



# **MAYBERRY COMMUNITIES MASTER DEVELOPMENT DRAINAGE PLAN**

**FOR**

## **MAYBERRY, COLORADO SPRINGS**

**PREPARED FOR:**

**COLORADO SPRINGS MAYBERRY, LLC  
3296 DEVINE HEIGHTS #208  
COLORADO SPRINGS, CO 80922**

**PREPARED BY:**

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**R&R JOB #MC22208  
EPC PROJECT NO. SKP236**

**ORIGINAL SUBMITTAL DATE: JULY 2023  
SUBMITTAL: DECEMBER 2024**

**ENGINEER'S STATEMENT:**

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

SIGNATURE: \_\_\_\_\_

Tim Stackhouse, P.E.  
Registered Professional Engineer  
State of Colorado No. 0061924

**DEVELOPER'S STATEMENT:**

I, the developer, have read and will comply with all of the requirements specified in this drainage report and plan.

SIGNATURE: \_\_\_\_\_

John Mick  
Colorado Springs Mayberry, LLC  
3296 Devine Heights #208  
Colorado Springs, CO 80922

**EL PASO COUNTY'S STATEMENT:**

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

SIGNATURE: \_\_\_\_\_

Joshua Palmer, P.E.  
County Engineer/ECM Administrator



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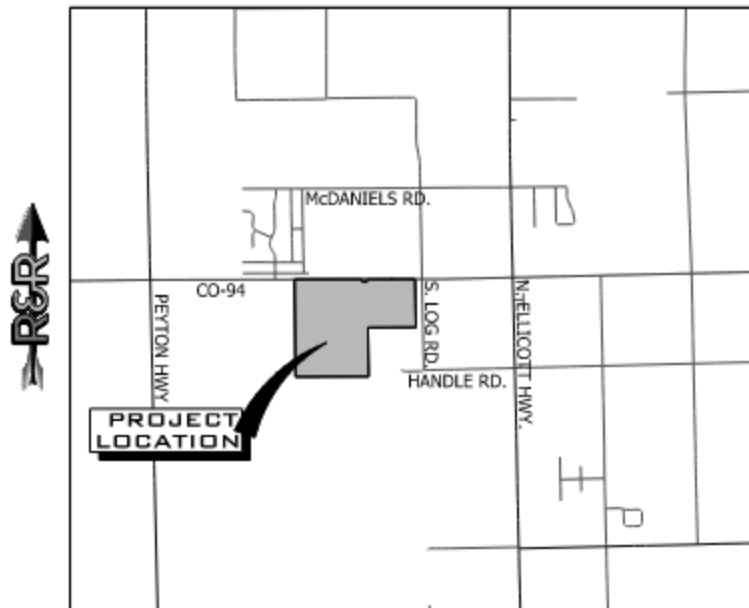
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## **I. GENERAL LOCATION AND DESCRIPTION**

### **A. Background**

Mayberry, Colorado Springs (formerly known as “Ellicott Town Center”) is a proposed subdivision located west of Ellicott, Colorado in El Paso County. The development is located on the south side of State Highway 94, approximately 1-1/2 miles west of Ellicott Highway, as shown in Figure 1.



**Figure 1: Vicinity Map**

There is an existing Master Development Drainage Plan (MDDP) for Ellicott Town Center that was approved in December of 2005. This new MDDP will supersede the previous report and is being prepared as part of the Sketch Plan submittal.

### **B. Scope**

This report has been prepared in support of the Sketch Plan application for Mayberry, Colorado Springs. The report is intended to fulfill the El Paso County requirements for an MDDP.

The report will provide a summary of site drainage issues impacting the proposed development, including analysis of impacts from upstream drainage patterns, site-specific developed drainage patterns, and impacts on downstream facilities. This drainage report was prepared based on the guidelines and criteria presented in the El Paso County Drainage Criteria Manual.

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**C. Site Location and Description**

The Mayberry, Colorado Springs development (hereon called the site) is approximately 632 acres and comprises the northern half and southwest quadrant of Section 14 along with the eastern quarter of Section 15. More specifically, the site lies within portions of Sections 14 and 15, Township 14 South, Range 63 West of the 6<sup>th</sup> Principal Meridian. The site is located at an elevation of approximately 6,060 feet.

State Highway 94 borders the Site to the north and unplatted agricultural properties border the Site on the west, south, and east sides. Properties to the west and southwest are zoned RR-5 and properties to the east/southeast are zoned A-35. Log Road borders the northeastern portion of the site to the east.

The master plan proposes single-family lots, multifamily development, commercial/mixed-use development, parks and open space, and an elementary school.

The primary access to the Site will be provided by newly constructed roads off Highway 94 and Log Road. The new roads, Springs Road and Mayberry Drive, will run through the site from north to south. Additionally, a new road will be constructed to run east west and will be an extension of the existing Handle Road located to the east of the Site.

The intermittent streams throughout this area drain into the Black Squirrel Creek Basin which ultimately outfalls into the Arkansas River. A majority of the site is located within the Ellicott Consolidated Drainage Basin (CHBS1200). This basin conveys surface drainage to the West Fork of Black Squirrel Creek, which is located east of this parcel between the site and Ellicott Highway. The Southwest Corner of the site is located within the Telephone Exchange Drainage Basin (CHW0200)

The terrain is generally flat with gentle northwest to southeast slopes ranging from one to two percent. Historic drainage patterns from the site are conveyed overland to the south and east boundaries of the site. Construction of roadways and single-family homes has begun within Filing 1, Filing 2, and Filing 3 while the remainder of the site is covered with native grasses. For the purpose of this MDDP, Filings 4 and 5 are assumed to be existing as these projects are currently under review.

**D. General Soil Conditions**

According to the Soil Survey of El Paso County prepared by the Soil Conservation Service, on-site soils are comprised primarily of "Blakeland Loamy Sand (type 8)" soils and "Truckton Loamy Sand (map symbol 95) (see Appendix). The onsite soils are

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characterized as well-drained sandy soils with low runoff rates and low erosion potential. These soils are classified as hydrologic soils group “A” for drainage analysis purposes.

**E. References**

David R. Sellon & Associates Inc., “Antelope Park Ranchettes Interior Drainage Plan,” March, 1972.

El Paso County “Drainage Criteria Manual County of El Paso, Colorado – Volumes 1 and 2” dated October 31, 2018. (Referred to throughout as EPC DCM)

El Paso County Planning Department, “Ellicott Valley Comprehensive Plan,” March, 1989.

El Paso County “Engineering Criteria Manual,” January 9, 2006.

El Paso County Resolution No. 15-042 (El Paso County adoption of “Chapter 6: Hydrology” and “Chapter 13, Section 3.2.1: Full Spectrum Detention” of the City of Colorado Springs Drainage Criteria Manual dated May 2014).

JPS Engineering, “Master Development Drainage Plan for Ellicott Town Center,” November 22, 2005 (approved by El Paso County 12/02/05).

JPS Engineering, “Master Development Drainage Plan and Preliminary Drainage Report for Springs East Village,” March 21, 2002 (approved by El Paso County 10/23/02).

JPS Engineering, “Master Development Drainage Plan and Preliminary Drainage Report for Viewpoint Village,” January 28, 2002 (approved by El Paso County 9/11/02).

JPS Engineering, “Preliminary Drainage Report for Ellicott Town Center - Phase 1,” January 15, 2007.

JPS Engineering, “Preliminary Drainage Report Amendment for Mayberry, Colorado Springs – Phase 1 PUD,” revised February 2022

JPS Engineering, “Final Drainage Report for Mayberry, Colorado Springs – Filing No. 1A Replat,” approved June 2022.

Leigh Whitehead & Associates, Inc., “Master Development Drainage Plan for Sunset Village,” May, 2000 (approved by El Paso County 8/31/00).

Pacific Summits Engineering, “Final Drainage Report for Viewpoint Estates,” January 6, 1998 (approved by El Paso County 10/6/99).

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United Planning and Engineering, "Preliminary Drainage Plan & Report for Springs East," November 19, 1999.

United Planning and Engineering, "Drainage Plan & Report for Viewpoint Subdivision," May, 2000.

USDA/NRCS, "Soil Survey of El Paso County Area, Colorado," June, 1981.

Federal Emergency Management Agency, Map Number 08041C0810G, Panel 810 of 1300, December 7, 2018

R&R Engineers-Surveyors, "Final Drainage Report for Mayberry, Colorado Springs – Filing No. 3," Approved May 2023

## **II. DRAINAGE BASINS AND SUB-BASINS**

### **A. Major Drainage Basins**

The proposed development lies primarily within the Ellicott Consolidated Drainage Basin (CHBS1200) and the Telephone Exchange Drainage Basin (CHWS0200) as classified by El Paso County. These basins are comprised of the area tributary to the West Fork of Black Squirrel Creek, with the majority of the basins bounded by SH94 to the north, Ellicott Highway to the east, and North Peyton Highway to the west. No drainage planning study has been completed for the Ellicott Consolidated Drainage Basin or the Telephone Exchange Drainage Basin. The introduction of new drainage patterns as part of this master study will cause minor alterations to the existing drainage boundaries of these basins. Specifically, the construction of Mayberry Drive will redirect approximately 20.5 acres of stormwater from the northeast corner of proposed Drainage Basin F to the historic Telephone Exchange Drainage Basin, an area that was formerly tributary to the Ellicott Consolidated Drainage Basin. Additionally, a portion of proposed Drainage Basin G will direct approximately 7.4 acres of stormwater from the southwest corner to the historic Ellicott Consolidated Drainage Basin, which was previously tributary to the Telephone Exchange Drainage Basin.

El Paso County approved the "Sunset Village Master Development Drainage Plan (MDDP)" prepared by Leigh Whitehead & Associates. This MDDP borders the Mayberry parcel to the west. Based on the Drainage Report for Viewpoint Estates, stormwater detention ponds were constructed to maintain historic flows leaving the upstream developed areas. As such, the drainage analysis for major basins impacting the site will assume that historic flows enter this parcel from upstream.

The major drainage basins lying in and around the proposed development are depicted in the appendix. Mayberry, Colorado Springs is located primarily within the

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Ellicott Consolidated Drainage Basin, which comprises a tributary area of about 13 square miles, or 8,320 acres. The proposed subdivision represents a total of approximately 632 acres of development, or 7 percent of the total basin area. An “on-site” drainage planning approach has been proposed based on the relatively small developed area in comparison to the remaining undeveloped basin area, which is primarily agricultural land.

The existing site topography has several off-site drainage basins that enter the north and west boundaries of the Mayberry parcel. Triple 30-inch CMP culverts cross SH94 at several locations along the north boundary of the site. These off-site basins combine with on-site flows, following existing grass-lined swales southeasterly through the site. The site historically consists of six major basins conveying flows towards the south and eastern boundaries of the site, as shown in Figure DR1 in Appendix D.

**B. Floodplain Impacts**

Mayberry, Colorado Springs is located approximately one mile southwest of the 100-year floodplain limits for the West Fork of Black Squirrel Creek, as delineated by the Federal Emergency Management Agency (FEMA). The floodplain limits in the vicinity of the site are shown in Flood Insurance Rate Map (FIRM) Number 08041C0810G, dated December 7, 2018 (see Appendix A).

**C. Sub-Basin Description**

The developed drainage basins lying within the site are depicted on the proposed drainage maps in Appendix D. The interior site layout has been delineated into several major drainage basins (A, B, D, E, F, and G) based on the anticipated proposed interior road layout and grading scheme. The natural drainage patterns were held to decrease the impact on downstream properties. Each of these sub-basins drain towards the southeast and sheet-flow onto neighboring properties to the east and south.

**III. DRAINAGE CRITERIA**

**A. Hydrologic Criteria**

Rational method procedures were utilized for calculations of peak flows within the existing and proposed on-site drainage basins. Rational method hydrologic calculations were based on the following assumptions:

- Design storm (minor) 5-year
- Design storm (major) 100-year
- Rainfall Intensities El Paso County I-D-F Curve
- Hydrologic soil type A

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	C5	C100
• Runoff Coefficients - undeveloped:		
Existing pasture/meadow areas	0.04	0.35
• Runoff Coefficients - developed:		
Proposed Residential (1/8-1/4 acre lots)	0.375	0.545
Proposed Neighborhood Commercial	0.81	0.88
Proposed Multi-Family	0.81	0.88

Composite runoff coefficients for the developed residential areas have been calculated based on average lot sizes between 1/8-acre and 1/4-acre. A rational method spreadsheet was utilized for modeling these flows and can be found in Appendix B.

Two offsite drainage basins to the north of State Highway 94 will be routed through the development as intended in the Mayberry Filing No. 1 Final Drainage Report (FDR) and the Mayberry Filing No. 3 Final Drainage Report. The SCS method was used for both offsite basins, EC10 and EC11, to identify the peak flows within the referenced FDRs. Please refer to Appendix E for supporting calculations.

#### **B. Detention and Water Quality Criteria**

This MDDP anticipates six full spectrum extended detention basins (EDB) to accommodate the entire master development. Basin volumes have been calculated using the Mile High Flood District (MHFD) spreadsheet and incorporated into the preliminary overlot grading surface to ensure a minimum 3% pond bottom can be satisfied and to identify pond outfall locations. The MHFD worksheets can be found in Appendix C. It is the responsibility of the individual Final Drainage Reports for future Mayberry filings to design an outlet structure which accommodate required release rates. The future facilities shall be designed to pass and release the water quality capture volume (WQCV), excess urban runoff volume (EURV), and the 100-year storm to meet all local and state regulations by means of a multi-stage outlet structure.

### **IV. DRAINAGE DESIGN**

#### **A. General Concept**

The drainage design intent is to maintain existing drainage patterns while protecting downstream properties and infrastructure from this development. This master drainage plan delineates six drainage basins, therefore six full spectrum extended detention basins are proposed. Open channels and future storm infrastructure are anticipated to route stormwater to the EDBs. For the purpose of this overview approach, only major roadways have been detail graded into the proposed overlot surface to demonstrate how these drainage basin divides will be accomplished.

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As there is no existing stormwater infrastructure to the south and east of this development, the ultimate stormwater discharge from the proposed EDBs will first enter a plunge pool before exiting the site. The recommended plunge pools will decrease the velocity and act as a level spreader to convert point discharges to a sheet-flow condition leaving the site.

Three offsite basins will impact this master development. Basin EC12 is conveyed under SH94 through culverts (DP ec12) and combines with basin OFF-1 which historically flows in and out of the western property line. To maintain the ultimate drainage pattern destination and protect the future development, a height varying berm has been recommended along the western property line to direct flows south. This will slightly alter drainage paths, however the ultimate discharge point, design point o1, will remain constant with historic flows. To avoid erosion and downstream impacts, it is recommended to install check dams and a riprap lined plunge pool at the southern limit of the berm, as this condition will cause channelized flow.

Basin EC11 is conveyed through culverts under SH94 (DP ec11), north of Filing No. 1. The Mayberry Filing No. 1A FDR continues this offsite flow south through an RCP pipe under Atchison Way. This master drainage plan recommends continuing this flow south until it reaches a defined open-channel (Channel B) where it will discharge with Pond A and Pond B's outfall points to Plunge Pool 3.

Basin EC10 is conveyed through culverts under SH94 (DP ec10), north of Filing No. 3. The Mayberry Filing No. 3 FDR continues this offsite flow via an open channel, Channel E per the Filing 3 FDR and a series of culverts, to the south where the ultimate discharge point enters the existing Log Road roadside ditch with the outfall of Pond D. This master drainage plan recommends continuing this flow via storm pipe along the same alignment as the existing Filing 3 channel, Channel F, to support the proposed development. The discharge location will remain the same.

## **B. Existing Basins**

Historic drainage conditions for this MDDP assume Mayberry Filings 1, 2, 3, 4, and 5 are to exist. This will include single family homes, apartment buildings, townhomes, parks, roadways, and commercial lots. The remaining undeveloped land to the south of these filings are depicted as pastures. Existing basins EX-A and EX-B depict the developed Mayberry Filings approved or currently under review with El Paso County as forementioned. Existing Basins EX-C, EX-D, EX-E, and EX-F depict the areas undeveloped on the Mayberry property. The general flow pattern of the entire site gradually falls from the northwest to the southeast at slopes ranging from one to two percent. Stormwater currently sheetflows across the eastern and southern property boundaries.



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**C. Developed Drainage Basins**

The developed drainage basins and projected flows are shown in the proposed drainage maps in Appendix D. A description of each basin is as follows:

Drainage Basin A is a total of 95 acres consisting of multifamily development, a small portion of single-family development, and commercial development located in the northwest portion of the site. Stormwater is anticipated to be routed via curb and gutter, storm pipe, and Channel A to ultimately be detained by Pond A in the lower southeast corner of the basin. The Pond A discharge will enter the storm network within Boulevard A and continue east until it is discharged into Plunge Pool 3 before exiting the site.

Drainage Basin B is a total of 49 acres consisting of single-family homes, multifamily development, and commercial development. Basin B encompasses the area south of Mayberry Filing 1. Stormwater is anticipated to be routed via curb and gutter and storm pipe to ultimately be detained by Pond B in the lower southeast corner of the basin. The Pond B discharge will enter Channel B and ultimately outfall into Plunge Pool 3 before exiting the site.

Drainage Basin C is a total of 43 acres consisting of single-family homes and multifamily development. Basin C encompasses the entirety of Mayberry Filing 1. The existing Pond C will be re-shaped from what was designed and constructed within Mayberry Filing 1. Stormwater is anticipated to be routed via curb and gutter and storm pipe to ultimately be detained by Pond C in the lower southeast corner of the basin. The Pond C discharge will enter Channel B and ultimately outfall into Plunge Pool 3 before exiting the site.

Drainage Basin D is a total of 110 acres consisting of single-family homes, multifamily development, and commercial development. Basin D encompasses Mayberry Filings 2, 3, and 4. Stormwater is anticipated to be routed via curb and gutter, storm pipe, and Channel D to ultimately be detained by Pond D in the lower southeast corner of the basin. The Pond D discharge will enter Channel F and ultimately outfall into Plunge Pool 4 before exiting the site.

Drainage Basin E is a total of 73 acres consisting of single-family homes, multifamily development, and commercial development located in the northeast portion of the site. Stormwater is anticipated to be routed via curb and gutter and storm pipe to ultimately be detained by Pond E in the lower southeast corner of the basin. The Pond E discharge will enter Plunge Pool 4 before exiting the site.

Drainage Basin F is a total of 75 acres consisting of single-family homes and multifamily development located in the southwest portion of the site. Stormwater is

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anticipated to be routed via curb and gutter, storm pipe, and Channel H to ultimately be detained by Pond F in the lower south side of the basin. The Pond F discharge will enter Plunge Pool 5 before exiting the site.

Drainage Basin G is a total of 160 acres consisting of single-family homes and multifamily development located in the southeast portion of the site. Stormwater is anticipated to be routed via curb and gutter, storm pipe, and Channel G to ultimately be detained by Pond G in the lower southeast corner of the basin. The Pond G discharge will enter Plunge Pool 6 before exiting the site.

Each proposed drainage basin has a specific design point relative to the overall discharge location of the basin. Please see the chart below indicating the 5-year and 100-year flows for each design point:

DESIGN POINT SUMMARY TABLE				
Design Point	Contributing Basins	Area (acres)	5-yr (cfs)	100-yr (cfs)
1	A	95.00	147.81	273.86
2	B	49.00	64.15	136.63
3	C	43.00	56.01	115.33
4	D	110.00	138.30	293.42
5	E	73.00	101.07	204.91
6	F	75.00	70.97	145.03
7	G	160.00	166.68	350.13

**D. Detention Design**

An extended detention basin is proposed for each major drainage basin to mitigate developed stormwater flows leaving the site. The total volume requiring storage is equivalent to the 100 Year + ½ WQCV produced by the onsite developed area. See Appendix C for each respective MHFD worksheet. A description of each EDB is as follows:

Pond A is located at the southeast corner of drainage Basin A. Based on the tributary land-use, the required volume for the pond is 16.5 acre-feet. Pond A will discharge into an underground RCP pipe that will continue east under Boulevard A until the flow ultimately discharges into a channel combined with the Pond B outfall and the offsite basin EC11 at Plunge Pool 3.

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Pond B is located at the southeast corner of drainage Basin B. Based on the tributary land-use, the required volume for the pond is 6.4 acre-feet. Pond B will discharge into Channel B, combining with the flow from offsite basin EC11 and the discharge from Pond C at Plunge Pool 3.

Pond C is located at the southeast corner of drainage Basin C. Based on the tributary land-use, the required volume for the pond is 6.0 acre-feet. Pond C has been designed and constructed with Mayberry Filing 1. In the ultimate buildout, Pond C will be reshaped as preliminarily depicted in the drainage map. Pond C will discharge into Channel B, combining with the flow from offsite basin EC11 and the discharge from Pond B at Plunge Pool 3.

Pond D is located at the southeast corner of drainage Basin D. Based on the tributary land-use, the required volume for the pond is 15.3 acre-feet. Pond D has been designed and approved in the Filing No. 3 Final Drainage Report. Although the approved Filing No. 3 Pond design is sufficient for this full development, the configuration will be revised to accommodate this future layout of single-family lots. Pond D will discharge into Channel F (SF2219), combining with the flow from offsite basin EC10. This flow will ultimately discharge into Plunge Pool 4.

Pond E is located at the southeast corner of drainage Basin E. Based on the tributary land-use, the required volume for the pond is 13.5 acre-feet. Pond E will discharge directly into Plunge Pool 4 located within Channel F (SF2219), combining with the flow from Pond D and the offsite basin, EC10.

Pond F is located at the southern boundary of drainage Basin F. Based on the tributary land-use, the required volume for the pond is 11.3 acre-feet. Pond F will discharge into Plunge Pool 1, where stormwater flow will slow down and sheet-flow onto the adjacent property.

Pond G is located at the southeast corner of drainage Basin G. Based on the tributary land-use, the required volume for the pond is 22.6 acre-feet. Pond G will discharge into Plunge Pool 2, where stormwater flow will slow down and sheet-flow onto the adjacent property.

#### **E. Open Channels**

Six open channels are proposed as part of this master development: A, B, D, F, H, and G. These channels will generally be designed as stable native grass-lined channels with subcritical flow regimes. Drainage channels have been designed to convey the 100-year flows, with trapezoidal cross-sections, side slopes of 4:1, and a minimum freeboard of 1-foot. Channel geometry can be subject to change in the final drainage reports for future filings, however the conservative parameters for the preliminary design is as follows:

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Channel A conveys flows from portions of Basin A, with a tributary area of 11.6 acres (see Appendix B). The channel is trapezoidal with a bottom width of 8 feet and a total depth of 2.5'. The channel is recommended to be lined with a native grass mixture.

Channel B conveys flows from the offsite basin, EC11. The flows for EC11 have been taken from the approved Final Drainage Report for Mayberry Filing No. 1A (see Appendix E for referenced calculations). The channel is trapezoidal with a bottom width of 8 feet and a total depth of 3.5'. The channel is recommended to be lined with a native grass mixture.

Channel D conveys flows from the northern portion of Basin D, assumed to be existing as Mayberry Filings 2, 3, and 4. The flows have been taken from the approved Final Drainage Report for Mayberry Filing No. 3 (see Appendix E for referenced calculations). The channel is trapezoidal with a bottom width of 8 feet and a total depth of 4'. The channel is recommended to be lined with a native grass mixture.

Channel F conveys flows from the offsite basin, EC10 and the discharge of Pond D. The flows for EC10 have been taken from the approved Final Drainage Report for Mayberry Filing No. 3 (see Appendix E for referenced calculations). The channel is trapezoidal with a bottom width of 8 feet and a total depth of 3.5'. The channel is recommended to be lined with a native grass mixture.

Channel H conveys flows from portions of Basin F, with a tributary area of 24 acres (see Appendix B). The channel is trapezoidal with a bottom width of 8 feet and a total depth of 2.5'. The channel is recommended to be lined with a native grass mixture.

Channel G conveys flows from portions of Basin G, with a tributary area of 64.4 acres (see Appendix B). The channel is trapezoidal with a bottom width of 8 feet and a total depth of 3'. The channel is recommended to be lined with a native grass mixture.

**F. Culverts**

Eight culverts are proposed beneath proposed roadways crossing the open channels. The culverts are designed so that during the 100-year storm event, water levels do not exceed 12 inches above finished grade when overtopping the roadway above per Table 6-4 of EPC DCM.

Culverts 1 and 2 will continue the stormwater flows of Channel B, consisting of the offsite basin, EC11 and the Pond B outfall. Culvert 3 will continue the stormwater flows of Channel F, consisting of the offsite basin, EC10 and the Pond D outfall. Culverts 4, 5, and 6 will continue the stormwater flows of Channel G. Lastly, culverts 7 and 8 will continue stormwater flows of Channel H. Refer to Appendix E for supporting calculations of the 5-year and 100-year flows for culverts 1, 2, and 3. Refer to Appendix B for supporting calculations of the 5-year and 100-year flows for culverts 4, 5, 6, 7, and 8.

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**G. Riprap and Plunge Pools**

Rip-Rap and plunge pools are recommended to be sized for the 100-year storm per UDFCD Chapter 9 Section 3.2.1 and 3.2.2. Rip-rap shall be placed where all pipes discharge into channels across the site and is sized to reduce velocities to 5 feet per second (fps). Plunge pools have been proposed where flows from the extended detention basins discharge before ultimately leaving the property. The plunge pools shall be sized to reduce velocities to 1.3 fps to ensure flows leaving the property are as non-erosive as possible and sheet-flow onto the adjacent properties to maintain historic flow patterns.

Plunge Pool 3, located southeast of Pond B, will mitigate Pond A, B, and C outfalls, and the offsite flow of Basin EC11. Plunge Pool 4, located south of Pond E and west of Log Road, will mitigate Pond D and E outfalls, and the offsite flow of Basin EC10 before discharging to the existing roadside ditch along Log Road. Plunge Pool 1 is located south of Pond F and will mitigate the Pond F outfall. Plunge Pool 2 is located south of Pond G and will mitigate the Pond G outfall.

**H. Analysis of Existing and Proposed Downstream Facilities**

The general concept of the proposed master drainage plan is to attenuate peak flows from the developed site by routing flows through proposed on-site detention ponds. The onsite detention ponds are designed to convert the developed flows from the Mayberry Communities master plan to historic levels before discharging to the adjacent property. The historic drainage patterns show stormwater sheet-flowing across the project boundaries along the southern and eastern property lines. As the proposed detention ponds will create a point discharge condition, plunge pools are recommended to slow down the stormwater flow, and convert the point discharge to a sheet-flow condition as the plunge pools will allow the stormwater to slowly spill over. A detail of a plunge pool has been added to Appendix C.

As the stormwater runoff overtops each plunge pool and enters the downstream property, the water will sheet flow to its historic destination. Plunge pools 01, 1, 2, and 3 will direct flows to the southern property, where the runoff will sheet flow southeasterly, until it ultimately enters the Lower Black Squirrel (CHBS0600) drainage basin per El Paso County. Plunge Pool 4 will discharge into the existing Log Road roadside ditch. This roadside ditch shall be evaluated for future improvements in the final drainage report pertaining to Basin E. Runoff from the roadside ditch will continue south until it is ultimately discharged into the Black Squirrel Creek. Conditions of each plunge pool shall be regularly inspected and cleared of sediment and debris to maintain the functionality to prohibit adverse effects to the downstream properties.

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**I. Anticipated Drainage Problems and Solutions**

The proposed stormwater detention ponds are designed to mitigate the impacts of developed drainage from this master planned development. The overall drainage plan anticipates a system of improved public streets with curb and gutter, storm inlets, and storm sewers conveying developed flows to improved drainage channels running throughout the site. The primary drainage problems anticipated within this development will consist of maintenance of these storm sewer systems, culverts, drainage channels, and detention pond facilities. Continuing maintenance will need to be implemented for proper erosion control measures in the proposed channels and swales, which will be designed to meet allowable velocity criteria.

A trail system shall be constructed along the major drainage channels to provide maintenance access to the drainage facilities throughout the development. Proper construction and maintenance of the proposed detention facilities will minimize downstream drainage impacts. The proposed detention ponds and channels throughout the site will be privately owned and maintained by the homeowner's association or metropolitan district.

**V. WATER QUALITY**

Water quality will be provided for all proposed drainage basins of this master planned development. The proposed channels will promote the conveyance of storm water at a slower, controlled rate and will act as a filter medium removing pollutants and allowing stormwater infiltration. The proposed detention ponds will be designed to include an outlet structure with a series of orifices to meet the 40-hour drain time for the water quality capture volumes. This allows sediment to settle prior to stormwater runoff discharging from the ponds.

**VI. SUMMARY**

The proposed Mayberry Communities master development will generate an increase in developed runoff from the site, which will be mitigated through construction of on-site stormwater detention facilities. The proposed drainage patterns will remain consistent with historic conditions, and new drainage facilities constructed to El Paso County standards will safely convey runoff to adequate outfalls protected by utilizing the design of plunge pools. The proposed detention ponds at the south and east boundaries of the site will ensure that developed flows from Mayberry Communities remain below historic levels. Construction of the proposed drainage facilities will ensure that this subdivision will not adversely affect downstream or surrounding areas.

**MAYBERRY COMMUNITIES  
MASTER DEVELOPMENT DRAINAGE PLAN**

**VII. Appendix**

**Appendix A – Referenced Maps**

- Vicinity Map
- Soils Map
- FEMA Map

**Appendix B – Hydrologic Calculations**

**Appendix C – Hydraulic Calculations**

**C1. Detention Basin Volumes**

**C2. Open Channels**

**C3. Culvert Sizing**

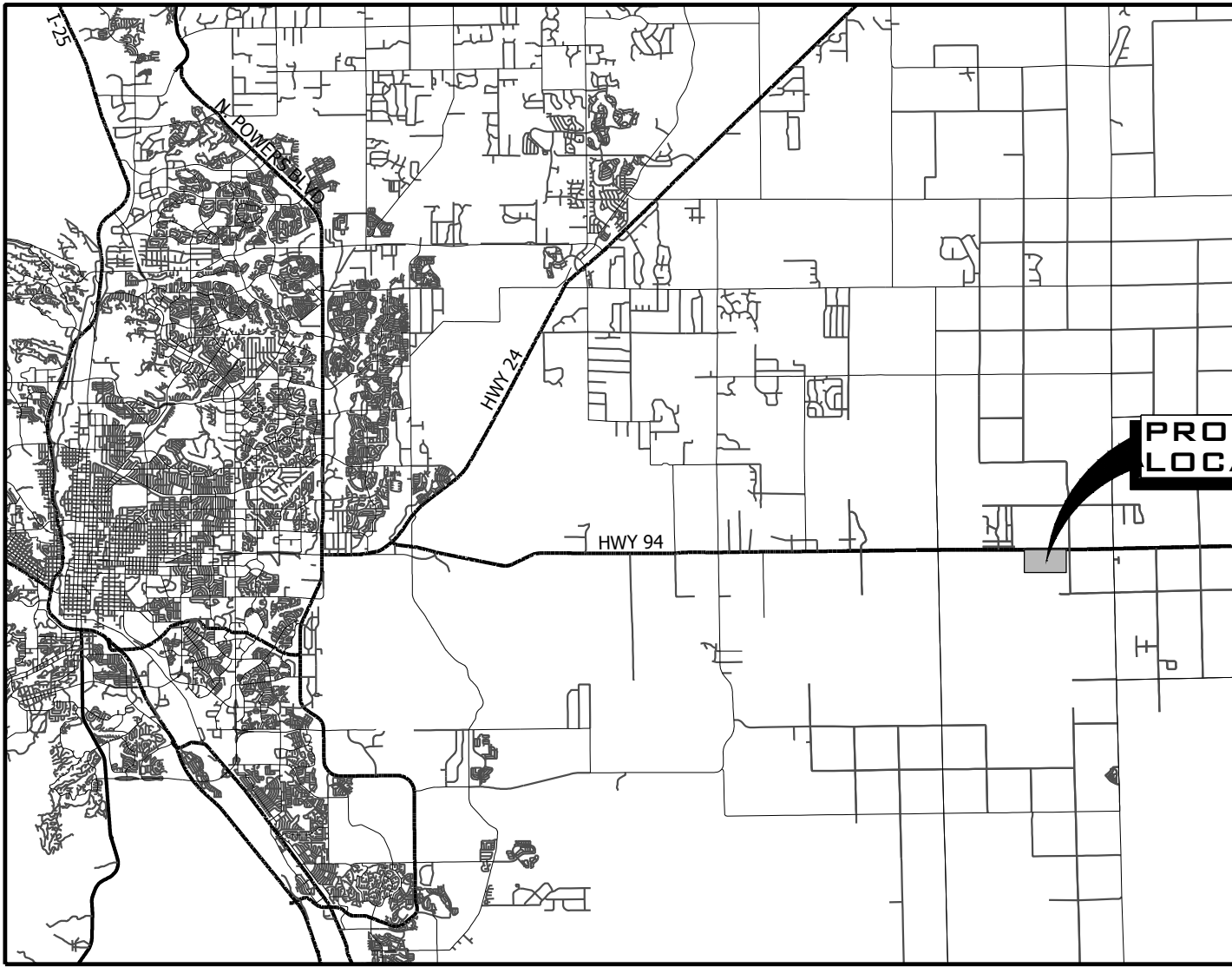
**Appendix D – Drainage Maps**

**Appendix E – Referenced Drainage Reports**

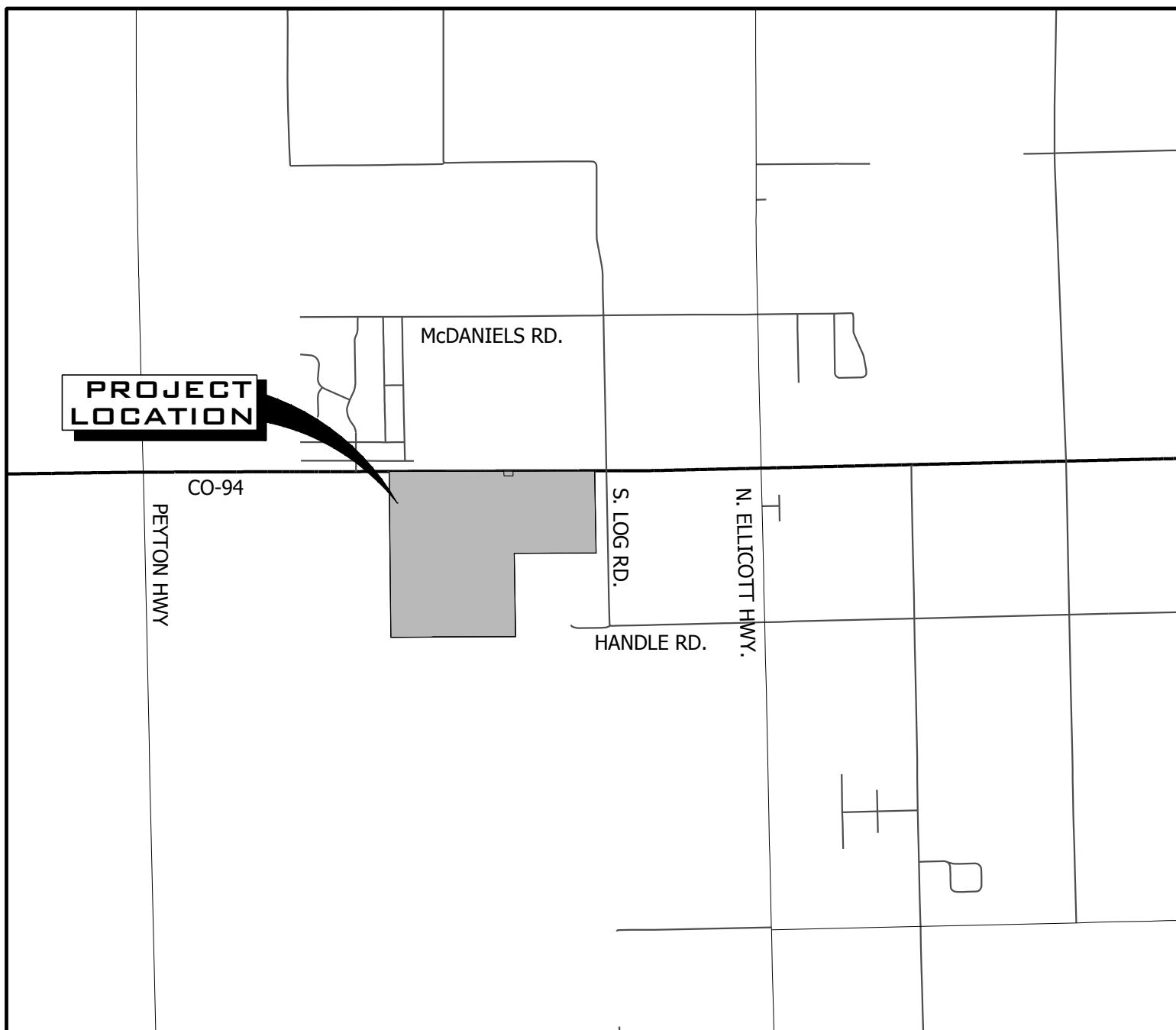
**MAYBERRY COMMUNITIES  
MASTER DEVELOPMENT DRAINAGE PLAN**

**APPENDIX A – REFERENCED MAPS**



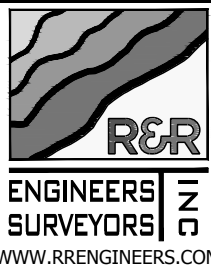


**VICINITY MAP**  
SCALE 1" = 20,000'



**SITE MAP**  
SCALE 1" = 5000'

REVISIONS			



**SITE MAP**

**MAYBERRY MASTER PLAN**

3296 DEVINE HEIGHTS #208  
COLORADO SPRINGS, CO 80922



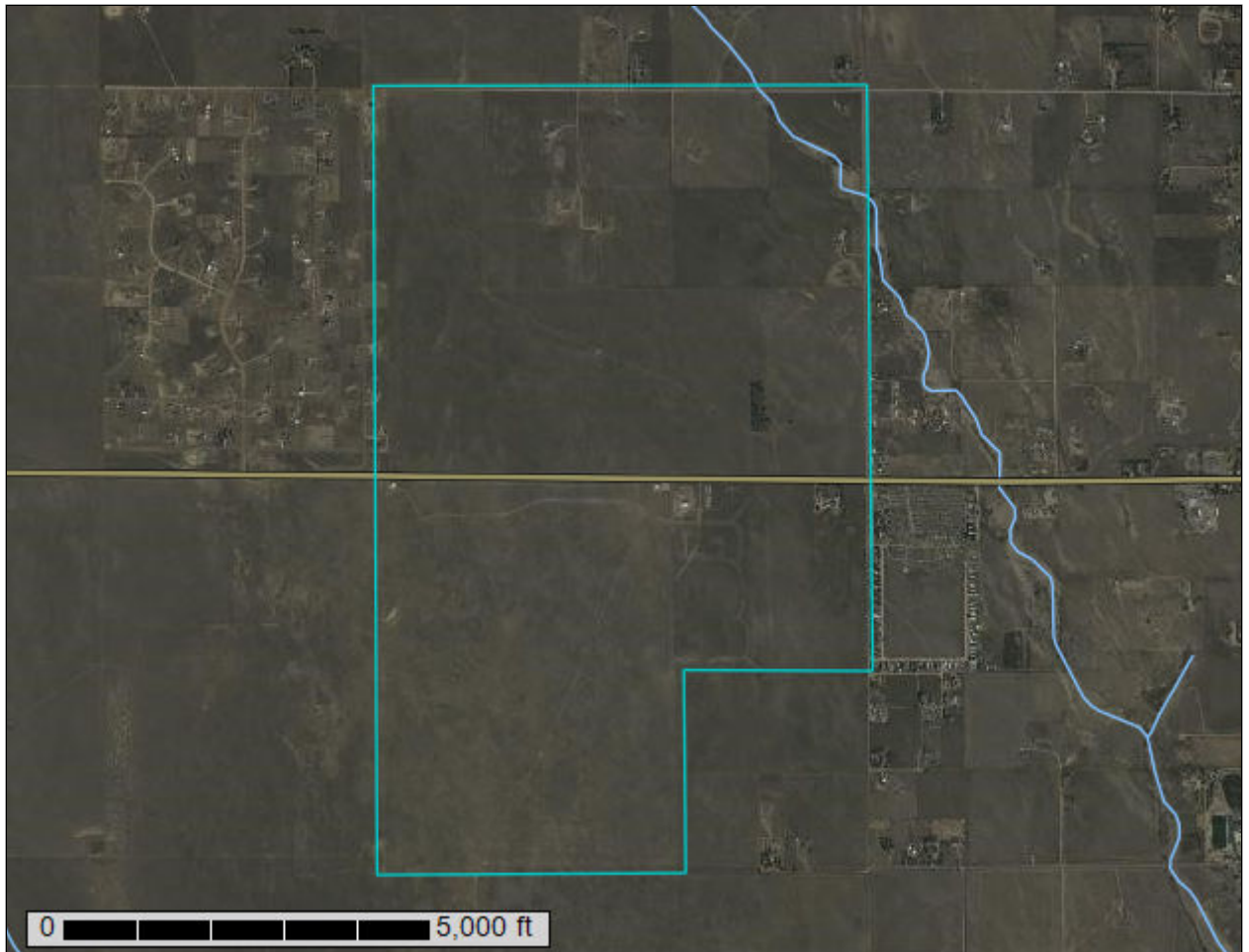
JOB NO.	MC22110
DATE	05-03-2023
DRN	LAO   CHK   CD
EXHIBIT NAME	SITE MAP
SHEET NO.	1 OF 1



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

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

## Mayberry Colorado Springs - MDDP



# 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.

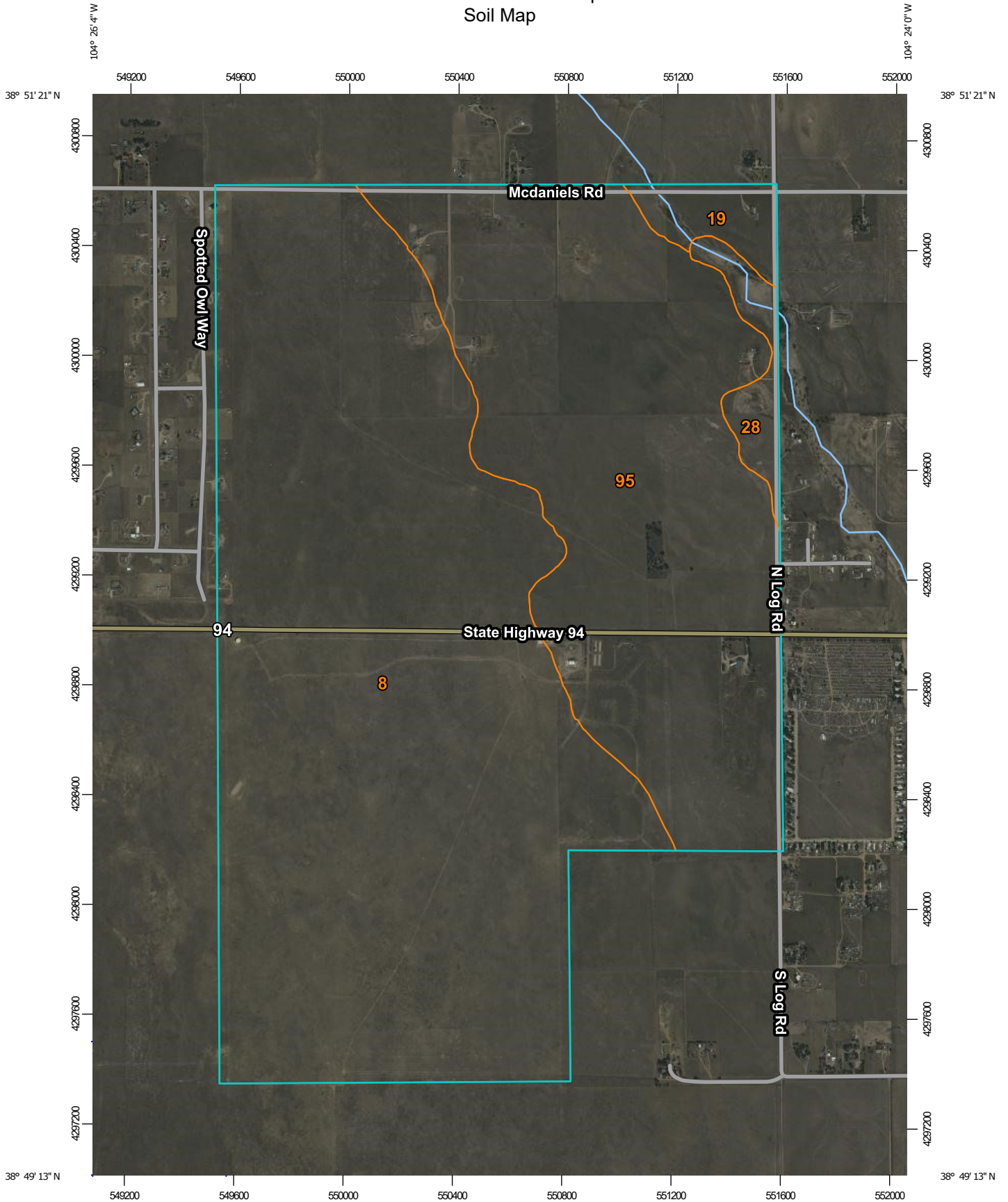


# Soil Map

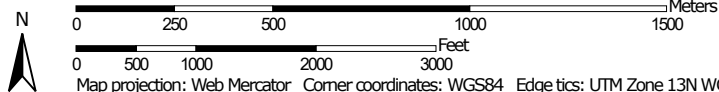
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The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce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

# Custom Soil Resource Report Soil Map




Map Scale: 1:19,200 if printed on A portrait (8.5" x 11") sheet.




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

### MAP LEGEND

**Area of Interest (AOI)**

 Area of Interest (AOI)




















**Soils**

 Soil Map Unit Polygons

 Soil Map Unit Lines


 Soil Map Unit Points

**Special Point Features**






-  Blowout
-  Borrow Pit
-  Clay Spot
-  Closed Depression
-  Gravel Pit
-  Gravelly Spot
-  Landfill
-  Lava Flow
-  Marsh or swamp
-  Mine or Quarry
-  Miscellaneous Water
-  Perennial Water
-  Rock Outcrop
-  Saline Spot
-  Sandy Spot
-  Severely Eroded Spot
-  Sinkhole
-  Slide or Slip
-  Sodic Spot

-  Spoil Area
-  Stony Spot
-  Very Stony Spot
-  Wet Spot
-  Other
-  Special Line Features

**Water Features**

 Streams and Canals

**Transportation**

-  Rails
-  Interstate Highways
-  US Routes
-  Major Roads
-  Local Roads

**Background**

 Aerial Photography

### MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

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

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

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

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

Soil Survey Area: El Paso County Area, Colorado  
 Survey Area Data: Version 20, Sep 2, 2022

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

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

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

## Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
8	Blakeland loamy sand, 1 to 9 percent slopes	930.4	61.7%
19	Columbine gravelly sandy loam, 0 to 3 percent slopes	29.7	2.0%
28	Ellicott loamy coarse sand, 0 to 5 percent slopes	29.4	1.9%
95	Truckton loamy sand, 1 to 9 percent slopes	519.2	34.4%
<b>Totals for Area of Interest</b>		<b>1,508.7</b>	<b>100.0%</b>

## Map Unit Descriptions

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

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

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

## Custom Soil Resource Report

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

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

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

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

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

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

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

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

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

## El Paso County Area, Colorado

### 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:* Flats, hills  
*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

## Custom Soil Resource Report

*Hydric soil rating:* No

### **Pleasant**

*Percent of map unit:* 1 percent

*Landform:* Depressions

*Hydric soil rating:* Yes

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

### **Map Unit Setting**

*National map unit symbol:* 367p

*Elevation:* 6,500 to 7,300 feet

*Mean annual precipitation:* 14 to 16 inches

*Mean annual air temperature:* 46 to 50 degrees F

*Frost-free period:* 125 to 145 days

*Farmland classification:* Not prime farmland

### **Map Unit Composition**

*Columbine and similar soils:* 97 percent

*Minor components:* 3 percent

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

### **Description of Columbine**

#### **Setting**

*Landform:* Fans, fan terraces, flood plains

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Parent material:* Alluvium

#### **Typical profile**

*A - 0 to 14 inches:* gravelly sandy loam

*C - 14 to 60 inches:* very gravelly loamy sand

#### **Properties and qualities**

*Slope:* 0 to 3 percent

*Depth to restrictive feature:* More than 80 inches

*Drainage class:* Well drained

*Runoff class:* Very low

*Capacity of the most limiting layer to transmit water (Ksat):* High to very high (5.95 to 19.98 in/hr)

*Depth to water table:* More than 80 inches

*Frequency of flooding:* None

*Frequency of ponding:* None

*Available water supply, 0 to 60 inches:* Very low (about 2.5 inches)

#### **Interpretive groups**

*Land capability classification (irrigated):* 4e

*Land capability classification (nonirrigated):* 6e

*Hydrologic Soil Group:* A

*Ecological site:* R049XY214CO - Gravelly Foothill

*Hydric soil rating:* No

**Minor Components**

**Fluvaquentic haplaquolls**

*Percent of map unit:* 1 percent

*Landform:* Swales

*Hydric soil rating:* Yes

**Other soils**

*Percent of map unit:* 1 percent

*Hydric soil rating:* No

**Pleasant**

*Percent of map unit:* 1 percent

*Landform:* Depressions

*Hydric soil rating:* Yes

**28—Ellicott loamy coarse sand, 0 to 5 percent slopes**

**Map Unit Setting**

*National map unit symbol:* 3680

*Elevation:* 5,500 to 6,500 feet

*Mean annual precipitation:* 13 to 15 inches

*Mean annual air temperature:* 47 to 50 degrees F

*Frost-free period:* 125 to 145 days

*Farmland classification:* Not prime farmland

**Map Unit Composition**

*Ellicott and similar soils:* 97 percent

*Minor components:* 3 percent

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

**Description of Ellicott**

**Setting**

*Landform:* Stream terraces, flood plains

*Landform position (three-dimensional):* Tread

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Parent material:* Sandy alluvium

**Typical profile**

*A - 0 to 4 inches:* loamy coarse sand

*C - 4 to 60 inches:* stratified coarse sand to sandy loam

**Properties and qualities**

*Slope:* 0 to 5 percent

*Depth to restrictive feature:* More than 80 inches

*Drainage class:* Somewhat excessively drained

*Runoff class:* Very low



## Custom Soil Resource Report

*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:* NoneFrequent

*Frequency of ponding:* None

*Available water supply, 0 to 60 inches:* Low (about 4.1 inches)

### Interpretive groups

*Land capability classification (irrigated):* None specified

*Land capability classification (nonirrigated):* 7w

*Hydrologic Soil Group:* A

*Ecological site:* R069XY031CO - Sandy Bottomland

*Other vegetative classification:* SANDY BOTTOMLAND (069AY031CO)

*Hydric soil rating:* No

### Minor Components

#### Fluvaquentic haplaquoll

*Percent of map unit:* 1 percent

*Landform:* Swales

*Hydric soil rating:* Yes

#### Other soils

*Percent of map unit:* 1 percent

*Hydric soil rating:* No

#### Pleasant

*Percent of map unit:* 1 percent

*Landform:* Depressions

*Hydric soil rating:* Yes

## 95—Truckton loamy sand, 1 to 9 percent slopes

### Map Unit Setting

*National map unit symbol:* 2yvrn

*Elevation:* 5,800 to 7,100 feet

*Mean annual precipitation:* 12 to 19 inches

*Mean annual air temperature:* 46 to 50 degrees F

*Frost-free period:* 90 to 155 days

*Farmland classification:* Not prime farmland

### Map Unit Composition

*Truckton and similar soils:* 87 percent

*Minor components:* 13 percent

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

### Description of Truckton

#### Setting

*Landform:* Interfluves, fan remnants

*Down-slope shape:* Linear

## Custom Soil Resource Report

*Across-slope shape:* Linear

*Parent material:* Wind re-worked alluvium derived from arkose

### Typical profile

*A - 0 to 4 inches:* loamy sand

*Bt1 - 4 to 12 inches:* sandy loam

*Bt2 - 12 to 19 inches:* sandy loam

*C - 19 to 80 inches:* sandy loam

### Properties and qualities

*Slope:* 1 to 9 percent

*Depth to restrictive feature:* More than 80 inches

*Drainage class:* Well drained

*Runoff class:* Low

*Capacity of the most limiting layer to transmit water (Ksat):* High (2.00 to 6.00 in/hr)

*Depth to water table:* More than 80 inches

*Frequency of flooding:* None

*Frequency of ponding:* None

*Calcium carbonate, maximum content:* 1 percent

*Maximum salinity:* Nonsaline to very slightly saline (0.1 to 2.0 mmhos/cm)

*Available water supply, 0 to 60 inches:* Moderate (about 6.5 inches)

### Interpretive groups

*Land capability classification (irrigated):* 6e

*Land capability classification (nonirrigated):* 6e

*Hydrologic Soil Group:* A

*Ecological site:* R049XB210CO - Sandy Foothill

*Hydric soil rating:* No

### Minor Components

#### Blakeland

*Percent of map unit:* 5 percent

*Landform:* Interfluves, hills

*Landform position (two-dimensional):* Summit, shoulder, backslope

*Landform position (three-dimensional):* Crest, side slope

*Down-slope shape:* Linear, convex

*Across-slope shape:* Linear, convex

*Ecological site:* R049XB210CO - Sandy Foothill

*Hydric soil rating:* No

#### Bresser

*Percent of map unit:* 5 percent

*Landform:* Interfluves, terraces

*Landform position (three-dimensional):* Tread

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Ecological site:* R049XB210CO - Sandy Foothill

*Hydric soil rating:* No

#### Urban land

*Percent of map unit:* 2 percent

*Hydric soil rating:* No

#### Ellicott, occasionally flooded

*Percent of map unit:* 1 percent

*Landform:* Flood plains, drainageways

## Custom Soil Resource Report

*Down-slope shape:* Linear

*Across-slope shape:* Linear, concave

*Ecological site:* R067BY031CO - Sandy Bottomland

*Hydric soil rating:* No

# **Soil Information for All Uses**

---

## **Soil Properties and Qualities**

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

## **Soil Erosion Factors**

Soil Erosion Factors are soil properties and interpretations used in evaluating the soil for potential erosion. Example soil erosion factors can include K factor for the whole soil or on a rock free basis, T factor, wind erodibility group and wind erodibility index.

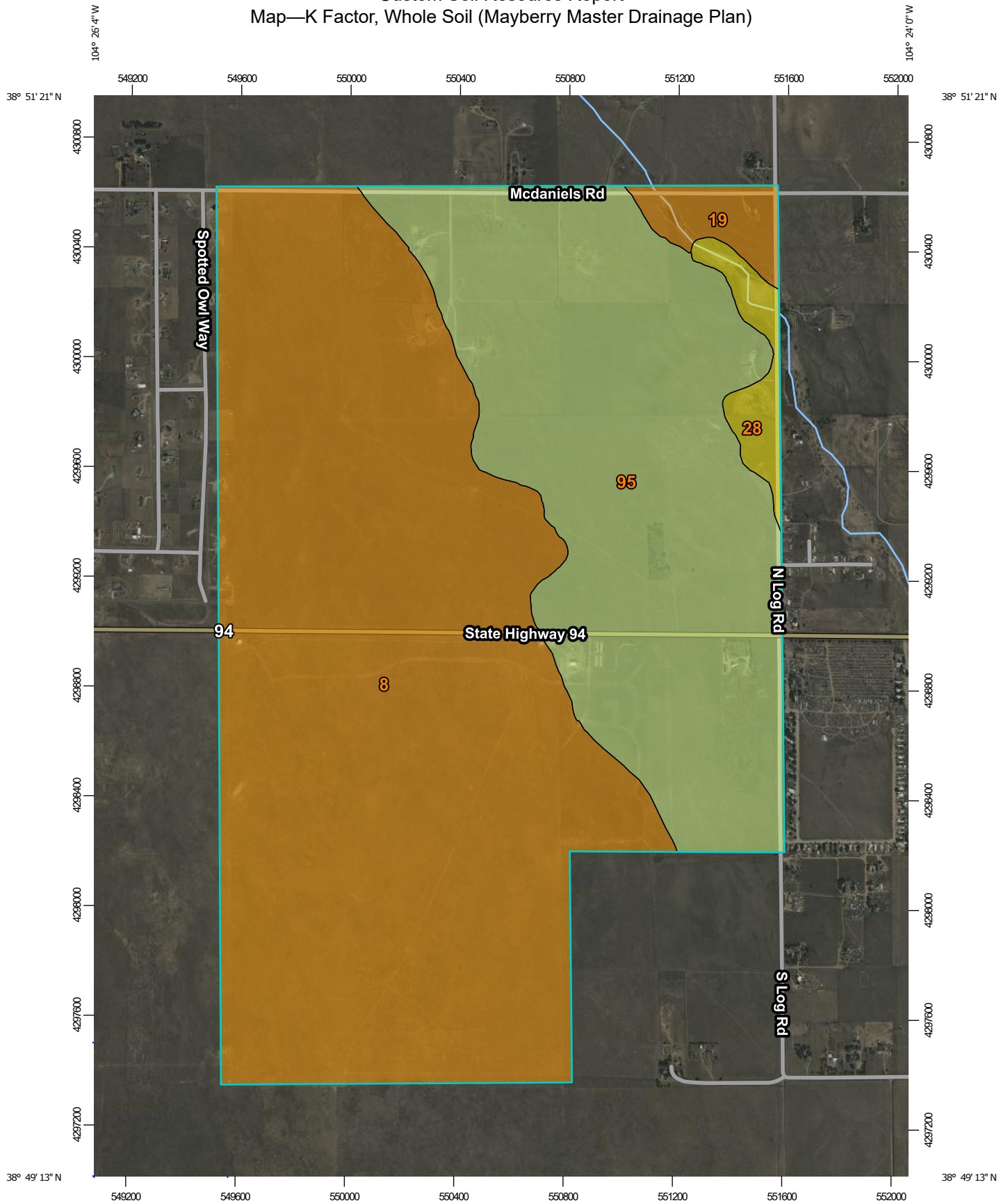
### **K Factor, Whole Soil (Mayberry Master Drainage Plan)**

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and saturated hydraulic conductivity (Ksat). Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

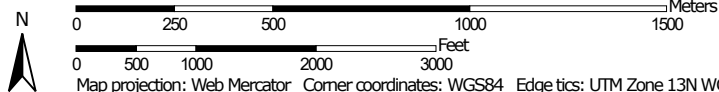
"Erosion factor Kw (whole soil)" indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments.

Factor K does not apply to organic horizons and is not reported for those layers.

Custom Soil Resource Report  
Map—K Factor, Whole Soil (Mayberry Master Drainage Plan)



Map Scale: 1:19,200 if printed on A portrait (8.5" x 11") sheet.




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

# Custom Soil Resource Report
















## MAP LEGEND

### Area of Interest (AOI)







 Area of Interest (AOI)










### Soils

#### Soil Rating Polygons
















-  .02
-  .05
-  .10
-  .15
-  .17
-  .20
-  .24
-  .28
-  .32
-  .37
-  .43
-  .49
-  .55
-  .64
-  Not rated or not available

#### Soil Rating Lines








-  .02
-  .05
-  .10
-  .15
-  .17
-  .20

-  .24
-  .28
-  .32
-  .37
-  .43
-  .49
-  .55
-  .64
-  Not rated or not available

#### Soil Rating Points

-  .02
-  .05
-  .10
-  .15
-  .17
-  .20
-  .24
-  .28
-  .32
-  .37
-  .43
-  .49
-  .55
-  .64
-  Not rated or not available

#### Water Features

-  Streams and Canals
- Transportation**
-  Rails
-  Interstate Highways
-  US Routes
-  Major Roads
-  Local Roads
- Background**
-  Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

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

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

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

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

Soil Survey Area: El Paso County Area, Colorado  
 Survey Area Data: Version 20, Sep 2, 2022

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

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

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

**Table—K Factor, Whole Soil (Mayberry Master Drainage Plan)**

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
8	Blakeland loamy sand, 1 to 9 percent slopes	.10	930.4	61.7%
19	Columbine gravelly sandy loam, 0 to 3 percent slopes	.10	29.7	2.0%
28	Ellicott loamy coarse sand, 0 to 5 percent slopes	.17	29.4	1.9%
95	Truckton loamy sand, 1 to 9 percent slopes	.24	519.2	34.4%
<b>Totals for Area of Interest</b>			<b>1,508.7</b>	<b>100.0%</b>

**Rating Options—K Factor, Whole Soil (Mayberry Master Drainage Plan)**

*Aggregation Method:* Dominant Condition

*Component Percent Cutoff:* None Specified

*Tie-break Rule:* Higher

*Layer Options (Horizon Aggregation Method):* Surface Layer (Not applicable)

**Soil Qualities and Features**

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

**Hydrologic Soil Group (Mayberry Master Drainage Plan)**

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

## Custom Soil Resource Report

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

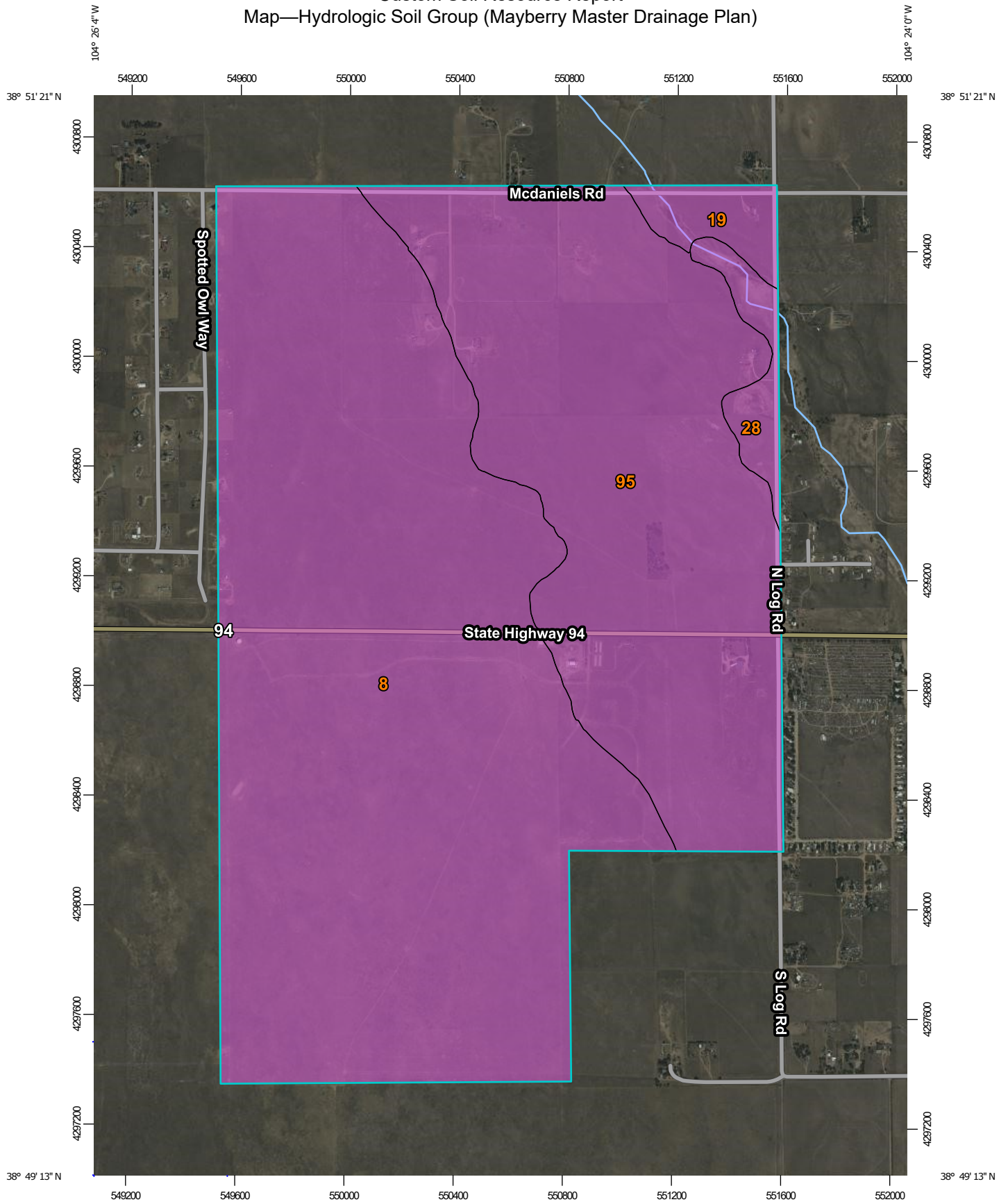
Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

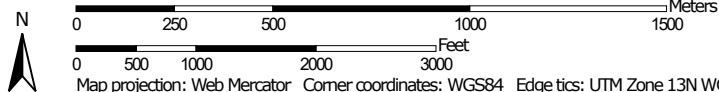
If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.



Custom Soil Resource Report  
Map—Hydrologic Soil Group (Mayberry Master Drainage Plan)




Map Scale: 1:19,200 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 Rating Polygons**





-  A
-  A/D
-  B
-  B/D
-  C
-  C/D
-  D
-  Not rated or not available

**Soil Rating Lines**


-  A
-  A/D
-  B
-  B/D
-  C
-  C/D
-  D
-  Not rated or not available

**Soil Rating Points**






-  A
-  A/D
-  B
-  B/D

-  C
-  C/D
-  D
-  Not rated or not available

**Water Features**

 Streams and Canals

**Transportation**

-  Rails
-  Interstate Highways
-  US Routes
-  Major Roads
-  Local Roads

**Background**

 Aerial Photography

### MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

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

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

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

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

Soil Survey Area: El Paso County Area, Colorado  
 Survey Area Data: Version 20, Sep 2, 2022

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

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

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**Table—Hydrologic Soil Group (Mayberry Master Drainage Plan)**

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
8	Blakeland loamy sand, 1 to 9 percent slopes	A	930.4	61.7%
19	Columbine gravelly sandy loam, 0 to 3 percent slopes	A	29.7	2.0%
28	Ellicott loamy coarse sand, 0 to 5 percent slopes	A	29.4	1.9%
95	Truckton loamy sand, 1 to 9 percent slopes	A	519.2	34.4%
<b>Totals for Area of Interest</b>			<b>1,508.7</b>	<b>100.0%</b>

**Rating Options—Hydrologic Soil Group (Mayberry Master Drainage Plan)**

*Aggregation Method: Dominant Condition*

*Component Percent Cutoff: None Specified*

*Tie-break Rule: Higher*

# References

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- American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.
- American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.
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- United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.
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- United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. <http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084>

## Custom Soil Resource Report

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. [http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2\\_054242](http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242)

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)

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. [http://www.nrcs.usda.gov/Internet/FSE\\_DOCUMENTS/nrcs142p2\\_052290.pdf](http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf)



**NOTES TO USERS**

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

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

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

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

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

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

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

NGS Information Services  
NOAA, NNGS12  
National Geodetic Survey  
SSMC-3, #9202  
1315 East-West Highway  
Silver Spring, MD 20910-3282

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

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

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

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

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

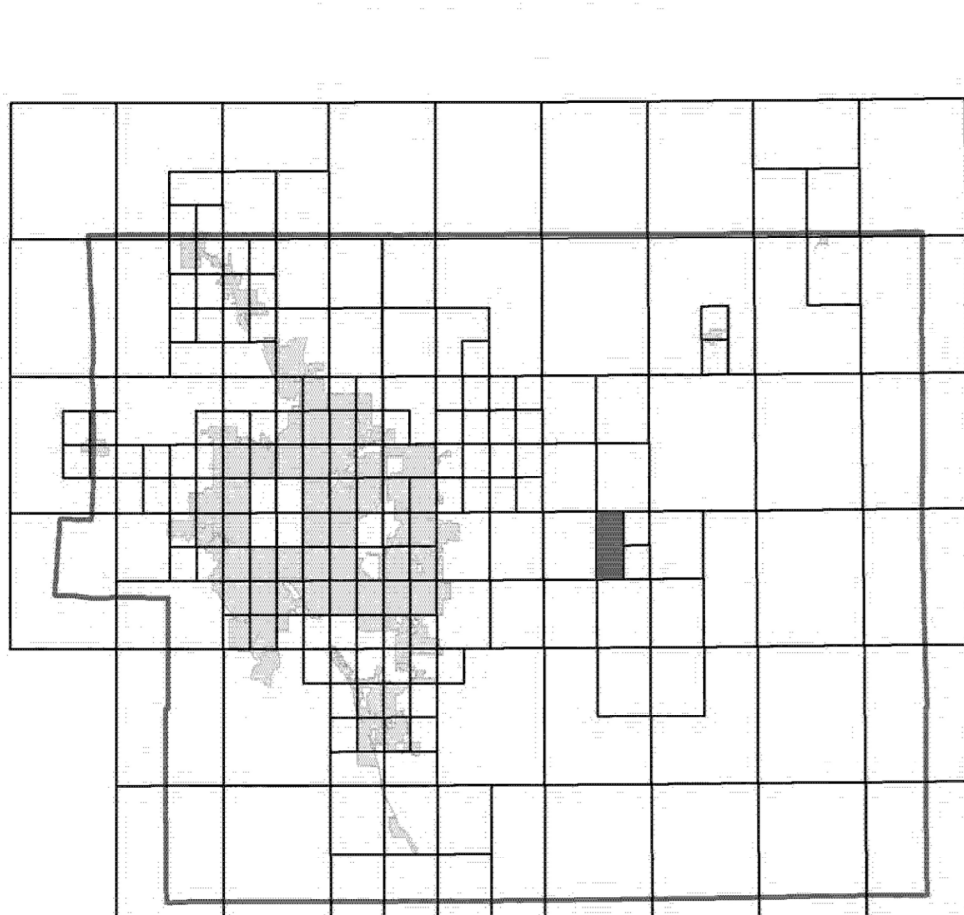
Contact **FEMA Map Service Center (MSC)** via the FEMA Map Information eXchange (FMIX) 1-877-336-2627 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this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

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

**El Paso County Vertical Datum Offset Table**

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

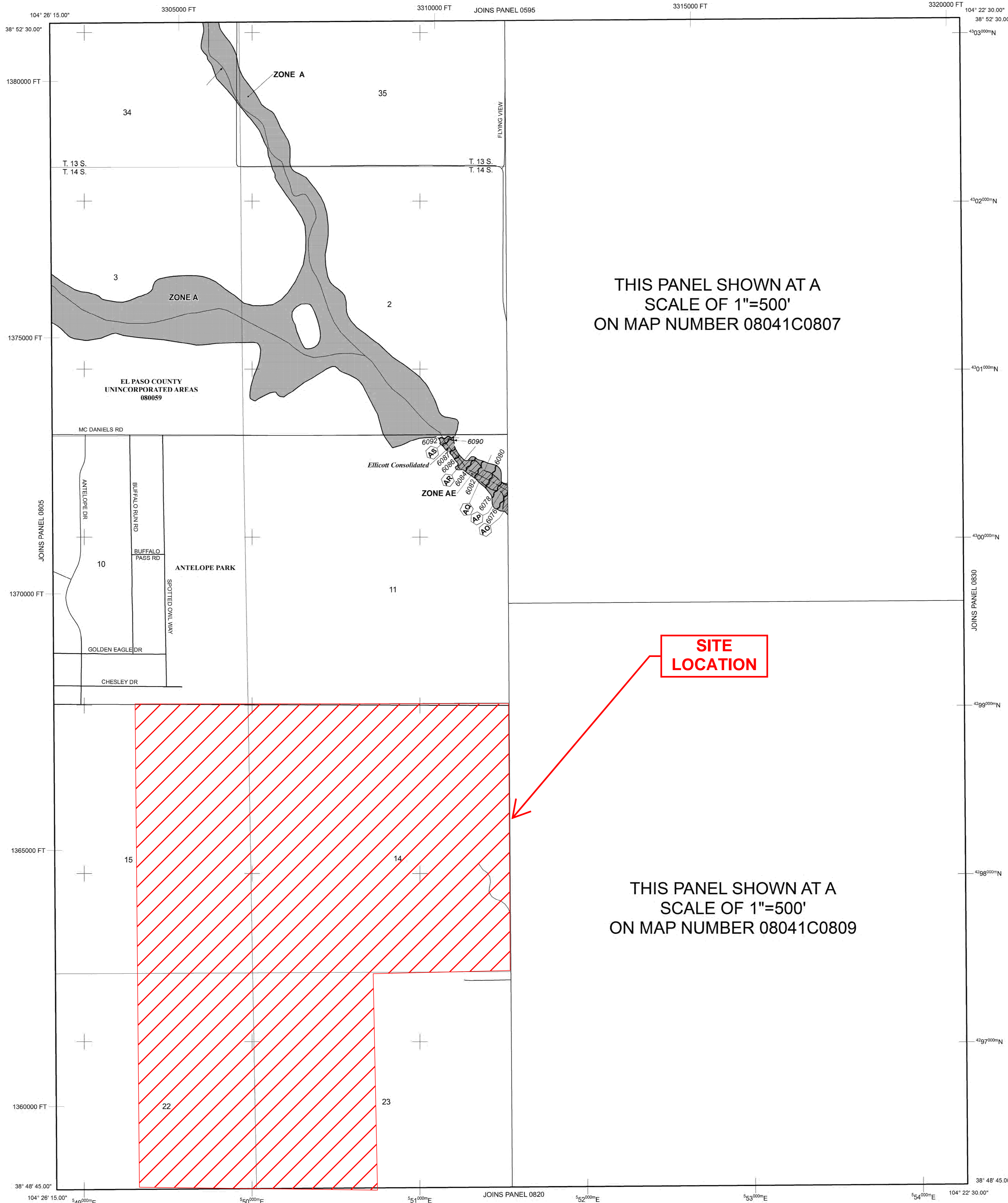
**Panel Location Map**



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



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



THIS PANEL SHOWN AT A SCALE OF 1"=500' ON MAP NUMBER 08041C0807

**SITE LOCATION**

THIS PANEL SHOWN AT A SCALE OF 1"=500' ON MAP NUMBER 08041C0809

NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 13 SOUTH, RANGE 63 WEST, AND TOWNSHIP 14 SOUTH, RANGE 63 WEST.

**LEGEND**

- SPECIAL FLOOD HAZARD AREAS (SFHAS) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD
- The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, X, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.
- ZONE A** No Base Flood Elevations determined.
- ZONE AE** Base Flood Elevations determined.
- ZONE AH** Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
- ZONE AO** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
- ZONE AR** Special Flood Hazard Area Formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
- ZONE A99** Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
- ZONE V** Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
- ZONE VE** Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.
- FLOODWAY AREAS IN ZONE AE
- The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.
- OTHER FLOOD AREAS
- ZONE X** Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.
- OTHER AREAS
- ZONE X** Areas determined to be outside the 0.2% annual chance floodplain.
- ZONE D** Areas in which flood hazards are undetermined, but possible.
- COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS
- OTHERWISE PROTECTED AREAS (OPAs)

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

- Floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
- Base Flood Elevation line and value; elevation in feet\*  
(EL 987)
- Base Flood Elevation value where uniform within zone; elevation in feet
- Cross section line
- Transect line
- Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
- 1000-meter Universal Transverse Mercator grid ticks, zone 13
- 5000-foot grid ticks; Colorado State Plane coordinate system, central zone (FIPS/ZONE 5502), Lambert Conformal Conic Projection
- Bench mark (see explanation in Notes to Users section of this FIRM panel)
- River Mile

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

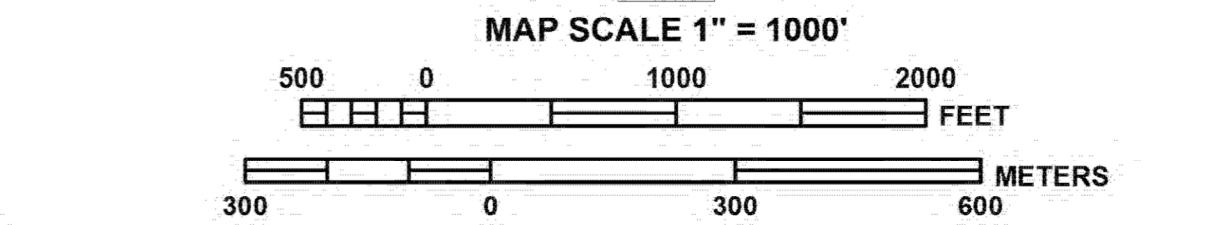
MAP REPOSITORIES  
Refer to Map Repositories list on Map Index

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL  
DECEMBER 7, 2018 - to update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

EFFECTIVE DATE OF COUNTY-WIDE FLOOD INSURANCE RATE MAP  
MARCH 17, 1997

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

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



**NFP** PANEL 0810G

**FIRM**  
FLOOD INSURANCE RATE MAP  
EL PASO COUNTY,  
COLORADO  
AND INCORPORATED AREAS

PANEL 810 OF 1300  
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:  
COMMUNITY NUMBER PANEL SUFFIX  
EL PASO COUNTY 08009 0810 G

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

MAP NUMBER  
08041C0810G

MAP REVISED  
DECEMBER 7, 2018  
Federal Emergency Management Agency



**MAYBERRY COMMUNITIES  
MASTER DEVELOPMENT DRAINAGE PLAN**

**APPENDIX B – HYDROLOGIC CALCULATIONS**

**EXISTING C VALUES**

Designer: LAO  
 Company: R&R Engineers-Surveyors  
 Date: 7/23/2024  
 Project: MAYBERRY SKETCH PLAN  
 Location: EL PASO COUNTY, COLORADO



Global Parameters <sup>1</sup>			
Land Use	% Imp.	C <sub>s</sub>	C <sub>100</sub>
SF LOTS (1/6 AC)*	65	0.45	0.59
Commercial	95	0.81	0.88
Multi-Family	95	0.81	0.88
Pasture/Meadows	1	0.08	0.35

\*Using 1/8 for

Summary	
Total Area (ac)	589.00
Composite Impervious	12.6%
Cells of this color are for required user-input	
Cells of this color are for optional user-input	

<sup>1</sup> From Table 6-3 in MHFD Volume 1  
<sup>2</sup> From Table 6-4 in MHFD Volume 1

Basin Name	Area (ac)	NRCS Hydrologic Soil Group	SF LOTS (1/6 AC)*		Commercial		Multi-Family		Pasture/Meadows		% Check	Percent Imperviousness	Runoff Coefficient, C <sup>2</sup>			
			Area (ac)	%	Area (ac)	%	Area (ac)	%	Area (ac)	%			2-yr	5-yr	10-yr	100-yr
OFF-1	44.00	A	0.00	0.0%	0.00	0.0%	0.00	0.0%	44.00	100.0%	100.00%	1.0%		0.08		0.35
EX-A	44.00	A	31.69	72.0%	0.00	0.0%	12.31	28.0%	0.00	0.0%	100.00%	73.4%		0.55		0.67
EX-B	100.00	A	36.80	36.8%	14.20	14.2%	0.00	0.0%	49.00	49.0%	100.00%	37.9%		0.32		0.51
EX-C	135.00	A	0.00	0.0%	0.00	0.0%	0.00	0.0%	135.00	100.0%	100.00%	1.0%		0.08		0.35
EX-D	185.00	A	0.00	0.0%	0.00	0.0%	0.00	0.0%	185.00	100.0%	100.00%	1.0%		0.08		0.35
EX-E	59.00	A	0.00	0.0%	0.00	0.0%	0.00	0.0%	59.00	100.0%	100.00%	1.0%		0.08		0.35
EX-F	22.00	A	0.00	0.0%	0.00	0.0%	0.00	0.0%	22.00	100.0%	100.00%	1.0%		0.08		0.35



## TIME OF CONCENTRATION

Designer: LAO
Company: R&R Engineers-Surveyors
Date: 7/23/2024
Project: MAYBERRY SKETCH PLAN
Location: EL PASO COUNTY, COLORADO

$$t_i = \frac{0.395(1.1 - C_s)\sqrt{L_i}}{S_i^{0.33}}$$

$$\text{Computed } t_c = t_i + t_t$$

$$t_{\text{minimum}} = 5 \text{ (urban)}$$

$$t_{\text{minimum}} = 10 \text{ (non-urban)}$$

$$t_t = \frac{L_t}{60K\sqrt{S_t}} = \frac{L_t}{60V_t}$$

$$\text{Selected } t_c = \max\{t_{\text{minimum}}, \min(\text{Computed } t_c, \text{Regional } t_c)\}$$

$$\text{Regional } t_c = (26 - 17i) + \frac{L_t}{60(14i + 9)\sqrt{S_t}}$$

Cells of this color are for required user-input



**ENGINEERS  
SURVEYORS** **INC**

Subbasin Data				Overland (Initial) Flow Time			Channelized (Travel) Flow Time					Time of Concentration			Remarks
Basin	Area	% Impervious	C5	Overland Flow Length L <sub>i</sub> (ft)	Overland Flow Slope S <sub>i</sub> (ft/ft)	Overland Flow Time t <sub>i</sub> (min)	Channelized Flow Length L <sub>c</sub> (ft)	Channelized Flow Slope S <sub>c</sub> (ft/ft)	NRCS Conveyance Factor K	Channelized Flow Velocity V <sub>c</sub> (ft/sec)	Channelized Flow Time t <sub>c</sub> (min)	Computed t <sub>c</sub> (min)	Regional t <sub>c</sub> (min)	Selected t <sub>c</sub> (min)	
EX-A	44.00	73.4%	0.55	36.00	0.020	4.73	1000.00	0.010	20	2.00	8.33	13.07	22.17	13.07	
EX-B	100.00	37.9%	0.32	36.00	0.020	6.72	1500.00	0.010	20	2.00	12.50	19.22	37.03	19.22	
EX-C	135.00	1.0%	0.08	500.00	0.010	41.18	1000.00	0.010	7	0.70	23.81	64.99	44.06	44.06	
EX-D	185.00	1.0%	0.08	500.00	0.010	41.18	1500.00	0.010	7	0.70	35.71	76.89	53.18	53.18	
EX-E	59.00	1.0%	0.08	500.00	0.010	41.18	1200.00	0.010	7	0.70	28.57	69.75	47.71	47.71	
EX-F	22.00	1.0%	0.08	200.00	0.010	26.04	500.00	0.010	7	0.70	11.90	37.95	34.95	34.95	
OFF-1	44.00	1.0%	0.08	300.00	0.010	31.90	3000.00	0.010	7	0.70	71.43	103.33	80.53	80.53	







## TIME OF CONCENTRATION

Designer: LAO
Company: R&R Engineers-Surveyors
Date: 7/23/2024
Project: MAYBERRY SKETCH PLAN
Location: EL PASO COUNTY, COLORADO

$$t_i = \frac{0.395(1.1 - C_s)\sqrt{L_i}}{S_i^{0.33}}$$

Computed  $t_c = t_i + t_t$

$t_{\text{minimum}} = 5$  (urban)  
 $t_{\text{minimum}} = 10$  (non-urban)

$$t_t = \frac{L_t}{60K\sqrt{S_t}} = \frac{L_t}{60V_t}$$

Selected  $t_c = \max\{t_{\text{minimum}}, \min(\text{Computed } t_c, \text{Regional } t_c)\}$

$$\text{Regional } t_c = (26 - 17i) + \frac{L_t}{60(14i + 9)\sqrt{S_t}}$$

Cells of this color are for required user-input



**ENGINEERS  
SURVEYORS** **INC**

Subbasin Data				Overland (Initial) Flow Time			Channelized (Travel) Flow Time					Time of Concentration			Remarks
Basin	Area	% Impervious	C5	Overland Flow Length $L_i$ (ft)	Overland Flow Slope $S_i$ (ft/ft)	Overland Flow Time $t_i$ (min)	Channelized Flow Length $L_t$ (ft)	Channelized Flow Slope $S_t$ (ft/ft)	NRCS Conveyance Factor K	Channelized Flow Velocity $V_t$ (ft/sec)	Channelized Flow Time $t_t$ (min)	Computed $t_c$ (min)	Regional $t_c$ (min)	Selected $t_c$ (min)	
A	95.00	84.4%	0.73	36.00	0.020	3.22	2705.00	0.005	20	1.41	31.88	35.10	42.29	35.10	
B	49.00	65.3%	0.48	36.00	0.020	5.36	1500.00	0.005	20	1.41	17.68	23.03	34.39	23.03	
C	43.00	68.8%	0.52	36.00	0.020	4.96	1900.00	0.005	20	1.41	22.39	27.35	38.33	27.35	
D	110.00	69.0%	0.50	36.00	0.020	5.19	1358.00	0.005	15	1.06	21.34	26.53	31.44	26.53	
E	73.00	89.1%	0.74	36.00	0.020	3.11	1500.00	0.005	15	1.06	23.57	26.68	27.33	26.68	
F	75.00	73.6%	0.55	36.00	0.020	4.71	3000.00	0.005	15	1.06	47.14	51.85	50.10	50.10	
G	160.00	70.1%	0.51	36.00	0.020	5.07	2100.00	0.005	15	1.06	33.00	38.07	40.38	38.07	
Channel G	64.40	73.5%	0.55	300.00	0.020	13.63	3200.00	0.005	20	1.41	37.71	51.34	52.59	51.34	
Channel H	24.00	65.0%	0.45	300.00	0.010	20.33	1680.00	0.005	20	1.41	19.80	40.13	36.83	36.83	
Channel A	11.60	95.0%	0.81	300.00	0.010	9.07	1800.00	0.010	20	2.00	15.00	24.07	23.30	23.30	
Culvert 4	7.80	95.0%	0.81	300.00	0.010	9.07	617.00	0.005	20	1.41	7.27	16.34	16.37	16.34	
Culvert 5	36.50	76.9%	0.59	300.00	0.010	15.85	2200.00	0.005	20	1.41	25.93	41.78	39.15	39.15	
Culvert 6	64.40	71.8%	0.53	300.00	0.010	17.79	2200.00	0.005	20	1.41	25.93	43.72	41.03	41.03	
Culvert 7	15.70	65.0%	0.45	300.00	0.010	20.33	1200.00	0.005	20	1.41	14.14	34.47	30.58	30.58	
Culvert 8	19.70	65.0%	0.45	300.00	0.010	20.33	2000.00	0.005	20	1.41	23.57	43.90	40.99	40.99	

**STORM DRAINAGE SYSTEM DESIGN - 5-YEAR DESIGN STORM**

Designer: LAO
Company: R&R Engineers-Surveyors
Date: 7/23/2024
Project: MAYBERRY SKETCH PLAN
Location: EL PASO COUNTY, COLORADO



Cells of this color are for required user-input
Cells of this color are for optional user-input

$$I_s = -1.50 \ln(D) + 7.583$$

DESIGN POINT	STREET/ CONTRIBUTING BASINS	DIRECT RUNOFF							TOTAL RUNOFF					STREET BYPASS			PIPE			TRAVEL TIME			Remarks
		Basin Name	Area (ac)	Coeff C	Tc (min)	C*A (ac)	I	Q (cfs)	Tc (min)	Sum Area (ac)	Sum C*A (ac)	I in/hr	Q cfs	Street Q cfs	Street Slope %	Length ft	Street Tt min	Design Q cfs	Slope %	PIPE SIZE	L ft	VEL ft/sec	
		A	95	0.73	35.1	69.01	2.25	155.0									155.0						
1	A							35.1	95.0	69.0	2.14	147.8					147.8						
		B	49	0.48	23.0	23.45	2.88	67.5									67.5						
2	B							23.0	49.0	23.5	2.74	64.1					64.1						
		C	43	0.52	27.4	22.55	2.62	59.1									59.1						
3	C							27.4	43.0	22.6	2.48	56.0					56.0						
		D	110	0.50	26.5	54.72	2.67	145.9									145.9						
4	D							26.5	110.0	54.7	2.53	138.3					138.3						
		E	73	0.74	26.7	53.92	2.66	143.3									143.3						
5	E							26.7	73.0	53.9	2.52	135.8					135.8						
		F	75	0.55	50.1	41.53	1.71	71.1									71.1						
6	F							50.1	75.0	41.5	1.71	71.0					71.0						
		G	160	0.51	38.1	81.83	2.12	173.8									173.8						
7	G							38.1	160.0	81.8	2.04	166.7					166.7						
		Channel G	64.4	0.55	51.3	35.57	1.68	59.6									59.6						
								51.3	64.4	35.6	1.68	59.8					59.8						
		Channel H	24	0.45	36.8	10.80	2.17	23.5									23.5						
								36.8	24.0	10.8	2.08	22.5					22.5						
		Channel A	11.6	0.81	23.3	9.40	2.86	26.9									26.9						
								23.3	11.6	9.4	2.72	25.5					25.5						
		Culvert 4	7.8	0.81	16.3	6.32	3.39	21.4									21.4						
								16.3	7.8	6.3	3.27	20.6					20.6						
		Culvert 5	36.5	0.59	39.2	21.65	2.08	45.1									45.1						
								39.2	36.5	21.6	2.00	43.3					43.3						
		Culvert 6	64.4	0.53	41.0	34.20	2.01	68.8									68.8						
								41.0	64.4	34.2	1.94	66.5					66.5						
		Culvert 7	15.7	0.45	30.6	7.07	2.45	17.3									17.3						
								30.6	15.7	7.1	2.33	16.4					16.4						
		Culvert 8	19.7	0.45	41.0	8.87	2.01	17.8									17.8						
								41.0	19.7	8.9	1.94	17.2					17.2						

**STORM DRAINAGE SYSTEM DESIGN - 100-YEAR DESIGN STORM**

Designer: LAO
Company: R&R Engineers-Surveyors
Date: 7/23/2024
Project: MAYBERRY SKETCH PLAN
Location: EL PASO COUNTY, COLORADO



Cells of this color are for required user-input
Cells of this color are for optional user-input

$$I_{100} = -2.52 \ln(D) + 12.735$$

DESIGN POINT	STREET/ CONTRIBUTING BASINS	DIRECT RUNOFF							TOTAL RUNOFF					STREET BYPASS			PIPE			TRAVEL TIME			Remarks
		Basin Name	Area (ac)	Coeff C	Tc (min)	C*A (ac)	I	Q (cfs)	Tc (min)	Sum Area (ac)	Sum C*A (ac)	I in/hr	Q cfs	Street Q cfs	Street Slope %	Length ft	Street Tt min	Design Q cfs	Slope %	PIPE SIZE	L ft	VEL ft/sec	
		A	95	0.80	35.1	76.11	3.77	286.8									286.8						
1	A								35.1	95.0	76.1	3.60	273.9				273.9						
		B	49	0.61	23.0	29.73	4.83	143.6									143.6						
2	B								23.0	49.0	29.7	4.60	136.6				136.6						
		C	43	0.64	27.4	27.64	4.40	121.5									121.5						
3	C								27.4	43.0	27.6	4.17	115.3				115.3						
		D	110	0.63	26.5	69.11	4.47	309.1									309.1						
4	D								26.5	110.0	69.1	4.25	293.4				293.4						
		E	73	0.82	26.7	60.04	4.46	267.7									267.7						
5	E								26.7	73.0	60.0	4.23	254.1				254.1						
		F	75	0.67	50.1	50.51	2.87	145.1									145.1						
6	F								50.1	75.0	50.5	2.87	145.0				145.0						
		G	160	0.64	38.1	102.32	3.56	364.6									364.6						
7	G								38.1	160.0	102.3	3.42	350.1				350.1						
		Channel G	64.4	0.67	51.3	43.30	2.81	121.7									121.7						
									51.3	64.4	43.3	2.83	122.4				122.4						
		Channel H	24	0.59	36.8	14.16	3.65	51.6									51.6						
									36.8	24.0	14.2	3.49	49.5				49.5						
		Channel A	11.6	0.88	23.3	10.21	4.80	49.0									49.0						
									23.3	11.6	10.2	4.57	46.6				46.6						
		Culvert 4	7.8	0.88	16.3	6.86	5.70	39.1									39.1						
		Culvert 5	36.5	0.71	39.2	25.74	3.49	89.9									89.9						
									39.2	36.5	25.7	3.36	86.6				86.6						
		Culvert 6	64.4	0.66	41.0	42.20	3.38	142.4									142.4						
									41.0	64.4	42.2	3.27	137.8				137.8						
		Culvert 7	15.7	0.59	30.6	9.26	4.12	38.1									38.1						
									30.6	15.7	9.3	3.91	36.2				36.2						
		Culvert 8	19.7	0.59	41.0	11.62	3.38	39.3									39.3						
									41.0	19.7	11.6	3.27	38.0				38.0						

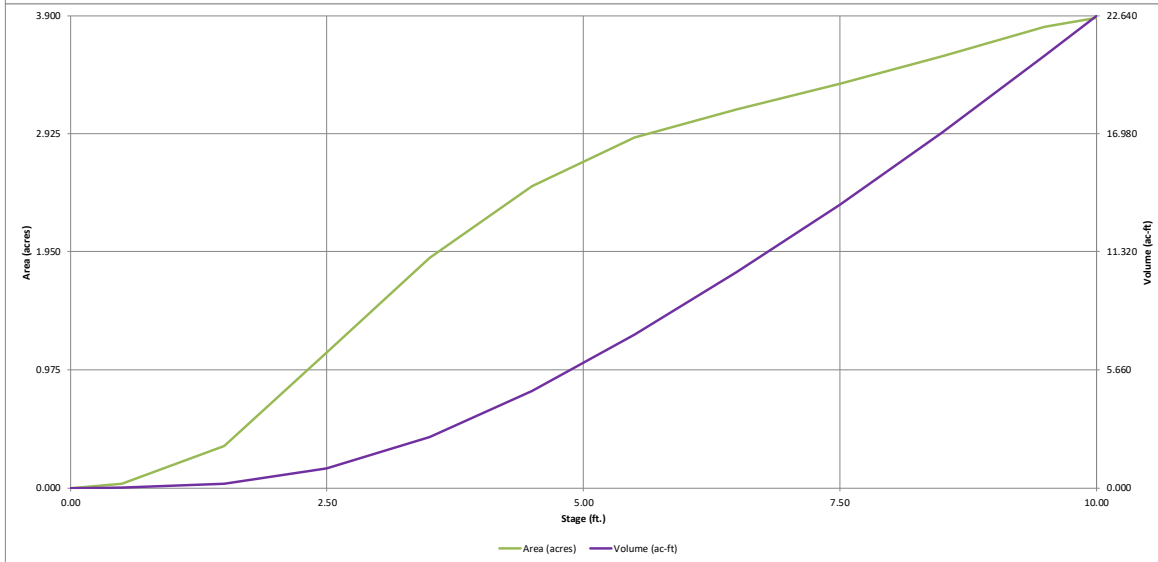
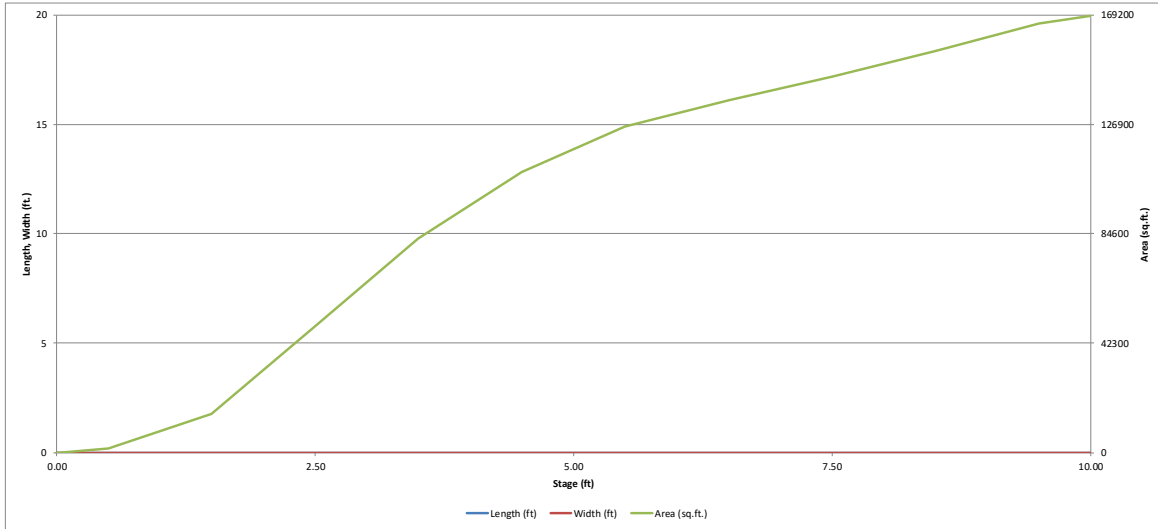
**APPENDIX C – HYDRAULIC CALCULATIONS**  
***C.1 DETENTION VOLUMES***





# DETENTION BASIN STAGE-STORAGE TABLE BUILDER

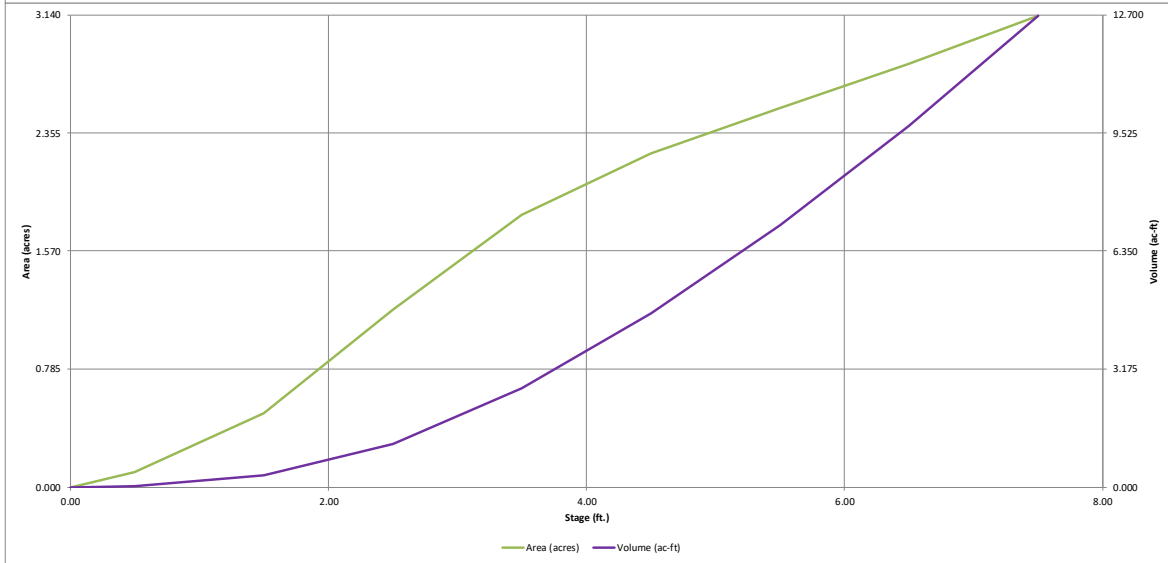
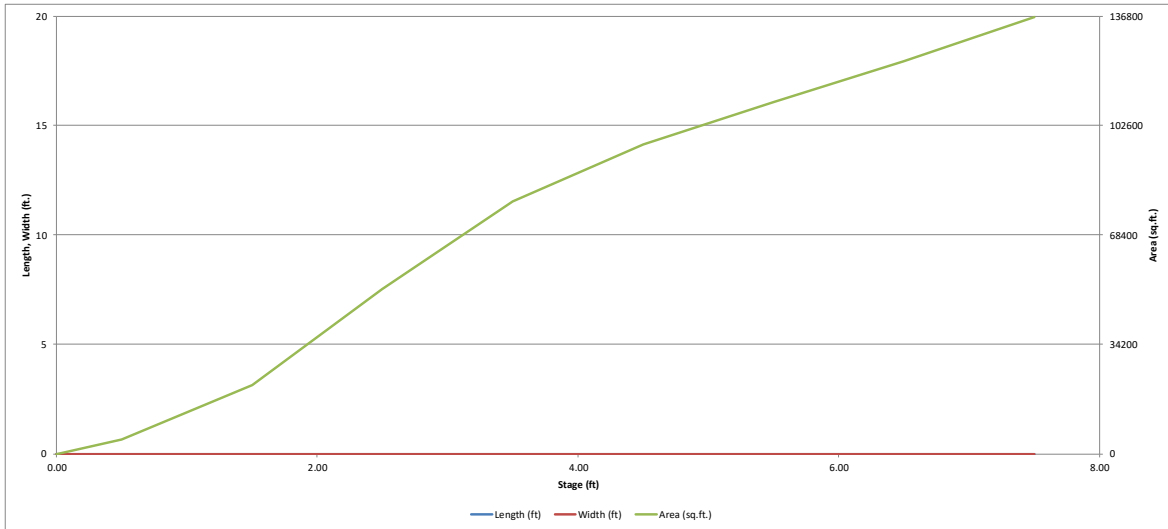
*MHFD-Detention, Version 4.06 (July 2022)*





# DETENTION BASIN STAGE-STORAGE TABLE BUILDER

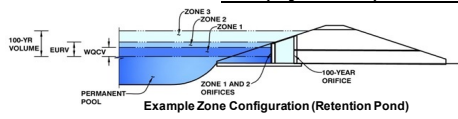
*MHFD-Detention, Version 4.06 (July 2022)*



DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: Mayberry Sketch Plan
Basin ID: Pond C (Stage 0 = 6046.01)



Example Zone Configuration (Retention Pond)

Watershed Information

Table of watershed information including Selected BMP Type (EDB), Watershed Area (43.00 acres), Watershed Length (2,700 ft), Watershed Length to Centroid (1,350 ft), Watershed Slope (0.010 ft/ft), Watershed Imperviousness (69.00%), Percentage Hydrologic Soil Group A (100.0%), Percentage Hydrologic Soil Group B (0.0%), Percentage Hydrologic Soil Groups C/D (0.0%), Target WQC Drain Time (40.0 hours), and Location for 1-hr Rainfall Depths (User Input).

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

Table of water quality capture and detention volumes including Water Quality Capture Volume (0.970 acre-feet), Excess Urban Runoff Volume (3.744 acre-feet), 2-yr Runoff Volume (2.760 acre-feet), 5-yr Runoff Volume (3.607 acre-feet), 10-yr Runoff Volume (4.287 acre-feet), 25-yr Runoff Volume (5.147 acre-feet), 50-yr Runoff Volume (5.990 acre-feet), 100-yr Runoff Volume (7.001 acre-feet), 500-yr Runoff Volume (9.221 acre-feet), and various approximate detention volumes (2-yr to 100-yr).

Optional User Overrides

Table of optional user overrides for rainfall depths (1.19 to 3.14 inches) and detention volumes.

Depth Increment = 1.00 ft

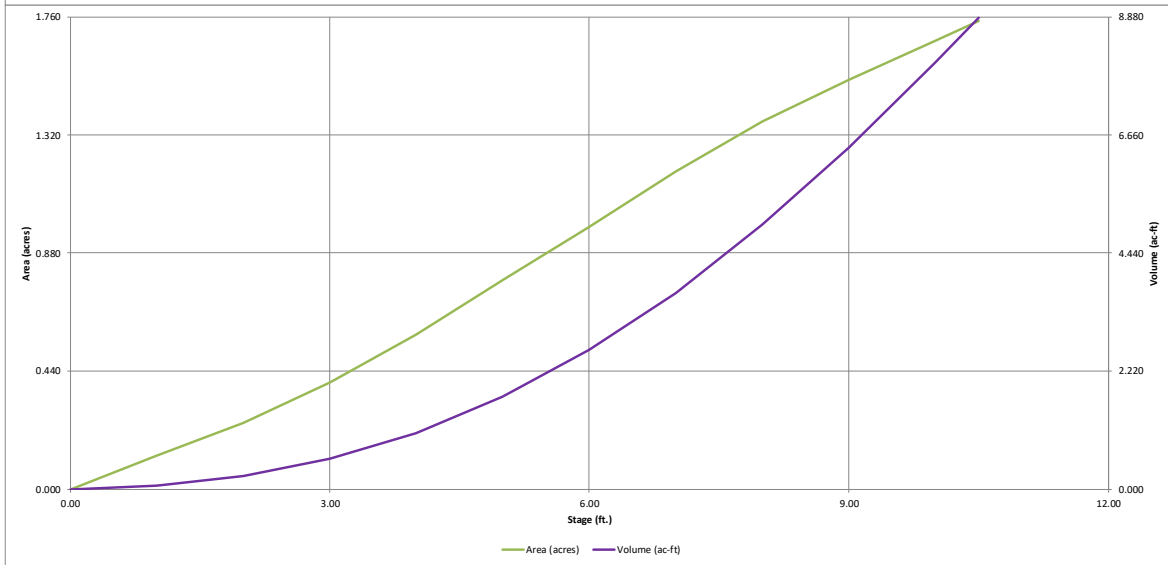
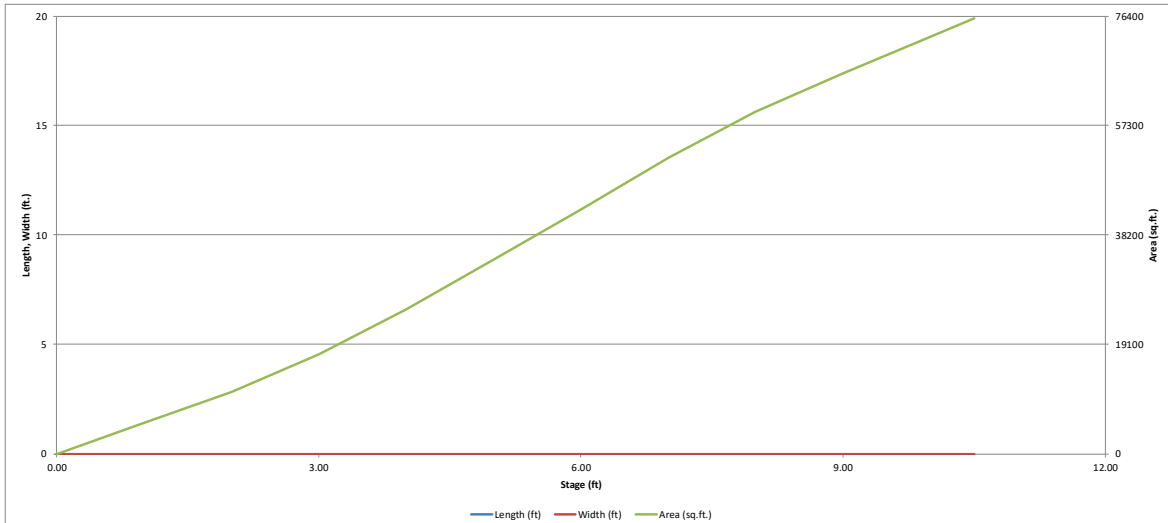
Main stage-storage table with columns: Stage - Storage Description, Stage (ft), Optional Override Stage (ft), Length (ft), Width (ft), Area (ft^2), Optional Override Area (ft^2), Area (acre), Volume (ft^3), and Volume (ac-ft). Rows include stages from 6047 to 6056.5.

Define Zones and Basin Geometry

Table defining zones and basin geometry including Zone 1 Volume (0.970 acre-feet), Zone 2 Volume (2.774 acre-feet), Zone 3 Volume (2.246 acre-feet), Total Detention Basin Volume (5.990 acre-feet), Initial Surcharge Volume (ISV) (ft^3), Initial Surcharge Depth (ISD) (ft), Total Available Detention Depth (Htotal) (ft), Depth of Trickle Channel (Htc) (ft), Slope of Trickle Channel (S1C) (ft/ft), Slopes of Main Basin Sides (Smain) (H:V), Basin Length-to-Width Ratio (RLW), Initial Surcharge Area (A1SV) (ft^2), Surcharge Volume Length (LSV) (ft), Surcharge Volume Width (WSV) (ft), Depth of Basin Floor (HFLOOR) (ft), Length of Basin Floor (LFLOOR) (ft), Width of Basin Floor (WFLOOR) (ft), Area of Basin Floor (AFLOOR) (ft^2), Volume of Basin Floor (VFLOOR) (ft^3), Depth of Main Basin (HMAIN) (ft), Length of Main Basin (LMAIN) (ft), Width of Main Basin (WMAIN) (ft), Area of Main Basin (AMAIN) (ft^2), Volume of Main Basin (VMAIN) (ft^3), and Calculated Total Basin Volume (Vtotal) (acre-feet).

# DETENTION BASIN STAGE-STORAGE TABLE BUILDER

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

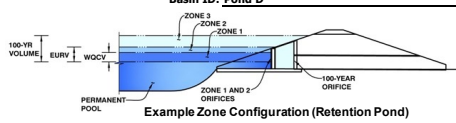


# DETENTION BASIN STAGE-STORAGE TABLE BUILDER

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

Project: Mayberry Filing 3

Basin ID: Pond D



Example Zone Configuration (Retention Pond)

### Watershed Information

Selected BMP Type =	<b>EDB</b>
Watershed Area =	110.00 acres
Watershed Length =	2,867 ft
Watershed Length to Centroid =	1,433 ft
Watershed Slope =	0.010 ft/ft
Watershed Imperviousness =	69.00% percent
Percentage Hydrologic Soil Group A =	100.0% percent
Percentage Hydrologic Soil Group B =	0.0% percent
Percentage Hydrologic Soil Groups C/D =	0.0% percent
Target WQCV Drain Time =	40.0 hours
Location for 1-hr Rainfall Depths =	User Input

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

Water Quality Capture Volume (WQCV) =	2,480	acre-feet
Excess Urban Runoff Volume (EURV) =	9,577	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	7,035	acre-feet
5-yr Runoff Volume (P1 = 1.5 in.) =	9,194	acre-feet
10-yr Runoff Volume (P1 = 1.75 in.) =	10,931	acre-feet
25-yr Runoff Volume (P1 = 2 in.) =	13,128	acre-feet
50-yr Runoff Volume (P1 = 2.25 in.) =	15,280	acre-feet
100-yr Runoff Volume (P1 = 2.52 in.) =	17,863	acre-feet
500-yr Runoff Volume (P1 = 3.14 in.) =	23,531	acre-feet
Approximate 2-yr Detention Volume =	6,247	acre-feet
Approximate 5-yr Detention Volume =	8,155	acre-feet
Approximate 10-yr Detention Volume =	9,802	acre-feet
Approximate 25-yr Detention Volume =	11,750	acre-feet
Approximate 50-yr Detention Volume =	12,913	acre-feet
Approximate 100-yr Detention Volume =	14,083	acre-feet

### Optional User Overrides

acre-feet	
acre-feet	
1.19	inches
1.50	inches
1.75	inches
2.00	inches
2.25	inches
2.52	inches
3.14	inches

Depth Increment = [ ] ft

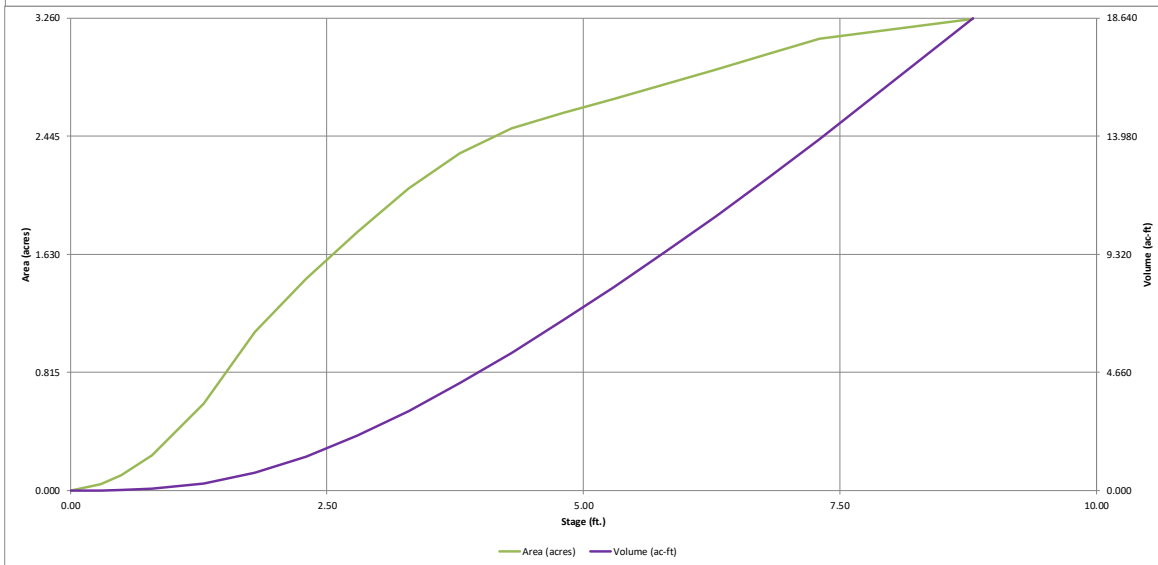
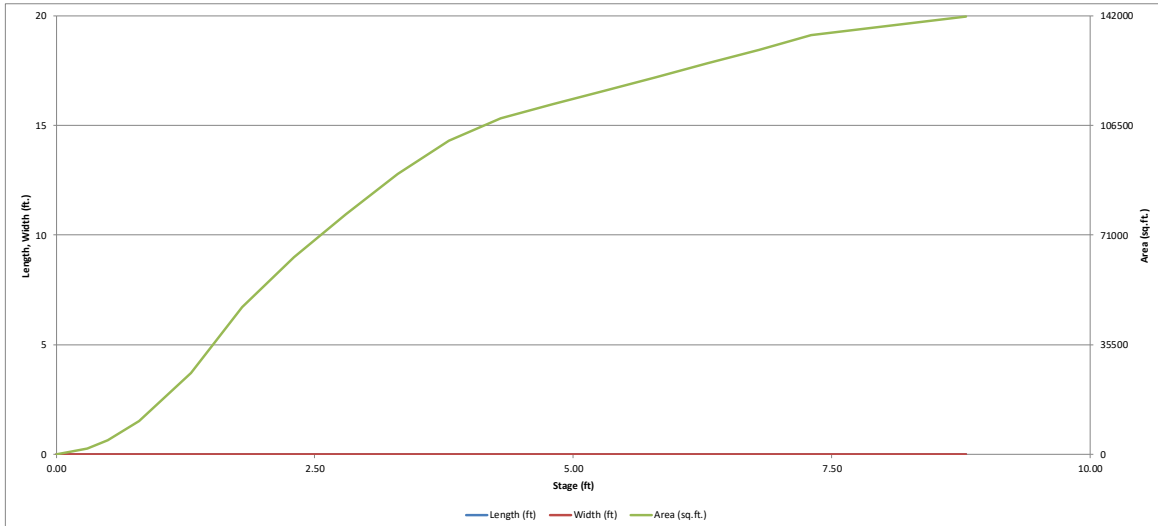
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft <sup>2</sup> )	Optional Override Area (ft <sup>2</sup> )	Area (acre)	Volume (ft <sup>3</sup> )	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	38	0.001		
6026	--	0.30	--	--	--	1,867	0.043	286	0.007
6026.2	--	0.50	--	--	--	4,584	0.105	931	0.021
6026.5	--	0.80	--	--	--	10,635	0.244	3,213	0.074
6027	--	1.30	--	--	--	26,196	0.601	12,421	0.285
6027.5	--	1.80	--	--	--	47,640	1.094	30,880	0.709
6028	--	2.30	--	--	--	63,718	1.463	58,719	1.348
6028.5	--	2.80	--	--	--	77,666	1.783	94,065	2.159
6029	--	3.30	--	--	--	90,791	2.084	136,180	3.126
6029.5	--	3.80	--	--	--	101,440	2.329	184,237	4.230
6030	--	4.30	--	--	--	108,842	2.499	236,808	5.436
6030.5	--	4.80	--	--	--	113,378	2.603	292,363	6.712
6031	--	5.30	--	--	--	117,742	2.703	350,143	8.038
6031.5	--	5.80	--	--	--	122,145	2.804	410,115	9.415
6032	--	6.30	--	--	--	126,588	2.906	472,298	10.842
6032.5	--	6.80	--	--	--	131,071	3.009	536,713	12.321
6033	--	7.30	--	--	--	135,710	3.115	603,408	13.852
6033.5	--	7.80	--	--	--	141,840	3.256	811,570	18.631

### Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	2,480	acre-feet
Zone 2 Volume (EURV - Zone 1) =	7,097	acre-feet
Zone 3 (100-yr + 1 / 2 WQCV - Zones 1 & 2) =	5,746	acre-feet
Total Detention Basin Volume =	15,324	acre-feet
Initial Surcharge Volume (ISV) =	user	ft <sup>3</sup>
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H <sub>total</sub> ) =	user	ft
Depth of Trickle Channel (H <sub>trickle</sub> ) =	user	ft
Slope of Trickle Channel (S <sub>trickle</sub> ) =	user	ft/ft
Slopes of Main Basin Sides (S <sub>main</sub> ) =	user	H:V
Basin Length-to-Width Ratio (R <sub>L/W</sub> ) =	user	
Initial Surcharge Area (A <sub>ISV</sub> ) =	user	ft <sup>2</sup>
Surcharge Volume Length (L <sub>ISV</sub> ) =	user	ft
Surcharge Volume Width (W <sub>ISV</sub> ) =	user	ft
Depth of Basin Floor (H <sub>FLOOR</sub> ) =	user	ft
Length of Basin Floor (L <sub>FLOOR</sub> ) =	user	ft
Width of Basin Floor (W <sub>FLOOR</sub> ) =	user	ft
Area of Basin Floor (A <sub>FLOOR</sub> ) =	user	ft <sup>2</sup>
Volume of Basin Floor (V <sub>FLOOR</sub> ) =	user	ft <sup>3</sup>
Depth of Main Basin (H <sub>MAIN</sub> ) =	user	ft
Length of Main Basin (L <sub>MAIN</sub> ) =	user	ft
Width of Main Basin (W <sub>MAIN</sub> ) =	user	ft
Area of Main Basin (A <sub>MAIN</sub> ) =	user	ft <sup>2</sup>
Volume of Main Basin (V <sub>MAIN</sub> ) =	user	ft <sup>3</sup>
Calculated Total Basin Volume (V <sub>total</sub> ) =	user	acre-feet

# DETENTION BASIN STAGE-STORAGE TABLE BUILDER

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

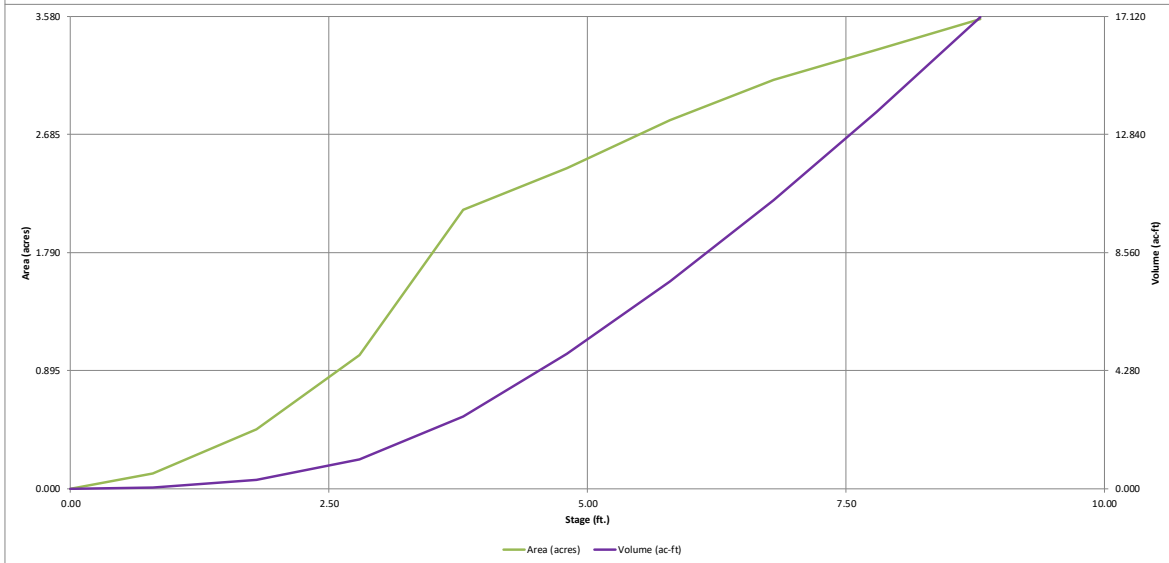
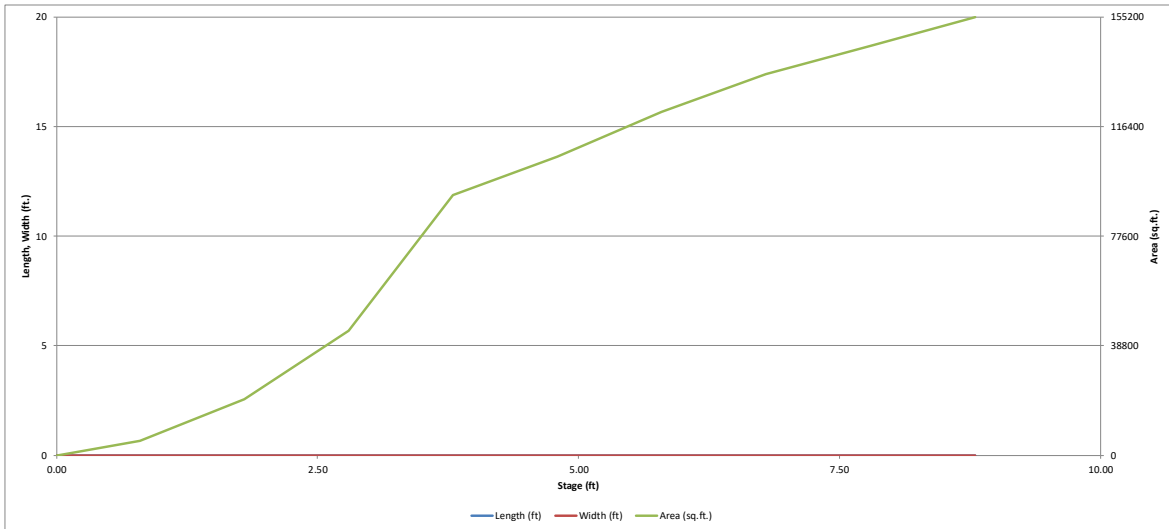






# DETENTION BASIN STAGE-STORAGE TABLE BUILDER

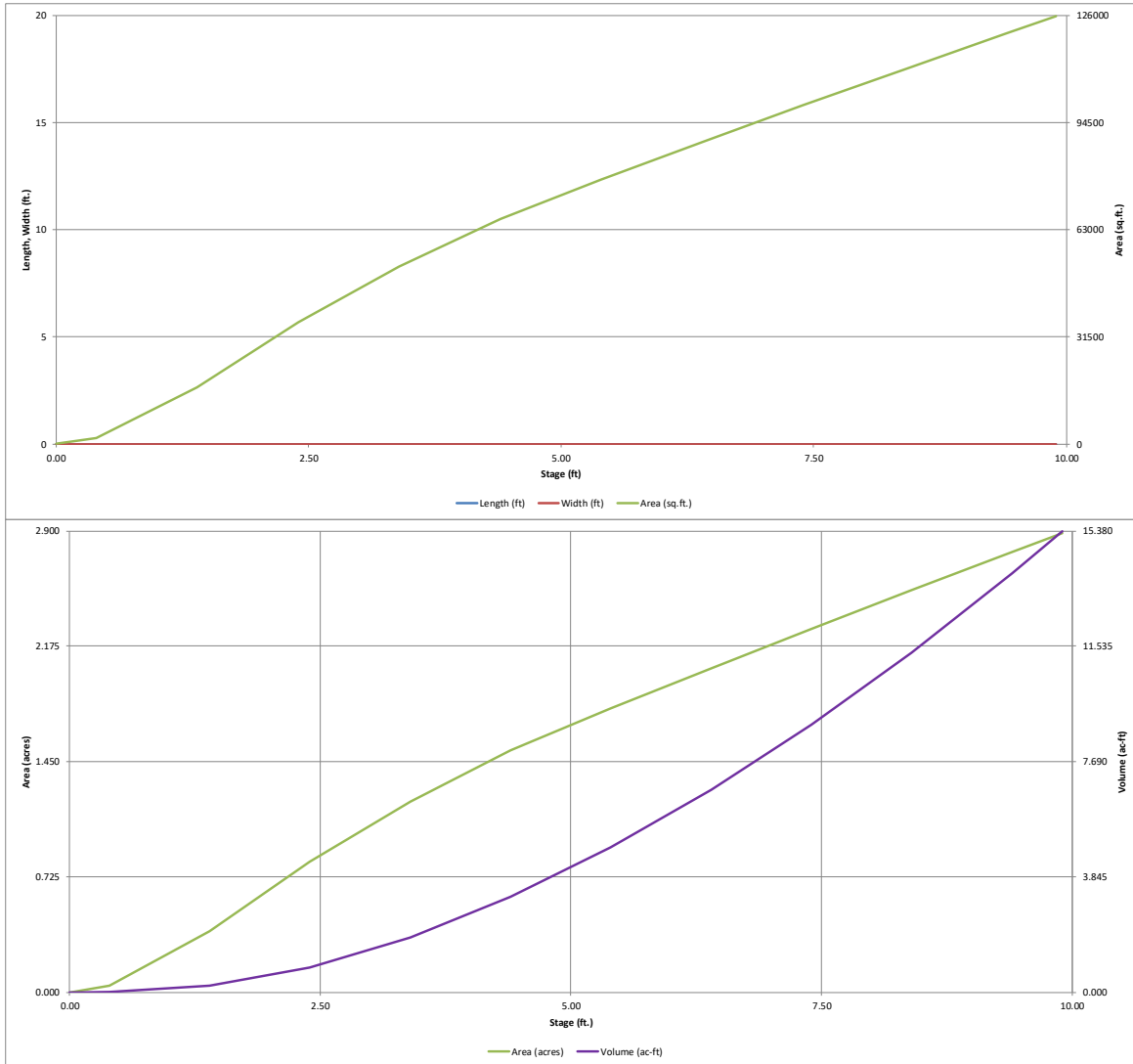
*MHFD-Detention, Version 4.06 (July 2022)*





# DETENTION BASIN STAGE-STORAGE TABLE BUILDER

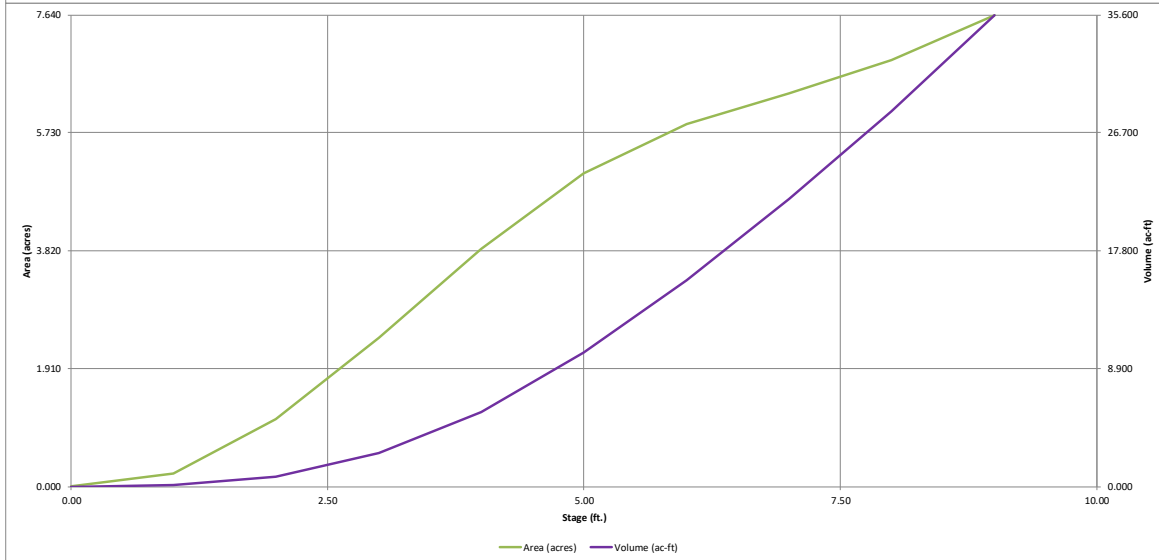
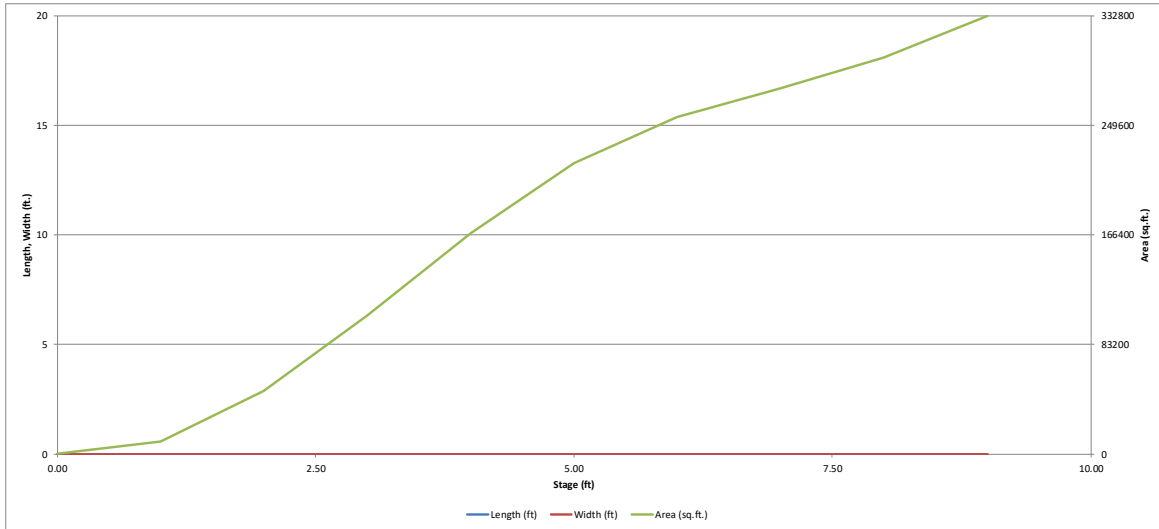
*MHFD-Detention, Version 4.06 (July 2022)*





# DETENTION BASIN STAGE-STORAGE TABLE BUILDER

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



**APPENDIX C – HYDRAULIC CALCULATIONS**  
***C.2 OPEN CHANNELS***

# Channel Report

## Channel A - 5 YEAR

### Trapezoidal

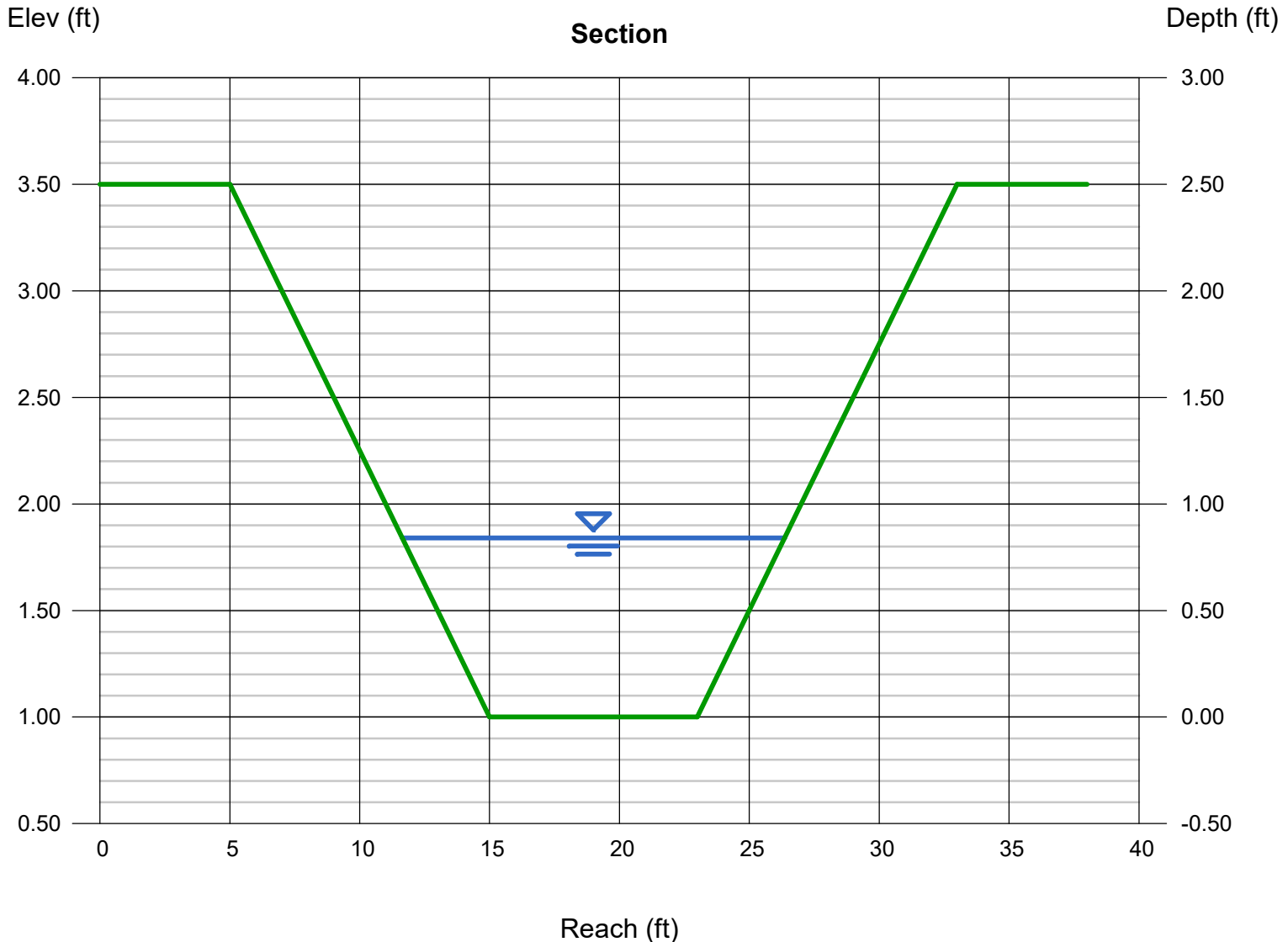
Bottom Width (ft) = 8.00  
Side Slopes (z:1) = 4.00, 4.00  
Total Depth (ft) = 2.50  
Invert Elev (ft) = 1.00  
Slope (%) = 0.60  
N-Value = 0.030

### Highlighted

Depth (ft) = 0.84  
Q (cfs) = 26.90  
Area (sqft) = 9.54  
Velocity (ft/s) = 2.82  
Wetted Perim (ft) = 14.93  
Crit Depth, Yc (ft) = 0.64  
Top Width (ft) = 14.72  
EGL (ft) = 0.96

### Calculations

Compute by: Known Q  
Known Q (cfs) = 26.90





# Channel Report

## Channel A - 100 YEAR

### Trapezoidal

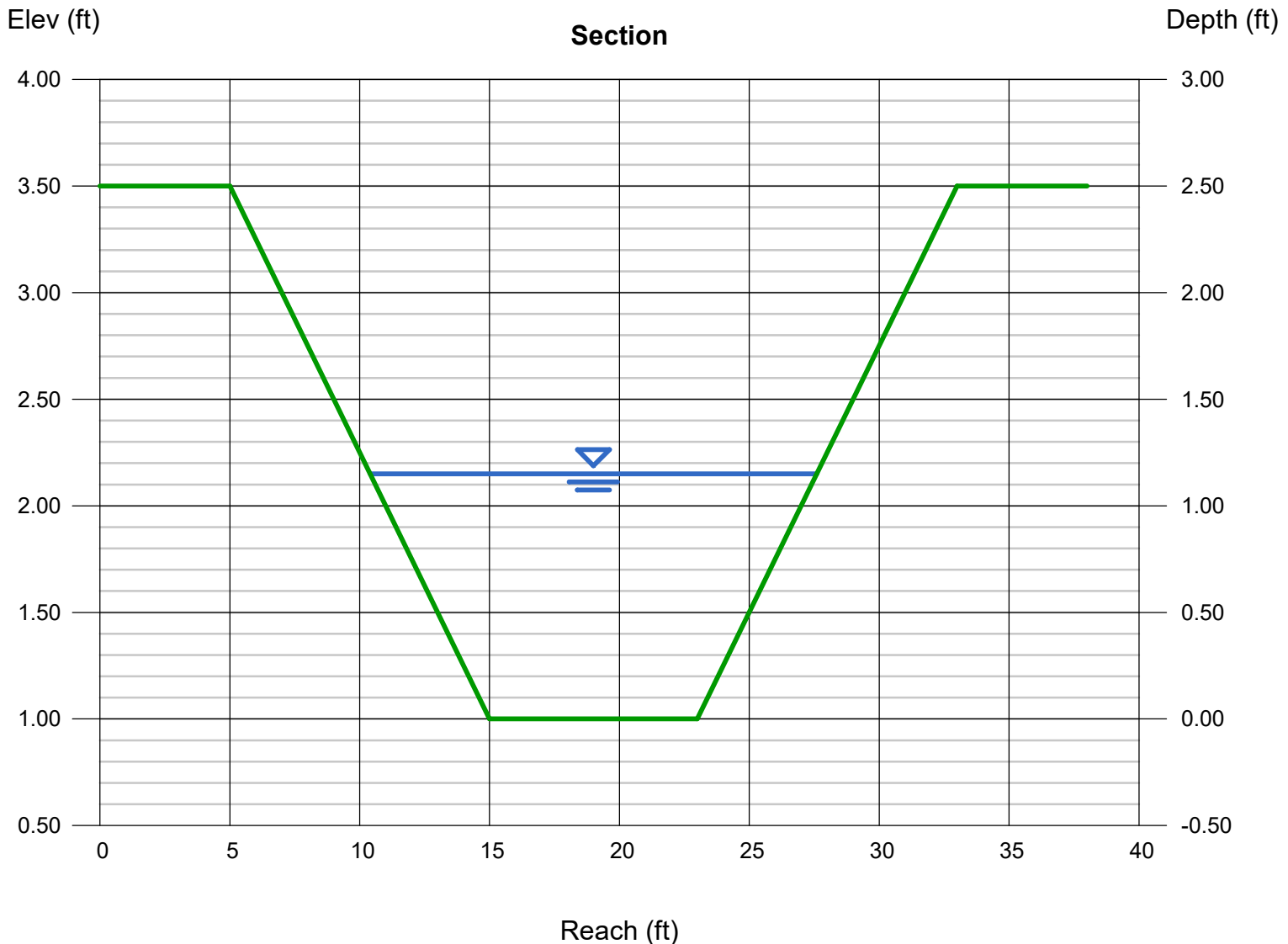
Bottom Width (ft) = 8.00  
Side Slopes (z:1) = 4.00, 4.00  
Total Depth (ft) = 2.50  
Invert Elev (ft) = 1.00  
Slope (%) = 0.60  
N-Value = 0.030

### Highlighted

Depth (ft) = 1.15  
Q (cfs) = 49.00  
Area (sqft) = 14.49  
Velocity (ft/s) = 3.38  
Wetted Perim (ft) = 17.48  
Crit Depth,  $Y_c$  (ft) = 0.90  
Top Width (ft) = 17.20  
EGL (ft) = 1.33

### Calculations

Compute by: Known Q  
Known Q (cfs) = 49.00



# Channel Report

## Channel B (Offsite) - 5 YEAR

### Trapezoidal

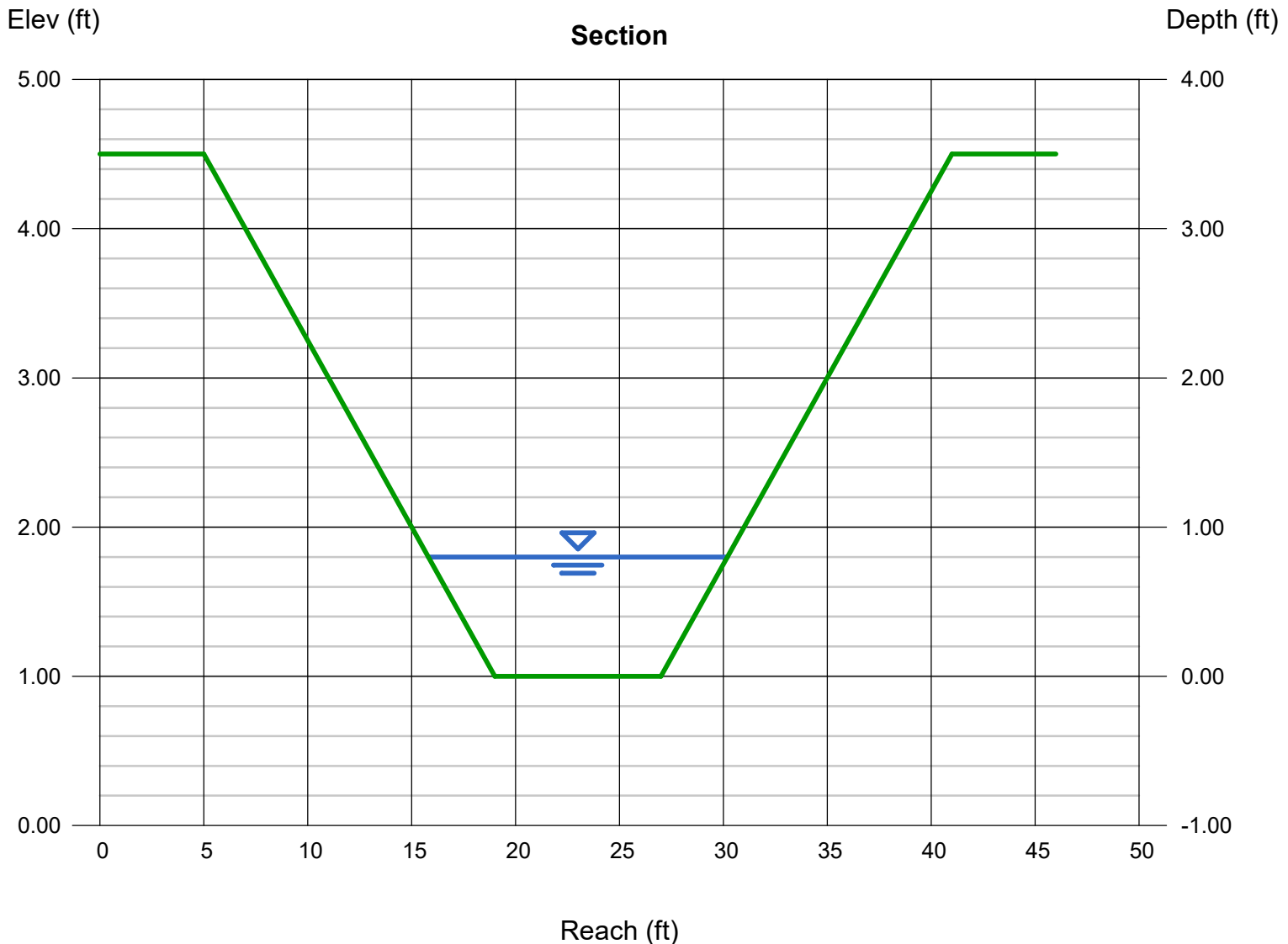
Bottom Width (ft) = 8.00  
Side Slopes (z:1) = 4.00, 4.00  
Total Depth (ft) = 3.50  
Invert Elev (ft) = 1.00  
Slope (%) = 0.60  
N-Value = 0.030

### Highlighted

Depth (ft) = 0.80  
Q (cfs) = 24.41  
Area (sqft) = 8.96  
Velocity (ft/s) = 2.72  
Wetted Perim (ft) = 14.60  
Crit Depth, Yc (ft) = 0.60  
Top Width (ft) = 14.40  
EGL (ft) = 0.92

### Calculations

Compute by: Known Q  
Known Q (cfs) = 24.41



# Channel Report

## Channel B (Offsite) - 100 YEAR

### Trapezoidal

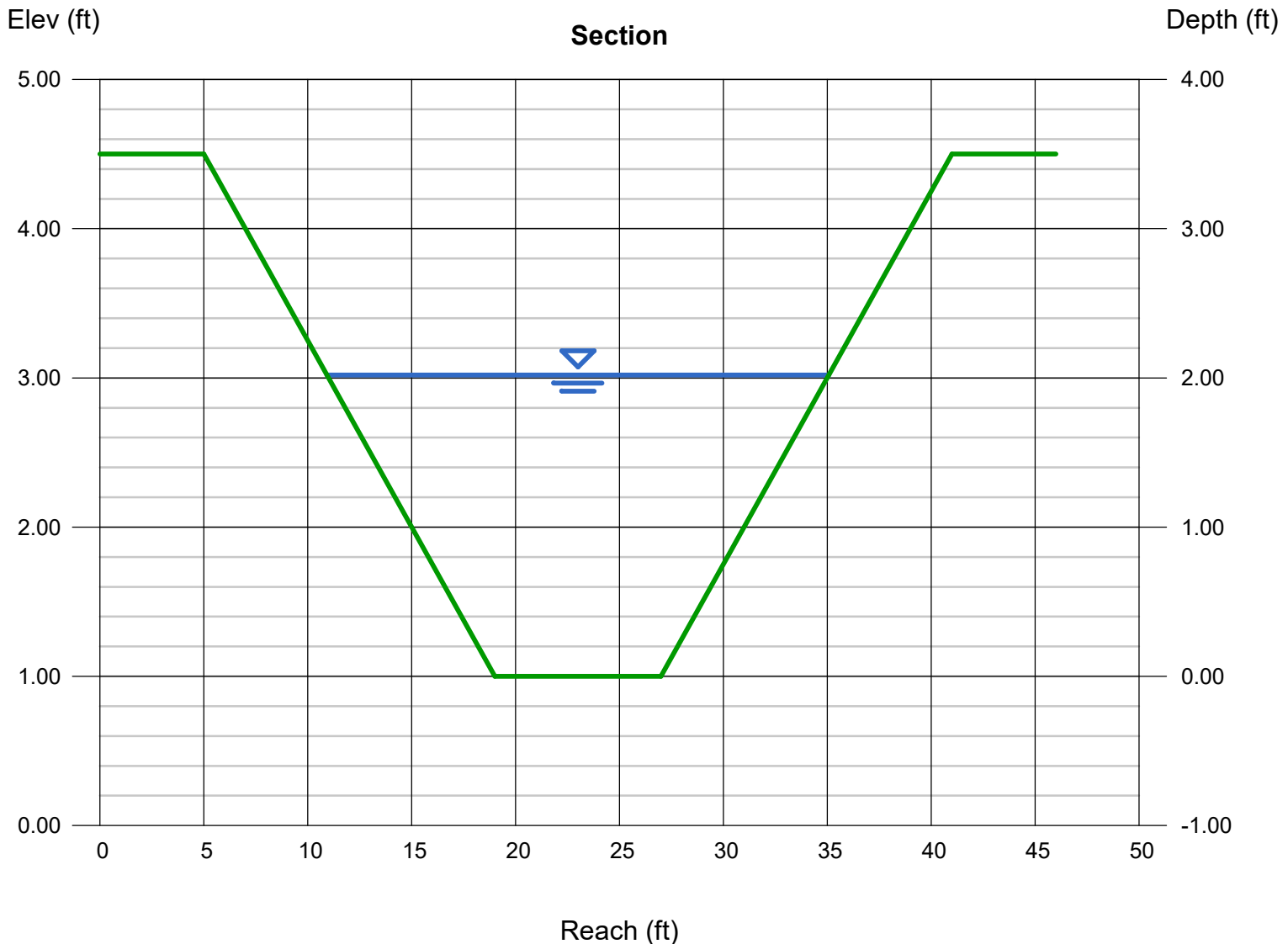
Bottom Width (ft)	= 8.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 3.50
Invert Elev (ft)	= 1.00
Slope (%)	= 0.60
N-Value	= 0.030

### Highlighted

Depth (ft)	= 2.02
Q (cfs)	= 149.50
Area (sqft)	= 32.48
Velocity (ft/s)	= 4.60
Wetted Perim (ft)	= 24.66
Crit Depth, Yc (ft)	= 1.68
Top Width (ft)	= 24.16
EGL (ft)	= 2.35

### Calculations

Compute by:	Known Q
Known Q (cfs)	= 149.50



# Channel Report

## Channel D - 5 YEAR

### Trapezoidal

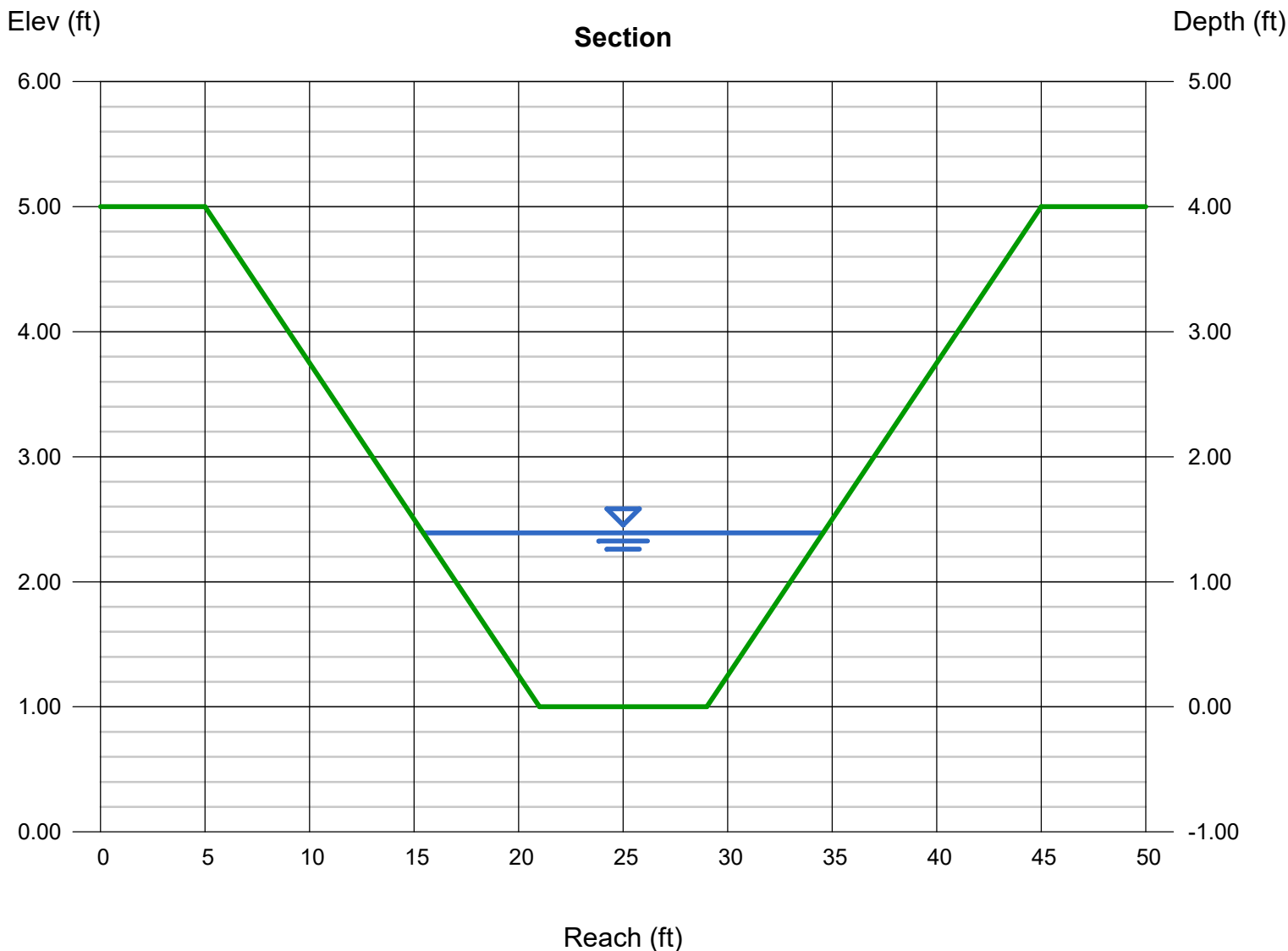
Bottom Width (ft) = 8.00  
Side Slopes (z:1) = 4.00, 4.00  
Total Depth (ft) = 4.00  
Invert Elev (ft) = 1.00  
Slope (%) = 0.40  
N-Value = 0.030

### Highlighted

Depth (ft) = 1.39  
Q (cfs) = 57.50  
Area (sqft) = 18.85  
Velocity (ft/s) = 3.05  
Wetted Perim (ft) = 19.46  
Crit Depth, Yc (ft) = 0.99  
Top Width (ft) = 19.12  
EGL (ft) = 1.53

### Calculations

Compute by: Known Q  
Known Q (cfs) = 57.50



# Channel Report

## Channel D - 100 YEAR

### Trapezoidal

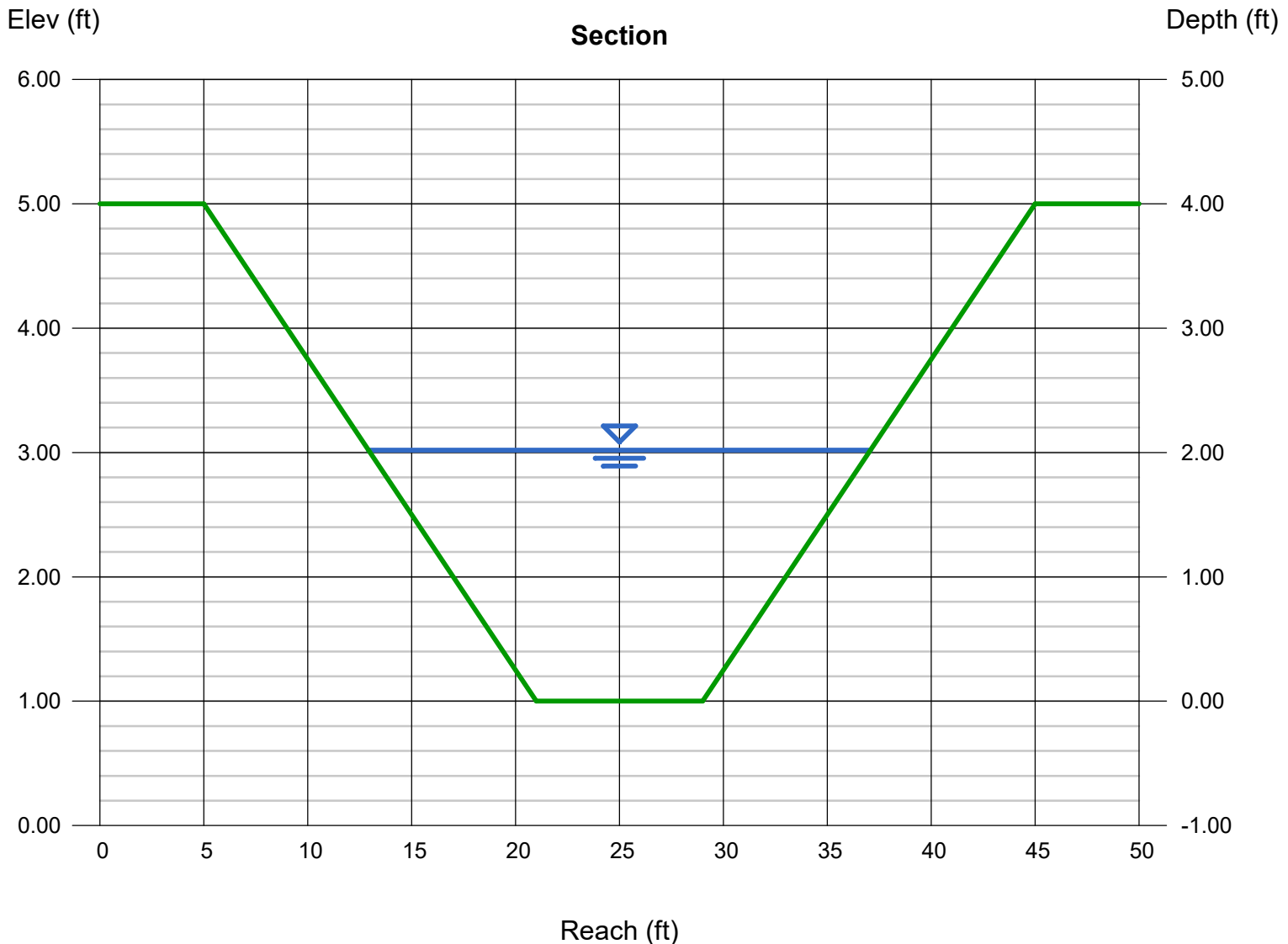
Bottom Width (ft) = 8.00  
Side Slopes (z:1) = 4.00, 4.00  
Total Depth (ft) = 4.00  
Invert Elev (ft) = 1.00  
Slope (%) = 0.40  
N-Value = 0.030

### Highlighted

Depth (ft) = 2.02  
Q (cfs) = 121.60  
Area (sqft) = 32.48  
Velocity (ft/s) = 3.74  
Wetted Perim (ft) = 24.66  
Crit Depth, Yc (ft) = 1.50  
Top Width (ft) = 24.16  
EGL (ft) = 2.24

### Calculations

Compute by: Known Q  
Known Q (cfs) = 121.60



# Channel Report

## Channel E (Offsite & Pond D) - 5 YEAR

### Trapezoidal

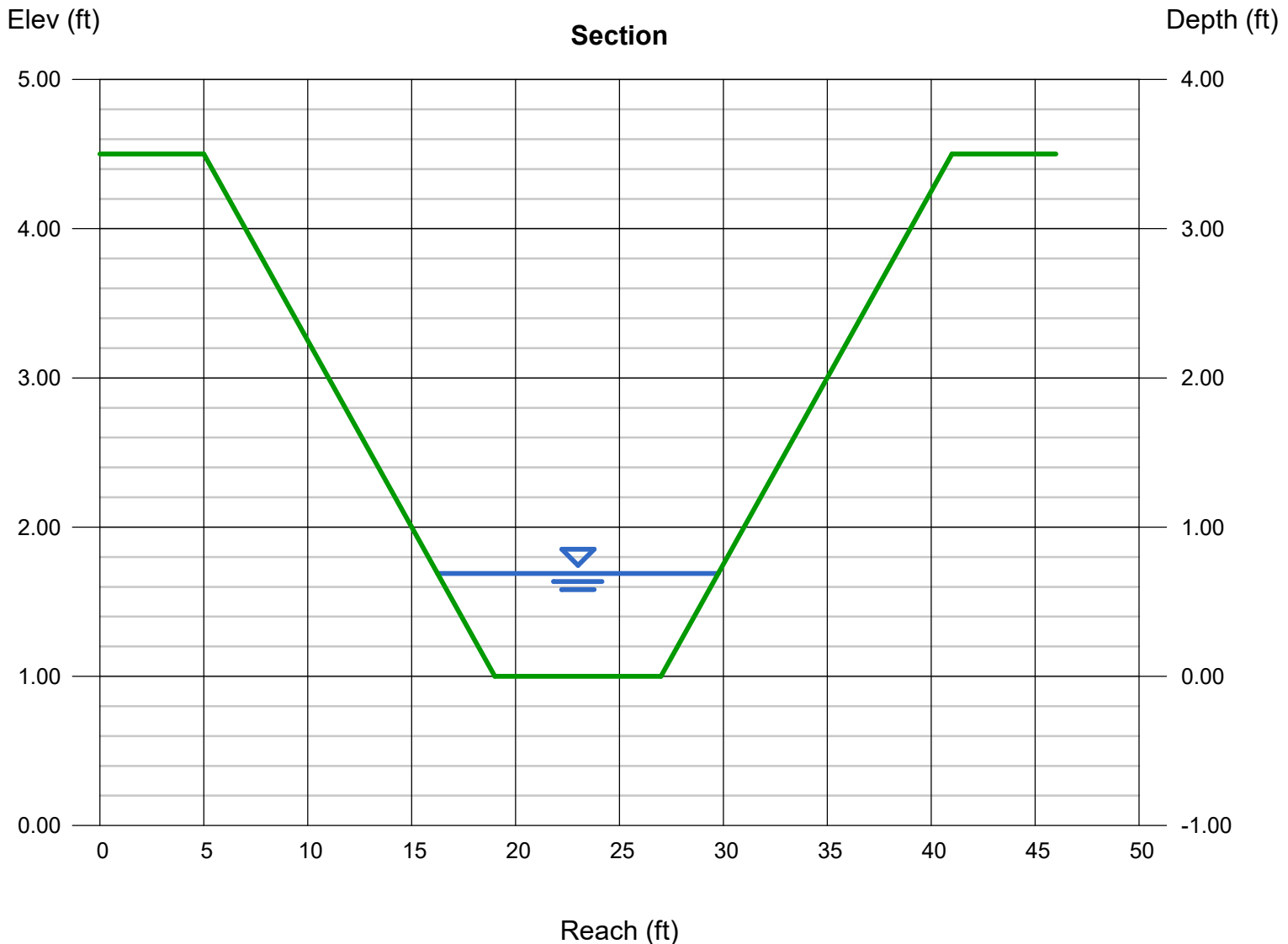
Bottom Width (ft) = 8.00  
Side Slopes (z:1) = 4.00, 4.00  
Total Depth (ft) = 3.50  
Invert Elev (ft) = 1.00  
Slope (%) = 0.60  
N-Value = 0.030

### Highlighted

Depth (ft) = 0.69  
Q (cfs) = 18.70  
Area (sqft) = 7.42  
Velocity (ft/s) = 2.52  
Wetted Perim (ft) = 13.69  
Crit Depth, Yc (ft) = 0.51  
Top Width (ft) = 13.52  
EGL (ft) = 0.79

### Calculations

Compute by: Known Q  
Known Q (cfs) = 18.70



# Channel Report

## Channel E (Offsite & Pond D) - 100 YEAR

### Trapezoidal

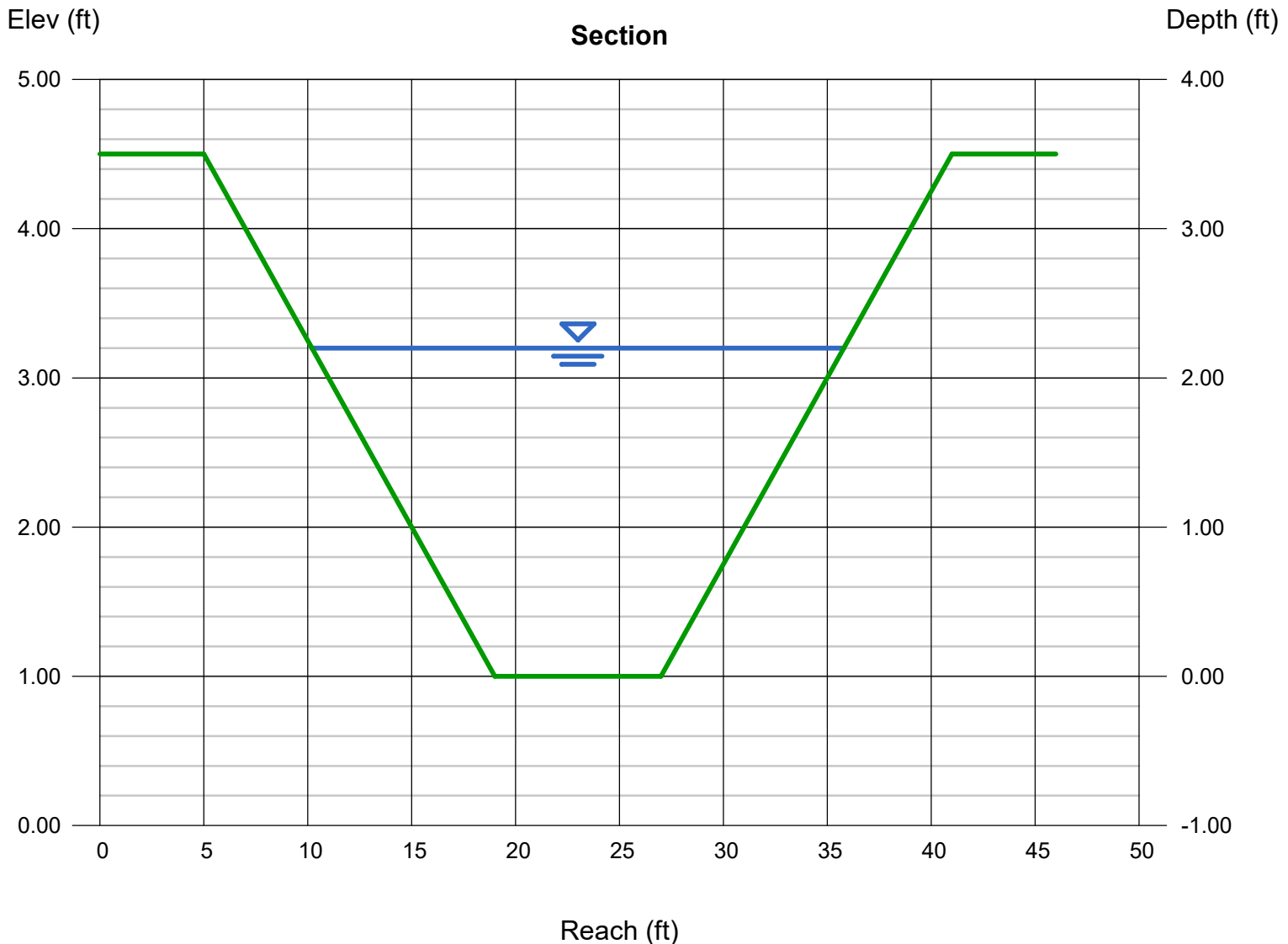
Bottom Width (ft)	= 8.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 3.50
Invert Elev (ft)	= 1.00
Slope (%)	= 0.60
N-Value	= 0.030

### Highlighted

Depth (ft)	= 2.20
Q (cfs)	= 177.50
Area (sqft)	= 36.96
Velocity (ft/s)	= 4.80
Wetted Perim (ft)	= 26.14
Crit Depth, Yc (ft)	= 1.84
Top Width (ft)	= 25.60
EGL (ft)	= 2.56

### Calculations

Compute by:	Known Q
Known Q (cfs)	= 177.50



# Channel Report

## Channel H - 5 YEAR

### Trapezoidal

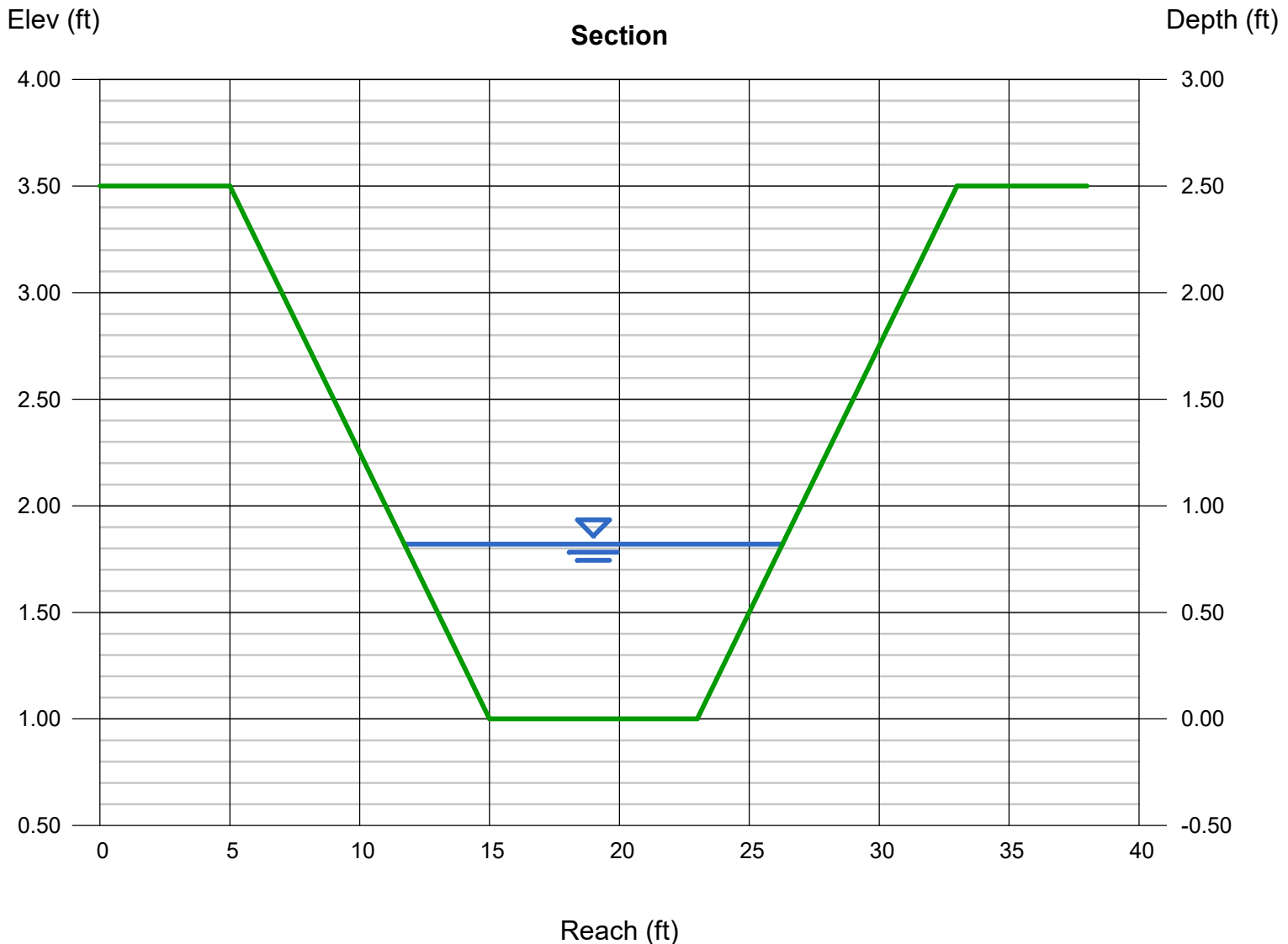
Bottom Width (ft) = 8.00  
Side Slopes (z:1) = 4.00, 4.00  
Total Depth (ft) = 2.50  
Invert Elev (ft) = 1.00  
Slope (%) = 0.50  
N-Value = 0.030

### Highlighted

Depth (ft) = 0.82  
Q (cfs) = 23.50  
Area (sqft) = 9.25  
Velocity (ft/s) = 2.54  
Wetted Perim (ft) = 14.76  
Crit Depth,  $Y_c$  (ft) = 0.59  
Top Width (ft) = 14.56  
EGL (ft) = 0.92

### Calculations

Compute by: Known Q  
Known Q (cfs) = 23.50





# Channel Report

## Channel H - 100 YEAR

### Trapezoidal

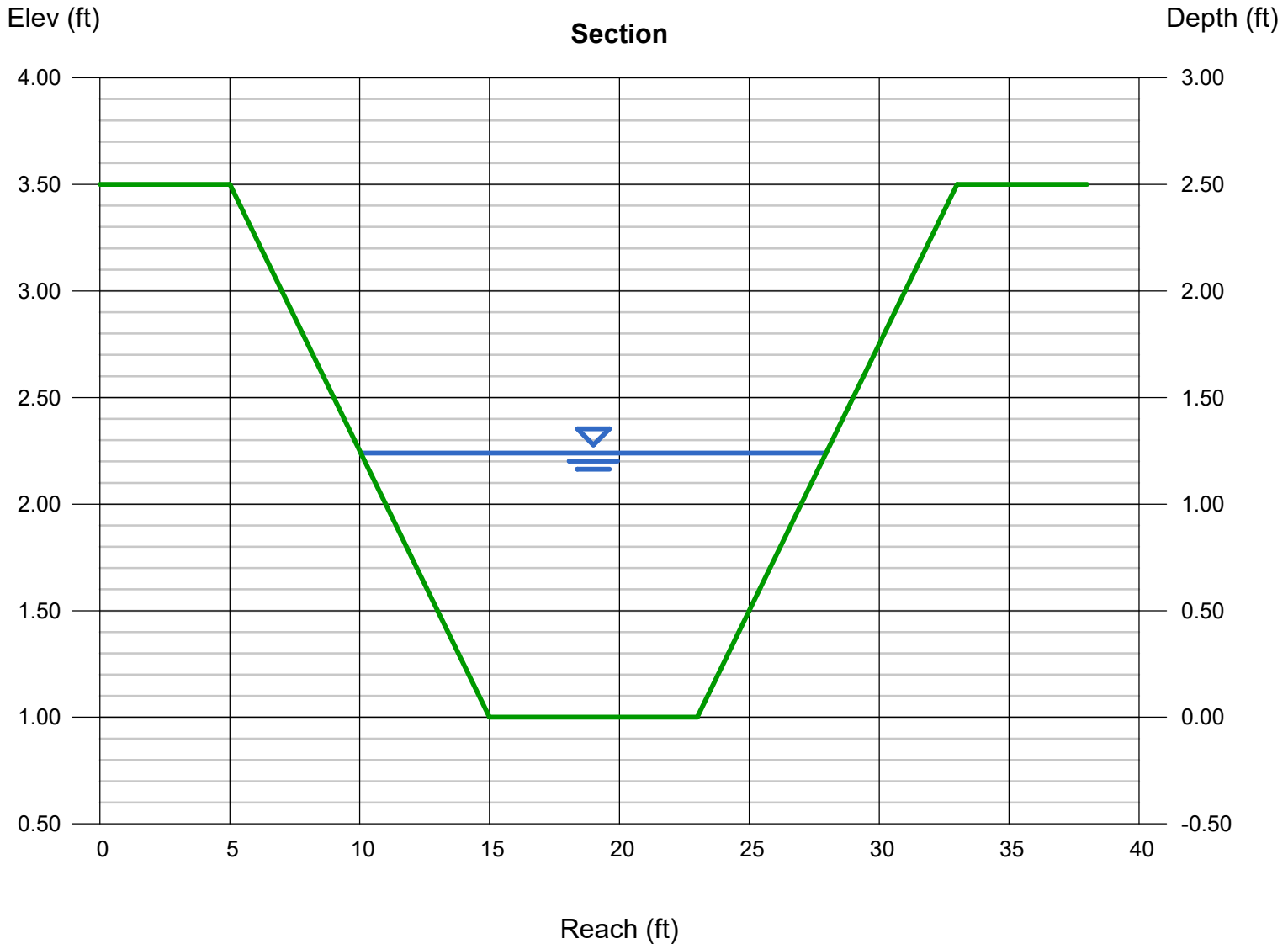
Bottom Width (ft) = 8.00  
Side Slopes (z:1) = 4.00, 4.00  
Total Depth (ft) = 2.50  
Invert Elev (ft) = 1.00  
Slope (%) = 0.50  
N-Value = 0.030

### Highlighted

Depth (ft) = 1.24  
Q (cfs) = 51.60  
Area (sqft) = 16.07  
Velocity (ft/s) = 3.21  
Wetted Perim (ft) = 18.23  
Crit Depth,  $Y_c$  (ft) = 0.93  
Top Width (ft) = 17.92  
EGL (ft) = 1.40

### Calculations

Compute by: Known Q  
Known Q (cfs) = 51.60



# Channel Report

## Channel G - 5 YEAR

### Trapezoidal

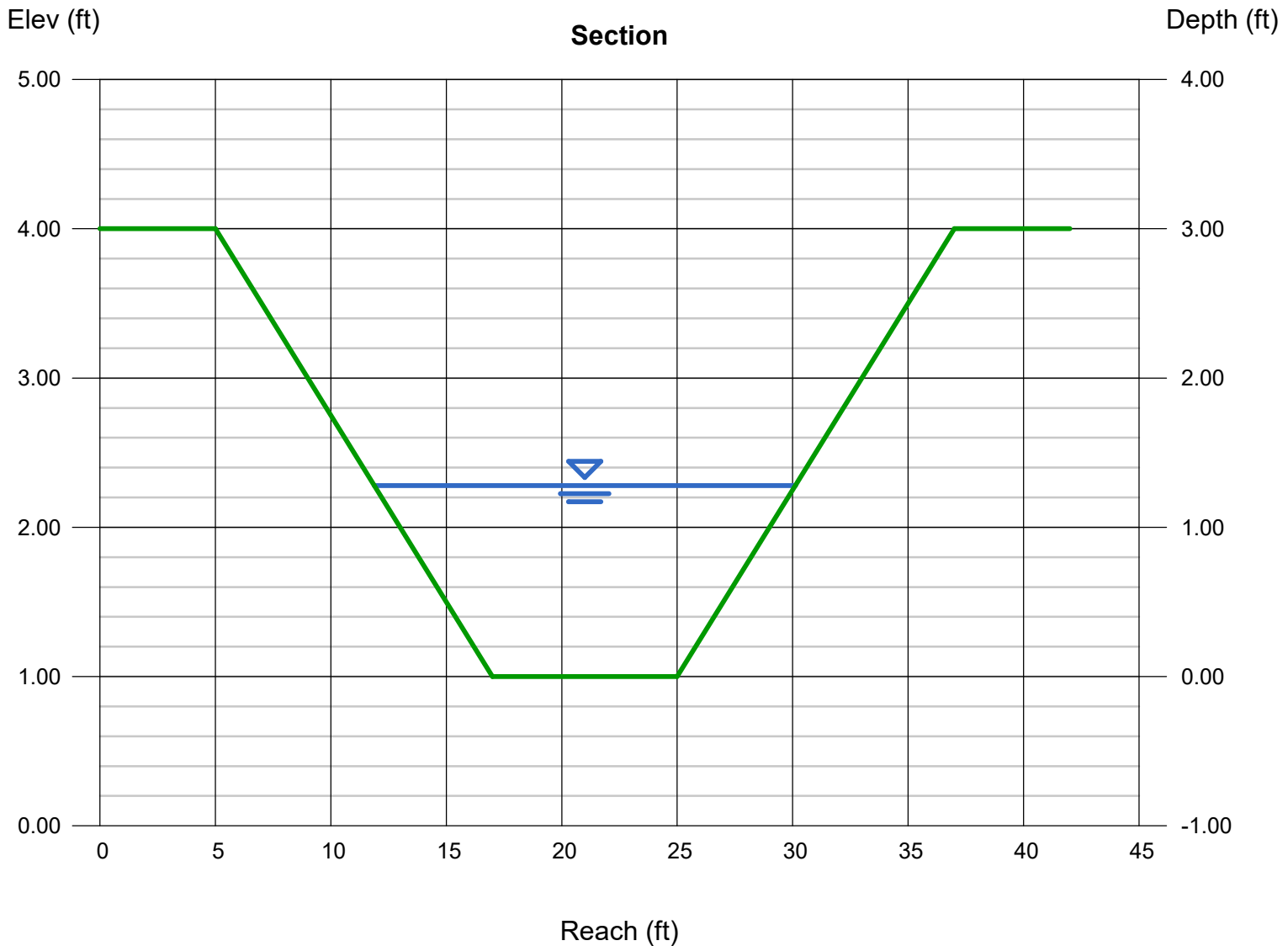
Bottom Width (ft) = 8.00  
Side Slopes (z:1) = 4.00, 4.00  
Total Depth (ft) = 3.00  
Invert Elev (ft) = 1.00  
Slope (%) = 0.60  
N-Value = 0.030

### Highlighted

Depth (ft) = 1.28  
Q (cfs) = 59.60  
Area (sqft) = 16.79  
Velocity (ft/s) = 3.55  
Wetted Perim (ft) = 18.56  
Crit Depth, Yc (ft) = 1.01  
Top Width (ft) = 18.24  
EGL (ft) = 1.48

### Calculations

Compute by: Known Q  
Known Q (cfs) = 59.60



# Channel Report

## Channel G - 100 YEAR

### Trapezoidal

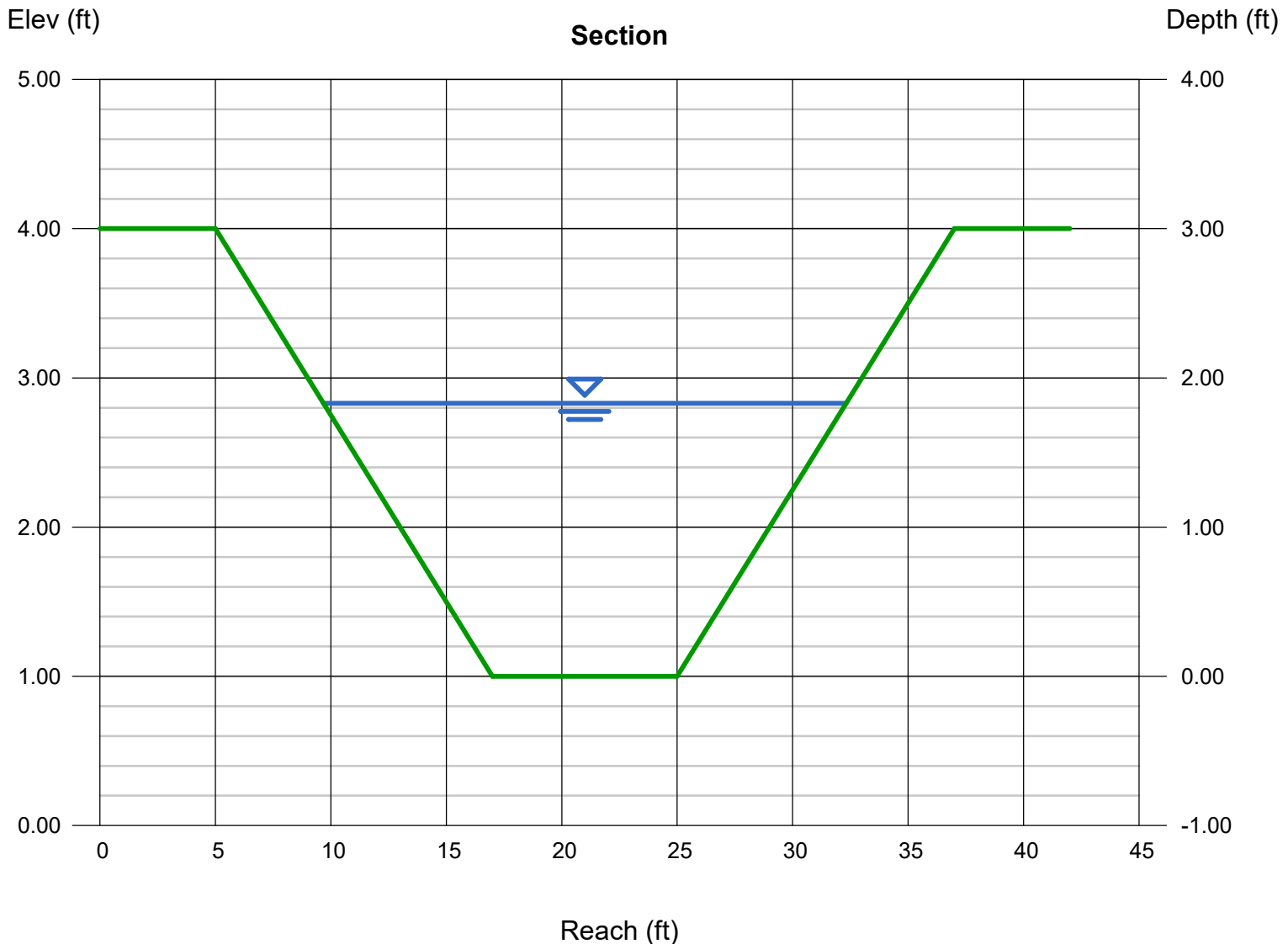
Bottom Width (ft) = 8.00  
Side Slopes (z:1) = 4.00, 4.00  
Total Depth (ft) = 3.00  
Invert Elev (ft) = 1.00  
Slope (%) = 0.60  
N-Value = 0.030

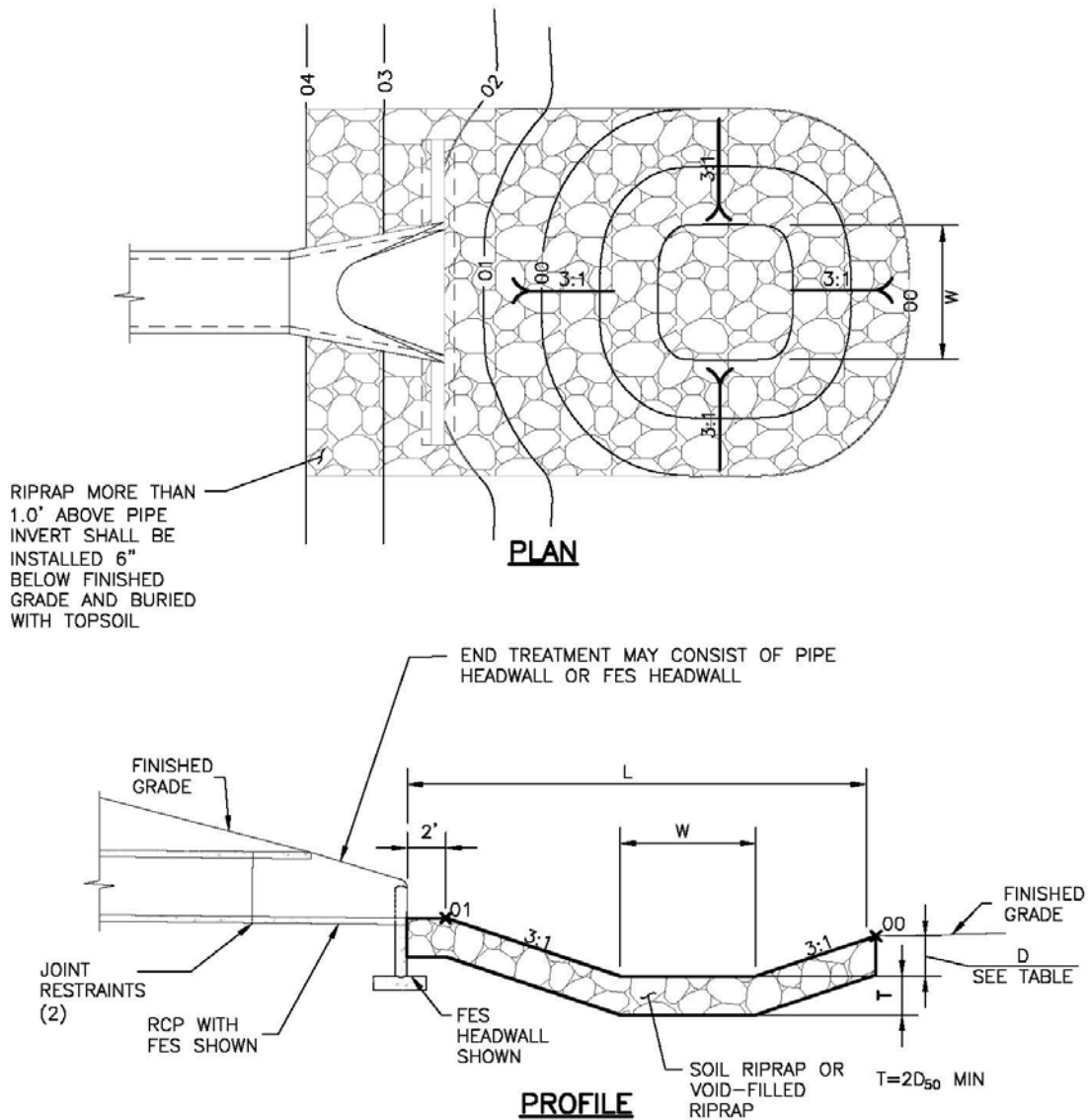
### Highlighted

Depth (ft) = 1.83  
Q (cfs) = 121.70  
Area (sqft) = 28.04  
Velocity (ft/s) = 4.34  
Wetted Perim (ft) = 23.09  
Crit Depth, Yc (ft) = 1.50  
Top Width (ft) = 22.64  
EGL (ft) = 2.12

### Calculations

Compute by: Known Q  
Known Q (cfs) = 121.70





PIPE SIZE OR BOX HEIGHT	D	W*	L
18" - 24"	1'-0"	4'	15'
30" - 36"	1'-6"	6'	20'
42" - 48"	2'-0"	7'	24'
54" - 60"	2'-6"	8'	28'
66" - 72"	3'-0"	9'	32'

\* IF OUTLET PIPE IS A BOX CULVERT WITH A WIDTH GREATER THAN W, THEN W = CULVERT WIDTH

**Figure 9-37. Low tailwater riprap basin**

**APPENDIX C – HYDRAULIC CALCULATIONS**  
***C.3 CULVERT SIZING***

# Culvert Report

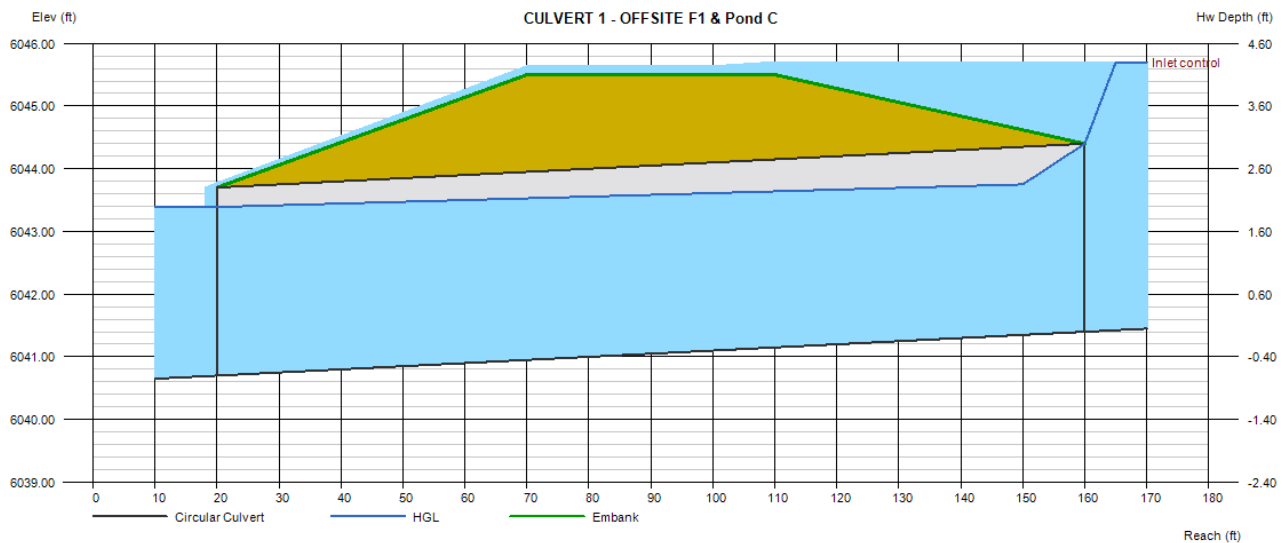
## CULVERT 1 - OFFSITE F1 & Pond C

Invert Elev Dn (ft)	= 6040.70
Pipe Length (ft)	= 140.00
Slope (%)	= 0.50
Invert Elev Up (ft)	= 6041.40
Rise (in)	= 36.0
Shape	= Circular
Span (in)	= 36.0
No. Barrels	= 1
n-Value	= 0.013
Culvert Type	= Circular Concrete
Culvert Entrance	= Square edge w/headwall (C)
Coeff. K,M,c,Y,k	= 0.0098, 2, 0.0398, 0.67, 0.5

<b>Embankment</b>	
Top Elevation (ft)	= 6045.50
Top Width (ft)	= 40.00
Crest Width (ft)	= 40.00

<b>Calculations</b>	
Qmin (cfs)	= 64.50
Qmax (cfs)	= 164.50
Tailwater Elev (ft)	= (dc+D)/2

<b>Highlighted</b>	
Qtotal (cfs)	= 64.50
Qpipe (cfs)	= 53.69
Qovertop (cfs)	= 10.81
Veloc Dn (ft/s)	= 8.04
Veloc Up (ft/s)	= 8.93
HGL Dn (ft)	= 6043.39
HGL Up (ft)	= 6043.78
Hw Elev (ft)	= 6045.70
Hw/D (ft)	= 1.43
Flow Regime	= Inlet Control



# Culvert Report

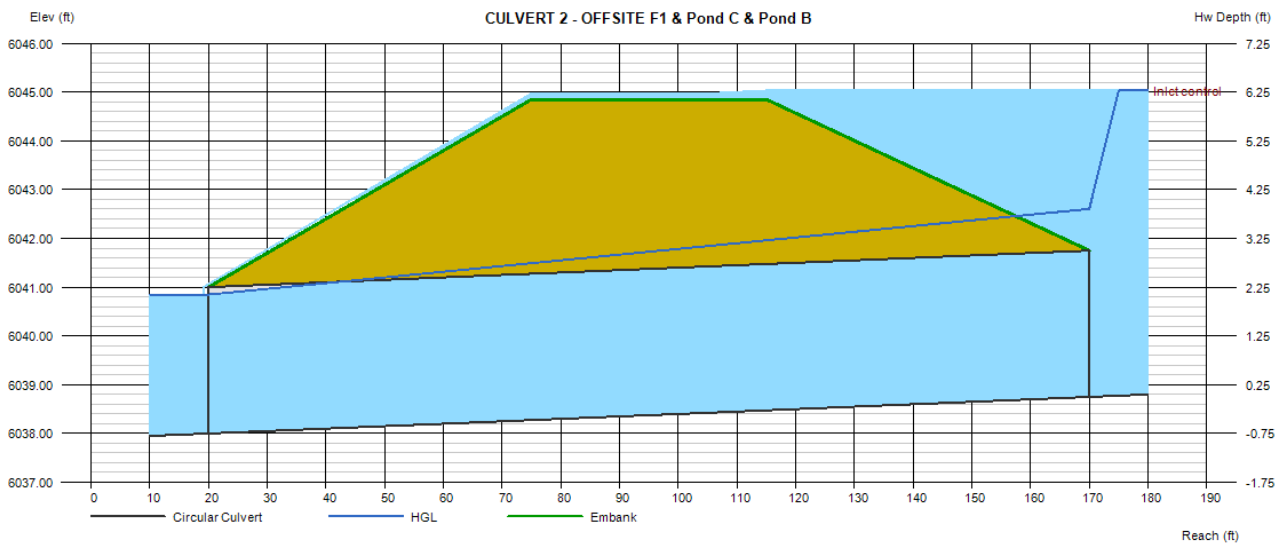
## CULVERT 2 - OFFSITE F1 & Pond C & Pond B

Invert Elev Dn (ft)	= 6038.00
Pipe Length (ft)	= 150.00
Slope (%)	= 0.50
Invert Elev Up (ft)	= 6038.75
Rise (in)	= 36.0
Shape	= Circular
Span (in)	= 36.0
No. Barrels	= 1
n-Value	= 0.013
Culvert Type	= Circular Concrete
Culvert Entrance	= Square edge w/headwall (C)
Coeff. K,M,c,Y,k	= 0.0098, 2, 0.0398, 0.67, 0.5

<b>Embankment</b>	
Top Elevation (ft)	= 6044.85
Top Width (ft)	= 40.00
Crest Width (ft)	= 40.00

<b>Calculations</b>	
Qmin (cfs)	= 82.50
Qmax (cfs)	= 182.50
Tailwater Elev (ft)	= (dc+D)/2

<b>Highlighted</b>	
Qtotal (cfs)	= 82.50
Qpipe (cfs)	= 73.30
Qovertop (cfs)	= 9.20
Veloc Dn (ft/s)	= 10.57
Veloc Up (ft/s)	= 10.37
HGL Dn (ft)	= 6040.85
HGL Up (ft)	= 6042.60
Hw Elev (ft)	= 6045.03
Hw/D (ft)	= 2.09
Flow Regime	= Inlet Control



# Culvert Report

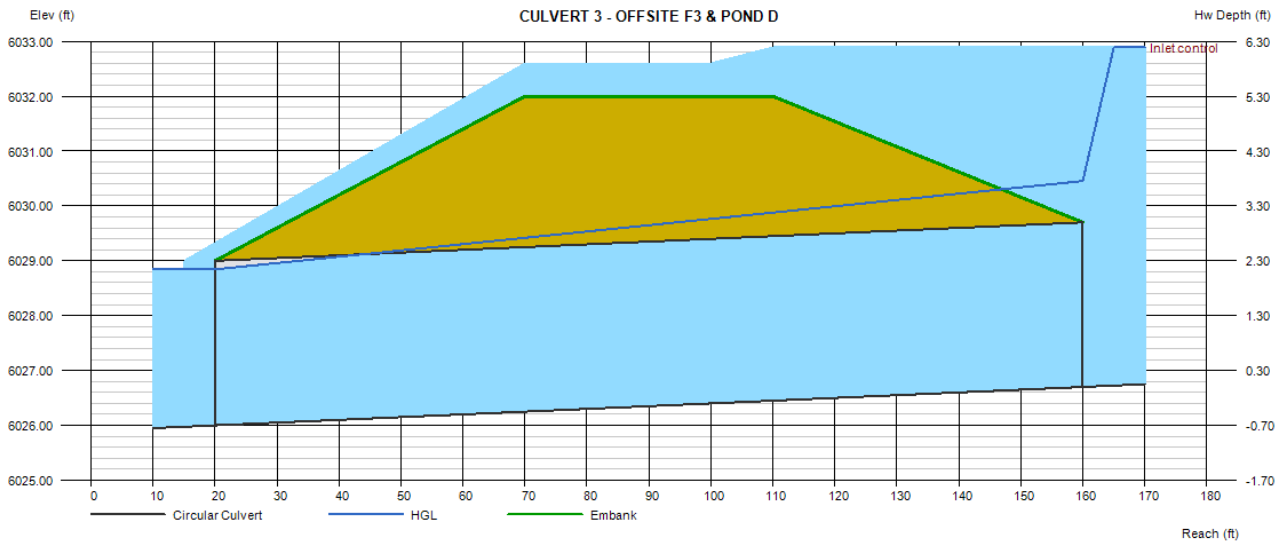
## CULVERT 3 - OFFSITE F3 & POND D

Invert Elev Dn (ft)	= 6026.00
Pipe Length (ft)	= 140.00
Slope (%)	= 0.50
Invert Elev Up (ft)	= 6026.70
Rise (in)	= 36.0
Shape	= Circular
Span (in)	= 36.0
No. Barrels	= 1
n-Value	= 0.013
Culvert Type	= Circular Concrete
Culvert Entrance	= Square edge w/headwall (C)
Coeff. K,M,c,Y,k	= 0.0098, 2, 0.0398, 0.67, 0.5

<b>Embankment</b>	
Top Elevation (ft)	= 6032.00
Top Width (ft)	= 40.00
Crest Width (ft)	= 40.00

<b>Calculations</b>	
Qmin (cfs)	= 77.50
Qmax (cfs)	= 177.50
Tailwater Elev (ft)	= (dc+D)/2

<b>Highlighted</b>	
Qtotal (cfs)	= 177.50
Qpipe (cfs)	= 72.50
Qovertop (cfs)	= 105.00
Veloc Dn (ft/s)	= 10.46
Veloc Up (ft/s)	= 10.26
HGL Dn (ft)	= 6028.84
HGL Up (ft)	= 6030.45
Hw Elev (ft)	= 6032.89
Hw/D (ft)	= 2.06
Flow Regime	= Inlet Control





# Culvert Report

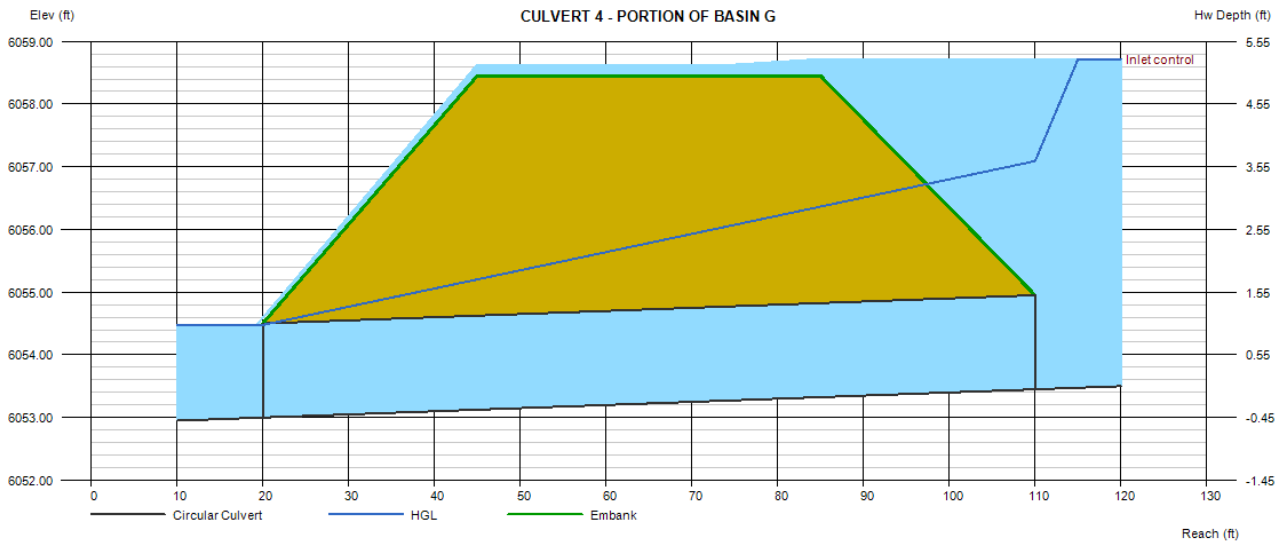
## CULVERT 4 - PORTION OF BASIN G

Invert Elev Dn (ft)	= 6053.00
Pipe Length (ft)	= 90.00
Slope (%)	= 0.50
Invert Elev Up (ft)	= 6053.45
Rise (in)	= 18.0
Shape	= Circular
Span (in)	= 18.0
No. Barrels	= 1
n-Value	= 0.013
Culvert Type	= Circular Concrete
Culvert Entrance	= Square edge w/headwall (C)
Coeff. K,M,c,Y,k	= 0.0098, 2, 0.0398, 0.67, 0.5

<b>Embankment</b>	
Top Elevation (ft)	= 6058.45
Top Width (ft)	= 40.00
Crest Width (ft)	= 40.00

<b>Calculations</b>	
Qmin (cfs)	= 21.40
Qmax (cfs)	= 39.10
Tailwater Elev (ft)	= (dc+D)/2

<b>Highlighted</b>	
Qtotal (cfs)	= 38.40
Qpipe (cfs)	= 18.29
Qovertop (cfs)	= 20.11
Veloc Dn (ft/s)	= 10.39
Veloc Up (ft/s)	= 10.35
HGL Dn (ft)	= 6054.48
HGL Up (ft)	= 6057.09
Hw Elev (ft)	= 6058.72
Hw/D (ft)	= 3.51
Flow Regime	= Inlet Control



# Culvert Report

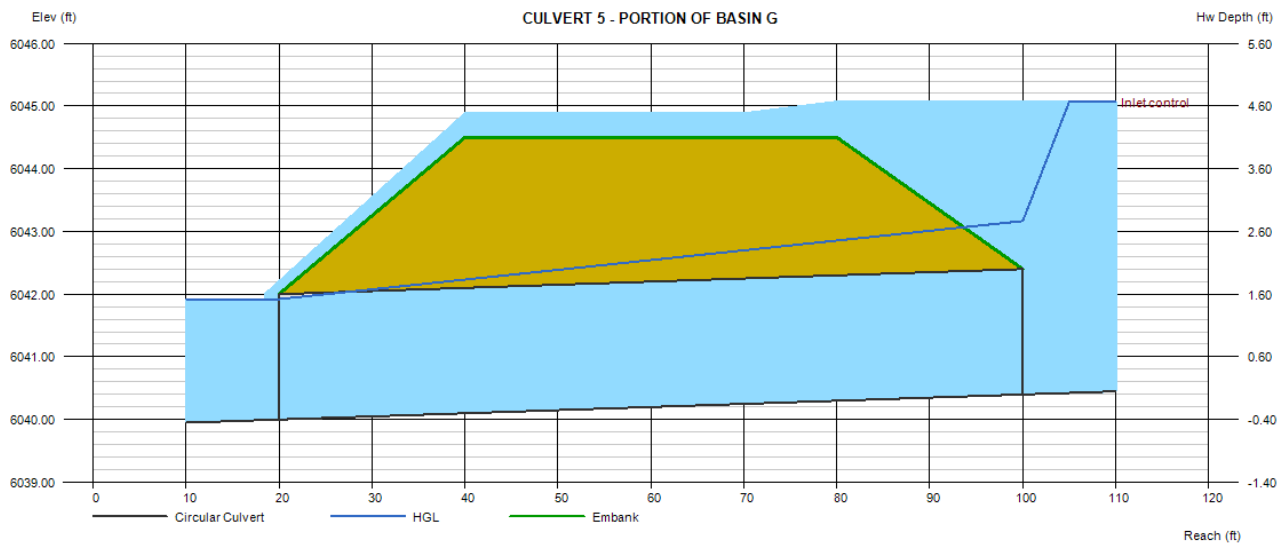
## CULVERT 5 - PORTION OF BASIN G

Invert Elev Dn (ft)	= 6040.00
Pipe Length (ft)	= 80.00
Slope (%)	= 0.50
Invert Elev Up (ft)	= 6040.40
Rise (in)	= 24.0
Shape	= Circular
Span (in)	= 24.0
No. Barrels	= 1
n-Value	= 0.013
Culvert Type	= Circular Concrete
Culvert Entrance	= Square edge w/headwall (C)
Coeff. K,M,c,Y,k	= 0.0098, 2, 0.0398, 0.67, 0.5

<b>Embankment</b>	
Top Elevation (ft)	= 6044.50
Top Width (ft)	= 40.00
Crest Width (ft)	= 40.00

<b>Calculations</b>	
Qmin (cfs)	= 45.10
Qmax (cfs)	= 89.90
Tailwater Elev (ft)	= (dc+D)/2

<b>Highlighted</b>	
Qtotal (cfs)	= 89.10
Qpipe (cfs)	= 28.76
Qovertop (cfs)	= 60.34
Veloc Dn (ft/s)	= 9.28
Veloc Up (ft/s)	= 9.15
HGL Dn (ft)	= 6041.92
HGL Up (ft)	= 6043.17
Hw Elev (ft)	= 6045.07
Hw/D (ft)	= 2.34
Flow Regime	= Inlet Control



# Culvert Report

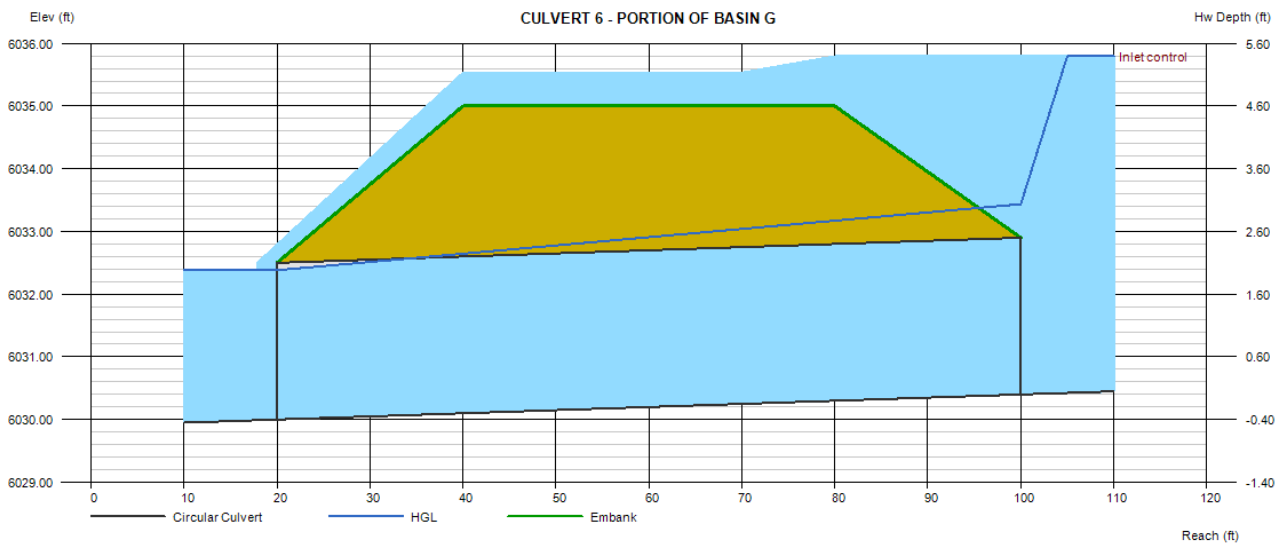
## CULVERT 6 - PORTION OF BASIN G

Invert Elev Dn (ft)	= 6030.00
Pipe Length (ft)	= 80.00
Slope (%)	= 0.50
Invert Elev Up (ft)	= 6030.40
Rise (in)	= 30.0
Shape	= Circular
Span (in)	= 30.0
No. Barrels	= 1
n-Value	= 0.013
Culvert Type	= Circular Concrete
Culvert Entrance	= Square edge w/headwall (C)
Coeff. K,M,c,Y,k	= 0.0098, 2, 0.0398, 0.67, 0.5

<b>Embankment</b>	
Top Elevation (ft)	= 6035.00
Top Width (ft)	= 40.00
Crest Width (ft)	= 40.00

<b>Calculations</b>	
Qmin (cfs)	= 68.80
Qmax (cfs)	= 142.40
Tailwater Elev (ft)	= (dc+D)/2

<b>Highlighted</b>	
Qtotal (cfs)	= 141.80
Qpipe (cfs)	= 47.49
Qovertop (cfs)	= 94.31
Veloc Dn (ft/s)	= 9.84
Veloc Up (ft/s)	= 9.68
HGL Dn (ft)	= 6032.38
HGL Up (ft)	= 6033.44
Hw Elev (ft)	= 6035.79
Hw/D (ft)	= 2.16
Flow Regime	= Inlet Control



# Culvert Report

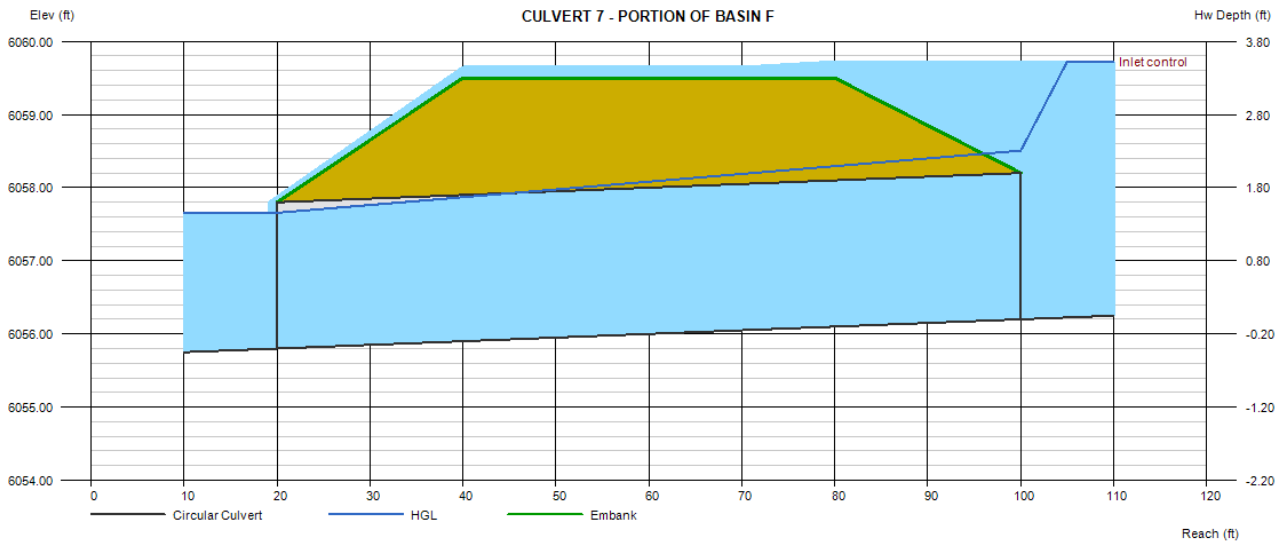
## CULVERT 7 - PORTION OF BASIN F

Invert Elev Dn (ft)	= 6055.80
Pipe Length (ft)	= 80.00
Slope (%)	= 0.50
Invert Elev Up (ft)	= 6056.20
Rise (in)	= 24.0
Shape	= Circular
Span (in)	= 24.0
No. Barrels	= 1
n-Value	= 0.013
Culvert Type	= Circular Concrete
Culvert Entrance	= Square edge w/headwall (C)
Coeff. K,M,c,Y,k	= 0.0098, 2, 0.0398, 0.67, 0.5

<b>Embankment</b>	
Top Elevation (ft)	= 6059.50
Top Width (ft)	= 40.00
Crest Width (ft)	= 40.00

<b>Calculations</b>	
Qmin (cfs)	= 17.30
Qmax (cfs)	= 38.10
Tailwater Elev (ft)	= (dc+D)/2

<b>Highlighted</b>	
Qtotal (cfs)	= 37.30
Qpipe (cfs)	= 23.31
Qovertop (cfs)	= 13.99
Veloc Dn (ft/s)	= 7.66
Veloc Up (ft/s)	= 7.42
HGL Dn (ft)	= 6057.66
HGL Up (ft)	= 6058.51
Hw Elev (ft)	= 6059.73
Hw/D (ft)	= 1.76
Flow Regime	= Inlet Control



# Culvert Report

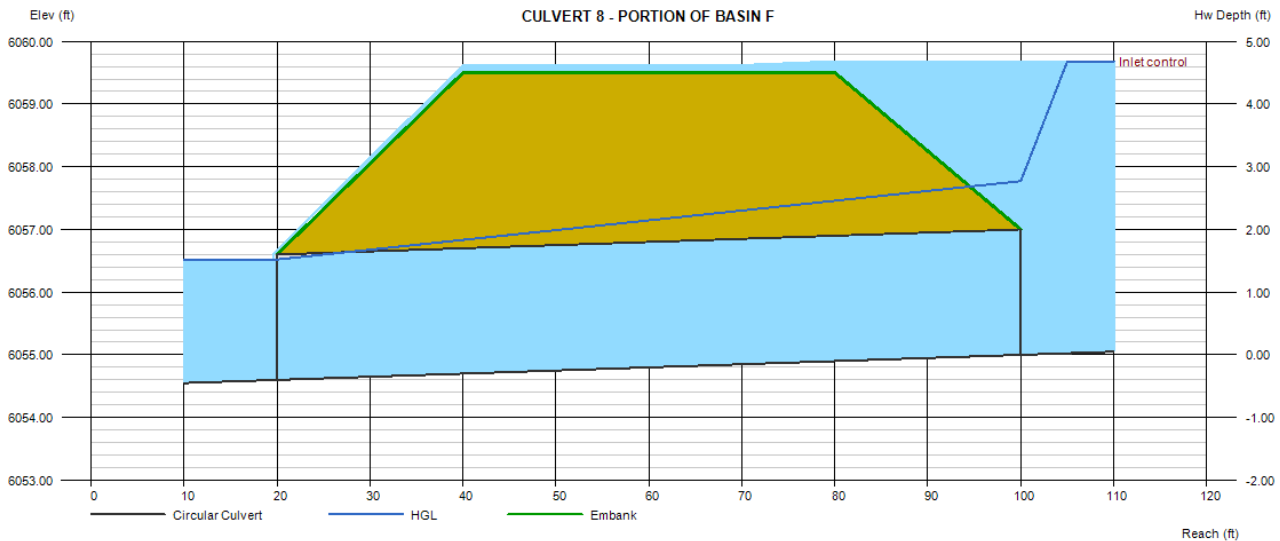
## CULVERT 8 - PORTION OF BASIN F

Invert Elev Dn (ft)	= 6054.60
Pipe Length (ft)	= 80.00
Slope (%)	= 0.50
Invert Elev Up (ft)	= 6055.00
Rise (in)	= 24.0
Shape	= Circular
Span (in)	= 24.0
No. Barrels	= 1
n-Value	= 0.013
Culvert Type	= Circular Concrete
Culvert Entrance	= Square edge w/headwall (C)
Coeff. K,M,c,Y,k	= 0.0098, 2, 0.0398, 0.67, 0.5

<b>Embankment</b>	
Top Elevation (ft)	= 6059.50
Top Width (ft)	= 40.00
Crest Width (ft)	= 40.00

<b>Calculations</b>	
Qmin (cfs)	= 17.80
Qmax (cfs)	= 39.30
Tailwater Elev (ft)	= (dc+D)/2

<b>Highlighted</b>	
Qtotal (cfs)	= 38.80
Qpipe (cfs)	= 28.81
Qovertop (cfs)	= 9.99
Veloc Dn (ft/s)	= 9.29
Veloc Up (ft/s)	= 9.17
HGL Dn (ft)	= 6056.52
HGL Up (ft)	= 6057.77
Hw Elev (ft)	= 6059.68
Hw/D (ft)	= 2.34
Flow Regime	= Inlet Control

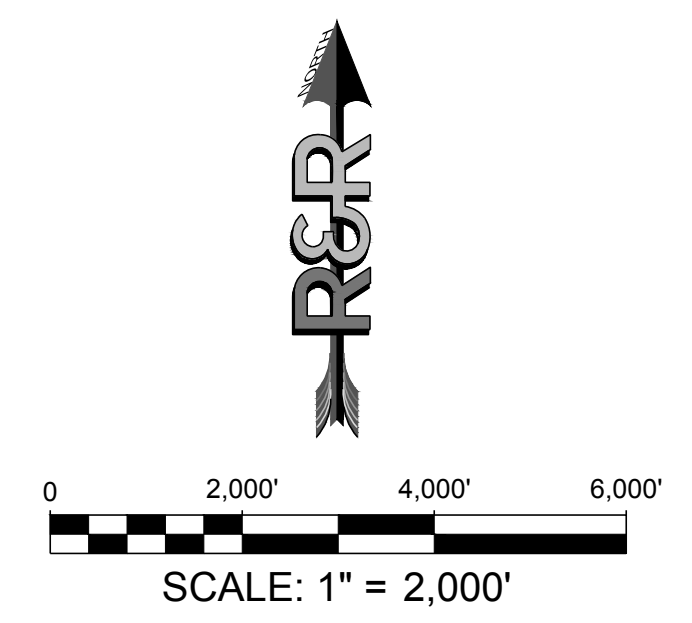


**MAYBERRY COMMUNITIES  
MASTER DEVELOPMENT DRAINAGE PLAN**

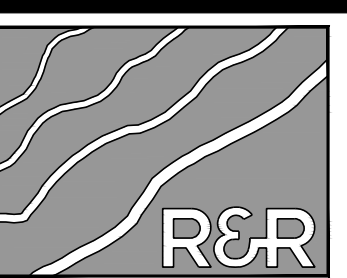
**APPENDIX D – DRAINAGE MAPS**



EXISTING	DESCRIPTION	PROPOSED
---	PROPERTY LINE	---
--- 5825 ---	MAJOR CONTOUR	--- 5825 ---
--- 5822 ---	MINOR CONTOUR	--- 5822 ---
	DRAINAGE BASIN LABEL	
	* BASIN LABEL	
	** TRIBUTARY AREA (AC)	
	FLOW ARROW	
	DESIGN POINT	
	DRAINAGE AREA BOUNDARY	---
	DRAINAGE BASIN BOUNDARY PER EL PASO COUNTY	---



NO.	REVISION	BY	DATE



**R&R ENGINEERS SURVEYORS**

**R&R ENGINEERS-SURVEYORS, INC.**  
 1635 WEST 13TH AVENUE, SUITE 310  
 DENVER, COLORADO 80204  
 PHONE: 303-753-6730

WWW.RRENGINEERS.COM

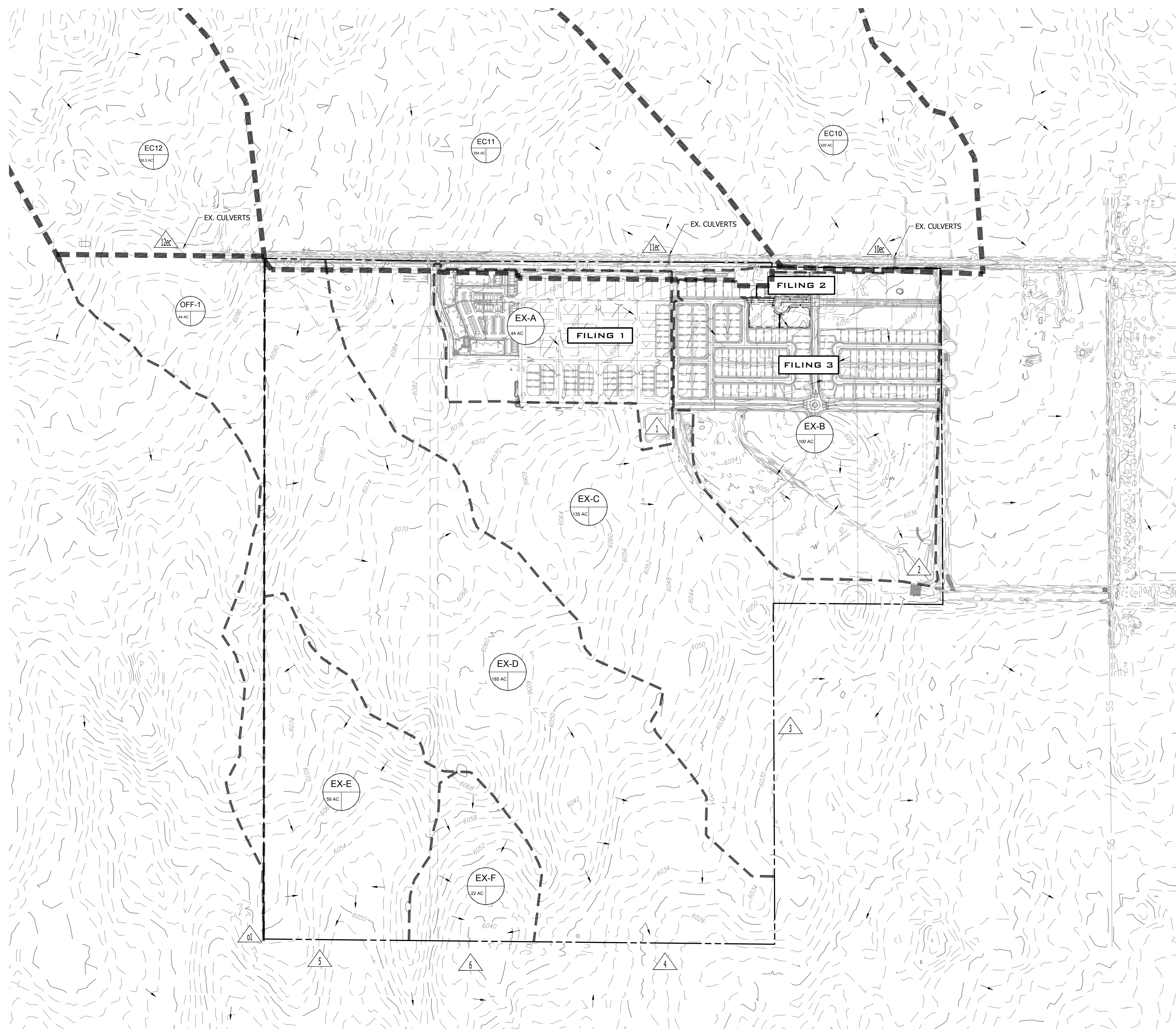
**MAYBERRY SKETCH PLAN**  
 SITE ADDRESS: MAYBERRY, COLORADO SPRINGS  
 EL PASO COUNTY  
 PREPARED FOR: MAYBERRY COMMUNITIES, LLC  
 3296 DEVINE HEIGHTS #208  
 COLORADO SPRINGS, CO 80922

Exhibit	
JOB NO.	MC22208
ORG. SUBM. DATE	
DWN:	GWH
CHKD:	CJD
NAME	

**HISTORIC DRAINAGE PLAN**

NO. **DR1**

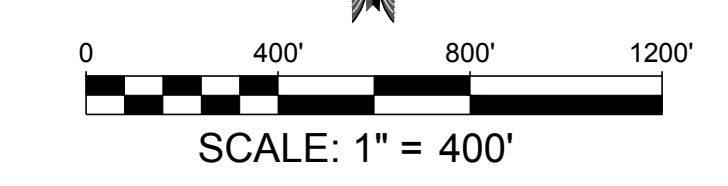
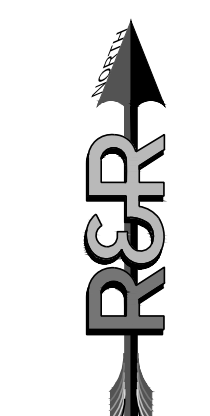




EXISTING	DESCRIPTION	PROPOSED
---	PROPERTY LINE	---
---	MAJOR CONTOUR	---
---	MINOR CONTOUR	---
	DRAINAGE BASIN LABEL	C-1*
	* BASIN LABEL	
	** TRIBUTARY AREA (AC)	1**
	FLOW ARROW	→
	DESIGN POINT	△
	DRAINAGE AREA BOUNDARY	---

Basin	Area (acres)	5-yr (cfs)	100-yr (cfs)
OFF-1	44.00	5.90	25.8
EX-A	44.00	151.65	184.8
EX-B	100.00	169.04	271.5
EX-C	135.00	34.51	151.0
EX-D	185.00	40.27	176.2
EX-E	59.00	14.14	61.8
EX-F	22.00	6.65	29.1
EC12	30.30	16.67	40.3
EC11	354.00	24.40	149.5
EC10	320.00	18.40	144.7

Design Point	Contributing Basins	Area (acres)	5-yr (cfs)	100-yr (cfs)
1	EX-A	44.00	87.90	179.97
2	EX-B	100.00	96.33	259.89
3	EX-C	135.00	20.06	147.43
4	EX-D	185.00	24.32	178.74
5	EX-E	59.00	8.33	61.21
6	EX-F	22.00	3.78	27.78
o1	OFF-1	44.00	4.36	32.04
10ec	EC10	320.00	18.40	144.7
11ec	EC11	354.00	24.40	149.5
12ec	EC12	30.30	16.67	40.3



NO.	REVISION	BY	DATE

**R&R ENGINEERS-SURVEYORS, INC.**  
 1635 WEST 13TH AVENUE, SUITE 310  
 DENVER, COLORADO 80204  
 PHONE: 303-753-6730

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**MAYBERRY SKETCH PLAN**  
 MAYBERRY, COLORADO SPRINGS  
 EL PASO COUNTY

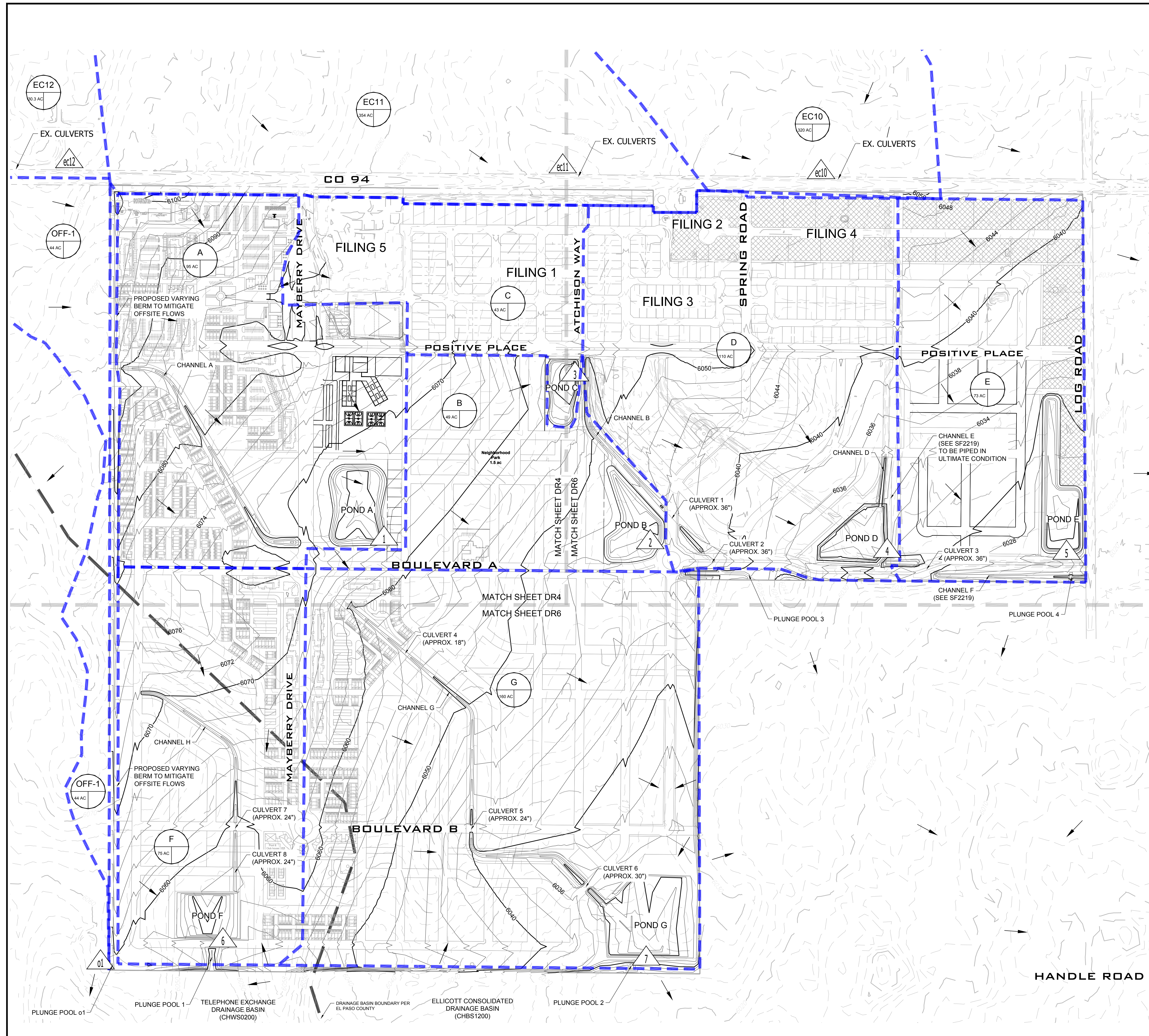
PREPARED FOR:  
 MAYBERRY COMMUNITIES, LLC  
 3296 DEVINE HEIGHTS #208  
 COLORADO SPRINGS, CO 80922

JOB NO.	MC22208
ORG. SUBM. DATE	
DWN:	GWJ
CHKD:	CJD
NAME	

**HISTORIC DRAINAGE PLAN**

NO. **DR2**





EXISTING	DESCRIPTION	PROPOSED
---	PROPERTY LINE	---
---	EASEMENT	---
---	EDGE OF PAVEMENT	---
---	VERTICAL CURB AND GUTTER	---
---	SPILL GUTTER	---
---	TRANSITION GUTTER	---
---	MAJOR CONTOUR	---
---	MINOR CONTOUR	---
---	STORM SEWER PIPE	---

○ X*	DRAINAGE BASIN LABEL
○ X**	* BASIN LABEL
	** TRIBUTARY AREA (AC)
→	FLOW ARROW
△	DESIGN POINT
---	DRAINAGE AREA BOUNDARY

Basin	Area (acres)	5-yr (cfs)	100-yr (cfs)
A	95.00	154.99	286.8
B	49.00	67.48	143.6
C	43.00	59.08	121.5
D	110.00	145.86	309.1
E	73.00	106.61	215.9
F	75.00	71.09	145.1
G	160.00	173.79	364.6
EC12	30.30	16.67	40.3
EC11	354.00	24.40	149.5
EC10	320.00	18.40	144.7
OFF-1	44.00	5.90	25.8

Design Point	Contributing Basins	Area (acres)	5-yr (cfs)	100-yr (cfs)
1	A	95.00	147.81	273.86
2	B	49.00	64.15	136.63
3	C	43.00	56.01	115.33
4	D	110.00	138.30	293.42
5	E	73.00	101.07	204.91
6	F	75.00	70.97	145.03
7	G	160.00	166.68	350.13

NO.	REVISION	BY	DATE

**R&R ENGINEERS-SURVEYORS, INC.**  
 1635 WEST 13TH AVENUE, SUITE 310  
 DENVER, COLORADO 80204  
 PHONE: 303-753-6730

WWW.RRENINEERS.COM

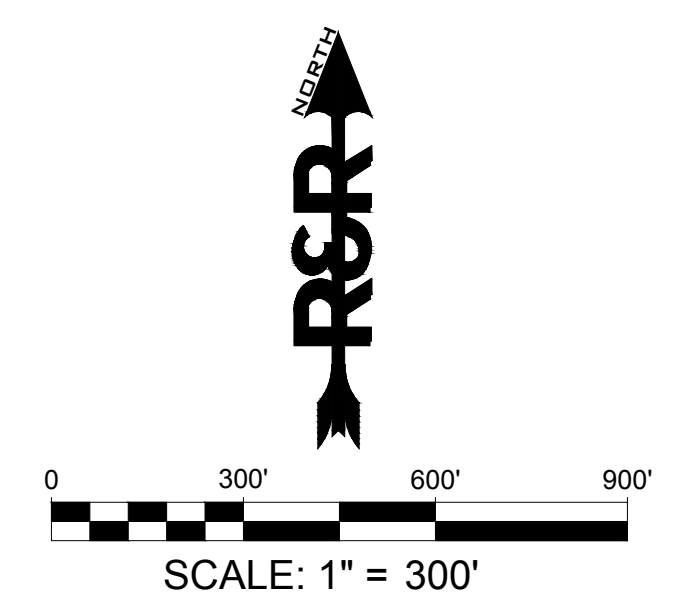
**MAYBERRY SKETCH PLAN**  
 MAYBERRY, COLORADO SPRINGS  
 EL PASO COUNTY

PREPARED FOR:  
 MAYBERRY COMMUNITIES, LLC  
 3296 DEVINE HEIGHTS #208  
 COLORADO SPRINGS, CO 80922

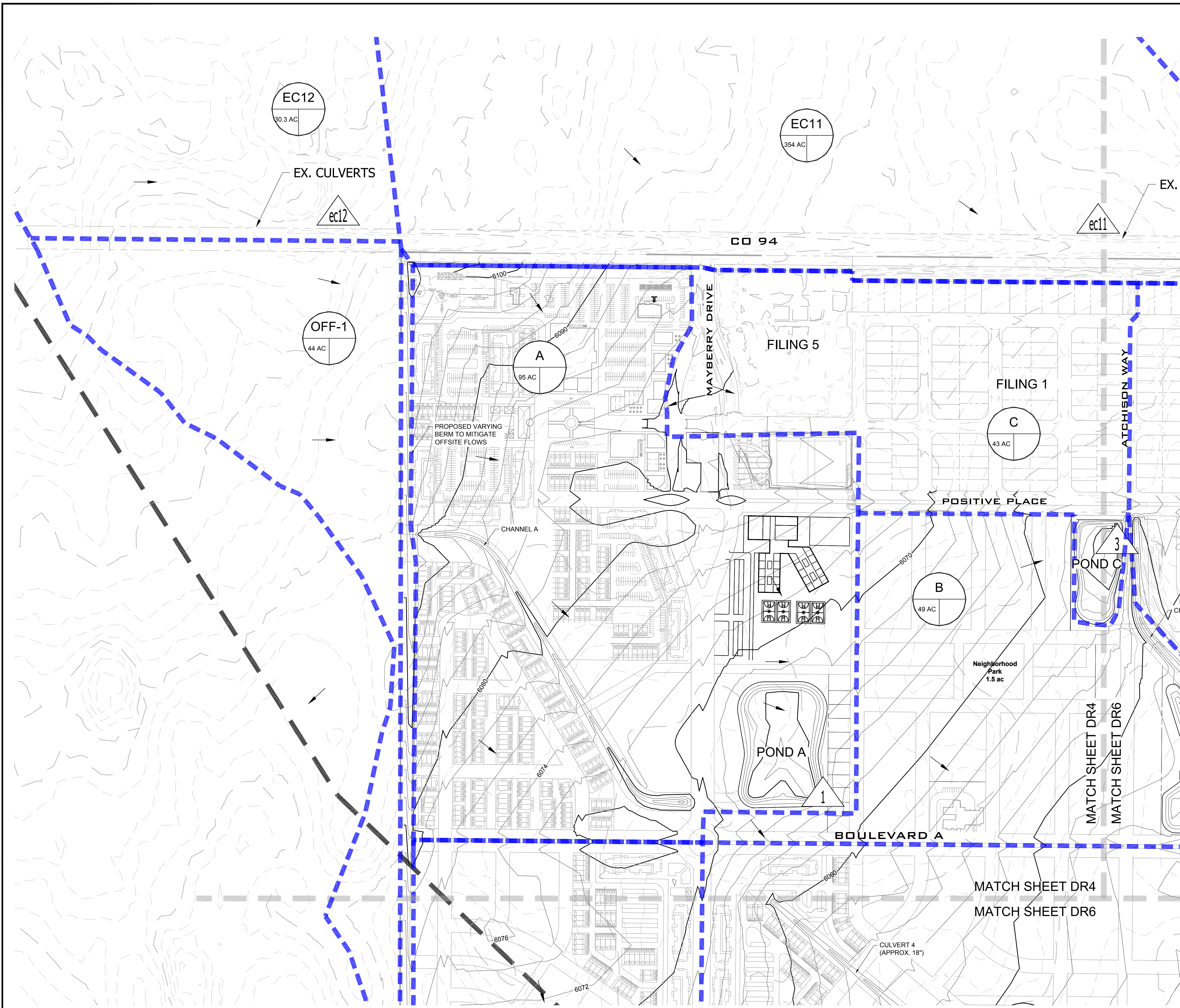
EXHIBIT  
 JOB NO. MC22208  
 ORG. SUBM. DATE  
 DWN: GWH CHKD: CJD  
 NAME

**OVERALL PROPOSED DRAINAGE MAP**

NO. **DR3**



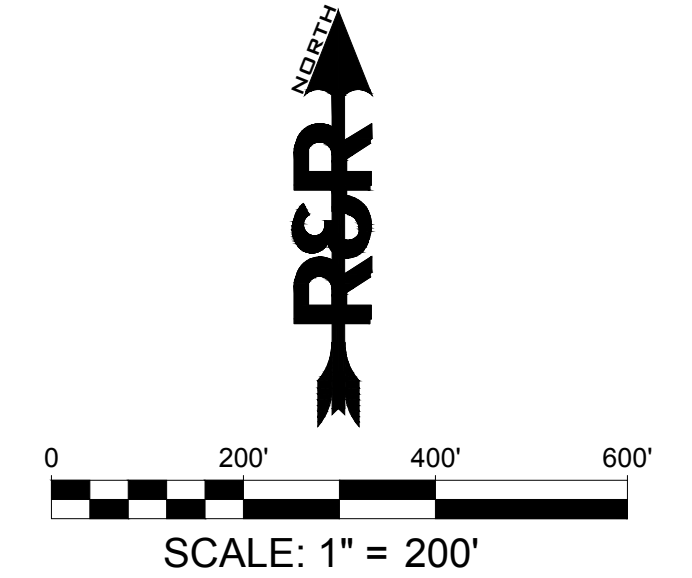




EXISTING	DESCRIPTION	PROPOSED
---	PROPERTY LINE	---
---	EASEMENT	---
---	EDGE OF PAVEMENT	---
---	VERTICAL CURB AND GUTTER	---
---	SPILL GUTTER	---
---	TRANSITION GUTTER	---
---	MAJOR CONTOUR	---
---	MINOR CONTOUR	---
---	STORM SEWER PIPE	---
	DRAINAGE BASIN LABEL	X*
	* BASIN LABEL	X**
	** TRIBUTARY AREA (AC)	
→	FLOW ARROW	→
	DESIGN POINT	△
---	DRAINAGE AREA BOUNDARY	---

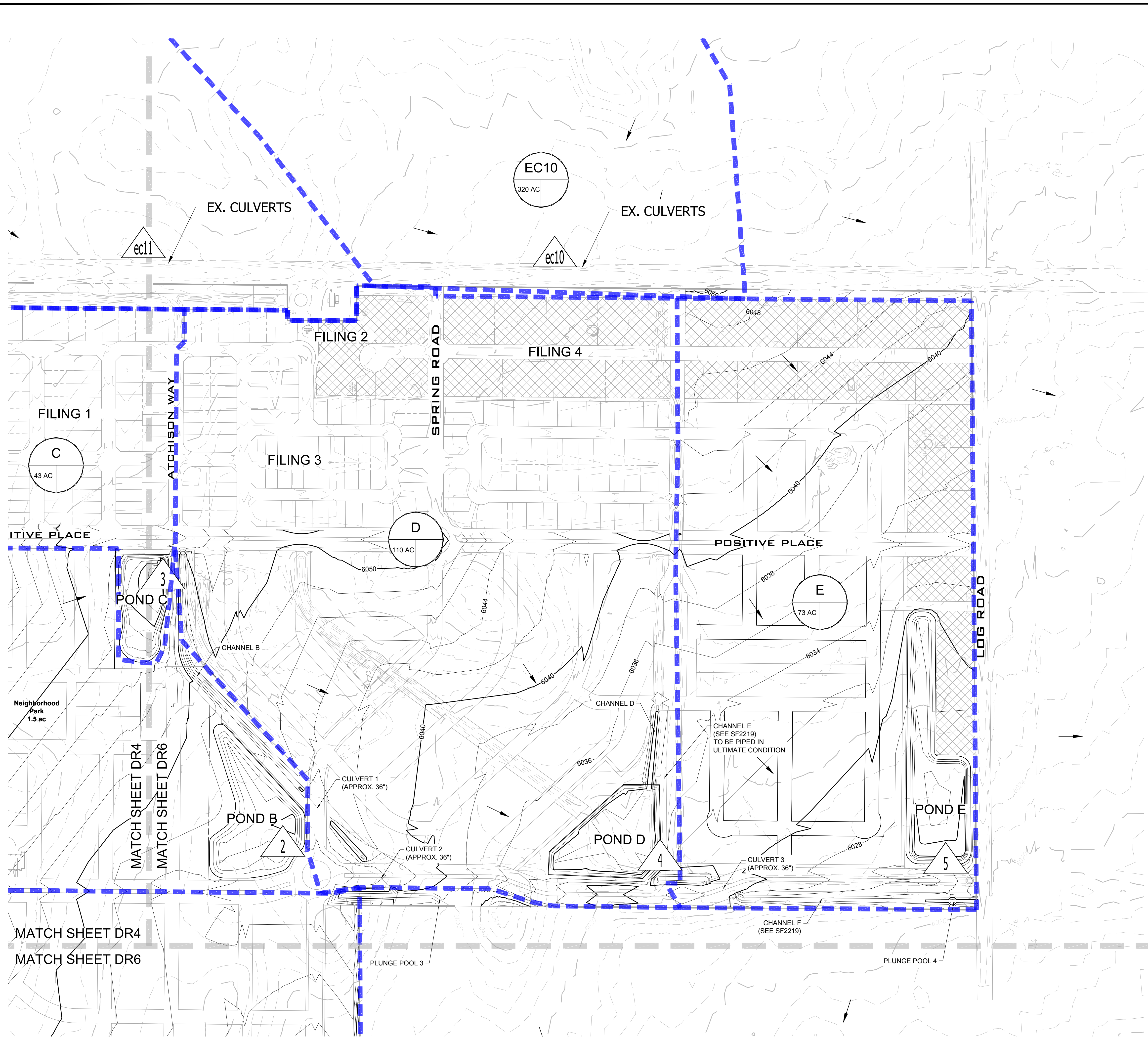
Basin	Area (acres)	5-yr (cfs)	100-yr (cfs)
A	95.00	154.99	286.8
B	49.00	67.48	143.6
C	43.00	59.08	121.5
D	110.00	145.86	309.1
E	73.00	106.61	215.9
F	75.00	71.09	145.1
G	160.00	173.79	364.6
EC12	30.30	16.67	40.3
EC11	354.00	24.40	149.5
EC10	320.00	18.40	144.7
OFF-1	44.00	5.90	25.8

Design Point	Contributing Basins	Area (acres)	5-yr (cfs)	100-yr (cfs)
1	A	95.00	147.81	273.86
2	B	49.00	64.15	136.63
3	C	43.00	56.01	115.33
4	D	110.00	138.30	293.42
5	E	73.00	101.07	204.91
6	F	75.00	70.97	145.03
7	G	160.00	166.68	350.13

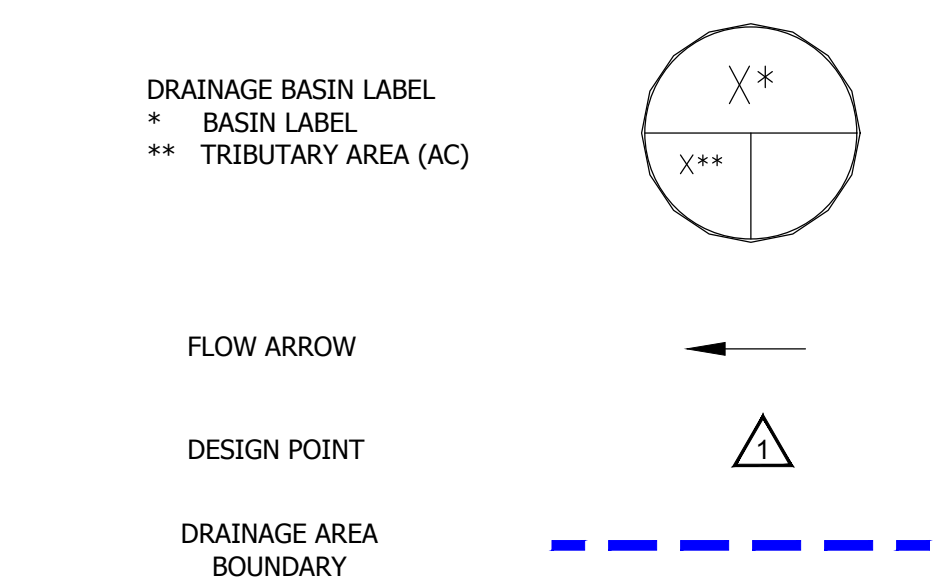


REVISION NO. BY DATE	
<b>R&amp;R ENGINEERS-SURVEYORS, INC.</b> 1635 WEST 13TH AVENUE, SUITE 310 DENVER, COLORADO 80204 PHONE: 303-753-6730	
WWW.RRENGINERS.COM	
<b>MAYBERRY SKETCH PLAN</b> MAYBERRY, COLORADO SPRINGS EL PASO COUNTY PREPARED FOR: MAYBERRY COMMUNITIES, LLC 3296 DEVINE HEIGHTS #208 COLORADO SPRINGS, CO 80922	
EXHIBIT JOB NO. MC22208 ORG. SUBM. DATE DWN: GWH CHD: CJD NAME	
<b>PROPOSED DRAINAGE MAP</b>	
NO. <b>DR4</b>	



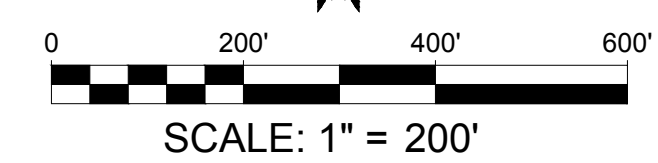
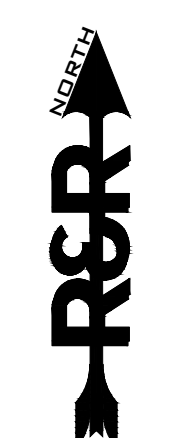


EXISTING	DESCRIPTION	PROPOSED
---	PROPERTY LINE	---
---	EASEMENT	---
---	EDGE OF PAVEMENT	---
---	VERTICAL CURB AND GUTTER	---
---	SPILL GUTTER	---
---	TRANSITION GUTTER	---
---	MAJOR CONTOUR	---
---	MINOR CONTOUR	---
---	STORM SEWER PIPE	---



Basin	Area (acres)	5-yr (cfs)	100-yr (cfs)
A	95.00	154.99	286.8
B	49.00	67.48	143.6
C	43.00	59.08	121.5
D	110.00	145.86	309.1
E	73.00	106.61	215.9
F	75.00	71.09	145.1
G	160.00	173.79	364.6
EC12	30.30	16.67	40.3
EC11	354.00	24.40	149.5
EC10	320.00	18.40	144.7
OFF-1	44.00	5.90	25.8

Design Point	Contributing Basins	Area (acres)	5-yr (cfs)	100-yr (cfs)
1	A	95.00	147.81	273.86
2	B	49.00	64.15	136.63
3	C	43.00	56.01	115.33
4	D	110.00	138.30	293.42
5	E	73.00	101.07	204.91
6	F	75.00	70.97	145.03
7	G	160.00	166.68	350.13



NO.	REVISION	BY	DATE

**R&R ENGINEERS-SURVEYORS, INC.**  
 ENGINEERS SURVEYORS  
 1635 WEST 13TH AVENUE, SUITE 310  
 DENVER, COLORADO 80204  
 PHONE: 303-753-6730

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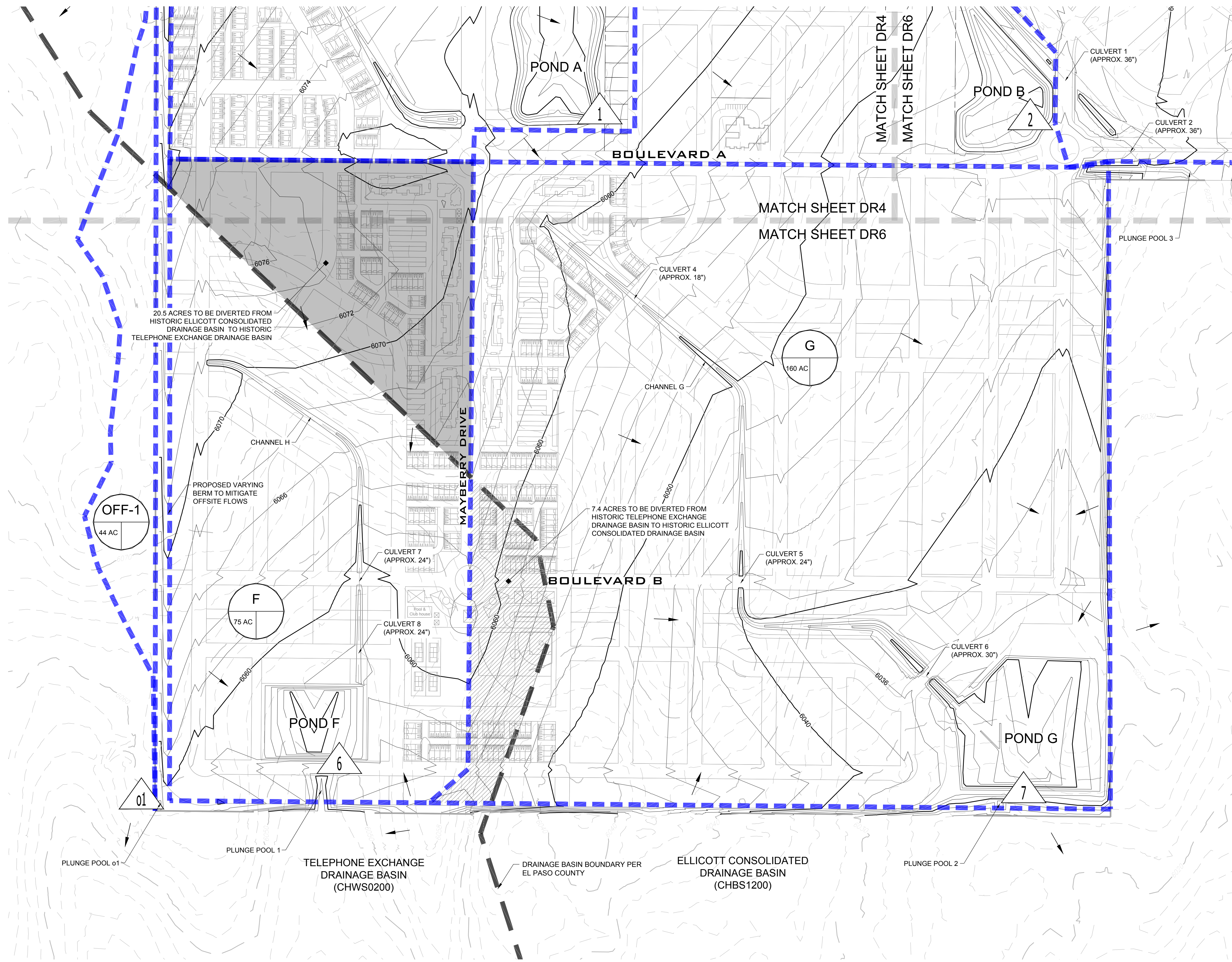
**MAYBERRY SKETCH PLAN**  
 MAYBERRY, COLORADO SPRINGS  
 EL PASO COUNTY  
 PREPARED FOR:  
 MAYBERRY COMMUNITIES, LLC  
 3296 DEVINE HEIGHTS #208  
 COLORADO SPRINGS, CO 80922

EXHIBIT
JOB NO. MC22208
ORG. SUBM. DATE
DWN: GWH
NAME

PROPOSED DRAINAGE MAP

NO. DR5





EXISTING	DESCRIPTION	PROPOSED
— 5825 —	MAJOR CONTOUR	— 5825 —
— 5822 —	MINOR CONTOUR	— 5822 —
====	STORM SEWER PIPE	====
	DRAINAGE BASIN LABEL	X*
	* BASIN LABEL	X**
	** TRIBUTARY AREA (AC)	
←	FLOW ARROW	←
	DESIGN POINT	△
	DRAINAGE AREA BOUNDARY	— — — —
	DRAINAGE AREA BEING DIVERTED FROM HISTORIC ELLICOTT CONSOLIDATED DRAINAGE BASIN TO HISTORIC TELEPHONE EXCHANGE DRAINAGE BASIN	■
	DRAINAGE AREA BEING DIVERTED FROM HISTORIC TELEPHONE EXCHANGE DRAINAGE BASIN TO HISTORIC ELLICOTT CONSOLIDATED DRAINAGE BASIN	▨

Basin	Area (acres)	5-yr (cfs)	100-yr (cfs)
A	95.00	154.99	286.8
B	49.00	67.48	143.6
C	43.00	59.08	121.5
D	110.00	145.86	309.1
E	73.00	106.61	215.9
F	75.00	71.09	145.1
G	160.00	173.79	364.6
EC12	30.30	16.67	40.3
EC11	354.00	24.40	149.5
EC10	320.00	18.40	144.7
OFF-1	44.00	5.90	25.8

Design Point	Contributing Basins	Area (acres)	5-yr (cfs)	100-yr (cfs)
1	A	95.00	147.81	273.86
2	B	49.00	64.15	136.63
3	C	43.00	56.01	115.33
4	D	110.00	138.30	293.42
5	E	73.00	101.07	204.91
6	F	75.00	70.97	145.03
7	G	160.00	166.68	350.13

NO.	REVISION	BY	DATE

**R&R ENGINEERS-SURVEYORS, INC.**  
 1635 WEST 13TH AVENUE, SUITE 310  
 DENVER, COLORADO 80204  
 PHONE: 303-753-6730

WWW.RRENGINEERS.COM

**MAYBERRY SKETCH PLAN**

SITE ADDRESS: MAYBERRY, COLORADO SPRINGS  
 EL PASO COUNTY

PREPARED FOR: MAYBERRY COMMUNITIES, LLC  
 3296 DEVINE HEIGHTS #208  
 COLORADO SPRINGS, CO 80922

EXHIBIT

JOB NO. MC22208  
 ORG. SUBM. DATE  
 DWN: GWH CHKD: CJD  
 NAME

**PROPOSED DRAINAGE MAP**

NO. **DR6**



## **APPENDIX E – REFERENCED DRAINAGE REPORTS**

SKP-05-005  
Rev. app.



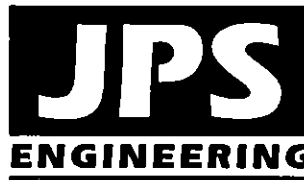
**MASTER DEVELOPMENT DRAINAGE PLAN  
FOR  
ELLCOTT TOWN CENTER**

**Prepared for:**

**Accretive Capital Partners, LLC  
3655 Nobel Drive, Suite 650  
San Diego, CA 92122**

August 25, 2005  
Revised October 31, 2005  
Revised November 22, 2005

**Prepared by:**



**19 East Willamette Avenue  
Colorado Springs, CO 80903  
(719)-477-9429  
(719)-471-0766 FAX**

**JPS Project No. 030502**

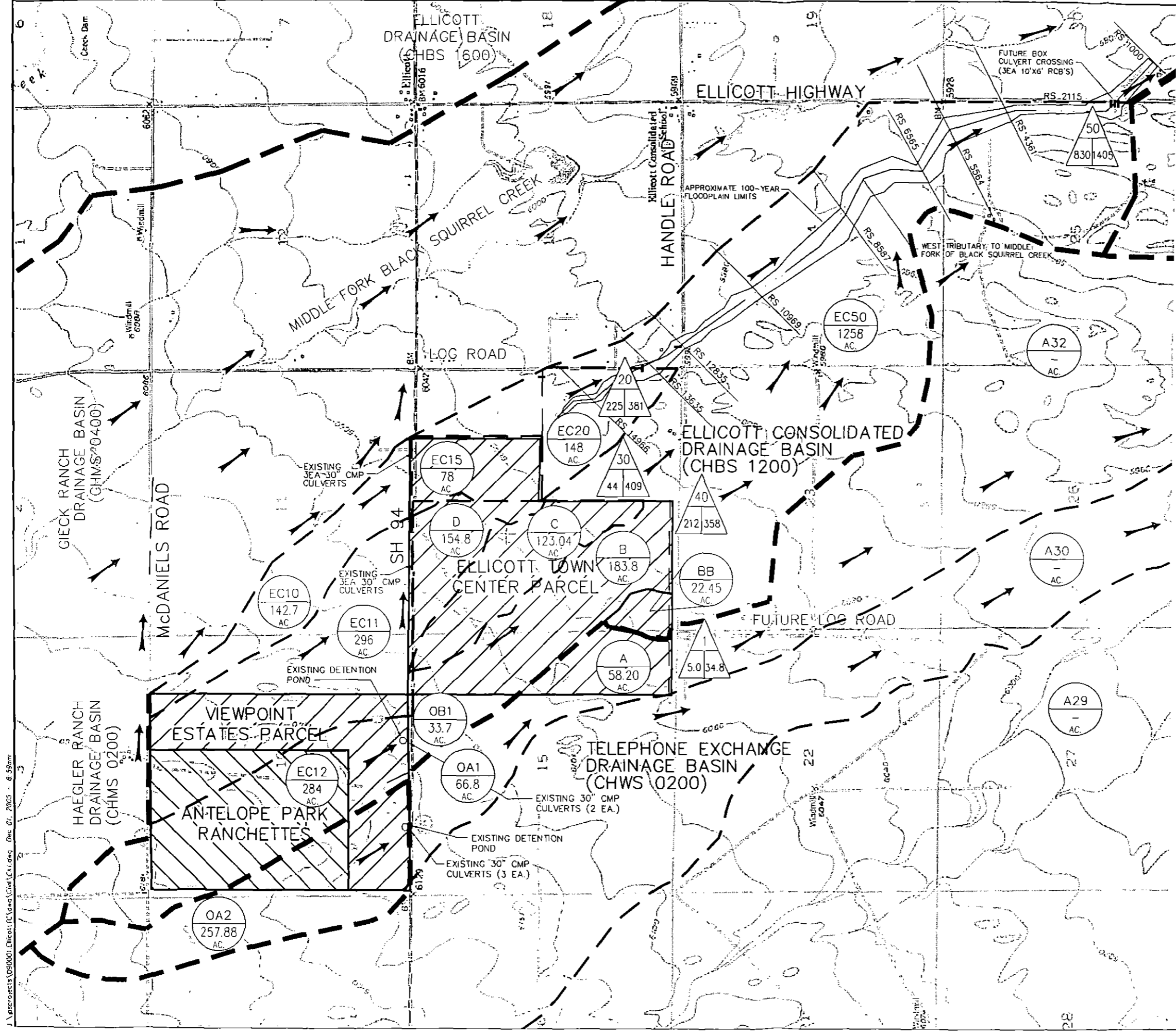
NO.	REVISION	BY	DATE

**ELLICOTT TOWN CENTER**

**MAJOR BASIN / HISTORIC  
DRAINAGE PLAN**

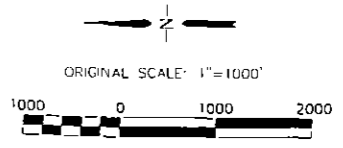
HORIZ. SCALE: 1"=1000'	DRAWN: MJP
VERT. SCALE: N/A	DESIGNED: JPS
SURVEYED: UP&E	CHECKED: JPS
CREATED: 12/3/00	LAST MODIFIED: 11/1/05
PROJECT NO: 090001	MODIFIED BY: MJP

**EX1**



**LEGEND**

- DRAINAGE BASIN AREA (AC)
- DESIGN POINT 05 / 0100 (CFS)
- MAJOR BASIN LINE
- BASIN LINE



J:\projects\090001\Ellicott\01\Draw\Civil\Ext.dwg Dec 07, 2005 - 8:59am

ELLICOTT TOWN CENTER  
RATIONAL METHOD - DRAINAGE CALCULATIONS

DEVELOPED FLOWS

BASIN	DESIGN POINT	AREA (AC)	C		OVERLAND LENGTH (FT)	SLOPE (%)	T <sub>co</sub> <sup>(1)</sup> (MIN)	CHANNEL LENGTH (FT)	CONVEYANCE COEFFICIENT K	SLOPE (%)	SCS <sup>(2)</sup> VELOCITY (FT/S)	T <sub>1</sub> <sup>(3)</sup> (MIN)	TOTAL T <sub>c</sub> <sup>(4)</sup> (MIN)	INTENSITY <sup>(5)</sup>		PEAK FLOW	
			5-YEAR <sup>(7)</sup>	100-YEAR <sup>(7)</sup>										5-YR (IN/HR)	100-YR (IN/HR)	Q <sub>5</sub> <sup>(6)</sup> (CFS)	Q <sub>100</sub> <sup>(6)</sup> (CFS)
OA2		15.1	0.250	0.350									26.5	2.50	4.50	9.44	23.78
OA1		66.8	0.250	0.350	1000	0.5	60.9	2300	1.50	0.9	1.42	26.9	87.9	1.50	2.65	25.05	61.96
A		60.0	0.468	0.568			0.0	2400	1.50	1.0	1.50	26.7	26.7	1.70	3.15	47.72	107.32
OA2,OA1, A	1	141.9	0.342	0.442									141.0	1.50	2.65	72.78	166.18
EC12		30.3	0.250	0.350									33.0	2.20	3.80	16.67	40.30
OB1		33.7	0.250	0.350	700	1.4	36.2	0				0.0	36.2	2.10	3.70	17.69	43.64
B1		97.0	0.591	0.671			0.0	2000	1.50	1.1	1.57	21.2	21.2	1.50	2.65	85.96	172.41
B2		85.3	0.522	0.622			0.0	2600	1.50	1.1	1.57	27.5	27.5	1.50	2.65	66.79	140.60
EC12,OB1,B1,B2	B2	246.3	0.479	0.571									117.9	1.50	2.65	176.94	372.63
BB		20.3	0.520	0.620	1000	2.8	23.4	300	1.50	1.0	1.50	3.3	26.8	2.00	3.50	21.11	44.05
B3		59.1	0.507	0.607			0.0	1300	1.50	1.3	1.71	12.7	12.7				
EC12,OB1,B1-B3,BB	3	325.7	0.486	0.580									130.6	1.50	2.65	237.41	500.54
B4	4	4.5	0.550	0.650	300	1.0	17.1	800	1.50	0.5	1.06	12.6	29.7	2.35	4.20	5.82	12.29
EC11		296	0.250	0.350	1000	1.0	48.4	6135	1.50	1.3	1.71	59.8	108.2	1.50	2.65	111.00	274.54
C		162.7	0.522	0.615			0.0	3900	1.50	0.9	1.38	47.0	47.0	1.50	2.65	127.39	265.16
D		58.62	0.539	0.639	300	1.0	17.5	3000	2.00	0.83	1.82	27.4	44.9	1.50	2.65	47.39	99.26
EC12,EC11,OB1,B,C	5	517.3	0.368	0.466									155.2	1.50	2.65	285.56	638.84
EC10		142.7	0.250	0.350	1000	1.0	48.4	6300	1.50	1.1	1.57	66.7	115.1	1.50	2.65	53.51	132.35
E		8.4	0.475	0.575			0.0	1300	1.50	0.9	1.39	15.6	15.6	1.50	2.65	6.00	12.83
EC10,E	6	151.1	0.263	0.363									130.7	2.00	3.65	79.49	200.23

1) OVERLAND FLOW T<sub>co</sub> = (1.87\*(1.1-RUNOFF COEFFICIENT)\*(OVERLAND FLOW LENGTH^(0.5))/(SLOPE^(0.333))

2) SCS VELOCITY = K \* ((SLOPE(%))^0.5)

K = 0.25 FOR MEADOW

K = 1.0 FOR BARE SOIL

K = 1.5 FOR GRASS CHANNEL

K = 2.0 FOR PAVEMENT

3) CHANNEL / SWALE / GUTTER FLOW, T<sub>1</sub> = (CHANNEL LENGTH/ SCS VELOCITY) / 60 SEC

4) T<sub>c</sub> = T<sub>co</sub> + T<sub>1</sub>

\*\*\* IF TOTAL TIME OF CONCENTRATION IS LESS THAN 5 MINUTES, THEN 5 MINUTES IS USED

5) INTENSITY BASED ON I-D-F CURVE IN EL PASO COUNTY DRAINAGE CRITERIA MANUAL

6) Q = CiA

7) WEIGHTED AVERAGE C VALUES FOR COMBINED BASINS



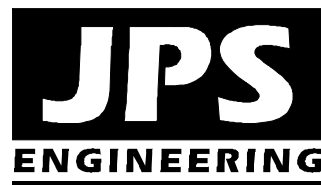
**FINAL DRAINAGE REPORT**  
**for**  
**MAYBERRY, COLORADO SPRINGS – FILING NO. 1A REPLAT**

**Prepared for:**

**Mayberry Communities, LLC**  
PO Box 675725  
Rancho Santa Fe, CA 92067

November 19, 2021  
Revised February 22, 2022  
Revised April 8, 2022

**Prepared by:**



**19 East Willamette Avenue**  
**Colorado Springs, CO 80903**  
**(719)-477-9429**  
**[www.jpsengr.com](http://www.jpsengr.com)**

**JPS Project No. 030502**  
**PCD File No. VR2113**

MAYBERRY, COLORADO SPRINGS (fka "ELLCOTT TOWN CENTER")

HISTORIC FLOWS										Overland Flow			Channel flow				Time of	Total	Total	Peak Flow			
BASIN	DESIGN POINT	AREA (AC)	AREA (SM)	RUNOFF COEFFICIENT (C5)	CURVE No. (CN)	S	la	PERCENT IMPERVIOUS (%)	LENGTH (FT)	SLOPE (%)	Tco <sup>(1)</sup> (MIN)	HIGH ELEV. (FT)	LOW ELEV. (FT)	H (FT)	CHANNEL LENGTH (FT)	CHANNEL LENGTH (MI)	SLOPE (%)	Tt <sup>(1)</sup> (MIN)	Concentration Tc <sup>(2)</sup> (MIN)	Lag Time Tl <sup>(2)</sup> (HR)	Lag Time Tl <sup>(2)</sup> (MIN)	Q5 <sup>(3)</sup> (CFS)	Q100 <sup>(3)</sup> (CFS)
EC11	EC11	353.6	0.55	0.08	61	6.39	1.28	2	1000	6.0	32.0	6180	6067	113	8945	1.69	1.3%	46.37	78.34	0.78	47.00	24.4	149.5
D		154.6	0.24	0.08	61	6.39	1.28	2			0.0	6067	6028	39	3850	0.73	1.0%	26.38	26.38	0.26	15.83	20.3	141.5
EC11,D	5	508.2	0.79																104.72	1.05	62.83	30.6	174.9
EC10	EC10	317.3	0.50	0.08	61	6.39	1.28	2	1000	1.0	58.1	6140	6052	88	8100	1.53	1.1%	45.53	103.59	1.04	62.15	18.9	110.6
E		7.4	0.01	0.08	61	6.39	1.28	2			0.0	6052	6040	12	1200	0.23	1.0%	10.80	10.80	0.11	6.48	1.4	9.1
EC10,E	6	324.74	0.51																114.39	1.14	68.63	19.1	111.4

DEVELOPED FLOWS										Overland Flow			Channel flow				Time of	Total	Total	Peak Flow			
BASIN	DESIGN POINT	AREA (AC)	AREA (SM)	RUNOFF COEFFICIENT (C5)	CURVE No. (CN)	S	la	PERCENT IMPERVIOUS (%)	LENGTH (FT)	SLOPE (%)	Tco <sup>(1)</sup> (MIN)	HIGH ELEV. (FT)	LOW ELEV. (FT)	H (FT)	CHANNEL LENGTH (FT)	CHANNEL LENGTH (MI)	SLOPE (%)	Tt <sup>(1)</sup> (MIN)	Concentration Tc <sup>(2)</sup> (MIN)	Lag Time Tl <sup>(2)</sup> (HR)	Lag Time Tl <sup>(2)</sup> (MIN)	Q5 <sup>(3)</sup> (CFS)	Q100 <sup>(3)</sup> (CFS)
EC11	EC11	353.6	0.55	0.08	61	6.39	1.28	2	1000	6.0	32.0	6180	6067	113	8945	1.69	1.3%	46.37	78.34	0.78	47.00	24.4	149.5
C1-C3,D		159.3	0.25	0.331	77.879	2.84	0.57	44.2			0.0	6067	6028	39	3850	0.73	1.0%	26.38	26.38	0.26	15.83	225.0	456.3
EC11,D	5	512.87	0.80																104.72	1.05	62.83	226.6	461.4
EC10	EC10	317.3	0.50	0.08	61	6.39	1.28	2	1000	1.0	58.1	6140	6052	88	8100	1.53	1.1%	45.53	103.59	1.04	62.15	18.9	110.6
E		2.4	0.00	0.114	63.165	5.83	1.17	6.0			0.0	6052	6040	12	1450	0.27	0.8%	13.44	13.44	0.13	8.07	0.9	4.0
EC10,E	6	319.67	0.50																117.03	1.17	70.22	19.0	111.0

FULLY DEVELOPED FLOWS - FOR UPSTREAM EMERGENCY CONDITIONS ANALYSIS ONLY										Overland Flow			Channel flow				Time of	Total	Total	Peak Flow			
BASIN	DESIGN POINT	AREA (AC)	AREA (SM)	RUNOFF COEFFICIENT (C5)	CURVE No. (CN)	S	la	PERCENT IMPERVIOUS (%)	LENGTH (FT)	SLOPE (%)	Tco <sup>(1)</sup> (MIN)	HIGH ELEV. (FT)	LOW ELEV. (FT)	H (FT)	CHANNEL LENGTH (FT)	CHANNEL LENGTH (MI)	SLOPE (%)	Tt <sup>(1)</sup> (MIN)	Concentration Tc <sup>(2)</sup> (MIN)	Lag Time Tl <sup>(2)</sup> (HR)	Lag Time Tl <sup>(2)</sup> (MIN)	Q5 <sup>(3)</sup> (CFS)	Q100 <sup>(3)</sup> (CFS)
EC11	EC11	353.6	0.55	0.08	63	5.87	1.17	7	1000	6.0	32.0	6180	6067	113	8945	1.69	1.3%	46.37	78.34	0.78	47.00	49.2	196.0

DETAINED FLOWS										Overland Flow			Channel flow				Time of	Total	Total	Peak Flow			
BASIN	DESIGN POINT	AREA (AC)	AREA (SM)	RUNOFF COEFFICIENT (C5)	CURVE No. (CN)	S	la	PERCENT IMPERVIOUS (%)	LENGTH (FT)	SLOPE (%)	Tco <sup>(1)</sup> (MIN)	HIGH ELEV. (FT)	LOW ELEV. (FT)	H (FT)	CHANNEL LENGTH (FT)	CHANNEL LENGTH (MI)	SLOPE (%)	Tt <sup>(1)</sup> (MIN)	Concentration Tc <sup>(2)</sup> (MIN)	Lag Time Tl <sup>(2)</sup> (HR)	Lag Time Tl <sup>(2)</sup> (MIN)	Q5 <sup>(3)</sup> (CFS)	Q100 <sup>(3)</sup> (CFS)
EC11	EC11	353.6	0.55	0.08	61	6.39	1.28	2	1000	6.0	32.0	6180	6067	113	8945	1.69	1.3%	46.37	78.34	0.78	47.00	24.4	149.5
CULVERT EC11												6180	6067	113	8945	1.69	1.3%	46.37	46.37	0.46	27.82		
C (C1.1-C1.10)	C1.10A	44.8	0.07	0.375	81.4	2.29	0.46	51.7											35.9	0.36	21.54		
POND C1 DISCHARGE		44.8	0.07																			1.0	9.7
CHANNEL C1												6048	6028	20	2800	0.53	0.7%	23.61	23.61	0.24	14.17		
REACH EC11												6180	6028	152	11745	2.22	1.3%	56.66	56.66	0.57	34.00		
C2,C3,D		113.2	0.18	0.329	58.2	7.18	1.44	43.1											62.6	0.63	37.56		
POND D DISCHARGE		113.2	0.18																			1.7	11.4
EC11,C,D - DETAINED	5d	511.6	0.80																			27.1	170.6

\* Tc from Rational Method Calculation Spreadsheet

\*\* Pond Discharge Flows from MHFD-Detention Calculations

- 1) OVERLAND FLOW Tco = (1.8\*(1.1-RUNOFF COEFFICIENT)^(OVERLAND FLOW LENGTH^(0.5)/(SLOPE^(0.333)))
- 2) TRAVEL TIME, Tl = ((11.9\*L^3)/H)^(0.385)
- 3) Tc = Tco + Tl
- 4) SCS LAG TIME, Tl = 0.6 \* Tc
- 5) PEAK FLOWS CALCULATED BY HEC-HMS 4.8 (TYPE 2 STORM; 5-YR; 24-HR RAINFALL = 2.6 IN; 100-YR; 24-HR RAINFALL = 4.4 IN)

Run: Run 2

Global Summary Results for Run "Run 2"

Project: ETC\_D Simulation Run: Run 2

Start of Run: 01Jan3000, 01:00 Basin Model: Basin 1  
 End of Run: 02Jan3000, 01:30 Meteorologic Model: Met 2  
 Compute Time: 10Sep2019, 21:18:23 Control Specifications: Control 1

Show Elements: All Elements

Volume Units:  IN  AC-FT

Hydrologic Element	Drainage Area (MI <sup>2</sup> )	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
EC11	0.55	24.4	01Jan3000, 13:52	7.9
Reach-D	0.55	24.4	01Jan3000, 14:07	7.8
C1-C3,D	0.25	225.0	01Jan3000, 13:08	21.6
DP5	0.80	226.6	01Jan3000, 13:08	29.4
EC10	0.50	18.9	01Jan3000, 14:13	7.1
Reach-E	0.50	18.9	01Jan3000, 14:19	7.0
E	0.00	0.9	01Jan3000, 13:04	0.1
DP6	0.50	19.0	01Jan3000, 14:18	7.1

Basin 1

- C1-C3,D
- Reach-D
- EC11
- DP5
- E
- Reach-E
- EC10
- DP6

Meteorologic Models

- Met 1
- Hypothetical Storm
- Met 2
- Hypothetical Storm

Components Compute Results

Hypothetical Storm

Met Name: Met 2

Method: SCS Type 2

\*Point Depth (IN) 2.6

Area Reduction: --None--

NOTE 40043: The basin model "Basin 1" contains 2 elements with no downstream connection: DP5, DP6

NOTE 40043: The basin model "Basin 1" contains 2 elements with no downstream connection: DP5, DP6

NOTE 15301: Began computing simulation run "Run 1" at time 10Sep2019, 21:12:10.

NOTE 20364: Found no parameter problems in meteorologic model "Met 1".

NOTE 40040: The basin model contains 2 outlets: DP5, DP6

NOTE 40049: Found no parameter problems in basin model "Basin 1".

NOTE 41743: Initial abstraction ratio for subbasin "EC11" is 0.2002.

NOTE 41743: Initial abstraction ratio for subbasin "C1-C3,D" is 0.2007.

NOTE 41743: Initial abstraction ratio for subbasin "EC10" is 0.2002.

NOTE 41743: Initial abstraction ratio for subbasin "E" is 0.2006.

NOTE 42413: Unit hydrograph volume for subbasin "EC11" is 1.0000 in.

NOTE 42413: Unit hydrograph volume for subbasin "C1-C3,D" is 1.0000 in.

NOTE 42413: Unit hydrograph volume for subbasin "EC10" is 1.0000 in.

NOTE 42413: Unit hydrograph volume for subbasin "E" is 1.0000 in.

NOTE 15302: Finished computing simulation run "Run 1" at time 10Sep2019, 21:12:11.

NOTE 40043: The basin model "Basin 1" contains 2 elements with no downstream connection: DP5, DP6

NOTE 40043: The basin model "Basin 1" contains 2 elements with no downstream connection: DP5, DP6

NOTE 15301: Began computing simulation run "Run 2" at time 10Sep2019, 21:18:23.

NOTE 20364: Found no parameter problems in meteorologic model "Met 2".

NOTE 40040: The basin model contains 2 outlets: DP5, DP6

NOTE 40049: Found no parameter problems in basin model "Basin 1".

NOTE 41743: Initial abstraction ratio for subbasin "EC11" is 0.2002.

NOTE 41743: Initial abstraction ratio for subbasin "C1-C3,D" is 0.2007.

NOTE 41743: Initial abstraction ratio for subbasin "EC10" is 0.2002.

NOTE 41743: Initial abstraction ratio for subbasin "E" is 0.2006.

NOTE 42413: Unit hydrograph volume for subbasin "EC11" is 1.0000 in.

NOTE 42413: Unit hydrograph volume for subbasin "C1-C3,D" is 1.0000 in.

NOTE 42413: Unit hydrograph volume for subbasin "EC10" is 1.0000 in.

Run: Run 1

Global Summary Results for Run "Run 1"

Project: ETC\_D Simulation Run: Run 1

Start of Run: 01Jan3000, 01:00 Basin Model: Basin 1  
 End of Run: 02Jan3000, 01:30 Meteorologic Model: Met 1  
 Compute Time: 10Sep2019, 21:12:10 Control Specifications: Control 1

Show Elements: All Elements Volume Units:  IN  AC-FT

Hydrologic Element	Drainage Area (MI <sup>2</sup> )	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
EC11	0.55	149.5	01Jan3000, 13:46	31.6
Reach-D	0.55	149.5	01Jan3000, 14:01	31.4
C1-C3,D	0.25	456.3	01Jan3000, 13:08	42.3
DP5	0.80	461.4	01Jan3000, 13:08	73.7
EC10	0.50	110.6	01Jan3000, 14:04	28.5
Reach-E	0.50	110.6	01Jan3000, 14:10	28.4
E	0.00	4.0	01Jan3000, 13:02	0.3
DP6	0.50	111.0	01Jan3000, 14:10	28.7

Basin Models

- Basin 1
  - C1-C3,D
  - Reach-D
  - EC11
  - DP5
  - E
  - Reach-E
  - EC10
  - DP6
- Meteorologic Models
  - Met 1
    - Hypothetical Storm

Components Compute Results

Hypothetical Storm

**Met Name: Met 1**

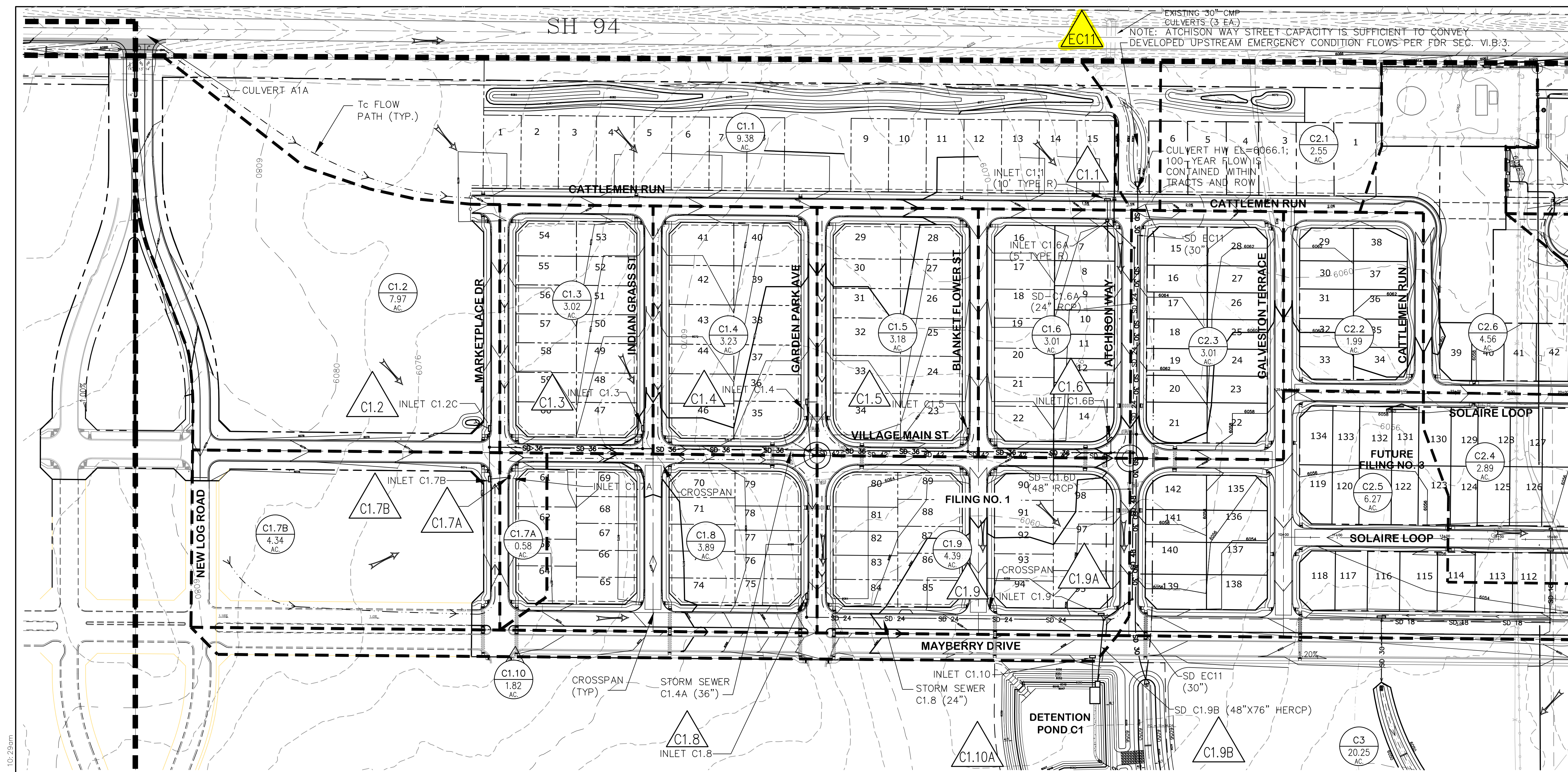
Method: SCS Type 2

\*Point Depth (IN) 4.4

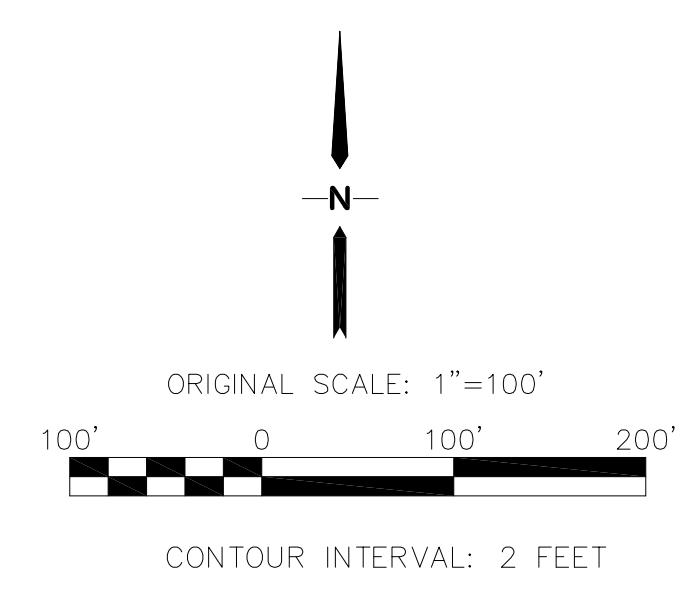
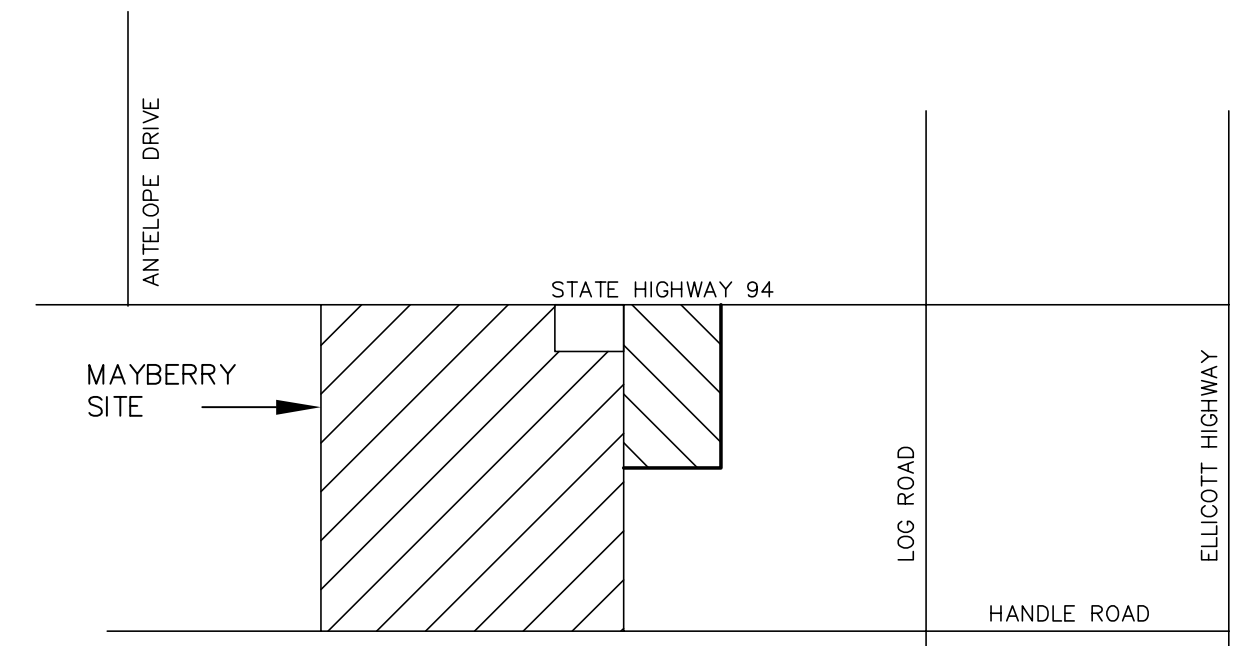
Area Reduction: --None--

NOTE 42413: Unit hydrograph volume for subbasin "D" is 1.0000 in.  
 NOTE 42413: Unit hydrograph volume for subbasin "EC11" is 1.0000 in.  
 NOTE 42413: Unit hydrograph volume for subbasin "E" is 1.0000 in.  
 NOTE 42413: Unit hydrograph volume for subbasin "EC10" is 1.0000 in.  
 NOTE 15302: Finished computing simulation run "Run 2" at time 10Sep2019, 20:56:09.  
 NOTE 40043: The basin model "Basin 1" contains 2 elements with no downstream connection: DP5, DP6  
 NOTE 40043: The basin model "Basin 1" contains 2 elements with no downstream connection: DP5, DP6  
 NOTE 40043: The basin model "Basin 1" contains 2 elements with no downstream connection: DP5, DP6  
 NOTE 10022: Begin copying project "ETC-H" to directory "G:\jpsprojects\030502.etc\ETC\_D" at time 10Sep2019, 21:04:34.  
 NOTE 10187: Closed project "ETC-H" at time 10Sep2019, 21:04:35.  
 NOTE 10023: Finished copying project "ETC\_D" to directory "G:\jpsprojects\030502.etc\ETC\_D" at time 10Sep2019, 21:04:36.  
 NOTE 10181: Opened control specifications "Control 1" at time 10Sep2019, 21:05:25.  
 NOTE 40043: The basin model "Basin 1" contains 2 elements with no downstream connection: DP5, DP6  
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 NOTE 20364: Found no parameter problems in meteorologic model "Met 1".  
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 NOTE 41743: Initial abstraction ratio for subbasin "C1-C3,D" is 0.2007.  
 NOTE 41743: Initial abstraction ratio for subbasin "EC10" is 0.2002.  
 NOTE 41743: Initial abstraction ratio for subbasin "E" is 0.2006.  
 NOTE 42413: Unit hydrograph volume for subbasin "EC11" is 1.0000 in.  
 NOTE 42413: Unit hydrograph volume for subbasin "C1-C3,D" is 1.0000 in.  
 NOTE 42413: Unit hydrograph volume for subbasin "EC10" is 1.0000 in.





EXISTING 30" CMP CULVERTS (3 EA.)  
 NOTE: ATCHISON WAY STREET CAPACITY IS SUFFICIENT TO CONVEY 100-YEAR FLOWS DEVELOPED UPSTREAM EMERGENCY CONDITION FLOWS PER FDR SEC. VI.B.3.

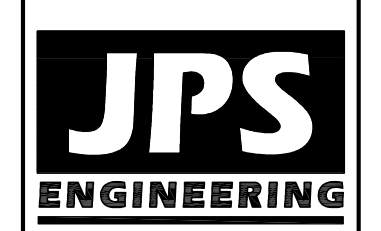


DESIGN POINT	Q5 (CFS)	Q100 (CFS)
EC11	24.4	149.5
C1.1	5.4	18.0
C1.2	16.9	35.9
C1.3	5.9	14.3
C1.4	6.3	15.3
C1.5	6.2	15.6
C1.6	3.8	9.4
C1.7A	1.1	2.7
C1.7B	8.2	17.3
C1.8	7.5	18.4
C1.9A	13.7	33.3
C1.9B	35.7	87.0
C1.10A	37.2	90.6

- LEGEND:**
- PROPERTY LINES
  - DRAINAGE BASIN BOUNDARY
  - SUB-BASIN BOUNDARY
  - ← PROPOSED FLOW DIRECTION ARROW
  - △ DESIGN POINT
  - DEVELOPED BASIN DESIGNATION
  - BASIN AREA (ACRES)
  - 6490 --- EXISTING CONTOURS
  - 6490 --- PROPOSED CONTOURS
  - 1.5% PROPOSED STREET PROFILE GRADE

**MAYBERRY, COLORADO SPRINGS - FILING NO. 1**

**FILING NO. 1  
DEVELOPED DRAINAGE PLAN**



19 E. Willamette Ave.  
 Colorado Springs, CO 80903  
 PH: 719-477-9429  
 FAX: 719-471-0766  
 www.jpsegr.com



CALL UTILITY NOTIFICATION CENTER OF COLORADO  
 1-800-922-1987  
 BEFORE YOU DIG, GRADE, OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES.

No.	REVISION	DATE

HORIZ. SCALE: 1"=100'	DRAWN: BJJ
VERT. SCALE: N/A	DESIGNED: JPS
SURVEYED: RAMPART	CHECKED: JPS
CREATED: 12/03/00	LAST MODIFIED: 4/7/22
PROJECT NO: 090001	MODIFIED BY: JPS

SHEET: **D2.1**

C:\Users\Owner\Desktop\proj\090001\_Ellicott\DWG\Civil\NDZ1.DWG - Apr. 08, 2022 - 10:29am





## **FINAL DRAINAGE REPORT**

FOR

### **MAYBERRY, COLORADO SPRINGS – FILING NO. 3**

**PREPARED FOR:**

**COLORADO SPRINGS MAYBERRY, LLC  
3296 DEVINE HEIGHTS #208  
COLORADO SPRINGS, CO 80922**

**PREPARED BY:**

**R & R ENGINEERS - SURVEYORS, INC.  
1635 W. 13<sup>TH</sup> AVE, SUITE 310  
DENVER, CO 80204  
CONTACT: CLIF DAYTON, P.E.  
(303) 753-6730**

**R&R JOB #MC22110  
EPC PROJECT No. SF2219**

**ORIGINAL SUBMITTAL: MAY 2022  
2<sup>ND</sup> SUBMITTAL: SEPTEMBER 2022  
3<sup>RD</sup> SUBMITTAL: JANUARY 2023  
4<sup>TH</sup> SUBMITTAL: APRIL 2023**

# Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

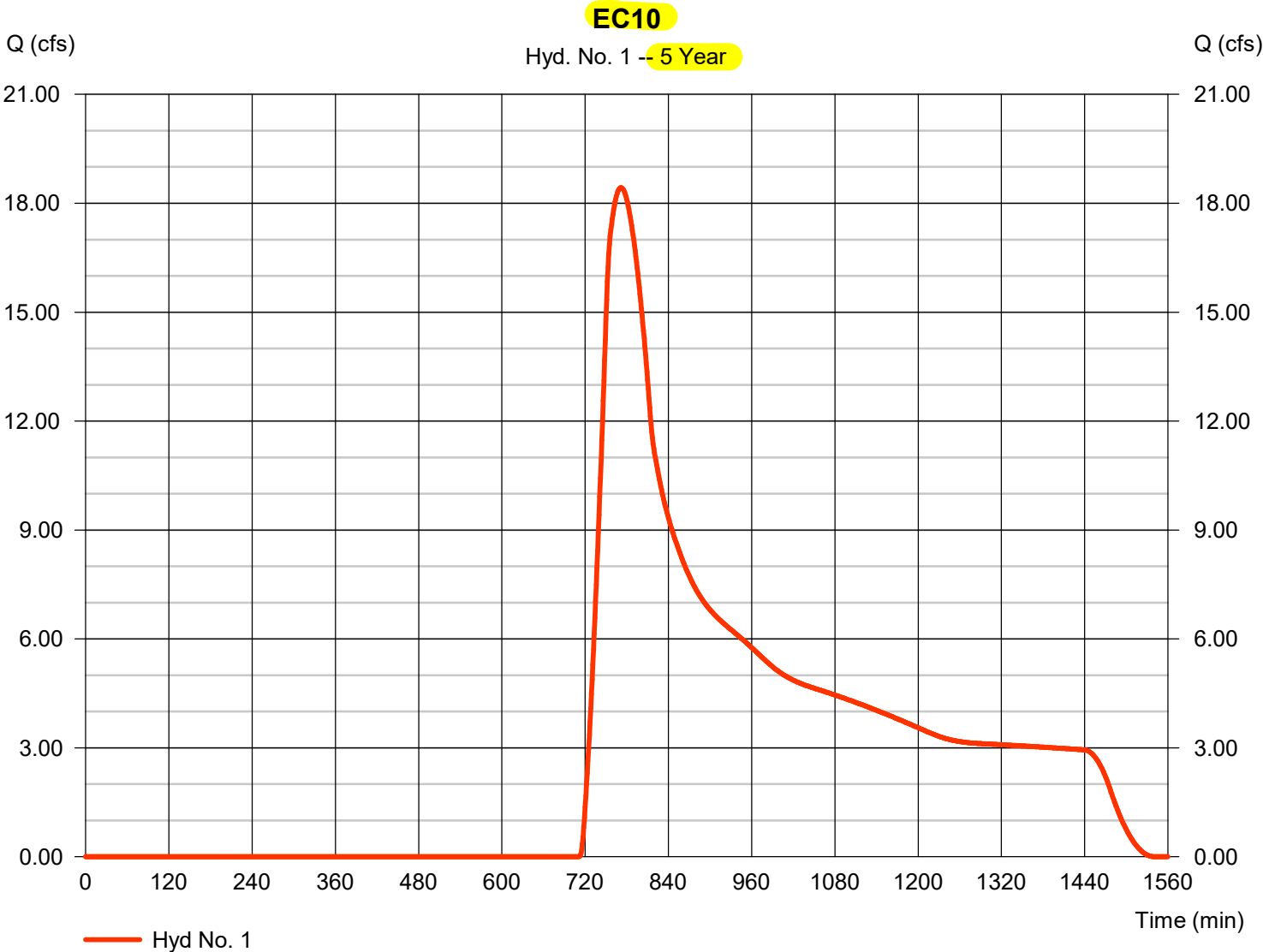
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	18.43	1	772	262,007	-----	-----	-----	EC10
2	SCS Runoff	1.349	1	734	6,442	-----	-----	-----	OS-1
3	SCS Runoff	8.399	1	737	76,243	-----	-----	-----	EX-D1
4	SCS Runoff	1.367	1	728	9,340	-----	-----	-----	EX-D2
5	Combine	9.557	1	735	85,583	3, 4	-----	-----	TOTAL ONSITE FLOW
6	Combine	23.73	1	755	344,692	1, 2, 3,	-----	-----	DP EX-5
7	SCS Runoff	6.054	1	745	62,432	-----	-----	-----	EX-E
8	SCS Runoff	3.682	1	729	15,373	-----	-----	-----	EX-LOG
9	Combine	30.51	1	752	422,497	6, 7, 8	-----	-----	DP EX-6
10	SCS Runoff	8.146	1	742	76,284	-----	-----	-----	EX-Z
11	Combine	38.16	1	751	498,780	9, 10	-----	-----	DP EX-7
SCS ROUTING - Existing Downstream Analysis Report					Return Period: 5 Year			Thursday, 01 / 5 / 2023	

# Hydrograph Report

## Hyd. No. 1

### EC10

Hydrograph type	= SCS Runoff	Peak discharge	= 18.43 cfs
Storm frequency	= 5 yrs	Time to peak	= 772 min
Time interval	= 1 min	Hyd. volume	= 262,007 cuft
Drainage area	= 320.000 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 63.00 min
Total precip.	= 2.60 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484





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Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	144.67	1	755	1,185,497	-----	-----	-----	EC10
2	SCS Runoff	4.333	1	733	18,356	-----	-----	-----	OS-1
3	SCS Runoff	76.23	1	732	344,975	-----	-----	-----	EX-D1
4	SCS Runoff	12.54	1	725	42,259	-----	-----	-----	EX-D2
5	Combine	86.19	1	731	387,234	3, 4	-----	-----	TOTAL ONSITE FLOW
6	Combine	183.85	1	749	1,548,829	1, 2, 3,	-----	-----	DP EX-5
7	SCS Runoff	53.32	1	736	282,485	-----	-----	-----	EX-E
8	SCS Runoff	6.317	1	729	27,009	-----	-----	-----	EX-LOG
9	Combine	231.35	1	745	1,858,321	6, 7, 8	-----	-----	DP EX-6
10	SCS Runoff	63.40	1	736	328,266	-----	-----	-----	EX-Z
11	Combine	289.85	1	740	2,186,588	9, 10	-----	-----	DP EX-7
SCS ROUTING - Existing Downstream Analysis Report					Return Period: 100 Year			Thursday, 01 / 5 / 2023	

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Thursday, 01 / 5 / 2023

## Hyd. No. 1

### EC10

Hydrograph type	= SCS Runoff	Peak discharge	= 144.67 cfs
Storm frequency	= 100 yrs	Time to peak	= 755 min
Time interval	= 1 min	Hyd. volume	= 1,185,497 cuft
Drainage area	= 320.000 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 63.00 min
Total precip.	= 4.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

