



## Preliminary Drainage Report

# Eagleview Subdivision El Paso County, Colorado

Prepared for:

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Project #: 196288000

Prepared: October 29th, 2021

Add text: PCD Filing No.: SP216

**Kimley»Horn**

## **CERTIFICATION**

### **DESIGN ENGINEER'S STATEMENT**

The attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by the County for drainage reports and said report is in conformity with the master plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparation of this report.

SIGNATURE (Affix Seal): \_\_\_\_\_  
Brice Hammersland, P.E.  
Colorado P.E. No. 56012  
Date

### **OWNER/DEVELOPER'S STATEMENT**

I, the developer, have read and will comply with all of the requirements specified in this Drainage Report and Plan.

\_\_\_\_\_  
Name of Developer

\_\_\_\_\_  
Authorized Signature  
Date

\_\_\_\_\_  
Printed Name

\_\_\_\_\_  
Title

\_\_\_\_\_  
Address:

### **EL PASO COUNTY**

Filed in accordance with the requirements of the Drainage Criteria Manual, Volumes 1 and 2, El Paso County Engineering Criteria Manual and Land Development Code as amended.

\_\_\_\_\_  
Jennifer Irvine, P.E.  
County Engineer/ ECM Administrator  
Date

Conditions:



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## INTRODUCTION

revise to "...and preliminary hydraulic calculations..." Add a statement that hydraulic design/calculation will be finalized with the Final Drainage Report.

### PURPOSE AND SCOPE OF STUDY

The purpose of this Preliminary Drainage Report (PDR) is to provide the hydrologic and hydraulic calculations and to document the drainage design methodology in support of the proposed Eagleview Subdivision ("the Project") for PT Eagleview LLC. The Project is located within the jurisdictional limits of El Paso County ("the County"). Therefore, the hydrologic and hydraulic design is based on the County's criteria which is described in further detail within the report.

### LOCATION

The Project is located approximately 4 miles northwest of Falcon, Colorado within Township 12 South, Range 55 West of the 6th Principal Meridian, County of El Paso, State of Colorado ("the Site") and which are bound by Flaming Sun Road and Tract E of Paint Brush Hills Piling No. 13E to the south and Arroya Lane to the north. A vicinity map has been attached.

Revise to Paint Brush Hills Fil 14 (PCD File No. SF2024) See the drainage report for PBH14 to ensure no drainage conflicts between the two development.

The Site is currently owned by PT Eagleview, LLC and will be developed by PT Eagleview, LLC.

### DESCRIPTION OF PROPERTY

The Site is approximately 124 acres consisting of undeveloped land with native vegetation and is classified as "Open Space" per Table 5-4 of the Drainage Criteria Manual of El Paso County. Vegetation within the site is characterized primarily by prairie grasses along with some area of scrub brush and a limited occurrence of small oaks. The Site does not currently provide water quality or detention for the Project area. The existing land use is undeveloped vacant land. There are no existing irrigation ditches on the Site.

The existing topography consists of slopes ranging from 1% to 20%. The West Kiowa Creek ("the Creek") runs in the northwest corner of the site.

According to NRCS soil mapping data, USCS Type B soils are the primary soil type within the site, indicating high levels of permeability. Soils present at the Site consist mainly of "Pring coarse sandy loam" which represent a moderate hazard for erosion. **Appendix B** contains detailed NRCS soil data.

The development of this site will include 38 2 ½ acre single family lots, roadway improvements to the site will include mowing, clearing and grubbing, weed control, paved access road construction, roadway grading, one sub regional detention pond, two water quality features, roadside ditches, culverts, drainage swales, native seeding and a proposed channel to convey flows to the detention pond and water quality features.

A Topographic field survey was completed for the Project by Rampart Surveys dated June 24<sup>th</sup>, 2008 and is the basis for design for the drainage improvements.

## **DRAINAGE BASINS**

### **MAJOR BASIN DESCRIPTIONS**

The Project is located within the West Tributary of the Falcon Drainage Basin. The watershed is generally located in the north central portion of El Paso County. The watershed contains three perennial streams and has an overall area of approximately 10.6 square miles at the confluence of Black Squirrel Creek. The headwaters of the watershed are made up of ponderosa pine forest, grassland on undeveloped land, and 2-to-5-acre rural residential lots. There is no FEMA mapped floodplains on the project site. Refer to **Appendix A** for the Flood Insurance Rate Map (FIRM) number 08041C05350G effective date, December 7, 2018.

### **EXISTING SUB-BASIN DESCRIPTIONS**

Historically the runoff from the Site drains into the West Tributary reach of the Falcon drainage basin. The West Tributary reach bisects the Site from north to south. The Site is located in upper portion of the Falcon drainage basin. The Site was divided into 4 onsite subbasins B1 – B4 and 9 offsite basins OB1 – OB9. Onsite and offsite flows generally flow from north to south overland over vacant and developed land to the West Tributary reach. The off-site basins draining to the site generally encompass rural land with pockets of residential development. Below is a description of the existing sub-basins.

#### **Sub-Basin B1**

The on-site sub-basin consists of an area of 5.88 acres, located in the southwest corner of the property. Drainage flows overland from the northwest to the southeast into the West Tributary. The curve number for this basin is 62.35. Runoff during the 5-year and 100-year events are 3.9 cfs and 10.8 cfs respectively.

#### **Sub-Basin B2**

The on-site sub-basin consists of an area of 41.43 acres, located on the west side of the property. Drainage flows overland from the northwest to the southeast into the West Tributary. The curve number for this basin is 60.68. Runoff during the 5-year and 100-year events are 17.9 cfs and 58.0 cfs respectively.

#### **Sub-Basin B3**

The on-site sub-basin consists of an area of 59.54 acres, located in the central portion of the property. Drainage flows overland from the northwest to the southeast into the West Tributary reach. The curve number for this basin is 60.90. Runoff during the 5-year and 100-year events are 42.3 cfs and 127.8 cfs respectively.

#### **Sub-Basin B4**

The on-site sub-basin consists of an area of 14.68 acres, located in the northeast portion of the property. Drainage flows overland from the north to the south into the West Tributary reach. The curve number for this basin is 61.00. Runoff during the 5-year and 100-year events are 6.8 cfs and 21.8 cfs respectively.

#### **Sub-Basin OB1**

The off-site sub-basin consists of an area of 10.37 acres, located on the southwest corner of the property. Drainage flows overland from the west to the east onto the property and continues to the southeast and outfalls along the south property line into the West Tributary reach at design

point J1. The curve number for this basin is 62.81. Runoff during the 5-year and 100-year events are 6.4 cfs and 17.5 cfs respectively.

#### **Sub-Basin OB2**

The off-site sub-basin consists of an area of 28.06 acres, located on the west side of the property. Drainage flows overland from the west to the east onto the property. Flows enter the site in a well-defined natural channel and continue to the southeast as channelized flow. Where the flows ultimately outfall along the south property line into the West Tributary reach at design point J2. The curve number for this basin is 63.23. Runoff during the 5-year and 100-year events are 18.7 cfs and 49.0 cfs respectively.

#### **Sub-basin OB3**

The off-site sub-basin consists of an area of 43.44 acres, located on the west of the property. Drainage flows overland from the northwest to the southeast and enters the site as channelized flow and continue to the southeast as channelized flow. Where the flows ultimately outfall at the south property line into the West Tributary reach at design point J2. The curve number for this basin is 62.68. Runoff during the 5-year and 100-year events are 23.7 cfs and 64.7 cfs respectively.

#### **Sub-basin OB4**

The off-site sub-basin consists of an area of 10.50 acres, located on the west side of the property. Drainage flows overland from the northwest to the southeast and enters the site as channelized flow and continues to the southeast as channelized flow. Where the flows ultimately outfall at the south property line into the West Tributary reach at design point J2. The curve number for this basin is 63.80. Runoff during the 5-year and 100-year events are 6.8 cfs and 17.4 cfs respectively.

#### **Sub-basin OB5**

The off-site sub-basin consists of an area of 143.82 acres, located on the northwest side of the property. Drainage flows overland from the northwest to the southeast and enters the site as channelized flow and continues to the southeast as channelized flow. Where the flows ultimately outfall into the West Tributary reach on-site at design point J4. The curve number for this basin is 57.50. Runoff during the 5-year and 100-year events are 46.1 cfs and 137.2 cfs respectively.

#### **Sub-basin OB6**

The off-site sub-basin consists of an area of 118.40 acres, located north side of the property. Drainage flows overland from the north to the south and enters the site as channelized flow and continues to the south where it outfalls into the West Tributary on-site at design point J4. The curve number for this basin is 59.96. Runoff during the 5-year and 100-year events are 53.6 cfs and 152.9 cfs respectively.

#### **Sub-Basin OB7**

The off-site sub-basin consists of an area of 421.20 acres, located on the north side of the property. Drainage flows overland from the north to the south and enters the site as channelized flow within the West Tributary reach. The curve number for this basin is 58.93. Runoff during the 5-year and 100-year events are 126.8 cfs and 362.2 cfs respectively.

#### **Sub-Basin OB8**

The offsite sub-basin consists of an area of 39.87 acres, located northeast of the property. Drainage flows overland from the north to the south and enters onto the site as shallow concentrated flow as there is no well-defined natural drainage channel in this area of the site. Flows then continue to the south in a more defined natural channel and outfall into the West

Tributary reach on-site at design point J3. The curve number for this basin is 65.60. Runoff during the 5-year and 100-year events are 28.4 cfs and 77.0 cfs respectively.

#### **Sub-Basin OB9**

The off-site sub-basin consists of an area of 117.46 acres, located on the east of the property. Drainage flows overland from the northeast to the southeast into private detention pond and outfalls into the West Tributary reach southeast of the project property. The curve number for this basin is 74.95. Runoff during the 5-year and 100-year events are 178.3 cfs and 372.9 cfs respectively.

Refer to **Appendix E** for the Existing Drainage Conditions Map.

### ***PROPOSED SUB-BASIN DESCRIPTIONS***

For the proposed condition, stormwater will generally maintain historic flow patterns from north to south. The proposed roadways will alter some of the existing flow paths. The roadway ditches will capture runoff from the roadways and direct flows back to the existing flow paths, which will ultimately outfall to existing natural drainage channels, sub regional pond, or water quality features. The proposed project has been divided into 15 on-site sub-basins. The off-site basins are fully built out and no changes to the upstream basins are anticipated.

#### **Sub-Basin PB1**

The on-site sub-basin consists of 2 residential lots at the southwest corner of the property. The sub-basin has an area of 4.25 acres. The curve number for the sub-basin is 64.35. Runoff during the 5-year and 100-year events are 3.7 cfs and 9.4 cfs respectively. Runoff from this basin will travel across the lots and outfall to the south as it has done historically a design point P1.

#### **Sub-Basin PB2**

The on-site sub-basin consists of 1 residential lot at the southwest corner of the property. The sub-basin has an area of 1.08 acres. The curve number for the sub-basin is 65.38. Runoff during the 5-year and 100-year events are 1.2 cfs and 2.9 cfs respectively. Runoff from this basin will travel across the lot and outfall to the south as it has done historically a design point P1.

#### **Sub-Basin PB3**

The on-site sub-basin consists of portions of 2 residential lots and the half street of the proposed local roadway at the southwest corner of the property. The sub-basin has an area of 1.38 acres. The curve number for the sub-basin is 67.68. Runoff during the 5-year and 100-year events are 1.8 cfs and 4.0 cfs respectively. Runoff from this basin will travel across the lots and be conveyed to Culvert 1 through a roadside ditch. Flows will then be conveyed through basin PB15 via a natural channel and outfall into a water quality feature before out falling into the West Tributary reach at design point P2.

specify which one.

#### **Sub-Basin PB4**

The on-site sub-basin consists of 4 residential lots and the half streets of the proposed local roadway at the southwest corner of the property. The sub-basin has an area of 10.54 acres. The curve number for the sub-basin is 64.84. Runoff during the 5-year and 100-year events are 14.1

cfs and 33.8 cfs respectively. Runoff from this basin will travel across the lots and be conveyed by a natural channel to Culvert 2. Where flows will then be conveyed through basin PB15 via a natural channel and outfall into a water quality feature before out falling into the West Tributary reach at design point P2.

specify which one.

#### Sub-Basin PB5

The on-site sub-basin consists of 2 residential lots and the half street of the proposed local roadways at the west side of the property. The sub-basin has an area of 6.18 acres. The curve number for the sub-basin is 64.70. Runoff during the 5-year and 100-year events are 5.1 cfs and 12.9 cfs respectively. Runoff from this basin will travel across the lots and be conveyed by a natural channel to Culvert 7. Where flows will then be conveyed through basin PB4 and PB15 via a natural channel and outfall into a water quality feature before out falling into the West Tributary reach at design point P2.

#### Sub-Basin PB6

The on-site sub-basin consists of 3 residential lots and the half street of the proposed local roadway near the central portion of the property. The sub-basin has an area of 11.09 acres. The curve number for the sub-basin is 65.33. Runoff during the 5-year and 100-year events are 6.8 cfs and 20.5 cfs respectively. Runoff from this basin will travel across the lots and roadside ditches to Culvert 3. Where flows will then be conveyed through basin PB15 via a natural channel and outfall into a water quality feature before out falling into the West Tributary reach at design point P2.

#### Sub-Basin PB7

The on-site sub-basin consists of 3 residential lots and portions of the proposed local roadways near the central portion of the property. The sub-basin has an area of 5.59 acres. The curve number for the sub-basin is 65.38. Runoff during the 5-year and 100-year events are 3.8 cfs and 11.2 cfs respectively. Runoff from this basin will travel across the lots and roadside ditches to Culvert 4. Runoff will then be conveyed through a roadside ditch to Culvert 3. From there the runoff will be conveyed through basin PB15 via a natural channel and outfall into a water quality feature before out falling into the West Tributary reach.

#### Sub-Basin PB8

The on-site sub-basin consists of 3 residential lots, a large natural drainage channel and a portion of the sub regional Pond 1 near the northwest corner of the property. The sub-basin has an area of 11.78 acres. The curve number for the sub-basin is 64.13. Runoff during the 5-year and 100-year events are 10.8 cfs and 30.6 cfs respectively. Runoff from this basin will travel across the lots and into the nature channel that outfalls into the sub regional detention Pond 1.

#### Sub-Basin PB9

The on-site sub-basin consists of 4 residential lots, a large natural drainage channel and a portion of the sub regional Pond 1 near the northern portion of the property. The sub-basin has an area of 12.80 acres. The curve number for the sub-basin is 64.39. Runoff during the 5-year and 100-year events are 8.4 cfs and 25.4 cfs respectively. Runoff from this basin will travel across the lots and into the nature channel that outfalls into the sub regional detention Pond 1.

#### Sub-Basin PB10



The on-site sub-basin consists of 4 residential lots and a portion of the sub regional Pond 1 near the northern portion of the property. The sub-basin has an area of 11.52 acres. The curve number for the sub-basin is 64.57. Runoff during the 5-year and 100-year events are 6.7 cfs and 20.7cfs respectively. Runoff from this basin will travel across the lots and into the nature channel that outfalls into the sub regional detention Pond 1.

#### Sub-Basin PB11

The on-site sub-basin consists of 6 residential lots and portions of the proposed local roadways near the northeast portion of the property. The sub-basin has an area of 16.11 acres. The curve number for the sub-basin is 64.80. Runoff during the 5-year and 100-year events are 14.7 cfs and 36.7 cfs respectively. Runoff from this basin will travel across the lots utilize roadside ditches and natural drainage channels to convey flows to Culvert 6. From there the runoff will be conveyed through basin PB14 via a natural channel and outfall into a water quality feature before out falling into the West Tributary reach.

specify that this is  
"Water Quality Feature 2"

#### Sub-Basin PB12

The on-site sub-basin consists of a portion of the proposed local roadways near the east portion of the property. The sub-basin has an area of 0.20 acres. The curve number for the sub-basin is 76.50. Runoff during the 5-year and 100-year events are 0.5 cfs and 1.0 cfs respectively. Runoff from this basin will utilize a roadside ditch to convey flows to Culvert 5. From there the runoff will be conveyed through basin PB14 via a natural channel and outfall into a water quality feature before out falling into the West Tributary reach.

#### Sub-Basin PB13

The on-site sub-basin consists of a portion of the proposed local roadways near the east portion of the property. The sub-basin has an area of 1.76 acres. The curve number for the sub-basin is 65.12. Runoff during the 5-year and 100-year events are 2.4 cfs and 5.7 cfs respectively. Runoff from this basin will sheet flow into the West Tributary reach. From there the runoff will be conveyed to Culvert 8 and through basin PB14 via the West Tributary reach and outfall to design point P3.

#### Sub-Basin PB14

The on-site sub-basin consists of 4 residential lots a portion of the proposed local roadways near the southeast portion of the property. The sub-basin has an area of 17.28 acres. The curve number for the sub-basin is 63.64. Runoff during the 5-year and 100-year events are 21.3 cfs and 52.0 cfs respectively. Runoff from this basin will sheet flow into the West Tributary reach and outfall to design point P3.

#### Sub-Basin PB15

The on-site sub-basin consists of 5 residential lots and portions of the proposed local roadways near the northeast portion of the property. The sub-basin has an area of 9.63 acres. The curve number for the sub-basin is 64.80. Runoff during the 5-year and 100-year events are 12.3 cfs and 29.4 cfs respectively. Runoff from this basin will travel across the lots utilize roadside ditches and natural drainage channels to convey flows to a water quality feature out falling into the West Tributary reach at design point P2.

specify that this is  
"Water Quality Feature 1"

#### Sub-Basins OB1 – OB9

The offsite sub basins are fully built out per the DBPS and are anticipated to maintain historic flows and drainage patterns.

## DRAINAGE DESIGN CRITERIA

### DEVELOPMENT CRITERIA REFERENCE

The proposed storm facilities are designed to be in compliance with the El Paso County "Engineering Criteria Manual" ("the Engineering Manual"), Volumes 1 and 2.

Site drainage is not significantly impacted by such constraints as utilities or existing development.

A Falcon Drainage Basin Planning Study (DBPS) was completed and includes the following for reference to assist with drainage design: a rate for sub regional pond is planned to be completed by DBPS. The study also completed a flood plain delineation of the West Tributary reach stream improvements were identified and conceptually designed for the entire reach. Refer to **Appendix D** for excerpts from the DBPS.

Update reference to City of Colorado Springs May 2014 Drainage Criteria Manual Vol 1. Per Resolution 15-042 the County adopted Chapter 6 (Hydrology) of the above City DCM. Update the hydrologic criteria, such as the CN and rainfall distributions, accordingly. Type II replaced the Type Ila for frontal storm

### HYDROLOGIC CRITERIA

The 5-year and 100-year design storm events were used in determining rainfall and runoff for the proposed drainage analysis per the Engineering Manual. The model utilizes the NRCS Type IIA rainfall distribution, the cumulative depth for the 5-year storm 2.7 inches and the cumulative depth for the 100-year storm is 4.6 inches. It should be noted that the DBPS used a slightly lower cumulative depth for the 5-yr (2.6 inches) and used the same cumulative depth for the 100-year of (4.6 inches). The DBPS also applied an aerial reduction of 2% to the rainfall depths as the Falcon Watershed is slightly larger than 10 square miles. Where the rainfall for the Site does not have an aerial reduction applied to the rainfall depths. Refer to Tables 5-3 and 6-2 in the El Paso County Engineering Manual for the rainfall distribution curve and rainfall depths data for the 5-year and 100-year design storm events utilized for the project. The project model was calibrated to the DBPS model and reflects similar results for the project site area. The project model does show slightly higher offsite flows coming to the site, which is to be expected with the with no aerial reduction being applied to the project rainfall depths. Design point JWT080 in the DBPS model and design points J4 and P7 in the project models were used as critical points to calibrate the existing and proposed condition models.

Design runoff was calculated using the NRCS curve number method for developed conditions as established in the Engineering Manual. This aligns with what was completed in the Falcon Drainage Basin Planning Study (DBPS). The NRCS curve number method was used for existing conditions and proposed conditions due to the on-site and off-site basins containing more than 130 acres. Existing and future land uses were obtained from the County GIS department and aligned with the DBPS. Runoff curve numbers for the existing drainage basins used the curve numbers developed by NRCS which aligned with the methodology of the DBPS. For the proposed curve numbers onsite the Engineering Manual was utilized to extrapolate the curve number and percent impervious values for the 2 ½ acre lots. As the Engineering Manual only goes up to a 2-acre lot. The curve numbers developed below were done with conservative interpolation as the curve numbers are not linear as the lot sizes increase. The following values for the 2 ½ lots in **Table 1** below were utilized for this report.

Clarify/specify which variables were calibrated and why



Update or provide another table that list all CN used/assumed such as the offsite areas developed areas and onsite undeveloped (existing condition) areas. Looking at the zoning map the offsite area is zoned RR-5. See DBPS Table 3-7 for representative 5 ac CN

Preliminary Drainage Report  
Eagleview Subdivision

Update title to identify these are CNs

Table 1: Values Extrapolated

Lot Size (Acres)	% Imp	Soil Type			
		A	B	C	D
2 1/2	11	N/A	64	76	81

The rainfall depths utilized the Frontal Storm which aligned with the D for the Frontal Storm rainfall values.

fix title. Thunder Storm is for short duration storm event and Frontal Storm is long duration. The table is showing both.

Table 2: Frontal Storm Rainfall Depths

Storm Event	Duration (HRS)	
	1 HR	24 HR
5 Year	1.5	2.7
100 Year	2.52	4.6

Calculations for the composite curve numbers and impervious values are included in the Appendix B.

The Site is providing one sub regional detention pond which will include water quality capture

See City (2014) DCM chapter 6 Section 2.2.2. Both thunder storm and frontal storm needs to be evaluated and it is the responsibility of the design engineer to determine the dominant design storm for this project. State which design storm applies.

providing two additional details of the Site and possible and not

There are no additional provisions selected or deviations from the criteria.

### HYDRAULIC CRITERIA

Routing of the stormwater runoff and modeling of the detention pond using the NRCS Curve Number Method as required for pond sizing and full spectrum detention pond sizing shall be done utilizing UD-Culvert and UD-Detention calculations.

Identify the method used for channel routing in HEC-HMS. See Cit DCM chapter 6 section 6.0 for allowable channel routing method.

Proposed drainage features on-site have been analyzed and sized for the following design storm events:

- Major Storm: 100-year Storm Event

Revise to Lag Time per City DCM Chapter 6 Section 4.6

The time of concentration was calculated per TR-55 by summing the travel time for overland flow, sheet flow, and channelized flow segments along the longest flow path. The longest flow paths were manually delineated to match the drainage patterns in each sub basin based on existing topography. Time of concentration calculations for each basin can be found in

Update and import the NRCS/HEC-HMS hydrograph into UD-Detention for the pond design or provide an explanation why this wasn't done or necessary. By not using the NRCS hydrograph it seems this would generate discrepancies in the design storm.

Expand on the description on the steps done to integrate UD-Detention to the HEC-HMS volume. Recommend reviewing the narrative written for Winsome Fil 2 FDR prepared by Kimley Horn for an example.

The channel routing for the Site model used the Muskingum-Cunge method for the channel routing in all reaches for the existing and proposed model. This aligned with the methodology that was also done in the DBPS models.

## **CULVERT SIZING**

Detailed sizing of the road culvert crossings will be included in a subsequent Final Drainage Report. Hydraulic modeling has been completed for the West Tributary per DBPS for existing and future hydrologic conditions. The West Tributary is not a FEMA mapped floodplain however, as part of the DBPS a floodplain delineation was completed for the West Tributary. It is anticipated that a box culvert will be sufficient for the stream crossing. The box culvert will have an approximate 100-yr flow of 510 cfs and will follow standard dimensions from the Colorado Department of Transportation specifications.

## **DETENTION POND SUMMARY**

Preliminary detention pond and water quality calculations have been completed. A total of one sub regional detention pond which has been designed for WQCV and 100-year detention and two water quality features. The detention pond has been designed per the DBPS and restrict flow to the historic flow determined in the DBPS of 510 cfs. Ownership and maintenance of the sub regional pond will be through El Paso County

Pond	Proposed Volume (ac-ft)	100-yr Inflow (Developed)	Flow Exiting Pond (Developed)	Flow Ratio (Developed vs Historic)
1	19.5 ac-ft	628.3	508.8	0.8

HEC-HMS results and UD-detention Pond calculations are provided in **Appendix B** and **Appendix C**.

## **DRAINAGE FACILITY DESIGN**

Add a sub-section discussing the drop structures identified in the DBPS. Show the planned location of these drop structures.

The proposed drainage patterns will match the historic patterns as much as possible and not significantly increasing developed flows. To maintain historic flows, one sub regional detention pond is being proposed and will capture and control a portion of the onsite and upstream offsite flows as outlined in the DBPS. The runoff from the proposed roads will be treated before releasing it into the West Tributary reach or on to the downstream properties at the historic discharge points.

Provided in the **Appendix B** are hydrologic calculations utilizing the NRCS/HEC-HMS method for the proposed conditions. Provided in **Appendix C** are the preliminary calculations for the proposed sub regional pond and water quality features. As previously mentioned, the existing and proposed drainage maps can be found in **Appendix E**.

## **SPECIFIC DETAILS**

The existing site is undeveloped land consisting of mostly grassland. The existing conditions of the Site have flows conveying from the northwest to the southeast and discharging into the

Revise statement to the following: "The project is within the Falcon Drainage Basin (CHWS1400) which is a part of the El Paso County Drainage Basin Fee Program. Drainage and bridge fees will be finalized with the Final Drainage Report. Drainage fees shall be paid at the time of final plat recordation."

the project site for the 100-year storm event and for the proposed conditions 801.8 cfs is leaving the project site at the south side. This development will not adversely impact the drainageways and related facilities downstream from the development.

A Proposed Drainage Conditions Map is included **Appendix E** of this report for reference.

The Site will disturb more than 1 acre and will require a Colorado Discharge Permit System (CDPS) General Permit for Stormwater Discharge Associated with Construction Activities from the Colorado Department of Public Health and Environment (CDPHE).

### **DRAINAGE FEE**

There are no current drainage and bridge fees for the Project as the West Tributary of the Falcon Drainage Basin is not part of the El Paso County Drainage Basin Fee Program.

### **EXISTING MAJOR DRAINAGE CHANNELS**

The DBPS has identified that stream improvements are need on the West Tributary reach specific to the project Site. The identified improvements within the Site will be designed as part of the Final Drainage Report. The design will look to meet the goals from the DBPS but also minimize the on-site stream mitigation measures needed to the West Tributary reach.

### **THE FOUR STEP PROCESS**

The P  
impac  
select

Modify/clarify the paragraph. The large lot exclusion is specific to the lots itself and does not apply to the roads. Permanent water quality control measure is required for the roads. You can look at I.7.1.C for base standards such as WQCV or runoff reduction.

to minimize adverse  
g Manual for BMP

Also, add a statement in step two that due to the large lot single family sites exclusion the lot imperviousness shall be limited to 10 percent or less.

proposing a low-density  
impact to the current  
ease the Site's impervious  
ed to slow down the runoff  
pond and two water quality

will be used to capture stormwater, provide water quality treatment, and maintain flows discharging off site at or below historic levels.

**Step 2. Implement BMPs That Provide a Water Quality Capture Volume with Slow Release** –Permanent water quality measures and detention facilities will be necessary for the Project. Temporary water quality and erosion control measures will be provided during construction to prevent sediment laden water from discharging from the Site. Water quality measures are being used for all stormwater that contacts roadways. Per ECM Appendix I Section 1.7.1.B in development areas of low-density housing water quality is not required across all areas.

**Step 3 Stabilize Drainageways**– Stabilizing proposed roadside ditches, swales, and channels by designing them with slopes that control the flow rates. Placement of riprap

I just want to confirm that this is true. If there are some areas that are not able to be treated by the WQ ponds, please see note below and add discussion to report accordingly. Otherwise, you can disregard this comment.

Possible exclusions for areas not treated by a PBMP include I.7.1.B.7 (land disturbance to undeveloped land that will remain undeveloped) and/or I.7.1.C.1 (which allows for 20% not to exceed 1 acre of the applicable development site area to not be captured).

upstream and downstream of culverts to help reduce erosion of the roadside ditches. Check dams will be used in areas with steeper grades to slow the runoff. We anticipate this will minimize erosion. Existing drainage ways will be graded to reduce the velocity of the water to minimize erosion.

**Step 4. Implement Site Specific and Other Source Control BMPs** – The erosion control construction BMPs of the Project were designed to reduce contamination. Source control BMPs include the use of vehicle tracking control, culvert protection, stockpile management, and stabilized staging areas.

## SUMMARY

This report has been prepared in accordance with El Paso County stormwater criteria. It outlines the Site design for the 5-year and 100-year storm events drainage system. The drainage design presented within this report conforms to the criteria presented in the MANUAL. Additionally, the Site runoff and storm drain facilities will not adversely affect the downstream and surrounding developments.

Add a section for public improvement/reimbursable structures.

Identify the facilities to be constructed by the developer that has been identified as reimbursable in the DBPS. Provide a general statement that Engineering Cost estimate for these reimbursable improvements will be provided with the Final Drainage Report.

Add a reference to Chapter 3 of the DCM for the process to obtain reimbursement or credit.

**NOTE:** Inform the applicant of the process so that they are aware of all required documents needed as part of the reimbursement application.

Examples: Three bids are required. Invoices are required so Staff typically recommend that reimbursable improvements are invoiced or itemized separately from other subdivision improvements in order to expedite the review of the costs.

## REFERENCES

1. City of Colorado Springs "Drainage Criteria Manual (DCM) Volume 1", dated May, 2014
2. El Paso County "Engineering Criteria Manual" Volumes 1 & 2, dated October 31, 2018
3. Natural Resources Conservation Service, Web Soil Survey, dated October 5, 2021.
4. Urban Drainage and Flood Control District Drainage Criteria Manuals (UDFCDCM), (Volumes 1, 2 and 3), prepared by Wright-McLaughlin Engineers, June 2001, with latest revisions.
5. Flood Insurance Rate Map, El Paso County, Colorado and Incorporated Areas, Map Number 08041C0507F and 08041C0530F, Effective Date March 17, 1997, prepared by the Federal Emergency Management Agency (FEMA).
6. Falcon Drainage Basin Planning Study Selected Plan Report (DBPS), prepared by Matrix Design Group, September 2015. PCD File No. ~~SP-18-006~~.

Revise to MP132

Add the following:

1. Paintbrush Hills Fil 14 FDR. (PCD File No SF2024)

## APPENDIX

***APPENDIX A: FIGURES***



NOTES TO USERS

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

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

**Coastal Base Flood Elevations** shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

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

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

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 13. The **horizontal datum** was NAD83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the **North American Vertical Datum of 1988 (NAVD88)**. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at <http://www.ngs.noaa.gov/> or contact the National Geodetic Survey at the following address:

NGS Information Services  
NOAA, NIMS12  
National Geodetic Survey  
SSMC-3, #9202  
1315 East-West Highway  
Silver Spring, MD 20910-3282

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

**Base Map** information shown on this FIRM was provided in digital format by El Paso County, Colorado Springs Utilities, and Anderson Consulting Engineers, Inc. These data are current as of 2008.

This map reflects more detailed and up-to-date **stream channel configurations and floodplain delineations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map. The profile baselines depicted on this map represent the hydraulic modeling baselines that match the flood profiles and Floodway Data Tables if applicable, in the FIS report. As a result, the profile baselines may deviate significantly from the new base map channel representation and may appear outside of the floodplain.

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

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

Contact **FEMA Map Service Center (MSC)** via the FEMA Map Information eXchange (FIRM) 1-877-336-2627 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. The MSC may also be reached by Fax at 1-800-358-9620 and its website at <http://www.msc.fema.gov/>.

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

El Paso County Vertical Datum Offset Table	
Flooding Source	Vertical Datum Offset (ft)
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION	

Panel Location Map

This Digital Flood Insurance Rate Map (DFIRM) was produced through a Cooperating Technical Partner (CTP) agreement between the State of Colorado Water Conservation Board (CWCB) and the Federal Emergency Management Agency (FEMA).

Additional Flood Hazard information and resources are available from local communities and the Colorado Water Conservation Board.

Additional Flood Hazard information and resources are available from local communities and the Colorado Water Conservation Board.

LEGEND

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

ZONE A

ZONE AE

ZONE AH

No Base Flood Elevations determined.  
Base Flood Elevations determined.  
Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.

ZONE AO

ZONE AR

ZONE A99

Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.  
Special Flood Hazard Area Formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AH indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.  
Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.

ZONE V

ZONE VE

Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.  
Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

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

OTHER FLOOD AREAS

ZONE X

ZONE X

ZONE D

Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.  
Areas determined to be outside the 0.2% annual chance floodplain.  
Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

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

Floodplain boundary

Floodway boundary

Zone D Boundary

CBRS and OPA boundary

Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.

Base Flood Elevation line and value; elevation in feet\* (EL 987)

Base Flood Elevation value where uniform within zone; elevation in feet\*

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

A

A

Cross section line

23

23

Transect line

97° 07' 30.00"  
32° 22' 30.00"

Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)

43°50'00"N

1000-meter Universal Transverse Mercator grid ticks, zone 13

6000000 FT

5000-foot grid ticks: Colorado State Plane coordinate system, central zone (FIPS ZONE 0502), Lambert Conformal Conic Projection

DX5510

Bench mark (see explanation in Notes to Users section of this FIRM panel)

M1.5

River Mile

MAP REPOSITORIES

Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP

MARCH 17, 1997

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

DECEMBER 7, 2018 - to update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision

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

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

MAP SCALE 1" = 1000'

500

0

1000

2000

FEET

300

0

300

600

METERS

NFIP

FIRM

PANEL 0535G

FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 535 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS, CITY OF	080060	0535	G
EL PASO COUNTY	080059	0535	G

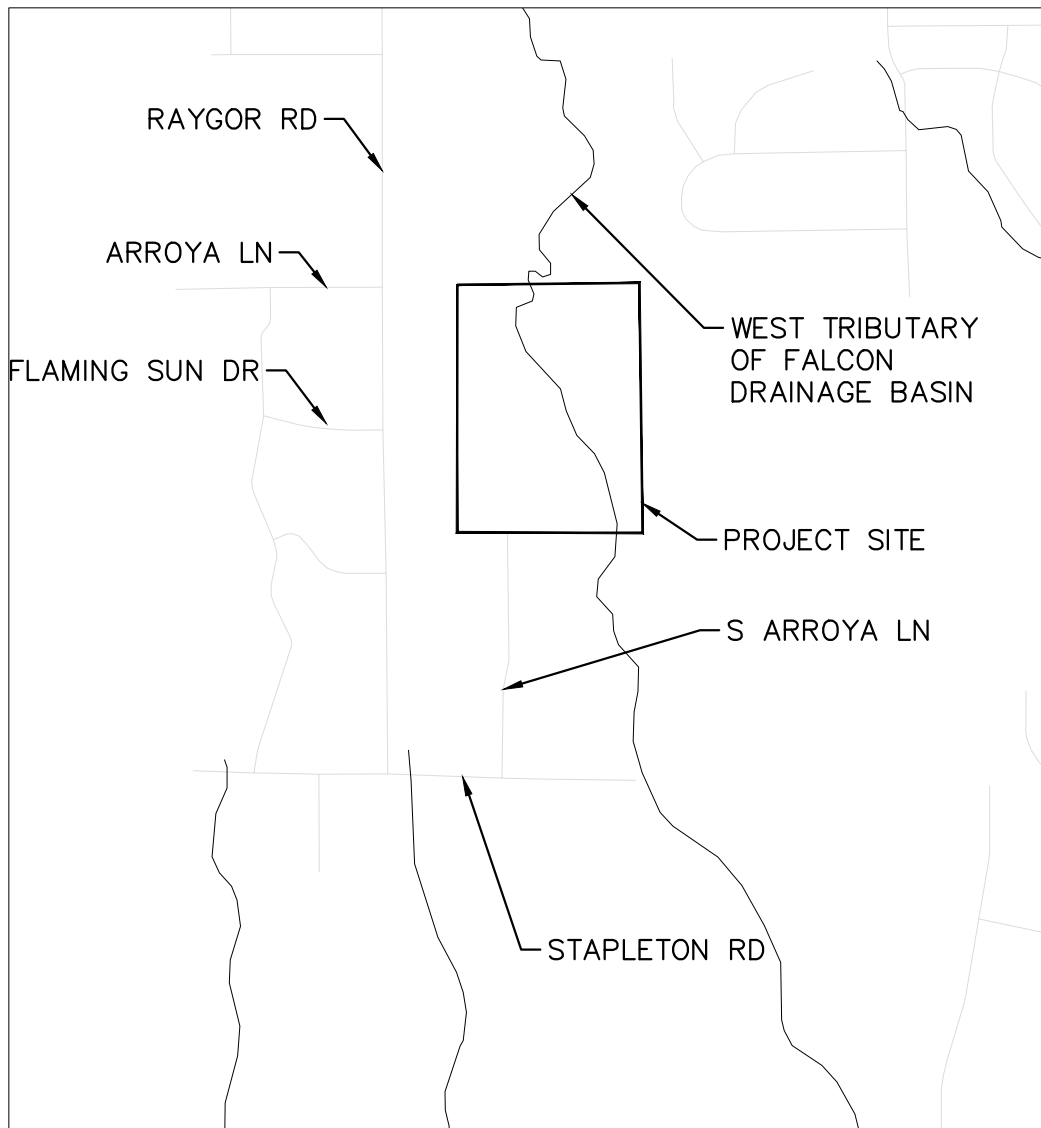
Notice to User: The Map Number shown below should be used when placing map orders. The Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER 08041C0535G

MAP REVISED DECEMBER 7, 2018

Federal Emergency Management Agency





VICINITY MAP  
1"=1,000'



***APPENDIX B: HYDROLOGY***



United States  
Department of  
Agriculture

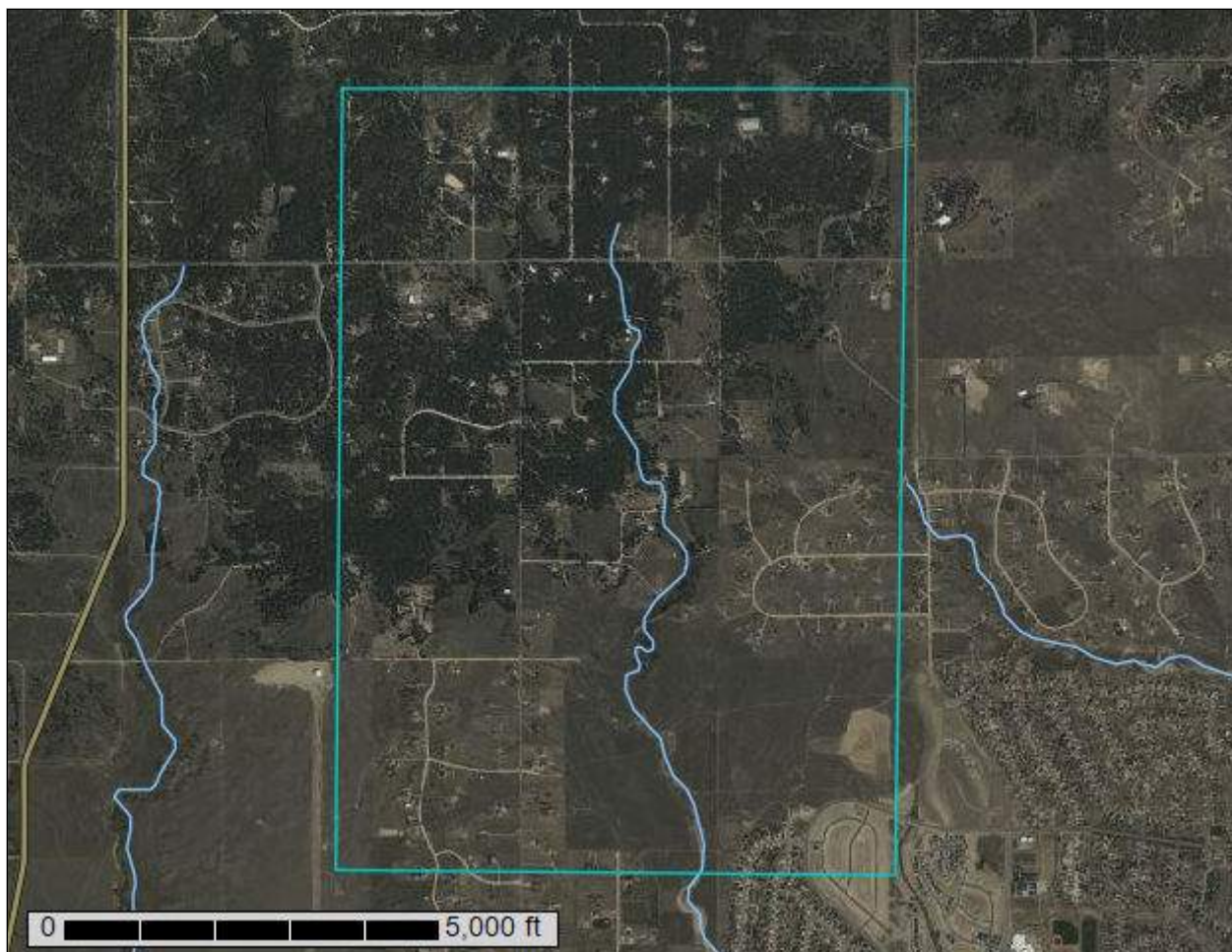
**NRCS**

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 **El Paso County Area, Colorado**

**Eagleview**



October 5, 2021

# Preface

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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](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.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

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# How Soil Surveys Are Made

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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

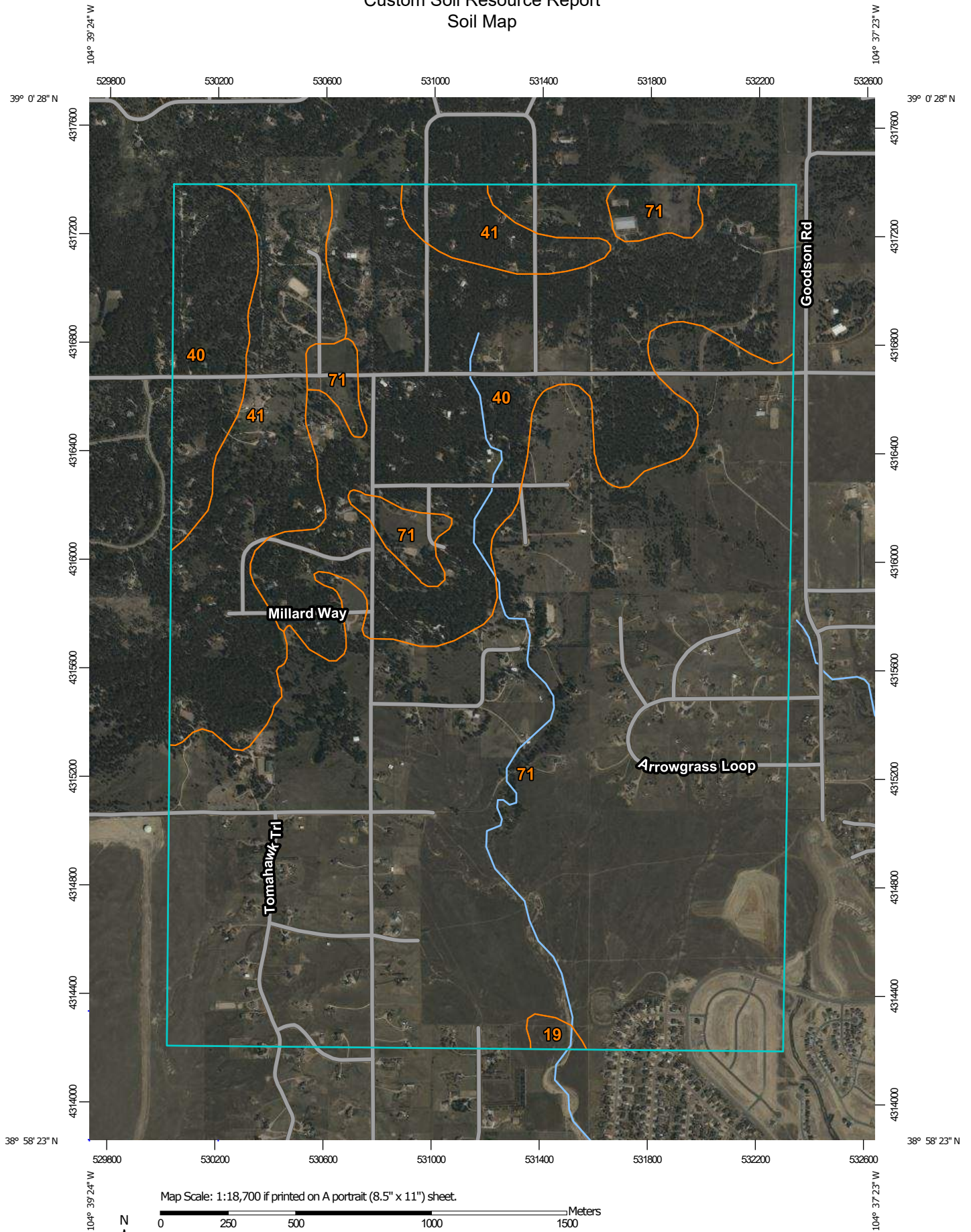
identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

# 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 1:24,000.

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: El Paso County Area, Colorado

Survey Area Data: Version 19, Aug 31, 2021

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

Date(s) aerial images were photographed: Sep 11, 2018—Oct 20, 2018

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
19	Columbine gravelly sandy loam, 0 to 3 percent slopes	5.2	0.3%
40	Kettle gravelly loamy sand, 3 to 8 percent slopes	506.7	28.0%
41	Kettle gravelly loamy sand, 8 to 40 percent slopes	205.0	11.3%
71	Pring coarse sandy loam, 3 to 8 percent slopes	1,092.9	60.4%
<b>Totals for Area of Interest</b>		<b>1,809.9</b>	<b>100.0%</b>

## 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.

## Custom Soil Resource Report

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.

## El Paso County Area, Colorado

### 19—Columbine gravelly sandy loam, 0 to 3 percent slopes

#### Map Unit Setting

*National map unit symbol:* 367p  
*Elevation:* 6,500 to 7,300 feet  
*Mean annual precipitation:* 14 to 16 inches  
*Mean annual air temperature:* 46 to 50 degrees F  
*Frost-free period:* 125 to 145 days  
*Farmland classification:* Not prime farmland

#### Map Unit Composition

*Columbine and similar soils:* 97 percent  
*Minor components:* 3 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

#### Description of Columbine

##### Setting

*Landform:* Flood plains, fan terraces, fans  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear  
*Parent material:* Alluvium

##### Typical profile

*A - 0 to 14 inches:* gravelly sandy loam  
*C - 14 to 60 inches:* very gravelly loamy sand

##### Properties and qualities

*Slope:* 0 to 3 percent  
*Depth to restrictive feature:* More than 80 inches  
*Drainage class:* Well drained  
*Runoff class:* Very low  
*Capacity of the most limiting layer to transmit water (Ksat):* High to very high (5.95 to 19.98 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:* Very low (about 2.5 inches)

##### Interpretive groups

*Land capability classification (irrigated):* 4e  
*Land capability classification (nonirrigated):* 6e  
*Hydrologic Soil Group:* A  
*Ecological site:* R049XY214CO - Gravelly Foothill  
*Hydric soil rating:* No

#### Minor Components

##### Fluvaquentic haplaquolls

*Percent of map unit:* 1 percent  
*Landform:* Swales  
*Hydric soil rating:* Yes

**Other soils**

*Percent of map unit:* 1 percent

*Hydric soil rating:* No

**Pleasant**

*Percent of map unit:* 1 percent

*Landform:* Depressions

*Hydric soil rating:* Yes

**40—Kettle gravelly loamy sand, 3 to 8 percent slopes**

**Map Unit Setting**

*National map unit symbol:* 368g

*Elevation:* 7,000 to 7,700 feet

*Farmland classification:* Not prime farmland

**Map Unit Composition**

*Kettle and similar soils:* 85 percent

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

**Description of Kettle**

**Setting**

*Landform:* Hills

*Landform position (three-dimensional):* Side slope

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Parent material:* Sandy alluvium derived from arkose

**Typical profile**

*E - 0 to 16 inches:* gravelly loamy sand

*Bt - 16 to 40 inches:* gravelly sandy loam

*C - 40 to 60 inches:* extremely gravelly loamy sand

**Properties and qualities**

*Slope:* 3 to 8 percent

*Depth to restrictive feature:* More than 80 inches

*Drainage class:* Somewhat excessively drained

*Runoff class:* Low

*Capacity of the most limiting layer to transmit water (Ksat):* High (2.00 to 6.00 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 3.4 inches)

**Interpretive groups**

*Land capability classification (irrigated):* None specified

*Land capability classification (nonirrigated):* 4e

*Hydrologic Soil Group:* B

*Ecological site:* F048AY908CO - Mixed Conifer



*Hydric soil rating:* No

**Minor Components**

**Other soils**

*Percent of map unit:*

*Hydric soil rating:* No

**Pleasant**

*Percent of map unit:*

*Landform:* Depressions

*Hydric soil rating:* Yes

**41—Kettle gravelly loamy sand, 8 to 40 percent slopes**

**Map Unit Setting**

*National map unit symbol:* 368h

*Elevation:* 7,000 to 7,700 feet

*Farmland classification:* Not prime farmland

**Map Unit Composition**

*Kettle and similar soils:* 85 percent

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

**Description of Kettle**

**Setting**

*Landform:* Hills

*Landform position (three-dimensional):* Side slope

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Parent material:* Sandy alluvium derived from arkose

**Typical profile**

*E - 0 to 16 inches:* gravelly loamy sand

*Bt - 16 to 40 inches:* gravelly sandy loam

*C - 40 to 60 inches:* extremely gravelly loamy sand

**Properties and qualities**

*Slope:* 8 to 40 percent

*Depth to restrictive feature:* More than 80 inches

*Drainage class:* Somewhat excessively drained

*Runoff class:* Medium

*Capacity of the most limiting layer to transmit water (Ksat):* High (2.00 to 6.00 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 3.4 inches)

**Interpretive groups**

*Land capability classification (irrigated):* None specified

## Custom Soil Resource Report

*Land capability classification (nonirrigated): 7e*  
*Hydrologic Soil Group: B*  
*Ecological site: F048AY908CO - Mixed Conifer*  
*Hydric soil rating: No*

### Minor Components

#### Pleasant

*Percent of map unit:*  
*Landform: Depressions*  
*Hydric soil rating: Yes*

#### Other soils

*Percent of map unit:*  
*Hydric soil rating: No*

## 71—Pring coarse sandy loam, 3 to 8 percent slopes

### Map Unit Setting

*National map unit symbol: 369k*  
*Elevation: 6,800 to 7,600 feet*  
*Farmland classification: Not prime farmland*

### Map Unit Composition

*Pring and similar soils: 85 percent*  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Pring

#### Setting

*Landform: Hills*  
*Landform position (three-dimensional): Side slope*  
*Down-slope shape: Linear*  
*Across-slope shape: Linear*  
*Parent material: Arkosic alluvium derived from sedimentary rock*

#### Typical profile

*A - 0 to 14 inches: coarse sandy loam*  
*C - 14 to 60 inches: gravelly sandy loam*

#### Properties and qualities

*Slope: 3 to 8 percent*  
*Depth to restrictive feature: More than 80 inches*  
*Drainage class: Well drained*  
*Runoff class: Low*  
*Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 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 6.0 inches)*

## Custom Soil Resource Report

### **Interpretive groups**

*Land capability classification (irrigated):* None specified

*Land capability classification (nonirrigated):* 3e

*Hydrologic Soil Group:* B

*Ecological site:* R048AY222CO - Loamy Park

*Hydric soil rating:* No

### **Minor Components**

#### **Pleasant**

*Percent of map unit:*

*Landform:* Depressions

*Hydric soil rating:* Yes

#### **Other soils**

*Percent of map unit:*

*Hydric soil rating:* No

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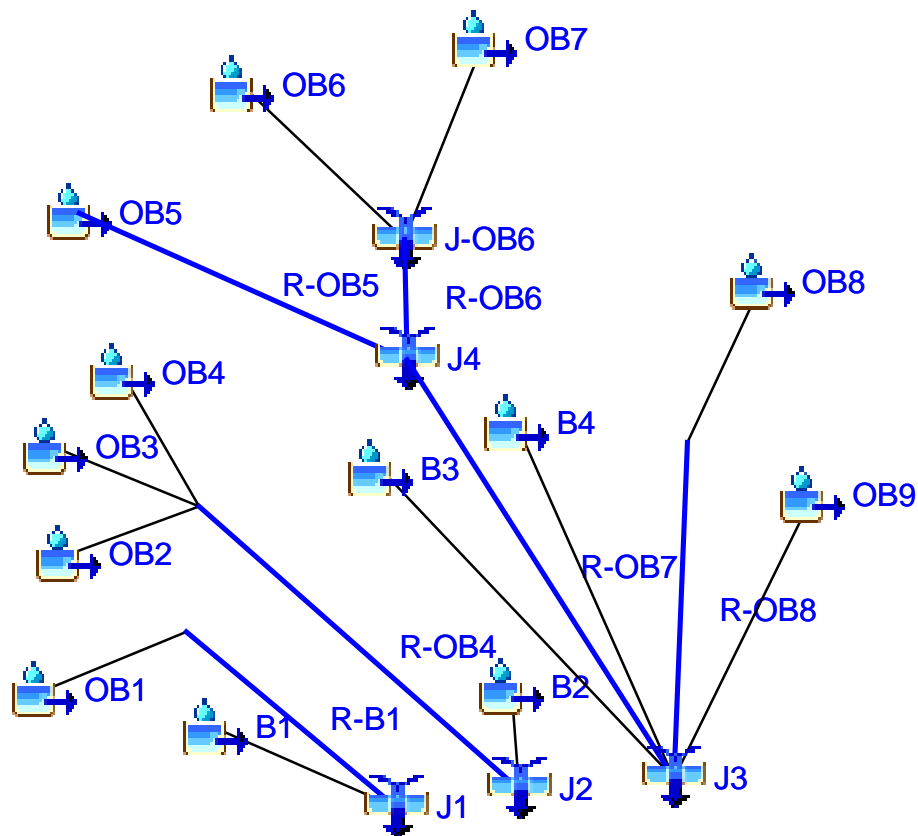
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## Project : Eagleview\_Subdivision

Basin Model : Eagleview\_Existing

Oct 29 11:38:26 MDT 2021

Review of the hydrology model will be provided on the re-submittal based on redline comments provided in the narrative section.



El Paso County Chapter 5: Table 5-3 SCS 24-hr Type IIA  
Distribution for TR-20 Input

Hour	Minutes			
	15	30	45	60
1	0.0005	0.0015	0.0030	0.0045
2	0.0060	0.0080	0.0100	0.0120
3	0.0143	0.0165	0.0188	0.0210
4	0.0233	0.0255	0.0278	0.0320
5	0.0390	0.0460	0.0530	0.0600
6	0.0750	0.1000	0.4000	0.7000
7	0.7250	0.7500	0.7650	0.7800
8	0.7900	0.8000	0.8100	0.8200
9	0.8250	0.8300	0.8350	0.8400
10	0.8450	0.8500	0.8550	0.8600
11	0.8638	0.8675	0.8713	0.8750
12	0.8788	0.8825	0.8863	0.8900
13	0.8938	0.8975	0.9013	0.9050
14	0.9083	0.9115	0.9148	0.9180
15	0.9210	0.9240	0.9270	0.9300
16	0.9325	0.9350	0.9375	0.9400
17	0.9425	0.9450	0.9475	0.9500
18	0.9525	0.9550	0.9575	0.9600
19	0.9625	0.9650	0.9675	0.9700
20	0.9725	0.9750	0.9775	0.9800
21	0.9813	0.9825	0.9838	0.9850
22	0.9863	0.9875	0.9888	0.9900
23	0.9913	0.9925	0.9938	0.9950
24	0.9963	0.9975	0.9988	1.0000

Table 6-2. Rainfall Depths for Colorado Springs

Return Period	Depths
2-yr	2.1
5-yr	2.7
10-yr	3.2
25-yr	3.6
50-yr	4.2
100-yr	4.6

Design Storm Hyetograph Table								
	Time (mins)	Fraction of 1-hr Rainfall Depth	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
	0	0	0	0	0	0	0	0
	15	0.0005	0.00105	0.00135	0.0016	0.0018	0.0021	0.0023
	30	0.0015	0.00315	0.00405	0.0048	0.0054	0.0063	0.0069
	45	0.0030	0.0063	0.0081	0.0096	0.0108	0.0126	0.0138
1	60	0.0045	0.00945	0.01215	0.0144	0.0162	0.0189	0.0207
	75	0.0060	0.0126	0.0162	0.0192	0.0216	0.0252	0.0276
	90	0.0080	0.0168	0.0216	0.0256	0.0288	0.0336	0.0368
	105	0.0100	0.021	0.027	0.032	0.036	0.042	0.046
2	120	0.0120	0.0252	0.0324	0.0384	0.0432	0.0504	0.0552
	135	0.0143	0.03003	0.03861	0.04576	0.05148	0.06006	0.06578
	150	0.0165	0.03465	0.04455	0.0528	0.0594	0.0693	0.0759
	165	0.0188	0.03948	0.05076	0.06016	0.06768	0.07896	0.08648
3	180	0.0210	0.0441	0.0567	0.0672	0.0756	0.0882	0.0966
	195	0.0233	0.04893	0.06291	0.07456	0.08388	0.09786	0.10718
	210	0.0255	0.05355	0.06885	0.0816	0.0918	0.1071	0.1173
	225	0.0278	0.05838	0.07506	0.08896	0.10008	0.11676	0.12788
4	240	0.0320	0.0672	0.0864	0.1024	0.1152	0.1344	0.1472
	255	0.0390	0.0819	0.1053	0.1248	0.1404	0.1638	0.1794
	270	0.0460	0.0966	0.1242	0.1472	0.1656	0.1932	0.2116
	285	0.0530	0.1113	0.1431	0.1696	0.1908	0.2226	0.2438
5	300	0.0600	0.126	0.162	0.192	0.216	0.252	0.276
	315	0.0750	0.1575	0.2025	0.24	0.27	0.315	0.345
	330	0.1000	0.21	0.27	0.32	0.36	0.42	0.46
	345	0.4000	0.84	1.08	1.28	1.44	1.68	1.84
6	360	0.7000	1.47	1.89	2.24	2.52	2.94	3.22
	375	0.7250	1.5225	1.9575	2.32	2.61	3.045	3.335
	390	0.7500	1.575	2.025	2.4	2.7	3.15	3.45
	405	0.7650	1.6065	2.0655	2.448	2.754	3.213	3.519
7	420	0.7800	1.638	2.106	2.496	2.808	3.276	3.588
	435	0.7900	1.659	2.133	2.528	2.844	3.318	3.634
	450	0.8000	1.68	2.16	2.56	2.88	3.36	3.68
	465	0.8100	1.701	2.187	2.592	2.916	3.402	3.726
8	480	0.8200	1.722	2.214	2.624	2.952	3.444	3.772
	495	0.8250	1.7325	2.2275	2.64	2.97	3.465	3.795
	510	0.8300	1.743	2.241	2.656	2.988	3.486	3.818
	525	0.8350	1.7535	2.2545	2.672	3.006	3.507	3.841
9	540	0.8400	1.764	2.268	2.688	3.024	3.528	3.864
	555	0.8450	1.7745	2.2815	2.704	3.042	3.549	3.887
	570	0.8500	1.785	2.295	2.72	3.06	3.57	3.91
	585	0.8550	1.7955	2.3085	2.736	3.078	3.591	3.933
10	600	0.8600	1.806	2.322	2.752	3.096	3.612	3.956
	615	0.8638	1.81398	2.33226	2.76416	3.10968	3.62796	3.97348
	630	0.8675	1.82175	2.34225	2.776	3.123	3.6435	3.9905



	645	0.8713	1.82973	2.35251	2.78816	3.13668	3.65946	4.00798
11	660	0.8750	1.8375	2.3625	2.8	3.15	3.675	4.025
	675	0.8788	1.84548	2.37276	2.81216	3.16368	3.69096	4.04248
	690	0.8825	1.85325	2.38275	2.824	3.177	3.7065	4.0595
	705	0.8863	1.86123	2.39301	2.83616	3.19068	3.72246	4.07698
12	720	0.8900	1.869	2.403	2.848	3.204	3.738	4.094
	735	0.8938	1.87698	2.41326	2.86016	3.21768	3.75396	4.11148
	750	0.8975	1.88475	2.42325	2.872	3.231	3.7695	4.1285
	765	0.9013	1.89273	2.43351	2.88416	3.24468	3.78546	4.14598
13	780	0.9050	1.9005	2.4435	2.896	3.258	3.801	4.163
	795	0.9083	1.90743	2.45241	2.90656	3.26988	3.81486	4.17818
	810	0.9115	1.91415	2.46105	2.9168	3.2814	3.8283	4.1929
	825	0.9148	1.92108	2.46996	2.92736	3.29328	3.84216	4.20808
14	840	0.9180	1.9278	2.4786	2.9376	3.3048	3.8556	4.2228
	855	0.9210	1.9341	2.4867	2.9472	3.3156	3.8682	4.2366
	870	0.9240	1.9404	2.4948	2.9568	3.3264	3.8808	4.2504
	885	0.9270	1.9467	2.5029	2.9664	3.3372	3.8934	4.2642
15	900	0.9300	1.953	2.511	2.976	3.348	3.906	4.278
	915	0.9325	1.95825	2.51775	2.984	3.357	3.9165	4.2895
	930	0.9350	1.9635	2.5245	2.992	3.366	3.927	4.301
	945	0.9375	1.96875	2.53125	3	3.375	3.9375	4.3125
16	960	0.9400	1.974	2.538	3.008	3.384	3.948	4.324
	975	0.9425	1.97925	2.54475	3.016	3.393	3.9585	4.3355
	990	0.9450	1.9845	2.5515	3.024	3.402	3.969	4.347
	1005	0.9475	1.98975	2.55825	3.032	3.411	3.9795	4.3585
17	1020	0.9500	1.995	2.565	3.04	3.42	3.99	4.37
	1035	0.9525	2.00025	2.57175	3.048	3.429	4.0005	4.3815
	1050	0.9550	2.0055	2.5785	3.056	3.438	4.011	4.393
	1065	0.9575	2.01075	2.58525	3.064	3.447	4.0215	4.4045
18	1080	0.9600	2.016	2.592	3.072	3.456	4.032	4.416
	1095	0.9625	2.02125	2.59875	3.08	3.465	4.0425	4.4275
	1110	0.9650	2.0265	2.6055	3.088	3.474	4.053	4.439
	1125	0.9675	2.03175	2.61225	3.096	3.483	4.0635	4.4505
19	1140	0.9700	2.037	2.619	3.104	3.492	4.074	4.462
	1155	0.9725	2.04225	2.62575	3.112	3.501	4.0845	4.4735
	1170	0.9750	2.0475	2.6325	3.12	3.51	4.095	4.485
	1185	0.9775	2.05275	2.63925	3.128	3.519	4.1055	4.4965
20	1200	0.9800	2.058	2.646	3.136	3.528	4.116	4.508
	1215	0.9813	2.06073	2.64951	3.14016	3.53268	4.12146	4.51398
	1230	0.9825	2.06325	2.65275	3.144	3.537	4.1265	4.5195
	1245	0.9838	2.06598	2.65626	3.14816	3.54168	4.13196	4.52548
21	1260	0.9850	2.0685	2.6595	3.152	3.546	4.137	4.531
	1275	0.9863	2.07123	2.66301	3.15616	3.55068	4.14246	4.53698
	1290	0.9875	2.07375	2.66625	3.16	3.555	4.1475	4.5425
	1305	0.9888	2.07648	2.66976	3.16416	3.55968	4.15296	4.54848
22	1320	0.9900	2.079	2.673	3.168	3.564	4.158	4.554
	1335	0.9913	2.08173	2.67651	3.17216	3.56868	4.16346	4.55998

	1350	0.9925	2.08425	2.67975	3.176	3.573	4.1685	4.5655
	1365	0.9938	2.08698	2.68326	3.18016	3.57768	4.17396	4.57148
23	1380	0.9950	2.0895	2.6865	3.184	3.582	4.179	4.577
	1395	0.9963	2.09223	2.69001	3.18816	3.58668	4.18446	4.58298
	1410	0.9975	2.09475	2.69325	3.192	3.591	4.1895	4.5885
	1425	0.9988	2.09748	2.69676	3.19616	3.59568	4.19496	4.59448
24	1440	1.0000	2.1	2.7	3.2	3.6	4.2	4.6

IMPERVIOUS FACTOR CALCULATION TABLE - EXISTING CONDITIONS

	Basin	Area (Acre)	Open Space (2%)	1/8 Acre Lot (100%)	Buildings (100%)	Paved Roadway (100%)	Gravel Roadway (80%)	Total % Check	Weighted Impervious
Onsite	B1	5.55	93%	0%	0%	0%	6%	99%	7%
	B2	41.43	100%	0%	0%	0%	0%	100%	2%
	B3	59.54	100%	0%	0%	0%	0%	100%	2%
	B4	14.68	100%	0%	0%	0%	0%	100%	2%
Offsite	OB1	10.37	93%	0%	2%	4%	2%	100%	9%
	OB2	28.06	90%	0%	3%	3%	5%	100%	11%
	OB3	43.44	92%	0%	2%	2%	4%	100%	9%
	OB4	10.50	87%	0%	4%	5%	4%	100%	13%
	OB5	143.82	94%	0%	2%	1%	3%	100%	7%
	OB6	118.40	93%	0%	1%	2%	4%	100%	8%
	OB7	421.43	93%	0%	2%	1%	4%	100%	8%
	OB8	39.65	94%	0%	2%	1%	4%	100%	7%
	OB9	117.43	54%	43%	1%	0%	2%	100%	31%
Total		1054.30							13.4%

Based on Aerial OB1  
to OB4 appears to be  
short grass prairie  
(0.15)

Provide the lag time table used for the HEC-HMS modeling in accordance with the City DCM for the NRCS Method.

Eagleview  
 196288000  
 Date: 10/28/2021  
 Date:  
 Date:  
 5.0 minutes

to OB4 appears to be short grass prairie (0.15)

		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Gross Sectional Area of Flow, A (ft²)	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)
		30.00	0.073	0.30	2.10						30.21
		18.00	0.038			U				3.14	5.93
Pre-Development Time of Concentration, OB1											36.14
Pre-Development											
Drainage Area: OB2											
		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Gross Sectional Area of Flow, A (ft²)	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)
	SHEET	300.00	0.063	0.30	2.10						32.05
	SHALLOW CONCENTRATED	554.00	0.046			U				3.45	2.67
	CHANNEL	841.00	0.029	0.05			9.50	6.60	1.44	6.45	2.17
Pre-Development Time of Concentration, OB2											36.90
Pre-Development											
Drainage Area: OB3											
		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Gross Sectional Area of Flow, A (ft²)	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)
	SHEET	300.00	0.074	0.30	2.10						30.05
	SHALLOW CONCENTRATED	2436.00	0.034			U				2.97	13.65
Pre-Development Time of Concentration, OB3											43.70
Pre-Development											
Drainage Area: OB4											
		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Gross Sectional Area of Flow, A (ft²)	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)
	SHEET	300.00	0.042	0.30	2.10						37.69
	SHALLOW CONCENTRATED	783.00	0.038			U				3.16	4.13
	CHANNEL	577.00	0.028	0.05			9.50	6.60	1.44	6.36	1.51
Pre-Development Time of Concentration, OB4											43.34
Pre-Development											
Drainage Area: OB5											
		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Gross Sectional Area of Flow, A (ft²)	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)
	SHEET	300.00	0.037	0.25	2.10						34.27
	SHALLOW CONCENTRATED	3838.00	0.033			U				2.93	21.83
	CHANNEL	1407.00	0.024	0.04			9.50	6.60	1.44	7.36	3.19
Pre-Development Time of Concentration, OB5											59.29
Pre-Development											
Drainage Area: OB6											
		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Gross Sectional Area of Flow, A (ft²)	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)
	SHEET	300.00	0.064	0.25	2.10						27.52
	SHALLOW CONCENTRATED	2569.00	0.038			U				3.14	13.62
	CHANNEL	2110.00	0.027	0.04			9.50	6.60	1.44	7.73	4.55
Pre-Development Time of Concentration, OB6											45.69
Pre-Development											
Drainage Area: OB7											
		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Gross Sectional Area of Flow, A (ft²)	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)
	SHEET	300.00	0.028	0.25	2.10						38.31
	SHALLOW CONCENTRATED	2068.00	0.036			U				3.06	11.28
	CHANNEL	6198.00	0.03	0.04			12.00	22.00	0.55	4.09	25.29
Pre-Development Time of Concentration, OB7											74.86
Pre-Development											
Drainage Area: OB8											
		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Gross Sectional Area of Flow, A (ft²)	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)
	SHEET	300.00	0.029	0.15	2.10						25.10
	SHALLOW CONCENTRATED	1117.00	0.043			U				3.34	5.57
	CHANNEL	762.00	0.033	0.03			9.50	6.60	1.44	11.43	1.11
Pre-Development Time of Concentration, OB8											31.78
Pre-Development											
Drainage Area: OB9											
		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Gross Sectional Area of Flow, A (ft²)	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)
	SHEET	300.00	0.087	0.01	2.10						2.00
	SHALLOW CONCENTRATED	4384.00	0.026			U				2.60	26.09
Pre-Development Time of Concentration, OB9											30.09
Pre-Development											
Drainage Area: B1											
		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Gross Sectional Area of Flow, A (ft²)	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)
	SHEET	300.00	0.027	0.15	2.10						25.83
	SHALLOW CONCENTRATED	368.00	0.033			U				2.91	2.11
	CHANNEL	210.00	0.034	0.03			9.50	6.60	1.44	11.68	0.30
Pre-Development Time of Concentration, B1											28.24
Pre-Development											
Drainage Area: B2											
		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Gross Sectional Area of Flow, A (ft²)	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)
	SHEET	300.00	0.022	0.15	2.10						28.04
	SHALLOW CONCENTRATED	737.00	0.025			U				2.55	4.82
	CHANNEL	1086.00	0.02	0.03			9.50	6.60	1.44	9.18	1.97
Pre-Development Time of Concentration, B2											34.83
Pre-Development											
Drainage Area: B3											
		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Gross Sectional Area of Flow, A (ft²)	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)
	CHANNEL	73 CHANNEL FLOW	2985.00	0.02	0.03		14.00	34.00	0.41	3.58	13.88
Pre-Development Time of Concentration, B3											13.88



### Pre vs. Post Runoff Analysis

#### Time of Concentration

### Project Information

Project Name: Eagleview  
KHA Project #: 196288000  
Designed by: DCM Date: 10/28/2021  
Revised by: Date:  
Checked by: Date:

Minimum Time of Concentration	5.0	minutes
2YR-24HR Rainfall, P2	2.10	

Post-Development											
Drainage Area: B4											
		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Cross Sectional Area of Flow, A (ft²)	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s) <sup>a</sup>	Travel Time, Tt (min)
SHEET	T1 SHEET FLOW	300.00	0.020	0.15	2.10						
SHALLOW CONCENTRATED	T2 SHALLOW CONCENTRATED FLOW	181.00	0.044			U				3.37	0.90
CHANNEL	T3 CHANNEL FLOW	1548.00	0.033	0.03		U	9.50	6.60	1.44	11.50	2.24
Post-Development Time of Concentration, B4											32.27



Pre vs. Post Runoff Analysis  
Composite CN and Crat

Project Name: 

Eagleview

KHA Project #: 

196288000

Designed by: 

DCM

Date: 

10/29/2021

Revised by: 

Date:

Revised by: 

Date:

Checked by: 

Date:

Update. Zoning map shows offsite residential area as RR-5. The 61 CN is extrapolated for 2.5 acres not 5 acre property.

Pre-Development				
Drainage Area: OB1				
COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)
RESIDENTIAL	Rangeland - Good Condition	B	61.00	9.79
IMPERVIOUS	Paved; curbs and storm sewers (excluding right-of-way)	B	98.00	0.38
IMPERVIOUS	Gravel (including right of way)	B	85.00	0.20
CUTSOM				
COMPOSITE SCS CURVE NUMBER - OB1		62.81		10.37

Clarify in the narrative if the CN for pre-developed was from the ARC II table in the DCM.

Pre-Development				
Drainage Area: OB2				
COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)
RESIDENTIAL	Rangeland - Good Condition	B	61.00	25.92
IMPERVIOUS	Paved; curbs and storm sewers (excluding right-of-way)	B	98.00	0.86
IMPERVIOUS	Gravel (including right of way)	B	85.00	1.28
CUTSOM				
COMPOSITE SCS CURVE NUMBER - OB2		63.23		28.06

Was the initial abstraction included in the HEC-HMS modeling. Provide a summary table of the initial abstraction values applied for each basin.

Pre-Development				
Drainage Area: OB3				
COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)
RESIDENTIAL	Rangeland - Good Condition	B	61.00	40.88
IMPERVIOUS	Paved; curbs and storm sewers (excluding right-of-way)	B	98.00	0.89
IMPERVIOUS	Gravel (including right of way)	B	85.00	1.67
CUTSOM				
COMPOSITE SCS CURVE NUMBER - OB3		62.68		43.44

Pre-Development				
Drainage Area: OB4				
COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)
RESIDENTIAL	Rangeland - Good Condition	B	61.00	9.55
IMPERVIOUS	Paved; curbs and storm sewers (excluding right-of-way)	B	98.00	0.52
IMPERVIOUS	Gravel (including right of way)	B	85.00	0.43
CUTSOM				
COMPOSITE SCS CURVE NUMBER - OB4		63.80		10.50

Pre-Development				
Drainage Area: OB5				
COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)
RESIDENTIAL	Rangeland - Good Condition	B	61.00	28.58
RESIDENTIAL	Woods - Good Condition	B	55.00	109.48
IMPERVIOUS	Paved; curbs and storm sewers (excluding right-of-way)	B	98.00	1.12
IMPERVIOUS	Gravel (including right of way)	B	85.00	4.64
CUTSOM				
COMPOSITE SCS CURVE NUMBER - OB5		57.50		143.82

Pre-Development				
Drainage Area: OB6				
COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)
RESIDENTIAL	Rangeland - Good Condition	B	61.00	60.64
RESIDENTIAL	Woods - Good Condition	B	55.00	51.19
IMPERVIOUS	Paved; curbs and storm sewers (excluding right-of-way)	B	98.00	2.04
IMPERVIOUS	Gravel (including right of way)	B	85.00	4.53
CUTSOM				
COMPOSITE SCS CURVE NUMBER - OB6		59.96		118.40



Pre vs. Post Runoff Analysis  
Composite CN and Crat

Project Name: 

Eagleview

KHA Project #: 

196288000

Designed by: 

DCM

Date: 

10/29/2021

Revised by: 

Date:

Revised by: 

Date:

Checked by: 

Date:

Pre-Development				
Drainage Area: OB7				
Cover Description	Hydrologic Condition or Cover Type	Hydrologic Soil Group	SCS Curve Number (CN)	Area, A (ac.)
RESIDENTIAL	Rangeland - Good Condition	B	61.00	122.08
RESIDENTIAL	Woods - Good Condition	B	55.00	259.48
RESIDENTIAL	2.5 acre	B	64.00	16.02
IMPERVIOUS	Paved; curbs and storm sewers (excluding right-of-way)	B	98.00	5.46
IMPERVIOUS	Gravel (including right of way)	B	85.00	18.17
CUTSOM				
COMPOSITE SCS CURVE NUMBER - OB7		58.93		421.20

Pre-Development				
Drainage Area: OB8				
Cover Description	Hydrologic Condition or Cover Type	Hydrologic Soil Group	SCS Curve Number (CN)	Area, A (ac.)
RESIDENTIAL	Rangeland - Good Condition	B	61.00	8.94
RESIDENTIAL	2.5 acre	B	64.00	22.04
RESIDENTIAL	1/2 acre (25% imp.)	B	71.00	7.07
IMPERVIOUS	Paved; curbs and storm sewers (excluding right-of-way)	B	98.00	0.24
IMPERVIOUS	Gravel (including right of way)	B	85.00	1.57
CUTSOM				
COMPOSITE SCS CURVE NUMBER - OB8		65.60		39.87

Pre-Development				
Drainage Area: OB9				
Cover Description	Hydrologic Condition or Cover Type	Hydrologic Soil Group	SCS Curve Number (CN)	Area, A (ac.)
RESIDENTIAL	2.5 acre	B	64.00	35.31
RESIDENTIAL	1/2 acre (25% imp.)	B	71.00	27.99
RESIDENTIAL	1/8 acre or less (town houses) (65% imp.)/small>	B	85.00	51.90
IMPERVIOUS	Paved; curbs and storm sewers (excluding right-of-way)	B	98.00	0.30
IMPERVIOUS	Gravel (including right of way)	B	85.00	1.96
CUTSOM				
COMPOSITE SCS CURVE NUMBER - OB9		74.95		117.46

Pre-Development				
Drainage Area: B1				
Cover Description	Hydrologic Condition or Cover Type	Hydrologic Soil Group	SCS Curve Number (CN)	Area, A (ac.)
OPEN_SPACE	Good condition (grass cover >75%)	B	61.00	5.22
IMPERVIOUS	Gravel (including right of way)	B	85.00	0.33
CUTSOM				
COMPOSITE SCS CURVE NUMBER - B1		62.43		5.55

Remove. Aerial does not show a gravel road within the property

Pre-Development				
Drainage Area: B2				
Cover Description	Hydrologic Condition or Cover Type	Hydrologic Soil Group	SCS Curve Number (CN)	Area, A (ac.)
OPEN_SPACE	Good condition (grass cover >75%)	A	39.00	0.61
OPEN_SPACE	Good condition (grass cover >75%)	B	61.00	40.82
CUTSOM				
COMPOSITE SCS CURVE NUMBER - B2		60.68		41.43

Pre-Development				
Drainage Area: B3				
Cover Description	Hydrologic Condition or Cover Type	Hydrologic Soil Group	SCS Curve Number (CN)	Area, A (ac.)
OPEN_SPACE	Good condition (grass cover >75%)	A	39.00	0.28
OPEN_SPACE	Good condition (grass cover >75%)	B	61.00	59.27
CUTSOM				
COMPOSITE SCS CURVE NUMBER - B3		60.90		59.54



Pre vs. Post Runoff Analysis  
Composite CN and Crat

Project Name: Eagleview

KHA Project #: 196288000

Designed by: DCM Date: 10/29/2021

Revised by: \_\_\_\_\_ Date: \_\_\_\_\_

Revised by: \_\_\_\_\_ Date: \_\_\_\_\_

Checked by: \_\_\_\_\_ Date: \_\_\_\_\_

Pre-Development				
Drainage Area: B4				
COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)
OPEN_SPACE	Good condition (grass cover >75%)	B	61.00	14.68
CUTSOM				
COMPOSITE SCS CURVE NUMBER - B4		61.00		14.68

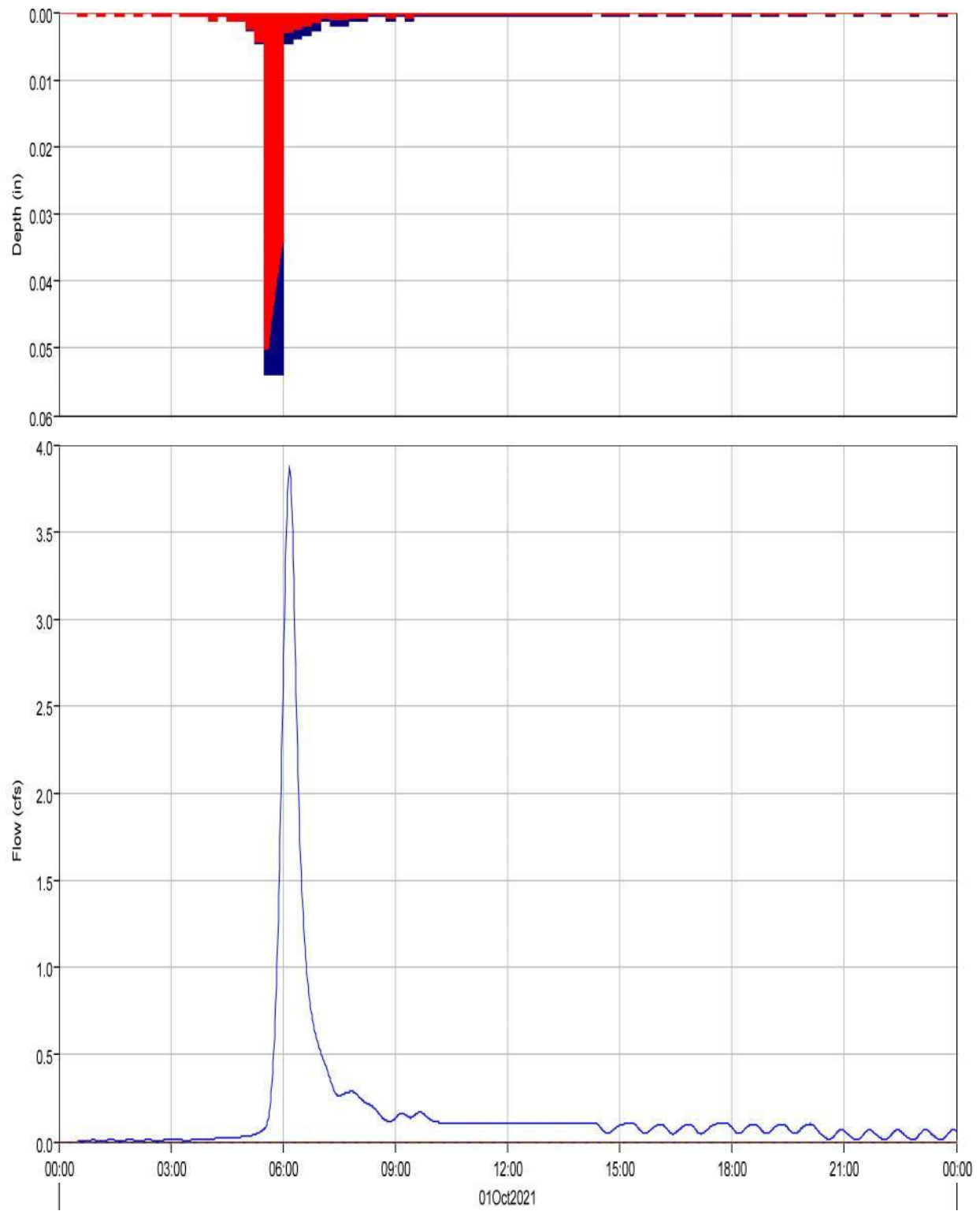


Project: Eagleview\_Subdivision Simulation Run: EV 5-yr Ex. Type IIA NR

Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 10:06:15 Control Specifications: 24-hr Storm

Hydrologic Element	Drainage Area (MI <sup>2</sup> )	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
B1	0.0091800	3.9	01Oct2021, 06:10	0.3
B2	0.0647266	17.9	01Oct2021, 06:14	1.8
B3	0.0930359	42.3	01Oct2021, 06:04	2.7
B4	0.0229422	6.8	01Oct2021, 06:13	0.7
J1	0.0253831	10.0	01Oct2021, 06:14	1.0
J2	0.1928516	65.5	01Oct2021, 06:19	7.1
J3	1.4296281	336.0	01Oct2021, 06:16	55.7
J4	1.0678500	212.7	01Oct2021, 06:32	35.0
J-OB6	0.8431300	166.7	01Oct2021, 06:31	28.2
OB1	0.0162031	6.4	01Oct2021, 06:14	0.6
OB2	0.0438438	18.7	01Oct2021, 06:14	1.9
OB3	0.0678750	23.7	01Oct2021, 06:18	2.7
OB4	0.0164062	6.8	01Oct2021, 06:17	0.7
OB5	0.2247200	46.1	01Oct2021, 06:28	6.8
OB6	0.1850100	53.6	01Oct2021, 06:19	6.4
OB7	0.6581200	126.8	01Oct2021, 06:38	21.8
OB8	0.0623000	28.4	01Oct2021, 06:12	2.6
OB9	0.1835000	178.3	01Oct2021, 06:09	14.8
R-B1	0.0162031	6.4	01Oct2021, 06:16	0.6
R-OB4	0.1281250	48.7	01Oct2021, 06:20	5.3
R-OB5	0.2247200	46.0	01Oct2021, 06:31	6.8
R-OB6	0.8431300	166.7	01Oct2021, 06:32	28.2
R-OB7	1.0678500	212.7	01Oct2021, 06:35	35.0
R-OB8	0.0623000	28.4	01Oct2021, 06:15	2.6

Subbasin "B1" Results for Run "EV 5-yr Ex. Type IIA NR"



Run:EV 5-yr Ex. Type IIA NR Element:B1 Result:Precipitation  
Run:EV 5-yr Ex. Type IIA NR Element:B1 Result:Outflow

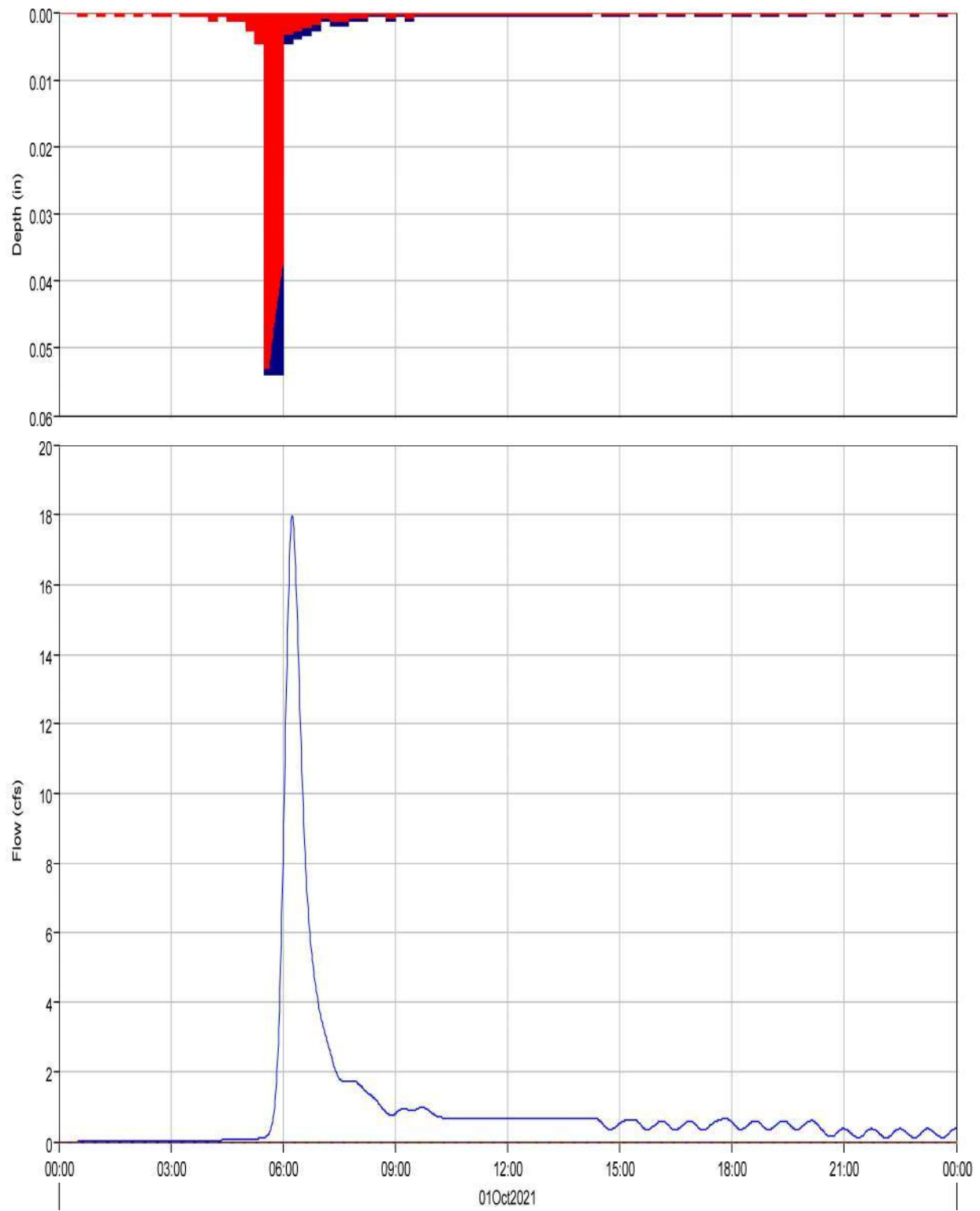
Run:EV 5-YR EX. TYPE IIA NR Element:B1 Result:Precipitation Loss  
Run:EV 5-YR EX. TYPE IIA NR Element:B1 Result:Baseflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Ex. Type IIA NR Subbasin: B1  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 10:06:15 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Discharge :	3.9 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:10
Total Precipitation :	1.3 (AC-FT)	Total Direct Runoff :	0.3 (AC-FT)
Total Loss :	1.0 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	0.3 (AC-FT)	Discharge :	0.3 (AC-FT)

Subbasin "B2" Results for Run "EV 5-yr Ex. Type IIA NR"



Run:EV 5-yr Ex. Type IIA NR Element:B2 Result:Precipitation  
Run:EV 5-yr Ex. Type IIA NR Element:B2 Result:Outflow

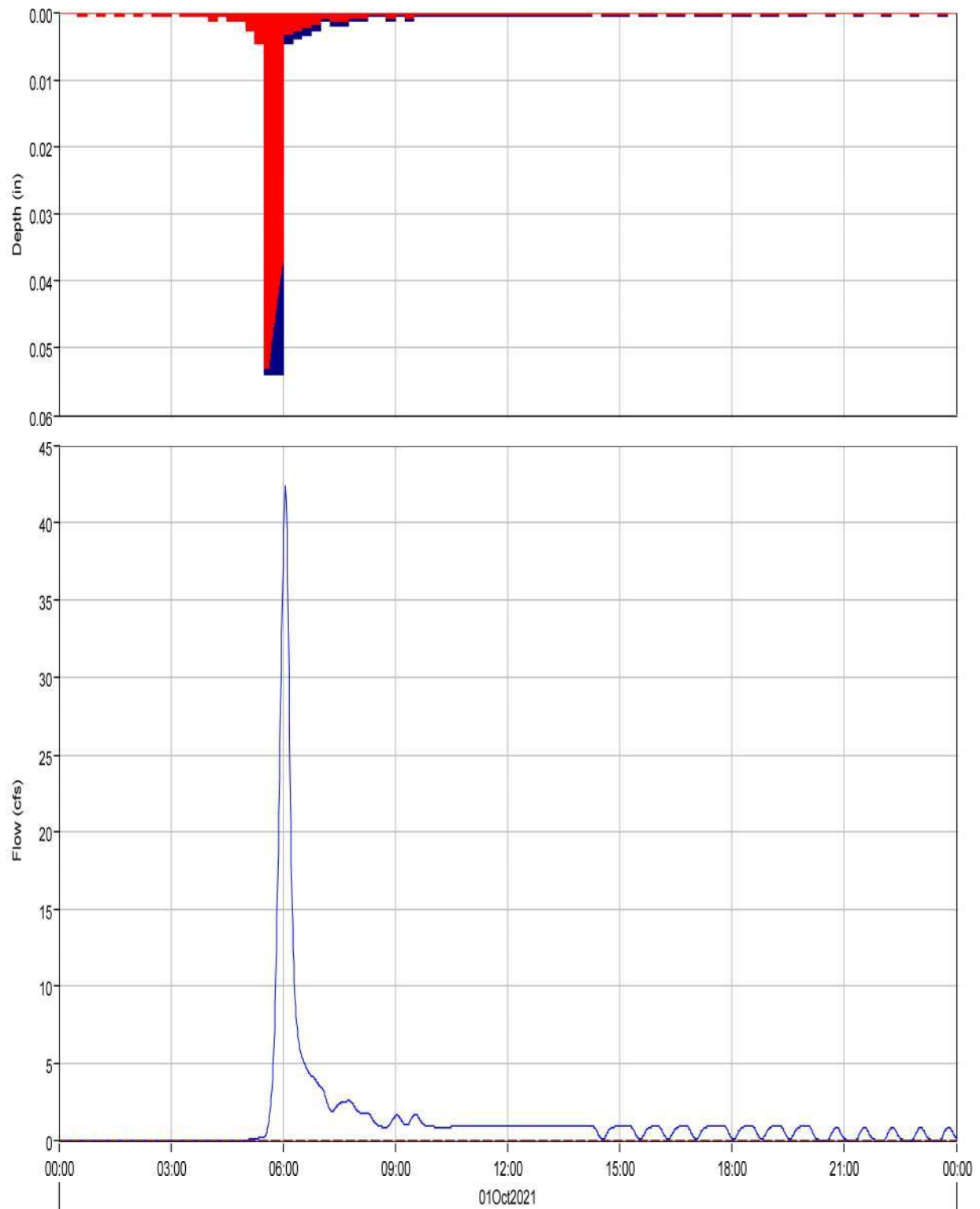
Run:EV 5-YR EX. TYPE IIA NR Element:B2 Result:Precipitation Loss  
Run:EV 5-YR EX. TYPE IIA NR Element:B2 Result:Baseflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Ex. Type IIA NR Subbasin: B2  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 10:06:15 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Discharge :	17.9 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:14
Total Precipitation :	9.3 (AC-FT)	Total Direct Runoff :	1.8 (AC-FT)
Total Loss :	7.5 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	1.9 (AC-FT)	Discharge :	1.8 (AC-FT)

Subbasin "B3" Results for Run "EV 5-yr Ex. Type IIA NR"



Run:EV 5-yr Ex. Type IIA NR Element:B3 Result:Precipitation  
Run:EV 5-yr Ex. Type IIA NR Element:B3 Result:Outflow

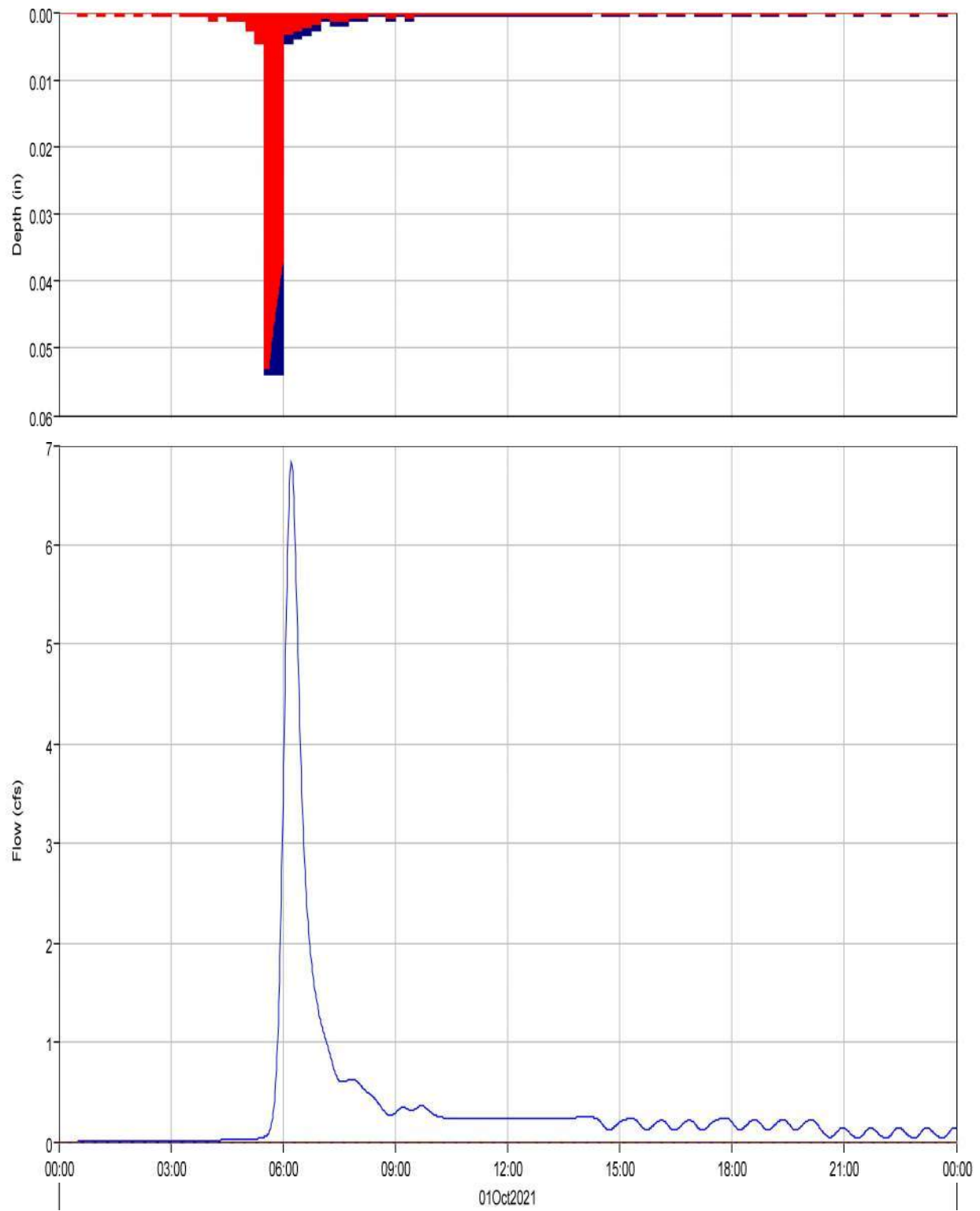
Run:EV 5-YR EX. TYPE IIA NR Element:B3 Result:Precipitation Loss  
Run:EV 5-YR EX. TYPE IIA NR Element:B3 Result:Baseflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Ex. Type IIA NR Subbasin: B3  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 10:06:15 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Discharge :	42.3 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:04
Total Precipitation :	13.4 (AC-FT)	Total Direct Runoff :	2.7 (AC-FT)
Total Loss :	10.7 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	2.7 (AC-FT)	Discharge :	2.7 (AC-FT)

Subbasin "B4" Results for Run "EV 5-yr Ex. Type IIA NR"



Run:EV 5-yr Ex. Type IIA NR Element:B4 Result:Precipitation  
Run:EV 5-yr Ex. Type IIA NR Element:B4 Result:Outflow

Run:EV 5-YR EX. TYPE IIA NR Element:B4 Result:Precipitation Loss  
Run:EV 5-YR EX. TYPE IIA NR Element:B4 Result:Baseflow

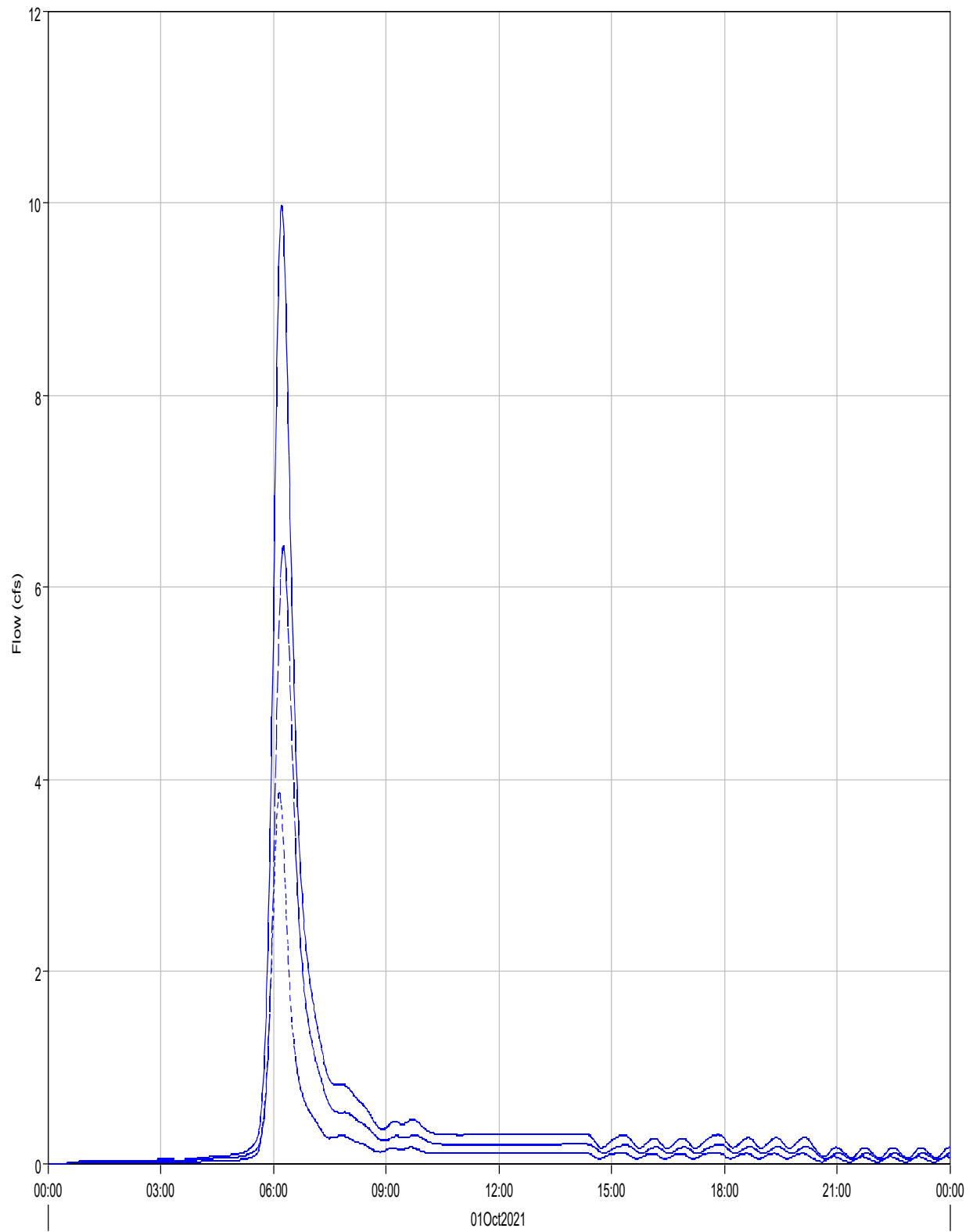


Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Ex. Type IIA NR Subbasin: B4  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 10:06:15 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Discharge :	6.8 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:13
Total Precipitation :	3.3 (AC-FT)	Total Direct Runoff :	0.7 (AC-FT)
Total Loss :	2.6 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	0.7 (AC-FT)	Discharge :	0.7 (AC-FT)

Junction "J1" Results for Run "EV 5-yr Ex. Type IIA NR"



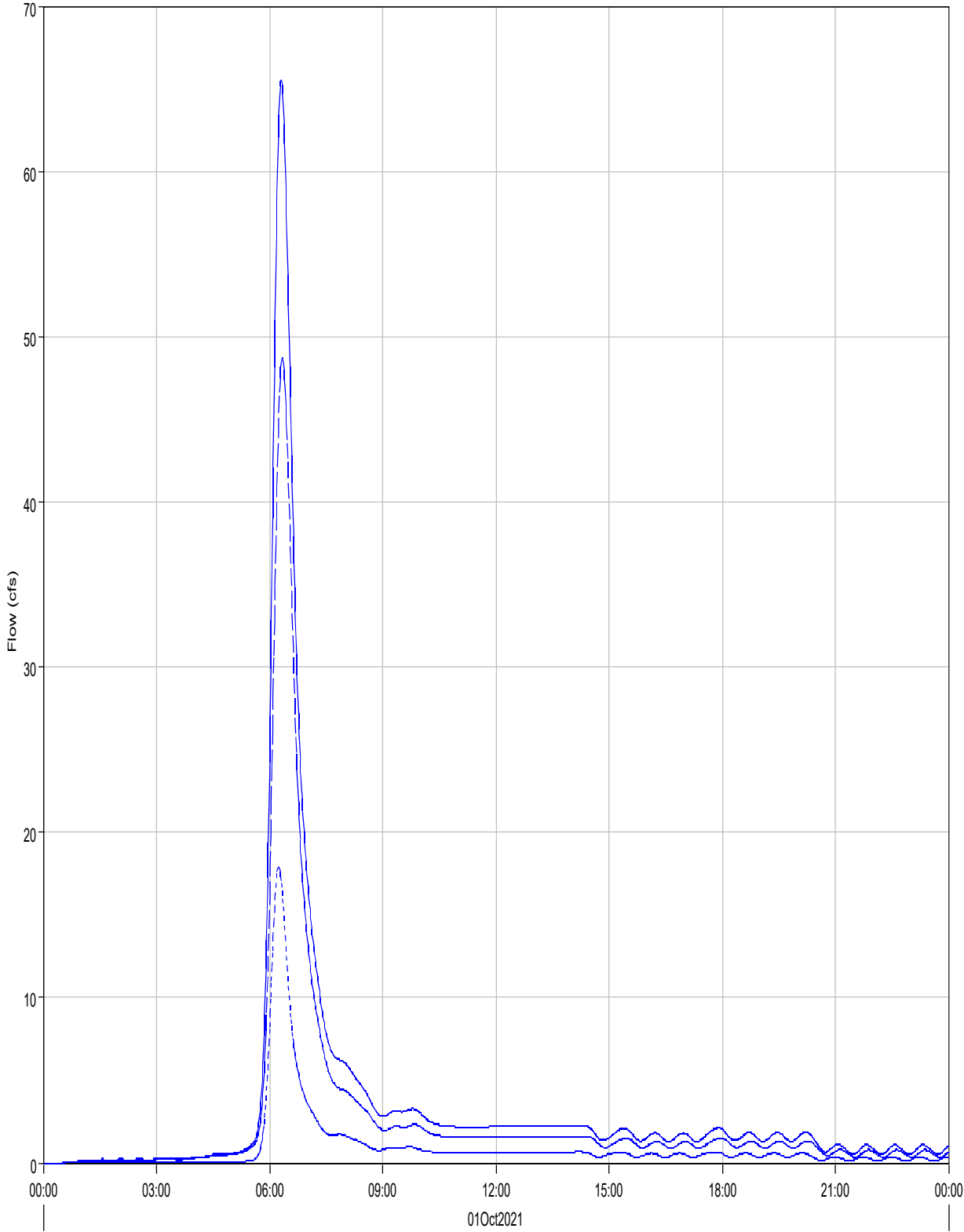
Run:EV 5-yr Ex. Type IIA NR Element:J1 Result:Outflow    Run:EV 5-yr Ex. Type IIA NR Element:R-B1 Result:Outflow    Run:EV 5-yr Ex. Type IIA NR Element:B1 Result:Outflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Ex. Type IIA NR Junction: J1  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 10:06:15 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Outflow : 10.0 (CFS) Date/Time of Peak Outflow : 01Oct2021, 06:14  
Total Outflow : 1.0 (AC-FT)

Junction "J2" Results for Run "EV 5-yr Ex. Type IIA NR"



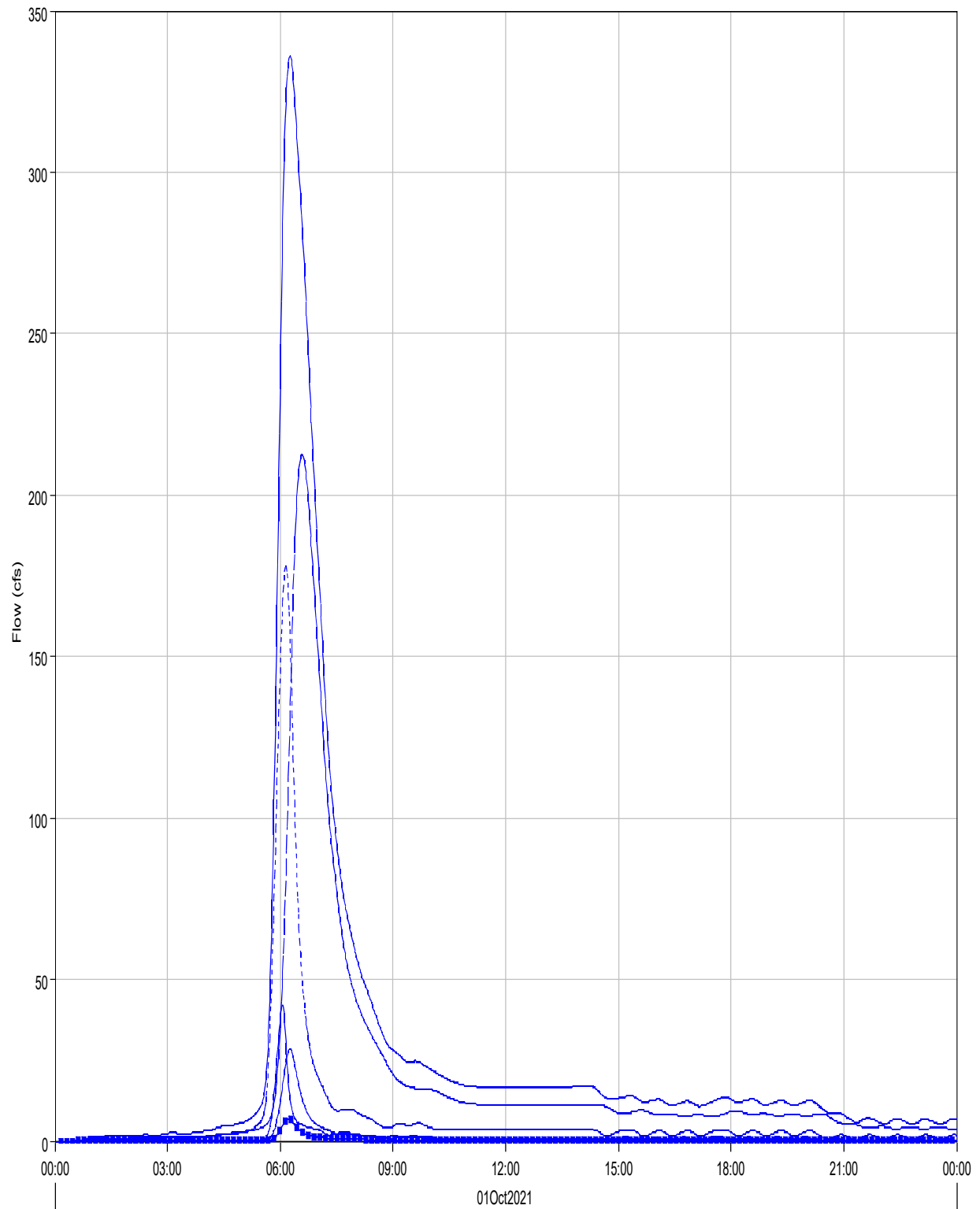
Run:EV 5-yr Ex. Type IIA NR Element:J2 Result:Outflow    Run:EV 5-yr Ex. Type IIA NR Element:R-OB4 Result:Outflow    Run:EV 5-yr Ex. Type IIA NR Element:B2 Result:Outflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Ex. Type IIA NR Junction: J2  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 10:06:15 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Outflow : 65.5 (CFS) Date/Time of Peak Outflow : 01Oct2021, 06:19  
Total Outflow : 7.1 (AC-FT)

Junction "J3" Results for Run "EV 5-yr Ex. Type IIA NR"



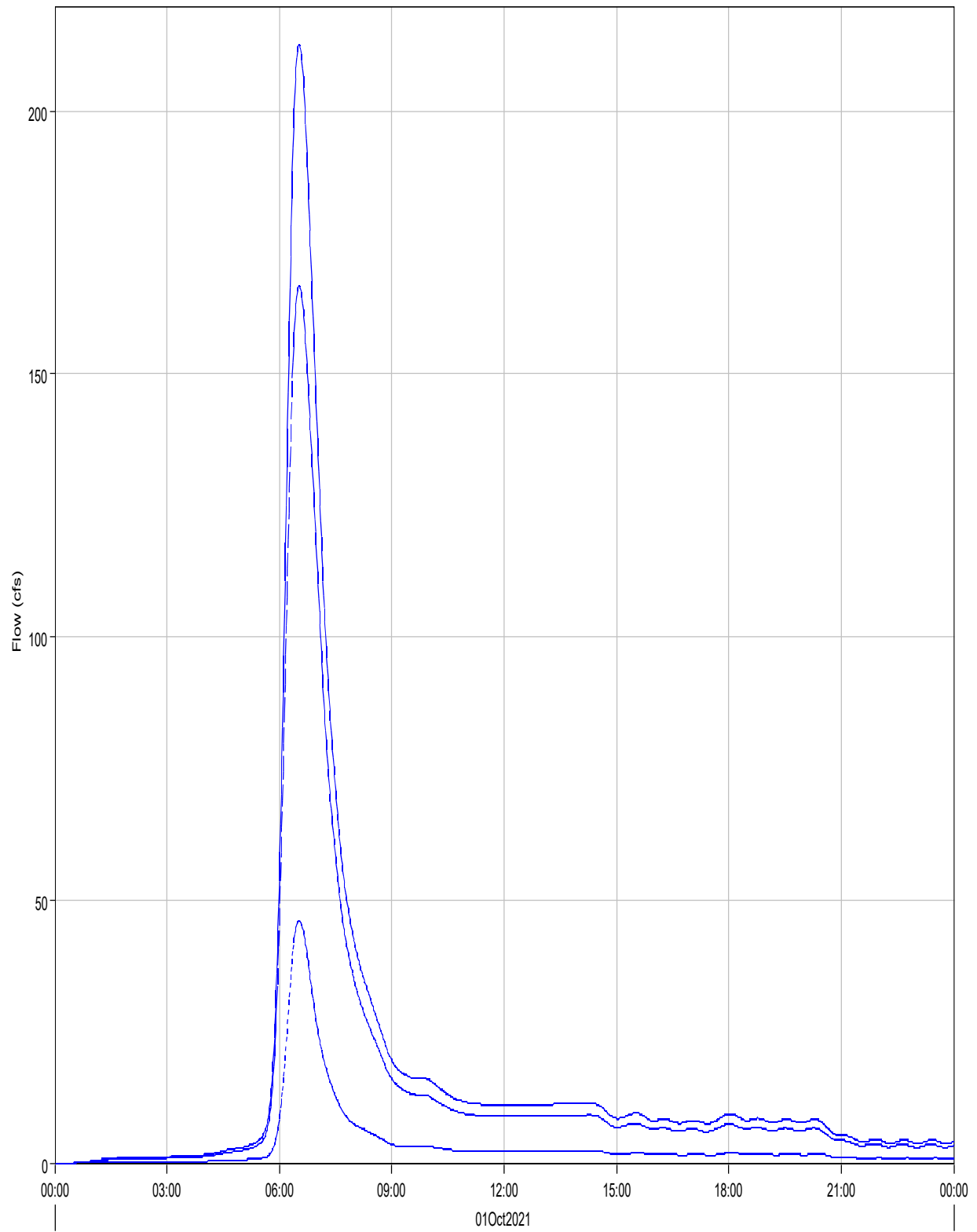
Run:EV 5-yr Ex. Type IIA NR Element:J3 Result:Outflow    Run:EV 5-yr Ex. Type IIA NR Element:R-OB7 Result:Outflow    Run:EV 5-yr Ex. Type IIA NR Element:OB9 Result:Outflow  
 Run:EV 5-yr Ex. Type IIA NR Element:B3 Result:Outflow    Run:EV 5-yr Ex. Type IIA NR Element:R-OB8 Result:Outflow    Run:EV 5-yr Ex. Type IIA NR Element:B4 Result:Outflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Ex. Type IIA NR Junction: J3  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 10:06:15 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Outflow :	336.0 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 06:16
Total Outflow :	55.7 (AC-FT)		

Junction "J4" Results for Run "EV 5-yr Ex. Type IIA NR"



Run:EV 5-yr Ex. Type IIA NR Element:J4 Result:Outflow    Run:EV 5-yr Ex. Type IIA NR Element:R-OB6 Result:Outflow    Run:EV 5-yr Ex. Type IIA NR Element:R-OB5 Result:Outflow

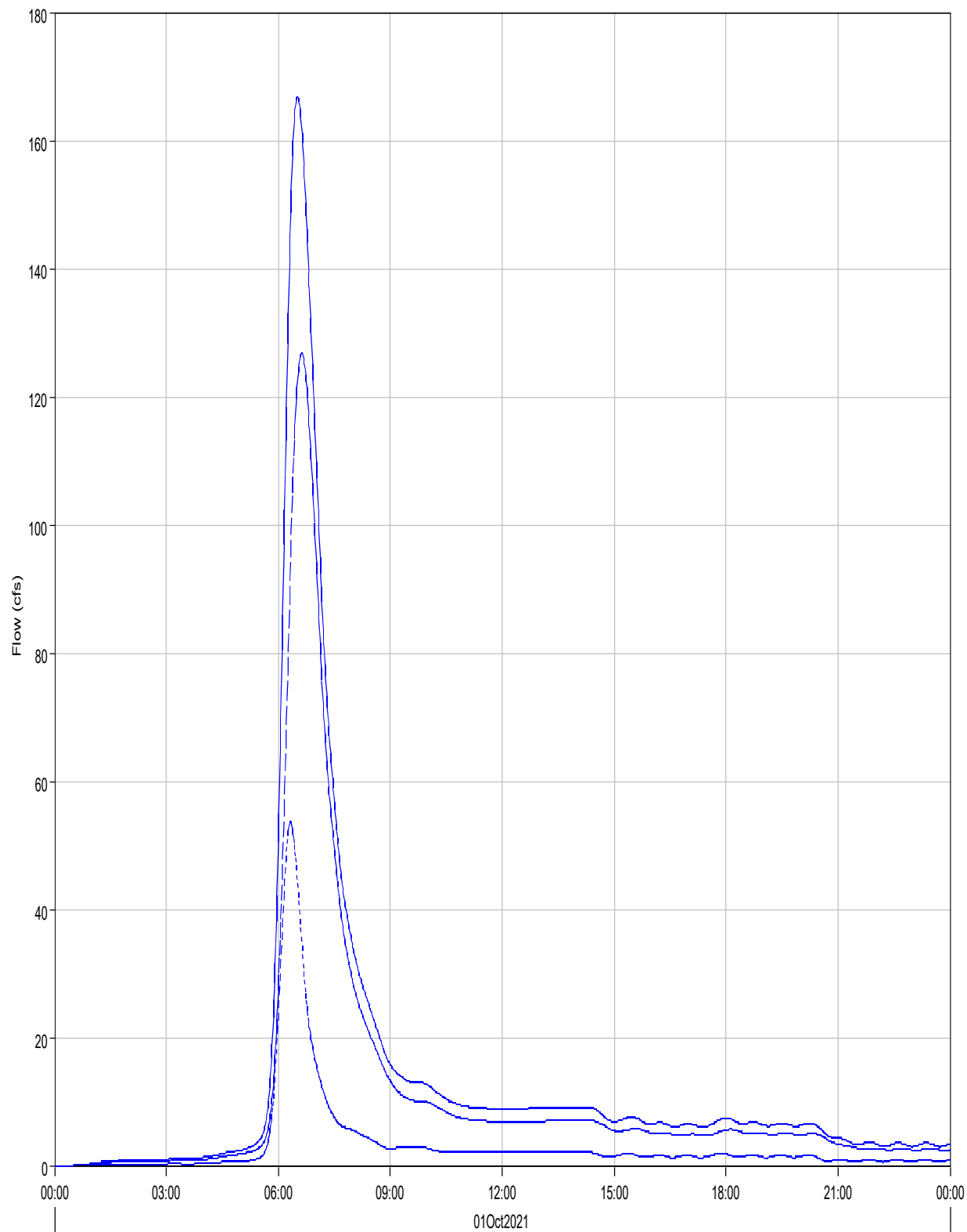


Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Ex. Type IIA NR Junction: J4  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 10:06:15 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Outflow :	212.7 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 06:32
Total Outflow :	35.0 (AC-FT)		

Junction "J-OB6" Results for Run "EV 5-yr Ex. Type IIA NR"



Run:EV 5-yr Ex. Type IIA NR Element:J-OB6 Result:Outflow    Run:EV 5-yr Ex. Type IIA NR Element:OB7 Result:Outflow    Run:EV 5-yr Ex. Type IIA NR Element:OB6 Result:Outflow

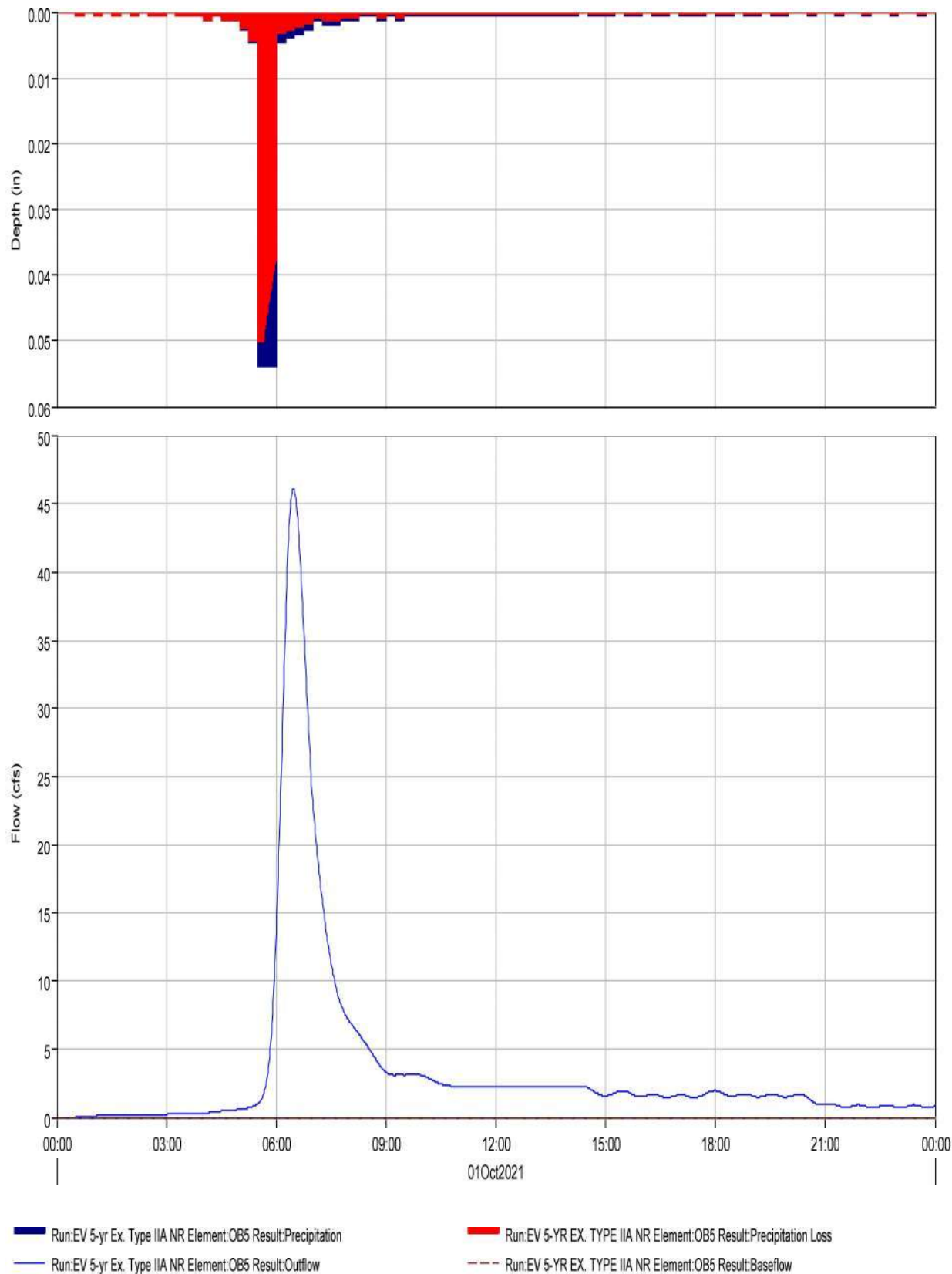
Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Ex. Type IIA NR Junction: J-OB6  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 10:06:15 Control Specifications: 24-hr Storm

Volume Units: AC-FT

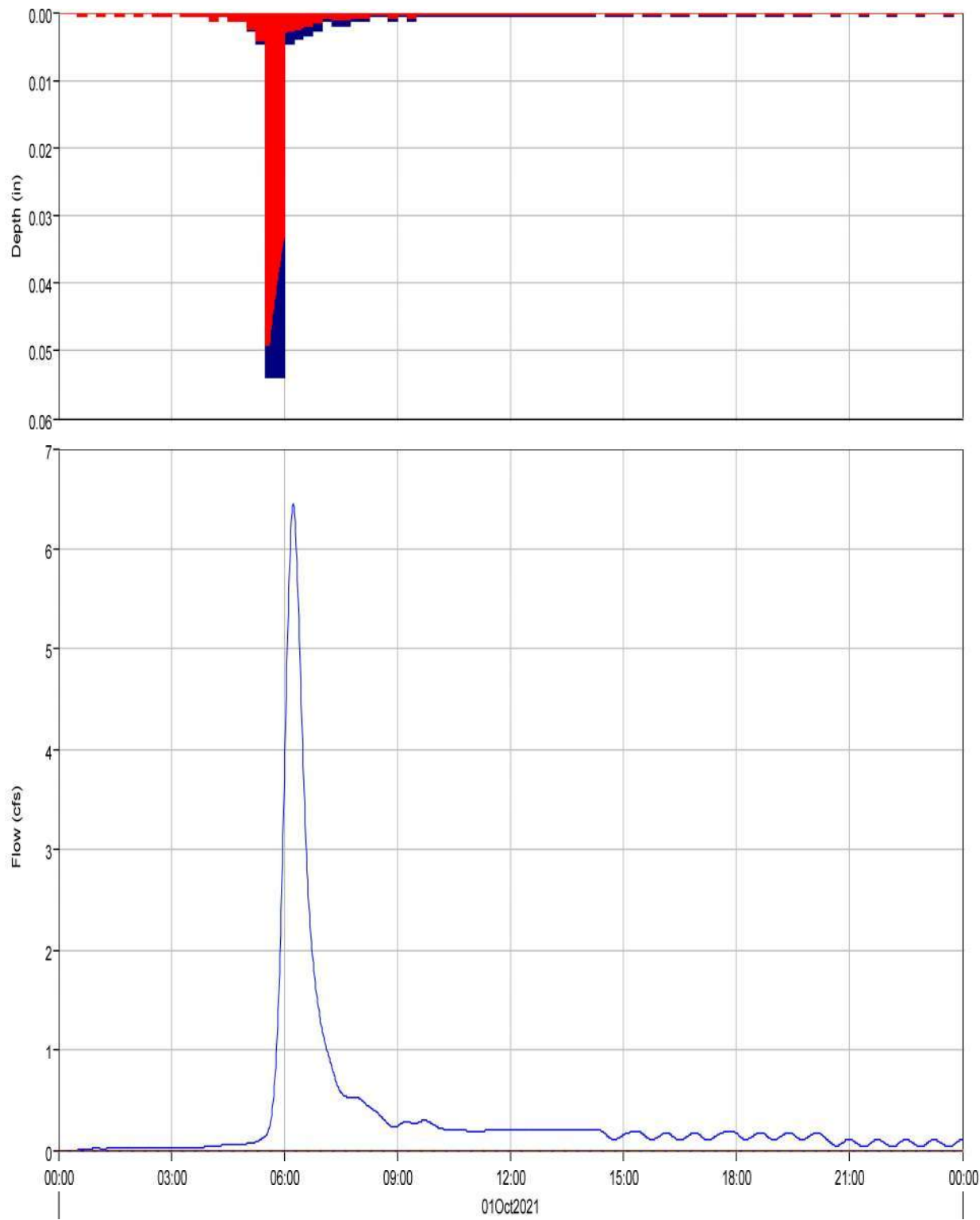
#### Computed Results

Peak Outflow :	166.7 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 06:31
Total Outflow :	28.2 (AC-FT)		

Subbasin "OB5" Results for Run "EV 5-yr Ex. Type IIA NR"



Subbasin "OB1" Results for Run "EV 5-yr Ex. Type IIA NR"



Run:EV 5-yr Ex. Type IIA NR Element:OB1 Result:Precipitation  
Run:EV 5-yr Ex. Type IIA NR Element:OB1 Result:Outflow

Run:EV 5-YR EX. TYPE IIA NR Element:OB1 Result:Precipitation Loss  
Run:EV 5-YR EX. TYPE IIA NR Element:OB1 Result:Baseflow

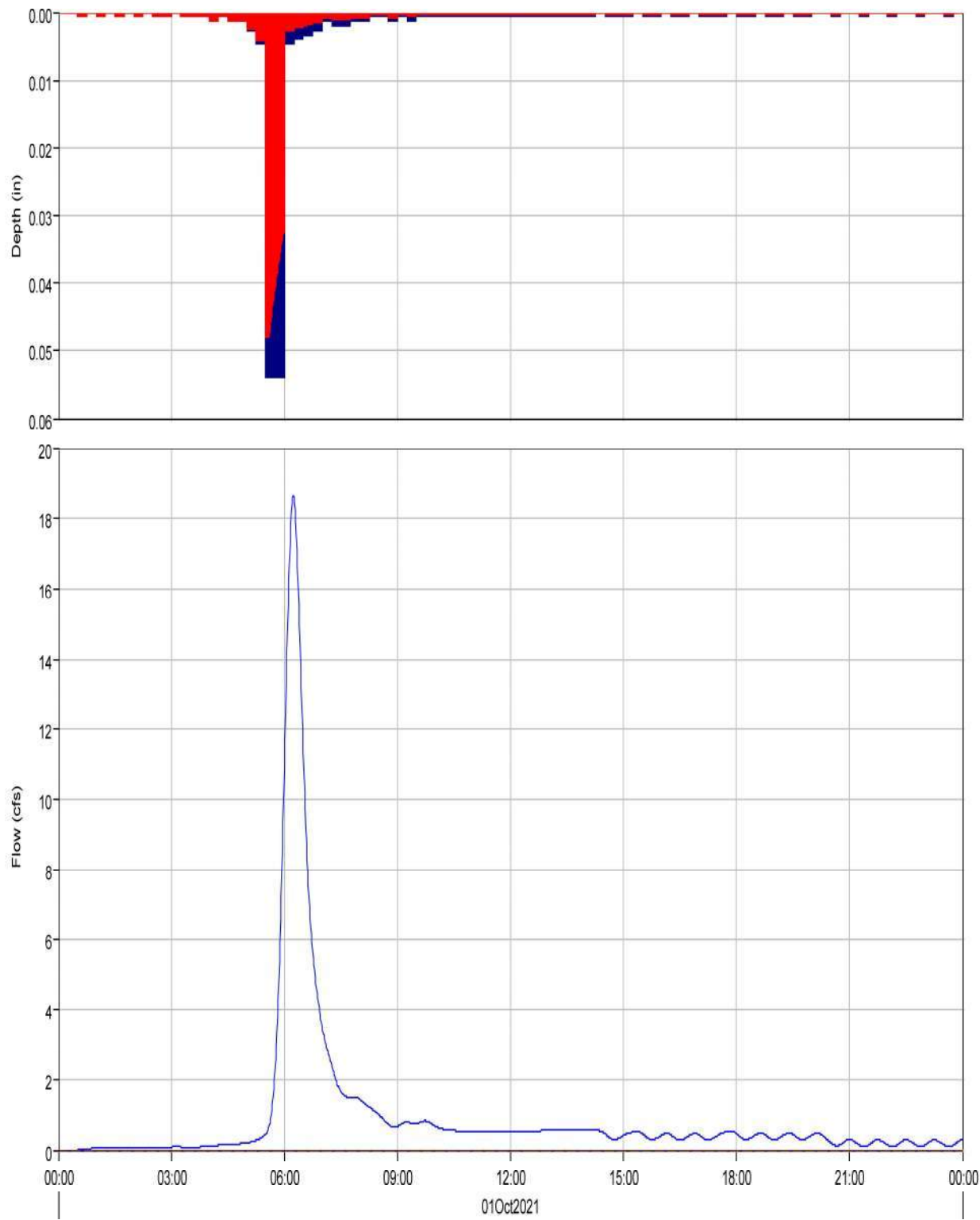
Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Ex. Type IIA NR Subbasin: OB1  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 10:06:15 Control Specifications: 24-hr Storm

Volume Units: AC-FT

#### Computed Results

Peak Discharge :	6.4 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:14
Total Precipitation :	2.3 (AC-FT)	Total Direct Runoff :	0.6 (AC-FT)
Total Loss :	1.7 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	0.6 (AC-FT)	Discharge :	0.6 (AC-FT)

Subbasin "OB2" Results for Run "EV 5-yr Ex. Type IIA NR"



Run:EV 5-yr Ex. Type IIA NR Element:OB2 Result:Precipitation  
Run:EV 5-yr Ex. Type IIA NR Element:OB2 Result:Outflow

Run:EV 5-YR EX. TYPE IIA NR Element:OB2 Result:Precipitation Loss  
Run:EV 5-YR EX. TYPE IIA NR Element:OB2 Result:Baseflow

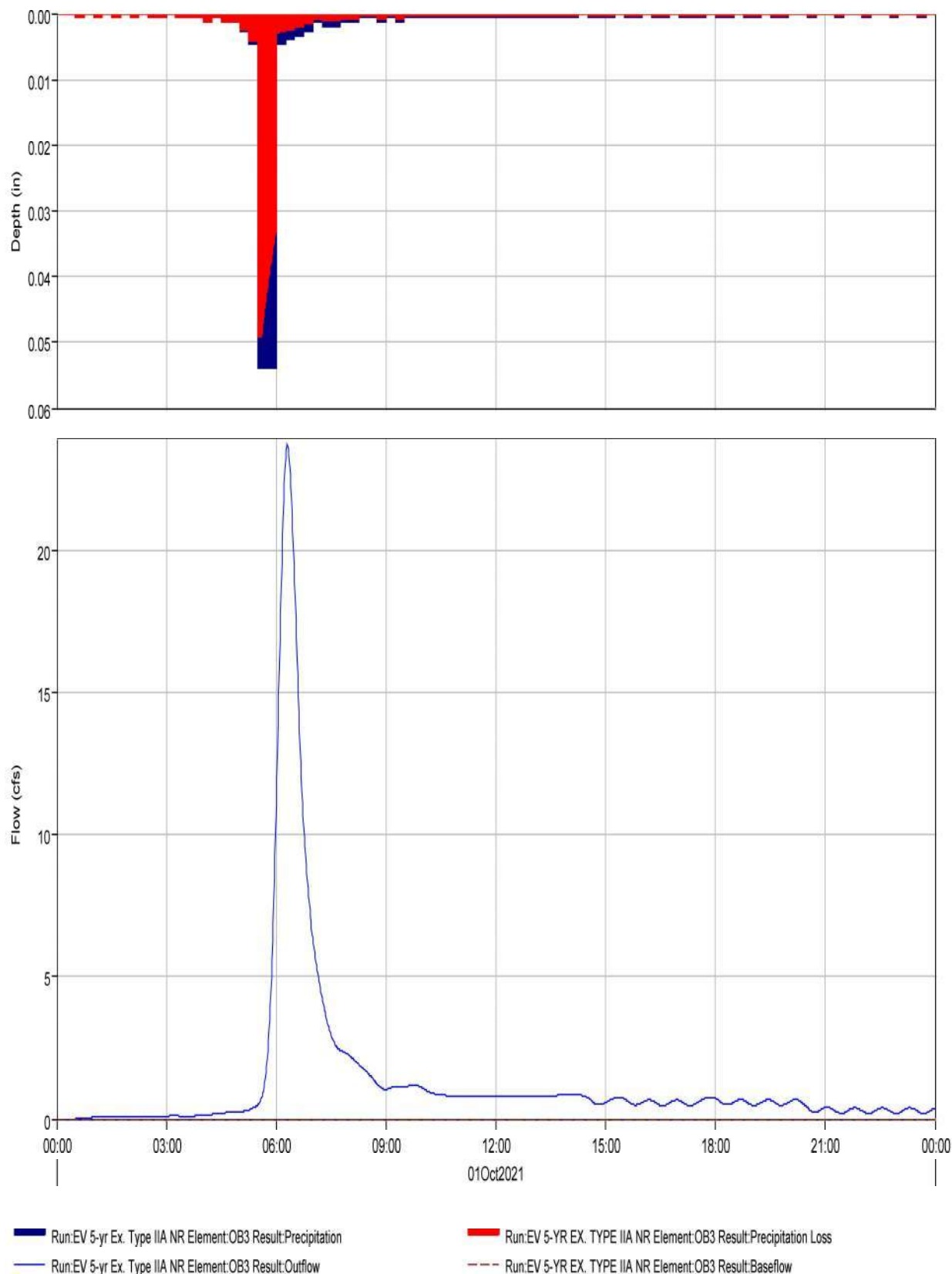
Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Ex. Type IIA NR Subbasin: OB2  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 10:06:15 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Discharge :	18.7 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:14
Total Precipitation :	6.3 (AC-FT)	Total Direct Runoff :	1.9 (AC-FT)
Total Loss :	4.4 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	1.9 (AC-FT)	Discharge :	1.9 (AC-FT)



Subbasin "OB3" Results for Run "EV 5-yr Ex. Type IIA NR"

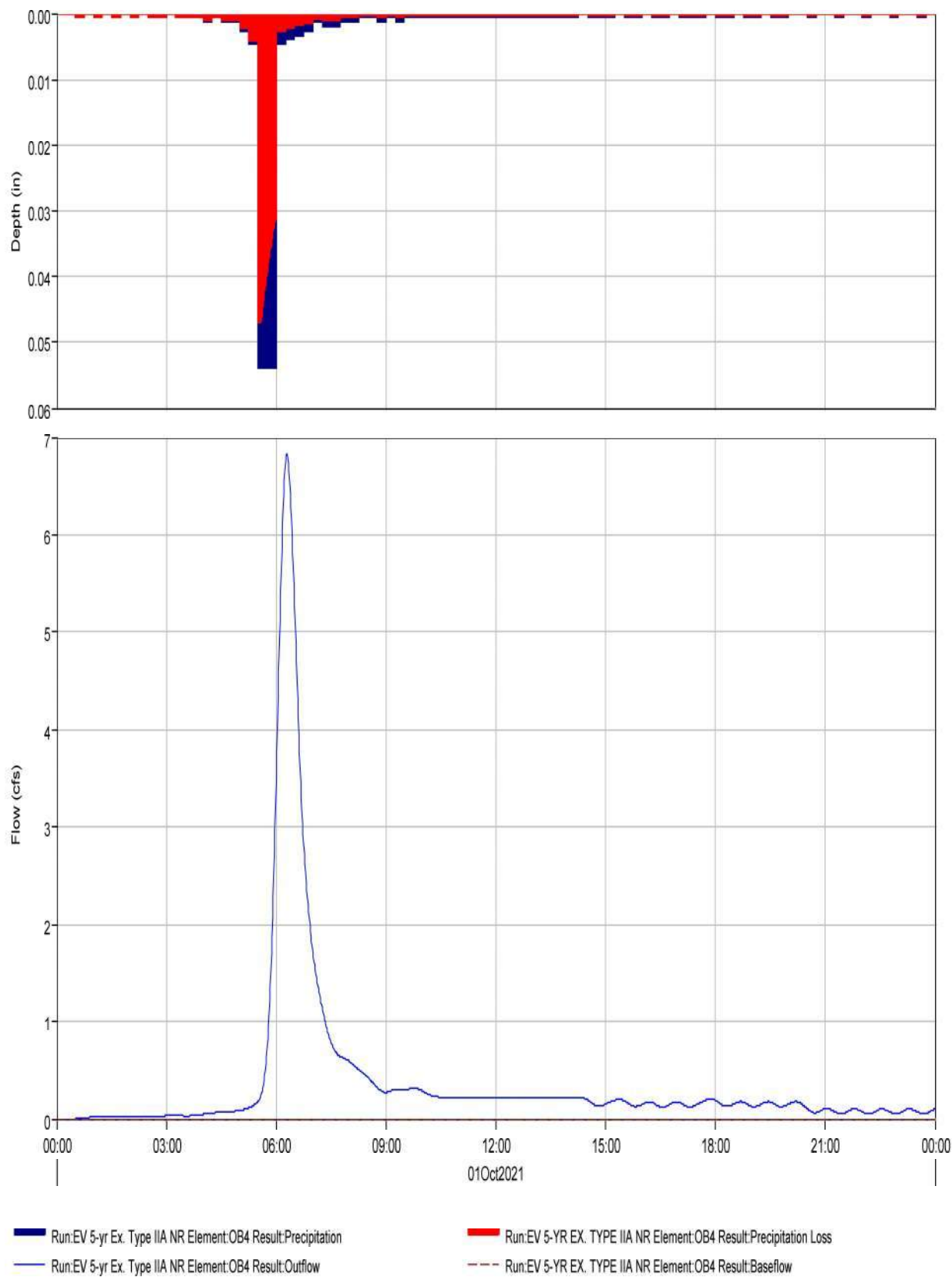


Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Ex. Type IIA NR Subbasin: OB3  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 10:06:15 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Discharge :	23.7 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:18
Total Precipitation :	9.8 (AC-FT)	Total Direct Runoff :	2.7 (AC-FT)
Total Loss :	7.1 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	2.7 (AC-FT)	Discharge :	2.7 (AC-FT)

Subbasin "OB4" Results for Run "EV 5-yr Ex. Type IIA NR"



Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Ex. Type IIA NR Subbasin: OB4  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 10:06:15 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

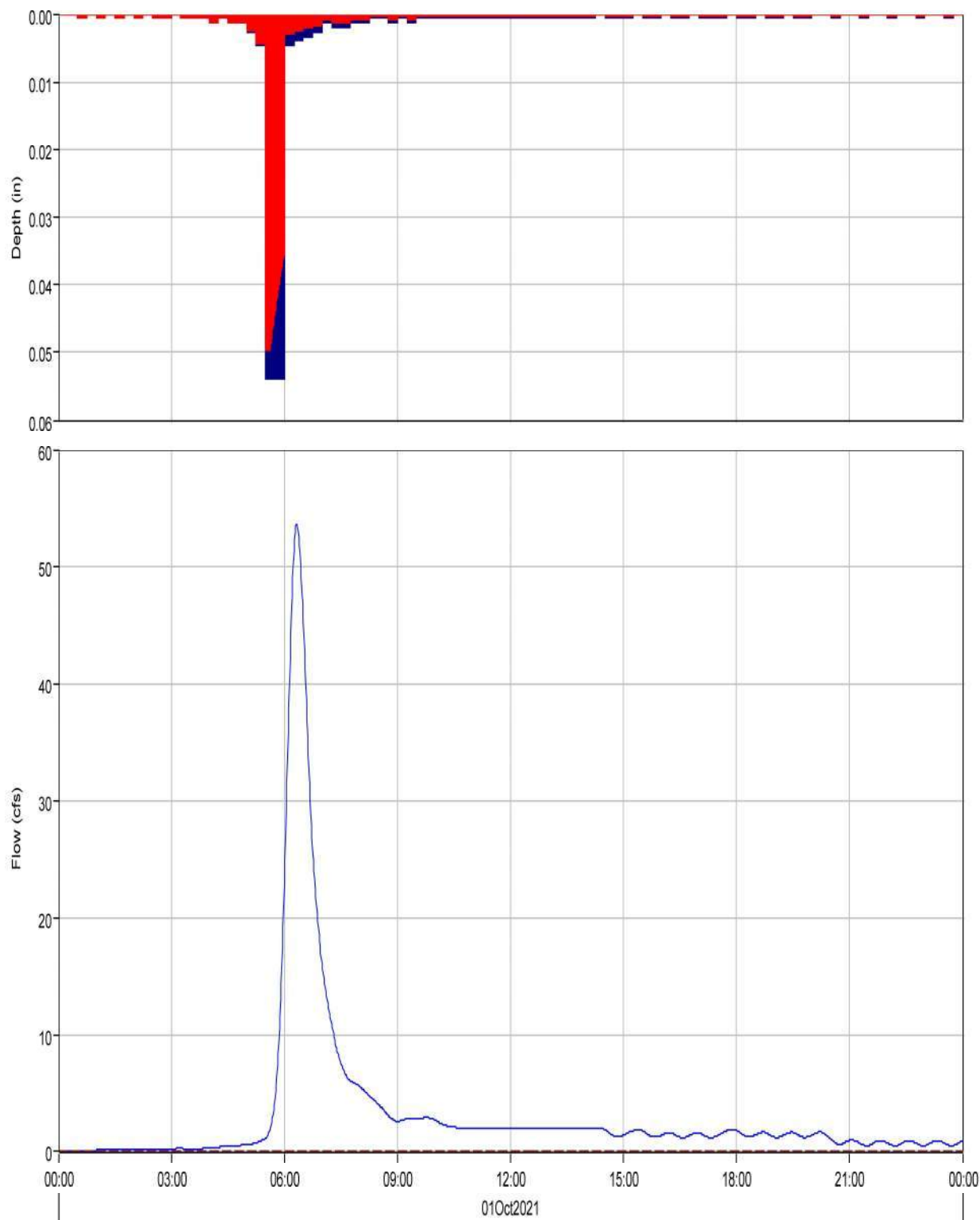
Peak Discharge :	6.8 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:17
Total Precipitation :	2.4 (AC-FT)	Total Direct Runoff :	0.7 (AC-FT)
Total Loss :	1.6 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	0.8 (AC-FT)	Discharge :	0.7 (AC-FT)

Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Ex. Type IIA NR Subbasin: OB5  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 10:06:15 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Discharge :	46.1 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:28
Total Precipitation :	32.4 (AC-FT)	Total Direct Runoff :	6.8 (AC-FT)
Total Loss :	25.5 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	6.8 (AC-FT)	Discharge :	6.8 (AC-FT)

Subbasin "OB6" Results for Run "EV 5-yr Ex. Type IIA NR"



Run:EV 5-yr Ex. Type IIA NR Element:OB6 Result:Precipitation  
Run:EV 5-yr Ex. Type IIA NR Element:OB6 Result:Outflow

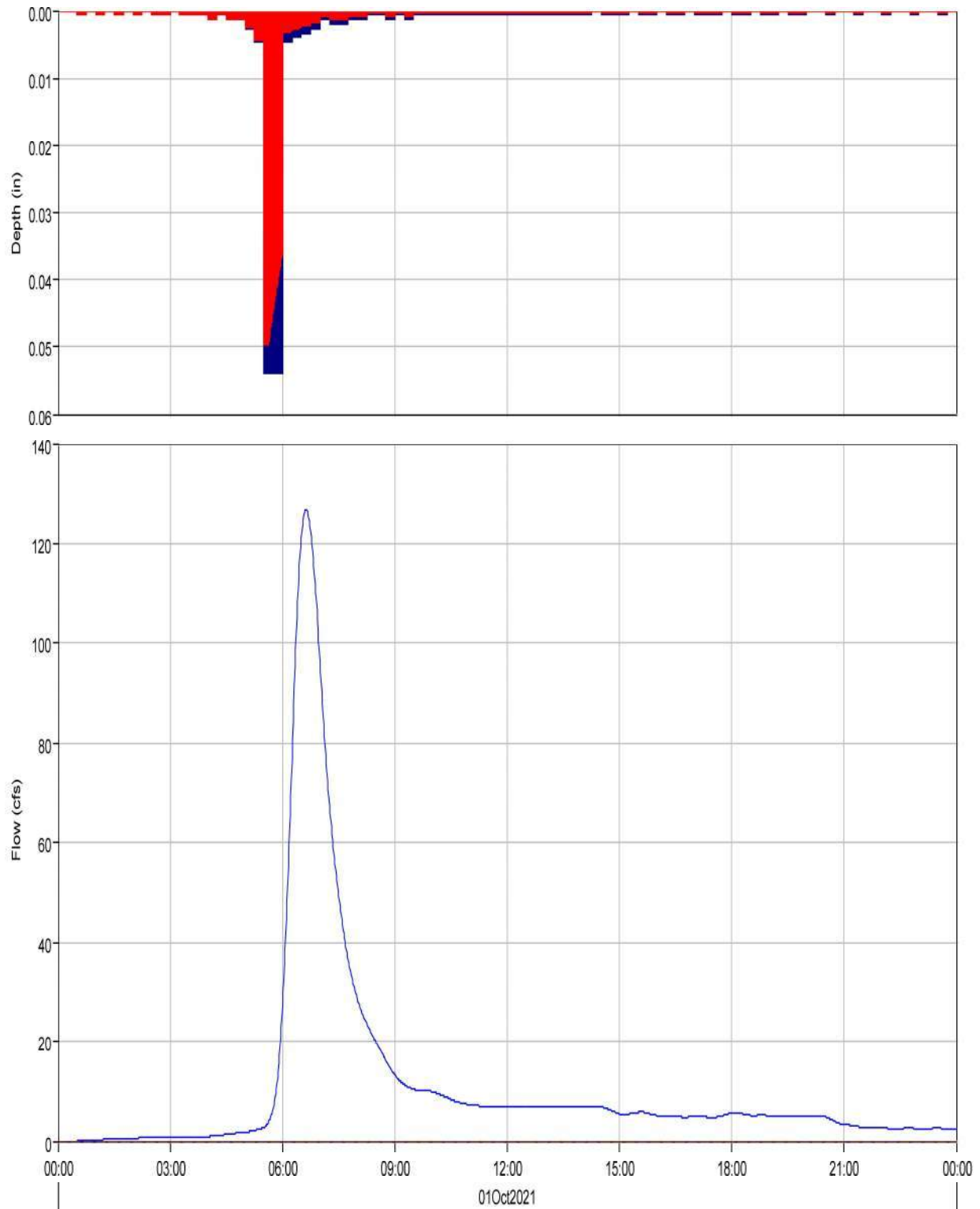
Run:EV 5-yr Ex. Type IIA NR Element:OB6 Result:Precipitation Loss  
Run:EV 5-yr Ex. Type IIA NR Element:OB6 Result:Baseflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Ex. Type IIA NR Subbasin: OB6  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 10:06:15 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Discharge :	53.6 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:19
Total Precipitation :	26.6 (AC-FT)	Total Direct Runoff :	6.4 (AC-FT)
Total Loss :	20.2 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	6.4 (AC-FT)	Discharge :	6.4 (AC-FT)

Subbasin "OB7" Results for Run "EV 5-yr Ex. Type IIA NR"



- Run:EV 5-yr Ex. Type IIA NR Element:OB7 Result:Precipitation
- Run:EV 5-yr Ex. Type IIA NR Element:OB7 Result:Outflow
- Run:EV 5-YR EX. TYPE IIA NR Element:OB7 Result:Precipitation Loss
- Run:EV 5-YR EX. TYPE IIA NR Element:OB7 Result:Baseflow

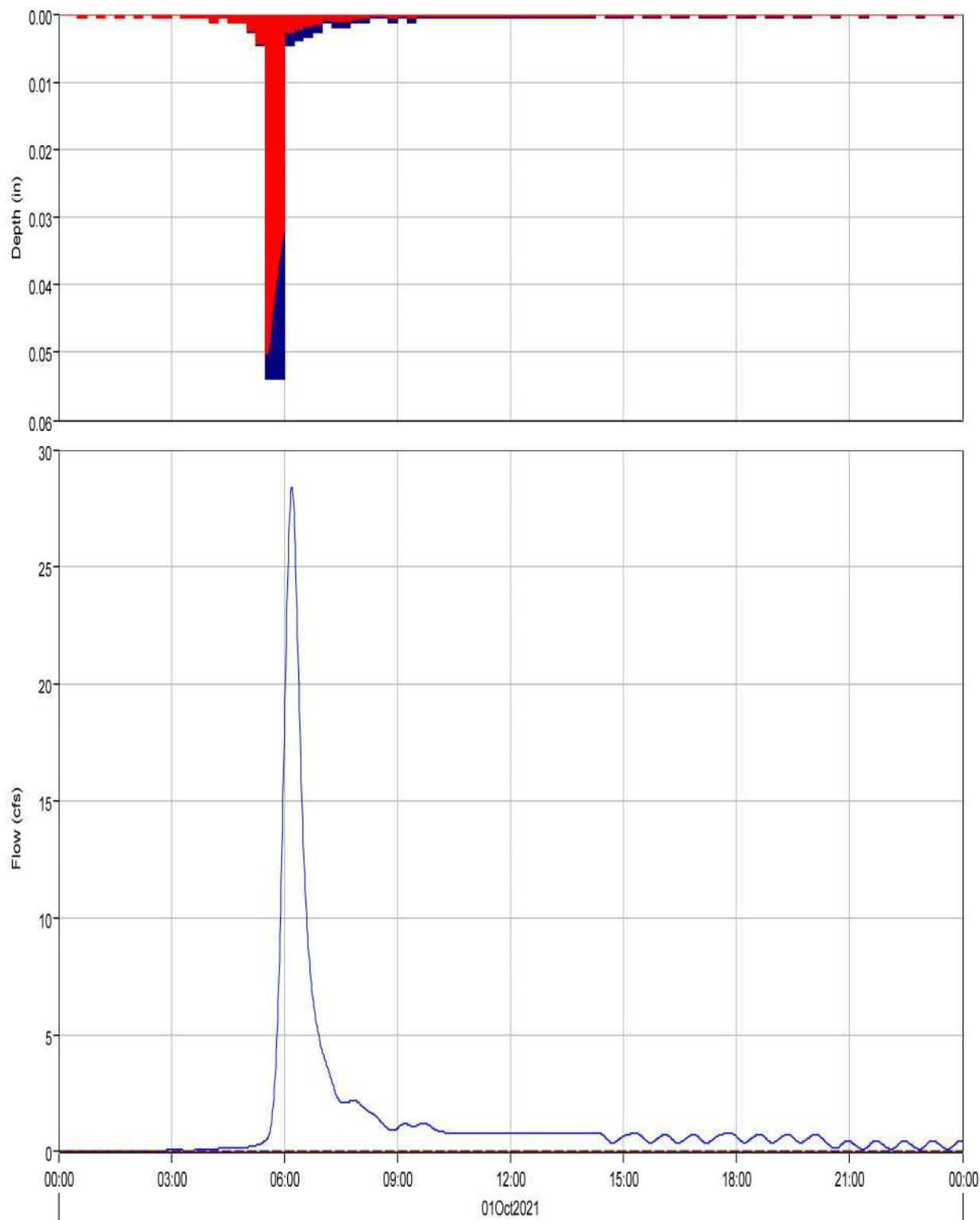


Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Ex. Type IIA NR Subbasin: OB7  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 10:06:15 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Discharge :	126.8 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:38
Total Precipitation :	94.8 (AC-FT)	Total Direct Runoff :	21.8 (AC-FT)
Total Loss :	72.7 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	22.0 (AC-FT)	Discharge :	21.8 (AC-FT)

Subbasin "OB8" Results for Run "EV 5-yr Ex. Type IIA NR"



Run:EV 5-yr Ex. Type IIA NR Element:OB8 Result:Precipitation  
Run:EV 5-yr Ex. Type IIA NR Element:OB8 Result:Outflow

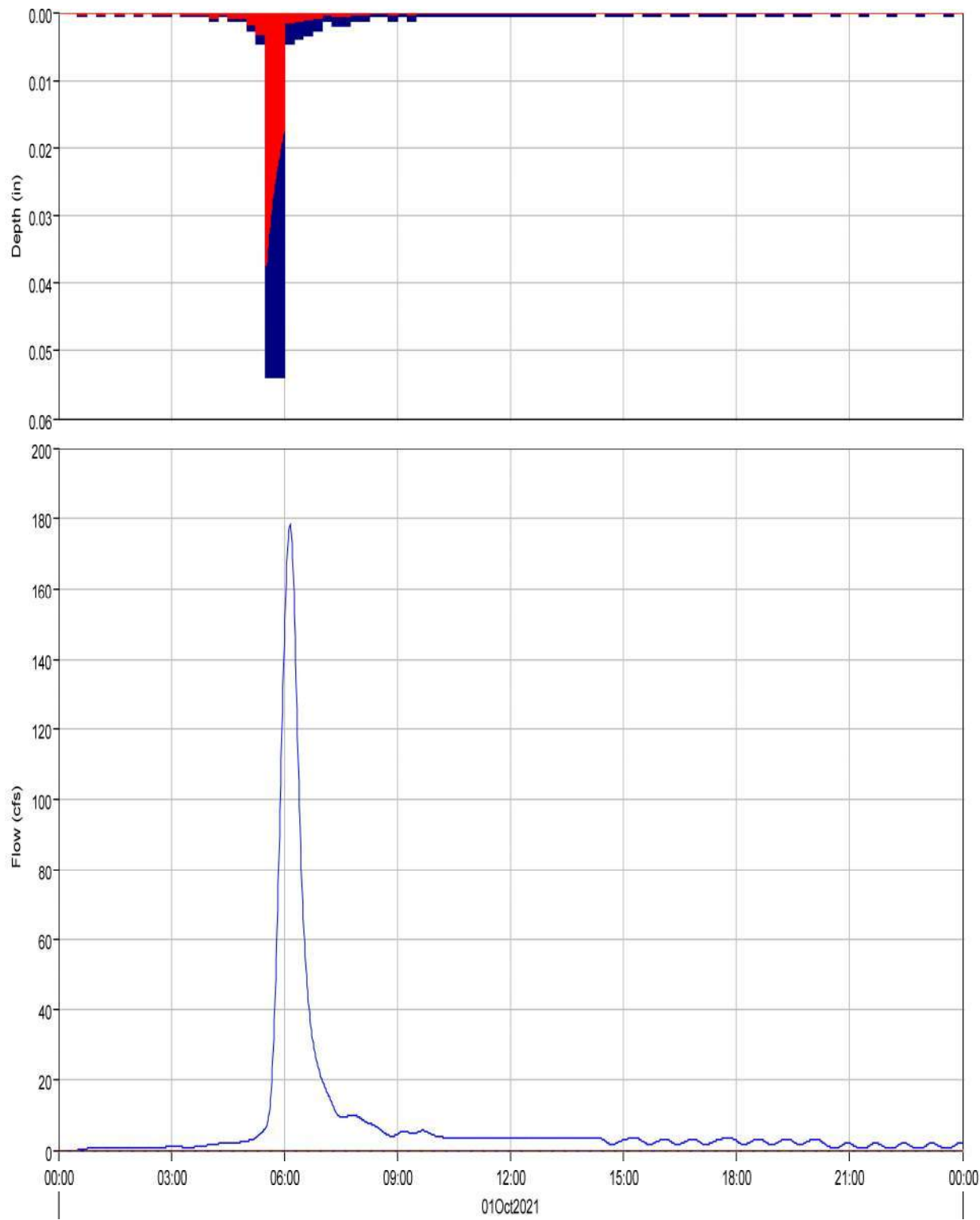
Run:EV 5-YR EX. TYPE IIA NR Element:OB8 Result:Precipitation Loss  
Run:EV 5-YR EX. TYPE IIA NR Element:OB8 Result:Baseflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Ex. Type IIA NR Subbasin: OB8  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 10:06:15 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Discharge :	28.4 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:12
Total Precipitation :	9.0 (AC-FT)	Total Direct Runoff :	2.6 (AC-FT)
Total Loss :	6.4 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	2.6 (AC-FT)	Discharge :	2.6 (AC-FT)

Subbasin "OB9" Results for Run "EV 5-yr Ex. Type IIA NR"



Run:EV 5-yr Ex. Type IIA NR Element:OB9 Result:Precipitation  
Run:EV 5-yr Ex. Type IIA NR Element:OB9 Result:Outflow

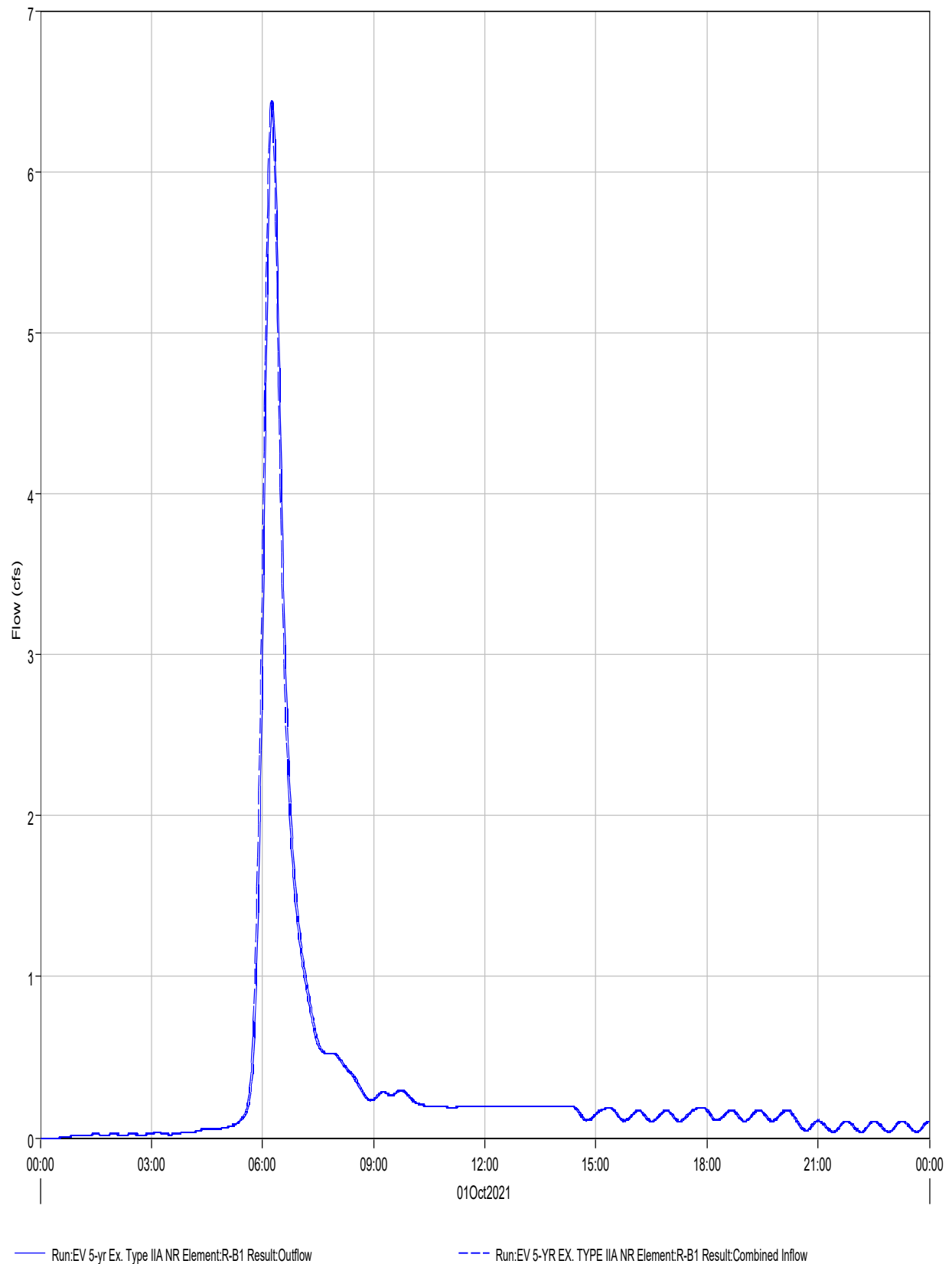
Run:EV 5-YR EX. TYPE IIA NR Element:OB9 Result:Precipitation Loss  
Run:EV 5-YR EX. TYPE IIA NR Element:OB9 Result:Baseflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Ex. Type IIA NR Subbasin: OB9  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 10:06:15 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Discharge :	178.3 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:09
Total Precipitation :	26.4 (AC-FT)	Total Direct Runoff :	14.8 (AC-FT)
Total Loss :	11.6 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	14.8 (AC-FT)	Discharge :	14.8 (AC-FT)

Reach "R-B1" Results for Run "EV 5-yr Ex. Type IIA NR"

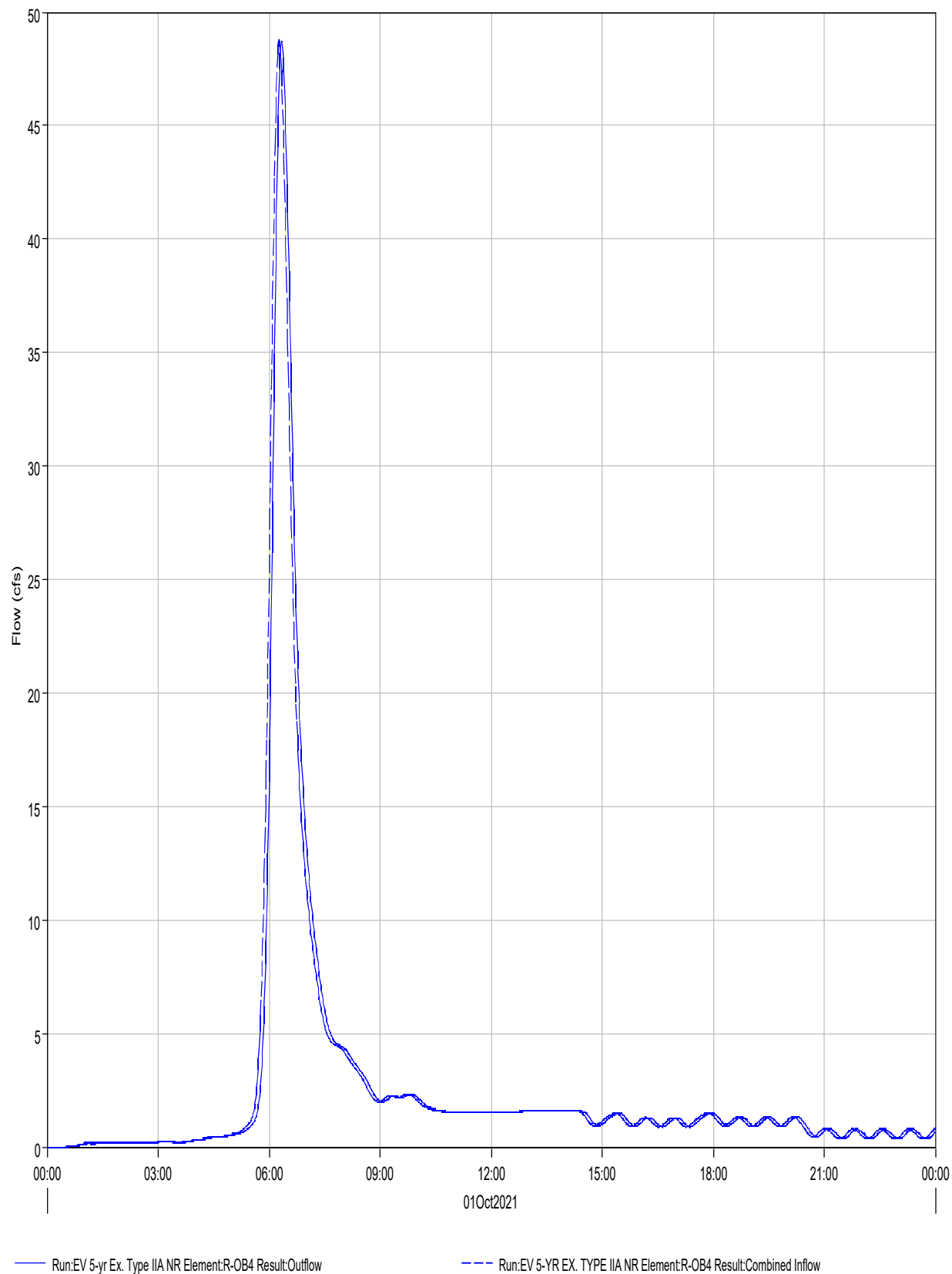


Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Ex. Type IIA NR Reach: R-B1  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 10:06:15 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Inflow :	6.4 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 06:14
Peak Outflow :	6.4 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 06:16
Total Inflow :	0.6 (AC-FT)	Total Outflow :	0.6 (AC-FT)

Reach "R-OB4" Results for Run "EV 5-yr Ex. Type IIA NR"



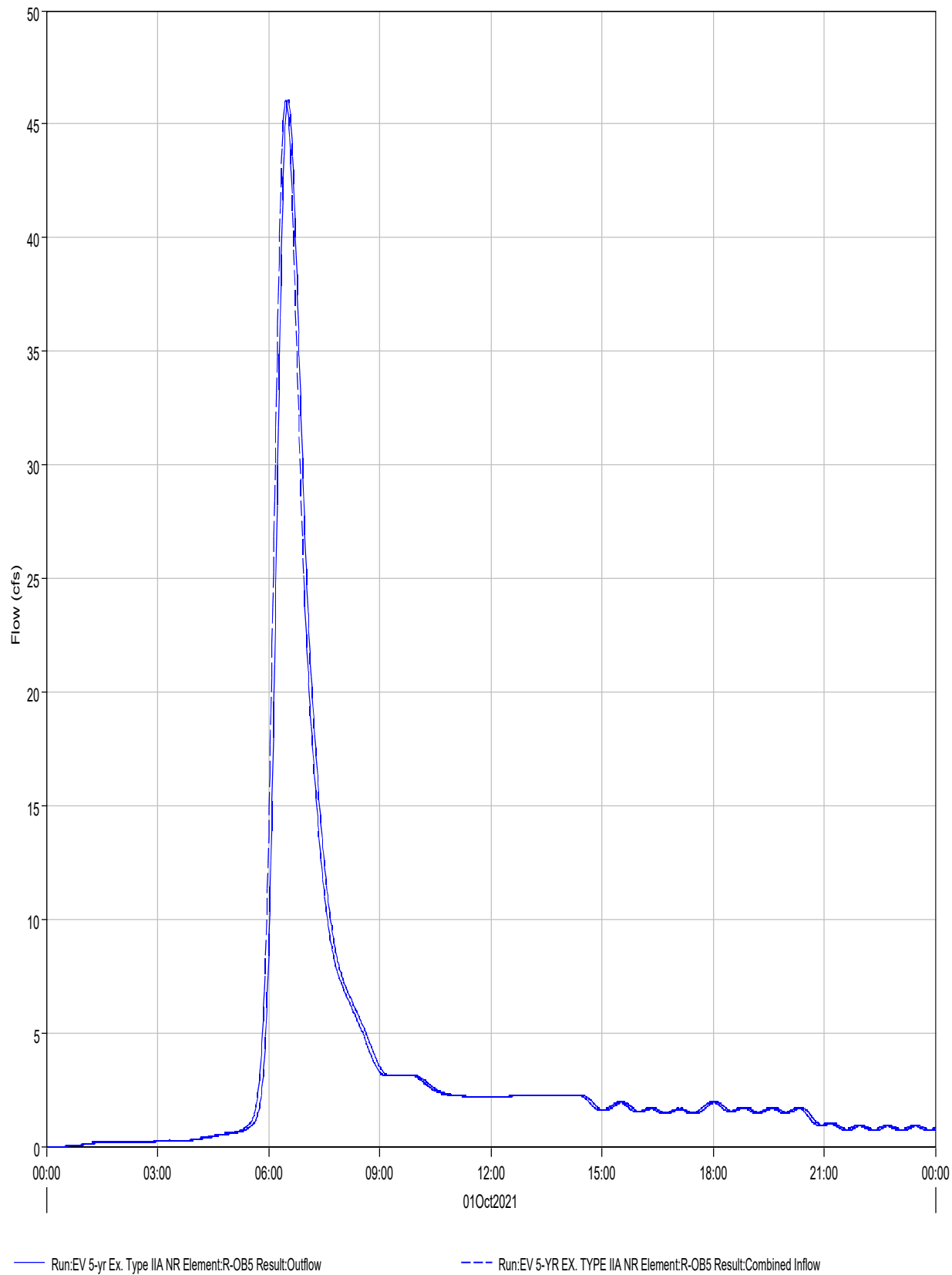


Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Ex. Type IIA NR Reach: R-OB4  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 10:06:15 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Inflow :	48.8 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 06:16
Peak Outflow :	48.7 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 06:20
Total Inflow :	5.3 (AC-FT)	Total Outflow :	5.3 (AC-FT)

Reach "R-OB5" Results for Run "EV 5-yr Ex. Type IIA NR"

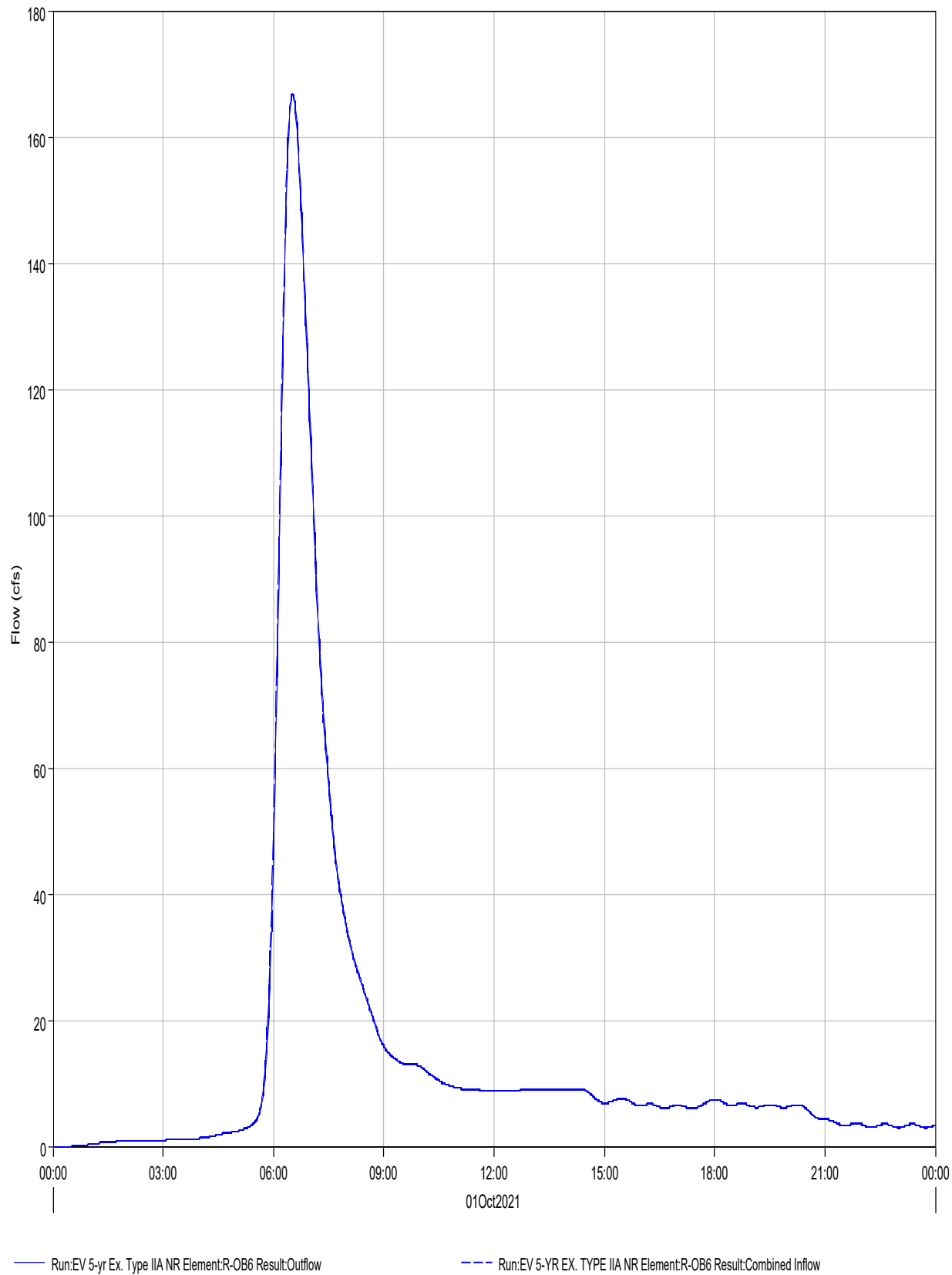


Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Ex. Type IIA NR Reach: R-OB5  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 10:06:15 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Inflow :	46.1 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 06:28
Peak Outflow :	46.0 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 06:31
Total Inflow :	6.8 (AC-FT)	Total Outflow :	6.8 (AC-FT)

Reach "R-OB6" Results for Run "EV 5-yr Ex. Type IIA NR"

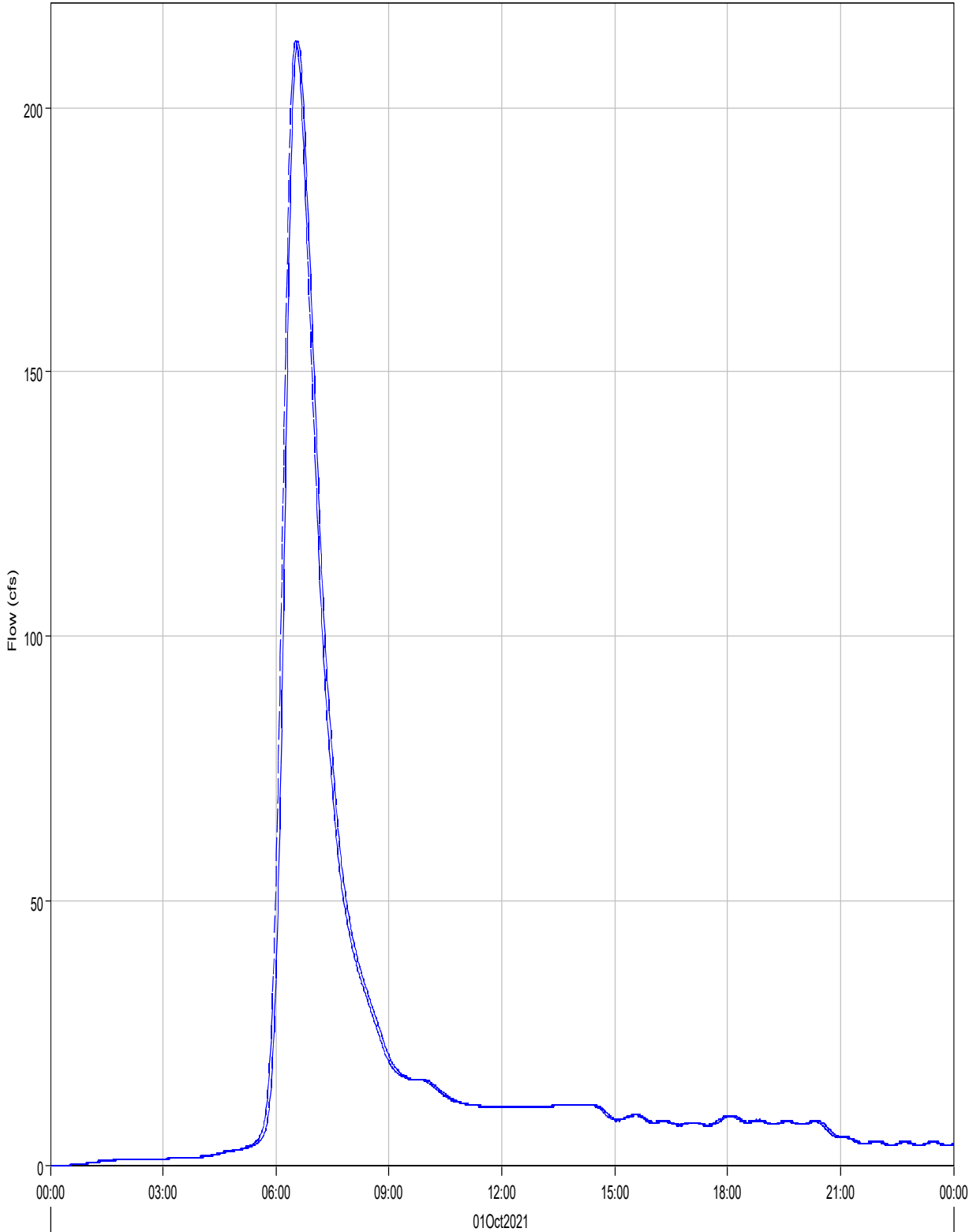


Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Ex. Type IIA NR Reach: R-OB6  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 10:06:15 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Inflow :	166.7 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 06:31
Peak Outflow :	166.7 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 06:32
Total Inflow :	28.2 (AC-FT)	Total Outflow :	28.2 (AC-FT)

Reach "R-OB7" Results for Run "EV 5-yr Ex. Type IIA NR"



Run:EV 5-yr Ex. Type IIA NR Element:R-OB7 Result:Outflow

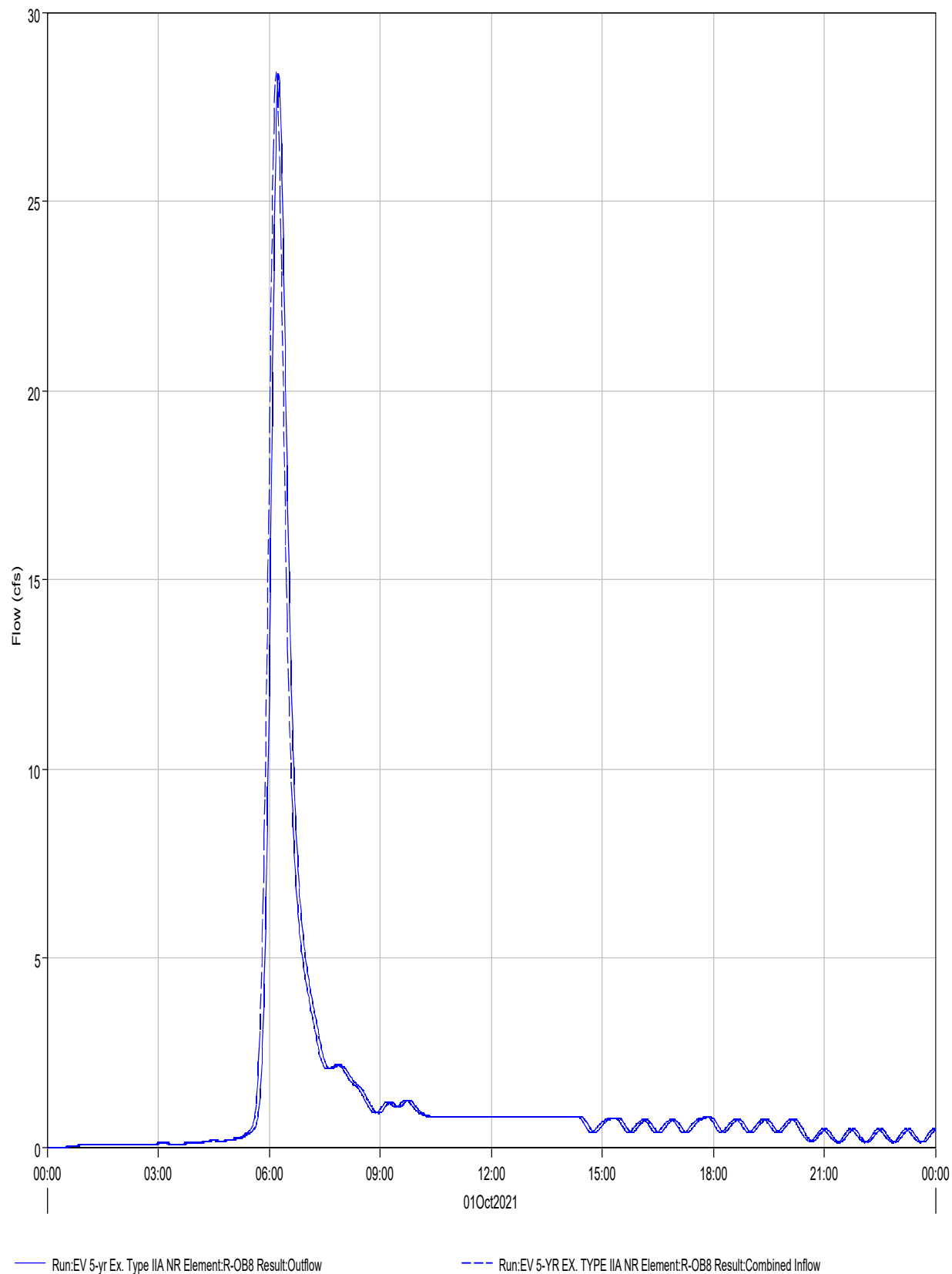
Run:EV 5-YR EX. TYPE IIA NR Element:R-OB7 Result:Combined Inflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Ex. Type IIA NR Reach: R-OB7  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 10:06:15 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Inflow :	212.7 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 06:32
Peak Outflow :	212.7 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 06:35
Total Inflow :	35.0 (AC-FT)	Total Outflow :	35.0 (AC-FT)

Reach "R-OB8" Results for Run "EV 5-yr Ex. Type IIA NR"





Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Ex. Type IIA NR Reach: R-OB8  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 10:06:15 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

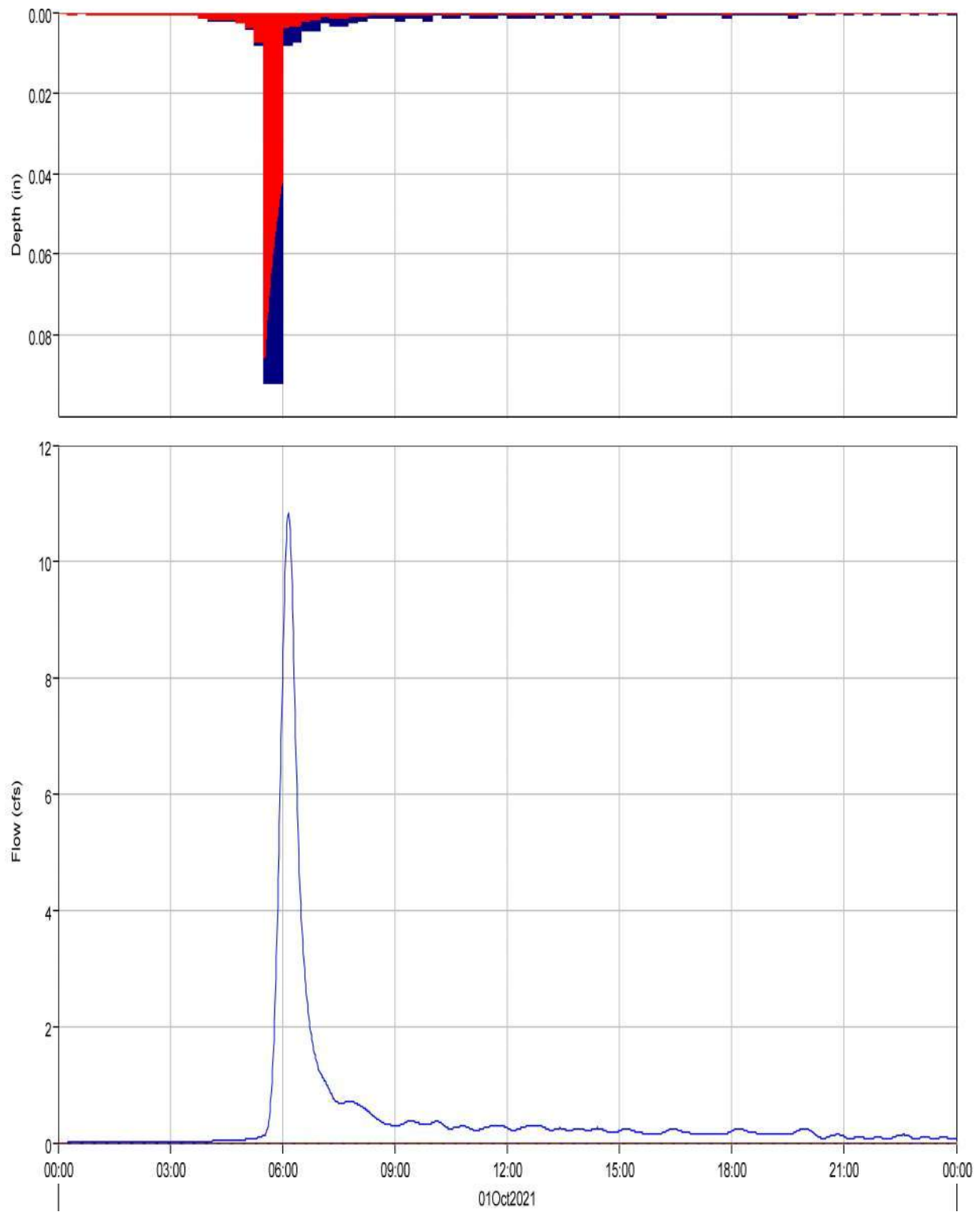
Peak Inflow :	28.4 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 06:12
Peak Outflow :	28.4 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 06:15
Total Inflow :	2.6 (AC-FT)	Total Outflow :	2.6 (AC-FT)

Project: Eagleview\_Subdivision Simulation Run: EV 100-yr Ex. Type IIA NR

Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
 End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
 Compute Time: 29Oct2021, 10:02:51 Control Specifications: 24-hr Storm

Hydrologic Element	Drainage Area (MI <sup>2</sup> )	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
B1	0.0091800	10.8	01Oct2021, 06:09	0.9
B2	0.0647266	58.0	01Oct2021, 06:13	5.4
B3	0.0930359	127.8	01Oct2021, 06:03	7.8
B4	0.0229422	21.8	01Oct2021, 06:12	1.9
J1	0.0253831	27.6	01Oct2021, 06:13	2.5
J2	0.1928516	184.5	01Oct2021, 06:17	18.5
J3	1.4296281	876.1	01Oct2021, 06:18	139.1
J4	1.0678500	611.5	01Oct2021, 06:31	92.9
J-OB6	0.8431300	474.5	01Oct2021, 06:30	74.4
OB1	0.0162031	17.5	01Oct2021, 06:13	1.6
OB2	0.0438438	49.0	01Oct2021, 06:13	4.6
OB3	0.0678750	64.7	01Oct2021, 06:17	6.8
OB4	0.0164062	17.4	01Oct2021, 06:17	1.8
OB5	0.2247200	137.2	01Oct2021, 06:27	18.5
OB6	0.1850100	152.9	01Oct2021, 06:19	16.8
OB7	0.6581200	362.2	01Oct2021, 06:37	57.7
OB8	0.0623000	77.0	01Oct2021, 06:11	6.6
OB9	0.1835000	372.9	01Oct2021, 06:09	30.0
R-B1	0.0162031	17.5	01Oct2021, 06:15	1.6
R-OB4	0.1281250	129.8	01Oct2021, 06:19	13.1
R-OB5	0.2247200	137.2	01Oct2021, 06:30	18.5
R-OB6	0.8431300	474.4	01Oct2021, 06:31	74.4
R-OB7	1.0678500	611.3	01Oct2021, 06:33	92.9
R-OB8	0.0623000	76.9	01Oct2021, 06:14	6.5

Subbasin "B1" Results for Run "EV 100-yr Ex. Type IIA NR"



Run:EV 100-yr Ex. Type IIA NR Element:B1 Result:Precipitation  
Run:EV 100-yr Ex. Type IIA NR Element:B1 Result:Outflow

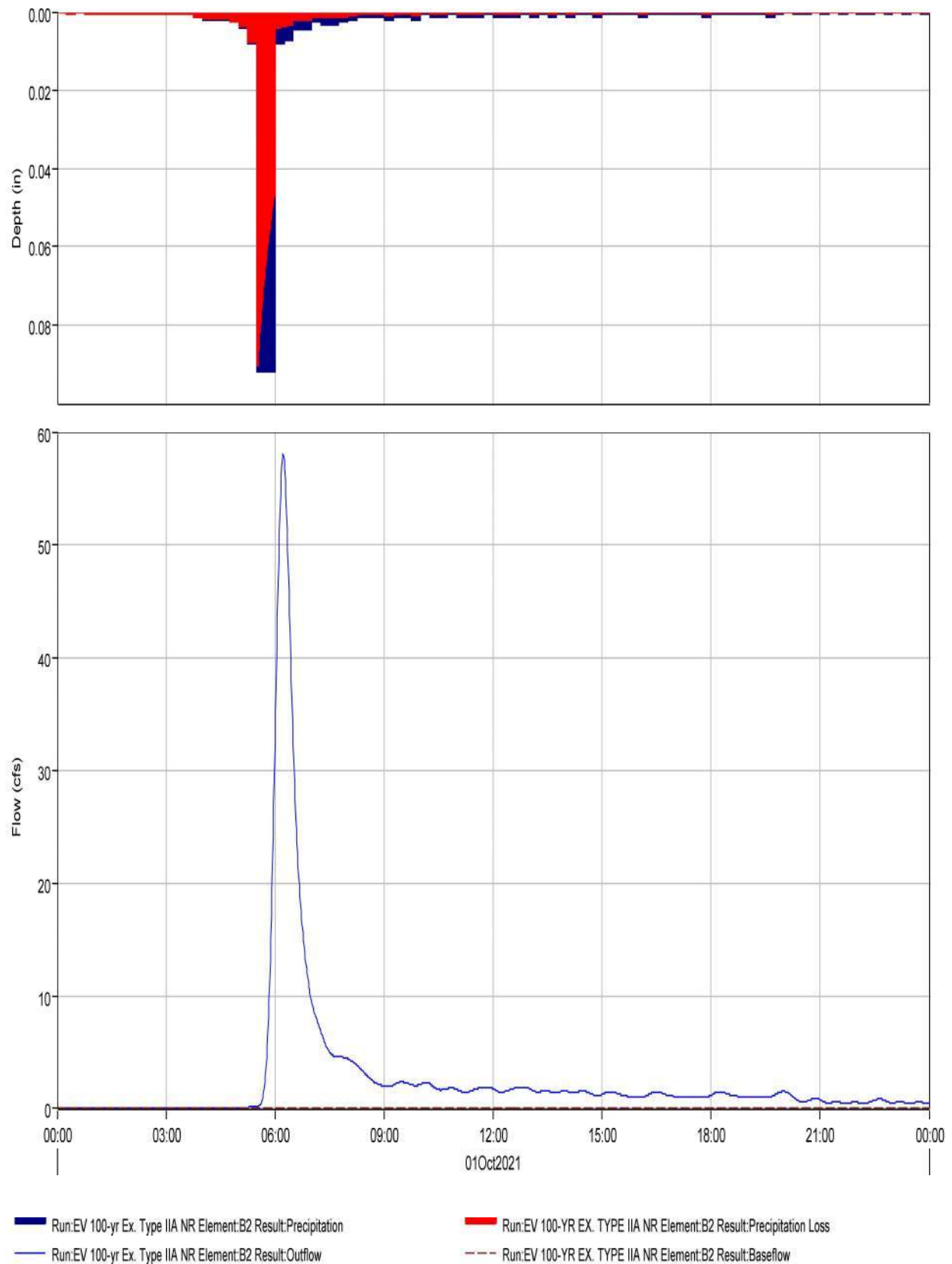
Run:EV 100-YR EX. TYPE IIA NR Element:B1 Result:Precipitation Loss  
Run:EV 100-YR EX. TYPE IIA NR Element:B1 Result:Baseflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Ex. Type IIA NR Subbasin: B1  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 10:02:51 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Discharge :	10.8 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:09
Total Precipitation :	2.3 (AC-FT)	Total Direct Runoff :	0.9 (AC-FT)
Total Loss :	1.4 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	0.9 (AC-FT)	Discharge :	0.9 (AC-FT)

Subbasin "B2" Results for Run "EV 100-yr Ex. Type IIA NR"

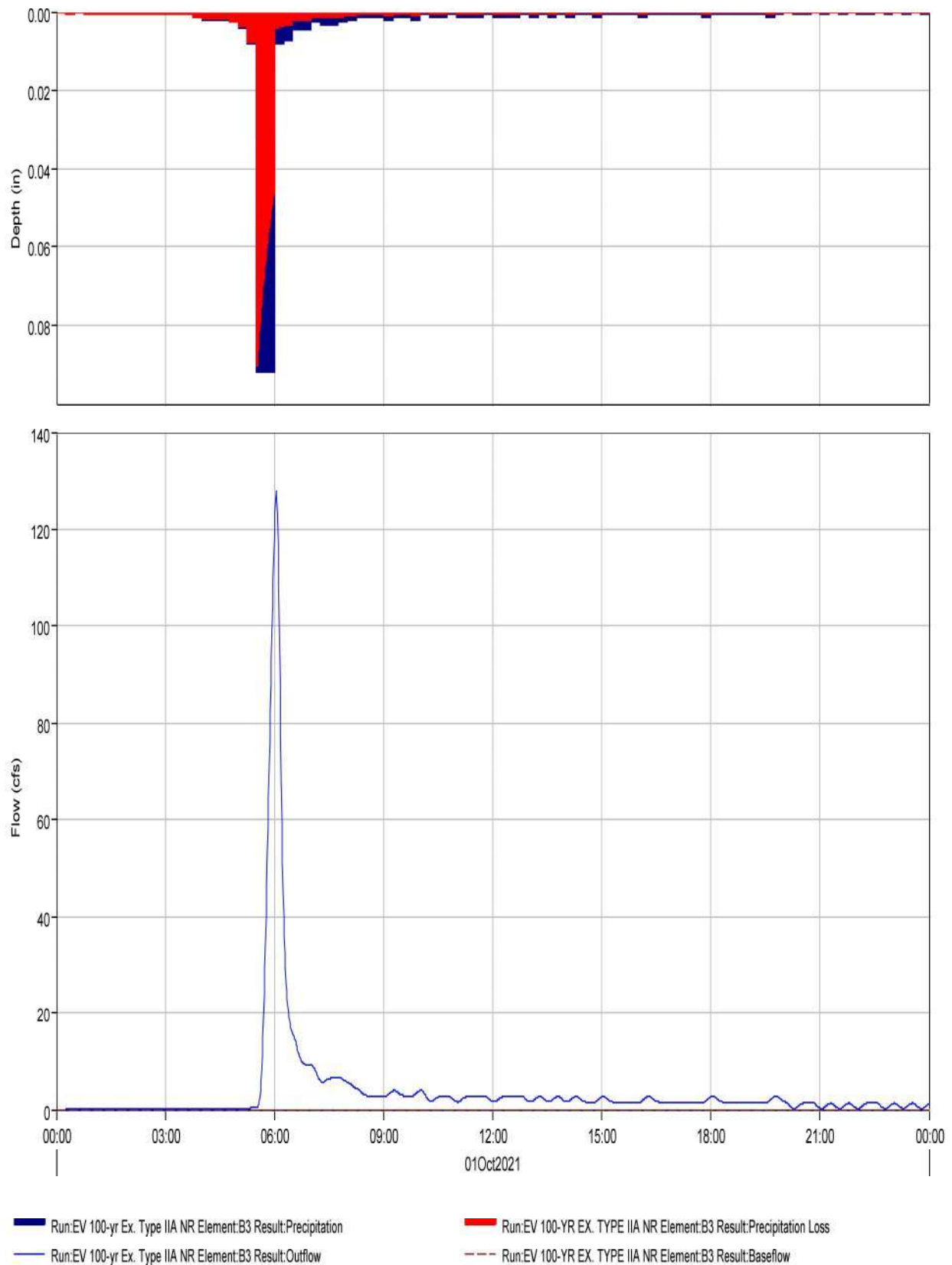


Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Ex. Type IIA NR Subbasin: B2  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 10:02:51 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Discharge :	58.0 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:13
Total Precipitation :	15.9 (AC-FT)	Total Direct Runoff :	5.4 (AC-FT)
Total Loss :	10.5 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	5.4 (AC-FT)	Discharge :	5.4 (AC-FT)

Subbasin "B3" Results for Run "EV 100-yr Ex. Type IIA NR"



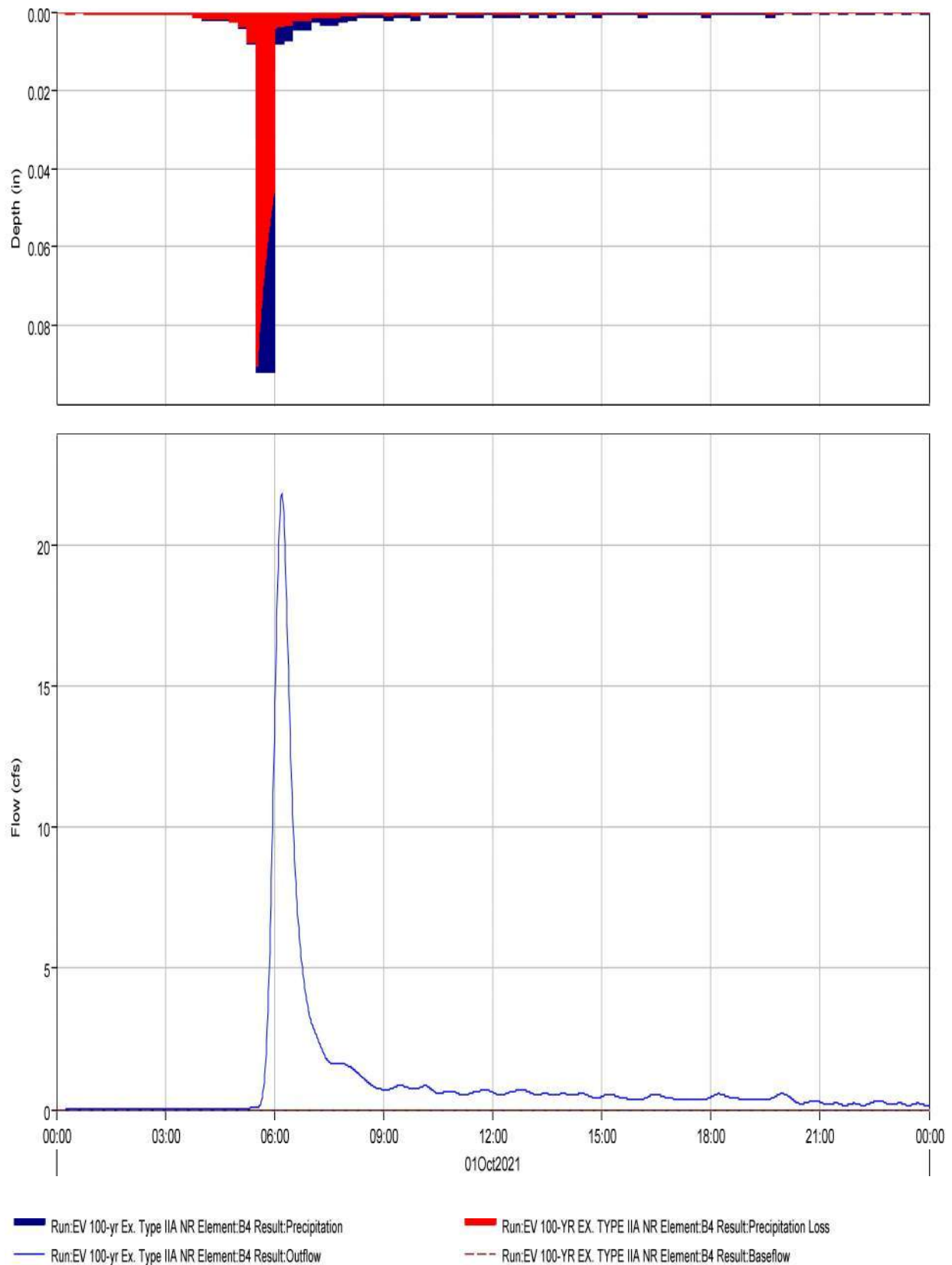
Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Ex. Type IIA NR Subbasin: B3  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 10:02:51 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Discharge :	127.8 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:03
Total Precipitation :	22.8 (AC-FT)	Total Direct Runoff :	7.8 (AC-FT)
Total Loss :	15.0 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	7.8 (AC-FT)	Discharge :	7.8 (AC-FT)



Subbasin "B4" Results for Run "EV 100-yr Ex. Type IIA NR"

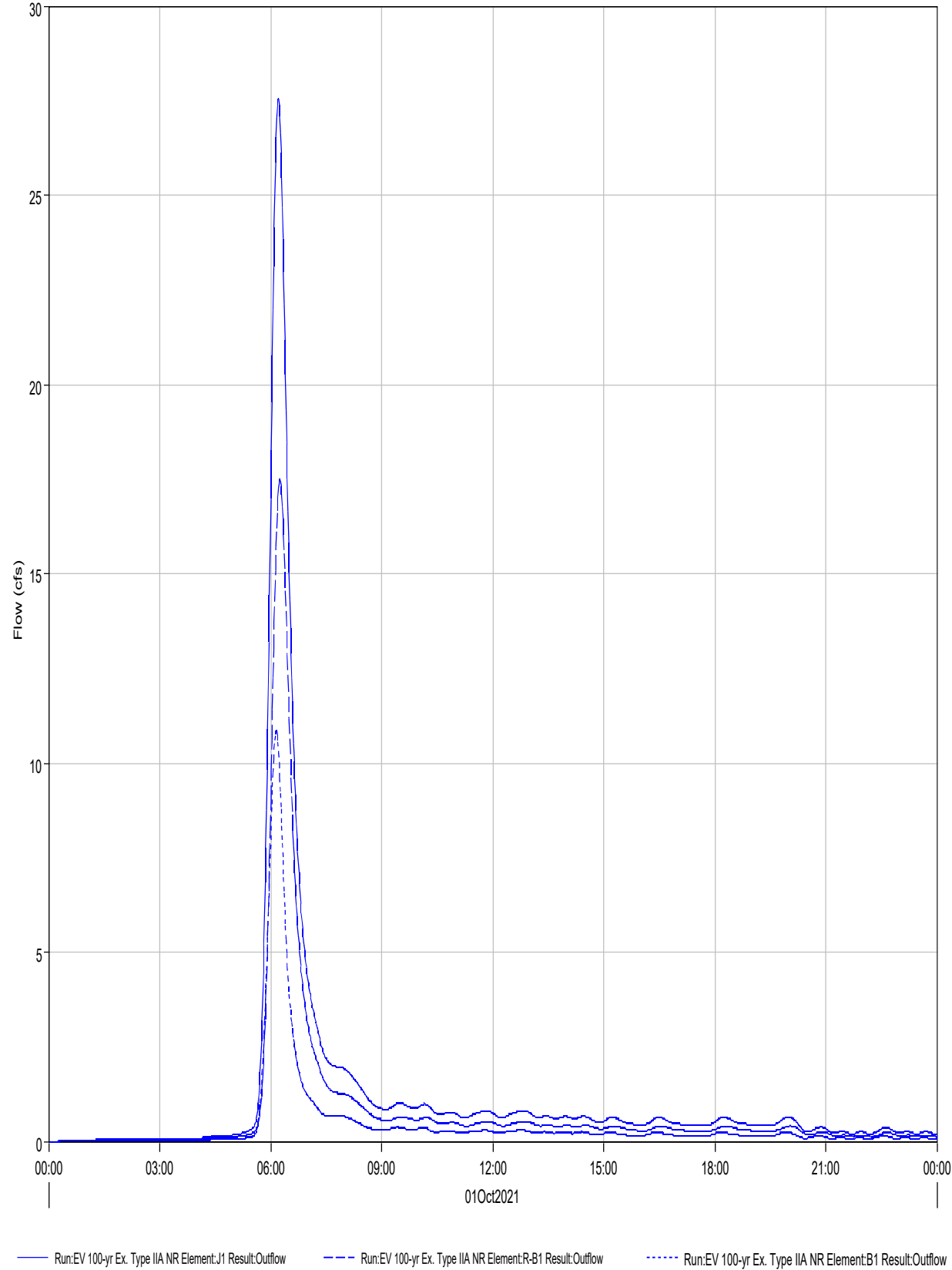


Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Ex. Type IIA NR Subbasin: B4  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 10:02:51 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Discharge :	21.8 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:12
Total Precipitation :	5.6 (AC-FT)	Total Direct Runoff :	1.9 (AC-FT)
Total Loss :	3.7 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	1.9 (AC-FT)	Discharge :	1.9 (AC-FT)

Junction "J1" Results for Run "EV 100-yr Ex. Type IIA NR"

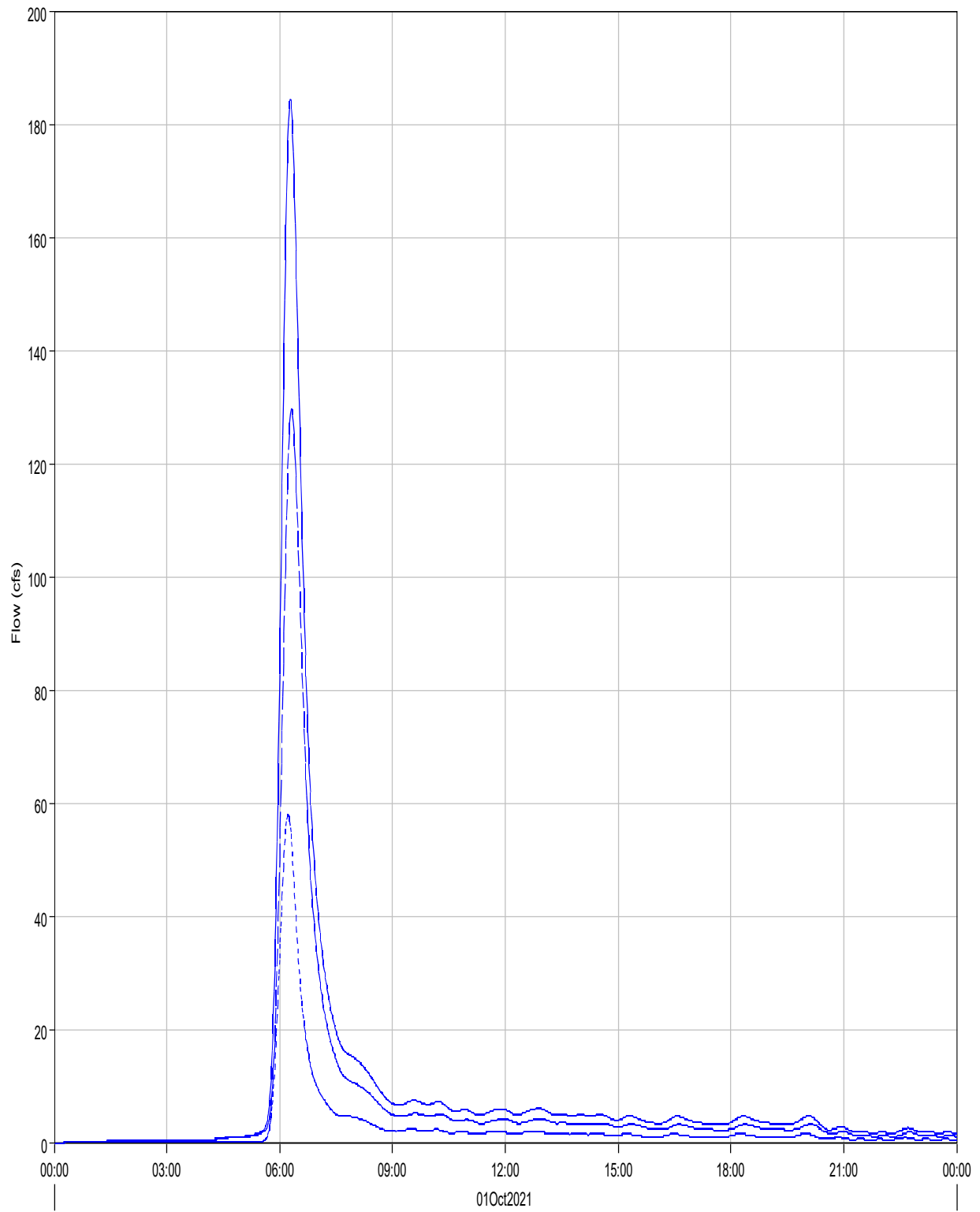


Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Ex. Type IIA NR Junction: J1  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 10:02:51 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Outflow : 27.6 (CFS) Date/Time of Peak Outflow : 01Oct2021, 06:13  
Total Outflow : 2.5 (AC-FT)

Junction "J2" Results for Run "EV 100-yr Ex. Type IIA NR"



Run:EV 100-yr Ex. Type IIA NR Element:J2 Result:Outflow

Run:EV 100-yr Ex. Type IIA NR Element:R-OB4 Result:Outflow

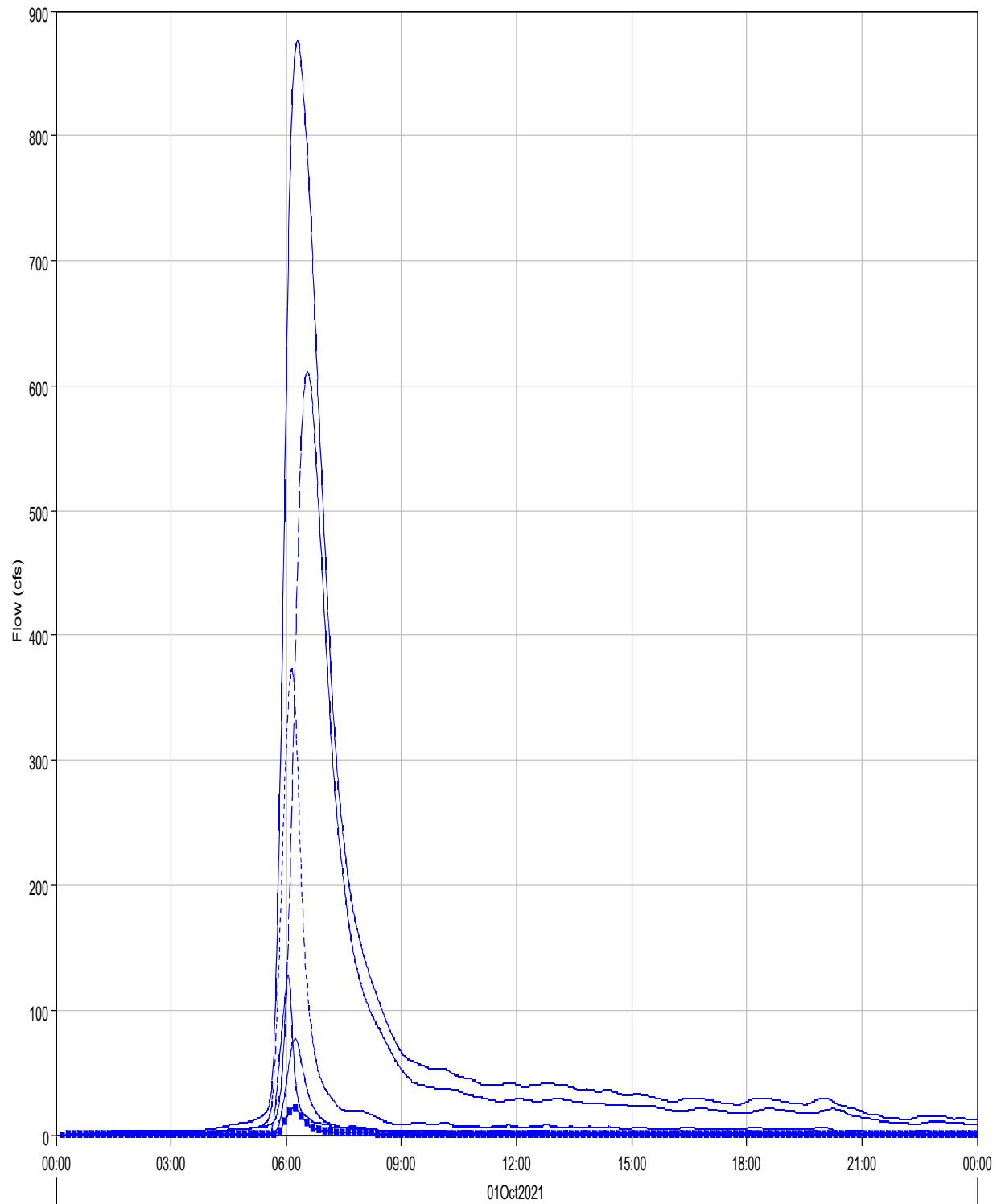
Run:EV 100-yr Ex. Type IIA NR Element:B2 Result:Outflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Ex. Type IIA NR Junction: J2  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 10:02:51 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Outflow :	184.5 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 06:17
Total Outflow :	18.5 (AC-FT)		

Junction "J3" Results for Run "EV 100-yr Ex. Type IIA NR"



- Run:EV 100-yr Ex. Type IIA NR Element:J3 Result:Outflow
- Run:EV 100-yr Ex. Type IIA NR Element:OB9 Result:Outflow
- Run:EV 100-yr Ex. Type IIA NR Element:R-OB8 Result:Outflow
- Run:EV 100-yr Ex. Type IIA NR Element:R-OB7 Result:Outflow
- Run:EV 100-yr Ex. Type IIA NR Element:B3 Result:Outflow
- Run:EV 100-yr Ex. Type IIA NR Element:B4 Result:Outflow

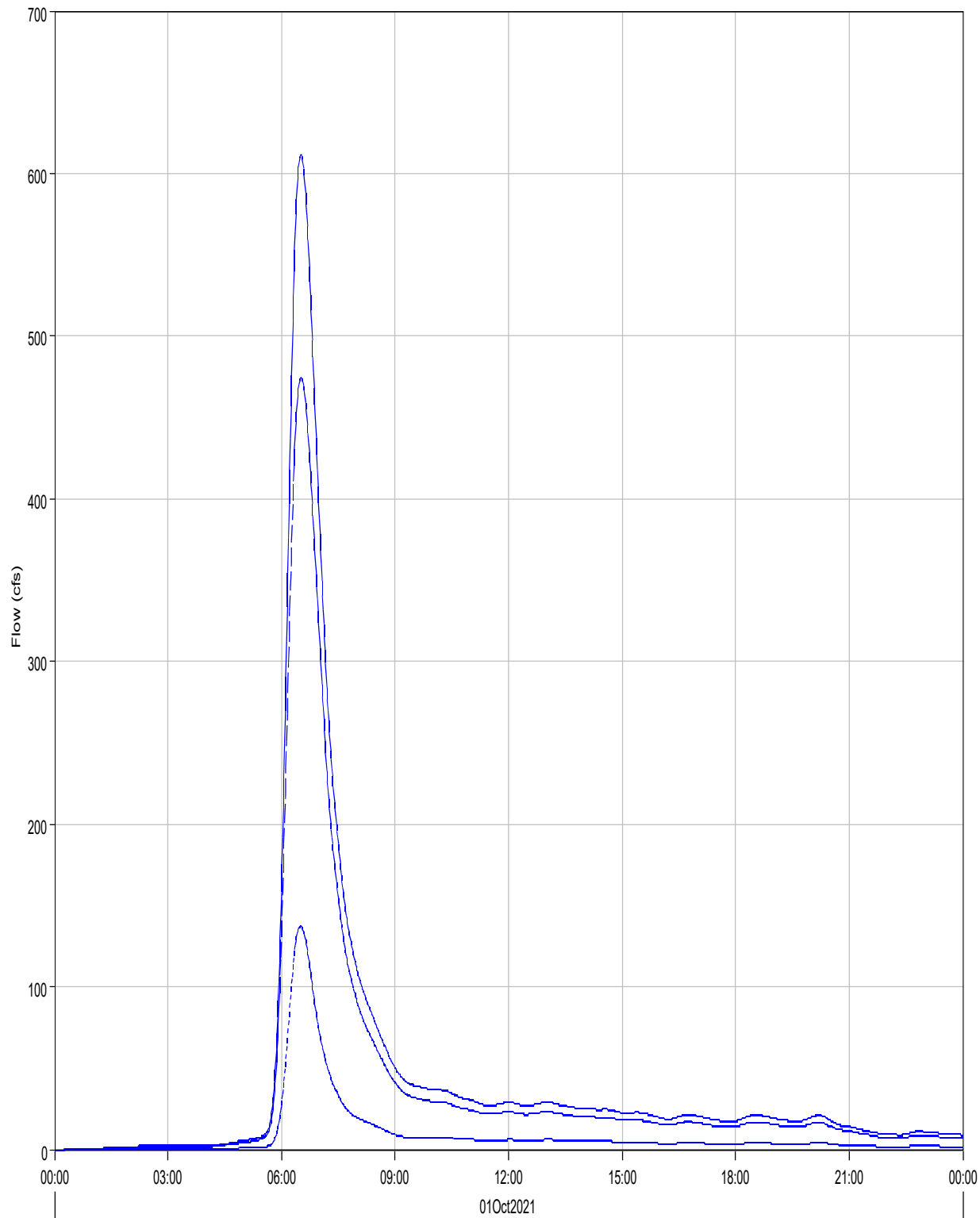
Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Ex. Type IIA NR Junction: J3  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 10:02:51 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Outflow : 876.1 (CFS) Date/Time of Peak Outflow : 01Oct2021, 06:18  
Total Outflow : 139.1 (AC-FT)



Junction "J4" Results for Run "EV 100-yr Ex. Type IIA NR"



Run:EV 100-yr Ex. Type IIA NR Element:J4 Result:Outflow  
Run:EV 100-yr Ex. Type IIA NR Element:R-OB5 Result:Outflow

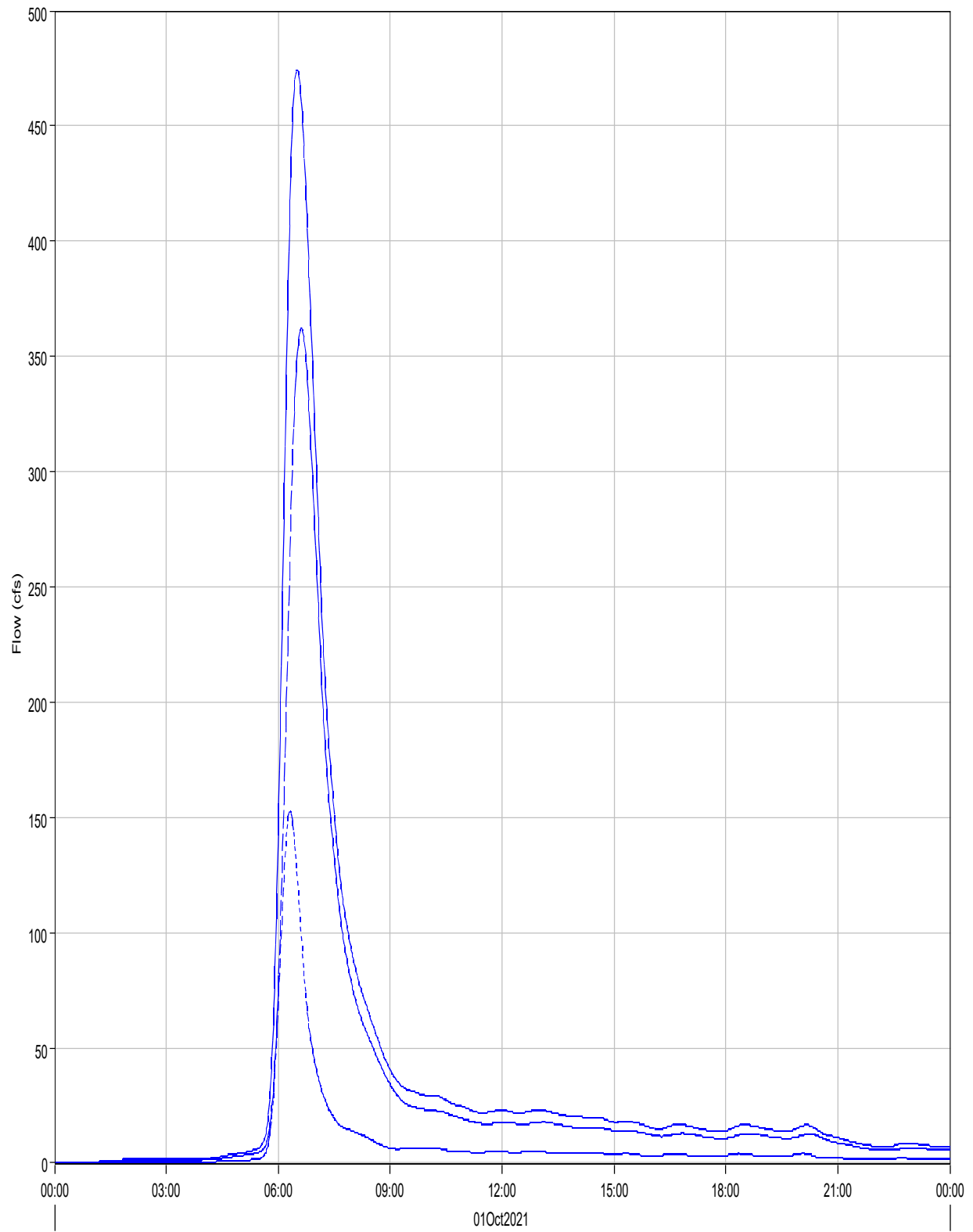
Run:EV 100-yr Ex. Type IIA NR Element:R-OB6 Result:Outflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Ex. Type IIA NR Junction: J4  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 10:02:51 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Outflow :	611.5 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 06:31
Total Outflow :	92.9 (AC-FT)		

Junction "J-OB6" Results for Run "EV 100-yr Ex. Type IIA NR"



Run:EV 100-yr Ex. Type IIA NR Element:J-OB6 Result:Outflow

Run:EV 100-yr Ex. Type IIA NR Element:OB7 Result:Outflow

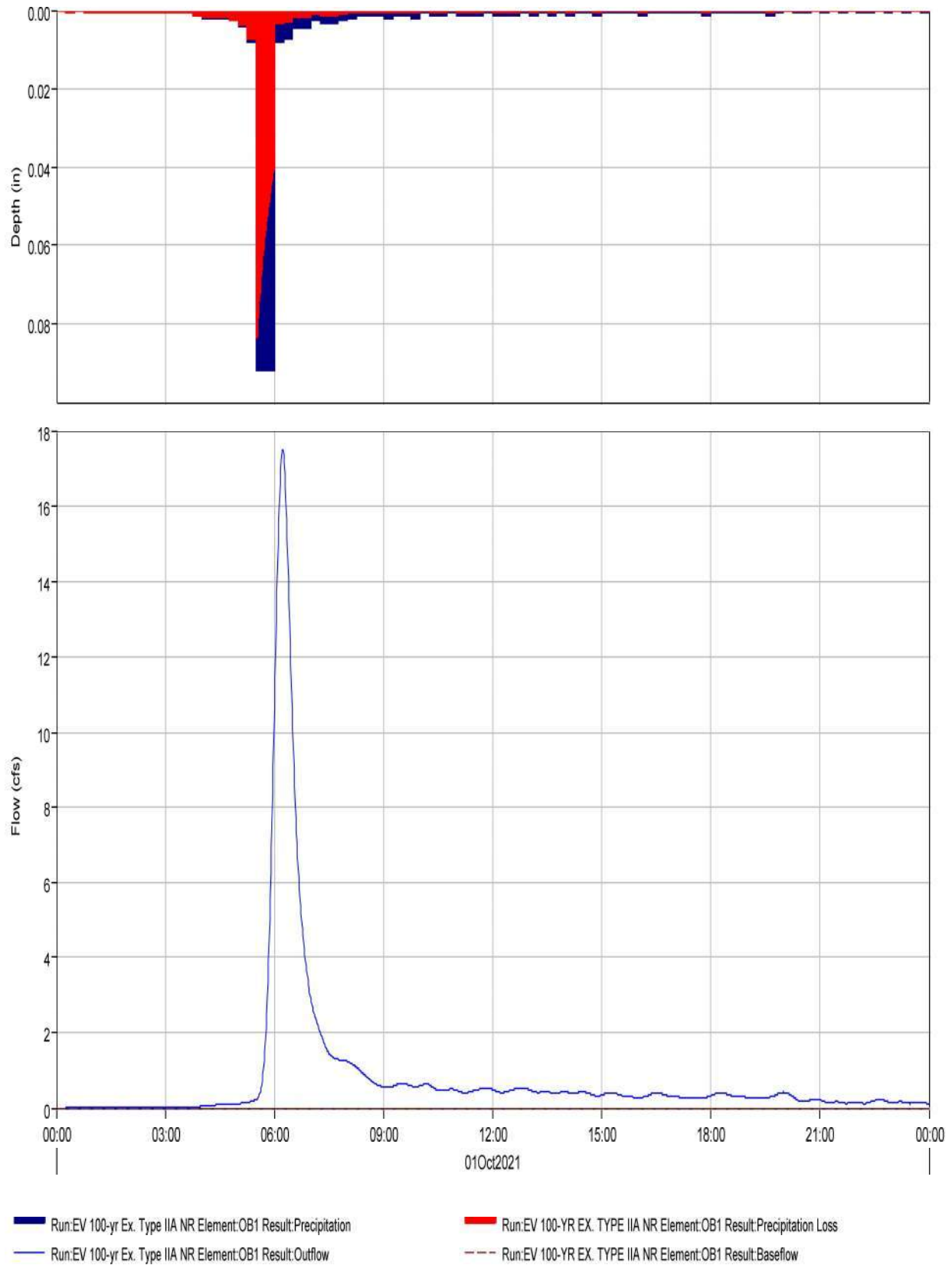
Run:EV 100-yr Ex. Type IIA NR Element:OB6 Result:Outflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Ex. Type IIA NR Junction: J-OB6  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 10:02:51 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Outflow :	474.5 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 06:30
Total Outflow :	74.4 (AC-FT)		

Subbasin "OB1" Results for Run "EV 100-yr Ex. Type IIA NR"

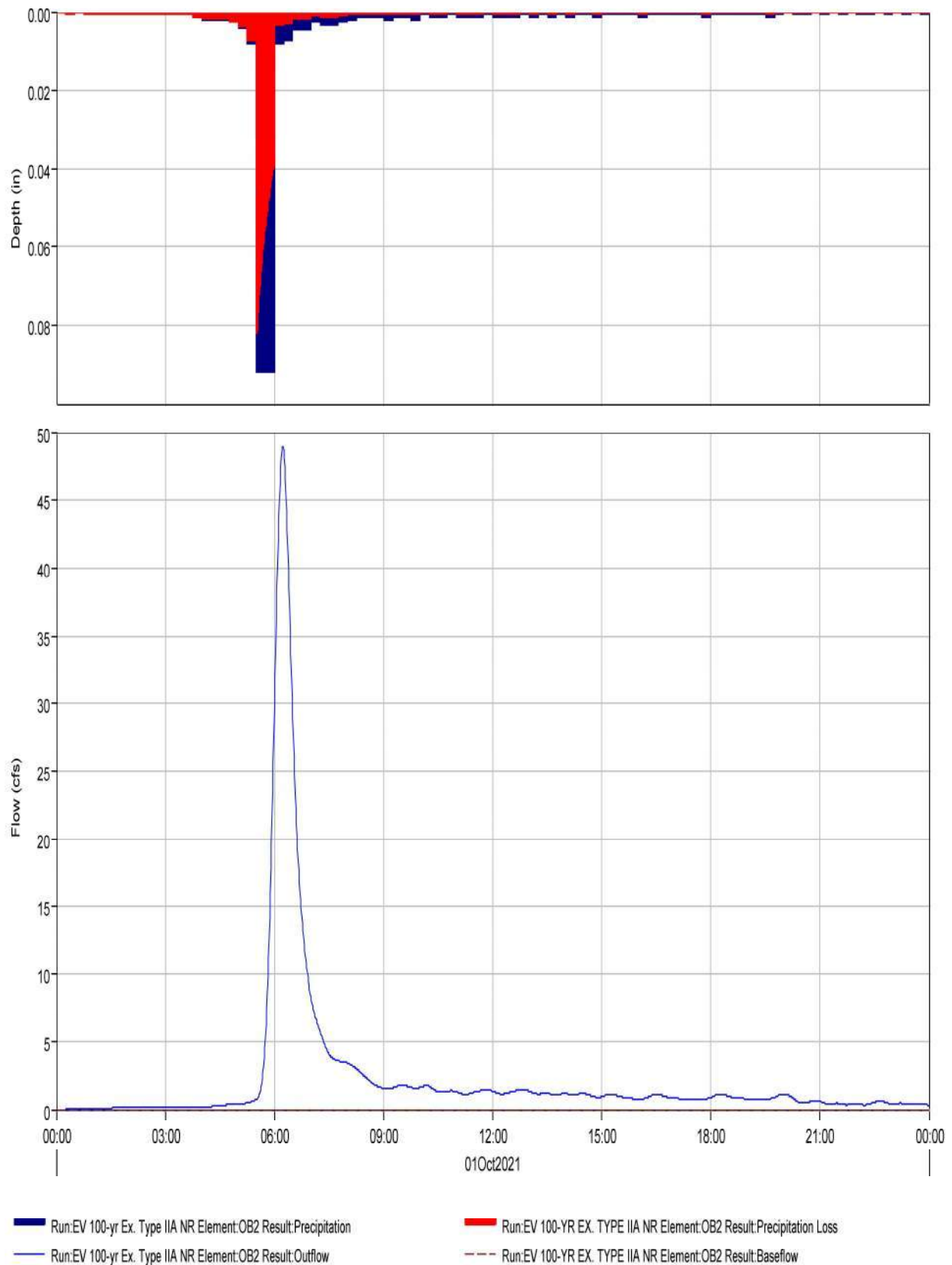


Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Ex. Type IIA NR Subbasin: OB1  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 10:02:51 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Discharge :	17.5 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:13
Total Precipitation :	4.0 (AC-FT)	Total Direct Runoff :	1.6 (AC-FT)
Total Loss :	2.3 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	1.6 (AC-FT)	Discharge :	1.6 (AC-FT)

Subbasin "OB2" Results for Run "EV 100-yr Ex. Type IIA NR"



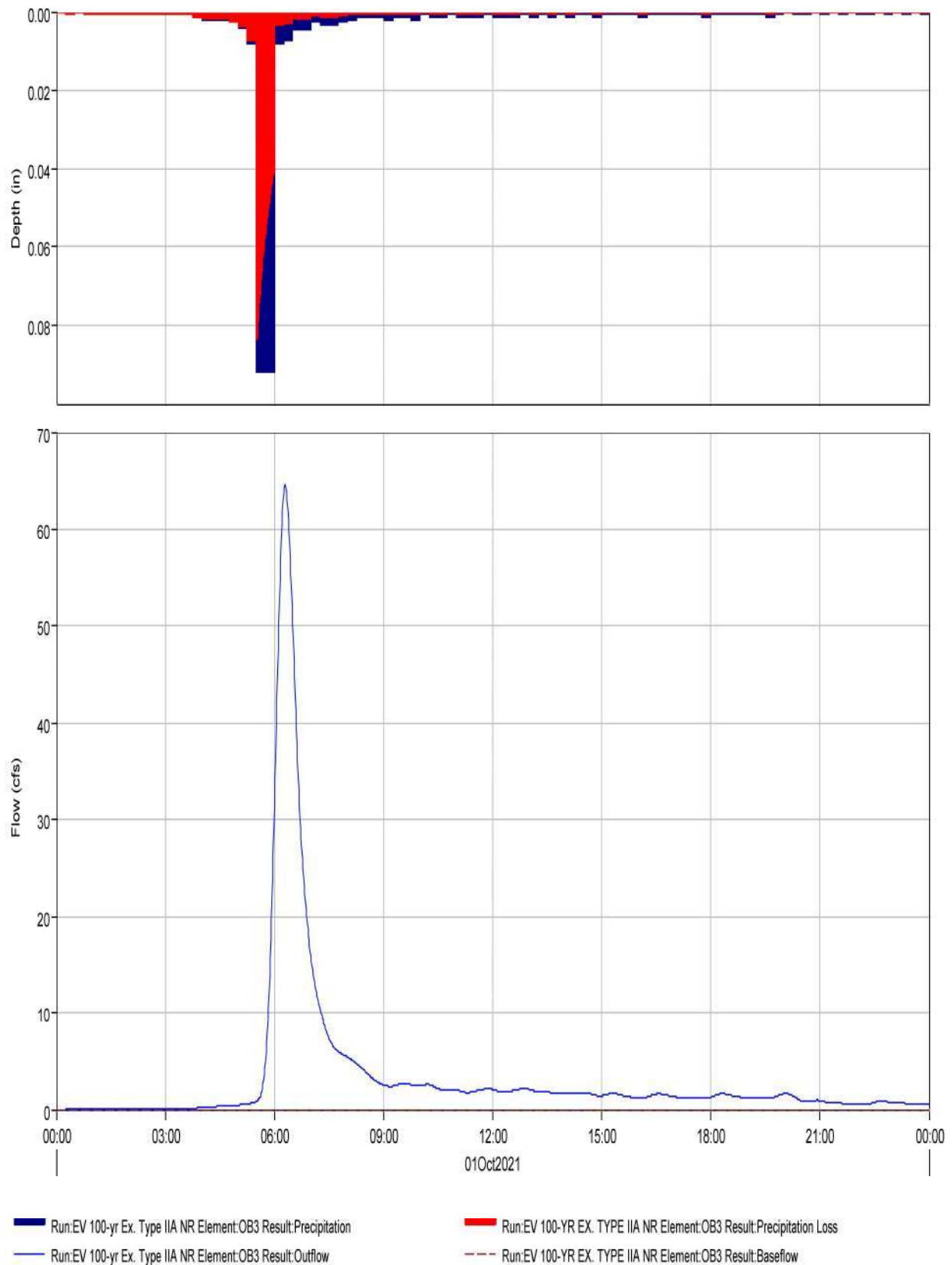
Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Ex. Type IIA NR Subbasin: OB2  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 10:02:51 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Discharge :	49.0 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:13
Total Precipitation :	10.8 (AC-FT)	Total Direct Runoff :	4.6 (AC-FT)
Total Loss :	6.2 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	4.6 (AC-FT)	Discharge :	4.6 (AC-FT)



Subbasin "OB3" Results for Run "EV 100-yr Ex. Type IIA NR"

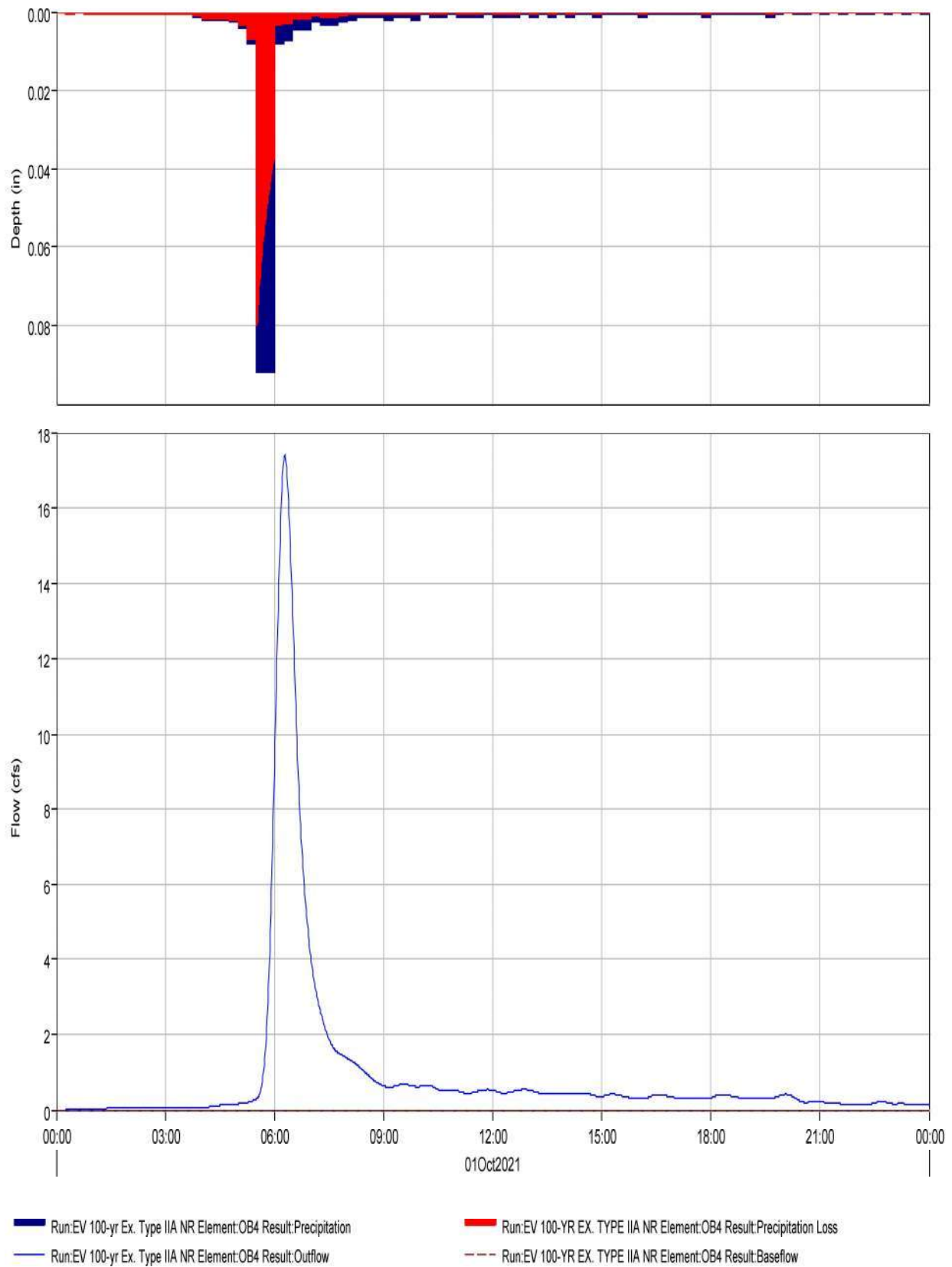


Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Ex. Type IIA NR Subbasin: OB3  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 10:02:51 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Discharge :	64.7 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:17
Total Precipitation :	16.7 (AC-FT)	Total Direct Runoff :	6.8 (AC-FT)
Total Loss :	9.8 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	6.8 (AC-FT)	Discharge :	6.8 (AC-FT)

Subbasin "OB4" Results for Run "EV 100-yr Ex. Type IIA NR"

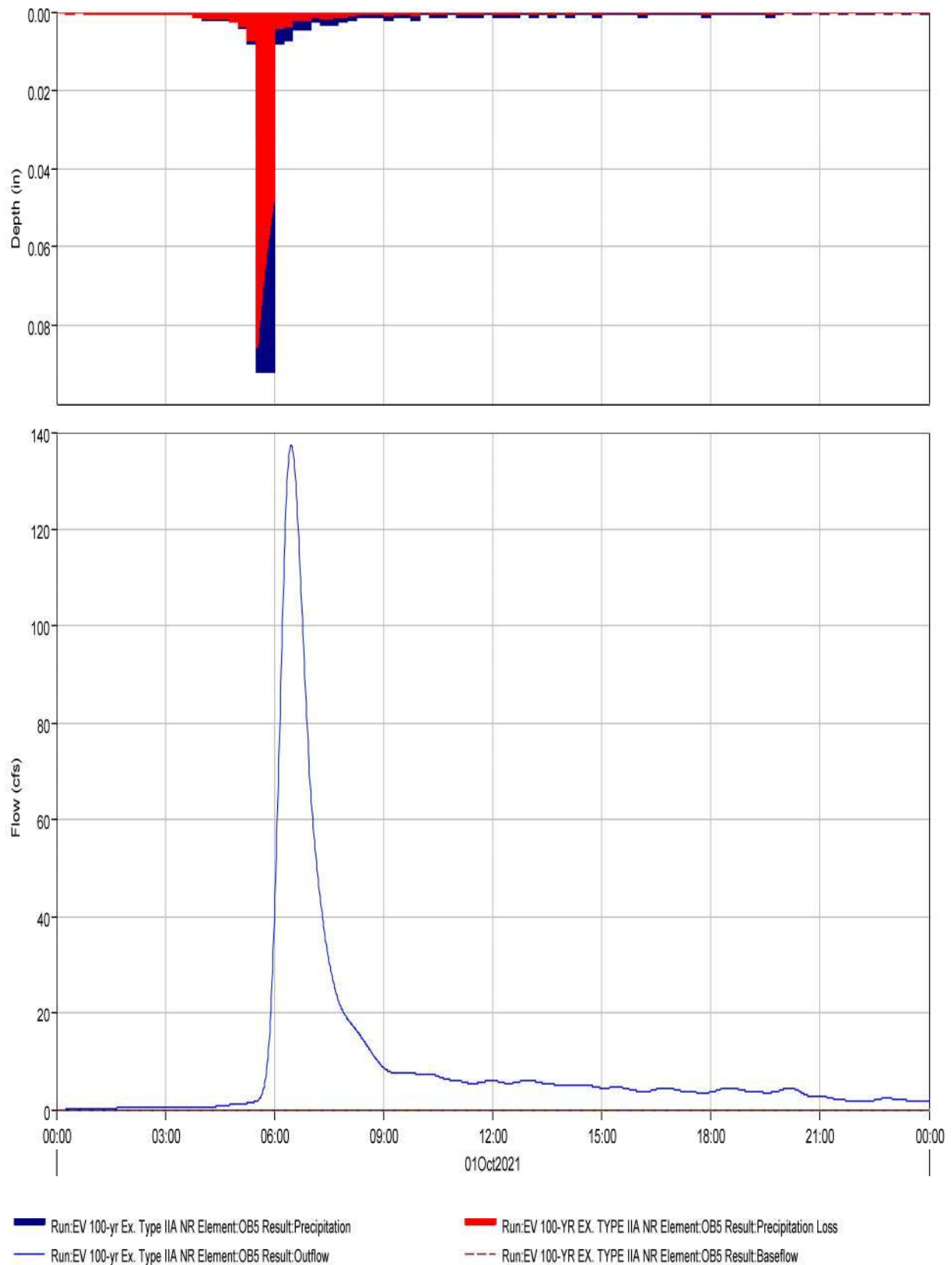


Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Ex. Type IIA NR Subbasin: OB4  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 10:02:51 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Discharge :	17.4 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:17
Total Precipitation :	4.0 (AC-FT)	Total Direct Runoff :	1.8 (AC-FT)
Total Loss :	2.2 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	1.8 (AC-FT)	Discharge :	1.8 (AC-FT)

Subbasin "OB5" Results for Run "EV 100-yr Ex. Type IIA NR"



Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Ex. Type IIA NR Subbasin: OB5  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 10:02:51 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

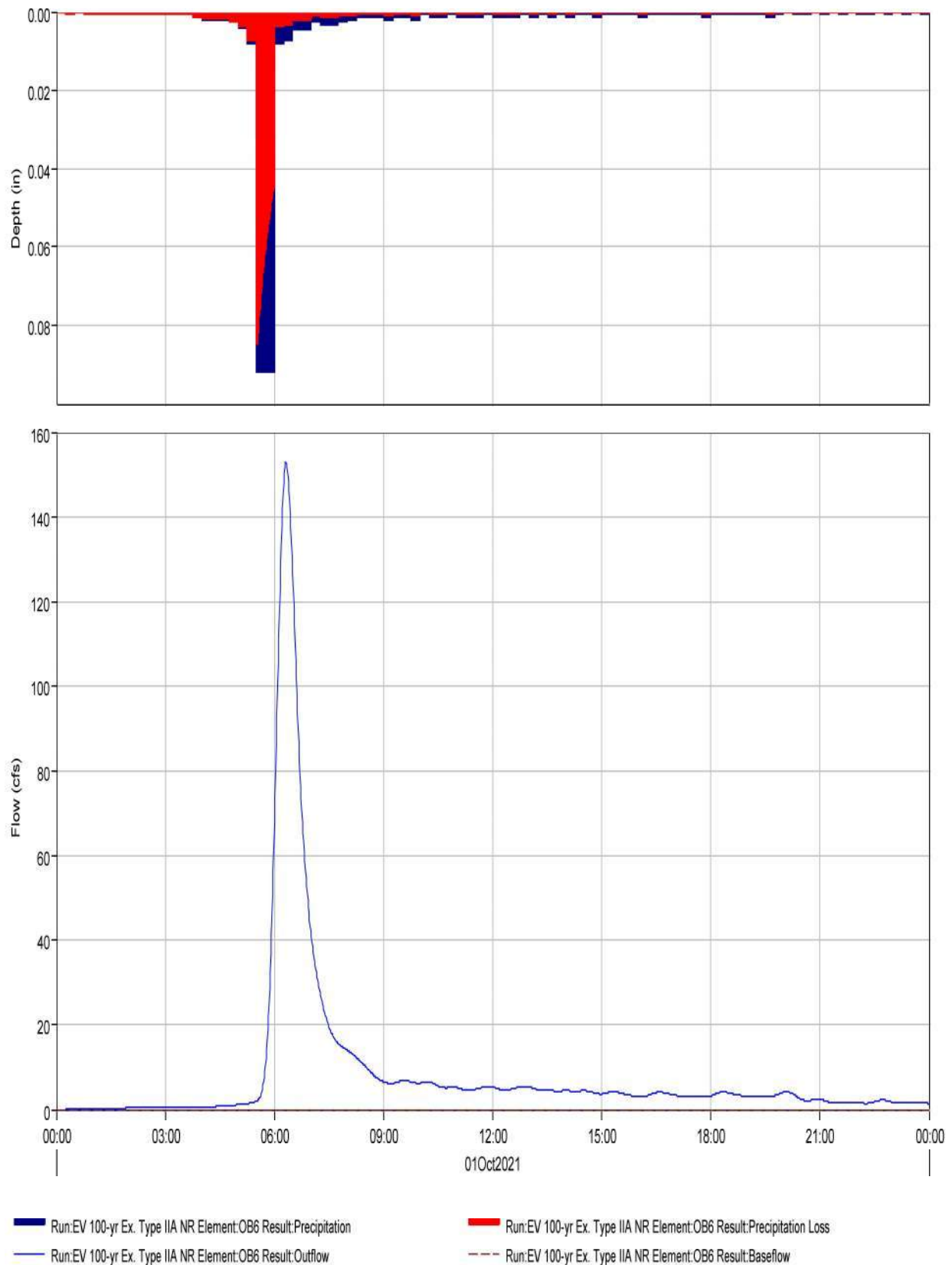
Peak Discharge :	137.2 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:27
Total Precipitation :	55.1 (AC-FT)	Total Direct Runoff :	18.5 (AC-FT)
Total Loss :	36.5 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	18.6 (AC-FT)	Discharge :	18.5 (AC-FT)

Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Ex. Type IIA NR Subbasin: OB6  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 10:02:51 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

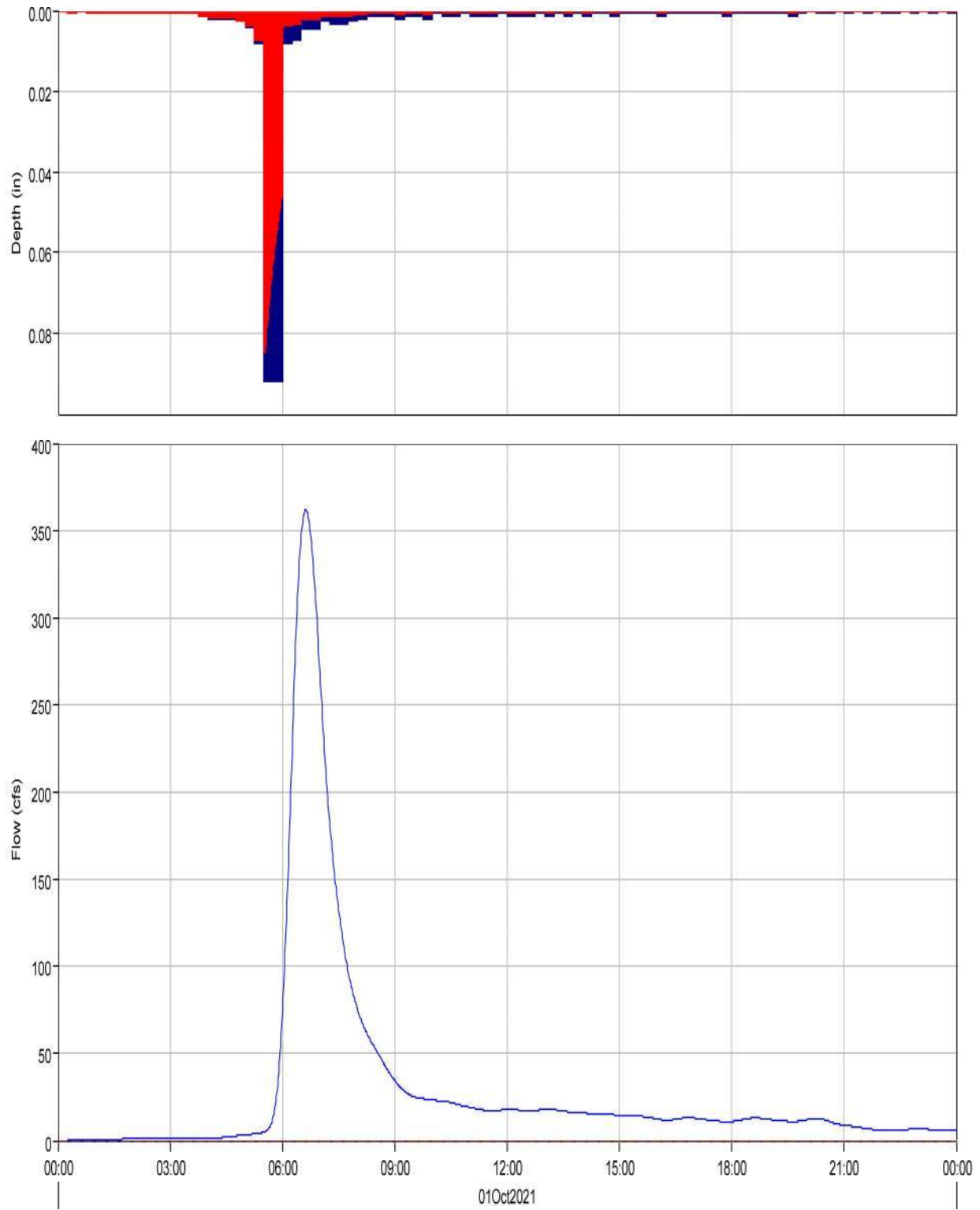
Peak Discharge :	152.9 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:19
Total Precipitation :	45.4 (AC-FT)	Total Direct Runoff :	16.8 (AC-FT)
Total Loss :	28.5 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	16.9 (AC-FT)	Discharge :	16.8 (AC-FT)

Subbasin "OB6" Results for Run "EV 100-yr Ex. Type IIA NR"





Subbasin "OB7" Results for Run "EV 100-yr Ex. Type IIA NR"

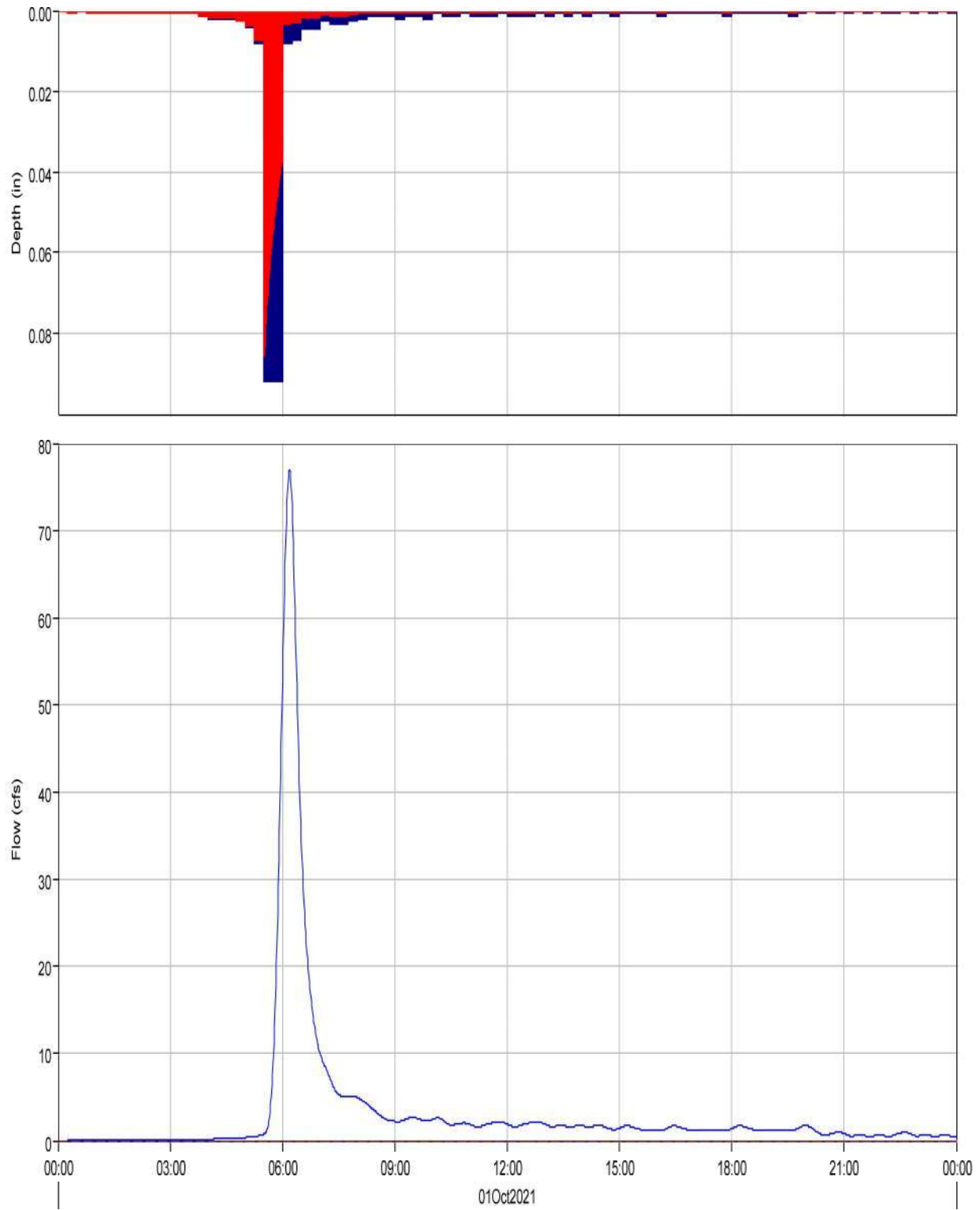


Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Ex. Type IIA NR Subbasin: OB7  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 10:02:51 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Discharge :	362.2 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:37
Total Precipitation :	161.5 (AC-FT)	Total Direct Runoff :	57.7 (AC-FT)
Total Loss :	103.3 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	58.2 (AC-FT)	Discharge :	57.7 (AC-FT)

Subbasin "OB8" Results for Run "EV 100-yr Ex. Type IIA NR"

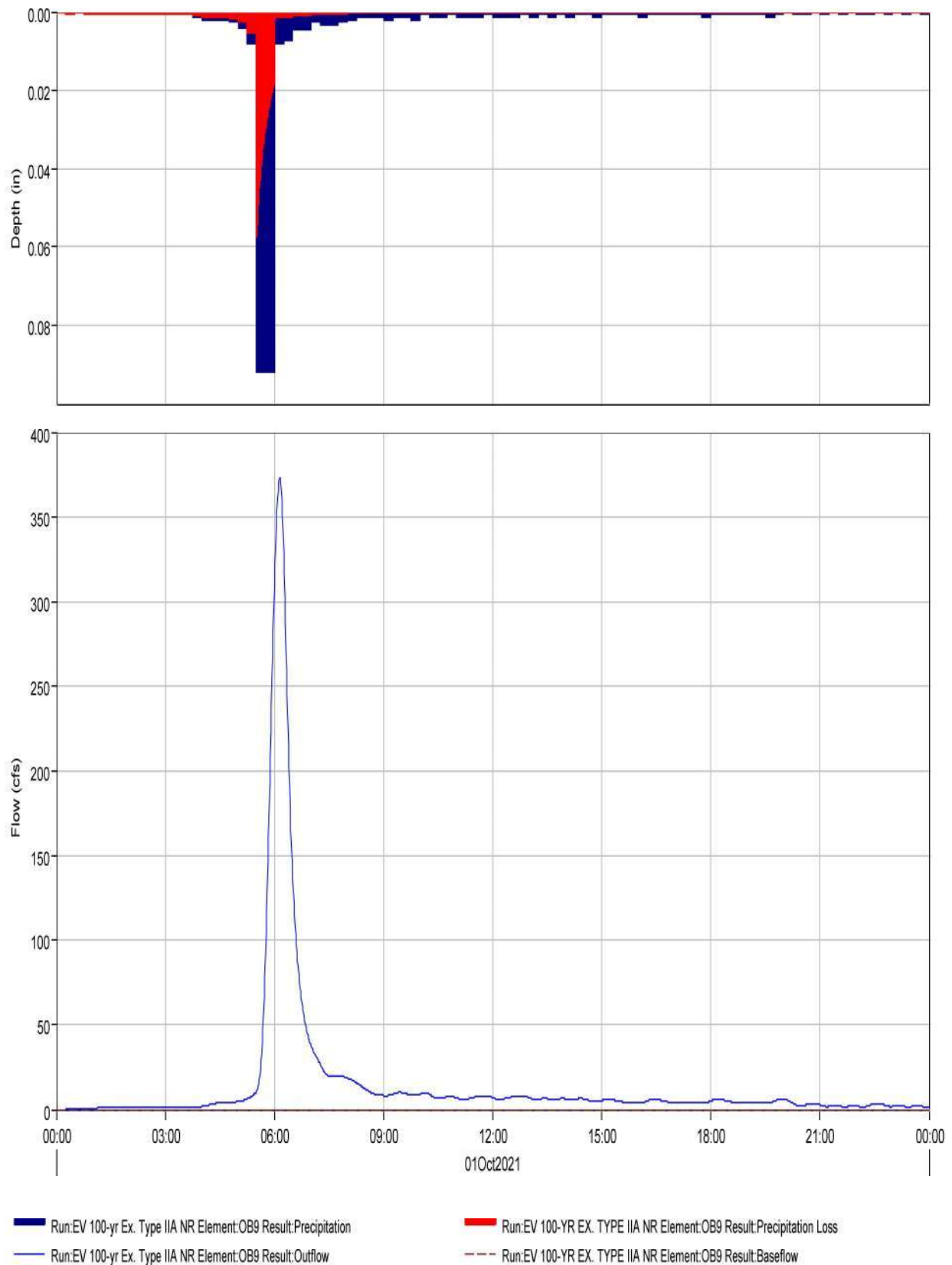


Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Ex. Type IIA NR Subbasin: OB8  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 10:02:51 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Discharge :	77.0 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:11
Total Precipitation :	15.3 (AC-FT)	Total Direct Runoff :	6.6 (AC-FT)
Total Loss :	8.7 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	6.6 (AC-FT)	Discharge :	6.6 (AC-FT)

Subbasin "OB9" Results for Run "EV 100-yr Ex. Type IIA NR"

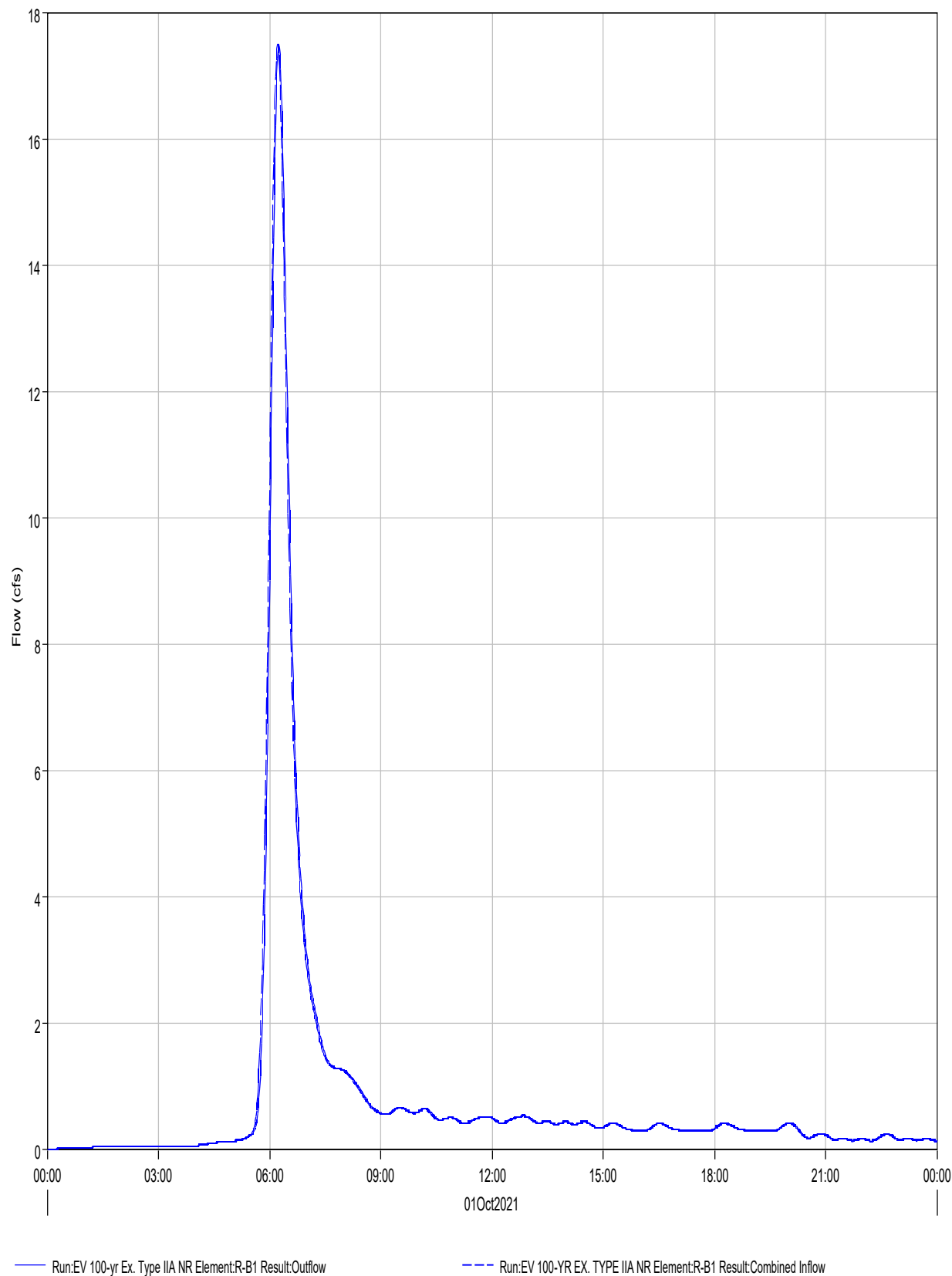


Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Ex. Type IIA NR Subbasin: OB9  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 10:02:51 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Discharge :	372.9 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:09
Total Precipitation :	45.0 (AC-FT)	Total Direct Runoff :	30.0 (AC-FT)
Total Loss :	14.9 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	30.1 (AC-FT)	Discharge :	30.0 (AC-FT)

Reach "R-B1" Results for Run "EV 100-yr Ex. Type IIA NR"



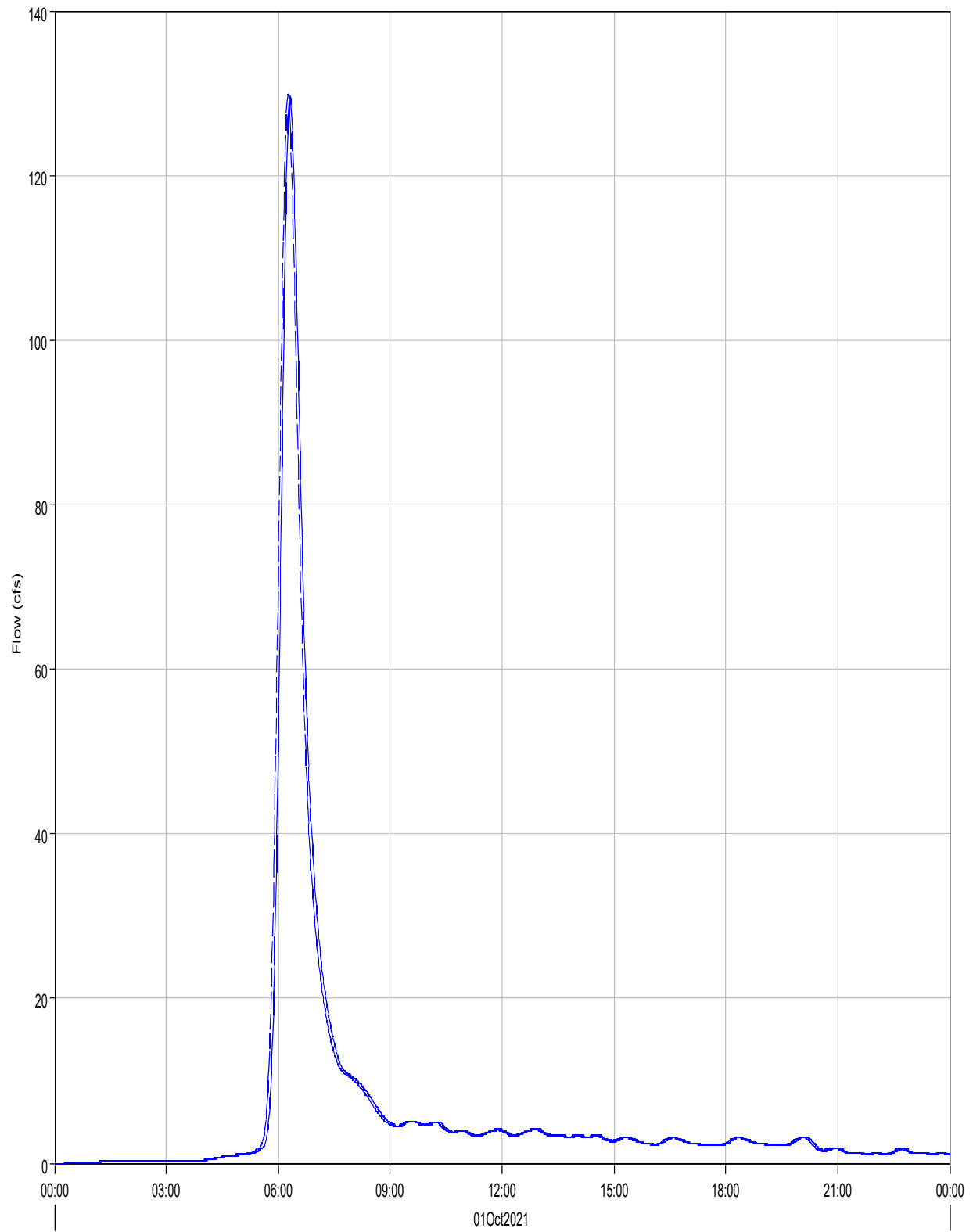
Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Ex. Type IIA NR Reach: R-B1  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 10:02:51 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Inflow :	17.5 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 06:13
Peak Outflow :	17.5 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 06:15
Total Inflow :	1.6 (AC-FT)	Total Outflow :	1.6 (AC-FT)



Reach "R-OB4" Results for Run "EV 100-yr Ex. Type IIA NR"



Run:EV 100-yr Ex. Type IIA NR Element:R-OB4 Result:Outflow

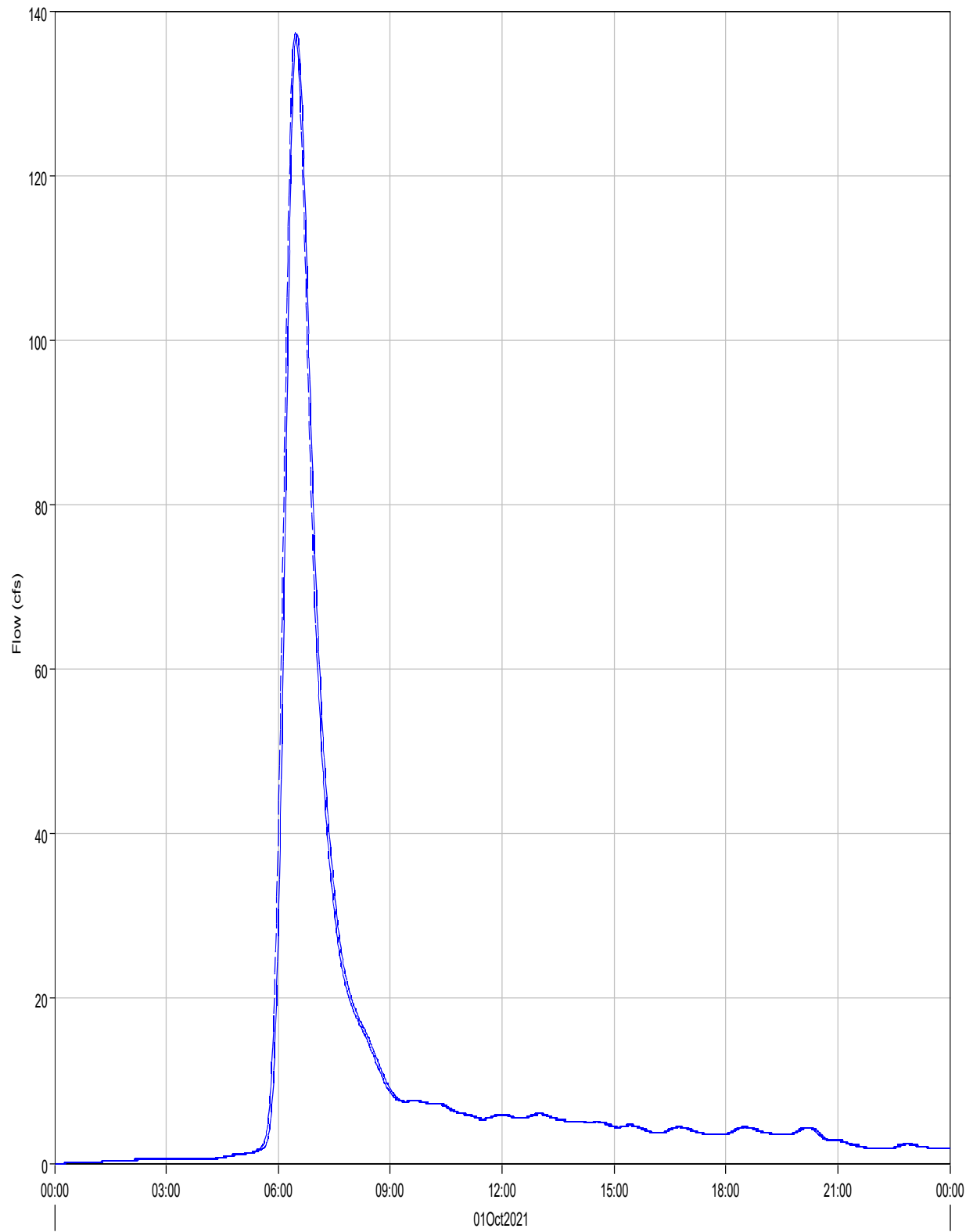
Run:EV 100-YR EX. TYPE IIA NR Element:R-OB4 Result:Combined Inflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Ex. Type IIA NR Reach: R-OB4  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 10:02:51 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Inflow :	129.9 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 06:16
Peak Outflow :	129.8 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 06:19
Total Inflow :	13.1 (AC-FT)	Total Outflow :	13.1 (AC-FT)

Reach "R-OB5" Results for Run "EV 100-yr Ex. Type IIA NR"



Run:EV 100-yr Ex. Type IIA NR Element:R-OB5 Result:Outflow

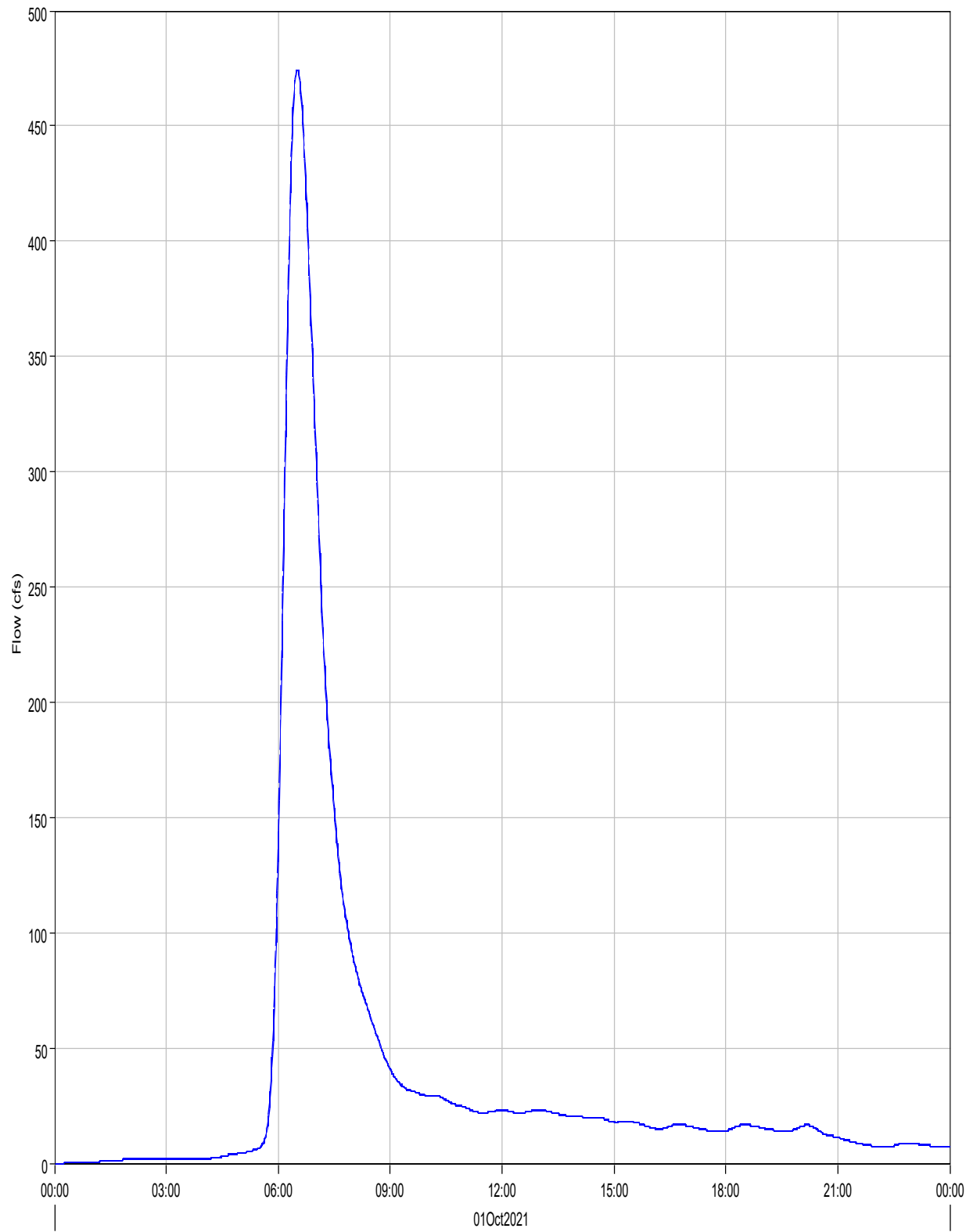
Run:EV 100-YR EX. TYPE IIA NR Element:R-OB5 Result:Combined Inflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Ex. Type IIA NR Reach: R-OB5  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 10:02:51 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Inflow :	137.2 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 06:27
Peak Outflow :	137.2 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 06:30
Total Inflow :	18.5 (AC-FT)	Total Outflow :	18.5 (AC-FT)

Reach "R-OB6" Results for Run "EV 100-yr Ex. Type IIA NR"



Run:EV 100-yr Ex. Type IIA NR Element:R-OB6 Result:Outflow

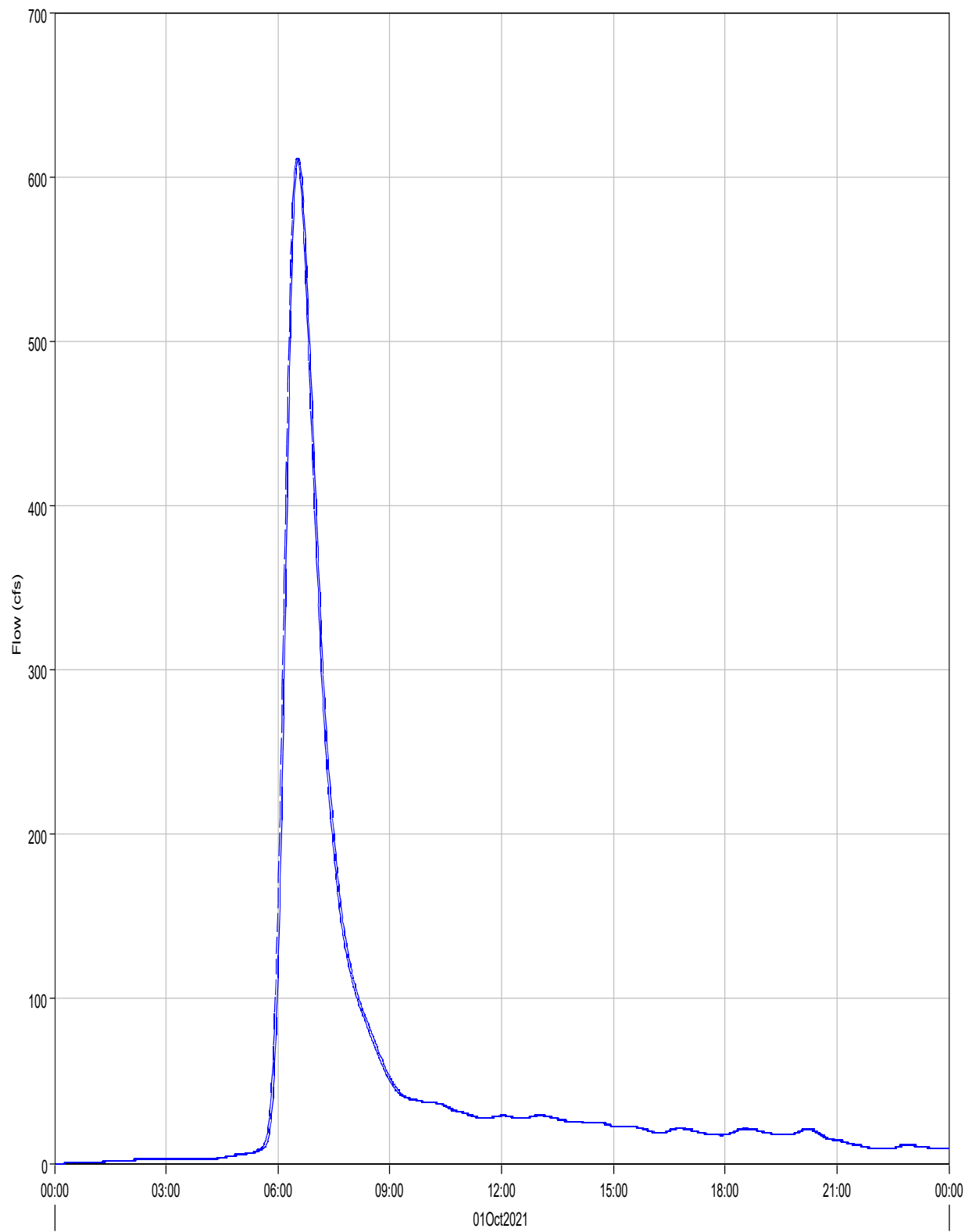
Run:EV 100-YR EX. TYPE IIA NR Element:R-OB6 Result:Combined Inflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Ex. Type IIA NR Reach: R-OB6  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 10:02:51 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Inflow :	474.5 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 06:30
Peak Outflow :	474.4 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 06:31
Total Inflow :	74.4 (AC-FT)	Total Outflow :	74.4 (AC-FT)

Reach "R-OB7" Results for Run "EV 100-yr Ex. Type IIA NR"



Run:EV 100-yr Ex. Type IIA NR Element:R-OB7 Result:Outflow

Run:EV 100-yr Ex. Type IIA NR Element:R-OB7 Result:Combined Inflow

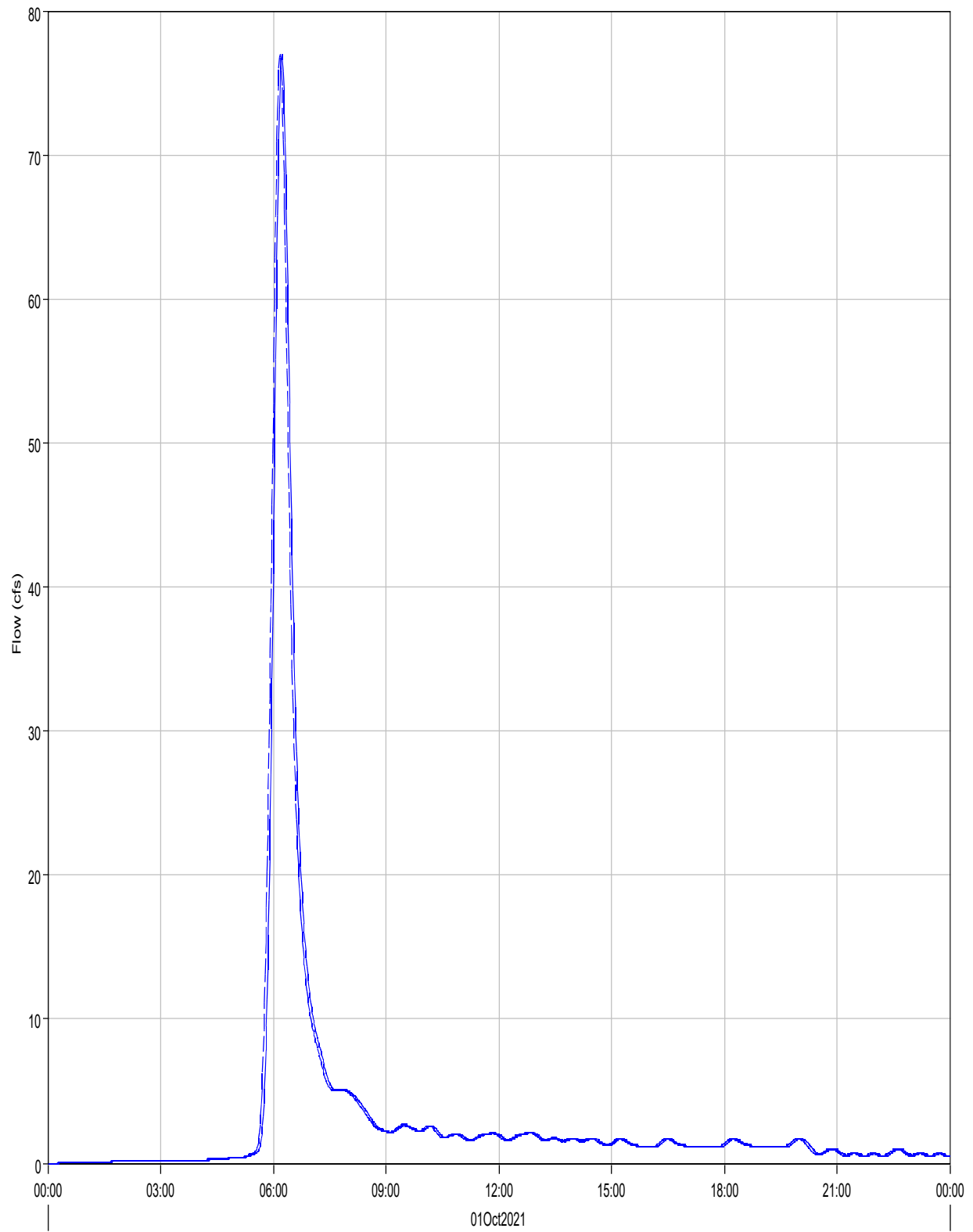
Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Ex. Type IIA NR Reach: R-OB7  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 10:02:51 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Inflow :	611.5 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 06:31
Peak Outflow :	611.3 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 06:33
Total Inflow :	92.9 (AC-FT)	Total Outflow :	92.9 (AC-FT)



Reach "R-OB8" Results for Run "EV 100-yr Ex. Type IIA NR"



— Run:EV 100-yr Ex. Type IIA NR Element:R-OB8 Result:Outflow

- - - Run:EV 100-YR EX. TYPE IIA NR Element:R-OB8 Result:Combined Inflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Ex. Type IIA NR Reach: R-OB8  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 10:02:51 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Inflow :	77.0 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 06:11
Peak Outflow :	76.9 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 06:14
Total Inflow :	6.6 (AC-FT)	Total Outflow :	6.5 (AC-FT)



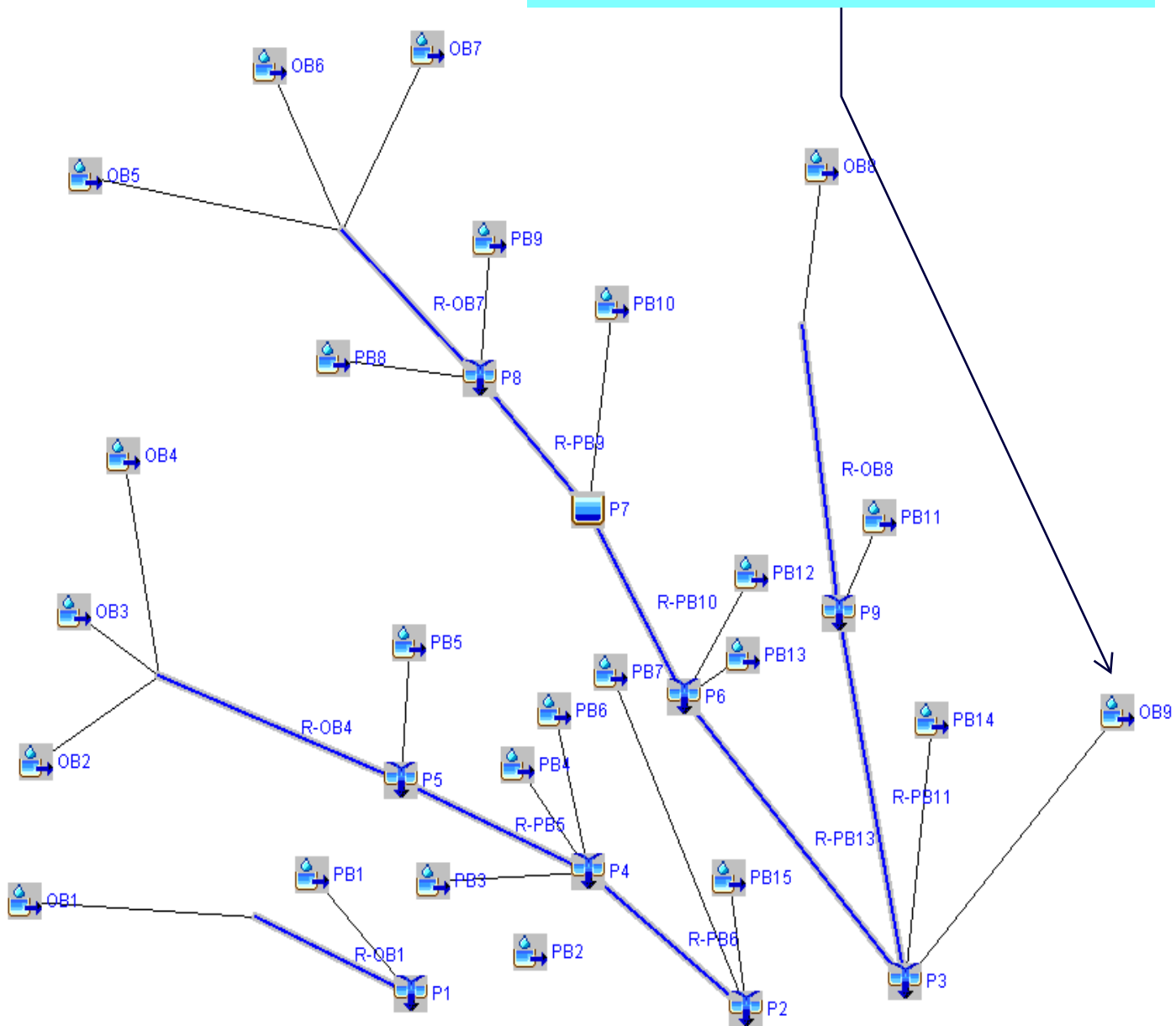
HEC-HMS

## Project : Eagleview\_Subdivision

Basin Model : Eagleview\_Proposed

Oct 29 11:40:37 AM 2024

Review the Paintbrush Hills Filing 14 drainage report. This basin appears to no longer appears to drain into the site in the PBH14 proposed condition. Update the narrative and modeling accordingly.



IMPERVIOUS FACTOR CALCULATION TABLE - PROPOSED CONDITIONS

	Basin	Area (Acre)	Open Space (2%)	2.5 Acre Lot (100%)	1/8 Acre Lot (100%)	Buildings (100%)	Paved Roadway (100%)	Gravel Roadway (80%)	Total % Check	Weighted Impervious
Onsite	PB1	4.25	0%	99%	0%	0%	1%	0%	100%	12%
	PB2	1.08	0%	94%	0%	0%	6%	0%	100%	16%
	PB3	1.38	0%	85%	0%	0%	15%	0%	100%	24%
	PB4	10.54	0%	97%	0%	0%	3%	0%	100%	14%
	PB5	6.18	0%	97%	0%	0%	3%	0%	100%	13%
	PB6	11.09	0%	95%	0%	0%	5%	0%	100%	16%
	PB7	5.59	0%	94%	0%	0%	6%	0%	100%	16%
	PB8	11.78	0%	99%	0%	0%	1%	0%	100%	11%
	PB9	12.80	0%	98%	0%	0%	2%	0%	100%	12%
	PB10	11.52	0%	98%	0%	0%	2%	0%	100%	13%
	PB11	16.11	0%	97%	0%	0%	3%	0%	100%	14%
	PB12	0.20	0%	50%	0%	0%	50%	0%	100%	55%
	PB13	1.76	0%	96%	0%	0%	4%	0%	100%	15%
	PB14	17.28	0%	97%	0%	0%	3%	0%	100%	13%
	PB15	9.63	0%	93%	0%	0%	7%	0%	100%	17%
Offsite	OB1	10.37	93%	0%	0%	2%	4%	2%	100%	9%
	OB2	28.06	90%	0%	0%	3%	3%	5%	100%	11%
	OB3	43.44	92%	0%	0%	2%	2%	4%	100%	9%
	OB4	10.50	87%	0%	0%	4%	5%	4%	100%	13%
	OB5	143.82	94%	0%	0%	2%	1%	3%	100%	7%
	OB6	118.40	92%	0%	0%	1%	2%	5%	100%	9%
	OB7	421.43	93%	0%	0%	2%	1%	4%	100%	8%
	OB8	39.65	94%	0%	0%	2%	1%	4%	100%	7%
	OB9	117.43	54%	0%	43%	1%	0%	2%	100%	31%
Total		1054.30								13.5%



### Pre vs. Post Runoff Analysis

#### Time of Concentration

## Project Information

Project Name:	Eagleview
KHA Project #:	196288000
Designed by:	DCM
Revised by:	
Checked by:	
Date:	10/28/2021
Date:	
Date:	

Minimum Time of Concentration	5.0
2YR-24HR Rainfall, P2	2.10

Post-Development												
Drainage Area: OB1												
		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Cross Sectional Area of Flow, A (ft <sup>2</sup> )	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)	
SHEET	T1 SHEET FLOW	300.00	0.073	0.30	2.10						30.21	
SHALLOW CONCENTRATED	T2 SHALLOW CONCENTRATED FLOW	1118.00	0.038			U				3.14	5.93	
							Post-Development Time of Concentration, OB1					36.14

Post-Development											
Drainage Area: OB2											
		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Cross Sectional Area of Flow, A (ft²)	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)
SHEET	T1 SHEET FLOW	300.00	0.063	0.30	2.10						32.05
SHALLOW CONCENTRATED	T2 SHALLOW CONCENTRATED FLOW	554.00	0.046			U				3.45	2.67
CHANNEL	T2 CHANNEL FLOW	841.00	0.029	0.05		U		6.60	1.44	6.45	2.17
							Post-Development Time of Concentration, OB2				36.90

Post-Development												
Drainage Area: OB3												
		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Cross Sectional Area of Flow, A (ft <sup>2</sup> )	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)	
SHEET	T1 SHEET FLOW	300.00	0.074	0.30	2.10						30.05	
SHALLOW CONCENTRATED	T2 SHALLOW CONCENTRATED FLOW	2436.00	0.034			U				2.97	13.65	
							Post-Development Time of Concentration, OB3					43.70

Post-Development												
Drainage Area: OB4												
		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Cross Sectional Area of Flow, A (ft²)	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)	
SHEET	T1 SHEET FLOW	300.00	0.042	0.30	2.10						37.69	
SHALLOW CONCENTRATED	T2 SHALLOW CONCENTRATED FLOW	783.00	0.038			U				3.16	4.13	
CHANNEL	T2 CHANNEL FLOW	577.00	0.028	0.05		U	9.50	6.60	1.44	6.36	1.51	
							Post-Development Time of Concentration, OB4					43.34

Post-Development											
Drainage Area: 0B5											
		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Cross Sectional Area of Flow, A (ft <sup>2</sup> )	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)
SHEET	T1 SHEET FLOW	300.00	0.037	0.25	2.10						34.27
SHALLOW CONCENTRATED	T2 SHALLOW CONCENTRATED FLOW	3838.00	0.033			U				2.93	21.83
CHANNEL	T2 CHANNEL FLOW	1407.00	0.024	0.04		U		6.60	1.44	7.36	3.19
						Post-Development Time of Concentration, 0B5					59.29

Post-Development												
Drainage Area: OB6												
		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Cross Sectional Area of Flow, A (ft <sup>2</sup> )	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)	
SHEET	T1 SHEET FLOW	300.00	0.064	0.25	2.10						27.52	
SHALLOW CONCENTRATED	T2 SHALLOW CONCENTRATED FLOW	2569.00	0.038			U				3.14	13.62	
CHANNEL	T2 CHANNEL FLOW	2110.00	0.027	0.04		U		6.60	1.44	7.73	4.55	
							Post-Development Time of Concentration, OB6					45.69

Post-Development											
Drainage Area: OB7											
		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Cross Sectional Area of Flow, A (ft <sup>2</sup> )	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)
SHEET	T1 SHEET FLOW	300.00	0.028	0.25	2.10						38.31
SHALLOW CONCENTRATED	T2 SHALLOW CONCENTRATED FLOW	2068.00	0.036			U				3.06	11.26
CHANNEL	T3 CHANNEL FLOW	6198.00	0.03	0.04		U	12.00	22.00	0.55	4.09	25.29
							Post-Development Time of Concentration, OB7				74.86

Post-Development											
Drainage Area: 0B8											
		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Cross Sectional Area of Flow, A (ft <sup>2</sup> )	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)
SHEET	T1 SHEET FLOW	300.00	0.029	0.15	2.10						25.10
SHALLOW CONCENTRATED	T2 SHALLOW CONCENTRATED FLOW	1117.00	0.043			U				3.34	5.57
CHANNEL	T2 CHANNEL FLOW	762.00	0.033	0.03		U		6.60	1.44	11.43	1.11
							Post-Development Time of Concentration, 0B8				31.78

Post-Development											
Drainage Area: 0B9											
		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Cross Sectional Area of Flow, A (ft <sup>2</sup> )	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)
SHEET	T1 SHEET FLOW	300.00	0.087	0.01	2.10						2.00
SHALLOW CONCENTRATED	T2 SHALLOW CONCENTRATED FLOW	4384.00	0.026			U				2.60	28.09
							Post-Development Time of Concentration, 0B9				30.09

Post-Development											
Drainage Area: PB1											
		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Cross Sectional Area of Flow, A (ft <sup>2</sup> )	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)
SHEET	T1 SHEET FLOW	300.00	0.033	0.15	2.10						23.84
SHALLOW CONCENTRATED	T2 SHALLOW CONCENTRATED FLOW	400.00	0.041			U				3.27	2.04
						Post-Development Time of Concentration, PB1					25.88

Post-Development											
Drainage Area: PB2											
		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Cross Sectional Area of Flow, A (ft <sup>2</sup> )	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)
SHEET	T1 SHEET FLOW	227.00	0.033	0.15	2.10		Post-Development Time of Concentration, PB2				19.07

Post-Development											
Drainage Area: PB3											
		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Cross Sectional Area of Flow, A (ft <sup>2</sup> )	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)
SHEET	T3 SHEET FLOW	313.00	0.05	0.15	2.10						21.59
CHANNEL	T3 CHANNEL FLOW	315.00	0.02	0.03		U	9.00	12.40	0.73	6.08	0.86
							Post-Development Time of Concentration, PB3				22.46



Pre vs. Post Runoff Analysis  
Composite CN and Crat

Project Name:

Eagleview

KHA Project #:

196288000

Designed by:

DCM

Date:

10/28/2021

Revised by:

Date:

Revised by:

Date:

Checked by:

Date:

See redline comments to the offsite basin in the pre-development condition and update accordingly.

Post-Development				
Drainage Area: OB1				
Cover Description	Hydrologic Condition or Cover Type	Hydrologic Soil Group	SCS Curve Number (CN)	Area, A (ac.)
RESIDENTIAL	Rangeland - Good Condition	B	61.00	9.79
IMPERVIOUS	Paved; curbs and storm sewers (excluding right-of-way)	B	98.00	0.38
IMPERVIOUS	Gravel (including right of way)	B	85.00	0.20
CUTSOM				
COMPOSITE SCS CURVE NUMBER - OB1		62.81		10.37

Post-Development				
Drainage Area: OB2				
Cover Description	Hydrologic Condition or Cover Type	Hydrologic Soil Group	SCS Curve Number (CN)	Area, A (ac.)
RESIDENTIAL	Rangeland - Good Condition	B	61.00	25.92
IMPERVIOUS	Paved; curbs and storm sewers (excluding right-of-way)	B	98.00	0.86
IMPERVIOUS	Gravel (including right of way)	B	85.00	1.28
CUTSOM				
COMPOSITE SCS CURVE NUMBER - OB2		63.23		28.06

Post-Development				
Drainage Area: OB3				
Cover Description	Hydrologic Condition or Cover Type	Hydrologic Soil Group	SCS Curve Number (CN)	Area, A (ac.)
RESIDENTIAL	Rangeland - Good Condition	B	61.00	40.88
IMPERVIOUS	Paved; curbs and storm sewers (excluding right-of-way)	B	98.00	0.89
IMPERVIOUS	Gravel (including right of way)	B	85.00	1.67
CUTSOM				
COMPOSITE SCS CURVE NUMBER - OB3		62.68		43.44

Post-Development				
Drainage Area: OB4				
Cover Description	Hydrologic Condition or Cover Type	Hydrologic Soil Group	SCS Curve Number (CN)	Area, A (ac.)
RESIDENTIAL	Rangeland - Good Condition	B	61.00	9.55
IMPERVIOUS	Paved; curbs and storm sewers (excluding right-of-way)	B	98.00	0.52
IMPERVIOUS	Gravel (including right of way)	B	85.00	0.43
CUTSOM				
COMPOSITE SCS CURVE NUMBER - OB4		63.80		10.50

Post-Development				
Drainage Area: OB5				
Cover Description	Hydrologic Condition or Cover Type	Hydrologic Soil Group	SCS Curve Number (CN)	Area, A (ac.)
RESIDENTIAL	Rangeland - Good Condition	B	61.00	28.58
RESIDENTIAL	Woods - Good Condition	B	55.00	109.48
IMPERVIOUS	Paved; curbs and storm sewers (excluding right-of-way)	B	98.00	1.12
IMPERVIOUS	Gravel (including right of way)	B	85.00	4.64
CUTSOM				
COMPOSITE SCS CURVE NUMBER - OB5		57.50		143.82

Post-Development				
Drainage Area: OB6				
Cover Description	Hydrologic Condition or Cover Type	Hydrologic Soil Group	SCS Curve Number (CN)	Area, A (ac.)
RESIDENTIAL	Rangeland - Good Condition	B	61.00	60.64
RESIDENTIAL	Woods - Good Condition	B	55.00	51.19
IMPERVIOUS	Paved; curbs and storm sewers (excluding right-of-way)	B	98.00	2.04
IMPERVIOUS	Gravel (including right of way)	B	85.00	4.53
CUTSOM				
COMPOSITE SCS CURVE NUMBER - OB6		59.96		118.40



Pre vs. Post Runoff Analysis  
Composite CN and Crat

Project Name:

Eagleview

KHA Project #:

196288000

Designed by:

DCM

Date:

10/28/2021

Revised by:

Date:

Revised by:

Date:

Checked by:

Date:

Post-Development				
Drainage Area: OB7				
Cover Description	Hydrologic Condition or Cover Type	Hydrologic Soil Group	SCS Curve Number (CN)	Area, A (ac.)
RESIDENTIAL	Rangeland - Good Condition	B	61.00	122.08
RESIDENTIAL	Woods - Good Condition	B	55.00	259.48
RESIDENTIAL	2.5 acre	B	64.00	16.02
IMPERVIOUS	Paved; curbs and storm sewers (excluding right-of-way)	B	98.00	5.46
IMPERVIOUS	Gravel (including right of way)	B	85.00	18.17
CUTSOM				
COMPOSITE SCS CURVE NUMBER - OB7		58.93		421.20

Post-Development				
Drainage Area: OB8				
Cover Description	Hydrologic Condition or Cover Type	Hydrologic Soil Group	SCS Curve Number (CN)	Area, A (ac.)
RESIDENTIAL	Rangeland - Good Condition	B	61.00	8.94
RESIDENTIAL	2.5 acre	B	64.00	22.04
RESIDENTIAL	1/2 acre (25% imp.)	B	71.00	7.07
IMPERVIOUS	Paved; curbs and storm sewers (excluding right-of-way)	B	98.00	0.24
IMPERVIOUS	Gravel (including right of way)	B	85.00	1.57
CUTSOM				
COMPOSITE SCS CURVE NUMBER - OB8		65.60		39.87

Post-Development				
Drainage Area: OB9				
Cover Description	Hydrologic Condition or Cover Type	Hydrologic Soil Group	SCS Curve Number (CN)	Area, A (ac.)
RESIDENTIAL	2.5 acre	B	64.00	35.28
RESIDENTIAL	1/2 acre (25% imp.)	B	71.00	27.99
RESIDENTIAL	1/8 acre or less (town houses) (65% imp.)/small>	B	85.00	51.90
IMPERVIOUS	Paved; curbs and storm sewers (excluding right-of-way)	B	98.00	0.30
IMPERVIOUS	Gravel (including right of way)	B	85.00	1.96
CUTSOM				
COMPOSITE SCS CURVE NUMBER - OB9		75.39		117.43

Post-Development				
Drainage Area: PB1				
Cover Description	Hydrologic Condition or Cover Type	Hydrologic Soil Group	SCS Curve Number (CN)	Area, A (ac.)
RESIDENTIAL	2.5 acre	B	64.00	4.19
IMPERVIOUS	Paved; open ditches (including right-of-way)	B	89.00	0.06
CUTSOM				
COMPOSITE SCS CURVE NUMBER - PB1		64.35		4.25

Post-Development				
Drainage Area: PB2				
Cover Description	Hydrologic Condition or Cover Type	Hydrologic Soil Group	SCS Curve Number (CN)	Area, A (ac.)
RESIDENTIAL	2.5 acre	B	64.00	1.02
IMPERVIOUS	Paved; open ditches (including right-of-way)	B	89.00	0.06
CUTSOM				
COMPOSITE SCS CURVE NUMBER - PB2		65.38		1.08

Post-Development				
Drainage Area: PB3				
Cover Description	Hydrologic Condition or Cover Type	Hydrologic Soil Group	SCS Curve Number (CN)	Area, A (ac.)
RESIDENTIAL	2.5 acre	B	64.00	1.18
IMPERVIOUS	Paved; open ditches (including right-of-way)	B	89.00	0.20
CUTSOM				
COMPOSITE SCS CURVE NUMBER - PB3		67.68		1.38

Post-Development				
Drainage Area: PB4				
Cover Description	Hydrologic Condition or Cover Type	Hydrologic Soil Group	SCS Curve Number (CN)	Area, A (ac.)
RESIDENTIAL	2.5 acre	B	64.00	10.18





Pre vs. Post Runoff Analysis  
Composite CN and Crat

Project Name:

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Revised by:

Date:

Checked by:

Date:

IMPERVIOUS	Paved; open ditches (including right-of-way)	B	89.00	0.35
CUTSOM				
COMPOSITE SCS CURVE NUMBER - PB4		64.84		10.54

Post-Development				
Drainage Area: PB5				
COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)
RESIDENTIAL	2.5 acre	B	64.00	6.01
IMPERVIOUS	Paved; open ditches (including right-of-way)	B	89.00	0.17
CUTSOM				
COMPOSITE SCS CURVE NUMBER - PB5		64.70		6.18

Post-Development				
Drainage Area: PB6				
COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)
RESIDENTIAL	2.5 acre	B	64.00	10.50
IMPERVIOUS	Paved; open ditches (including right-of-way)	B	89.00	0.59
CUTSOM				
COMPOSITE SCS CURVE NUMBER - PB6		65.33		11.09

Post-Development				
Drainage Area: PB7				
COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)
RESIDENTIAL	2.5 acre	B	64.00	5.28
IMPERVIOUS	Paved; open ditches (including right-of-way)	B	89.00	0.31
CUTSOM				
COMPOSITE SCS CURVE NUMBER - PB7		65.38		5.59

Post-Development				
Drainage Area: PB8				
COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)
RESIDENTIAL	2.5 acre	B	64.00	11.72
IMPERVIOUS	Paved; open ditches (including right-of-way)	B	89.00	0.06
CUTSOM				
COMPOSITE SCS CURVE NUMBER - PB8		64.13		11.78

Post-Development				
Drainage Area: PB9				
COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)
RESIDENTIAL	2.5 acre	B	64.00	12.60
IMPERVIOUS	Paved; open ditches (including right-of-way)	B	89.00	0.20
CUTSOM				
COMPOSITE SCS CURVE NUMBER - PB9		64.39		12.80

Post-Development				
Drainage Area: PB10				
COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)
RESIDENTIAL	2.5 acre	B	64.00	11.25
IMPERVIOUS	Paved; open ditches (including right-of-way)	B	89.00	0.26
CUTSOM				
COMPOSITE SCS CURVE NUMBER - PB10		64.57		11.52

Post-Development				
Drainage Area: PB11				
COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)
RESIDENTIAL	2.5 acre	B	64.00	15.60
IMPERVIOUS	Paved; open ditches (including right-of-way)	B	89.00	0.51
CUTSOM				
COMPOSITE SCS CURVE NUMBER - PB11		64.80		16.11





Pre vs. Post Runoff Analysis  
Composite CN and Crat

Project Name:

Eagleview

KHA Project #:

196288000

Designed by:

DCM

Date:

10/28/2021

Revised by:

Date:

Revised by:

Date:

Checked by:

Date:

Post-Development				
Drainage Area: PB12				
Cover Description	Hydrologic Condition or Cover Type	Hydrologic Soil Group	SCS Curve Number (CN)	Area, A (ac.)
RESIDENTIAL	2.5 acre	B	64.00	0.10
IMPERVIOUS	Paved; open ditches (including right-of-way)	B	89.00	0.10
CUTSOM				
COMPOSITE SCS CURVE NUMBER - PB12		76.50		0.20

Post-Development				
Drainage Area: PB13				
Cover Description	Hydrologic Condition or Cover Type	Hydrologic Soil Group	SCS Curve Number (CN)	Area, A (ac.)
RESIDENTIAL	2.5 acre	B	64.00	1.68
IMPERVIOUS	Paved; open ditches (including right-of-way)	B	89.00	0.08
CUTSOM				
COMPOSITE SCS CURVE NUMBER - PB13		65.12		1.76

Post-Development				
Drainage Area: PB14				
Cover Description	Hydrologic Condition or Cover Type	Hydrologic Soil Group	SCS Curve Number (CN)	Area, A (ac.)
RESIDENTIAL	2.5 acre	A	45.00	0.28
RESIDENTIAL	2.5 acre	B	64.00	16.54
IMPERVIOUS	Paved; open ditches (including right-of-way)	B	89.00	0.46
CUTSOM				
COMPOSITE SCS CURVE NUMBER - PB14		63.64		17.28

Post-Development				
Drainage Area: PB15				
Cover Description	Hydrologic Condition or Cover Type	Hydrologic Soil Group	SCS Curve Number (CN)	Area, A (ac.)
RESIDENTIAL	2.5 acre	A	45.00	0.61
RESIDENTIAL	2.5 acre	B	64.00	8.38
IMPERVIOUS	Paved; open ditches (including right-of-way)	B	89.00	0.65
CUTSOM				
COMPOSITE SCS CURVE NUMBER - PB15		61.65		9.63



Pre vs. Post Runoff Analysis  
Time of Concentration

Provide the lag time

Project Information

Project Name: Eagleview  
KHA Project #: 196288000  
Designed by: DCM Date: 10/28/2021  
Revised by: Date:  
Checked by: Date:

Minimum Time of Concentration 5.0 minutes  
2YR-24HR Rainfall, P2 2.10

Post-Development											
Drainage Area: PB4											
		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Cross Sectional Area of Flow, A (ft²)	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)
MINIMUM TC	T2 MINIMUM TC FLOW										5.00
Post-Development Time of Concentration, PB4											5.00
Post-Development											
Drainage Area: PB5											
		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Cross Sectional Area of Flow, A (ft²)	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)
SHEET	T1 SHEET FLOW	300.00	0.021	0.15	2.10						28.56
SHALLOW CONCENTRATED	T2 SHALLOW CONCENTRATED FLOW	292.00	0.024			U				2.50	1.95
CHANNEL	T2 CHANNEL FLOW	44.00	0.032	0.03		U	9.50	6.60	1.44	11.33	0.06
Post-Development Time of Concentration, PB5											30.58
Post-Development											
Drainage Area: PB6											
		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Cross Sectional Area of Flow, A (ft²)	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)
SHEET	T1 SHEET FLOW	300.00	0.034	0.15	2.10						23.66
SHALLOW CONCENTRATED	T2 SHALLOW CONCENTRATED FLOW	650.00	0.036			U				3.06	3.54
CHANNEL	T2 CHANNEL FLOW	66.00	0.001	0.03		U	9.00	12.40	0.73	1.27	0.87
Post-Development Time of Concentration, PB6											27.96
Post-Development											
Drainage Area: PB7											
		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Cross Sectional Area of Flow, A (ft²)	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)
SHEET	T1 SHEET FLOW	300.00	0.043	0.15	2.10						21.44
SHALLOW CONCENTRATED	T2 SHALLOW CONCENTRATED FLOW	235.00	0.051			U				3.64	1.08
CHANNEL	T2 CHANNEL FLOW	539.00	0.035	0.03		U	9.00	12.40	0.73	7.50	1.20
Post-Development Time of Concentration, PB7											23.72
Post-Development											
Drainage Area: PB8											
		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Cross Sectional Area of Flow, A (ft²)	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)
SHEET	T1 SHEET FLOW	17.00	0.018	0.15	2.10						3.06
SHALLOW CONCENTRATED	T2 SHALLOW CONCENTRATED FLOW	136.00	0.110			U				5.35	0.42
CHANNEL	T2 CHANNEL FLOW	1445.00	0.031	0.03		U	14.00	34.00	0.41	4.84	4.98
Post-Development Time of Concentration, PB8											8.46
Post-Development											
Drainage Area: PB9											
		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Cross Sectional Area of Flow, A (ft²)	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)
SHEET	T1 SHEET FLOW	300.00	0.060	0.15	2.10						18.77
SHALLOW CONCENTRATED	T2 SHALLOW CONCENTRATED FLOW	171.00	0.072			U				4.33	0.66
CHANNEL	T2 CHANNEL FLOW	873.00	0.028	0.03		U	14.00	34.00	0.41	4.60	3.16
Post-Development Time of Concentration, PB9											22.59
Post-Development											
Drainage Area: PB10											
		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Cross Sectional Area of Flow, A (ft²)	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)
SHEET	T1 SHEET FLOW	300.00	0.035	0.15	2.10						23.29
SHALLOW CONCENTRATED	T2 SHALLOW CONCENTRATED FLOW	395.00	0.034			U				2.97	2.21
CHANNEL	T2 CHANNEL FLOW	771.00	0.042	0.03		U	14.00	34.00	0.41	5.63	2.28
Post-Development Time of Concentration, PB10											27.78
Post-Development											
Drainage Area: PB11											
		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Cross Sectional Area of Flow, A (ft²)	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)
SHEET	T1 SHEET FLOW	300.00	0.031	0.15	2.10						24.44
CHANNEL	T2 CHANNEL FLOW	1252.00	0.025	0.03		U	9.50	6.60	1.44	10.01	2.08
Post-Development Time of Concentration, PB11											26.53
Post-Development											
Drainage Area: PB12											
		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Cross Sectional Area of Flow, A (ft²)	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)
MINIMUM TC	T2 MINIMUM TC FLOW										5.00
Post-Development Time of Concentration, PB12											5.00
Post-Development											
Drainage Area: PB13											
		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Cross Sectional Area of Flow, A (ft²)	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)
MINIMUM TC	T2 MINIMUM TC FLOW										5.00
Post-Development Time of Concentration, PB13											5.00
Post-Development											
Drainage Area: PB14											
		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Cross Sectional Area of Flow, A (ft²)	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)
SHEET	T1 SHEET FLOW	40.00	0.085	0.01	2.10						0.40
CHANNEL	T2 CHANNEL FLOW	244.00	0.060	0.03		U	9.00	12.40	0.73	9.82	0.41
CHANNEL	T2 CHANNEL FLOW	1123.00	0.014	0.03		U	14.00	34.00	0.41	3.25	5.76
Post-Development Time of Concentration, PB14											6.57
Post-Development											
Drainage Area: PB15											
		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Cross Sectional Area of Flow, A (ft²)	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)
MINIMUM TC	T2 MINIMUM TC FLOW										5.00
Post-Development Time of Concentration, PB15											5.00

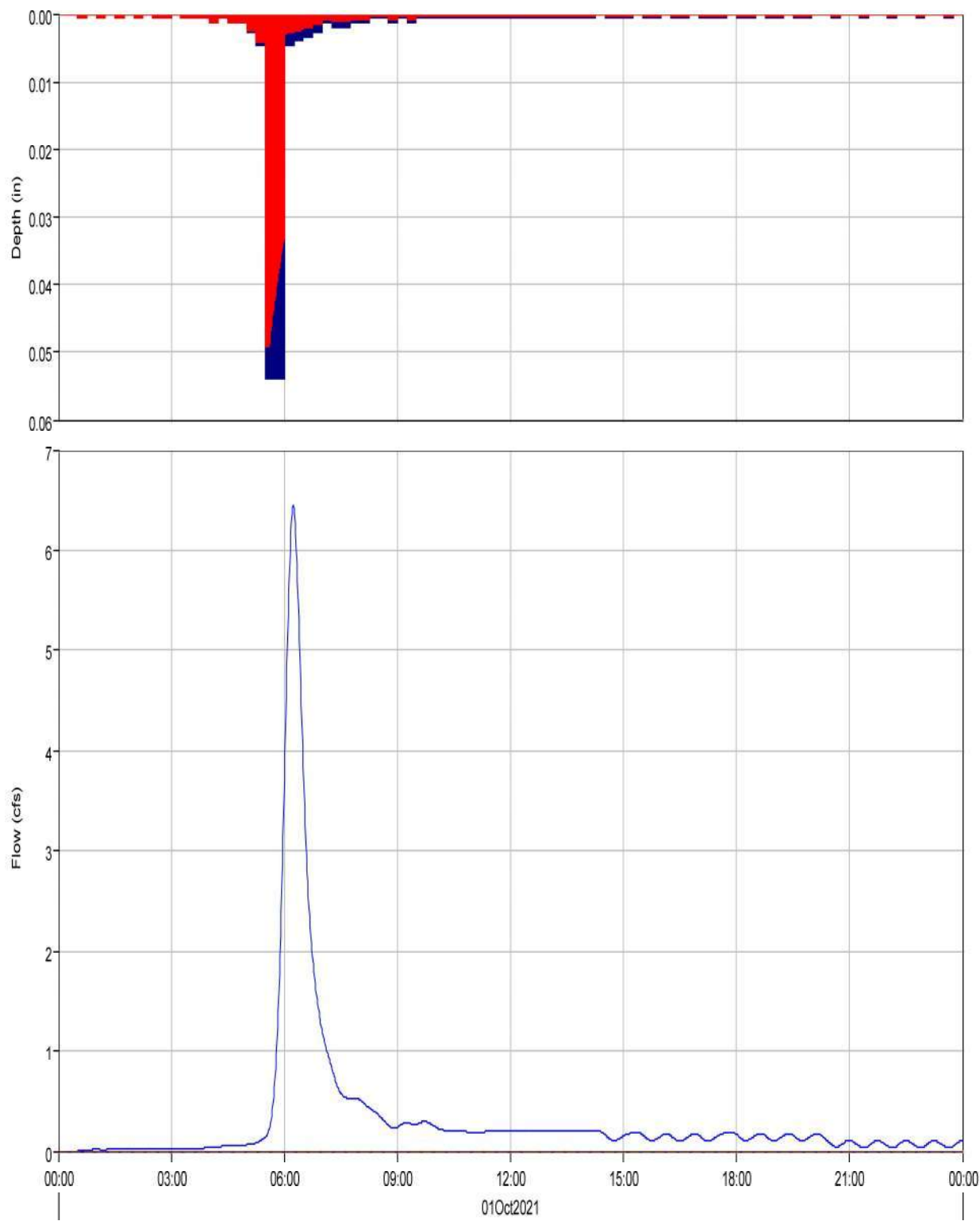
Project: Eagleview\_Subdivision Simulation Run: EV 5-yr Pr. Type IIA NR

Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
 End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
 Compute Time: 29Oct2021, 12:11:52 Control Specifications: 24-hr Storm

Hydrologic Element	Drainage Area (MI <sup>2</sup> )	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
OB1	0.0162031	6.4	01Oct2021, 06:14	0.6
OB2	0.0438438	18.7	01Oct2021, 06:14	1.9
OB3	0.0678750	23.7	01Oct2021, 06:18	2.7
OB4	0.0164062	6.8	01Oct2021, 06:17	0.7
OB5	0.22472	46.1	01Oct2021, 06:28	6.8
OB6	0.18501	55.9	01Oct2021, 06:19	6.6
OB7	0.65812	126.8	01Oct2021, 06:38	21.8
OB8	0.0623000	28.4	01Oct2021, 06:12	2.6
OB9	0.18350	180.0	01Oct2021, 06:09	14.9
P1	0.0228484	9.6	01Oct2021, 06:13	0.9
P2	0.19753	63.9	01Oct2021, 06:18	8.3
P3	1.4253	220.3	01Oct2021, 06:10	52.5
P4	0.17375	60.5	01Oct2021, 06:18	7.2
P5	0.13779	53.1	01Oct2021, 06:17	5.7
P6	1.1273	145.6	01Oct2021, 07:02	32.6
P7	1.1242	145.5	01Oct2021, 07:01	32.4
P8	1.1062	217.0	01Oct2021, 06:32	36.4
P9	0.0874766	41.3	01Oct2021, 06:13	3.8
PB1	0.0066453	3.7	01Oct2021, 06:08	0.3
PB10	0.0179938	6.7	01Oct2021, 06:10	0.6
PB11	0.0251766	14.7	01Oct2021, 06:08	1.2
PB12	.000315625	0.5	01Oct2021, 06:00	0.0
PB13	0.0027469	2.4	01Oct2021, 06:00	0.1
PB14	0.0270031	21.3	01Oct2021, 06:01	1.2
PB15	0.0150500	12.3	01Oct2021, 06:00	0.7
PB2	0.0016938	1.2	01Oct2021, 06:05	0.1

Hydrologic Element	Drainage Area (MI <sup>2</sup> )	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
PB3	0.0021625	1.8	01Oct2021, 06:06	0.1
PB4	0.0164672	14.1	01Oct2021, 06:00	0.8
PB5	0.0096625	5.1	01Oct2021, 06:10	0.5
PB6	0.0173312	6.8	01Oct2021, 06:10	0.6
PB7	0.0087281	3.8	01Oct2021, 06:08	0.3
PB8	0.0184000	10.8	01Oct2021, 06:02	0.6
PB9	0.0199984	8.4	01Oct2021, 06:08	0.6
R-OB1	0.0162031	6.4	01Oct2021, 06:16	0.6
R-OB4	0.12813	48.7	01Oct2021, 06:17	5.3
R-OB7	1.0678	214.1	01Oct2021, 06:32	35.2
R-OB8	0.0623000	28.4	01Oct2021, 06:15	2.6
R-PB10	1.1242	145.4	01Oct2021, 07:02	32.4
R-PB11	0.0874766	41.2	01Oct2021, 06:16	3.8
R-PB13	1.1273	145.6	01Oct2021, 07:03	32.6
R-PB5	0.13779	53.1	01Oct2021, 06:19	5.7
R-PB6	0.17375	60.5	01Oct2021, 06:19	7.2
R-PB9	1.1062	217.0	01Oct2021, 06:32	36.4

Subbasin "OB1" Results for Run "EV 5-yr Pr. Type IIA NR"



Run:EV 5-yr Pr. Type IIA NR Element:OB1 Result:Precipitation  
Run:EV 5-yr Pr. Type IIA NR Element:OB1 Result:Outflow

Run:EV 5-YR PR. TYPE IIA NR Element:OB1 Result:Precipitation Loss  
Run:EV 5-YR PR. TYPE IIA NR Element:OB1 Result:Baseflow

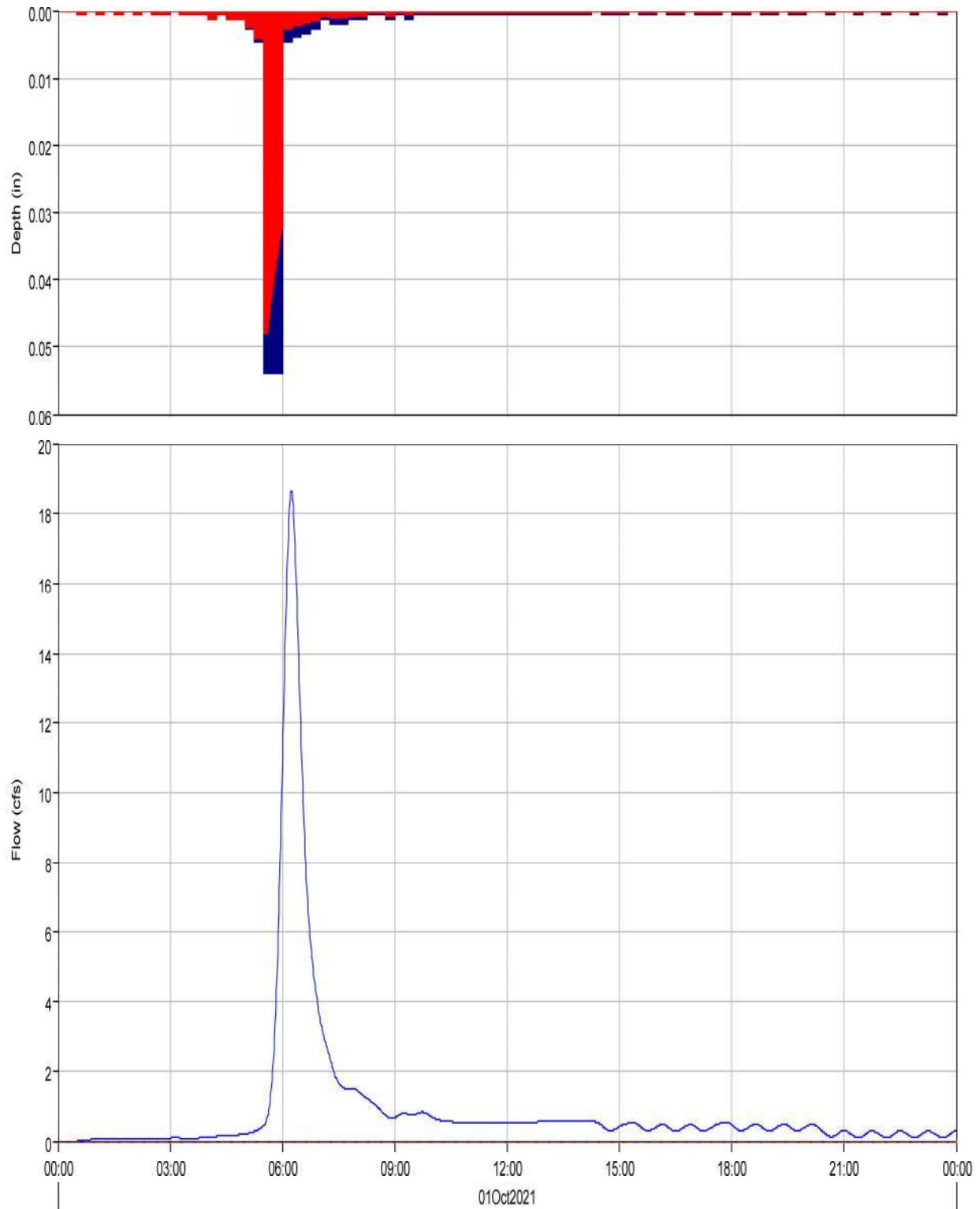
Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Pr. Type IIA NR Subbasin: OB1  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:52 Control Specifications: 24-hr Storm

Volume Units: AC-FT

#### Computed Results

Peak Discharge :	6.4 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:14
Total Precipitation :	2.3 (AC-FT)	Total Direct Runoff :	0.6 (AC-FT)
Total Loss :	1.7 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	0.6 (AC-FT)	Discharge :	0.6 (AC-FT)

Subbasin "OB2" Results for Run "EV 5-yr Pr. Type IIA NR"



Run:EV 5-yr Pr. Type IIA NR Element:OB2 Result:Precipitation  
Run:EV 5-yr Pr. Type IIA NR Element:OB2 Result:Outflow  
Run:EV 5-YR PR. TYPE IIA NR Element:OB2 Result:Precipitation Loss  
Run:EV 5-YR PR. TYPE IIA NR Element:OB2 Result:Baseflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Pr. Type IIA NR Subbasin: OB2  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:52 Control Specifications: 24-hr Storm

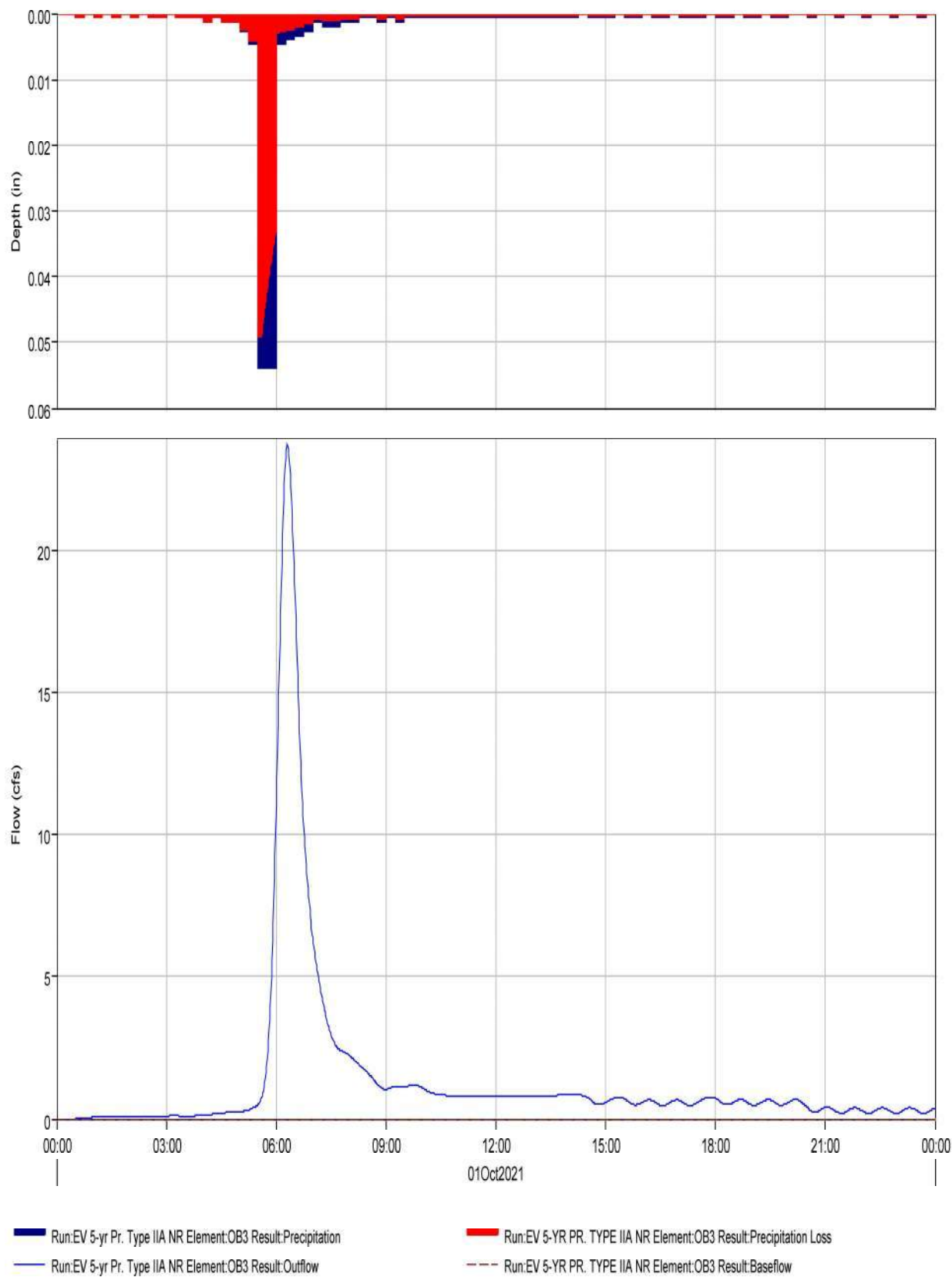
Volume Units: AC-FT

#### Computed Results

Peak Discharge :	18.7 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:14
Total Precipitation :	6.3 (AC-FT)	Total Direct Runoff :	1.9 (AC-FT)
Total Loss :	4.4 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	1.9 (AC-FT)	Discharge :	1.9 (AC-FT)



Subbasin "OB3" Results for Run "EV 5-yr Pr. Type IIA NR"

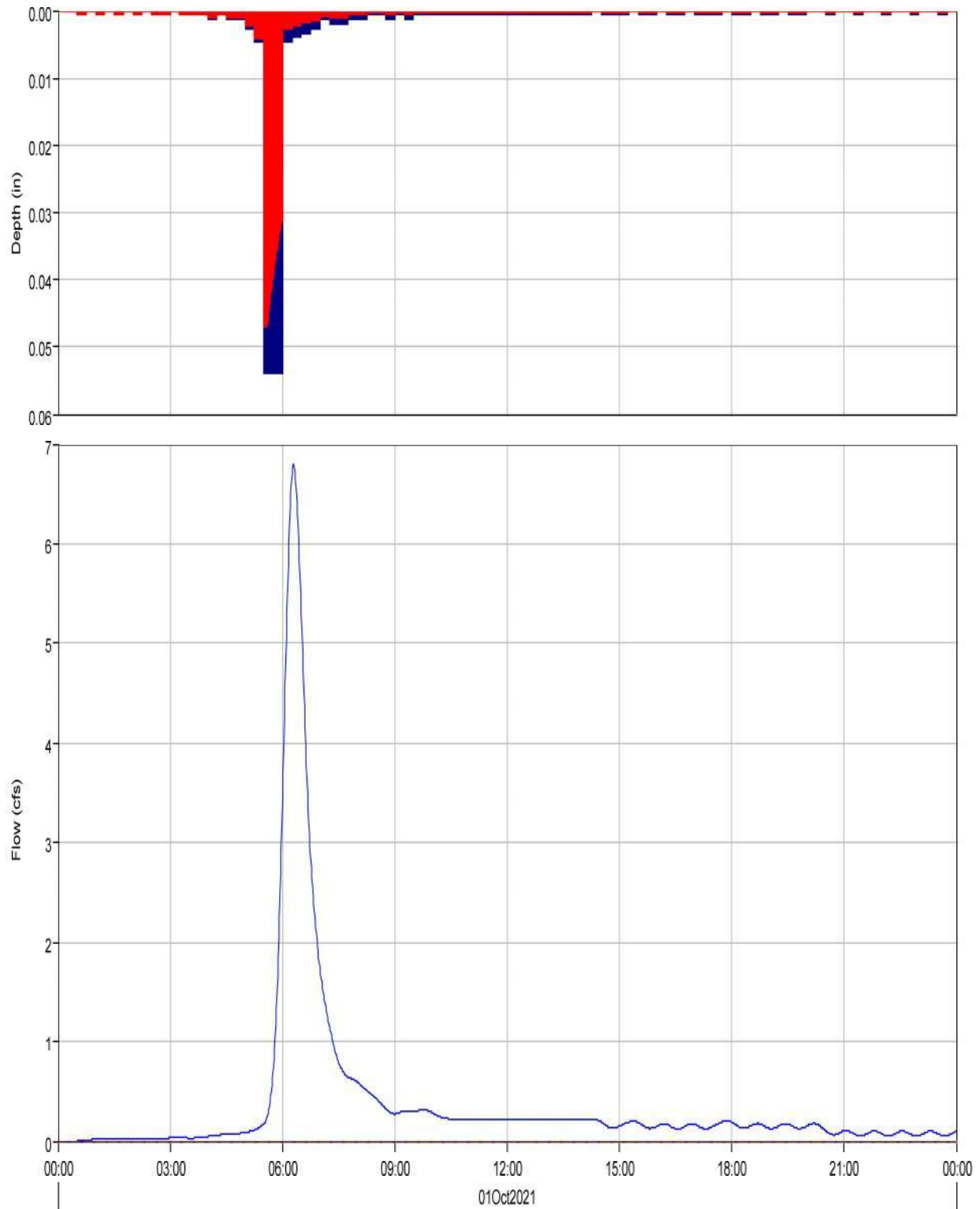


Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Pr. Type IIA NR Subbasin: OB3  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:52 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Discharge :	23.7 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:18
Total Precipitation :	9.8 (AC-FT)	Total Direct Runoff :	2.7 (AC-FT)
Total Loss :	7.1 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	2.7 (AC-FT)	Discharge :	2.7 (AC-FT)

Subbasin "OB4" Results for Run "EV 5-yr Pr. Type IIA NR"



- Run:EV 5-yr Pr. Type IIA NR Element:OB4 Result:Precipitation
- Run:EV 5-yr Pr. Type IIA NR Element:OB4 Result:Outflow
- Run:EV 5-YR PR. TYPE IIA NR Element:OB4 Result:Precipitation Loss
- Run:EV 5-YR PR. TYPE IIA NR Element:OB4 Result:Baseflow

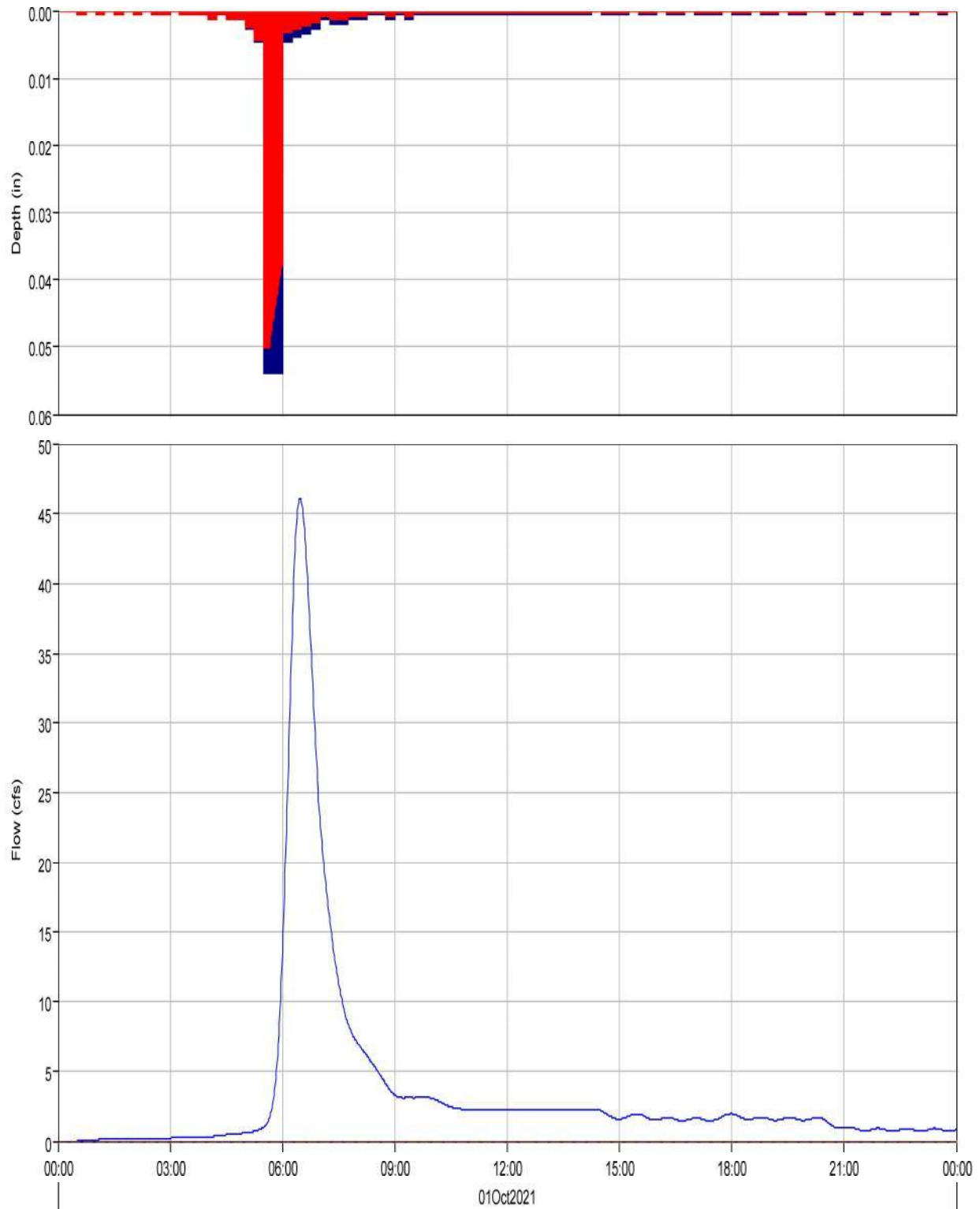
Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Pr. Type IIA NR Subbasin: OB4  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:52 Control Specifications: 24-hr Storm

Volume Units: AC-FT

#### Computed Results

Peak Discharge :	6.8 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:17
Total Precipitation :	2.4 (AC-FT)	Total Direct Runoff :	0.7 (AC-FT)
Total Loss :	1.6 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	0.8 (AC-FT)	Discharge :	0.7 (AC-FT)

Subbasin "OB5" Results for Run "EV 5-yr Pr. Type IIA NR"



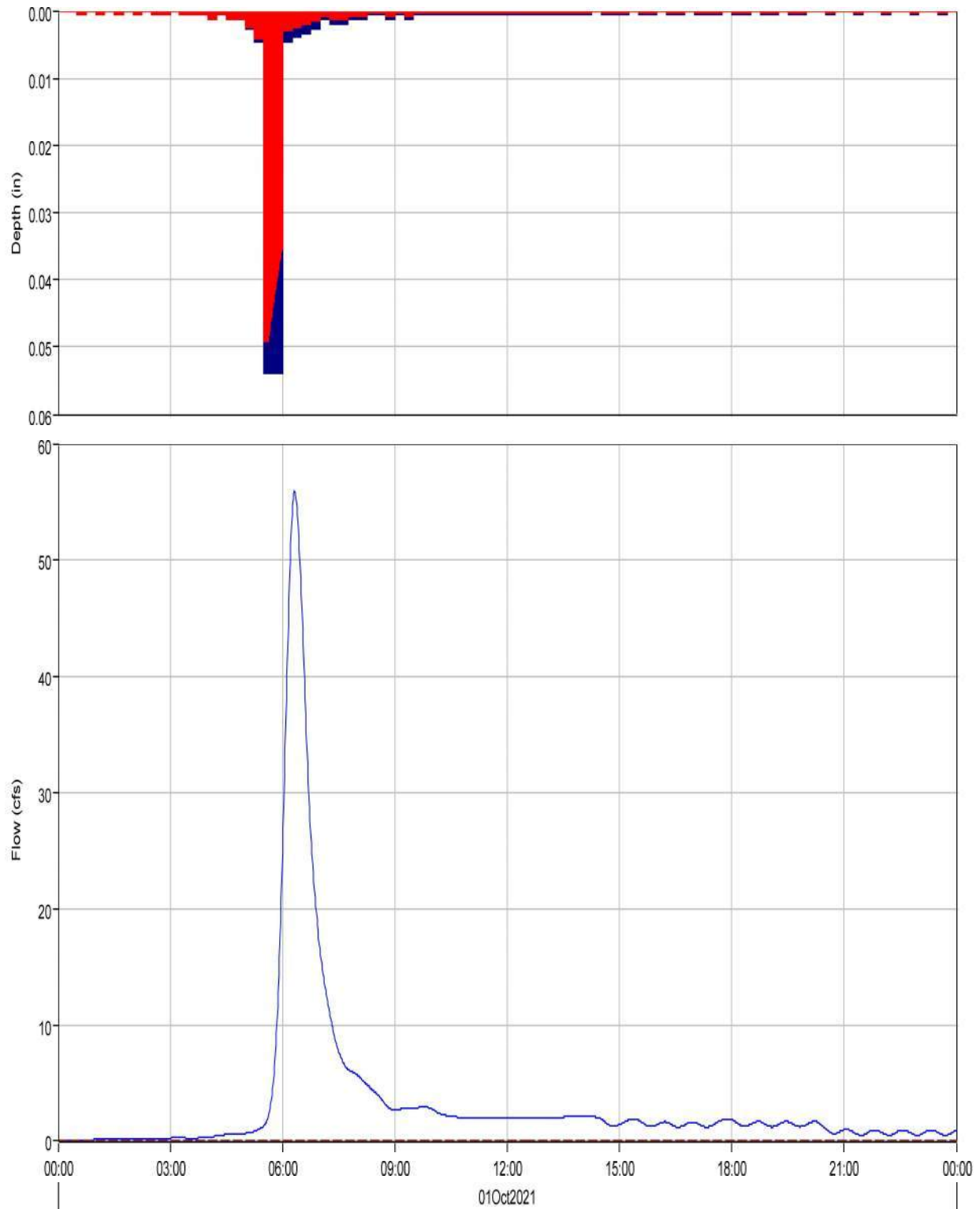
- Run:EV 5-yr Pr. Type IIA NR Element:OB5 Result:Precipitation
- Run:EV 5-yr Pr. Type IIA NR Element:OB5 Result:Outflow
- Run:EV 5-YR PR. TYPE IIA NR Element:OB5 Result:Precipitation Loss
- Run:EV 5-YR PR. TYPE IIA NR Element:OB5 Result:Baseflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Pr. Type IIA NR Subbasin: OB5  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:52 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Discharge :	46.1 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:28
Total Precipitation :	32.4 (AC-FT)	Total Direct Runoff :	6.8 (AC-FT)
Total Loss :	25.5 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	6.8 (AC-FT)	Discharge :	6.8 (AC-FT)

Subbasin "OB6" Results for Run "EV 5-yr Pr. Type IIA NR"



- Run:EV 5-yr Pr. Type IIA NR Element:OB6 Result:Precipitation
- Run:EV 5-yr Pr. Type IIA NR Element:OB6 Result:Outflow
- Run:EV 5-YR PR. TYPE IIA NR Element:OB6 Result:Precipitation Loss
- Run:EV 5-YR PR. TYPE IIA NR Element:OB6 Result:Baseflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Pr. Type IIA NR Subbasin: OB6  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:52 Control Specifications: 24-hr Storm

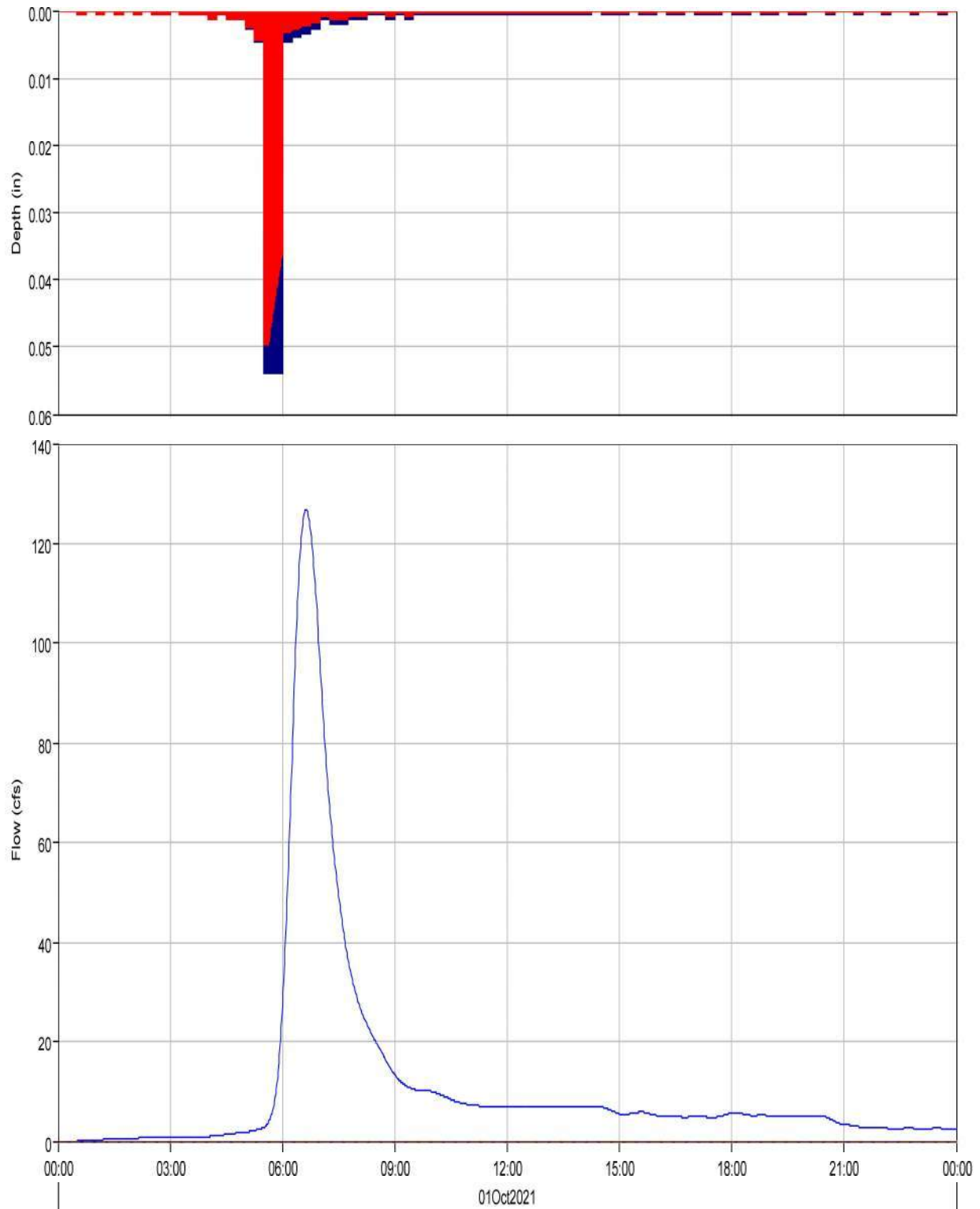
Volume Units: AC-FT

#### Computed Results

Peak Discharge :	55.9 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:19
Total Precipitation :	26.6 (AC-FT)	Total Direct Runoff :	6.6 (AC-FT)
Total Loss :	20.0 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	6.7 (AC-FT)	Discharge :	6.6 (AC-FT)



Subbasin "OB7" Results for Run "EV 5-yr Pr. Type IIA NR"



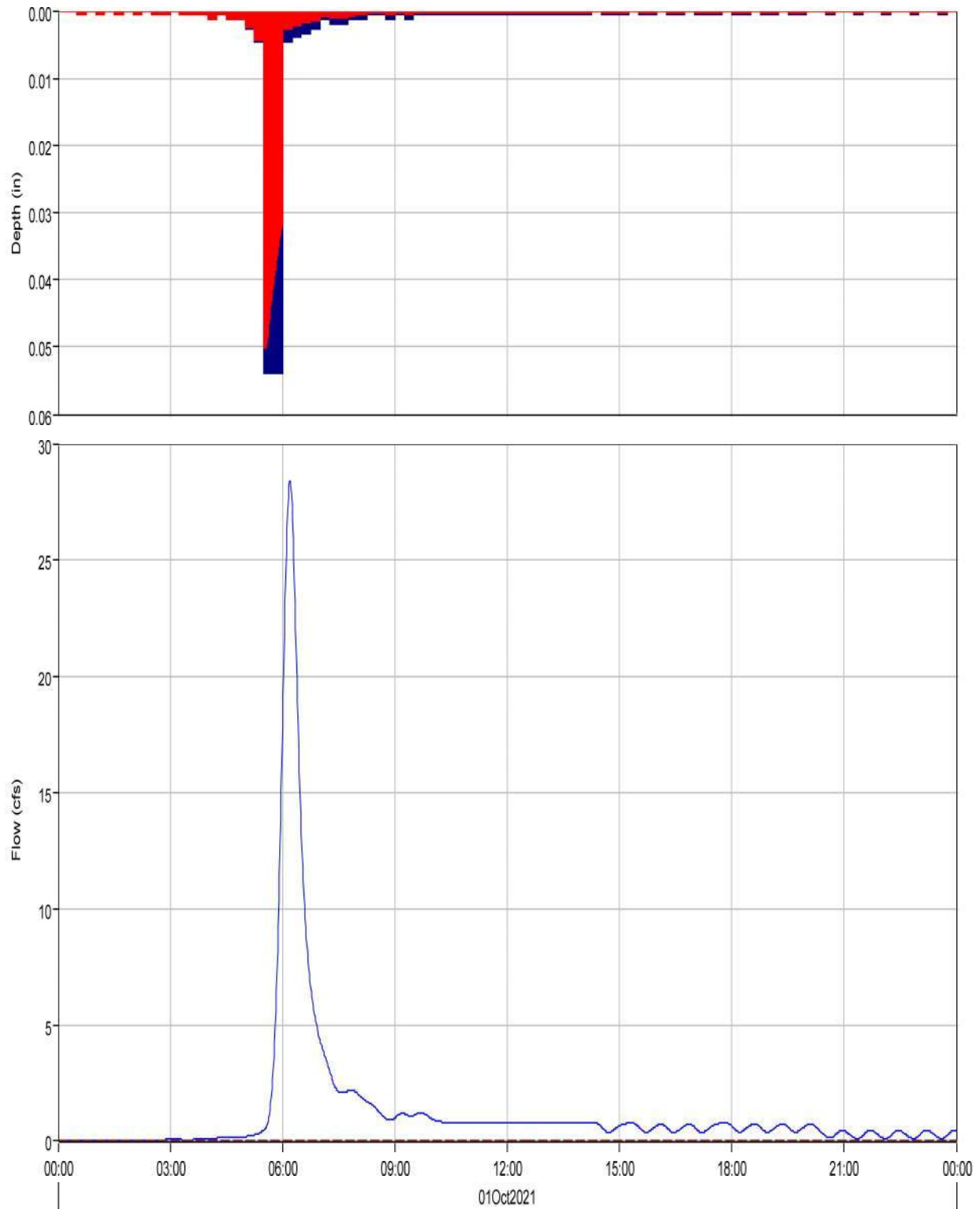
Run:EV 5-yr Pr. Type IIA NR Element:OB7 Result:Precipitation  
Run:EV 5-yr Pr. Type IIA NR Element:OB7 Result:Outflow  
Run:EV 5-YR PR. TYPE IIA NR Element:OB7 Result:Precipitation Loss  
Run:EV 5-YR PR. TYPE IIA NR Element:OB7 Result:Baseflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Pr. Type IIA NR Subbasin: OB7  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:52 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Discharge :	126.8 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:38
Total Precipitation :	94.8 (AC-FT)	Total Direct Runoff :	21.8 (AC-FT)
Total Loss :	72.7 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	22.0 (AC-FT)	Discharge :	21.8 (AC-FT)

Subbasin "OB8" Results for Run "EV 5-yr Pr. Type IIA NR"



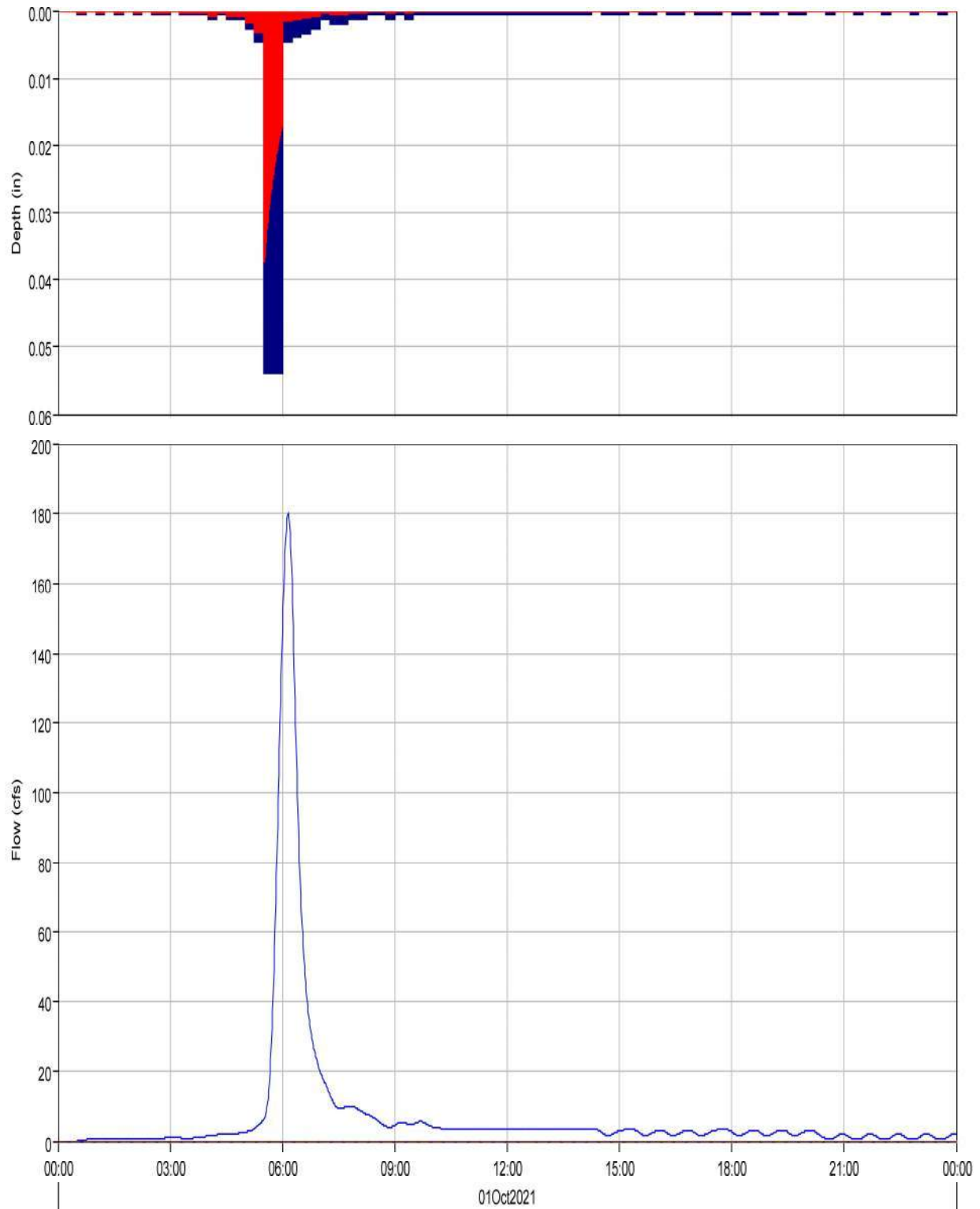
- Run:EV 5-yr Pr. Type IIA NR Element:OB8 Result:Precipitation
- Run:EV 5-yr Pr. Type IIA NR Element:OB8 Result:Outflow
- Run:EV 5-YR PR. TYPE IIA NR Element:OB8 Result:Precipitation Loss
- Run:EV 5-YR PR. TYPE IIA NR Element:OB8 Result:Baseflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Pr. Type IIA NR Subbasin: OB8  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:52 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Discharge :	28.4 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:12
Total Precipitation :	9.0 (AC-FT)	Total Direct Runoff :	2.6 (AC-FT)
Total Loss :	6.4 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	2.6 (AC-FT)	Discharge :	2.6 (AC-FT)

Subbasin "OB9" Results for Run "EV 5-yr Pr. Type IIA NR"



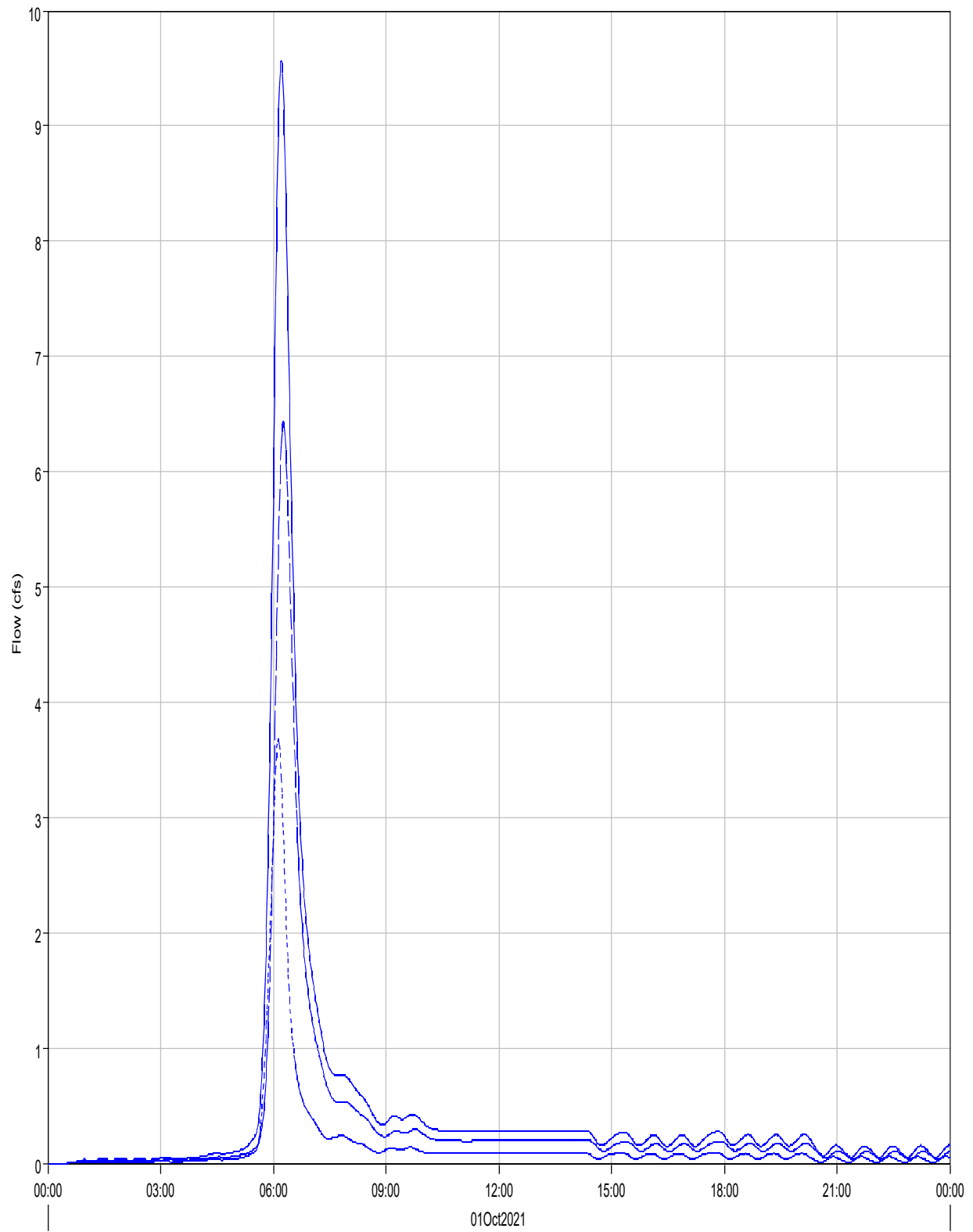
- Run:EV 5-yr Pr. Type IIA NR Element:OB9 Result:Precipitation
- Run:EV 5-yr Pr. Type IIA NR Element:OB9 Result:Precipitation Loss
- Run:EV 5-yr Pr. Type IIA NR Element:OB9 Result:Outflow
- Run:EV 5-yr Pr. Type IIA NR Element:OB9 Result:Baseflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Pr. Type IIA NR Subbasin: OB9  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:52 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Discharge :	180.0 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:09
Total Precipitation :	26.4 (AC-FT)	Total Direct Runoff :	14.9 (AC-FT)
Total Loss :	11.5 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	14.9 (AC-FT)	Discharge :	14.9 (AC-FT)

Junction "P1" Results for Run "EV 5-yr Pr. Type IIA NR"



Run:EV 5-yr Pr. Type IIA NR Element:P1 Result:Outflow    Run:EV 5-yr Pr. Type IIA NR Element:R-OB1 Result:Outflow    Run:EV 5-yr Pr. Type IIA NR Element:PB1 Result:Outflow

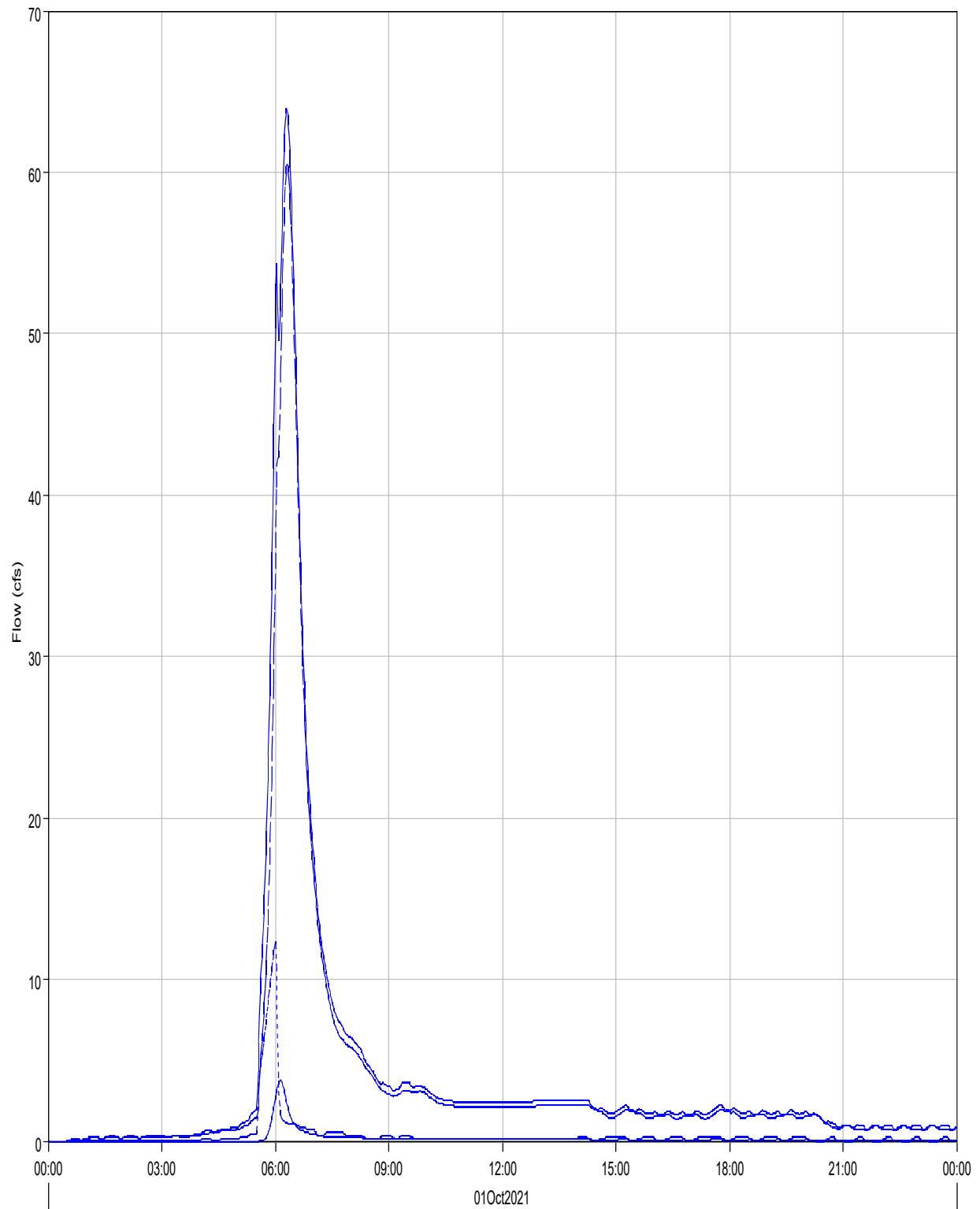
Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Pr. Type IIA NR Junction: P1  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:52 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Outflow :	9.6 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 06:13
Total Outflow :	0.9 (AC-FT)		



Junction "P2" Results for Run "EV 5-yr Pr. Type IIA NR"



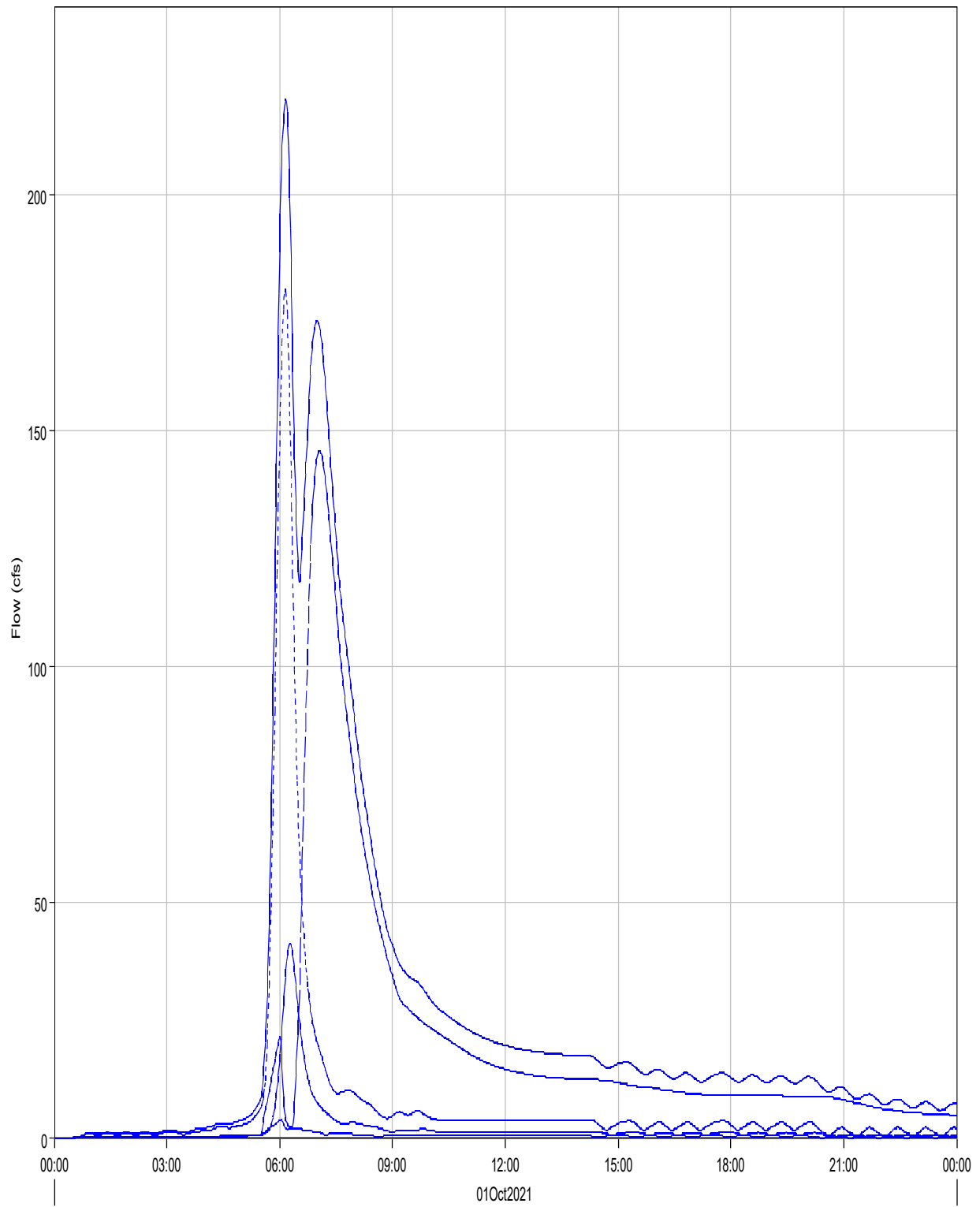
Run:EV 5-yr Pr. Type IIA NR Element:P2 Result:Outflow    Run:EV 5-yr Pr. Type IIA NR Element:R-PB6 Result:Outflow    Run:EV 5-yr Pr. Type IIA NR Element:PB15 Result:Outflow  
Run:EV 5-yr Pr. Type IIA NR Element:PB7 Result:Outflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Pr. Type IIA NR Junction: P2  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:52 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Outflow :	63.9 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 06:18
Total Outflow :	8.3 (AC-FT)		

Junction "P3" Results for Run "EV 5-yr Pr. Type IIA NR"



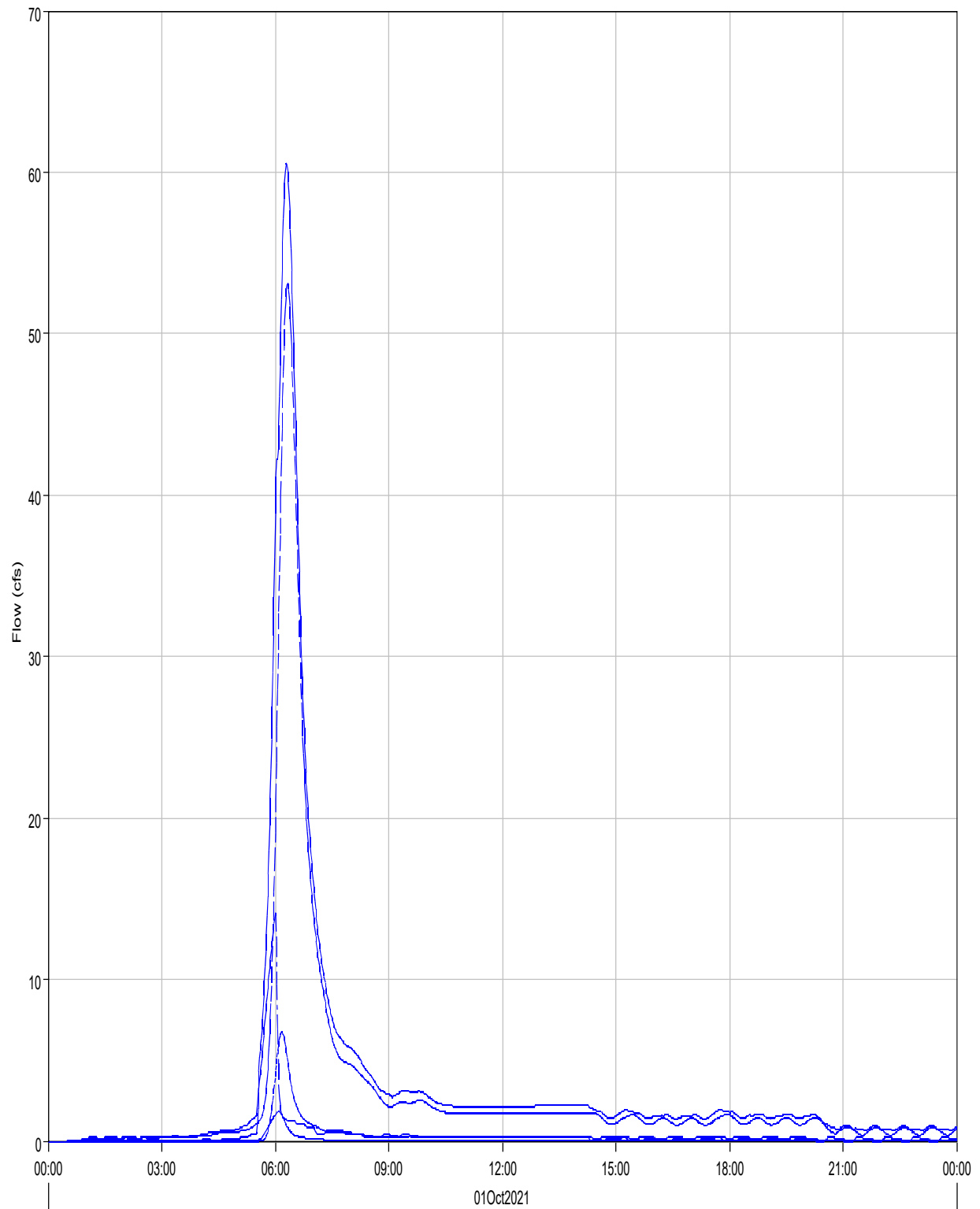
Run:EV 5-yr Pr. Type IIA NR Element:P3 Result:Outflow     
 Run:EV 5-yr Pr. Type IIA NR Element:R-PB13 Result:Outflow     
 Run:EV 5-yr Pr. Type IIA NR Element:OB9 Result:Outflow  
 Run:EV 5-yr Pr. Type IIA NR Element:R-PB11 Result:Outflow     
 Run:EV 5-yr Pr. Type IIA NR Element:PB14 Result:Outflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Pr. Type IIA NR Junction: P3  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:52 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Outflow : 220.3 (CFS) Date/Time of Peak Outflow : 01Oct2021, 06:10  
Total Outflow : 52.5 (AC-FT)

Junction "P4" Results for Run "EV 5-yr Pr. Type IIA NR"



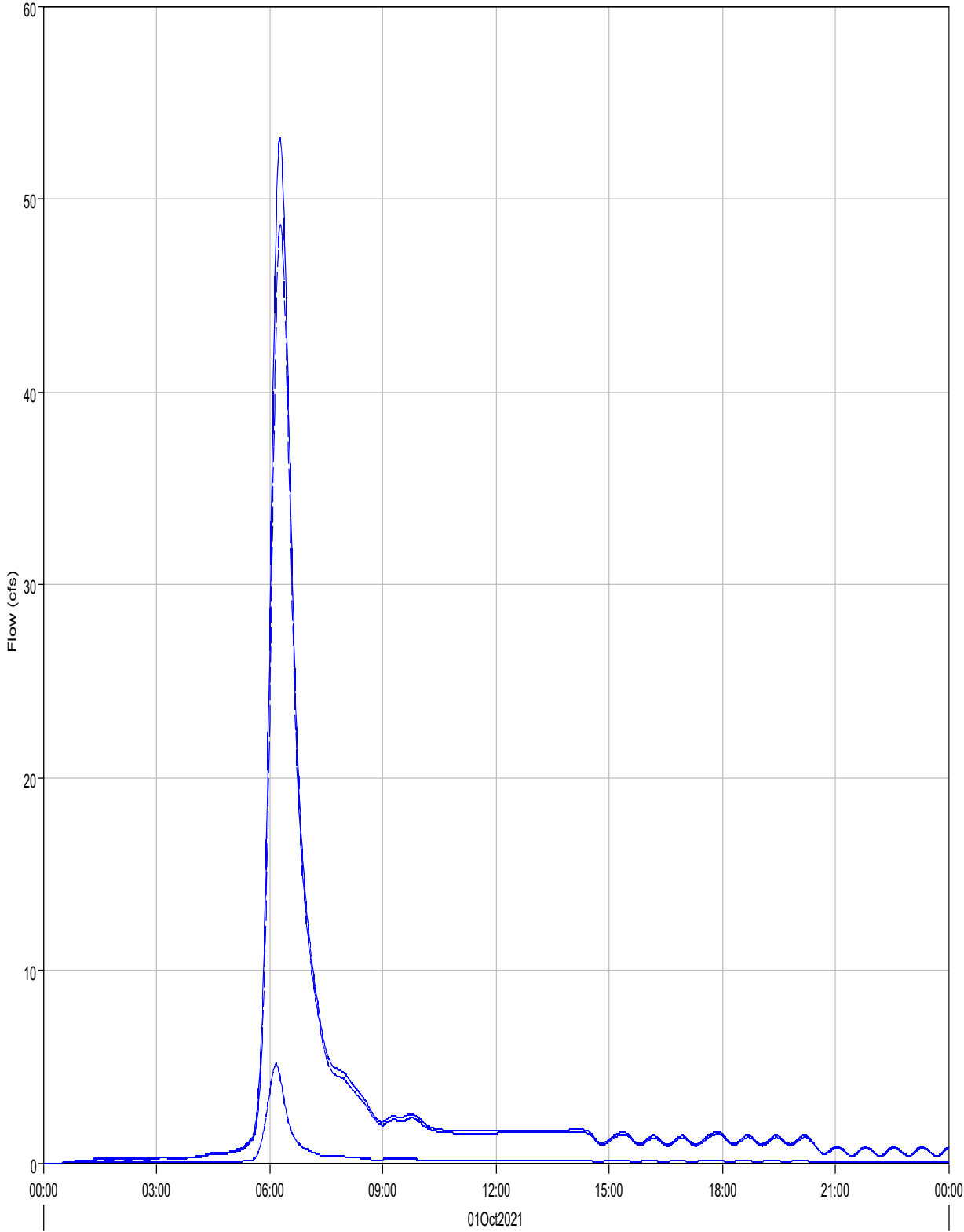
Run:EV 5-yr Pr. Type IIA NR Element:P4 Result:Outflow    Run:EV 5-yr Pr. Type IIA NR Element:R-PB5 Result:Outflow    Run:EV 5-yr Pr. Type IIA NR Element:PB6 Result:Outflow  
Run:EV 5-yr Pr. Type IIA NR Element:PB4 Result:Outflow    Run:EV 5-yr Pr. Type IIA NR Element:PB3 Result:Outflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Pr. Type IIA NR Junction: P4  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:52 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Outflow :	60.5 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 06:18
Total Outflow :	7.2 (AC-FT)		

Junction "P5" Results for Run "EV 5-yr Pr. Type IIA NR"



Run:EV 5-yr Pr. Type IIA NR Element:P5 Result:Outflow    Run:EV 5-yr Pr. Type IIA NR Element:R-OB4 Result:Outflow    Run:EV 5-yr Pr. Type IIA NR Element:PB5 Result:Outflow

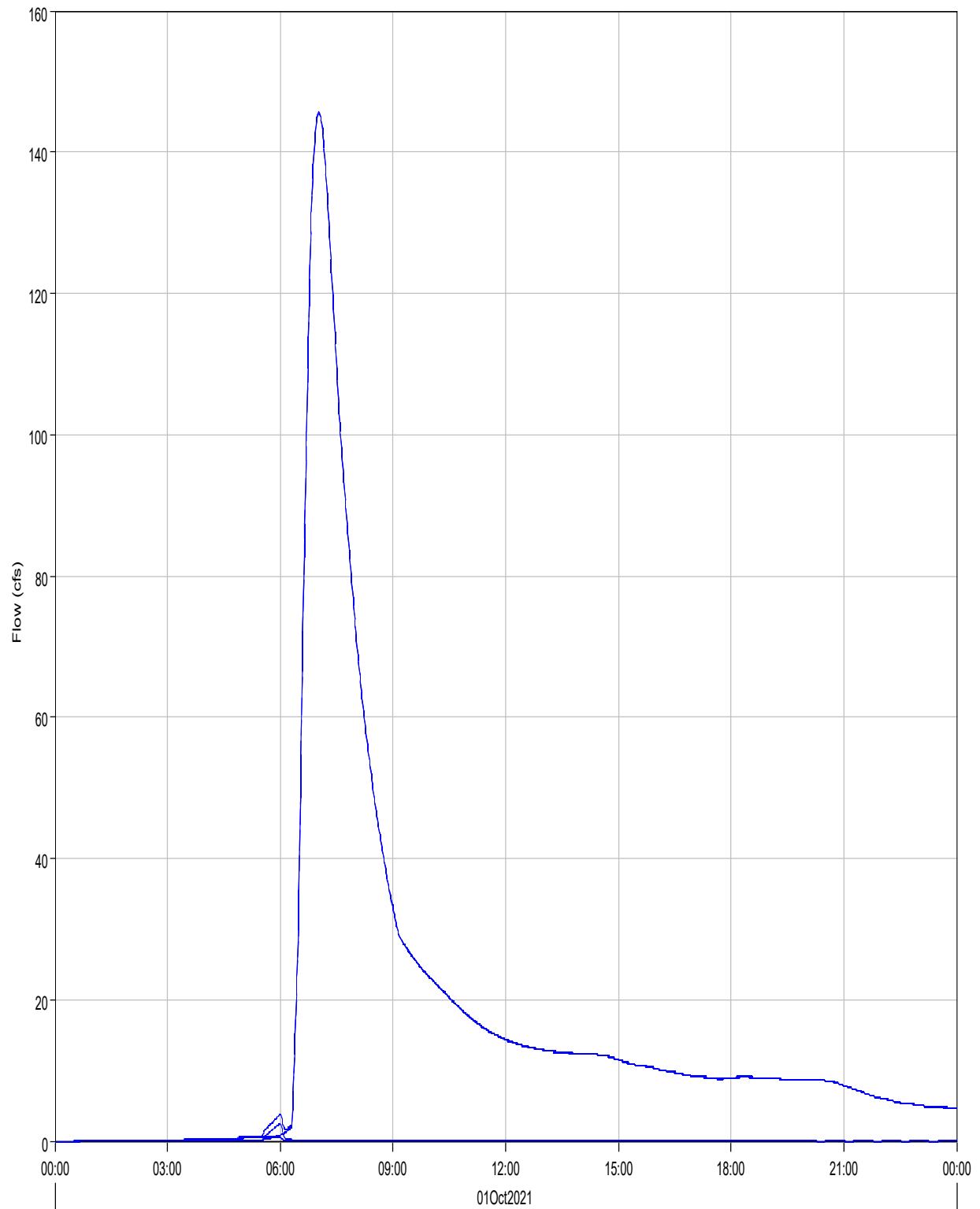
Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Pr. Type IIA NR Junction: P5  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:52 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Outflow :	53.1 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 06:17
Total Outflow :	5.7 (AC-FT)		



Junction "P6" Results for Run "EV 5-yr Pr. Type IIA NR"



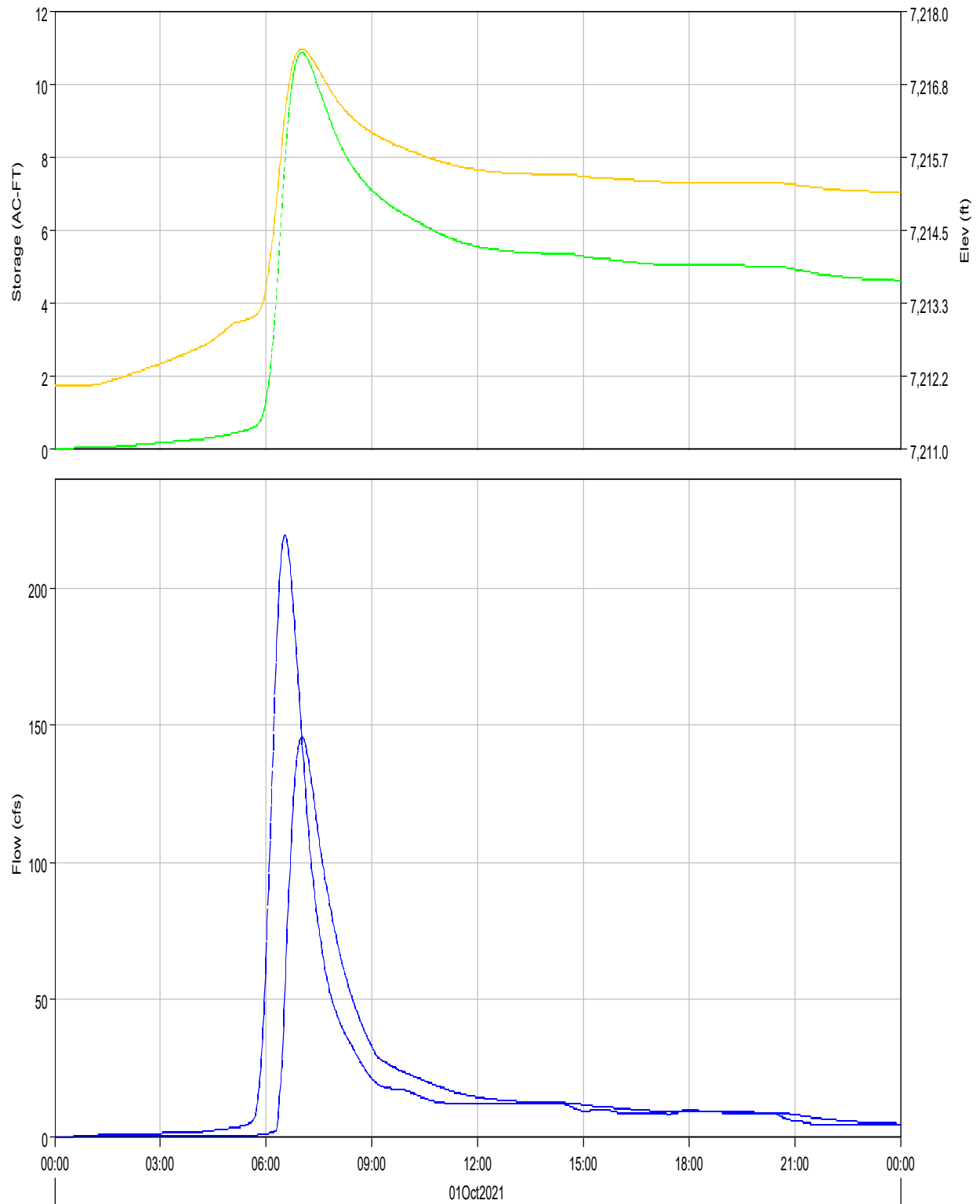
Run:EV 5-yr Pr. Type IIA NR Element:P6 Result:Outflow    Run:EV 5-yr Pr. Type IIA NR Element:R-PB10 Result:Outflow    Run:EV 5-yr Pr. Type IIA NR Element:PB13 Result:Outflow  
Run:EV 5-yr Pr. Type IIA NR Element:PB12 Result:Outflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Pr. Type IIA NR Junction: P6  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:52 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Outflow : 145.6 (CFS) Date/Time of Peak Outflow : 01Oct2021, 07:02  
Total Outflow : 32.6 (AC-FT)

Reservoir "P7" Results for Run "EV 5-yr Pr. Type IIA NR"



--- Run:EV 5-YR PR. TYPE IIA NR Element:P7 Result:Storage  
 — Run:EV 5-yr Pr. Type IIA NR Element:P7 Result:Outflow

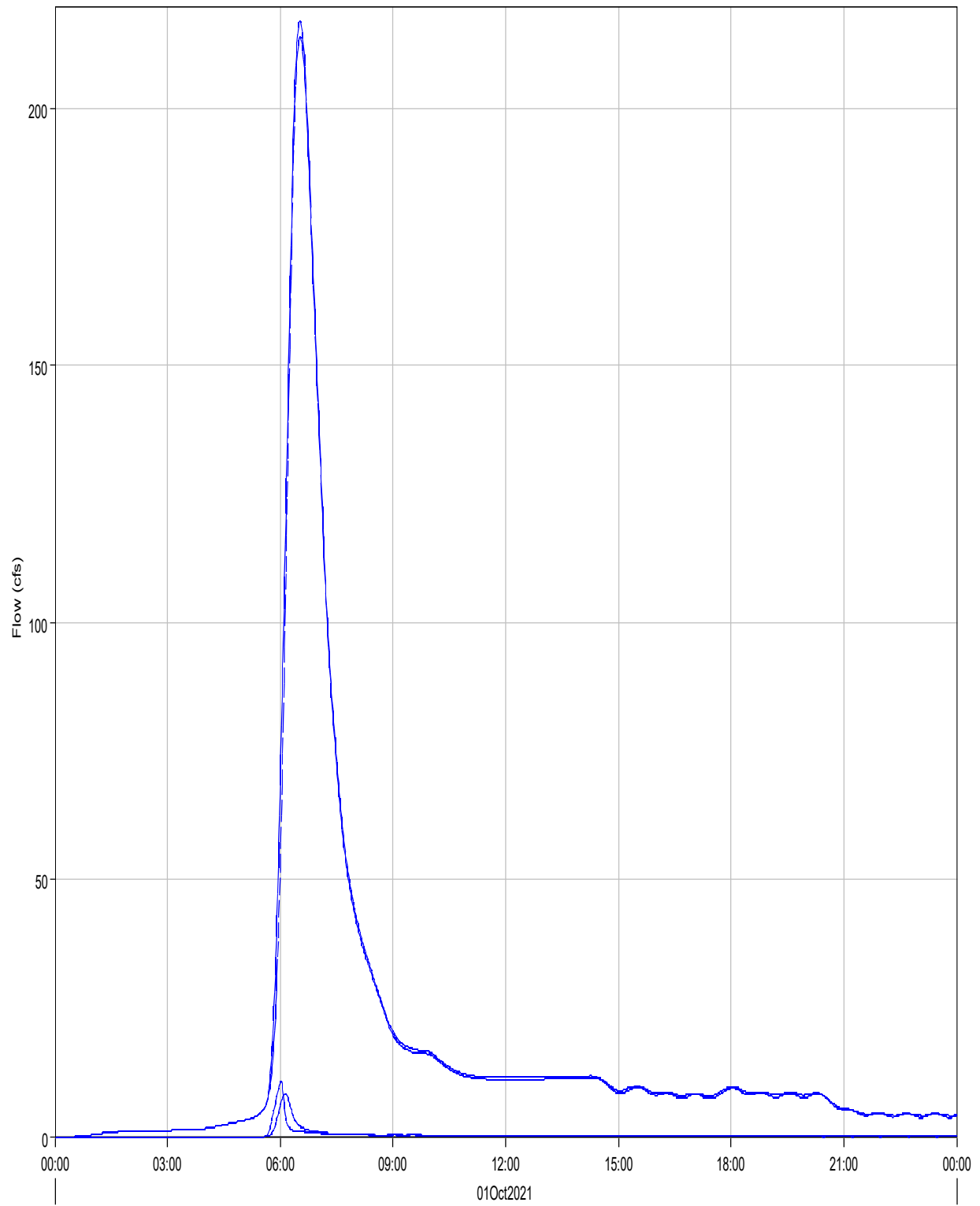
--- Run:EV 5-YR PR. TYPE IIA NR Element:P7 Result:Pool Elevation  
 - - - Run:EV 5-YR PR. TYPE IIA NR Element:P7 Result:Combined Flow

Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Pr. Type IIA NR Reservoir: P7  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:52 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Inflow :	219.3 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 06:32
Peak Outflow :	145.5 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 07:01
Total Inflow :	37.0 (AC-FT)	Peak Storage :	10.9 (AC-FT)
Total Outflow :	32.4 (AC-FT)	Peak Elevation :	7217.4 (FT)

Junction "P8" Results for Run "EV 5-yr Pr. Type IIA NR"



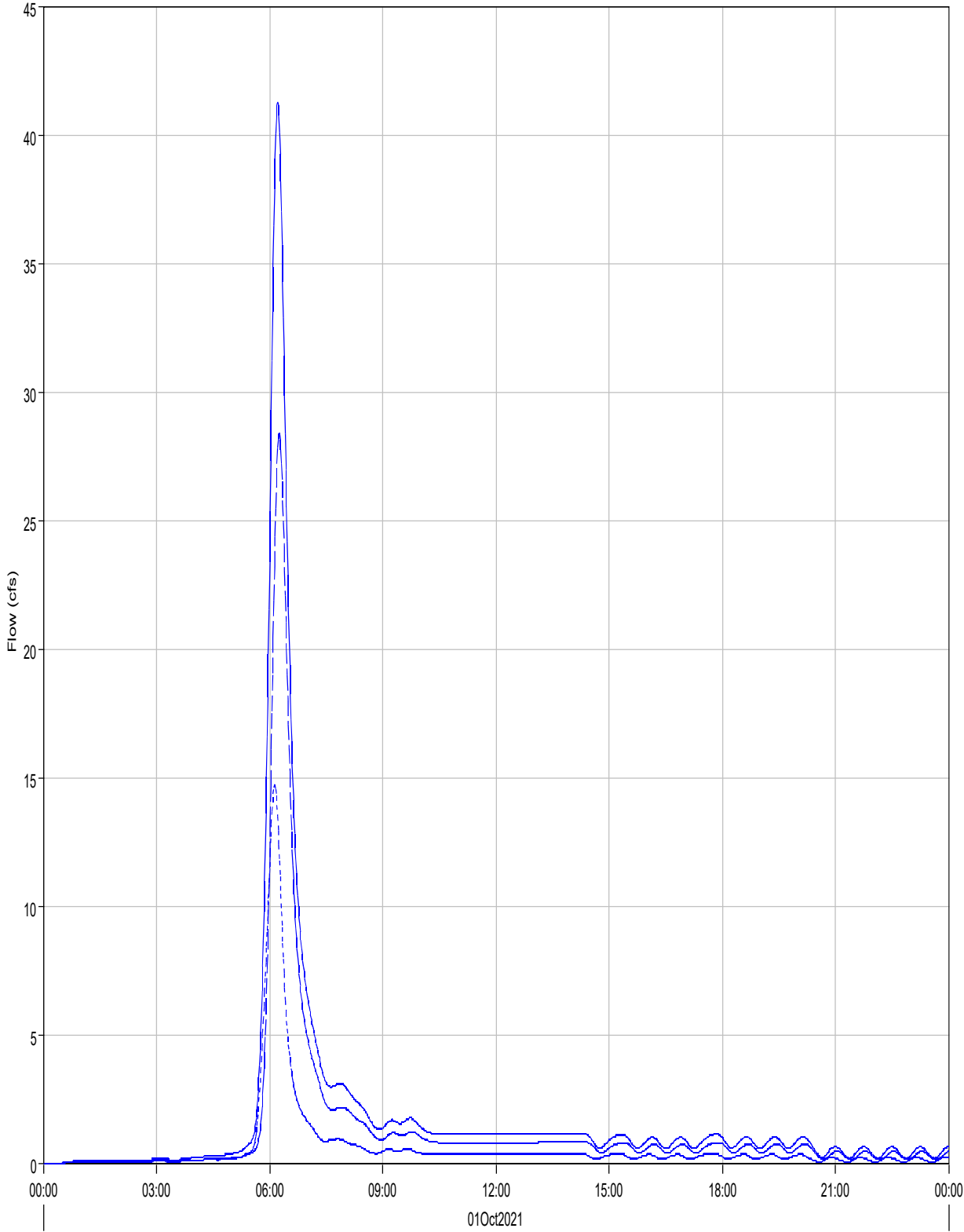
Run:EV 5-yr Pr. Type IIA NR Element:P8 Result:Outflow    Run:EV 5-yr Pr. Type IIA NR Element:R-OB7 Result:Outflow    Run:EV 5-yr Pr. Type IIA NR Element:PB9 Result:Outflow  
Run:EV 5-yr Pr. Type IIA NR Element:PB8 Result:Outflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Pr. Type IIA NR Junction: P8  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:52 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Outflow : 217.0 (CFS) Date/Time of Peak Outflow : 01Oct2021, 06:32  
Total Outflow : 36.4 (AC-FT)

Junction "P9" Results for Run "EV 5-yr Pr. Type IIA NR"



Run:EV 5-yr Pr. Type IIA NR Element:P9 Result:Outflow    Run:EV 5-yr Pr. Type IIA NR Element:R-OB8 Result:Outflow    Run:EV 5-yr Pr. Type IIA NR Element:PB11 Result:Outflow

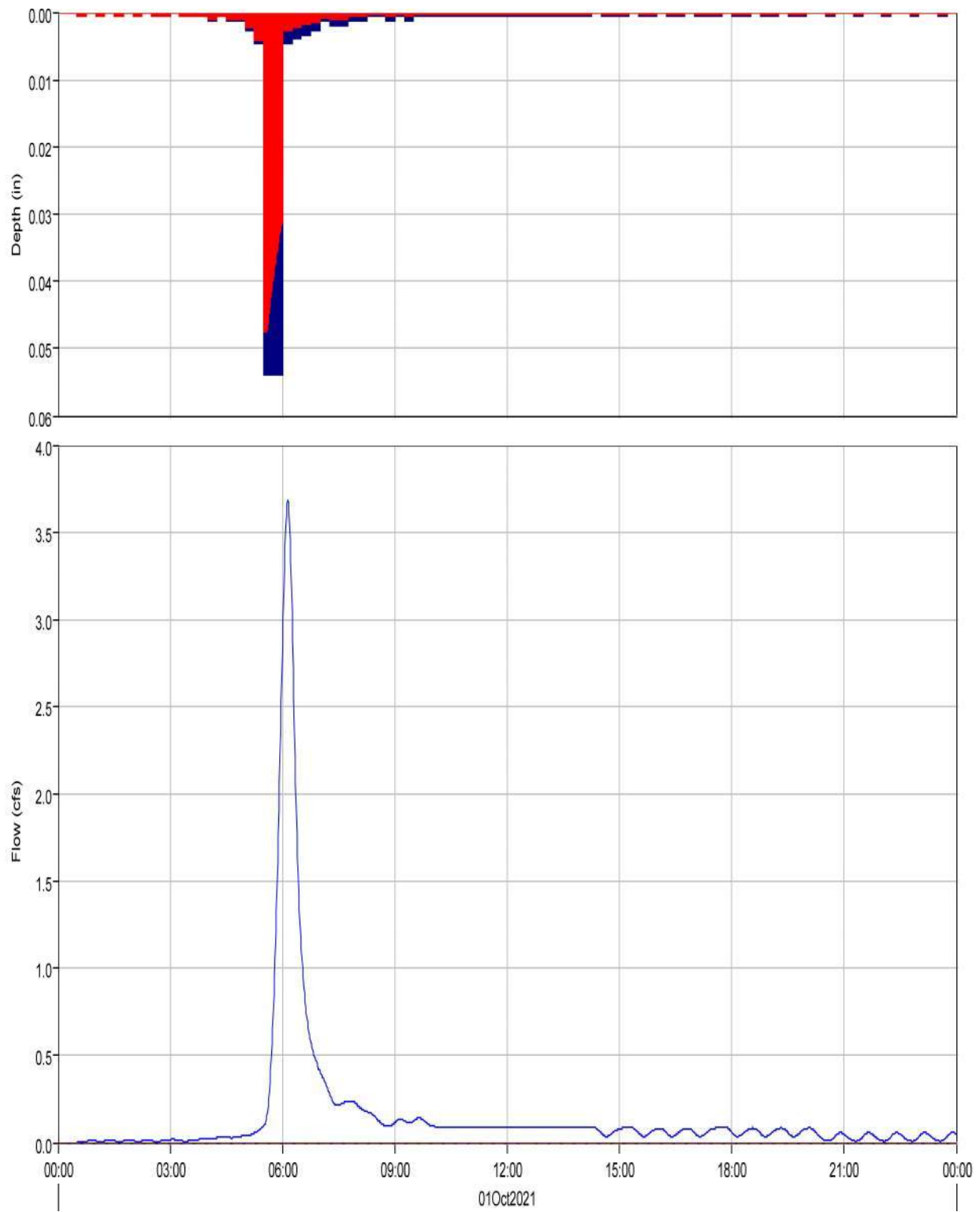
Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Pr. Type IIA NR Junction: P9  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:52 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Outflow :	41.3 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 06:13
Total Outflow :	3.8 (AC-FT)		



Subbasin "PB1" Results for Run "EV 5-yr Pr. Type IIA NR"



Run:EV 5-yr Pr. Type IIA NR Element:PB1 Result:Precipitation  
Run:EV 5-yr Pr. Type IIA NR Element:PB1 Result:Outflow

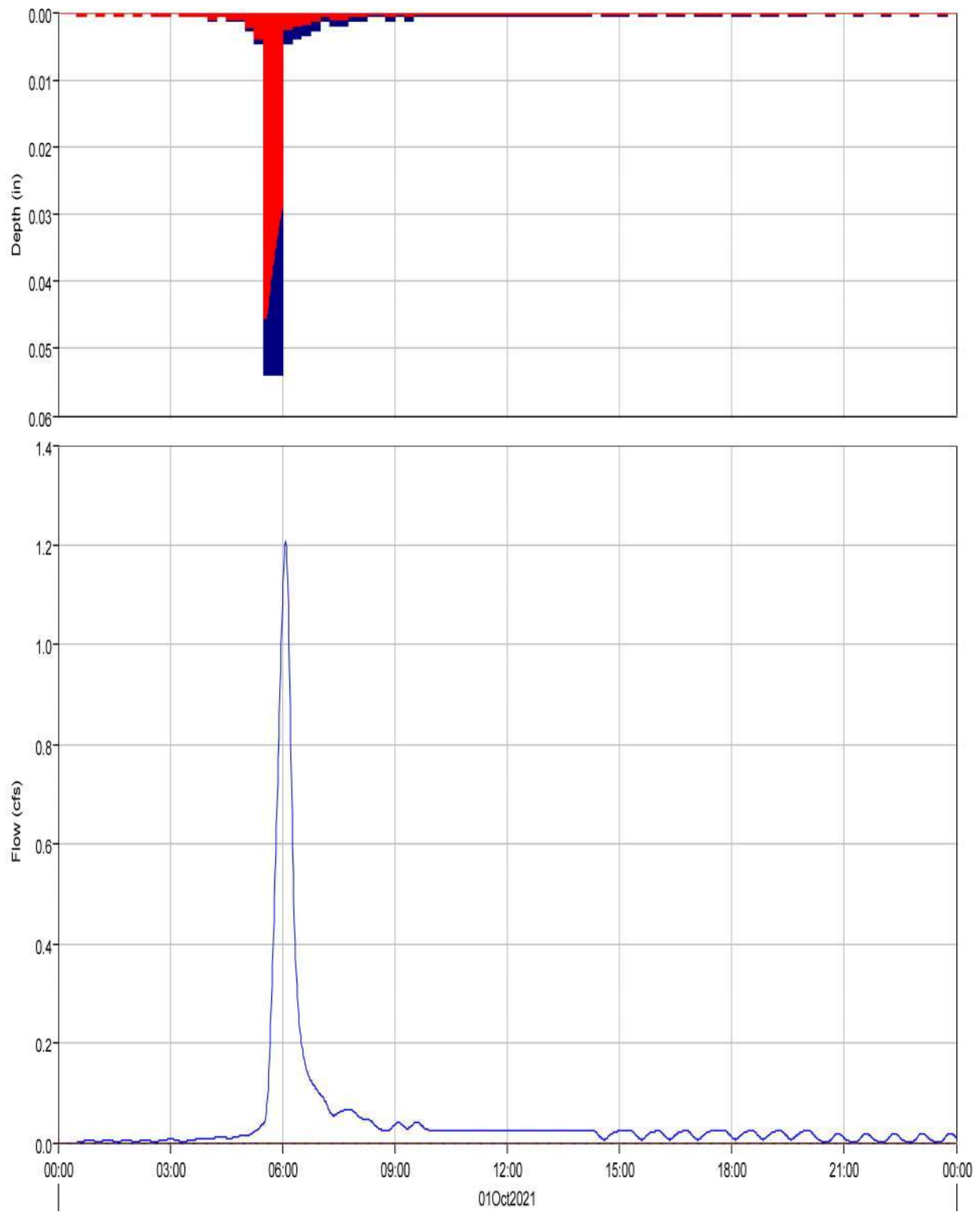
Run:EV 5-YR PR. TYPE IIA NR Element:PB1 Result:Precipitation Loss  
Run:EV 5-YR PR. TYPE IIA NR Element:PB1 Result:Baseflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Pr. Type IIA NR Subbasin: PB1  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:52 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Discharge :	3.7 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:08
Total Precipitation :	1.0 (AC-FT)	Total Direct Runoff :	0.3 (AC-FT)
Total Loss :	0.7 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	0.3 (AC-FT)	Discharge :	0.3 (AC-FT)

Subbasin "PB2" Results for Run "EV 5-yr Pr. Type IIA NR"



Run:EV 5-yr Pr. Type IIA NR Element:PB2 Result:Precipitation  
Run:EV 5-yr Pr. Type IIA NR Element:PB2 Result:Outflow

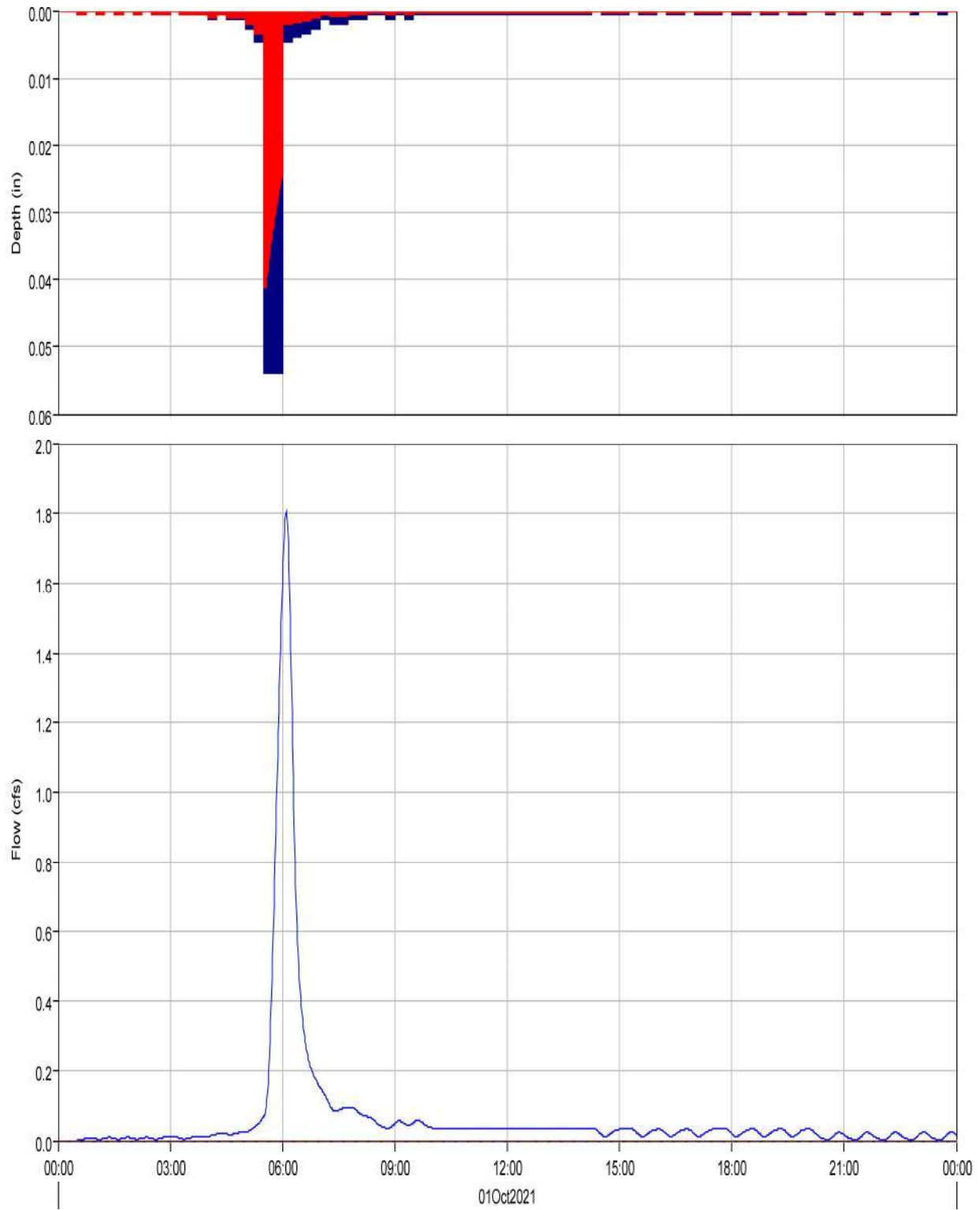
Run:EV 5-YR PR. TYPE IIA NR Element:PB2 Result:Precipitation Loss  
Run:EV 5-YR PR. TYPE IIA NR Element:PB2 Result:Baseflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Pr. Type IIA NR Subbasin: PB2  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:52 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Discharge :	1.2 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:05
Total Precipitation :	0.2 (AC-FT)	Total Direct Runoff :	0.1 (AC-FT)
Total Loss :	0.2 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	0.1 (AC-FT)	Discharge :	0.1 (AC-FT)

Subbasin "PB3" Results for Run "EV 5-yr Pr. Type IIA NR"



Run:EV 5-yr Pr. Type IIA NR Element:PB3 Result:Precipitation  
Run:EV 5-yr Pr. Type IIA NR Element:PB3 Result:Outflow

Run:EV 5-YR PR. TYPE IIA NR Element:PB3 Result:Precipitation Loss  
Run:EV 5-YR PR. TYPE IIA NR Element:PB3 Result:Baseflow

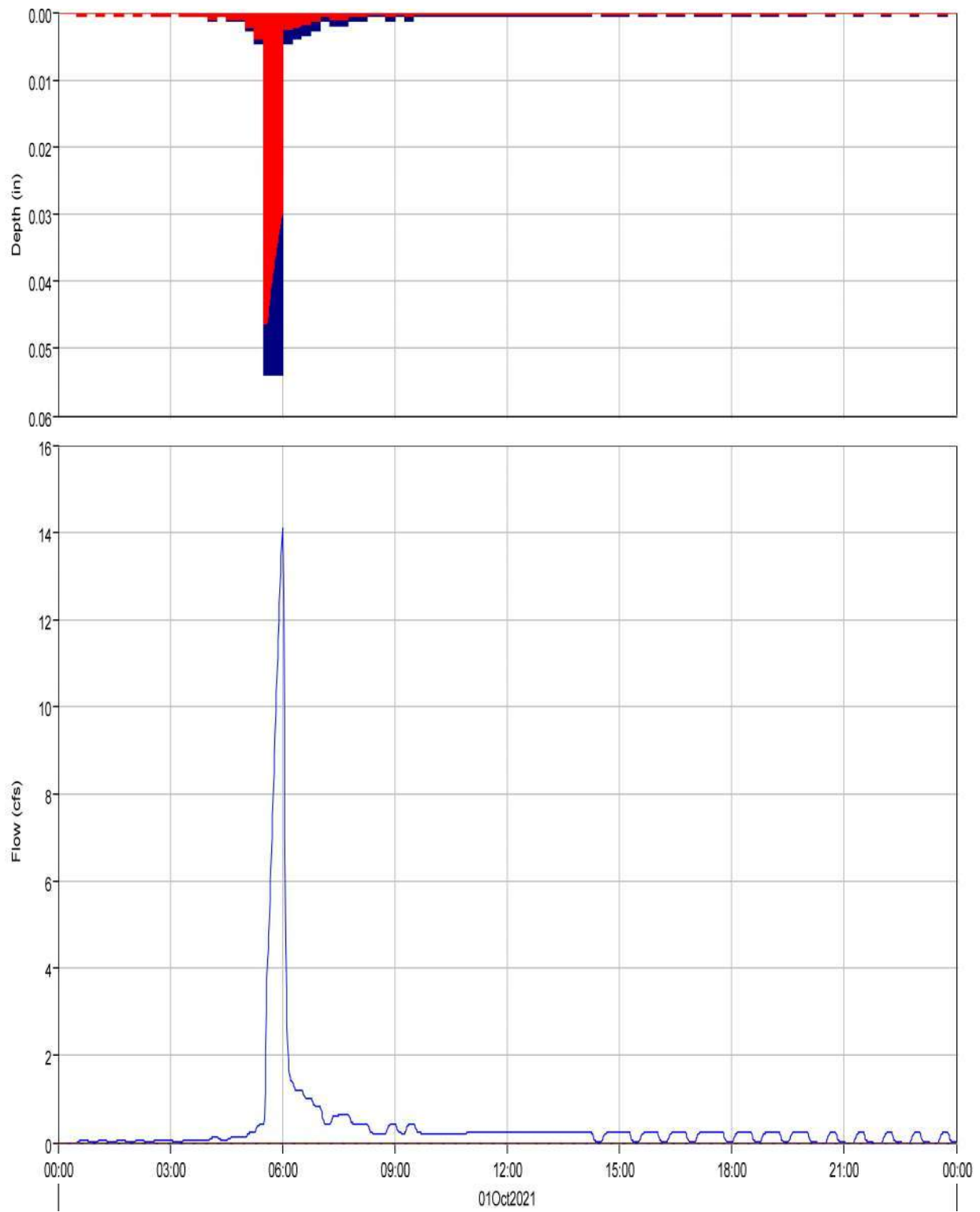
Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Pr. Type IIA NR Subbasin: PB3  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:52 Control Specifications: 24-hr Storm

Volume Units: AC-FT

#### Computed Results

Peak Discharge :	1.8 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:06
Total Precipitation :	0.3 (AC-FT)	Total Direct Runoff :	0.1 (AC-FT)
Total Loss :	0.2 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	0.1 (AC-FT)	Discharge :	0.1 (AC-FT)

Subbasin "PB4" Results for Run "EV 5-yr Pr. Type IIA NR"



Run:EV 5-yr Pr. Type IIA NR Element:PB4 Result:Precipitation  
Run:EV 5-yr Pr. Type IIA NR Element:PB4 Result:Outflow

Run:EV 5-YR PR. TYPE IIA NR Element:PB4 Result:Precipitation Loss  
Run:EV 5-YR PR. TYPE IIA NR Element:PB4 Result:Baseflow

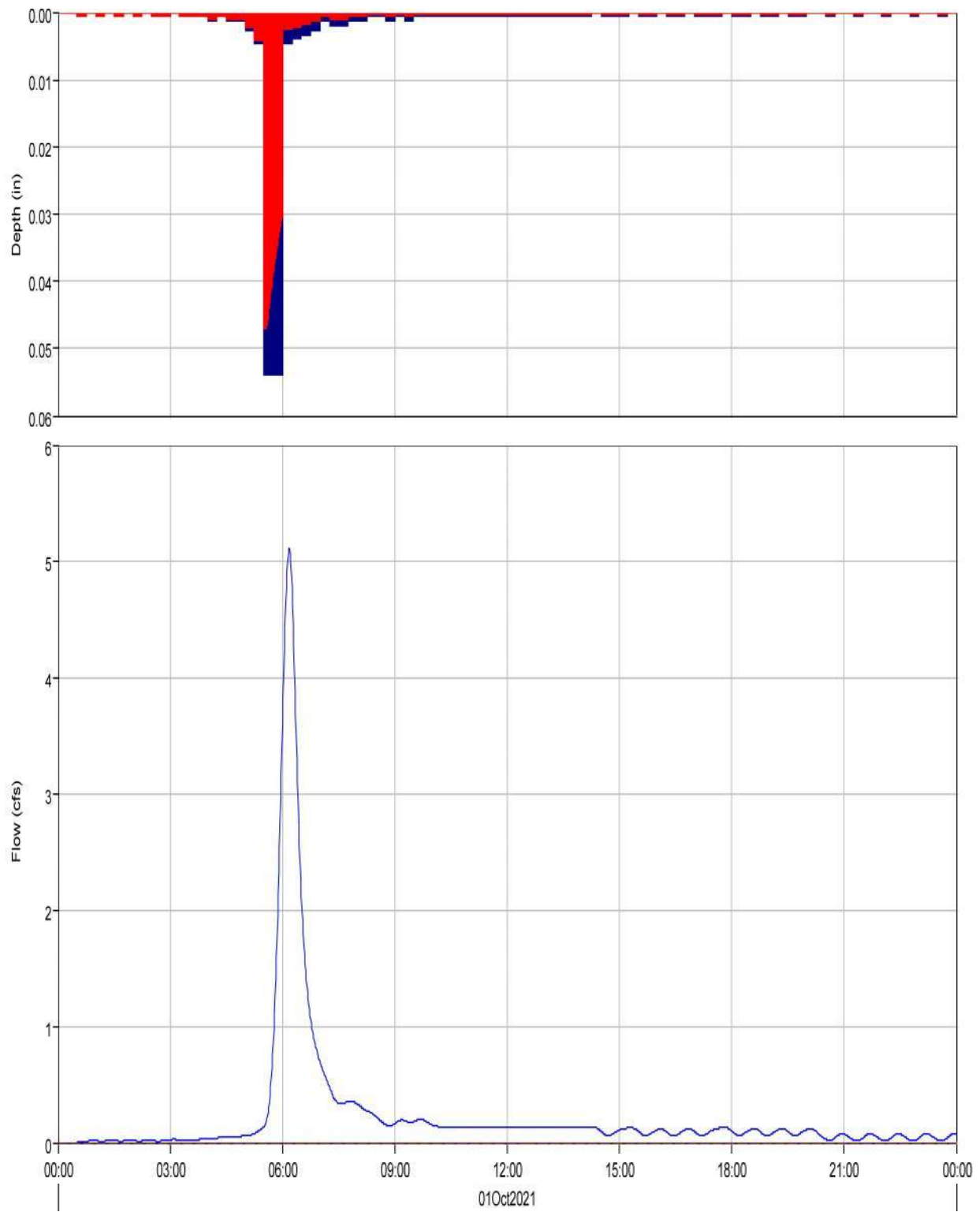
Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Pr. Type IIA NR Subbasin: PB4  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:52 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Discharge :	14.1 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:00
Total Precipitation :	2.4 (AC-FT)	Total Direct Runoff :	0.8 (AC-FT)
Total Loss :	1.6 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	0.8 (AC-FT)	Discharge :	0.8 (AC-FT)



Subbasin "PB5" Results for Run "EV 5-yr Pr. Type IIA NR"



Run:EV 5-yr Pr. Type IIA NR Element:PB5 Result:Precipitation  
Run:EV 5-yr Pr. Type IIA NR Element:PB5 Result:Outflow

Run:EV 5-YR PR. TYPE IIA NR Element:PB5 Result:Precipitation Loss  
Run:EV 5-YR PR. TYPE IIA NR Element:PB5 Result:Baseflow

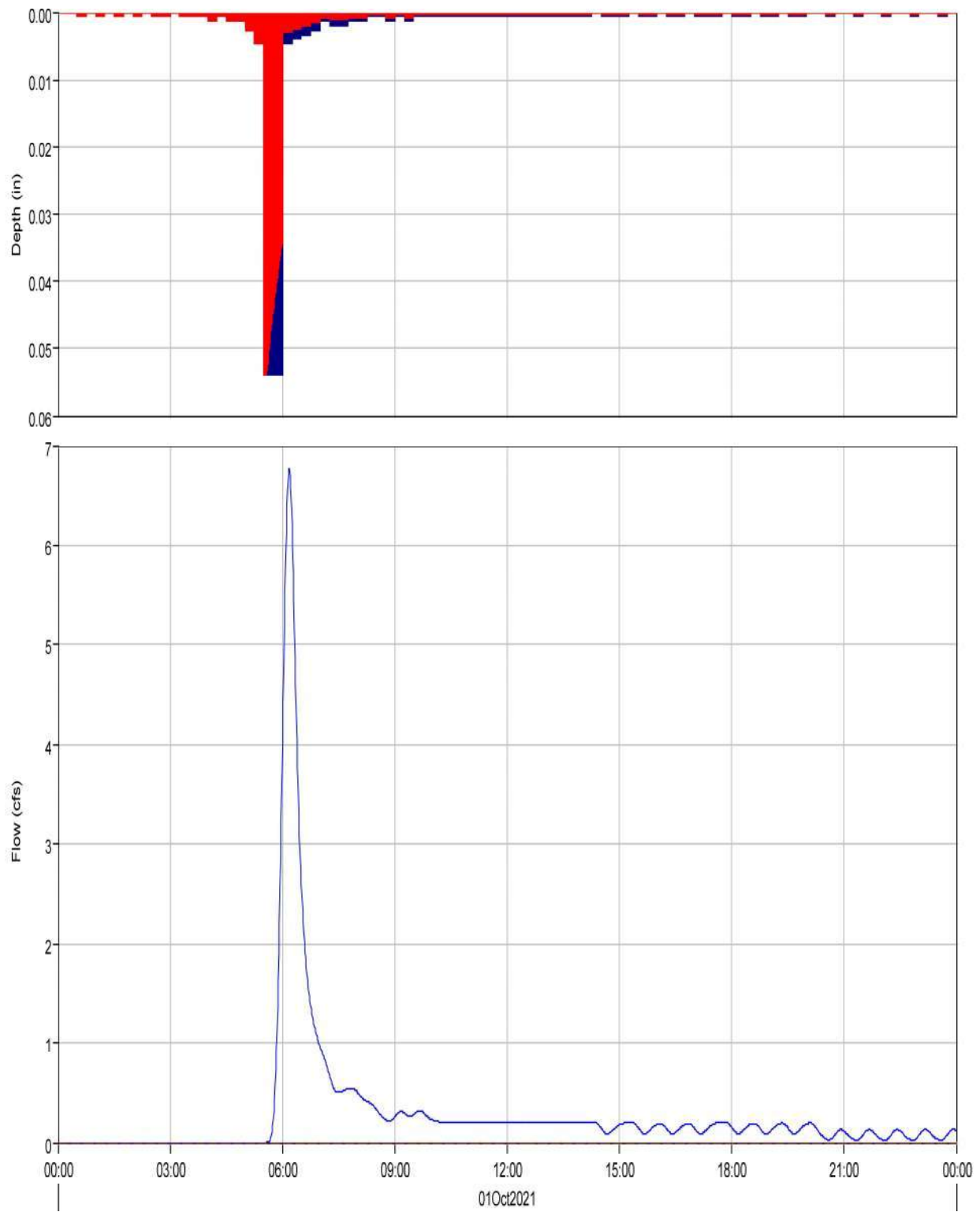
Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Pr. Type IIA NR Subbasin: PB5  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:52 Control Specifications: 24-hr Storm

Volume Units: AC-FT

#### Computed Results

Peak Discharge :	5.1 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:10
Total Precipitation :	1.4 (AC-FT)	Total Direct Runoff :	0.5 (AC-FT)
Total Loss :	0.9 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	0.5 (AC-FT)	Discharge :	0.5 (AC-FT)

Subbasin "PB6" Results for Run "EV 5-yr Pr. Type IIA NR"



Run:EV 5-yr Pr. Type IIA NR Element:PB6 Result:Precipitation  
Run:EV 5-yr Pr. Type IIA NR Element:PB6 Result:Outflow

Run:EV 5-YR PR. TYPE IIA NR Element:PB6 Result:Precipitation Loss  
Run:EV 5-YR PR. TYPE IIA NR Element:PB6 Result:Baseflow

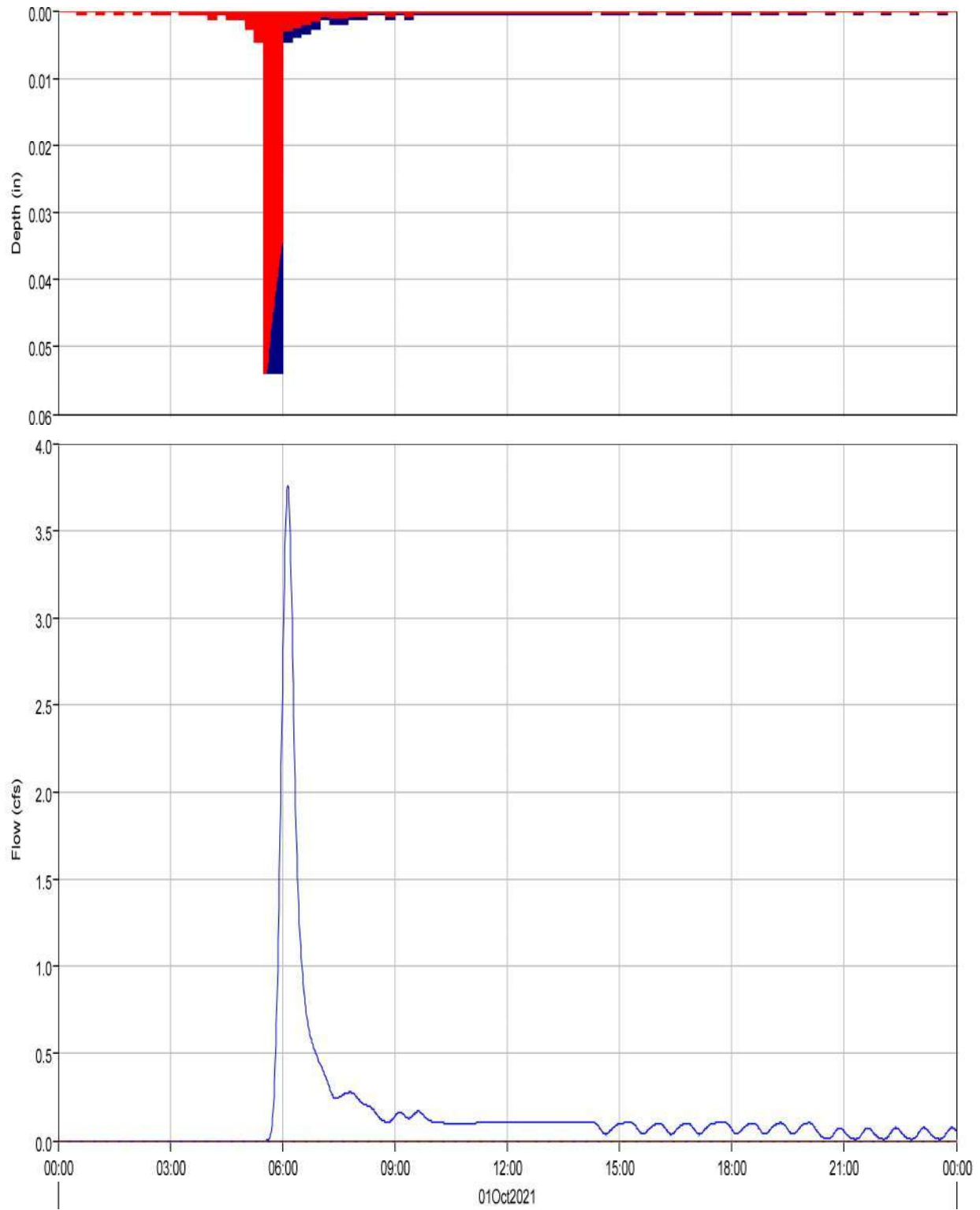
Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Pr. Type IIA NR Subbasin: PB6  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:52 Control Specifications: 24-hr Storm

Volume Units: AC-FT

#### Computed Results

Peak Discharge :	6.8 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:10
Total Precipitation :	2.5 (AC-FT)	Total Direct Runoff :	0.6 (AC-FT)
Total Loss :	1.9 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	0.6 (AC-FT)	Discharge :	0.6 (AC-FT)

Subbasin "PB7" Results for Run "EV 5-yr Pr. Type IIA NR"



Run:EV 5-yr Pr. Type IIA NR Element:PB7 Result:Precipitation

Run:EV 5-yr Pr. Type IIA NR Element:PB7 Result:Outflow

Run:EV 5-YR PR. TYPE IIA NR Element:PB7 Result:Precipitation Loss

Run:EV 5-YR PR. TYPE IIA NR Element:PB7 Result:Baseflow

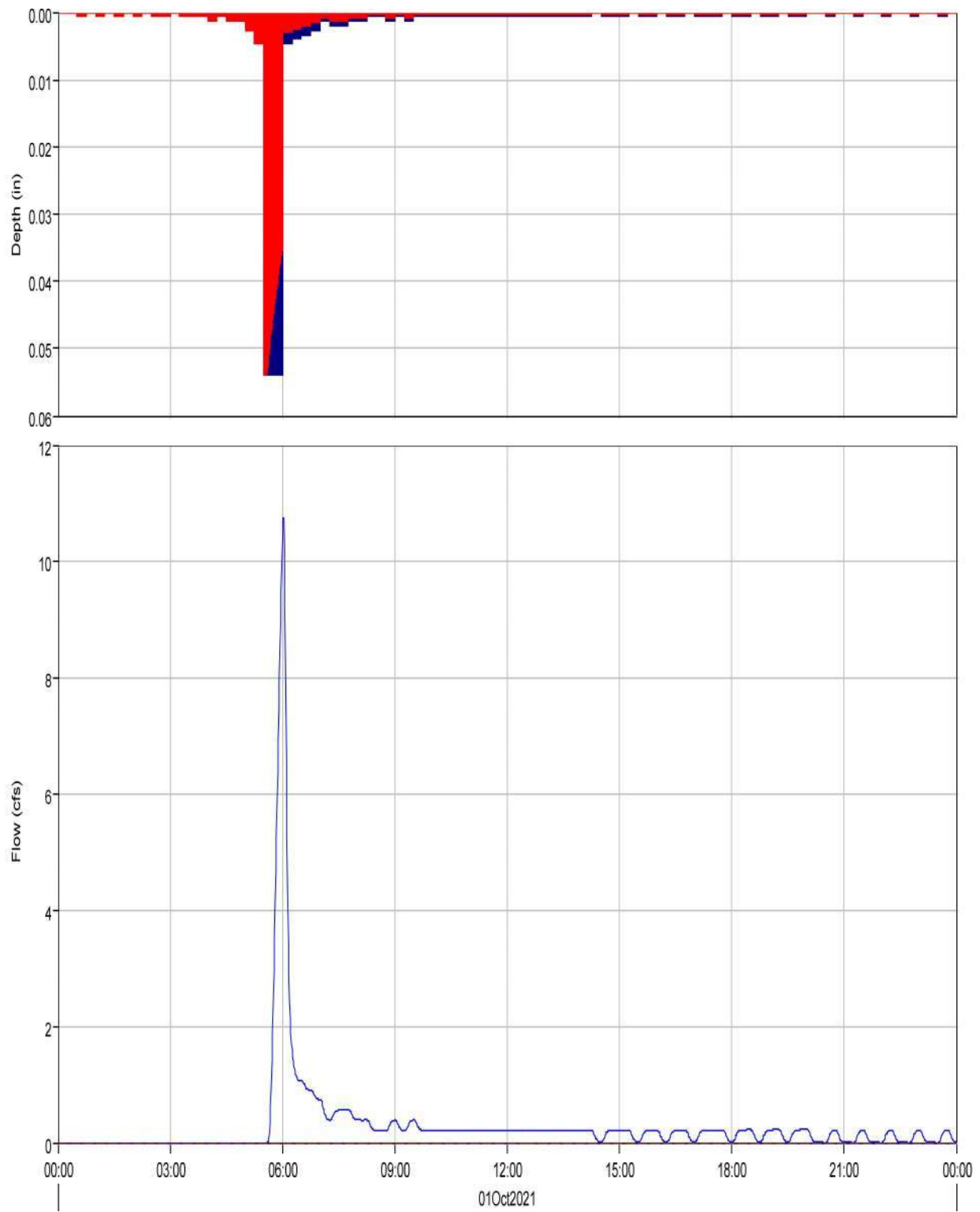
Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Pr. Type IIA NR Subbasin: PB7  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:52 Control Specifications: 24-hr Storm

Volume Units: AC-FT

#### Computed Results

Peak Discharge :	3.8 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:08
Total Precipitation :	1.3 (AC-FT)	Total Direct Runoff :	0.3 (AC-FT)
Total Loss :	1.0 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	0.3 (AC-FT)	Discharge :	0.3 (AC-FT)

Subbasin "PB8" Results for Run "EV 5-yr Pr. Type IIA NR"



Run:EV 5-yr Pr. Type IIA NR Element:PB8 Result:Precipitation  
Run:EV 5-yr Pr. Type IIA NR Element:PB8 Result:Outflow

Run:EV 5-YR PR. TYPE IIA NR Element:PB8 Result:Precipitation Loss  
Run:EV 5-YR PR. TYPE IIA NR Element:PB8 Result:Baseflow

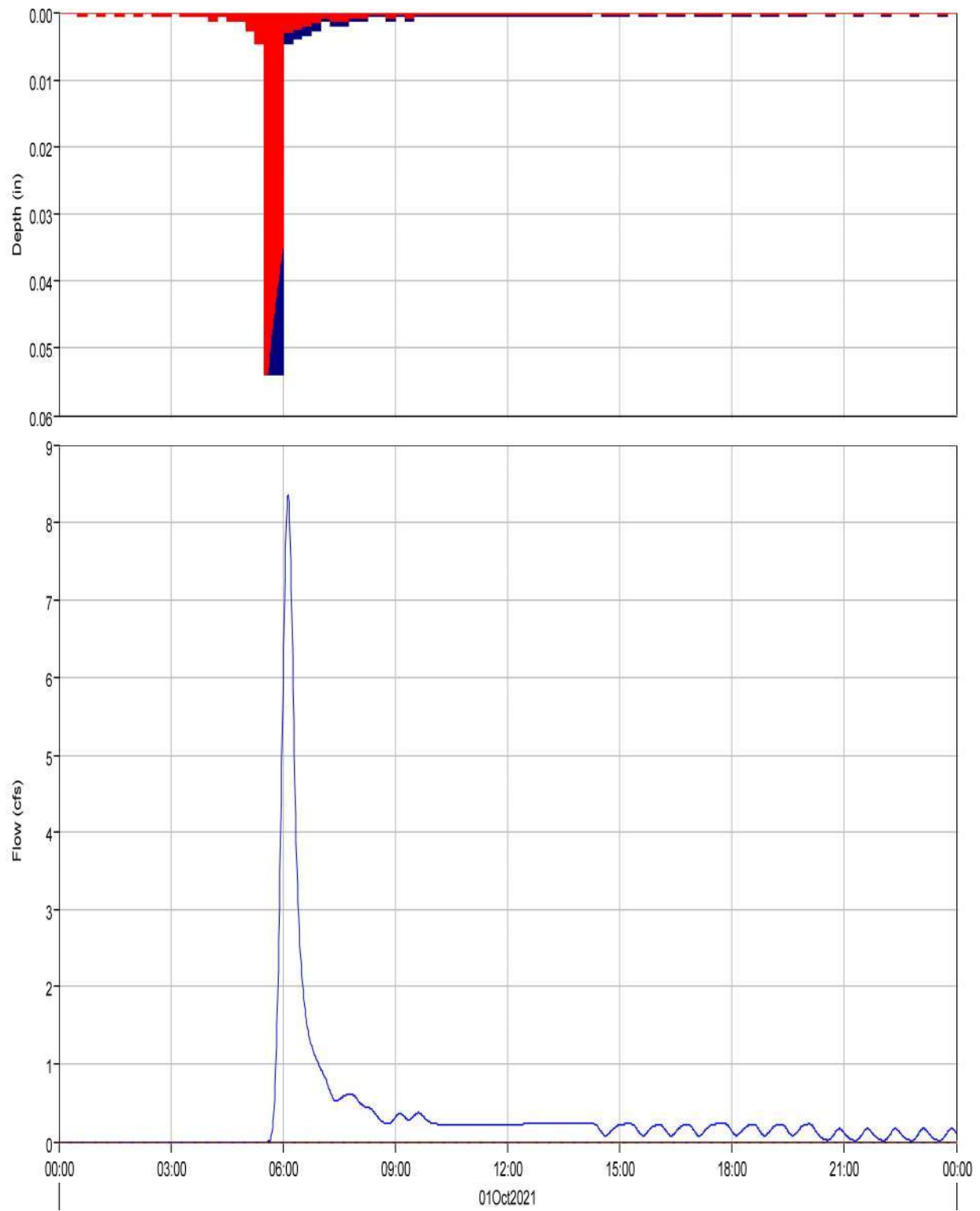
Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Pr. Type IIA NR Subbasin: PB8  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:52 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Discharge :	10.8 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:02
Total Precipitation :	2.6 (AC-FT)	Total Direct Runoff :	0.6 (AC-FT)
Total Loss :	2.1 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	0.6 (AC-FT)	Discharge :	0.6 (AC-FT)



Subbasin "PB9" Results for Run "EV 5-yr Pr. Type IIA NR"



Run:EV 5-yr Pr. Type IIA NR Element:PB9 Result:Precipitation  
Run:EV 5-yr Pr. Type IIA NR Element:PB9 Result:Outflow

Run:EV 5-YR PR. TYPE IIA NR Element:PB9 Result:Precipitation Loss  
Run:EV 5-YR PR. TYPE IIA NR Element:PB9 Result:Baseflow

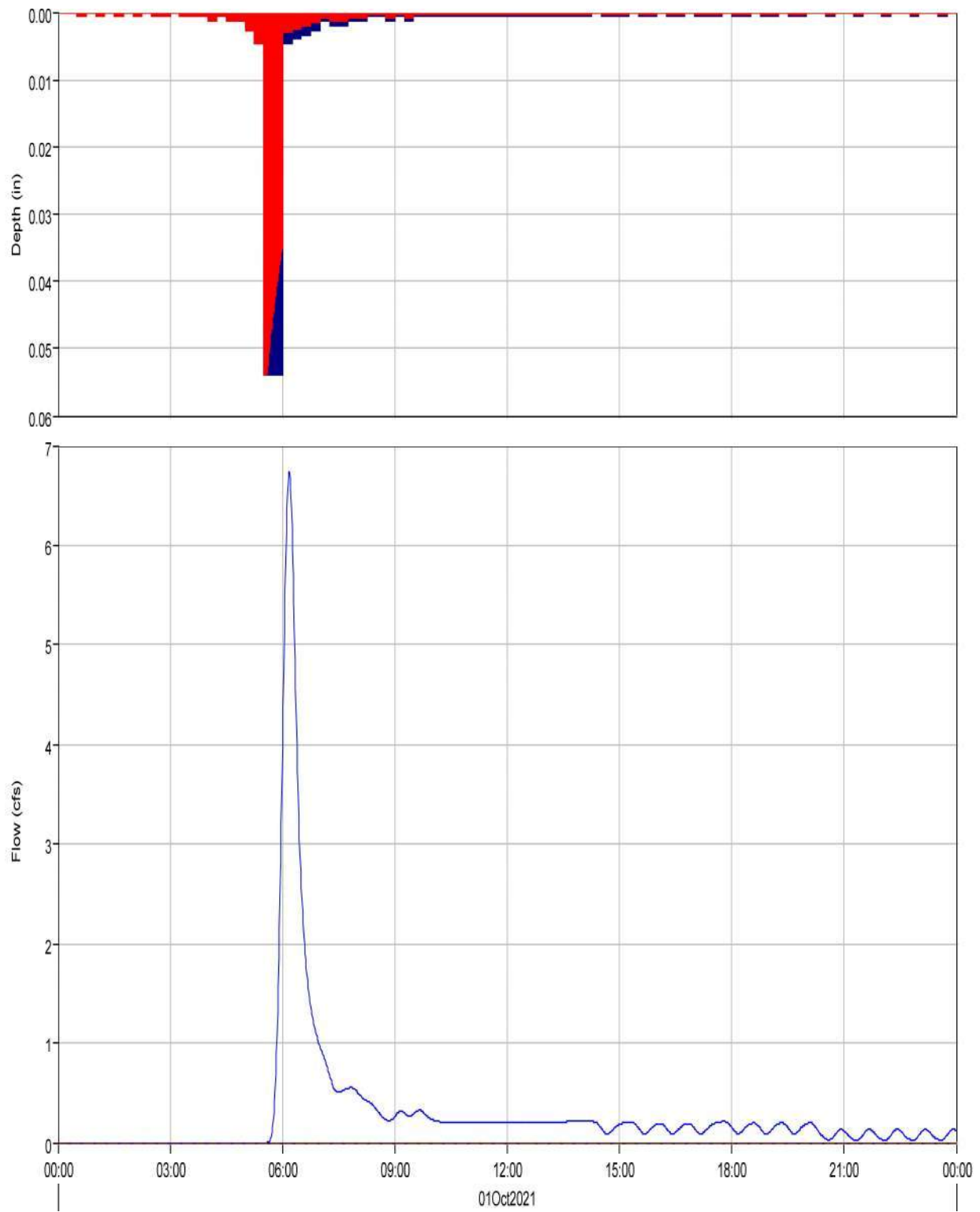
Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Pr. Type IIA NR Subbasin: PB9  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:52 Control Specifications: 24-hr Storm

Volume Units: AC-FT

#### Computed Results

Peak Discharge :	8.4 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:08
Total Precipitation :	2.9 (AC-FT)	Total Direct Runoff :	0.6 (AC-FT)
Total Loss :	2.2 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	0.6 (AC-FT)	Discharge :	0.6 (AC-FT)

Subbasin "PB10" Results for Run "EV 5-yr Pr. Type IIA NR"



Run:EV 5-yr Pr. Type IIA NR Element:PB10 Result:Precipitation  
Run:EV 5-yr Pr. Type IIA NR Element:PB10 Result:Outflow

Run:EV 5-YR PR. TYPE IIA NR Element:PB10 Result:Precipitation Loss  
Run:EV 5-YR PR. TYPE IIA NR Element:PB10 Result:Baseflow

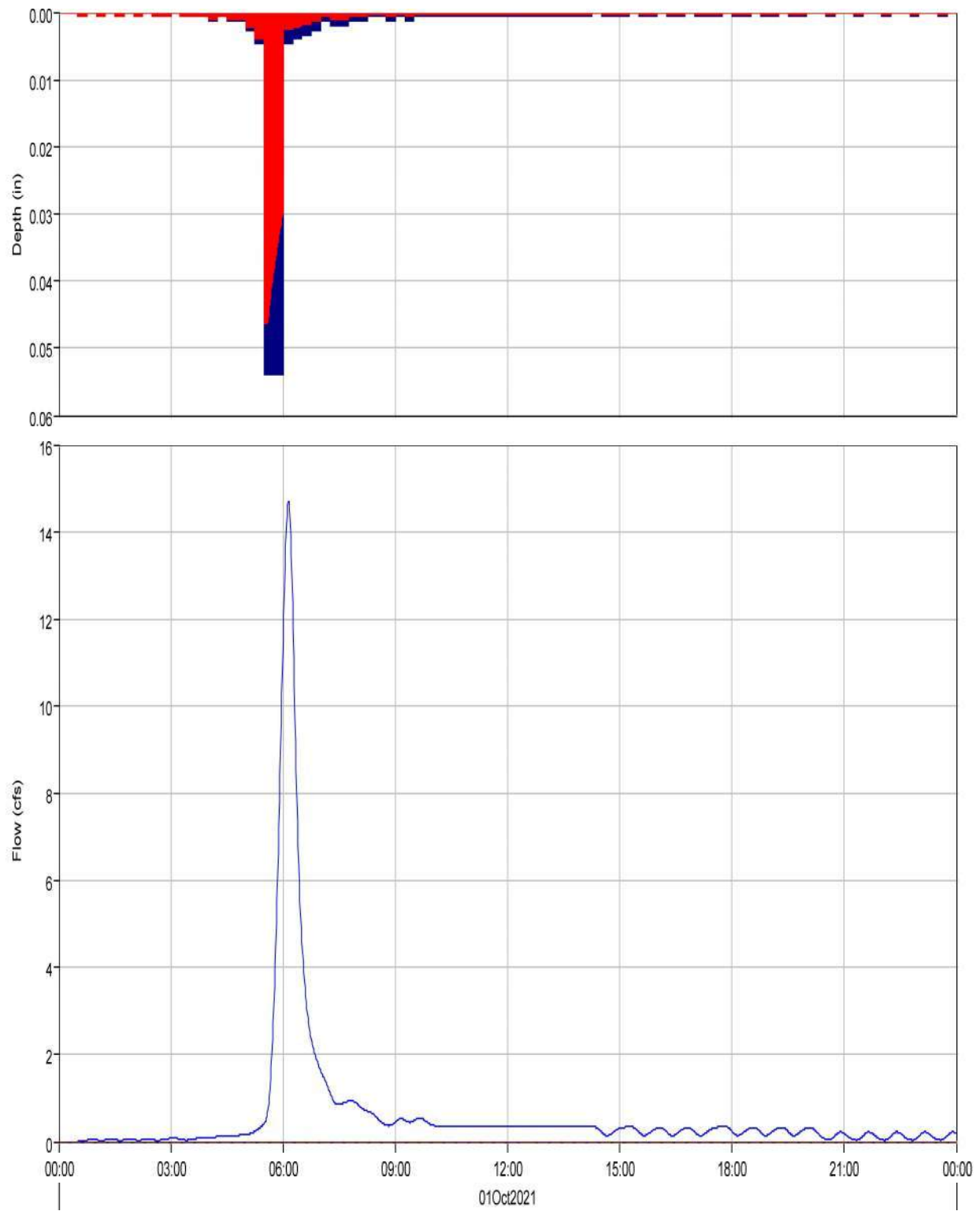
Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Pr. Type IIA NR Subbasin: PB10  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:52 Control Specifications: 24-hr Storm

Volume Units: AC-FT

#### Computed Results

Peak Discharge :	6.7 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:10
Total Precipitation :	2.6 (AC-FT)	Total Direct Runoff :	0.6 (AC-FT)
Total Loss :	2.0 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	0.6 (AC-FT)	Discharge :	0.6 (AC-FT)

Subbasin "PB11" Results for Run "EV 5-yr Pr. Type IIA NR"



Run:EV 5-yr Pr. Type IIA NR Element:PB11 Result:Precipitation  
Run:EV 5-yr Pr. Type IIA NR Element:PB11 Result:Outflow

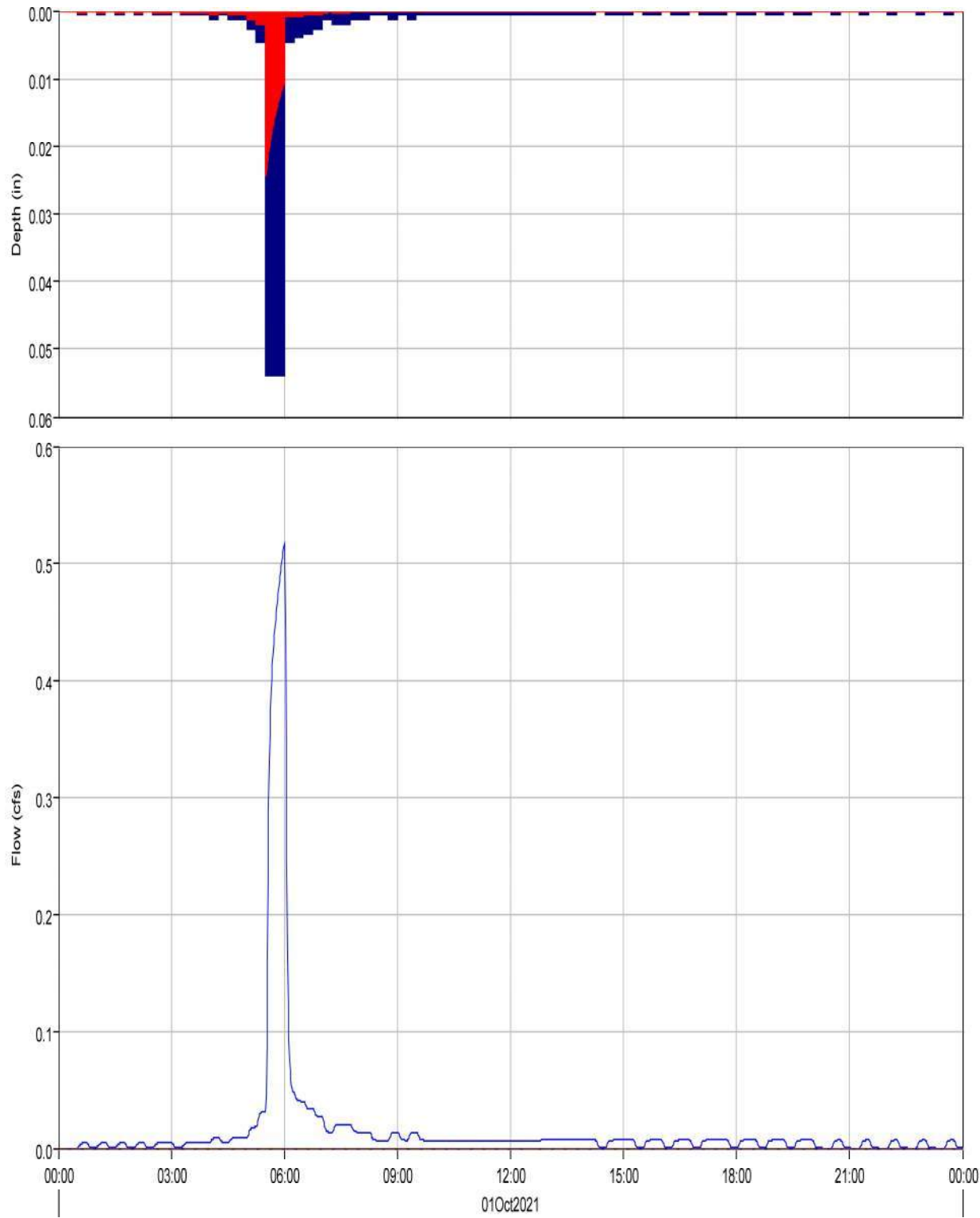
Run:EV 5-YR PR. TYPE IIA NR Element:PB11 Result:Precipitation Loss  
Run:EV 5-YR PR. TYPE IIA NR Element:PB11 Result:Baseflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Pr. Type IIA NR Subbasin: PB11  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:52 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Discharge :	14.7 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:08
Total Precipitation :	3.6 (AC-FT)	Total Direct Runoff :	1.2 (AC-FT)
Total Loss :	2.4 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	1.2 (AC-FT)	Discharge :	1.2 (AC-FT)

Subbasin "PB12" Results for Run "EV 5-yr Pr. Type IIA NR"



Run:EV 5-yr Pr. Type IIA NR Element:PB12 Result:Precipitation  
Run:EV 5-yr Pr. Type IIA NR Element:PB12 Result:Outflow

Run:EV 5-YR PR. TYPE IIA NR Element:PB12 Result:Precipitation Loss  
Run:EV 5-YR PR. TYPE IIA NR Element:PB12 Result:Baseflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Pr. Type IIA NR Subbasin: PB12  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:52 Control Specifications: 24-hr Storm

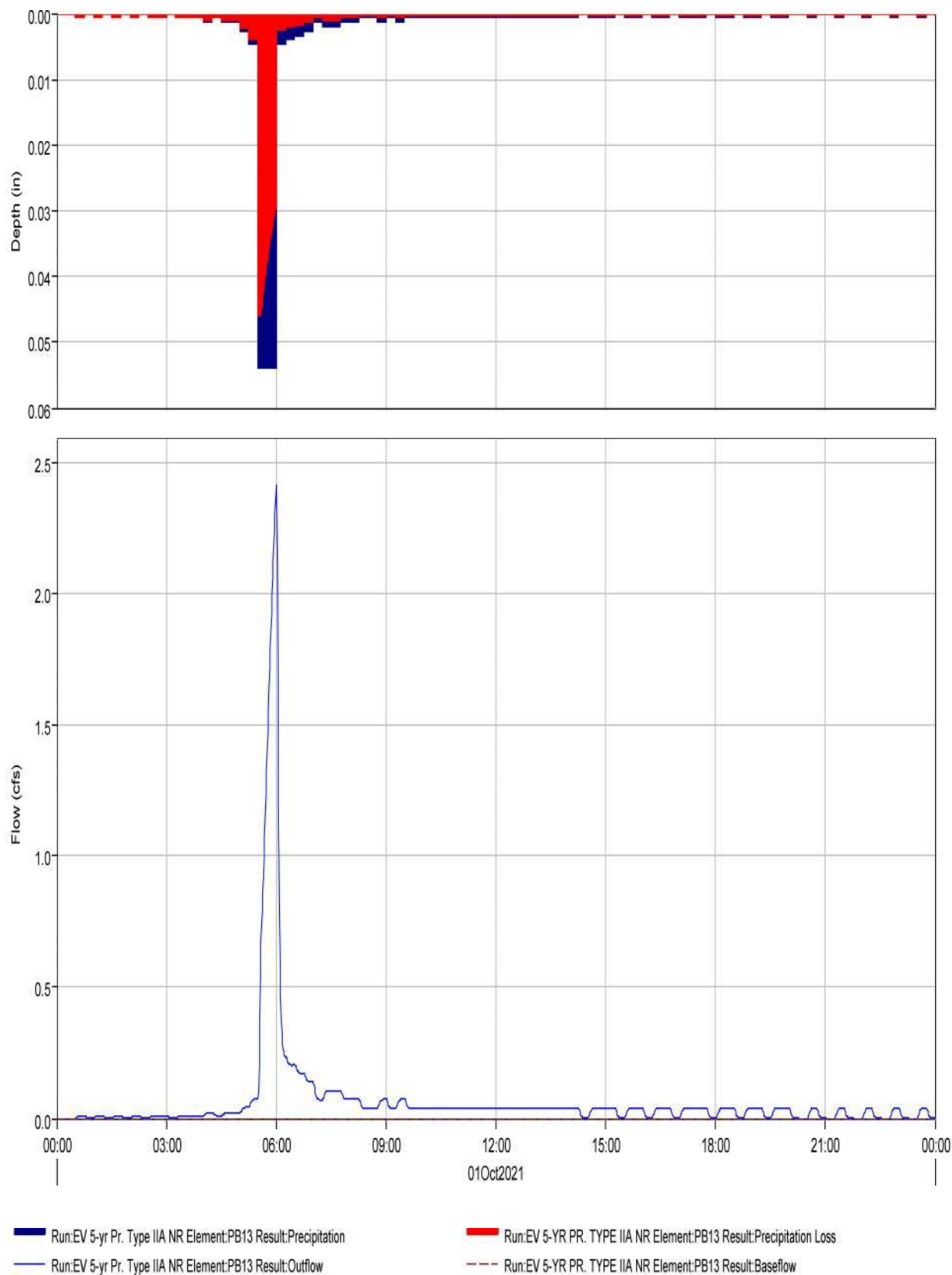
Volume Units: AC-FT

#### Computed Results

Peak Discharge :	0.5 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:00
Total Precipitation :	0.0 (AC-FT)	Total Direct Runoff :	0.0 (AC-FT)
Total Loss :	0.0 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	0.0 (AC-FT)	Discharge :	0.0 (AC-FT)



Subbasin "PB13" Results for Run "EV 5-yr Pr. Type IIA NR"



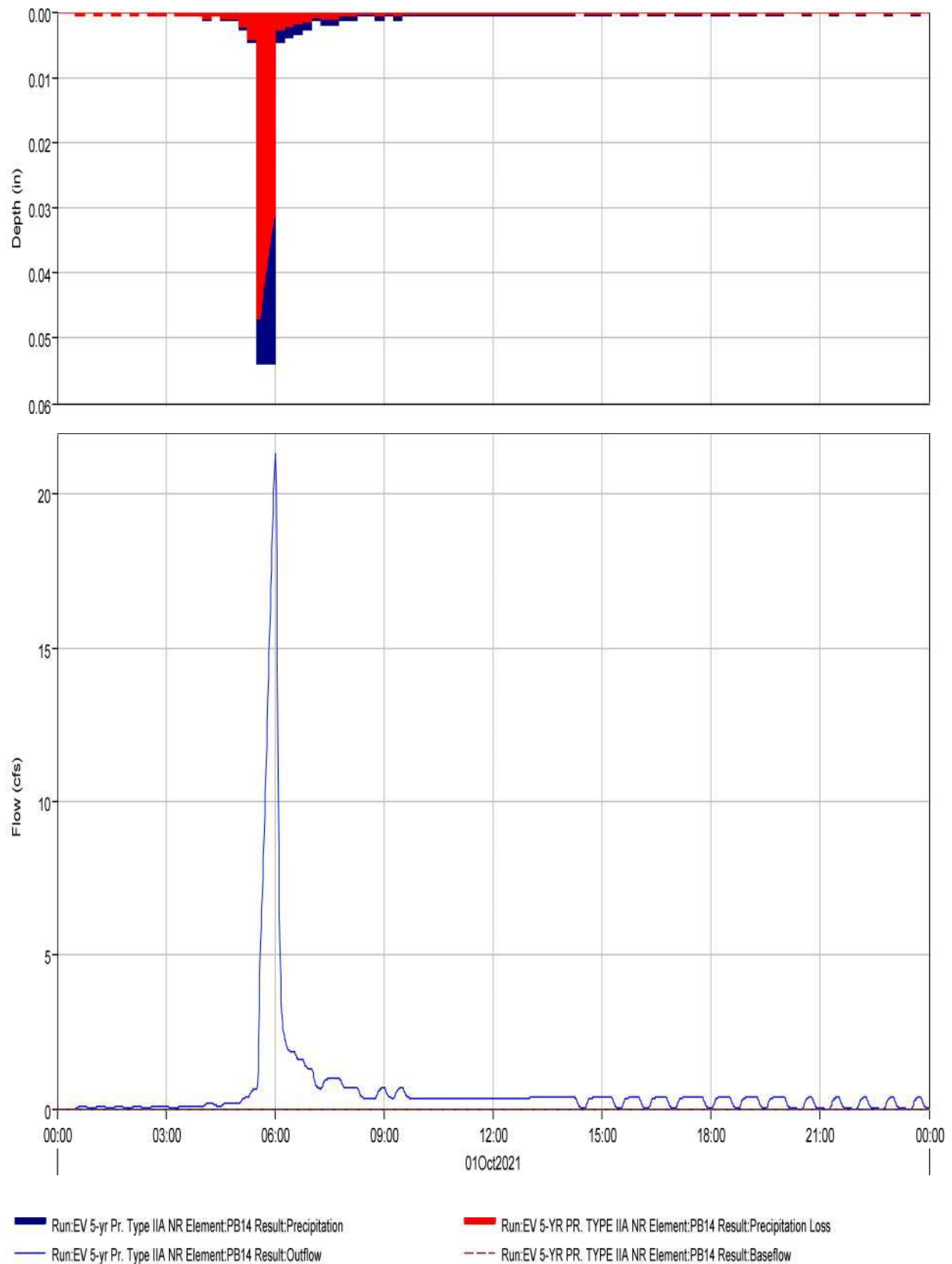
Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Pr. Type IIA NR Subbasin: PB13  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:52 Control Specifications: 24-hr Storm

Volume Units: AC-FT

#### Computed Results

Peak Discharge :	2.4 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:00
Total Precipitation :	0.4 (AC-FT)	Total Direct Runoff :	0.1 (AC-FT)
Total Loss :	0.3 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	0.1 (AC-FT)	Discharge :	0.1 (AC-FT)

Subbasin "PB14" Results for Run "EV 5-yr Pr. Type IIA NR"

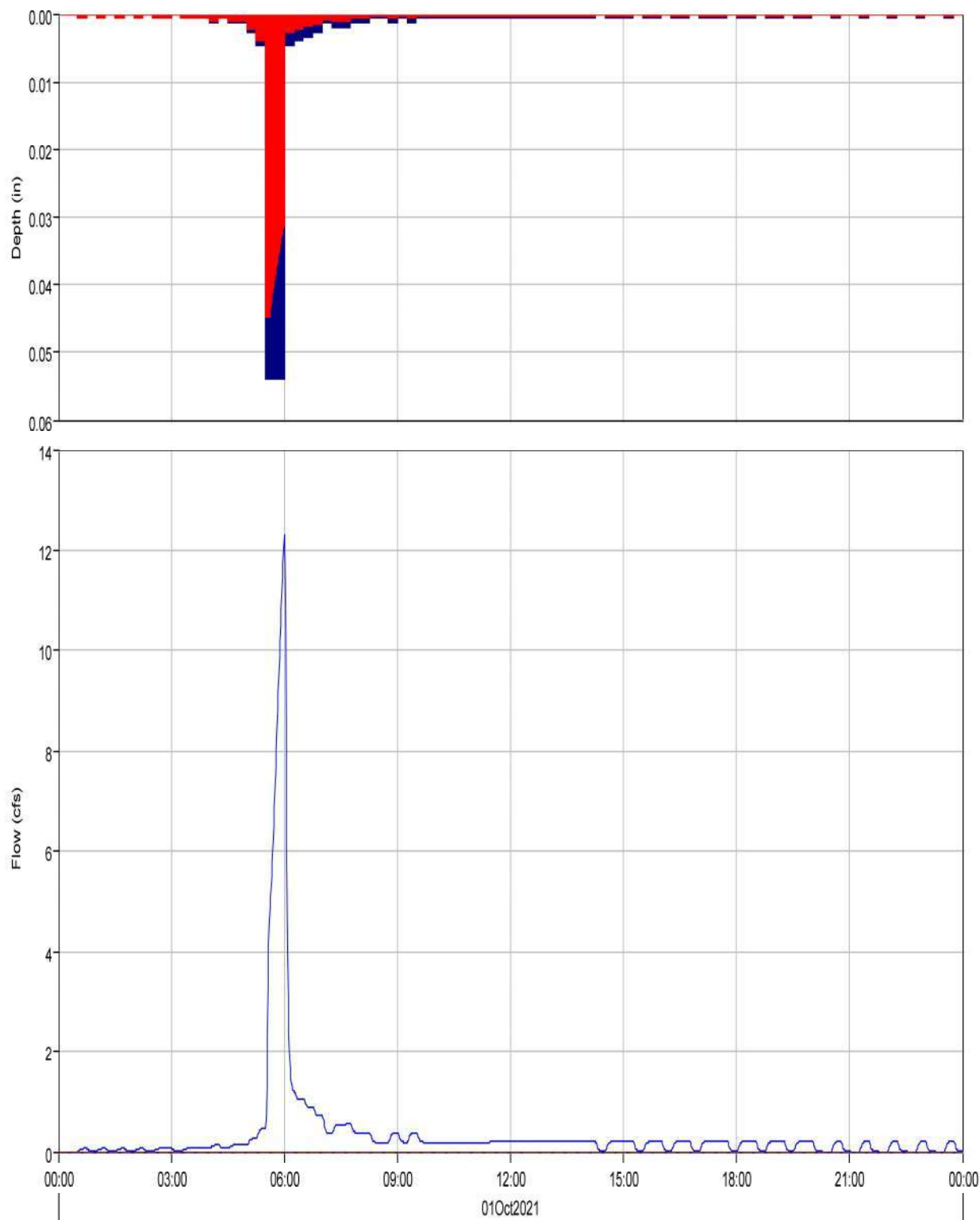


Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Pr. Type IIA NR Subbasin: PB14  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:52 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Discharge :	21.3 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:01
Total Precipitation :	3.9 (AC-FT)	Total Direct Runoff :	1.2 (AC-FT)
Total Loss :	2.7 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	1.2 (AC-FT)	Discharge :	1.2 (AC-FT)

Subbasin "PB15" Results for Run "EV 5-yr Pr. Type IIA NR"



Run:EV 5-yr Pr. Type IIA NR Element:PB15 Result:Precipitation  
Run:EV 5-yr Pr. Type IIA NR Element:PB15 Result:Outflow

Run:EV 5-YR PR. TYPE IIA NR Element:PB15 Result:Precipitation Loss  
Run:EV 5-YR PR. TYPE IIA NR Element:PB15 Result:Baseflow

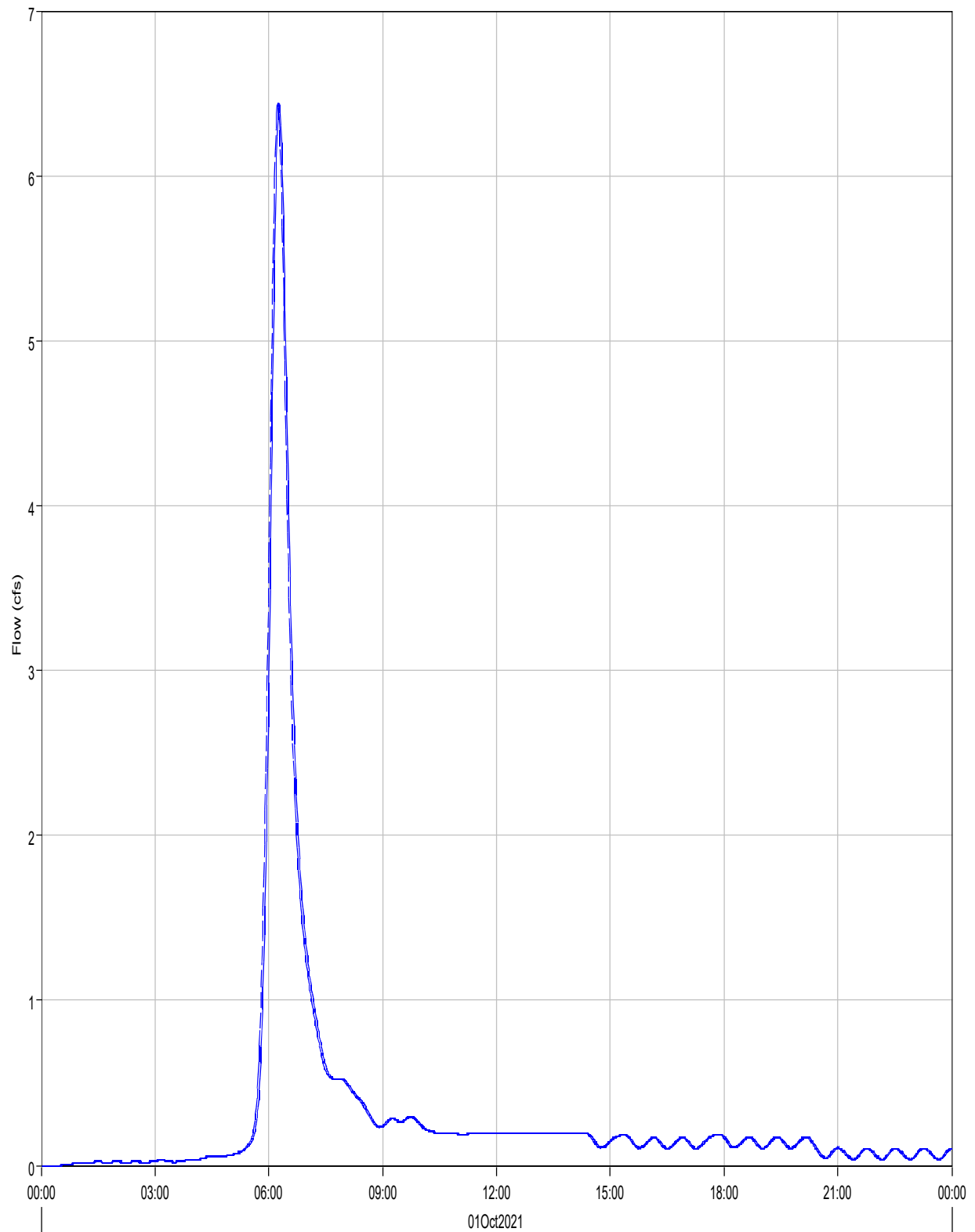
Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Pr. Type IIA NR Subbasin: PB15  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:52 Control Specifications: 24-hr Storm

Volume Units: AC-FT

#### Computed Results

Peak Discharge :	12.3 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:00
Total Precipitation :	2.2 (AC-FT)	Total Direct Runoff :	0.7 (AC-FT)
Total Loss :	1.5 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	0.7 (AC-FT)	Discharge :	0.7 (AC-FT)

Reach "R-OB1" Results for Run "EV 5-yr Pr. Type IIA NR"



Run:EV 5-yr Pr. Type IIA NR Element:R-OB1 Result:Outflow

Run:EV 5-YR PR. TYPE IIA NR Element:R-OB1 Result:Combined Inflow

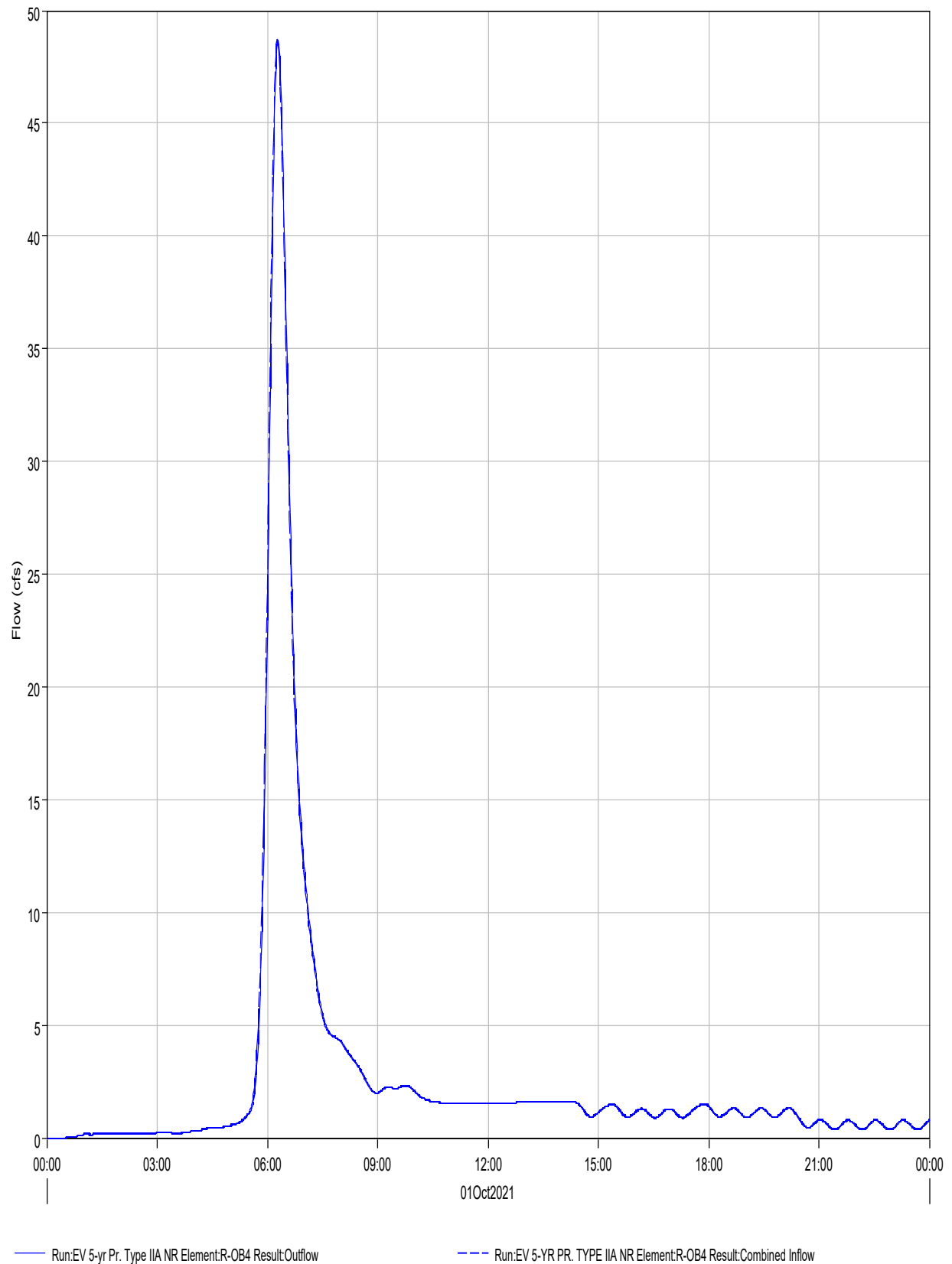
Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Pr. Type IIA NR Reach: R-OB1  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:52 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Inflow :	6.4 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 06:14
Peak Outflow :	6.4 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 06:16
Total Inflow :	0.6 (AC-FT)	Total Outflow :	0.6 (AC-FT)



Reach "R-OB4" Results for Run "EV 5-yr Pr. Type IIA NR"

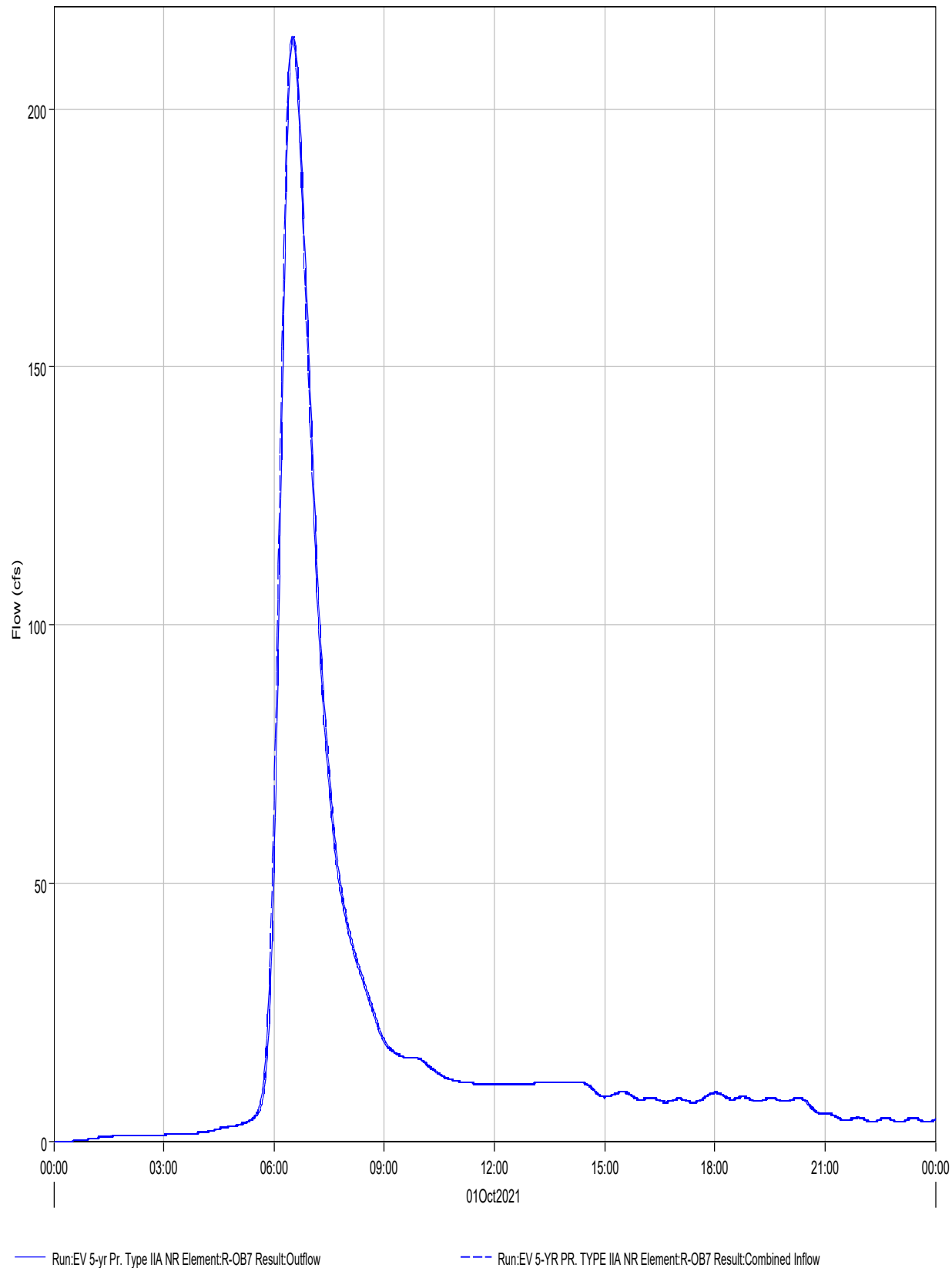


Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Pr. Type IIA NR Reach: R-OB4  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:52 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Inflow :	48.7 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 06:16
Peak Outflow :	48.7 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 06:17
Total Inflow :	5.3 (AC-FT)	Total Outflow :	5.3 (AC-FT)

Reach "R-OB7" Results for Run "EV 5-yr Pr. Type IIA NR"

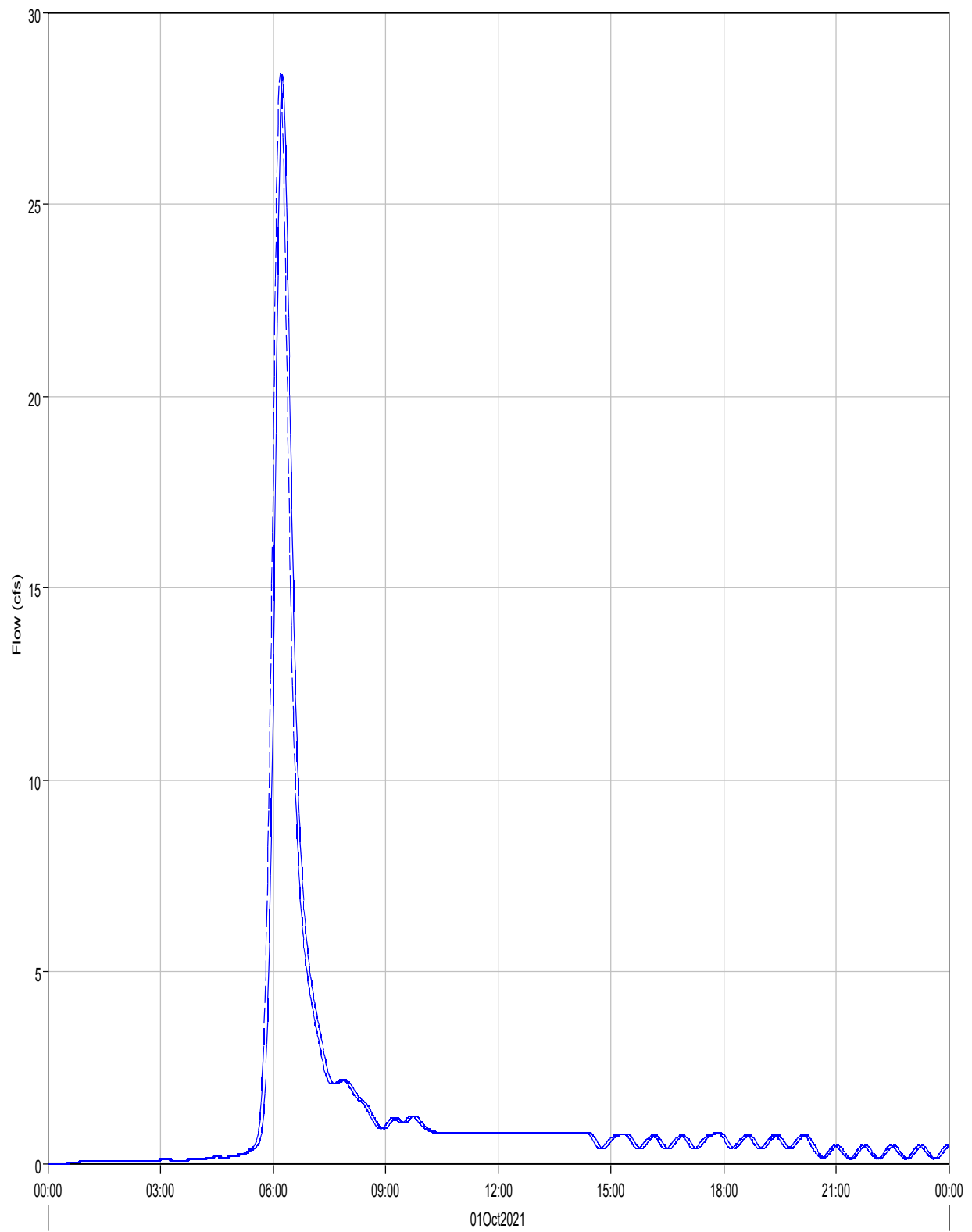


Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Pr. Type IIA NR Reach: R-OB7  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:52 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Inflow :	214.1 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 06:30
Peak Outflow :	214.1 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 06:32
Total Inflow :	35.2 (AC-FT)	Total Outflow :	35.2 (AC-FT)

Reach "R-OB8" Results for Run "EV 5-yr Pr. Type IIA NR"



— Run:EV 5-yr Pr. Type IIA NR Element:R-OB8 Result:Outflow

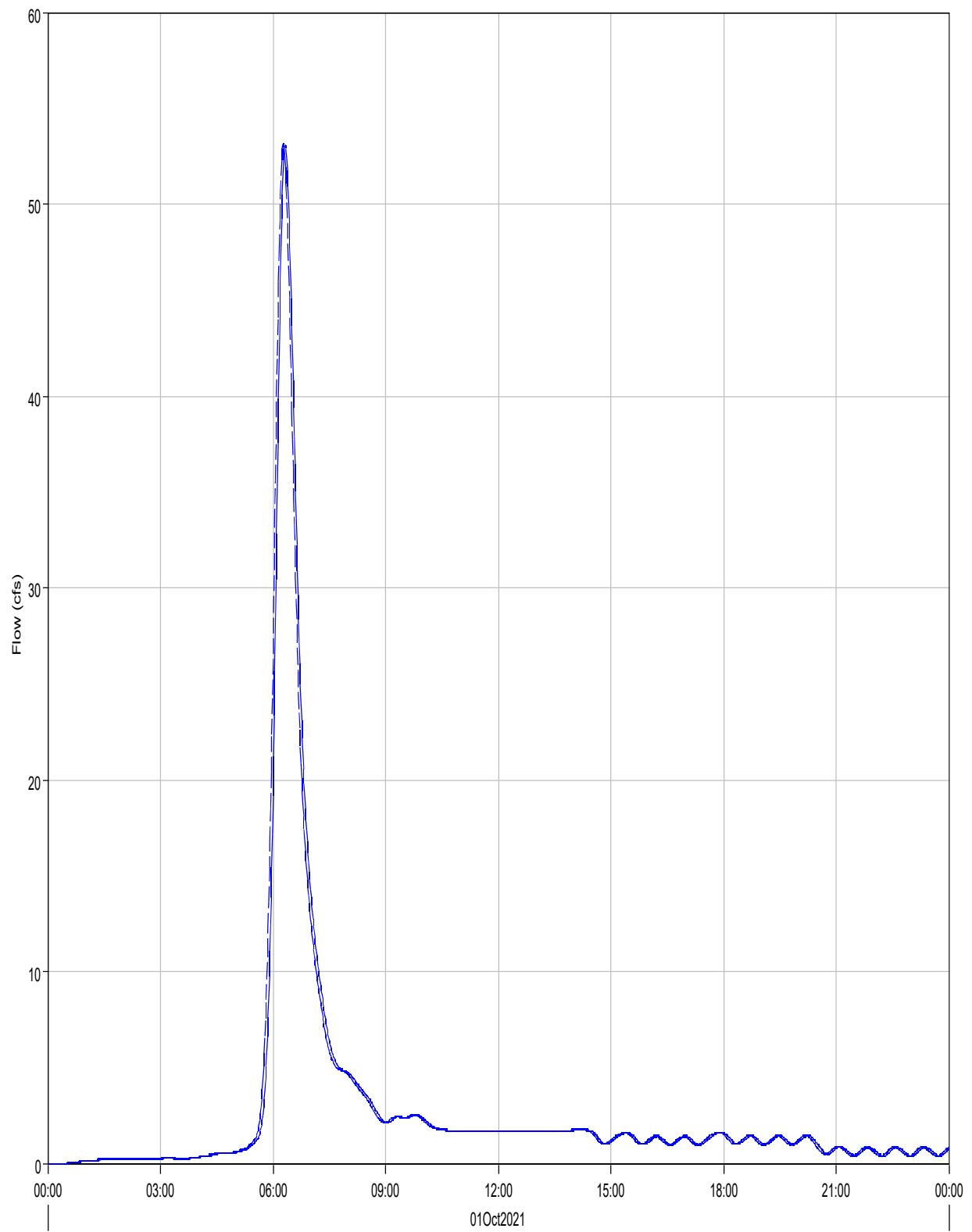
- - - Run:EV 5-YR PR. TYPE IIA NR Element:R-OB8 Result:Combined Inflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Pr. Type IIA NR Reach: R-OB8  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:52 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Inflow :	28.4 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 06:12
Peak Outflow :	28.4 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 06:15
Total Inflow :	2.6 (AC-FT)	Total Outflow :	2.6 (AC-FT)

Reach "R-PB5" Results for Run "EV 5-yr Pr. Type IIA NR"



Run:EV 5-yr Pr. Type IIA NR Element:R-PB5 Result:Outflow

Run:EV 5-YR PR. TYPE IIA NR Element:R-PB5 Result:Combined Inflow

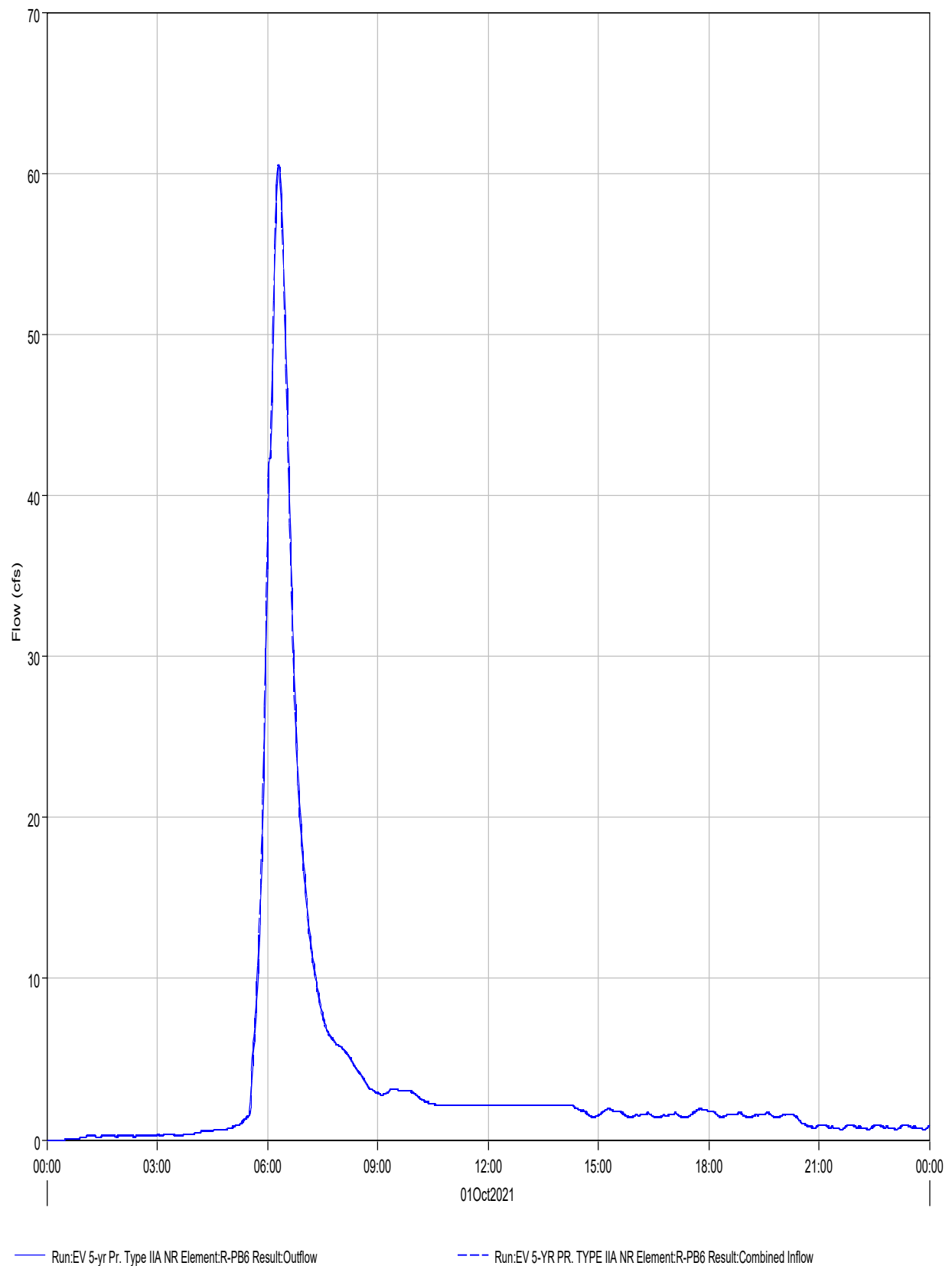
Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Pr. Type IIA NR Reach: R-PB5  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:52 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Inflow :	53.1 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 06:17
Peak Outflow :	53.1 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 06:19
Total Inflow :	5.7 (AC-FT)	Total Outflow :	5.7 (AC-FT)



Reach "R-PB6" Results for Run "EV 5-yr Pr. Type IIA NR"

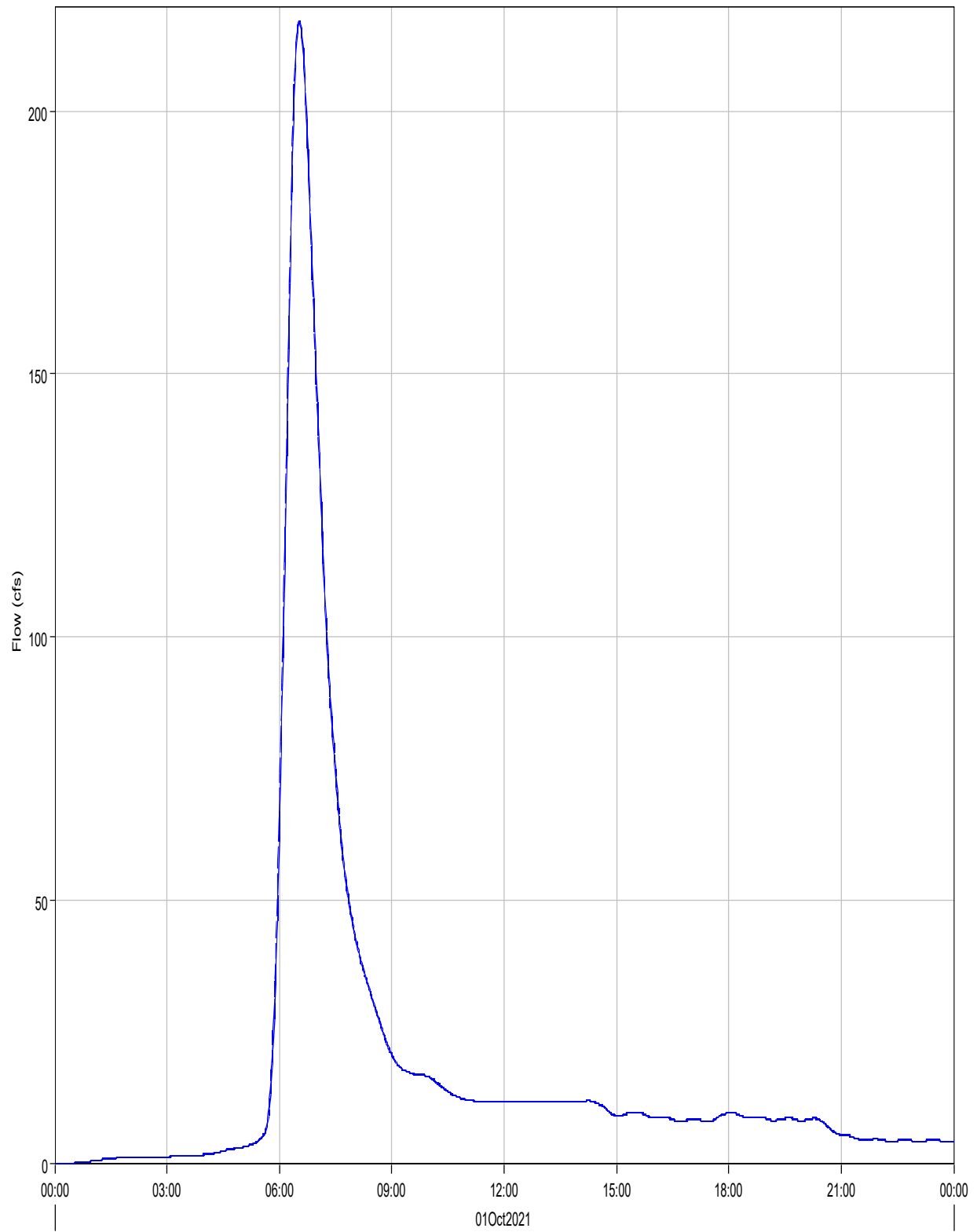


Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Pr. Type IIA NR Reach: R-PB6  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:52 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Inflow :	60.5 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 06:18
Peak Outflow :	60.5 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 06:19
Total Inflow :	7.2 (AC-FT)	Total Outflow :	7.2 (AC-FT)

Reach "R-PB9" Results for Run "EV 5-yr Pr. Type IIA NR"



Run:EV 5-yr Pr. Type IIA NR Element:R-PB9 Result:Outflow

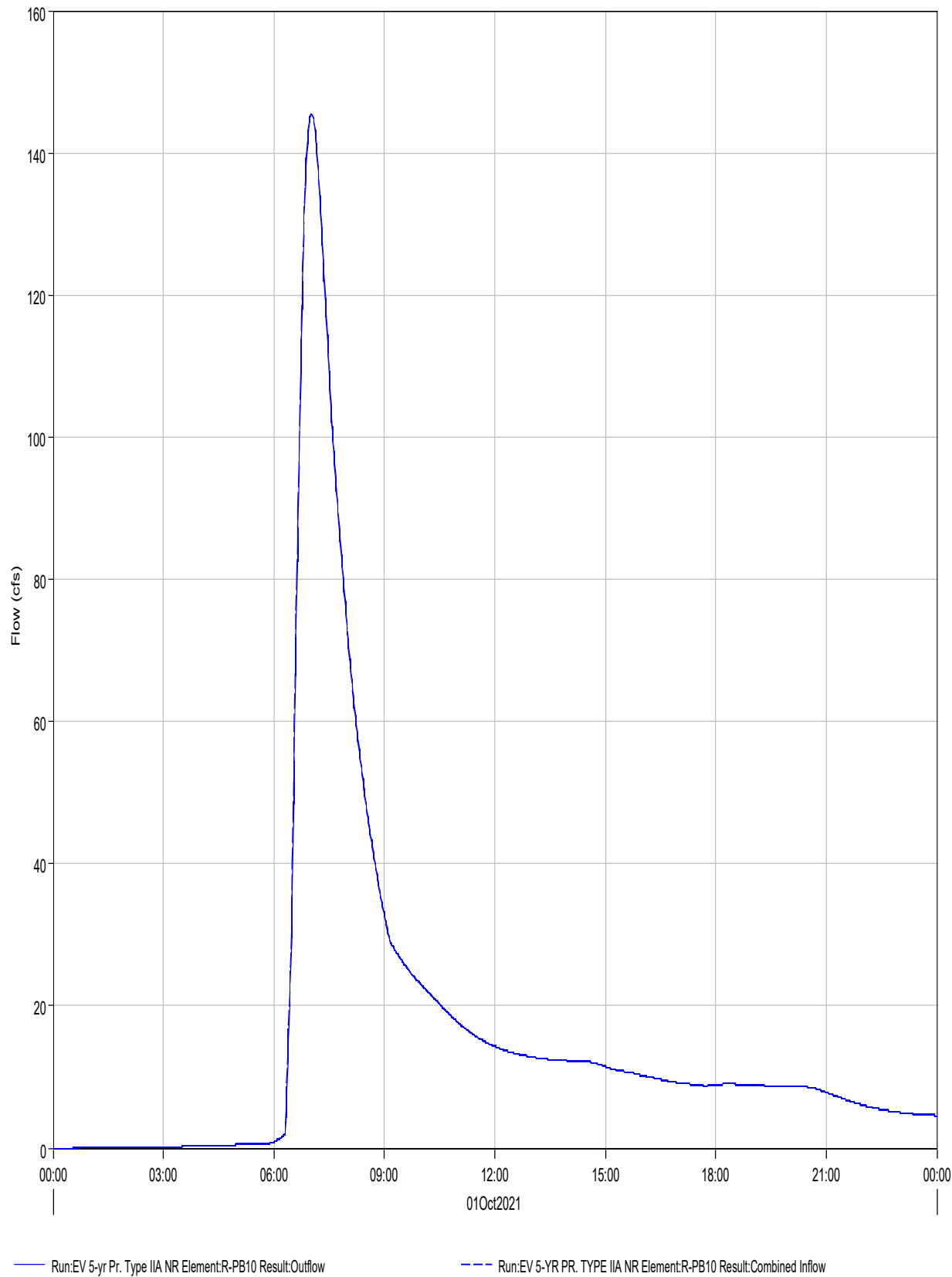
Run:EV 5-YR PR. TYPE IIA NR Element:R-PB9 Result:Combined Inflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Pr. Type IIA NR Reach: R-PB9  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:52 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Inflow :	217.0 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 06:32
Peak Outflow :	217.0 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 06:32
Total Inflow :	36.4 (AC-FT)	Total Outflow :	36.4 (AC-FT)

Reach "R-PB10" Results for Run "EV 5-yr Pr. Type IIA NR"

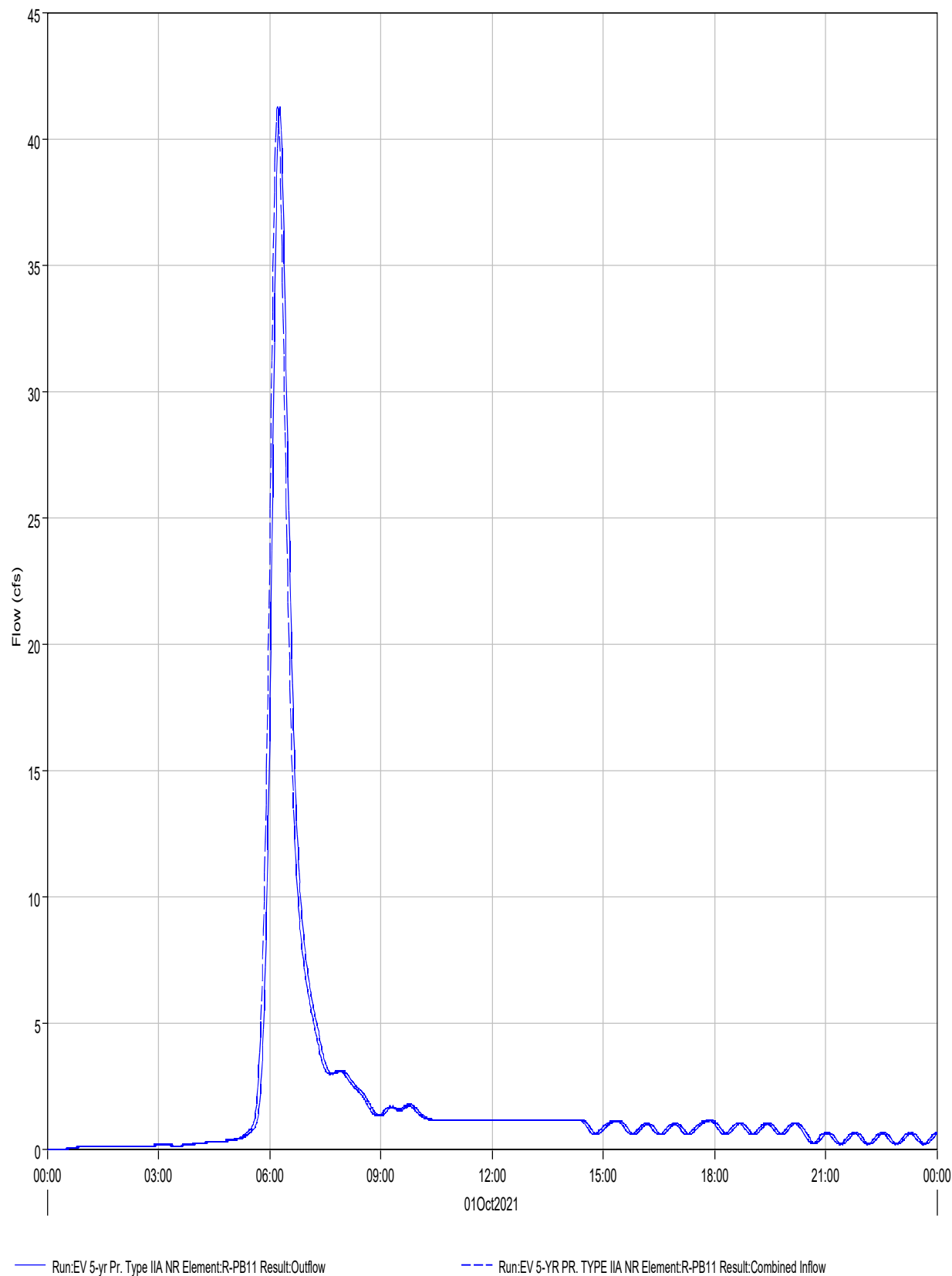


Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Pr. Type IIA NR Reach: R-PB10  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:52 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Inflow :	145.5 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 07:01
Peak Outflow :	145.4 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 07:02
Total Inflow :	32.4 (AC-FT)	Total Outflow :	32.4 (AC-FT)

Reach "R-PB11" Results for Run "EV 5-yr Pr. Type IIA NR"



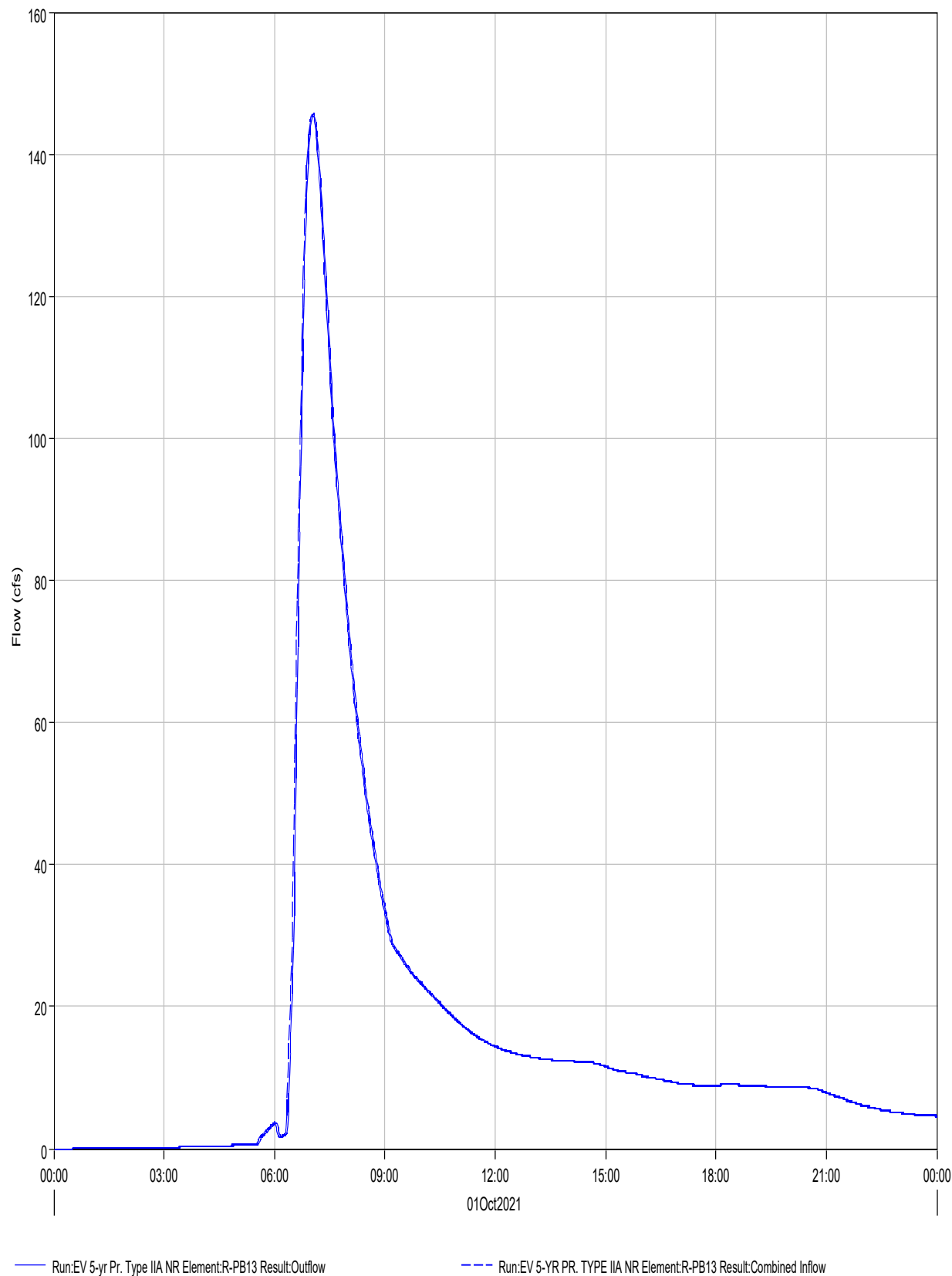
Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Pr. Type IIA NR Reach: R-PB11  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:52 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Inflow :	41.3 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 06:13
Peak Outflow :	41.2 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 06:16
Total Inflow :	3.8 (AC-FT)	Total Outflow :	3.8 (AC-FT)



Reach "R-PB13" Results for Run "EV 5-yr Pr. Type IIA NR"



Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Pr. Type IIA NR Reach: R-PB13  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:52 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Inflow :	145.6 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 07:02
Peak Outflow :	145.6 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 07:03
Total Inflow :	32.6 (AC-FT)	Total Outflow :	32.6 (AC-FT)

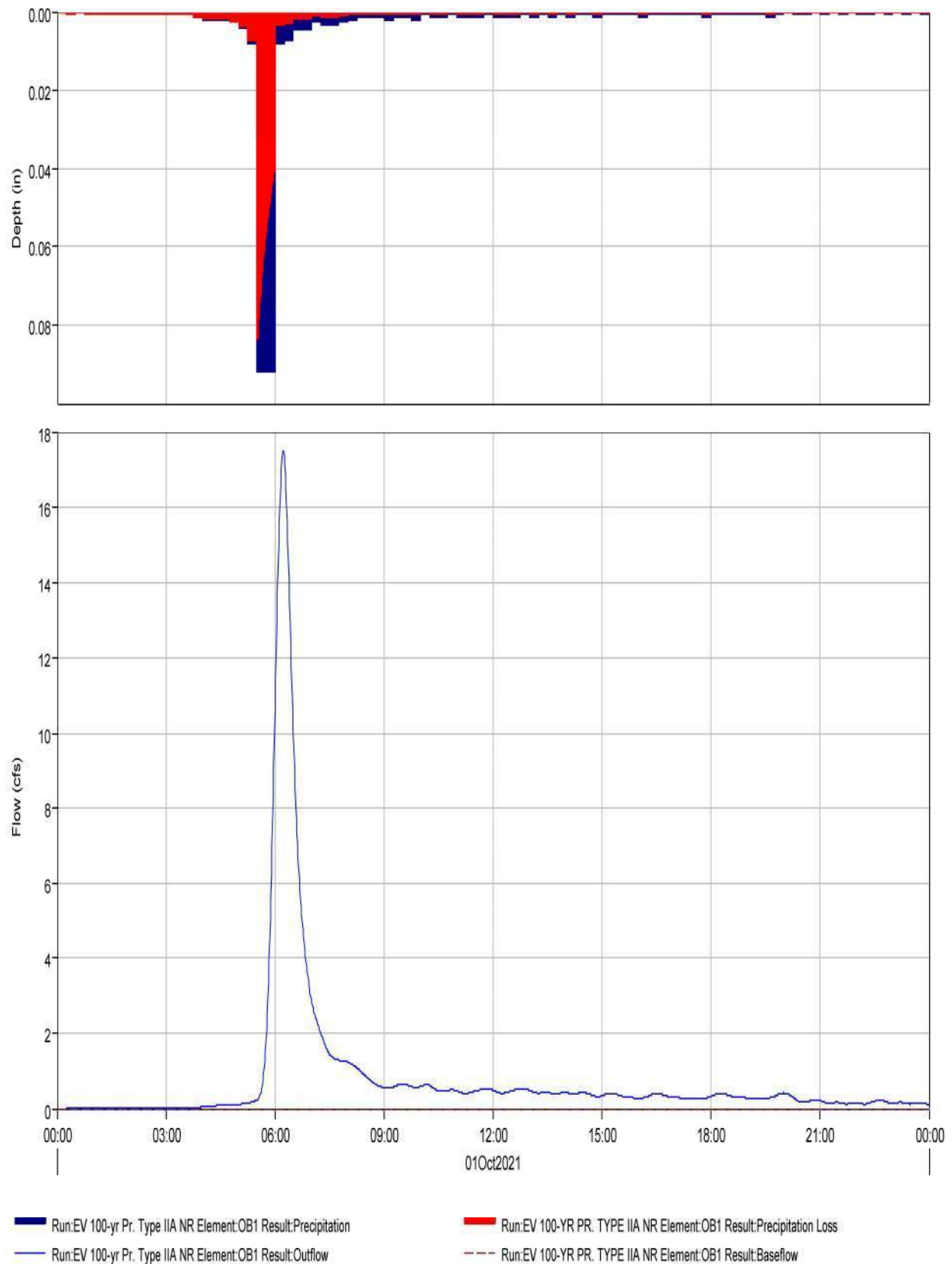
Project: Eagleview\_Subdivision Simulation Run: EV 100-yr Pr. Type IIA NR

Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:25 Control Specifications: 24-hr Storm

Hydrologic Element	Drainage Area (MI <sup>2</sup> )	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
OB1	0.0162031	17.5	01Oct2021, 06:13	1.6
OB2	0.0438438	49.0	01Oct2021, 06:13	4.6
OB3	0.0678750	64.7	01Oct2021, 06:17	6.8
OB4	0.0164062	17.3	01Oct2021, 06:17	1.8
OB5	0.22472	137.2	01Oct2021, 06:27	18.5
OB6	0.18501	156.1	01Oct2021, 06:19	17.1
OB7	0.65812	362.2	01Oct2021, 06:37	57.7
OB8	0.0623000	77.0	01Oct2021, 06:11	6.6
OB9	0.18350	375.9	01Oct2021, 06:09	30.2
P1	0.0228484	25.7	01Oct2021, 06:12	2.3
P2	0.19753	172.6	01Oct2021, 06:17	20.5
P3	1.4253	603.5	01Oct2021, 06:43	136.0
P4	0.17375	162.6	01Oct2021, 06:17	18.0
P5	0.13779	141.2	01Oct2021, 06:16	14.2
P6	1.1273	509.2	01Oct2021, 06:50	93.5
P7	1.1242	508.8	01Oct2021, 06:50	93.1
P8	1.1062	621.6	01Oct2021, 06:31	96.7
P9	0.0874766	110.4	01Oct2021, 06:12	9.4
PB1	0.0066453	9.4	01Oct2021, 06:08	0.7
PB10	0.0179938	20.7	01Oct2021, 06:09	1.6
PB11	0.0251766	36.7	01Oct2021, 06:08	2.9
PB12	.000315625	1.0	01Oct2021, 06:00	0.1
PB13	0.0027469	5.7	01Oct2021, 06:00	0.3
PB14	0.0270031	52.0	01Oct2021, 06:00	2.9
PB15	0.0150500	29.4	01Oct2021, 06:00	1.7
PB2	0.0016938	2.9	01Oct2021, 06:05	0.2

Hydrologic Element	Drainage Area (MI <sup>2</sup> )	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
PB3	0.0021625	4.0	01Oct2021, 06:06	0.3
PB4	0.0164672	33.8	01Oct2021, 06:00	1.9
PB5	0.0096625	12.9	01Oct2021, 06:10	1.1
PB6	0.0173312	20.5	01Oct2021, 06:09	1.6
PB7	0.0087281	11.2	01Oct2021, 06:07	0.8
PB8	0.0184000	30.6	01Oct2021, 06:01	1.7
PB9	0.0199984	25.4	01Oct2021, 06:07	1.8
R-OB1	0.0162031	17.5	01Oct2021, 06:15	1.6
R-OB4	0.12813	129.7	01Oct2021, 06:17	13.1
R-OB7	1.0678	612.9	01Oct2021, 06:31	93.2
R-OB8	0.0623000	76.9	01Oct2021, 06:14	6.5
R-PB10	1.1242	508.8	01Oct2021, 06:50	93.1
R-PB11	0.0874766	110.2	01Oct2021, 06:14	9.4
R-PB13	1.1273	509.1	01Oct2021, 06:51	93.5
R-PB5	0.13779	141.0	01Oct2021, 06:18	14.2
R-PB6	0.17375	162.5	01Oct2021, 06:18	18.0
R-PB9	1.1062	621.4	01Oct2021, 06:31	96.7

Subbasin "OB1" Results for Run "EV 100-yr Pr. Type IIA NR"

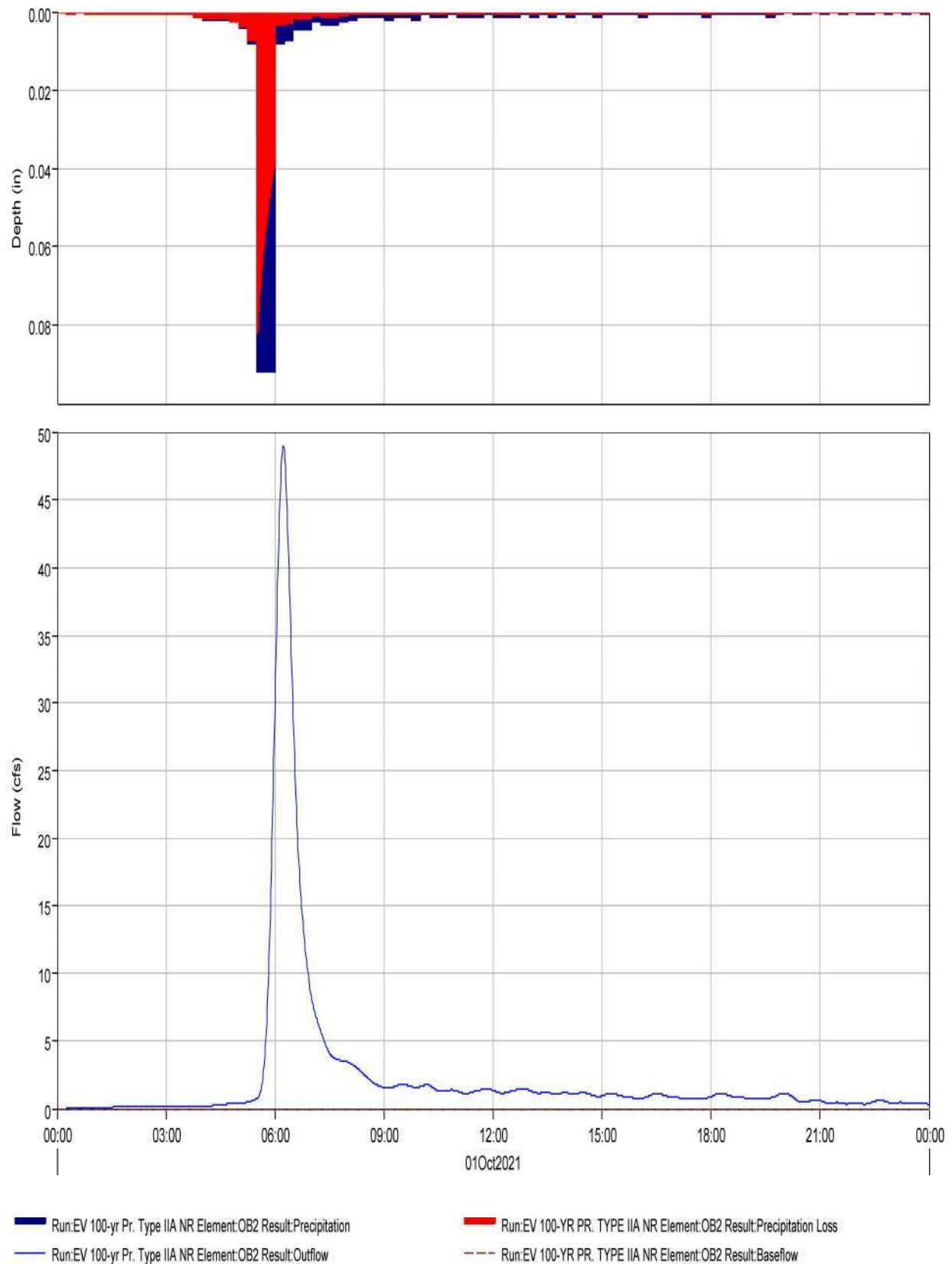


Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Pr. Type IIA NR Subbasin: OB1  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:25 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Discharge :	17.5 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:13
Total Precipitation :	4.0 (AC-FT)	Total Direct Runoff :	1.6 (AC-FT)
Total Loss :	2.3 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	1.6 (AC-FT)	Discharge :	1.6 (AC-FT)

Subbasin "OB2" Results for Run "EV 100-yr Pr. Type IIA NR"



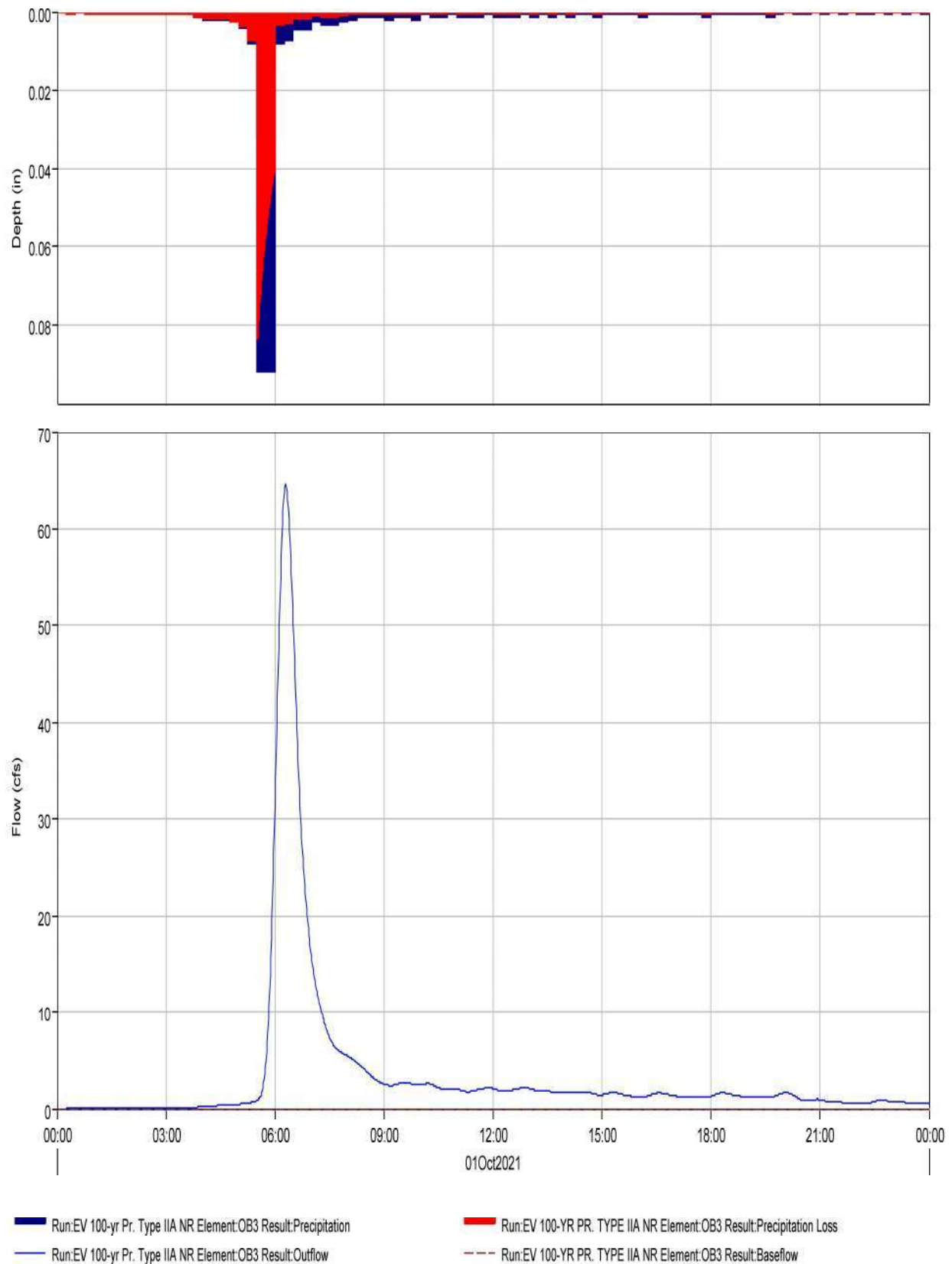
Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Pr. Type IIA NR Subbasin: OB2  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:25 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Discharge :	49.0 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:13
Total Precipitation :	10.8 (AC-FT)	Total Direct Runoff :	4.6 (AC-FT)
Total Loss :	6.2 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	4.6 (AC-FT)	Discharge :	4.6 (AC-FT)



Subbasin "OB3" Results for Run "EV 100-yr Pr. Type IIA NR"

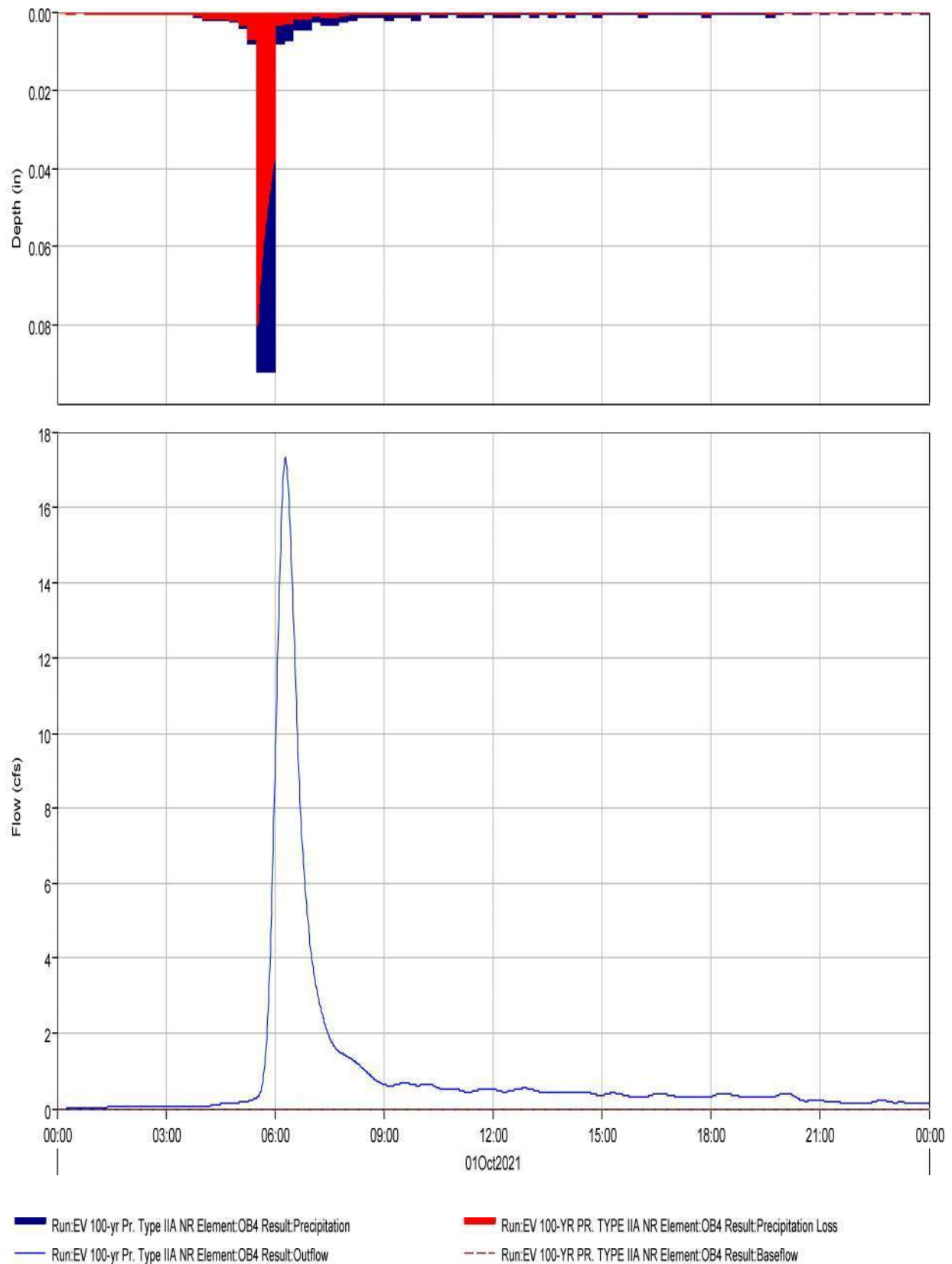


Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Pr. Type IIA NR Subbasin: OB3  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:25 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Discharge :	64.7 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:17
Total Precipitation :	16.7 (AC-FT)	Total Direct Runoff :	6.8 (AC-FT)
Total Loss :	9.8 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	6.8 (AC-FT)	Discharge :	6.8 (AC-FT)

Subbasin "OB4" Results for Run "EV 100-yr Pr. Type IIA NR"



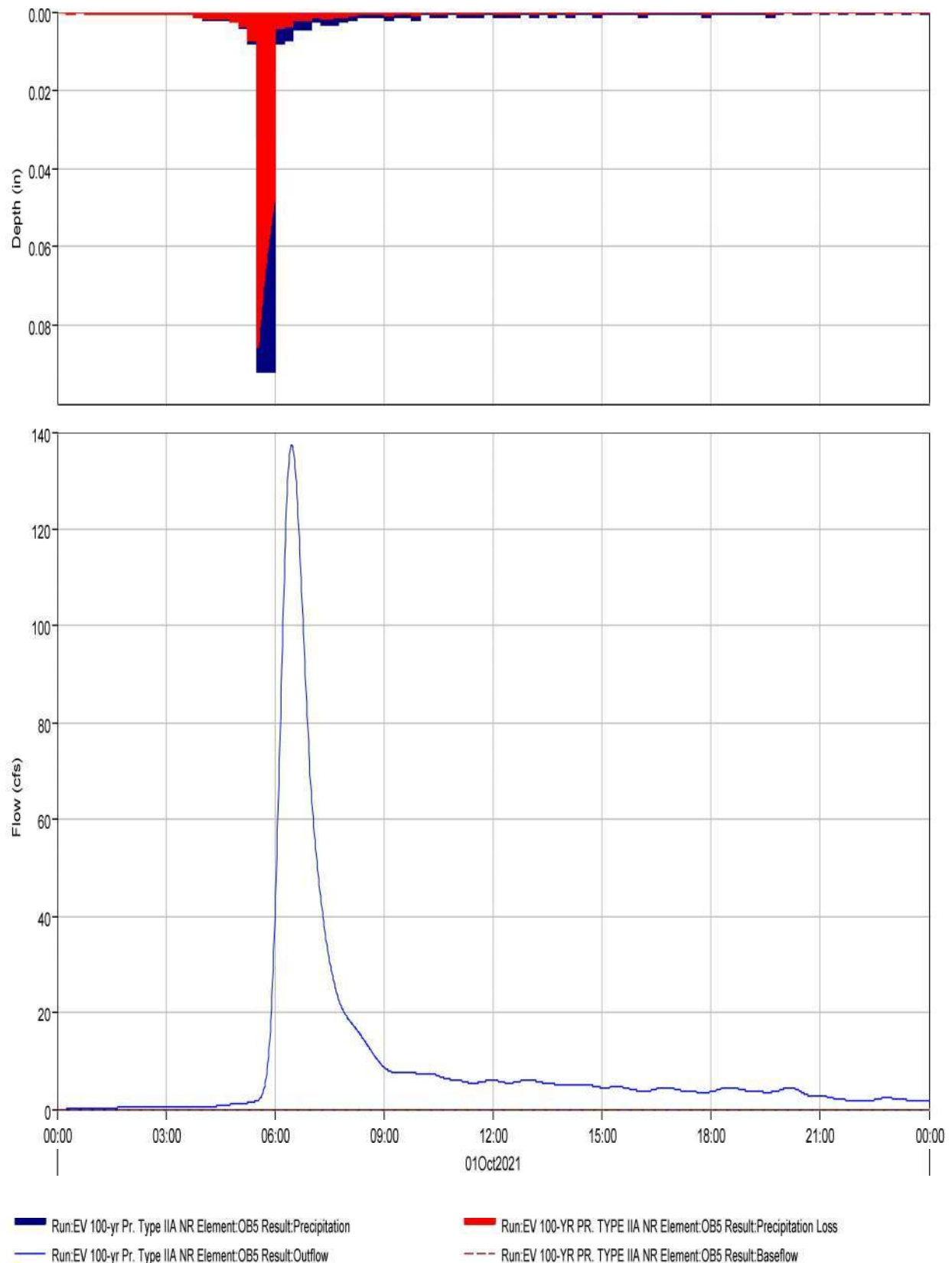
Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Pr. Type IIA NR Subbasin: OB4  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:25 Control Specifications: 24-hr Storm

Volume Units: AC-FT

#### Computed Results

Peak Discharge :	17.3 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:17
Total Precipitation :	4.0 (AC-FT)	Total Direct Runoff :	1.8 (AC-FT)
Total Loss :	2.2 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	1.8 (AC-FT)	Discharge :	1.8 (AC-FT)

Subbasin "OB5" Results for Run "EV 100-yr Pr. Type IIA NR"

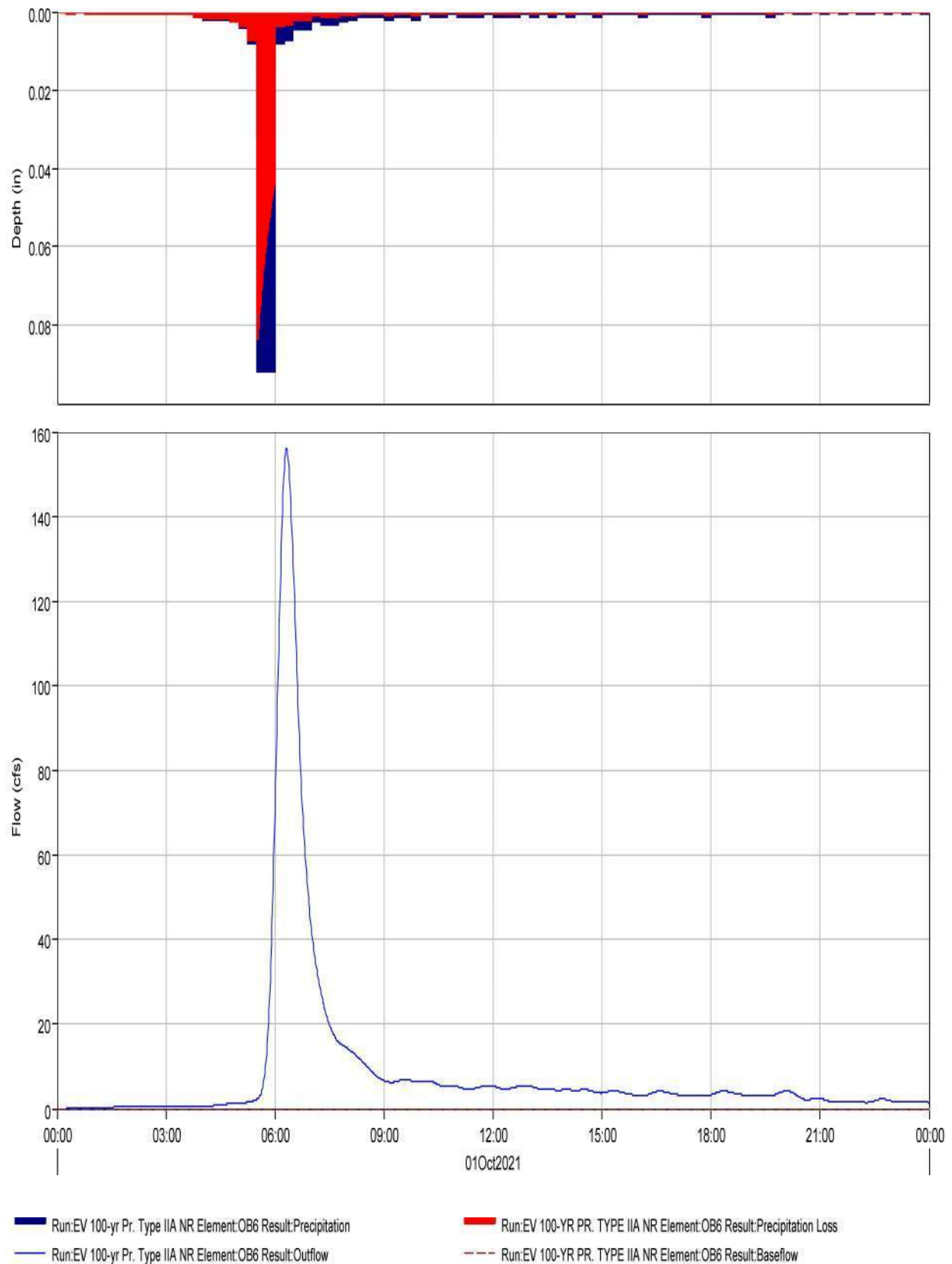


Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Pr. Type IIA NR Subbasin: OB5  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:25 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Discharge :	137.2 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:27
Total Precipitation :	55.1 (AC-FT)	Total Direct Runoff :	18.5 (AC-FT)
Total Loss :	36.5 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	18.6 (AC-FT)	Discharge :	18.5 (AC-FT)

Subbasin "OB6" Results for Run "EV 100-yr Pr. Type IIA NR"



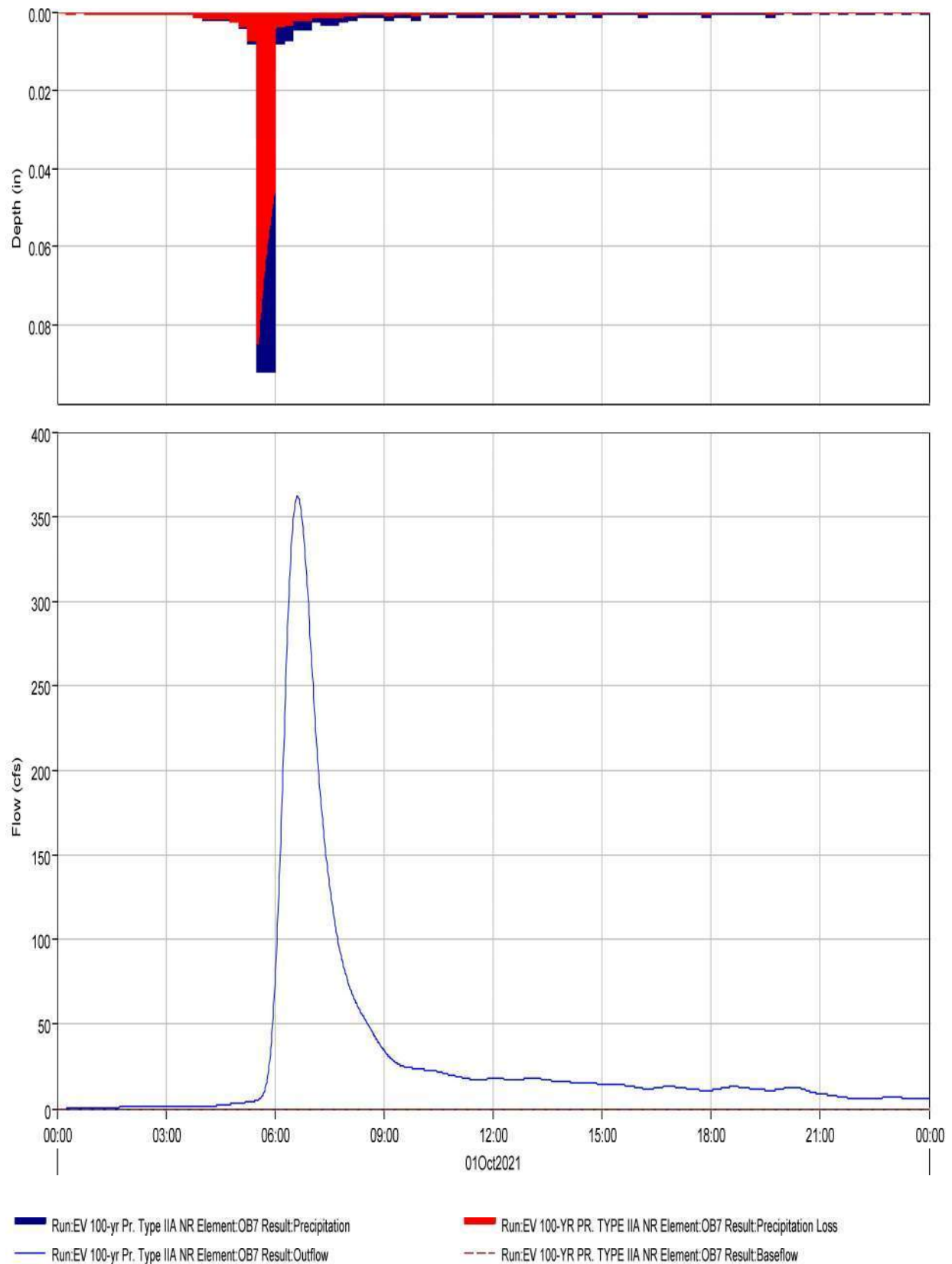
Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Pr. Type IIA NR Subbasin: OB6  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:25 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Discharge :	156.1 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:19
Total Precipitation :	45.4 (AC-FT)	Total Direct Runoff :	17.1 (AC-FT)
Total Loss :	28.2 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	17.2 (AC-FT)	Discharge :	17.1 (AC-FT)



Subbasin "OB7" Results for Run "EV 100-yr Pr. Type IIA NR"

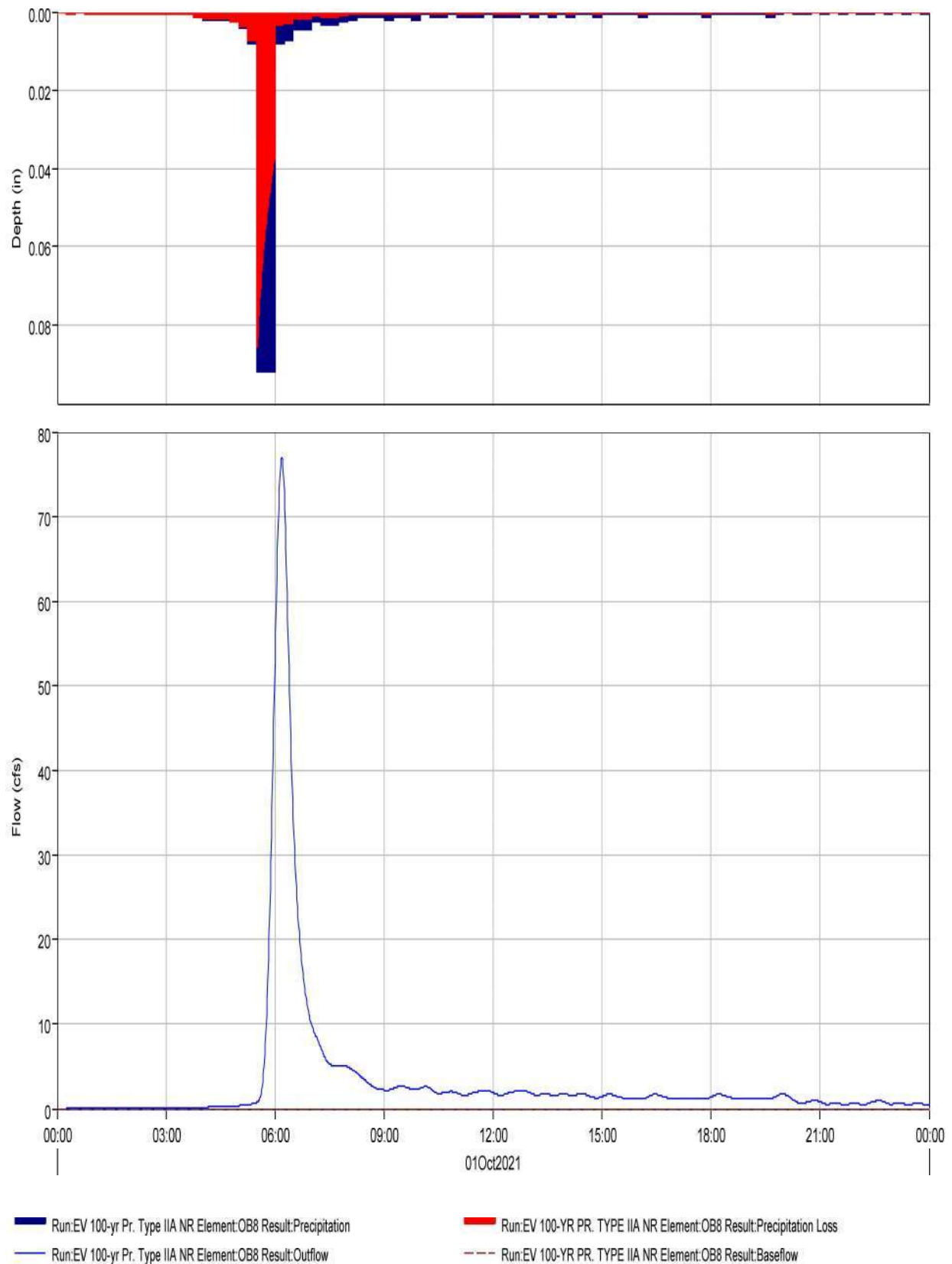


Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Pr. Type IIA NR Subbasin: OB7  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:25 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Discharge :	362.2 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:37
Total Precipitation :	161.5 (AC-FT)	Total Direct Runoff :	57.7 (AC-FT)
Total Loss :	103.3 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	58.2 (AC-FT)	Discharge :	57.7 (AC-FT)

Subbasin "OB8" Results for Run "EV 100-yr Pr. Type IIA NR"

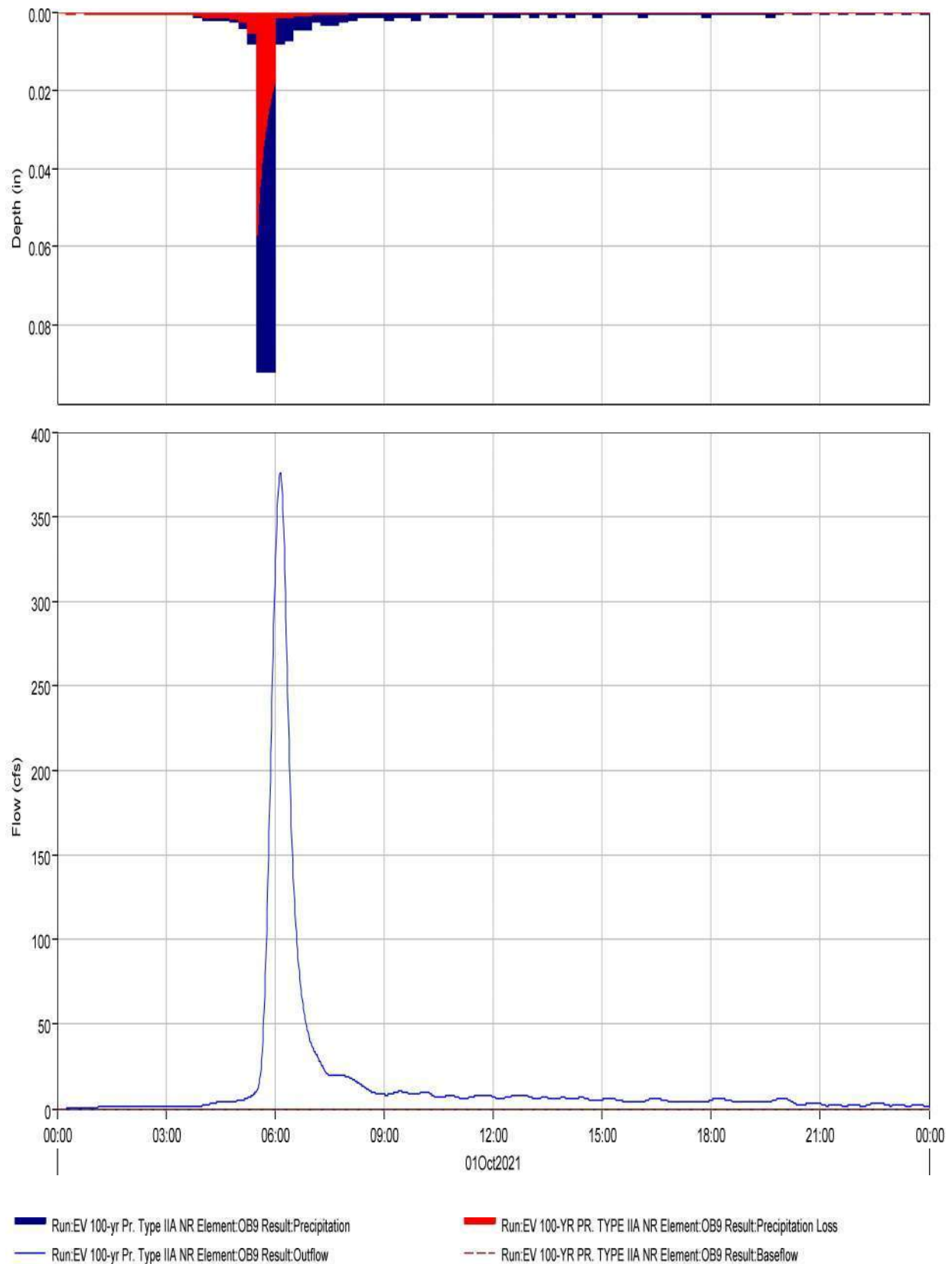


Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Pr. Type IIA NR Subbasin: OB8  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:25 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Discharge :	77.0 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:11
Total Precipitation :	15.3 (AC-FT)	Total Direct Runoff :	6.6 (AC-FT)
Total Loss :	8.7 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	6.6 (AC-FT)	Discharge :	6.6 (AC-FT)

Subbasin "OB9" Results for Run "EV 100-yr Pr. Type IIA NR"

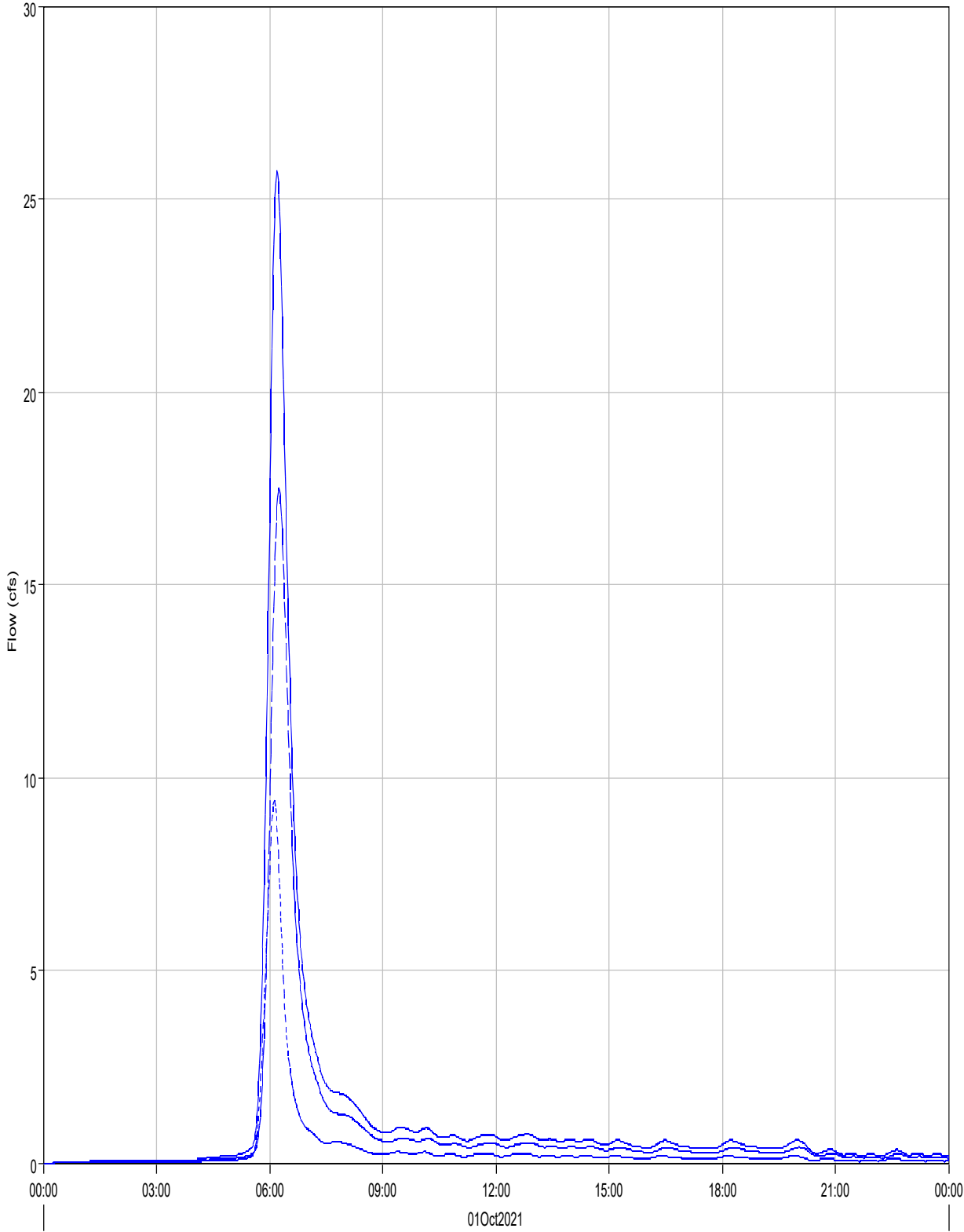


Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Pr. Type IIA NR Subbasin: OB9  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:25 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Discharge :	375.9 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:09
Total Precipitation :	45.0 (AC-FT)	Total Direct Runoff :	30.2 (AC-FT)
Total Loss :	14.7 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	30.3 (AC-FT)	Discharge :	30.2 (AC-FT)

Junction "P1" Results for Run "EV 100-yr Pr. Type IIA NR"



Run:EV 100-yr Pr. Type IIA NR Element:P1 Result:Outflow      Run:EV 100-yr Pr. Type IIA NR Element:R-OB1 Result:Outflow      Run:EV 100-yr Pr. Type IIA NR Element:PB1 Result:Outflow

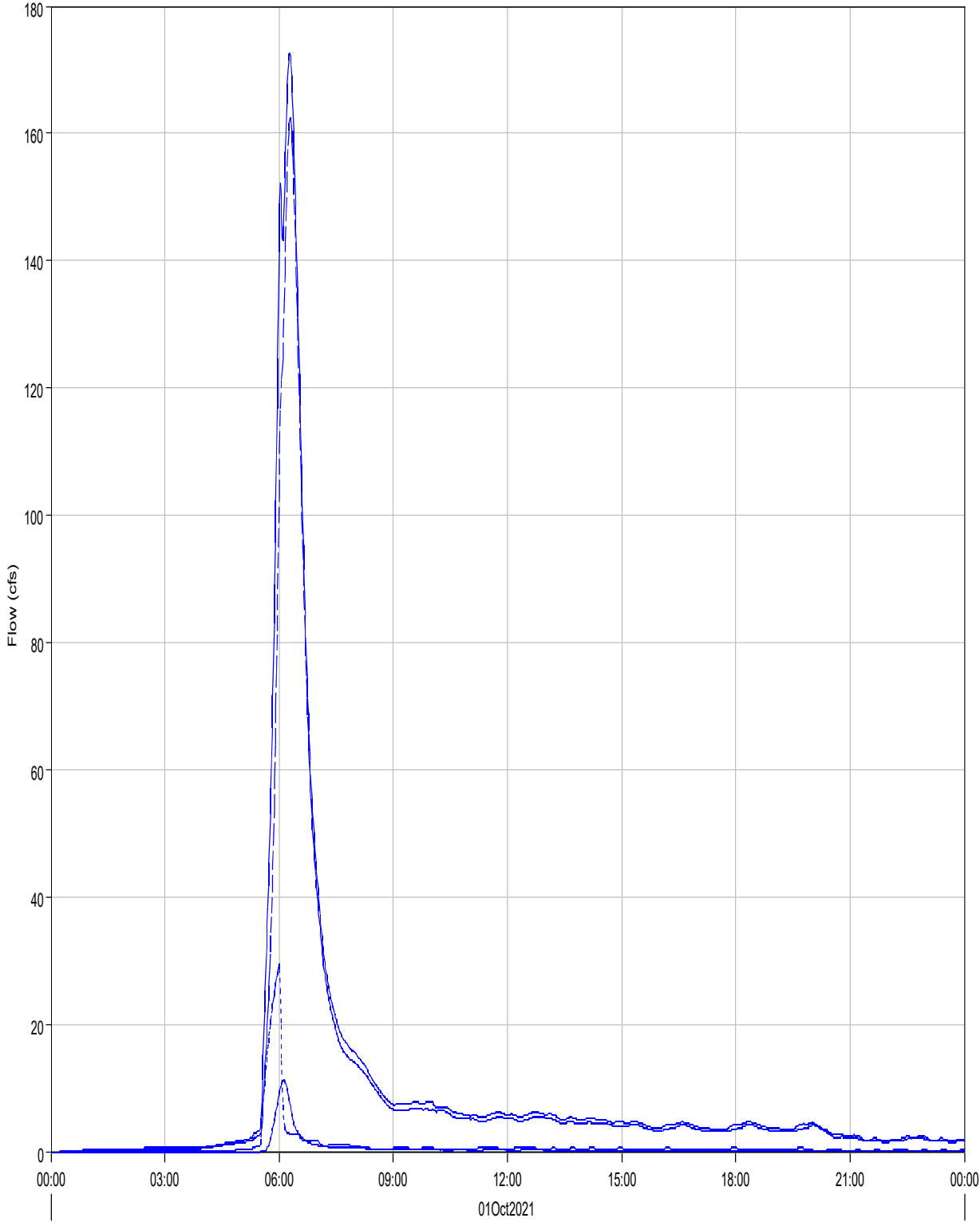
Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Pr. Type IIA NR Junction: P1  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:25 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Outflow :	25.7 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 06:12
Total Outflow :	2.3 (AC-FT)		



Junction "P2" Results for Run "EV 100-yr Pr. Type IIA NR"



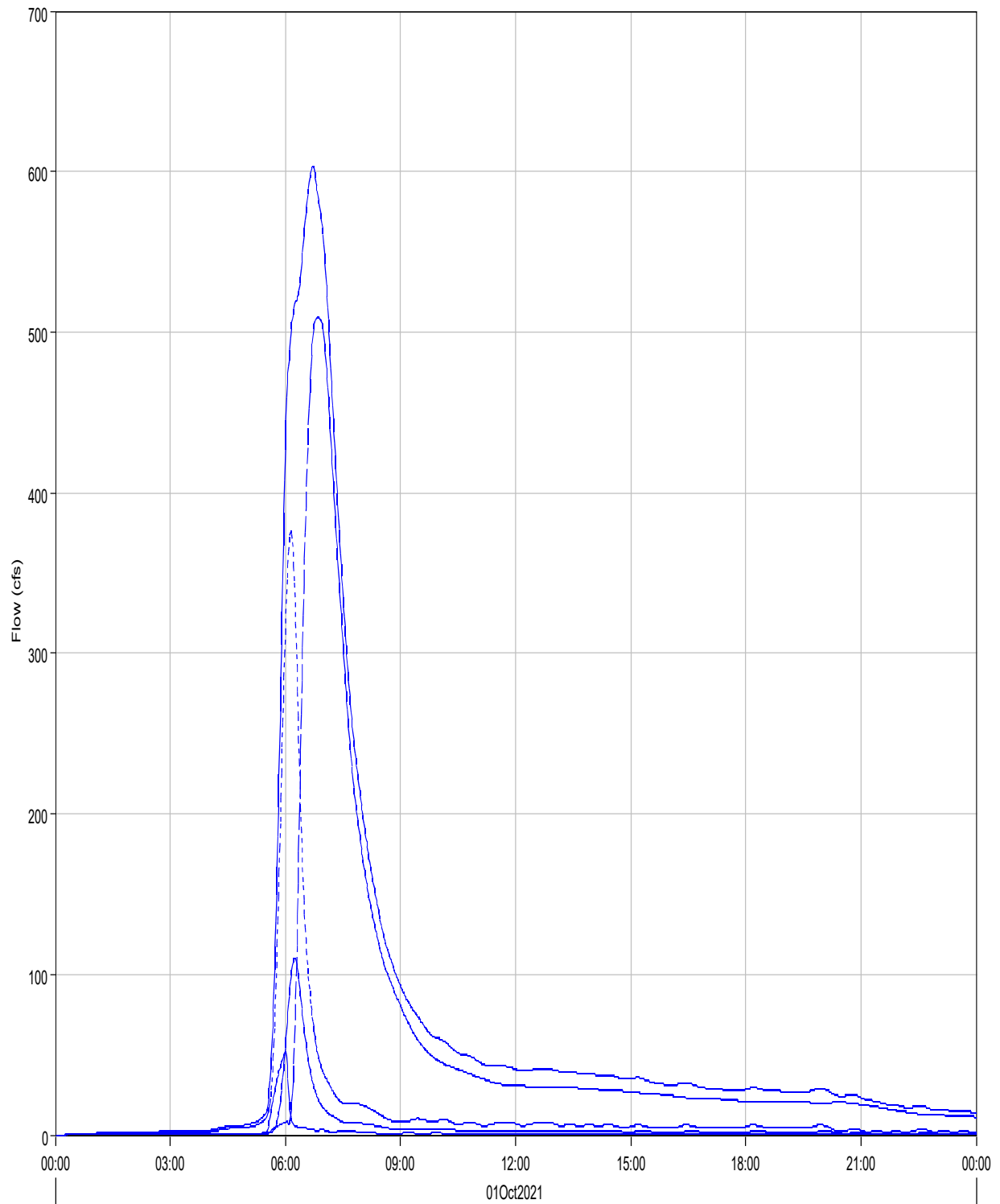
Run:EV 100-yr Pr. Type IIA NR Element:P2 Result:Outflow    Run:EV 100-yr Pr. Type IIA NR Element:R-PB6 Result:Outflow    Run:EV 100-yr Pr. Type IIA NR Element:PB15 Result:Outflow  
Run:EV 100-yr Pr. Type IIA NR Element:PB7 Result:Outflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Pr. Type IIA NR Junction: P2  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:25 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Outflow : 172.6 (CFS) Date/Time of Peak Outflow : 01Oct2021, 06:17  
Total Outflow : 20.5 (AC-FT)

Junction "P3" Results for Run "EV 100-yr Pr. Type IIA NR"



Run:EV 100-yr Pr. Type IIA NR Element:P3 Result:Outflow  
Run:EV 100-yr Pr. Type IIA NR Element:OB9 Result:Outflow  
Run:EV 100-yr Pr. Type IIA NR Element:PB14 Result:Outflow

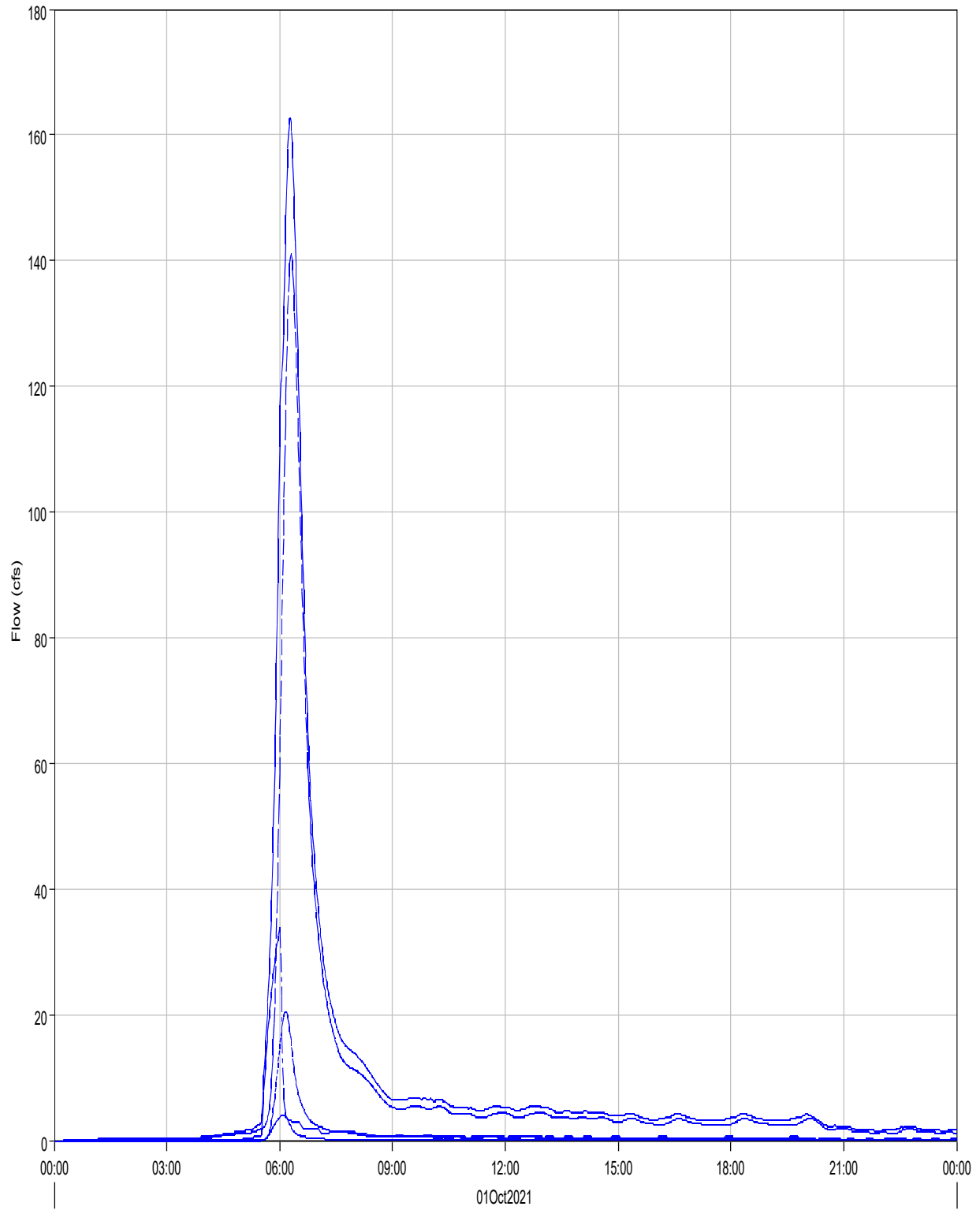
Run:EV 100-yr Pr. Type IIA NR Element:R-PB13 Result:Outflow  
Run:EV 100-yr Pr. Type IIA NR Element:R-PB11 Result:Outflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Pr. Type IIA NR Junction: P3  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:25 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Outflow : 603.5 (CFS) Date/Time of Peak Outflow : 01Oct2021, 06:43  
Total Outflow : 136.0 (AC-FT)

Junction "P4" Results for Run "EV 100-yr Pr. Type IIA NR"



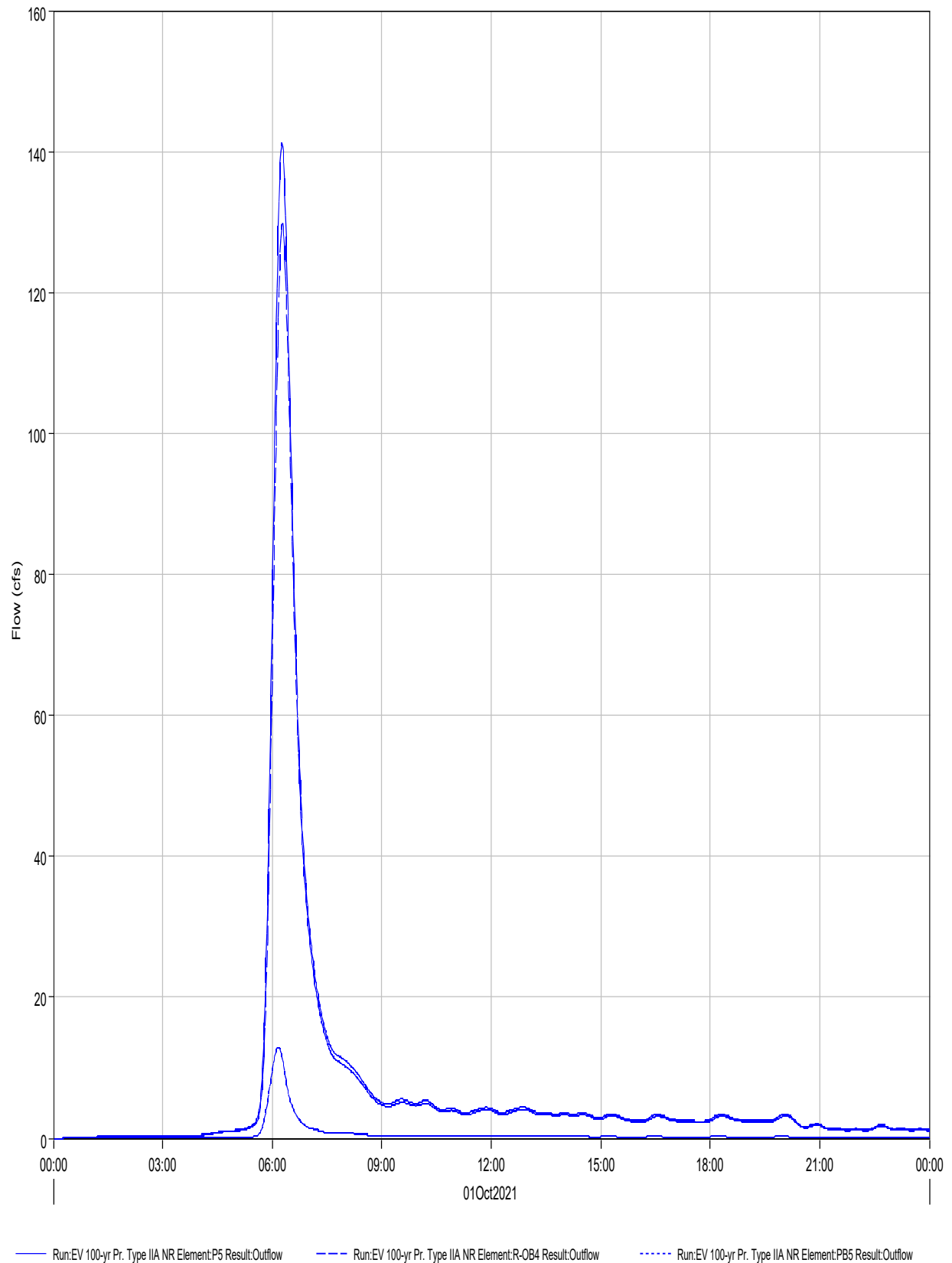
Run:EV 100-yr Pr. Type IIA NR Element:P4 Result:Outflow    Run:EV 100-yr Pr. Type IIA NR Element:R-PB5 Result:Outflow    Run:EV 100-yr Pr. Type IIA NR Element:PB6 Result:Outflow  
Run:EV 100-yr Pr. Type IIA NR Element:PB4 Result:Outflow    Run:EV 100-yr Pr. Type IIA NR Element:PB3 Result:Outflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Pr. Type IIA NR Junction: P4  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:25 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Outflow : 162.6 (CFS) Date/Time of Peak Outflow : 01Oct2021, 06:17  
Total Outflow : 18.0 (AC-FT)

Junction "P5" Results for Run "EV 100-yr Pr. Type IIA NR"



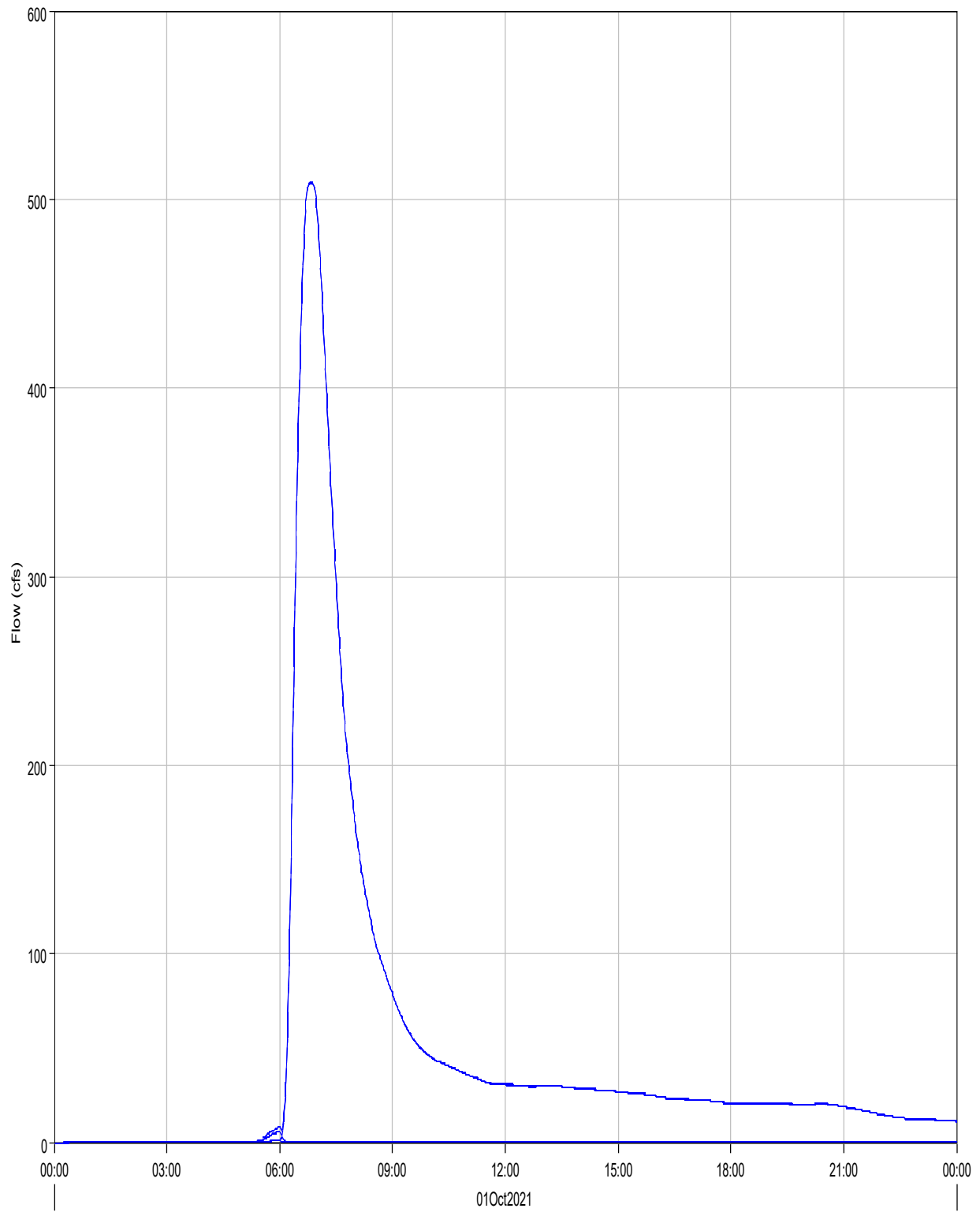
Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Pr. Type IIA NR Junction: P5  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:25 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Outflow : 141.2 (CFS) Date/Time of Peak Outflow : 01Oct2021, 06:16  
Total Outflow : 14.2 (AC-FT)



Junction "P6" Results for Run "EV 100-yr Pr. Type IIA NR"



Run:EV 100-yr Pr. Type IIA NR Element:P6 Result:Outflow  
Run:EV 100-yr Pr. Type IIA NR Element:PB13 Result:Outflow

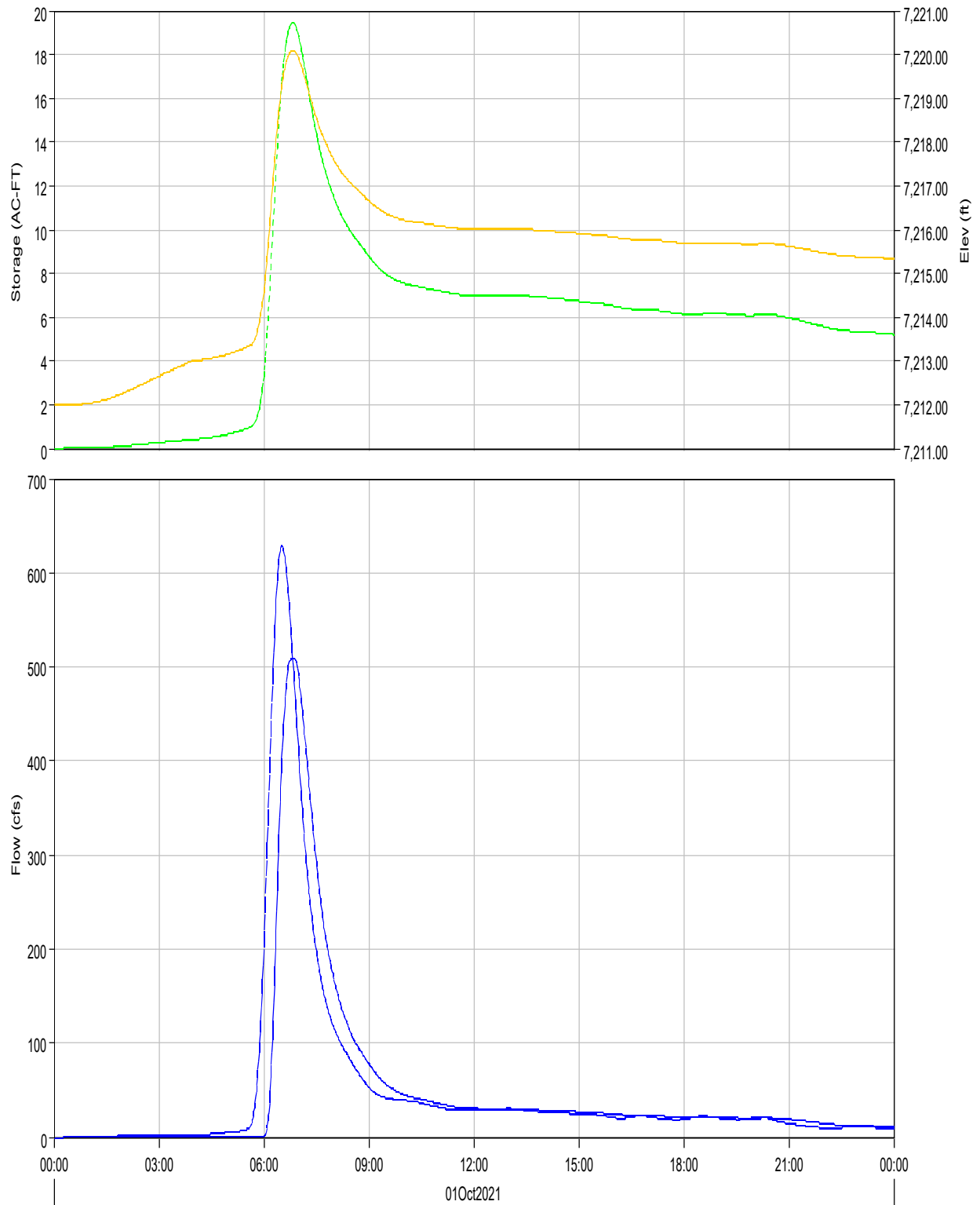
Run:EV 100-yr Pr. Type IIA NR Element:R-PB10 Result:Outflow  
Run:EV 100-yr Pr. Type IIA NR Element:PB12 Result:Outflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Pr. Type IIA NR Junction: P6  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:25 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Outflow : 509.2 (CFS) Date/Time of Peak Outflow : 01Oct2021, 06:50  
Total Outflow : 93.5 (AC-FT)

Reservoir "P7" Results for Run "EV 100-yr Pr. Type IIA NR"



Run:EV 100-YR PR. TYPE IIA NR Element:P7 Result:Storage

Run:EV 100-yr Pr. Type IIA NR Element:P7 Result:Outflow

Run:EV 100-YR PR. TYPE IIA NR Element:P7 Result:Pool Elevation

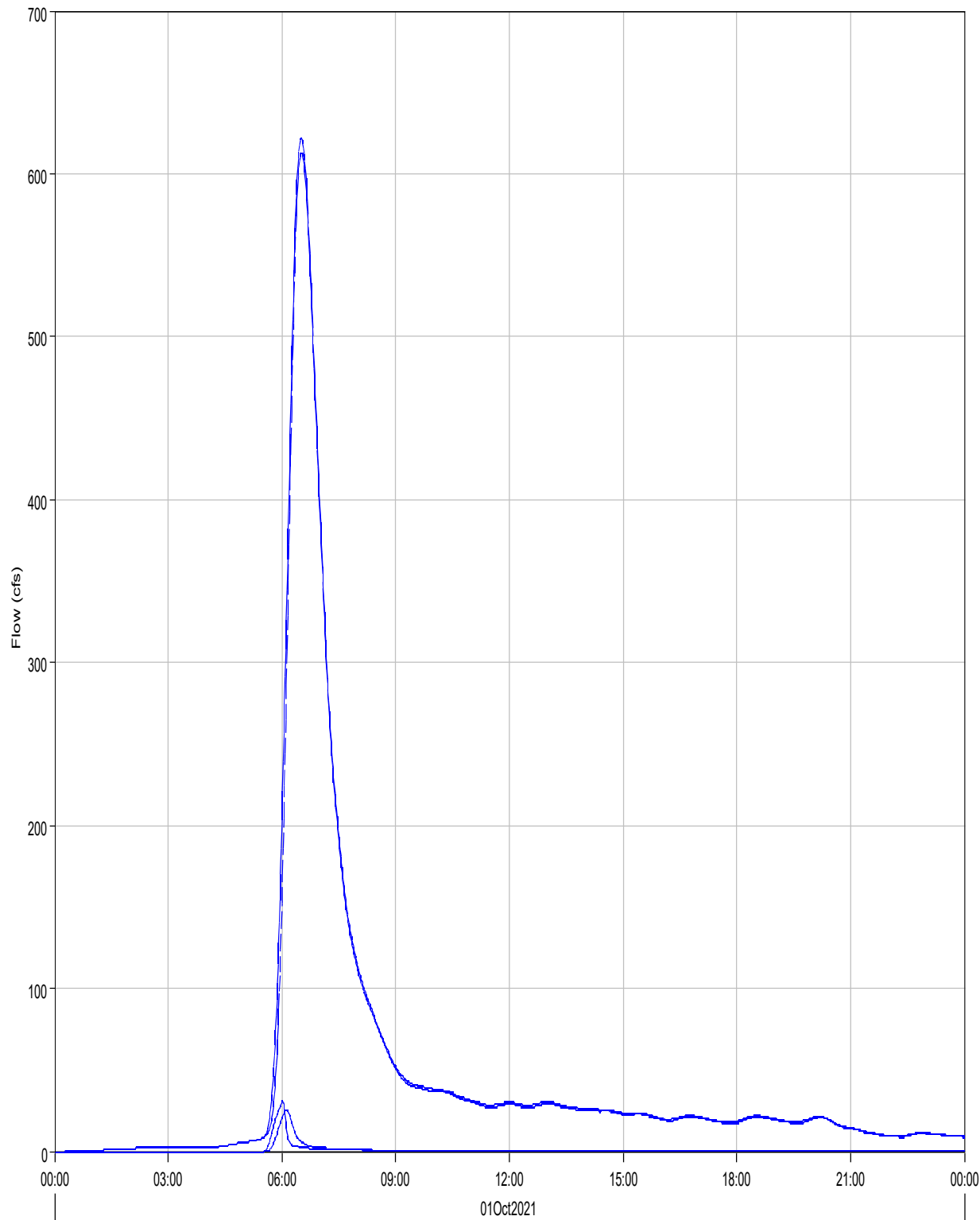
Run:EV 100-YR PR. TYPE IIA NR Element:P7 Result:Combined Flow

Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Pr. Type IIA NR Reservoir: P7  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:25 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Inflow :	628.3 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 06:31
Peak Outflow :	508.8 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 06:50
Total Inflow :	98.3 (AC-FT)	Peak Storage :	19.5 (AC-FT)
Total Outflow :	93.1 (AC-FT)	Peak Elevation :	7220.1 (FT)

Junction "P8" Results for Run "EV 100-yr Pr. Type IIA NR"



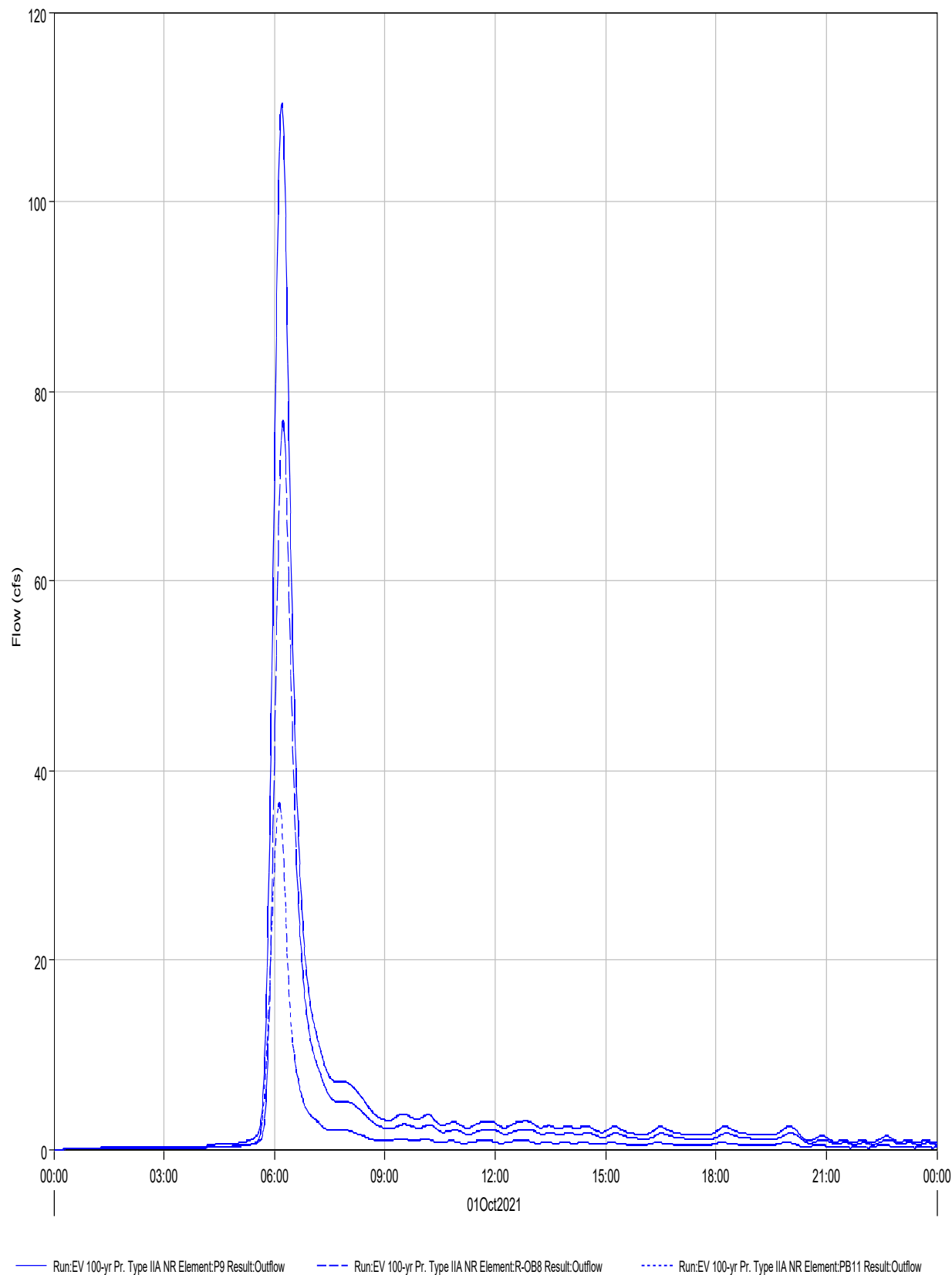
Run:EV 100-yr Pr. Type IIA NR Element:P8 Result:Outflow    Run:EV 100-yr Pr. Type IIA NR Element:R-OB7 Result:Outflow    Run:EV 100-yr Pr. Type IIA NR Element:PB9 Result:Outflow  
Run:EV 100-yr Pr. Type IIA NR Element:PB8 Result:Outflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Pr. Type IIA NR Junction: P8  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:25 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Outflow : 621.6 (CFS) Date/Time of Peak Outflow : 01Oct2021, 06:31  
Total Outflow : 96.7 (AC-FT)

Junction "P9" Results for Run "EV 100-yr Pr. Type IIA NR"



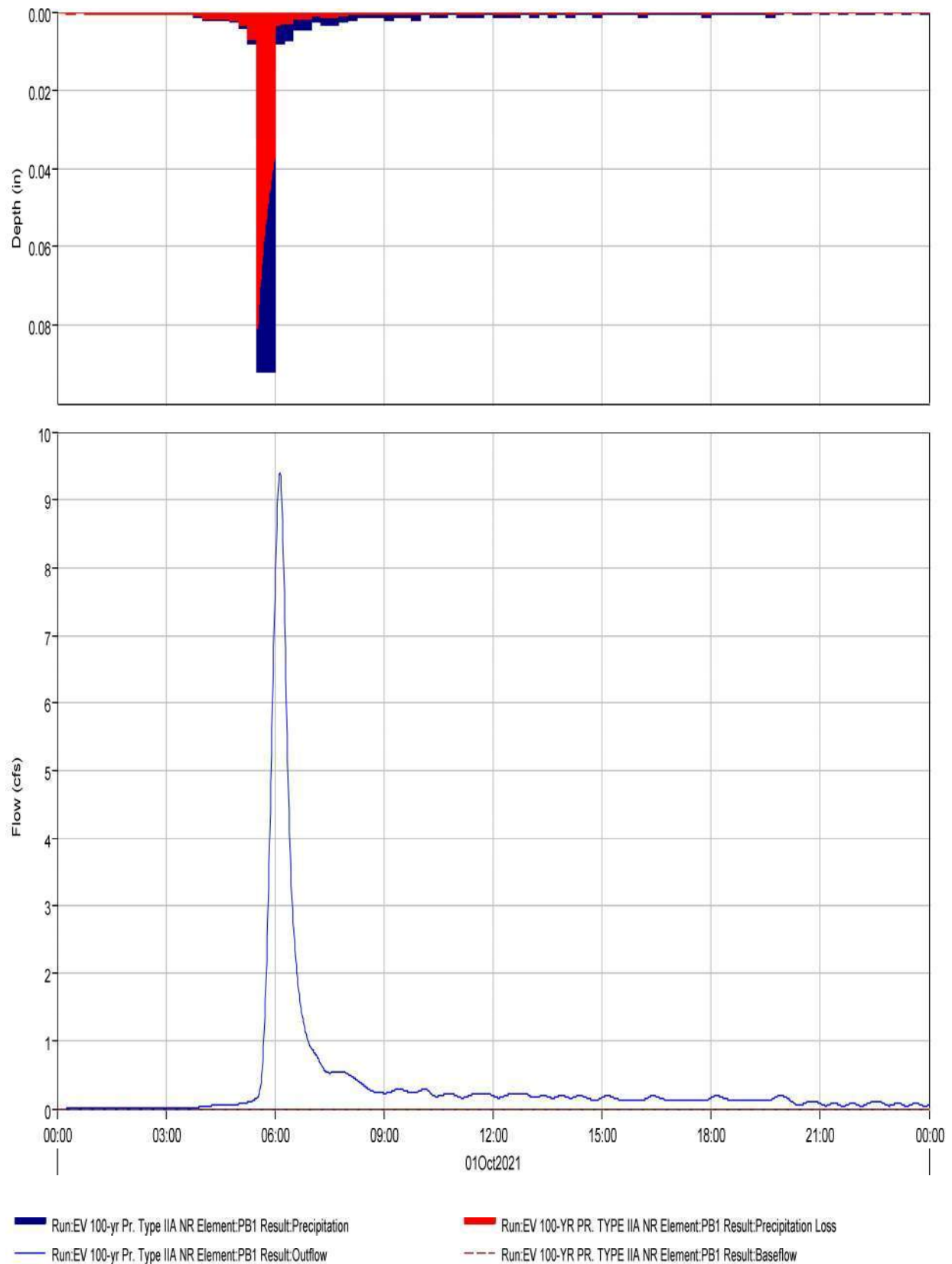
Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Pr. Type IIA NR Junction: P9  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:25 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Outflow : 110.4 (CFS) Date/Time of Peak Outflow : 01Oct2021, 06:12  
Total Outflow : 9.4 (AC-FT)



Subbasin "PB1" Results for Run "EV 100-yr Pr. Type IIA NR"

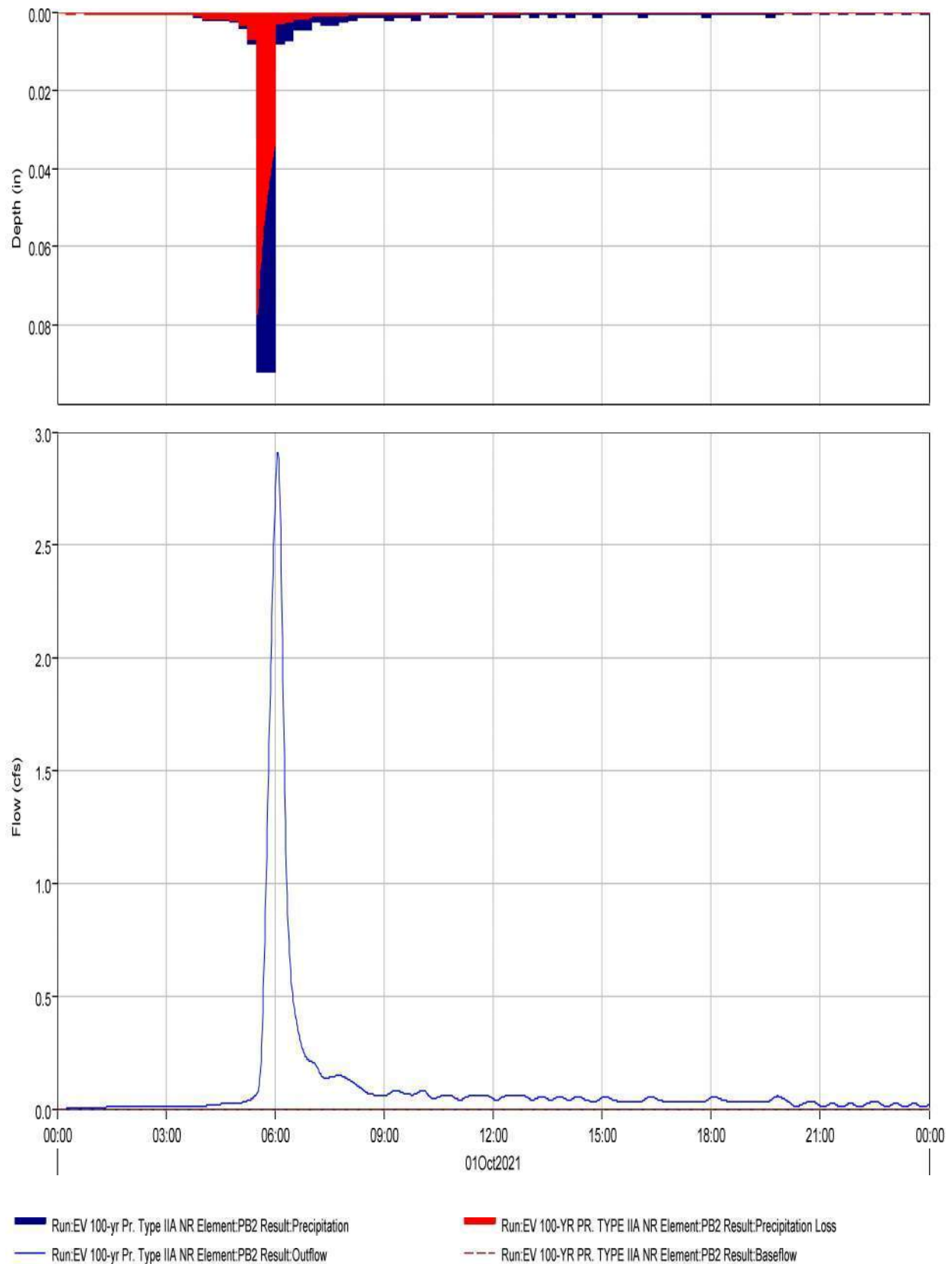


Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Pr. Type IIA NR Subbasin: PB1  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:25 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Discharge :	9.4 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:08
Total Precipitation :	1.6 (AC-FT)	Total Direct Runoff :	0.7 (AC-FT)
Total Loss :	0.9 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	0.7 (AC-FT)	Discharge :	0.7 (AC-FT)

Subbasin "PB2" Results for Run "EV 100-yr Pr. Type IIA NR"

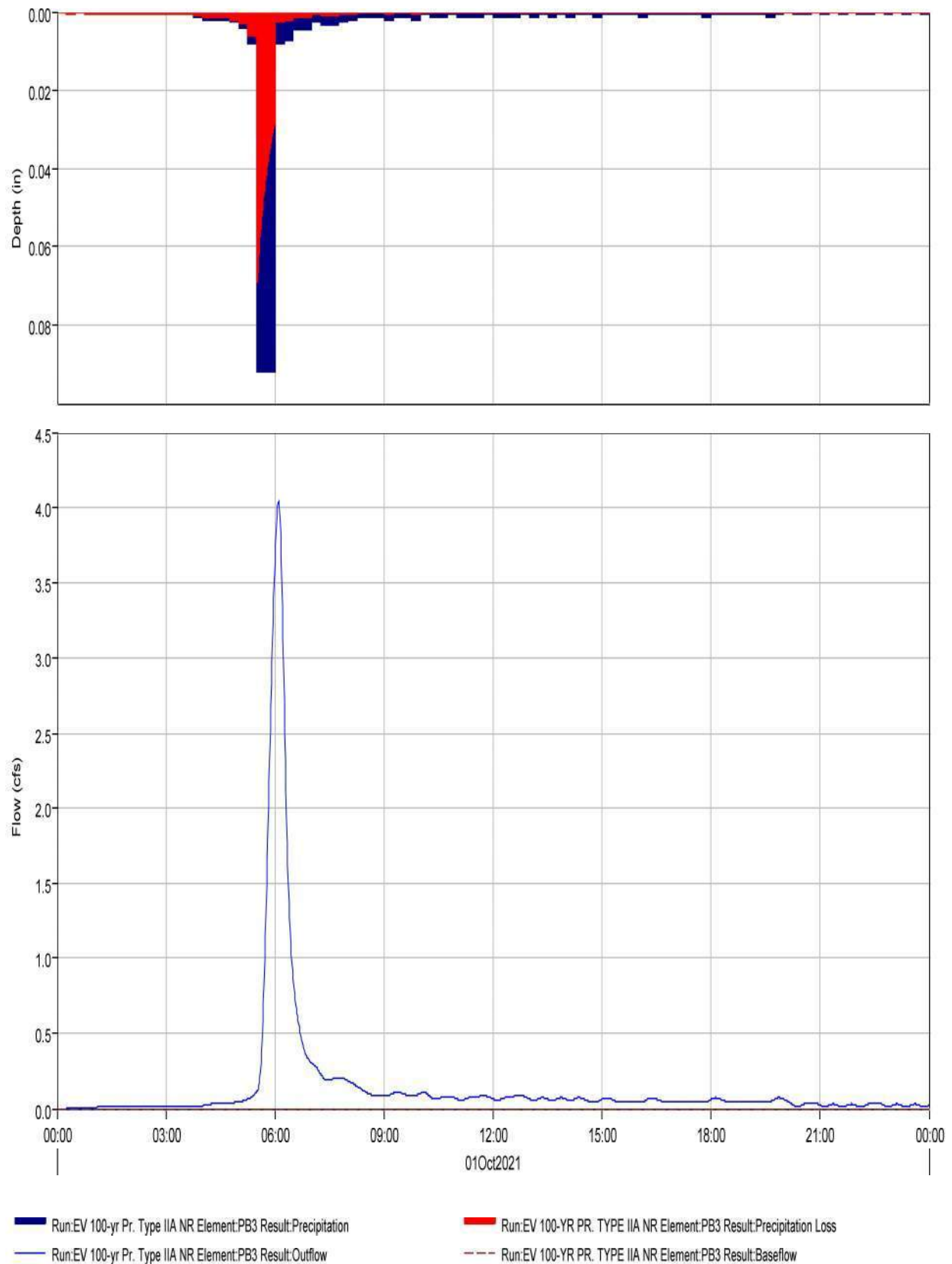


Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Pr. Type IIA NR Subbasin: PB2  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:25 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Discharge :	2.9 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:05
Total Precipitation :	0.4 (AC-FT)	Total Direct Runoff :	0.2 (AC-FT)
Total Loss :	0.2 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	0.2 (AC-FT)	Discharge :	0.2 (AC-FT)

Subbasin "PB3" Results for Run "EV 100-yr Pr. Type IIA NR"



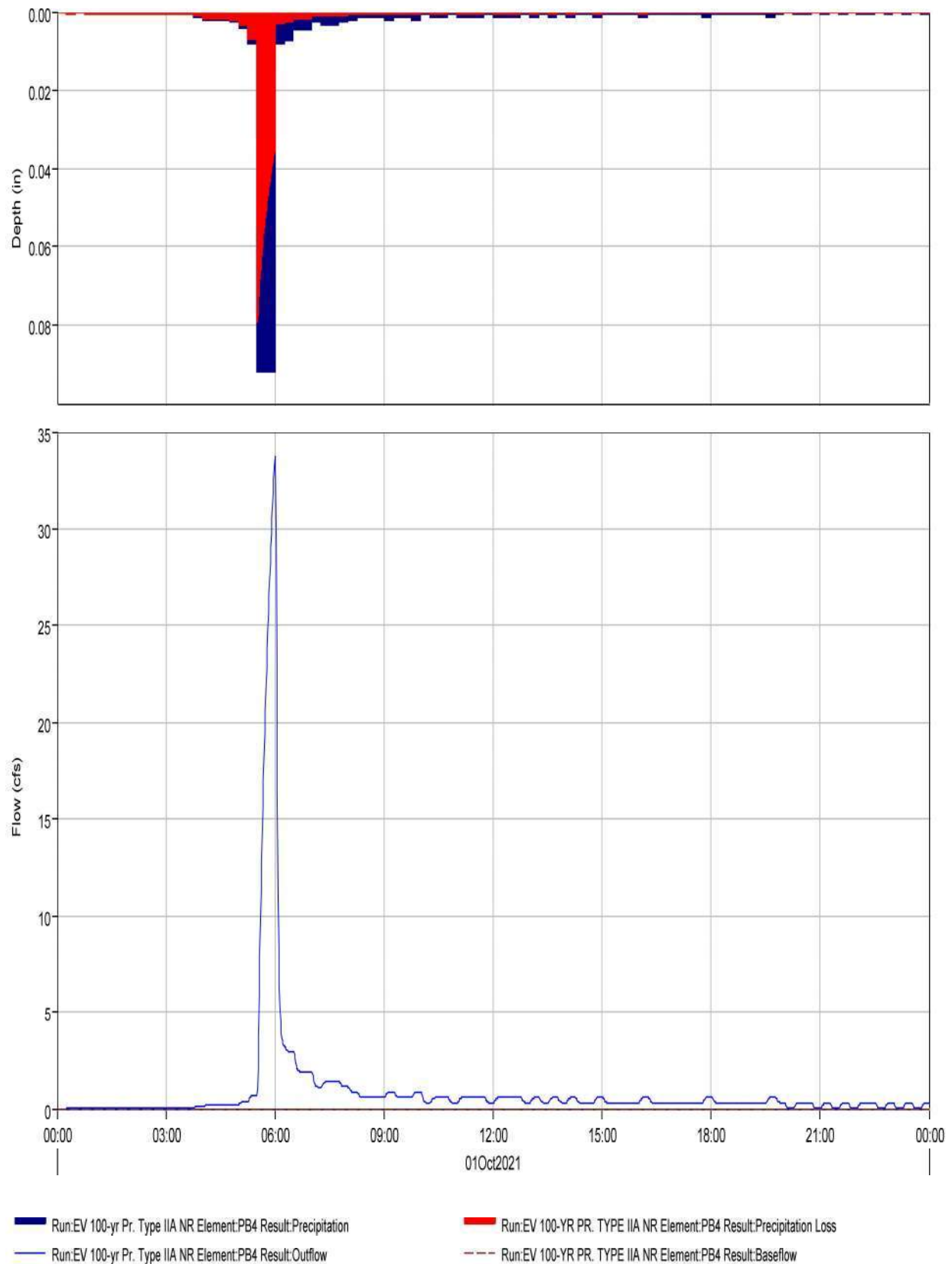
Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Pr. Type IIA NR Subbasin: PB3  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:25 Control Specifications: 24-hr Storm

Volume Units: AC-FT

#### Computed Results

Peak Discharge :	4.0 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:06
Total Precipitation :	0.5 (AC-FT)	Total Direct Runoff :	0.3 (AC-FT)
Total Loss :	0.2 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	0.3 (AC-FT)	Discharge :	0.3 (AC-FT)

Subbasin "PB4" Results for Run "EV 100-yr Pr. Type IIA NR"



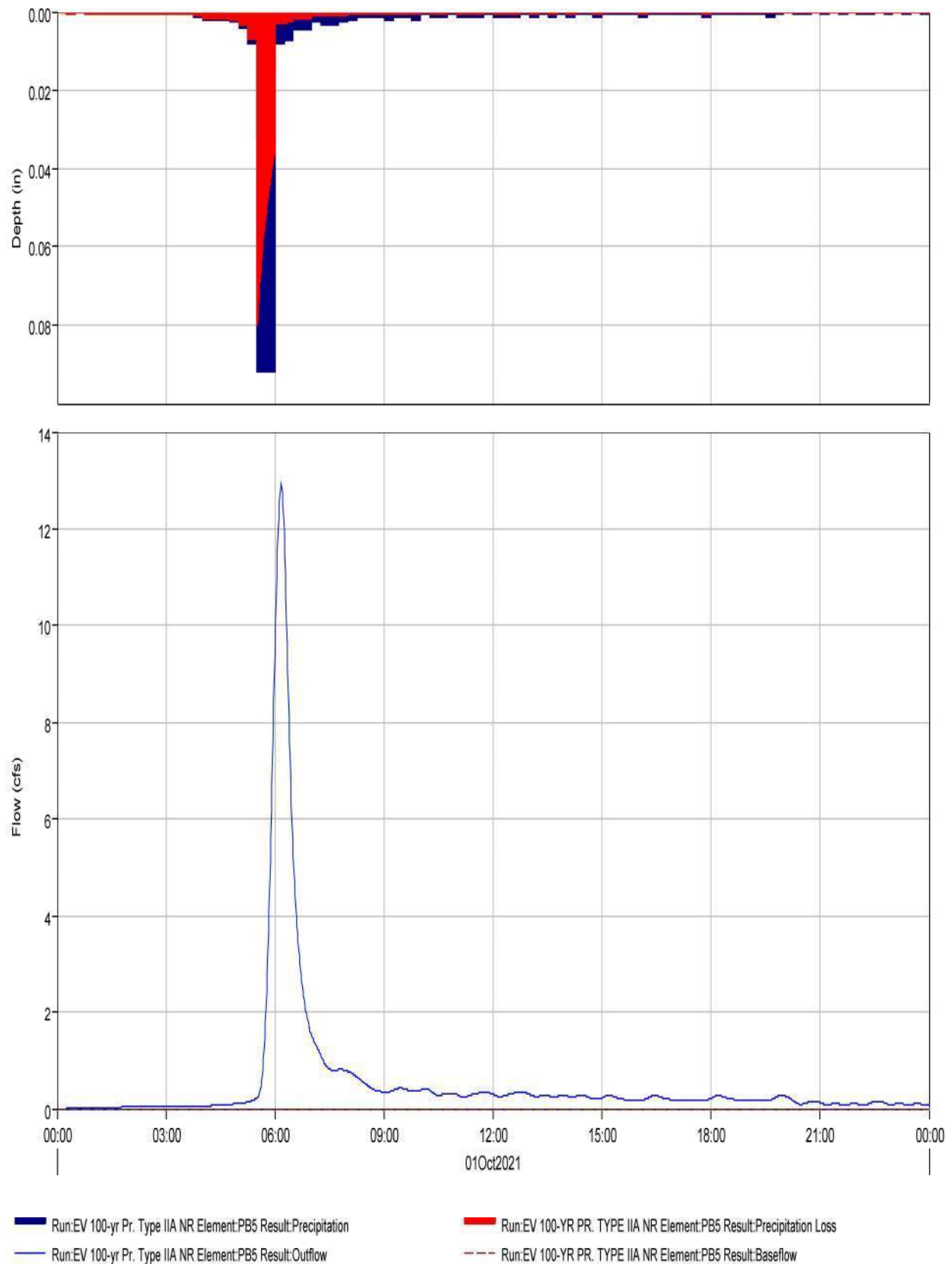
Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Pr. Type IIA NR Subbasin: PB4  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:25 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Discharge :	33.8 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:00
Total Precipitation :	4.0 (AC-FT)	Total Direct Runoff :	1.9 (AC-FT)
Total Loss :	2.2 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	1.9 (AC-FT)	Discharge :	1.9 (AC-FT)



Subbasin "PB5" Results for Run "EV 100-yr Pr. Type IIA NR"

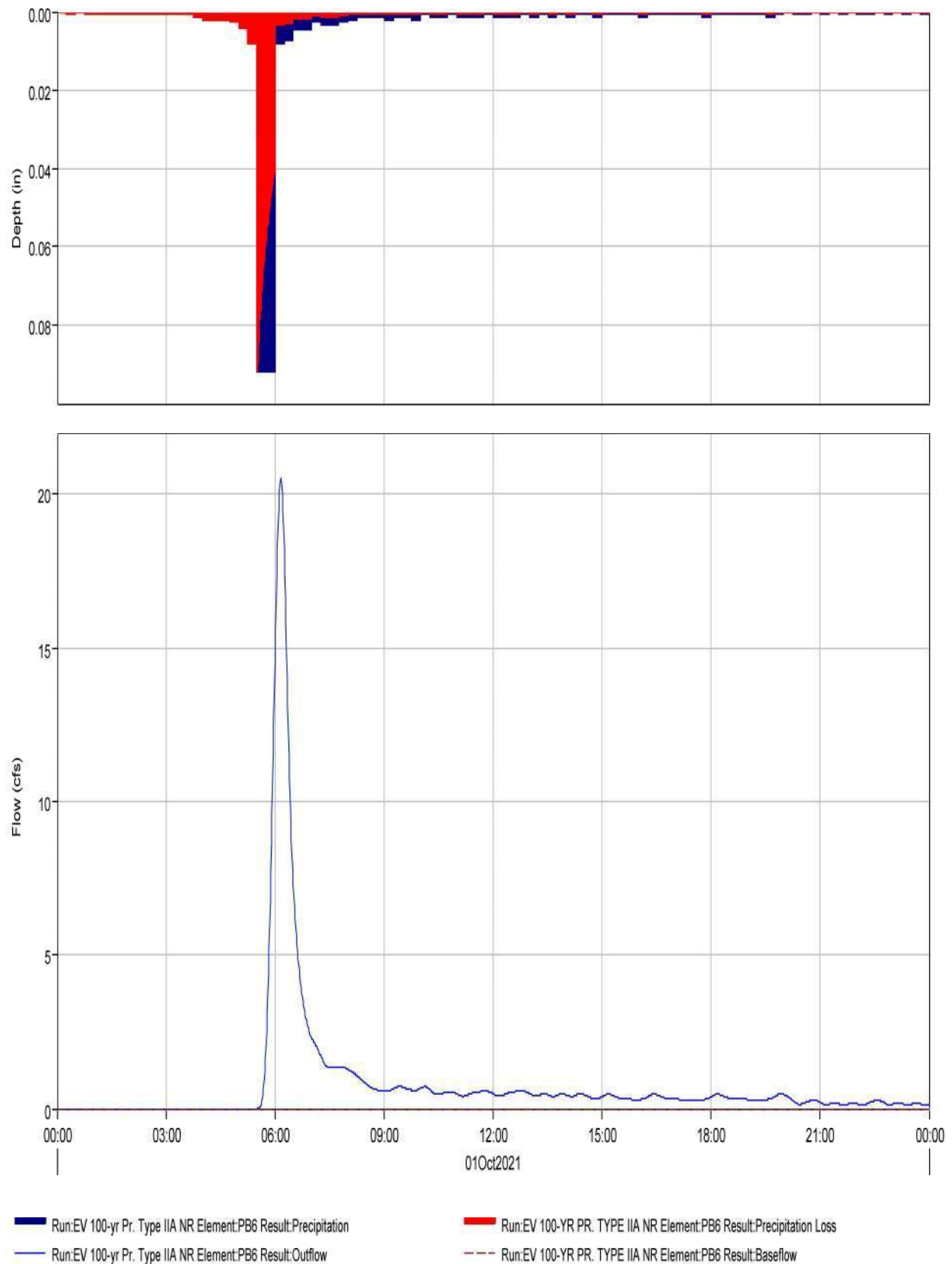


Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Pr. Type IIA NR Subbasin: PB5  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:25 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Discharge :	12.9 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:10
Total Precipitation :	2.4 (AC-FT)	Total Direct Runoff :	1.1 (AC-FT)
Total Loss :	1.3 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	1.1 (AC-FT)	Discharge :	1.1 (AC-FT)

Subbasin "PB6" Results for Run "EV 100-yr Pr. Type IIA NR"

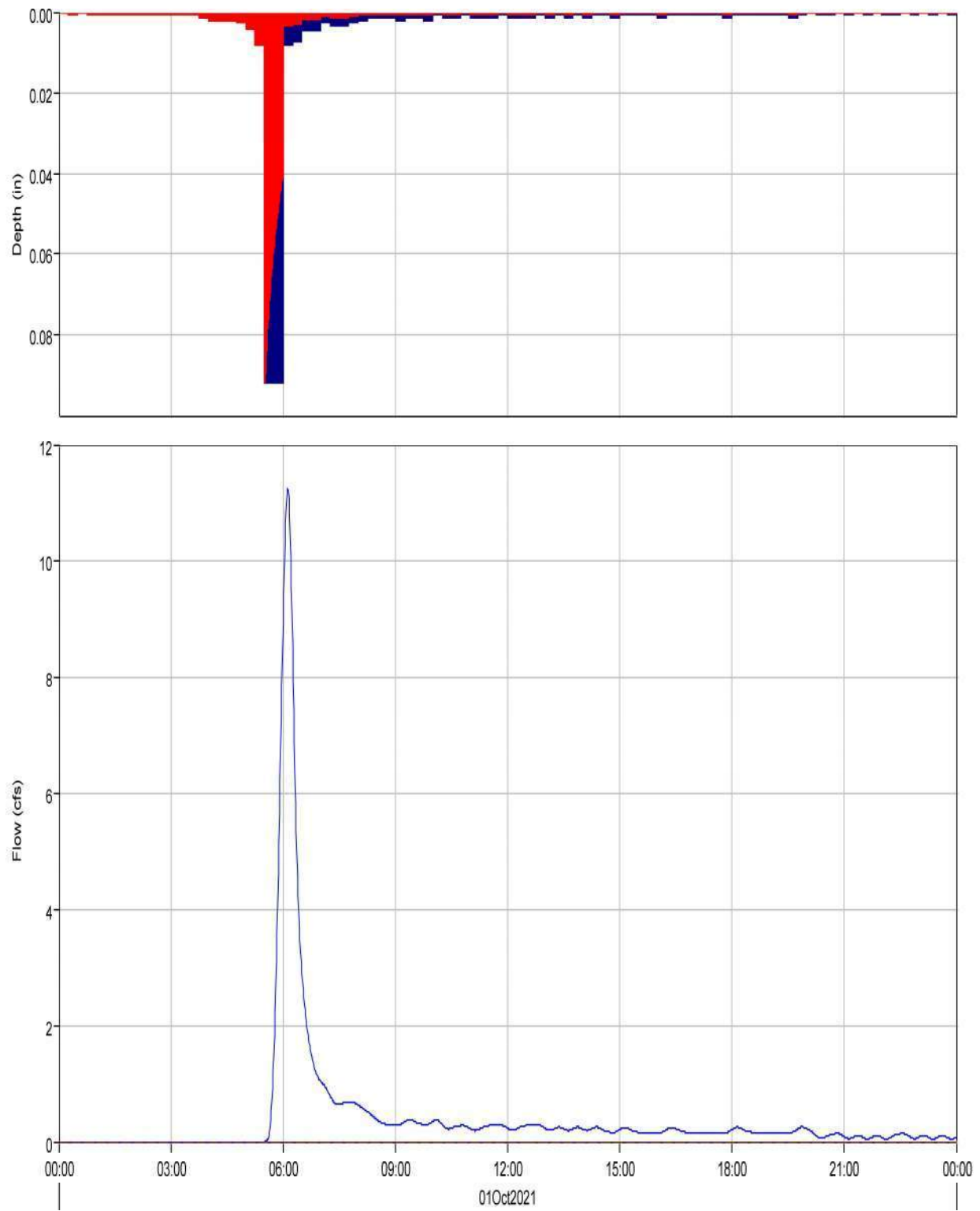


Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Pr. Type IIA NR Subbasin: PB6  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:25 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Discharge :	20.5 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:09
Total Precipitation :	4.3 (AC-FT)	Total Direct Runoff :	1.6 (AC-FT)
Total Loss :	2.6 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	1.6 (AC-FT)	Discharge :	1.6 (AC-FT)

Subbasin "PB7" Results for Run "EV 100-yr Pr. Type IIA NR"



Run:EV 100-yr Pr. Type IIA NR Element:PB7 Result:Precipitation  
Run:EV 100-yr Pr. Type IIA NR Element:PB7 Result:Outflow

Run:EV 100-YR PR. TYPE IIA NR Element:PB7 Result:Precipitation Loss  
Run:EV 100-YR PR. TYPE IIA NR Element:PB7 Result:Baseflow

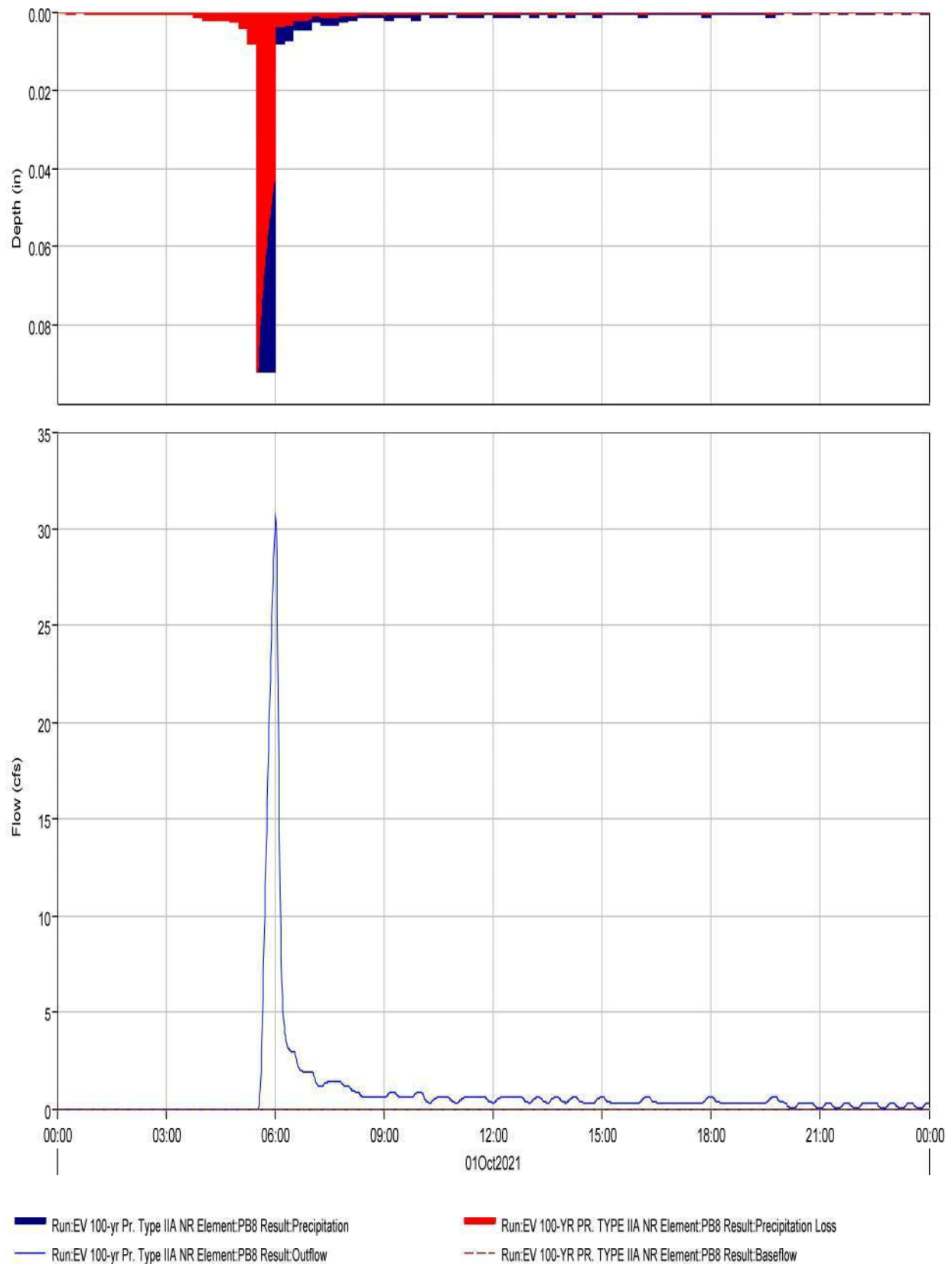
Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Pr. Type IIA NR Subbasin: PB7  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:25 Control Specifications: 24-hr Storm

Volume Units: AC-FT

#### Computed Results

Peak Discharge :	11.2 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:07
Total Precipitation :	2.1 (AC-FT)	Total Direct Runoff :	0.8 (AC-FT)
Total Loss :	1.3 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	0.8 (AC-FT)	Discharge :	0.8 (AC-FT)

Subbasin "PB8" Results for Run "EV 100-yr Pr. Type IIA NR"



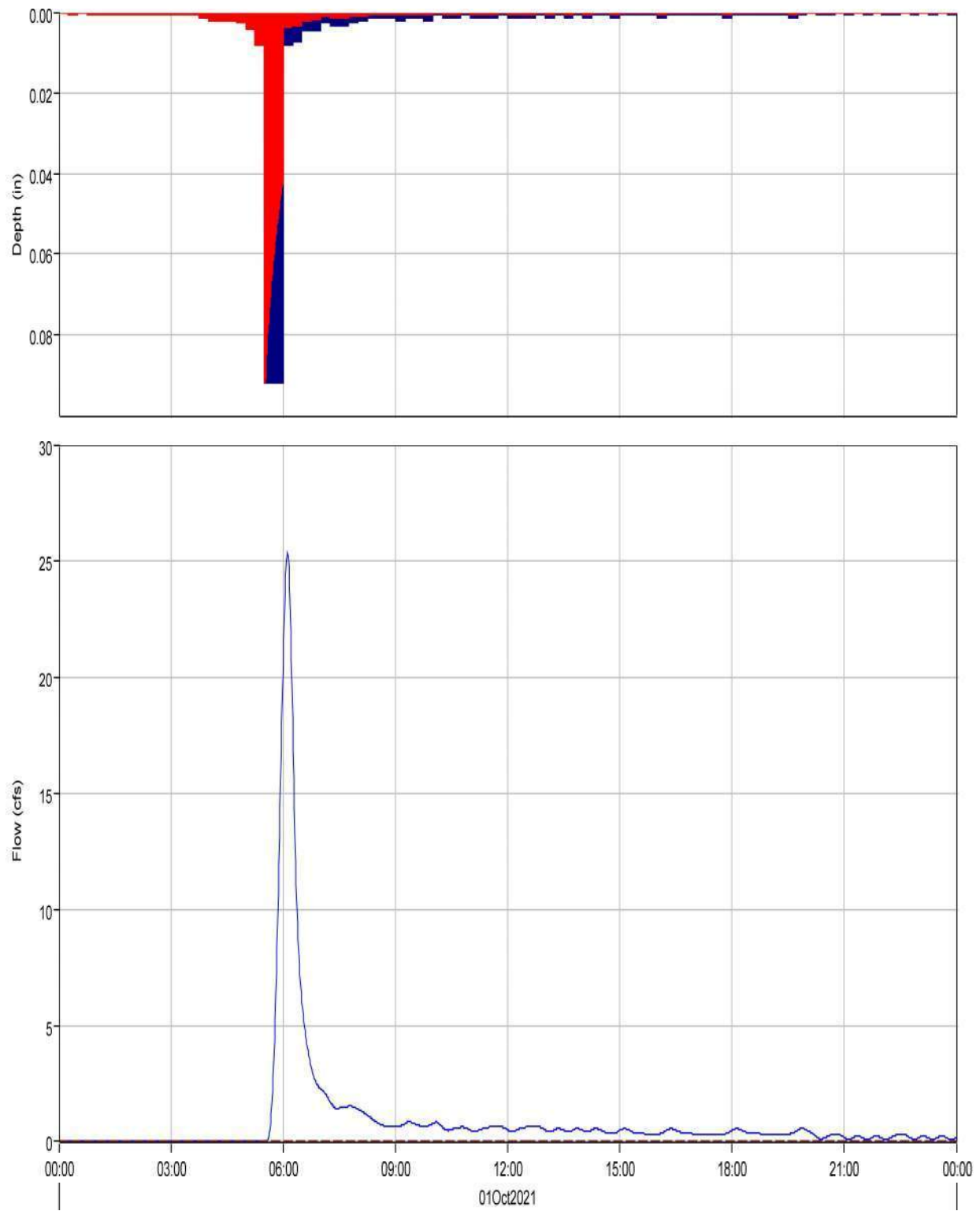
Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Pr. Type IIA NR Subbasin: PB8  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:25 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Discharge :	30.6 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:01
Total Precipitation :	4.5 (AC-FT)	Total Direct Runoff :	1.7 (AC-FT)
Total Loss :	2.9 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	1.7 (AC-FT)	Discharge :	1.7 (AC-FT)



Subbasin "PB9" Results for Run "EV 100-yr Pr. Type IIA NR"



Run:EV 100-yr Pr. Type IIA NR Element:PB9 Result:Precipitation  
Run:EV 100-yr Pr. Type IIA NR Element:PB9 Result:Outflow

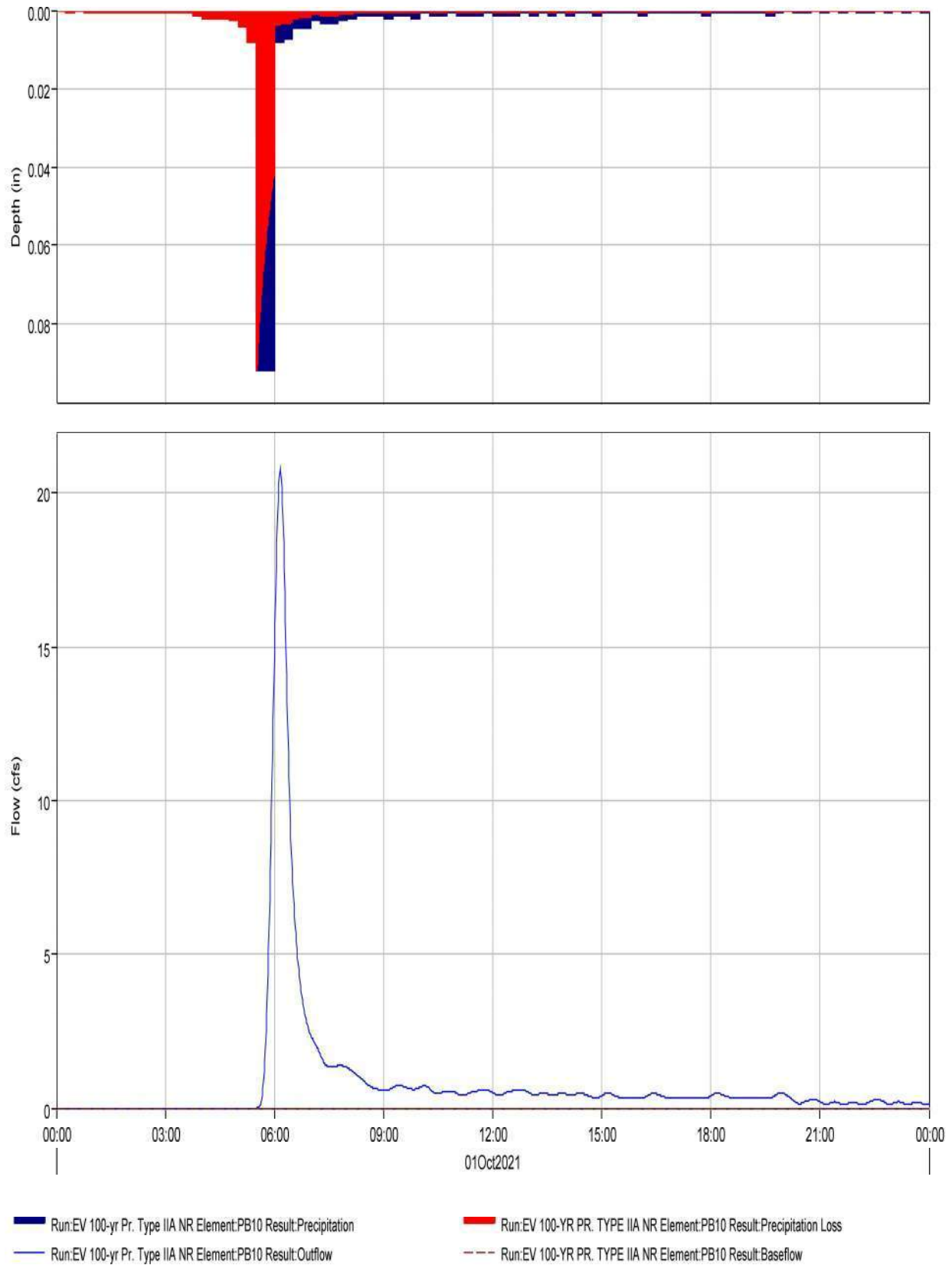
Run:EV 100-YR PR. TYPE IIA NR Element:PB9 Result:Precipitation Loss  
Run:EV 100-YR PR. TYPE IIA NR Element:PB9 Result:Baseflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Pr. Type IIA NR Subbasin: PB9  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:25 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Discharge :	25.4 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:07
Total Precipitation :	4.9 (AC-FT)	Total Direct Runoff :	1.8 (AC-FT)
Total Loss :	3.1 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	1.8 (AC-FT)	Discharge :	1.8 (AC-FT)

Subbasin "PB10" Results for Run "EV 100-yr Pr. Type IIA NR"



Project: Eagleview\_Subdivision

Simulation Run: EV 100-yr Pr. Type IIA NR Subbasin: PB10

Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed

End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR

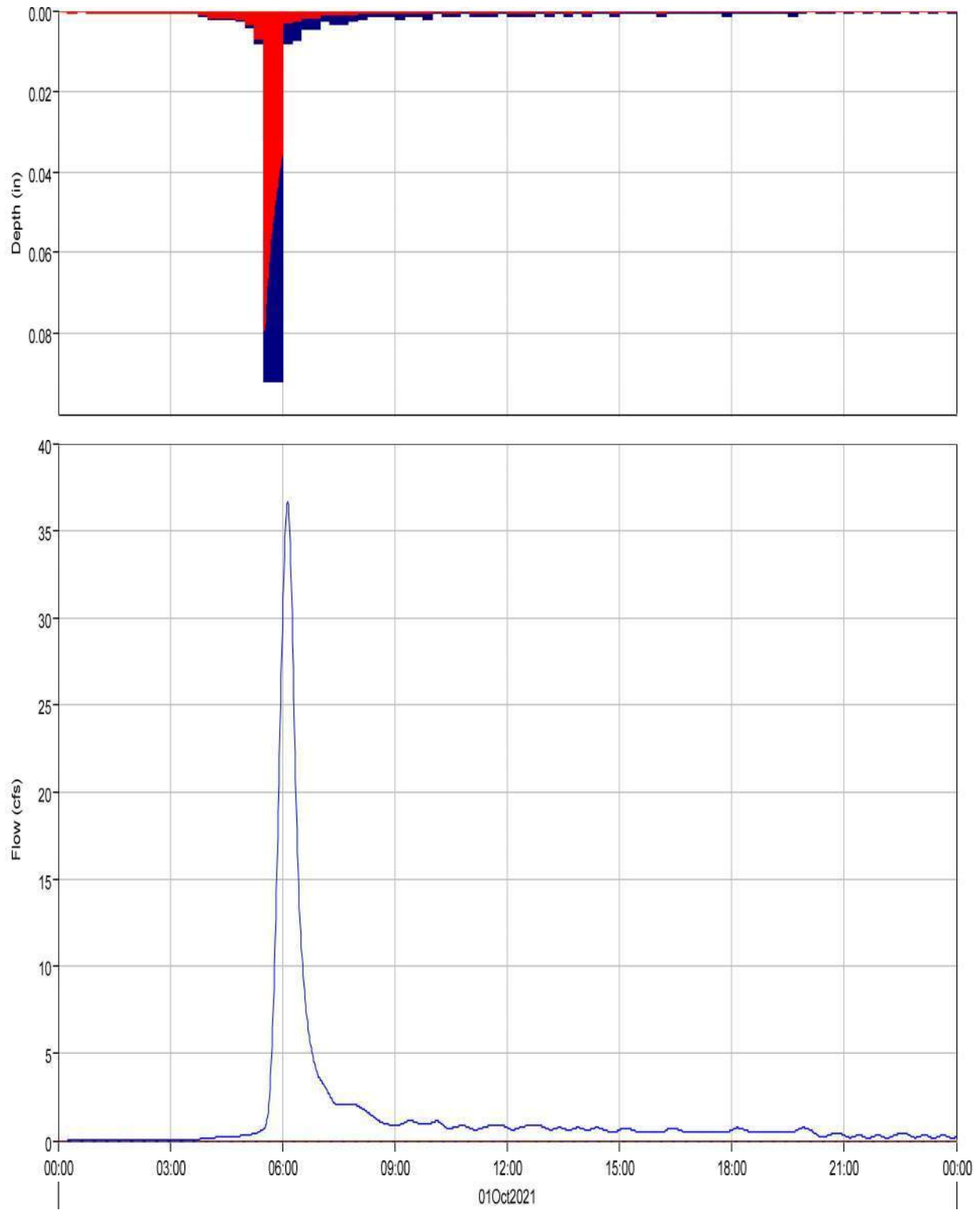
Compute Time: 29Oct2021, 12:11:25 Control Specifications: 24-hr Storm

Volume Units: AC-FT

#### Computed Results

Peak Discharge :	20.7 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:09
Total Precipitation :	4.4 (AC-FT)	Total Direct Runoff :	1.6 (AC-FT)
Total Loss :	2.8 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	1.7 (AC-FT)	Discharge :	1.6 (AC-FT)

Subbasin "PB11" Results for Run "EV 100-yr Pr. Type IIA NR"



Run:EV 100-yr Pr. Type IIA NR Element:PB11 Result:Precipitation  
Run:EV 100-yr Pr. Type IIA NR Element:PB11 Result:Outflow

Run:EV 100-YR PR. TYPE IIA NR Element:PB11 Result:Precipitation Loss  
Run:EV 100-YR PR. TYPE IIA NR Element:PB11 Result:Baseflow

Project: Eagleview\_Subdivision

Simulation Run: EV 100-yr Pr. Type IIA NR Subbasin: PB11

Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed

End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR

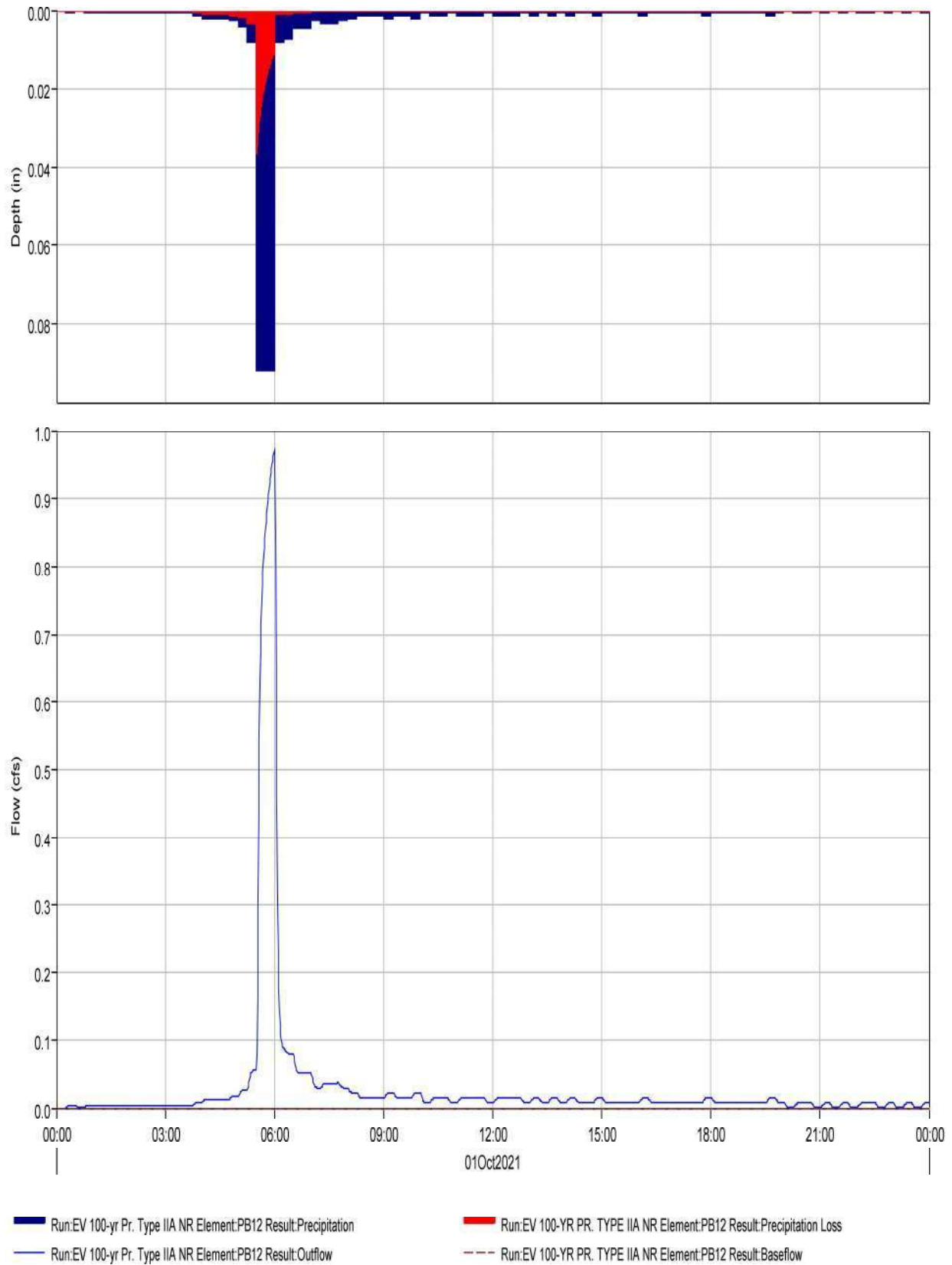
Compute Time: 29Oct2021, 12:11:25 Control Specifications: 24-hr Storm

Volume Units: AC-FT

#### Computed Results

Peak Discharge :	36.7 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:08
Total Precipitation :	6.2 (AC-FT)	Total Direct Runoff :	2.9 (AC-FT)
Total Loss :	3.3 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	2.9 (AC-FT)	Discharge :	2.9 (AC-FT)

Subbasin "PB12" Results for Run "EV 100-yr Pr. Type IIA NR"



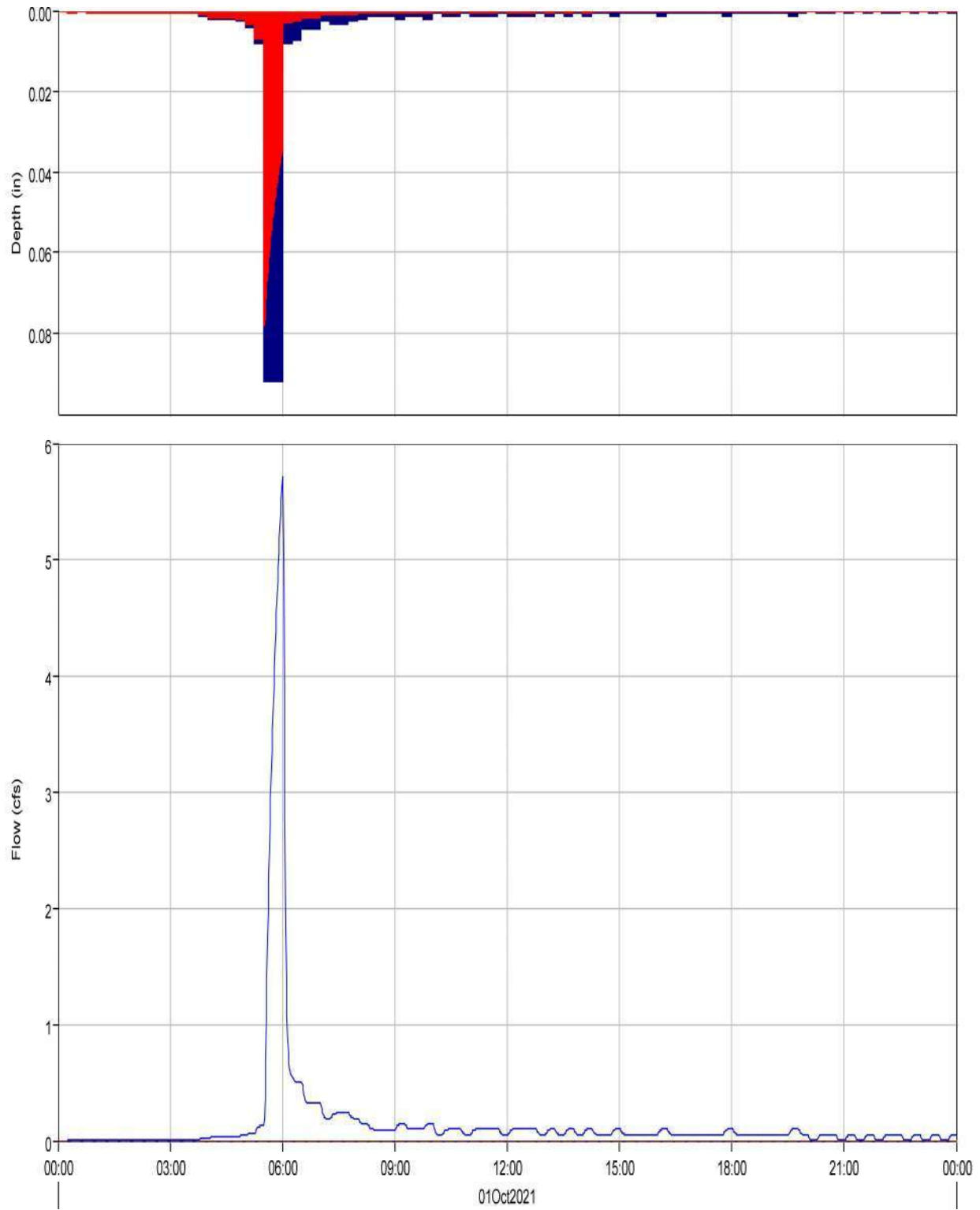
Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Pr. Type IIA NR Subbasin: PB12  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:25 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Discharge :	1.0 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:00
Total Precipitation :	0.1 (AC-FT)	Total Direct Runoff :	0.1 (AC-FT)
Total Loss :	0.0 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	0.1 (AC-FT)	Discharge :	0.1 (AC-FT)



Subbasin "PB13" Results for Run "EV 100-yr Pr. Type IIA NR"



Run:EV 100-yr Pr. Type IIA NR Element:PB13 Result:Precipitation  
Run:EV 100-yr Pr. Type IIA NR Element:PB13 Result:Outflow

Run:EV 100-YR PR. TYPE IIA NR Element:PB13 Result:Precipitation Loss  
Run:EV 100-YR PR. TYPE IIA NR Element:PB13 Result:Baseflow

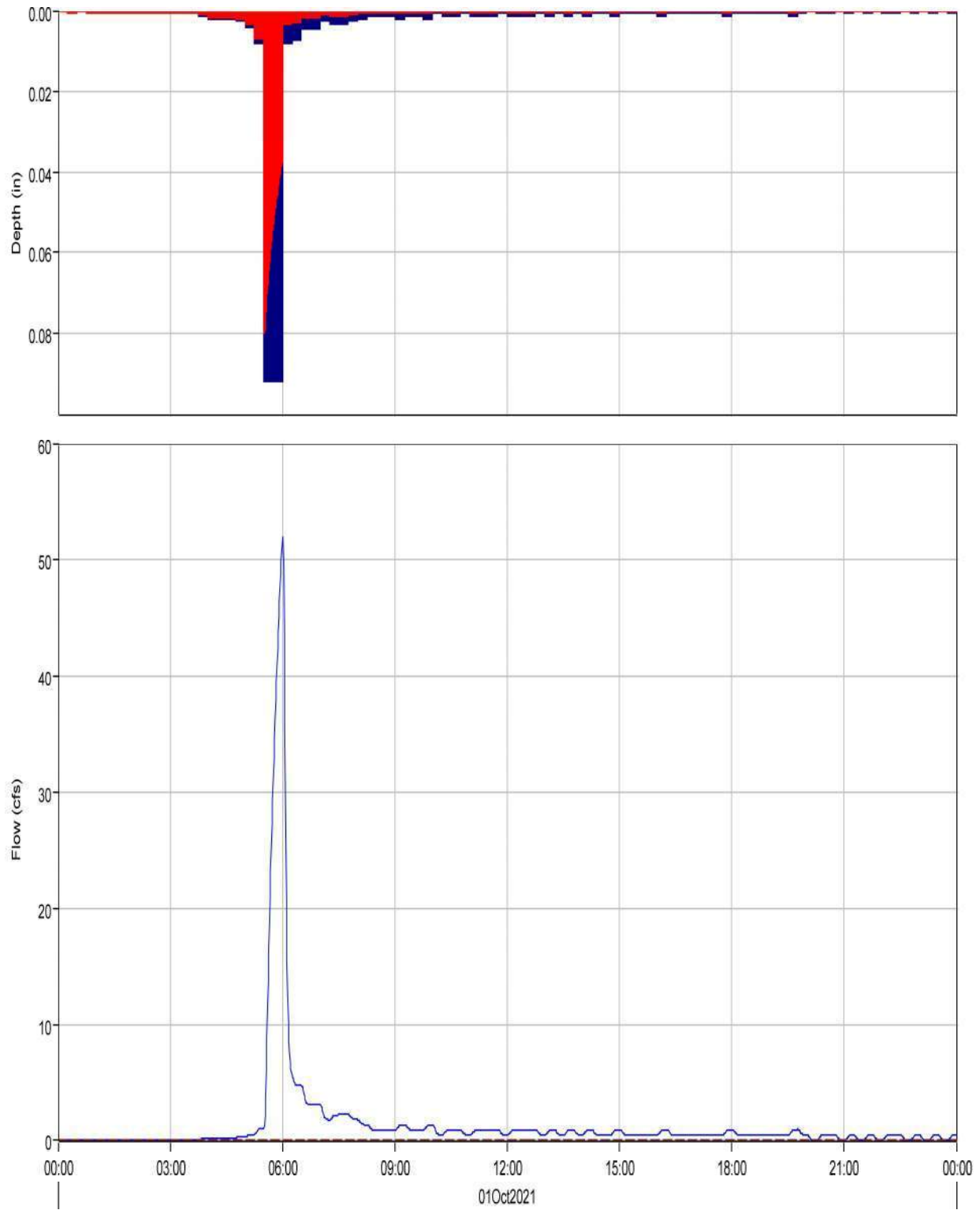
Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Pr. Type IIA NR Subbasin: PB13  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:25 Control Specifications: 24-hr Storm

Volume Units: AC-FT

#### Computed Results

Peak Discharge :	5.7 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:00
Total Precipitation :	0.7 (AC-FT)	Total Direct Runoff :	0.3 (AC-FT)
Total Loss :	0.4 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	0.3 (AC-FT)	Discharge :	0.3 (AC-FT)

Subbasin "PB14" Results for Run "EV 100-yr Pr. Type IIA NR"



Run:EV 100-yr Pr. Type IIA NR Element:PB14 Result:Precipitation  
Run:EV 100-yr Pr. Type IIA NR Element:PB14 Result:Outflow

Run:EV 100-YR PR. TYPE IIA NR Element:PB14 Result:Precipitation Loss  
Run:EV 100-YR PR. TYPE IIA NR Element:PB14 Result:Baseflow

Project: Eagleview\_Subdivision

Simulation Run: EV 100-yr Pr. Type IIA NR Subbasin: PB14

Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed

End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR

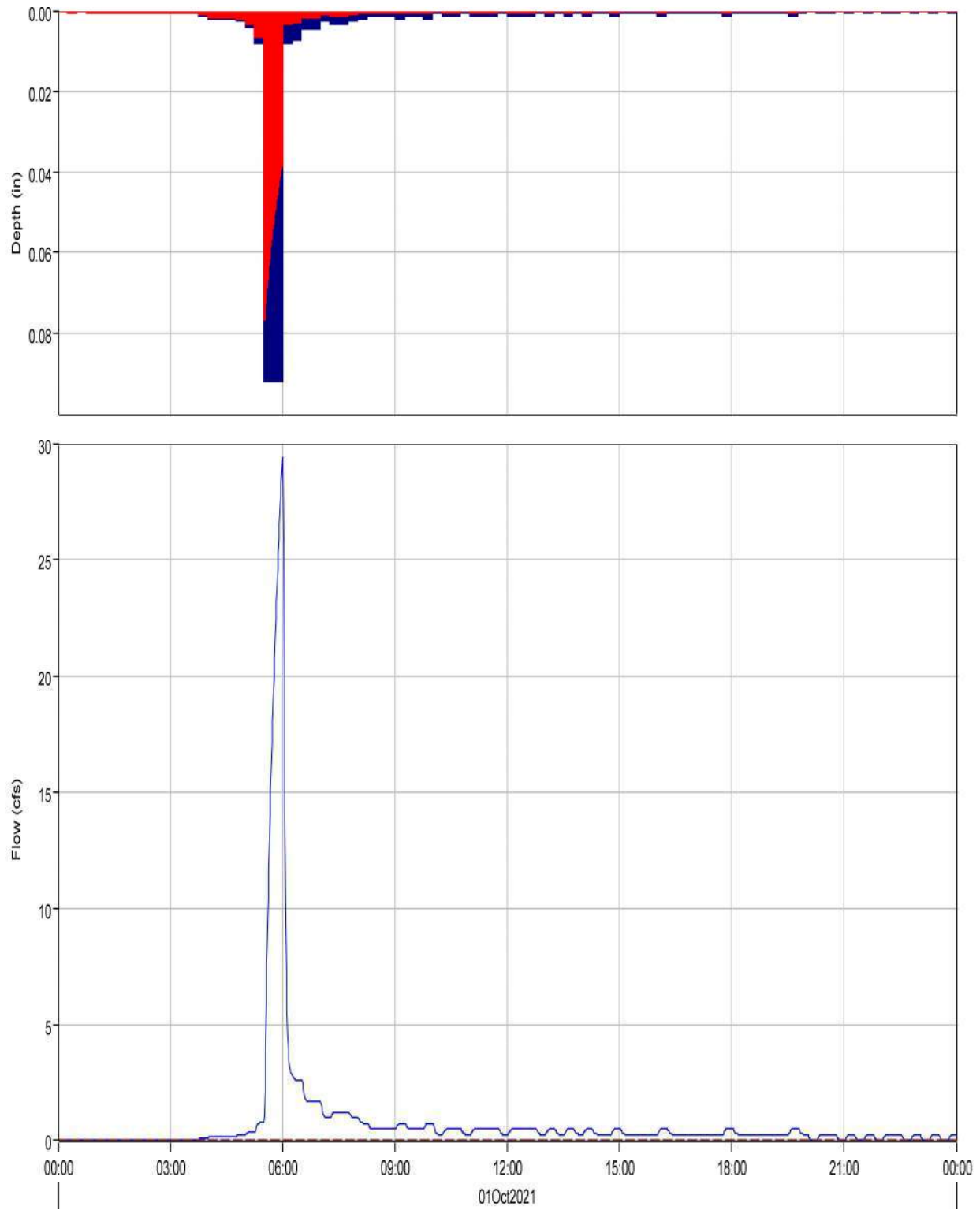
Compute Time: 29Oct2021, 12:11:25 Control Specifications: 24-hr Storm

Volume Units: AC-FT

#### Computed Results

Peak Discharge :	52.0 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:00
Total Precipitation :	6.6 (AC-FT)	Total Direct Runoff :	2.9 (AC-FT)
Total Loss :	3.7 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	2.9 (AC-FT)	Discharge :	2.9 (AC-FT)

Subbasin "PB15" Results for Run "EV 100-yr Pr. Type IIA NR"



Run:EV 100-yr Pr. Type IIA NR Element:PB15 Result:Precipitation  
Run:EV 100-yr Pr. Type IIA NR Element:PB15 Result:Outflow

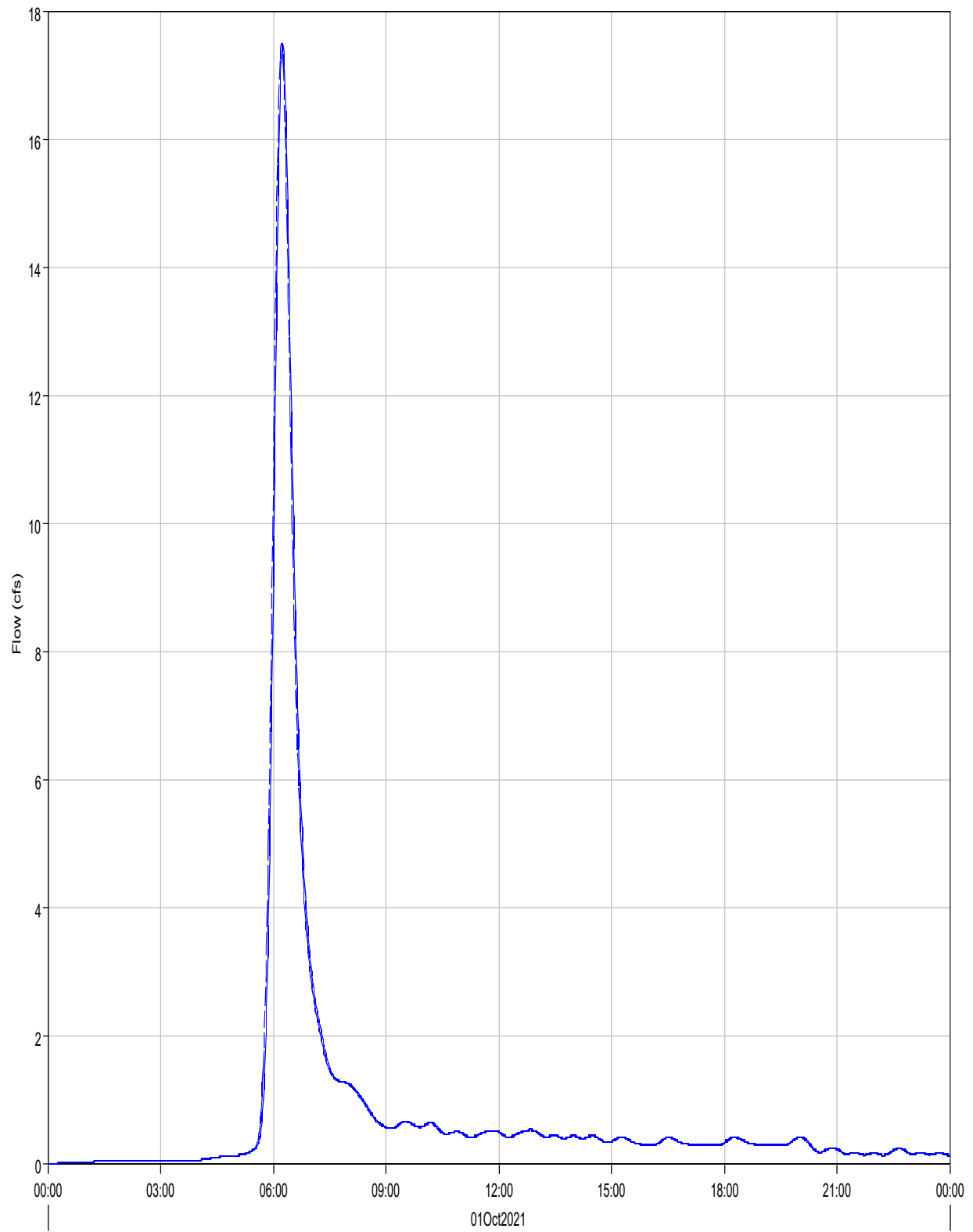
Run:EV 100-yr Pr. Type IIA NR Element:PB15 Result:Precipitation Loss  
Run:EV 100-yr Pr. Type IIA NR Element:PB15 Result:Baseflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Pr. Type IIA NR Subbasin: PB15  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:25 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Discharge :	29.4 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 06:00
Total Precipitation :	3.7 (AC-FT)	Total Direct Runoff :	1.7 (AC-FT)
Total Loss :	2.0 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	1.7 (AC-FT)	Discharge :	1.7 (AC-FT)

Reach "R-OB1" Results for Run "EV 100-yr Pr. Type IIA NR"



Run:EV 100-yr Pr. Type IIA NR Element:R-OB1 Result:Outflow

Run:EV 100-YR PR. TYPE IIA NR Element:R-OB1 Result:Combined Inflow

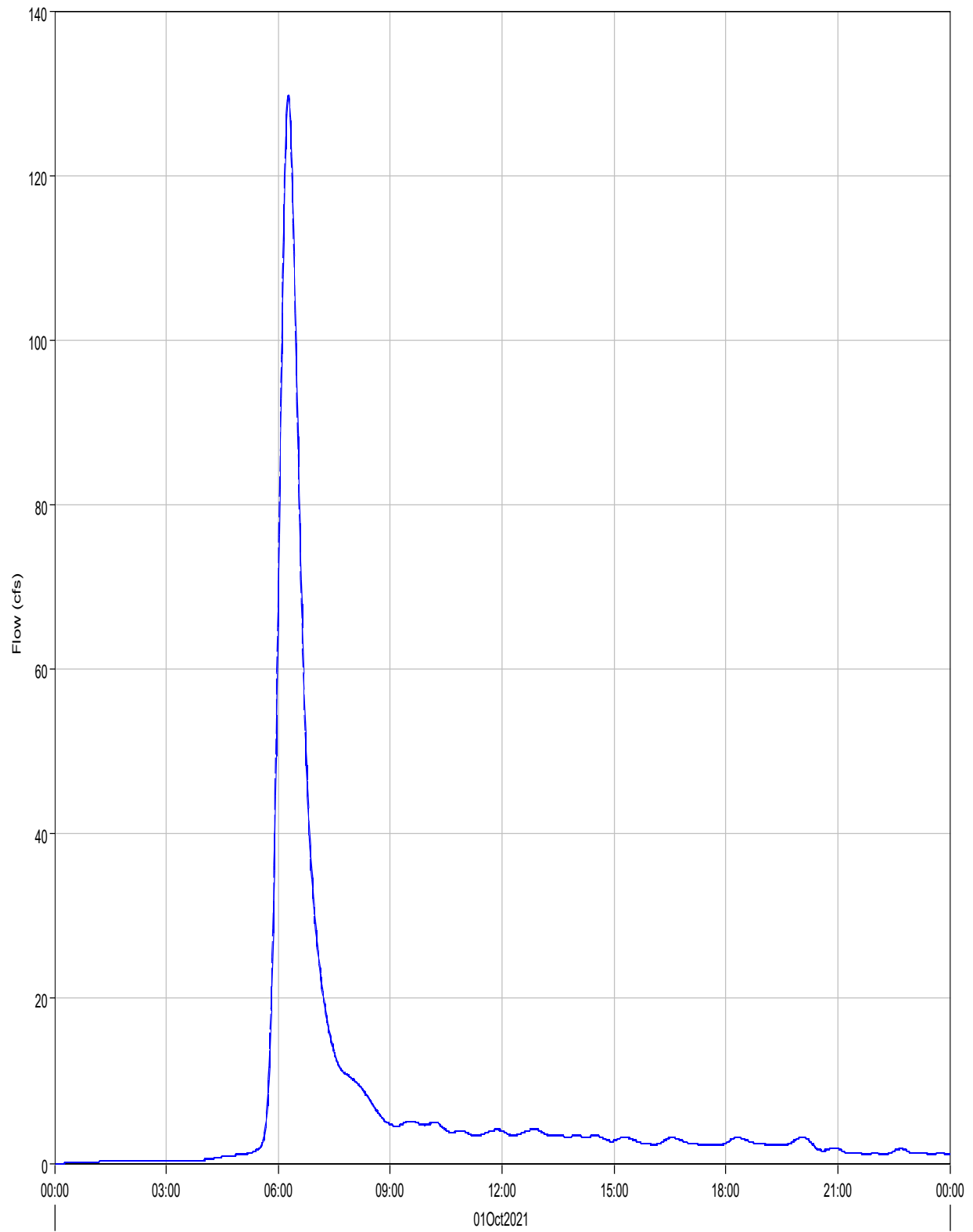
Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Pr. Type IIA NR Reach: R-OB1  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:25 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Inflow :	17.5 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 06:13
Peak Outflow :	17.5 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 06:15
Total Inflow :	1.6 (AC-FT)	Total Outflow :	1.6 (AC-FT)



Reach "R-OB4" Results for Run "EV 100-yr Pr. Type IIA NR"



Run:EV 100-yr Pr. Type IIA NR Element:R-OB4 Result:Outflow

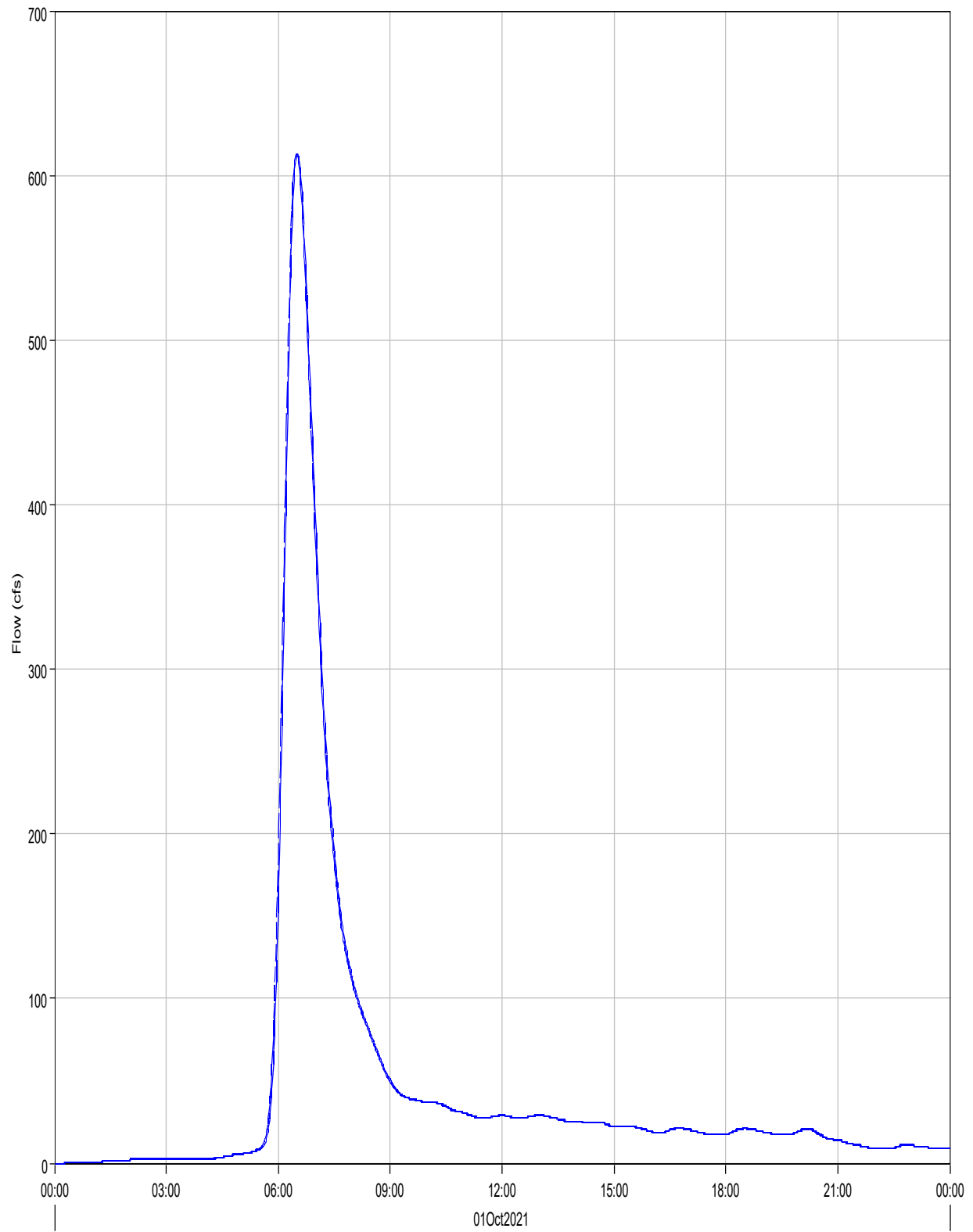
Run:EV 100-YR PR. TYPE IIA NR Element:R-OB4 Result:Combined Inflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Pr. Type IIA NR Reach: R-OB4  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:25 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Inflow :	129.8 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 06:16
Peak Outflow :	129.7 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 06:17
Total Inflow :	13.1 (AC-FT)	Total Outflow :	13.1 (AC-FT)

Reach "R-OB7" Results for Run "EV 100-yr Pr. Type IIA NR"



Run:EV 100-yr Pr. Type IIA NR Element:R-OB7 Result:Outflow

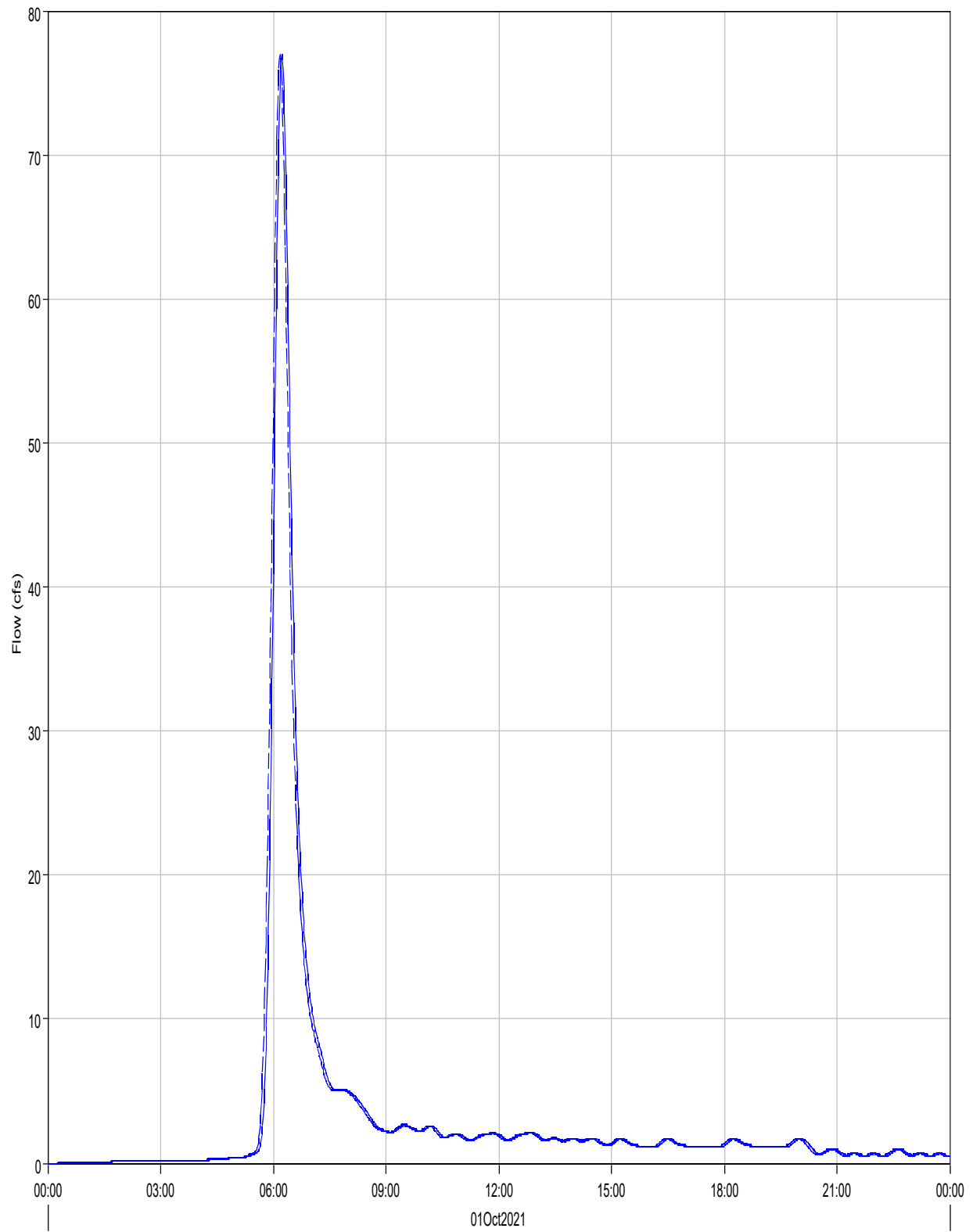
Run:EV 100-YR PR. TYPE IIA NR Element:R-OB7 Result:Combined Inflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Pr. Type IIA NR Reach: R-OB7  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:25 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Inflow :	613.0 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 06:29
Peak Outflow :	612.9 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 06:31
Total Inflow :	93.3 (AC-FT)	Total Outflow :	93.2 (AC-FT)

Reach "R-OB8" Results for Run "EV 100-yr Pr. Type IIA NR"



Run:EV 100-yr Pr. Type IIA NR Element:R-OB8 Result:Outflow

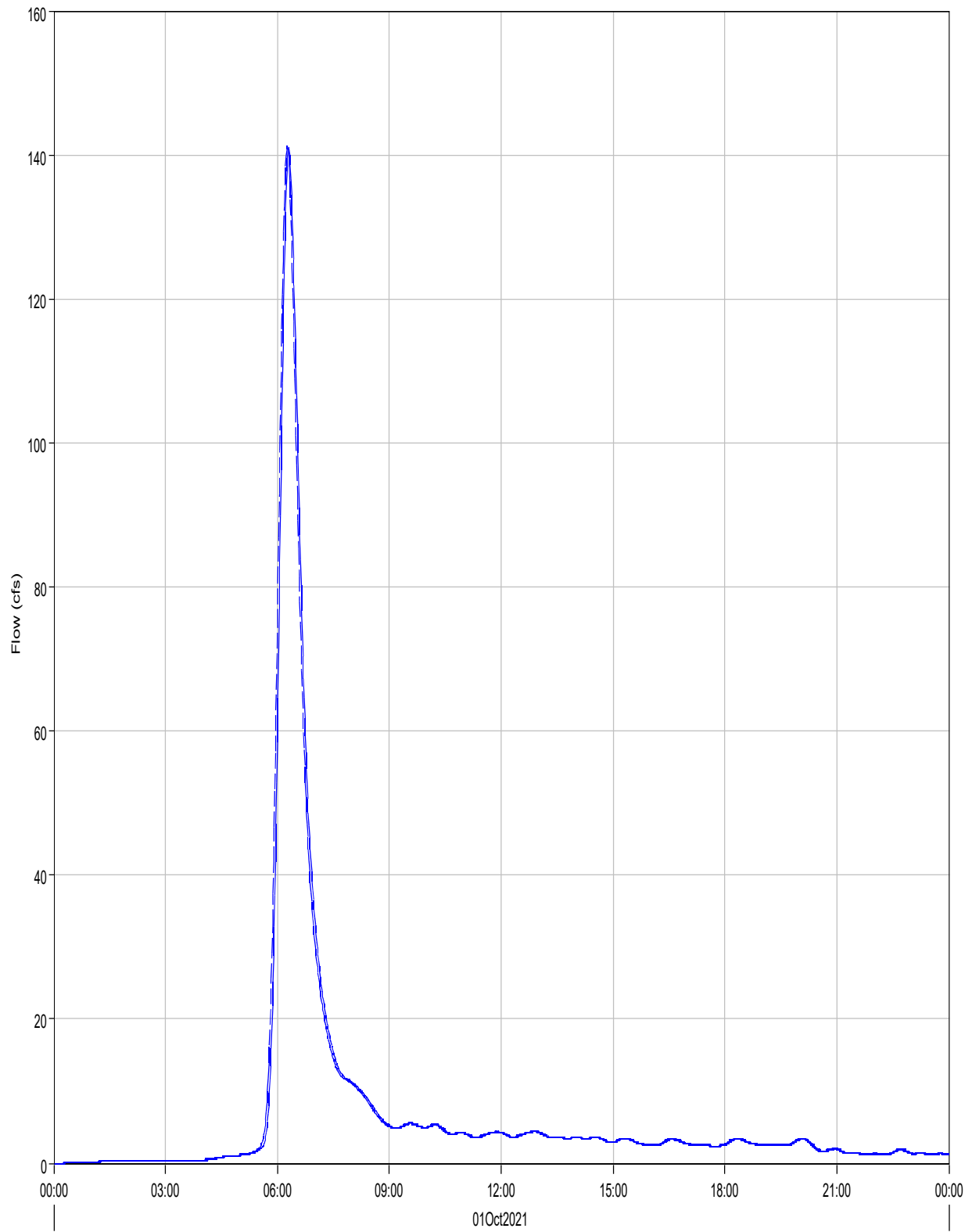
Run:EV 100-YR PR. TYPE IIA NR Element:R-OB8 Result:Combined Inflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Pr. Type IIA NR Reach: R-OB8  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:25 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Inflow :	77.0 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 06:11
Peak Outflow :	76.9 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 06:14
Total Inflow :	6.6 (AC-FT)	Total Outflow :	6.5 (AC-FT)

Reach "R-PB5" Results for Run "EV 100-yr Pr. Type IIA NR"



Run:EV 100-yr Pr. Type IIA NR Element:R-PB5 Result:Outflow

Run:EV 100-YR PR. TYPE IIA NR Element:R-PB5 Result:Combined Inflow

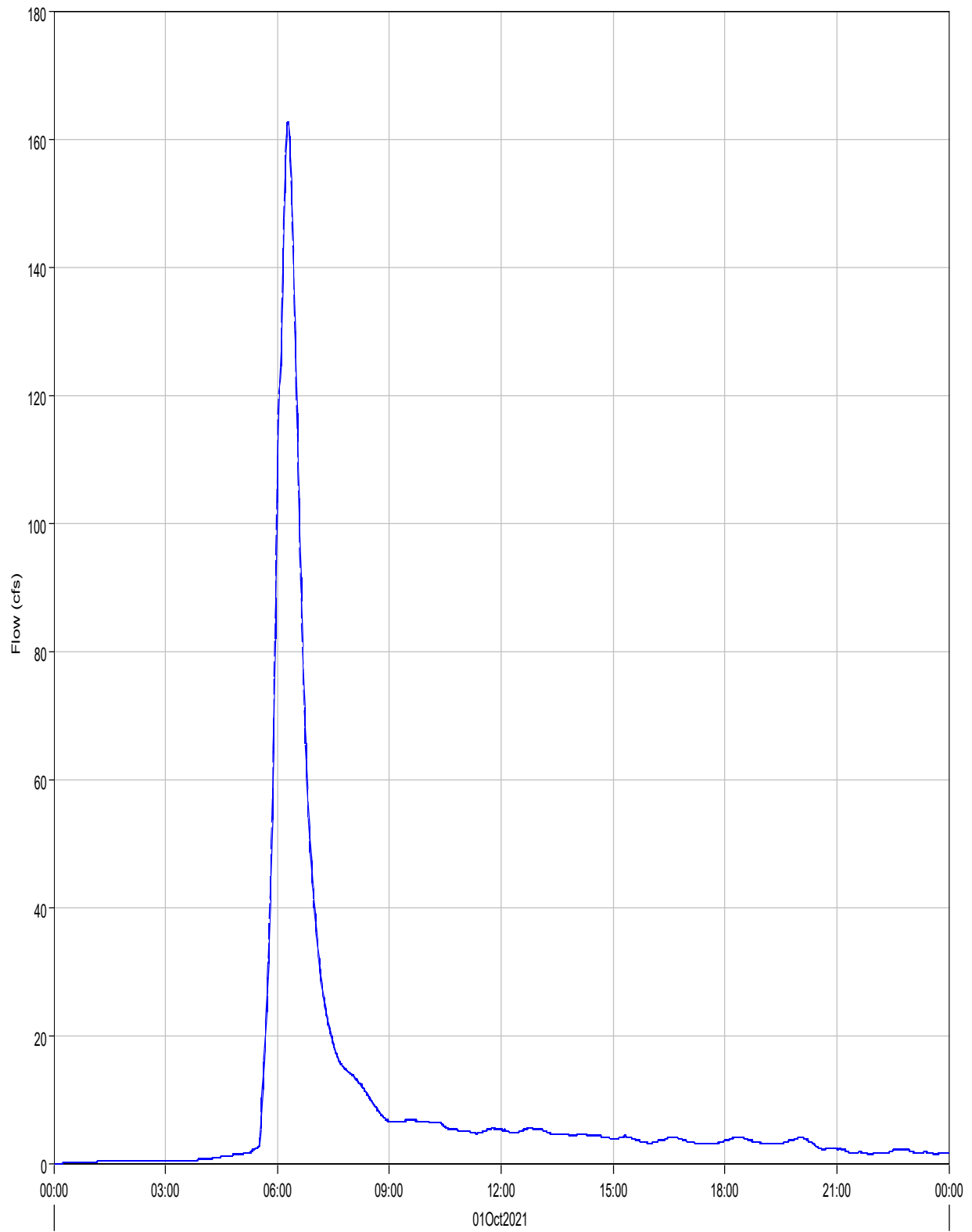
Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Pr. Type IIA NR Reach: R-PB5  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:25 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Inflow :	141.2 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 06:16
Peak Outflow :	141.0 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 06:18
Total Inflow :	14.2 (AC-FT)	Total Outflow :	14.2 (AC-FT)



Reach "R-PB6" Results for Run "EV 100-yr Pr. Type IIA NR"



Run:EV 100-yr Pr. Type IIA NR Element:R-PB6 Result:Outflow

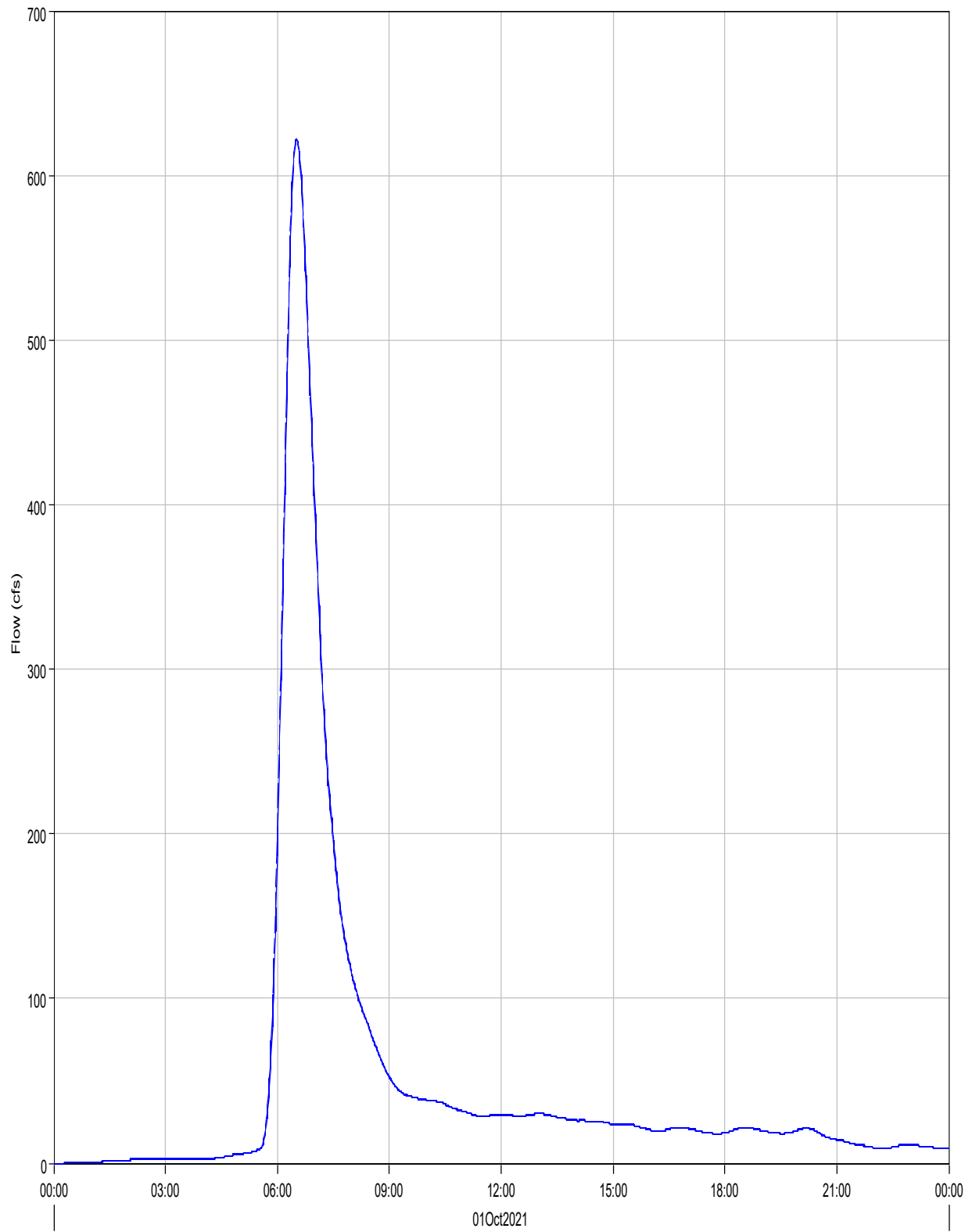
Run:EV 100-YR PR. TYPE IIA NR Element:R-PB6 Result:Combined Inflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Pr. Type IIA NR Reach: R-PB6  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:25 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Inflow :	162.6 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 06:17
Peak Outflow :	162.5 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 06:18
Total Inflow :	18.0 (AC-FT)	Total Outflow :	18.0 (AC-FT)

Reach "R-PB9" Results for Run "EV 100-yr Pr. Type IIA NR"



Run:EV 100-yr Pr. Type IIA NR Element:R-PB9 Result:Outflow

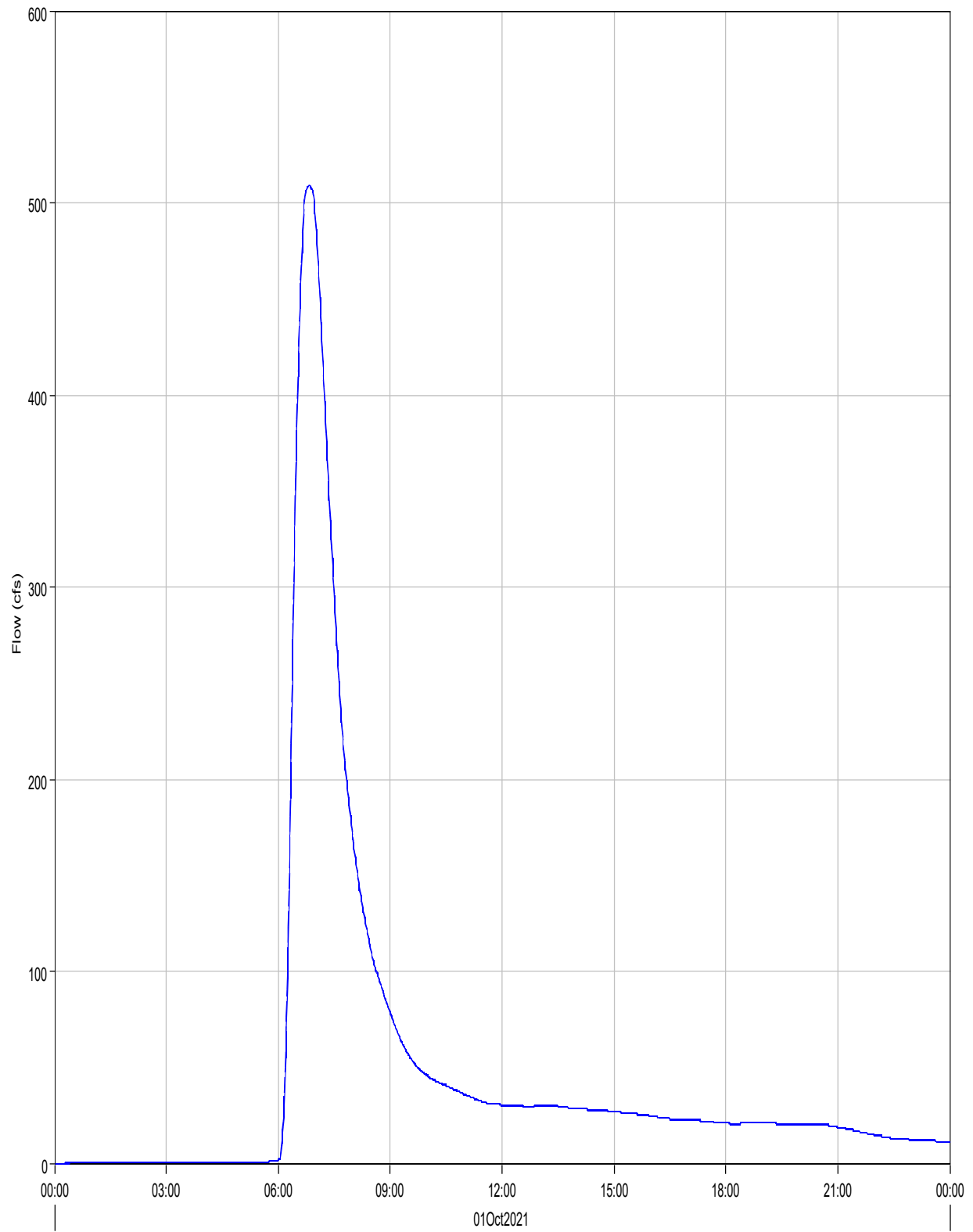
Run:EV 100-YR PR. TYPE IIA NR Element:R-PB9 Result:Combined Inflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Pr. Type IIA NR Reach: R-PB9  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:25 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Inflow :	621.6 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 06:31
Peak Outflow :	621.4 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 06:31
Total Inflow :	96.7 (AC-FT)	Total Outflow :	96.7 (AC-FT)

Reach "R-PB10" Results for Run "EV 100-yr Pr. Type IIA NR"



— Run:EV 100-yr Pr. Type IIA NR Element:R-PB10 Result:Outflow

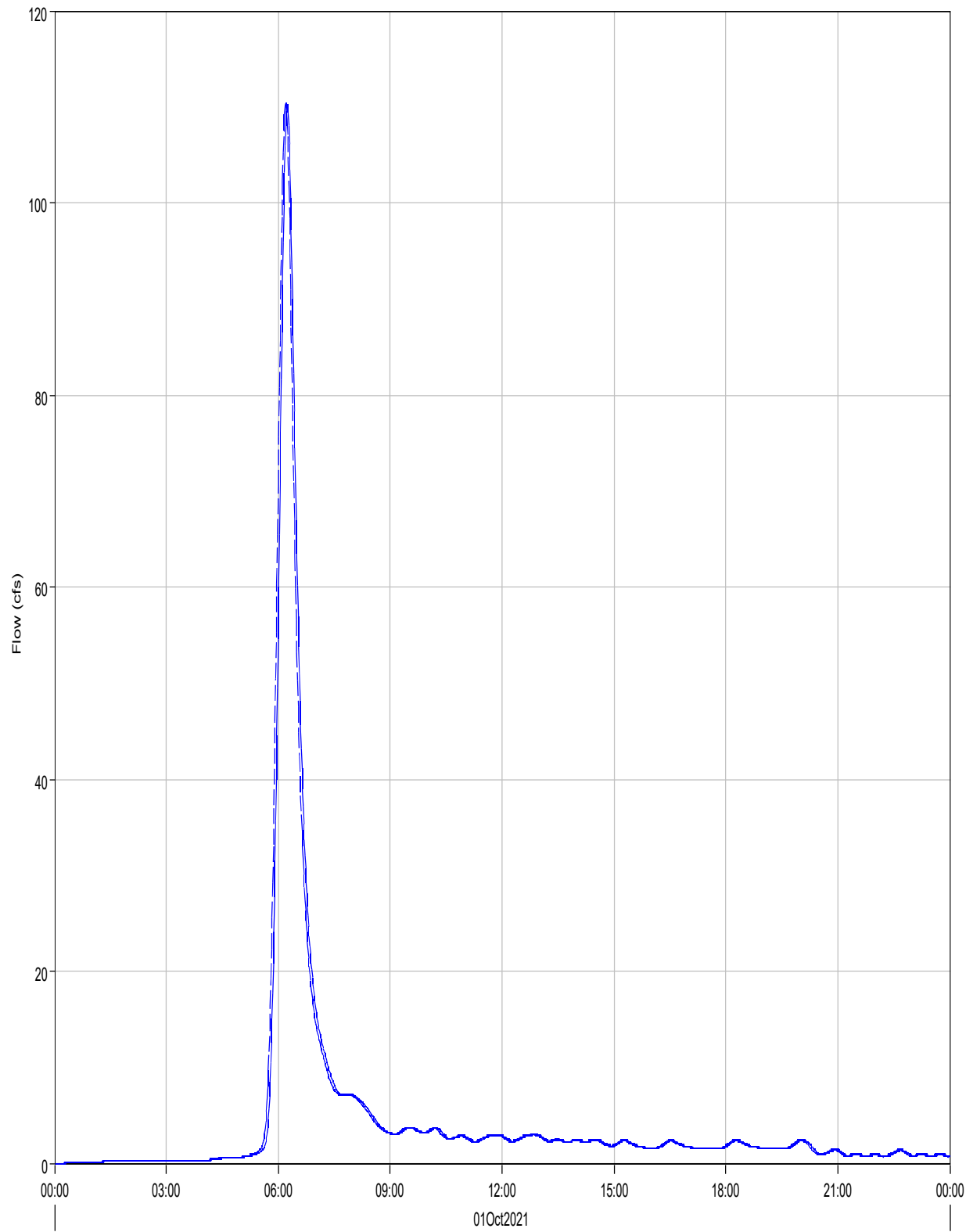
- - - Run:EV 100-YR PR. TYPE IIA NR Element:R-PB10 Result:Combined Inflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Pr. Type IIA NR Reach: R-PB10  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:25 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Inflow :	508.8 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 06:50
Peak Outflow :	508.8 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 06:50
Total Inflow :	93.1 (AC-FT)	Total Outflow :	93.1 (AC-FT)

Reach "R-PB11" Results for Run "EV 100-yr Pr. Type IIA NR"



Run:EV 100-yr Pr. Type IIA NR Element:R-PB11 Result:Outflow

Run:EV 100-yr Pr. Type IIA NR Element:R-PB11 Result:Combined Inflow

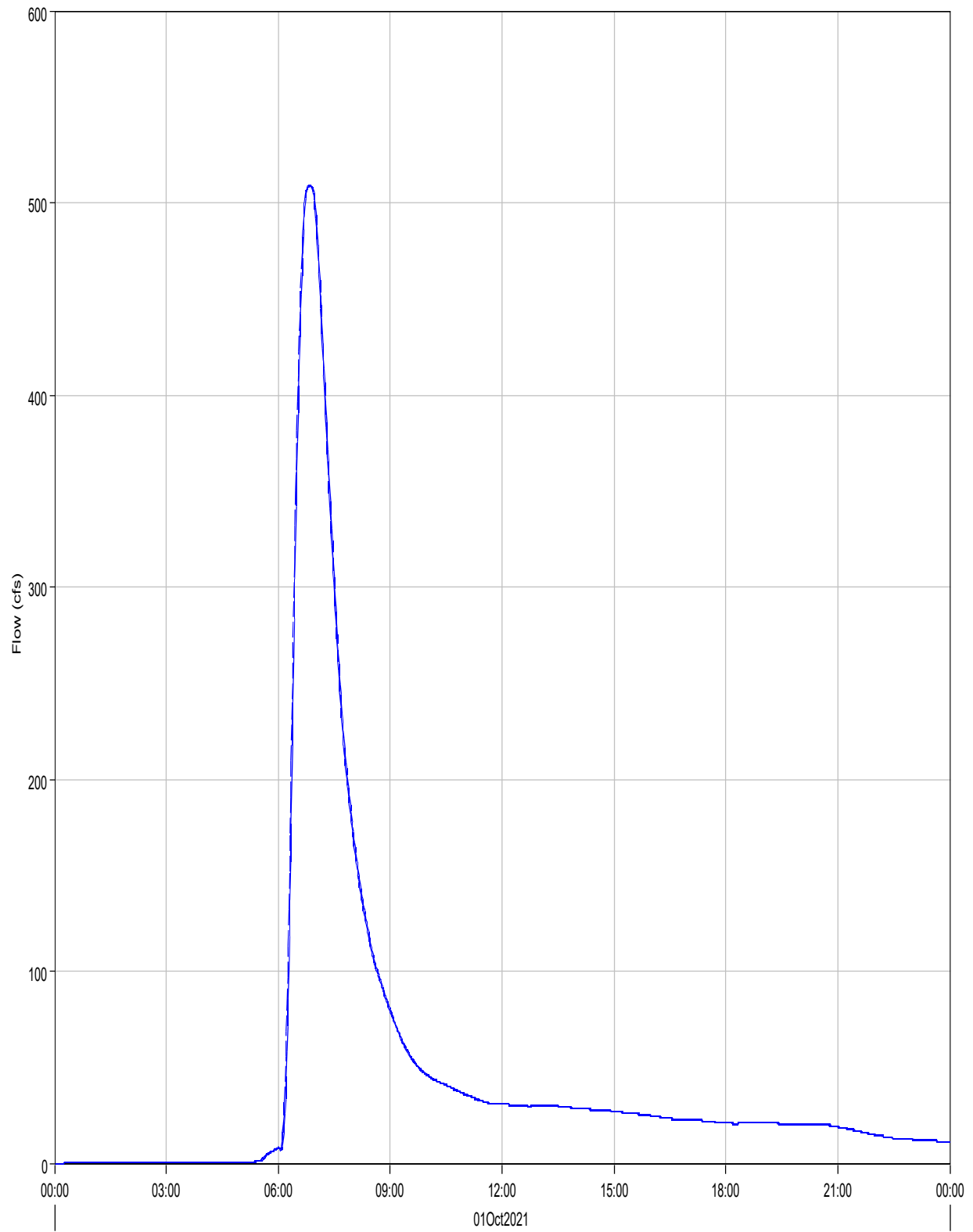
Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Pr. Type IIA NR Reach: R-PB11  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:25 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Inflow :	110.4 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 06:12
Peak Outflow :	110.2 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 06:14
Total Inflow :	9.4 (AC-FT)	Total Outflow :	9.4 (AC-FT)



Reach "R-PB13" Results for Run "EV 100-yr Pr. Type IIA NR"



Run:EV 100-yr Pr. Type IIA NR Element:R-PB13 Result:Outflow

Run:EV 100-YR PR. TYPE IIA NR Element:R-PB13 Result:Combined Inflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Pr. Type IIA NR Reach: R-PB13  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type IIA NR  
Compute Time: 29Oct2021, 12:11:25 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

#### Computed Results

Peak Inflow :	509.2 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 06:50
Peak Outflow :	509.1 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 06:51
Total Inflow :	93.5 (AC-FT)	Total Outflow :	93.5 (AC-FT)

## TypicalChannel

Project Description	
Friction Method	Manning
Solve For	Formula Discharge
Input Data	
Roughness Coefficient	0.030
Channel Slope	0.025 ft/ft
Normal Depth	24.0 in
Left Side Slope	1.300 H:V
Right Side Slope	1.300 H:V
Results	
Discharge	34.88 cfs
Flow Area	5.2 ft <sup>2</sup>
Wetted Perimeter	6.6 ft
Hydraulic Radius	9.5 in
Top Width	5.20 ft
Critical Depth	25.7 in
Critical Slope	0.017 ft/ft
Velocity	6.71 ft/s
Velocity Head	0.70 ft
Specific Energy	2.70 ft
Froude Number	1.183
Flow Type	Supercritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	24.0 in
Critical Depth	25.7 in
Channel Slope	0.025 ft/ft
Critical Slope	0.017 ft/ft

update narrative  
to provide a  
summary of this  
worksheet

## Worksheet for Typical Ditch

Project Description	
Friction Method	Manning Formula
Solve For	Discharge
<b>Input Data</b>	
Roughness Coefficient	0.030
Channel Slope	0.025 ft/ft
Normal Depth	18.0 in
Left Side Slope	4.000 H:V
Right Side Slope	4.000 H:V
<b>Results</b>	
Discharge	57.02 cfs
Flow Area	9.0 ft <sup>2</sup>
Wetted Perimeter	12.4 ft
Hydraulic Radius	8.7 in
Top Width	12.00 ft
Critical Depth	19.9 in
Critical Slope	0.015 ft/ft
Velocity	6.34 ft/s
Velocity Head	0.62 ft
Specific Energy	2.12 ft
Froude Number	1.290
Flow Type	Supercritical
<b>GVF Input Data</b>	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
<b>GVF Output Data</b>	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	18.0 in
Critical Depth	19.9 in
Channel Slope	0.025 ft/ft
Critical Slope	0.015 ft/ft

update narrative  
to provide a  
summary of this  
worksheet

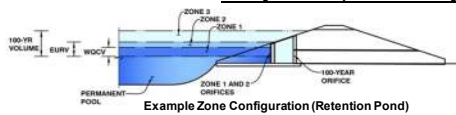
***APPENDIX C: HYDRAULICS***

Note that pond calcs are not reviewed until the Final Plat stage.

EAGLEVIEW SUBDIVISION - PRELINARY CULVERT SIZING					
Culvert	Peak Flow (Q <sub>5</sub> , cfs)	Maximum HW/D at Q <sub>5</sub>	Peak Flow (Q <sub>100</sub> , cfs)	Culvert Size (in)	Barrels
1	1.8	1.5	4	18	1
2	69.3	1.5	178.8	48	2
3	10.6	1.5	31.7	30	1
4	3.8	1.5	11.2	24	1
5	0.5	1.5	1	18	1
6	43.2	1.5	113.9	48	1
7	36.2	1.5	95.6	42	1
8	258	1.5	719.8	72	2

## MHFD-Detention, Version 4.04 (February 2021)

**Basin ID: Sub Regional Pond 1 (Actual Area draining to the pond)**



### Watershed Information

**Area > 1 sq.mi. for WQ Facility**

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

### Optional User Overrides

Zone 1 Volume (WQCV) =	3.388	acre-feet
Zone 2 Volume (100-year - Zone 1) =	20.852	acre-feet
Select Zone 3 Storage Volume (Optional) =		
Total Detention Basin Volume =	24.239	acre-feet
Initial Surcharge Volume (ISV) =	user	ft <sup>3</sup>
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth ( $H_{total}$ ) =	user	ft
Depth of Trickle Channel ( $H_{TC}$ ) =	user	ft
Slope of Trickle Channel ( $S_{TC}$ ) =	user	ft/ft
Slopes of Main Basin Slopes ( $S_{main}$ ) =	user	ft:V
Basin Length-to-Width Ratio ( $R_{L/W}$ ) =	user	

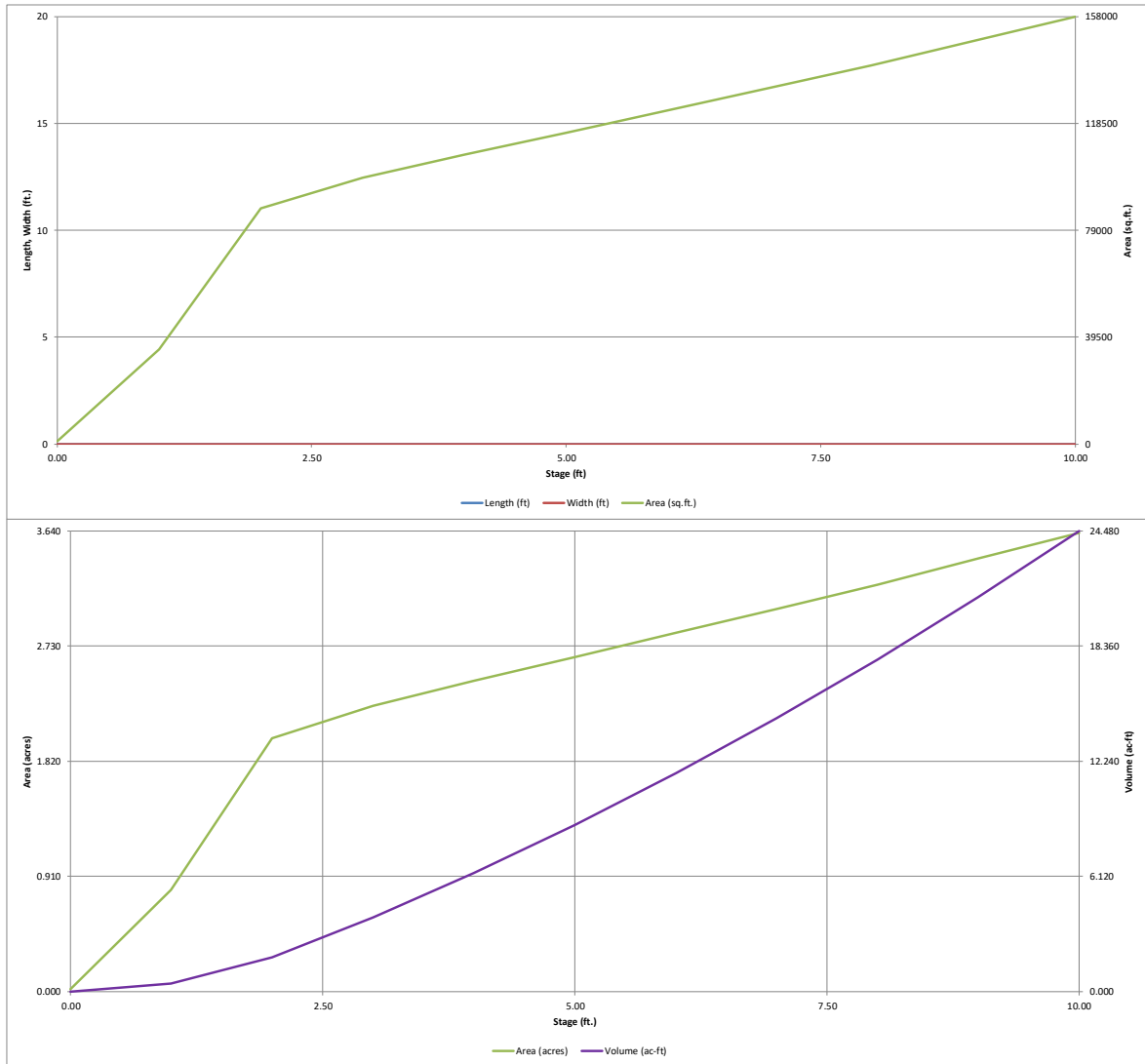
Initial Surcharge Area ( $A_{SIV}$ )	=	user	ft <sup>2</sup>
Surcharge Volume Length ( $L_{SIV}$ )	=	user	ft
Surcharge Volume Width ( $W_{SIV}$ )	=	user	ft
Depth of Basin Floor ( $H_{FLOOR}$ )	=	user	ft
Length of Basin Floor ( $L_{FLOOR}$ )	=	user	ft
Width of Basin Floor ( $W_{FLOOR}$ )	=	user	ft
Area of Basin Floor ( $A_{FLOOR}$ )	=	user	ft <sup>2</sup>
Volume of Basin Floor ( $V_{FLOOR}$ )	=	user	ft <sup>3</sup>
Depth of Main Basin ( $H_{MAIN}$ )	=	user	ft
Length of Main Basin ( $L_{MAIN}$ )	=	user	ft
Width of Main Basin ( $W_{MAIN}$ )	=	user	ft
Area of Main Basin ( $A_{MAIN}$ )	=	user	ft <sup>2</sup>
Volume of Main Basin ( $V_{MAIN}$ )	=	user	ft <sup>3</sup>
Calculated Total Basin Volume ( $V_{TOTAL}$ )	=	user	acre-feet

[illegible]

Change zone 2 to EURV-Zone 1 & add Zone 3 (100yr-zone 1 & zone 2. County adopted full spectrum detention

# DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)



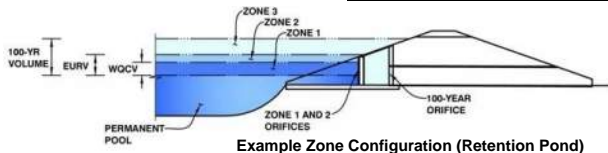


# DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Project: **Eagleview**

Basin ID: **Sub Regional Pond 1 (Actual Area draining to the pond)**



**Example Zone Configuration (Retention Pond)**

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.75	3.388	Orifice Plate
Zone 2 (100-year)	9.94	20.852	Weir&Pipe (Restrict)
Zone 3			
Total (all zones)		24.239	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =  ft (distance below the filtration media surface)  
Underdrain Orifice Diameter =  inches

Calculated Parameters for Underdrain  
Underdrain Orifice Area =  ft<sup>2</sup>  
Underdrain Orifice Centroid =  feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Invert of Lowest Orifice =  ft (relative to basin bottom at Stage = 0 ft)  
Depth at top of Zone using Orifice Plate =  ft (relative to basin bottom at Stage = 0 ft)  
Orifice Plate: Orifice Vertical Spacing =  inches  
Orifice Plate: Orifice Area per Row =  sq. inches (use rectangular openings)

Calculated Parameters for Plate  
WQ Orifice Area per Row =  ft<sup>2</sup>  
Elliptical Half-Width =  feet  
Elliptical Slot Centroid =  feet  
Elliptical Slot Area =  ft<sup>2</sup>

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.99	1.99					
Orifice Area (sq. inches)	16.27	16.27	16.27					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

Invert of Vertical Orifice =  ft (relative to basin bottom at Stage = 0 ft)  
Depth at top of Zone using Vertical Orifice =  ft (relative to basin bottom at Stage = 0 ft)  
Vertical Orifice Diameter =  inches

Calculated Parameters for Vertical Orifice  
Vertical Orifice Area =  ft<sup>2</sup>  
Vertical Orifice Centroid =  feet

User Input: Overflow Weir (Dropbox with Flat or Sloped Gate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe))

Overflow Weir Front Edge Height, H<sub>o</sub> =  ft (relative to basin bottom at Stage = 0 ft)  
Overflow Weir Front Edge Length =  feet  
Overflow Weir Gate Slope =  H:V  
Horiz. Length of Weir Sides =  feet  
Overflow Gate Type =   
Debris Clogging % =  %

Calculated Parameters for Overflow Weir  
Height of Gate Upper Edge, H<sub>u</sub> =  feet  
Overflow Weir Slope Length =  feet  
Gate Open Area / 100-yr Orifice Area =   
Overflow Gate Open Area w/o Debris =  ft<sup>2</sup>  
Overflow Gate Open Area w/ Debris =  ft<sup>2</sup>

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

Depth to Invert of Outlet Pipe =  ft (distance below basin bottom at Stage = 0 ft)  
Outlet Pipe Diameter =  inches  
Restrictor Plate Height Above Pipe Invert =  inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate  
Outlet Orifice Area =  ft<sup>2</sup>  
Outlet Orifice Centroid =  feet  
Half-Central Angle of Restrictor Plate on Pipe =  radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage =  ft (relative to basin bottom at Stage = 0 ft)  
Spillway Crest Length =  feet  
Spillway End Slopes =  H:V  
Freeboard above Max Water Surface =  feet

Calculated Parameters for Spillway  
Spillway Design Flow Depth =  feet  
Stage at Top of Freeboard =  feet  
Basin Area at Top of Freeboard =  acres  
Basin Volume at Top of Freeboard =  acre-ft

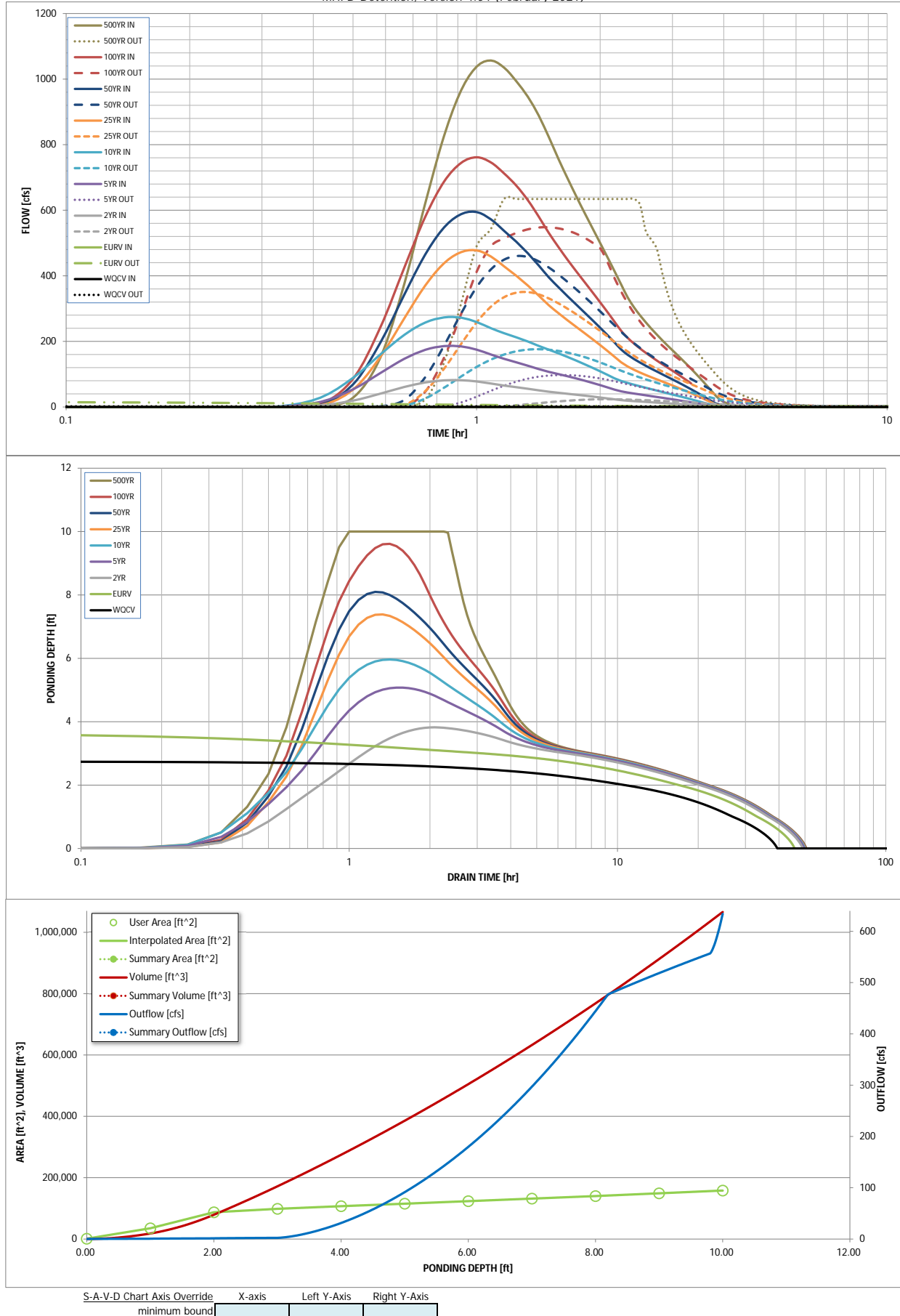
## Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
CUHP Runoff Volume (acre-ft) =	3.388	5.462	8.651	20.007	31.468	52.314	66.342	86.725	123.614
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	8.651	20.007	31.468	52.314	66.342	86.725	123.614
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	54.6	154.6	241.8	446.5	562.6	726.3	1020.0
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.08	0.21	0.34	0.62	0.78	1.01	1.42
Peak Inflow Q (cfs) =	N/A	N/A	81.5	185.6	273.2	477.5	594.5	761.4	1056.7
Peak Outflow Q (cfs) =	2.1	16.3	23.6	97.1	176.1	350.3	460.3	548.1	634.2
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.6	0.7	0.8	0.8	0.8	0.6
Structure Controlling Flow =	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	N/A
Max Velocity through Gate 1 (fps) =	N/A	0.02	0.03	0.1	0.2	0.5	0.7	0.8	0.8
Max Velocity through Gate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	35	39	40	34	30	24	20	16	9
Time to Drain 99% of Inflow Volume (hours) =	37	43	45	42	40	36	34	31	28
Maximum Ponding Depth (ft) =	2.75	3.66	3.82	5.08	5.96	7.39	8.10	9.61	10.00
Area at Maximum Ponding Depth (acres) =	2.19	2.39	2.42	2.66	2.83	3.10	3.23	3.55	3.63
Maximum Volume Stored (acre-ft) =	3.390	5.480	5.865	9.039	11.478	15.682	17.928	23.080	24.479

# DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)



# DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: \_\_\_\_\_

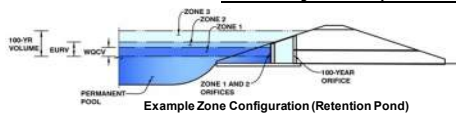
## Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

Time Interval	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.04
	0:15:00	0.00	0.00	0.10	0.16	0.20	0.13	0.19	0.17	0.31
	0:20:00	0.00	0.00	0.53	1.34	2.31	0.60	0.75	0.78	2.35
	0:25:00	0.00	0.00	4.80	15.49	28.52	4.71	6.14	9.14	28.12
	0:30:00	0.00	0.00	19.22	53.69	88.79	52.74	68.74	85.87	151.65
	0:35:00	0.00	0.00	40.74	103.72	160.54	153.40	197.00	243.84	375.80
	0:40:00	0.00	0.00	60.96	146.92	219.95	270.56	342.88	425.15	621.87
	0:45:00	0.00	0.00	74.80	174.36	257.51	370.61	465.53	580.40	827.08
	0:50:00	0.00	0.00	81.18	185.62	273.22	438.50	547.60	687.33	965.47
	0:55:00	0.00	0.00	81.55	184.65	272.44	472.24	588.08	744.28	1037.74
	1:00:00	0.00	0.00	77.87	174.82	259.10	477.53	594.54	761.41	1056.70
	1:05:00	0.00	0.00	71.57	160.02	240.29	459.01	572.32	745.88	1034.92
	1:10:00	0.00	0.00	65.23	146.73	224.93	428.94	537.09	712.23	993.16
	1:15:00	0.00	0.00	60.20	136.09	212.37	399.88	503.68	674.77	946.08
	1:20:00	0.00	0.00	55.38	125.72	199.59	370.21	468.65	630.52	888.91
	1:25:00	0.00	0.00	50.63	115.54	186.23	339.64	431.56	580.52	822.69
	1:30:00	0.00	0.00	46.40	106.96	174.50	309.98	395.03	530.33	755.80
	1:35:00	0.00	0.00	43.13	100.13	163.50	285.82	364.97	487.32	696.50
	1:40:00	0.00	0.00	40.14	93.53	152.33	264.02	337.41	448.44	641.78
	1:45:00	0.00	0.00	37.29	86.88	141.16	243.93	311.84	413.13	591.44
	1:50:00	0.00	0.00	34.49	80.12	130.17	224.91	287.61	380.62	544.73
	1:55:00	0.00	0.00	31.69	73.34	119.38	206.63	264.37	349.36	500.01
	2:00:00	0.00	0.00	28.87	66.54	108.74	188.66	241.62	319.02	456.84
	2:05:00	0.00	0.00	26.04	59.74	98.05	170.93	219.19	289.46	414.68
	2:10:00	0.00	0.00	23.20	53.01	87.45	153.39	196.93	260.44	373.28
	2:15:00	0.00	0.00	20.70	47.60	79.27	136.17	175.09	232.13	334.25
	2:20:00	0.00	0.00	19.00	43.95	73.24	123.40	159.07	210.68	304.27
	2:25:00	0.00	0.00	17.69	40.93	67.98	113.42	146.31	193.53	279.70
	2:30:00	0.00	0.00	16.51	38.16	63.11	105.03	135.41	178.59	258.00
	2:35:00	0.00	0.00	15.38	35.50	58.53	97.43	125.47	165.16	238.36
	2:40:00	0.00	0.00	14.28	32.94	54.11	90.54	116.44	152.85	220.30
	2:45:00	0.00	0.00	13.21	30.44	49.84	83.97	107.85	141.33	203.41
	2:50:00	0.00	0.00	12.17	27.99	45.72	77.63	99.62	130.55	187.60
	2:55:00	0.00	0.00	11.16	25.58	41.74	71.53	91.74	120.51	172.90
	3:00:00	0.00	0.00	10.15	23.22	37.91	65.52	84.01	110.61	158.51
	3:05:00	0.00	0.00	9.15	20.89	34.21	59.56	76.40	100.78	144.38
	3:10:00	0.00	0.00	8.16	18.58	30.56	53.62	68.83	90.96	130.28
	3:15:00	0.00	0.00	7.17	16.29	26.93	47.71	61.29	81.15	116.22
	3:20:00	0.00	0.00	6.18	14.02	23.32	41.81	53.77	71.36	102.18
	3:25:00	0.00	0.00	5.20	11.76	19.73	35.92	46.26	61.57	88.16
	3:30:00	0.00	0.00	4.22	9.51	16.16	30.03	38.77	51.80	74.18
	3:35:00	0.00	0.00	3.25	7.26	12.60	24.15	31.29	42.04	60.23
	3:40:00	0.00	0.00	2.28	5.04	9.10	18.29	23.84	32.31	46.34
	3:45:00	0.00	0.00	1.37	3.01	6.00	12.49	16.49	22.73	32.95
	3:50:00	0.00	0.00	0.72	1.77	4.21	7.47	10.20	14.51	21.98
	3:55:00	0.00	0.00	0.49	1.29	3.27	4.67	6.72	9.62	15.19
	4:00:00	0.00	0.00	0.37	1.00	2.58	2.99	4.53	6.45	10.61
	4:05:00	0.00	0.00	0.30	0.79	2.04	1.94	3.09	4.21	7.27
	4:10:00	0.00	0.00	0.23	0.62	1.60	1.23	2.07	2.63	4.82
	4:15:00	0.00	0.00	0.18	0.48	1.22	0.82	1.42	1.53	3.05
	4:20:00	0.00	0.00	0.14	0.37	0.89	0.51	0.94	0.80	1.80
	4:25:00	0.00	0.00	0.11	0.27	0.63	0.33	0.62	0.42	1.08
	4:30:00	0.00	0.00	0.09	0.20	0.43	0.24	0.45	0.32	0.77
	4:35:00	0.00	0.00	0.07	0.14	0.30	0.17	0.33	0.25	0.57
	4:40:00	0.00	0.00	0.06	0.10	0.23	0.13	0.25	0.20	0.45
	4:45:00	0.00	0.00	0.04	0.07	0.17	0.09	0.19	0.15	0.35
	4:50:00	0.00	0.00	0.03	0.04	0.12	0.07	0.14	0.11	0.26
	4:55:00	0.00	0.00	0.02	0.03	0.08	0.05	0.10	0.08	0.18
	5:00:00	0.00	0.00	0.01	0.02	0.05	0.03	0.06	0.05	0.12
	5:05:00	0.00	0.00	0.01	0.01	0.02	0.02	0.04	0.03	0.07
	5:10:00	0.00	0.00	0.00	0.00	0.01	0.01	0.02	0.01	0.03
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

## MHFD-Detention, Version 4.04 (February 2021)

**Basin ID: Onsite Sub Regional Pond 1 (Watershed Area adjusted to match HEC-HMS)**



### Example Zone Configuration (Retention Pond)

Selected BMP Type =	<b>EDB</b>	
Watershed Area =	620.50	acres
Watershed Length =	9,000	ft
Watershed Length to Centroid =	4,500	ft
Watershed Slope =	0.030	ft/ft
Watershed Imperviousness =	8.20%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	100.0%	percent
Percentage Hydrologic Soil Group C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths = User Input		

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

Water Quality Capture Volume (WQCV) =	4,070	acre-feet
Excess Urban Runoff Volume (EURV) =	7,407	acre-feet
2-yr Runoff Volume ( $P_1 = 1.19$ in.) =	7,451	acre-feet
5-yr Runoff Volume ( $P_1 = 1.5$ in.) =	17,238	acre-feet
10-yr Runoff Volume ( $P_1 = 1.75$ in.) =	27,114	acre-feet
25-yr Runoff Volume ( $P_1 = 2.1$ in.) =	45,076	acre-feet
50-yr Runoff Volume ( $P_1 = 2.25$ in.) =	57,163	acre-feet
100-yr Runoff Volume ( $P_1 = 2.52$ in.) =	74,726	acre-feet
500-yr Runoff Volume ( $P_1 = 3.14$ in.) =	106,512	acre-feet
Approximate 2-yr Detention Volume =	2,943	acre-feet
Approximate 5-yr Detention Volume =	4,695	acre-feet
Approximate 10-yr Detention Volume =	10,680	acre-feet
Approximate 25-yr Detention Volume =	15,377	acre-feet
Approximate 50-yr Detention Volume =	15,984	acre-feet
Approximate 100-yr Detention Volume =	20,890	acre-feet

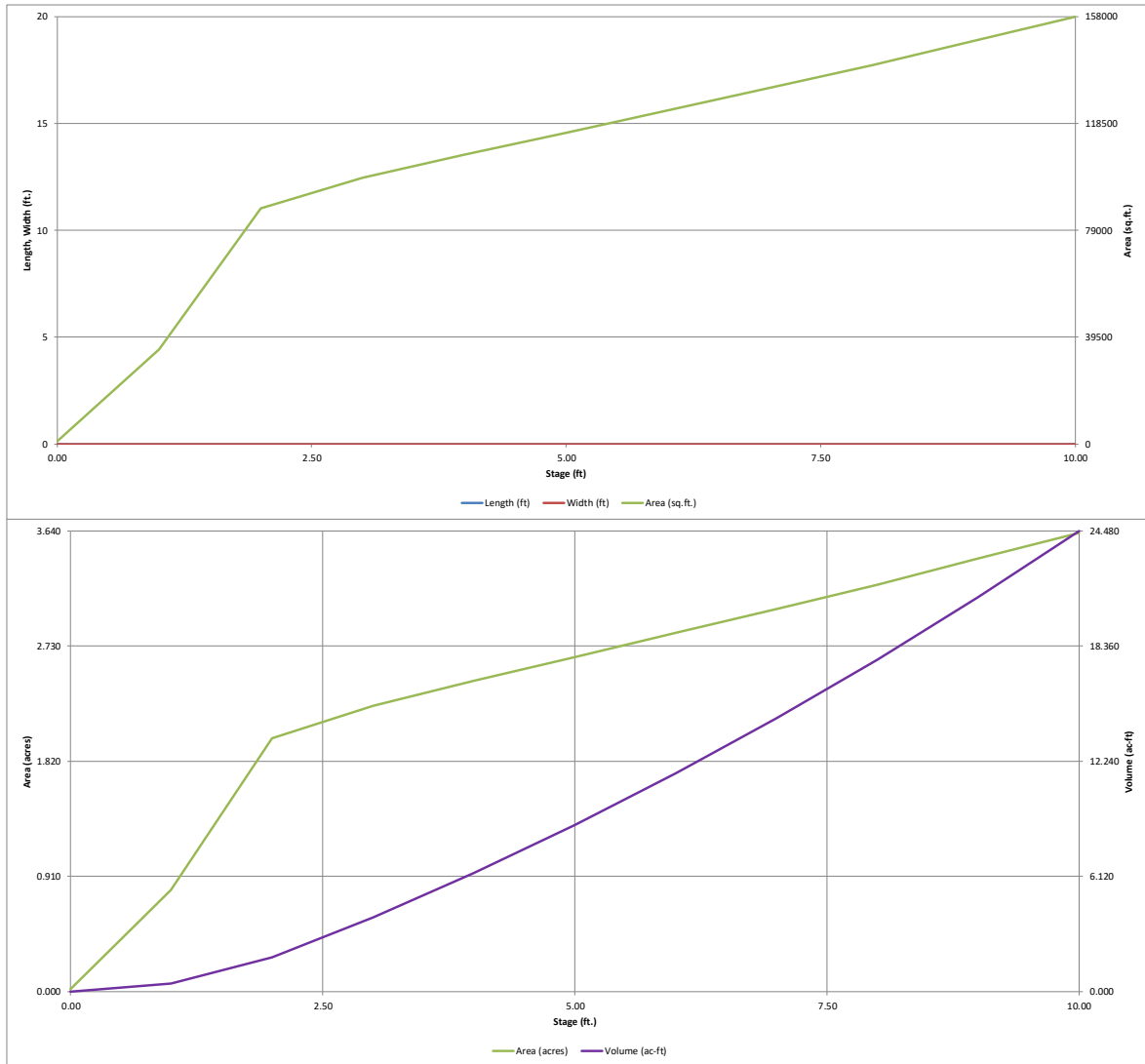
Zone 1 Volume (WQCV) =	4.070	acre-feet
Zone 2 Volume (100-year - Zone 1) =	16.820	acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	20.890	acre-feet
Initial Surcharge Volume (ISV) =	user	ft <sup>3</sup>
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth ( $H_{total}$ ) =	user	ft
Depth of Trickle Channel ( $H_{TC}$ ) =	user	ft
Slope of Trickle Channel ( $S_{TC}$ ) =	user	ft/ft
Slopes of Main Basin Sides ( $S_{main}$ ) =	user	H:V
Basin Length-to-Width Ratio ( $R_{L/W}$ ) =	user	

Initial Surcharge Area ( $A_{SV}$ )	=	user	ft <sup>2</sup>
Surcharge Volume Length ( $L_{SV}$ )	=	user	ft
Surcharge Volume Width ( $W_{SV}$ )	=	user	ft
Depth of Basin Floor ( $H_{FLOOR}$ )	=	user	ft
Length of Basin Floor ( $L_{FLOOR}$ )	=	user	ft
Width of Basin Floor ( $W_{FLOOR}$ )	=	user	ft
Area of Basin Floor ( $A_{FLOOR}$ )	=	user	ft <sup>2</sup>
Volume of Basin Floor ( $V_{FLOOR}$ )	=	user	ft <sup>3</sup>
Depth of Main Basin ( $H_{MAIN}$ )	=	user	ft
Length of Main Basin ( $L_{MAIN}$ )	=	user	ft
Width of Main Basin ( $W_{MAIN}$ )	=	user	ft
Area of Main Basin ( $A_{MAIN}$ )	=	user	ft <sup>2</sup>
Volume of Main Basin ( $V_{MAIN}$ )	=	user	ft <sup>3</sup>
Calculated Total Basin Volume ( $V_{TOTAL}$ )	=	user	acre-feet

[illegible]

# DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

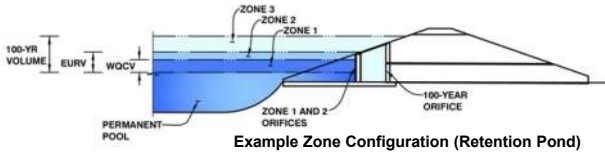


# DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Project: **Eagleview**

Basin ID: **Onsite Sub Regional Pond 1 (Watershed Area adjusted to match HEC-HMS)**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.06	4.070	Orifice Plate
Zone 2 (100-year)	8.99	16.820	Weir&Pipe (Restrict)
Zone 3			
Total (all zones)		20.890	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =  ft (distance below the filtration media surface)  
Underdrain Orifice Diameter =  inches

Calculated Parameters for Underdrain  
Underdrain Orifice Area =  ft<sup>2</sup>  
Underdrain Orifice Centroid =  feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Invert of Lowest Orifice =  0.00 ft (relative to basin bottom at Stage = 0 ft)  
Depth at top of Zone using Orifice Plate =  3.06 ft (relative to basin bottom at Stage = 0 ft)  
Orifice Plate: Orifice Vertical Spacing =  N/A inches  
Orifice Plate: Orifice Area per Row =  N/A inches

Calculated Parameters for Plate  
WQ Orifice Area per Row =  N/A ft<sup>2</sup>  
Elliptical Half-Width =  N/A feet  
Elliptical Slot Centroid =  N/A feet  
Elliptical Slot Area =  N/A ft<sup>2</sup>

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.02	2.04					
Orifice Area (sq. inches)	14.00	15.00	16.00					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

Invert of Vertical Orifice =  Not Selected  Not Selected ft (relative to basin bottom at Stage = 0 ft)  
Depth at top of Zone using Vertical Orifice =  ft (relative to basin bottom at Stage = 0 ft)  
Vertical Orifice Diameter =  inches

Calculated Parameters for Vertical Orifice  
Vertical Orifice Area =  Not Selected  Not Selected ft<sup>2</sup>  
Vertical Orifice Centroid =  ft

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe))

Overflow Weir Front Edge Height, H<sub>o</sub> =  3.25 ft (relative to basin bottom at Stage = 0 ft)  
Overflow Weir Front Edge Length =  45.00 feet  
Overflow Weir Grate Slope =  4.00 H:V  
Horiz. Length of Weir Sides =  28.00 feet  
Overflow Grate Type =  Type C Grate  
Debris Clogging % =  50%

Calculated Parameters for Overflow Weir  
Height of Grate Upper Edge, H<sub>u</sub> =  10.25 feet  
Overflow Weir Slope Length =  28.86 feet  
Grate Open Area / 100-yr Orifice Area =  19.98  
Overflow Grate Open Area w/o Debris =  903.95 ft<sup>2</sup>  
Overflow Grate Open Area w/ Debris =  451.97 ft<sup>2</sup>

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

Depth to Invert of Outlet Pipe =  1.00 ft (distance below basin bottom at Stage = 0 ft)  
Outlet Pipe Diameter =  96.00 inches  
Restrictor Plate Height Above Pipe Invert =  81.00 inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate  
Outlet Orifice Area =  45.25 ft<sup>2</sup>  
Outlet Orifice Centroid =  3.64 feet  
Half-Central Angle of Restrictor Plate on Pipe =  2.33 radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage =  8.15 ft (relative to basin bottom at Stage = 0 ft)  
Spillway Crest Length =  211.00 feet  
Spillway End Slopes =  4.00 H:V  
Freeboard above Max Water Surface =  1.00 feet

Calculated Parameters for Spillway  
Spillway Design Flow Depth =  0.98 feet  
Stage at Top of Freeboard =  10.13 feet  
Basin Area at Top of Freeboard =  3.63 acres  
Basin Volume at Top of Freeboard =  24.48 acre-ft

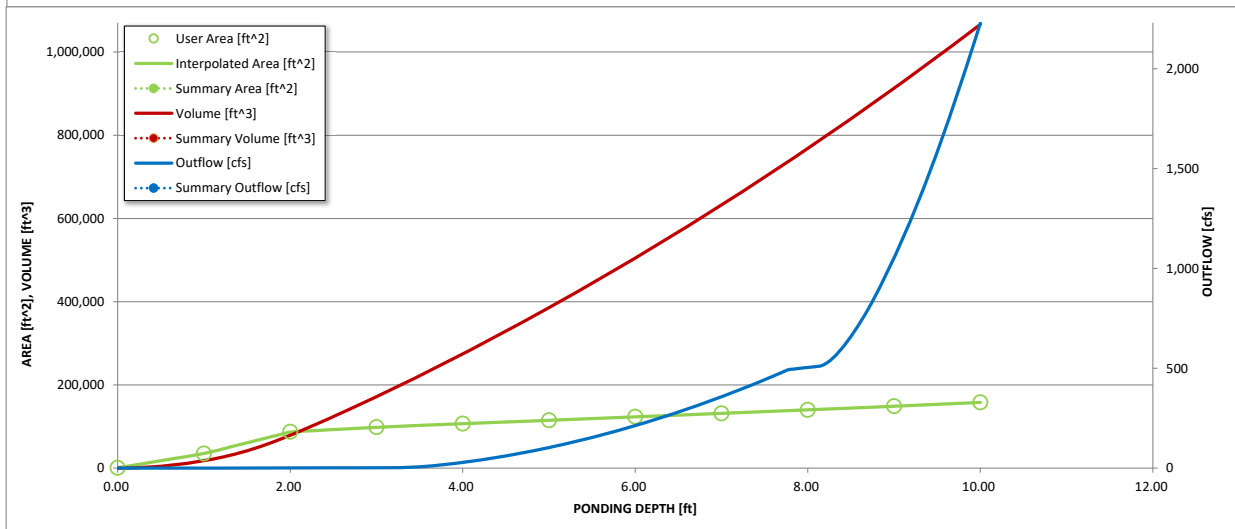
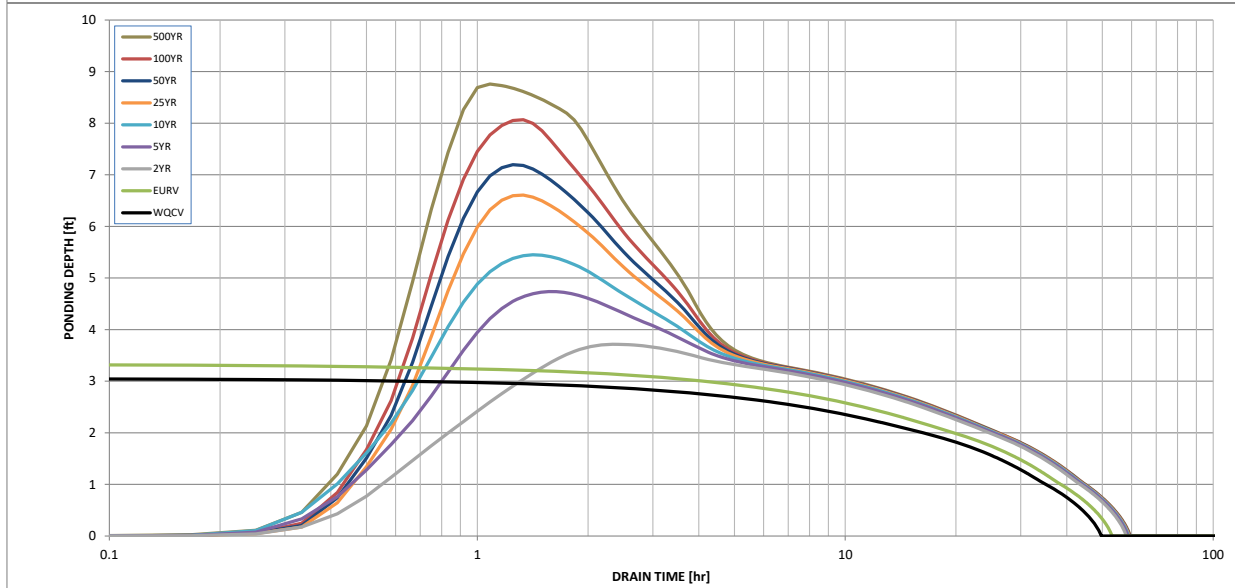
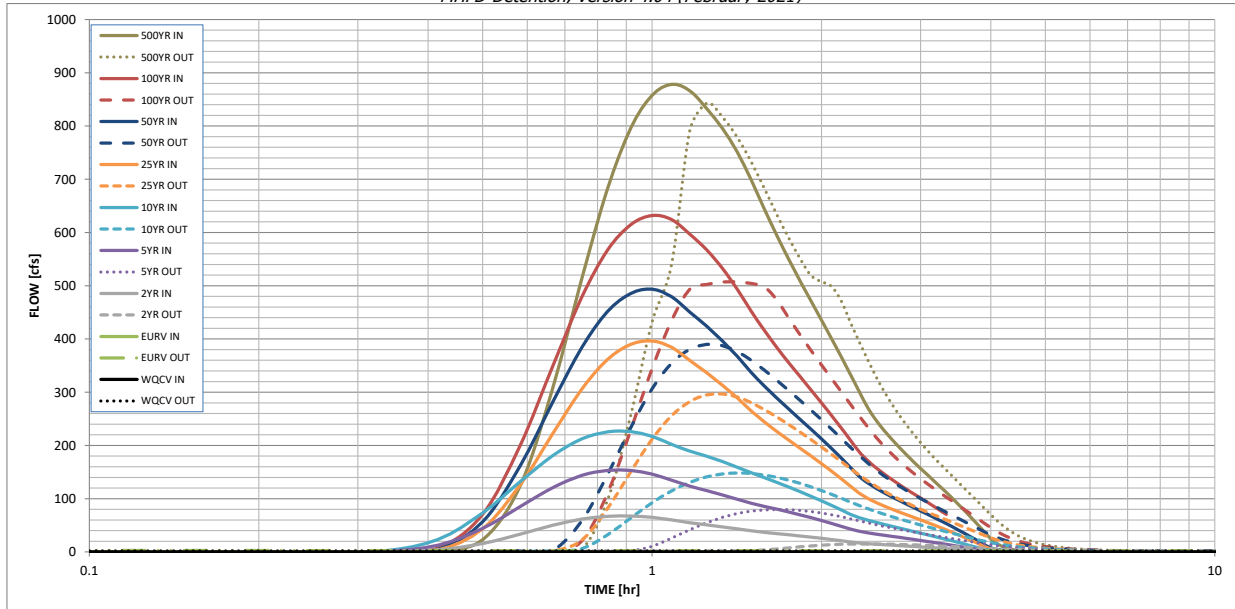
## Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
CUHP Runoff Volume (acre-ft) =	4.070	4.707	7.454	17.238	27.114	45.076	57.163	74.726	106.512
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	7.454	17.238	27.114	45.076	57.163	74.726	106.512
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	45.0	128.1	200.8	370.9	467.6	607.8	852.3
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.07	0.21	0.32	0.60	0.75	0.98	1.37
Peak Inflow Q (cfs) =	N/A	N/A	67.5	153.2	226.0	396.2	493.5	631.9	878.2
Peak Outflow Q (cfs) =	2.1	3.1	15.0	79.8	148.3	296.8	390.0	507.6	842.7
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.6	0.7	0.8	0.8	0.8	1.0
Structure Controlling Flow =	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	0.00	0.01	0.1	0.2	0.3	0.4	0.6	0.6
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	44	47	49	42	38	31	27	22	15
Time to Drain 99% of Inflow Volume (hours) =	47	50	54	51	48	44	42	39	35
Maximum Ponding Depth (ft) =	3.06	3.34	3.71	4.73	5.45	6.61	7.19	8.07	8.76
Area at Maximum Ponding Depth (acres) =	2.27	2.33	2.40	2.59	2.73	2.95	3.06	3.23	3.37
Maximum Volume Stored (acre-ft) =	4.082	4.726	5.600	8.147	10.034	13.325	15.097	17.831	20.106

# DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)



S-A-V-D Chart Axis Override  
minimum bound

# DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: \_\_\_\_\_

## Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

Time Interval	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.03
	0:15:00	0.00	0.00	0.08	0.13	0.16	0.11	0.16	0.14	0.25
	0:20:00	0.00	0.00	0.44	1.10	1.90	0.49	0.61	0.64	1.93
	0:25:00	0.00	0.00	3.95	12.74	23.46	3.88	5.05	7.52	23.13
	0:30:00	0.00	0.00	15.82	44.22	73.14	43.38	56.54	70.64	124.82
	0:35:00	0.00	0.00	33.58	85.48	132.31	126.39	162.32	200.91	309.65
	0:40:00	0.00	0.00	50.24	121.09	181.28	222.97	282.58	350.38	512.50
	0:45:00	0.00	0.00	61.66	143.72	212.27	305.45	383.69	478.35	681.68
	0:50:00	0.00	0.00	66.96	153.18	225.54	361.46	451.41	566.61	796.10
	0:55:00	0.00	0.00	67.49	153.04	226.04	389.90	485.59	614.59	857.61
	1:00:00	0.00	0.00	64.98	146.26	217.08	396.25	493.50	631.93	878.17
	1:05:00	0.00	0.00	60.21	134.68	201.95	384.38	479.47	624.24	866.29
	1:10:00	0.00	0.00	54.94	123.66	189.44	359.83	450.49	596.97	832.70
	1:15:00	0.00	0.00	50.95	115.29	179.74	336.76	424.09	567.38	795.79
	1:20:00	0.00	0.00	47.15	107.16	169.88	313.35	396.57	532.84	751.38
	1:25:00	0.00	0.00	43.39	98.99	159.01	289.40	367.55	493.49	699.05
	1:30:00	0.00	0.00	39.82	91.55	148.77	265.01	337.43	452.41	643.97
	1:35:00	0.00	0.00	36.91	85.61	139.53	244.25	311.62	415.97	594.12
	1:40:00	0.00	0.00	34.47	80.30	130.59	226.19	288.90	383.95	549.29
	1:45:00	0.00	0.00	32.19	75.03	121.74	209.82	268.13	355.12	508.35
	1:50:00	0.00	0.00	29.99	69.69	113.04	194.59	248.74	329.05	470.93
	1:55:00	0.00	0.00	27.79	64.35	104.51	180.01	230.19	304.10	435.21
	2:00:00	0.00	0.00	25.57	59.00	96.12	165.80	212.20	279.98	400.89
	2:05:00	0.00	0.00	23.34	53.63	87.66	151.77	194.43	256.44	367.32
	2:10:00	0.00	0.00	21.08	48.26	79.14	137.90	176.83	233.43	334.39
	2:15:00	0.00	0.00	18.82	42.98	70.76	124.06	159.24	210.52	301.68
	2:20:00	0.00	0.00	16.86	38.79	64.44	110.52	142.04	188.26	271.02
	2:25:00	0.00	0.00	15.55	35.97	59.76	100.66	129.66	171.66	247.75
	2:30:00	0.00	0.00	14.53	33.63	55.67	92.92	119.74	158.33	228.63
	2:35:00	0.00	0.00	13.61	31.47	51.88	86.39	111.25	146.68	211.70
	2:40:00	0.00	0.00	12.73	29.39	48.31	80.45	103.50	136.20	196.39
	2:45:00	0.00	0.00	11.87	27.39	44.86	75.09	96.47	126.60	182.31
	2:50:00	0.00	0.00	11.04	25.43	41.52	69.93	89.74	117.59	169.10
	2:55:00	0.00	0.00	10.22	23.51	38.30	64.97	83.29	109.15	156.74
	3:00:00	0.00	0.00	9.43	21.62	35.19	60.19	77.13	101.30	145.25
	3:05:00	0.00	0.00	8.64	19.77	32.18	55.47	71.07	93.53	133.97
	3:10:00	0.00	0.00	7.85	17.95	29.28	50.79	65.09	85.81	122.88
	3:15:00	0.00	0.00	7.07	16.13	26.42	46.13	59.15	78.10	111.81
	3:20:00	0.00	0.00	6.29	14.33	23.57	41.49	53.23	70.40	100.76
	3:25:00	0.00	0.00	5.52	12.55	20.73	36.86	47.33	62.70	89.74
	3:30:00	0.00	0.00	4.75	10.77	17.91	32.23	41.43	55.02	78.73
	3:35:00	0.00	0.00	3.98	9.00	15.11	27.60	35.55	47.35	67.75
	3:40:00	0.00	0.00	3.21	7.24	12.32	22.99	29.67	39.68	56.79
	3:45:00	0.00	0.00	2.45	5.48	9.54	18.38	23.81	32.03	45.86
	3:50:00	0.00	0.00	1.70	3.74	6.81	13.78	17.98	24.40	34.98
	3:55:00	0.00	0.00	1.01	2.22	4.51	9.26	12.24	16.92	24.63
	4:00:00	0.00	0.00	0.54	1.34	3.21	5.56	7.63	10.85	16.50
	4:05:00	0.00	0.00	0.37	0.98	2.49	3.49	5.04	7.21	11.43
	4:10:00	0.00	0.00	0.28	0.76	1.97	2.24	3.40	4.82	7.97
	4:15:00	0.00	0.00	0.23	0.60	1.56	1.44	2.31	3.13	5.44
	4:20:00	0.00	0.00	0.18	0.47	1.22	0.92	1.56	1.95	3.59
	4:25:00	0.00	0.00	0.14	0.37	0.92	0.61	1.06	1.12	2.25
	4:30:00	0.00	0.00	0.11	0.28	0.67	0.38	0.70	0.58	1.33
	4:35:00	0.00	0.00	0.08	0.21	0.48	0.25	0.47	0.32	0.82
	4:40:00	0.00	0.00	0.07	0.15	0.33	0.18	0.34	0.24	0.58
	4:45:00	0.00	0.00	0.05	0.11	0.23	0.13	0.25	0.19	0.44
	4:50:00	0.00	0.00	0.04	0.08	0.17	0.10	0.19	0.15	0.35
	4:55:00	0.00	0.00	0.03	0.05	0.13	0.07	0.14	0.12	0.27
	5:00:00	0.00	0.00	0.02	0.03	0.09	0.05	0.10	0.09	0.20
	5:05:00	0.00	0.00	0.02	0.02	0.06	0.04	0.07	0.06	0.14
	5:10:00	0.00	0.00	0.01	0.01	0.03	0.02	0.05	0.04	0.09
	5:15:00	0.00	0.00	0.00	0.01	0.02	0.01	0.03	0.02	0.05
	5:20:00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.02
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





4582 S. Ulster Street - Suite 1500  
Denver, Colorado 80237

Project: Eagleview  
Project Number: 196288000  
Date: 10/28/2021

Prepared By: DM  
Checked By: BAH

Water Quality Capture Volume

Sub Regional Pond 1

Water Quality Capture Volume		
UDFCD V3 Equation 3-1		
WQ Watershed Inches = $a*(0.91i^3-1.19i^2+.78i)$		
$a_{12} = 0.8$ (12-Hr Drain Time)		
$a_{24} = 0.9$ (24-Hr Drain Time)		
$a_{40} = 1.0$ (40-Hr Drain Time)		
UDFCD V3 Equation 3-3		
WQCV = (WQCV/12)*(Area)		
WQCV Impervious (Site) =	8.2%	
a =	1.0	
WQ Watershed Inches (Site) =	0.06	
Area (Site) =	720.00	AC
WQ Capture Volume (Site) =	3.388	AC-FT
	147,564	FT <sup>3</sup>
20% extra for Sediment	4.07	AC-FT

IMPERVIOUS FACTOR CALCULATION TABLE - PROPOSED CONDITIONS

		Imp %	2%	11%	90%	100%	80%		
	Basin	Area (Acre)	Open Space (2%)	2.5 Acre Lot (100%)	Buildings (100%)	Paved Roadway (100%)	Gravel Roadway (80%)	Total % Check	Weighted Impervious
SBR1	B8	11.78	0%	99%	0%	1%	0%	100%	11%
	B9	12.80	0%	98%	0%	2%	0%	100%	12%
	B10	11.52	0%	98%	0%	2%	0%	100%	13%
	OB5	143.82	94%	0%	2%	1%	3%	100%	7%
	OB6	118.40	92%	0%	1%	2%	5%	100%	9%
	OB7	421.43	93%	0%	2%	1%	4%	100%	8%
Total		719.74							8.2%



4582 S. Ulster Street - Suite 1500  
Denver, Colorado 80237

Project: Eagleview  
Project Number: 196288000  
Date: 10/28/2021

Prepared By: DM  
Checked By: BAH

Water Quality Capture Volume

Water Quality Feature 1

Water Quality Capture Volume		
UDFCD V3 Equation 3-1		
WQ Watershed Inches = $a \cdot (0.91i^3 - 1.19i^2 + .78i)$		
$a_{12} = 0.8$ (12-Hr Drain Time)		
$a_{24} = 0.9$ (24-Hr Drain Time)		
$a_{40} = 1.0$ (40-Hr Drain Time)		
UDFCD V3 Equation 3-3		
WQCV = (WQCV/12)*(Area)		
WQCV Impervious (Site) =	100.0%	
a =	1.0	
WQ Watershed Inches (Site) =	0.50	
Area (Site) =	2.29	AC
WQ Capture Volume (Site) =	0.095	AC-FT
	4,156	FT <sup>3</sup>



4582 S. Ulster Street - Suite 1500  
Denver, Colorado 80237

Project: Eagleview  
Project Number: 196288000  
Date: 10/28/2021

Prepared By: DM  
Checked By: BAH

Water Quality Capture Volume

Water Quality Feature 2

Water Quality Capture Volume		
UDFCD V3 Equation 3-1		
WQ Watershed Inches = $a \cdot (0.91i^3 - 1.19i^2 + .78i)$		
$a_{12} = 0.8$ (12-Hr Drain Time)		
$a_{24} = 0.9$ (24-Hr Drain Time)		
$a_{40} = 1.0$ (40-Hr Drain Time)		
UDFCD V3 Equation 3-3		
WQCV = (WQCV/12) * (Area)		
WQCV Impervious (Site) =	100.0%	
a =	1.0	
WQ Watershed Inches (Site) =	0.50	
Area (Site) =	0.92	AC
WQ Capture Volume (Site) =	0.038	AC-FT
	1,670	FT <sup>3</sup>

***APPENDIX D: REFERENCES***

# FALCON DRAINAGE BASIN PLANNING STUDY

## SELECTED PLAN REPORT

### FINAL - SEPTEMBER 2015

Prepared for:



El Paso County Public Services Department  
3275 Akers Drive  
Colorado Springs, CO 80922

Prepared By:



Matrix Design Group  
2435 Research Parkway, Suite 300  
Colorado Springs, CO 80920

Matrix Project No. 10.122.003

BCC

RESOLUTION NO. 15- 387

BOARD OF COUNTY COMMISSIONERS  
COUNTY OF EL PASO, STATE OF COLORADO

RESOLUTION TO RECOGNIZE AND ADOPT THE  
FALCON DRAINAGE BASIN PLANNING STUDY AND TO ESTABLISH A  
DRAINAGE FEE AND BRIDGE FEE FOR THE BASIN (CHWS1400)

WHEREAS, the Board of County Commissioners of the County of El Paso ("Board") has the authority granted to it under the provisions of §§30-11-101, (1)(e), and 30-11-107, (1)(e), C.R.S., to represent the County and exercise its further powers to address concerns of the County in all cases where no other provisions are made by law; and

WHEREAS, a plan for the development of drainage basins of mutual concern was adopted by the El Paso County Planning Commission as part of the County Master Plan on December 17, 1984 and has been subsequently amended; and

WHEREAS, Section 30-28-133(11), C.R.S., authorizes counties to adopt subdivision regulations providing for the payment of a sum of money or proof of a line of credit or other fees in equitable contribution to the total costs of the drainage facilities in the drainage basin in which the subdivision is located; and

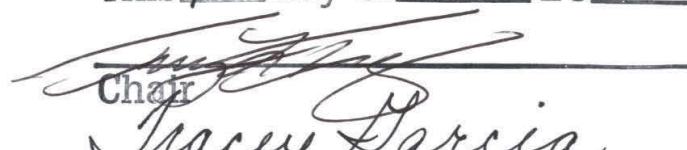
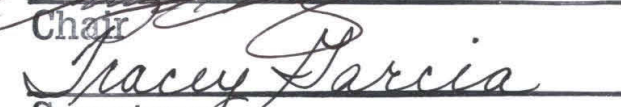
WHEREAS, Section 8.5.5 of the *El Paso County Land Development Code* provides for the assessment of drainage basin and bridge fees and for the repayment to a subdivider, from any surplus basin funds available, of any costs the subdivider incurs because of compliance with the plans for the development of drainage basins in excess of the sum of the drainage basin fees assessed against the subdivider's impervious acreage; and

WHEREAS, the Board of County Commissioners of El Paso County, Colorado, Resolution 87-178A, authorized creation of the *City of Colorado Springs/El Paso County Drainage Criteria Manual* to set forth provisions for drainage policies, criteria, finance, and administration; and

WHEREAS, said manual has been further modified by Resolutions Nos. 88-58, 91-334, 95-81, 01-384, 04-483, 15-42 and others; and

WHEREAS, the El Paso County Public Services Department initiated an update to the Falcon Drainage Basin Planning Study dated December 15, 2000 (approved by the Planning Commission on October 17, 2000 and the Board of County Commissioners on December 14, 2000); and

WHEREAS, in accordance with the procedures outlined in the aforementioned *City of Colorado Springs/El Paso County Drainage Criteria Manual*, the El Paso County Public

Approved  
El Paso County  
Planning Commission  
This 15<sup>th</sup> day of March 20 16  
  
Chair  
  
Secretary

Chuck Broerman  
10/07/2015 12:22:14 PM  
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El Paso County, CO



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### 3.0 HYDROLOGIC ANALYSIS

#### 3.1. Watershed Description

The Falcon Watershed is located in the north central portion of El Paso County (County) and flows southeasterly from the southern slope of the Black Forest. The Falcon Watershed contains three perennial streams and has a contributing drainage area of approximately 10.6 square miles (sq mi) at its confluence with Black Squirrel Creek. A routing schematic of the Falcon Watershed is provided in Figure 3-1.

The headwaters of the Falcon Watershed are dominated by ponderosa pine forest and grassland on undeveloped large acreage tracts and 2- to 5-acre (ac) rural residential lots. The middle portion of the Falcon Watershed between Londonderry Drive and Highway 24 has been developed into residential areas consisting primarily of single-family homes, commercial centers, and vacant land. The lower portion of the Falcon Watershed south of Highway 24 is dominated by grassland on undeveloped large acreage tracts and 2- to 5-acre (ac) rural residential lots. A basin map of the Falcon Watershed is provided in Figure 3-2.

#### 3.2. Methodology

Hydrologic analysis for the Falcon Watershed was completed for historical, existing, and future land use conditions by applying a 24-hour storm event with 2-, 5-, 10-, 25-, 50-, and 100-year recurrence intervals. The following sections provide a summary of the hydrologic analyses. A detailed compilation of hydrology model data, calculations, and results are provided in Appendix A.

#### 3.3. HEC-HMS Model

A hydrology model for the Falcon Watershed was developed using the US Army Corps of Engineers (USACE) Hydrologic Engineering Center – Hydrologic Modeling System Version 3.5 (HEC-HMS) to simulate the rainfall-runoff process and generate flood hydrographs for select storm events. Each component of the model is described in detail following this section. A geospatially referenced basin model was developed in ArcGIS® Version 9.2 using USACE’s Geospatial Hydrologic Modeling Extension (HEC-GeoHMS). Using these tools, subbasin and stream reach physical characteristics including area, longest hydraulic flowpath, reach length, slope, and topological connectivity were extracted for calculation of hydrologic parameters. Hydrologic parameters were calculated as outlined below and populated to the basin and meteorological components of the HEC-HMS model. A summary of selected methodologies for each HEC-HMS model component is provided in Table 3-1.

The Specified Hyetograph method was chosen to model the Type IIa hypothetical storm event recommended in the City of Colorado Springs and El Paso County Drainage Criteria Manual (DCM) (1991) with rainfall depths published in *NOAA Atlas II Vol. 3 (Miller et al. 1973)*. These hyetographs were imported into the HEC-HMS precipitation gage manager and applied to each subbasin within the Falcon Watershed. Rainfall was modeled with a uniform spatial distribution across the entire Falcon Watershed.

Infiltration and runoff volumes were modeled using the SCS (since renamed NRCS) Runoff Curve Number (runoff CN) Loss Method. The composite runoff CN was calculated for each subbasin and imported into HEC-HMS. For modeling purposes, initial infiltration loss rates were automatically calculated as functions of composite runoff CNs by HEC-HMS.

Table 3-1. HEC-HMS Model Components

Model Component	Selected Methodology
Meteorological Model	Specified Hyetograph
Infiltration Loss	SCS Runoff Curve Number Method
Runoff Transformation	SCS Unit Hydrograph Method
Channel Routing	Muskingum-Cunge Method
Baseflow Method	None

Notes:  
SCS = Soil Conservation Service (since renamed Natural Resources Conservation Service)

The transformation of runoff volume to a runoff hydrograph was modeled using the SCS Unit Hydrograph Method. Subbasin lag times were calculated from the time of concentration as computed using the method outlined in *Technical Release 55 (TR-55)* (NRCS 1986).

The Muskingum-Cunge Method was selected to develop the channel routing component of the HEC-HMS model. Eight-point cross sections developed from 2-foot (ft) contour data were used to represent open channel reaches while circular and rectangular sections were used to represent storm sewer reaches, as applicable.

#### 3.4. Subbasin Delineation

Matrix subcontracted Aerial Mapping Services to obtain and develop orthometric aerial imagery of the current conditions within the Falcon Watershed to assist with the DBPS. Basin delineation and stream network definition were completed in an ArcGIS® environment using 2-ft contours, information obtained from field reconnaissance, and the storm sewer GIS coverage obtained from the County.

The Falcon Watershed was divided into 65 subbasins with areas ranging from 0.03 sq mi (19 ac) up to 0.33 sq mi (211 ac) as shown on Figure 3-2. Subbasin slopes in the Falcon Watershed range from 2.9% to 8.7%. Subbasins were delineated at tributaries, major road crossings, changes in slope, changes in land use, and major drainage features. Information obtained from drainage plans was used to supplement the basin delineation within developed areas when all other pieces of information did not provide a clear direction of delineation. Table 3-2 lists all drainage plans received from the County that were reviewed and incorporated as necessary.

The Falcon Watershed was divided into 3 major subbasins: West Tributary (WT), Middle Tributary (MT), and East Tributary (ET) as shown on Figure 3-2. The West Tributary consists of 37 subbasins and 10 minor tributaries along the entire length of the watershed from the Black Forest to the confluence with Black Squirrel Creek. These subbasins primarily encompass rural land with pockets of residential development. The Middle Tributary consists of 11 subbasins and 2 minor tributaries and is primarily north of Highway 24. These subbasins encompass rural, residential, and commercial land. The East Tributary consists of 16 subbasins and 1 minor tributary and encompasses residential land north of Highway 24 and rural land south of Highway 24.

**Table 3-2. Drainage Plans within the Falcon Watershed**

Beckett at Woodmen Hills Filing 1	Meridian Ranch Filing 4
Beckett at Woodmen Hills Filing 2	Paint Brush Hills Filing 4 Drainage Analysis
Beckett at Woodmen Hills Filing 3	Paint Brush Hills Filing 5
Courtyards at Woodmen Hills North Filing 1	Paint Brush Hills Filing 9
Courtyards at Woodmen Hills South Filing 1	Paint Brush Hills Filing 10
Courtyards at Woodmen Hills South Filing 2	Paint Brush Hills Filing 11
Courtyards at Woodmen Hills West	Paint Brush Hills Filing 12
Falcon Highlands Filing 1	Woodmen Hills Filing 1
Falcon Highlands Filing 2	Woodmen Hills Filing 4
Falcon Highlands Market Place Filing 1	Woodmen Hills Filing 5
Falcon Highlands Market Place Filing 2	Woodmen Hills Filing 6
Falcon Vista Subdivision Filing 1	Woodmen Hills Filing 7C & G
Falcon Vista Subdivision Filing 2	Woodmen Hills Filing 8
Forest Gate Subdivision	Woodmen Hills Filing 9
Latigo Business Center Filing 1	Woodmen Hills Filing 10
The Meadows Filing 3	Woodmen Hills Filing 11
Meridian Crossing Filing 1	

The Falcon South (FS) subbasin is a single subbasin at the southern portion of the Falcon Watershed that lies directly to the west of the watershed outlet. This subbasin does not contain any tributaries and discharges directly south of the Falcon Watershed outlet. The drainage area from the FS subbasin was previously included in the Falcon Watershed in the 2000 Falcon DBPS (URS Corporation 2000). However, based on new topographic data and aerial photography it was determined that this subbasin is not a part of the Falcon Watershed but was evaluated as a part of this DBPS for comparison purposes.

The subbasins delineated for the existing watershed condition are assumed to also represent both the historical (undeveloped) and future (full build-out) conditions. The reason for this is to maintain consistent comparison points with identical drainage areas when evaluating detention and channel improvement alternatives later in this report. Subbasin delineations were likely much different in the historical condition due to the absence of development and have the potential to change significantly as a result of future development. These changes are not able to be identified at this point due to data limitations and ambiguity of future development patterns.

Currently, there is a diversion berm that exists in the northwest portion of the Falcon Watershed as shown on Figure 3-1. This berm will divert approximately 195 cfs out of the Falcon Watershed. However, according to the County it can be assumed that this berm did not exist during the historical watershed conditions nor will it exist for the future watershed condition because this area is planned to be developed in the future and will likely result in the berm being removed.

**3.5. Hydrologic Soil Groups**

Soils are classified into hydrologic soil groups (HSG) by the NRCS for hydrologic modeling. HSG is a parameter assigned to each soil series by the NRCS to reflect the relative rate of infiltration of water into the soil profile. *TR-55* defines HSGs into A, B, C, and D groups.

The HSG was determined for each of the soil mapping units from the NRCS Soil Survey Geographic (SSURGO) data for the County. Only two of the four HSGs are found within the Falcon Watershed. Group B soils, with moderate infiltration rates, dominate the Falcon Watershed at 42% coverage. According to the SSURGO data there is an equally large coverage of HSG A soils, however, most of this coverage lies within or near development. Any areas within the HSG A coverage that have been regraded as part of urban development were regrouped to HSG B for runoff CN calculations that are described later. The reason for this is that as soon HSG A soils are disturbed or regraded the high infiltration rates associated with these soils are lost due to compaction. A HSG map is provided in Figure 3-3 that shows the distribution and coverage of each group within the Falcon Watershed. Table 3-3 shows the percentage of each HSG present in the Falcon Watershed.

**Table 3-3. Hydrologic Soil Groups within the Falcon Watershed**

Hydrologic Soil Groups	Coverage
A	9.9%
B	41.8%
B (Re-graded A Soils)	48.1%
C	0.0%
D	0.0%
Water	0.1%

**3.6. Land Use**

Historical land use conditions were assigned based on the land use categories defined in *TR-55* that are consistent with the native land uses within the watershed. Historical land use conditions represent an undeveloped watershed condition and were used as the underlying land use for runoff CN development as described below. Undeveloped land use conditions listed in *TR-55* are separated by good, fair, and poor condition. Woods (Good Condition) is the dominant underlying land use in upper portion of the Falcon Watershed while Rangeland (Good Condition) is the dominant underlying land use throughout the remainder of the watershed. Each of these land uses categories were assigned a good condition based on field observation of ground cover.

Existing and future land use information for the Falcon Watershed was obtained from the County GIS department. Existing land use data was developed in 2010 and was derived from the Assessor’s parcel database. Future land use data represents development conditions sometime after 2030 and represents the current prediction of a full basin build-out scenario.

The Falcon Watershed reflects a variety of existing land uses including rural, grazing and farmland, rural residential, urban, commercial and industrial, vacant, and rights-of-way. Due to urban growth, land use is expected to change in the future condition with significant residential development planned in the middle portion of the watershed.

Historical, existing, and future land use conditions are shown in Figure 3-4, Figure 3-5, and Figure 3-6, respectively. Rangeland (Good Condition) was the dominant land use in historical conditions at 94%; while rural/rural residential is the dominant land use for existing and future conditions at 43% and 49%, respectively. Table 3-4, Table 3-5, and Table 3-6 outline major basin coverage by land use class for historical, exiting, and future conditions.

Table 3-4. Historical Land Use Classes within Falcon Watershed

Land Use <sup>1</sup>	Coverage
Woods (Good Condition)	5.9%
Rangeland (Good Condition)	94.1%

Notes:  
<sup>1</sup> As defined in *TR-55*

Table 3-5. Existing Land Use Classes within Falcon Watershed

Land Use	Coverage
Rural	27.0%
Rural Residential	16.0%
Urban	14.7%
Vacant > 5 Acres	11.8%
Grazing Land	8.2%
Political Subdivision	4.4%
Commercial	2.4%
State	2.3%
Vacant 2.5 Acres – 5 Acres	1.6%
County	1.1%
Vacant < 2.5 Acres	1.0%
Other	9.5%

Table 3-6. Future Land Use Classes within Falcon Watershed

Land Use	Coverage
5 Acre Rural Residential	43.4%
0.5 Acre Residential	17.4%
Exclusion	16.3%
Single Family Urban	11.0%
2.5 Acre Rural Residential	5.4%
Schools and Colleges	1.9%
Service Commercial	1.5%
Parks	1.2%
Other	1.9%

3.7. Runoff Curve Number Development

Runoff CN is a parameter developed by the NRCS to quantify the relationship between rainfall, infiltration, and runoff. It represents the combination of a HSG and a land use class and condition (McCuen 1998). Runoff CNs are estimated as a function of land use, impervious cover, HSG, and antecedent moisture condition (AMC).

Historical runoff CNs were assigned to each subbasin based on HSG and underlying *TR-55* land use class and condition. Within an ArcMap® GIS environment, discrete grid combinations of HSG and underlying land uses were developed. Assuming an average AMC, runoff CNs were determined for each unique soil/land use combination and composite runoff CNs for each subbasin were calculated.

Existing runoff CNs were assigned to each subbasin based on the percent impervious cover and an underlying *TR-55* land use class and condition. Additionally, public gravel roads were included as a part of the CN calculation but were assigned independently of impervious area and underlying land use. The impervious area coverage was developed from the orthometric data obtained from Aerial Mapping Services that included planimetric data of roads, parking lots, and rooftops. This data was supplemented with manual delineation of driveways and the County’s Parcel, Right of Way (ROW), and Building Footprint GIS data. Within an ArcMap® GIS environment, discrete grid combinations of HSG and underlying land uses were developed. Assuming an average AMC, runoff CNs were determined for each unique soil/land use combination based on presence or absence of impervious cover in the grid cell while evaluating gravel roads separately. The impervious areas were given a CN of 98, gravel roads were given a CN of 85, and all underlying areas were given a CN from *TR-55* based on the HSG and a woods-, open space-, or range land-land use. Composite runoff CNs were calculated from the gridded CN values within each subbasin. Figure 3-7 shows the existing impervious areas and provides the percent impervious by land use class and subbasin.

Future runoff CNs were assigned to each subbasin by using the existing CN grid in combination with representative CN values that were assigned to existing vacant land planned for future development. Representative CN values were developed by calculating composite CN values for each land use class in the existing condition that is planned for future conditions. Representative CN values were only developed for vacant land that is identified in the existing land use coverage as Dry Farmland, Grazing Land, County, Political Subdivision, State, Other, and Vacant land. Composite runoff CNs were calculated from the gridded CN values within each subbasin. Table 3-7 outlines representative CN values for future land use classes.

Figure 3-8, Figure 3-9 and Figure 3-10 show the discrete combinations of CNs used to develop the composite CNs for historical, existing, and future conditions, respectively.

Table 3-8 shows the area-weighted CN averages for historical, existing, and future conditions with the Falcon Watershed.

**Table 3-7. Representative CN Values by Land Use**

Land Use	Representative CN
Single Family Urban	79
0.5 Acre Residential	71
2.5 Acre Rural Residential	64
5 Acre Rural Residential (Rangeland Land Use)	62
5 Acre Rural Residential (Woods Land Use)	58
Schools & Colleges	69
Community Commercial/Service Commercial	81
Light Industrial	96

**Table 3-8. Average Runoff Curve Numbers within the Falcon Watershed**

Land Use	Historical CN	Existing CN	Future CN
Falcon Watershed	48	62	66

### 3.8. Initial Abstraction

Initial abstraction represents all water losses before runoff begins and is a function of the potential maximum water retention of soil. Initial abstraction includes water retained in surface depressions, water intercepted by vegetation, evaporation, and infiltration (*TR-55*). Conventional modeling uses an initial abstraction ratio of 0.20 which is also the default value in HEC-HMS. However, newer publications such as *Curve Number Hydrology* (ASCE/EWRI 2009) have revealed that an initial abstraction ratio of 0.20 is far too high for most applications and that an initial abstraction ratio of 0.05 is more appropriate for general application. Additionally, Matrix recently completed an extensive model calibration for the Jimmy Camp Creek watershed using measured rainfall and runoff information as a part of the Stormwater Management Assessment and Standards Development project for the City of Colorado Springs. The results of this analysis showed that an initial abstraction ratio of 0.10 is representative of the conditions in this area. As a result, an initial abstraction ratio of 0.10 was used for runoff calculations for the Falcon Watershed.

### 3.9. Time of Concentration

The time of concentration ( $T_c$ ) was calculated by summing the travel time for overland sheet flow, shallow concentrated flow, and channel flow segments along the hydraulically longest flowpath as outlined in *TR-55*. The longest flowpaths were delineated using HEC-GeoHMS and manually modified to match the drainage patterns in the subbasins based on existing topology, roads, inlets, and culvert crossings.

Overland flow was assumed to occur within the first 300 ft and may end before 300 ft if development or a concentrated flow condition is encountered, as described in *TR-55*. Shallow concentrated flow occurs after overland flow and before channel flow occurs. In some instances shallow concentrated flow may not occur if overland flow transitions directly to channel flow. Channel flow occurs after shallow concentrated flow or, in some cases overland flow, where surveyed channel cross section information has been obtained, where a defined channel is apparent in aerial photography or contours, or where streams appear on United States Geological Survey (USGS) quadrangle sheets and transports the runoff to the outlet of the subbasin. Detailed time of concentration calculations are provided in Appendix A.

Time of concentration calculations were completed for existing conditions for each of the 65 Falcon Watershed subbasins using overland, sheet, and channel flow segments. The longest flowpaths and corresponding time of concentration values were likely much slower for historical conditions because of the absence of development. The longest flowpaths and corresponding time of concentration values will also likely change in the future condition but are not able to be identified at this point due to data limitations and ambiguity of future development patterns.

To account for changing development conditions, time of concentration values for undeveloped subbasins were compared to the values calculated for developed subbasins in order to determine the impact that development has on this parameter. Undeveloped subbasins were identified as subbasins with minimal (< 3% impervious area) or no development and where the longest flowpaths and time of concentration calculations were not impacted by development. In this watershed, the time of concentration for developed subbasins was calculated to be approximately 25% shorter for undeveloped subbasins meaning that water moves through the subbasin faster.

Time of concentration values are typically longer for historical conditions compared to existing conditions because the overland and sheet flow segments are not shortened by development or because of an extended channel flow segment. Also, channel flow segments occur in natural channels versus storm sewers and roadway drainage systems, which lengthens the time of concentration due to increased channel roughness. Time of concentration values were lengthened for historical conditions so that the reduction in time of concentration to existing conditions was 25%. This was completed for all subbasins other than the subbasins that were identified as undeveloped for existing conditions.

Time of concentration values for future conditions are typically shorter compared to existing conditions because of the increase in development, reduction in overland and sheet flow segment lengths, and increase in channel flow segment lengths. Time of concentration values were shortened for future conditions by reducing the existing time of concentration values by 25% for all subbasins except where there is no change in development between existing and future conditions.

A summary of the time of concentration values for the Falcon Watershed is provided in Table 3-9.



**Table 3-9. Time of Concentration Summary for the Falcon Watershed**

	Historical T <sub>c</sub>	Existing T <sub>c</sub>	Future T <sub>c</sub>
Minimum	8 min	6 min	5 min
Maximum	153 min	115 min	86 min
Average	51 min	41 min	34 min

Notes:  
min = minutes

### 3.10. Channel Routing

The Muskingum-Cunge method was used for channel routing in 70 reaches in the Falcon Watershed, which is dominated by a wide, grass bottom channel. Reach delineations were performed for existing conditions and were likely much different historically because of the absence of development. Reach delineations will also likely change in the future condition but are not able to be identified at this point due to data limitations and ambiguity of future development patterns. Manning's channel roughness coefficient (Manning's n) values for earthen channels were assigned based on published values. Storm sewer reaches were represented as either circular or rectangular cross sections and were assigned a Manning's n value of 0.013. Table 3-10 outlines the channel characteristics in the Falcon Watershed.

**Table 3-10. Channel Characteristics within Falcon Watershed**

	West Tributary		Middle Tributary		East Tributary	
	Slope	Manning's n	Slope	Manning's n	Slope	Manning's n
Minimum	0.50%	0.013	0.40%	0.013	0.40%	0.030
Maximum	2.9%	0.070	2.1%	0.070	2.1%	0.070
Average	1.7%	0.047	1.5%	0.044	1.3%	0.049

### 3.11. Detention Ponds

Fifteen existing detention ponds were included in the Falcon Watershed HEC-HMS model. According to discussion with the County, no as-built drawings exist for any of these detention ponds and the stage-storage-discharge relationships published in available drainage plans and reports are not reliable. As a result, Matrix developed stage-storage-discharge relationships using 2-ft contour information and field measurements of the outlet structures for each of the 15 detention ponds. The stage-storage-discharge relationships developed for this DBPS should only be used for planning purposes and not for further design of any the existing detention ponds in the Falcon Watershed. Detailed survey information should be obtained for any of the existing ponds where additional design is desired.

According to Falcon Highlands Final Drainage Report Filing No. 1 (URS Corporation 2005), Regional Pond WU was intended to be an off-line detention pond with a constructed weir to control flow into the pond from the main channel. However, based on field observation and measurements Regional Pond WU is an on-line detention pond that captures all flow from the upstream channel up to the elevation of the secondary outlet structure which discharges flow to the adjacent channel.

There are several stock ponds throughout the Falcon Watershed that appear to always remain full and do not have any apparent outlet structures. These ponds provide minimal flood attenuation and were not modeled using a detention reservoir model. All detention pond locations are shown on Figure 3-1. Detention pond characteristics are summarized in Table 3-11.

Note that all detention ponds must be approved by the Federal Emergency Management Agency (FEMA) before a hydrology model can be approved by FEMA. FEMA-approved ponds likely consist only of County- and District-owned and maintained ponds and likely do not include privately-owned and maintained ponds. Some of the ponds included in this analysis are within developments and are possibly privately owned and maintained.

**Table 3-11. Detention Pond Summary for the Falcon Watershed**

Detention Pond	I.D.	Location	Surface Area (ac)	Vol. (ac-ft)	Initial Condition <sup>2</sup>
Meadows Pond #1	M 1	600 ft east of Towner Ave. on Woodmen Hills Dr.	1.0	2.2	Initial Storage = 0
Meadows Pond #2	M 2	2,100 ft east of Towner Ave. on Woodmen Hills Dr.	1.6	6.3	Initial Storage = 0
Paint Brush Hills Pond #4	PBH 4	Northeast corner of Brockton Ln. & Liberty Grove Dr.	0.90	1.3	Initial Storage = 0
Paint Brush Hills Pond A	PB A	300 ft west of Keating Dr. on Rockingham Dr.	1.1	2.6	Initial Storage = 0
Paint Brush Hills Pond B1	PB B1	North of Duxbury Dr.	1.6	9.2	Initial Storage = 0
Paint Brush Hills Pond B2	PB B2	East of Duxbury Dr.	2.5	12	Initial Storage = 0
Paint Brush Hills Pond C	PB C	East of London Derry Dr. & Rockingham Dr.	1.9	6.8	Initial Storage = 0
Regional Pond MN	R MN	Between Meridian Rd. & McLaughlin Rd.	2.1	7.5	Initial Storage = 0
Regional Pond WU <sup>1</sup>	R WU	Southwest corner of Meridian Rd. & Tamlin Rd.	6.5	41	Initial Storage = 0
Woodmen Hills Pond #1 <sup>1</sup>	WH 1	500 ft east of Tompkins Rd. on Woodmen Hills Dr.	3.6	16	Initial Storage = 0
Woodmen Hills Pond #2	WH 2	West of Ledoux Rd.	2.8	9.2	Initial Storage = 0
Woodmen Hills Pond #3	WH 3	North of Tompkins Rd. & Eastonville Rd.	5.5	8.4	Initial Storage = 0
Woodmen Hills Pond #4	WH 4	Northeast corner of Woodmen Rd. & Hwy. 24	8.1	22	Initial Storage = 0
Woodmen Hills Pond #5	WH 5	South of Corbu Heights & Maybeck view	1.5	4.1	Initial Storage = 0
Woodmen Hills Pond H	WH H	Northwest corner of Meridian Rd. & Woodmen Hills Dr.	1.0	2.7	Initial Storage = 0

Notes:

<sup>1</sup> Pond is divided by road. Values represent cumulative value of both areas.

<sup>2</sup> All detention ponds were assumed to be empty at the beginning of the model simulation.

### 3.12. Hypothetical Rainfall

A hypothetical rainfall event was used to simulate precipitation for hydrologic analyses. The SCS Type IIa 24-hour storm distribution is recommended for temporal distribution in the DCM. Storm

events with 2-, 5-, 10-, 25-, 50-, and 100-year recurrence intervals were selected for hydrologic modeling. These storm events have an equivalent of a 50-, 20-, 10-, 4-, 2-, and 1-percent chance of exceedance annually, respectively.

Isopluvial maps published in *NOAA Atlas 2 Vol. III* (Miller et al. 1973) were used to estimate rainfall in the Falcon Watershed for each recurrence interval. Since the Falcon Watershed is slightly larger than 10 sq mi, an areal reduction of 2% was applied as prescribed by *NOAA Atlas 2 Vol. III*. Table 3-12 provides the 24-hour rainfall depths for each recurrence interval.

Table 3-12. Rainfall Depths within the Falcon Watershed		
Recurrence Interval	Unadjusted Rainfall Depths	Areal Adjusted Rainfall Depths <sup>1</sup>
2-year	2.0 in.	1.96 in.
5-year	2.6 in.	2.55 in.
10-year	3.0 in.	2.94 in.
25-year	3.8 in.	3.72 in.
50-year	4.2 in.	4.12 in.
100-year	4.6 in.	4.51 in.

Notes:  
<sup>1</sup> Areal reduction of 2% applied to rainfall depths from the *NOAA Atlas 2 Vol. III*

The areal adjusted rainfall depths for all modeled storm events were multiplied by each ordinate of the SCS Type IIa 24-hour temporal unit distribution to develop hyetographs for each storm event.

3.13. Results

The HEC-HMS model for the Falcon Watershed was run to simulate the rainfall-runoff process and generate flood hydrographs for historical, existing, and future land use conditions by applying a 24-hour storm event with 2-, 5-, 10-, 25-, 50-, and 100-year recurrence intervals. As expected, future peak flows increased over existing conditions in conjunction with planned development. Table 3-15 provides a brief summary of peak flows at points of interest within the Falcon Watershed and Table 3-16 provides a brief summary of flow volumes at the same points of interest. The future conditions model results reported in this section do not reflect any proposed detention, channel improvements, or other alternatives described in later sections of this report. Historical, existing, and future results are summarized graphically on Figure 3-11, Figure 3-12, and Figure 3-13, respectively.

3.14. Model Comparison

Previously published studies and flood flow analyses applicable to the Falcon Watershed include:

- URS Corporation *Falcon DBPS*, 2000
- FEMA Flood Insurance Study (FIS)
- FEMA Letters of Map Revision (LOMR)
- USGS *Analysis of the Magnitude and Frequency of Floods in Colorado*, 2000
- Colorado Water Conservation Board (CWCB) *Guidelines for Determining 100-year Flood Flows for Approximate Floodplains in Colorado*, 2004.

The peak flow results of this modeling effort were compared to the studies and analyses listed above to check for reasonableness. Table 3-14 provides a comparison of peak flow results at the Falcon Watershed outlet from the various flood studies. Flood flows are not published in the FEMA FIS for the tributaries in the Falcon Watershed. However, flood flows at sporadic locations throughout the Falcon Watershed were published in some of the LOMRs completed for developments. A comparison of these flows is provided in Table 3-17.

As shown in Table 3-14 the existing conditions peak flows for this DBPS are higher than the 2000 DBPS for the 5-yr event and lower than the 2000 DBPS for the 100-yr event. The reason for this is because of the lower initial abstraction value that was used for this DBPS. Lowering the initial abstraction ratio has a more noticeable impact on increasing smaller flood flows compared to larger flood flows. A summary of the major differences between this DBPS and the 2000 DBPS are:

- The 2000 DBPS model included 3 detention ponds with a total storage volume of approximately 31 ac-ft while this DBPS includes 15 detention ponds with a total volume of approximately 151 ac-ft.
- The 2000 DBPS did not account for the existing basin diversion in the northwest portion of the watershed
- It is assumed that the 2000 DBPS used an initial abstraction ratio of 0.20. The HEC-1 data that was received from the County shows that the first value in the LS card was left blank which indicates that the default initial abstraction value was used. There is no formal documentation that this value was used, however, this is typically the default initial abstraction ratio for most models. This DBPS used an initial abstraction ratio of 0.10.

A comparison of model parameters between this DBPS and the 2000 DBPS is provided in Table 3-13.

	CN		T <sub>c</sub> (min)		Manning's n	
	2000 DBPS	2011 DBPS	2000 DBPS	2011 DBPS	2000 DBPS	2011 DBPS
Min.	60	41	3.9	6.2	.020	.013
Max.	81	86	33	115	.035	.070
Avg.	61	62	14	41	.034	.047

Table 3-14. Flood Summary for the Falcon Watershed Outlet

Annual Percent Chance Flood Event	Recurrence Interval	Peak Flow (cfs)			
		Matrix HEC-HMS Model <sup>1</sup>		URS Corporation DBPS <sup>2</sup>	
		Existing	Future	Existing	Future
50%	2-year	190	230	--	--
20%	5-year	400	560	222	458
10%	10-year	600	860	--	--
4%	25-year	1,200	1,500	--	--
2%	50-year	1,500	2,000	--	--
1%	100-year	1,900	2,500	2,935	3,303

Notes:

1) Existing and Future peak flows from the Matrix HEC-HMS model prepared as a part of the Falcon DBPS

2) Existing and Future peak flows from the 2000 Falcon DBPS prepared by URS Corporation

3) USGS Regression Analysis equations are from "Analysis of the Magnitude and Frequency of Floods in Colorado" Water-Resources Investigations Report 99-4190. The Plains Region covers the entire portion of the Falcon Watershed. Drainage areas for the study ranged from 5 to 1,000 mi<sup>2</sup>.  $Q_2=39.0(A)^{0.486}$ ,  $Q_5=195.8(A)^{0.399}$ ,  $Q_{10}=364.6(A)^{0.400}$ ,  $Q_{25}=725.3(A)^{0.395}$ ,  $Q_{50}=1116(A)^{0.392}$ ,  $Q_{100}=1640(A)^{0.388}$ , where A = Drainage Area (mi<sup>2</sup>)

4) CWCB Regression Analysis equations are from the "Guidelines for Determining 100-Year Flood Flows for Approximated Floodplains in Colorado" by the Department of Natural Resources Colorado Water Conservation Board, June 2004. ARK-5 includes tributaries east of Monument Creek, including the Black Squirrel Creek based east of Colorado Springs, for tributaries between 4 and 75 mi<sup>2</sup>.  $Q=1343.4(A)^{0.578}$ . Where A=Drainage Area (mi<sup>2</sup>).



## 4.0 HYDRAULIC ANALYSIS

### 4.1. Introduction

The purpose of the hydraulics analysis was to gain an understanding of the open channel flow characteristics and geomorphic conditions within the Falcon Watershed by:

- Performing and inventory of major drainageway structures
- Performing one-dimensional, steady flow hydraulic analysis for the main stems of West Tributary, Middle Tributary, and East Tributary
- Performing normal depth, full-flow Manning’s equation calculations for the main line of each storm sewer
- Performing field work and aerial photo analysis to identify areas of geomorphic instability

Objectives of this analysis were to identify areas of potential infrastructure deficiency and delineate approximate floodplain boundaries for both the existing and future hydrologic conditions in Section 3.0.

### 4.2. Open Channel Hydraulics

Hydraulic analyses for existing and future hydrologic conditions were completed for the main stems of West Tributary, Middle Tributary, and East Tributary. These analyses were completed to represent peak flows for the flood events with 2-, 5-, 10-, 25-, 50-, and 100-year recurrence intervals. The hydraulic analyses were completed using the USACE Hydrologic Engineering Center-River Analysis System Version 4.1.0 (HEC-RAS). Summaries of the employed methodology, models, characteristics, and input data used in the hydraulic models are summarized in this section.

#### 4.2.1. Hydraulic Structure Inventory & Field Work

All major drainageway structures that the County is responsible for maintaining on the main stem of each of the three tributaries were measured and inventoried over a period of 2 days. The size of each culvert or bridge crossing was measured with a tape and relative measurements were collected for distance below the top of road and orientation within the creek.

Additionally, the field work performed in Section 3.0 was used for the development of the hydraulic model and identification of erosional areas.

#### 4.2.2. HEC-RAS Modeling

Hydraulic modeling was completed using USACE Hydrologic Engineering Center – Geospatial River Analysis System Version 4.2.92 (HEC-GeoRAS) and HEC-RAS. HEC-GeoRAS was used to define all of the physical reach characteristics. After all preprocessing was complete, reach characteristics were exported to HEC-RAS to perform one-dimensional, steady flow hydraulic calculations.

HEC-GeoRAS was used within ArcMap®, to define the stream centerlines, banks, flow paths, and cross-sections for each reach. The stream centerline follows the channel thalweg to define the reach network. The banks lines differentiate the change in Manning’s n value that typically occurs at the extent of the low flow channel. The flowpath lines identify the centroid of the flow in the left overbank, main channel, and right overbank in order to determine the respective reach lengths. The cross-section lines define the channel dimension to acquire topography information along the reach. Cross-section topography data was obtained from a triangulated irregular network (TIN) that was created from the contour information obtained from Aerial Mapping Services. A HEC-GeoRAS file

that contained three-dimensional coordinates for the stream centerlines and cross-sections, as well as reach stations, bank stations, reach lengths, and stream topology was then imported into HEC-RAS.

Bridges, culverts, and ineffective flow areas were added to the HEC-RAS model after import from HEC-GeoRAS. Physical parameters for measured structures were incorporated into the hydraulic model using HEC-RAS bridge/culvert and cross-section data editors. All of the drainageway crossings were modeled to represent existing conditions which, in many cases, consists of a partially obstructed bridge or culvert. Many of the crossings are obstructed with sedimentation, vegetation growth, and the accumulation of debris. Cleaning and maintenance of these culverts is imperative to restore and maintain flood flow capacities.

#### 4.2.3. Reaches

Each of the three tributaries that were modeled with HEC-RAS was evaluated based upon the existing topography, physical condition of the channel, and the floodplains along each of the tributaries. The modeled reaches are shown in Sheet 4-1 through Sheet 4-37 and described below.

**West Tributary:** This tributary is the main tributary within the Falcon Watershed and is approximately 9.0 miles in length and flows from Burgess Road to the confluence with Black Squirrel Creek. This tributary is primarily stable and in good condition and consists primarily of a wide grass-lined channel. There are two erosional areas existing along this tributary. One is between Arroya Lane and Stapleton Drive, which is followed by a depositional area, and the other is between Garrett Road and Blaney Road. This tributary crosses 14 structures and one on-line detention ponds that are summarized in Table 4-1. A summary of channel velocities and shear stresses for this tributary are provided in Table 4-2.

**Table 4-1. West Tributary Drainageway Crossings**

Crossing	HEC-RAS River Station	Location
WT 14	47262	Burgess Rd.
WT 13	45766.17	Pine Park Trl.
WT 11	41441.59	Arroya Ln.
WT 10	21948.92	Woodmen Rd.
WT 9	19961.38	Meridian Rd.
Pond WU Inlet Structure	18654	Tamlin Rd.
Regional Pond WU	17840	Tamlin Rd.
WT 7-2	17647.61	Rail Road
WT 7-1	17517.42	Hwy. 24
WT 6	15318.93	Falcon Hwy.
WT 5	14944.59	Meridian Rd.
WT 5-2	14944.59	Meridian Rd.
WT 4	9806.61	W. Condor Rd.
WT 3	8435.27	Garrett Rd.
WT 1	5398.42	Blaney Rd.

**Table 4-2. West Tributary 100-yr Velocity & Shear Stress Summary**

Parameter	Existing Conditions		Future Conditions	
	Minimum	Maximum	Minimum	Maximum
Velocity (ft/s)	0.17	12	0.17	13
Shear Stress (lb/ft <sup>2</sup> )	0.01	5.9	0.01	6.9

**Middle Tributary:** This tributary is approximately 2.9 miles in length and flows from Woodmen Hills Drive to its confluence with West Tributary just south of Falcon Highway. This tributary is primarily stable and in good condition and consists primarily of a grass-lined channel north of Woodmen Road and a willow-lined channel south of Hwy. 24. This tributary enters a storm sewer at Woodmen Road through Meridian Road and crosses 8 structures and two on-line detention ponds that are summarized in Table 4-3. A summary of channel velocities and shear stresses for this tributary are provided in Table 4-4.

**Table 4-3. Middle Tributary Drainageway Crossings**

Crossing	HEC-RAS River Station	Location
The Meadows Pond #2	15205.815	Woodmen Hills Dr.
MT 7	10706	Owl Ln.
MT 6	7238	Woodmen Rd.
MT 6-2	7238	Woodmen Rd.
Regional Pond MN	6420.9204	McLaughlin Rd.
MT 5-1	6276.979	McLaughlin Rd.
MT 4	5184.12	Rail Road
MT 3	5035.56	Hwy. 24
MT 2	3667.171	Swingline Rd.
MT 1	1661.946	Falcon Hwy.

**Table 4-4. Middle Tributary 100-yr Velocity & Shear Stress Summary**

Parameter	Existing Conditions		Future Conditions	
	Minimum	Maximum	Minimum	Maximum
Velocity (ft/s)	0.43	10	0.6	11
Shear Stress (lb/ft <sup>2</sup> )	0.01	9.9	0.02	12

**East Tributary:** This tributary is approximately 6.2 miles in length and flows from Liberty Grove Drive to its confluence with West Tributary just east of Blaney Road. This tributary transitions between stable, erosional, and depositional areas and consequently transitions between a grass- and willow-lined channel to a sand bottom channel. This reach crosses 12 structures and 6 on-line detention ponds that are summarized in Table 4-5. A summary of channel velocities and shear stresses for this tributary are provided in Table 4-6.

**Table 4-5. East Tributary Drainageway Crossings**

Crossing	HEC-RAS River Station	Location
ET 32	32376.64	Liberty Grove Dr.
Paint Brush Hills Pond #4	31486	SE of Liberty Grove Dr.
ET 31	28298.89	Stapleton Dr.
ET 30	26454.7	Royal County Down Rd.
ET 26	23413.07	Rio Secco Ln.
Woodmen Hills Pond #1 North	21604.86	Woodmen Hills Dr.
Woodmen Hills Pond #1 South	21169.19	Woodmen Hills Dr.
Woodmen Hills Pond #2	19810.83	McClure Rd.
Woodmen Hills Pond #3	18205.02	Eastonville Rd.
ET 19	18092.76	Eastonville Rd.
Woodmen Hills Pond #4	14543.949	West of Rail Road
ET 15	14364.16	Rail Road
ET 14	14215.6	Hwy. 24
ET 13	12425.19	Pinto Pony Rd.
ET 11	8304.048	Falcon Hwy.
ET 10	6243.929	N. Condor Rd.
ET 9	5333.859	Sunset Trl.
ET 4	2073.649	Garrett Rd.

**Table 4-6. East Tributary 100-yr Velocity & Shear Stress Summary**

Parameter	Existing Conditions		Future Conditions	
	Minimum	Maximum	Minimum	Maximum
Velocity (ft/s)	0.25	9.9	0.33	10
Shear Stress (lb/ft <sup>2</sup> )	0.01	8.8	0.01	9.5

#### 4.2.4. Manning's n Values

Manning's n values were calculated and assigned using the same procedure outlined in Section 3.0. Different Manning's n values were applied across the channel cross-section to reflect changes in vegetative cover between the main channel and overbank areas. The Manning's n values for the channels and floodplains are summarized in Table 4-7.

**Table 4-7 Manning's n Values**

Tributary	Manning's n Value	
	Channel	Overbank
West	0.03-0.07	0.08-0.15
Middle	0.05-0.07	0.08-0.15
East	0.03-0.07	0.08-0.15

The selected Manning's n values for the channels and the floodplains were based on the following:

- Guide for Selecting Manning's Roughness Coefficients for Natural Channels and Floodplains by the USGS (WSP 2339). This manual allows the Manning's n value to be adjusted for surface irregularities, variation in cross-sections, obstructions, vegetation, and meandering.

- SCS Guide for Selecting Roughness Coefficient “n” Values For Channels. This manual uses visual examples of what specific n values look like along with the corresponding slopes, soils, and vegetation.
- Cottonwood Creek DBPS (Matrix 2010)
- City of Colorado Springs & El Paso County DCM
- Urban Drainage and Flood Control District (UDFCD) Drainage Criteria Manual
- Colorado Department of Transportation (CDOT) Drainage Design Manual

#### 4.2.5. Cross-sections

Cross-sections were initially placed approximately 400-ft apart and additional cross-sections were added to represent confluences, drainageway crossings, changes in channel form, and changes in channel slope. Cross-sections were automatically stationed from downstream to upstream along tributary. Each cross-section was adjusted to extend across the estimated floodplain and was placed perpendicular to the anticipated direction of flow in both the main channel and left/right floodplains. The cross-sections were bent in some locations to meet this requirement as described in Chapter 3 of HEC-RAS Hydraulic Reference Manual (Version 4.1, January 2010).

Additional cross-sections were added at the major drainageway crossings. At each of these locations, four cross-sections were added to the HEC-RAS model that included an upstream cross-section prior to flow contraction, a cross-section at the upstream face of the structure, a cross-section at the downstream face of the structure, and a downstream cross-section where flow is fully expanded. All bridge and culvert crossings were field surveyed to determine their size, inverts, and material.

The cross sections generated from the surface TIN by HEC-GeoRAS generally represent the top of the vegetated surface. In locations where vegetation is sparse, and not deep, the channel invert is accurately represented. In locations of dense and deep vegetative cover the channel invert was not accurately represented and was much shallower than what actually exists. This condition results in cross sections with less flood capacity than actually exists and leads to a conservative estimation of floodplain widths.

Several non-critical model warnings were generated for each tributary during model runs. To address model warnings by either defining numerous additional cross sections or by interpolating cross sections between every defined cross section would be necessary. Neither of these solutions is practical given the level of detail required for this study and as such were not completed.

Expansion and contraction coefficients in the cross-sections were estimated based on the ratio of expansion and contraction of the effective flow area in the floodplain occurring at cross-sections and at roadway crossings. For subcritical flow conditions where the change in the stream cross-section was gradual, a contraction coefficient of 0.1 and expansion coefficient of 0.3 were used. Wherever the change in effective cross section area was abrupt, such as at bridges and culverts, a contraction coefficient of 0.3 and expansion coefficient of 0.5 were used.

#### 4.2.6. Ineffective Flow

Ineffective flow areas are used to describe portions of a cross section in which water does not actively flow. Ineffective flow is typically used at the upstream and downstream bounding cross sections of a drainageway crossing and for a side channel with stagnant storage. All ineffective flow is considered permanent and will not become effective flow until the barrier is overtopped.

#### 4.2.7. Bridges and Culverts

The information from the hydraulic structure inventory was combined with the surface TIN to develop the bounding cross sections upstream and downstream of each major drainageway crossing. The cross sections generated from the TIN by HEC-GeoRAS were used as a starting point and were amended where appropriate to match the measured invert of each crossing. Only the cross section points in the immediate vicinity of the drainageway crossing were lowered in the event that invert of the cross section developed by HEC-GeoRAS was above the measured invert of the drainageway crossing. This scenario occurred primarily in areas of dense vegetation in the vicinity of a drainageway crossing. In some instances the invert of the cross sections were below the measured drainageway crossing invert. In these instances, the cross section inverts were modified on a case-by-case basis based on field observation.

The required inputs for bridge modeling include data for the deck/roadway, pier, and sloping abutments. The required inputs for culvert modeling include data for the deck/roadway, culvert shape, culvert size, and culvert material. This data was obtained from the hydraulic structure inventory, topography, and aerial photography.

Entrance loss coefficients were used to estimate the amount of energy lost as the flow enters a culvert and is used to determine the upstream headwater elevation for outlet control computations. Entrance loss coefficients for different types of culverts were selected from Table 6.3 of HEC-RAS Hydraulic Reference Manual (Version 4.1, January 2010). Exit losses were set to 1.0 for cases where sudden expansion occurs such as at a typical culvert outlet.

#### Special Cases

In some cases, either a steep slope entrance condition or adverse slope exit condition were created in the channel profile by modifying the bounding cross sections of the drainageway crossings. In these cases, the inverts of next upstream or downstream cross sections were adjusted to match the relative elevation change along the channel profile, reflected on the topography, in order to prevent an artificially improved or reduced hydraulic conveyance condition near a drainageway crossing.

There are two culvert entrances (MT 6 and MT 6-2) on the north side of Woodmen Road along Middle Tributary. These culverts are entrances to two separate storm sewers that eventually connect underground and discharge into Regional Pond MN. HEC-RAS does not have the capability to model a storm sewer and was only used to calculate the headwater elevation at Woodmen Road and not a flood profile between Woodmen Road and Regional Pond MN. It is assumed that these culverts are inlet controlled and that there is no tailwater condition that could exist in Regional Pond MN that would impact that headwater condition at Woodmen Road since the maximum water surface in Regional Pond MN is approximately 18 feet below the invert elevation of MT 6 and MT 6-2. There is only one outlet into Regional Pond MN which was assigned to MT 6. HEC-RAS requires an outlet for each entrance so an artificial outfall was defined for MT 6-2 in order for HEC-RAS to calculate the headwater at Woodmen Road.

#### 4.2.8. Detention Pond Outlet Works

On-line detention pond structures were included in the HEC-RAS model if the outlet structure of the pond consisted of a basic outlet works consisting of a culvert and embankment. In the event that the outlet works of the detention pond was more complex, a rating curve based on the stage-storage-discharge relationship developed in Section 3.0, was input into the cross section upstream of the detention pond outlet works for modeling in HEC-RAS. The detention pond outlet works were not included in the pond hydraulic deficiency analysis; however, a potential deficiency was identified in

the event that a spillway was overtopped as shown on Figure 4-38 and Figure 4-39. The operational function of the pond outlet works was further examined in the alternatives analysis.

4.2.9. Steady Flow and Boundary Conditions

Steady flow data were entered for all reaches based on the results of the hydrologic modeling in Section 3.0. Steady flow data corresponding to the peak flow for flood events with recurrence intervals of 2-, 5-, 10-, 25-, 50- and 100-years for existing and future hydrologic conditions was entered for each reach at points of significant hydrologic change as determined in the hydrologic model. A summary of hydrologic flows for each tributary at different points is provided in tabular form in Appendix B.

The boundary condition for the West Tributary was based on the normal depth in the downstream reach of this tributary. The boundary condition for the Middle Tributary was based on the 100-yr water surface elevation in the West Tributary, at the location of this confluence, which is higher than the normal depth in Middle Tributary at this location. The boundary condition for the East Tributary was based on the normal depth in the downstream reach of this tributary which resulted in a higher water surface elevation than using the 100-yr water surface elevation in the West Tributary at the location of this confluence. Only the downstream boundary conditions were required because the more conservative subcritical flow condition was evaluated.

4.2.10. Approximate Floodplains

After the HEC-RAS model analysis was complete, the 100-year water surface elevations were exported back to HEC-GeoRAS for refinement. Approximate floodplains for the existing and future 100-year floods were delineated for all of the tributaries listed above and are shown in Sheet 4-1 through Sheet 4-37. The FEMA floodplains for the Falcon Watershed are overlaid in these figures for comparison to the results of this analysis. Flood profiles for the existing and future 100-year floods are shown in Appendix B. The approximate floodplains and profiles were used to assess where potential drainageway crossing deficiencies exist along the major drainageways and identify areas of potential flooding.

The approximate floodplain information shown on the figures above is intended primarily for the identification of flood prone areas along the tributaries and to aid in the evaluation of potential alternatives. The approximate floodplain data contained herein is not intended to replace the information presented in the City of Colorado Springs and El Paso County Flood Insurance studies (FEMA 1999) but should be used as a planning tool for drainageway development projects. The FEMA floodplain remains as the regulatory floodplain.

Limitations

- 3. There are locations along each tributary where the cross section does not fully contain the 100-yr flood. The cross sections at these locations were extended; however, some cross sections still do not fully contain the 100-yr flood. HEC-RAS calculates the 100-yr Water Surface Elevation (WSE) for this condition by assuming that a vertical wall exists at the boundary of the cross section. The 100-yr floodplain was delineated at these locations by projecting the calculated depth at the edge of the cross section to the intersecting contour on the topography.
- 4. As described above, the channel invert was not accurately represented in locations of dense and deep vegetative cover and was much shallower than what actually exists. This condition results in cross sections with less flood capacity than actually exists and leads to a conservative estimation of floodplain widths. This same issue caused difficulties modeling structure crossings.

- 5. There are numerous locations along each of the three tributaries where split flow occurs and diverges from the primary flowpath. A detailed split flow model is required in order to correctly map the floodplain for the primary and secondary flowpaths and identify what percentage of flow exists within each flowpath. The 100-yr floodplain for all of these locations was mapped based on the maximum extents of the water surface that HEC-RAS calculated at each cross section. Locations where split flow occurs and appears to leave the watershed are:
  - a. West Tributary at all of the diversion berms south of Stapleton Drive
  - b. Middle Tributary at the depression south of Woodmen Hills Drive
  - c. Middle Tributary at the depression south of Salinas Road
  - d. East Tributary at Eastonville Road
  - e. East Tributary at Falcon Hwy.
  - f. East Tributary north of Garret Road and Blaney Road (quantified below due to severity)

- 6. The East Tributary overtops Blaney Road approximately 1,600 feet north of Garrett Road. Downstream of this location only a portion of the incoming flow remains in the East Tributary while the remainder of the flow overtops Blaney Road and enters a secondary channel. The amount of flow that overtops Blaney Road was estimated by using a lateral weir in HEC-RAS. The approximate floodplain in the secondary channel was delineated based on the results of three normal depth calculations at the beginning, middle, and end of the channel with the overtopping flow. The floodplain in the East Tributary downstream of this location was delineated using HEC-RAS with the remainder of flow that does not overtop Blaney Road. A summary of the split flow quantities at this location is provided in Table 4-8.

Table 4-8 East Tributary Split Flow at Blaney Road

Existing 100-yr Inflow (cfs)	East Tributary 100-yr Flow (cfs)	Secondary Channel 100-yr flow (cfs)
620	310	320
Future 100-yr Inflow (cfs)	East Tributary 100-yr Flow (cfs)	Secondary Channel 100-yr flow (cfs)
710	330	380

Flow will likely overtop Blaney Road again downstream of this location, however, it was assumed to only overtop at this location for the purposes of this study. The floodplains delineated for East Tributary and the secondary channel downstream of this location are approximate and should be used accordingly. A more detailed and thorough analysis is required at this location to determine the exact extents of the floodplain.

4.3. Storm Sewer Modeling

Storm sewer data was obtained from the County’s GIS data set which provided pipe sizes, approximate horizontal layout, and material. Storm sewer slopes were estimated from the 2-ft contours of the ground surface. The Bentley FlowMaster software was used to perform full flow, unpressurized, capacity calculations for all of the main lines of each storm sewer system. Full flow capacity calculations provide a quick method to estimate capacity and screen systems that may have a capacity problem. Additional street capacity was accounted for in situations where flow in excess of the storm sewer could be conveyed down a street in the same direction as the reach while meeting County criteria. Storm sewer capacities were

compared to the existing and future hydrology results in Section 3.0 in order to identify potential deficiencies. Each of the storm systems is entirely contained within one of the subbasins of the Falcon Watershed. Proportioned flows were calculated by estimating the approximate drainage area from each subbasin to each of the storm systems and applying that ratio to the calculated peak flow for the subbasin. This method was used in order to avoid artificially identifying a deficiency by using a peak flow that was greater than what will be captured by an individual storm system. Results of this analysis are provided in Appendix B.

4.4. Deficiencies

Deficiencies were broken into four categories:

- 1. Potential detention pond deficiencies
- 2. Drainageway crossing deficiencies
- 3. Storm sewer deficiencies
- 4. Areas of geomorphic instability

All existing deficiencies also exist in the future hydrologic condition; however, most of these are at a higher level of deficiency due to the increase in flow. Figure 4-38 and Figure 4-39 show areas of deficiency throughout the Falcon Watershed for both existing and future conditions. All deficiencies were evaluated and quantified at a planning level. A detailed design is recommended prior to addressing any deficiency.

4.4.1. Potential Detention Pond Deficiencies

Detention ponds were determined to be potentially deficient if the spillway was overtopped. The 100-yr WSE within each detention pond was calculated using HEC-HMS using the stage-storage-discharge curves developed in Section 3.0 and compared with the 100-yr flood profile calculated by HEC-RAS through each detention pond. The results of the 100-yr WSE varied in some cases because of the way each of the programs calculates the water surface within a detention pond system and because of the limitations described in Sections 4.2.5 and 4.2.7. HEC-HMS calculates the water surface based on detention pond routing equations using with unsteady flow. HEC-RAS calculates the water surface based on culvert hydraulics and steady flow. Detention ponds were determined to be potentially deficient if either program calculated a 100-yr WSE above the spillway elevation. Results of this analysis are provided in Table 4-9 and Table 4-10.

4.4.2. Drainageway Crossing Deficiencies

The drainageway crossing deficiency analysis was performed for all major drainageway structures that the County is responsible for maintaining on the main stem of each of the three tributaries. Crossings were determined to be deficient using the criteria published in the DCM for culverts and bridges and the results of the HEC-RAS model. Results of this analysis are provided in Table 4-11.

4.4.3. Storm Sewer Deficiencies

The storm sewer deficiency analysis was performed for all of the main lines of each storm sewer system. Storm sewers were determined to be deficient if the calculated flow from the hydrologic model was greater than the total system capacity. Total system capacity includes storm sewer capacity and street conveyance capacity. Results of this analysis are provided in Table 4-12. Note that only storm sewers with a priority of 1 and 2 are shown in Table 4-12. The complete analysis is provided in Appendix B.

The purpose of the storm sewer deficiencies screening was to identify potential deficiencies at a planning level. The hydrologic results calculated in this DBPS are not resolute enough for detailed hydraulic evaluation of storm systems. As a result, a detailed study is recommended to determine the magnitude of the storm sewer deficiencies that were identified and to determine the appropriate plan of action.

4.4.4. Areas of Geomorphic Instability

Areas of geomorphic instability along each of the three tributaries were identified during field work and review of aerial photography. These areas were identified based on observation and are not all inclusive due to access constraints. Two types of geomorphic instability exist within the Falcon Watershed: erosional areas and depositional areas. Erosional areas are reaches where the channel has downcut and become incised. This process generates an excessive sediment load which is transported downstream and increases lateral migration which results in unstable channel banks. Depositional areas are typically found downstream of an erosional area where the excessive sediment that was generated is dispersed across the channel and floodplain. This process reduces the flood capacity within the channel, clogs drainageway crossings, and increases the risk that flood flows will overtop roadways. All observed locations of geomorphic instability are shown on Figure 4-38. These locations are also provided on Figure 4-39 for reference only as they are reflective only of existing conditions.

Table 4-9. Existing Potential Detention Pond Deficiencies

Detention Pond	Tributary	Spillway Elev. (ft)	HEC-RAS 100-yr WSE (ft)	HEC-HMS 100-yr WSE (ft)
Paint Brush Hills Pond A	West (offline)	7,148	N/A	7,149
Woodmen Hills Pond H	Middle (offline)	6976	N/A	6,977
Regional Pond MN	Middle	6,854	6,853	6,855
Paint Brush Hills Pond #4	East	7,134	7,136	7,135
Woodmen Hills Pond #1 South	East	6,954	6,947	6,956
Woodmen Hills Pond #2	East	6,930	6,926	6,932
Woodmen Hills Pond #3	East	6,902	6,903	6,903
Woodmen Hills Pond #4	East	6,860	6,857	6,861

Notes:  
<sup>1</sup> Offline ponds were not modeled with HEC-RAS

Table 4-11. Drainageway Crossing Deficiencies

Crossing Name	Priority <sup>1</sup>	Tributary	100-yr Flow (cfs)		Location	Size <sup>2</sup>	Existing Deficiency <sup>3</sup>	Future Deficiency <sup>3</sup>
			Existing	Future				
WT 14	1	West	89	89	Burgess Rd.	18” CMP	Overtops, Does Not Meet Hw/D Criteria	Overtops, Does Not Meet Hw/D Criteria
WT 13	1	West	170	170	Pine Park Trl.	30” CMP	Overtops, Does Not Meet Hw/D Criteria	Overtops, Does Not Meet Hw/D Criteria
WT 11	1	West	480	480	Arroya Ln.	12” CMP	Overtops, Does Not Meet Hw/D Criteria	Overtops, Does Not Meet Hw/D Criteria
Pond WU Inlet Structure	1	West	1,017	1,398	Tamlin Rd.	(3) 18” RCP	Overtops, Does Not Meet Hw/D Criteria	Overtops, Does Not Meet Hw/D Criteria
WT 6	1	West	910	1,100	Falcon Hwy.	(2) 5.58’ x 8.25’ Arch CMP	Overtops	Overtops
WT 5	1	West	910	1,100	Meridian Rd.	24” CMP	Overtops	Overtops
WT 5-2	1	West	910	1,100	Meridian Rd.	18” CMP	Overtops, Does Not Meet Hw/D Criteria	Overtops, Does Not Meet Hw/D Criteria
WT 4	1	West	1,300	1,700	W. Condor Rd.	48” CMP	Overtops, Does Not Meet Hw/D Criteria	Overtops, Does Not Meet Freeboard Criteria
WT 1	1	West	1,900	2,406	Blaney Rd.	(2) 36” RCP	Overtops, Does Not Meet Freeboard Criteria	Overtops, Does Not Meet Freeboard Criteria
MT 7	1	Middle	259	360	Owl Ln.	1.75’ x 1.25’ Elliptical CMP	Overtops, Does Not Meet Hw/D Criteria	Overtops, Does Not Meet Hw/D Criteria
MT 6	1	Middle	760	1,200	Woodmen Rd.	(3) 48” RCP	Overtops, Does Not Meet Hw/D Criteria	Overtops, Does Not Meet Hw/D Criteria
MT 6-2	1	Middle	760	1,200	Woodmen Rd.	(3) 48” RCP	Overtops, Does Not Meet Hw/D Criteria	Overtops, Does Not Meet Hw/D Criteria
MT 1	1	Middle	820	1,200	Falcon Hwy.	24” CMP	Overtops, Does Not Meet Hw/D Criteria	Overtops, Does Not Meet Hw/D Criteria
ET 31	1	East	280	390	Stapleton Dr.	(2) 6’ x 2.5’ RCBC	Does Not Meet Hw/D Criteria	Overtops, Does Not Meet Hw/D Criteria
ET 26	1	East	460	580	Rio Secco Ln.	(3) 48” RCP	Overtops, Does Not Meet Hw/D Criteria	Overtops, Does Not Meet Hw/D Criteria
ET 13	1	East	380	390	Pinto Pony Rd.	(2) 48” CMP	Overtops, Does Not Meet Hw/D Criteria	Overtops, Does Not Meet Hw/D Criteria
ET 11	1	East	430	450	Falcon Hwy.	(2) 60” RCP	Overtops, Does Not Meet Hw/D Criteria	Overtops, Does Not Meet Hw/D Criteria
ET 10	1	East	590	680	N. Condor Rd.	4.67’ x 3.17’ Arch CMP	Overtops, Does Not Meet Hw/D Criteria	Overtops, Does Not Meet Hw/D Criteria
ET 9	1	East	590	680	Sunset Trl.	48” CMP	Overtops, Does Not Meet Hw/D Criteria	Overtops, Does Not Meet Hw/D Criteria
ET 4	1	East	309	325	Garrett Rd.	4.67’ x 3.17’ Arch CMP	Does Not Meet Hw/D Criteria	Overtops, Does Not Meet Hw/D Criteria
WT 10	2	West	950	1,100	Woodmen Road	8.75’ x 18.92’ RCBC	None	Does Not Meet Hw/D Criteria
WT 9	2	West	1,000	1,400	Meridian Rd.	(4) 10’ x 6’ RCBC	Does Not Meet Freeboard Criteria	Does Not Meet Freeboard Criteria
WT 7-2	2	West	890	1,100	Rail Road	54’ Wood Bridge	Does Not Meet Freeboard Criteria	Does Not Meet Freeboard Criteria
WT 7-1	2	West	890	1,100	Hwy. 24	(3) 12’ x 6’ RCBC	Does Not Meet Freeboard Criteria	Does Not Meet Freeboard Criteria
WT 3	2	West	1,300	1,700	Garrett Rd.	(2) 12’ x 7.33’ Arch CMP	Does Not Meet Freeboard Criteria	Does Not Meet Freeboard Criteria
MT 5-1	2	Middle	770	1,200	McLaughlin Rd.	27’ Steel Bridge	Does Not Meet Freeboard Criteria	Does Not Meet Freeboard Criteria
MT 4	2	Middle	800	1,200	Rail Road	77’ Wood Bridge	None	Does Not Meet Freeboard Criteria
MT 3	2	Middle	800	1,200	Hwy. 24	(2) 12’ x 6’ RCBC	Does Not Meet Freeboard Criteria	Does Not Meet Freeboard Criteria
MT 2	2	Middle	820	1,200	Swingline Rd.	20’ x 6.83’ RCBC	Does Not Meet Freeboard Criteria	Does Not Meet Freeboard Criteria
ET 32	2	East	150	200	Liberty Grove Dr.	(2) 42” CMP	Does Not Meet Hw/D Criteria	Does Not Meet Hw/D Criteria
ET 30	2	East	460	580	Royal County Down Rd.	72” RCP	Does Not Meet Hw/D Criteria	Does Not Meet Hw/D Criteria
ET 19	2	East	733	733	Eastonville Rd.	72” CMP	Does Not Meet Hw/D Criteria	Does Not Meet Hw/D Criteria
ET 14	2	East	370	390	Hwy. 24	(2) 12’ x 4.83’ RCBC	Does Not Meet Freeboard Criteria	Does Not Meet Freeboard Criteria

Notes:  
1) Priority 1 = Overtopping, Priority 2 = Does Not Meet Hw/D Criteria or Freeboard Criteria  
2) Based on field measurements  
3) Per DCM page 6-10

# 5.0 ALTERNATIVES ANALYSIS

## 5.1. Introduction

The purpose of the alternatives analysis was to synthesize all of the information gathered and analyzed thus far in this DBPS and evaluate several detention and reach alternatives for the Falcon Watershed. In addition to the previous hydrologic and hydraulic analyses, one public meeting and several project team meetings were conducted to gather input for the alternatives analysis. The outcome of this section is a recommended detention alternative and a reach alternative prioritization to be carried forward to the plan development design phase for further analysis. All backup calculations and data are provided in Appendix C.

## 5.2. Planning Reach Delineation

### Open Channel Reaches

Planning reaches within the Falcon Watershed were delineated based on the environmental factors discussed in Section 2.0, the projected future flows in Section 3.0, and the hydraulic evaluation and deficiency analysis in Section 4.0. All of the open-channel reaches identified through these analyses were evaluated for alternatives as a part of this DBPS.

### Storm Systems

The potential storm sewer deficiencies that were identified in Section 4.0 will not be evaluated for alternatives as a part of this DBPS. The hydrologic results calculated in this DBPS are not resolute enough for detailed hydraulic evaluation of storm systems. Therefore, it is recommended that a detailed study be completed for all storm systems that were identified to be potentially deficient.

### Spillway Overtopping & Drainageway Crossing Deficiencies

The deficiencies analysis completed in Section 4.0 shows that 13 of the 16 existing detention pond spillways are overtopped and that 33 of the 34 drainageway crossings are deficient. The deficiencies for drainageway crossings range from roadway overtopping to inadequate headwater-to-depth ratios. The deficiencies analysis for both the spillways and drainageway crossings is reflective of future flows without any additional detention ponds or modifications to any of the existing detention ponds.

Deficiencies for existing detention pond spillways and drainageway crossings were not reexamined with the revised peak flows from the detention pond alternatives analysis. These deficiencies were revised and quantified during plan development design after the preferred detention alternative was selected. In general, as peak flows are reduced due to increased detention, spillway and drainageway crossing deficiencies will decrease.

## 5.3. Evaluation of Detention Alternatives

The two primary issues within the Falcon Watershed are areas of channel instability and flooding. Channel instability consists of both erosion and deposition and is primarily a result of increased channel-forming flows being released into the tributaries, when compared to historical conditions. The channel-forming flow is the discharge that shapes the channel through erosion and sedimentation and is typically associated with more frequently occurring, small storm events. Flooding, on the other hand, typically results from less frequently occurring, large storm events that cause inundation at drainageway crossings, along roads, and at individual properties. As a result, the goals of the detention alternatives for the Falcon Watershed are to:

1. Manage the channel-forming flows to historical conditions where possible
2. Manage the major flood flows to historical conditions where possible

The idea driving these goals is that if the hydrology within the watershed is appropriately managed:

- Many of the stable, relatively “pristine” reaches within the watershed can be preserved,
- Many of the currently impaired reaches within the watershed can be returned to a near pristine condition,
- Overall costs for required channel and infrastructure improvements will be much lower, and
- Flooding will be reduced.

The UDFCD recommends using full spectrum detention to mimic historic peak flows for the full range of storm events, such as the 2-, 5-, 10-, 25-, 50-, and 100-yr. In order to accomplish this, the UDFCD DCM, Vol. 2 recommends using a two-stage outlet structure that consists of the capture and slow release of the Excess Urban Runoff Volume (EURV) over 72 hours in combination with the 100-yr storage volume to effectively manage the full range of flood flows. The EURV approximately represents the difference between the pre-developed and post-developed 2-yr runoff volumes and includes the Water Quality Capture Volume (WQCV). Full spectrum detention provides water quality benefits by:

- Treating pollutant-laden stormwater runoff via settling and infiltration processes
- Managing the channel-forming flow to historical conditions, thereby limiting channel erosion
- Reducing runoff volume via infiltration

Three detention alternatives were evaluated using a combination of existing, planned, and potential detention ponds:

1. Do Nothing Alternative
2. Regional Detention Alternative
3. Sub Regional Detention Alternative

Full spectrum detention was implemented into existing, planned, and potential detention ponds where possible for both the regional and sub regional alternatives. Existing detention ponds are those currently in place and consist of on-site, sub regional, and regional detention ponds. Existing detention ponds can easily be retrofit to incorporate full spectrum detention by the use of low flow restrictor plates, additional grated inlets, additional culverts, and spillway modifications. Planned detention ponds are those ponds that have been designed in other studies, but have not been constructed or funded. Potential detention pond locations were recommended as a part of this DBPS and were sited on County-owned land where possible and only placed on private property if it was determined to be necessary. All potential ponds were placed on-line for the evaluation of these alternatives. On-line ponds shouldn’t pose a risk for sediment in-fill in the Falcon Watershed because it is not a high sediment load watershed. Rough grading was performed at each potential location using:

- Approximate pond shape (i.e. triangle, square, elliptical, etc.)
- 4 horizontal to 1 vertical maximum grades



- 10-ft maximum water depth within the estimated pond grading due to jurisdictional dam limitations

The analysis of these three alternatives was developed using the future hydrology model developed in Section 3.0 as the base model. The stage-storage-discharge (SSD) curves developed for the existing detention ponds in Section 3.0 were used for all of the detention ponds in the Do Nothing Alternative. Each of the detention ponds modeled for the Regional and Sub Regional alternative was modeled using a simplified SSD curve with points to represent the pond bottom, EURV/WQCV, 100-yr volume, and spillway overtopping with the following criteria:

- EURV/WQCV
  - Storage and discharge requirements were calculated based on the guidelines outlined in the UDFCD DCM, Vol. 2
  - EURV drain time of 72 hours
  - WQCV drain time of 40 hours
- 100-yr Volume
  - Storage was initially estimated based on the difference between the pre-development and post-development 100-yr hydrographs
  - 100-yr storage was limited to the spillway elevation of the pond
  - 100-yr storage was limited to a 10-ft maximum water depth within the estimated pond grading of proposed ponds due to jurisdictional dam limitations
  - Release rates were greater than historic in some cases due to storage limitations
- Spillway Overtopping
  - Stage and storage calculated at 2 ft above the spillway elevation
  - Release rates were set as the sum of the inflow hydrograph plus the target 100-yr discharge

### 5.3.1. Do Nothing Alternative

This alternative utilizes all of the existing detention ponds shown in Figure 5-1 without retrofit for full spectrum detention and would require that channel improvements for all of the tributaries be designed for the future peak flows calculated in Section 3.0. This alternative would not provide any additional flood flow attenuation for managing channel-forming flows or flood flows and would put the watershed at risk for continued erosion, deposition, and flooding.

### 5.3.2. Regional Detention Alternative

This alternative recommends adding 1 additional detention pond at the confluence of each of the major tributaries for a total of 2 new detention ponds as shown on Figure 5-2. Full spectrum detention was incorporated into all existing and proposed detention ponds where applicable for this alternative. However, in some cases different detention configurations were used due to pond volume limitations. The other types of detention pond configurations that were used consist of:

- 100-yr control only – Used in ponds where there was minimal head differential between the EURV or WQCV stage and the 100-yr stage. Recommending a 100-yr control above the

EURV/WQCV with minimal head differential may result in an outlet structure configuration that is not feasible to pass the 100-yr flow.

- EURV storage – Used in ponds where available storage volume was limited and the additional volume for the 100-yr flood could not be contained.
- WQCV storage in combination with 100-yr storage - Used in ponds where there was minimal head differential between the EURV stage and the 100-yr stage. The WQCV requires less storage volume and still provides attenuation for the channel forming flows. This combination of control allows for a more feasible outlet structure configuration because it provides more head differential between the WQCV stage and 100-yr stage.

A list of all detention ponds, and the type of outlet control used in each, is provided in Table 5-1.

**Table 5-1. Regional Detention Alternative**

Detention Pond	Tributary	Outlet Stages	Type of Outlet Control
Paint Brush Hills Pond C	West Tributary	EURV + 100-yr	Full Spectrum
Paint Brush Hills Pond A	West Tributary	WQCV + 100-yr	Low Flow (<2-yr) + 100-yr
Paint Brush Hills Pond B1	West Tributary	No Modification	N/A
Paint Brush Hills Pond B2	West Tributary	EURV + 100-yr	Full Spectrum
The Meadows Pond #1	West Tributary	EURV + 100-yr	Full Spectrum
Regional Pond WU	West Tributary	EURV + 100-yr	Full Spectrum
Regional Pond R1	West Tributary	EURV + 100-yr	Full Spectrum
Proposed Regional Pond R2	West Tributary	EURV Only	~2-yr
Woodmen Hills Pond H	Middle Tributary	No Modification	N/A
The Meadows Pond #2	Middle Tributary	EURV + 100-yr	Full Spectrum
Regional pond MN	Middle Tributary	100-yr Only	100-yr
Woodmen Hills Pond #5	Middle Tributary	EURV + 100-yr	Full Spectrum
Paint Brush Hills Pond #4	East Tributary	No Modification	N/A
Woodmen Hills Pond #1 North	East Tributary	EURV + 100-yr	Full Spectrum
Woodmen Hills Pond #1 South	East Tributary	EURV + 100-yr	Full Spectrum
Woodmen Hills Pond #2	East Tributary	WQCV + 100-yr	Low Flow (<2-yr) + 100-yr
Woodmen Hills Pond #3	East Tributary	WQCV + 100-yr	Low Flow (<2-yr) + 100-yr
Woodmen Hills Pond #4	East Tributary	WQCV + 100-yr	Low Flow (<2-yr) + 100-yr

Both Woodmen Hills Pond H and Paint Brush Hills Pond #4 are grossly undersized and both of the spillways currently overtop during the 100-yr storm. As a result, no retrofit solution was provided for these ponds. It is recommended that on-site detention be incorporated upstream of these ponds to reduce flooding at these locations. The drainage area that needs to be mitigated by an EURV or WQCV at these pond locations was accounted for in downstream detention ponds. A detailed analysis and summary for all of the detention ponds in this alternative is provided in Appendix C.

### 5.3.3. Sub Regional Detention Alternative

This alternative recommends adding 7 additional ponds at points of major hydrologic change along each of the major tributaries as shown on Figure 5-3. Full spectrum detention was incorporated into all existing and proposed detention ponds where applicable for this alternative. However, in



some cases other controls were used due to pond volume limitations. A list of all detention ponds, and the type of outlet control used in each, is provided in Table 5-2.

**Table 5-2. Sub Regional Detention Alternative**

Detention Pond	Tributary	Outlet Stages	Type of Outlet Control
Proposed Sub Regional Pond SR1	West Tributary	WQCV + 100-yr	Low Flow (<2-yr) + 100-yr
Paint Brush Hills Pond C	West Tributary	EURV + 100-yr	Full Spectrum
Paint Brush Hills Pond A	West Tributary	WQCV + 100-yr	Low Flow (<2-yr) + 100-yr
Paint Brush Hills Pond B1	West Tributary	No Modification	N/A
Paint Brush Hills Pond B2	West Tributary	EURV + 100-yr	Full Spectrum
Proposed Sub Regional Pond SR2	West Tributary	EURV Only	~2-yr
The Meadows Pond #1	West Tributary	EURV + 100-yr	Full Spectrum
Proposed Sub Regional Pond SR3	West Tributary	EURV Only	~2-yr
Regional Pond WU	West Tributary	EURV + 100-yr	Full Spectrum
Proposed Regional Pond R1	West Tributary	EURV + 100-yr	Full Spectrum
Proposed Regional Pond R2	West Tributary	EURV Only	~2-yr
Woodmen Hills Pond H	Middle Tributary	No Modification	N/A
The Meadows Pond #2	Middle Tributary	EURV + 100-yr	Full Spectrum
Proposed Sub Regional Pond SR4	Middle Tributary	WQCV + 100-yr	Low Flow (<2-yr) + 100-yr
Regional pond MN	Middle Tributary	WQCV + 100-yr	Low Flow (<2-yr) + 100-yr
Woodmen Hills Pond #5	Middle Tributary	EURV + 100-yr	Full Spectrum
Paint Brush Hills Pond #4	East Tributary	No Modification	N/A
Proposed Sub Regional Pond SR6 (previously planned location)	East Tributary	EURV + 100-yr	Full Spectrum
Woodmen Hills Pond #1 North	East Tributary	EURV + 100-yr	Full Spectrum
Woodmen Hills Pond #1 South	East Tributary	EURV Only	~2-yr
Woodmen Hills Pond #2	East Tributary	EURV + 100-yr	Full Spectrum
Woodmen Hills Pond #3	East Tributary	WQCV + 100-yr	Low Flow (<2-yr) + 100-yr
Woodmen Hills Pond #4	East Tributary	WQCV + 100-yr	Low Flow (<2-yr) + 100-yr

Both Woodmen Hills Pond H and Paint Brush Hills Pond #4 are grossly undersized and both of the spillways currently overtop during the 100-yr storm. As a result, no retrofit solution was provided for these ponds. It is recommended that on-site detention be incorporated upstream of these ponds to reduce flooding at these locations. The drainage area that needs to be mitigated by an EURV or WQCV at these pond locations was accounted for in downstream detention ponds. A detailed analysis and summary for all of the detention ponds in this alternative is provided in Appendix C.

**5.3.4. Hydrologic Results**

The hydrologic results for each of the detention alternatives at key locations throughout the Falcon Watershed are shown in Table 5-3. These results reflect all 16 existing, 1 planned, and all potential detention ponds as shown on Figure 5-1 through Figure 5-3. Note that in some cases the reported peak flows for the Regional Detention and Sub Regional Detention alternatives is higher than the Do Nothing alternative. This is because the configuration of the outlet structures for existing detention ponds had to be modified for these alternatives in order to meet the EURV/WQCV discharge rates. This resulted in having to increase the discharge rates for larger floods to meet the storage constraints

within the existing detention ponds. In general, the Sub Regional Detention Alternative reduces peak flows the most throughout the Falcon Watershed. A summary of peak flows at the location of each detention pond is provided on Figure 5-2 and Figure 5-3.

Table 5-3. Peak Flows at Points of Interest within the Falcon Watershed for Detention Alternatives

Location	HEC-HMS Element <sup>2</sup>	2-year Peak Flow (cfs) <sup>3</sup>				100-year Peak Flow (cfs) <sup>3</sup>			
		Historical	Do Nothing	Regional Detention	Sub Regional Detention	Historical	Do Nothing	Regional Detention	Sub Regional Detention
West Tributary									
Raygor Rd.	JWT030	6	9	9	9	75	85	85	85
Stapleton Rd.	JWT120	58	85	73	55	750	920	950	710
Woodmen Rd.	JWT210	80	120	97	81	1,000	1,300	1,300	1,000
Hwy. 24	JWT250	84	85	65	64	1,100	1,100	1,200	980
Falcon Hwy.	JWT260	86	86	70	70	1,100	1,100	1,200	1,000
Garrett Rd.	JWT320	110	160	82	80	1,500	1,700	1,700	1,500
East Blaney Rd.	JWT354	110	230	140	140	1,700	2,500	2,400	2,100
Upstream of Bennett Ranch Tributary <sup>1</sup>	JWT374_Outlet	110	230	140	140	1,700	2,500	2,400	2,100
Middle Tributary									
Woodmen Hills Dr.	JMT010	1	1	5	5	57	160	99	99
Woodmen Rd.	JMT070	24	150	150	31	350	1,200	1,200	840
Hwy. 24	JMT106	24	92	140	33	360	1,200	1,100	840
Falcon Hwy.	JMT110	22	94	140	34	360	1,200	1,100	860
Confluence with West Tributary	RMT114	22	94	140	34	360	1,200	1,100	860
East Tributary									
Stapleton Dr.	JET020	20	74	74	9	200	390	390	200
Woodmen Hills Dr.	JET040	19	27	14	10	240	570	620	260
Eastonville Rd.	JET060	19	13	14	13	260	430	510	360
Hwy. 24	JET090	17	26	30	30	260	390	410	300
Pinto Pony Rd.	JET100	17	27	32	32	260	390	410	300
Falcon Hwy.	JET120	17	49	50	50	270	450	470	400
Garrett Rd.	JET160	18	66	67	67	300	710	720	640
Confluence with West Tributary	RET164	18	66	66	66	300	710	720	630

Notes:

<sup>1</sup> Falcon Watershed Outlet

<sup>2</sup> Reference Figure 3-12 and 3-13

<sup>3</sup> Results shown for Do Nothing, Regional Detention, and Sub Regional Detention reflect fully developed conditions

5.3.5. Detention Alternative Comparison

All three of the detention alternatives were compared against each other using the evaluation parameters listed in Table 5-4 in order to determine which detention alternative provides the most benefit to the watershed. Scores range from 1 to 3, where a score of 1 represents the best alternative for any given evaluation parameter and a score of 3 represents the worst alternative for any given evaluation parameter. The scoring system is intended to be relative so that each detention alternative is compared against the other alternatives for each of the evaluation parameters. The lowest total score represents the best alternative.

Table 5-4. Detention Pond Alternative Scoring Matrix

Evaluation Parameter	Do Nothing	Regional Detention	Sub Regional Detention
Detention Pond Construction Cost	1	2	3
Reach Construction Cost	3	2	1
Detention Pond O&M Costs	1	2	3
Reach O&M Costs	3	2	1
Flood Damage Reduction	2	3	1
Channel Stability (Near-Term)	3	2	1
Channel Stability (Long-Term)	3	2	1
Impact Upon Known Environmental Resources	1	2	3
Impact Upon Existing Utilities	1	1	1
Impact Upon Future Utilities	1	1	1
Impact Upon Existing Thoroughfares	1	1	1
Impact Upon Future Thoroughfares	1	1	1
ROW & Property Acquisition	1	2	3
Regulatory Issues	1	1	1
Trails & Open Space	1	2	2
Stormwater Quality	3	2	1
2-yr Flood Control	3	2	1
100-yr Flood Control	2	3	1
Flexibility for Development	1	1	1
Lot Premium	3	2	1
Habitat Improvements	3	2	1
Total	39	38	30

5.3.6. Woodmen Hills Detention Pond #4

Woodmen Hills Detention Pond #4 is currently not operating correctly which has resulted in severe and extensive erosion and numerous locations of flooding downstream of Highway 24. This pond was restudied by Wilson & Company in 2011. The release rates for the restudy of Woodmen Hills Pond #4 published in the report titled “*Pond 4 of the Falcon Area Stormwater Assessment*” (Pond 4 Assessment) (Wilson & Co. 2011) compare well with what was calculated in the Sub Regional Detention Alternative for this DBPS and are shown in Table 5-5. Further, Matrix determined release

rates for Pond #4 based on using the more recent inflow hydrograph from this DBPS (discussed below) and the proposed Wilson & Co. SSD curve for comparison.

Table 5-5. Release Rates from Woodmen Hills Detention Pond #4

Source	2-yr Release Rate (cfs)	100-yr Release Rate (cfs)
Pond 4 Assessment (Wilson & Co. 2011)	11	278
Matrix DBPS model	15	260
Matrix DBPS model w/Wilson & Co. SSD curve	10	288

The Pond 4 Assessment identifies Woodmen Hills Pond #1 and Woodmen Hills Pond #2 as being deficient because both of the spillways are overtopped. The redesign of Woodmen Hills Detention Pond #4 assumes that the outlet structures for both of these ponds will be improved so that flows do not overtop the spillway. The Pond 4 Assessment also assumes that the future pond in the northwest corner of Meridian Road and Stapleton Drive will be constructed.

This DBPS shows that the spillways for Woodmen Hills Pond #1 and Woodmen Hills Pond #2 are overtopped. However, it also shows that the spillway for Woodmen Hills Detention Pond #3 is overtopped. This DBPS did not evaluate a future detention pond in the northwest corner of Meridian Road and Stapleton Drive for the Regional Detention Alternative, but did for the Sub Regional Detention Alternative. The Sub Regional Detention Alternative provides solutions to address spillway overtopping for Woodmen Hills Ponds #1, #2, and #3 and provides a potential configuration for the future detention pond in the northwest corner of Meridian Road and Stapleton Drive. As a result, the inflow hydrograph from this DBPS is likely to be different than what was used in the Pond 4 Assessment.

Recommendations

1. It is recommended that the County use the more recent hydrographs developed for the final version of this DBPS for the redesign of Woodmen Hills Detention Pond #4.
2. It is recommended that the County reevaluate the SSD curve based on the outlet configuration proposed in the final redesign for Woodmen Hills Detention Pond #4 in order to evaluate impacts downstream of this pond.
3. It is recommended that the County include drain time constraints for low flows (< 2-yr) over a 40- to 72-hr period as outlined in the UDFCD DCM. Low flow attenuation was discussed in the Pond 4 Assessment, but drain time was not evaluated.

5.3.7. Detention Alternative Conceptual Cost Estimate

Conceptual cost estimates were developed for each of the three detention pond alternatives and are provided in Table 5-6. These cost estimates were developed for comparison purposes only and were refined during plan development design. The cost estimates were based on the following assumptions:

- Retrofit detention costs include the costs to retrofit existing outlet structures for EURV/WQCV control and 100-yr volume control. This cost assumes that the existing outlet structure can be retrofit by utilizing low flow restrictor plates, adding additional grated inlets, or adding additional culverts. Retrofit costs were assumed to be \$10,000/ea.

- Construction costs for potential detention ponds are based on \$24,500/ac-ft as documented in the Jimmy Camp Creek DBPS - FSD Costs Memo.
- Required pond volume is based on the pond volume up to the 100-yr WSE and does not include the embankment.
- Land requirements for potential ponds are based on a (land area/pond volume) ratio of 0.285 ac/ac-ft as documented in the Jimmy Camp Creek DBPS - FSD Costs Memorandum.
- 15% engineering and construction administration fee
- 20% contingency

**Table 5-6. Detention Alternative Cost Summary**

Detention Alternative	Detention Cost
No Detention	\$ 0
Regional Detention	\$ 7,700,000
Sub Regional Detention	\$ 10,800,000

The Sub Regional Detention Alternative is the best alternative when compared against the list of evaluation parameters and it provides the most flow reduction throughout the watershed. The preliminary analysis indicates that this alternative is the most expensive detention alternative. The impact on reach alternatives will be discussed later in this section to determine which detention alternative allows for the implementation of the preferred reach alternatives. Final costs are provided in Section 6.

**5.4. Evaluation of Reach Alternatives**

Alternatives for each of the planning reaches were evaluated using the peak flows calculated for each of the three different detention alternatives in Section 5.3. The result of this process was a recommended alternative for each planning reach that corresponds to the Do Nothing Detention Alternative, Regional Detention Alternative, and Sub Regional Detention Alternative. A total of five different reach alternatives were considered in the screening process and are described below.

**5.4.1. Protect In Place**

There are several relatively pristine reaches of channel throughout the Falcon Watershed that are currently in a stable condition. These reaches typically consist of a small low-flow channel that is connected to a very wide floodplain which allows for the effective conveyance of all flood flows by dissipating erosive energy over the entire floodplain area. These reaches also provide water quality benefit due to the amount of surface area available for infiltration and the filtering effect of vegetation. Additionally, there are several reaches throughout the Falcon Watershed that have already been improved and appear to be stable. Preserving both of these reach conditions would not require a direct channel improvement cost. However, upstream detention improvements may be required depending on the location of the reach. Reaches had to meet the following criteria in order to fall into this category:

- The reach had to be in a stable condition currently.
- The 2-yr flood flows within the reach had to be at or below historical conditions.

**5.4.2. Natural Channel Design**

The goal of this reach alternative is to restore the low-flow channel and connect it to the adjacent floodplain. This alternative allows for channel sheer stress to be reduced by allowing flood flows to access the floodplain where erosive energy is dissipated over the entire floodplain area. This reach alternative can be used where mild longitudinal slopes exist and where floodplain sheer stresses are within a range that vegetation can withstand. These reaches also provide water quality benefit due to the amount of surface area available for infiltration, the filtering effect of vegetation, and because they limit channel erosion. The target slope and channel section for this alternative would be maintained through grade control structures. An illustration of this alternative is shown in Figure 5-4. Reaches had to meet the following criteria in order to fall into this category:

- Existing slope of less than or equal to 0.015 ft/ft. This was based on the average slope in channel sections that are currently stable.
- Shear stress at the 2-yr flood stage of less than or equal to 1 lb/ft<sup>2</sup>
  - Based on the average shear stress in channel sections that are currently stable
  - Calculated using the 2-yr flood stage from Section 3.0 within the existing channel section

**5.4.3. Small Drop Structures**

This reach alternative involves hardening the lower portion of the side slopes of the channel cross-section while relying on smaller (< 3 ft) drop structures to maintain a target longitudinal slope. An illustration of this alternative is shown in Figure 5-5. Reaches had to meet the following criteria in order to fall into this category:

- A calculated spacing between drops greater than or equal to 100 ft (assuming 3-ft drops). A closer spacing between drop structures would result in too many structures in a reach.

**5.4.4. Large Drop Structures**

This reach alternative involves hardening the lower portion of the side slopes of the channel cross-section while relying on larger (6 ft > drop height > 3 ft) drop structures to maintain the stable longitudinal slope. An illustration of this alternative is shown in Figure 5-6. Large drops structures were only used if the spacing required for small drop structures was less than 100 ft.

**5.4.5. Fully-Lined Channel**

This reach alternative involves lining a portion of the channel cross-section with riprap for the full length of the reach. Riprap should be sized to handle the projected shear stress for the 100-year flood event with limited or no grade control. An illustration of this alternative is shown in Figure 5-7. Fully lined channels are only required where it is determined that large drop structures are not suitable due to spacing or width constraints. Fully-lined channels were not required anywhere in the Falcon Watershed but were considered for reach alternative comparison purposes.

**5.4.6. Reach Alternative Comparison**

All five of the reach alternatives were compared against each other using the evaluation parameters listed in Table 5-7 in order to help determine which reach alternative provides the most benefit to the watershed. Scores range from 1 to 5 where a score of 1 represents the best alternative for any given evaluation parameter and a score of 5 represents the worst alternative for any given evaluation parameter. The scoring system is intended to be relative so that each reach alternative is compared

against the other alternatives for each of the evaluation parameters. The lowest total score represents the best alternative.

Table 5-7. Reach Alternative Scoring Matrix

Evaluation Parameter	Protect In Place	Natural Channel Design	Small Drop Structures	Large Drop Structures	Fully Lined Channel
Reach Construction Cost	1	2	3	4	5
Reach O&M Costs	1	3	3	3	5
Flood Damage Reduction	1	1	3	4	5
Channel Stability (Near-Term)	1	2	3	4	5
Channel Stability (Long-Term)	1	2	3	4	5
Impact Upon Known Environmental Resources	1	2	3	4	5
Impact Upon Existing Utilities	3	3	3	3	3
Impact Upon Future Utilities	3	3	3	3	3
Impact Upon Existing Thoroughfares	3	3	3	3	3
Impact Upon Future Thoroughfares	3	3	3	3	3
ROW & Property Acquisition	1	3	3	3	5
Regulatory Issues	1	3	3	3	5
Trails & Open Space	1	3	3	3	5
Stormwater Quality	1	2	3	4	5
2-yr Flood Control	1	2	3	4	5
100-yr Flood Control	1	2	3	4	5
Flexibility for Development	5	5	3	3	1
Lot Premium	1	2	3	4	5
Habitat Improvements	1	2	3	4	5
Total	31	48	57	67	83

The Protect In Place reach alternative is the best reach alternative when compared against the list of evaluation parameters. However, it is not possible to implement this reach alternative in all of the planning reaches due to the criteria constraints previously outlined. Therefore, this scoring matrix was used to set the prioritization of how each reach alternative was implemented while adhering to the criteria previously described. Prioritization for the implementation of the five reach alternatives is as follows:

1. Protect In Place
2. Natural Channel Design
3. Small Drop Structures
4. Large Drop Structures

5. Fully Lined Channel

Some other benefits of the Protect In Place and Natural Channel Design alternatives that were not explicitly captured in Table 5-7 are that these alternatives provide aesthetic value, improve channel function, and limit erosion.

The result of this analysis for each of the detention alternatives is shown on Figure 5-1 through Figure 5-3.

5.4.7. Immediate Action Required

There are 5 locations where immediate action is required in order to preserve the existing reach conditions. These locations are at points adjacent to pristine channel reaches, or Natural Channel Design reaches, where current erosion or deposition has been identified. If left unmitigated, the issues at these locations have the potential to propagate and worsen the existing condition. This will require additional reach improvement costs. These locations can be addressed by implementing the recommended reach alternative for the impaired reach at the sites that are identified while improvements for the remainder of the impaired reaches can be constructed at a later date.

5.4.8. Reach Alternative Conceptual Cost Estimate

Conceptual cost estimates were developed for all of the reaches using flows from the three different detention alternatives in Section 5.3 and the reach alternative prioritization outlined above. These cost estimates were developed for comparison purposes only and were refined during plan development design. The cost estimates were based on the following assumptions:

- Natural Channel Design reach cost of \$400/LF as documented in the Cottonwood Creek DBPS
- Small Drops Structures reach cost of \$900/LF as documented in the Cottonwood Creek DBPS
- Large Drops Structures reach cost of \$2,600/LF as documented in the Cottonwood Creek DBPS
- 15% engineering and construction administration fee
- 20% contingency

Table 5-8. Reach Alternative Cost Summary

Detention Alternative	Reach Cost
No Detention	\$ 138,000,000
Regional Detention	\$ 125,000,000
Sub Regional Detention	\$ 111,000,000

5.5. Recommended Alternative

The Sub Regional Detention Alternative is the best alternative when compared against the list of evaluation parameters and it provides the most flow reduction throughout the watershed. This alternative was previously determined to be the most expensive detention alternative. However, this alternative results in the lowest reach improvement cost, using the reach prioritization previously described, and the lowest total cost as shown in Table 5-9. All of the costs developed in this section were for comparison purposes only and based on conservative estimates of required construction costs. Once the recommended alternative was selected, the detention and reach costs were then refined in the plan development design phase.

**Table 5-9. Total Cost Summary**

Detention Alternative	Detention Cost	Reach Cost	Total Cost
No Detention	\$ 0	\$ 138,000,000	\$ 138,000,000
Regional Detention	\$ 7,700,000	\$ 125,000,000	\$ 133,000,000
Sub Regional Detention	\$ 10,800,000	\$ 111,000,000	\$ 122,000,000

Detention pond spillway and drainageway crossing repair and/or replacement costs were the only cost component that was not evaluated in this section. In general, as peak flows are reduced due to increased detention the quantity of spillway and drainageway crossing deficiencies will decrease. Therefore, it is assumed that the Sub Regional Detention Alternative will result in the lowest repair and/or replacement costs to address these deficiencies. These deficiencies were revised and quantified once the recommended detention alternative was selected.

It is recommended that the Sub Regional Detention Alternative be used in combination with incorporating reach alternatives with the following prioritization:

1. Protect In Place
2. Natural Channel Design
3. Small Drop Structures
4. Large Drop Structures
5. Fully Lined Channel

**5.5.1. Utility Coordination**

It is anticipated that none of the major utility corridors will be impacted as a result of the recommended alternative. The major utility corridors identified by the County are:

- The Mountain View Electric Association corridor along Woodmen Road to Meridian Road
- The New Star Energy Oil Line which runs north on Meridian Road, from the intersection of Woodmen Road and Meridian Road, to Eastonville Road and then east on Eastonville Road

**Figure 5-1. Do Nothing Alternative**

**Figure 5-2. Regional Detention Alternative**

**Figure 5-3. Sub Regional Detention Alternative**

**Figure 5-4. Natural Channel Design**

**Figure 5-5. Small Drop Structures**

**Figure 5-6. Large Drop Structures**

**Figure 5-7. Fully-Lined Channel**

## 6.0 PLAN DEVELOPMENT DESIGN

### 6.1. Introduction

The purpose of the plan development design effort was to refine the selected detention and reach alternatives for the Falcon Watershed and finalize proposed infrastructure improvements and associated implementation costs. The recommended detention and reach alternatives, outlined in Section 5.0, were vetted through one public meeting and several project team meetings. The Sub Regional Detention Alternative along with the corresponding reach alternatives were selected to carry forward into plan development. The detention pond and reach components from the selected alternative were analyzed using a more detailed set of criteria to ensure that the recommendation would be feasible for future implementation. The outcome of the selected plan development design is a conceptual set of infrastructure improvements and costs for use in the fee development phase of this DBPS. All backup calculations and data are provided in Appendix D.

### 6.2. Selected Detention Alternative

The Sub Regional Detention Alternative that was recommended in Section 5.3 was refined by:

- Performing rough grading at each potential location.
- Maximizing storage for ponds based on existing site conditions.
- Modifying the SSD curves to target EURV or WQCV, and 100-yr volume with no spillway overtopping as outlined in Section 5-3. The EURV target outflow was based on releasing the EURV over 72 hours. The WQCV drain time was 40 hours. 100-yr target outflows were historical 100-yr flow where possible given storage constraints; selected as either the existing 100-yr flow or the lowest attainable 100-yr peak flow based on pond limitations. Release rates were greater than historic in some cases due to storage limitations. Storage and discharge requirements were calculated based on the guidelines outlined in the UDFCD DCM, Vol. 2.
- Assessing the hydrologic benefit of each pond.
- Spillway overtopping based on stage and storage calculations at 2 ft above the spillway elevation.

Full spectrum detention was incorporated into all existing and proposed detention ponds where applicable for this alternative. However, in some cases other controls were used due to pond volume limitations. A detailed analysis and summary for all of the detention ponds in the selected alternative are provided in Appendix D.

#### 6.2.1. Detention Pond Classification

The selected detention alternative consists of 23 ponds that fall within 2 different classifications: existing constructed ponds and proposed ponds. All ponds are shown graphically in Figure 6-1.

##### Existing Constructed Ponds

Existing constructed ponds include PBH C, PBH A, PBH B1, PBH B2, M 1, R WUS, WH H, M 2, R MN, WH 5, PB 4, WH 1N, WH 1S, WH 2, WH 3, and WH 4. These ponds are currently constructed and functioning within the Falcon Watershed. Each of these ponds was evaluated to determine if it could be retrofit to provide a benefit to the selected detention alternative. Table 6-1 shows the proposed modification to the outlet stages of each of the existing constructed ponds.

**Table 6-1. Existing Pond Outlet Modifications**

Pond	Proposed Outlet Stages
Paintbrush Hills Pond C	EURV + 100-yr
Paintbrush Hills Pond A	WQCV + 100-yr
Paintbrush Hills Pond B1	Existing Configuration
Paintbrush Hills Pond B2	EURV + 100-yr
The Meadows Pond #1	EURV + 100-yr
Regional Pond WU South	EURV + 100-yr
Woodmen Hills Pond H	Existing Configuration
The Meadows Pond #2	EURV + 100-yr
Regional Pond MN	WQCV + 100-yr
Woodmen Hills Pond #5	EURV + 100-yr
Paint Brush Hills Pond #4	Existing Configuration
Woodmen Hills Pond #1 North	100-yr Only
Woodmen Hills Pond #1 South	EURV Only
Woodmen Hills Pond #2	EURV + 100-yr
Woodmen Hills Pond #3	WQCV + 100-yr
Woodmen Hills Pond #4	EURV + 100-yr

Both Woodmen Hills Pond H and Paint Brush Hills Pond #4 are grossly undersized and both of the spillways currently overtop during the 100-yr storm. As a result, no retrofit solution was provided for these ponds. It is recommended that on-site detention be incorporated upstream of these ponds to reduce flooding at these locations. The drainage area that needs to be mitigated by an EURV or WQCV at these pond locations was accounted for in downstream detention ponds.

##### Proposed Ponds

Proposed ponds include ponds SR 1, SR 2, SR 3, SR 4, R 1, SR 6, and R 2. These ponds are not constructed or planned for and are recommended as a part of the selected detention alternative. Table 6-2 shows the hydraulic configurations for the proposed ponds.

**Table 6-2. Proposed Pond Outlet Configurations**

Pond	Outlet Stages
Sub Regional Pond SR1	WQCV + 100-yr
Sub Regional Pond SR2	EURV Only
Sub Regional Pond SR3	EURV Only
Sub Regional Pond SR4	WQCV + 100-yr
Regional Pond R1	EURV + 100-yr
Sub Regional Pond SR6	EURV + 100-yr
Regional Pond R2	EURV Only

#### 6.2.2. Hydrologic Results

The hydrologic results for the selected detention alternative are shown in Table 6-3. These results reflect all 23 ponds shown in Figure 6-1.



Table 6-3. Selected Detention Alternative Results

Location	HEC-HMS Element	Sub Regional Peak Flow (cfs)	
		2-year	100-year
West Tributary			
Raygor Rd.	JWT030	9	85
Stapleton Rd.	JWT120	55	710
Woodmen Rd.	JWT210	81	1,000
Hwy. 24	JWT250	64	980
Falcon Hwy.	JWT260	70	1,000
Garrett Rd.	JWT320	80	1,500
East Blaney Rd.	JWT354	140	2,200
Upstream of Bennett Ranch Tributary	JWT374_Outlet	140	2,200
Middle Tributary			
Woodmen Hills Dr.	JMT010	5	99
Woodmen Rd.	JMT070	31	840
Hwy. 24	JMT106	33	840
Falcon Hwy.	JMT110	34	860
Confluence with West Tributary	RMT114	34	860
East Tributary			
Stapleton Dr.	JET020	9	200
Woodmen Hills Dr.	JET040	10	260
Eastonville Rd.	JET060	13	360
Hwy. 24	JET090	31	300
Pinto Pony Rd.	JET100	32	300
Falcon Hwy.	JET120	50	400
Garrett Rd.	JET160	67	640
Confluence with West Tributary	RET164	66	630

6.2.3. Detention Pond Sizes & Cost Estimate

The detention ponds sizes and costs estimate as a result of selected detention alternative are provided in Table 6-4. Assumptions that were used in developing the detention pond cost estimate are as follows:

- Land requirement for proposed ponds is based on proposed rough grading and the corresponding footprint at the spillway stage.
- Construction cost based on \$24,500/ac-ft as documented in the Jimmy Camp Creek DBPS - FSD Costs Memo. Engineering costs were removed from construction cost and added later to the subtotal.
- Land cost was estimated as \$50,000/ac based on the current (2013) El Paso County Parks land value of \$46,954/ac.
- Improvement cost was estimated at \$20,000 per modified pond to retrofit existing outlet structures for EURV/WQCV and 100-yr flood control. Not all existing ponds were retrofit.

Table 6-4. Detention Pond Cost Estimate

Pond	Pond Volume (ac-ft)	Land Requirement (ac)	Construction Cost (\$)	Land Cost (\$)	Improvement Cost (\$)	Total Cost (\$)
Paint Brush Hills Pond #4	1.34	-	\$ -	\$ -	\$ -	\$ -
Paint Brush Hills Pond A	2.62	-	\$ -	\$ -	\$ 20,000	\$ 20,000
Paint Brush Hills Pond B1	9.17	-	\$ -	\$ -	\$ -	\$ -
Paint Brush Hills Pond B2	12.09	-	\$ -	\$ -	\$ 20,000	\$ 20,000
Paint Brush Hills Pond C	6.77	-	\$ -	\$ -	\$ 20,000	\$ 20,000
Regional Pond MN	7.53	-	\$ -	\$ -	\$ 20,000	\$ 20,000
Regional Pond R1	25.00	18.8	\$ 532,609	\$ 940,420	\$ -	\$ 1,473,028
Regional Pond R2	3.13	5.1	\$ 66,634	\$ 255,974	\$ -	\$ 322,608
Regional Pond WU South	39.54	-	\$ -	\$ -	\$ 20,000	\$ 20,000
Sub Regional Pond SR1	11.03	3.4	\$ 234,987	\$ 170,782	\$ -	\$ 405,769
Sub Regional Pond SR2	2.05	5.2	\$ 43,674	\$ 257,529	\$ -	\$ 301,203
Sub Regional Pond SR3	1.03	0.6	\$ 21,943	\$ 27,609	\$ -	\$ 49,552
Sub Regional Pond SR4	19.37	20.5	\$ 412,665	\$ 1,022,834	\$ -	\$ 1,435,500
Sub Regional Pond SR6	11.82	6.7	\$ 251,817	\$ 334,260	\$ -	\$ 586,078
The Meadows Pond #1	3.25	-	\$ -	\$ -	\$ 20,000	\$ 20,000
The Meadows Pond #2	7.94	-	\$ -	\$ -	\$ 20,000	\$ 20,000
Woodmen Hills Pond #1 North	7.13	-	\$ -	\$ -	\$ 20,000	\$ 20,000
Woodmen Hills Pond #1 South	8.78	-	\$ -	\$ -	\$ 20,000	\$ 20,000
Woodmen Hills Pond #2	9.18	-	\$ -	\$ -	\$ 20,000	\$ 20,000
Woodmen Hills Pond #3	8.35	-	\$ -	\$ -	\$ 20,000	\$ 20,000
Woodmen Hills Pond #4	40.45	-	\$ -	\$ -	\$ 240,000	\$ 240,000
Woodmen Hills Pond #5	4.10	-	\$ -	\$ -	\$ 20,000	\$ 20,000
Woodmen Hills Pond H	2.66	-	\$ -	\$ -	\$ -	\$ -
Subtotal					\$	5,053,738
Engineering/ Construction Admin. (15%)					\$	758,061
Contingency (20%)					\$	1,010,748
Total					\$	6,822,546

Additional costs as a percentage of the subtotal construction cost include Engineering/Construction Administration (15%), and Contingency (20%). Detailed quantities and cost estimates are provided in Appendix D.

6.2.4. Detention Pond Phasing Priority

Detention pond construction or modification should be phased so that detention ponds located at the upper end of tributaries are constructed first and detention ponds located on the main stem are constructed last. This method of phasing helps reduce sediment issues that may be caused by construction activities if upstream ponds are developed after ponds on the main stem. In addition to pond location, consideration must also be given to the timing of new development. Detention ponds should generally be constructed or modified along with upstream development with an interim condition in place to mitigate the increased sediment load caused by construction.

Table 6-5 lists the phasing priority for each of the existing and proposed ponds. A phasing priority of “1” means the pond should be constructed or modified immediately or as soon as upstream/adjacent development begins. Higher phasing priority numbers indicate more upstream detention ponds must be built prior to construction of the pond in question.

Table 6-5. Detention Pond Phasing Priority

Pond	Phasing Priority	Constraint
Paint Brush Hills Pond #4	2	None
Paint Brush Hills Pond A	1	Modify after PBH-C
Paint Brush Hills Pond B1	1	None
Paint Brush Hills Pond B2	1	Modify after PBH-B1
Paint Brush Hills Pond C	1	Modify after SR1
Regional Pond MN	3	None
Regional Pond R1	4	Construct after R-WU, R-MN, and WH5
Regional Pond R2	4	Construct after R1 and WH4
Regional Pond WU South	3	Modify after SR3
Sub Regional Pond SR1	1	None
Sub Regional Pond SR2	2	Construct after PBH-A and PBH-B2
Sub Regional Pond SR3	3	Construct after SR2 and M1
Sub Regional Pond SR4	3	Construct after M2 and WH-H
Sub Regional Pond SR6	2	Construct after PBH4
The Meadows Pond #1	2	None
The Meadows Pond #2	2	None
Woodmen Hills Pond #1 North	3	Construct after SR6
Woodmen Hills Pond #1 South	3	Construct after WH1n
Woodmen Hills Pond #2	3	Construct after WH1s
Woodmen Hills Pond #3	3	Construct after WH2
Woodmen Hills Pond #4	4	Construct after WH3
Woodmen Hills Pond #5	3	None
Woodmen Hills Pond H	2	None

6.3. Selected Reach Alternatives

The selected reach alternatives, as defined in Section 5-4, were refined using the flows reported in Section 6.2. Additionally, all bridge and culvert crossings were evaluated as a part of the selected reach alternatives. A summary of the selected reach alternatives is provided graphically in Figure 6-1.

6.3.1. Reach Evaluation

A summary of the reach screening results is provided in Table 6-6.

Table 6-6. Selected Reach Alternatives

Alternative	Length (ft)
Natural Channel Design	13,216
Protect in Place	64,325
Roadside Ditch Improvement	7,519
Small Drop Structures w/Toe Protection	50,751
Total	135,811

6.3.2. Bridge & Culvert Crossing Evaluation

All of the bridge and culvert crossings on the main stem of the creek were evaluated for adherence to DCM criteria. Bridge and culvert crossings were analyzed using the 100-year peak flow from the selected detention alternative. The culvert and bridge design criteria listed in the DCM, Pg. 6-10 was used to evaluate the adequacy of each crossing. The results of the evaluation are provided in Table 6-7.

Table 6-7. Existing Bridge and Culvert Crossing Evaluation

Crossing	Location	Q100 (cfs)	Structure Class <sup>1</sup>	Existing Size	Within Criteria <sup>2</sup>	Reason
WT 14	Burgess Rd.	89	Culvert	1.5’ dia	No	Overtops, Does Not Meet Hw/D
WT 13	Pine Park Trl.	89	Culvert	2.5’ dia	No	Overtops, Does Not Meet Hw/D
WT 11	Arroya Ln	480	Culvert	1’ dia	No	Overtops, Does Not Meet Hw/D
WT 10	Woodmen Rd.	1,000	Culvert	8.75’ x 18.92’	Yes	
WT 9	Meridian Rd.	1,100	Bridge	(4) 6’ x 10’	No	Does Not Meet Freeboard
Pond WU Inlet	Tamlin Rd.	1,100	Culvert	(3) 1.5’ dia	No	Overtops, Does Not Meet Hw/D
WT 7-2	Rail Road	970	Bridge	7.41’ x 54’	Yes	
WT 7-1	Hwy. 24	970	Bridge	(3) 6’ x 12’	No	Does Not Meet Freeboard
WT 6	Falcon Hwy.	1,000	Culvert	(2) 5.58’ x 8.25’	No	Overtops
WT 5	Meridian Rd.	1,100	Culvert	2’ dia	No	Does Not Meet Hw/D
WT 5-2	Meridian Rd.	1,100	Culvert	1.5’ dia	No	Overtops, Does Not Meet Hw/D
WT 4	W. Condor Rd.	1500	Bridge	4’ dia	No	Overtops, Does Not Meet Freeboard
WT 3	Garrett Rd.	1,500	Bridge	(3) 7.33’ x 12’	No	Does Not Meet Freeboard
WT 1	Blaney Rd.	2,200	Bridge	(2) 3’ dia	No	Overtops, Does Not Meet Freeboard
MT 7	Owl Ln.	299	Culvert	1.25’ x 1.75’	No	Overtops, Does Not Meet Hw/D
MT 6	Woodmen Rd.	840	Culvert	(3) 4’ dia	No	Overtops, Does Not Meet Hw/D
MT 6-2	Woodmen Rd.	840	Culvert	(3) 4’ dia	No	Overtops, Does Not Meet Hw/D
MT 5-1	McLaughlin Rd.	820	Bridge	5.22’ x 27’	No	Does Not Meet Freeboard
MT 4	Rail Road	840	Bridge	9.17’ x 77’	Yes	
MT 3	Hwy. 24	840	Bridge	(2) 6’ x 12’	No	Does Not Meet Freeboard
MT 2	Swingline Rd.	860	Bridge	6.83’ x 20’	No	Does Not Meet Freeboard
MT 1	Falcon Hwy.	860	Culvert	2’ dia	No	Overtops, Does Not Meet Hw/D
ET 32	Liberty Grove Dr.	200	Culvert	(2) 3.5’ dia	No	Does Not Meet Hw/D
ET 31	Stapleton Dr.	200	Culvert	(2) 2.5’ x 6’	No	Overtops, Does Not Meet Hw/D
ET 30	Royal County Down Rd.	270	Culvert	6’ dia	Yes	
ET 26	Rio Secco Ln.	270	Culvert	(3) 4’ dia	No	Overtops, Does Not Meet Hw/D
ET 19	Eastonville Rd.	530	Culvert	6’ dia	No	Does Not Meet Hw/D
ET 15	Rail Road	300	Bridge	6.5’ x 67’	No	Does Not Meet Freeboard
ET 14	Hwy. 24	300	Bridge	(2) 4.83’ x 12’	No	Does Not Meet Freeboard
ET 13	Pinto Pony Rd.	300	Culvert	(2) 4’ dia	No	Overtops, Does Not Meet Hw/D
ET 11	Falcon Hwy.	400	Culvert	(2) 5’ dia	No	Overtops, Does Not Meet Hw/D
ET 10	N. Condor Rd.	590	Culvert	3.17’ x 4.67’	No	Overtops, Does Not Meet Hw/D
ET 9	Sunset Trl.	590	Culvert	4’ dia	No	Overtops, Does Not Meet Hw/D
ET 4	Garrett Rd.	640	Culvert	3.17’ x 4.67’	No	Overtops, Does Not Meet Hw/D

Notes:  
<sup>1</sup>According to the Drainage Criteria Manual

6.3.3. Plans & Profiles

Sheets 6-2 through 6-50 provide more detailed plan and profile views of selected reach improvements for each planning reach. These conceptual plans show stream centerline, detention ponds and associated data, proposed grade control structures, drainageway crossings and proposed improvements, and the approximate 100-yr floodplain along with existing infrastructure such as roadways and storm sewers. Hydraulic grade lines shown on the profile, representing the WSE for 5- and 100-year storm events, were generated using HEC-RAS along the main stem of each major tributary.

Sheets 6-51 through 6-56 provide typical details and section views of proposed reach grade control structures, detention pond profiles, and proposed roadside ditch improvements.

6.3.4. Reach Quantities & Cost Estimate

The assumptions and methods used to calculate the quantities and costs for each alternative category listed in Table 6-6 and defined in Section 5.4 are provided in the following sections. Additional costs as a percentage of the subtotal construction cost include Engineering/Construction Administration (15%) and Contingency (20%). Detailed quantities and cost estimates are provided in Appendix D.

Roadside Ditch Sizing

The quantities for this reach alternative include the infrastructure necessary to provide sufficient capacity for roadside ditches only. The required roadside ditch sizes were assumed to have the same slope and roughness as the infrastructure that is being replaced. The quantities and costs for all infrastructure sizing reaches are provided in Table 6-8.

Table 6-8. Roadside Ditch Cost Estimate

Reach	Length (ft)	Q100 (cfs)	Total Cost (\$)
RWT344	1,379	250	\$ 167,006
RWT354	16	2,200	\$ 23,544
RET140	4,052	85	\$ 295,914
RET164	2,072	630	\$ 132,703
Subtotal			\$ 619,166
Engineering/Construction Admin. (15%)			\$ 92,875
Contingency (20%)			\$ 123,833
Total			\$ 835,874

Natural Channel Design

The quantities for this reach alternative include the number of structures per reach. Natural channel design costs were developed with the following assumptions:

- The crest width for a natural channel drop structure is the channel width associated with the low flow (bankfull) event as defined in the DCM update Section 3.1.1.1.
- Natural channel structures were spaced at increments of 7 times the low flow channel width.
- Cost per structure based on \$24,400 per structure plus \$420 times the width of the low flow channel.

The quantities and costs for all natural channel design reaches are provided in Table 6-9.

Table 6-9. Natural Channel Design Reaches Cost Estimate			
Reach	Length	Number of Structures	Cost
RET120	1,379	2	\$ 72,798
RET154	2,357	14	\$ 468,927
RET156	942	2	\$ 73,722
RWT094	2,145	7	\$ 1,474,717
RWT122	518	2	\$ 424,187
RWT150	3,741	24	\$ 765,482
RWT210_upstream	2,132	16	\$ 593,011
Subtotal			\$ 2,291,521
Engineering/Construction Admin. (15%)			\$ 343,728
Contingency (20%)			\$ 548,304
Total			\$ 3,093,554

**Small Drop Structures**

The quantities for this reach alternative include earthwork, rip rap toe protection, vegetation, and small (3ft vertical) drop structures. Note that small drop structures span the low flow channel width. Small drop structure reach costs were developed with the following assumptions:

- Earthwork is required to fill the existing degraded channel area to approximate the original section. Earthwork was estimated to cost \$15 per cubic yard.
- Revegetation is required to cover the area equal to the earthwork area. Revegetation was estimated to cost \$0.50 per square foot.
- Small drop structures are 3ft vertical with a 3ft key depth for a 6ft total height. The cost for small drop structures is estimated using a regression equation developed for this DBPS and is a function of their total height of 6ft and the low flow channel width. The average cost per small drop structure is about \$208,000.
- Small drop structures are to be spaced by assuming that the existing channel slope degrades to a design slope less than 0.4 percent and the total drop structure height (6ft) is utilized.

The quantities and costs for all small drop structure reaches are provided in Table 6-10.

**Table 6-10. Small Drop Structure Reaches Cost Estimate**

Reach	Length	Cost (\$)
RET020	1,915	\$ 1,169,444
RET030	5,042	\$ 1,405,908
RET040	1,820	\$ 1,073,275
RET100	1,791	\$ 1,342,120
RET110	2,751	\$ 1,055,516
RET152	2,030	\$ 1,081,390
RET162	3,256	\$ 656,460
RMT050	1,568	\$ 814,189
RMT062	5,688	\$ 2,381,127
RMT064	3,358	\$ 1,231,110
RMT102	1,021	\$ 636,082
RMT104	874	\$ 186,349
RMT106	226	\$ 212,322
RMT112	3,372	\$ 1,276,142
RMT114	1,667	\$ 853,693
RWT054	2,497	\$ 1,414,531
RWT080	3,494	\$ 2,345,153
RWT092	626	\$ 414,434
RWT124_upstream	1,246	\$ 640,054
RWT174	1,871	\$ 606,335
RWT234	2,129	\$ 976,863
RWT296	1,134	\$ 223,458
RWT372	1,377	\$ 947,221
Subtotal		\$ 22,943,176
Engineering/Construction Admin. (15%)		\$ 3,441,476
Contingency (20%)		\$ 4,588,635
Total		\$ 30,973,288

**Bridge and Culvert Crossing Replacements**

The proposed size for crossing replacements includes the infrastructure necessary to provide the bridge or culvert with sufficient capacity to adhere to DCM criteria. Costs were estimated using a regression equation developed for this DBPS that was based on 2012 UDFCD master plan costs. Note that several crossings (e.g., WT 5-2, WT 4, WT 1, and MT 1) require such a large number of cells to comply with criteria that the proposed configurations are likely impractical. These locations may necessitate consideration of a more comprehensive capital improvement project including raising the roadway profile to achieve feasibility. The quantities and costs for all crossing replacements are provided in Table 6-11.

**Table 6-11. Crossing Replacement Cost Estimate**

Crossing	Location	Q100 (cfs)	Proposed Size	Length	Total Cost
WT 14	Burgess Rd.	89	5'	66	\$ 31,585
WT 13	Pine Park Trl.	89	5'	53	\$ 28,525
Pond WU Inlet Structure	Tamlin Rd.	1,110	(8) 6' x 12'	74	\$ 658,410
WT 6	Falcon Hwy.	1,000	(5) 6' x 12'	43	\$ 249,775
WT 5	Meridian Rd.	1,100	3'	43	\$ 8,651
WT 5-2	Meridian Rd.	1,100	(25) 3' x 10'	43	\$ 718,121
WT 4	W. Condor Rd.	1,500	(11) 5' x 12'	48	\$ 528,324
WT 3	Garrett Rd.	1,500	(3) 9' x 12'	46	\$ 218,292
WT 1	Blaney Rd.	2,200	(16) 5' x 12'	40	\$ 636,648
MT 7	Owl Ln.	299	(9) 2' x 4'	58	\$ 207,465
MT 6	Woodmen Rd.	840	(3) 5'	200	\$ 166,177
MT 6-2	Woodmen Rd.	840	(3) 5'	220	\$ 181,365
MT 5-1	McLaughlin Rd.	820	(3) 7' x 12'	48	\$ 191,098
MT 2	Swingline Rd.	840	(3) 8' x 12'	83	\$ 343,147
MT 1	Falcon Hwy.	860	(11) 4' x 12'	45	\$ 433,032
ET 31	Stapleton Dr.	200	(2) 4' x 12'	302	\$ 525,026
ET 19	Eastonville Rd.	530	7' x 10'	39	\$ 63,340
ET 13	Pinto Pony Rd.	300	(2) 6' x 8'	50	\$ 113,991
ET 11	Falcon Hwy.	400	(2) 6' x 8'	40	\$ 84,348
ET 10	N. Condor Rd.	590	(3) 7' x 10'	44	\$ 162,656
ET 9	Sunset Trl.	490	(2) 6' x 8'	40	\$ 84,102
ET 4	Garrett Rd.	640	(2) 5' x 8'	61	\$ 106,060
Subtotal				\$	5,740,139
Engineering/Construction Admin. (15%)				\$	861,021
Contingency (20%)				\$	1,148,028
<b>Total</b>				<b>\$</b>	<b>7,749,187</b>

No crossing improvements were necessary at WT 10, WT 7-2, MT 4, or ET 30 since the hydraulic condition at these locations were within criteria as noted in Table 6-7. Crossings WT 7-1, MT 3, and ET 14 were not resized because they are CDOT structures. Crossing WT 11 was not resized because it is located under a private drive. Other crossings, including WT 9, ET 32, ET 26, and ET 15, were not resized because the degree of criteria exceedance was so minor that they did not warrant replacement.

**6.3.5. Immediate Action Required**

There are 6 locations where immediate action is required in order to preserve the existing reach conditions as shown in Figure 6-1. These locations are at points adjacent to pristine channel reaches, or Natural Channel Design reaches, where current erosion or deposition has been identified. If left unmitigated, the issues at these locations have the potential to propagate and worsen the existing condition, thereby necessitating additional reach improvement costs. These locations can be addressed by implementing the recommended reach alternative for the impaired reach at the sites that are identified while improvements for the remainder of the impaired reaches can be constructed at a later date.

**6.3.6. Protect In Place**

There are several relatively pristine reaches of channel throughout the Falcon Watershed that are currently in a stable condition. Additionally, there are several reaches throughout the Falcon Watershed that have already been improved and appear to be stable. Preserving both of these reach conditions would not require a direct reach improvement cost. However, upstream detention improvements may be required depending on the location of the reach.

**6.3.7. Reach Phasing Priority**

Reach construction should be phased so that planned upstream detention ponds are constructed prior to reach construction. This method of phasing protects the reach alternatives from being damaged as a result of higher than designed for flows being released into the reach. A phasing priority of 1 means the reach can be constructed. Higher phasing priority numbers indicate more upstream detention ponds should be built prior to construction of the reach in question. The phasing priority for each of the reaches is provided in Appendix D.

**6.4. Cost Summary**

Costs for all detention ponds, reach improvements, bridge and culvert replacements, and roadside ditches are summarized in Table 6-12.

**Table 6-12. Cost Summary**

Alternative	Cost <sup>1</sup>
Detention Ponds	\$ 6,822,546
Roadside Ditches	\$ 835,874
Reaches <sup>2</sup>	\$ 34,066,842
Bridge & Culvert Crossings	\$ 7,749,187
<b>Total</b>	<b>\$ 49,474,449</b>

Notes:

<sup>1</sup>Includes all construction and additional costs

<sup>2</sup>Reaches includes both Natural Channel Design and Small Drop Structure reaches

**Figure 6-1. Selected Plan**

**Sheet 6-2 to Sheet 6-19. Falcon DBPS Conceptual Plan West Tributary**

**Sheet 6-20 to Sheet 6-25. Falcon DBPS Conceptual Plan Middle Tributary**

**Sheet 6-26 to Sheet 6-38. Falcon DBPS Conceptual Plan East Tributary**

**Sheet 6-39 to Sheet 6-50. Falcon DBPS Conceptual Plan Small Tributaries**

**Sheet 6-51. Typical Natural Channel Cross-Sections**

**Sheet 6-52. Typical Rock Cross Vane Details**

**Sheet 6-53. Typical Riffle Cross Sections**

**Sheet 6-54. Typical Grouted Sloping (GSB) Boulder Drop Structure**

**Sheet 6-55. Typical Profile of Detention Basin**

**Sheet 6-56. Typical Roadside Ditch Improvements**

## 7.0 FEE DEVELOPMENT

### 7.1. Introduction

The objective of the fee development exercise was to determine the equitable share of drainage improvement costs that a developer is responsible for paying to El Paso County if they wish to plat a property. This fee is a function of the total cost for the selected plan outlined in Section 6 and will be used by the County to pay for drainage improvements that are necessary as a result of development. The product of this calculation is a unit fee (cost/impervious acre) that is a one-time charge to the developer based on the number of impervious acres within the platted property.

### 7.2. Developable Land

The Falcon Watershed has a total area of 6,847 acres. The entirety of the watershed is within the County with 1,969 acres unplatted, according to the GIS dataset received from the County. This dataset also includes unplatted areas that can't be developed because of specific land use designations. Table 7-1 provides a summary of land classifications in the Falcon Watershed. A complete summary of unplatted area land use is provided in Appendix E.

**Table 7-1. Land Classification**

Classification	Area (acres)
Platted	3,670
Unplatted	1,969
Other	1,208
<b>Total</b>	<b>6,847</b>

The projected impervious acreage within unplatted areas totals 645.58 acres. A summary of land classification within the Falcon Watershed is provided in Figure 7-3.

### 7.3. Fee Calculation & County Cost

The total cost for the Selected Plan was separated into a Development Fee, County Cost, Metropolitan District Cost, and Drainage and Bridge Funds. A description of how the aforementioned were defined is as follows:

- **County Cost** – Drainage improvement costs that are the responsibility of the County as shown in Figure 7-1.
- **Metropolitan District Cost** – Drainage improvement costs that are the responsibility of a metropolitan district as shown in Figure 7-2.
- **Development Fee** – All drainage improvement costs that are directly associated with new development.
- **Drainage and Bridge Funds** – The balance of drainage and bridge funds as of August 2015 was \$584,134 and \$510,777, respectively, with a liability of \$300,000 cost for this DBPS (an additional contract amendment increased the cost of this DBPS to \$339,088).

The anticipated reimbursements due for work completed in the Falcon Watershed are approximately equivalent to the available drainage and bridge funds. As a result, reimbursements were not included in

the fee calculation. Drainage improvements that are required as a result of new development are listed in Appendix E.

The costs apportioned to County and metropolitan district drainage improvements are provided in Table 7-2 and Table 7-3. The bridge improvement fees shown in Table 7-2 and Table 7-3 were determined by classification of the crossing as either a bridge or a culvert. This classification was based on the DCM criteria.

**Table 7-2. County Cost**

Drainage Improvements	\$ 24,051,349
Bridge Improvements	\$ 2,887,437
<b>Total Cost</b>	<b>\$ 26,938,786</b>

**Table 7-3. Metropolitan District Cost**

Drainage Improvements	\$ 3,972,407
Bridge Improvements	\$ 1,855,620
<b>Total Cost</b>	<b>\$ 5,828,027</b>

The development cost and corresponding fee calculations based on impervious acreage are provided in Table 7-4 and 7-5.

**Table 7-4. Development Drainage Cost and Fee**

Drainage Improvements	\$ 14,649,163
DBPS Cost	\$ 339,088
<b>Total Cost</b>	<b>\$ 14,988,251</b>
<b>Drainage Fee (per imp. ac.)</b>	<b>\$ 23,217</b>

**Table 7-5. Development Bridge Cost and Fee**

Bridge Improvements	\$ 2,058,474
<b>Total Cost</b>	<b>\$ 2,058,474</b>
<b>Bridge Fee (per imp. ac.)</b>	<b>\$ 3,189</b>

**Appendix A. Hydrologic Analysis**

**Appendix B. Hydraulic Analysis**

**Appendix C. Alternatives Analysis**

**Appendix D. Plan Development**

**Appendix E. Fee Development**



Falcon DBPS  
Subbasin Properties

Subbasin ID	Area (mi <sup>2</sup> ) <sup>2</sup>	Existing % Impervious <sup>3</sup>	Curve Number <sup>3</sup>			Lag Time (min)		
			Historical	Existing	Future	Historical <sup>4</sup>	Existing <sup>2</sup>	Future <sup>5</sup>
ET010	0.15	21.72%	61	69	72	33.64	25.23	18.92
ET020	0.21	19.07%	61	68	73	23.15	17.37	13.02
ET030	0.20	27.31%	41	71	72	42.61	31.96	23.97
ET040	0.15	20.35%	42	69	69	29.71	22.28	22.28
ET050	0.12	19.07%	39	68	68	10.36	7.77	7.77
ET060	0.29	21.94%	39	69	69	7.38	5.54	5.54
ET070	0.25	26.60%	39	71	71	10.51	7.88	7.88
ET080	0.29	37.81%	39	75	76	25.98	19.49	14.61
ET090	0.12	12.34%	39	61	74	54.90	41.18	30.88
ET100	0.05	3.12%	39	48	63	10.67	8.00	6.00
ET110 <sup>1</sup>	0.23	1.49%	39	54	61	25.68	25.68	19.26
ET120	0.11	6.79%	39	60	61	38.28	28.71	21.53
ET130	0.13	6.57%	39	61	63	61.63	46.22	34.67
ET140	0.27	3.21%	39	61	63	92.13	69.09	51.82
ET150 <sup>1</sup>	0.18	1.79%	39	62	62	25.39	25.39	25.39
ET160	0.19	3.36%	42	64	64	41.04	30.78	30.78
FS010	0.12	1.16%	44	49	56	41.23	30.92	23.19
MT010	0.29	6.99%	45	64	64	42.16	31.62	31.62
MT020 <sup>1</sup>	0.09	1.48%	57	62	68	12.94	12.94	9.71
MT030	0.16	13.35%	54	66	67	19.92	14.94	11.21
MT040	0.31	7.07%	55	64	75	35.44	26.58	19.93
MT050	0.12	16.00%	39	67	67	34.84	26.13	26.13
MT060 <sup>1</sup>	0.19	1.83%	39	55	66	27.90	27.90	20.93
MT070	0.20	5.68%	42	59	67	54.09	40.57	30.42
MT080	0.06	63.24%	48	86	87	6.91	5.18	3.88
MT090	0.04	60.08%	39	83	85	4.92	3.69	2.77
MT100	0.06	13.21%	39	67	70	21.19	15.89	11.92
MT110	0.12	18.56%	39	68	68	32.51	24.38	24.38
WT010 <sup>1</sup>	0.14	2.31%	56	58	58	24.38	24.38	24.38
WT020 <sup>1</sup>	0.07	2.39%	56	59	59	27.95	27.95	27.95
WT030	0.08	3.57%	57	59	59	17.99	13.49	13.49
WT040 <sup>1</sup>	0.19	2.72%	56	58	58	34.99	34.99	34.99
WT050 <sup>1</sup>	0.19	1.60%	60	62	62	26.99	26.99	26.99
WT060	0.20	2.35%	59	61	61	44.53	33.40	33.40
WT070 <sup>1</sup>	0.17	1.31%	56	58	58	18.77	18.77	18.77
WT080 <sup>1</sup>	0.07	1.95%	60	62	62	17.52	17.52	17.52
WT090 <sup>1</sup>	0.15	0.66%	61	62	63	21.52	21.52	16.14
WT100 <sup>1</sup>	0.19	1.28%	61	62	69	13.65	13.65	10.24
WT110 <sup>1</sup>	0.19	2.04%	60	61	63	29.57	29.57	22.18
WT120 <sup>1</sup>	0.05	2.96%	43	54	63	19.24	19.24	14.43

Falcon DBPS  
Curve Numbers

Historical Curve Numbers

Land Use	Hydrologic Soil Group			
	A	B	C	D
Rangeland Good Condition	39	61	74	80
Woods Good Condition	30	55	70	77
Water	98	98	98	98

Notes:

- 1 Rangeland Good Condition values from Aerawide Urban Runoff Conrol Manual, Pg. 26-27  
2 Other values from TR55, Table 2-2

Existing Curve Numbers

Land Use	Hydrologic Soil Group			
	A <sup>1</sup>	B	C	D
Rangeland Good Condition	39	61	74	80
Woods Good Condition	30	55	70	77
Open Space Good Condition	39	61	74	80
Gravel Roads	76	85	89	91
Water	98	98	98	98
Impervious Area	98	98	98	98

Notes:

- <sup>1</sup> All HSG Type A soils that have been graded shall be considered HSG Type B soils  
2 Rangeland Good Condition values from Aerawide Urban Runoff Conrol Manual, Pg. 26-27  
3 Other values from TR55, Table 2-2

Future Curve Numbers

Land Use	Average CN
0.50 Acre Residential	71
2.5 Acre Rural Residentail	64
5 Acre Rural Residentail - Woods	58
5 Acre Rural Residential - Rangeland	62
Community Commercial/Service Commercial	81
Light Industrial	96
Single Family Urban	79

Notes:

- 1 Values represent the average CN values that were developed for Existing Conditions for each corresponding land use

Falcon DBPS  
Ia Adjustment

Subbasin ID	Historical CN	Ia (in)	Existing CN	Ia (in)	Future CN	Ia (in)
ET010	61	0.64	69	0.45	72	0.39
ET020	61	0.64	68	0.47	73	0.37
ET030	41	1.44	71	0.41	72	0.39
ET040	42	1.38	69	0.45	69	0.45
ET050	39	1.56	68	0.47	68	0.47
ET060	39	1.56	69	0.45	69	0.45
ET070	39	1.56	71	0.41	71	0.41
ET080	39	1.56	75	0.33	76	0.32
ET090	39	1.56	61	0.64	74	0.35
ET100	39	1.56	48	1.08	63	0.59
ET110	39	1.56	54	0.85	61	0.64
ET120	39	1.56	60	0.67	61	0.64
ET130	39	1.56	61	0.64	63	0.59
ET140	39	1.56	61	0.64	63	0.59
ET150	39	1.56	62	0.61	62	0.61
ET160	42	1.38	64	0.56	64	0.56
FS010	44	1.27	49	1.04	56	0.79
MT010	45	1.22	64	0.56	64	0.56
MT020	57	0.75	62	0.61	68	0.47
MT030	54	0.85	66	0.52	67	0.49
MT040	55	0.82	64	0.56	75	0.33
MT050	39	1.56	67	0.49	67	0.49
MT060	39	1.56	55	0.82	66	0.52
MT070	42	1.38	59	0.69	67	0.49
MT080	48	1.08	86	0.16	87	0.15
MT090	39	1.56	83	0.20	85	0.18
MT100	39	1.56	67	0.49	70	0.43
MT110	39	1.56	68	0.47	68	0.47
WT010	56	0.79	58	0.72	58	0.72
WT020	56	0.79	59	0.69	59	0.69
WT030	57	0.75	59	0.69	59	0.69
WT040	56	0.79	58	0.72	58	0.72
WT050	60	0.67	62	0.61	62	0.61
WT060	59	0.69	61	0.64	61	0.64
WT070	56	0.79	58	0.72	58	0.72
WT080	60	0.67	62	0.61	62	0.61
WT090	61	0.64	62	0.61	63	0.59
WT100	61	0.64	62	0.61	69	0.45
WT110	60	0.67	61	0.64	63	0.59
WT120	43	1.33	54	0.85	63	0.59
WT130	60	0.67	72	0.39	72	0.39
WT140	61	0.64	62	0.61	70	0.43
WT150	61	0.64	65	0.54	74	0.35

Falcon DBPS  
Existing Time of Concentration Calculations  
Worksheet for computation of time of travel according to  
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Watershed Name	WT060	WT050	WT080	WT090	WT110	WT100	ET070	WT150	WT140	MT010	ET060	WT170
Watershed ID	177	66	342	69	70	71	83	332	146	151	210	282
Sheet Flow Characteristics												
Manning's Roughness Coefficient	0.4	0.15	0.15	0.15	0.4	0.011	0.011	0.011	0.15	0.15	0.011	0.15
Flow Length (ft)	100	297	152	131	125	47.4265	100	100	252.4879	220.7734	44.6252	120.7109
Two-Year 24-hour Rainfall (in)	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
Land Slope (ft/ft)	0.0776	0.0316	0.0712	0.0669	0.0937	0.0401	0.0437	0.0174	0.0715	0.0874	0.1261	0.0224
Sheet Flow Tt (hr)	0.26	0.40	0.17	0.15	0.29	0.01	0.02	0.03	0.25	0.21	0.01	0.22
Shallow Concentrated Flow Characteristics												
Surface Description (1 - unpaved, 2 - paved)	1	1	1	1	1	1	1	1	1	1	1	1
Flow Length (ft)	629	630	921	4216	2838	625.1232	564.9179	0	340.5642	3491.1034	278.3003	723.4077
Watercourse Slope (ft/ft)	0.0429	0.0401	0.0474	0.0339	0.034	0.0471	0.0115	0	0.0301	0.0267	0.0446	0.0168
Average Velocity - computed (ft/s)	3.34	3.23	3.51	2.97	2.98	3.50	1.73	0.00	2.80	2.64	3.41	2.09
Shallow Concentrated Flow Tt (hr)	0.05	0.05	0.07	0.39	0.26	0.05	0.09	0.00	0.03	0.37	0.02	0.10
Channel Flow Characterisitics												
Cross-sectional Flow Area (ft2)	3.82	102.48	26.55	41.73	5.37	112.64	9.62	9	3.47	60.78	15.9	76.89
Wetted Perimeter (ft)	12.23	70.06	41.28	84.92	11.19	110.27	11	14.04	12.11	77.26	14.14	58.7
Hydraulic Radius - computed (ft)	0.31	1.46	0.64	0.49	0.48	1.02	0.87	0.64	0.29	0.79	1.12	1.31
Channel Slope (ft/ft)	0.0344	0.024	0.0247	0.012	0.0219	0.021	0.013	0.0036	0.0255	0.0226	0.0132	0.0184
Manning's Roughness Coefficient	0.06	0.05	0.05	0.03	0.05	0.05	0.013	0.05	0.05	0.05	0.013	0.05
Average Velocity - computed (ft/s)	2.12	5.95	3.49	3.39	2.70	4.38	11.95	1.33	2.07	3.82	14.24	4.84
Flow Length (ft)	4722	6298	3073	604	2635	5032.4692	4731.5554	5328.7401	2294.7909	4121.0832	6400.2723	3430.8373
Channel Flow Tt (hr)	0.62	0.29	0.24	0.05	0.27	0.32	0.11	1.11	0.31	0.30	0.12	0.20
Watershed Time of travel (hr)	0.93	0.75	0.49	0.60	0.82	0.38	0.22	1.14	0.60	0.88	0.15	0.52
Watershed Lag Time (min)	33.40	26.99	17.52	21.52	29.57	13.65	7.88	41.04	21.46	31.62	5.54	18.61
Number of watersheds	04											
MXD Path	Falcon_DBPS.mxd											
Stored workbook												
\$AVHOME directory												
Name of the table to store the results of the calculation	Subbasin1											
Workspace path	C:\GeoHMS\Falcon_DBPS\Falcon_DBPS.mdb											

Notes:

<sup>1</sup> Sheet Flow Manning's n values from Table 3-1 in TR55

<sup>2</sup> For LFP's with no Shallow Concentrated Flow length, slopes were manually changed from NaN (default) to 0 and Shallow Concentrated Flow Tc was changed to 0 so Watershed Time of Travel could be computed.

<sup>3</sup> Channel Flow Manning's n values were selected from multiple sources and are documented in the Manning's n Value Selection Quality Assurance packet

<sup>4</sup> Watershed Lag Time = 0.6\*Watershed Time of Travel

Falcon DBPS  
Existing Time of Concentration Calculations  
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Watershed Name	WT010	WT280	ET140	ET130	WT230	WT040	MT020	MT050	WT240	WT250	ET110	ET100	WT220	WT370	WT350	WT340	WT330
Watershed ID	183	247	351	353	407	588	635	649	663	667	681	682	267	114	214	116	123
Sheet Flow Characteristics																	
Manning's Roughness Coefficient	0.4	0.15	0.15	0.15	0.24	0.4	0.15	0.24	0.011	0.011	0.15	0.011	0.011	0.15	0.15	0.15	0.15
Flow Length (ft)	146.5688	68.6391	118.6398	119.4977	45.0001	128.3412	16.2369	167.7821	54	110.7786	296.0756	48.2844	56.2392	148.5814	199.706	296.2138	298.7012
Two-Year 24-hour Rainfall (in)	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
Land Slope (ft/ft)	0.0766	0.0321	0.0214	0.0243	0.1104	0.0443	0.0215	0.0209	0.037	0.0125	0.0362	0.1191	0.019	0.0363	0.024	0.0345	0.05
Sheet Flow Tt (hr)	0.35	0.12	0.22	0.22	0.08	0.39	0.05	0.44	0.01	0.03	0.38	0.01	0.02	0.22	0.33	0.39	0.34
Shallow Concentrated Flow Characteristics																	
Surface Description (1 - unpaved, 2 - paved)	1	1	1	1	2	1	1	2	2	2	1	1	1	1	1	1	1
Flow Length (ft)	742.1945	1860.327	1172.282	828.555	181.5689	984.9924	3260.587	275.2087	0	0	2365.505	762.0473	5060.256	0	3420.637	4497.88	5188.524
Watercourse Slope (ft/ft)	0.04	0.0259	0.0172	0.0128	0.0228	0.0516	0.032	0.0239	0	0	0.0271	0.0225	0.021	0	0.0467	0.0237	0.0225
Average Velocity - computed (ft/s)	3.23	2.60	2.12	1.83	3.07	3.67	2.89	3.14	0.00	0.00	2.66	2.42	2.34	0.00	3.49	2.48	2.42
Shallow Concentrated Flow Tt (hr)	0.06	0.20	0.15	0.13	0.02	0.07	0.31	0.02	0.00	0.00	0.25	0.09	0.60	0.00	0.27	0.50	0.60
Channel Flow Characterisitcs																	
Cross-sectional Flow Area (ft2)	3.99	2.43	25.47	21.02	4.39	8.4	20.97	2.91	4.39	4.39	39.65	4.58	6.73	30.81	59.79	6.55	12.59
Wetted Perimeter (ft)	15.4	9.26	84.23	169.15	23.26	26.23	40.88	6.68	23.26	23.26	105.42	8.91	12.27	26.96	38.47	17.42	25.95
Hydraulic Radius - computed (ft)	0.26	0.26	0.30	0.12	0.19	0.32	0.51	0.44	0.19	0.19	0.38	0.51	0.55	1.14	1.55	0.38	0.49
Channel Slope (ft/ft)	0.0324	0.0179	0.0113	0.0144	0.009	0.026	0	0.0173	0.0175	0.0112	0.0114	0.0119	0.0108	0.0119	0.0088	0.0209	0.0119
Manning's Roughness Coefficient	0.06	0.03	0.06	0.05	0.013	0.05	0.05	0.03	0.013	0.013	0.03	0.03	0.03	0.05	0.05	0.03	0.05
Average Velocity - computed (ft/s)	1.82	2.72	1.19	0.89	3.58	2.25	0.00	3.75	4.99	3.99	2.76	3.48	3.46	3.55	3.75	3.74	2.01
Flow Length (ft)	1719.181	2209.347	6595.197	3022.555	4460.603	4086.883	0	3582.906	4002.366	3560.407	866.4156	1602.548	1573.016	6132.815	3083.294	4257.557	508.9379
Channel Flow Tt (hr)	0.26	0.23	1.54	0.94	0.35	0.50	0.00	0.27	0.22	0.25	0.09	0.13	0.13	0.48	0.23	0.32	0.07
Watershed Time of travel (hr)	0.68	0.55	1.92	1.28	0.44	0.97	0.36	0.73	0.23	0.28	0.71	0.22	0.74	0.70	0.83	1.21	1.00
Watershed Lag Time (min)	24.38	19.72	69.09	46.22	15.88	34.99	12.94	26.13	8.45	10.10	25.68	8.00	26.77	25.11	29.76	43.40	36.05
Number of watersheds																	
MXD Path																	
Stored workbook																	
\$AVHOME directory																	
Name of the table to store the results of the calculation																	
Workspace path																	

Falcon DBPS

Existing Time of Concentration Calculations

Worksheet for computation of time of travel according to

TR-55 methodology

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Watershed Name	WT030	WT020	WT210	ET160	WT360	WT260	WT290	WT270	ET120	ET090	WT180	MT040	WT200	WT190	WT130	WT320	ET010
Watershed ID	187	189	199	221	227	256	238	242	252	262	848	272	276	278	288	308	318
Sheet Flow Characteristics																	
Manning's Roughness Coefficient	0.15	0.4	0.15	0.15	0.011	0.15	0.011	0.011	0.011	0.24	0.25	0.15	0.15	0.011	0.15	0.15	0.15
Flow Length (ft)	141.2626	266.2251	285.0006	80.005	87.4266	100	100	40.3554	61.2133	138.9952	296	75.2183	183.5462	100	88.7973	261.2747	78
Two-Year 24-hour Rainfall (in)	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
Land Slope (ft/ft)	0.103	0.1066	0.0231	0.0189	0.0402	0.0508	0.0513	0.0274	0.0332	0.0589	0.027	0.0608	0.0297	0.0174	0.0421	0.0858	0.0256
Sheet Flow Tt (hr)	0.14	0.50	0.44	0.17	0.02	0.14	0.02	0.01	0.01	0.25	0.64	0.10	0.28	0.03	0.14	0.24	0.15
Shallow Concentrated Flow Characteristics																	
Surface Description (1 - unpaved, 2 - paved)	1	1	1	1	1	1	1	1	1	1	2	1	1	1	2	1	1
Flow Length (ft)	432.1399	295.3505	4198.315	3912.236	2241.548	1133.028	267.4881	0	5817.561	0	4489.17	3144.352	9180.05	0	0	2919.894	528
Watercourse Slope (ft/ft)	0.0424	0.0619	0.0198	0.0146	0.0171	0.0154	0.0196	0	0.0164	0	0.024	0.03	0.0209	0	0	0.0372	0.0303
Average Velocity - computed (ft/s)	3.32	4.01	2.27	1.95	2.11	2.00	2.26	0.00	2.07	0.00	3.15	2.79	2.33	0.00	0.00	3.11	2.81
Shallow Concentrated Flow Tt (hr)	0.04	0.02	0.51	0.56	0.30	0.16	0.03	0.00	0.78	0.00	0.40	0.31	1.09	0.00	0.00	0.26	0.05
Channel Flow Characterisitcs																	
Cross-sectional Flow Area (ft2)	6.12	8.51	39.77	22.37	10.27	0.82	41.59	9.66	25.13	9.72	163.44	4.32	25.69	3.88	4.39	28.9	15.97
Wetted Perimeter (ft)	11.83	29.87	160.6	24.5	37.46	3.97	114.48	33.28	25.13	31.92	140.79	7.39	57.74	14.09	23.26	26.6	31.94
Hydraulic Radius - computed (ft)	0.52	0.28	0.25	0.91	0.27	0.21	0.36	0.29	1.00	0.30	1.16	0.58	0.44	0.28	0.19	1.09	0.50
Channel Slope (ft/ft)	0.0224	0.0271	0.0145	0.0093	0.0083	0.0082	0.0107	0.0147	0.005	0.0096	0.0135	0.0172	0.0316	0.0232	0.0249	0.0101	0.0217
Manning's Roughness Coefficient	0.05	0.06	0.06	0.03	0.05	0.06	0.05	0.03	0.013	0.03	0.05	0.03	0.05	0.03	0.013	0.05	0.05
Average Velocity - computed (ft/s)	2.87	1.77	1.18	4.51	1.15	0.79	1.57	2.64	8.10	2.20	3.82	4.55	3.09	3.20	5.95	3.17	2.77
Flow Length (ft)	2076.623	1662.612	2770.435	2028.925	1285.17	2358.52	2236.363	3268.233	47.5001	7102.49	443	5292.631	316	3336.891	3894.055	2166.302	4966.49
Channel Flow Tt (hr)	0.20	0.26	0.65	0.13	0.31	0.83	0.40	0.34	0.00	0.90	0.03	0.32	0.03	0.29	0.18	0.19	0.50
Watershed Time of travel (hr)	0.37	0.78	1.61	0.85	0.62	1.13	0.45	0.35	0.80	1.14	1.07	0.74	1.40	0.32	0.32	0.69	0.70
Watershed Lag Time (min)	13.49	27.95	57.82	30.78	22.45	40.67	16.05	12.76	28.71	41.18	38.49	26.58	50.45	11.37	11.44	24.97	25.23
Number of watersheds																	
MXD Path																	
Stored workbook																	
\$AVHOME directory																	
Name of the table to store the results of the calculation																	
Workspace path																	

Falcon DBPS  
Existing Time of Concentration Calculations  
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Watershed Name	ET020	WT070	ET050	ET040	FS010	
Watershed ID	328	343	467	468	5	
Sheet Flow Characteristics						
Manning's Roughness Coefficient	0.15	0.4	0.011	0.011	0.011	
Flow Length (ft)	43.6613	45.0001	47.0712	301.3711	29	
Two-Year 24-hour Rainfall (in)	2.1	2.1	2.1	2.1	2.1	
Land Slope (ft/ft)	0.1105	0.0566	0.0263	0.052	0.0552	
Sheet Flow Tt (hr)	0.05	0.15	0.01	0.04	0.01	
Shallow Concentrated Flow Characteristics						
Surface Description (1 - unpaved, 2 - paved)	2	1	1	1	1	
Flow Length (ft)	0	861.3369	1478.833	0	0	
Watercourse Slope (ft/ft)	0	0.0441	0.0202	0	0	
Average Velocity - computed (ft/s)	0.00	3.39	2.29	0.00	0.00	
Shallow Concentrated Flow Tt (hr)	0.00	0.07	0.18	0.00	0.00	
Channel Flow Characterisitcs						
Cross-sectional Flow Area (ft2)	3.55	13.56	12.57	2.07	10	
Wetted Perimeter (ft)	9.58	20.48	12.57	6.76	40.01	
Hydraulic Radius - computed (ft)	0.37	0.66	1.00	0.31	0.25	
Channel Slope (ft/ft)	0.0211	0.0236	0.0125	0.0171	0.0208	
Manning's Roughness Coefficient	0.03	0.05	0.013	0.03	0.06	
Average Velocity - computed (ft/s)	3.72	3.48	12.81	2.95	1.42	
Flow Length (ft)	5760.795	3717.648	1130.583	6137.448	4362	
Channel Flow Tt (hr)	0.43	0.30	0.02	0.58	0.85	
Watershed Time of travel (hr)	0.48	0.52	0.22	0.62	0.86	
Watershed Lag Time (min)	17.37	18.77	7.77	22.28	30.92	
Number of watersheds					1	
MXD Path					Falcon_DBPS.mxd	
Stored workbook						
\$AVHOME directory					Subbasin3	
Name of the table to store the results of the calculation					C:\GeoHMS\Falcon_DBPS_South\Falcon_DBPS_South.mdb	
Workspace path						

Falcon DBPS

Manning's n Values

Manning's n Description	Selected Value
Vegetated Roadside Ditch	0.03
Grass Swale	0.06
Channel - Sand	0.03
Channel - Grass	0.05
Channel - Willow	0.07
Floodplain - Grass	0.08
Floodplain - Willow	0.15

References:

- 1 Guide for Selecting Manning's Roughness Coefficients for Natural Channels and Floodplains, USGS Water Supply Paper 2339
- 2 City of Colorado Springs DCM
- 3 CDOT DCM
- 4 UDFCD DCM
- 5 Guide for Selecting Roughness Coefficient "n" Values For Channels, NRCS (SCS), 1963
- 6 Cottonwood Creek DBPS



**Falcon DBPS**  
**Routing Description**

Reach	Length (ft)	Slope (ft/ft)	Manning's n	Invert (ft)	Shape	Diameter (ft)	Width (ft)	Side Slope (h:v)	L.B. Manning's n	R.B. Manning's n
RET020	3063.9	0.0186036	0.05	7113.75	Eight Point	--	--	--	0.08	0.08
RET030	5307.2	0.0146972	0.07	7019.43	Eight Point	--	--	--	0.08	0.08
RET040	1951	0.0194768	0.07	6958.54	Eight Point	--	--	--	0.15	0.15
RET050	1877.3	0.0207744	0.07	6938.26	Eight Point	--	--	--	0.08	0.08
RET060	1866	0.0117898	0.05	6896.01	Eight Point	--	--	--	0.08	0.08
RET070	2209.2	0.0185584	0.07	6868.86	Eight Point	--	--	--	0.08	0.08
RET080	1569.2	0.0044608	0.07	6855.75	Eight Point	--	--	--	0.15	0.15
RET090	378.7	0.0052812	0.07	6854.04	Eight Point	--	--	--	0.15	0.15
RET100	1916.5	0.0203494	0.03	6832.6	Eight Point	--	--	--	0.08	0.08
RET110	2956.5	0.0145443	0.03	6780.51	Eight Point	--	--	--	0.08	0.08
RET120	1474.5	0.0047475	0.03	6766.26	Eight Point	--	--	--	0.08	0.08
RET140	4052.5	0.0134575	0.03	6779.63	Eight Point	--	--	--	0.08	0.08
RET152	2217.2	0.0175895	0.03	6755.38	Eight Point	--	--	--	0.08	0.08
RET154	2358.2	0.0132409	0.05	6743.88	Eight Point	--	--	--	0.08	0.08
RET156	1006.8	0.0079457	0.03	6727.09	Eight Point	--	--	--	0.08	0.08
RET162	3410.6	0.0108486	0.05	6699.33	Eight Point	--	--	--	0.08	0.08
RET164	2094.9	0.0124114	0.03	6671.23	Eight Point	--	--	--	0.08	0.08
RMT030	3636.4	0.0202839	0.03	7033.46	Eight Point	--	--	--	0.08	0.08
RMT040	1310.1	0.0091599	0.03	6984	Eight Point	--	--	--	0.08	0.08
RMT050	1567.7	0.0191364	0.03	6965.39	Eight Point	--	--	--	0.08	0.08
RMT062	6001.9	0.0201602	0.05	6928.82	Eight Point	--	--	--	0.08	0.08
RMT064	3355.9	0.0160912	0.05	6911.23	Eight Point	--	--	--	0.08	0.08
RMT070	1118.3	0.0107303	0.05	6881.93	Eight Point	--	--	--	0.08	0.08
RMT080	2187.7	0.0118848	0.013		Rectangle	--	8	--		
RMT090	284.64	0.0105	0.013		Circle	3	--	--		
RMT102	1101.3	0.0208837	0.07	6840.11	Eight Point	--	--	--	0.15	0.15
RMT104	866.69	0.015	0.05	6846	Eight Point	--	--	--	0.08	0.08
RMT106	234.5	0.0042644	0.07	6831.79	Eight Point	--	--	--	0.15	0.15
RMT112	3556.1	0.0143416	0.07	6802.15	Eight Point	--	--	--	0.15	0.15
RMT114	1760.2	0.0170437	0.05	6758.55	Eight Point	--	--	--	0.08	0.08
RWT030	2078.5	0.0232	0.05	7392.86	Eight Point	--	--	--	0.08	0.08
RWT042	1561.2	0.0263708	0.05	7366.57	Eight Point	--	--	--	0.08	0.08
RWT044	2369.4	0.0291215	0.05	7367.84	Eight Point	--	--	--	0.08	0.08
RWT046	2587.6	0.0212553	0.05	7294.2	Eight Point	--	--	--	0.08	0.08
RWT054	2699.213562	0.021117	0.05	7267.87	Eight Point	--	--	--	0.08	0.08
RWT080	3461.5	0.0271559	0.05	7253.59	Eight Point	--	--	--	0.08	0.08
RWT092	651.99	0.0184053	0.03	7224.51	Eight Point	--	--	--	0.08	0.08
RWT094	2357.7	0.0114517	0.03	7190.23	Eight Point	--	--	--	0.08	0.08
RWT122	561.63	0.0124637	0.03	7184.96	Eight Point	--	--	--	0.08	0.08
RWT124	2423.9	0.0165024	0.03	7153.3	Eight Point	--	--	--	0.08	0.08
RWT150	2608	0.019	0.05	7174.97	Eight Point	--	--	--	0.08	0.08
RWT160	1565.7	0.0204375	0.05	7114.22	Eight Point	--	--	--	0.08	0.08
RWT172	3101.9	0.0190205	0.05	7114.4	Eight Point	--	--	--	0.08	0.08

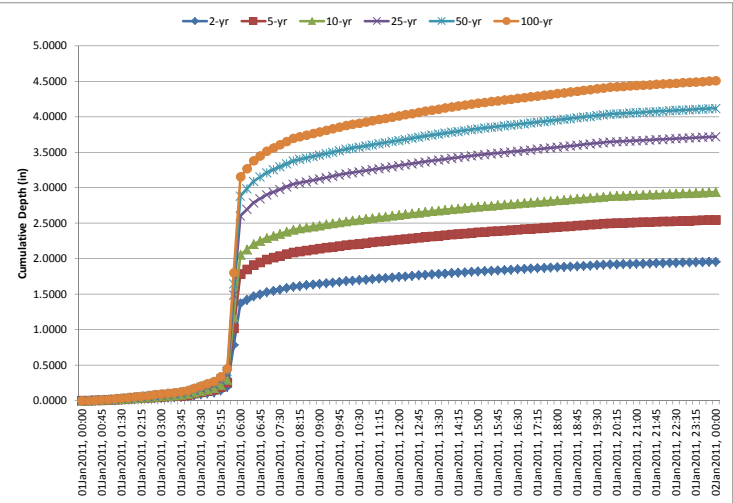
Falcon DBPS										
Routing Description										
Reach	Length (ft)	Slope (ft/ft)	Manning's n	Invert (ft)	Shape	Diameter (ft)	Width (ft)	Side Slope (h:v)	L.B. Manning's n	R.B. Manning's n
RWT174	1869.6	0.0160463	0.05	7105.07	Eight Point	--	--	--	0.08	0.08
RWT176	326.42	0.0122541	0.03	7079.07	Eight Point	--	--	--	0.08	0.08
RWT180	3727.614345	0.0204	0.05	7015.13	Eight Point	--	--	--	0.08	0.08
RWT202	3011.790196	0.0212	0.05	6953.23	Eight Point	--	--	--	0.08	0.08
RWT204	3538.4	0.0218	0.05	6952	Eight Point	--	--	--	0.08	0.08
RWT210	2914.7	0.0133803	0.03	6906.35	Eight Point	--	--	--	0.08	0.08
RWT232	2180	0.0178898	0.05	6861.66	Eight Point	--	--	--	0.08	0.08
RWT234	2126.1	0.0201117	0.05	6860	Eight Point	--	--	--	0.08	0.08
RWT236	124.98	0.008	0.013		Rectangle		42		--	--
RWT240	1044	0.013	0.05	6837.41	Eight Point	--	--	--	0.08	0.08
RWT240_Diversion Reach	929	0.013	0.07	6826	Eight Point	--	--	--	0.15	0.15
RWT250	184.35	0.0054245	0.07	6818.14	Eight Point	--	--	--	0.15	0.15
RWT260	2371.1	0.015183	0.05	6800.68	Eight Point	--	--	--	0.08	0.08
RWT291	986.55	0.0223001	0.05	6780.96	Eight Point	--	--	--	0.08	0.08
RWT292	733.2	0.0165	0.05	6779.41	Eight Point	--	--	--	0.08	0.08
RWT294	536.02	0.0149	0.05	6772.93	Eight Point	--	--	--	0.08	0.08
RWT295	217	0.0091575	0.05	6763.06	Eight Point	--	--	--	0.08	0.08
RWT296	1202.594155	0.0091575	0.05	6763.06	Eight Point	--	--	--	0.08	0.08
RWT312	3295.8	0.0265	0.05	6731.53	Eight Point	--	--	--	0.08	0.08
RWT314	2428.7	0.0148227	0.05	6734.64	Eight Point	--	--	--	0.08	0.08
RWT320	2459.5	0.0093515	0.05	6692.49	Eight Point	--	--	--	0.08	0.08
RWT344	1380.563492	0.010865	0.03	6666	Eight Point	--	--	--	0.08	0.08
RWT352	3134.2	0.0121	0.05	6662.01	Eight Point	--	--	--	0.08	0.08
RWT354	14.142	0.0121	0.05	6658.11	Eight Point	--	--	--	0.08	0.08
RWT372	1466.3	0.0184133	0.07	6642.65	Eight Point	--	--	--	0.15	0.15
RWT374	2309.9	0.016	0.05	6659.99	Eight Point	--	--	--	0.08	0.08
RWT376	2601.5	0.0103788	0.05	6623.3	Eight Point	--	--	--	0.08	0.08

24-hr Rainfall Depths		
Recurrence Interval	NOAA Depth (in) <sup>1</sup>	Adjusted Depth (in)
2-yr	2	1.96
5-yr	2.6	2.55
10-yr	3	2.94
25-yr	3.8	3.72
50-yr	4.2	4.12
100-yr	4.6	4.51
Areal Reduction DA=10.6 mi <sup>2</sup>		0.98

Notes:

<sup>1</sup> NOAA Atlas 2 Vol. III

Falcon DBPS								
Typella Rainfall Distribution								
Ordinate	Date/Time	Type Ila Cumulative	Recurrence					
		Precipitation (in)	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
1	01Jan2011, 00:00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	01Jan2011, 00:15	0.0005	0.0010	0.0013	0.0015	0.0019	0.0021	0.0023
3	01Jan2011, 00:30	0.0015	0.0029	0.0038	0.0044	0.0056	0.0062	0.0068
4	01Jan2011, 00:45	0.0030	0.0059	0.0077	0.0088	0.0112	0.0124	0.0135
5	01Jan2011, 01:00	0.0045	0.0088	0.0115	0.0132	0.0167	0.0185	0.0203
6	01Jan2011, 01:15	0.0060	0.0118	0.0153	0.0176	0.0223	0.0247	0.0271
7	01Jan2011, 01:30	0.0080	0.0157	0.0204	0.0235	0.0298	0.0330	0.0361
8	01Jan2011, 01:45	0.0100	0.0196	0.0255	0.0294	0.0372	0.0412	0.0451
9	01Jan2011, 02:00	0.0120	0.0235	0.0306	0.0353	0.0446	0.0494	0.0541
10	01Jan2011, 02:15	0.0143	0.0280	0.0365	0.0420	0.0532	0.0589	0.0645
11	01Jan2011, 02:30	0.0165	0.0323	0.0421	0.0485	0.0614	0.0680	0.0744
12	01Jan2011, 02:45	0.0188	0.0368	0.0479	0.0553	0.0699	0.0775	0.0848
13	01Jan2011, 03:00	0.0210	0.0412	0.0536	0.0617	0.0781	0.0865	0.0947
14	01Jan2011, 03:15	0.0233	0.0457	0.0594	0.0685	0.0867	0.0960	0.1050
15	01Jan2011, 03:30	0.0255	0.0500	0.0650	0.0750	0.0949	0.1051	0.1150
16	01Jan2011, 03:45	0.0278	0.0545	0.0709	0.0817	0.1034	0.1145	0.1254
17	01Jan2011, 04:00	0.0320	0.0627	0.0816	0.0941	0.1190	0.1318	0.1443
18	01Jan2011, 04:15	0.0390	0.0764	0.0995	0.1147	0.1451	0.1607	0.1759
19	01Jan2011, 04:30	0.0460	0.0902	0.1173	0.1352	0.1711	0.1895	0.2075
20	01Jan2011, 04:45	0.0530	0.1039	0.1352	0.1558	0.1972	0.2184	0.2390
21	01Jan2011, 05:00	0.0600	0.1176	0.1530	0.1764	0.2232	0.2472	0.2706
22	01Jan2011, 05:15	0.0750	0.1470	0.1913	0.2205	0.2790	0.3090	0.3383
23	01Jan2011, 05:30	0.1000	0.1960	0.2550	0.2940	0.3720	0.4120	0.4510
24	01Jan2011, 05:45	0.4000	0.7840	1.0200	1.1760	1.4880	1.6480	1.8040
25	01Jan2011, 06:00	0.7000	1.3720	1.7850	2.0580	2.6040	2.8840	3.1570
26	01Jan2011, 06:15	0.7250	1.4210	1.8488	2.1315	2.6970	2.9870	3.2698
27	01Jan2011, 06:30	0.7500	1.4700	1.9125	2.2050	2.7900	3.0900	3.3825
28	01Jan2011, 06:45	0.7650	1.4994	1.9508	2.2491	2.8458	3.1518	3.4502
29	01Jan2011, 07:00	0.7800	1.5288	1.9890	2.2932	2.9016	3.2136	3.5178
30	01Jan2011, 07:15	0.7900	1.5484	2.0145	2.3226	2.9388	3.2548	3.5629
31	01Jan2011, 07:30	0.8000	1.5680	2.0400	2.3520	2.9760	3.2960	3.6080
32	01Jan2011, 07:45	0.8100	1.5876	2.0655	2.3814	3.0132	3.3372	3.6531
33	01Jan2011, 08:00	0.8200	1.6072	2.0910	2.4108	3.0504	3.3784	3.6982
34	01Jan2011, 08:15	0.8250	1.6170	2.1038	2.4255	3.0690	3.3990	3.7208
35	01Jan2011, 08:30	0.8300	1.6268	2.1165	2.4402	3.0876	3.4196	3.7433
36	01Jan2011, 08:45	0.8350	1.6366	2.1293	2.4549	3.1062	3.4402	3.7659
37	01Jan2011, 09:00	0.8400	1.6464	2.1420	2.4696	3.1248	3.4608	3.7884
38	01Jan2011, 09:15	0.8450	1.6562	2.1548	2.4843	3.1434	3.4814	3.8110
39	01Jan2011, 09:30	0.8500	1.6660	2.1675	2.4990	3.1620	3.5020	3.8335
40	01Jan2011, 09:45	0.8550	1.6758	2.1803	2.5137	3.1806	3.5226	3.8561
41	01Jan2011, 10:00	0.8600	1.6856	2.1930	2.5284	3.1992	3.5432	3.8786
42	01Jan2011, 10:15	0.8638	1.6930	2.2027	2.5396	3.2133	3.5589	3.8957
43	01Jan2011, 10:30	0.8675	1.7003	2.2121	2.5505	3.2271	3.5741	3.9124
44	01Jan2011, 10:45	0.8713	1.7077	2.2218	2.5616	3.2412	3.5898	3.9296
45	01Jan2011, 11:00	0.8750	1.7150	2.2313	2.5725	3.2550	3.6050	3.9463
46	01Jan2011, 11:15	0.8788	1.7224	2.2409	2.5837	3.2691	3.6207	3.9634
47	01Jan2011, 11:30	0.8825	1.7297	2.2504	2.5946	3.2829	3.6359	3.9801
48	01Jan2011, 11:45	0.8863	1.7371	2.2601	2.6057	3.2970	3.6516	3.9972
49	01Jan2011, 12:00	0.8900	1.7444	2.2695	2.6166	3.3108	3.6668	4.0139
50	01Jan2011, 12:15	0.8938	1.7518	2.2792	2.6278	3.3249	3.6825	4.0310
51	01Jan2011, 12:30	0.8975	1.7591	2.2886	2.6387	3.3387	3.6977	4.0477
52	01Jan2011, 12:45	0.9013	1.7665	2.2983	2.6498	3.3528	3.7134	4.0649
53	01Jan2011, 13:00	0.9050	1.7738	2.3078	2.6607	3.3666	3.7286	4.0816
54	01Jan2011, 13:15	0.9083	1.7803	2.3162	2.6704	3.3789	3.7422	4.0964
55	01Jan2011, 13:30	0.9115	1.7865	2.3243	2.6798	3.3908	3.7554	4.1109
56	01Jan2011, 13:45	0.9148	1.7930	2.3327	2.6895	3.4031	3.7690	4.1257
57	01Jan2011, 14:00	0.9180	1.7993	2.3409	2.6989	3.4150	3.7822	4.1402
58	01Jan2011, 14:15	0.9210	1.8052	2.3486	2.7077	3.4261	3.7945	4.1537
59	01Jan2011, 14:30	0.9240	1.8110	2.3562	2.7166	3.4373	3.8069	4.1672
60	01Jan2011, 14:45	0.9270	1.8169	2.3639	2.7254	3.4484	3.8192	4.1808
61	01Jan2011, 15:00	0.9300	1.8228	2.3715	2.7342	3.4596	3.8316	4.1943
62	01Jan2011, 15:15	0.9325	1.8277	2.3779	2.7416	3.4689	3.8419	4.2056
63	01Jan2011, 15:30	0.9350	1.8326	2.3843	2.7489	3.4782	3.8522	4.2169
64	01Jan2011, 15:45	0.9375	1.8375	2.3906	2.7563	3.4875	3.8625	4.2281
65	01Jan2011, 16:00	0.9400	1.8424	2.3970	2.7636	3.4968	3.8728	4.2394
66	01Jan2011, 16:15	0.9425	1.8473	2.4034	2.7710	3.5061	3.8831	4.2507
67	01Jan2011, 16:30	0.9450	1.8522	2.4098	2.7783	3.5154	3.8934	4.2620
68	01Jan2011, 16:45	0.9475	1.8571	2.4161	2.7857	3.5247	3.9037	4.2732
69	01Jan2011, 17:00	0.9500	1.8620	2.4225	2.7930	3.5340	3.9140	4.2845
70	01Jan2011, 17:15	0.9525	1.8669	2.4289	2.8004	3.5433	3.9243	4.2958
71	01Jan2011, 17:30	0.9550	1.8718	2.4353	2.8077	3.5526	3.9346	4.3071
72	01Jan2011, 17:45	0.9575	1.8767	2.4416	2.8151	3.5619	3.9449	4.3183
73	01Jan2011, 18:00	0.9600	1.8816	2.4480	2.8224	3.5712	3.9552	4.3296
74	01Jan2011, 18:15	0.9625	1.8865	2.4544	2.8298	3.5805	3.9655	4.3409
75	01Jan2011, 18:30	0.9650	1.8914	2.4608	2.8371	3.5898	3.9758	4.3522
76	01Jan2011, 18:45	0.9675	1.8963	2.4671	2.8445	3.5991	3.9861	4.3634
77	01Jan2011, 19:00	0.9700	1.9012	2.4735	2.8518	3.6084	3.9964	4.3747
78	01Jan2011, 19:15	0.9725	1.9061	2.4799	2.8592	3.6177	4.0067	4.3860
79	01Jan2011, 19:30	0.9750	1.9110	2.4863	2.8665	3.6270	4.0170	4.3973
80	01Jan2011, 19:45	0.9775	1.9159	2.4926	2.8739	3.6363	4.0273	4.4085
81	01Jan2011, 20:00	0.9800	1.9208	2.4990	2.8812	3.6456	4.0376	4.4198
82	01Jan2011, 20:15	0.9813	1.9233	2.5023	2.8850	3.6504	4.0430	4.4257
83	01Jan2011, 20:30	0.9825	1.9257	2.5054	2.8886	3.6549	4.0479	4.4311
84	01Jan2011, 20:45	0.9838	1.9282	2.5087	2.8924	3.6597	4.0533	4.4369
85	01Jan2011, 21:00	0.9850	1.9306	2.5118	2.8959	3.6642	4.0582	4.4424
86	01Jan2011, 21:15	0.9863	1.9331	2.5151	2.8997	3.6690	4.0636	4.4482
87	01Jan2011, 21:30	0.9875	1.9355	2.5181	2.9033	3.6735	4.0685	4.4536
88	01Jan2011, 21:45	0.9888	1.9380	2.5214	2.9071	3.6783	4.0739	4.4595
89	01Jan2011, 22:00	0.9900	1.9404	2.5245	2.9106	3.6828	4.0788	4.4649
90	01Jan2011, 22:15	0.9913	1.9429	2.5278	2.9144	3.6876	4.0842	4.4708
91	01Jan2011, 22:30	0.9925	1.9453	2.5309	2.9180	3.6921	4.0891	4.4762
92	01Jan2011, 22:45	0.9938	1.9478	2.5342	2.9218	3.6969	4.0945	4.4820
93	01Jan2011, 23:00	0.9950	1.9502	2.5373	2.9253	3.7014	4.0994	4.4875
94	01Jan2011, 23:15	0.9963	1.9527	2.5406	2.9291	3.7062	4.1048	4.4933
95	01Jan2011, 23:30	0.9975	1.9551	2.5436	2.9327	3.7107	4.1097	4.4987
96	01Jan2011, 23:45	0.9988	1.9576	2.5469	2.9365	3.7155	4.1151	4.5046
97	02Jan2011, 00:00	1.0000	1.9600	2.5500	2.9400	3.7200	4.1200	4.5100



Falcon DBPS  
Peak Flow Results

Hydrologic Element	Area (sq mi)	Historical Peak Flows (cfs)					
		2-year	5-year	10-year	25-year	50-year	100-year
ET010	0.15	10	22	32	57	71	86
ET020	0.21	20	44	63	110	140	170
ET030	0.20	0	2	5	14	21	28
ET040	0.15	0	2	5	16	22	30
ET050	0.12	0	1	5	18	27	38
ET060	0.29	0	4	15	54	80	110
ET070	0.25	0	3	10	38	58	79
ET080	0.29	0	2	6	23	35	49
ET090	0.12	0	1	2	6	9	12
ET100	0.05	0	1	2	7	11	15
ET110	0.23	0	1	5	18	27	38
ET120	0.11	0	1	2	6	10	14
ET130	0.13	0	1	2	6	8	12
ET140	0.27	0	1	3	8	12	17
ET150	0.18	0	1	4	14	22	30
ET160	0.19	0	2	6	15	22	30
FS010	0.12	0	2	5	12	17	23
JET010	0.15	10	22	32	57	71	86
JET020	0.36	20	45	67	130	160	200
JET030	0.56	20	46	71	140	180	230
JET040	0.71	19	48	74	150	190	240
JET050	0.83	19	48	75	150	200	250
JET060	1.11	19	48	77	150	200	260
JET070	1.36	19	49	79	160	210	260
JET080	1.66	17	46	74	150	200	250
JET090	1.78	17	47	75	150	200	260
JET100	1.83	17	47	75	150	200	260
JET110	2.05	17	47	76	160	210	260
JET120	2.16	17	47	77	160	210	270
JET130	0.13	0	1	2	6	8	12
JET140	0.40	0	2	4	14	21	29
JET152	2.57	17	49	81	170	230	290
JET154	2.74	17	49	82	170	230	300
JET160	2.93	18	48	81	180	240	300
JFS010_OUTLET	0.12	0	2	5	12	17	23
JMT010	0.29	1	7	13	32	44	57
JMT020	0.09	8	20	30	54	68	83
JMT030	0.25	15	38	58	100	130	160
JMT040	0.56	24	65	99	180	230	290
JMT050	0.67	24	65	100	190	240	300
JMT060	1.16	24	66	100	200	260	330
JMT070	1.36	24	67	110	210	280	350
JMT080	1.42	24	68	110	210	280	350
JMT090	0.04	0	1	3	10	14	19
JMT102	1.46	24	68	110	220	280	360
JMT104	0.04	0	1	3	10	14	19
JMT106	1.52	24	68	110	210	280	360
JMT110	1.64	22	63	120	220	290	360
JWT010	0.14	7	18	27	51	65	80
JWT020	0.07	3	8	12	23	29	36
JWT030	0.14	6	15	23	46	60	75
JWT042	0.28	12	32	50	97	120	160
JWT044	0.46	19	49	77	150	190	240
JWT050	0.85	33	87	140	260	330	410
JWT070	0.17	10	27	42	77	99	120
JWT080	1.09	40	110	170	330	420	510
JWT090	1.43	49	120	200	380	500	610
JWT110	1.63	56	150	220	440	580	720
JWT120	1.77	58	150	230	460	600	750
JWT140	0.13	13	28	40	70	88	110
JWT150	0.36	21	44	64	110	140	170
JWT160	0.47	23	50	71	120	160	190
JWT172	2.24	79	200	300	580	750	930
JWT174	2.36	81	200	310	590	760	950
JWT180	2.46	81	200	310	600	770	960

Hydrologic Element	Area (sq mi)	Existing Peak Flows (cfs)					
		2-year	5-year	10-year	25-year	50-year	100-year
ET010	0.15	25	47	64	100	130	150
ET020	0.21	44	84	110	180	220	260
ET030	0.20	34	62	84	130	160	190
ET040	0.15	28	53	72	120	140	170
ET050	0.12	37	67	89	140	170	200
ET060	0.29	110	190	250	380	450	530
ET070	0.25	94	160	220	330	400	460
ET080	0.29	91	160	210	320	380	440
ET090	0.12	7	16	24	41	52	63
ET100	0.05	1	6	10	21	27	34
ET110	0.23	8	24	38	73	94	120
ET120	0.11	8	18	26	46	57	70
ET130	0.13	7	16	23	41	51	62
ET140	0.27	11	23	34	59	73	89
ET150	0.18	17	37	53	91	110	140
ET160	0.19	19	39	55	92	110	140
FS010	0.12	2	6	11	24	32	41
JET010	0.15	23	37	49	80	99	120
JET020	0.36	44	85	120	190	240	280
JET030	0.56	65	130	190	310	380	460
JET040	0.71	23	59	110	260	390	480
JET050	0.83	7	32	67	170	260	410
JET060	1.11	13	28	45	180	240	340
JET070	1.36	94	170	220	350	420	490
JET080	1.66	14	36	55	170	230	320
JET090	1.78	15	39	64	170	270	370
JET100	1.83	15	40	65	170	270	380
JET110	2.05	16	43	76	180	300	410
JET120	2.16	17	48	84	190	320	430
JET130	0.13	7	16	23	41	51	62
JET140	0.40	18	39	57	99	120	150
JET152	2.57	28	86	140	290	430	570
JET154	2.74	31	91	140	300	450	590
JET160	2.93	32	96	150	320	470	620
JFS010_OUTLET	0.12	2	6	11	24	32	41
JMT010	0.29	1	11	25	62	120	160
JMT020	0.09	14	29	41	70	86	100
JMT030	0.25	34	74	100	160	200	240
JMT040	0.56	40	120	190	320	400	470
JMT050	0.67	50	150	230	390	490	580
JMT060	1.16	54	160	250	450	560	670
JMT070	1.36	61	180	280	510	630	760
JMT080	1.42	40	110	260	510	640	770
JMT090	0.04	8	13	16	23	27	30
JMT102	1.46	44	110	270	530	660	790
JMT104	0.04	8	13	16	23	27	30
JMT106	1.52	45	120	260	530	660	800
JMT110	1.64	46	120	260	540	680	820
JWT010	0.14	9	21	32	58	73	89
JWT020	0.07	4	10	15	27	34	42
JWT030	0.14	9	20	30	55	69	85
JWT042	0.28	15	37	57	110	140	170
JWT044	0.46	24	59	89	170	210	260
JWT050	0.85	43	110	170	310	390	480
JWT070	0.17	14	33	49	87	110	130
JWT080	1.09	54	140	210	400	500	610
JWT090	1.43	67	160	250	470	600	740
JWT110	1.63	76	180	280	540	700	850
JWT120	1.77	84	190	300	570	740	910
JWT140	0.13	14	30	43	74	92	110
JWT150	0.36	11	15	17	43	66	91
JWT160	0.47	35	64	85	130	160	180
JWT172	2.24	90	210	320	600	760	930
JWT174	2.36	92	210	320	610	780	960
JWT174 Diversion	2.36	0	15	130	410	580	760

Hydrologic Element	Area (sq mi)	Future Peak Flows (cfs)					
		2-year	5-year	10-year	25-year	50-year	100-year
ET010	0.15	38	67	90	140	170	200
ET020	0.21	73	130	170	260	310	360
ET030	0.20	45	81	110	170	210	240
ET040	0.15	28	53	72	120	140	170
ET050	0.12	37	67	89	140	170	200
ET060	0.29	110	190	250	380	450	530
ET070	0.25	94	160	220	330	400	460
ET080	0.29	110	190	250	380	450	520
ET090	0.12	26	46	61	95	110	130
ET100	0.05	11	22	31	50	61	72
ET110	0.23	24	53	76	130	160	200
ET120	0.11	11	24	34	59	74	89
ET130	0.13	11	23	33	57	71	85
ET140	0.27	16	33	48	82	100	120
ET150	0.18	17	37	53	91	110	140
ET160	0.19	19	39	55	92	110	140
FS010	0.12	6	17	26	48	61	75
JET010	0.15	29	49	64	110	130	150
JET020	0.36	74	130	170	270	330	390
JET030	0.56	97	180	250	410	500	580
JET040	0.71	27	85	140	380	500	570
JET050	0.83	11	38	88	210	380	530
JET060	1.11	13	32	68	210	300	430
JET070	1.36	94	170	220	350	420	480
JET080	1.66	15	38	61	200	270	350
JET090	1.78	26	47	81	200	290	390
JET100	1.83	27	49	83	200	290	390
JET110	2.05	40	85	120	210	320	440
JET120	2.16	49	110	160	270	340	450
JET130	0.13	11	23	33	57	71	85
JET140	0.40	26	55	80	140	170	200
JET152	2.57	51	120	180	350	500	650
JET154	2.74	62	140	200	370	530	680
JET160	2.93	66	150	230	410	550	710
JFS010_OUTLET	0.12	6	17	26	48	61	75
JMT010	0.29	1	11	25	62	120	160
JMT020	0.09	26	47	64	100	120	140
JMT030	0.25	50	94	130	200	250	290
JMT040	0.56	110	240	330	520	620	750
JMT050	0.67	120	280	380	590	710	850
JMT060	1.16	130	310	430	700	850	1,000
JMT070	1.36	150	350	490	800	980	1,200
JMT080	1.42	86	330	490	810	980	1,200
JMT090	0.04	9	15	18	25	29	32
JMT102	1.46	91	330	500	820	1,000	1,200
JMT104	0.04	9	15	18	25	29	32
JMT106	1.52	92	320	490	820	1,000	1,200
JMT110	1.64	94	320	500	830	1,000	1,200
JWT010	0.14	9	21	32	58	73	89
JWT020	0.07	4	10	15	27	34	42
JWT030	0.14	9	20	30	55	69	85
JWT042	0.28	15	37	57	110	140	170
JWT044	0.46	24	59	89	170	210	260
JWT050	0.85	43	110	170	310	390	480
JWT070	0.17	14	33	49	87	110	130
JWT080	1.09	54	140	210	400	500	610
JWT090	1.43	68	160	250	480	610	730
JWT110	1.63	77	170	280	530	690	840
JWT120	1.77	85	190	300	570	730	920
JWT140	0.13	32	59	80	130	150	180
JWT150	0.36	15	19	39	97	140	170
JWT160	0.47	35	64	85	130	160	190
JWT172	2.24	99	210	320	600	760	960
JWT174	2.36	100	210	330	610	780	990
JWT180	2.46	100	220	330	620	800	1,000

Falcon DBPS  
Peak Flow Results

Hydrologic Element	Area (sq mi)	Historical Peak Flows (cfs)					
		2-year	5-year	10-year	25-year	50-year	100-year
JWT190	0.06	0	0	2	7	10	14
JWT200	2.82	80	200	310	610	790	990
JWT210	3.09	80	200	320	620	810	1,000
JWT220	0.19	1	7	12	28	38	49
JWT232	3.28	81	210	320	630	830	1,000
JWT234	3.47	82	210	330	640	840	1,100
JWT240	3.55	83	210	330	650	840	1,100
JWT250	3.70	84	210	330	650	850	1,100
JWT260	3.84	86	220	340	670	870	1,100
JWT270	0.03	0	2	4	8	11	15
JWT280	0.27	22	50	72	130	160	190
JWT292	3.87	86	220	340	670	870	1,100
JWT294	4.13	89	220	350	690	900	1,100
JWT296	5.88	110	290	420	860	1,100	1,400
JWT300	0.10	6	14	22	39	50	61
JWT310	6.25	110	290	430	870	1,100	1,500
JWT320	6.46	110	290	430	880	1,100	1,500
JWT330	0.33	0	3	7	23	34	47
JWT352	9.69	110	300	460	970	1,300	1,600
JWT354	10.30	110	310	470	990	1,300	1,700
JWT360	0.07	1	3	5	11	15	20
JWT372	10.36	110	310	470	990	1,300	1,700
JWT374_OUTLET	10.58	110	310	470	990	1,300	1,700
MT010	0.29	1	7	13	32	44	57
MT020	0.09	8	20	30	54	68	83
MT030	0.16	7	20	32	61	78	97
MT040	0.31	10	28	43	82	110	130
MT050	0.12	0	1	2	7	11	16
MT060	0.19	0	1	4	14	22	31
MT070	0.20	0	2	5	13	19	25
MT080	0.06	2	8	14	29	38	48
MT090	0.04	0	1	3	10	14	19
MT100	0.06	0	0	1	5	8	11
MT110	0.12	0	1	2	8	12	16
RET020	0.15	10	22	32	57	71	82
RET030	0.36	19	44	67	120	160	200
RET040	0.56	19	46	71	140	180	230
RET050	0.71	19	47	74	150	190	240
RET060	0.83	19	47	75	150	190	250
RET070	1.11	19	48	77	150	200	250
RET080	1.36	17	45	72	140	190	240
RET090	1.66	17	46	74	150	200	250
RET100	1.78	17	47	75	150	200	260
RET110	1.83	17	47	75	150	200	260
RET120	2.05	17	47	76	160	210	260
RET140	0.13	0	1	2	6	8	12
RET152	2.16	17	47	77	160	210	270
RET154	0.40	0	2	4	14	21	29
RET156	2.57	17	49	81	170	230	290
RET162	2.74	17	48	80	170	230	300
RET164	2.93	18	48	81	180	240	300
RMT030	0.09	8	20	30	54	67	82
RMT040	0.25	14	38	57	100	130	160
RMT050	0.56	24	65	99	180	230	290
RMT062	0.29	1	7	13	31	44	57
RMT064	0.67	24	65	100	190	240	300
RMT070	1.16	24	66	100	200	260	330
RMT080	1.36	24	67	110	210	280	350
RMT090	0.04	0	1	3	10	14	19
RMT102	1.42	24	68	110	210	280	350
RMT104	0.04	0	1	3	10	14	19
RMT106	1.46	24	67	110	210	280	350
RMT112	1.52	22	62	120	210	280	360
RMT114	1.64	22	63	110	220	290	360
RWT030	0.07	3	8	12	23	29	36

Hydrologic Element	Area (sq mi)	Existing Peak Flows (cfs)					
		2-year	5-year	10-year	25-year	50-year	100-year
JWT174 Diversion_OUTLET	0.00	92	200	200	200	200	200
JWT180	2.46	0	15	130	420	590	770
JWT190	0.06	4	7	12	26	35	43
JWT200	2.82	14	32	150	470	670	880
JWT210	3.09	21	50	170	510	720	950
JWT220	0.19	16	35	50	88	110	130
JWT232	3.28	27	64	180	530	750	990
JWT234	3.47	50	93	180	540	760	1,000
JWT240	3.55	26	54	86	410	670	890
JWT250	3.70	39	75	100	420	680	890
JWT260	3.84	47	92	130	420	690	910
JWT270	0.03	8	14	20	31	38	45
JWT280	0.27	33	70	100	170	210	250
JWT292	3.87	49	97	130	430	690	910
JWT294	4.13	71	140	200	440	700	930
JWT296	5.88	94	190	350	700	1,000	1,300
JWT300	0.10	12	26	36	62	76	92
JWT310	6.25	120	230	370	730	1,000	1,300
JWT320	6.46	120	250	370	740	1,000	1,300
JWT330	0.33	16	38	57	100	130	160
JWT352	9.69	160	320	520	1,000	1,400	1,900
JWT354	10.30	190	400	590	1,100	1,400	1,900
JWT360	0.07	7	15	21	37	46	55
JWT372	10.36	190	400	600	1,200	1,500	1,900
JWT374_OUTLET	10.58	190	400	600	1,200	1,500	1,900
MT010	0.29	28	58	82	140	170	210
MT020	0.09	14	29	41	70	86	100
MT030	0.16	30	59	82	130	160	190
MT040	0.31	34	70	100	170	210	250
MT050	0.12	17	33	46	76	92	110
MT060	0.19	8	21	33	62	80	99
MT070	0.20	10	23	34	61	77	93
MT080	0.06	58	86	110	140	170	190
MT090	0.04	36	54	67	94	110	120
MT100	0.06	11	22	30	49	59	70
MT110	0.12	19	36	50	81	99	120
Paint Brush Hills Pond #4	0.15	23	37	49	80	99	120
Paint Brush Hills Pond A	0.10	10	18	24	64	97	130
Paint Brush Hills Pond B1	0.36	23	46	70	120	150	170
Paint Brush Hills Pond B2	0.36	11	15	17	43	66	91
Paint Brush Hills Pond C	0.19	7	11	13	30	45	60
Regional Pond MN	1.42	40	110	260	510	640	770
Regional Pond WU Diversion	3.55	14	46	97	510	730	970
Regional Pond WU North	3.55	30	69	130	550	770	1,000
Regional Pond WU South	3.55	10	32	57	370	630	850
RET020	0.15	23	37	49	79	98	120
RET030	0.36	43	83	110	190	230	280
RET040	0.56	62	130	190	310	380	460
RET050	0.71	23	59	110	260	380	480
RET060	0.83	7	32	67	170	260	400
RET070	1.11	13	28	45	180	240	340
RET080	1.36	65	120	160	270	340	420
RET090	1.66	14	36	55	170	230	320
RET100	1.78	15	39	64	170	270	370
RET110	1.83	15	40	65	170	270	380
RET120	2.05	16	43	76	180	300	410
RET140	0.13	7	16	23	41	51	62
RET152	2.16	17	48	84	190	320	430
RET154	0.40	18	39	57	99	120	150
RET156	2.57	28	86	140	290	430	570
RET162	2.74	30	91	140	300	450	590
RET164	2.93	32	96	150	310	470	620
RMT030	0.09	14	29	41	69	85	100
RMT040	0.25	33	73	100	160	200	240
RMT050	0.56	40	120	190	320	400	470

Hydrologic Element	Area (sq mi)	Future Peak Flows (cfs)					
		2-year	5-year	10-year	25-year	50-year	100-year
JWT190	0.06	4	7	12	26	35	43
JWT200	2.82	110	230	360	690	890	1,200
JWT210	3.09	120	250	400	760	990	1,300
JWT220	0.19	47	85	110	180	210	250
JWT232	3.28	120	260	410	790	1,000	1,400
JWT234	3.47	130	270	420	810	1,000	1,400
JWT240	3.55	83	200	380	770	940	1,100
JWT250	3.70	85	210	390	780	950	1,100
JWT260	3.84	86	210	390	790	970	1,100
JWT270	0.03	11	20	27	41	49	57
JWT280	0.27	33	70	100	170	210	250
JWT292	3.87	86	210	390	790	970	1,100
JWT294	4.13	96	210	400	800	990	1,100
JWT296	5.88	160	410	620	1,100	1,400	1,700
JWT300	0.10	12	26	36	62	76	92
JWT310	6.25	160	420	640	1,100	1,400	1,700
JWT320	6.46	160	410	630	1,100	1,400	1,700
JWT330	0.33	32	68	98	170	210	250
JWT352	9.69	210	530	820	1,400	2,000	2,400
JWT354	10.30	230	560	870	1,500	2,000	2,500
JWT360	0.07	7	15	21	37	46	55
JWT372	10.36	230	560	860	1,500	2,000	2,500
JWT374_OUTLET	10.58	230	560	860	1,500	2,000	2,500
MT010	0.29	28	58	82	140	170	210
MT020	0.09	26	47	64	100	120	140
MT030	0.16	39	73	100	160	190	230
MT040	0.31	95	160	220	330	390	460
MT050	0.12	17	33	46	76	92	110
MT060	0.19	30	59	83	140	170	200
MT070	0.20	25	50	69	110	140	170
MT080	0.06	62	92	110	150	170	190
MT090	0.04	40	59	73	100	110	130
MT100	0.06	17	30	40	63	75	88
MT110	0.12	19	36	50	81	99	120
Paint Brush Hills Pond #4	0.15	29	49	64	110	130	150
Paint Brush Hills Pond A	0.10	10	18	24	64	97	130
Paint Brush Hills Pond B1	0.36	51	100	140	190	210	270
Paint Brush Hills Pond B2	0.36	15	19	39	97	140	170
Paint Brush Hills Pond C	0.19	11	14	23	56	74	160
Regional Pond MN	1.42	86	330	490	810	980	1,200
Regional Pond WU Diversion	3.55	83	230	380	770	1,000	1,300
Regional Pond WU North	3.55	110	270	420	810	1,100	1,400
Regional Pond WU South	3.55	55	170	340	730	900	1,000
RET020	0.15	29	49	64	100	130	150
RET030	0.36	71	130	170	270	320	380
RET040	0.56	95	180	250	400	490	580
RET050	0.71	27	85	140	370	490	570
RET060	0.83	11	38	88	210	370	530
RET070	1.11	13	32	68	210	300	430
RET080	1.36	65	120	170	270	340	420
RET090	1.66	15	38	61	200	270	350
RET100	1.78	26	47	81	200	290	390
RET110	1.83	27	49	83	200	290	390
RET120	2.05	39	84	120	210	320	430
RET140	0.13	11	23	33	57	70	85
RET152	2.16	49	110	150	270	340	450
RET154	0.40	26	55	80	140	170	200
RET156	2.57	50	120	180	350	500	650
RET162	2.74	59	130	200	360	530	680
RET164	2.93	66	150	230	410	550	710
RMT030	0.09	25	47	63	100	120	140
RMT040	0.25	49	93	130	200	250	290
RMT050	0.56	110	240	330	520	620	750
RMT062	0.29	1	11	25	62	110	160
RMT064	0.67	120	270	370	590	710	850

Falcon DBPS  
Peak Flow Results

Hydrologic Element	Area (sq mi)	Historical Peak Flows (cfs)					
		2-year	5-year	10-year	25-year	50-year	100-year
RWT042	0.14	6	15	23	46	60	75
RWT044	0.14	7	18	27	51	65	80
RWT046	0.28	12	32	50	97	120	150
RWT054	0.46	18	49	77	150	190	240
RWT080	0.17	10	27	42	77	98	120
RWT092	0.85	33	87	140	260	330	410
RWT094	1.09	40	110	170	330	420	510
RWT122	1.43	48	120	200	380	500	610
RWT124	1.63	56	140	220	440	580	720
RWT150	0.13	13	28	40	70	87	110
RWT160	0.36	21	44	64	110	140	170
RWT172	1.77	58	150	230	460	600	750
RWT174	0.47	23	49	71	120	160	190
RWT176	2.24	79	200	300	580	750	930
RWT180	2.36	81	200	310	590	760	950
RWT202	2.46	80	200	310	600	770	960
RWT204	0.06	0	0	2	7	10	14
RWT210	2.82	80	200	310	610	790	990
RWT232	3.09	80	200	320	620	810	1,000
RWT234	0.19	1	7	12	28	38	49
RWT236	3.28	81	210	320	630	830	1,000
RWT240	3.47	82	210	330	640	840	1,100
RWT250	3.55	83	210	330	650	840	1,100
RWT260	3.70	84	210	330	650	850	1,100
RWT291	3.84	86	220	340	670	870	1,100
RWT292	0.03	0	2	4	8	11	15
RWT294	0.27	22	50	72	130	160	190
RWT295	3.87	86	220	340	670	870	1,100
RWT296	4.13	88	220	350	680	890	1,100
RWT312	0.10	6	14	22	39	49	60
RWT314	5.88	110	290	420	860	1,100	1,400
RWT320	6.25	110	290	430	870	1,100	1,500
RWT344	0.33	0	3	7	23	34	47
RWT352	6.46	110	290	430	870	1,100	1,500
RWT354	9.69	110	300	460	970	1,300	1,600
RWT372	10.30	110	310	470	990	1,300	1,700
RWT374	0.07	1	3	5	11	15	20
RWT376	10.36	190	400	600	1,100	1,500	1,900
WT010	0.14	7	18	27	51	65	80
WT020	0.07	3	8	12	23	29	36
WT030	0.08	6	14	21	38	48	59
WT040	0.19	7	18	28	53	68	83
WT050	0.19	14	32	47	83	100	130
WT060	0.20	9	21	31	55	70	85
WT070	0.17	10	27	42	77	99	120
WT080	0.07	7	16	23	41	51	62
WT090	0.15	15	33	48	83	100	130
WT100	0.19	25	55	78	130	170	200
WT110	0.19	13	30	45	79	100	120
WT120	0.05	0	1	2	8	11	15
WT130	0.10	11	25	37	64	80	97
WT140	0.13	13	28	40	70	88	110
WT150	0.23	11	24	35	61	77	93
WT160	0.11	17	36	51	86	110	130
WT170	0.12	7	18	28	52	67	82
WT180	0.10	0	1	2	6	9	12
WT190	0.06	0	0	2	7	10	14
WT200	0.30	0	1	4	12	18	25
WT210	0.27	0	2	4	11	16	21
WT220	0.19	1	7	12	28	38	49
WT230	0.20	5	18	29	60	79	99
WT240	0.08	9	20	29	52	64	78
WT250	0.15	7	22	35	68	88	110
WT260	0.14	6	13	19	33	42	51
WT270	0.03	0	2	4	8	11	15

Hydrologic Element	Area (sq mi)	Existing Peak Flows (cfs)					
		2-year	5-year	10-year	25-year	50-year	100-year
RMT062	0.29	1	11	25	62	110	160
RMT064	0.67	50	140	230	390	490	580
RMT070	1.16	54	150	250	440	560	670
RMT080	1.36	61	180	280	500	630	760
RMT090	0.04	8	13	16	23	27	30
RMT102	1.42	40	110	260	510	640	770
RMT104	0.04	8	13	16	23	27	30
RMT106	1.46	44	110	250	520	650	780
RMT112	1.52	44	120	250	520	650	790
RMT114	1.64	46	120	260	540	670	820
RWT030	0.07	4	10	15	27	34	42
RWT042	0.14	9	20	30	54	69	85
RWT044	0.14	9	21	32	57	73	89
RWT046	0.28	15	37	57	110	140	170
RWT054	0.46	24	59	89	170	210	260
RWT080	0.17	14	33	48	87	110	130
RWT092	0.85	43	110	170	310	390	480
RWT094	1.09	54	140	210	400	500	610
RWT122	1.43	66	160	250	470	600	740
RWT124	1.63	76	180	280	540	700	850
RWT150	0.13	14	30	43	74	92	110
RWT160	0.36	11	15	17	43	66	91
RWT172	1.77	84	190	300	570	730	900
RWT174	0.47	35	62	84	130	160	180
RWT176	2.24	90	210	320	600	760	930
RWT180	2.36	0	14	130	410	580	760
RWT202	2.46	0	14	130	420	590	770
RWT204	0.06	4	7	12	26	34	43
RWT210	2.82	14	32	150	470	670	880
RWT232	3.09	20	50	170	510	720	950
RWT234	0.19	16	35	50	88	110	130
RWT236	3.28	27	64	180	530	750	990
RWT240	3.47	50	93	180	540	760	1,000
RWT240_Diversion Reach	0.00	16	23	31	38	38	39
RWT250	3.55	26	54	86	410	670	880
RWT260	3.70	38	73	100	410	670	890
RWT291	3.84	46	91	130	420	690	910
RWT292	0.03	8	14	19	31	38	45
RWT294	0.27	33	70	100	170	210	250
RWT295	3.87	49	97	130	430	690	910
RWT296	4.13	70	140	200	440	700	920
RWT312	0.10	12	25	36	61	76	91
RWT314	5.88	93	190	350	700	1,000	1,300
RWT320	6.25	120	230	360	720	1,000	1,300
RWT344	0.33	16	38	57	100	130	160
RWT352	6.46	120	240	360	730	1,000	1,300
RWT354	9.69	160	320	520	1,000	1,400	1,900
RWT372	10.30	190	400	590	1,100	1,400	1,900
RWT374	0.07	7	15	21	36	45	55
RWT376	10.36	190	400	600	1,100	1,500	1,900
The Meadows Pond #1	0.06	4	7	12	26	35	43
The Meadows Pond #2	0.29	1	11	25	62	120	160
Woodmen Hills Pond #1 North	0.71	59	130	190	320	400	480
Woodmen Hills Pond #1 South	0.71	23	59	110	260	390	480
Woodmen Hills Pond #2	0.83	7	32	67	170	260	410
Woodmen Hills Pond #3	1.11	13	28	45	180	240	340
Woodmen Hills Pond #4	1.66	14	36	55	170	230	320
Woodmen Hills Pond #5	0.04	8	13	16	23	27	30
Woodmen Hills Pond H	0.56	40	120	190	320	400	470
WT010	0.14	9	21	32	58	73	89
WT020	0.07	4	10	15	27	34	42
WT030	0.08	9	20	29	50	62	75
WT040	0.19	9	22	33	60	76	93
WT050	0.19	17	37	54	93	120	140
WT060	0.20	14	30	44	77	96	120

Hydrologic Element	Area (sq mi)	Future Peak Flows (cfs)					
		2-year	5-year	10-year	25-year	50-year	100-year
RMT070	1.16	130	310	430	690	840	1,000
RMT080	1.36	150	350	490	800	980	1,200
RMT090	0.04	9	15	18	25	29	32
RMT102	1.42	86	320	490	800	980	1,200
RMT104	0.04	9	15	18	25	29	32
RMT106	1.46	91	320	490	810	990	1,200
RMT112	1.52	92	310	490	810	990	1,200
RMT114	1.64	94	320	500	830	1,000	1,200
RWT030	0.07	4	10	15	27	34	42
RWT042	0.14	9	20	30	54	69	85
RWT044	0.14	9	21	32	57	73	89
RWT046	0.28	15	37	57	110	140	170
RWT054	0.46	24	59	89	170	210	260
RWT080	0.17	14	33	48	87	110	130
RWT092	0.85	43	110	170	310	390	480
RWT094	1.09	54	140	210	400	500	610
RWT122	1.43	68	160	250	480	610	730
RWT124	1.63	77	170	280	530	690	840
RWT150	0.13	32	59	79	130	150	180
RWT160	0.36	15	19	39	97	140	170
RWT172	1.77	85	190	300	570	730	920
RWT174	0.47	35	63	84	130	160	180
RWT176	2.24	98	210	320	600	760	960
RWT180	2.36	100	210	330	610	780	990
RWT202	2.46	100	220	330	620	800	1,000
RWT204	0.06	4	7	12	26	34	43
RWT210	2.82	110	230	360	690	890	1,200
RWT232	3.09	120	250	400	760	990	1,300
RWT234	0.19	47	84	110	180	210	250
RWT236	3.28	120	260	410	790	1,000	1,400
RWT240	3.47	130	270	420	810	1,000	1,400
RWT240_Diversion Reach	0.00	30	37	38	38	39	39
RWT250	3.55	83	200	380	770	940	1,100
RWT260	3.70	85	210	380	780	950	1,100
RWT291	3.84	86	210	390	790	970	1,100
RWT292	0.03	11	20	26	41	49	57
RWT294	0.27	33	70	100	170	210	250
RWT295	3.87	86	210	390	790	970	1,100
RWT296	4.13	94	210	400	800	990	1,100
RWT312	0.10	12	25	36	61	76	91
RWT314	5.88	160	400	620	1,100	1,400	1,700
RWT320	6.25	160	400	620	1,100	1,400	1,700
RWT344	0.33	32	68	97	170	210	250
RWT352	6.46	160	400	620	1,100	1,400	1,700
RWT354	9.69	210	530	820	1,400	2,000	2,400
RWT372	10.30	230	560	860	1,500	2,000	2,500
RWT374	0.07	7	15	21	36	45	55
RWT376	10.36	230	550	850	1,500	2,000	2,500
The Meadows Pond #1	0.06	4	7	12	26	35	43
The Meadows Pond #2	0.29	1	11	25	62	120	160
Woodmen Hills Pond #1 North	0.71	88	180	260	420	500	570
Woodmen Hills Pond #1 South	0.71	27	85	140	380	500	570
Woodmen Hills Pond #2	0.83	11	38	88	210	380	530
Woodmen Hills Pond #3	1.11	13	32	68	210	300	430
Woodmen Hills Pond #4	1.66	15	38	61	200	270	350
Woodmen Hills Pond #5	0.04	9	15	18	25	29	32
Woodmen Hills Pond #6	0.56	110	240	220	520	620	750
WT010	0.14	9	21	32	58	73	89
WT020	0.07	4	10	15	27	34	42
WT030	0.08	9	20	29	50	62	75
WT040	0.19	9	22	33	60	76	93
WT050	0.19	17	37	54	93	120	140
WT060	0.20	14	30	44	77	96	120
WT070	0.17	14	33	49	87	110	130
WT080	0.07	9	19	27	45	56	67

Falcon DBPS  
Peak Flow Results

Hydrologic Element	Area (sq mi)	Historical Peak Flows (cfs)					
		2-year	5-year	10-year	25-year	50-year	100-year
WT280	0.27	22	50	72	130	160	190
WT290	0.10	3	11	19	38	50	62
WT300	0.10	6	14	22	39	50	61
WT310	0.28	2	8	16	37	51	67
WT320	0.21	0	2	6	17	26	35
WT330	0.33	0	3	7	23	34	47
WT340	0.28	0	3	6	17	25	34
WT350	0.30	3	12	21	45	61	78
WT360	0.07	1	3	5	11	15	20
WT370	0.21	0	2	5	16	24	33

Hydrologic Element	Area (sq mi)	Existing Peak Flows (cfs)					
		2-year	5-year	10-year	25-year	50-year	100-year
WT070	0.17	14	33	49	87	110	130
WT080	0.07	9	19	27	45	56	67
WT090	0.15	17	36	51	88	110	130
WT100	0.19	28	59	83	140	170	210
WT110	0.19	15	33	48	84	110	130
WT120	0.05	2	6	10	19	25	31
WT130	0.10	35	61	81	120	150	170
WT140	0.13	14	30	43	74	92	110
WT150	0.23	20	40	56	95	120	140
WT160	0.11	35	64	85	130	160	180
WT170	0.12	10	23	35	62	79	96
WT180	0.10	0	1	3	7	11	15
WT190	0.06	11	23	31	51	63	75
WT200	0.30	10	25	37	69	87	110
WT210	0.27	7	18	27	51	65	80
WT220	0.19	16	35	50	88	110	130
WT230	0.20	50	92	120	200	240	280
WT240	0.08	28	49	65	100	120	140
WT250	0.15	39	72	98	160	190	220
WT260	0.14	10	21	30	52	64	78
WT270	0.03	8	14	20	31	38	45
WT280	0.27	33	70	100	170	210	250
WT290	0.10	15	31	44	75	92	110
WT300	0.10	12	26	36	62	76	92
WT310	0.28	20	47	68	120	150	180
WT320	0.21	18	40	58	100	130	150
WT330	0.33	16	38	57	100	130	160
WT340	0.28	19	40	57	98	120	150
WT350	0.30	26	55	80	140	170	210
WT360	0.07	7	15	21	37	46	55
WT370	0.21	1	7	14	35	49	64

Hydrologic Element	Area (sq mi)	Future Peak Flows (cfs)					
		2-year	5-year	10-year	25-year	50-year	100-year
WT090	0.15	22	46	65	110	140	160
WT100	0.19	56	100	140	210	260	300
WT110	0.19	22	47	67	110	140	170
WT120	0.05	8	18	22	37	48	55
WT130	0.10	35	61	81	120	150	170
WT140	0.13	32	59	80	130	150	180
WT150	0.23	49	86	110	180	210	250
WT160	0.11	35	64	85	130	160	180
WT170	0.12	21	43	60	99	120	140
WT180	0.10	8	17	25	43	54	66
WT190	0.06	11	23	31	51	63	75
WT200	0.30	25	52	74	130	160	190
WT210	0.27	32	60	81	130	160	190
WT220	0.19	47	85	110	180	210	250
WT230	0.20	71	120	160	250	300	350
WT240	0.08	36	61	79	120	140	160
WT250	0.15	63	110	140	210	250	290
WT260	0.14	10	21	30	52	64	78
WT270	0.03	11	20	27	41	49	57
WT280	0.27	33	70	100	170	210	250
WT290	0.10	15	31	44	75	92	110
WT300	0.10	12	26	36	62	76	92
WT310	0.28	31	67	96	170	210	250
WT320	0.21	27	56	80	140	170	200
WT330	0.33	32	68	98	170	210	250
WT340	0.28	19	40	57	98	120	150
WT350	0.30	38	79	110	190	230	280
WT360	0.07	7	15	21	37	46	55
WT370	0.21	7	23	38	76	99	120

Sig Figs (<10cfs) 1  
Sig Figs (>10cfs) 2



Falcon DBPS  
Sub Regional Ponds (Including Existing Detention Ponds)

Pond Description					EURV/WQCV				
Modeling Order	Name	Pond Type <sup>1</sup>	Location	Inflow Hydrograph <sup>2</sup>	Drainage Area (Acres) <sup>3</sup>	% Impervious (Future) <sup>4</sup>	Stage (ft) <sup>5</sup>	Storage (AF) <sup>6</sup>	Release Rate (cfs) <sup>7</sup>
1	Sub Regional Pond SR1	Sub Regional	West Tributary	JWT080	703	3%	7218.0	1.57	2.60
1	Paint Brush Hills Pond C	On-site	West Tributary	WT100	120	19%	7197.2	2.18	2.93
1	Paint Brush Hills Pond A	On-site	West Tributary	WT130	65	30%	7146.3	0.99	1.65
1	Paint Brush Hills Pond B1	On-site	West Tributary	Paint Brush Hills Pond B1	N/A Place EURV in d/s Paint Brush Hills Pond B2				
1	Paint Brush Hills Pond B2	On-site	West Tributary	Paint Brush Hills Pond B2	231	31%	7146.1	7.46	17.37
2	Sub Regional Pond SR2	Sub Regional	West Tributary	JWT174	394	8%	7080.8	2.05	2.88
1	The Meadows Pond #1	On-site	West Tributary	WT190	37	8%	7011.0	0.19	0.12
3	Sub Regional Pond SR3	Sub Regional	West Tributary	JWT200	256	7%	6941.3	1.03	1.48
4	Regional Pond WU South	Regional	West Tributary	Regional Pond WU South	467	29%	6826.8	13.97	29.90
1	Woodmen Hills Pond H	Sub Regional	Middle Tributary	Woodmen Hills Pond H	355	29%	N/A	10.62	N/A
1	The Meadows Pond #2	On-site	Middle Tributary	MT010	186	11%	7006.5	1.62	1.83
2	Sub Regional Pond SR4	Sub Regional	Middle Tributary	JMT060	555	24%	6896.6	7.28	24.40
3	Regional Pond MN	Regional	Middle Tributary	Regional Pond MN	169	28%	6851.4	2.45	3.25
1	Woodmen Hills Pond #5	On-site	Middle Tributary	MT090	28	64%	6852.5	1.99	2.25
5	Regional Pond R1	Regional	West Tributary @ N	JWT296	548	14%	6760.3	6.72	12.31
1	Paint Brush Hills Pond #4	On-site	East Tributary	ET010	93	29%		2.78	
1	Sub Regional Pond SR6	Sub Regional	East Tributary	JET020	229	31%	7100.0	7.39	16.34
2	Woodmen Hills Pond #1 North	Sub Regional	East Tributary	Woodmen Hills Pond #1 North	N/A Place EURV in d/s Woodmen Hills Pond #1 South. Use Existing SSD curve up to 100-yr stage.				
3	Woodmen Hills Pond #1 South	Sub Regional	East Tributary	Woodmen Hills Pond #1 South	226	26%	6952.5	5.96	10.86
4	Woodmen Hills Pond #2	Sub Regional	East Tributary	Woodmen Hills Pond #2	75	19%	6926.8	1.36	0.67
5	Woodmen Hills Pond #3	Sub Regional	East Tributary	Woodmen Hills Pond #3	183	22%	6900.7	2.26	1.58
6	Woodmen Hills Pond #4	Sub Regional	East Tributary	Woodmen Hills Pond #4	346	34%	6858.7	12.39	16.88
7	Sub Regional Pond SR5	Sub Regional	East Tributary	JET152	673	8%			
8	Regional Pond R2	Regional	West Tributary d/s	JWT372	1,882	5%	6639.3	3.13	15.00

Notes

<sup>1</sup> On-site = located off of the main tributary, Sub-reional = located on the main tributary with a small drainage area, Regional = located on the main tributary with a large drainage area

<sup>2</sup> From the Falcon\_DBPS HEC-HMS model

<sup>3</sup> Only includes area draining directly to the pond. This does not include the area draining to an upstream detention pond if one exists. This column is for sizing the EURV/WQCV only.

<sup>4</sup> Calculated in ArcMap using the existing impervious area coverage and average impervious area values for undeveloped land with known future land use

<sup>5</sup> Corresponds to the stage within the existing pond grading given the required storage volume or the stage within the proposed pond with an assumed triangular pond grading

<sup>6</sup> Calculated using UDFCD criteria. Watershed is primarily covered by HSG B soils in the developed condition.

<sup>7</sup> Calculated using UDFCD EURV criteria for a 72-hr drain time or UDFCD WQCV criteria for a 40-hr drain time

<sup>8</sup> Estimated based on the intersection of the 100-yr release rate with the desending portion of the Developed 100-yr hydrograph. For proposed ponds the maximum pond volume was set based on a maximum depth of 10ft within the approximated grading.

<sup>9</sup> According to existing pond volume estimates calculated in this DBPS based on pond volume at the spillway elevation. See the Hydrology Section for assumptions on storage volume.

<sup>10</sup> Developed flows account for existing and proposed upstream detention

Targeted the release of the historical 100-yr flow where possible given storage constraints. In some instances released flows are higher or lower depending on the available storage volume in existing detention ponds. This number was modified from the initial estiamte based on modeling results. All release rates reflect a 100-yr WSE that is at the spillway elevation (no spillway overtopping).

<sup>11</sup>

<sup>12</sup> Corresponds to stage/storage at an elevation of 2ft above the 100-yr stage or where existing pond grading limits stage.

<sup>13</sup> Set at the 100-yr release rate + the peak 100-yr inflow



Falcon DBPS													
Sub Regional Ponds (Including Existing Detention Ponds)													
Pond Description					100-yr						Spillway Overtopping		
Modeling Order	Name	Pond Type <sup>1</sup>	Location	Inflow Hydrograph <sup>2</sup>	Stage (ft) <sup>5</sup>	Required Storage (AF) <sup>8</sup>	Constructed Storage (AF) <sup>9</sup>	Developed Q <sub>100</sub> (cfs) <sup>10</sup>	Historical Q <sub>100</sub> (cfs) <sup>2</sup>	Release Rate (cfs) <sup>11</sup>	Stage (ft) <sup>12</sup>	Storage (AF) <sup>12</sup>	Release Rate (cfs) <sup>13</sup>
1	Sub Regional Pond SR1	Sub Regional	West Tributary	JWT080	7224.8	11.03	Proposed Pond	610.6	509	513	7226.8	15.18	1,124
1	Paint Brush Hills Pond C	On-site	West Tributary	WT100	7,200	6.77	6.77	303	200	144	7202	10.80	447
1	Paint Brush Hills Pond A	On-site	West Tributary	WT130	7,148	2.62	2.62	173	97	142	7150	4.89	315
1	Paint Brush Hills Pond B1	On-site	West Tributary	Paint Brush Hills Pond B1	Use existing SSD curve. Provide additional 100-yr control in Paint Brush Hills Pond B2.								
1	Paint Brush Hills Pond B2	On-site	West Tributary	Paint Brush Hills Pond B2	7,148	12.09	12.09	267	171	191	7150	17.28	458
2	Sub Regional Pond SR2	Sub Regional	West Tributary	JWT174	N/A	N/A	Proposed Pond	842	952	N/A	7083	4.21	844
1	The Meadows Pond #1	On-site	West Tributary	WT190	7,015	3.25	3.25	75	14	2.2	7016	4.56	77
3	Sub Regional Pond SR3	Sub Regional	West Tributary	JWT200	N/A	N/A	Proposed Pond	908	988	N/A	6943.3	1.97	909
4	Regional Pond WU South	Regional	West Tributary	Regional Pond WU South	6,832	39.54	39.54	1,069	1,057	932	6834	50.38	2,001
1	Woodmen Hills Pond H	Sub Regional	Middle Tributary	Woodmen Hills Pond H	N/A	18.65	2.66	748	288	288	N/A	N/A	1,036
1	The Meadows Pond #2	On-site	Middle Tributary	MT010	7,011	7.94	7.94	206	57	99	7012	9.88	305
2	Sub Regional Pond SR4	Sub Regional	Middle Tributary	JMT060	6,898	19.37	Proposed Pond	1,016	328	727	6900	43.33	1,743
3	Regional Pond MN	Regional	Middle Tributary	Regional Pond MN	6,854	7.53	7.53	854	355	825	6856	11.93	1,679
1	Woodmen Hills Pond #5	On-site	Middle Tributary	MT090	6,854	4.10	4.10	127	19	19	6856	7.42	146
5	Regional Pond R1	Regional	West Tributary @ N	JWT296	6,766	25.00	Proposed Pond	1,560	1,431	1,505	6768	32.00	3,065
1	Paint Brush Hills Pond #4	On-site	East Tributary	ET010		5.91	1.34	198	86	86			284
1	Sub Regional Pond SR6	Sub Regional	East Tributary	JET020	7,102	11.82	Proposed Pond	385	198	195	7104	16.44	580
2	Woodmen Hills Pond #1 North	Sub Regional	East Tributary	Woodmen Hills Pond #1 North	6,960	7.13	7.13	388	242	264	Use existing SSD after 100-yr stage.		
3	Woodmen Hills Pond #1 South	Sub Regional	East Tributary	Woodmen Hills Pond #1 South	6,954	8.78	8.78	264	242	261	6958	17.50	525
4	Woodmen Hills Pond #2	Sub Regional	East Tributary	Woodmen Hills Pond #2	6,930	9.18	9.18	270	246	250	6934	23.09	520
5	Woodmen Hills Pond #3	Sub Regional	East Tributary	Woodmen Hills Pond #3	6,902	8.35	8.35	530	255	360	6904	20.46	890
6	Woodmen Hills Pond #4	Sub Regional	East Tributary	Woodmen Hills Pond #4	6,862	40.45	44.20	789	251	259	6864	60.00	1,048
7	Sub Regional Pond SR5	Sub Regional	East Tributary	JET152									0
8	Regional Pond R2	Regional	West Tributary d/s	JWT372	6,644	7.90	Proposed Pond	2,235	1,674	2,233	6646	16.00	4,468

Notes

<sup>1</sup> On-site = located off of the main tributary, Sub-reional = located on the main tributary with a small drainage area, Regional = located on the main tributary with a large drainage area

<sup>2</sup> From the Falcon\_DBPS HEC-HMS model

<sup>3</sup> Only includes area draining directly to the pond. This does not include the area draining to an upstream detention pond if one exists. This column is for sizing the EURV/WQCV only.

<sup>4</sup> Calculated in ArcMap using the existing impervious area coverage and average impervious area values for undeveloped land with known future land use

<sup>5</sup> Corresponds to the stage within the existing pond grading given the required storage volume or the stage within the proposed pond with an assumed triangular pond grading

<sup>6</sup> Calculated using UDFCD criteria. Watershed is primarily covered by HSG B soils in the developed condition.

<sup>7</sup> Calculated using UDFCD EURV criteria for a 72-hr drain time or UDFCD WQCV criteria for a 40-hr drain time

<sup>8</sup> Estimated based on the intersection of the 100-yr release rate with the desending portion of the Developed 100-yr hydrograph. For proposed ponds the maximum pond volume was set based on a maximum depth of 10ft within the approximated grading.

<sup>9</sup> According to existing pond volume estimates calculated in this DBPS based on pond volume at the spillway elevation. See the Hydrology Section for assumptions on storage volume.

<sup>10</sup> Developed flows account for existing and proposed upstream detention

Targeted the release of the historical 100-yr flow where possible given storage constraints. In some instances released flows are higher or lower depending on the available storage volume in existing detention ponds. This number was modified from the initial estiamte based on modeling results. All release rates reflect a 100-yr WSE that is at the spillway elevation (no spillway overtopping).

<sup>11</sup> Corresponds to stage/storage at an elevation of 2ft above the 100-yr stage or where existing pond grading limits stage.

<sup>13</sup> Set at the 100-yr release rate + the peak 100-yr inflow

Falcon DBPS  
Sub Regional Ponds (Including Existing Detention Ponds)

Pond Description					Pond Type	Design Notes
Modeling Order	Name	Pond Type <sup>1</sup>	Location	Inflow Hydrograph <sup>2</sup>		
1	Sub Regional Pond SR1	Sub Regional	West Tributary	JWT080	WQCV+100-yr	No EURV required per UDFCD criteria. Used WQCV instead to control low flows.
1	Paint Brush Hills Pond C	On-site	West Tributary	WT100	EURV+100-yr	Enough room for EURV, release less than historical Q100 to maximize pond volume
1	Paint Brush Hills Pond A	On-site	West Tributary	WT130	WQCV+100-yr	Used WQCV instead. Using an EURV resulted in very little depth between the EURV WSE and the 100-yr WSE which may result in an infeasible outlet structure configuration. Release more than historical Q100 due to pond volume limitations.
1	Paint Brush Hills Pond B1	On-site	West Tributary	Paint Brush Hills Pond B1	Existing configuration	Use existing SSD curve without modification. Provide additional 100-yr control and EURV in Pond B2 as the outlet structure in this pond will be easier to retrofit.
1	Paint Brush Hills Pond B2	On-site	West Tributary	Paint Brush Hills Pond B2	EURV+100-yr	Enough room for EURV, released more than historical Q100 due to pond volume limitations
2	Sub Regional Pond SR2	Sub Regional	West Tributary	JWT174	EURV only	Only using EURV. 100-yr flow is already less than historic upstream of this location.
1	The Meadows Pond #1	On-site	West Tributary	WT190	EURV+100-yr	Enough room for EURV, release less than historical Q100 to maximize pond volume
3	Sub Regional Pond SR3	Sub Regional	West Tributary	JWT200	EURV only	Only using EURV. 100-yr flow is already less than historic upstream of this location.
4	Regional Pond WU South	Regional	West Tributary	Regional Pond WU South	EURV+100-yr	Enough room for EURV, released less than historical to optimize pond volume
1	Woodmen Hills Pond H	Sub Regional	Middle Tributary	Woodmen Hills Pond H	Existing configuration	NO RETROFIT. Pond is grossly undersized. Can't do anything as there isn't enough pond volume to even control the 2-year. Recommend, but not design, on-site detention u/s of pond? Major problem - pond is off MT main stem and therefore overtopping deficiencies were not identified but this road crossing will likely overtop. Try and incorporate WQCV in proposed Sub Regional Pond SR4 downstream.
1	The Meadows Pond #2	On-site	Middle Tributary	MT010	EURV+100-yr	Enough room for EURV, released more than historical Q100 due to pond volume limitations
2	Sub Regional Pond SR4	Sub Regional	Middle Tributary	JMT060	WQCV+100-yr	Included Woodmen Hills Pond H DA. Used WQCV instead. Using an EURV resulted in very little depth between the EURV WSE and the 100-yr WSE which may result in an infeasible outlet structure configuration. Released more than historical Q100 due to pond volume limitations at the proposed pond site.
3	Regional Pond MN	Regional	Middle Tributary	Regional Pond MN	WQCV+100-yr	Used WQCV instead. Using an EURV resulted in very little depth between the EURV WSE and the 100-yr WSE which may result in an infeasible outlet structure configuration. Release more than historical Q100 due to pond volume limitations.
1	Woodmen Hills Pond #5	On-site	Middle Tributary	MT090	EURV+100-yr	Enough room for EURV, release less than historical Q100 to maximize pond volume
5	Regional Pond R1	Regional	West Tributary @ N	JWT296	EURV+100-yr	Enough room for EURV, released more than historical Q100 due to pond volume limitations
1	Paint Brush Hills Pond #4	On-site	East Tributary	ET010	Existing configuration	NO RETROFIT. Pond is grossly undersized. Can't do anything as there isn't enough pond volume to even control the 2-year. Recommend, but not design, on-site detention u/s of pond. Try and incorporate EURV in proposed Sub Regional Pond SR6 downstream.
1	Sub Regional Pond SR6	Sub Regional	East Tributary	JET020	EURV+100-yr	Included DA to Paint Brush Hills Pond #4 in EURV. Released at historical 100-yr.
2	Woodmen Hills Pond #1 North	Sub Regional	East Tributary	Woodmen Hills Pond #1 North	100-yr	Placing EURV in #1 south. Use #1 north as 100-yr attenuation. Reduce 100-yr as much as possible given storage constraints. Use existing SSD up to, and after, 100-yr stage.
3	Woodmen Hills Pond #1 South	Sub Regional	East Tributary	Woodmen Hills Pond #1 South	EURV only	Enough room for EURV. Pond only has enough volume to detain the EURV but not the 100-yr. This is acceptable since the 100-yr flow at this point is 264 cfs and the historical flow is 242 cfs.
4	Woodmen Hills Pond #2	Sub Regional	East Tributary	Woodmen Hills Pond #2	EURV+100-yr	Enough room for EURV. Pond also can be retrofit to release the ~ historical 100-yr flow. The depth of the EURV is 0.8ft. UDFCD criteria says 1ft is the minimum depth. Assume this is ok at this point.
5	Woodmen Hills Pond #3	Sub Regional	East Tributary	Woodmen Hills Pond #3	WQCV+100-yr	Used WQCV instead. Using an EURV resulted in very little depth between the EURV WSE and the 100-yr WSE which may result in an infeasible outlet structure configuration. Release more than historical Q100 due to pond volume limitations.
6	Woodmen Hills Pond #4	Sub Regional	East Tributary	Woodmen Hills Pond #4	EURV+100-yr	
7	Sub Regional Pond SR5	Sub Regional	East Tributary	JET152	Not using pond	Not an effective location. Only ~1.5AF of storage available and EURV required at this location is ~3.5AF.
8	Regional Pond R2	Regional	West Tributary d/s	JWT372	EURV only	Only using EURV. Included DA from Sub Regional Pond SR5 in EURV. Had to increase discharge to 15 cfs, which was above what was calculated using UDFCD criteria, because drain time was much greater than 72-hr. Not enough available storage volume for 100-yr control.

Notes

<sup>1</sup> On-site = located off of the main tributary, Sub-reional = located on the main tributary with a small drainage area, Regional = located on the main tributary with a large drainage area

<sup>2</sup> From the Falcon\_DBPS HEC-HMS model

<sup>3</sup> Only includes area draining directly to the pond. This does not include the area draining to an upstream detention pond if one exists. This column is for sizing the EURV/WQCV only.

<sup>4</sup> Calculated in ArcMap using the existing impervious area coverage and average impervious area values for undeveloped land with known future land use

<sup>5</sup> Corresponds to the stage within the existing pond grading given the required storage volume or the stage within the proposed pond with an assumed triangular pond grading

<sup>6</sup> Calculated using UDFCD criteria. Watershed is primarily covered by HSG B soils in the developed condition.

<sup>7</sup> Calculated using UDFCD EURV criteria for a 72-hr drain time or UDFCD WQCV criteria for a 40-hr drain time

<sup>8</sup> Estimated based on the intersection of the 100-yr release rate with the desending portion of the Developed 100-yr hydrograph. For proposed ponds the maximum pond volume was set based on a maximum depth of 10ft within the approximated grading.

<sup>9</sup> According to existing pond volume estimates calculated in this DBPS based on pond volume at the spillway elevation. See the Hydrology Section for assumptions on storage volume.

<sup>10</sup> Developed flows account for existing and proposed upstream detention

Targeted the release of the historical 100-yr flow where possible given storage constraints. In some instances released flows are higher or lower depending on the available

<sup>11</sup> storage volume in existing detention ponds. This number was modified from the initial estiamte based on modeling results. All release rates reflect a 100-yr WSE that is at the spillway elevation (no spillway overtopping).

<sup>12</sup> Corresponds to stage/storage at an elevation of 2ft above the 100-yr stage or where existing pond grading limits stage.

<sup>13</sup> Set at the 100-yr release rate + the peak 100-yr inflow

Falcon DBPS

Pond Effectiveness

Hydrologic Element	Pond Type	Area (sq mi)	Inflow (cfs) <sup>1</sup>		Outflow (cfs) <sup>1</sup>		% Reduction		Estimated 100-yr Drain Time (hr) <sup>2</sup>	Benefits		
			2-year	100-year	2-year	100-year	2-year	100-year		2-yr Peak Flow Reduction (cfs)	100-yr Peak Flow Reduction (cfs)	EURV/WQCV
Paint Brush Hills Pond #4	Existing configuration	0.15	38	198	29	151	22%	24%	10	x	x	
Paint Brush Hills Pond A	WQCV+100-yr	0.10	35	173	7	142	81%	18%	45	x	x	x
Paint Brush Hills Pond B1	Existing configuration	0.36	80	423	51	267	36%	37%	25	x	x	
Paint Brush Hills Pond B2	EURV+100-yr	0.36	51	267	10	182	81%	32%	46	x	x	x
Paint Brush Hills Pond C	EURV+100-yr	0.19	56	303	3	144	95%	53%	57	x	x	x
Regional Pond MN	WQCV+100-yr	1.42	65	854	32	824	51%	3%	72	x		x
Regional Pond R1	EURV+100-yr	5.88	113	1,561	77	1,506	32%	3%	72	x		x
Regional Pond R2	EURV only	10.36	143	2,233	140	2,232	2%	0%	>72			x
Regional Pond WU South	EURV+100-yr	3.55	47	1,072	22	932	54%	13%	72	x	x	x
Sub Regional Pond SR1	WQCV+100-yr	1.09	54	611	42	513	22%	16%	51	x	x	x
Sub Regional Pond SR2	EURV only	2.36	65	842	65	839	0%	0%	72			x
Sub Regional Pond SR3	EURV only	2.82	72	908	72	907	1%	0%	>72			x
Sub Regional Pond SR4	WQCV+100-yr	1.16	133	1,016	27	727	80%	28%	56	x	x	x
Sub Regional Pond SR6	EURV+100-yr	0.36	74	385	9	195	87%	49%	47	x	x	x
The Meadows Pond #1	EURV+100-yr	0.06	11	75	0	2	97%	97%	72	x	x	x
The Meadows Pond #2	EURV+100-yr	0.29	28	206	5	99	81%	52%	62	x	x	x
Woodmen Hills Pond #1 North	100-yr	0.71	65	388	61	264	6%	32%	26		x	
Woodmen Hills Pond #1 South	EURV only	0.71	61	264	10	261	84%	1%	65	x		x
Woodmen Hills Pond #2	EURV+100-yr	0.83	37	270	10	250	72%	7%	>72	x		x
Woodmen Hills Pond #3	WQCV+100-yr	1.11	105	530	13	361	88%	32%	>72	x	x	x
Woodmen Hills Pond #4	EURV+100-yr	1.66	114	789	15	259	87%	67%	72	x	x	x
Woodmen Hills Pond #5	EURV+100-yr	0.04	40	127	1	19	96%	85%	58	x	x	x
Woodmen Hills Pond H	Existing configuration	0.56	142	748	108	752	24%	0%	26	x		

Notes:

- 1 From Falcon\_DBPS\_SubRegional.hms file
- 2 Assumed a 72-hr drain time if the remaining storage volume was less than 5% of total pond volume after 72 hour simultaion.  
Existing ponds and 100-yr ponds do not have a targeted drain time.  
Per a phone conversation with Ken MacKenzie on 02/04/2013, the simplified equations for EURV target a drain time of 72-hours, however, actual drain times could vary between ~40-72 hours.  
Ponds were sized using simplified UDFCD equations for EURV and WQCV design. Detailed design (optimizing drain time scenarios) is not part of this scope.  
Assume WQCV ponds are functioning properly if they drain between ~40 and ~72 hours.  
Assume EURV ponds are functioning properly if they drain between ~48 and ~72 hours.  
In instances where EURV ponds release faster than 72 hours, reducing pond discharge to meet the 72-hr drain time would not change the downstream reach alternative.

**Falcon DBPS**  
**Sub Regional Detention Alternative<sup>1</sup>**

Pond	Q <sub>2</sub> In (cfs)	Q <sub>2</sub> Out (cfs)	Q <sub>100</sub> In (cfs)	Q <sub>100</sub> Out (cfs)	Required Volume (AF) <sup>2</sup>	Land Requirement (ac) <sup>3</sup>	Construction Cost <sup>4</sup>	Land Cost <sup>5</sup>	Improvement Cost <sup>6</sup>	Total Cost
Paint Brush Hills Pond #4	38	29	200	150	1.34	0	\$ -	\$ -	\$ -	\$ -
Paint Brush Hills Pond A	35	7	170	140	2.62	0	\$ -	\$ -	\$ 20,000	\$ 20,000
Paint Brush Hills Pond B1	80	51	420	270	9.17	0	\$ -	\$ -	\$ -	\$ -
Paint Brush Hills Pond B2	51	10	270	180	12.09	0	\$ -	\$ -	\$ 20,000	\$ 20,000
Paint Brush Hills Pond C	56	3	300	140	6.77	0	\$ -	\$ -	\$ 20,000	\$ 20,000
Regional Pond MN	65	32	850	820	7.53	0	\$ -	\$ -	\$ 20,000	\$ 20,000
Regional Pond R1	110	77	1,600	1,500	25.00	18.8	\$ 532,609	\$ 940,420	\$ -	\$ 1,473,028
Regional Pond R2	140	140	2,200	2,200	3.13	5.1	\$ 66,634	\$ 255,974	\$ -	\$ 322,608
Regional Pond WU South	47	22	1,100	930	39.54	0		\$ -	\$ 20,000	\$ 20,000
Sub Regional Pond SR1	54	42	610	510	11.03	3.4	\$ 234,987	\$ 170,782	\$ -	\$ 405,769
Sub Regional Pond SR2	65	65	840	840	2.05	5.2	\$ 43,674	\$ 257,529	\$ -	\$ 301,203
Sub Regional Pond SR3	72	72	910	910	1.03	0.6	\$ 21,943	\$ 27,609	\$ -	\$ 49,552
Sub Regional Pond SR4	130	27	1,000	730	19.37	20.5	\$ 412,665	\$ 1,022,834	\$ -	\$ 1,435,500
Sub Regional Pond SR6	74	9	390	200	11.82	6.69	\$ 251,817	\$ 334,260	\$ -	\$ 586,078
The Meadows Pond #1	11	0	70	0	3.25	0	\$ -	\$ -	\$ 20,000	\$ 20,000
The Meadows Pond #2	28	5	210	100	7.94	0	\$ -	\$ -	\$ 20,000	\$ 20,000
Woodmen Hills Pond #1 North	65	61	390	260	7.13	0	\$ -	\$ -	\$ 20,000	\$ 20,000
Woodmen Hills Pond #1 South	61	10	260	260	8.78	0	\$ -	\$ -	\$ 20,000	\$ 20,000
Woodmen Hills Pond #2	37	10	270	250	9.18	0	\$ -	\$ -	\$ 20,000	\$ 20,000
Woodmen Hills Pond #3	110	13	530	360	8.35	0	\$ -	\$ -	\$ 20,000	\$ 20,000
Woodmen Hills Pond #4	110	15	790	260	40.45	0	\$ -	\$ -	\$ 240,000	\$ 240,000
Woodmen Hills Pond #5	40	1	130	20	4.10	0	\$ -	\$ -	\$ 20,000	\$ 20,000
Woodmen Hills Pond H	140	110	750	750	2.66	0	\$ -	\$ -	\$ -	\$ -

Subtotal	\$ 5,053,738
Engineering (15%)	\$ 758,061
Contingency (20%)	\$ 1,010,748
Total	\$ 6,822,546

Notes

<sup>1</sup> Represents future hydrology with retrofit existing detention ponds and 7 new sub regional detention ponds

<sup>2</sup> Required volume to highest WSE, either EURV or 100-yr respectively, not including embankment

<sup>3</sup> Land requirement is based on approximate grading at spillway stage. Refer to Conceptual Plan GIS mapbook. Copied as value from GIS attribute.

<sup>4</sup> Based on \$24,500/AF as documented in the Jimmy Camp Creek DBPS - FSD Costs Memo. The published value includes engineering costs - so dividing this cost by 1.15 to represent construction portion only.

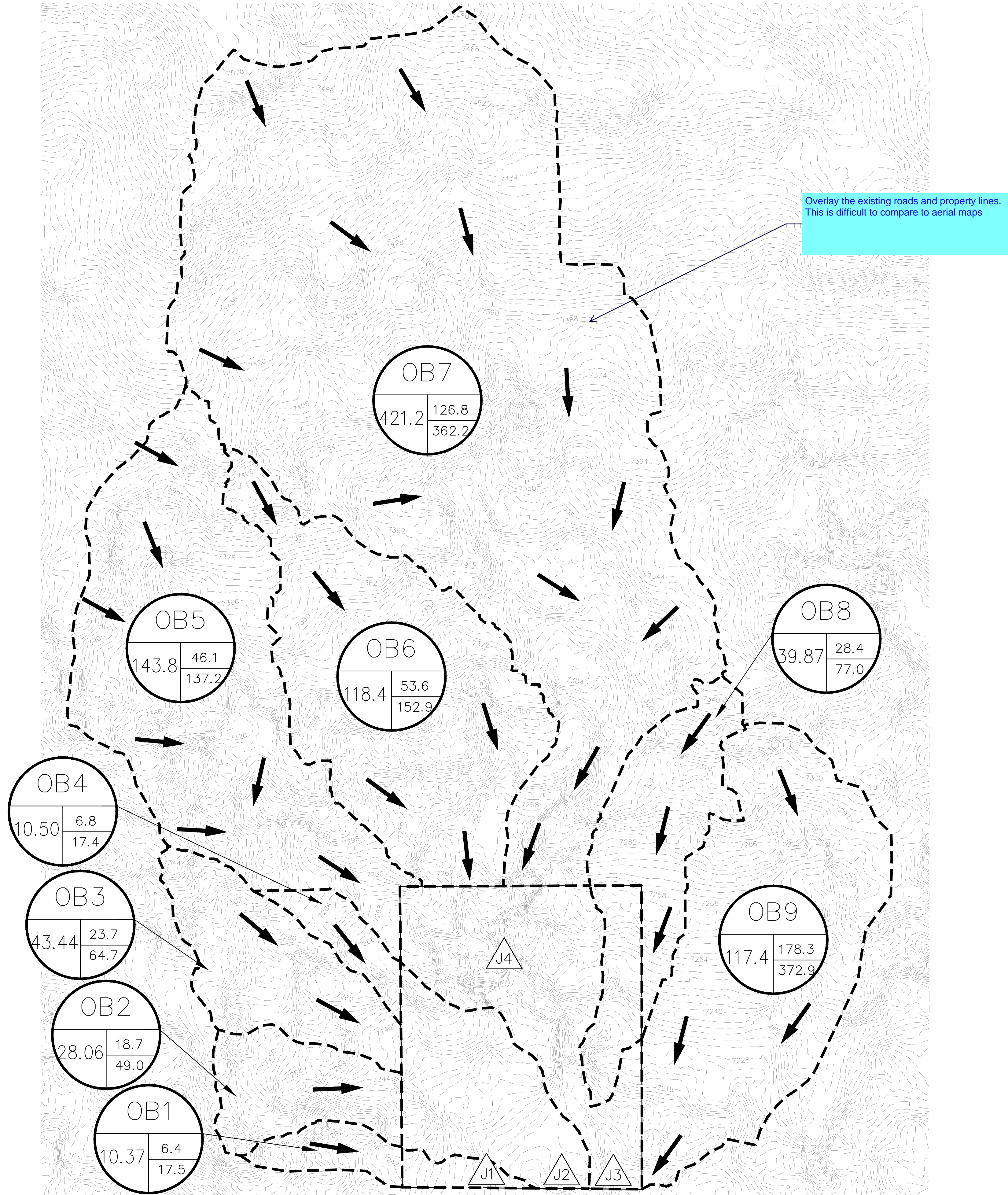
<sup>5</sup> From Jeff Rice via comment letter on 5/24/13: Use \$50,000/Ac. for land purchase costs, with a note that the actual current (2013) Parks fees are based on land value of \$46,954/Ac.

Includes costs to retrofit existing outlet structures for EURV/WQCV and 100-yr flood control. This costs assumes a plate can be placed over a low flow orifice and/or an opening be cut out of the existing drop structure OR 2 CDOT Type C inlets w/ 100LF of 48" RCP be used for the retrofit. Not all existing ponds are

<sup>6</sup> retrofit. Woodmen Hills Pond #4 improvement cost was taken directly from the March 2011 Wilson & Co. Pond 4 Assessment Report Preliminary Cost Estimates table for Alternative 2 on pg. 21.

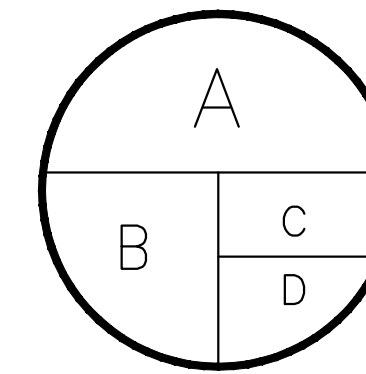
***APPENDIX E: DRAINAGE MAPS***



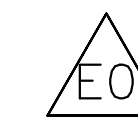


## LEGEND

— — — DRAINAGE BASIN AREAS



A – HEC-HMS BASINS  
B – BASIN ACREAGE  
C – 5-YR RUNOFF  
D – 100-YR RUNOFF



DESIGN POINT

— — — — — EXISTING CONTOURS

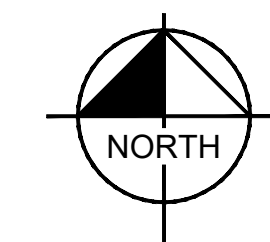
— — — — — PROPERTY BOUNDARY



FLOW ARROW


Add the flow plath used to calculate the time of concentration on all the drainage maps

HEC-HMS - EXISTING RUNOFF TABLE						
DESIGN POINT	BASIN DESIGNATION	BASIN AREA (ACRES)	DIRECT 5-YR RUNOFF (CFS)	DIRECT 100-YR RUNOFF (CFS)	CUMULATIVE DIRECT 5-YR RUNOFF (CFS)	CUMULATIVE DIRECT 100-YR RUNOFF (CFS)
J1	B1	5.55	3.9	10.8	-	-
	OB1	10.37	6.6	17.5	10.0	27.6
	B2	41.43	17.9	58.0	-	-
	OB2	28.06	19.0	49.0	-	-
J2	OB3	43.44	24.2	64.7	-	-
	OB4	10.50	6.9	17.4	65.5	184.5
	OB5	143.82	44.8	137.2	-	-
	OB6	118.40	51.8	152.9	-	-
J4	OB7	421.43	133.1	362.2	212.7	611.5
	B3	59.54	42.3	127.8	-	-
	B4	14.68	6.8	21.8	-	-
	OB8	39.65	28.5	77.0	-	-
J3	OB9	117.43	180.0	372.9	336.0	876.1



GRAPHIC SCALE IN FEET

0 250 500 1000

A horizontal scale bar with tick marks at 0, 250, 500, and 1000 feet. The segments between 0-250, 250-500, and 500-1000 are alternating white and black.

DESIGNED BY: MK  
DRAWN BY: RS  
CHECKED BY: KK  
DATE: 10/29/2021

EAGLEVIEW  
EL PASO COUNTY, COLORADO  
PRE DEVELOPMENT DRAINAGE MAP

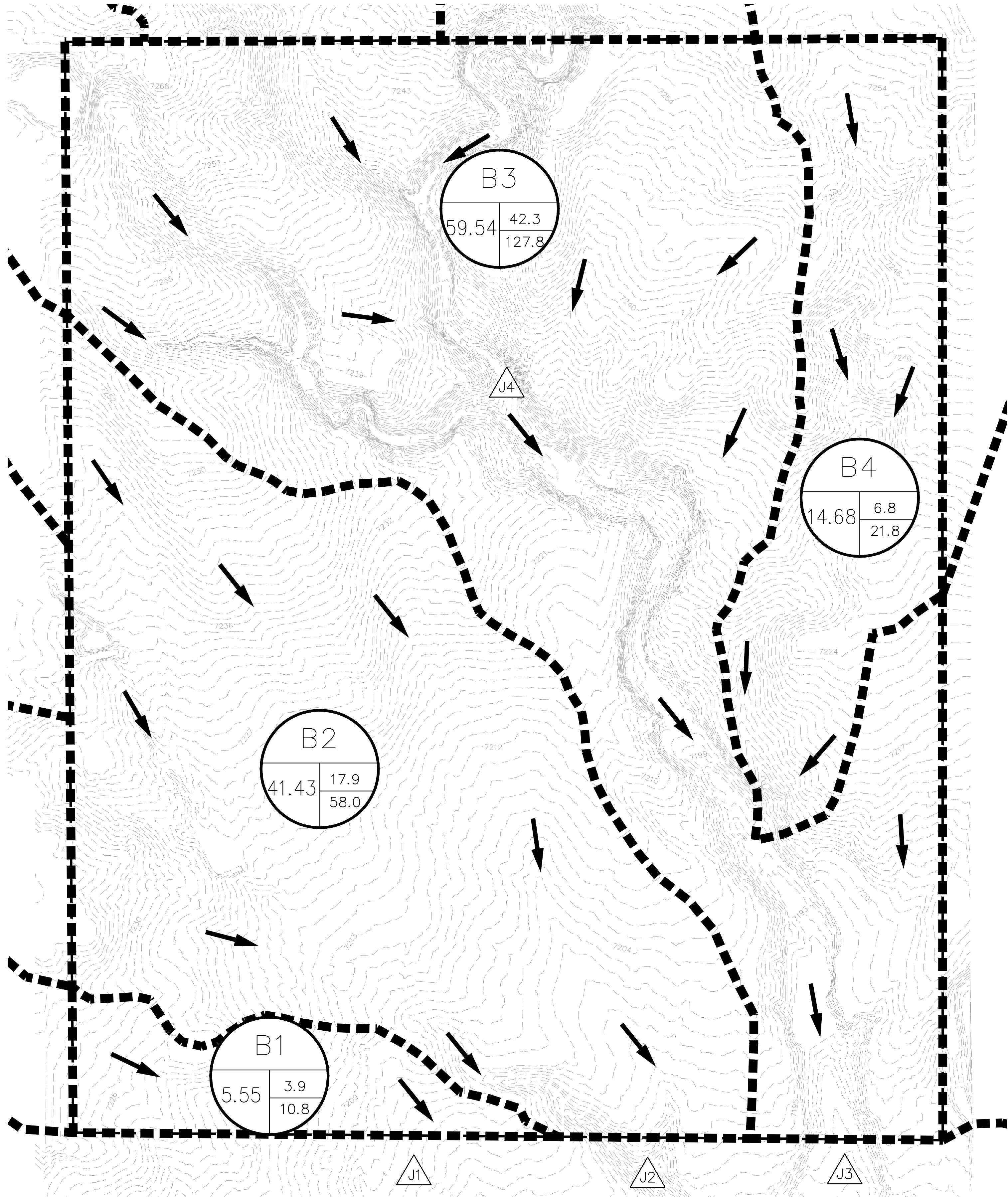
**PRELIMINARY**  
FOR REVIEW ONLY  
NOT FOR  
CONSTRUCTION  
**Kimley»Horn**  
Kimley-Horn and Associates, Inc.

PROJECT NO.  
196288000

SHEET



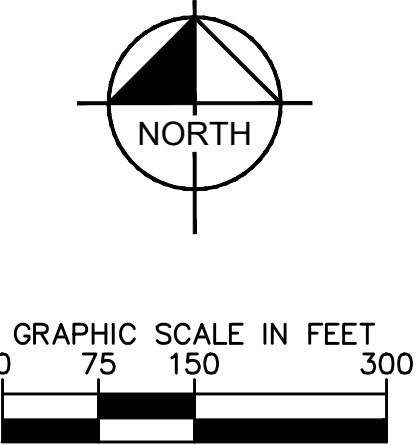
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## LEGEND

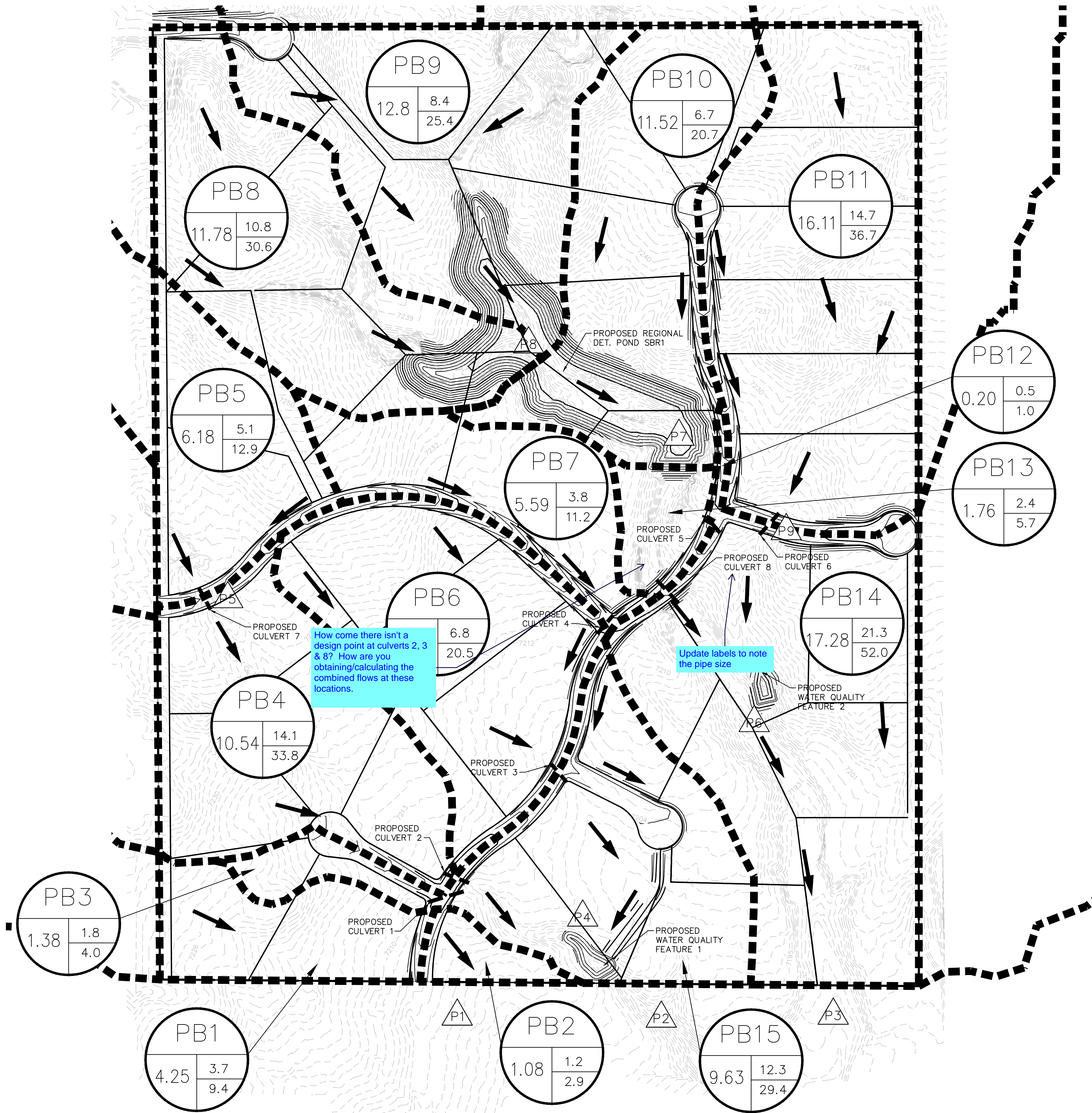
- DRAINAGE BASIN AREAS
- A -- HEC-HMS BASINS  
B -- BASIN ACREAGE  
C -- 5-YR RUNOFF  
D -- 100-YR RUNOFF
- △ E0 DESIGN POINT
- EXISTING CONTOURS
- PROPERTY BOUNDARY
- FLOW ARROW

HEC-HMS - EXISTING RUNOFF TABLE						
DESIGN POINT	BASIN DESIGNATION	BASIN AREA (ACRES)	DIRECT 5-YR RUNOFF (CFS)	DIRECT 100-YR RUNOFF (CFS)	CUMULATIVE DIRECT 5-YR RUNOFF (CFS)	CUMULATIVE DIRECT 100-YR RUNOFF (CFS)
J1	B1	5.55	3.9	10.8	-	-
	OB1	10.37	6.6	17.5	10.0	27.6
	B2	41.43	17.9	58.0	-	-
J2	OB2	28.06	19.0	49.0	-	-
	OB3	43.44	24.2	64.7	-	-
	OB4	10.50	6.9	17.4	65.5	184.5
J3	OB5	143.82	44.8	137.2	-	-
	OB6	118.40	51.8	152.9	-	-
	J4	OB7	421.43	133.1	212.7	611.5
J4	B3	59.54	42.3	127.8	-	-
	B4	14.68	6.8	21.8	-	-
	OB8	39.65	28.5	77.0	-	-
J3	OB9	117.43	180.0	372.9	336.0	876.1



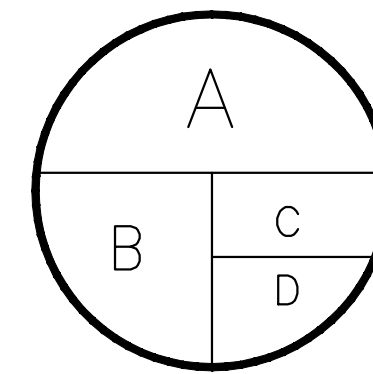


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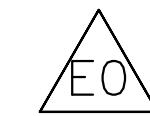


## LEGEND

### DRAINAGE BASIN AREAS



- A — HEC-HMS BASINS
- B — BASIN ACREAGE
- C — 5-YR RUNOFF
- D — 100-YR RUNOFF



DESIGN POINT

--- EXISTING CONTOURS

--- PROPOSED CONTOURS

--- PROPERTY BOUNDARY



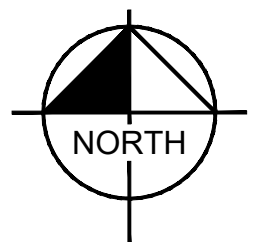
FLOW ARROW

HEC-HMS - DEVELOPED RUNOFF TABLE						
DESIGN POINT	BASIN DESIGNATION	BASIN AREA (ACRES)	DIRECT 5-YR RUNOFF (CFS)	DIRECT 100-YR RUNOFF (CFS)	CUMULATIVE DIRECT 5-YR RUNOFF (CFS)	CUMULATIVE DIRECT 100-YR RUNOFF (CFS)
	PB2	1.08	1.2	2.9	-	-
	PB1	4.25	3.7	9.4	-	-
P1	OB1	10.37	6.4	17.5	9.6	25.7
	OB2	28.06	18.7	49	-	-
	OB3	43.44	23.7	64.7	-	-
	OB4	10.50	6.8	17.3	-	-
P5	PB5	6.18	5.1	12.9	53.1	141.2
	PB3	1.38	1.8	4	-	-
	PB4	10.54	14.1	33.8	-	-
P4	PB6	11.09	6.8	20.5	60.5	162.6
	PB7	5.59	3.8	11.2	-	-
P2	PB15	9.63	12.3	29.4	61.6	172.6
	OB5	143.82	46.1	137.2	-	-
	OB6	118.40	55.9	156.1	-	-
	OB7	421.43	126.8	362.2	-	-
	PB8	11.78	10.8	30.6	-	-
P8	PB9	12.80	8.4	25.4	217	621.6
P7 (SBR1)	PB10	11.52	6.7	20.7	219.3	628.3
	PB12	0.20	0.5	1	-	-
P6	PB13	1.76	2.4	5.7	155.8	555.9
	OB8	39.65	10.8	77	-	-
P9	PB11	16.11	14.7	36.7	41.3	110.4
	PB14	17.28	21.3	52	-	-
P3	OB9	117.43	8.4	375.9	224.1	648.4

Please create a basic overview map (or modify existing drainage map) with color shading/hatching that shows areas tributary to each PBMP (pond, runoff reduction, etc) and those areas that are not treated by a PBMP, with the applicable exclusion labeled (ex: 20% up to 1ac of development can be excluded per ECM App I.7.1.C.1 and exclusions listed in ECM App I.7.1.B.#). A summary table on the current map would also be acceptable (example provided):

PBMP SUMMARY TABLE		
BASINS	PBMP TRIBUTARY AREA (AC)	PBMP
A1.1	1.43	RG-A1.1
A3.1	1.87	RG-A3.1
B1,B2	8.60	EDB-B
OA2,A2	0.95	EXCLUDED*

\* EXCLUDED BASED ON < 1-ACRE OF DEVELOPED ROADWAY AREA PER ECM APP. I.7.C.1.g



GRAPHIC SCALE IN FEET  
0 75 150 300

**Kimley»Horn**

2021 KIMLEY-HORN AND ASSOCIATES, INC.  
2 North Nevada Avenue Suite 300  
Colorado Springs, Colorado 80903 (719) 453-0180

DESIGNED BY: MK  
DRAWN BY: RS  
CHECKED BY: KK  
DATE: 12/03/2021

EAGLEVIEW  
EL PASO COUNTY, COLORADO  
POST DEVELOPMENT DRAINAGE MAP

PRELIMINARY  
FOR REVIEW ONLY  
NOT FOR CONSTRUCTION  
**Kimley»Horn**  
Kimley-Horn and Associates, Inc.

PROJECT NO.  
196288000

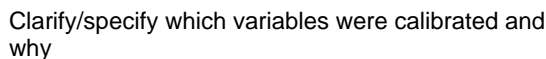
SHEET

3

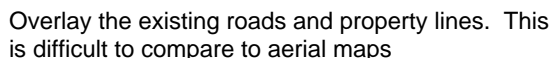


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Callout (20)



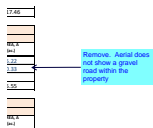
fix title. Thunder Storm is for short duration storm event and Frontal Storm is long duration. The table is showing both.



List the different n-values and it's corresponding surface description in the narrative section of the report.

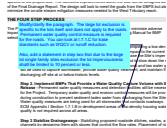
Based on Aerial OB1 to OB4 appears to be short grass prairie (0.15)

Update. Zoning map shows offsite residential area as RR-5. The 61 CN is extrapolated for 2.5 acres not 5 acre property.



**Subject:** Callout  
**Page Label:** 49  
**Author:** dsdlaforce  
**Date:** 1/11/2022 1:55:05 PM  
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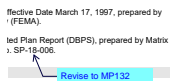
Remove. Aerial does not show a gravel road within the property



**Subject:** Callout  
**Page Label:** 13  
**Author:** dsdlaforce  
**Date:** 1/11/2022 10:07:44 AM  
**Status:**  
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Modify/clarify the paragraph. The large lot exclusion is specific to the lots itself and does not apply to the roads. Permanent water quality control measure is required for the roads. You can look at I.7.1.C for base standards such as WQCV or runoff reduction.

Also, add a statement in step two that due to the large lot single family sites exclusion the lot imperviousness shall be limited to 10 percent or less.



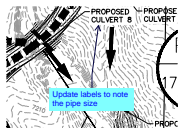
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**Page Label:** 15  
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Revise to MP132



**Subject:** Callout  
**Page Label:** 13  
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**Date:** 1/11/2022 10:31:58 AM  
**Status:**  
**Color:** ■  
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Revise statement to the following: "The project is within the Falcon Drainage Basin (CHWS1400) which is a part of the El Paso County Drainage Basin Fee Program. Drainage and bridge fees will be finalized with the Final Drainage Report. Drainage fees shall be paid at the time of final plat recordation."



**Subject:** Callout  
**Page Label:** [1] PR DRN MAP - 150sc  
**Author:** dsdlaforce  
**Date:** 1/11/2022 2:29:32 PM  
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Update labels to note the pipe size



**Subject:** Callout  
**Page Label:** 149  
**Author:** dsdlaforce  
**Date:** 1/11/2022 2:31:00 PM  
**Status:**  
**Color:** ■  
**Layer:**  
**Space:**

Review the Paintbrush Hills Filing 14 drainage report. This basin appears to no longer appears to drain into the site in the PBH14 proposed condition. Update the narrative and modeling accordingly.



[illegible]

Revise to Lag Time per City DCM Chapter 6  
Section 4.6


Update and import the NRCS/HEC-HMS hydrograph into UD-Detention for the pond design or provide an explanation why this wasn't done or necessary. By not using the NRCS hydrograph it seems this would generate discrepancies in the design storm.

Expand on the description on the steps done to integrate UD-Detention to the HEC-HMS volume. Recommend reviewing the narrative written for Winsome Fil 2 FDR prepared by Kimley Horn for an example.

The following is the text of the letter that was sent to the project manager. The letter is a copy of the original letter that was sent to the project manager. The letter is a copy of the original letter that was sent to the project manager.


**Subject:** Cloud  
**Page Label:** 13  
**Author:** eschoenheit  
**Date:** 1/11/2022 9:59:56 AM  
**Status:**  
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inches). The DBPS at Watershed is slightly larger than an aerial reduction application. Engineering Manager and 100-year design to the DBPS model analyses show slightly higher

**Subject:** Highlight  
**Page Label:** 10  
**Author:** dsdlaforce  
**Date:** 1/10/2022 4:45:46 PM  
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## Engineering

us. The model utilizes the NRCS Type II storm 2.7 inches and the cumulative noted that the DBPS used a slightly ed the same cumulative depth for the il reduction of 2% to the rainfall depths e miles. Where the rainfall for the Site depths. Refer to Tables 5-3 and 6-2 in distribution curve and rainfall depths lized for the project. The project model results for the project site area. The ing to the site, which is to be expected roject rainfall depths. Design point 33 in the project wide watershed.

**Subject:** Highlight  
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**Author:** dsdlaforce  
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Refer to Tables 5-3 and 6-2

the pro  
IIA rai  
depth

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**Author:** dsdlaforce  
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IIA

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/as calibrated to t  
roject model does  
with the with no a

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calibrated

igrate the existing a  
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Engineering

tions due to the on-site and off-s  
land uses were obtained from th  
f curve numbers for the existing c  
S which aligned with the metric  
te the Engineering Manual was u  
as values for the 2 1/2 acre lots. A  
curve numbers developed below  
bers are not linear as the lot sizes  
w were utilized for this report.

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Engineering Manual

he County GIS department and  
drainage basins used the curve  
dology of the DBPS. For the  
utilized to extrapolate the curve  
is the Engineering Manual only  
w were done with conservative  
s increase. The following values


**Subject:** Highlight  
**Page Label:** 10  
**Author:** dsdlaforce  
**Date:** 1/10/2022 5:04:55 PM  
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Engineering Manual


4.1. Introduction.....  
4.2. Open Channel Hydraulics.....  
4.2.1. Hydraulic Structure Invento  
4.2.2. HEC-RAS Modeling.....  
4.2.3. Reaches.....

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JWT090

**Subject:** Highlight  
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**Date:** 10/22/2021 10:33:23 AM  
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[illegible]

**Subject:** Highlight  
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[illegible]

**Subject:** Highlight  
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[illegible]

**Subject:** Highlight  
**Page Label:** 398  
**Author:** Brice.Hammersland  
**Date:** 10/22/2021 10:33:47 AM  
**Status:**  
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with some other suitable metric according to your subject population. In fact, all the dimensions, particularly the upper extremities, need to be scaled. In practice, it is better to use a table like Table 3.4.

Measurement	Reliability	Measurement	Reliability
Shoulder flexion/extension	0.90-0.95	Trunk flexion/extension	0.80-0.90
Shoulder abduction/adduction	0.85-0.90	Trunk lateral bending	0.70-0.80
Shoulder internal/external rotation	0.80-0.85	Trunk rotation	0.70-0.80
Elbow flexion/extension	0.90-0.95	Wrist flexion/extension	0.80-0.90
Elbow pronation/supination	0.80-0.85	Wrist ulnar/radial deviation	0.70-0.80
Forearm pronation/supination	0.80-0.85	Handgrip strength	0.90-0.95
Wrist flexion/extension	0.80-0.85	Hand strength	0.80-0.90
Wrist ulnar/radial deviation	0.70-0.80	Hand strength	0.80-0.90
Handgrip strength	0.90-0.95	Hand strength	0.80-0.90
Hand strength	0.80-0.90	Hand strength	0.80-0.90

**Subject:** Highlight  
**Page Label:** 371  
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**Date:** 10/22/2021 8:08:35 AM  
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**Table 6-2. Proposed Pond Outlet Configurations**

Pond	Outlet Stages
Sub Regional Pond S2R1	WQCV = 100-y
Sub Regional Pond S2R2	15.9V Only
Sub Regional Pond S2R3	15.9V Only
Sub Regional Pond S2R4	WQCV = 100-y
Regional Pond R1	15.9V = 100-y
Sub Regional Pond S2R6	15.9V = 100-y
Regional Pond R2	15.9V Only




**Subject:** Highlight  
**Page Label:** 378  
**Author:** Brice.Hammersland  
**Date:** 10/22/2021 8:08:58 AM  
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Table with 2 columns: Alternative, and a column with 10 rows of data.

Subject: Highlight  
Page Label: 378  
Author: Brice.Hammersland  
Date: 10/22/2021 8:09:57 AM  
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or this alternative. H  
A detailed analysis  
in **Appendix D**.  
ention Pond Clas

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Page Label: 378  
Author: Brice.Hammersland  
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id into all existing and proposed detention ponds where  
in some cases other controls were used due to pond volume  
nary for all of the detention ponds in the selected alternative  
on  
as of 23 ponds that fall within 2 different classifications  
ponds. All ponds are shown graphically in Figure 6.5.  
1.C. PHB1.A, PHB1.B, PHB1.E, M.1, & WUS, WITH M.2, R  
1.2, SR1.3, and SR1.4. These ponds are currently constructed  
pond. Each of these ponds was evaluated to determine if it  
be selected alternative. Table 6.1 shows the  
as of each of the existing constructed ponds.

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Author: Brice.Hammersland  
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Regional Pond R2
Regional Pond WU South
Sub Regional Pond SR1
Sub Regional Pond SR2

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Author: Brice.Hammersland  
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11.03




Subject: Highlight  
Page Label: 379  
Author: Brice.Hammersland  
Date: 10/22/2021 8:14:16 AM  
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Table with 2 columns: Alternative, and a column with 10 rows of data.

Subject: Highlight  
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Author: Brice.Hammersland  
Date: 10/22/2021 8:15:41 AM  
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MT110  
WT010<sup>1</sup>  
WT020<sup>1</sup>

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**Page Label:** 387  
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**Date:** 10/25/2021 5:00:03 PM  
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WT010<sup>+</sup>  
WT020<sup>1</sup>  
WT030

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**Page Label:** 387  
**Author:** Brice.Hammersland  
**Date:** 10/25/2021 5:00:05 PM  
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WT020<sup>+</sup>  
WT030  
WT040<sup>1</sup>

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**Date:** 10/25/2021 5:00:11 PM  
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WT030  
WT040<sup>1</sup>  
WT050<sup>1</sup>

**Subject:** Highlight  
**Page Label:** 387  
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WT040<sup>+</sup>  
WT050<sup>1</sup>  
WT060

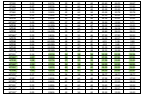
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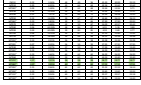
WT050<sup>+</sup>  
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**Subject:** Highlight  
**Page Label:** 387  
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**Page Label:** 387  
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**Date:** 10/25/2021 5:01:48 PM  
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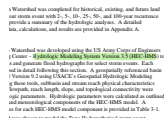
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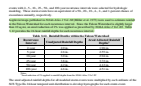
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MS Model Components
Selected Methodology
Specified Hyetograph
SCS Runoff Curve Number Method
SCS Unit Hydrograph Method
Muskingum-Cunge Method

**Subject:** Highlight  
**Page Label:** 356  
**Author:** Brice.Hammersland  
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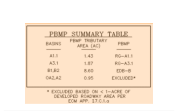



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**Subject:** Highlight  
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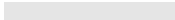
Image (1)




**Subject:** Image  
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**Author:** Glenn Reese - EPC Stormwater  
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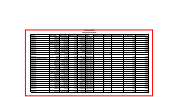
Line (1)


ected Plan Report (  
No. [SP-18-006](#).

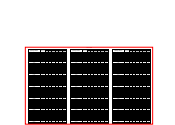



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Rectangle (23)




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**Subject:** Rectangle  
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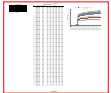
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**Layer:**  
**Space:**




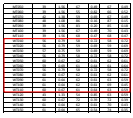
---

**Subject:** Rectangle  
**Page Label:** 388  
**Author:** Brice.Hammersland  
**Date:** 10/25/2021 5:04:20 PM  
**Status:**  
**Color:**   
**Layer:**  
**Space:**




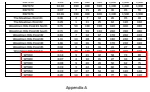
---

**Subject:** Rectangle  
**Page Label:** 397  
**Author:** Brice.Hammersland  
**Date:** 10/25/2021 5:17:41 PM  
**Status:**  
**Color:**   
**Layer:**  
**Space:**




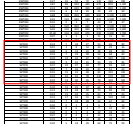
---

**Subject:** Rectangle  
**Page Label:** 389  
**Author:** Doug.Morey  
**Date:** 10/26/2021 10:39:24 AM  
**Status:**  
**Color:**   
**Layer:**  
**Space:**




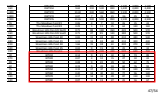
---

**Subject:** Rectangle  
**Page Label:** 400  
**Author:** Doug.Morey  
**Date:** 10/26/2021 11:27:24 AM  
**Status:**  
**Color:**   
**Layer:**  
**Space:**




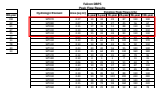
---

**Subject:** Rectangle  
**Page Label:** 400  
**Author:** Doug.Morey  
**Date:** 10/26/2021 11:27:46 AM  
**Status:**  
**Color:**   
**Layer:**  
**Space:**




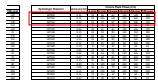
---

**Subject:** Rectangle  
**Page Label:** 400  
**Author:** Doug.Morey  
**Date:** 10/26/2021 11:27:56 AM  
**Status:**  
**Color:**   
**Layer:**  
**Space:**




---

**Subject:** Rectangle  
**Page Label:** 401  
**Author:** Doug.Morey  
**Date:** 10/26/2021 11:28:17 AM  
**Status:**  
**Color:**   
**Layer:**  
**Space:**




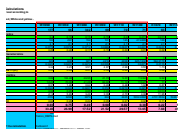
---

**Subject:** Rectangle  
**Page Label:** 401  
**Author:** Doug.Morey  
**Date:** 10/26/2021 11:28:24 AM  
**Status:**  
**Color:**   
**Layer:**  
**Space:**

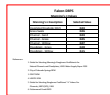


---

**Subject:** Rectangle  
**Page Label:** 393  
**Author:** Doug.Morey  
**Date:** 10/26/2021 11:43:46 AM  
**Status:**  
**Color:**   
**Layer:**  
**Space:**



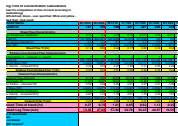
**Subject:** Rectangle  
**Page Label:** 390  
**Author:** Brice.Hammersland  
**Date:** 10/26/2021 12:22:24 PM  
**Status:**  
**Color:** ■  
**Layer:**  
**Space:**



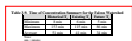
**Subject:** Rectangle  
**Page Label:** 394  
**Author:** Brice.Hammersland  
**Date:** 10/26/2021 9:39:30 AM  
**Status:**  
**Color:** ■  
**Layer:**  
**Space:**



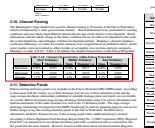
**Subject:** Rectangle  
**Page Label:** 391  
**Author:** Doug.Morey  
**Date:** 10/26/2021 9:46:54 AM  
**Status:**  
**Color:** ■  
**Layer:**  
**Space:**



**Subject:** Rectangle  
**Page Label:** 392  
**Author:** Doug.Morey  
**Date:** 10/26/2021 9:47:18 AM  
**Status:**  
**Color:** ■  
**Layer:**  
**Space:**



**Subject:** Rectangle  
**Page Label:** 360  
**Author:** Brice.Hammersland  
**Date:** 8/17/2021 5:02:30 PM  
**Status:**  
**Color:** ■  
**Layer:**  
**Space:**



**Subject:** Rectangle  
**Page Label:** 360  
**Author:** Brice.Hammersland  
**Date:** 8/17/2021 5:02:41 PM  
**Status:**  
**Color:** ■  
**Layer:**  
**Space:**

Table with 2 columns and 10 rows. The first column contains numerical values (e.g., 1.0, 2.0, 3.0) and the second column contains text descriptions (e.g., '1.0', '2.0', '3.0').

**Subject:** Rectangle  
**Page Label:** 361  
**Author:** Brice.Hammersland  
**Date:** 8/17/2021 5:09:12 PM  
**Status:**  
**Color:** ■  
**Layer:**  
**Space:**

SW - Highlight (9)

Table with 2 columns and 10 rows. The first column contains numerical values (e.g., 1.0, 2.0, 3.0) and the second column contains text descriptions (e.g., '1.0', '2.0', '3.0').

**Subject:** SW - Highlight  
**Page Label:** 13  
**Author:** Glenn Reese - EPC Stormwater  
**Date:** 1/5/2022 1:11:08 PM  
**Status:**  
**Color:** ■  
**Layer:**  
**Space:**

Water quality measures are being used for all stormwater that contacts roadways.

of 16.11 acres. The curve  
0-year events are 14.7 cfs  
as the lots utilize roadside  
from there the runoff will be  
to a **water quality feature**

**Subject:** SW - Highlight  
**Page Label:** 9  
**Author:** Glenn Reese - EPC Stormwater  
**Date:** 1/5/2022 3:27:56 PM  
**Status:**  
**Color:** ■  
**Layer:**  
**Space:**

water quality feature

ways near the east portion  
number for the sub-basin is  
1.0 cfs respectively. Runoff  
i. From there the runoff will  
into a **water quality feature**

**Subject:** SW - Highlight  
**Page Label:** 9  
**Author:** Glenn Reese - EPC Stormwater  
**Date:** 1/5/2022 3:28:19 PM  
**Status:**  
**Color:** ■  
**Layer:**  
**Space:**

water quality feature

corner of the property. The sub-  
basin is 67.68. Runoff during the  
r. Runoff from this basin will travel  
side ditch. Flows will then be cor  
to a **water quality feature** before

**Subject:** SW - Highlight  
**Page Label:** 7  
**Author:** Glenn Reese - EPC Stormwater  
**Date:** 1/5/2022 3:29:22 PM  
**Status:**  
**Color:** ■  
**Layer:**  
**Space:**


water quality feature

Eagle  
'. Runoff from this basin will tr  
ert 2. Where flows will then be  
to a **water quality feature** bef

**Subject:** SW - Highlight  
**Page Label:** 8  
**Author:** Glenn Reese - EPC Stormwater  
**Date:** 1/5/2022 3:29:40 PM  
**Status:**  
**Color:** ■  
**Layer:**  
**Space:**


water quality featur

property. The sub-basin has an area of 65.33 acres. Runoff during the 5-year and 100-year events will then be conveyed through the water quality feature before entering the pond.

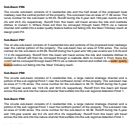
**Subject:** SW - Highlight  
**Page Label:** 8  
**Author:** Glenn Reese - EPC Stormwater  
**Date:** 1/5/2022 3:29:57 PM  
**Status:**  
**Color:**   
**Layer:**  
**Space:**


water quality feature

central portion of the property. The sub-basin is 65.33 acres. Runoff during the 5-year and 100-year events will then be conveyed through the water quality feature before entering the pond.

**Subject:** SW - Highlight  
**Page Label:** 8  
**Author:** Glenn Reese - EPC Stormwater  
**Date:** 1/5/2022 3:30:01 PM  
**Status:**  
**Color:**   
**Layer:**  
**Space:**


water quality feature



**Subject:** SW - Highlight  
**Page Label:** 8  
**Author:** Glenn Reese - EPC Stormwater  
**Date:** 1/5/2022 3:30:18 PM  
**Status:**  
**Color:**   
**Layer:**  
**Space:**

water quality  
feature


portions of the proposed local road. The sub-basin has an area of 9.63 acres. Runoff during the 5-year and 100-year events will then be conveyed through the water quality feature before entering the pond.

**Subject:** SW - Highlight  
**Page Label:** 9  
**Author:** Glenn Reese - EPC Stormwater  
**Date:** 1/5/2022 3:31:04 PM  
**Status:**  
**Color:**   
**Layer:**  
**Space:**

water quality feature

## SW - Textbox with Arrow (1)



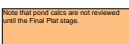
**Subject:** SW - Textbox with Arrow  
**Page Label:** 13  
**Author:** Glenn Reese - EPC Stormwater  
**Date:** 1/10/2022 8:24:15 AM  
**Status:**  
**Color:**   
**Layer:**  
**Space:**


I just want to confirm that this is true. If there are some areas that are not able to be treated by the WQ ponds, please see note below and add discussion to report accordingly. Otherwise, you can disregard this comment.

Possible exclusions for areas not treated by a PBMP include I.7.1.B.7 (land disturbance to undeveloped land that will remain undeveloped) and/or I.7.1.C.1 (which allows for 20% not to exceed 1 acre of the applicable development site area to not be captured).

## SW - Textbox (3)

APPENDIX C: HYDRAULICS



**Subject:** SW - Textbox  
**Page Label:** 335  
**Author:** Glenn Reese - EPC Stormwater  
**Date:** 1/10/2022 8:24:35 AM  
**Status:**  
**Color:**   
**Layer:**  
**Space:**

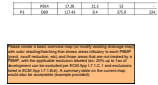
Note that pond calcs are not reviewed until the Final Plat stage.

Add text: PCD Filing No.: SP216

Kimley»Horn

**Subject:** SW - Textbox  
**Page Label:** 1  
**Author:** Glenn Reese - EPC Stormwater  
**Date:** 1/5/2022 10:11:58 AM  
**Status:**  
**Color:** ■  
**Layer:**  
**Space:**

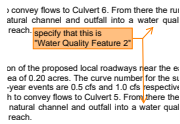
Add text: PCD Filing No.: SP216



**Subject:** SW - Textbox  
**Page Label:** [1] PR DRN MAP - 150sc  
**Author:** Glenn Reese - EPC Stormwater  
**Date:** 1/5/2022 11:17:42 AM  
**Status:**  
**Color:** ■  
**Layer:**  
**Space:**

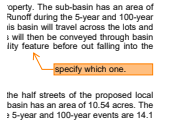
Please create a basic overview map (or modify existing drainage map) with color shading/hatching that shows areas tributary to each PBMP (pond, runoff reduction, etc) and those areas that are not treated by a PBMP, with the applicable exclusion labeled (ex: 20% up to 1ac of development can be excluded per ECM App I.7.1.C.1 and exclusions listed in ECM App I.7.1.B.#). A summary table on the current map would also be acceptable (example provided):

## SW - Textbox with Arrow (4)



**Subject:** SW - Textbox with Arrow  
**Page Label:** 9  
**Author:** Glenn Reese - EPC Stormwater  
**Date:** 1/5/2022 3:28:44 PM  
**Status:**  
**Color:** ■  
**Layer:**  
**Space:**

specify that this is  
"Water Quality Feature 2"



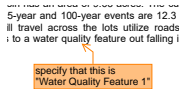
**Subject:** SW - Textbox with Arrow  
**Page Label:** 7  
**Author:** Glenn Reese - EPC Stormwater  
**Date:** 1/5/2022 3:29:18 PM  
**Status:**  
**Color:** ■  
**Layer:**  
**Space:**

specify which one.



**Subject:** SW - Textbox with Arrow  
**Page Label:** 8  
**Author:** Glenn Reese - EPC Stormwater  
**Date:** 1/5/2022 3:30:14 PM  
**Status:**  
**Color:** ■  
**Layer:**  
**Space:**

specify which one.



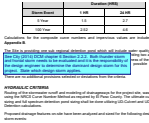
**Subject:** SW - Textbox with Arrow  
**Page Label:** 9  
**Author:** Glenn Reese - EPC Stormwater  
**Date:** 1/5/2022 3:30:57 PM  
**Status:**  
**Color:** ■  
**Layer:**  
**Space:**

specify that this is  
"Water Quality Feature 1"

Kimley»Ho



## Text Box (14)



**Subject:** Text Box  
**Page Label:** 11  
**Author:** dsdlaforce  
**Date:** 1/10/2022 5:30:49 PM  
**Status:**  
**Color:**    
**Layer:**  
**Space:**

See City (2014) DCM chapter 6 Section 2.2.2. Both thunder storm and frontal storm needs to be evaluated and it is the responsibility of the design engineer to determine the dominant design storm for this project. State which design storm applies.



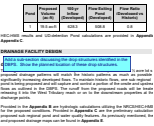
**Subject:** Text Box  
**Page Label:** 408  
**Author:** dsdlaforce  
**Date:** 1/11/2022 1:13:53 PM  
**Status:**  
**Color:**    
**Layer:**  
**Space:**

Add the flow plath used to calculate the time of concentration on all the drainage maps



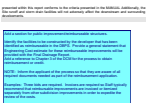
**Subject:** Text Box  
**Page Label:** 15  
**Author:** dsdlaforce  
**Date:** 1/11/2022 10:14:26 AM  
**Status:**  
**Color:**    
**Layer:**  
**Space:**

Add the following:  
1. Paintbrush Hills Fil 14 FDR. (PCD File No SF2024)



**Subject:** Text Box  
**Page Label:** 12  
**Author:** dsdlaforce  
**Date:** 1/11/2022 10:32:59 AM  
**Status:**  
**Color:**    
**Layer:**  
**Space:**

Add a sub-section discussing the drop structures identified in the DBPS. Show the planned location of these drop structures.



**Subject:** Text Box  
**Page Label:** 14  
**Author:** dsdlaforce  
**Date:** 1/11/2022 10:48:29 AM  
**Status:**  
**Color:**    
**Layer:**  
**Space:**

Add a section for public improvement/reimbursable structures.

Identify the facilities to be constructed by the developer that has been identified as reimbursable in the DBPS. Provide a general statement that Engineering Cost estimate for these reimbursable improvements will be provided with the Final Drainage Report. Add a reference to Chapter 3 of the DCM for the process to obtain reimbursement or credit.

NOTE: Inform the applicant of the process so that they are aware of all required documents needed as part of the reimbursement application.

Examples: Three bids are required. Invoices are required so Staff typically recommend that reimbursable improvements are invoiced or itemized separately from other subdivision improvements in order to expedite the review of the costs.

Review of the hydrology model will be provided on the re-submittal based on redline comments provided in the narrative section.

**Subject:** Text Box  
**Page Label:** 40  
**Author:** dsdlaforce  
**Date:** 1/11/2022 12:52:04 PM  
**Status:**  
**Color:** ■  
**Layer:**  
**Space:**

Review of the hydrology model will be provided on the re-submittal based on redline comments provided in the narrative section.

Provide the lag time table used for the HEC-HMS modeling in accordance with the City DCM for the NRCS Method.

**Subject:** Text Box  
**Page Label:** 46  
**Author:** dsdlaforce  
**Date:** 1/11/2022 12:57:03 PM  
**Status:**  
**Color:** ■  
**Layer:**  
**Space:**

Provide the lag time table used for the HEC-HMS modeling in accordance with the City DCM for the NRCS Method.

See redline comments to the offsite basin in the pre-development condition and update accordingly.

**Subject:** Text Box  
**Page Label:** 152  
**Author:** dsdlaforce  
**Date:** 1/11/2022 2:00:21 PM  
**Status:**  
**Color:** ■  
**Layer:**  
**Space:**

See redline comments to the offsite basin in the pre-development condition and update accordingly.

Provide the lag time

**Subject:** Text Box  
**Page Label:** 156  
**Author:** dsdlaforce  
**Date:** 1/11/2022 2:04:22 PM  
**Status:**  
**Color:** ■  
**Layer:**  
**Space:**

Provide the lag time

Clarify in the narrative if the CN for pre-developed was from the ARC II table in the DCM.

**Subject:** Text Box  
**Page Label:** 48  
**Author:** dsdlaforce  
**Date:** 1/11/2022 2:06:30 PM  
**Status:**  
**Color:** ■  
**Layer:**  
**Space:**

Clarify in the narrative if the CN for pre-developed was from the ARC II table in the DCM.

Was the initial abstraction included in the HEC-HMS modeling. Provide a summary table of the initial abstraction values applied for each basin.

**Subject:** Text Box  
**Page Label:** 48  
**Author:** dsdlaforce  
**Date:** 1/11/2022 2:08:09 PM  
**Status:**  
**Color:** ■  
**Layer:**  
**Space:**

Was the initial abstraction included in the HEC-HMS modeling. Provide a summary table of the initial abstraction values applied for each basin.

update narrative to provide a summary of this worksheet

update narrative to provide a summary of this worksheet

Identify the method used for channel routing in HEC-HMS. See Cit DCM chapter 6 section 6.0 for allowable channel routing method.