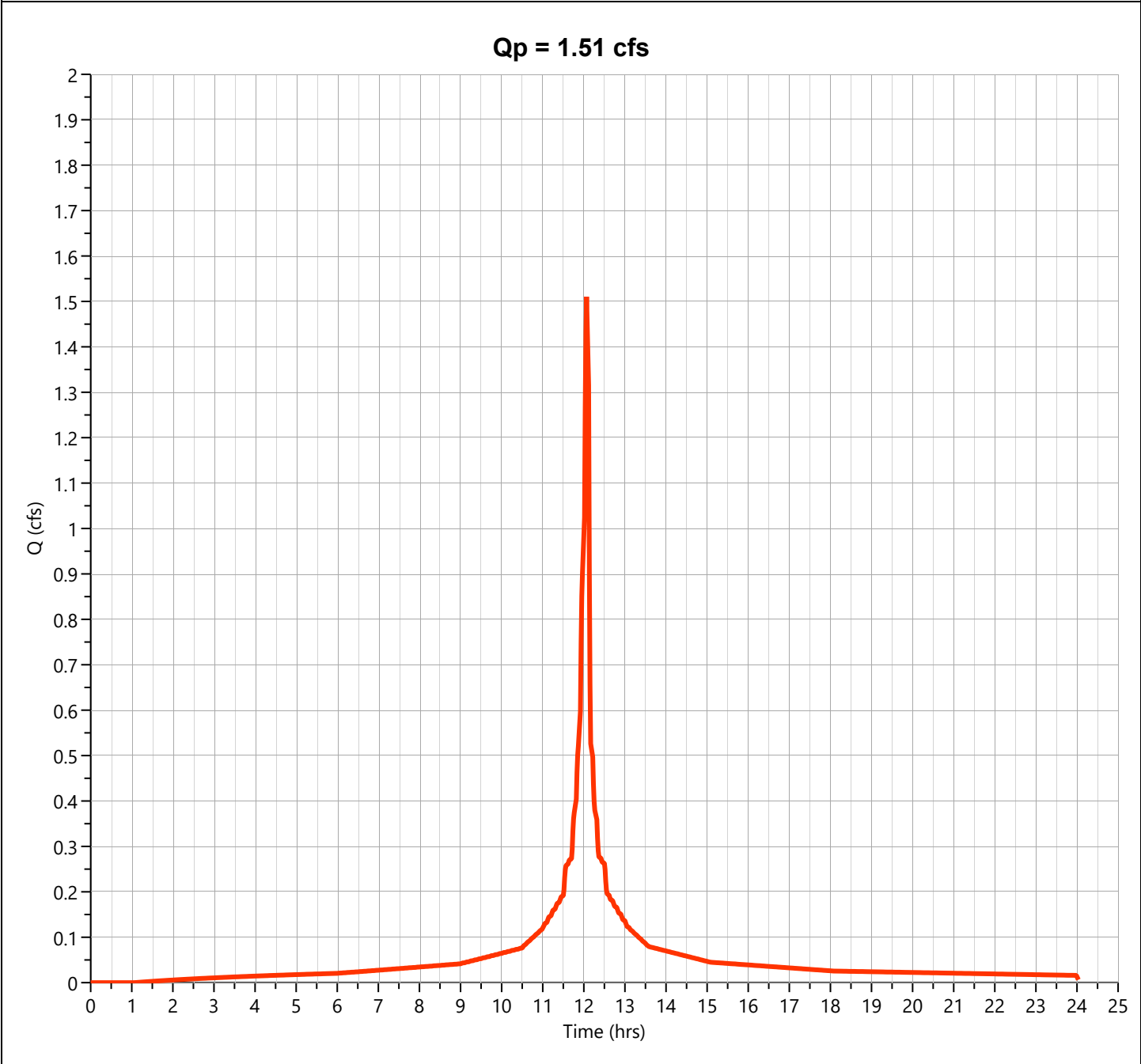
Hydrology Studio v 3.0.0.29

01-15-2024

EX WSD 1 IMP UNDIST

Hyd. No. 2

Hydrograph Type	= NRCS Runoff	Peak Flow	= 1.512 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.10 hrs
Time Interval	= 1 min	Runoff Volume	= 4,911 cuft
Drainage Area	= 0.45 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 2.0 min
Total Rainfall	= 3.44 in	Design Storm	= NOAA-D
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

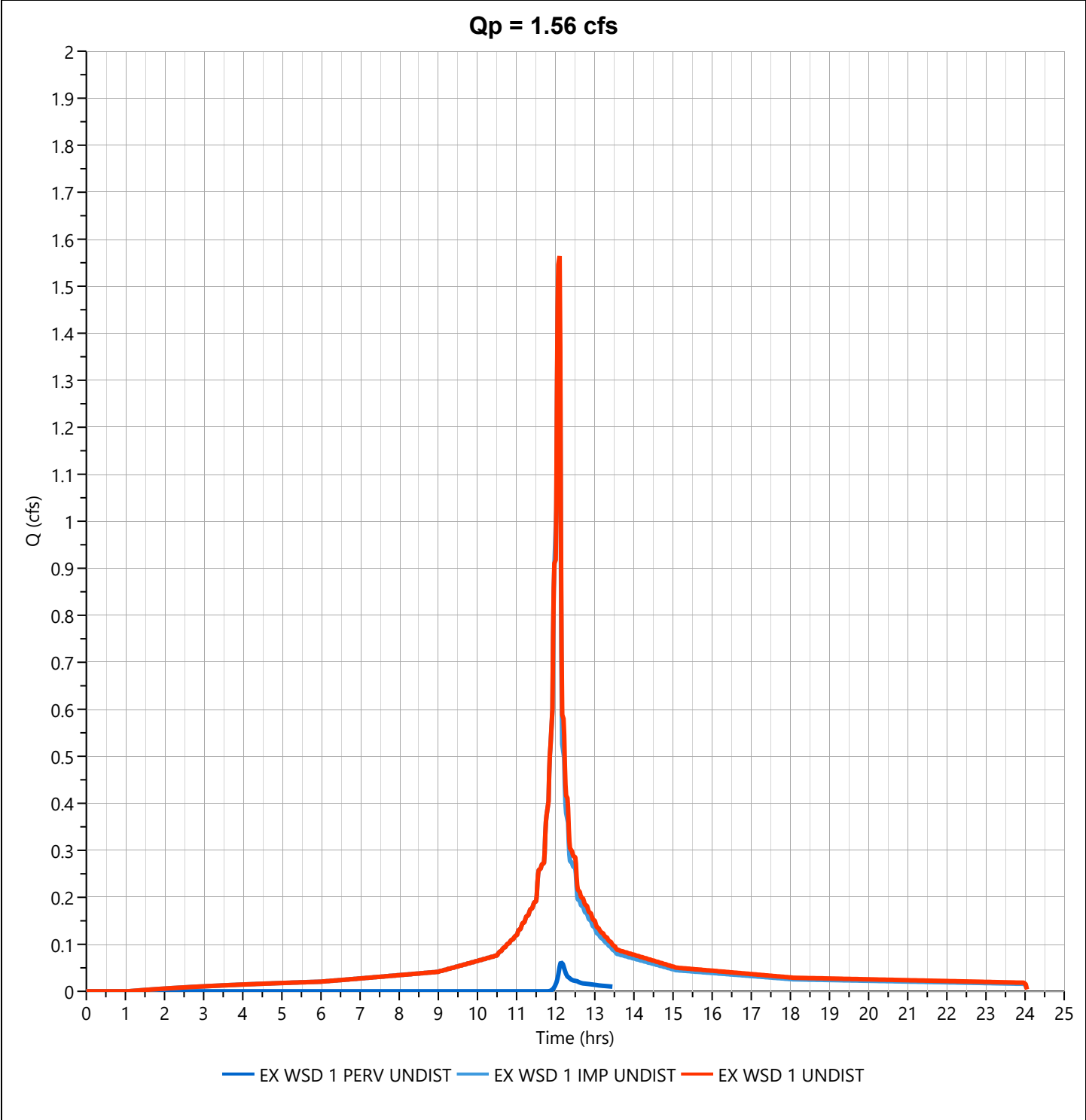
Hydrology Studio v 3.0.0.29

01-15-2024

EX WSD 1 UNDIST

Hyd. No. 3

Hydrograph Type	= Junction	Peak Flow	= 1.564 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.10 hrs
Time Interval	= 1 min	Hydrograph Volume	= 5,181 cuft
Inflow Hydrographs	= 1, 2	Total Contrib. Area	= 0.59 ac



Hydrograph Report

Project Name:

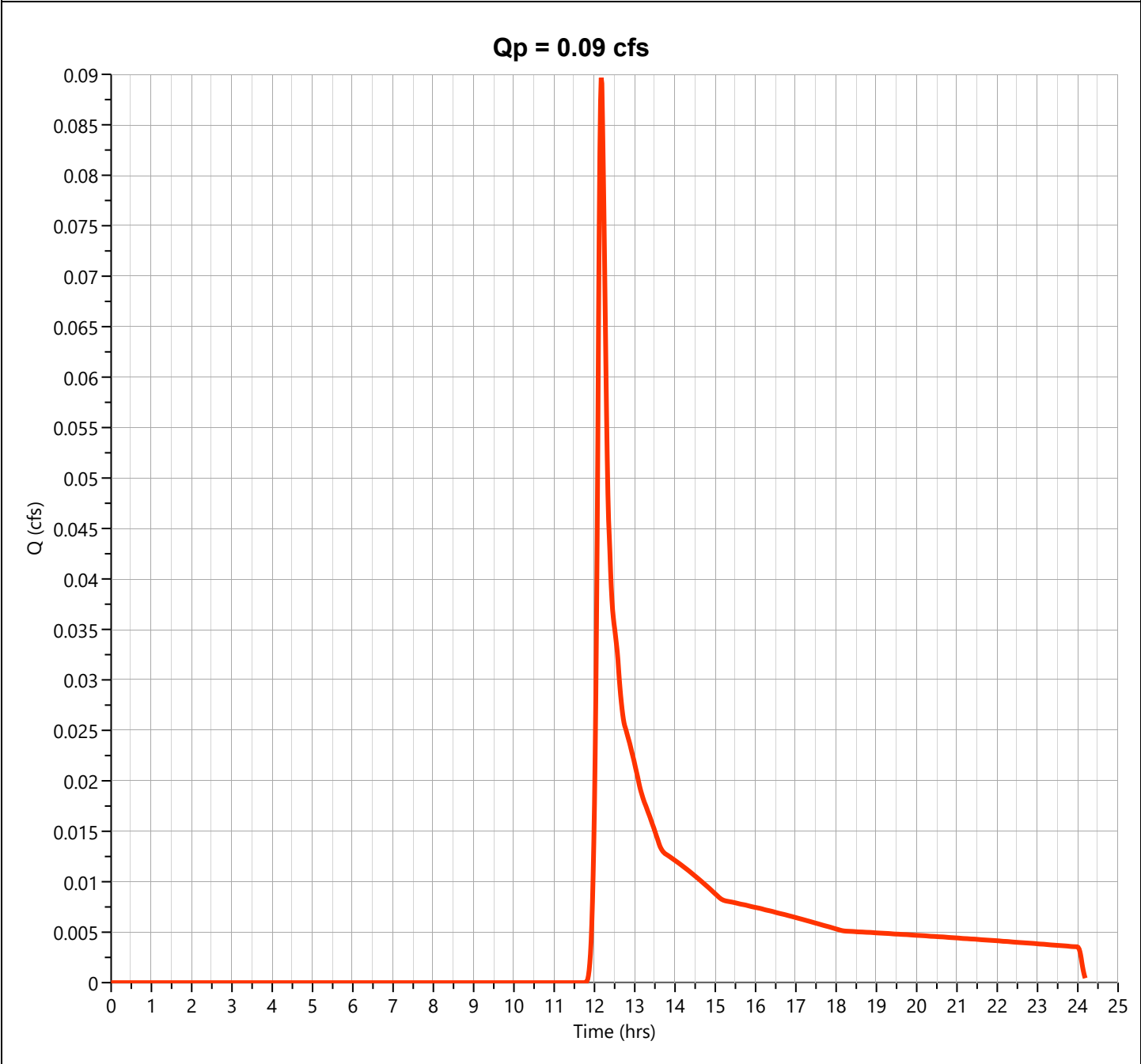
Hydrology Studio v 3.0.0.29

01-15-2024

EX WSD 1 PERV DIST

Hyd. No. 4

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.090 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.17 hrs
Time Interval	= 1 min	Runoff Volume	= 416 cuft
Drainage Area	= 0.21 ac	Curve Number	= 61
Tc Method	= User	Time of Conc. (Tc)	= 9.0 min
Total Rainfall	= 3.44 in	Design Storm	= NOAA-D
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

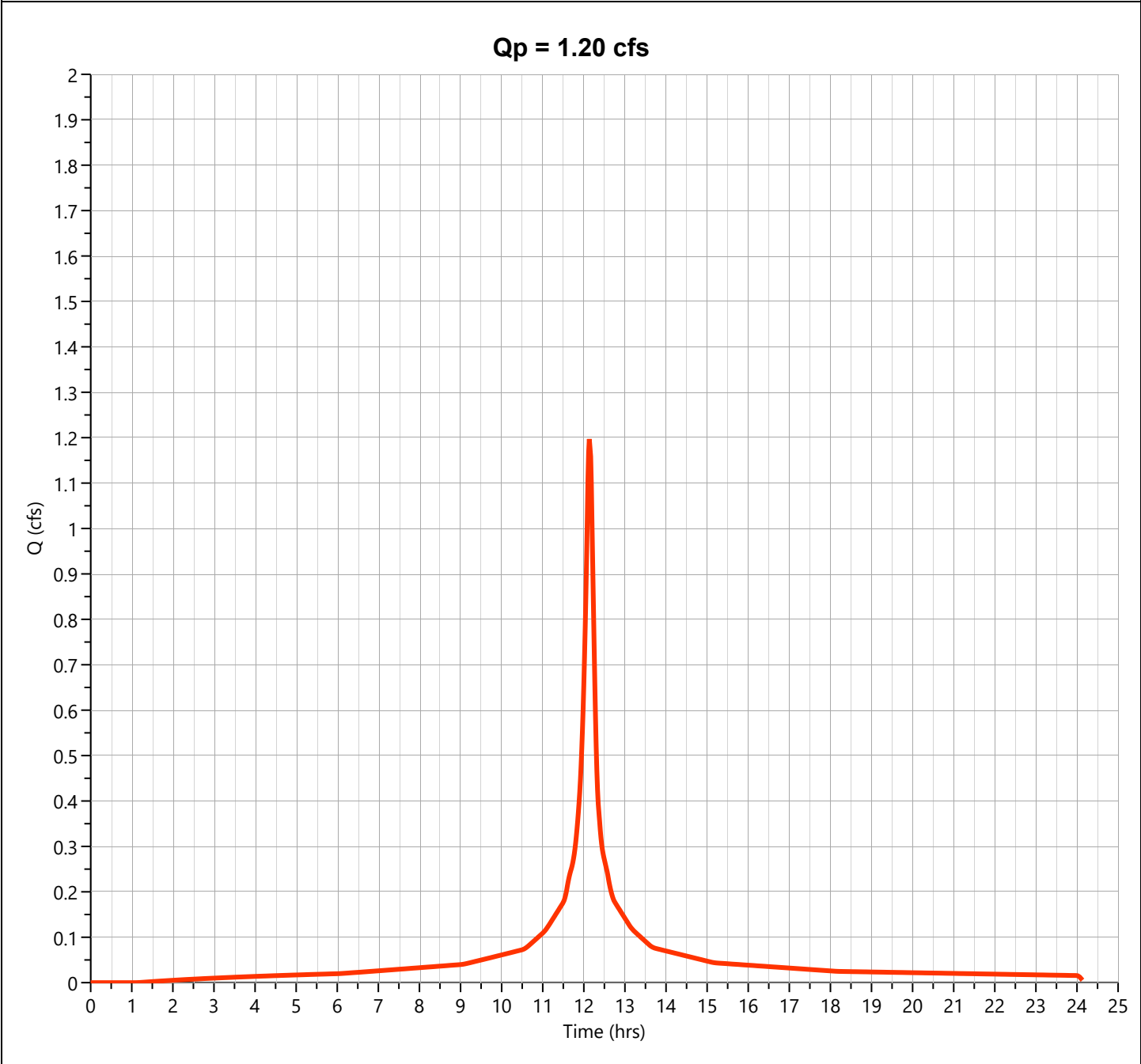
Hydrology Studio v 3.0.0.29

01-15-2024

EX WSD 1 IMP DIST

Hyd. No. 5

Hydrograph Type	= NRCS Runoff	Peak Flow	= 1.197 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.13 hrs
Time Interval	= 1 min	Runoff Volume	= 4,772 cuft
Drainage Area	= 0.41 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 9.0 min
Total Rainfall	= 3.44 in	Design Storm	= NOAA-D
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

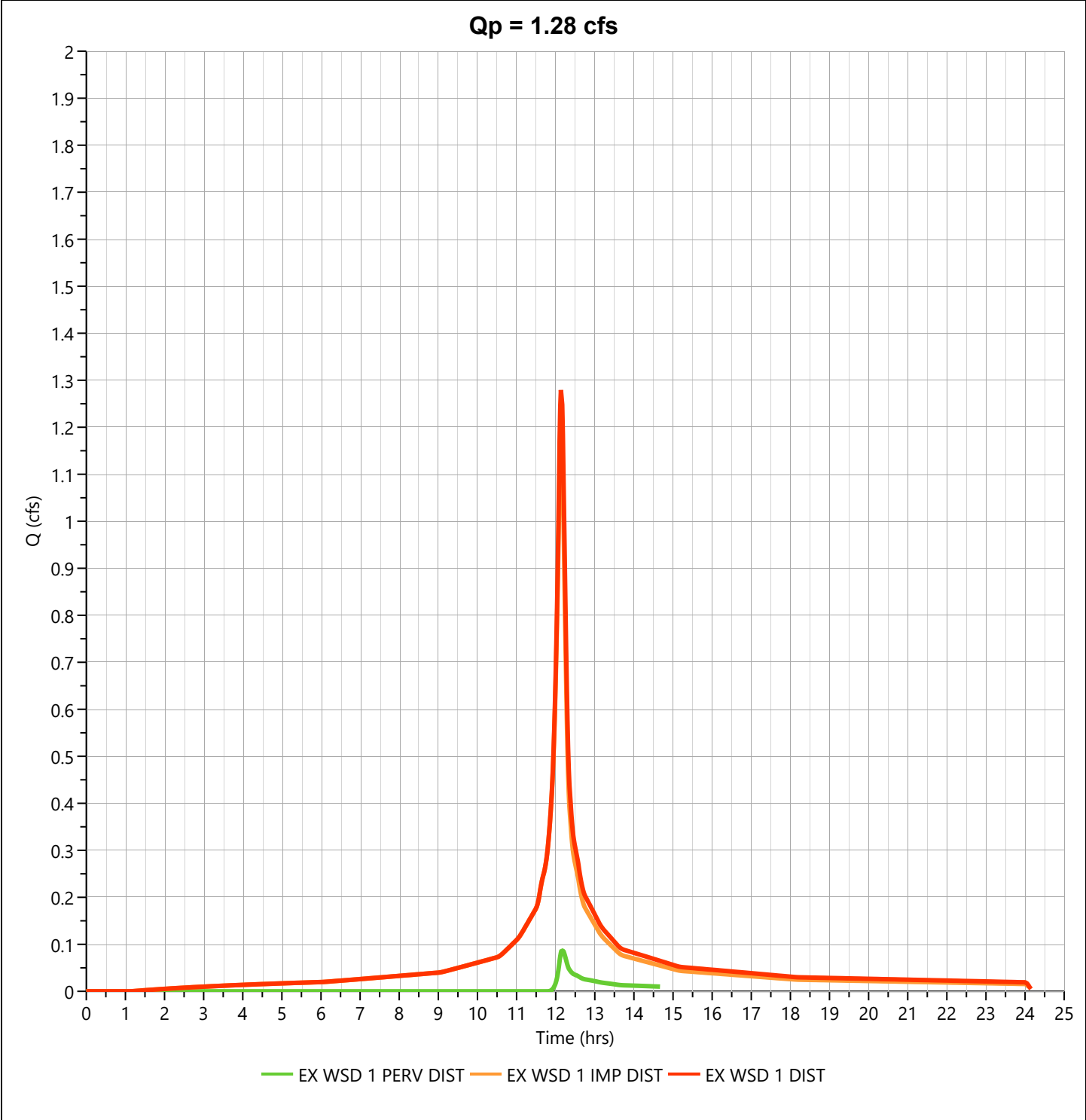
Hydrology Studio v 3.0.0.29

01-15-2024

EX WSD 1 DIST

Hyd. No. 6

Hydrograph Type	= Junction	Peak Flow	= 1.281 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.15 hrs
Time Interval	= 1 min	Hydrograph Volume	= 5,189 cuft
Inflow Hydrographs	= 4, 5	Total Contrib. Area	= 0.62 ac



Hydrograph Report

Project Name:

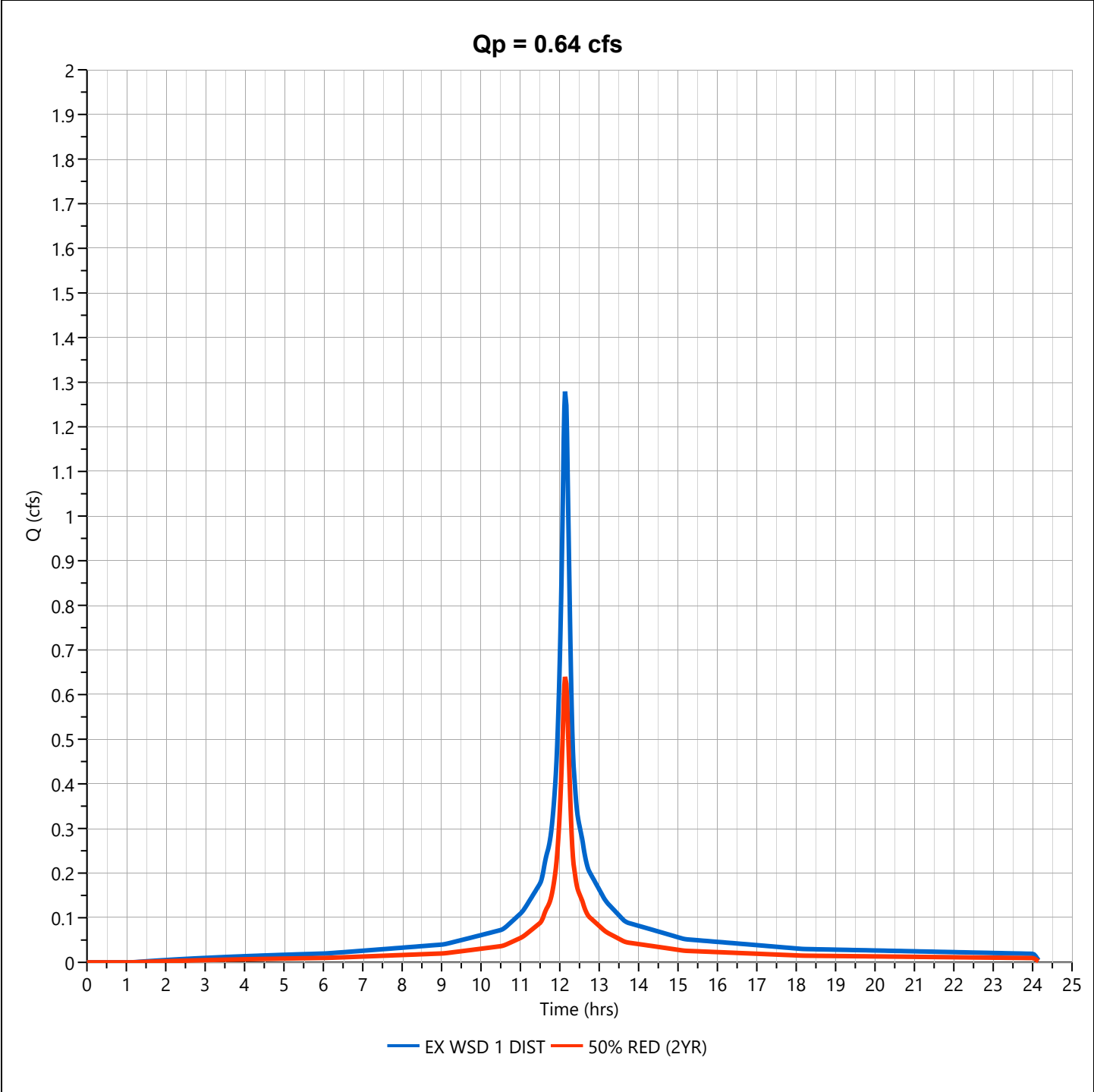
Hydrology Studio v 3.0.0.29

01-15-2024

50% RED (2YR)

Hyd. No. 7

Hydrograph Type	= Diversion	Peak Flow	= 0.640 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.15 hrs
Time Interval	= 1 min	Hydrograph Volume	= 2,594 cuft
Inflow Hydrograph	= 6 - EX WSD 1 DIST	Diversion Method	= Flow Ratio
Companion Hyd	= 8 - N/A	Flow Ratio	= 0.5



Hydrograph Report

Project Name:

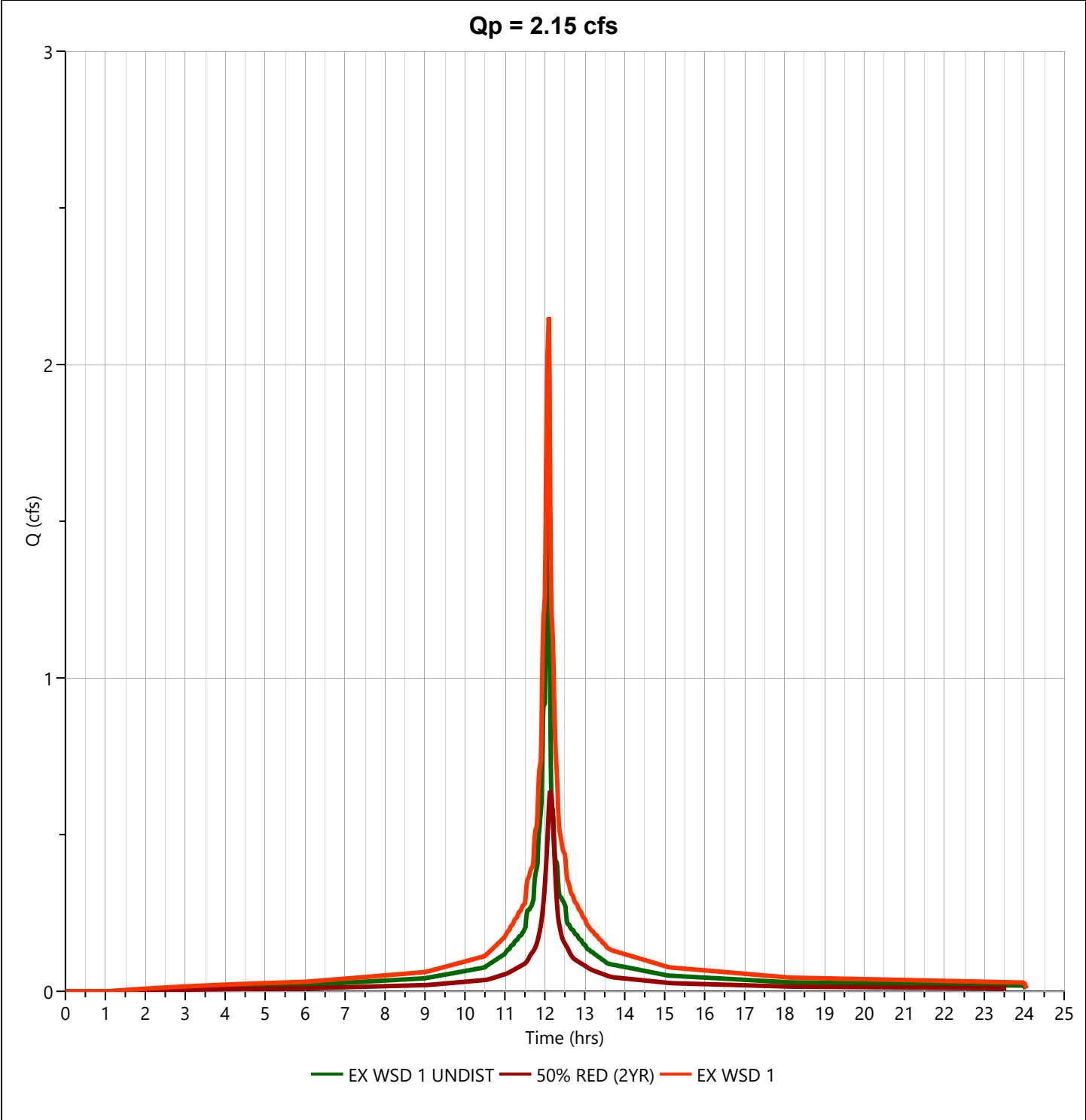
Hydrology Studio v 3.0.0.29

01-15-2024

EX WSD 1

Hyd. No. 9

Hydrograph Type	= Junction	Peak Flow	= 2.150 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.10 hrs
Time Interval	= 1 min	Hydrograph Volume	= 7,776 cuft
Inflow Hydrographs	= 3, 7	Total Contrib. Area	= 0.59 ac



Hydrograph Report

Project Name:

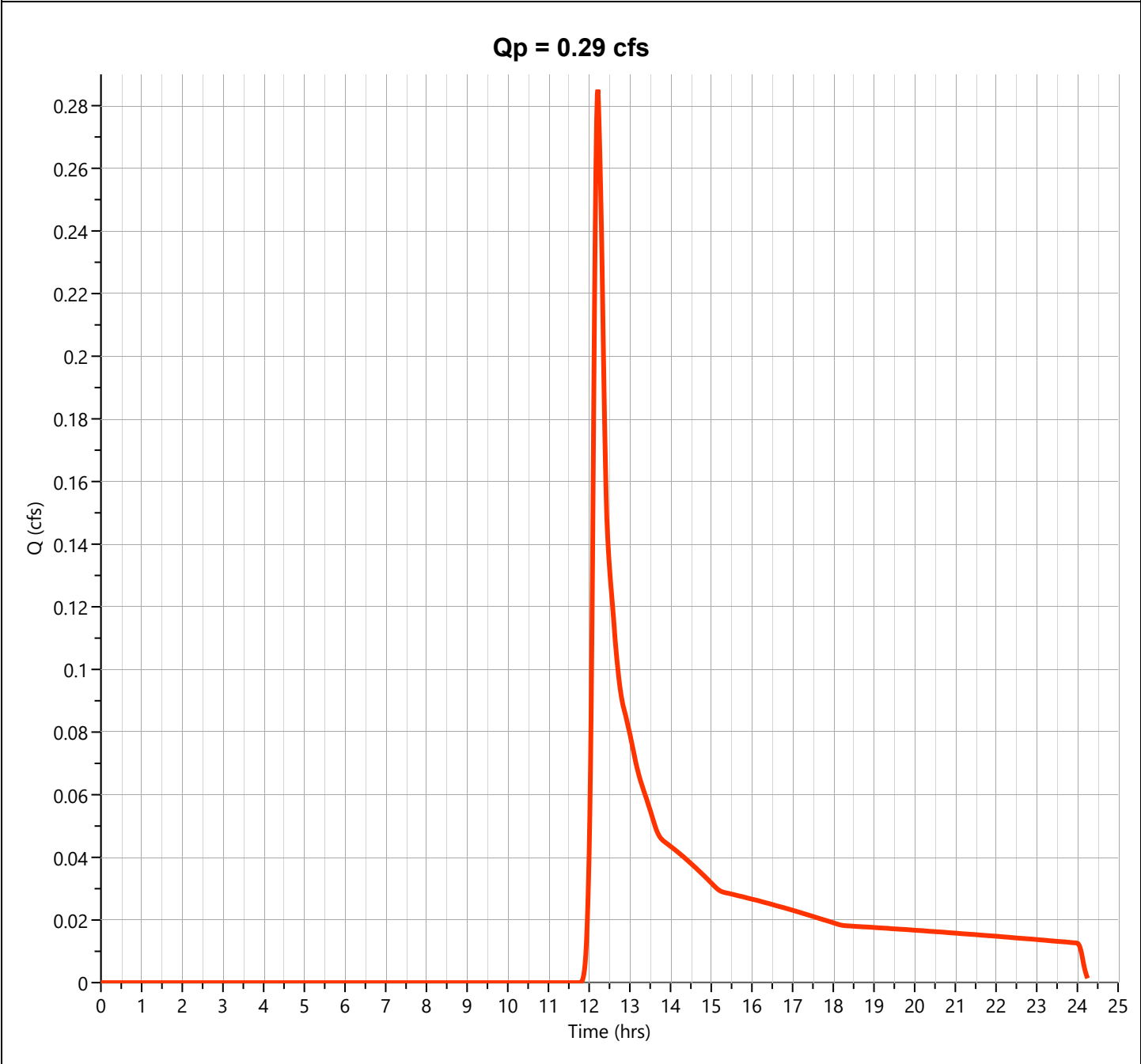
Hydrology Studio v 3.0.0.29

01-15-2024

EX WSD 3 PERV UNDIST

Hyd. No. 11

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.285 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.22 hrs
Time Interval	= 1 min	Runoff Volume	= 1,483 cuft
Drainage Area	= 0.76 ac	Curve Number	= 61
Tc Method	= User	Time of Conc. (Tc)	= 12.0 min
Total Rainfall	= 3.44 in	Design Storm	= NOAA-D
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

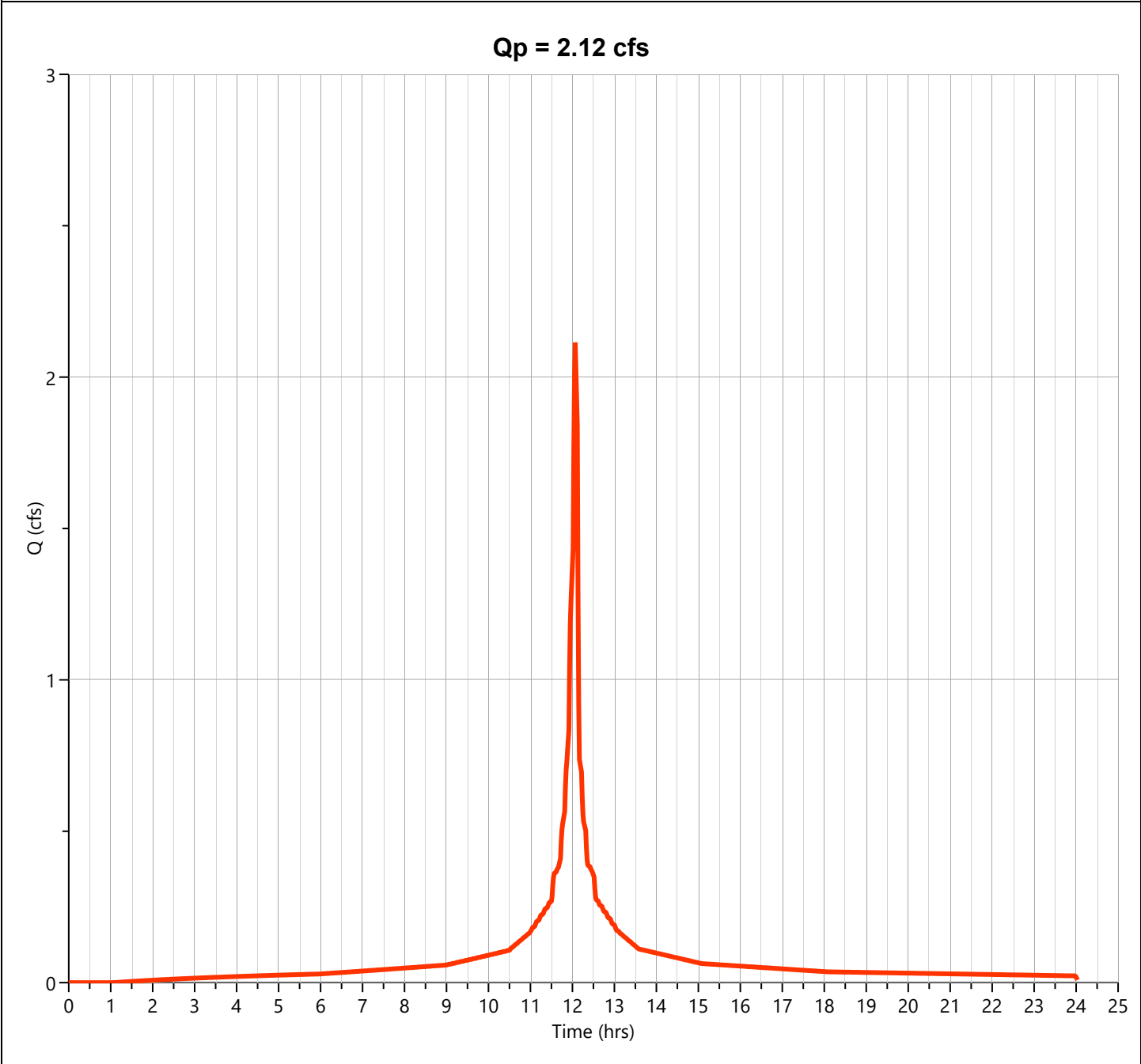
Hydrology Studio v 3.0.0.29

01-15-2024

EX WSD 3 IMP UNDIST

Hyd. No. 12

Hydrograph Type	= NRCS Runoff	Peak Flow	= 2.117 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.10 hrs
Time Interval	= 1 min	Runoff Volume	= 6,875 cuft
Drainage Area	= 0.63 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 3.0 min
Total Rainfall	= 3.44 in	Design Storm	= NOAA-D
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

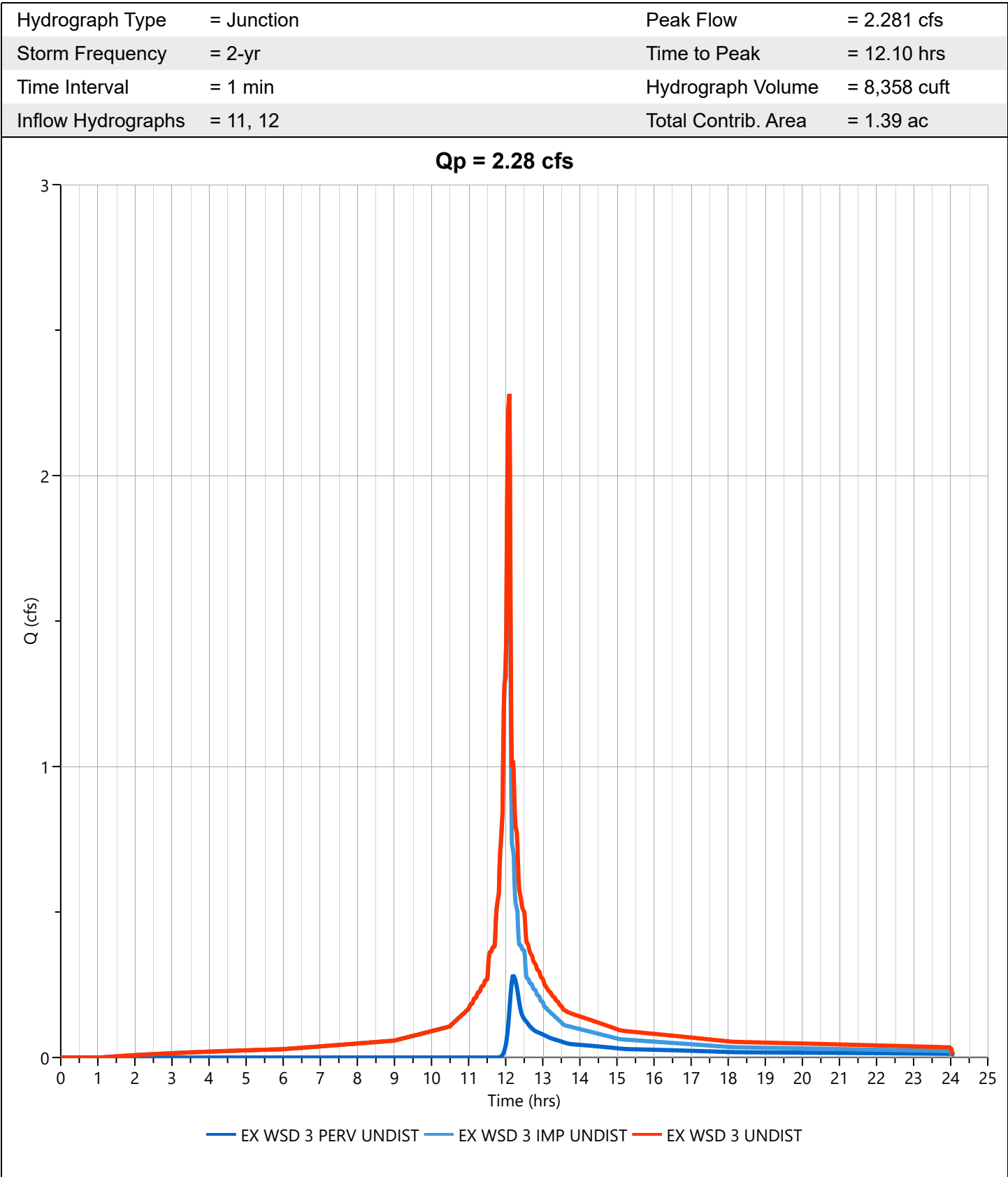
Project Name:

Hydrology Studio v 3.0.0.29

01-15-2024

EX WSD 3 UNDIST

Hyd. No. 13



Hydrograph Report

Project Name:

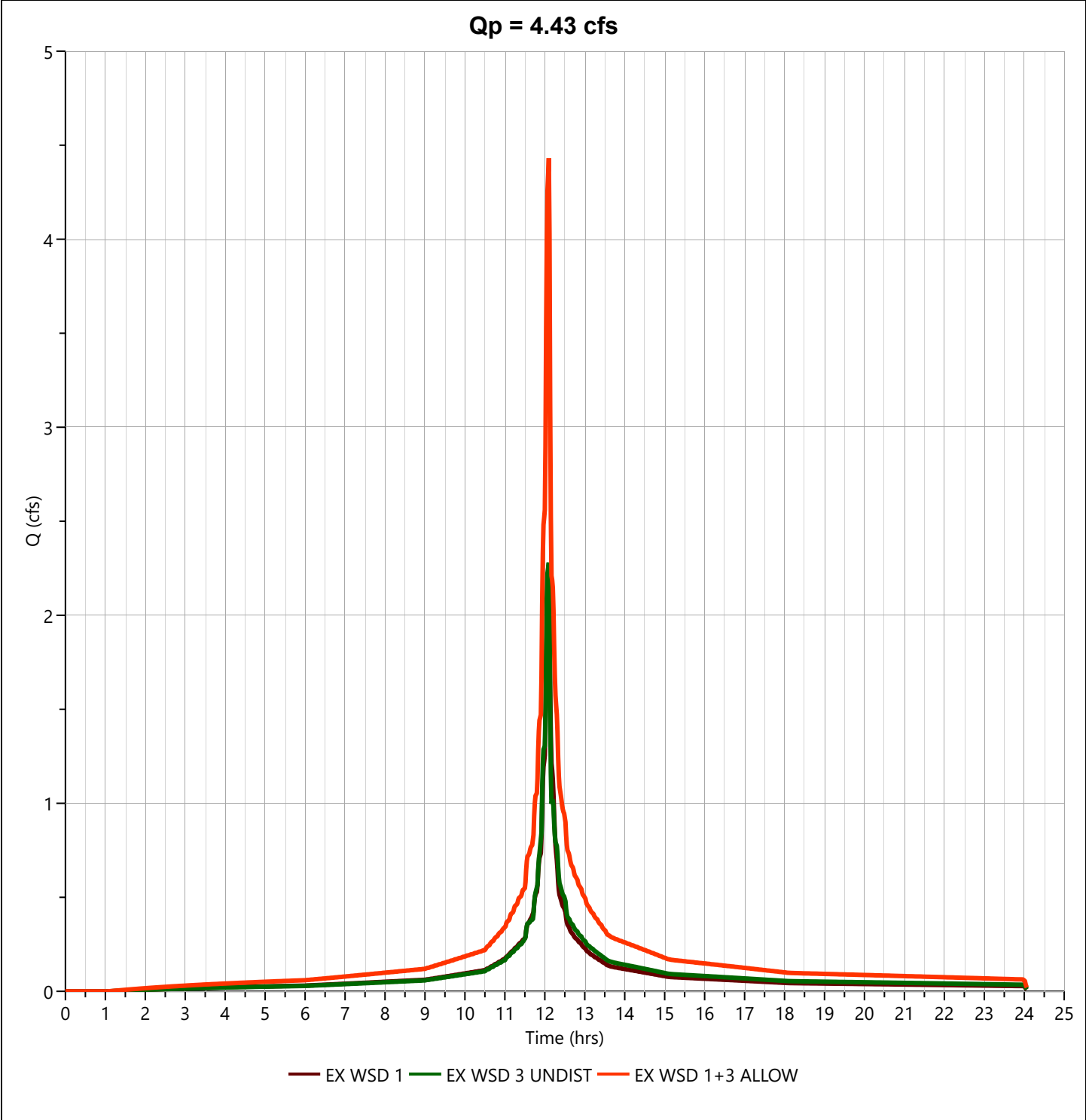
Hydrology Studio v 3.0.0.29

01-15-2024

EX WSD 1+3 ALLOW

Hyd. No. 15

Hydrograph Type	= Junction	Peak Flow	= 4.431 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.10 hrs
Time Interval	= 1 min	Hydrograph Volume	= 16,133 cuft
Inflow Hydrographs	= 9, 13	Total Contrib. Area	= 1.98 ac

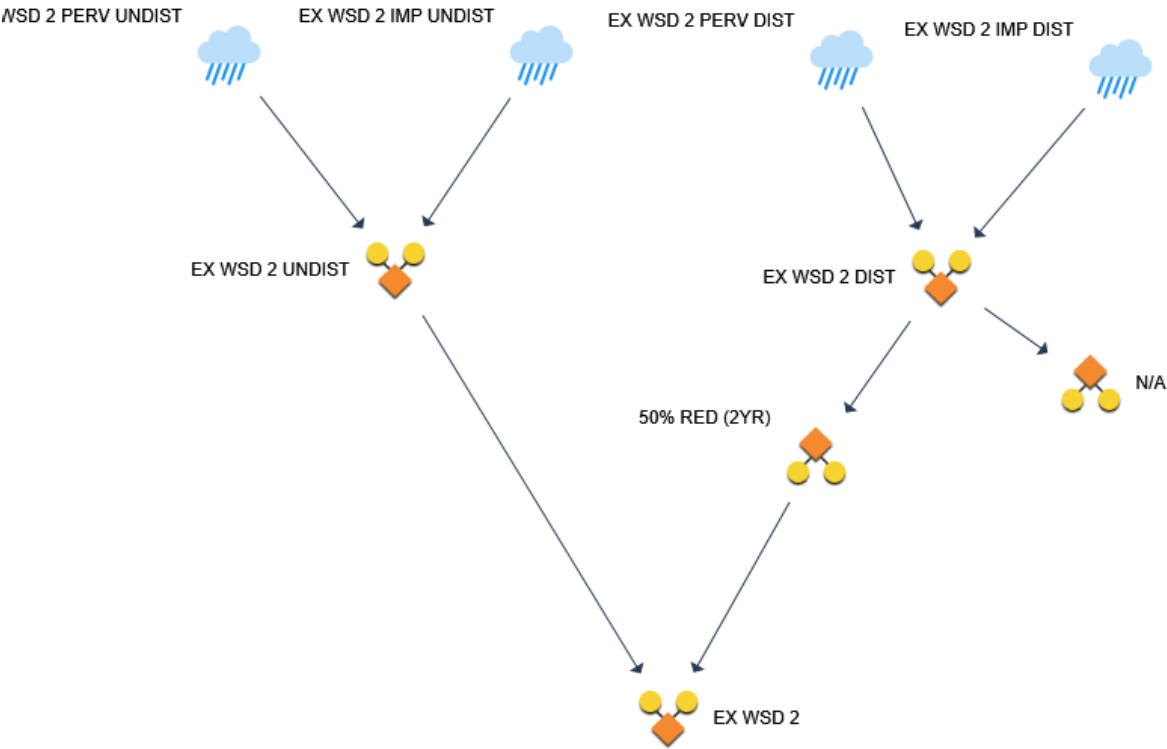


Basin Model

Hydrology Studio v 3.0.0.29

Project Name:

01-15-2024



Hydrograph 2-yr Summary

Project Name:

Hydrology Studio v 3.0.0.29

01-15-2024

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 WSD 2 PERV UNDIST	0.559	12.22	2,907	----		
2	NRCS Runoff	EX WSD 2 IMP UNDIST	9.544	12.10	30,992	----		
3	Junction	EX WSD 2 UNDIST	9.864	12.10	33,899	1, 2		
4	NRCS Runoff	EX WSD 2 PERV DIST	0.166	12.17	773	----		
5	NRCS Runoff	EX WSD 2 IMP DIST	0.403	12.10	1,310	----		
6	Junction	EX WSD 2 DIST	0.524	12.10	2,083	4, 5		
7	Diversion1	50% RED (2YR)	0.262	12.10	1,041	6		
8	Diversion2	N/A	0.262	12.10	1,041	6		
9	Junction	EX WSD 2	10.13	12.10	34,940	3, 7		

Hydrograph Report

Project Name:

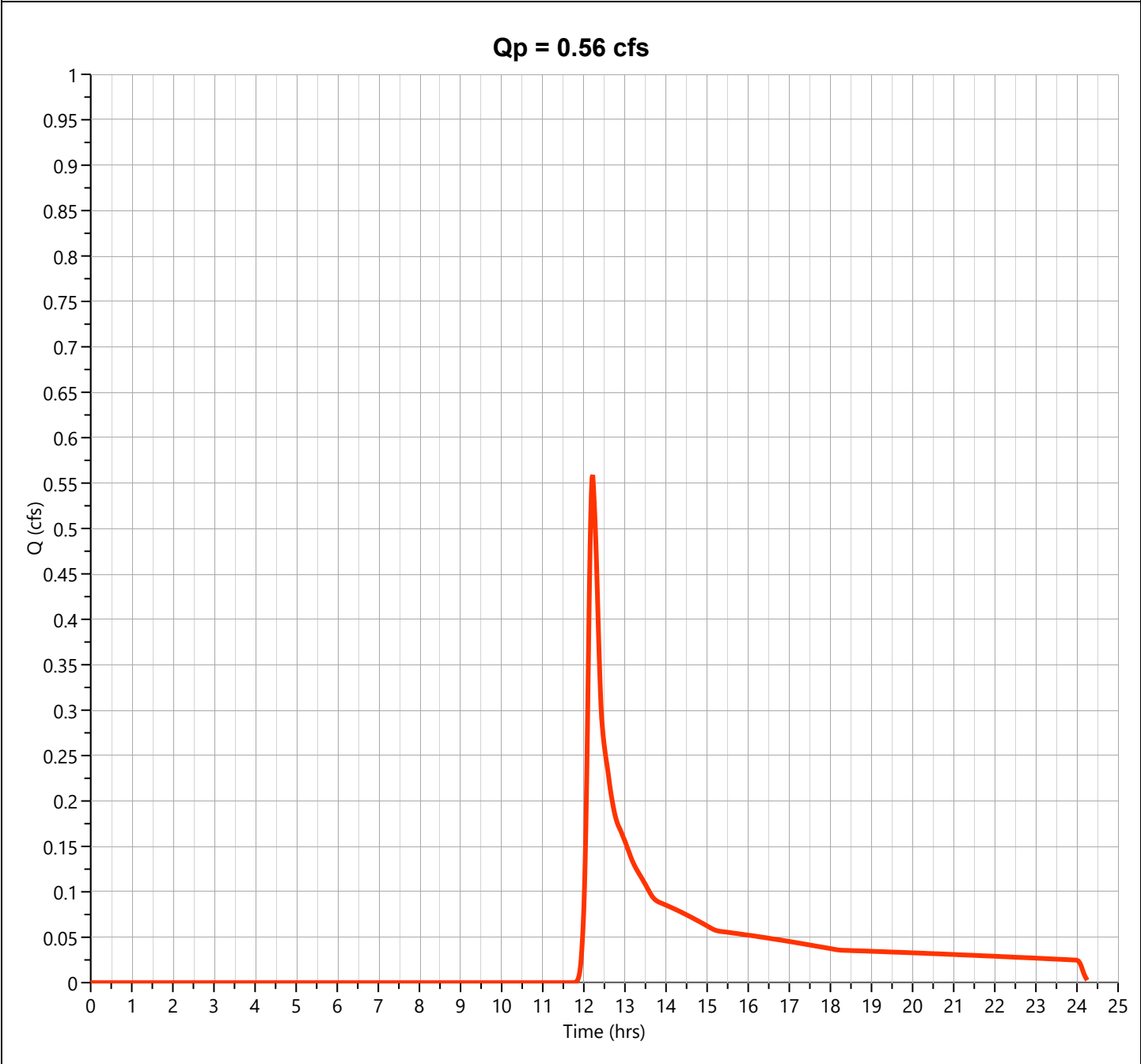
Hydrology Studio v 3.0.0.29

01-15-2024

EX WSD 2 PERV UNDIST

Hyd. No. 1

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.559 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.22 hrs
Time Interval	= 1 min	Runoff Volume	= 2,907 cuft
Drainage Area	= 1.49 ac	Curve Number	= 61
Tc Method	= User	Time of Conc. (Tc)	= 12.0 min
Total Rainfall	= 3.44 in	Design Storm	= NOAA-D
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

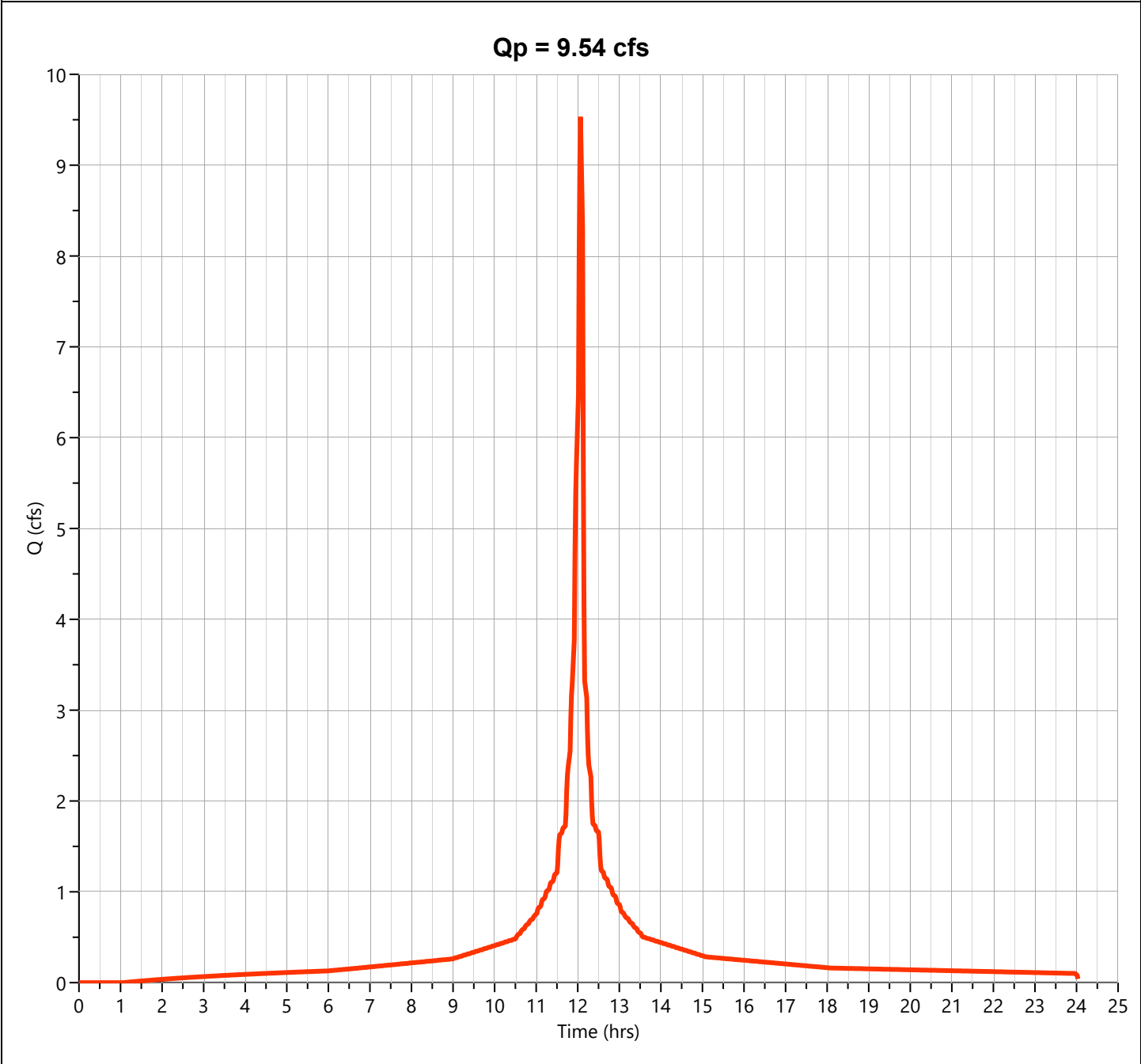
Hydrology Studio v 3.0.0.29

01-15-2024

EX WSD 2 IMP UNDIST

Hyd. No. 2

Hydrograph Type	= NRCS Runoff	Peak Flow	= 9.544 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.10 hrs
Time Interval	= 1 min	Runoff Volume	= 30,992 cuft
Drainage Area	= 2.84 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 3.0 min
Total Rainfall	= 3.44 in	Design Storm	= NOAA-D
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

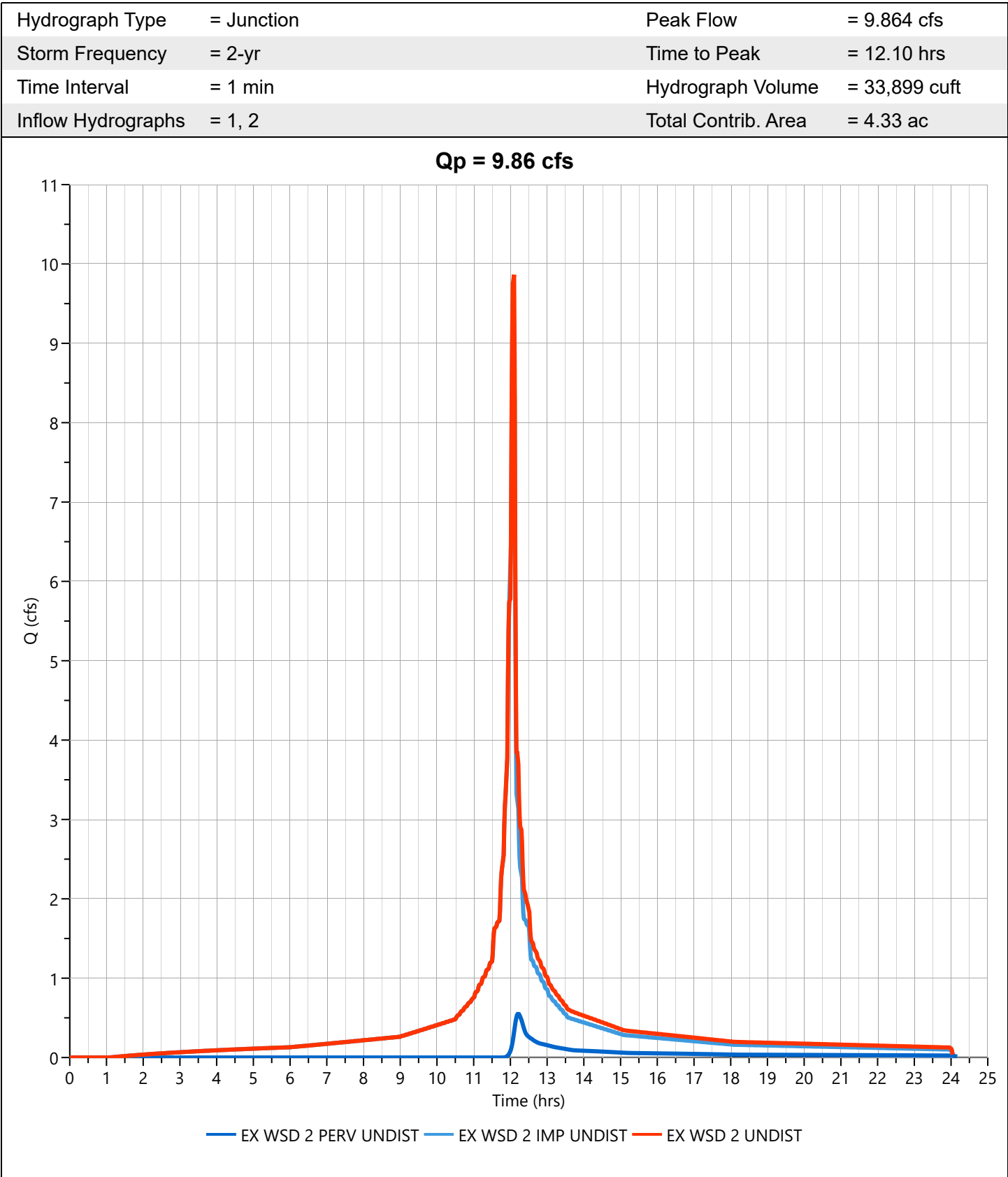
Project Name:

Hydrology Studio v 3.0.0.29

01-15-2024

EX WSD 2 UNDIST

Hyd. No. 3



Hydrograph Report

Project Name:

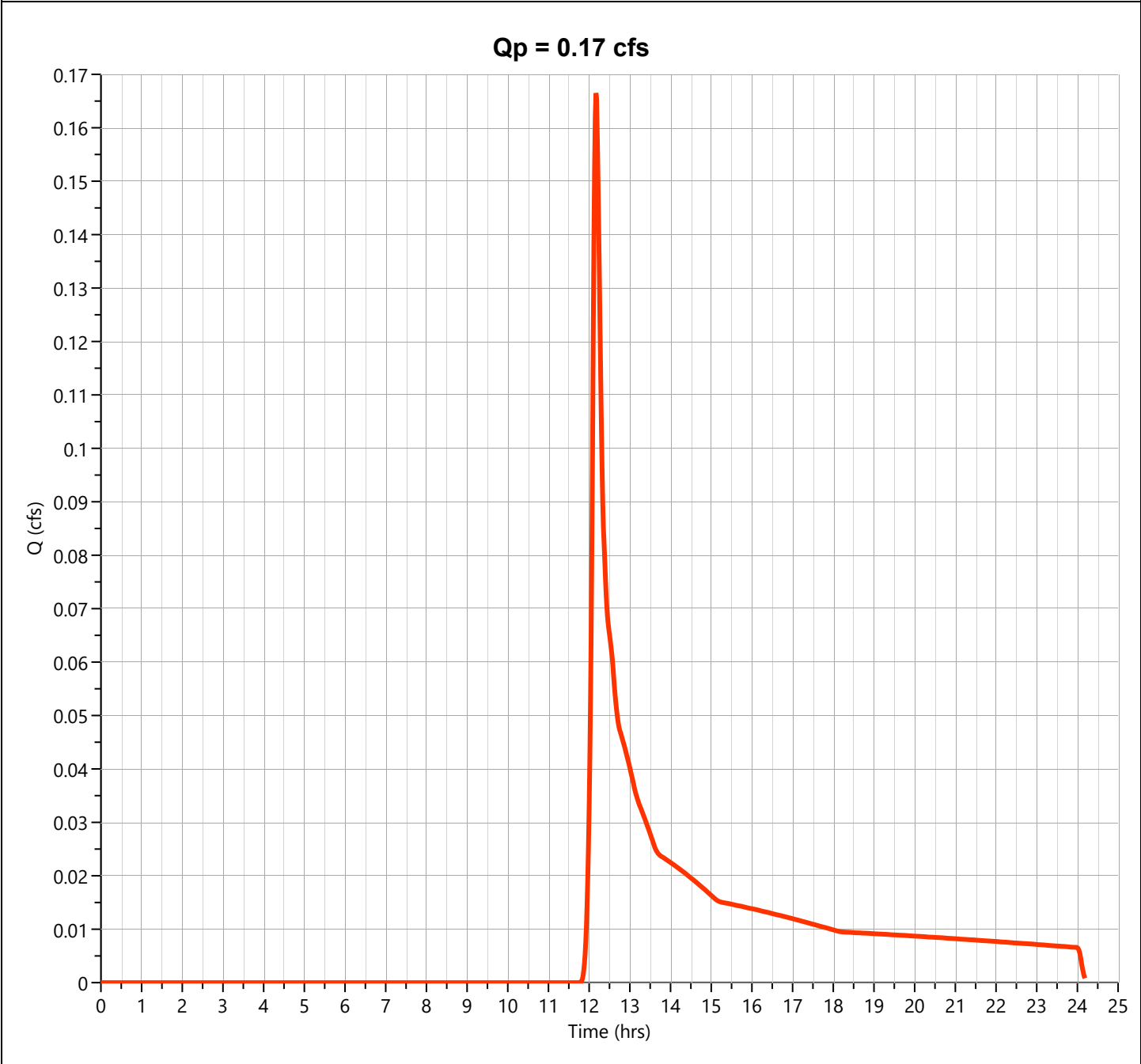
Hydrology Studio v 3.0.0.29

01-15-2024

EX WSD 2 PERV DIST

Hyd. No. 4

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.166 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.17 hrs
Time Interval	= 1 min	Runoff Volume	= 773 cuft
Drainage Area	= 0.39 ac	Curve Number	= 61
Tc Method	= User	Time of Conc. (Tc)	= 9.0 min
Total Rainfall	= 3.44 in	Design Storm	= NOAA-D
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

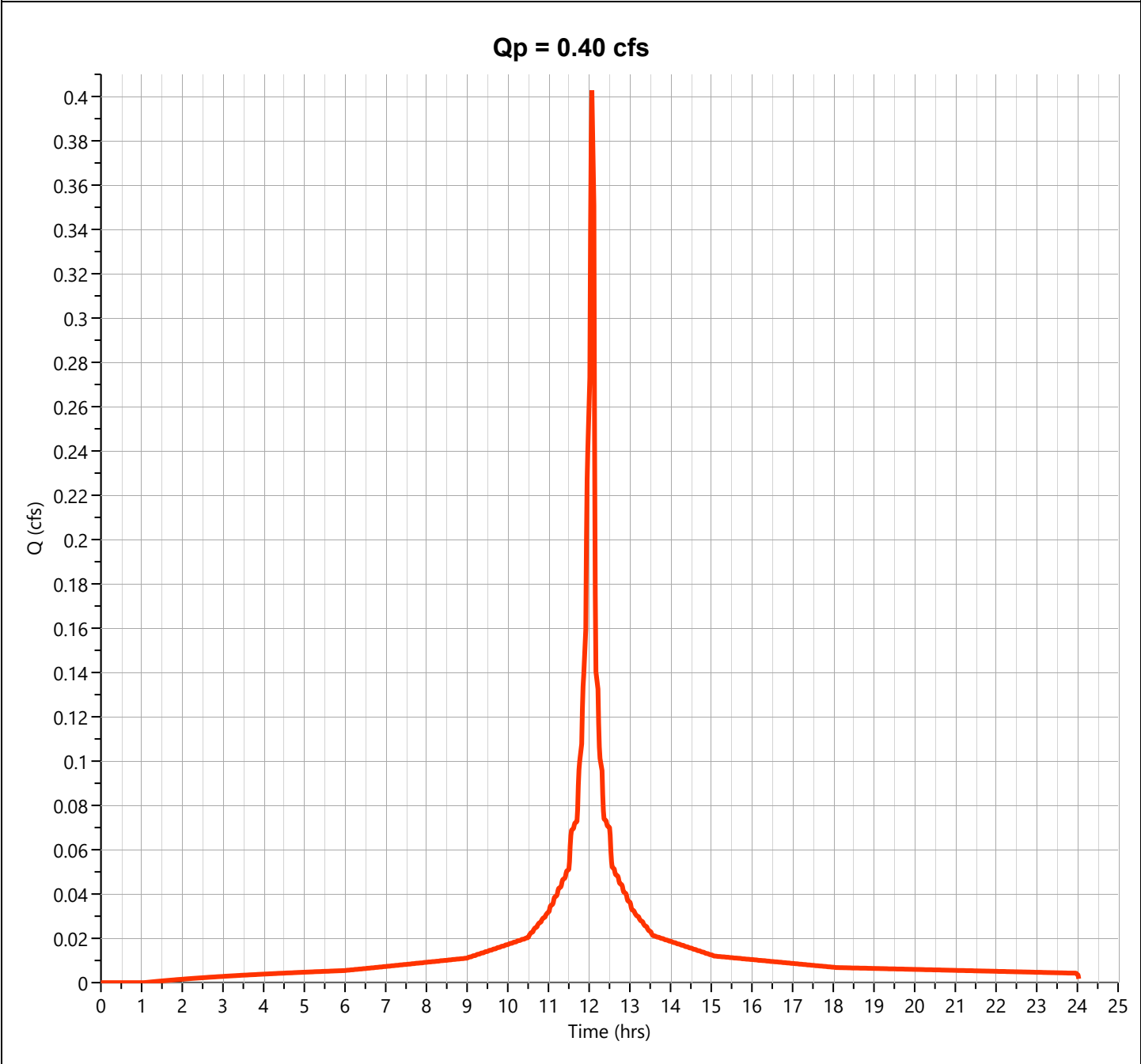
Hydrology Studio v 3.0.0.29

01-15-2024

EX WSD 2 IMP DIST

Hyd. No. 5

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.403 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.10 hrs
Time Interval	= 1 min	Runoff Volume	= 1,310 cuft
Drainage Area	= 0.12 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 2.0 min
Total Rainfall	= 3.44 in	Design Storm	= NOAA-D
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

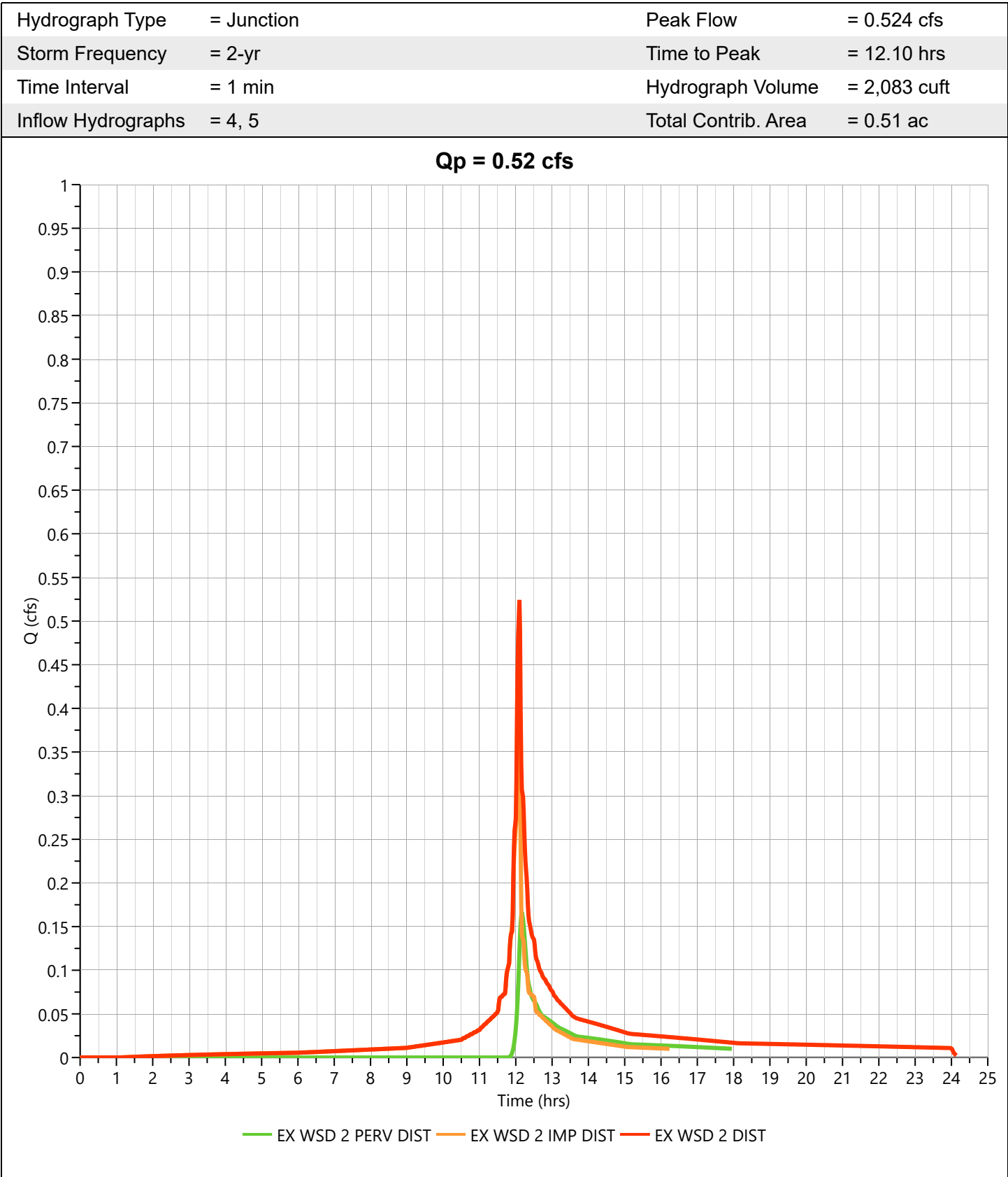
Project Name:

Hydrology Studio v 3.0.0.29

01-15-2024

EX WSD 2 DIST

Hyd. No. 6



Hydrograph Report

Project Name:

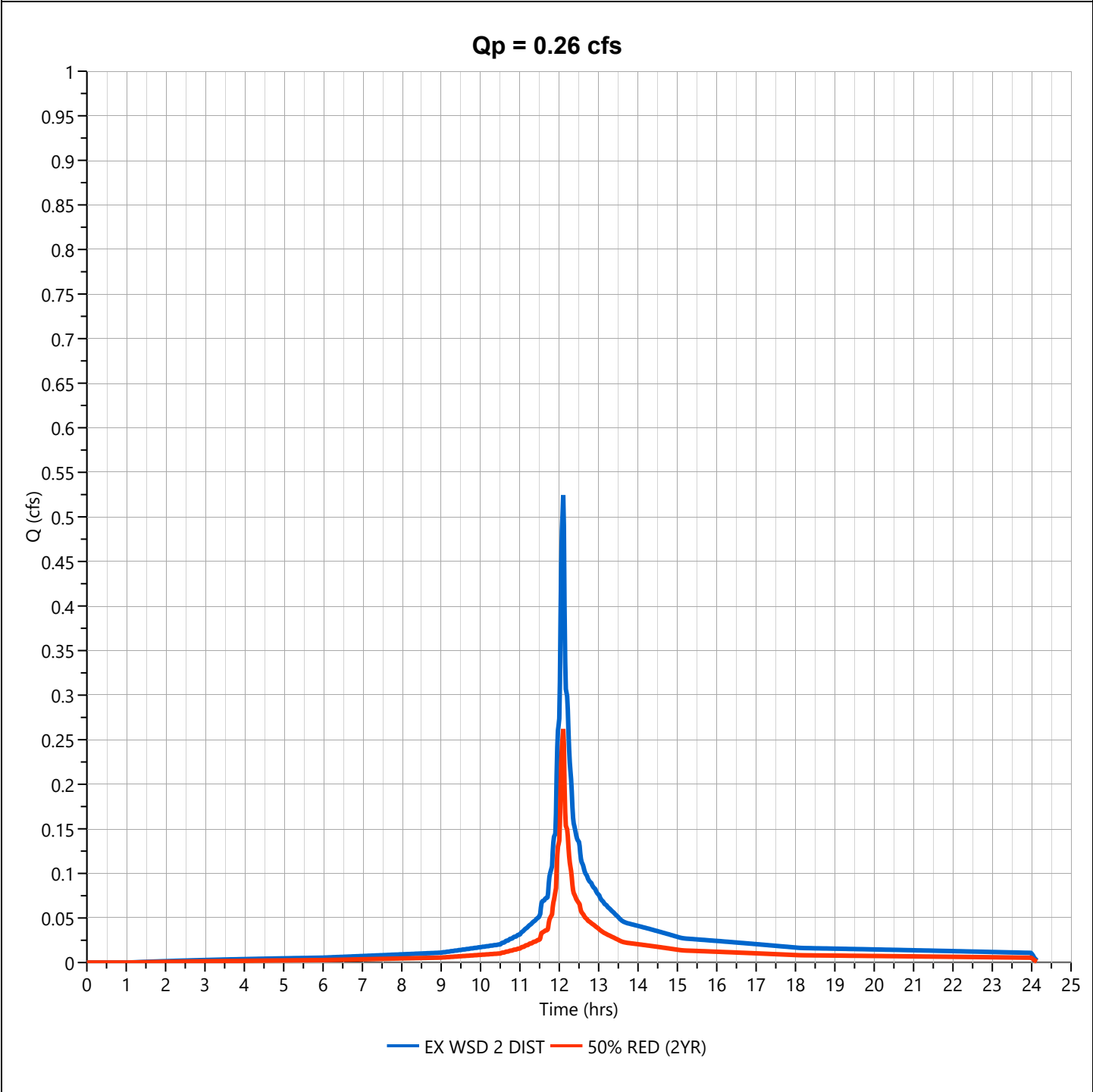
Hydrology Studio v 3.0.0.29

01-15-2024

50% RED (2YR)

Hyd. No. 7

Hydrograph Type	= Diversion	Peak Flow	= 0.262 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.10 hrs
Time Interval	= 1 min	Hydrograph Volume	= 1,041 cuft
Inflow Hydrograph	= 6 - EX WSD 2 DIST	Diversion Method	= Flow Ratio
Companion Hyd	= 8 - N/A	Flow Ratio	= 0.5



Hydrograph Report

Project Name:

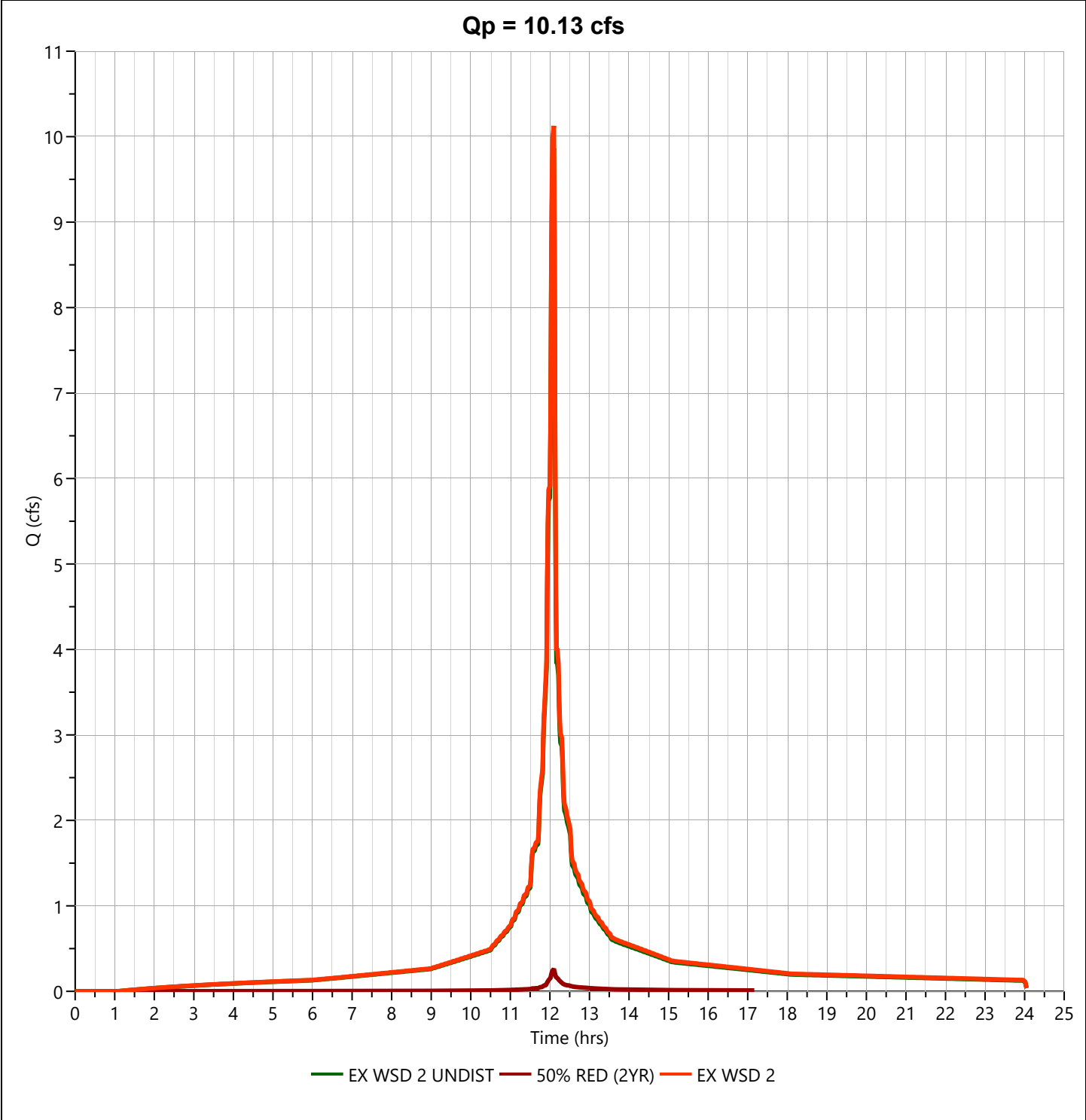
Hydrology Studio v 3.0.0.29

01-15-2024

EX WSD 2

Hyd. No. 9

Hydrograph Type	= Junction	Peak Flow	= 10.13 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.10 hrs
Time Interval	= 1 min	Hydrograph Volume	= 34,940 cuft
Inflow Hydrographs	= 3, 7	Total Contrib. Area	= 4.33 ac



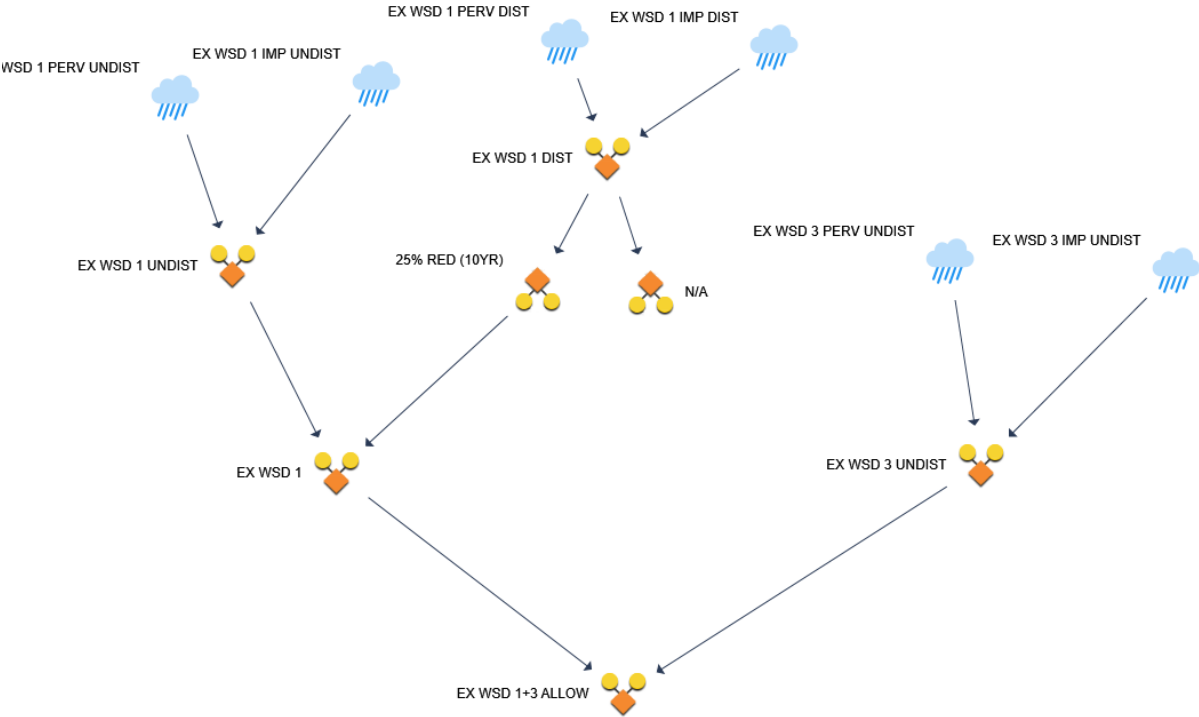
**EXISTING (ALLOWABLE) RUNOFF HYDROGRAPHS
10-YEAR**

Basin Model

Hydrology Studio v 3.0.0.29

Project Name:

01-15-2024



Hydrograph 10-yr Summary

Project Name:

Hydrology Studio v 3.0.0.29

01-15-2024

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 WSD 1 PERV UNDIST	0.217	12.13	745	----		
2	NRCS Runoff	EX WSD 1 IMP UNDIST	2.307	12.10	7,631	----		
3	Junction	EX WSD 1 UNDIST	2.505	12.10	8,376	1, 2		
4	NRCS Runoff	EX WSD 1 PERV DIST	0.311	12.15	1,146	----		
5	NRCS Runoff	EX WSD 1 IMP DIST	1.828	12.13	7,416	----		
6	Junction	EX WSD 1 DIST	2.133	12.15	8,562	4, 5		
7	Diversion1	25% RED (10YR)	1.600	12.15	6,421	6		
8	Diversion2	N/A	0.533	12.15	2,140	6		
9	Junction	EX WSD 1	3.972	12.10	14,797	3, 7		
11	NRCS Runoff	EX WSD 3 PERV UNDIST	0.998	12.20	4,082	----		
12	NRCS Runoff	EX WSD 3 IMP UNDIST	3.230	12.10	10,683	----		
13	Junction	EX WSD 3 UNDIST	3.965	12.10	14,765	11, 12		
15	Junction	EX WSD 1+3 ALLOW	7.936	12.10	29,562	9, 13		

Hydrograph Report

Project Name:

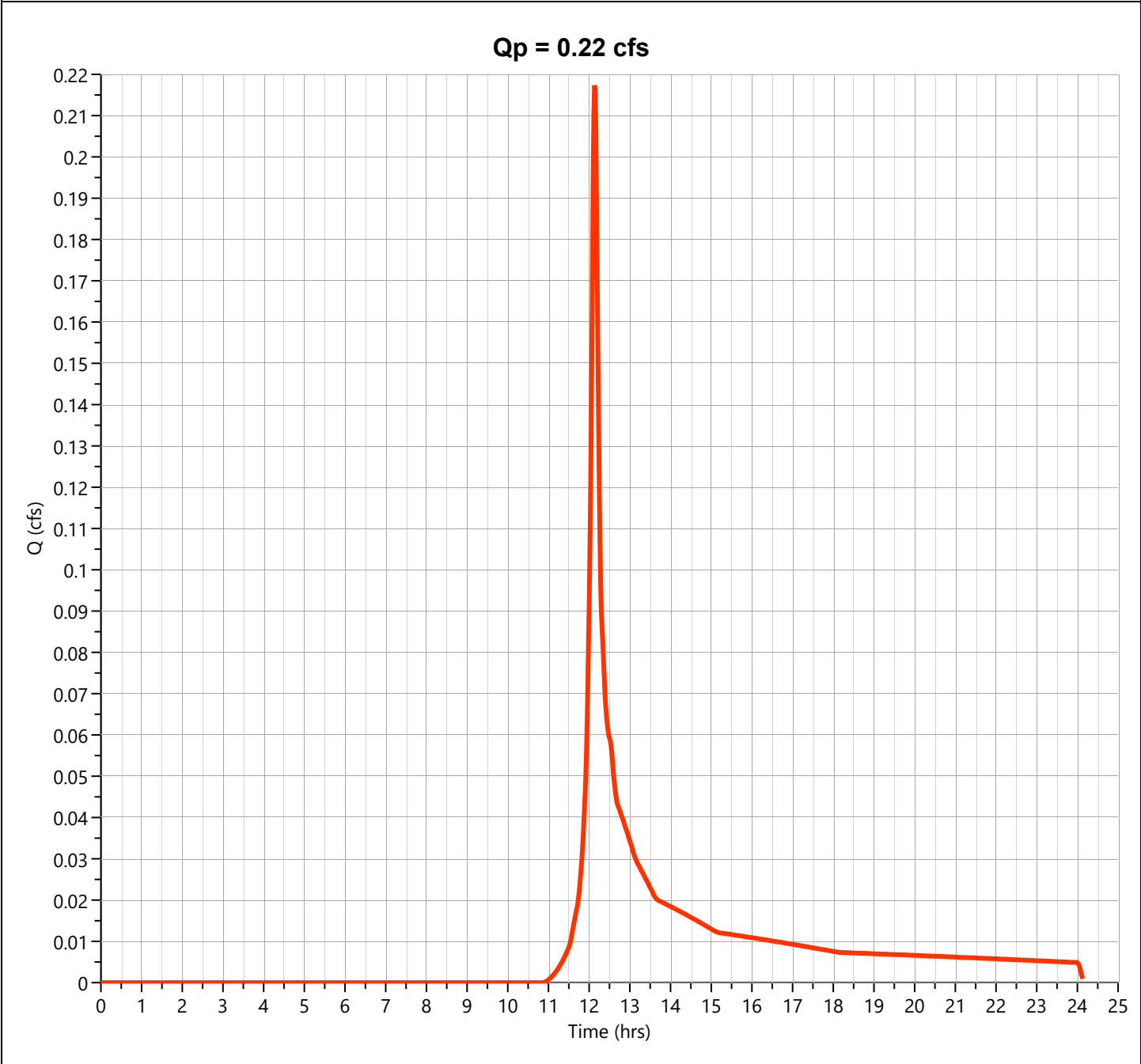
Hydrology Studio v 3.0.0.29

01-15-2024

EX WSD 1 PERV UNDIST

Hyd. No. 1

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.217 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.13 hrs
Time Interval	= 1 min	Runoff Volume	= 745 cuft
Drainage Area	= 0.14 ac	Curve Number	= 61
Tc Method	= User	Time of Conc. (Tc)	= 8.0 min
Total Rainfall	= 5.22 in	Design Storm	= NOAA-D
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

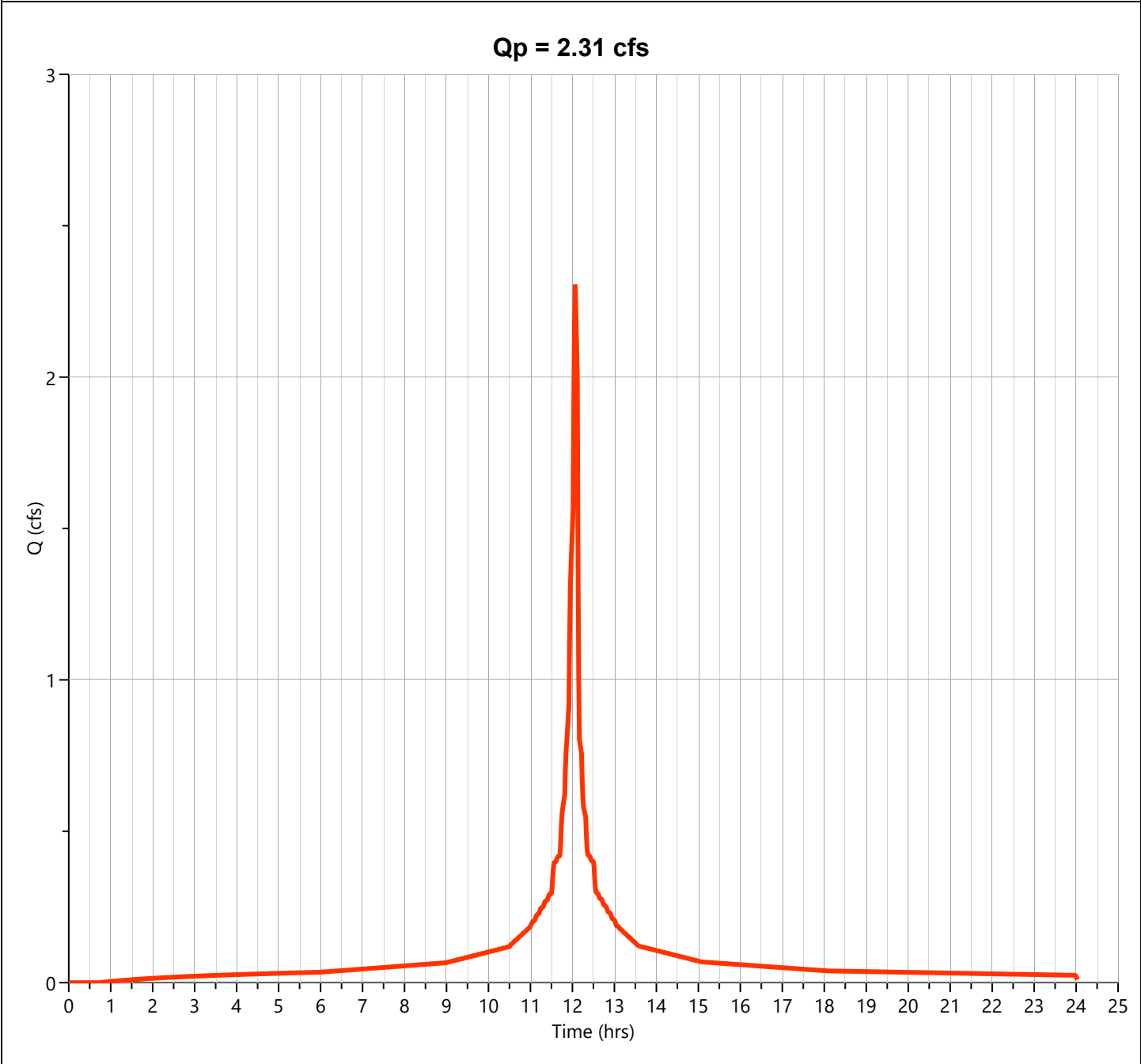
Hydrology Studio v 3.0.0.29

01-15-2024

EX WSD 1 IMP UNDIST

Hyd. No. 2

Hydrograph Type	= NRCS Runoff	Peak Flow	= 2.307 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.10 hrs
Time Interval	= 1 min	Runoff Volume	= 7,631 cuft
Drainage Area	= 0.45 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 2.0 min
Total Rainfall	= 5.22 in	Design Storm	= NOAA-D
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

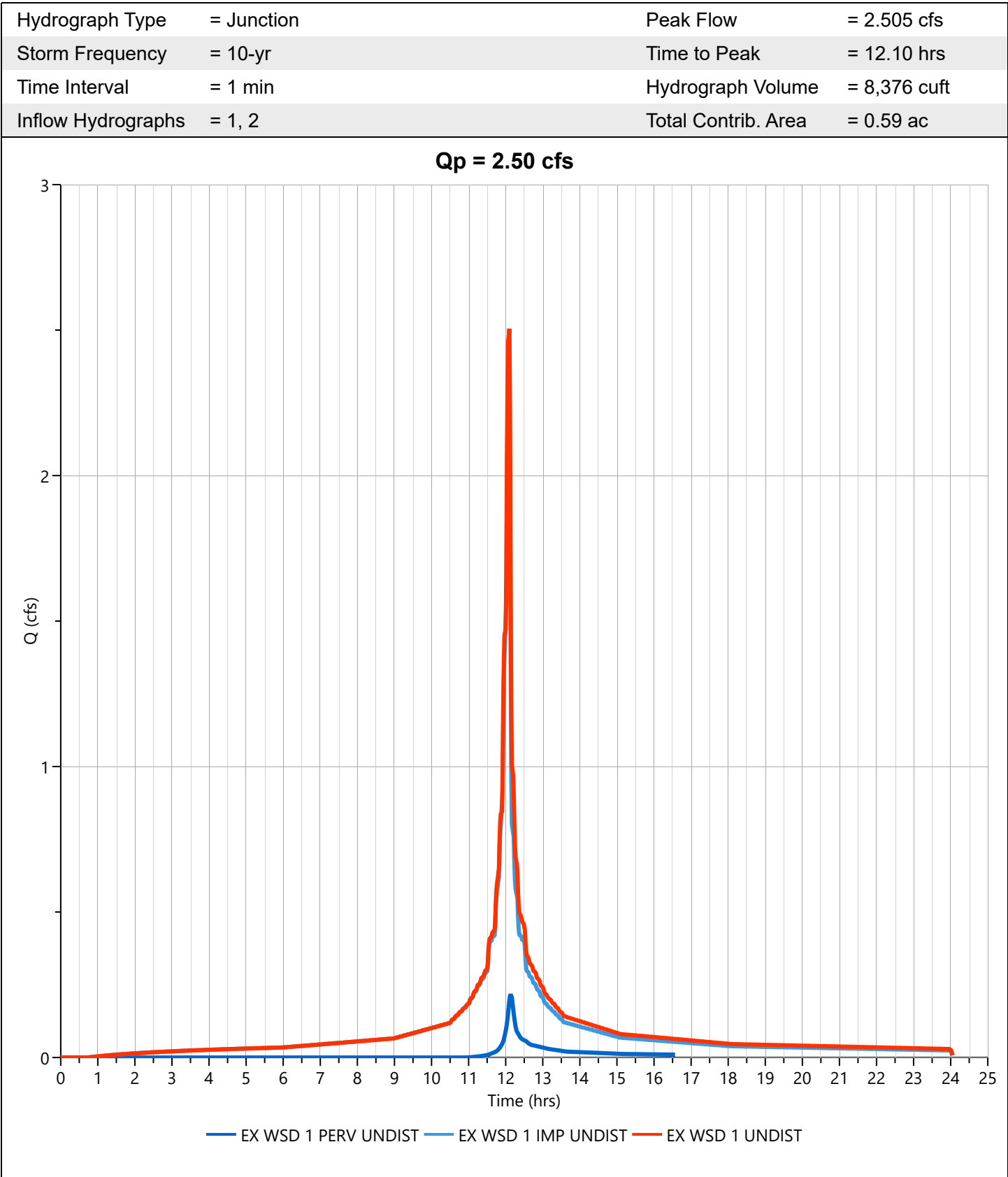
Project Name:

Hydrology Studio v 3.0.0.29

01-15-2024

EX WSD 1 UNDIST

Hyd. No. 3



Hydrograph Report

Project Name:

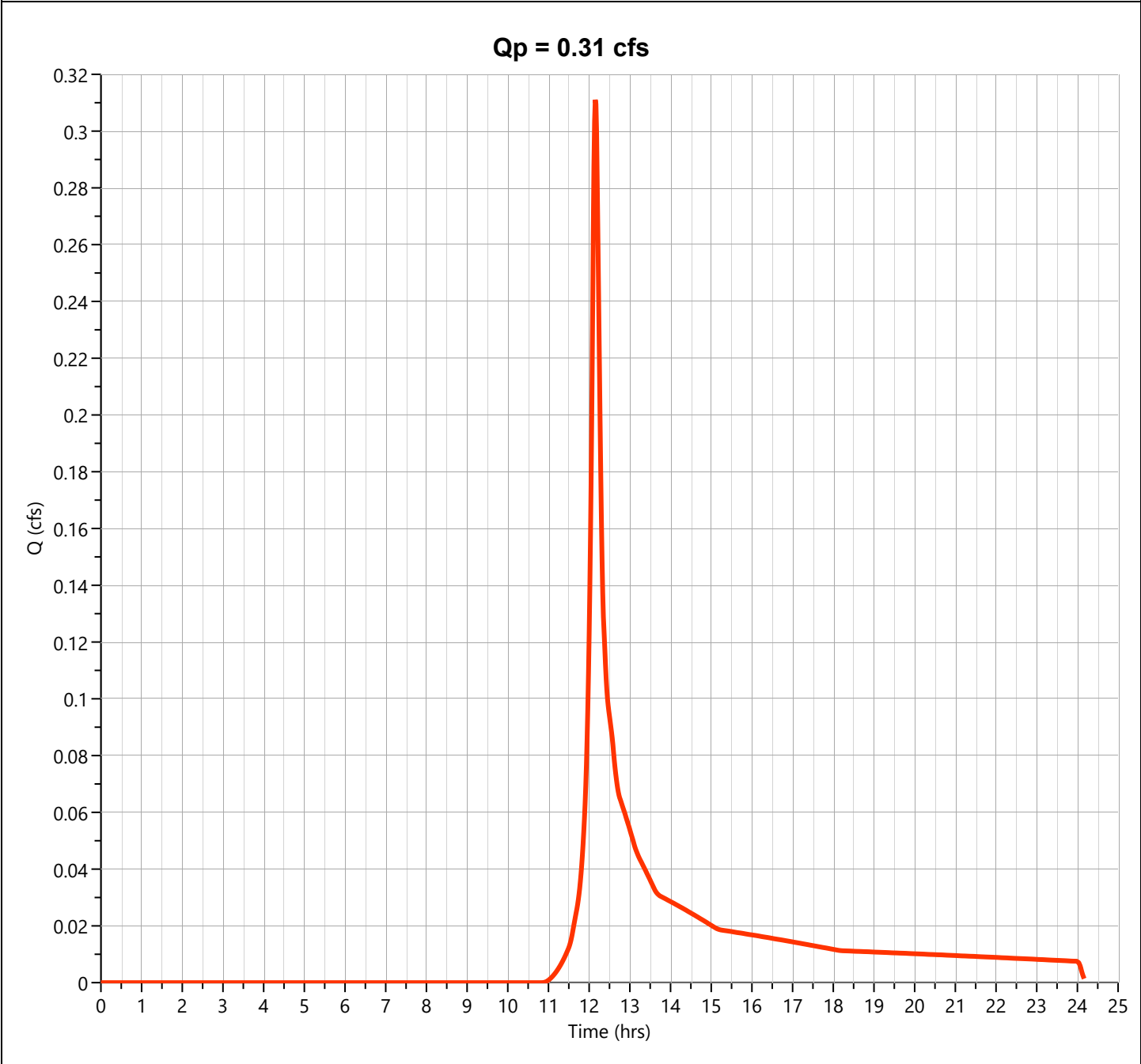
Hydrology Studio v 3.0.0.29

01-15-2024

EX WSD 1 PERV DIST

Hyd. No. 4

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.311 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.15 hrs
Time Interval	= 1 min	Runoff Volume	= 1,146 cuft
Drainage Area	= 0.21 ac	Curve Number	= 61
Tc Method	= User	Time of Conc. (Tc)	= 9.0 min
Total Rainfall	= 5.22 in	Design Storm	= NOAA-D
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

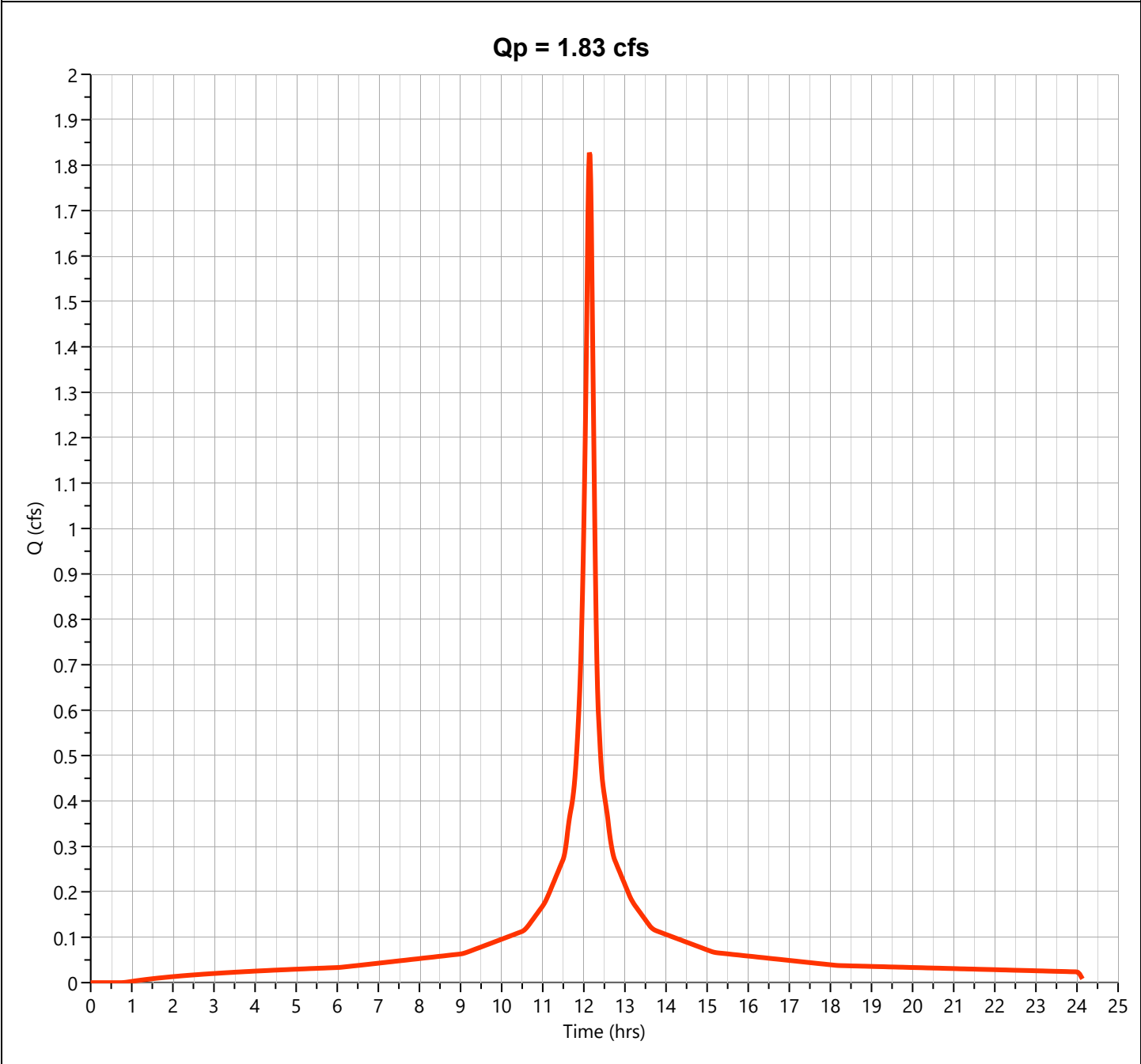
Hydrology Studio v 3.0.0.29

01-15-2024

EX WSD 1 IMP DIST

Hyd. No. 5

Hydrograph Type	= NRCS Runoff	Peak Flow	= 1.828 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.13 hrs
Time Interval	= 1 min	Runoff Volume	= 7,416 cuft
Drainage Area	= 0.41 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 9.0 min
Total Rainfall	= 5.22 in	Design Storm	= NOAA-D
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

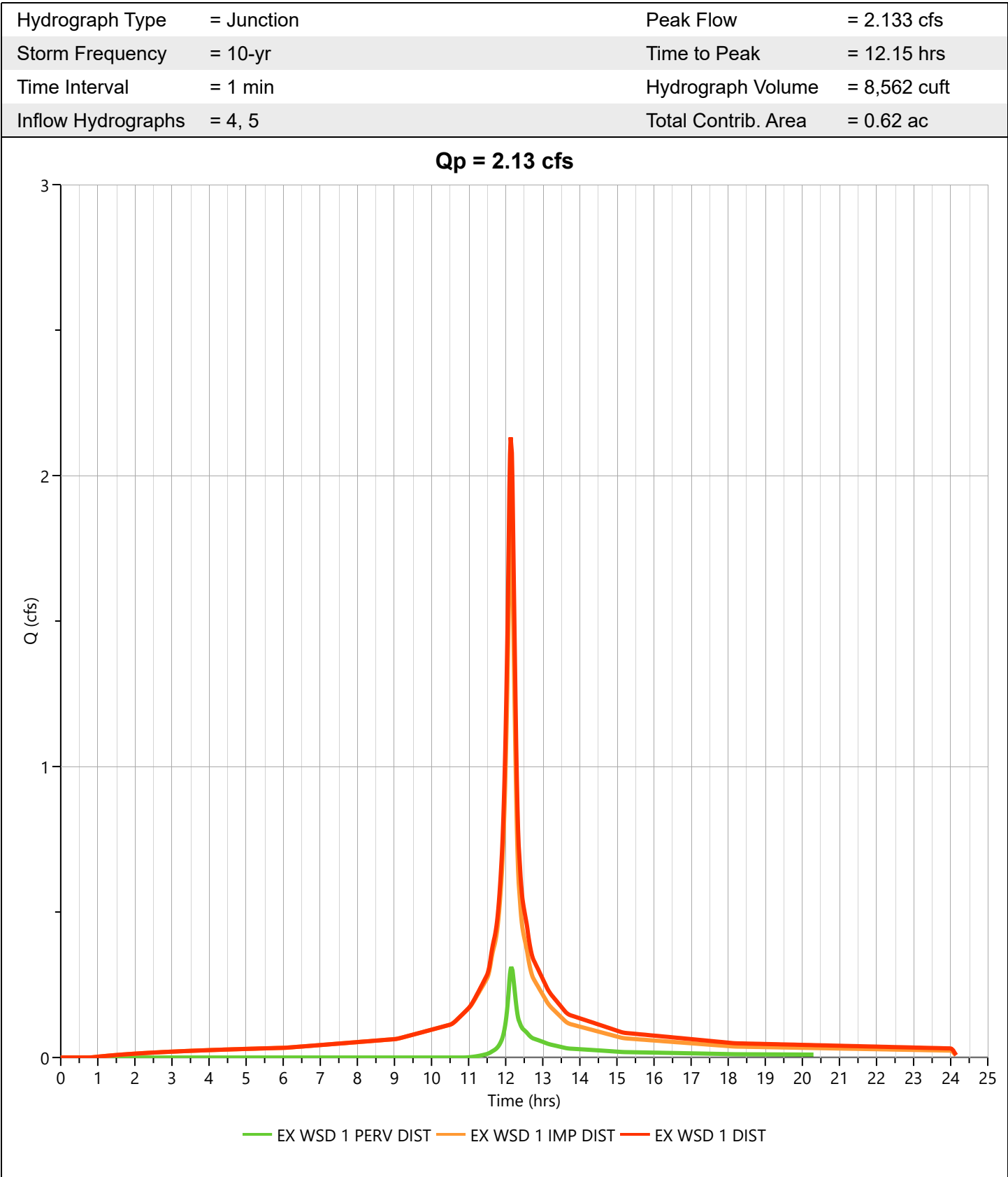
Project Name:

Hydrology Studio v 3.0.0.29

01-15-2024

EX WSD 1 DIST

Hyd. No. 6



Hydrograph Report

Project Name:

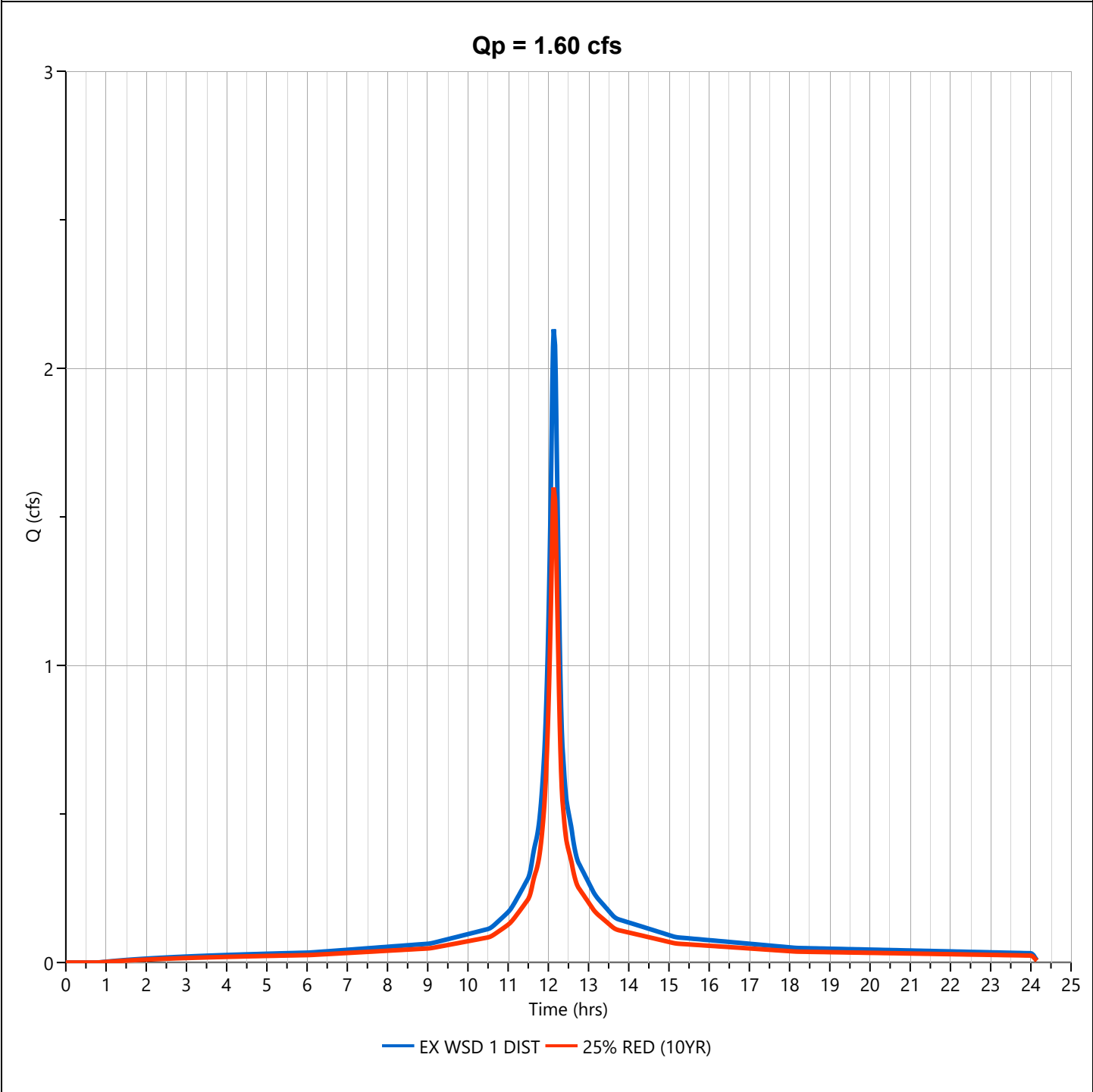
Hydrology Studio v 3.0.0.29

01-15-2024

25% RED (10YR)

Hyd. No. 7

Hydrograph Type	= Diversion	Peak Flow	= 1.600 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.15 hrs
Time Interval	= 1 min	Hydrograph Volume	= 6,421 cuft
Inflow Hydrograph	= 6 - EX WSD 1 DIST	Diversion Method	= Flow Ratio
Companion Hyd	= 8 - N/A	Flow Ratio	= 0.75



Hydrograph Report

Project Name:

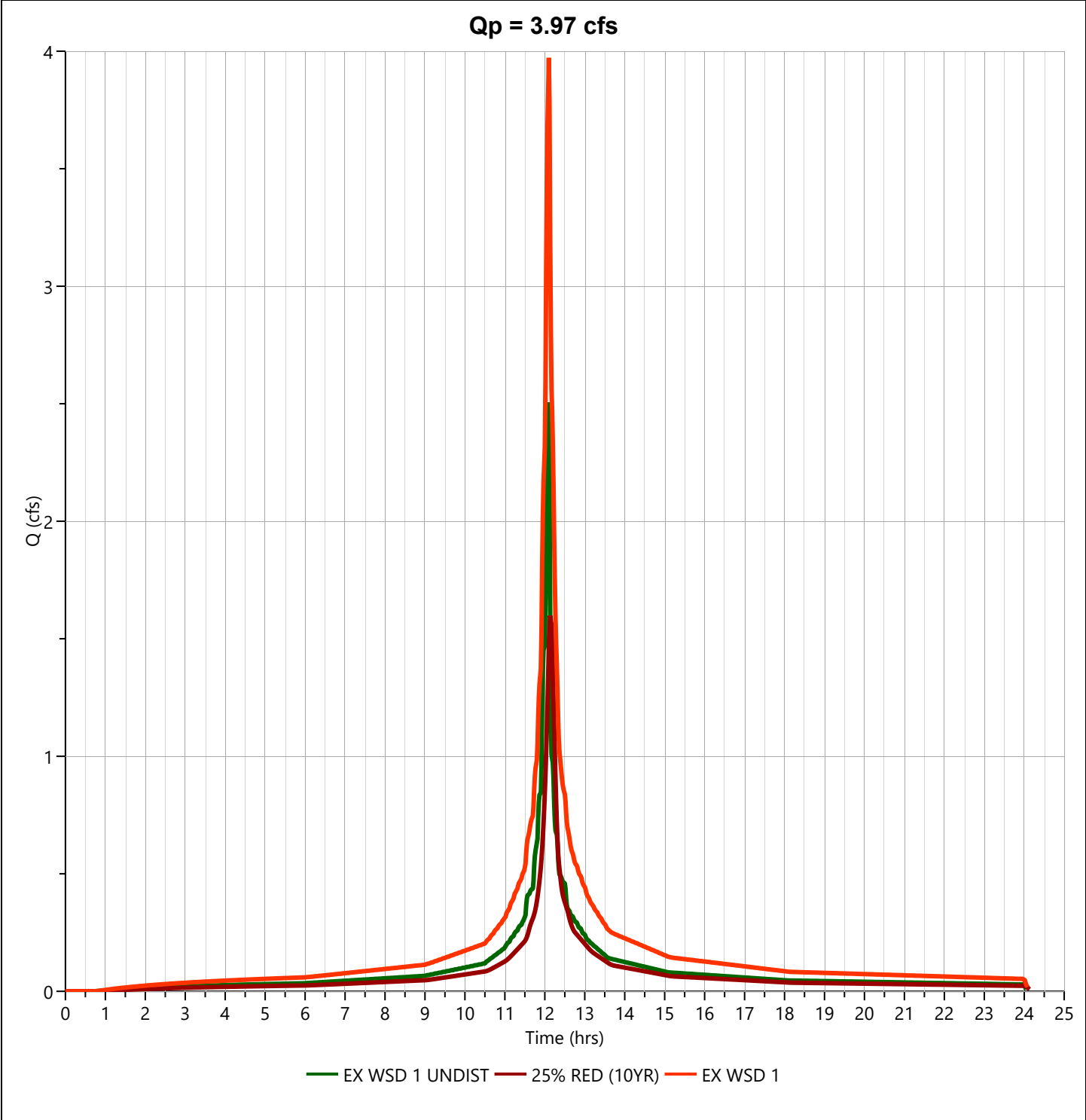
Hydrology Studio v 3.0.0.29

01-15-2024

EX WSD 1

Hyd. No. 9

Hydrograph Type	= Junction	Peak Flow	= 3.972 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.10 hrs
Time Interval	= 1 min	Hydrograph Volume	= 14,797 cuft
Inflow Hydrographs	= 3, 7	Total Contrib. Area	= 0.59 ac



Hydrograph Report

Project Name:

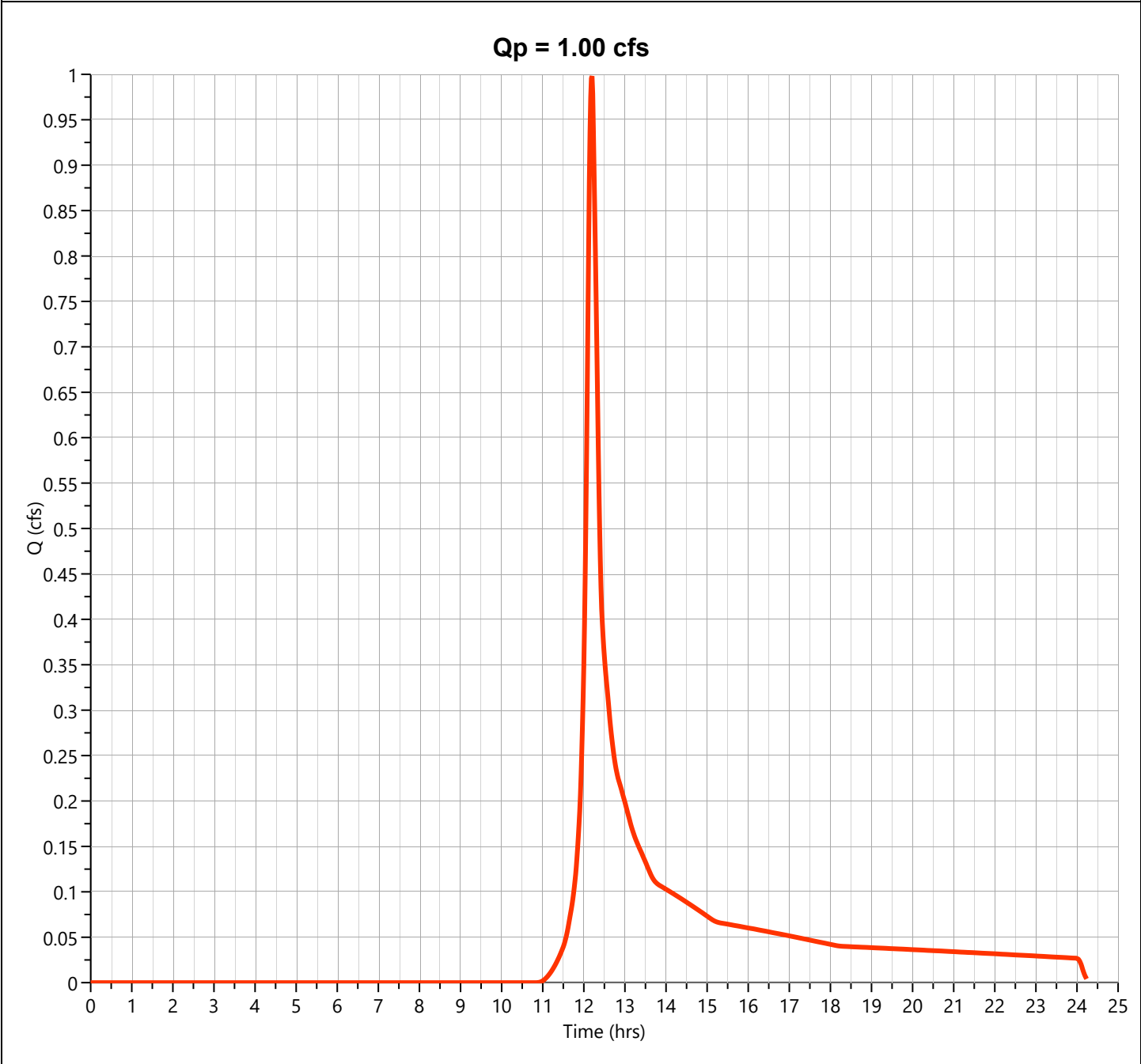
Hydrology Studio v 3.0.0.29

01-15-2024

EX WSD 3 PERV UNDIST

Hyd. No. 11

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.998 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.20 hrs
Time Interval	= 1 min	Runoff Volume	= 4,082 cuft
Drainage Area	= 0.76 ac	Curve Number	= 61
Tc Method	= User	Time of Conc. (Tc)	= 12.0 min
Total Rainfall	= 5.22 in	Design Storm	= NOAA-D
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

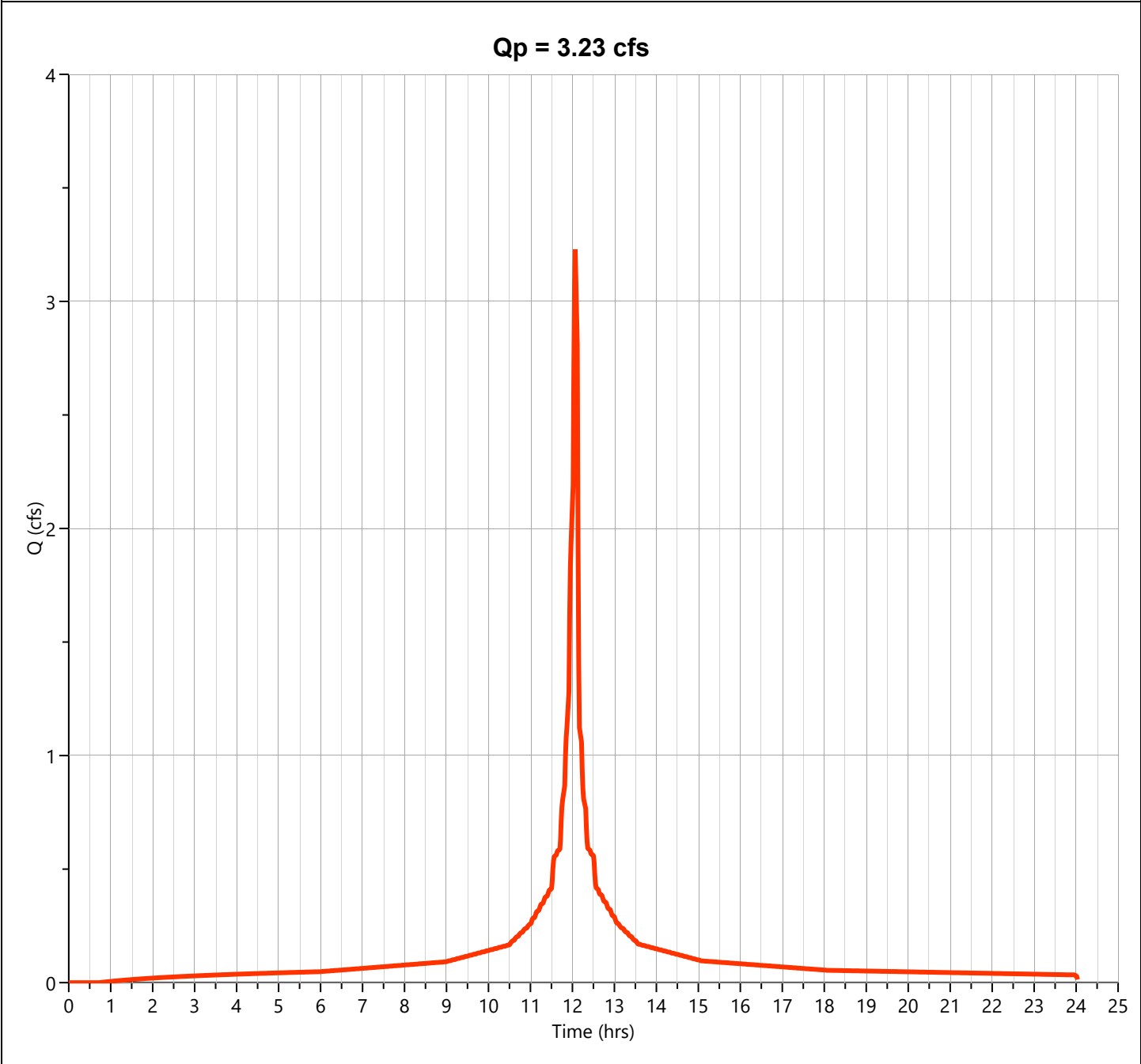
Hydrology Studio v 3.0.0.29

01-15-2024

EX WSD 3 IMP UNDIST

Hyd. No. 12

Hydrograph Type	= NRCS Runoff	Peak Flow	= 3.230 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.10 hrs
Time Interval	= 1 min	Runoff Volume	= 10,683 cuft
Drainage Area	= 0.63 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 3.0 min
Total Rainfall	= 5.22 in	Design Storm	= NOAA-D
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

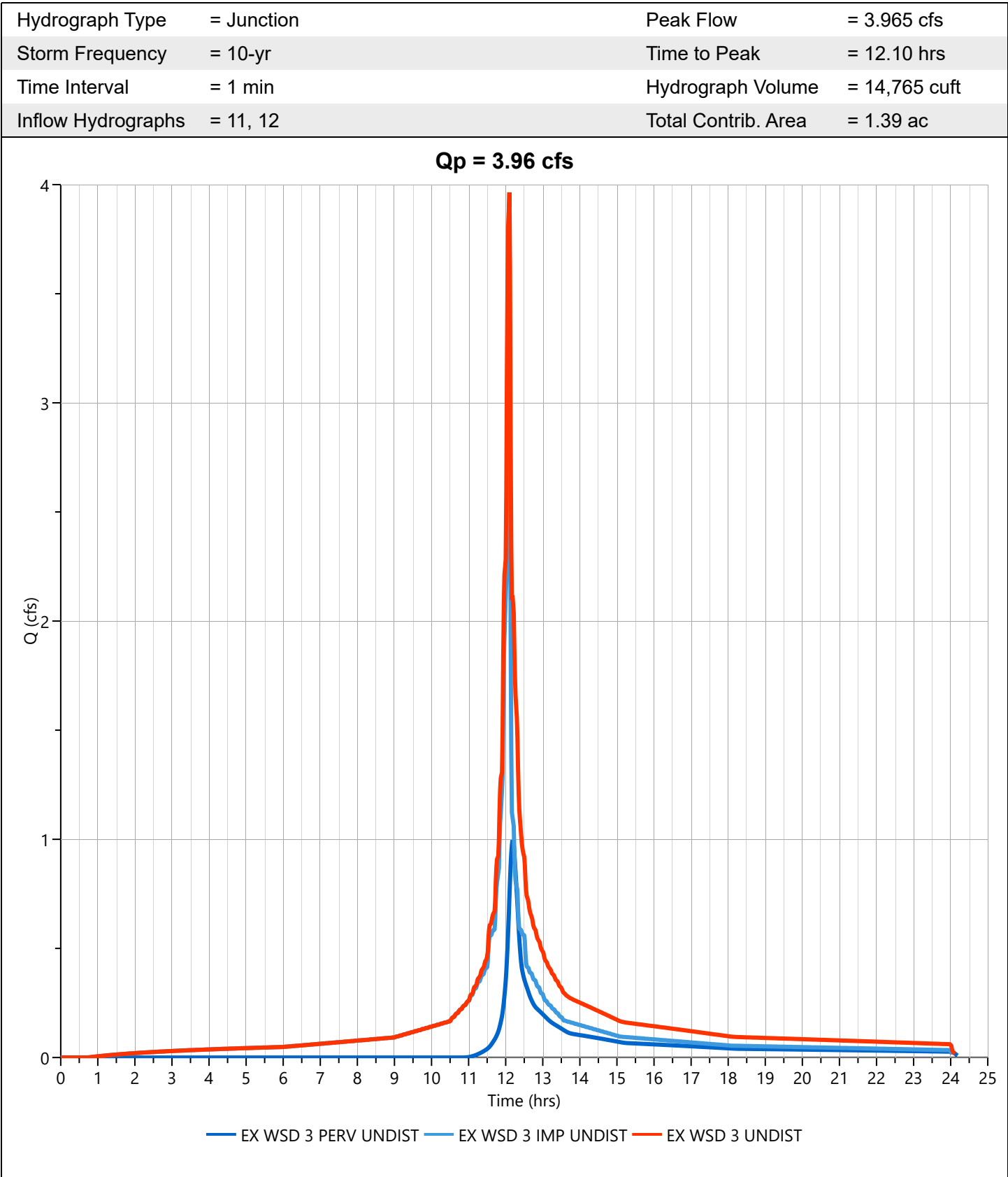
Project Name:

Hydrology Studio v 3.0.0.29

01-15-2024

EX WSD 3 UNDIST

Hyd. No. 13



Hydrograph Report

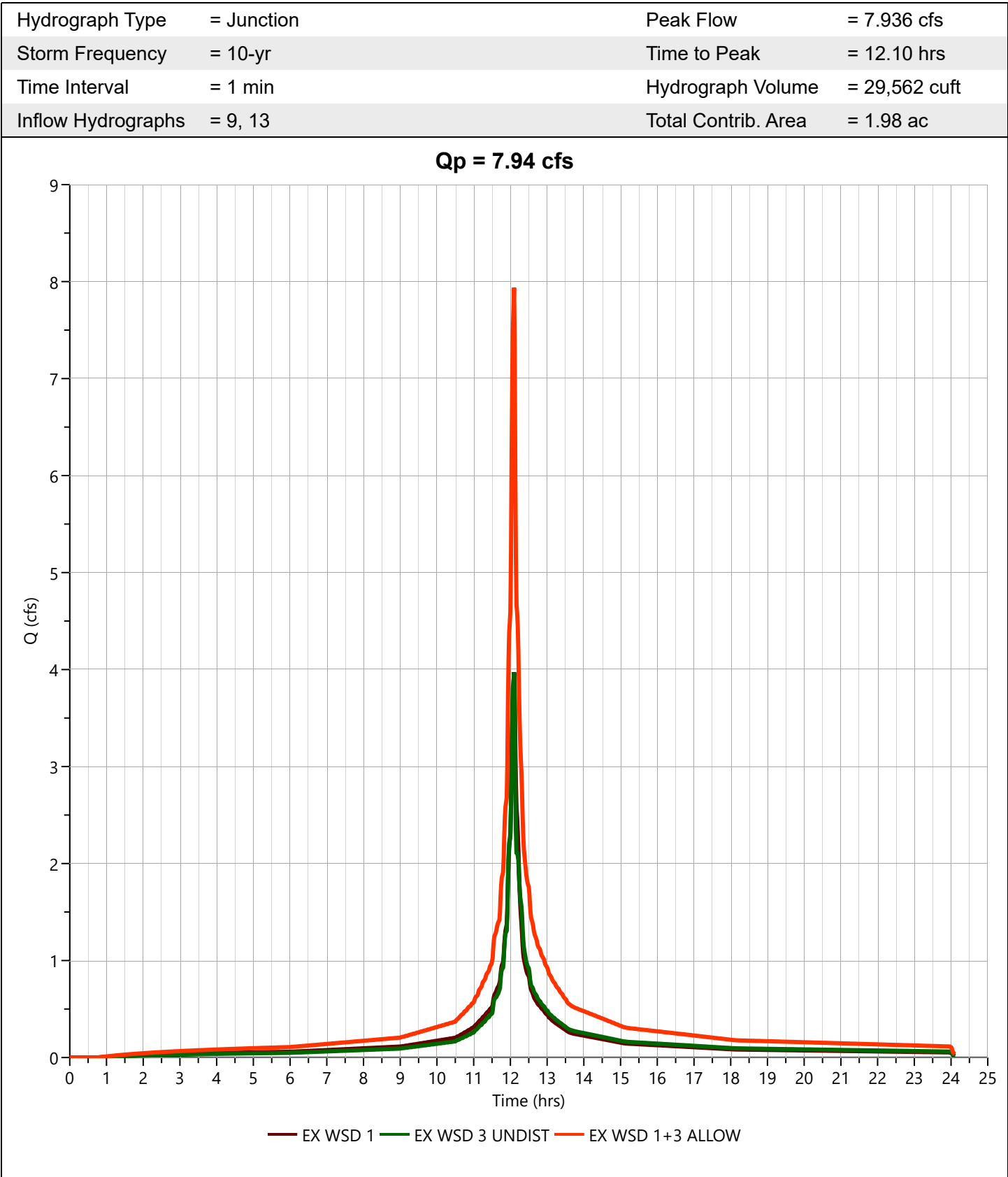
Project Name:

Hydrology Studio v 3.0.0.29

01-15-2024

EX WSD 1+3 ALLOW

Hyd. No. 15

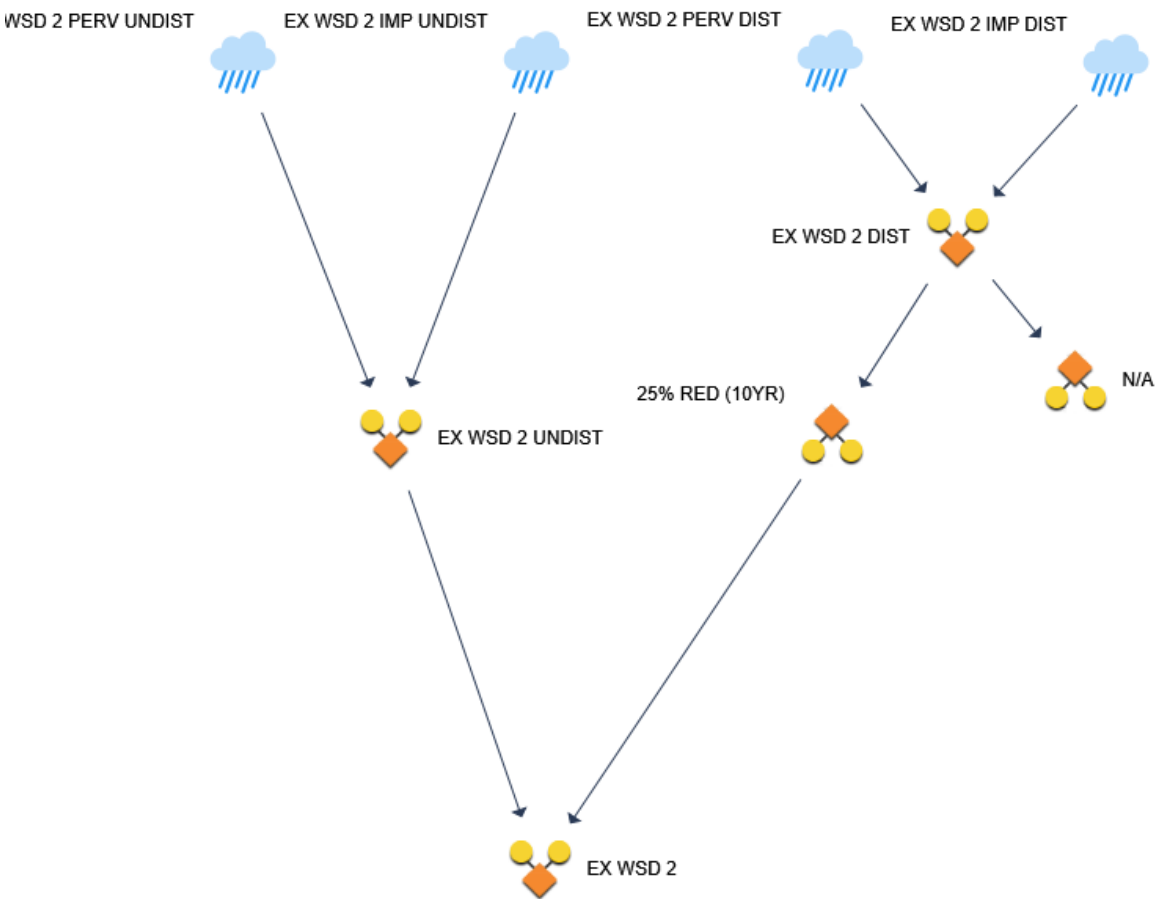


Basin Model

Hydrology Studio v 3.0.0.29

Project Name:

01-15-2024



Hydrograph 10-yr Summary

Project Name:

Hydrology Studio v 3.0.0.29

01-15-2024

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 WSD 2 PERV UNDIST	1.957	12.20	8,003	----		
2	NRCS Runoff	EX WSD 2 IMP UNDIST	14.56	12.10	48,159	----		
3	Junction	EX WSD 2 UNDIST	16.00	12.10	56,161	1, 2		
4	NRCS Runoff	EX WSD 2 PERV DIST	0.578	12.15	2,128	----		
5	NRCS Runoff	EX WSD 2 IMP DIST	0.615	12.10	2,035	----		
6	Junction	EX WSD 2 DIST	1.105	12.10	4,163	4, 5		
7	Diversion1	25% RED (10YR)	0.829	12.10	3,122	6		
8	Diversion2	N/A	0.276	12.10	1,041	6		
9	Junction	EX WSD 2	16.83	12.10	59,283	3, 7		

Hydrograph Report

Project Name:

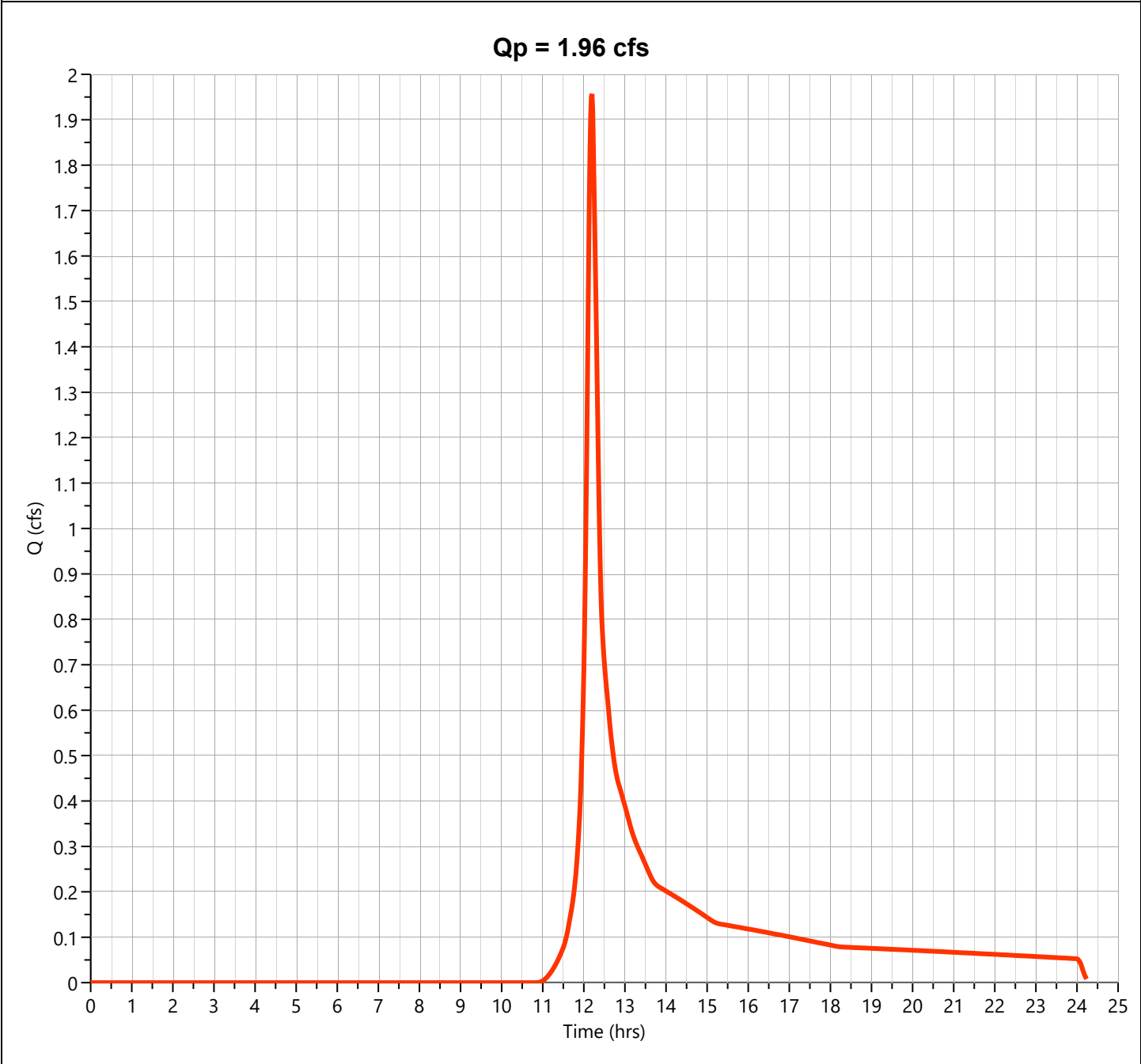
Hydrology Studio v 3.0.0.29

01-15-2024

EX WSD 2 PERV UNDIST

Hyd. No. 1

Hydrograph Type	= NRCS Runoff	Peak Flow	= 1.957 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.20 hrs
Time Interval	= 1 min	Runoff Volume	= 8,003 cuft
Drainage Area	= 1.49 ac	Curve Number	= 61
Tc Method	= User	Time of Conc. (Tc)	= 12.0 min
Total Rainfall	= 5.22 in	Design Storm	= NOAA-D
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

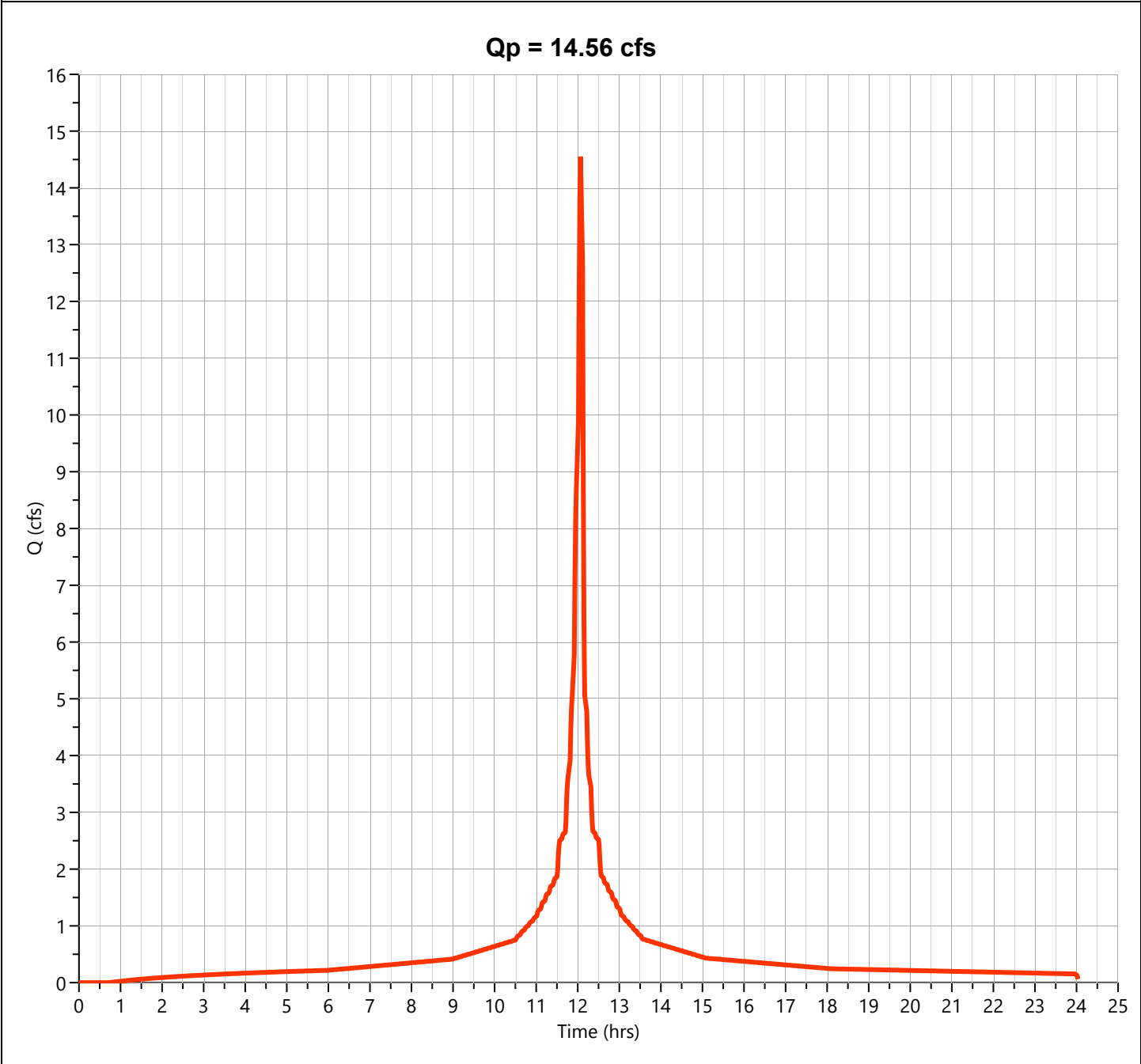
Hydrology Studio v 3.0.0.29

01-15-2024

EX WSD 2 IMP UNDIST

Hyd. No. 2

Hydrograph Type	= NRCS Runoff	Peak Flow	= 14.56 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.10 hrs
Time Interval	= 1 min	Runoff Volume	= 48,159 cuft
Drainage Area	= 2.84 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 3.0 min
Total Rainfall	= 5.22 in	Design Storm	= NOAA-D
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

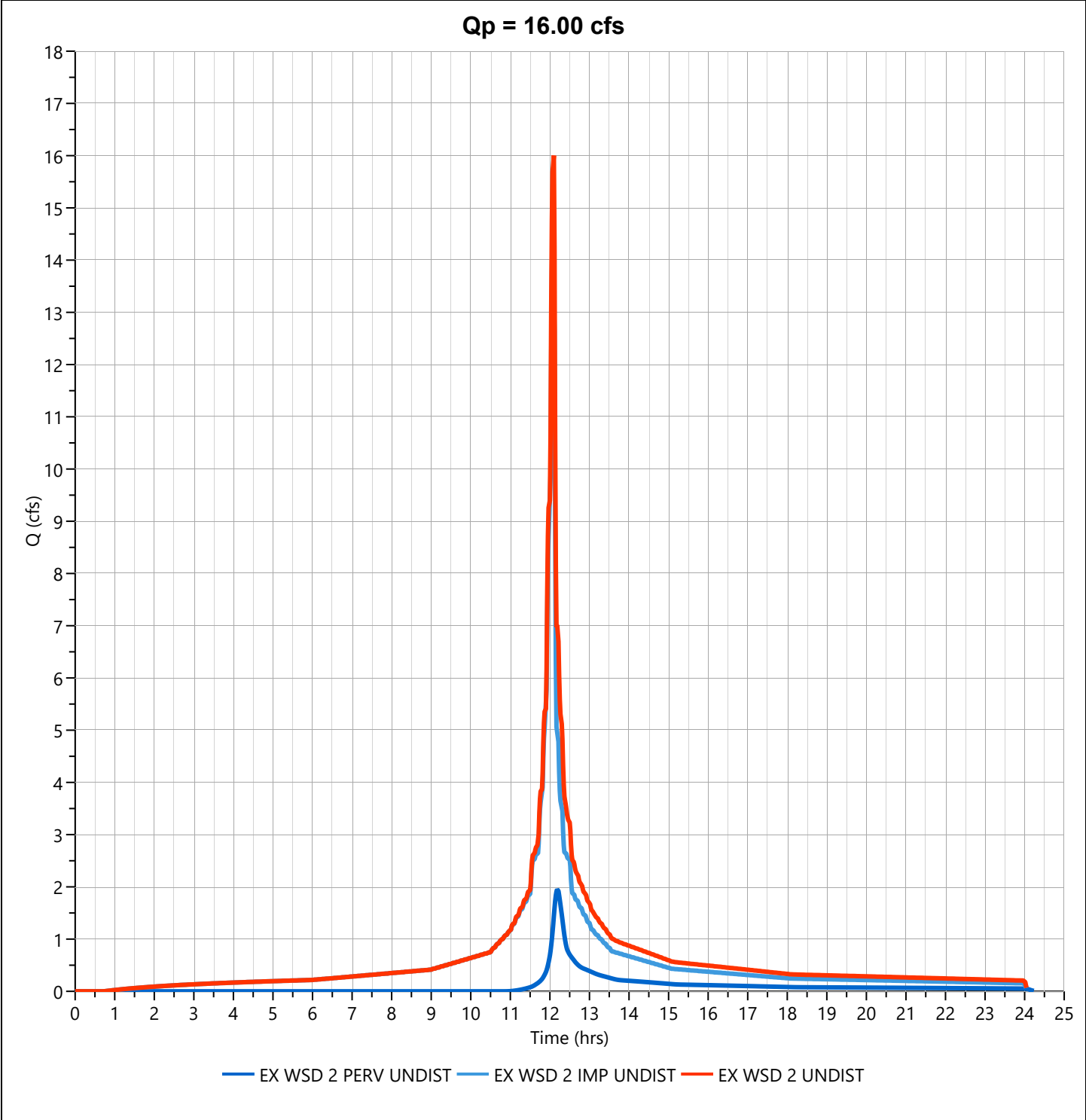
Hydrology Studio v 3.0.0.29

01-15-2024

EX WSD 2 UNDIST

Hyd. No. 3

Hydrograph Type	= Junction	Peak Flow	= 16.00 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.10 hrs
Time Interval	= 1 min	Hydrograph Volume	= 56,161 cuft
Inflow Hydrographs	= 1, 2	Total Contrib. Area	= 4.33 ac



Hydrograph Report

Project Name:

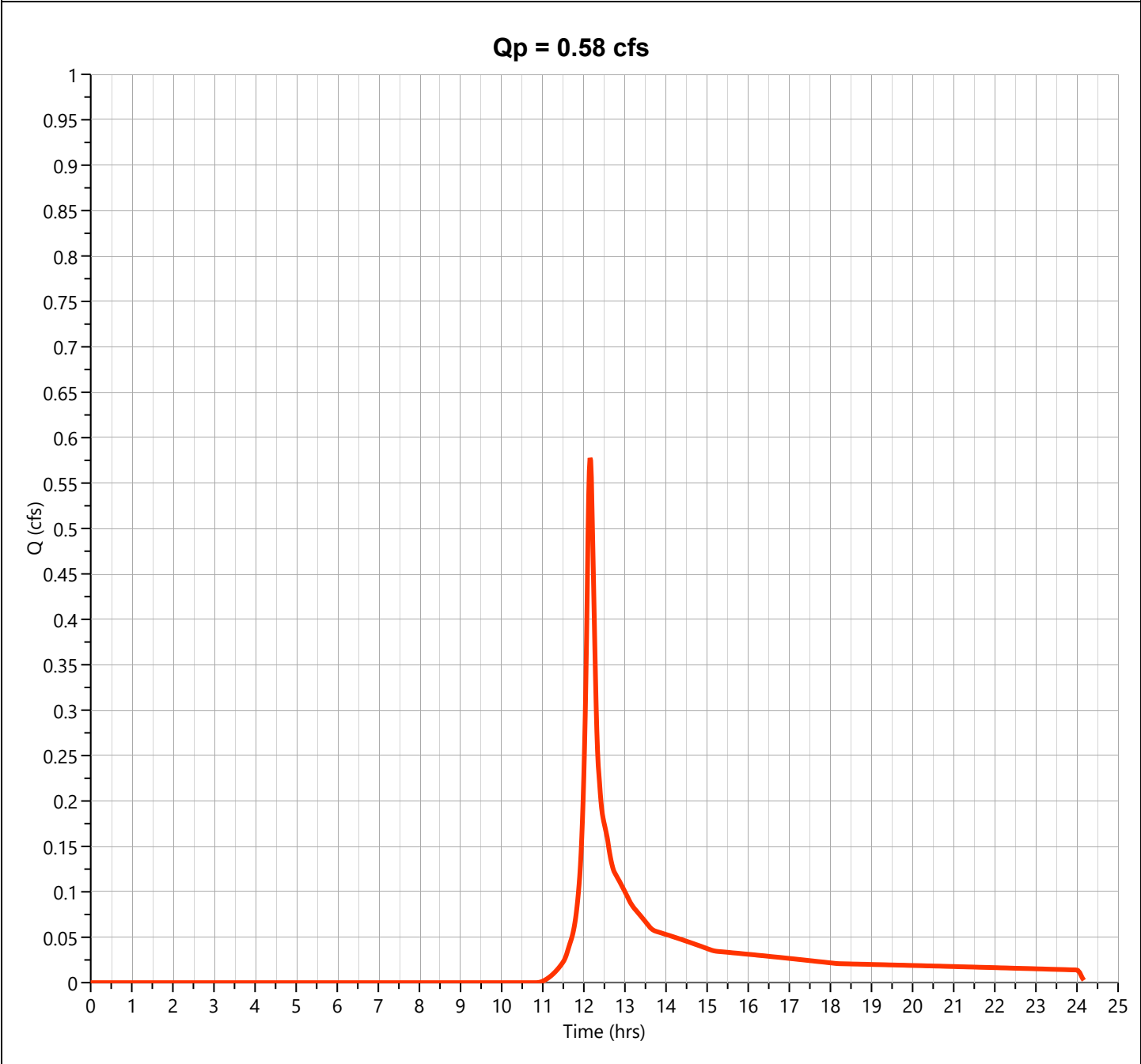
Hydrology Studio v 3.0.0.29

01-15-2024

EX WSD 2 PERV DIST

Hyd. No. 4

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.578 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.15 hrs
Time Interval	= 1 min	Runoff Volume	= 2,128 cuft
Drainage Area	= 0.39 ac	Curve Number	= 61
Tc Method	= User	Time of Conc. (Tc)	= 9.0 min
Total Rainfall	= 5.22 in	Design Storm	= NOAA-D
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

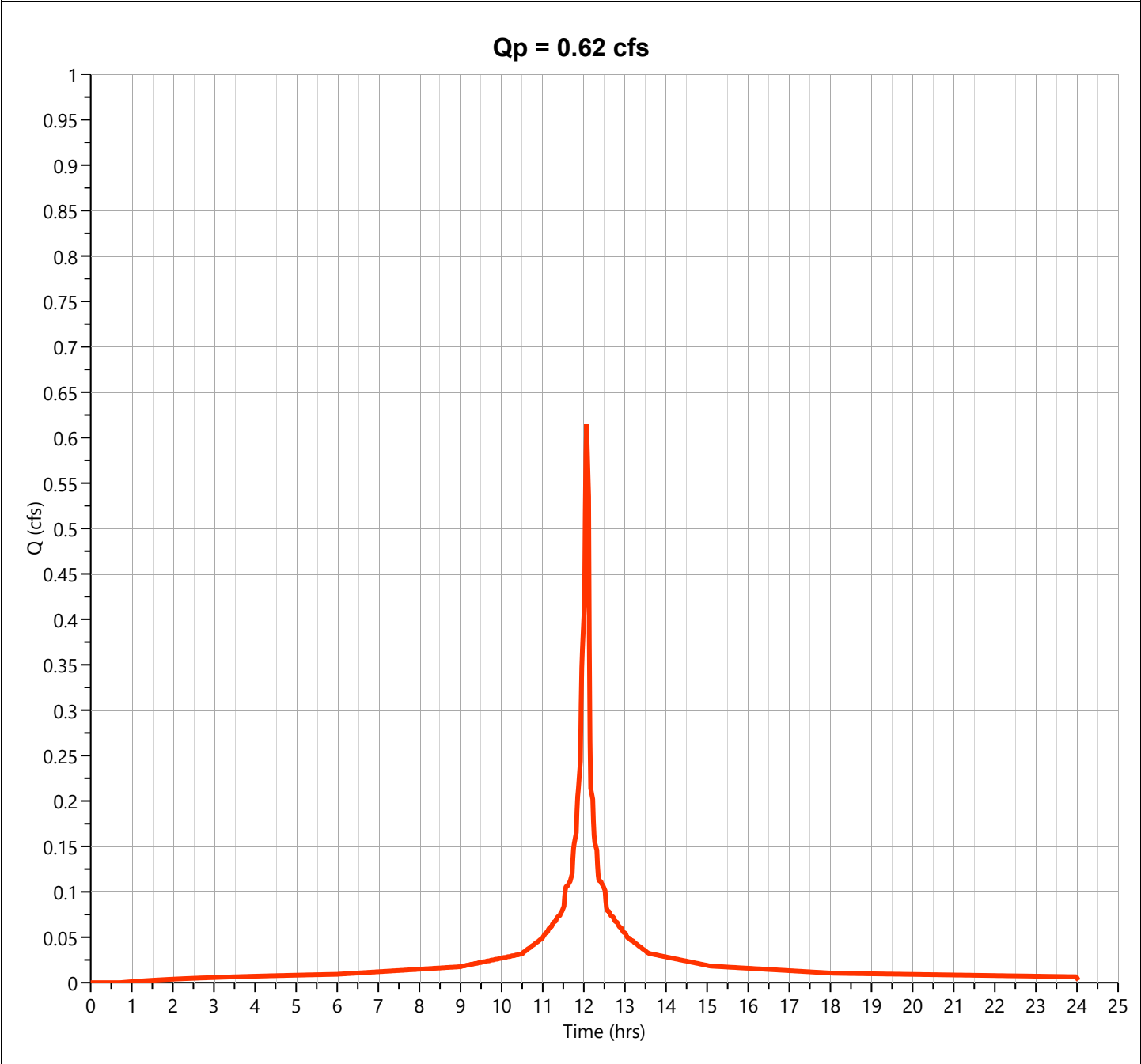
Hydrology Studio v 3.0.0.29

01-15-2024

EX WSD 2 IMP DIST

Hyd. No. 5

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.615 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.10 hrs
Time Interval	= 1 min	Runoff Volume	= 2,035 cuft
Drainage Area	= 0.12 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 2.0 min
Total Rainfall	= 5.22 in	Design Storm	= NOAA-D
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

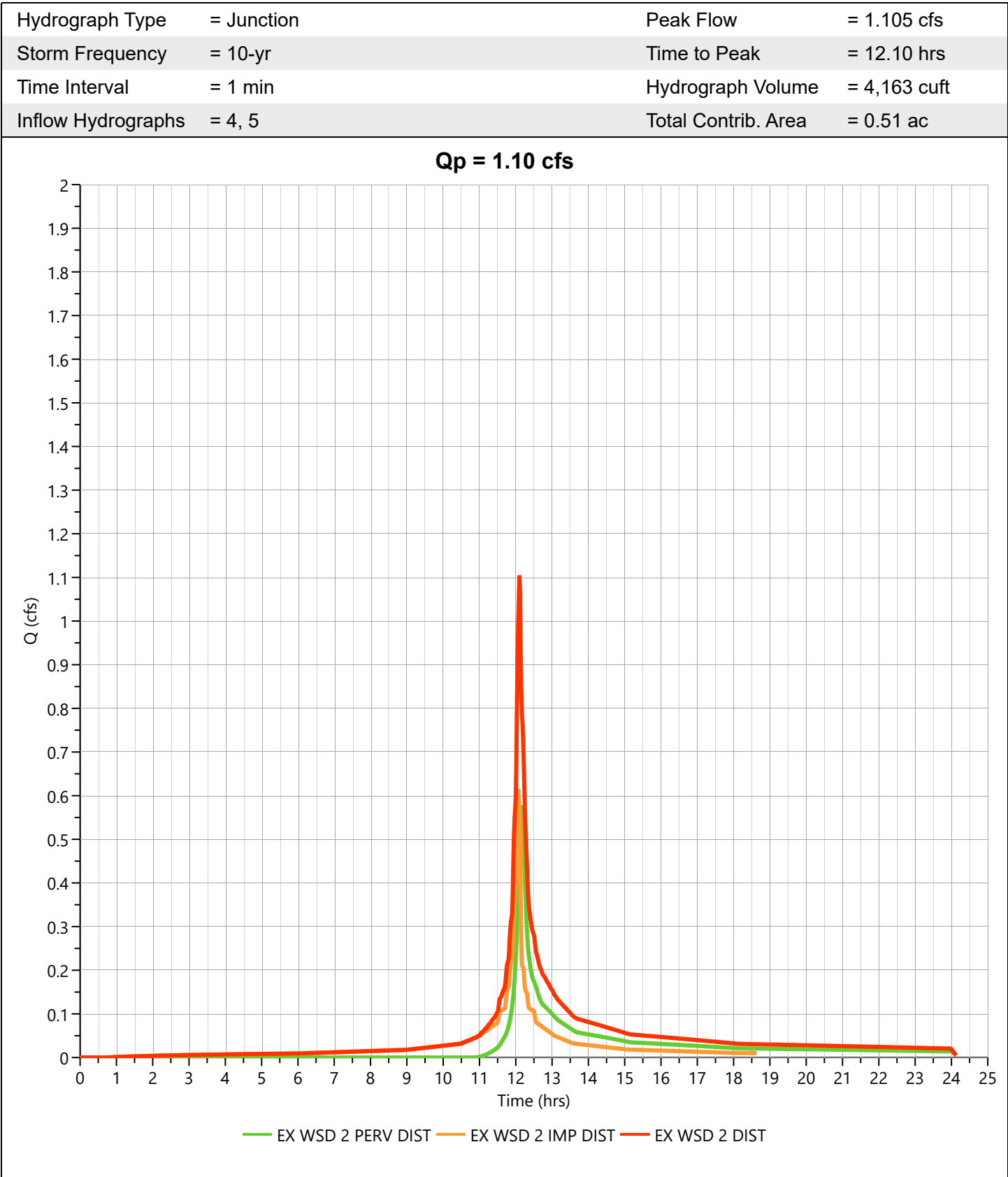
Project Name:

Hydrology Studio v 3.0.0.29

01-15-2024

EX WSD 2 DIST

Hyd. No. 6



Hydrograph Report

Project Name:

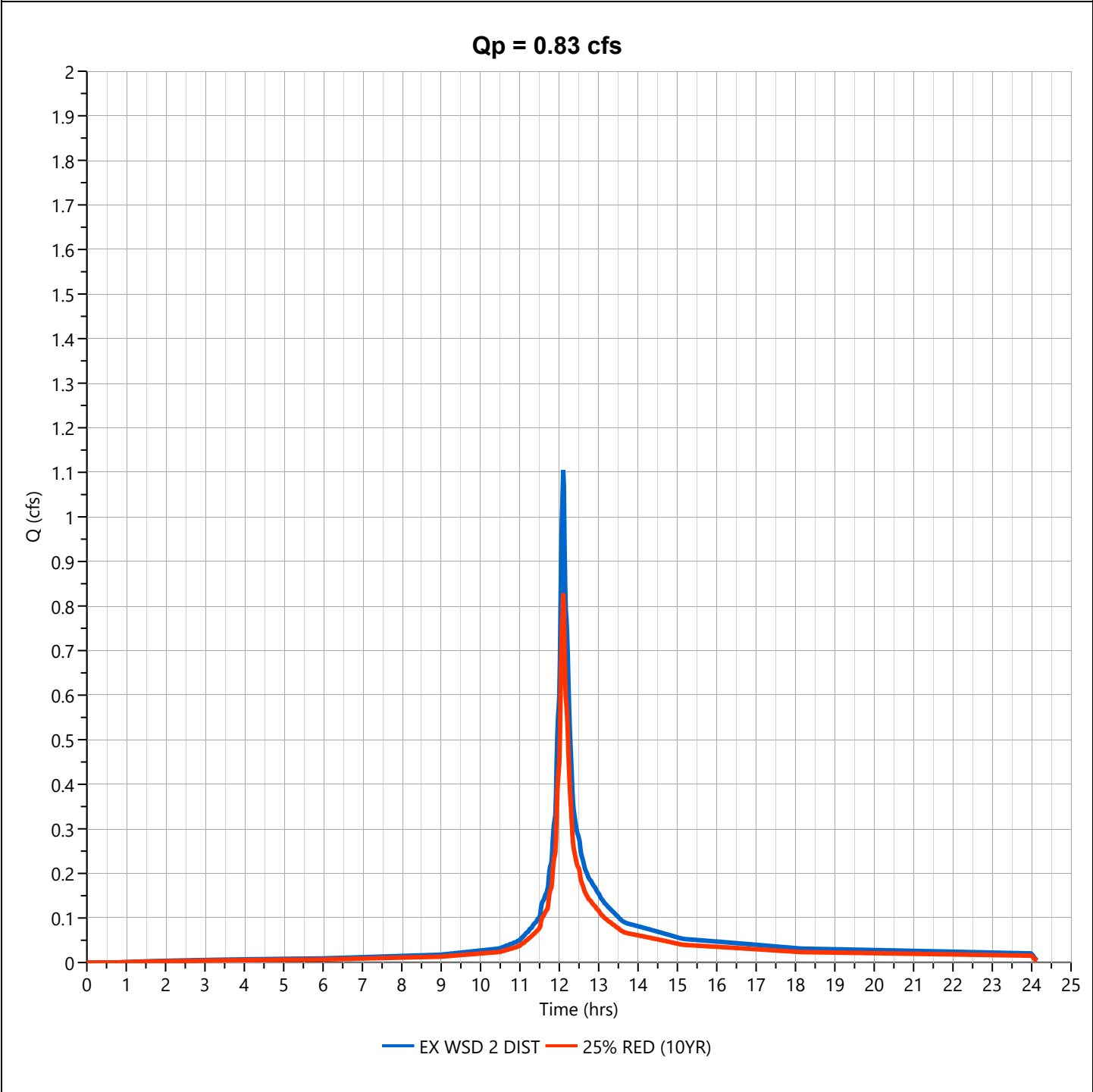
Hydrology Studio v 3.0.0.29

01-15-2024

25% RED (10YR)

Hyd. No. 7

Hydrograph Type	= Diversion	Peak Flow	= 0.829 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.10 hrs
Time Interval	= 1 min	Hydrograph Volume	= 3,122 cuft
Inflow Hydrograph	= 6 - EX WSD 2 DIST	Diversion Method	= Flow Ratio
Companion Hyd	= 8 - N/A	Flow Ratio	= 0.75



Hydrograph Report

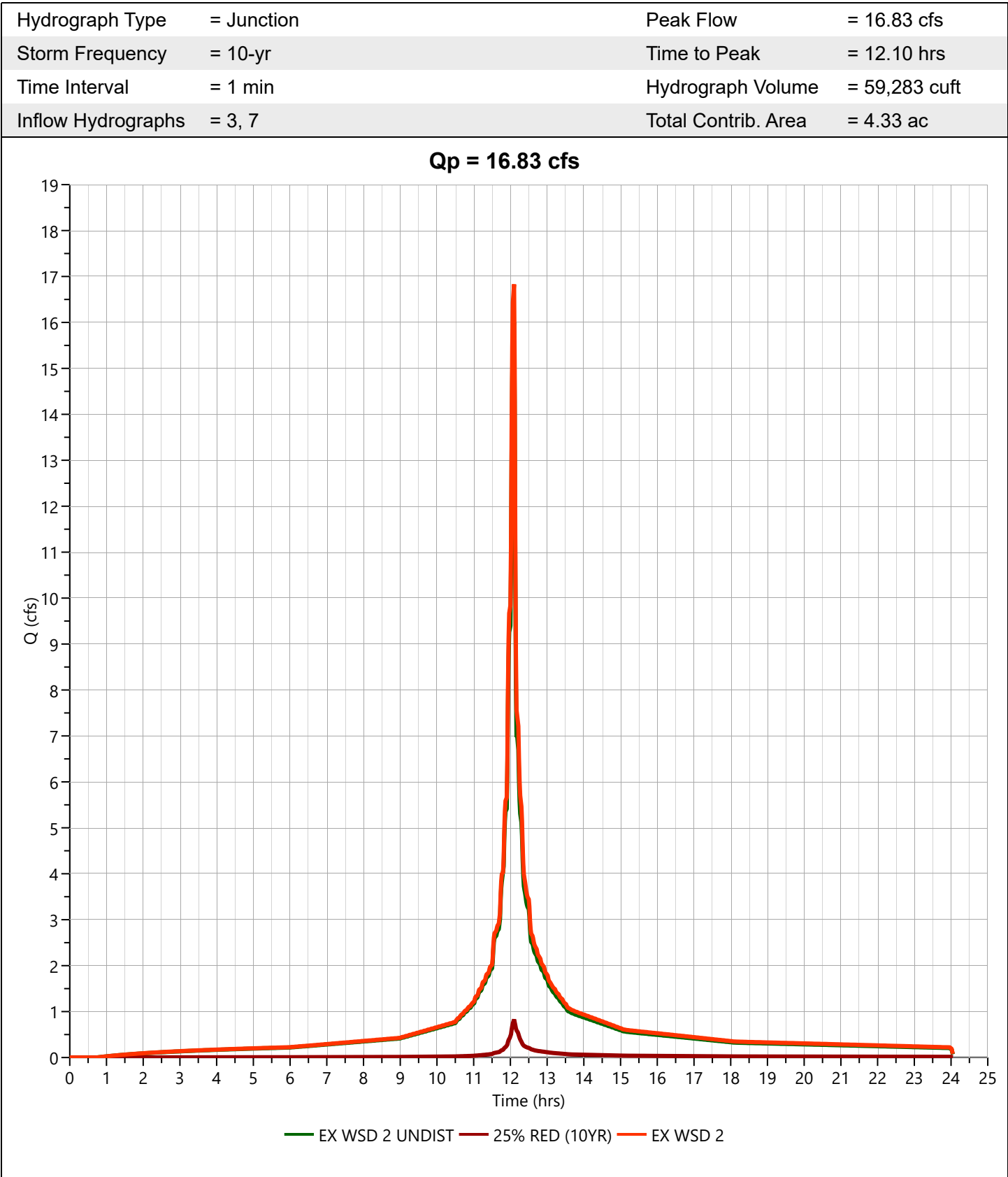
Project Name:

Hydrology Studio v 3.0.0.29

01-15-2024

EX WSD 2

Hyd. No. 9



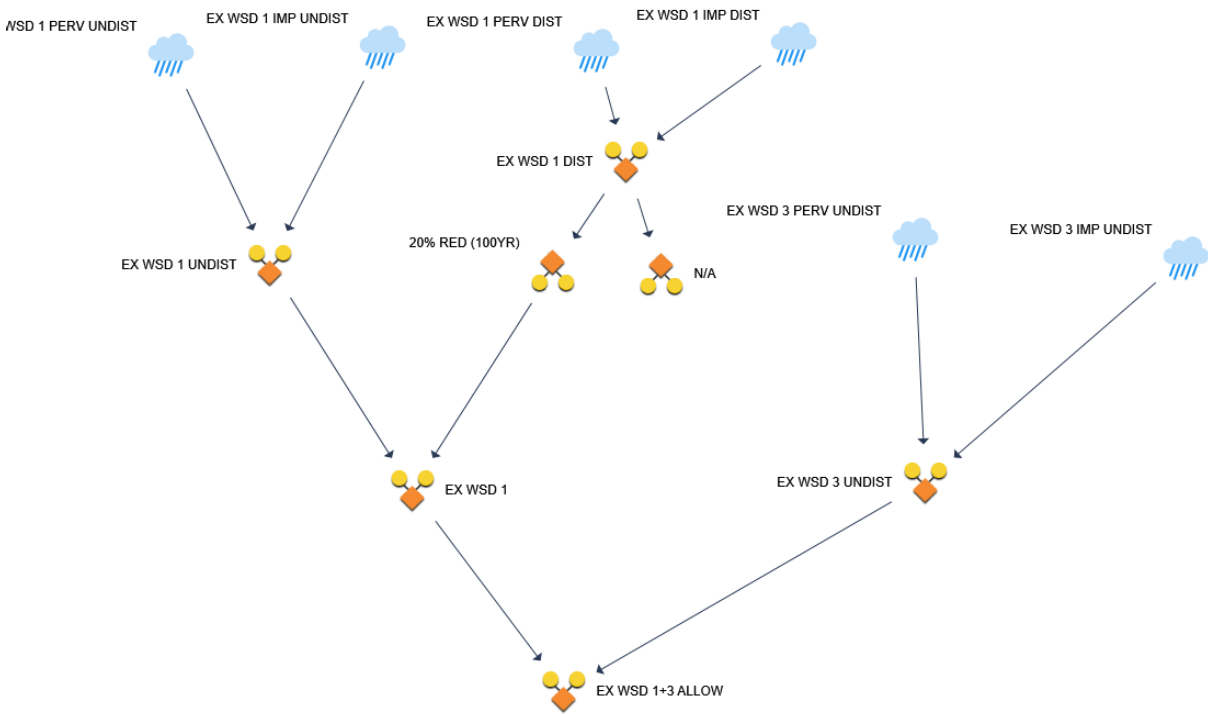
**EXISTING (ALLOWABLE) RUNOFF HYDROGRAPHS
100-YEAR**

Basin Model

Hydrology Studio v 3.0.0.29

Project Name:

01-15-2024



Hydrology Studio v 3.0.0.29

01-15-2024

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 WSD 1 PERV UNDIST	0.601	12.13	1,960	----		
2	NRCS Runoff	EX WSD 1 IMP UNDIST	3.838	12.10	12,894	----		
3	Junction	EX WSD 1 UNDIST	4.403	12.10	14,854	1, 2		
4	NRCS Runoff	EX WSD 1 PERV DIST	0.866	12.15	3,015	----		
5	NRCS Runoff	EX WSD 1 IMP DIST	3.042	12.13	12,531	----		
6	Junction	EX WSD 1 DIST	3.899	12.15	15,546	4, 5		
7	Diversion1	20% RED (100YR)	3.119	12.15	12,437	6		
8	Diversion2	N/A	0.780	12.15	3,109	6		
9	Junction	EX WSD 1	7.269	12.10	27,291	3, 7		
11	NRCS Runoff	EX WSD 3 PERV UNDIST	2.787	12.18	10,741	----		
12	NRCS Runoff	EX WSD 3 IMP UNDIST	5.374	12.10	18,052	----		
13	Junction	EX WSD 3 UNDIST	7.576	12.10	28,793	11, 12		
15	Junction	EX WSD 1+3 ALLOW	14.85	12.10	56,084	9, 13		

Hydrograph Report

Project Name:

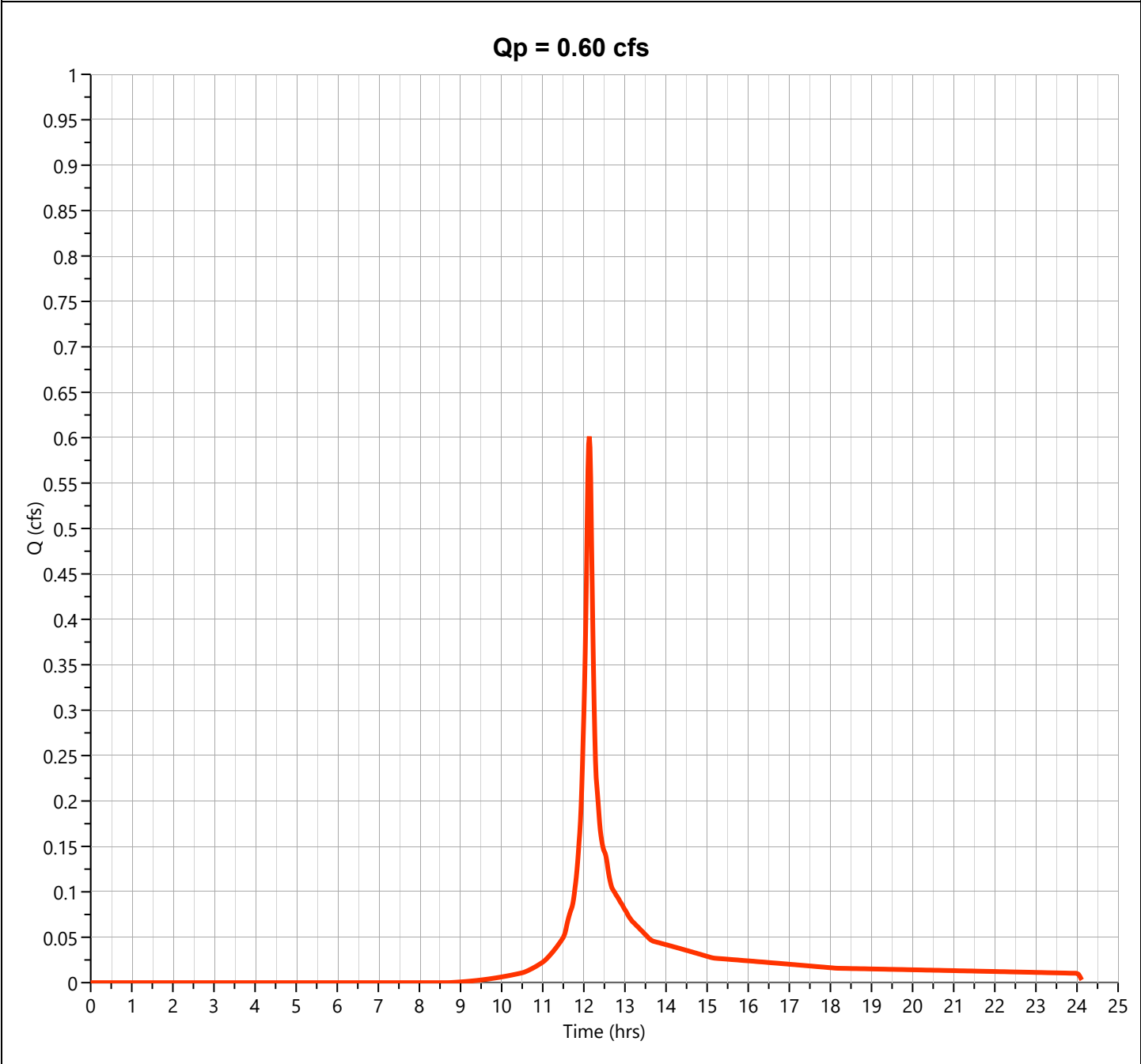
Hydrology Studio v 3.0.0.29

01-15-2024

EX WSD 1 PERV UNDIST

Hyd. No. 1

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.601 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.13 hrs
Time Interval	= 1 min	Runoff Volume	= 1,960 cuft
Drainage Area	= 0.14 ac	Curve Number	= 61
Tc Method	= User	Time of Conc. (Tc)	= 8.0 min
Total Rainfall	= 8.66 in	Design Storm	= NOAA-D
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

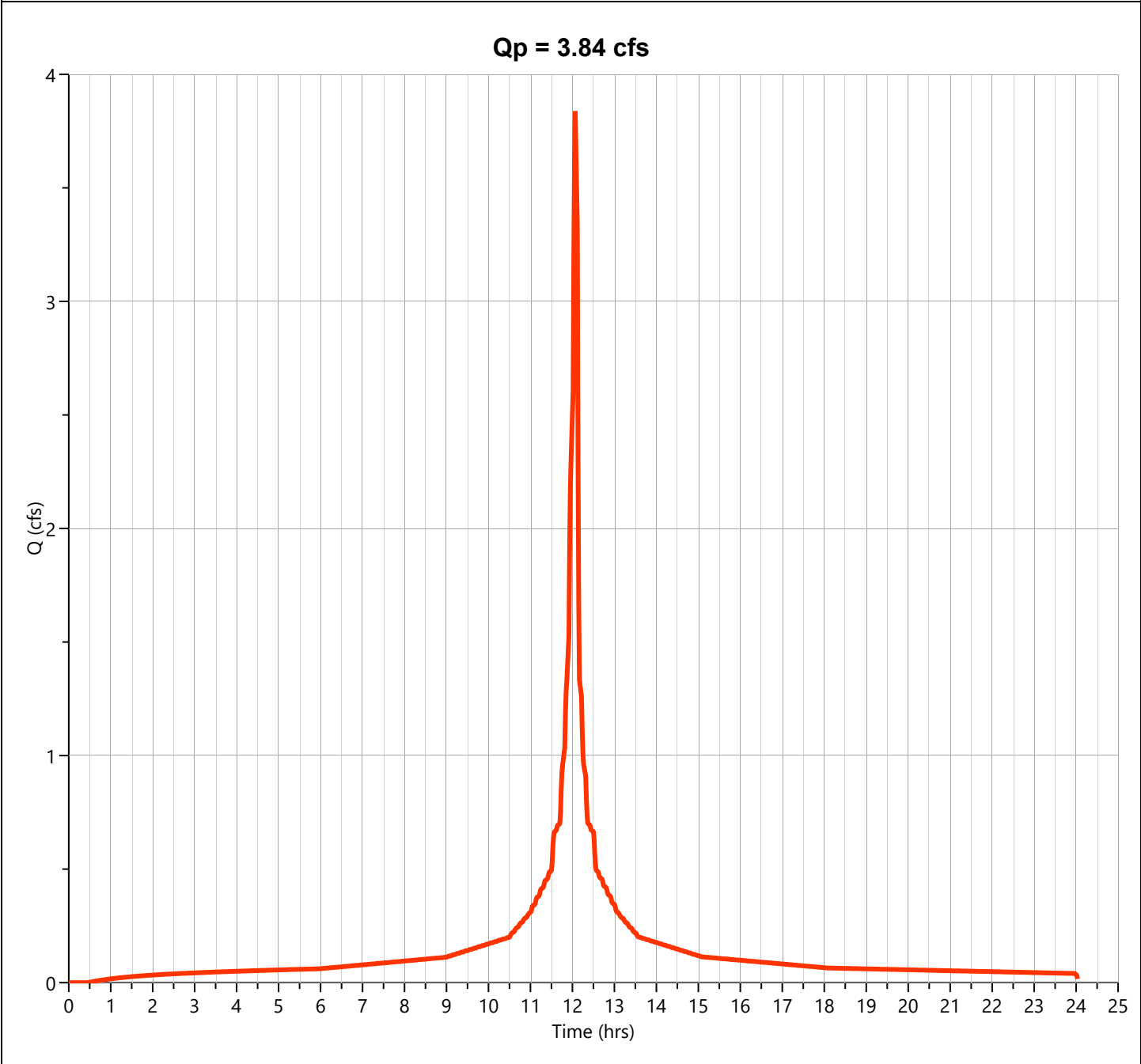
Hydrology Studio v 3.0.0.29

01-15-2024

EX WSD 1 IMP UNDIST

Hyd. No. 2

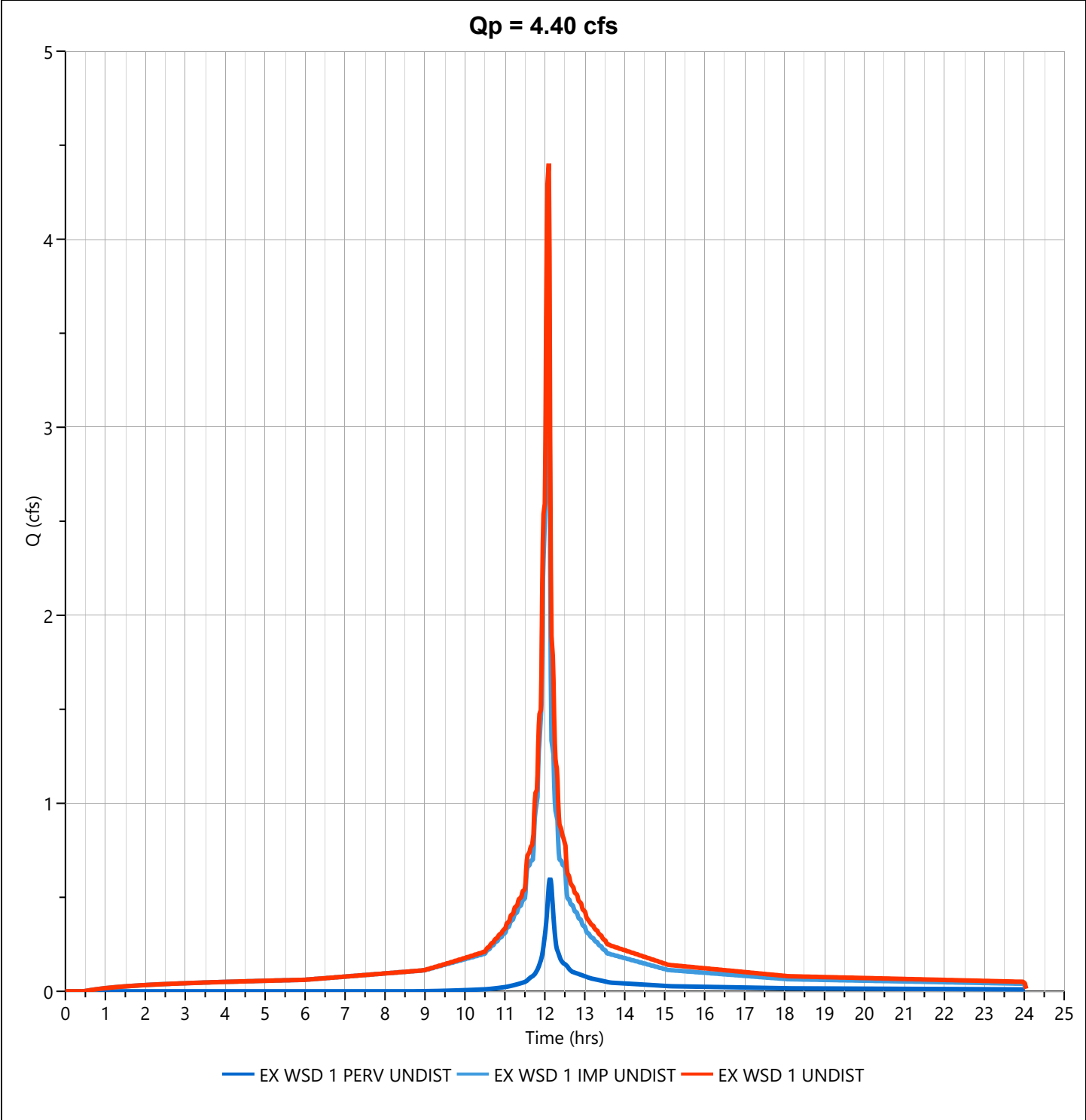
Hydrograph Type	= NRCS Runoff	Peak Flow	= 3.838 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.10 hrs
Time Interval	= 1 min	Runoff Volume	= 12,894 cuft
Drainage Area	= 0.45 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 2.0 min
Total Rainfall	= 8.66 in	Design Storm	= NOAA-D
Storm Duration	= 24 hrs	Shape Factor	= 484



EX WSD 1 UNDIST

Hyd. No. 3

Hydrograph Type	= Junction	Peak Flow	= 4.403 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.10 hrs
Time Interval	= 1 min	Hydrograph Volume	= 14,854 cuft
Inflow Hydrographs	= 1, 2	Total Contrib. Area	= 0.59 ac



Hydrograph Report

Project Name:

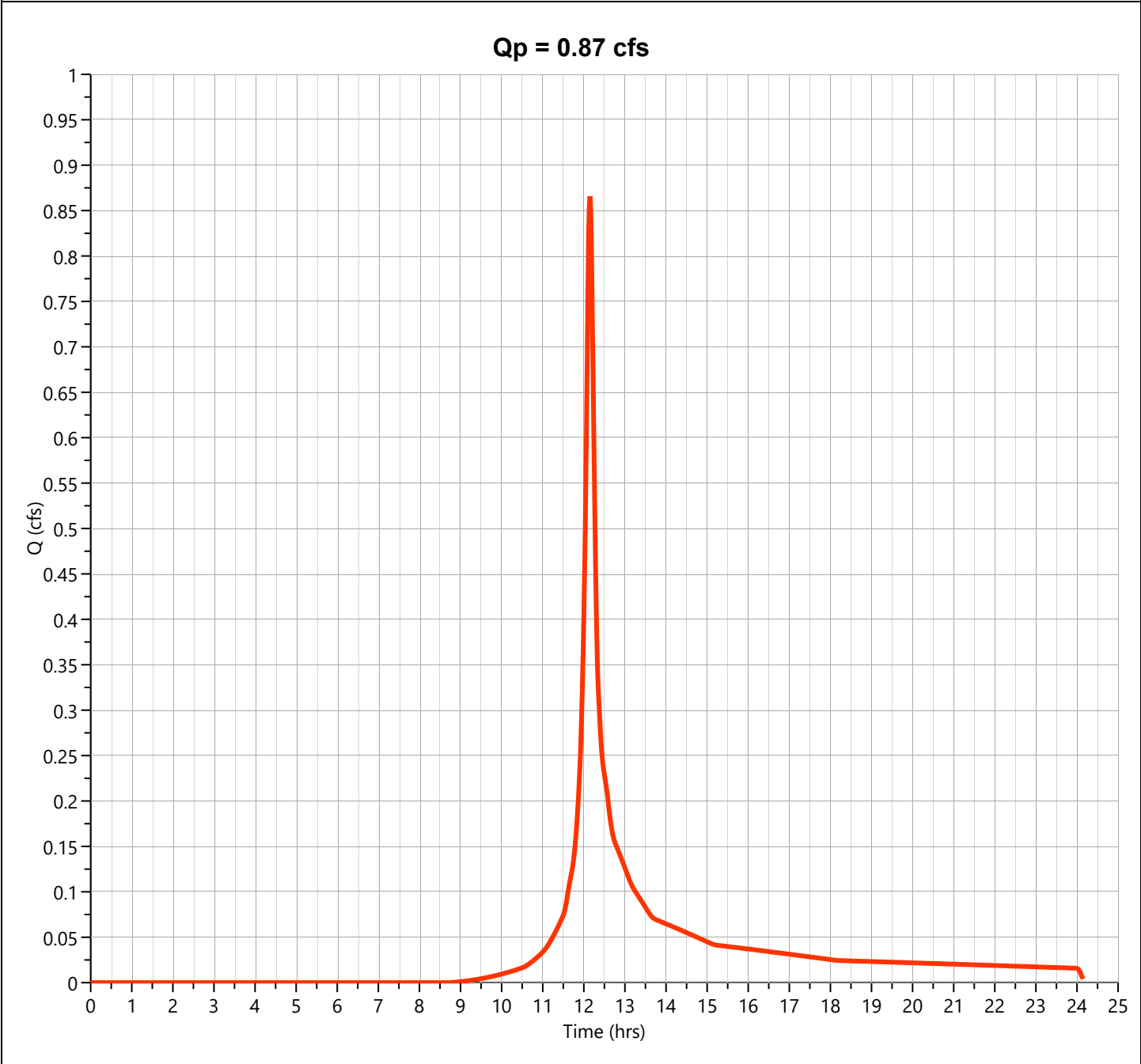
Hydrology Studio v 3.0.0.29

01-15-2024

EX WSD 1 PERV DIST

Hyd. No. 4

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.866 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.15 hrs
Time Interval	= 1 min	Runoff Volume	= 3,015 cuft
Drainage Area	= 0.21 ac	Curve Number	= 61
Tc Method	= User	Time of Conc. (Tc)	= 9.0 min
Total Rainfall	= 8.66 in	Design Storm	= NOAA-D
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

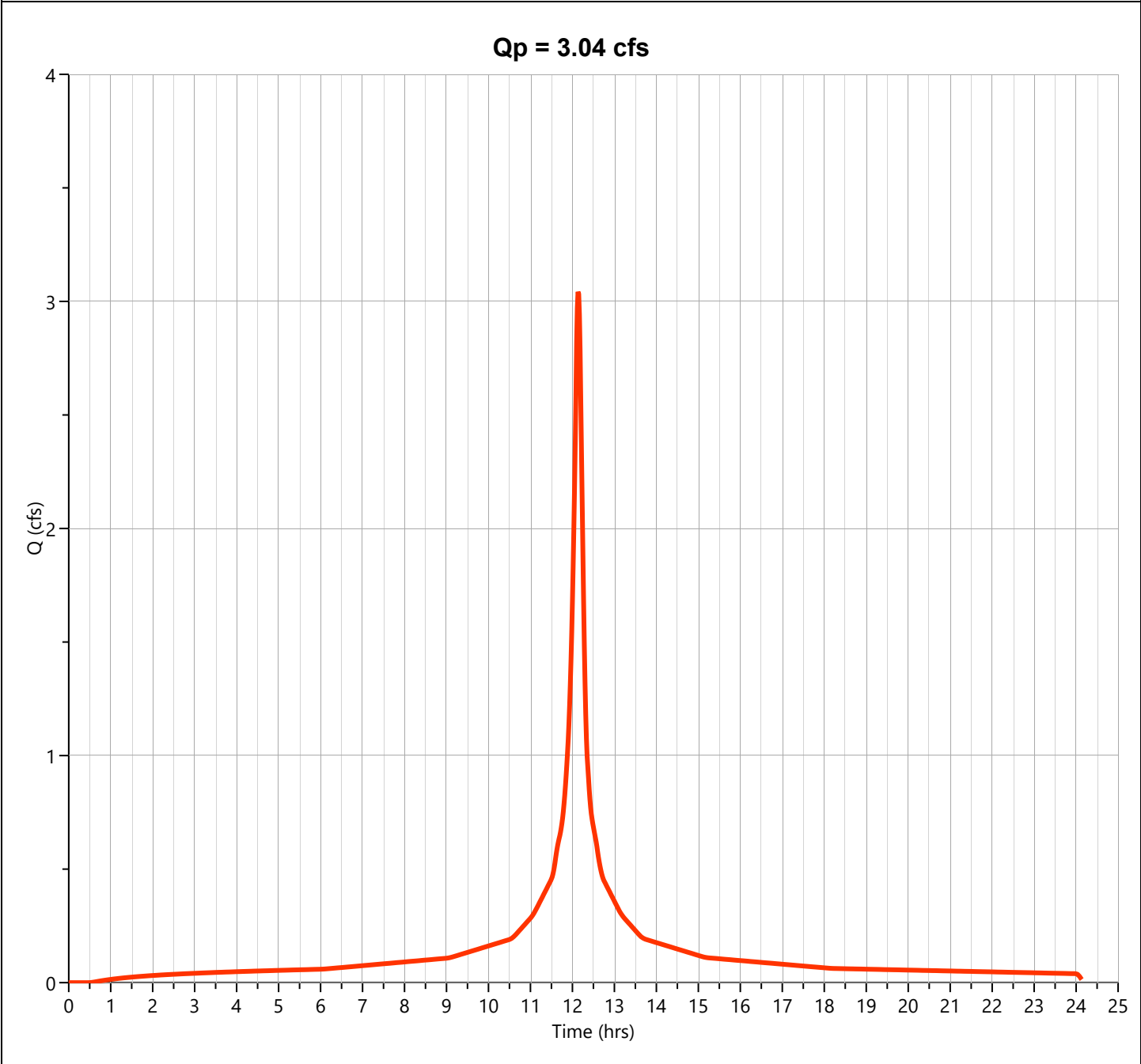
Hydrology Studio v 3.0.0.29

01-15-2024

EX WSD 1 IMP DIST

Hyd. No. 5

Hydrograph Type	= NRCS Runoff	Peak Flow	= 3.042 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.13 hrs
Time Interval	= 1 min	Runoff Volume	= 12,531 cuft
Drainage Area	= 0.41 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 9.0 min
Total Rainfall	= 8.66 in	Design Storm	= NOAA-D
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

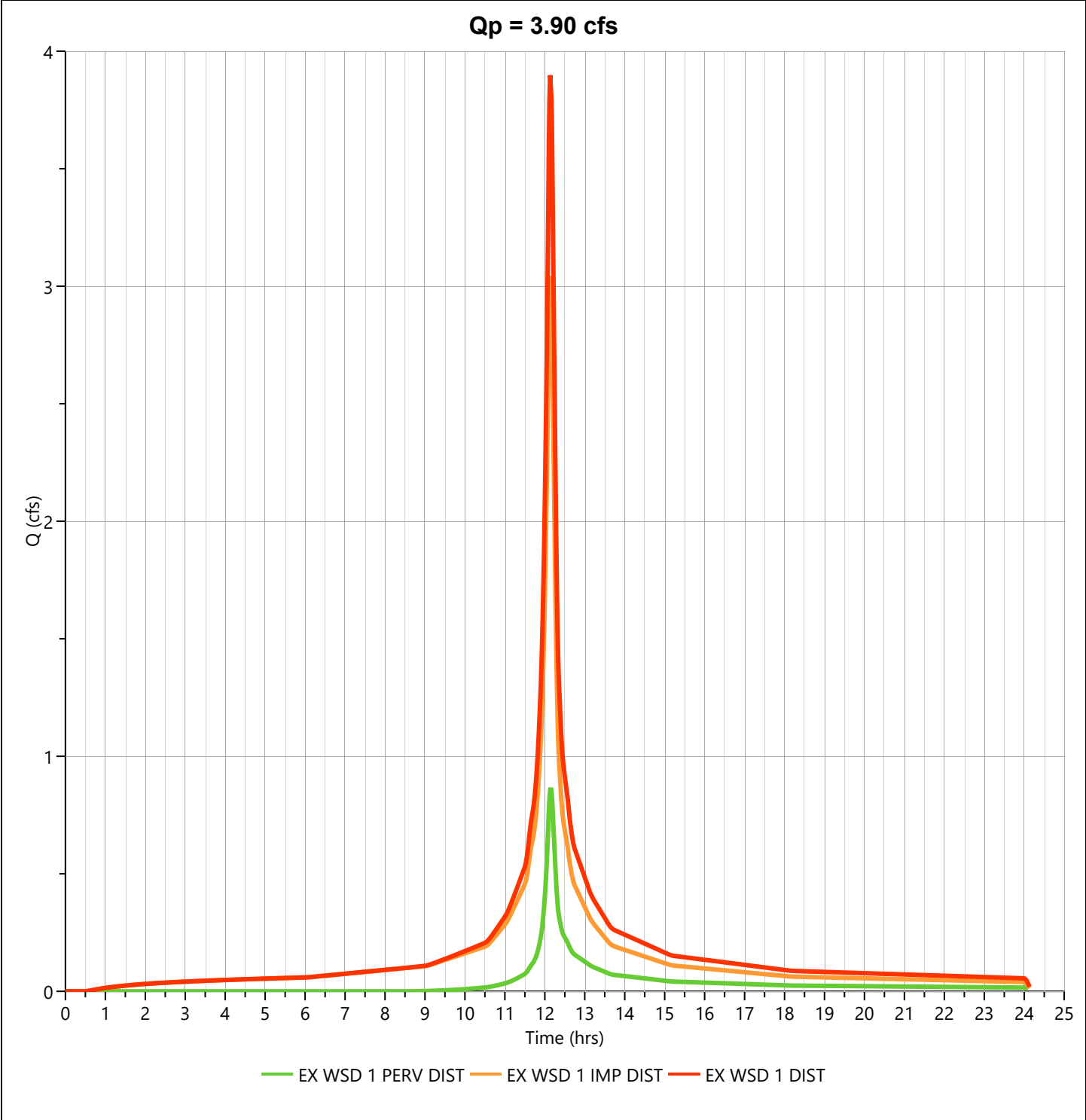
Hydrology Studio v 3.0.0.29

01-15-2024

EX WSD 1 DIST

Hyd. No. 6

Hydrograph Type	= Junction	Peak Flow	= 3.899 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.15 hrs
Time Interval	= 1 min	Hydrograph Volume	= 15,546 cuft
Inflow Hydrographs	= 4, 5	Total Contrib. Area	= 0.62 ac



Hydrograph Report

Project Name:

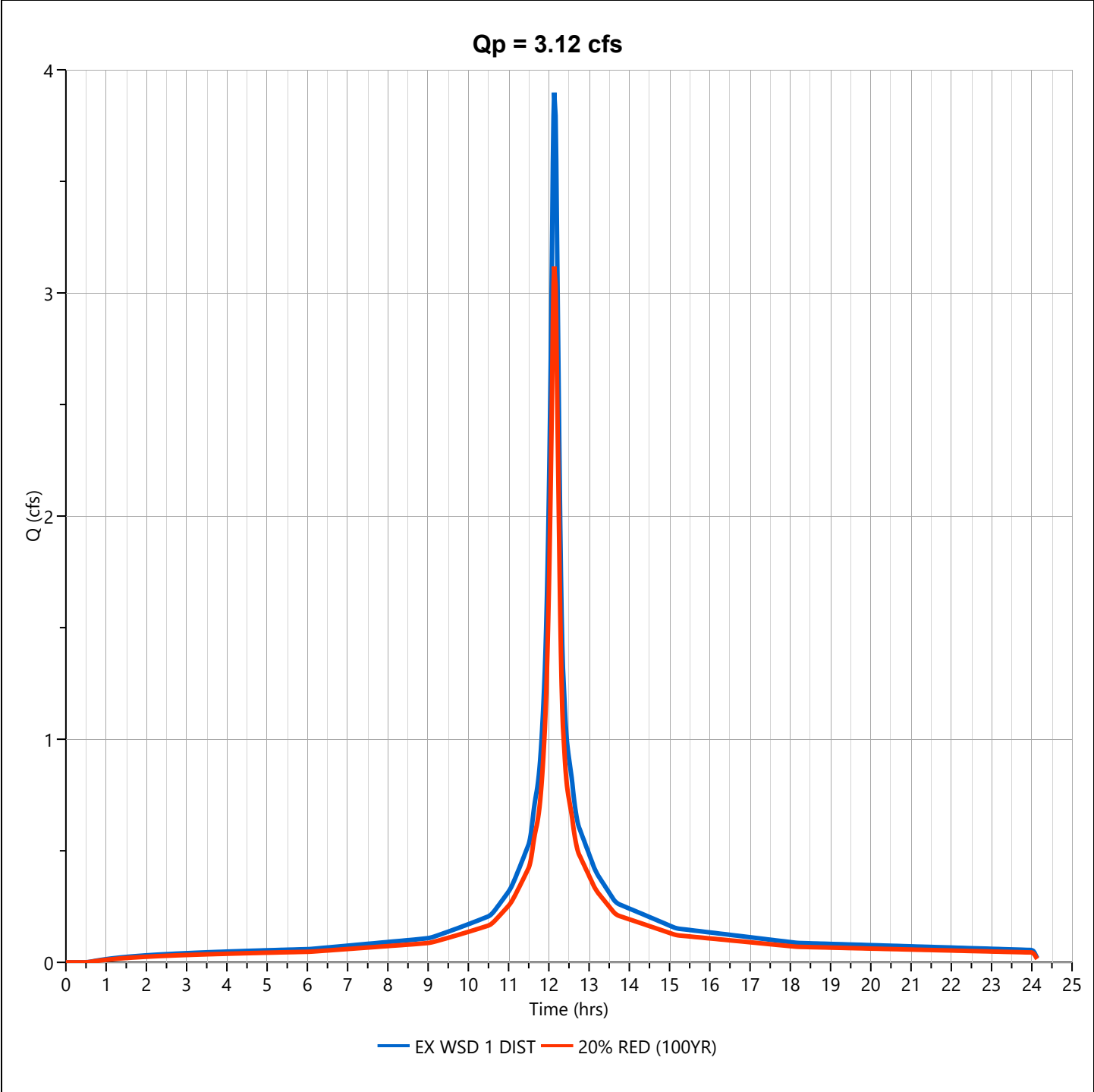
Hydrology Studio v 3.0.0.29

01-15-2024

20% RED (100YR)

Hyd. No. 7

Hydrograph Type	= Diversion	Peak Flow	= 3.119 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.15 hrs
Time Interval	= 1 min	Hydrograph Volume	= 12,437 cuft
Inflow Hydrograph	= 6 - EX WSD 1 DIST	Diversion Method	= Flow Ratio
Companion Hyd	= 8 - N/A	Flow Ratio	= 0.8



Hydrograph Report

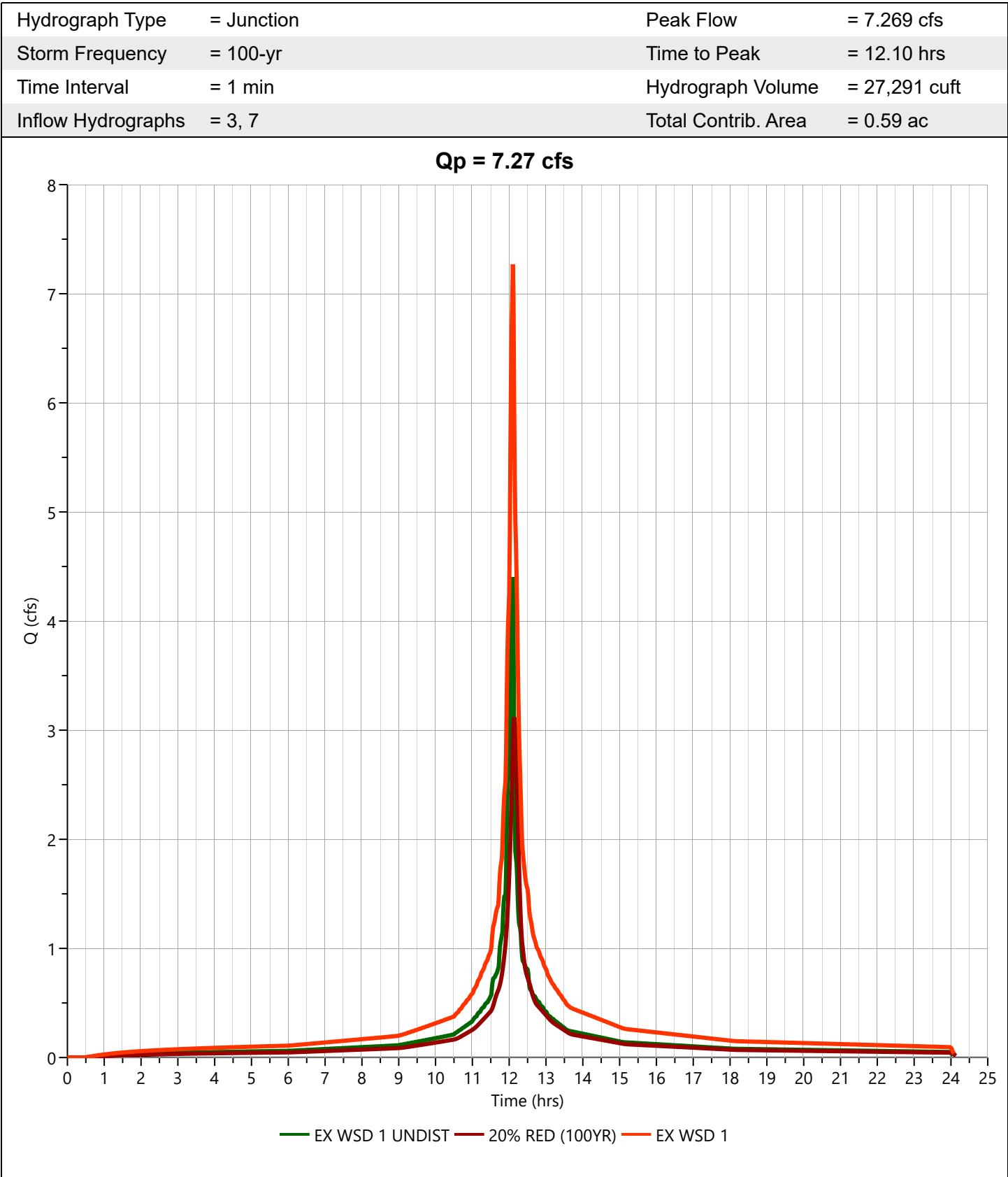
Project Name:

Hydrology Studio v 3.0.0.29

01-15-2024

EX WSD 1

Hyd. No. 9



Hydrograph Report

Project Name:

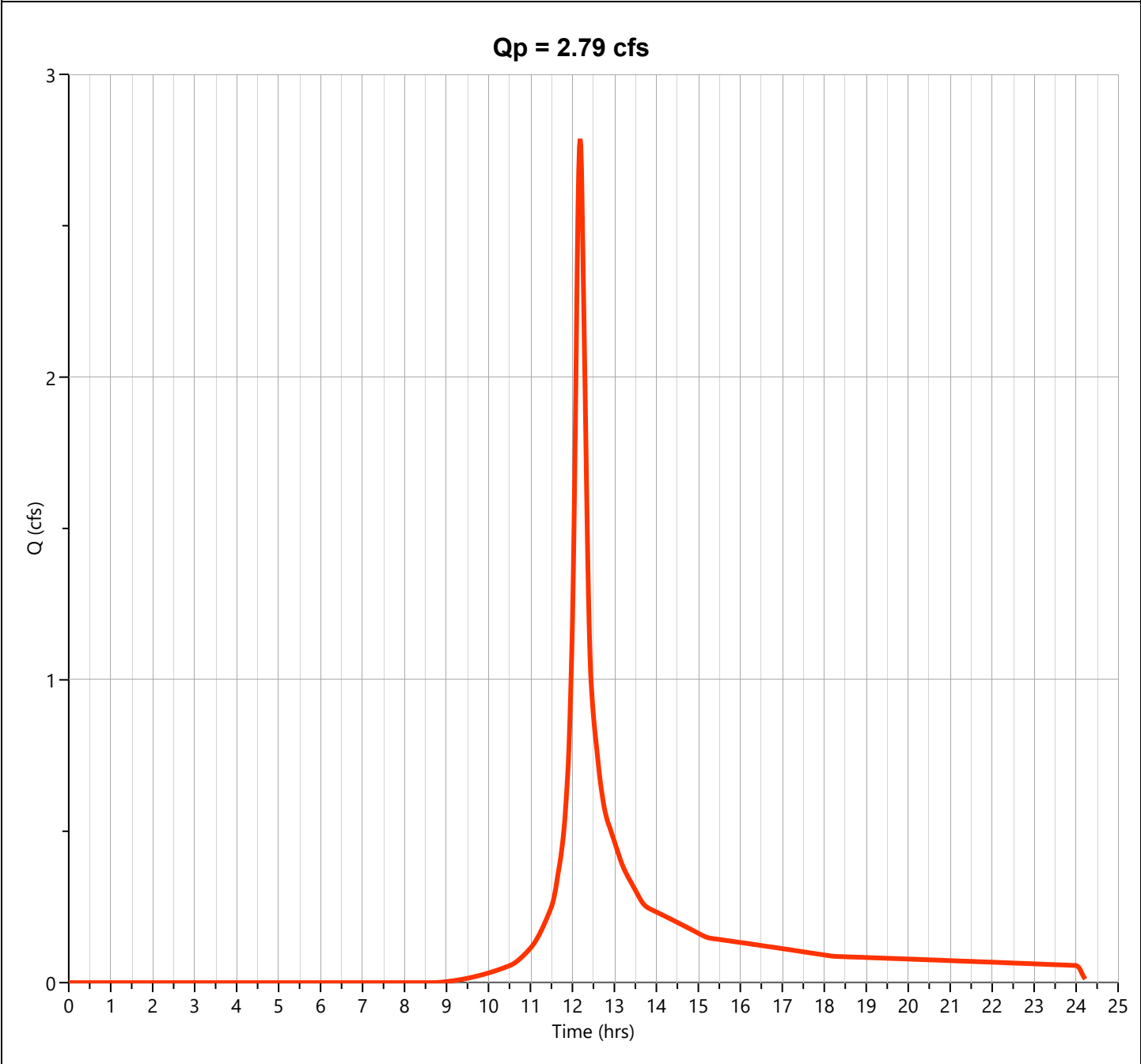
Hydrology Studio v 3.0.0.29

01-15-2024

EX WSD 3 PERV UNDIST

Hyd. No. 11

Hydrograph Type	= NRCS Runoff	Peak Flow	= 2.787 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.18 hrs
Time Interval	= 1 min	Runoff Volume	= 10,741 cuft
Drainage Area	= 0.76 ac	Curve Number	= 61
Tc Method	= User	Time of Conc. (Tc)	= 12.0 min
Total Rainfall	= 8.66 in	Design Storm	= NOAA-D
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

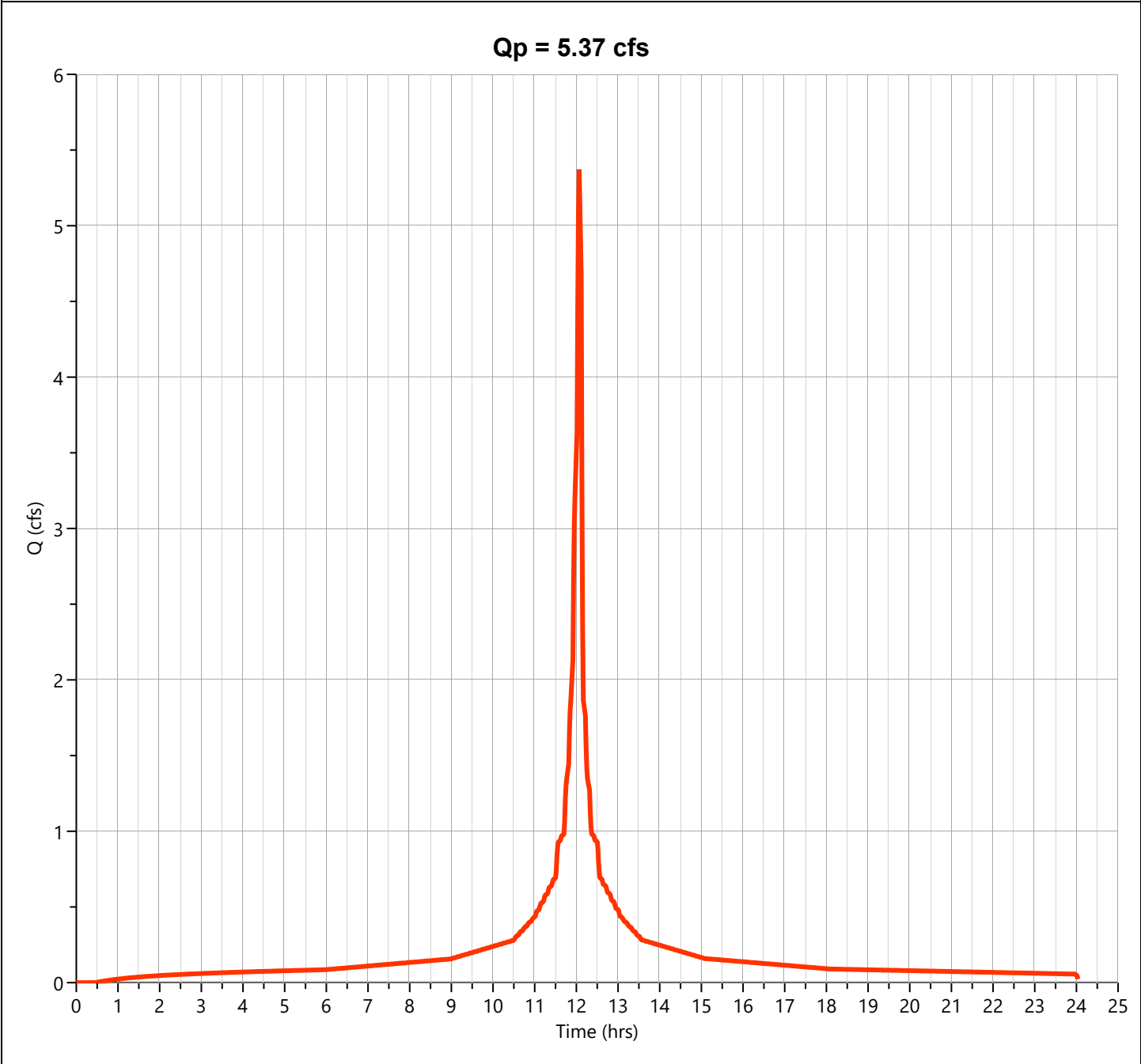
Hydrology Studio v 3.0.0.29

01-15-2024

EX WSD 3 IMP UNDIST

Hyd. No. 12

Hydrograph Type	= NRCS Runoff	Peak Flow	= 5.374 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.10 hrs
Time Interval	= 1 min	Runoff Volume	= 18,052 cuft
Drainage Area	= 0.63 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 3.0 min
Total Rainfall	= 8.66 in	Design Storm	= NOAA-D
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

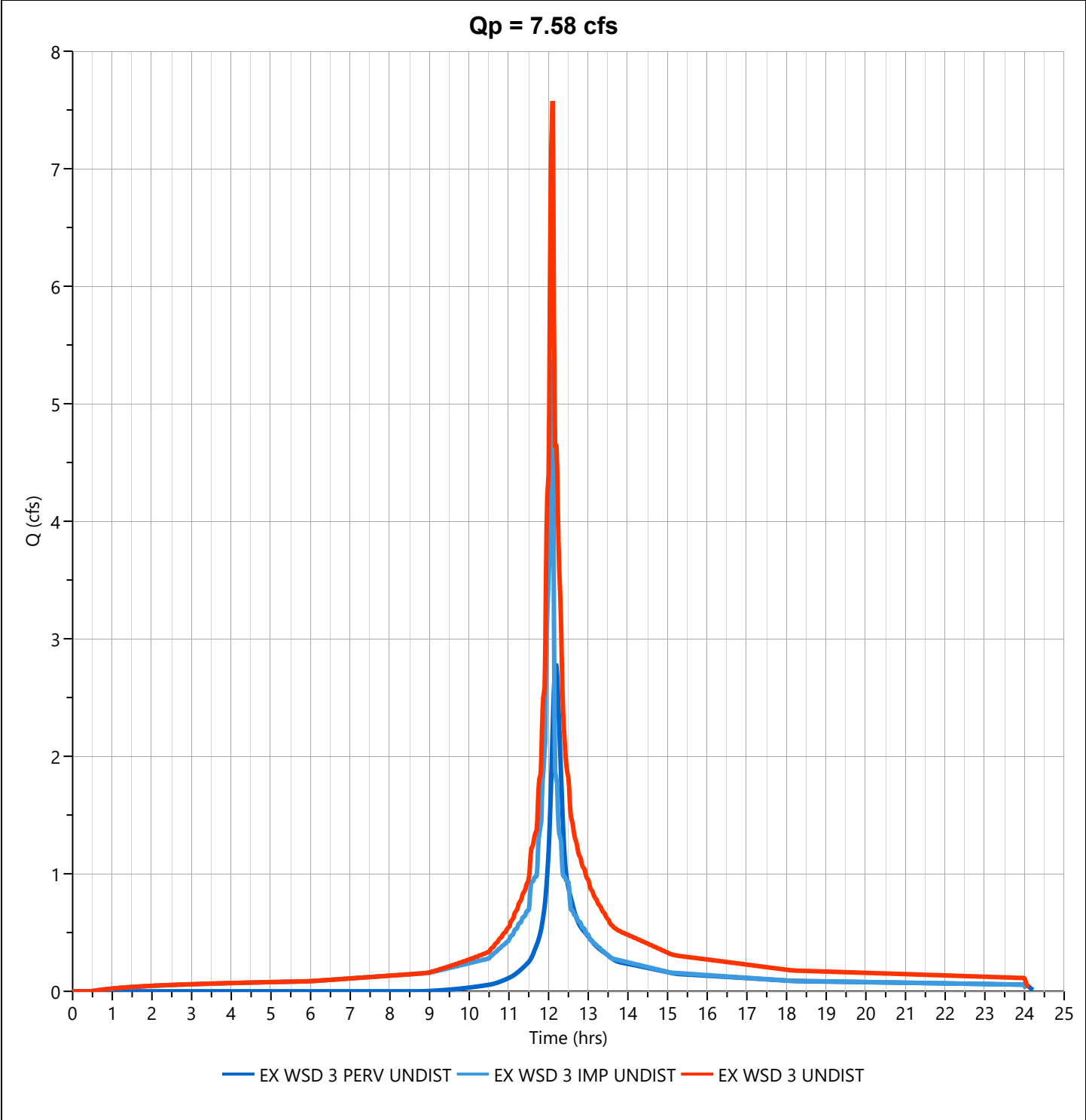
Hydrology Studio v 3.0.0.29

01-15-2024

EX WSD 3 UNDIST

Hyd. No. 13

Hydrograph Type	= Junction	Peak Flow	= 7.576 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.10 hrs
Time Interval	= 1 min	Hydrograph Volume	= 28,793 cuft
Inflow Hydrographs	= 11, 12	Total Contrib. Area	= 1.39 ac



Hydrograph Report

Project Name:

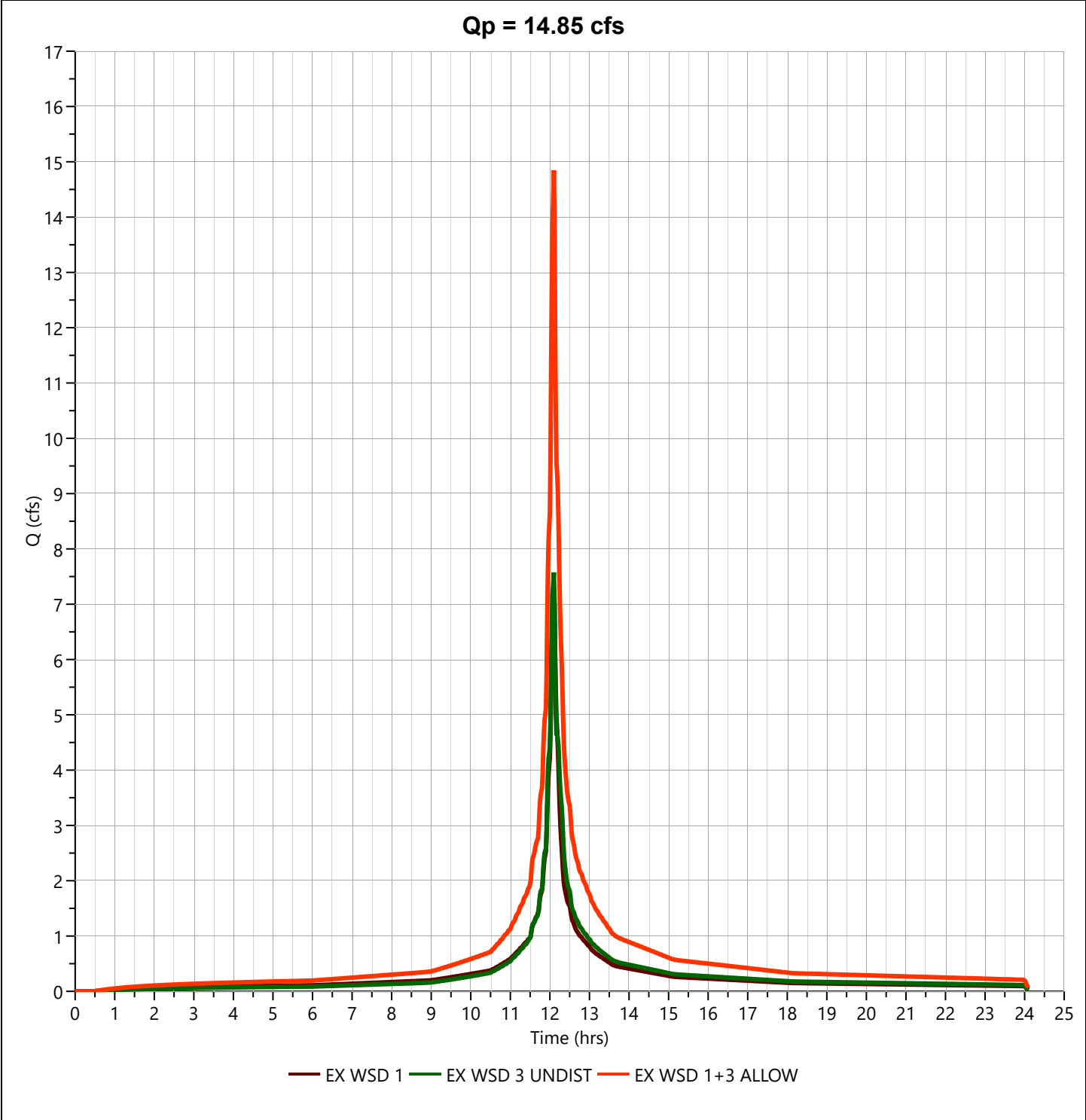
Hydrology Studio v 3.0.0.29

01-15-2024

EX WSD 1+3 ALLOW

Hyd. No. 15

Hydrograph Type	= Junction	Peak Flow	= 14.85 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.10 hrs
Time Interval	= 1 min	Hydrograph Volume	= 56,084 cuft
Inflow Hydrographs	= 9, 13	Total Contrib. Area	= 1.98 ac

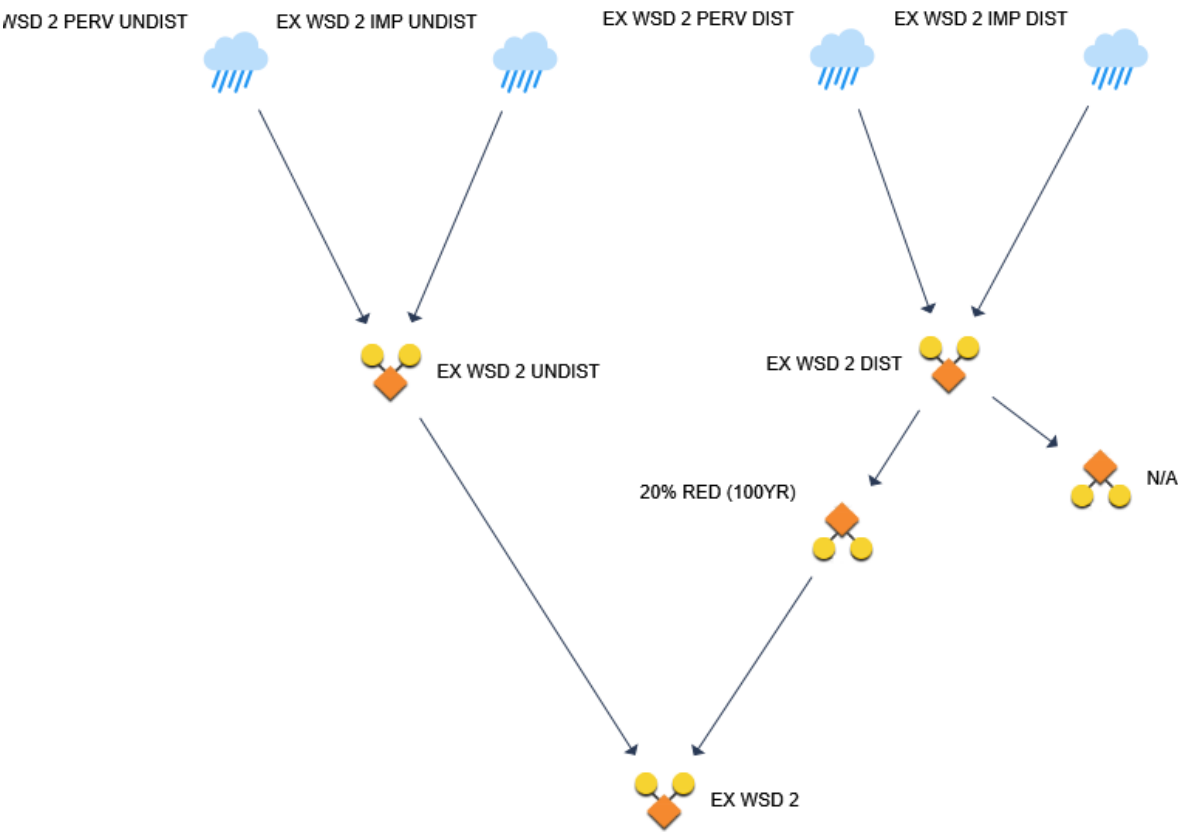


Basin Model

Hydrology Studio v 3.0.0.29

Project Name:

01-15-2024



Hydrograph 100-yr Summary

Project Name:

Hydrology Studio v 3.0.0.29

01-15-2024

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 WSD 2 PERV UNDIST	5.463	12.18	21,059	----		
2	NRCS Runoff	EX WSD 2 IMP UNDIST	24.22	12.10	81,377	----		
3	Junction	EX WSD 2 UNDIST	28.54	12.10	102,435	1, 2		
4	NRCS Runoff	EX WSD 2 PERV DIST	1.608	12.15	5,600	----		
5	NRCS Runoff	EX WSD 2 IMP DIST	1.024	12.10	3,438	----		
6	Junction	EX WSD 2 DIST	2.446	12.10	9,038	4, 5		
7	Diversion1	20% RED (100YR)	1.957	12.10	7,230	6		
8	Diversion2	N/A	0.489	12.10	1,808	6		
9	Junction	EX WSD 2	30.50	12.10	109,666	3, 7		

Hydrograph Report

Project Name:

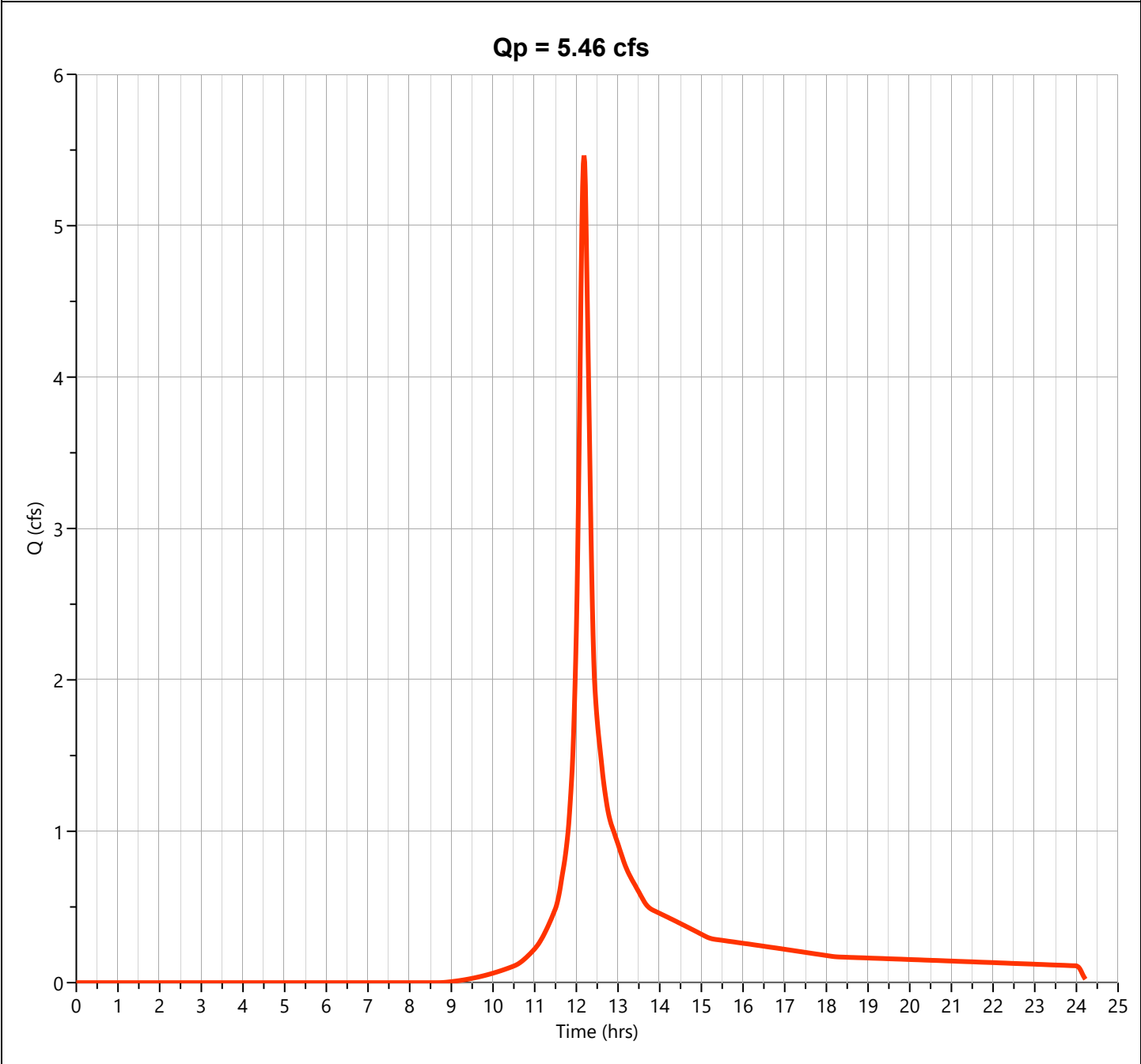
Hydrology Studio v 3.0.0.29

01-15-2024

EX WSD 2 PERV UNDIST

Hyd. No. 1

Hydrograph Type	= NRCS Runoff	Peak Flow	= 5.463 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.18 hrs
Time Interval	= 1 min	Runoff Volume	= 21,059 cuft
Drainage Area	= 1.49 ac	Curve Number	= 61
Tc Method	= User	Time of Conc. (Tc)	= 12.0 min
Total Rainfall	= 8.66 in	Design Storm	= NOAA-D
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

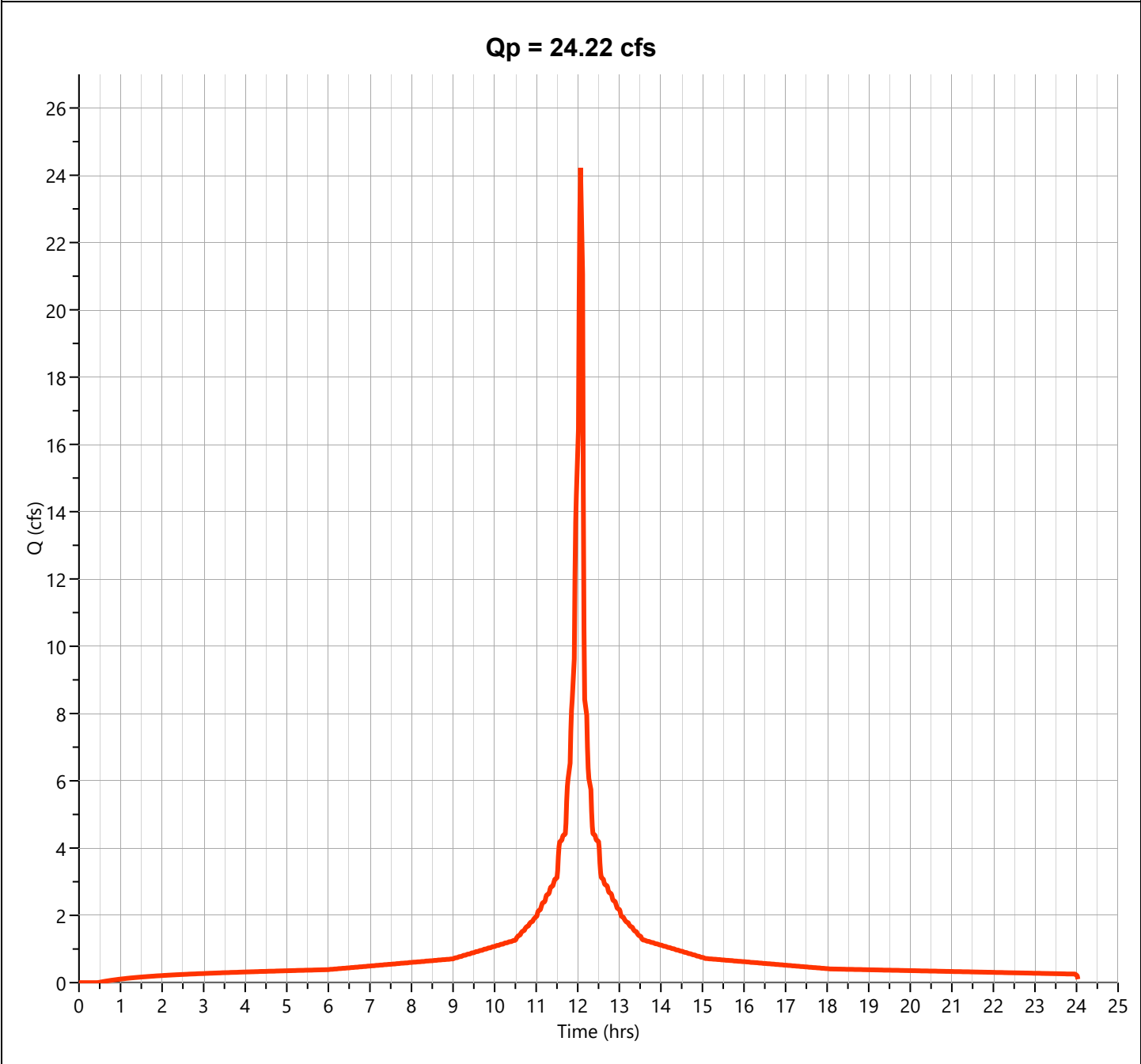
Hydrology Studio v 3.0.0.29

01-15-2024

EX WSD 2 IMP UNDIST

Hyd. No. 2

Hydrograph Type	= NRCS Runoff	Peak Flow	= 24.22 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.10 hrs
Time Interval	= 1 min	Runoff Volume	= 81,377 cuft
Drainage Area	= 2.84 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 3.0 min
Total Rainfall	= 8.66 in	Design Storm	= NOAA-D
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

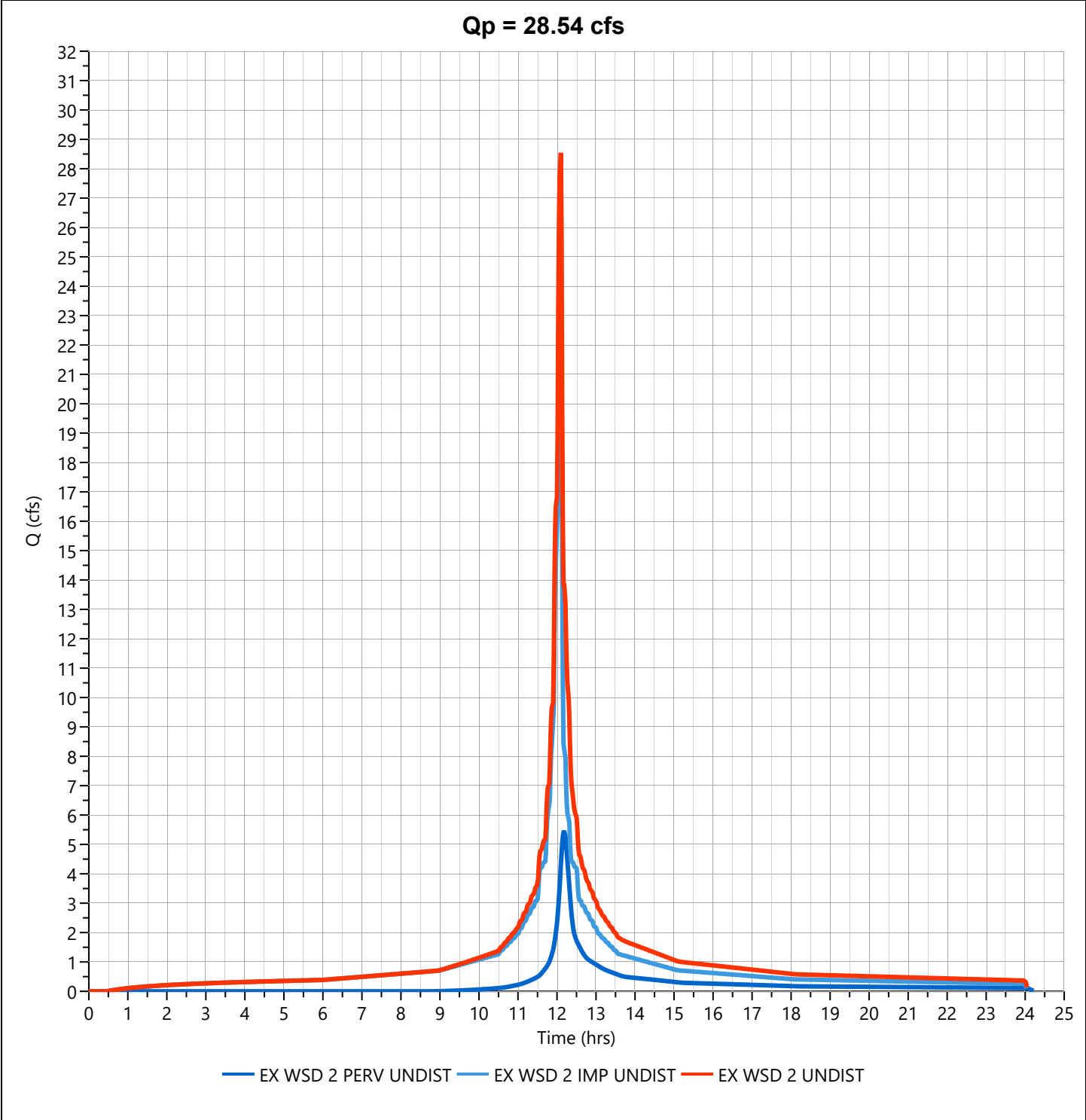
Hydrology Studio v 3.0.0.29

01-15-2024

EX WSD 2 UNDIST

Hyd. No. 3

Hydrograph Type	= Junction	Peak Flow	= 28.54 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.10 hrs
Time Interval	= 1 min	Hydrograph Volume	= 102,435 cuft
Inflow Hydrographs	= 1, 2	Total Contrib. Area	= 4.33 ac



Hydrograph Report

Project Name:

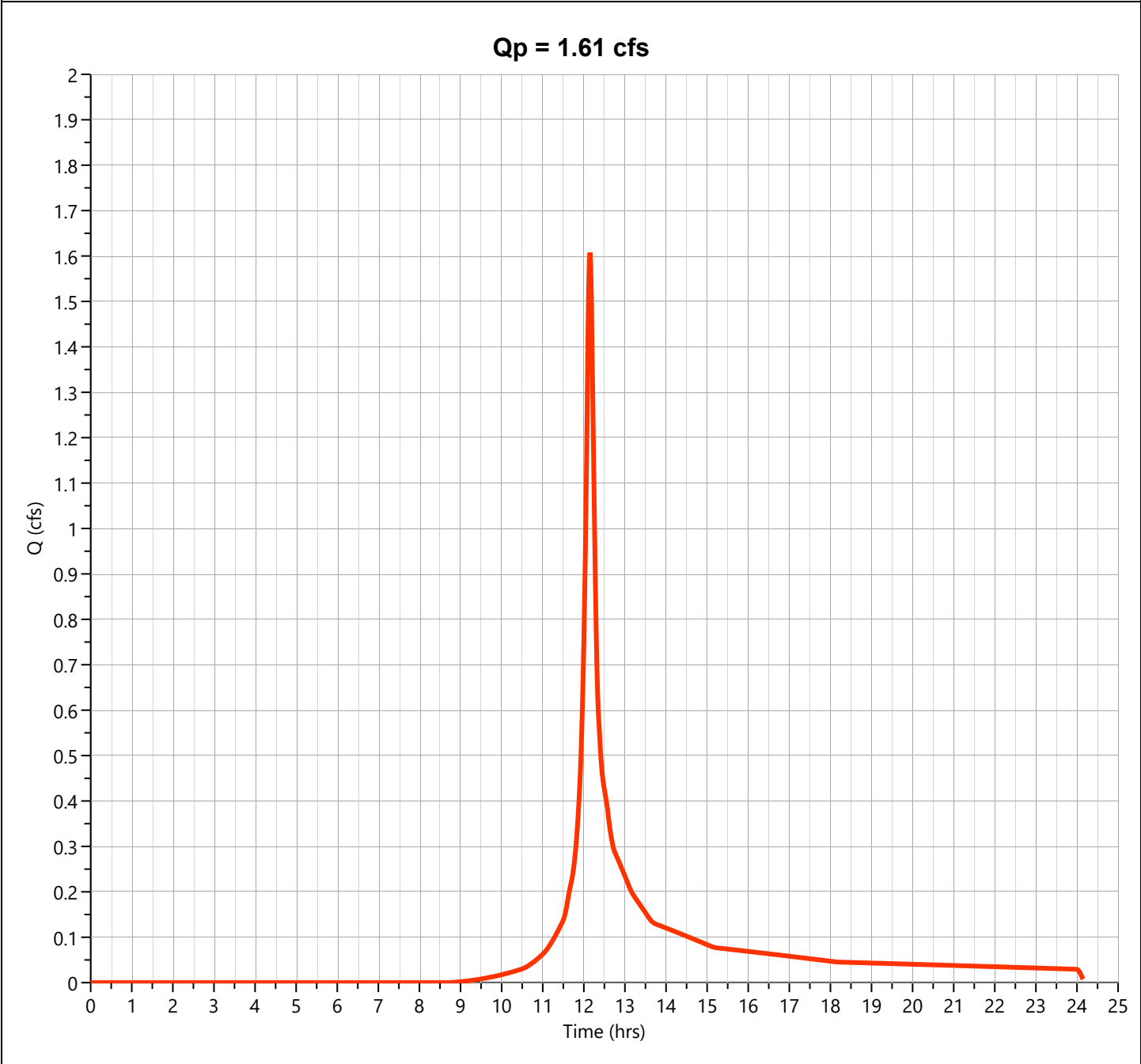
Hydrology Studio v 3.0.0.29

01-15-2024

EX WSD 2 PERV DIST

Hyd. No. 4

Hydrograph Type	= NRCS Runoff	Peak Flow	= 1.608 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.15 hrs
Time Interval	= 1 min	Runoff Volume	= 5,600 cuft
Drainage Area	= 0.39 ac	Curve Number	= 61
Tc Method	= User	Time of Conc. (Tc)	= 9.0 min
Total Rainfall	= 8.66 in	Design Storm	= NOAA-D
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

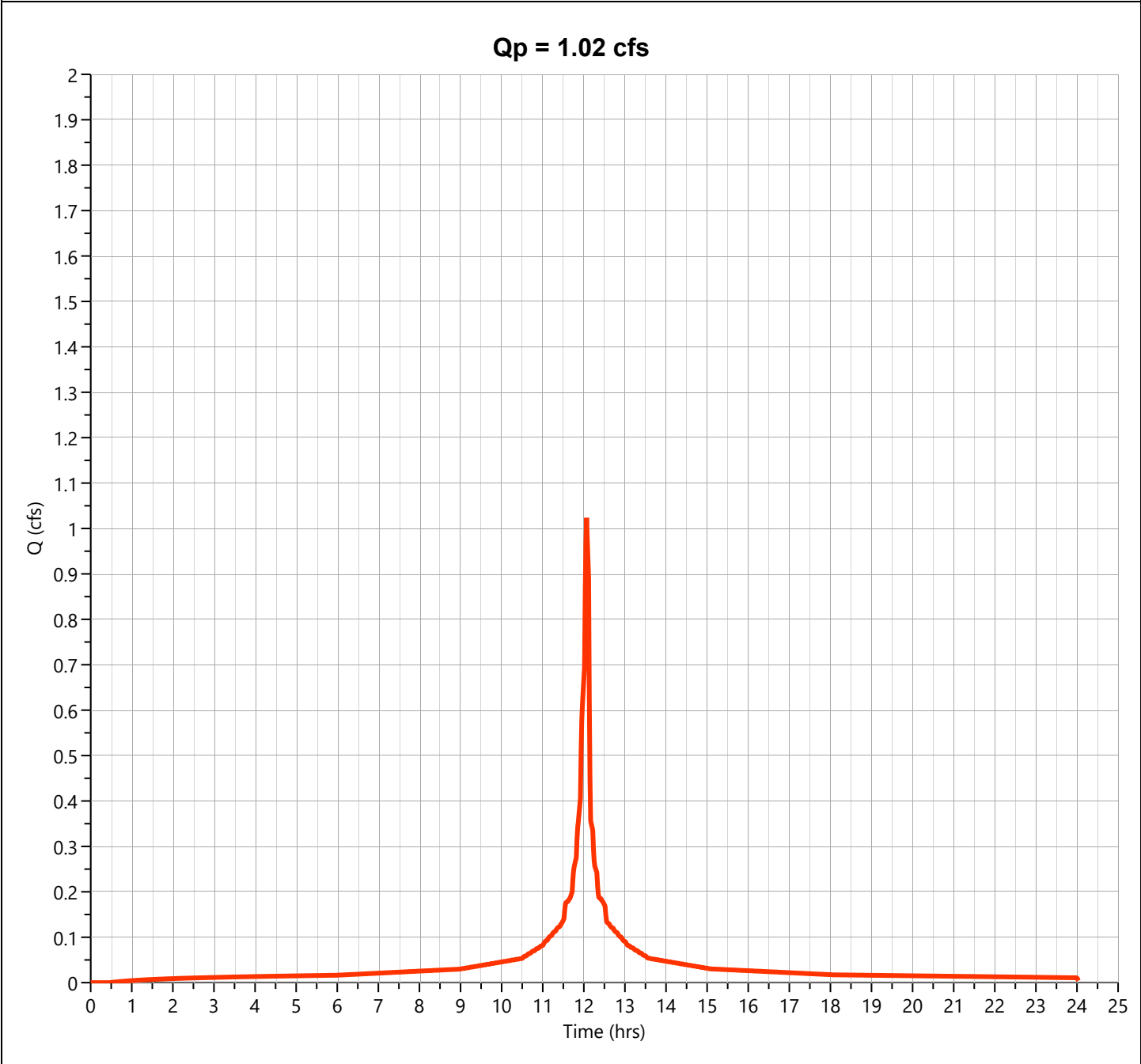
Hydrology Studio v 3.0.0.29

01-15-2024

EX WSD 2 IMP DIST

Hyd. No. 5

Hydrograph Type	= NRCS Runoff	Peak Flow	= 1.024 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.10 hrs
Time Interval	= 1 min	Runoff Volume	= 3,438 cuft
Drainage Area	= 0.12 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 2.0 min
Total Rainfall	= 8.66 in	Design Storm	= NOAA-D
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

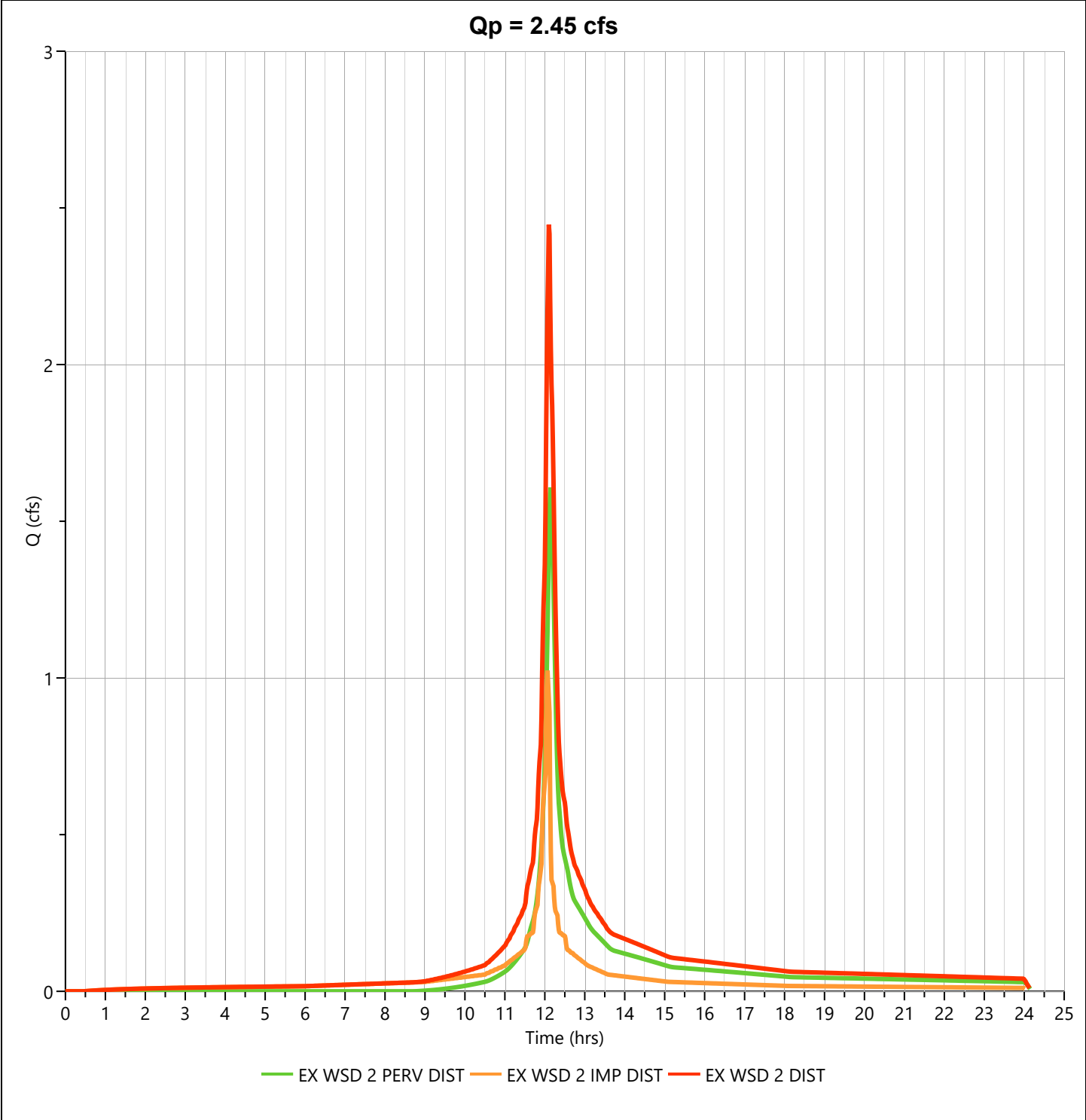
Hydrology Studio v 3.0.0.29

01-15-2024

EX WSD 2 DIST

Hyd. No. 6

Hydrograph Type	= Junction	Peak Flow	= 2.446 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.10 hrs
Time Interval	= 1 min	Hydrograph Volume	= 9,038 cuft
Inflow Hydrographs	= 4, 5	Total Contrib. Area	= 0.51 ac



Hydrograph Report

Project Name:

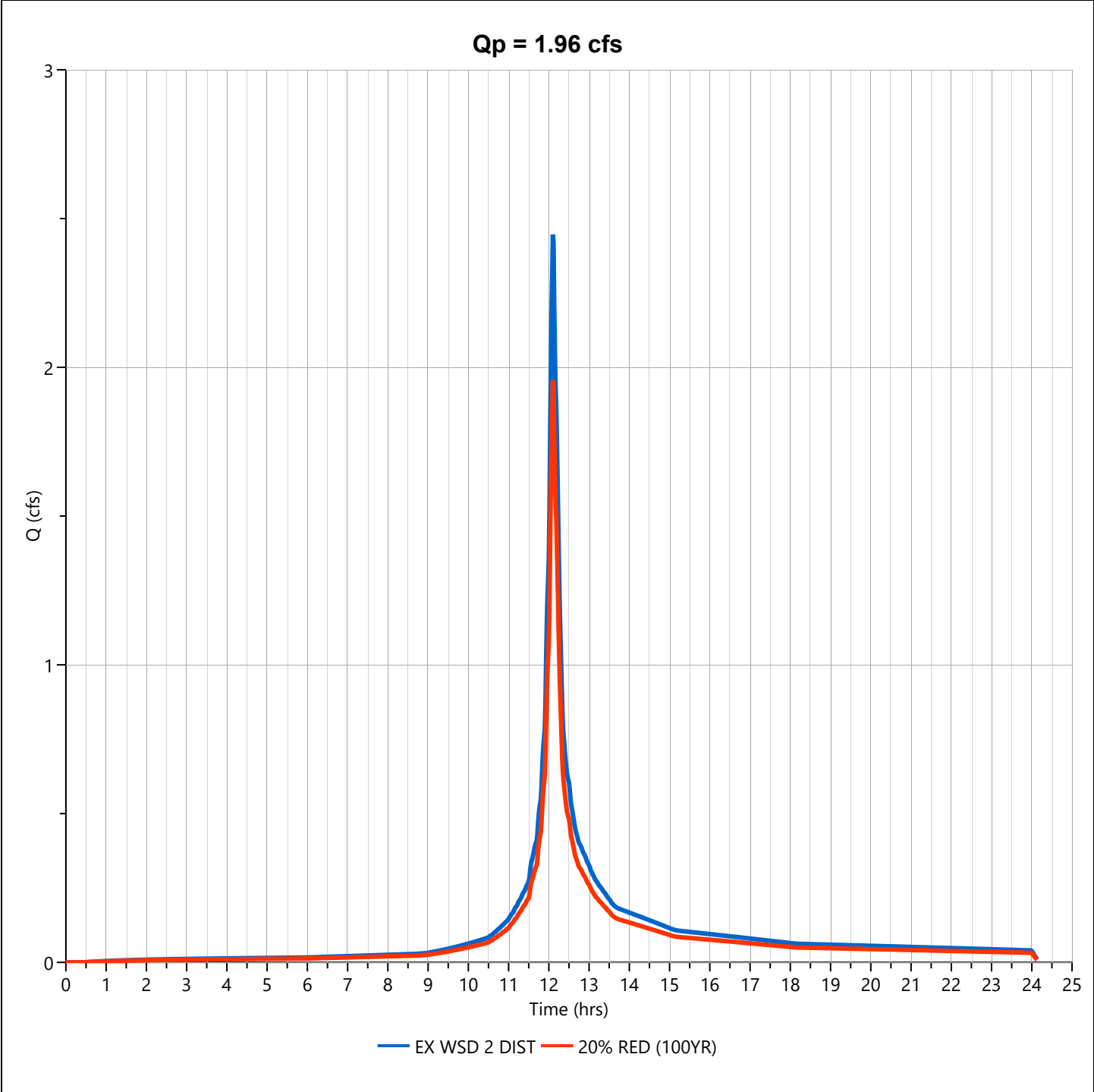
Hydrology Studio v 3.0.0.29

01-15-2024

20% RED (100YR)

Hyd. No. 7

Hydrograph Type	= Diversion	Peak Flow	= 1.957 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.10 hrs
Time Interval	= 1 min	Hydrograph Volume	= 7,230 cuft
Inflow Hydrograph	= 6 - EX WSD 2 DIST	Diversion Method	= Flow Ratio
Companion Hyd	= 8 - N/A	Flow Ratio	= 0.8



Hydrograph Report

Project Name:

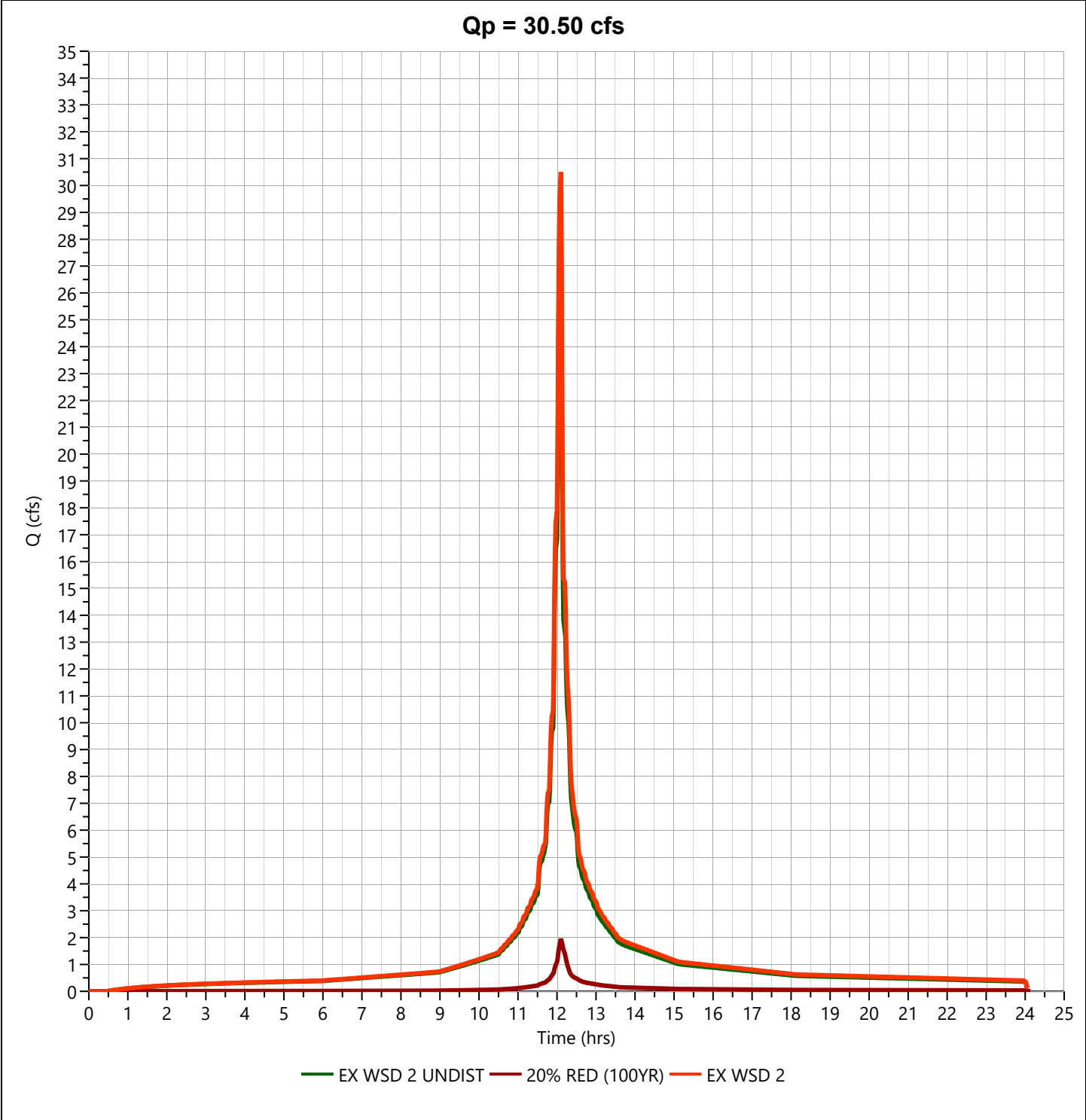
Hydrology Studio v 3.0.0.29

01-15-2024

EX WSD 2

Hyd. No. 9

Hydrograph Type	= Junction	Peak Flow	= 30.50 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.10 hrs
Time Interval	= 1 min	Hydrograph Volume	= 109,666 cuft
Inflow Hydrographs	= 3, 7	Total Contrib. Area	= 4.33 ac



APPENDIX B

PROPOSED STORMWATER RUNOFF CALCULATIONS

CN and Tc CALCULATION SHEETS

Project MGC - Halfway House & Clubhouse ParkingBy: NGDate: 1/15/2024Location West Orange, NJChecked By: TDDate Checked: 1/15/2024

Circle one: Present

DevelopedProposed Watershed 1 - Halfway House (Disturbed)

Include a map, schematic, or description of coverage areas.

Runoff Curve Number (CN)

Soil Name and hydrologic group (Appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN ^{*2}			Area x acres mi² %	Product of CN x Area
		Table 2-2	Fig. 2-3	Fig. 2-4		
D	Impervious	98			0.38	37.24
B	Impervious	98			0.45	44.10
Totals =					0.83	81.34

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{81.34}{0.83} = 98.00 \quad \text{Use CN} =$$

98

Project MGC - Halfway House & Clubhouse ParkingBy: NGDate: 1/15/2024Location West Orange, NJChecked By: TDDate Checked: 1/15/2024

Circle one: Present

DevelopedProposed Watershed 1 - Halfway House (Disturbed)

Include a map, schematic, or description of coverage areas.

Runoff Curve Number (CN)

Soil Name and hydrologic group (Appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN ^{*2}			Area x acres mi² %	Product of CN x Area
		Table 2-2	Fig. 2-3	Fig. 2-4		
D	Open Space, Good Cond.	80			0.23	18.40
B	Open Space, Good Cond.	61			0.14	8.54
Totals =					0.37	26.94

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{26.94}{0.37} = 72.81 \quad \text{Use CN} =$$

73

Project: Montclair GC - Parking Lot Expansion
Location: West Orange, NJ

By: NG

Date: 1/15/2024

Checked By: TD

Date Checked: 1/15/2024

Circle One: Present Developed

Proposed Watershed 1 - Undetained - Pervious

Circle One: T_c T_t through subarea

1A-1 through 1A-4

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

Sheet Flow (Applicable to T_c Only)

- Surface Description (NEH table 15-1)
- Manning's Roughness Coeff., n (NEH table 15-1)
- Design Flow Length, L_{des} (Total L_{des} < 100 ft)
- Two-year 24-hr rainfall, P₂
- Land Slope, s
- McCuen-Spiess Limit, L_{mcs} (max. 100 ft) $L_{mcs} = (100 s^{0.5})/n$
- Compute T_t $T_t = \frac{0.007 (n L_{des})^{0.8}}{P_2^{0.5} s^{0.4}}$

Segment ID	1	2	
	Dense Grasses	Smooth Surfaces	
	0.24	0.011	
ft	58	31	
in	3.44	3.44	
ft/ft	0.041	0.069	
ft	84	100	
hr	0.111	0.005	+

Sheet Flow Sub-Total **0.116 hours**

Shallow Concentrated Flow

- Surface Description
- Flow Length, L
- Watercourse Slope, s
- Average Velocity, V (NEH table 15-3)
- Compute T_t $T_t = \frac{L}{3600 V}$

Segment ID	3		
	Pavement		
ft	115		
ft/ft	0.036		
ft/s	3.83		
hr	0.008	+	

Shallow Conc. Flow Sub-Total **0.008 hours**

Channel Flow

- Flow Length, L
- Cross Sectional flow area, a
- Wetted Perimeter, P_w
- Hydraulic Radius, r $r = a / P_w$
- Channel Slope, s
- Manning's Roughness Coeff., n
- Velocity, V $V = (1.49 r^{2/3} s^{1/2}) / n$
- Compute T_t $T_t = \frac{L}{3600 V}$

Segment ID			
ft			
ft ²			
ft			
ft			
ft/ft			
ft/s			
hr		+	

Channel Flow Sub-Total **0.000 hours**

Watershed or subarea T_c or T_t
(Add Sub-Total T_t from prior steps)

Total T_c (hours) = **0.124 hours**
Total T_c (minutes) = **7 minutes**

Project: Montclair GC - Parking Lot Expansion
Location: West Orange, NJ

By: NG

Date: 1/15/2024

Checked By: TD

Date Checked: 1/15/2024

Circle One: Present Developed

Proposed Watershed 1 - Undetained - Impervious

Circle One: T_c T_t through subarea

1B-1 through 1B-5

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

Sheet Flow (Applicable to T_c Only)

- Surface Description (NEH table 15-1)
- Manning's Roughness Coeff., n (NEH table 15-1)
- Design Flow Length, L_{des} (Total L_{des} < 100 ft)
- Two-year 24-hr rainfall, P₂
- Land Slope, s
- McCuen-Spiess Limit, L_{mcs} (max. 100 ft) $L_{mcs} = (100 s^{0.5})/n$
- Compute T_t $T_t = \frac{0.007 (n L_{des})^{0.8}}{P_2^{0.5} s^{0.4}}$

Segment ID	1	2	3
	Smooth Surfaces	Dense Grasses	Smooth Surfaces
	0.011	0.24	0.011
ft	17	58	14
in	3.44	3.44	3.44
ft/ft	0.023	0.041	0.066
ft	100	84	100
hr	0.004	0.111	0.003

Sheet Flow Sub-Total **0.118 hours**

Shallow Concentrated Flow

- Surface Description
- Flow Length, L
- Watercourse Slope, s
- Average Velocity, V (NEH table 15-3)
- Compute T_t $T_t = \frac{L}{3600 V}$

Segment ID	4		
	Pavement		
ft	132		
ft/ft	0.040		
ft/s	4.08		
hr	0.009		

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

Channel Flow

- Flow Length, L
- Cross Sectional flow area, a
- Wetted Perimeter, P_w
- Hydraulic Radius, r $r = a / P_w$
- Channel Slope, s
- Manning's Roughness Coeff., n
- Velocity, V $V = (1.49 r^{2/3} s^{1/2}) / n$
- Compute T_t $T_t = \frac{L}{3600 V}$

Segment ID			
ft			
ft ²			
ft			
ft			
ft/ft			
ft/s			
hr			

Channel Flow Sub-Total **0.000 hours**

Watershed or subarea T_c or T_t
(Add Sub-Total T_t from prior steps)

Total T_c (hours) = **0.127 hours**
Total T_c (minutes) = **8 minutes**

Project MGC - Halfway House & Clubhouse ParkingBy: NGDate: 1/15/2024Location West Orange, NJChecked By: TDDate Checked: 1/15/2024

Circle one: Present

DevelopedProp Watershed 2 - Clubhouse Parking (Detained)

Include a map, schematic, or description of coverage areas.

Runoff Curve Number (CN)

Soil Name and hydrologic group (Appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN ^{*2}			Area	Product of CN x Area			
		Table 2-2	Fig. 2-3	Fig. 2-4	<table><tr><td>x</td><td>acres</td></tr><tr><td></td><td>mi²</td></tr><tr><td></td><td>%</td></tr></table>		x	acres	
x	acres								
	mi ²								
	%								
D	Impervious	98			0.30	29.40			
Totals =					0.30	29.40			

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{29.40}{0.30} = 98.00$$

Use CN =

98

Project MGC - Halfway House & Clubhouse ParkingBy: NGDate: 1/15/2024Location West Orange, NJChecked By: TDDate Checked: 1/15/2024

Circle one: Present

DevelopedProp Watershed 2 - Clubhouse Parking (Detained)

Include a map, schematic, or description of coverage areas.

Runoff Curve Number (CN)

Soil Name and hydrologic group (Appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN ^{*2}			Area	Product of CN x Area			
		Table 2-2	Fig. 2-3	Fig. 2-4	<table><tr><td>x</td><td>acres</td></tr><tr><td></td><td>mi²</td></tr><tr><td></td><td>%</td></tr></table>		x	acres	
x	acres								
	mi ²								
	%								
D	Open Space, Good Cond.	80			0.21	16.80			
B	Open Space, Good Cond.	61			0.10	6.10			
Totals =					0.31	22.90			

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{22.90}{0.31} = 73.87 \quad \text{Use CN} =$$

74

Project MGC - Halfway House & Clubhouse Parking By: NG Date: 1/15/2024
 Location West Orange, NJ Checked By: TD Date Checked: 1/15/2024
 Circle one: Present Developed Prop Watershed 2 - Clubhouse Parking (Undetained)
 Include a map, schematic, or description of coverage areas.

Runoff Curve Number (CN)

Soil Name and hydrologic group (Appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN ^{*2}			Area x acres mi² %	Product of CN x Area
		Table 2-2	Fig. 2-3	Fig. 2-4		
D	Impervious	98			2.74	268.52
Totals =					2.74	268.52

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{268.52}{2.74} = 98.00$ Use CN = **98**

Project MGC - Halfway House & Clubhouse ParkingBy: NGDate: 1/15/2024Location West Orange, NJChecked By: TDDate Checked: 1/15/2024

Circle one: Present

DevelopedProp Watershed 2 - Clubhouse Parking (Undetained)

Include a map, schematic, or description of coverage areas.

Runoff Curve Number (CN)

Soil Name and hydrologic group (Appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN ^{*2}			Area	Product of CN x Area			
		Table 2-2	Fig. 2-3	Fig. 2-4	<table><tr><td>x</td><td>acres</td></tr><tr><td></td><td>mi²</td></tr><tr><td></td><td>%</td></tr></table>		x	acres	
x	acres								
	mi ²								
	%								
D	Open Space, Good Cond.	80			0.26	20.80			
B	Open Space, Good Cond.	61			1.24	75.64			
Totals =					1.50	96.44			

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{96.44}{1.50} = 64.29 \quad \text{Use CN} =$$

64

Project: Montclair GC - Parking Lot Expansion
Location: West Orange, NJ

By: NG

Date: 1/15/2024

Checked By: TD

Date Checked: 1/15/2024

Circle One: Present Developed

Proposed Watershed 2 - Undetained - Pervious

Circle One: T_c T_t through subarea

2A-1 through 2A-2

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

Sheet Flow (Applicable to T_c Only)

- Surface Description (NEH table 15-1)
- Manning's Roughness Coeff., n (NEH table 15-1)
- Design Flow Length, L_{des} (Total L_{des} < 100 ft)
- Two-year 24-hr rainfall, P₂
- Land Slope, s
- McCuen-Spiess Limit, L_{mcs} (max. 100 ft) $L_{mcs} = (100 s^{0.5})/n$
- Compute T_t $T_t = \frac{0.007 (n L_{des})^{0.8}}{P_2^{0.5} s^{0.4}}$

Segment ID	1		
	Dense Grasses		
	0.24		
ft	75		
in	3.44		
ft/ft	0.033		
ft	76		
hr	0.149	+	

Sheet Flow Sub-Total **0.149 hours**

Shallow Concentrated Flow

- Surface Description
- Flow Length, L
- Watercourse Slope, s
- Average Velocity, V (NEH table 15-3)
- Compute T_t $T_t = \frac{L}{3600 V}$

Segment ID	2		
	Short-Grass Pasture		
ft	21		
ft/ft	0.012		
ft/s	0.76		
hr	0.008	+	

Shallow Conc. Flow Sub-Total **0.008 hours**

Channel Flow

- Flow Length, L
- Cross Sectional flow area, a
- Wetted Perimeter, P_w
- Hydraulic Radius, r $r = a / P_w$
- Channel Slope, s
- Manning's Roughness Coeff., n
- Velocity, V $V = (1.49 r^{2/3} s^{1/2}) / n$
- Compute T_t $T_t = \frac{L}{3600 V}$

Segment ID			
ft			
ft ²			
ft			
ft			
ft/ft			
ft/s			
hr		+	

Channel Flow Sub-Total **0.000 hours**

Watershed or subarea T_c or T_t
(Add Sub-Total T_t from prior steps)

Total T _c (hours) =	0.156 hours
Total T _c (minutes) =	9 minutes

Project: Montclair GC - Parking Lot Expansion
Location: West Orange, NJ

By: NG

Date: 1/15/2024

Checked By: TD

Date Checked: 1/15/2024

Circle One: Present Developed

Proposed Watershed 2 - Undetained - Impervious

Circle One: T_c T_t through subarea

2B-1 through 2B-3

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

Sheet Flow (Applicable to T_c Only)

- Surface Description (NEH table 15-1)
- Manning's Roughness Coeff., n (NEH table 15-1)
- Design Flow Length, L_{des} (Total L_{des} < 100 ft)
- Two-year 24-hr rainfall, P₂
- Land Slope, s
- McCuen-Spiess Limit, L_{mcs} (max. 100 ft) $L_{mcs} = (100 s^{0.5})/n$
- Compute T_t $T_t = \frac{0.007 (n L_{des})^{0.8}}{P_2^{0.5} s^{0.4}}$

Segment ID	1		
	Smooth Surfaces		
	0.011		
ft	100		
in	3.44		
ft/ft	0.012		
ft	100		
hr	0.024	+	

Sheet Flow Sub-Total **0.024 hours**

Shallow Concentrated Flow

- Surface Description
- Flow Length, L
- Watercourse Slope, s
- Average Velocity, V (NEH table 15-3)
- Compute T_t $T_t = \frac{L}{3600 V}$

Segment ID	2		
	Pavement		
ft	194		
ft/ft	0.013		
ft/s	2.28		
hr	0.024	+	

Shallow Conc. Flow Sub-Total **0.024 hours**

Channel Flow

- Flow Length, L
- Cross Sectional flow area, a
- Wetted Perimeter, P_w
- Hydraulic Radius, r $r = a / P_w$
- Channel Slope, s
- Manning's Roughness Coeff., n
- Velocity, V $V = (1.49 r^{2/3} s^{1/2}) / n$
- Compute T_t $T_t = \frac{L}{3600 V}$

Segment ID			
ft			
ft ²			
ft			
ft			
ft/ft			
ft/s			
hr		+	

Channel Flow Sub-Total **0.000 hours**

Watershed or subarea T_c or T_t
(Add Sub-Total T_t from prior steps)

Total T_c (hours) = **0.048 hours**
Total T_c (minutes) = **3 minutes**

Project: Montclair GC - Parking Lot Expansion
Location: West Orange, NJ

By: NG

Date: 1/15/2024

Checked By: TD

Date Checked: 1/15/2024

Circle One: Present Developed

Proposed Watershed 2 - Detained - Pervious

Circle One: T_c T_t through subarea

2C-1 through 2C-4

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

Sheet Flow (Applicable to T_c Only)

- Surface Description (NEH table 15-1)
- Manning's Roughness Coeff., n (NEH table 15-1)
- Design Flow Length, L_{des} (Total L_{des} < 100 ft)
- Two-year 24-hr rainfall, P₂
- Land Slope, s
- McCuen-Spiess Limit, L_{mcs} (max. 100 ft) $L_{mcs} = (100 s^{0.5})/n$
- Compute T_t

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

Segment ID

	1	2	
	Dense Grasses	Smooth Surfaces	
	0.24	0.011	
ft	27	35	
in	3.44	3.44	
ft/ft	0.010	0.029	
ft	42	100	
hr	0.106	0.007	+

Sheet Flow Sub-Total **0.113 hours**

Shallow Concentrated Flow

- Surface Description
- Flow Length, L
- Watercourse Slope, s
- Average Velocity, V (NEH table 15-3)
- Compute T_t

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

Segment ID

	3		
	Pavement		
ft	41		
ft/ft	0.031		
ft/s	3.58		
hr	0.003	+	

Shallow Conc. Flow Sub-Total **0.003 hours**

Channel Flow

- Flow Length, L
- Cross Sectional flow area, a
- Wetted Perimeter, P_w
- Hydraulic Radius, r $r = a / P_w$
- Channel Slope, s
- Manning's Roughness Coeff., n
- Velocity, V $V = (1.49 r^{2/3} s^{1/2}) / n$
- Compute T_t

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

Segment ID

ft			
ft ²			
ft			
ft			
ft/ft			
ft/s			
hr		+	

Channel Flow Sub-Total **0.000 hours**

Watershed or subarea T_c or T_t
(Add Sub-Total T_t from prior steps)

Total T_c (hours) = **0.117 hours**
Total T_c (minutes) = **7 minutes**

Project: Montclair GC - Parking Lot Expansion
Location: West Orange, NJ

By: NG

Date: 1/15/2024

Checked By: TD

Date Checked: 1/15/2024

Circle One: Present Developed

Proposed Watershed 2 - Detained - Impervious

Circle One: T_c T_t through subarea

2D-1 through 2D-4

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

Sheet Flow (Applicable to T_c Only)

- Surface Description (NEH table 15-1)
- Manning's Roughness Coeff., n (NEH table 15-1)
- Design Flow Length, L_{des} (Total L_{des} < 100 ft)
- Two-year 24-hr rainfall, P₂
- Land Slope, s
- McCuen-Spiess Limit, L_{mcs} (max. 100 ft) $L_{mcs} = (100 s^{0.5})/n$
- Compute T_t $T_t = \frac{0.007 (n L_{des})^{0.8}}{P_2^{0.5} s^{0.4}}$

Segment ID	1		
	Smooth Surfaces		
	0.011		
ft	100		
in	3.44		
ft/ft	0.014		
ft	100		
hr	0.022	+	

Sheet Flow Sub-Total **0.022 hours**

Shallow Concentrated Flow

- Surface Description
- Flow Length, L
- Watercourse Slope, s
- Average Velocity, V (NEH table 15-3)
- Compute T_t $T_t = \frac{L}{3600 V}$

Segment ID	2		
	Pavement		
ft	43		
ft/ft	0.032		
ft/s	3.63		
hr	0.003	+	

Shallow Conc. Flow Sub-Total **0.003 hours**

Channel Flow

- Flow Length, L
- Cross Sectional flow area, a
- Wetted Perimeter, P_w
- Hydraulic Radius, r $r = a / P_w$
- Channel Slope, s
- Manning's Roughness Coeff., n
- Velocity, V $V = (1.49 r^{2/3} s^{1/2}) / n$
- Compute T_t $T_t = \frac{L}{3600 V}$

Segment ID			
ft			
ft ²			
ft			
ft			
ft/ft			
ft/s			
hr		+	

Channel Flow Sub-Total **0.000 hours**

Watershed or subarea T_c or T_t
(Add Sub-Total T_t from prior steps)

Total T _c (hours) =	0.026 hours
Software Limitations Require Minimum T _c =	2 minutes

Project MGC - Halfway House & Clubhouse ParkingBy: NGDate: 1/15/2024Location West Orange, NJChecked By: TDDate Checked: 1/15/2024

Circle one: Present

DevelopedWatershed 3 - Clubhouse/Practice Green

Include a map, schematic, or description of coverage areas.

Runoff Curve Number (CN)

Soil Name and hydrologic group (Appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN ^{*2}			Area	Product of CN x Area
		Table 2-2	Fig. 2-3	Fig. 2-4	x acres mi² %	
B	Impervious	98			0.63	61.74
Totals =					0.63	61.74

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{61.74}{0.63} = 98.00$$

Use CN =

98

Project MGC - Halfway House & Clubhouse ParkingBy: NGDate: 1/15/2024Location West Orange, NJChecked By: TDDate Checked: 1/15/2024

Circle one: Present

DevelopedWatershed 3 - Clubhouse/Practice Green

Include a map, schematic, or description of coverage areas.

Runoff Curve Number (CN)

Soil Name and hydrologic group (Appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN ^{*2}			Area	Product of CN x Area
		Table 2-2	Fig. 2-3	Fig. 2-4	x acres mi² %	
B	Open Space, Good Cond.	61			0.76	46.36
Totals =					0.76	46.36

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{46.36}{0.76} = 61.00$$

Use CN =

61

Project: Montclair GC - Parking Lot Expansion
 Location: West Orange, NJ
 Circle One: Present Developed
 Circle One: T_c T_t ough subarea

By: NG Date: 12/22/2023
 Checked By: _____ Date Checked: _____
Watershed 3 - Undisturbed - Pervious
3A-1 through 3A-3

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

Sheet Flow (Applicable to T_c Only)

- Surface Description (NEH table 15-1)
- Manning's Roughness Coeff., n (NEH table 15-1)
- Flow Length, L (total L < 100 ft)
- Two-year 24-hr rainfall, P₂
- Land Slope, s
- Compute T_t

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

Segment ID	1		
	Dense Grasses		
	0.24		
ft	100		
in	3.44		
ft/ft	0.030		
hr	0.194	+	

Sheet Flow Sub-Total **0.194 hours**

Shallow Concentrated Flow

- Surface Description
- Flow Length, L
- Watercourse Slope, s
- Average Velocity, V (NEH table 15-3)
- Compute T_t

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

Segment ID	2	3	
	Short-Grass Pasture	Pavement	
ft	39	13	
ft/ft	0.144	0.085	
ft/s	2.64	5.91	
hr	0.004	0.001	+

Shallow Conc. Flow Sub-Total **0.005 hours**

Channel Flow

- Flow Length, L
- Cross Sectional flow area, a
- Wetted Perimeter, P_w
- Hydraulic Radius, r
- Channel Slope, s
- Manning's Roughness Coeff., n
- Velocity, V
- Compute T_t

$$r = a / P_w$$

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

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

Segment ID			
ft			
ft ²			
ft			
ft			
ft/ft			
ft/s			
hr			+

Channel Flow Sub-Total **0.000 hours**

Watershed or subarea T_c or T_t
(Add Sub-Total T_t from prior steps)

Total T _c (hours) =	0.199 hours
Total T _c (minutes) =	12 minutes

Project: Montclair GC - Parking Lot Expansion
 Location: West Orange, NJ
 Circle One: Present Developed
 Circle One: T_c T_t ough subarea

By: NG
 Checked By: _____
 Date: 12/22/2023
 Date Checked: _____
Watershed 3 - Undisturbed - Impervious
3B-1 through 3B-4

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

Sheet Flow (Applicable to T_c Only)

- Surface Description (NEH table 15-1)
- Manning's Roughness Coeff., n (NEH table 15-1)
- Flow Length, L (total L < 100 ft)
- Two-year 24-hr rainfall, P₂
- Land Slope, s
- Compute T_t

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

Segment ID	1		
	Smooth Surfaces		
	0.011		
ft	100		
in	3.44		
ft/ft	0.011		
hr	0.025	+	

Sheet Flow Sub-Total **0.025 hours**

Shallow Concentrated Flow

- Surface Description
- Flow Length, L
- Watercourse Slope, s
- Average Velocity, V (NEH table 15-3)
- Compute T_t

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

Segment ID	2		
	Pavement		
ft	299		
ft/ft	0.027		
ft/s	3.33		
hr	0.025	+	

Shallow Conc. Flow Sub-Total **0.025 hours**

Channel Flow

- Flow Length, L
- Cross Sectional flow area, a
- Wetted Perimeter, P_w
- Hydraulic Radius, r
- Channel Slope, s
- Manning's Roughness Coeff., n
- Velocity, V
- Compute T_t

$$r = a / P_w$$

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

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

Segment ID			
ft			
ft ²			
ft			
ft			
ft/ft			
ft/s			
hr		+	

Channel Flow Sub-Total **0.000 hours**

Watershed or subarea T_c or T_t
(Add Sub-Total T_t from prior steps)

Total T _c (hours) =	0.050 hours
Total T _c (minutes) =	3 minutes

PROPOSED RUNOFF HYDROGRAPHS

Hydrograph 2-yr Summary

Project Name:

Hydrology Studio v 3.0.0.29

01-15-2024

[illegible]

Hydrograph Report

Project Name:

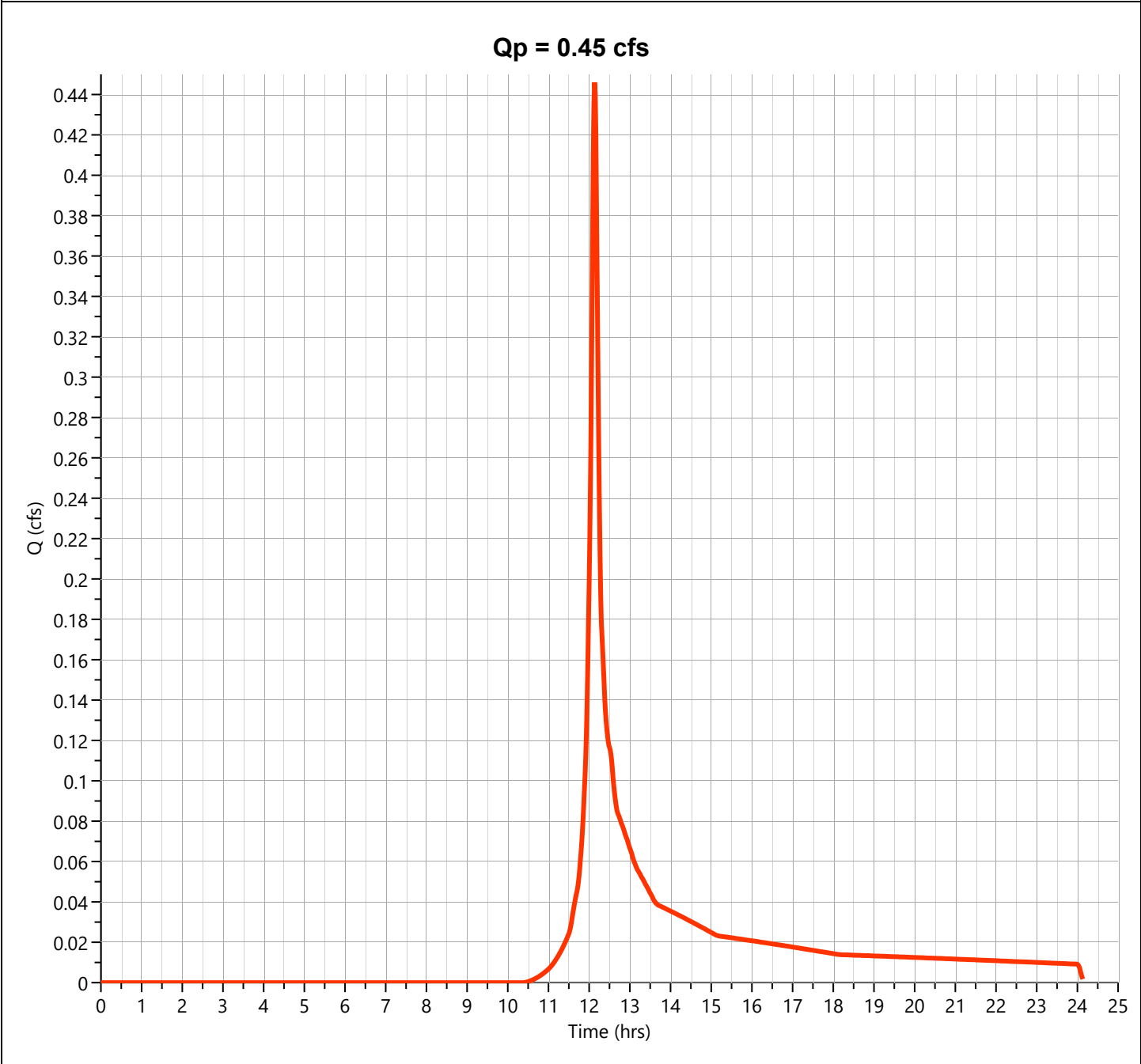
Hydrology Studio v 3.0.0.29

01-15-2024

PR WSD 1 PERV UNDET

Hyd. No. 1

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.446 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.13 hrs
Time Interval	= 1 min	Runoff Volume	= 1,492 cuft
Drainage Area	= 0.37 ac	Curve Number	= 73
Tc Method	= User	Time of Conc. (Tc)	= 8.0 min
Total Rainfall	= 3.44 in	Design Storm	= NOAA-D
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

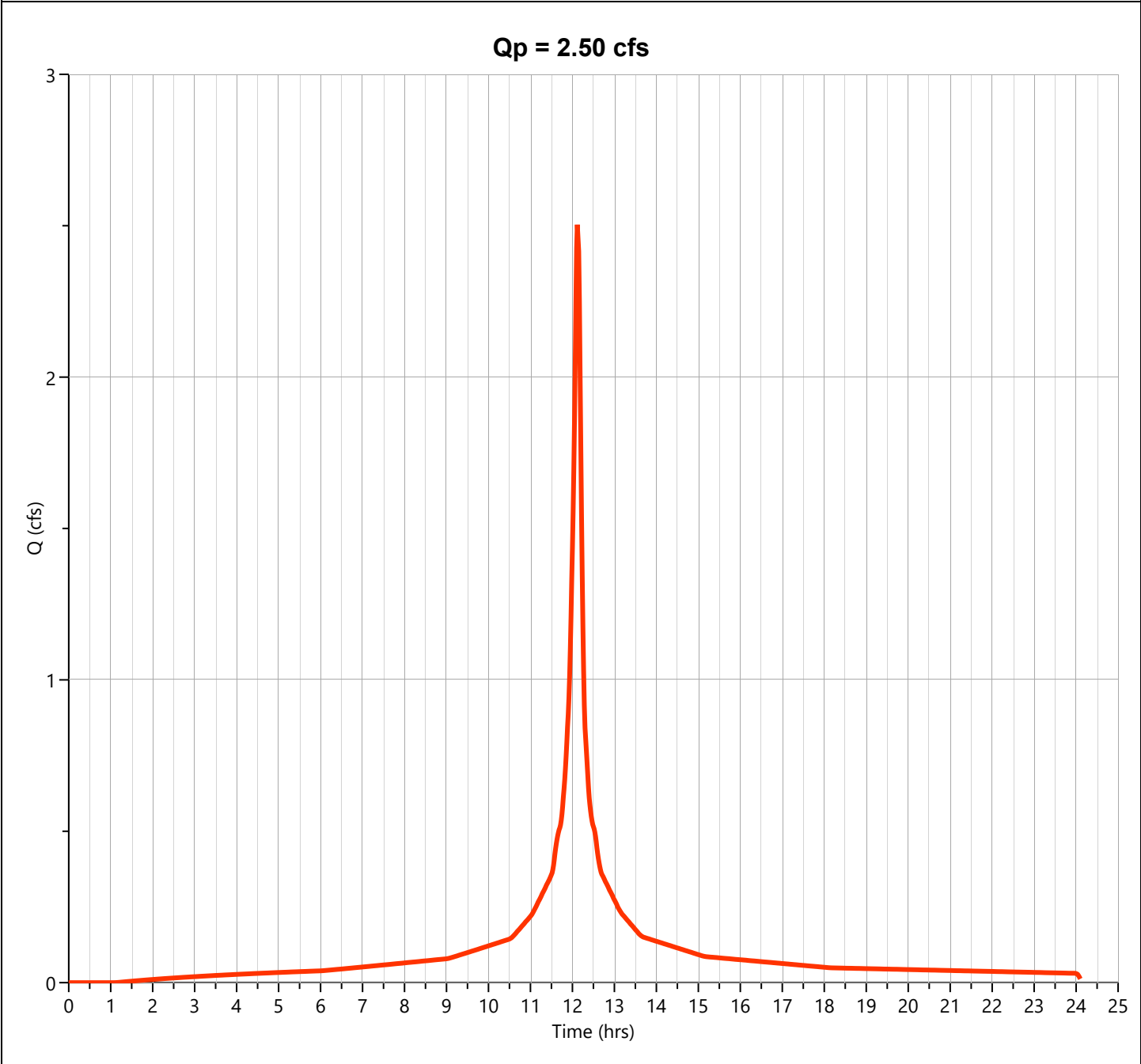
Hydrology Studio v 3.0.0.29

01-15-2024

PR WSD 1 IMP UNDET

Hyd. No. 2

Hydrograph Type	= NRCS Runoff	Peak Flow	= 2.504 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.12 hrs
Time Interval	= 1 min	Runoff Volume	= 9,420 cuft
Drainage Area	= 0.83 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 8.0 min
Total Rainfall	= 3.44 in	Design Storm	= NOAA-D
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

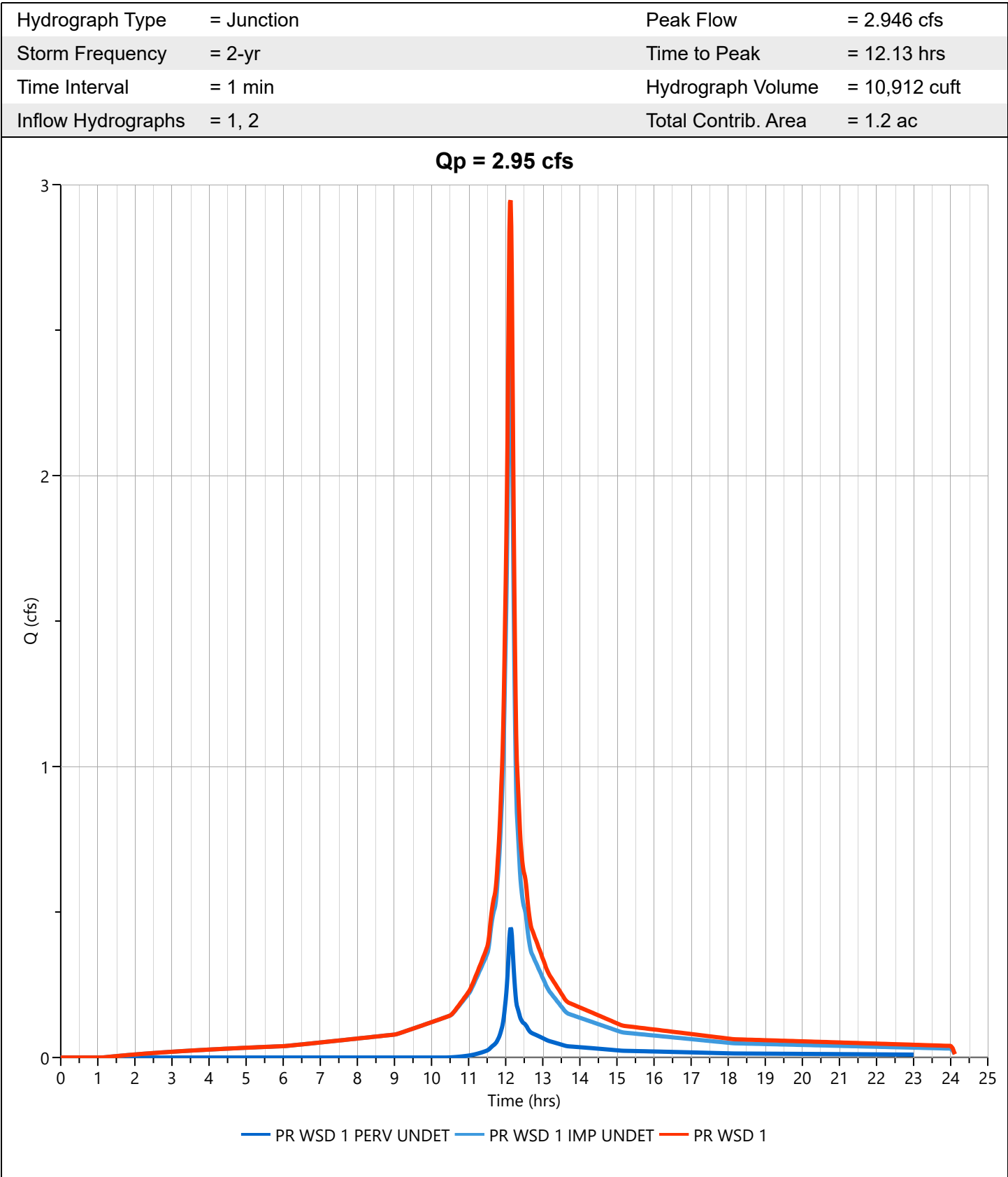
Project Name:

Hydrology Studio v 3.0.0.29

01-15-2024

PR WSD 1

Hyd. No. 3



Hydrograph Report

Project Name:

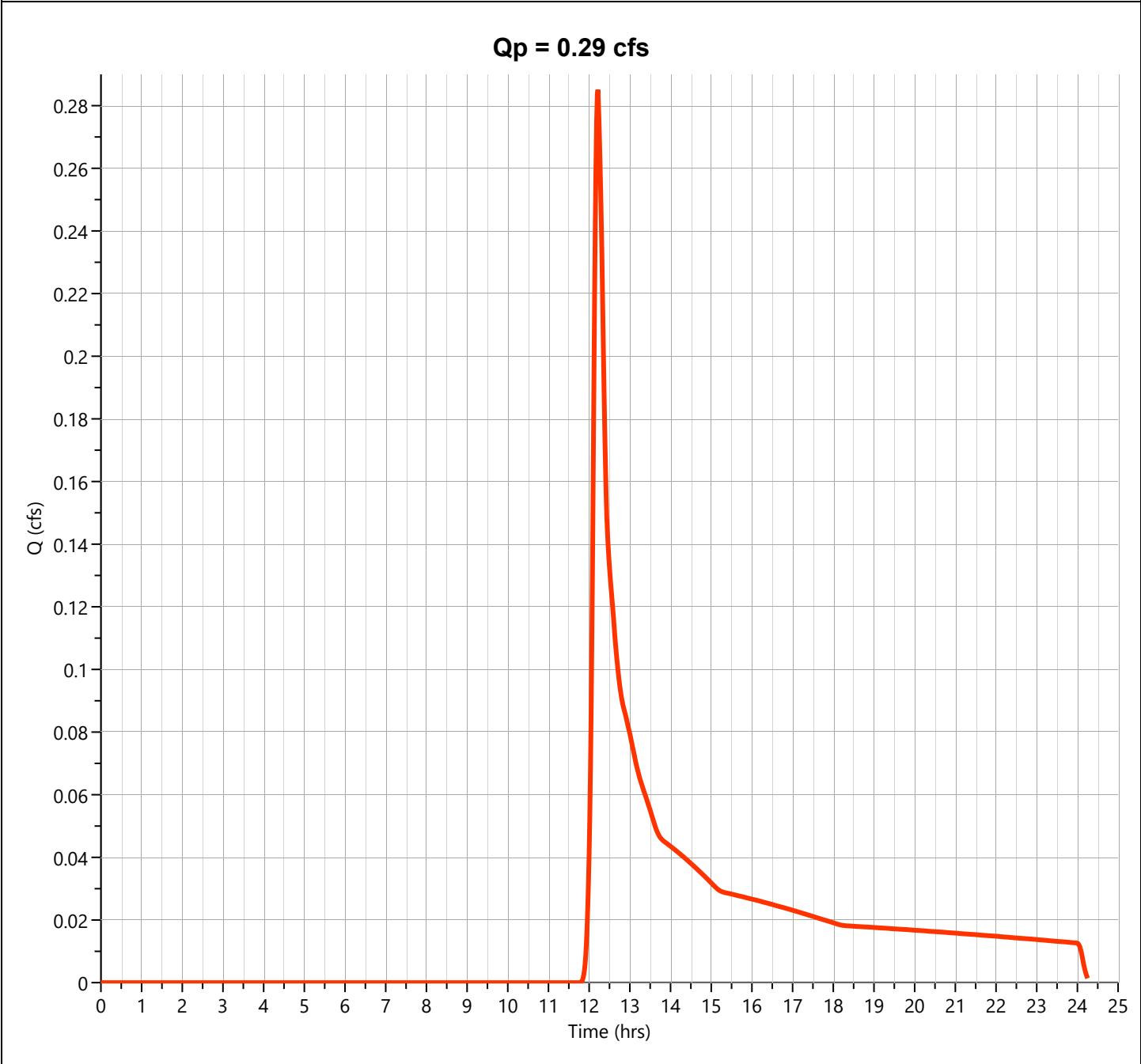
Hydrology Studio v 3.0.0.29

01-15-2024

PR WSD 3 PERV DET

Hyd. No. 5

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.285 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.22 hrs
Time Interval	= 1 min	Runoff Volume	= 1,483 cuft
Drainage Area	= 0.76 ac	Curve Number	= 61
Tc Method	= User	Time of Conc. (Tc)	= 12.0 min
Total Rainfall	= 3.44 in	Design Storm	= NOAA-D
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

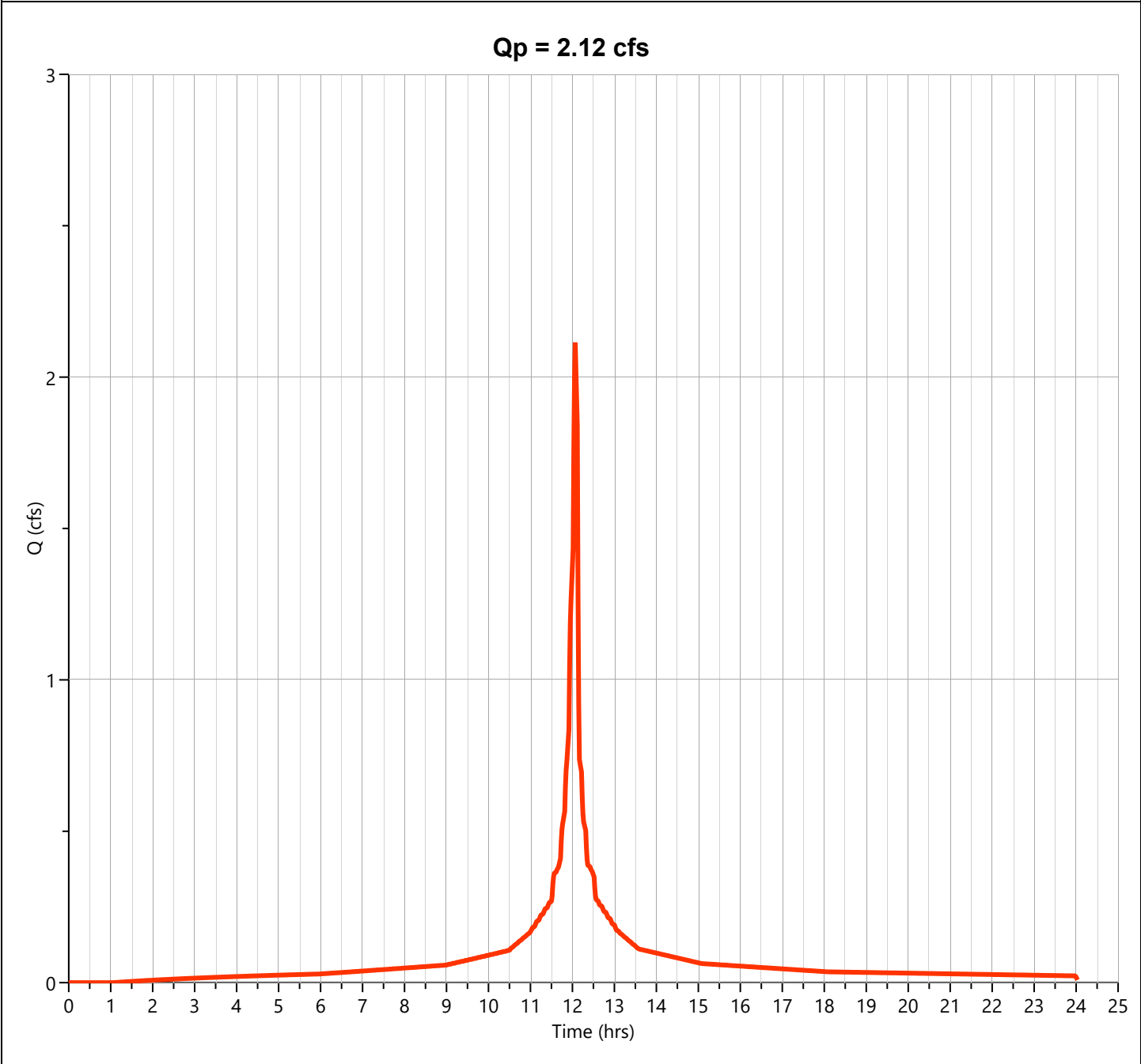
Hydrology Studio v 3.0.0.29

01-15-2024

PR WSD 3 IMP DET

Hyd. No. 6

Hydrograph Type	= NRCS Runoff	Peak Flow	= 2.117 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.10 hrs
Time Interval	= 1 min	Runoff Volume	= 6,875 cuft
Drainage Area	= 0.63 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 3.0 min
Total Rainfall	= 3.44 in	Design Storm	= NOAA-D
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

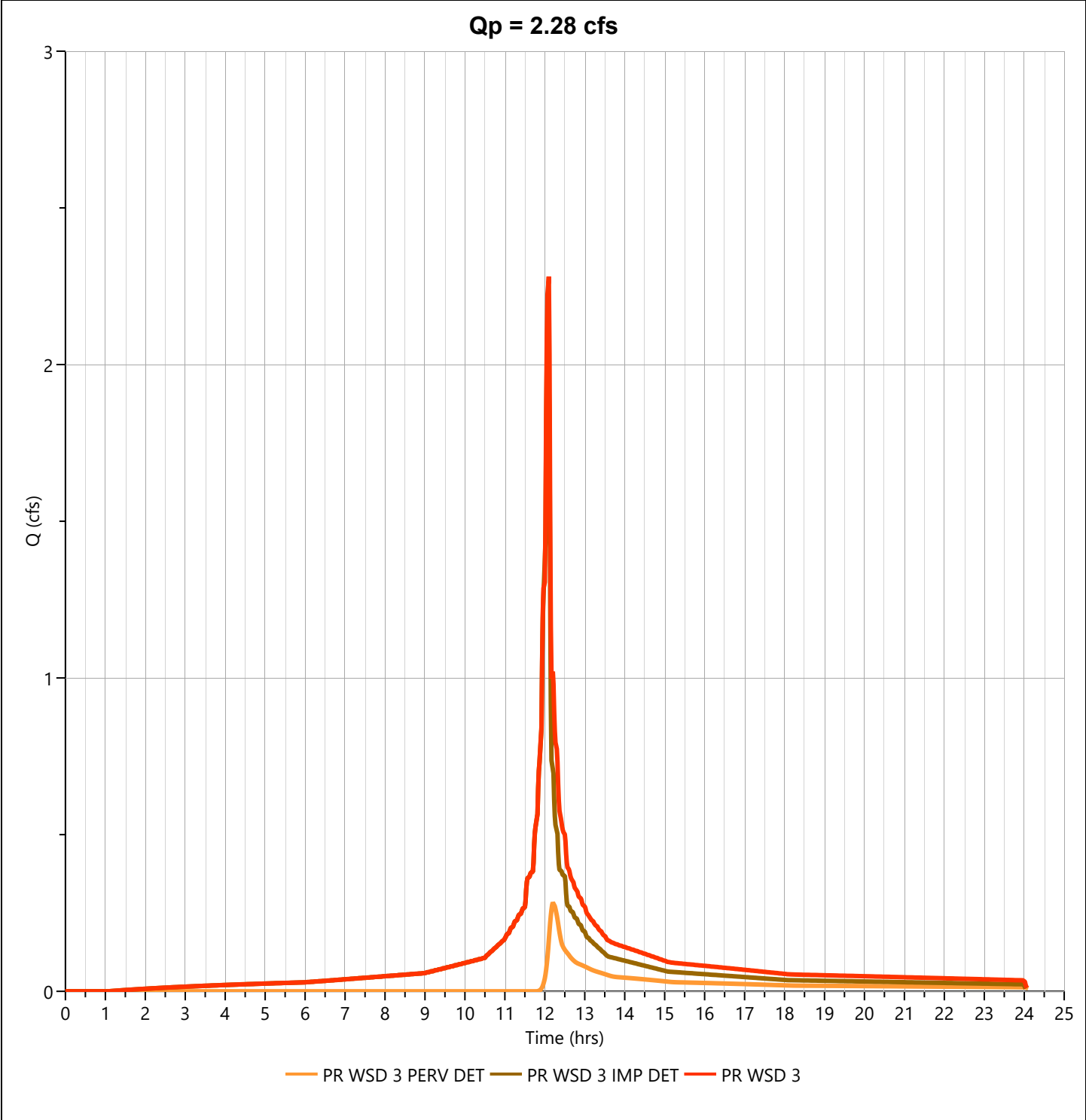
Hydrology Studio v 3.0.0.29

01-15-2024

PR WSD 3

Hyd. No. 7

Hydrograph Type	= Junction	Peak Flow	= 2.281 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.10 hrs
Time Interval	= 1 min	Hydrograph Volume	= 8,358 cuft
Inflow Hydrographs	= 5, 6	Total Contrib. Area	= 1.39 ac



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

01-15-2024

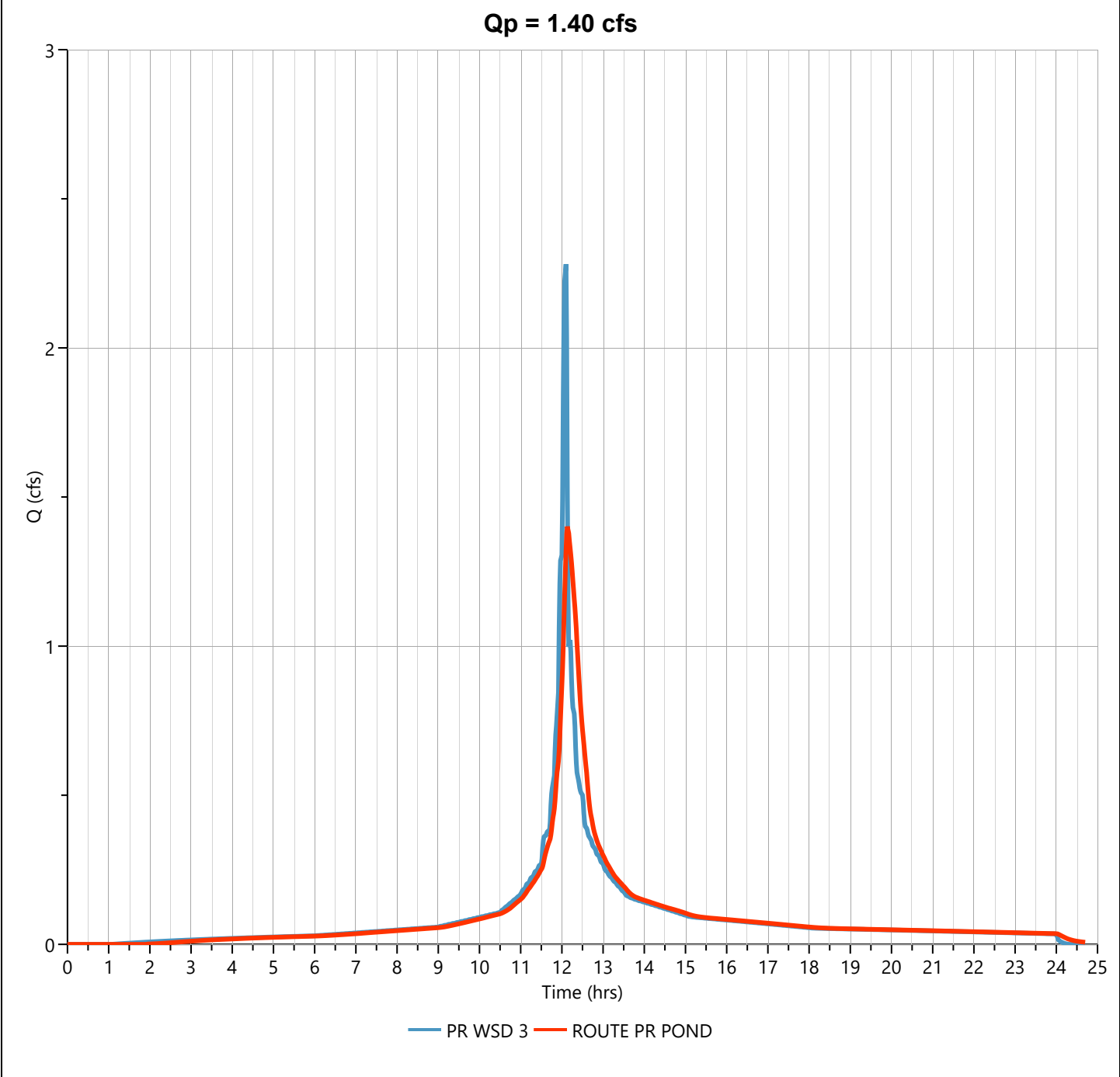
ROUTE PR POND

Hyd. No. 8

Hydrograph Type	= Pond Route	Peak Flow	= 1.401 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.13 hrs
Time Interval	= 1 min	Hydrograph Volume	= 8,345 cuft
Inflow Hydrograph	= 7 - PR WSD 3	Max. Elevation	= 541.56 ft
Pond Name	= 30" Stormtech	Max. Storage	= 833 cuft

Pond Routing by Storage Indication Method

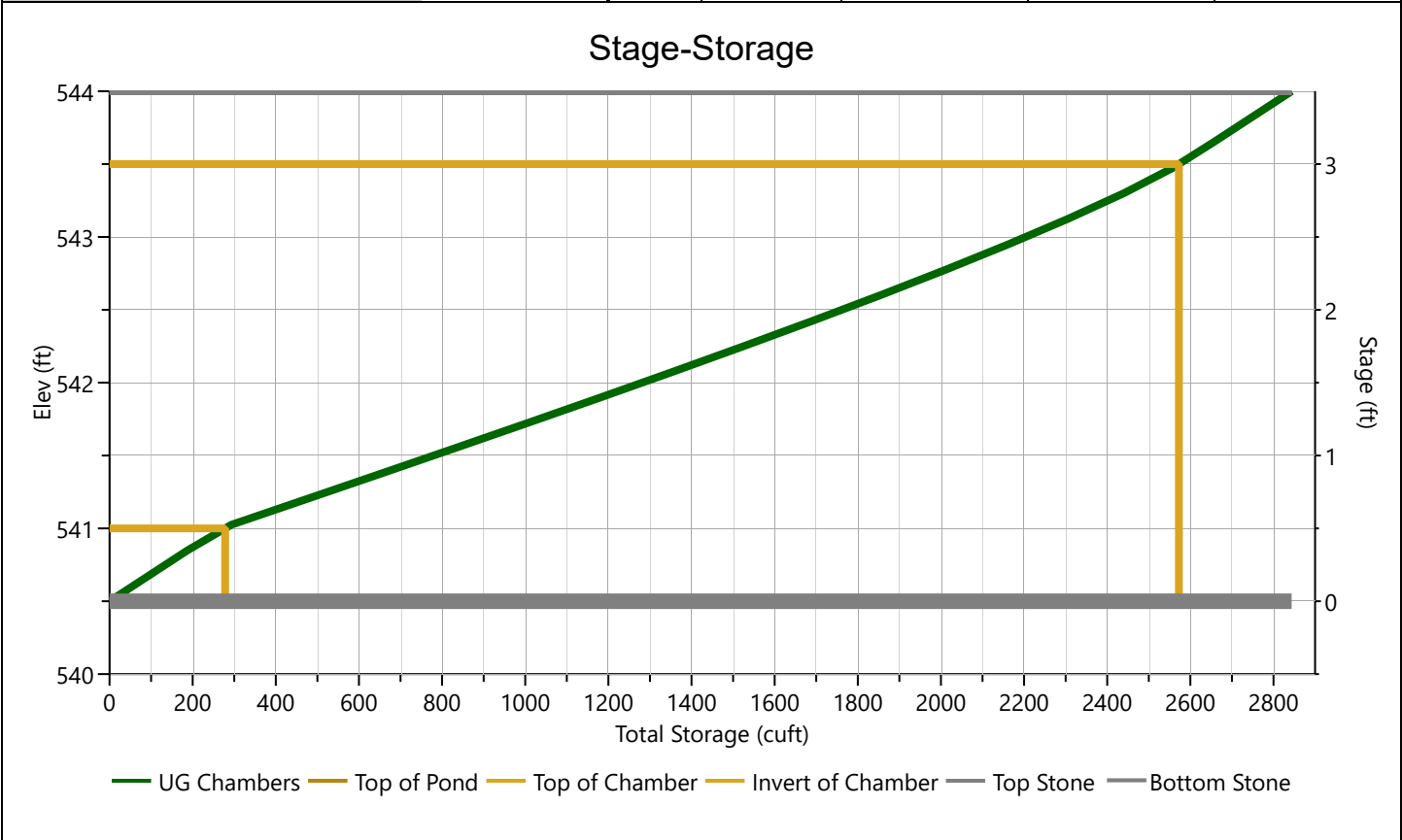
Center of mass detention time = 14 min



30" Stormtech

Stage-Storage

StormTech® SC-740™ Chamber		Stage / Storage Table				
Description	Input	Stage (in)	Elevation (ft)	Contour Area (sqft)	Incr. Storage (cuft)	Total Storage (cuft)
Chamber Height, in	30	0.0	540.50	1,343	0.000	0.000
Chamber Shape	Arch	2.1	540.68	1,343	94.0	94.0
Chamber Width, in	51	4.2	540.85	1,343	94.0	188
Installed Length, ft	7.12	6.3	541.03	1,343	105	293
No. Chambers	35	8.4	541.20	1,343	180	473
Bare Chamber Stor, cuft	1,607	10.5	541.38	1,343	179	652
No. Rows	5	12.6	541.55	1,343	178	830
Space Between Rows, in	6	14.7	541.73	1,343	177	1,007
Stone Above, in	6	16.8	541.90	1,343	175	1,183
Stone Below, in	6	18.9	542.08	1,343	173	1,355
Stone Sides, in	12	21.0	542.25	1,343	170	1,525
Stone Ends, in	12	23.1	542.43	1,343	166	1,692
Encasement Voids, %	40.00	25.2	542.60	1,343	162	1,854
Encasement Bottom Elevation, ft	540.50	27.3	542.78	1,343	157	2,011
		29.4	542.95	1,343	151	2,163
		31.5	543.13	1,343	144	2,306
		33.6	543.30	1,343	134	2,440
		35.7	543.48	1,343	119	2,559
		37.8	543.65	1,343	97.0	2,656
		39.9	543.83	1,343	94.0	2,750
		42.0	544.00	1,343	94.0	2,844

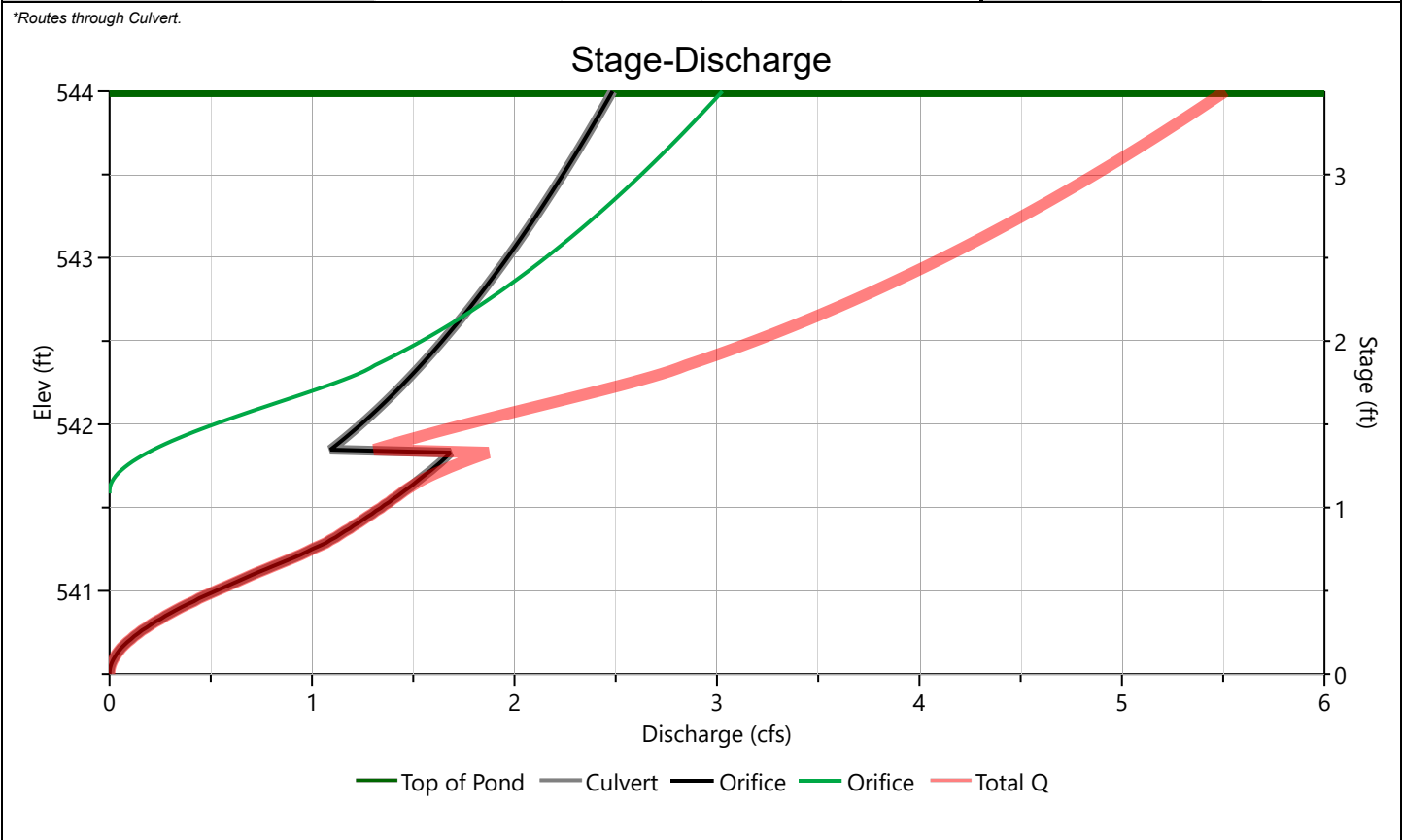


30" Stormtech

Stage-Discharge

Culvert / Orifices	Culvert	Orifices			Perforated Riser
		1*	2	3	
Rise, in	10	9.5	9		Hole Diameter, in
Span, in	10	9.5	9		No. holes
No. Barrels	1	1	1		Invert Elevation, ft
Invert Elevation, ft	540.50	540.51	541.60		Height, ft
Orifice Coefficient, Co	0.60	0.60	0.60		Orifice Coefficient, Co
Length, ft	100				
Barrel Slope, %					
N-Value, n	0.012				
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.



Pond Report

Project Name:

Hydrology Studio v 3.0.0.29

01-15-2024

30" Stormtech

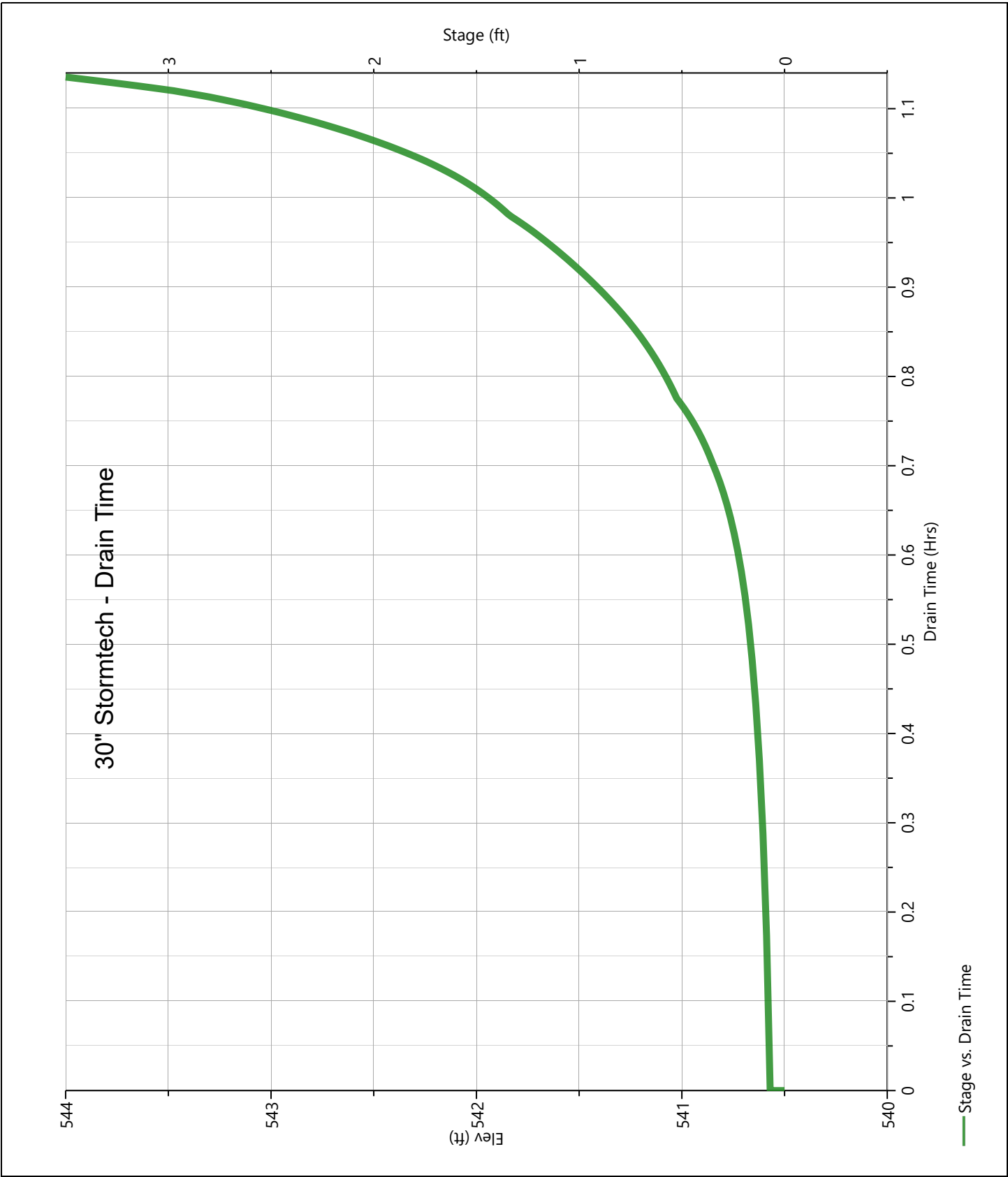
Stage-Storage-Discharge Summary

[illegible]

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

30" Stormtech

Pond Drawdown



Hydrograph Report

Project Name:

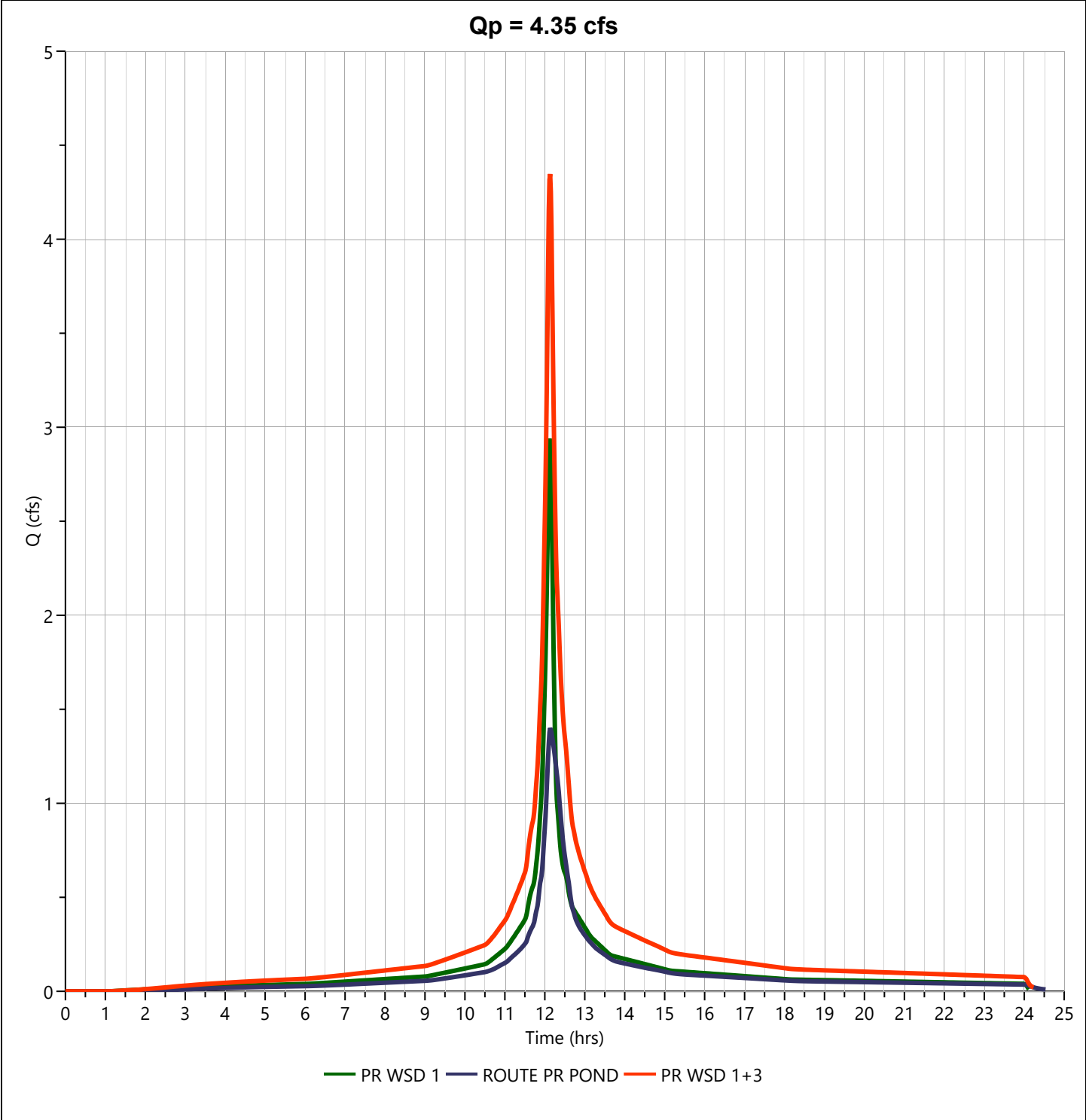
Hydrology Studio v 3.0.0.29

01-15-2024

PR WSD 1+3

Hyd. No. 10

Hydrograph Type	= Junction	Peak Flow	= 4.347 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.13 hrs
Time Interval	= 1 min	Hydrograph Volume	= 19,257 cuft
Inflow Hydrographs	= 3, 8	Total Contrib. Area	= 1.2 ac



Hydrograph 10-yr Summary

Project Name:

Hydrology Studio v 3.0.0.29

01-15-2024

[illegible]

Hydrograph Report

Project Name:

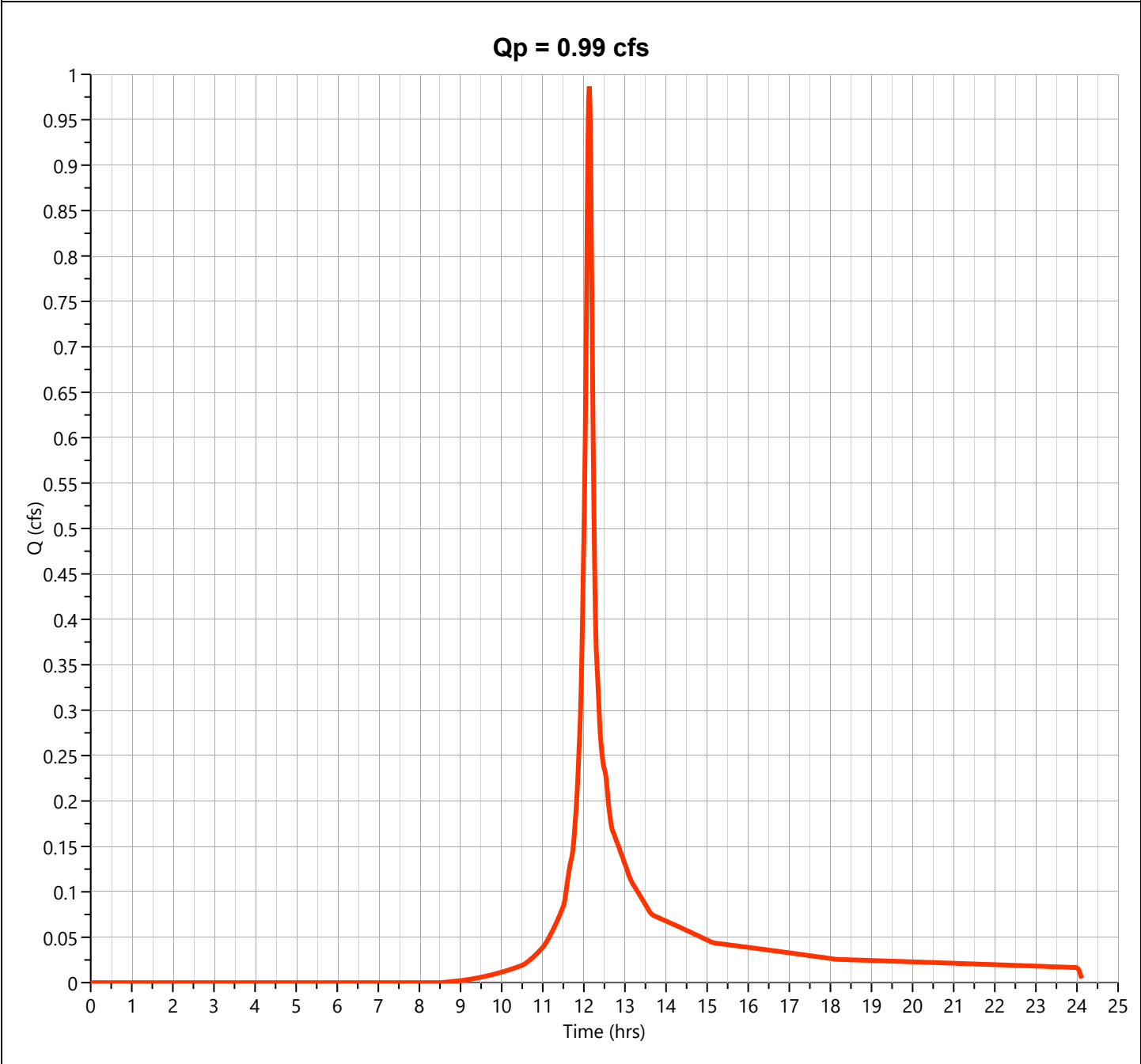
Hydrology Studio v 3.0.0.29

01-15-2024

PR WSD 1 PERV UNDET

Hyd. No. 1

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.987 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.13 hrs
Time Interval	= 1 min	Runoff Volume	= 3,214 cuft
Drainage Area	= 0.37 ac	Curve Number	= 73
Tc Method	= User	Time of Conc. (Tc)	= 8.0 min
Total Rainfall	= 5.22 in	Design Storm	= NOAA-D
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

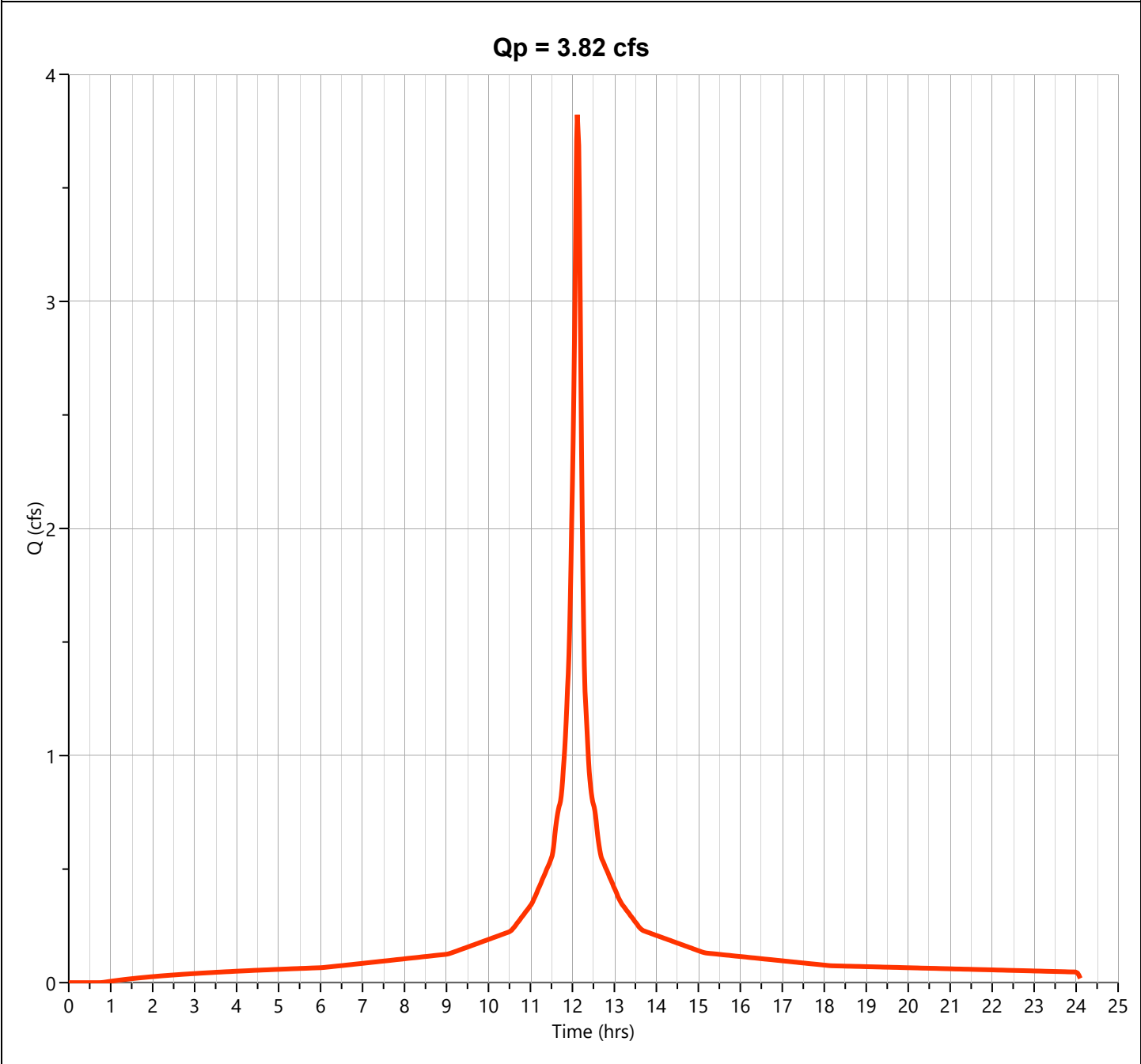
Hydrology Studio v 3.0.0.29

01-15-2024

PR WSD 1 IMP UNDET

Hyd. No. 2

Hydrograph Type	= NRCS Runoff	Peak Flow	= 3.822 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.12 hrs
Time Interval	= 1 min	Runoff Volume	= 14,637 cuft
Drainage Area	= 0.83 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 8.0 min
Total Rainfall	= 5.22 in	Design Storm	= NOAA-D
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

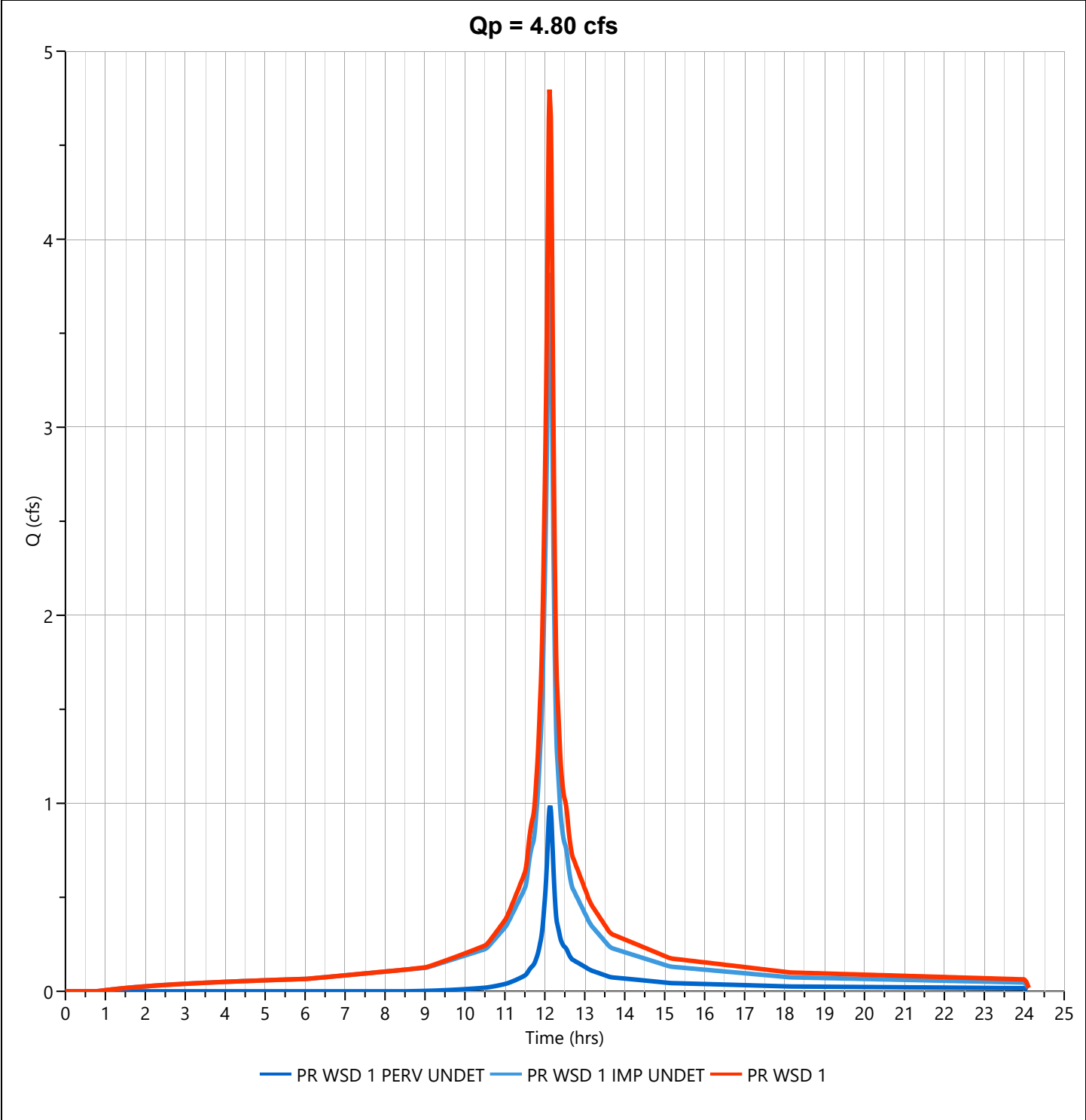
Hydrology Studio v 3.0.0.29

01-15-2024

PR WSD 1

Hyd. No. 3

Hydrograph Type	= Junction	Peak Flow	= 4.803 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.13 hrs
Time Interval	= 1 min	Hydrograph Volume	= 17,851 cuft
Inflow Hydrographs	= 1, 2	Total Contrib. Area	= 1.2 ac



Hydrograph Report

Project Name:

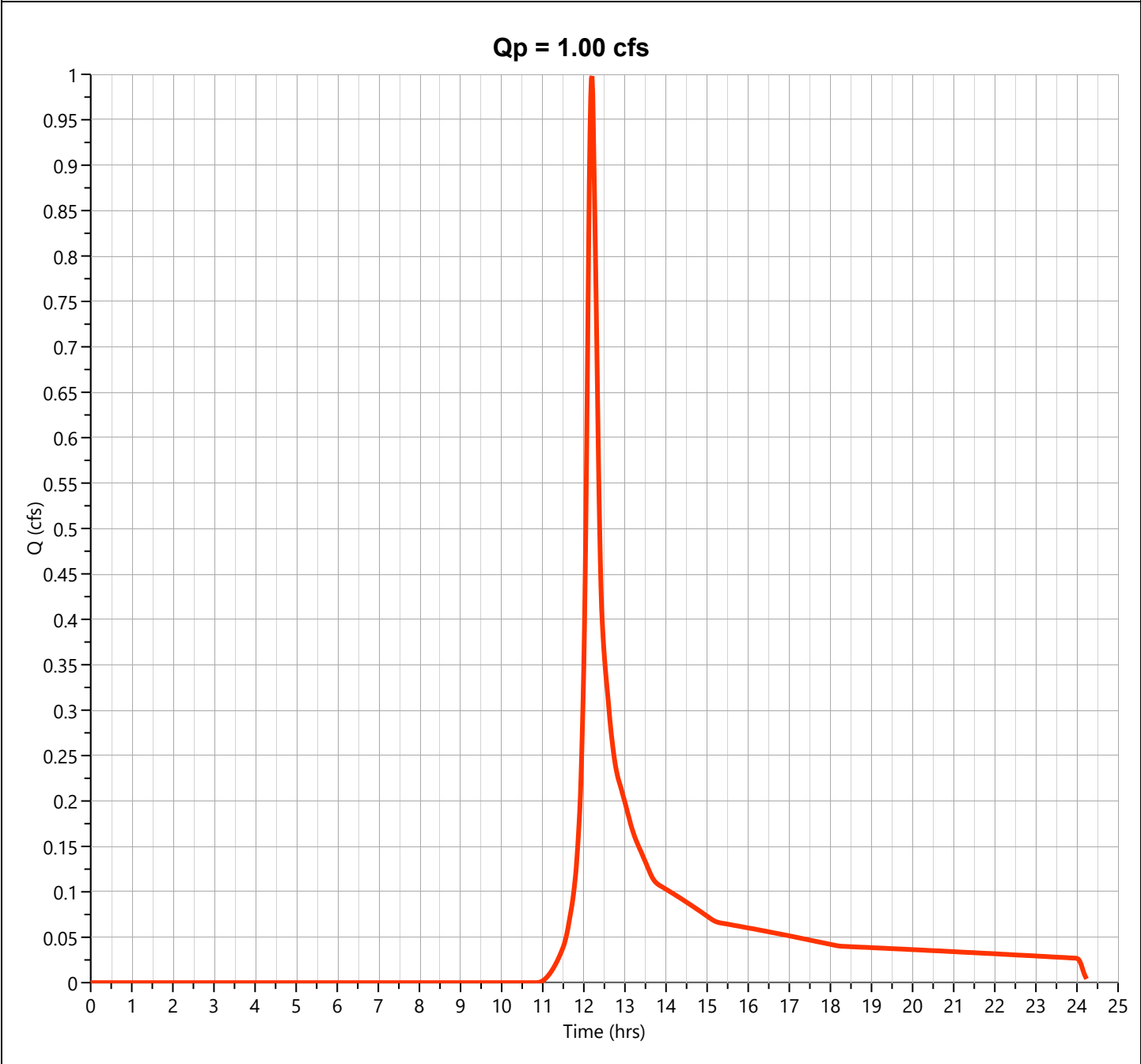
Hydrology Studio v 3.0.0.29

01-15-2024

PR WSD 3 PERV DET

Hyd. No. 5

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.998 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.20 hrs
Time Interval	= 1 min	Runoff Volume	= 4,082 cuft
Drainage Area	= 0.76 ac	Curve Number	= 61
Tc Method	= User	Time of Conc. (Tc)	= 12.0 min
Total Rainfall	= 5.22 in	Design Storm	= NOAA-D
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

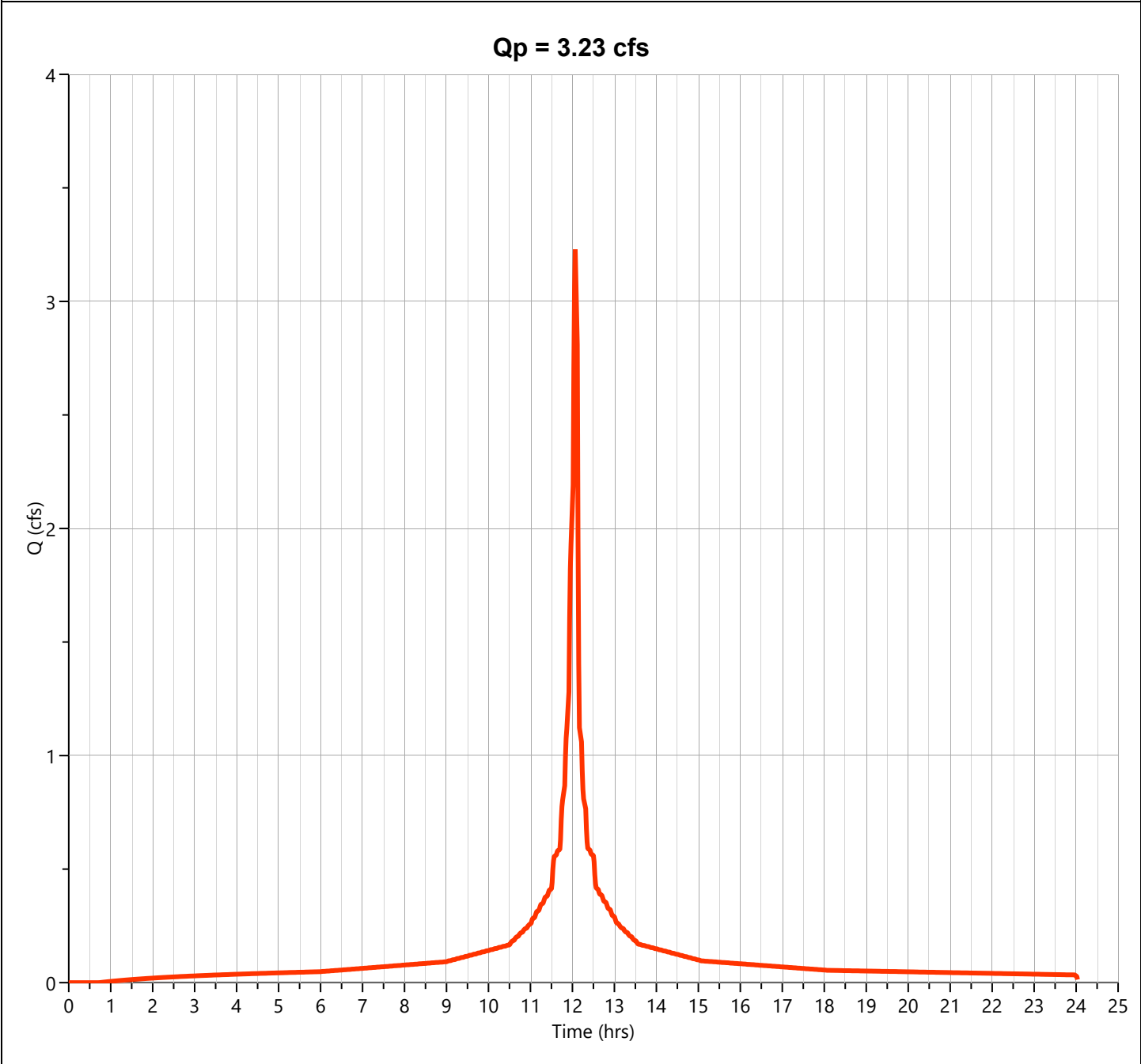
Hydrology Studio v 3.0.0.29

01-15-2024

PR WSD 3 IMP DET

Hyd. No. 6

Hydrograph Type	= NRCS Runoff	Peak Flow	= 3.230 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.10 hrs
Time Interval	= 1 min	Runoff Volume	= 10,683 cuft
Drainage Area	= 0.63 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 3.0 min
Total Rainfall	= 5.22 in	Design Storm	= NOAA-D
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

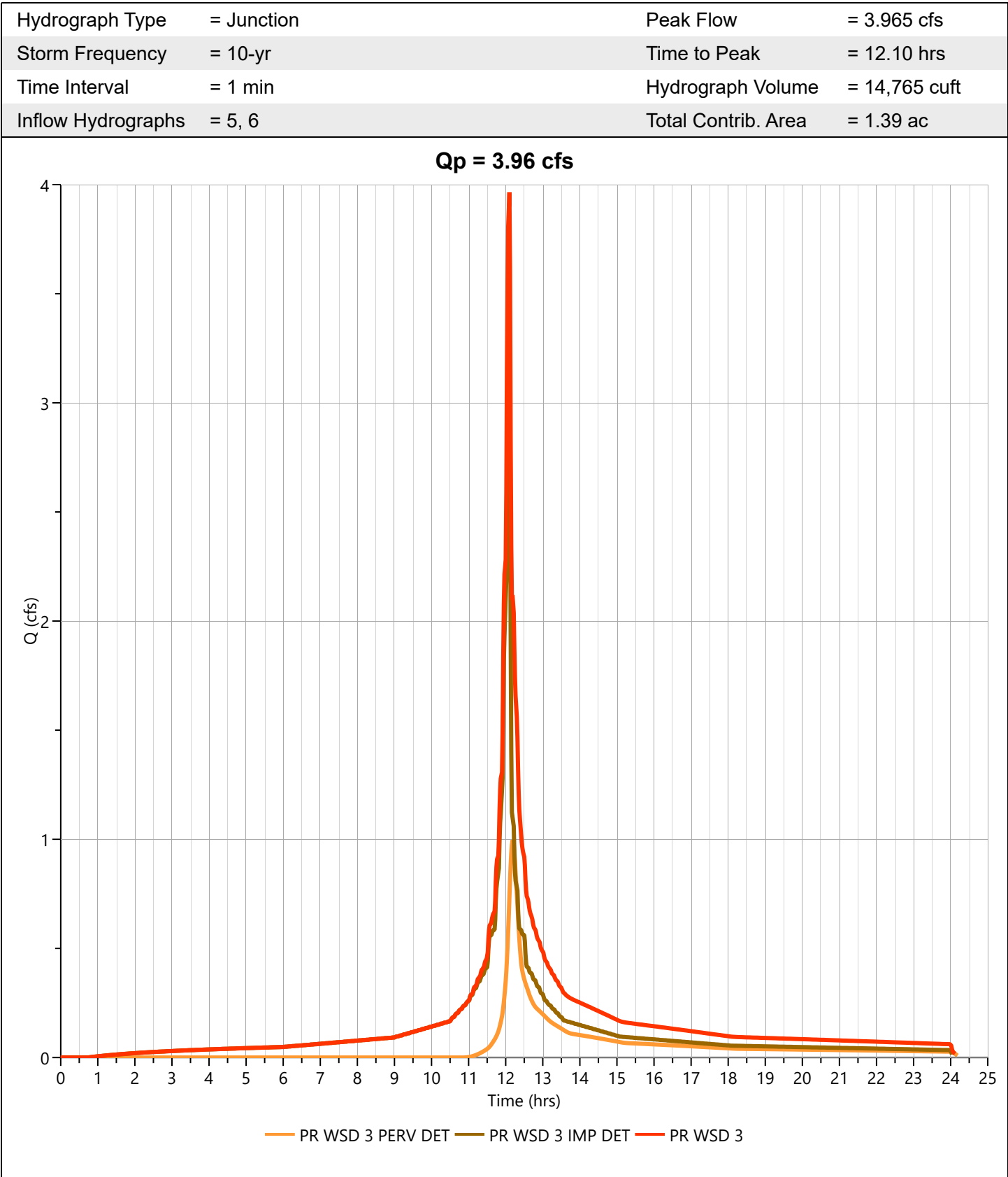
Project Name:

Hydrology Studio v 3.0.0.29

01-15-2024

PR WSD 3

Hyd. No. 7



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

01-15-2024

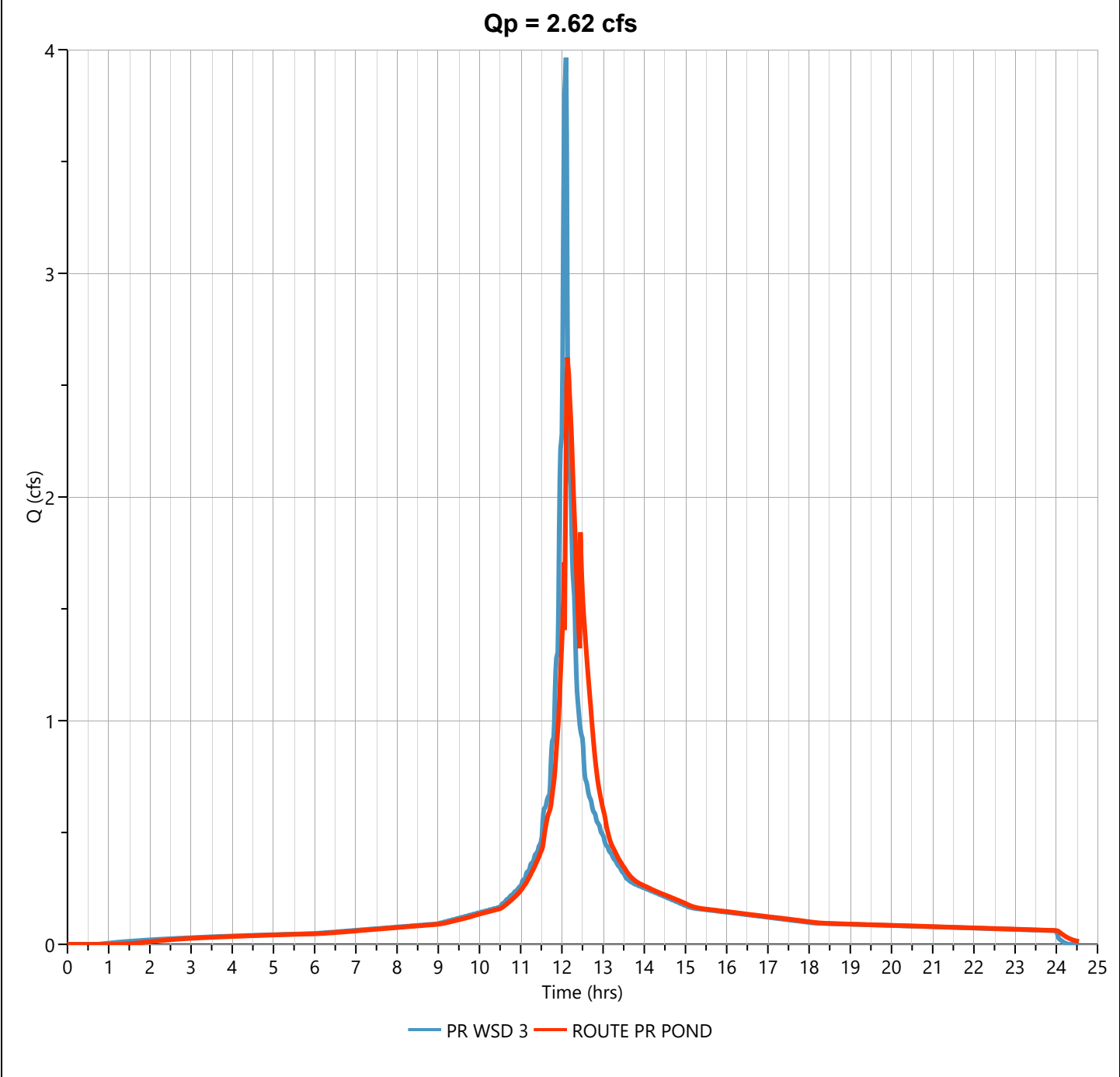
ROUTE PR POND

Hyd. No. 8

Hydrograph Type	= Pond Route	Peak Flow	= 2.624 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.13 hrs
Time Interval	= 1 min	Hydrograph Volume	= 14,752 cuft
Inflow Hydrograph	= 7 - PR WSD 3	Max. Elevation	= 542.27 ft
Pond Name	= 30" Stormtech	Max. Storage	= 1,541 cuft

Pond Routing by Storage Indication Method

Center of mass detention time = 12 min



Hydrograph Report

Project Name:

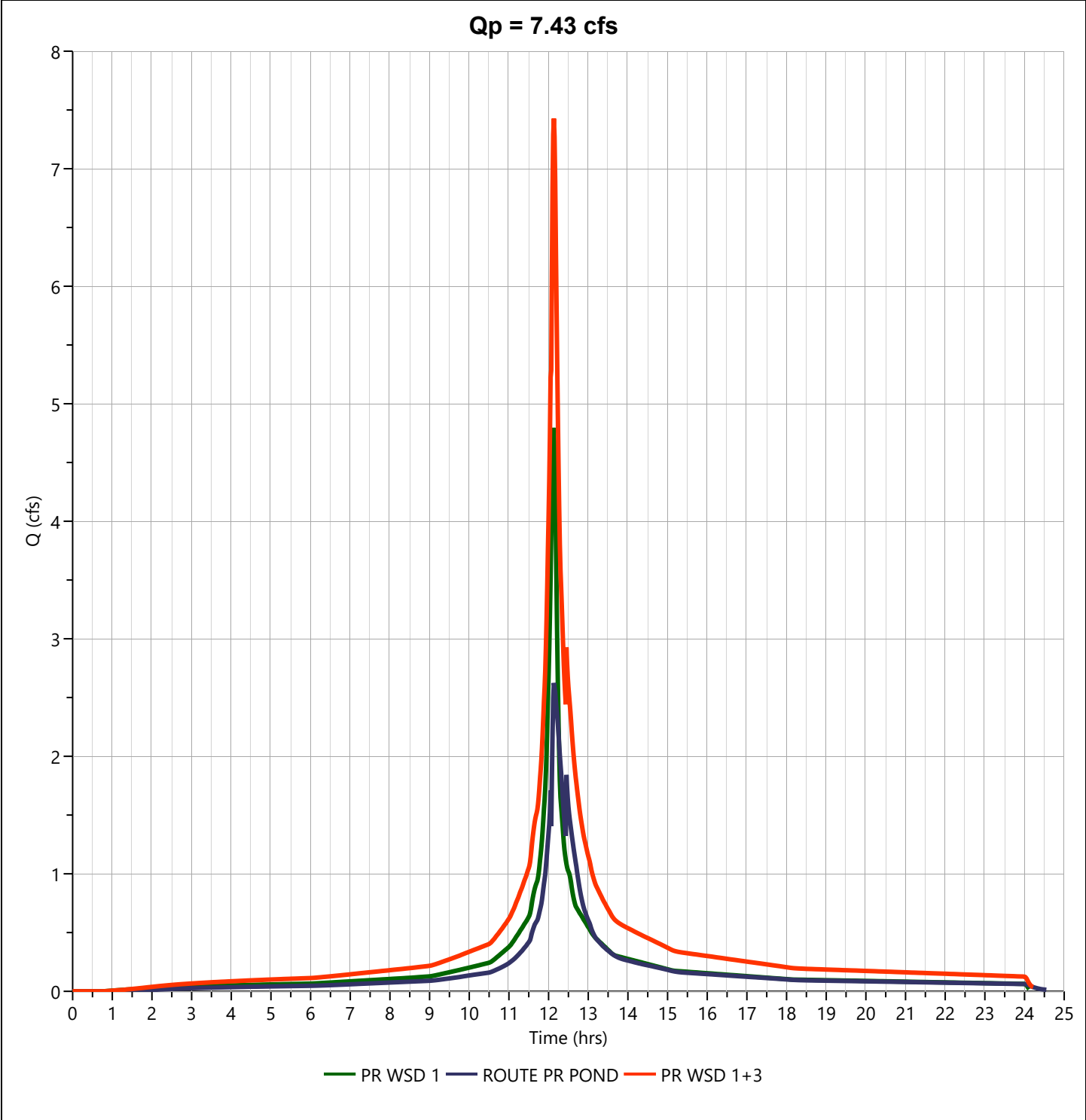
Hydrology Studio v 3.0.0.29

01-15-2024

PR WSD 1+3

Hyd. No. 10

Hydrograph Type	= Junction	Peak Flow	= 7.427 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.13 hrs
Time Interval	= 1 min	Hydrograph Volume	= 32,604 cuft
Inflow Hydrographs	= 3, 8	Total Contrib. Area	= 1.2 ac



Hydrograph 100-yr Summary

Project Name:

Hydrology Studio v 3.0.0.29

01-15-2024

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 WSD 1 PERV UNDET	2.143	12.13	7,070	----		
2	NRCS Runoff	PR WSD 1 IMP UNDET	6.362	12.12	24,734	----		
3	Junction	PR WSD 1	8.494	12.13	31,804	1, 2		
5	NRCS Runoff	PR WSD 3 PERV DET	2.787	12.18	10,741	----		
6	NRCS Runoff	PR WSD 3 IMP DET	5.374	12.10	18,052	----		
7	Junction	PR WSD 3	7.576	12.10	28,793	5, 6		
8	Pond Route	ROUTE PR POND	5.369	12.15	28,781	7	543.90	2,782
10	Junction	PR WSD 1+3	13.85	12.13	60,585	3, 8		

Hydrograph Report

Project Name:

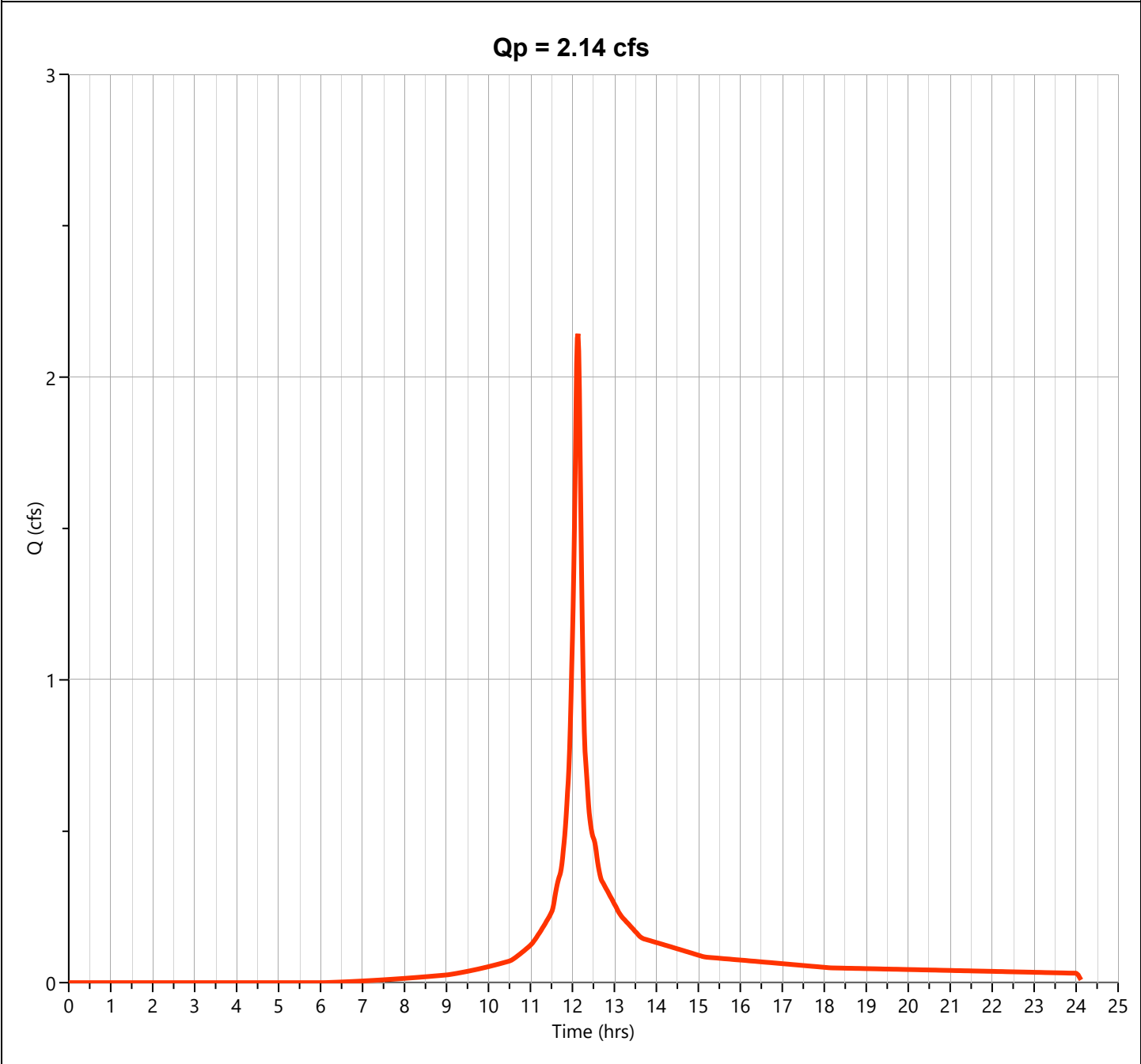
Hydrology Studio v 3.0.0.29

01-15-2024

PR WSD 1 PERV UNDET

Hyd. No. 1

Hydrograph Type	= NRCS Runoff	Peak Flow	= 2.143 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.13 hrs
Time Interval	= 1 min	Runoff Volume	= 7,070 cuft
Drainage Area	= 0.37 ac	Curve Number	= 73
Tc Method	= User	Time of Conc. (Tc)	= 8.0 min
Total Rainfall	= 8.66 in	Design Storm	= NOAA-D
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

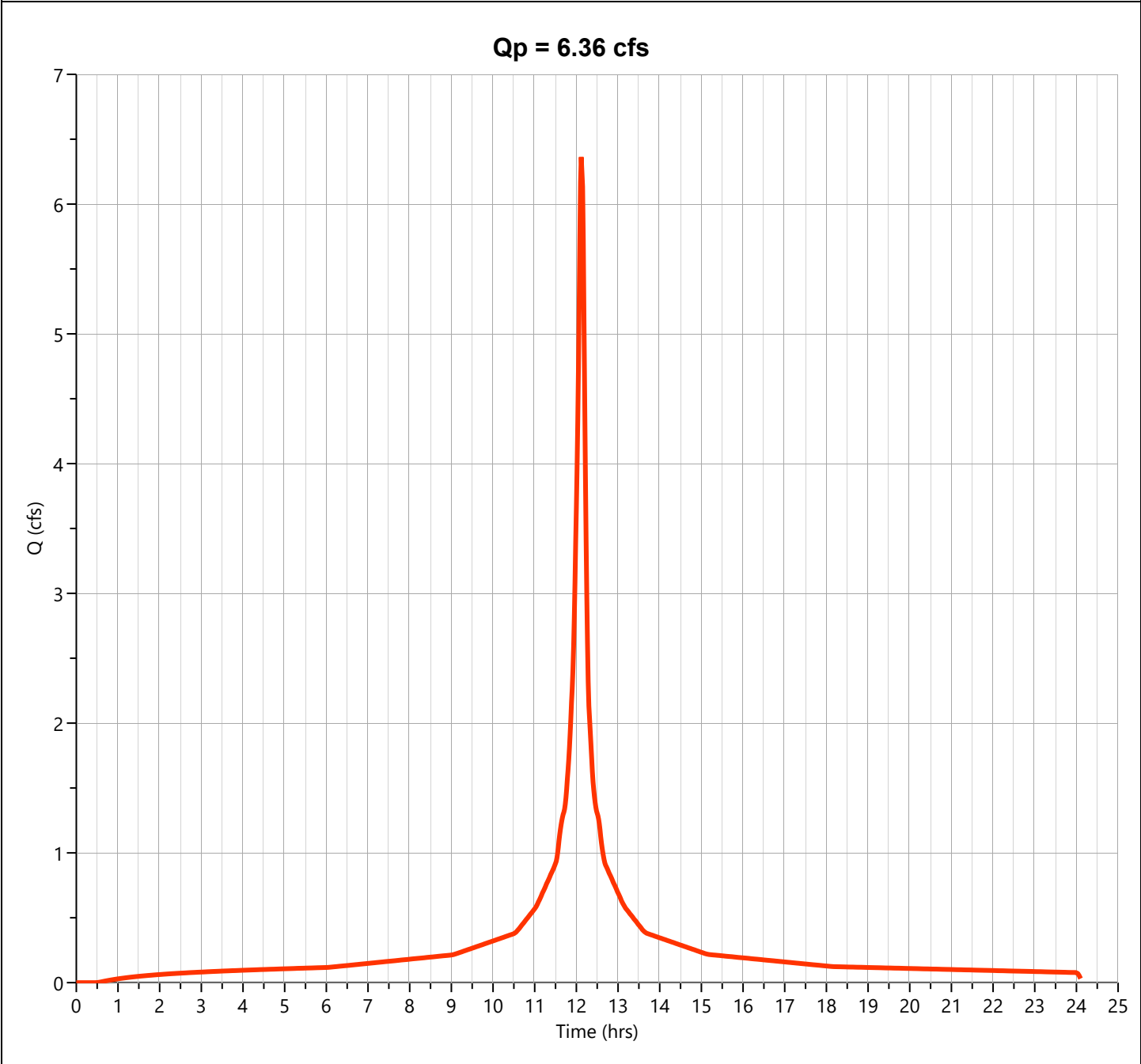
Hydrology Studio v 3.0.0.29

01-15-2024

PR WSD 1 IMP UNDET

Hyd. No. 2

Hydrograph Type	= NRCS Runoff	Peak Flow	= 6.362 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.12 hrs
Time Interval	= 1 min	Runoff Volume	= 24,734 cuft
Drainage Area	= 0.83 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 8.0 min
Total Rainfall	= 8.66 in	Design Storm	= NOAA-D
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

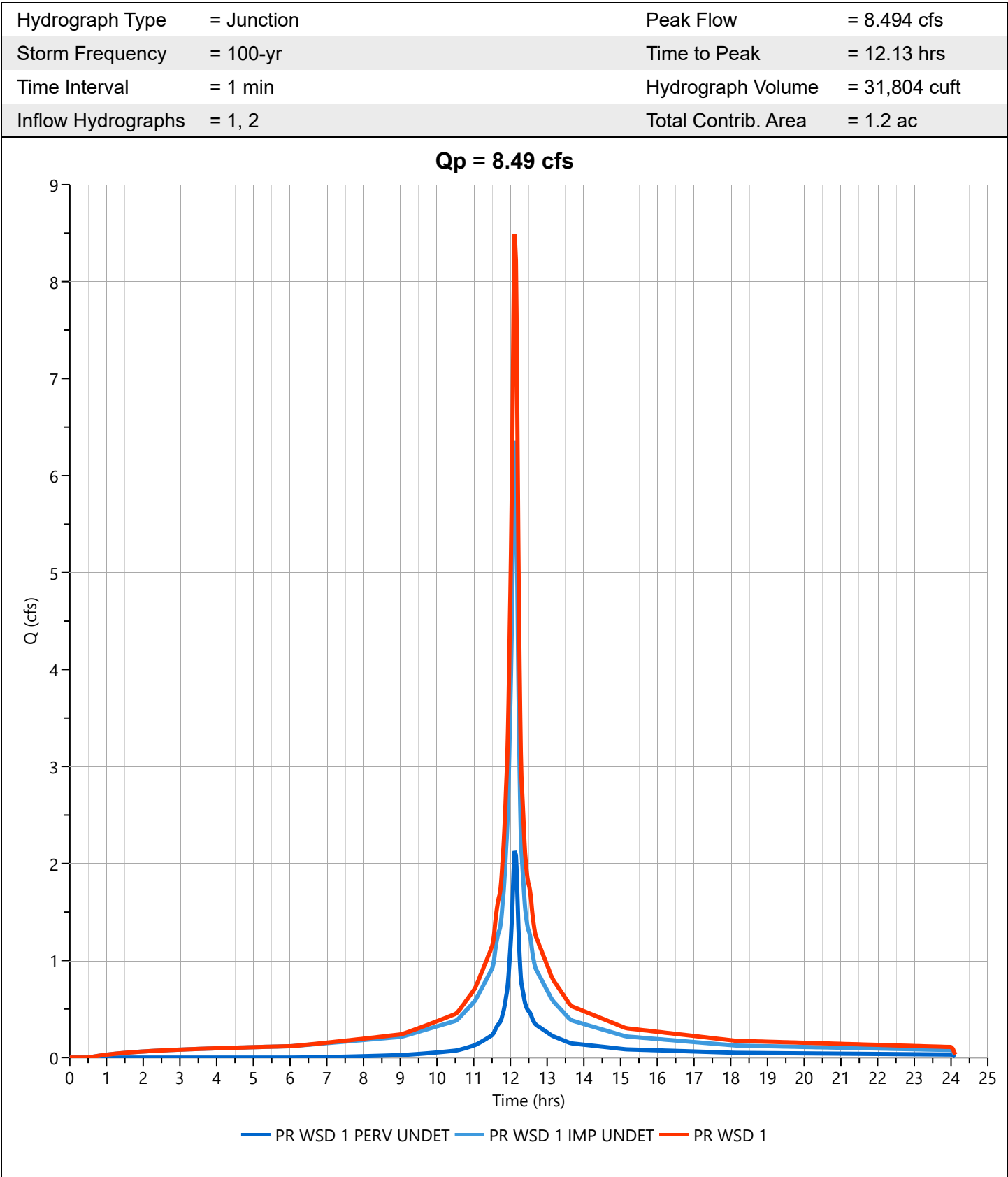
Project Name:

Hydrology Studio v 3.0.0.29

01-15-2024

PR WSD 1

Hyd. No. 3



Hydrograph Report

Project Name:

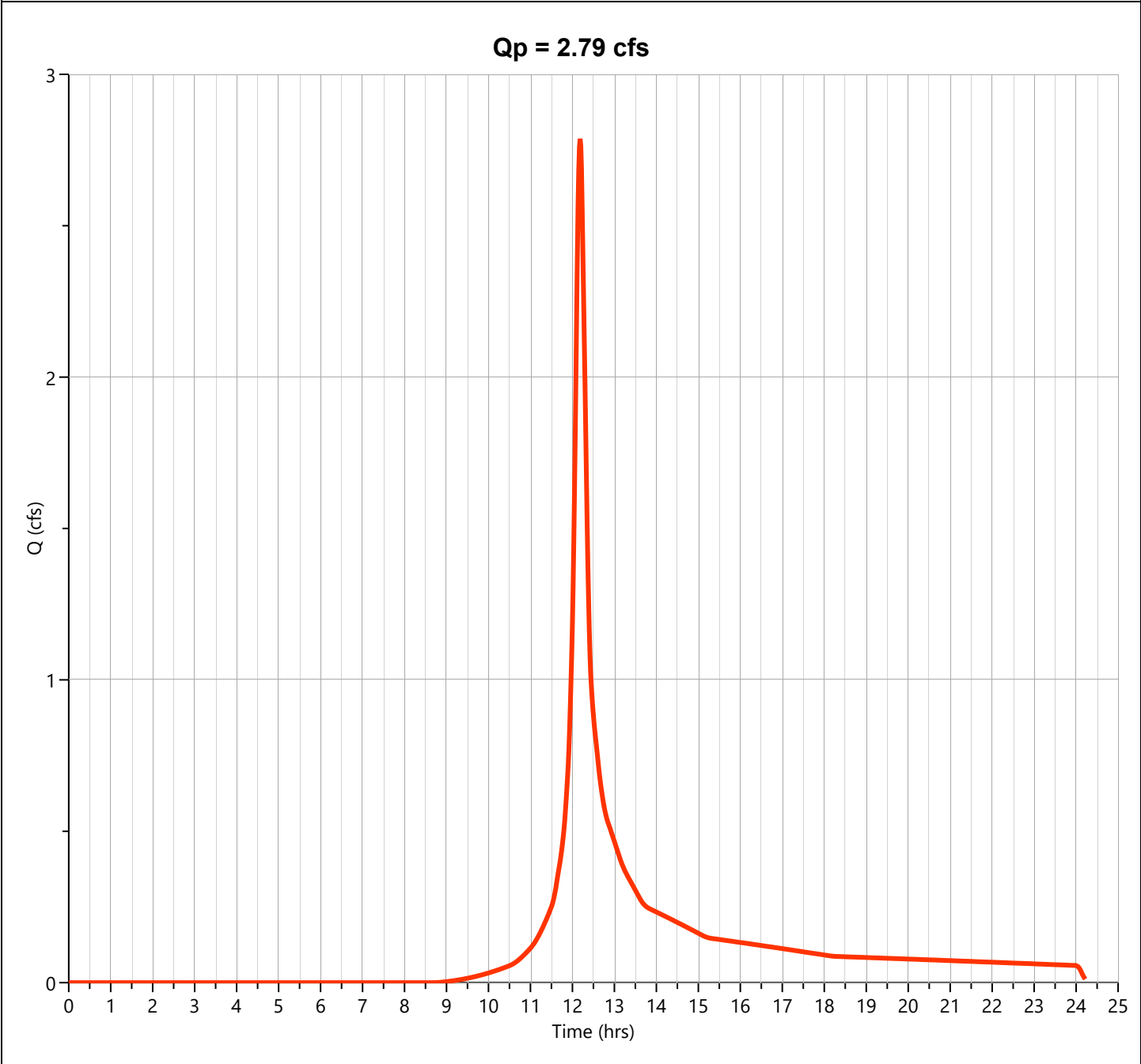
Hydrology Studio v 3.0.0.29

01-15-2024

PR WSD 3 PERV DET

Hyd. No. 5

Hydrograph Type	= NRCS Runoff	Peak Flow	= 2.787 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.18 hrs
Time Interval	= 1 min	Runoff Volume	= 10,741 cuft
Drainage Area	= 0.76 ac	Curve Number	= 61
Tc Method	= User	Time of Conc. (Tc)	= 12.0 min
Total Rainfall	= 8.66 in	Design Storm	= NOAA-D
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

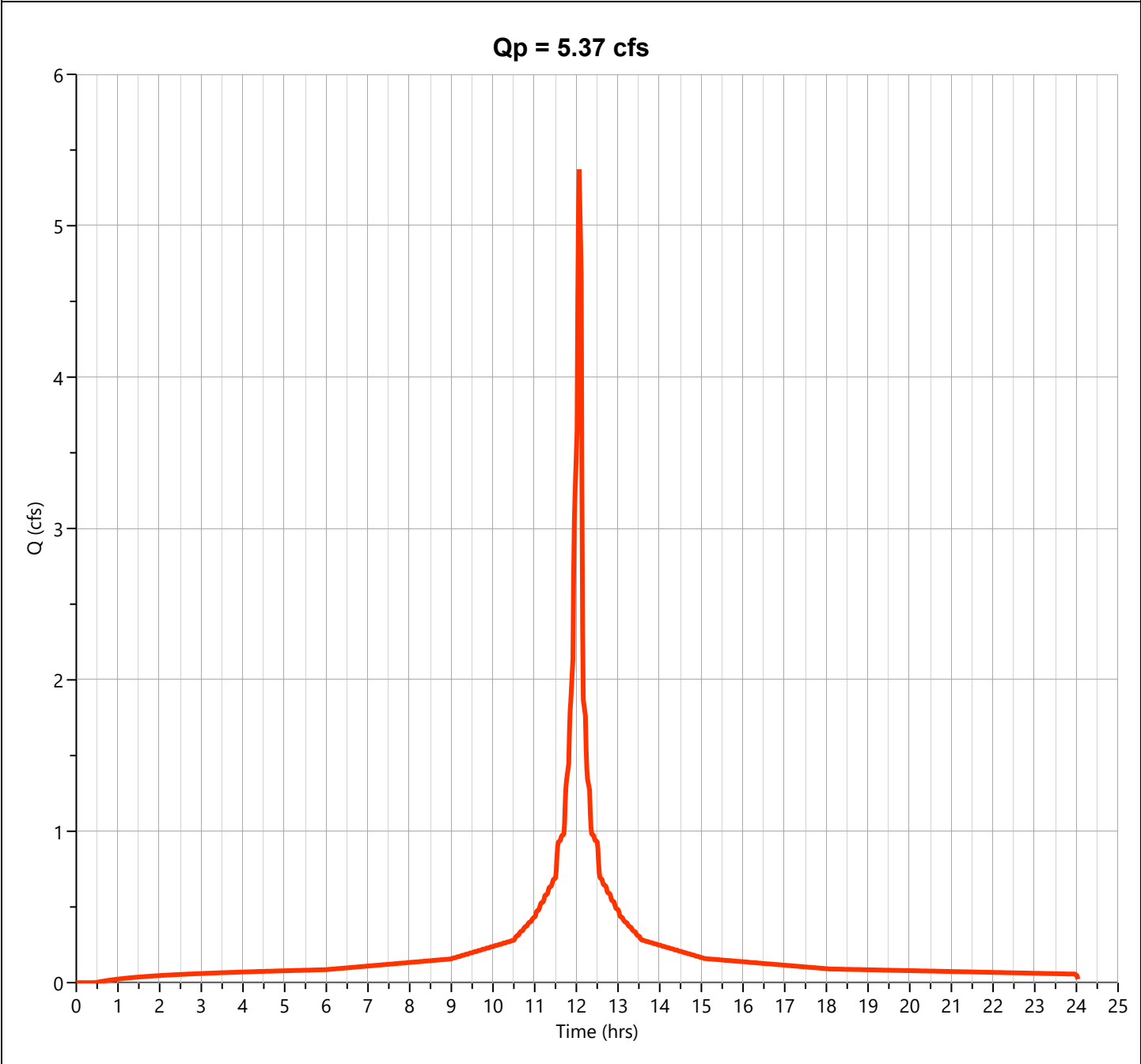
Hydrology Studio v 3.0.0.29

01-15-2024

PR WSD 3 IMP DET

Hyd. No. 6

Hydrograph Type	= NRCS Runoff	Peak Flow	= 5.374 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.10 hrs
Time Interval	= 1 min	Runoff Volume	= 18,052 cuft
Drainage Area	= 0.63 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 3.0 min
Total Rainfall	= 8.66 in	Design Storm	= NOAA-D
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

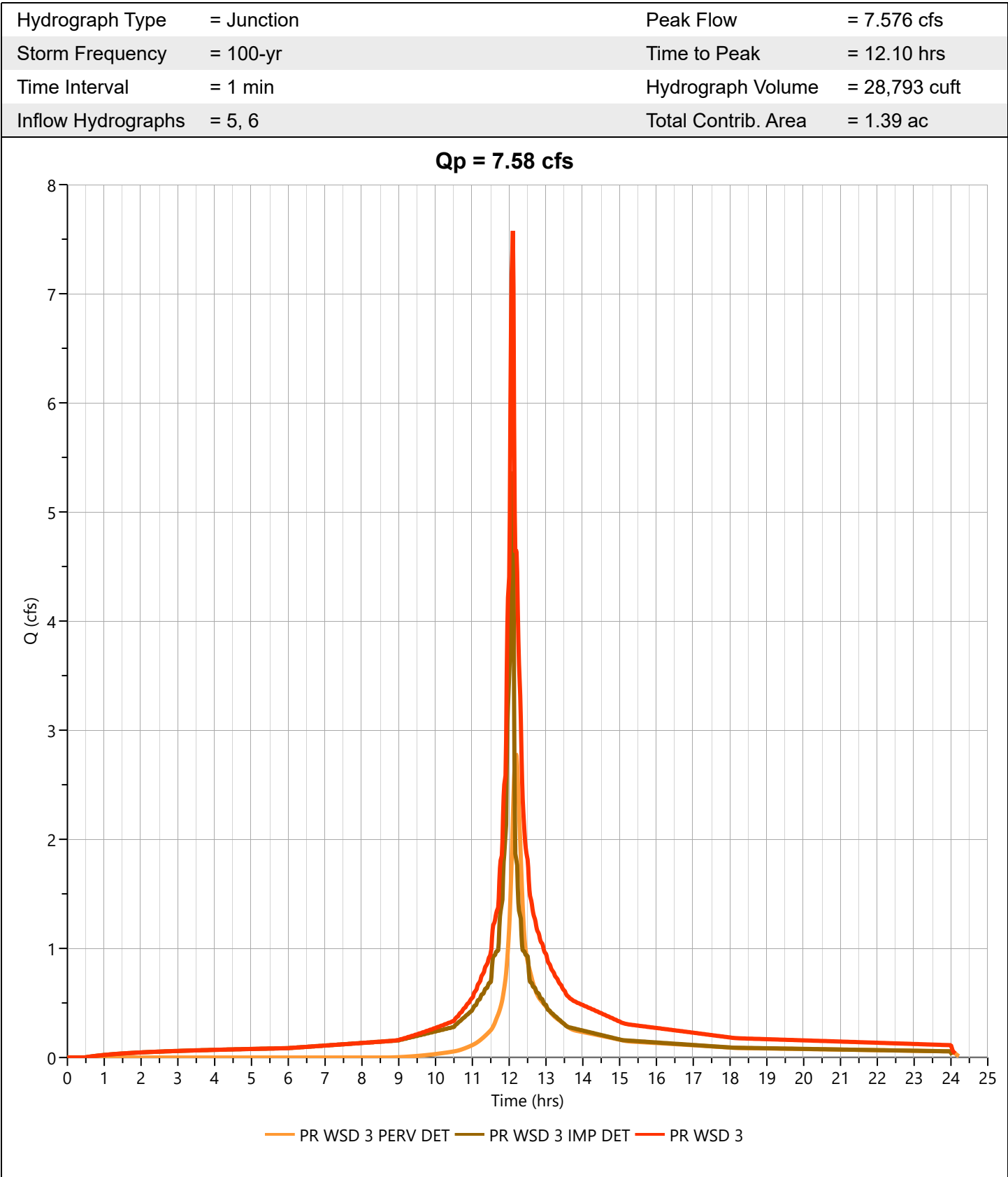
Project Name:

Hydrology Studio v 3.0.0.29

01-15-2024

PR WSD 3

Hyd. No. 7



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

01-15-2024

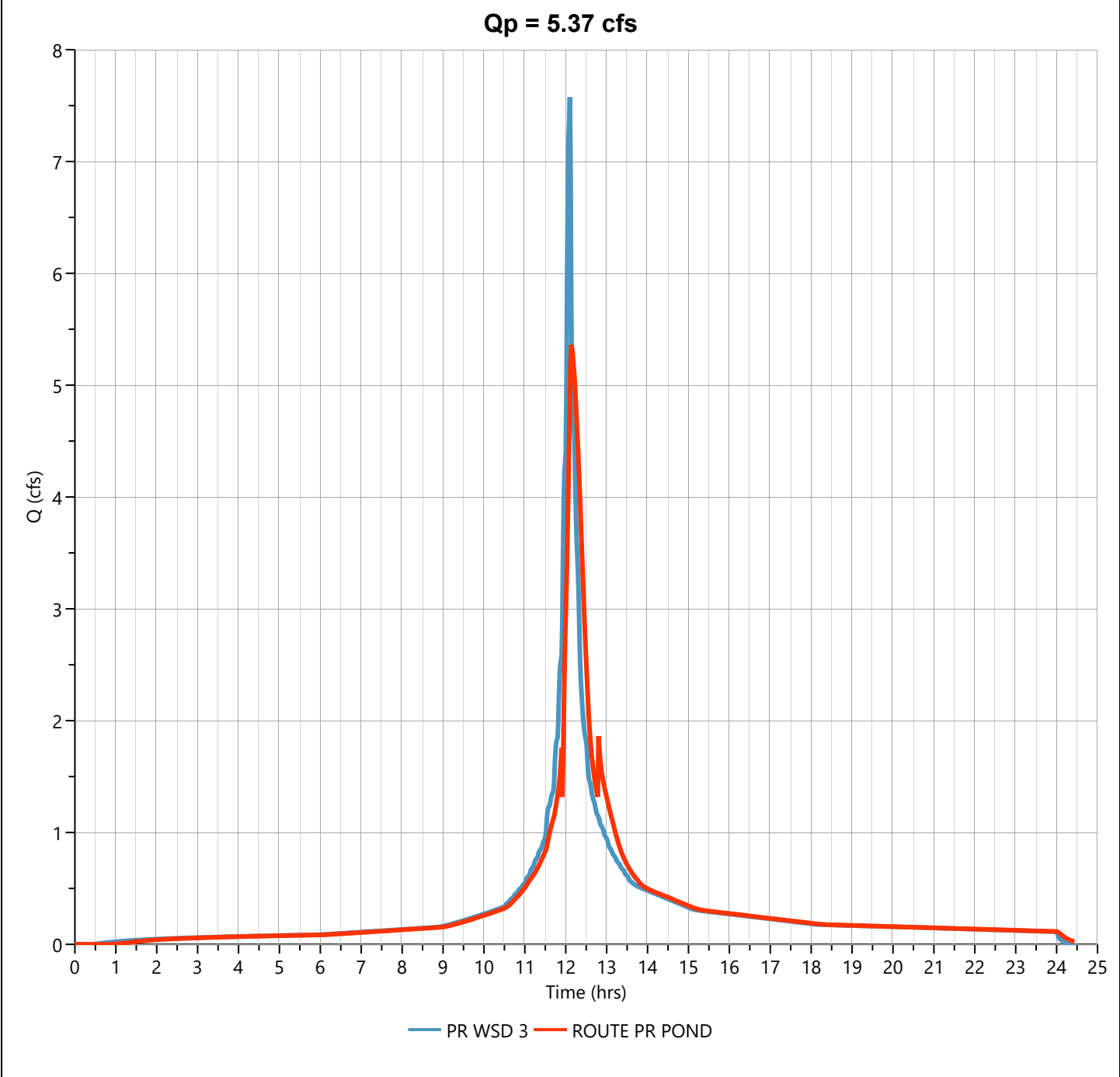
ROUTE PR POND

Hyd. No. 8

Hydrograph Type	= Pond Route	Peak Flow	= 5.369 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.15 hrs
Time Interval	= 1 min	Hydrograph Volume	= 28,781 cuft
Inflow Hydrograph	= 7 - PR WSD 3	Max. Elevation	= 543.90 ft
Pond Name	= 30" Stormtech	Max. Storage	= 2,782 cuft

Pond Routing by Storage Indication Method

Center of mass detention time = 10 min



Hydrograph Report

Project Name:

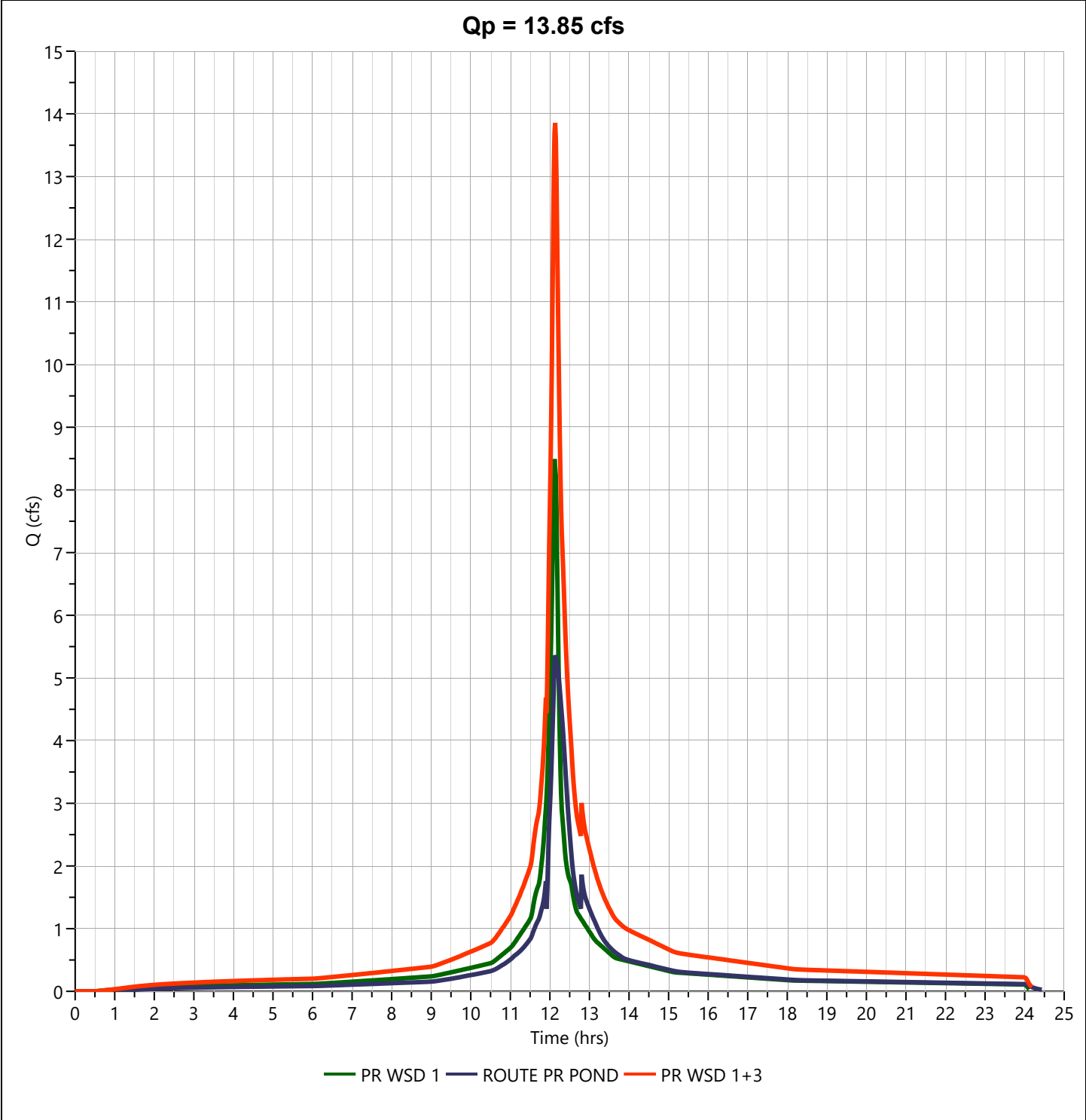
Hydrology Studio v 3.0.0.29

01-15-2024

PR WSD 1+3

Hyd. No. 10

Hydrograph Type	= Junction	Peak Flow	= 13.85 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.13 hrs
Time Interval	= 1 min	Hydrograph Volume	= 60,585 cuft
Inflow Hydrographs	= 3, 8	Total Contrib. Area	= 1.2 ac

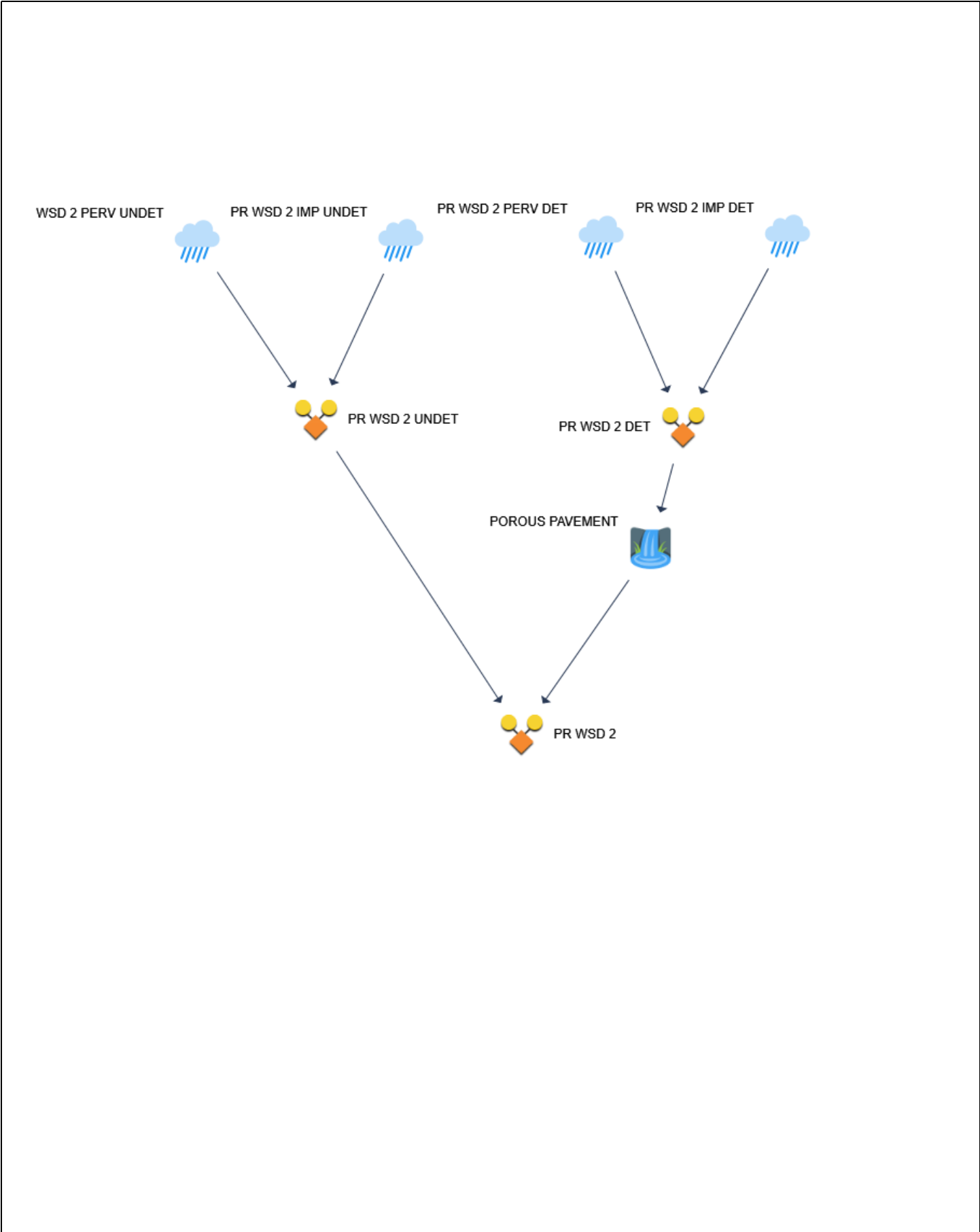


Basin Model

Hydrology Studio v 3.0.0.29

Project Name:

01-15-2024



Hydrograph 2-yr Summary

Project Name:

Hydrology Studio v 3.0.0.29

01-15-2024

[illegible]

Hydrograph Report

Project Name:

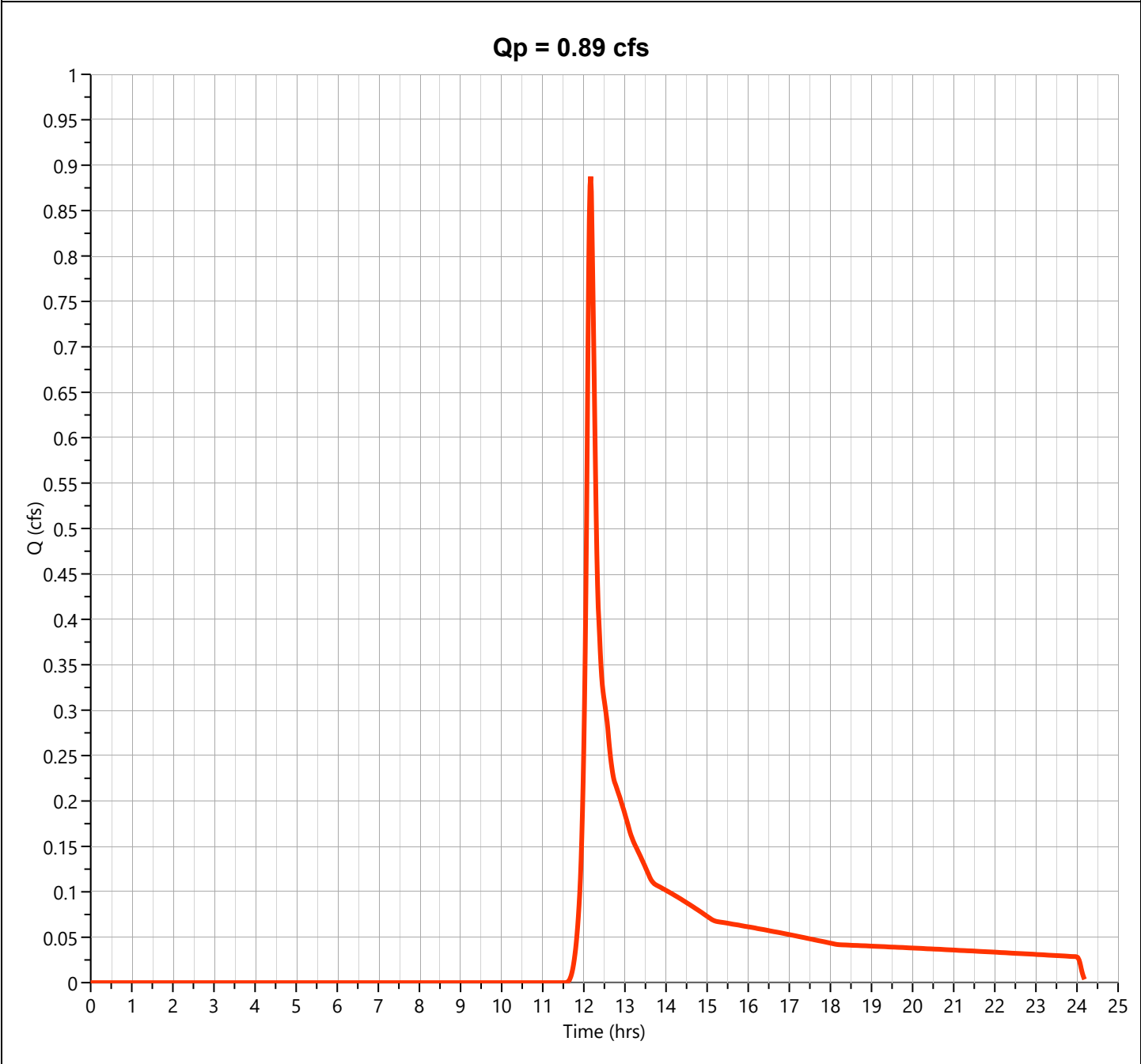
Hydrology Studio v 3.0.0.29

01-15-2024

PR WSD 2 PERV UNDET

Hyd. No. 1

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.888 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.17 hrs
Time Interval	= 1 min	Runoff Volume	= 3,675 cuft
Drainage Area	= 1.5 ac	Curve Number	= 64
Tc Method	= User	Time of Conc. (Tc)	= 9.0 min
Total Rainfall	= 3.44 in	Design Storm	= NOAA-D
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

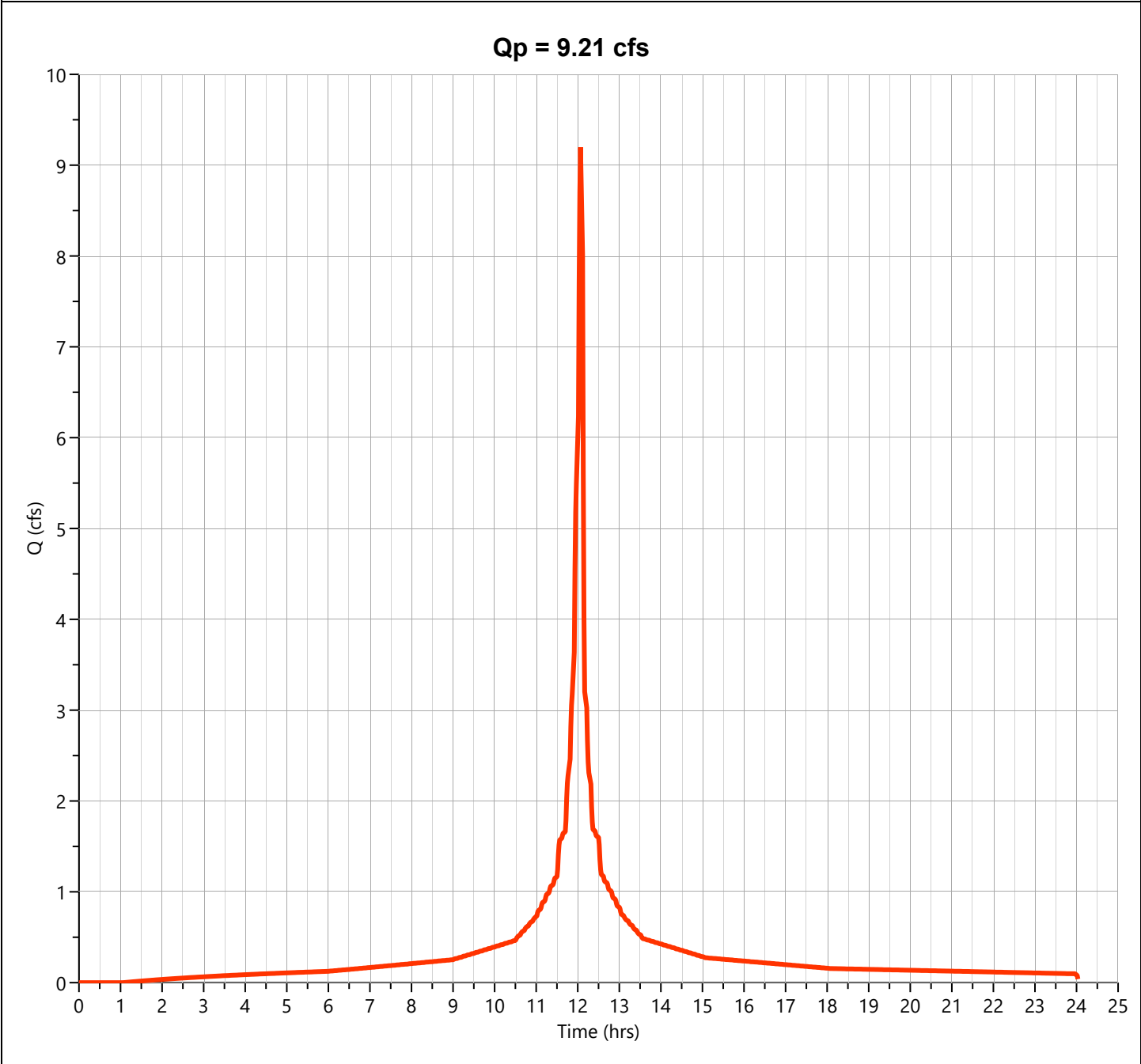
Hydrology Studio v 3.0.0.29

01-15-2024

PR WSD 2 IMP UNDET

Hyd. No. 2

Hydrograph Type	= NRCS Runoff	Peak Flow	= 9.208 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.10 hrs
Time Interval	= 1 min	Runoff Volume	= 29,901 cuft
Drainage Area	= 2.74 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 3.0 min
Total Rainfall	= 3.44 in	Design Storm	= NOAA-D
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

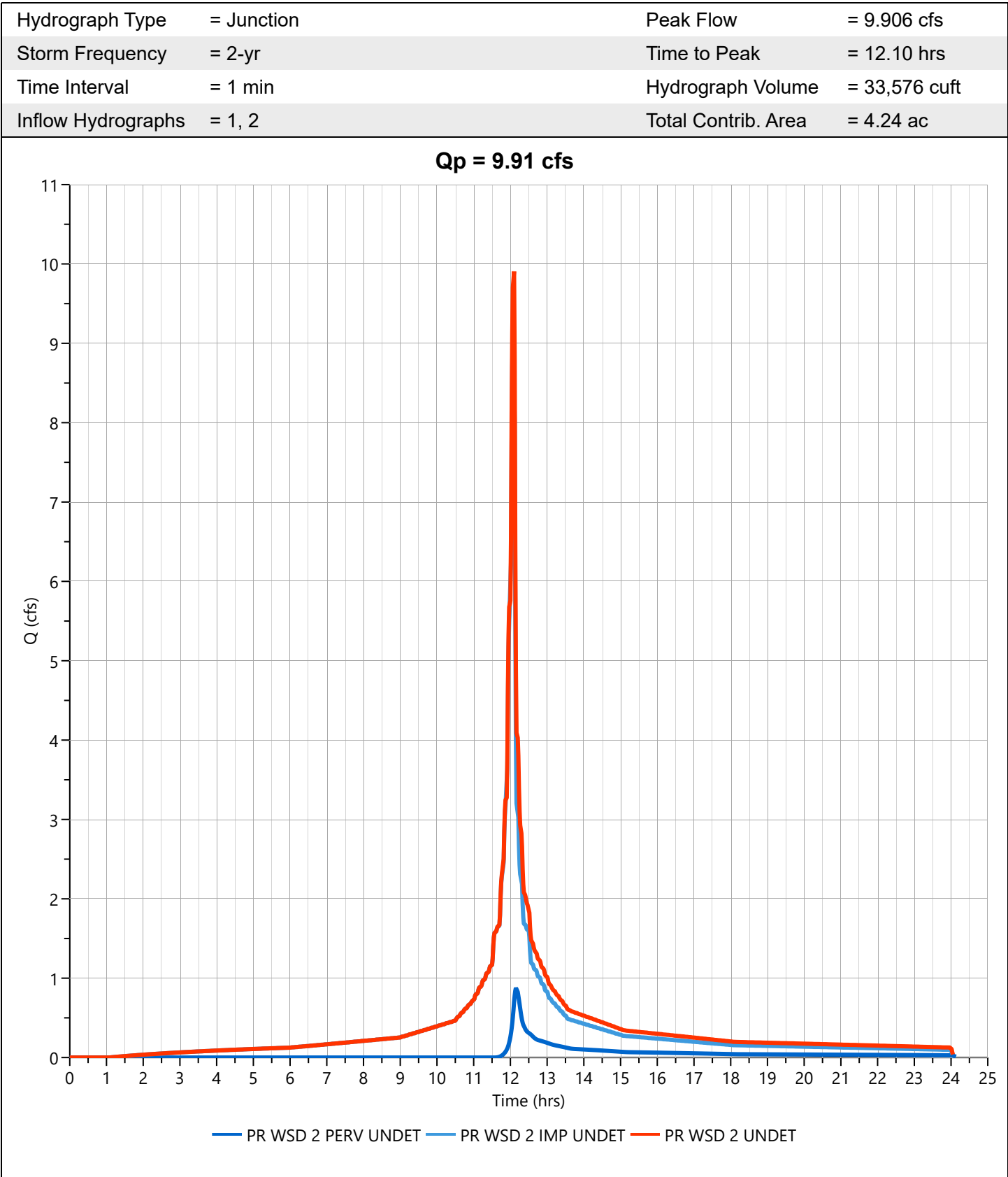
Project Name:

Hydrology Studio v 3.0.0.29

01-15-2024

PR WSD 2 UNDET

Hyd. No. 3



Hydrograph Report

Project Name:

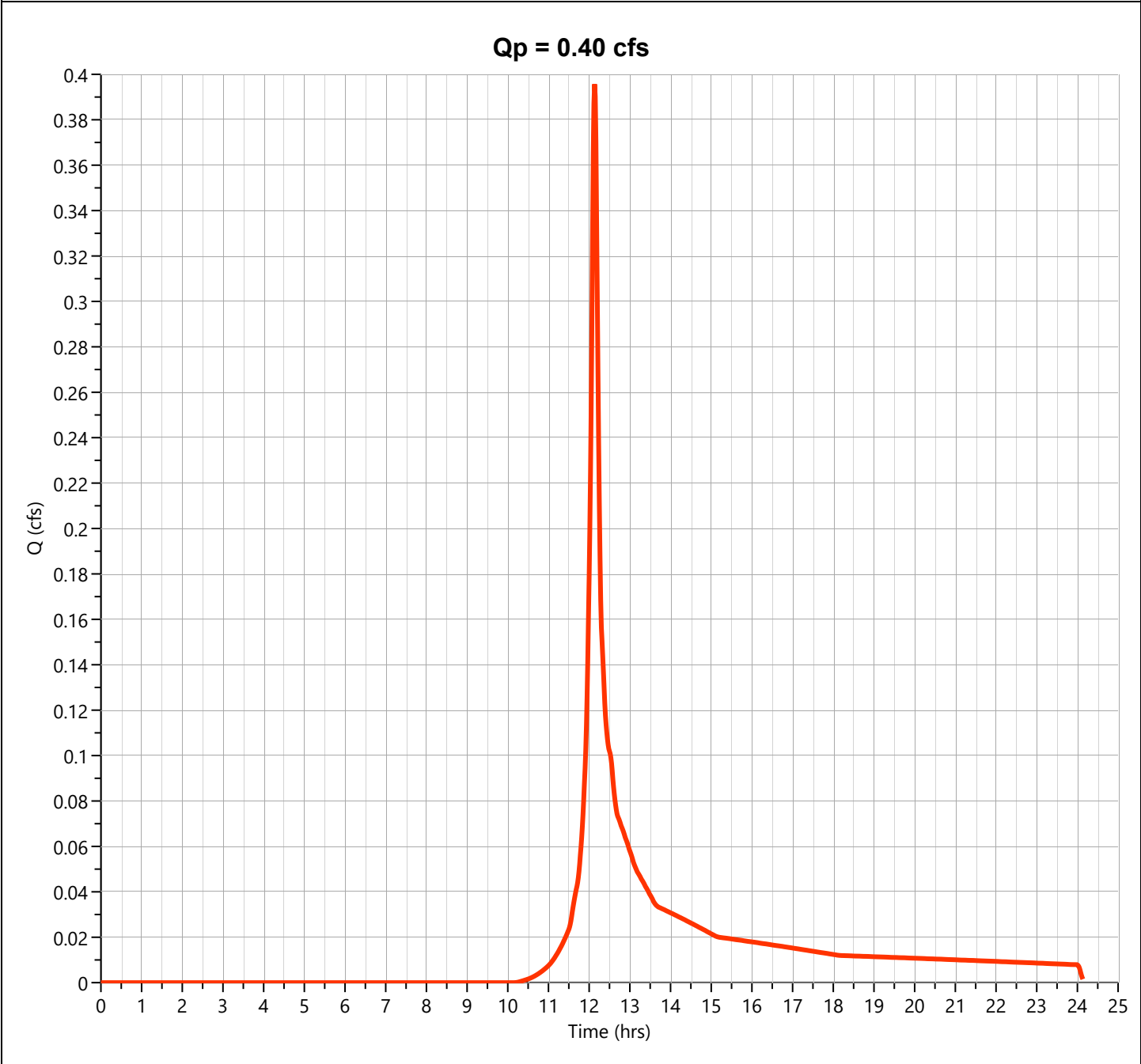
Hydrology Studio v 3.0.0.29

01-15-2024

PR WSD 2 PERV DET

Hyd. No. 5

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.396 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.13 hrs
Time Interval	= 1 min	Runoff Volume	= 1,315 cuft
Drainage Area	= 0.31 ac	Curve Number	= 74
Tc Method	= User	Time of Conc. (Tc)	= 7.0 min
Total Rainfall	= 3.44 in	Design Storm	= NOAA-D
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

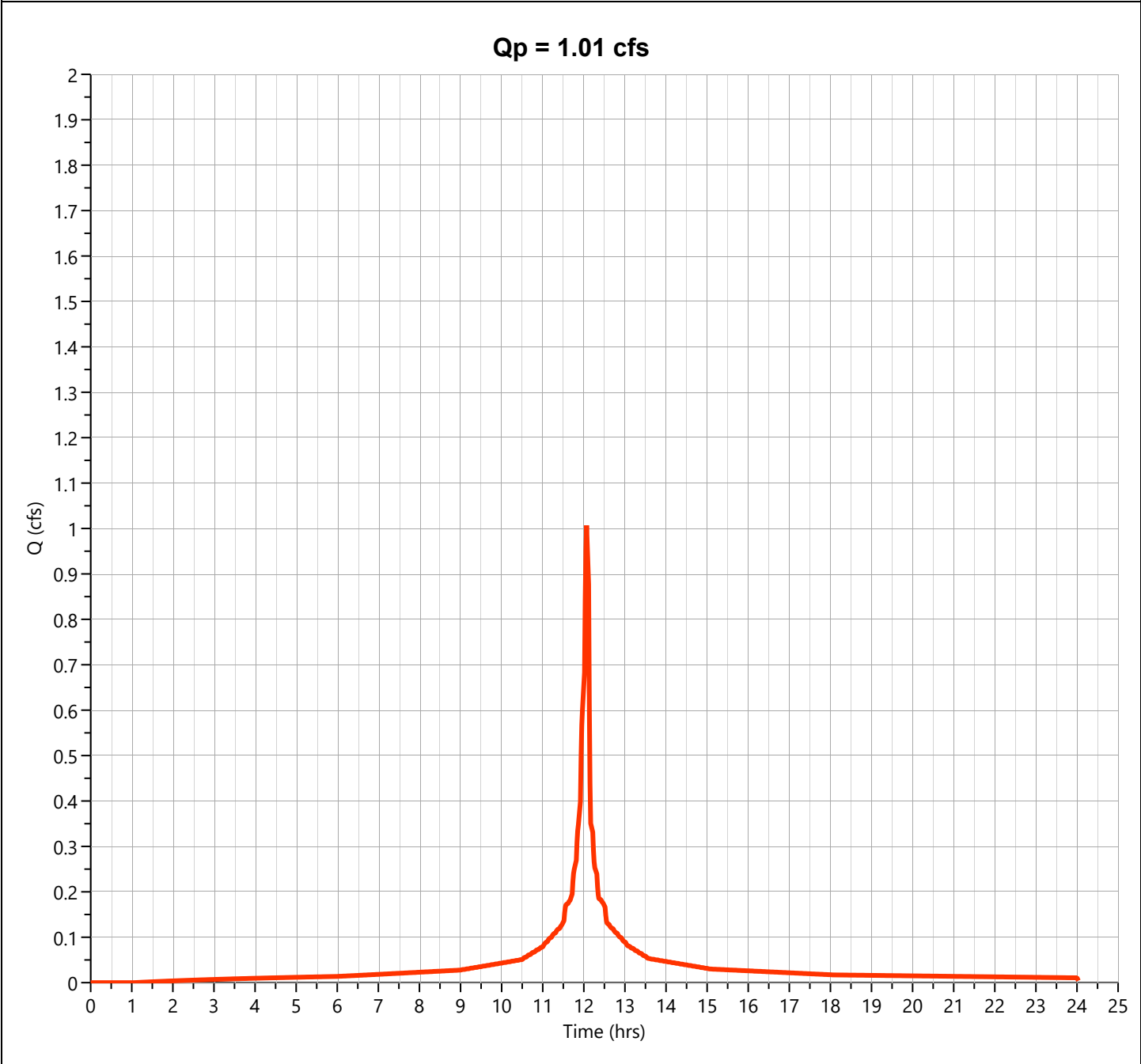
Hydrology Studio v 3.0.0.29

01-15-2024

PR WSD 2 IMP DET

Hyd. No. 6

Hydrograph Type	= NRCS Runoff	Peak Flow	= 1.008 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.10 hrs
Time Interval	= 1 min	Runoff Volume	= 3,274 cuft
Drainage Area	= 0.3 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 2.0 min
Total Rainfall	= 3.44 in	Design Storm	= NOAA-D
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrology Studio v 3.0.0.29

01-15-2024

Hyd. No. 7

Qp = 1.37 cfs

Q (cfs)

Time (hrs)

PR WSD 2 PERV DET PR WSD 2 IMP DET PR WSD 2 DET

Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

01-15-2024

POROUS PAVEMENT

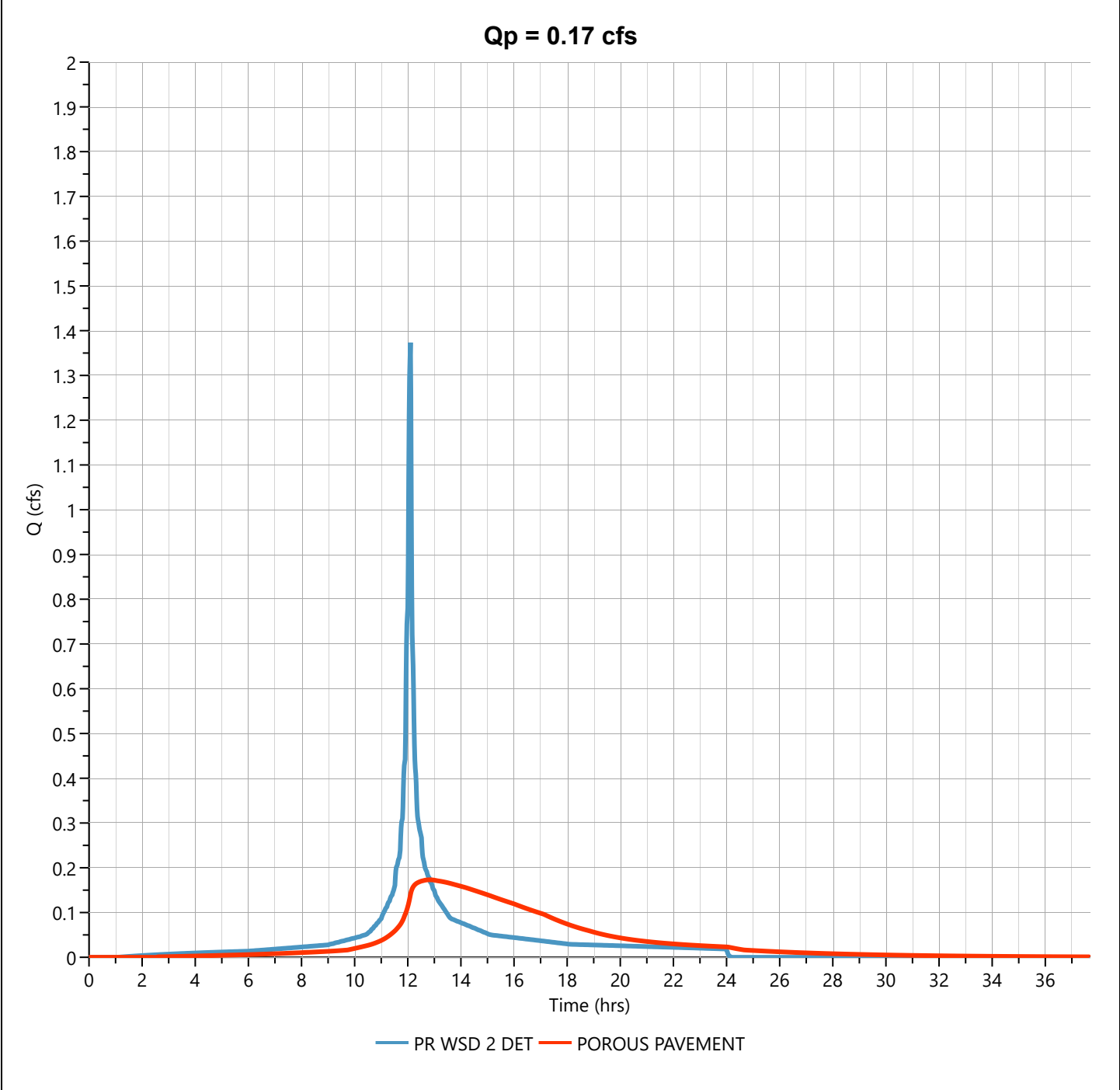
Hyd. No. 8

Hydrograph Type	= Pond Route	Peak Flow	= 0.173 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.83 hrs
Time Interval	= 1 min	Hydrograph Volume	= 4,572 cuft
Inflow Hydrograph	= 7 - PR WSD 2 DET	Max. Elevation	= 558.71 ft
Pond Name	= Porous Pavement	Max. Storage	= 1,929 cuft

Pond Routing by Storage Indication Method

Center of mass detention time = 2.89 hrs

Qp = 0.17 cfs



Pond Report

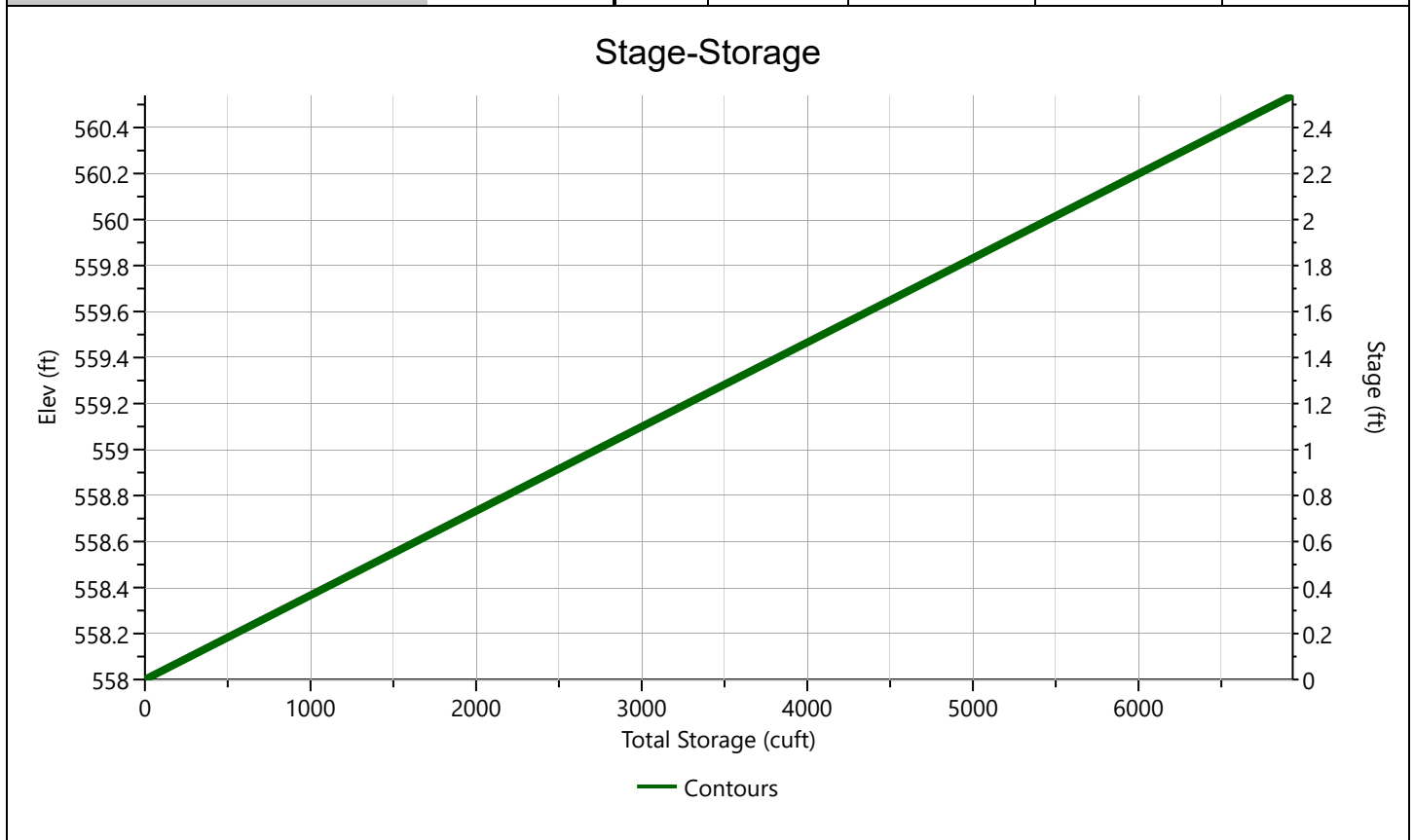
Project Name:

Hydrology Studio v 3.0.0.29

01-15-2024

Porous Pavement

Stage-Storage

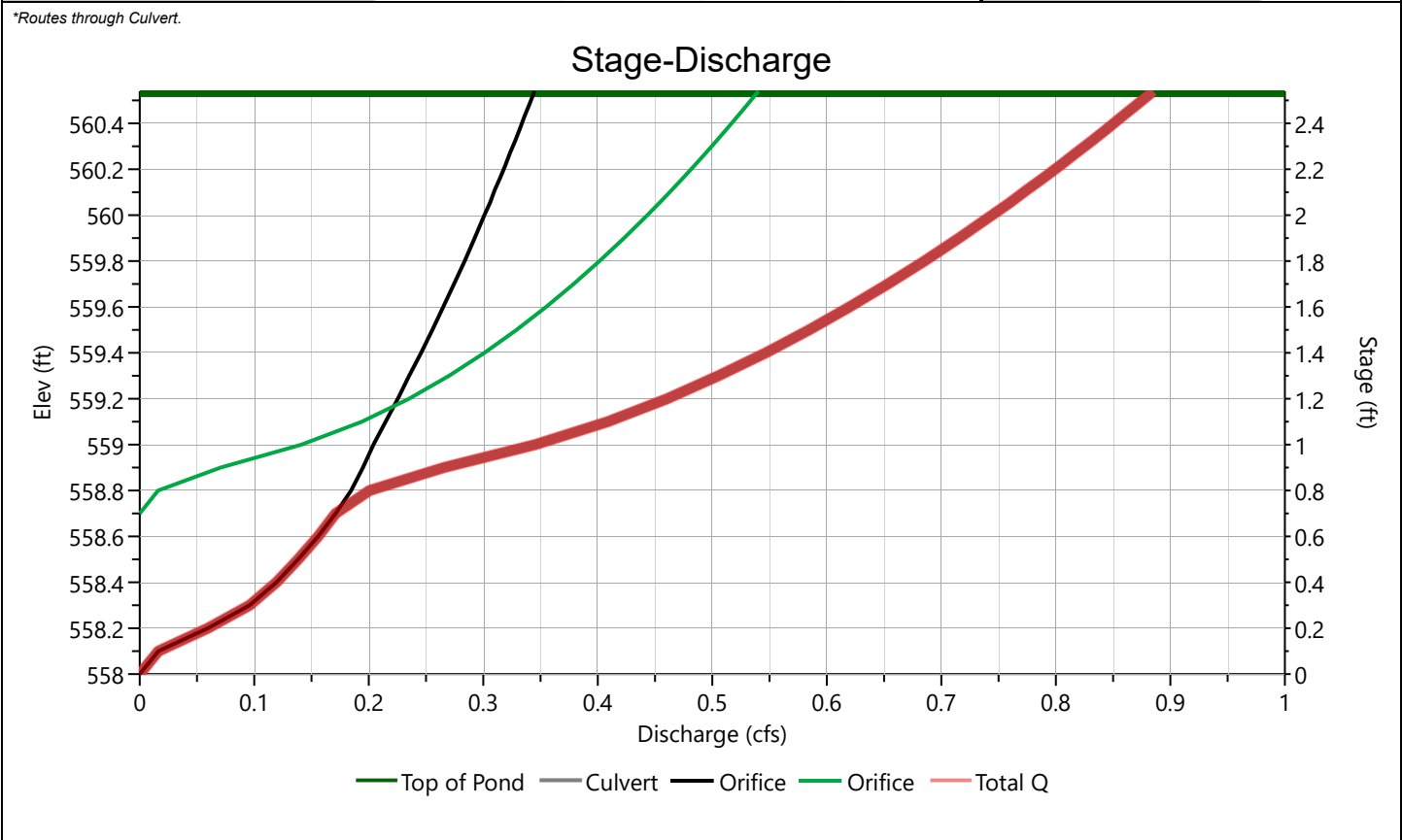
[illegible]

Porous Pavement

Stage-Discharge

Culvert / Orifices	Culvert	Orifices			Perforated Riser
		1*	2*	3	
Rise, in	18	3	4		Hole Diameter, in
Span, in	18	3	4		No. holes
No. Barrels	1	1	1		Invert Elevation, ft
Invert Elevation, ft	558.00	558.01	558.72		Height, ft
Orifice Coefficient, Co	0.60	0.60	0.60		Orifice Coefficient, Co
Length, ft	15				
Barrel Slope, %					
N-Value, n	0.012				
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.



Pond Report

Project Name:

Hydrology Studio v 3.0.0.29

01-15-2024

Porous Pavement

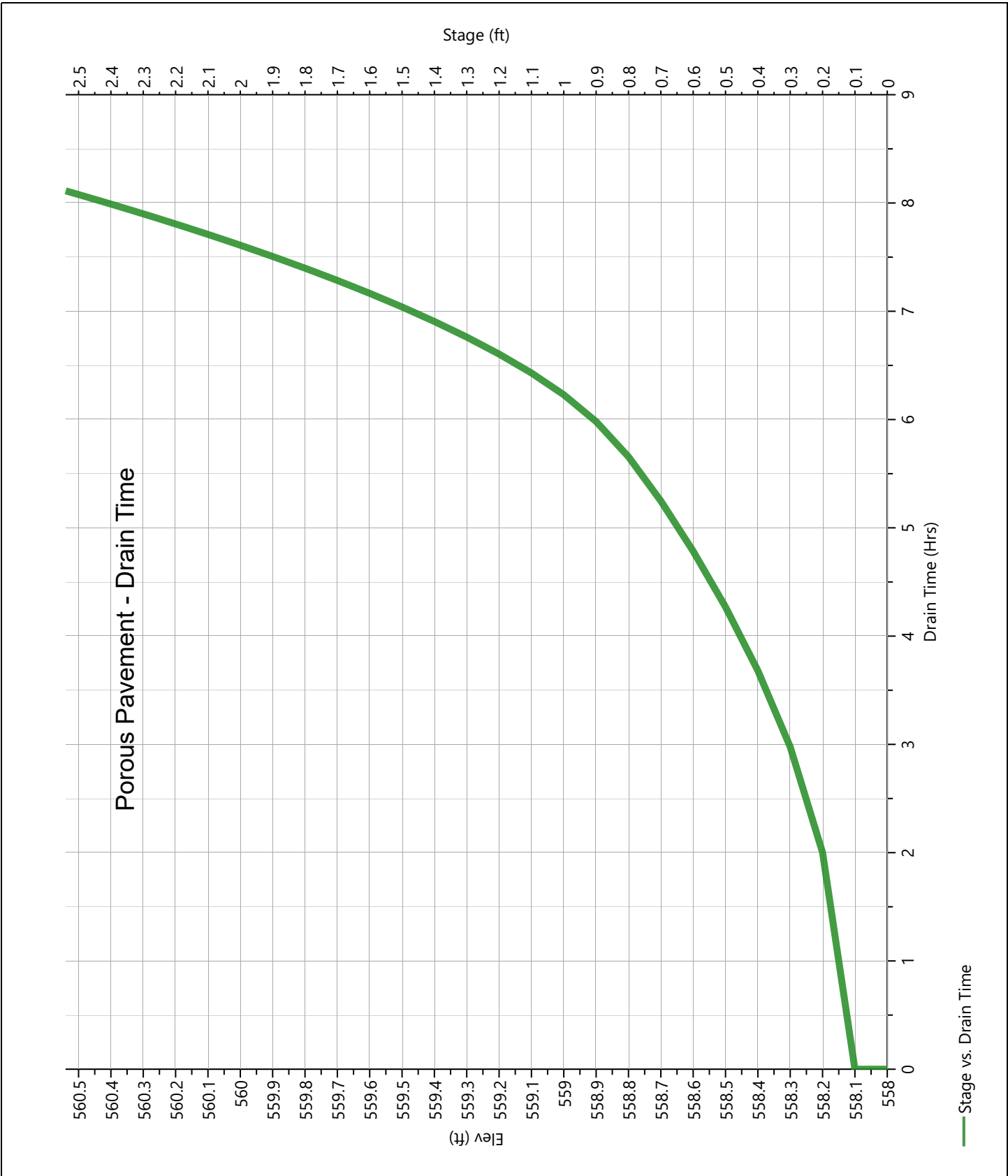
Stage-Storage-Discharge Summary

[illegible]

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

Porous Pavement

Pond Drawdown



Hydrograph Report

Project Name:

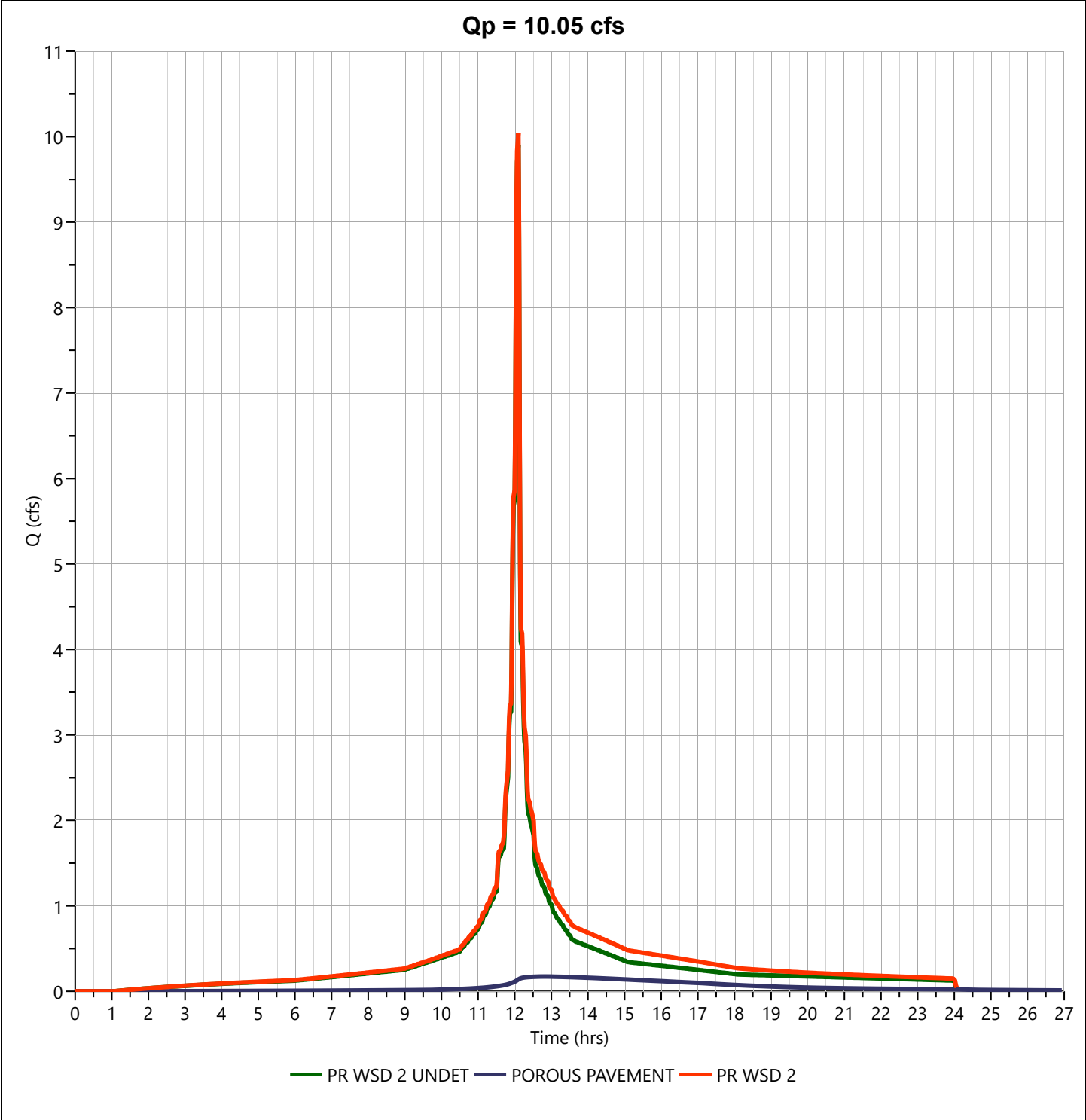
Hydrology Studio v 3.0.0.29

01-15-2024

PR WSD 2

Hyd. No. 10

Hydrograph Type	= Junction	Peak Flow	= 10.05 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.10 hrs
Time Interval	= 1 min	Hydrograph Volume	= 38,148 cuft
Inflow Hydrographs	= 3, 8	Total Contrib. Area	= 4.24 ac



Hydrograph 10-yr Summary

Project Name:

Hydrology Studio v 3.0.0.29

01-15-2024

[illegible]

Hydrograph Report

Project Name:

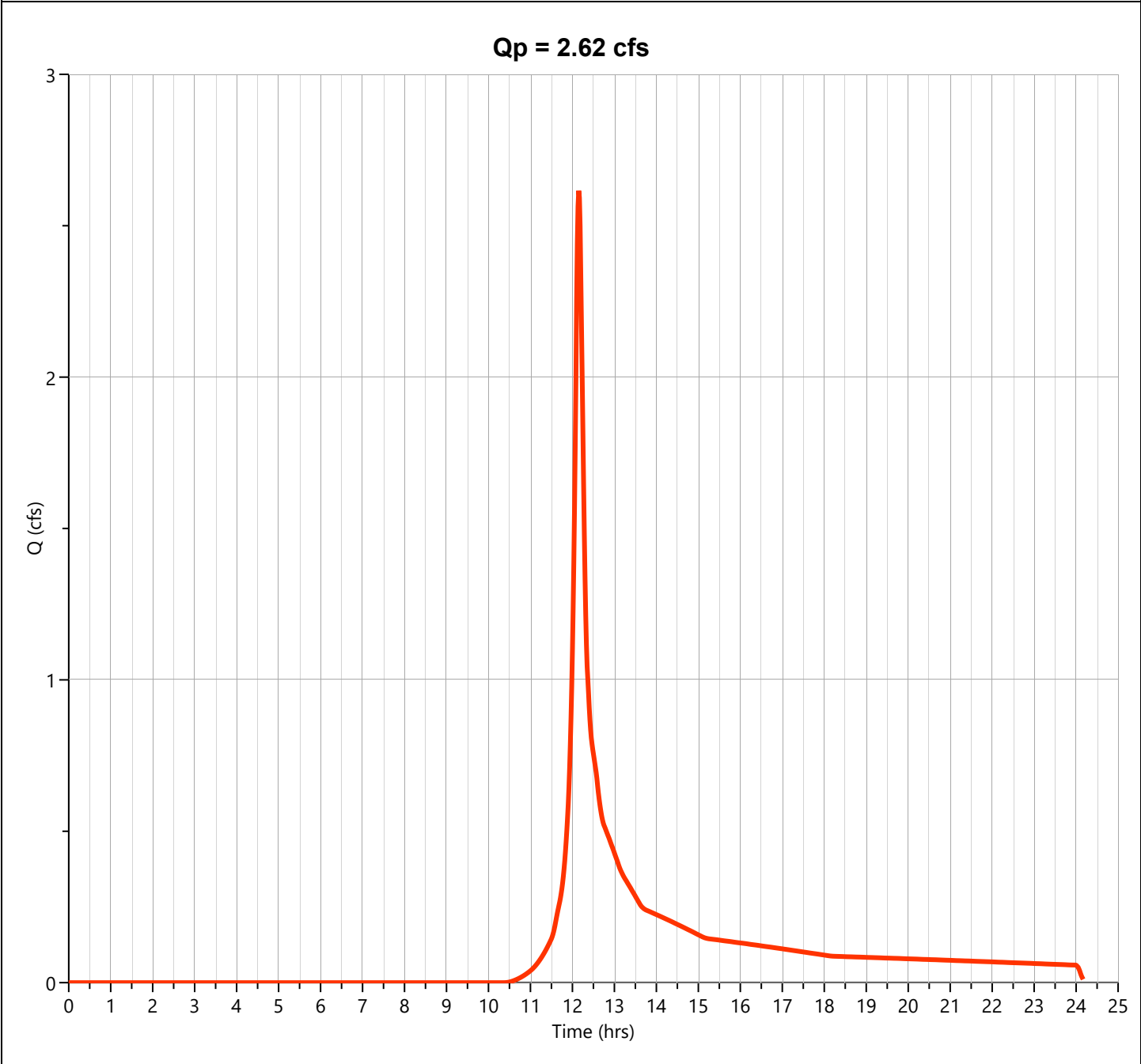
Hydrology Studio v 3.0.0.29

01-15-2024

PR WSD 2 PERV UNDET

Hyd. No. 1

Hydrograph Type	= NRCS Runoff	Peak Flow	= 2.616 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.15 hrs
Time Interval	= 1 min	Runoff Volume	= 9,394 cuft
Drainage Area	= 1.5 ac	Curve Number	= 64
Tc Method	= User	Time of Conc. (Tc)	= 9.0 min
Total Rainfall	= 5.22 in	Design Storm	= NOAA-D
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

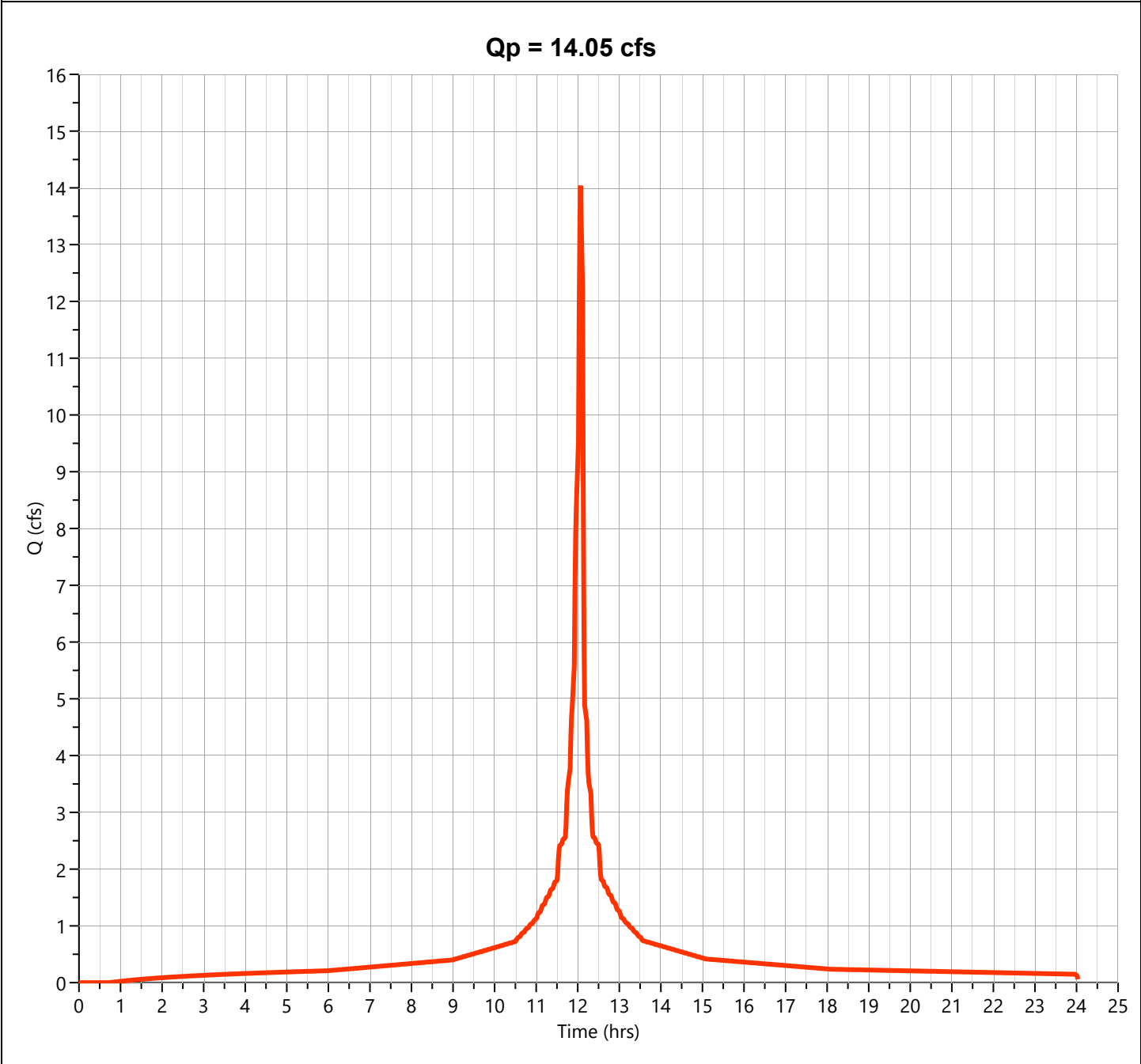
Hydrology Studio v 3.0.0.29

01-15-2024

PR WSD 2 IMP UNDET

Hyd. No. 2

Hydrograph Type	= NRCS Runoff	Peak Flow	= 14.05 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.10 hrs
Time Interval	= 1 min	Runoff Volume	= 46,463 cuft
Drainage Area	= 2.74 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 3.0 min
Total Rainfall	= 5.22 in	Design Storm	= NOAA-D
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

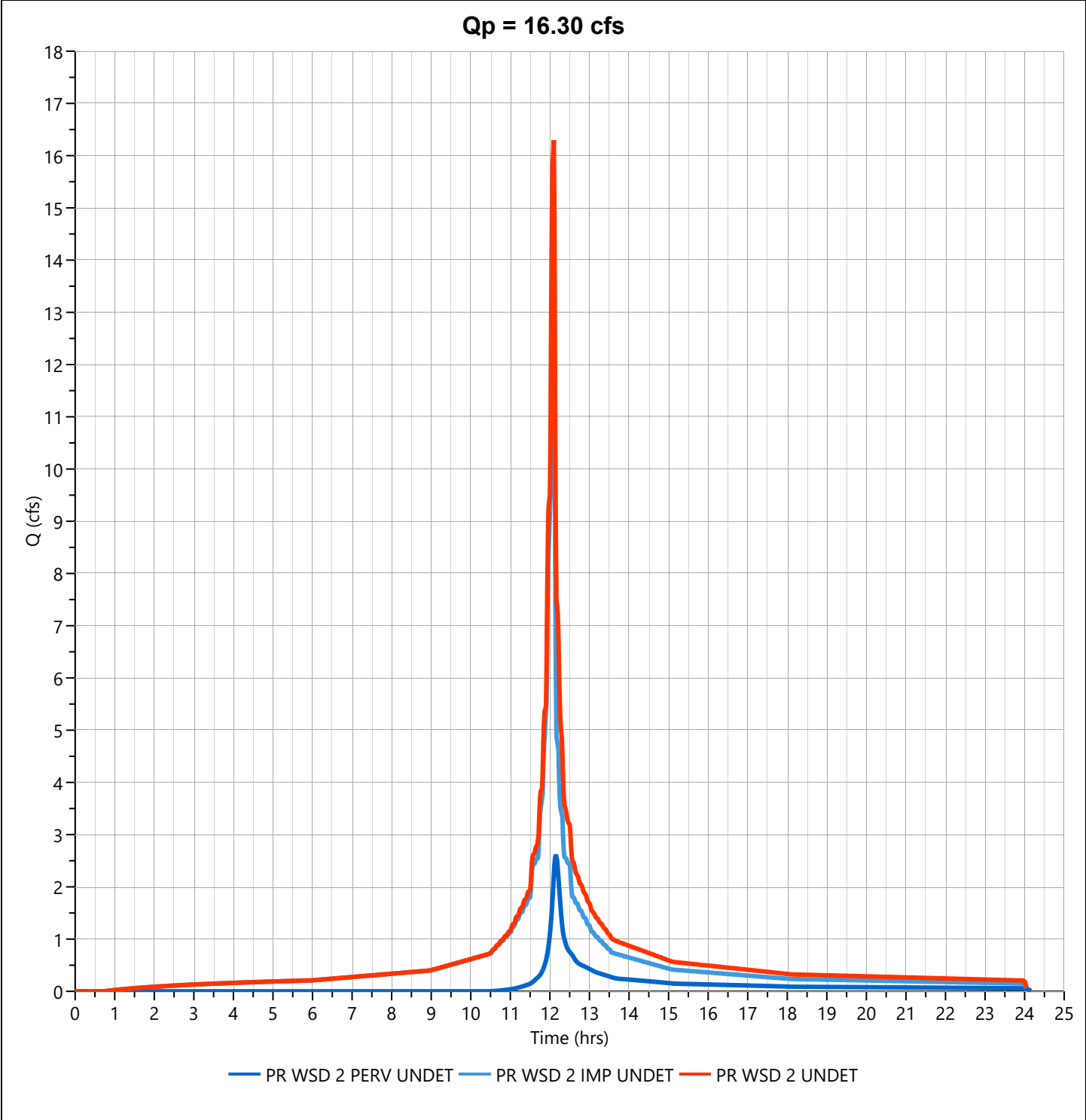
Hydrology Studio v 3.0.0.29

01-15-2024

PR WSD 2 UNDET

Hyd. No. 3

Hydrograph Type	= Junction	Peak Flow	= 16.30 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.10 hrs
Time Interval	= 1 min	Hydrograph Volume	= 55,856 cuft
Inflow Hydrographs	= 1, 2	Total Contrib. Area	= 4.24 ac



Hydrograph Report

Project Name:

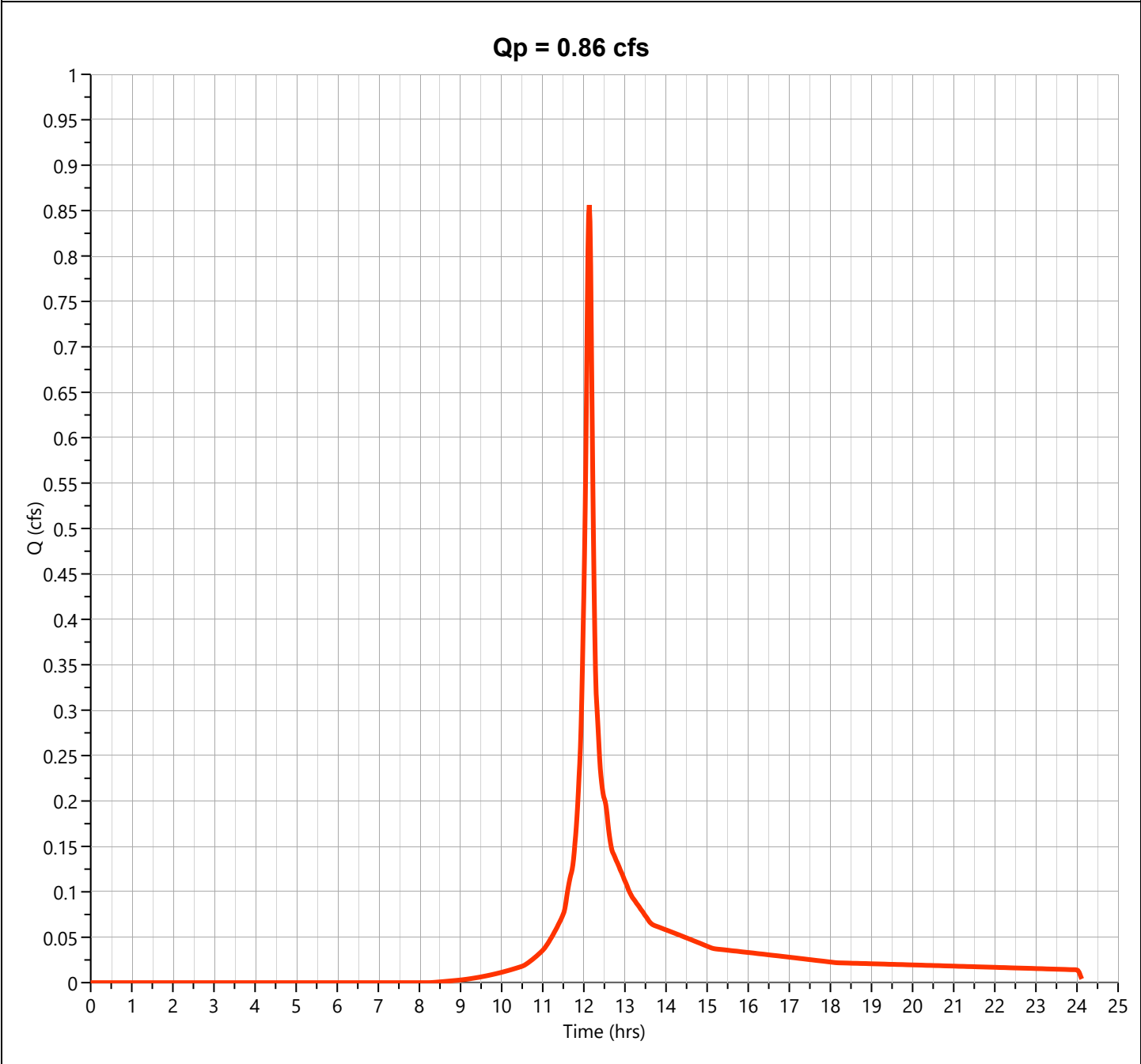
Hydrology Studio v 3.0.0.29

01-15-2024

PR WSD 2 PERV DET

Hyd. No. 5

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.856 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.13 hrs
Time Interval	= 1 min	Runoff Volume	= 2,788 cuft
Drainage Area	= 0.31 ac	Curve Number	= 74
Tc Method	= User	Time of Conc. (Tc)	= 7.0 min
Total Rainfall	= 5.22 in	Design Storm	= NOAA-D
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

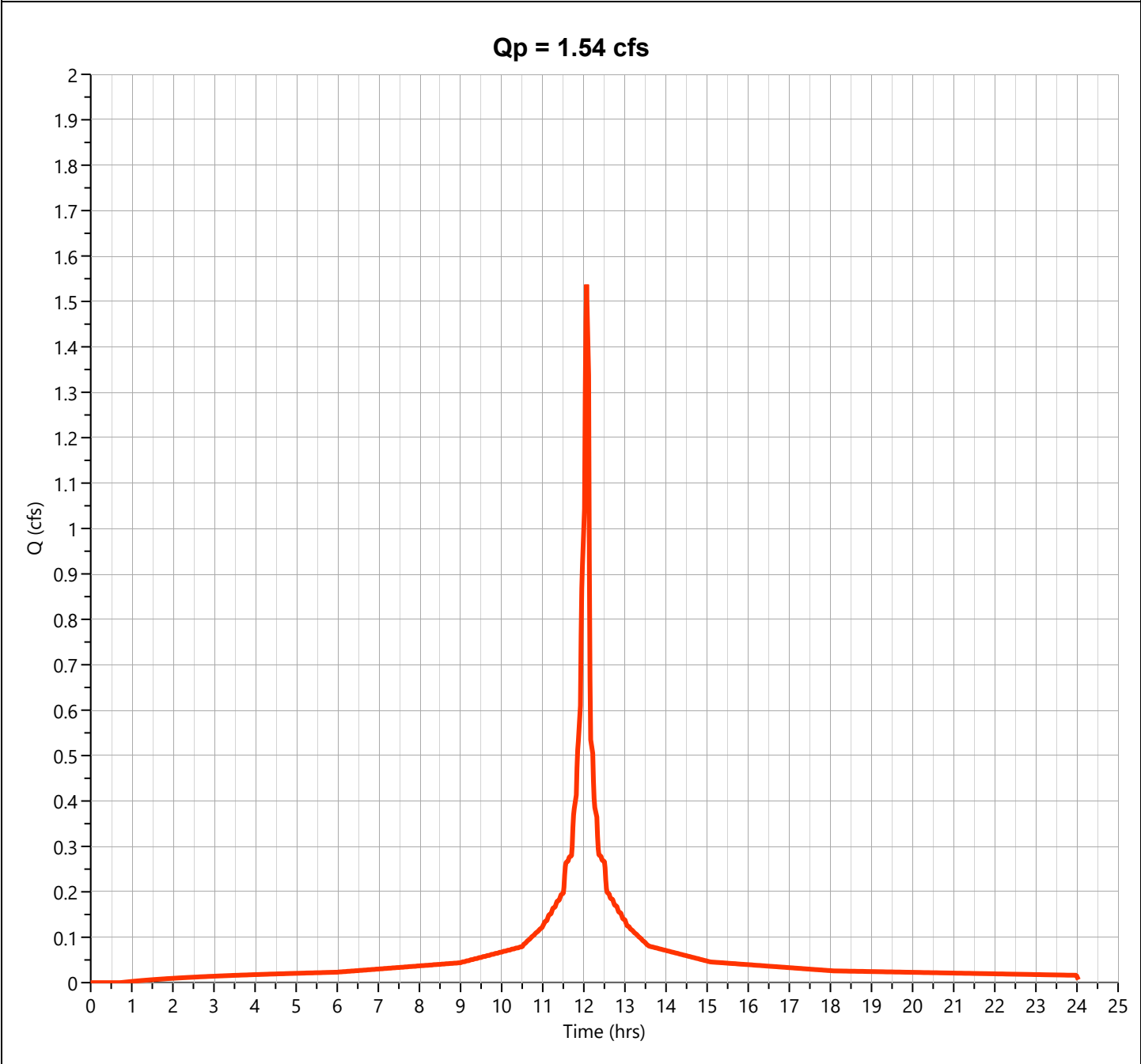
Hydrology Studio v 3.0.0.29

01-15-2024

PR WSD 2 IMP DET

Hyd. No. 6

Hydrograph Type	= NRCS Runoff	Peak Flow	= 1.538 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.10 hrs
Time Interval	= 1 min	Runoff Volume	= 5,087 cuft
Drainage Area	= 0.3 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 2.0 min
Total Rainfall	= 5.22 in	Design Storm	= NOAA-D
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

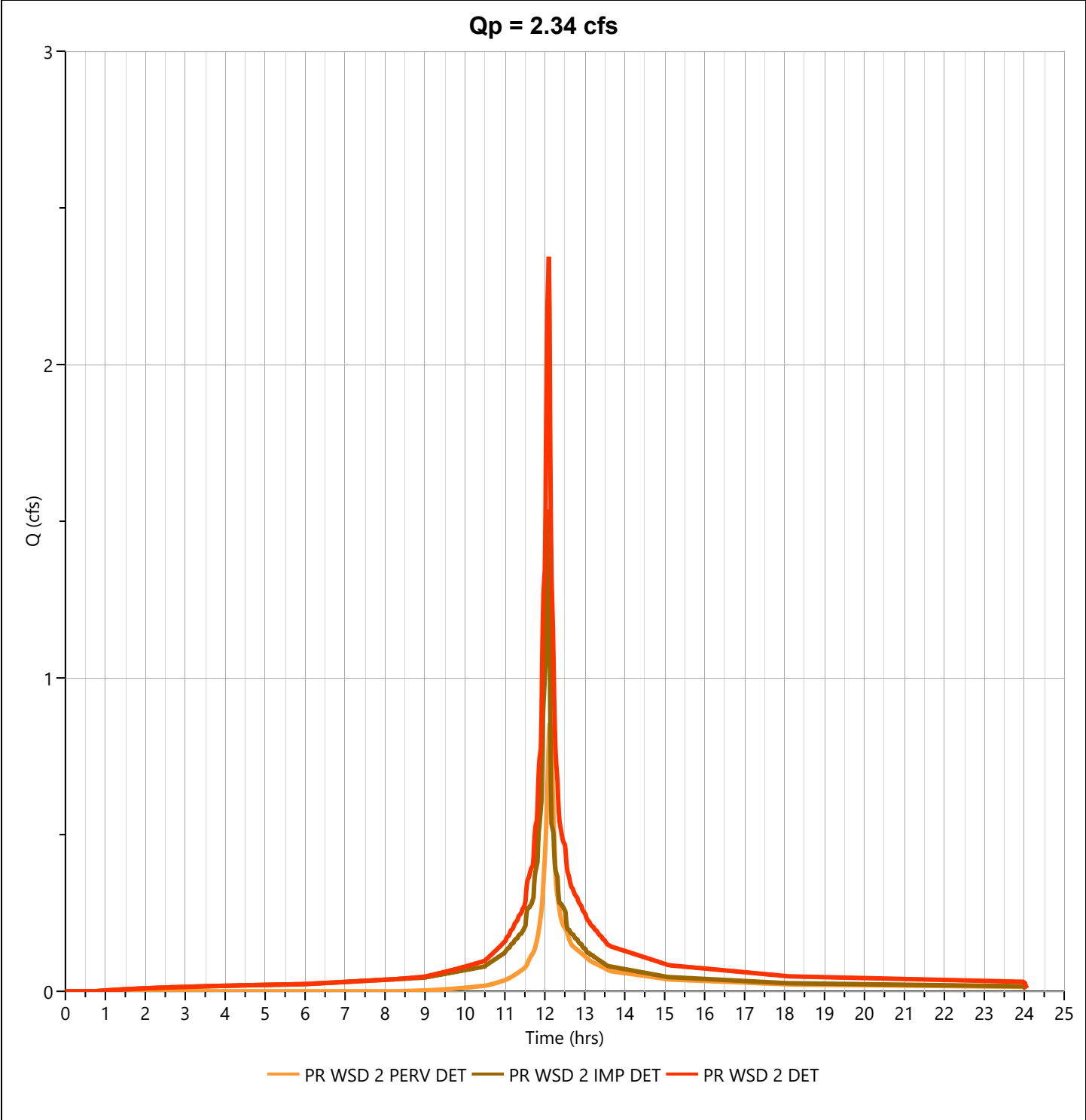
Hydrology Studio v 3.0.0.29

01-15-2024

PR WSD 2 DET

Hyd. No. 7

Hydrograph Type	= Junction	Peak Flow	= 2.344 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.10 hrs
Time Interval	= 1 min	Hydrograph Volume	= 7,875 cuft
Inflow Hydrographs	= 5, 6	Total Contrib. Area	= 0.61 ac



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

01-15-2024

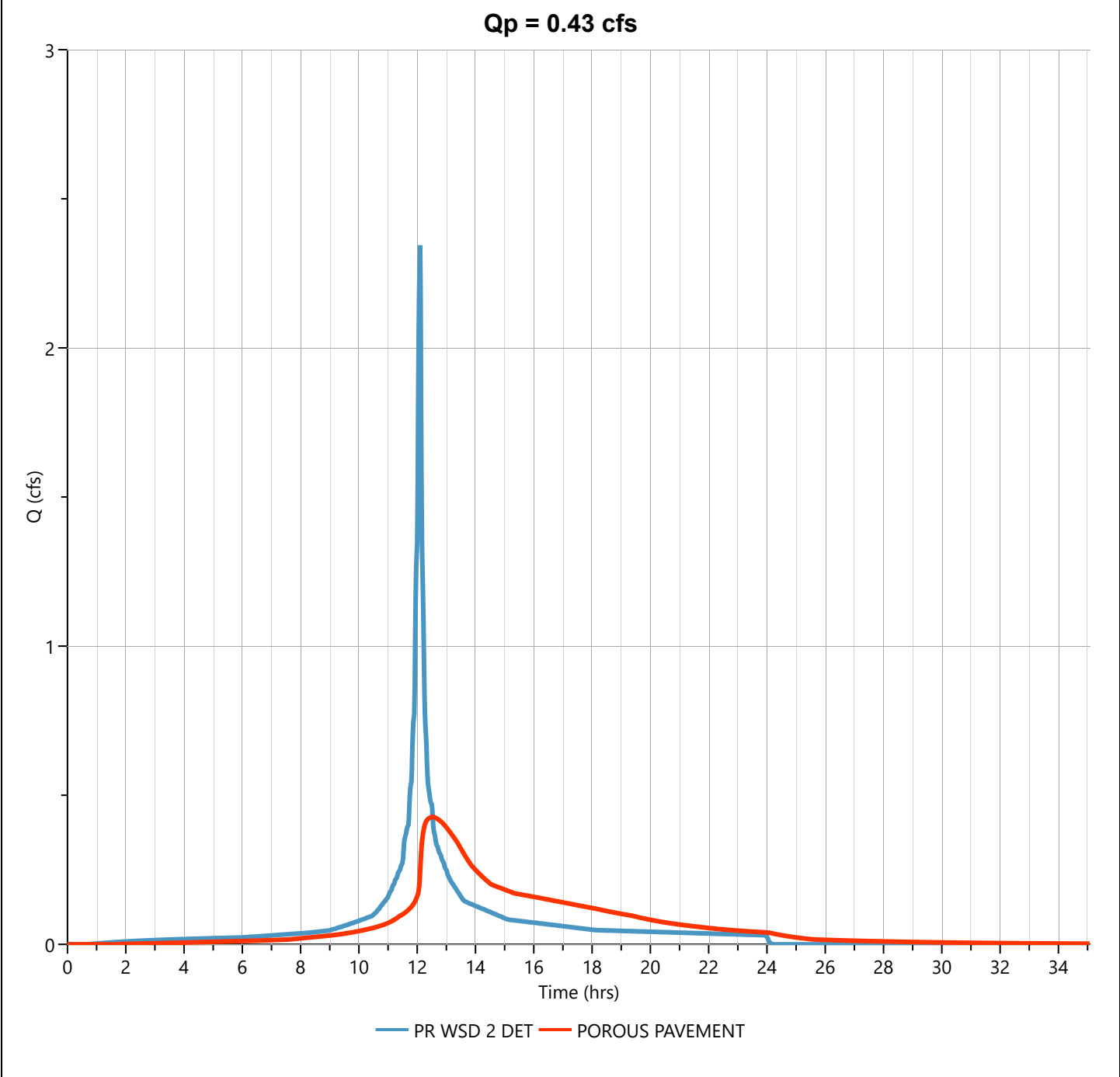
POROUS PAVEMENT

Hyd. No. 8

Hydrograph Type	= Pond Route	Peak Flow	= 0.427 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.53 hrs
Time Interval	= 1 min	Hydrograph Volume	= 7,858 cuft
Inflow Hydrograph	= 7 - PR WSD 2 DET	Max. Elevation	= 559.14 ft
Pond Name	= Porous Pavement	Max. Storage	= 3,100 cuft

Pond Routing by Storage Indication Method

Center of mass detention time = 2.51 hrs



Hydrograph Report

Project Name:

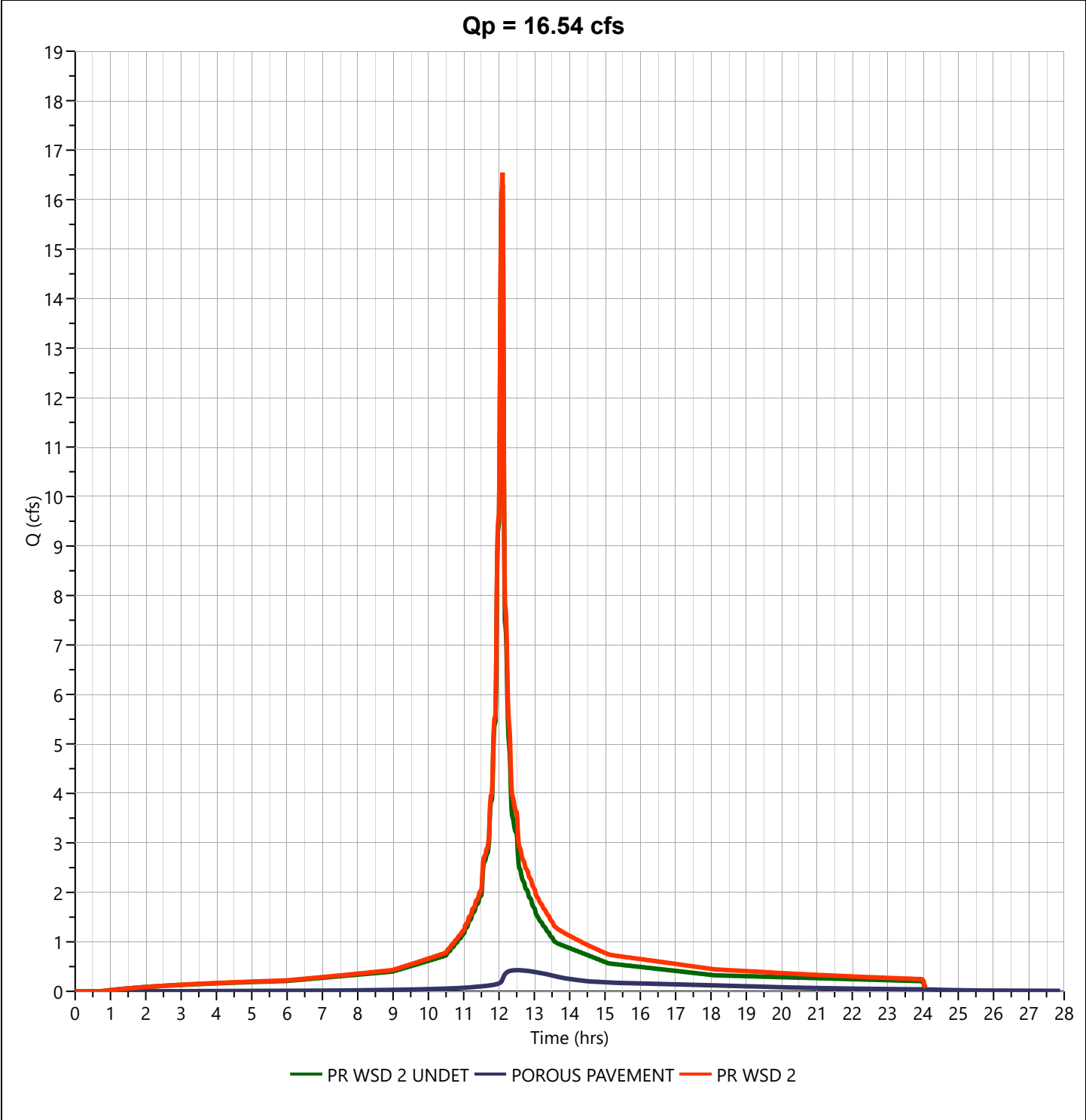
Hydrology Studio v 3.0.0.29

01-15-2024

PR WSD 2

Hyd. No. 10

Hydrograph Type	= Junction	Peak Flow	= 16.54 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.10 hrs
Time Interval	= 1 min	Hydrograph Volume	= 63,715 cuft
Inflow Hydrographs	= 3, 8	Total Contrib. Area	= 4.24 ac



Hydrograph 100-yr Summary

Project Name:

Hydrology Studio v 3.0.0.29

01-15-2024

[illegible]

Hydrograph Report

Project Name:

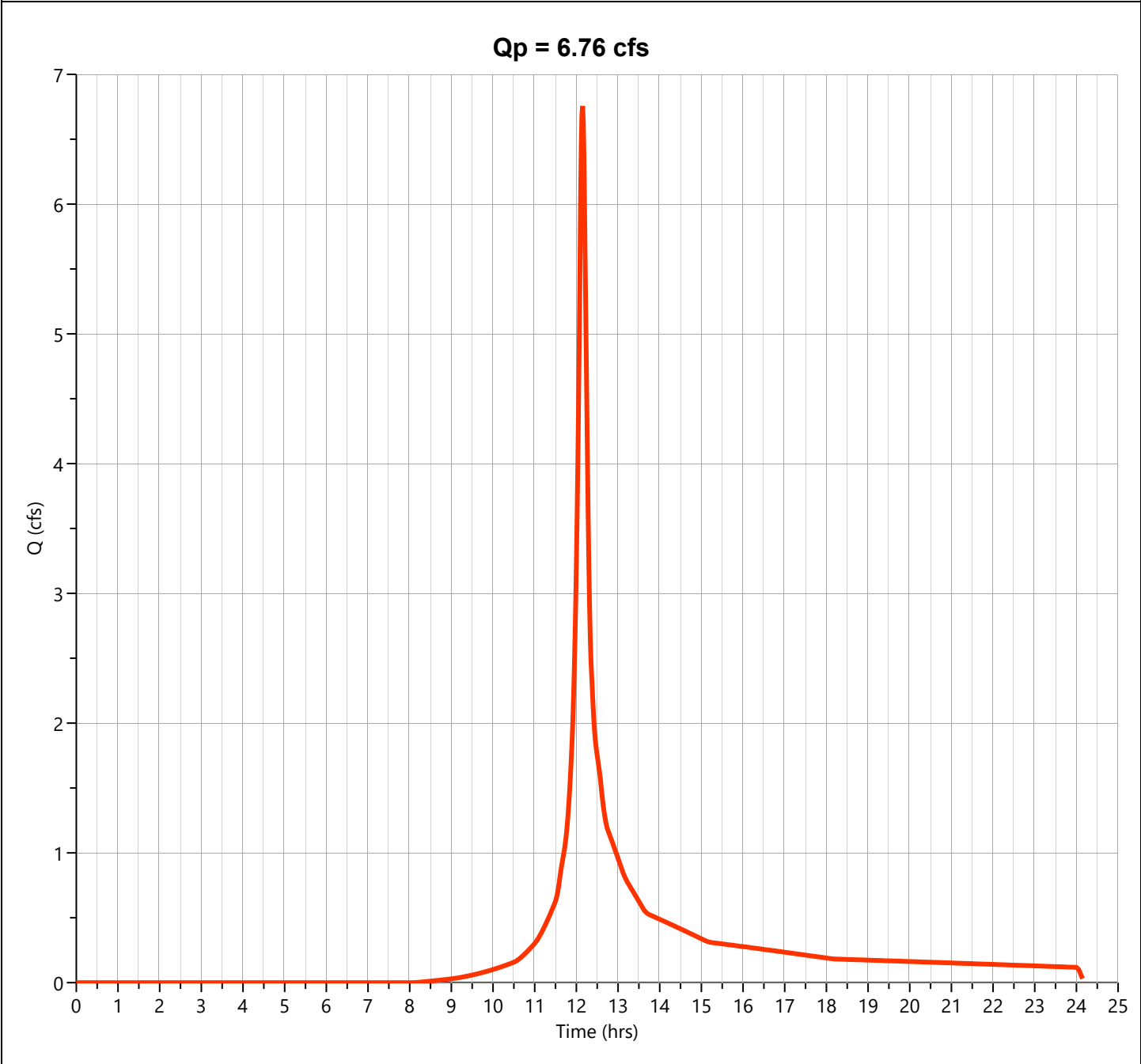
Hydrology Studio v 3.0.0.29

01-15-2024

PR WSD 2 PERV UNDET

Hyd. No. 1

Hydrograph Type	= NRCS Runoff	Peak Flow	= 6.756 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.15 hrs
Time Interval	= 1 min	Runoff Volume	= 23,491 cuft
Drainage Area	= 1.5 ac	Curve Number	= 64
Tc Method	= User	Time of Conc. (Tc)	= 9.0 min
Total Rainfall	= 8.66 in	Design Storm	= NOAA-D
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

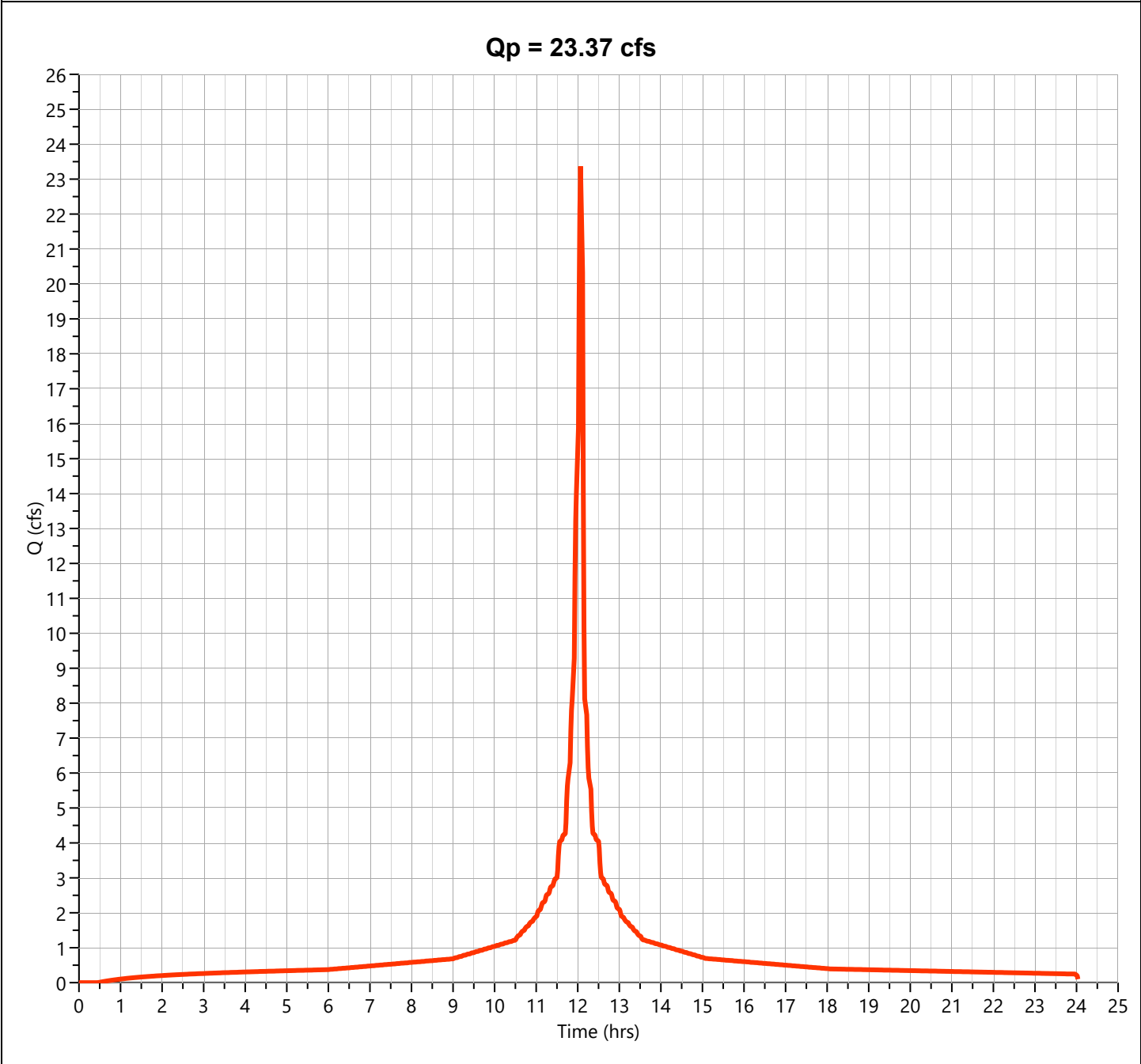
Hydrology Studio v 3.0.0.29

01-15-2024

PR WSD 2 IMP UNDET

Hyd. No. 2

Hydrograph Type	= NRCS Runoff	Peak Flow	= 23.37 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.10 hrs
Time Interval	= 1 min	Runoff Volume	= 78,511 cuft
Drainage Area	= 2.74 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 3.0 min
Total Rainfall	= 8.66 in	Design Storm	= NOAA-D
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

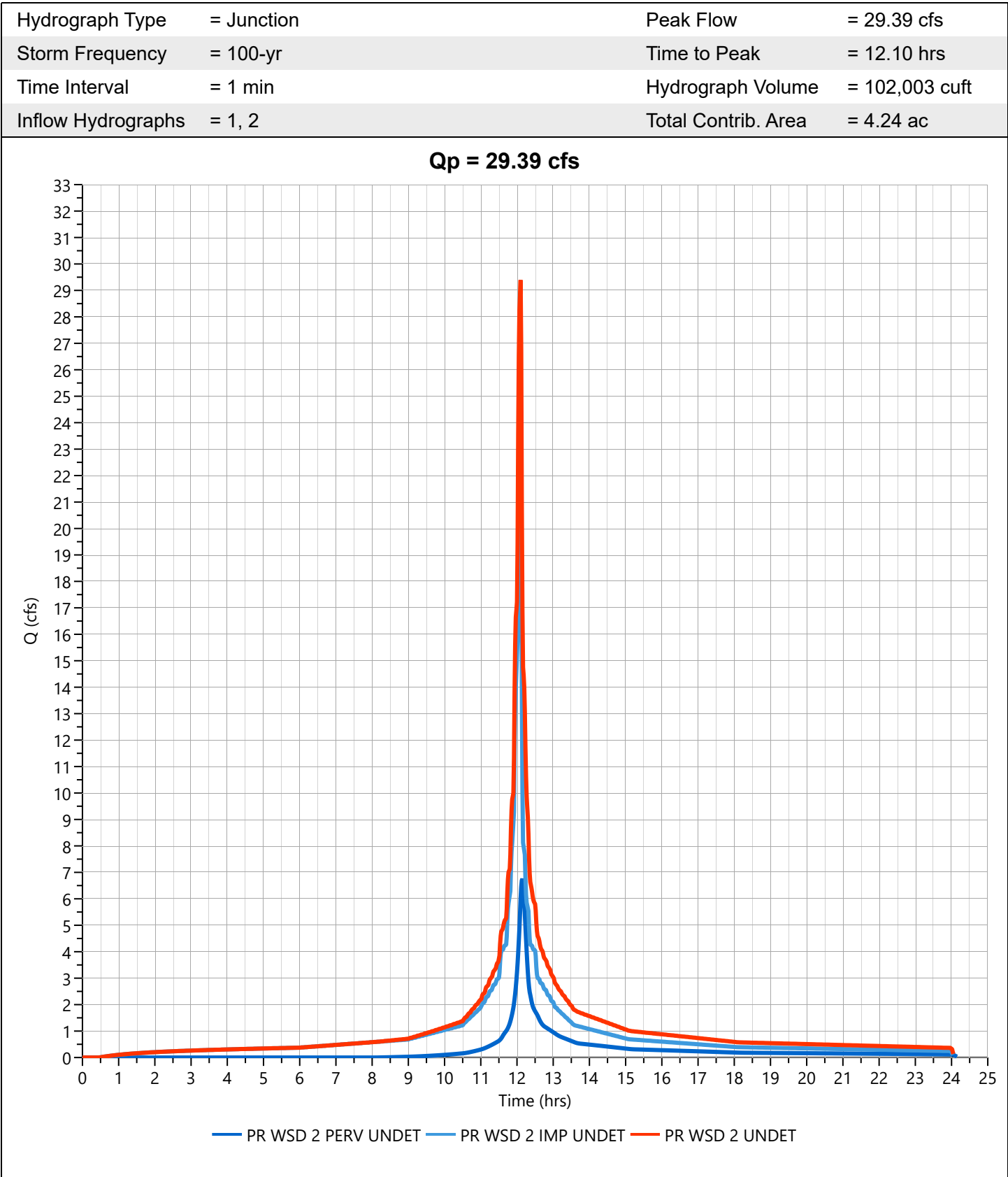
Project Name:

Hydrology Studio v 3.0.0.29

01-15-2024

PR WSD 2 UNDET

Hyd. No. 3



Hydrograph Report

Project Name:

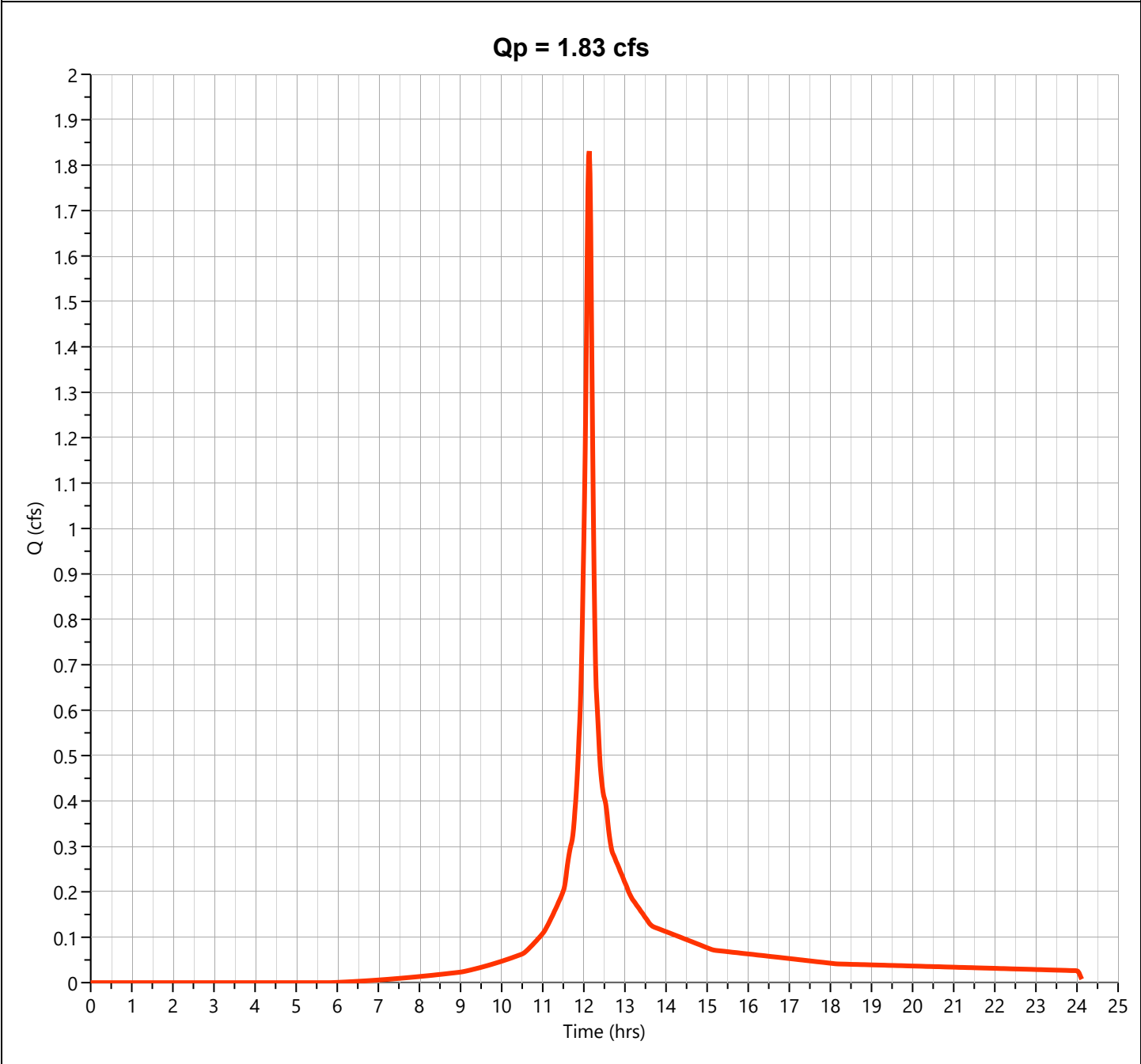
Hydrology Studio v 3.0.0.29

01-15-2024

PR WSD 2 PERV DET

Hyd. No. 5

Hydrograph Type	= NRCS Runoff	Peak Flow	= 1.831 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.13 hrs
Time Interval	= 1 min	Runoff Volume	= 6,056 cuft
Drainage Area	= 0.31 ac	Curve Number	= 74
Tc Method	= User	Time of Conc. (Tc)	= 7.0 min
Total Rainfall	= 8.66 in	Design Storm	= NOAA-D
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

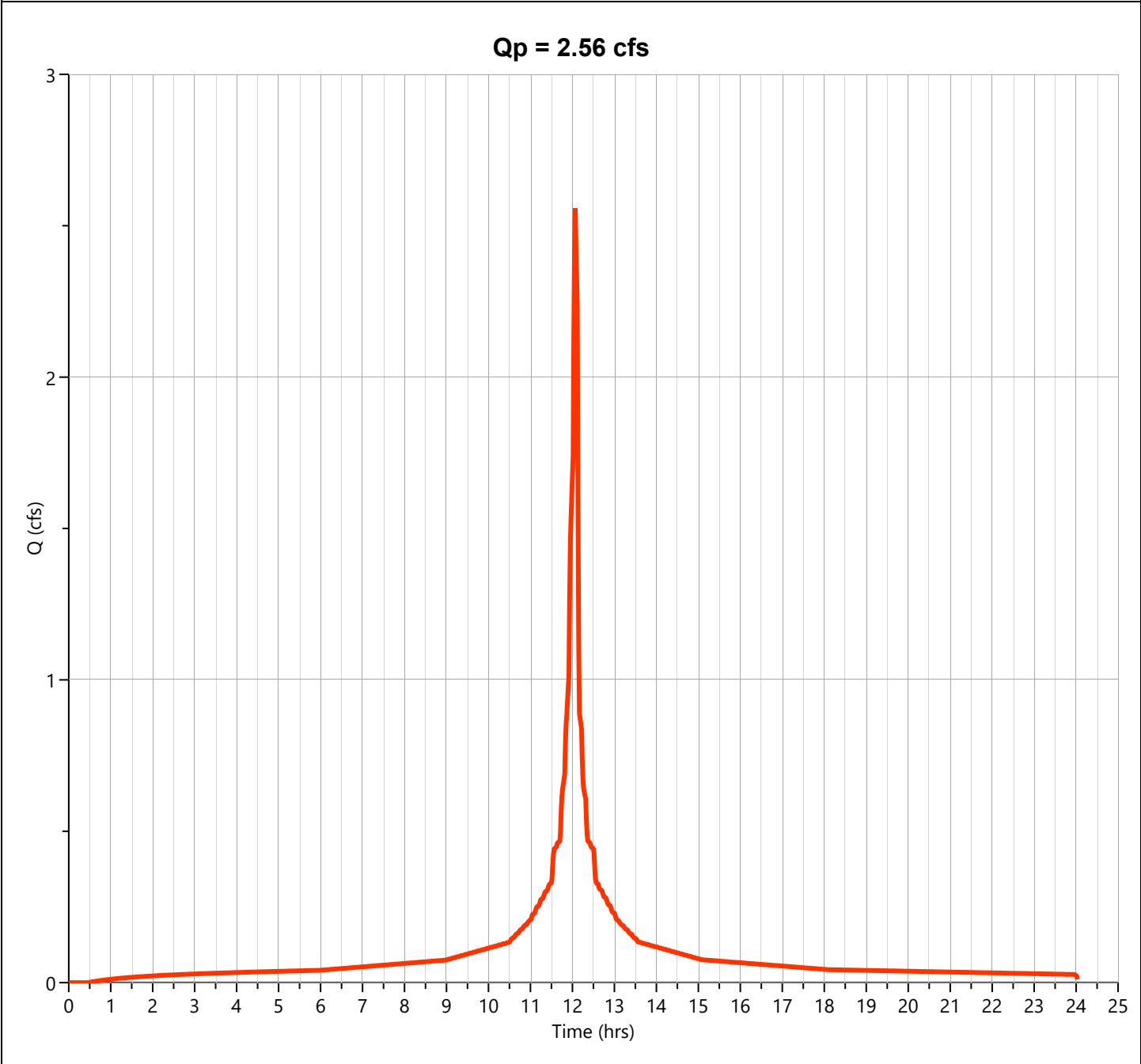
Hydrology Studio v 3.0.0.29

01-15-2024

PR WSD 2 IMP DET

Hyd. No. 6

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	= 8,596 cuft
Drainage Area	= 0.3 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 2.0 min
Total Rainfall	= 8.66 in	Design Storm	= NOAA-D
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

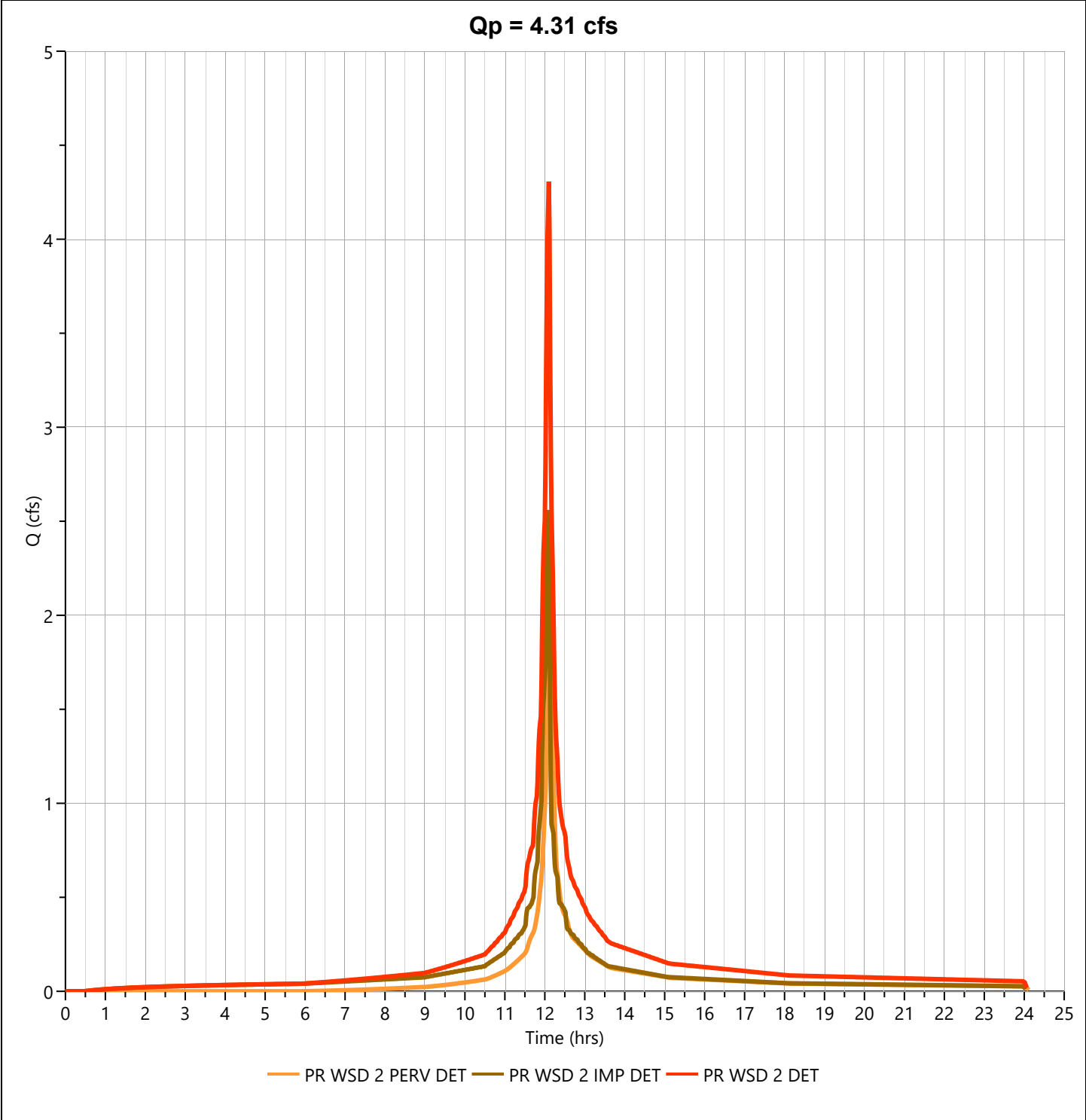
Hydrology Studio v 3.0.0.29

01-15-2024

PR WSD 2 DET

Hyd. No. 7

Hydrograph Type	= Junction	Peak Flow	= 4.307 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.10 hrs
Time Interval	= 1 min	Hydrograph Volume	= 14,652 cuft
Inflow Hydrographs	= 5, 6	Total Contrib. Area	= 0.61 ac



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

01-15-2024

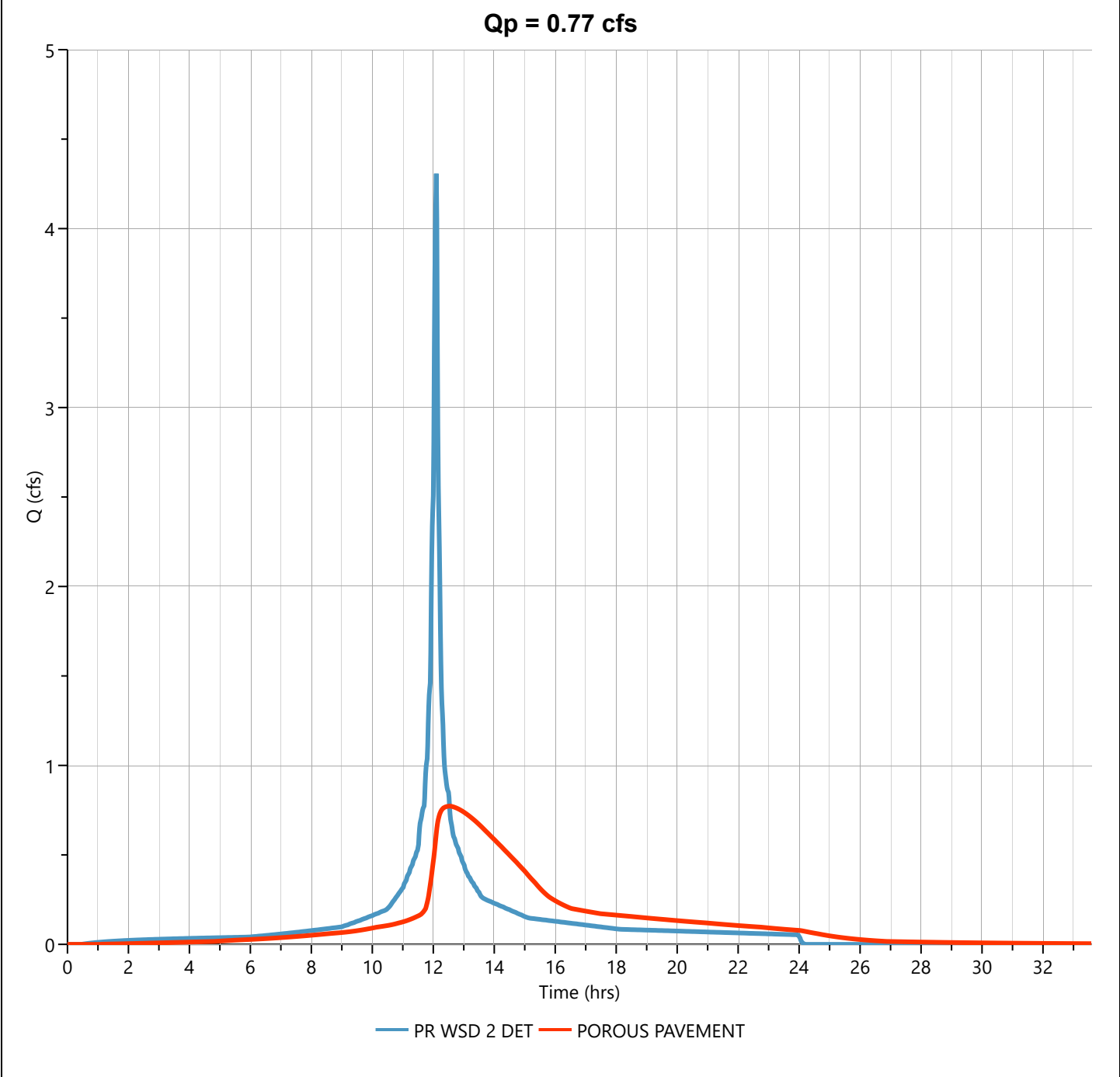
POROUS PAVEMENT

Hyd. No. 8

Hydrograph Type	= Pond Route	Peak Flow	= 0.773 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.53 hrs
Time Interval	= 1 min	Hydrograph Volume	= 14,636 cuft
Inflow Hydrograph	= 7 - PR WSD 2 DET	Max. Elevation	= 560.10 ft
Pond Name	= Porous Pavement	Max. Storage	= 5,736 cuft

Pond Routing by Storage Indication Method

Center of mass detention time = 2.25 hrs



Hydrograph Report

Project Name:

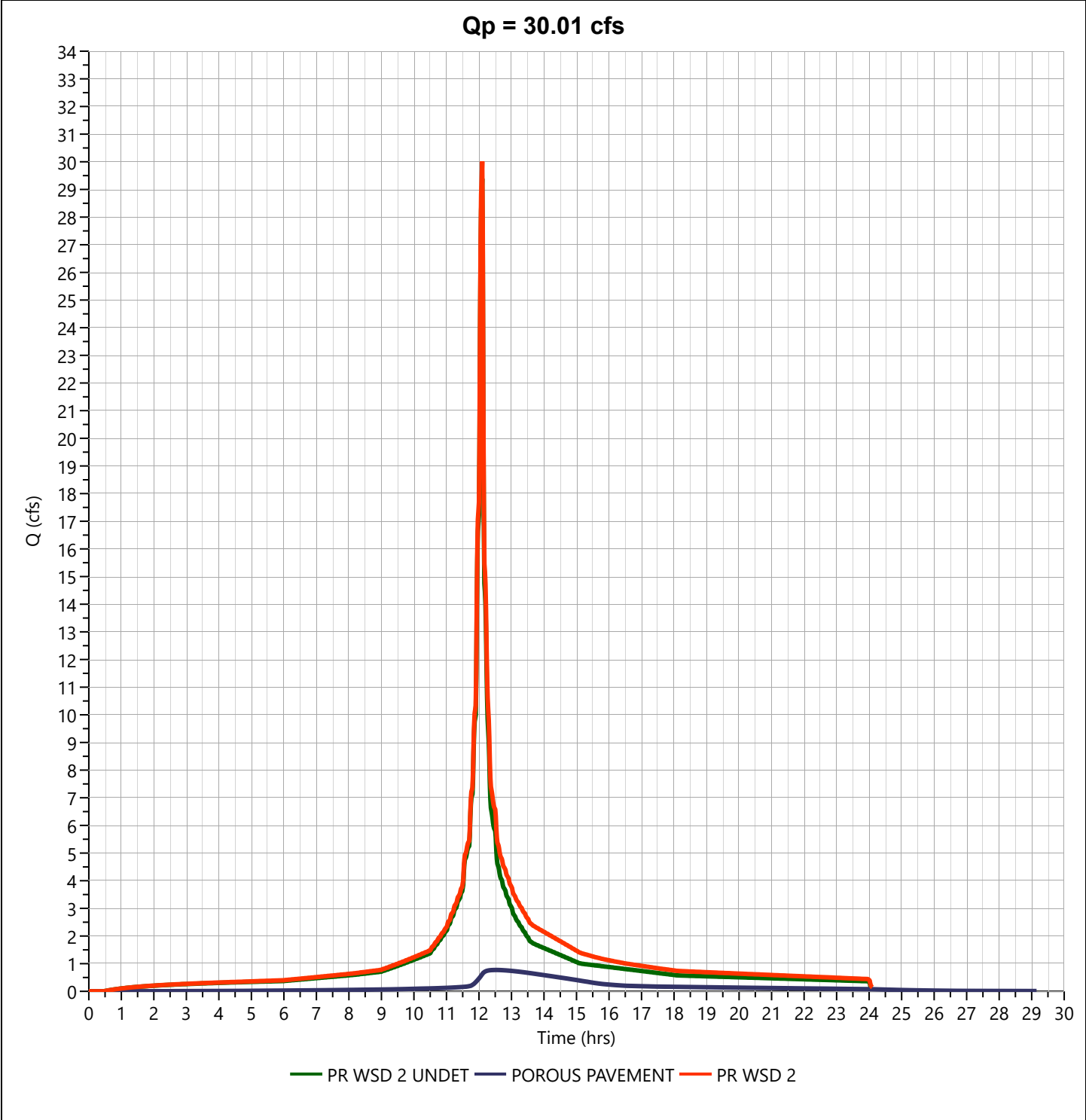
Hydrology Studio v 3.0.0.29

01-15-2024

PR WSD 2

Hyd. No. 10

Hydrograph Type	= Junction	Peak Flow	= 30.01 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.10 hrs
Time Interval	= 1 min	Hydrograph Volume	= 116,638 cuft
Inflow Hydrographs	= 3, 8	Total Contrib. Area	= 4.24 ac



APPENDIX C

NJGRS GROUNDWATER RECHARGE SPREADSHEET

Annual Groundwater Recharge Analysis (based on GSR-32)

Select Township ↓	Average Annual P (in)	Climatic Factor
ESSEX CO., WEST ORANGE TOWN	49.0	1.67

Project Name: Montclair Golf Club

Description: Halfway House

Analysis Date: 01/12/24

Pre-Developed Conditions

Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)
1	0.07	Open space	Udorthents	0.0	-
2	0.08	Impervious areas	Udorthents	0.0	-
3	0.28	Open space	Urban Land*	0.0	-
4	0.77	Impervious areas	Urban Land*	0.0	-
5	0				
6	0				
7	0				
8	0				
9	0				
10	0				
11	0				
12	0				
13	0				
14	0				
15	0				
Total =	1.2			Total Annual Recharge (in)	Total Annual Recharge (cu-ft)
				0.0	-

Post-Developed Conditions

Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)
1	0.07	Open space	Udorthents	0.0	-
2	0.08	Impervious areas	Udorthents	0.0	-
3	0.76	Open space	Urban Land*	0.0	-
4	0.29	Impervious areas	Urban Land*	0.0	-
5	0				
6	0				
7	0				
8	0				
9	0				
10	0				
11	0				
12	0				
13	0				
14	0				
15	0				
Total =	1.2			Total Annual Recharge (in)	Total Annual Recharge (cu.ft)
				0.0	-

Annual Recharge Requirements Calculation ↓

% of Pre-Developed Annual Recharge to Preserve =	100%	Total Impervious Area (sq.ft)	16,117
--	------	-------------------------------	--------

Post-Development Annual Recharge Deficit=

0

(cubic feet)

Recharge Efficiency Parameters Calculations (area averages)

RWC=	0.00	(in)	DRWC=	0.00	(in)
ERWC =	0.00	(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.

APPENDIX D

GROUNDWATER MOUNDING

Input Values

1.00	R	Recharge rate (permeability rate) (in/hr)
0.150	Sy	Specific yield, Sy (dimensionless) default value is 0.15; max value is 0.2 provided that a lab test data is submitted
1.00	Kh	Horizontal hydraulic conductivity (in/hr) Kh = 5xRecharge Rate (R) in the costal plan; Kh=R outside the coastal plan
26.500	x	1/2 length of basin (x direction, in feet)
12.500	y	1/2 width of basin (y direction, in feet)
2.40	t	Duration of infiltration period (hours)
10.00	hi(0)	Initial thickness of saturated zone (feet)

11.328	h(max)	Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
1.328	Δh(max)	Maximum groundwater mounding (beneath center of basin at end of infiltration period)

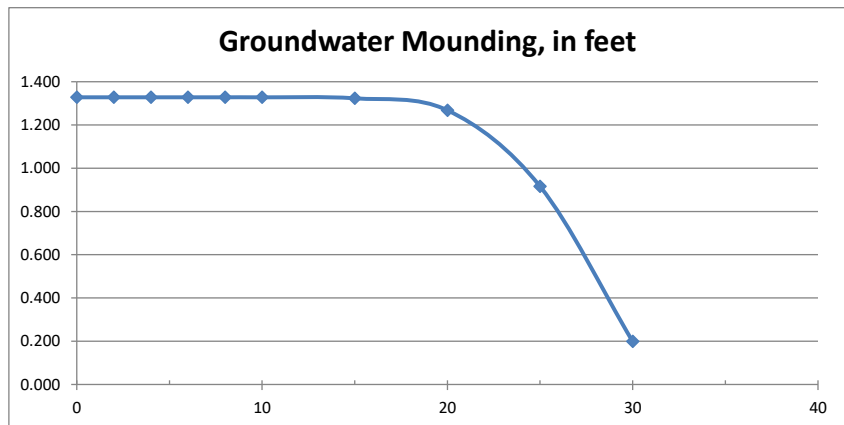
Ground-water Mounding, in feet

Distance from center of basin in x direction, in feet

1.328	0
1.328	2
1.328	4
1.328	6
1.328	8
1.328	10
1.323	15
1.268	20
0.916	25
0.199	30



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.

Infiltration Area: 1,325 SF
Basin Invert El: 540.5

Seasonal High Water Table (SHWT) El: 538.33

Initial Thickness of Saturation Zone: 10 ft

Maximum Allowable Mounding Height: $540.5 - 538.33 = 2.17$ ft

Vertical Infiltration Rate: 1 in/hr (2 in/hr with a factor of safety of 2)

Adjusted field rate: N/A in/hr

Kh: 1 in/hr

Volume of Stormwater to Infiltrate: 265 CF

Infiltration duration = 2.4 hours = $\frac{546 \text{ cf} \times 12 \text{ in}}{1,325 \text{ sf} \times 1 \text{ in/hr}}$

Duration of infiltration period, t (hr) = $\frac{\text{Discarded Volume via Exfiltration (cf)} \times 12 \text{ in/ft}}{\text{Infiltration area (sf)} \times \text{Exfiltration rate (in/hr)}}$

Results: 1.38 ft Mounding Height $\leq$ 2.17 ft OK

APPENDIX E

PROPOSED CONVEYANCE SYSTEM DESIGN

RUNOFF COEFFICIENT (C) TABLE

CATCHMENT AREA - C VALUE SUMMARY										
CA	TOTAL AREA (SF)	TOTAL AREA (AC)	GRASS-D AREA (SF)	GRASS-D AREA (AC)	GRASS-D (0.65)	PERVIOUS AREA (SF)	IMPERVIOUS AREA (SF)	IMPERVIOUS AREA (AC)	IMPERVIOUS x(0.99)	C VALUE
EX CB-101	37,451	0.86	6575.46	0.15	0.10	6575.46	30875.45	0.71	0.70	0.93
CB-101	1,467	0.03	408.93	0.01	0.01	408.93	1057.87	0.02	0.02	0.90
CB-103	6,056	0.14	594.77	0.01	0.01	594.77	5461.38	0.13	0.12	0.96
CB-104	13,999	0.32	3830.53	0.09	0.06	3830.53	10168.27	0.23	0.23	0.90
YD-101	1,199	0.03	1199.39	0.03	0.02	1199.39	0.00	0.00	0.00	0.65
YD-102	1,117	0.03	1116.69	0.03	0.02	1116.69	0.00	0.00	0.00	0.65
YD-103	649	0.01	649.08	0.01	0.01	649.08	0.00	0.00	0.00	0.65
YD-104	6,326	0.15	6326.26	0.15	0.09	6326.26	0.00	0.00	0.00	0.65
OCS-101	18,909	0.43	6019.71	0.14	0.09	6019.71	12889.70	0.30	0.29	0.88
RL-101	7,111	0.16		0.00	0.00	0.00	7111.03	0.16	0.16	0.99
RL-102	2,028	0.05		0.00	0.00	0.00	2027.62	0.05	0.05	0.99
RL-103	4,680	0.11		0.00	0.00	0.00	4680.26	0.11	0.11	0.99
RL-104	624	0.01		0.00	0.00	0.00	623.50	0.01	0.01	0.99
RL-105	781	0.02		0.00	0.00	0.00	781.23	0.02	0.02	0.99
RL-106	693	0.02		0.00	0.00	0.00	693.00	0.02	0.02	0.99
RL-107	535	0.01		0.00	0.00	0.00	535.27	0.01	0.01	0.99

STORMWATER CONVEYANCE SYSTEM DESIGN

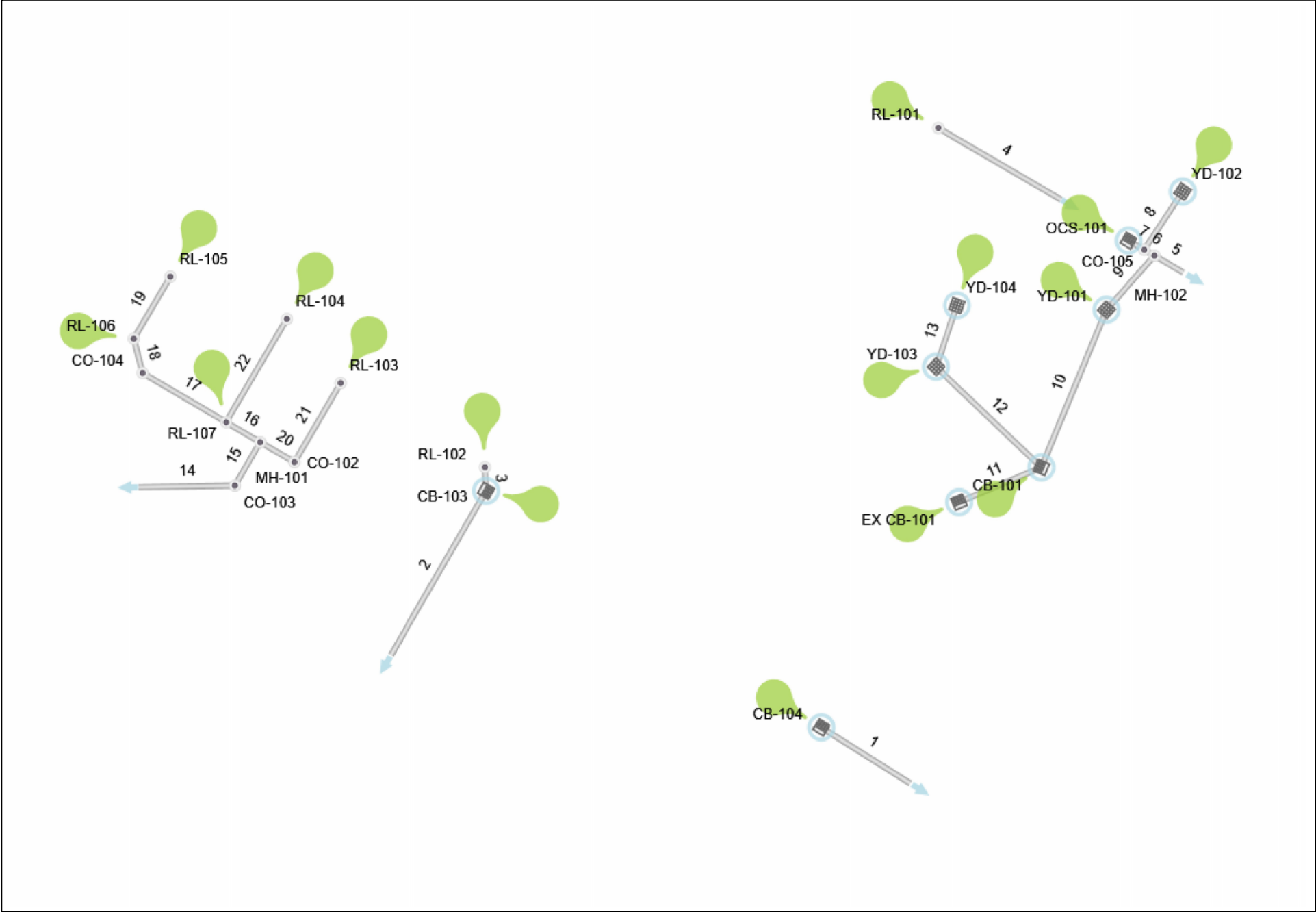
25-YEAR STORM EVENT

Plan View

Stormwater Studio 2023 v 1.0.0.0

Project Name: NST0301 - Parking Lot Expansion

05-03-2024



Storm Sewer Tabulation

Project Name: NST0301 - Parking Lot Expansion

Stormwater Studio 2023 v 1.0.0.0

05-03-2024

Line ID	Length (ft)	Drng Area		Rational (C)	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)	
CB-104 TO EX	45.53	0.320	0.320	0.90	0.29	0.29	6.0	6.00	6.81	1.96	2.62	2.58	12	0.46	560.37	560.16	561.26	561.16	561.20	0.00	1
CB-103 TO EX MH-101	82.75	0.050	0.100	0.96	0.05	0.10	6.0	6.09	6.78	0.66	2.26	2.06	10	0.91	559.40	558.65	559.76	559.48	561.55	562.38	2
RL-102 TO CB-103	10.38	0.050	0.050	0.99	0.05	0.05	6.0	6.00	6.81	0.34	0.67	2.00	6	1.00	559.50	559.40	559.86	559.86	561.59	561.55	3
RL-101 TO PAVEMENT	61.90	0.160	0.160	0.99	0.16	0.16	6.0	6.00	6.81	1.08	0.67	5.44	6	1.00	558.62	558.00	560.09	558.50	563.45	561.00	4
MH-102 TO EX CB-102	14.24	0.000	1.540	0.00	0.00	1.35	0.0	8.19	6.20	8.36	13.82	4.93	18	1.47	556.46	556.25	557.76	557.75	561.10	561.20	5
CO-105 TO MH-102	5.21	0.000	0.460	0.00	0.00	0.40	0.0	8.10	6.23	2.48	2.32	4.54	10	0.96	556.58	556.53	558.48	558.43	561.05	561.10	6
OCS-101 TO CO-105	8.00	0.430	0.430	0.88	0.38	0.38	6.0	6.00	6.81	2.58	2.37	4.73	10	1.00	556.66	556.58	558.77	558.67	561.00	561.05	7
YD-102 TO CO-105	30.62	0.030	0.030	0.65	0.02	0.02	6.0	6.00	6.81	0.13	2.35	0.24	10	0.99	556.88	556.58	558.88	558.88	561.25	561.05	8
YD-101 TO MH-102	31.85	0.030	1.080	0.65	0.02	0.95	6.0	8.03	6.24	5.93	11.40	3.36	18	1.00	556.78	556.46	558.60	558.52	561.25	561.10	9
CB-101 TO YD-101	74.74	0.030	1.050	0.90	0.03	0.93	6.0	7.77	6.31	5.87	4.92	4.79	15	0.50	557.15	556.78	559.13	558.60	559.90	561.25	10
EX CB-101 TO CB-101	39.16	0.860	0.860	0.93	0.80	0.80	6.0	6.00	6.81	5.45	2.76	6.94	12	0.51	557.35	557.15	559.89	559.11	559.46	559.90	11
YD-103 TO CB-101A	63.94	0.010	0.160	0.65	0.01	0.10	6.0	6.56	6.64	0.69	2.73	0.88	12	0.50	557.67	557.35	559.57	559.55	560.91	559.90	12
YD-104 TO YD-103	28.40	0.150	0.150	0.65	0.10	0.10	6.0	6.00	6.81	0.66	2.73	0.85	12	0.50	557.81	557.67	559.58	559.58	560.53	560.91	13
CO-103 TO EX MH-102	41.87	0.000	0.110	0.00	0.00	0.11	0.0	8.81	6.05	0.66	0.67	3.45	6	1.00	554.81	554.39	555.25	554.89	560.61	557.75	14
MH-101 TO CO-103	22.03	0.000	0.110	0.00	0.00	0.11	0.0	8.70	6.08	0.66	0.67	3.34	6	1.00	555.03	554.81	555.78	555.57	561.99	560.61	15
RL-107 TO MH-101	17.36	0.010	0.060	0.99	0.01	0.06	6.0	8.54	6.12	0.36	0.67	1.83	6	1.00	555.20	555.03	556.12	556.07	561.38	561.99	16
CO-104 TO RL-107	42.54	0.000	0.040	0.00	0.00	0.04	0.0	6.68	6.61	0.26	0.67	1.32	6	1.00	555.63	555.20	556.24	556.18	562.08	561.38	17
RL-106 TO CO-104	15.56	0.020	0.040	0.99	0.02	0.04	6.0	6.48	6.67	0.26	0.67	1.33	6	1.00	555.78	555.63	556.28	556.27	561.89	562.08	18
RL-105 TO RL-106	31.54	0.020	0.020	0.99	0.02	0.02	6.0	6.00	6.81	0.13	0.67	1.09	6	1.00	556.10	555.78	556.33	556.32	561.94	561.89	19
CO-102 TO MH-101	17.36	0.000	0.050	0.00	0.00	0.05	0.0	6.39	6.69	0.33	0.67	1.67	6	1.00	555.20	555.03	556.12	556.08	561.51	561.99	20
RL-103 TO CO-102	40.15	0.050	0.050	0.99	0.05	0.05	6.0	6.00	6.81	0.34	0.67	1.70	6	1.00	555.60	555.20	556.27	556.17	562.33	561.51	21
RL-104 TO RL-107	52.54	0.010	0.010	0.99	0.01	0.01	6.0	6.00	6.81	0.07	0.67	0.34	6	1.00	555.73	555.20	556.20	556.19	562.15	561.38	22

Notes: IDF File = MGC - Clubhouse.idf, Return Period = 25-yrs.

Project File: MGC - Clubhouse - Storm Network.sws

APPENDIX F

SUBSURFACE SOIL DOCUMENTATION (NRCS – WEB SOIL SURVEY)



United States
Department of
Agriculture

NRCS

Natural
Resources
Conservation
Service

A product of the National
Cooperative Soil Survey,
a joint effort of the United
States Department of
Agriculture and other
Federal agencies, State
agencies including the
Agricultural Experiment
Stations, and local
participants

Custom Soil Resource Report for **Essex County, New Jersey**



January 11, 2024

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (<http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/>) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (<https://offices.sc.egov.usda.gov/locator/app?agency=nrcs>) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

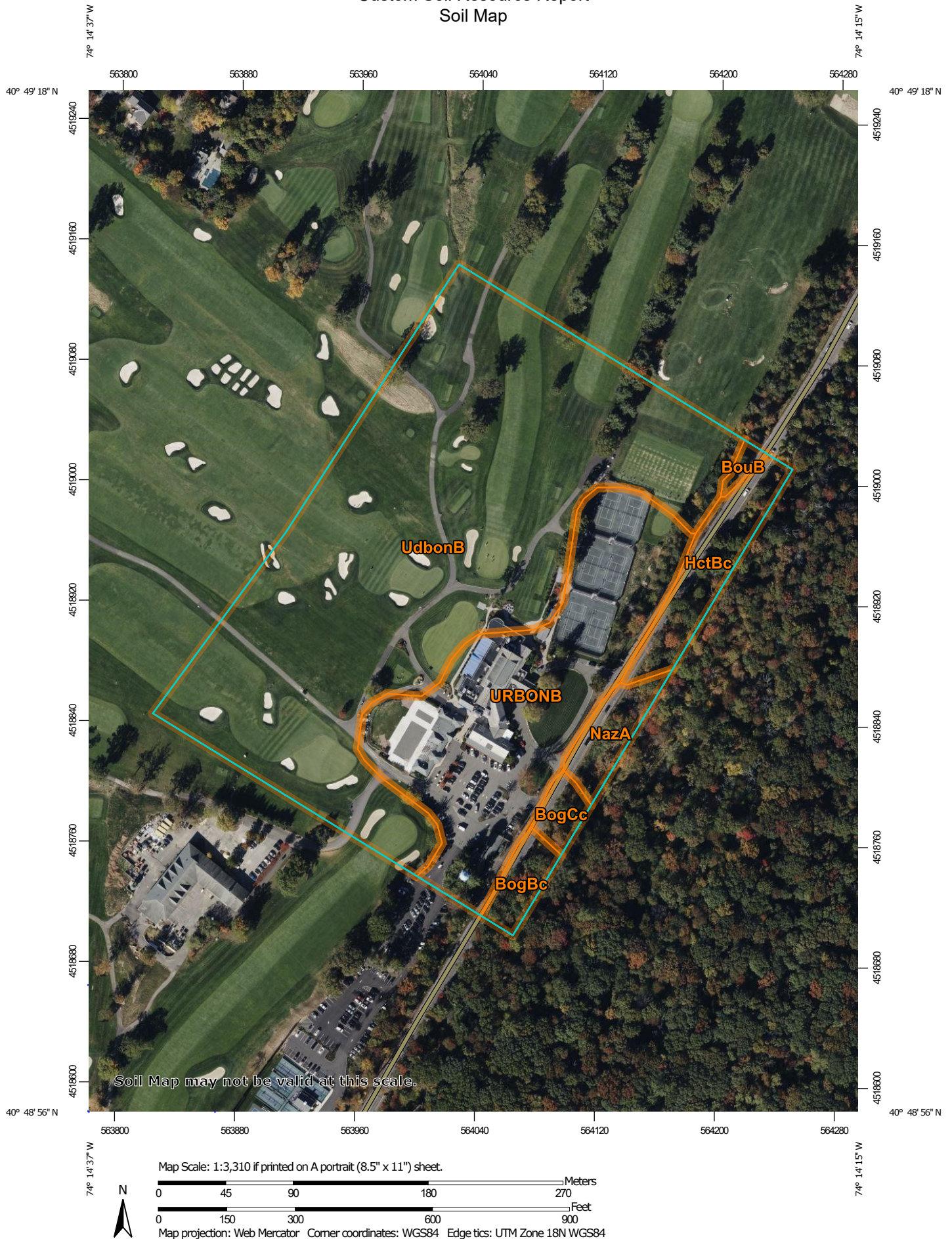
Custom Soil Resource Report

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report Soil Map



Custom Soil Resource Report

MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features

 Blowout

 Borrow Pit

 Clay Spot

 Closed Depression

 Gravel Pit

 Gravelly Spot

 Landfill

 Lava Flow

 Marsh or swamp

 Mine or Quarry

 Miscellaneous Water

 Perennial Water

 Rock Outcrop

 Saline Spot

 Sandy Spot

 Severely Eroded Spot

 Sinkhole

 Slide or Slip

 Sodic Spot

 Spoil Area

 Stony Spot

 Very Stony Spot

 Wet Spot

 Other

 Special Line Features

Water Features

 Streams and Canals

Transportation

 Rails

 Interstate Highways

 US Routes

 Major Roads

 Local Roads

Background

 Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Essex County, New Jersey
Survey Area Data: Version 19, Aug 29, 2023

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

Date(s) aerial images were photographed: Oct 10, 2022—Oct 16, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
BogBc	Boonton loam, 0 to 8 percent slopes, extremely stony	0.4	1.8%
BogCc	Boonton loam, 8 to 15 percent slopes, extremely stony	0.3	1.2%
BouB	Boonton - Urban land, Boonton substratum complex, 0 to 8 percent slopes	0.1	0.5%
HctBc	Hasbrouck silt loam, 0 to 8 percent slopes, extremely stony	1.2	4.9%
NazA	Natchaug muck, 0 to 2 percent slopes	0.6	2.5%
UdbonB	Udorthents, Boonton substratum, 0 to 8 percent slopes	15.3	63.6%
URBONB	Urban land, Boonton substratum, 0 to 8 percent slopes	6.1	25.5%
Totals for Area of Interest		24.1	100.0%

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the

scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Essex County, New Jersey

BogBc—Boonton loam, 0 to 8 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: b128
Elevation: 50 to 500 feet
Mean annual precipitation: 30 to 64 inches
Mean annual air temperature: 46 to 79 degrees F
Frost-free period: 131 to 178 days
Farmland classification: Not prime farmland

Map Unit Composition

Boonton, extremely stony, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Boonton, Extremely Stony

Setting

Landform: Ground moraines
Landform position (three-dimensional): Upper third of mountainflank, center third of mountainflank
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Coarse-loamy basal till derived from basalt

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
Oa - 1 to 3 inches: highly decomposed plant material
A - 3 to 5 inches: loam
BA - 5 to 8 inches: silt loam
BE - 8 to 17 inches: silt loam
Bt - 17 to 30 inches: silt loam
Btx1 - 30 to 40 inches: gravelly fine sandy loam
Btx2 - 40 to 47 inches: fine sandy loam
CBt1 - 47 to 58 inches: loamy sand
CBt2 - 58 to 72 inches: loamy sand

Properties and qualities

Slope: 0 to 8 percent
Surface area covered with cobbles, stones or boulders: 10.0 percent
Depth to restrictive feature: 20 to 36 inches to fragipan
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 5.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s

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Hydrologic Soil Group: C

Ecological site: F144AY037MA - Moist Dense Till Uplands

Hydric soil rating: No

Minor Components

Boonton, moderately well drained, extremely stony

Percent of map unit: 10 percent

Landform: Ground moraines

Landform position (two-dimensional): Summit, shoulder

Landform position (three-dimensional): Head slope, side slope

Down-slope shape: Convex

Across-slope shape: Linear

Hydric soil rating: No

Haledon, extremely stony

Percent of map unit: 5 percent

Landform: Ground moraines

Landform position (two-dimensional): Summit, shoulder

Landform position (three-dimensional): Head slope, side slope

Down-slope shape: Convex

Across-slope shape: Linear

Hydric soil rating: No

BogCc—Boonton loam, 8 to 15 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: b120

Elevation: 50 to 500 feet

Mean annual precipitation: 30 to 64 inches

Mean annual air temperature: 46 to 79 degrees F

Frost-free period: 131 to 178 days

Farmland classification: Not prime farmland

Map Unit Composition

Boonton, extremely stony, and similar soils: 85 percent

Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Boonton, Extremely Stony

Setting

Landform: Ground moraines

Landform position (three-dimensional): Upper third of mountainflank, center third of mountainflank

Down-slope shape: Convex

Across-slope shape: Linear

Parent material: Coarse-loamy basal till derived from basalt

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material

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Oa - 1 to 3 inches: highly decomposed plant material
A - 3 to 5 inches: loam
BA - 5 to 8 inches: silt loam
BE - 8 to 17 inches: silt loam
Bt - 17 to 30 inches: silt loam
Btx1 - 30 to 40 inches: gravelly fine sandy loam
Btx2 - 40 to 47 inches: fine sandy loam
CBt1 - 47 to 58 inches: loamy sand
CBt2 - 58 to 72 inches: loamy sand

Properties and qualities

Slope: 8 to 15 percent
Surface area covered with cobbles, stones or boulders: 10.0 percent
Depth to restrictive feature: 20 to 36 inches to fragipan
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 5.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C
Ecological site: F144AY037MA - Moist Dense Till Uplands
Hydric soil rating: No

Minor Components

Boonton, moderately well drained, extremely stony

Percent of map unit: 10 percent
Landform: Ground moraines
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Head slope, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Haledon, extremely stony

Percent of map unit: 5 percent
Landform: Ground moraines
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Head slope, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

BouB—Boonton - Urban land, Boonton substratum complex, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: b12f
Elevation: 50 to 500 feet
Mean annual precipitation: 30 to 64 inches
Mean annual air temperature: 46 to 79 degrees F
Frost-free period: 131 to 178 days
Farmland classification: Not prime farmland

Map Unit Composition

Boonton and similar soils: 50 percent
Urban land, boonton substratum: 40 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Boonton

Setting

Landform: Ground moraines
Landform position (three-dimensional): Upper third of mountainflank, center third of mountainflank
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Coarse-loamy basal till derived from basalt

Typical profile

A - 0 to 5 inches: loam
BA - 5 to 8 inches: silt loam
BE - 8 to 17 inches: silt loam
Bt - 17 to 30 inches: silt loam
Btx1 - 30 to 40 inches: gravelly fine sandy loam
Btx2 - 40 to 47 inches: fine sandy loam
CBt1 - 47 to 58 inches: loamy sand
CBt2 - 58 to 72 inches: loamy sand

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: 20 to 36 inches to fragipan
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Ecological site: F144AY037MA - Moist Dense Till Uplands
Hydric soil rating: No

Description of Urban Land, Boonton Substratum

Setting

Landform: Ground moraines
Landform position (three-dimensional): Lower third of mountainflank, upper third of mountainflank, center third of mountainflank
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Surface covered by pavement, concrete, buildings, and other structures underlain by disturbed and natural soil material

Typical profile

H1 - 0 to 12 inches: material
H2 - 12 to 47 inches: silt loam
2CBt1 - 47 to 58 inches: loamy sand
2CBt2 - 58 to 72 inches: loamy sand

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: Unranked

Minor Components

Udorthents, boonton substratum

Percent of map unit: 10 percent
Landform: Ground moraines
Landform position (three-dimensional): Lower third of mountainflank, upper third of mountainflank, center third of mountainflank
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

HctBc—Hasbrouck silt loam, 0 to 8 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: b12r
Elevation: 50 to 1,000 feet
Mean annual precipitation: 30 to 64 inches
Mean annual air temperature: 46 to 79 degrees F
Frost-free period: 131 to 178 days
Farmland classification: Not prime farmland

Map Unit Composition

Hasbrouck, extremely stony, and similar soils: 85 percent

Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hasbrouck, Extremely Stony

Setting

Landform: Depressions

Landform position (two-dimensional): Toeslope

Landform position (three-dimensional): Base slope

Down-slope shape: Concave

Across-slope shape: Concave

Parent material: Fine-loamy eroded and redeposited glacial material over glacial till

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material

Oa - 1 to 2 inches: highly decomposed plant material

A1 - 2 to 5 inches: silt loam

A2 - 5 to 10 inches: gravelly loam

Eg - 10 to 17 inches: loam

Btg1 - 17 to 25 inches: loam

Btg2 - 25 to 34 inches: loam

Btx - 34 to 36 inches: gravelly loam

Btgx - 36 to 39 inches: loam

B'tx - 39 to 50 inches: fine sandy loam

CB - 50 to 60 inches: fine sandy loam

Properties and qualities

Slope: 0 to 8 percent

Surface area covered with cobbles, stones or boulders: 10.0 percent

Depth to restrictive feature: 16 to 34 inches to fragipan

Drainage class: Poorly drained

Runoff class: Medium

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)

Depth to water table: About 0 to 6 inches

Frequency of flooding: None

Frequency of ponding: Occasional

Available water supply, 0 to 60 inches: Moderate (about 6.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7s

Hydrologic Soil Group: C/D

Ecological site: F144AY009CT - Wet Till Depressions

Hydric soil rating: Yes

Minor Components

Natchaug

Percent of map unit: 10 percent

Landform: Outwash plains

Landform position (three-dimensional): Dip

Down-slope shape: Linear

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Across-slope shape: Linear

Hydric soil rating: Yes

Haledon, extremely stony

Percent of map unit: 5 percent

Landform: Ground moraines

Down-slope shape: Linear

Across-slope shape: Convex

Hydric soil rating: No

NazA—Natchaug muck, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2w68z

Elevation: 0 to 1,550 feet

Mean annual precipitation: 36 to 71 inches

Mean annual air temperature: 39 to 55 degrees F

Frost-free period: 145 to 240 days

Farmland classification: Farmland of unique importance

Map Unit Composition

Natchaug and similar soils: 80 percent

Minor components: 20 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Natchaug

Setting

Landform: Depressions, depressions, depressions

Down-slope shape: Concave

Across-slope shape: Concave

Parent material: Highly decomposed organic material over loamy glaciofluvial deposits and/or loamy glaciolacustrine deposits and/or loamy till

Typical profile

Oa1 - 0 to 12 inches: muck

Oa2 - 12 to 31 inches: muck

2Cg1 - 31 to 39 inches: silt loam

2Cg2 - 39 to 79 inches: fine sandy loam

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Very poorly drained

Runoff class: Negligible

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high
(0.01 to 14.17 in/hr)

Depth to water table: About 0 to 6 inches

Frequency of flooding: None

Frequency of ponding: Frequent

Calcium carbonate, maximum content: 25 percent

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Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)

Available water supply, 0 to 60 inches: Very high (about 17.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 5w

Hydrologic Soil Group: B/D

Ecological site: F144AY042NY - Semi-Rich Organic Wetlands

Hydric soil rating: Yes

Minor Components

Catden

Percent of map unit: 8 percent

Landform: Depressions, depressions, depressions

Down-slope shape: Concave

Across-slope shape: Concave

Hydric soil rating: Yes

Limerick

Percent of map unit: 5 percent

Landform: Flood plains

Landform position (three-dimensional): Tread

Down-slope shape: Concave

Across-slope shape: Concave

Hydric soil rating: Yes

Sun

Percent of map unit: 4 percent

Landform: Hills, depressions

Landform position (two-dimensional): Footslope, toeslope

Landform position (three-dimensional): Head slope, base slope

Down-slope shape: Concave

Across-slope shape: Concave

Hydric soil rating: Yes

Halsey

Percent of map unit: 3 percent

Landform: Terraces

Landform position (three-dimensional): Tread

Down-slope shape: Concave

Across-slope shape: Concave

Hydric soil rating: Yes

UdbonB—Udorthents, Boonton substratum, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: w8r1

Elevation: 50 to 660 feet

Mean annual precipitation: 30 to 64 inches

Mean annual air temperature: 46 to 79 degrees F

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Frost-free period: 131 to 178 days

Farmland classification: Not prime farmland

Map Unit Composition

Udorthents, boonton substratum, and similar soils: 95 percent

Minor components: 5 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents, Boonton Substratum

Setting

Landform: Ground moraines

Landform position (three-dimensional): Lower third of mountainflank

Down-slope shape: Convex

Across-slope shape: Linear

Parent material: Loamy material transported by human activity

Typical profile

A - 0 to 12 inches: loam

CBt1 - 12 to 58 inches: loamy sand

CBt2 - 58 to 72 inches: loamy sand

Properties and qualities

Slope: 0 to 8 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained

Runoff class: Medium

Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water supply, 0 to 60 inches: Moderate (about 8.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 3w

Hydrologic Soil Group: A

Hydric soil rating: No

Minor Components

Boonton

Percent of map unit: 5 percent

Landform: Ground moraines

Landform position (three-dimensional): Upper third of mountainflank, center third of mountainflank

Down-slope shape: Convex

Across-slope shape: Linear

Hydric soil rating: No

URBONB—Urban land, Boonton substratum, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: w9cn
Elevation: 50 to 500 feet
Mean annual precipitation: 30 to 64 inches
Mean annual air temperature: 46 to 79 degrees F
Frost-free period: 131 to 178 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land, boonton substratum: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land, Boonton Substratum

Setting

Landform: Ground moraines
Landform position (three-dimensional): Lower third of mountainflank
Down-slope shape: Linear, convex
Across-slope shape: Linear
Parent material: Surface covered by pavement, concrete, buildings, and other structures underlain by disturbed and natural soil material

Typical profile

H1 - 0 to 12 inches: material
H2 - 12 to 47 inches: silt loam
2CBt1 - 47 to 58 inches: loamy sand
2CBt2 - 58 to 72 inches: loamy sand

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: Unranked

Minor Components

Boonton

Percent of map unit: 5 percent
Landform: Ground moraines
Landform position (three-dimensional): Upper third of mountainflank, center third of mountainflank
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Udorthents, boonton substratum

Percent of map unit: 5 percent
Landform: Ground moraines

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Landform position (three-dimensional): Lower third of mountainflank, upper third of mountainflank, center third of mountainflank

Down-slope shape: Convex

Across-slope shape: Linear

Hydric soil rating: No

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