



Final Drainage Report

# Eagleview Subdivision El Paso County, Colorado

Prepared for:

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Project #: 196288000

PCD Filing No.: SF-2242

Prepared: April 19, 2024

**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.

\_\_\_\_\_  
PT Eagleview LLC

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

\_\_\_\_\_  
Joseph W. DesJardin

\_\_\_\_\_  
Director of Entitlements

\_\_\_\_\_  
Address:  
1864 Woodmoor Drive  
Monument, CO 80132

**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.

\_\_\_\_\_  
Josh Palmer, P.E. Date  
County Engineer/ ECM Administrator

Conditions:

**TABLE OF CONTENTS**

**CERTIFICATION .....2**

    DESIGN ENGINEER'S STATEMENT .....2

    OWNER/DEVELOPER'S STATEMENT .....2

    EL PASO COUNTY .....2

**TABLE OF CONTENTS .....3**

**INTRODUCTION .....4**

    PURPOSE AND SCOPE OF STUDY .....4

    LOCATION .....4

    DESCRIPTION OF PROPERTY .....4

**DRAINAGE BASINS .....5**

    MAJOR BASIN DESCRIPTIONS .....5

    EXISTING SUB-BASIN DESCRIPTIONS .....5

    PROPOSED SUB-BASIN DESCRIPTIONS .....7

**DRAINAGE DESIGN CRITERIA.....10**

    DEVELOPMENT CRITERIA REFERENCE .....10

    HYDROLOGIC CRITERIA .....10

    HYDRAULIC CRITERIA .....13

    DETENTION AND WATER QUALITY POND.....13

    CULVERT SIZING .....15

    CHANNEL STABILIZATION .....15

    PAINTBRUSH HILLS- POND C.....18

**DRAINAGE FACILITY DESIGN .....19**

    GENERAL CONCEPT .....19

    SPECIFIC DETAILS .....19

    EXISTING MAJOR DRAINAGE CHANNELS .....20

**THE FOUR STEP PROCESS .....20**

**DRAINAGE FEES AND REIMBURSABLE COSTS .....21**

    FEES .....21

    IMPROVEMENTS AND REIMBURSABLE COSTS .....21

**SUMMARY .....22**

**REFERENCES .....23**

**APPENDIX**

    APPENDIX A: FIGURES

    APPENDIX B: HYDROLOGY

    APPENDIX C: HYDRAULICS

    APPENDIX D: REFERENCES

    APPENDIX E: DRAINAGE MAPS

## INTRODUCTION

### **PURPOSE AND SCOPE OF STUDY**

The purpose of this Final Drainage Report (FDR) 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 Section 26, Township 12 South, Range 65 West of the 6<sup>th</sup> Principal Meridian, County of El Paso, State of Colorado (“the Site”). The Site comprises two parcels of land which are bound by Stapleton Estates Filing No. 1 on the west and south, Paint Brush Hills Filing No. 14 (PCD File No. SF2024) to the east, and the Rodgwick Subdivision and MFY Farm Subdivision to the north. A vicinity map has been provided in the **Appendix A** of this report.

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

### **DESCRIPTION OF PROPERTY**

The Site is approximately 121 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 tributary of the Falcon drainage basin runs from the northwest corner of the site to the southeast 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 full spectrum detention pond, two water quality ponds, roadside ditches, culverts, drainage swales, native seeding and a proposed channel to convey flows to the detention pond and water quality ponds.

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 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 floodplain 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 8 offsite basins OB1 – OB8. 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 5.55 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 61.00. Runoff during the 5-year and 100-year events are 3.0 cfs and 8.5 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 15.4 cfs and 48.5 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 36.4 cfs and 110.0 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 5.4 cfs and 18.2 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 63.76. Runoff during the 5-year and 100-year events are 7.1 cfs and 18.8 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 64.16. Runoff during the 5-year and 100-year events are 20.6 cfs and 52.7 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 63.62. Runoff during the 5-year and 100-year events are 25.3 cfs and 67.1 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 64.71. Runoff during the 5-year and 100-year events are 7.5 cfs and 18.9 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 59.98. Runoff during the 5-year and 100-year events are 36.8 cfs and 106.9 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 61.77. Runoff during the 5-year and 100-year events are 40.8 cfs and 113.2 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 61.07. Runoff during the 5-year and 100-year events are 101.4 cfs and 284.2 cfs respectively.

**Sub-Basin OB8**

The offsite sub-basin consists of an area of 33.07 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 64.89. Runoff during the 5-year and 100-year events are 19.5 cfs and 51.6 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, full spectrum detention pond, or water quality ponds. The proposed project has been divided into 14 on-site sub-basins. The off-site basins are fully developed 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 3.0 cfs and 7.7 cfs respectively. Runoff from this basin will travel across the lots and outfall to the south as it has done historically at 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 1.0 cfs and 2.4 cfs respectively. Runoff from this basin will travel across the lot and outfall to the south as it has done historically at design point P1. Flows from this sub-basin are not required to be conveyed to a water quality facility according to Appendix I Section 1.7.1.B of El Paso County's Engineering Construction Manual (ECM). The sub-basin is identified as a large lot single family area with an impervious cover under 20 percent under Section 1.7.1.B, number 5. In addition to a small portion of roadway flows that are not required to be conveyed to a water quality facility according to Appendix I Section 1.7.1.C.1.

#### **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 1.5 cfs and 3.3 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 Water Quality Pond 1 before out falling into the West Tributary reach at design point P2.

#### **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 12.6 cfs and 30.2 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 Water Quality Pond 1 before out falling into the West Tributary reach at design point P2.

#### **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 4.2 cfs and 10.4 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, Culvert 2, and outfall into Water Quality Pond 1 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 8.6 cfs and 20.7 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 Water Quality Pond 1 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 3.46 acres. The curve number for the sub-basin is 66.22. Runoff during the 5-year and 100-year events are 3.2 cfs and 7.4 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 Water Quality Pond 1 before out falling into the West Tributary reach.

#### **Sub-Basin PB8A**

The on-site sub-basin consists of 2 residential lots, a large natural drainage channel and Pond 3 near the northwest corner of the property. The sub-basin has an area of 7.60 acres. The curve number for the sub-basin is 64.63. Runoff during the 5-year and 100-year events are 8.3 cfs and 20.3 cfs respectively. Runoff from this basin will travel across the lots and into the natural channel that outfall into Pond 3. Offsite sub-basin OB5 also discharges onto the property and is conveyed to Pond 3 through sub-basin PB8A via the natural channel and rock chutes.

#### **Sub-Basin PB8B**

The on-site sub-basin consists of 4 residential lots and a large natural drainage channel. The sub-basin has an area of 5.79 acres. The curve number for the sub-basin is 64.00. Runoff during the 5-year and 100-year events are 6.1 cfs and 15.2 cfs respectively. Runoff from this basin will travel across the lots and into the natural channel that outfalls into the main natural channel.

### **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 9.8 cfs and 24.8 cfs respectively. Runoff from this basin will travel across the lots and into the natural channel.

### **Sub-Basin PB10**

The on-site sub-basin consists of 4 residential lots near the northern portion of the property. The sub-basin has an area of 8.47 acres. The curve number for the sub-basin is 64.00. Runoff during the 5-year and 100-year events are 5.6 cfs and 14.4 cfs respectively. Runoff from this basin will travel across the lots and into the West Tributary reach .

### **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 17.56 acres. The curve number for the sub-basin is 65.20. Runoff during the 5-year and 100-year events are 13.6 cfs and 33.2 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 Water Quality Pond 2 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 4.02 acres. The curve number for the sub-basin is 65.12. Runoff during the 5-year and 100-year events are 4.9 cfs and 11.7 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. Flows from this sub-basin are not required to be conveyed to a water quality facility according to Appendix I Section 1.7.1.B of El Paso County's Engineering Construction Manual (ECM). The sub-basin is identified as a large lot single family area with an impervious cover under 20 percent under Section 1.7.1.B, number 5. In addition to a small portion of roadway flows that are not required to be conveyed to a water quality facility according to Appendix I Section 1.7.1.C.1.

### **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 18.9 cfs and 46.3 cfs respectively. Runoff from this basin will sheet flow into the West Tributary reach and outfall to design point P3. Flows from this sub-basin are not required to be conveyed to a water quality facility according to Appendix I Section 1.7.1.B of El Paso County's Engineering Construction Manual (ECM). The sub-basin is identified as a large lot single family area with an impervious cover under 20 percent under Section 1.7.1.B, number 5. In addition to a small portion of roadway flows that are not required to be conveyed to a water quality facility according to Appendix I Section 1.7.1.C.1.

### **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 61.65. Runoff during the 5-year and 100-year events are 11.0 cfs and 26.3 cfs respectively. Runoff from this basin will travel across the lots utilize roadside ditches and natural drainage channels to convey flows to Water Quality Pond 1 out falling into the West Tributary reach at design point P2.

### **Sub-Basins OB1 – OB8**

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”, Volumes 1 and 2 and the City of Colorado Springs May 2014 Drainage Criteria Manual, Volume 1, (“the DCM”).

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

A Falcon Drainage Basin Planning Study prepared by Matrix Design Group, September 2015 (DBPS) was completed and includes the Eagleview subdivision. This planning study was used for reference to assist with drainage design for the proposed subdivision. A DBPS Amendment to the Falcon DBPS (Dated March 8, 2024) was completed and approved through the Drainage Board on March 27, 2024 which proposed alternatives to the onsite detention location and improvements required along each reach of the tributary. The new location of the detention pond is located off of the West Tributary reach. The proposed detention pond still provides water quality for onsite and offsite areas draining to it and also provides attenuation for the 100-yr storm event. As part West Tributary reach analysis, stream improvements were identified and conceptually designed for the entire reach. Refer to **Appendix D** for excerpts from the DBPS.

### ***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 II 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. Per the DCM both Frontal and Thunderstorms were evaluated to determine the higher design flow. The comparative analysis between the two storms shows that the Frontal Storm produces a significantly higher flow rates therefore, this storm was used for the drainage design. The rainfall distribution for the Frontal Storm was selected as the dominant storm-type for this project. See **Table 1** below for the rainfall values.



**Table 1: Colorado Springs Rainfall Depths**

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

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) because the DBPS used an aerial reduction of 2% to the rainfall depths as the Falcon Watershed is slightly larger than 10 square miles. This aerial reduction was not applied to the rainfall depths for this Site as the drainage area analyzed was smaller and didn't require an aerial reduction. Refer to Tables 6-2 and 6-4 in Chapter 6 of the DCM for the frontal rainfall distribution curve and Colorado Springs rainfall depths data for the 5-year and 100-year design storm events utilized for the project. The project model was compared to the DBPS model, and it generally reflects lower flows for the project site area. This is mainly due to using the Type II rainfall distribution curve versus the Type Ila rainfall distribution curve that the DBPS model used. Design point JWT080 in the DBPS model and design points J4 and P7 in the project models were used as critical points to compare the existing and proposed condition models.

Design runoff was calculated using the NRCS curve number method as established in the DCM. 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. Where possible, runoff curve numbers established in the DBPS were utilized since these were more conservative than equivalents found in the DCM. For all other areas, curve numbers were developed by using Table 6-10 (ARCI) in the DCM. The CN values calculated for basins in this analysis align closely with those found in the DBPS, with a weighted average of 61.5. **Table 2** below shows all CN values utilized for this report and their source. Calculations for the composite curve numbers are included in the **Appendix B**.

A combination of aerial imagery and available public GIS data were used to calculate weighted impervious values. However, the DBPS was found to underestimate imperviousness of the basins; the impervious values in the DBPS ranged between 1% and 4% with most basins having an impervious value of 2%. Calculations for impervious values are included in the **Appendix B**.

**Table 2: CN Values**

		Soil Type			
Cover Description	% Imp	A	B	C	D
Open Space	---	39	61	74	80
Gravel	---	76	85	89	91

Cover Description	% Imp	Soil Type			
		A	B	C	D
Paved	---	98	98	98	98
5 Acre Rural Residential (Woods Landuse) *	---	33	58	73	80
5 Acre Rural Residential (Rangeland Landuse) *	---	40	62	75	81
½ Acre Residential*	25	55	71	81	86
2 ½ Acre Rural Residential*	11	45	64	76	81

\*Values from the Falcon Drainage Basin Planning Study (DBPS) completed in 2015.

The Manning's n values used to calculate the channelized flow regime for the time of concentration were developed by comparison with the DBPS HEC-HMS and HEC-RAS models and through physical confirmation at the site. The Manning's n values used to calculate the overland flow regime for the time of concentration were taken from Table 6-11 in the DCM and can be found in **Table 3** below.

**Table 3: Manning's n Roughness Coefficients**

Surface Description	n Value
Short Grass Prairie	0.15
Woods – Light underbrush	0.4

The time of concentration was calculated following the guidance provided in TR-55 by summing the travel time for overland flow, sheet flow, and channelized flow segments along the longest flow path and a factor of 0.6 was then applied to generate the lag time, per Ch. 6 Section 4.6 of the DCM. 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 **Appendix B**.

Routing of the stormwater runoff and modeling of drainageways for the project site, was done using the NRCS Curve Number Method as required by El Paso County. Routing of channelized flow was based on the Muskingum-Cunge method for all reaches for the existing and proposed model. This aligned with the methodology completed in the DBPS models.

Small existing channels onsite were modeled with a typical section using FlowMaster that has the following characteristics: a longitudinal slope of 0.025, side slopes of 1.3 (H:V), a Manning's n value of 0.030, and a normal depth of 2 feet. Similarly, proposed roadside ditches were modeled in FlowMaster with a typical section that has the following characteristics: a longitudinal slope of 0.025, side slopes of 4.0 (H:V), a Manning's n value of 0.030, and a normal depth of 18 inches. Calculated discharge for the typical channel and typical ditch are approximately 8 cfs and 67 cfs, respectively. See the FlowMaster worksheet in **Appendix C** for



further details on the typical channel and typical ditch. The larger main tributary channel was modeled based on an averaging of cross sections within the DBPS HEC-RAS model for the subject reaches. The longest of these, R-PB13, has the following characteristics: a longitudinal slope of 0.02, side slopes of 3:1 (H:V), and a Manning's n value of 0.03.

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

### **HYDRAULIC CRITERIA**

Applicable design methods were utilized to size the proposed detention pond, water quality ponds, culverts, drainage channels, erosion protection, which include the use of Mile High Flood Districts UD-Detention spreadsheet, UD-Culvert spreadsheet, and FlowMaster. The Site is providing one full spectrum detention pond which will include water quality capture volume (WQCV), excess urban runoff volume (EURV), and 100-year detention per the DBPS. The site is also providing two additional water quality ponds. The Site is not significantly increasing the imperviousness of the Site and the Project is maintaining the historic drainage patterns as much as possible and not significantly increasing developed flows. Proposed drainage features on-site have been analyzed and sized for the Major Storm, 100-year design storm event.

### **DETENTION AND WATER QUALITY POND**

The full spectrum detention pond design was completed utilizing Mile High Flood District's UD-Detention spreadsheet to design the pond outlet structure. The UD-detention spreadsheet in **Appendix C** was designed for the total area onsite and offsite draining to the Pond. The pond was designed to reduce the peak flow by ~10% to reach the pre vs post ratio of 0.9. Once the design of the pond was completed in UD-detention the stage storage curve and stage discharge curve from the spreadsheet was then input into HEC-HMS and run. The peak storage and peak outflow results from UD-detention spreadsheet compared to the HEC-HMS results were negligible. Therefore, verifying the detention Pond 3 was sized adequately for the 100-yr storm event.

The water quality capture volume for Pond 3 was determined using an empirical formula based on percent impervious. Refer to **Appendix C** for calculations.

As previously mentioned, a full spectrum detention pond and two water quality ponds are being proposed for the site. The full spectrum detention pond is a non-jurisdictional detention pond which has been designed for WQCV, EURV, and 100-year detention. The detention pond has been designed per the DBPS Amendment and restricts flow to be less than the historic flow leaving the site to 561 cfs. Maintenance of the detention Pond 3 and water quality ponds will be through Eagleview Metro District. Water quality ponds 1 and 2 will provide water quality control volumes of 0.13 ac-ft and 0.05 ac-ft, respectively. Flows in excess of the water quality control volume will be routed through the spillways of the water quality ponds.

**Table 4: Pond Summary Table**

Pond	Proposed Volume (ac-ft)	100-yr Inflow (Developed) [cfs]	Flow Exiting Pond (Developed) [cfs]	Flow Ratio (Developed vs Historic)	100-yr Flows Detained
Pond 3	2.8 ac-ft	109	97	0.89	Yes
WQP1	0.13 ac-ft	181	181	-	No
WQP2	0.05 ac-ft	82	82	-	No

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

The detention Pond 3 has two rock chutes proposed with a downstream stilling basin to dissipate the energy of the flow being conveyed into the pond through the rock chutes. The stilling basin for each rock chute will have dual purpose. The first purpose will be to assist in dissipating the energy before out falling into the pond bottom and second purpose is to serve as a forebay structure. The concrete line trickle channels will convey flows to the outlet structure micro pool. The outlet structure is designed to provide full spectrum characteristics. The 100-year storm volume will be released via 1-42" RCP. An emergency spillway is proposed and designed to convey the 100-year flow with a depth of 1'. The emergency spillway has been designed to provide a minimum of 1' of freeboard. A 15' wide access road is proposed from top of the pond to the bottom of the pond for maintenance. The pond reduces proposed flows at the outfall below historic levels relative to the existing conditions analysis results.

Water Quality Pond 1 has two rock chutes proposed with a downstream stilling basin for each to dissipate the energy of the flow being conveyed into the water quality pond through the rock chutes. The stilling basin for each rock chute will have dual purpose. The first purpose will be to assist in dissipating the energy before out falling into the pond bottom and second purpose is to serve as a forebay structure. The concrete line trickle channel will convey flows to the outlet structure micro pool. The outlet structure is designed to provide water quality treatment only. The water quality flows will be released through a 24" RCP. Once a volume greater than the water quality volume is reached the flows will be conveyed through a combination of the outlet structure and spillway. The spillway has been designed to convey the 100-year flow of 181 cfs. The spillway has been designed to provide a minimum of 1' of freeboard. A 15" wide access road is proposed to the bottom of the pond for maintenance.

Water Quality Pond 2 has one rock chute proposed with a downstream stilling basin to dissipate the energy of the flow being conveyed into the water quality pond through the rock chute. The stilling basin for each rock chute will have dual purpose. The first purpose will be to assist in dissipating the energy before out falling into the pond bottom and second purpose is to serve as a forebay structure. The concrete line trickle channel will convey flows to the outlet structure micro pool. The outlet structure is designed to provide water quality treatment only. The water quality flows will be released through a 18" RCP. Once a volume greater than the water quality volume is reached the flows will be conveyed through a combination of the outlet structure and spillway. The spillway has been designed to convey the 100-year flow of 82 cfs. The spillway has been designed to provide a minimum of 1' of freeboard. A 15" wide access road is proposed to the bottom of the pond for maintenance.

**CULVERT SIZING**

The proposed culverts for the site were designed utilizing Mile High Flood Districts UD-Culvert spreadsheet. Refer to **Appendix C** for culvert sizing and erosion protection calculations.

**CHANNEL STABILIZATION**

The Falcon Drainage Basin Study identifies the need for channel stabilization improvements with the Site. In particular, the DBPS calls for the construction of 24 small drop structures within the Eagleview Subdivision. A DBPS Amendment to the Falcon DBPS (Dated March 8, 2024) was completed and approved through the Drainage Board on March 27, 2024 which proposed alternatives to the onsite detention location and improvements required along each reach of the tributary. The proposed improvements represent the Amended improvements associated with the DBPS Amendment. See **Appendix E** for check structure and riffle drop locations based on hydraulic analysis of the site.

The channel stabilization was analyzed as part of this report. The larger main tributary channel was modeled in HEC-RAS to analyze the reach for stability. As the DBPS identified this reach for channel improvement. Refer to the HEC-RAS results and exhibits in **Appendix C**. Based on the HEC-RAS modeling results proposed amendments to the identified drainage features in the DBPS have been analyzed using the following hydraulic design parameters, in **Table 5**, consistent with the Mile High Flood Districts, Urban Drainage and Flood Control District Drainage Criteria Manuals (UDFCDM), (Volumes 1,2, and 3), prepared by Wright-McLaughlin Engineers, June 2001, with the latest revisions.

**Table 5: Hydraulic Design Parameters for Natural Channels**

Design Parameter	Design Value
Maximum 100-year depth outside of bankfull channel	5 ft
Roughness values	Per Table 8-5
Maximum 5-year velocity, main channel (within bankfull channel width) (ft/s)	5 ft/s
Maximum 100-year velocity, main channel (within bankfull channel width) (ft/s)	7 ft/s
Froude No., 5-year, main channel (within bankfull channel width)	0.7
Froude No., 100-year, main channel (within bankfull channel width)	0.8
Maximum shear stress, 100-year, main channel (within bankfull channel width)	1.2 lb/sf
Minimum bankfull capacity of bankfull channel (based on future development conditions)	70% of 2-year discharge or 10% of 100-yr discharge, whichever is greater <sup>1</sup>
Minimum bankfull channel geometry	Per Table 8-2
Minimum bankfull channel width/depth ratio (Equation 8-3)	9
Minimum entrenchment ratio (Equation 8-4)	3
Maximum longitudinal slope of low flow channel (assuming unlined, unvegetated low flow channel)	0.2 percent →
Bankfull channel sinuosity (Equation 8-5)	1.1 to 1.3
Maximum overbank side slope	4(H):1(V)
Maximum bankfull side slope	2.5(H):1(V)
Minimum radius of curvature	2.5 times top width

Revised to 0.4% based on Falcon DBPS recommendations.

<sup>1</sup>Roughly equivalent to a 1.5-year event based on extrapolation of regional data.

As part of this hydraulic analysis the DBPS model was updated to represent the existing conditions of the channel more accurately. These updates included adding and removing cross-sections to better represent existing conditions. Manning’s n adjustments we also done based on visual inspection. The velocity and Froude from the HEC-RAS modeling, of the Falcon DBPS, did not appear to match the channel stability of Falcon Creek as seen in the field. The reaches appear to function with more stability than the results of the DBPS imply in the initial DBPS HEC-RAS models. Additional field investigation was completed in an effort to evaluate Manning’s n based on existing channel and vegetation conditions. Pictures were taken at each HEC-RAS cross section identified in the DBPS to assess vegetation type, height, and flow resistance. Engineering judgement was used to revise the Manning’s n by considering flow depth relative to vegetation type. As a result of this evaluation, Manning’s n values in the RWT092 and RWT054 reach were increased to be closer to 0.1 for the channel bottom and 0.045 for the channel slopes based on the following factors:

- Vegetation is comprised mostly of willows and cattails about 4 to 6 feet in height.
- Flow depths are 4-feet or less.
- Willows and cattails are known to be highly resistant to flow until they are submerged.

Where flow depths are unable to submerge the vegetation, a Manning’s n roughness of 0.08 to 0.1 is an acceptable range hydraulic modeling in areas with this type of vegetation.

A HEC-RAS model was completed for the existing conditions, using flow rates determined based on hydrologic analyses completed as a part of the Eagleview Subdivision PDR and the results of that study are presented therein. A abbreviated overview of the existing results from revised HEC-RAS modeling is provided in **Table 6**.

**Table 6: HEC-RAS Results Comparison Between Existing and Proposed Conditions**

	Cross Section	Revised Falcon DBPS HEC-RAS Cross Sections (Existing Condition)				HEC-RAS Cross Sections (Proposed Condition)	
		DBPS		Eagleview		Eagleview	
		Input	Output	Input	Output	Input	Output
		100-yr Flow (cfs)	Froude No.	100-yr Flow (cfs)	Froude No.	100-yr Flow (cfs)	Froude No.
Offsite	41218.78	480	0.74	285	0.57	285	0.57
Eagleview Onsite	40884.05	480	0.97	285	0.40	285	0.40
	40418.78	480	0.91	285	0.49	285	0.49
	40018.78	740	1.01	375	0.38	375	0.38
	39618.78 <sup>1</sup>	740	1.04	375	0.56	375	0.57
	39218.78	740	1.15	478	0.29	478	0.28
				478	0.51	478	0.52

	38818.78	740	1.03	478	0.55	480	0.39
	38418.78 <sup>2</sup>	740	1.07	478	0.75	480	0.56
	38018.78 <sup>3</sup>	740	1.06	502	0.82	502	0.57
	37618.78 <sup>4</sup>	740	1.04	502	0.87	502	0.77
Offsite	37218.78	740	0.93	502	0.82	502	0.82

<sup>1</sup> DBPS cross section 39618.78 corresponds to existing and proposed Eagleview cross sections 39666 and 39542

<sup>2</sup> DBPS and existing Eagleview cross section 38418.78 corresponds to proposed Eagleview cross section 38437

<sup>3</sup> DBPS and existing Eagleview cross section 38018.78 corresponds to proposed Eagleview cross section 38001

<sup>4</sup> DBPS and existing Eagleview cross section 37618.78 corresponds to proposed Eagleview cross section 37609

As shown in **Table 6**, there are sections of the reaches that are not in compliance with the hydraulic criteria in existing condition which will be improved, and comply with criteria, in the proposed condition. The proposed improvements that were modeled are described in detail in the following section of the report. Note that cross section 37218.78, the downstream offsite cross section, is not meeting criteria in the existing condition and the hydraulic results remain identical in the proposed condition. Full hydraulic results, including results for proposed design cross sections not present in the DBPS, are provided in **Appendix C**.

To mitigate the velocities and Froude numbers within the existing reaches, proposed improvements are proposed to provide a stable, natural channel through the Site. Through a combination of riffle drops, concrete check structures, and improved vegetation, the proposed improvements meet the design criteria for velocity and Froude. See **Appendix C** for proposed HEC-RAS results. The proposed improvements are based on the principle found in the El Paso County's Drainage Criteria Manual (DCM). Per Section 2.2.1 of the DCM "A stable channel reaches "equilibrium" over many years. Therefore, channel modifications should be minimal." A summary of the proposed improvements are included below.

#### RWT094

- A combination of natural riprap riffle drops, coir matting and channel grading will be shown south of the proposed road (South Arroya Lane) due to the width of the channel in this section, approximately DBPS stations 37+600 to 38+800.
- Concrete check structures north of South Arroya Lane to the confluence of RWT094 with RWT080 and RWT092, approximately DBPS stations 38+800 to 39+600. Check structures are proposed to be installed at grade in the existing channel to minimize disturbance and protect the channel by maintaining a three-foot maximum drop and a 0% longitudinal slope between structures.

RWT094 is located south the confluence with RWT080 and RWT092 and flows south to the southern property line and beyond. The portion of RWT094 within the Eagleview property is approximately bounded by DBPS stations 37+600 to 39+600. It is divided into two sections, split by the proposed South Arroya Lane. The section north of the proposed roadway (approximately DBPS stations 37+600 to 38+800) has a narrower cross section and more closely resembles the cross section of reach RWT092 to the north. A total of five check structures are proposed in the northern section of this reach.



South of the proposed South Arroya Lane, the channel becomes much wider with shallower slopes (approximately DBPS stations 38+800 to 39+600). A total of four constructed riffles are proposed within this section of the reach. The drop heights of the constructed riffles range from 2.3 feet to 3 feet with 3% to 4% slopes. The channel sections outside of the riffles within this reach use the DBPS recommended stable channel slope of 0.40% to reduce the potential of erosion. For the riffle portion of the RWT094 reach, the 2-year flow of 77.5 cfs at design point P3 was used as the basis to size the low flow portion of the channel in this reach that will be regraded. This results in a 22 foot wide low flow channel. The Falcon DBPS states, "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". Thus riprap protection is provided for only the low flow portion of the riffle. A full analysis of the riffle drop structures is included in **Appendix C**.

#### **RWT092**

- Check structures are proposed to be installed at grade in the existing channel to minimize disturbance and protect the channel by maintaining a three-foot maximum drop and a 0% longitudinal slope between structures.

RWT092 is located between RWT054 and the sub regional detention pond SR1, approximately DBPS stations 39+600 to 40+150. A total of four check structures are proposed within this reach. The reach ends at the confluence with another smaller channel from the west.

#### **RWT054**

- Check structures are proposed to be installed at grade in the existing channel to minimize disturbance and protect the channel by maintaining a three-foot maximum drop and a 0% longitudinal slope between structures.

RWT054 is located north of reach RWT092, approximately DBPS stations 40+150 to 41+000. A total of one check structure is proposed within this reach at approximately 40+300. Due to the denser vegetation, including fully grown willows, cattails, and ponderosa trees within the low flow channel, no improvements are proposed north of structure at 40+300. A discussion and justification of the Manning's n was previously provided.

#### **RWT080**

- A full spectrum detention facility is proposed along this reach. Design details are included within this report.

RWT080 is located west of RWT092. Based on the extent of existing vegetation on this reach, willow plantings are proposed as a channel improvement. During the 100 YR event, RWT080 experiences relatively low flow depths of approximately 1 foot, making willow plantings an ideal natural and less invasive solution for channel stability. A maintenance agreement with the County would be required to maintain the vegetation along the channel to maintain the channel.

The construction of the 11.03 AC-FT (100 YR) Sub Regional Pond (SR-1) will be completed by the County at a later date. A 2.8 AC-FT full spectrum detention basin is proposed on the RWT080 reach in the northwest corner of the Eagleview site.

#### ***PAINTBRUSH HILLS- POND C***

Adjacent to the southeast corner of the site, Detention Pond C was designed and constructed with Paint Brush Hills Filing No 12 in approximately 2004. Pond C was recently upgraded to

include water quality and increased emergency spillway flows with Paint Brush Hills Filing No 14 in the 2021 time frame.

The new spillway associated with redesigned Detention Pond C, discharges stormwater runoff straight to the west via a 3:1 rip-rap slope at the property line. The rate, form and path of runoff does not match historic and should not have been approved by the County. Nonetheless, we recommend an additional 107 CY of 12" rip-rap be placed at the toe of slope. The additional rip-rap toe protection will allow the spillway runoff to turn 90 degrees south and return to the historic flow path. Also, a 18,048 SF easement is warranted on Lot 31 to reduce the chance of building in the path of the emergency spillway.

## **DRAINAGE FACILITY DESIGN**

### ***GENERAL CONCEPT***

The Eagleview subdivision is a low-density residential development with 2 ½ acre lot sizes. The proposed drainage patterns will match the historic patterns as much as possible and not significantly increasing developed flows. To maintain historic flows, one detention pond (Pond 3) is being proposed and will capture and control a portion of the onsite and upstream offsite flows as outlined in the DBPS Amendment. 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 calculations for the proposed detention pond, water quality ponds, culvert, and channels. 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 being conveyed from the northwest to the southeast and discharging into the West Tributary reach of the Falcon drainage basin. The site is undeveloped and runoff conditions for the Site were modeled within this study using HEC-HMS. The proposed development looks to preserve the natural drainageways and drainage patterns as much as possible. Culverts have been sized using UD-Culvert and the calculations can be found in **Appendix C**.

The results from the HEC-HMS model for existing conditions show 578 cfs leaving the project site for the 100-year storm event and for the proposed conditions 561 cfs is leaving the project site at the south side. It is not anticipated that the development will negatively impact the drainageways and related facilities downstream of the development.

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

The U.S. Army Corps of Engineers (USACE) provided an approved jurisdictional determination (AJD) for the wetlands present within the Eagleview site. The USACE AJD found that the wetlands within the site were isolated and not Waters of the U.S. (WOTUS); therefore impacts to these wetlands will not require permitting under Section 404 of the Clean Water Act. Furthermore, the wetlands onsite are unregulated and shall not incur any additional permitting requirements beyond the scope of El Paso County.

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). The proposed detention pond will be non-jurisdictional and will therefore require the submission of a Non-Jurisdictional Water Impoundment Structure application form as a part of the platting process.

### **EXISTING MAJOR DRAINAGE CHANNELS**

The DBPS has identified that stream improvements are needed on the West Tributary reach specific to the project Site. The design of the identified improvements are included within this report. The design meets the goals from the DBPS but also minimizes the on-site stream mitigation measures needed to the West Tributary reach.

### **THE FOUR STEP PROCESS**

The Project was designed in accordance with the four-step process to minimize adverse impacts of urbanization, as outlined in the El Paso County Engineering Manual for BMP selection as noted below:

**Step 1. Employ Runoff Reduction Practices** – The project is proposing a low-density residential development that will be designed to minimize the impact to the current existing terrain. The Site's proposed paved roadways will increase the Site's impervious area, however, roadside ditches and channels will be constructed to slow down the runoff velocity and reduce runoff peaks. The detention pond and two water quality ponds 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, excluding 0.97 acres which cannot practicably be treated. Per ECM Appendix I Section 1.7.C.A., 20% of the development site or less than 1 acre can be excluded from providing water quality. As mentioned, 0.97 acres of impervious area will not be able to be treated which is less than 1 acre of the overall site. Per ECM Appendix I Section 1.7.1.B, in development areas of low-density housing, water quality is required for all roads, but is not required for the entirety of the large-lots. Due to the Project consisting of single family large-lots, lot imperviousness shall be limited to 10 percent or less. Refer to **Appendix E** for PBMP Tributary Areas map.

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



**DRAINAGE FEES AND REIMBURSABLE COSTS**

**FEES**

The project is within the Falcon Drainage Basin (CHWS1400) which is a part of the El Paso County Drainage Basin Fee Program, which is based on the total amount of impervious acres for the Site. Based on impervious calculations in the Appendix, there are 16.95 impervious acres for the proposed project. Current rates are for the 2022 calendar year. See the detailed breakdown below.

- Drainage Fee/Acre =                 \$34,117 x 121.2 acres x 13.86% x 75% Imp = \$429,831
  - Bridge Fee/Acre =                    \$4,687 x 121.2 acres x 13.86% Imp =   \$78,734
- Total =     \$508,565**

**IMPROVEMENTS AND REIMBURSABLE COSTS**

The Falcon Drainage Basin Study identifies two types improvements for the Site, County Costs or Developer Costs. Items identified as Developer Costs (those incurred by the Developer) are eligible for reimbursement. County Costs are not eligible for reimbursement. A DBPS Amendment to the Falcon DBPS (Dated March 8, 2024) was completed and approved through the Drainage Board on March 27, 2024 and amended the type of three reaches from a County Cost to a Developer Cost and thus making them reimbursable. A summary of the changes from the DBPS amendment are provided below:

<b>Reach/Feature</b>	<b>Description</b>	<b>Type of Cost</b>	<b>Reimbursable</b>	<b>Amended</b>
RWT094	South of SR1	Developer Cost	Yes	
SR1	Sub-Regional Pond	County Cost	No	Yes (Drainage Easement is Reimbursable)
RWT080	Northwest of SR1	County Cost	No	Yes
RWT092	Northeast of SR1	County Cost	No	Yes

Once construction of the reimbursable facilities is completed, procedures for Drainage Improvement Credits and Reimbursements outlined in Chapter 3 of the Drainage Criteria Manual will be in effect.

A summary of the anticipated construction costs for the reaches/ features in the DBPS Amendment are provided in a table below:

<b>DBPS Reach</b>	<b>PROPOSED COST (2023) W/ 35% Contingency</b>	<b>Comments</b>
RWT-094	\$469,342.00	
RWT-080	\$46,778.00	
RWT-092	\$200,367.00	
RWT-054	\$61,700.00	
Sub Regional Detention Pond (SR1)	\$773,776.00	Drainage Easement Only
<b>Total:</b>	<b>\$1,822,785.00</b>	

Following the Drainage reimbursement request application approval, the Drainage Fees will be as follows based on DBPS cost estimates:

- Drainage Fees= \$429,831
- Improvement Costs= \$1,822,785
- Reimbursement Credit= \$1,392,954

Fees are deferred at plat recordation due to reimbursement expenses being greater than the required drainage fees.

## 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.

## 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. MP132.
7. Paintbrush Hills Fil. 14 FDR. (PCD File No. SF2024)
8. Eagleview Subdivision Preliminary Drainage Report (PDR), prepared by Kimley-Horn, October 28, 2022. PCD File No. SP216

**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/>.

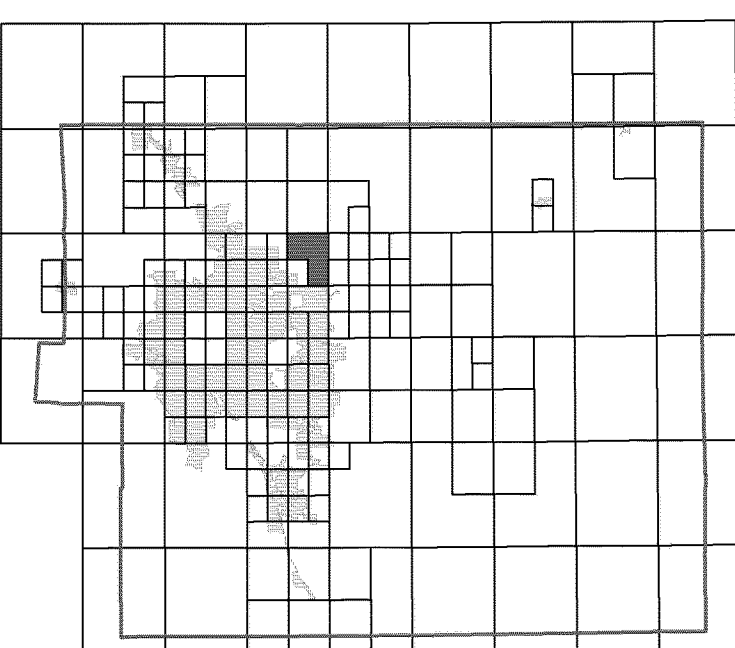
If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP (1-877-336-2627)** or visit the FEMA website at <http://www.fema.gov/business/nfp>.

**El Paso County Vertical Datum Offset Table**

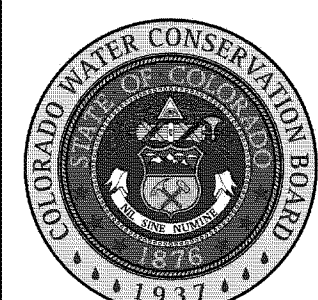
Flooding Source	Vertical Datum Offset (ft)

REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION

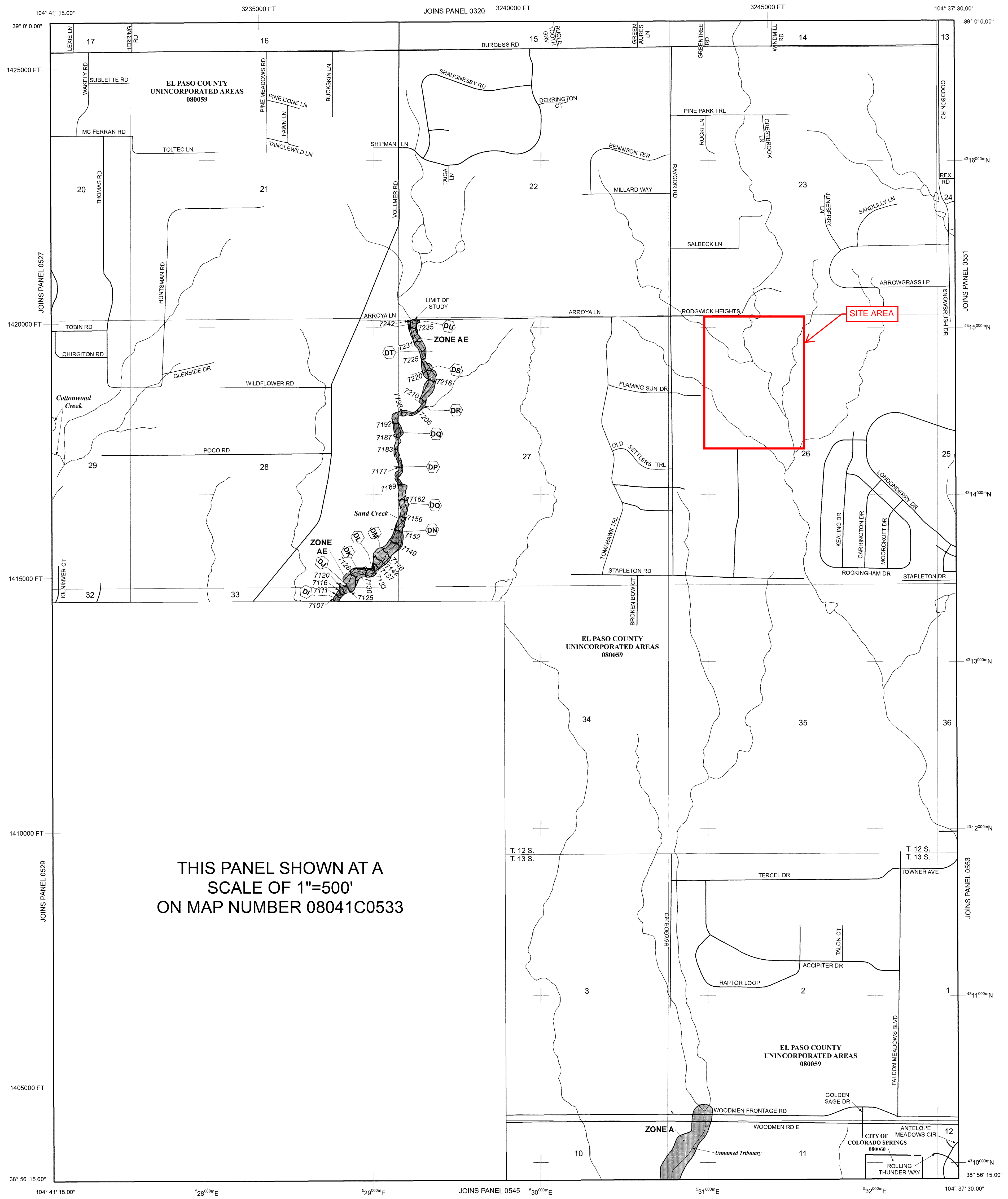
**Panel Location Map**



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.



THIS PANEL SHOWN AT A SCALE OF 1"=500' ON MAP NUMBER 08041C0533

NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 12 SOUTH, RANGE 65 WEST, AND TOWNSHIP 13 SOUTH, RANGE 65 WEST.

**LEGEND**

- SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD
- The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equalled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.
- ZONE A** No Base Flood Elevations determined.
- ZONE AE** Base Flood Elevations determined.
- ZONE AH** Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
- ZONE AO** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
- ZONE AR** Special Flood Hazard Area Formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
- ZONE A99** Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
- ZONE V** Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
- ZONE VE** Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.
- FLOODWAY AREAS IN ZONE AE
- The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.
- OTHER FLOOD AREAS
- ZONE X** Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot, or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.
- OTHER AREAS
- ZONE X** Areas determined to be outside the 0.2% annual chance floodplain.
- ZONE D** Areas in which flood hazards are undetermined, but possible.
- COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS
- OTHERWISE PROTECTED AREAS (OPAs)
- CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.
- 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)
- \* Referenced to the North American Vertical Datum of 1988 (NAVD 88)
- Cross section line
- Transsect line
- 97° 07' 30.00" 32° 22' 30.00" Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
- 4750000N 1000-meter Universal Transverse Mercator grid ticks, zone 13
- 6000000 FT 5000-foot grid ticks: Colorado State Plane coordinate system, central zone (FIPSZONE 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.

**PANEL 0535G**

**FIRM**  
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	

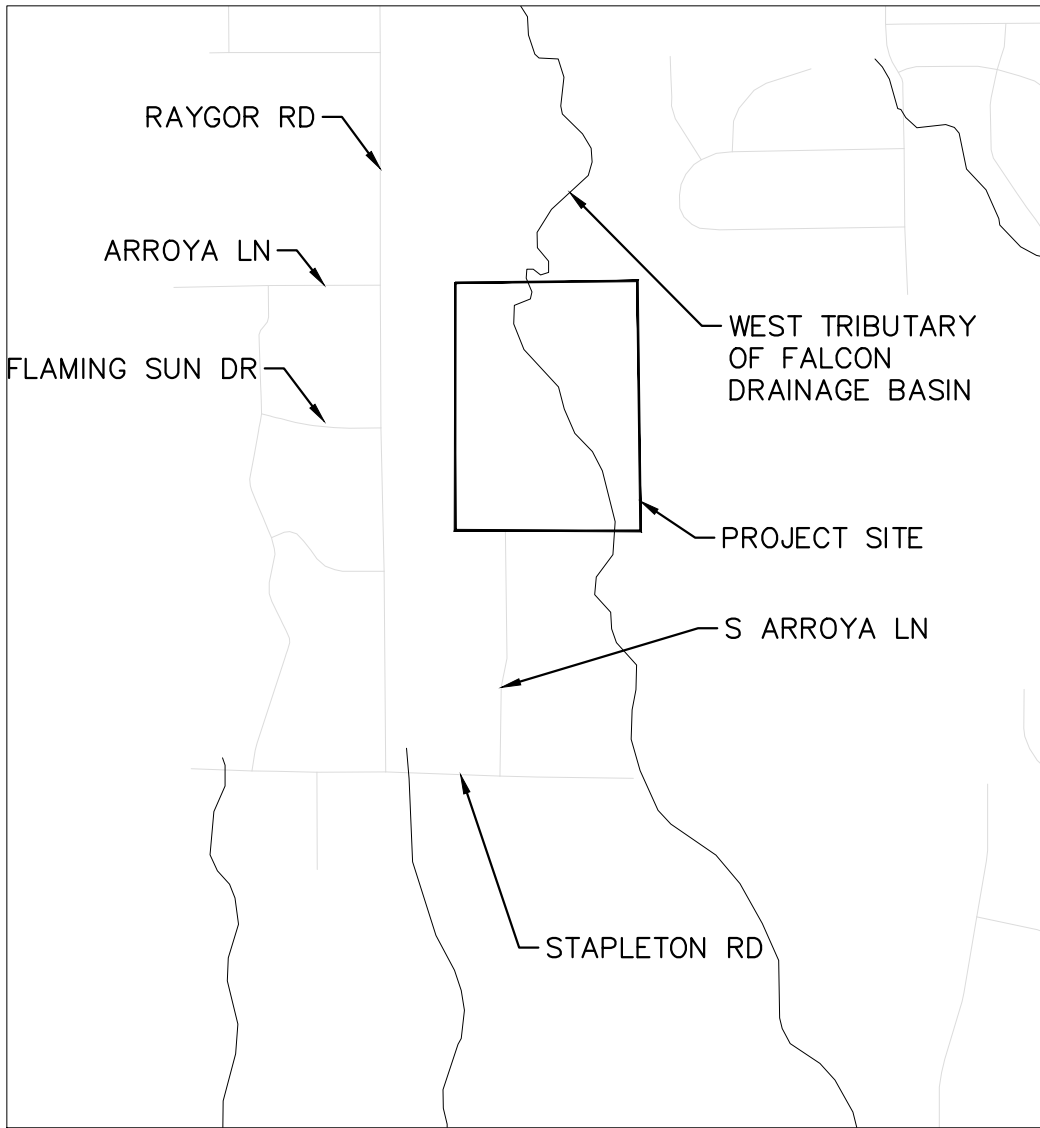
Notice to User: The Map Number shown below should be used when placing map orders. The Community Number shown above should be used on insurance applications for the subject community.

**MAP NUMBER**  
08041C0535G

**MAP REVISED**  
DECEMBER 7, 2018

Federal Emergency Management Agency





VICINITY MAP  
1"=1,000'



***APPENDIX B: HYDROLOGY***

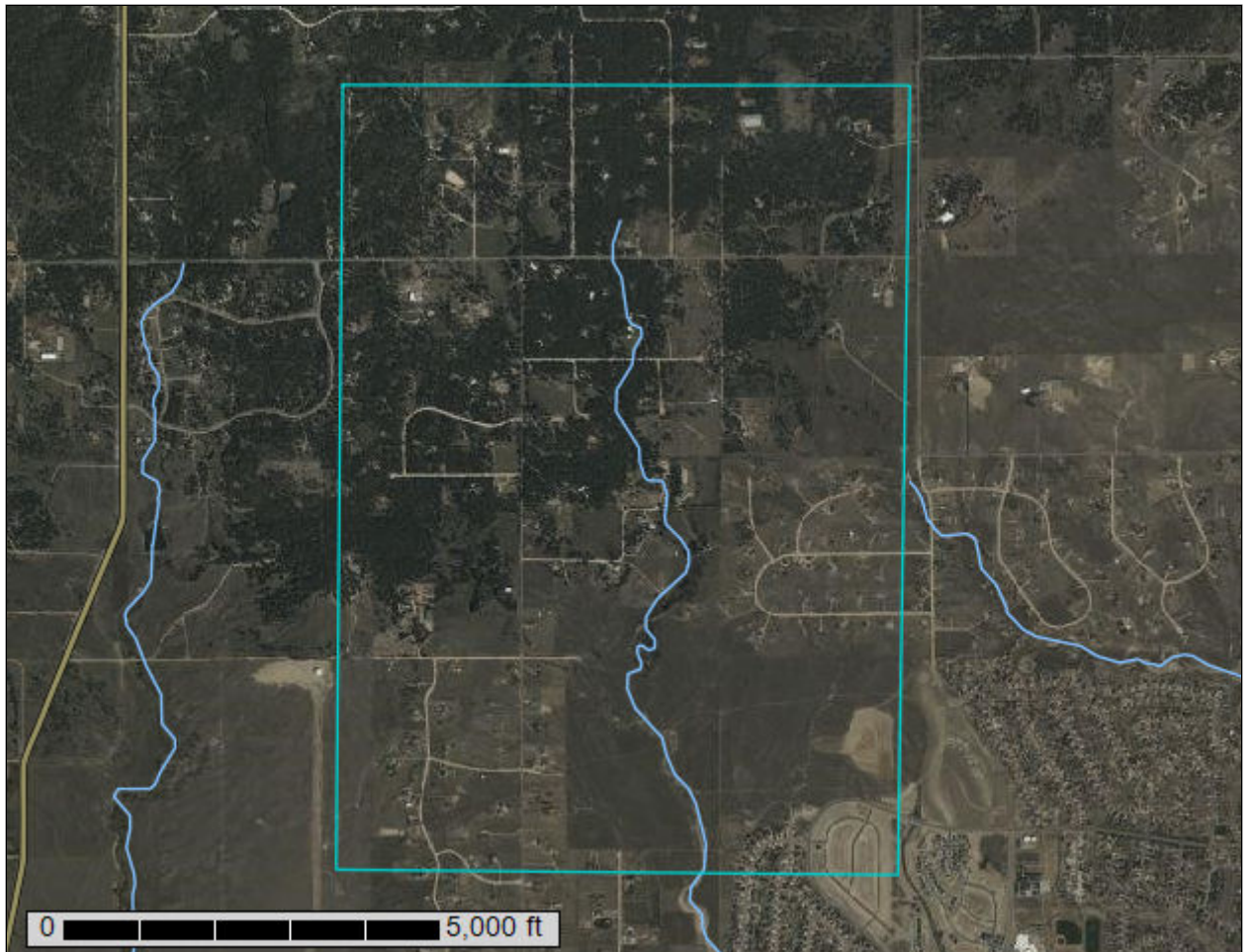




A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

# Custom Soil Resource Report for El Paso County Area, Colorado

## Eagleview



# 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.

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# Contents

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<b>Preface</b> .....	2
<b>How Soil Surveys Are Made</b> .....	5
<b>Soil Map</b> .....	8
Soil Map.....	9
Legend.....	10
Map Unit Legend.....	11
Map Unit Descriptions.....	11
El Paso County Area, Colorado.....	13
19—Columbine gravelly sandy loam, 0 to 3 percent slopes.....	13
40—Kettle gravelly loamy sand, 3 to 8 percent slopes.....	14
41—Kettle gravelly loamy sand, 8 to 40 percent slopes.....	15
71—Pring coarse sandy loam, 3 to 8 percent slopes.....	16
<b>References</b> .....	18

# 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

## Custom Soil Resource Report

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.

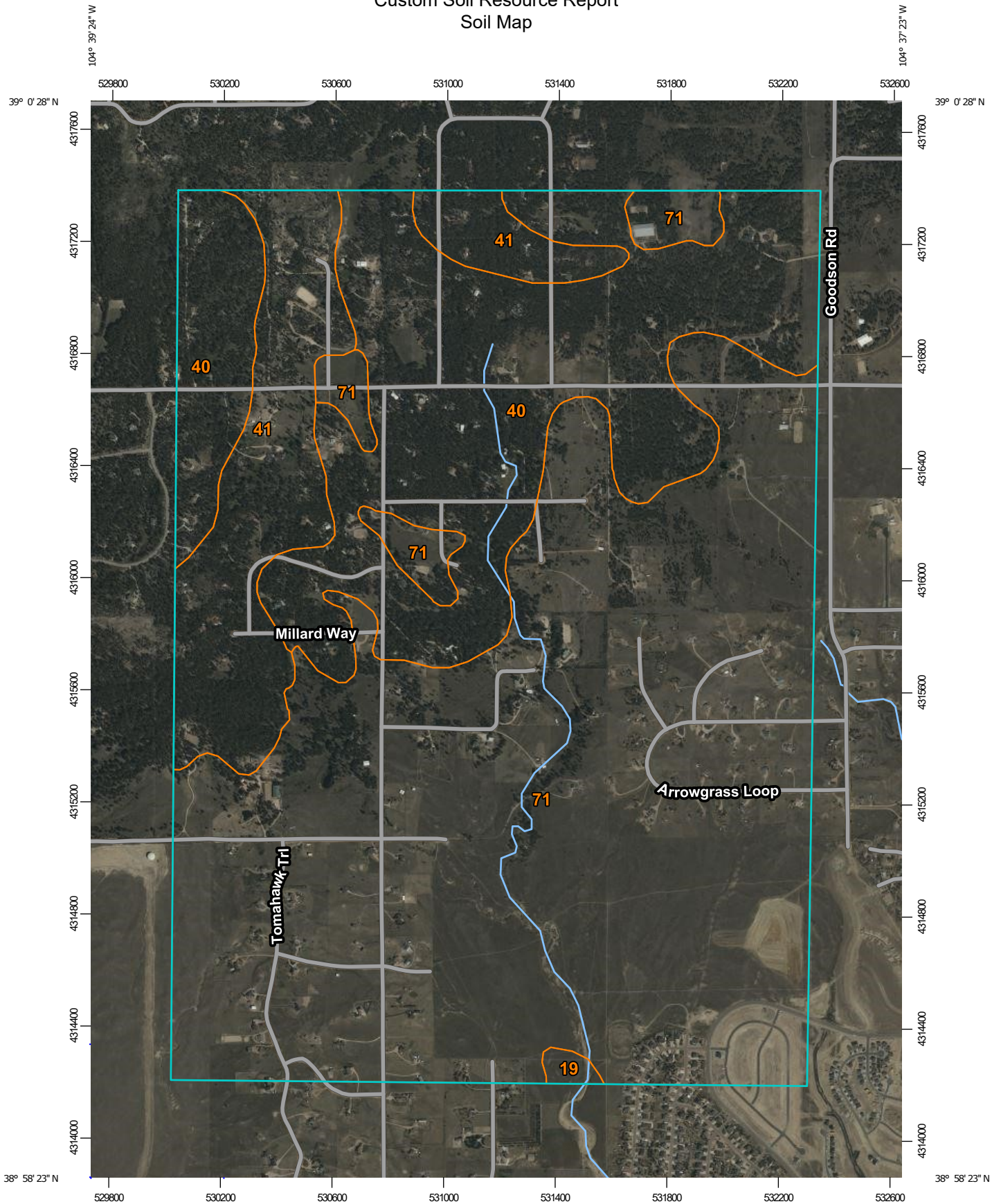
# Soil Map

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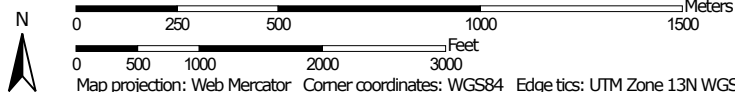
The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.



# Custom Soil Resource Report Soil Map



Map Scale: 1:18,700 if printed on A portrait (8.5" x 11") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

### 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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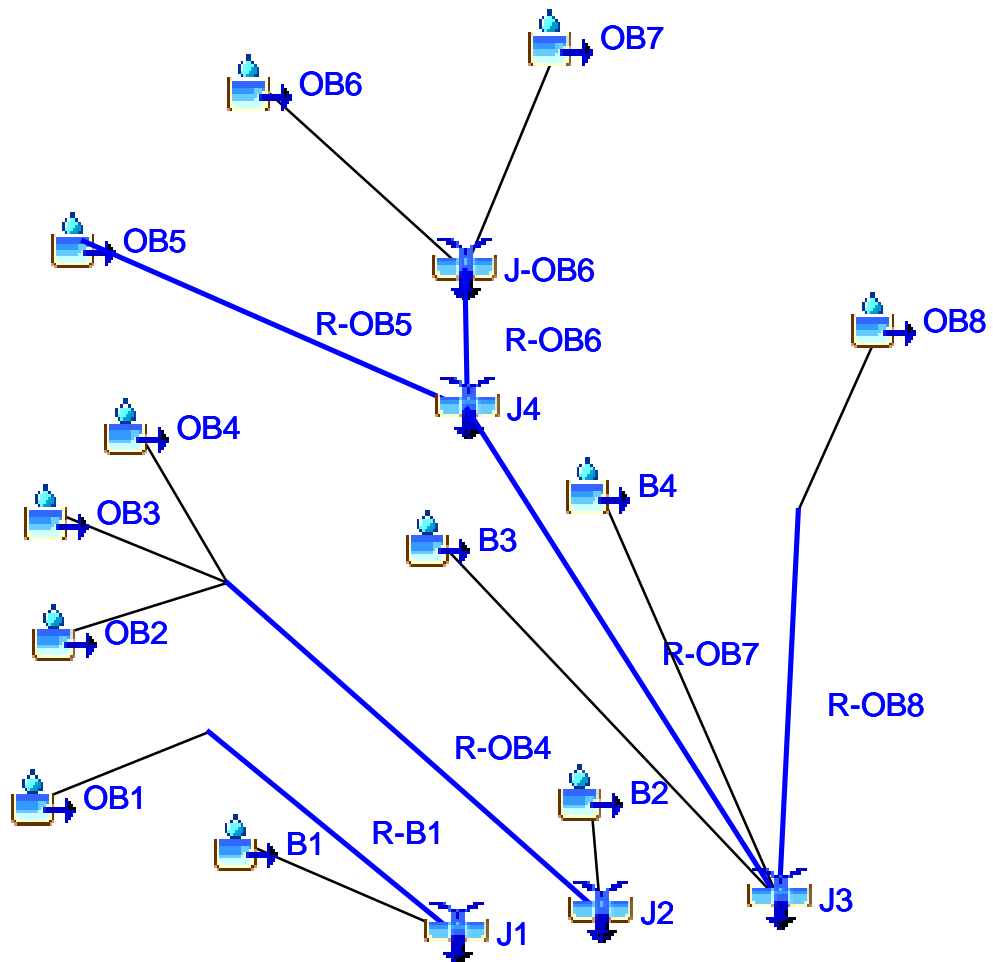


HEC-HMS

# Project : Eagleview\_Subdivision

Basin Model : Eagleview\_Existing

Mar 11 13:21:39 MST 2022



El Paso County Chapter 5: Table 5-2 SCS 24-hr Type II Distribution for TR-20 Input

Hour	Minutes			
	15	30	45	60
1	0.002	0.005	0.008	0.01
2	0.014	0.017	0.020	0.02
3	0.026	0.029	0.032	0.04
4	0.038	0.041	0.044	0.05
5	0.052	0.056	0.060	0.06
6	0.068	0.072	0.076	0.08
7	0.085	0.090	0.095	0.1
8	0.105	0.110	0.115	0.12
9	0.126	0.133	0.140	0.15
10	0.155	0.163	0.172	0.18
11	0.191	0.203	0.218	0.24
12	0.257	0.283	0.387	0.66
13	0.707	0.735	0.758	0.78
14	0.791	0.804	0.815	0.83
15	0.834	0.842	0.849	0.86
16	0.863	0.869	0.875	0.88
17	0.887	0.893	0.898	0.9
18	0.908	0.913	0.918	0.92
19	0.926	0.930	0.934	0.94
20	0.942	0.946	0.950	0.95
21	0.956	0.959	0.962	0.97
22	0.968	0.971	0.974	0.98
23	0.980	0.983	0.986	0.99
24	0.992	0.995	0.998	1

Table 6-2. 24hr 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	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
		Rainfall Depth						
	0	0	0	0	0	0	0	0
	15	0.002	0.0042	0.0054	0.0064	0.0072	0.0084	0.0092
	30	0.005	0.0105	0.0135	0.016	0.018	0.021	0.023
	45	0.008	0.0168	0.0216	0.0256	0.0288	0.0336	0.0368
1	60	0.011	0.0231	0.0297	0.0352	0.0396	0.0462	0.0506
	75	0.014	0.0294	0.0378	0.0448	0.0504	0.0588	0.0644
	90	0.017	0.0357	0.0459	0.0544	0.0612	0.0714	0.0782
	105	0.02	0.042	0.054	0.064	0.072	0.084	0.092
2	120	0.023	0.0483	0.0621	0.0736	0.0828	0.0966	0.1058
	135	0.026	0.0546	0.0702	0.0832	0.0936	0.1092	0.1196
	150	0.029	0.0609	0.0783	0.0928	0.1044	0.1218	0.1334
	165	0.032	0.0672	0.0864	0.1024	0.1152	0.1344	0.1472
3	180	0.035	0.0735	0.0945	0.112	0.126	0.147	0.161
	195	0.038	0.0798	0.1026	0.1216	0.1368	0.1596	0.1748
	210	0.041	0.0861	0.1107	0.1312	0.1476	0.1722	0.1886
	225	0.044	0.0924	0.1188	0.1408	0.1584	0.1848	0.2024
4	240	0.048	0.1008	0.1296	0.1536	0.1728	0.2016	0.2208
	255	0.052	0.1092	0.1404	0.1664	0.1872	0.2184	0.2392
	270	0.056	0.1176	0.1512	0.1792	0.2016	0.2352	0.2576
	285	0.06	0.126	0.162	0.192	0.216	0.252	0.276
5	300	0.0604	0.12684	0.16308	0.19328	0.21744	0.25368	0.27784
	315	0.068	0.1428	0.1836	0.2176	0.2448	0.2856	0.3128
	330	0.072	0.1512	0.1944	0.2304	0.2592	0.3024	0.3312
	345	0.076	0.1596	0.2052	0.2432	0.2736	0.3192	0.3496
6	360	0.08	0.168	0.216	0.256	0.288	0.336	0.368
	375	0.085	0.1785	0.2295	0.272	0.306	0.357	0.391
	390	0.09	0.189	0.243	0.288	0.324	0.378	0.414
	405	0.095	0.1995	0.2565	0.304	0.342	0.399	0.437
7	420	0.1	0.21	0.27	0.32	0.36	0.42	0.46
	435	0.105	0.2205	0.2835	0.336	0.378	0.441	0.483
	450	0.11	0.231	0.297	0.352	0.396	0.462	0.506
	465	0.115	0.2415	0.3105	0.368	0.414	0.483	0.529
8	480	0.12	0.252	0.324	0.384	0.432	0.504	0.552
	495	0.126	0.2646	0.3402	0.4032	0.4536	0.5292	0.5796
	510	0.133	0.2793	0.3591	0.4256	0.4788	0.5586	0.6118
	525	0.14	0.294	0.378	0.448	0.504	0.588	0.644
9	540	0.147	0.3087	0.3969	0.4704	0.5292	0.6174	0.6762
	555	0.155	0.3255	0.4185	0.496	0.558	0.651	0.713
	570	0.163	0.3423	0.4401	0.5216	0.5868	0.6846	0.7498
	585	0.172	0.3612	0.4644	0.5504	0.6192	0.7224	0.7912
10	600	0.181	0.3801	0.4887	0.5792	0.6516	0.7602	0.8326
	615	0.191	0.4011	0.5157	0.6112	0.6876	0.8022	0.8786
	630	0.203	0.4263	0.5481	0.6496	0.7308	0.8526	0.9338
	645	0.218	0.4578	0.5886	0.6976	0.7848	0.9156	1.0028
11	660	0.236	0.4956	0.6372	0.7552	0.8496	0.9912	1.0856
	675	0.257	0.5397	0.6939	0.8224	0.9252	1.0794	1.1822
	690	0.283	0.5943	0.7641	0.9056	1.0188	1.1886	1.3018
	705	0.387	0.8127	1.0449	1.2384	1.3932	1.6254	1.7802
12	720	0.663	1.3923	1.7901	2.1216	2.3868	2.7846	3.0498
	735	0.707	1.4847	1.9089	2.2624	2.5452	2.9694	3.2522
	750	0.735	1.5435	1.9845	2.352	2.646	3.087	3.381
	765	0.758	1.5918	2.0466	2.4256	2.7288	3.1836	3.4868
13	780	0.776	1.6296	2.0952	2.4832	2.7936	3.2592	3.5696
	795	0.791	1.6611	2.1357	2.5312	2.8476	3.3222	3.6386
	810	0.804	1.6884	2.1708	2.5728	2.8944	3.3768	3.6984
	825	0.815	1.7115	2.2005	2.608	2.934	3.423	3.749



14	840	0.825	1.7325	2.2275	2.64	2.97	3.465	3.795
	855	0.834	1.7514	2.2518	2.6688	3.0024	3.5028	3.8364
	870	0.842	1.7682	2.2734	2.6944	3.0312	3.5364	3.8732
	885	0.849	1.7829	2.2923	2.7168	3.0564	3.5658	3.9054
15	900	0.856	1.7976	2.3112	2.7392	3.0816	3.5952	3.9376
	915	0.863	1.8123	2.3301	2.7616	3.1068	3.6246	3.9698
	930	0.869	1.8249	2.3463	2.7808	3.1284	3.6498	3.9974
	945	0.875	1.8375	2.3625	2.8	3.15	3.675	4.025
16	960	0.881	1.8501	2.3787	2.8192	3.1716	3.7002	4.0526
	975	0.887	1.8627	2.3949	2.8384	3.1932	3.7254	4.0802
	990	0.893	1.8753	2.4111	2.8576	3.2148	3.7506	4.1078
	1005	0.898	1.8858	2.4246	2.8736	3.2328	3.7716	4.1308
17	1020	0.903	1.8963	2.4381	2.8896	3.2508	3.7926	4.1538
	1035	0.908	1.9068	2.4516	2.9056	3.2688	3.8136	4.1768
	1050	0.913	1.9173	2.4651	2.9216	3.2868	3.8346	4.1998
	1065	0.918	1.9278	2.4786	2.9376	3.3048	3.8556	4.2228
18	1080	0.922	1.9362	2.4894	2.9504	3.3192	3.8724	4.2412
	1095	0.926	1.9446	2.5002	2.9632	3.3336	3.8892	4.2596
	1110	0.93	1.953	2.511	2.976	3.348	3.906	4.278
	1125	0.934	1.9614	2.5218	2.9888	3.3624	3.9228	4.2964
19	1140	0.938	1.9698	2.5326	3.0016	3.3768	3.9396	4.3148
	1155	0.942	1.9782	2.5434	3.0144	3.3912	3.9564	4.3332
	1170	0.946	1.9866	2.5542	3.0272	3.4056	3.9732	4.3516
	1185	0.95	1.995	2.565	3.04	3.42	3.99	4.37
20	1200	0.953	2.0013	2.5731	3.0496	3.4308	4.0026	4.3838
	1215	0.956	2.0076	2.5812	3.0592	3.4416	4.0152	4.3976
	1230	0.959	2.0139	2.5893	3.0688	3.4524	4.0278	4.4114
	1245	0.962	2.0202	2.5974	3.0784	3.4632	4.0404	4.4252
21	1260	0.965	2.0265	2.6055	3.088	3.474	4.053	4.439
	1275	0.968	2.0328	2.6136	3.0976	3.4848	4.0656	4.4528
	1290	0.971	2.0391	2.6217	3.1072	3.4956	4.0782	4.4666
	1305	0.974	2.0454	2.6298	3.1168	3.5064	4.0908	4.4804
22	1320	0.977	2.0517	2.6379	3.1264	3.5172	4.1034	4.4942
	1335	0.98	2.058	2.646	3.136	3.528	4.116	4.508
	1350	0.983	2.0643	2.6541	3.1456	3.5388	4.1286	4.5218
	1365	0.986	2.0706	2.6622	3.1552	3.5496	4.1412	4.5356
23	1380	0.989	2.0769	2.6703	3.1648	3.5604	4.1538	4.5494
	1395	0.992	2.0832	2.6784	3.1744	3.5712	4.1664	4.5632
	1410	0.995	2.0895	2.6865	3.184	3.582	4.179	4.577
	1425	0.998	2.0958	2.6946	3.1936	3.5928	4.1916	4.5908
24	1440	1	2.1	2.7	3.2	3.6	4.2	4.6

IMPERVIOUS FACTOR CALCULATION TABLE - EXISTING CONDITIONS

	Basin	Area (Acre)	Open Space (2%)	Buildings (100%)	Paved Roadway (100%)	Gravel Roadway (80%)	Total % Check	Weighted Impervious
Onsite	B1	5.55	93%	0%	0%	6%	99%	7%
	B2	41.43	100%	0%	0%	0%	100%	2%
	B3	59.54	100%	0%	0%	0%	100%	2%
	B4	14.68	100%	0%	0%	0%	100%	2%
Offsite	OB1	10.37	93%	2%	4%	2%	100%	9%
	OB2	28.06	90%	3%	3%	5%	100%	11%
	OB3	43.44	92%	2%	2%	4%	100%	9%
	OB4	10.50	87%	4%	5%	4%	100%	13%
	OB5	143.82	94%	2%	1%	3%	100%	7%
	OB6	118.40	93%	1%	2%	4%	100%	8%
	OB7	421.43	93%	2%	1%	4%	100%	8%
	OB8	33.08	93%	2%	1%	5%	100%	8%
Total		930.30						10.6%

Pre Runoff Analysis  
Time of Concentration

Project Information

Project Name: Eagleview  
 KHA Project #: 106288000  
 Designed by: DCM Date: 3/17/2022  
 Revised by: \_\_\_\_\_ Date: \_\_\_\_\_  
 Checked by: BAH Date: 3/17/2022

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

Pre-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)	Lag Time (min)
SHEET	T1 SHEET FLOW	300.00	0.073	0.15	2.10						17.35	
SHALLOW CONCENTRATED	T2 SHALLOW CONCENTRATED FLOW	1118.00	0.038			U				3.14	5.93	
<b>Pre-Development Time of Concentration, OB1</b>											23.28	13.97

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	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)	Lag Time (min)
SHEET	T1 SHEET FLOW	300.00	0.063	0.15	2.10						18.41	
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	9.50	6.60	1.44	6.45	2.17	
<b>Pre-Development Time of Concentration, OB2</b>											23.26	13.95

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	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)	Lag Time (min)
SHEET	T1 SHEET FLOW	300.00	0.074	0.15	2.10						17.26	
SHALLOW CONCENTRATED	T2 SHALLOW CONCENTRATED FLOW	2436.00	0.034			U				2.97	13.65	
<b>Pre-Development Time of Concentration, OB3</b>											30.91	18.55

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	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)	Lag Time (min)
SHEET	T1 SHEET FLOW	300.00	0.043	0.15	2.10						21.65	
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	
<b>Pre-Development Time of Concentration, OB4</b>											27.29	16.38

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	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)	Lag Time (min)
SHEET	T1 SHEET FLOW	300.00	0.037	0.40	2.10						49.91	
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	9.50	6.60	1.44	7.36	3.19	
<b>Pre-Development Time of Concentration, OB5</b>											74.93	44.96

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	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)	Lag Time (min)
SHEET	T1 SHEET FLOW	300.00	0.064	0.40	2.10						40.09	
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	9.50	6.60	1.44	7.78	4.55	
<b>Pre-Development Time of Concentration, OB6</b>											58.25	34.95

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	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)	Lag Time (min)
SHEET	T1 SHEET FLOW	300.00	0.028	0.40	2.10						55.80	
SHALLOW CONCENTRATED	T2 SHALLOW CONCENTRATED FLOW	2068.00	0.036			U				3.06	11.26	
CHANNEL	T2 CHANNEL FLOW	6198.00	0.03	0.04		U	12.00	22.00	0.55	4.09	25.29	
<b>Pre-Development Time of Concentration, OB7</b>											92.35	55.41

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	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)	Lag Time (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	9.50	6.60	1.44	13.43	1.11	
<b>Pre-Development Time of Concentration, OB8</b>											31.78	19.07

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	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)	Lag Time (min)
SHEET	T1 SHEET FLOW	300.00	0.027	0.15	2.10						25.83	
SHALLOW CONCENTRATED	T2 SHALLOW CONCENTRATED FLOW	368.00	0.033			U				2.91	2.11	
CHANNEL	T2 CHANNEL FLOW	210.00	0.034	0.03		U	9.50	6.60	1.44	11.68	0.30	
<b>Pre-Development Time of Concentration, B1</b>											28.24	16.94

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	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)	Lag Time (min)
SHEET	T1 SHEET FLOW	300.00	0.022	0.15	2.10						28.04	
SHALLOW CONCENTRATED	T2 SHALLOW CONCENTRATED FLOW	737.00	0.025			U				2.55	4.82	
CHANNEL	T2 CHANNEL FLOW	1086.00	0.02	0.03		U	9.50	6.60	1.44	9.18	1.07	
<b>Pre-Development Time of Concentration, B2</b>											34.83	20.90

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	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)	Lag Time (min)
CHANNEL	T1 CHANNEL FLOW	2965.00	0.02	0.03		U	14.00	34.50	0.41	3.58	13.68	8.33
<b>Pre-Development Time of Concentration, B3</b>											13.88	8.33

Pre Runoff Analysis  
Time of Concentration

Project Information

Project Name: Eagleview  
 KHA Project #: 106288000  
 Designed by: DCM Date: 3/17/2022  
 Revised by: \_\_\_\_\_ Date: \_\_\_\_\_  
 Checked by: BAH Date: 3/17/2022

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

Pre-Development												
Drainage Area: B4												
		Row Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficients, 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)	Lag Time (min)
SHEET	T1 SHEET FLOW	300.00	0.020	0.15	2.10						29.13	
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	
<b>Pre-Development Time of Concentration, B4</b>											32.27	19.36

Pre Runoff Analysis  
Composite CN

Project Name: Eagleview  
 KHA Project #: 196288000  
 Designed by: DCM Date: 3/17/2022  
 Revised by: \_\_\_\_\_ Date: \_\_\_\_\_  
 Revised by: \_\_\_\_\_ Date: \_\_\_\_\_  
 Checked by: BAH Date: 3/17/2022

Pre-Development					
Drainage Area: OB1					
COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)	INITIAL ABSTRACTION, IA
RESIDENTIAL	RR-5 (Rangeland Landuse)	B	62.00	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			63.76	10.37	0.569

Pre-Development					
Drainage Area: OB2					
COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)	INITIAL ABSTRACTION, IA
RESIDENTIAL	RR-5 (Rangeland Landuse)	B	62.00	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			64.16	28.06	0.559

Pre-Development					
Drainage Area: OB3					
COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)	INITIAL ABSTRACTION, IA
RESIDENTIAL	RR-5 (Rangeland Landuse)	B	62.00	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			63.62	43.44	0.572

Pre-Development					
Drainage Area: OB4					
COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)	INITIAL ABSTRACTION, IA
RESIDENTIAL	RR-5 (Rangeland Landuse)	B	62.00	9.55	0.00
IMPERVIOUS	Paved; curbs and storm sewers (excluding right-of-way)	B	98.00	0.52	0.55
IMPERVIOUS	Gravel (including right of way)	B	85.00	0.43	9.95
CUTSOM					
COMPOSITE SCS CURVE NUMBER - OB4			64.71	10.50	0.545

Pre-Development					
Drainage Area: OB5					
COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)	INITIAL ABSTRACTION, IA
RESIDENTIAL	RR-5 (Rangeland Landuse)	B	62.00	28.58	--
RESIDENTIAL	RR-5 (Woods Landuse)	B	58.00	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			59.98	143.82	0.667

Pre-Development					
Drainage Area: OB6					
COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)	INITIAL ABSTRACTION, IA
RESIDENTIAL	RR-5 (Rangeland Landuse)	B	62.00	60.64	--
RESIDENTIAL	RR-5 (Woods Landuse)	B	58.00	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			61.77	118.40	0.619

Pre Runoff Analysis  
Composite CN

Project Name: Eagleview  
 KHA Project #: 196288000  
 Designed by: DCM Date: 3/17/2022  
 Revised by: \_\_\_\_\_ Date: \_\_\_\_\_  
 Revised by: \_\_\_\_\_ Date: \_\_\_\_\_  
 Checked by: BAH Date: 3/17/2022

Pre-Development					
Drainage Area: OB7					
COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)	INITIAL ABSTRACTION, IA
RESIDENTIAL	RR-5 (Rangeland Landuse)	B	62.00	122.08	--
RESIDENTIAL	RR-5 (Woods Landuse)	B	58.00	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			61.07	421.20	0.637

Pre-Development					
Drainage Area: OB8					
COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)	INITIAL ABSTRACTION, IA
RESIDENTIAL	RR-5 (Rangeland Landuse)	B	62.00	8.71	--
RESIDENTIAL	2.5 acre	B	64.00	21.76	--
RESIDENTIAL	1/2 acre (25% Imp.)	B	71.00	0.79	--
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			64.89	33.07	0.541

Pre-Development					
Drainage Area: B1					
COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)	INITIAL ABSTRACTION, IA
OPEN_SPACE	Good condition (grass cover >75%)	B	61.00	5.55	--
CUTSOM					
COMPOSITE SCS CURVE NUMBER - B1			61.00	5.55	0.639

Pre-Development					
Drainage Area: B2					
COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)	INITIAL ABSTRACTION, IA
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	0.648

Pre-Development					
Drainage Area: B3					
COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)	INITIAL ABSTRACTION, IA
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	0.642

Pre-Development					
Drainage Area: B4					
COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)	INITIAL ABSTRACTION, IA
OPEN_SPACE	Good condition (grass cover >75%)	B	61.00	14.68	--
CUTSOM					
COMPOSITE SCS CURVE NUMBER - B4			61.00	14.68	0.639

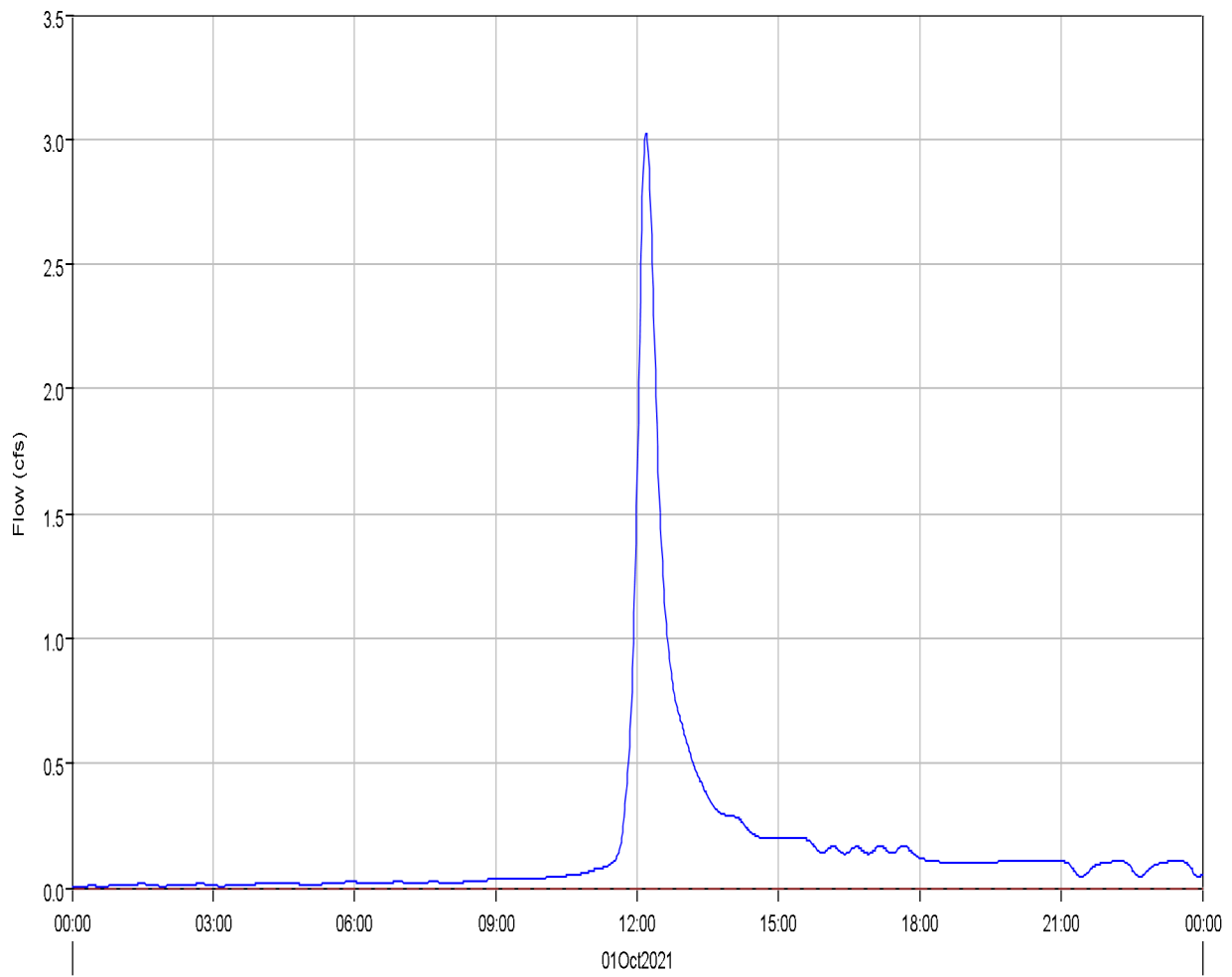
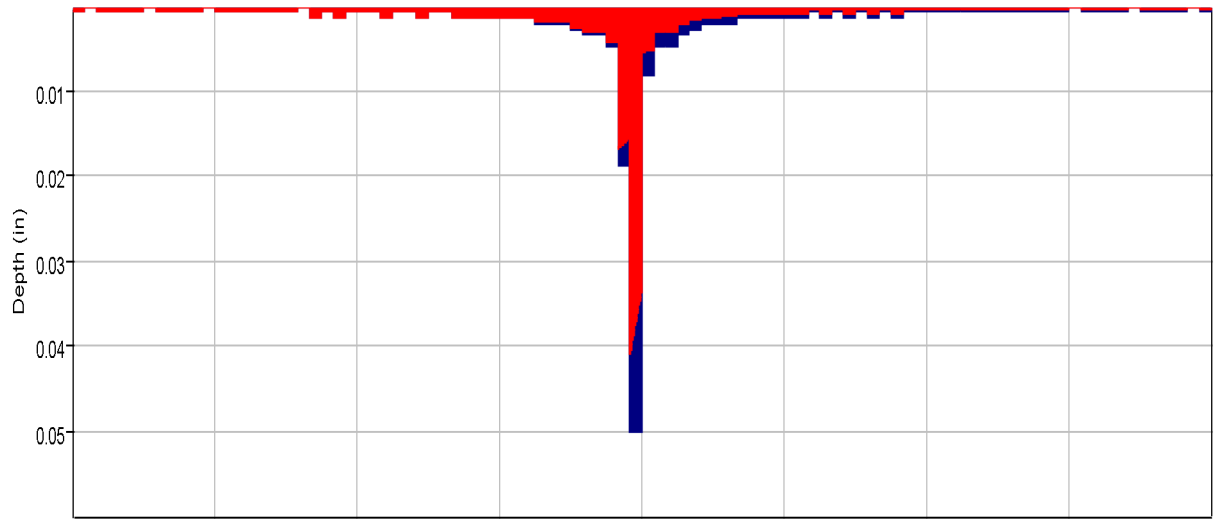
Project: Eagleview\_Subdivision Simulation Run: EV 5-yr Ex. Type II

Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
 End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type II  
 Compute Time: 11Mar2022, 14:50:40 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	3.0	01Oct2021, 12:11	0.3
B2	0.0647266	15.4	01Oct2021, 12:16	1.8
B3	0.0930359	36.4	01Oct2021, 12:04	2.7
B4	0.0229422	5.8	01Oct2021, 12:14	0.7
J1	0.0253831	10.1	01Oct2021, 12:11	1.0
J2	0.1928516	67.5	01Oct2021, 12:15	7.3
J3	1.2354980	183.1	01Oct2021, 12:47	42.8
J4	1.0678500	169.2	01Oct2021, 12:46	37.4
J-OB6	0.8431300	132.4	01Oct2021, 12:45	30.1
OB1	0.0162031	7.1	01Oct2021, 12:08	0.7
OB2	0.0438438	20.6	01Oct2021, 12:08	1.9
OB3	0.0678750	25.3	01Oct2021, 12:13	2.8
OB4	0.0164062	7.5	01Oct2021, 12:10	0.8
OB5	0.2247200	36.8	01Oct2021, 12:42	7.4
OB6	0.1850100	40.8	01Oct2021, 12:30	6.8
OB7	0.6581200	101.4	01Oct2021, 12:53	23.3
OB8	0.0516699	19.5	01Oct2021, 12:13	2.1
R-B1	0.0162031	7.1	01Oct2021, 12:11	0.7
R-OB4	0.1281250	52.2	01Oct2021, 12:14	5.4
R-OB5	0.2247200	36.8	01Oct2021, 12:45	7.4
R-OB6	0.8431300	132.4	01Oct2021, 12:46	30.0
R-OB7	1.0678500	169.2	01Oct2021, 12:49	37.3
R-OB8	0.0516699	19.4	01Oct2021, 12:17	2.1



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



Run:EV 5-yr Ex. Type II Element:B1 Result:Precipitation    Run:EV 5-yr Ex. Type II Element:B1 Result:Precipitation Loss    Run:EV 5-yr Ex. Type II Element:B1 Result:Outflow  
Run:EV 5-yr Ex. Type II Element:B1 Result:Baseflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Ex. Type II Subbasin: B1

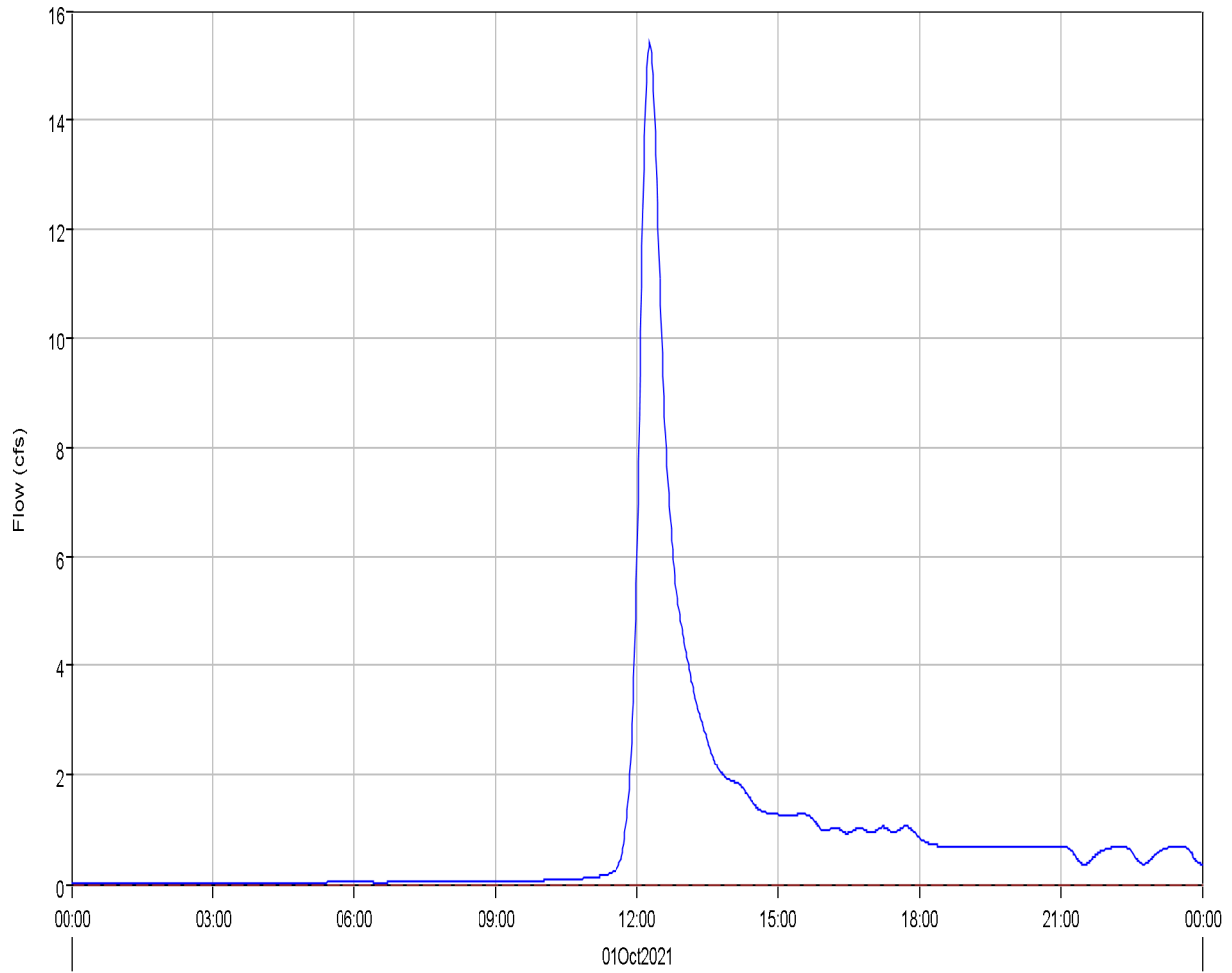
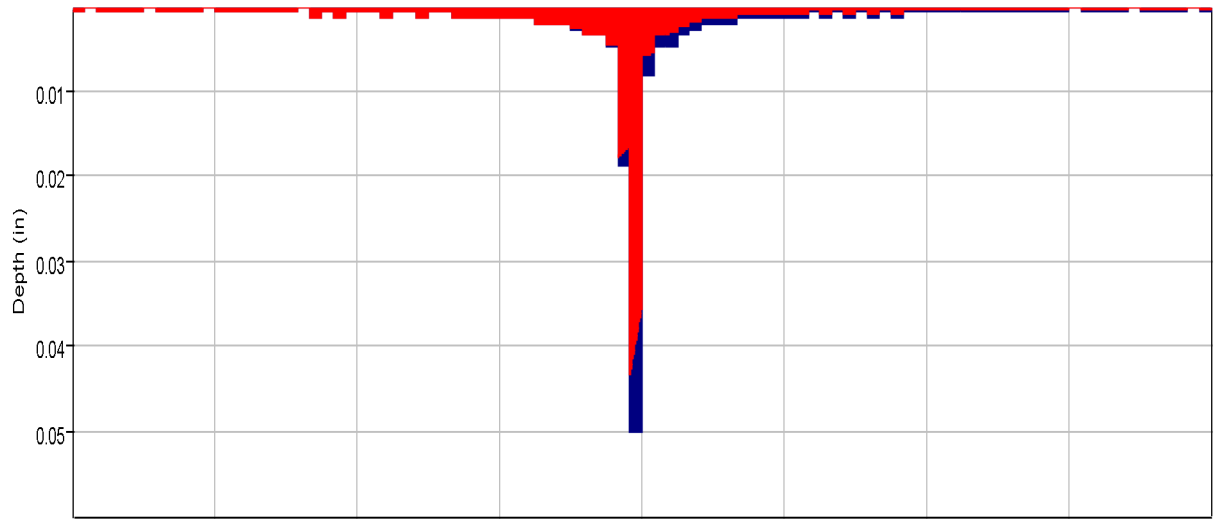
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type II  
Compute Time: 11Mar2022, 14:50:40 Control Specifications: 24-hr Storm

Volume Units: AC-FT

#### Computed Results

Peak Discharge :	3.0 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:11
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 II"



Run:EV 5-yr Ex. Type II Element:B2 Result:Precipitation    Run:EV 5-yr Ex. Type II Element:B2 Result:Precipitation Loss    Run:EV 5-yr Ex. Type II Element:B2 Result:Outflow  
Run:EV 5-yr Ex. Type II Element:B2 Result:Baseflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Ex. Type II Subbasin: B2  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type II  
Compute Time: 11Mar2022, 14:50:40 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

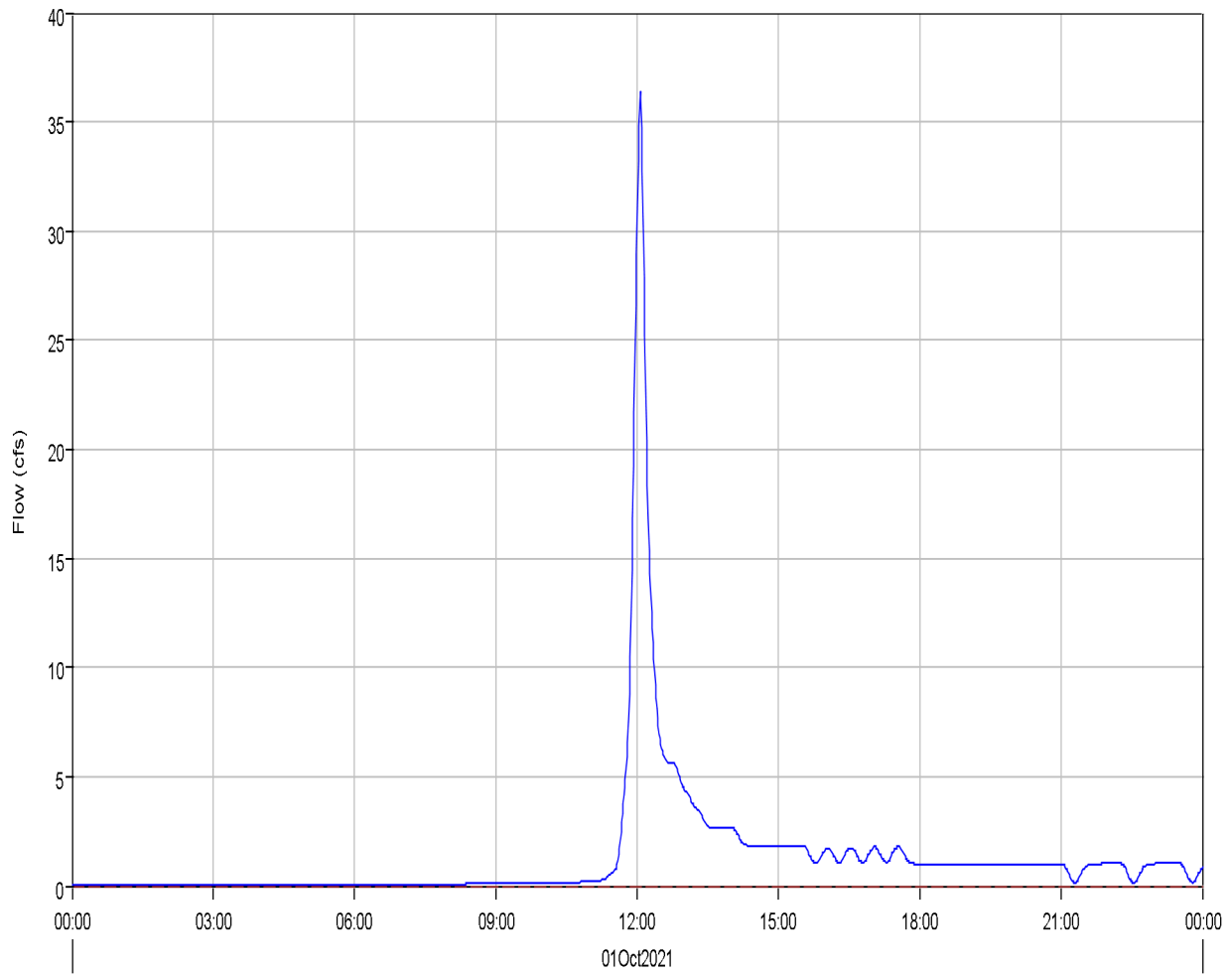
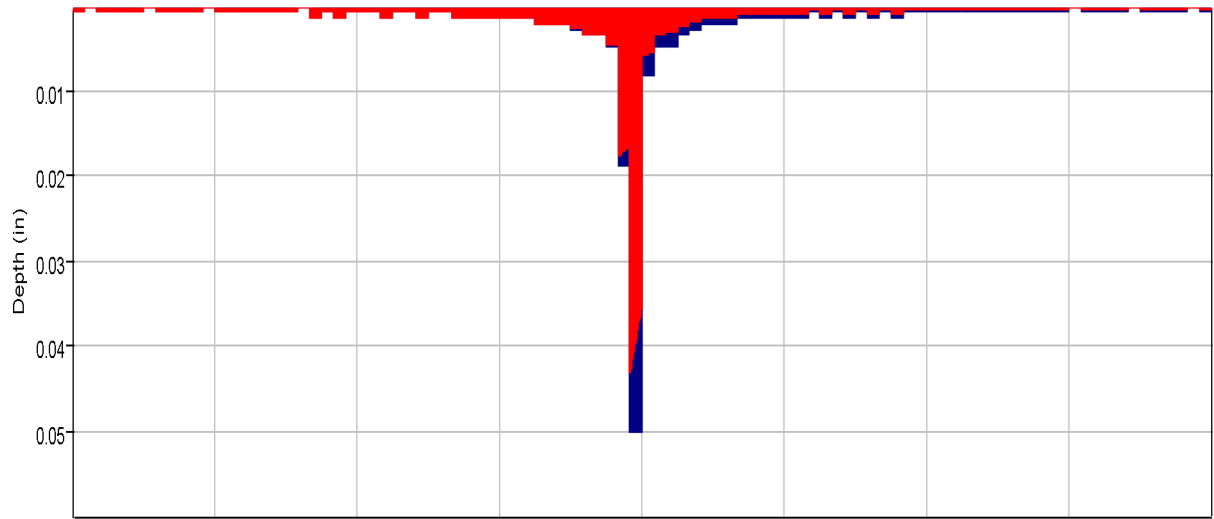
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Computed Results

Peak Discharge :	15.4 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:16
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 II"



Run:EV 5-yr Ex. Type II Element:B3 Result:Precipitation    Run:EV 5-yr Ex. Type II Element:B3 Result:Precipitation Loss    Run:EV 5-yr Ex. Type II Element:B3 Result:Outflow  
Run:EV 5-yr Ex. Type II Element:B3 Result:Baseflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Ex. Type II Subbasin: B3  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type II  
Compute Time: 11Mar2022, 14:50:40 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

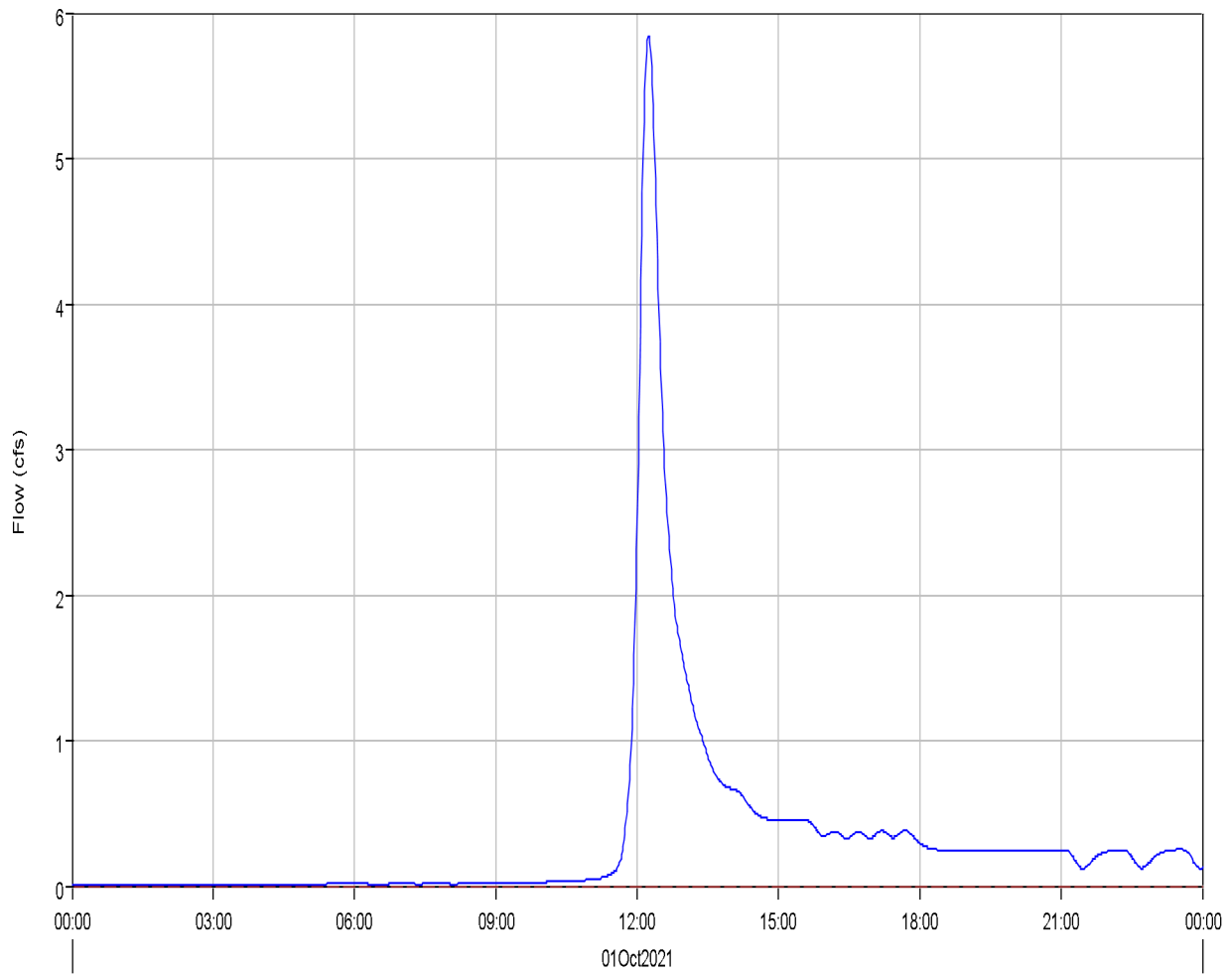
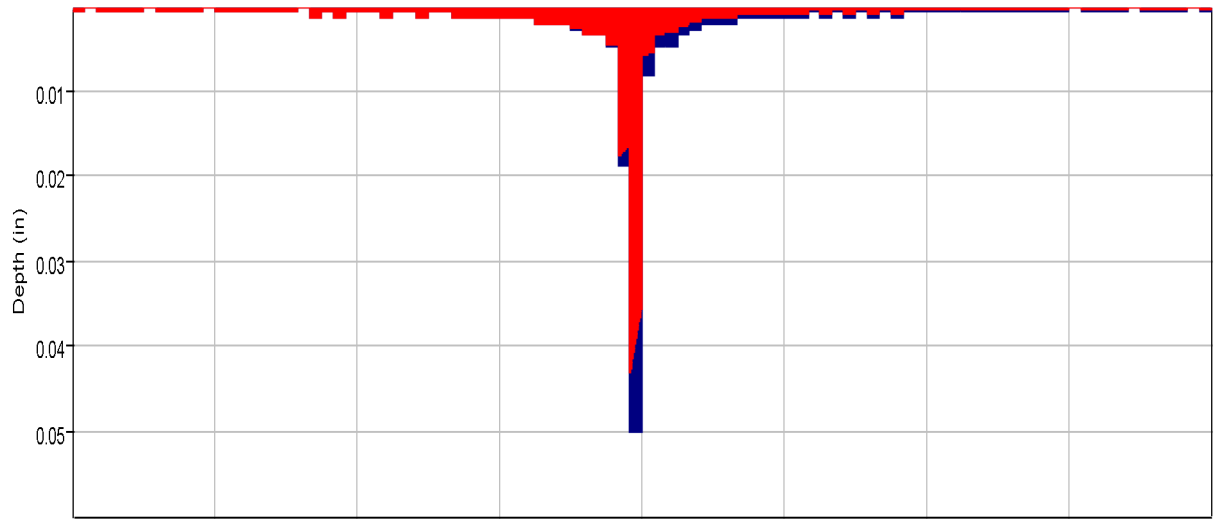
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Computed Results

Peak Discharge :	36.4 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:04
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 II"



Run:EV 5-yr Ex. Type II Element:B4 Result:Precipitation    Run:EV 5-yr Ex. Type II Element:B4 Result:Precipitation Loss    Run:EV 5-yr Ex. Type II Element:B4 Result:Outflow  
Run:EV 5-yr Ex. Type II Element:B4 Result:Baseflow



Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Ex. Type II Subbasin: B4

Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type II  
Compute Time: 11Mar2022, 14:50:40 Control Specifications: 24-hr Storm

Volume Units: AC-FT

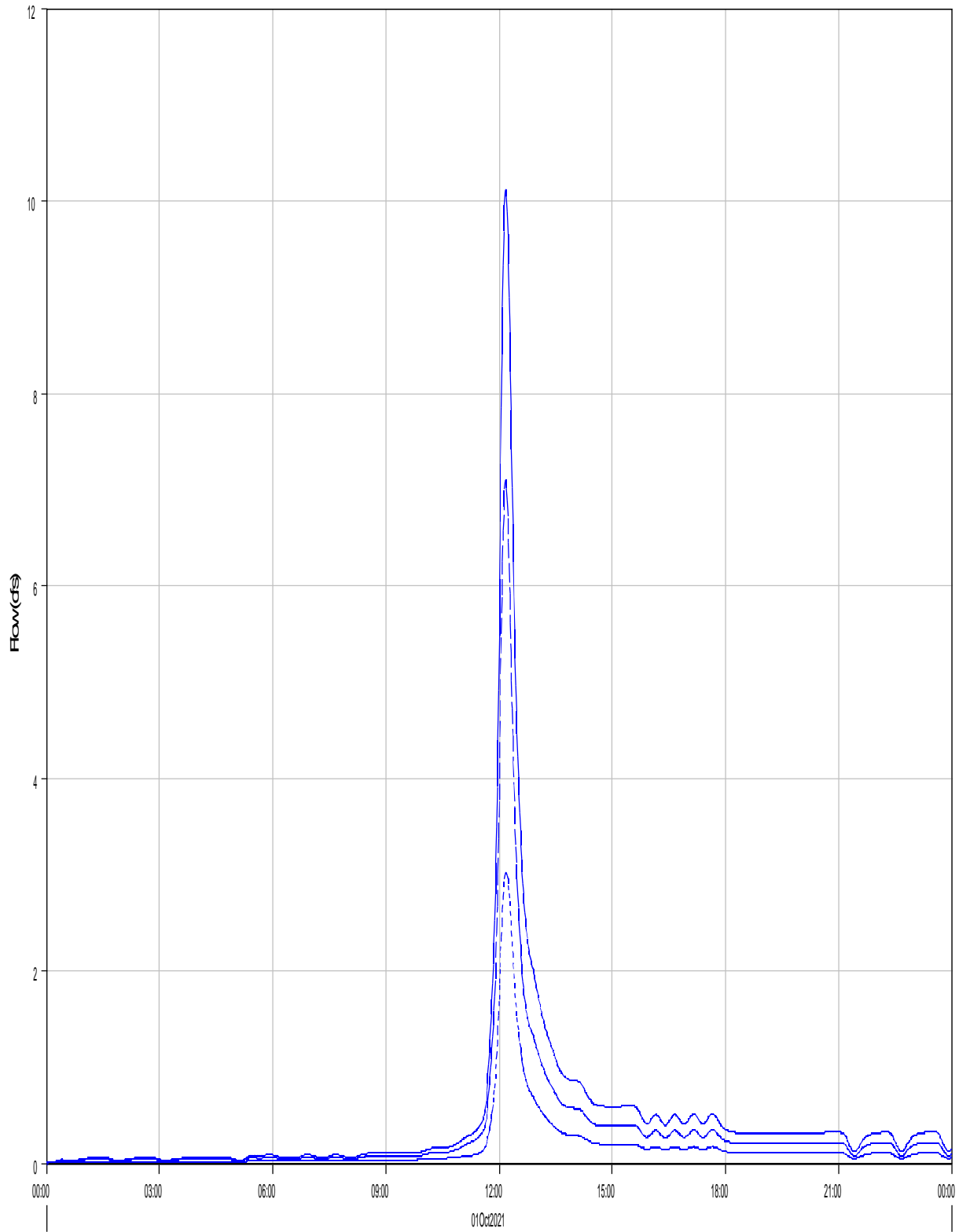
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#### Computed Results

Peak Discharge :	5.8 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:14
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 II'



Run:EV 5-yr Ex. Type II Element J1 Result:Outflow

Run:EV 5-yr Ex. Type II Element R-B1 Result:Outflow

Run:EV 5-yr Ex. Type II Element B1 Result:Outflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Ex. Type II Junction: J1  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type II  
Compute Time: 11Mar2022, 14:50:40 Control Specifications: 24-hr Storm

Volume Units: AC-FT

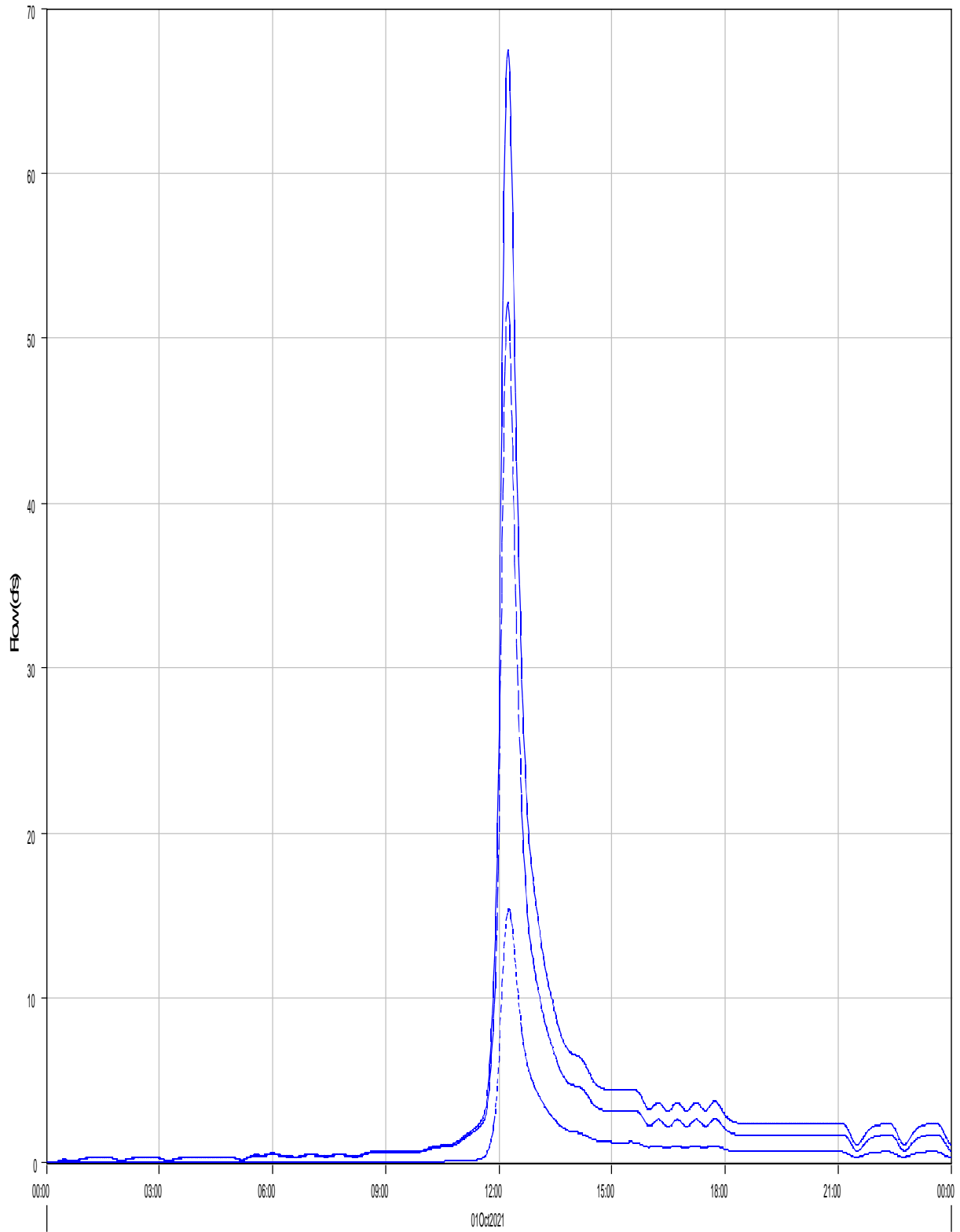
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Computed Results

Peak Outflow : 10.1 (CFS) Date/Time of Peak Outflow : 01Oct2021, 12:11  
Total Outflow : 1.0 (AC-FT)

---

Junction 'J2' Results for Run 'EV 5-yr Ex. Type II'



Run:EV 5-yr Ex. Type II Element J2 Result:Outflow

Run:EV 5-yr Ex. Type II Element R:OB4 Result:Outflow

Run:EV 5-yr Ex. Type II Element B2 Result:Outflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Ex. Type II Junction: J2  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type II  
Compute Time: 11Mar2022, 14:50:40 Control Specifications: 24-hr Storm

Volume Units: AC-FT

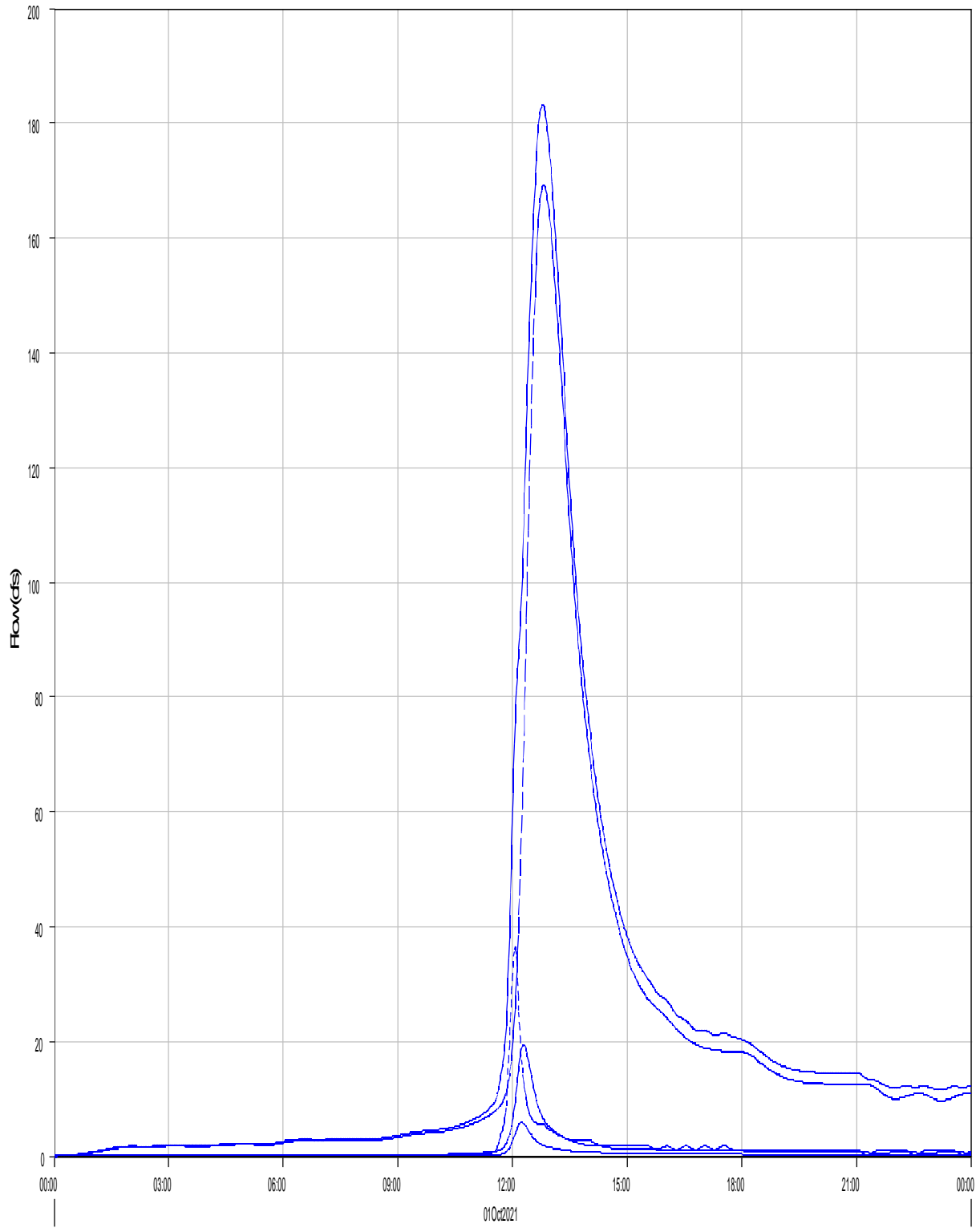
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Computed Results

Peak Outflow : 67.5 (CFS) Date/Time of Peak Outflow : 01Oct2021, 12:15  
Total Outflow : 7.3 (AC-FT)

---

Junction 'J3' Results for Run 'EV 5-yr Ex. Type II'



Run:EV 5-yr Ex. Type II Element:J3 Result:Outflow

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

Run:EV 5-yr Ex. Type II Element:B3 Result:Outflow

Run:EV 5-yr Ex. Type II Element:R-OB8 Result:Outflow

Run:EV 5-yr Ex. Type II Element:B4 Result:Outflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Ex. Type II Junction: J3  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type II  
Compute Time: 11Mar2022, 14:50:40 Control Specifications: 24-hr Storm

Volume Units: AC-FT

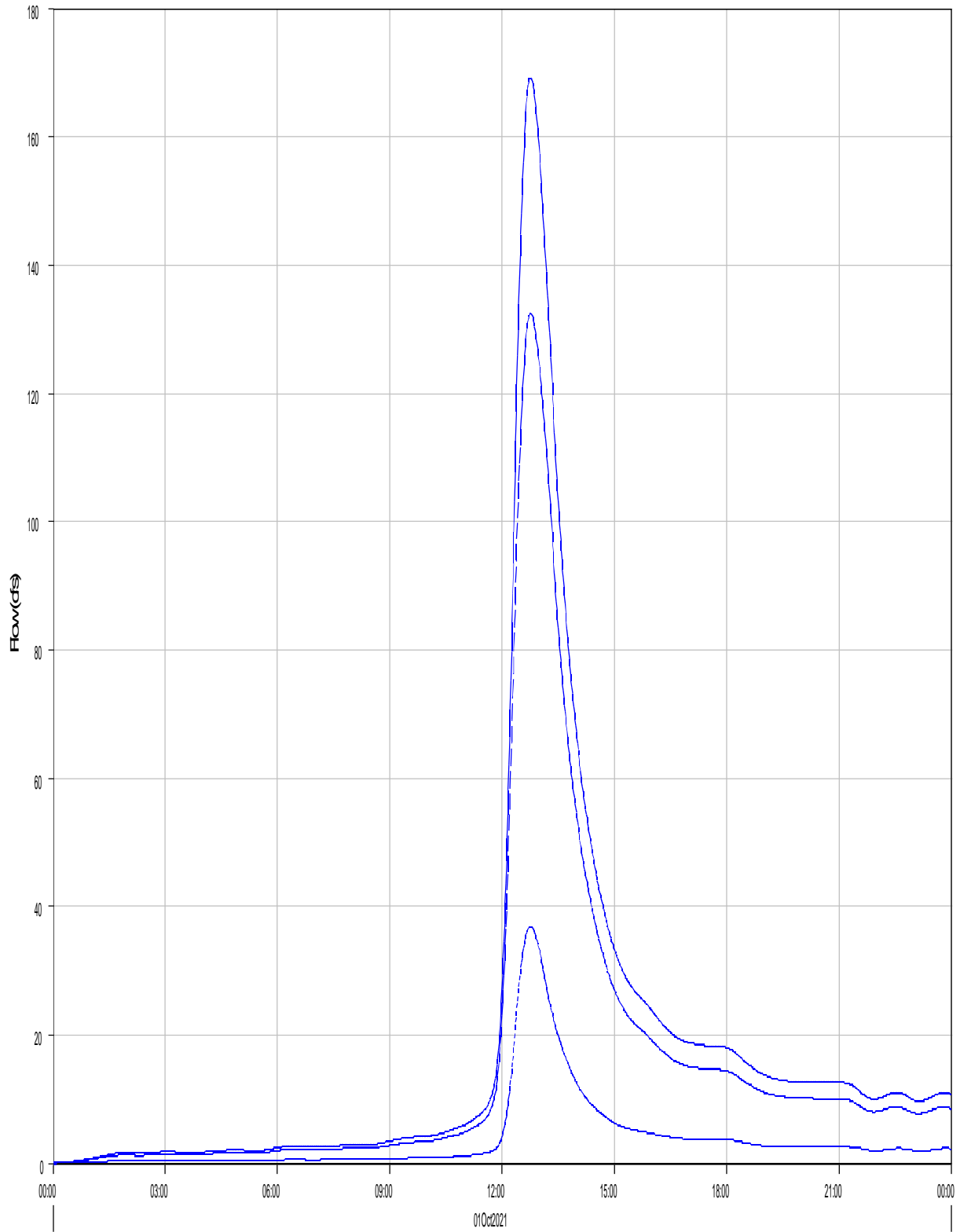
---

Computed Results

Peak Outflow : 183.1 (CFS) Date/Time of Peak Outflow : 01Oct2021, 12:47  
Total Outflow : 42.8 (AC-FT)

---

Junction 'J4' Results for Run 'EV 5-yr Ex. Type II'



Run:EV 5-yr Ex. Type II Element:J4 Result:Outflow

Run:EV 5-yr Ex. Type II Element:R-OB6 Result:Outflow

Run:EV 5-yr Ex. Type II Element:R-OB5 Result:Outflow



Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Ex. Type II Junction: J4  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type II  
Compute Time: 11Mar2022, 14:50:40 Control Specifications: 24-hr Storm

Volume Units: AC-FT

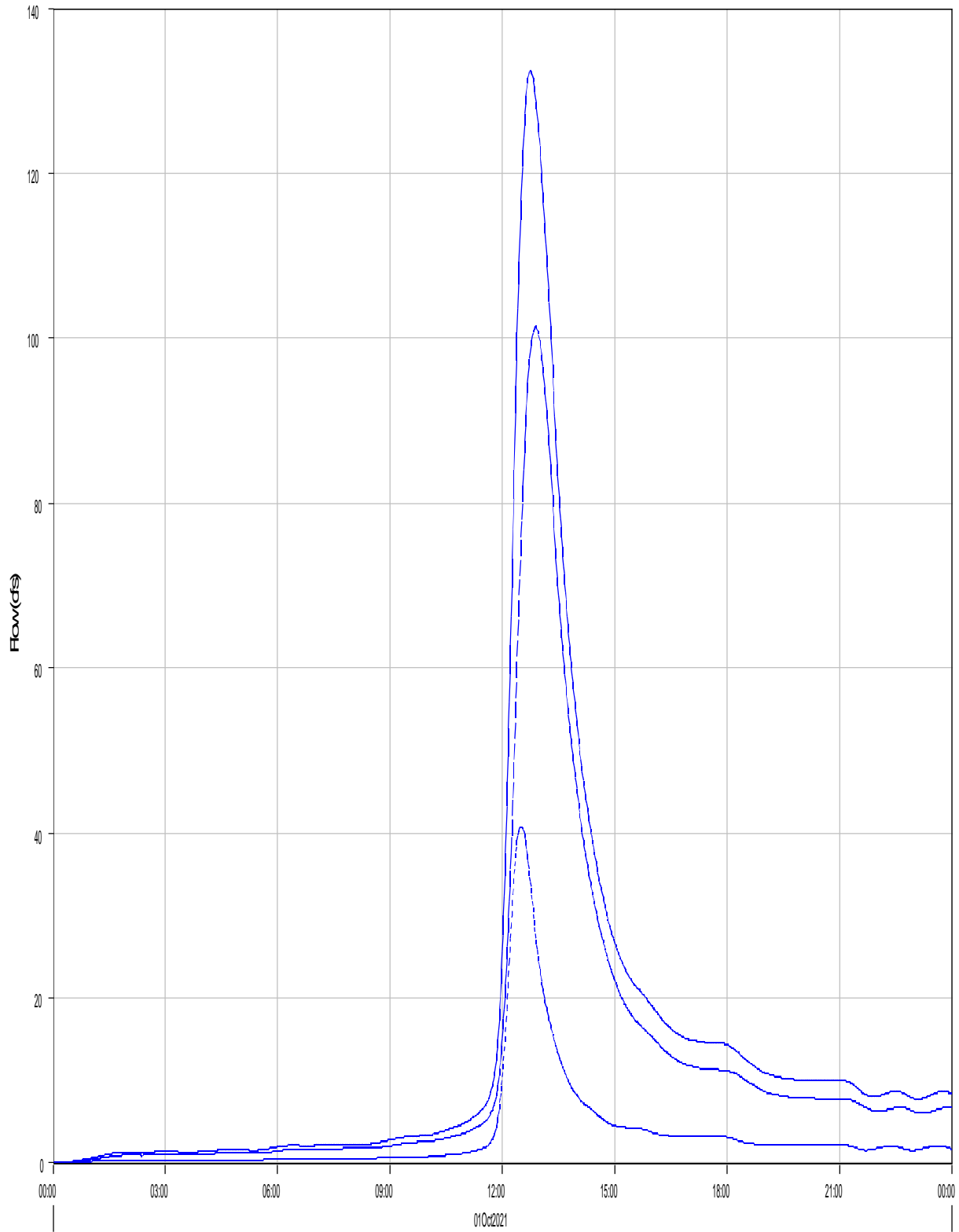
---

Computed Results

Peak Outflow : 169.2 (CFS) Date/Time of Peak Outflow : 01Oct2021, 12:46  
Total Outflow : 37.4 (AC-FT)

---

Junction 'J-OB6' Results for Run 'EV 5-yr Ex. Type II'



Run:EV 5-yr Ex. Type II Element:OB6 Result:Outflow

Run:EV 5-yr Ex. Type II Element:OB7 Result:Outflow

Run:EV 5-yr Ex. Type II Element:OB6 Result:Outflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Ex. Type II Junction: J-OB6

Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type II  
Compute Time: 11Mar2022, 14:50:40 Control Specifications: 24-hr Storm

Volume Units: AC-FT

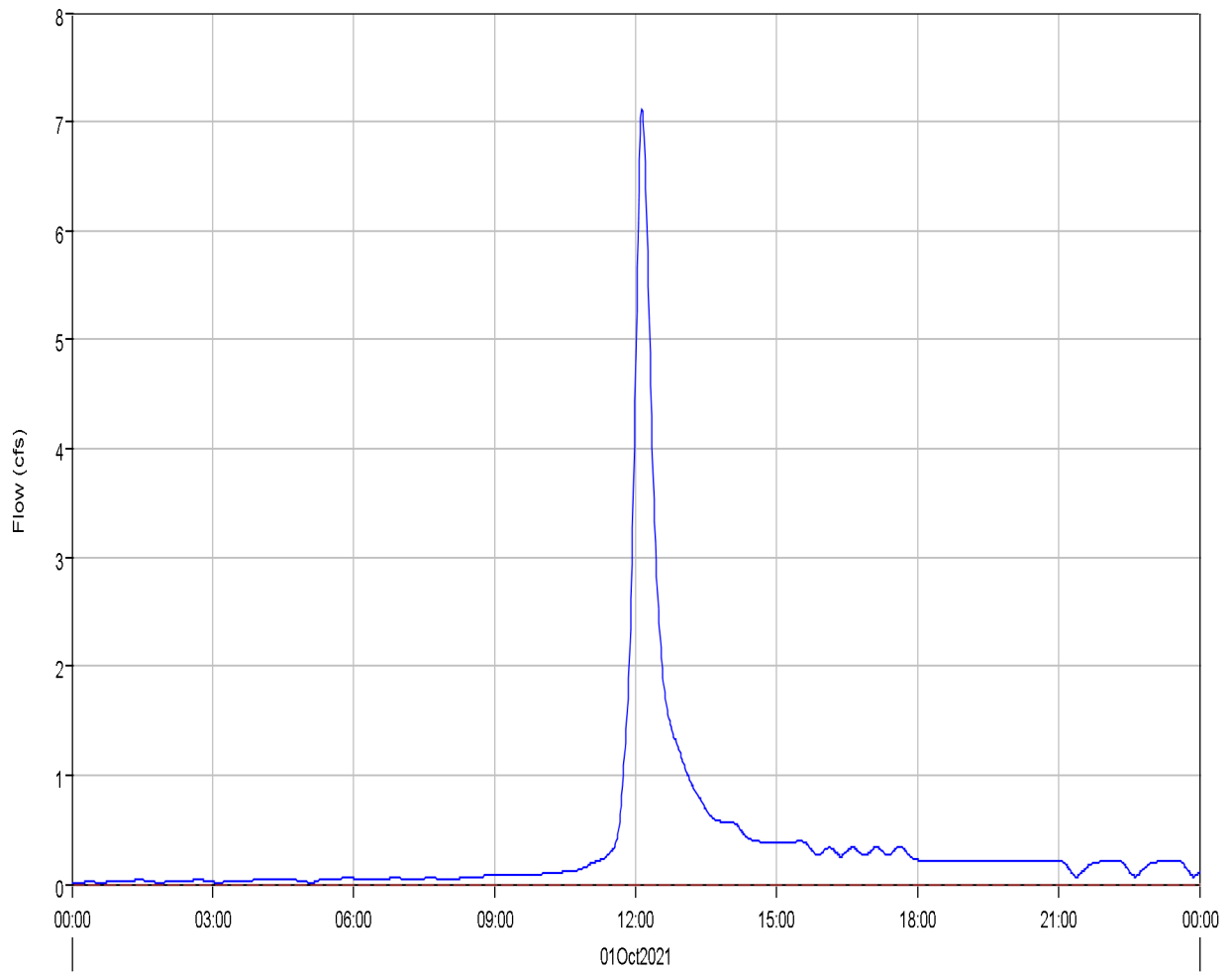
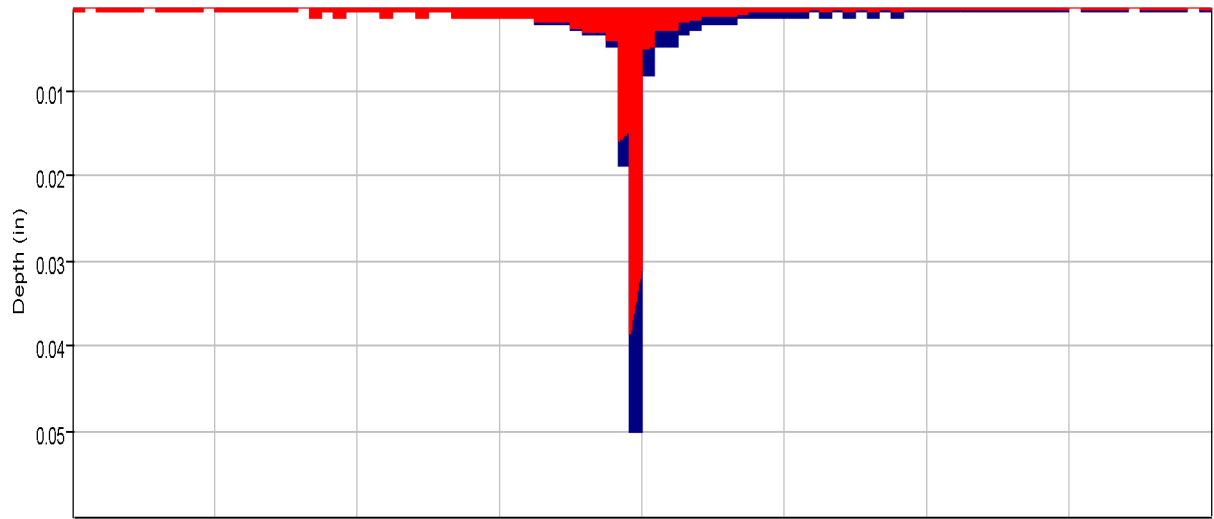
---

#### Computed Results

Peak Outflow : 132.4 (CFS) Date/Time of Peak Outflow : 01Oct2021, 12:45  
Total Outflow : 30.1 (AC-FT)

---

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



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

Run:EV 5-yr Ex. Type II Element:OB1 Result:Precipitation Loss  
Run:EV 5-yr Ex. Type II Element:OB1 Result:Baseflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Ex. Type II Subbasin: OB1

Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type II  
Compute Time: 11Mar2022, 14:50:40 Control Specifications: 24-hr Storm

Volume Units: AC-FT

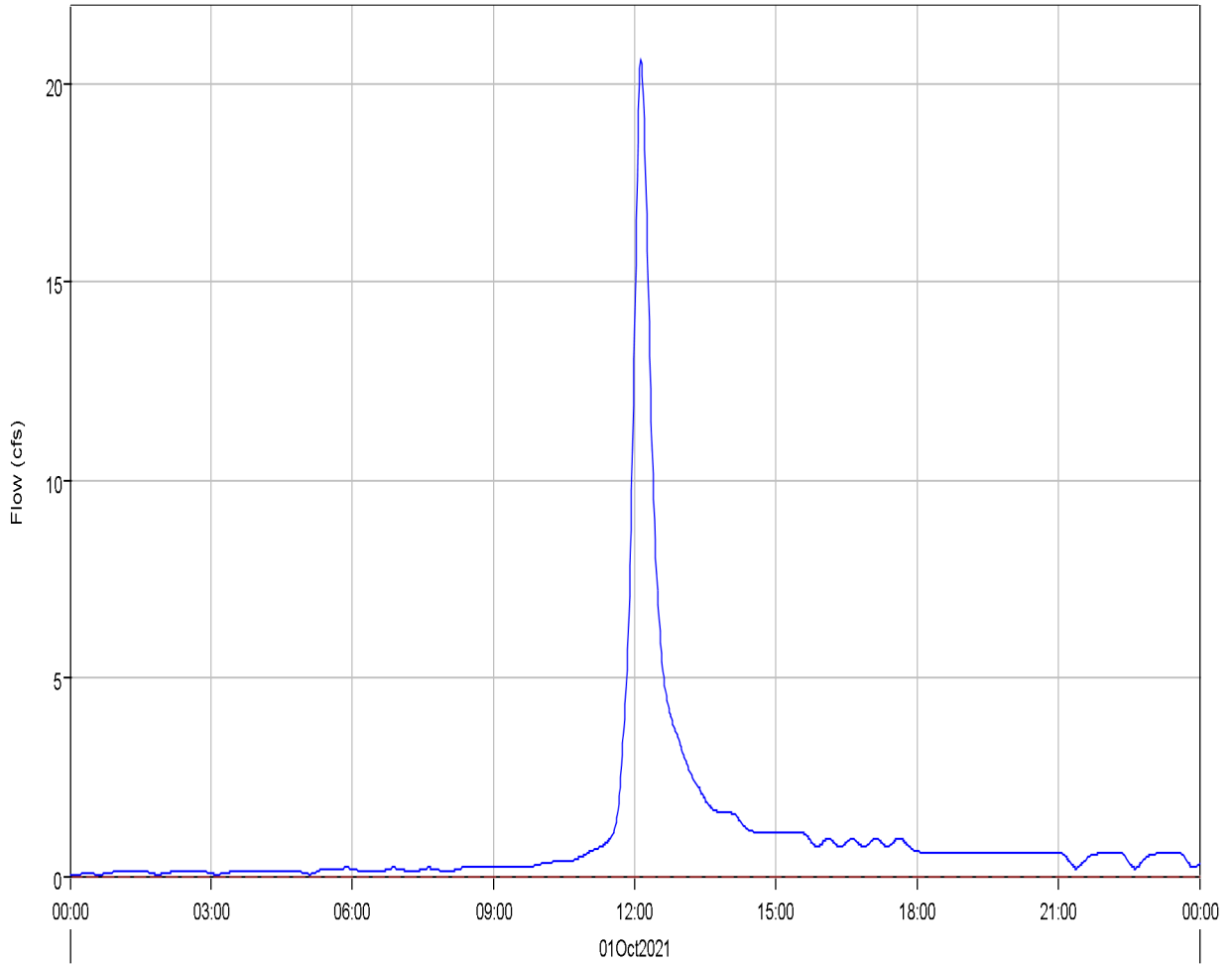
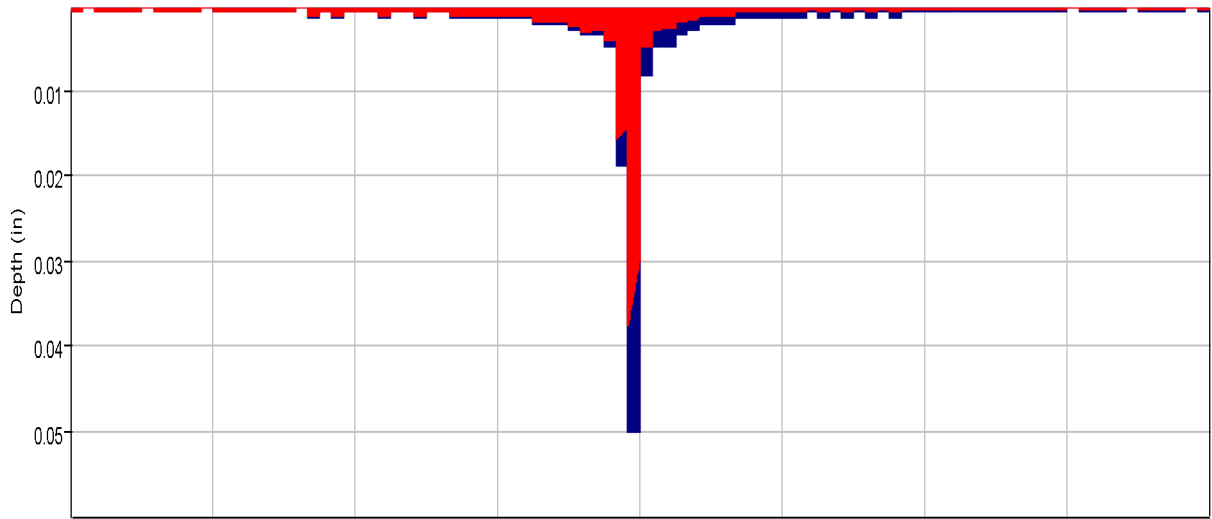
---

#### Computed Results

Peak Discharge :	7.1 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:08
Total Precipitation :	2.3 (AC-FT)	Total Direct Runoff :	0.7 (AC-FT)
Total Loss :	1.7 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	0.7 (AC-FT)	Discharge :	0.7 (AC-FT)

---

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



Run:EV 5-yr Ex. Type II Element:OB2 Result:Precipitation

Run:EV 5-yr Ex. Type II Element:OB2 Result:Outflow

Run:EV 5-yr Ex. Type II Element:OB2 Result:Precipitation Loss

Run:EV 5-yr Ex. Type II Element:OB2 Result:Baseflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Ex. Type II Subbasin: OB2

Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type II  
Compute Time: 11Mar2022, 14:50:40 Control Specifications: 24-hr Storm

Volume Units: AC-FT

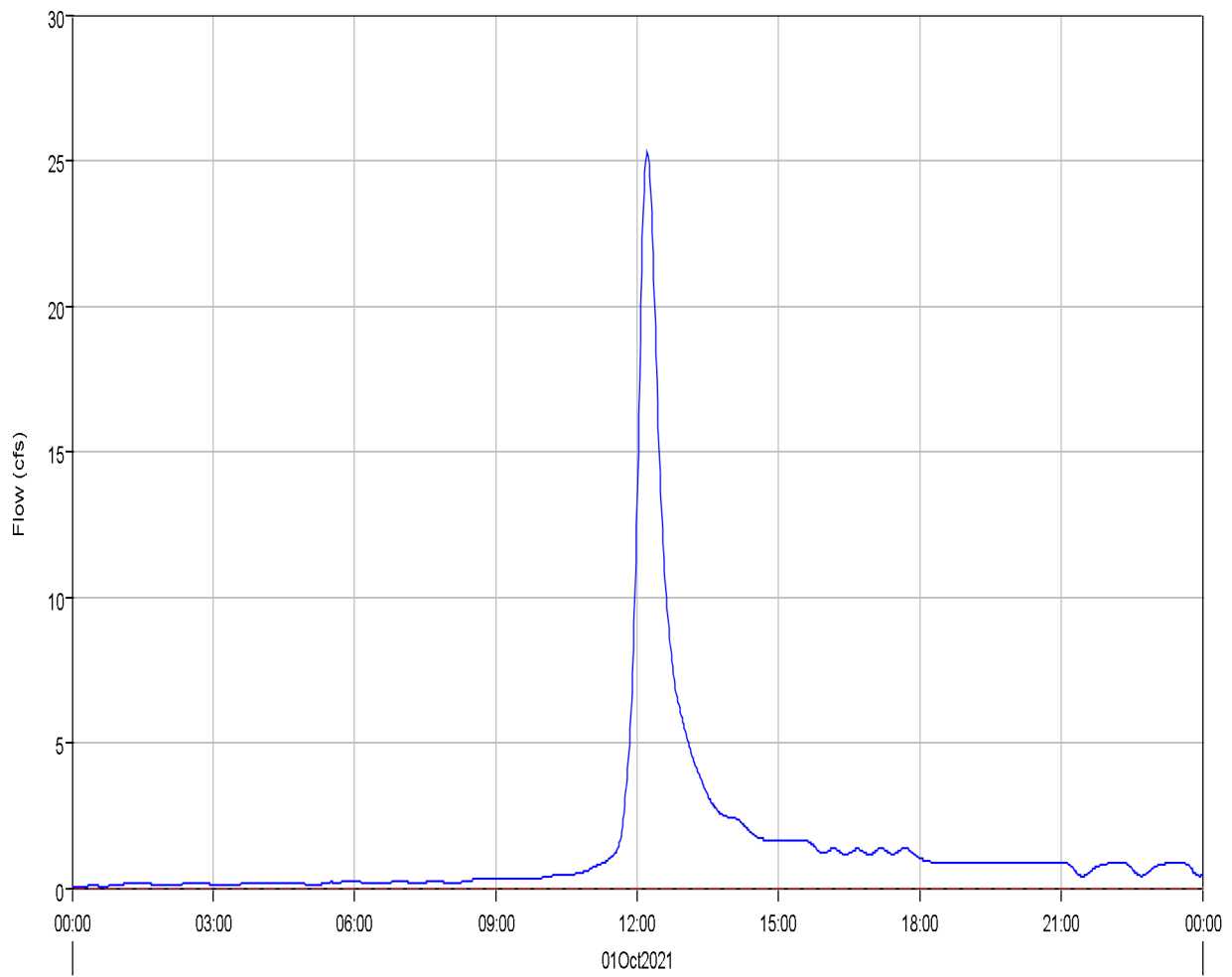
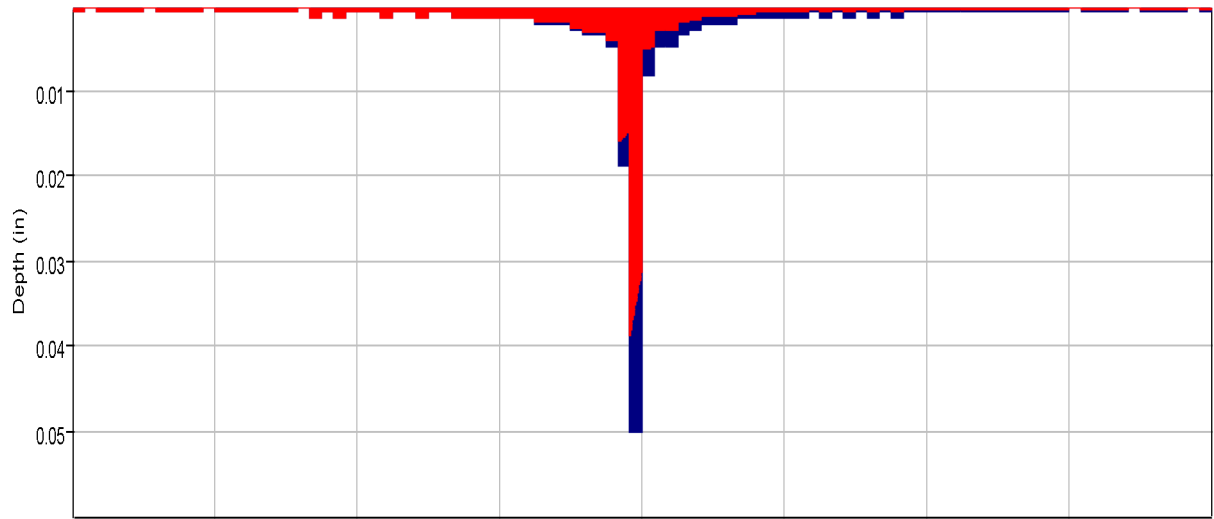
---

#### Computed Results

Peak Discharge :	20.6 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:08
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 II"



Run:EV 5-yr Ex. Type II Element:OB3 Result:Precipitation

Run:EV 5-yr Ex. Type II Element:OB3 Result:Precipitation Loss

Run:EV 5-yr Ex. Type II Element:OB3 Result:Outflow

Run:EV 5-yr Ex. Type II Element:OB3 Result:Baseflow



Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Ex. Type II Subbasin: OB3

Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type II  
Compute Time: 11Mar2022, 14:50:40 Control Specifications: 24-hr Storm

Volume Units: AC-FT

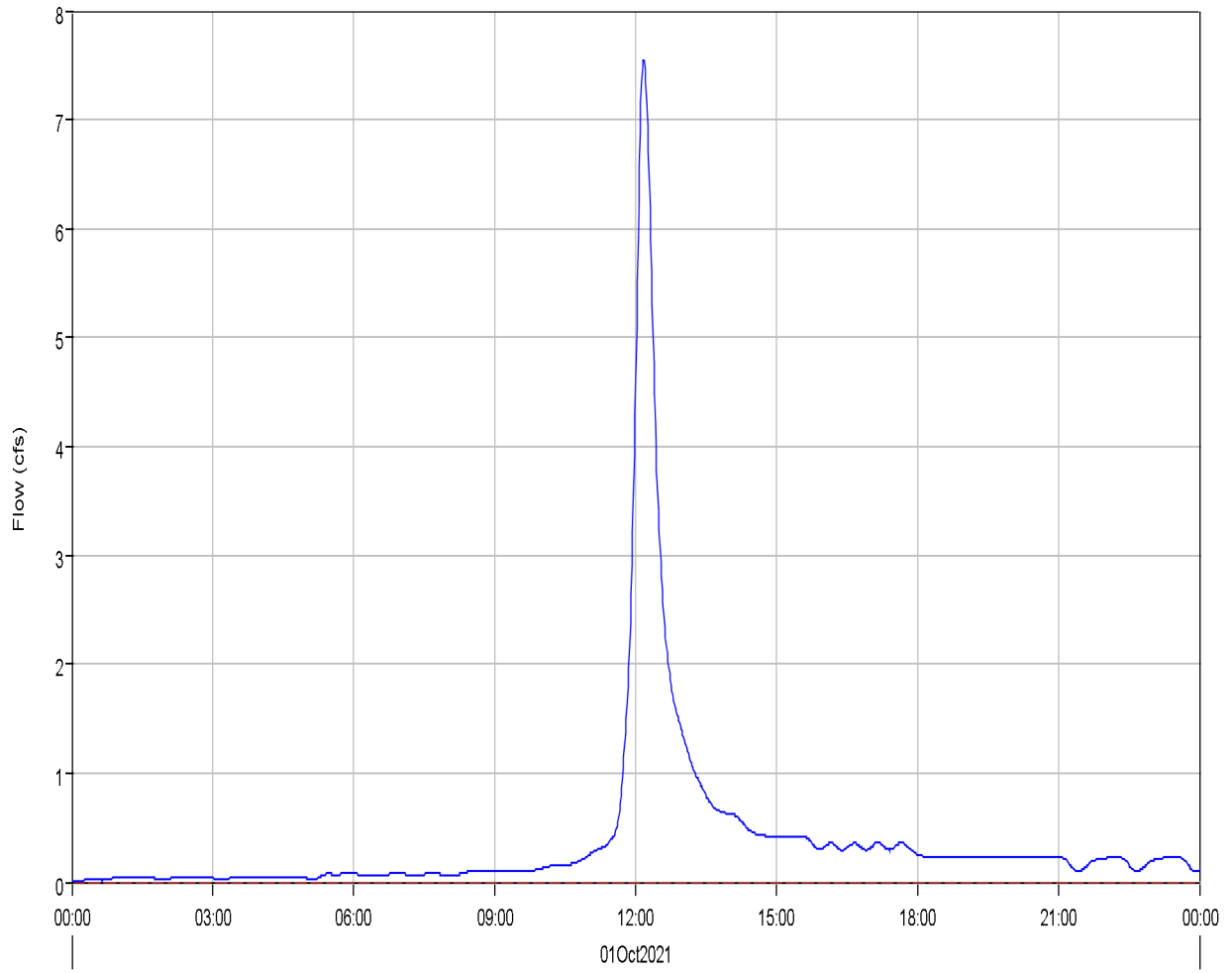
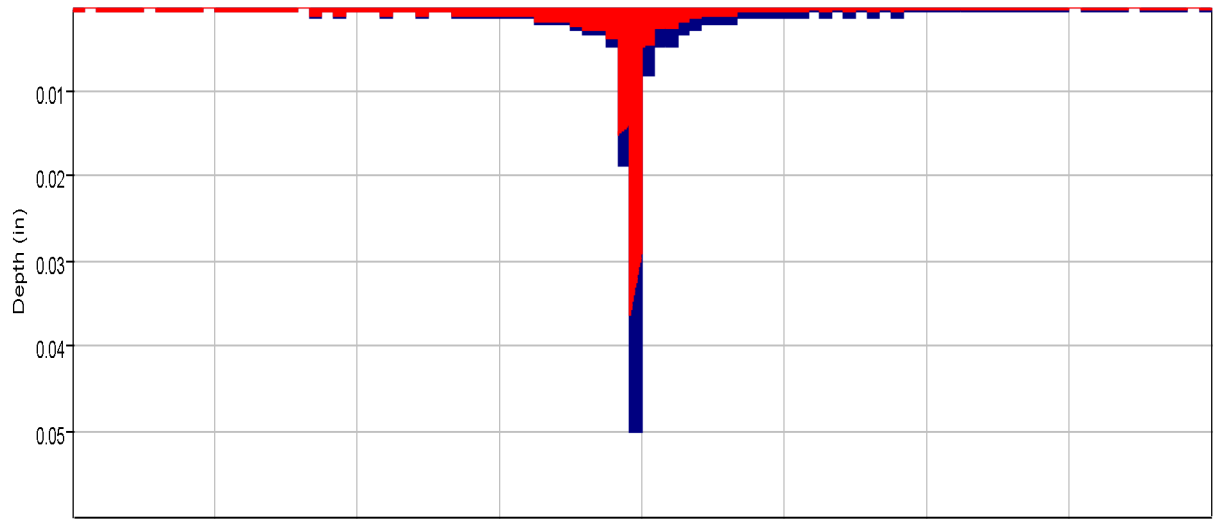
---

#### Computed Results

Peak Discharge :	25.3 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:13
Total Precipitation :	9.8 (AC-FT)	Total Direct Runoff :	2.8 (AC-FT)
Total Loss :	7.0 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	2.8 (AC-FT)	Discharge :	2.8 (AC-FT)

---

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



Run:EV 5-yr Ex. Type II Element:OB4 Result:Precipitation

Run:EV 5-yr Ex. Type II Element:OB4 Result:Outflow

Run:EV 5-yr Ex. Type II Element:OB4 Result:Precipitation Loss

Run:EV 5-yr Ex. Type II Element:OB4 Result:Baseflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Ex. Type II Subbasin: OB4

Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type II  
Compute Time: 11Mar2022, 14:50:40 Control Specifications: 24-hr Storm

Volume Units: AC-FT

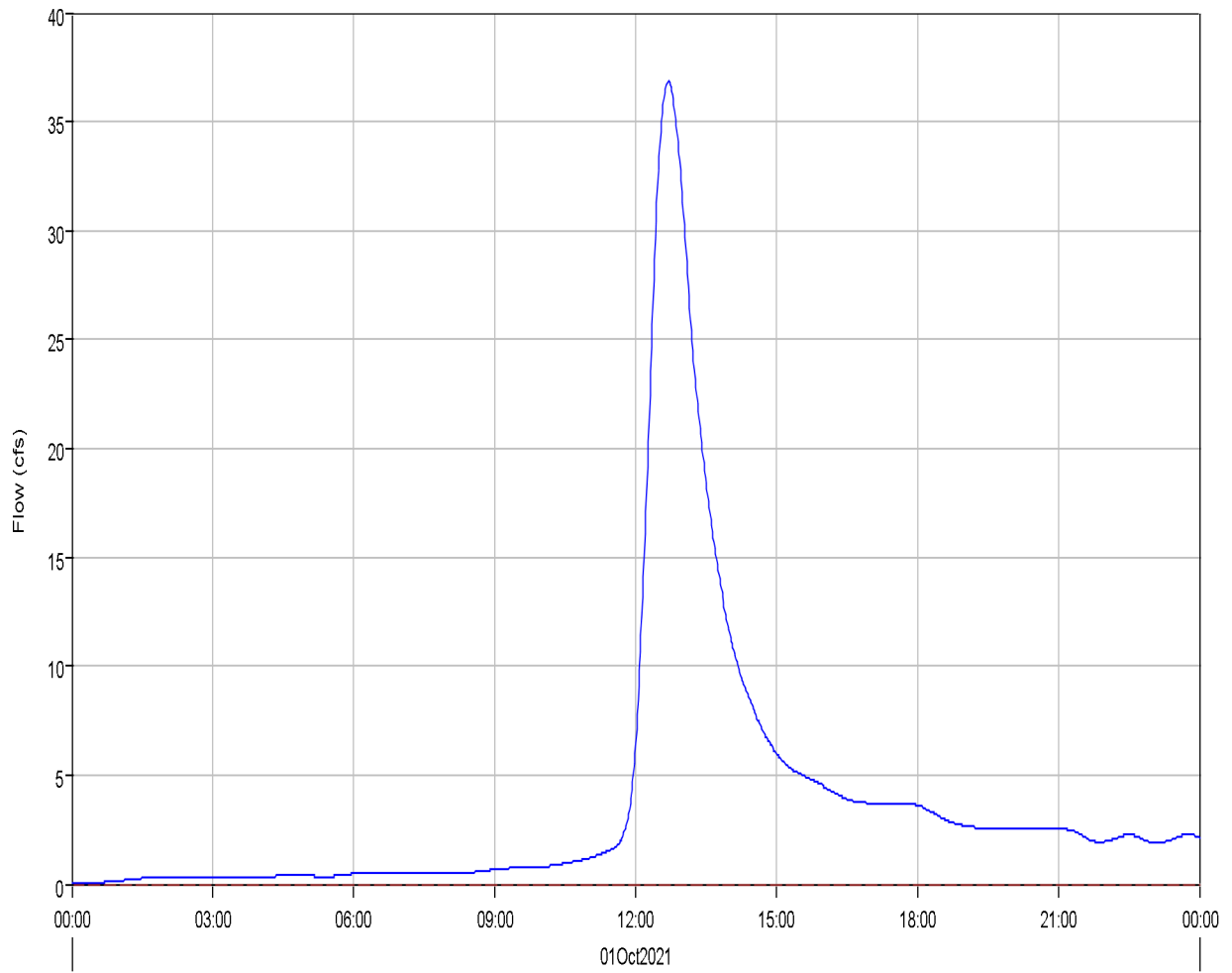
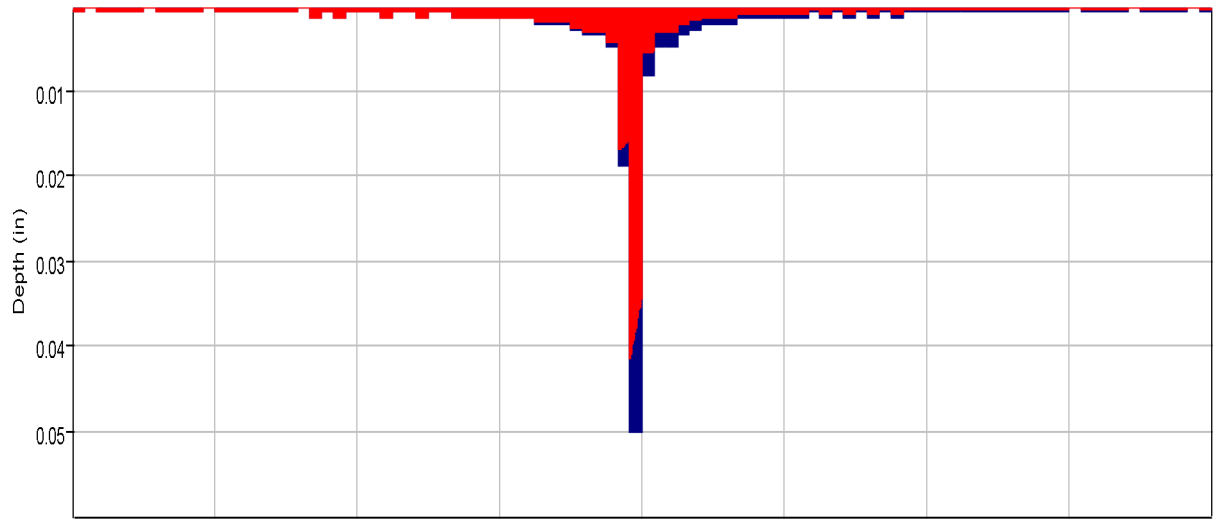
---

#### Computed Results

Peak Discharge :	7.5 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:10
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 "OB5" Results for Run "EV 5-yr Ex. Type II"



Run:EV 5-yr Ex. Type II Element:OB5 Result:Precipitation

Run:EV 5-yr Ex. Type II Element:OB5 Result:Outflow

Run:EV 5-yr Ex. Type II Element:OB5 Result:Precipitation Loss

Run:EV 5-yr Ex. Type II Element:OB5 Result:Baseflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Ex. Type II Subbasin: OB5

Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type II  
Compute Time: 11Mar2022, 14:50:40 Control Specifications: 24-hr Storm

Volume Units: AC-FT

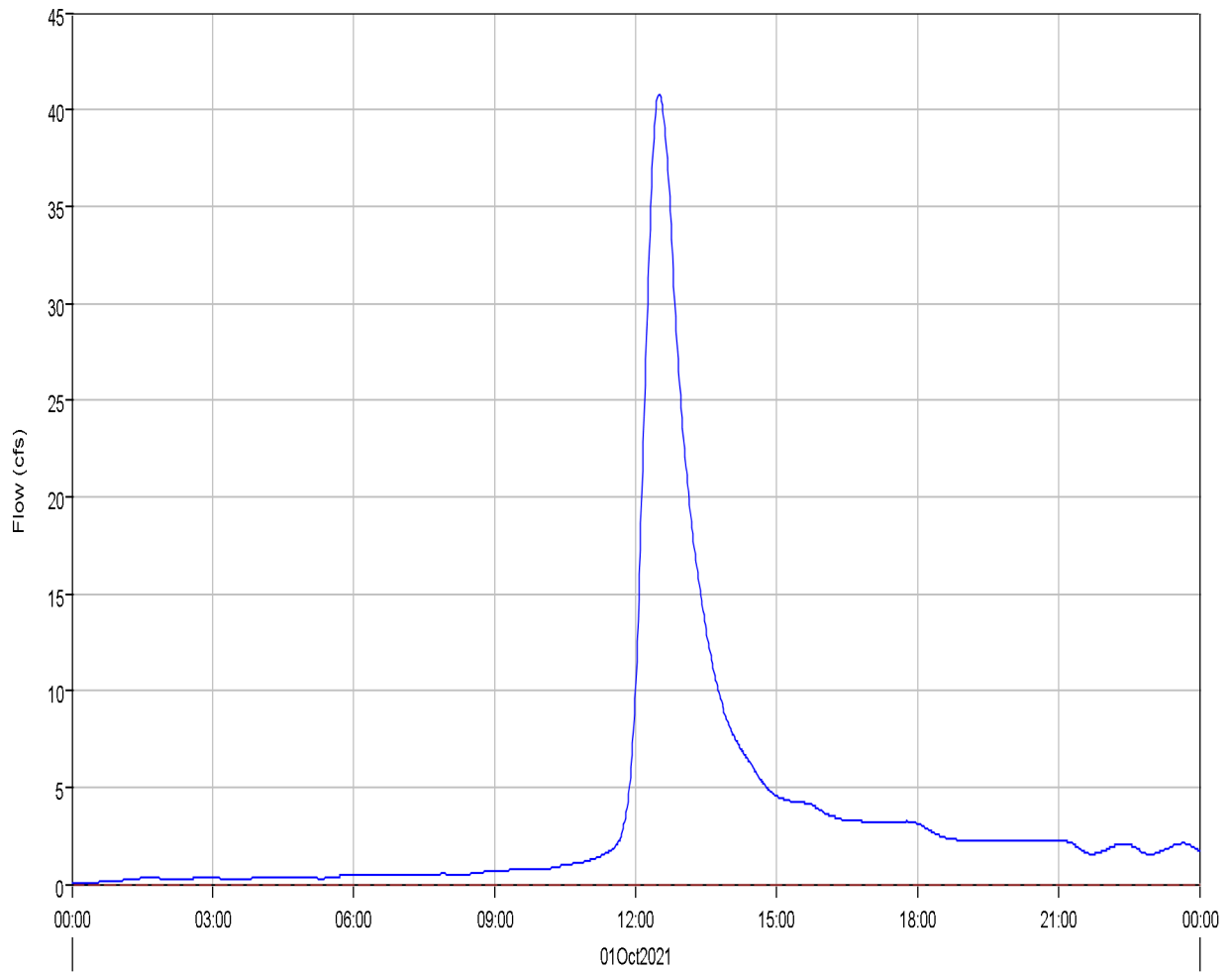
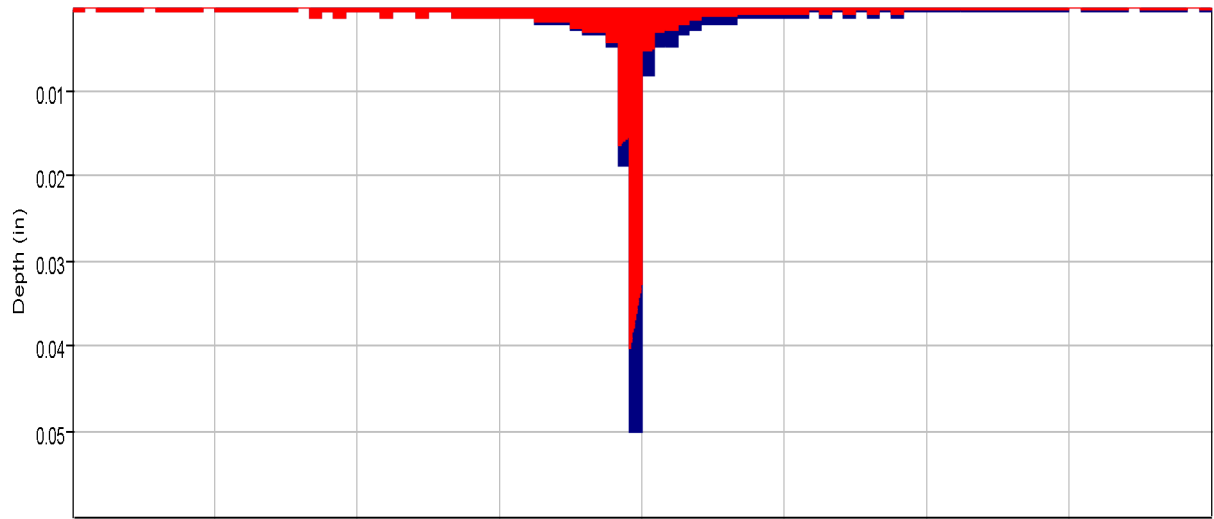
---

#### Computed Results

Peak Discharge :	36.8 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:42
Total Precipitation :	32.4 (AC-FT)	Total Direct Runoff :	7.4 (AC-FT)
Total Loss :	24.8 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	7.6 (AC-FT)	Discharge :	7.4 (AC-FT)

---

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



Run:EV 5-yr Ex. Type II Element:OB6 Result:Precipitation

Run:EV 5-yr Ex. Type II Element:OB6 Result:Precipitation Loss

Run:EV 5-yr Ex. Type II Element:OB6 Result:Outflow

Run:EV 5-yr Ex. Type II Element:OB6 Result:Baseflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Ex. Type II Subbasin: OB6

Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type II  
Compute Time: 11Mar2022, 14:50:40 Control Specifications: 24-hr Storm

Volume Units: AC-FT

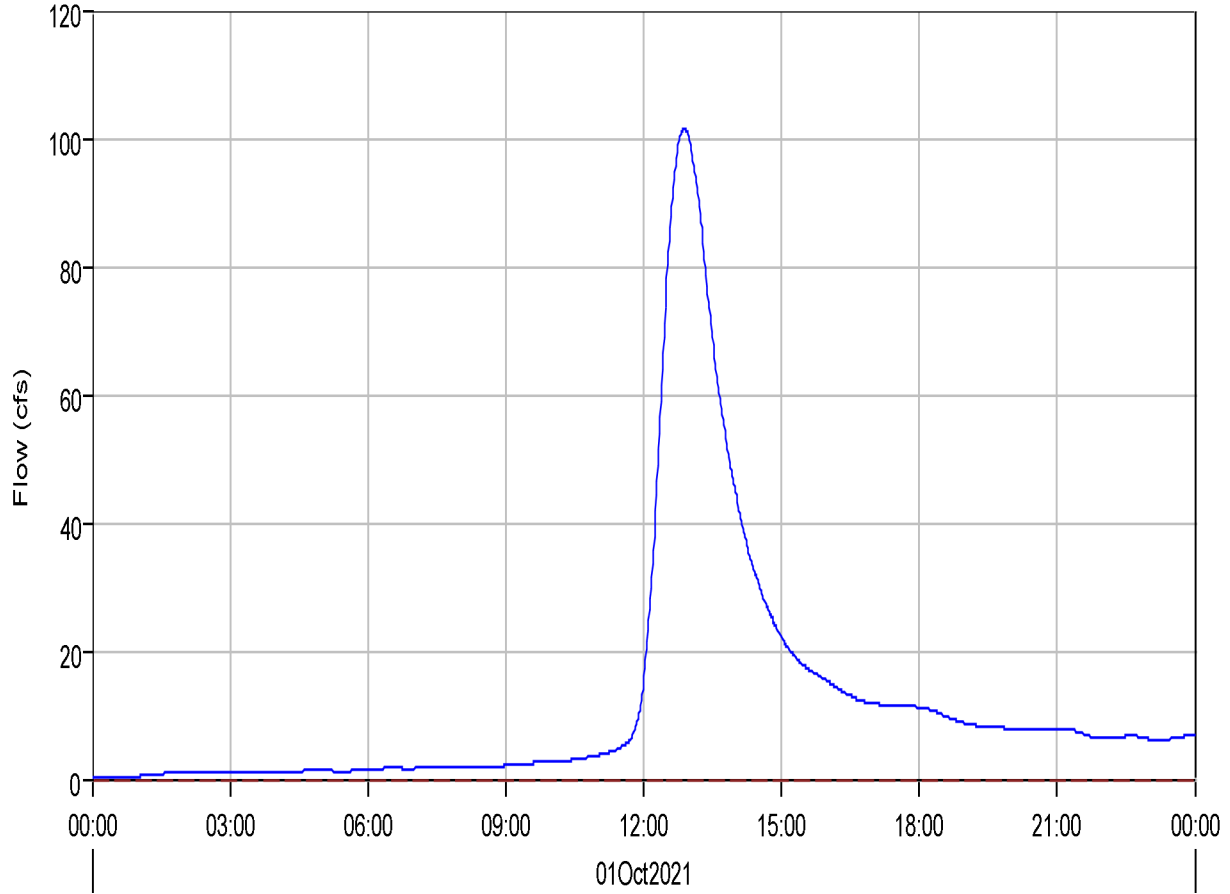
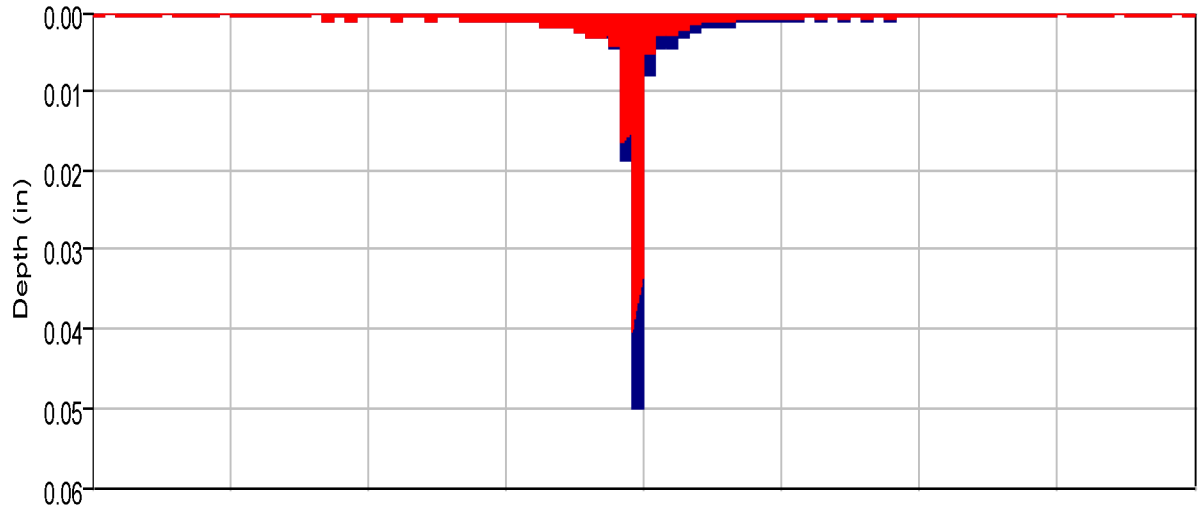
#### Computed Results

---

Peak Discharge :	40.8 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:30
Total Precipitation :	26.6 (AC-FT)	Total Direct Runoff :	6.8 (AC-FT)
Total Loss :	19.8 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	6.9 (AC-FT)	Discharge :	6.8 (AC-FT)

---

### Subbasin "OB7" Results for Run "EV 5-yr Ex. Type II"



- Run:EV 5-yr Ex. Type II Element:OB7 Result:Precipitation
- Run:EV 5-yr Ex. Type II Element:OB7 Result:Precipitation Loss
- Run:EV 5-yr Ex. Type II Element:OB7 Result:Outflow
- Run:EV 5-yr Ex. Type II Element:OB7 Result:Baseflow



Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Ex. Type II Subbasin: OB7

Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type II  
Compute Time: 11Mar2022, 14:50:40 Control Specifications: 24-hr Storm

Volume Units: AC-FT

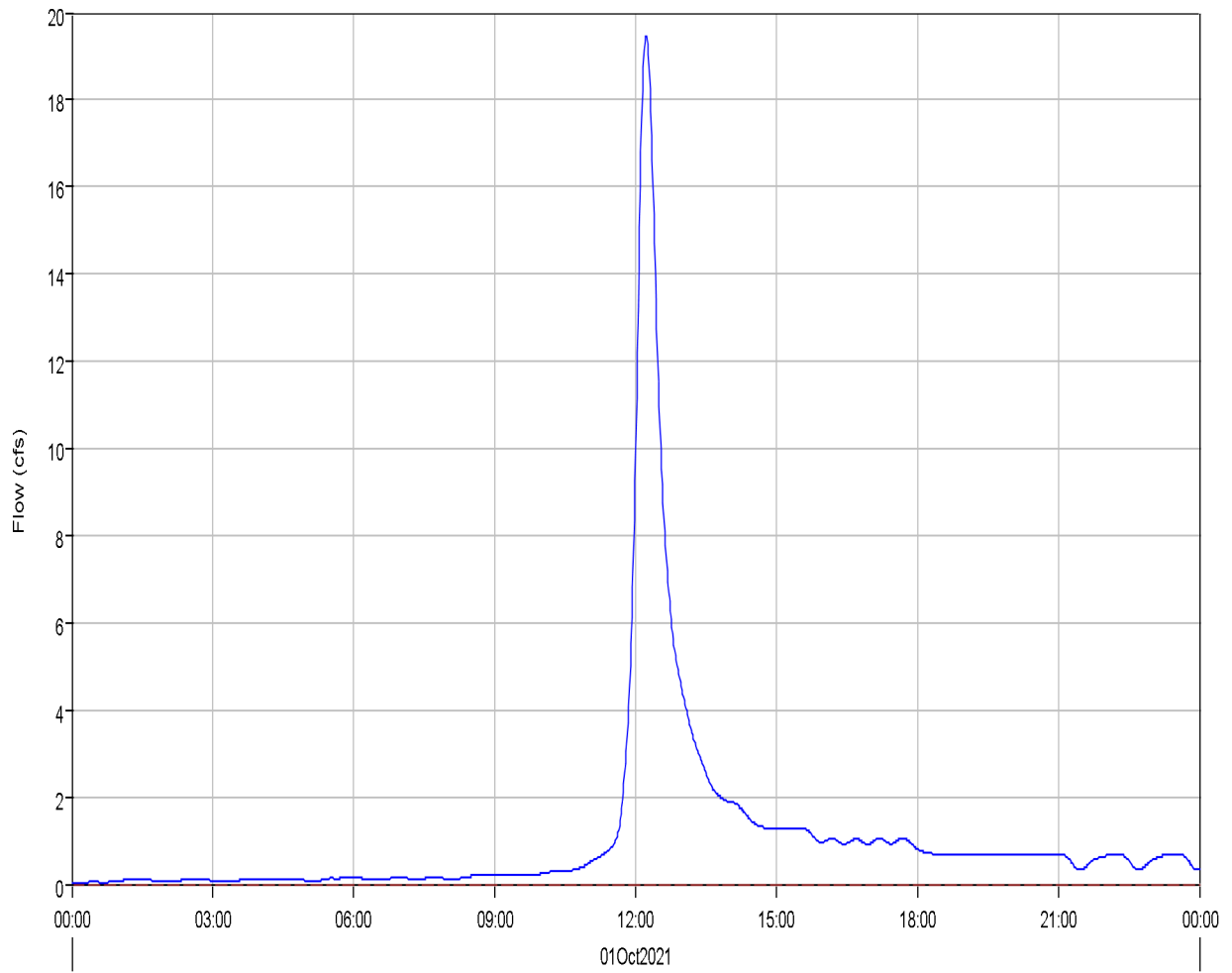
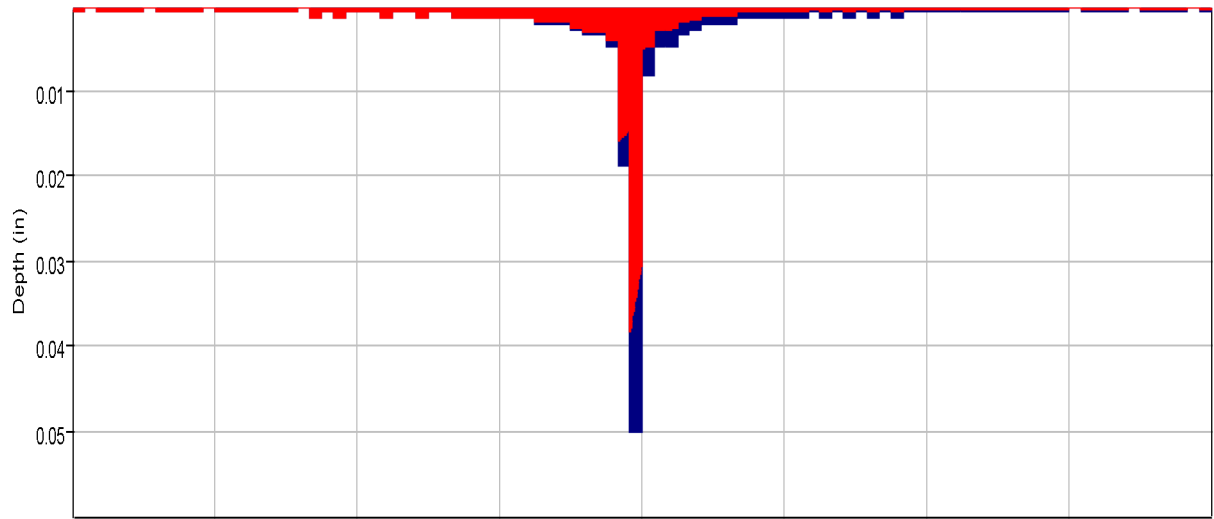
---

#### Computed Results

Peak Discharge :	101.4 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:53
Total Precipitation :	94.8 (AC-FT)	Total Direct Runoff :	23.3 (AC-FT)
Total Loss :	70.9 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	23.9 (AC-FT)	Discharge :	23.3 (AC-FT)

---

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



Run:EV 5-yr Ex. Type II Element:OB8 Result:Precipitation

Run:EV 5-yr Ex. Type II Element:OB8 Result:Precipitation Loss

Run:EV 5-yr Ex. Type II Element:OB8 Result:Outflow

Run:EV 5-yr Ex. Type II Element:OB8 Result:Baseflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Ex. Type II Subbasin: OB8

Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type II  
Compute Time: 11Mar2022, 14:50:40 Control Specifications: 24-hr Storm

Volume Units: AC-FT

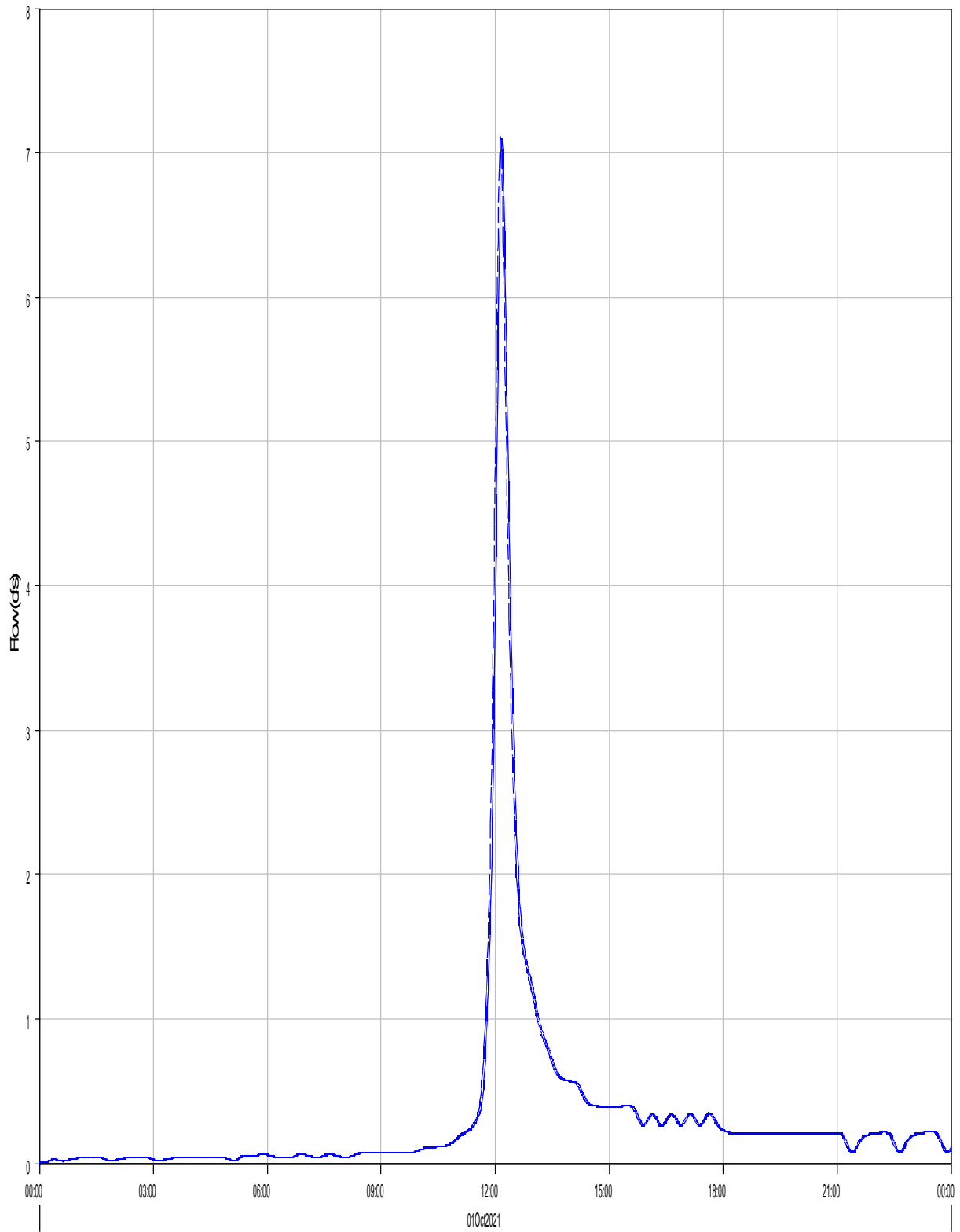
---

#### Computed Results

Peak Discharge :	19.5 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:13
Total Precipitation :	7.4 (AC-FT)	Total Direct Runoff :	2.1 (AC-FT)
Total Loss :	5.3 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	2.2 (AC-FT)	Discharge :	2.1 (AC-FT)

---

Reach 'R-B1' Results for Run 'EV 5-yr Ex. Type II'



Run:EV 5-yr Ex. Type II Element:R-B1 Result:Outflow

Run:EV 5-yr Ex. Type II Element:R-B1 Result:Combined Inflow

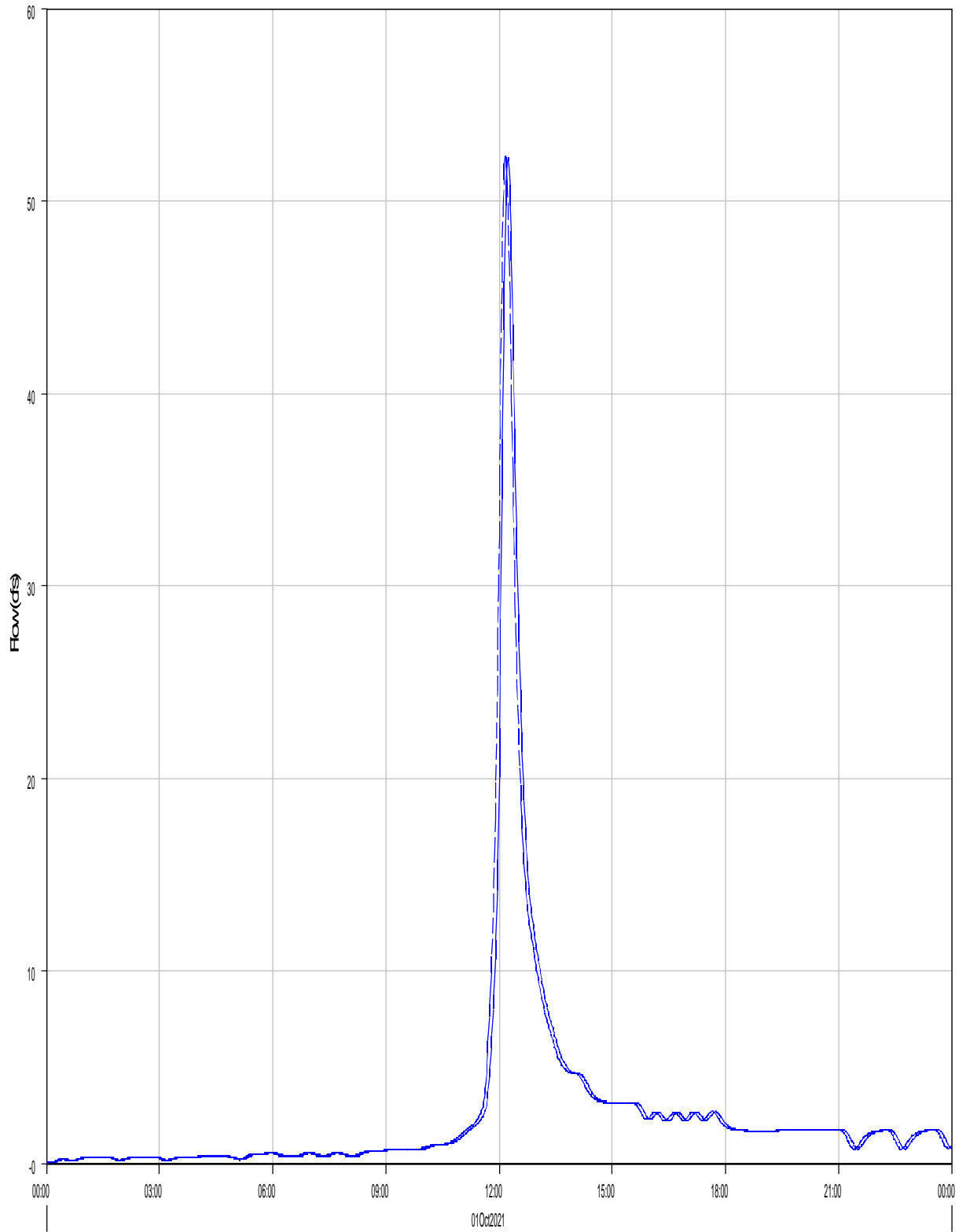
Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Ex. Type II Reach: R-B1  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type II  
Compute Time: 11Mar2022, 14:50:40 Control Specifications: 24-hr Storm

Volume Units: AC-FT

#### Computed Results

Peak Inflow :	7.1 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 12:08
Peak Outflow :	7.1 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 12:11
Total Inflow :	0.7 (AC-FT)	Total Outflow :	0.7 (AC-FT)

Reach 'R-OB4' Results for Run 'EV 5-yr Ex. Type II'



Run:EV 5-yr Ex. Type II Element:R-OB4 Result:Outflow

Run:EV 5-yr Ex. Type II Element:R-OB4 Result:Combined Inflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Ex. Type II Reach: R-OB4

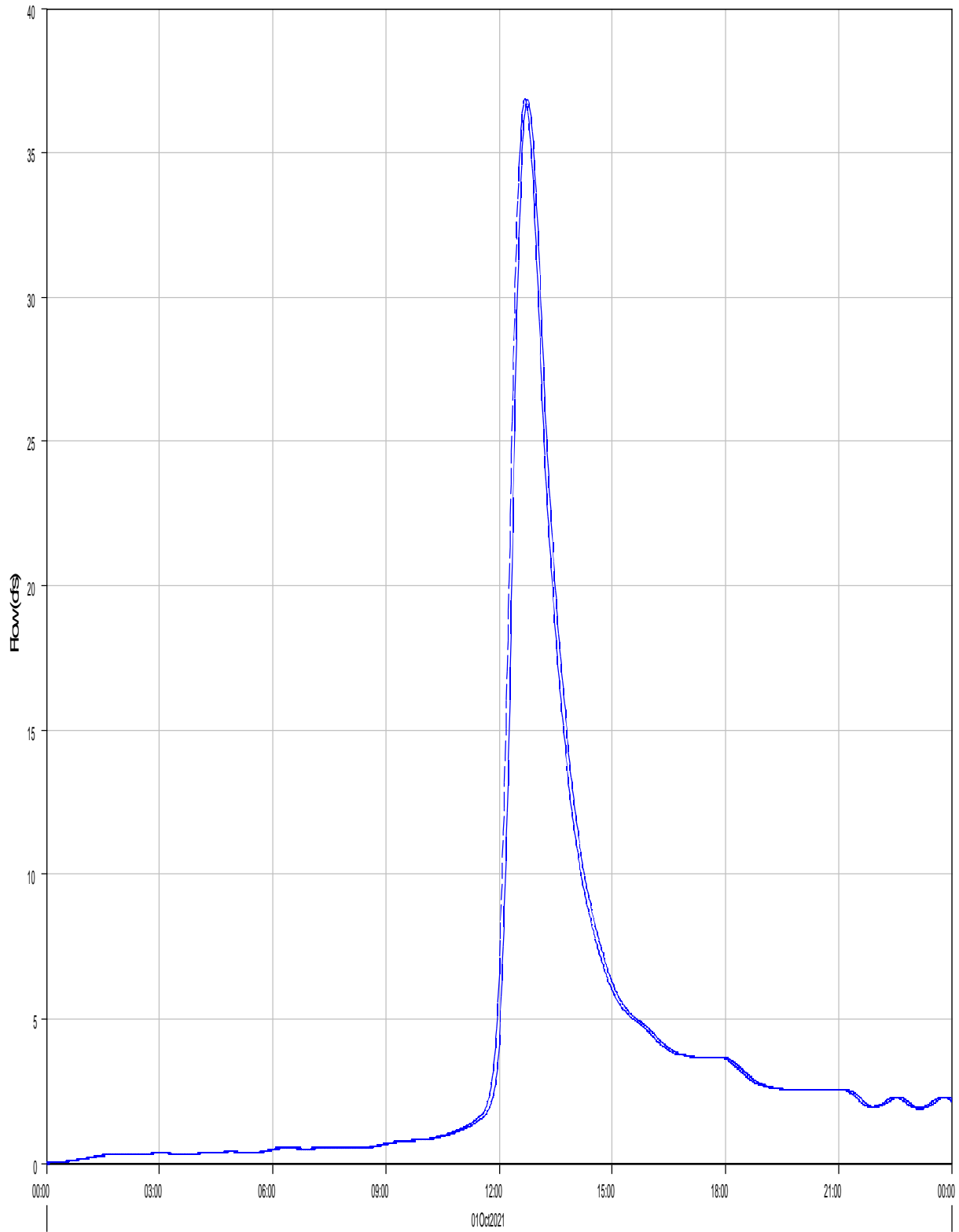
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type II  
Compute Time: 11Mar2022, 14:50:40 Control Specifications: 24-hr Storm

Volume Units: AC-FT

#### Computed Results

Peak Inflow :	52.3 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 12:10
Peak Outflow :	52.2 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 12:14
Total Inflow :	5.4 (AC-FT)	Total Outflow :	5.4 (AC-FT)

Reach 'R-OBS' Results for Run 'EV 5-yr Ex. Type II'



Run:EV 5-yr Ex. Type II Element:R-OBS Result:Outflow

Run:EV 5-yr Ex. Type II Element:R-OBS Result:Combined Inflow



Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Ex. Type II Reach: R-OB5

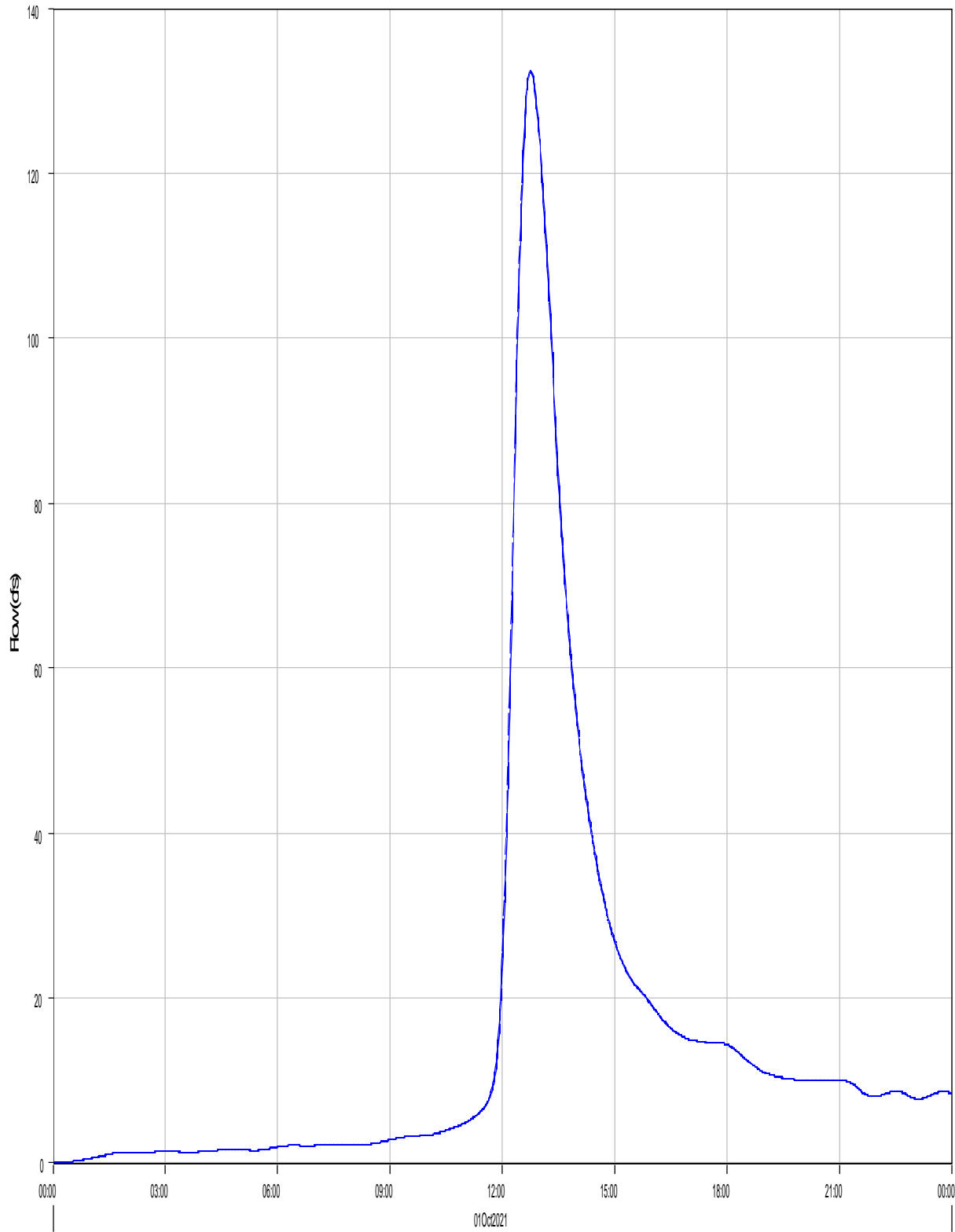
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type II  
Compute Time: 11Mar2022, 14:50:40 Control Specifications: 24-hr Storm

Volume Units: AC-FT

#### Computed Results

Peak Inflow :	36.8 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 12:42
Peak Outflow :	36.8 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 12:45
Total Inflow :	7.4 (AC-FT)	Total Outflow :	7.4 (AC-FT)

Reach 'R-OB6' Results for Run 'EV 5-yr Ex. Type II'



— Run:EV 5-yr Ex. Type II Element:R-OB6 Result:Outflow

- - - Run:EV 5-yr Ex. Type II Element:R-OB6 Result:Combined Inflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Ex. Type II Reach: R-OB6

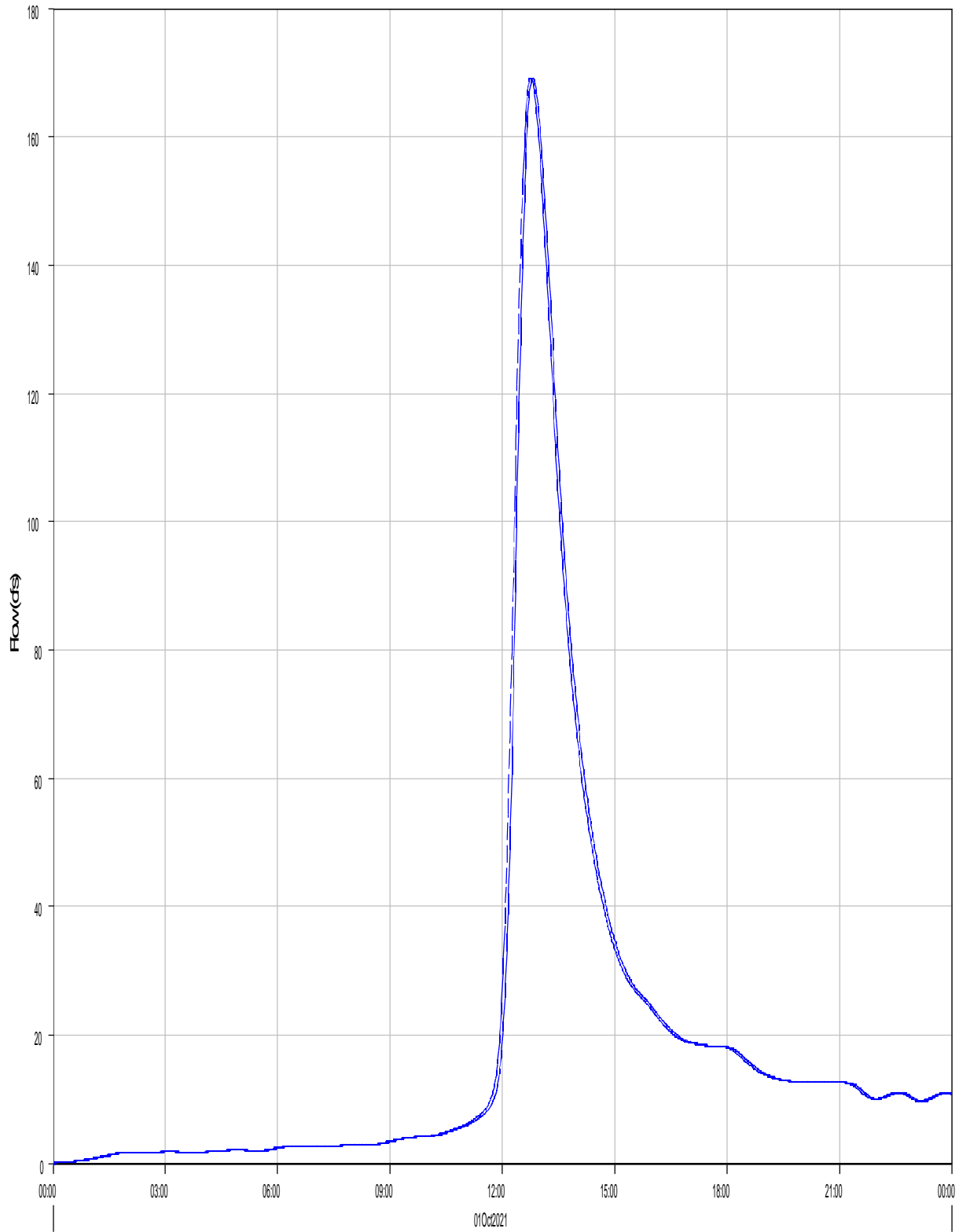
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type II  
Compute Time: 11Mar2022, 14:50:40 Control Specifications: 24-hr Storm

Volume Units: AC-FT

#### Computed Results

Peak Inflow :	132.4 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 12:45
Peak Outflow :	132.4 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 12:46
Total Inflow :	30.1 (AC-FT)	Total Outflow :	30.0 (AC-FT)

Reach 'R-OB7' Results for Run 'EV 5-yr Ex. Type II'



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

Run:EV 5-yr Ex. Type II Element:R-OB7 Result:Combined Inflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Ex. Type II Reach: R-OB7

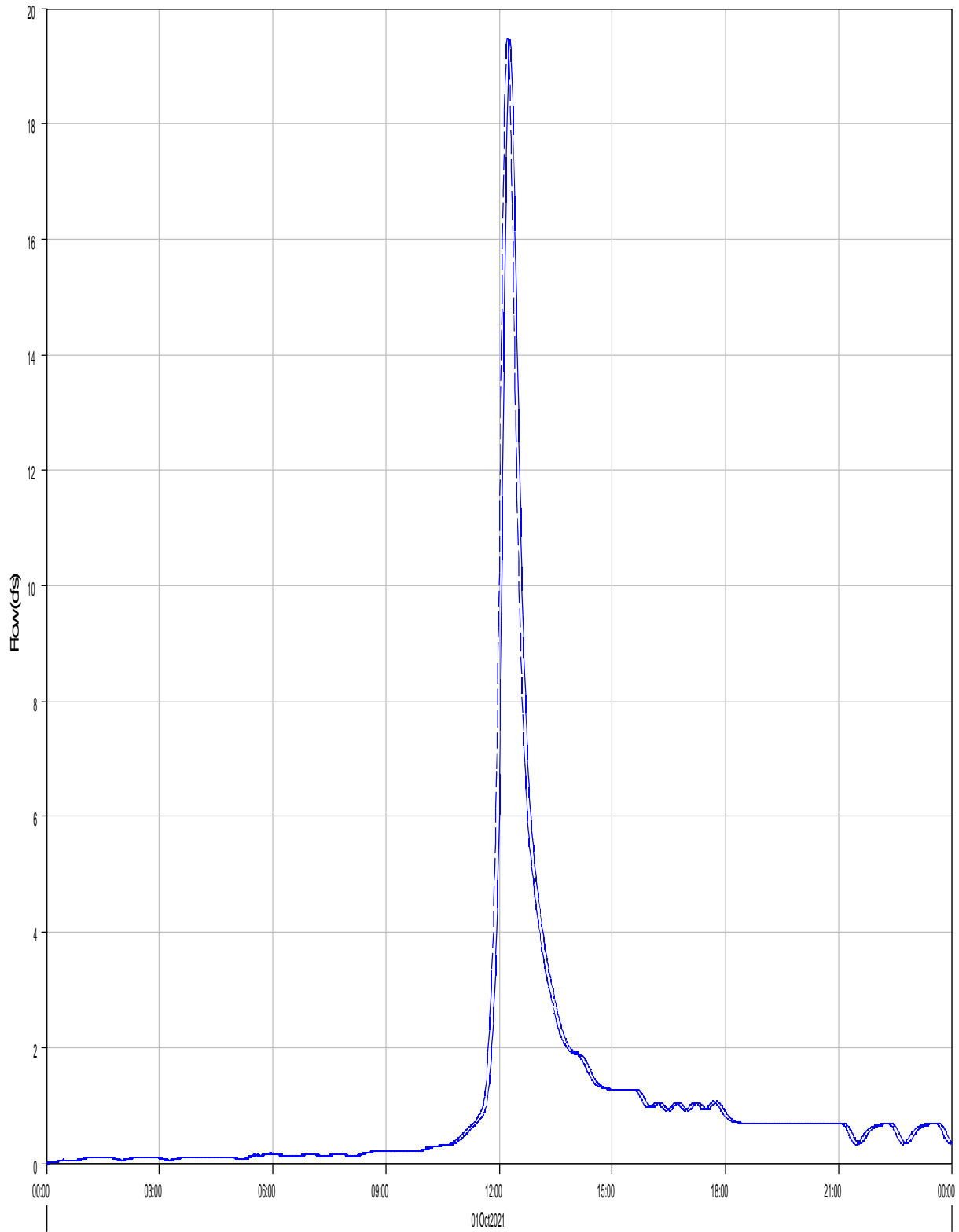
Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Existing
End of Run:	02Oct2021, 00:00	Meteorologic Model:	5-yr Type II
Compute Time:	11Mar2022, 14:50:40	Control Specifications:	24-hr Storm

Volume Units: AC-FT

#### Computed Results

Peak Inflow :	169.2 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 12:46
Peak Outflow :	169.2 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 12:49
Total Inflow :	37.4 (AC-FT)	Total Outflow :	37.3 (AC-FT)

Reach 'R-OB8' Results for Run 'EV 5-yr Ex. Type II'



Run:EV 5-yr Ex. Type II Element:R-OB8 Result:Outflow

Run:EV 5-yr Ex. Type II Element:R-OB8 Result:Combined Inflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 5-yr Ex. Type II Reach: R-OB8

Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type II  
Compute Time: 11Mar2022, 14:50:40 Control Specifications: 24-hr Storm

Volume Units: AC-FT

#### Computed Results

Peak Inflow :	19.5 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 12:13
Peak Outflow :	19.4 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 12:17
Total Inflow :	2.1 (AC-FT)	Total Outflow :	2.1 (AC-FT)

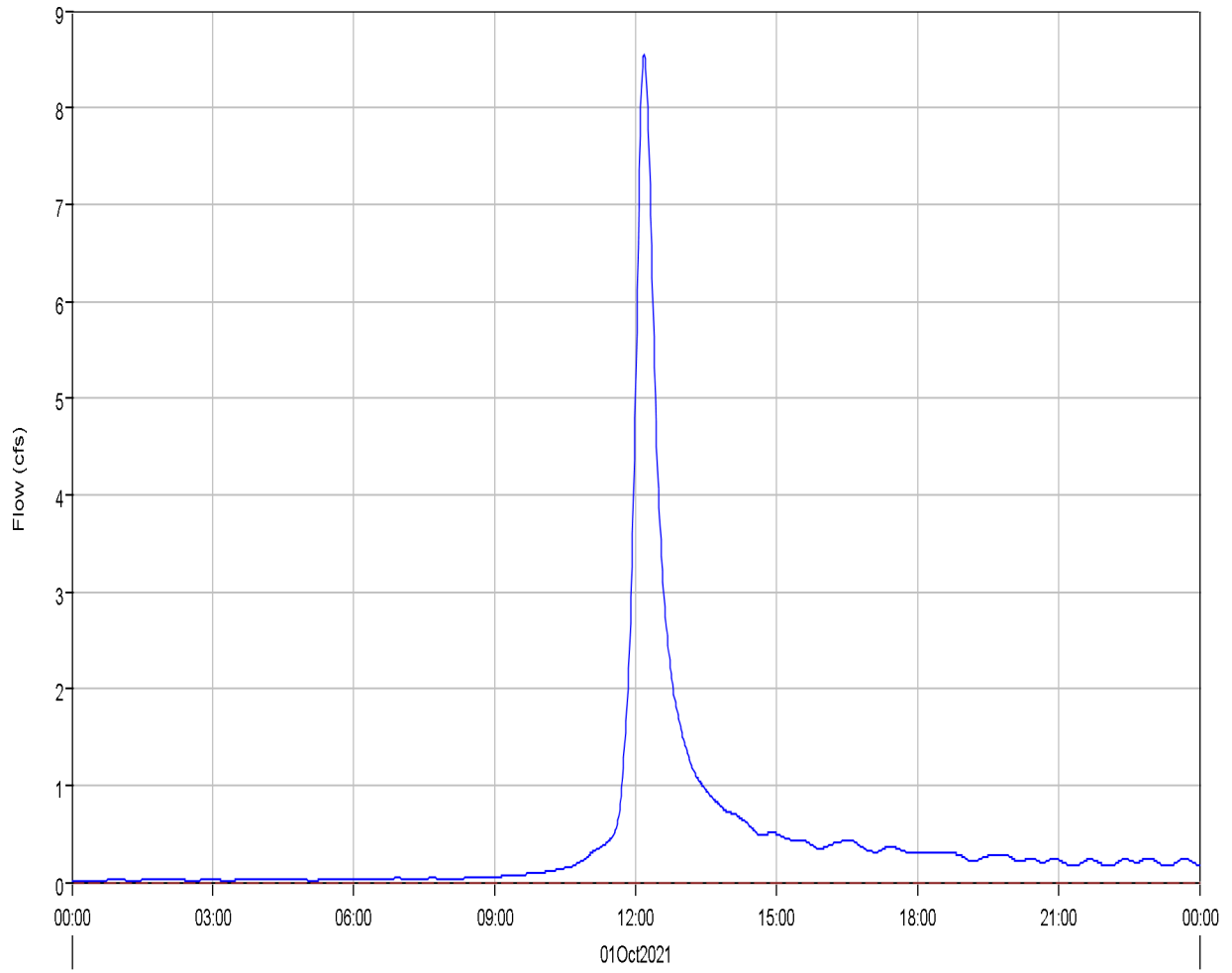
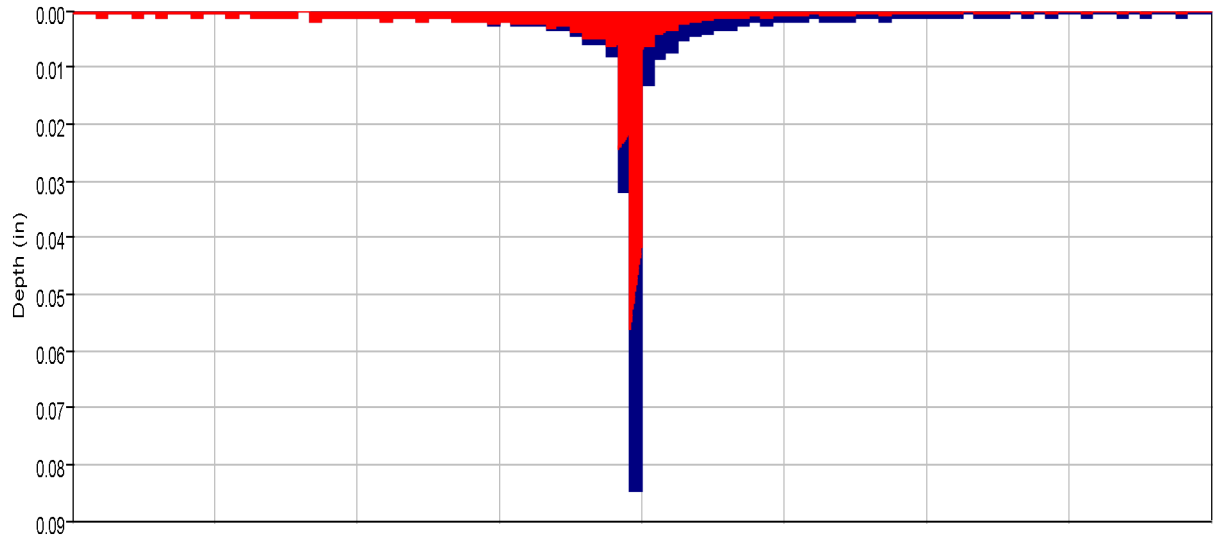
Project: Eagleview\_Subdivision Simulation Run: EV 100-yr Ex. Type II

Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
 End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type II  
 Compute Time: 11Mar2022, 10:12:01 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	8.5	01Oct2021, 12:11	0.8
B2	0.0647266	48.5	01Oct2021, 12:15	5.3
B3	0.0930359	110.0	01Oct2021, 12:04	7.8
B4	0.0229422	18.2	01Oct2021, 12:13	1.9
J1	0.0253831	27.3	01Oct2021, 12:10	2.5
J2	0.1928516	183.8	01Oct2021, 12:13	18.8
J3	1.2354980	515.5	01Oct2021, 12:44	112.7
J4	1.0678500	478.0	01Oct2021, 12:44	97.8
J-OB6	0.8431300	371.3	01Oct2021, 12:43	78.1
OB1	0.0162031	18.8	01Oct2021, 12:08	1.7
OB2	0.0438438	52.7	01Oct2021, 12:08	4.7
OB3	0.0678750	67.1	01Oct2021, 12:12	6.9
OB4	0.0164062	18.9	01Oct2021, 12:10	1.8
OB5	0.2247200	106.9	01Oct2021, 12:40	19.7
OB6	0.1850100	113.2	01Oct2021, 12:29	17.5
OB7	0.6581200	284.2	01Oct2021, 12:52	60.6
OB8	0.0516699	51.6	01Oct2021, 12:13	5.4
R-B1	0.0162031	18.7	01Oct2021, 12:10	1.7
R-OB4	0.1281250	135.8	01Oct2021, 12:13	13.4
R-OB5	0.2247200	106.8	01Oct2021, 12:43	19.7
R-OB6	0.8431300	371.3	01Oct2021, 12:44	78.1
R-OB7	1.0678500	477.9	01Oct2021, 12:46	97.7
R-OB8	0.0516699	51.5	01Oct2021, 12:16	5.4



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



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

Run:EV 100-yr Ex. Type II Element:B1 Result:Precipitation Loss  
Run:EV 100-yr Ex. Type II Element:B1 Result:Baseflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Ex. Type II Subbasin: B1

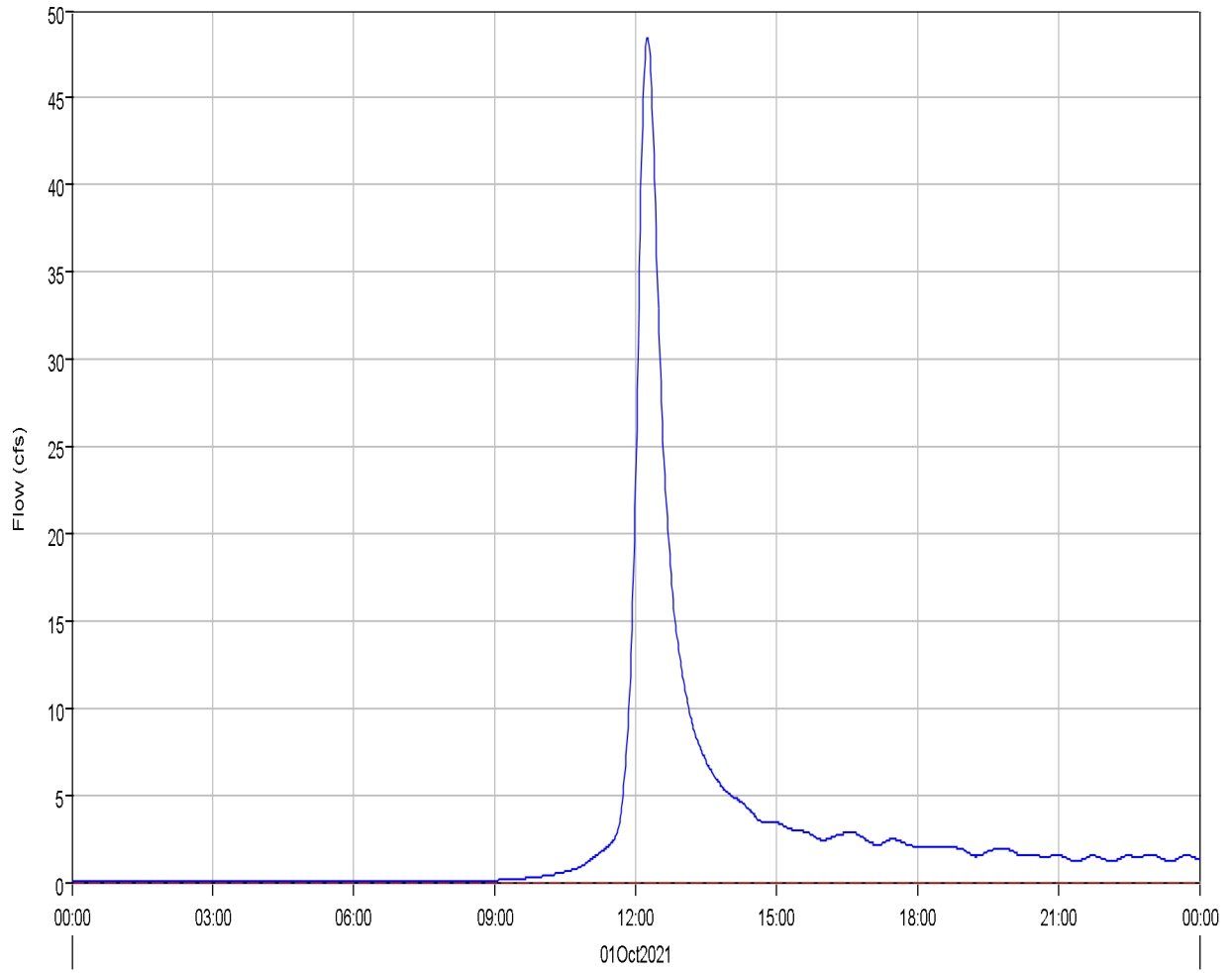
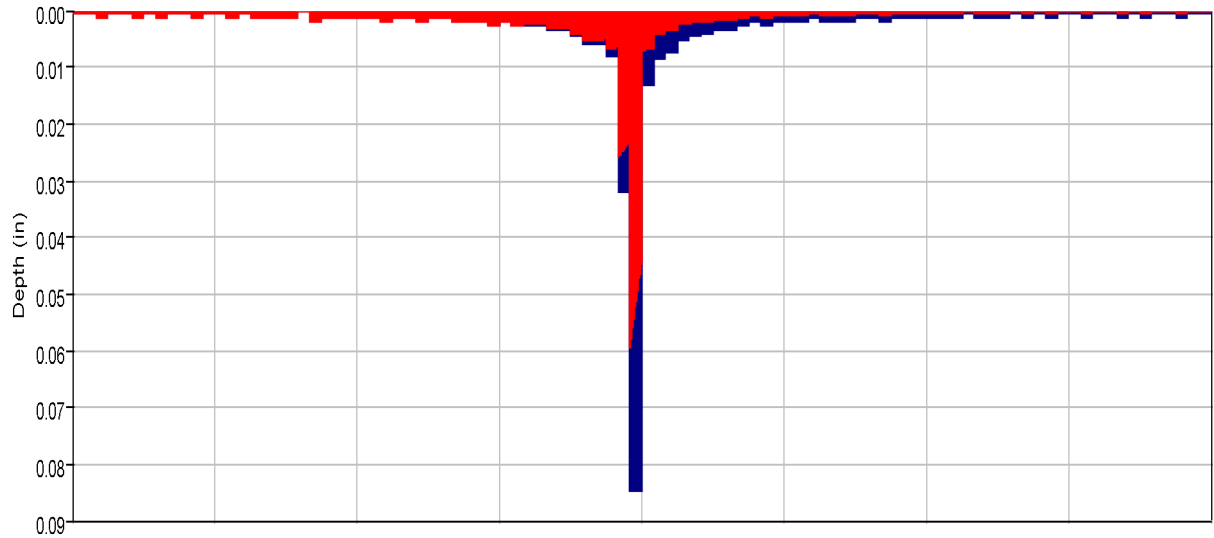
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type II  
Compute Time: 11Mar2022, 10:12:01 Control Specifications: 24-hr Storm

Volume Units: AC-FT

#### Computed Results

Peak Discharge :	8.5 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:11
Total Precipitation :	2.3 (AC-FT)	Total Direct Runoff :	0.8 (AC-FT)
Total Loss :	1.4 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	0.8 (AC-FT)	Discharge :	0.8 (AC-FT)

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



Run:EV 100-yr Ex. Type II Element:B2 Result:Precipitation  
Run:EV 100-yr Ex. Type II Element:B2 Result:Outflow

Run:EV 100-yr Ex. Type II Element:B2 Result:Precipitation Loss  
Run:EV 100-yr Ex. Type II Element:B2 Result:Baseflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Ex. Type II Subbasin: B2  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type II  
Compute Time: 11Mar2022, 10:12:01 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

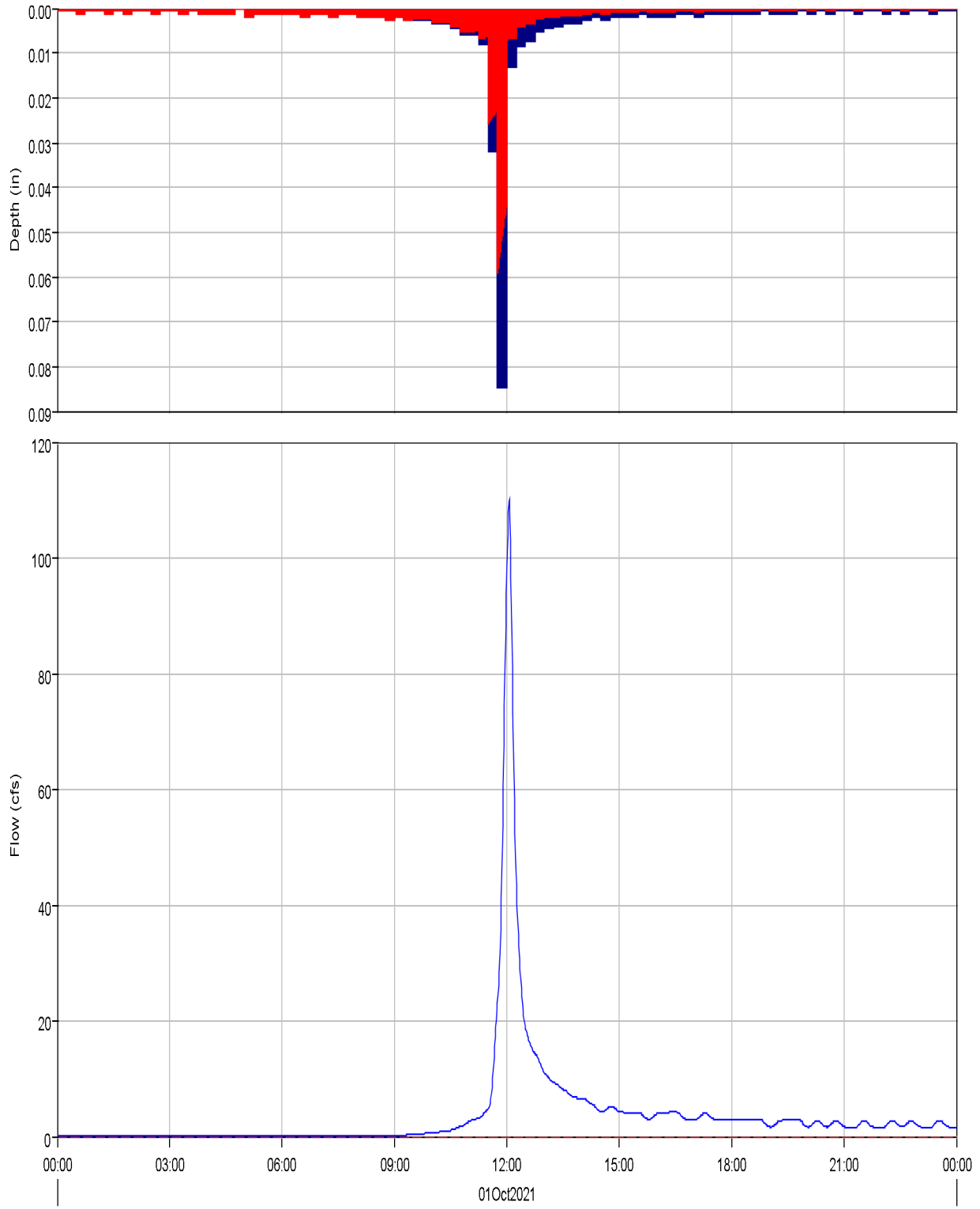
---

Computed Results

Peak Discharge :	48.5 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:15
Total Precipitation :	15.9 (AC-FT)	Total Direct Runoff :	5.3 (AC-FT)
Total Loss :	10.5 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	5.4 (AC-FT)	Discharge :	5.3 (AC-FT)

---

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



Run:EV 100-yr Ex. Type II Element:B3 Result:Precipitation  
Run:EV 100-yr Ex. Type II Element:B3 Result:Outflow

Run:EV 100-yr Ex. Type II Element:B3 Result:Precipitation Loss  
Run:EV 100-yr Ex. Type II Element:B3 Result:Baseflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Ex. Type II Subbasin: B3

Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type II  
Compute Time: 11Mar2022, 10:12:01 Control Specifications: 24-hr Storm

Volume Units: AC-FT

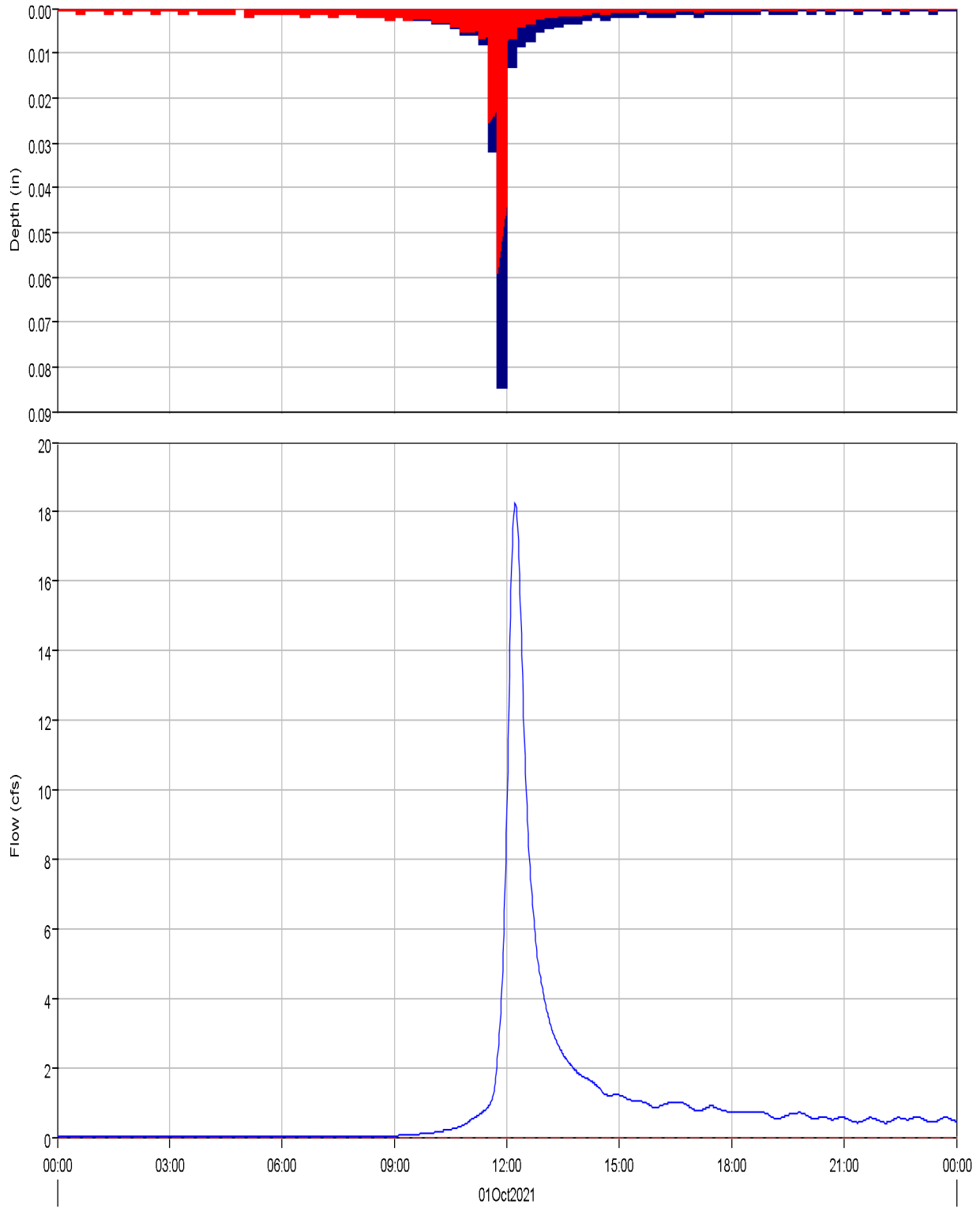
---

#### Computed Results

Peak Discharge :	110.0 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:04
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 II"



Run:EV 100-yr Ex. Type II Element:B4 Result:Precipitation  
Run:EV 100-yr Ex. Type II Element:B4 Result:Outflow

Run:EV 100-yr Ex. Type II Element:B4 Result:Precipitation Loss  
Run:EV 100-yr Ex. Type II Element:B4 Result:Baseflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Ex. Type II Subbasin: B4  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type II  
Compute Time: 11Mar2022, 10:12:01 Control Specifications: 24-hr Storm

Volume Units: AC-FT

---

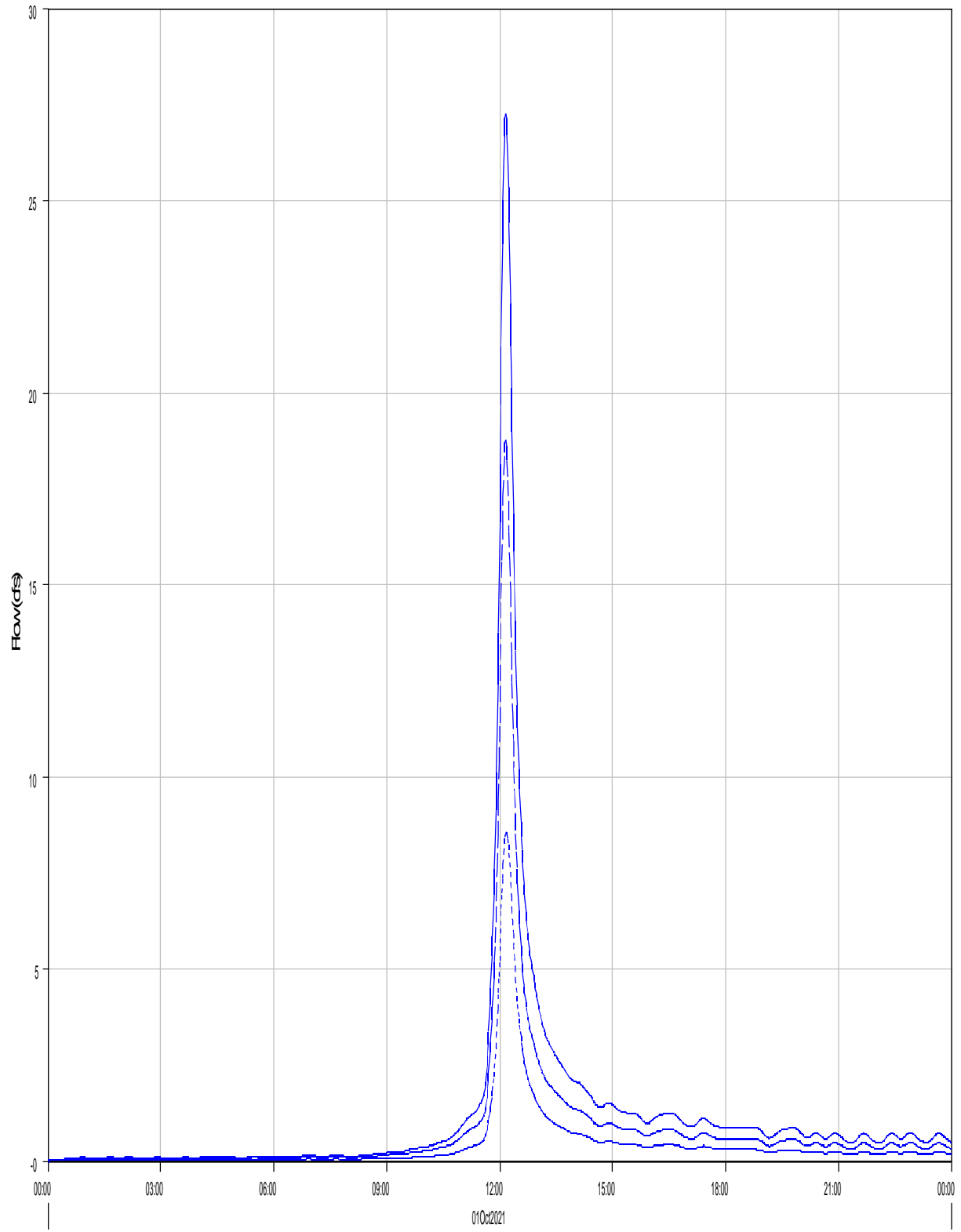
#### Computed Results

Peak Discharge :	18.2 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:13
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 II'



— Run:EV 100-yr Ex. Type II Element:J1 Result:Outflow

- - - Run:EV 100-yr Ex. Type II Element:R-B1 Result:Outflow

... Run:EV 100-yr Ex. Type II Element:B1 Result:Outflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Ex. Type II Junction: J1  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type II  
Compute Time: 11Mar2022, 10:12:01 Control Specifications: 24-hr Storm

Volume Units: AC-FT

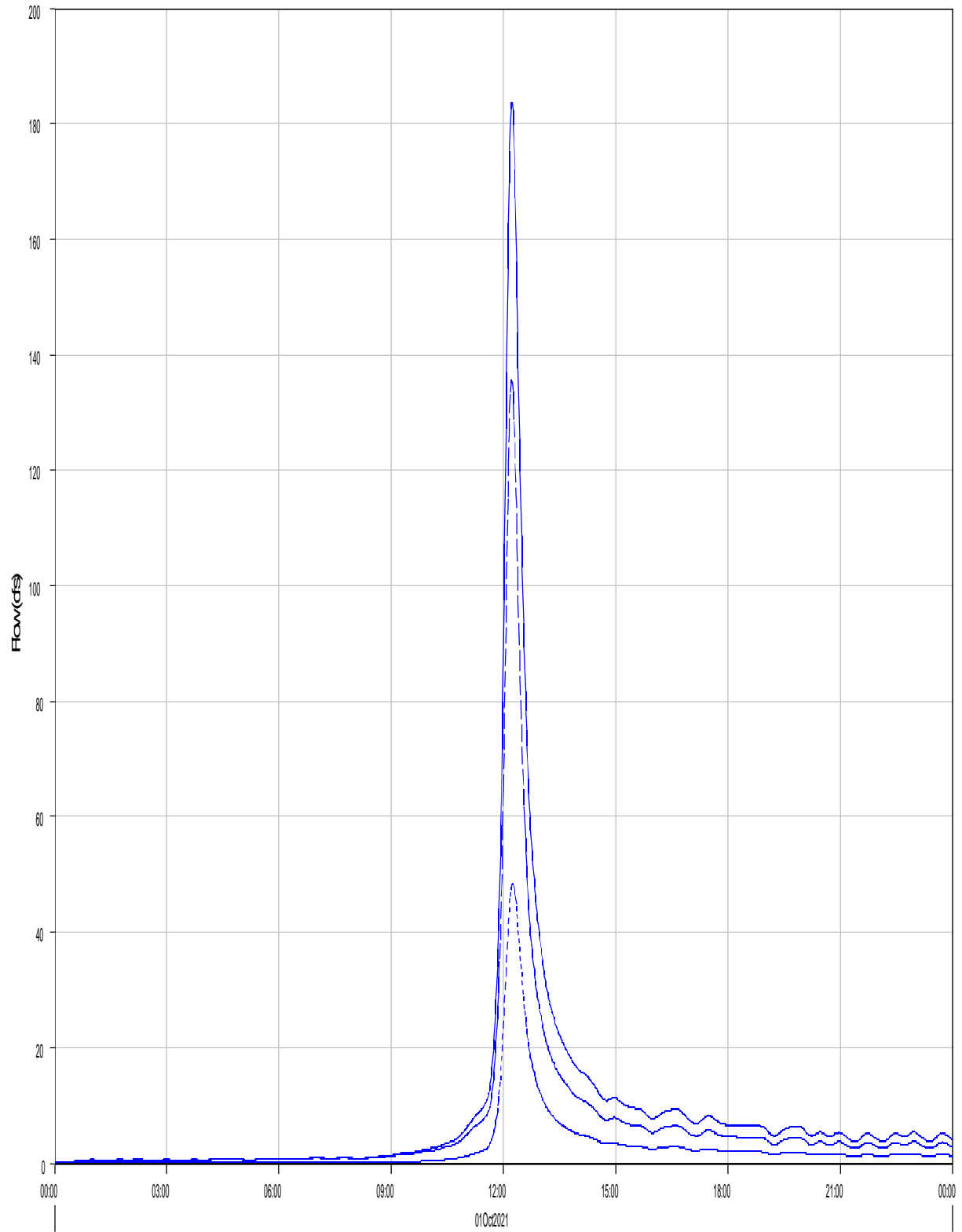
---

Computed Results

Peak Outflow : 27.3 (CFS) Date/Time of Peak Outflow : 01Oct2021, 12:10  
Total Outflow : 2.5 (AC-FT)

---

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



— Run: EV 100-yr Ex. Type II Element: J2 Result: Outflow

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

· · · Run: EV 100-yr Ex. Type II Element: B2 Result: Outflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Ex. Type II Junction: J2  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type II  
Compute Time: 11Mar2022, 10:12:01 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

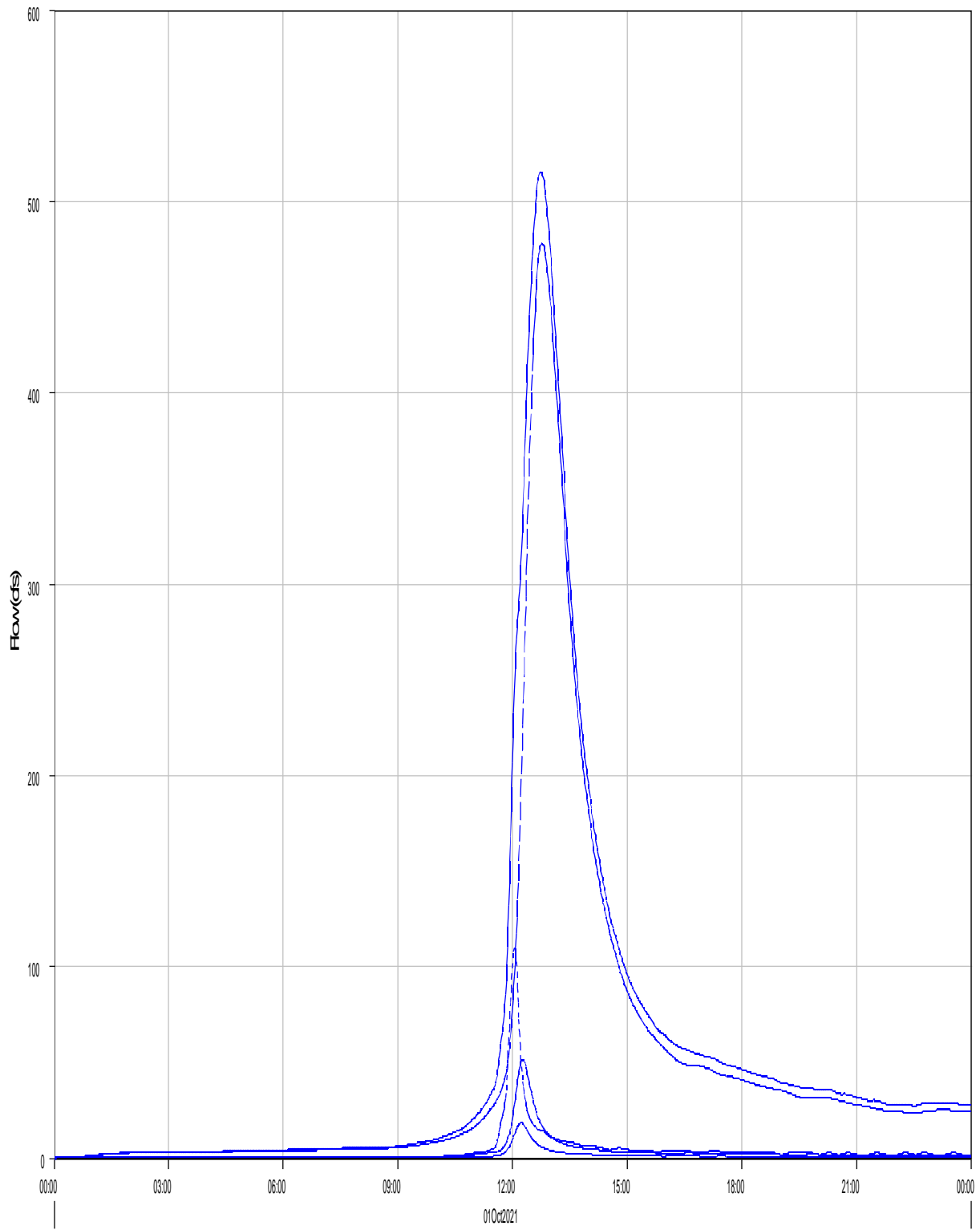
---

Computed Results

Peak Outflow : 183.8 (CFS) Date/Time of Peak Outflow : 01Oct2021, 12:13  
Total Outflow : 18.8 (AC-FT)

---

Junction 'J3' Results for Run 'EV 100-yr Ex. Type II'



— Run EV 100-yr Ex. Type II Element J3 Result Outflow  
- - - Run EV 100-yr Ex. Type II Element R-OB8 Result Outflow

- - - Run EV 100-yr Ex. Type II Element R-OB7 Result Outflow  
- - - Run EV 100-yr Ex. Type II Element B4 Result Outflow

- - - Run EV 100-yr Ex. Type II Element B3 Result Outflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Ex. Type II Junction: J3  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type II  
Compute Time: 11Mar2022, 10:12:01 Control Specifications: 24-hr Storm

Volume Units: AC-FT

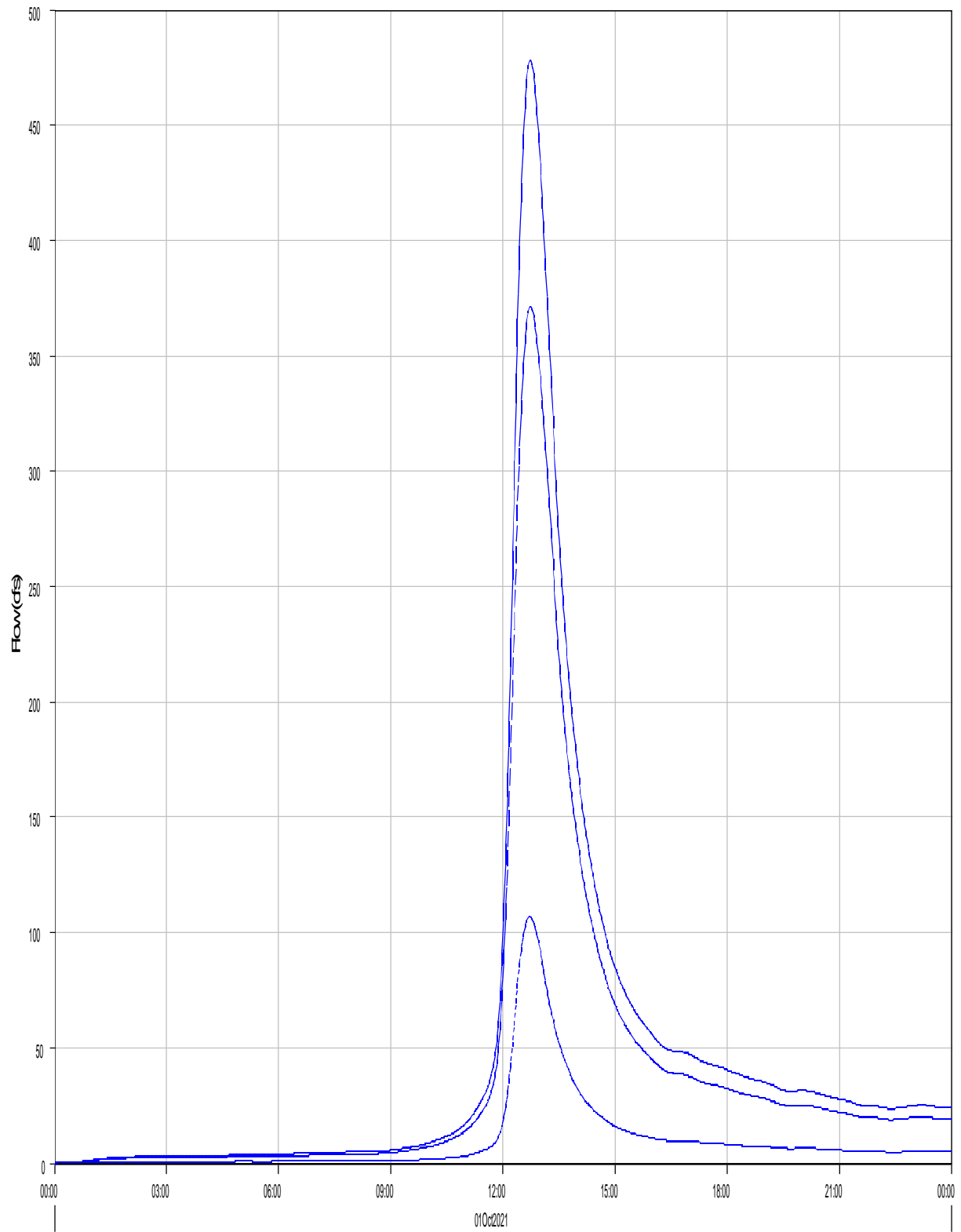
---

Computed Results

Peak Outflow : 515.5 (CFS) Date/Time of Peak Outflow : 01Oct2021, 12:44  
Total Outflow : 112.7 (AC-FT)

---

Junction 'J4' Results for Run 'EV 100-yr Ex. Type II'



Run:EV 100-yr Ex. Type II Element:J4 Result:Outflow

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

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

Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Ex. Type II Junction: J4  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type II  
Compute Time: 11Mar2022, 10:12:01 Control Specifications: 24-hr Storm

Volume Units: IN

---

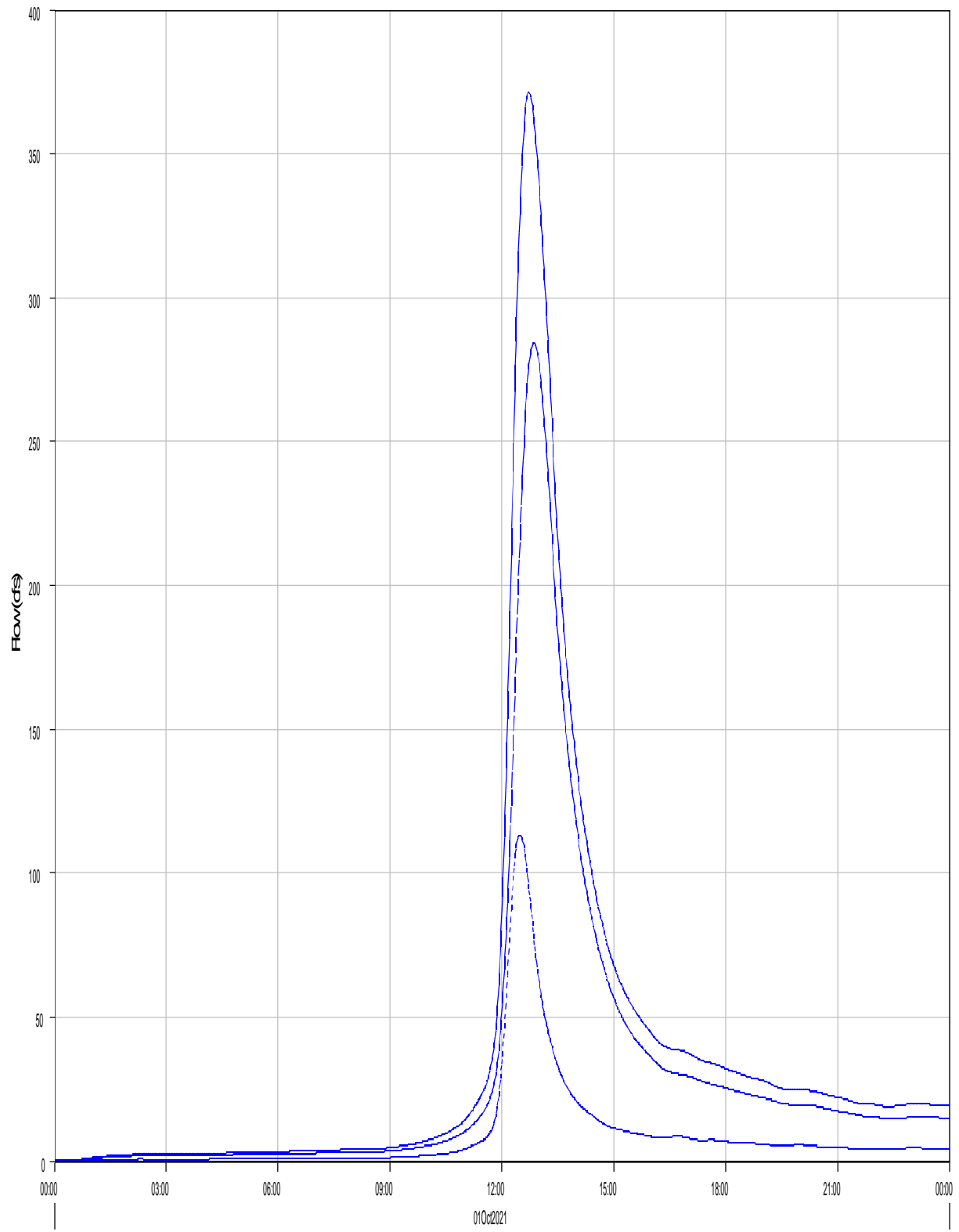
Computed Results

Peak Outflow : 478.0 (CFS) Date/Time of Peak Outflow : 01Oct2021, 12:44  
Total Outflow : 1.72 (IN)

---



Junction 'J-OB6' Results for Run 'EV 100-yr Ex. Type II'



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

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

Run:EV 100-yr Ex. Type II Element:OB8 Result:Outflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Ex. Type II Junction: J-OB6  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type II  
Compute Time: 11Mar2022, 10:12:01 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

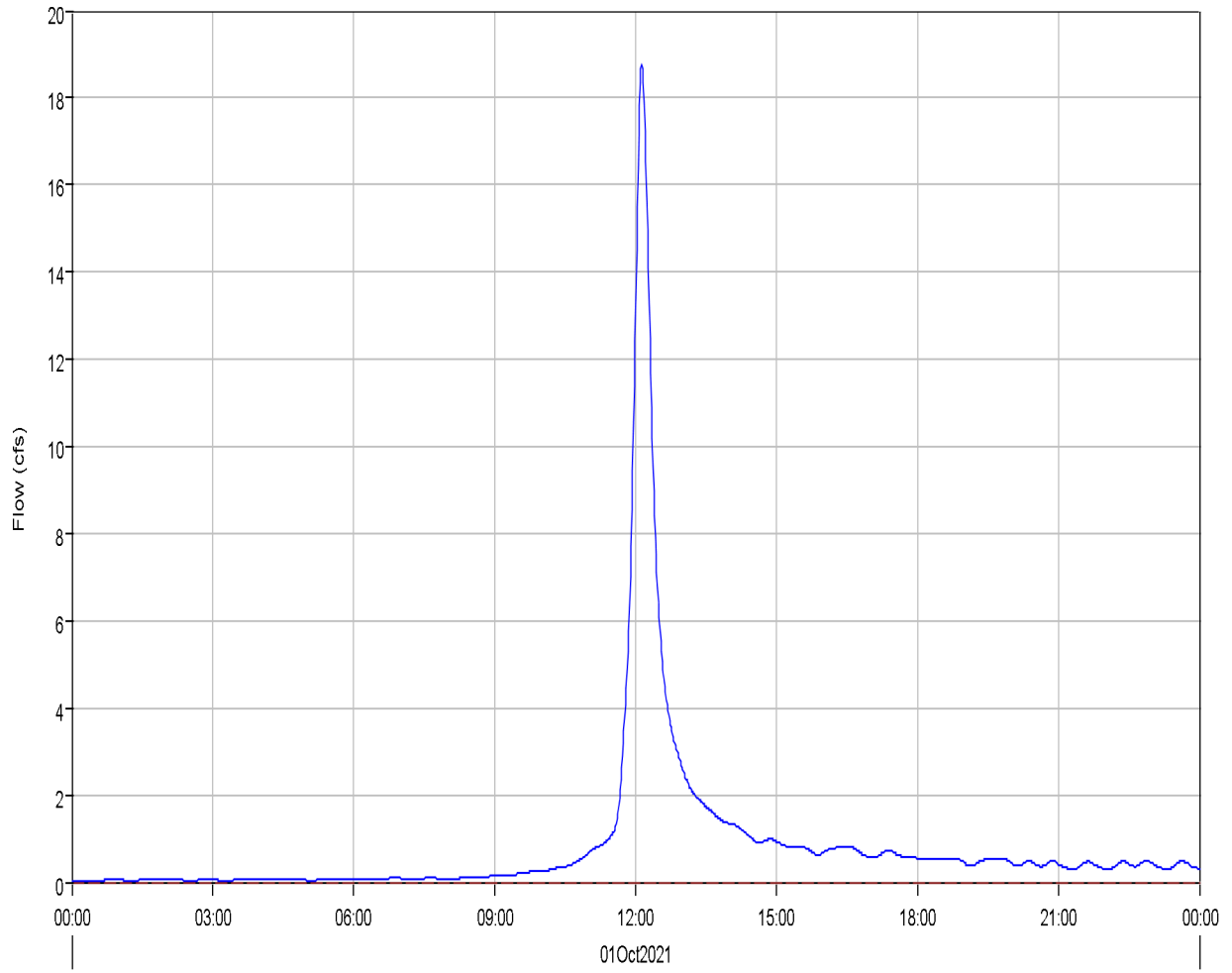
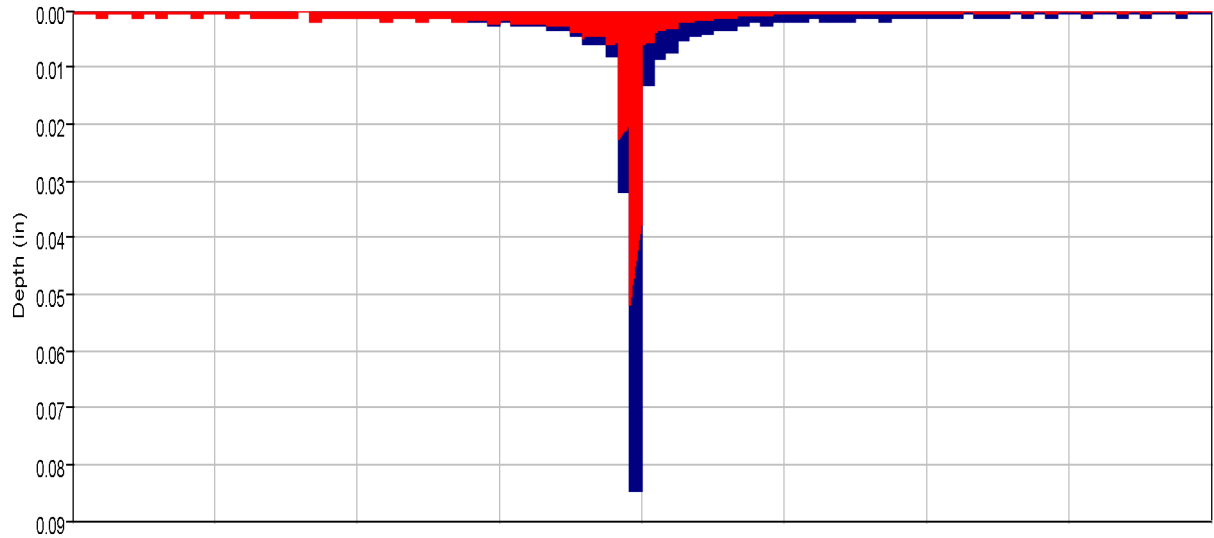
---

Computed Results

Peak Outflow : 371.3 (CFS) Date/Time of Peak Outflow : 01Oct2021, 12:43  
Total Outflow : 78.1 (AC-FT)

---

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



Run:EV 100-yr Ex. Type II Element:OB1 Result:Precipitation  
Run:EV 100-yr Ex. Type II Element:OB1 Result:Outflow

Run:EV 100-yr Ex. Type II Element:OB1 Result:Precipitation Loss  
Run:EV 100-yr Ex. Type II Element:OB1 Result:Baseflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Ex. Type II Subbasin: OB1  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type II  
Compute Time: 11Mar2022, 10:12:01 Control Specifications: 24-hr Storm

Volume Units: AC-FT

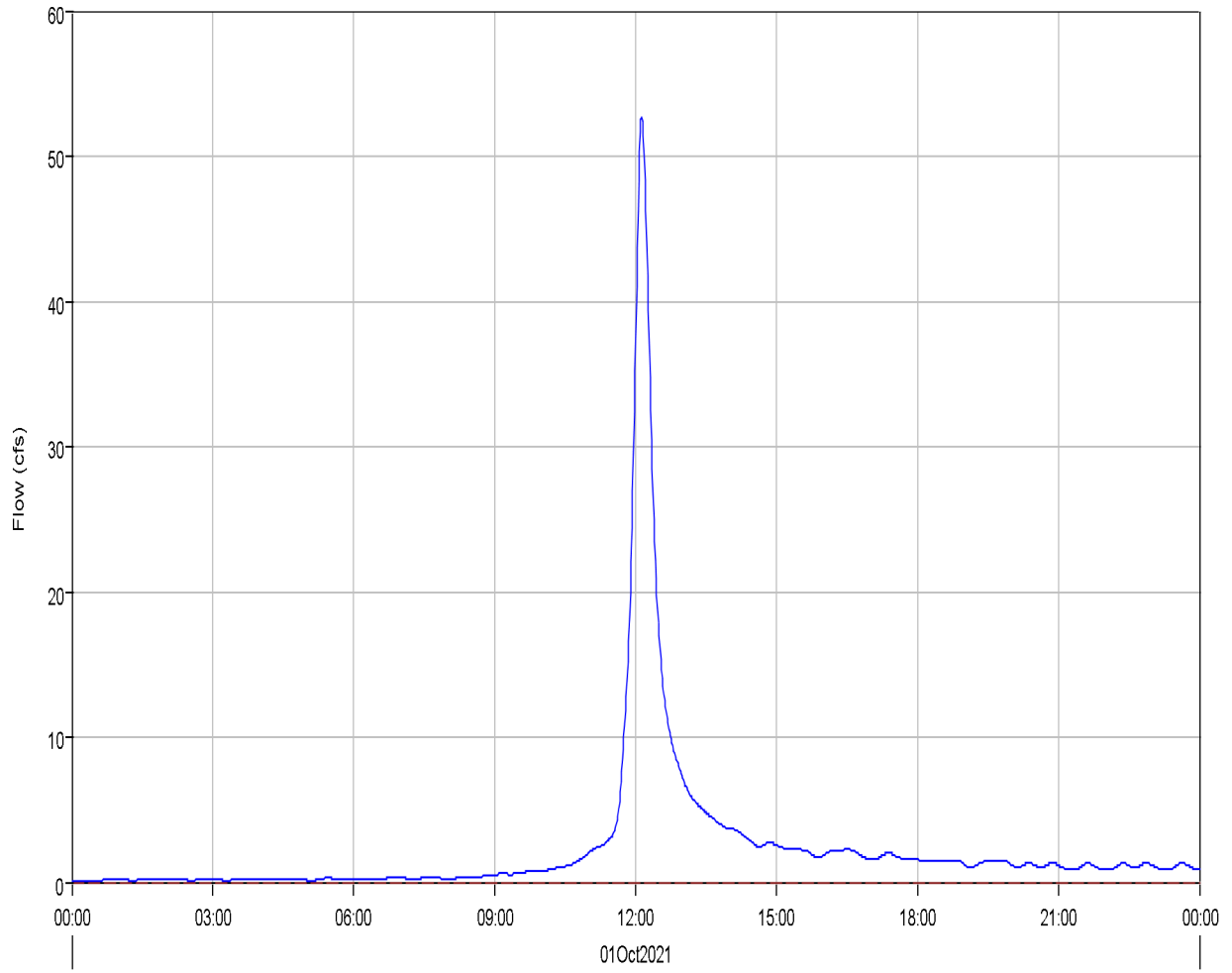
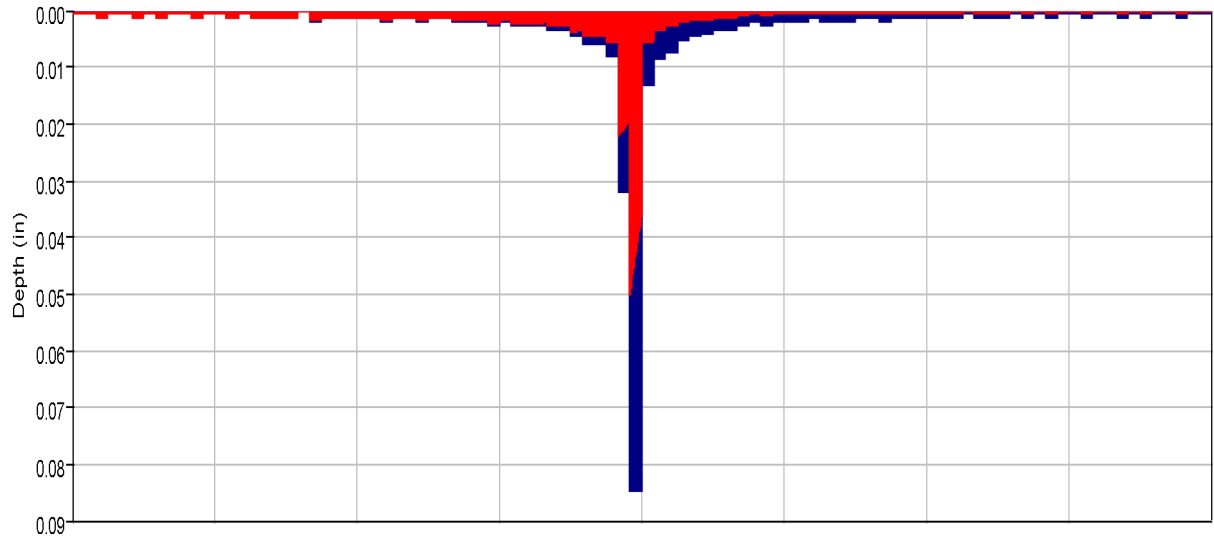
---

#### Computed Results

Peak Discharge :	18.8 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:08
Total Precipitation :	4.0 (AC-FT)	Total Direct Runoff :	1.7 (AC-FT)
Total Loss :	2.3 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	1.7 (AC-FT)	Discharge :	1.7 (AC-FT)

---

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



Run:EV 100-yr Ex. Type II Element:OB2 Result:Precipitation  
Run:EV 100-yr Ex. Type II Element:OB2 Result:Outflow

Run:EV 100-yr Ex. Type II Element:OB2 Result:Precipitation Loss  
Run:EV 100-yr Ex. Type II Element:OB2 Result:Baseflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Ex. Type II Subbasin: OB2  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type II  
Compute Time: 11Mar2022, 10:12:01 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

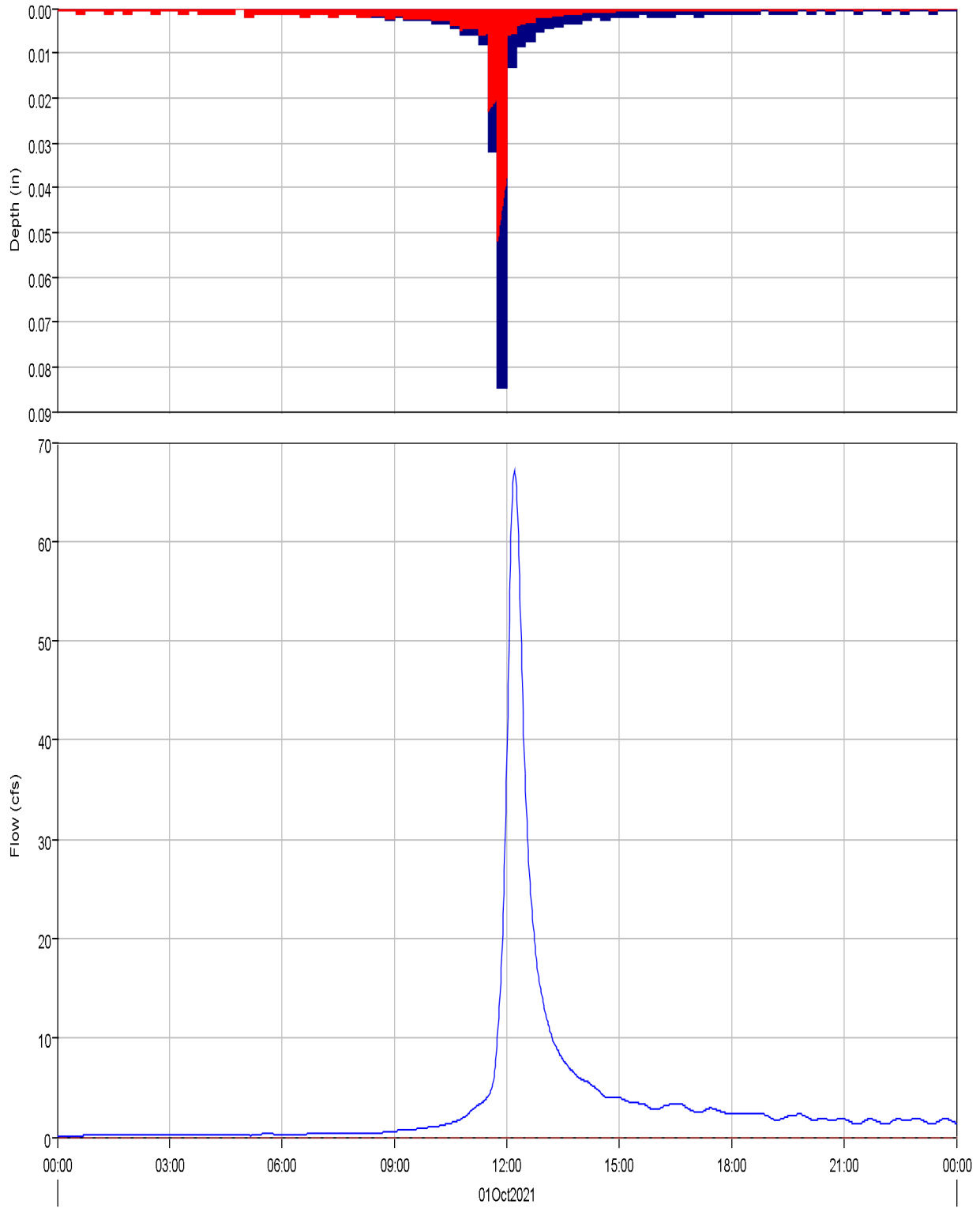
---

#### Computed Results

Peak Discharge :	52.7 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:08
Total Precipitation :	10.8 (AC-FT)	Total Direct Runoff :	4.7 (AC-FT)
Total Loss :	6.0 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	4.7 (AC-FT)	Discharge :	4.7 (AC-FT)

---

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



Run:EV 100-yr Ex. Type II Element:OB3 Result:Precipitation  
Run:EV 100-yr Ex. Type II Element:OB3 Result:Outflow

Run:EV 100-yr Ex. Type II Element:OB3 Result:Precipitation Loss  
Run:EV 100-yr Ex. Type II Element:OB3 Result:Baseflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Ex. Type II Subbasin: OB3  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type II  
Compute Time: 11Mar2022, 10:12:01 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

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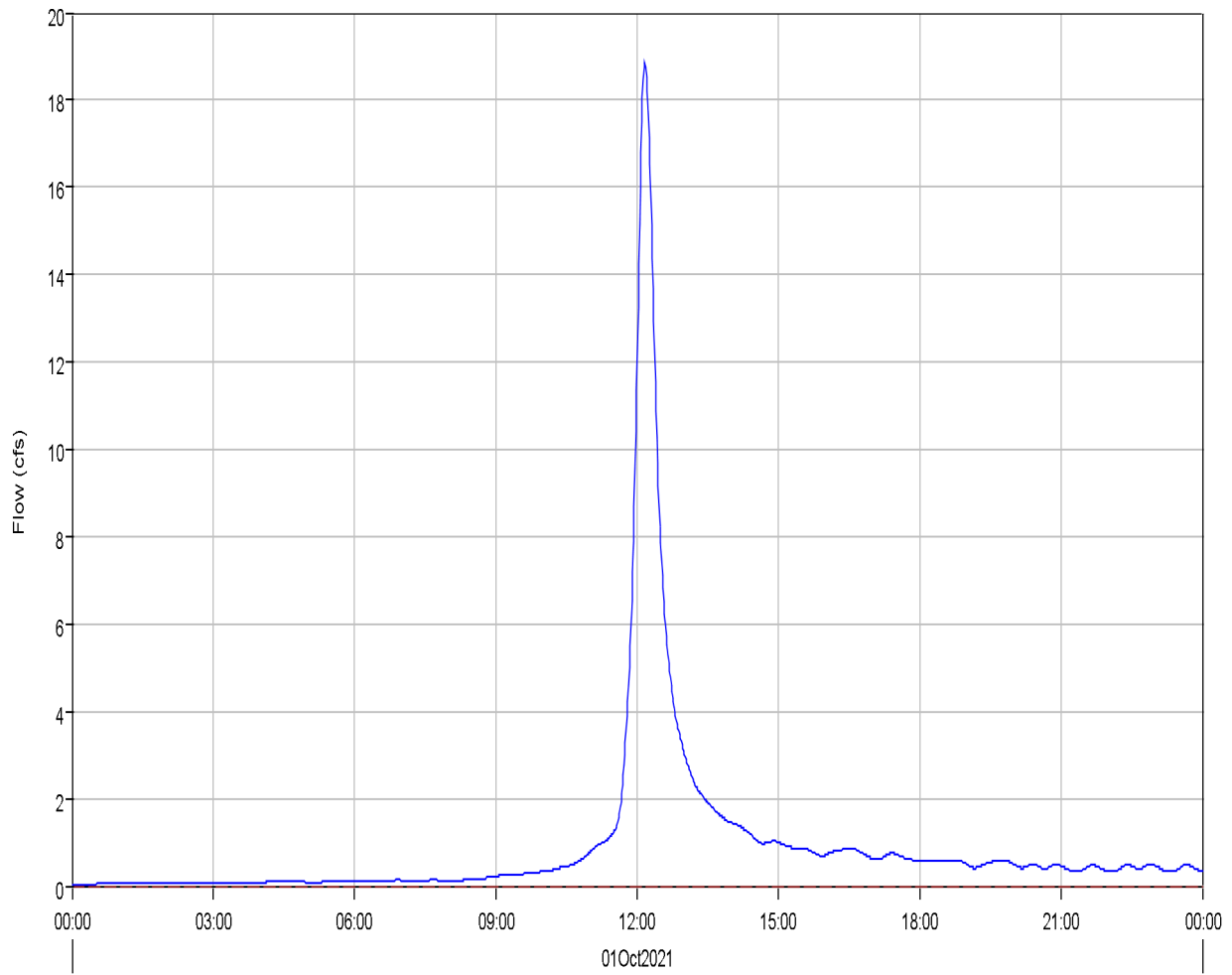
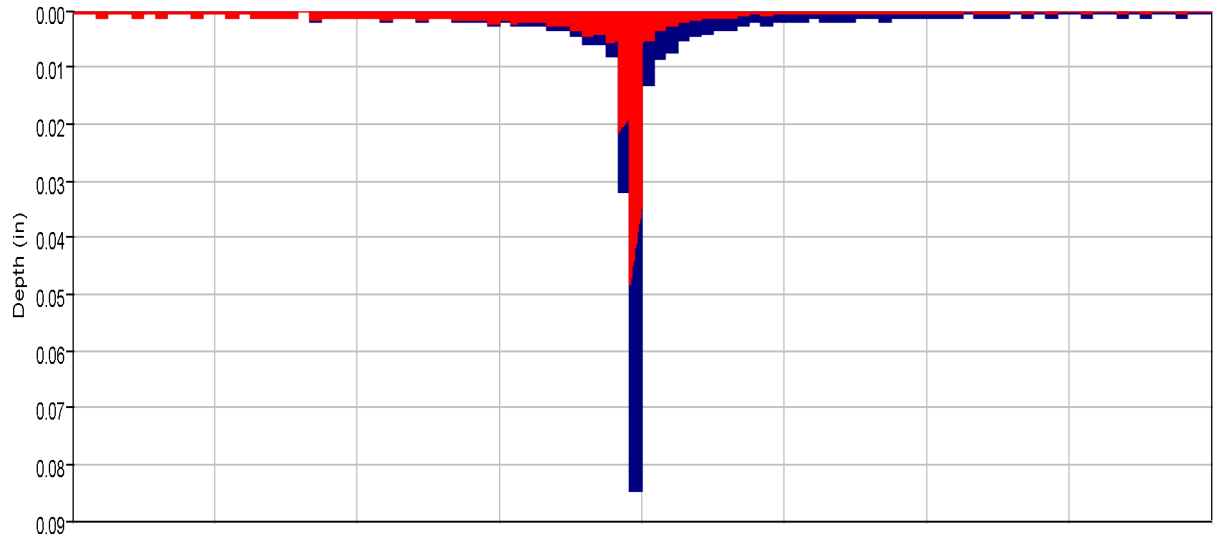
Computed Results

Peak Discharge :	67.1 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:12
Total Precipitation :	16.7 (AC-FT)	Total Direct Runoff :	6.9 (AC-FT)
Total Loss :	9.7 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	7.0 (AC-FT)	Discharge :	6.9 (AC-FT)

---



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



Run:EV 100-yr Ex. Type II Element:OB4 Result:Precipitation

Run:EV 100-yr Ex. Type II Element:OB4 Result:Precipitation Loss

Run:EV 100-yr Ex. Type II Element:OB4 Result:Outflow

Run:EV 100-yr Ex. Type II Element:OB4 Result:Baseflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Ex. Type II Subbasin: OB4  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type II  
Compute Time: 11Mar2022, 10:12:01 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

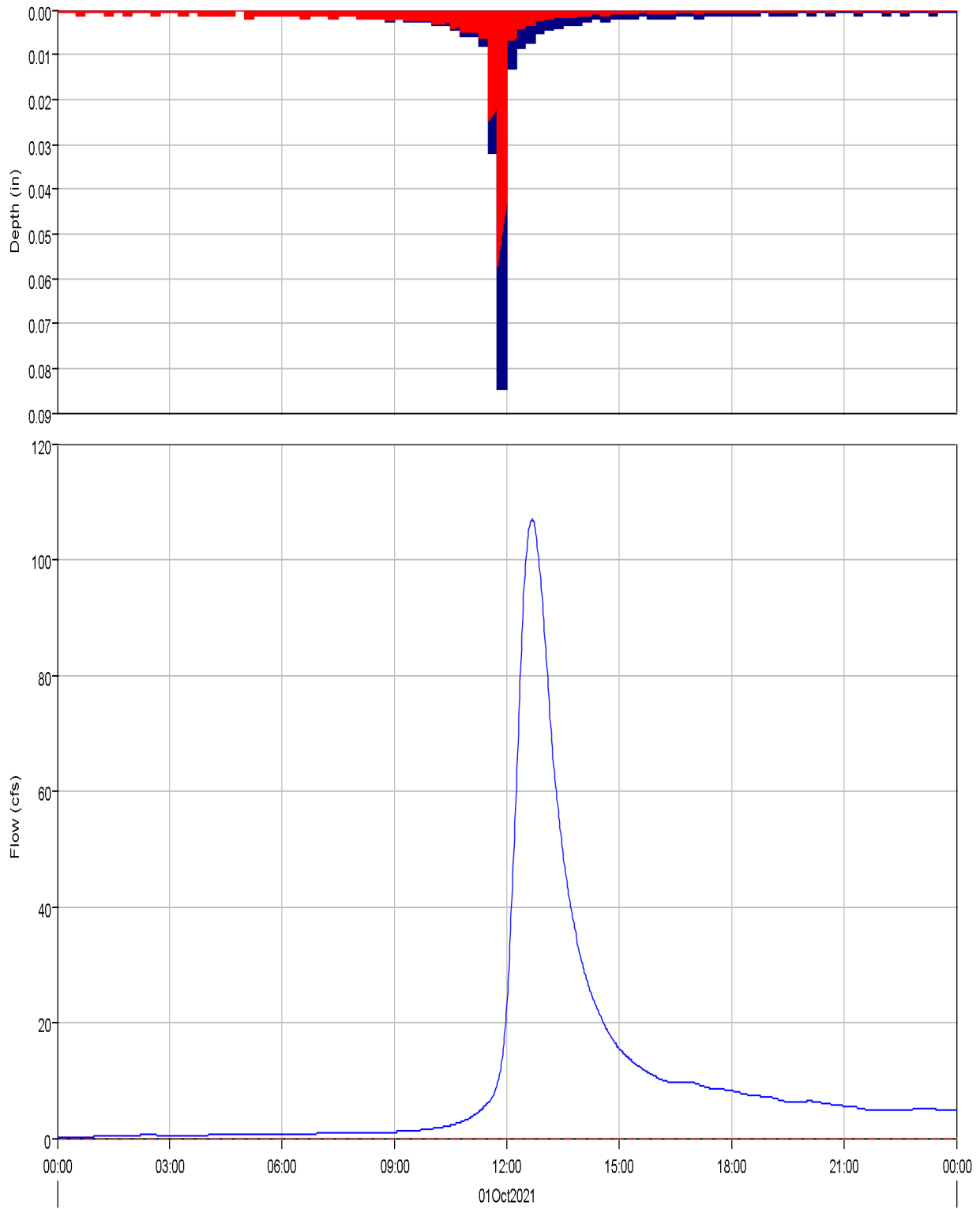
---

Computed Results

Peak Discharge :	18.9 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:10
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 II"



Run:EV 100-yr Ex. Type II Element:OB5 Result:Precipitation

Run:EV 100-yr Ex. Type II Element:OB5 Result:Precipitation Loss

Run:EV 100-yr Ex. Type II Element:OB5 Result:Outflow

Run:EV 100-yr Ex. Type II Element:OB5 Result:Baseflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Ex. Type II Subbasin: OB5

Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type II  
Compute Time: 11Mar2022, 10:12:01 Control Specifications: 24-hr Storm

Volume Units: AC-FT

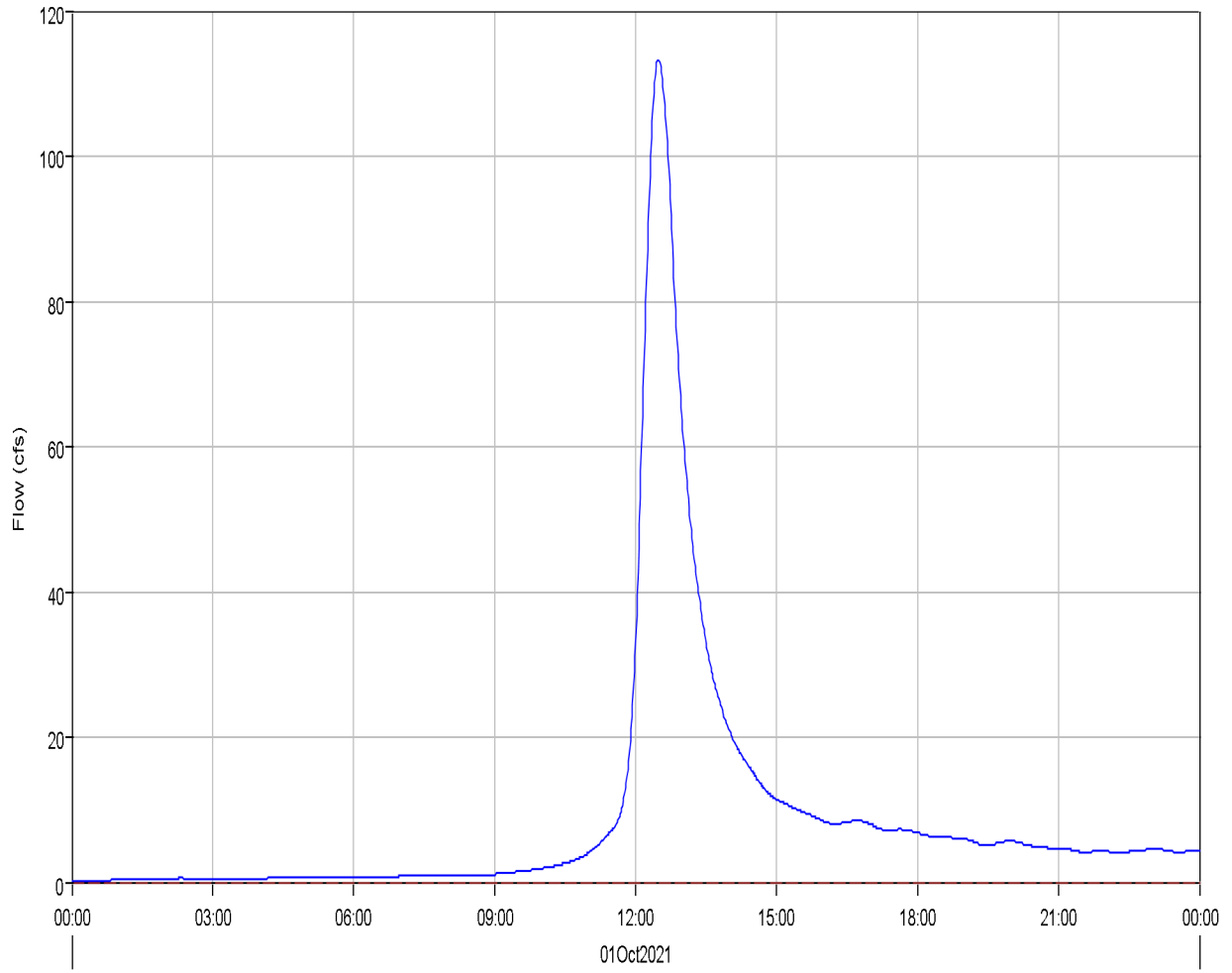
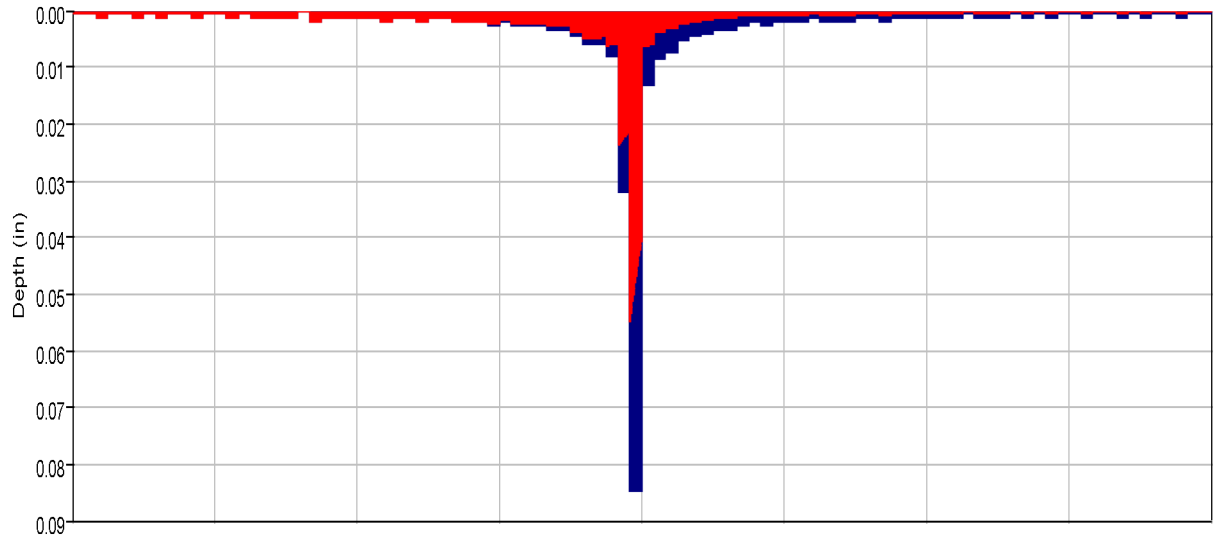
---

#### Computed Results

Peak Discharge :	106.9 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:40
Total Precipitation :	55.1 (AC-FT)	Total Direct Runoff :	19.7 (AC-FT)
Total Loss :	35.0 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	20.1 (AC-FT)	Discharge :	19.7 (AC-FT)

---

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



Run:EV 100-yr Ex. Type II Element:OB6 Result:Precipitation  
Run:EV 100-yr Ex. Type II Element:OB6 Result:Outflow

Run:EV 100-yr Ex. Type II Element:OB6 Result:Precipitation Loss  
Run:EV 100-yr Ex. Type II Element:OB6 Result:Baseflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Ex. Type II Subbasin: OB6

Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type II  
Compute Time: 11Mar2022, 10:12:01 Control Specifications: 24-hr Storm

Volume Units: AC-FT

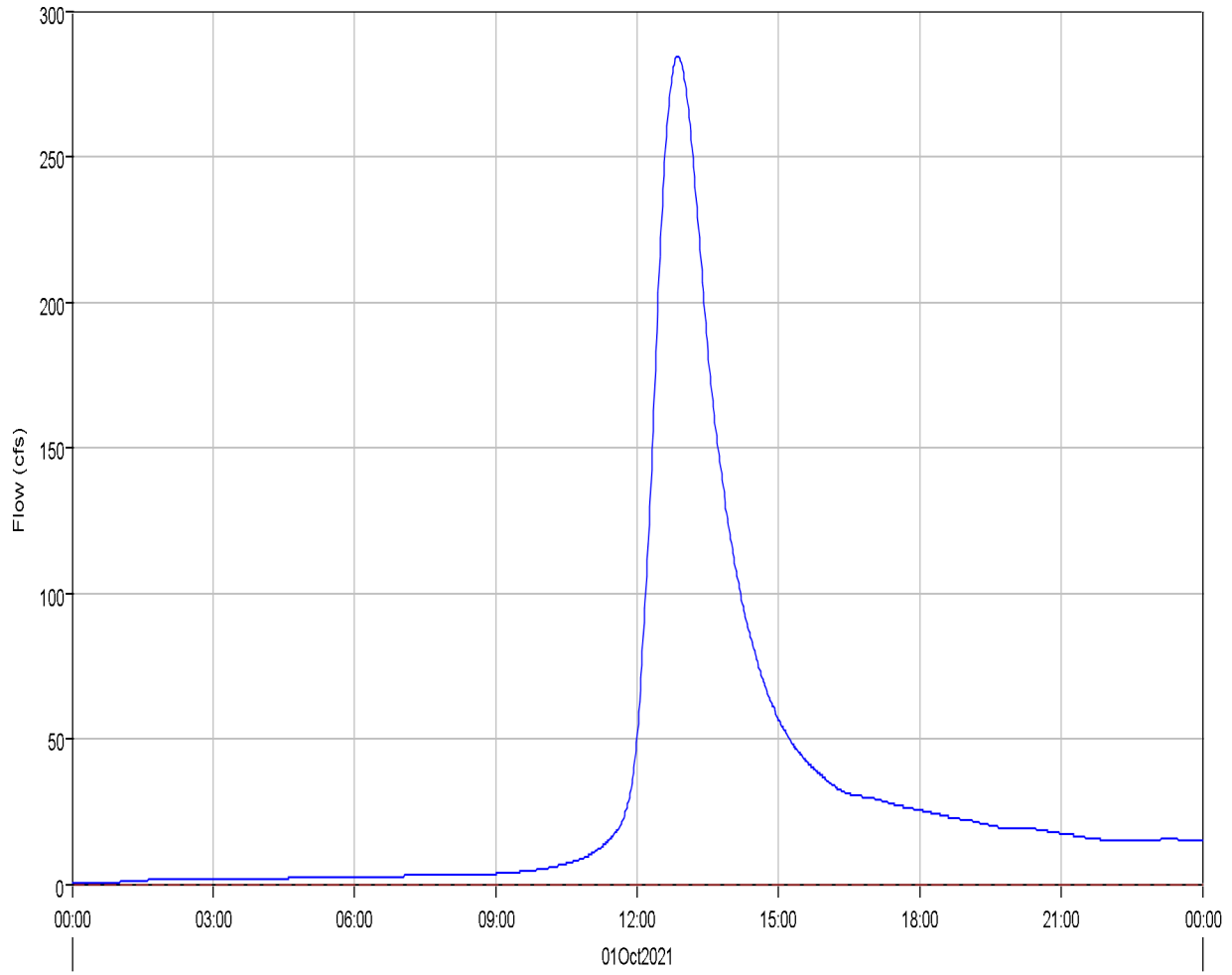
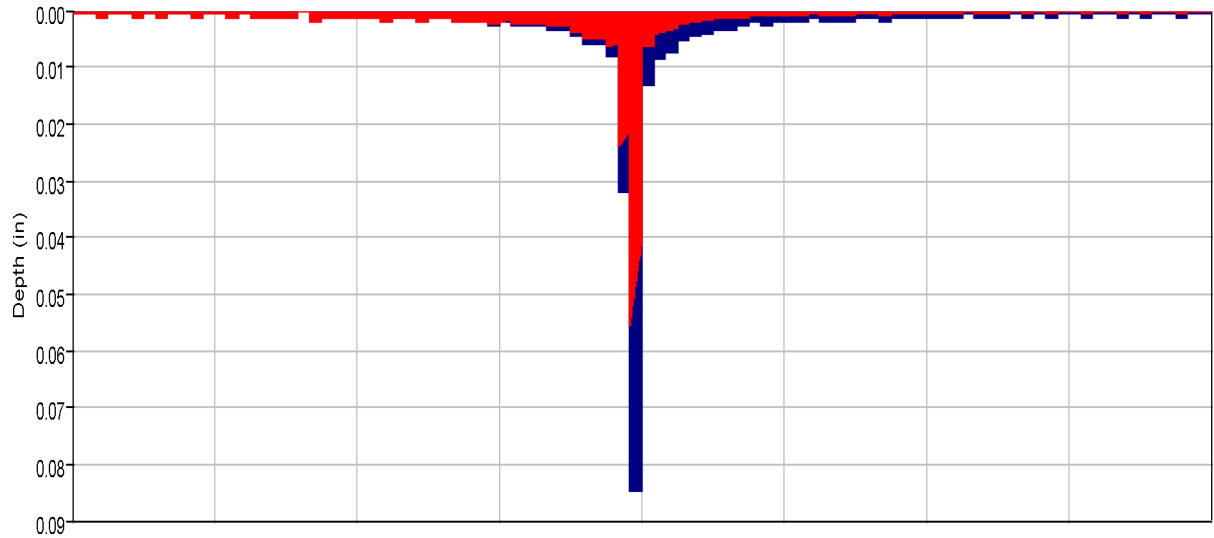
---

#### Computed Results

Peak Discharge :	113.2 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:29
Total Precipitation :	45.4 (AC-FT)	Total Direct Runoff :	17.5 (AC-FT)
Total Loss :	27.6 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	17.8 (AC-FT)	Discharge :	17.5 (AC-FT)

---

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



Run:EV 100-yr Ex. Type II Element:OB7 Result:Precipitation  
Run:EV 100-yr Ex. Type II Element:OB7 Result:Outflow

Run:EV 100-yr Ex. Type II Element:OB7 Result:Precipitation Loss  
Run:EV 100-yr Ex. Type II Element:OB7 Result:Baseflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Ex. Type II Subbasin: OB7

Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type II  
Compute Time: 11Mar2022, 10:12:01 Control Specifications: 24-hr Storm

Volume Units: AC-FT

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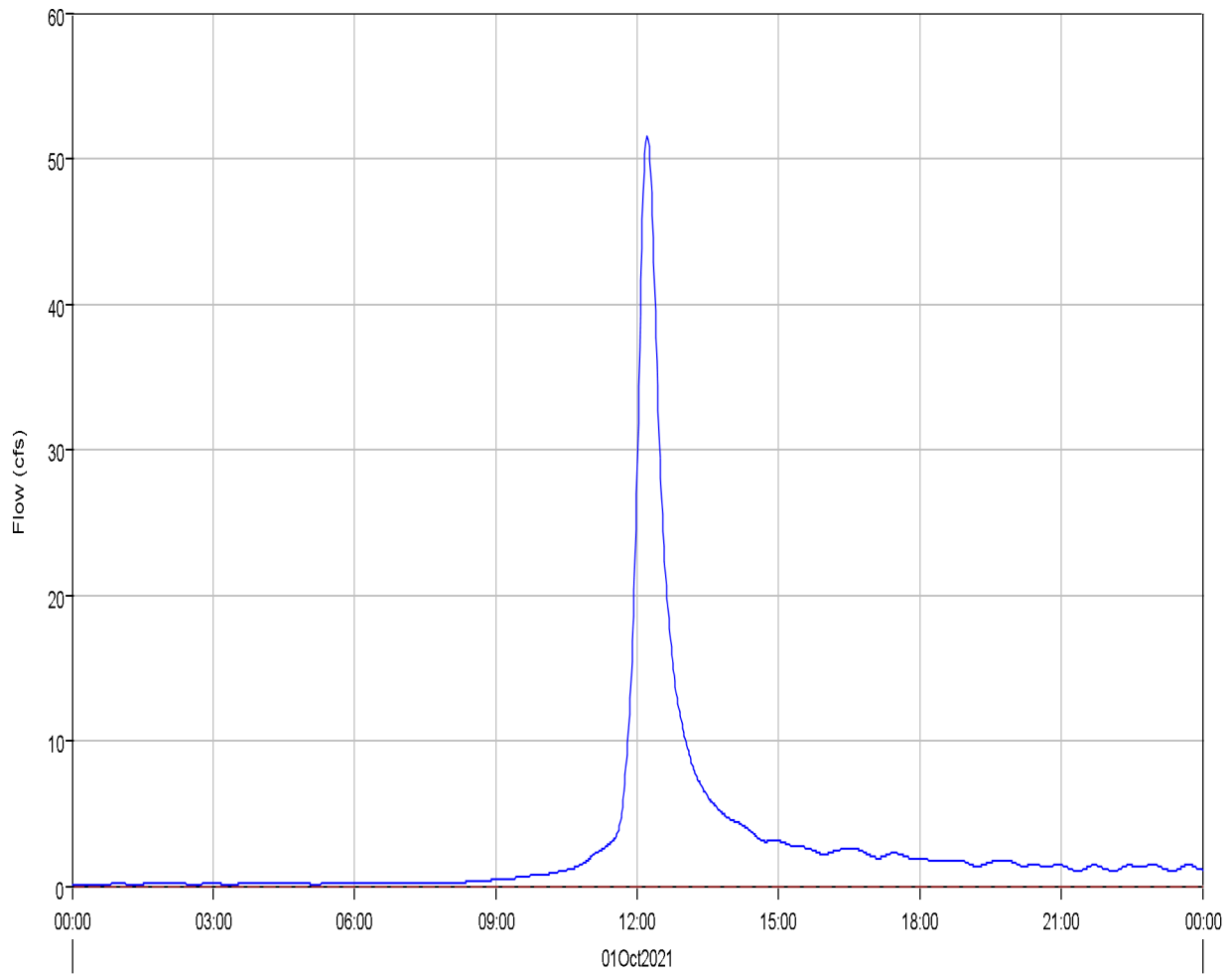
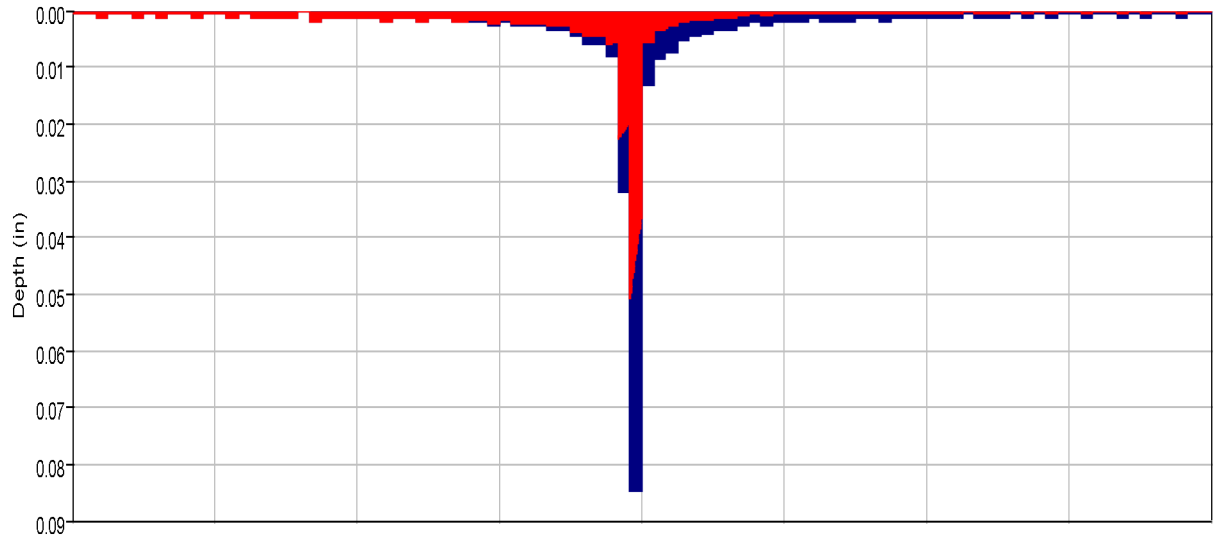
#### Computed Results

Peak Discharge :	284.2 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:52
Total Precipitation :	161.5 (AC-FT)	Total Direct Runoff :	60.6 (AC-FT)
Total Loss :	99.5 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	62.0 (AC-FT)	Discharge :	60.6 (AC-FT)

---



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



Run:EV 100-yr Ex. Type II Element:OB8 Result:Precipitation  
Run:EV 100-yr Ex. Type II Element:OB8 Result:Outflow

Run:EV 100-yr Ex. Type II Element:OB8 Result:Precipitation Loss  
Run:EV 100-yr Ex. Type II Element:OB8 Result:Baseflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Ex. Type II Subbasin: OB8  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type II  
Compute Time: 11Mar2022, 10:12:01 Control Specifications: 24-hr Storm  
Volume Units: AC-FT

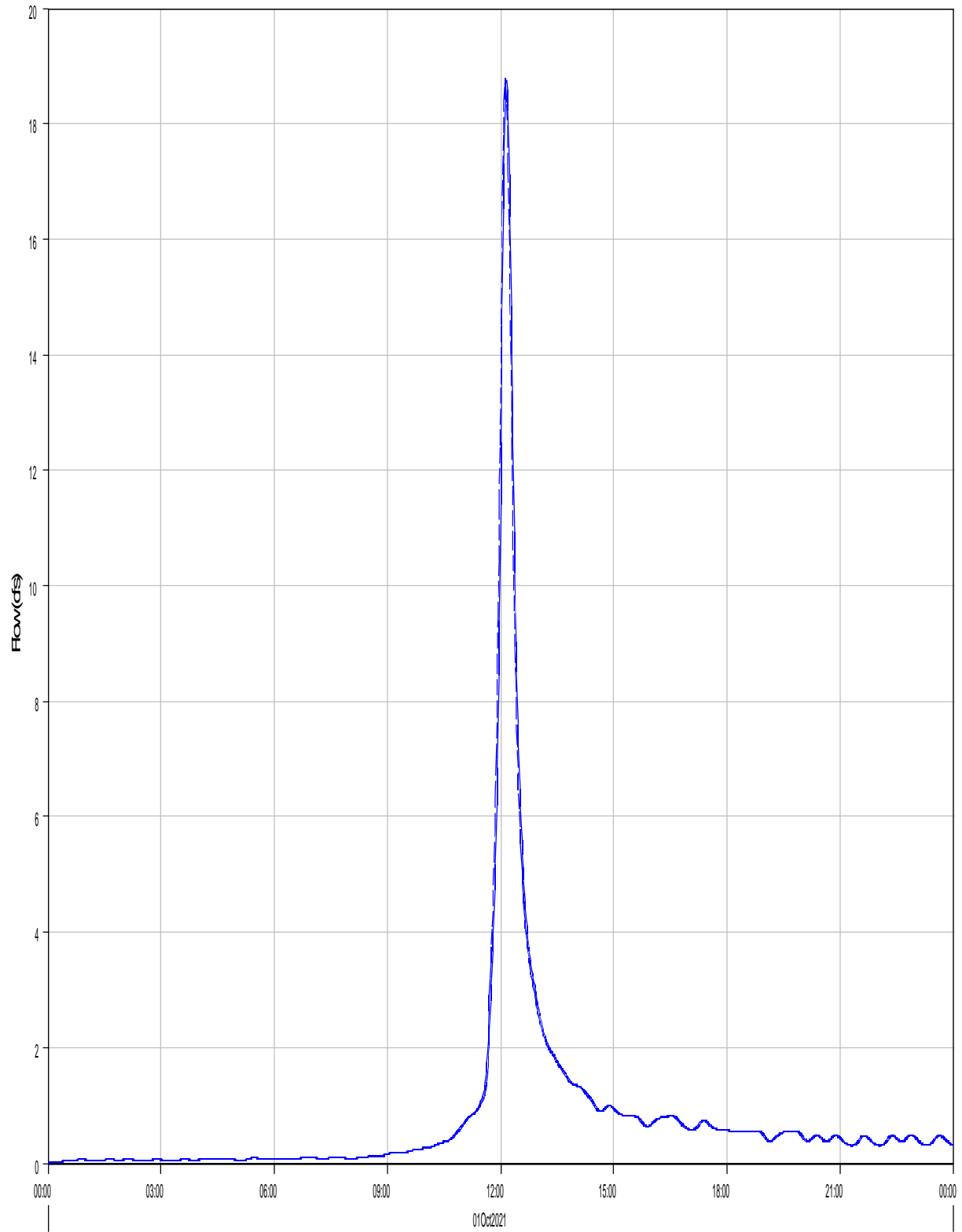
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Computed Results

Peak Discharge :	51.6 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:13
Total Precipitation :	12.7 (AC-FT)	Total Direct Runoff :	5.4 (AC-FT)
Total Loss :	7.3 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	5.4 (AC-FT)	Discharge :	5.4 (AC-FT)

---

Reach 'R-B1' Results for Run 'EV 100-yr Ex. Type II'



Run:EV 100-yr Ex. Type II Element:R-B1 Result:Outflow

Run:EV 100-yr Ex. Type II Element:R-B1 Result:Combined Inflow

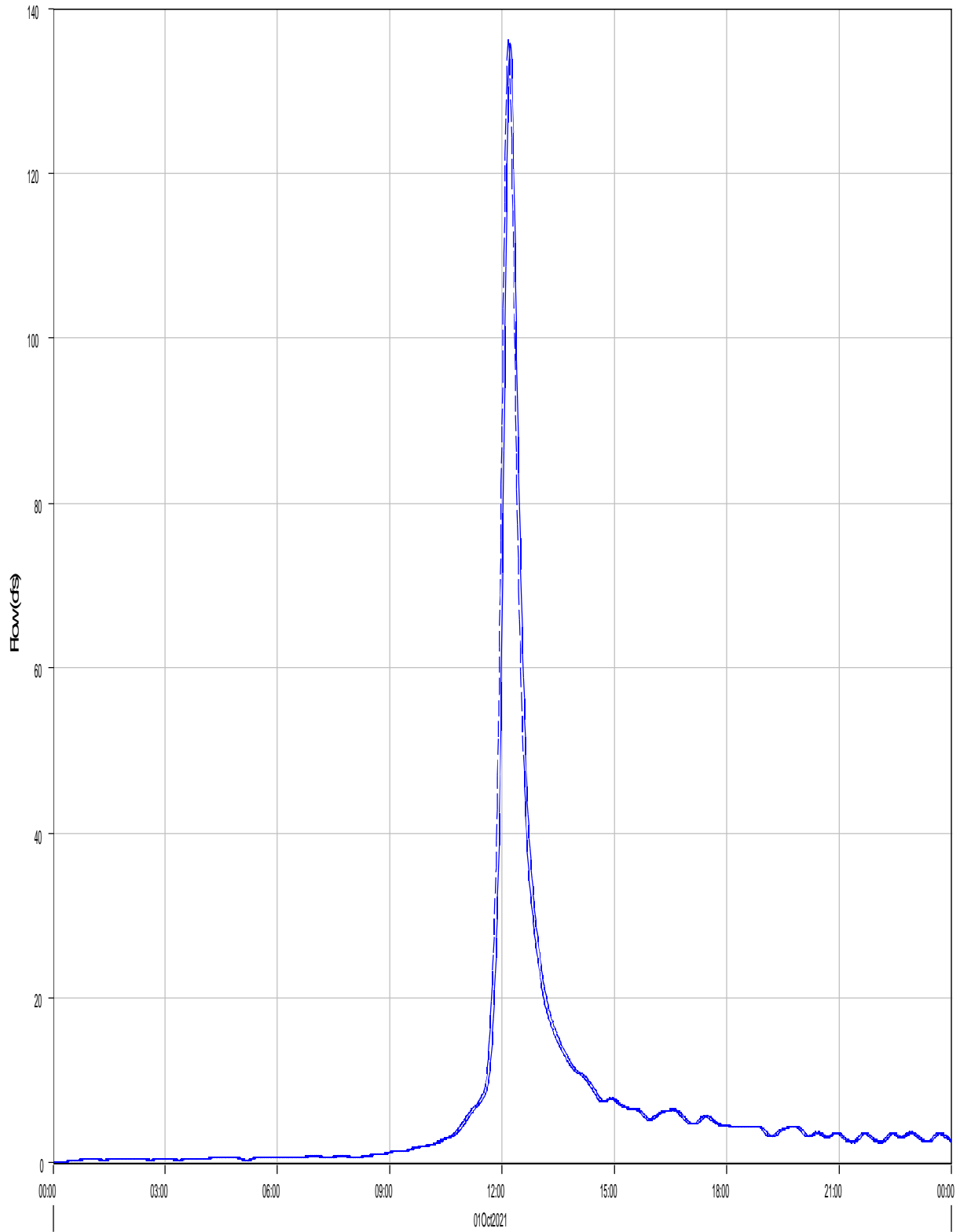
Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Ex. Type II Reach: R-B1  
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type II  
Compute Time: 11Mar2022, 10:12:01 Control Specifications: 24-hr Storm

Volume Units: AC-FT

#### Computed Results

Peak Inflow :	18.8 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 12:08
Peak Outflow :	18.7 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 12:10
Total Inflow :	1.7 (AC-FT)	Total Outflow :	1.7 (AC-FT)

Reach 'R-OB4' Results for Run 'EV 100-yr Ex. Type II'



— Run:EV 100-yr Ex. Type II Element:R-OB4 Result:Outflow

- - - Run:EV 100-yr Ex. Type II Element:R-OB4 Result:Combined Inflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Ex. Type II Reach: R-OB4

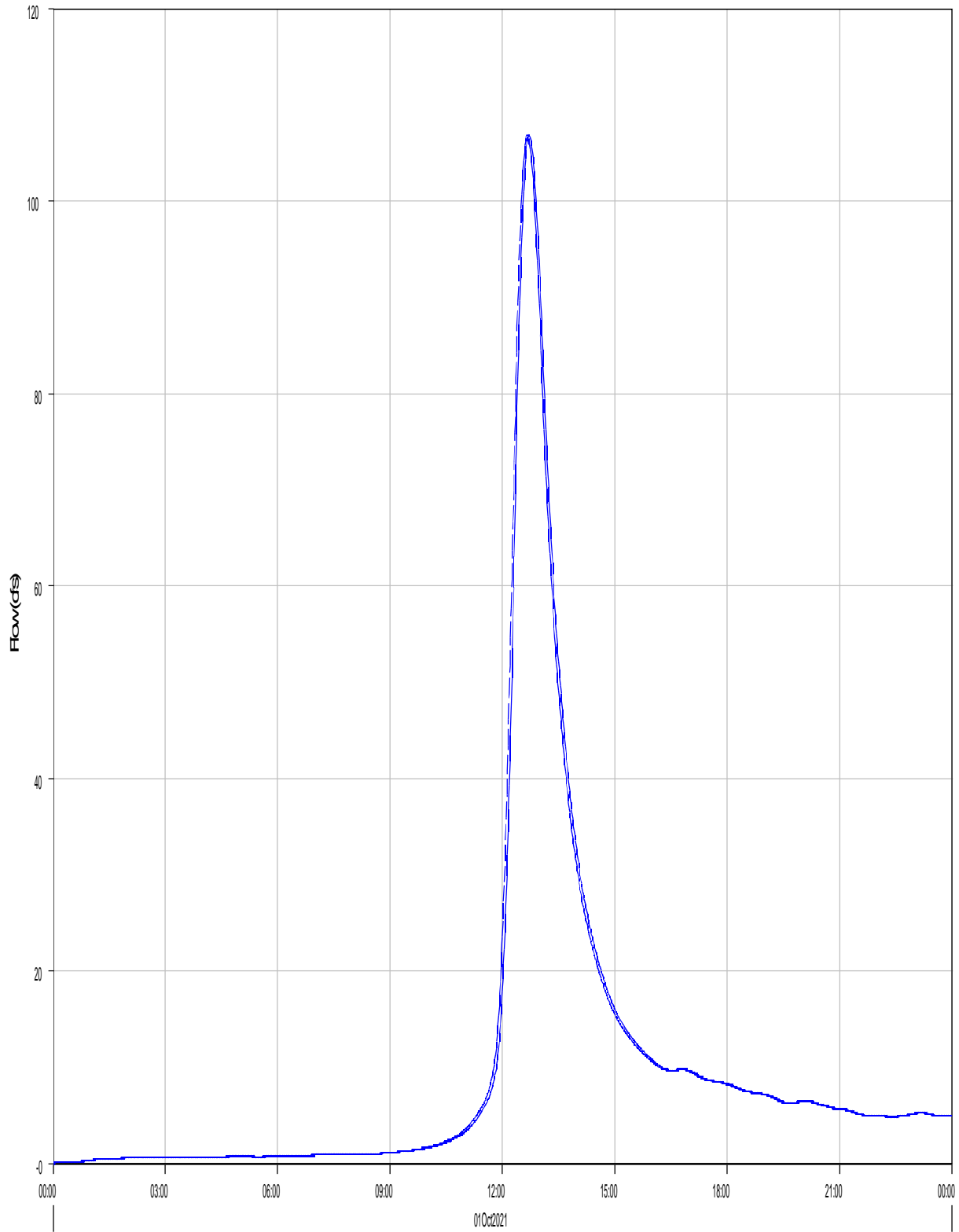
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type II  
Compute Time: 11Mar2022, 10:12:01 Control Specifications: 24-hr Storm

Volume Units: AC-FT

#### Computed Results

Peak Inflow :	136.1 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 12:10
Peak Outflow :	135.8 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 12:13
Total Inflow :	13.5 (AC-FT)	Total Outflow :	13.4 (AC-FT)

Reach 'R-CBS' Results for Run 'EV 100-yr Ex. Type II'



Run:EV 100-yr Ex. Type II Element:R-CBS Result:Outflow

Run:EV 100-yr Ex. Type II Element:R-CBS Result:Combined Inflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Ex. Type II Reach: R-OB5

Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type II  
Compute Time: 11Mar2022, 10:12:01 Control Specifications: 24-hr Storm

Volume Units: AC-FT

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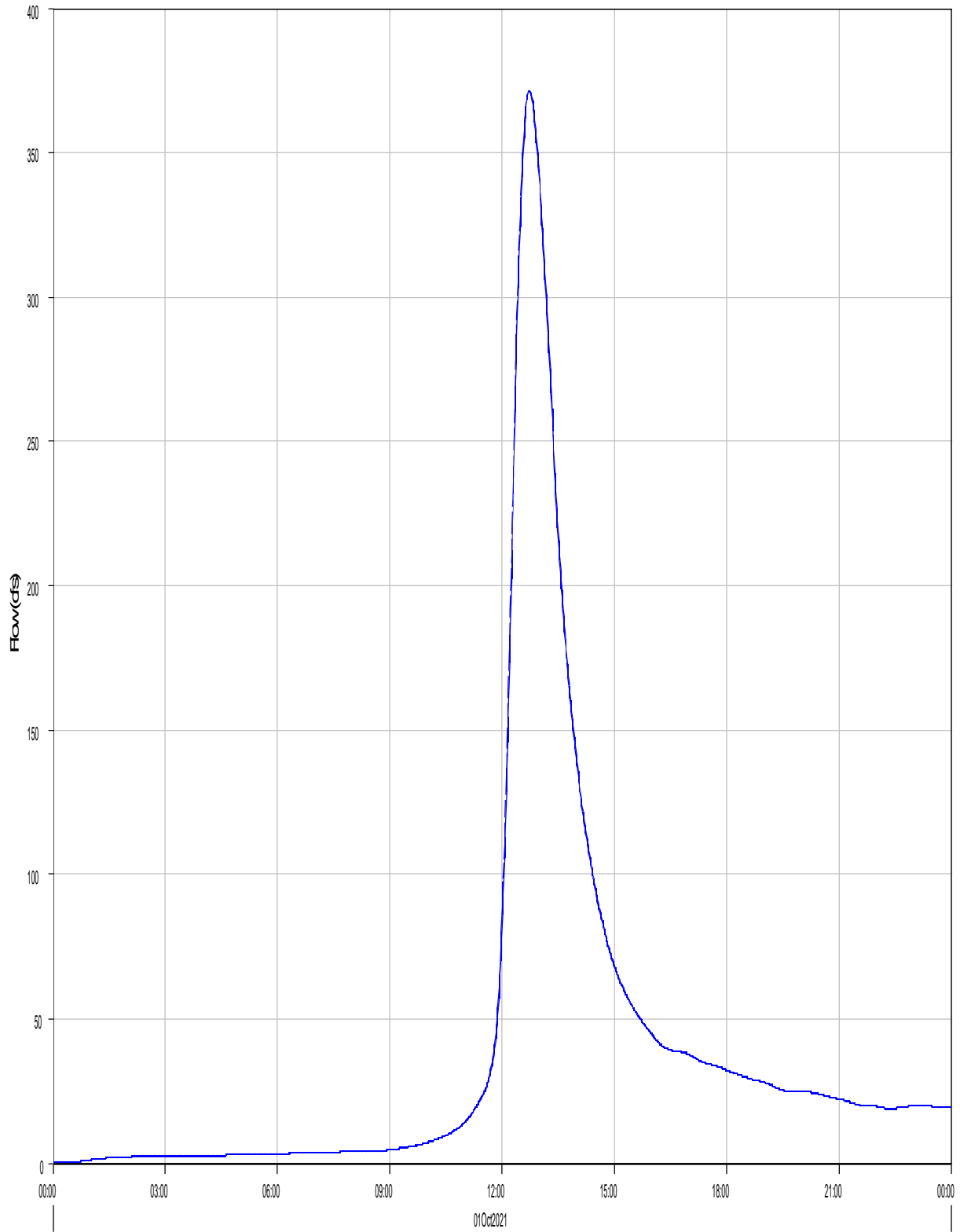
#### Computed Results

Peak Inflow :	106.9 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 12:40
Peak Outflow :	106.8 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 12:43
Total Inflow :	19.7 (AC-FT)	Total Outflow :	19.7 (AC-FT)

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Reach 'R-OB6' Results for Run 'EV 100-yr Ex. Type II'



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

Run:EV 100-yr Ex. Type II Element:R-OB6 Result:Combined Inflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Ex. Type II Reach: R-OB6

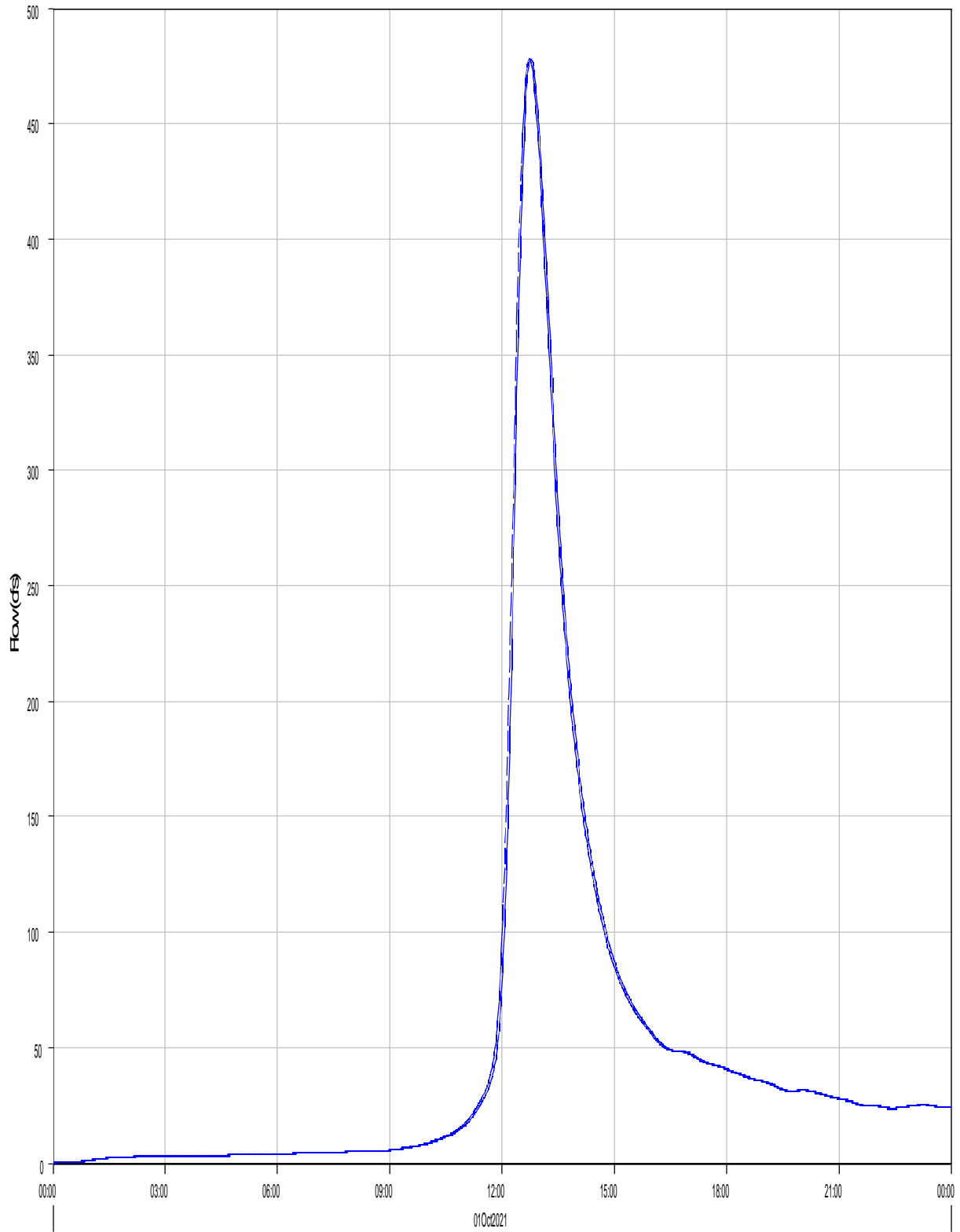
Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type II  
Compute Time: 11Mar2022, 10:12:01 Control Specifications: 24-hr Storm

Volume Units: AC-FT

#### Computed Results

Peak Inflow :	371.3 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 12:43
Peak Outflow :	371.3 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 12:44
Total Inflow :	78.1 (AC-FT)	Total Outflow :	78.1 (AC-FT)

Reach 'R-OB7' Results for Run 'EV 100-yr Ex. Type II'



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

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

Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Ex. Type II Reach: R-OB7

Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Existing  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type II  
Compute Time: 11Mar2022, 10:12:01 Control Specifications: 24-hr Storm

Volume Units: AC-FT

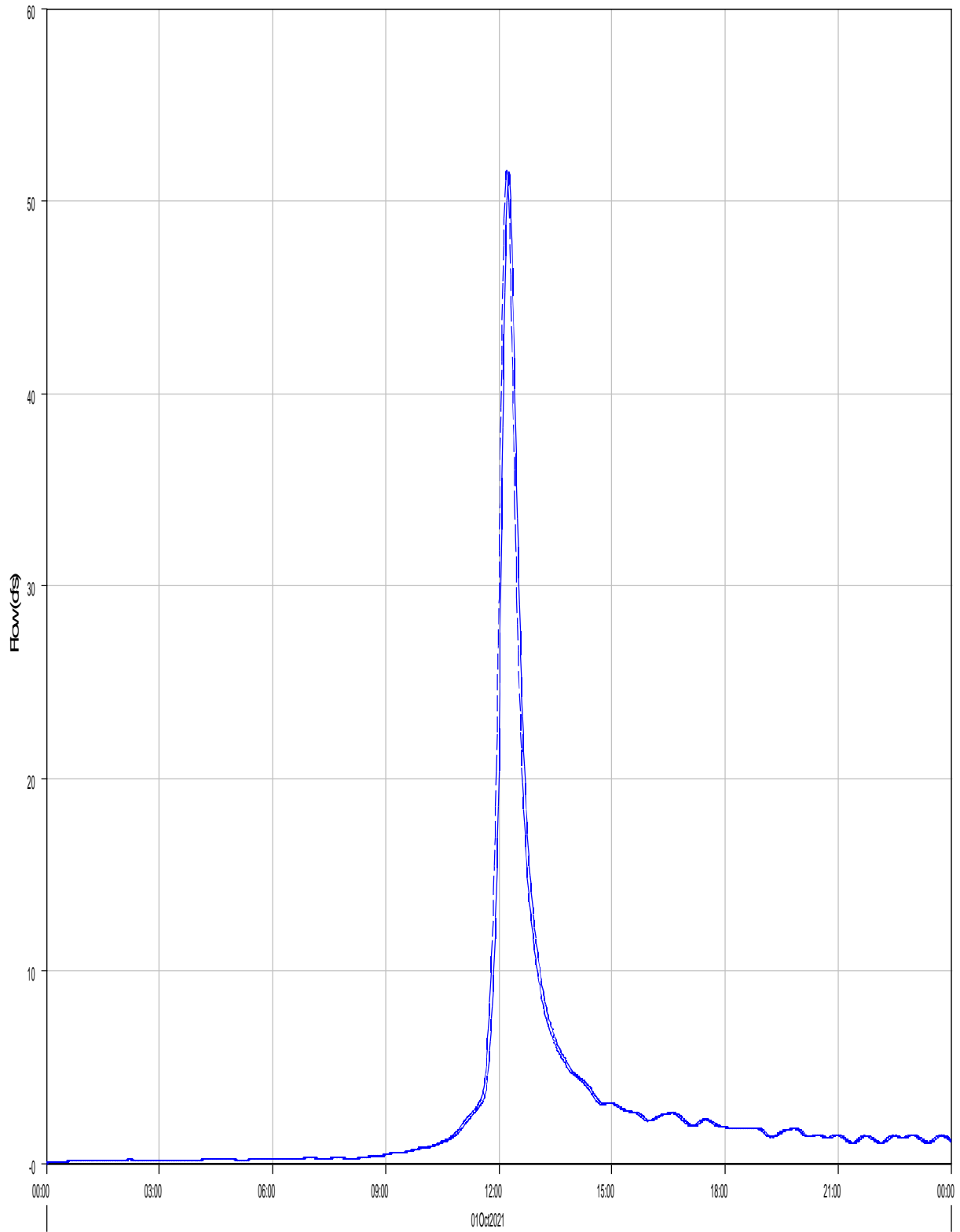
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#### Computed Results

Peak Inflow :	478.0 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 12:44
Peak Outflow :	477.9 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 12:46
Total Inflow :	97.8 (AC-FT)	Total Outflow :	97.7 (AC-FT)

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Reach 'R-CB8' Results for Run 'EV 100-yr Ex. Type II'



Run:EV 100-yr Ex. Type II Element:R-CB8 Result:Outflow

Run:EV 100-yr Ex. Type II Element:R-CB8 Result:Combined Inflow

Project: Eagleview\_Subdivision  
Simulation Run: EV 100-yr Ex. Type II Reach: R-OB8

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Existing
End of Run:	02Oct2021, 00:00	Meteorologic Model:	100-yr Type II
Compute Time:	11Mar2022, 10:12:01	Control Specifications:	24-hr Storm

Volume Units: AC-FT

#### Computed Results

Peak Inflow :	51.6 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 12:13
Peak Outflow :	51.5 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 12:16
Total Inflow :	5.4 (AC-FT)	Total Outflow :	5.4 (AC-FT)

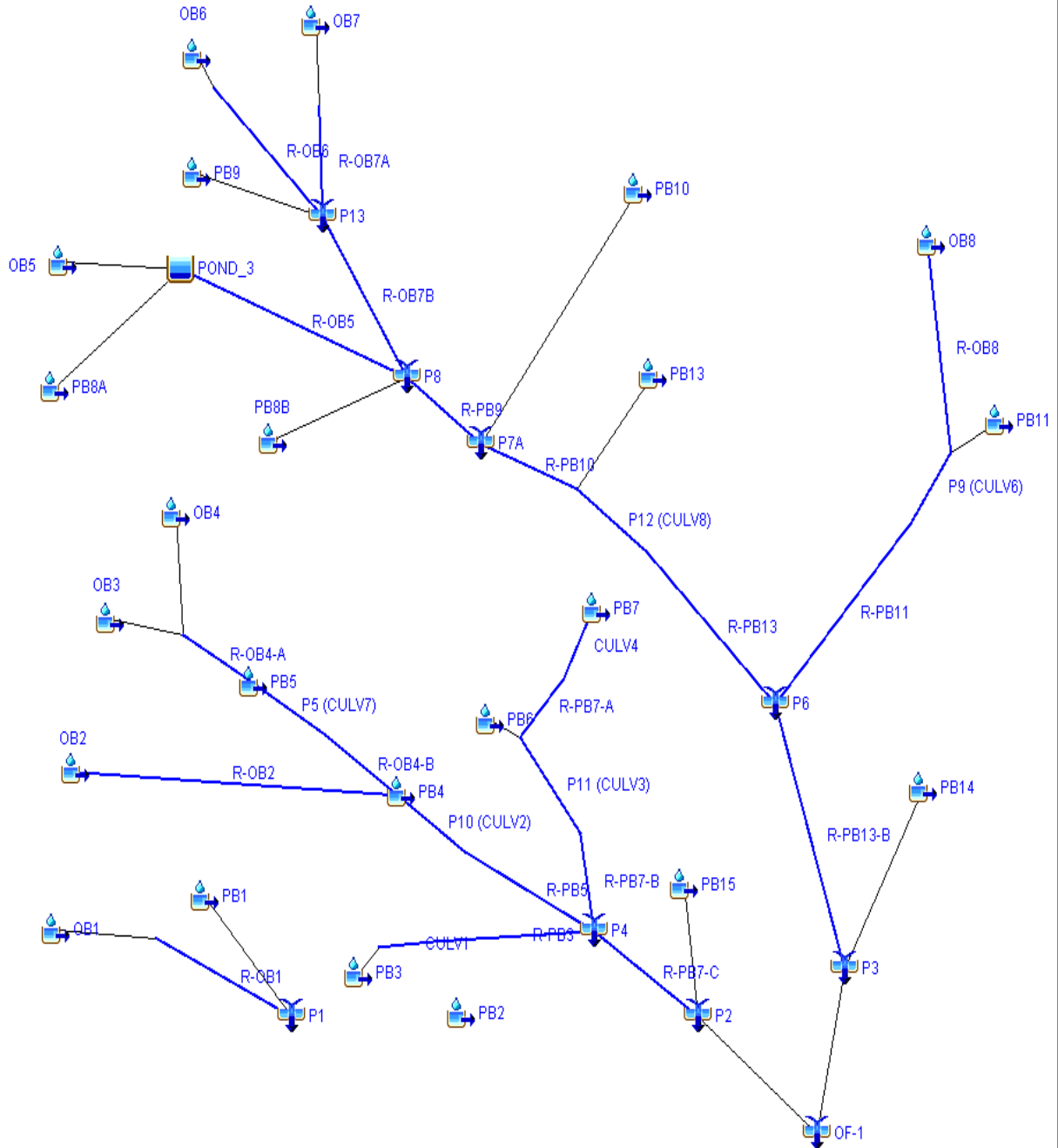


HEC-HMS

# Project : Eagleview\_Subdivision

Basin Model : Eagleview\_Proposed

Apr 16 11:49:13 MDT 2024







Post Runoff Analysis  
Time of Concentration

Project Information

Project Name: Eagleview  
 KHA Project #: 19628800  
 Designed by: DCM Date: 4/16/2024  
 Revised by: \_\_\_\_\_ Date: \_\_\_\_\_  
 Checked by: BAH Date: 4/16/2024

Minimum Time of Concentration 5.0 minutes  
 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)	Lag Time (min)
SHEET	T1 SHEET FLOW	300.00	0.073	0.15	2.10						17.35	
SHALLOW CONCENTRATED	T2 SHALLOW CONCENTRATED FLOW	1116.00	0.038			U				3.14	5.93	
Post-Development Time of Concentration, OB1											23.28	13.97

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 (ft <sup>2</sup> )	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)	Lag Time (min)
SHEET	T1 SHEET FLOW	300.00	0.063	0.15	2.10						18.41	
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	9.50	6.60	1.44	6.45	2.17	
Post-Development Time of Concentration, OB2											23.26	13.95

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)	Lag Time (min)
SHEET	T1 SHEET FLOW	300.00	0.074	0.15	2.10						17.26	
SHALLOW CONCENTRATED	T2 SHALLOW CONCENTRATED FLOW	2436.00	0.034			U				2.97	13.65	
Post-Development Time of Concentration, OB3											30.91	18.55

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 (ft <sup>2</sup> )	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)	Lag Time (min)
SHEET	T1 SHEET FLOW	300.00	0.043	0.15	2.10						21.65	
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											27.29	16.38

Post-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	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)	Lag Time (min)
SHEET	T1 SHEET FLOW	300.00	0.037	0.40	2.10						49.91	
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	9.50	6.60	1.44	7.36	3.19	
Post-Development Time of Concentration, OB5											74.93	44.96

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)	Lag Time (min)
SHEET	T1 SHEET FLOW	300.00	0.064	0.40	2.10						40.09	
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	9.50	6.60	1.44	7.73	4.56	
Post-Development Time of Concentration, OB6											58.25	34.95

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)	Lag Time (min)
SHEET	T1 SHEET FLOW	300.00	0.028	0.40	2.10						55.80	
SHALLOW CONCENTRATED	T2 SHALLOW CONCENTRATED FLOW	2068.00	0.036			U				3.06	11.28	
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											92.35	55.41

Post-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	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)	Lag Time (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	9.50	6.60	1.44	11.43	1.11	
Post-Development Time of Concentration, OB8											31.78	19.07

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)	Lag Time (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	15.53

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)	Lag Time (min)
SHEET	T1 SHEET FLOW	227.00	0.033	0.15	2.10						19.07	
Post-Development Time of Concentration, PB2											19.07	11.44

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)	Lag Time (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	13.47

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 (ft <sup>2</sup> )	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)	Lag Time (min)
MINIMUM TC	T2 MINIMUM TC FLOW										5.00	
Post-Development Time of Concentration, PB4											5.00	3.00

Post Runoff Analysis  
Time of Concentration

Project Information

Project Name: Eagleview  
 KHA Project #: 19628800  
 Designed by: DCM Date: 4/16/2024  
 Revised by: \_\_\_\_\_ Date: \_\_\_\_\_  
 Checked by: BAH Date: 4/16/2024

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

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 (ft <sup>2</sup> )	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)	Lag Time (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	18.35

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 (ft <sup>2</sup> )	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)	Lag Time (min)
SHEET	T1 SHEET FLOW	300.00	0.034	0.15	2.10						23.56	
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		12.40	0.73	1.27	0.87	
Post-Development Time of Concentration, PB6											27.96	16.78

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 (ft <sup>2</sup> )	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)	Lag Time (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	14.23

Post-Development												
Drainage Area: PB8A												
		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)	Lag Time (min)
SHEET	T1 SHEET FLOW	100.00	0.090	0.15	2.10						6.63	
SHALLOW CONCENTRATED	T2 SHALLOW CONCENTRATED FLOW	100.00	0.030			U				2.79	0.60	
CHANNEL	T2 CHANNEL FLOW	572.00	0.090	0.03		U	14.00	34.00	0.41	8.24	1.16	
Post-Development Time of Concentration, PB8A											8.38	5.03

Post-Development												
Drainage Area: PB8B												
		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)	Lag Time (min)
SHEET	T1 SHEET FLOW	30.00	0.040	0.15	2.10						3.50	
SHALLOW CONCENTRATED	T2 SHALLOW CONCENTRATED FLOW	250.00	0.080			U				4.56	0.91	
CHANNEL	T2 CHANNEL FLOW	780.00	0.029	0.03		U	14.00	34.00	0.41	4.68	2.78	
Post-Development Time of Concentration, PB8B											7.19	4.31

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 (ft <sup>2</sup> )	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)	Lag Time (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	13.56

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 (ft <sup>2</sup> )	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)	Lag Time (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	16.67

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 (ft <sup>2</sup> )	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)	Lag Time (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											28.53	15.92

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 (ft <sup>2</sup> )	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)	Lag Time (min)
CHANNEL	T2 CHANNEL FLOW	316.00	0.018	0.03		U	14.00	34.00	0.41	3.64	1.45	
MINIMUM TC	T2 MINIMUM TC FLOW										5.00	
Post-Development Time of Concentration, PB13											5.00	3.00

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 (ft <sup>2</sup> )	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)	Lag Time (min)
SHEET	T1 SHEET FLOW	40.00	0.085	0.013	2.10						0.46	
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											6.63	3.98

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 (ft <sup>2</sup> )	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)	Lag Time (min)
MINIMUM TC	T2 MINIMUM TC FLOW										5.00	
Post-Development Time of Concentration, PB15											5.00	3.00

Post Runoff Analysis  
Composite CN

Project Name: Eagleview  
 KHA Project #: 196288000  
 Designed by: DCM Date: 4/18/2024  
 Revised by: \_\_\_\_\_ Date: \_\_\_\_\_  
 Revised by: \_\_\_\_\_ Date: \_\_\_\_\_  
 Checked by: BAH Date: 4/16/2024

Post-Development					
Drainage Area: OB1					
COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)	INITIAL ABSTRACTION, IA
RESIDENTIAL	RR-5 (Rangeland Landuse)	B	62.00	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			63.76	10.37	0.569

Post-Development					
Drainage Area: OB2					
COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)	INITIAL ABSTRACTION, IA
RESIDENTIAL	RR-5 (Rangeland Landuse)	B	62.00	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			64.16	28.06	0.559

Post-Development					
Drainage Area: OB3					
COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)	INITIAL ABSTRACTION, IA
RESIDENTIAL	RR-5 (Rangeland Landuse)	B	62.00	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			63.62	43.44	0.572

Post-Development					
Drainage Area: OB4					
COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)	INITIAL ABSTRACTION, IA
RESIDENTIAL	RR-5 (Rangeland Landuse)	B	62.00	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			64.71	10.50	0.545

Post-Development					
Drainage Area: OB5					
COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)	INITIAL ABSTRACTION, IA
RESIDENTIAL	RR-5 (Rangeland Landuse)	B	62.00	28.58	--
RESIDENTIAL	RR-5 (Woods Landuse)	B	58.00	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			59.98	143.82	0.667

Post-Development					
Drainage Area: OB6					
COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)	INITIAL ABSTRACTION, IA
RESIDENTIAL	RR-5 (Rangeland Landuse)	B	62.00	60.64	--
RESIDENTIAL	RR-5 (Woods Landuse)	B	58.00	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			61.77	118.40	0.619

## Post Runoff Analysis Composite CN

Project Name: Eagleview  
 KHA Project #: 196288000  
 Designed by: DCM Date: 4/18/2024  
 Revised by: \_\_\_\_\_ Date: \_\_\_\_\_  
 Revised by: \_\_\_\_\_ Date: \_\_\_\_\_  
 Checked by: BAH Date: 4/16/2024

Post-Development					
Drainage Area: OB7					
COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)	INITIAL ABSTRACTION, IA
RESIDENTIAL	RR-5 (Rangeland Landuse)	B	62.00	122.08	--
RESIDENTIAL	RR-5 (Woods Landuse)	B	58.00	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			61.07	421.20	0.637

Post-Development					
Drainage Area: OB8					
COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)	INITIAL ABSTRACTION, IA
RESIDENTIAL	RR-5 (Rangeland Landuse)	B	62.00	8.71	--
RESIDENTIAL	2.5 acre	B	64.00	21.76	--
RESIDENTIAL	1/2 acre (25% imp.)	B	71.00	0.79	--
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			64.89	33.07	0.541

Post-Development					
Drainage Area: PB1					
COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)	INITIAL ABSTRACTION, IA
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	0.554

Post-Development					
Drainage Area: PB2					
COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)	INITIAL ABSTRACTION, IA
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	0.530

Post-Development					
Drainage Area: PB3					
COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)	INITIAL ABSTRACTION, IA
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	0.478

Post-Development					
Drainage Area: PB4					
COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)	INITIAL ABSTRACTION, IA
RESIDENTIAL	2.5 acre	B	64.00	10.18	--
IMPERVIOUS	Paved: open ditches (including right-of-way)	B	89.00	0.35	--
CUTSOM					
COMPOSITE SCS CURVE NUMBER - PB4			64.84	10.54	0.542

Post-Development					
Drainage Area: PB5					
COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)	INITIAL ABSTRACTION, IA
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	0.546





**Post Runoff Analysis  
Composite CN**

Project Name: Eagleview  
 KHA Project #: 196288000  
 Designed by: DCM Date: 4/18/2024  
 Revised by: \_\_\_\_\_ Date: \_\_\_\_\_  
 Revised by: \_\_\_\_\_ Date: \_\_\_\_\_  
 Checked by: BAH Date: 4/16/2024

<b>Post-Development</b>					
<i>Drainage Area: PB13</i>					
COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)	INITIAL ABSTRACTION, IA
RESIDENTIAL	2.5 acre	B	64.00	3.84	--
IMPERVIOUS	Paved: open ditches (including right-of-way)	B	89.00	0.18	--
CUTSOM					
<b>COMPOSITE SCS CURVE NUMBER - PB13</b>			<b>65.12</b>	<b>4.02</b>	<b>0.536</b>

<b>Post-Development</b>					
<i>Drainage Area: PB14</i>					
COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)	INITIAL ABSTRACTION, IA
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					
<b>COMPOSITE SCS CURVE NUMBER - PB14</b>			<b>63.64</b>	<b>17.28</b>	<b>0.571</b>

<b>Post-Development</b>					
<i>Drainage Area: PB15</i>					
COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)	INITIAL ABSTRACTION, IA
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					
<b>COMPOSITE SCS CURVE NUMBER - PB15</b>			<b>61.65</b>	<b>9.63</b>	<b>0.622</b>

## Pond 3 Stage Area Curve

Select a Paired Data ×

Select **Table** Graph

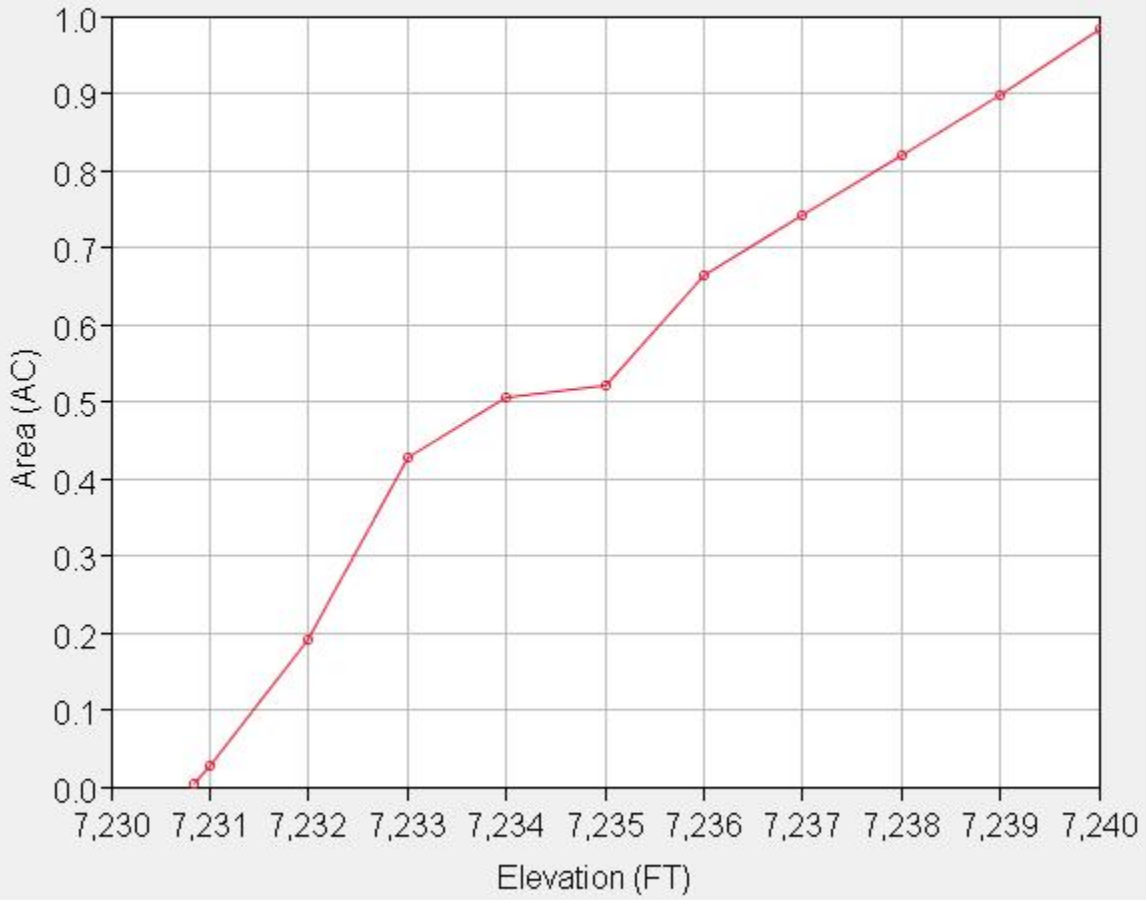
Elevation (FT)	Area (AC)
7230.83	0.004
7231.00	0.026
7232.00	0.190
7233.00	0.427
7234.00	0.505
7235.00	0.521
7236.00	0.664
7237.00	0.742
7238.00	0.819
7239.00	0.898
7240.00	0.983

Select Apply Cancel

Select a Paired Data



Select Table **Graph**



Select

Apply

Cancel



# DETENTION BASIN OUTLET STRUCTURE DE

*MHFD-Detention, Version 4.04 (February 2021)*

## Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table. The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm.

Stage - Storage Description	Stage [ft]	Area [ft <sup>2</sup> ]	Area [acres]	Volume [ft <sup>3</sup> ]	Volume [ac-ft]
7230.83	0.00	162	0.004	0	0.000
7231	1.17	1,148	0.026	704	0.016
7232	2.17	8,283	0.190	5,419	0.124
7233	3.17	18,607	0.427	18,864	0.433
7234	4.17	21,993	0.505	39,164	0.899
7235	5.17	22,691	0.521	61,506	1.412
7236	6.17	28,920	0.664	87,311	2.004
7237	7.17	32,308	0.742	117,925	2.707
7238	8.17	35,680	0.819	151,919	3.488
7239	9.17	39,108	0.898	189,313	4.346
7240	10.17	42,799	0.983	230,267	5.286

Select a Paired Data

Select Table Graph

Elevation (FT)	Discharge (CFS)
7230.83	0.00
7231.00	0.06
7232.00	0.14
7233.00	0.24
7234.00	0.61
7235.00	7.88
7236.00	52.70
7237.00	95.56
7238.00	103.01
7239.00	239.56
7240.00	510.21

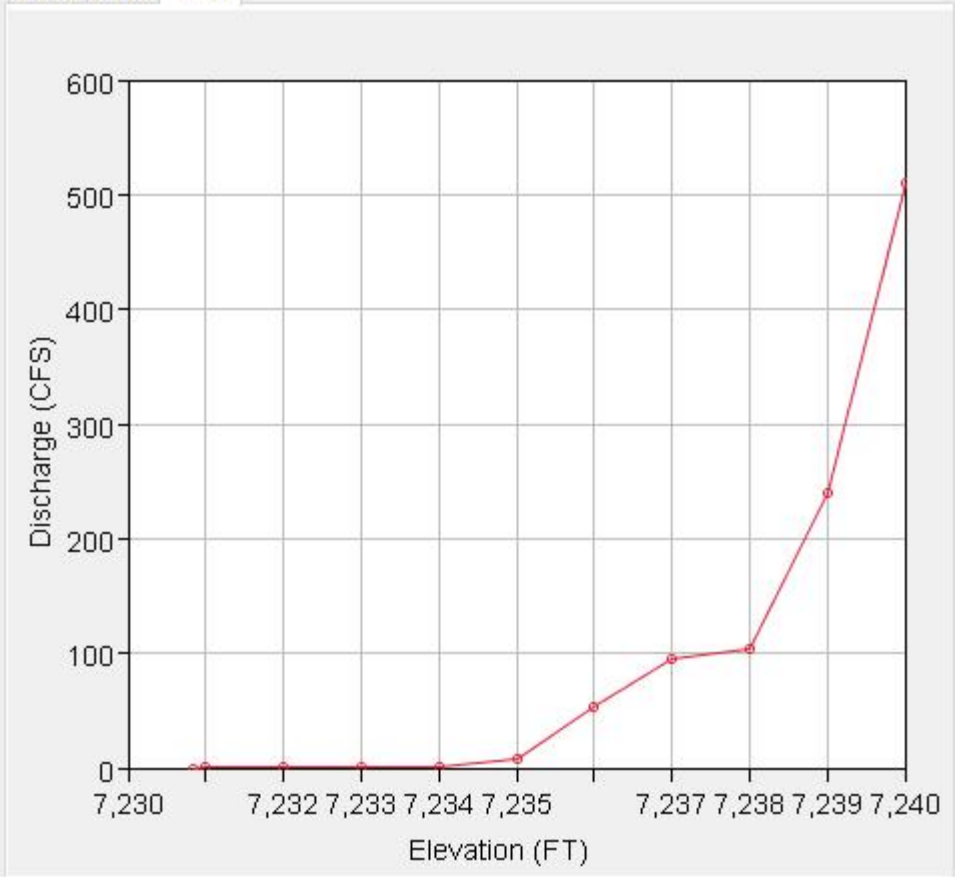
Select Apply Cancel



Select a Paired Data



Select Table Graph



Select

Apply

Cancel

## DETENTION BASIN OUTLET STRUCTURE DESIGN

*MHFD-Detention, Version 4.04 (February 2021)*

### Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.

The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

Stage - Storage Description	Stage [ft]	Area [ft <sup>2</sup> ]	Area [acres]	Volume [ft <sup>3</sup> ]	Volume [ac-ft]	Total Outflow [cfs]
7230.83	0.00	162	0.004	0	0.000	0.00
7231	1.17	1,148	0.026	704	0.016	0.06
7232	2.17	8,283	0.190	5,419	0.124	0.14
7233	3.17	18,607	0.427	18,864	0.433	0.24
7234	4.17	21,993	0.505	39,164	0.899	0.61
7235	5.17	22,691	0.521	61,506	1.412	7.88
7236	6.17	28,920	0.664	87,311	2.004	52.70
7237	7.17	32,308	0.742	117,925	2.707	95.56
7238	8.17	35,680	0.819	151,919	3.488	103.01
7239	9.17	39,108	0.898	189,313	4.346	239.56
7240	10.17	42,799	0.983	230,267	5.286	510.21

For best results, include the stages of all grade slope changes (e.g. ISV and Floor) from the S-A-V table on Sheet 'Basin'.

Also include the inverts of all outlets (e.g. vertical orifice, overflow grate, and spillway, where applicable).

Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_5-yr

Start of Run: 01Oct2021, 00:00

Basin Model: Eagleview\_Proposed

End of Run: 02Oct2021, 00:00

Meteorologic Model: 5-yr Type II

Compute Time: 19Apr2024, 08:27:02

Control Specifications: 24-hr Storm

Show Elements: All Elements

Volume Units:  IN  AC-FT

Sorting: Hydrologic

Hydrologic Element	Drainage Area (MI <sup>2</sup> )	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
OB7	0.6581200	101.4	01Oct2021, 12:53	23.3
R-OB7A	0.6581200	101.4	01Oct2021, 12:55	23.2
OB6	0.1850100	40.8	01Oct2021, 12:30	6.8
R-OB6	0.1850100	40.8	01Oct2021, 12:31	6.8
PB9	0.0199984	9.8	01Oct2021, 12:08	0.9
P13	0.8631284	133.8	01Oct2021, 12:46	30.9
R-OB7B	0.8631284	133.8	01Oct2021, 12:47	30.9
OB5	0.2247200	37.0	01Oct2021, 12:42	7.4
PB8A	0.0118750	8.3	01Oct2021, 12:01	0.6
POND_3	0.2365950	34.8	01Oct2021, 12:54	7.0
R-OB5	0.2365950	34.8	01Oct2021, 12:58	7.0
PB8B	0.0090469	6.1	01Oct2021, 12:01	0.4
P8	1.1087703	167.3	01Oct2021, 12:51	38.3
R-PB9	1.1087703	167.3	01Oct2021, 12:52	38.3
PB10	0.0132344	5.6	01Oct2021, 12:11	0.6
P7A	1.1220047	168.5	01Oct2021, 12:52	38.8
R-PB10	1.1220047	168.5	01Oct2021, 12:52	38.8
PB13	0.0062812	4.9	01Oct2021, 12:00	0.3
P12 (CULV8)	1.1282859	168.9	01Oct2021, 12:52	39.1
R-PB13	1.1282859	168.9	01Oct2021, 12:53	39.1
OB8	0.0516742	19.5	01Oct2021, 12:13	2.1
R-OB8	0.0516742	19.5	01Oct2021, 12:16	2.1
PB11	0.0274375	13.6	01Oct2021, 12:10	1.4
P9 (CULV6)	0.0791117	31.8	01Oct2021, 12:14	3.5
R-PB11	0.0791117	31.7	01Oct2021, 12:14	3.5
P6	1.2073976	177.3	01Oct2021, 12:52	42.6
R-PB13-B	1.2073976	177.3	01Oct2021, 12:53	42.6
PB14	0.0270031	18.9	01Oct2021, 12:01	1.2
P3	1.2344007	179.0	01Oct2021, 12:53	43.8
OB3	0.0678750	25.4	01Oct2021, 12:13	2.8
OB4	0.0164062	7.5	01Oct2021, 12:10	0.8
R-OB4-A	0.0842812	32.7	01Oct2021, 12:13	3.5
PB5	0.0096625	4.2	01Oct2021, 12:12	0.5
P5 (CULV7)	0.0939437	36.9	01Oct2021, 12:13	4.0
R-OB4-B	0.0939437	36.8	01Oct2021, 12:15	4.0
OB2	0.0438438	20.5	01Oct2021, 12:08	1.9
R-OB2	0.0438438	20.5	01Oct2021, 12:10	1.9
PB4	0.0164672	12.6	01Oct2021, 12:00	0.8
P10 (CULV2)	0.1542547	58.0	01Oct2021, 12:13	6.7
R-PB5	0.1542547	58.0	01Oct2021, 12:14	6.7
PB6	0.0173312	8.6	01Oct2021, 12:11	0.9
PB7	0.0054062	3.2	01Oct2021, 12:08	0.3
CULV4	0.0054062	3.2	01Oct2021, 12:08	0.3
R-PB7-A	0.0054062	3.2	01Oct2021, 12:10	0.3
P11 (CULV3)	0.0227374	11.7	01Oct2021, 12:11	1.2

R-PB7-B	0.0227374	11.7	01Oct2021, 12:12	1.2
PB3	0.0021625	1.5	01Oct2021, 12:07	0.1
CULV1	0.0021625	1.5	01Oct2021, 12:08	0.1
R-PB3	0.0021625	1.5	01Oct2021, 12:09	0.1
P4	0.1791546	70.8	01Oct2021, 12:14	8.0
R-PB7-C	0.1791546	70.7	01Oct2021, 12:15	8.0
PB15	0.0150500	11.0	01Oct2021, 12:00	0.7
P2	0.1942046	72.7	01Oct2021, 12:15	8.7
OF-1	1.4286053	198.9	01Oct2021, 12:49	52.5
OB1	0.0162031	7.1	01Oct2021, 12:08	0.7
R-OB1	0.0162031	7.1	01Oct2021, 12:10	0.7
PB1	0.0066453	3.0	01Oct2021, 12:10	0.3
P1	0.0228484	10.1	01Oct2021, 12:10	1.0
PB2	0.0016935	1.0	01Oct2021, 12:06	0.1



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_5-yr Subbasin: OB7

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 5-yr Type II
Compute Time: 19Apr2024, 08:27:02	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

## Computed Results

Peak Discharge : 101.4 (CFS)	Date/Time of Peak Discharge : 01Oct2021, 12:53
Total Precipitation : 94.8 (AC-FT)	Total Direct Runoff : 23.3 (AC-FT)
Total Loss : 70.9 (AC-FT)	Total Baseflow : 0.0 (AC-FT)
Total Excess : 23.9 (AC-FT)	Discharge : 23.3 (AC-FT)

Project: Eagleview\_Subdivision  
Simulation Run: EV\_Proposed\_5-yr Reach: R-OB7A

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 5-yr Type II
Compute Time: 19Apr2024, 08:27:02	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Inflow : 101.4 (CFS)	Date/Time of Peak Inflow : 01Oct2021, 12:53
Peak Outflow : 101.4 (CFS)	Date/Time of Peak Outflow : 01Oct2021, 12:55
Total Inflow : 23.3 (AC-FT)	Total Outflow : 23.2 (AC-FT)





Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_5-yr Subbasin: OB6

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 5-yr Type II
Compute Time: 19Apr2024, 08:27:02	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Discharge : 40.8 (CFS)	Date/Time of Peak Discharge : 01Oct2021, 12:30
Total Precipitation : 26.6 (AC-FT)	Total Direct Runoff : 6.8 (AC-FT)
Total Loss : 19.8 (AC-FT)	Total Baseflow : 0.0 (AC-FT)
Total Excess : 6.9 (AC-FT)	Discharge : 6.8 (AC-FT)



Project: Eagleview\_Subdivision  
Simulation Run: EV\_Proposed\_5-yr Reach: R-OB6

Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type II  
Compute Time: 19Apr2024, 08:27:02 Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Inflow :	40.8 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 12:30
Peak Outflow :	40.8 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 12:31
Total Inflow :	6.8 (AC-FT)	Total Outflow :	6.8 (AC-FT)

Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_5-yr Subbasin: PB9

Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type II  
Compute Time: 19Apr2024, 08:27:02 Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Discharge :	9.8 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:08
Total Precipitation :	2.9 (AC-FT)	Total Direct Runoff :	0.9 (AC-FT)
Total Loss :	2.0 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	0.9 (AC-FT)	Discharge :	0.9 (AC-FT)

Summary Results for Junction "P13"



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_5-yr Junction: P13

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 5-yr Type II
Compute Time: 19Apr2024, 08:27:02	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Outflow : 133.8 (CFS)	Date/Time of Peak Outflow : 01Oct2021, 12:46
Total Outflow : 30.9 (AC-FT)	



Project: Eagleview\_Subdivision  
Simulation Run: EV\_Proposed\_5-yr Reach: R-OB7B

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 5-yr Type II
Compute Time: 19Apr2024, 08:27:02	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Inflow : 133.8 (CFS)	Date/Time of Peak Inflow : 01Oct2021, 12:46
Peak Outflow : 133.8 (CFS)	Date/Time of Peak Outflow : 01Oct2021, 12:47
Total Inflow : 30.9 (AC-FT)	Total Outflow : 30.9 (AC-FT)

Summary Results for Subbasin "OB5"



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_5-yr Subbasin: OB5

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

End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type II

Compute Time: 19Apr2024, 08:27:02 Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Discharge : 37.0 (CFS) Date/Time of Peak Discharge : 01Oct2021, 12:42

Total Precipitation : 32.4 (AC-FT) Total Direct Runoff : 7.4 (AC-FT)

Total Loss : 24.8 (AC-FT) Total Baseflow : 0.0 (AC-FT)

Total Excess : 7.6 (AC-FT) Discharge : 7.4 (AC-FT)



Project: Eagleview\_Subdivision  
Simulation Run: EV\_Proposed\_5-yr Subbasin: PB8A

Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type II  
Compute Time: 19Apr2024, 08:27:02 Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Discharge :	8.3 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:01
Total Precipitation :	1.7 (AC-FT)	Total Direct Runoff :	0.6 (AC-FT)
Total Loss :	1.2 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	0.6 (AC-FT)	Discharge :	0.6 (AC-FT)



Project: Eagleview\_Subdivision  
Simulation Run: EV\_Proposed\_5-yr Reservoir: POND\_3

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 5-yr Type II
Compute Time: 19Apr2024, 08:27:02	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Inflow : 37.9 (CFS)	Date/Time of Peak Inflow : 01Oct2021, 12:42
Peak Outflow : 34.8 (CFS)	Date/Time of Peak Outflow : 01Oct2021, 12:54
Total Inflow : 8.0 (AC-FT)	Peak Storage : 1.7 (AC-FT)
Total Outflow : 7.0 (AC-FT)	Peak Elevation : 7235.6 (FT)





Project: Eagleview\_Subdivision  
Simulation Run: EV\_Proposed\_5-yr Reach: R-OB5

Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type II  
Compute Time: 19Apr2024, 08:27:02 Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Inflow : 34.8 (CFS)	Date/Time of Peak Inflow : 01Oct2021, 12:54
Peak Outflow : 34.8 (CFS)	Date/Time of Peak Outflow : 01Oct2021, 12:58
Total Inflow : 7.0 (AC-FT)	Total Outflow : 7.0 (AC-FT)



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_5-yr Subbasin: PB8B

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Proposed
End of Run:	02Oct2021, 00:00	Meteorologic Model:	5-yr Type II
Compute Time:	19Apr2024, 08:27:02	Control Specifications:	24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Discharge :	6.1 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:01
Total Precipitation :	1.3 (AC-FT)	Total Direct Runoff :	0.4 (AC-FT)
Total Loss :	0.9 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	0.4 (AC-FT)	Discharge :	0.4 (AC-FT)



Project: Eagleview\_Subdivision  
Simulation Run: EV\_Proposed\_5-yr Junction: P8

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 5-yr Type II
Compute Time: 19Apr2024, 08:27:02	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Outflow : 167.3 (CFS)	Date/Time of Peak Outflow : 01Oct2021, 12:51
Total Outflow : 38.3 (AC-FT)	



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_5-yr Reach: R-PB9

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 5-yr Type II
Compute Time: 19Apr2024, 08:27:02	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Inflow : 167.3 (CFS)	Date/Time of Peak Inflow : 01Oct2021, 12:51
Peak Outflow : 167.3 (CFS)	Date/Time of Peak Outflow : 01Oct2021, 12:52
Total Inflow : 38.3 (AC-FT)	Total Outflow : 38.3 (AC-FT)



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_5-yr Subbasin: PB10

Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type II  
Compute Time: 19Apr2024, 08:27:02 Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Discharge :	5.6 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:11
Total Precipitation :	1.9 (AC-FT)	Total Direct Runoff :	0.6 (AC-FT)
Total Loss :	1.3 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	0.6 (AC-FT)	Discharge :	0.6 (AC-FT)



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_5-yr Junction: P7A

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 5-yr Type II
Compute Time: 19Apr2024, 08:27:02	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Outflow : 168.5 (CFS)	Date/Time of Peak Outflow : 01Oct2021, 12:52
Total Outflow : 38.8 (AC-FT)	



Project: Eagleview\_Subdivision  
Simulation Run: EV\_Proposed\_5-yr Reach: R-PB10

Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type II  
Compute Time: 19Apr2024, 08:27:02 Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Inflow :	168.5 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 12:52
Peak Outflow :	168.5 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 12:52
Total Inflow :	38.8 (AC-FT)	Total Outflow :	38.8 (AC-FT)



Project: Eagleview\_Subdivision  
Simulation Run: EV\_Proposed\_5-yr Subbasin: PB13

Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type II  
Compute Time: 19Apr2024, 08:27:02 Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Discharge :	4.9 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:00
Total Precipitation :	0.9 (AC-FT)	Total Direct Runoff :	0.3 (AC-FT)
Total Loss :	0.6 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	0.3 (AC-FT)	Discharge :	0.3 (AC-FT)



Summary Results for Reach "P12 (CULV8)"



Project: Eagleview\_Subdivision  
Simulation Run: EV\_Proposed\_5-yr Reach: P12 (CULV8)

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 5-yr Type II
Compute Time: 19Apr2024, 08:27:02	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Inflow : 168.9 (CFS)	Date/Time of Peak Inflow : 01Oct2021, 12:52
Peak Outflow : 168.9 (CFS)	Date/Time of Peak Outflow : 01Oct2021, 12:52
Total Inflow : 39.1 (AC-FT)	Total Outflow : 39.1 (AC-FT)



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_5-yr Reach: R-PB13

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 5-yr Type II
Compute Time: 19Apr2024, 08:27:02	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Inflow : 168.9 (CFS)	Date/Time of Peak Inflow : 01Oct2021, 12:52
Peak Outflow : 168.9 (CFS)	Date/Time of Peak Outflow : 01Oct2021, 12:53
Total Inflow : 39.1 (AC-FT)	Total Outflow : 39.1 (AC-FT)



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_5-yr Subbasin: OB8

Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type II  
Compute Time: 19Apr2024, 08:27:02 Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Discharge :	19.5 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:13
Total Precipitation :	7.4 (AC-FT)	Total Direct Runoff :	2.1 (AC-FT)
Total Loss :	5.3 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	2.2 (AC-FT)	Discharge :	2.1 (AC-FT)

Project: Eagleview\_Subdivision  
Simulation Run: EV\_Proposed\_5-yr Reach: R-OB8

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 5-yr Type II
Compute Time: 19Apr2024, 08:27:02	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Inflow : 19.5 (CFS)	Date/Time of Peak Inflow : 01Oct2021, 12:13
Peak Outflow : 19.5 (CFS)	Date/Time of Peak Outflow : 01Oct2021, 12:16
Total Inflow : 2.1 (AC-FT)	Total Outflow : 2.1 (AC-FT)

Project: Eagleview\_Subdivision  
 Simulation Run: EV\_Proposed\_5-yr Subbasin: PB11

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 5-yr Type II
Compute Time: 19Apr2024, 08:27:02	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Discharge :	13.6 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:10
Total Precipitation :	4.0 (AC-FT)	Total Direct Runoff :	1.4 (AC-FT)
Total Loss :	2.6 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	1.4 (AC-FT)	Discharge :	1.4 (AC-FT)



Project: Eagleview\_Subdivision  
Simulation Run: EV\_Proposed\_5-yr Reach: P9 (CULV6)

Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type II  
Compute Time: 19Apr2024, 08:27:02 Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Inflow :	31.8 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 12:14
Peak Outflow :	31.8 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 12:14
Total Inflow :	3.5 (AC-FT)	Total Outflow :	3.5 (AC-FT)

Summary Results for Reach "R-PB11"



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_5-yr Reach: R-PB11

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 5-yr Type II
Compute Time: 19Apr2024, 08:27:02	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Inflow : 31.8 (CFS)	Date/Time of Peak Inflow : 01Oct2021, 12:14
Peak Outflow : 31.7 (CFS)	Date/Time of Peak Outflow : 01Oct2021, 12:14
Total Inflow : 3.5 (AC-FT)	Total Outflow : 3.5 (AC-FT)

Summary Results for Junction "P6"



Project: Eagleview\_Subdivision  
Simulation Run: EV\_Proposed\_5-yr Junction: P6

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 5-yr Type II
Compute Time: 19Apr2024, 08:27:02	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Outflow : 177.3 (CFS)	Date/Time of Peak Outflow : 01Oct2021, 12:52
Total Outflow : 42.6 (AC-FT)	





Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_5-yr Reach: R-PB13-B

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 5-yr Type II
Compute Time: 19Apr2024, 08:27:02	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Inflow : 177.3 (CFS)	Date/Time of Peak Inflow : 01Oct2021, 12:52
Peak Outflow : 177.3 (CFS)	Date/Time of Peak Outflow : 01Oct2021, 12:53
Total Inflow : 42.6 (AC-FT)	Total Outflow : 42.6 (AC-FT)

Summary Results for Subbasin "PB14"



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_5-yr Subbasin: PB14

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Proposed
End of Run:	02Oct2021, 00:00	Meteorologic Model:	5-yr Type II
Compute Time:	19Apr2024, 08:27:02	Control Specifications:	24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Discharge :	18.9 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:01
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)

Summary Results for Junction "P3"



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_5-yr Junction: P3

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 5-yr Type II
Compute Time: 19Apr2024, 08:27:02	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Outflow : 179.0 (CFS)	Date/Time of Peak Outflow : 01Oct2021, 12:53
Total Outflow : 43.8 (AC-FT)	



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_5-yr Subbasin: OB3

Start of Run: 01Oct2021, 00:00

Basin Model:

Eagleview\_Proposed

End of Run: 02Oct2021, 00:00

Meteorologic Model:

5-yr Type II

Compute Time: 19Apr2024, 08:27:02

Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

## Computed Results

Peak Discharge : 25.4 (CFS)

Date/Time of Peak Discharge : 01Oct2021, 12:13

Total Precipitation : 9.8 (AC-FT)

Total Direct Runoff :

2.8 (AC-FT)

Total Loss : 7.0 (AC-FT)

Total Baseflow :

0.0 (AC-FT)

Total Excess : 2.8 (AC-FT)

Discharge :

2.8 (AC-FT)

Summary Results for Subbasin "OB4"



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_5-yr Subbasin: OB4

Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type II  
Compute Time: 19Apr2024, 08:27:02 Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Discharge :	7.5 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:10
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)



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_5-yr Reach: R-OB4-A

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 5-yr Type II
Compute Time: 19Apr2024, 08:27:02	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Inflow : 32.8 (CFS)	Date/Time of Peak Inflow : 01Oct2021, 12:12
Peak Outflow : 32.7 (CFS)	Date/Time of Peak Outflow : 01Oct2021, 12:13
Total Inflow : 3.5 (AC-FT)	Total Outflow : 3.5 (AC-FT)

Summary Results for Subbasin "PB5"



Project: Eagleview\_Subdivision  
Simulation Run: EV\_Proposed\_5-yr Subbasin: PB5

Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type II  
Compute Time: 19Apr2024, 08:27:02 Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Discharge :	4.2 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:12
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)



Project: Eagleview\_Subdivision  
Simulation Run: EV\_Proposed\_5-yr Reach: P5 (CULV7)

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 5-yr Type II
Compute Time: 19Apr2024, 08:27:02	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Inflow : 36.9 (CFS)	Date/Time of Peak Inflow : 01Oct2021, 12:13
Peak Outflow : 36.9 (CFS)	Date/Time of Peak Outflow : 01Oct2021, 12:13
Total Inflow : 4.0 (AC-FT)	Total Outflow : 4.0 (AC-FT)



Summary Results for Reach "R-OB4-B"



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_5-yr Reach: R-OB4-B

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 5-yr Type II
Compute Time: 19Apr2024, 08:27:02	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Inflow : 36.9 (CFS)	Date/Time of Peak Inflow : 01Oct2021, 12:13
Peak Outflow : 36.8 (CFS)	Date/Time of Peak Outflow : 01Oct2021, 12:15
Total Inflow : 4.0 (AC-FT)	Total Outflow : 4.0 (AC-FT)



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_5-yr Subbasin: OB2

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 5-yr Type II
Compute Time: 19Apr2024, 08:27:02	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Discharge :	20.5 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:08
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)

Summary Results for Reach "R-OB2"



Project: Eagleview\_Subdivision  
Simulation Run: EV\_Proposed\_5-yr Reach: R-OB2

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 5-yr Type II
Compute Time: 19Apr2024, 08:27:02	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Inflow : 20.5 (CFS)	Date/Time of Peak Inflow : 01Oct2021, 12:08
Peak Outflow : 20.5 (CFS)	Date/Time of Peak Outflow : 01Oct2021, 12:10
Total Inflow : 1.9 (AC-FT)	Total Outflow : 1.9 (AC-FT)



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_5-yr Subbasin: PB4

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Proposed
End of Run:	02Oct2021, 00:00	Meteorologic Model:	5-yr Type II
Compute Time:	19Apr2024, 08:27:02	Control Specifications:	24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Discharge :	12.6 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:00
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)

Summary Results for Reach "P10 (CULV2)"



Project: Eagleview\_Subdivision  
Simulation Run: EV\_Proposed\_5-yr Reach: P10 (CULV2)

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 5-yr Type II
Compute Time: 19Apr2024, 08:27:02	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Inflow : 58.0 (CFS)	Date/Time of Peak Inflow : 01Oct2021, 12:13
Peak Outflow : 58.0 (CFS)	Date/Time of Peak Outflow : 01Oct2021, 12:13
Total Inflow : 6.7 (AC-FT)	Total Outflow : 6.7 (AC-FT)



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_5-yr Reach: R-PB5

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 5-yr Type II
Compute Time: 19Apr2024, 08:27:02	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Inflow : 58.0 (CFS)	Date/Time of Peak Inflow : 01Oct2021, 12:13
Peak Outflow : 58.0 (CFS)	Date/Time of Peak Outflow : 01Oct2021, 12:14
Total Inflow : 6.7 (AC-FT)	Total Outflow : 6.7 (AC-FT)

Summary Results for Subbasin "PB6"



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_5-yr Subbasin: PB6

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 5-yr Type II
Compute Time: 19Apr2024, 08:27:02	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Discharge : 8.6 (CFS)	Date/Time of Peak Discharge : 01Oct2021, 12:11
Total Precipitation : 2.5 (AC-FT)	Total Direct Runoff : 0.9 (AC-FT)
Total Loss : 1.6 (AC-FT)	Total Baseflow : 0.0 (AC-FT)
Total Excess : 0.9 (AC-FT)	Discharge : 0.9 (AC-FT)



Project: Eagleview\_Subdivision  
Simulation Run: EV\_Proposed\_5-yr Subbasin: PB7

Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type II  
Compute Time: 19Apr2024, 08:27:02 Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Discharge :	3.2 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:08
Total Precipitation :	0.8 (AC-FT)	Total Direct Runoff :	0.3 (AC-FT)
Total Loss :	0.5 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	0.3 (AC-FT)	Discharge :	0.3 (AC-FT)





Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_5-yr Reach: CULV4

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 5-yr Type II
Compute Time: 19Apr2024, 08:27:02	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Inflow : 3.2 (CFS)	Date/Time of Peak Inflow : 01Oct2021, 12:08
Peak Outflow : 3.2 (CFS)	Date/Time of Peak Outflow : 01Oct2021, 12:08
Total Inflow : 0.3 (AC-FT)	Total Outflow : 0.3 (AC-FT)



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_5-yr Reach: R-PB7-A

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 5-yr Type II
Compute Time: 19Apr2024, 08:27:02	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Inflow : 3.2 (CFS)	Date/Time of Peak Inflow : 01Oct2021, 12:08
Peak Outflow : 3.2 (CFS)	Date/Time of Peak Outflow : 01Oct2021, 12:10
Total Inflow : 0.3 (AC-FT)	Total Outflow : 0.3 (AC-FT)



Project: Eagleview\_Subdivision  
Simulation Run: EV\_Proposed\_5-yr Reach: P11 (CULV3)

Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type II  
Compute Time: 19Apr2024, 08:27:02 Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Inflow :	11.7 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 12:10
Peak Outflow :	11.7 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 12:11
Total Inflow :	1.2 (AC-FT)	Total Outflow :	1.2 (AC-FT)



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_5-yr Reach: R-PB7-B

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 5-yr Type II
Compute Time: 19Apr2024, 08:27:02	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Inflow : 11.7 (CFS)	Date/Time of Peak Inflow : 01Oct2021, 12:11
Peak Outflow : 11.7 (CFS)	Date/Time of Peak Outflow : 01Oct2021, 12:12
Total Inflow : 1.2 (AC-FT)	Total Outflow : 1.2 (AC-FT)

Summary Results for Subbasin "PB3"



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_5-yr Subbasin: PB3

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Proposed
End of Run:	02Oct2021, 00:00	Meteorologic Model:	5-yr Type II
Compute Time:	19Apr2024, 08:27:02	Control Specifications:	24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Discharge :	1.5 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:07
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)



Project: Eagleview\_Subdivision  
Simulation Run: EV\_Proposed\_5-yr Reach: CULV1

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 5-yr Type II
Compute Time: 19Apr2024, 08:27:02	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Inflow : 1.5 (CFS)	Date/Time of Peak Inflow : 01Oct2021, 12:07
Peak Outflow : 1.5 (CFS)	Date/Time of Peak Outflow : 01Oct2021, 12:08
Total Inflow : 0.1 (AC-FT)	Total Outflow : 0.1 (AC-FT)

Project: Eagleview\_Subdivision  
Simulation Run: EV\_Proposed\_5-yr Reach: R-PB3

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 5-yr Type II
Compute Time: 19Apr2024, 08:27:02	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Inflow : 1.5 (CFS)	Date/Time of Peak Inflow : 01Oct2021, 12:08
Peak Outflow : 1.5 (CFS)	Date/Time of Peak Outflow : 01Oct2021, 12:09
Total Inflow : 0.1 (AC-FT)	Total Outflow : 0.1 (AC-FT)



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_5-yr Junction: P4

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 5-yr Type II
Compute Time: 19Apr2024, 08:27:02	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Outflow : 70.8 (CFS)	Date/Time of Peak Outflow : 01Oct2021, 12:14
Total Outflow : 8.0 (AC-FT)	





Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_5-yr Reach: R-PB7-C

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 5-yr Type II
Compute Time: 19Apr2024, 08:27:02	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Inflow : 70.8 (CFS)	Date/Time of Peak Inflow : 01Oct2021, 12:14
Peak Outflow : 70.7 (CFS)	Date/Time of Peak Outflow : 01Oct2021, 12:15
Total Inflow : 8.0 (AC-FT)	Total Outflow : 8.0 (AC-FT)



Project: Eagleview\_Subdivision  
Simulation Run: EV\_Proposed\_5-yr Subbasin: PB15

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 5-yr Type II
Compute Time: 19Apr2024, 08:27:02	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Discharge :	11.0 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:00
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)

Summary Results for Junction "P2"



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_5-yr Junction: P2

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 5-yr Type II
Compute Time: 19Apr2024, 08:27:02	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Outflow : 72.7 (CFS)	Date/Time of Peak Outflow : 01Oct2021, 12:15
Total Outflow : 8.7 (AC-FT)	

Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_5-yr Junction: OF-1

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

End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type II

Compute Time: 19Apr2024, 08:27:02 Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Outflow : 198.9 (CFS) Date/Time of Peak Outflow : 01Oct2021, 12:49  
Total Outflow : 52.5 (AC-FT)

Summary Results for Subbasin "OB1"



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_5-yr Subbasin: OB1

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 5-yr Type II
Compute Time: 19Apr2024, 08:27:02	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Discharge :	7.1 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:08
Total Precipitation :	2.3 (AC-FT)	Total Direct Runoff :	0.7 (AC-FT)
Total Loss :	1.7 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	0.7 (AC-FT)	Discharge :	0.7 (AC-FT)



Project: Eagleview\_Subdivision  
Simulation Run: EV\_Proposed\_5-yr Reach: R-OB1

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 5-yr Type II
Compute Time: 19Apr2024, 08:27:02	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Inflow : 7.1 (CFS)	Date/Time of Peak Inflow : 01Oct2021, 12:08
Peak Outflow : 7.1 (CFS)	Date/Time of Peak Outflow : 01Oct2021, 12:10
Total Inflow : 0.7 (AC-FT)	Total Outflow : 0.7 (AC-FT)

Project: Eagleview\_Subdivision  
Simulation Run: EV\_Proposed\_5-yr Subbasin: PB1

Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type II  
Compute Time: 19Apr2024, 08:27:02 Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Discharge :	3.0 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:10
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)



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_5-yr Junction: P1

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 5-yr Type II
Compute Time: 19Apr2024, 08:27:02	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Outflow : 10.1 (CFS)	Date/Time of Peak Outflow : 01Oct2021, 12:10
Total Outflow : 1.0 (AC-FT)	





Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_5-yr Subbasin: PB2

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Proposed
End of Run:	02Oct2021, 00:00	Meteorologic Model:	5-yr Type II
Compute Time:	19Apr2024, 08:27:02	Control Specifications:	24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Discharge :	1.0 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:06
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)

Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_100-yr

Start of Run: 01Oct2021, 00:00

Basin Model: Eagleview\_Proposed

End of Run: 02Oct2021, 00:00

Meteorologic Model: 100-yr Type II

Compute Time: 19Apr2024, 09:33:53

Control Specifications: 24-hr Storm

Show Elements: All Elements

Volume Units:  IN  AC-FT

Sorting: Hydrologic

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
OB7	0.6581200	284.3	01Oct2021, 12:52	1.73
R-OB7A	0.6581200	284.3	01Oct2021, 12:53	1.72
OB6	0.1850100	113.3	01Oct2021, 12:29	1.78
R-OB6	0.1850100	113.3	01Oct2021, 12:30	1.78
PB9	0.0199984	24.8	01Oct2021, 12:07	2.05
P13	0.8631284	375.0	01Oct2021, 12:44	1.74
R-OB7B	0.8631284	374.9	01Oct2021, 12:45	1.74
OB5	0.2247200	107.1	01Oct2021, 12:40	1.65
PB8A	0.0118750	20.3	01Oct2021, 12:01	2.10
POND_3	0.2365950	97.1	01Oct2021, 12:55	1.58
R-OB5	0.2365950	97.1	01Oct2021, 12:58	1.58
PB8B	0.0090469	15.2	01Oct2021, 12:01	2.00
P8	1.1087703	472.4	01Oct2021, 12:46	1.71
R-PB9	1.1087703	472.3	01Oct2021, 12:46	1.71
PB10	0.0132344	14.4	01Oct2021, 12:10	2.00
P7A	1.1220047	475.7	01Oct2021, 12:46	1.71
R-PB10	1.1220047	475.6	01Oct2021, 12:47	1.71
PB13	0.0062812	11.7	01Oct2021, 12:00	2.18
P12 (CULV8)	1.1282859	476.7	01Oct2021, 12:47	1.71
R-PB13	1.1282859	476.7	01Oct2021, 12:47	1.71
OB8	0.0516742	51.6	01Oct2021, 12:13	1.96
R-OB8	0.0516742	51.6	01Oct2021, 12:15	1.95
PB11	0.0274375	33.2	01Oct2021, 12:10	2.17
P9 (CULV6)	0.0791117	82.3	01Oct2021, 12:13	2.03
R-PB11	0.0791117	82.2	01Oct2021, 12:13	2.03
P6	1.2073976	500.7	01Oct2021, 12:46	1.73
R-PB13-B	1.2073976	500.6	01Oct2021, 12:47	1.73
PB14	0.0270031	46.3	01Oct2021, 12:01	2.04
P3	1.2344007	505.2	01Oct2021, 12:46	1.74
OB3	0.0678750	67.2	01Oct2021, 12:12	1.92
OB4	0.0164062	18.9	01Oct2021, 12:10	2.09
R-OB4-A	0.0842812	85.7	01Oct2021, 12:13	1.95
PB5	0.0096625	10.4	01Oct2021, 12:12	2.09
P5 (CULV7)	0.0939437	96.1	01Oct2021, 12:13	1.97
R-OB4-B	0.0939437	95.9	01Oct2021, 12:14	1.97
OB2	0.0438438	52.7	01Oct2021, 12:08	2.01
R-OB2	0.0438438	52.5	01Oct2021, 12:09	2.00
PB4	0.0164672	30.2	01Oct2021, 12:00	2.14
P10 (CULV2)	0.1542547	150.2	01Oct2021, 12:12	1.99
R-PB5	0.1542547	150.1	01Oct2021, 12:13	1.99
PB6	0.0173312	20.7	01Oct2021, 12:10	2.21
PB7	0.0054062	7.4	01Oct2021, 12:08	2.34
CULV4	0.0054062	7.4	01Oct2021, 12:08	2.34
R-PB7-A	0.0054062	7.4	01Oct2021, 12:09	2.34

P11 (CULV3)	0.0227374	28.0	01Oct2021, 12:10	2.24
R-PB7-B	0.0227374	27.9	01Oct2021, 12:11	2.24
PB3	0.0021625	3.3	01Oct2021, 12:07	2.55
CULV1	0.0021625	3.3	01Oct2021, 12:07	2.55
R-PB3	0.0021625	3.3	01Oct2021, 12:09	2.55
P4	0.1791546	180.8	01Oct2021, 12:12	2.03
R-PB7-C	0.1791546	180.8	01Oct2021, 12:13	2.03
PB15	0.0150500	26.3	01Oct2021, 12:00	2.07
P2	0.1942046	185.4	01Oct2021, 12:13	2.03
OF-1	1.4286053	560.8	01Oct2021, 12:43	1.78
OB1	0.0162031	18.8	01Oct2021, 12:08	1.93
R-OB1	0.0162031	18.7	01Oct2021, 12:09	1.93
PB1	0.0066453	7.7	01Oct2021, 12:09	2.04
P1	0.0228484	26.4	01Oct2021, 12:09	1.96
PB2	0.0016935	2.4	01Oct2021, 12:06	2.21



Summary Results for Subbasin "OB7"



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_100-yr Subbasin: OB7

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 100-yr Type II
Compute Time: 19Apr2024, 09:33:53	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Discharge : 284.3 (CFS)	Date/Time of Peak Discharge : 01Oct2021, 12:52
Total Precipitation : 161.5 (AC-FT)	Total Direct Runoff : 60.6 (AC-FT)
Total Loss : 99.5 (AC-FT)	Total Baseflow : 0.0 (AC-FT)
Total Excess : 62.0 (AC-FT)	Discharge : 60.6 (AC-FT)



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_100-yr Reach: R-OB7A

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 100-yr Type II
Compute Time: 19Apr2024, 09:33:53	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Inflow : 284.3 (CFS)	Date/Time of Peak Inflow : 01Oct2021, 12:52
Peak Outflow : 284.3 (CFS)	Date/Time of Peak Outflow : 01Oct2021, 12:53
Total Inflow : 60.6 (AC-FT)	Total Outflow : 60.5 (AC-FT)



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_100-yr Subbasin: OB6

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 100-yr Type II
Compute Time: 19Apr2024, 09:33:53	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Discharge :	113.3 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:29
Total Precipitation :	45.4 (AC-FT)	Total Direct Runoff :	17.5 (AC-FT)
Total Loss :	27.6 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	17.8 (AC-FT)	Discharge :	17.5 (AC-FT)



Project: Eagleview\_Subdivision  
Simulation Run: EV\_Proposed\_100-yr Reach: R-OB6

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 100-yr Type II
Compute Time: 19Apr2024, 09:33:53	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Inflow : 113.3 (CFS)	Date/Time of Peak Inflow : 01Oct2021, 12:29
Peak Outflow : 113.3 (CFS)	Date/Time of Peak Outflow : 01Oct2021, 12:30
Total Inflow : 17.5 (AC-FT)	Total Outflow : 17.5 (AC-FT)



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_100-yr Subbasin: PB9

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 100-yr Type II
Compute Time: 19Apr2024, 09:33:53	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Discharge :	24.8 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:07
Total Precipitation :	4.9 (AC-FT)	Total Direct Runoff :	2.2 (AC-FT)
Total Loss :	2.7 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	2.2 (AC-FT)	Discharge :	2.2 (AC-FT)



Summary Results for Junction "P13"



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_100-yr Junction: P13

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 100-yr Type II
Compute Time: 19Apr2024, 09:33:53	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Outflow : 375.0 (CFS)	Date/Time of Peak Outflow : 01Oct2021, 12:44
Total Outflow : 80.3 (AC-FT)	

Project: Eagleview\_Subdivision  
Simulation Run: EV\_Proposed\_100-yr Reach: R-OB7B

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 100-yr Type II
Compute Time: 19Apr2024, 09:33:53	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Inflow : 375.0 (CFS)	Date/Time of Peak Inflow : 01Oct2021, 12:44
Peak Outflow : 374.9 (CFS)	Date/Time of Peak Outflow : 01Oct2021, 12:45
Total Inflow : 80.3 (AC-FT)	Total Outflow : 80.2 (AC-FT)

Project: Eagleview\_Subdivision  
Simulation Run: EV\_Proposed\_100-yr Subbasin: OB5

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 100-yr Type II
Compute Time: 19Apr2024, 09:33:53	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Discharge :	107.1 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:40
Total Precipitation :	55.1 (AC-FT)	Total Direct Runoff :	19.8 (AC-FT)
Total Loss :	35.0 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	20.2 (AC-FT)	Discharge :	19.8 (AC-FT)

Summary Results for Subbasin "PB8A"



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_100-yr Subbasin: PB8A

Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type II  
Compute Time: 19Apr2024, 09:33:53 Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Discharge :	20.3 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:01
Total Precipitation :	2.9 (AC-FT)	Total Direct Runoff :	1.3 (AC-FT)
Total Loss :	1.6 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	1.3 (AC-FT)	Discharge :	1.3 (AC-FT)

Summary Results for Reservoir "POND\_3"



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_100-yr Reservoir: POND\_3

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 100-yr Type II
Compute Time: 19Apr2024, 09:33:53	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Inflow : 109.3 (CFS)	Date/Time of Peak Inflow : 01Oct2021, 12:40
Peak Outflow : 97.1 (CFS)	Date/Time of Peak Outflow : 01Oct2021, 12:55
Total Inflow : 21.1 (AC-FT)	Peak Storage : 2.8 (AC-FT)
Total Outflow : 19.9 (AC-FT)	Peak Elevation : 7237.2 (FT)

Summary Results for Reach "R-OB5"



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_100-yr Reach: R-OB5

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 100-yr Type II
Compute Time: 19Apr2024, 09:33:53	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Inflow : 97.1 (CFS)	Date/Time of Peak Inflow : 01Oct2021, 12:55
Peak Outflow : 97.1 (CFS)	Date/Time of Peak Outflow : 01Oct2021, 12:58
Total Inflow : 19.9 (AC-FT)	Total Outflow : 19.9 (AC-FT)

Summary Results for Subbasin "PB8B"



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_100-yr Subbasin: PB8B

Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type II  
Compute Time: 19Apr2024, 09:33:53 Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Discharge :	15.2 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:01
Total Precipitation :	2.2 (AC-FT)	Total Direct Runoff :	1.0 (AC-FT)
Total Loss :	1.3 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	1.0 (AC-FT)	Discharge :	1.0 (AC-FT)

Summary Results for Junction "P8"



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_100-yr Junction: P8

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 100-yr Type II
Compute Time: 19Apr2024, 09:33:53	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Outflow : 472.4 (CFS)	Date/Time of Peak Outflow : 01Oct2021, 12:46
Total Outflow : 101.1 (AC-FT)	



Summary Results for Reach "R-PB9"



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_100-yr Reach: R-PB9

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 100-yr Type II
Compute Time: 19Apr2024, 09:33:53	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Inflow : 472.4 (CFS)	Date/Time of Peak Inflow : 01Oct2021, 12:46
Peak Outflow : 472.3 (CFS)	Date/Time of Peak Outflow : 01Oct2021, 12:46
Total Inflow : 101.1 (AC-FT)	Total Outflow : 101.1 (AC-FT)



Summary Results for Subbasin "PB10"



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_100-yr Subbasin: PB10

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Proposed
End of Run:	02Oct2021, 00:00	Meteorologic Model:	100-yr Type II
Compute Time:	19Apr2024, 09:33:53	Control Specifications:	24-hr Storm

Volume Units:  IN  AC-FT

#### Computed Results

Peak Discharge :	14.4 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:10
Total Precipitation :	3.2 (AC-FT)	Total Direct Runoff :	1.4 (AC-FT)
Total Loss :	1.8 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	1.4 (AC-FT)	Discharge :	1.4 (AC-FT)

Summary Results for Junction "P7A"



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_100-yr Junction: P7A

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 100-yr Type II
Compute Time: 19Apr2024, 09:33:53	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Outflow : 475.7 (CFS)	Date/Time of Peak Outflow : 01Oct2021, 12:46
Total Outflow : 102.5 (AC-FT)	

Summary Results for Reach "R-PB10"



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_100-yr Reach: R-PB10

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 100-yr Type II
Compute Time: 19Apr2024, 09:33:53	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Inflow : 475.7 (CFS)	Date/Time of Peak Inflow : 01Oct2021, 12:46
Peak Outflow : 475.6 (CFS)	Date/Time of Peak Outflow : 01Oct2021, 12:47
Total Inflow : 102.5 (AC-FT)	Total Outflow : 102.4 (AC-FT)

Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_100-yr Subbasin: PB13

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 100-yr Type II
Compute Time: 19Apr2024, 09:33:53	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

## Computed Results

Peak Discharge :	11.7 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:00
Total Precipitation :	1.5 (AC-FT)	Total Direct Runoff :	0.7 (AC-FT)
Total Loss :	0.8 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	0.7 (AC-FT)	Discharge :	0.7 (AC-FT)



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_100-yr Reach: P12 (CULV8)

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 100-yr Type II
Compute Time: 19Apr2024, 09:33:53	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Inflow : 476.7 (CFS)	Date/Time of Peak Inflow : 01Oct2021, 12:46
Peak Outflow : 476.7 (CFS)	Date/Time of Peak Outflow : 01Oct2021, 12:47
Total Inflow : 103.2 (AC-FT)	Total Outflow : 103.2 (AC-FT)



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_100-yr Reach: R-PB13

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 100-yr Type II
Compute Time: 19Apr2024, 09:33:53	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Inflow : 476.7 (CFS)	Date/Time of Peak Inflow : 01Oct2021, 12:47
Peak Outflow : 476.7 (CFS)	Date/Time of Peak Outflow : 01Oct2021, 12:47
Total Inflow : 103.2 (AC-FT)	Total Outflow : 103.1 (AC-FT)



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_100-yr Subbasin: OB8

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 100-yr Type II
Compute Time: 19Apr2024, 09:33:53	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Discharge :	51.6 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:13
Total Precipitation :	12.7 (AC-FT)	Total Direct Runoff :	5.4 (AC-FT)
Total Loss :	7.3 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	5.4 (AC-FT)	Discharge :	5.4 (AC-FT)



Summary Results for Reach "R-OB8"



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_100-yr Reach: R-OB8

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 100-yr Type II
Compute Time: 19Apr2024, 09:33:53	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Inflow : 51.6 (CFS)	Date/Time of Peak Inflow : 01Oct2021, 12:13
Peak Outflow : 51.6 (CFS)	Date/Time of Peak Outflow : 01Oct2021, 12:15
Total Inflow : 5.4 (AC-FT)	Total Outflow : 5.4 (AC-FT)



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_100-yr Subbasin: PB11

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 100-yr Type II
Compute Time: 19Apr2024, 09:33:53	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Discharge :	33.2 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:10
Total Precipitation :	6.7 (AC-FT)	Total Direct Runoff :	3.2 (AC-FT)
Total Loss :	3.5 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	3.2 (AC-FT)	Discharge :	3.2 (AC-FT)

Project: Eagleview\_Subdivision  
Simulation Run: EV\_Proposed\_100-yr Reach: P9 (CULV6)

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 100-yr Type II
Compute Time: 19Apr2024, 09:33:53	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Inflow : 82.3 (CFS)	Date/Time of Peak Inflow : 01Oct2021, 12:13
Peak Outflow : 82.3 (CFS)	Date/Time of Peak Outflow : 01Oct2021, 12:13
Total Inflow : 8.6 (AC-FT)	Total Outflow : 8.6 (AC-FT)

Summary Results for Reach "R-PB11"



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_100-yr Reach: R-PB11

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 100-yr Type II
Compute Time: 19Apr2024, 09:33:53	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Inflow : 82.3 (CFS)	Date/Time of Peak Inflow : 01Oct2021, 12:13
Peak Outflow : 82.2 (CFS)	Date/Time of Peak Outflow : 01Oct2021, 12:13
Total Inflow : 8.6 (AC-FT)	Total Outflow : 8.6 (AC-FT)

Summary Results for Junction "P6"



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_100-yr Junction: P6

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

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

Compute Time: 19Apr2024, 09:33:53 Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Outflow : 500.7 (CFS)

Date/Time of Peak Outflow : 01Oct2021, 12:46

Total Outflow : 111.7 (AC-FT)



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_100-yr Reach: R-PB13-B

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 100-yr Type II
Compute Time: 19Apr2024, 09:33:53	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Inflow : 500.7 (CFS)	Date/Time of Peak Inflow : 01Oct2021, 12:46
Peak Outflow : 500.6 (CFS)	Date/Time of Peak Outflow : 01Oct2021, 12:47
Total Inflow : 111.7 (AC-FT)	Total Outflow : 111.6 (AC-FT)



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_100-yr Subbasin: PB14

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

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

Compute Time: 19Apr2024, 09:33:53 Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Discharge :	46.3 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:01
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)

Summary Results for Junction "P3"



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_100-yr Junction: P3

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 100-yr Type II
Compute Time: 19Apr2024, 09:33:53	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Outflow : 505.2 (CFS)	Date/Time of Peak Outflow : 01Oct2021, 12:46
Total Outflow : 114.6 (AC-FT)	



Summary Results for Subbasin "OB3"



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_100-yr Subbasin: OB3

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 100-yr Type II
Compute Time: 19Apr2024, 09:33:53	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Discharge : 67.2 (CFS)	Date/Time of Peak Discharge : 01Oct2021, 12:12
Total Precipitation : 16.7 (AC-FT)	Total Direct Runoff : 7.0 (AC-FT)
Total Loss : 9.7 (AC-FT)	Total Baseflow : 0.0 (AC-FT)
Total Excess : 7.0 (AC-FT)	Discharge : 7.0 (AC-FT)



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_100-yr Subbasin: OB4

Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type II  
Compute Time: 19Apr2024, 09:33:53 Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Discharge :	18.9 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:10
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)

Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_100-yr Reach: R-OB4-A

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 100-yr Type II
Compute Time: 19Apr2024, 09:33:53	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Inflow : 85.8 (CFS)	Date/Time of Peak Inflow : 01Oct2021, 12:12
Peak Outflow : 85.7 (CFS)	Date/Time of Peak Outflow : 01Oct2021, 12:13
Total Inflow : 8.8 (AC-FT)	Total Outflow : 8.8 (AC-FT)



Project: Eagleview\_Subdivision  
Simulation Run: EV\_Proposed\_100-yr Subbasin: PB5

Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type II  
Compute Time: 19Apr2024, 09:33:53 Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Discharge :	10.4 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:12
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)

Summary Results for Reach "P5 (CULV7)"



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_100-yr Reach: P5 (CULV7)

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

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

Compute Time: 19Apr2024, 09:33:53 Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Inflow : 96.1 (CFS)	Date/Time of Peak Inflow : 01Oct2021, 12:13
Peak Outflow : 96.1 (CFS)	Date/Time of Peak Outflow : 01Oct2021, 12:13
Total Inflow : 9.9 (AC-FT)	Total Outflow : 9.9 (AC-FT)

Summary Results for Reach "R-OB4-B"



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_100-yr Reach: R-OB4-B

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 100-yr Type II
Compute Time: 19Apr2024, 09:33:53	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Inflow : 96.1 (CFS)	Date/Time of Peak Inflow : 01Oct2021, 12:13
Peak Outflow : 95.9 (CFS)	Date/Time of Peak Outflow : 01Oct2021, 12:14
Total Inflow : 9.9 (AC-FT)	Total Outflow : 9.8 (AC-FT)

Summary Results for Subbasin "OB2"



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_100-yr Subbasin: OB2

Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type II  
Compute Time: 19Apr2024, 09:33:53 Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Discharge :	52.7 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:08
Total Precipitation :	10.8 (AC-FT)	Total Direct Runoff :	4.7 (AC-FT)
Total Loss :	6.0 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	4.7 (AC-FT)	Discharge :	4.7 (AC-FT)



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_100-yr Reach: R-OB2

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 100-yr Type II
Compute Time: 19Apr 2024, 09:33:53	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Inflow : 52.7 (CFS)	Date/Time of Peak Inflow : 01Oct2021, 12:08
Peak Outflow : 52.5 (CFS)	Date/Time of Peak Outflow : 01Oct2021, 12:09
Total Inflow : 4.7 (AC-FT)	Total Outflow : 4.7 (AC-FT)





Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_100-yr Subbasin: PB4

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Proposed
End of Run:	02Oct2021, 00:00	Meteorologic Model:	100-yr Type II
Compute Time:	19Apr2024, 09:33:53	Control Specifications:	24-hr Storm

Volume Units:  IN  AC-FT

## Computed Results

Peak Discharge :	30.2 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:00
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)

Summary Results for Reach "P10 (CULV2)"



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_100-yr Reach: P10 (CULV2)

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 100-yr Type II
Compute Time: 19Apr2024, 09:33:53	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Inflow : 150.3 (CFS)	Date/Time of Peak Inflow : 01Oct2021, 12:12
Peak Outflow : 150.2 (CFS)	Date/Time of Peak Outflow : 01Oct2021, 12:12
Total Inflow : 16.4 (AC-FT)	Total Outflow : 16.4 (AC-FT)



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_100-yr Reach: R-PB5

Start of Run: 01Oct2021, 00:00

Basin Model:

Eagleview\_Proposed

End of Run: 02Oct2021, 00:00

Meteorologic Model:

100-yr Type II

Compute Time: 19Apr 2024, 09:33:53

Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Inflow : 150.2 (CFS)

Date/Time of Peak Inflow : 01Oct2021, 12:12

Peak Outflow : 150.1 (CFS)

Date/Time of Peak Outflow : 01Oct2021, 12:13

Total Inflow : 16.4 (AC-FT)

Total Outflow : 16.4 (AC-FT)

Summary Results for Subbasin "PB6"



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_100-yr Subbasin: PB6

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Proposed
End of Run:	02Oct2021, 00:00	Meteorologic Model:	100-yr Type II
Compute Time:	19Apr2024, 09:33:53	Control Specifications:	24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Discharge :	20.7 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:10
Total Precipitation :	4.3 (AC-FT)	Total Direct Runoff :	2.0 (AC-FT)
Total Loss :	2.2 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	2.1 (AC-FT)	Discharge :	2.0 (AC-FT)



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_100-yr Subbasin: PB7

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Proposed
End of Run:	02Oct2021, 00:00	Meteorologic Model:	100-yr Type II
Compute Time:	19Apr2024, 09:33:53	Control Specifications:	24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Discharge :	7.4 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:08
Total Precipitation :	1.3 (AC-FT)	Total Direct Runoff :	0.7 (AC-FT)
Total Loss :	0.6 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	0.7 (AC-FT)	Discharge :	0.7 (AC-FT)



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_100-yr Reach: CULV4

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 100-yr Type II
Compute Time: 19Apr2024, 09:33:53	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Inflow : 7.4 (CFS)	Date/Time of Peak Inflow : 01Oct2021, 12:08
Peak Outflow : 7.4 (CFS)	Date/Time of Peak Outflow : 01Oct2021, 12:08
Total Inflow : 0.7 (AC-FT)	Total Outflow : 0.7 (AC-FT)

Summary Results for Reach "R-PB7-A"



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_100-yr Reach: R-PB7-A

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 100-yr Type II
Compute Time: 19Apr2024, 09:33:53	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Inflow : 7.4 (CFS)	Date/Time of Peak Inflow : 01Oct2021, 12:08
Peak Outflow : 7.4 (CFS)	Date/Time of Peak Outflow : 01Oct2021, 12:09
Total Inflow : 0.7 (AC-FT)	Total Outflow : 0.7 (AC-FT)



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_100-yr Reach: P11 (CULV3)

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 100-yr Type II
Compute Time: 19Apr2024, 09:33:53	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Inflow : 28.0 (CFS)	Date/Time of Peak Inflow : 01Oct2021, 12:10
Peak Outflow : 28.0 (CFS)	Date/Time of Peak Outflow : 01Oct2021, 12:10
Total Inflow : 2.7 (AC-FT)	Total Outflow : 2.7 (AC-FT)



Summary Results for Reach "R-PB7-B"



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_100-yr Reach: R-PB7-B

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 100-yr Type II
Compute Time: 19Apr2024, 09:33:53	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Inflow : 28.0 (CFS)	Date/Time of Peak Inflow : 01Oct2021, 12:10
Peak Outflow : 27.9 (CFS)	Date/Time of Peak Outflow : 01Oct2021, 12:11
Total Inflow : 2.7 (AC-FT)	Total Outflow : 2.7 (AC-FT)



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_100-yr Subbasin: PB3

Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type II  
Compute Time: 19Apr2024, 09:33:53 Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Discharge :	3.3 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:07
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)

Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_100-yr Reach: CULV1

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 100-yr Type II
Compute Time: 19Apr2024, 09:33:53	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Inflow : 3.3 (CFS)	Date/Time of Peak Inflow : 01Oct2021, 12:07
Peak Outflow : 3.3 (CFS)	Date/Time of Peak Outflow : 01Oct2021, 12:07
Total Inflow : 0.3 (AC-FT)	Total Outflow : 0.3 (AC-FT)



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_100-yr Reach: R-PB3

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Proposed
End of Run:	02Oct2021, 00:00	Meteorologic Model:	100-yr Type II
Compute Time:	19Apr2024, 09:33:53	Control Specifications:	24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Inflow :	3.3 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 12:07
Peak Outflow :	3.3 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 12:09
Total Inflow :	0.3 (AC-FT)	Total Outflow :	0.3 (AC-FT)

Summary Results for Junction "P4"



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_100-yr Junction: P4

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

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

Compute Time: 19Apr2024, 09:33:53 Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Outflow : 180.8 (CFS) Date/Time of Peak Outflow : 01Oct2021, 12:12  
Total Outflow : 19.4 (AC-FT)



Project: Eagleview\_Subdivision  
Simulation Run: EV\_Proposed\_100-yr Reach: R-PB7-C

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 100-yr Type II
Compute Time: 19Apr2024, 09:33:53	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Inflow : 180.8 (CFS)	Date/Time of Peak Inflow : 01Oct2021, 12:12
Peak Outflow : 180.8 (CFS)	Date/Time of Peak Outflow : 01Oct2021, 12:13
Total Inflow : 19.4 (AC-FT)	Total Outflow : 19.4 (AC-FT)

Summary Results for Subbasin "PB15"



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_100-yr Subbasin: PB15

Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type II  
Compute Time: 19Apr2024, 09:33:53 Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Discharge :	26.3 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:00
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)

Summary Results for Junction "P2"



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_100-yr Junction: P2

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 100-yr Type II
Compute Time: 19Apr2024, 09:33:53	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Outflow : 185.4 (CFS)	Date/Time of Peak Outflow : 01Oct2021, 12:13
Total Outflow : 21.1 (AC-FT)	





Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_100-yr Junction: OF-1

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 100-yr Type II
Compute Time: 19Apr2024, 09:33:53	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Outflow : 560.8 (CFS)	Date/Time of Peak Outflow : 01Oct2021, 12:43
Total Outflow : 135.7 (AC-FT)	

Summary Results for Subbasin "OB1"



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_100-yr Subbasin: OB1

Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type II  
Compute Time: 19Apr2024, 09:33:53 Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Discharge :	18.8 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:08
Total Precipitation :	4.0 (AC-FT)	Total Direct Runoff :	1.7 (AC-FT)
Total Loss :	2.3 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	1.7 (AC-FT)	Discharge :	1.7 (AC-FT)

Summary Results for Reach "R-OB1"



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_100-yr Reach: R-OB1

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 100-yr Type II
Compute Time: 19Apr2024, 09:33:53	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Inflow : 18.8 (CFS)	Date/Time of Peak Inflow : 01Oct2021, 12:08
Peak Outflow : 18.7 (CFS)	Date/Time of Peak Outflow : 01Oct2021, 12:09
Total Inflow : 1.7 (AC-FT)	Total Outflow : 1.7 (AC-FT)

Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_100-yr Subbasin: PB1

Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type II  
Compute Time: 19Apr2024, 09:33:53 Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Discharge :	7.7 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:09
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)



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_100-yr Junction: P1

Start of Run: 01Oct2021, 00:00	Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00	Meteorologic Model: 100-yr Type II
Compute Time: 19Apr2024, 09:33:53	Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Outflow : 26.4 (CFS)	Date/Time of Peak Outflow : 01Oct2021, 12:09
Total Outflow : 2.4 (AC-FT)	



Project: Eagleview\_Subdivision

Simulation Run: EV\_Proposed\_100-yr Subbasin: PB2

Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview\_Proposed  
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type II  
Compute Time: 19Apr2024, 09:33:53 Control Specifications: 24-hr Storm

Volume Units:  IN  AC-FT

Computed Results

Peak Discharge :	2.4 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:06
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)

## Worksheet for R-B1 (Tri)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.030
Channel Slope	0.031 ft/ft
Left Side Slope	1.300 H:V
Right Side Slope	1.300 H:V
Discharge	18.80 cfs
Results	
Normal Depth	18.3 in
Flow Area	3.0 ft <sup>2</sup>
Wetted Perimeter	5.0 ft
Hydraulic Radius	7.2 in
Top Width	3.96 ft
Critical Depth	20.0 in
Critical Slope	0.019 ft/ft
Velocity	6.23 ft/s
Velocity Head	0.60 ft
Specific Energy	2.13 ft
Froude Number	1.258
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	18.3 in
Critical Depth	20.0 in
Channel Slope	0.031 ft/ft
Critical Slope	0.019 ft/ft

## Worksheet for R-OB4 (Tri)

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.030
Channel Slope	0.020 ft/ft
Left Side Slope	1.300 H:V
Right Side Slope	1.300 H:V
Discharge	136.10 cfs
Results	
Normal Depth	41.7 in
Flow Area	15.7 ft <sup>2</sup>
Wetted Perimeter	11.4 ft
Hydraulic Radius	16.5 in
Top Width	9.03 ft
Critical Depth	44.2 in
Critical Slope	0.015 ft/ft
Velocity	8.67 ft/s
Velocity Head	1.17 ft
Specific Energy	4.64 ft
Froude Number	1.160
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	41.7 in
Critical Depth	44.2 in
Channel Slope	0.020 ft/ft
Critical Slope	0.015 ft/ft



## Worksheet for R-OB5 (Trap)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.030
Channel Slope	0.020 ft/ft
Left Side Slope	3.000 H:V
Right Side Slope	3.000 H:V
Bottom Width	15.00 ft
Discharge	106.90 cfs
Results	
Normal Depth	11.6 in
Flow Area	17.4 ft <sup>2</sup>
Wetted Perimeter	21.1 ft
Hydraulic Radius	9.9 in
Top Width	20.82 ft
Critical Depth	13.0 in
Critical Slope	0.014 ft/ft
Velocity	6.15 ft/s
Velocity Head	0.59 ft
Specific Energy	1.56 ft
Froude Number	1.187
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	11.6 in
Critical Depth	13.0 in
Channel Slope	0.020 ft/ft
Critical Slope	0.014 ft/ft

## Worksheet for R-OB6 (Trap)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

---

Input Data	
Roughness Coefficient	0.030
Channel Slope	0.020 ft/ft
Left Side Slope	3.000 H:V
Right Side Slope	3.000 H:V
Bottom Width	15.00 ft
Discharge	371.30 cfs

---

Results	
Normal Depth	23.4 in
Flow Area	40.7 ft <sup>2</sup>
Wetted Perimeter	27.3 ft
Hydraulic Radius	17.9 in
Top Width	26.70 ft
Critical Depth	27.3 in
Critical Slope	0.011 ft/ft
Velocity	9.13 ft/s
Velocity Head	1.30 ft
Specific Energy	3.25 ft
Froude Number	1.304
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	23.4 in
Critical Depth	27.3 in
Channel Slope	0.020 ft/ft
Critical Slope	0.011 ft/ft

## Worksheet for R-OB7 (Trap)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.030
Channel Slope	0.020 ft/ft
Left Side Slope	3.000 H:V
Right Side Slope	3.000 H:V
Bottom Width	15.00 ft
Discharge	478.00 cfs
Results	
Normal Depth	26.8 in
Flow Area	48.6 ft <sup>2</sup>
Wetted Perimeter	29.1 ft
Hydraulic Radius	20.0 in
Top Width	28.42 ft
Critical Depth	31.6 in
Critical Slope	0.011 ft/ft
Velocity	9.84 ft/s
Velocity Head	1.51 ft
Specific Energy	3.74 ft
Froude Number	1.328
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	26.8 in
Critical Depth	31.6 in
Channel Slope	0.020 ft/ft
Critical Slope	0.011 ft/ft

## Worksheet for R-OB8 (Tri)

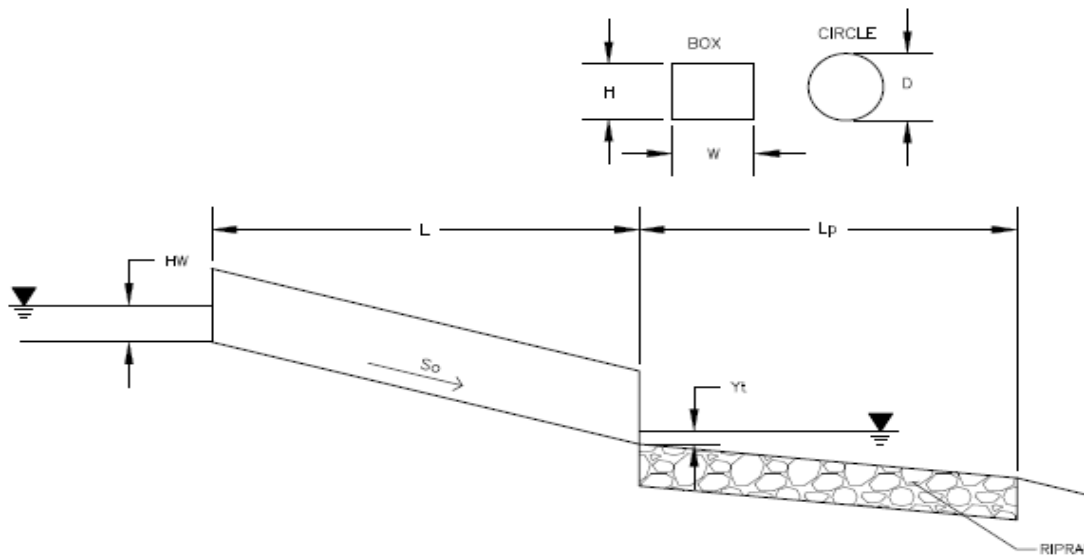
Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.030
Channel Slope	0.033 ft/ft
Left Side Slope	1.300 H:V
Right Side Slope	1.300 H:V
Discharge	51.60 cfs
Results	
Normal Depth	26.4 in
Flow Area	6.3 ft <sup>2</sup>
Wetted Perimeter	7.2 ft
Hydraulic Radius	10.5 in
Top Width	5.72 ft
Critical Depth	30.0 in
Critical Slope	0.017 ft/ft
Velocity	8.21 ft/s
Velocity Head	1.05 ft
Specific Energy	3.25 ft
Froude Number	1.380
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	26.4 in
Critical Depth	30.0 in
Channel Slope	0.033 ft/ft
Critical Slope	0.017 ft/ft

***APPENDIX C: HYDRAULICS***

# DETERMINATION OF CULVERT HEADWATER AND OUTLET PROTECTION

MHFD-Culvert, Version 4.00 (May 2020)

**Project:** Eagleview  
**ID:** EXISTING Culvert - Arroya Lane



**Soil Type:**

Choose One:

Sandy

Non-Sandy

**Supercritical Flow! Using Adjusted Diameter to calculate protection type.**

**Design Information:**

Design Discharge	Q = <input type="text" value="106.9"/> cfs
Circular Culvert:	
Barrel Diameter in Inches	D = <input type="text" value="48"/> inches
Inlet Edge Type (Choose from pull-down list)	Square Edge Projecting
<b>OR:</b>	
Box Culvert:	
Barrel Height (Rise) in Feet	H (Rise) = <input type="text" value="OR"/> ft
Barrel Width (Span) in Feet	W (Span) = <input type="text" value="OR"/> ft
Inlet Edge Type (Choose from pull-down list)	
Number of Barrels	# Barrels = <input type="text" value="1"/>
Inlet Elevation	Elev IN = <input type="text" value="7267.4"/> ft
Outlet Elevation <b>OR</b> Slope	Elev OUT = <input type="text" value="7265.7"/> ft
Culvert Length	L = <input type="text" value="61.5"/> ft
Manning's Roughness	n = <input type="text" value="0.012"/>
Bend Loss Coefficient	k <sub>b</sub> = <input type="text" value="0"/>
Exit Loss Coefficient	k <sub>x</sub> = <input type="text" value="1"/>
Tailwater Surface Elevation	Y <sub>t</sub> , Elevation = <input type="text" value="OR"/> ft
Max Allowable Channel Velocity	V = <input type="text" value="5"/> ft/s

**Calculated Results:**

Culvert Cross Sectional Area Available	A = <input type="text" value="12.57"/> ft <sup>2</sup>
Culvert Normal Depth	Y <sub>n</sub> = <input type="text" value="1.79"/> ft
Culvert Critical Depth	Y <sub>c</sub> = <input type="text" value="3.13"/> ft
Froude Number	Fr = <input type="text" value="2.96"/> <b>Supercritical!</b>
Entrance Loss Coefficient	k <sub>e</sub> = <input type="text" value="0.20"/>
Friction Loss Coefficient	k <sub>f</sub> = <input type="text" value="0.26"/>
Sum of All Loss Coefficients	k <sub>s</sub> = <input type="text" value="1.46"/> ft

**Headwater:**

Inlet Control Headwater	HW <sub>I</sub> = <input type="text" value="5.58"/> ft
Outlet Control Headwater	HW <sub>O</sub> = <input type="text" value="3.50"/> ft
<b>Design Headwater Elevation</b>	<b>HW = <input type="text" value="7272.98"/> ft</b>
<b>Headwater/Diameter <u>OR</u> Headwater/Rise Ratio</b>	<b>HW/D = <input type="text" value="1.39"/></b>

**Outlet Protection:**

Flow/(Diameter <sup>2.5</sup> )	Q/D <sup>2.5</sup> = <input type="text" value="3.34"/> ft <sup>0.5</sup> /s
Tailwater Surface Height	Y <sub>t</sub> = <input type="text" value="1.60"/> ft
Tailwater/Diameter	Y <sub>t</sub> /D = <input type="text" value="0.40"/>
Expansion Factor	1/(2*tan(θ)) = <input type="text" value="4.08"/>
Flow Area at Max Channel Velocity	A <sub>t</sub> = <input type="text" value="21.38"/> ft <sup>2</sup>
Width of Equivalent Conduit for Multiple Barrels	W <sub>eq</sub> = <input type="text" value="-"/> ft
<b>Length of Riprap Protection</b>	<b>L<sub>p</sub> = <input type="text" value="39"/> ft</b>
<b>Width of Riprap Protection at Downstream End</b>	<b>T = <input type="text" value="14"/> ft</b>
Adjusted Diameter for Supercritical Flow	Da = <input type="text" value="2.89"/> ft
Minimum Theoretical Riprap Size	d <sub>50</sub> min = <input type="text" value="12"/> in
Nominal Riprap Size	d <sub>50</sub> nominal = <input type="text" value="18"/> in
<b>MHFD Riprap Type</b>	<b>Type = <input type="text" value="H"/></b>

**Culvert Summary Table**

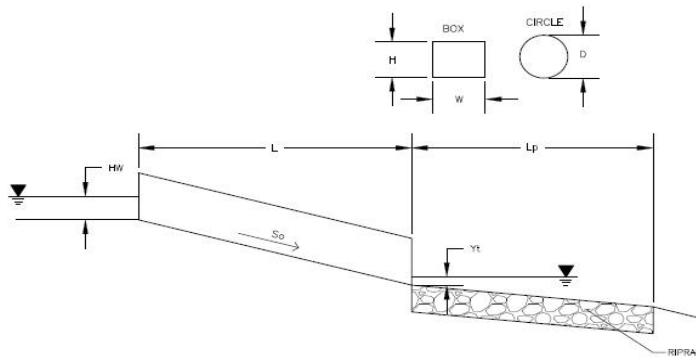
Culvert	Design Point	Pipe Size (in)	Barrels (No.)	Design Discharge Q100 (cfs)	Low Tailwater Basin Bottom Width -W (ft)	Low Tailwater Basin Length - L (ft)	Low Tailwater Basin Top Width (ft)	Headwater Depth	Upstream Invert	HW/D	HGL (Upstream Ponding Depth Elevation)	Culvert Normal Depth [HGL in Culvert] (ft)
(Ex.) Arroya Ln	OB5	48	1	106.9	11	24	23	5.58	7267.4	1.40	7272.98	1.79
1	PB3	18	1	3.3	4	15	16	1	7207.85	0.67	7208.85	0.56
2	P10	36	3	150.2	26	20	38	4	7205.31	1.33	7209.31	2.41
3	P11	24	2	28	12	15	24	2.13	7204.44	1.07	7206.57	1.08
4	PB7	18	1	7.4	4	15	16	1.71	7210.32	1.14	7212.03	0.94
5	N/A	18	1	0.9	4	15	16	0.48	7232.7	0.32	7233.18	0.36
6	P9	36	2	87.8	16	20	28	3.26	7214.87	1.09	7218.13	1.73
7	P5	36	2	96.1	16	20	28	3.82	7230.29	1.27	7234.11	1.35
8	P12	66	2	474.8	22	32	34	7.7	7201.96	1.40	7209.66	4.04
Det Pond 3	N/A	42	1	101	11	24	23	N/A	7230.04	N/A	N/A	3.5
*WQ Pond 1	N/A	24	1	19.3	4	15	16	N/A	7192	N/A	N/A	2
*WQ Pond 2	N/A	18	1	7.6	4	15	16	N/A	7199.39	N/A	N/A	0.98

\*The water quality ponds are designed to release the 2-year flow.

# DETERMINATION OF CULVERT HEADWATER AND OUTLET PROTECTION

MHFD-Culvert, Version 4.00 (May 2020)

Project: Eagleview  
 ID: Culvert 1



Soil Type:  
 Choose One:  
 Sandy  
 Non-Sandy

Supercritical Flow! Using Adjusted Diameter to calculate protection type.

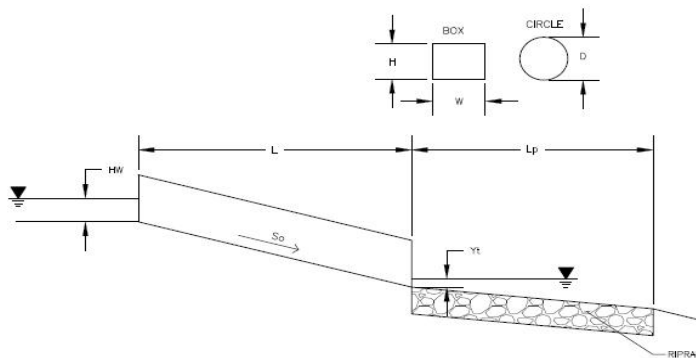
Design Information:	
Design Discharge	Q = <input type="text" value="3.3"/> cfs
Circular Culvert:	
Barrel Diameter in Inches	D = <input type="text" value="18"/> inches
Inlet Edge Type (Choose from pull-down list)	Square Edge with Headwall
OR:	
Box Culvert:	
Barrel Height (Rise) in Feet	H (Rise) = <input type="text" value="OR"/> ft
Barrel Width (Span) in Feet	W (Span) = <input type="text" value="OR"/> ft
Inlet Edge Type (Choose from pull-down list)	
Number of Barrels	# Barrels = <input type="text" value="1"/>
Inlet Elevation	Elev IN = <input type="text" value="7207.85"/> ft
Outlet Elevation <u>OR</u> Slope	Elev OUT = <input type="text" value="7207.09"/> ft
Culvert Length	L = <input type="text" value="79.8"/> ft
Manning's Roughness	n = <input type="text" value="0.012"/>
Bend Loss Coefficient	k <sub>b</sub> = <input type="text" value="0"/>
Exit Loss Coefficient	k <sub>x</sub> = <input type="text" value="1"/>
Tailwater Surface Elevation	Y <sub>t</sub> , Elevation = <input type="text" value=""/> ft
Max Allowable Channel Velocity	V = <input type="text" value="5"/> ft/s
Calculated Results:	
Culvert Cross Sectional Area Available	A = <input type="text" value="1.77"/> ft <sup>2</sup>
Culvert Normal Depth	Y <sub>n</sub> = <input type="text" value="0.56"/> ft
Culvert Critical Depth	Y <sub>c</sub> = <input type="text" value="0.69"/> ft
Froude Number	Fr = <input type="text" value="1.50"/> <span style="color: red;">Supercritical!</span>
Entrance Loss Coefficient	k <sub>e</sub> = <input type="text" value="0.50"/>
Friction Loss Coefficient	k <sub>f</sub> = <input type="text" value="1.23"/>
Sum of All Loss Coefficients	k <sub>s</sub> = <input type="text" value="2.73"/> ft
Headwater:	
Inlet Control Headwater	HW <sub>I</sub> = <input type="text" value="1.00"/> ft
Outlet Control Headwater	HW <sub>O</sub> = <input type="text" value="N/A"/> ft
Design Headwater Elevation	HW = <input type="text" value="N/A"/> ft
Headwater/Diameter <u>OR</u> Headwater/Rise Ratio	HW/D = <input type="text" value="N/A"/>
Outlet Control Headwater Approximation Method Inaccurate for Low Flow - Backwater Calculations Required	
Outlet Protection:	
Flow/(Diameter <sup>2.5</sup> )	Q/D <sup>2.5</sup> = <input type="text" value="1.20"/> ft <sup>0.5</sup> /s
Tailwater Surface Height	Y <sub>t</sub> = <input type="text" value="0.60"/> ft
Tailwater/Diameter	Y <sub>t</sub> /D = <input type="text" value="0.40"/>
Expansion Factor	1/(2*tan(Θ)) = <input type="text" value="6.51"/>
Flow Area at Max Channel Velocity	A <sub>t</sub> = <input type="text" value="0.66"/> ft <sup>2</sup>
Width of Equivalent Conduit for Multiple Barrels	W <sub>eq</sub> = <input type="text" value="-"/> ft
Length of Riprap Protection	L <sub>p</sub> = <input type="text" value="5"/> ft
Width of Riprap Protection at Downstream End	T = <input type="text" value="3"/> ft
Adjusted Diameter for Supercritical Flow	Da = <input type="text" value="1.03"/> ft
Minimum Theoretical Riprap Size	d <sub>50</sub> min = <input type="text" value="2"/> in
Nominal Riprap Size	d <sub>50</sub> nominal = <input type="text" value="6"/> in
MHFD Riprap Type	Type = <input type="text" value="VL"/>



# DETERMINATION OF CULVERT HEADWATER AND OUTLET PROTECTION

*MHFD-Culvert, Version 4.00 (May 2020)*

Project: Eagleview  
 ID: Culvert 2



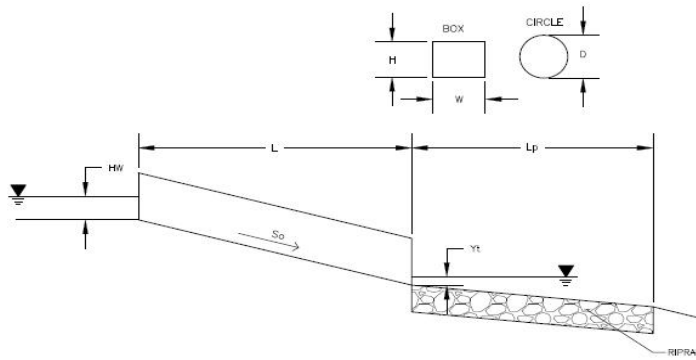
Soil Type:  
 Choose One:  
 Sandy  
 Non-Sandy

Design Information:	
Design Discharge	Q = <input style="width: 100px;" type="text" value="150.2"/> cfs
Circular Culvert:	
Barrel Diameter in Inches	D = <input style="width: 100px;" type="text" value="36"/> inches
Inlet Edge Type (Choose from pull-down list)	Square Edge with Headwall
<u>OR</u> :	
Box Culvert:	
Barrel Height (Rise) in Feet	H (Rise) = <input style="width: 100px;" type="text" value="OR"/> ft
Barrel Width (Span) in Feet	W (Span) = <input style="width: 100px;" type="text" value="OR"/> ft
Inlet Edge Type (Choose from pull-down list)	
Number of Barrels	# Barrels = <input style="width: 100px;" type="text" value="3"/>
Inlet Elevation	Elev IN = <input style="width: 100px;" type="text" value="7205.35"/> ft
Outlet Elevation <u>OR</u> Slope	Elev OUT = <input style="width: 100px;" type="text" value="7204.97"/> ft
Culvert Length	L = <input style="width: 100px;" type="text" value="76.5"/> ft
Manning's Roughness	n = <input style="width: 100px;" type="text" value="0.012"/>
Bend Loss Coefficient	k <sub>b</sub> = <input style="width: 100px;" type="text" value="0"/>
Exit Loss Coefficient	k <sub>x</sub> = <input style="width: 100px;" type="text" value="1"/>
Tailwater Surface Elevation	Y <sub>t</sub> , Elevation = <input style="width: 100px;" type="text" value=""/> ft
Max Allowable Channel Velocity	V = <input style="width: 100px;" type="text" value="5"/> ft/s
Calculated Results:	
Culvert Cross Sectional Area Available	A = <input style="width: 100px;" type="text" value="7.07"/> ft <sup>2</sup>
Culvert Normal Depth	Y <sub>n</sub> = <input style="width: 100px;" type="text" value="2.41"/> ft
Culvert Critical Depth	Y <sub>c</sub> = <input style="width: 100px;" type="text" value="2.30"/> ft
Froude Number	Fr = <input style="width: 100px;" type="text" value="0.91"/>
Entrance Loss Coefficient	k <sub>e</sub> = <input style="width: 100px;" type="text" value="0.50"/>
Friction Loss Coefficient	k <sub>f</sub> = <input style="width: 100px;" type="text" value="0.47"/>
Sum of All Loss Coefficients	k <sub>s</sub> = <input style="width: 100px;" type="text" value="1.97"/> ft
Headwater:	
Inlet Control Headwater	HW <sub>i</sub> = <input style="width: 100px;" type="text" value="4.00"/> ft
Outlet Control Headwater	HW <sub>o</sub> = <input style="width: 100px;" type="text" value="3.81"/> ft
Design Headwater Elevation	HW = <input style="width: 100px;" type="text" value="7209.35"/> ft
Headwater/Diameter <u>OR</u> Headwater/Rise Ratio	HW/D = <input style="width: 100px;" type="text" value="1.33"/>
Outlet Protection:	
Flow/(Diameter <sup>2.5</sup> )	Q/D <sup>2.5</sup> = <input style="width: 100px;" type="text" value="3.21"/> ft <sup>0.5</sup> /s
Tailwater Surface Height	Y <sub>t</sub> = <input style="width: 100px;" type="text" value="1.20"/> ft
Tailwater/Diameter	Y <sub>t</sub> /D = <input style="width: 100px;" type="text" value="0.40"/>
Expansion Factor	1/(2*tan(Θ)) = <input style="width: 100px;" type="text" value="4.20"/>
Flow Area at Max Channel Velocity	A <sub>t</sub> = <input style="width: 100px;" type="text" value="30.04"/> ft <sup>2</sup>
Width of Equivalent Conduit for Multiple Barrels	W <sub>eq</sub> = <input style="width: 100px;" type="text" value="9.00"/> ft
Length of Riprap Protection	L <sub>p</sub> = <input style="width: 100px;" type="text" value="30"/> ft
Width of Riprap Protection at Downstream End	T = <input style="width: 100px;" type="text" value="17"/> ft
Adjusted Diameter for Supercritical Flow	Da = <input style="width: 100px;" type="text" value="-"/> ft
Minimum Theoretical Riprap Size	d <sub>50</sub> min = <input style="width: 100px;" type="text" value="8"/> in
Nominal Riprap Size	d <sub>50</sub> nominal = <input style="width: 100px;" type="text" value="9"/> in
MHFD Riprap Type	Type = <input style="width: 100px;" type="text" value="L"/>

# DETERMINATION OF CULVERT HEADWATER AND OUTLET PROTECTION

MHFD-Culvert, Version 4.00 (May 2020)

Project: Eagleview  
 ID: Culvert 3



Soil Type:  
 Choose One:  
 Sandy  
 Non-Sandy

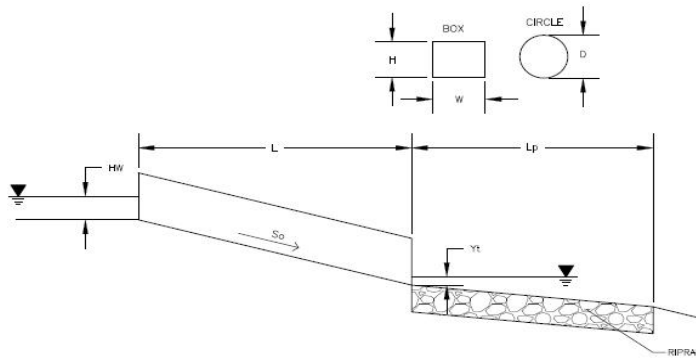
Supercritical Flow! Using Adjusted Diameter to calculate protection type.

Design Information:	
Design Discharge	Q = <input type="text" value="28"/> cfs
<b>Circular Culvert:</b>	
Barrel Diameter in Inches	D = <input type="text" value="24"/> inches
Inlet Edge Type (Choose from pull-down list)	Square Edge with Headwall
<b>OR:</b>	
<b>Box Culvert:</b>	
Barrel Height (Rise) in Feet	H (Rise) = <input type="text" value="OR"/> ft
Barrel Width (Span) in Feet	W (Span) = <input type="text" value="OR"/> ft
Inlet Edge Type (Choose from pull-down list)	
Number of Barrels	# Barrels = <input type="text" value="2"/>
Inlet Elevation	Elev IN = <input type="text" value="7204.5"/> ft
Outlet Elevation <u>OR</u> Slope	Elev OUT = <input type="text" value="7203.49"/> ft
Culvert Length	L = <input type="text" value="100.6"/> ft
Manning's Roughness	n = <input type="text" value="0.012"/>
Bend Loss Coefficient	k <sub>b</sub> = <input type="text" value="0"/>
Exit Loss Coefficient	k <sub>x</sub> = <input type="text" value="1"/>
Tailwater Surface Elevation	Y <sub>t</sub> , Elevation = <input type="text" value=""/> ft
Max Allowable Channel Velocity	V = <input type="text" value="5"/> ft/s
Calculated Results:	
Culvert Cross Sectional Area Available	A = <input type="text" value="3.14"/> ft <sup>2</sup>
Culvert Normal Depth	Y <sub>n</sub> = <input type="text" value="1.08"/> ft
Culvert Critical Depth	Y <sub>c</sub> = <input type="text" value="1.35"/> ft
Froude Number	Fr = <input type="text" value="1.53"/> <span style="color: red;">Supercritical!</span>
Entrance Loss Coefficient	k <sub>e</sub> = <input type="text" value="0.50"/>
Friction Loss Coefficient	k <sub>f</sub> = <input type="text" value="1.06"/>
Sum of All Loss Coefficients	k <sub>s</sub> = <input type="text" value="2.56"/> ft
<b>Headwater:</b>	
Inlet Control Headwater	HW <sub>I</sub> = <input type="text" value="2.13"/> ft
Outlet Control Headwater	HW <sub>O</sub> = <input type="text" value="N/A"/> ft
Design Headwater Elevation	HW = <input type="text" value="7206.63"/> ft
Headwater/Diameter <u>OR</u> Headwater/Rise Ratio	HW/D = <input type="text" value="1.07"/>
Outlet Control Headwater Approximation Method Inaccurate for Low Flow - Backwater Calculations Required	
<b>Outlet Protection:</b>	
Flow/(Diameter <sup>2.5</sup> )	Q/D <sup>2.5</sup> = <input type="text" value="2.47"/> ft <sup>0.5</sup> /s
Tailwater Surface Height	Y <sub>t</sub> = <input type="text" value="0.80"/> ft
Tailwater/Diameter	Y <sub>t</sub> /D = <input type="text" value="0.40"/>
Expansion Factor	1/(2*tan(Θ)) = <input type="text" value="5.10"/>
Flow Area at Max Channel Velocity	A <sub>t</sub> = <input type="text" value="5.60"/> ft <sup>2</sup>
Width of Equivalent Conduit for Multiple Barrels	W <sub>eq</sub> = <input type="text" value="4.00"/> ft
Length of Riprap Protection	L <sub>p</sub> = <input type="text" value="16"/> ft
Width of Riprap Protection at Downstream End	T = <input type="text" value="8"/> ft
Adjusted Diameter for Supercritical Flow	Da = <input type="text" value="1.54"/> ft
Minimum Theoretical Riprap Size	d <sub>50</sub> min = <input type="text" value="4"/> in
Nominal Riprap Size	d <sub>50</sub> nominal = <input type="text" value="6"/> in
MHFD Riprap Type	Type = <input type="text" value="VL"/>

# DETERMINATION OF CULVERT HEADWATER AND OUTLET PROTECTION

MHFD-Culvert, Version 4.00 (May 2020)

Project: Eagleview  
 ID: Culvert 4



Soil Type:  
 Choose One:  
 Sandy  
 Non-Sandy

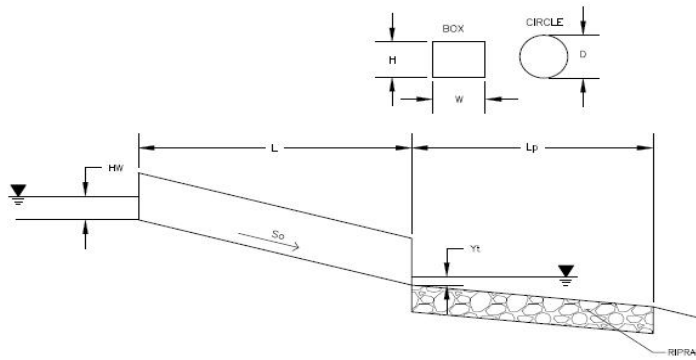
Supercritical Flow! Using Adjusted Diameter to calculate protection type.

Design Information:	
Design Discharge	Q = <input type="text" value="7.4"/> cfs
<b>Circular Culvert:</b>	
Barrel Diameter in Inches	D = <input type="text" value="18"/> inches
Inlet Edge Type (Choose from pull-down list)	Square Edge with Headwall
<b>OR:</b>	
<b>Box Culvert:</b>	
Barrel Height (Rise) in Feet	H (Rise) = <input type="text" value="OR"/> ft
Barrel Width (Span) in Feet	W (Span) = <input type="text" value="OR"/> ft
Inlet Edge Type (Choose from pull-down list)	
Number of Barrels	# Barrels = <input type="text" value="1"/>
Inlet Elevation	Elev IN = <input type="text" value="7210.32"/> ft
Outlet Elevation <b>OR</b> Slope	Elev OUT = <input type="text" value="7209.67"/> ft
Culvert Length	L = <input type="text" value="78.9"/> ft
Manning's Roughness	n = <input type="text" value="0.012"/>
Bend Loss Coefficient	$k_b$ = <input type="text" value="0"/>
Exit Loss Coefficient	$k_x$ = <input type="text" value="1"/>
Tailwater Surface Elevation	$Y_t$ , Elevation = <input type="text" value=""/> ft
Max Allowable Channel Velocity	V = <input type="text" value="5"/> ft/s
Calculated Results:	
Culvert Cross Sectional Area Available	A = <input type="text" value="1.77"/> ft <sup>2</sup>
Culvert Normal Depth	$Y_n$ = <input type="text" value="0.94"/> ft
Culvert Critical Depth	$Y_c$ = <input type="text" value="1.05"/> ft
Froude Number	Fr = <input type="text" value="1.25"/> <span style="color: red;">Supercritical!</span>
Entrance Loss Coefficient	$k_e$ = <input type="text" value="0.50"/>
Friction Loss Coefficient	$k_f$ = <input type="text" value="1.22"/>
Sum of All Loss Coefficients	$k_s$ = <input type="text" value="2.72"/> ft
<b>Headwater:</b>	
Inlet Control Headwater	$HW_i$ = <input type="text" value="1.71"/> ft
Outlet Control Headwater	$HW_o$ = <input type="text" value="1.37"/> ft
Design Headwater Elevation	HW = <input type="text" value="7212.03"/> ft
Headwater/Diameter <b>OR</b> Headwater/Rise Ratio	HW/D = <input type="text" value="1.14"/>
<b>Outlet Protection:</b>	
Flow/(Diameter <sup>2.5</sup> )	Q/D <sup>2.5</sup> = <input type="text" value="2.69"/> ft <sup>0.5</sup> /s
Tailwater Surface Height	$Y_t$ = <input type="text" value="0.60"/> ft
Tailwater/Diameter	$Y_t/D$ = <input type="text" value="0.40"/>
Expansion Factor	$1/(2*\tan(\Theta))$ = <input type="text" value="4.81"/>
Flow Area at Max Channel Velocity	$A_t$ = <input type="text" value="1.48"/> ft <sup>2</sup>
Width of Equivalent Conduit for Multiple Barrels	$W_{eq}$ = <input type="text" value="-"/> ft
Length of Riprap Protection	$L_p$ = <input type="text" value="5"/> ft
Width of Riprap Protection at Downstream End	T = <input type="text" value="3"/> ft
Adjusted Diameter for Supercritical Flow	Da = <input type="text" value="1.22"/> ft
Minimum Theoretical Riprap Size	$d_{50 \text{ min}}$ = <input type="text" value="4"/> in
Nominal Riprap Size	$d_{50 \text{ nominal}}$ = <input type="text" value="6"/> in
MHFD Riprap Type	Type = <input type="text" value="VL"/>

# DETERMINATION OF CULVERT HEADWATER AND OUTLET PROTECTION

MHFD-Culvert, Version 4.00 (May 2020)

Project: Eagleview  
 ID: Culvert 5



Soil Type:  
 Choose One:  
 Sandy  
 Non-Sandy

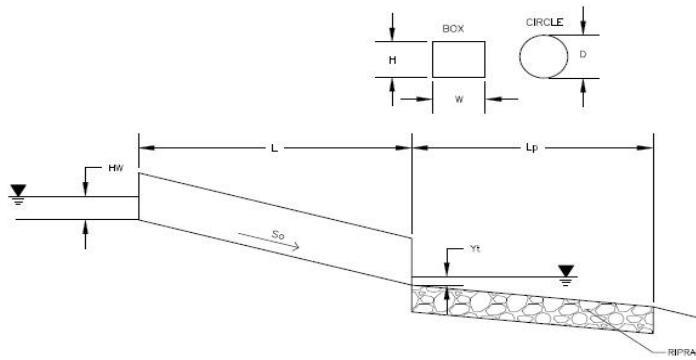
Supercritical Flow! Using Adjusted Diameter to calculate protection type.

Design Information:	
Design Discharge	Q = <input type="text" value="0.9"/> cfs
Circular Culvert:	
Barrel Diameter in Inches	D = <input type="text" value="18"/> inches
Inlet Edge Type (Choose from pull-down list)	Square Edge with Headwall
OR:	
Box Culvert:	
Barrel Height (Rise) in Feet	H (Rise) = <input type="text" value="OR"/> ft
Barrel Width (Span) in Feet	W (Span) = <input type="text" value="OR"/> ft
Inlet Edge Type (Choose from pull-down list)	
Number of Barrels	# Barrels = <input type="text" value="1"/>
Inlet Elevation	Elev IN = <input type="text" value="7232.7"/> ft
Outlet Elevation OR Slope	Elev OUT = <input type="text" value="7231.3"/> ft
Culvert Length	L = <input type="text" value="70.2"/> ft
Manning's Roughness	n = <input type="text" value="0.012"/>
Bend Loss Coefficient	k <sub>b</sub> = <input type="text" value="0"/>
Exit Loss Coefficient	k <sub>x</sub> = <input type="text" value="1"/>
Tailwater Surface Elevation	Y <sub>t</sub> , Elevation = <input type="text" value=""/> ft
Max Allowable Channel Velocity	V = <input type="text" value="5"/> ft/s
Calculated Results:	
Culvert Cross Sectional Area Available	A = <input type="text" value="1.77"/> ft <sup>2</sup>
Culvert Normal Depth	Y <sub>n</sub> = <input type="text" value="0.24"/> ft
Culvert Critical Depth	Y <sub>c</sub> = <input type="text" value="0.35"/> ft
Froude Number	Fr = <input type="text" value="2.12"/> <span style="color: red;">Supercritical!</span>
Entrance Loss Coefficient	k <sub>e</sub> = <input type="text" value="0.50"/>
Friction Loss Coefficient	k <sub>f</sub> = <input type="text" value="1.08"/>
Sum of All Loss Coefficients	k <sub>s</sub> = <input type="text" value="2.58"/> ft
Headwater:	
Inlet Control Headwater	HW <sub>i</sub> = <input type="text" value="0.48"/> ft
Outlet Control Headwater	HW <sub>o</sub> = <input type="text" value="N/A"/> ft
Design Headwater Elevation	HW = <input type="text" value="N/A"/> ft
Headwater/Diameter OR Headwater/Rise Ratio	HW/D = <input type="text" value="N/A"/>
Outlet Control Headwater Approximation Method Inaccurate for Low Flow - Backwater Calculations Required	
Outlet Protection:	
Flow/(Diameter <sup>2.5</sup> )	Q/D <sup>2.5</sup> = <input type="text" value="0.33"/> ft <sup>0.5</sup> /s
Tailwater Surface Height	Y <sub>t</sub> = <input type="text" value="0.60"/> ft
Tailwater/Diameter	Y <sub>t</sub> /D = <input type="text" value="0.40"/>
Expansion Factor	1/(2*tan(Θ)) = <input type="text" value="6.70"/>
Flow Area at Max Channel Velocity	A <sub>t</sub> = <input type="text" value="0.18"/> ft <sup>2</sup>
Width of Equivalent Conduit for Multiple Barrels	W <sub>eq</sub> = <input type="text" value="-"/> ft
Length of Riprap Protection	L <sub>p</sub> = <input type="text" value="5"/> ft
Width of Riprap Protection at Downstream End	T = <input type="text" value="3"/> ft
Adjusted Diameter for Supercritical Flow	Da = <input type="text" value="0.87"/> ft
Minimum Theoretical Riprap Size	d <sub>50</sub> min = <input type="text" value="0"/> in
Nominal Riprap Size	d <sub>50</sub> nominal = <input type="text" value="6"/> in
MHFD Riprap Type	Type = <input type="text" value="VL"/>

# DETERMINATION OF CULVERT HEADWATER AND OUTLET PROTECTION

MHFD-Culvert, Version 4.00 (May 2020)

Project: Eagleview  
 ID: Culvert 6



Soil Type:  
 Choose One:  
 Sandy  
 Non-Sandy

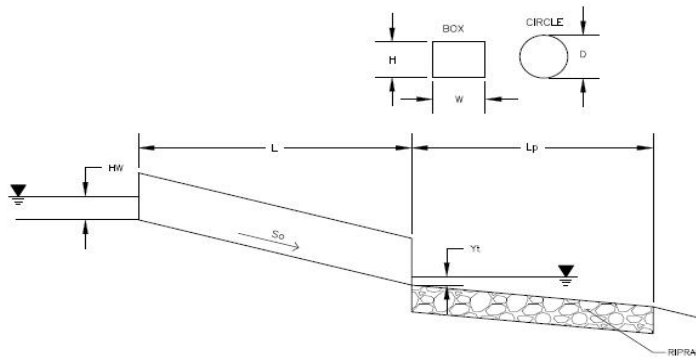
Supercritical Flow! Using Adjusted Diameter to calculate protection type.

Design Information:	
Design Discharge	Q = <input type="text" value="87.8"/> cfs
<b>Circular Culvert:</b>	
Barrel Diameter in Inches	D = <input type="text" value="36"/> inches
Inlet Edge Type (Choose from pull-down list)	Square Edge with Headwall
<b>OR:</b>	
<b>Box Culvert:</b>	
Barrel Height (Rise) in Feet	H (Rise) = <input type="text" value="OR"/> ft
Barrel Width (Span) in Feet	W (Span) = <input type="text" value="OR"/> ft
Inlet Edge Type (Choose from pull-down list)	
Number of Barrels	# Barrels = <input type="text" value="2"/>
Inlet Elevation	Elev IN = <input type="text" value="7214.87"/> ft
Outlet Elevation <u>OR</u> Slope	Elev OUT = <input type="text" value="7214.25"/> ft
Culvert Length	L = <input type="text" value="83.3"/> ft
Manning's Roughness	n = <input type="text" value="0.012"/>
Bend Loss Coefficient	$k_b$ = <input type="text" value="0"/>
Exit Loss Coefficient	$k_x$ = <input type="text" value="1"/>
Tailwater Surface Elevation	$Y_t$ , Elevation = <input type="text" value=""/> ft
Max Allowable Channel Velocity	V = <input type="text" value="5"/> ft/s
Calculated Results:	
Culvert Cross Sectional Area Available	A = <input type="text" value="7.07"/> ft <sup>2</sup>
Culvert Normal Depth	$Y_n$ = <input type="text" value="1.85"/> ft
Culvert Critical Depth	$Y_c$ = <input type="text" value="2.16"/> ft
Froude Number	Fr = <input type="text" value="1.35"/> <span style="color: red;">Supercritical!</span>
Entrance Loss Coefficient	$k_e$ = <input type="text" value="0.50"/>
Friction Loss Coefficient	$k_f$ = <input type="text" value="0.51"/>
Sum of All Loss Coefficients	$k_s$ = <input type="text" value="2.01"/> ft
<b>Headwater:</b>	
Inlet Control Headwater	$HW_i$ = <input type="text" value="3.55"/> ft
Outlet Control Headwater	$HW_o$ = <input type="text" value="3.16"/> ft
Design Headwater Elevation	HW = <input type="text" value="7218.42"/> ft
Headwater/Diameter <u>OR</u> Headwater/Rise Ratio	HW/D = <input type="text" value="1.18"/>
<b>Outlet Protection:</b>	
Flow/(Diameter <sup>2.5</sup> )	Q/D <sup>2.5</sup> = <input type="text" value="2.82"/> ft <sup>0.5</sup> /s
Tailwater Surface Height	$Y_t$ = <input type="text" value="1.20"/> ft
Tailwater/Diameter	$Y_t/D$ = <input type="text" value="0.40"/>
Expansion Factor	$1/(2*\tan(\Theta))$ = <input type="text" value="4.63"/>
Flow Area at Max Channel Velocity	$A_t$ = <input type="text" value="17.56"/> ft <sup>2</sup>
Width of Equivalent Conduit for Multiple Barrels	$W_{eq}$ = <input type="text" value="6.00"/> ft
Length of Riprap Protection	$L_p$ = <input type="text" value="30"/> ft
Width of Riprap Protection at Downstream End	T = <input type="text" value="13"/> ft
Adjusted Diameter for Supercritical Flow	Da = <input type="text" value="2.43"/> ft
Minimum Theoretical Riprap Size	$d_{50}$ min = <input type="text" value="7"/> in
Nominal Riprap Size	$d_{50}$ nominal = <input type="text" value="9"/> in
MHFD Riprap Type	Type = <input type="text" value="L"/>

# DETERMINATION OF CULVERT HEADWATER AND OUTLET PROTECTION

MHFD-Culvert, Version 4.00 (May 2020)

Project: Eagleview  
ID: Culvert 7



Soil Type:  
Choose One:  
 Sandy  
 Non-Sandy

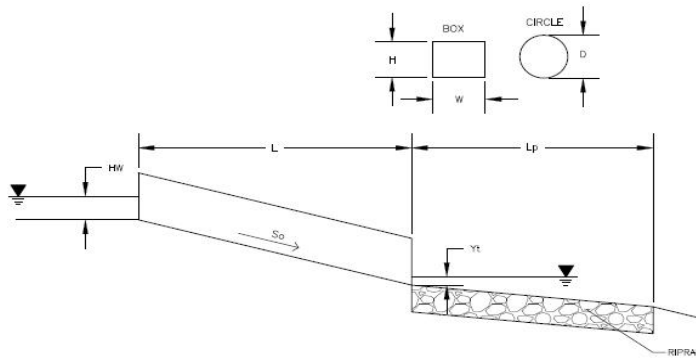
Supercritical Flow! Using Adjusted Diameter to calculate protection type.

Design Information:	
Design Discharge	Q = <input type="text" value="96.1"/> cfs
<b>Circular Culvert:</b>	
Barrel Diameter in Inches	D = <input type="text" value="36"/> inches
Inlet Edge Type (Choose from pull-down list)	Square Edge with Headwall
<b>OR:</b>	
<b>Box Culvert:</b>	
Barrel Height (Rise) in Feet	H (Rise) = <input type="text" value="OR"/> ft
Barrel Width (Span) in Feet	W (Span) = <input type="text" value="OR"/> ft
Inlet Edge Type (Choose from pull-down list)	
Number of Barrels	# Barrels = <input type="text" value="2"/>
Inlet Elevation	Elev IN = <input type="text" value="7230.29"/> ft
Outlet Elevation <u>OR</u> Slope	Elev OUT = <input type="text" value="7228.38"/> ft
Culvert Length	L = <input type="text" value="76.4"/> ft
Manning's Roughness	n = <input type="text" value="0.012"/>
Bend Loss Coefficient	k <sub>b</sub> = <input type="text" value="0"/>
Exit Loss Coefficient	k <sub>x</sub> = <input type="text" value="1"/>
Tailwater Surface Elevation	Y <sub>t</sub> , Elevation = <input type="text" value=""/> ft
Max Allowable Channel Velocity	V = <input type="text" value="5"/> ft/s
Calculated Results:	
Culvert Cross Sectional Area Available	A = <input type="text" value="7.07"/> ft <sup>2</sup>
Culvert Normal Depth	Y <sub>n</sub> = <input type="text" value="1.35"/> ft
Culvert Critical Depth	Y <sub>c</sub> = <input type="text" value="2.26"/> ft
Froude Number	Fr = <input type="text" value="2.68"/> <span style="color: red;">Supercritical!</span>
Entrance Loss Coefficient	k <sub>e</sub> = <input type="text" value="0.50"/>
Friction Loss Coefficient	k <sub>f</sub> = <input type="text" value="0.47"/>
Sum of All Loss Coefficients	k <sub>s</sub> = <input type="text" value="1.97"/> ft
<b>Headwater:</b>	
Inlet Control Headwater	HW <sub>I</sub> = <input type="text" value="3.82"/> ft
Outlet Control Headwater	HW <sub>O</sub> = <input type="text" value="N/A"/> ft
Design Headwater Elevation	HW = <input type="text" value="7234.11"/> ft
Headwater/Diameter <u>OR</u> Headwater/Rise Ratio	HW/D = <input type="text" value="1.27"/>
Outlet Control Headwater Approximation Method Inaccurate for Low Flow - Backwater Calculations Required	
<b>Outlet Protection:</b>	
Flow/(Diameter <sup>2.5</sup> )	Q/D <sup>2.5</sup> = <input type="text" value="3.08"/> ft <sup>0.5</sup> /s
Tailwater Surface Height	Y <sub>t</sub> = <input type="text" value="1.20"/> ft
Tailwater/Diameter	Y <sub>t</sub> /D = <input type="text" value="0.40"/>
Expansion Factor	1/(2*tan(Θ)) = <input type="text" value="4.31"/>
Flow Area at Max Channel Velocity	A <sub>t</sub> = <input type="text" value="19.22"/> ft <sup>2</sup>
Width of Equivalent Conduit for Multiple Barrels	W <sub>eq</sub> = <input type="text" value="6.00"/> ft
Length of Riprap Protection	L <sub>p</sub> = <input type="text" value="30"/> ft
Width of Riprap Protection at Downstream End	T = <input type="text" value="13"/> ft
Adjusted Diameter for Supercritical Flow	Da = <input type="text" value="2.18"/> ft
Minimum Theoretical Riprap Size	d <sub>50</sub> min = <input type="text" value="8"/> in
Nominal Riprap Size	d <sub>50</sub> nominal = <input type="text" value="9"/> in
MHFD Riprap Type	Type = <input type="text" value="L"/>

# DETERMINATION OF CULVERT HEADWATER AND OUTLET PROTECTION

MHFD-Culvert, Version 4.00 (May 2020)

Project: Eagleview  
ID: Culvert 8



Soil Type:  
Choose One:  
 Sandy  
 Non-Sandy

Supercritical Flow! Using Adjusted Diameter to calculate protection type.

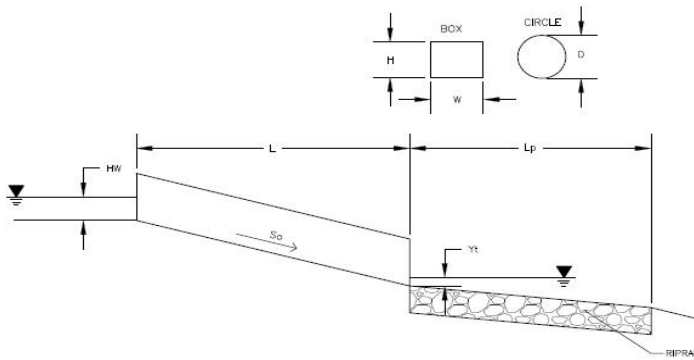
Design Information:	
Design Discharge	Q = <input type="text" value="474.8"/> cfs
Circular Culvert:	
Barrel Diameter in Inches	D = <input type="text" value="66"/> inches
Inlet Edge Type (Choose from pull-down list)	Square Edge with Headwall
OR:	
Box Culvert:	
Barrel Height (Rise) in Feet	H (Rise) = <input type="text" value="OR"/> ft
Barrel Width (Span) in Feet	W (Span) = <input type="text" value="OR"/> ft
Inlet Edge Type (Choose from pull-down list)	
Number of Barrels	# Barrels = <input type="text" value="2"/>
Inlet Elevation	Elev IN = <input type="text" value="7201.96"/> ft
Outlet Elevation OR Slope	Elev OUT = <input type="text" value="7201.48"/> ft
Culvert Length	L = <input type="text" value="97"/> ft
Manning's Roughness	n = <input type="text" value="0.012"/>
Bend Loss Coefficient	k <sub>b</sub> = <input type="text" value="0"/>
Exit Loss Coefficient	k <sub>x</sub> = <input type="text" value="1"/>
Tailwater Surface Elevation	Y <sub>t</sub> , Elevation = <input type="text" value=""/> ft
Max Allowable Channel Velocity	V = <input type="text" value="5"/> ft/s
Calculated Results:	
Culvert Cross Sectional Area Available	A = <input type="text" value="23.76"/> ft <sup>2</sup>
Culvert Normal Depth	Y <sub>n</sub> = <input type="text" value="4.18"/> ft
Culvert Critical Depth	Y <sub>c</sub> = <input type="text" value="4.30"/> ft
Froude Number	Fr = <input type="text" value="1.06"/> <span style="color: red;">Supercritical!</span>
Entrance Loss Coefficient	k <sub>e</sub> = <input type="text" value="0.50"/>
Friction Loss Coefficient	k <sub>f</sub> = <input type="text" value="0.26"/>
Sum of All Loss Coefficients	k <sub>s</sub> = <input type="text" value="1.76"/> ft
Headwater:	
Inlet Control Headwater	HW <sub>i</sub> = <input type="text" value="7.63"/> ft
Outlet Control Headwater	HW <sub>o</sub> = <input type="text" value="7.16"/> ft
Design Headwater Elevation	HW = <input type="text" value="7209.59"/> ft
Headwater/Diameter OR Headwater/Rise Ratio	HW/D = <input type="text" value="1.39"/>
Outlet Protection:	
Flow/(Diameter <sup>2.5</sup> )	Q/D <sup>2.5</sup> = <input type="text" value="3.35"/> ft <sup>0.5</sup> /s
Tailwater Surface Height	Y <sub>t</sub> = <input type="text" value="2.20"/> ft
Tailwater/Diameter	Y <sub>t</sub> /D = <input type="text" value="0.40"/>
Expansion Factor	1/(2*tan(Θ)) = <input type="text" value="4.08"/>
Flow Area at Max Channel Velocity	A <sub>t</sub> = <input type="text" value="94.96"/> ft <sup>2</sup>
Width of Equivalent Conduit for Multiple Barrels	W <sub>eq</sub> = <input type="text" value="11.00"/> ft
Length of Riprap Protection	L <sub>p</sub> = <input type="text" value="55"/> ft
Width of Riprap Protection at Downstream End	T = <input type="text" value="25"/> ft
Adjusted Diameter for Supercritical Flow	Da = <input type="text" value="4.84"/> ft
Minimum Theoretical Riprap Size	d <sub>50</sub> min = <input type="text" value="16"/> in
Nominal Riprap Size	d <sub>50</sub> nominal = <input type="text" value="18"/> in
MHFD Riprap Type	Type = <input type="text" value="H"/>

# DETERMINATION OF CULVERT HEADWATER AND OUTLET PROTECTION

MHFD-Culvert, Version 4.00 (May 2020)

Project: Eagleview

ID: Pond #3 Outfall Culvert 42-inch



Soil Type:

Choose One:

- Sandy  
 Non-Sandy

### Design Information:

Design Discharge	Q = <input type="text" value="101"/> cfs
<b>Circular Culvert:</b>	
Barrel Diameter in Inches	D = <input type="text" value="42"/> inches
Inlet Edge Type (Choose from pull-down list)	Square Edge with Headwall
<b>OR:</b>	
<b>Box Culvert:</b>	
Barrel Height (Rise) in Feet	H (Rise) = <input type="text" value="OR"/> ft
Barrel Width (Span) in Feet	W (Span) = <input type="text" value="OR"/> ft
Inlet Edge Type (Choose from pull-down list)	
Number of Barrels	# Barrels = <input type="text" value="1"/>
Inlet Elevation	Elev IN = <input type="text" value="7230.34"/> ft
Outlet Elevation <u>OR</u> Slope	Elev OUT = <input type="text" value="7230.04"/> ft
Culvert Length	L = <input type="text" value="61"/> ft
Manning's Roughness	n = <input type="text" value="0.012"/>
Bend Loss Coefficient	k <sub>b</sub> = <input type="text" value="0"/>
Exit Loss Coefficient	k <sub>x</sub> = <input type="text" value="1"/>
Tailwater Surface Elevation	Y <sub>t</sub> , Elevation = <input type="text" value=""/> ft
Max Allowable Channel Velocity	V = <input type="text" value="5"/> ft/s

### Calculated Results:

Culvert Cross Sectional Area Available	A = <input type="text" value="9.62"/> ft <sup>2</sup>
Culvert Normal Depth	Y <sub>n</sub> = <input type="text" value="3.50"/> ft
Culvert Critical Depth	Y <sub>c</sub> = <input type="text" value="3.08"/> ft
Froude Number	Fr = <input type="text" value="-"/> <span style="color: red;">Pressure flow!</span>
Entrance Loss Coefficient	k <sub>e</sub> = <input type="text" value="0.50"/>
Friction Loss Coefficient	k <sub>f</sub> = <input type="text" value="0.30"/>
Sum of All Loss Coefficients	k <sub>s</sub> = <input type="text" value="1.80"/> ft
<b>Headwater:</b>	
Inlet Control Headwater	HW <sub>I</sub> = <input type="text" value="6.68"/> ft
Outlet Control Headwater	HW <sub>O</sub> = <input type="text" value="6.08"/> ft
Design Headwater Elevation	HW = <input type="text" value="7237.02"/> ft
Headwater/Diameter <u>OR</u> Headwater/Rise Ratio	HW/D = <input type="text" value="1.91"/> <span style="color: red;">HW/D &gt; 1.5!</span>
<b>Outlet Protection:</b>	
Flow/(Diameter <sup>2.5</sup> )	Q/D <sup>2.5</sup> = <input type="text" value="4.41"/> ft <sup>0.5</sup> /s
Tailwater Surface Height	Y <sub>t</sub> = <input type="text" value="1.40"/> ft
Tailwater/Diameter	Y <sub>t</sub> /D = <input type="text" value="0.40"/>
Expansion Factor	1/(2*tan(Θ)) = <input type="text" value="3.06"/>
Flow Area at Max Channel Velocity	A <sub>t</sub> = <input type="text" value="20.20"/> ft <sup>2</sup>
Width of Equivalent Conduit for Multiple Barrels	W <sub>eq</sub> = <input type="text" value="-"/> ft
Length of Riprap Protection	L <sub>p</sub> = <input type="text" value="34"/> ft
Width of Riprap Protection at Downstream End	T = <input type="text" value="15"/> ft
Adjusted Diameter for Supercritical Flow	Da = <input type="text" value="-"/> ft
Minimum Theoretical Riprap Size	d <sub>50</sub> min = <input type="text" value="13"/> in
Nominal Riprap Size	d <sub>50</sub> nominal = <input type="text" value="18"/> in
MHFD Riprap Type	Type = <input type="text" value="H"/>

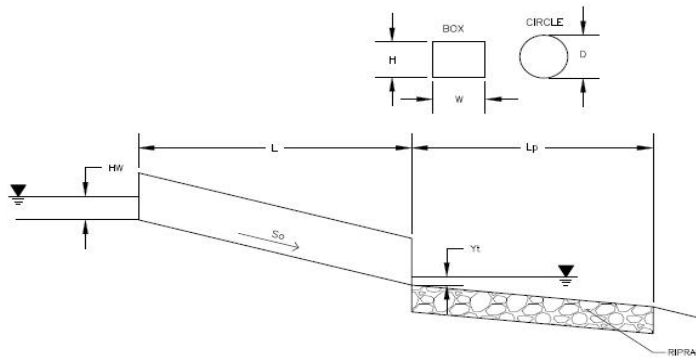


# DETERMINATION OF CULVERT HEADWATER AND OUTLET PROTECTION

*MHFD-Culvert, Version 4.00 (May 2020)*

Project: Eagleview

ID: Water Quality Pond 1 Outfall



Soil Type:

Choose One:

- Sandy  
 Non-Sandy

### Design Information:

Design Discharge	Q = <input type="text" value="19.3"/> cfs
Circular Culvert:	
Barrel Diameter in Inches	D = <input type="text" value="24"/> inches
Inlet Edge Type (Choose from pull-down list)	Grooved Edge Projecting
<u>OR:</u>	
Box Culvert:	
Barrel Height (Rise) in Feet	H (Rise) = <input type="text" value="OR"/> ft
Barrel Width (Span) in Feet	W (Span) = <input type="text" value="OR"/> ft
Inlet Edge Type (Choose from pull-down list)	
Number of Barrels	# Barrels = <input type="text" value="1"/>
Inlet Elevation	Elev IN = <input type="text" value="7192"/> ft
Outlet Elevation <u>OR</u> Slope	Elev OUT = <input type="text" value="7191.74"/> ft
Culvert Length	L = <input type="text" value="52"/> ft
Manning's Roughness	n = <input type="text" value="0.012"/>
Bend Loss Coefficient	k <sub>b</sub> = <input type="text" value="0"/>
Exit Loss Coefficient	k <sub>x</sub> = <input type="text" value="1"/>
Tailwater Surface Elevation	Y <sub>t</sub> , Elevation = <input type="text" value=""/> ft
Max Allowable Channel Velocity	V = <input type="text" value="5"/> ft/s

### Calculated Results:

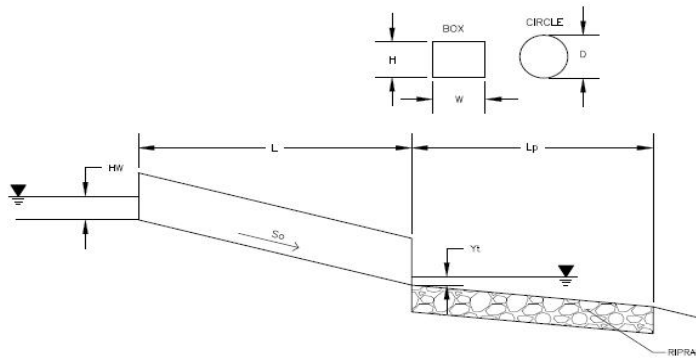
Culvert Cross Sectional Area Available	A = <input type="text" value="3.14"/> ft <sup>2</sup>
Culvert Normal Depth	Y <sub>n</sub> = <input type="text" value="2.00"/> ft
Culvert Critical Depth	Y <sub>c</sub> = <input type="text" value="1.58"/> ft
Froude Number	Fr = <input type="text" value="-"/> <span style="color: red;">Pressure flow!</span>
Entrance Loss Coefficient	k <sub>e</sub> = <input type="text" value="0.20"/>
Friction Loss Coefficient	k <sub>f</sub> = <input type="text" value="0.55"/>
Sum of All Loss Coefficients	k <sub>s</sub> = <input type="text" value="1.75"/> ft
Headwater:	
Inlet Control Headwater	HW <sub>I</sub> = <input type="text" value="2.57"/> ft
Outlet Control Headwater	HW <sub>O</sub> = <input type="text" value="2.55"/> ft
Design Headwater Elevation	HW = <input type="text" value="7194.57"/> ft
Headwater/Diameter <u>OR</u> Headwater/Rise Ratio	HW/D = <input type="text" value="1.29"/>
Outlet Protection:	
Flow/(Diameter <sup>2.5</sup> )	Q/D <sup>2.5</sup> = <input type="text" value="3.41"/> ft <sup>0.5</sup> /s
Tailwater Surface Height	Y <sub>t</sub> = <input type="text" value="0.80"/> ft
Tailwater/Diameter	Y <sub>t</sub> /D = <input type="text" value="0.40"/>
Expansion Factor	1/(2*tan(Θ)) = <input type="text" value="4.02"/>
Flow Area at Max Channel Velocity	A <sub>t</sub> = <input type="text" value="3.86"/> ft <sup>2</sup>
Width of Equivalent Conduit for Multiple Barrels	W <sub>eq</sub> = <input type="text" value="-"/> ft
Length of Riprap Protection	L <sub>p</sub> = <input type="text" value="12"/> ft
Width of Riprap Protection at Downstream End	T = <input type="text" value="5"/> ft
Adjusted Diameter for Supercritical Flow	Da = <input type="text" value="-"/> ft
Minimum Theoretical Riprap Size	d <sub>50</sub> min = <input type="text" value="6"/> in
Nominal Riprap Size	d <sub>50</sub> nominal = <input type="text" value="6"/> in
MHFD Riprap Type	Type = <input type="text" value="VL"/>

# DETERMINATION OF CULVERT HEADWATER AND OUTLET PROTECTION

*MHFD-Culvert, Version 4.00 (May 2020)*

Project: Eagleview

ID: Water Quality Pond 2 Outfall



Soil Type:

Choose One:

- Sandy  
 Non-Sandy

### Design Information:

Design Discharge	Q = <input type="text" value="7.6"/> cfs
Circular Culvert:	
Barrel Diameter in Inches	D = <input type="text" value="18"/> inches
Inlet Edge Type (Choose from pull-down list)	Grooved Edge Projecting
<b>OR:</b>	
Box Culvert:	
Barrel Height (Rise) in Feet	H (Rise) = <input type="text" value="OR"/> ft
Barrel Width (Span) in Feet	W (Span) = <input type="text" value="OR"/> ft
Inlet Edge Type (Choose from pull-down list)	
Number of Barrels	# Barrels = <input type="text" value="1"/>
Inlet Elevation	Elev IN = <input type="text" value="7199.39"/> ft
Outlet Elevation <b>OR</b> Slope	Elev OUT = <input type="text" value="7199"/> ft
Culvert Length	L = <input type="text" value="78.5"/> ft
Manning's Roughness	n = <input type="text" value="0.012"/>
Bend Loss Coefficient	k <sub>b</sub> = <input type="text" value="0"/>
Exit Loss Coefficient	k <sub>x</sub> = <input type="text" value="1"/>
Tailwater Surface Elevation	Y <sub>t</sub> , Elevation = <input type="text" value=""/> ft
Max Allowable Channel Velocity	V = <input type="text" value="5"/> ft/s

### Calculated Results:

Culvert Cross Sectional Area Available	A = <input type="text" value="1.77"/> ft <sup>2</sup>
Culvert Normal Depth	Y <sub>n</sub> = <input type="text" value="1.16"/> ft
Culvert Critical Depth	Y <sub>c</sub> = <input type="text" value="1.07"/> ft
Froude Number	Fr = <input type="text" value="0.84"/>
Entrance Loss Coefficient	k <sub>e</sub> = <input type="text" value="0.20"/>
Friction Loss Coefficient	k <sub>f</sub> = <input type="text" value="1.21"/>
Sum of All Loss Coefficients	k <sub>s</sub> = <input type="text" value="2.41"/> ft
Headwater:	
Inlet Control Headwater	HW <sub>I</sub> = <input type="text" value="1.62"/> ft
Outlet Control Headwater	HW <sub>O</sub> = <input type="text" value="1.59"/> ft
Design Headwater Elevation	HW = <input type="text" value="7201.01"/> ft
Headwater/Diameter <b>OR</b> Headwater/Rise Ratio	HW/D = <input type="text" value="1.08"/>
Outlet Protection:	
Flow/(Diameter <sup>2.5</sup> )	Q/D <sup>2.5</sup> = <input type="text" value="2.76"/> ft <sup>0.5</sup> /s
Tailwater Surface Height	Y <sub>t</sub> = <input type="text" value="0.60"/> ft
Tailwater/Diameter	Y <sub>t</sub> /D = <input type="text" value="0.40"/>
Expansion Factor	1/(2*tan(Θ)) = <input type="text" value="4.71"/>
Flow Area at Max Channel Velocity	A <sub>t</sub> = <input type="text" value="1.52"/> ft <sup>2</sup>
Width of Equivalent Conduit for Multiple Barrels	W <sub>eq</sub> = <input type="text" value="-"/> ft
Length of Riprap Protection	L <sub>p</sub> = <input type="text" value="5"/> ft
Width of Riprap Protection at Downstream End	T = <input type="text" value="3"/> ft
Adjusted Diameter for Supercritical Flow	Da = <input type="text" value="-"/> ft
Minimum Theoretical Riprap Size	d <sub>50</sub> min = <input type="text" value="3"/> in
Nominal Riprap Size	d <sub>50</sub> nominal = <input type="text" value="6"/> in
MHFD Riprap Type	Type = <input type="text" value="VL"/>

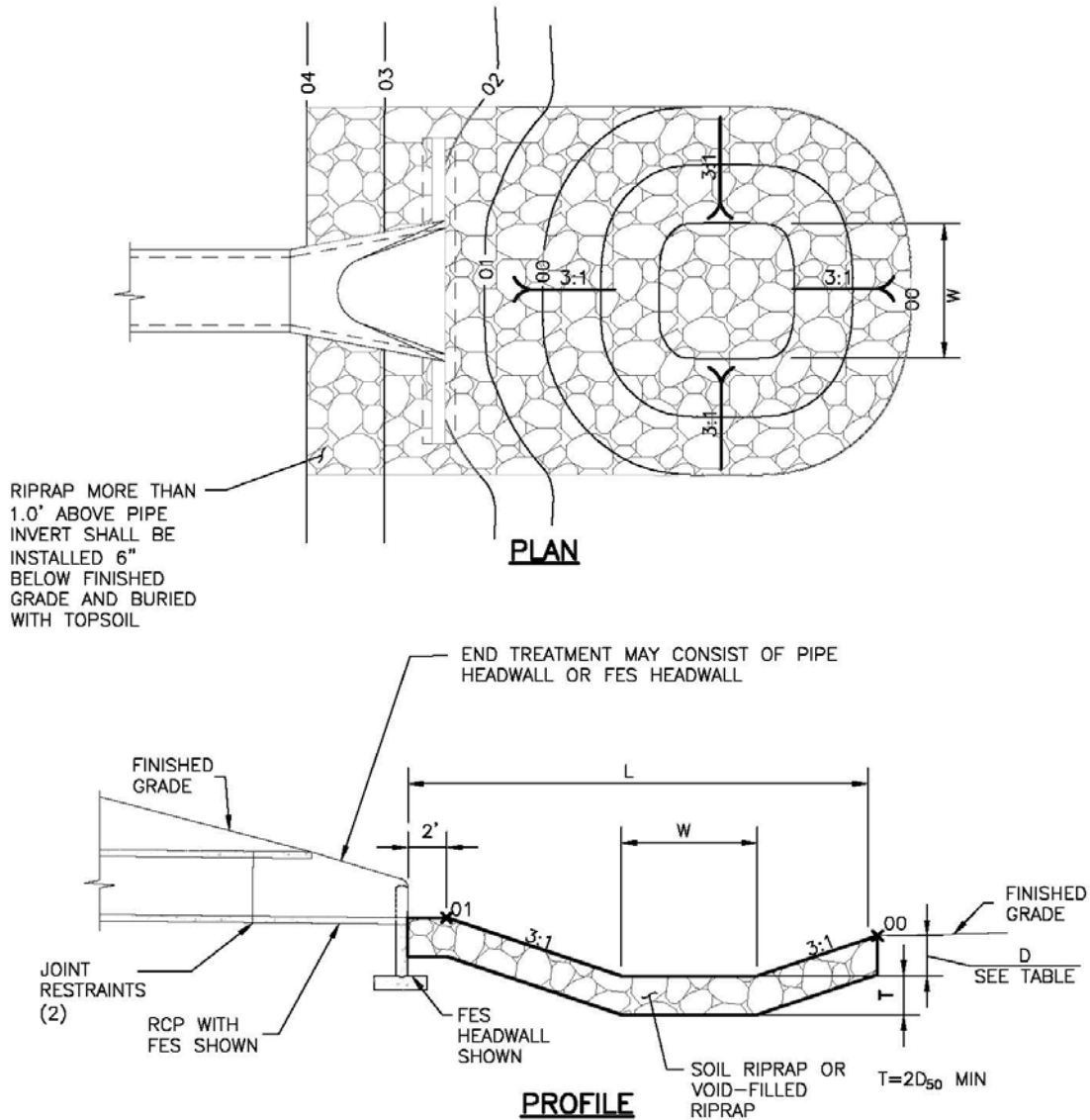
DRIVEWAY CULVERT SIZING TABLE					
Lot	Basin Located in	100 yr. Flow (cfs)	Culvert size (in)	Anticipated Driveway Location	Notes
1	PB3	<8	18	North side of lot	Cross roadside ditch
1	PB1	<8	18	East side of lot	Cross roadside ditch
2	PB3	<8	18	Northeast side of lot	Cross roadside ditch
3	PB4	<8	18	East side of lot	Cross roadside ditch
4	PB4	<8	18	South side of lot	Cross roadside ditch
5	PB4	<8	18	Southwest side of lot	Cross roadside ditch. If culvert is placed on the southwest side of the lot, the driveway would cross a drainage way that would require an additional 3-36" RCPs to be built.
5	PB6	<8	18	Southeast side of lot	Cross roadside ditch
6	PB6	15.9	24	East side of lot	Cross roadside ditch
6	PB6	<8	18	North side of lot	Cross roadside ditch
7	PB6	<8	18	Northeast side of lot	Cross roadside ditch
8	PB6	<8	18	North side of lot	Cross roadside ditch
9	PB6	<8	N/A	Northwest side of lot	Sheet flows off road and through Lot 9
10	PB4	<8	18	Southeast side of lot	Cross roadside ditch
11	PB5	<8	18	Southeast side of lot	Cross roadside ditch
12	PB5	<8	18	South side of lot	Cross roadside ditch
13	PB7	<8	18	South side of lot	Cross roadside ditch
14	PB7	<8	18	Southwest side of lot	Cross roadside ditch
15	PB7	<8	18	Southwest side of lot	Cross roadside ditch
16	PB15	<8	18	West side of lot	Cross roadside ditch
16	PB15	<8	18	South side of lot	Cross roadside ditch
17	PB15	<8	18	West side of lot	Cross roadside ditch
18	PB15	<8	18	North side of lot	Cross roadside ditch
19	PB15	<8	N/A	Northeast side of lot	Sheet flows off road and through Lot 19. If culvert is placed on the northeast side of the lot, the driveway would cross a drainage way that would require an additional 2-24" RCPs to be built.
19	PB15	<8	18	Northwest side of lot	Cross roadside ditch
20	PB15	<8	N/A	Northwest side of lot south of intersection	Sheet flows off road and through Lot 20
21	PB10	<8	18	East side of lot	Cross roadside ditch
22	PB10	<8	18	East side of lot	Cross roadside ditch
23	PB10	<8	18	Southeast side of lot	Cross roadside ditch
24	PB10	<8	18	South side of lot	Cross roadside ditch
25	PB11	<8	18	Southwest side of lot	Cross roadside ditch
26	PB11	<8	18	Southwest side of lot	Cross roadside ditch
27	PB11	<8	18	West side of lot	Cross roadside ditch
28	PB11	<8	18	West side of lot	Cross roadside ditch
29	PB11	8.2	24	West side of lot	Cross roadside ditch
30	PB11	9.0	24	West side of lot	Cross roadside ditch
30	PB11	<8	18	South side of lot	Cross roadside ditch. Culvert would need to be placed east of the Culvert 6 crossing underneath Acequia Ct.
31	PB14	<8	18	North side of lot	Shared Lot 31 and 32 driveway
32	PB14	<8	18	North side of lot	Shared Lot 31 and 32 driveway
33	PB14	<8	18	North side of lot	Cross roadside ditch
34	PB14	<8	18	North side of lot	Cross roadside ditch. Culvert would need to be placed east of the Culvert 6 crossing underneath Acequia Ct.
34	PB14	<8	18	Northwest side of lot	Cross roadside ditch. If culvert is placed on the northwest side of the lot, the driveway would cross a drainage way that would require an additional culvert that would be larger than an 18" RCP to be built.
35	PB8	<8	18	North side of lot	Cross roadside ditch
36	PB9	<8	18	Northwest side of lot	Sheet flows off road and through Lot 36
37	PB9	<8	18	Northwest side of lot	Sheet flows off road and through Lot 37
38	PB9	<8	18	West side of lot	Cross roadside ditch
38*	PB9	120.9	2 - 42"	Inside of lot culvert	Culvert crossing natural Channel section A in Lot 38

\*Culvert sizing is based on flows in roadside ditch. If driveways cross natural channels, an engineering site plan would be required.

Generic Driveway Culvert Sizing Table\*

Culvert Diameter (in)	# of Barrels	Allowable Flow (cfs)
18	1	8
24	1	18
30	1	30
36	1	45
42	1	70
48	1	100
42	2	150

\*See Generic Driveway Culvert Sizing calculations for Hw/D and culvert slope assumptions for each culvert size.



PIPE SIZE OR BOX HEIGHT	D	W*	L
18" - 24"	1'-0"	4'	15'
30" - 36"	1'-6"	6'	20'
42" - 48"	2'-0"	7'	24'
54" - 60"	2'-6"	8'	28'
66" - 72"	3'-0"	9'	32'

\* IF OUTLET PIPE IS A BOX CULVERT WITH A WIDTH GREATER THAN W, THEN W = CULVERT WIDTH

**Figure 9-37. Low tailwater riprap basin**

**Eagleview Low Tailwater Basin Summary Table**

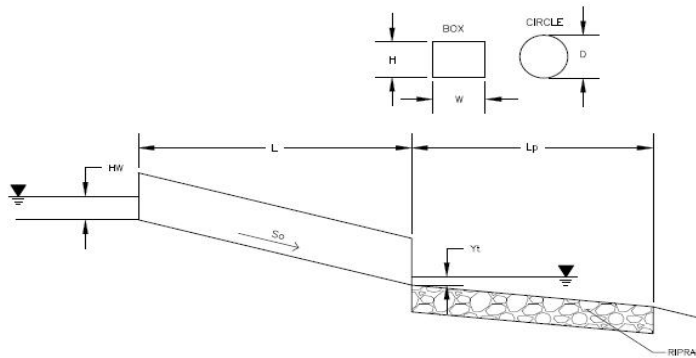
Culvert	Pipe Size (in)	Barrels (No.)	Bottom Width -W (ft)	Length - L (ft)	Top Width (ft)	Tailwater Basin Depth - D (ft)	D50 (in)	RipRap Thickness - [2*D50] (ft)	MHFD Riprap Type	Vol (ft^3)	Vol (yd^3)
(Ex.) Arroya Ln	48	1	11	24	23	2	18	3	H	1656	61.33
1	18	1	4	15	16	1	6	1	VL	240	8.89
2	36	3	26	20	38	1.5	9	1.5	L	1140	42.22
3	24	2	12	15	24	1	6	1	VL	360	13.33
4	18	1	4	15	16	1	6	1	VL	240	8.89
5	18	1	4	15	16	1	6	1	VL	240	8.89
6	36	2	16	20	28	1.5	9	1.5	L	840	31.11
7	36	2	16	20	28	1.5	9	1.5	L	840	31.11
8	66	2	22	32	34	3	18	3	H	3264	120.89
Pond 3 Outfall	42	1	11	24	23	2	18	3	H	1656	61.33
WQ Pond 1	24	1	4	15	16	1	6	1	VL	240	8.89
WQ Pond 2	18	1	4	15	16	1	6	1	VL	240	8.89
<b>Total</b>			<b>115</b>	<b>176</b>	<b>223</b>					<b>8820</b>	<b>327</b>

# DETERMINATION OF CULVERT HEADWATER AND OUTLET PROTECTION

*MHFD-Culvert, Version 4.00 (May 2020)*

Project: Eagleview

ID: Generic Driveway Culvert 18-inch



Soil Type:

Choose One:

- Sandy  
 Non-Sandy

Supercritical Flow! Using Adjusted Diameter to calculate protection type.

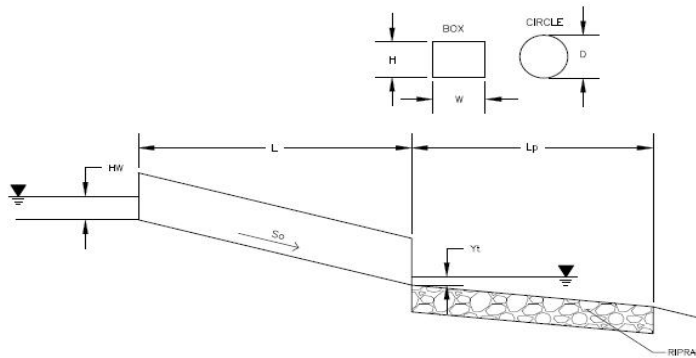
Design Information:	
Design Discharge	Q = <input type="text" value="8"/> cfs
Circular Culvert:	
Barrel Diameter in Inches	D = <input type="text" value="18"/> inches
Inlet Edge Type (Choose from pull-down list)	Square Edge with Headwall
OR:	
Box Culvert:	
Barrel Height (Rise) in Feet	H (Rise) = <input type="text" value="OR"/> ft
Barrel Width (Span) in Feet	W (Span) = <input type="text" value="OR"/> ft
Inlet Edge Type (Choose from pull-down list)	
Number of Barrels	# Barrels = <input type="text" value="1"/>
Inlet Elevation	Elev IN = <input type="text" value="7222.1"/> ft
Outlet Elevation OR Slope	Elev OUT = <input type="text" value="7222"/> ft
Culvert Length	L = <input type="text" value="10"/> ft
Manning's Roughness	n = <input type="text" value="0.012"/>
Bend Loss Coefficient	k <sub>b</sub> = <input type="text" value="0"/>
Exit Loss Coefficient	k <sub>x</sub> = <input type="text" value="1"/>
Tailwater Surface Elevation	Y <sub>t</sub> , Elevation = <input type="text" value=""/> ft
Max Allowable Channel Velocity	V = <input type="text" value="5"/> ft/s
Calculated Results:	
Culvert Cross Sectional Area Available	A = <input type="text" value="1.77"/> ft <sup>2</sup>
Culvert Normal Depth	Y <sub>n</sub> = <input type="text" value="0.93"/> ft
Culvert Critical Depth	Y <sub>c</sub> = <input type="text" value="1.10"/> ft
Froude Number	Fr = <input type="text" value="1.39"/> <span style="color: red;">Supercritical!</span>
Entrance Loss Coefficient	k <sub>e</sub> = <input type="text" value="0.50"/>
Friction Loss Coefficient	k <sub>f</sub> = <input type="text" value="0.15"/>
Sum of All Loss Coefficients	k <sub>s</sub> = <input type="text" value="1.65"/> ft
Headwater:	
Inlet Control Headwater	HW <sub>i</sub> = <input type="text" value="1.82"/> ft
Outlet Control Headwater	HW <sub>o</sub> = <input type="text" value="1.72"/> ft
Design Headwater Elevation	HW = <input type="text" value="7223.92"/> ft
Headwater/Diameter OR Headwater/Rise Ratio	HW/D = <input type="text" value="1.21"/>
Outlet Protection:	
Flow/(Diameter <sup>2.5</sup> )	Q/D <sup>2.5</sup> = <input type="text" value="2.90"/> ft <sup>0.5</sup> /s
Tailwater Surface Height	Y <sub>t</sub> = <input type="text" value="0.60"/> ft
Tailwater/Diameter	Y <sub>t</sub> /D = <input type="text" value="0.40"/>
Expansion Factor	1/(2*tan(Θ)) = <input type="text" value="4.51"/>
Flow Area at Max Channel Velocity	A <sub>t</sub> = <input type="text" value="1.60"/> ft <sup>2</sup>
Width of Equivalent Conduit for Multiple Barrels	W <sub>eq</sub> = <input type="text" value="-"/> ft
Length of Riprap Protection	L <sub>p</sub> = <input type="text" value="6"/> ft
Width of Riprap Protection at Downstream End	T = <input type="text" value="3"/> ft
Adjusted Diameter for Supercritical Flow	Da = <input type="text" value="1.21"/> ft
Minimum Theoretical Riprap Size	d <sub>50</sub> min = <input type="text" value="4"/> in
Nominal Riprap Size	d <sub>50</sub> nominal = <input type="text" value="6"/> in
MHFD Riprap Type	Type = <input type="text" value="VL"/>

# DETERMINATION OF CULVERT HEADWATER AND OUTLET PROTECTION

*MHFD-Culvert, Version 4.00 (May 2020)*

Project: Eagleview

ID: Generic Driveway Culvert 24-inch



Supercritical Flow! Using Adjusted Diameter to calculate protection type.

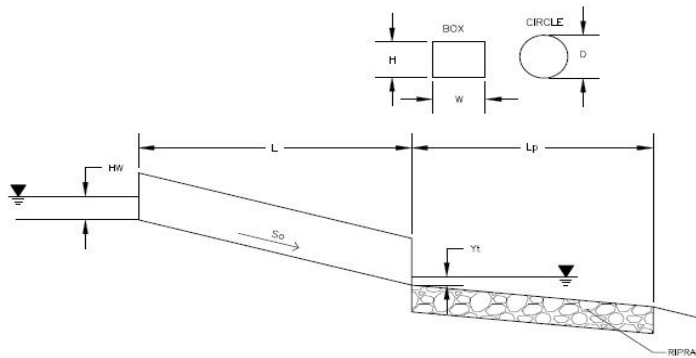
Design Information:	
Design Discharge	Q = <input type="text" value="18"/> cfs
Circular Culvert:	
Barrel Diameter in Inches	D = <input type="text" value="24"/> inches
Inlet Edge Type (Choose from pull-down list)	Square Edge with Headwall
OR:	
Box Culvert:	
Barrel Height (Rise) in Feet	H (Rise) = <input type="text" value="OR"/> ft
Barrel Width (Span) in Feet	W (Span) = <input type="text" value="OR"/> ft
Inlet Edge Type (Choose from pull-down list)	
Number of Barrels	# Barrels = <input type="text" value="1"/>
Inlet Elevation	Elev IN = <input type="text" value="7222.1"/> ft
Outlet Elevation <u>OR</u> Slope	Elev OUT = <input type="text" value="7222"/> ft
Culvert Length	L = <input type="text" value="10"/> ft
Manning's Roughness	n = <input type="text" value="0.012"/>
Bend Loss Coefficient	k <sub>b</sub> = <input type="text" value="0"/>
Exit Loss Coefficient	k <sub>x</sub> = <input type="text" value="1"/>
Tailwater Surface Elevation	Y <sub>t</sub> , Elevation = <input type="text" value=""/> ft
Max Allowable Channel Velocity	V = <input type="text" value="5"/> ft/s
Calculated Results:	
Culvert Cross Sectional Area Available	A = <input type="text" value="3.14"/> ft <sup>2</sup>
Culvert Normal Depth	Y <sub>n</sub> = <input type="text" value="1.27"/> ft
Culvert Critical Depth	Y <sub>c</sub> = <input type="text" value="1.53"/> ft
Froude Number	Fr = <input type="text" value="1.44"/> <span style="color: red;">Supercritical!</span>
Entrance Loss Coefficient	k <sub>e</sub> = <input type="text" value="0.50"/>
Friction Loss Coefficient	k <sub>f</sub> = <input type="text" value="0.11"/>
Sum of All Loss Coefficients	k <sub>s</sub> = <input type="text" value="1.61"/> ft
Headwater:	
Inlet Control Headwater	HW <sub>I</sub> = <input type="text" value="2.64"/> ft
Outlet Control Headwater	HW <sub>O</sub> = <input type="text" value="2.48"/> ft
Design Headwater Elevation	HW = <input type="text" value="7224.74"/> ft
Headwater/Diameter <u>OR</u> Headwater/Rise Ratio	HW/D = <input type="text" value="1.32"/>
Outlet Protection:	
Flow/(Diameter <sup>2.5</sup> )	Q/D <sup>2.5</sup> = <input type="text" value="3.18"/> ft <sup>0.5</sup> /s
Tailwater Surface Height	Y <sub>t</sub> = <input type="text" value="0.80"/> ft
Tailwater/Diameter	Y <sub>t</sub> /D = <input type="text" value="0.40"/>
Expansion Factor	1/(2*tan(Θ)) = <input type="text" value="4.22"/>
Flow Area at Max Channel Velocity	A <sub>t</sub> = <input type="text" value="3.60"/> ft <sup>2</sup>
Width of Equivalent Conduit for Multiple Barrels	W <sub>eq</sub> = <input type="text" value="-"/> ft
Length of Riprap Protection	L <sub>p</sub> = <input type="text" value="11"/> ft
Width of Riprap Protection at Downstream End	T = <input type="text" value="5"/> ft
Adjusted Diameter for Supercritical Flow	Da = <input type="text" value="1.64"/> ft
Minimum Theoretical Riprap Size	d <sub>50</sub> min = <input type="text" value="6"/> in
Nominal Riprap Size	d <sub>50</sub> nominal = <input type="text" value="6"/> in
MHFD Riprap Type	Type = <input type="text" value="VL"/>

# DETERMINATION OF CULVERT HEADWATER AND OUTLET PROTECTION

*MHFD-Culvert, Version 4.00 (May 2020)*

Project: Eagleview

ID: Generic Driveway Culvert 30-inch



Soil Type:

Choose One:

- Sandy  
 Non-Sandy

Supercritical Flow! Using Adjusted Diameter to calculate protection type.

Design Information:	
Design Discharge	Q = <input type="text" value="30"/> cfs
Circular Culvert:	
Barrel Diameter in Inches	D = <input type="text" value="30"/> inches
Inlet Edge Type (Choose from pull-down list)	Square Edge with Headwall
OR:	
Box Culvert:	
Barrel Height (Rise) in Feet	H (Rise) = <input type="text" value="OR"/> ft
Barrel Width (Span) in Feet	W (Span) = <input type="text" value="OR"/> ft
Inlet Edge Type (Choose from pull-down list)	
Number of Barrels	# Barrels = <input type="text" value="1"/>
Inlet Elevation	Elev IN = <input type="text" value="7222.1"/> ft
Outlet Elevation <u>OR</u> Slope	Elev OUT = <input type="text" value="7222"/> ft
Culvert Length	L = <input type="text" value="10"/> ft
Manning's Roughness	n = <input type="text" value="0.012"/>
Bend Loss Coefficient	k <sub>b</sub> = <input type="text" value="0"/>
Exit Loss Coefficient	k <sub>x</sub> = <input type="text" value="1"/>
Tailwater Surface Elevation	Y <sub>t</sub> , Elevation = <input type="text" value=""/> ft
Max Allowable Channel Velocity	V = <input type="text" value="5"/> ft/s
Calculated Results:	
Culvert Cross Sectional Area Available	A = <input type="text" value="4.91"/> ft <sup>2</sup>
Culvert Normal Depth	Y <sub>n</sub> = <input type="text" value="1.50"/> ft
Culvert Critical Depth	Y <sub>c</sub> = <input type="text" value="1.87"/> ft
Froude Number	Fr = <input type="text" value="1.53"/> <span style="color: red;">Supercritical!</span>
Entrance Loss Coefficient	k <sub>e</sub> = <input type="text" value="0.50"/>
Friction Loss Coefficient	k <sub>f</sub> = <input type="text" value="0.08"/>
Sum of All Loss Coefficients	k <sub>s</sub> = <input type="text" value="1.58"/> ft
Headwater:	
Inlet Control Headwater	HW <sub>i</sub> = <input type="text" value="3.15"/> ft
Outlet Control Headwater	HW <sub>o</sub> = <input type="text" value="3.00"/> ft
Design Headwater Elevation	HW = <input type="text" value="7225.25"/> ft
Headwater/Diameter <u>OR</u> Headwater/Rise Ratio	HW/D = <input type="text" value="1.26"/>
Outlet Protection:	
Flow/(Diameter <sup>2.5</sup> )	Q/D <sup>2.5</sup> = <input type="text" value="3.04"/> ft <sup>0.5</sup> /s
Tailwater Surface Height	Y <sub>t</sub> = <input type="text" value="1.00"/> ft
Tailwater/Diameter	Y <sub>t</sub> /D = <input type="text" value="0.40"/>
Expansion Factor	1/(2*tan(Θ)) = <input type="text" value="4.35"/>
Flow Area at Max Channel Velocity	A <sub>t</sub> = <input type="text" value="6.00"/> ft <sup>2</sup>
Width of Equivalent Conduit for Multiple Barrels	W <sub>eq</sub> = <input type="text" value="-"/> ft
Length of Riprap Protection	L <sub>p</sub> = <input type="text" value="16"/> ft
Width of Riprap Protection at Downstream End	T = <input type="text" value="7"/> ft
Adjusted Diameter for Supercritical Flow	Da = <input type="text" value="2.00"/> ft
Minimum Theoretical Riprap Size	d <sub>50</sub> min = <input type="text" value="7"/> in
Nominal Riprap Size	d <sub>50</sub> nominal = <input type="text" value="9"/> in
MHFD Riprap Type	Type = <input type="text" value="L"/>

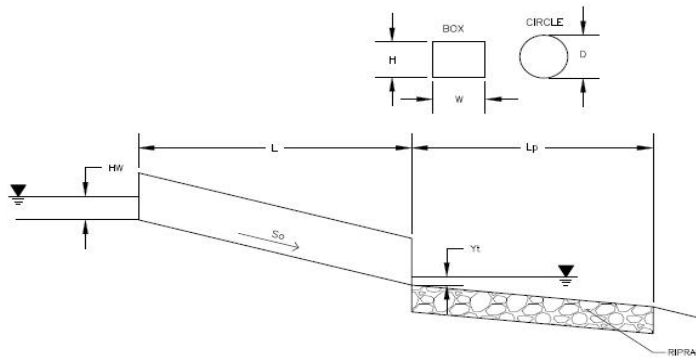


# DETERMINATION OF CULVERT HEADWATER AND OUTLET PROTECTION

MHFD-Culvert, Version 4.00 (May 2020)

Project: Eagleview

ID: Generic Driveway Culvert 36-inch



Soil Type:

Choose One:

- Sandy  
 Non-Sandy

Supercritical Flow! Using Adjusted Diameter to calculate protection type.

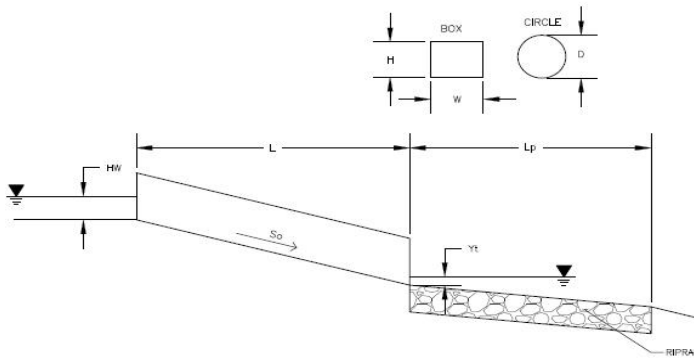
Design Information:	
Design Discharge	Q = <input type="text" value="45"/> cfs
<b>Circular Culvert:</b>	
Barrel Diameter in Inches	D = <input type="text" value="36"/> inches
Inlet Edge Type (Choose from pull-down list)	Square Edge with Headwall
<b>OR:</b>	
<b>Box Culvert:</b>	
Barrel Height (Rise) in Feet	H (Rise) = <input type="text" value="OR"/> ft
Barrel Width (Span) in Feet	W (Span) = <input type="text" value="OR"/> ft
Inlet Edge Type (Choose from pull-down list)	
Number of Barrels	# Barrels = <input type="text" value="1"/>
Inlet Elevation	Elev IN = <input type="text" value="7222.1"/> ft
Outlet Elevation <u>OR</u> Slope	Elev OUT = <input type="text" value="7222"/> ft
Culvert Length	L = <input type="text" value="10"/> ft
Manning's Roughness	n = <input type="text" value="0.012"/>
Bend Loss Coefficient	k <sub>b</sub> = <input type="text" value="0"/>
Exit Loss Coefficient	k <sub>x</sub> = <input type="text" value="1"/>
Tailwater Surface Elevation	Y <sub>t</sub> , Elevation = <input type="text" value=""/> ft
Max Allowable Channel Velocity	V = <input type="text" value="5"/> ft/s
Calculated Results:	
Culvert Cross Sectional Area Available	A = <input type="text" value="7.07"/> ft <sup>2</sup>
Culvert Normal Depth	Y <sub>n</sub> = <input type="text" value="1.71"/> ft
Culvert Critical Depth	Y <sub>c</sub> = <input type="text" value="2.19"/> ft
Froude Number	Fr = <input type="text" value="1.61"/> <span style="color: red;">Supercritical!</span>
Entrance Loss Coefficient	k <sub>e</sub> = <input type="text" value="0.50"/>
Friction Loss Coefficient	k <sub>f</sub> = <input type="text" value="0.06"/>
Sum of All Loss Coefficients	k <sub>s</sub> = <input type="text" value="1.56"/> ft
<b>Headwater:</b>	
Inlet Control Headwater	HW <sub>I</sub> = <input type="text" value="3.62"/> ft
Outlet Control Headwater	HW <sub>O</sub> = <input type="text" value="3.48"/> ft
Design Headwater Elevation	HW = <input type="text" value="7225.72"/> ft
Headwater/Diameter <u>OR</u> Headwater/Rise Ratio	HW/D = <input type="text" value="1.21"/>
<b>Outlet Protection:</b>	
Flow/(Diameter <sup>2.5</sup> )	Q/D <sup>2.5</sup> = <input type="text" value="2.89"/> ft <sup>0.5</sup> /s
Tailwater Surface Height	Y <sub>t</sub> = <input type="text" value="1.20"/> ft
Tailwater/Diameter	Y <sub>t</sub> /D = <input type="text" value="0.40"/>
Expansion Factor	1/(2*tan(Θ)) = <input type="text" value="4.54"/>
Flow Area at Max Channel Velocity	A <sub>t</sub> = <input type="text" value="9.00"/> ft <sup>2</sup>
Width of Equivalent Conduit for Multiple Barrels	W <sub>eq</sub> = <input type="text" value="-"/> ft
Length of Riprap Protection	L <sub>p</sub> = <input type="text" value="21"/> ft
Width of Riprap Protection at Downstream End	T = <input type="text" value="8"/> ft
Adjusted Diameter for Supercritical Flow	Da = <input type="text" value="2.36"/> ft
Minimum Theoretical Riprap Size	d <sub>50</sub> min = <input type="text" value="8"/> in
Nominal Riprap Size	d <sub>50</sub> nominal = <input type="text" value="9"/> in
MHFD Riprap Type	Type = <input type="text" value="L"/>

# DETERMINATION OF CULVERT HEADWATER AND OUTLET PROTECTION

*MHFD-Culvert, Version 4.00 (May 2020)*

Project: Eagleview

ID: Generic Driveway Culvert 42-inch



Soil Type:

Choose One:

- Sandy  
 Non-Sandy

Supercritical Flow! Using Adjusted Diameter to calculate protection type.

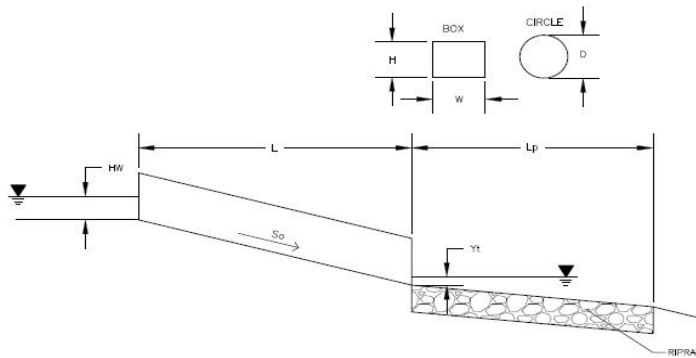
Design Information:	
Design Discharge	Q = <input style="width: 100px;" type="text" value="70"/> cfs
Circular Culvert:	
Barrel Diameter in Inches	D = <input style="width: 100px;" type="text" value="42"/> inches
Inlet Edge Type (Choose from pull-down list)	Square Edge with Headwall
OR:	
Box Culvert:	
Barrel Height (Rise) in Feet	H (Rise) = <input style="width: 100px;" type="text" value="OR"/> ft
Barrel Width (Span) in Feet	W (Span) = <input style="width: 100px;" type="text" value="OR"/> ft
Inlet Edge Type (Choose from pull-down list)	
Number of Barrels	# Barrels = <input style="width: 100px;" type="text" value="1"/>
Inlet Elevation	Elev IN = <input style="width: 100px;" type="text" value="7222.1"/> ft
Outlet Elevation OR Slope	Elev OUT = <input style="width: 100px;" type="text" value="7222"/> ft
Culvert Length	L = <input style="width: 100px;" type="text" value="10"/> ft
Manning's Roughness	n = <input style="width: 100px;" type="text" value="0.012"/>
Bend Loss Coefficient	k <sub>b</sub> = <input style="width: 100px;" type="text" value="0"/>
Exit Loss Coefficient	k <sub>x</sub> = <input style="width: 100px;" type="text" value="1"/>
Tailwater Surface Elevation	Y <sub>t</sub> , Elevation = <input style="width: 100px;" type="text" value=""/> ft
Max Allowable Channel Velocity	V = <input style="width: 100px;" type="text" value="5"/> ft/s
Calculated Results:	
Culvert Cross Sectional Area Available	A = <input style="width: 100px;" type="text" value="9.62"/> ft <sup>2</sup>
Culvert Normal Depth	Y <sub>n</sub> = <input style="width: 100px;" type="text" value="2.04"/> ft
Culvert Critical Depth	Y <sub>c</sub> = <input style="width: 100px;" type="text" value="2.62"/> ft
Froude Number	Fr = <input style="width: 100px;" type="text" value="1.64"/> <span style="color: red;">Supercritical!</span>
Entrance Loss Coefficient	k <sub>e</sub> = <input style="width: 100px;" type="text" value="0.50"/>
Friction Loss Coefficient	k <sub>f</sub> = <input style="width: 100px;" type="text" value="0.05"/>
Sum of All Loss Coefficients	k <sub>s</sub> = <input style="width: 100px;" type="text" value="1.55"/> ft
Headwater:	
Inlet Control Headwater	HW <sub>i</sub> = <input style="width: 100px;" type="text" value="4.44"/> ft
Outlet Control Headwater	HW <sub>o</sub> = <input style="width: 100px;" type="text" value="4.23"/> ft
Design Headwater Elevation	HW = <input style="width: 100px;" type="text" value="7226.54"/> ft
Headwater/Diameter OR Headwater/Rise Ratio	HW/D = <input style="width: 100px;" type="text" value="1.27"/>
Outlet Protection:	
Flow/(Diameter <sup>2.5</sup> )	Q/D <sup>2.5</sup> = <input style="width: 100px;" type="text" value="3.05"/> ft <sup>0.5</sup> /s
Tailwater Surface Height	Y <sub>t</sub> = <input style="width: 100px;" type="text" value="1.40"/> ft
Tailwater/Diameter	Y <sub>t</sub> /D = <input style="width: 100px;" type="text" value="0.40"/>
Expansion Factor	1/(2*tan(Θ)) = <input style="width: 100px;" type="text" value="4.33"/>
Flow Area at Max Channel Velocity	A <sub>t</sub> = <input style="width: 100px;" type="text" value="14.00"/> ft <sup>2</sup>
Width of Equivalent Conduit for Multiple Barrels	W <sub>eq</sub> = <input style="width: 100px;" type="text" value="-"/> ft
Length of Riprap Protection	L <sub>p</sub> = <input style="width: 100px;" type="text" value="29"/> ft
Width of Riprap Protection at Downstream End	T = <input style="width: 100px;" type="text" value="11"/> ft
Adjusted Diameter for Supercritical Flow	Da = <input style="width: 100px;" type="text" value="2.77"/> ft
Minimum Theoretical Riprap Size	d <sub>50</sub> min = <input style="width: 100px;" type="text" value="10"/> in
Nominal Riprap Size	d <sub>50</sub> nominal = <input style="width: 100px;" type="text" value="12"/> in
MHFD Riprap Type	Type = <input style="width: 100px;" type="text" value="M"/>

# DETERMINATION OF CULVERT HEADWATER AND OUTLET PROTECTION

*MHFD-Culvert, Version 4.00 (May 2020)*

Project: Eagleview

ID: Generic Driveway Culvert 48-inch



Soil Type:

Choose One:

- Sandy  
 Non-Sandy

Supercritical Flow! Using Adjusted Diameter to calculate protection type.

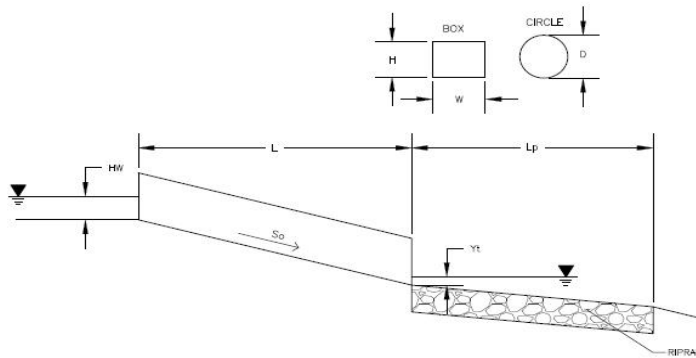
Design Information:	
Design Discharge	Q = <input type="text" value="100"/> cfs
Circular Culvert:	
Barrel Diameter in Inches	D = <input type="text" value="48"/> inches
Inlet Edge Type (Choose from pull-down list)	Square Edge with Headwall
OR:	
Box Culvert:	
Barrel Height (Rise) in Feet	H (Rise) = <input type="text" value="OR"/> ft
Barrel Width (Span) in Feet	W (Span) = <input type="text" value="OR"/> ft
Inlet Edge Type (Choose from pull-down list)	
Number of Barrels	# Barrels = <input type="text" value="1"/>
Inlet Elevation	Elev IN = <input type="text" value="7222.1"/> ft
Outlet Elevation OR Slope	Elev OUT = <input type="text" value="7222"/> ft
Culvert Length	L = <input type="text" value="10"/> ft
Manning's Roughness	n = <input type="text" value="0.012"/>
Bend Loss Coefficient	k <sub>b</sub> = <input type="text" value="0"/>
Exit Loss Coefficient	k <sub>x</sub> = <input type="text" value="1"/>
Tailwater Surface Elevation	Y <sub>t</sub> , Elevation = <input type="text" value=""/> ft
Max Allowable Channel Velocity	V = <input type="text" value="5"/> ft/s
Calculated Results:	
Culvert Cross Sectional Area Available	A = <input type="text" value="12.57"/> ft <sup>2</sup>
Culvert Normal Depth	Y <sub>n</sub> = <input type="text" value="2.33"/> ft
Culvert Critical Depth	Y <sub>c</sub> = <input type="text" value="3.03"/> ft
Froude Number	Fr = <input type="text" value="1.67"/> <span style="color: red;">Supercritical!</span>
Entrance Loss Coefficient	k <sub>e</sub> = <input type="text" value="0.50"/>
Friction Loss Coefficient	k <sub>f</sub> = <input type="text" value="0.04"/>
Sum of All Loss Coefficients	k <sub>s</sub> = <input type="text" value="1.54"/> ft
Headwater:	
Inlet Control Headwater	HW <sub>i</sub> = <input type="text" value="5.18"/> ft
Outlet Control Headwater	HW <sub>o</sub> = <input type="text" value="4.93"/> ft
Design Headwater Elevation	HW = <input type="text" value="7227.28"/> ft
Headwater/Diameter OR Headwater/Rise Ratio	HW/D = <input type="text" value="1.30"/>
Outlet Protection:	
Flow/(Diameter <sup>2.5</sup> )	Q/D <sup>2.5</sup> = <input type="text" value="3.13"/> ft <sup>0.5</sup> /s
Tailwater Surface Height	Y <sub>t</sub> = <input type="text" value="1.60"/> ft
Tailwater/Diameter	Y <sub>t</sub> /D = <input type="text" value="0.40"/>
Expansion Factor	1/(2*tan(Θ)) = <input type="text" value="4.27"/>
Flow Area at Max Channel Velocity	A <sub>t</sub> = <input type="text" value="20.00"/> ft <sup>2</sup>
Width of Equivalent Conduit for Multiple Barrels	W <sub>eq</sub> = <input type="text" value="-"/> ft
Length of Riprap Protection	L <sub>p</sub> = <input type="text" value="37"/> ft
Width of Riprap Protection at Downstream End	T = <input type="text" value="13"/> ft
Adjusted Diameter for Supercritical Flow	Da = <input type="text" value="3.16"/> ft
Minimum Theoretical Riprap Size	d <sub>50</sub> min = <input type="text" value="11"/> in
Nominal Riprap Size	d <sub>50</sub> nominal = <input type="text" value="12"/> in
MHFD Riprap Type	Type = <input type="text" value="M"/>

# DETERMINATION OF CULVERT HEADWATER AND OUTLET PROTECTION

*MHFD-Culvert, Version 4.00 (May 2020)*

Project: Eagleview

ID: Generic Driveway Culvert Double 42-inch



Supercritical Flow! Using Adjusted Diameter to calculate protection type.

Design Information:	
Design Discharge	Q = <input type="text" value="150"/> cfs
Circular Culvert:	
Barrel Diameter in Inches	D = <input type="text" value="42"/> inches
Inlet Edge Type (Choose from pull-down list)	Square Edge with Headwall
OR:	
Box Culvert:	
Barrel Height (Rise) in Feet	H (Rise) = <input type="text" value="OR"/> ft
Barrel Width (Span) in Feet	W (Span) = <input type="text" value="OR"/> ft
Inlet Edge Type (Choose from pull-down list)	
Number of Barrels	# Barrels = <input type="text" value="2"/>
Inlet Elevation	Elev IN = <input type="text" value="7222.1"/> ft
Outlet Elevation <u>OR</u> Slope	Elev OUT = <input type="text" value="7222"/> ft
Culvert Length	L = <input type="text" value="10"/> ft
Manning's Roughness	n = <input type="text" value="0.012"/>
Bend Loss Coefficient	k <sub>b</sub> = <input type="text" value="0"/>
Exit Loss Coefficient	k <sub>x</sub> = <input type="text" value="1"/>
Tailwater Surface Elevation	Y <sub>t</sub> , Elevation = <input type="text" value=""/> ft
Max Allowable Channel Velocity	V = <input type="text" value="5"/> ft/s
Calculated Results:	
Culvert Cross Sectional Area Available	A = <input type="text" value="9.62"/> ft <sup>2</sup>
Culvert Normal Depth	Y <sub>n</sub> = <input type="text" value="2.04"/> ft
Culvert Critical Depth	Y <sub>c</sub> = <input type="text" value="2.62"/> ft
Froude Number	Fr = <input type="text" value="1.64"/> <span style="color: red;">Supercritical!</span>
Entrance Loss Coefficient	k <sub>e</sub> = <input type="text" value="0.50"/>
Friction Loss Coefficient	k <sub>f</sub> = <input type="text" value="0.05"/>
Sum of All Loss Coefficients	k <sub>s</sub> = <input type="text" value="1.55"/> ft
Headwater:	
Inlet Control Headwater	HW <sub>I</sub> = <input type="text" value="4.44"/> ft
Outlet Control Headwater	HW <sub>O</sub> = <input type="text" value="4.23"/> ft
Design Headwater Elevation	HW = <input type="text" value="7226.54"/> ft
Headwater/Diameter <u>OR</u> Headwater/Rise Ratio	HW/D = <input type="text" value="1.27"/>
Outlet Protection:	
Flow/(Diameter <sup>2.5</sup> )	Q/D <sup>2.5</sup> = <input type="text" value="3.27"/> ft <sup>0.5</sup> /s
Tailwater Surface Height	Y <sub>t</sub> = <input type="text" value="1.40"/> ft
Tailwater/Diameter	Y <sub>t</sub> /D = <input type="text" value="0.40"/>
Expansion Factor	1/(2*tan(Θ)) = <input type="text" value="4.14"/>
Flow Area at Max Channel Velocity	A <sub>t</sub> = <input type="text" value="30.00"/> ft <sup>2</sup>
Width of Equivalent Conduit for Multiple Barrels	W <sub>eq</sub> = <input type="text" value="7.00"/> ft
Length of Riprap Protection	L <sub>p</sub> = <input type="text" value="29"/> ft
Width of Riprap Protection at Downstream End	T = <input type="text" value="15"/> ft
Adjusted Diameter for Supercritical Flow	
Minimum Theoretical Riprap Size	Da = <input type="text" value="2.77"/> ft
Nominal Riprap Size	d <sub>50</sub> min = <input type="text" value="10"/> in
MHFD Riprap Type	d <sub>50</sub> nominal = <input type="text" value="12"/> in
	Type = <input type="text" value="M"/>

EXISTING CHANNEL FLOWS SUMMARY

Reach/Channel ID	Contributing Basins	Tributary Areas (ac)	Flows (cfs)	Slope (%)
CHNL A	(7%B3) + OB6	122.6	120.9	5.65
CHNL B	(7%B3) + (100%OB5)	148.0	114.6	5.98
CHNL C	(4%B3) + (62%OB5)	91.6	70.7	8.54
CHNL D	(9%B3) + (1%OB7)	9.6	12.7	3.32
CHNL E	(70%B4) + OB8	43.3	64.3	2.57
CHNL F	(7%B2) + OB4	13.4	22.3	2.05
CHNL G	(86%B4) + OB8	45.7	67.3	2.29
CHNL H	(11%B2) + OB4 + OB3 + OB2	86.6	144.0	2.45
CHNL I	(17%B2) + OB4 + OB3 + OB2	89.0	146.9	2.22
CHNL J	(40%B2)	16.6	19.4	1.25
CHNL K	(27%B2) + OB4 + OB3 + OB2	93.2	151.8	2.46
CHNL L	(16%B1) + OB1	11.3	20.2	3.87
CHNL M	(34%B2) + OB4 + OB3 + OB2	96.1	155.2	4.54
CHNL O	(65%B2)	26.9	31.5	3.26
CHNL P	(7%B3)	4.2	7.7	7.65

## Worksheet for EX CHNL A

---

### Project Description

---

Friction Method	Manning Formula
Solve For	Normal Depth

---

### Input Data

---

Channel Slope	5.560 %
Discharge	120.90 cfs

---

### Section Definitions

	Station (ft)	Elevation (ft)	
	0+00		7,239.40
	0+61		7,236.49
	1+07		7,231.74
	1+84		7,246.00
	2+04		7,246.60

### Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 7,239.40)	(2+04, 7,246.60)	0.040

---

### Options

---

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

---



---

### Results

---

Normal Depth	17.9 in
Roughness Coefficient	0.040
Elevation	7,233.23 ft
Elevation Range	7,231.7 to 7,246.6 ft
Flow Area	16.9 ft <sup>2</sup>
Wetted Perimeter	22.9 ft
Hydraulic Radius	8.9 in
Top Width	22.68 ft
Normal Depth	17.9 in
Critical Depth	20.8 in
Critical Slope	2.476 %
Velocity	7.16 ft/s
Velocity Head	0.80 ft
Specific Energy	2.29 ft
Froude Number	1.461
Flow Type	Supercritical

---

## Worksheet for EX CHNL A

---

### 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	17.9 in
Critical Depth	20.8 in
Channel Slope	5.560 %
Critical Slope	2.476 %

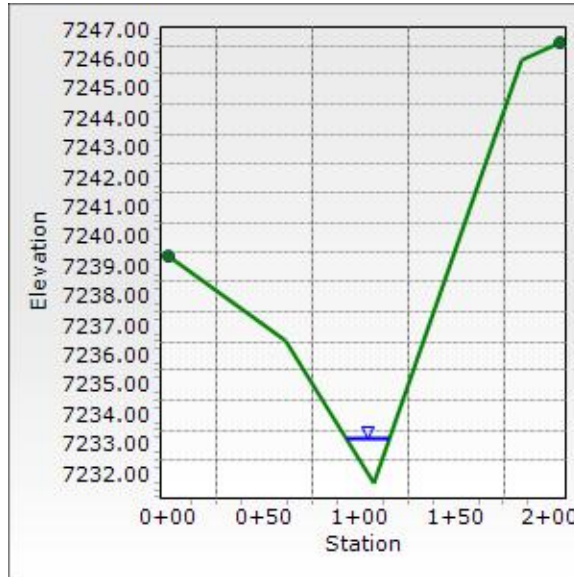
---

## Cross Section for EX CHNL A

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	5.560 %
Normal Depth	17.9 in
Discharge	120.90 cfs





## Worksheet for EX CHNL B

---

### Project Description

---

Friction Method	Manning Formula
Solve For	Normal Depth

---

### Input Data

---

Channel Slope	5.980 %
Discharge	114.60 cfs

---

### Section Definitions

Station (ft)	Elevation (ft)
0+00	7,249.10
0+38	7,248.00
0+78	7,243.32
0+95	7,240.83
1+48	7,247.55
1+79	7,249.28

### Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 7,249.10)	(1+79, 7,249.28)	0.040

---

### Options

---

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

---



---

### Results

---

Normal Depth	17.4 in
Roughness Coefficient	0.040
Elevation	7,242.28 ft
Elevation Range	7,240.8 to 7,249.3 ft
Flow Area	15.7 ft <sup>2</sup>
Wetted Perimeter	21.8 ft
Hydraulic Radius	8.6 in
Top Width	21.60 ft
Normal Depth	17.4 in
Critical Depth	20.6 in
Critical Slope	2.484 %
Velocity	7.30 ft/s
Velocity Head	0.83 ft
Specific Energy	2.28 ft
Froude Number	1.509

## Worksheet for EX CHNL B

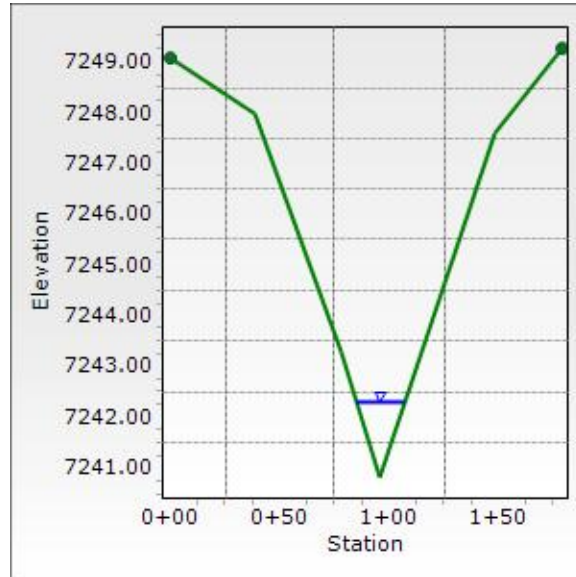
Results	
Flow Type	Supercritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	17.4 in
Critical Depth	20.6 in
Channel Slope	5.980 %
Critical Slope	2.484 %

## Cross Section for EX CHNL B

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	5.980 %
Normal Depth	17.4 in
Discharge	114.60 cfs



## Worksheet for EX CHNL C

---

### Project Description

---

Friction Method	Manning Formula
Solve For	Normal Depth

---

### Input Data

---

Channel Slope	8.540 %
Discharge	70.70 cfs

---

### Section Definitions

	Station (ft)	Elevation (ft)
	0+07	7,248.79
	0+81	7,244.00
	1+03	7,237.94
	1+22	7,246.00
	1+63	7,250.20

### Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+07, 7,248.79)	(1+63, 7,250.20)	0.040

---

### Options

---

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

---

### Results

---

Normal Depth	19.3 in
Roughness Coefficient	0.040
Elevation	7,239.54 ft
Elevation Range	7,237.9 to 7,250.2 ft
Flow Area	7.8 ft <sup>2</sup>
Wetted Perimeter	10.3 ft
Hydraulic Radius	9.1 in
Top Width	9.74 ft
Normal Depth	19.3 in
Critical Depth	24.3 in
Critical Slope	2.497 %
Velocity	9.05 ft/s
Velocity Head	1.27 ft
Specific Energy	2.88 ft
Froude Number	1.780
Flow Type	Supercritical

---

## Worksheet for EX CHNL C

---

### 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	19.3 in
Critical Depth	24.3 in
Channel Slope	8.540 %
Critical Slope	2.497 %

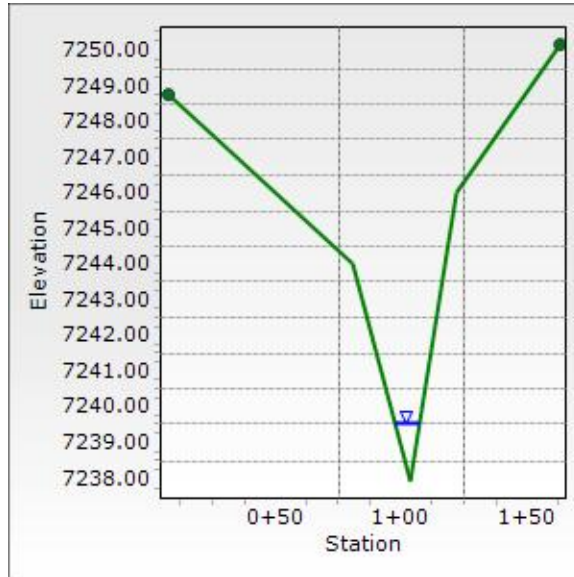
---

# Cross Section for EX CHNL C

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	8.540 %
Normal Depth	19.3 in
Discharge	70.70 cfs



## Worksheet for EX CHNL D

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

---

Input Data	
Channel Slope	3.320 %
Discharge	12.70 cfs

### Section Definitions

	Station (ft)	Elevation (ft)	
	0+00		7,237.14
	0+22		7,237.45
	0+78		7,235.70
	0+84		7,235.20
	0+98		7,236.20
	1+12		7,236.63
	1+58		7,239.52
	1+69		7,239.77

### Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 7,237.14)	(1+69, 7,239.77)	0.040

### Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

### Results

Normal Depth	7.0 in
Roughness Coefficient	0.040
Elevation	7,235.78 ft
Elevation Range	7,235.2 to 7,239.8 ft
Flow Area	4.5 ft <sup>2</sup>
Wetted Perimeter	16.9 ft
Hydraulic Radius	3.2 in
Top Width	16.86 ft
Normal Depth	7.0 in
Critical Depth	6.9 in
Critical Slope	3.641 %
Velocity	2.81 ft/s
Velocity Head	0.12 ft

## Worksheet for EX CHNL D

---

### Results

---

Specific Energy	0.71 ft
Froude Number	0.956
Flow Type	Subcritical

---

### 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	7.0 in
Critical Depth	6.9 in
Channel Slope	3.320 %
Critical Slope	3.641 %

---

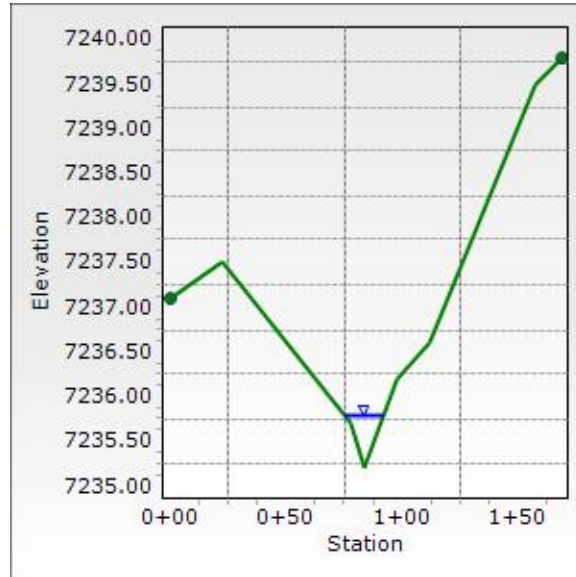


## Cross Section for EX CHNL D

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	3.320 %
Normal Depth	7.0 in
Discharge	12.70 cfs



## Worksheet for EX CHNL E

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

---

Input Data	
Channel Slope	2.570 %
Discharge	64.30 cfs

### Section Definitions

Station (ft)	Elevation (ft)
0+00	7,229.28
0+45	7,228.39
0+96	7,224.00
1+37	7,222.21
1+52	7,221.75
1+73	7,222.00
2+07	7,224.35
2+62	7,225.92

### Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 7,229.28)	(2+62, 7,225.92)	0.040

### Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

### Results

Normal Depth	7.9 in
Roughness Coefficient	0.040
Elevation	7,222.41 ft
Elevation Range	7,221.8 to 7,229.3 ft
Flow Area	19.3 ft <sup>2</sup>
Wetted Perimeter	46.5 ft
Hydraulic Radius	5.0 in
Top Width	46.45 ft
Normal Depth	7.9 in
Critical Depth	7.6 in
Critical Slope	3.175 %
Velocity	3.32 ft/s
Velocity Head	0.17 ft

## Worksheet for EX CHNL E

---

### Results

---

Specific Energy	0.83 ft
Froude Number	0.908
Flow Type	Subcritical

---

### 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	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	7.9 in
Critical Depth	7.6 in
Channel Slope	2.570 %
Critical Slope	3.175 %

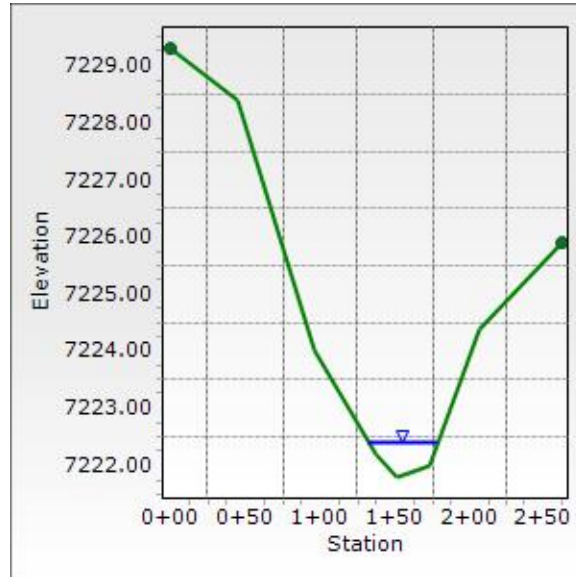
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# Cross Section for EX CHNL E

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	2.570 %
Normal Depth	7.9 in
Discharge	64.30 cfs



## Worksheet for EX CHNL F

---

### Project Description

---

Friction Method	Manning Formula
Solve For	Normal Depth

---

### Input Data

---

Channel Slope	2.050 %
Discharge	22.30 cfs

---

### Section Definitions

	Station (ft)	Elevation (ft)
	0+04	7,238.00
	0+58	7,237.06
	1+10	7,237.86
	1+28	7,238.35

### Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+04, 7,238.00)	(1+28, 7,238.35)	0.040

---

### Options

---

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

---



---

### Results

---

Normal Depth	5.2 in
Roughness Coefficient	0.040
Elevation	7,237.50 ft
Elevation Range	7,237.1 to 7,238.4 ft
Flow Area	11.6 ft <sup>2</sup>
Wetted Perimeter	53.3 ft
Hydraulic Radius	2.6 in
Top Width	53.27 ft
Normal Depth	5.2 in
Critical Depth	4.6 in
Critical Slope	4.045 %
Velocity	1.92 ft/s
Velocity Head	0.06 ft
Specific Energy	0.49 ft
Froude Number	0.727
Flow Type	Subcritical

---

## Worksheet for EX CHNL F

---

### GVF Input Data

---

Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

---

### GVF Output Data

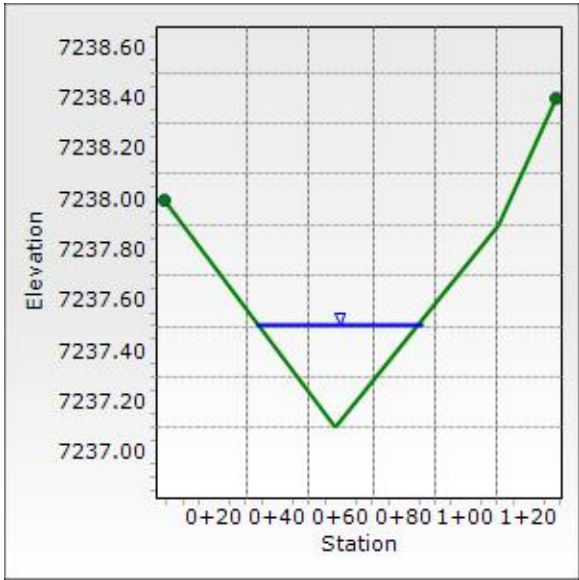
---

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	5.2 in
Critical Depth	4.6 in
Channel Slope	2.050 %
Critical Slope	4.045 %

---

# Cross Section for EX CHNL F

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Channel Slope	2.050 %
Normal Depth	5.2 in
Discharge	22.30 cfs



## Worksheet for EX CHNL G

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

---

Input Data	
Channel Slope	2.290 %
Discharge	67.30 cfs

### Section Definitions

Station (ft)		Elevation (ft)
	0+00	7,215.15
	0+58	7,209.92
	0+75	7,209.09
	0+88	7,210.43
	1+14	7,211.58

### Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 7,215.15)	(1+14, 7,211.58)	0.040

### Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

### Results

Normal Depth	12.9 in
Roughness Coefficient	0.040
Elevation	7,210.16 ft
Elevation Range	7,209.1 to 7,215.2 ft
Flow Area	17.5 ft <sup>2</sup>
Wetted Perimeter	30.8 ft
Hydraulic Radius	6.8 in
Top Width	30.70 ft
Normal Depth	12.9 in
Critical Depth	12.3 in
Critical Slope	2.871 %
Velocity	3.85 ft/s
Velocity Head	0.23 ft
Specific Energy	1.30 ft
Froude Number	0.901
Flow Type	Subcritical



## Worksheet for EX CHNL G

---

### 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	12.9 in
Critical Depth	12.3 in
Channel Slope	2.290 %
Critical Slope	2.871 %

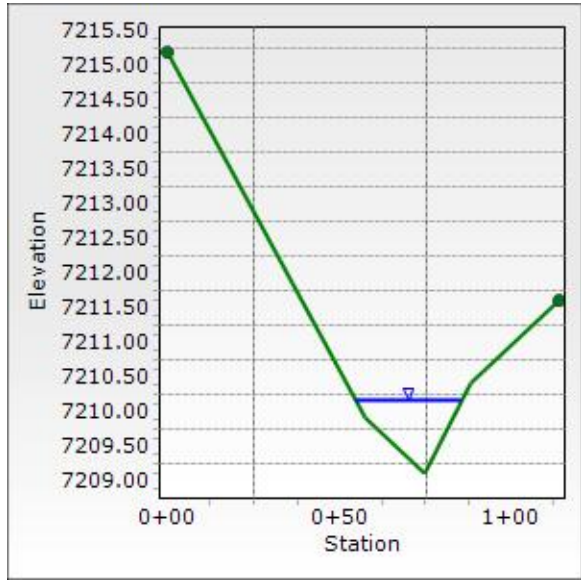
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# Cross Section for EX CHNL G

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	2.290 %
Normal Depth	12.9 in
Discharge	67.30 cfs



## Worksheet for EX CHNL H

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

---

Input Data	
Channel Slope	2.450 %
Discharge	144.00 cfs

### Section Definitions

Station (ft)	Elevation (ft)
0+00	7,224.47
0+19	7,224.03
0+31	7,222.38
0+48	7,224.36
0+60	7,224.54

### Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 7,224.47)	(0+60, 7,224.54)	0.040

### Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

### Results

Normal Depth	22.6 in
Roughness Coefficient	0.040
Elevation	7,224.26 ft
Elevation Range	7,222.4 to 7,224.5 ft
Flow Area	29.7 ft <sup>2</sup>
Wetted Perimeter	38.9 ft
Hydraulic Radius	9.2 in
Top Width	38.64 ft
Normal Depth	22.6 in
Critical Depth	22.4 in
Critical Slope	2.566 %
Velocity	4.86 ft/s
Velocity Head	0.37 ft
Specific Energy	2.25 ft
Froude Number	0.977
Flow Type	Subcritical

## Worksheet for EX CHNL H

---

### 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	22.6 in
Critical Depth	22.4 in
Channel Slope	2.450 %
Critical Slope	2.566 %

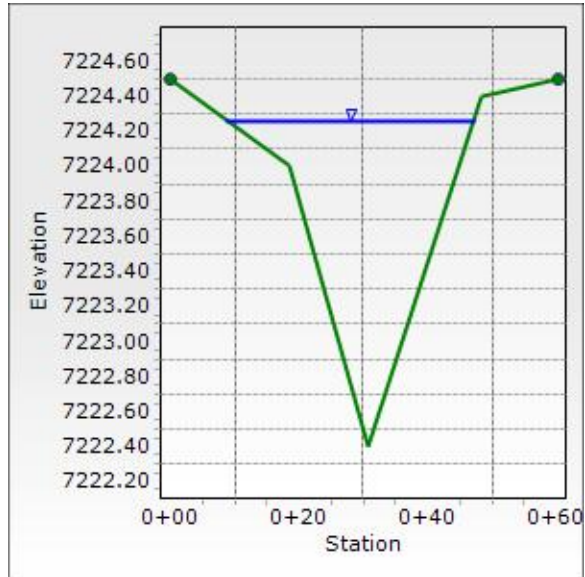
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## Cross Section for EX CHNL H

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	2.450 %
Normal Depth	22.6 in
Discharge	144.00 cfs



## Worksheet for EX CHNL I

---

### Project Description

---

Friction Method	Manning Formula
Solve For	Normal Depth

---

### Input Data

---

Channel Slope	2.220 %
Discharge	146.90 cfs

---

### Section Definitions

	Station (ft)	Elevation (ft)	
	0+00		7,218.31
	0+47		7,218.50
	0+86		7,216.59
	1+59		7,221.00
	1+71		7,221.35

### Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 7,218.31)	(1+71, 7,221.35)	0.040

---

### Options

---

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

---



---

### Results

---

Normal Depth	16.4 in
Roughness Coefficient	0.040
Elevation	7,217.96 ft
Elevation Range	7,216.6 to 7,221.4 ft
Flow Area	34.2 ft <sup>2</sup>
Wetted Perimeter	50.2 ft
Hydraulic Radius	8.2 in
Top Width	50.08 ft
Normal Depth	16.4 in
Critical Depth	15.8 in
Critical Slope	2.683 %
Velocity	4.29 ft/s
Velocity Head	0.29 ft
Specific Energy	1.65 ft
Froude Number	0.915
Flow Type	Subcritical

---

## Worksheet for EX CHNL I

---

### 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	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	16.4 in
Critical Depth	15.8 in
Channel Slope	2.220 %
Critical Slope	2.683 %

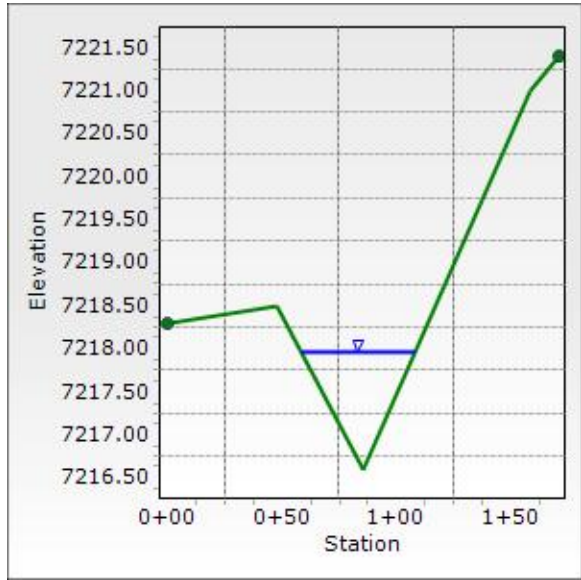
---

# Cross Section for EX CHNL I

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	2.220 %
Normal Depth	16.4 in
Discharge	146.90 cfs





## Worksheet for EX CHNL L

---

### Project Description

---

Friction Method	Manning Formula
Solve For	Normal Depth

---

### Input Data

---

Channel Slope	3.870 %
Discharge	20.20 cfs

---

### Section Definitions

	Station (ft)	Elevation (ft)	
	0+00		7,226.12
	0+53		7,222.85
	0+74		7,221.57
	1+55		7,223.80

### Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient	
(0+00, 7,226.12)	(1+55, 7,223.80)		0.040

---

### Options

---

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

---



---

### Results

---

Normal Depth	6.1 in
Roughness Coefficient	0.040
Elevation	7,222.08 ft
Elevation Range	7,221.6 to 7,226.1 ft
Flow Area	6.9 ft <sup>2</sup>
Wetted Perimeter	26.8 ft
Hydraulic Radius	3.1 in
Top Width	26.79 ft
Normal Depth	6.1 in
Critical Depth	6.2 in
Critical Slope	3.664 %
Velocity	2.94 ft/s
Velocity Head	0.13 ft
Specific Energy	0.65 ft
Froude Number	1.026
Flow Type	Supercritical

---

## Worksheet for EX CHNL L

---

### GVF Input Data

---

Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

---

### GVF Output Data

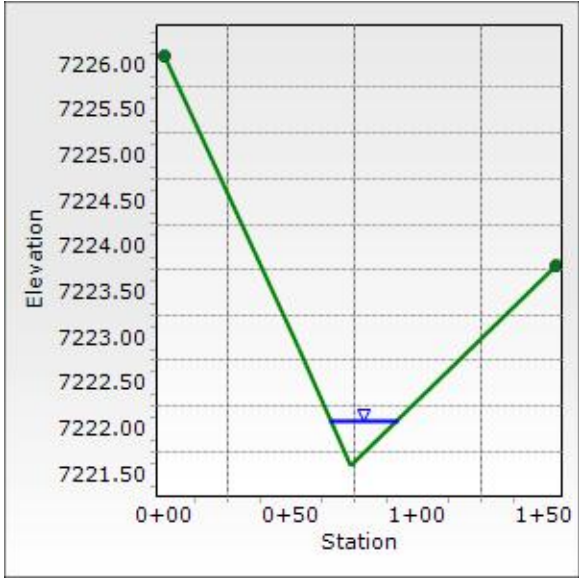
---

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	6.1 in
Critical Depth	6.2 in
Channel Slope	3.870 %
Critical Slope	3.664 %

---

# Cross Section for EX CHNL L

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Channel Slope	3.870 %
Normal Depth	6.1 in
Discharge	20.20 cfs



## Worksheet for EX CHNL M

---

### Project Description

---

Friction Method	Manning Formula
Solve For	Normal Depth

---

### Input Data

---

Channel Slope	4.540 %
Discharge	155.20 cfs

---

### Section Definitions

	Station (ft)	Elevation (ft)
	0+00	7,203.94
	0+72	7,201.87
	1+11	7,198.36
	1+38	7,202.50
	2+08	7,202.04

### Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 7,203.94)	(2+08, 7,202.04)	0.040

---

### Options

---

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

---



---

### Results

---

Normal Depth	19.3 in
Roughness Coefficient	0.040
Elevation	7,199.97 ft
Elevation Range	7,198.4 to 7,203.9 ft
Flow Area	22.8 ft <sup>2</sup>
Wetted Perimeter	28.6 ft
Hydraulic Radius	9.6 in
Top Width	28.37 ft
Normal Depth	19.3 in
Critical Depth	21.7 in
Critical Slope	2.434 %
Velocity	6.81 ft/s
Velocity Head	0.72 ft
Specific Energy	2.33 ft
Froude Number	1.339
Flow Type	Supercritical

---

## Worksheet for EX CHNL M

---

### 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	19.3 in
Critical Depth	21.7 in
Channel Slope	4.540 %
Critical Slope	2.434 %

---

## Cross Section for EX CHNL M

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	4.540 %
Normal Depth	19.3 in
Discharge	155.20 cfs



## Worksheet for EX CHNL O

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

---

Input Data	
Channel Slope	3.260 %
Discharge	31.50 cfs

### Section Definitions

Station (ft)	Elevation (ft)
0+00	7,195.73
0+70	7,196.09
1+00	7,192.99
1+30	7,195.99
1+83	7,197.86

### Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 7,195.73)	(1+83, 7,197.86)	0.040

### Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

### Results

Normal Depth	10.8 in
Roughness Coefficient	0.040
Elevation	7,193.89 ft
Elevation Range	7,193.0 to 7,197.9 ft
Flow Area	8.0 ft <sup>2</sup>
Wetted Perimeter	17.9 ft
Hydraulic Radius	5.4 in
Top Width	17.79 ft
Normal Depth	10.8 in
Critical Depth	11.0 in
Critical Slope	3.049 %
Velocity	3.93 ft/s
Velocity Head	0.24 ft
Specific Energy	1.14 ft
Froude Number	1.032
Flow Type	Supercritical

## Worksheet for EX CHNL O

---

### 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	10.8 in
Critical Depth	11.0 in
Channel Slope	3.260 %
Critical Slope	3.049 %

---

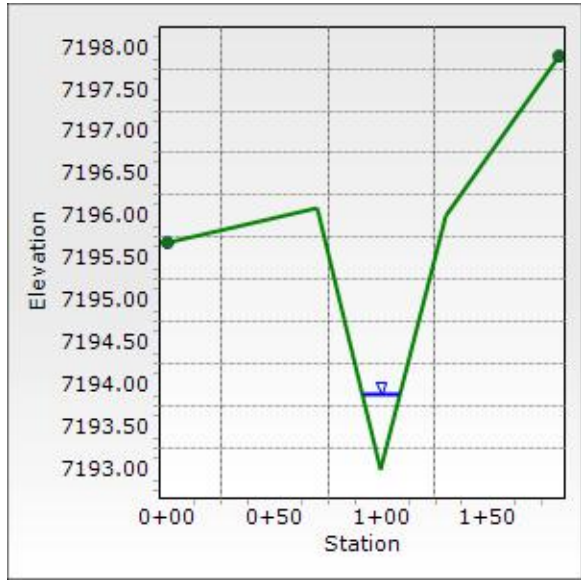


## Cross Section for EX CHNL O

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	3.260 %
Normal Depth	10.8 in
Discharge	31.50 cfs



## Worksheet for EX CHNL P

---

### Project Description

---

Friction Method	Manning Formula
Solve For	Normal Depth

---

### Input Data

---

Channel Slope	7.650 %
Discharge	7.70 cfs

---

### Section Definitions

Station (ft)		Elevation (ft)
	0+00	7,199.37
	0+28	7,199.01
	0+88	7,193.89
	1+16	7,198.17
	1+63	7,198.52

### Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 7,199.37)	(1+63, 7,198.52)	0.040

---

### Options

---

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

---



---

### Results

---

Normal Depth	5.6 in
Roughness Coefficient	0.040
Elevation	7,194.36 ft
Elevation Range	7,193.9 to 7,199.4 ft
Flow Area	2.0 ft <sup>2</sup>
Wetted Perimeter	8.6 ft
Hydraulic Radius	2.8 in
Top Width	8.53 ft
Normal Depth	5.6 in
Critical Depth	6.4 in
Critical Slope	3.649 %
Velocity	3.87 ft/s
Velocity Head	0.23 ft
Specific Energy	0.70 ft
Froude Number	1.414
Flow Type	Supercritical

---

## Worksheet for EX CHNL P

---

### 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	5.6 in
Critical Depth	6.4 in
Channel Slope	7.650 %
Critical Slope	3.649 %

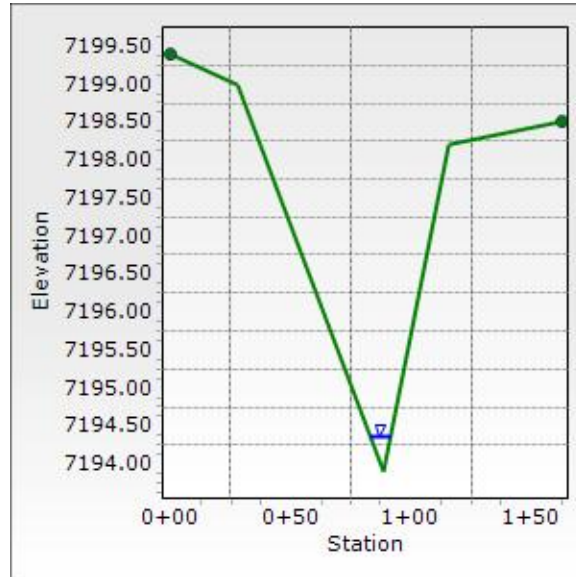
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## Cross Section for EX CHNL P

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	7.650 %
Normal Depth	5.6 in
Discharge	7.70 cfs



## Worksheet for EX CHNL J

---

### Project Description

---

Friction Method	Manning Formula
Solve For	Normal Depth

---

### Input Data

---

Channel Slope	1.250 %
Discharge	19.40 cfs

---

### Section Definitions

	Station (ft)	Elevation (ft)	
	0+00		7,205.29
	1+14		7,202.00
	1+30		7,201.92
	2+31		7,203.75

### Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 7,205.29)	(2+31, 7,203.75)	0.040

---

### Options

---

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

---



---

### Results

---

Normal Depth	4.8 in
Roughness Coefficient	0.040
Elevation	7,202.32 ft
Elevation Range	7,201.9 to 7,205.3 ft
Flow Area	12.0 ft <sup>2</sup>
Wetted Perimeter	49.2 ft
Hydraulic Radius	2.9 in
Top Width	49.18 ft
Normal Depth	4.8 in
Critical Depth	3.7 in
Critical Slope	4.048 %
Velocity	1.62 ft/s
Velocity Head	0.04 ft
Specific Energy	0.44 ft
Froude Number	0.579
Flow Type	Subcritical

---

## Worksheet for EX CHNL J

---

### 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	4.8 in
Critical Depth	3.7 in
Channel Slope	1.250 %
Critical Slope	4.048 %

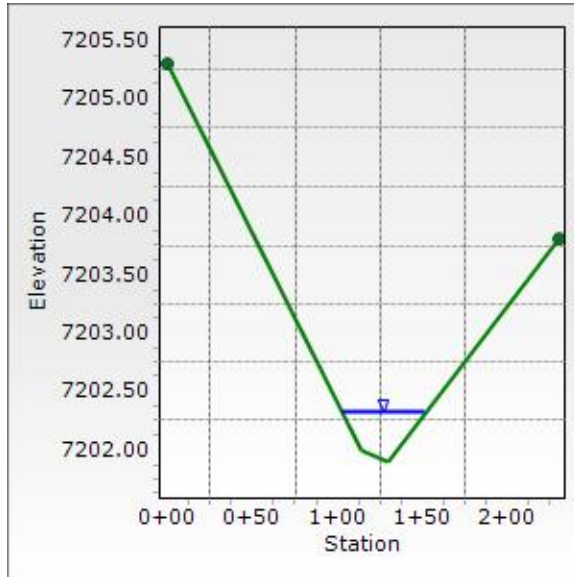
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## Cross Section for EX CHNL J

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.250 %
Normal Depth	4.8 in
Discharge	19.40 cfs



## Worksheet for EX CHNL K

---

### Project Description

---

Friction Method	Manning Formula
Solve For	Normal Depth

---

### Input Data

---

Channel Slope	2.460 %
Discharge	151.80 cfs

---

### Section Definitions

	Station (ft)	Elevation (ft)
	0+00	7,212.20
	0+95	7,210.70
	1+38	7,211.30
	1+68	7,210.90
	2+11	7,211.97

### Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 7,212.20)	(2+11, 7,211.97)	0.040

---

### Options

---

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

---



---

### Results

---

Normal Depth	8.8 in
Roughness Coefficient	0.040
Elevation	7,211.43 ft
Elevation Range	7,210.7 to 7,212.2 ft
Flow Area	51.2 ft <sup>2</sup>
Wetted Perimeter	140.8 ft
Hydraulic Radius	4.4 in
Top Width	140.76 ft
Normal Depth	8.8 in
Critical Depth	8.4 in
Critical Slope	3.352 %
Velocity	2.97 ft/s
Velocity Head	0.14 ft
Specific Energy	0.87 ft
Froude Number	0.868
Flow Type	Subcritical

---



## Worksheet for EX CHNL K

---

### 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	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	8.8 in
Critical Depth	8.4 in
Channel Slope	2.460 %
Critical Slope	3.352 %

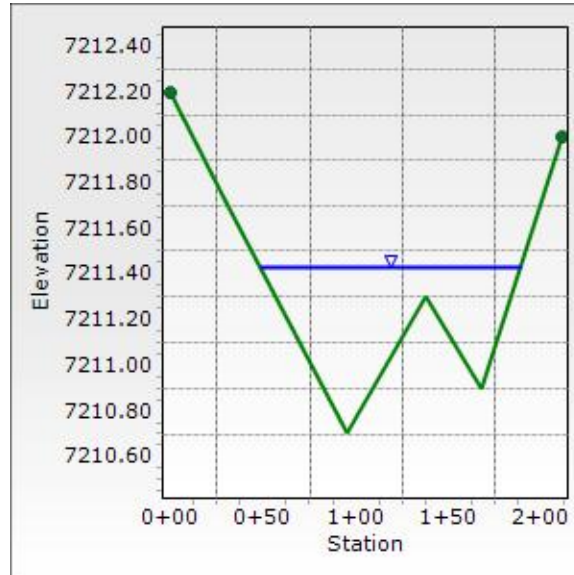
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## Cross Section for EX CHNL K

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	2.460 %
Normal Depth	8.8 in
Discharge	151.80 cfs



PROPOSED CHANNEL FLOWS SUMMARY

Reach/Channel ID	Contributing Basins	Tributary Areas (ac)	Flows (cfs)	Slope (%)	Lining
CHNL A	(30%PB9) + OB6	122.2	120.7	5.65	TRM
CHNL B	(34%PB8) + OB5	147.8	117.4	5.98	TRM
CHNL C	(20%PB8) + (2%OB5)	5.2	8.2	8.54	TRM
CHNL D	(47%PB10) + (1%OB7)	38.5	61.2	3.32	TRM
CHNL E	PB11 + OB8	49.2	81.4	2.57	TRM
CHNL F	(46%PB5) + OB4	13.3	23.7	2.05	-
CHNL G	(6%PB14) + PB11 + OB8	50.2	84.2	2.29	TRM
CHNL H	(20%PB4) + OB2 + OB3 + OB4	84.1	144.8	2.45	TRM
CHNL I	(45%PB4) + OB2 + OB3 + OB4	86.7	152.4	2.22	TRM
CHNL J	(7%PB15) + PB6 + PB7	15.2	29.9	1.25	-
CHNL K	(95%PB4) + OB2 + OB3 + OB4	92.0	167.5	2.46	-
CHNL L	(40%PB1) + OB1	12.1	21.9	3.87	TRM
CHNL M	(10%PB15) + OB2 + OB3 + OB4 + PB5 + PB4 + PB3	101.1	185.3	4.54	TRM
CHNL N	(50%PB15) + PB6 + PB7	19.4	41.3	0.50	-
CHNL O	(21%PB15)	2.0	5.5	3.26	TRM
CHNL P	(5%PB14)	0.9	2.3	7.65	TRM

## Worksheet for PROP CHNL A

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

---

Input Data	
Channel Slope	5.650 %
Discharge	120.70 cfs

### Section Definitions

	Station (ft)		Elevation (ft)
		0+00	7,239.40
		0+61	7,236.49
		1+07	7,231.74
		1+84	7,246.00
		2+04	7,246.60

### Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 7,239.40)	(2+04, 7,246.60)	0.040

### Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

### Results

Normal Depth	17.8 in
Roughness Coefficient	0.040
Elevation	7,233.22 ft
Elevation Range	7,231.7 to 7,246.6 ft
Flow Area	16.8 ft <sup>2</sup>
Wetted Perimeter	22.8 ft
Hydraulic Radius	8.8 in
Top Width	22.60 ft
Normal Depth	17.8 in
Critical Depth	20.8 in
Critical Slope	2.476 %
Velocity	7.20 ft/s
Velocity Head	0.80 ft
Specific Energy	2.29 ft
Froude Number	1.472
Flow Type	Supercritical

## Worksheet for PROP CHNL A

---

### 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	17.8 in
Critical Depth	20.8 in
Channel Slope	5.650 %
Critical Slope	2.476 %

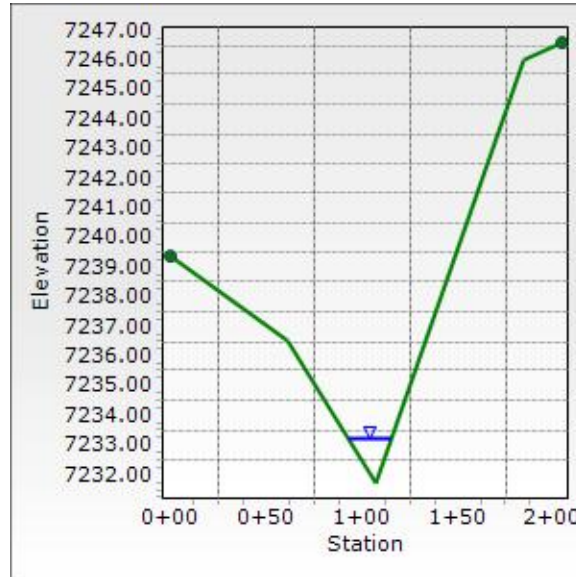
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## Cross Section for PROP CHNL A

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	5.650 %
Normal Depth	17.8 in
Discharge	120.70 cfs



## Worksheet for PROP CHNL B

---

### Project Description

---

Friction Method	Manning Formula
Solve For	Normal Depth

---

### Input Data

---

Channel Slope	5.980 %
Discharge	117.40 cfs

---

### Section Definitions

	Station (ft)	Elevation (ft)	
	0+00		7,249.10
	0+38		7,248.00
	0+78		7,243.32
	0+95		7,240.83
	1+06		7,243.14
	1+48		7,247.55
	1+79		7,249.28

### Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 7,249.10)	(1+79, 7,249.28)	0.040

---

### Options

---

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

---



---

### Results

---

Normal Depth	19.2 in
Roughness Coefficient	0.040
Elevation	7,242.43 ft
Elevation Range	7,240.8 to 7,249.3 ft
Flow Area	15.1 ft <sup>2</sup>
Wetted Perimeter	19.2 ft
Hydraulic Radius	9.5 in
Top Width	18.94 ft
Normal Depth	19.2 in
Critical Depth	22.7 in
Critical Slope	2.420 %
Velocity	7.75 ft/s
Velocity Head	0.93 ft
Specific Energy	2.53 ft

## Worksheet for PROP CHNL B

---

### Results

---

Froude Number	1.528
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	19.2 in
Critical Depth	22.7 in
Channel Slope	5.980 %
Critical Slope	2.420 %

---

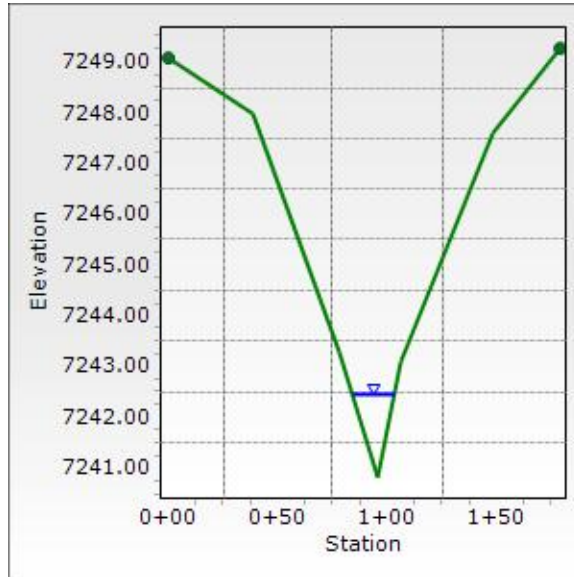


## Cross Section for PROP CHNL B

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	5.980 %
Normal Depth	19.2 in
Discharge	117.40 cfs



## Worksheet for PROP CHNL C

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

---

Input Data	
Channel Slope	8.540 %
Discharge	8.20 cfs

### Section Definitions

	Station (ft)	Elevation (ft)
	0+00	7,248.79
	0+77	7,244.26
	0+98	7,243.56
	1+16	7,244.42
	1+79	7,250.54

### Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 7,248.79)	(1+79, 7,250.54)	0.040

### Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

### Results

Normal Depth	3.8 in
Roughness Coefficient	0.040
Elevation	7,243.88 ft
Elevation Range	7,243.6 to 7,250.5 ft
Flow Area	2.6 ft <sup>2</sup>
Wetted Perimeter	16.1 ft
Hydraulic Radius	1.9 in
Top Width	16.05 ft
Normal Depth	3.8 in
Critical Depth	4.4 in
Critical Slope	4.108 %
Velocity	3.19 ft/s
Velocity Head	0.16 ft
Specific Energy	0.48 ft
Froude Number	1.407
Flow Type	Supercritical

## Worksheet for PROP CHNL C

---

### 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	3.8 in
Critical Depth	4.4 in
Channel Slope	8.540 %
Critical Slope	4.108 %

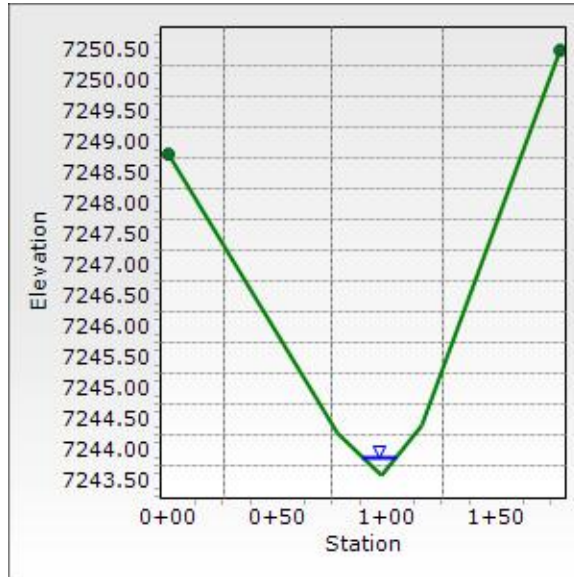
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# Cross Section for PROP CHNL C

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	8.540 %
Normal Depth	3.8 in
Discharge	8.20 cfs



## Worksheet for PROP CHNL D

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

---

Input Data	
Channel Slope	3.320 %
Discharge	61.20 cfs

### Section Definitions

	Station (ft)	Elevation (ft)
	0+00	7,237.14
	0+22	7,237.45
	0+78	7,235.70
	0+84	7,235.20
	0+98	7,236.20
	1+12	7,236.63
	1+58	7,239.52
	1+69	7,239.77

### Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 7,237.14)	(1+69, 7,239.77)	0.040

### Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

### Results

Normal Depth	12.1 in
Roughness Coefficient	0.040
Elevation	7,236.21 ft
Elevation Range	7,235.2 to 7,239.8 ft
Flow Area	15.8 ft <sup>2</sup>
Wetted Perimeter	36.3 ft
Hydraulic Radius	5.2 in
Top Width	36.22 ft
Normal Depth	12.1 in
Critical Depth	12.3 in
Critical Slope	3.076 %
Velocity	3.88 ft/s
Velocity Head	0.23 ft

## Worksheet for PROP CHNL D

---

### Results

---

Specific Energy	1.24 ft
Froude Number	1.038
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	12.1 in
Critical Depth	12.3 in
Channel Slope	3.320 %
Critical Slope	3.076 %

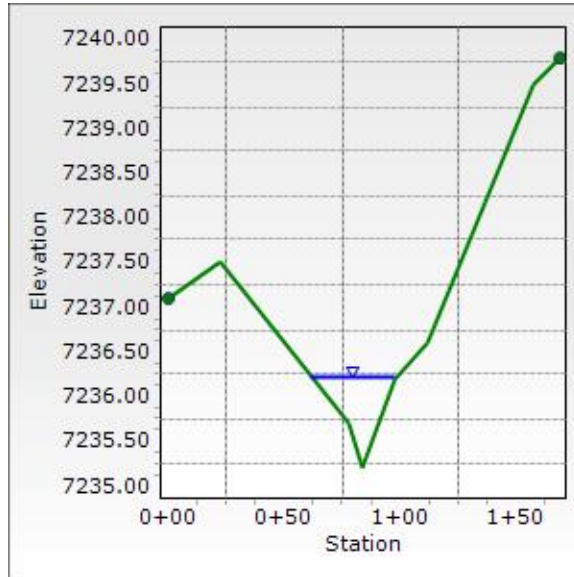
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## Cross Section for PROP CHNL D

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	3.320 %
Normal Depth	12.1 in
Discharge	61.20 cfs



## Worksheet for PROP CHNL E

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

---

Input Data	
Channel Slope	2.570 %
Discharge	81.40 cfs

### Section Definitions

	Station (ft)	Elevation (ft)
	0+00	7,229.28
	0+45	7,228.39
	0+96	7,224.00
	1+37	7,222.21
	1+52	7,221.75
	1+73	7,222.00
	2+07	7,224.35
	2+62	7,225.92

### Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 7,229.28)	(2+62, 7,225.92)	0.040

### Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

### Results

Normal Depth	8.8 in
Roughness Coefficient	0.040
Elevation	7,222.48 ft
Elevation Range	7,221.8 to 7,229.3 ft
Flow Area	22.8 ft <sup>2</sup>
Wetted Perimeter	49.2 ft
Hydraulic Radius	5.6 in
Top Width	49.15 ft
Normal Depth	8.8 in
Critical Depth	8.5 in
Critical Slope	3.053 %
Velocity	3.57 ft/s
Velocity Head	0.20 ft



## Worksheet for PROP CHNL E

---

### Results

---

Specific Energy	0.93 ft
Froude Number	0.924
Flow Type	Subcritical

---

### 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	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	8.8 in
Critical Depth	8.5 in
Channel Slope	2.570 %
Critical Slope	3.053 %

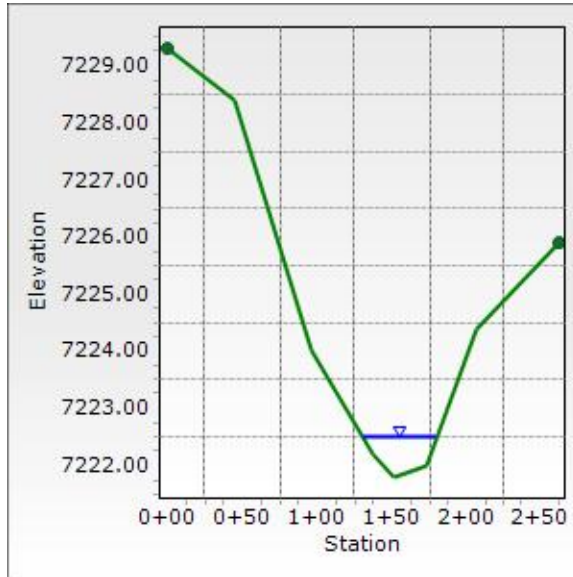
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# Cross Section for PROP CHNL E

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	2.570 %
Normal Depth	8.8 in
Discharge	81.40 cfs



## Worksheet for PROP CHNL F

---

### Project Description

---

Friction Method	Manning Formula
Solve For	Normal Depth

---

### Input Data

---

Channel Slope	2.050 %
Discharge	23.70 cfs

---

### Section Definitions

Station (ft)	Elevation (ft)
0+04	7,238.00
0+58	7,237.06
1+10	7,237.86
1+28	7,238.35

### Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+04, 7,238.00)	(1+28, 7,238.35)	0.040

---

### Options

---

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

---



---

### Results

---

Normal Depth	5.3 in
Roughness Coefficient	0.040
Elevation	7,237.51 ft
Elevation Range	7,237.1 to 7,238.4 ft
Flow Area	12.1 ft <sup>2</sup>
Wetted Perimeter	54.5 ft
Hydraulic Radius	2.7 in
Top Width	54.50 ft
Normal Depth	5.3 in
Critical Depth	4.7 in
Critical Slope	4.013 %
Velocity	1.95 ft/s
Velocity Head	0.06 ft
Specific Energy	0.50 ft
Froude Number	0.730
Flow Type	Subcritical

---

## Worksheet for PROP CHNL F

---

### 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	5.3 in
Critical Depth	4.7 in
Channel Slope	2.050 %
Critical Slope	4.013 %

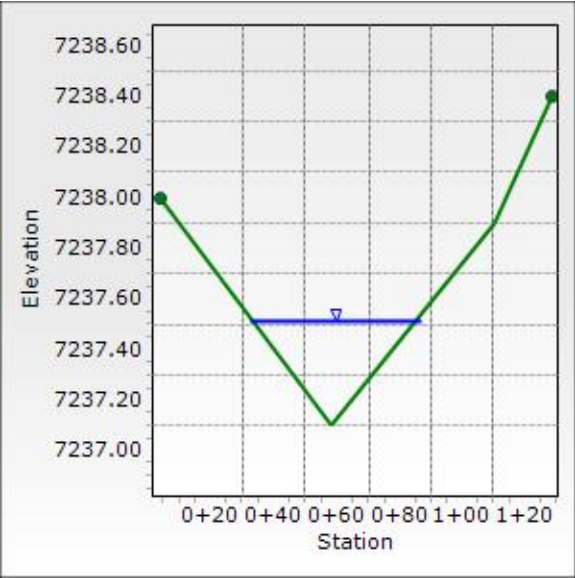
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# Cross Section for PROP CHNL F

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	2.050 %
Normal Depth	5.3 in
Discharge	23.70 cfs



## Worksheet for PROP CHNL G

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

---

Input Data	
Channel Slope	2.290 %
Discharge	84.20 cfs

### Section Definitions

Station (ft)	Elevation (ft)
0+00	7,215.15
0+58	7,209.92
0+75	7,209.09
0+88	7,210.43
1+14	7,211.58

### Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 7,215.15)	(1+14, 7,211.58)	0.040

### Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

### Results

Normal Depth	14.0 in
Roughness Coefficient	0.040
Elevation	7,210.26 ft
Elevation Range	7,209.1 to 7,215.2 ft
Flow Area	20.5 ft <sup>2</sup>
Wetted Perimeter	32.8 ft
Hydraulic Radius	7.5 in
Top Width	32.71 ft
Normal Depth	14.0 in
Critical Depth	13.5 in
Critical Slope	2.772 %
Velocity	4.11 ft/s
Velocity Head	0.26 ft
Specific Energy	1.43 ft
Froude Number	0.915
Flow Type	Subcritical

## Worksheet for PROP CHNL G

---

### 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	14.0 in
Critical Depth	13.5 in
Channel Slope	2.290 %
Critical Slope	2.772 %

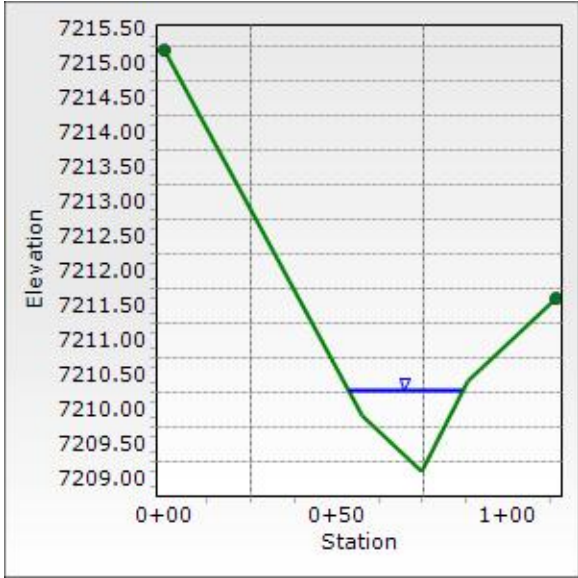
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# Cross Section for PROP CHNL G

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	2.290 %
Normal Depth	14.0 in
Discharge	84.20 cfs





## Worksheet for PROP CHNL H

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	2.450 %
Discharge	144.80 cfs

### Section Definitions

	Station (ft)	Elevation (ft)	
	0+00	7,224.50	
	0+19	7,224.00	
	0+31	7,222.40	
	0+48	7,224.40	
	0+53	7,224.66	

### Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 7,224.50)	(0+53, 7,224.66)	0.040

Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	22.7 in
Roughness Coefficient	0.040
Elevation	7,224.29 ft
Elevation Range	7,222.4 to 7,224.7 ft
Flow Area	29.9 ft <sup>2</sup>
Wetted Perimeter	39.4 ft
Hydraulic Radius	9.1 in
Top Width	39.15 ft
Normal Depth	22.7 in
Critical Depth	22.5 in
Critical Slope	2.571 %
Velocity	4.84 ft/s
Velocity Head	0.36 ft
Specific Energy	2.26 ft
Froude Number	0.976
Flow Type	Subcritical

## Worksheet for PROP CHNL H

---

### 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	22.7 in
Critical Depth	22.5 in
Channel Slope	2.450 %
Critical Slope	2.571 %

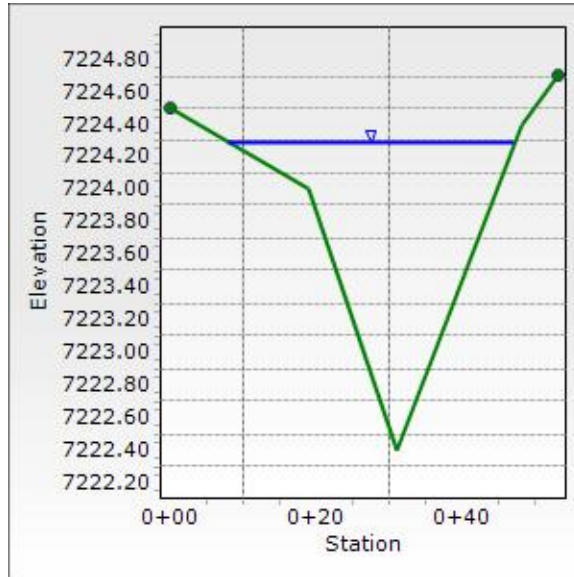
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## Cross Section for PROP CHNL H

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	2.450 %
Normal Depth	22.7 in
Discharge	144.80 cfs



## Worksheet for PROP CHNL I

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

---

Input Data	
Channel Slope	2.220 %
Discharge	152.40 cfs

### Section Definitions

	Station (ft)		Elevation (ft)
		0+00	7,218.31
		0+47	7,218.50
		0+86	7,216.59
		1+59	7,221.00
		1+71	7,221.35

### Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 7,218.31)	(1+71, 7,221.35)	0.040

### Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

### Results

Normal Depth	16.6 in
Roughness Coefficient	0.040
Elevation	7,217.98 ft
Elevation Range	7,216.6 to 7,221.4 ft
Flow Area	35.2 ft <sup>2</sup>
Wetted Perimeter	50.9 ft
Hydraulic Radius	8.3 in
Top Width	50.78 ft
Normal Depth	16.6 in
Critical Depth	16.1 in
Critical Slope	2.670 %
Velocity	4.33 ft/s
Velocity Head	0.29 ft
Specific Energy	1.68 ft
Froude Number	0.917
Flow Type	Subcritical

## Worksheet for PROP CHNL I

---

### 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	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	16.6 in
Critical Depth	16.1 in
Channel Slope	2.220 %
Critical Slope	2.670 %

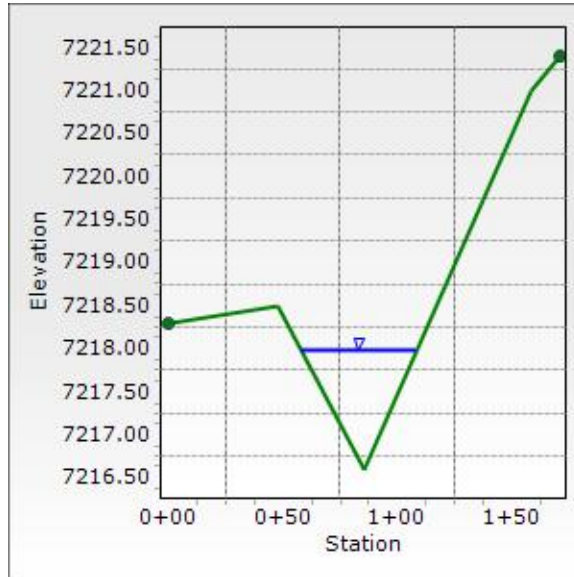
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## Cross Section for PROP CHNL I

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	2.220 %
Normal Depth	16.6 in
Discharge	152.40 cfs



## Worksheet for PROP CHNL J

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.250 %
Discharge	29.90 cfs

### Section Definitions

	Station (ft)	Elevation (ft)
	0+24	7,204.53
	1+22	7,201.99
	2+31	7,203.75

### Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+24, 7,204.53)	(2+31, 7,203.75)	0.040

Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	6.9 in
Roughness Coefficient	0.040
Elevation	7,202.56 ft
Elevation Range	7,202.0 to 7,204.5 ft
Flow Area	16.5 ft <sup>2</sup>
Wetted Perimeter	57.5 ft
Hydraulic Radius	3.4 in
Top Width	57.48 ft
Normal Depth	6.9 in
Critical Depth	5.6 in
Critical Slope	3.787 %
Velocity	1.81 ft/s
Velocity Head	0.05 ft
Specific Energy	0.63 ft
Froude Number	0.595
Flow Type	Subcritical

GVF Input Data
----------------

## Worksheet for PROP CHNL J

---

### 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	6.9 in
Critical Depth	5.6 in
Channel Slope	1.250 %
Critical Slope	3.787 %

---

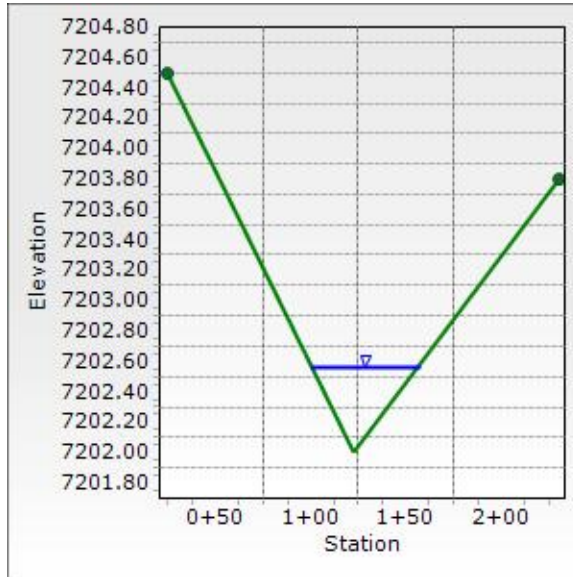


## Cross Section for PROP CHNL J

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.250 %
Normal Depth	6.9 in
Discharge	29.90 cfs



## Worksheet for PROP CHNL K

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

---

Input Data	
Channel Slope	2.460 %
Discharge	167.50 cfs

### Section Definitions

	Station (ft)	Elevation (ft)
	0+00	7,212.20
	0+96	7,210.71
	1+60	7,211.35
	1+65	7,210.93
	1+72	7,210.90
	1+75	7,211.02
	1+83	7,213.46

### Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 7,212.20)	(1+83, 7,213.46)	0.040

### Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

### Results

Normal Depth	8.9 in
Roughness Coefficient	0.040
Elevation	7,211.46 ft
Elevation Range	7,210.7 to 7,213.5 ft
Flow Area	52.4 ft <sup>2</sup>
Wetted Perimeter	128.9 ft
Hydraulic Radius	4.9 in
Top Width	128.77 ft
Normal Depth	8.9 in
Critical Depth	8.5 in
Critical Slope	3.224 %
Velocity	3.20 ft/s
Velocity Head	0.16 ft
Specific Energy	0.90 ft

## Worksheet for PROP CHNL K

---

### Results

---

Froude Number	0.883
Flow Type	Subcritical

---

### 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	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	8.9 in
Critical Depth	8.5 in
Channel Slope	2.460 %
Critical Slope	3.224 %

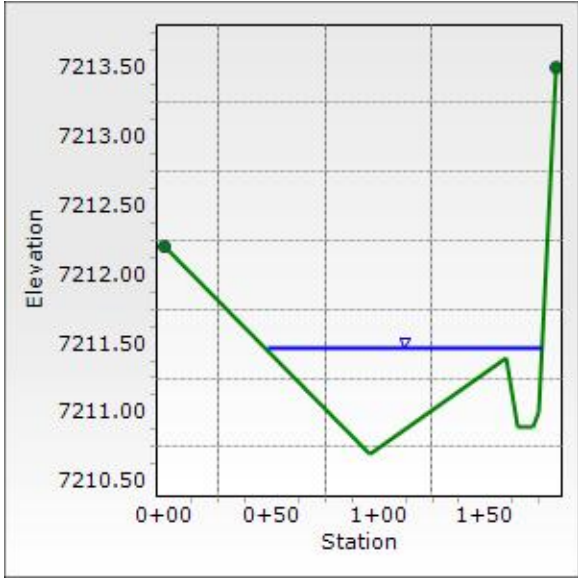
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# Cross Section for PROP CHNL K

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	2.460 %
Normal Depth	8.9 in
Discharge	167.50 cfs



## Worksheet for PROP CHNL L

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

---

Input Data	
Channel Slope	3.870 %
Discharge	21.90 cfs

### Section Definitions

	Station (ft)	Elevation (ft)
	0+12	7,226.00
	0+53	7,222.85
	0+74	7,221.57
	1+55	7,223.80

### Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+12, 7,226.00)	(1+55, 7,223.80)	0.040

### Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

### Results

Normal Depth	6.3 in
Roughness Coefficient	0.040
Elevation	7,222.10 ft
Elevation Range	7,221.6 to 7,226.0 ft
Flow Area	7.3 ft <sup>2</sup>
Wetted Perimeter	27.6 ft
Hydraulic Radius	3.2 in
Top Width	27.62 ft
Normal Depth	6.3 in
Critical Depth	6.4 in
Critical Slope	3.624 %
Velocity	3.00 ft/s
Velocity Head	0.14 ft
Specific Energy	0.67 ft
Froude Number	1.031
Flow Type	Supercritical

## Worksheet for PROP CHNL L

---

### 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	6.3 in
Critical Depth	6.4 in
Channel Slope	3.870 %
Critical Slope	3.624 %

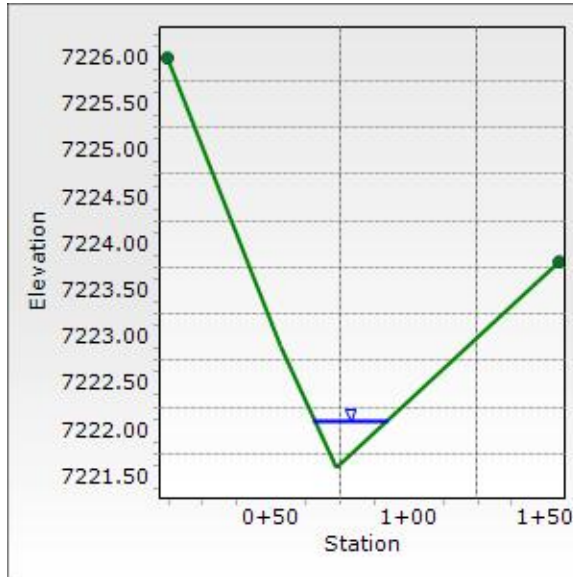
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## Cross Section for PROP CHNL L

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	3.870 %
Normal Depth	6.3 in
Discharge	21.90 cfs



## Worksheet for PROP CHNL M

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

---

Input Data	
Channel Slope	4.540 %
Discharge	185.30 cfs

### Section Definitions

	Station (ft)	Elevation (ft)
	0+00	7,203.94
	0+72	7,201.87
	1+11	7,198.36
	1+38	7,202.50
	2+08	7,202.04

### Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 7,203.94)	(2+08, 7,202.04)	0.040

### Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

### Results

Normal Depth	20.6 in
Roughness Coefficient	0.040
Elevation	7,200.08 ft
Elevation Range	7,198.4 to 7,203.9 ft
Flow Area	26.0 ft <sup>2</sup>
Wetted Perimeter	30.5 ft
Hydraulic Radius	10.2 in
Top Width	30.32 ft
Normal Depth	20.6 in
Critical Depth	23.3 in
Critical Slope	2.377 %
Velocity	7.12 ft/s
Velocity Head	0.79 ft
Specific Energy	2.50 ft
Froude Number	1.355
Flow Type	Supercritical



## Worksheet for PROP CHNL M

---

### 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	20.6 in
Critical Depth	23.3 in
Channel Slope	4.540 %
Critical Slope	2.377 %

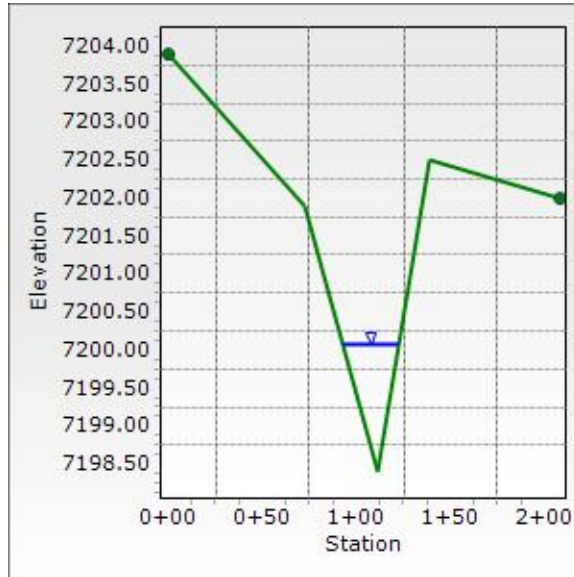
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# Cross Section for PROP CHNL M

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	4.540 %
Normal Depth	20.6 in
Discharge	185.30 cfs



## Worksheet for PROP CHNL N

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

---

Input Data	
Channel Slope	0.500 %
Discharge	41.30 cfs

### Section Definitions

	Station (ft)		Elevation (ft)
	0+03		7,201.34
	0+15		7,198.34
	0+21		7,198.34
	0+33		7,201.34

### Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+03, 7,201.34)	(0+33, 7,201.34)	0.040

### Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

### Results

Normal Depth	17.0 in
Roughness Coefficient	0.040
Elevation	7,199.75 ft
Elevation Range	7,198.3 to 7,201.3 ft
Flow Area	16.5 ft <sup>2</sup>
Wetted Perimeter	17.7 ft
Hydraulic Radius	11.2 in
Top Width	17.31 ft
Normal Depth	17.0 in
Critical Depth	11.0 in
Critical Slope	2.729 %
Velocity	2.51 ft/s
Velocity Head	0.10 ft
Specific Energy	1.51 ft
Froude Number	0.453
Flow Type	Subcritical

## Worksheet for PROP CHNL N

---

### 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	17.0 in
Critical Depth	11.0 in
Channel Slope	0.500 %
Critical Slope	2.729 %

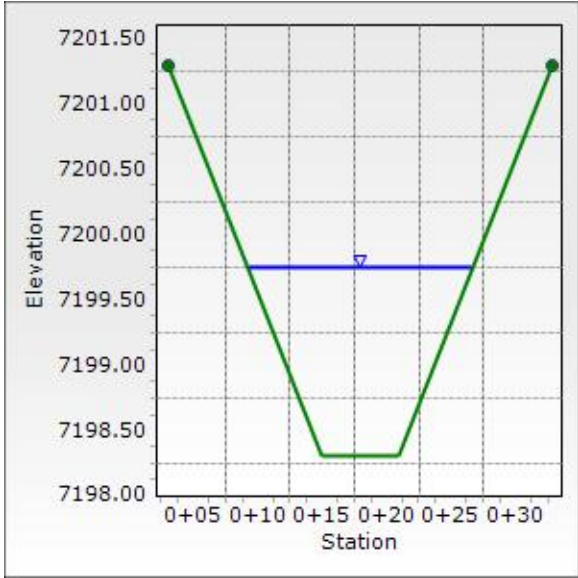
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## Cross Section for PROP CHNL N

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.500 %
Normal Depth	17.0 in
Discharge	41.30 cfs



## Worksheet for PROP CHNL O

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

---

Input Data	
Channel Slope	3.260 %
Discharge	5.50 cfs

### Section Definitions

	Station (ft)	Elevation (ft)
	0+00	7,195.73
	0+70	7,196.09
	1+00	7,192.99
	1+30	7,195.99
	1+83	7,197.86

### Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 7,195.73)	(1+83, 7,197.86)	0.040

### Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

### Results

Normal Depth	5.6 in
Roughness Coefficient	0.040
Elevation	7,193.46 ft
Elevation Range	7,193.0 to 7,197.9 ft
Flow Area	2.2 ft <sup>2</sup>
Wetted Perimeter	9.3 ft
Hydraulic Radius	2.8 in
Top Width	9.25 ft
Normal Depth	5.6 in
Critical Depth	5.5 in
Critical Slope	3.848 %
Velocity	2.54 ft/s
Velocity Head	0.10 ft
Specific Energy	0.57 ft
Froude Number	0.924
Flow Type	Subcritical

## Worksheet for PROP CHNL O

---

### 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	5.6 in
Critical Depth	5.5 in
Channel Slope	3.260 %
Critical Slope	3.848 %

---

# Cross Section for PROP CHNL O

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	3.260 %
Normal Depth	5.6 in
Discharge	5.50 cfs





## Worksheet for PROP CHNL P

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

---

Input Data	
Channel Slope	7.650 %
Discharge	2.30 cfs

### Section Definitions

Station (ft)	Elevation (ft)
0+00	7,199.37
0+28	7,199.01
0+88	7,193.89
1+16	7,198.17
1+63	7,198.52

### Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 7,199.37)	(1+63, 7,198.52)	0.040

### Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

### Results

Normal Depth	3.6 in
Roughness Coefficient	0.040
Elevation	7,194.19 ft
Elevation Range	7,193.9 to 7,199.4 ft
Flow Area	0.8 ft <sup>2</sup>
Wetted Perimeter	5.5 ft
Hydraulic Radius	1.8 in
Top Width	5.42 ft
Normal Depth	3.6 in
Critical Depth	4.0 in
Critical Slope	4.288 %
Velocity	2.86 ft/s
Velocity Head	0.13 ft
Specific Energy	0.42 ft
Froude Number	1.312
Flow Type	Supercritical

## Worksheet for PROP CHNL P

---

### 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	3.6 in
Critical Depth	4.0 in
Channel Slope	7.650 %
Critical Slope	4.288 %

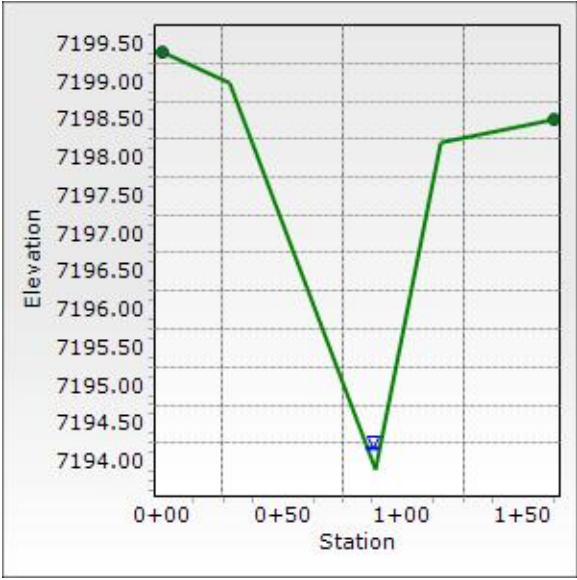
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# Cross Section for PROP CHNL P

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	7.650 %
Normal Depth	3.6 in
Discharge	2.30 cfs



**ROADSIDE DITCH SUMMARY TABLE**

Ditch #	ROADWAY	FROM STA	TO STA	PROPOSED SLOPE (%)	SIDE	SIDE SLOPE (L/R)	CHANNEL DEPTH (FT)	FRICTION FACTOR	BASIN	Q100 FLOW (CFS)	DITCH FLOW % OF BASIN	DITCH FLOW (CFS)	Q100 DEPTH (FT)	Q100 VELOCITY (FT/S)	Froude No. (Fr)	DITCH LINING
1	ARROYA COURT	80+36	84+06	2.62%	LEFT	4:1/4:1	2.5	0.04	5%OB5	107.1	5%	5.4	0.7	2.9	0.9	GRASS
2	S. ARROYA LANE	8+67	12+00	1.18%	LEFT	4:1/4:1	2.5	0.04	PB7 + 10%PB6	28.1	34%	12.6	1.2	2.6	0.6	GRASS
3	S. ARROYA LANE	8+67	12+00	1.18%	RIGHT	4:1/4:1	2.5	0.04	1%PB14	46.3	1%	0.5	0.3	1.2	0.5	GRASS
4	S. ARROYA LANE	15+88	20+00	2.69%	RIGHT	4:1/4:1	2.5	0.04	30%PB11	8.2	30%	2.5	0.5	2.4	0.8	GRASS
5	S. ARROYA LANE	20+00	24+28	2.16%	RIGHT	4:1/4:1	2.5	0.04	12%PB11	8.2	12%	1.0	0.4	1.8	0.7	GRASS
6	S. ARROYA LANE	20+00	24+28	2.16%	LEFT	4:1/4:1	2.5	0.04	5%PB10	24.8	5%	7.4	0.8	2.9	0.8	GRASS
7	ACEQUIA COURT	70+30	71+00	1.12%	LEFT	4:1/4:1	2.5	0.04	30%PB11	8.2	30%	2.5	0.6	1.7	0.6	GRASS
8	ACEQUIA COURT	71+60	75+44	1.00%	LEFT	4:1/4:1	2.5	0.04	5%PB11	8.2	5%	0.4	0.3	1.1	0.5	GRASS
9	ACEQUIA COURT	71+60	75+44	1.00%	RIGHT	4:1/4:1	2.5	0.04	10%PB14	46.3	10%	4.6	0.8	1.9	0.5	GRASS
10	FLAMING SUN DRIVE	24+40	26+88	1.84%	RIGHT	4:1/4:1	2.5	0.04	10%OB2	52.7	10%	5.3	0.7	2.5	0.7	GRASS
11	FLAMING SUN DRIVE	26+88	30+80	2.14%	LEFT	4:1/4:1	2.5	0.04	5% OB2 + 2%OB3	67.2	3%	2.2	0.5	2.1	0.7	GRASS
12	FLAMING SUN DRIVE	26+88	30+80	2.14%	RIGHT	4:1/4:1	2.5	0.04	10%OB2	52.7	10%	5.3	0.7	2.7	0.8	GRASS
13	FLAMING SUN DRIVE	34+00	35+90	1.10%	LEFT	4:1/4:1	2.5	0.04	20%PB5	10.4	20%	2.1	0.6	1.6	0.5	GRASS
14	FLAMING SUN DRIVE	34+00	35+90	1.10%	RIGHT	4:1/4:1	2.5	0.04	1%PB6	20.7	1%	0.2	0.2	0.9	0.5	GRASS
15	FLAMING SUN DRIVE	35+90	44+00	3.34%	LEFT	4:1/4:1	2.5	0.04	75%PB7	7.4	75%	5.6	0.7	3.2	1.0	GRASS/TRM
16	FLAMING SUN DRIVE	43+10	44+00	3.34%	RIGHT	4:1/4:1	2.5	0.04	8%PB6	20.7	8%	1.7	0.4	2.4	0.9	GRASS/TRM
17	CHAMITA TRAIL	60+00	63+78	2.18%	LEFT	4:1/4:1	2.5	0.04	15%PB15+1%PB14	46.3	15%	6.9	0.8	2.9	0.8	GRASS



# Design Data and Test Results

## Excel PP5-12™



## Specifications

A variety of test methods are utilized to determine performance and conformance values for Rolled Erosion Control Products (RECPs). Information within this document is presented to provide conformance values and recommended design values. Test results obtained for the Excel PP5-12 Turf Reinforcement Mat (TRM) and general design values are presented in Tables 1-4. For specific information detailing testing protocols, results and application of design values, refer to document number WE\_EXCEL\_PERF\_GEN.

Table 1 - Bench Scale Testing / NTPEP

Test Method	Condition	Result
ASTM D7101 Bench Scale Rainfall and Rainsplash Test	2 in per hour	14.53
	4 in per hour	5.59
	6 in per hour	4.82
ASTM D7207 Bench Scale Shear Resistance Test	3.0 psf (145 PA)	0.5 in (12 mm)
ASTM D7322 Bench Scale Vegetation Establishment Test	Top Soil, Fescue, 21 Day Incubation	661 %
NTPEP Report Number	ECP-2016-03-008	

Table 3 - Recommended Design Values\*

Design Value	Unvegetated	Vegetated
Typical RUSLE Cover Factor (C Factor)**	0.03	N/A
Maximum Slope Gradient (RUSLE)	1H : 1V	N/A
Max Allowable Velocity (0.5 in (12mm) soil loss)***	9.0 ft/s (2.7 m/s)	15.0 ft/s (4.6 m/s)
Max Allowable Shear Stress (0.5 in (12mm) soil loss)***	2.8 psf (134 PA)	12.0 psf (575 PA)
CF <sub>veg</sub> /CF <sub>TRM</sub>	N/A	0.26

\*\*C Factor value compliant with ASTM D6459. \*\*\* Shear Stress and Velocity values compliant with ASTM D6460.

Table 2 - Texas Transportation Institute (TTI) Results

Class	Test Condition	Result
A	< 3H:1 Clay Slope Test	N/A
B	< 3H:1 Sand Slope Test	N/A
C	> 3H:1 Clay Slope Test	N/A
D	> 3H:1 Sand Slope Test	N/A
E	2 psf Partially Vegetated Channel Test	Approved
F	4 psf Partially Vegetated Channel Test	Approved
G	6 psf Partially Vegetated Channel Test	Approved
H	8 psf Partially Vegetated Channel Test	Approved

Table 4 - HEC-15 Resistance to Flow Values

Design Value	Unvegetated
Manning's n @ Tau lower (0.7 psf (34 PA))	0.027
Manning's n @ Tau mid (1.4 psf (67 PA))	0.027
Manning's n @ Tau upper (2.8 psf (134 PA))	0.027

\*Recommended Design Values are based on results of standardized industry full-scale testing and may not be applicable for all field conditions. For most accurate computation of field performance, consult Excel Erosion Design (EED) at [www.westernexcelsior.com](http://www.westernexcelsior.com).

The information contained herein may represent product index data, performance ratings, bench scale testing or other material utility quantifications. Each representation may have unique utility and limitations. Every effort has been made to ensure accuracy, however, no warranty is claimed and no liability shall be assumed by Western Excelsior Corporation (WEC) or its affiliates regarding the completeness, accuracy or fitness of these values for any particular application or interpretation. While testing methods are provided for reference, values shown may be derived from interpolation or adjustment to be representative of intended use. For further information, please feel free to contact WEC.

ROCK CHUTE DETAILS

Rock Chute ID	Rock Chute Location	Contributing Basins	Q100 Flow (cfs)	Upstream Inlet Apron Length (ft)	Drop (ft) (Inlet Apron to Outlet Apron)	Chute Length (ft)	Downstream Outlet Apron Length (ft)	Chute Width (ft)	D50 (in)	Rock Chute Thickness (in)	Radius (ft)	Rock Chute Depth* (ft)	Top Chute Width** (ft)
1	PB8A	PB8A(60%), OB5	103	12.5	10	40	14	10	12	24	36	3.0	34
2	PB8A	PB8A (40%)	20	5	10	40	7	10	12	24	17	2.0	26
3	PB14	OB8, PB11, PB14 (10%)	96	12	7	28	16	10	18	36	27	3.0	34
4	PB15	PB6, PB7, PB15(55%)	43	10	6	24	13	14	12	24	21	2.0	30
5	PB15	OB2, OB3, OB4, PB3, PB4, PB5, PB15 (10%)	185	14	5	20	23	18	24	48	39	3.5	46

NOTES:

\*: Rock Chute Depth accounts for 1' of freeboard.

\*\* : Top Chute Width accounts for 1' of freeboard.

# Rock Chute Design Data

(Version WI-July-2010, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)

**Project:** Eagleview North Rock Chute #1  
**Designer:** BAH  
**Date:** April 15, 2024

**County:** El Paso  
**Checked by:** \_\_\_\_\_  
**Date:** \_\_\_\_\_

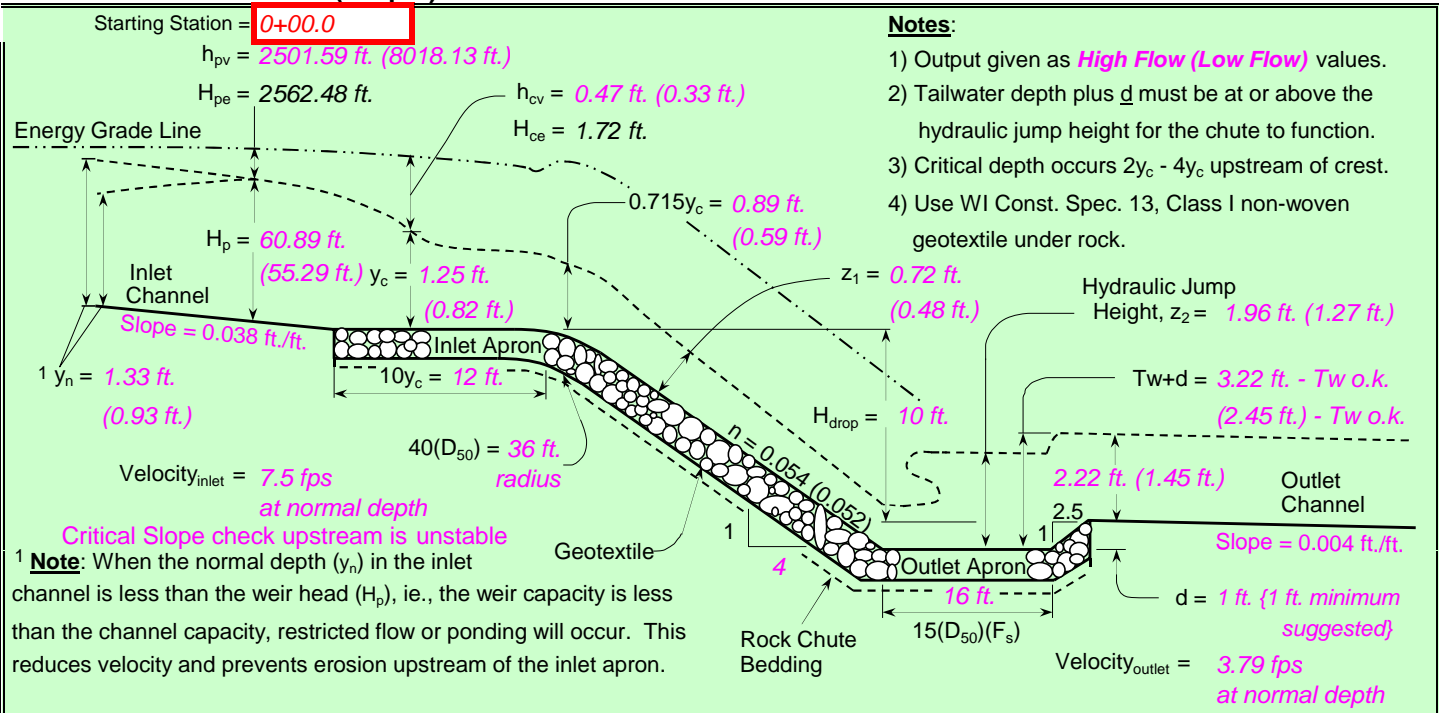
**Input Geometry:**

Upstream Channel	Chute	Downstream Channel
Bw = 5.0 ft.	Bw = 10.0 ft.	Bw = 10.0 ft.
Side slopes = 4.0 (m:1)	Factor of safety = 1.20 ( $F_s$ ) <b>1.2 Min</b>	Side slopes = 1.0 (m:1)
Velocity n-value = 0.035	Side slopes = 4.0 (m:1) → <b>2.0:1 max.</b>	Velocity n-value = 0.035
Bed slope = 0.0380 ft./ft.	Bed slope (4:1) = 0.250 ft./ft. → <b>3.0:1 max.</b>	Bed slope = 0.0040 ft./ft.
<i>Note: n value = a) velocity n from waterway program or b) computed manning's n for channel</i>	Freeboard = 0.5 ft. →	Base flow = 0.0 cfs
	Outlet apron depth, d = 1.0 ft.	

**Design Storm Data (Table 2, FOTG, WI-NRCS Grade Stabilization Structure No. 410):**

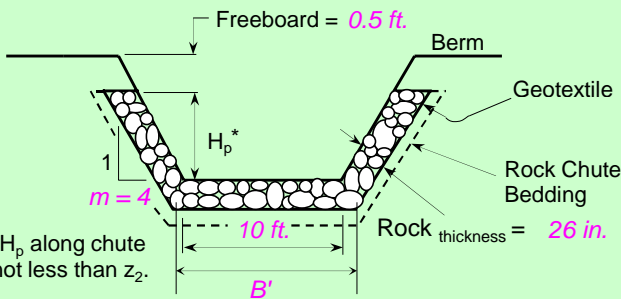
Apron elev. --- Inlet = 103.0 ft. ----- Outlet 92.0 ft. --- ( $H_{drop} = 10$ ft.)	<b>Note:</b> The total required capacity is routed through the chute (principal spillway) or in combination with an auxiliary spillway. <b>Input tailwater (<math>T_w</math>):</b> 0.25 1.20
$Q_{high}$ = Runoff from design storm capacity from Table 2, FOTG Standard 410 $Q_5$ = Runoff from a 5-year, 24-hour storm.	
$Q_{high} = 103.0$ cfs High flow storm <b>through chute</b> → $T_w$ (ft.) = <b>Program</b> $Q_5 = 50.0$ cfs Low flow storm <b>through chute</b> → $T_w$ (ft.) = <b>Program</b>	

**Profile and Cross Section (Output):**



**Profile Along Centerline of Chute**

**Typical Cross Section**



$F_s = 1.20$	Factor of safety (multiplier)
$Z_1 = 0.72$ ft.	Normal depth in chute
n-value = 0.054	Manning's roughness coefficient
$D_{50}(F_s) = 13$ in.	Minimum Design $D_{50}$ *
$2(D_{50})(F_s) = 26$ in.	Rock chute thickness
$T_w + d = 3.22$ ft.	Tailwater above outlet apron
$Z_2 = 1.96$ ft.	Hydraulic jump height
<b>*** The outlet will function adequately</b>	

**High Flow Storm Information**

# Rock Chute Design - Plan Sheet

(Version WI-July-2010, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)

Project: Eagleview North Rock Chute #1  
 Designer: BAH  
 Date: 4/15/2024

County: El Paso  
 Checked by: \_\_\_\_\_  
 Date: \_\_\_\_\_

Minimum	Enter	Rock Gradation Envelope		Quantities <sup>a</sup>
Design Values	Plan Values	% Passing	Diameter, in. (weight, lbs.)	
13.0 in. D <sub>50</sub> dia. =	in.	D <sub>100</sub> -----	0 - 0 (0 - 0)	Rock = 0 yd <sup>3</sup>
26.0 in. Rock <sub>chute</sub> thickness =	in.	D <sub>85</sub> -----	0 - 0 (0 - 0)	Geotextile (WCS-13) <sup>b</sup> = 140 yd <sup>2</sup>
12 ft. Inlet apron length =	ft.	D <sub>50</sub> -----	0 - 0 (0 - 0)	Bedding enter thickness in. = #VALUE!
16 ft. Outlet apron length =	ft.	D <sub>10</sub> -----	0 - 0 (0 - 0)	Excavation = 0 yd <sup>3</sup>
36 ft. Radius =	0 ft.			Earthfill = 0 yd <sup>3</sup>
Will bedding be used? Yes ----- Depth (in.) = <i>enter thickness</i>				Seeding = 0.0 acres

**Notes:** <sup>a</sup> Rock, bedding, and geotextile quantities are determined from the x-section below (neglect radius).  
<sup>b</sup> Geotextile Class I (non-woven) shall be overlapped and anchored (18-in. min. along sides and 24-in. min. on the ends).

Degree of angularity = 1

1	50% angular, 50% rounded
2	100% rounded

**Stakeout Notes**

Sta.	Elev. (Pnt)
0+00.0	103 ft. (1)
0+00.0	103 ft. (2)
0+00.0	103 ft. (3)
0+00.0	103 ft. (4)
0+44.0	92 ft. (5)
0+44.0	92 ft. (6)
0+46.5	93 ft. (7)

**Profile Along Centerline of Rock Chute**

**\*\* Note: The outlet will function adequately**

Class I non-woven

Rock gradation envelope can be met with DOT Light riprap Gradation

**Rock Chute Cross Section**

**Profile, Cross Sections, and Quantities**

Rock Chute Cost Estimate		
Unit	Unit Cost	Cost
Rock	\$10.00 /yd <sup>3</sup>	\$0.00
Geotextile	\$12.00 /yd <sup>2</sup>	\$1,680.00
Bedding	\$12.00 /yd <sup>3</sup>	#VALUE!
Excavation	\$12.00 /yd <sup>3</sup>	\$0.00
Earthfill	\$1.00 /yd <sup>3</sup>	\$0.00
Seeding	\$2.00 /ac.	\$0.00
<b>Total</b>		<b>#VALUE!</b>



Eagleview North Rock Chute #1

El Paso County

	Date	File Name
Designed	BAH	_____
Drawn	_____	_____
Checked	_____	_____
Approved	_____	_____
		Drawing Name
		Sheet ___ of ___

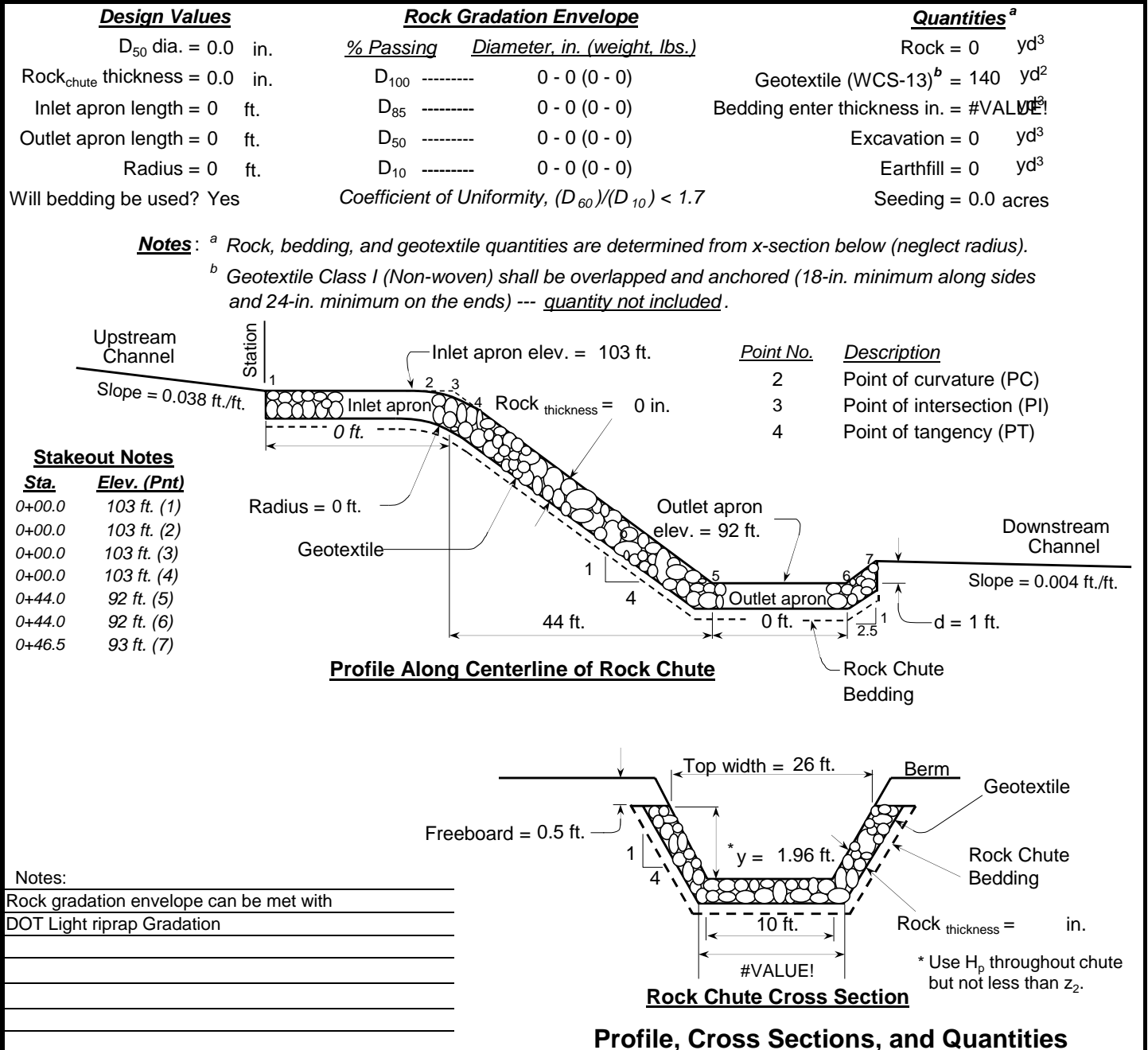


# Rock Chute Design - Cut/Paste Plan

(Version WI-July-2010, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)

**Project:** Eagleview North Rock Chute #1  
**Designer:** BAH  
**Date:** 4/15/2024

**County:** El Paso  
**Checked by:** \_\_\_\_\_  
**Date:** \_\_\_\_\_



## Profile, Cross Sections, and Quantities



Eagleview North Rock Chute #1  
 El Paso County

Designed	BAH	Date	_____	File Name
Drawn	_____	_____	_____	Drawing Name
Checked	_____	_____	_____	Sheet ___ of ___
Approved	_____	_____	_____	

# Rock Chute Design Data

(Version WI-July-2010, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)

**Project:** Eagview - South Rock Chute #2  
**Designer:** BAH  
**Date:** April 15, 2024

**County:** El Paso  
**Checked by:** \_\_\_\_\_  
**Date:** \_\_\_\_\_

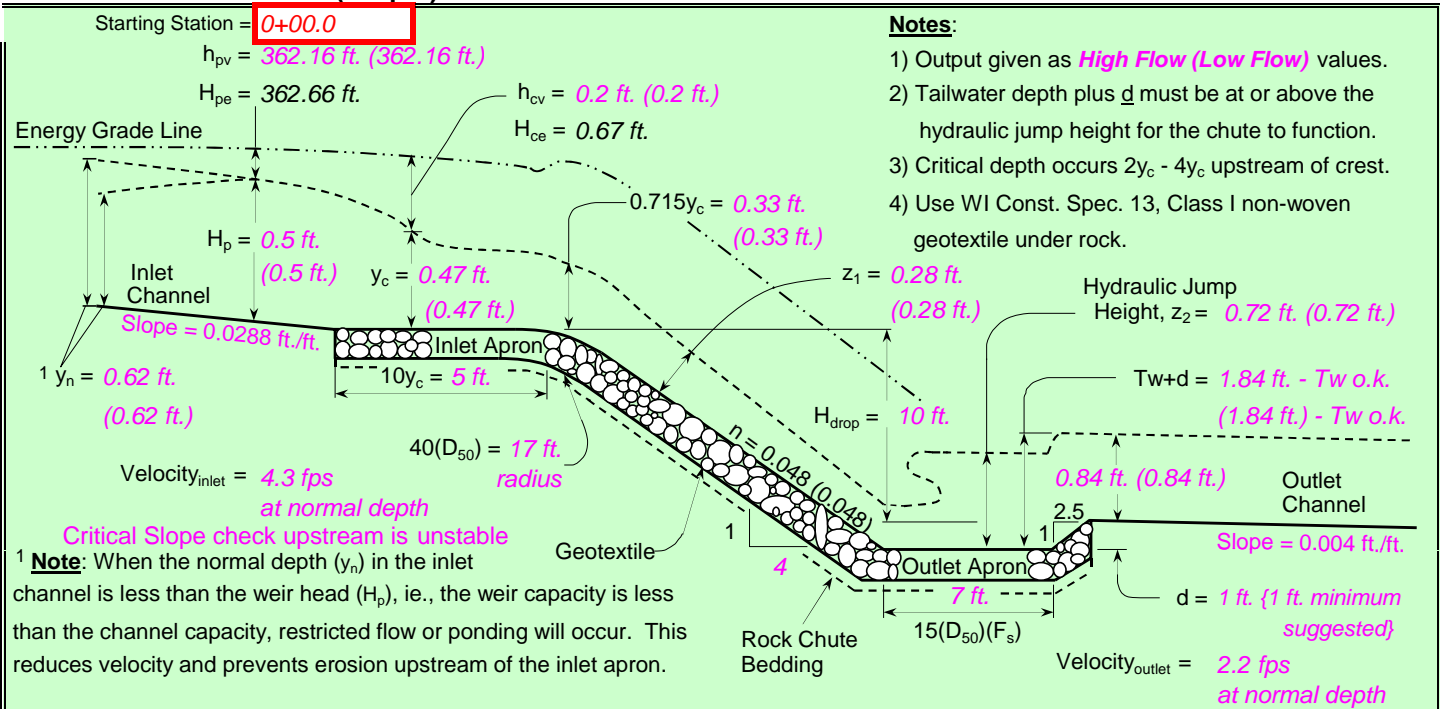
**Input Geometry:**

Upstream Channel	Chute	Downstream Channel
Bw = 5.0 ft.	Bw = 10.0 ft.	Bw = 10.0 ft.
Side slopes = 4.0 (m:1)	Factor of safety = 1.20 ( $F_s$ ) <b>1.2 Min</b>	Side slopes = 1.0 (m:1)
Velocity n-value = 0.035	Side slopes = 4.0 (m:1) → <b>2.0:1 max.</b>	Velocity n-value = 0.035
Bed slope = 0.0288 ft./ft.	Bed slope (4:1) = 0.250 ft./ft. → <b>3.0:1 max.</b>	Bed slope = 0.0040 ft./ft.
<i>Note: n value = a) velocity n from waterway program or b) computed manning's n for channel</i>	Freeboard = 0.5 ft. →	Base flow = 0.0 cfs
	Outlet apron depth, d = 1.0 ft.	

**Design Storm Data (Table 2, FOTG, WI-NRCS Grade Stabilization Structure No. 410):**

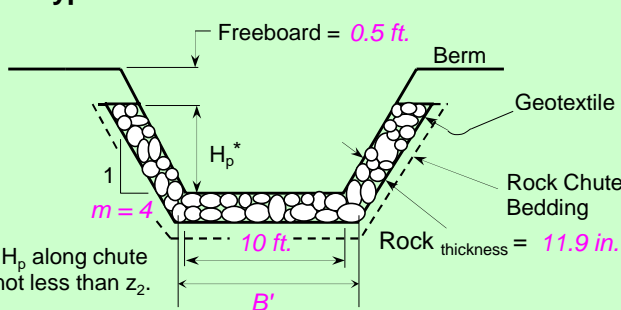
Apron elev. --- Inlet = 103.0 ft. ----- Outlet 92.0 ft. --- ( $H_{drop} = 10$ ft.)	<b>Note:</b> The total required capacity is routed through the chute (principal spillway) or in combination with an auxiliary spillway.
$Q_{high}$ = Runoff from design storm capacity from Table 2, FOTG Standard 410	<b>Input tailwater (<math>T_w</math>):</b> 0.25 1.20
$Q_5$ = Runoff from a 5-year, 24-hour storm.	
$Q_{high} = 20.0$ cfs High flow storm through chute	→ $T_w$ (ft.) = Program
$Q_5 = 20.0$ cfs Low flow storm through chute	→ $T_w$ (ft.) = Program

**Profile and Cross Section (Output):**



**Profile Along Centerline of Chute**

**Typical Cross Section**



$F_s =$ <u>1.20</u>	Factor of safety (multiplier)
$Z_1 =$ <u>0.28 ft.</u>	Normal depth in chute
n-value = <u>0.048</u>	Manning's roughness coefficient
$D_{50}(F_s) =$ <u>6 in.</u>	Minimum Design $D_{50}$ *
$2(D_{50})(F_s) =$ <u>11.9 in.</u>	Rock chute thickness
$T_w + d =$ <u>1.84 ft.</u>	Tailwater above outlet apron
$Z_2 =$ <u>0.72 ft.</u>	Hydraulic jump height
<b>*** The outlet will function adequately</b>	

**High Flow Storm Information**

# Rock Chute Design - Plan Sheet

(Version WI-July-2010, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)

Project: Eagview - South Rock Chute #2  
 Designer: BAH  
 Date: 4/15/2024

County: El Paso  
 Checked by: \_\_\_\_\_  
 Date: \_\_\_\_\_

Minimum	Enter	Rock Gradation Envelope		Quantities <sup>a</sup>
Design Values	Plan Values	% Passing	Diameter, in. (weight, lbs.)	
6.0 in. D <sub>50</sub> dia. =	in.	D <sub>100</sub> -----	0 - 0 (0 - 0)	Rock = 0 yd <sup>3</sup>
11.9 in. Rock <sub>chute</sub> thickness =	in.	D <sub>85</sub> -----	0 - 0 (0 - 0)	Geotextile (WCS-13) <sup>b</sup> = 86 yd <sup>2</sup>
5 ft. Inlet apron length =	ft.	D <sub>50</sub> -----	0 - 0 (0 - 0)	Bedding enter thickness in. = #VALUE!
7 ft. Outlet apron length =	ft.	D <sub>10</sub> -----	0 - 0 (0 - 0)	Excavation = 0 yd <sup>3</sup>
17 ft. Radius =	0 ft.			Earthfill = 0 yd <sup>3</sup>
Will bedding be used? Yes ----- Depth (in.) = enter thickness				Seeding = 0.0 acres

**Notes:** <sup>a</sup> Rock, bedding, and geotextile quantities are determined from the x-section below (neglect radius).  
<sup>b</sup> Geotextile Class I (non-woven) shall be overlapped and anchored (18-in. min. along sides and 24-in. min. on the ends).

Degree of angularity = 1

1	50% angular, 50% rounded
2	100% rounded

**Stakeout Notes**

Sta.	Elev. (Pnt)
0+00.0	103 ft. (1)
0+00.0	103 ft. (2)
0+00.0	103 ft. (3)
0+00.0	103 ft. (4)
0+44.0	92 ft. (5)
0+44.0	92 ft. (6)
0+46.5	93 ft. (7)

**Profile Along Centerline of Rock Chute**

**\*\* Note: The outlet will function adequately**

Class I non-woven

Rock gradation envelope can be met with DOT Light riprap Gradation

**Rock Chute Cross Section**

**Rock Chute Cost Estimate**

Unit	Unit Cost	Cost
Rock	\$10.00 /yd <sup>3</sup>	\$0.00
Geotextile	\$12.00/yd <sup>2</sup>	\$1,032.00
Bedding	\$12.00 /yd <sup>3</sup>	#VALUE!
Excavation	\$12.00/yd <sup>3</sup>	\$0.00
Earthfill	\$1.00 /yd <sup>3</sup>	\$0.00
Seeding	\$2.00 /ac.	\$0.00
<b>Total</b>		<b>#VALUE!</b>

**Profile, Cross Sections, and Quantities**



Eagview - South Rock Chute #2

El Paso County

	Date	File Name
Designed	BAH	_____
Drawn	_____	Drawing Name
Checked	_____	Sheet ___ of ___
Approved	_____	

# Rock Chute Design - Cut/Paste Plan

(Version WI-July-2010, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)

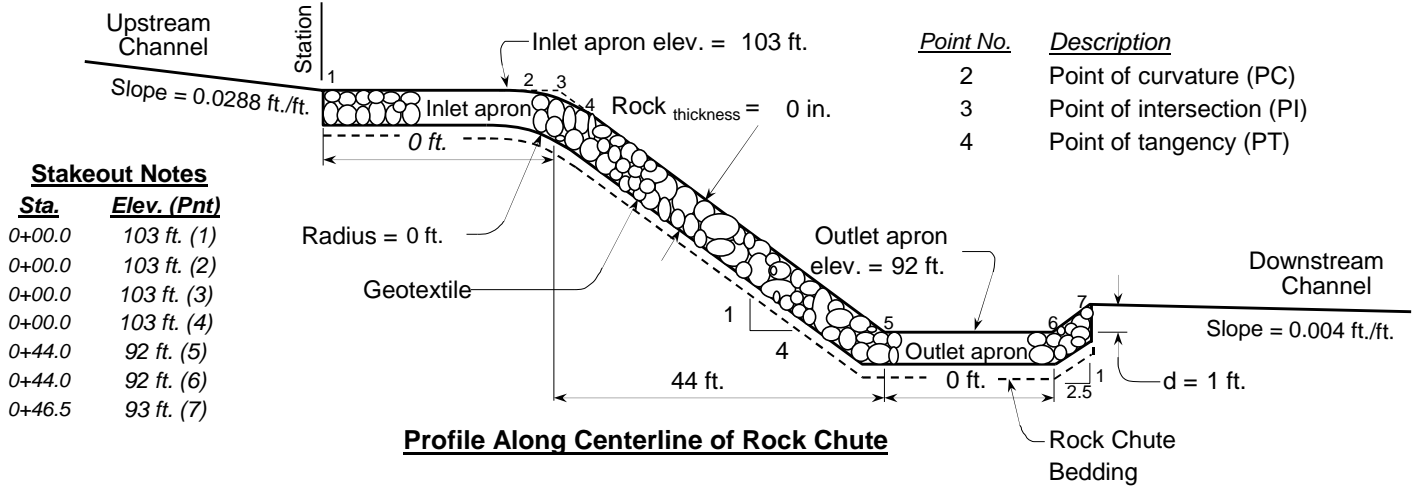
**Project:** Eagview - South Rock Chute #2  
**Designer:** BAH  
**Date:** 4/15/2024

**County:** El Paso  
**Checked by:** \_\_\_\_\_  
**Date:** \_\_\_\_\_

<u>Design Values</u>	<u>Rock Gradation Envelope</u>	<u>Quantities<sup>a</sup></u>
D <sub>50</sub> dia. = 0.0 in.	<u>% Passing</u> <u>Diameter, in. (weight, lbs.)</u>	Rock = 0    yd <sup>3</sup>
Rock <sub>chute</sub> thickness = 0.0 in.	D <sub>100</sub> -----    0 - 0 (0 - 0)	Geotextile (WCS-13) <sup>b</sup> = 86    yd <sup>2</sup>
Inlet apron length = 0 ft.	D <sub>85</sub> -----    0 - 0 (0 - 0)	Bedding enter thickness in. = #VALUE!
Outlet apron length = 0 ft.	D <sub>50</sub> -----    0 - 0 (0 - 0)	Excavation = 0    yd <sup>3</sup>
Radius = 0 ft.	D <sub>10</sub> -----    0 - 0 (0 - 0)	Earthfill = 0    yd <sup>3</sup>
Will bedding be used? Yes	Coefficient of Uniformity, (D <sub>60</sub> )/(D <sub>10</sub> ) < 1.7	Seeding = 0.0 acres

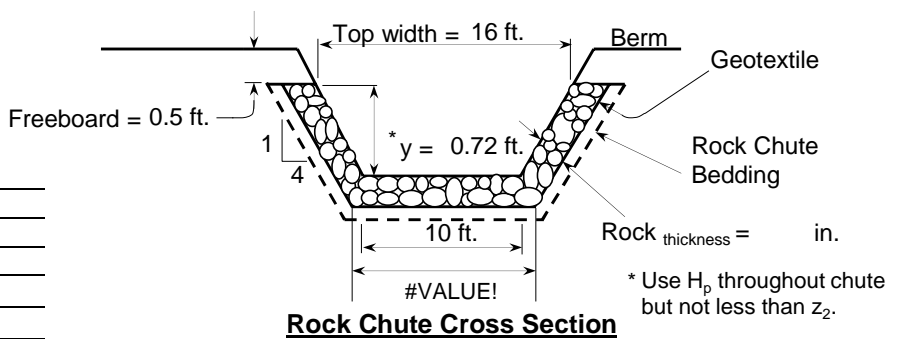
**Notes:** <sup>a</sup> Rock, bedding, and geotextile quantities are determined from x-section below (neglect radius).

<sup>b</sup> Geotextile Class I (Non-woven) shall be overlapped and anchored (18-in. minimum along sides and 24-in. minimum on the ends) --- quantity not included.



**Stakeout Notes**

Sta.	Elev. (Pnt)
0+00.0	103 ft. (1)
0+00.0	103 ft. (2)
0+00.0	103 ft. (3)
0+00.0	103 ft. (4)
0+44.0	92 ft. (5)
0+44.0	92 ft. (6)
0+46.5	93 ft. (7)



Notes:

Rock gradation envelope can be met with  
 DOT Light riprap Gradation

## Profile, Cross Sections, and Quantities

<p><b>NRCS</b> Natural Resources Conservation Service United States Department of Agriculture</p>	Eagview - South Rock Chute #2	El Paso County	Date	File Name	
			Designed: BAH	Drawing Name	
			Drawn: _____		
			Checked: _____		
			Approved: _____		Sheet ___ of ___

# Rock Chute Design Data

(Version WI-July-2010, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)

**Project:** Eagleview - Rock Chute 3 (WQ 2)  
**Designer:** TOS  
**Date:** April 18, 2024

**County:** El Paso  
**Checked by:** \_\_\_\_\_  
**Date:** \_\_\_\_\_

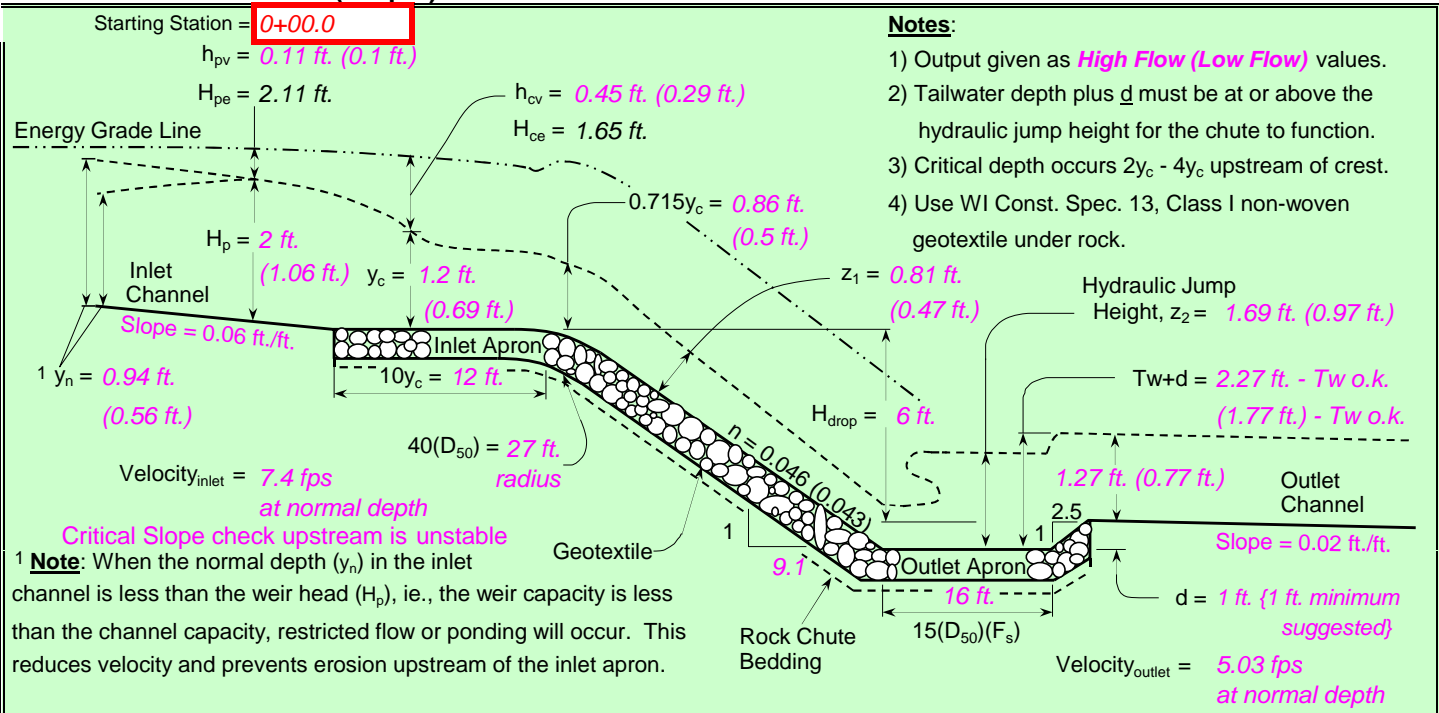
**Input Geometry:**

Upstream Channel	Chute	Downstream Channel
Bw = 10.0 ft.	Bw = 10.0 ft.	Bw = 10.0 ft.
Side slopes = 4.0 (m:1)	Factor of safety = 1.60 ( $F_s$ ) <b>1.2 Min</b>	Side slopes = 4.0 (m:1)
Velocity n-value = 0.040	Side slopes = 4.0 (m:1) → <b>2.0:1 max.</b>	Velocity n-value = 0.040
Bed slope = 0.0600 ft./ft.	Bed slope (9.1:1) = 0.110 ft./ft → <b>3.0:1 max.</b>	Bed slope = 0.0200 ft./ft.
<i>Note: n value = a) velocity n from waterway program or b) computed manning's n for channel</i>	Freeboard = 1.0 ft. →	Base flow = 0.0 cfs
	Outlet apron depth, d = 1.0 ft.	

**Design Storm Data (Table 2, FOTG, WI-NRCS Grade Stabilization Structure No. 410):**

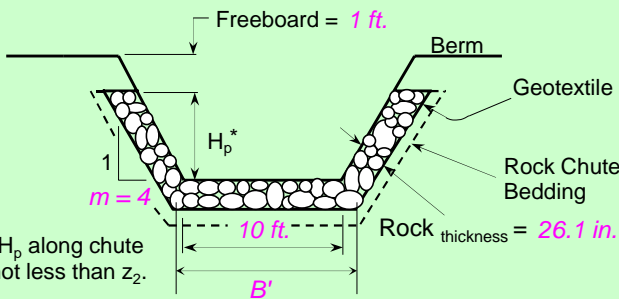
Apron elev. --- Inlet = 7205.0 ft. ----- Outlet = 7198.0 ft. --- ( $H_{drop} = 6$ ft.)	<b>Note:</b> The total required capacity is routed through the chute (principal spillway) or in combination with an auxiliary spillway.
$Q_{high}$ = Runoff from design storm capacity from Table 2, FOTG Standard 410	<b>Input tailwater (<math>T_w</math>):</b> 0.11 1.60
$Q_5$ = Runoff from a 5-year, 24-hour storm.	
$Q_{high} = 96.0$ cfs High flow storm through chute → $T_w$ (ft.) = Program	
$Q_5 = 38.0$ cfs Low flow storm through chute → $T_w$ (ft.) = Program	

**Profile and Cross Section (Output):**



**Profile Along Centerline of Chute**

**Typical Cross Section**



$F_s = 1.60$	Factor of safety (multiplier)
$Z_1 = 0.81$ ft.	Normal depth in chute
n-value = 0.046	Manning's roughness coefficient
$D_{50}(F_s) = 13.1$ in.	Minimum Design $D_{50}$ *
$2(D_{50})(F_s) = 26.1$ in.	Rock chute thickness
$T_w + d = 2.27$ ft.	Tailwater above outlet apron
$Z_2 = 1.69$ ft.	Hydraulic jump height
<b>*** The outlet will function adequately</b>	

**High Flow Storm Information**

$7.46$ cfs/ft.	Equivalent unit discharge
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# Rock Chute Design - Plan Sheet

(Version WI-July-2010, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)

Project: Eagleview - Rock Chute 3 (WQ 2)  
 Designer: TOS  
 Date: 4/18/2024

County: El Paso  
 Checked by: \_\_\_\_\_  
 Date: \_\_\_\_\_

Minimum	Enter	Rock Gradation Envelope		Quantities <sup>a</sup>
Design Values	Plan Values	% Passing	Diameter, in. (weight, lbs.)	
13.1 in. D <sub>50</sub> dia. =	in.	D <sub>100</sub> -----	0 - 0 (0 - 0)	Rock = 0 yd <sup>3</sup>
26.1 in. Rock <sub>chute</sub> thickness =	in.	D <sub>85</sub> -----	0 - 0 (0 - 0)	Geotextile (WCS-13) <sup>b</sup> = 197 yd <sup>2</sup>
12 ft. Inlet apron length =	ft.	D <sub>50</sub> -----	0 - 0 (0 - 0)	Bedding = 0 yd <sup>3</sup>
16 ft. Outlet apron length =	ft.	D <sub>10</sub> -----	0 - 0 (0 - 0)	Excavation = 0 yd <sup>3</sup>
27 ft. Radius =	0 ft.			Earthfill = 0 yd <sup>3</sup>
Will bedding be used? <b>No</b>				Seeding = 0.0 acres

**Notes:** <sup>a</sup> Rock, bedding, and geotextile quantities are determined from the x-section below (neglect radius).  
<sup>b</sup> Geotextile Class I (non-woven) shall be overlapped and anchored (18-in. min. along sides and 24-in. min. on the ends).

Degree of angularity = 1

1	50% angular, 50% rounded
2	100% rounded

**Stakeout Notes**

Sta.	Elev. (Pnt)
0+00.0	7205 ft. (1)
0+00.0	7205 ft. (2)
0+00.0	7205 ft. (3)
0+00.0	7205 ft. (4)
0+63.6	7198 ft. (5)
0+63.6	7198 ft. (6)
0+66.1	7199 ft. (7)

**Profile Along Centerline of Rock Chute**

**\*\* Note: The outlet will function adequately**

Class I non-woven

Rock gradation envelope can be met with DOT Light riprap Gradation

**Rock Chute Cross Section**

Rock Chute Cost Estimate		
Unit	Unit Cost	Cost
Rock	\$10.00 /yd <sup>3</sup>	\$0.00
Geotextile	\$12.00 /yd <sup>2</sup>	\$2,364.00
Bedding	\$12.00 /yd <sup>3</sup>	\$0.00
Excavation	\$12.00 /yd <sup>3</sup>	\$0.00
Earthfill	\$1.00 /yd <sup>3</sup>	\$0.00
Seeding	\$2.00 /ac.	\$0.00
<b>Total</b>		<b>\$2,364.00</b>



Eagleview - Rock Chute 3 (WQ 2)  
 El Paso County

	Date	File Name
Designed	TOS	
Drawn		
Checked		
Approved		
		Drawing Name
		Sheet ___ of ___



# Rock Chute Design - Cut/Paste Plan

(Version WI-July-2010, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)

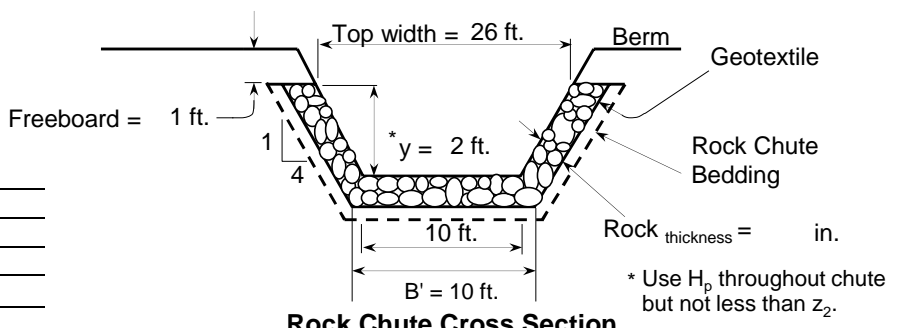
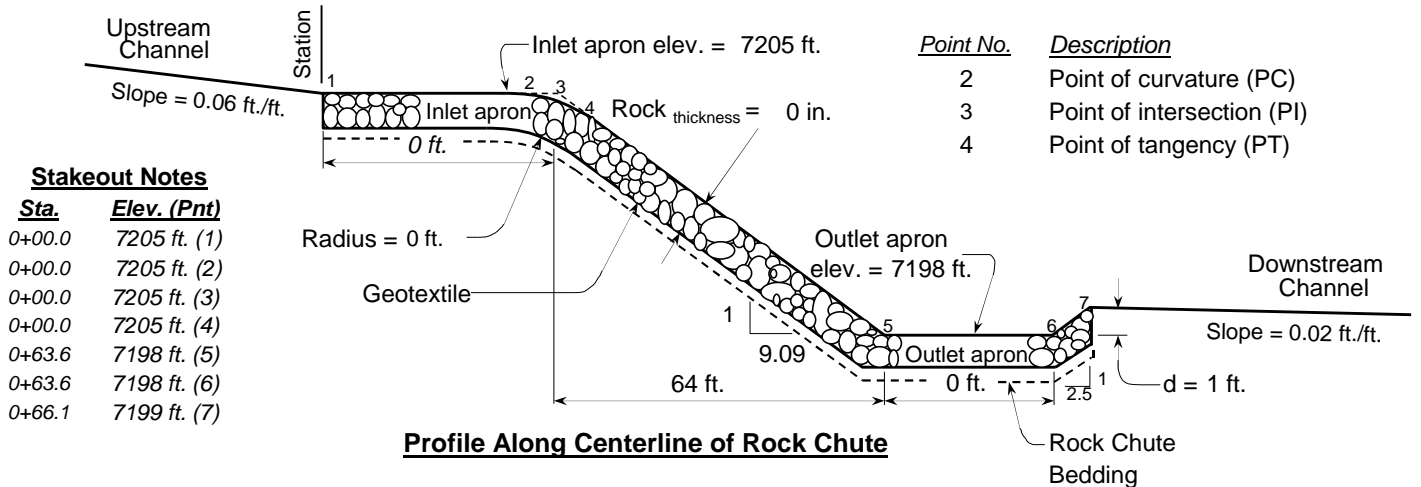
**Project:** Eagleview - Rock Chute 3 (WQ 2)  
**Designer:** TOS  
**Date:** 4/18/2024

**County:** El Paso  
**Checked by:** \_\_\_\_\_  
**Date:** \_\_\_\_\_

<u>Design Values</u>	<u>Rock Gradation Envelope</u>	<u>Quantities<sup>a</sup></u>
D <sub>50</sub> dia. = 0.0 in.	<u>% Passing</u> <u>Diameter, in. (weight, lbs.)</u>	Rock = 0    yd <sup>3</sup>
Rock <sub>chute</sub> thickness = 0.0 in.	D <sub>100</sub> -----    0 - 0 (0 - 0)	Geotextile (WCS-13) <sup>b</sup> = 197    yd <sup>2</sup>
Inlet apron length = 0 ft.	D <sub>85</sub> -----    0 - 0 (0 - 0)	Bedding = 0    yd <sup>3</sup>
Outlet apron length = 0 ft.	D <sub>50</sub> -----    0 - 0 (0 - 0)	Excavation = 0    yd <sup>3</sup>
Radius = 0 ft.	D <sub>10</sub> -----    0 - 0 (0 - 0)	Earthfill = 0    yd <sup>3</sup>
Will bedding be used? No	Coefficient of Uniformity, (D <sub>60</sub> )/(D <sub>10</sub> ) < 1.7	Seeding = 0.0 acres

**Notes:** <sup>a</sup> Rock, bedding, and geotextile quantities are determined from x-section below (neglect radius).

<sup>b</sup> Geotextile Class I (Non-woven) shall be overlapped and anchored (18-in. minimum along sides and 24-in. minimum on the ends) --- quantity not included.



Notes:

Rock gradation envelope can be met with  
 DOT Light riprap Gradation

## Profile, Cross Sections, and Quantities

<p><b>NRCS</b> Natural Resources Conservation Service United States Department of Agriculture</p>	Eagleview - Rock Chute 3 (WQ 2)	Date	File Name
	El Paso County	Designed <u>TOS</u>	_____
		Drawn _____	_____
		Checked _____	_____
		Approved _____	_____
		_____	Drawing Name
		_____	Sheet ___ of ___

# Rock Chute Design Data

(Version WI-July-2010, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)

**Project:** Eagleview - Rock Chute 4 (WQ1-East)  
**Designer:** TOS  
**Date:** April 18, 2024

**County:** El Paso  
**Checked by:** \_\_\_\_\_  
**Date:** \_\_\_\_\_

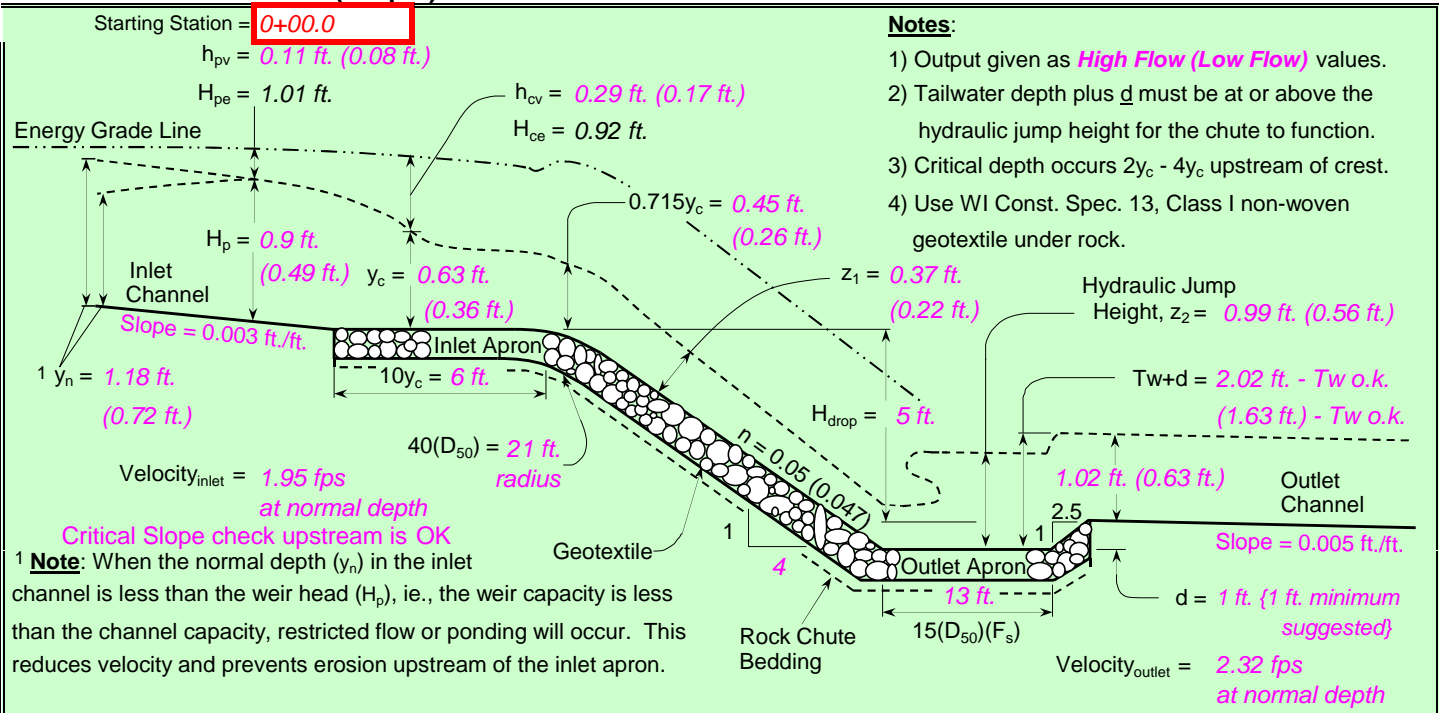
**Input Geometry:**

Upstream Channel	Chute	Downstream Channel
Bw = 14.0 ft.	Bw = 14.0 ft.	Bw = 14.0 ft.
Side slopes = 4.0 (m:1)	Factor of safety = 1.60 (F <sub>s</sub> ) <b>1.2 Min</b>	Side slopes = 4.0 (m:1)
Velocity n-value = 0.040	Side slopes = 3.0 (m:1) → <b>2.0:1 max.</b>	Velocity n-value = 0.040
Bed slope = 0.0030 ft./ft.	Bed slope (4:1) = 0.250 ft./ft → <b>3.0:1 max.</b>	Bed slope = 0.0050 ft./ft.
<i>Note: n value = a) velocity n from waterway program or b) computed manning's n for channel</i>	Freeboard = 1.0 ft. →	Base flow = 0.0 cfs
	Outlet apron depth, d = 1.0 ft.	

**Design Storm Data (Table 2, FOTG, WI-NRCS Grade Stabilization Structure No. 410):**

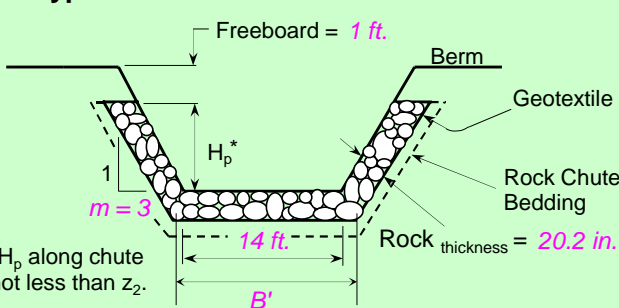
Apron elev. --- Inlet = 7198.0 ft. ----- Outlet = 7192.0 ft. --- (H <sub>drop</sub> = 5 ft.)		<b>Note:</b> The total required capacity is routed through the chute (principal spillway) or in combination with an auxiliary spillway.
Q <sub>high</sub> = Runoff from design storm capacity from Table 2, FOTG Standard 410		<b>Input tailwater (Tw):</b> 0.25 1.60
Q <sub>5</sub> = Runoff from a 5-year, 24-hour storm.		
Q <sub>high</sub> = 43.0 cfs	High flow storm through chute →	Tw (ft.) = Program
Q <sub>5</sub> = 18.0 cfs	Low flow storm through chute →	Tw (ft.) = Program

**Profile and Cross Section (Output):**



**Profile Along Centerline of Chute**

**Typical Cross Section**



$F_s = 1.60$	Equivalent unit discharge
$n = 0.05$	Factor of safety (multiplier)
$z_1 = 0.37$	Normal depth in chute
$D_{50}(F_s) = 10.1$	Manning's roughness coefficient
$2(D_{50})(F_s) = 20.2$	Minimum Design D50*
$Tw + d = 2.02$	Rock chute thickness
$z_2 = 0.99$	Tailwater above outlet apron
<b>*** The outlet will function adequately</b>	Hydraulic jump height

**High Flow Storm Information**



# Rock Chute Design - Plan Sheet

(Version WI-July-2010, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)

Project: Eagleview - Rock Chute 4 (WQ1-East)  
 Designer: TOS  
 Date: 4/18/2024

County: El Paso  
 Checked by: \_\_\_\_\_  
 Date: \_\_\_\_\_

Minimum	Enter			Quantities <sup>a</sup>
Design Values	Plan Values	Rock Gradation Envelope		
10.1 in. D <sub>50</sub> dia. =	12.00 in.	% Passing	Diameter, in. (weight, lbs.)	Rock = 101 yd <sup>3</sup>
20.2 in. Rock <sub>chute</sub> thickness =	24.00 in.	D <sub>100</sub> -----	18 - 24 (413 - 978)	Geotextile (WCS-13) <sup>b</sup> = 188 yd <sup>2</sup>
6 ft. Inlet apron length =	10.00 ft.	D <sub>85</sub> -----	16 - 22 (269 - 713)	Bedding = 0 yd <sup>3</sup>
13 ft. Outlet apron length =	13.00 ft.	D <sub>50</sub> -----	12 - 18 (122 - 413)	Excavation = 0 yd <sup>3</sup>
21 ft. Radius =	33 ft.	D <sub>10</sub> -----	10 - 16 (63 - 269)	Earthfill = 0 yd <sup>3</sup>
Will bedding be used? <b>No</b>				Seeding = 0.0 acres

**Notes:** <sup>a</sup> Rock, bedding, and geotextile quantities are determined from the x-section below (neglect radius).  
<sup>b</sup> Geotextile Class I (non-woven) shall be overlapped and anchored (18-in. min. along sides and 24-in. min. on the ends).

Degree of angularity = 1

1	50% angular, 50% rounded
2	100% rounded

**Stakeout Notes**

Sta.	Elev. (Pnt)
0+00.0	7198 ft. (1)
0+05.9	7198 ft. (2)
0+10.0	7197.7 ft. (3)
0+14.0	7197 ft. (4)
0+34.0	7192 ft. (5)
0+47.0	7192 ft. (6)
0+49.5	7193 ft. (7)

**Profile Along Centerline of Rock Chute**

**\*\* Note: The outlet will function adequately**

Class I non-woven

Rock gradation envelope can be met with DOT Extra Heavy riprap Gradation

**Rock Chute Cross Section**

**Profile, Cross Sections, and Quantities**

\* Use H<sub>p</sub> throughout chute but not less than z<sub>2</sub>.

Rock Chute Cost Estimate		
Unit	Unit Cost	Cost
Rock	\$10.00 /yd <sup>3</sup>	\$1,010.00
Geotextile	\$12.00 /yd <sup>2</sup>	\$2,256.00
Bedding	\$12.00 /yd <sup>3</sup>	\$0.00
Excavation	\$12.00 /yd <sup>3</sup>	\$0.00
Earthfill	\$1.00 /yd <sup>3</sup>	\$0.00
Seeding	\$2.00 /ac.	\$0.00
<b>Total</b>		<b>\$3,266.00</b>



Eagleview - Rock Chute 4 (WQ1-East)

El Paso County

	Date
Designed	TOS
Drawn	_____
Checked	_____
Approved	_____

File Name	_____
Drawing Name	_____
Sheet ___ of ___	_____

# Rock Chute Design - Cut/Paste Plan

(Version WI-July-2010, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)

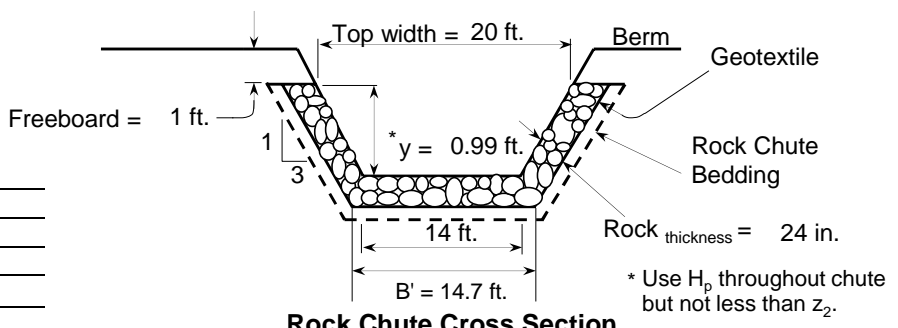
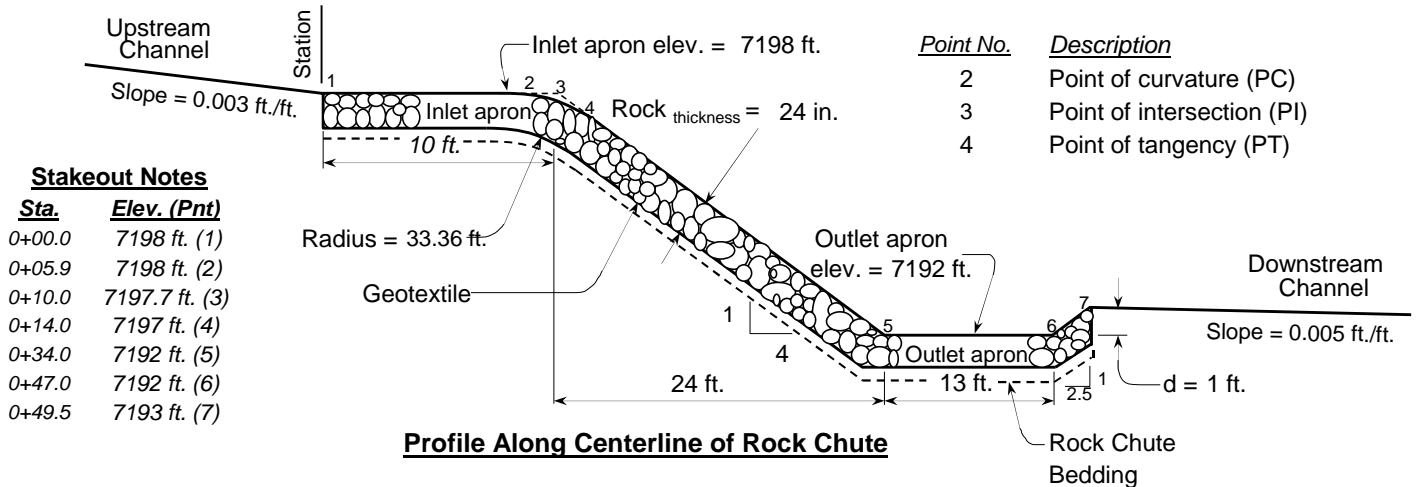
**Project:** Eagleview - Rock Chute 4 (WQ1-East)  
**Designer:** TOS  
**Date:** 4/18/2024

**County:** El Paso  
**Checked by:** \_\_\_\_\_  
**Date:** \_\_\_\_\_

<u>Design Values</u>	<u>Rock Gradation Envelope</u>	<u>Quantities<sup>a</sup></u>
D <sub>50</sub> dia. = 12.0 in.	<u>% Passing</u> <u>Diameter, in. (weight, lbs.)</u>	Rock = 101 yd <sup>3</sup>
Rock <sub>chute</sub> thickness = 24.0 in.	D <sub>100</sub> ----- 18 - 24 (413 - 978)	Geotextile (WCS-13) <sup>b</sup> = 188 yd <sup>2</sup>
Inlet apron length = 10 ft.	D <sub>85</sub> ----- 16 - 22 (269 - 713)	Bedding = 0 yd <sup>3</sup>
Outlet apron length = 13 ft.	D <sub>50</sub> ----- 12 - 18 (122 - 413)	Excavation = 0 yd <sup>3</sup>
Radius = 33 ft.	D <sub>10</sub> ----- 10 - 16 (63 - 269)	Earthfill = 0 yd <sup>3</sup>
Will bedding be used? No	Coefficient of Uniformity, (D <sub>60</sub> )/(D <sub>10</sub> ) < 1.7	Seeding = 0.0 acres

**Notes:** <sup>a</sup> Rock, bedding, and geotextile quantities are determined from x-section below (neglect radius).

<sup>b</sup> Geotextile Class I (Non-woven) shall be overlapped and anchored (18-in. minimum along sides and 24-in. minimum on the ends) --- quantity not included.



Notes:

Rock gradation envelope can be met with  
 DOT Extra Heavy riprap Gradation

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## Profile, Cross Sections, and Quantities

<p><b>NRCS</b> Natural Resources Conservation Service United States Department of Agriculture</p>	Eagleview - Rock Chute 4 (WQ1-East)  <b>El Paso County</b>	Date: _____	File Name: _____	
	Designed: <u>TOS</u>		Drawing Name: _____	
	Drawn: _____		Sheet ___ of ___	
	Checked: _____		Approved: _____	

# Rock Chute Design Data

(Version WI-July-2010, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)

**Project:** Eagleview - Rock Chute 5 (WQ1-West)  
**Designer:** TOS  
**Date:** April 18, 2024

**County:** El Paso  
**Checked by:** \_\_\_\_\_  
**Date:** \_\_\_\_\_

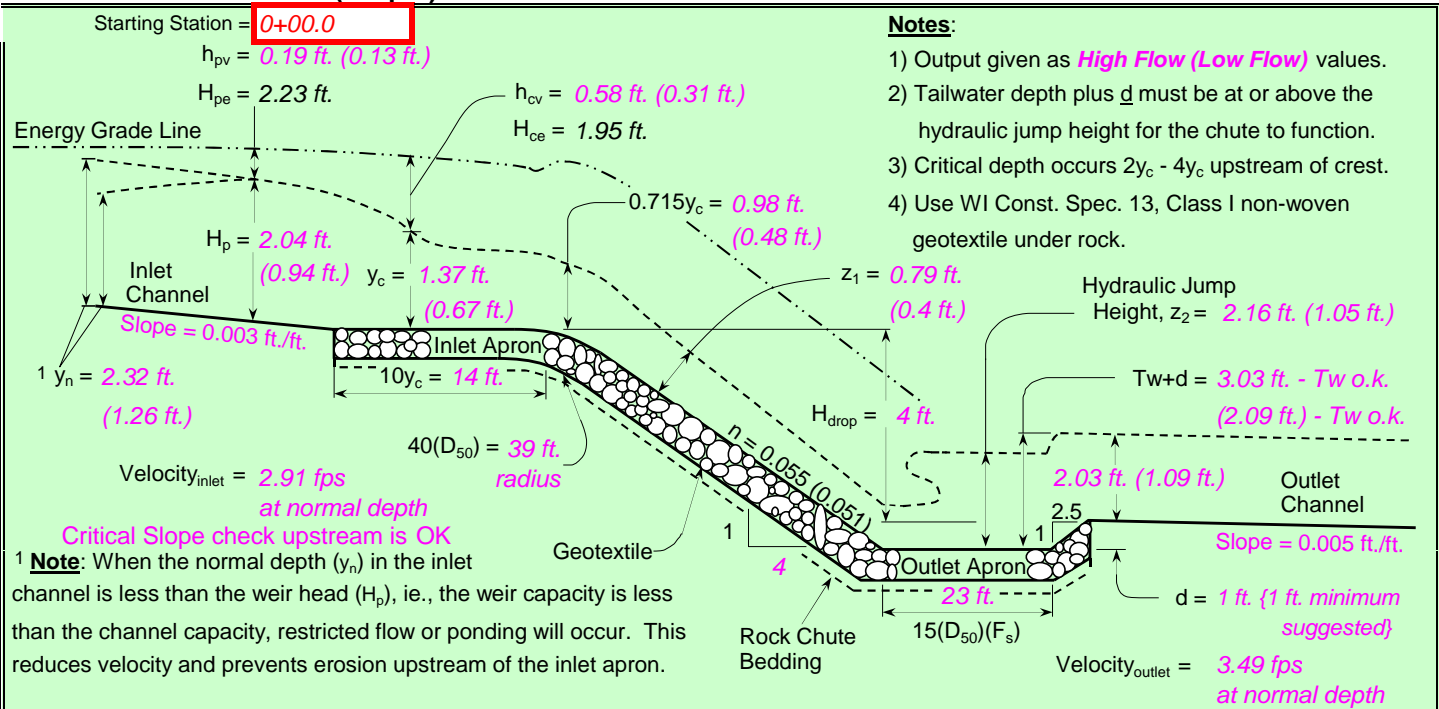
**Input Geometry:**

Upstream Channel	Chute	Downstream Channel
Bw = 18.0 ft.	Bw = 18.0 ft.	Bw = 18.0 ft.
Side slopes = 4.0 (m:1)	Factor of safety = 1.60 ( $F_s$ ) <b>1.2 Min</b>	Side slopes = 4.0 (m:1)
Velocity n-value = 0.040	Side slopes = 3.0 (m:1) → <b>2.0:1 max.</b>	Velocity n-value = 0.040
Bed slope = 0.0030 ft./ft.	Bed slope (4:1) = 0.250 ft./ft → <b>3.0:1 max.</b>	Bed slope = 0.0050 ft./ft.
<i>Note: n value = a) velocity n from waterway program or b) computed manning's n for channel</i>	Freeboard = 1.0 ft. →	Base flow = 0.0 cfs
	Outlet apron depth, d = 1.0 ft.	

**Design Storm Data (Table 2, FOTG, WI-NRCS Grade Stabilization Structure No. 410):**

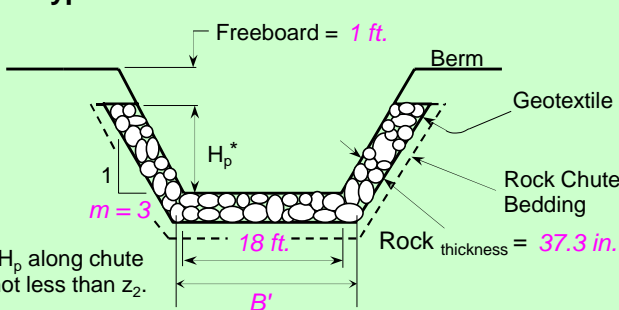
Apron elev. --- Inlet = 7197.0 ft. ----- Outlet = 7192.0 ft. --- ( $H_{drop} = 4$ ft.)		<b>Note:</b> The total required capacity is routed through the chute (principal spillway) or in combination with an auxiliary spillway.
$Q_{high}$ = Runoff from design storm capacity from Table 2, FOTG Standard 410	$Q_5$ = Runoff from a 5-year, 24-hour storm.	
$Q_{high} = 185.0$ cfs	High flow storm <b>through chute</b>	<b>Input tailwater (<math>T_w</math>):</b> 0.25 1.60
$Q_5 = 60.0$ cfs	Low flow storm <b>through chute</b>	$T_w$ (ft.) = <b>Program</b>
		$T_w$ (ft.) = <b>Program</b>

**Profile and Cross Section (Output):**



**Profile Along Centerline of Chute**

**Typical Cross Section**



$F_s = 1.60$	Equivalent unit discharge
$Z_1 = 0.79$ ft.	Factor of safety (multiplier)
n-value = 0.055	Normal depth in chute
$D_{50}(F_s) = 18.7$ in.	Manning's roughness coefficient
$2(D_{50})(F_s) = 37.3$ in.	Minimum Design $D_{50}$ *
$T_w + d = 3.03$ ft.	Rock chute thickness
$Z_2 = 2.16$ ft.	Tailwater above outlet apron
<b>*** The outlet will function adequately</b>	Hydraulic jump height

**High Flow Storm Information**

# Rock Chute Design - Plan Sheet

(Version WI-July-2010, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)

Project: Eagleview - Rock Chute 5 (WQ1-West)  
 Designer: TOS  
 Date: 4/18/2024

County: El Paso  
 Checked by: \_\_\_\_\_  
 Date: \_\_\_\_\_

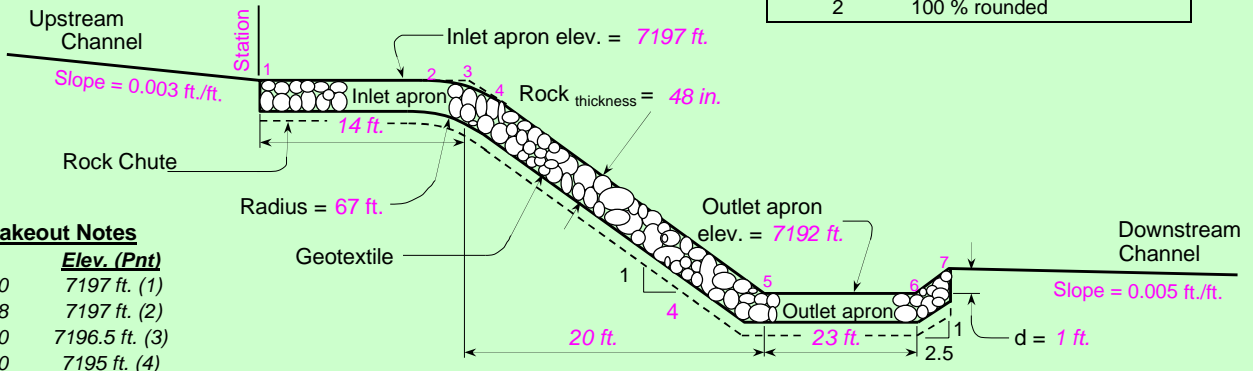
Minimum	Enter	Rock Gradation Envelope	Quantities <sup>a</sup>
<b>Design Values</b>	<b>Plan Values</b>	<b>% Passing</b> <b>Diameter, in. (weight, lbs.)</b>	
18.7 in. D <sub>50</sub> dia. =	24.00 in.	D <sub>100</sub> ----- 36 - 48 (3302 - 7827)	Rock = 402 yd <sup>3</sup>
37.3 in. Rock <sub>chute</sub> thickness =	48.00 in.	D <sub>85</sub> ----- 31 - 43 (2150 - 5706)	Geotextile (WCS-13) <sup>b</sup> = 390 yd <sup>2</sup>
14 ft. Inlet apron length =	14.00 ft.	D <sub>50</sub> ----- 24 - 36 (978 - 3302)	Bedding = 0 yd <sup>3</sup>
23 ft. Outlet apron length =	23.00 ft.	D <sub>10</sub> ----- 19 - 31 (501 - 2150)	Excavation = 0 yd <sup>3</sup>
39 ft. Radius =	67 ft.		Earthfill = 0 yd <sup>3</sup>
Will bedding be used? <b>No</b>			Seeding = 0.0 acres

**Notes:** <sup>a</sup> Rock, bedding, and geotextile quantities are determined from the x-section below (neglect radius).

<sup>b</sup> Geotextile Class I (non-woven) shall be overlapped and anchored (18-in. min. along sides and 24-in. min. on the ends).

Degree of angularity = 1

1	50% angular, 50% rounded
2	100% rounded



**Stakeout Notes**

Sta.	Elev. (Pnt)
0+00.0	7197 ft. (1)
0+05.8	7197 ft. (2)
0+14.0	7196.5 ft. (3)
0+22.0	7195 ft. (4)
0+34.0	7192 ft. (5)
0+57.0	7192 ft. (6)
0+59.5	7193 ft. (7)

**Profile Along Centerline of Rock Chute**

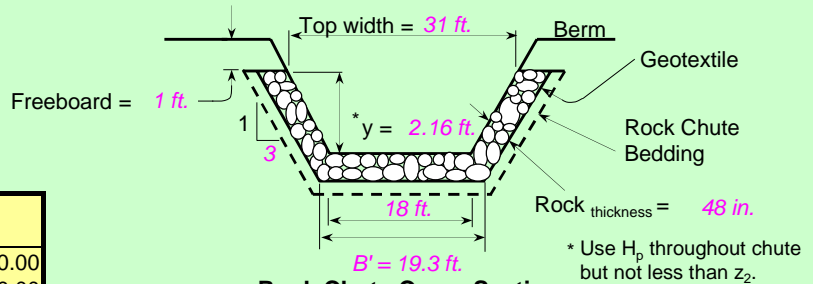
**\*\* Note: The outlet will function adequately**

Class I non-woven

Rock gradation envelope can be met with Gradation printed

**Rock Chute Cost Estimate**

Unit	Unit Cost	Cost
Rock	\$10.00 /yd <sup>3</sup>	\$4,020.00
Geotextile	\$12.00/yd <sup>2</sup>	\$4,680.00
Bedding	\$12.00 /yd <sup>3</sup>	\$0.00
Excavation	\$12.00/yd <sup>3</sup>	\$0.00
Earthfill	\$1.00 /yd <sup>3</sup>	\$0.00
Seeding	\$2.00 /ac.	\$0.00
<b>Total</b>		<b>\$8,700.00</b>



**Rock Chute Cross Section**

**Profile, Cross Sections, and Quantities**



Eagleview - Rock Chute 5 (WQ1-West)

El Paso County

	Date
Designed	TOS
Drawn	_____
Checked	_____
Approved	_____

File Name	_____
Drawing Name	_____
Sheet ___ of ___	_____

# Rock Chute Design - Cut/Paste Plan

(Version WI-July-2010, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)

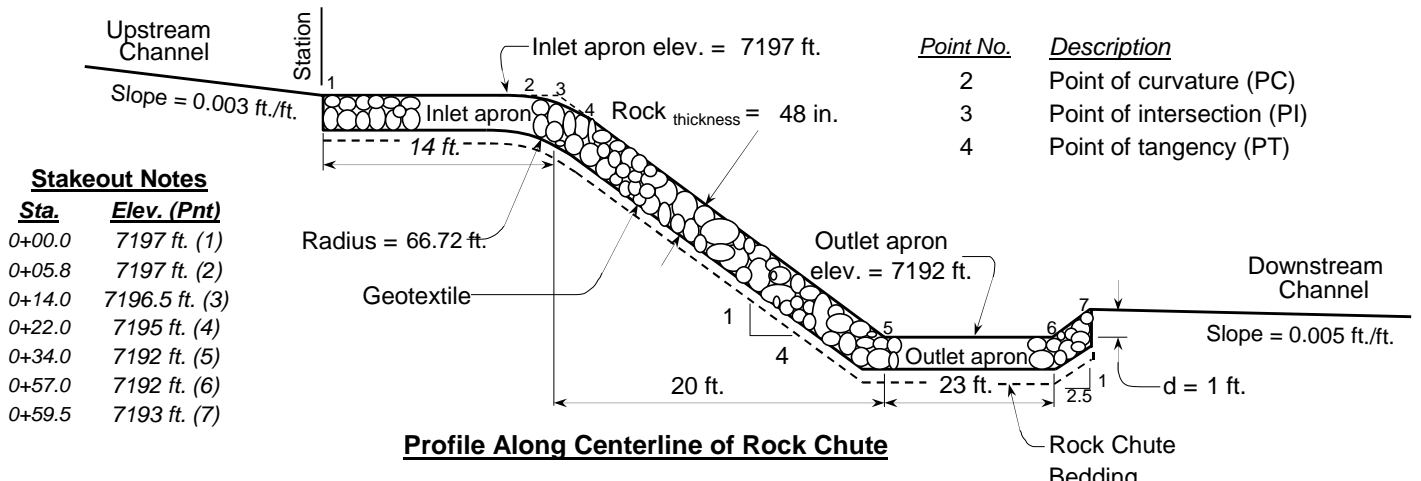
**Project:** Eagleview - Rock Chute 5 (WQ1-West)  
**Designer:** TOS  
**Date:** 4/18/2024

**County:** El Paso  
**Checked by:** \_\_\_\_\_  
**Date:** \_\_\_\_\_

<u>Design Values</u>	<u>Rock Gradation Envelope</u>	<u>Quantities<sup>a</sup></u>
D <sub>50</sub> dia. = 24.0 in.	<u>% Passing</u> <u>Diameter, in. (weight, lbs.)</u>	Rock = 402 yd <sup>3</sup>
Rock <sub>chute</sub> thickness = 48.0 in.	D <sub>100</sub> ----- 36 - 48 (3302 - 7827)	Geotextile (WCS-13) <sup>b</sup> = 390 yd <sup>2</sup>
Inlet apron length = 14 ft.	D <sub>85</sub> ----- 31 - 43 (2150 - 5706)	Bedding = 0 yd <sup>3</sup>
Outlet apron length = 23 ft.	D <sub>50</sub> ----- 24 - 36 (978 - 3302)	Excavation = 0 yd <sup>3</sup>
Radius = 67 ft.	D <sub>10</sub> ----- 19 - 31 (501 - 2150)	Earthfill = 0 yd <sup>3</sup>
Will bedding be used? No	Coefficient of Uniformity, (D <sub>60</sub> )/(D <sub>10</sub> ) < 1.7	Seeding = 0.0 acres

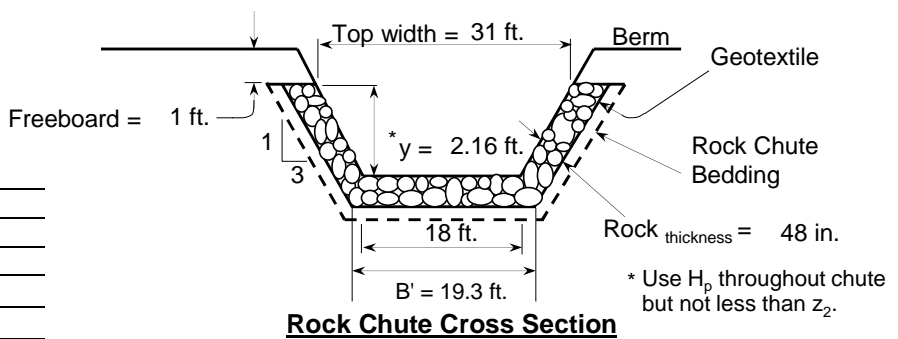
**Notes:** <sup>a</sup> Rock, bedding, and geotextile quantities are determined from x-section below (neglect radius).

<sup>b</sup> Geotextile Class I (Non-woven) shall be overlapped and anchored (18-in. minimum along sides and 24-in. minimum on the ends) --- quantity not included.



**Stakeout Notes**

<u>Sta.</u>	<u>Elev. (Pnt)</u>
0+00.0	7197 ft. (1)
0+05.8	7197 ft. (2)
0+14.0	7196.5 ft. (3)
0+22.0	7195 ft. (4)
0+34.0	7192 ft. (5)
0+57.0	7192 ft. (6)
0+59.5	7193 ft. (7)



Notes:

Rock gradation envelope can be met with
Gradation printed

## Profile, Cross Sections, and Quantities

<p style="font-size: 24pt; font-weight: bold; margin: 0;">NRCS</p> <p style="font-size: 10pt; margin: 0;">Natural Resources Conservation Service United States Department of Agriculture</p>	<p>Eagleview - Rock Chute 5 (WQ1-West)</p> <p style="color: magenta; font-weight: bold; font-size: 12pt;">El Paso County</p>	<p>Date _____</p>	<p>File Name _____</p>	
	Designed	TOS	_____	_____
	Drawn	_____	_____	_____
	Checked	_____	_____	_____
	Approved	_____	_____	_____
			<p>Drawing Name _____</p> <p>Sheet ___ of ___</p>	

possible for as much of the reach as possible to the maximum prudent values for the hydraulic parameters in the 100 year event. The designer should determine the return period where these parameters would be achieved and, with the owner and local jurisdiction, determine if the associated risks are acceptable.

On the other hand, if the recommendation to avoid floodplain filling is not followed and fill is proposed, this should only happen in floodplains where the maximum prudent values for the hydraulic parameters shown in Table 8-1 are not exceeded in the 100-year event.

Type B

**Table 8-1. Maximum prudent values for natural channel hydraulic parameters**

Design Parameter	Non-Cohesive Soils or Poor Vegetation	Cohesive Soils and Vegetation
Maximum flow velocity (average of section)	5 ft/s	7 ft/s
Maximum Froude number	0.6	0.8
Maximum tractive force (average of section)	0.60 lb/sf	1.0 lb/sf
Maximum depth outside bankfull channel	5 ft	5 ft

**Stream Restoration Principle 8: Evaluate Hydraulics of Streams over a Range of Flows**

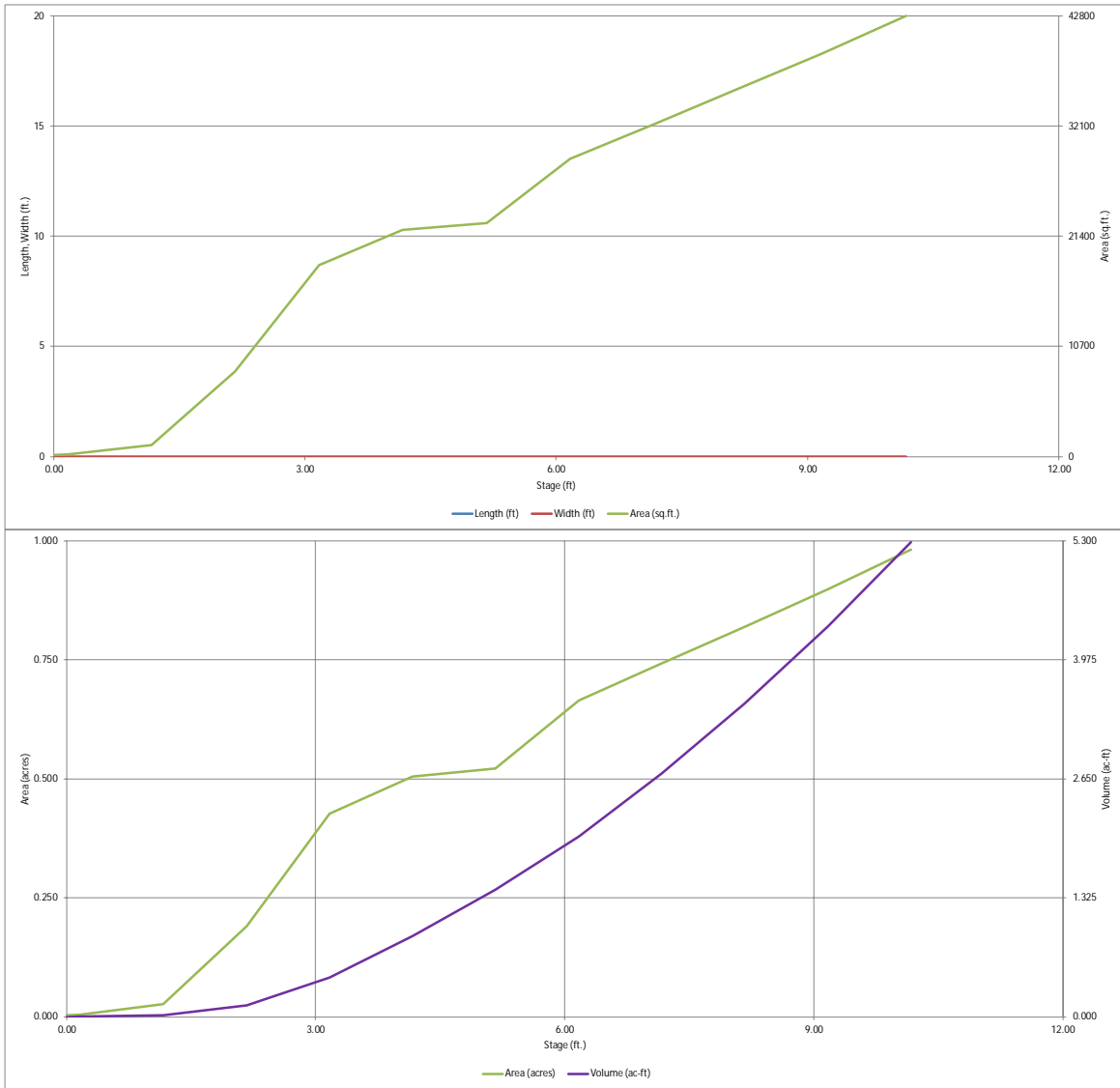
**Representative Design Tasks and Deliverables**

1. Document hydraulic analyses of the project reach following the guidance of Section 7.0.
2. Describe how hydraulic performance of the project reach compares to maximum prudent values for the hydraulic parameters shown in Table 8-1 for several return periods (including 2-, 10-, and 100-year events at a minimum). Describe any locations in the reach where these parameters are exceeded and discuss efforts made to improve hydraulics.
3. Confirm that hydraulic parameters of Table 8-1 are satisfied in for the 100-year event in all locations where fill is proposed in the floodplain.



# DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

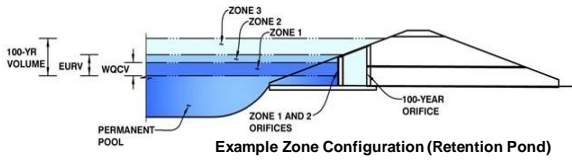




# DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD- Detention, Version 4.04 (February 2021)

Project: EAGLEVIEW  
Basin ID: POND 3



	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WOCV)	3.79	0.713	Orifice Plate
Zone 2 (EURV)	4.67	0.436	Rectangular Orifice
Zone 3 (100-year)	9.98	3.950	Weir&Pipe (Restrict)
Total (all zones)		5.099	

**User Input: Orifice at Underdrain Outlet (typically used to drain WOCV 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 WOCV 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 =  inches

**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	0.63	1.26	1.89	2.52	3.15		
Orifice Area (sq. inches)	1.00	1.00	1.00	1.20	1.20	1.20		

	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)**

	Zone 2 Rectangular	Not Selected	
Invert of Vertical Orifice =	<input type="text" value="4.00"/>	<input type="text" value="N/A"/>	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	<input type="text" value="4.67"/>	<input type="text" value="N/A"/>	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Height =	<input type="text" value="3.50"/>	<input type="text" value="N/A"/>	inches
Vertical Orifice Width =	<input type="text" value="16.00"/>	<input type="text" value="N/A"/>	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))**

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	<input type="text" value="4.80"/>	<input type="text" value="N/A"/>	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	<input type="text" value="15.00"/>	<input type="text" value="N/A"/>	feet
Overflow Weir Gate Slope =	<input type="text" value="10.00"/>	<input type="text" value="N/A"/>	H:V
Horiz. Length of Weir Sides =	<input type="text" value="5.00"/>	<input type="text" value="N/A"/>	feet
Overflow Gate Type =	<input type="text" value="Type C Gate"/>	<input type="text" value="N/A"/>	
Debris Clogging % =	<input type="text" value="50%"/>	<input type="text" value="N/A"/>	%

**Calculated Parameters for Overflow Weir**  
Height of Gate Upper Edge, H<sub>1</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)**

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	<input type="text" value="0.49"/>	<input type="text" value="N/A"/>	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	<input type="text" value="42.00"/>	<input type="text" value="N/A"/>	inches
Restrictor Plate Height Above Pipe Invert =	<input type="text" value="32.50"/>	<input type="text" value="N/A"/>	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 =	<input type="text" value="8.17"/>	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	<input type="text" value="40.00"/>	feet
Spillway End Slopes =	<input type="text" value="4.00"/>	H:V
Freeboard above Max Water Surface =	<input type="text" value="1.00"/>	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

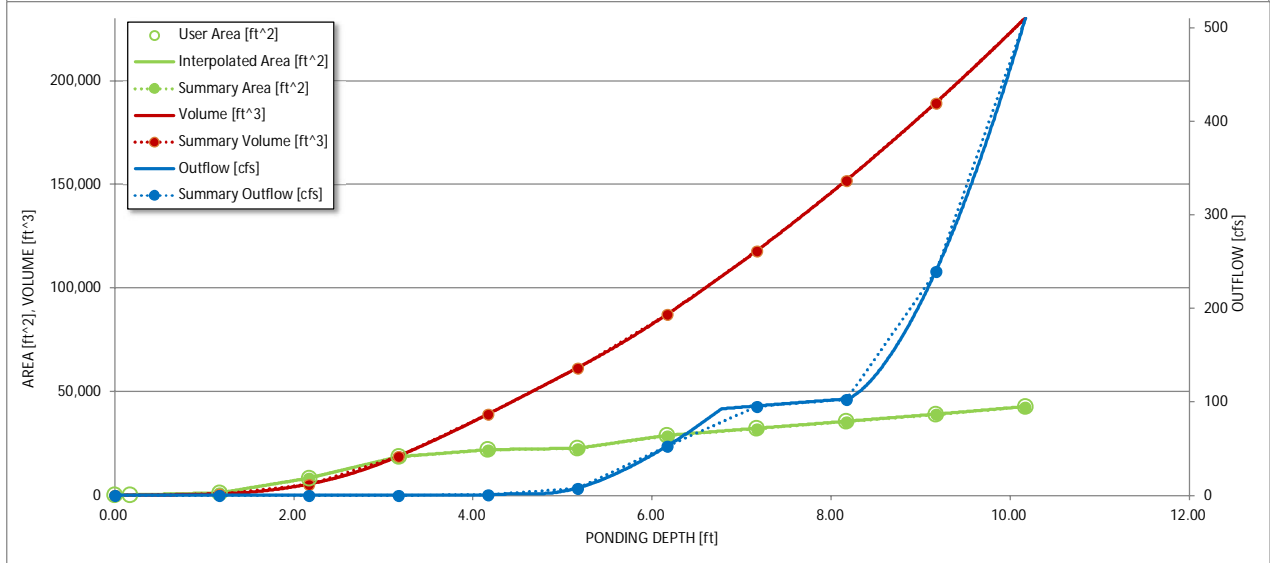
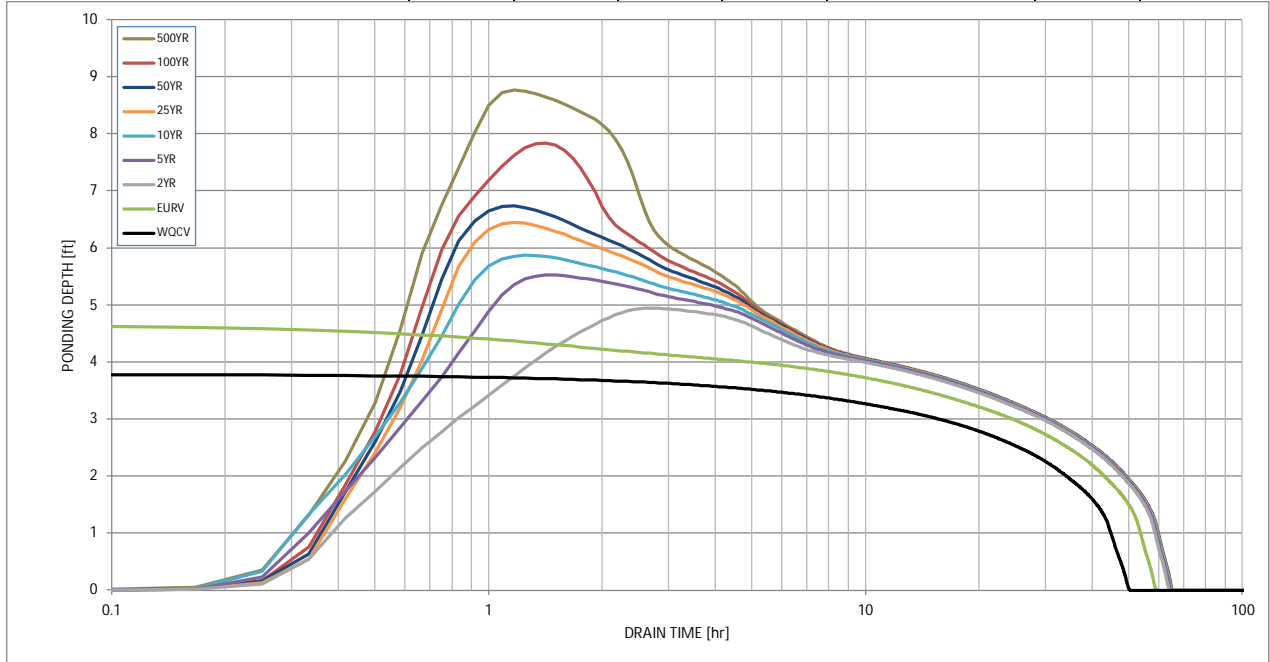
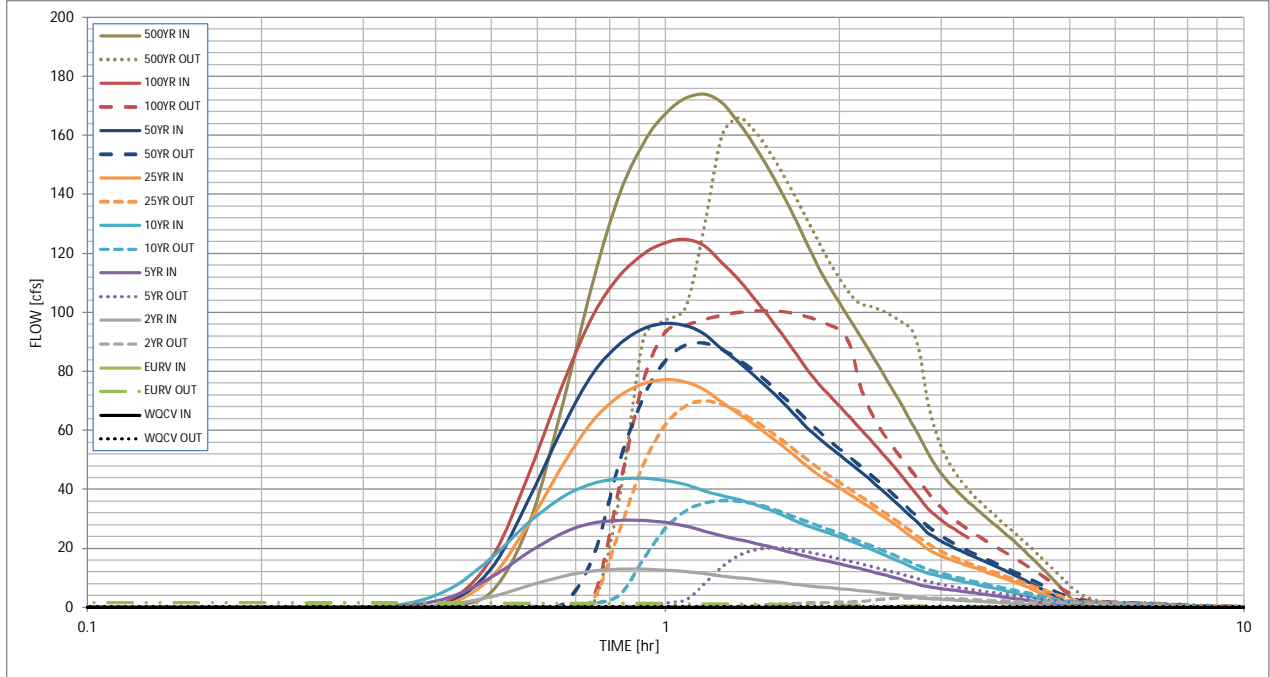
## Routed Hydrograph Results

*The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).*

	WOCV	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)	0.713	1.149	1.820	4.208	6.619	11.003	13.954	18.242	26.002
Inflow Hydrograph Volume (acre-ft)	N/A	N/A	1.820	4.208	6.619	11.003	13.954	18.242	26.002
CUHP Predevelopment Peak Q (cfs)	N/A	N/A	8.6	24.5	38.6	71.9	90.8	119.6	168.6
OPTIONAL Override Predevelopment Peak Q (cfs)	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre)	N/A	N/A	0.06	0.16	0.26	0.47	0.60	0.79	1.11
Peak Inflow Q (cfs)	N/A	N/A	13.0	29.6	43.8	77.2	96.3	124.8	174.0
Peak Outflow Q (cfs)	0.3	1.7	3.3	20.2	36.3	70.0	89.6	100.7	166.0
Ratio Peak Outflow to Predevelopment Q	N/A	N/A	N/A	0.8	0.9	1.0	1.0	0.8	1.0
Structure Controlling Flow	Plate	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Spillway
Max Velocity through Gate 1 (fps)	N/A	N/A	0.02	0.3	0.6	1.3	1.6	1.8	2.0
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)	43	50	52	46	40	32	28	22	13
Time to Drain 99% of Inflow Volume (hours)	46	54	57	54	52	48	45	42	37
Maximum Ponding Depth (ft)	3.80	4.67	4.95	5.53	5.87	6.45	6.74	7.85	8.77
Area at Maximum Ponding Depth (acres)	0.48	0.51	0.52	0.57	0.62	0.69	0.71	0.79	0.87
Maximum Volume Stored (acre-ft)	0.718	1.154	1.293	1.603	1.812	2.193	2.388	3.221	3.993

# 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	0.00	0.00	0.01
	0:15:00	0.00	0.00	0.02	0.03	0.04	0.03	0.04	0.03	0.06
	0:20:00	0.00	0.00	0.10	0.26	0.46	0.12	0.14	0.15	0.46
	0:25:00	0.00	0.00	0.94	3.05	5.62	0.92	1.20	1.80	5.54
	0:30:00	0.00	0.00	3.72	10.36	17.07	10.39	13.54	16.89	29.55
	0:35:00	0.00	0.00	7.59	19.09	29.24	29.39	37.71	46.58	70.85
	0:40:00	0.00	0.00	10.73	25.49	37.80	49.01	61.97	76.82	111.15
	0:45:00	0.00	0.00	12.45	28.65	42.04	63.58	79.64	99.34	140.41
	0:50:00	0.00	0.00	12.98	29.57	43.63	71.76	89.43	112.54	157.71
	0:55:00	0.00	0.00	12.98	29.52	43.83	75.98	94.59	120.02	167.64
	1:00:00	0.00	0.00	12.70	28.82	43.09	77.23	96.30	123.75	172.65
	1:05:00	0.00	0.00	12.21	27.59	41.61	76.46	95.60	124.79	174.04
	1:10:00	0.00	0.00	11.51	25.90	39.54	73.83	92.62	122.63	171.24
	1:15:00	0.00	0.00	10.73	24.34	37.95	69.64	87.71	117.10	164.61
	1:20:00	0.00	0.00	10.13	23.14	36.64	65.88	83.36	111.31	157.38
	1:25:00	0.00	0.00	9.57	21.97	35.11	62.22	78.96	105.27	149.40
	1:30:00	0.00	0.00	9.03	20.79	33.35	58.67	74.57	99.17	141.04
	1:35:00	0.00	0.00	8.48	19.60	31.46	55.08	70.08	93.07	132.52
	1:40:00	0.00	0.00	7.94	18.39	29.53	51.58	65.67	87.03	124.03
	1:45:00	0.00	0.00	7.45	17.31	27.88	48.11	61.30	81.12	115.87
	1:50:00	0.00	0.00	7.06	16.41	26.47	45.22	57.69	76.19	108.99
	1:55:00	0.00	0.00	6.72	15.58	25.16	42.74	54.57	72.01	103.05
	2:00:00	0.00	0.00	6.39	14.78	23.86	40.46	51.69	68.11	97.51
	2:05:00	0.00	0.00	6.06	13.98	22.59	38.28	48.92	64.40	92.23
	2:10:00	0.00	0.00	5.72	13.18	21.30	36.16	46.22	60.78	87.05
	2:15:00	0.00	0.00	5.38	12.38	20.01	34.07	43.55	57.24	81.95
	2:20:00	0.00	0.00	5.04	11.59	18.72	32.01	40.90	53.77	76.95
	2:25:00	0.00	0.00	4.70	10.80	17.45	29.96	38.29	50.39	72.08
	2:30:00	0.00	0.00	4.36	10.01	16.19	27.93	35.70	47.02	67.24
	2:35:00	0.00	0.00	4.03	9.23	14.95	25.90	33.12	43.66	62.43
	2:40:00	0.00	0.00	3.69	8.45	13.73	23.88	30.54	40.31	57.63
	2:45:00	0.00	0.00	3.36	7.69	12.54	21.87	27.98	36.97	52.89
	2:50:00	0.00	0.00	3.08	7.11	11.67	19.93	25.53	33.80	48.55
	2:55:00	0.00	0.00	2.91	6.73	11.03	18.56	23.81	31.47	45.27
	3:00:00	0.00	0.00	2.76	6.41	10.46	17.47	22.42	29.58	42.56
	3:05:00	0.00	0.00	2.64	6.10	9.92	16.54	21.21	27.92	40.15
	3:10:00	0.00	0.00	2.51	5.80	9.42	15.69	20.10	26.42	37.96
	3:15:00	0.00	0.00	2.39	5.51	8.92	14.92	19.10	25.03	35.94
	3:20:00	0.00	0.00	2.27	5.23	8.44	14.18	18.13	23.74	34.04
	3:25:00	0.00	0.00	2.15	4.95	7.98	13.46	17.20	22.52	32.27
	3:30:00	0.00	0.00	2.03	4.68	7.53	12.77	16.30	21.38	30.60
	3:35:00	0.00	0.00	1.92	4.41	7.09	12.08	15.42	20.25	28.96
	3:40:00	0.00	0.00	1.81	4.14	6.67	11.40	14.55	19.13	27.35
	3:45:00	0.00	0.00	1.69	3.88	6.25	10.72	13.69	18.01	25.73
	3:50:00	0.00	0.00	1.58	3.62	5.84	10.04	12.82	16.88	24.13
	3:55:00	0.00	0.00	1.47	3.36	5.42	9.37	11.96	15.76	22.52
	4:00:00	0.00	0.00	1.35	3.10	5.01	8.69	11.11	14.64	20.92
	4:05:00	0.00	0.00	1.24	2.84	4.61	8.02	10.25	13.52	19.31
4:10:00	0.00	0.00	1.13	2.58	4.20	7.35	9.39	12.41	17.72	
4:15:00	0.00	0.00	1.02	2.33	3.79	6.67	8.54	11.29	16.12	
4:20:00	0.00	0.00	0.91	2.07	3.39	6.00	7.69	10.18	14.53	
4:25:00	0.00	0.00	0.80	1.82	2.99	5.33	6.84	9.07	12.94	
4:30:00	0.00	0.00	0.69	1.56	2.59	4.66	5.98	7.95	11.36	
4:35:00	0.00	0.00	0.58	1.30	2.18	3.99	5.13	6.84	9.77	
4:40:00	0.00	0.00	0.47	1.05	1.78	3.32	4.28	5.73	8.18	
4:45:00	0.00	0.00	0.36	0.79	1.38	2.65	3.43	4.61	6.59	
4:50:00	0.00	0.00	0.25	0.54	0.98	1.98	2.58	3.50	5.01	
4:55:00	0.00	0.00	0.15	0.32	0.65	1.33	1.75	2.42	3.51	
5:00:00	0.00	0.00	0.08	0.19	0.46	0.80	1.09	1.55	2.36	
5:05:00	0.00	0.00	0.05	0.14	0.36	0.50	0.72	1.03	1.63	
5:10:00	0.00	0.00	0.04	0.11	0.28	0.32	0.49	0.69	1.14	
5:15:00	0.00	0.00	0.03	0.09	0.23	0.21	0.33	0.45	0.78	
5:20:00	0.00	0.00	0.03	0.07	0.18	0.13	0.22	0.28	0.51	
5:25:00	0.00	0.00	0.02	0.05	0.13	0.09	0.15	0.16	0.32	
5:30:00	0.00	0.00	0.02	0.04	0.10	0.05	0.10	0.08	0.19	
5:35:00	0.00	0.00	0.01	0.03	0.07	0.04	0.07	0.05	0.12	
5:40:00	0.00	0.00	0.01	0.02	0.05	0.03	0.05	0.04	0.08	
5:45:00	0.00	0.00	0.01	0.02	0.03	0.02	0.04	0.03	0.06	
5:50:00	0.00	0.00	0.01	0.01	0.02	0.01	0.03	0.02	0.05	
5:55:00	0.00	0.00	0.00	0.01	0.02	0.01	0.02	0.02	0.04	
6:00:00	0.00	0.00	0.00	0.00	0.01	0.01	0.02	0.01	0.03	

## DETENTION BASIN OUTLET STRUCTURE DESIGN

*MHFD-Detention, Version 4.04 (February 2021)*

### Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.

The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

Stage - Storage Description	Stage [ft]	Area [ft <sup>2</sup> ]	Area [acres]	Volume [ft <sup>3</sup> ]	Volume [ac-ft]	Total Outflow [cfs]
7230.83	0.00	162	0.004	0	0.000	0.00
7231	1.17	1,148	0.026	704	0.016	0.06
7232	2.17	8,283	0.190	5,419	0.124	0.14
7233	3.17	18,607	0.427	18,864	0.433	0.24
7234	4.17	21,993	0.505	39,164	0.899	0.61
7235	5.17	22,691	0.521	61,506	1.412	7.88
7236	6.17	28,920	0.664	87,311	2.004	52.70
7237	7.17	32,308	0.742	117,925	2.707	95.56
7238	8.17	35,680	0.819	151,919	3.488	103.01
7239	9.17	39,108	0.898	189,313	4.346	239.56
7240	10.17	42,799	0.983	230,267	5.286	510.21

For best results, include the stages of all grade slope changes (e.g. ISV and Floor) from the S-A-V table on Sheet 'Basin'.

Also include the inverts of all outlets (e.g. vertical orifice, overflow grate, and spillway, where applicable).



Emergency Overflow Weir Calculation - Onsite Full Spectrum Pond 3

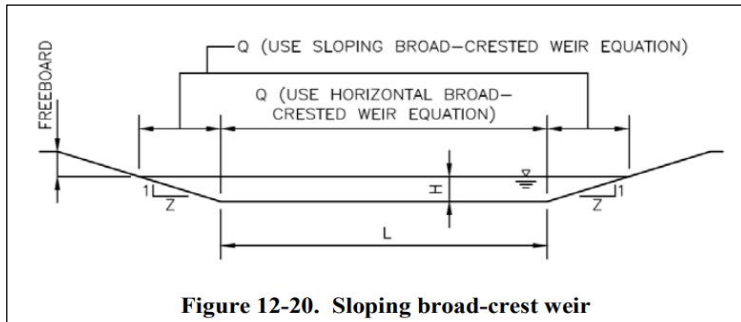
Q (cfs) =	109	100-yr peak inflow (109 cfs)
$C_{BCW}$ =	2.8	
Z =	4	
H =	0.97	

L (ft) = 37.64 (Proposing 40 feet)

$$Q = C_{BCW}LH^{1.5} + 2 \left[ \left( \frac{2}{5} \right) C_{BCW}ZH^{2.5} \right]$$

rearrange to solve for length:

$$L = \frac{Q - \left( \frac{4}{5} \right) C_{BCW}ZH^{2.5}}{C_{BCW}H^{1.5}}$$



**Figure 12-20. Sloping broad-crest weir**

Horizontal Broad Crested Weir Equation (from USDCM Eqn. 12-8)

$$Q = C_{BCW}LH^{1.5} \quad \text{Equation 12-8}$$

Where:

$Q$  = discharge (cfs)

$C_{BCW}$  = broad-crested weir coefficient (This ranges from 2.6 to 3.0. A value of 3.0 is often used in practice.) See Hydraulic Engineering Circular No. 22 for additional information.

$L$  = broad-crested weir length (ft)

$H$  = head above weir crest (ft)

Sloping Broad Crested Weir Equation (from USDCM Eqn. 12-9)

$$Q = \left( \frac{2}{5} \right) C_{BCW}ZH^{2.5} \quad \text{Equation 12-9}$$

Where:

$Q$  = discharge (cfs)

$C_{BCW}$  = broad-crested weir coefficient (This ranges from 2.6 to 3.0. A value of 3.0 is often used in practice.) See Hydraulic Engineering Circular No. 22 for additional information.

$Z$  = side slope (horizontal: vertical)

$H$  = head above weir crest (ft)

Note that in order to calculate the total flow over the weir depicted in Figure 12-20, the results from Equation 12-8 must be added to two times the results from Equation 12-9.



2 North Nevada Avenue, Suite 900  
Colorado Springs, Colorado 80903

Project: Eagleview  
Project Number: 196288000  
Date: 4/16/2024

Prepared By: BH  
Checked By: BH

### Water Quality Capture Volume

### Water Quality Pond 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) =	0.60	
Area (Site) =	2.67	AC
WQ Capture Volume (Site) =	0.134	AC-FT
	5,815	FT <sup>3</sup>

## WQP1 Imperviousness

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
WQF1	PB3	1.38	0%	85%	0%	15%	0%	100%	24%
	PB4	10.54	0%	97%	0%	3%	0%	100%	14%
	PB5	6.18	0%	97%	0%	3%	0%	100%	13%
	PB6	11.09	0%	95%	0%	5%	0%	100%	5%
	PB7	3.46	0%	91%	0%	9%	0%	100%	9%
	PB15*	5.58	0%	88%	0%	12%	0%	100%	12%
	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%
Total		120.24							10.3%

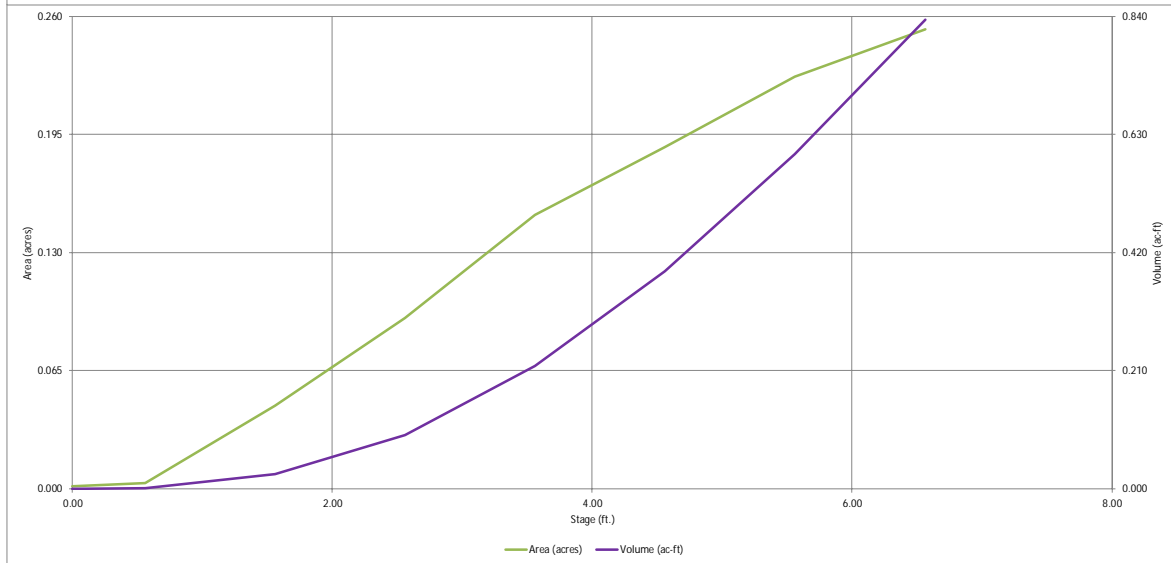
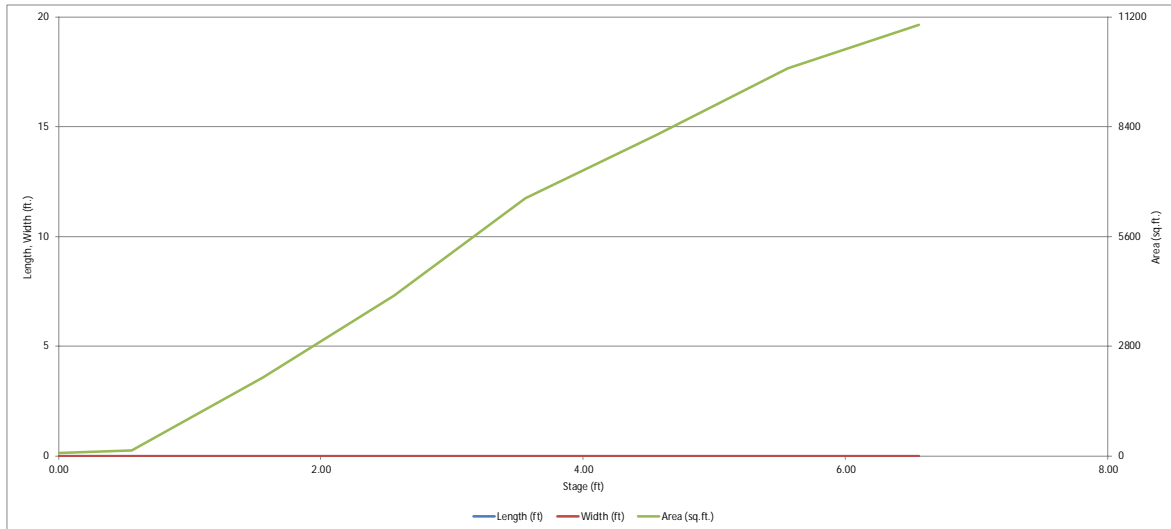
\*Total area reduced based on portion tributary to WQP1





# DETENTION BASIN STAGE-STORAGE TABLE BUILDER

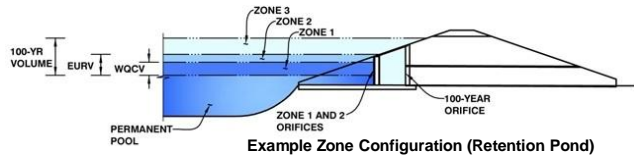
MHFD-Detention, Version 4.04 (February 2021)



# DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Project: Eagleview  
Basin ID: Water Quality Pond 1



	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WOCV)	2.93	0.134	Orifice Plate
Zone 2			Weir&Pipe (Circular)
Zone 3			
<b>Total (all zones)</b>		<b>0.134</b>	

User Input: Orifice at Underdrain Outlet (typically used to drain WOCV in a Filtration BMP)

Calculated Parameters for Underdrain

Underdrain Orifice Invert Depth =	<input type="text" value=""/>	ft (distance below the filtration media surface)	Underdrain Orifice Area =	<input type="text" value=""/>	ft <sup>2</sup>
Underdrain Orifice Diameter =	<input type="text" value=""/>	inches	Underdrain Orifice Centroid =	<input type="text" value=""/>	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WOCV and/or EURV in a sedimentation BMP)

Calculated Parameters for Plate

Invert of Lowest Orifice =	<input type="text" value="0.00"/>	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	<input type="text" value="N/A"/>	ft <sup>2</sup>
Depth at top of Zone using Orifice Plate =	<input type="text" value="2.93"/>	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	<input type="text" value="N/A"/>	feet
Orifice Plate: Orifice Vertical Spacing =	<input type="text" value="N/A"/>	inches	Elliptical Slot Centroid =	<input type="text" value="N/A"/>	feet
Orifice Plate: Orifice Area per Row =	<input type="text" value="N/A"/>	inches	Elliptical Slot Area =	<input type="text" value="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)	<input type="text" value="0.00"/>	<input type="text" value="0.98"/>	<input type="text" value="1.96"/>	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>
Orifice Area (sq. inches)	<input type="text" value="0.40"/>	<input type="text" value="0.40"/>	<input type="text" value="0.60"/>	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>

	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)	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>
Orifice Area (sq. inches)	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>

User Input: Vertical Orifice (Circular or Rectangular)

Calculated Parameters for Vertical Orifice

Invert of Vertical Orifice =	<input type="text" value="Not Selected"/>	<input type="text" value="Not Selected"/>	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	<input type="text" value="Not Selected"/>	ft <sup>2</sup>
Depth at top of Zone using Vertical Orifice =	<input type="text" value=""/>	<input type="text" value=""/>	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	<input type="text" value=""/>	feet
Vertical Orifice Diameter =	<input type="text" value=""/>	<input type="text" value=""/>	inches			

User Input: Overflow Weir (Dropbox with Flat or Sloped Gate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe)

Calculated Parameters for Overflow Weir

Overflow Weir Front Edge Height, Ho =	<input type="text" value="3.00"/>	<input type="text" value="Not Selected"/>	ft (relative to basin bottom at Stage = 0 ft)	Height of Gate Upper Edge, H <sub>1</sub> =	<input type="text" value="3.00"/>	feet
Overflow Weir Front Edge Length =	<input type="text" value="5.00"/>	<input type="text" value=""/>	feet	Overflow Weir Slope Length =	<input type="text" value="5.00"/>	feet
Overflow Weir Gate Slope =	<input type="text" value="0.00"/>	<input type="text" value=""/>	H:V	Gate Open Area / 100-yr Orifice Area =	<input type="text" value="5.54"/>	
Horiz. Length of Weir Sides =	<input type="text" value="5.00"/>	<input type="text" value=""/>	feet	Overflow Gate Open Area w/o Debris =	<input type="text" value="17.40"/>	ft <sup>2</sup>
Overflow Gate Type =	<input type="text" value="Type C Gate"/>	<input type="text" value=""/>		Overflow Gate Open Area w/ Debris =	<input type="text" value="8.70"/>	ft <sup>2</sup>
Debris Clogging % =	<input type="text" value="50%"/>	<input type="text" value=""/>	%			

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

Depth to Invert of Outlet Pipe =	<input type="text" value="0.00"/>	<input type="text" value="Not Selected"/>	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	<input type="text" value="3.14"/>	ft <sup>2</sup>
Circular Orifice Diameter =	<input type="text" value="24.00"/>	<input type="text" value=""/>	inches	Outlet Orifice Centroid =	<input type="text" value="1.00"/>	feet
				Half-Central Angle of Restrictor Plate on Pipe =	<input type="text" value="N/A"/>	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Calculated Parameters for Spillway

Spillway Invert Stage =	<input type="text" value="4.06"/>	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth =	<input type="text" value="1.20"/>	feet
Spillway Crest Length =	<input type="text" value="35.00"/>	feet	Stage at Top of Freeboard =	<input type="text" value="6.26"/>	feet
Spillway End Slopes =	<input type="text" value="4.00"/>	H:V	Basin Area at Top of Freeboard =	<input type="text" value="0.25"/>	acres
Freeboard above Max Water Surface =	<input type="text" value="1.00"/>	feet	Basin Volume at Top of Freeboard =	<input type="text" value="0.76"/>	acre-ft

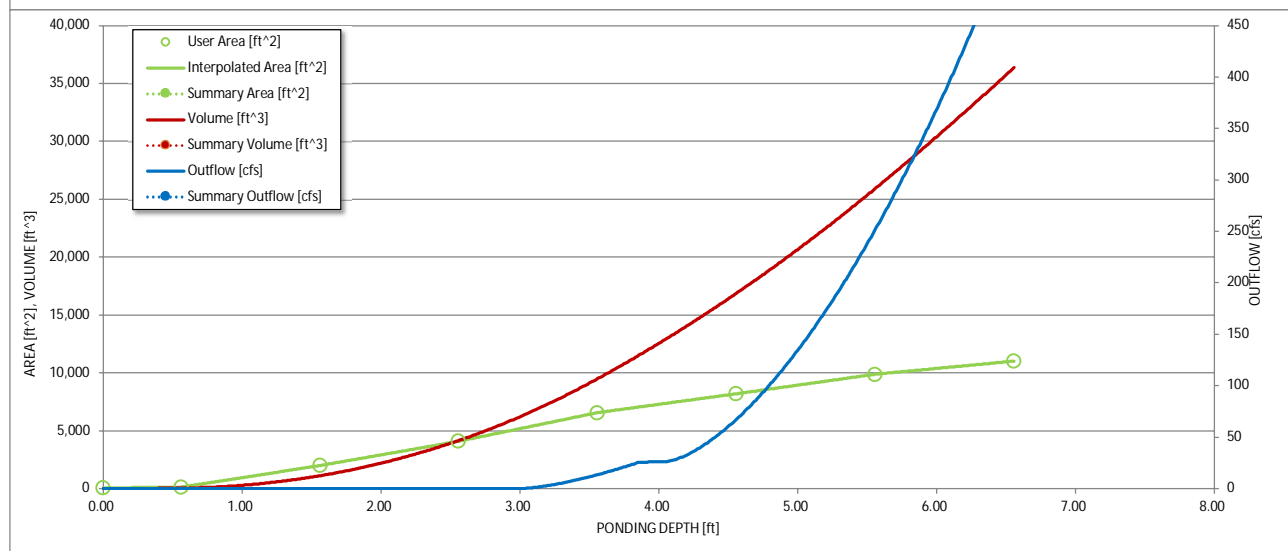
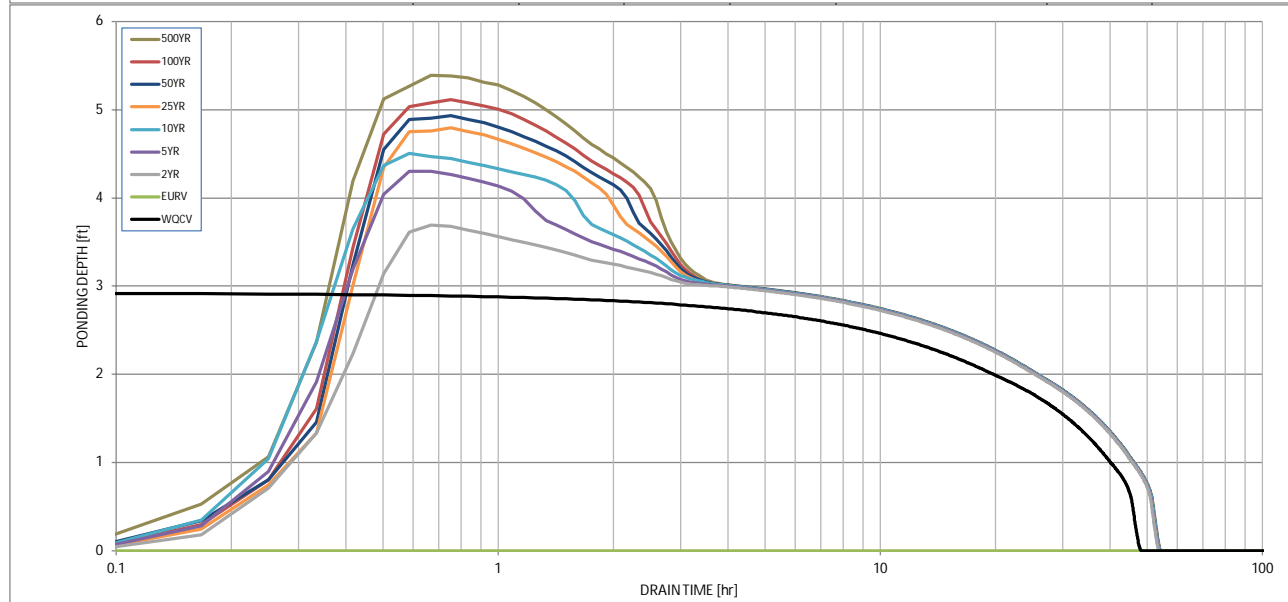
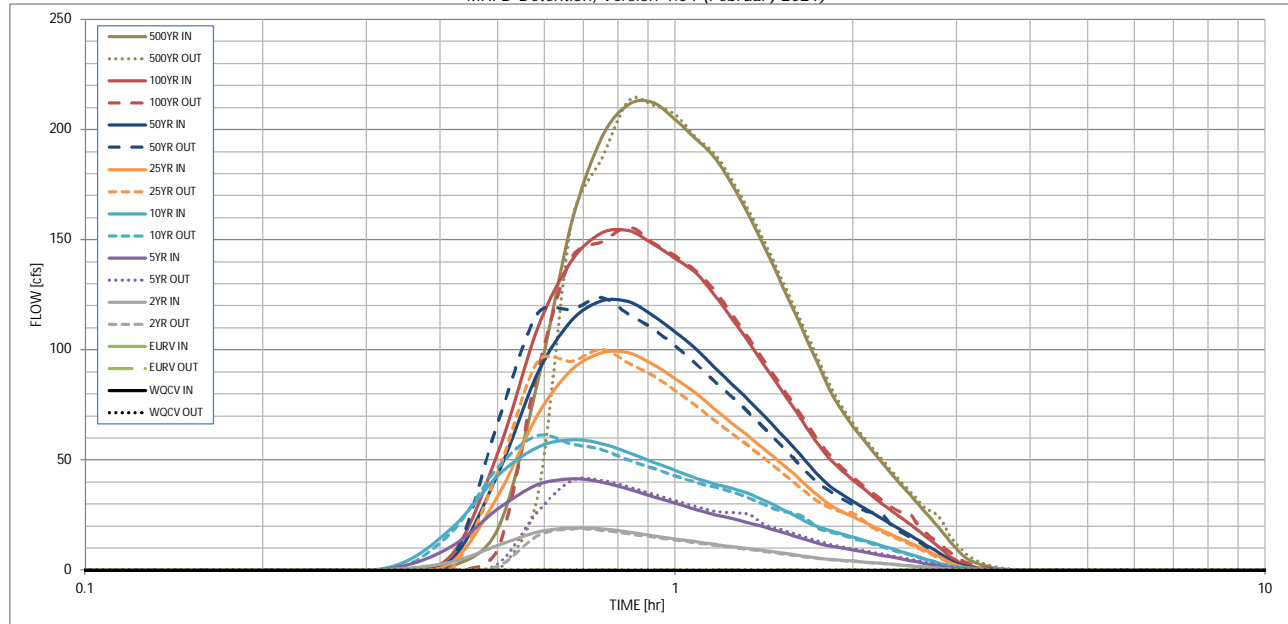
## Routed Hydrograph Results

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	1.636	3.586	5.529	8.980	11.339	14.730	20.917
CUHP Runoff Volume (acre-ft) =	<input type="text" value="0.134"/>	<input type="text" value="1.167"/>	<input type="text" value="1.636"/>	<input type="text" value="3.586"/>	<input type="text" value="5.529"/>	<input type="text" value="8.980"/>	<input type="text" value="11.339"/>	<input type="text" value="14.730"/>	<input type="text" value="20.917"/>
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	1.636	3.586	5.529	8.980	11.339	14.730	20.917
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	11.7	32.9	50.2	91.3	114.6	146.5	204.3
OPTIONAL Override Predevelopment Peak Q (cfs) =	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.10	0.27	0.42	0.76	0.95	1.22	1.70
Peak Inflow Q (cfs) =	N/A	N/A	19.3	41.5	59.1	98.7	122.2	154.2	212.3
Peak Outflow Q (cfs) =	<input type="text" value="0.1"/>	<input type="text" value="185.2"/>	<input type="text" value="18.9"/>	<input type="text" value="40.8"/>	<input type="text" value="61.1"/>	<input type="text" value="100.3"/>	<input type="text" value="123.8"/>	<input type="text" value="155.9"/>	<input type="text" value="213.1"/>
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	<input type="text" value="1.2"/>	<input type="text" value="1.2"/>	<input type="text" value="1.1"/>	<input type="text" value="1.1"/>	<input type="text" value="1.1"/>	<input type="text" value="1.0"/>
Structure Controlling Flow =	Plate	Plate	Overflow Weir 1	Spillway	Spillway	Spillway	Spillway	Spillway	Spillway
Max Velocity through Gate 1 (fps) =	N/A	N/A	1.08	1.6	1.6	1.7	1.7	1.8	1.8
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) =	<input type="text" value="43"/>	<input type="text" value="&gt;120"/>	<input type="text" value="26"/>	<input type="text" value="11"/>	<input type="text" value="3"/>	<input type="text" value="2"/>	<input type="text" value="2"/>	<input type="text" value="1"/>	<input type="text" value="1"/>
Time to Drain 99% of Inflow Volume (hours) =	<input type="text" value="45"/>	<input type="text" value="&gt;120"/>	<input type="text" value="40"/>	<input type="text" value="31"/>	<input type="text" value="24"/>	<input type="text" value="15"/>	<input type="text" value="10"/>	<input type="text" value="4"/>	<input type="text" value="3"/>
Maximum Ponding Depth (ft) =	<input type="text" value="2.93"/>	<input type="text" value="0.00"/>	<input type="text" value="3.70"/>	<input type="text" value="4.31"/>	<input type="text" value="4.51"/>	<input type="text" value="4.80"/>	<input type="text" value="4.94"/>	<input type="text" value="5.12"/>	<input type="text" value="5.39"/>
Area at Maximum Ponding Depth (acres) =	<input type="text" value="0.11"/>	<input type="text" value="0.00"/>	<input type="text" value="0.16"/>	<input type="text" value="0.18"/>	<input type="text" value="0.19"/>	<input type="text" value="0.20"/>	<input type="text" value="0.20"/>	<input type="text" value="0.21"/>	<input type="text" value="0.22"/>
Maximum Volume Stored (acre-ft) =	<input type="text" value="0.134"/>	<input type="text" value="0.000"/>	<input type="text" value="0.238"/>	<input type="text" value="0.340"/>	<input type="text" value="0.376"/>	<input type="text" value="0.432"/>	<input type="text" value="0.462"/>	<input type="text" value="0.497"/>	<input type="text" value="0.557"/>

# DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)



S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum 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	0.04
	0:15:00	0.00	0.00	0.10	0.17	0.21	0.14	0.19	0.17	0.29
	0:20:00	0.00	0.00	0.46	1.09	1.86	0.49	0.59	0.63	1.83
	0:25:00	0.00	0.00	3.70	10.61	18.83	3.58	4.65	6.67	18.55
	0:30:00	0.00	0.00	11.33	27.76	42.86	33.70	43.64	53.11	84.74
	0:35:00	0.00	0.00	17.34	38.78	55.90	70.39	89.16	109.51	157.30
	0:40:00	0.00	0.00	19.27	41.48	59.12	90.92	113.26	140.23	196.11
	0:45:00	0.00	0.00	18.90	40.09	57.61	98.66	122.18	152.97	211.55
	0:50:00	0.00	0.00	17.34	36.80	53.36	98.63	121.86	154.15	212.29
	0:55:00	0.00	0.00	15.64	33.45	49.11	93.40	115.58	148.12	204.53
	1:00:00	0.00	0.00	14.28	30.51	45.42	86.89	108.09	141.52	195.94
	1:05:00	0.00	0.00	13.01	27.68	41.87	80.43	100.61	135.04	187.43
	1:10:00	0.00	0.00	11.81	25.34	39.20	73.19	92.07	124.98	174.79
	1:15:00	0.00	0.00	10.78	23.44	37.15	66.61	84.36	113.96	160.96
	1:20:00	0.00	0.00	9.83	21.54	34.70	60.65	77.09	103.35	146.83
	1:25:00	0.00	0.00	8.90	19.62	31.69	54.96	69.92	92.98	132.34
	1:30:00	0.00	0.00	8.00	17.69	28.48	49.39	62.87	83.22	118.53
	1:35:00	0.00	0.00	7.10	15.78	25.26	44.01	56.07	74.08	105.48
	1:40:00	0.00	0.00	6.23	13.83	22.15	38.71	49.37	65.19	92.88
	1:45:00	0.00	0.00	5.47	12.16	19.75	33.61	42.96	56.79	81.33
	1:50:00	0.00	0.00	4.96	10.98	18.03	29.71	38.14	50.36	72.47
	1:55:00	0.00	0.00	4.57	10.06	16.57	26.75	34.44	45.35	65.44
	2:00:00	0.00	0.00	4.21	9.22	15.16	24.30	31.35	41.06	59.38
	2:05:00	0.00	0.00	3.84	8.39	13.77	22.05	28.46	37.14	53.74
	2:10:00	0.00	0.00	3.47	7.56	12.38	19.96	25.74	33.47	48.38
	2:15:00	0.00	0.00	3.11	6.76	11.03	17.97	23.14	30.03	43.32
	2:20:00	0.00	0.00	2.75	5.97	9.73	16.05	20.65	26.79	38.58
	2:25:00	0.00	0.00	2.41	5.21	8.48	14.21	18.27	23.79	34.18
	2:30:00	0.00	0.00	2.07	4.47	7.29	12.41	15.95	20.85	29.92
	2:35:00	0.00	0.00	1.74	3.73	6.14	10.62	13.68	17.95	25.73
	2:40:00	0.00	0.00	1.41	3.01	5.03	8.85	11.43	15.05	21.58
	2:45:00	0.00	0.00	1.09	2.30	3.92	7.10	9.20	12.17	17.46
	2:50:00	0.00	0.00	0.77	1.60	2.84	5.35	6.98	9.30	13.36
	2:55:00	0.00	0.00	0.48	0.99	1.92	3.64	4.80	6.49	9.46
	3:00:00	0.00	0.00	0.28	0.63	1.38	2.23	3.04	4.20	6.38
	3:05:00	0.00	0.00	0.20	0.47	1.08	1.42	2.04	2.81	4.45
	3:10:00	0.00	0.00	0.15	0.37	0.86	0.93	1.40	1.90	3.12
	3:15:00	0.00	0.00	0.12	0.30	0.68	0.62	0.97	1.25	2.15
	3:20:00	0.00	0.00	0.10	0.23	0.54	0.41	0.67	0.80	1.45
	3:25:00	0.00	0.00	0.08	0.18	0.41	0.28	0.47	0.48	0.94
	3:30:00	0.00	0.00	0.06	0.14	0.31	0.19	0.32	0.26	0.58
	3:35:00	0.00	0.00	0.05	0.11	0.22	0.13	0.22	0.16	0.37
	3:40:00	0.00	0.00	0.04	0.08	0.16	0.09	0.16	0.12	0.27
	3:45:00	0.00	0.00	0.03	0.06	0.11	0.07	0.12	0.09	0.21
	3:50:00	0.00	0.00	0.02	0.04	0.08	0.05	0.09	0.07	0.16
	3:55:00	0.00	0.00	0.02	0.03	0.06	0.04	0.07	0.06	0.13
	4:00:00	0.00	0.00	0.01	0.02	0.04	0.03	0.05	0.04	0.09
	4:05:00	0.00	0.00	0.01	0.01	0.03	0.02	0.04	0.03	0.06
	4:10:00	0.00	0.00	0.01	0.01	0.02	0.01	0.02	0.02	0.04
	4:15:00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.02
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
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	



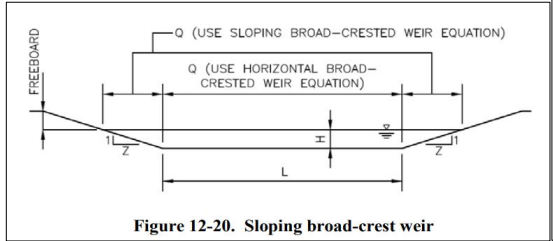
Emergency Overflow Weir Calculation - Water Quality Pond 1

Q (cfs) =	181	(100-yr peak inflow (181 cfs))
$C_{BCW}$ =	2.8	
Z =	4	
H =	1.5	
L (ft) =	30.39	(Proposing 35 feet)

$$Q = C_{BCW} L H^{1.5} + 2 \left[ \left( \frac{2}{5} \right) C_{BCW} Z H^{2.5} \right]$$

rearrange to solve for length:

$$L = \frac{Q - \left( \frac{4}{5} \right) C_{BCW} Z H^{2.5}}{C_{BCW} H^{1.5}}$$



Horizontal Broad Crested Weir Equation (from USDCM Eqn. 12-8)

$$Q = C_{BCW} L H^{1.5} \quad \text{Equation 12-8}$$

Where:

- Q = discharge (cfs)
- $C_{BCW}$  = broad-crested weir coefficient (This ranges from 2.6 to 3.0. A value of 3.0 is often used in practice.) See Hydraulic Engineering Circular No. 22 for additional information.
- L = broad-crested weir length (ft)
- H = head above weir crest (ft)

Sloping Broad Crested Weir Equation (from USDCM Eqn. 12-9)

$$Q = \left( \frac{2}{5} \right) C_{BCW} Z H^{2.5} \quad \text{Equation 12-9}$$

Where:

- Q = discharge (cfs)
- $C_{BCW}$  = broad-crested weir coefficient (This ranges from 2.6 to 3.0. A value of 3.0 is often used in practice.) See Hydraulic Engineering Circular No. 22 for additional information.
- Z = side slope (horizontal: vertical)
- H = head above weir crest (ft)

Note that in order to calculate the total flow over the weir depicted in Figure 12-20, the results from Equation 12-8 must be added to two times the results from Equation 12-9.



2 North Nevada Avenue, Suite 900  
Colorado Springs, Colorado 80903

Project: Eagleview  
Project Number: 196288000  
Date: 4/16/2024

Prepared By: BH  
Checked By: BH

### Water Quality Capture Volume

### Water Quality Pond 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) =	0.60	
Area (Site) =	1.03	AC
WQ Capture Volume (Site) =	0.052	AC-FT
	2,243	FT <sup>3</sup>



IMPERVIOUS FACTOR CALCULATION TABLE - PROPOSED CONDITIONS

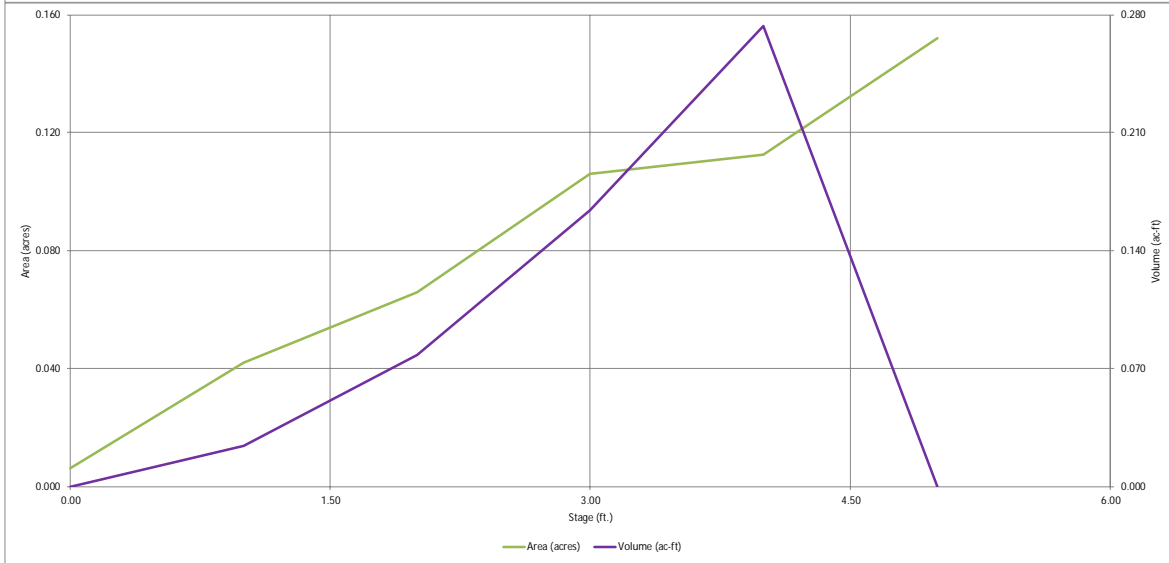
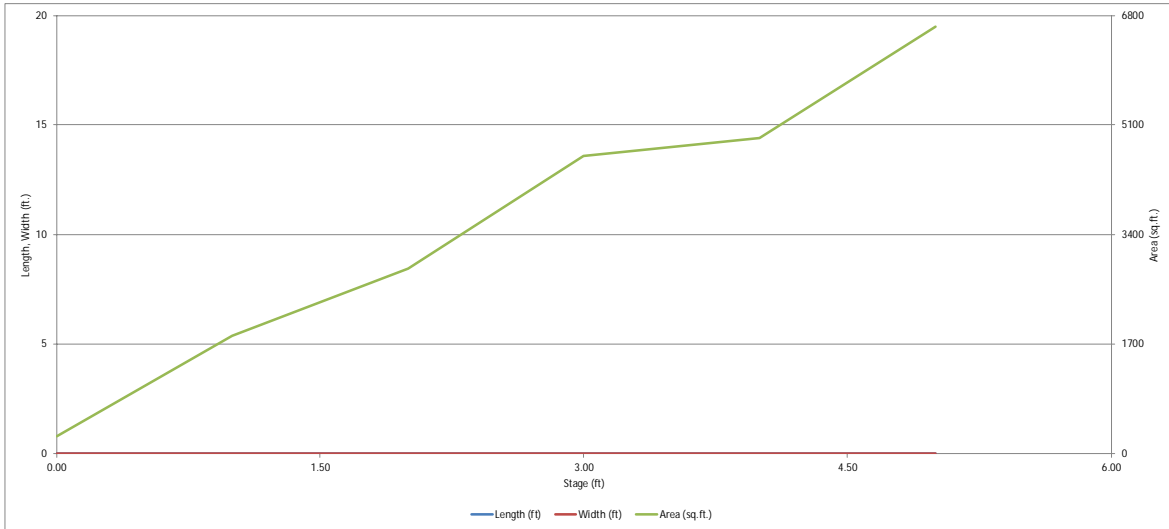
	Imp %	2%	11%	90%	100%	80%			
	Basin	Area (Acre)	Open Space (2%)	2.5 Acre Lot (100%)	Buildings (100%)	Paved Roadway (100%)	Gravel Roadway (80%)	Total % Check	Weighted Impervious
WQF2	PB11	21.08	0%	96%	0%	4%	0%	100%	14%
	PB14*	3.38	0%	92%	0%	8%	0%	100%	18%
	OB8	33.08	93%	0%	2%	1%	5%	100%	8%
Total		57.54							10.9%

\*Total area reduced based on portion tributary to WQP2



# DETENTION BASIN STAGE-STORAGE TABLE BUILDER

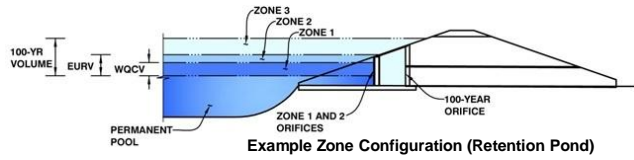
*MHFD-Detention, Version 4.04 (February 2021)*



# DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Project: Eagleview  
Basin ID: Water Quality Pond 2



	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WOCV)	1.58	0.052	Orifice Plate
Zone 2			Weir&Pipe (Circular)
Zone 3			
Total (all zones)		0.052	

User Input: Orifice at Underdrain Outlet (typically used to drain WOCV in a Filtration BMP)

Calculated Parameters for Underdrain

Underdrain Orifice Invert Depth =  ft (distance below the filtration media surface)  
Underdrain Orifice Diameter =  inches

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 WOCV and/or EURV in a sedimentation BMP)

Calculated Parameters for Plate

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 =  inches

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	0.53	1.06					
Orifice Area (sq. inches)	0.30	0.30	0.30					

	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)

Calculated Parameters for Vertical Orifice

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

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)

Calculated Parameters for Overflow Weir

Overflow Weir Front Edge Height, Ho =  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 % =  %

Height of Gate Upper Edge, H<sub>1</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)

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

Depth to Invert of Outlet Pipe =  ft (distance below basin bottom at Stage = 0 ft)  
Circular Orifice Diameter =  inches

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)

Calculated Parameters for Spillway

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

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

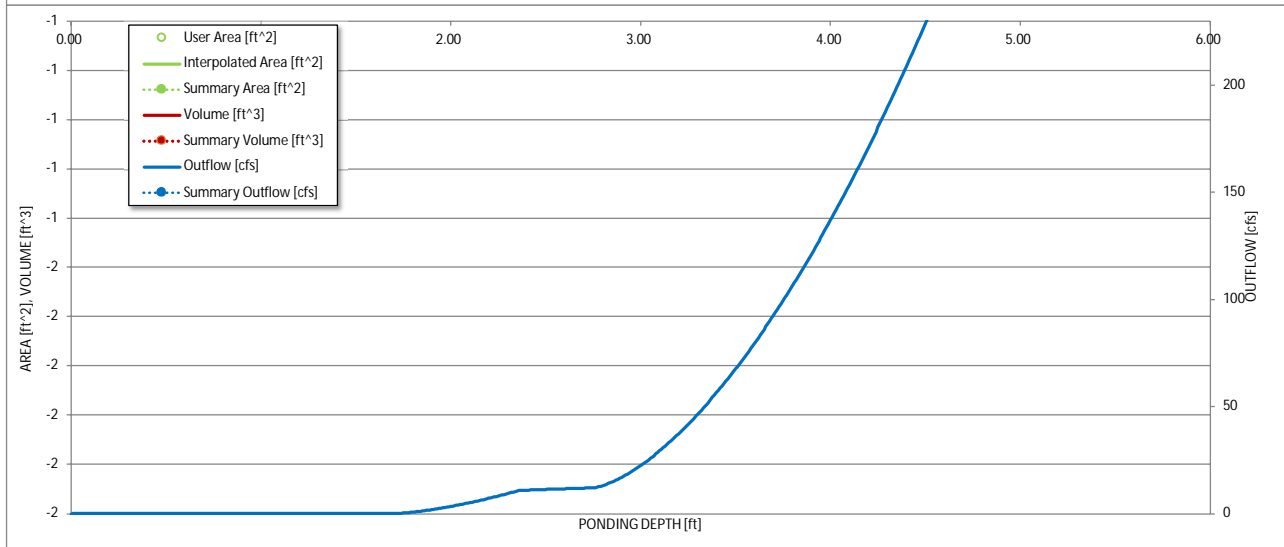
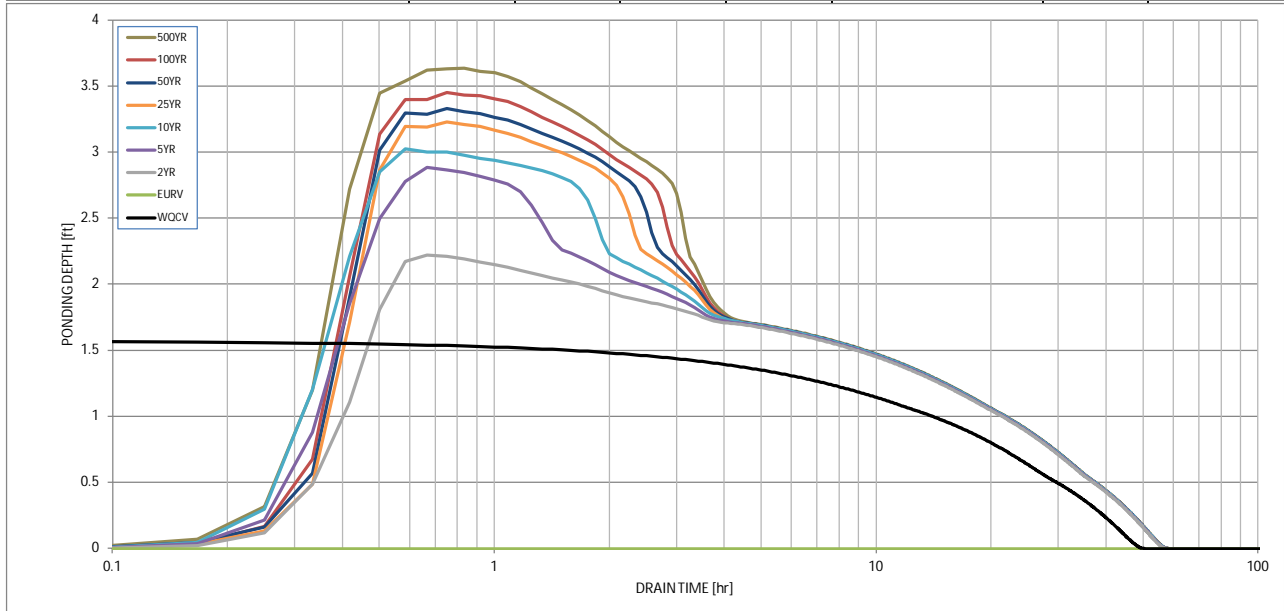
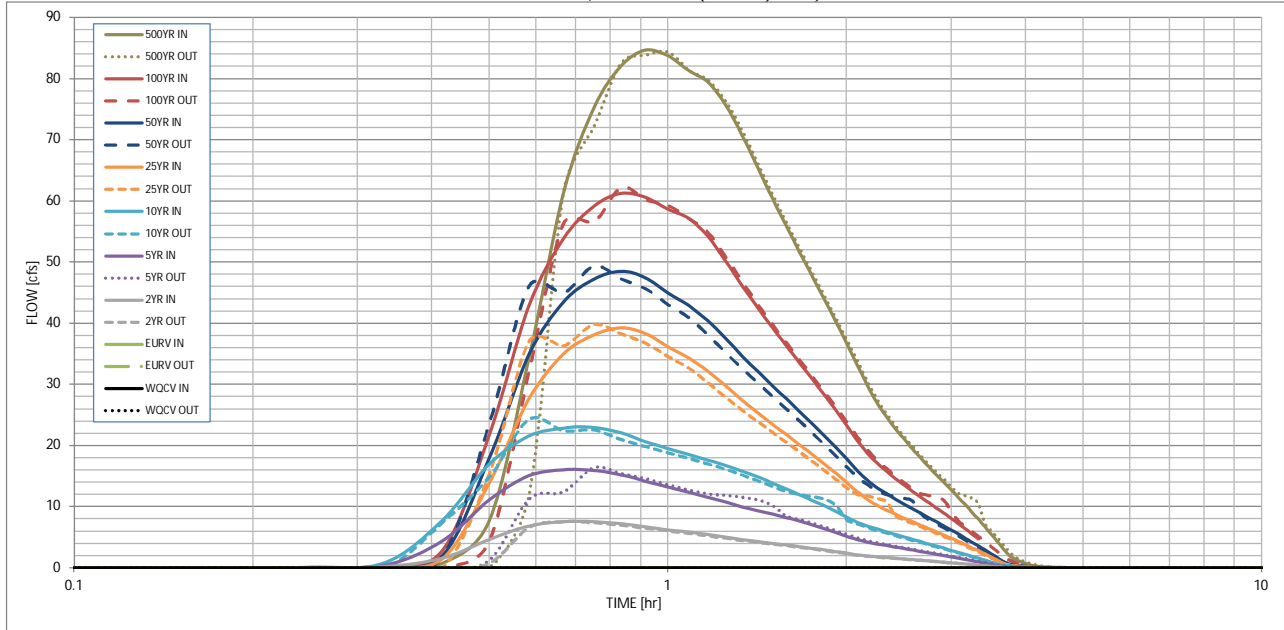
## Routed Hydrograph Results

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	0.812	1.753	2.687	4.336	5.467	7.089	10.053
CUHP Runoff Volume (acre-ft) =	0.052	0.594	0.812	1.753	2.687	4.336	5.467	7.089	10.053
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.812	1.753	2.687	4.336	5.467	7.089	10.053
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	4.4	12.5	19.4	35.5	44.6	57.2	80.1
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.08	0.22	0.34	0.62	0.78	0.99	1.39
Peak Inflow Q (cfs) =	N/A	N/A	7.6	16.1	23.0	39.3	48.5	61.3	84.7
Peak Outflow Q (cfs) =	0.0	100.9	7.6	16.4	24.3	39.8	49.4	62.2	84.4
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.3	1.3	1.1	1.1	1.1	1.1
Structure Controlling Flow =	Plate	Spillway	Overflow Weir 1	Spillway	Spillway	Spillway	Spillway	Spillway	Spillway
Max Velocity through Gate 1 (fps) =	N/A	2.30	1.13	1.9	1.9	2.0	2.0	2.1	2.2
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) =	42	0	21	7	3	2	2	1	1
Time to Drain 99% of Inflow Volume (hours) =	46	0	36	27	20	11	7	4	3
Maximum Ponding Depth (ft) =	1.58	4.01	2.22	2.89	3.03	3.23	3.33	3.45	3.64
Area at Maximum Ponding Depth (acres) =	0.06	0.00	0.07	0.10	0.11	0.11	0.11	0.11	0.11
Maximum Volume Stored (acre-ft) =	0.052	#VALUE!	0.093	0.152	0.166	0.187	0.199	0.212	0.232

# DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)



S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum 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	0.02
	0:15:00	0.00	0.00	0.05	0.08	0.10	0.07	0.09	0.08	0.13
	0:20:00	0.00	0.00	0.21	0.50	0.83	0.22	0.26	0.30	0.81
	0:25:00	0.00	0.00	1.61	4.47	7.82	1.56	2.01	2.86	7.72
	0:30:00	0.00	0.00	4.67	11.14	16.97	13.89	17.94	21.74	34.21
	0:35:00	0.00	0.00	6.87	15.06	21.56	27.62	34.89	42.85	61.24
	0:40:00	0.00	0.00	7.57	16.08	22.90	34.97	43.49	53.81	75.28
	0:45:00	0.00	0.00	7.58	15.96	22.99	38.17	47.26	59.16	82.10
	0:50:00	0.00	0.00	7.23	15.26	22.10	39.26	48.54	61.28	84.68
	0:55:00	0.00	0.00	6.74	14.22	20.71	38.34	47.46	60.60	83.72
	1:00:00	0.00	0.00	6.26	13.21	19.56	36.19	44.97	58.67	81.35
	1:05:00	0.00	0.00	5.88	12.39	18.60	34.35	42.91	57.17	79.48
	1:10:00	0.00	0.00	5.48	11.60	17.68	32.22	40.44	54.29	75.84
	1:15:00	0.00	0.00	5.05	10.78	16.77	29.85	37.64	50.32	70.83
	1:20:00	0.00	0.00	4.65	10.02	15.85	27.43	34.70	46.21	65.43
	1:25:00	0.00	0.00	4.32	9.38	14.88	25.37	32.13	42.55	60.40
	1:30:00	0.00	0.00	4.03	8.80	13.90	23.51	29.80	39.28	55.84
	1:35:00	0.00	0.00	3.76	8.24	12.94	21.77	27.62	36.30	51.63
	1:40:00	0.00	0.00	3.50	7.65	11.99	20.13	25.56	33.54	47.71
	1:45:00	0.00	0.00	3.23	7.03	11.06	18.55	23.57	30.88	43.93
	1:50:00	0.00	0.00	2.97	6.41	10.16	17.01	21.62	28.29	40.28
	1:55:00	0.00	0.00	2.70	5.80	9.25	15.48	19.71	25.77	36.71
	2:00:00	0.00	0.00	2.43	5.20	8.32	13.98	17.83	23.31	33.25
	2:05:00	0.00	0.00	2.17	4.65	7.49	12.49	15.95	20.88	29.87
	2:10:00	0.00	0.00	1.97	4.25	6.88	11.21	14.35	18.80	27.00
	2:15:00	0.00	0.00	1.83	3.95	6.37	10.26	13.15	17.20	24.73
	2:20:00	0.00	0.00	1.70	3.68	5.92	9.47	12.14	15.84	22.78
	2:25:00	0.00	0.00	1.59	3.42	5.49	8.78	11.24	14.64	21.03
	2:30:00	0.00	0.00	1.47	3.17	5.08	8.15	10.42	13.54	19.43
	2:35:00	0.00	0.00	1.36	2.94	4.68	7.56	9.66	12.52	17.94
	2:40:00	0.00	0.00	1.26	2.70	4.30	6.99	8.93	11.56	16.55
	2:45:00	0.00	0.00	1.16	2.48	3.93	6.45	8.22	10.67	15.24
	2:50:00	0.00	0.00	1.05	2.25	3.58	5.92	7.54	9.81	14.00
	2:55:00	0.00	0.00	0.95	2.04	3.24	5.39	6.88	8.96	12.77
	3:00:00	0.00	0.00	0.86	1.82	2.90	4.87	6.22	8.11	11.56
	3:05:00	0.00	0.00	0.76	1.61	2.58	4.36	5.56	7.27	10.35
	3:10:00	0.00	0.00	0.66	1.40	2.25	3.84	4.91	6.42	9.15
	3:15:00	0.00	0.00	0.56	1.19	1.92	3.33	4.25	5.58	7.95
	3:20:00	0.00	0.00	0.46	0.98	1.60	2.82	3.60	4.74	6.75
	3:25:00	0.00	0.00	0.37	0.77	1.28	2.30	2.96	3.90	5.55
	3:30:00	0.00	0.00	0.27	0.57	0.97	1.79	2.31	3.07	4.36
	3:35:00	0.00	0.00	0.18	0.37	0.66	1.29	1.67	2.23	3.19
	3:40:00	0.00	0.00	0.11	0.23	0.47	0.80	1.06	1.45	2.13
	3:45:00	0.00	0.00	0.07	0.17	0.36	0.51	0.70	0.97	1.48
	3:50:00	0.00	0.00	0.05	0.13	0.29	0.34	0.48	0.66	1.05
	3:55:00	0.00	0.00	0.04	0.10	0.23	0.23	0.34	0.44	0.74
	4:00:00	0.00	0.00	0.04	0.08	0.19	0.15	0.24	0.29	0.50
	4:05:00	0.00	0.00	0.03	0.07	0.14	0.10	0.17	0.18	0.33
	4:10:00	0.00	0.00	0.02	0.05	0.11	0.07	0.12	0.10	0.21
	4:15:00	0.00	0.00	0.02	0.04	0.08	0.05	0.08	0.06	0.13
	4:20:00	0.00	0.00	0.01	0.03	0.06	0.04	0.06	0.04	0.10
	4:25:00	0.00	0.00	0.01	0.02	0.04	0.03	0.04	0.03	0.07
	4:30:00	0.00	0.00	0.01	0.02	0.03	0.02	0.03	0.03	0.06
	4:35:00	0.00	0.00	0.01	0.01	0.02	0.01	0.03	0.02	0.04
	4:40:00	0.00	0.00	0.01	0.01	0.02	0.01	0.02	0.02	0.03
	4:45:00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.02
	4:50:00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.02
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
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	



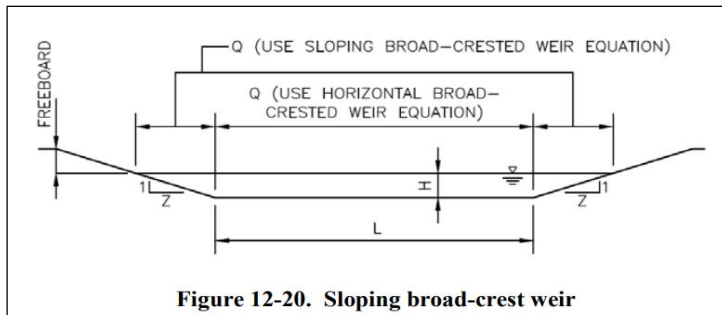
Emergency Overflow Weir Calculation - Water Quality Pond 2

Q (cfs) =	82	(100-yr peak inflow (82 cfs))
$C_{BCW}$ =	2.8	
Z =	4	
H =	1.03	
L (ft) =	24.72	(Proposing 25 feet)

$$Q = C_{BCW}LH^{1.5} + 2 \left[ \left( \frac{2}{5} \right) C_{BCW}ZH^{2.5} \right]$$

rearrange to solve for length:

$$L = \frac{Q - \left( \frac{4}{5} \right) C_{BCW}ZH^{2.5}}{C_{BCW}H^{1.5}}$$



Horizontal Broad Crested Weir Equation (from USDCM Eqn. 12-8)

$$Q = C_{BCW}LH^{1.5} \quad \text{Equation 12-8}$$

Where:

$Q$  = discharge (cfs)

$C_{BCW}$  = broad-crested weir coefficient (This ranges from 2.6 to 3.0. A value of 3.0 is often used in practice.) See Hydraulic Engineering Circular No. 22 for additional information.

$L$  = broad-crested weir length (ft)

$H$  = head above weir crest (ft)

Sloping Broad Crested Weir Equation (from USDCM Eqn. 12-9)

$$Q = \left( \frac{2}{5} \right) C_{BCW}ZH^{2.5} \quad \text{Equation 12-9}$$

Where:

$Q$  = discharge (cfs)

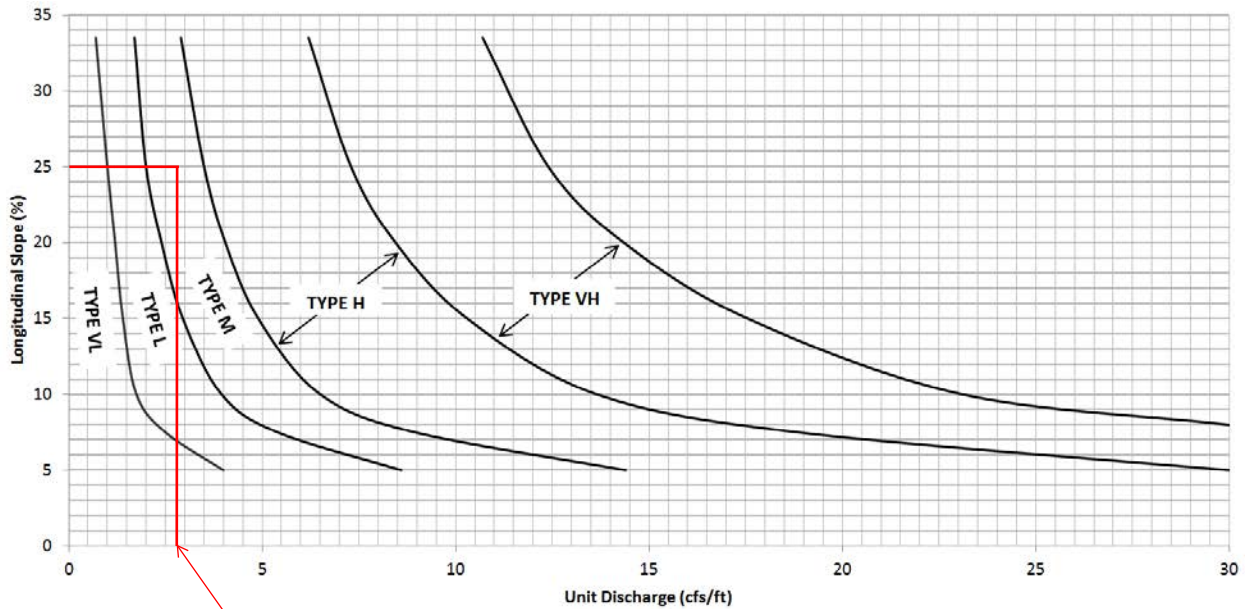
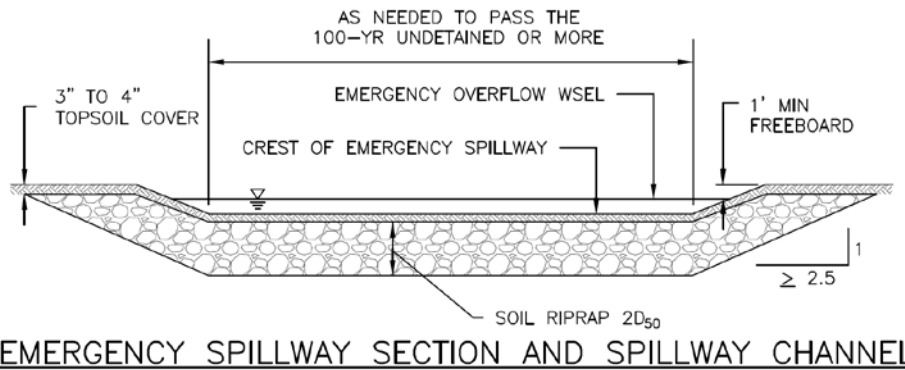
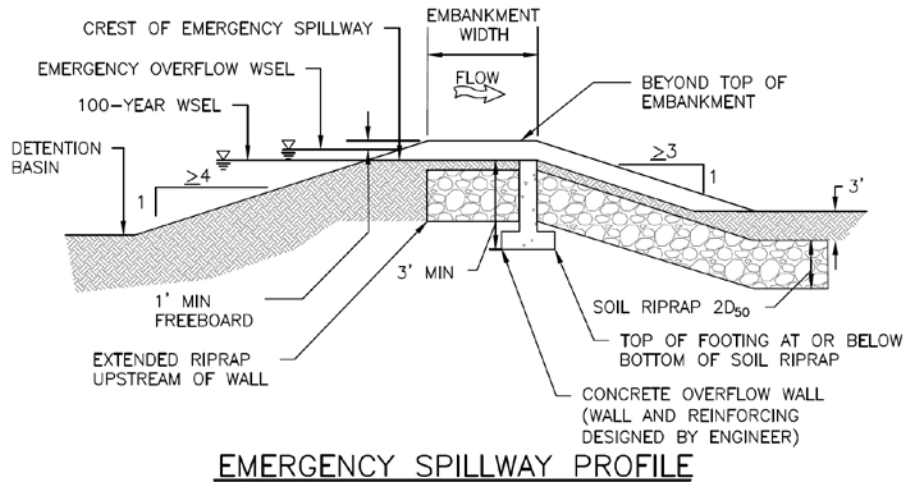
$C_{BCW}$  = broad-crested weir coefficient (This ranges from 2.6 to 3.0. A value of 3.0 is often used in practice.) See Hydraulic Engineering Circular No. 22 for additional information.

$Z$  = side slope (horizontal: vertical)

$H$  = head above weir crest (ft)

Note that in order to calculate the total flow over the weir depicted in Figure 12-20, the results from Equation 12-8 must be added to two times the results from Equation 12-9.





**Figure 12-21. Embankment protection details and rock sizing chart** (adapted from Arapahoe County)

109 cfs/40 ft = 2.73

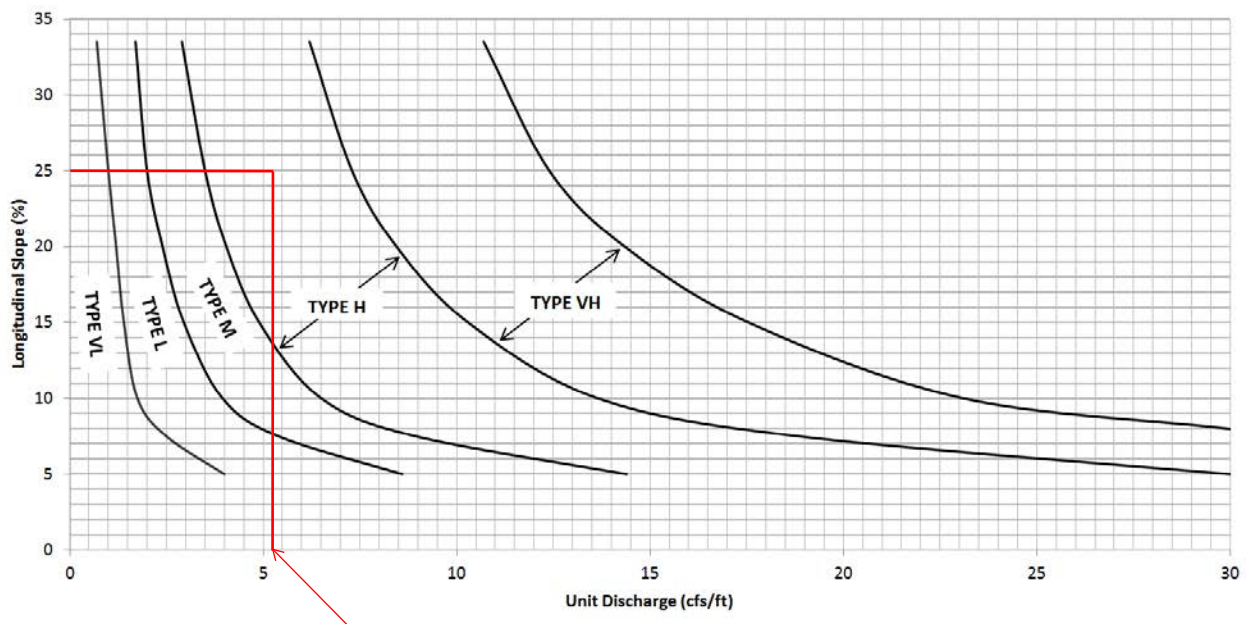
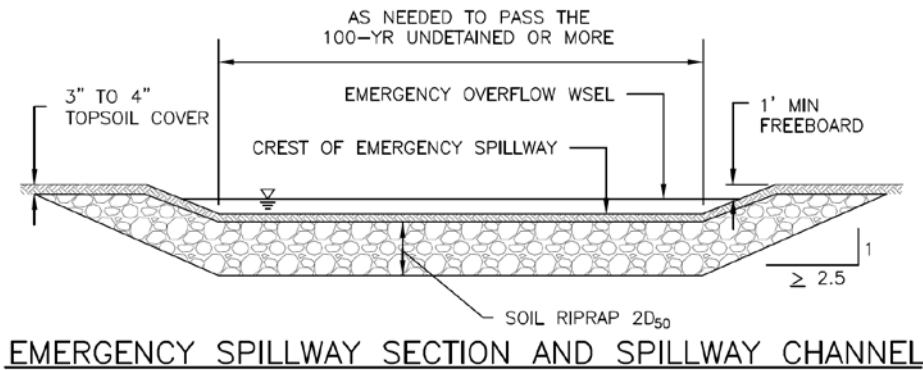
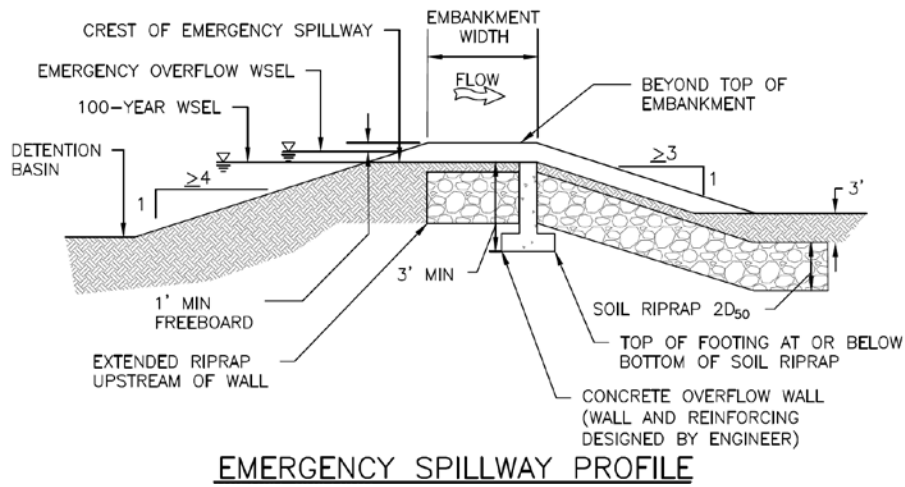


Figure 12-21. Embankment protection details and rock sizing chart (adapted from Arapahoe County)  
 181 cfs/35 ft = 5.17

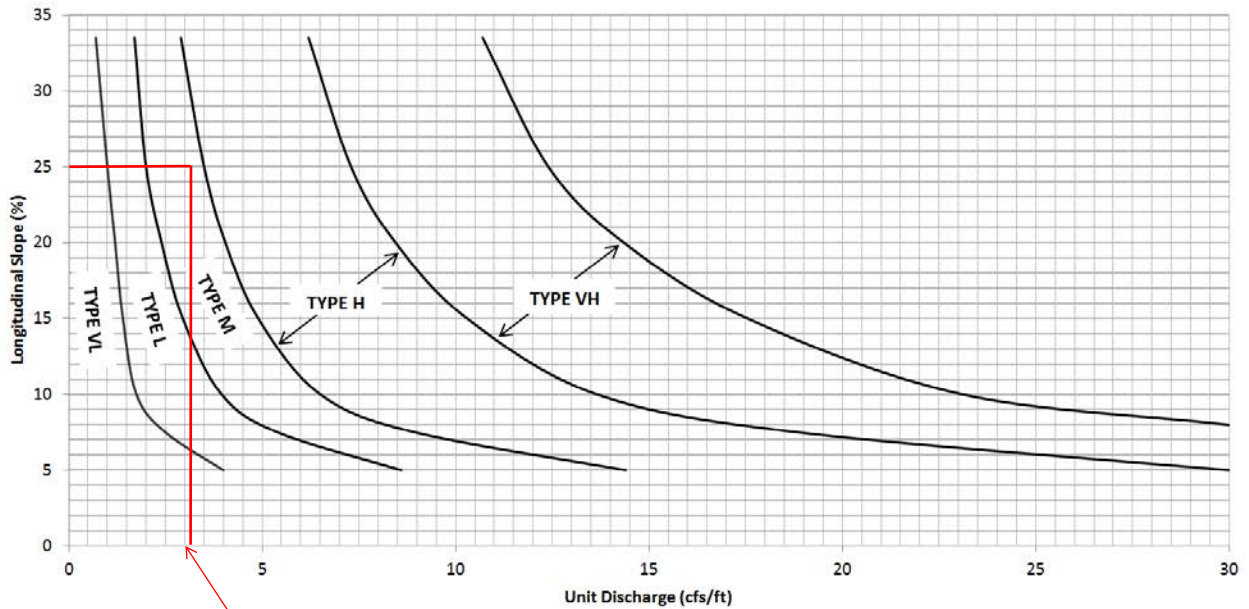
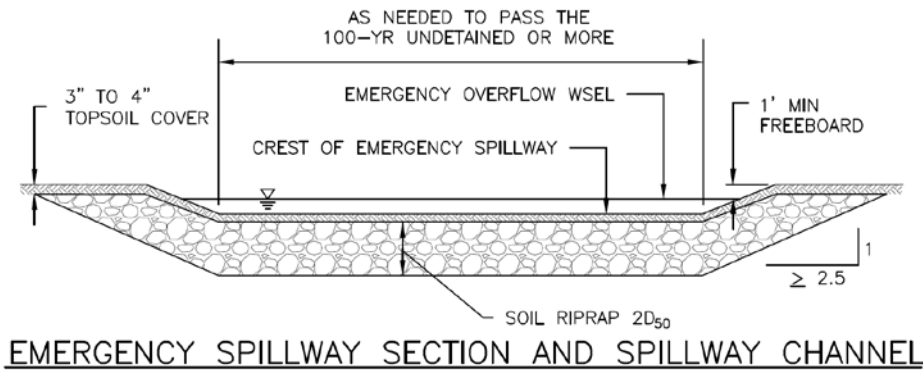
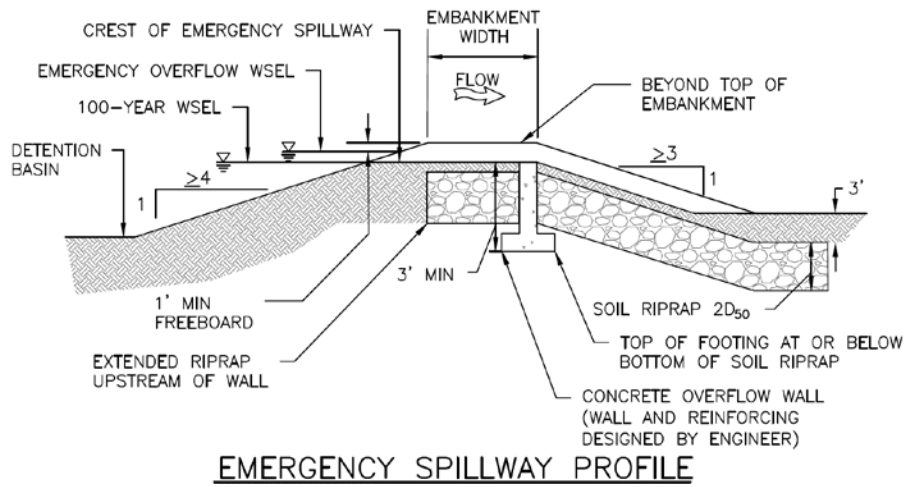
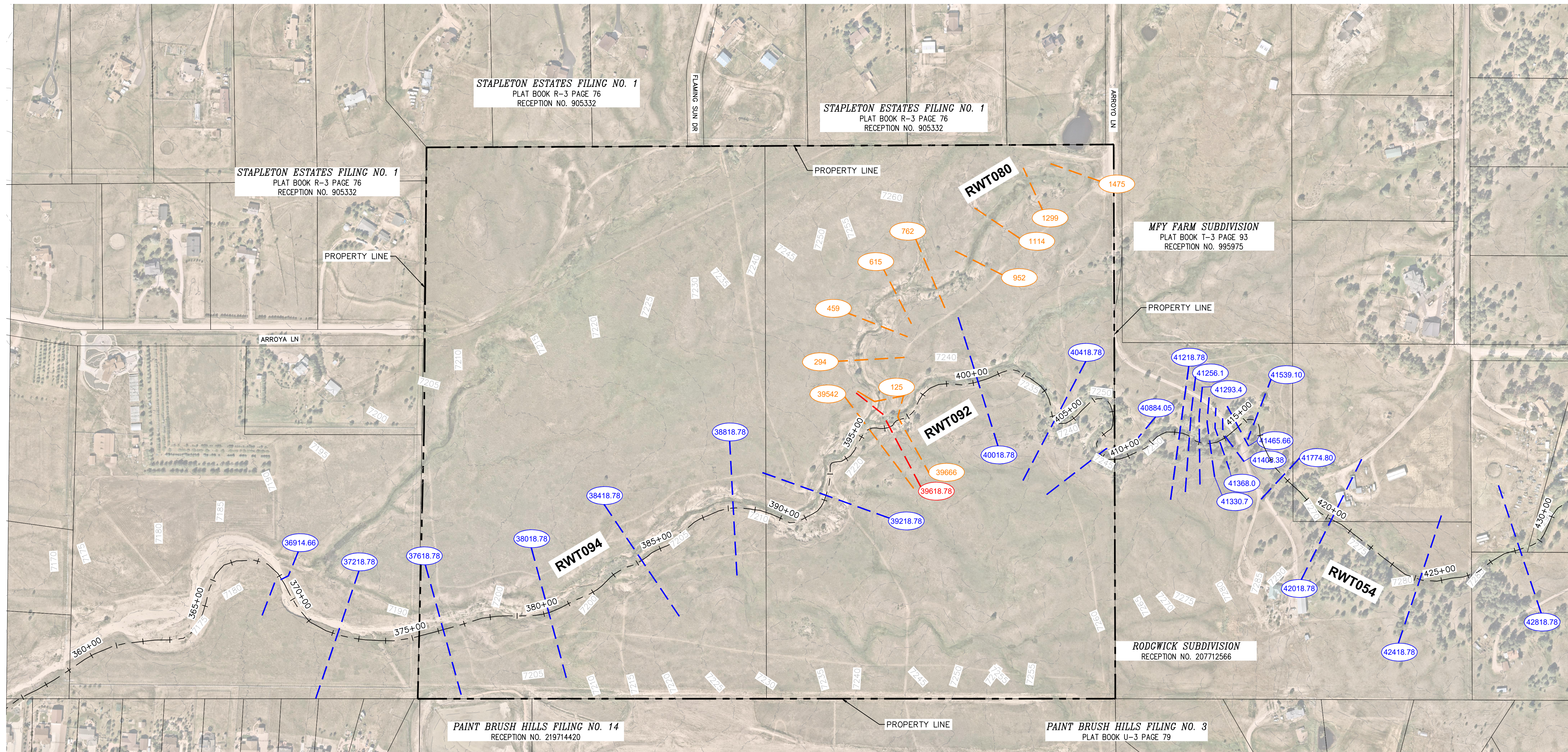


Figure 12-21. Embankment protection details and rock sizing chart (adapted from Arapahoe County)

82 cfs/25 ft = 3.28

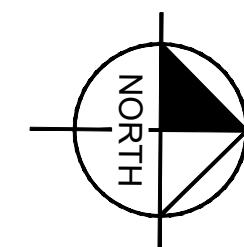
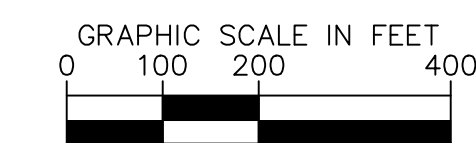




**LEGEND**

- PROPERTY LINE
- LOT LINE
- - - - - DBPS HEC-RAS CROSS SECTION
- - - - - DBPS HEC-RAS CROSS SECTION (REMOVED)
- - - - - NEW HEC-RAS CROSS SECTION
- XXXX ----- EXISTING MAJOR CONTOUR
- XXXX ----- EXISTING MINOR CONTOUR
- (XXXX.XX) HEC-RAS CROSS SECTION ID

NOTE:  
 PHOTOS NOT PROVIDED FOR CROSS SECTIONS 36914.66,  
 37218.78, 42018.78, 42418.78, AND 42818.78.



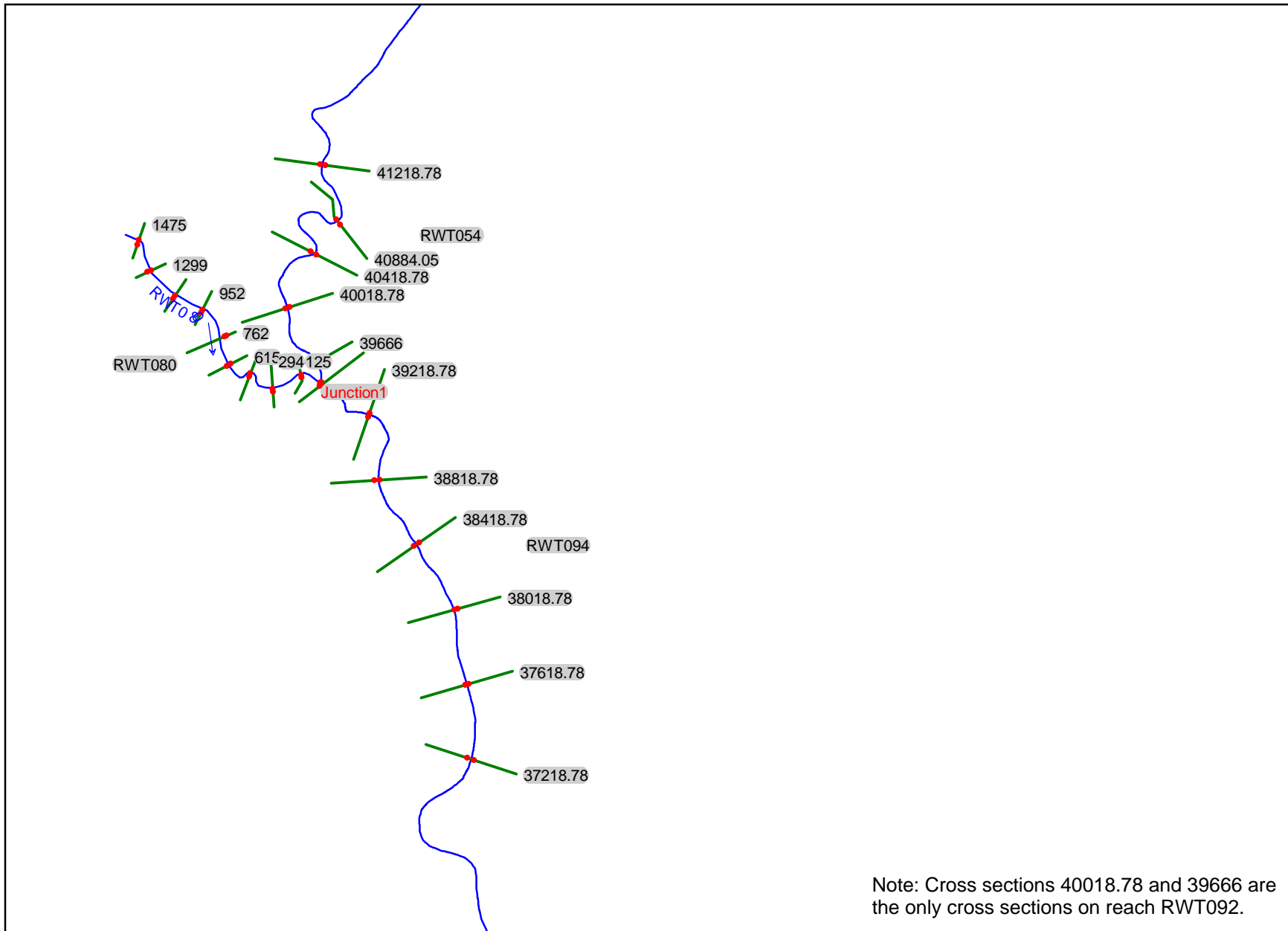
EAGLEVIEW HEC-RAS CROSS  
 SECTIONS EXHIBIT  
 10/12/2023

**Kimley»Horn**

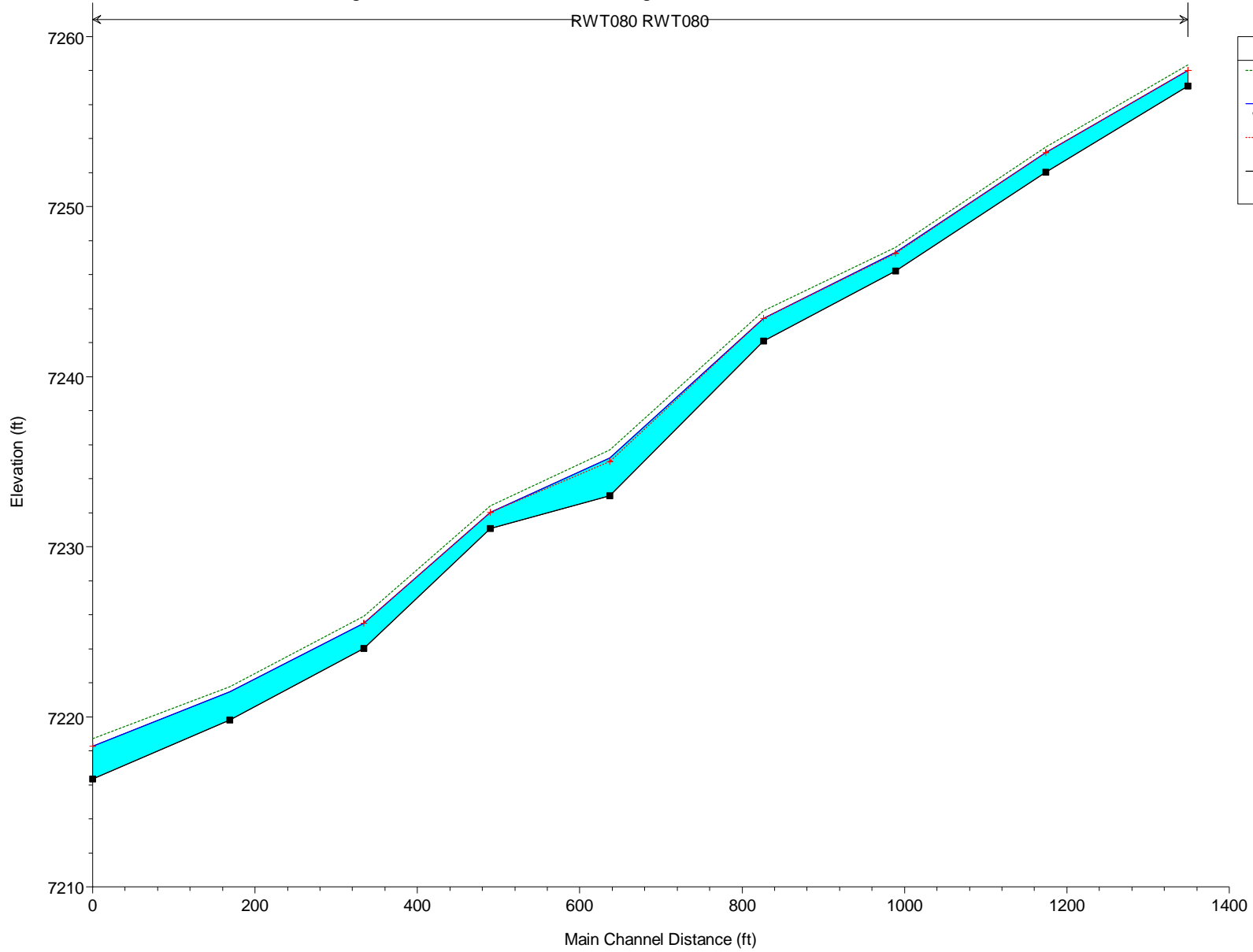
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 2 N NEVADA AVE, SUITE 900, COLORADO SPRINGS, CO 80903  
 PHONE: 719-453-0160



EXISTING CONDITIONS HEC-RAS RESULTS



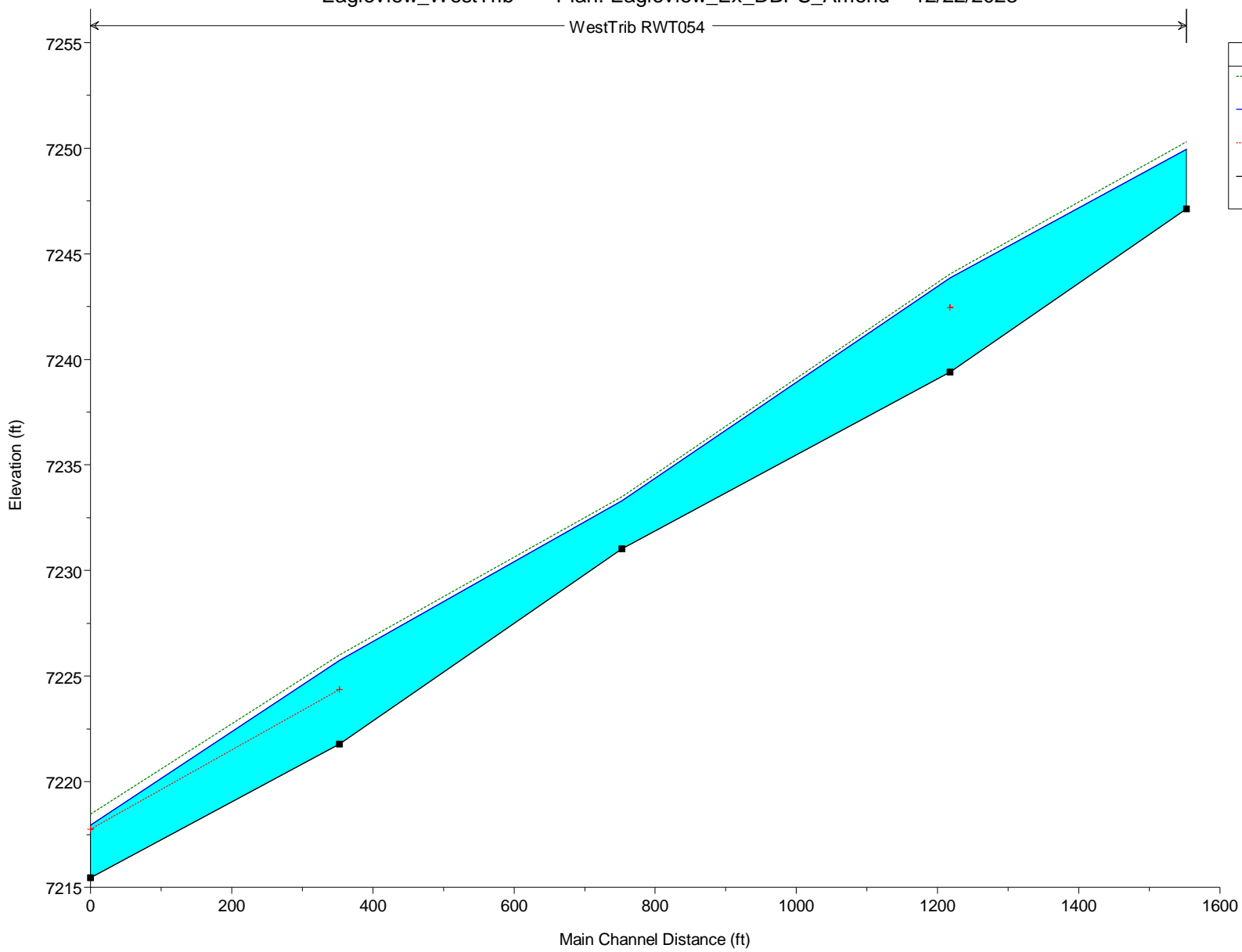
RWT080 RWT080



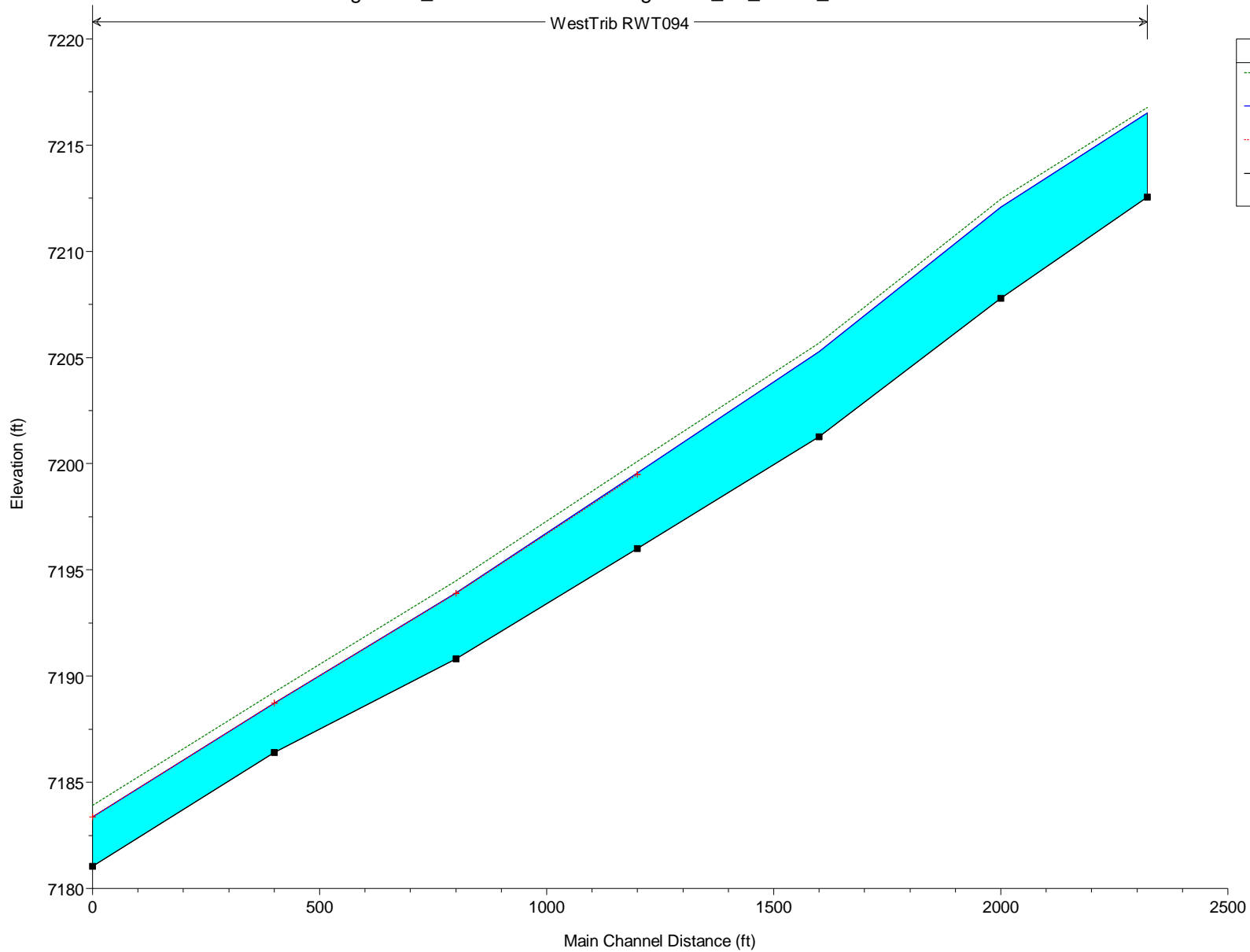
Legend	
EG 100-yr	(dashed green line)
WS 100-yr	(solid blue line)
Crit 100-yr	(dotted red line)
Ground	(solid black line)

WestTrib RWT054

Legend	
EG 100-yr	
WS 100-yr	
Crit 100-yr	
Ground	



WestTrib RWT094



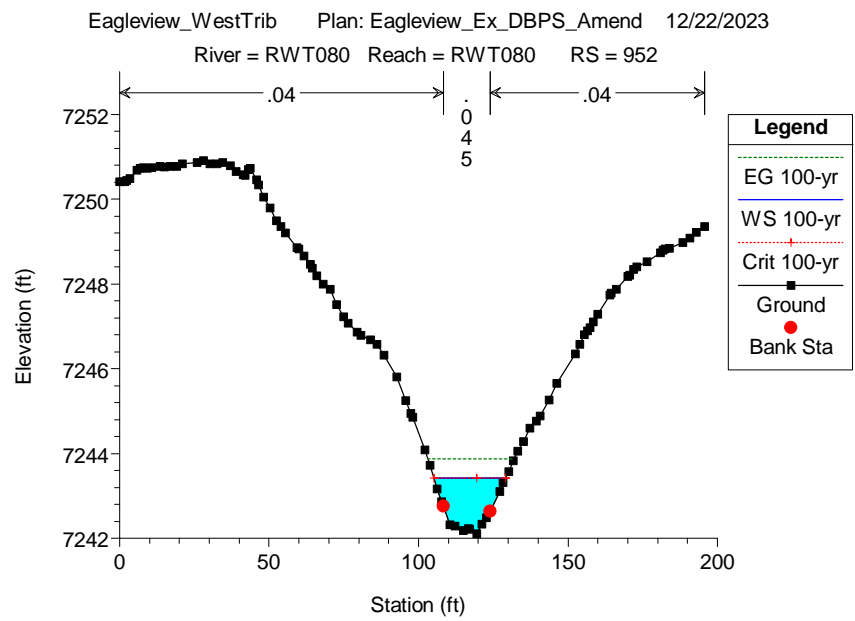
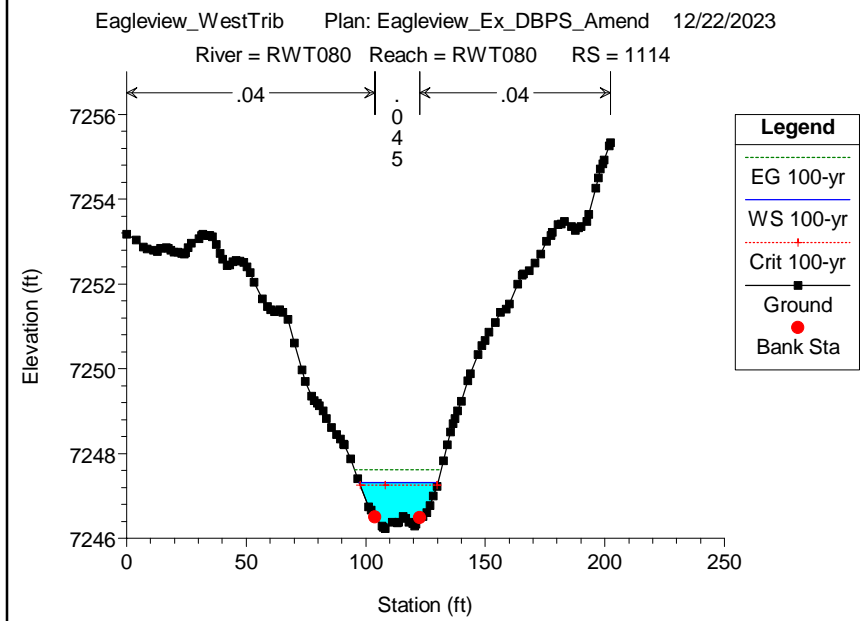
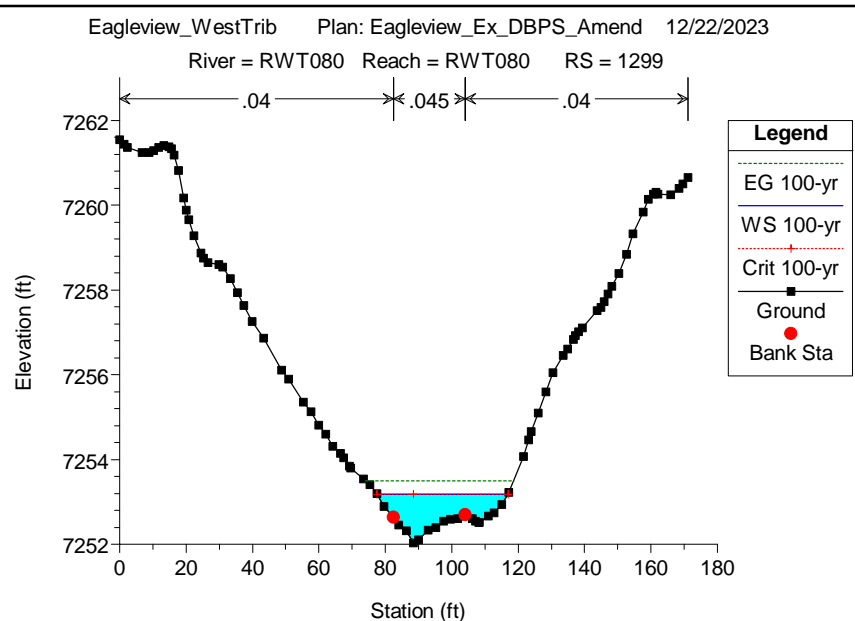
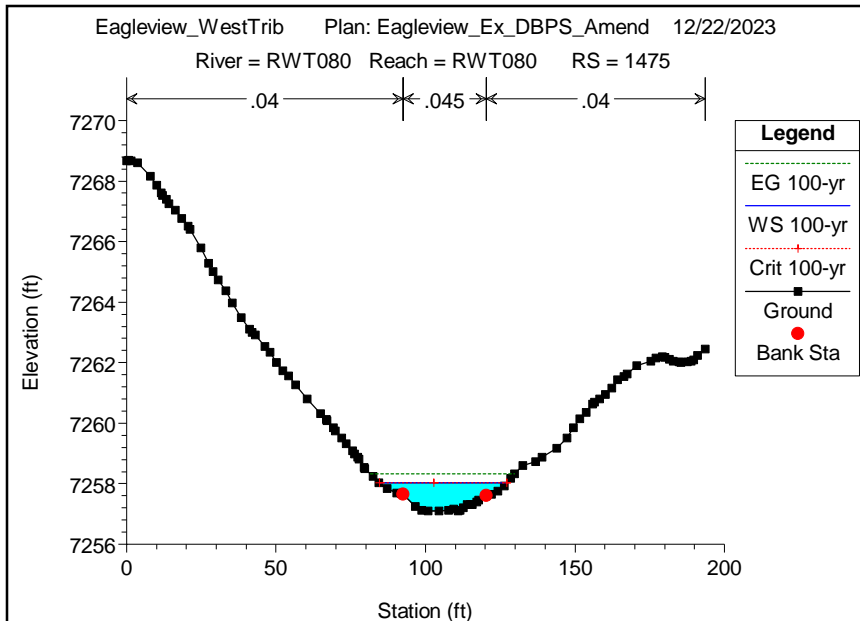


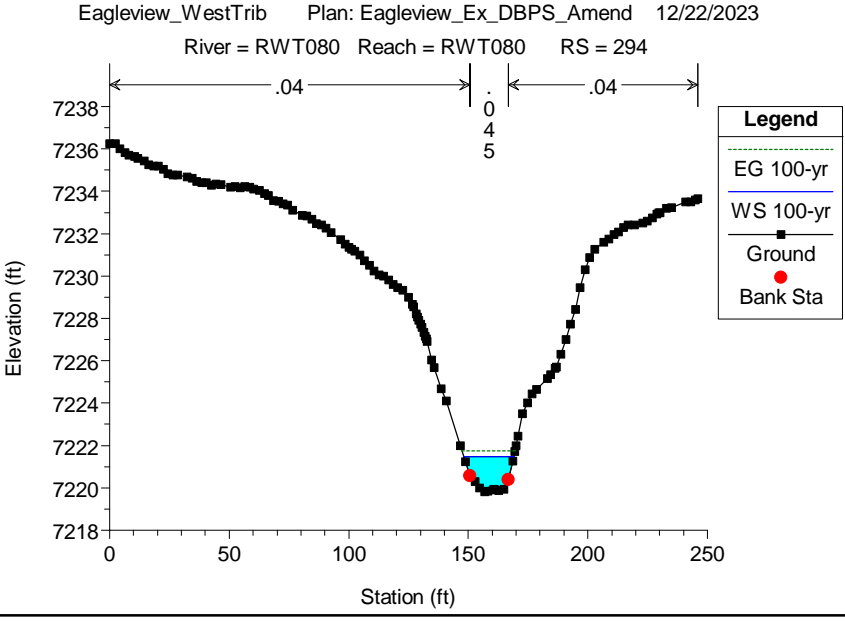
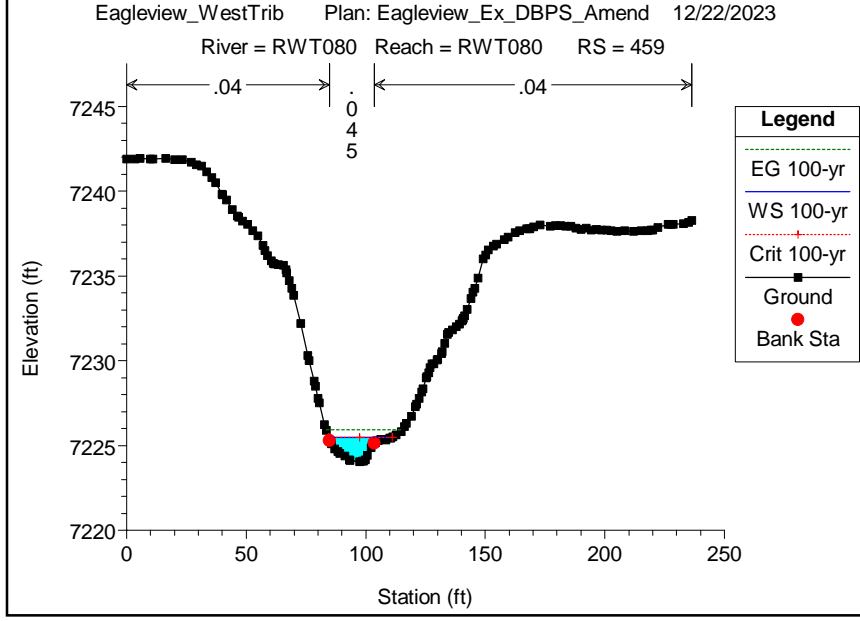
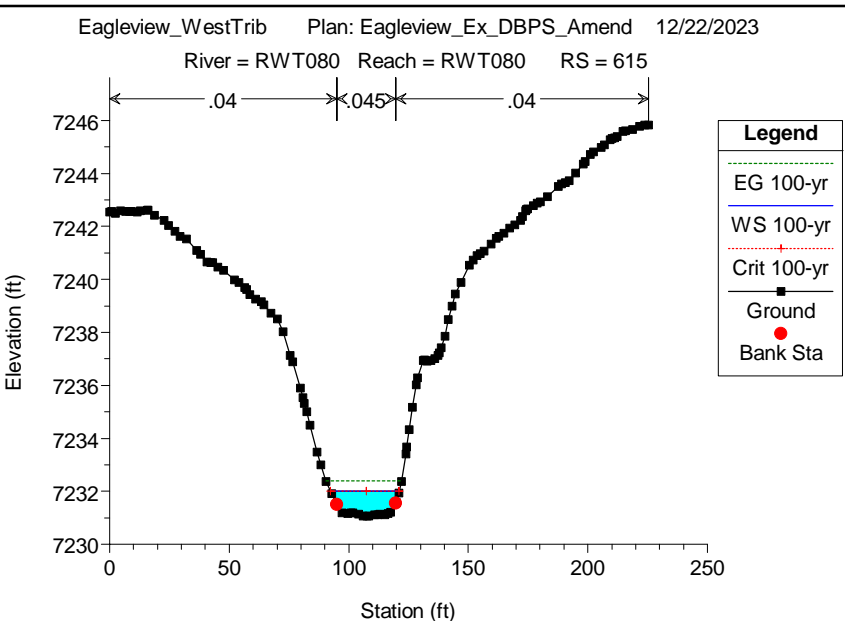
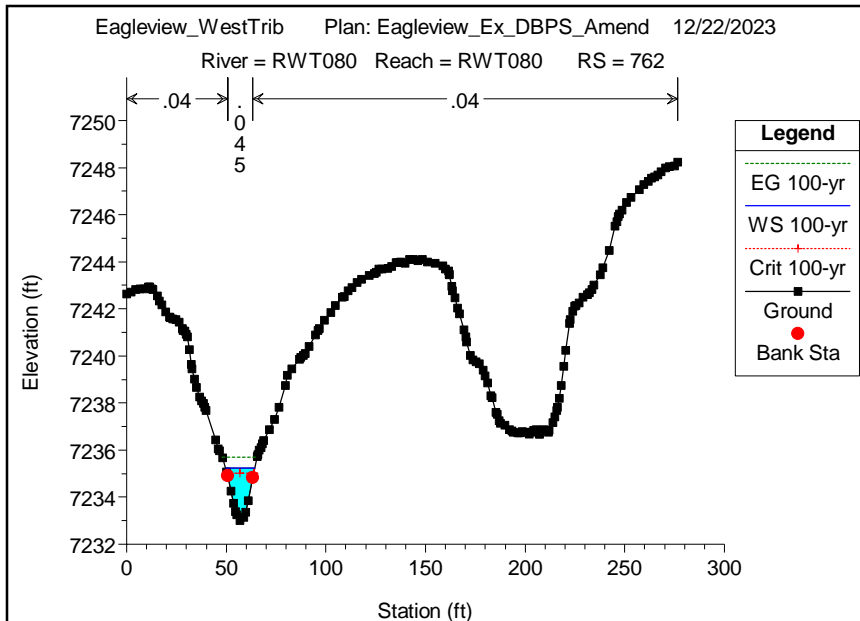
Cross section  
outside project area

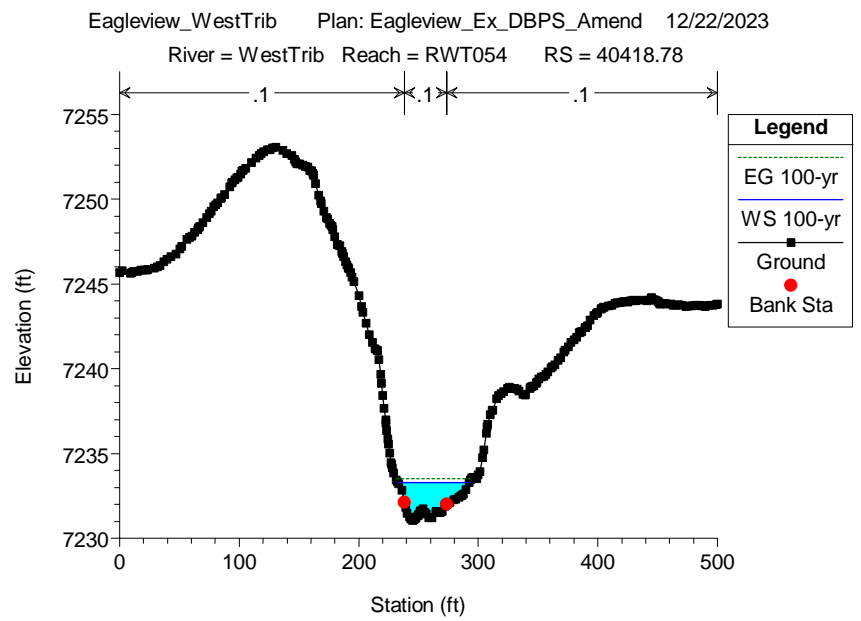
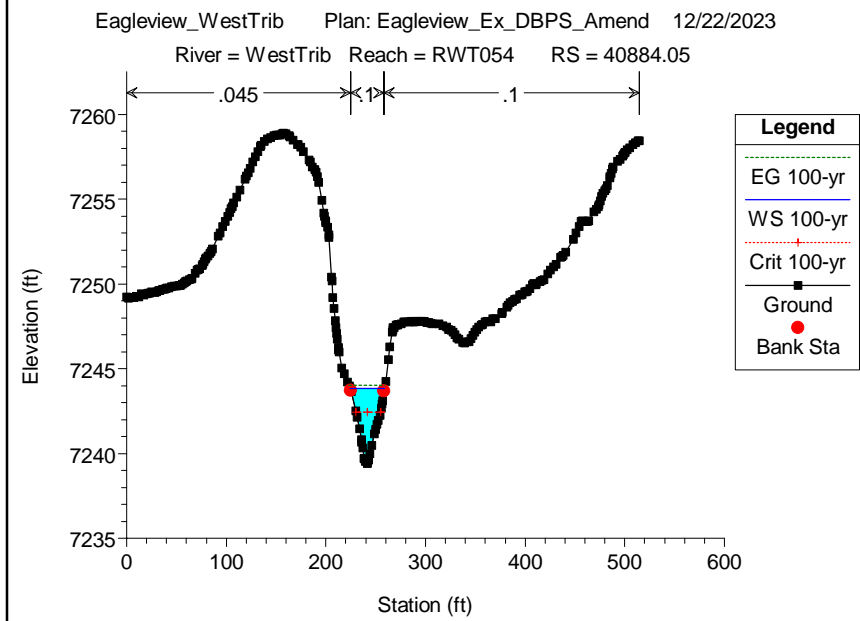
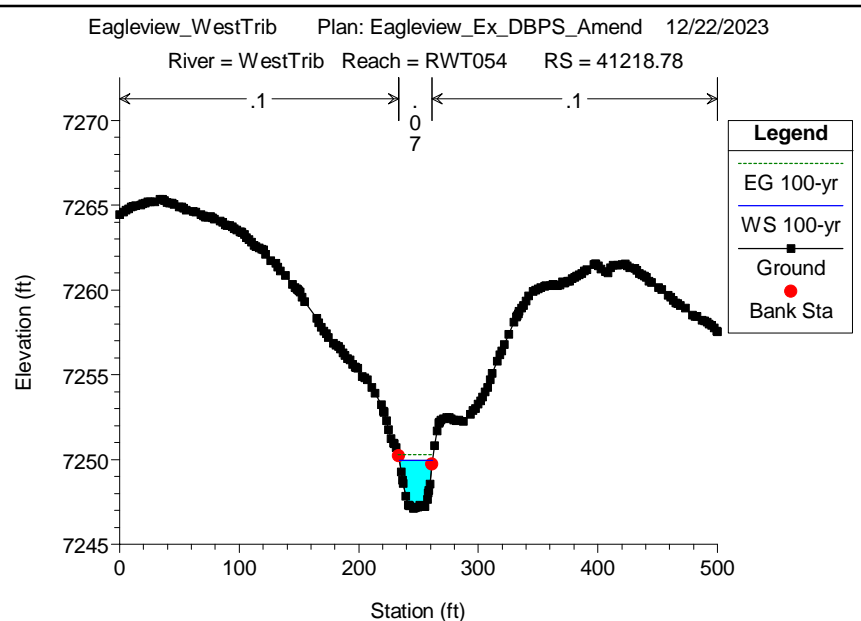
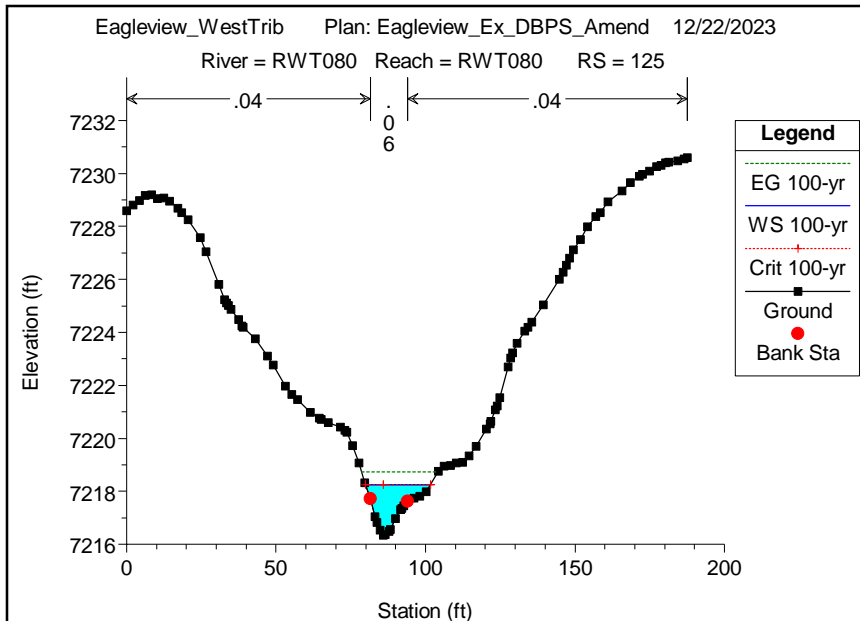
HEC-RAS Plan: Ex\_DBPS\_Amend Profile: 100-yr

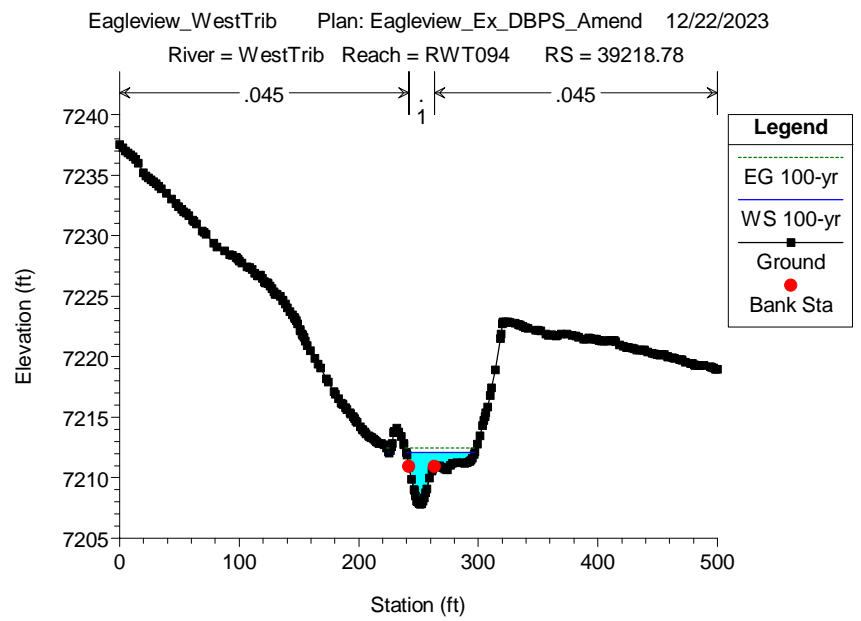
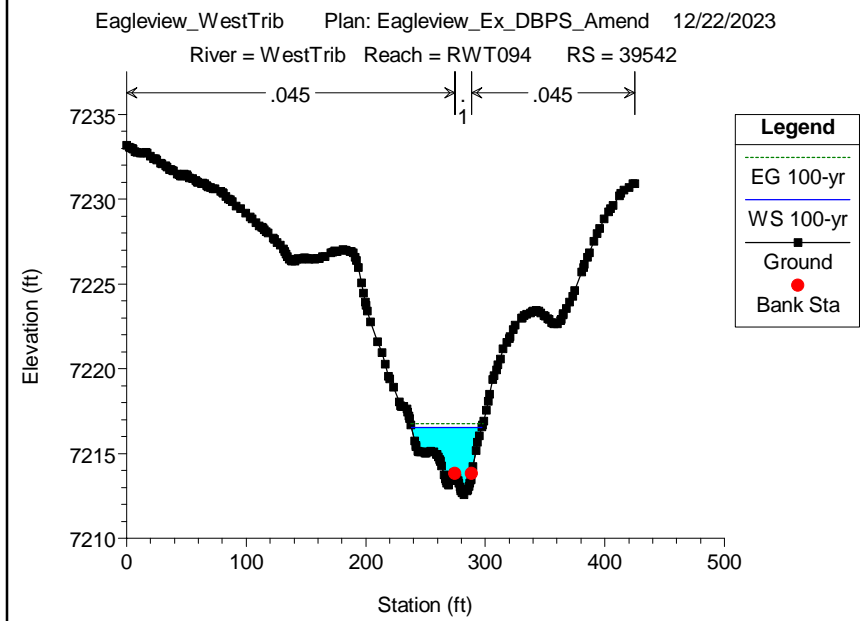
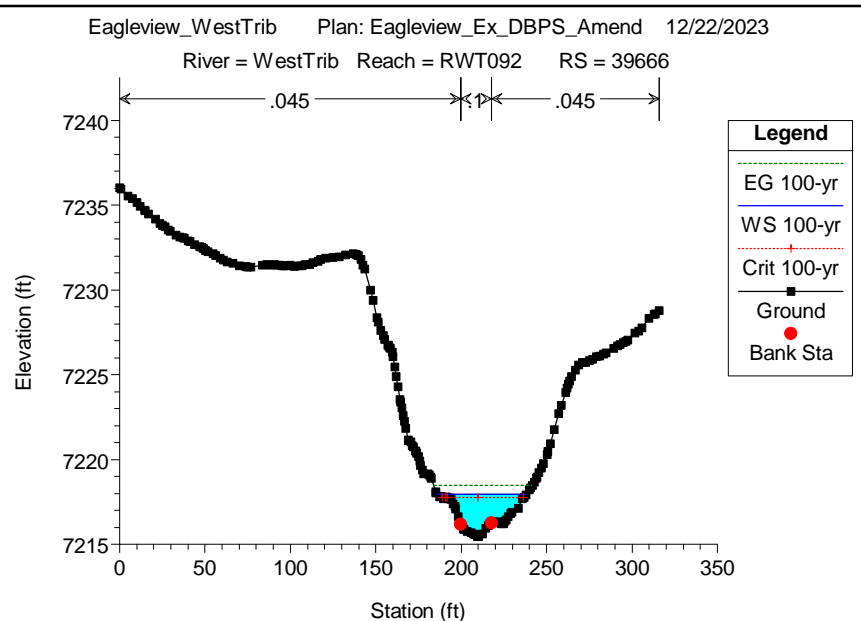
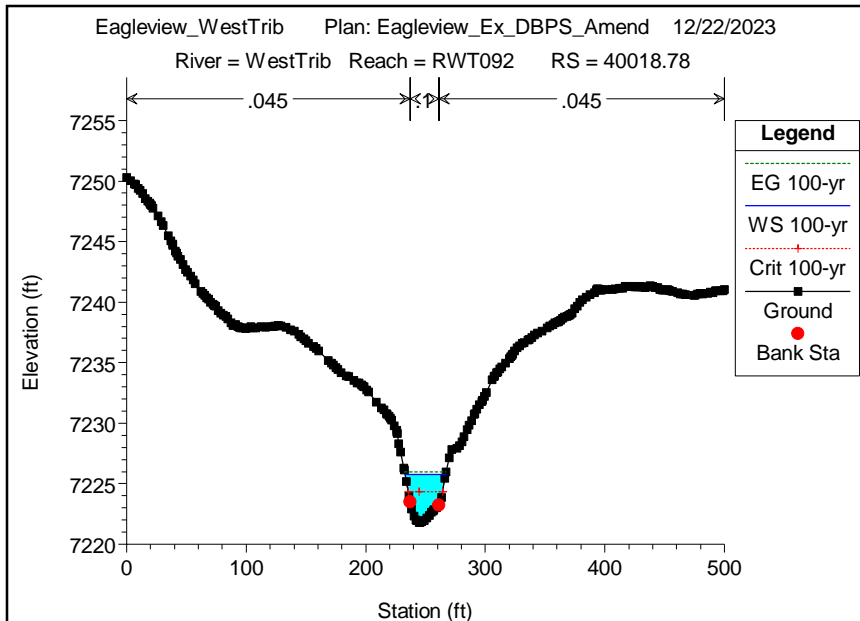
River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W. S. Elev (ft)	Crit W. S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl	Shear Total (lb/sq ft)
WestTrib	RWT054	41218.78	100-yr	285.00	7247.13	7249.95		7250.31	0.018854	4.76	59.87	28.01	0.57	2.42
WestTrib	RWT054	40884.05	100-yr	285.00	7239.41	7243.85	7242.45	7244.04	0.018267	3.53	80.86	34.51	0.40	2.58
WestTrib	RWT054	40418.78	100-yr	285.00	7231.04	7233.30		7233.50	0.028680	3.77	83.64	59.72	0.49	2.49
WestTrib	RWT092	40018.78	100-yr	375.00	7221.79	7225.74	7224.36	7225.99	0.014303	3.94	93.70	33.92	0.38	2.36
WestTrib	RWT092	39666	100-yr	375.00	7215.46	7217.95	7217.76	7218.46	0.035530	4.70	69.87	52.16	0.56	2.94
WestTrib	RWT094	39542	100-yr	478.00	7212.56	7216.52		7216.77	0.008165	3.03	125.66	58.70	0.29	1.07
WestTrib	RWT094	39218.78	100-yr	478.00	7207.80	7212.07		7212.47	0.027829	4.90	95.16	57.21	0.51	2.82
WestTrib	RWT094	38818.78	100-yr	478.00	7201.28	7205.27		7205.69	0.011630	5.31	93.31	40.73	0.55	1.60
WestTrib	RWT094	38418.78	100-yr	478.00	7196.01	7199.55	7199.49	7200.10	0.016669	6.25	86.43	71.63	0.75	1.24
WestTrib	RWT094	38018.78	100-yr	502.00	7190.82	7193.92	7193.89	7194.49	0.012139	7.22	97.33	73.20	0.82	1.00
WestTrib	RWT094	37618.78	100-yr	502.00	7186.41	7188.73	7188.73	7189.24	0.014100	7.17	103.73	96.78	0.87	0.94
WestTrib	RWT094	37218.78	100-yr	502.00	7181.04	7183.38	7183.38	7183.92	0.009919	6.32	97.73	108.66	0.82	0.55
RWT080	RWT080	1475	100-yr	107.00	7257.10	7258.03	7258.03	7258.33	0.026387	4.53	25.34	42.71	0.91	0.98
RWT080	RWT080	1299	100-yr	107.00	7252.03	7253.19	7253.19	7253.50	0.029085	4.77	24.27	39.39	0.95	1.12
RWT080	RWT080	1114	100-yr	107.00	7246.23	7247.32	7247.26	7247.62	0.021513	4.67	24.82	33.00	0.85	1.01
RWT080	RWT080	952	100-yr	107.00	7242.11	7243.43	7243.43	7243.88	0.024629	5.56	20.70	24.06	0.93	1.31
RWT080	RWT080	762	100-yr	107.00	7233.00	7235.23	7235.02	7235.71	0.017553	5.57	19.47	14.63	0.80	1.38
RWT080	RWT080	615	100-yr	107.00	7231.06	7232.01	7232.01	7232.40	0.029365	5.04	21.79	28.83	0.97	1.38
RWT080	RWT080	459	100-yr	107.00	7224.03	7225.49	7225.49	7225.93	0.025019	5.34	20.86	26.59	0.92	1.21
RWT080	RWT080	294	100-yr	107.00	7219.80	7221.48		7221.76	0.010406	4.31	25.99	21.05	0.63	0.78
RWT080	RWT080	125	100-yr	107.00	7216.33	7218.26	7218.26	7218.72	0.037599	5.67	20.02	21.68	0.87	2.12

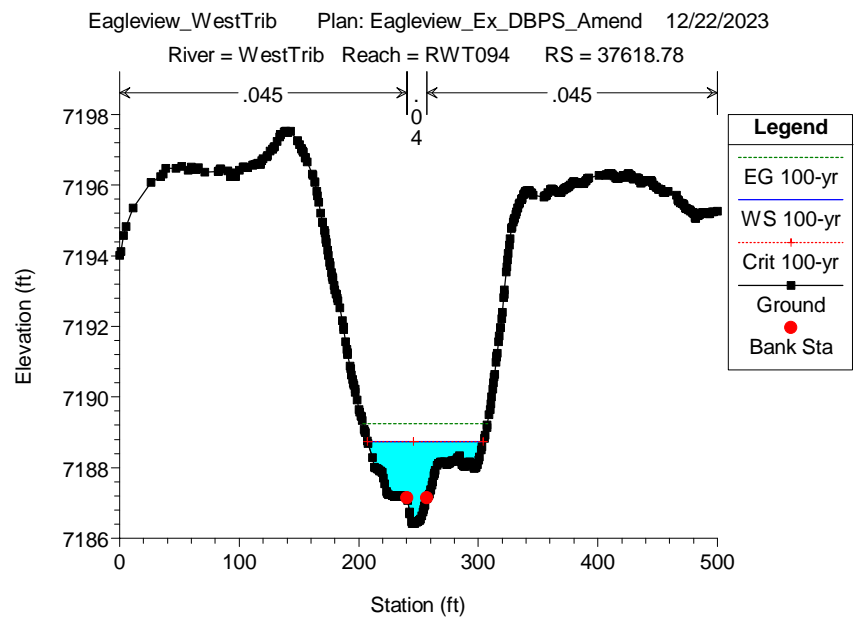
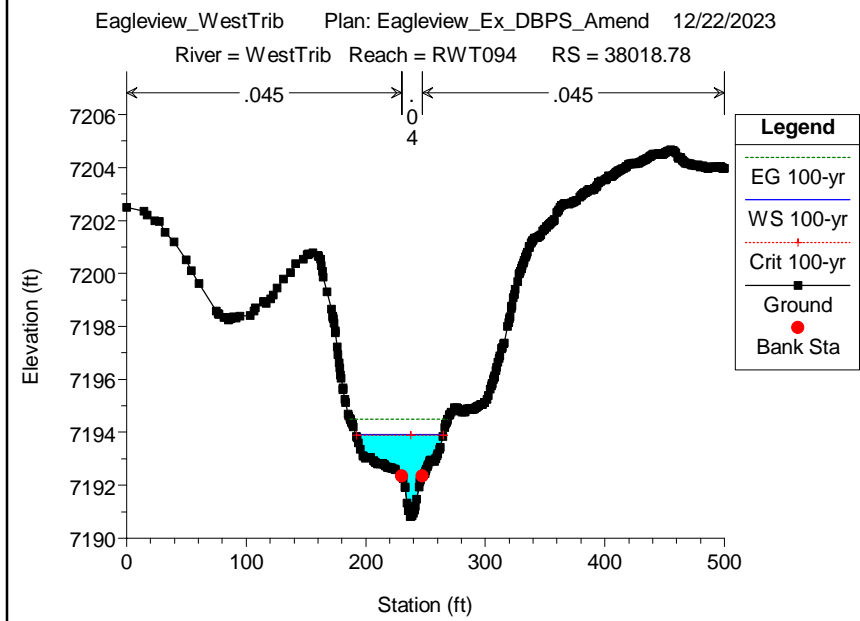
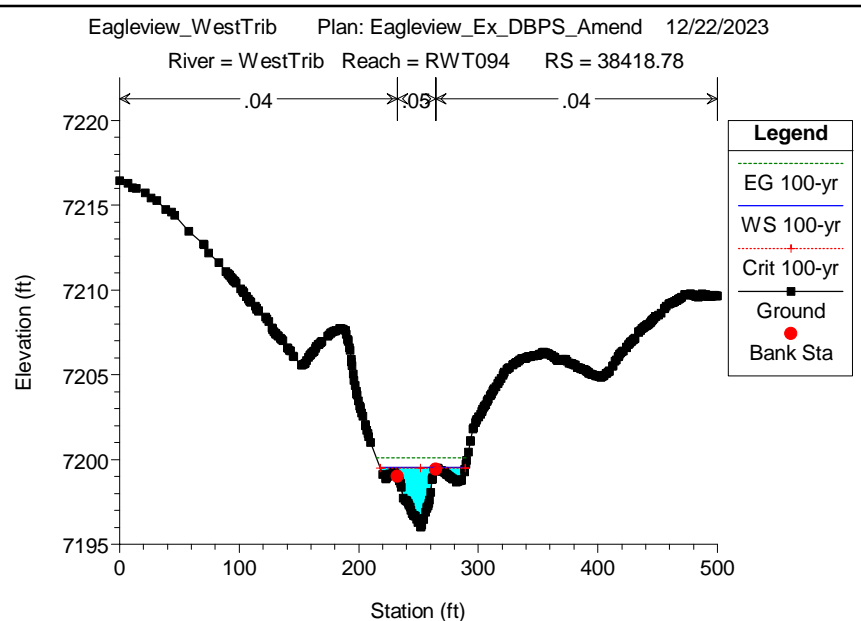
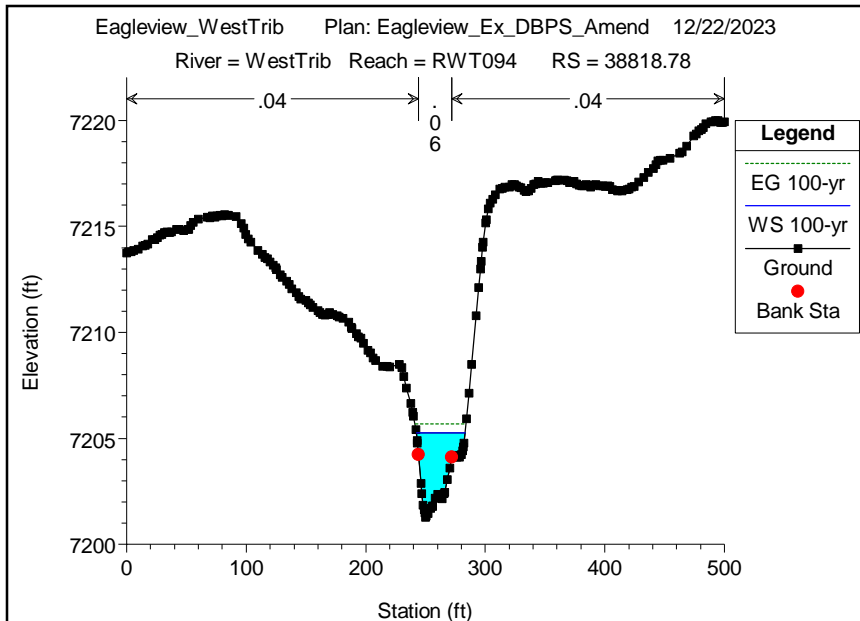
Cross section  
outside project area





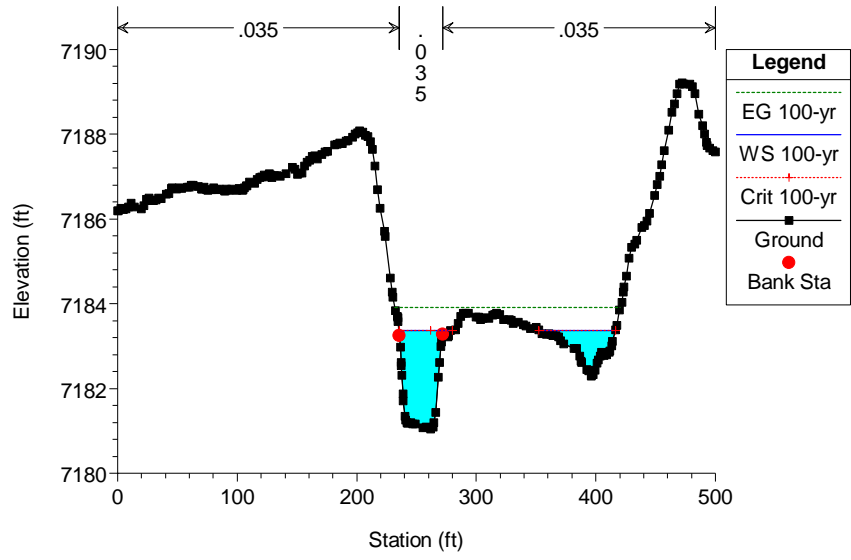




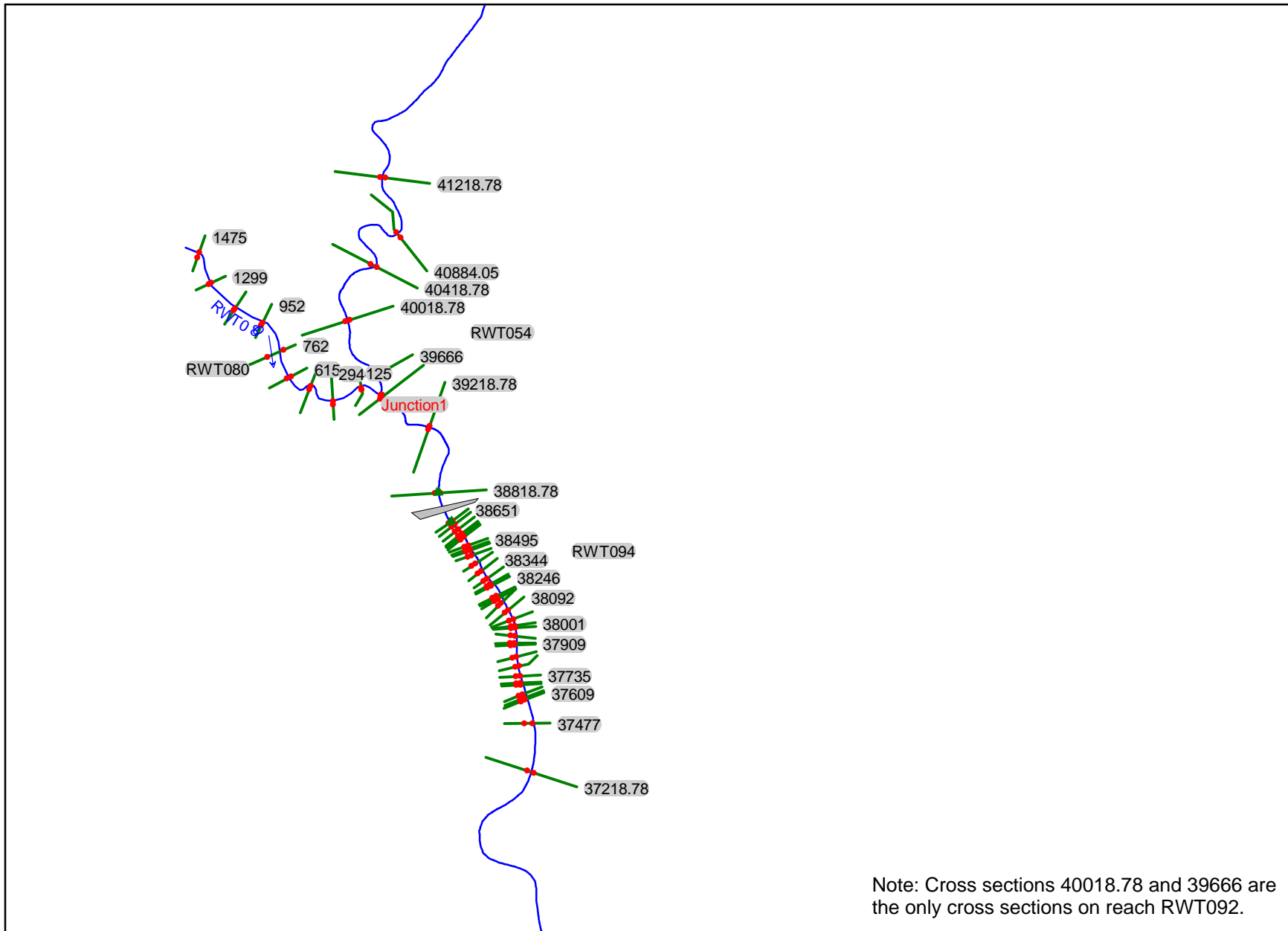


Eagleview\_WestTrib Plan: Eagleview\_Ex\_DBPS\_Amend 12/22/2023

River = WestTrib Reach = RWT094 RS = 37218.78

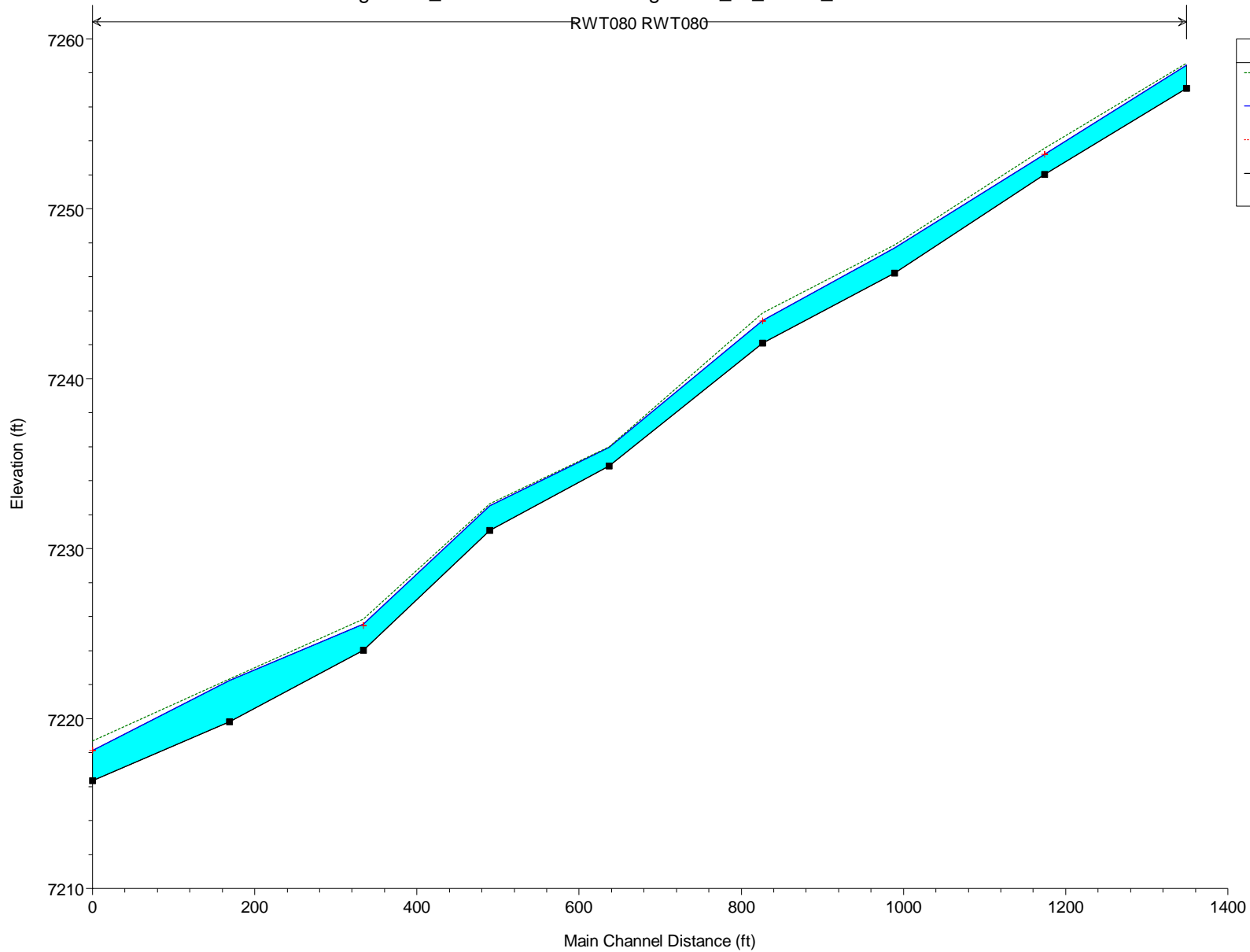


PROPOSED CONDITIONS HEC-RAS RESULTS





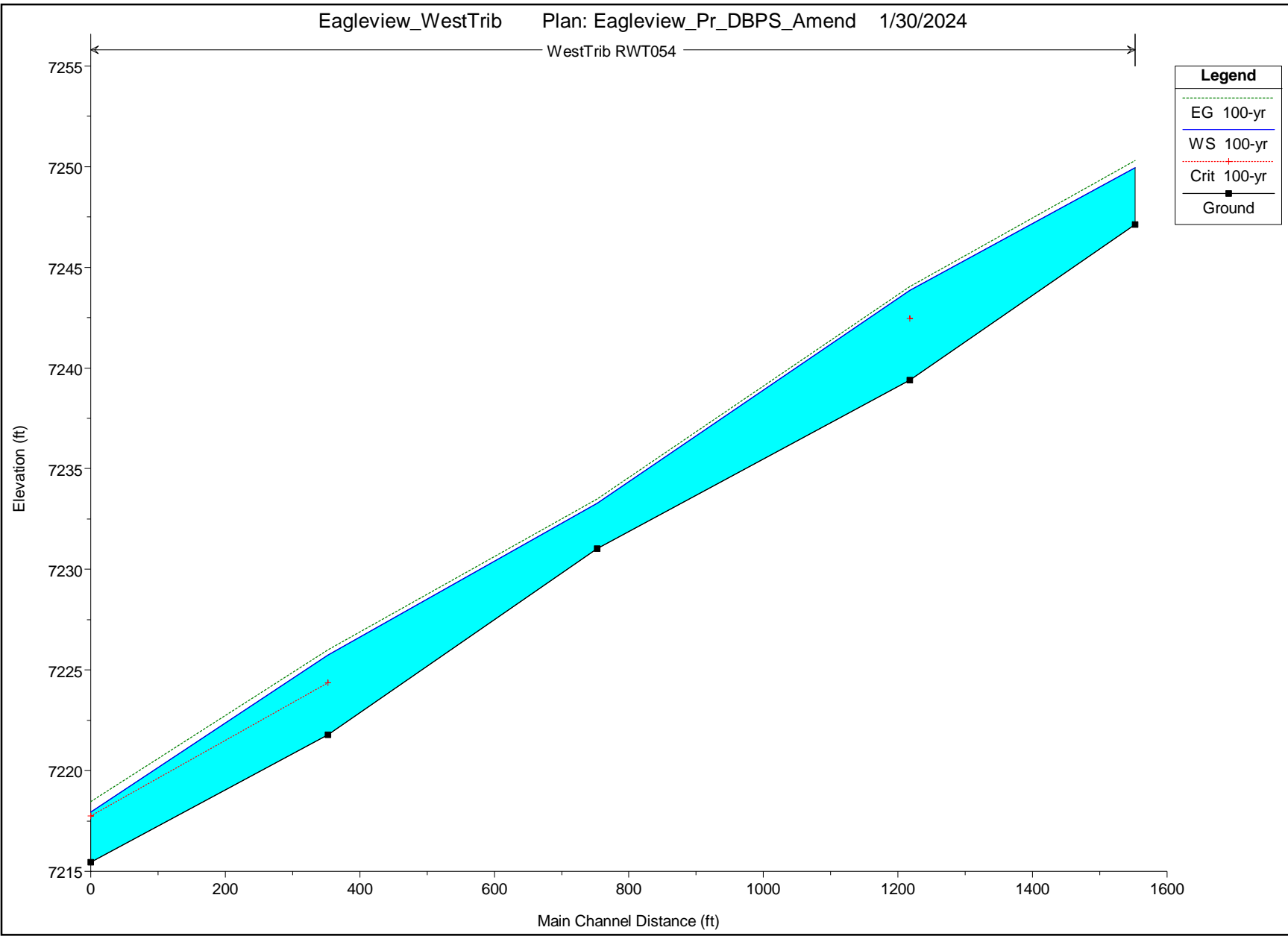
RWT080 RWT080



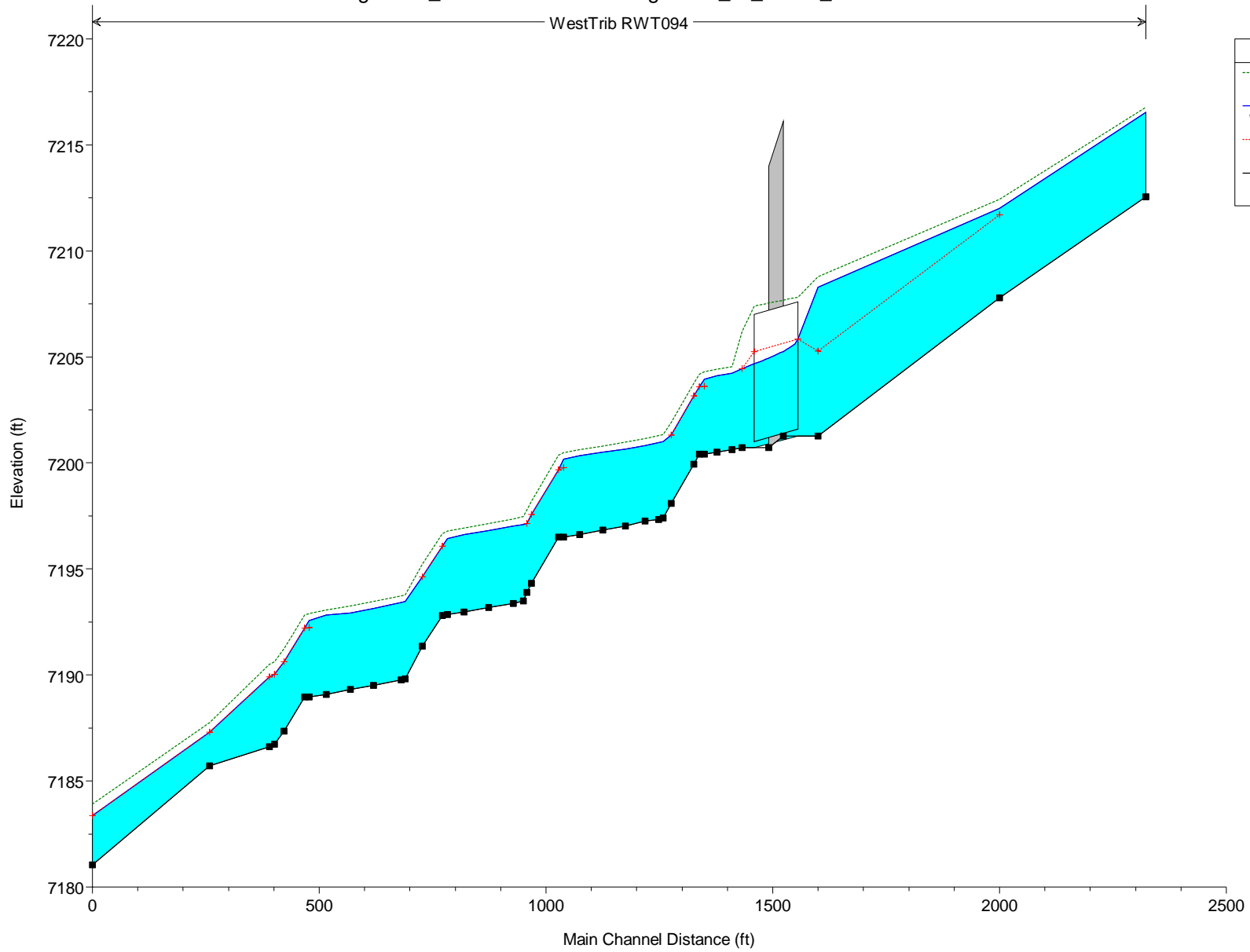
Legend	
EG 100-yr	(dashed green line)
WS 100-yr	(solid blue line)
Crit 100-yr	(dotted red line with '+' markers)
Ground	(solid black line with square markers)

WestTrib RWT054

Legend	
EG 100-yr	
WS 100-yr	
Crit 100-yr	
Ground	



WestTrib RWT094



Legend	
EG 100-yr	
WS 100-yr	
Crit 100-yr	
Ground	

Cross section  
outside project area

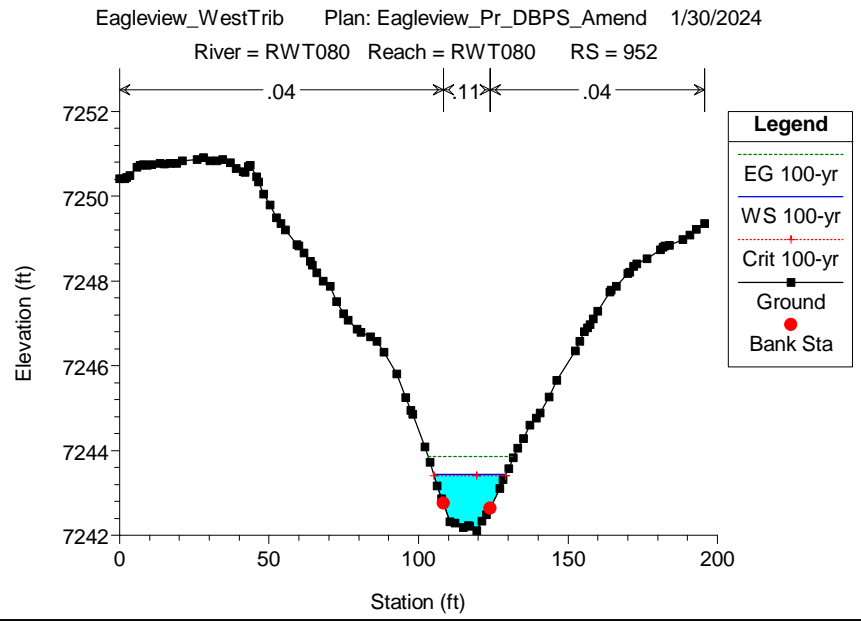
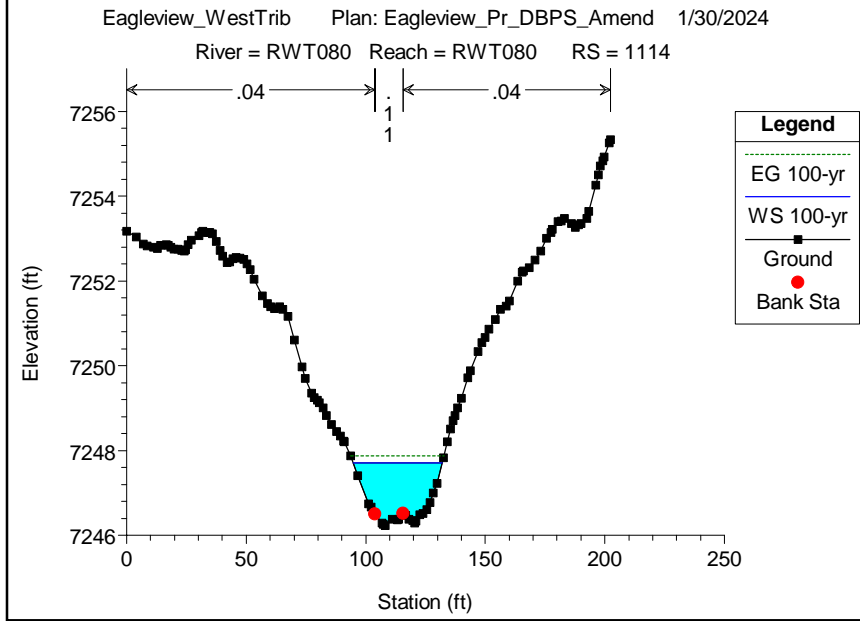
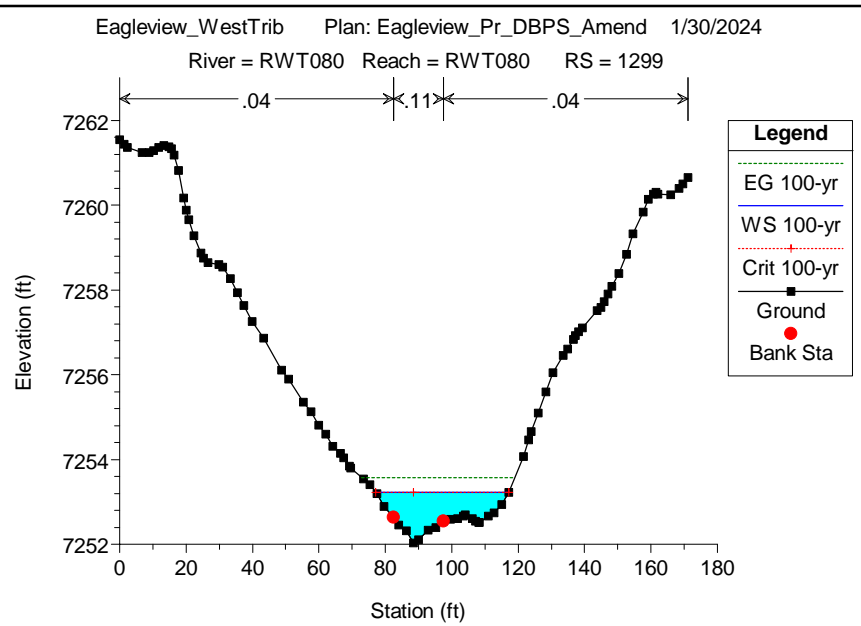
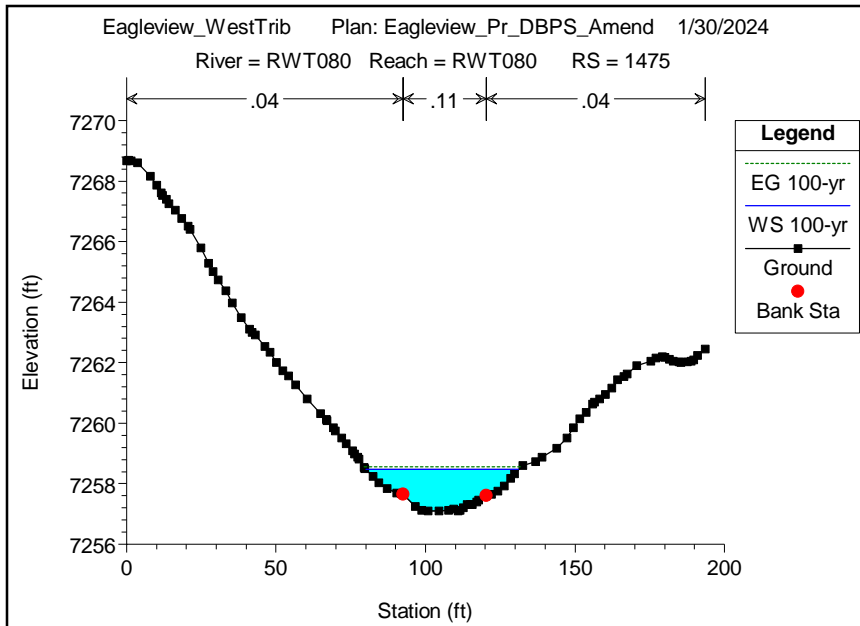
HEC-RAS Plan: Pr\_DBPS\_Amend Profile: 100-yr

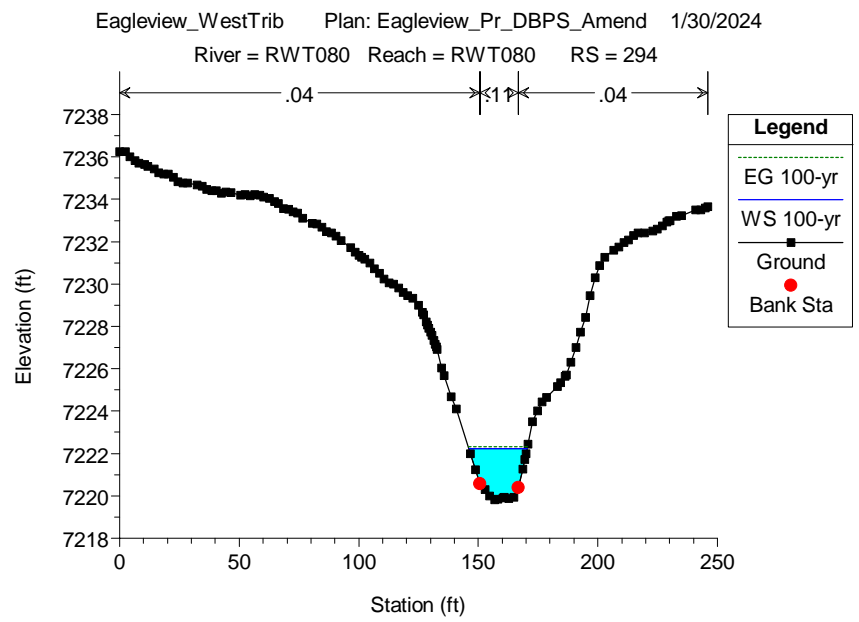
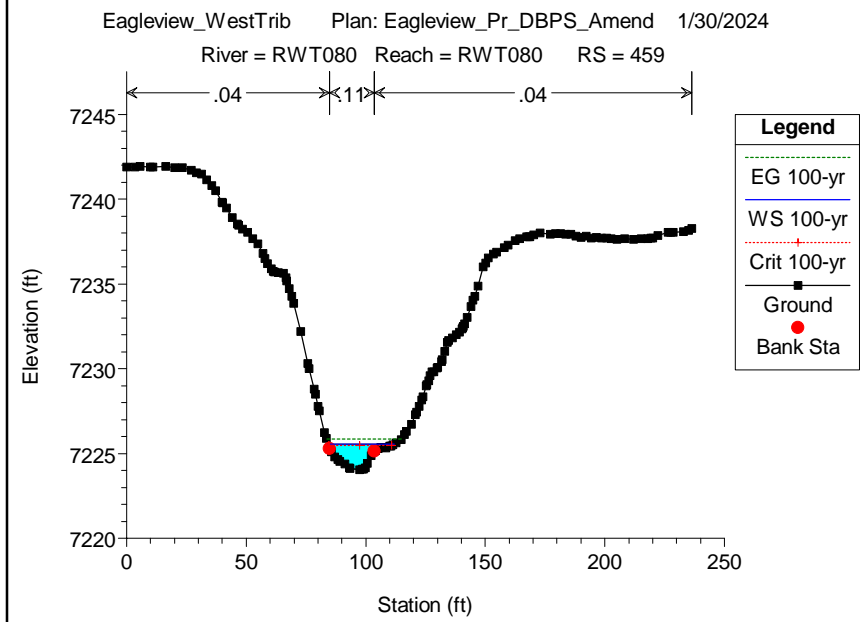
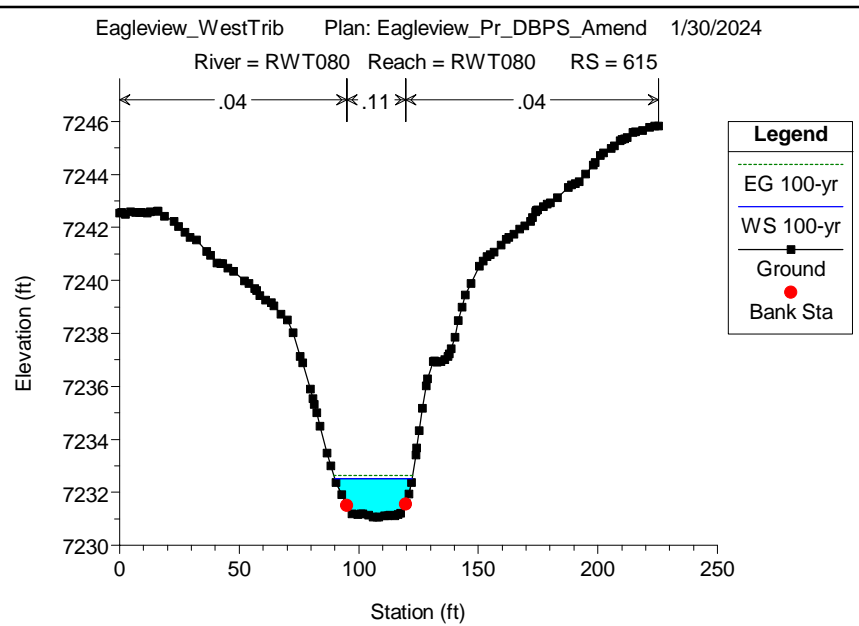
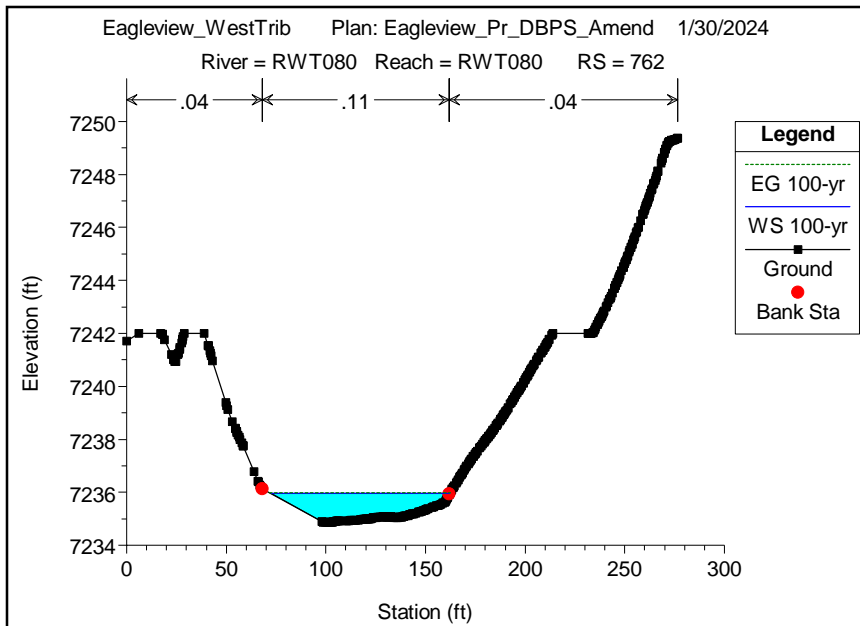
River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W. S. Elev (ft)	Crit W. S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl	Shear Total (lb/sq ft)
WestTrib	RWT054	41218.78	100-yr	285.00	7247.13	7249.95		7250.30	0.018985	4.77	59.73	27.99	0.57	2.43
WestTrib	RWT054	40884.05	100-yr	285.00	7239.41	7243.85	7242.45	7244.05	0.018095	3.52	81.09	34.57	0.40	2.56
WestTrib	RWT054	40418.78	100-yr	285.00	7231.04	7233.29		7233.49	0.029142	3.79	83.18	59.58	0.49	2.52
WestTrib	RWT092	40018.78	100-yr	375.00	7221.79	7225.75	7224.36	7226.00	0.014143	3.92	94.03	33.96	0.38	2.34
WestTrib	RWT092	39666	100-yr	375.00	7215.46	7217.94	7217.76	7218.46	0.036273	4.73	69.39	52.02	0.57	2.99
WestTrib	RWT094	39542	100-yr	478.00	7212.56	7216.54		7216.78	0.007978	3.00	126.58	58.82	0.28	1.05
WestTrib	RWT094	39218.78	100-yr	478.00	7207.80	7212.02	7211.70	7212.44	0.029777	5.13	92.09	56.58	0.52	2.95
WestTrib	RWT094	38818.78	100-yr	480.00	7201.28	7208.28	7205.27	7208.78	0.004427	5.69	84.40	57.62	0.39	1.77
WestTrib	RWT094	38726		Culvert										
WestTrib	RWT094	38651	100-yr	480.00	7200.72	7204.46	7204.46	7206.19	0.012010	10.58	45.36	82.88	1.00	2.57
WestTrib	RWT094	38628	100-yr	480.00	7200.62	7204.23		7204.54	0.003752	5.14	125.43	89.65	0.54	0.33
WestTrib	RWT094	38596	100-yr	480.00	7200.50	7204.11		7204.42	0.003748	5.19	126.68	93.03	0.54	0.32
WestTrib	RWT094	38567	100-yr	480.00	7200.41	7203.95	7203.61	7204.29	0.005231	5.35	121.13	89.62	0.56	0.44
WestTrib	RWT094	38557	100-yr	480.00	7200.41	7203.59	7203.59	7204.20	0.010483	6.87	90.84	78.96	0.78	0.75
WestTrib	RWT094	38545	100-yr	480.00	7199.94	7203.17	7203.17	7203.75	0.009839	6.76	92.87	78.99	0.76	0.72
WestTrib	RWT094	38495	100-yr	480.00	7198.10	7201.31	7201.31	7201.91	0.010311	6.92	89.32	71.16	0.77	0.80
WestTrib	RWT094	38477	100-yr	480.00	7197.41	7201.01		7201.33	0.004722	5.19	119.77	74.49	0.54	0.47
WestTrib	RWT094	38467	100-yr	480.00	7197.34	7200.96		7201.28	0.004782	5.20	119.36	74.88	0.54	0.47
WestTrib	RWT094	38437	100-yr	480.00	7197.25	7200.82		7201.16	0.004035	5.33	116.60	75.41	0.56	0.39
WestTrib	RWT094	38394	100-yr	480.00	7197.03	7200.66		7200.98	0.003736	5.21	120.89	78.68	0.54	0.36
WestTrib	RWT094	38344	100-yr	480.00	7196.84	7200.51		7200.79	0.003332	4.95	127.51	81.24	0.51	0.32
WestTrib	RWT094	38293	100-yr	480.00	7196.62	7200.34		7200.63	0.003218	4.92	129.53	83.97	0.50	0.31
WestTrib	RWT094	38257	100-yr	502.00	7196.50	7200.18	7199.77	7200.49	0.004615	5.18	131.76	92.22	0.53	0.41
WestTrib	RWT094	38246	100-yr	502.00	7196.50	7199.68	7199.68	7200.37	0.011966	7.39	89.74	81.66	0.83	0.81
WestTrib	RWT094	38186	100-yr	502.00	7194.32	7197.58	7197.58	7198.18	0.010192	6.95	95.31	80.68	0.77	0.75
WestTrib	RWT094	38176	100-yr	502.00	7193.90	7197.15	7197.15	7197.78	0.010546	7.00	93.46	78.16	0.78	0.78
WestTrib	RWT094	38169	100-yr	502.00	7193.50	7197.11		7197.47	0.005551	5.54	120.58	86.18	0.58	0.48
WestTrib	RWT094	38146	100-yr	502.00	7193.38	7197.02		7197.35	0.003922	5.35	126.30	88.52	0.55	0.35
WestTrib	RWT094	38092	100-yr	502.00	7193.18	7196.82		7197.14	0.003729	5.23	128.16	85.21	0.54	0.35
WestTrib	RWT094	38038	100-yr	502.00	7192.97	7196.63		7196.94	0.003694	5.21	130.14	89.33	0.54	0.33
WestTrib	RWT094	38001	100-yr	502.00	7192.84	7196.43		7196.78	0.005331	5.49	125.19	92.62	0.57	0.45
WestTrib	RWT094	37990	100-yr	502.00	7192.81	7196.06	7196.06	7196.67	0.010335	6.93	95.15	81.54	0.77	0.75
WestTrib	RWT094	37946	100-yr	502.00	7191.35	7194.63	7194.63	7195.22	0.009868	6.88	97.36	84.27	0.76	0.71
WestTrib	RWT094	37909	100-yr	502.00	7189.81	7193.46		7193.77	0.004712	5.17	131.16	91.54	0.54	0.42
WestTrib	RWT094	37900	100-yr	502.00	7189.78	7193.42		7193.73	0.004722	5.20	130.51	90.17	0.54	0.42
WestTrib	RWT094	37838	100-yr	502.00	7189.50	7193.14		7193.46	0.003848	5.30	130.81	96.05	0.55	0.32
WestTrib	RWT094	37787	100-yr	502.00	7189.31	7192.93		7193.27	0.003980	5.37	130.55	100.92	0.56	0.32
WestTrib	RWT094	37735	100-yr	502.00	7189.09	7192.83		7193.06	0.002753	4.58	153.86	106.97	0.46	0.25
WestTrib	RWT094	37696	100-yr	502.00	7188.97	7192.57	7192.23	7192.91	0.005231	5.43	127.19	95.14	0.56	0.43
WestTrib	RWT094	37687	100-yr	502.00	7188.97	7192.22	7192.22	7192.82	0.010177	6.88	96.67	85.74	0.77	0.71
WestTrib	RWT094	37641	100-yr	502.00	7187.36	7190.62	7190.62	7191.24	0.010587	7.00	94.92	84.61	0.78	0.74
WestTrib	RWT094	37620	100-yr	502.00	7186.74	7190.03	7190.02	7190.62	0.009805	6.88	98.21	87.54	0.76	0.68
WestTrib	RWT094	37609	100-yr	502.00	7186.62	7189.90	7189.90	7190.50	0.010047	6.93	97.03	86.07	0.77	0.70
WestTrib	RWT094	37477	100-yr	502.00	7185.72	7187.30	7187.30	7187.75	0.012728	6.05	102.10	114.12	0.90	0.71
WestTrib	RWT094	37218.78	100-yr	502.00	7181.04	7183.38	7183.38	7183.92	0.009919	6.32	97.73	108.66	0.82	0.55
RWT080	RWT080	1475	100-yr	107.00	7257.10	7258.47		7258.56	0.017587	2.04	45.85	51.04	0.33	0.98

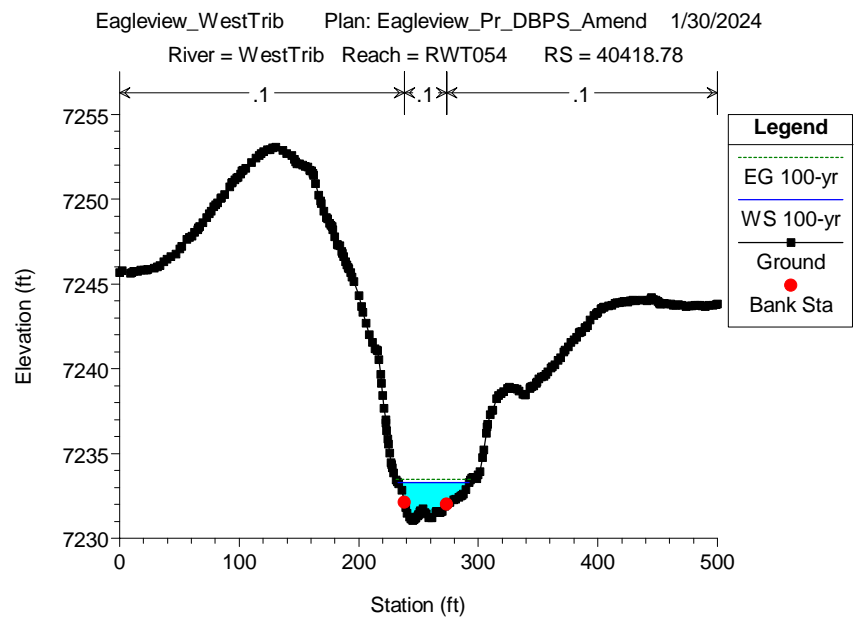
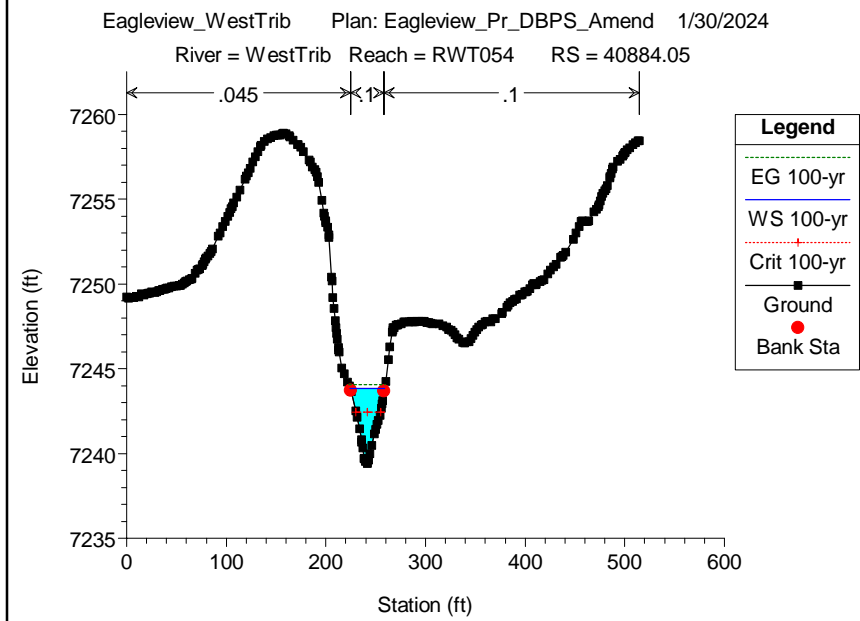
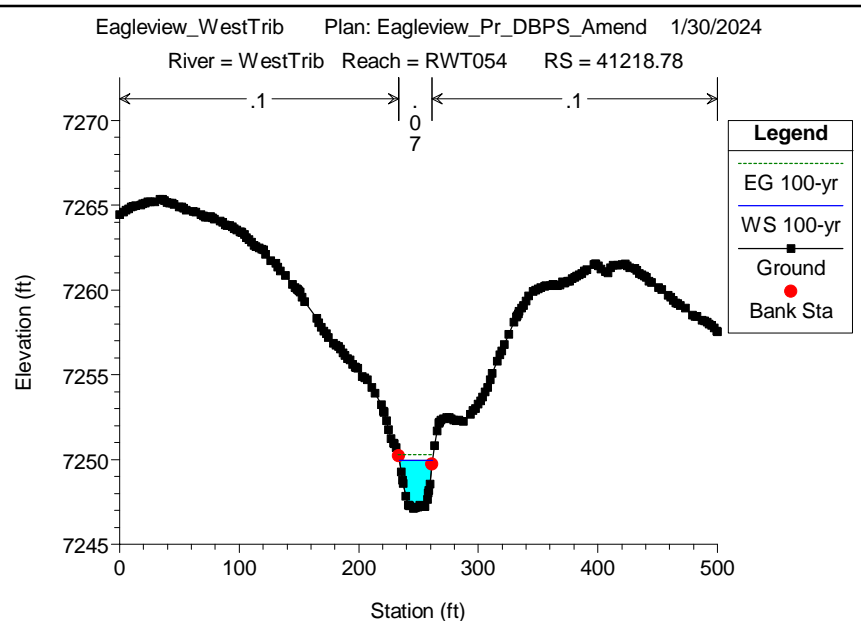
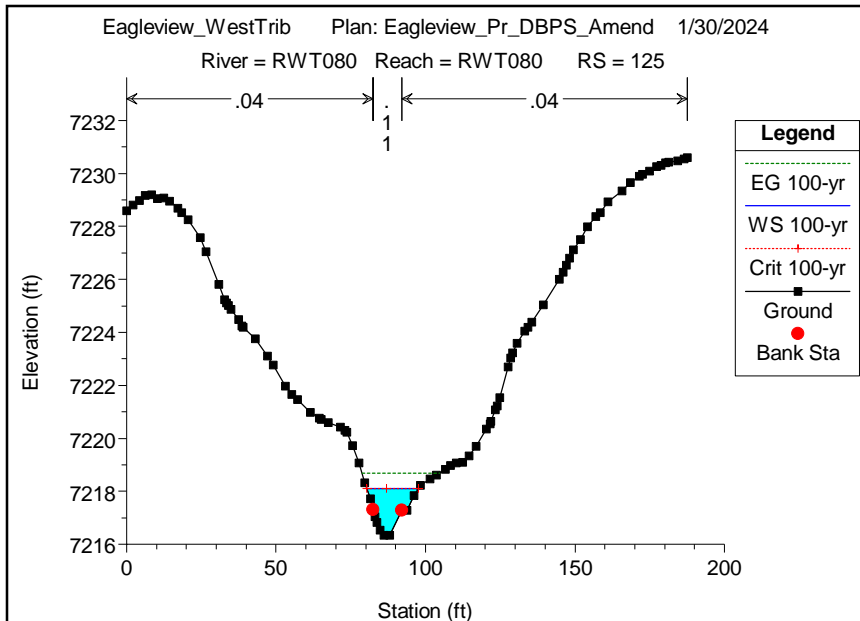
Cross sections  
outside project area

HEC-RAS Plan: Pr\_DBPS\_Amend Profile: 100-yr (Continued)

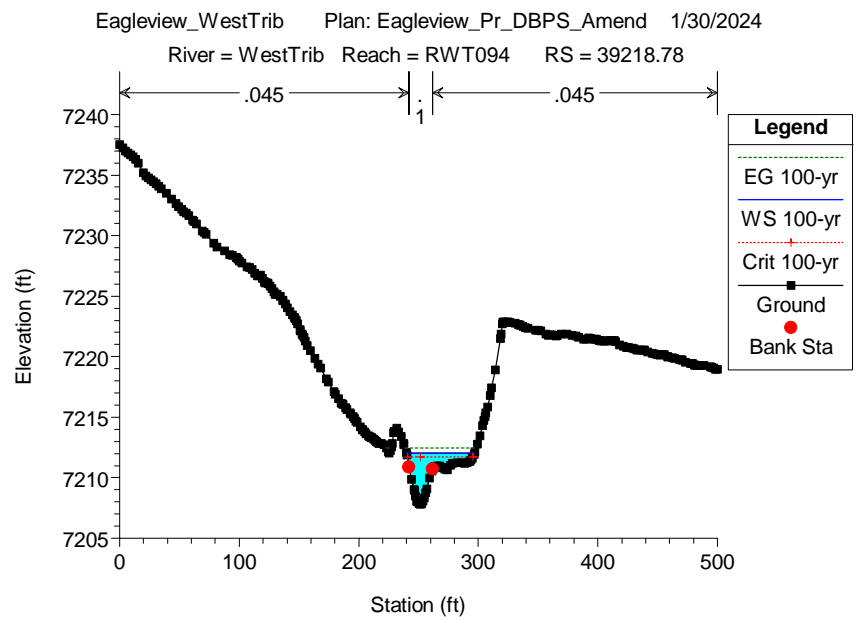
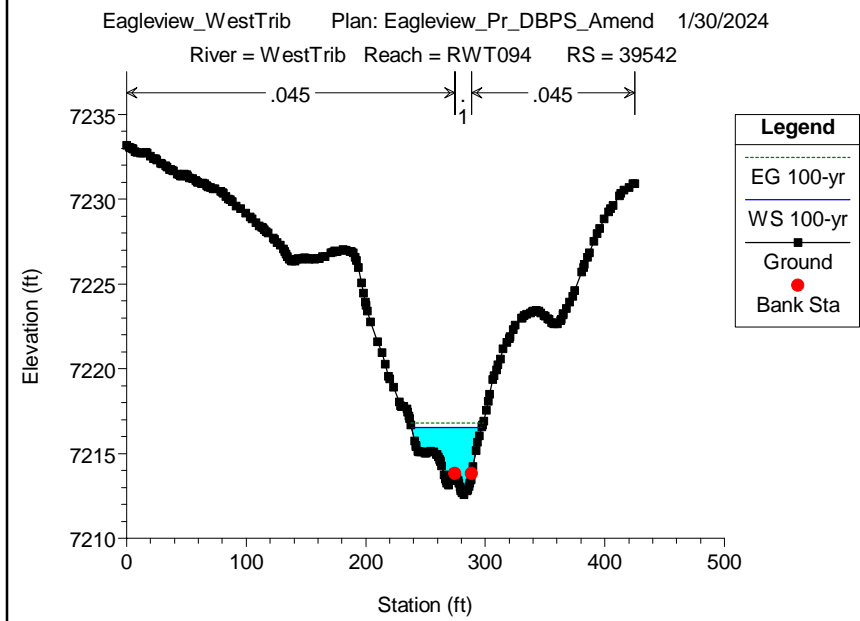
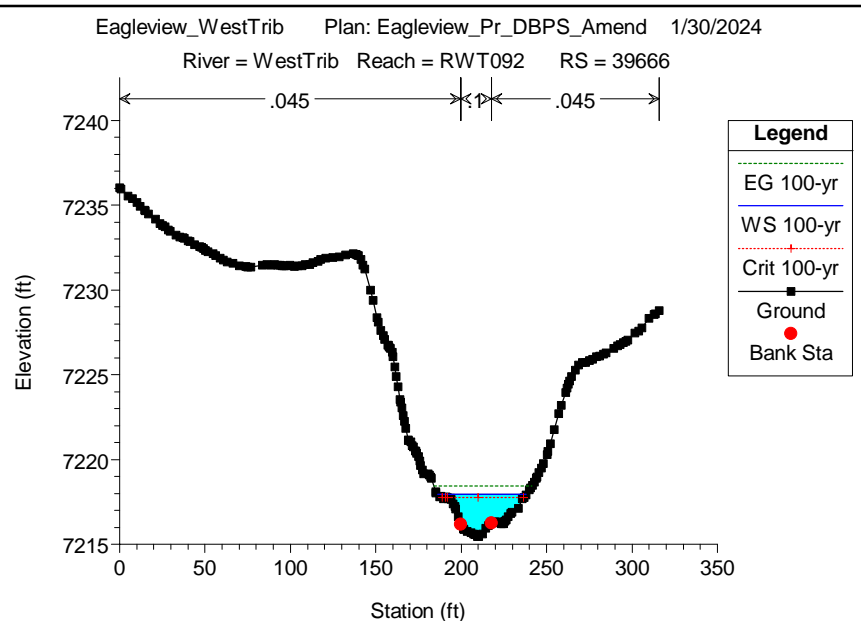
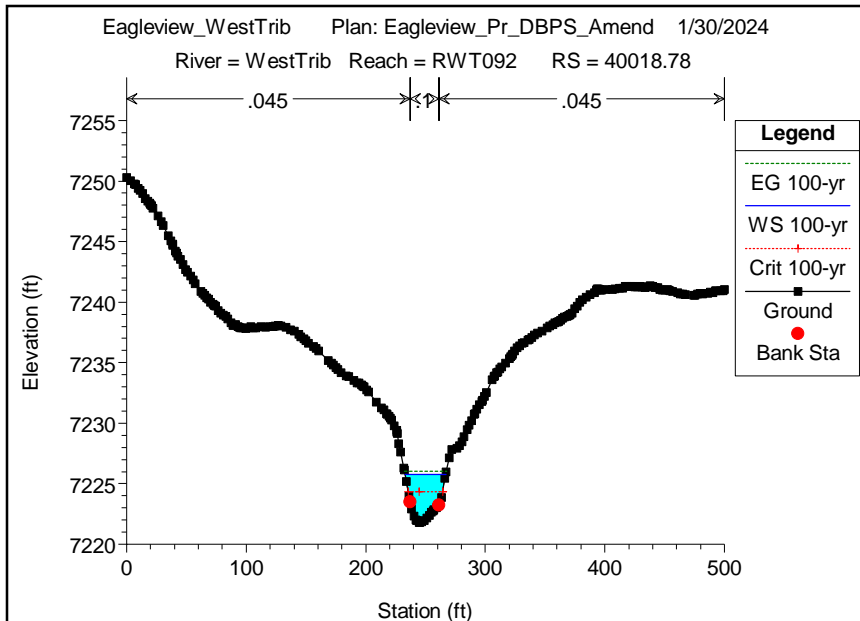
River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl	Shear Total (lb/sq ft)
RWT080	RWT080	1299	100-yr	107.00	7252.03	7253.22	7253.22	7253.58	0.054712	2.95	25.83	40.07	0.55	2.19
RWT080	RWT080	1114	100-yr	107.00	7246.23	7247.71		7247.87	0.010471	1.69	38.50	37.23	0.26	0.67
RWT080	RWT080	952	100-yr	107.00	7242.11	7243.44	7243.41	7243.86	0.109855	4.83	20.95	24.18	0.80	5.89
RWT080	RWT080	762	100-yr	107.00	7234.88	7235.95		7235.99	0.021254	1.61	66.34	89.57	0.33	0.98
RWT080	RWT080	615	100-yr	101.00	7231.06	7232.52		7232.64	0.024496	2.58	37.32	32.37	0.39	1.75
RWT080	RWT080	459	100-yr	101.00	7224.03	7225.56	7225.47	7225.87	0.096854	4.48	22.72	27.53	0.75	4.93
RWT080	RWT080	294	100-yr	101.00	7219.80	7222.24		7222.33	0.009024	2.17	43.13	24.39	0.26	0.96
RWT080	RWT080	125	100-yr	101.00	7216.33	7218.11	7218.11	7218.67	0.101209	5.36	17.41	17.26	0.79	6.20

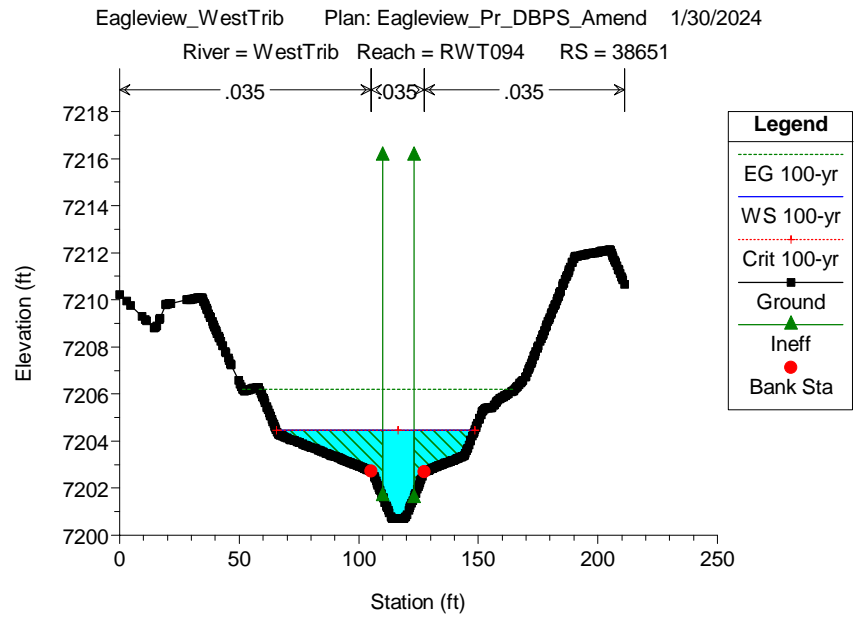
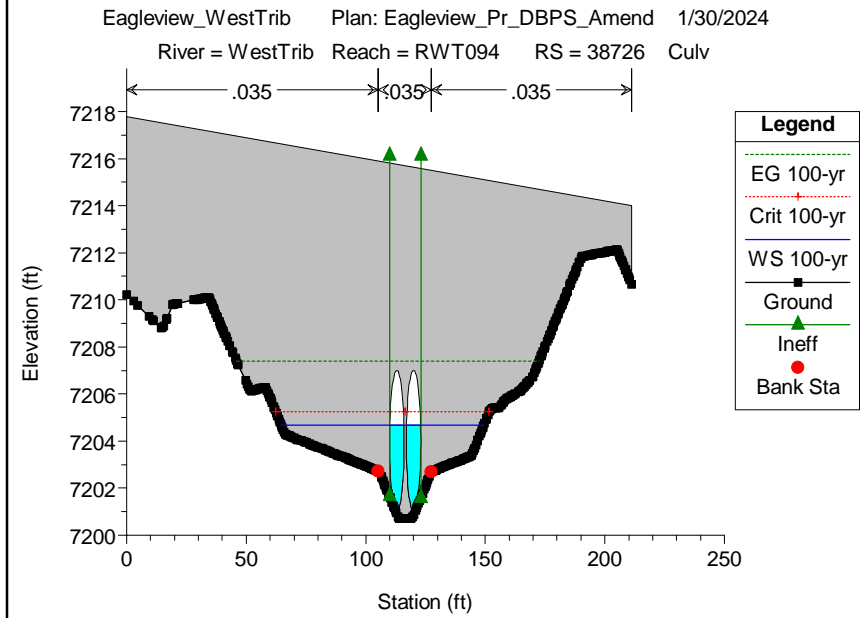
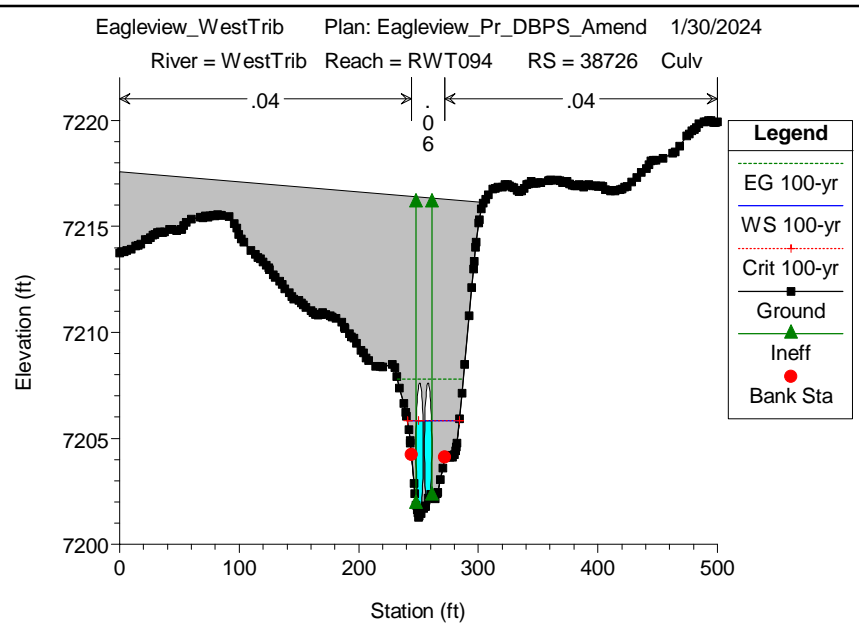
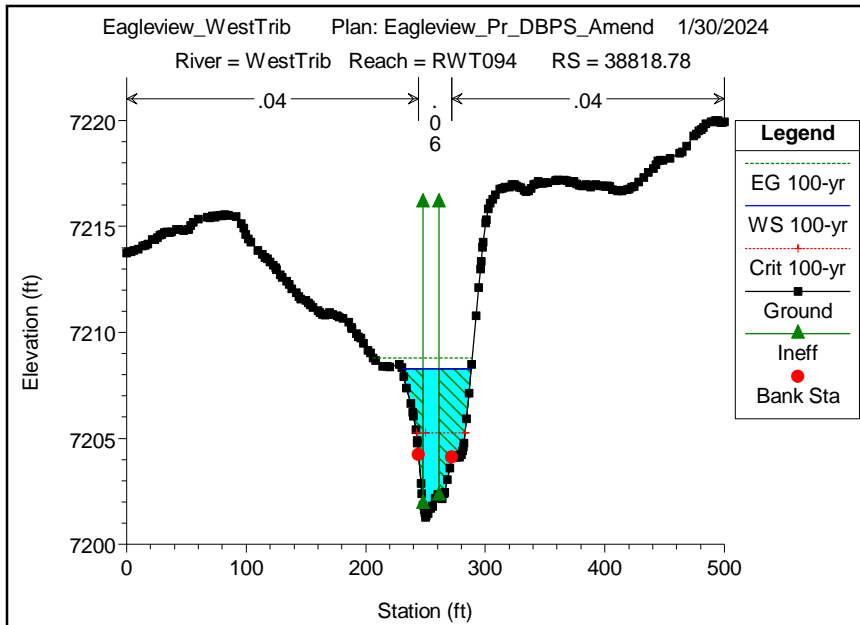


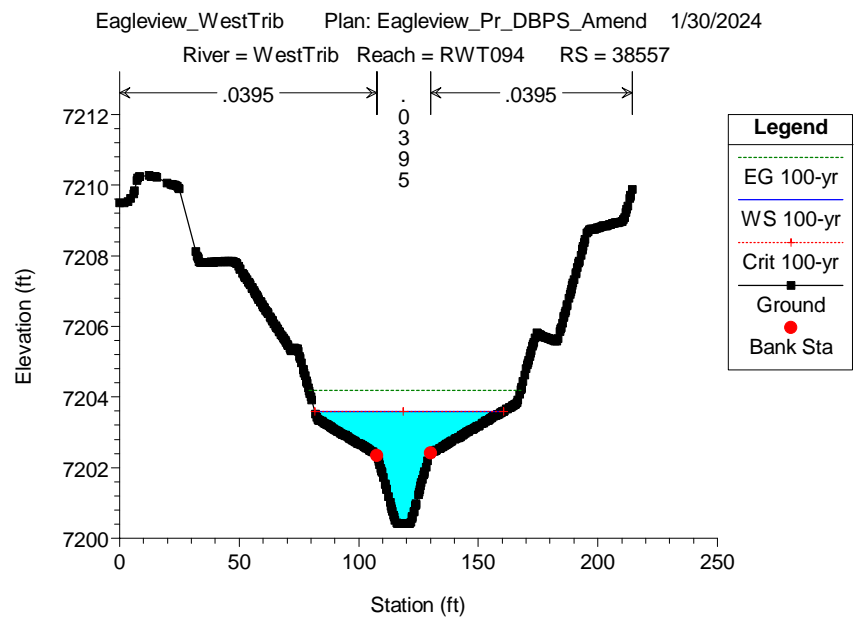
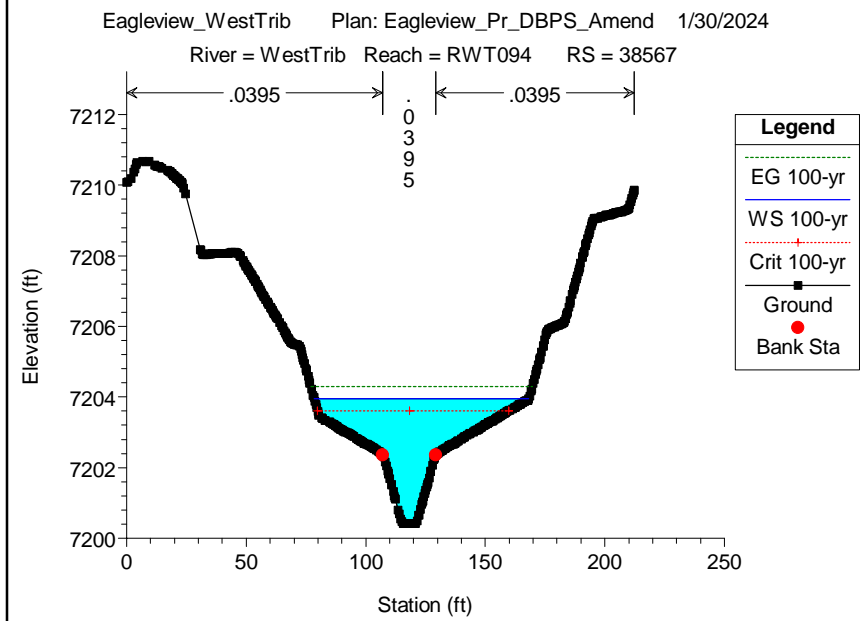
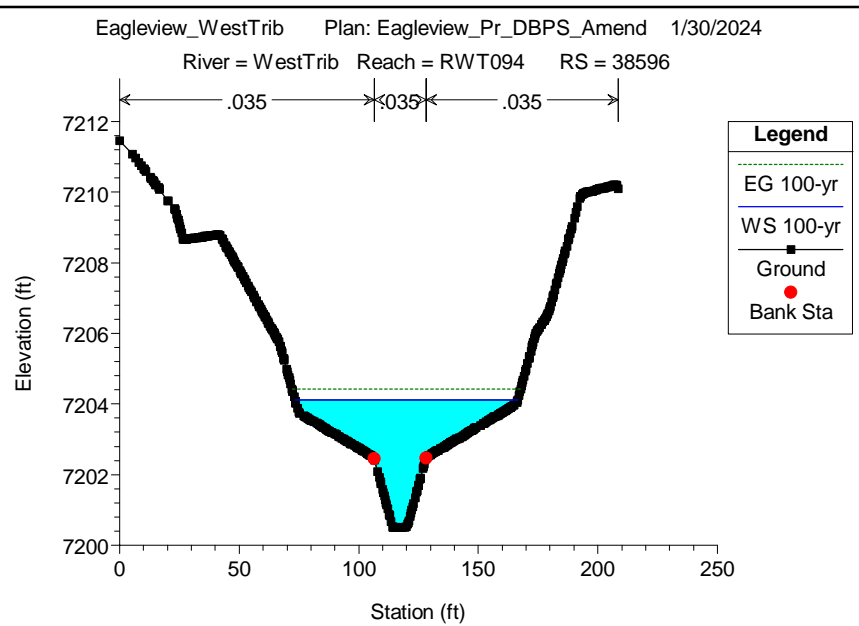
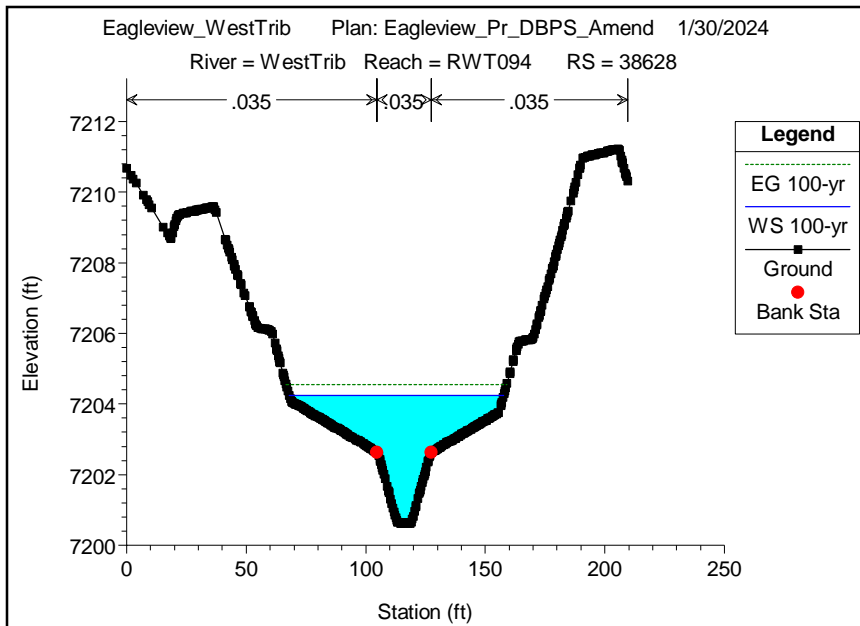


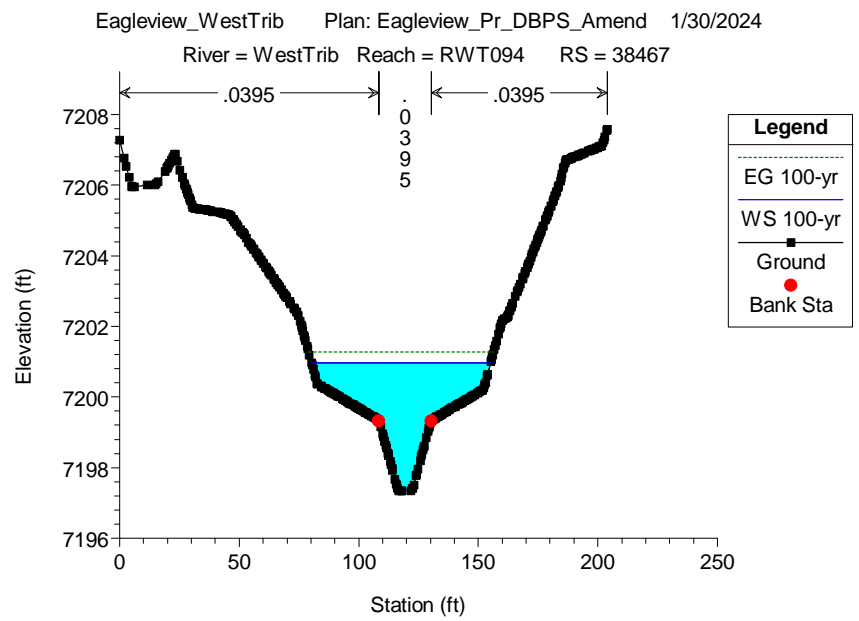
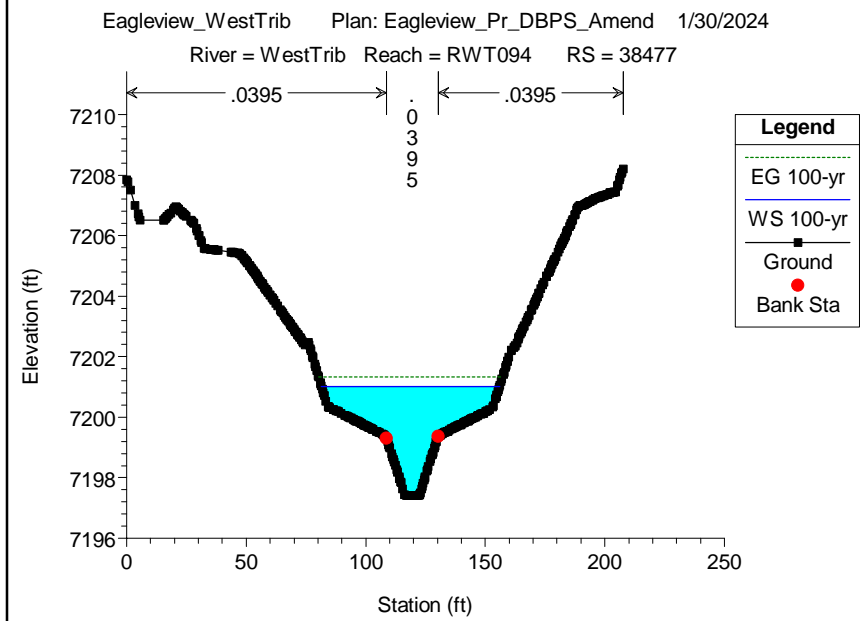
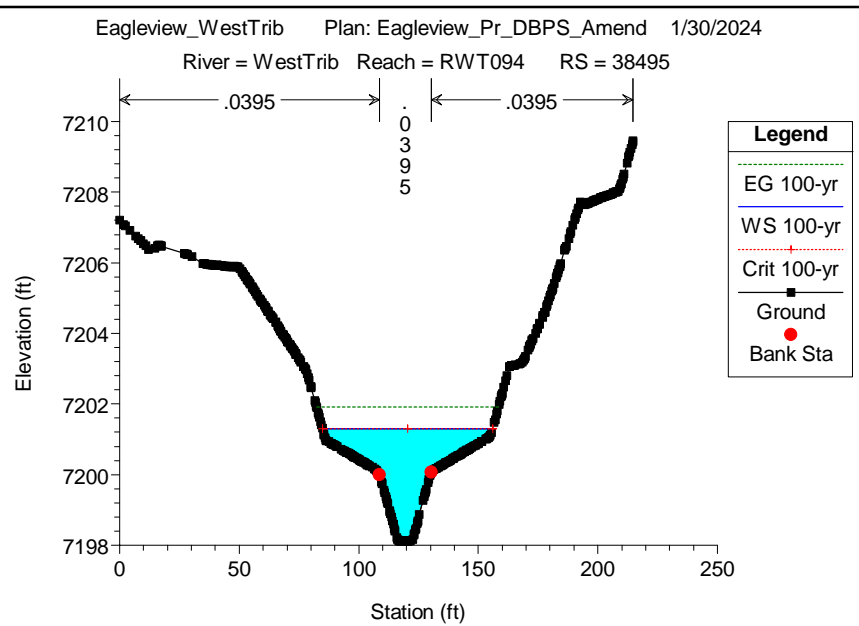
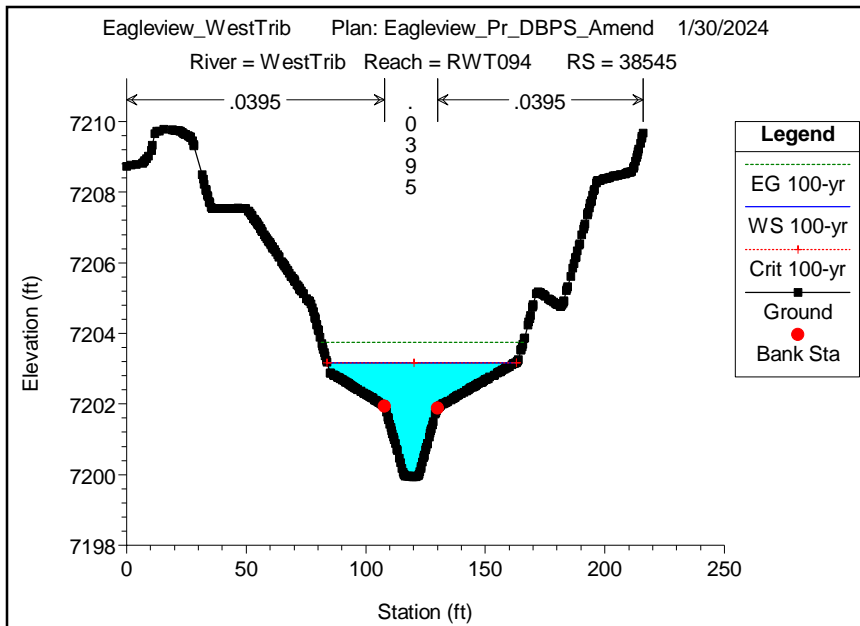


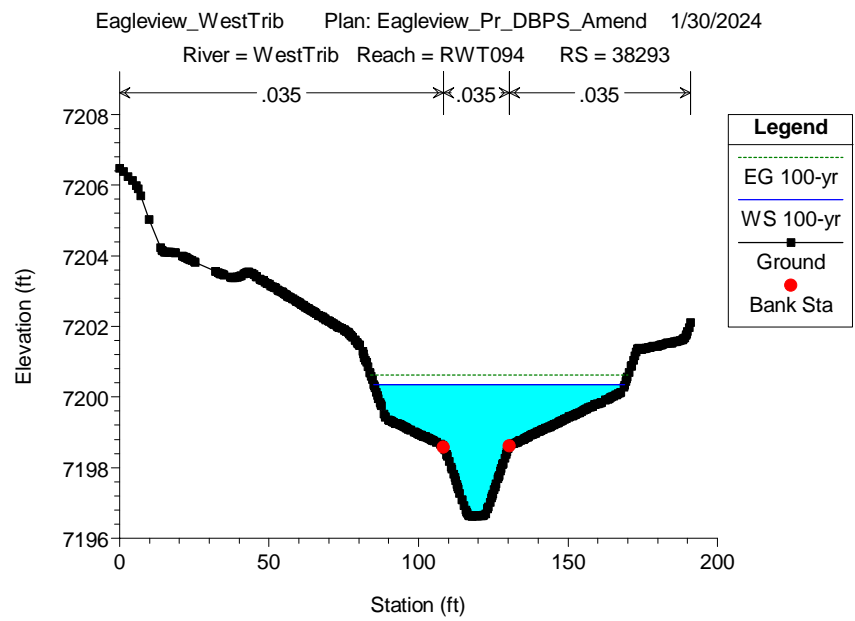
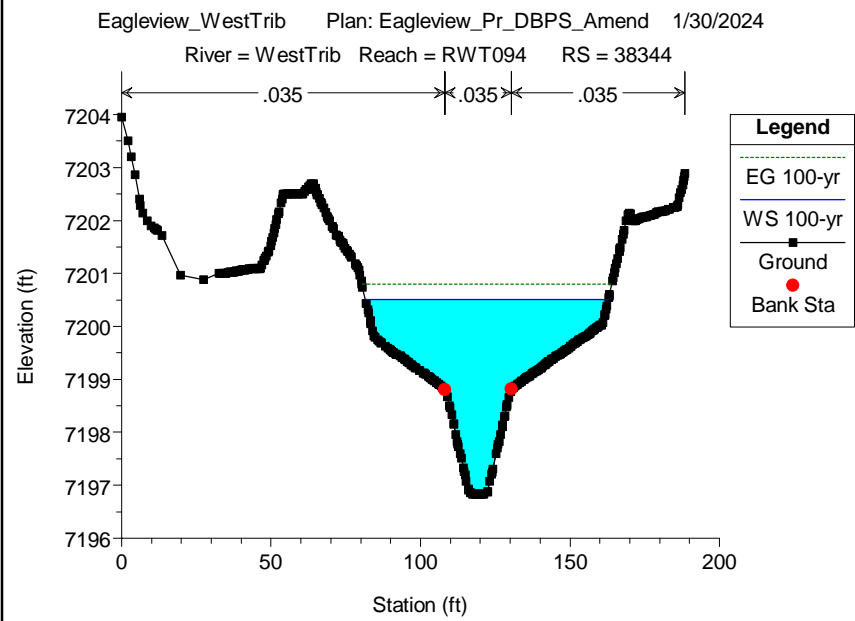
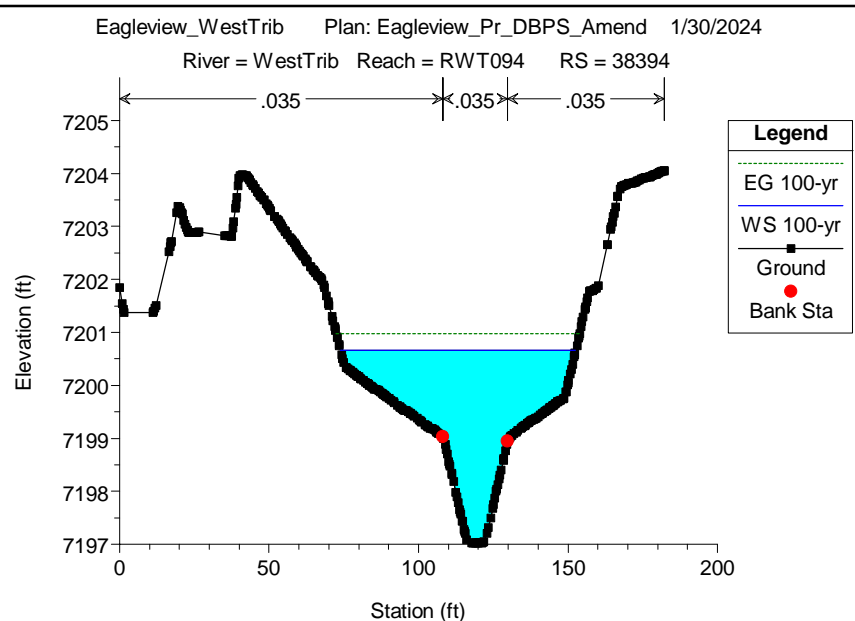
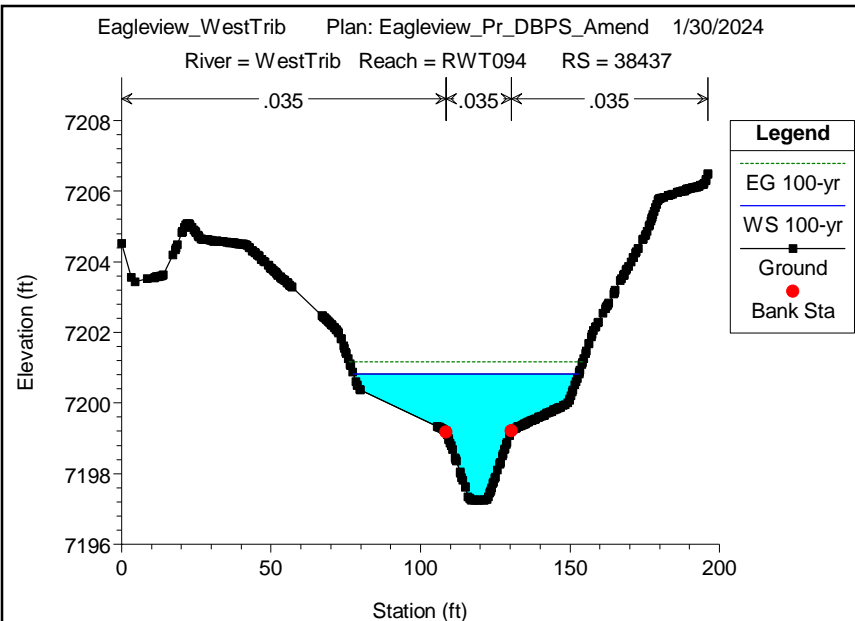


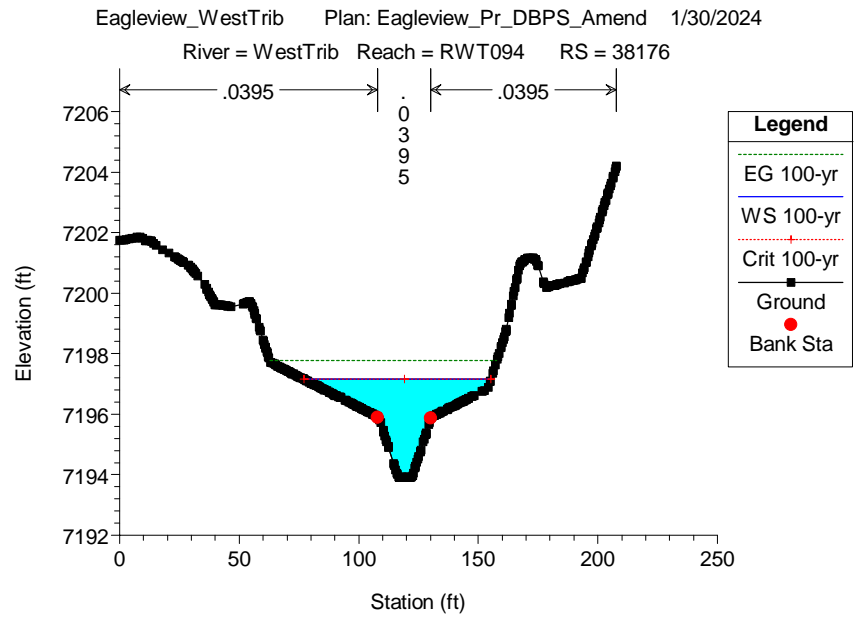
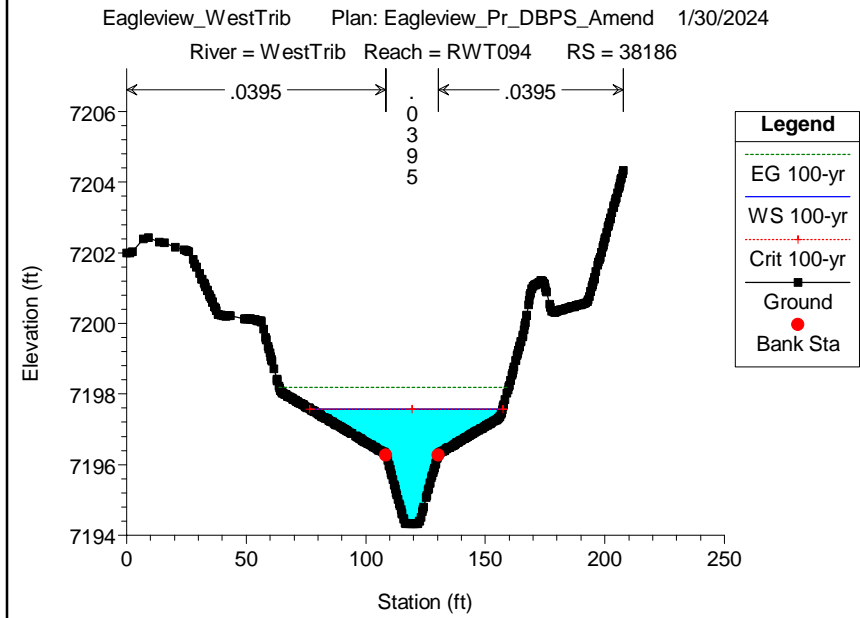
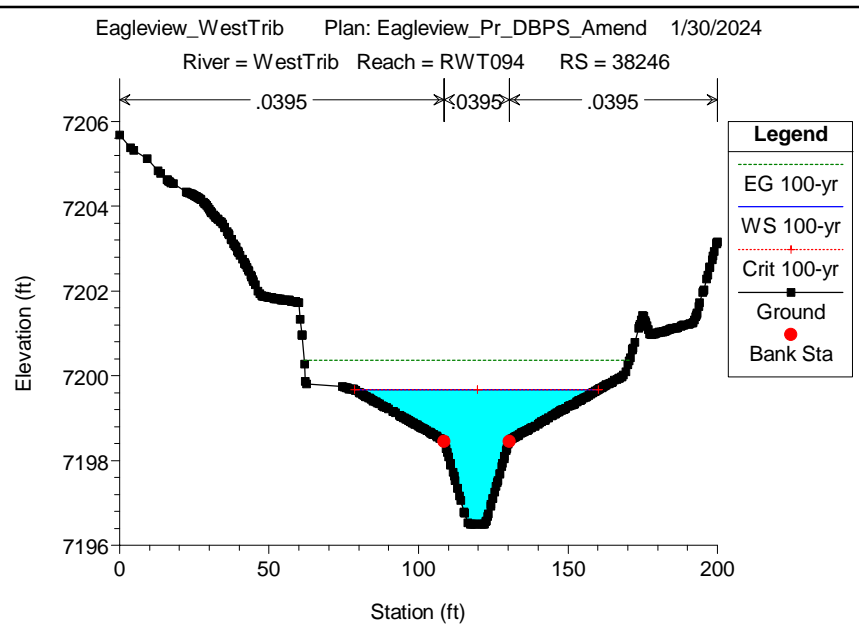
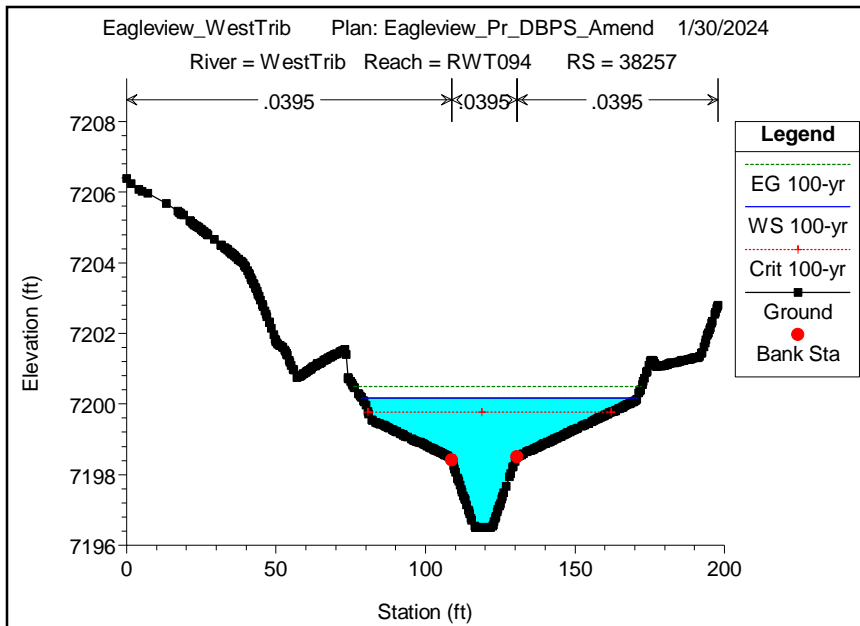


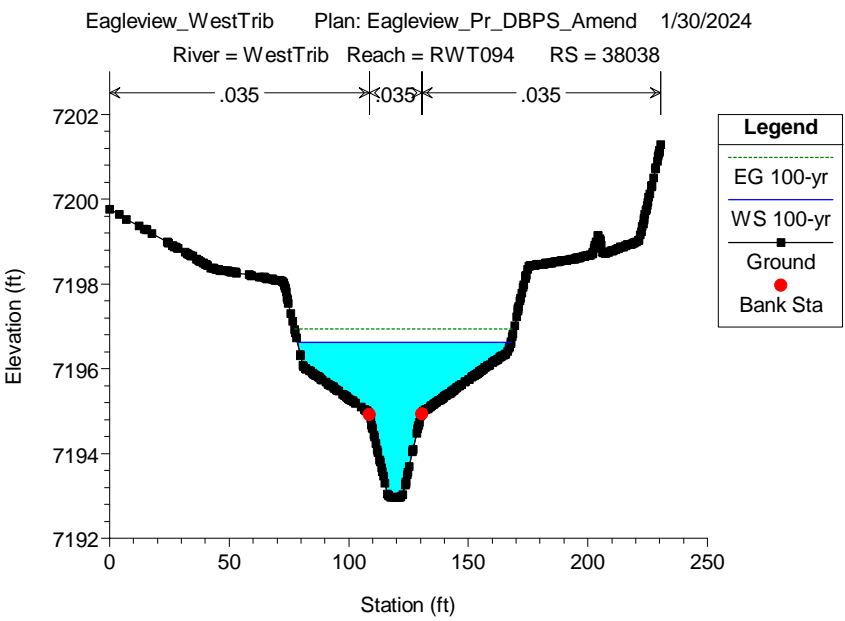
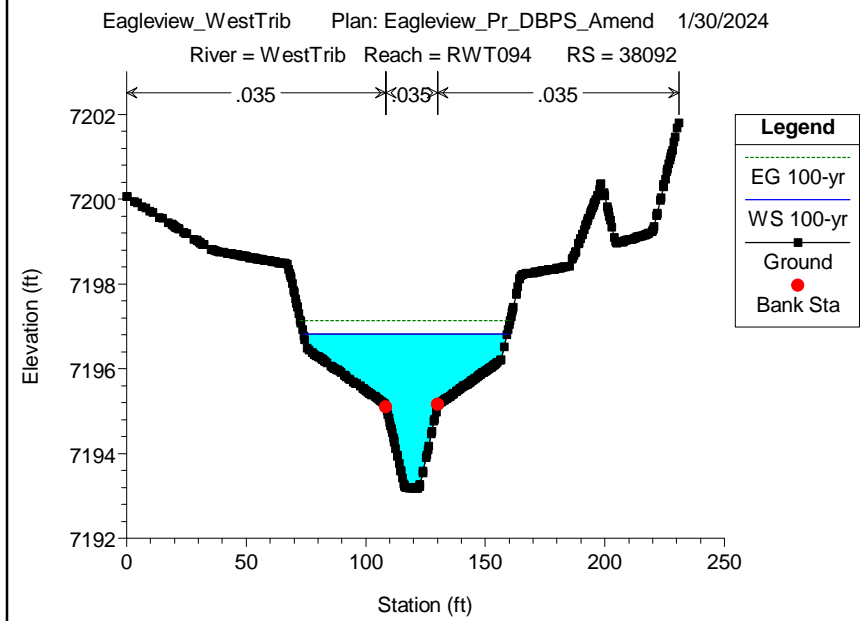
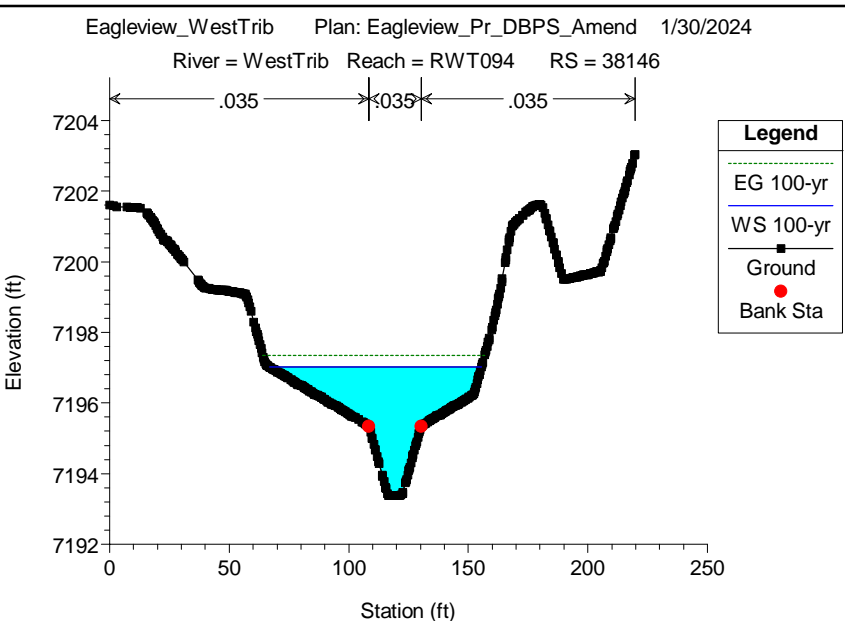
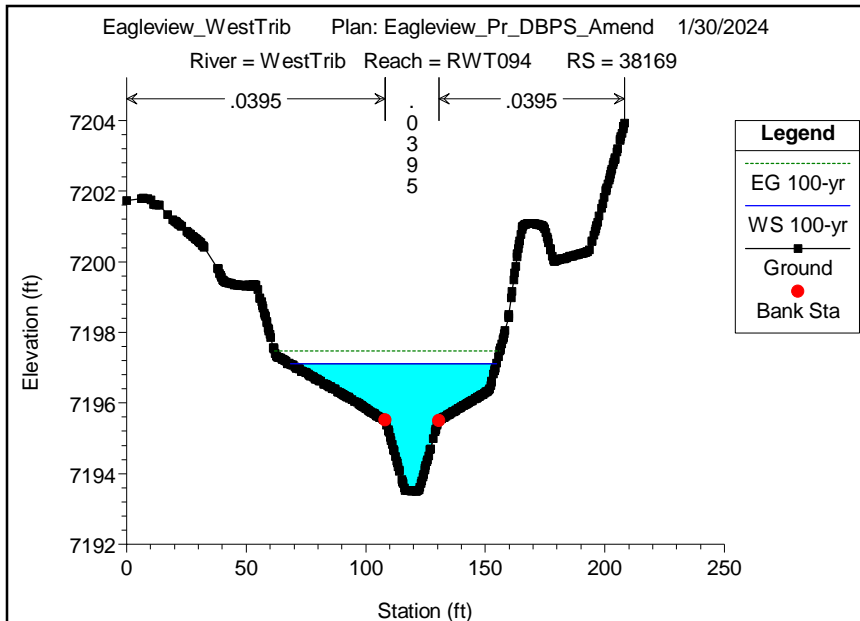


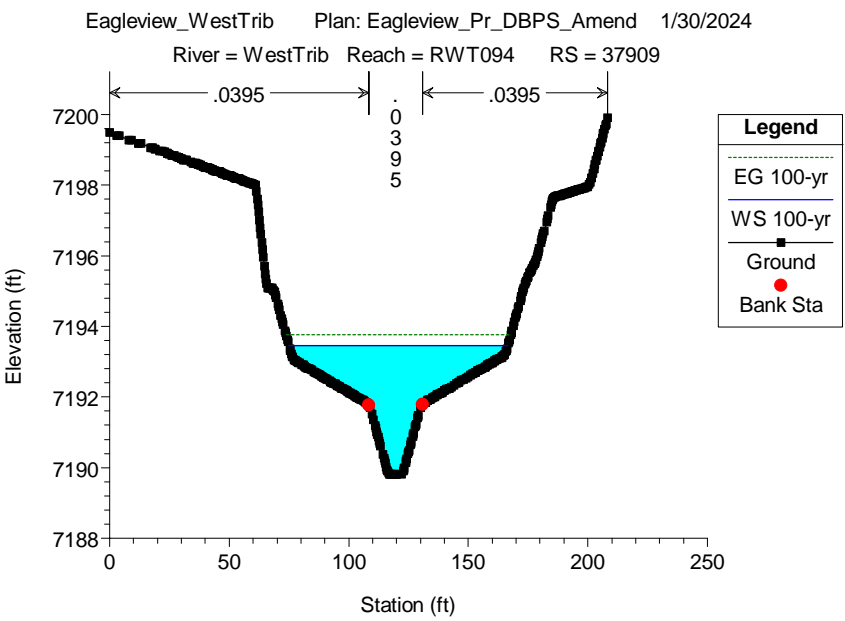
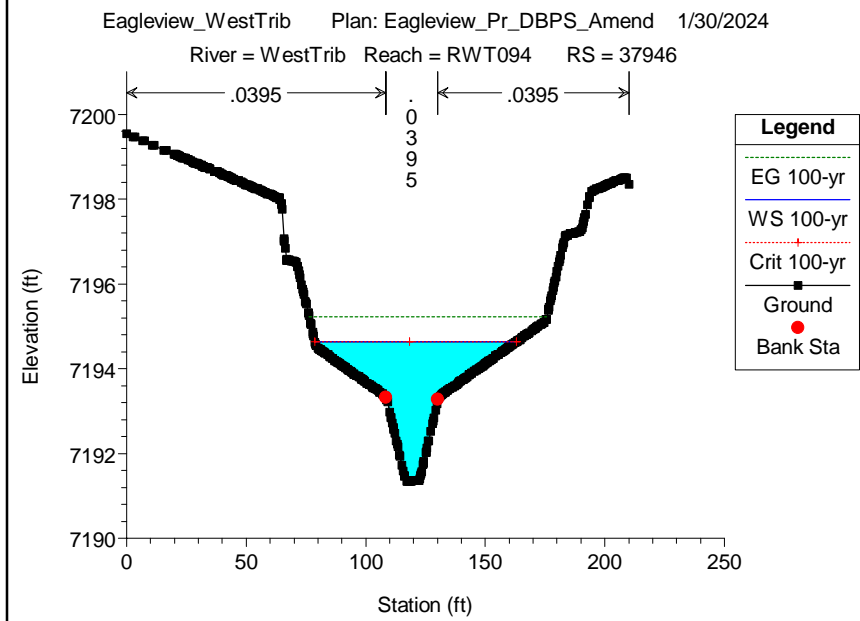
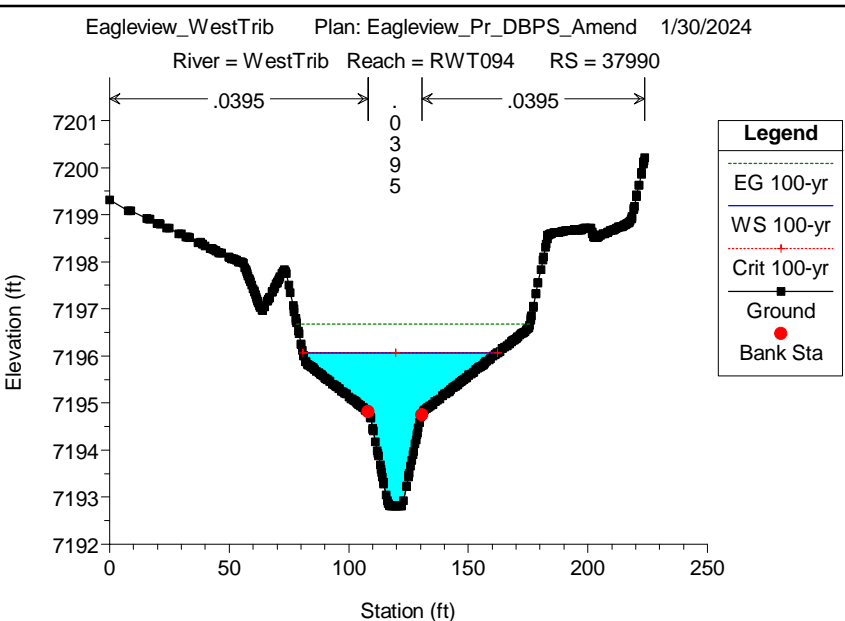
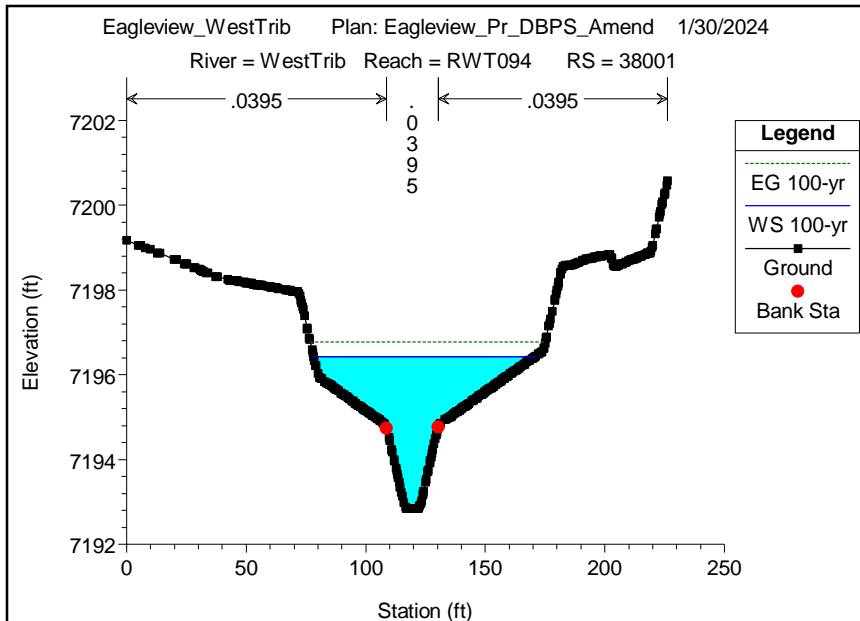




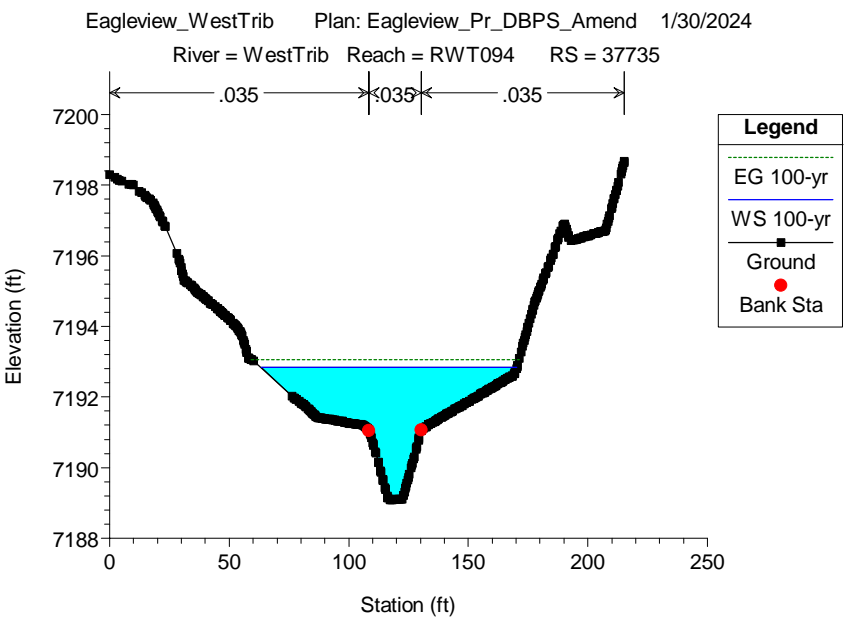
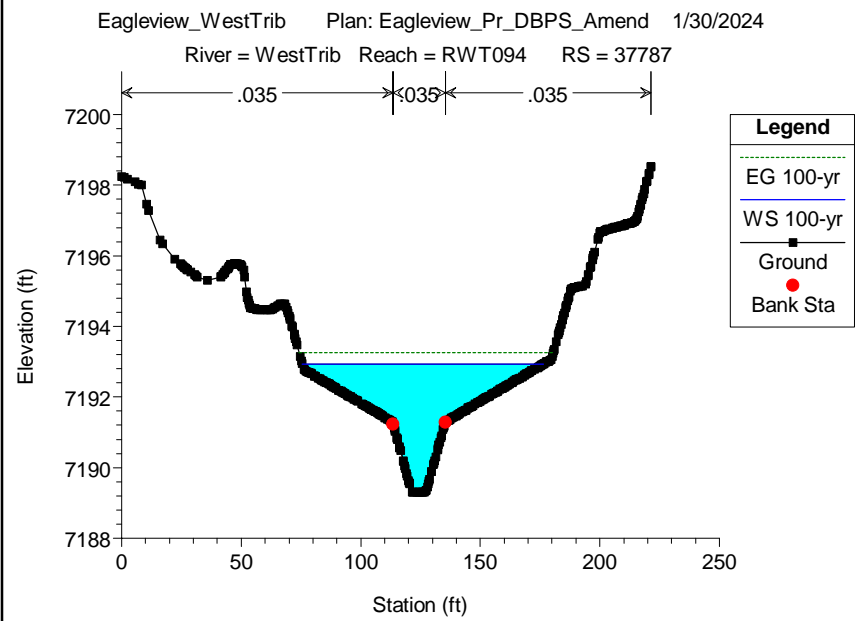
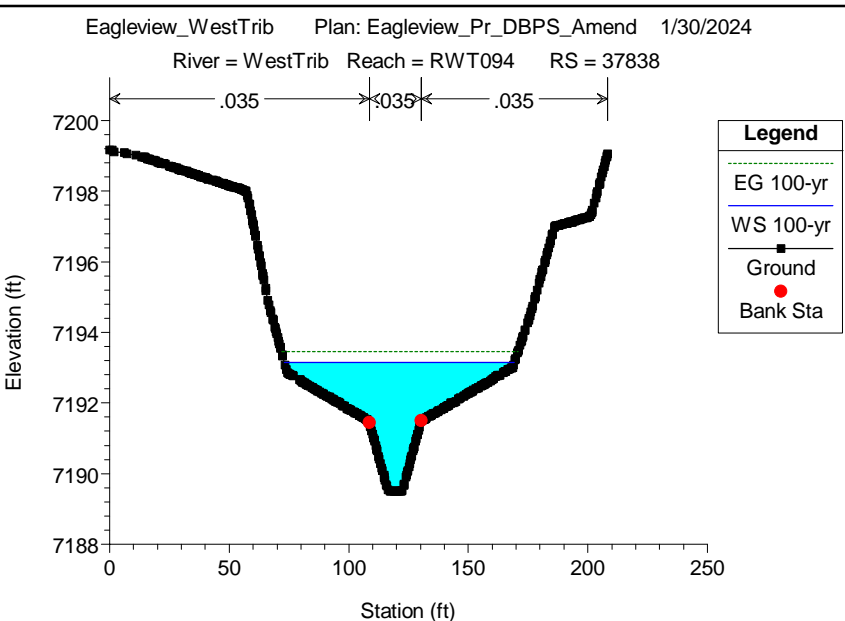
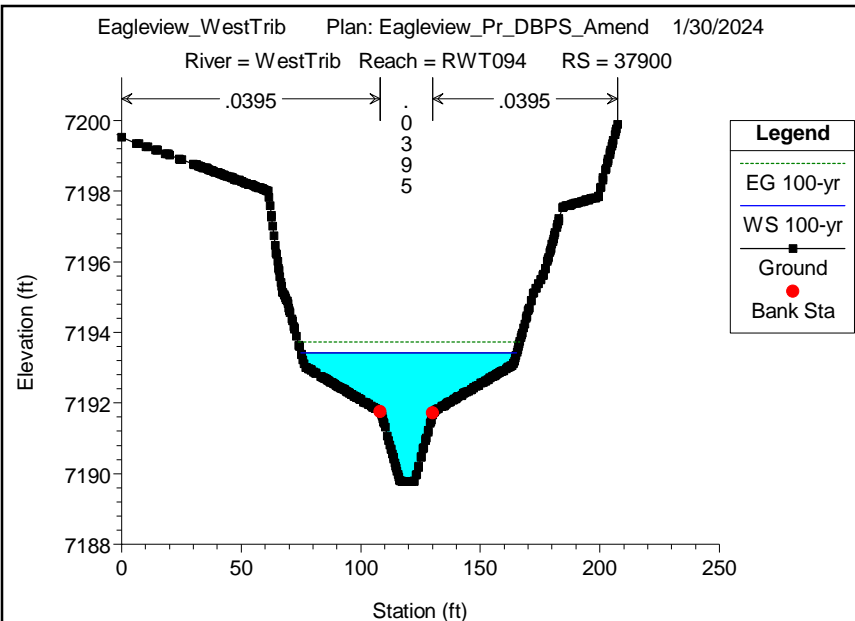






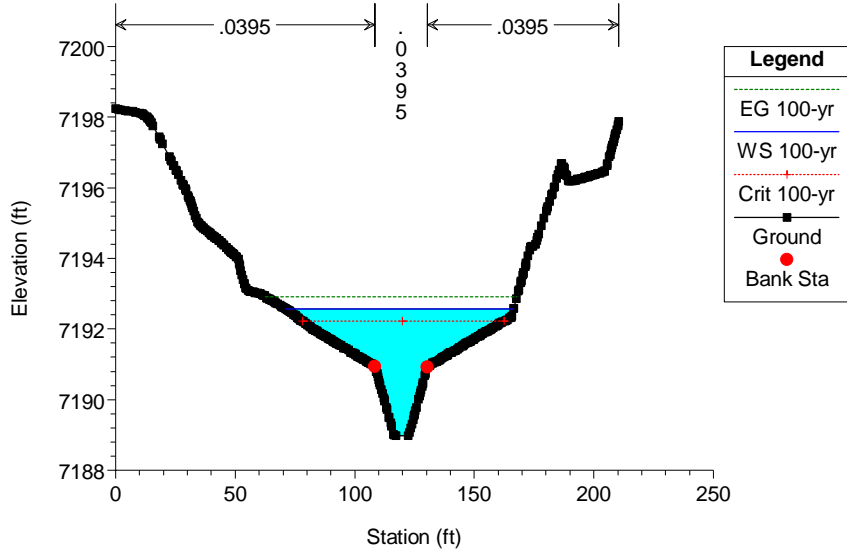






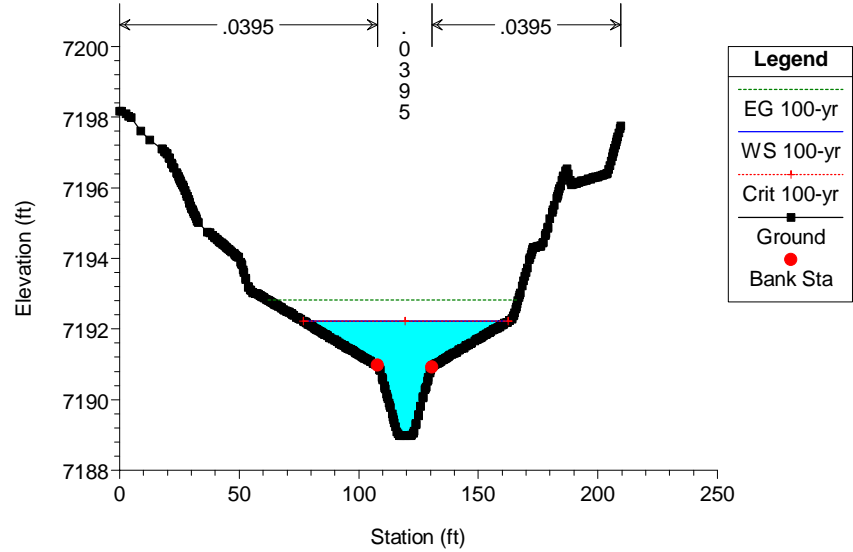
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River = WestTrib Reach = RWT094 RS = 37696



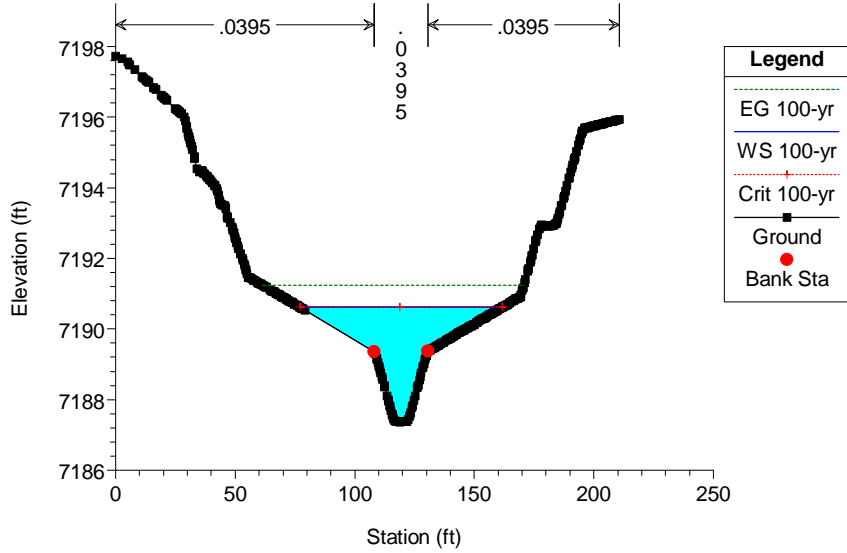
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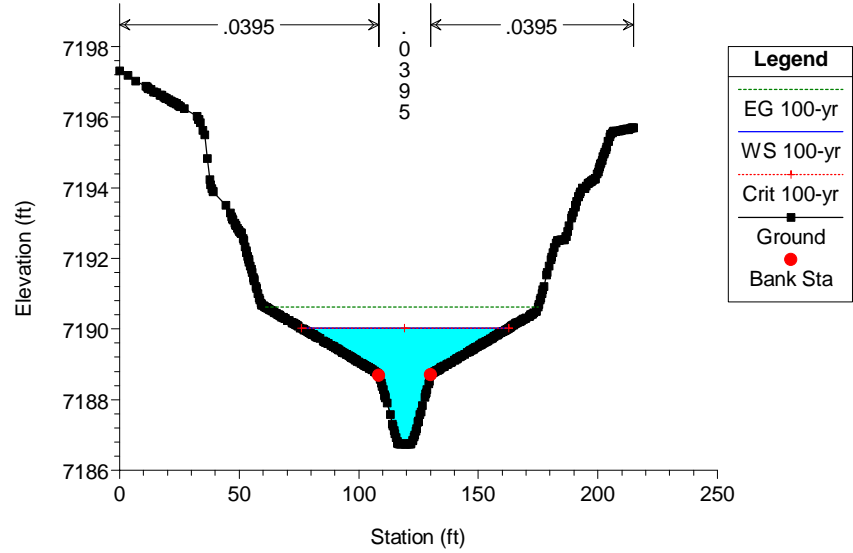
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River = WestTrib Reach = RWT094 RS = 37641



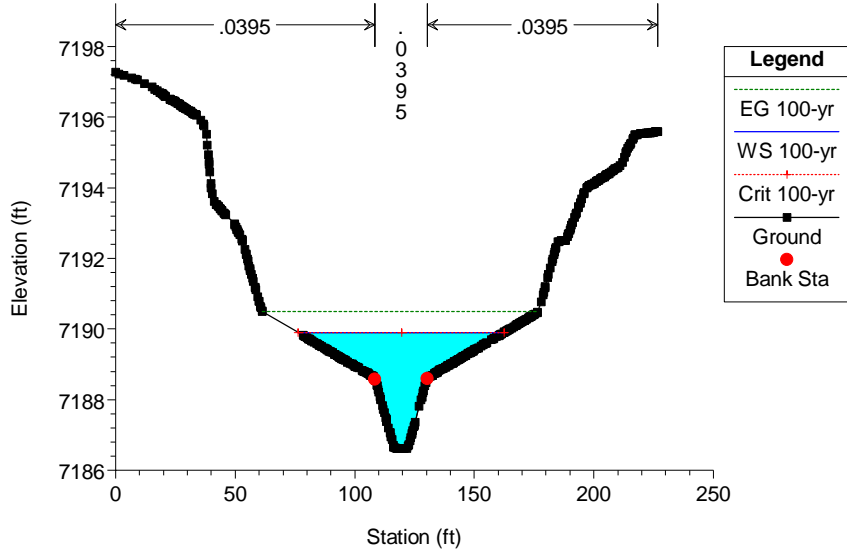
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River = WestTrib Reach = RWT094 RS = 37620



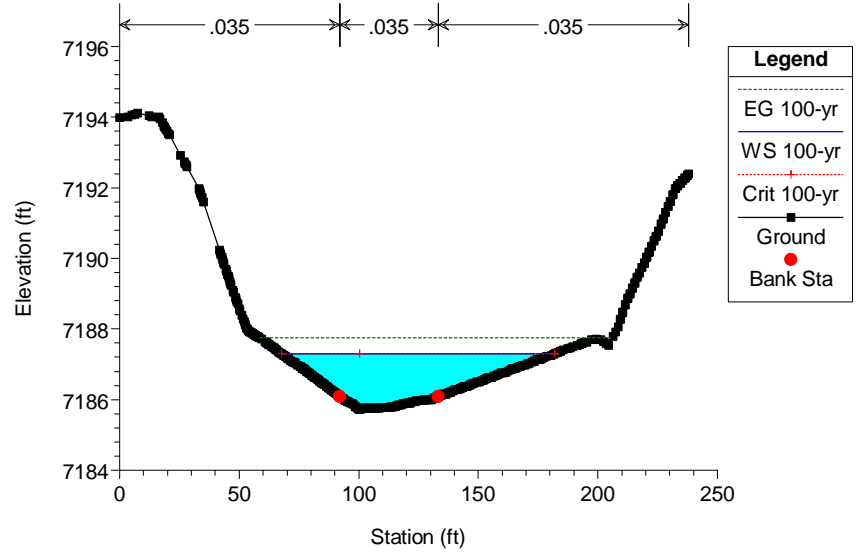
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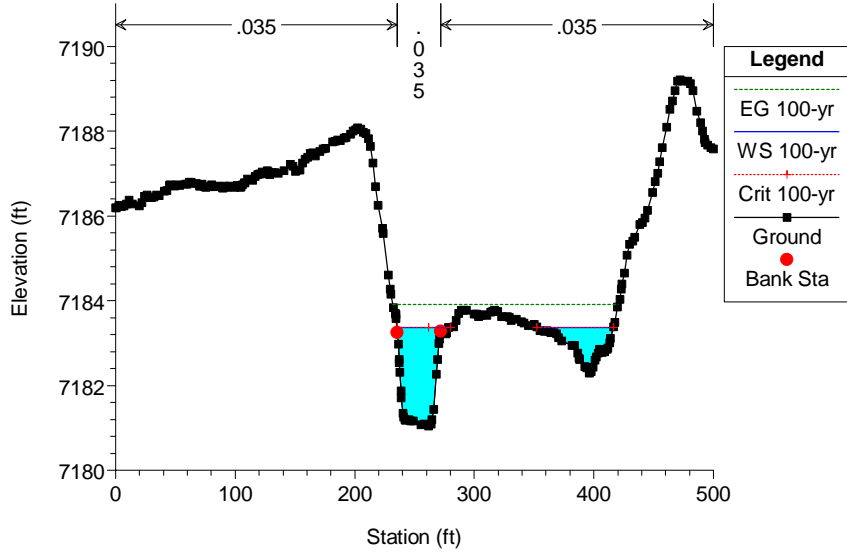
Eagleview\_WestTrib Plan: Eagleview\_Pr\_DBPS\_Amend 1/30/2024

River = WestTrib Reach = RWT094 RS = 37477



Eagleview\_WestTrib Plan: Eagleview\_Pr\_DBPS\_Amend 1/30/2024

River = WestTrib Reach = RWT094 RS = 37218.78



***APPENDIX D: REFERENCES***



Preliminary Drainage Report

# Eagleview Subdivision El Paso County, Colorado

Prepared for:

**Joe DesJardin**  
**PT Eagleview LLC**  
**1864 Woodmoor Drive, Suite 100**  
**Monument, CO 80132**

Prepared by:

**Kimley-Horn and Associates, Inc.**  
**2 North Nevada Avenue, Suite 300**  
**Colorado Springs, Colorado 80903**  
**(719) 453-0180**  
**Contact: Brice Hammersland, P.E.**

Project #: 196288000

PCD Filing No.: SP216

Prepared: October 28, 2022



**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):  10/28/2022  
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.

\_\_\_\_\_  
PT Eagleview LLC

✓ *Joseph W. DesJardin* 10/28/2022  
Authorized Signature Date

\_\_\_\_\_  
Joseph W. DesJardin

\_\_\_\_\_  
Director of Entitlements

\_\_\_\_\_  
Address:  
1864 Woodmoor Drive  
Monument, CO 80132

**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.

\_\_\_\_\_  
Josh Palmer, P.E. \_\_\_\_\_  
County Engineer/ ECM Administrator Date


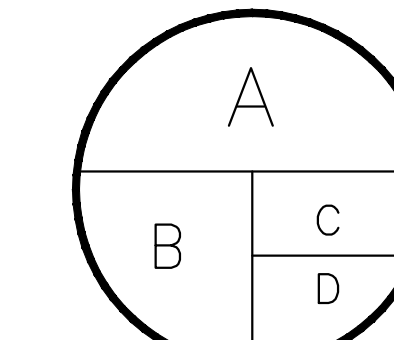
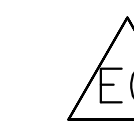

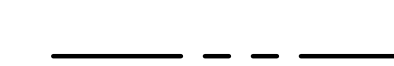



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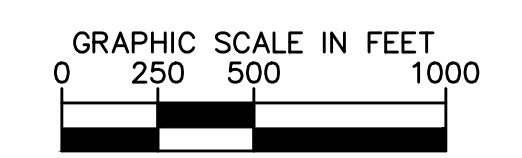
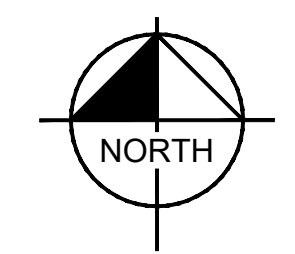
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### LEGEND

-  DRAINAGE BASIN AREAS
- 
  - A - HEC-HMS BASINS
  - B - BASIN ACREAGE
  - C - 5-YR RUNOFF
  - D - 100-YR RUNOFF
-  DESIGN POINT
-  EXISTING CONTOURS
-  PROPERTY BOUNDARY
-  FLOW ARROW
-  FLOW PATH
-  PARCEL LINE

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)
	B1	5.55	3.0	8.5	-	-
J1	OB1	10.37	7.1	18.8	10.1	27.3
	B2	41.43	15.4	48.5	-	-
	OB2	28.06	20.6	52.7	-	-
	OB3	43.44	25.3	67.1	-	-
J2	OB4	10.50	7.5	18.9	67.5	183.8
	OB5	143.82	36.8	106.9	-	-
	OB6	118.40	40.8	113.2	-	-
J4	OB7	421.43	101.4	284.2	169.2	478.0
	B3	59.54	36.4	110.0	-	-
	B4	14.68	5.4	18.2	-	-
J3	OB8	33.07	19.5	51.6	183.1	515.5



**Kimley»Horn**  
 2022 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: 04/08/2022

EAGLEVIEW  
 EL PASO COUNTY, COLORADO  
 PRE DEVELOPMENT DRAINAGE MAP

**PRELIMINARY**  
 FOR REVIEW ONLY  
 NOT FOR  
 CONSTRUCTION  
**Kimley»Horn**  
 Kimley-Horn and Associates, Inc.

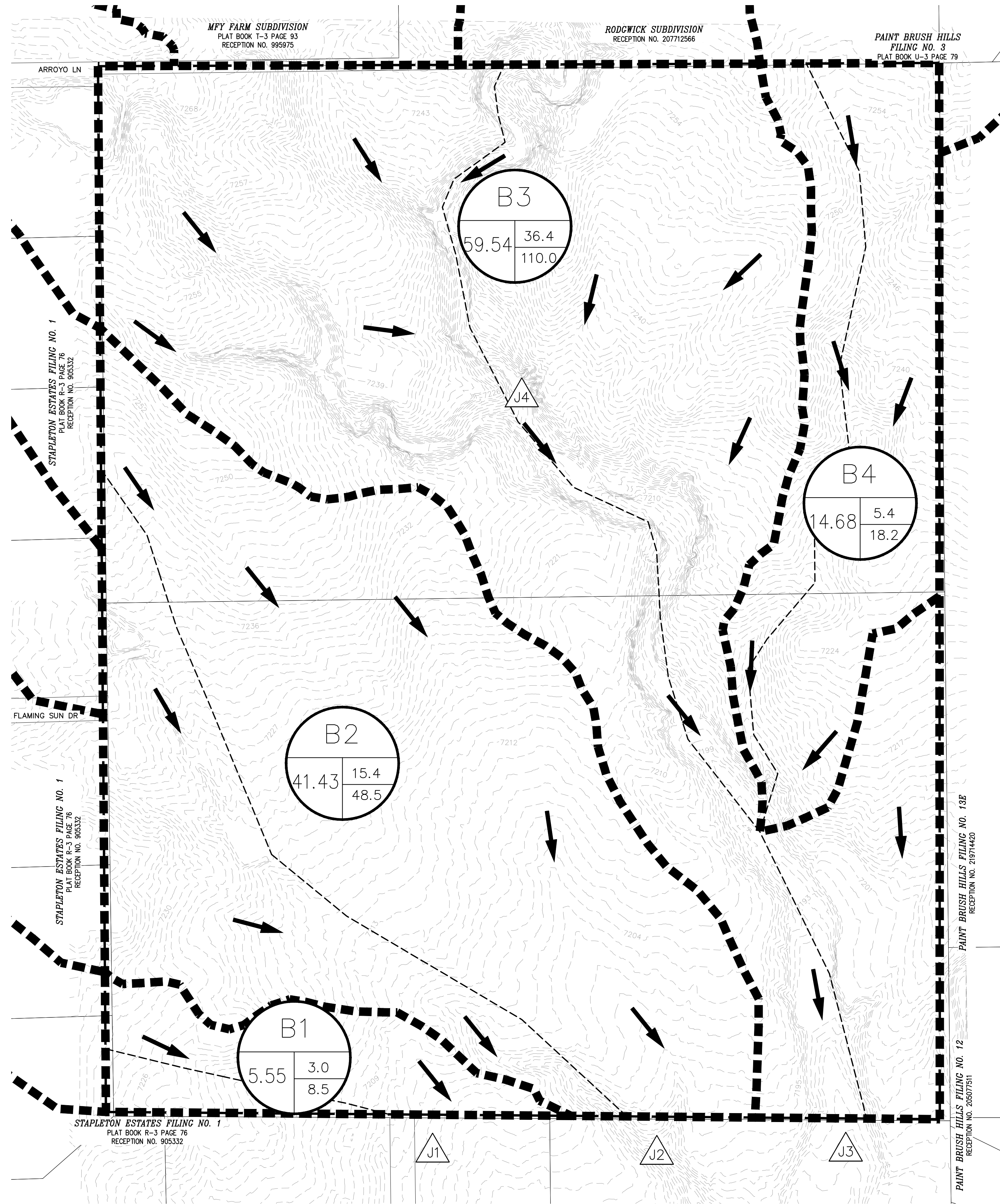
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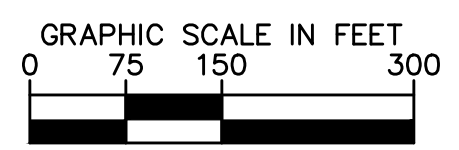
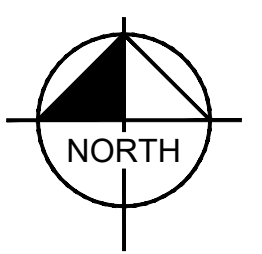
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LEGEND

- DRAINAGE BASIN AREAS
- A - HEC-HMS BASINS  
B - BASIN ACREAGE  
C - 5-YR RUNOFF  
D - 100-YR RUNOFF
- DESIGN POINT
- EXISTING CONTOURS
- PROPERTY BOUNDARY
- FLOW ARROW
- FLOW PATH

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)
	B1	5.55	3.0	8.5	-	-
J1	OB1	10.37	7.1	18.8	10.1	27.3
	B2	41.43	15.4	48.5	-	-
	OB2	28.06	20.6	52.7	-	-
	OB3	43.44	25.3	67.1	-	-
J2	OB4	10.50	7.5	18.9	67.5	183.8
	OB5	143.82	36.8	106.9	-	-
	OB6	118.40	40.8	113.2	-	-
J4	OB7	421.43	101.4	284.2	169.2	478.0
	B3	59.54	36.4	110.0	-	-
	B4	14.68	5.4	18.2	-	-
J3	OB8	33.07	19.5	51.6	183.1	515.5



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 Colorado Springs, Colorado 80903 (719) 453-0180

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 DRAWN BY: RS  
 CHECKED BY: KK  
 DATE: 04/08/2022

EAGLEVIEW  
 EL PASO COUNTY, COLORADO  
 PRE DEVELOPMENT DRAINAGE MAP

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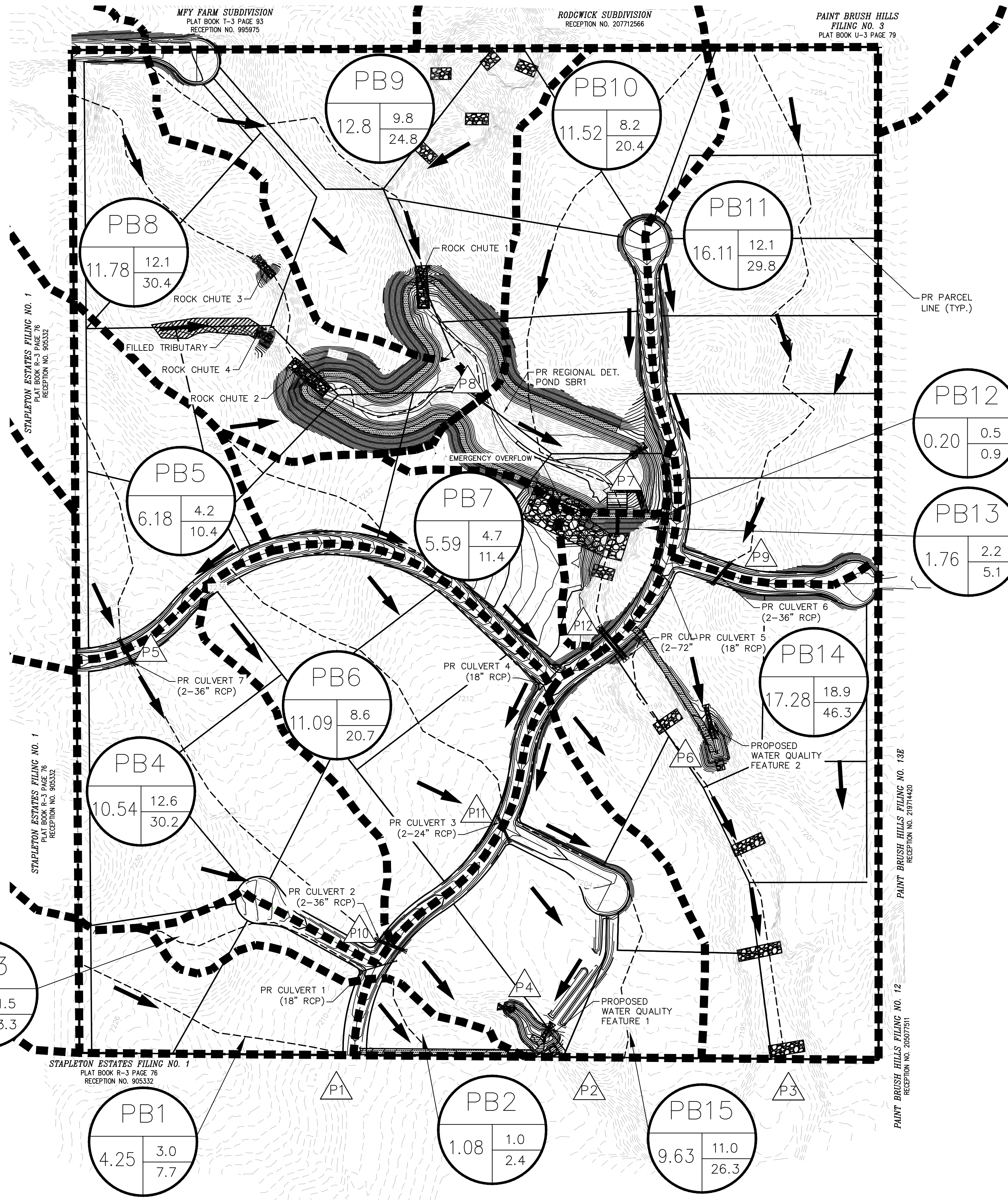
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**LEGEND**

- 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
- FLOW PATH
- DROP STRUCTURE

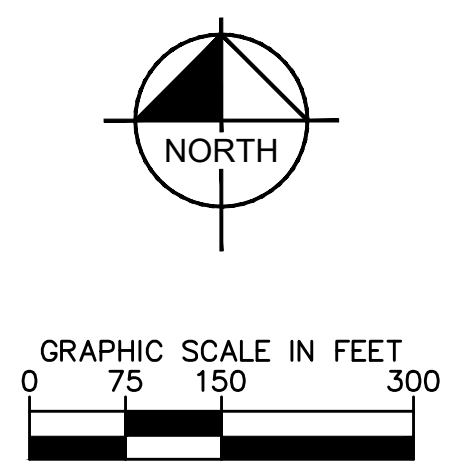
HEC-HMS - DEVELOPED RUNOFF BASIN TABLE

BASIN DESIGNATION	BASIN AREA (ACRES)	DIRECT 5-YR RUNOFF (CFS)	DIRECT 100-YR RUNOFF (CFS)
OB1	10.37	7.1	18.8
OB2	28.06	20.6	52.7
OB3	43.44	25.3	67.1
OB4	10.50	7.5	18.9
OB5	143.82	36.8	106.9
OB6	118.40	42.1	114.9
OB7	421.43	101.4	284.3
OB8	33.07	19.0	51.0
PB1	4.25	3.0	7.7
PB2	1.08	1.0	2.4
PB3	1.38	1.5	3.3
PB4	10.54	12.6	30.2
PB5	6.18	4.2	10.4
PB6	11.09	8.6	20.7
PB7	5.59	4.7	11.4
PB8	11.78	12.1	29.8
PB9	12.8	9.8	24.8
PB10	11.52	8.2	20.4
PB11	16.11	12.1	29.8
PB12	0.20	0.5	0.9
PB13	1.76	2.2	5.1
PB14	17.28	18.9	46.3
PB15	9.63	11.0	26.3

HEC-HMS - DEVELOPED RUNOFF DESIGN POINT TABLE

DESIGN POINT	TRIBUTARY BASINS	TRIBUTARY AREA (ACRES)	CUMULATIVE 5-YR FLOW (CFS)	CUMULATIVE 100-YR FLOW (CFS)
P1	OB1, PB1	14.62	10.1	26.4
P2	OB2, OB3, OB4, PB3, PB4, PB5, PB6, PB7, PB15	126.42	74.1	189.1
P3	OB5, OB6, OB7, OB8, OB8, PB9, PB10, PB11, PB12, PB13, PB14	787.97	131.8	437.7
P4	OB2, OB3, OB4, PB3, PB4, PB5, PB6, PB7	116.79	72.2	184.6
P5 (CULVERT 7)	OB3, OB4, PB5	60.12	36.8	95.9
P6	OB8, PB11, PB12	49.38	29.9	78.5
P7 (POND SR1)	OB5, OB6, OB7, PB8, PB9, PB10	719.49	131.7	420.1
P8	OB5, OB6, OB7, PB8, PB9, PB10	707.97	173.4	486.7
P9 (CULVERT 6)	OB8, PB11	49.18	29.8	78.4
P10 (CULVERT 2)	OB2, OB3, OB4, PB4, PB5	98.72	57.9	150.1
P11 (CULVERT 3)	PB6, PB7	16.68	13.2	31.9
P12 (CULVERT 8)	OB5, OB6, OB7, PB8, PB9, PB10, PB13	721.28	137.9	420.3

NOTES:  
1. LOCATION OF DROP STRUCTURES IS APPROXIMATE AND WILL BE FINALIZED IN THE FINAL DRAINAGE REPORT.



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CHECKED BY: KK  
DATE: 04/08/2022

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EAGLEVIEW  
EL PASO COUNTY, COLORADO  
POST DEVELOPMENT DRAINAGE MAP

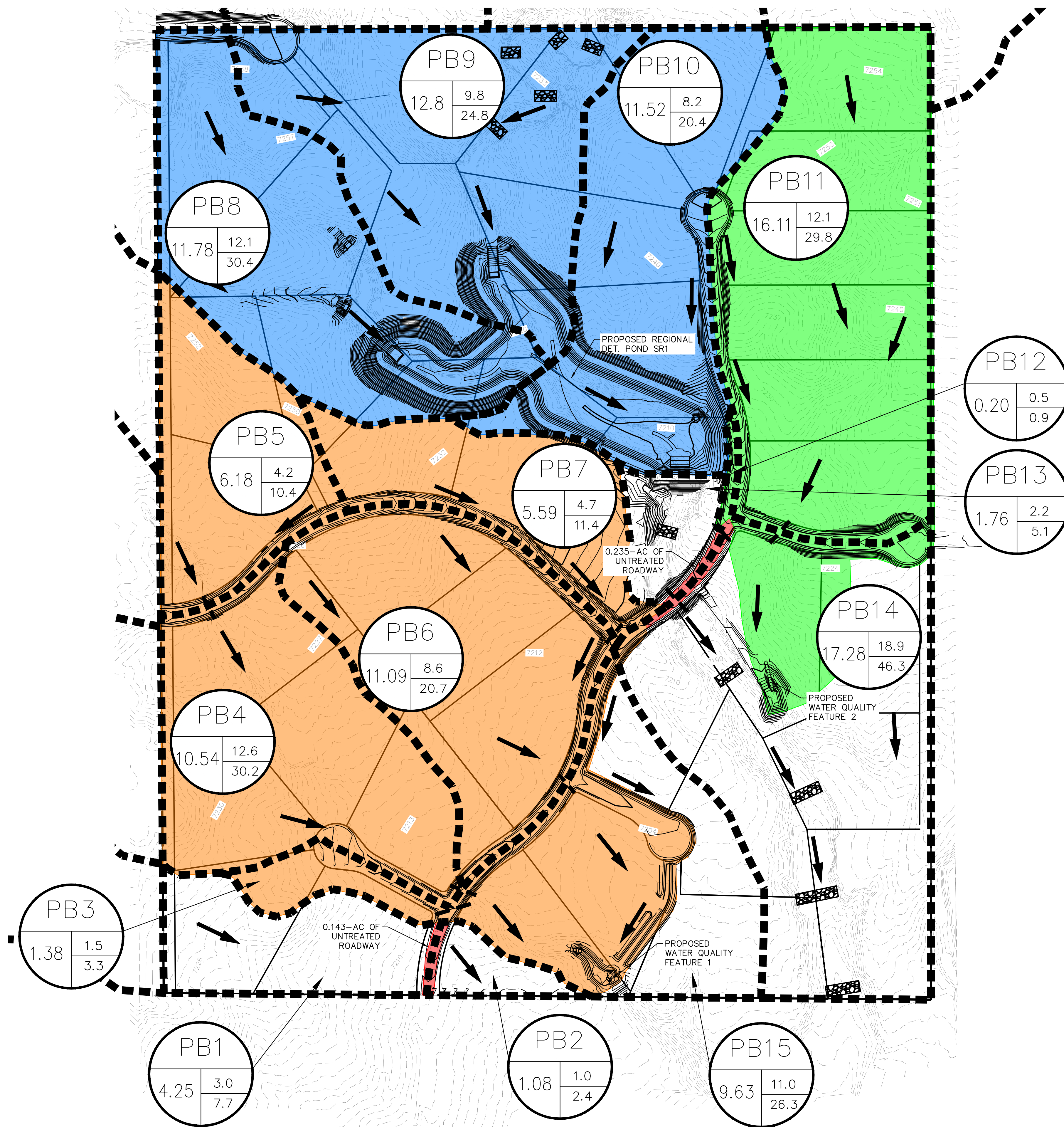
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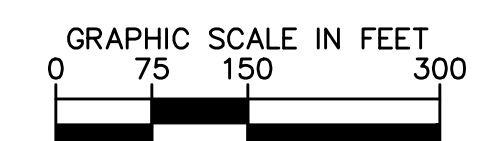
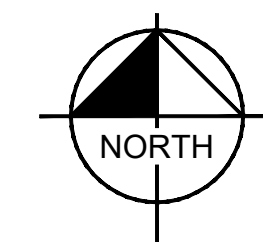
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### LEGEND

- DRAINAGE BASIN AREAS
- A - HEC-HMS BASINS
  - B - BASIN ACREAGE
  - C - 5-YR RUNOFF
  - D - 100-YR RUNOFF
- EXISTING CONTOURS
- PROPOSED CONTOURS
- PROPERTY BOUNDARY
- FLOW ARROW
- FLOW PATH
- AREA TRIBUTARY TO SR1
- AREA TRIBUTARY TO WQF1
- AREA TRIBUTARY TO WQF2
- ROADWAY AREA NOT TREATED

NOTES:  
 1. NON-ROADWAY AREAS NOT TREATED BY A PBMP ARE EXCLUDED BASED ON ECM APP 1.7.1.B.5.  
 2. ROADWAY AREA NOT TREATED BY A PBMP TOTALS 0.39 ACRES AND IS EXCLUDED BASED ON ECM APP 1.7.1.C.1.



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DESIGNED BY: MK  
 DRAWN BY: RS  
 CHECKED BY: KK  
 DATE: 04/08/2022

EAGLEVIEW  
 EL PASO COUNTY, COLORADO  
 OVERVIEW MAP - PBMP TRIBUTARY AREAS

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## I.7. - POST-CONSTRUCTION STORMWATER MANAGEMENT

### I.7.1. Post-Construction Stormwater Management Planning

[Replaces DCM2 Section 4.1, pages 4-1 through "Other BMPs" continued on 4-5]

A. **Overview.** This chapter contains requirements and procedures for the selection, installation, implementation and maintenance of permanent stormwater quality control measures that will remain in operation after construction for new development and significant redevelopment. All applicable development sites must have operational permanent stormwater quality control measures at the completion of the site, unless excluded from the requirements of an applicable development site as described in Section I.7.1.C. All permanent control measures for applicable development sites shall meet one of the "base design standards" described in Section 1.71.D.

In the case where permanent water quality control measures are part of future phasing, the permittee must have a mechanism to ensure that all control measures will be implemented, regardless of completion of future phases or site ownership. In such cases, temporary water quality control measures must be implemented as feasible and maintained until removed or modified. All temporary water quality control measure must meet one of the "base design standards" described in Section I.7.1.D.

A procedure is provided within the context of a flow chart and a four-step process that shall be followed for all applicable development sites. Detailed descriptions, sizing and design criteria, and design procedures for control measures are provided in the New Development BMP Factsheets found in Section 4.2 of the DCMV2.

It is recommended that discussions and collaboration regarding proposed BMPs occur early in each project between the developer's planner and engineer, County Stormwater and County Planning and Community Development staff.

The analysis of the requirements, exclusions and base design standards presented in this Section I.7 shall be incorporated into existing ECM Administrator submittals for review and acceptance including Preliminary/Final Drainage Reports and construction plans, or as otherwise specified by the ECM Administrator.

B. **Applicable Development Sites: Excluded Sites.** The following types of sites and associated land disturbances are excluded from the requirements of this Section 1.7. Although a site may qualify for an exclusion to Section 1.7 below, the site may still be considered an applicable construction activity subject to the requirements of an ESQCP or BESQCP.

1. **Pavement Management Sites.** Sites, or portions of sites, for the rehabilitation, maintenance, and reconstruction of roadway pavement, which includes roadway resurfacing, mill and overlay, white topping, black topping, curb and gutter replacement, concrete panel replacement, and pothole repair. The purpose of the site must be to provide additional years of service life and optimize service and safety. The site also must be limited to the repair and replacement of pavement in a manner that does not result in an increased impervious area, and the infrastructure must not substantially change. The types of sites covered under this exclusion include day-to-day maintenance activities, rehabilitation, and reconstruction of pavement. "Roadways" include roads and bridges that are improved, designed or ordinarily used for vehicular travel and contiguous areas or that are improved, designed or ordinarily used for pedestrian or bicycle traffic, drainage for the roadway, and/or parking along the roadway. Areas primarily used for parking or access to parking are not roadways.

2. **Excluded Roadway Redevelopment.** Redevelopment sites for existing roadways, when 1 of the following criteria:
  - 1) The site adds less than 1 acre of paved area per mile of roadway to an existing roadway, or
  - 2) The site does not add more than 8.25 feet of paved width at any location to the existing roadway.
3. **Excluded Existing Roadway Areas.** For redevelopment sites for existing roadways, only the area of the existing roadway is excluded from the requirements of an applicable development site when the site does not increase the width by 2 times or more, on average, of the original roadway area. The entire site is not excluded from being considered an applicable development site for this exclusion. The area of the site that is part of the added new roadway area is still an applicable development site.
4. **Aboveground and Underground Utilities.** Activities for installation or maintenance of underground utilities or infrastructure that does not permanently alter the terrain, ground cover, or drainage patterns from those present prior to the construction activity. This exclusion includes, but is not limited to, activities to install, replace, or maintain utilities under roadways or other paved areas that return the surface to the same condition.
5. **Large Lot Single Family Sites.** A single-family residential lot, or agricultural zoned lands, greater than or equal to 2.5 acres in size per dwelling and having a total lot impervious area of less than 10 percent. A total lot imperviousness greater than 10 percent is allowed when a study specific to the watershed and/or MS4 shows that expected soil and vegetation conditions are suitable for infiltration/filtration of the WQCV for a typical site, and the permittee accepts such study as applicable within its MS4 boundaries. The maximum total lot impervious covered under this exclusion shall be 20 percent.
6. **Non-Residential and Non-Commercial Infiltration Conditions.** This exclusion does not apply to residential or commercial sites for buildings. This exclusion applies to applicable development sites for which post-development surface conditions do not result in concentrated stormwater flow during the 80th percentile stormwater runoff event. In addition, post-development surface conditions must not be projected to result in a surface water discharge from the 80th percentile stormwater runoff events. Specifically, the 80th percentile event must be infiltrated and not discharged as concentrated flow. For this exclusion to apply, a study specific to the site, watershed and/or MS4 must be conducted. The study must show rainfall and soil conditions present within the project area, must include allowable slopes, surface conditions, and ratios of impervious area to pervious area, and the County must accept such study as applicable within its MS4 boundaries.
7. **Sites with Land Disturbance to Undeveloped Land that will Remain Undeveloped.** Sites with land disturbance to undeveloped land (land with no human-made structures such as buildings or pavement) that will remain undeveloped after the site. Typical examples of this type of site are trails, parks and open space without structures.
8. **Stream Stabilization Sites.** Construction activity that is solely for the purpose of stream stabilization.
9. **Trails.** Bike and pedestrian trails. Bike lanes for roadways are not included in this exclusion, unless attached to a roadway that qualifies under another exclusion in this section.
10. **Oil and Gas Exploration.** Facilities associated with oil and gas exploration, production, processing, or treatment operations, or transmission facilities, including activities necessary to prepare a site for drilling and for the movement and placement of drilling equipment, whether or not such field activities or operations may be considered to be an applicable construction activity.
11. **County Growth Areas.** The County may exclude the following when they occur within the county growth areas:

- a. Agricultural facilities and structures on agricultural zoned lands (e.g., barn, stables).
  - b. Residential development site or larger common plans of development for which associated construction activities results in a land disturbance of less than or equal to 10 acres and have a proposed density of less than 1,000 people per square mile.
  - c. Commercial or industrial development site or larger common plans of development for which associated construction activities results in a land disturbance of less than or equal to 10 acres.
- C. **Base Design Standard Requirements.** The "base design standard" is the minimum design standard for new and redevelopment before applying any exclusions or alternative standards. The control measures for applicable development sites shall meet one of the following base design standards:
1. **Water Quality Capture Volume (WQCV) Standard.** The control measures is designed to provide treatment and/or infiltration of the WQCV and:
    - a. 100% of the applicable development site is captured, except the County may exclude up to 20 percent, not to exceed 1 acre, of the applicable development site area when the County has determined that it is not practicable to capture runoff from portions of the site that will not drain towards control measures. In addition, the County must also determine that the implementation of a separate control measure for that portion of the site is not practicable (e.g., driveway access that drains directly to street).
    - b. Evaluation of the minimum drain time shall be based on the pollutant removal mechanism and functionality of the control measure implemented. Consideration of drain time shall include maintaining vegetation necessary for operation of the control measure (e.g., wetland vegetation).
  2. **Pollutant Removal Standard.** The control measures is designed to treat at a minimum the 80th percentile storm event. The control measures shall be designed to treat stormwater runoff in a manner expected to reduce the event mean concentration of total suspended solids (TSS) to a median value of 30 mg/L or less.

100% of the applicable development site must be captured, except the County may exclude up to 20 percent not to exceed 1 acre of the applicable development site area when the County has determined that it is not practicable to capture runoff from portions of the site that will not drain towards control measures. In addition, the County must also determine that the implementation of a separate control measure for that portion of the site is not practicable (e.g., driveway access that drains directly to street).
  3. **Runoff Reduction Standard.** The control measures is designed to infiltrate into the ground where site geology permits, evaporate, or evapotranspire a quantity of water equal to 60% of what the calculated WQCV would be if all impervious area for the applicable development site discharged without infiltration. This base design standard can be met through practices such as green infrastructure. "Green infrastructure" generally refers to control measures that use vegetation, soils, and natural processes or mimic natural processes to manage stormwater. Green infrastructure can be used in place of or in addition to low impact development principles.
  4. **Applicable Development Site Draining to a Regional WQCV Control Measure.** The regional WQCV control measure must be designed to accept the drainage from the applicable development site. Stormwater from the site must not discharge to a water of the state before being discharged to the regional WQCV control measure. The regional WQCV control measure must meet the requirements of the WQCV in Part I.7.C.1.
  5. **Applicable Development Site Draining to a Regional WQCV Facility.** The regional WQCV facility is

designed to accept drainage from the applicable development site. Stormwater from the site may discharge to a water of the state before being discharged to the regional WQCV facility. Before discharging to a water of the state, at least 20 percent of the upstream imperviousness of the applicable development site must be disconnected from the storm drainage system and drain through a receiving pervious area control measure comprising a footprint of at least 10 percent of the upstream disconnected impervious area of the applicable development site. The control measure must be designed in accordance with a design manual identified by the permittee. In addition, the stream channel between the discharge point of the applicable development site and the regional WQCV facility must be stabilized. The regional WQCV facility must meet the following requirements:

- a. The regional WQCV facility must be implemented, functional, and maintained following good engineering, hydrologic and pollution control practices.
- b. The regional WQCV facility must be designed and maintained for 100% WQCV for its entire drainage area.
- c. The regional WQCV facility must have capacity to accommodate the drainage from the applicable development site.
- d. The regional WQCV facility must be designed and built to comply with all assumptions for the development activities planned by the County within its drainage area, including the imperviousness of its drainage area and the applicable development site.
- e. Evaluation of the minimum drain time shall be based on the pollutant removal mechanism and functionality of the facility. Consideration of drain time shall include maintaining vegetation necessary for operation of the facility (e.g., wetland vegetation).
- f. The County shall require site plans and perform a site plan review consistent with the requirements of this ECM to ensure the regional WQCV facility and control measures for the applicable development site plans include:
  - i. Design details for all structural control measures implemented to meet the requirements of Part I.E.4.
  - ii. A narrative reference for all non-structural control measures for the site, if applicable. "Non-structural control measures" are control measures that are not structural control measures and include, but are not limited to, control measures that prevent or reduce pollutants being introduced to water or that prevent or reduce the generation of runoff or illicit discharges.
  - iii. Documentation of operation and maintenance procedures to ensure the long term observation, maintenance, and operation of the control measures. The documentation shall include frequencies for routine inspections and maintenance activities.
  - iv. Documentation regarding easements or other legal means for access of the control measure sites for operation, maintenance, and inspection of control measures.
  - v. Confirmation that control measures meet the requirements of section I.7.C
  - vi. Confirmation that site plans meet the requirements of County's site plan review and approval requirements
- g. The regional WQCV facility must be subject to the County's authority consistent with requirements and actions for a Control Measure in accordance with a base design standard.
- h. Regional Facilities must be designed and implemented with flood control or water quality as the primary use. Recreational ponds and reservoirs may not be considered Regional Facilities. Water

bodies listed by name in surface water quality classifications and standards regulations (5 CCR 1002-32 through 5 CCR 1002-38) may not be considered regional facilities.

6. **Constrained Redevelopment Sites Design Standard.** The constrained redevelopment sites standard applies to redevelopment sites meeting the following criteria:
- (a) The applicable redevelopment site is for a site that has greater than 75% impervious area, and
  - (b) The County must determine that it is not practicable to meet any of the base design standards in section I.7.1.C (1), (2), or (3). The County's determination shall include an evaluation of the applicable redevelopment site's ability to install a control measure without reducing surface area covered with the structures.

The control measures is designed to meet one of the following:

- (a) Provide treatment of the WQCV for the area captured. The captured area shall be 50% or more of the impervious area of the applicable redevelopment site. Evaluation of the minimum drain time shall be based on the pollutant removal mechanism and functionality of the control measure implemented,
- (b) The control measures is designed to provide for treatment of the 80th percentile storm event. The control measures shall be designed to treat stormwater runoff in a manner expected to reduce the event mean concentration of total suspended solids (TSS) to a median value of 30 mg/L or less.

A minimum of 50% of the applicable development area including 50% or more of the impervious area of the applicable development area shall drain to the control measures. This standard does not require that 100% of the applicable redevelopment site area be directed to a control measures as long as the overall removal goal is met or exceeded (e.g., providing increased removal for a smaller area), or

- (c) Infiltrate, evaporate, or evapotranspire, through practices such as green infrastructure, a quantity of water equal to 30% of what the calculated WQCV would be if all impervious area for the applicable redevelopment site discharged without infiltration.

#### I.7.2. BMP Selection

The selection of appropriate BMPs is based on the characteristics of the site and potential pollutants. The Four-Step Process provides a method of going through the selection process. Figure I.1 and Figure I.2 with annotations covers site-specific issues to be considered in selecting an effective BMP for each site.

- A. **Four-Step Process.** The following four-step process is recommended for selecting structural BMPs in newly developing and redeveloping urban areas:

##### **Step 1: Employ Runoff Reduction Practices**

To reduce runoff peaks and volumes from urbanizing areas, employ a practice generally termed "minimizing directly connected impervious areas" (MDCIA). The principal behind MDCIA is twofold — to reduce impervious areas and to route runoff from impervious surfaces over grassy areas to slow down runoff and promote infiltration. The benefits are less runoff, less stormwater pollution, and less cost for drainage infrastructure. There are several approaches to reduce the effective imperviousness of a development site:

##### **Reduced Pavement Area**

Sometimes, creative site layout can reduce the extent of paved areas including parking, thereby saving on initial capital cost of pavement and then saving on pavement maintenance, repair, and replacement over time.

### **Porous Pavement**

The use of modular block porous pavement or reinforced turf in low-traffic zones such as parking areas and low use service drives such as fire lanes can significantly reduce site imperviousness. This practice may reduce the extent and size of the downstream storm sewers and detention.

### **Grass Buffers**

Draining impervious areas over grass buffers slows down runoff and encourages infiltration, in effect reducing the impact of the impervious area.

### **Grass Swales**

The use of grass swales instead of storm sewers slows down runoff, promotes infiltration, and also reducing effective imperviousness. It also may reduce the size and cost of downstream storm sewers and detention.

Implementing these approaches on a new development site is discussed further in the DCM2 section titled Employing Runoff Reduction Techniques. This section provides a procedure for estimating a reduced imperviousness based on the use of grass buffers and swales. The latter three of the approaches for reducing imperviousness are structural BMPs and are described in detail in Section 4.2 of DCM2 (New Development BMP Factsheets):

- Grass Buffer.
- Grass Swale.
- Modular Block Porous Pavement (or Stabilized-Grass Porous Pavement).

## **Step 2: Stabilize Drainageways**

Drainageway, natural and manmade, erosion can be a major source of sediment and associated constituents, such as phosphorus. Natural drainageways are often subject to bed and bank erosion when urbanizing areas increase the frequency, rate, and volume of runoff. Therefore, drainageways are required to be stabilized. One of three basic methods of stabilization may be selected.

### **Constructed Grass, Riprap, or Concrete-Lined Channel**

These methods of channel stabilization have been in practice for some time. The water quality benefit associated with these channels is the reduction of severe bed and bank erosion that can occur in the absence of a stabilized channel. On the other hand, the hard-lined low flow channels that are often used do not offer much in the way of water quality enhancement or wetland habitat. The use of riprap or concrete lined flood conveyance channels is not recommended, unless hydraulic or physical conditions require such an alternative. Rock lined low-flow channels in many cases may be a better alternative.

### **Stabilized Natural Channel**



In practice, many natural drainageways in and adjacent to new developments are frequently left in an undisturbed condition. While this may be positive in terms of retaining desirable riparian vegetation and habitat, urban development may cause the channel to become destabilized. When degradation occurs in these drainageways, significant erosion, loss of riparian and aquatic habitat, and elevated levels of sediment and associated pollutants can result. Therefore, it is recommended that some level of stream stabilization always be considered. Small grade control structures sized for a 5-year or larger runoff event are often an effective means of establishing a mild slope for the baseflow channel and arresting stream degradation. Severe bends or cut banks may also need to be stabilized. Such efforts to stabilize a natural waterway also preserve and promote natural riparian vegetation which can provide paybacks in terms of enhanced aesthetics, habitat, and water quality.

One additional method of drainageway stabilization gives special attention to stormwater quality and is described in Section 4.2 (New Development BMP Factsheets):

- Constructed Wetland Channel.

### **Step 3: Provide Water Quality Capture Volume (WQCV)**

All applicable development sites must have operational permanent stormwater quality control measures at the completion of construction. Designing structures that provide the WQCV is a common preferred approach in El Paso County. Other base design standards discussed earlier may be used if applicable, however. One or more of six types of water quality basins, each draining slowly to provide for long-term settling of sediment particles, may be selected. Information on selecting and configuring for a site one or more of the WQCV facilities listed below is provided in the Section 4.2 of the DCMV2. These six BMPs are also described in detail in the New Development BMP Factsheets found in the DCMV2 Section 4.2.

- Porous Pavement Detention.
- Porous Landscape Detention.
- Extended Detention Basin.
- Sand Filter Extended Detention Basin.
- Constructed Wetland Basin.
- Retention Pond.

Full Spectrum Detention is a newer approach to providing the WQCV. Details on the use, sizing, configuration and maintenance of Full Spectrum Detention structures are located in the DCMV1 update of 2014, sections of which are incorporated by reference into this ECM.

### **Step 4: Consider Need for Industrial and Commercial BMPs**

If a new development or significant redevelopment activity is planned for an industrial or commercial site, the need for specialized BMPs must be considered. Two approaches are described in the New Development BMP Factsheets:

- Covering of Storage/Handling Areas
- Spill Containment and Control

Other Specialized BMPs may also be required

- B. Other Specialized BMPs.** The Technical Advisory Committee (TAC) selected the above structural BMPs after a comprehensive screening of known structural BMPs. The members of TAC included representatives from many County agencies and individuals from the development community. Final selection by TAC was based on the rev documentation on potential effectiveness in a semiarid climate, local applicability, maintenance considerations, Development and evaluation of permanent BMPs are continuing processes. Better designs of the BMPs included in DCM2 and designs of new BMPs, including manufactured (proprietary) BMPs, will be developed and tested. To allow for this progress, additional BMPs will be considered on a case-by-case basis by County Stormwater Staff. Design and sizing details and results of independent testing of the BMP in conditions similar to those at the site will be submitted demonstrating that the BMP will meet or exceed the performance of approved BMPs for the site.

To promote improvement in stormwater protection, County Stormwater Staff may approve promising BMPs on an experimental basis. A performance monitoring program to be pre-approved by County Stormwater Staff and an agreement to replace the Experimental System with an approved system should it not function to the required level of performance, both at the owner's expense, will be required. A request to use an "experimental system" must be submitted to El Paso County in the form of a Request for a Deviation from these standards, submitted consistent with the criteria and process described Chapters 1 and 5, respectively. Design of any "experimental system" shall not commence until a Request for Deviation is submitted to and approved by the County.

- C. Guidance for Selecting and Locating WQCV Facilities.**

[The following section replaces DCM2 Section 4.1 pages 4-19 through 4-23]

Laying out WQCV facilities within a development site and watershed requires thought and planning. This planning and decision-making should occur during a master drainage planning process (Drainage Basin Planning Study or Master Development Drainage Plan) undertaken by local jurisdictions or a developer's engineer. Such plans, studies or other reports may depict a recommended approach for implementing WQCV on a watershed basis. Such reports may call for a few large regional WQCV facilities, smaller sub-regional facilities, or alternatively an onsite approach. It is always a good idea to find out if a master planning study has been completed that addresses water quality and to attempt to follow the Plan's recommendations.

If the master drainage planning process addresses water quality, the following provides supplemental information on the BMPs. If the existing master drainage planning process has not addressed water quality, or if a new master drainage process is underway, this will direct the water quality evaluation.

- D. Post-Construction Stormwater Quality Control Measure Selection Process.** The BMP selection process is illustrated in Figure I-1 and Figure I-2. These two figures shall be used for all projects except those that are strictly highway/roadway projects; that is, projects with no plans for building pad sites. Projects that are strictly highway/roadway projects are discussed in a separate section below.

The following process references the use of the permanent control measures (BMPs) and other practices outlined in DCM2 and this Appendix. The use of DCM2 BMPs will promote consistency between the City and County. These BMPs are commonly found in manuals and other literature from municipalities across the country, and they are the accepted best industry practices in stormwater quality control.

As described below, other control measures (which may be relatively new to the field of stormwater management) are acceptable if they can be shown to meet performance criteria provided in this Section 1.7. A Request for a Deviation from these standards submitted consistent with the criteria and process described

Chapters 1 and 5, respectively, must be submitted and approved by the County prior to the use of a permanent control measure not included in this ECM, DCMV1, DCMV2 and the DCMV1 Update of 2014.

The following items explain the decision points (i.e., the Boxes) in Figure I-1 and Figure I-2:

**Box 1:** For all sites, the possibility of incorporating runoff reduction practices must be investigated. Impervious area should be reduced to the maximum extent practicable, per DCM2. DCM2 also provides guidance for MDCIA by routing runoff to pervious areas. This is Step 1 in the Four-Step Process.

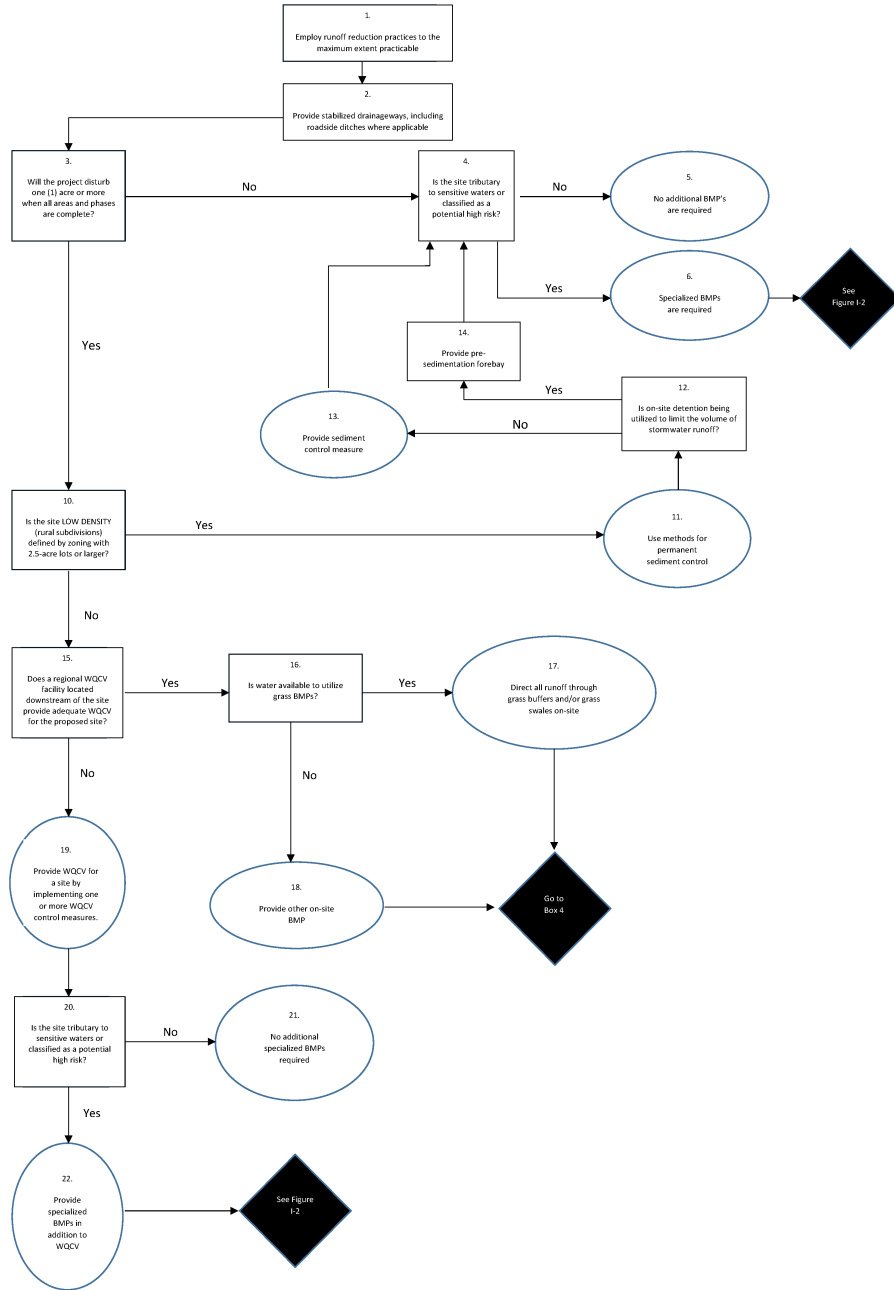
**Box 2:** All drainageways, ditches, and channels shall be stabilized with one of three methods included in Step 2, which include the use of appropriate methods for the type of drainageway as described in the DCM1. Drainageways include:

- Tributaries to creeks that have been left in a relatively natural state,
- Tributaries, channels, and drainageways that are graded or regraded and may include drop or check structures, side slope stabilization, and low-flow channels.
- Roadside ditches that are completely man-made and should only be used to convey runoff from roads and roadway right-of-ways (ROWS).

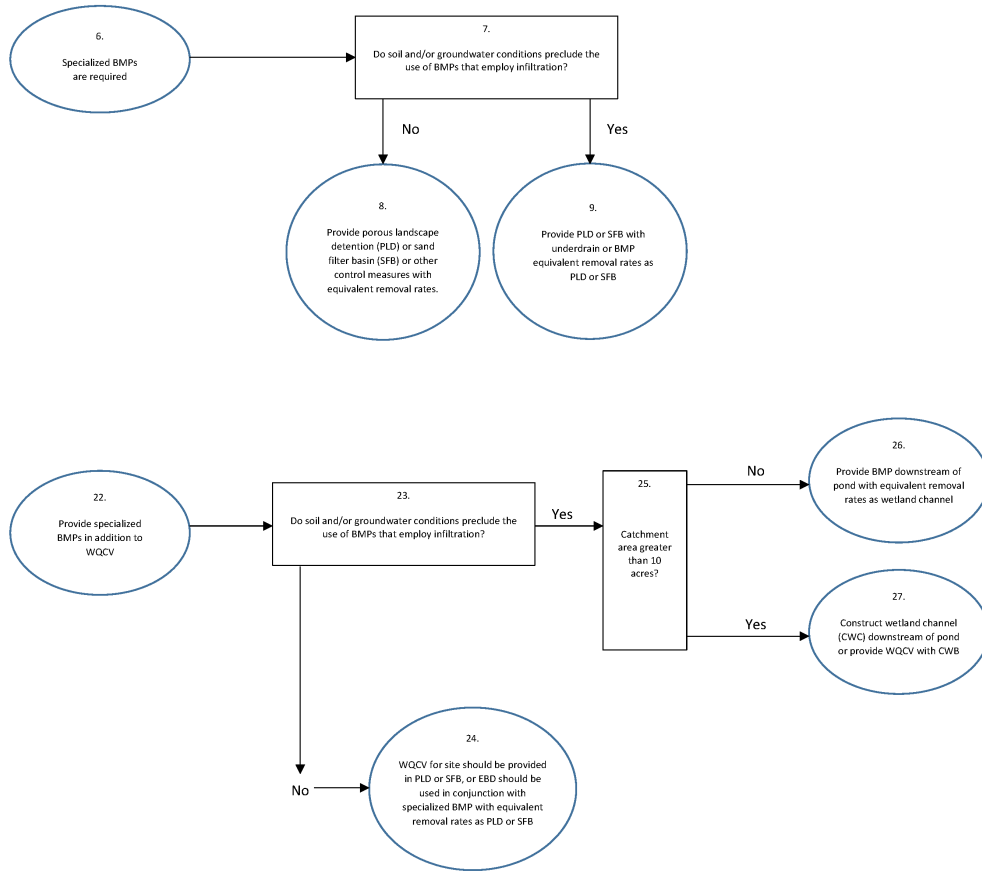
**Box 3:** It must be determined if the development and/or redevelopment disturbs an area of land that is 1 acre or larger (or planned to be 1 acre or larger) when all phases are complete.

**Box 4:** Sites tributary to sensitive waters should consider specialized BMPs to address the parameter of concern as shown in Table I-5. At this time, no special BMPs are required until the County develops an overall strategy to address the parameters of concern, probably if and when a Total Maximum Daily Load (TMDL) is determined.

Figure I-1. BMP Requirements Flowchart for New Development and Redevelopment Sites—For Selecting Post-Construction BMPs in Compliance with El Paso County's Stormwater NPDES Permit



**Figure I-2. BMP Requirements Flowchart for New Development and Redevelopment Sites—For Selecting Post-Construction BMPs in Compliance with El Paso County's Stormwater NPDES Permit**



**Table I-4. Best Management Practices Abbreviations**

Abbreviation	Best Management Practice
CWB	Constructed Wetlands Basin
CWC	Constructed Wetlands Channel - Sedimentation Facility
EDB	Extended Detention Basin - Sedimentation Facility
PLD	Porous Landscape Detention
RP	Retention Pond - Sedimentation Facility
SFB	Sand Filter Extended Detention Basin
WQCV	Water Quality Capture Volume
GB	Grass Buffer
GS	Grass Swale

MBP	Modular Block Porous Pavement
PPD	Porous Pavement Detention

**Table I-5. El Paso County Sensitive<sup>1</sup>Waters**

Stream and Segment	Parameter of Concern	Specialized BMPs Required
Fountain Creek and tributaries above Monument Creek	E. coli and Se	None at this time
Fountain Creek from Monument Creek to Highway 47	E. coli	None at this time
Monument Creek from National Forest to Fountain Creek	Se	None at this time
Willow Springs Pond #1 and #2	PCE	None at this time

<sup>1</sup> CDPHE 2006 303(d) list. Standard agreement forms for Private Detention Basins are in Appendix G. [This list may change in the future. The 303(d) list or equivalent in effect at the time of permitting will apply.]

Potential high-risk sites must also incorporate specialized BMPs. High-risk sites are defined by two factors:

- Sites with land uses involving the potential for significant deposition of pollutants.
- Sites without practices to eliminate exposure of pollutants to stormwater.

Land uses involving the potential for significant deposition of pollutants include, but are not limited to:

- Vehicle maintenance facilities,
- Gas stations,
- Automobile salvage yards and junk yards,
- Commercial sites with high levels of "in and out" traffic such as fast-food restaurants and convenience stores.

Many industrial facilities are required to obtain coverage under an industrial stormwater permit; these facilities include automobile salvage yards. Practices to eliminate exposure of pollutants to stormwater may or may not be part of an industrial stormwater permit. These practices include coverage of material storage

areas, berms around tanks, spill control plans, and other "good housekeeping" measures. For industrial sites where stormwater is not exposed to pollutants, structural BMPs, including detention ponds for water quality and other BMPs discussed below, may not be required.

Because stormwater pollutants are often transported with sediment, erosion protection and sediment control are necessary for stormwater quality protection. This is very important in the County because of the sandy soils in the region. In particular, discharges that may impact sensitive waters or that come from potentially high-risk sites should have a high level of sediment protection. Thus, in addition to the specialized BMPs, sediment control practices such as revegetation, grading to prevent steep side slopes, check dams, slope drains, and sediment basins should be employed where practical.

**Box 5:** No BMPs are required other than stabilized drainageways and possibly MDCIA.

**Box 6:** Specialized BMPs are required and therefore proceed to Box 7 on Table I-1.

**Box 7:** BMPs that employ infiltration include porous landscape detention and sand filter basins without underdrains. Certain conditions preclude the use of these types of BMPs, including close proximity of groundwater or relatively impervious soils to the bottom of the facility. Groundwater levels should be characterized during the season with the highest levels (often late Spring or early Summer). Impervious soils include bedrock as well as soil types C and D. The term "close proximity" means 5 feet or less. If there is less than 5 feet, a study of the hydraulic conductivity of the soils must be conducted to show that excessive groundwater mounding or direct groundwater contamination will not result from the use of BMPs that employ infiltration.

**Box 8:** If groundwater or relatively impervious soils are not within 5 feet of the surface, implement porous landscape detention (PLD) or a sand filter basin (SFB) from DCM2. Alternative BMPs can be used if shown to be equally effective as PLD or SFB (see discussion below).

**Box 9:** Implement PLDs or SFBs with underdrains, or implement a BMP with removal rates equivalent to PLDs or SFBs, including qualifying manufactured BMPs. Qualifying manufactured BMPs are those that have undergone independent tests to verify that the installation, flow volumes, and removal rates will work for the site under consideration.

**Box 10:** If the site disturbance is larger than one acre and is low density residential, then no WQCV may be required provided the site meets criteria presented in Section I.7.1. If WQCV is not required, the need for a permanent sediment control measure must still be evaluated. If the site is located near and will discharge to a sensitive water, then a "jump" to Box 4 is required for continued evaluation.

**Box 11:** Sediment is best controlled at the source. That is, rather than using structures to collect soil after it is suspended in stormwater, it is preferable to stabilize soil to prevent suspension from occurring. Sediment source controls must be implemented for all low-density developments and include (but are not limited to):

- Adequately established vegetation per DCM1 criteria,
- Side slopes that are 3 horizontal to 1 vertical or flatter or the use of benched side slopes when slopes are steeper than 3 horizontal to 1 vertical,
- The use of erosion control blankets to aid establishment of vegetation,
- Check dams,

- Slope drains.

Temporary irrigation and maintenance of vegetation until adequately established may be required.

**Box 12:** In low density (rural) subdivisions, a method for permanent sediment control must be provided. If a detention pond is used, the forebay is to be sized according to the criteria for Extended Detention Basins. If a detention pond/Extended Detention Pond is not required, a sediment basin as described in DCM2, page 3-32 may be used. It should be sized to collect 1,800 cubic feet per acre of disturbed area. Drainage area above a sediment basin can be reduced by use of vegetated swales, buffers, or contour berms.

**Box 13:** If there are no detention ponds, separate sediment control measure must be located to catch all runoff leaving the disturbed area of the site.

**Box 14:** In cases where a detention pond is already required for controlling the volume of runoff, a sediment basin can take the form of a forebay to this pond.

**Box 15:** Regional WQCV facilities may only be used if they meet the requirements of Section I.7.1.C.

**Box 16:** The site is required to direct all runoff through grass buffers and/or grass swales or provide a similar BMP. (Note that this is required in accordance with the CDPHE guidance manual to afford some protection to state waters in between the site and the downstream WQCV BMP.)

**Box 17:** Grass buffers require irrigation in almost all cases in the County; swales sometimes require irrigation.

**Box 18:** "Dry" alternatives may be used if they are shown to have equivalent removal rates as buffers and swales. All of the structural treatment BMPs in DCM2 (Section 4.2) have equivalent removal rates and may be used. The covering of storage/handling areas and spill containment and control are not structural treatment BMPs, and thus are not substitutes for grass buffers and swales.

**Box 19:** If there is no regional WQCV facility downstream with adequate capacity to provide the WQCV for the proposed site, then a WQCV control measure must be provided for the site. Examples of potentially acceptable control measures include Extended Detention Basin, Full Spectrum Detention Basin, Sand Filter Basin, Constructed Wetland Basin, or a Retention Pond. For all ponds, issues related to dam construction and potential groundwater infiltration must be considered. Retention Ponds must be considered in the context of additional issues including safety and health (e.g., drowning and mosquito/West Nile virus) and water rights. For all structures that may hold water for more than 72 hours with an exposed water surface, water storage rights must be obtained before a structure (e.g. retention pond) can be proposed for a site. See Sections 3.2.5.F and 3.3.7 of this ECM for additional information regarding water right and permanent stormwater quality control measures.

**Box 20:** Sites tributary to sensitive waters must meet the requirements as outlined in Table I-5, and potential high-risk sites must have specialized BMPs.

**Box 21:** No additional BMPs are required other than WQCV-based BMPs. Also, as always, drainageways must be stabilized and runoff should be reduced as much as possible (Boxes 1 and 2).

**Box 22:** When specialized BMPs are required, proceed to Box 23 on Figure I-2.

**Box 23:** Two situations apply, one where conditions preclude the installation of BMPs that employ infiltration, and one where they do not. (See Box 7.) If conditions preclude the installation of BMPs that employ infiltration then proceed to Box 25; otherwise proceed to Box 24.



**Box 24:** Where soil and groundwater conditions are not prohibitive (that is, groundwater or relatively impervious soils are not within 5 feet of the surface), implement PLD or SFB from DCM2. Alternative BMPs can be used if shown to be equally effective as PLD or SFB (see discussion below).

**Box 25:** Constructed wetlands (either channels or basins) are an effective BMP for sites with drainage areas greater than 10 acres.

**Box 26:** Provide a BMP downstream of the pond with equivalent removal rates as a wetland channel; this could be a qualifying manufactured BMP or other BMP that meets the criteria below.

**Box 27:** If the catchment area is greater than 10 acres, provide a constructed wetland channel (CWC) downstream of pond or provide WQCV with CWB.

**E. Projects that are Strictly Roadway Construction.** For projects that entail highway or other roadway construction, there are three basic questions for the applicant:

- Is the road urban or rural?
- That is, does the road have curb and gutter or does it utilize roadside ditches?
- For rural roads, do the ditches require "water turnouts"?
- Is the road a "hot spot" or does it discharge to sensitive waters?

For road construction projects, the applicant must determine if the roadway project is an applicable development site as defined in Section I.7.1.B. Excluded sites do not need to comply with the requirements of this Section I.7. If a roadway construction project is an applicable development site, then the owner must determine which base design standard is appropriate for the project and must design and implement water quality improvement with the project. Requirements for roadway projects included in the DCMV1 may be used provided they do not conflict with other provisions of this Section I.7.

Rural roads, i.e. those roads which utilize roadside ditches for conveyance of runoff from the roadway, do not have sufficient capacity in the roadside ditches to convey much more runoff than that which runs off the road itself. Rural roads (which by definition have roadside ditches) must be stabilized with one of three methods included in DCM2 on pages 4-3 and 4-4. These methods are described in DCMV1. "Water turnouts," which function as spillways which direct flow out of the ditches onto property adjacent to the ROW, are frequently required as a result. Design for the "water turnout" should ensure the turnout discharges into a "suitable outfall" as described in DCM1 along the roadway such as a natural swale. A drainage easement for this runoff must be acquired at these locations. A possible consequence of "water turnouts" is the loading of sediment onto private property. If "water turnouts" will be utilized for the ditches, sediment basins shall be used at these locations. However, there must be sufficient space in the ROW for both the structure itself and for maintenance access, or a specific drainage easement must be provided for the feature and access. Sediment basins can be designed in accordance with the guidelines in DCM2 in the section for construction BMPs. The basin shall be sized to collect 1,800 cubic feet of sediment per acre of drainage area of the roadway.

The term "high risk site" can be defined by traffic volume for a section of roadway. If the road will experience traffic volume of 30,000 average daily traffic (ADT) or more it is likely to contribute high levels of pollutants. For these situations, additional BMPs are required and selection must follow Boxes 6, 7, 8, and 9 in Figure 1b. Additional BMPs may also be required for discharge to sensitive waters. As described above for the general developments (with building pads), these additional requirements will depend on the TMDL process.

F. **Additional Guidelines for BMP Selection.** Additional Guidelines for selecting among the appropriate BMPs derive from Figure I-1 and Figure I-2. Figure I-3 (Figure ND-7 in DCM2) depicts a decision tree for selecting one of the six BMPs based on drainage catchment area and whether water is available to satisfy evapotranspiration requirements. Porous pavement and porous landscape detention are generally suited for small drainage areas (i.e. much less than 10 acres); however, larger subwatersheds can be subdivided into individual drainage sub-catchment areas meeting criteria shown in Figure I-3 for these BMPs.

WQCV control measures and Regional WQCV control measures shall be located prior to the stormwater runoff being discharged to State Waters. When using a Regional WQCV facility for a site, the site may discharge to a water of the state before being discharged to the Regional WQCV facility; however, the conditions in Section I.7.1.C.5 shall be met.

Figure I-4 (Figure ND-8 in DCM2) provides an illustration of selection and location options for WQCV facilities based on the principles discussed above.

Figure I-6 (Table ND-1 in DCM2) indicates the BMP options for the four watershed areas shown in Figure I-4.

### I.7.3. Incorporating WQCV into Stormwater Detention Structures

Wherever possible, it is recommended that WQCV facilities be incorporated into stormwater quantity detention facilities. This is relatively straightforward for an extended detention basin, constructed wetland basin, and a retention pond. When combined, the 2, 5, 10, and 100-year detention levels are provided above the WQCV and the outlet structure is designed to control two or three different releases. Stormwater quantity detention could be provided above the WQCV for porous pavement and landscape detention provided the drain times for the larger events are kept short.

The following approaches are to be implemented when incorporating WQCV into stormwater quantity detention facilities:

1. **Water Quality.** The full WQCV is to be provided according to the design procedures documented in the New Development BMP Factsheets.
2. **Minor Storm.** The full WQCV plus the full minor storm quantity detention volume is to be provided.
3. **100-Year Storm.** One-half the WQCV plus the full 100-year detention volume is to be provided.

For linear projects and projects with limited space available for permanent water quality control measures, WQCV may be included in the design of underground detention structures such as sand filter basins (SFB) and proprietary underground detention structures. These systems rely on appropriate soil conditions to infiltrate or evapotranspire the WQCV.

It is extremely important that high sediment loading and compaction of underlying soils in the area to be used for infiltration be controlled to the maximum extent practicable. These structures are best suited to being brought on line at the end of the construction phase where disturbed ground has been stabilized with pavement or vegetation.

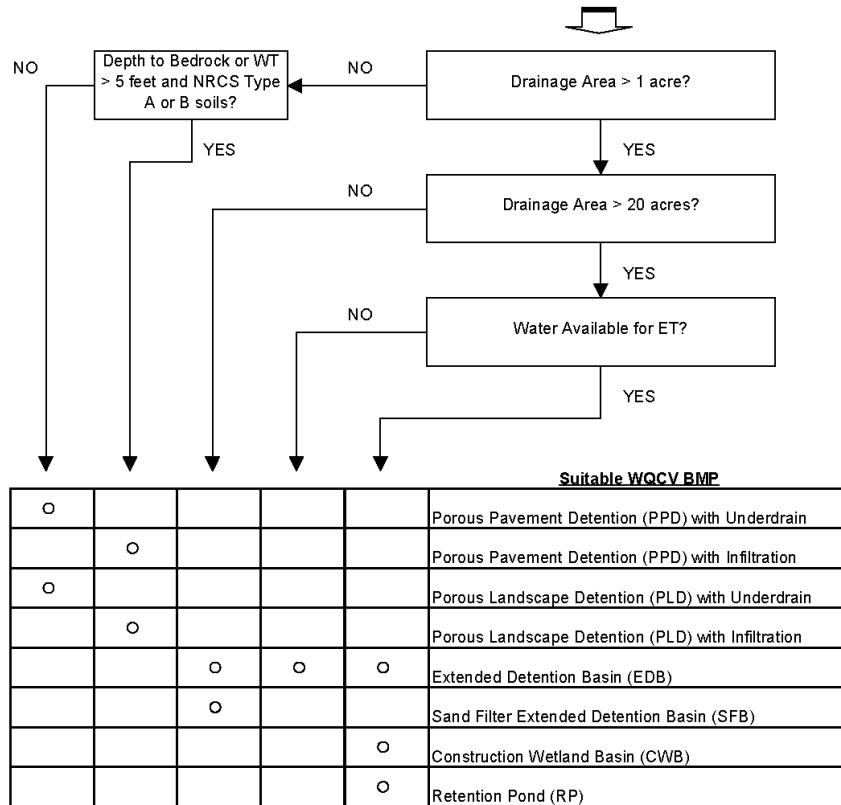
Any underground detention facilities proposed for use in the County must meet the good engineering, hydrologic and pollution control practices as defined in this Section I.7. The design of underground detention that incorporates WQCV shall not commence until a Request for Deviation is submitted for review and approved by the ECM Administrator. In addition to the approval criteria for a deviation request provide in Chapters 1 and 5 of this ECM, the owner or authorized agent must provide a structure-specific Operation and Maintenance (O&M)

Manual and maintenance agreement for the structures. The Operation and Maintenance Manual shall include specific procedures and equipment that will be used by the owner or authorized representative to operate and maintain the structures. A specification sheet or generic O&M manual provided by the vendor will not satisfy the O&M Manual requirement.

**I.7.4. Separate Presedimentation Facilities**

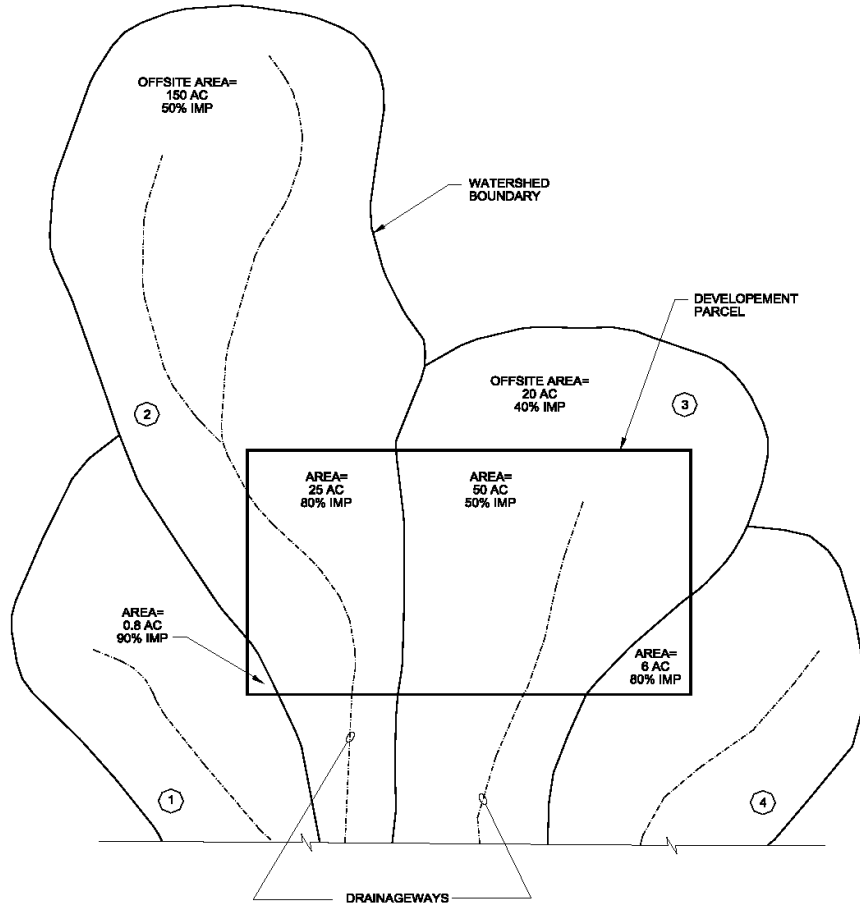
The design criteria shown in the New Development BMP Factsheets section shows presedimentation forebays at the upstream end of the extended detention basin, constructed wetland basin, and retention pond. The purpose of the forebay is to settle out coarse sediment and skim off floatables prior to the main body of the facility. An option to this approach is to install a separate facility upstream from the main WQCV facility. If this option is selected, the recommended size is at least 20 percent of the WQCV and the recommended drain time is 1 hour for the presedimentation forebay volume only. Using this approach, any requirement for sediment storage in the main facility may be reduced consistent with the storage capacity of the separated presedimentation forebay, and the forebay within the main facility may be eliminated.

**Figure I-3. Decision Tree for WQCV BMP Selection**



Note: Large drainage areas may be subdivided into areas < 20 acres for use of SFB or < 1 acre for use of PPD or PLD.

Figure I-4. Illustration of Selection and Location Options for WQCV Facilities



Note: For this example, sufficient make-up water exists for constructed wetlands and retention pond for the watershed areas > 50 acres through irrigation return flows.

Table I-7. Illustration of Selection and Location Options for WQCV Facilities for the Development Parcel on Figure I.4

Watershed Number	Onstream or Offstream	BMP Options	Minimum Number of BMP Installations	Average Drainage Area for Sizing each BMP, acre
1	Offstream	Porous Pavement Detention	1	0.8
		Porous Landscape Detention	1	0.8
2	Offstream	Porous Pavement Detention	24	1
		Porous Landscape Detention	24	1
		Extended Detention Basin	2	12
		Sand Filter Extended	2	12
		Detention Basin		

3	Offstream	Porous Pavement Detention	49	1
		Porous Landscape Detention	49	1
		Extended Detention Basin	2	24
		Sand Filter Extended Detention Basin	3	16
	Onstream	Extended Detention Basin	1	70
		Constructed Wetland Basin	1	70
		Retention Pond	1	70
4	Offstream	Porous Pavement Detention	6	1
		Porous Landscape Detention	6	1
		Extended Detention Basin	1	6
		Sand Filter Extended Detention Basin	1	6

**I.7.5. Structural BMP Effectiveness**

Table I-7 (Table ND-2 in DCM2) indicates ranges of removal efficiencies reported in literature for a number of structural BMPs. Although combinations of nonstructural/structural BMPs can improve the overall water quality of the runoff, the effectiveness of several BMPs in their ability to reduce influent pollutant concentrations as a group are not directly additive. Table I-7 also shows a most probable range of removal efficiencies for structural BMPs.

**I.7.6. Separation Distances**

To reduce potential for surface and ground water contamination, permanent water quality BMPs will be located away from wells and Individual Sewage Disposal Systems (ISDS). Rules for separation distances and grouting depths for wells and BMPs will be based on distances between wells and "sources of contamination" in Colorado's Rules and Regulations for Water Well Construction, Pump Installation, and Monitoring and Observation Hole/Well Construction. Permanent BMPs and ISDS will be separated by the same distances specified between the components of the ISDS and "waterways" in the El Paso County ISDS regulations. Additional separation distance may be required when a permanent stormwater quality control measure is located near a water of the state and relies on a vegetated buffer strip as part of the strategy to address WQCV prior to discharge to waters of the state.

**Table I-8. BMP Pollutant Removal Ranges for Stormwater Runoff and Most Probable Range for BMPs**

Type of BMP	(1)	TSS	TP	TN	TZ	TPb	BOD	Bacteria
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Grass Buffer	LRR: EPR	10-50	0-30	0-10	0-10	N/A	N/A	N/A
		10-20	0-10	0-10	0-10	N/A	N/A	N/A
Grass Swale	LRR: EPR	20-60	0-40	0-30	0-40	N/A	N/A	N/A
		20-40	0-15	0-15	0-20	N/A	N/A	N/A
Modular Block Porous Pavement	LRR: EPR	80-95	65	75-85	98	80	80	N/A
		70-90	40-55	10-20	40-80	60-70	N/A	N/A
Porous Pavement Detention	LRR: EPR	8-96	5-92	-130-	10-98	60-80	60-80	N/A
		70-90	40-55	85 10-20	40-80	60-70	N/A	N/A
Porous Landscape Detention	LRR: EPR	8-96	5-92	-100-	10-98	60-90	60-80	N/A
		70-90	40-55	85 20-55	50-80	60-80	N/A	N/A
Extended Detention Basin	LRR: EPR	50-70	10-20	10-20	30-60	75-90	N/A	50-90
		55-75	45-55	10-20	30-60	55-80	N/A	N/A
Constructed Wetland Basin	LRR: EPR	40-94	-4-90	21	-29-82	27-94	18	N/A
		50-60	40-80	20-50	30-80	40-80	N/A	N/A
Retention Pond	LRR: EPR	70-91	0-79	0-80	0-71	9-95	0-69	N/A
		80-90	45-70	20-60	20-60	60-80	N/A	N/A
Sand Filter Extended Detention	LRR: EPR	8-96	5-92	-129-	10-98	60-80	60-80	N/A
		80-90	45-55	84 35-55	50-80	60-80	60-80	N/A
Constructed Wetland Channel*	LRR: EPR	20-60	0-40	0-30	0-40	N/A	N/A	N/A
		30-50	20-40	10-30	20-40	20-40	N/A	N/A

Ref: Bell et al. (1996), Colorado (1990), Harper & Herr (1992), Lakatos & McNemer (1987), Schueler (1987), Southwest (1995), Strecker et al. (1990), USGS (1986), US EPA (1983), Veenhuis et al. (1989), Whipple and Hunter (1981), Urbonas (1997).

(1) LRR Literature reported range, EPR—expected probable range of annual performance by DCM2 BMPs.

N/A Insufficient data to make an assessment.

\* The EPR rates for a Constructed Wetland Channel assume the wetland surface area is equal or greater than 0.5% of the tributary total impervious area.

### I.7.7. Operation and Maintenance of Best Management Practices

A. **Long-term Operation and Maintenance of Post-Construction Stormwater Management Structures.** The El Paso County Phase II MS4 Permit requires the County to ensure the long-term operation and maintenance of all post-construction stormwater management control measures constructed by an applicable development site. Part I E.4.a.vi of MS4 permit states:

"vi. Construction Inspection and Acceptance: The County must implement inspection and acceptance procedures to ensure that control measures are installed and implemented in accordance with the site plan and include the following:

- (A) Confirmation that the completed control measure operates in accordance with the approved site plan.
- (B) All applicable development sites must have operational permanent water quality control measures at the completion of the site. In the case where permanent water quality control measures are part of future phasing, the County must have a mechanism to ensure that all control measures will be implemented, regardless of completion of future phases or site ownership. In such cases, temporary water quality control measures must be implemented as feasible and maintained until removed or modified. All temporary water quality control measure must meet one of the design standards in Part I.E.4.a.iv.

For the purpose of this section, completion of a site or phase shall be determined by the issuance of a certificate of occupancy, use of the completed site area according to the site plan, payment marking the completion of a site control measure, the nature of the selected control measure or equivalent determination of completion as appropriate to the nature of the site."

For all structures approved by El Paso County which are not public improvements, the property owner or authorized agent shall be responsible for the operation and maintenance of all permanent stormwater quality control measures. All temporary control measures required during construction shall be removed after construction activity on the site has been completed and final stabilization of the site is achieved.

Prior to approval of a subdivision, issuance of a Certificate of Occupancy, or closure of the ESQCP for sites that did not go through the subdivision review process that have permanent post-construction stormwater quality control measures, a signed private maintenance agreement for permanent BMPs must be submitted to and recorded by the County. El Paso County uses these agreements as the primary mechanism to ensure the long-term operation and maintenance of post construction stormwater quality control measures. Agreement templates are found in Appendix G.

During construction a County Stormwater Inspector will inspect structures for conformance with approved construction plans and the SWMP. Once the structure has been accepted into the County Permanent Stormwater Quality Control Measure Inventory consistent with Chapter 5, control measures will be inspected at minimum once every five (5) years. All inspections will be conducted as described in Section I.5.

Confirmation that post-construction stormwater quality control measures operate according to approved plans occurs through the use of an inflow hydrograph routed through a basin model. This analysis and the resulting hydrograph shall be performed by the Engineer of Record for the owner or authorized agent of the applicable development site and provided with Final Drainage Report included in the development plan submitted to the County. If the ECM Administrator determines that significant changes to the approved plans are identified in the "as-built" drawings provided in conformance with Section 5.10.6, an additional inflow hydrograph based on the "as-built" changes shall be provided to the County to confirm that the changes made during construction did not negatively alter the effective operation of the control measure.

If during an inspection of a post-construction stormwater quality control structure it is determined and documented by a County Stormwater Inspector that any owner or authorized agent failed to adequately operate and maintain a permanent stormwater quality control measures or remove the temporary control measures, an enforcement action described in Section I.6 shall be pursued.

- B. **Operation and Maintenance Manual.** A detailed Operation and Maintenance Manual covering inspections, operation and maintenance of permanent BMPs will be provided to the party who holds the Private Maintenance Agreement for Permanent BMPs. The Operation and Maintenance Manual will include specifics on frequency of inspections and maintenance; standards for vegetation or structures, such as species of vegetation, mowing height, revegetation of worn or eroded areas, cleaning methods; depth of sediment requiring removal; replacement frequencies; and other relevant topics.

(Res. No. 19-245, 7-2-19)




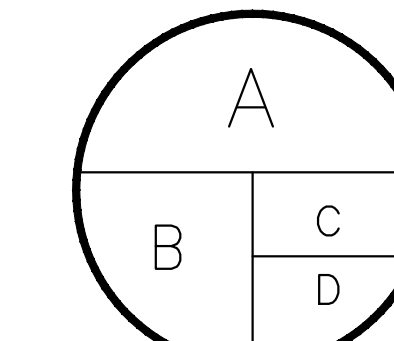
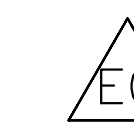

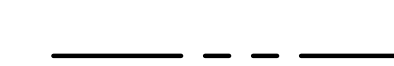

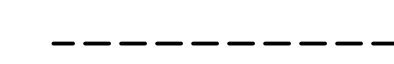

***APPENDIX E: DRAINAGE MAPS***



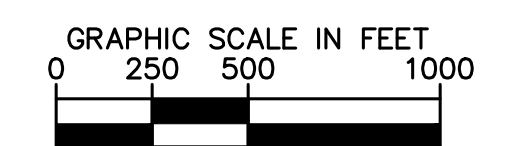
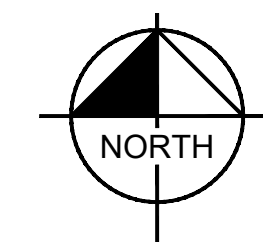
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### LEGEND

-  DRAINAGE BASIN AREAS
- 
  - A - HEC-HMS BASINS
  - B - BASIN ACREAGE
  - C - 5-YR RUNOFF
  - D - 100-YR RUNOFF
-  DESIGN POINT
-  EXISTING CONTOURS
-  PROPERTY BOUNDARY
-  FLOW ARROW
-  FLOW PATH
-  PARCEL LINE

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)
	B1	5.55	3.0	8.5	-	-
J1	OB1	10.37	7.1	18.8	10.1	27.3
	B2	41.43	15.4	48.5	-	-
	OB2	28.06	20.6	52.7	-	-
	OB3	43.44	25.3	67.1	-	-
J2	OB4	10.50	7.5	18.9	67.5	183.8
	OB5	143.82	36.8	106.9	-	-
	OB6	118.40	40.8	113.2	-	-
J4	OB7	421.43	101.4	284.2	169.2	478.0
	B3	59.54	36.4	110.0	-	-
	B4	14.68	5.4	18.2	-	-
J3	OB8	33.07	19.5	51.6	183.1	515.5



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DESIGNED BY: MK  
 DRAWN BY: RS  
 CHECKED BY: KK  
 DATE: 12/06/2022

EAGLEVIEW  
 EL PASO COUNTY, COLORADO  
 PRE DEVELOPMENT DRAINAGE MAP

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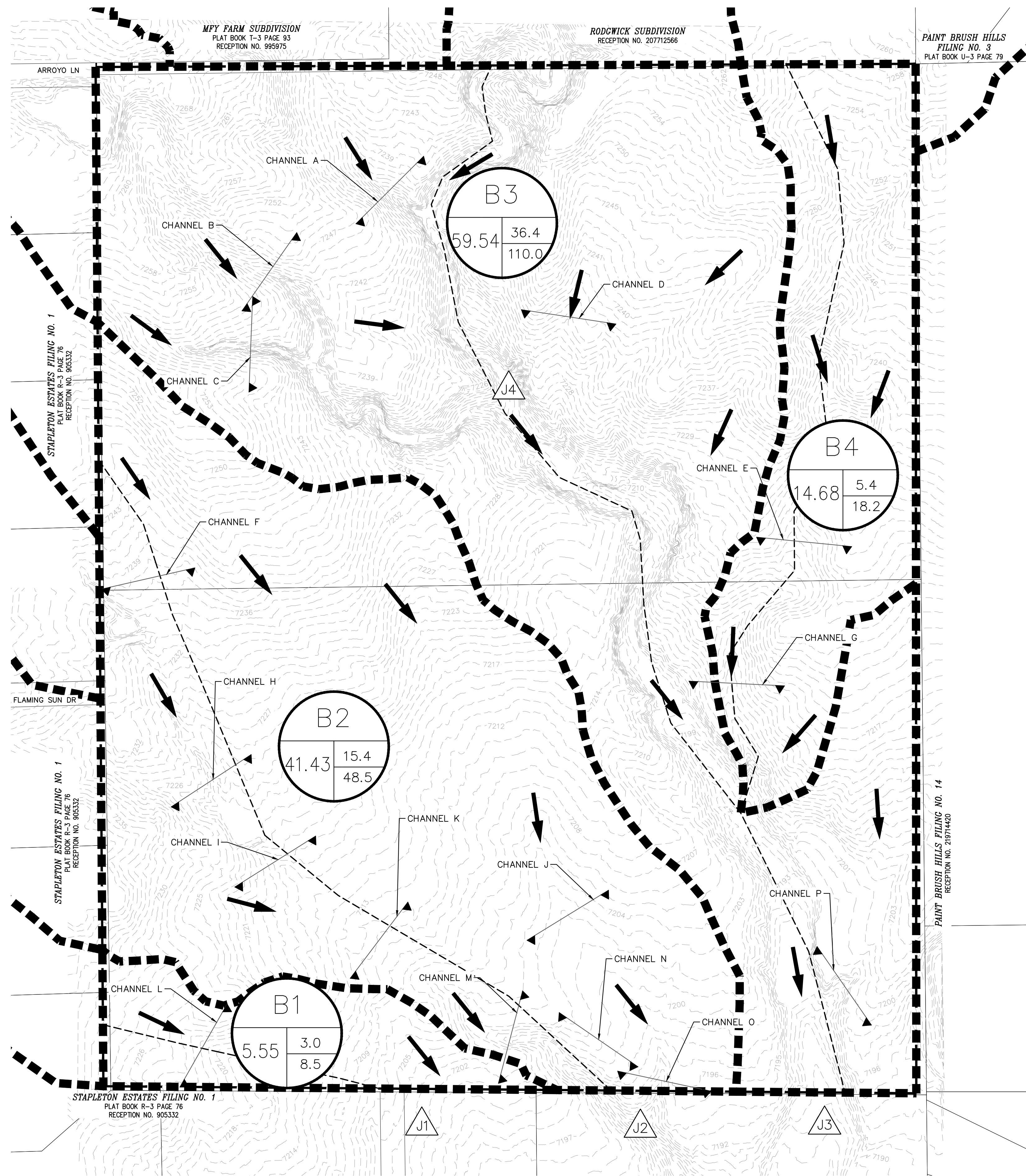
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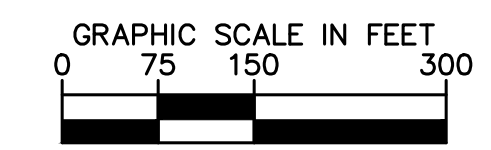
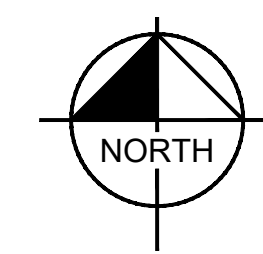
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### LEGEND

- DRAINAGE BASIN AREAS
- A - HEC-HMS BASINS
  - B - BASIN ACREAGE
  - C - 5-YR RUNOFF
  - D - 100-YR RUNOFF
- DESIGN POINT
- EXISTING CONTOURS
- PROPERTY BOUNDARY
- FLOW ARROW
- FLOW PATH
- EXISTING CHANNEL CROSS SECTIONS

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)
	B1	5.55	3.0	8.5	-	-
J1	OB1	10.37	7.1	18.8	10.1	27.3
	B2	41.43	15.4	48.5	-	-
	OB2	28.06	20.6	52.7	-	-
	OB3	43.44	25.3	67.1	-	-
J2	OB4	10.50	7.5	18.9	67.5	183.8
	OB5	143.82	36.8	106.9	-	-
	OB6	118.40	40.8	113.2	-	-
J4	OB7	421.43	101.4	284.2	169.2	478.0
	B3	59.54	36.4	110.0	-	-
	B4	14.68	5.4	18.2	-	-
J3	OB8	33.07	19.5	51.6	183.1	515.5



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 DATE: 12/06/2022

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 EL PASO COUNTY, COLORADO  
 PRE DEVELOPMENT DRAINAGE MAP

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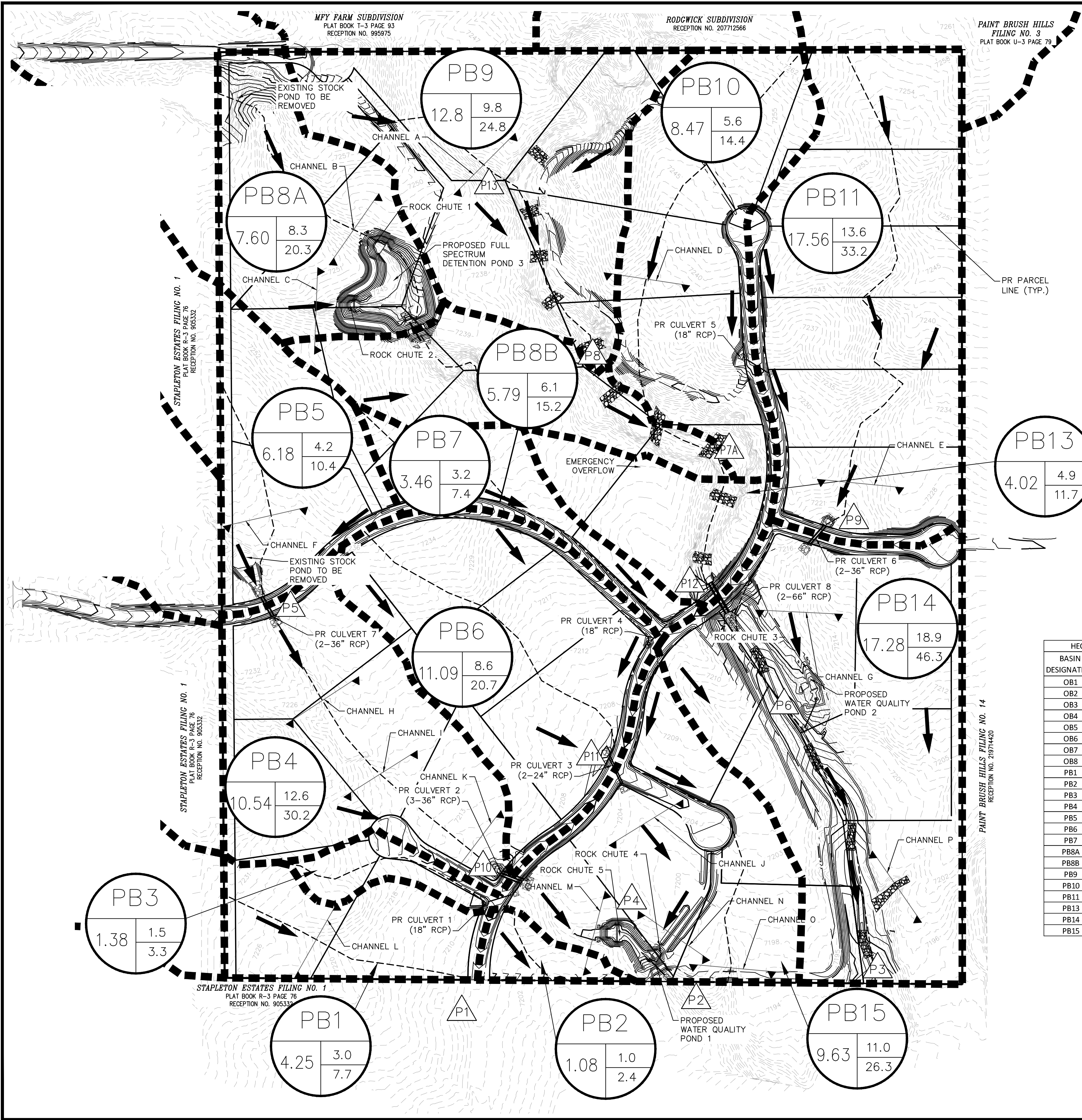
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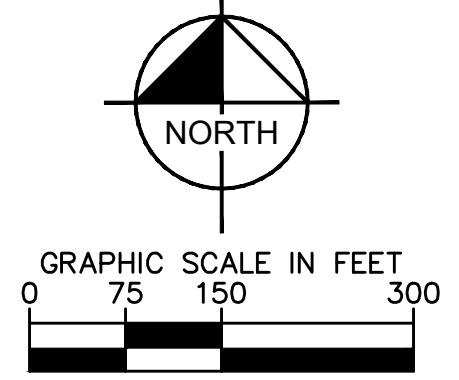


### LEGEND

- 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
- FLOW PATH
- PROPOSED CHANNEL CROSS SECTIONS
- CONCRETE CHECK STRUCTURE (10)
- RIFFLE DROP STRUCTURE (5)

HEC-HMS - DEVELOPED RUNOFF BASIN TABLE			
BASIN DESIGNATION	BASIN AREA (ACRES)	DIRECT 5-YR RUNOFF (CFS)	DIRECT 100-YR RUNOFF (CFS)
OB1	10.37	7.1	18.8
OB2	28.06	20.5	52.7
OB3	43.44	25.4	67.2
OB4	10.50	7.5	18.9
OB5	143.82	37.0	107.1
OB6	118.41	40.8	113.3
OB7	421.20	101.4	284.3
OB8	33.07	19.5	51.6
PB1	4.25	3.0	7.7
PB2	1.08	1.0	2.4
PB3	1.38	1.5	3.3
PB4	10.54	12.6	30.2
PB5	6.18	4.2	10.4
PB6	11.09	8.6	20.7
PB7	3.46	3.2	7.4
PB8A	7.60	8.3	20.3
PB8B	5.79	6.1	15.2
PB9	12.8	9.8	24.8
PB10	8.47	5.6	14.4
PB11	17.56	13.6	33.2
PB13	4.02	4.9	11.7
PB14	17.28	18.9	46.3
PB15	9.63	11.0	26.3

HEC-HMS - DEVELOPED RUNOFF DESIGN POINT TABLE				
DESIGN POINT	TRIBUTARY BASINS	TRIBUTARY AREA (ACRES)	CUMULATIVE 5-YR FLOW (CFS)	CUMULATIVE 100-YR FLOW (CFS)
P1	OB1, PB1	14.62	10.1	26.4
P2	OB2, OB3, OB4, PB3, PB4, PB5, PB6, PB7, PB15	124.29	72.7	185.4
P3	OB5, OB6, OB7, OB8, PB8, PB9, PB10, PB11, PB12, PB13, PB14	790.02	179.0	505.2
P4	OB2, OB3, OB4, PB3, PB4, PB5, PB6, PB7	114.66	70.8	180.8
P5 (CULVERT 7)	OB3, OB4, PB5	60.12	36.9	96.1
P6	OB5, OB6, OB7, OB8, PB8A, PB8B, PB9, PB10, PB11, PB13	772.73	177.3	500.7
P7A	OB5, OB6, OB7, PB8A, PB8B, PB9, PB10	718.08	168.5	475.7
P8	OB5, OB6, OB7, PB8, PB9, PB10	709.61	167.3	472.4
P9 (CULVERT 6)	OB8, PB11	50.63	31.8	82.3
P10 (CULVERT 2)	OB2, OB3, OB4, PB4, PB5	98.72	58.0	150.2
P11 (CULVERT 3)	PB6, PB7	14.55	11.7	28
P12 (CULVERT 8)	OB5, OB6, OB7, PB8, PB9, PB10, PB13	722.10	168.9	476.7
P13	PB9, OB6, OB7	552.40	133.8	375.0



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EL PASO COUNTY, COLORADO  
POST DEVELOPMENT - DRAINAGE MAP

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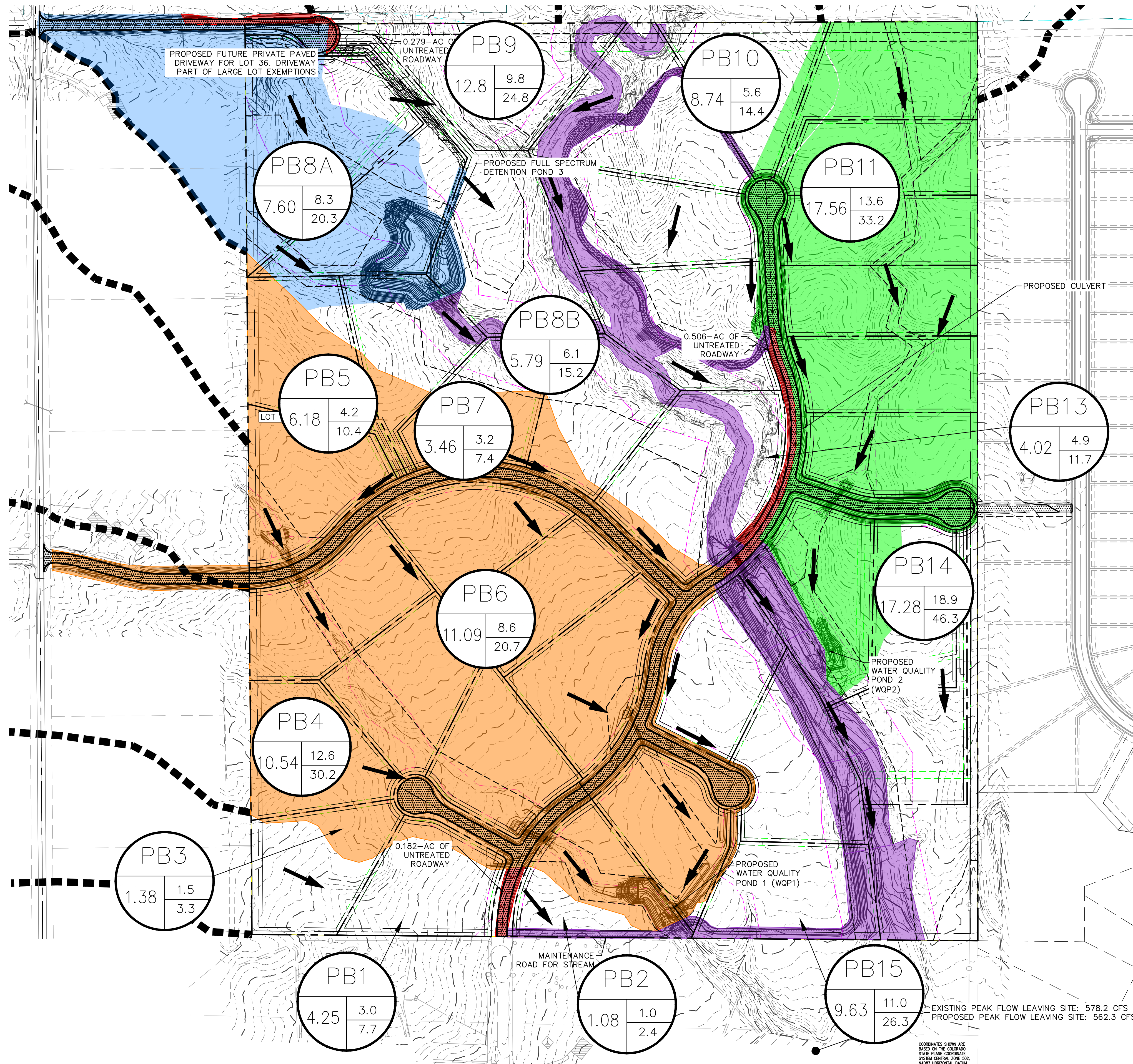
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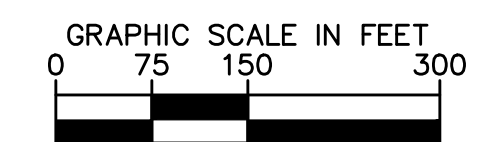
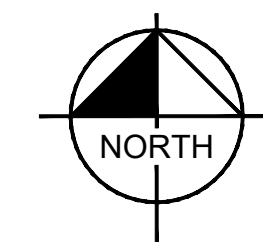


### LEGEND

- DRAINAGE BASIN AREAS
- A - HEC-HMS BASINS
  - B - BASIN ACREAGE
  - C - 5-YR RUNOFF
  - D - 100-YR RUNOFF
- EXISTING CONTOURS
- PROPOSED CONTOURS
- PROPERTY BOUNDARY
- FLOW ARROW
- FLOW PATH
- AREA TRIBUTARY TO PROPOSED FULL SPECTRUM DETENTION BASIN
- AREA TRIBUTARY TO WQ POND 1
- AREA TRIBUTARY TO WQ POND 2
- ROADWAY AREA NOT TREATED (SEE NOTE 2)
- STREAM STABILIZATION SITES NOT TREATED (SEE NOTE 3)

### NOTES:

1. NON-ROADWAY AREAS NOT TREATED BY A PBMP ARE EXCLUDED BASED ON ECM APP I.7.1.B.7 AND I.7.1.B.7 DUE TO GRADING WITHIN A DEDICATED DRAINAGE EASEMENT TO PROVIDE A PATHWAY FOR THE EMERGENCY OVERFLOW FROM THE SUB-REGIONAL POND AND A MAINTENANCE ROAD FROM TO THE WATER QUALITY PONDS #1 AND #2. THE PORTION OF THE AREA NOT WITHIN THE DRAINAGE EASEMENT WILL BE PART OF A "LARGE LOT" 2.5 ACRES OR GREATER WITH AND IMPERVIOUS PERCENTAGE LESS THAN 10%
2. ROADWAY AREA NOT TREATED BY A PBMP TOTALS 0.967 ACRES AND IS EXCLUDED BASED ON ECM APP I.7.1.C.1.
3. AREAS DISTURBED THROUGH THE CONSTRUCTION OF DROP STRUCTURES ARE EXCLUDED BASED ON ECM APP I.7.1.B.8.



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OVERVIEW MAP - PBMP TRIBUTARY AREAS

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