

**CIMARRON HILLS SOUTHEAST MIXED USE  
FILING NO. 1  
FINAL DRAINAGE REPORT**

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## **I. INTRODUCTION**

The proposed Cimarron Hills Southeast Mixed Use Filing No. 1 development is comprised of approximately 32.99 acres of land previously platted under the Softball West Subdivision No. 2 development. The site is currently not being used. It is located northeast of the intersection of Peterson Road and Highway 24. Improvements proposed by the developments will extend Meadowbrook Parkway through the site to an intersection with Peterson Road. The site is bounded to the north by the East Fork of Sand Creek. Currently, the site is comprised of three (3) parcels.

### ***a. PURPOSE AND SCOPE OF STUDY***

The purpose of this Final Drainage Report (FDR) is to evaluate the specific drainage infrastructure requirements which will provide compliance with the El Paso County Drainage Criteria Manual (DCM). This study will identify off-site, and on-site drainage patterns associated with respective land uses, provide hydrologic and hydraulic analysis of tributary basins and conveyance structures to a detention pond, and identify effective, safe routing to the downstream outfall. The improvements associated with this report maintain compliance with the DCM by providing full spectrum detention where necessary, which is to be constructed concurrently with the improvements associated with this FDR.

### ***b. DBPS RELATED INVESTIGATIONS***

The proposed development is located within the Sand Creek Drainage Basin. A Drainage Basin Planning Study (DBPS) was completed for this basin in 2021.

### ***c. GENERAL PROJECT DESCRIPTION***

The Cimarron Hills Southeast Mixed Use Filing No. 1 Subdivision is located to the northeast of the intersection of Peterson Road and Highway 24. The site is located as follows:

1. General Location: West ½ of the Southwest ¼ of Section 8, Range 65 West of the 6<sup>th</sup> P.M. in the County of El Paso, State of Colorado.
2. Drainageway: The proposed development is in the Sand Creek Drainage Basin. The site generally drains southwest eventually draining into East Fork Sand Creek at a point approximately 1,400 feet west of the site. East Fork Sand Creek is a tributary to Sand Creek which ultimately drains into Fountain Creek.
3. Surrounding Developments: The site is bounded on the east by Meadowbrook Crossing Filing No. 1 and Crossroads Mixed Use Filing No. 1, on the north by the East Fork of Sand Creek and Cimarron Southeast Filing No. 1, on the south by Highway 24 and on the west Peterson Road.
4. Lots to be Platted: The site is to be subdivided into 1 lot and 4 tracts.
5. Area of Disturbance: The proposed development is expected to disturb a total area of approximately 5.52 acres.
6. Streamside Zone: This project is not located within a streamside zone.
7. Vegetation: The site contains a small, paved area. The remainder of the site is sparsely vegetated, abandoned softball fields.

Refer to Appendix D for the Vicinity Map.

**d. SOILS CONDITIONS**

Soils can be classified in four different hydrologic groups, A, B, C, or D to help predict stormwater runoff rates. Hydrologic group “A” is characterized by deep, well-drained coarse-grained soils with a rapid infiltration rate when thoroughly wet and having a low runoff potential. Group “D” typically has a clay layer at or near to the surface, or a very shallow depth to impervious bedrock and has a very slow infiltration rate and a high runoff potential. See Soils Map, Appendix C. The following soil types are present at the site:

**Table 1.1 – NRCS Soil Survey for El Paso County – Cimarron Hills Southeast Mixed Use Filing No. 1**

<b>Soil ID Number</b>	<b>Soil</b>	<b>Hydrologic Classification</b>	<b>Drainage Class</b>	<b>Percent of Site</b>	
8	Blakeland loamy sand, 1 to 9 percent slopes	A	Well Drained	49.2%	
10	Blendon sandy loam, 0 to 3 percent slopes	B	Well Drained	50.8%	

**DATA SOURCES**

Topographical information for the development area was found using a combination of **United States Geological Survey** (USGS) mapping as well as field surveying. The **Web Soil Survey**, created by the **Natural Resources Conservation Service**, was utilized to investigate the existing general soil types within the proposed development. Offsite contours may be taken from the **2018 El Paso County LIDAR** survey and/or USGS Quad Sheets.

**e. APPLICABLE CRITERIA AND STANDARDS**

This report has been prepared in accordance with the criteria set forth in the City of Colorado Springs and El Paso County DCM, El Paso County Engineering Criteria Manual (ECM) and El Paso County Resolutions 15-042 and 19-245. In addition to the DCM, the **Urban Storm Drainage Criteria Manuals, Volumes 1 through 3**, dated 2016 have been used to supplement the County’s Criteria Manual.

**II. Hydrologic Methodology**

**a. MAJOR BASINS AND SUBBASINS**

The proposed development is located within the Sand Creek Drainage Fee Basin. Runoff presently flows overland to the southwest until reaching the Highway 24 road ditch. Flows are conveyed west along Highway 24 until reaching the East Fork of Sand Creek.

**b. METHODOLOGY**

**i. UD Methods**

The hydrology for this project uses both the **SCS Hydrograph Procedure** and the **Rational Method** as recommended by the Drainage Criteria Manual (DCM) for the minor and major storms. The Rational Method is used for drainage basins less than 100-acres in size. The Rational Method uses the following equation:

$$Q=C*i*A$$

Where:

- Q = Maximum runoff rate in cubic feet per second (cfs)
- C = Runoff coefficient
- i = Average rainfall intensity (inches per hour)
- A = Area of drainage sub-basin (acres)

Rational Method coefficients from Table 6-6 of the Drainage Criteria Manual for developed land were utilized in the Rational Method calculations. This method will be used primarily for sizing of storm sewer infrastructure. See Appendix B for more information.

### Time of Concentration

The time of concentration consists of the initial time of overland flow and the travel time in a channel to the inlet or point of interest. A minimum time of concentrations of 5 minutes is utilized for urban areas. The Rational Calculation spreadsheet included in Appendix A shows an initial overland flow length, a channel or street flow length for each sub-basin, and also demonstrates the time of concentration calculations for initial (overland) and channel (or street) conditions. A maximum “True Initial” Flow Length of 300 feet will be used for pre-developed sub-basins and a maximum length of 100 feet will be used for Developed sub-basins for time of concentration calculations in compliance with the DCM.

### Rainfall Intensity

The hypothetical rainfall depths for the 1-hour storm duration were derived using Table 6-2 of the DCM (shown below).

**Table 6-2. Rainfall Depths for Colorado Springs**

Return Period	1-Hour Depth	6-Hour Depth	24-Hour Depth
2	1.19	1.70	2.10
5	1.50	2.10	2.70
10	1.75	2.40	3.20
25	2.00	2.90	3.60
50	2.25	3.20	4.20
100	2.52	3.50	4.60

Where Z= 6,840 ft/100

The rainfall intensity equation for the Rational Method was taken from Drainage Criteria Manual Volume 1 Figure 6-5.

### C-Factors

C-factors for the Rational Method are based on anticipated land use and are taken from Table 6-6. Proposed single family residential is considered as the Single Family – 5 acres category. Areas which will be future open spaces or detention facilities are modeled under the Parks and Cemeteries

category. Undeveloped or pre-development areas are model under Undeveloped Areas-Historic Flow Analysis—Greenbelts, Agriculture category.

**ii. HGL Profile Methods**

Preliminary sizing of storm sewer has been completed using the Manning’s channel flow calculation.

To confirm DCM compliant capacity and velocity values the site has been modeled in StormCAD using the Standard head loss method and head loss values taken from Table 9-4 of the DCM. HGL profiles modeled in StormCAD are included in Appendix C.

**Table 9-4. STORMCAD Standard Method Coefficients**

Bend Loss		
Bend Angle	K Coefficient	
0°	0.05	
22.5°	0.10	
45°	0.40	
60°	0.64	
90°	1.32	
LATERAL LOSS		
One Lateral K Coefficient		
Bend Angle	Non-surcharged	Surcharged
45°	0.27	0.47
60°	0.52	0.90
90°	1.02	1.77
Two Laterals K Coefficient		
45°	0.96	
60°	1.16	
90°	1.52	

**III. Project Characteristics**

**a. MAJOR DRAINAGEWAYS**

**Sand Creek**

The proposed development is located within the Sand Creek Drainage Basin. Runoff generated within this basin presently flows overland with slopes ranging from 5 to 50% until reaching an existing natural drainage swale located within the site. This drainage swale directs the sites flows internally until discharging from the site near the northeastern corner. Drainage from the developed road will be directed to Pond 1, where the runoff will be treated for water quality and detained to maintain the historic major event discharge rate from the site.

**b. LAND USES**

The proposed site was previously platted and contained softball fields. The 31.8-acre area is entirely zoned CR CAD-O. The site will consist of one lot and four tracts, one containing the proposed Pond 1, one containing the proposed roadway, and the other two containing undeveloped land.

**IV. BASIN HYDROLOGY**

- a. The ***Pre-development conditions*** for the Proposed development have been analyzed and are presented by design points and are described as follows:

Predevelopment conditions have been analyzed using the Rational Method. Runoff generated, either on-site or off-site, drains overland towards the southwest where it is ultimately captured by the existing road ditch along Highway 24, exiting the site and releasing flows to be collected in the East Fork of Sand Creek. Generally, all undeveloped basins are considered to be vegetated with sparse grasses. A delineation of the basin boundaries can be found in Appendix D in drawings DR-01. Runoff calculations can be found in Appendix A. The existing runoff design points are described below:

**Design Point EX-1** ( $Q_5 = 6.3$  cfs,  $Q_{100} = 37.6$  cfs) (sub-basins: OS1 and EX-1; Area: 32.23 Ac.) (Slopes: 2 to 25%) This point represents the discharge from sub-basins OS1 and EX-1 under predevelopment conditions. Under the predevelopment conditions Flows generated within sub-

basins OS1 and EX-1 drain overland to the southwest. Flows are ultimately captured by the Highway 24 (Public) Road Ditch and conveyed westward, eventually reaching the East Fork of Sand Creek.

**Design Point EX-2** ( $Q_5 = 0.2$  cfs,  $Q_{100} = 1.4$  cfs) (sub-basin: EX-2; Area: 0.45 Ac.) (Slopes: 2 to 25%) This point represents the discharge from sub-basin EX-2 under predevelopment conditions. Under the predevelopment conditions sub-basin EX-2 drains to the north into East Fork Sand Creek.

**Design Point DSCH** ( $Q_5 = 6.5$  cfs,  $Q_{100} = 39.0$  cfs) (sub-basins: OS1, EX-1 and EX-2; Area: 33.68 Ac.) (Slopes: 2 to 25%) This point represents the discharge from the site under predevelopment conditions. Under the predevelopment conditions the general drainage direction is to the southwest. Flows are ultimately captured by the Highway 24 (Public) Road Ditch and conveyed westward, eventually reaching the East Fork of Sand Creek.

b. The ***fully developed conditions*** for the site are as follows:

Post development conditions have been analyzed using the rational method. Runoff drains overland and in proposed private storm sewer towards the southwestern corner of the site where developed flows will be treated in the proposed private full spectrum detention facility. Flows will be discharged into the Highway 24 road ditch which will convey the flows to the west, eventually reaching the East Fork of Sand Creek. All proposed storm is to be public unless otherwise indicated.

A delineation of the basin boundaries can be found in Appendix D in drawing DR-02. Runoff calculations can be found in Appendix A. The proposed runoff design points are described below:

**Design Point 1** ( $Q_5 = 1.3$  cfs,  $Q_{100} = 2.4$  cfs) (sub-basin: PR-3; Area: 0.32 Ac.) (Slopes: 1 to 5%) This point represents the two at grade inlets capturing runoff in basin PR-3. The inlets are sized to capture the local flows. In the unlikely event of flooding from the East Fork of Sand Creek, the flows in excess of the designed capacity of the inlets will bypass to the south along historic paths. Stormwater collected in the inlets at DP1 is conveyed downstream toward the proposed full spectrum extended detention facility via 36-inch RCP.

**Design Point 2** ( $Q_5 = 6.0$  cfs,  $Q_{100} = 10.9$  cfs) (sub-basin: PR-2; Area: 1.82 Ac.) (Slopes: 1 to 5%) This point represents the two sump inlets capturing runoff in basin PR-2. Stormwater runoff generated within sub-basin PR-2 drains overland and in curb and gutter to the two inlets at DP-2. Stormwater collected in the inlets at DP2 is conveyed downstream toward the proposed full spectrum extended detention facility via 36-inch RCP.

**Design Point 3** ( $Q_5 = 11.0$  cfs,  $Q_{100} = 23.4$  cfs) (sub-basin: PR-1; Area: 6.05 Ac.) (Slopes: 1 to 5%) This point represents the stormwater runoff generated within sub-basin PR-1 collected in a temporary Type C inlet at DP3. Development of sub-basin PR-1 is not proposed with this project. In fully developed conditions flows generated within sub-basin PR-1 will be conveyed to DP3 via future storm sewer infrastructure to be designed with the FDR for Lot 2. The temporary type C inlet collects flows from the undeveloped site which are then conveyed downstream toward the proposed detention facility via proposed 30-inch RCP.

**Design Point 4** ( $Q_5 = 12.0$  cfs,  $Q_{100} = 25.2$  cfs) (sub-basins: PR-1, PR-3; Area: 6.37 Ac.) (Slopes: 1 to 10%) This point represents the combination of flows from DP1, and DP3 in the proposed storm sewer. The combined flows will continue in the proposed public 36-inch RCP storm sewer to the east eventually discharging into the proposed detention facility.

**Design Point 5** ( $Q_5 = 17.8$  cfs,  $Q_{100} = 35.8$  cfs) (sub-basins: PR-1, PR-2, PR-3; Area: 8.19 Ac.) (Slopes: 1 to 10%) This point represents the combination of flows from DP1, DP2, and DP3 in the proposed storm sewer. The combined flows will continue in the proposed private 42-inch RCP storm sewer to the south eventually discharging into the proposed detention facility.

**Design Point 6** ( $Q_5 = 30.5$  cfs,  $Q_{100} = 62.9$  cfs) (sub-basins: PR-1, PR-2, PR-3, PR-4; Area: 15.19 Ac.) (Slopes: 1 to 10%) This point represents the discharge from sub-basins PR-1, PR-2, PR-3, and PR-4 into the proposed detention facility. Flows at DP6 have been calculated assuming fully developed conditions even though the development of sub-basins PR-1, and PR-4 is not proposed at this time. In fully developed conditions stormwater runoff generated within sub-basin PR-4 will be directed to the proposed private manhole (MH-3) via future storm sewer infrastructure to be designed with the FDR for Lot 3. In the interim condition, stormwater generated in sub-basin PR-4 drains overland to the southwest exiting the site into the existing curb and gutter along the east side of Peterson Road before continuing along historic paths.

**Design Point 7** ( $Q_5 = 41.6$  cfs,  $Q_{100} = 78.6$  cfs) (sub-basin: PR-5; Area: 14.46 Ac.) (Slopes: 1 to 10%) This point represents the discharge from sub-basin PR-5 into the proposed detention facility. Flows at DP7 have been calculated assuming fully developed conditions even though the development of sub-basin PR-5 is not proposed at this time. In fully developed conditions stormwater runoff generated within sub-basin PR-5 will be directed to the proposed detention facility via future storm sewer infrastructure to be designed with the FDR for Lot 1. In the interim condition, stormwater generated in sub-basin PR-5 drains overland to the south exiting the site into the existing ditch along the north side of the Highway 24 off ramp before continuing along historic paths.

**Design Point 8** ( $Q_5 = 71.6$  cfs,  $Q_{100} = 143.6$  cfs) (sub-basins: PR-1, PR-2, PR-3, PR-4, PR-5, PR-6; Area: 31.52 Ac.) (Slopes: 1 to 10%) This point represents the discharge from the fully developed site into the proposed private Full Spectrum Extended Detention Basin located in the southwestern corner of the site (Pond 1). Stormwater is collected in Pond 1 which provides water quality treatment and detention for the site.

**Design Point 9** ( $Q_5 = 4.7$  cfs,  $Q_{100} = 31.9$  cfs) (sub-basins: PR-1, PR-2, PR-3, PR-4, PR-5, PR-6; Area: 31.52 Ac.) (Slopes: 1 to 10%) This point represents the discharge from Pond 1 in fully developed conditions. Stormwater collected in the proposed detention facility will be discharged to the Roadside ditch along the north side of the Highway 24 off-ramp before continuing along historic paths.

**Notes:**

- **MHFD-Detention Analysis for the proposed detention pond (Pond 1) which will be constructed as part of the Improvements associated with Cimarron Hills Southeast Mixed Use Filing No. 1 can be found in Appendix A of this report.**

- Tables summarizing inlet sizes and capacities, storm pipe sizes and capacities and swale capacities for the proposed improvements can be found in Appendix A and/or in the following section.
- All ponds and associated internal infrastructure are to be owned and maintained by the HOA.
- The ratio of the total site discharge in proposed conditions vs existing conditions is 0.8, representing no significant increase in flows in the proposed condition.

## V. Hydraulic Analysis

### a. Proposed Inlets

This project will use Type R inlets in both sump and at grade conditions. Sump inlet capacities were determined utilizing the nomographs available from the El Paso County Drainage Criteria Manual Volume 1 (DCM). The Type R inlet has a total depth in sump conditions of 9-inches based on a flow depth of 6-inches in the curb and gutter and an additional 3-inches of depth in the throat of the inlet. The table below lists inlets by design point and corresponding capacity. Figure 1 shows the capacities for Type R inlets in sump conditions.

<b>INLET SUMMARY</b>										
<b>CIMARRON HILLS SOUTHEAST MIXED USE FILING NO. 1</b>										
<i>DESIGN POINT or SUB-BASIN</i>	<i>SUB-BASINS/ DESCRIPTION</i>	<i>TOTAL AREA (AC)</i>	<i>INLET</i>			<i>Q(5) TOTAL INFLOW</i>	<i>Q5 INLET CAPACITY</i>	<i>Q(100) BYPASS FLOWS (cfs)</i>	<i>Q(100) TOTAL INFLOW (cfs)</i>	<i>MAX INLET CAPACITY</i>
			<i>SIZE (Ft.)</i>	<i>TYPE</i>	<i>CONDITION</i>					
1	PR-3	0.32	2 x 5'	R	AT GRADE	1.3	1.3	0.0	2.4	2.4
2	PR-2	1.82	2 x 5'	R	SUMP	6.0	22.0	0.0	10.9	22.0

Note: Inlet sizes indicated are minimums. Larger sizes may be used in the construction plans for conservative design.

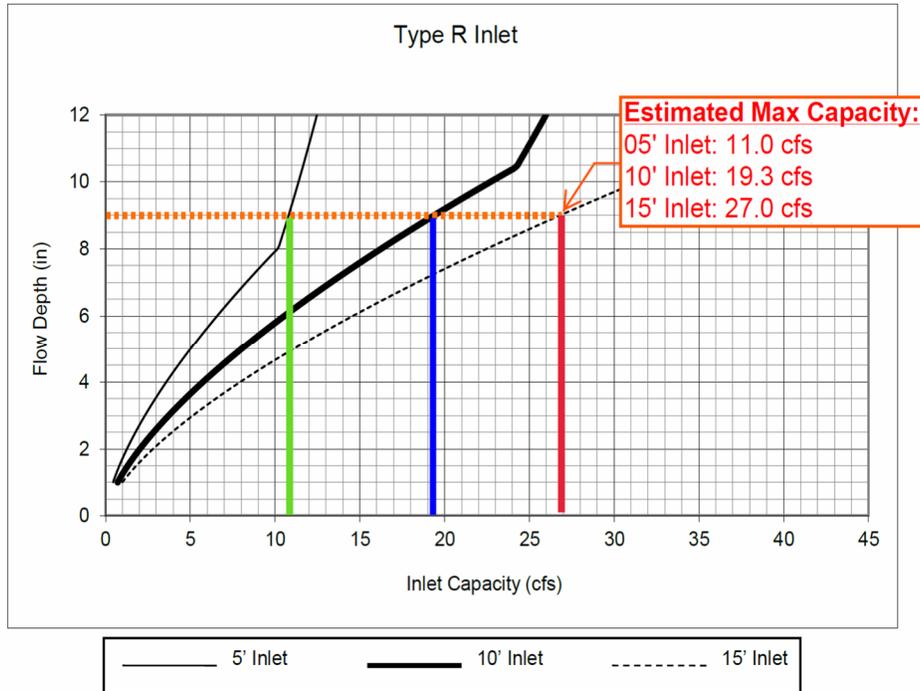


Figure 1

<i>Inlet Overflow Routing</i>	
<i>Inlet</i>	<i>Overflow Routing Under Sump Inlet Blockage Conditions</i>
2	Blockage of these inlets will force flows south along the nearby utility easement and into the proposed detention facility.

**b. Storm Pipes**

Preliminary sizing of storm sewer has been completed using the Manning’s channel flow calculation. To confirm DCM compliant capacity and velocity values the site has been modeled in StormCAD using the Standard head loss method and head loss values taken from Table 9-4 of the DCM. HGL profiles modeled in StormCAD are included in Appendix A. Outfall protection has been provided at discharge points in accordance with DCM standards. Outfall protection calculations are included in Appendix A. All outfalls have been designed to provide flow velocities consistent with a stable and suitable outfall.

**c. Detention**

The proposed private Extended Detention Basin (Pond 1) has been designed to detain stormwater flows to reduce the total site discharge to predevelopment levels. The pond will provide detention and water quality treatment for stormwater runoff generated within the Proposed development. The proposed private Forebay at the north side of Pond 1 has been sized based on the untreated WQCV calculated in the MHFD-DETENTION worksheet. The forebay calculations and MHFD-DETENTION worksheet can be found in Appendix A. The proposed private trickle channel has been sized to accommodate the release from the proposed private forebay. Trickle channel

calculations are included in Appendix A. Pond 1 will outfall to a riprap pad to the southwest. Design information including calculations are included in Appendix A. The table below summarizes the detention provided for this development.

<b>Proposed Pond Summary</b>								
<b>CIMARRON HILLS SOUTHEAST MIXED USE FILING NO. 1</b>								
Pond	Tributary Area	% Impervious	Pre-Development Peak		Pond Outflow		Pre vs. Post Ratio	
			Q5	Q100	Q5	Q100	Q5	Q100
Pond 1	31.52	74.52	9.3	40.7	4.7	31.9	0.5	0.8

**Emergency Overflow**

**Pond 1:** If the emergency overflow weir receives flows, these flows will continue downstream and drain into the roadside ditch along the north side of the Highway 24 off-ramp.

**VI. Storm Water Quality**

Per the DCM Volume 2, Section 4.1, El Paso County recommends the MHFD Four Step Process for receiving water protection that focuses on reducing runoff by disconnecting impervious area, eliminating “unnecessary” impervious area and encouraging infiltration into soils that are suitable, treat and slowly release the WQCV, stabilize stream channels, and implement source controls. The four-step process has been completed below.

**Step 1: Employ Runoff Reduction Practices.**

- Where possible runoff will be directed across and through grassed swales, however, please note that this report is for street infrastructure, which is difficult to drain across pervious areas and maintain compliance with the DCM and the County’s standard street sections.

**Step 2: Stabilize Drainageways.**

- The site is in the Sand Creek Drainage Fee Basin. Drainage fees paid at the time of initial platting help fund proposed channel improvements. Information on planned future improvements to the Sand Creek channel was unavailable for this report.

**Step 3: Provide Water Quality Capture Volume (WQCV).**

- As required by the DCM, runoff from the proposed streets which is feasible to detain, is directed into a proposed detention pond (Pond 1) via proposed storm sewer. The pond has been designed to meet the DCM standards for the release rates of Full Spectrum Detention Ponds for Water Quality Capture Volumes, and all of the other storm events listed in the MHFD- Detention spreadsheet. Exclusions are listed below:

- Disturbed areas that are not practicable to detain are excluded from WQ treatment per section I.7.1.C.1.a. This includes sub-basin NC-1 which contains 0.27 acres or 1.0% of the overall site.

**Step 4: Consider Need for Industrial and Commercial BMPs.**

- There are no commercial or industrial components of this development, therefore no BMPs of this nature are required.

## **VII. Erosion Control Plan**

A grading and erosion control plan (GEC) for the proposed improvements will be submitted for review as a separate submittal. These plans will incorporate straw wattles, straw bale check dams, silt fence, vehicle tracking control, inlet & outlet control, sedimentation basins and other best management practices (CMs) identified in the DCM Volume 2.

## **VIII. Floodplains**

Per the *Flood Insurance Rate Maps (FIRM) 08041C0752 G & 08041C0754 G*, effective date December 7, 2018, published by the Federal Emergency Management Agency (FEMA), East Fork Sand Creek, a Tributary to Sand Creek runs along the northern bound of the Cimarron Hills Southeast Mixed Use Filing No. 1 area and has designated 100-year floodplain. The developed portion of the site is generally not touched by the 100 year floodplain, however the road improvements associated with this site will cross the FEMA floodplain along the western portion of the proposed roadway. Additionally, a portion of proposed Pond 1 is to be constructed within the floodplain. Both instances of construction in the floodplain will be demonstrated to cause “no rise” in the associated base flood elevations and a “no rise” certification will be submitted with the floodplain development permit application. Refer to the map in Appendix C.

## **IX. Fee Development**

### ***a. Previously Platted Land***

The Proposed development is located within the Sand Creek Drainage Fee Basin and within previously platted land. The 2024 Drainage Basin Fees for the Sand Creek Drainage Fee Basin are: \$25,632/impervious acre for the Drainage Fee and \$10,484.00/impervious acre for the Bridge Fee. Drainage fees were paid at the time of the initial plat so no fees are due at this time.

Cost Estimate

Table 9.1

<b>Engineer's Estimate of Probable Construction Costs</b>				
<b>SAND CREEK</b>				
<b>CIMARRON HILLS SOUTHEAST MIXED USE FILING NO. 1</b>				
<b>Private Non-Reimbursable</b>				
Item	Unit	Quantity	Unit Cost	Extension
18" RCP/HP	LF	56	\$82.00	\$4,592.00
24" RCP/HP	LF	57	\$98.00	\$5,586.00
30" RCP/HP	LF	97	\$123.00	\$11,931.00
36" RCP/HP	LF	545	\$151.00	\$82,295.00
42" RCP/HP	LF	711	\$201.00	\$142,911.00
30" FES	EA	1	\$738.00	\$738.00
5' Type R Inlet	EA	4	\$9,377.00	\$37,508.00
66" x 48" CCS Box Base MH	EA	5	\$15,130.00	\$75,650.00
RIPRAP	CY	90	\$135.00	\$12,150.00
Sub Total				\$373,361.00
10% Contingency				\$37,336.10
<b>TOTAL:</b>				<b>\$410,697.10</b>

<b>Engineer's Estimate of Probable Construction Costs</b>				
<b>SAND CREEK</b>				
<b>CIMARRON HILLS SOUTHEAST MIXED USE FILING NO. 1</b>				
<b>Permanent BMP (EDB): Private Non-reimbursable</b>				
Item	Unit	Quantity	Unit Cost	Extension
DETENTION POND GRADING	EA	1	\$35,000.00	\$35,000.00
3' TRICKLE CHANNEL	LF	260	\$250.00	\$65,000.00
FOREBAY	EA	1	\$40,000.00	\$40,000.00
OUTLET STRUCTURE	EA	1	\$40,000.00	\$40,000.00
EMERGENCY SPILLWAY	EA	1	\$5,000.00	\$5,000.00
Sub Total				\$185,000.00
10% Contingency				\$18,500.00
<b>TOTAL:</b>				<b>\$203,500.00</b>
<b>Overall Total</b>				<b>\$614,197.10</b>

Since the engineer has no control over the cost of labor, materials, equipment, or services furnished by others, or over the contractor's method of determining prices, or over the competitive bidding or market conditions, the opinion of probable construction costs provided herein are made on the basis of the engineer's experience and qualifications and represents the best judgment as an experienced and qualified professional familiar with the construction industry. The engineer cannot, and does not guarantee that proposals, bid or actual construction costs will not vary from the opinion of probable costs.

## **X. Summary**

This report demonstrates that the proposed infrastructure associated with Cimarron Hills Southeast Mixed Use Filing No. 1 is in conformance with the El Paso County Drainage Criteria Manual, Volumes 1 and 2, October 2018 and all previously approved studies related to the project site. Stormwater flows will generally remain the same in post-development conditions ( $Q_5 = 7.8$  cfs,  $Q_{100} = 38.7$  cfs) as in pre-development conditions ( $Q_5 = 6.5$  cfs,  $Q_{100} = 38.7$  cfs). These proposed improvements should not adversely affect downstream or surrounding developments and are in conformance with the pertinent studies for the area.

## **XI. References**

1. ***El Paso County and City of Colorado Springs Drainage Criteria Manual, Volume 1 & 2***, El Paso County, May 2014
2. ***El Paso County Engineering Criteria Manual***, El Paso County, Rev. December 2016
3. ***Web Soil Survey of El Paso County Area, Colorado. Unites States Department of Agriculture Soil Conservation Service.***
4. ***Flood Insurance Rate Maps for El Paso County, Colorado and Incorporated Areas, Panel 279 of 1275, Federal Emergency Management Agency***, Effective Date December 7, 2018.
5. ***Urban Storm Drainage Criteria Manual, Vol. 1-3*** by Urban Drainage and Flood Control District (UDFCD), January 2016

**Appendices**

**APPENDIX A**

***HYDROLOGIC AND HYDRAULIC CALCULATIONS***

Project Name: CIMARRON HILLS SOUTHEAST MIXED USE FILING NO. 1  
 Project Location: EL PASO COUNTY  
 Designer: JTS  
 Notes: EXISTING CONDITIONS

Heavy Meadow	2
Tillage/Field	3
Short Pasture and Lawns	4
Nearly Bare Ground	5
Grassed Waterway	6
Paved Areas	7

Average Channel Velocity: 4.00 ft/s (If specific channel vel is used, this will be ignored)  
 Average Slope for Initial Flow: 0.04 ft/ft (If Elevations are used, this will be ignored)

Sub-basin	Comments	Area		Soil Group	Rational 'C' Values								Flow Lengths				Tc		Rainfall Intensity & Rational Flow Rate						Sub-basin												
		sf	acres		95%				2%				Initial	True Initial	Channel	True Channel	Average (decimal)	Initial	Average (%)	Channel Flow Type (See Key above)	Velocity (ft/s)	Channel	Tc (min)	Total (min)		i2		i5		Q5		i100		Q100			
					C5	C100	Area	Percent Impervious	C5	C100	Area	Percent Impervious														ft	Length ft	ft	Length ft	Slope	Tc (min)	Slope	Ground Type	in/hr	cfs	in/hr	cfs
<b>OS-1</b>	<b>OFFSITE BASIN SOUTHWEST OF SITE. CONTAINS EXISTING HOTEL.</b>	52319	1.20	B	0.81	0.88	29246	0.09	0.36	23073	0.49	0.65	53.99	25	25	350	350	0.10	2.54	2.0	7	2.83	2.06	5.00	4.12	2.46	5.17	3.1	8.68	6.8							<b>OS-1</b>
<b>EX-1</b>	<b>UNDEVELOPED SITE AREA</b>	1395360	32.03	B	0.81	0.88		0.09	0.36	1395360	0.09	0.36	2.00	300	100	1800	2000	0.25	10.77	1.7	4	0.89	37.65	48.41	1.42	4.12	1.76	5.1	2.96	34.4							<b>EX-1</b>
<b>EX-2</b>	<b>UNDEVELOPED SITE AREA</b>	19495	0.45	B	0.81	0.88		0.09	0.36	19495	0.09	0.36	2.00	50	50	0	0	0.17	5.04	0.5	4	0.49	0.00	5.03	4.11	0.17	5.16	0.2	8.66	1.4							<b>EX-2</b>
<b>DESIGN POINTS</b>	<b>Sub-basins</b>																																				<b>DESIGN POINTS</b>
<b>EX-1</b>	<b>EXISTING SITE DISCHARGE</b>	1447679	33.23	B	0.81	0.88	29246	0.09	0.36	1418433	0.10	0.37	3.88	300	100	1800	2000	0.25	10.61	2	4	0.91	36.52	47.13	1.45	5.08	1.80	6.3	3.03	37.6							<b>EX-1</b>
<b>EX-2</b>	<b>EXISTING SITE DISCHARGE</b>	19495	0.45	B	0.81	0.88		0.09	0.36	19495	0.09	0.36	2.00	50	50	0	0	0.17	5.04	1	4	0.49	0.00	5.03	4.11	0.17	5.16	0.2	8.66	1.4							<b>EX-2</b>
<b>DSCH</b>	<b>EXISTING SITE DISCHARGE</b>	1467174	33.68	B	0.81	0.88	29246	0.09	0.36	1457928	0.10	0.37	3.85	300	100	1800	2000	0.25	10.62	2.0	4	0.99	33.67	44.28	1.52	5.40	1.90	6.5	3.18	39.0							<b>DSCH</b>

Rational Method - Proposed Conditions

Project Name: CIMARRON HILLS SOUTHEAST MIXED USE FILING NO. 1  
 Project Location: EL PASO COUNTY  
 Designer: JTS  
 Notes: PROPOSED CONDITIONS

Channel Flow Type Key

- Heavy Meadow 2
- Tillage/Field 3
- Short Pasture and Lawns 4
- Nearly Bare Ground 5
- Grassed Waterway 6
- Paved Areas 7

Average Channel Velocity 4.00 ft/s (If specific channel vel is used, this will be ignored)  
 Average Slope for Initial Flow 0.04 ft/ft (If Elevations are used, this will be ignored)

Sub-basin	Comments	Area		Soil Group	Rational 'C' Values												Flow Lengths				Tc		Rainfall Intensity & Rational Flow Rate				Sub-basin					
		sf	acres		95%		70%				2%		Composite	Percent Impervious	Initial	True Initial	Channel	True Channel	Average (decimal)	Initial	Average (%)	Channel Flow Type (See Key above)	Velocity	Channel	Total	i5		Q5	i100	Q100		
					C5	C100	C5	C100	Area	C5	C100	Area																			C5	C100
PR-1	NORTH OF MEADOWBROOK PKWY MULTIFAMILY	263491	6.05	B	0.81	0.88		0.49	0.62	263491	0.09	0.36		0.49	0.62	70.00%	100	100	640	640	0.05	6.42	2.0	7	2.83	3.77	10.19	4.10	12.3	6.89	26.0	PR-1
PR-2	MEADOWBROOK PKWY	79312	1.82	B	0.81	0.88	78822	0.49	0.62		0.09	0.36	490	0.81	0.88	94.43%	50	50	1024	1024	0.03	2.57	1.1	7	2.10	8.14	10.70	4.03	6.0	6.76	10.9	PR-2
PR-3	MEADOWBROOK PKWY	13794	0.32	B	0.81	0.88	13794	0.49	0.62		0.09	0.36		0.81	0.88	95.00%	50	50	136	136	0.02	2.93	1.1	7	2.10	1.08	5.00	5.17	1.3	8.68	2.4	PR-3
PR-4	MULTIFAMILY	304990	7.00	B	0.81	0.88		0.49	0.62	304990	0.09	0.36		0.49	0.62	70.00%	100	100	960	960	0.05	6.42	2.0	7	2.83	5.66	12.07	3.85	13.3	6.46	28.3	PR-4
PR-5	CHURCH PARCEL	630078	14.46	B	0.81	0.88	562345	0.49	0.62		0.09	0.36	67733	0.73	0.82	85.00%	100	100	1460	1460	0.10	3.07	2.0	7	2.83	8.60	11.67	3.90	41.6	6.54	78.6	PR-5
PR-6	DETENTION TRACT	81301	1.87	B	0.81	0.88		0.49	0.62		0.09	0.36	81301	0.09	0.36	2.00%	25	25	330	330	0.25	3.11	0.5	4	0.49	11.11	14.22	3.60	0.6	6.05	4.1	PR-6
NC-1	PORTION OF MEADOWBROOK PKWY IMPRACTICABLE TO DETAIN	11613	0.27	B	0.81	0.88	11613	0.49	0.62		0.09	0.36		0.81	0.88	95.00%	25	25	136	136	0.02	2.07	1.0	7	2.00	1.13	5.00	5.17	1.1	8.68	2.1	NC-1
NC-2	UNDEVELOPABLE AREA DRAINING TO THE NORTH	30344	0.70	B	0.81	0.88		0.49	0.62		0.09	0.36	30344	0.09	0.36	2.00%	25	25	188	188	0.05	5.32	12.0	4	2.42	1.29	6.60	4.75	0.3	7.98	2.0	NC-2
OS-1	OFFSITE BASIN SOUTHWEST OF SITE. CONTAINS EXISTING HOTEL	52319	1.20	B	0.81	0.88	29246	0.49	0.62		0.09	0.36	23073	0.49	0.65	53.99%	25	25	350	350	0.10	2.54	2.0	7	2.83	2.06	5.00	5.17	3.1	8.68	6.8	OS-1
DESIGN POINTS	Sub-basins																															DESIGN POINTS
DP1	MEADOWBROOK PKWY- AT GRADE INLETS	13794	0.32	B	0.81	0.88	13794	0.49	0.62	0	0.09	0.36	0	0.81	0.88	95.00%	50	50	136	136	0.02	2.93	1.1	7	2.10	1.08	5.00	5.17	1.3	8.68	2.4	DP1
DP2	MEADOWBROOK PKWY- SUMP INLETS	79312	1.82	B	0.81	0.88	78822	0.49	0.62	0	0.09	0.36	490	0.81	0.88	94.43%	50	50	1024	1024	0.03	2.57	1.1	7	2.10	8.14	10.70	4.03	6.0	6.76	10.9	DP2
DP3	LOT 2	263491	6.05	B	0.81	0.88	0	0.49	0.62	263491	0.09	0.36	0	0.49	0.62	70.00%	50	50	1024	1024	0.03	5.32	1.1	7	2.10	8.14	13.46	3.68	11.0	6.18	23.4	DP3
DP4	DP1, DP3	277285	6.37	B	0.81	0.88	13794	0.49	0.62	263491	0.09	0.36	0	0.51	0.63	71.24%	50	50	1024	1024	0.03	5.19	1.1	7	2.10	8.14	13.32	3.70	12.0	6.21	25.2	DP4
DP5	DP 2, DP3, & DP 1	356597	8.19	B	0.81	0.88	92616	0.49	0.62	263491	0.09	0.36	490	0.57	0.69	76.40%	50	50	1024	1024	0.03	4.60	1.1	7	2.10	8.14	12.74	3.77	17.8	6.32	35.8	DP5
DP6	DP4 & LOT 3	661587	15.19	B	0.81	0.88	92616	0.49	0.62	568481	0.09	0.36	490	0.53	0.66	73.45%	50	50	1375	1375	0.03	4.94	2.0	7	2.83	8.10	13.03	3.73	30.5	6.27	62.9	DP6
DP7	CHURCH PARCEL	630078	14.46	B	0.81	0.88	562345	0.49	0.62	0	0.09	0.36	67733	0.73	0.82	85.00%	100	100	1460	1460	0.10	3.07	2.0	7	2.83	8.60	11.67	3.90	41.6	6.54	78.6	DP7
DP8	INTO DETENTION POND	1372966	31.52	B	0.81	0.88	654961	0.49	0.62	568481	0.09	0.36	149524	0.60	0.72	74.52%	100	100	1460	1460	0.10	4.19	2.0	7	2.83	8.60	12.78	3.76	71.6	6.31	143.6	DP8
DP9	OUT OF DETENTION POND	1372966	31.52	B	0.81	0.88	654961	0.49	0.62	568481	0.09	0.36	149524	0.60	0.72	74.52%	100	100	1460	1460	0.10	4.19	2.0	7	2.83	8.60	12.78	3.76	4.7	6.31	31.9	DP9
DSCH	SITE DISCHARGE	1436898	32.99	B	0.81	0.88	695820	0.49	0.62	568481	0.09	0.36	172597	0.60	0.71	73.94%	100	100	1810	1810	0.10	4.20	2.0	7	2.83	10.67	14.86	3.53	7.8	5.93	38.7	DSCH

# INLET MANAGEMENT

Worksheet Protected

<b>INLET NAME</b>	DP1
Site Type (Urban or Rural)	URBAN
Inlet Application (Street or Area)	STREET
Hydraulic Condition	On Grade
Inlet Type	CDOT Type R Curb Opening

## USER-DEFINED INPUT

### User-Defined Design Flows

Minor $Q_{Known}$ (cfs)	1.3
Major $Q_{Known}$ (cfs)	2.4

### Bypass (Carry-Over) Flow from Upstream Inlets must be organized from upstream (left to right)

Receive Bypass Flow from:	No Bypass Flow Received
Minor Bypass Flow Received, $Q_b$ (cfs)	0.0
Major Bypass Flow Received, $Q_b$ (cfs)	0.0

### Watershed Characteristics

Subcatchment Area (acres)	
Percent Impervious	
NRCS Soil Type	

### Watershed Profile

Overland Slope (ft/ft)	
Overland Length (ft)	
Channel Slope (ft/ft)	
Channel Length (ft)	

### Minor Storm Rainfall Input

Design Storm Return Period, $T_r$ (years)	
One-Hour Precipitation, $P_1$ (inches)	

### Major Storm Rainfall Input

Design Storm Return Period, $T_r$ (years)	
One-Hour Precipitation, $P_1$ (inches)	

## CALCULATED OUTPUT

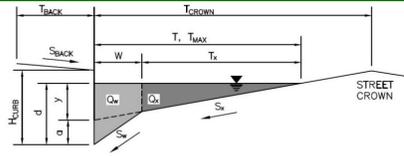
<b>Minor Total Design Peak Flow, <math>Q</math> (cfs)</b>	<b>1.3</b>
<b>Major Total Design Peak Flow, <math>Q</math> (cfs)</b>	<b>2.4</b>
Minor Flow Bypassed Downstream, $Q_b$ (cfs)	0.0
Major Flow Bypassed Downstream, $Q_b$ (cfs)	0.0

## ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project:

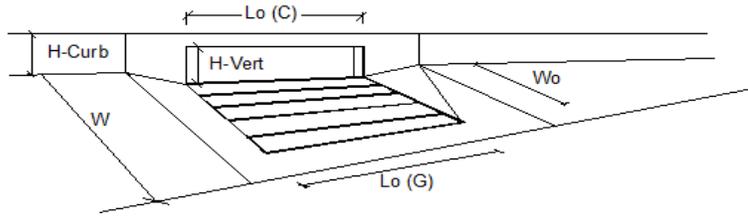
Inlet ID: **DP1**



<b>Gutter Geometry:</b>							
Maximum Allowable Width for Spread Behind Curb	$T_{BACK} = $ <input style="width: 50px; text-align: center;" type="text" value="0.0"/> ft						
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	$S_{BACK} = $ <input style="width: 50px; text-align: center;" type="text" value="0.013"/> ft/ft						
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	$n_{BACK} = $ <input style="width: 50px; text-align: center;" type="text" value="0.013"/>						
Height of Curb at Gutter Flow Line	$H_{CURB} = $ <input style="width: 50px; text-align: center;" type="text" value="6.00"/> inches						
Distance from Curb Face to Street Crown	$T_{CROWN} = $ <input style="width: 50px; text-align: center;" type="text" value="26.0"/> ft						
Gutter Width	$W = $ <input style="width: 50px; text-align: center;" type="text" value="2.00"/> ft						
Street Transverse Slope	$S_X = $ <input style="width: 50px; text-align: center;" type="text" value="0.020"/> ft/ft						
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	$S_W = $ <input style="width: 50px; text-align: center;" type="text" value="0.083"/> ft/ft						
Street Longitudinal Slope - Enter 0 for sump condition	$S_0 = $ <input style="width: 50px; text-align: center;" type="text" value="0.010"/> ft/ft						
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	$n_{STREET} = $ <input style="width: 50px; text-align: center;" type="text" value="0.013"/>						
Max. Allowable Spread for Minor & Major Storm	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center; padding: 2px;">Minor Storm</td> <td style="text-align: center; padding: 2px;">Major Storm</td> <td style="padding: 2px;"></td> </tr> <tr> <td style="text-align: center; padding: 2px;"><math>T_{MAX} = </math> <input style="width: 50px; text-align: center;" type="text" value="21.0"/></td> <td style="text-align: center; padding: 2px;"><input style="width: 50px; text-align: center;" type="text" value="26.0"/></td> <td style="text-align: right; padding: 2px;">ft</td> </tr> </table>	Minor Storm	Major Storm		$T_{MAX} = $ <input style="width: 50px; text-align: center;" type="text" value="21.0"/>	<input style="width: 50px; text-align: center;" type="text" value="26.0"/>	ft
Minor Storm	Major Storm						
$T_{MAX} = $ <input style="width: 50px; text-align: center;" type="text" value="21.0"/>	<input style="width: 50px; text-align: center;" type="text" value="26.0"/>	ft					
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center; padding: 2px;">Minor Storm</td> <td style="text-align: center; padding: 2px;">Major Storm</td> <td style="padding: 2px;"></td> </tr> <tr> <td style="text-align: center; padding: 2px;"><math>d_{MAX} = </math> <input style="width: 50px; text-align: center;" type="text" value="6.0"/></td> <td style="text-align: center; padding: 2px;"><input style="width: 50px; text-align: center;" type="text" value="9.0"/></td> <td style="text-align: right; padding: 2px;">inches</td> </tr> </table>	Minor Storm	Major Storm		$d_{MAX} = $ <input style="width: 50px; text-align: center;" type="text" value="6.0"/>	<input style="width: 50px; text-align: center;" type="text" value="9.0"/>	inches
Minor Storm	Major Storm						
$d_{MAX} = $ <input style="width: 50px; text-align: center;" type="text" value="6.0"/>	<input style="width: 50px; text-align: center;" type="text" value="9.0"/>	inches					
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center; padding: 2px;"><input type="checkbox"/></td> <td style="text-align: center; padding: 2px;"><input type="checkbox"/></td> <td style="padding: 2px;"></td> </tr> </table>	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/>	<input type="checkbox"/>						
<a href="#">MINOR STORM Allowable Capacity is based on Depth Criterion</a>							
<a href="#">MAJOR STORM Allowable Capacity is based on Spread Criterion</a>							
<b>Minor storm max. allowable capacity GOOD - greater than the design peak flow of 1.30 cfs on sheet 'Inlet Management'</b>							
<b>Major storm max. allowable capacity GOOD - greater than the design peak flow of 2.40 cfs on sheet 'Inlet Management'</b>							
$Q_{allow} = $	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center; padding: 2px;">Minor Storm</td> <td style="text-align: center; padding: 2px;">Major Storm</td> <td style="padding: 2px;"></td> </tr> <tr> <td style="text-align: center; padding: 2px;"><input style="width: 50px; text-align: center;" type="text" value="17.0"/></td> <td style="text-align: center; padding: 2px;"><input style="width: 50px; text-align: center;" type="text" value="39.3"/></td> <td style="text-align: right; padding: 2px;">cfs</td> </tr> </table>	Minor Storm	Major Storm		<input style="width: 50px; text-align: center;" type="text" value="17.0"/>	<input style="width: 50px; text-align: center;" type="text" value="39.3"/>	cfs
Minor Storm	Major Storm						
<input style="width: 50px; text-align: center;" type="text" value="17.0"/>	<input style="width: 50px; text-align: center;" type="text" value="39.3"/>	cfs					

# INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)

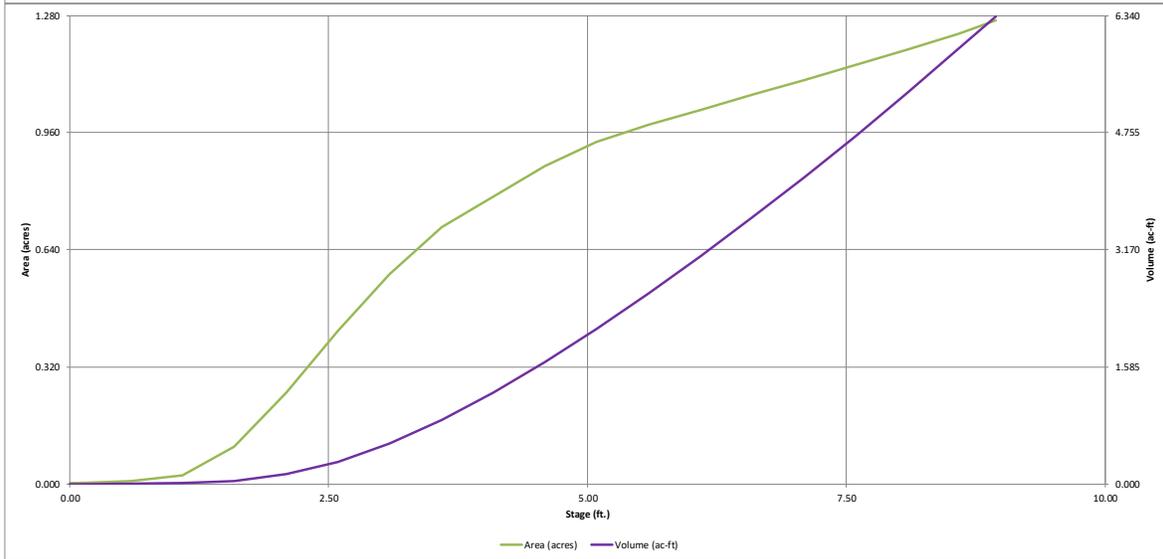
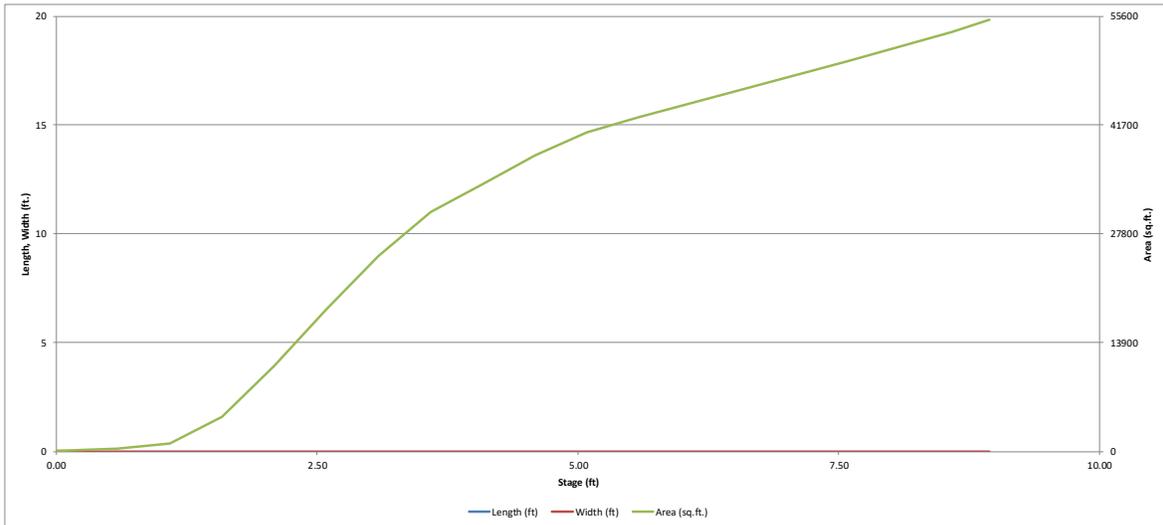


Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	2	2	
Length of a Single Unit Inlet (Grate or Curb Opening)	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity			
Total Inlet Interception Capacity	Q = 1.3	2.4	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	Q <sub>s</sub> = 0.0	0.0	cfs
Capture Percentage = Q <sub>i</sub> /Q <sub>s</sub>	C% = 100	100	%



# DETENTION BASIN STAGE-STORAGE TABLE BUILDER

*MHFD-Detention, Version 4.06 (July 2022)*

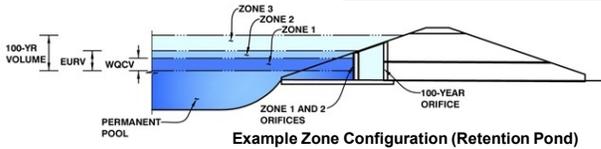


# DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-*Detention*, Version 4.06 (July 2022)

**Project: PETERSON AND MEADOWBROOK**

**Basin ID: SAND CREEK**



	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.47	0.780	Orifice Plate
Zone 2 (EURV)	5.61	1.812	Circular Orifice
Zone 3 (100-year)	6.98	1.420	Weir&Pipe (Restrict)
<b>Total (all zones)</b>		<b>4.012</b>	

**User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)**

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)
Underdrain Orifice Diameter =	N/A	inches

**Calculated Parameters for Underdrain**

Underdrain Orifice Area =	N/A	ft <sup>2</sup>
Underdrain Orifice Centroid =	N/A	feet

**User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)**

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	3.23	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	N/A	inches
Orifice Plate: Orifice Area per Row =	2.64	sq. inches (diameter = 1-13/16 inches)

**Calculated Parameters for Plate**

WQ Orifice Area per Row =	1.833E-02	ft <sup>2</sup>
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft <sup>2</sup>

**User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)**

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.50	3.00					
Orifice Area (sq. inches)	2.64	2.64	2.64					

	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 Circular	Not Selected	
Invert of Vertical Orifice =	3.47	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	5.61	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	3.00	N/A	inches

**Calculated Parameters for Vertical Orifice**

	Zone 2 Circular	Not Selected	
Vertical Orifice Area =	0.05	N/A	ft <sup>2</sup>
Vertical Orifice Centroid =	0.13	N/A	feet

**User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)**

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	5.61	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	6.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V
Horiz. Length of Weir Sides =	6.00	N/A	feet
Overflow Grate Type =	Type C Grate	N/A	
Debris Clogging % =	50%	N/A	%

**Calculated Parameters for Overflow Weir**

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H <sub>u</sub> =	5.61	N/A	feet
Overflow Weir Slope Length =	6.00	N/A	feet
Grate Open Area / 100-yr Orifice Area =	9.56	N/A	
Overflow Grate Open Area w/o Debris =	25.06	N/A	ft <sup>2</sup>
Overflow Grate Open Area w/ Debris =	12.53	N/A	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 =	0.25	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	30.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	15.80	N/A	inches

**Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate**

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	2.62	N/A	ft <sup>2</sup>
Outlet Orifice Centroid =	0.76	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	1.62	N/A	radians

**User Input: Emergency Spillway (Rectangular or Trapezoidal)**

Spillway Invert Stage =	7.00	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	38.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

**Calculated Parameters for Spillway**

Spillway Design Flow Depth =	0.95	feet
Stage at Top of Freeboard =	8.95	feet
Basin Area at Top of Freeboard =	1.27	acres
Basin Volume at Top of Freeboard =	6.33	acre-ft

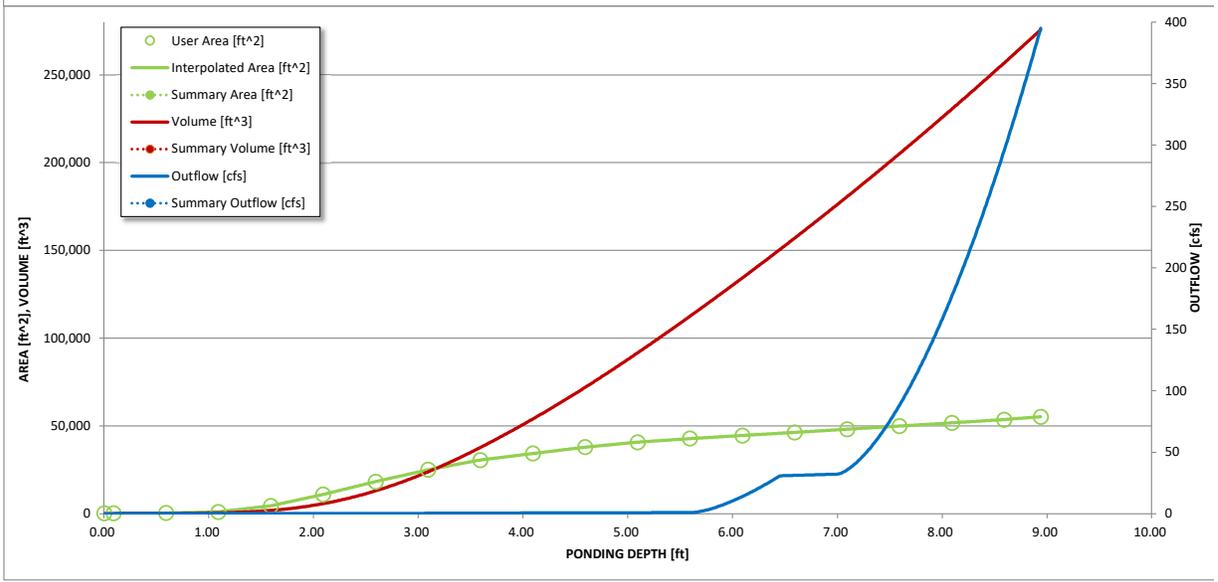
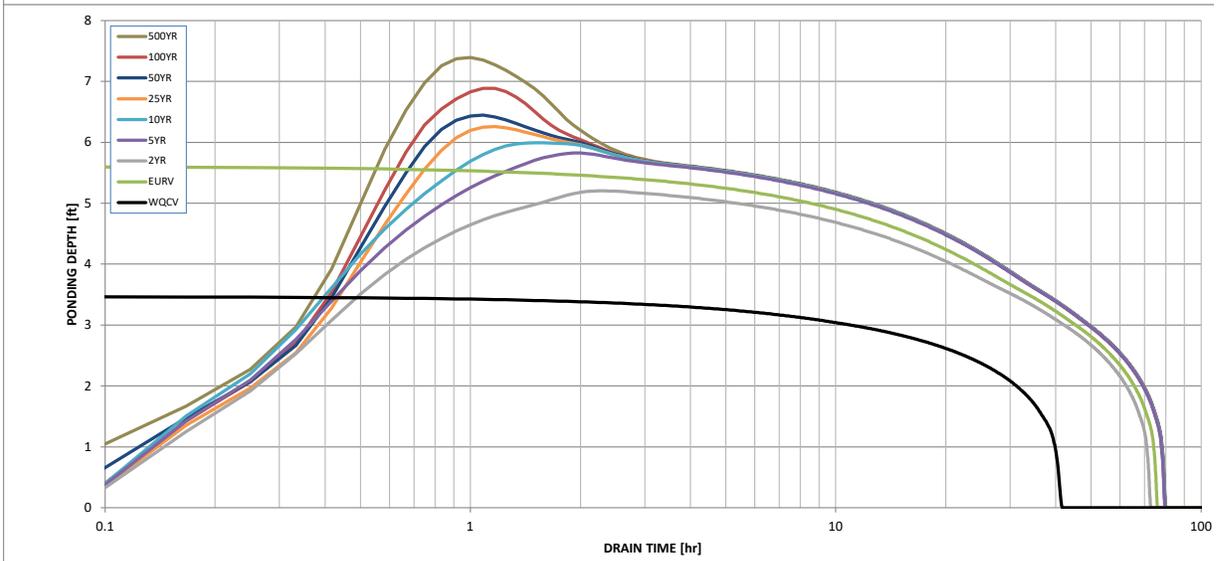
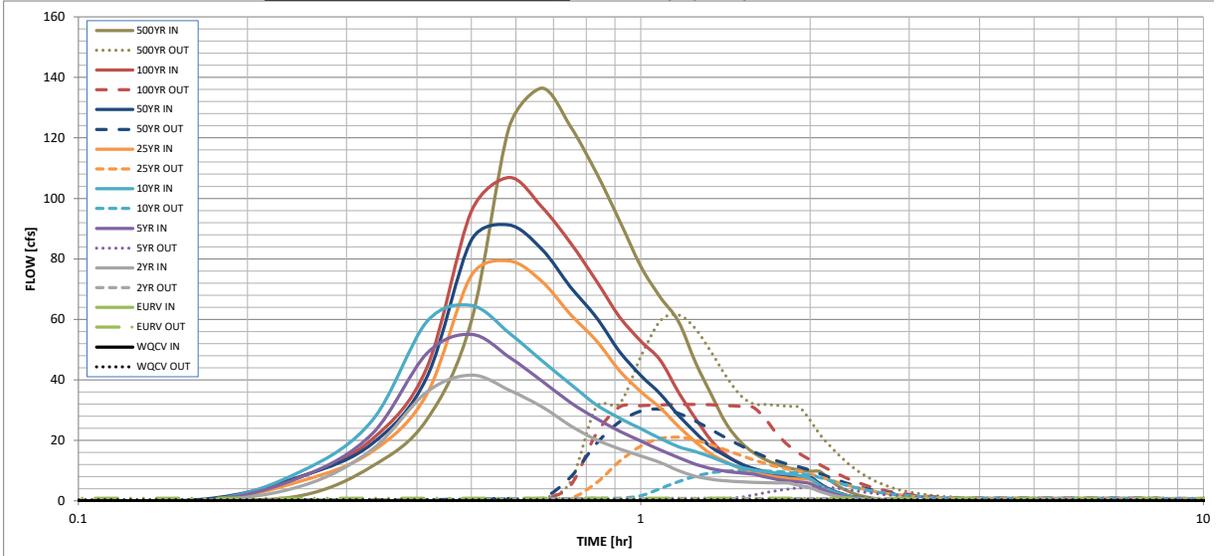
**Routed Hydrograph Results**

*The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).*

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
CUHP Runoff Volume (acre-ft) =	0.780	2.593	2.326	3.107	3.760	4.510	5.188	5.981	7.698
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	2.326	3.107	3.760	4.510	5.188	5.981	7.698
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	3.4	9.3	14.1	25.4	31.9	40.7	56.8
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.11	0.30	0.45	0.81	1.01	1.29	1.80
Peak Inflow Q (cfs) =	N/A	N/A	41.6	55.0	64.6	79.3	91.2	106.9	136.4
Peak Outflow Q (cfs) =	0.3	0.9	0.8	4.7	10.0	21.0	30.3	31.9	61.4
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.5	0.7	0.8	1.0	0.8	1.1
Structure Controlling Flow =	Plate	Overflow Weir 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	0.1	0.4	0.8	1.2	1.2	1.3
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	68	65	70	69	68	67	65	63
Time to Drain 99% of Inflow Volume (hours) =	40	72	69	75	75	74	74	73	72
Maximum Ponding Depth (ft) =	3.47	5.61	5.20	5.82	5.99	6.26	6.44	6.89	7.39
Area at Maximum Ponding Depth (acres) =	0.67	0.98	0.94	1.00	1.01	1.03	1.05	1.09	1.13
Maximum Volume Stored (acre-ft) =	0.781	2.599	2.194	2.807	2.978	3.244	3.442	3.913	4.466

# DETENTION BASIN OUTLET STRUCTURE DESIGN

*MHFD-Detention, Version 4.06 (July 2022)*



S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

# DETENTION BASIN OUTLET STRUCTURE DESIGN

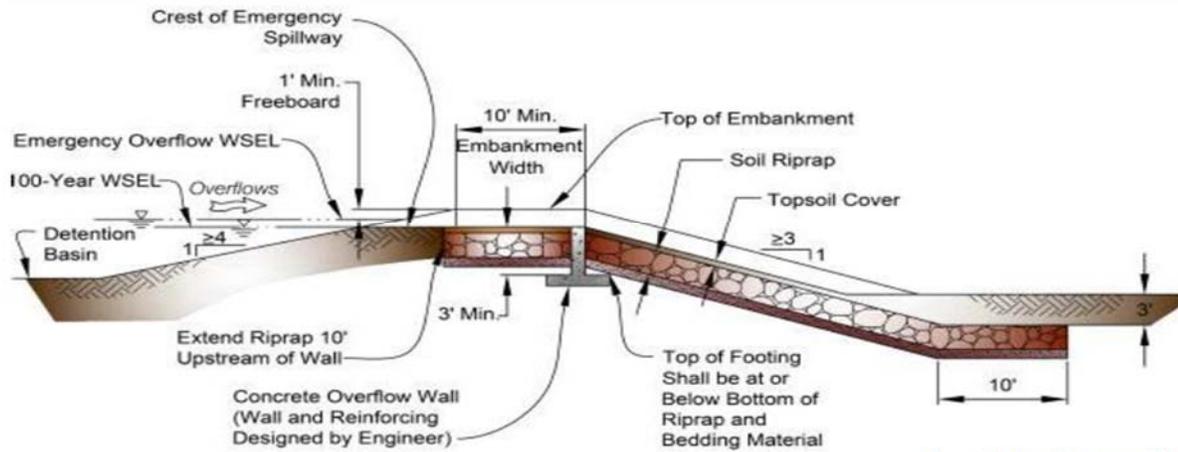
Outflow Hydrograph Workbook Filename: \_\_\_\_\_

## 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	0.56	0.06	1.78
	0:15:00	0.00	0.00	4.93	8.04	9.94	6.67	8.26	8.11	11.46
	0:20:00	0.00	0.00	17.06	22.24	26.66	16.36	18.97	20.39	26.84
	0:25:00	0.00	0.00	35.98	48.70	59.23	35.28	40.84	44.03	59.43
	0:30:00	0.00	0.00	41.62	55.03	64.59	74.53	86.20	95.75	123.30
	0:35:00	0.00	0.00	36.65	47.61	55.58	79.30	91.17	106.92	136.43
	0:40:00	0.00	0.00	31.11	39.69	46.42	72.57	83.23	97.19	123.83
	0:45:00	0.00	0.00	24.89	32.55	38.62	61.71	70.75	85.28	108.54
	0:50:00	0.00	0.00	20.24	27.26	31.81	53.01	60.74	72.82	92.64
	0:55:00	0.00	0.00	17.19	23.08	27.38	43.05	49.37	60.85	77.54
	1:00:00	0.00	0.00	14.82	19.77	23.85	36.12	41.47	52.79	67.31
	1:05:00	0.00	0.00	12.68	16.83	20.63	30.75	35.35	46.52	59.34
	1:10:00	0.00	0.00	10.01	14.37	17.94	24.64	28.35	35.96	46.02
	1:15:00	0.00	0.00	8.13	12.17	16.29	19.64	22.63	27.37	35.25
	1:20:00	0.00	0.00	7.15	10.68	14.56	15.44	17.79	19.97	25.79
	1:25:00	0.00	0.00	6.62	9.82	12.60	12.94	14.90	15.29	19.79
	1:30:00	0.00	0.00	6.33	9.25	11.22	10.82	12.42	12.39	16.05
	1:35:00	0.00	0.00	6.16	8.88	10.26	9.40	10.75	10.53	13.64
	1:40:00	0.00	0.00	6.03	7.88	9.60	8.47	9.66	9.27	12.00
	1:45:00	0.00	0.00	5.94	7.12	9.14	7.86	8.94	8.43	10.91
	1:50:00	0.00	0.00	5.88	6.59	8.82	7.44	8.44	7.86	10.18
	1:55:00	0.00	0.00	5.04	6.20	8.29	7.19	8.14	7.58	9.80
	2:00:00	0.00	0.00	4.39	5.74	7.43	7.03	7.96	7.48	9.66
	2:05:00	0.00	0.00	3.11	4.07	5.23	5.00	5.66	5.34	6.89
	2:10:00	0.00	0.00	2.13	2.78	3.59	3.43	3.88	3.69	4.76
	2:15:00	0.00	0.00	1.44	1.87	2.45	2.35	2.65	2.53	3.27
	2:20:00	0.00	0.00	0.95	1.22	1.62	1.56	1.76	1.68	2.17
	2:25:00	0.00	0.00	0.59	0.78	1.04	1.01	1.14	1.09	1.41
	2:30:00	0.00	0.00	0.35	0.50	0.64	0.65	0.73	0.70	0.90
	2:35:00	0.00	0.00	0.18	0.28	0.35	0.37	0.41	0.39	0.51
	2:40:00	0.00	0.00	0.07	0.12	0.14	0.16	0.18	0.18	0.22
	2:45:00	0.00	0.00	0.02	0.03	0.03	0.04	0.05	0.04	0.06
	2:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	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

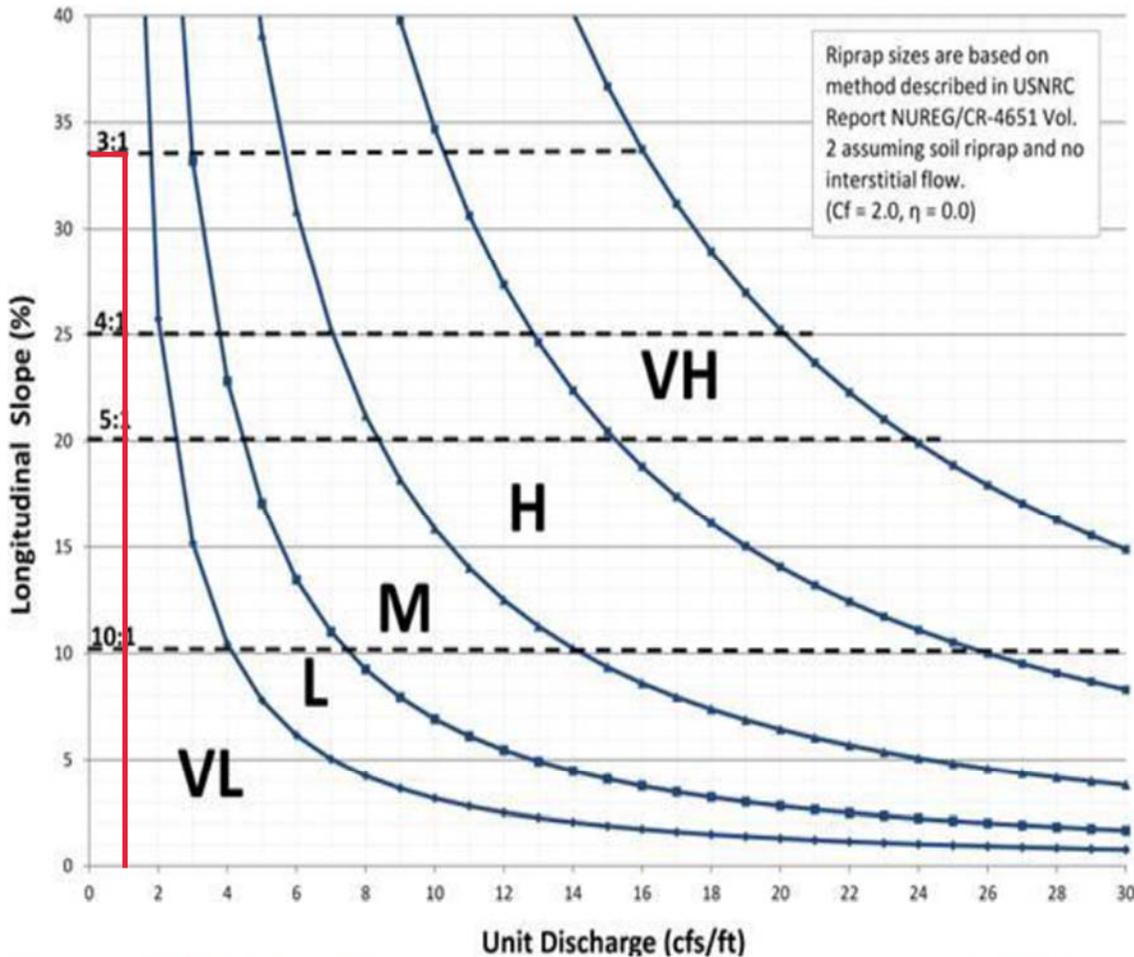
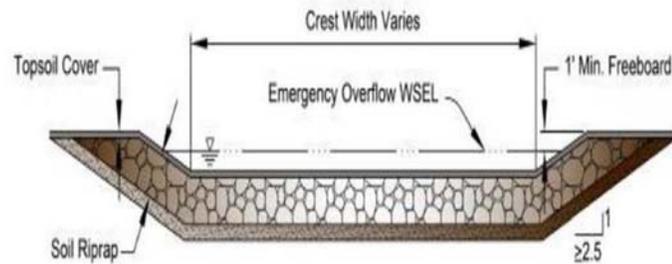
**Figure 13-12b. Emergency Spillway Profile at Embankment**



**Figure 13-12c. Emergency Spillway Protection**

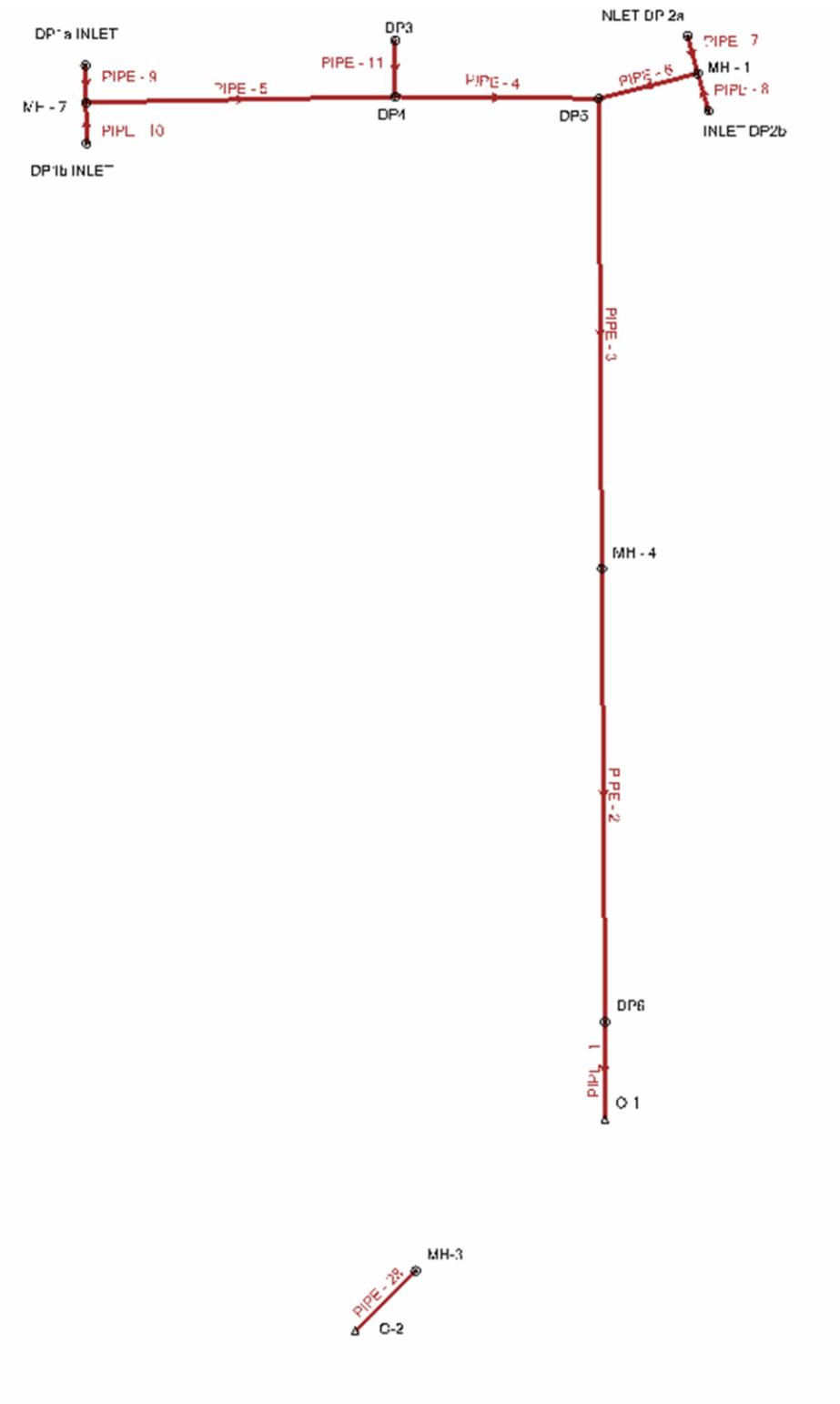
Q=31.9 CFS  
 LENGTH=38 Feet  
 UNIT FLOW RATE: 0.84 CFS/FT

=> TYPE VL RIP RAP

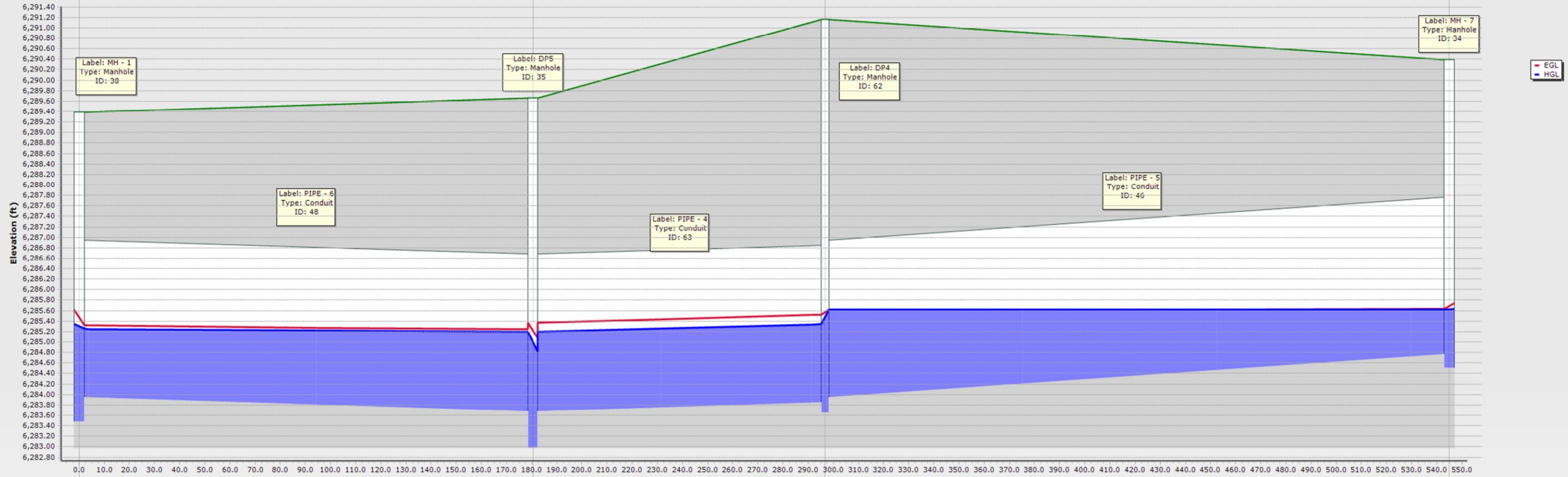


**Figure 13-12d. Riprap Types for Emergency Spillway Protection**

# STORMCAD LAYOUT NTS

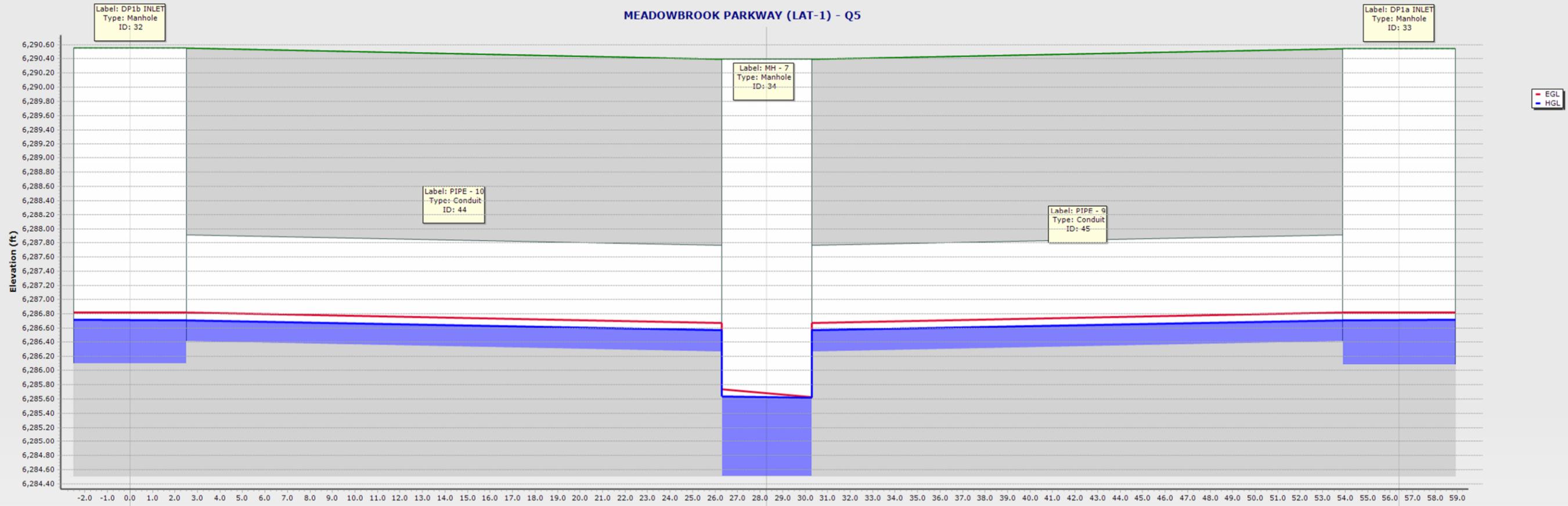


MEADOWBROOK PARKWAY (MAIN) - Q5



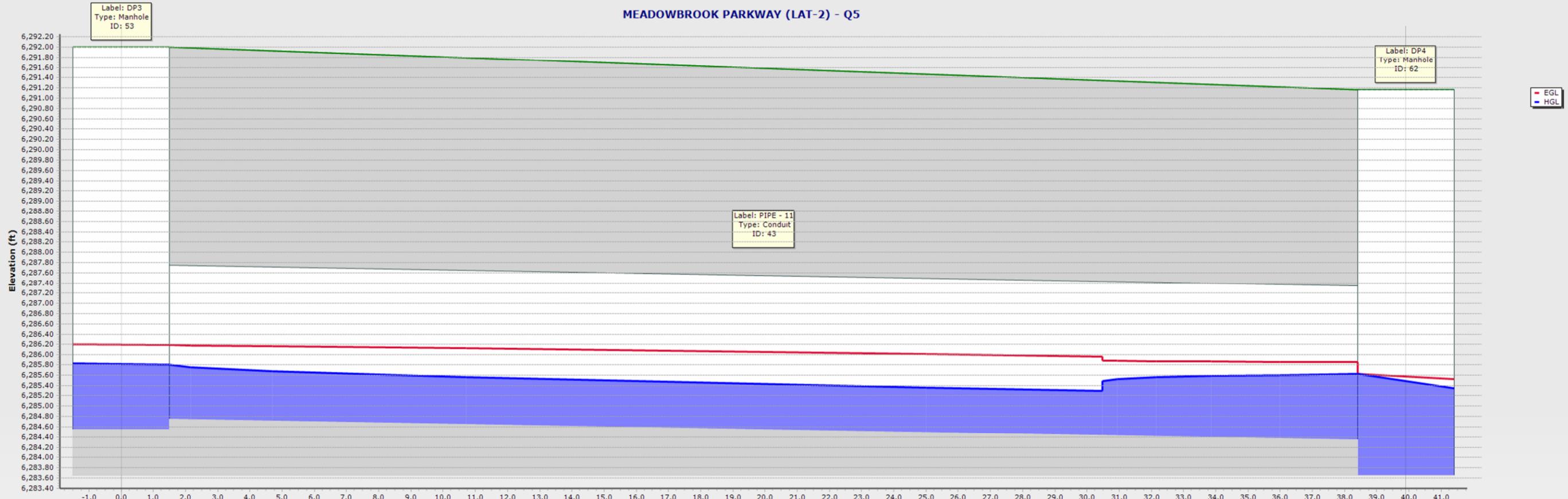
ID\Label	48 \ PIPE - 6	63 \ PIPE - 4	46 \ PIPE - 5	
Link Length (ft)	180.5	116.2	248.4	
Rise (in)\Material	36.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete	
Flow (cfs)	6.00	12.00	1.30	
Slope (ft/ft)	0.001	0.001	0.003	
ID\Label	30 \ MH - 1	35 \ DPS	62 \ DP4	34 \ MH - 7
Ground (ft)	6289.39	6289.66	6291.16	6290.39
Invert (ft)	6283.48	6282.98	6283.65	6284.51
Station (ft)	0.0	180.5	296.6	545.0

MEADOWBROOK PARKWAY (LAT-1) - Q5



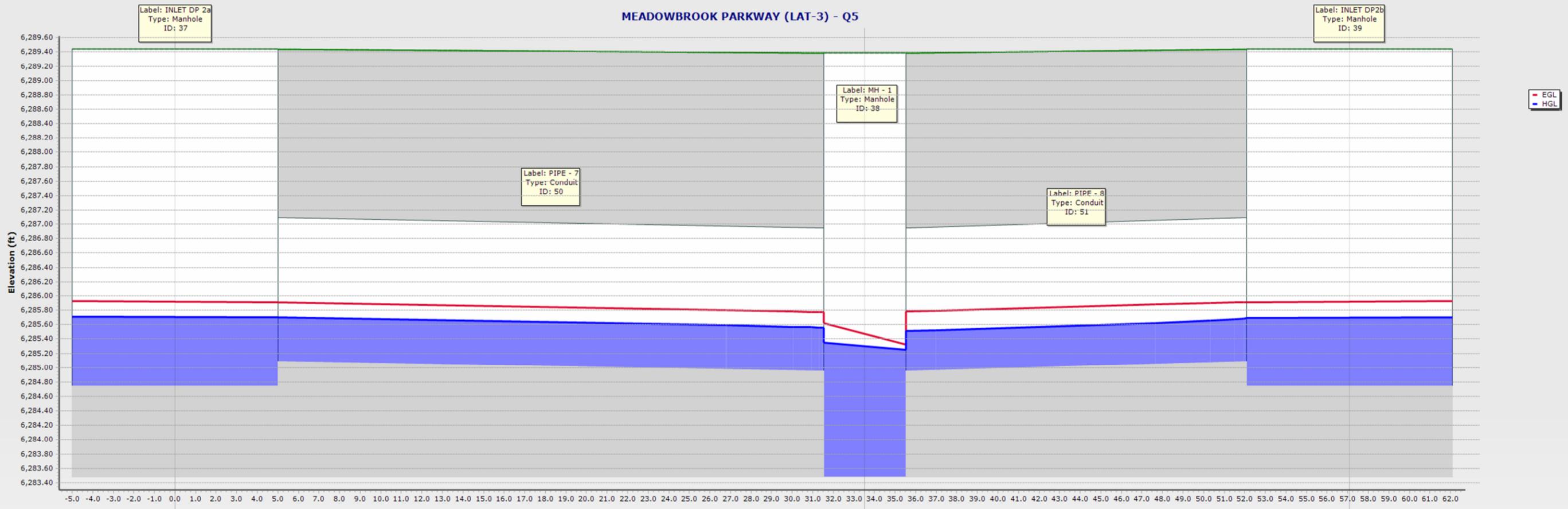
ID\Label		44 \ PIPE - 10		45 \ PIPE - 9
Link Length (ft)		28.3		28.1
Rise (in)\Material		18.0 \ Concrete		18.0 \ Concrete
Flow (cfs)		0.65		0.65
Slope (ft/ft)		0.005		0.005
ID\Label	32 \ DP1b INLET		34 \ MH - 7	33 \ DP1a INLET
Ground (ft)	6290.55		6290.39	6290.54
Invert (ft)	6286.10		6284.51	6286.08
Station (ft)	0.0		28.3	56.4

MEADOWBROOK PARKWAY (LAT-2) - Q5



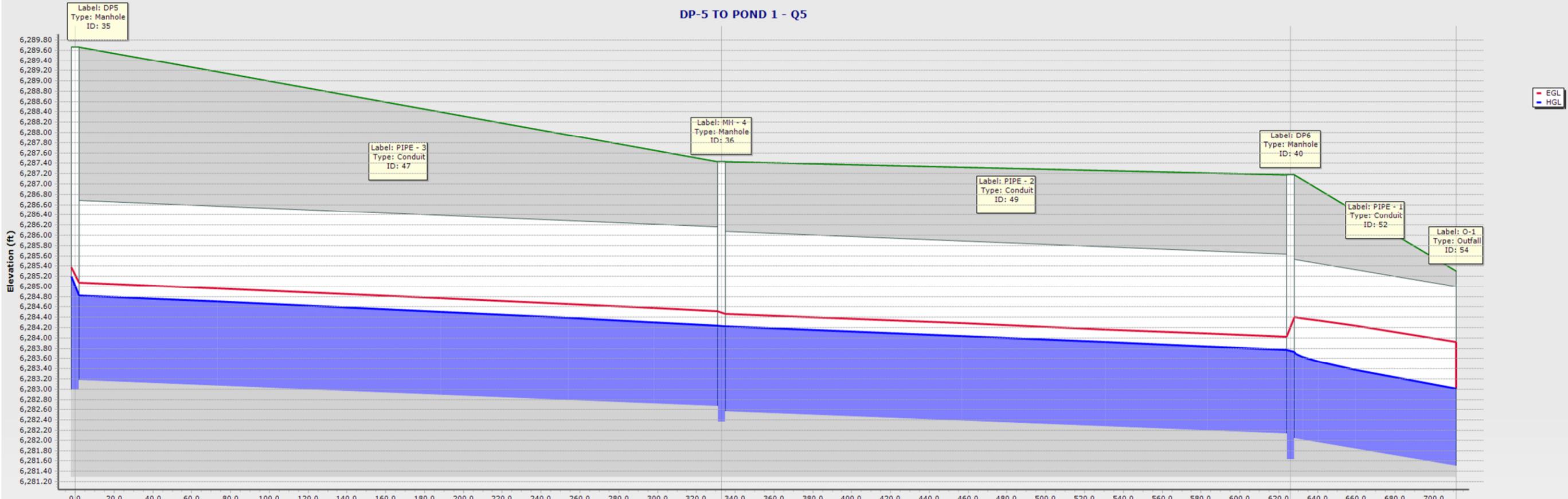
ID\Label			43 \ PIPE - 11
Link Length (ft)			39.9
Rise (in)\Material			36.0 \ Concrete
Flow (cfs)			11.00
Slope (ft/ft)			0.010
ID\Label	53 \ DP3		62 \ DP4
Ground (ft)	6292.00		6291.16
Invert (ft)	6284.55		6283.65
Station (ft)	0.0		39.9

MEADOWBROOK PARKWAY (LAT-3) - Q5



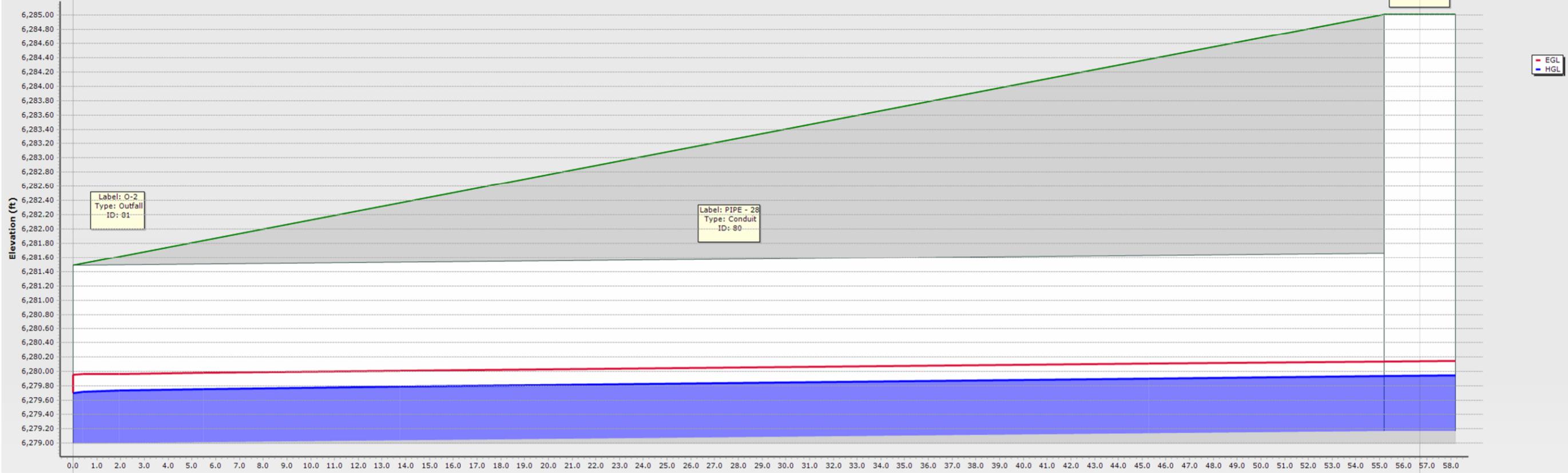
ID\Label		50 \ PIPE - 7		51 \ PIPE - 8	
Link Length (ft)		33.5		23.6	
Rise (in)\Material		24.0 \ Concrete		24.0 \ Concrete	
Flow (cfs)		3.00		3.00	
Slope (ft/ft)		0.004		0.006	
ID\Label	37 \ INLET DP 2a		38 \ MH - 1		39 \ INLET DP2b
Ground (ft)	6289.44		6289.39		6289.44
Invert (ft)	6284.74		6283.48		6284.74
Station (ft)	0.0		33.5		57.1

DP-5 TO POND 1 - Q5



ID\Label	47 \ PIPE - 3	49 \ PIPE - 2	52 \ PIPE - 1	
Link Length (ft)	332.9	293.1	85.5	
Rise (in)\Material	42.0 \ Concrete	42.0 \ Concrete	42.0 \ Concrete	
Flow (cfs)	17.80	17.80	30.50	
Slope (ft/ft)	0.002	0.002	0.006	
ID\Label	35 \ DP5	36 \ MH - 4	40 \ DP6	54 \ O-1
Ground (ft)	6289.66	6287.43	6287.18	6285.30
Invert (ft)	6282.98	6282.37	6281.63	6281.30
Station (ft)	0.0	332.9	625.9	711.4

POND 1 OUTFALL - Q5



ID\Label	80 \ PIPE - 28	78 \ MH-3
Link Length (ft)	56.7	
Rise (in)\Material	30.0 \ Concrete	
Flow (cfs)	4.70	
Slope (ft/ft)	0.003	
ID\Label	81 \ O-2	78 \ MH-3
Ground (ft)	6281.49	6285.01
Invert (ft)	6278.99	6279.16
Station (ft)	0.0	56.7

	Label ▲	Flow (cfs)	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (User Defined) (ft)	Slope (Calculated) (ft/ft)	Manning's n	Diameter (in)	Capacity (Full Flow) (cfs)	Velocity (ft/s)	Elevation Ground (Start) (ft)	Hydraulic Grade Line (In) (ft)	Elevation Ground (Stop) (ft)	Hydraulic Grade Line (Out) (ft)	Material
52: PIPE - 1	PIPE - 1	30.50	DP6	6,282.03	O-1	6,281.50	85.5	0.006	0.013	42.0	79.23	7.70	6,287.18	6,283.74	6,285.30	6,283.01	Concrete
49: PIPE - 2	PIPE - 2	17.80	MH - 4	6,282.57	DP6	6,282.13	293.1	0.002	0.013	42.0	38.98	3.96	6,287.43	6,284.23	6,287.18	6,283.77	Concrete
47: PIPE - 3	PIPE - 3	17.80	DP5	6,283.18	MH - 4	6,282.67	332.9	0.002	0.013	42.0	39.38	3.99	6,289.66	6,284.82	6,287.43	6,284.24	Concrete
63: PIPE - 4	PIPE - 4	12.00	DP4	6,283.85	DP5	6,283.68	116.2	0.001	0.013	36.0	25.51	3.55	6,291.16	6,285.34	6,289.66	6,285.20	Concrete
46: PIPE - 5	PIPE - 5	1.30	MH - 7	6,284.77	DP4	6,283.95	248.4	0.003	0.013	36.0	38.32	2.52	6,290.39	6,285.62	6,291.16	6,285.62	Concrete
48: PIPE - 6	PIPE - 6	6.00	MH - 1	6,283.95	DP5	6,283.68	180.5	0.001	0.013	36.0	25.80	2.97	6,289.39	6,285.25	6,289.66	6,285.20	Concrete
50: PIPE - 7	PIPE - 7	3.00	INLET DP 2a	6,285.09	MH - 1	6,284.95	33.5	0.004	0.013	24.0	14.62	3.66	6,289.44	6,285.70	6,289.39	6,285.55	Concrete
51: PIPE - 8	PIPE - 8	3.00	INLET DP2b	6,285.09	MH - 1	6,284.95	23.6	0.006	0.013	24.0	17.43	4.15	6,289.44	6,285.69	6,289.39	6,285.51	Concrete
45: PIPE - 9	PIPE - 9	0.65	DP1a INLET	6,286.41	MH - 7	6,286.27	28.1	0.005	0.013	18.0	7.41	2.58	6,290.54	6,286.71	6,290.39	6,286.57	Concrete
44: PIPE - 10	PIPE - 10	0.65	DP1b INLET	6,286.41	MH - 7	6,286.27	28.3	0.005	0.013	18.0	7.39	2.57	6,290.55	6,286.71	6,290.39	6,286.57	Concrete
43: PIPE - 11	PIPE - 11	11.00	DP3	6,284.75	DP4	6,284.35	39.9	0.010	0.013	36.0	66.77	6.98	6,292.00	6,285.80	6,291.16	6,285.62	Concrete
80: PIPE - 28	PIPE - 28	4.70	MH-3	6,279.16	O-2	6,278.99	56.7	0.003	0.013	30.0	22.46	3.62	6,285.01	6,279.94	6,281.49	6,279.70	Concrete

Figure 1-Q5 – Free Outfall CONDUIT SUMMARY

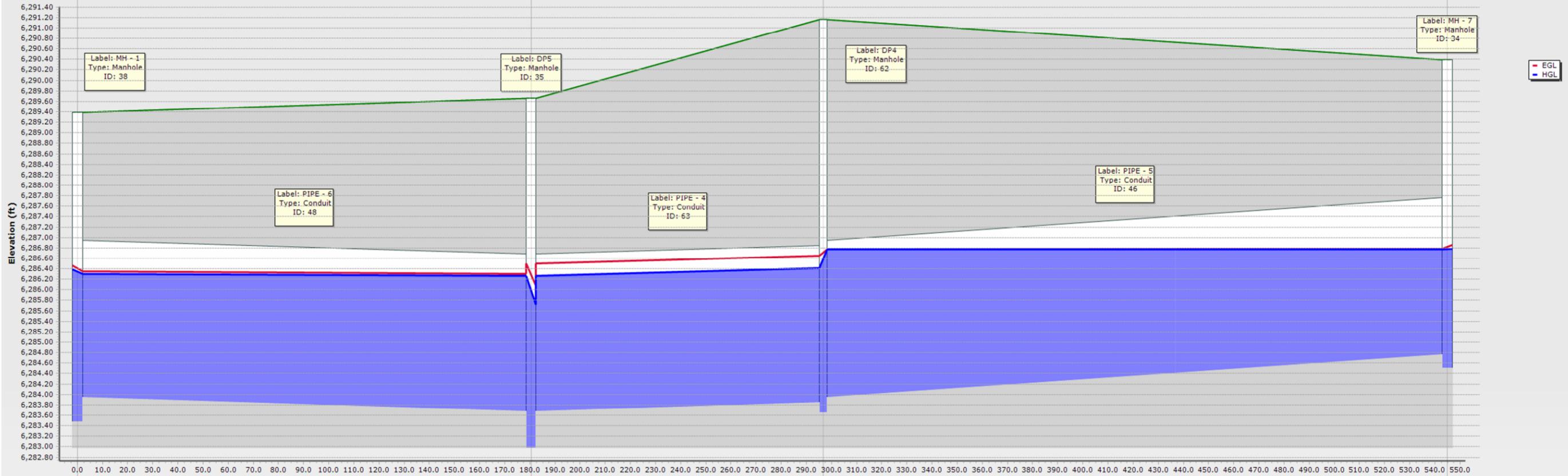
	Label ▲	Flow (Total Out) (cfs)	Elevation (Ground) (ft)	Elevation (Rim) (ft)	Headloss (ft)	Elevation (Invert in 1) (ft)	Elevation (Invert in 2) (ft)	Elevation (Invert in 3) (ft)	Elevation (Invert Out) (ft)	Hydraulic Grade Line (In) (ft)	Energy Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Energy Grade Line (Out) (ft)	Headloss Method
33: DP1a INLET	DP1a INLET	0.65	6,290.54	6,290.54	0.01	(N/A)	(N/A)	(N/A)	6,286.41	6,286.72	6,286.82	6,286.71	6,286.81	Standard
32: DP1b INLET	DP1b INLET	0.65	6,290.55	6,290.55	0.01	(N/A)	(N/A)	(N/A)	6,286.41	6,286.72	6,286.82	6,286.71	6,286.81	Standard
53: DP3	DP3	11.00	6,292.00	6,292.00	0.02	(N/A)	(N/A)	(N/A)	6,284.75	6,285.82	6,286.21	6,285.80	6,286.19	Standard
62: DP4	DP4	12.00	6,291.16	6,291.16	0.28	6,284.35	6,283.95	(N/A)	6,283.85	6,285.62	6,285.62	6,285.34	6,285.52	Standard
35: DP5	DP5	17.80	6,289.66	6,289.66	0.38	6,283.68	6,283.68	(N/A)	6,283.18	6,285.20	6,285.37	6,284.82	6,285.07	Standard
40: DP6	DP6	30.50	6,287.18	6,287.18	0.03	6,282.13	(N/A)	(N/A)	6,282.03	6,283.77	6,284.02	6,283.74	6,284.40	Standard
37: INLET DP 2a	INLET DP 2a	3.00	6,289.44	6,289.44	0.01	(N/A)	(N/A)	(N/A)	6,285.09	6,285.71	6,285.92	6,285.70	6,285.91	Standard
39: INLET DP2b	INLET DP2b	3.00	6,289.44	6,289.44	0.01	(N/A)	(N/A)	(N/A)	6,285.09	6,285.71	6,285.92	6,285.69	6,285.91	Standard
38: MH - 1	MH - 1	6.00	6,289.39	6,289.39	0.10	6,284.95	6,284.95	(N/A)	6,283.95	6,285.35	6,285.62	6,285.25	6,285.32	Standard
36: MH - 4	MH - 4	17.80	6,287.43	6,287.43	0.01	6,282.67	(N/A)	(N/A)	6,282.57	6,284.24	6,284.52	6,284.23	6,284.47	Standard
34: MH - 7	MH - 7	1.30	6,290.39	6,290.39	0.01	6,286.27	6,286.27	(N/A)	6,284.77	6,285.63	6,285.74	6,285.62	6,285.63	Standard
78: MH-3	MH-3	4.70	6,285.01	6,285.01	0.01	(N/A)	(N/A)	(N/A)	6,279.16	6,279.95	6,280.15	6,279.94	6,280.14	Standard

Figure 2-Q5 – Free Outfall NODE SUMMARY

	Label ▲	Elevation (Ground) (ft)	Elevation (Invert) (ft)	Boundary Condition Type	Elevation (User Defined Tailwater) (ft)	Hydraulic Grade (ft)	Flow (Total Out) (cfs)
54: O-1	O-1	6,285.30	6,281.30	Free Outfall		6,283.01	30.50
81: O-2	O-2	6,281.49	6,278.99	Free Outfall		6,279.70	4.70

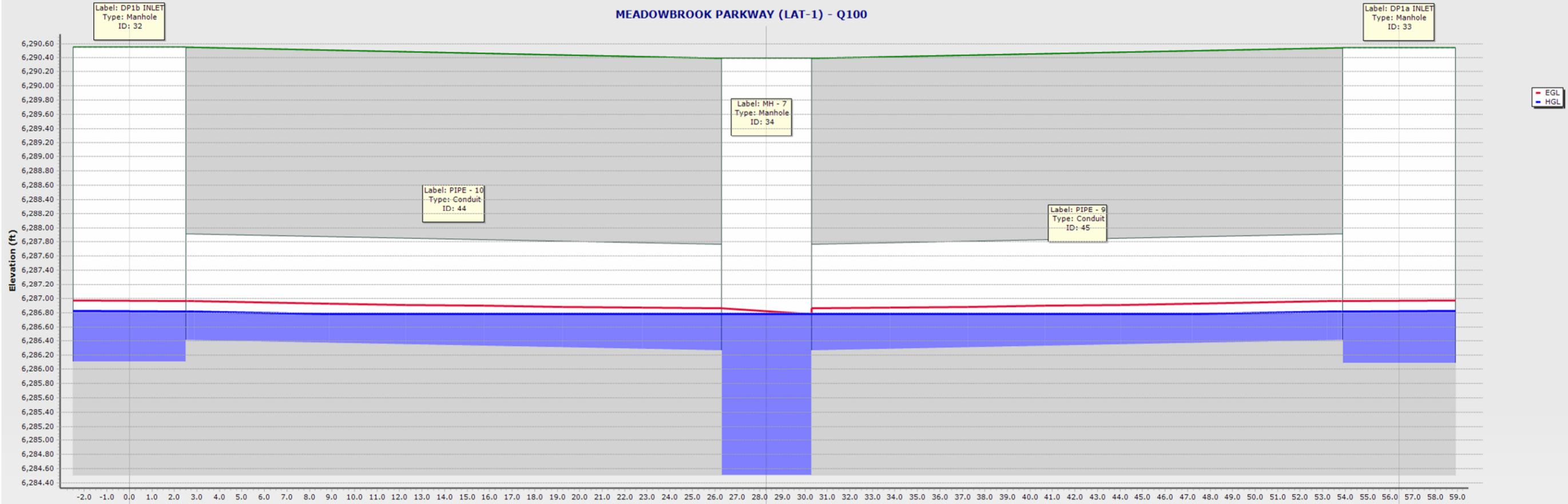
Figure 3-Q5 – Free Outfall OUTFALL SUMMARY

MEADOWBROOK PARKWAY (MAIN) - Q100



ID/Label	48 \ PIPE - 6	63 \ PIPE - 4	46 \ PIPE - 5	
Link Length (ft)	180.5	116.2	248.4	
Rise (in)/Material	36.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete	
Flow (cfs)	10.90	25.20	2.40	
Slope (ft/ft)	0.001	0.001	0.003	
ID/Label	38 \ MH - 1	35 \ DP5	62 \ DP4	34 \ MH - 7
Ground (ft)	6289.39	6289.66	6291.16	6290.39
Invert (ft)	6283.48	6282.98	6283.65	6284.51
Station (ft)	0.0	180.5	296.6	545.0

MEADOWBROOK PARKWAY (LAT-1) - Q100



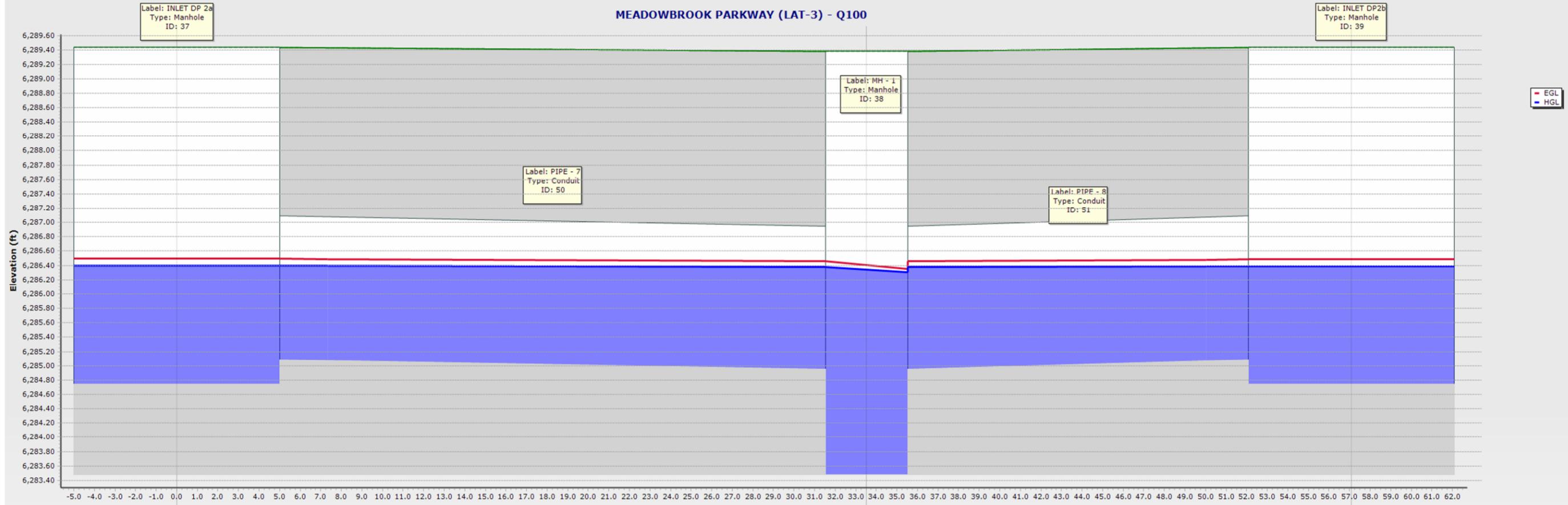
ID/Label	44 \ PIPE - 10		45 \ PIPE - 9	
Link Length (ft)	28.3		28.1	
Rise (in)/Material	18.0 \ Concrete		18.0 \ Concrete	
Flow (cfs)	1.20		1.20	
Slope (ft/R)	0.005		0.005	
ID/Label	32 \ DP1b INLET	34 \ MH - 7	33 \ DP1a INLET	
Ground (ft)	6290.55	6290.39	6290.54	
Invert (ft)	6286.10	6284.51	6286.08	
Station (ft)	0.0	28.3	56.4	

MEADOWBROOK PARKWAY (LAT-2) - Q100



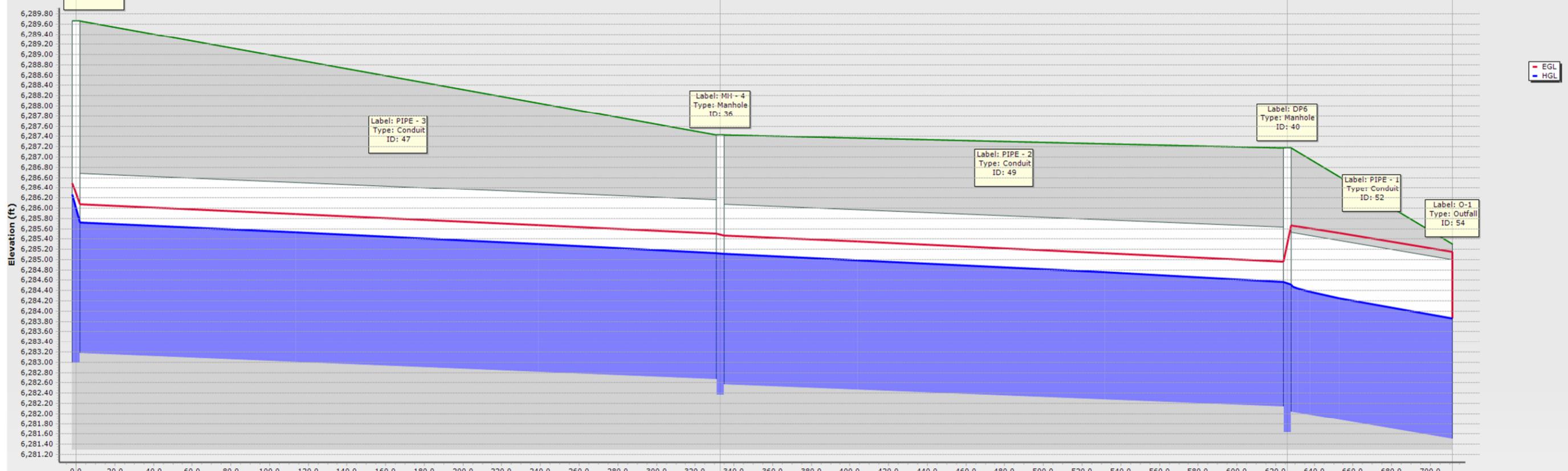
ID\Label	43 \ PIPE - 11	
Link Length (ft)	39.9	
Size (in)\Material	36.0 \ Concrete	
Flow (cfs)	23.40	
Slope (ft/ft)	0.010	
ID\Label	53 \ DP3	62 \ DP4
Ground (ft)	6292.00	6291.16
Invert (ft)	6284.55	6283.65
Station (ft)	0.0	39.9

MEADOWBROOK PARKWAY (LAT-3) - Q100



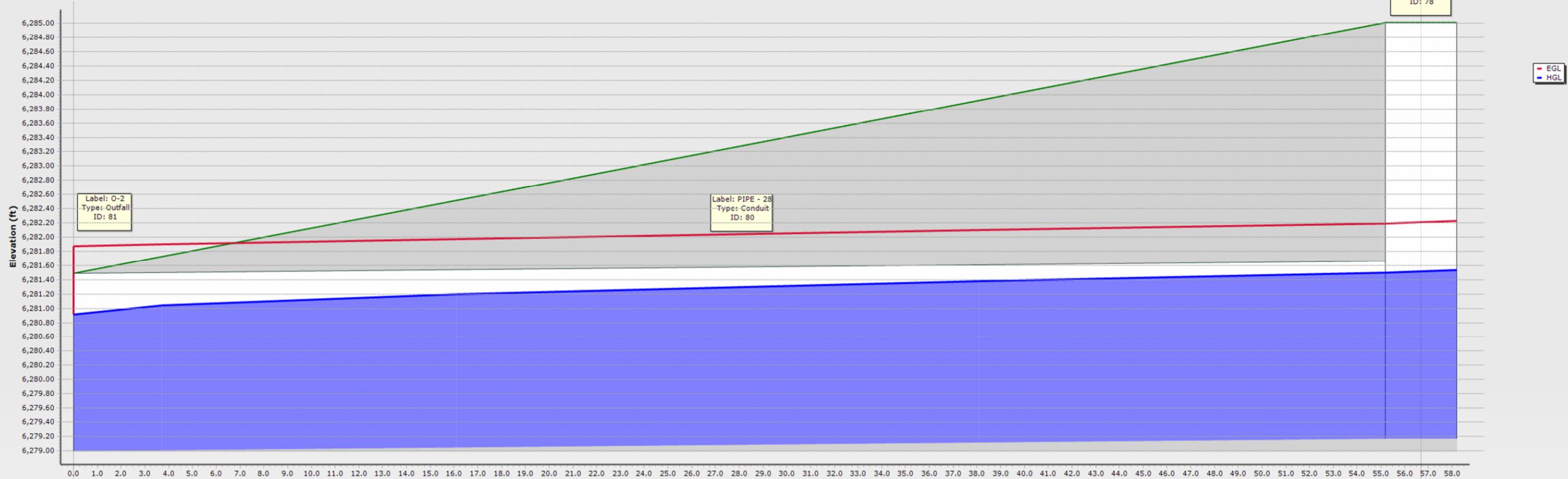
ID\Label		50 \ PIPE - 7		51 \ PIPE - 8
Link Length (ft)		33.5		23.6
Rise (in)\Material		24.0 \ Concrete		24.0 \ Concrete
Flow (cfs)		5.45		5.45
Slope (ft/ft)		0.004		0.006
ID\Label	37 \ INLET DP 2a		38 \ MH - 1	39 \ INLET DP2b
Ground (ft)	6289.44		6289.39	6289.44
Invert (ft)	6284.74		6283.48	6284.74
Station (ft)	0.0		33.5	57.1

DP-5 TO POND 1 - Q100



ID\Label	47 \ PIPE - 3	49 \ PIPE - 2	52 \ PIPE - 1	
Link Length (ft)	332.9	293.1	85.5	
Size (in)\Material	42.0 \ Concrete	42.0 \ Concrete	42.0 \ Concrete	
Flow (cfs)	35.80	35.80	62.90	
Slope (ft/ft)	0.002	0.002	0.006	
ID\Label	35 \ DP5	36 \ MH - 4	40 \ DP6	54 \ O-1
Ground (ft)	6289.66	6287.43	6287.18	6285.30
Invert (ft)	6282.98	6282.37	6281.63	6281.30
Station (ft)	0.0	332.9	625.9	711.4

POND 1 OUTFALL - Q100



ID\Label	80 \ PIPE - 28	78 \ MH-3
Link Length (ft)	56.7	
Rise (in)\Material	30.0 \ Concrete	
Flow (cfs)	31.90	
Slope (ft/ft)	0.003	
ID\Label	81 \ O-2	
Ground (ft)	6281.49	6285.01
Invert (ft)	6278.99	6279.16
Station (ft)	0.0	56.7

	Label ▲	Flow (cfs)	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (User Defined) (ft)	Slope (Calculated) (ft/ft)	Manning's n	Diameter (in)	Capacity (Full Flow) (cfs)	Velocity (ft/s)	Elevation Ground (Start) (ft)	Hydraulic Grade Line (In) (ft)	Elevation Ground (Stop) (ft)	Hydraulic Grade Line (Out) (ft)	Material
52: PIPE - 1	PIPE - 1	62.90	DP6	6,282.03	O-1	6,281.50	85.5	0.006	0.013	42.0	79.23	9.14	6,287.18	6,284.52	6,285.30	6,283.85	Concrete
49: PIPE - 2	PIPE - 2	35.80	MH - 4	6,282.57	DP6	6,282.13	293.1	0.002	0.013	42.0	38.98	4.60	6,287.43	6,285.11	6,287.18	6,284.57	Concrete
47: PIPE - 3	PIPE - 3	35.80	DP5	6,283.18	MH - 4	6,282.67	332.9	0.002	0.013	42.0	39.38	4.64	6,289.66	6,285.72	6,287.43	6,285.13	Concrete
63: PIPE - 4	PIPE - 4	25.20	DP4	6,283.85	DP5	6,283.68	116.2	0.001	0.013	36.0	25.51	4.11	6,291.16	6,286.41	6,289.66	6,286.26	Concrete
46: PIPE - 5	PIPE - 5	2.40	MH - 7	6,284.77	DP4	6,283.95	248.4	0.003	0.013	36.0	38.32	3.02	6,290.39	6,286.78	6,291.16	6,286.78	Concrete
48: PIPE - 6	PIPE - 6	10.90	MH - 1	6,283.95	DP5	6,283.68	180.5	0.001	0.013	36.0	25.80	3.50	6,289.39	6,286.30	6,289.66	6,286.26	Concrete
50: PIPE - 7	PIPE - 7	5.45	INLET DP 2a	6,285.09	MH - 1	6,284.95	33.5	0.004	0.013	24.0	14.62	4.31	6,289.44	6,286.39	6,289.39	6,286.38	Concrete
51: PIPE - 8	PIPE - 8	5.45	INLET DP2b	6,285.09	MH - 1	6,284.95	23.6	0.006	0.013	24.0	17.43	4.91	6,289.44	6,286.38	6,289.39	6,286.38	Concrete
45: PIPE - 9	PIPE - 9	1.20	DP 1a INLET	6,286.41	MH - 7	6,286.27	28.1	0.005	0.013	18.0	7.41	3.08	6,290.54	6,286.82	6,290.39	6,286.78	Concrete
44: PIPE - 10	PIPE - 10	1.20	DP 1b INLET	6,286.41	MH - 7	6,286.27	28.3	0.005	0.013	18.0	7.39	3.08	6,290.55	6,286.82	6,290.39	6,286.78	Concrete
43: PIPE - 11	PIPE - 11	23.40	DP3	6,284.75	DP4	6,284.35	39.9	0.010	0.013	36.0	66.77	8.61	6,292.00	6,286.71	6,291.16	6,286.78	Concrete
80: PIPE - 28	PIPE - 28	31.90	MH-3	6,279.16	O-2	6,278.99	56.7	0.003	0.013	30.0	22.46	6.50	6,285.01	6,281.50	6,281.49	6,280.91	Concrete

Figure 4- Q100 – Free Outfall CONDUIT SUMMARY

	Label ▲	Flow (Total Out) (cfs)	Elevation (Ground) (ft)	Elevation (Rim) (ft)	Headloss (ft)	Elevation (Invert in 1) (ft)	Elevation (Invert in 2) (ft)	Elevation (Invert in 3) (ft)	Elevation (Invert Out) (ft)	Hydraulic Grade Line (In) (ft)	Energy Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Energy Grade Line (Out) (ft)	Headloss Method
33: DP1a INLET	DP 1a INLET	1.20	6,290.54	6,290.54	0.01	(N/A)	(N/A)	(N/A)	6,286.41	6,286.83	6,286.97	6,286.82	6,286.97	Standard
32: DP1b INLET	DP 1b INLET	1.20	6,290.55	6,290.55	0.01	(N/A)	(N/A)	(N/A)	6,286.41	6,286.83	6,286.97	6,286.82	6,286.97	Standard
53: DP3	DP3	23.40	6,292.00	6,292.00	0.02	(N/A)	(N/A)	(N/A)	6,284.75	6,286.73	6,287.08	6,286.71	6,287.07	Standard
62: DP4	DP4	25.20	6,291.16	6,291.16	0.36	6,284.35	6,283.95	(N/A)	6,283.85	6,286.78	6,286.78	6,286.41	6,286.65	Standard
35: DP5	DP5	35.80	6,289.66	6,289.66	0.54	6,283.68	6,283.68	(N/A)	6,283.18	6,286.26	6,286.50	6,285.72	6,286.08	Standard
40: DP6	DP6	62.90	6,287.18	6,287.18	0.06	6,282.13	(N/A)	(N/A)	6,282.03	6,284.57	6,284.96	6,284.52	6,285.67	Standard
37: INLET DP 2a	INLET DP 2a	5.45	6,289.44	6,289.44	0.00	(N/A)	(N/A)	(N/A)	6,285.09	6,286.40	6,286.50	6,286.39	6,286.49	Standard
39: INLET DP2b	INLET DP2b	5.45	6,289.44	6,289.44	0.00	(N/A)	(N/A)	(N/A)	6,285.09	6,286.39	6,286.49	6,286.38	6,286.48	Standard
38: MH - 1	MH - 1	10.90	6,289.39	6,289.39	0.08	6,284.95	6,284.95	(N/A)	6,283.95	6,286.38	6,286.46	6,286.30	6,286.35	Standard
36: MH - 4	MH - 4	35.80	6,287.43	6,287.43	0.02	6,282.67	(N/A)	(N/A)	6,282.57	6,285.13	6,285.51	6,285.11	6,285.47	Standard
34: MH - 7	MH - 7	2.40	6,290.39	6,290.39	0.01	6,286.27	6,286.27	(N/A)	6,284.77	6,286.78	6,286.86	6,286.78	6,286.78	Standard
78: MH-3	MH-3	31.90	6,285.01	6,285.01	0.03	(N/A)	(N/A)	(N/A)	6,279.16	6,281.53	6,282.23	6,281.50	6,282.19	Standard

Figure 5- Q100 – Free Outfall NODE SUMMARY

	Label ▲	Elevation (Ground) (ft)	Elevation (Invert) (ft)	Boundary Condition Type	Elevation (User Defined Tailwater) (ft)	Hydraulic Grade (ft)	Flow (Total Out) (cfs)
54: O-1	O-1	6,285.30	6,281.30	Free Outfall		6,283.85	62.90
81: O-2	O-2	6,281.49	6,278.99	Free Outfall		6,280.91	31.90

Figure 6- Q100 Free Outfall OUTFALL SUMMARY

**APPENDIX B**

***STANDARD DESIGN CHARTS AND TABLES***

**Table 6-6. Runoff Coefficients for Rational Method**  
(Source: UDFCD 2001)

Land Use or Surface Characteristics	Percent Impervious	Runoff Coefficients											
		2-year		5-year		10-year		25-year		50-year		100-year	
		HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D
Business													
Commercial Areas	95	0.79	0.80	0.81	0.82	0.83	0.84	0.85	0.87	0.87	0.88	0.88	0.89
Neighborhood Areas	70	0.45	0.49	0.49	0.53	0.53	0.57	0.58	0.62	0.60	0.65	0.62	0.68
Residential													
1/8 Acre or less	65	0.41	0.45	0.45	0.49	0.49	0.54	0.54	0.59	0.57	0.62	0.59	0.65
1/4 Acre	40	0.23	0.28	0.30	0.35	0.36	0.42	0.42	0.50	0.46	0.54	0.50	0.58
1/3 Acre	30	0.18	0.22	0.25	0.30	0.32	0.38	0.39	0.47	0.43	0.52	0.47	0.57
1/2 Acre	25	0.15	0.20	0.22	0.28	0.30	0.36	0.37	0.46	0.41	0.51	0.46	0.56
1 Acre	20	0.12	0.17	0.20	0.26	0.27	0.34	0.35	0.44	0.40	0.50	0.44	0.55
Industrial													
Light Areas	80	0.57	0.60	0.59	0.63	0.63	0.66	0.66	0.70	0.68	0.72	0.70	0.74
Heavy Areas	90	0.71	0.73	0.73	0.75	0.75	0.77	0.78	0.80	0.80	0.82	0.81	0.83
Parks and Cemeteries	7	0.05	0.09	0.12	0.19	0.20	0.29	0.30	0.40	0.34	0.46	0.39	0.52
Playgrounds	13	0.07	0.13	0.16	0.23	0.24	0.31	0.32	0.42	0.37	0.48	0.41	0.54
Railroad Yard Areas	40	0.23	0.28	0.30	0.35	0.36	0.42	0.42	0.50	0.46	0.54	0.50	0.58
Undeveloped Areas													
Historic Flow Analysis-- Greenbelts, Agriculture	2	0.03	0.05	0.09	0.16	0.17	0.26	0.26	0.38	0.31	0.45	0.36	0.51
Pasture/Meadow	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50
Forest	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50
Exposed Rock	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Offsite Flow Analysis (when landuse is undefined)	45	0.26	0.31	0.32	0.37	0.38	0.44	0.44	0.51	0.48	0.55	0.51	0.59
Streets													
Paved	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Gravel	80	0.57	0.60	0.59	0.63	0.63	0.66	0.66	0.70	0.68	0.72	0.70	0.74
Drive and Walks	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Roofs	90	0.71	0.73	0.73	0.75	0.75	0.77	0.78	0.80	0.80	0.82	0.81	0.83
Lawns	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50

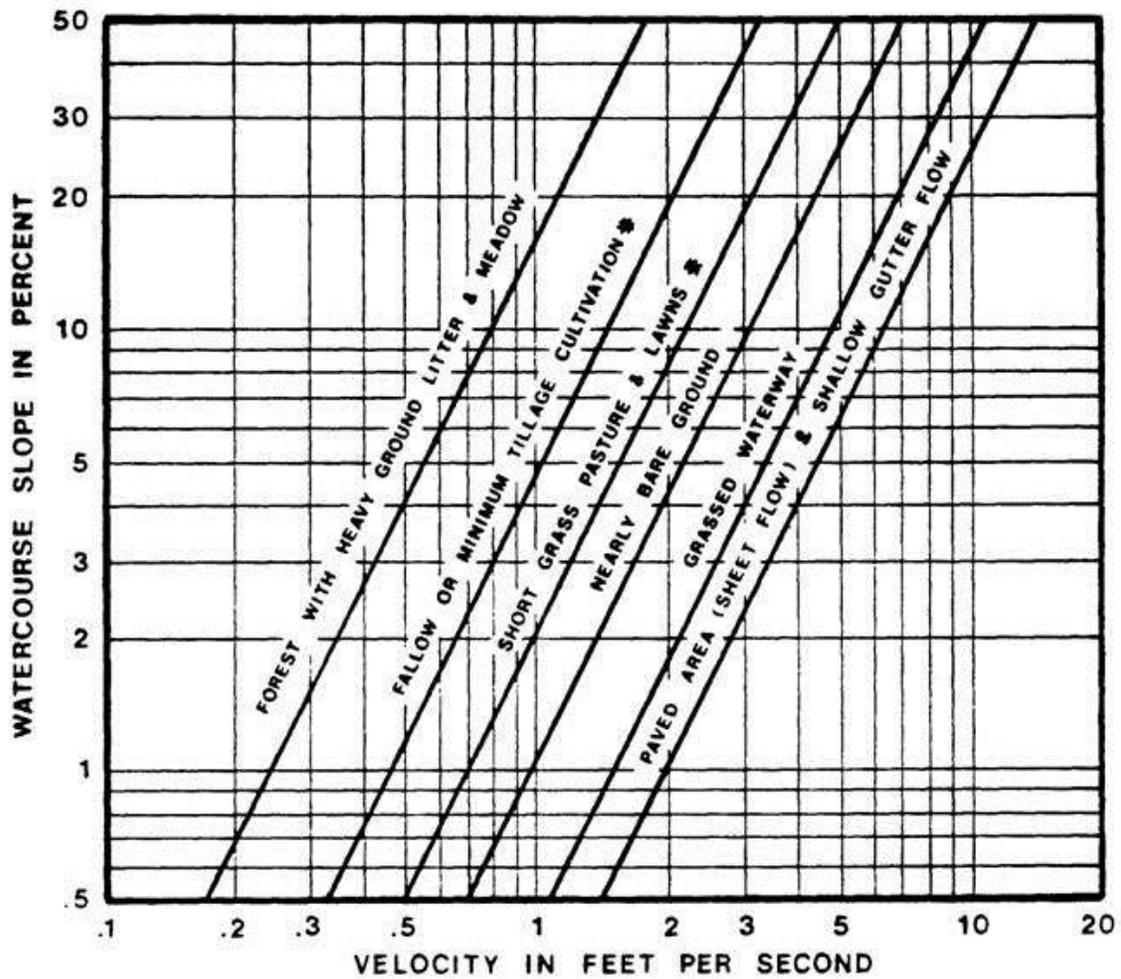
### 3.2 Time of Concentration

One of the basic assumptions underlying the Rational Method is that runoff is a function of the average rainfall rate during the time required for water to flow from the hydraulically most remote part of the drainage area under consideration to the design point. However, in practice, the time of concentration can be an empirical value that results in reasonable and acceptable peak flow calculations.

For urban areas, the time of concentration ( $t_c$ ) consists of an initial time or overland flow time ( $t_i$ ) plus the travel time ( $t_t$ ) in the storm sewer, paved gutter, roadside drainage ditch, or drainage channel. For non-urban areas, the time of concentration consists of an overland flow time ( $t_i$ ) plus the time of travel in a concentrated form, such as a swale or drainageway. The travel portion ( $t_t$ ) of the time of concentration can be estimated from the hydraulic properties of the storm sewer, gutter, swale, ditch, or drainageway. Initial time, on the other hand, will vary with surface slope, depression storage, surface cover, antecedent rainfall, and infiltration capacity of the soil, as well as distance of surface flow. The time of concentration is represented by Equation 6-7 for both urban and non-urban areas.

<b>Type of Development</b>	<b>Percent Impervious</b>
Commercial	95%
Industrial	85%
Multi-Family	65%
Single Family - 0.1377 acre lots (6,000 SF)	53%
Single-Family - 0.20 acre lots	43%
Single-Family - 0.25 acre lots	40%
Single-Family - 0.33 acre lots	30%
Single-Family - 0.5 acre lots	25%
Single-Family - 1.0 acre lots	20%
Single-Family - 2.5 acre lots	11%
Single-Family - 5 acre lots	7%

Figure 6-25. Estimate of Average Concentrated Shallow Flow



## El Paso County Drainage Basin Fees

Resolution No. 23-400

Basin Number	Receiving Waters	Year Studied	Drainage Basin Name	2024 Drainage Fee (per Impervious Acre)	2024 Bridge Fee (per Impervious Acre)
<b><u>Drainage Basins with DBPS's:</u></b>					
CHMS0200	Chico Creek	2013	Haegler Ranch	\$13,971	\$2,062
CHWS1200	Chico Creek	2001	Bennett Ranch	\$15,641	\$6,000
CHWS1400	Chico Creek	2013	Falcon	\$40,088	\$5,507
FOFO2000	Fountain Creek	2001	West Fork Jimmy Camp Creek	\$17,003	\$5,031
FOFO2600	Fountain Creek	1991*	Big Johnson / Crews Gulch	\$24,832	\$3,207
FOFO2800	Fountain Creek	1988*	Widefield	\$24,832	\$0
FOFO2900	Fountain Creek	1988*	Security	\$24,832	\$0
FOFO3000	Fountain Creek	1991*	Windmill Gulch	\$24,832	\$372
FOFO3100 / FOFO3200	Fountain Creek	1988*	Carson Street / Little Johnson	\$15,147	\$0
FOFO3400	Fountain Creek	1984*	Peterson Field	\$17,911	\$1,358
FOFO3600	Fountain Creek	1991*	Fisher's Canyon	\$24,832	\$0
FOFO4000	Fountain Creek	1996	Sand Creek	\$25,632	\$10,484
FOFO4200	Fountain Creek	1977	Spring Creek	\$12,879	\$0
FOFO4600	Fountain Creek	1984*	Southwest Area	\$24,832	\$0
FOFO4800	Fountain Creek	1991	Bear Creek	\$24,832	\$1,358
FOFO5800	Fountain Creek	1964	Camp Creek	\$2,752	\$0
FOMO1000	Monument Creek	1981	Douglas Creek	\$15,617	\$345
FOMO1200	Monument Creek	1977	Templeton Gap	\$16,032	\$372
FOMO2000	Monument Creek	1971	Pulpit Rock	\$8,234	\$0
FOMO2200	Monument Creek	1994	Cottonwood Creek / S. Pine	\$24,832	\$1,358
FOMO2400	Monument Creek	1966	Dry Creek	\$19,603	\$710
FOMO3600	Monument Creek	1989*	Black Squirrel Creek	\$11,275	\$710
FOMO3700	Monument Creek	1987*	Middle Tributary	\$20,722	\$0
FOMO3800	Monument Creek	1987*	Monument Branch	\$24,832	\$0
FOMO4000	Monument Creek	1996	Smith Creek	\$10,124	\$1,358
FOMO4200	Monument Creek	1989*	Black Forest	\$24,832	\$676
FOMO5200	Monument Creek	1993*	Dirty Woman Creek	\$24,832	\$1,358
FOMO5300	Fountain Creek	1993*	Crystal Creek	\$24,832	\$1,358
<b><u>Miscellaneous Drainage Basins: <sup>1</sup></u></b>					
CHBS0800	Chico Creek		Book Ranch	\$23,300	\$3,373
CHEC0400	Chico Creek		Upper East Chico	\$12,694	\$368
CHWS0200	Chico Creek		Telephone Exchange	\$13,947	\$327
CHWS0400	Chico Creek		Livestock Company	\$22,973	\$273
CHWS0600	Chico Creek		West Squirrel	\$11,975	\$4,970
CHWS0800	Chico Creek		Solberg Ranch	\$24,832	\$0
FOFO1200	Fountain Creek		Crooked Canyon	\$7,497	\$0
FOFO1400	Fountain Creek		Calhan Reservoir	\$6,259	\$365
FOFO1600	Fountain Creek		Sand Canyon	\$4,522	\$0
FOFO2000	Fountain Creek		Jimmy Camp Creek	\$24,832	\$1,161
FOFO2200	Fountain Creek		Fort Carson	\$19,603	\$710
FOFO2700	Fountain Creek		West Little Johnson	\$1,636	\$0
FOFO3800	Fountain Creek		Stratton	\$11,911	\$533
FOFO5000	Fountain Creek		Midland	\$19,603	\$710
FOFO6000	Fountain Creek		Palmer Trail	\$19,603	\$710
FOFO6800	Fountain Creek		Black Canyon	\$19,603	\$710
FOMO4600	Monument Creek		Beaver Creek	\$14,846	\$0
FOMO3000	Monument Creek		Kettle Creek	\$13,410	\$0
FOMO3400	Monument Creek		Elkhorn	\$2,253	\$0
FOMO5000	Monument Creek		Monument Rock	\$10,763	\$0
FOMO5400	Monument Creek		Palmer Lake	\$17,210	\$0
FOMO5600	Monument Creek		Raspberry Mountain	\$5,789	\$0
PLPL0200	Monument Creek		Bald Mountain	\$12,337	\$0
<b><u>Interim Drainage Basins: <sup>2</sup></u></b>					
FOFO1800	Fountain Creek		Little Fountain Creek	\$3,175	\$0
FOMO4400	Monument Creek		Jackson Creek	\$9,829	\$0
FOMO4800	Monument Creek		Teachout Creek	\$6,825	\$1,026

1. The miscellaneous drainage fee previous to September 1999 resolution was the average of all drainage fees for basins with Basin Planning Studies performed within the last 14 years.

2. Interim Drainage Fees are based upon draft Drainage Basin Planning Studies or the Drainage Basin Identification and Fee Estimation Report. (Best available information suitable for setting a fee.)

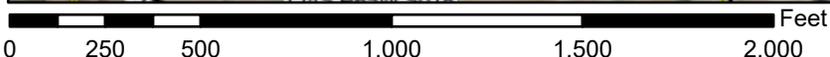
**APPENDIX C**

***REPORT REFERENCES***

# National Flood Hazard Layer FIRMMette



104°42'24"W 38°50'48"N



1:6,000

104°41'46"W 38°50'20"N

Basemap Imagery Source: USGS National Map 2023

## Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

- |   |  |
|---|--|
| <p><b>SPECIAL FLOOD HAZARD AREAS</b></p>  | <ul style="list-style-type: none"> <li><span style="display: inline-block; width: 20px; height: 10px; background-color: #e0ffff; border: 1px solid black; margin-right: 5px;"></span> Without Base Flood Elevation (BFE)<br/><i>Zone A, V, A99</i></li> <li><span style="display: inline-block; width: 20px; height: 10px; background-color: #e0ffff; border: 1px solid black; margin-right: 5px;"></span> With BFE or Depth <i>Zone AE, AO, AH, VE, AR</i></li> <li><span style="display: inline-block; width: 20px; height: 10px; background: repeating-linear-gradient(45deg, transparent, transparent 2px, red 2px, red 4px); border: 1px solid black; margin-right: 5px;"></span> Regulatory Floodway</li> </ul>  |
| <p><b>OTHER AREAS OF FLOOD HAZARD</b></p> | <ul style="list-style-type: none"> <li><span style="display: inline-block; width: 20px; height: 10px; background-color: #ffcc99; border: 1px solid black; margin-right: 5px;"></span> 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile <i>Zone X</i></li> <li><span style="display: inline-block; width: 20px; height: 10px; background: repeating-linear-gradient(-45deg, transparent, transparent 2px, gray 2px, gray 4px); border: 1px solid black; margin-right: 5px;"></span> Future Conditions 1% Annual Chance Flood Hazard <i>Zone X</i></li> <li><span style="display: inline-block; width: 20px; height: 10px; background: repeating-linear-gradient(45deg, transparent, transparent 2px, orange 2px, orange 4px); border: 1px solid black; margin-right: 5px;"></span> Area with Reduced Flood Risk due to Levee. See Notes. <i>Zone X</i></li> <li><span style="display: inline-block; width: 20px; height: 10px; background: repeating-linear-gradient(-45deg, transparent, transparent 2px, yellow 2px, yellow 4px); border: 1px solid black; margin-right: 5px;"></span> Area with Flood Risk due to Levee <i>Zone D</i></li> </ul> |
| <p><b>OTHER AREAS</b></p>                 | <ul style="list-style-type: none"> <li><span style="display: inline-block; width: 20px; height: 10px; background-color: #e0ffff; border: 1px solid black; margin-right: 5px;"></span> NO SCREEN Area of Minimal Flood Hazard <i>Zone X</i></li> <li><span style="display: inline-block; width: 20px; height: 10px; background-color: #e0ffff; border: 2px solid blue; margin-right: 5px;"></span> Effective LOMRs</li> <li><span style="display: inline-block; width: 20px; height: 10px; background-color: #ffe4c4; border: 1px solid black; margin-right: 5px;"></span> Area of Undetermined Flood Hazard <i>Zone D</i></li> </ul>   |
| <p><b>GENERAL STRUCTURES</b></p>          | <ul style="list-style-type: none"> <li><span style="display: inline-block; width: 20px; border-bottom: 2px dashed black; margin-right: 5px;"></span> Channel, Culvert, or Storm Sewer</li> <li><span style="display: inline-block; width: 20px; border-bottom: 2px dashed gray; margin-right: 5px;"></span> Levee, Dike, or Floodwall</li> </ul>   |
| <p><b>OTHER FEATURES</b></p>              | <ul style="list-style-type: none"> <li><span style="display: inline-block; width: 20px; border-bottom: 2px solid blue; margin-right: 5px;"></span> Cross Sections with 1% Annual Chance Water Surface Elevation</li> <li><span style="display: inline-block; width: 20px; border-bottom: 2px dashed gray; margin-right: 5px;"></span> Coastal Transect</li> <li><span style="display: inline-block; width: 20px; border-bottom: 2px dashed black; margin-right: 5px;"></span> Base Flood Elevation Line (BFE)</li> <li><span style="display: inline-block; width: 20px; border-bottom: 2px solid red; margin-right: 5px;"></span> Limit of Study</li> <li><span style="display: inline-block; width: 20px; border-bottom: 2px solid yellow; margin-right: 5px;"></span> Jurisdiction Boundary</li> <li><span style="display: inline-block; width: 20px; border-bottom: 2px dashed black; margin-right: 5px;"></span> Coastal Transect Baseline</li> <li><span style="display: inline-block; width: 20px; border-bottom: 2px solid blue; margin-right: 5px;"></span> Profile Baseline</li> <li><span style="display: inline-block; width: 20px; border-bottom: 2px solid blue; margin-right: 5px;"></span> Hydrographic Feature</li> </ul>                    |
| <p><b>MAP PANELS</b></p>                  | <ul style="list-style-type: none"> <li><span style="display: inline-block; width: 15px; height: 15px; background-color: #e0ffff; border: 1px solid black; margin-right: 5px;"></span> Digital Data Available</li> <li><span style="display: inline-block; width: 15px; height: 15px; background-color: #e0ffff; border: 1px solid black; margin-right: 5px;"></span> No Digital Data Available</li> <li><span style="display: inline-block; width: 15px; height: 15px; background-color: #e0ffff; border: 1px solid black; margin-right: 5px;"></span> Unmapped</li> </ul>   |



The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

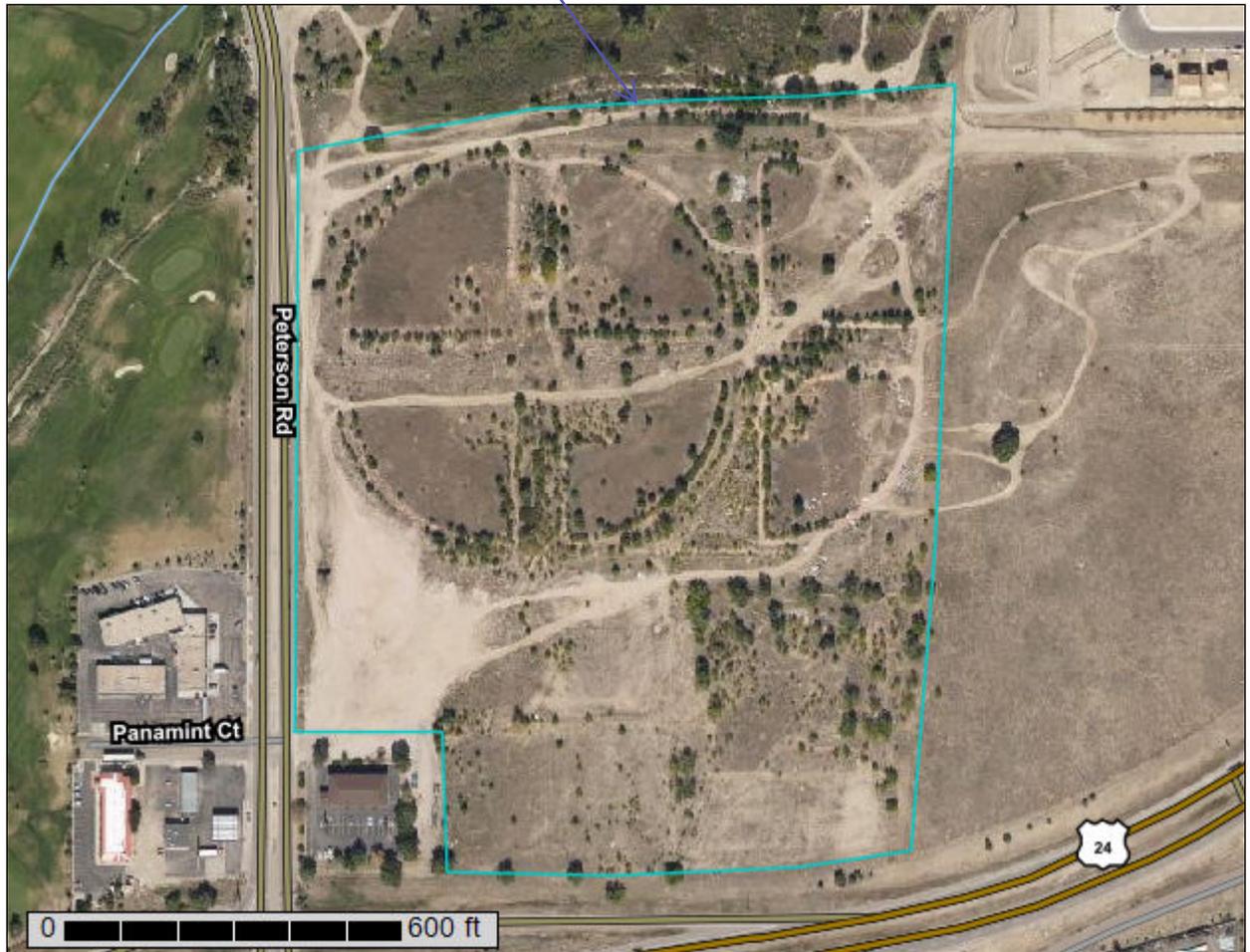
This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards.

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 6/28/2024 at 4:59 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

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

**APPROXIMATE SITE  
BOUNDARY**



# 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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# 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

APPROXIMATE SITE  
BOUNDARY



Map Scale: 1:2,770 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.

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

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

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

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

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

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

Soil Survey Area: El Paso County Area, Colorado  
 Survey Area Data: Version 21, Aug 24, 2023

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

Date(s) aerial images were photographed: Aug 19, 2018—Sep 23, 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
8	Blakeland loamy sand, 1 to 9 percent slopes	16.6	49.2%
10	Blendon sandy loam, 0 to 3 percent slopes	17.2	50.8%
<b>Totals for Area of Interest</b>		<b>33.8</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.

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,

## Custom Soil Resource Report

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

### 8—Blakeland loamy sand, 1 to 9 percent slopes

#### Map Unit Setting

*National map unit symbol:* 369v  
*Elevation:* 4,600 to 5,800 feet  
*Mean annual precipitation:* 14 to 16 inches  
*Mean annual air temperature:* 46 to 48 degrees F  
*Frost-free period:* 125 to 145 days  
*Farmland classification:* Not prime farmland

#### Map Unit Composition

*Blakeland and similar soils:* 98 percent  
*Minor components:* 2 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

#### Description of Blakeland

##### Setting

*Landform:* Hills, flats  
*Landform position (three-dimensional):* Side slope, talf  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear  
*Parent material:* Alluvium derived from sedimentary rock and/or eolian deposits derived from sedimentary rock

##### Typical profile

*A - 0 to 11 inches:* loamy sand  
*AC - 11 to 27 inches:* loamy sand  
*C - 27 to 60 inches:* sand

##### Properties and qualities

*Slope:* 1 to 9 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 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  
*Calcium carbonate, maximum content:* 5 percent  
*Available water supply, 0 to 60 inches:* Low (about 4.5 inches)

##### Interpretive groups

*Land capability classification (irrigated):* 3e  
*Land capability classification (nonirrigated):* 6e  
*Hydrologic Soil Group:* A  
*Ecological site:* R049XB210CO - Sandy Foothill  
*Hydric soil rating:* No

#### Minor Components

##### 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

**10—Blendon sandy loam, 0 to 3 percent slopes**

**Map Unit Setting**

*National map unit symbol:* 3671

*Elevation:* 6,000 to 6,800 feet

*Mean annual precipitation:* 14 to 16 inches

*Mean annual air temperature:* 46 to 48 degrees F

*Frost-free period:* 125 to 145 days

*Farmland classification:* Not prime farmland

**Map Unit Composition**

*Blendon and similar soils:* 98 percent

*Minor components:* 2 percent

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

**Description of Blendon**

**Setting**

*Landform:* Terraces, alluvial fans

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Parent material:* Sandy alluvium derived from arkose

**Typical profile**

*A - 0 to 10 inches:* sandy loam

*Bw - 10 to 36 inches:* sandy loam

*C - 36 to 60 inches:* gravelly sandy loam

**Properties and qualities**

*Slope:* 0 to 3 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):* Moderately high to high  
(0.60 to 2.00 in/hr)

*Depth to water table:* More than 80 inches

*Frequency of flooding:* None

*Frequency of ponding:* None

*Calcium carbonate, maximum content:* 2 percent

*Available water supply, 0 to 60 inches:* Moderate (about 6.2 inches)

**Interpretive groups**

*Land capability classification (irrigated):* None specified

*Land capability classification (nonirrigated):* 3e

## Custom Soil Resource Report

*Hydrologic Soil Group: B*

*Ecological site: R049XB210CO - Sandy Foothill*

*Hydric soil rating: No*

### **Minor Components**

#### **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*

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United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. [http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2\\_053624](http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624)

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**APPENDIX D**

***MAPS***

EL PASO COUNTY

MEADOWBROOK CROSSING FILING NO. 1

MEADOWBROOK PARKWAY

PETERSON ROAD

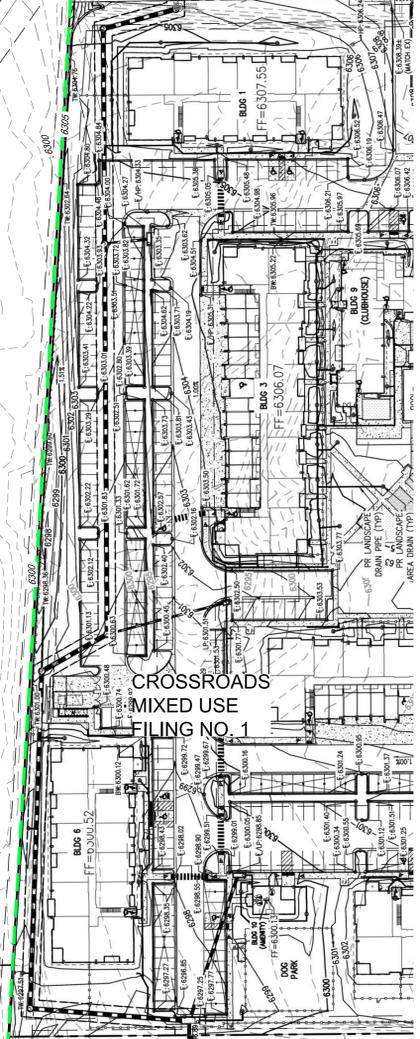
TRACT A ±6.752 AC

TRACT D ±2.397 AC

TRACT B ±7.675 AC

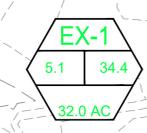
LOT 1 ±13.815 AC

TRACT C ±2.045 AC



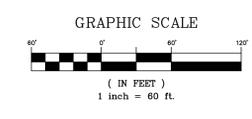
CROSSROADS MIXED USE FILING NO. 1

CROSSROADS MIXED USE FILING NO. 1 EXISTING EDB



**LEGEND**

- BASIN BOUNDARY
- EXISTING CONTOUR
- EXISTING STORM DRAIN PIPE
- DESIGN POINT
- SUB BASIN DESIGNATION
- 5-YEAR STORM EVENT PEAK FLOW (CFS)
- 100-YEAR STORM EVENT PEAK FLOW (CFS)
- SUB BASIN AREA (AC.)



CIMARRON HILLS SOUTHEAST MIXED USE FILING NO. 1			
Existing Conditions Sub-basin Summary			
Basin	Area	Q5	Q100
	acres	cfs	cfs
OS-1	1.20	3.1	6.8
EX-1	32.03	5.1	34.4
EX-2	0.45	0.2	1.4

Existing Design Point Summary				
CIMARRON HILLS SOUTHEAST MIXED USE FILING NO. 1				
Design Point	Sub-Basins	Total Area (ac.)	Q(5) (cfs)	Q(100) (cfs)
EX-1	UNDEVELOPED SITE AREA	32.03	5.12	34.39
EX-2	UNDEVELOPED SITE AREA	0.45	0.21	1.41
DSCH	EXISTING SITE DISCHARGE	33.68	6.53	38.96

REFERENCE DRAWINGS

No.	DATE	DESCRIPTION	BY

**COMPUTER FILE MANAGEMENT**

FILE NAME: S:\24.1382.003 Peterson Road and Meadowbrook Parkway Overall Development\200 Design\220 Drainage-WR\222 Reports\FDR\DWG\DR-Venezia.dwg  
 PLOT DATE: July 11, 2024 9:15:13 AM  
 THIS DRAWING IS CURRENT AS OF PLOT DATE AND MAY BE SUBJECT TO CHANGE

SHEET KEY



**PRELIMINARY**  
 THIS DRAWING HAS NOT BEEN APPROVED BY GOVERNING AGENCIES AND IS SUBJECT TO CHANGE

**EL PASO COUNTY**  
 CIMARRON HILLS SOUTHEAST MIXED USE FILING NO. 1  
 FINAL DRAINAGE REPORT  
 EXISTING CONDITIONS DRAINAGE MAP

DESIGNED BY	WCG	SCALE	DATE ISSUED	JULY 2024	DRAWING No.
DRAWN BY	WCG <td>HORIZ</td> <td>1" = 60'</td> <td>1 OF 2</td> <td>DR01</td>	HORIZ	1" = 60'	1 OF 2	DR01
CHECKED BY	JTS <td>VERT</td> <td>N/A</td> <td> </td> <td> </td>	VERT	N/A		

EL PASO COUNTY

MEADOWBROOK CROSSING FILING NO. 1

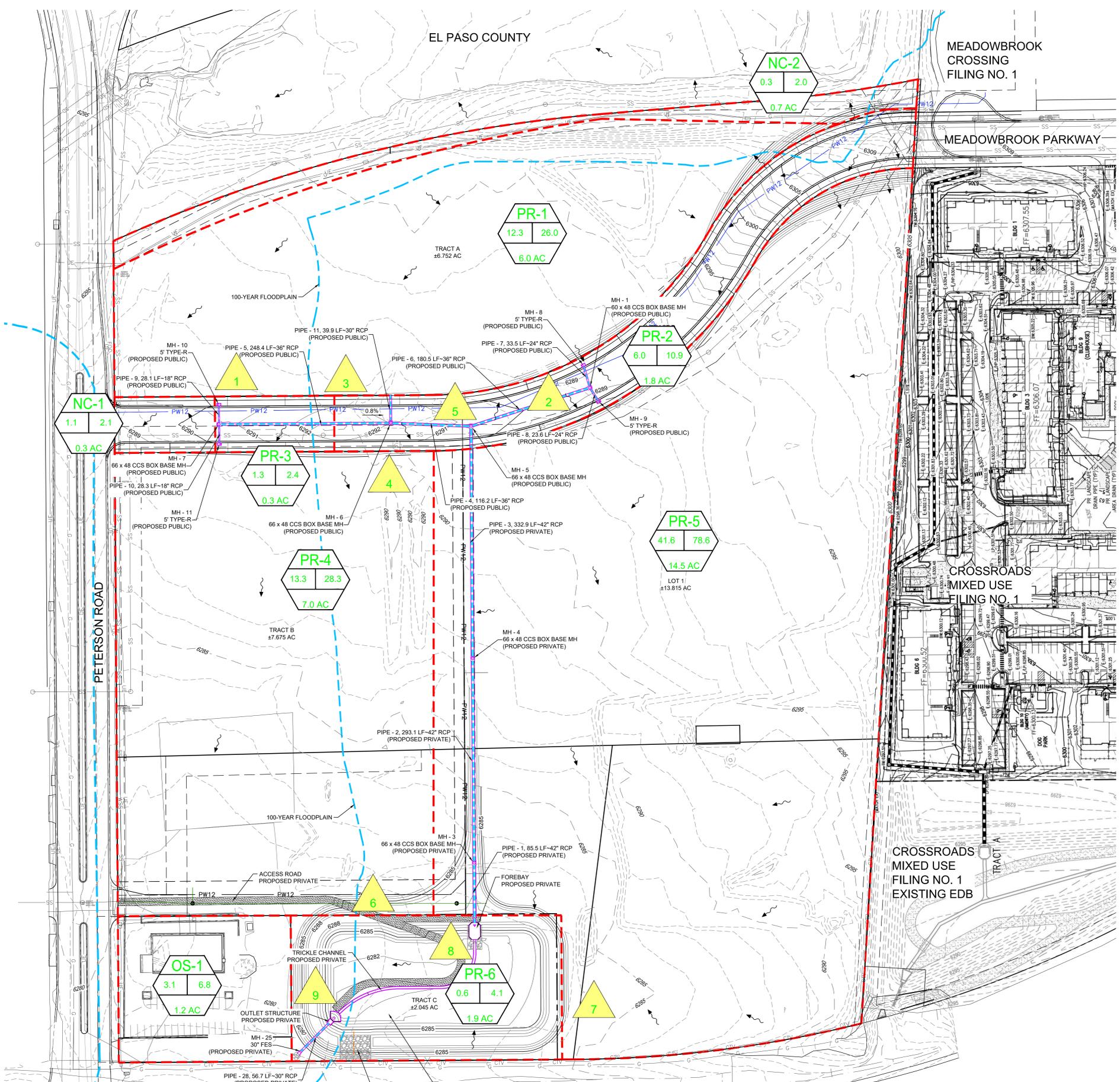
MEADOWBROOK PARKWAY

CROSSROADS MIXED USE FILING NO. 1

CROSSROADS MIXED USE FILING NO. 1 EXISTING EDB

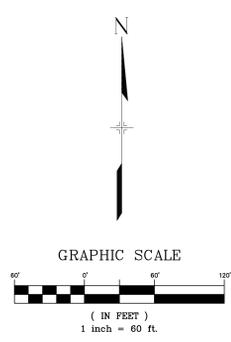
HIGHWAY 24 OFF RAMP

PETERSON ROAD



LEGEND

- EX BASIN BOUNDARY
- PR BASIN BOUNDARY
- EXISTING CONTOUR
- PROPOSED CONTOUR
- PROPOSED STORM DRAIN PIPE
- EXISTING STORM DRAIN PIPE
- PROPOSED PROPERTY LINE
- PROPOSED FLOW DIRECTION
- PROPOSED STORM STRUCTURES
- ▲ DESIGN POINT
- PROPOSED MAINTENANCE ACCESS ROAD
- PROPOSED RIP RAP
- PROPOSED WATER LINE
- PROPOSED SANITARY SEWER
- EMERGENCY FLOW PATHS
- BASIN SUB BASIN DESIGNATION
- Q5 5-YEAR STORM EVENT PEAK FLOW (CFS)
- Q100 100-YEAR STORM EVENT PEAK FLOW (CFS)
- AREA SUB BASIN AREA (AC)



CIMARRON HILLS SOUTHEAST MIXED USE FILING NO. 1				
Proposed Conditions Sub-basin Summary				
Basin	Area	Q5		Q100
		acres	cfs	cfs
PR-1	6.05	12.3	26.0	
PR-2	1.82	6.0	10.9	
PR-3	0.32	1.3	2.4	
PR-4	7.00	13.3	28.3	
PR-5	14.46	41.6	78.6	
PR-6	1.87	0.6	4.1	
NC-1	0.27	1.1	2.1	
NC-2	0.70	0.3	2.0	
OS-1	1.20	3.1	6.8	

Proposed Design Point Summary				
CIMARRON HILLS SOUTHEAST MIXED USE FILING NO. 1				
Design Point	Sub-Basins	Total Area (ac.)	Q(5) (cfs)	Q(100) (cfs)
DP1	MEADOWBROOK PKWY. AT GRADE INLETS	0.32	1.34	2.44
DP2	MEADOWBROOK PKWY. SUMP INLETS	1.82	5.95	10.88
DP3	LOT 2	6.05	11.00	23.38
DP4	DP1, DP3	6.37	12.01	25.22
DP5	DP 2, DP3, & DP 1	8.19	17.79	35.85
DP6	DP4 & LOT 3	15.19	30.54	62.94
DP7	CHURCH PARCEL	14.46	41.63	78.62
DP8	INTO DETENTION POND	31.52	71.59	143.58
DP9	OUT OF DETENTION POND	31.52	4.70	31.90
DSCI	SITE DISCHARGE	32.99	7.78	38.74

No.	DATE	DESCRIPTION	BY
COMPUTER FILE MANAGEMENT			
FILE NAME: S:\24.1382.003 Peterson Road and Meadowbrook Parkway Overall Development\200 Design\220 Drainage-WR\222 Reports\FDR\DWGDR-Venezia.dwg			
C78 FILE:			
PLOT DATE: July 11, 2024 9:15:52 AM			
THIS DRAWING IS CURRENT AS OF PLOT DATE AND MAY BE SUBJECT TO CHANGE			

SHEET KEY	

PREPARED BY:

Excellence by Design

**PRELIMINARY**  
THIS DRAWING HAS NOT BEEN APPROVED BY GOVERNING AGENCIES AND IS SUBJECT TO CHANGE

**EL PASO COUNTY**

CIMARRON HILLS SOUTHEAST MIXED USE FILING NO. 1  
FINAL DRAINAGE REPORT

**PROPOSED CONDITIONS DRAINAGE MAP**

DESIGNED BY: WCG	SCALE: 1" = 60'	DATE ISSUED: JULY 2024	DRAWING No: DR02
DRAWN BY: WCG	HORIZ: N/A	SHEET: 2 OF 2	
CHECKED BY: JTS	VERT: N/A		