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:

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

SKP236

EPC number added accordingly.

R&R JOB #MC22208
EPC PROJECT NO. XXX

ORIGINAL SUBMITTAL: JULY 2023

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: _____

Clif Dayton, P.E.
Registered Professional Engineer
State of Colorado No. 51674

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

TABLE OF CONTENTS

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.

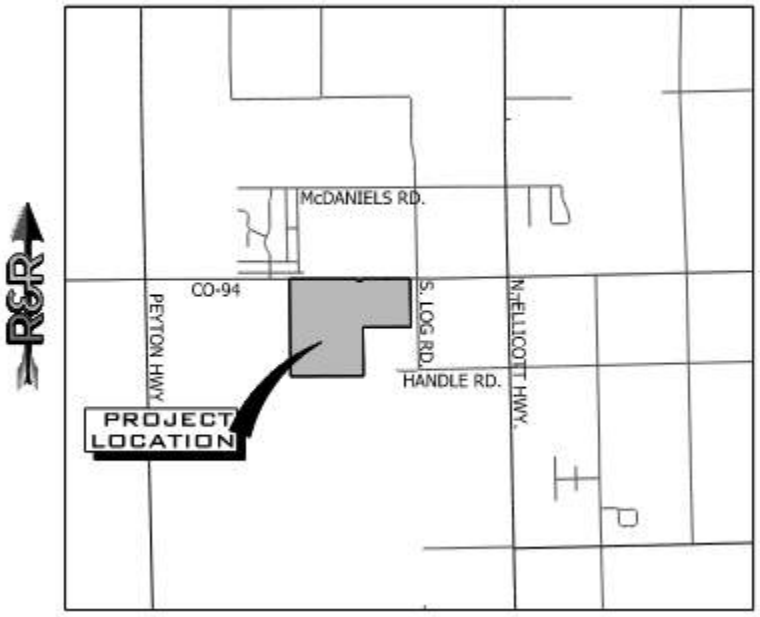


Figure 1: Vicinity Map

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.

C. Site Location and Description

The Mayberry, Colorado Springs development (hereon called the site) is approximately 632 acres (of which 80 acres is within parcel 3400000232 and is not yet owned by the developer) 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 6th 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 New Log Road, 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 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).

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

It looks like a portion of the project is within Telephone Exchange Drainage Basin. Discuss both basin and address any transfer of flows

The Telephone Exchange Drainage Basin is now discussed in this section as being part of the overall master drainage study boundary.

The proposed development lies primarily within the Ellicott Consolidated Drainage Basin (CHBS1200) as classified by El Paso County. This basin is comprised of the area tributary to the West Fork of Black Squirrel Creek, with the majority of the basin bounded by SH94 to the north and Ellicott Highway to the east. No drainage planning study has been completed for the Ellicott Consolidated Drainage Basin or any adjacent drainage basins. El Paso County approved the "Sunset Village Master Development ainage Plan (MDDP)" prepared by Leigh Whitehead & Associates. This MDDP covers adjacent Telephone Exchange Drainage Basin, which borders the Mayberry parcel the west. Based on the Drainage Report for Viewpoint Estates, stormwater tention ponds were constructed to maintain historic flows leaving the upstream veloped areas. As such, the drainage analysis for major basins impacting the site 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 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	
	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.

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 combining with

This offsite flow (EC12 and OFF-1) will now be channelized. Erosion and downstream impacts should be addressed.

The narrative and drainage map has been enhanced to discuss recommended BMPs to avoid erosion and downstream impacts.

Please identify where this flow will be directed if prevented from entering the site as done in historic conditions. Provide design points and flows of the offsite basins entering the development.

The narrative and drainage map has been enhanced to discuss the flow patterns and ultimate discharge point.

add street label to Drainage map

Now labeled on the map.

storically flows in and ... maintain the ...age pattern destinatio... ...ent, a height ...as been recommende... ...Basin EC11 is ...ugh culverts under SH... ...erry Filing No. ...ues this offsite flow south through an RCP pipe under Achison 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 EC12 is conveyed through culverts under SH94, north of Filing No. 3. The Mayberry Filing No. 3 FDR continues this offsite flow via an open channel 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 to support the proposed development. The discharge location will remain the same.

Channel E?

Channel E is now noted for clarity.

Channel F?

Channel F is now noted for clarity.

should this be EC10 as this offsite flow is on the eastern side of filing 3& 4?

Yes, this was an error. Text corrected accordingly.

B. Existing Basins

Historic drainage conditions for this MDDP assume Mayberry Filings 1, ... to exist. This will include single family homes, apartment buildings, tow... roadways, and commercial lots. The remaining undeveloped land to th... 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.

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 81 acres consisting of multifamily 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.

Drainage Basin B is a total of 106 acres consisting of single-family homes, multifamily development, and commercial development. Basin B encompasses Mayberry Filings 1 and 5. 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.

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.

Drainage Basin E is a total of 73 acres consisting of single-family homes 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.

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 anticipated to be routed via curb and gutter, storm pipe, and Channel F to ultimately be detained by Pond F in the lower south side of the basin.

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.

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 11.8 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.

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 15.7 acre-feet. Once Pond B is fully developed and functioning, the existing Pond C, designed and constructed within Mayberry Filing No. 1, will be filled in and taken offline. Pond B will discharge into Channel B, combining with the flow from offsite basin EC11. Discuss Plunge Pool 3

Plunge Pool 3 is discussed in Pond A and Pond B descriptions

Pond D is located at the southeast corner ed on the tributary land-use, the required volume for the pond i has been designed and approved in the Filing No. 3 Final Drain e 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 E, combining with the flow from offsite basin EC10.

Channel F? (see SF2219)

Channel F is now noted.

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 11.1 acre-feet. Pond E will discharge into Channel E, combining with the flow from Pond D and the offsite basin, EC10. Discuss Plunge Pool 4

Plunge Pool 4 is now discussed in the description of Pond D and E.

Pond F is located at the southern boundary of drainage Basin F. Based
land-use, the required volume for the pond is 11.3 acre-feet. Pond F w
Plunge Pool 1, where stormwater flow will slow down and sheet-flow o
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, E, F, 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:

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.

Now Channel F

Channel E 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.

Now Channel H

Channel F 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 E, 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 F. 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.

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.

pool 3 is adjacent to pond B

Corrected.

plunge pool 4

Corrected.

Plunge Pool 1, locate Pond B, will mitigate Por lls, and the offsite flow of Basin EC11. Plunge Pool 2, 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 3 is located south of Pond F and will mitigate the Pond F outfall. Plunge Pool 4 is located south of Pond G and will mitigate the Pond G outfall.

1

Corrected.

2

Corrected.

Please discuss the downstream conditions of each of the design points where flows are conveyed offsite. Discuss the ultimate outfall for these flows. For example is Log Rd ditch anticipated to need improvements; will the flows from DP 4 continue south and cross handle Rd ultimately ending up at Black Squirrel Creek? please address

H. Analysis of Existing and Propos

A discussion has been added to this section about the ultimate receiving body/basin and condition.

The general concept of the pro ate peak flows from the developed site by rout ion ponds. The onsite detention ponds are designed to convert the developed flows from the Mayberry Communities master 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.

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.

Address water quality for the site.

A water quality section has been added to the report as section V.

please include in the narrative the total flows at the design points. These will be the basis for future final drainage reports

A description and table is now added to the report in section C.

V. 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.

VI. Appendix

Appendix A – Referenced Maps

- **Vicinity Map**
- **Soils Map**
- **FEMA Map**

Appendix B – Hydrologic Calculations

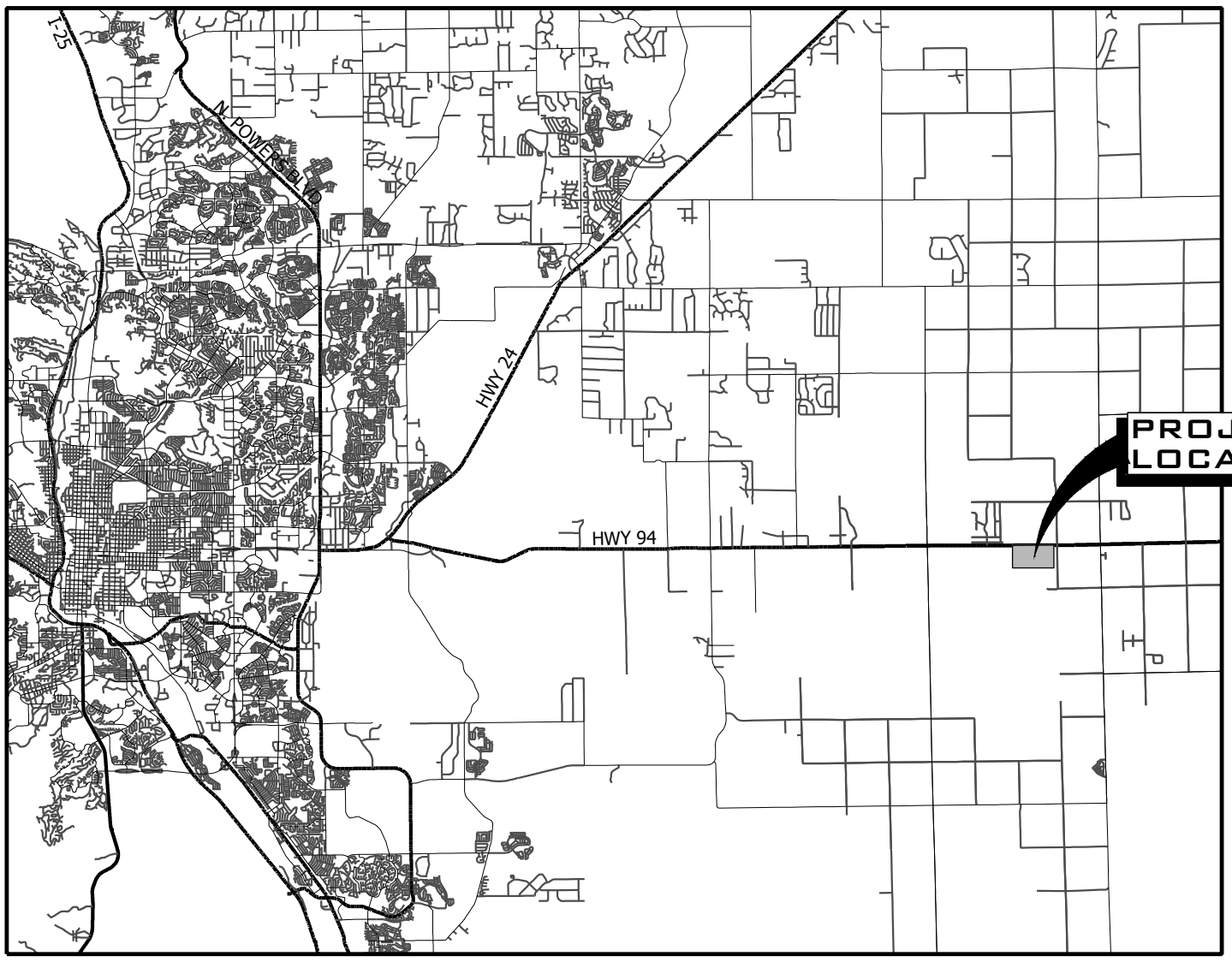
Appendix C – Hydraulic Calculations

- **C1. Detention Basin Volumes**
- **C2. Open Channels**
- **C3. Culvert Sizing**

Appendix D – Drainage Maps

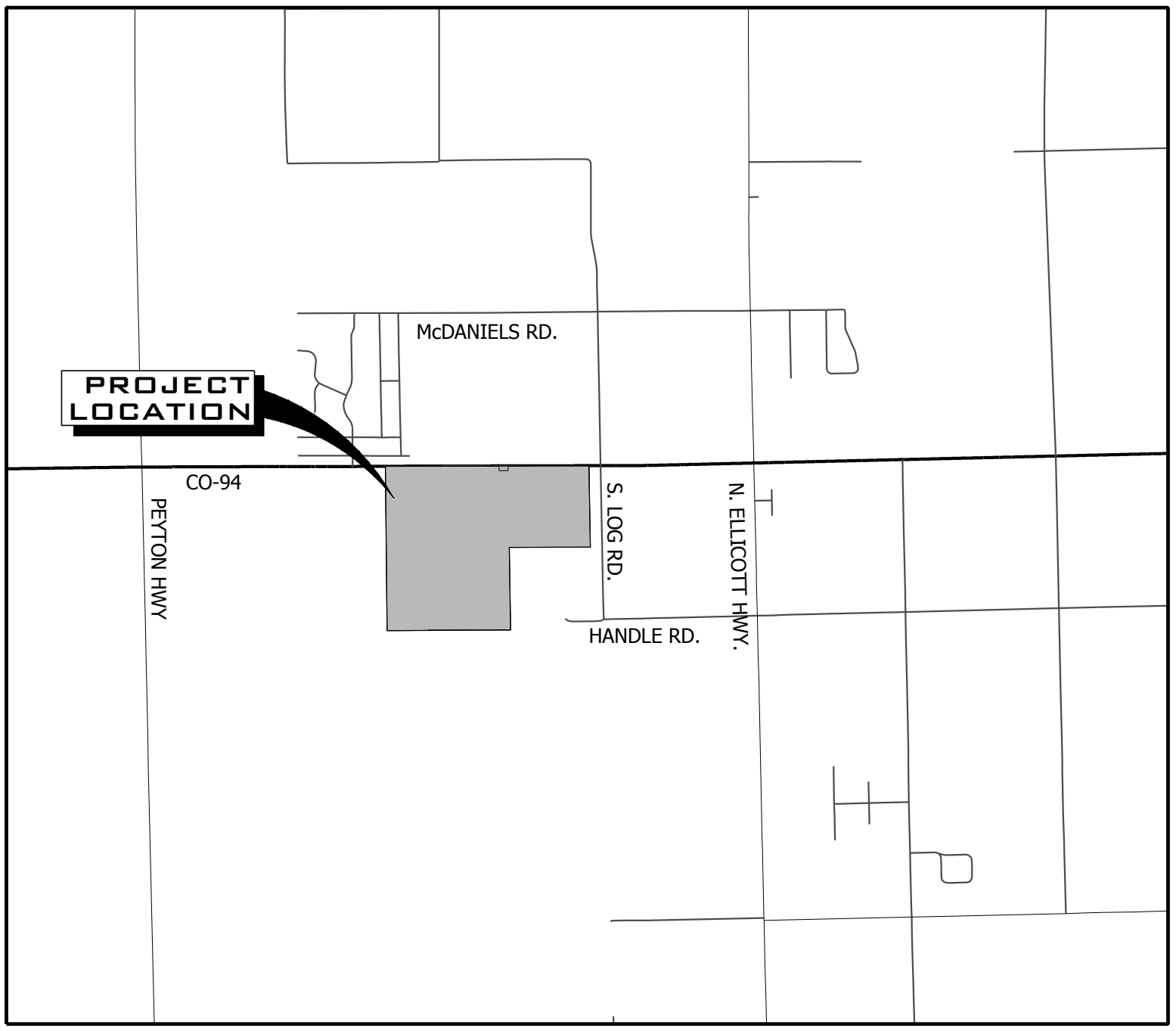
Appendix E – Referenced Drainage Reports

APPENDIX A – REFERENCED MAPS



VICINITY MAP

SCALE 1" = 20,000'



SITE MAP

SCALE 1" = 5000'

REVISIONS

ENGINEERS SURVEYORS INC
WWW.RRENGINEERS.COM

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

United States Department of Agriculture

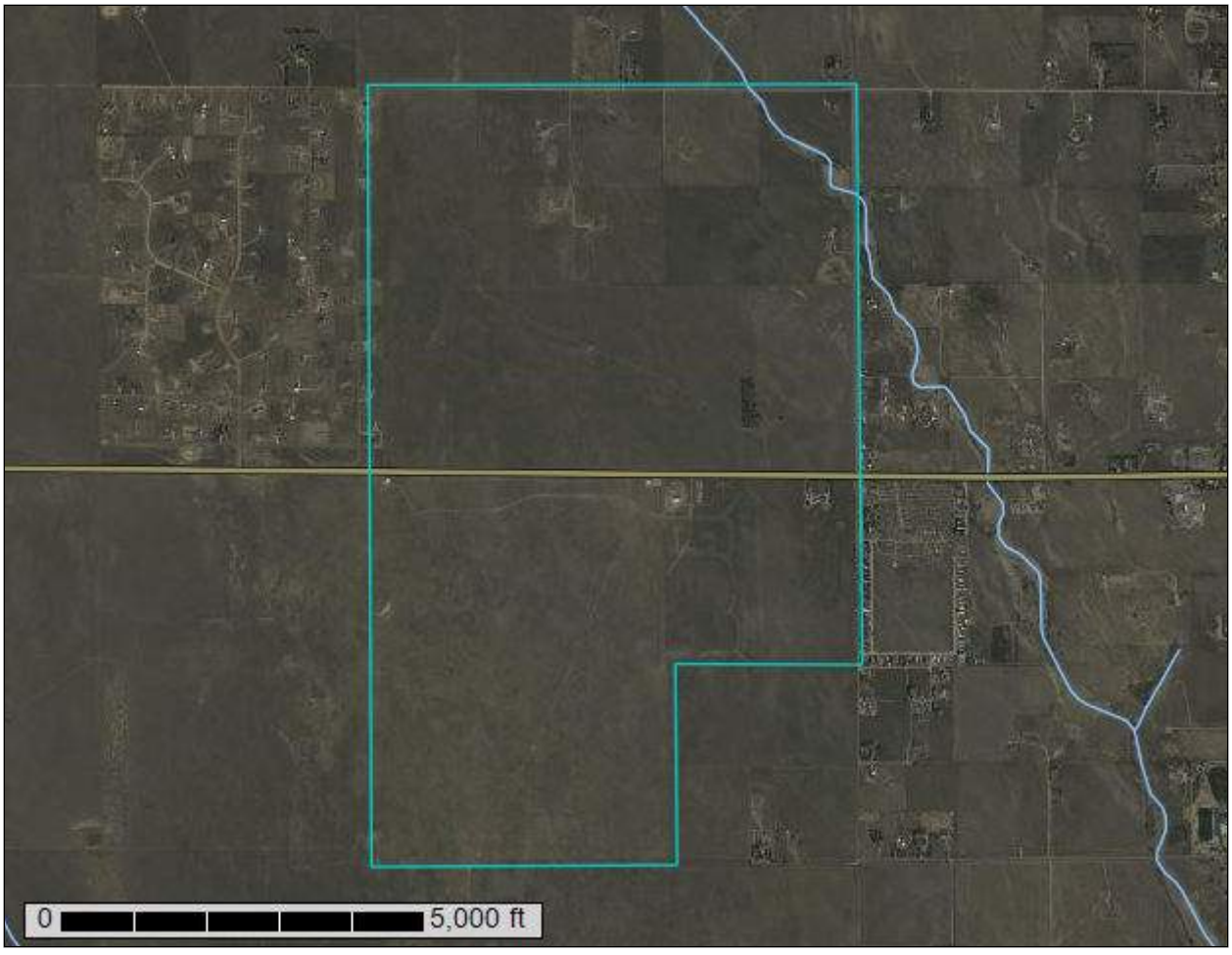
NRCS

Natural Resources Conservation Service

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

Custom Soil Resource Report for El Paso County Area, Colorado

Mayberry Colorado Springs - MDDP



January 10, 2023

Preface

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

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

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

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

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

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

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Contents

How Soil Surveys Are Made

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

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

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

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

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

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

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

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

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

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

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

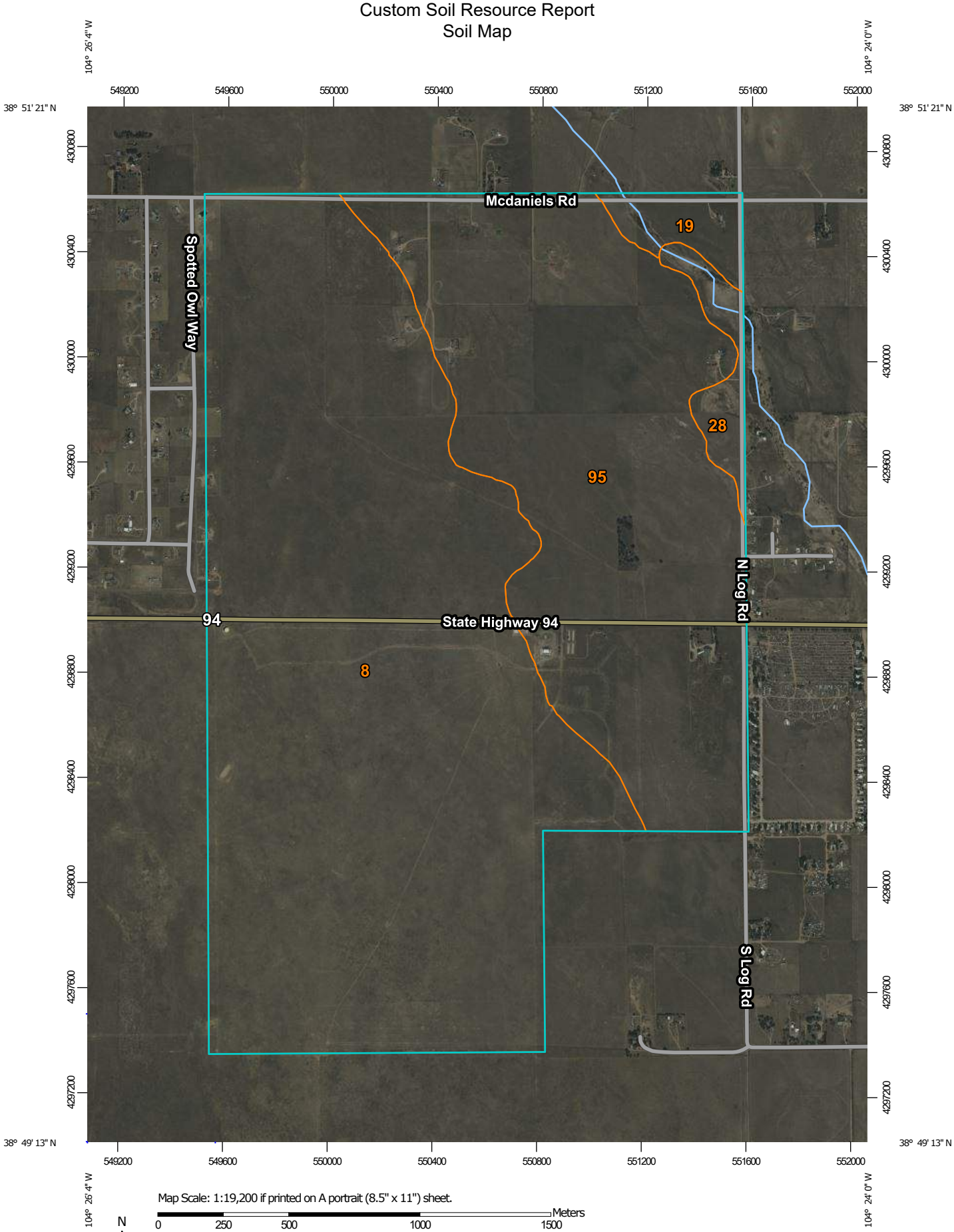
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

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

Soil Map

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

Custom Soil Resource Report
Soil Map



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

N

Meters
0 250 500 1000 1500

Feet
0 500 1000 2000 3000

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%
Totals for Area of Interest		**1,508.7**	**100.0%**

Map Unit Descriptions

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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: 2yvrm
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

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

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.

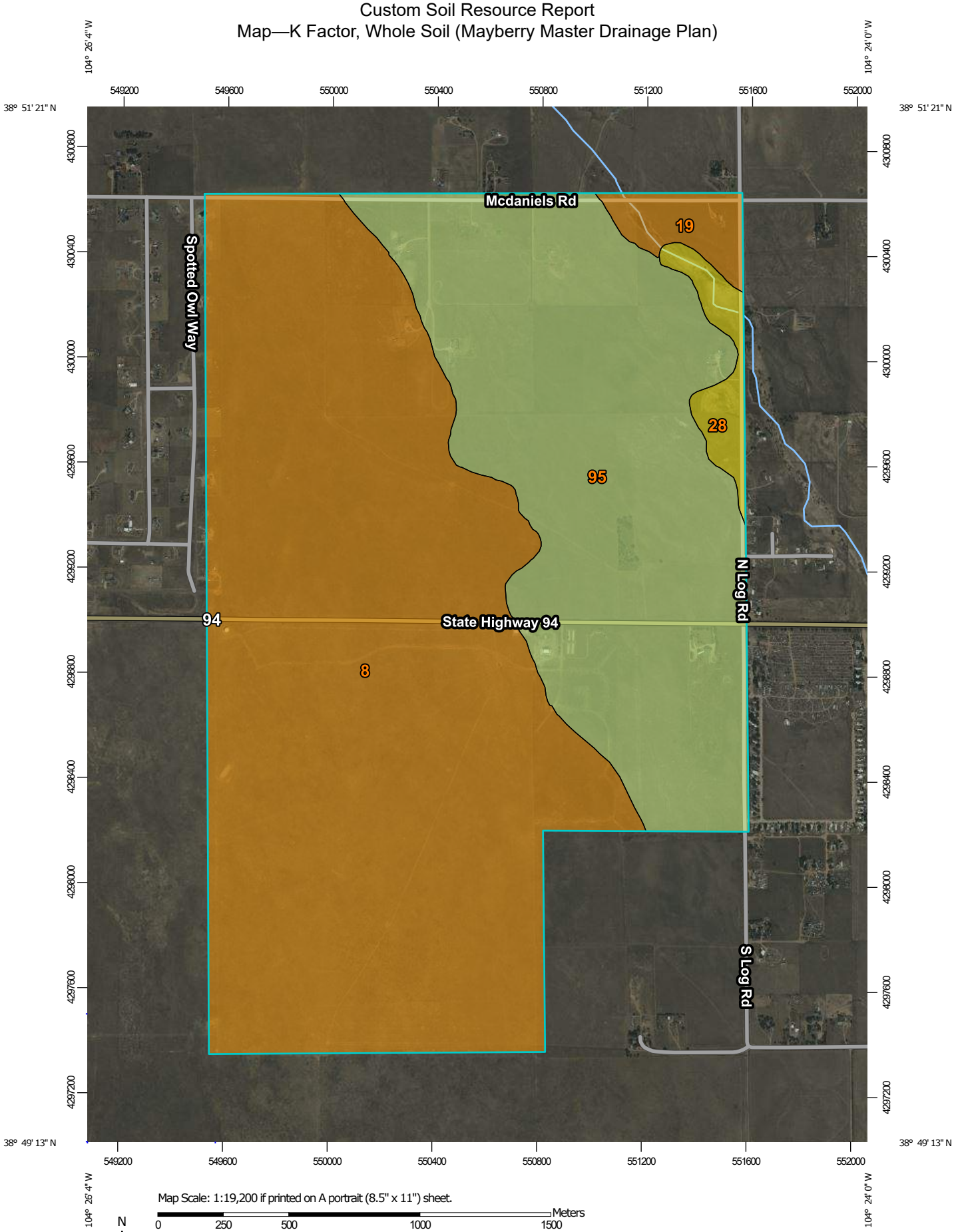
K Factor, Whole Soil (Mayberry Master Drainage Plan)

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.

N

Meters: 0 250 500 1000 1500

Feet: 0 500 1000 2000 3000

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

.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%
Totals for Area of Interest			**1,508.7**	**100.0%**

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:

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.

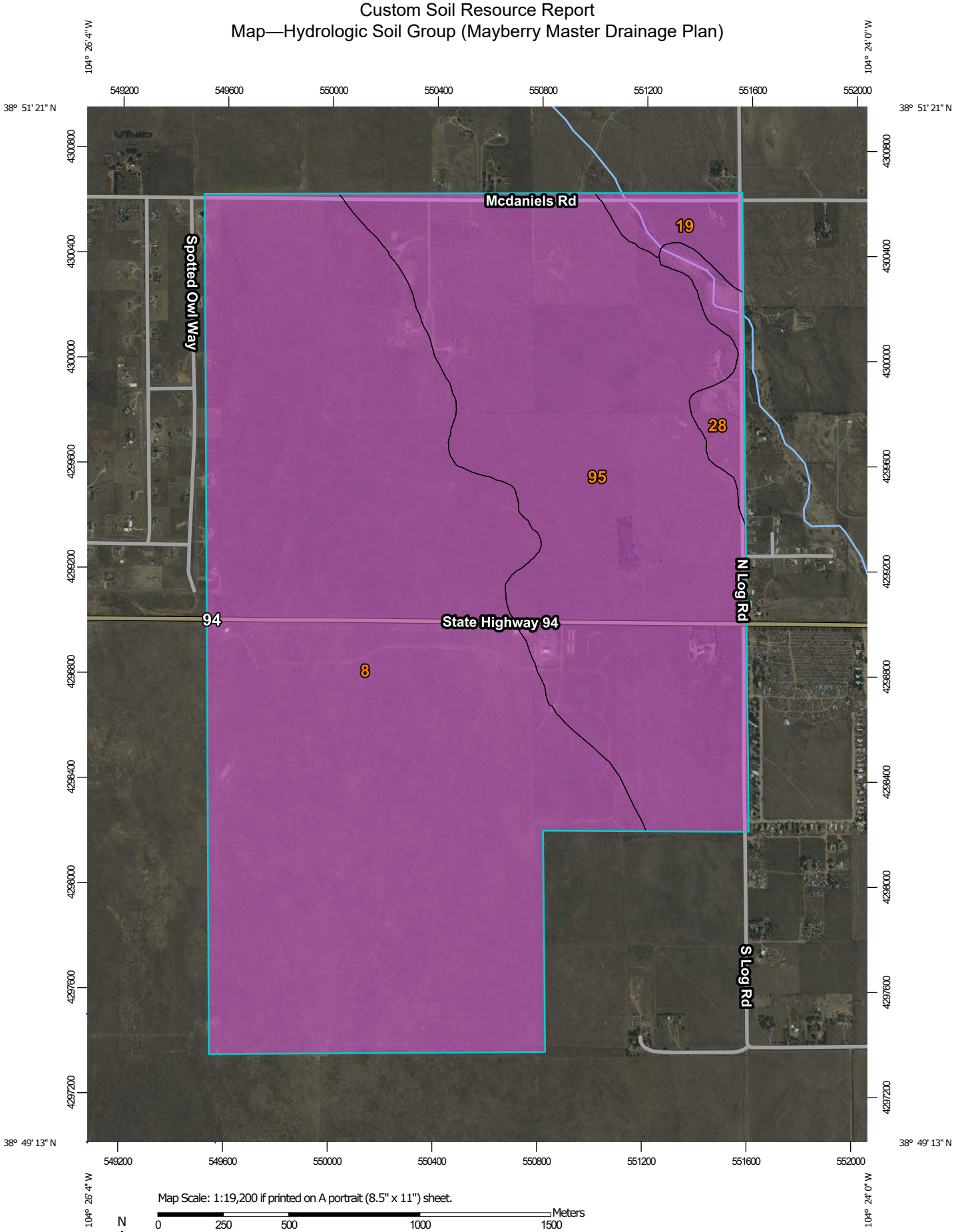
Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

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.

N

Meters
0 250 500 1000 1500

Feet
0 500 1000 2000 3000

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

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—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%
Totals for Area of Interest			**1,508.7**	**100.0%**

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

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

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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, N/NGS12
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/.

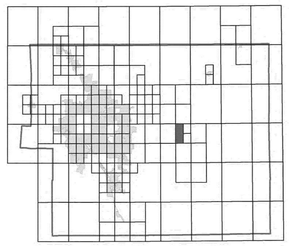
If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.

El Paso County Vertical Datum Offset Table

Flooding Source	Vertical Datum Offset (ft)

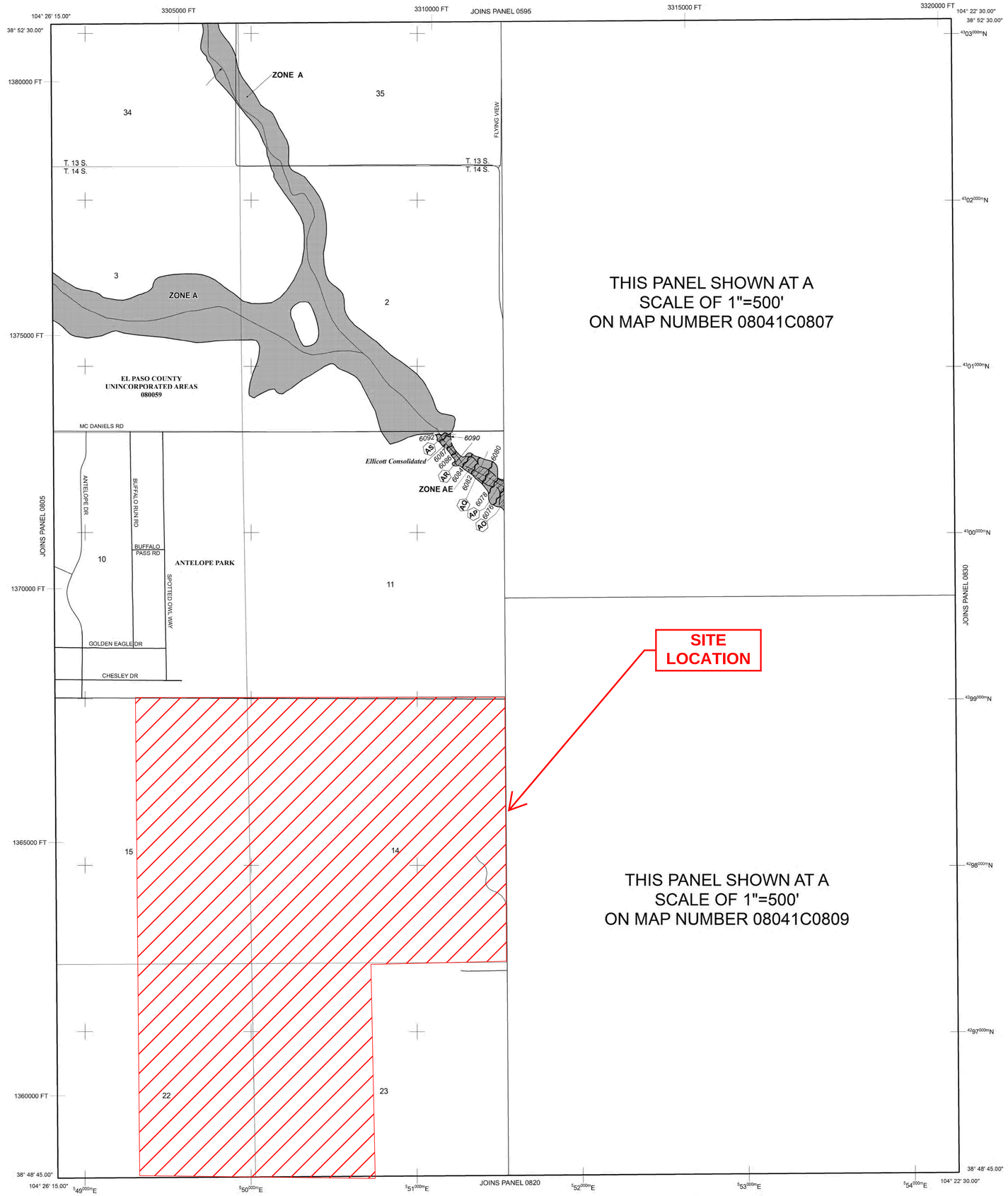
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION

Panel Location Map



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

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



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

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, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A No Base Flood Elevations determined.
ZONE AE Base Flood Elevations determined.
ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR Special Flood Hazard Area Formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99 Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

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

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

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

Floodplain boundary
Floodway boundary
Zone D Boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
513 — Base Flood Elevation line and value; elevation in feet*
(EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

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

A — A — Cross section line
23 — 23 — Transect line
97° 07' 30.00" / 32° 22' 30.00" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
4275000mN — 1000-meter Universal Transverse Mercator grid ticks, zone 13
6000000 FT — 5000-foot grid ticks: Colorado State Plane coordinate system, central zone (FIPSZONE 0502), Lambert Conformal Conic Projection
DX5510 × — Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
MARCH 17, 1997

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

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

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

MAP SCALE 1" = 1000'

500 0 1000 2000 FEET
300 0 300 600 METERS

NFIP

PANEL 0810G

NATIONAL FLOOD INSURANCE PROGRAM

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	080059	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

APPENDIX B – HYDROLOGIC CALCULATIONS

EXISTING C VALUES

Designer: LAO
Company: R&R Engineers-Surveyors
Date: 5/2/2023
Project: MAYBERRY SKETCH PLAN
Location: EL PASO COUNTY, COLORADO

Global Parameters[1]			
Land Use	% Imp.	C_5	C_{100}
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 fo

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

[1] From Table 6-3 in MHFD Volume 1
[2] 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[2]			
			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:	5/2/2023
Project:	MAYBERRY SKETCH PLAN
Location:	EL PASO COUNTY, COLORADO

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L_i}}{S_i^{0.33}}$$

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

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

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

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

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

Cells of this color are for required user-input

Subbasin Data				Overland (Initial) Flow Time			Channelized (Travel) Flow Time					Time of Concentration			
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)	Remarks
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	

STORM DRAINAGE SYSTEM DESIGN - 5-YEAR DESIGN STORM

Designer: LAO
Company: R&R Engineers-Surveyors
Date: 5/2/2023
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

$I_5 = -1.50 \ln(D) + 7.583$

DESGIN 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	Tt min	
		EX-A	44	0.55	13.1	24.23	6.26	151.7										151.7						
1																								
		EX-B	100	0.32	19.2	31.98	3.01	96.3										96.3						
2																								
		EX-C	135	0.08	44.1	10.80	1.86	20.1										20.1						
3																								
		EX-D	185	0.08	53.2	14.80	1.64	24.3										24.3						
4																								
		EX-E	59	0.08	47.7	4.72	1.76	8.3										8.3						
5																								
		EX-F	22	0.08	34.9	1.76	2.15	3.8										3.8						
6																								

STORM DRAINAGE SYSTEM DESIGN - 100-YEAR DESIGN STORM

Designer:	LAO
Company:	R&R Engineers-Surveyors
Date:	5/2/2023
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

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

DESGIN POINT	STREET/ CONTRIBUTING BASINS	DIRECT RUNOFF							TOTAL RUNOFF					STREET BYPASS				PIPE			TRAVEL TIME			
		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	Tt min	Remarks
		EX-A	44	0.67	13.1	29.53	6.26	184.8										184.8						
1																								
		EX-B	100	0.51	19.2	51.36	5.29	271.5										271.5						
2																								
		EX-C	135	0.35	44.1	47.25	3.20	151.0										151.0						
3																								
		EX-D	185	0.35	53.2	64.75	2.72	176.2										176.2						
4																								
		EX-E	59	0.35	47.7	20.65	2.99	61.8										61.8						
5																								
		EX-F	22	0.35	34.9	7.70	3.78	29.1										29.1						
6																								

POST-DEVELOPMENT C VALUES

Designer: LAO
Company: R&R Engineers-Surveyors
Date: 6/29/2023
Project: MAYBERRY SKETCH PLAN
Location: EL PASO COUNTY, COLORADO

Global Parameters[1]			
Land Use	% Imp.	C_5	C_{100}
SF LOTS (1/6 AC)*	65	0.45	0.59
Commercial	95	0.81	0.88
Multi-Family	95	0.81	0.88
Neighborhood Areas	70		
Park	7		

*Using 1/8 for conservativeness

Summary	
Total Area (ac)	849.10
Composite Impervious	51.0%

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

[1] From Table 6-3 in MHFD Volume 1
[2] From Table 6-4 in MHFD Volume 1

Basin Name	Area (ac)	NRCS Hydrologic Soil Group	SF LOTS (1/6 AC)*		Commercial		Multi-Family		Neighborhood Areas		Park		% Check	Percent Imperviousness	Runoff Coefficient, C[2]			
			Area (ac)	%	Area (ac)	%	Area (ac)	%	Area (ac)	%	Area (ac)	%			2-yr	5-yr	10-yr	100-yr
A	81.00	A	0.00	0.0%	14.90	18.4%	29.70	36.7%	20.50	25.3%	15.90	19.6%	100.00%	71.4%		0.45		0.48
B	106.00	A	74.63	70.4%	0.00	0.0%	26.17	24.7%	5.20	4.9%	0.00	0.0%	100.00%	72.7%		0.52		0.63
D	110.00	A	95.50	86.8%	14.50	13.2%	0.00	0.0%	0.00	0.0%	0.00	0.0%	100.00%	69.0%		0.50		0.63
E	73.00	A	49.29	67.5%	23.71	32.5%	0.00	0.0%	0.00	0.0%	0.00	0.0%	100.00%	74.7%		0.57		0.68
F	75.00	A	53.40	71.2%	0.00	0.0%	21.60	28.8%	0.00	0.0%	0.00	0.0%	100.00%	73.6%		0.55		0.67
G	160.00	A	132.70	82.9%	27.30	17.1%	0.00	0.0%	0.00	0.0%	0.00	0.0%	100.00%	70.1%		0.51		0.64
Channel G	64.40	A	46.10	71.6%	0.00	0.0%	18.30	28.4%	0.00	0.0%	0.00	0.0%	100.00%	73.5%		0.55		0.67
Channel A	11.60	A	0.00	0.0%	0.00	0.0%	11.60	100.0%	0.00	0.0%	0.00	0.0%	100.00%	95.0%		0.81		0.88
Channel F	24.00	A	24.00	100.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	100.00%	65.0%		0.45		0.59
Culvert 4	7.80	A	0.00	0.0%	0.00	0.0%	7.80	100.0%	0.00	0.0%	0.00	0.0%	100.00%	95.0%		0.81		0.88
Culvert 5	36.50	A	22.00	60.3%	0.00	0.0%	14.50	39.7%	0.00	0.0%	0.00	0.0%	100.00%	76.9%		0.59		0.71
Culvert 6	64.40	A	49.90	77.5%	0.00	0.0%	14.50	22.5%	0.00	0.0%	0.00	0.0%	100.00%	71.8%		0.53		0.66
Culvert 7	15.70	A	15.70	100.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	100.00%	65.0%		0.45		0.59
Culvert 8	19.70	A	19.70	100.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	100.00%	65.0%		0.45		0.59

TIME OF CONCENTRATION

Designer:	LAO
Company:	R&R Engineers-Surveyors
Date:	6/29/2023
Project:	MAYBERRY SKETCH PLAN
Location:	EL PASO COUNTY, COLORADO

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L_i}}{S_i^{0.33}}$$

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

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

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

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

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

Cells of this color are for required user-input

Subbasin Data				Overland (Initial) Flow Time			Channelized (Travel) Flow Time					Time of Concentration			
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)	Remarks
A	81.00	71.4%	0.45	36.00	0.020	5.64	2705.00	0.005	20	1.41	31.88	37.51	47.43	37.51	
B	106.00	72.7%	0.52	36.00	0.020	5.03	2900.00	0.005	15	1.06	45.57	50.60	49.30	49.30	
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	74.7%	0.57	36.00	0.020	4.59	1500.00	0.005	15	1.06	23.57	28.16	31.46	28.16	
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 F	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: 6/29/2023
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

$I_5 = -1.50 \ln(D) + 7.583$

DESGIN 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	Tt min	
		A	81	0.45	37.5	36.13	2.15	77.5										77.5						
1																								
		B	106	0.52	49.3	54.78	1.74	95.1										95.1						
2																								
		D	110	0.50	26.5	54.72	2.67	145.9										145.9						
3																								
		E	73	0.57	28.2	41.39	2.58	106.6										106.6						
4																								
		F	75	0.55	50.1	41.53	1.71	71.1										71.1						
5																								
		G	160	0.51	38.1	81.83	2.12	173.8										173.8						
6																								
		Channel G	64.4	0.55	51.3	35.57	1.68	59.6										59.6						
		Channel F	24	0.45	36.8	10.80	2.17	23.5										23.5						
		Channel A	11.6	0.81	23.3	9.40	2.86	26.9										26.9						
		Culvert 4	7.8	0.81	16.3	6.32	3.39	21.4										21.4						
		Culvert 5	36.5	0.59	39.2	21.65	2.08	45.1										45.1						
		Culvert 6	64.4	0.53	41.0	34.20	2.01	68.8										68.8						
		Culvert 7	15.7	0.45	30.6	7.07	2.45	17.3										17.3						
		Culvert 8	19.7	0.45	41.0	8.87	2.01	17.8										17.8						

STORM DRAINAGE SYSTEM DESIGN - 100-YEAR DESIGN STORM

Designer:	LAO
Company:	R&R Engineers-Surveyors
Date:	6/29/2023
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

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

DESGIN 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	Tt min	
		A	81	0.48	37.5	39.25	3.60	141.3										141.3						
1																								
		B	106	0.63	49.3	67.06	2.91	195.3										195.3						
2																								
		D	110	0.63	26.5	69.11	4.47	309.1										309.1						
3																								
		E	73	0.68	28.2	49.95	4.32	215.9										215.9						
4																								
		F	75	0.67	50.1	50.51	2.87	145.1										145.1						
5																								
		G	160	0.64	38.1	102.32	3.56	364.6										364.6						
6																								
		Channel G	64.4	0.67	51.3	43.30	2.81	121.7										121.7						
		Channel F	24	0.59	36.8	14.16	3.65	51.6										51.6						
		Channel A	11.6	0.88	23.3	10.21	4.80	49.0										49.0						
		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						
		Culvert 6	64.4	0.66	41.0	42.20	3.38	142.4										142.4						
		Culvert 7	15.7	0.59	30.6	9.26	4.12	38.1										38.1						
		Culvert 8	19.7	0.59	41.0	11.62	3.38	39.3										39.3						

APPENDIX C – HYDRAULIC CALCULATIONS

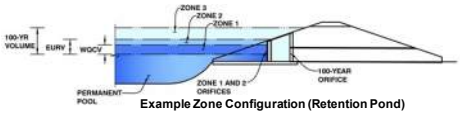
C.1 DETENTION VOLUMES

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: MAYBERRY SKETCH PLAN

Basin ID: POND A (Stage 0 = 6057)



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	81.00	acres
Watershed Length =	2,784	ft
Watershed Length to Centroid =	1,392	ft
Watershed Slope =	0.010	ft/ft
Watershed Imperviousness =	72.00%	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.

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	1.919	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	7.447	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	5.451	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	7.108	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	8.438	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	10.083	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	11.692	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	13.606	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	17.814	acre-feet	3.14	inches
Approximate 2-yr Detention Volume =	4.867	acre-feet		
Approximate 5-yr Detention Volume =	6.346	acre-feet		
Approximate 10-yr Detention Volume =	7.613	acre-feet		
Approximate 25-yr Detention Volume =	9.101	acre-feet		
Approximate 50-yr Detention Volume =	9.985	acre-feet		
Approximate 100-yr Detention Volume =	10.851	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	1.919	acre-feet
Zone 2 Volume (EURV - Zone 1) =	5.528	acre-feet
Zone 3 (100yr + 1 / 2 WQCV - Zones 1 & 2) =	4.364	acre-feet
Total Detention Basin Volume =	11.811	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

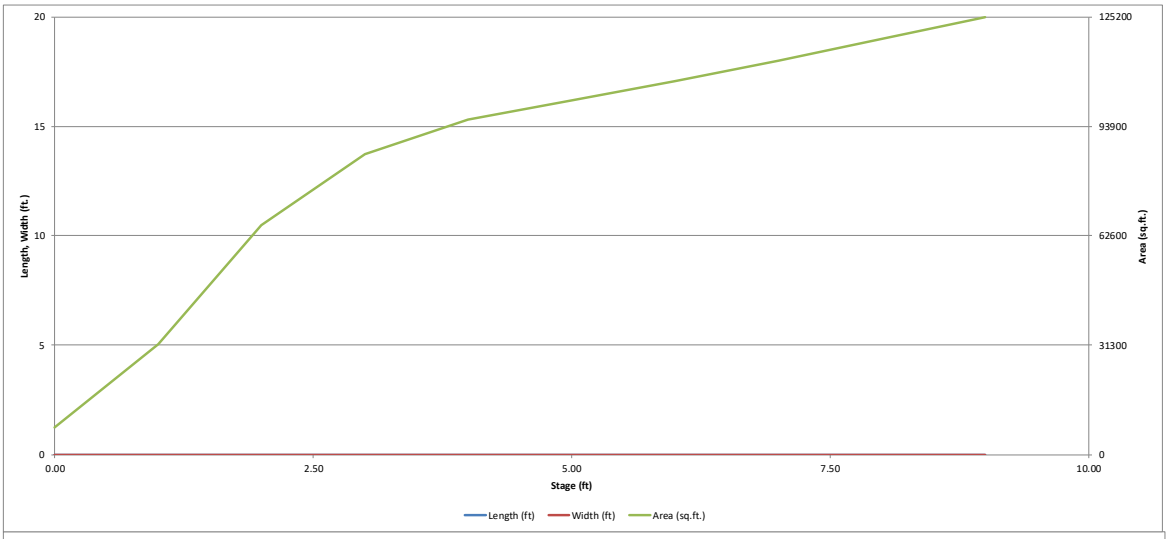
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

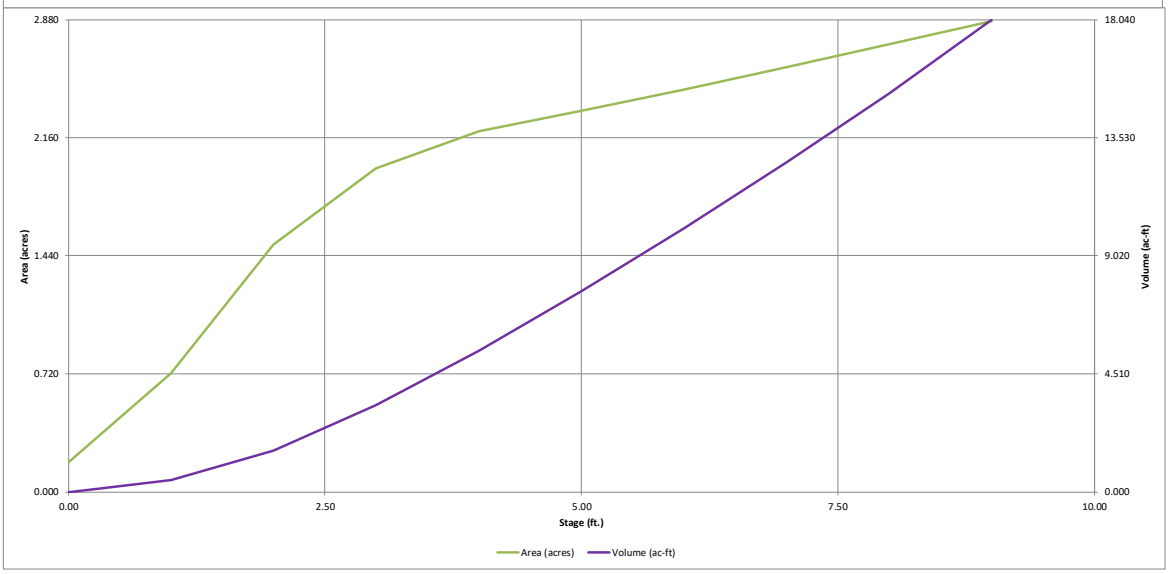
Depth Increment = ft

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)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	7,906	0.181		
6058	--	1.00	--	--	--	31,549	0.724	19,727	0.453
6059	--	2.00	--	--	--	65,600	1.506	68,302	1.568
6060	--	3.00	--	--	--	85,864	1.971	144,034	3.307
6061	--	4.00	--	--	--	95,845	2.200	234,888	5.392
6062	--	5.00	--	--	--	101,259	2.325	333,440	7.655
6063	--	6.00	--	--	--	106,891	2.454	437,515	10.044
6064	--	7.00	--	--	--	112,752	2.588	547,337	12.565
6065	--	8.00	--	--	--	118,840	2.728	663,133	15.223
6066	--	9.00	--	--	--	125,155	2.873	785,130	18.024

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)



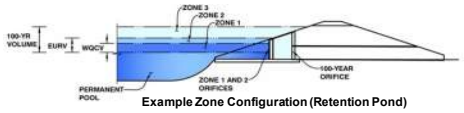


DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: Mayberry Sketch Plan

Basin ID: Pond B



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	106.00	acres
Watershed Length =	2,700	ft
Watershed Length to Centroid =	1,350	ft
Watershed Slope =	0.010	ft/ft
Watershed Imperviousness =	73.00%	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.

			Optional User Overrides
Water Quality Capture Volume (WQCV) =	2.555	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	9.919	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	7.278	acre-feet	1.19 inches
5-yr Runoff Volume (P1 = 1.5 in.) =	9.483	acre-feet	1.50 inches
10-yr Runoff Volume (P1 = 1.75 in.) =	11.247	acre-feet	1.75 inches
25-yr Runoff Volume (P1 = 2 in.) =	13.420	acre-feet	2.00 inches
50-yr Runoff Volume (P1 = 2.25 in.) =	15.544	acre-feet	2.25 inches
100-yr Runoff Volume (P1 = 2.52 in.) =	18.063	acre-feet	2.52 inches
500-yr Runoff Volume (P1 = 3.14 in.) =	23.605	acre-feet	3.14 inches
Approximate 2-yr Detention Volume =	6.486	acre-feet	
Approximate 5-yr Detention Volume =	8.454	acre-feet	
Approximate 10-yr Detention Volume =	10.136	acre-feet	
Approximate 25-yr Detention Volume =	12.107	acre-feet	
Approximate 50-yr Detention Volume =	13.275	acre-feet	
Approximate 100-yr Detention Volume =	14.411	acre-feet	

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	2.555	acre-feet
Zone 2 Volume (EURV - Zone 1) =	7.364	acre-feet
Zone 3 (100yr + 1 / 2 WQCV - Zones 1 & 2) =	5.770	acre-feet
Total Detention Basin Volume =	15.689	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

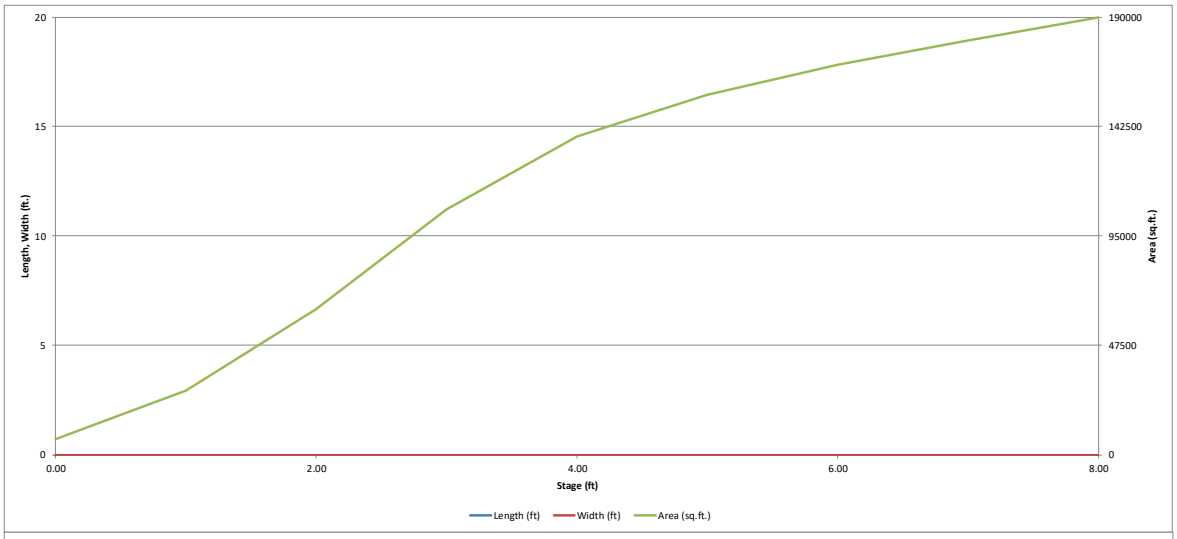
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

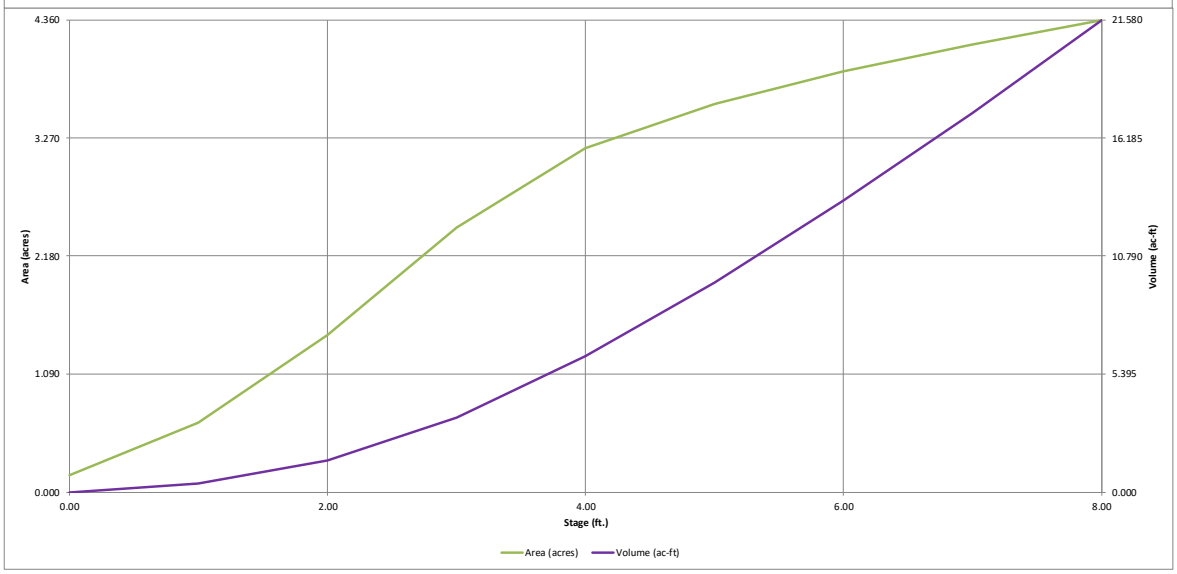
Depth Increment = ft

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)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	6,967	0.160		
6041	--	1.00	--	--	--	27,989	0.643	17,478	0.401
6042	--	2.00	--	--	--	63,165	1.450	63,055	1.448
6043	--	3.00	--	--	--	106,519	2.445	147,897	3.395
6044	--	4.00	--	--	--	138,250	3.174	270,281	6.205
6045	--	5.00	--	--	--	156,165	3.585	417,489	9.584
6046	--	6.00	--	--	--	169,255	3.886	580,199	13.320
6047	--	7.00	--	--	--	179,955	4.131	754,804	17.328
6048	--	8.00	--	--	--	189,874	4.359	939,718	21.573

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)



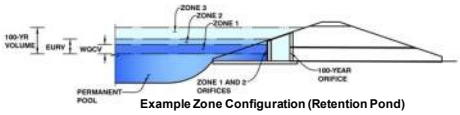


DETENTION BASIN STAGE-STORAGE TABLE BUILDER

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 =	EDB	
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.

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	2.480	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	9.577	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	7.035	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	9.194	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	10.931	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	13.128	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	15.280	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	17.863	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	23.531	acre-feet	3.14	inches
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		

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 (100yr + 1 / 2 WQCV - Zones 1 & 2) =	5.746	acre-feet
Total Detention Basin Volume =	15.324	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

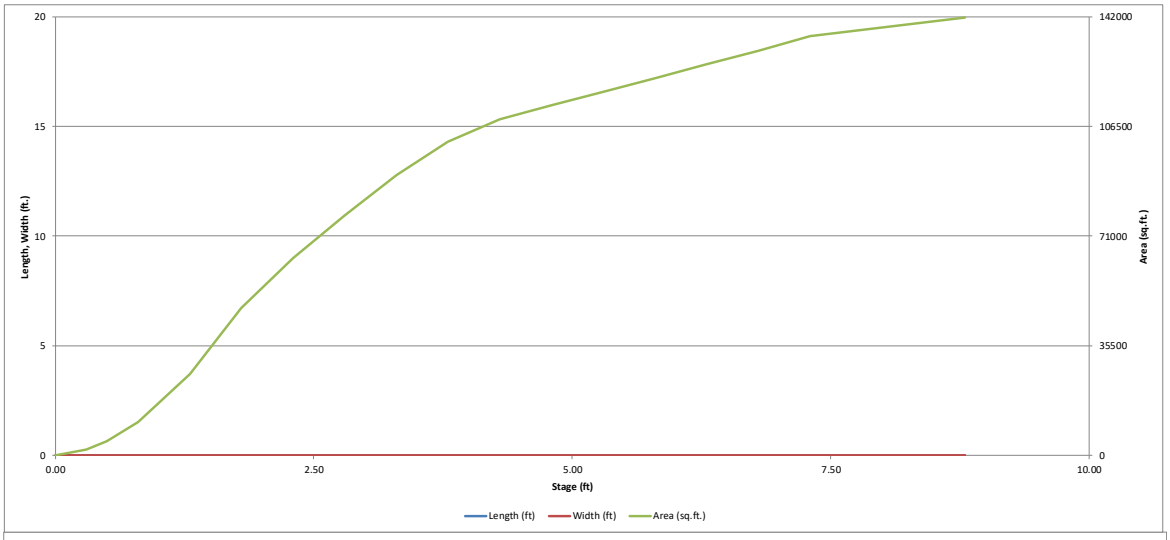
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

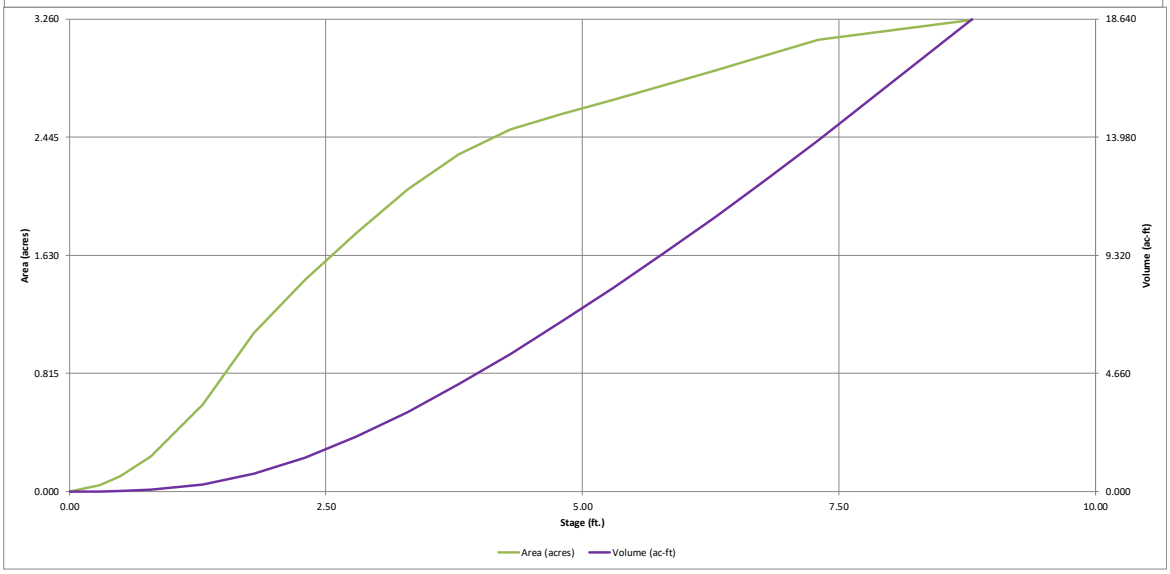
Depth Increment = ft

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)	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	--	8.80	--	--	--	141,840	3.256	811,570	18.631

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)



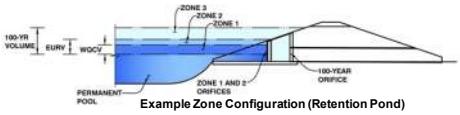


DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: Mayberry Sketch Plan

Basin ID: Pond E



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	73.00	acres
Watershed Length =	2,800	ft
Watershed Length to Centroid =	1,400	ft
Watershed Slope =	0.040	ft/ft
Watershed Imperviousness =	75.00%	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.

		Optional User Overrides	
Water Quality Capture Volume (WQCV) =	1.822 acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	7.072 acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	5.124 acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	6.666 acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	7.901 acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	9.395 acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	10.854 acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	12.577 acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	16.373 acre-feet	3.14	inches
Approximate 2-yr Detention Volume =	4.630 acre-feet		
Approximate 5-yr Detention Volume =	6.030 acre-feet		
Approximate 10-yr Detention Volume =	7.220 acre-feet		
Approximate 25-yr Detention Volume =	8.610 acre-feet		
Approximate 50-yr Detention Volume =	9.430 acre-feet		
Approximate 100-yr Detention Volume =	10.216 acre-feet		

Define Zones and Basin Geometry

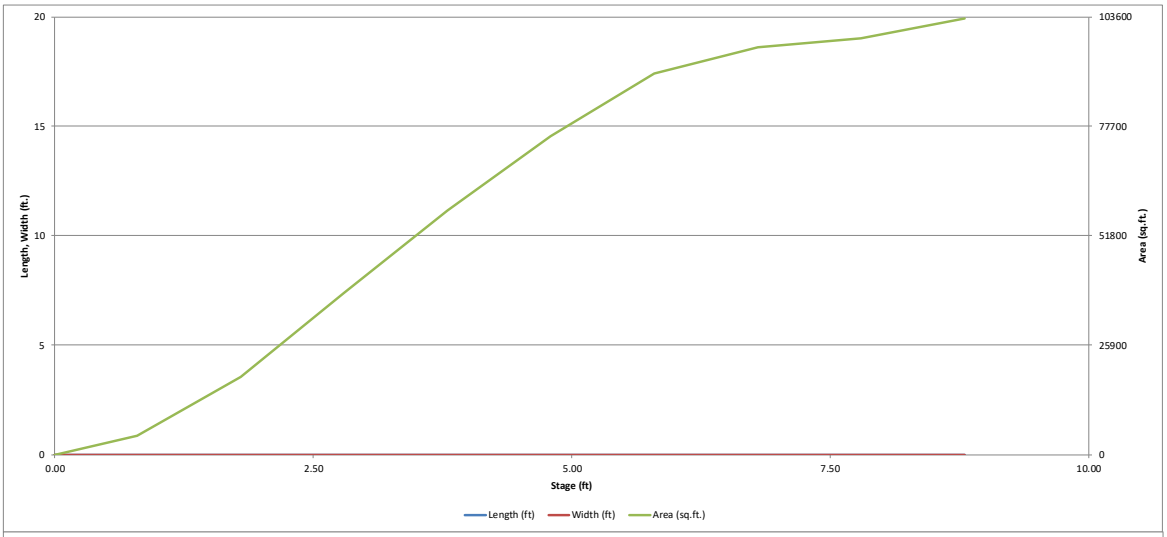
Zone 1 Volume (WQCV) =	1.822	acre-feet
Zone 2 Volume (EURV - Zone 1) =	5.250	acre-feet
Zone 3 (100yr + 1 / 2 WQCV - Zones 1 & 2) =	4.056	acre-feet
Total Detention Basin Volume =	11.128	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

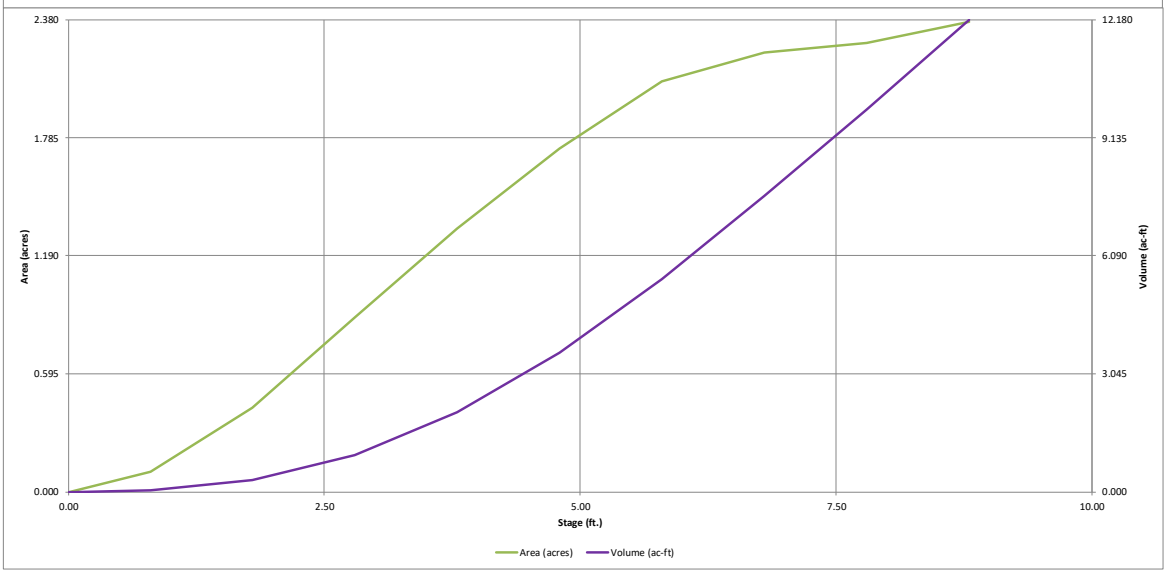
Depth Increment = ft

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)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	16	0.000		
6019	--	0.80	--	--	--	4,460	0.102	1,790	0.041
6020	--	1.80	--	--	--	18,435	0.423	13,238	0.304
6021	--	2.80	--	--	--	38,284	0.879	41,597	0.955
6022	--	3.80	--	--	--	57,822	1.327	89,650	2.058
6023	--	4.80	--	--	--	75,326	1.729	156,224	3.586
6024	--	5.80	--	--	--	90,171	2.070	238,973	5.486
6025	--	6.80	--	--	--	96,369	2.212	332,243	7.627
6026	--	7.80	--	--	--	98,485	2.261	429,670	9.864
6027	--	8.80	--	--	--	103,229	2.370	530,527	12.179

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)



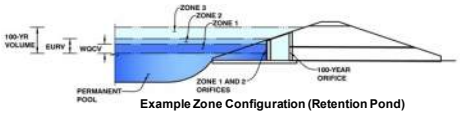


DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: Mayberry Sketch Plan

Basin ID: Pond F



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	75.00	acres
Watershed Length =	2,785	ft
Watershed Length to Centroid =	1,393	ft
Watershed Slope =	0.010	ft/ft
Watershed Imperviousness =	74.00%	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.

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	1.839	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	7.142	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	5.210	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	6.783	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	8.047	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	9.588	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	11.093	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	12.873	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	16.793	acre-feet	3.14	inches
Approximate 2-yr Detention Volume =	4.673	acre-feet		
Approximate 5-yr Detention Volume =	6.088	acre-feet		
Approximate 10-yr Detention Volume =	7.294	acre-feet		
Approximate 25-yr Detention Volume =	8.706	acre-feet		
Approximate 50-yr Detention Volume =	9.540	acre-feet		
Approximate 100-yr Detention Volume =	10.346	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	1.839	acre-feet
Zone 2 Volume (EURV - Zone 1) =	5.302	acre-feet
Zone 3 (100yr + 1 / 2 WQCV - Zones 1 & 2) =	4.124	acre-feet
Total Detention Basin Volume =	11.266	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

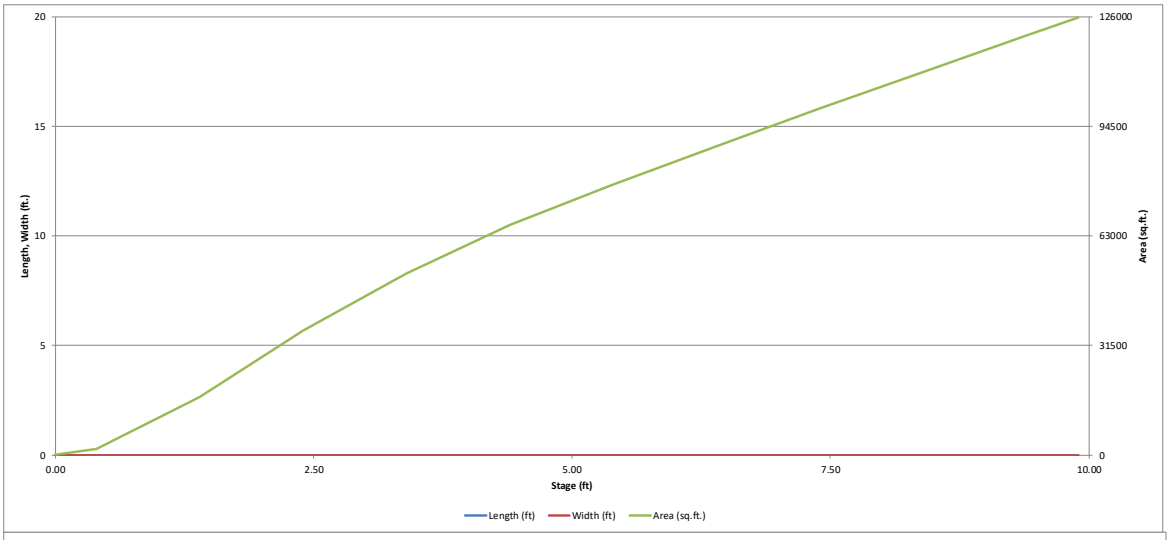
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

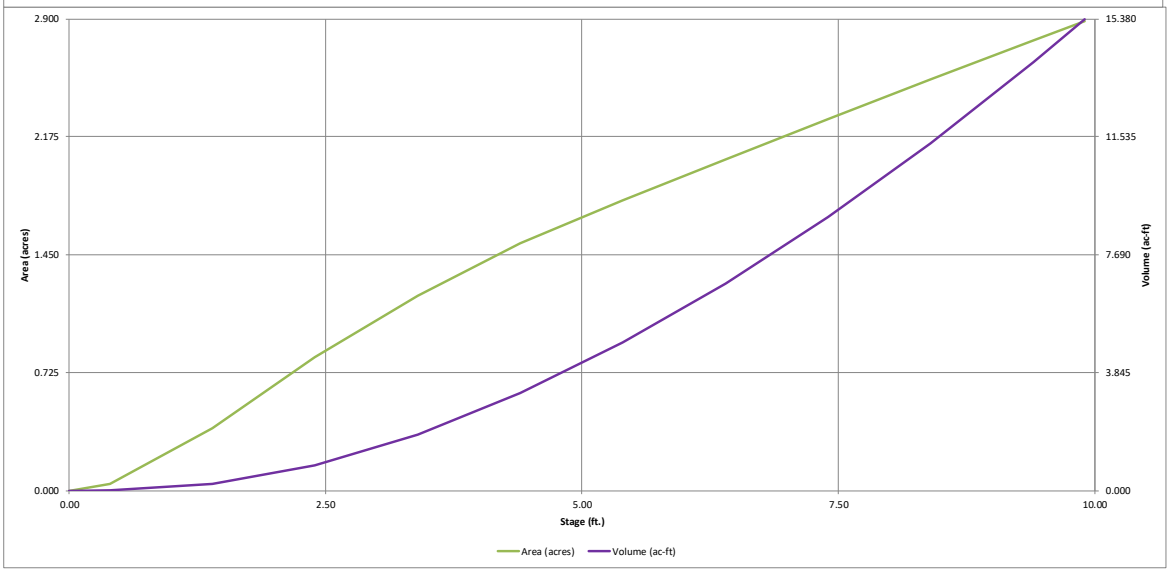
Depth Increment = ft

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)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	48	0.001		
6049	--	0.40	--	--	--	1,745	0.040	359	0.008
6050	--	1.40	--	--	--	16,626	0.382	9,544	0.219
6051	--	2.40	--	--	--	35,675	0.819	35,694	0.819
6052	--	3.40	--	--	--	52,181	1.198	79,622	1.828
6053	--	4.40	--	--	--	66,143	1.518	138,784	3.186
6054	--	5.40	--	--	--	77,732	1.784	210,722	4.838
6055	--	6.40	--	--	--	88,692	2.036	293,934	6.748
6056	--	7.40	--	--	--	99,487	2.284	388,023	8.908
6057	--	8.40	--	--	--	110,114	2.528	492,824	11.314
6058	--	9.40	--	--	--	120,573	2.768	608,167	13.962
6058.5	--	9.90	--	--	--	125,740	2.887	669,746	15.375

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)



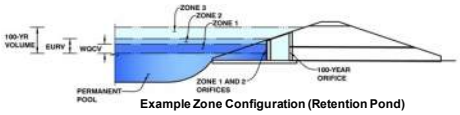


DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: Mayberry Sketch Plan

Basin ID: Pond G



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	160.00	acres
Watershed Length =	3,625	ft
Watershed Length to Centroid =	1,822	ft
Watershed Slope =	0.010	ft/ft
Watershed Imperviousness =	70.00%	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.

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	3.667	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	14.190	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	10.426	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	13.616	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	16.175	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	19.390	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	22.536	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	26.302	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	34.568	acre-feet	3.14	inches
Approximate 2-yr Detention Volume =	9.261	acre-feet		
Approximate 5-yr Detention Volume =	12.085	acre-feet		
Approximate 10-yr Detention Volume =	14.516	acre-feet		
Approximate 25-yr Detention Volume =	17.386	acre-feet		
Approximate 50-yr Detention Volume =	19.095	acre-feet		
Approximate 100-yr Detention Volume =	20.801	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	3.667	acre-feet
Zone 2 Volume (EURV - Zone 1) =	10.523	acre-feet
Zone 3 (100yr + 1 / 2 WQCV - Zones 1 & 2) =	8.445	acre-feet
Total Detention Basin Volume =	22.634	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

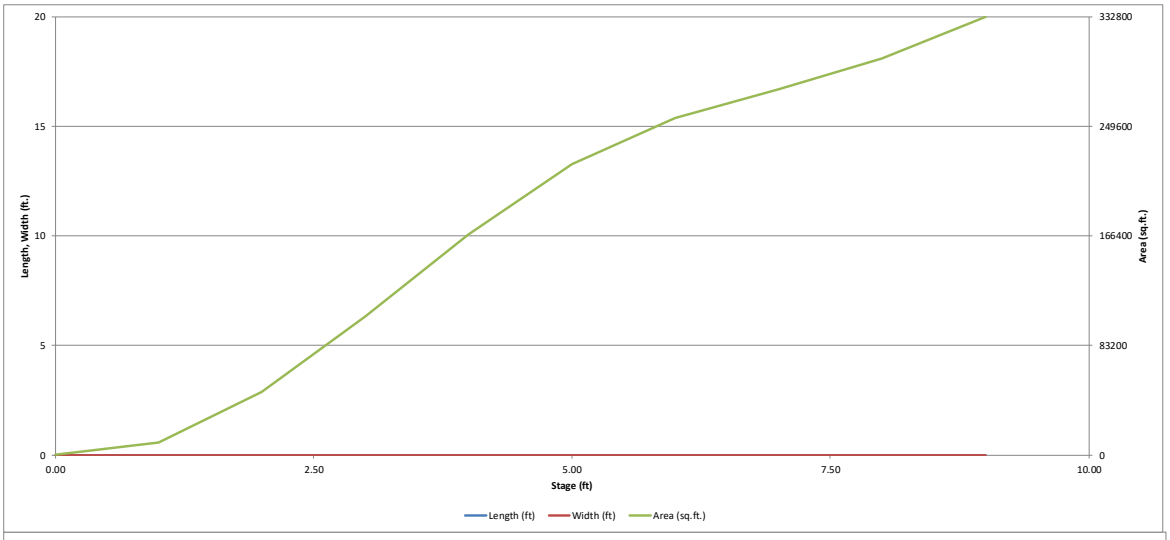
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

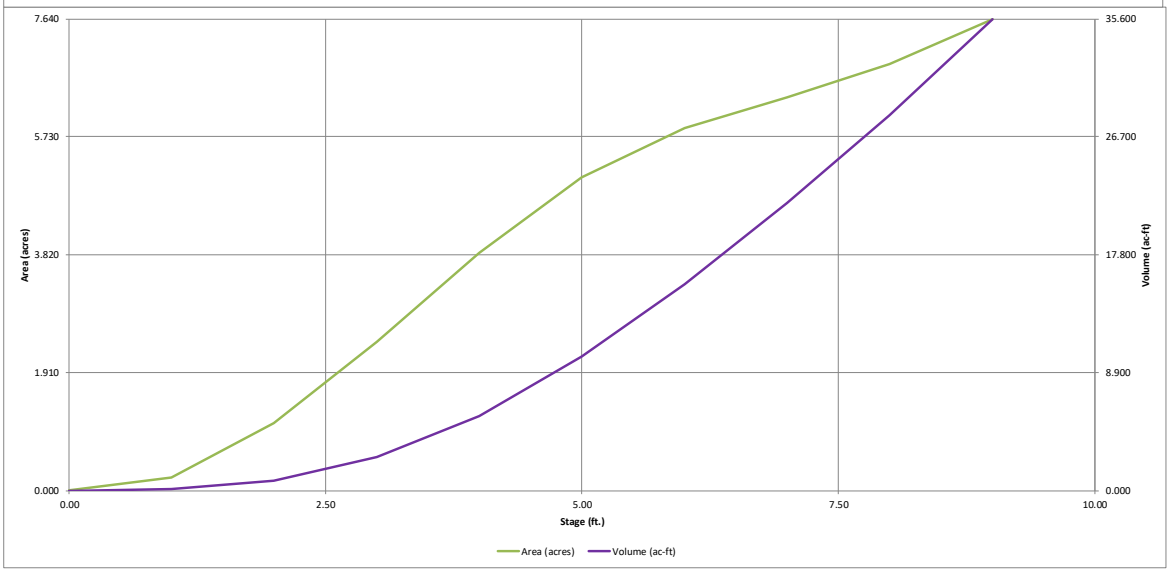
Depth Increment = ft

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)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	470	0.011		
6026	--	1.00	--	--	--	9,193	0.211	4,831	0.111
6027	--	2.00	--	--	--	47,523	1.091	33,189	0.762
6028	--	3.00	--	--	--	105,030	2.411	109,465	2.513
6029	--	4.00	--	--	--	167,485	3.845	245,723	5.641
6030	--	5.00	--	--	--	220,930	5.072	439,930	10.099
6031	--	6.00	--	--	--	255,650	5.869	678,220	15.570
6032	--	7.00	--	--	--	277,365	6.367	944,728	21.688
6033	--	8.00	--	--	--	300,965	6.909	1,233,893	28.326
6034	--	9.00	--	--	--	332,445	7.632	1,550,598	35.597

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)





APPENDIX C – HYDRAULIC CALCULATIONS

C.2 OPEN CHANNELS

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, May 2 2023

Channel A - 5 YEAR

Trapezoidal

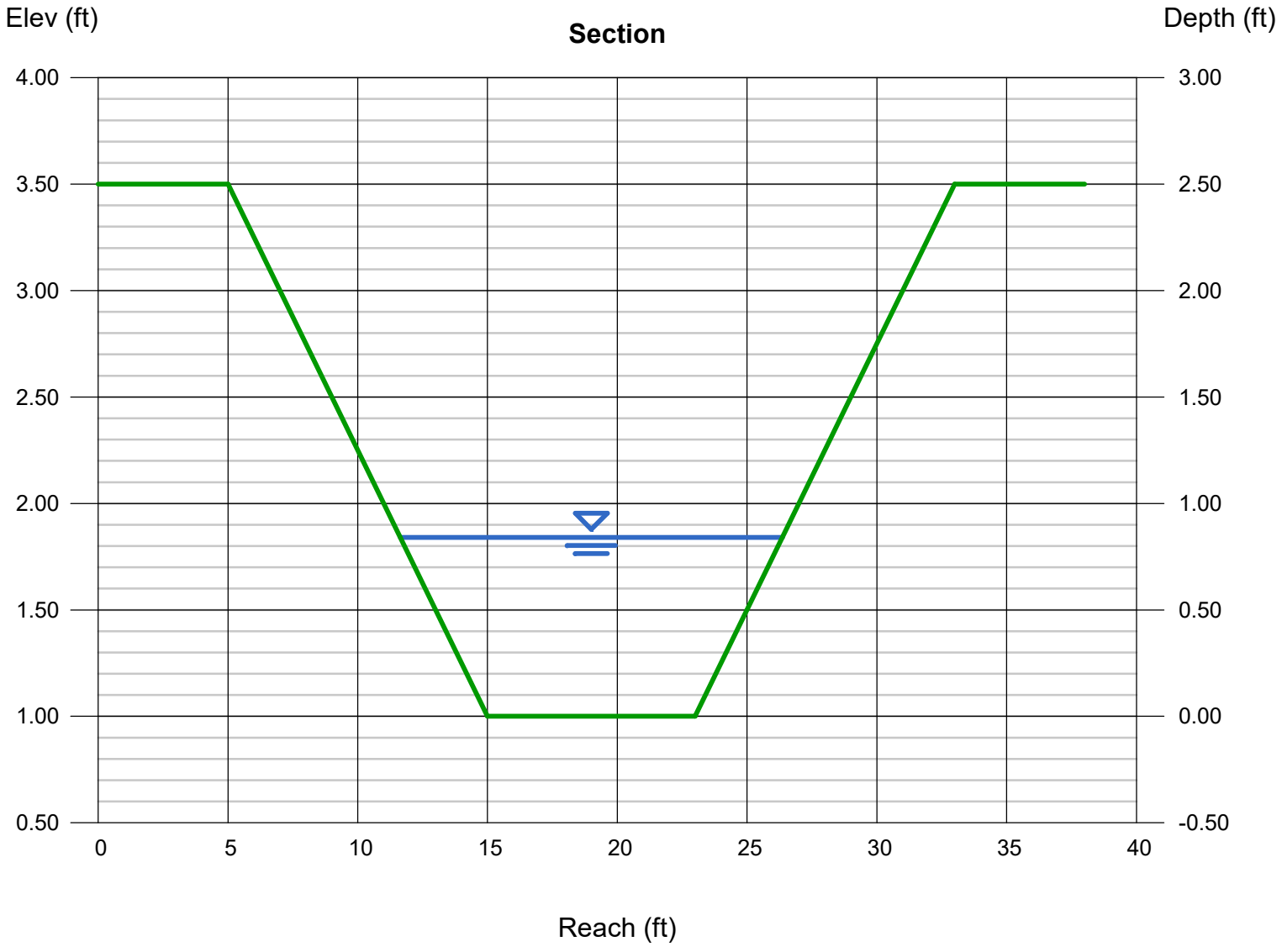
Bottom Width (ft)	= 8.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 2.50
Invert Elev (ft)	= 1.00
Slope (%)	= 0.60
N-Value	= 0.030

Calculations

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

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



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, May 2 2023

Channel A - 100 YEAR

Trapezoidal

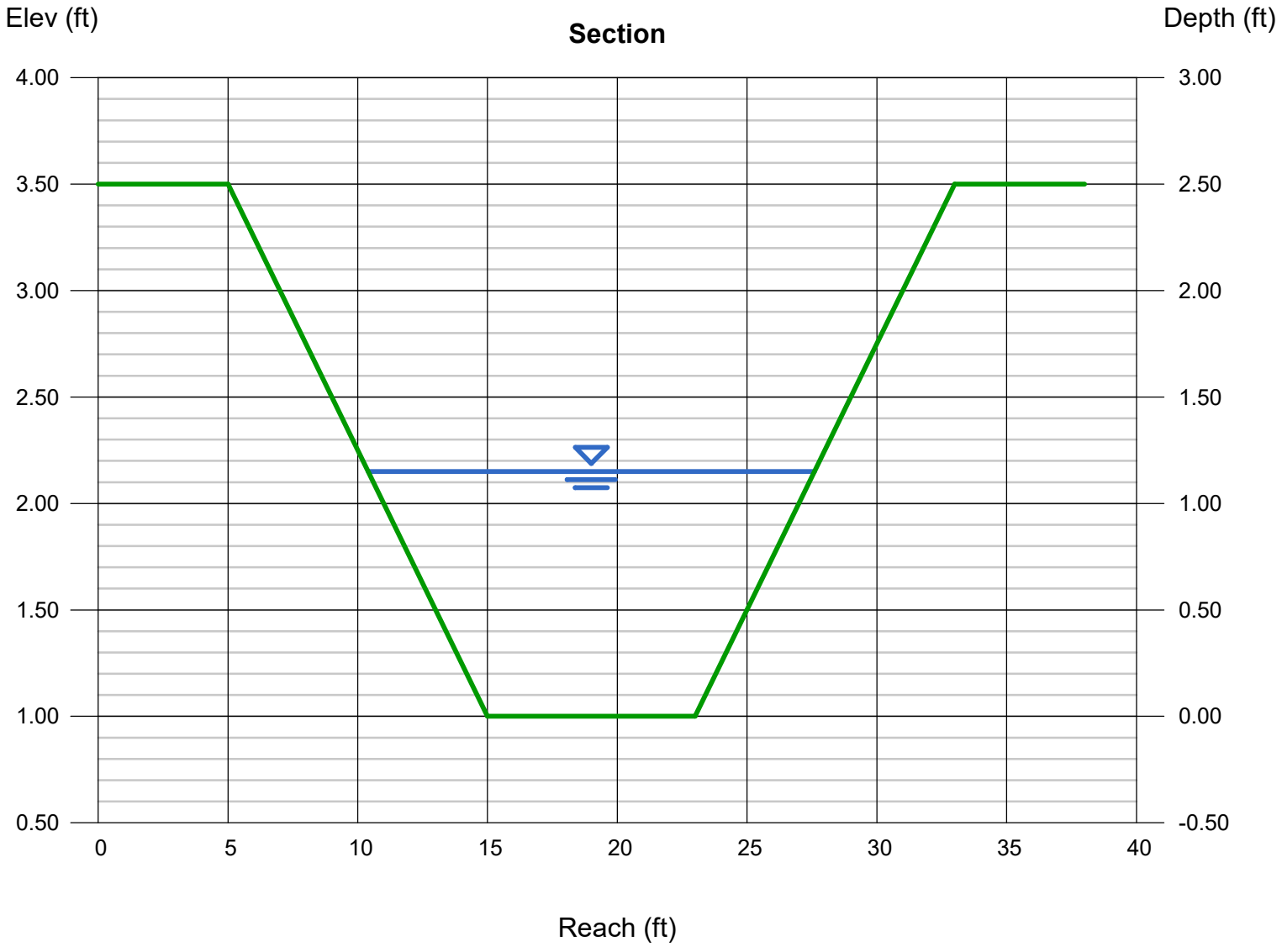
Bottom Width (ft)	= 8.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 2.50
Invert Elev (ft)	= 1.00
Slope (%)	= 0.60
N-Value	= 0.030

Calculations

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

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, Yc (ft)	= 0.90
Top Width (ft)	= 17.20
EGL (ft)	= 1.33



Channel Report

Channel B (Offsite) - 5 YEAR

Trapezoidal

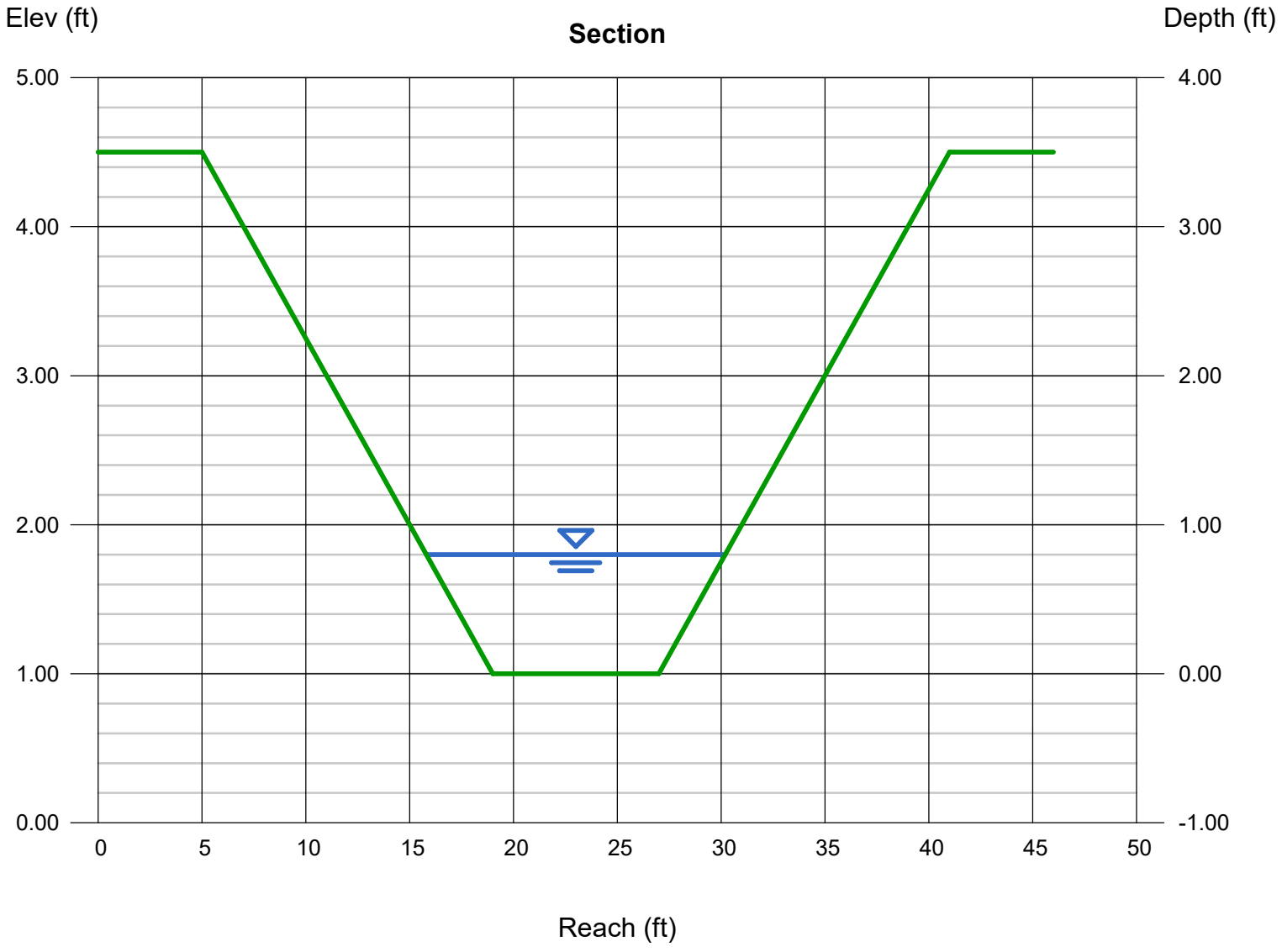
Bottom Width (ft)	= 8.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 3.50
Invert Elev (ft)	= 1.00
Slope (%)	= 0.60
N-Value	= 0.030

Calculations

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

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



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, May 1 2023

Channel B (Offsite) - 100 YEAR

Trapezoidal

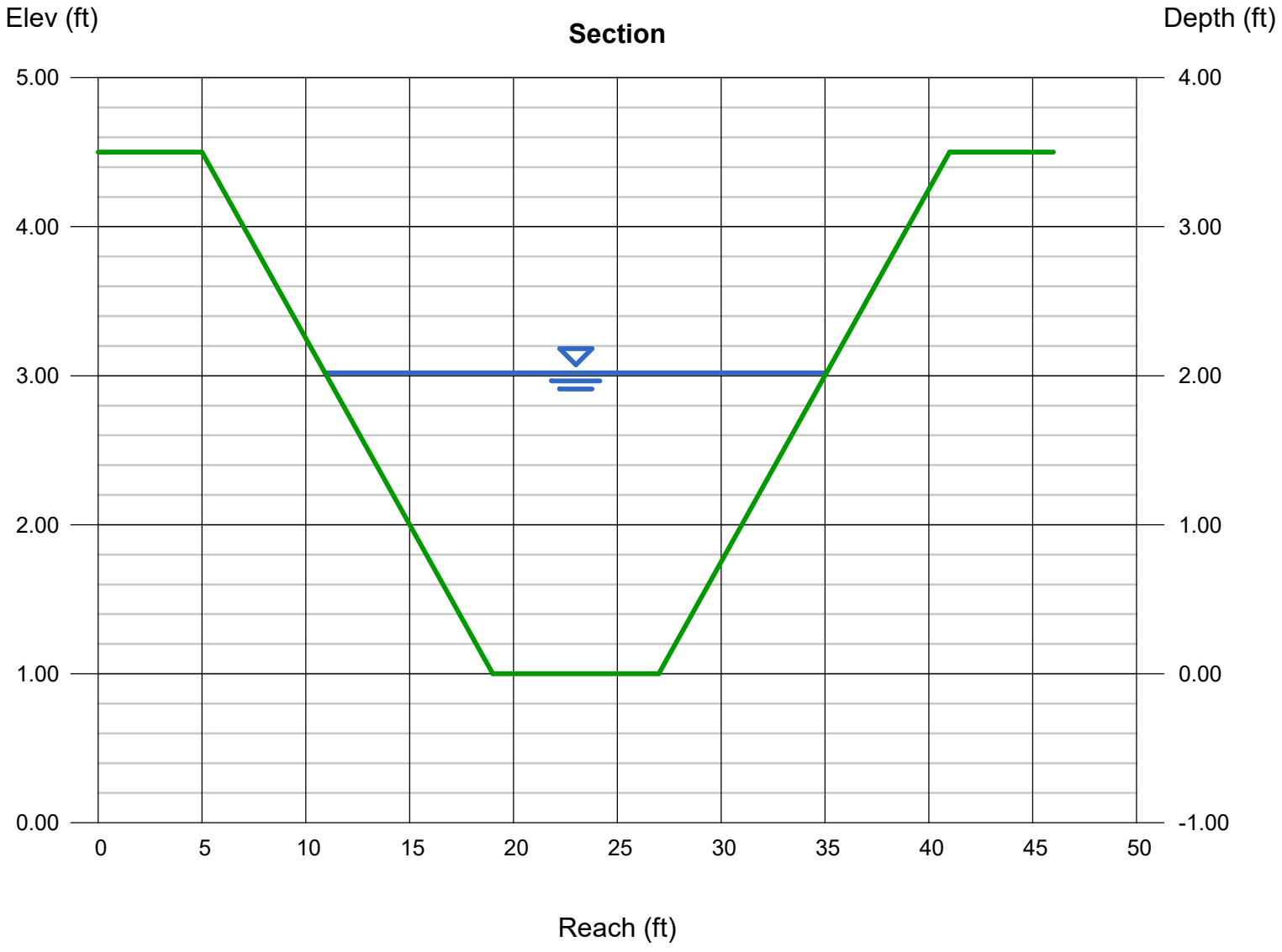
Bottom Width (ft)	= 8.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 3.50
Invert Elev (ft)	= 1.00
Slope (%)	= 0.60
N-Value	= 0.030

Calculations

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

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



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, May 1 2023

Channel D - 5 YEAR FLOW

Trapezoidal

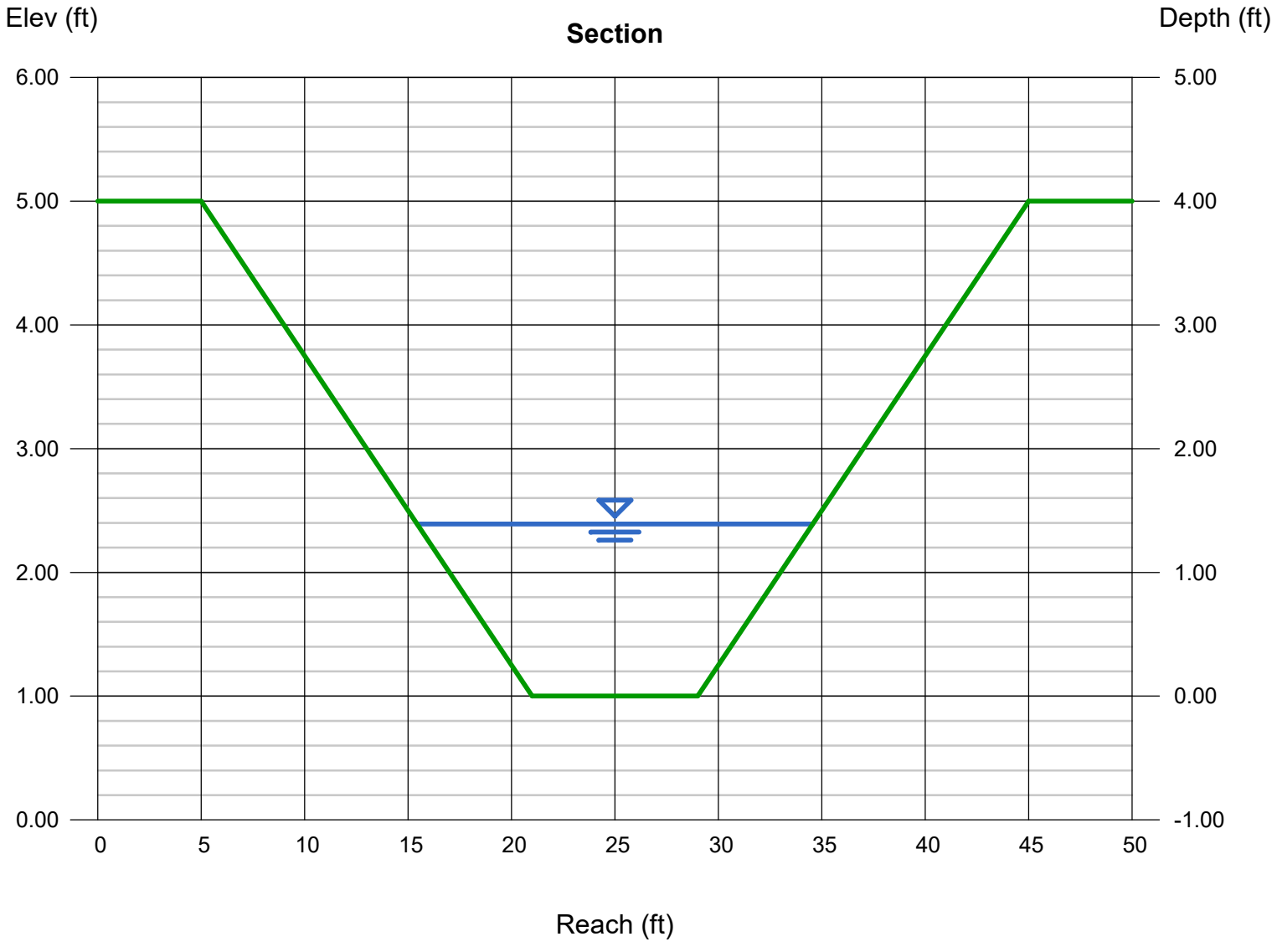
Bottom Width (ft)	= 8.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 4.00
Invert Elev (ft)	= 1.00
Slope (%)	= 0.40
N-Value	= 0.030

Calculations

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

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



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, May 1 2023

Channel D - 100 YEAR

Trapezoidal

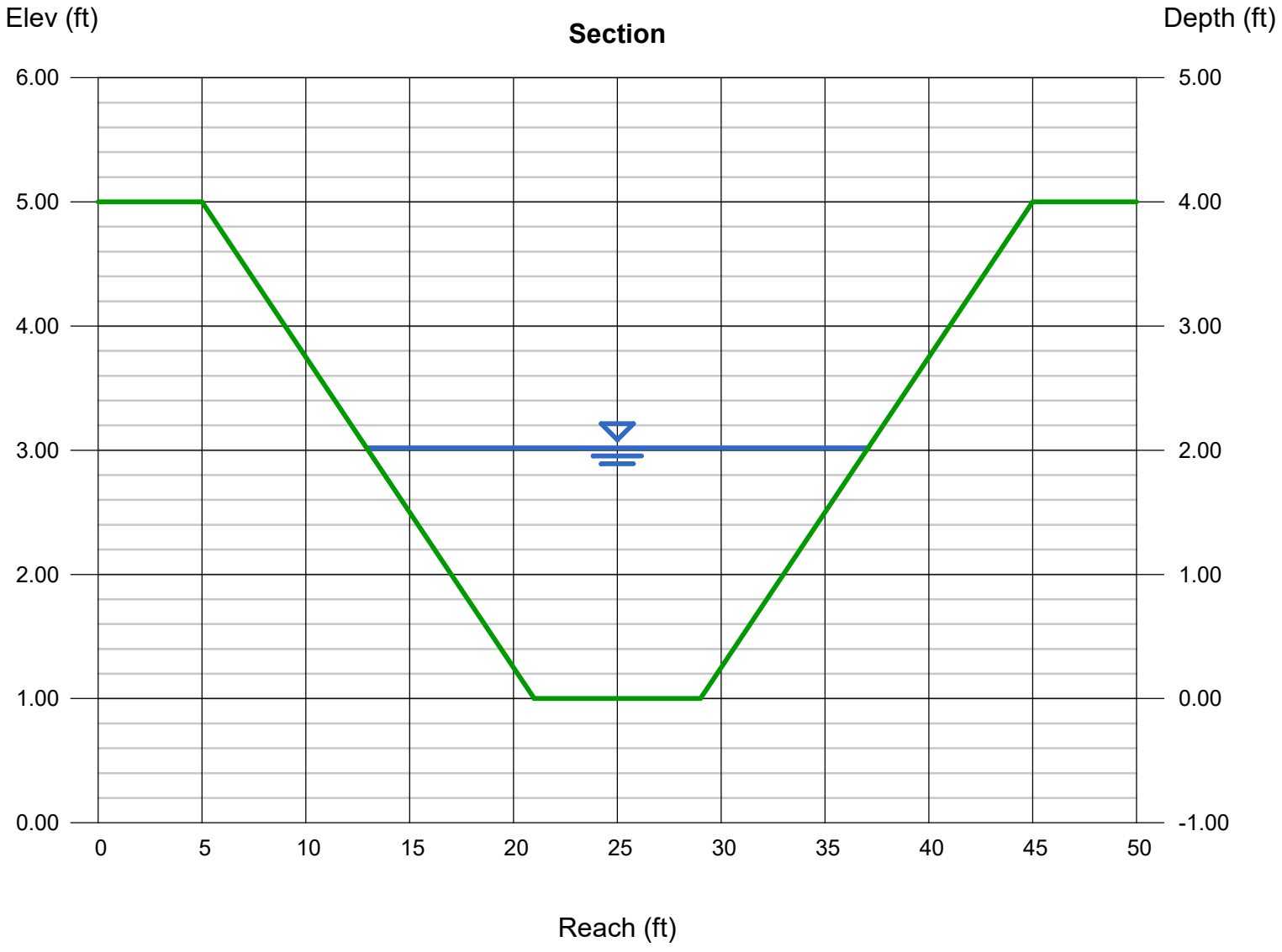
Bottom Width (ft)	= 8.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 4.00
Invert Elev (ft)	= 1.00
Slope (%)	= 0.40
N-Value	= 0.030

Calculations

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

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



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, May 1 2023

Channel E (Offsite & Pond D) - 5 YEAR

Trapezoidal

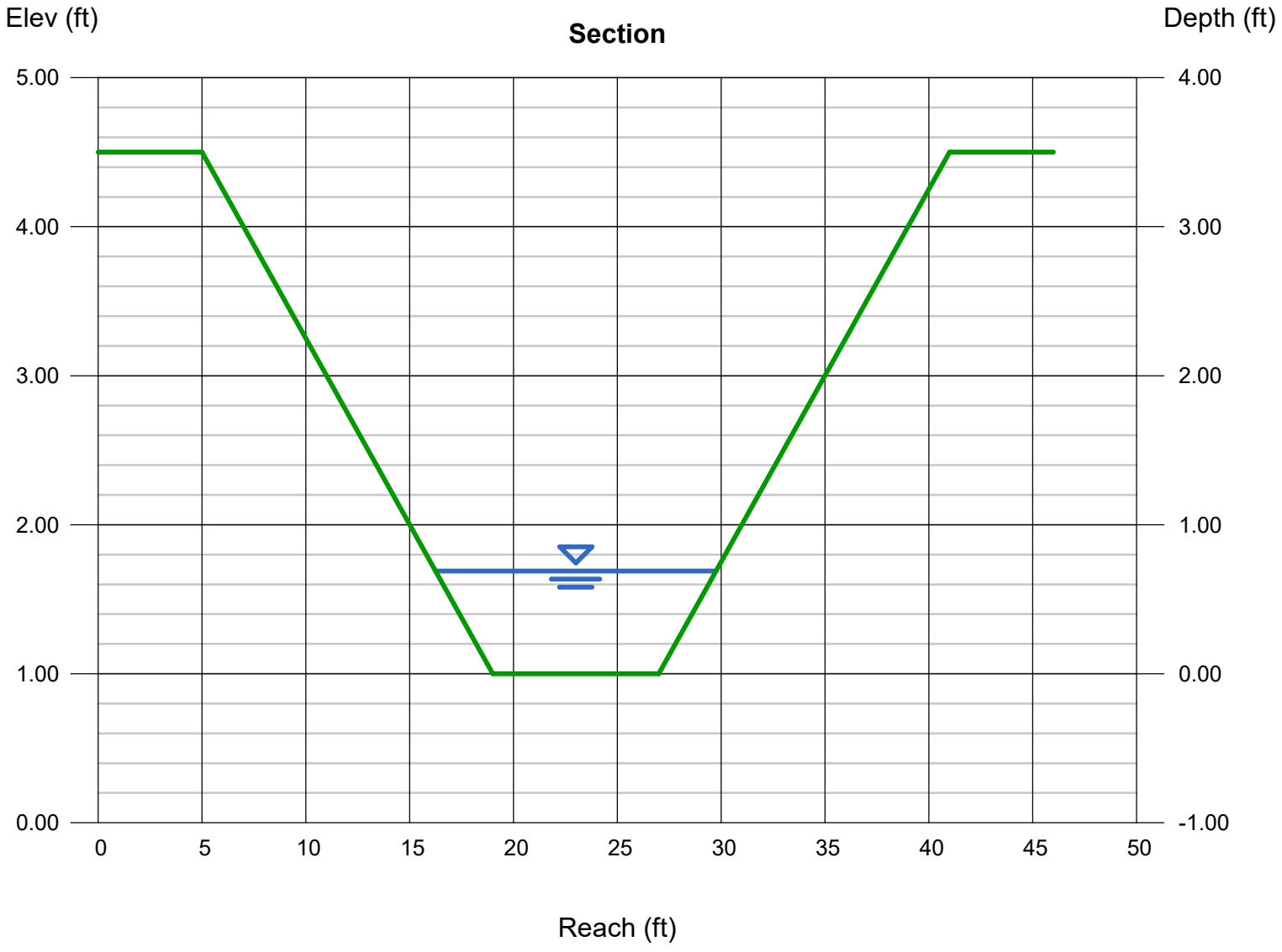
Bottom Width (ft)	= 8.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 3.50
Invert Elev (ft)	= 1.00
Slope (%)	= 0.60
N-Value	= 0.030

Calculations

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

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



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, May 1 2023

Channel E (Offsite & Pond D) - 100 YEAR

Trapezoidal

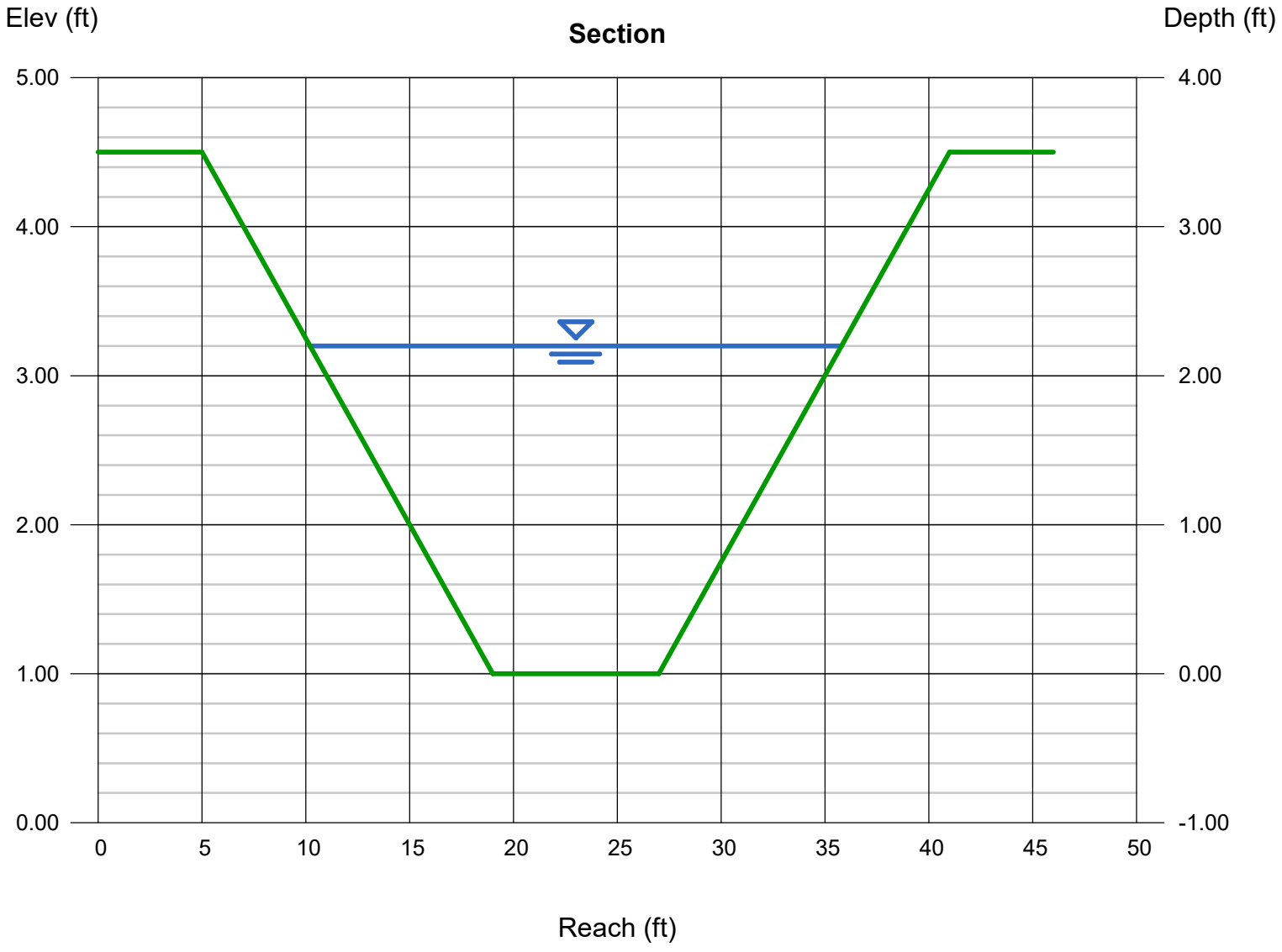
Bottom Width (ft)	= 8.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 3.50
Invert Elev (ft)	= 1.00
Slope (%)	= 0.60
N-Value	= 0.030

Calculations

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

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



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, May 2 2023

Channel F - 5 YEAR

Trapezoidal

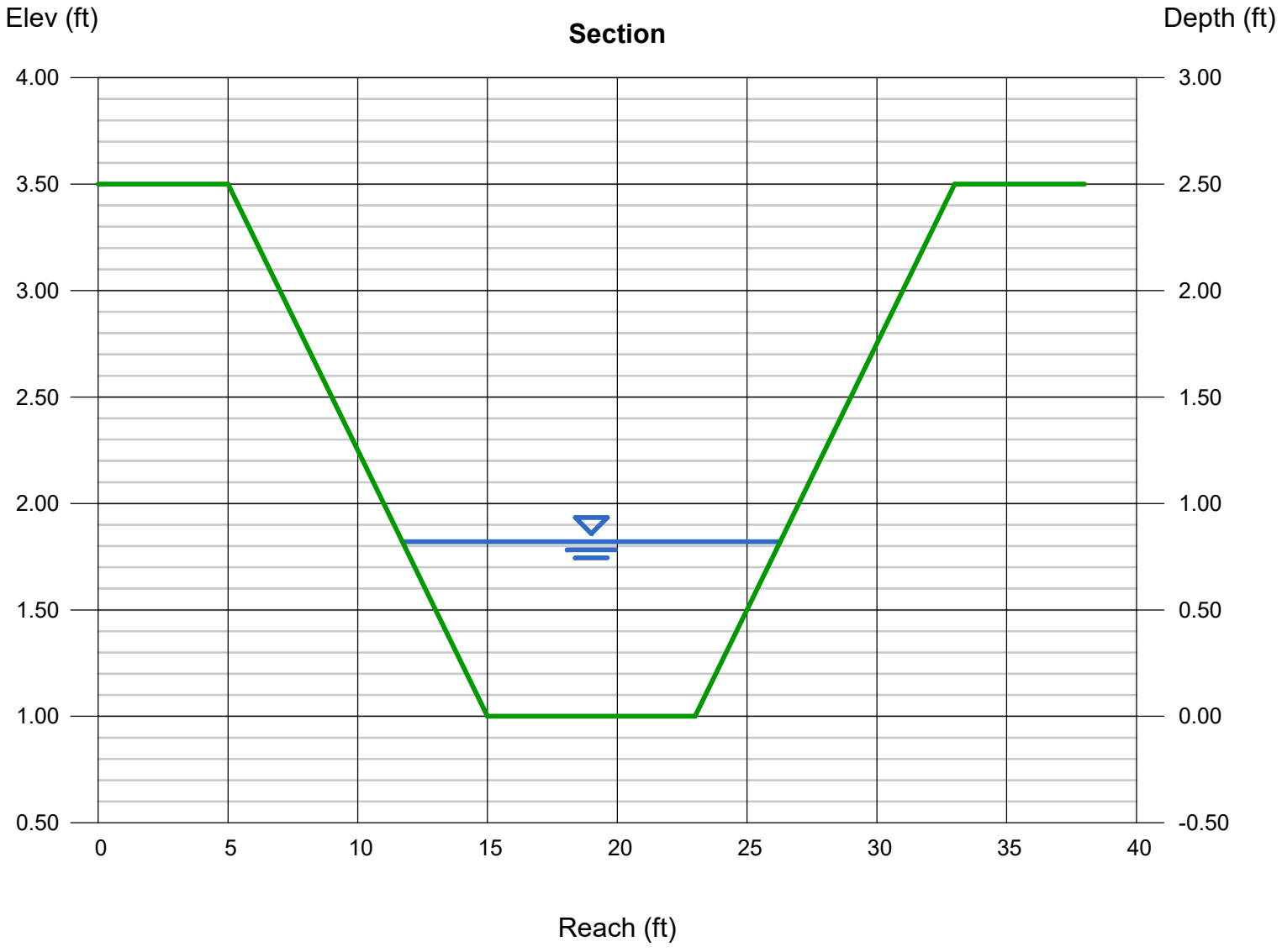
Bottom Width (ft)	= 8.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 2.50
Invert Elev (ft)	= 1.00
Slope (%)	= 0.50
N-Value	= 0.030

Calculations

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

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, Yc (ft)	= 0.59
Top Width (ft)	= 14.56
EGL (ft)	= 0.92



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, May 2 2023

Channel F - 100 YEAR

Trapezoidal

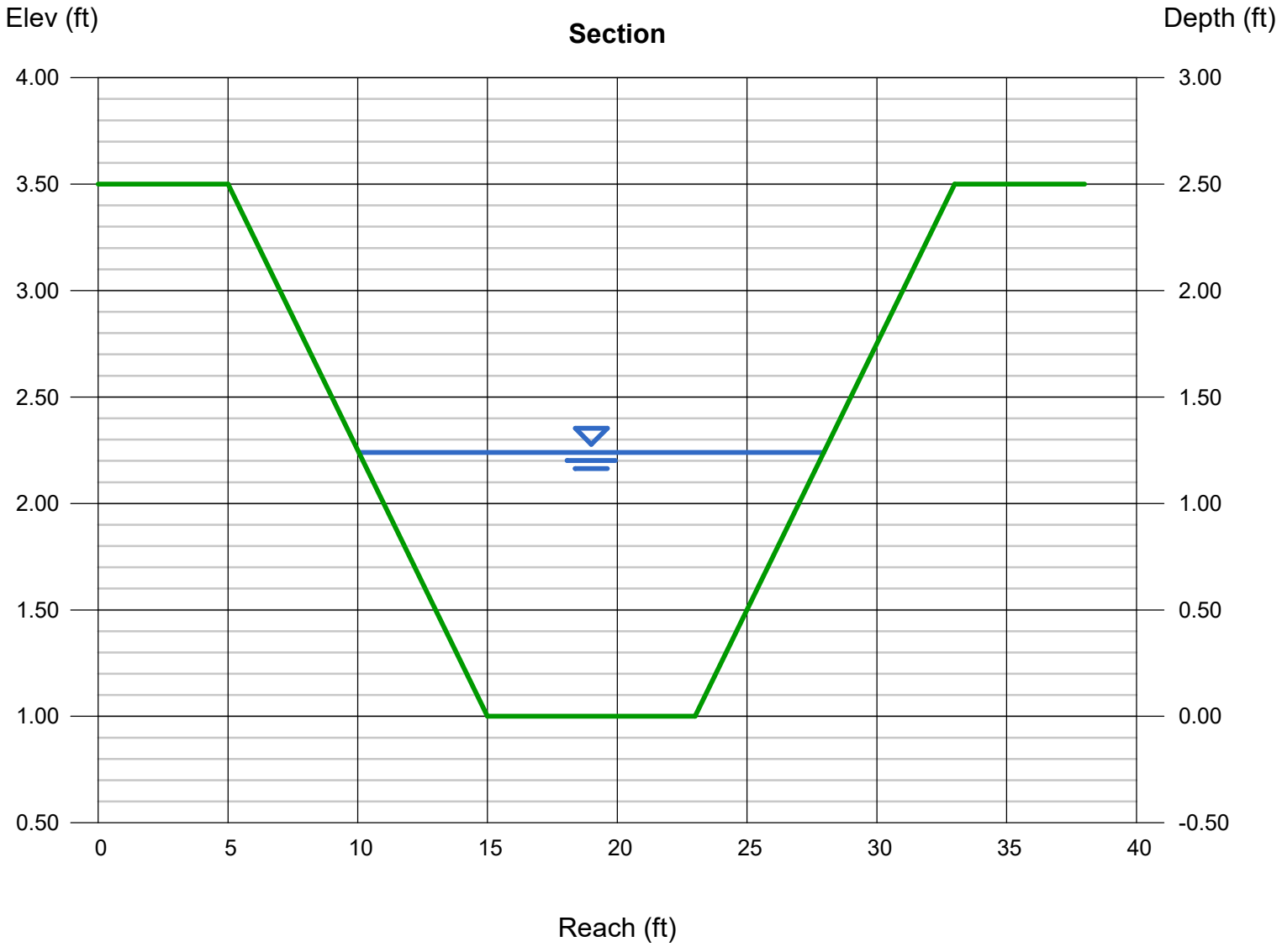
Bottom Width (ft)	= 8.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 2.50
Invert Elev (ft)	= 1.00
Slope (%)	= 0.50
N-Value	= 0.030

Calculations

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

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, Yc (ft)	= 0.93
Top Width (ft)	= 17.92
EGL (ft)	= 1.40



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, May 2 2023

Channel G - 5 YEAR

Trapezoidal

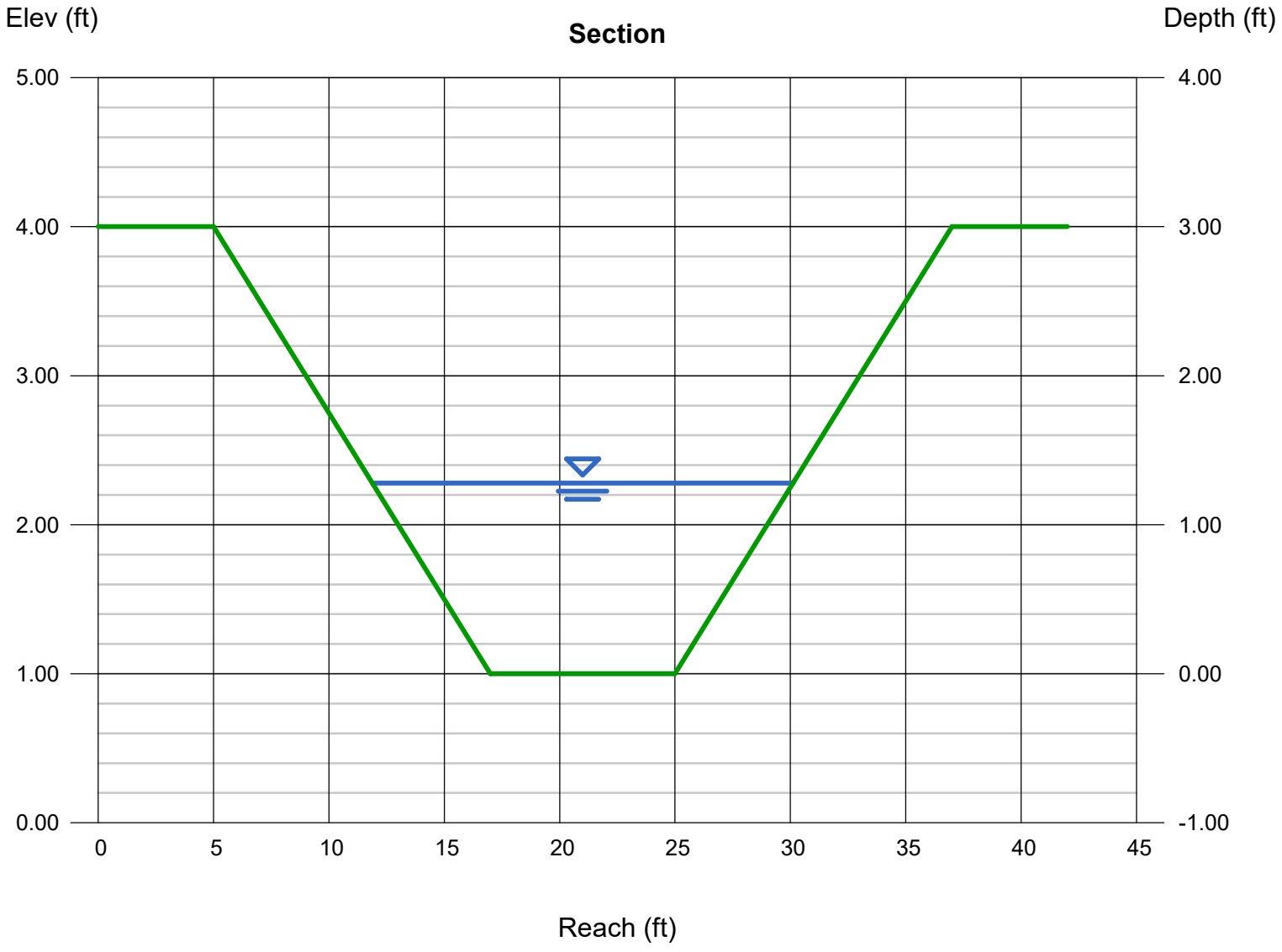
Bottom Width (ft)	= 8.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 1.00
Slope (%)	= 0.60
N-Value	= 0.030

Calculations

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

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



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, May 2 2023

Channel G - 100 YEAR

Trapezoidal

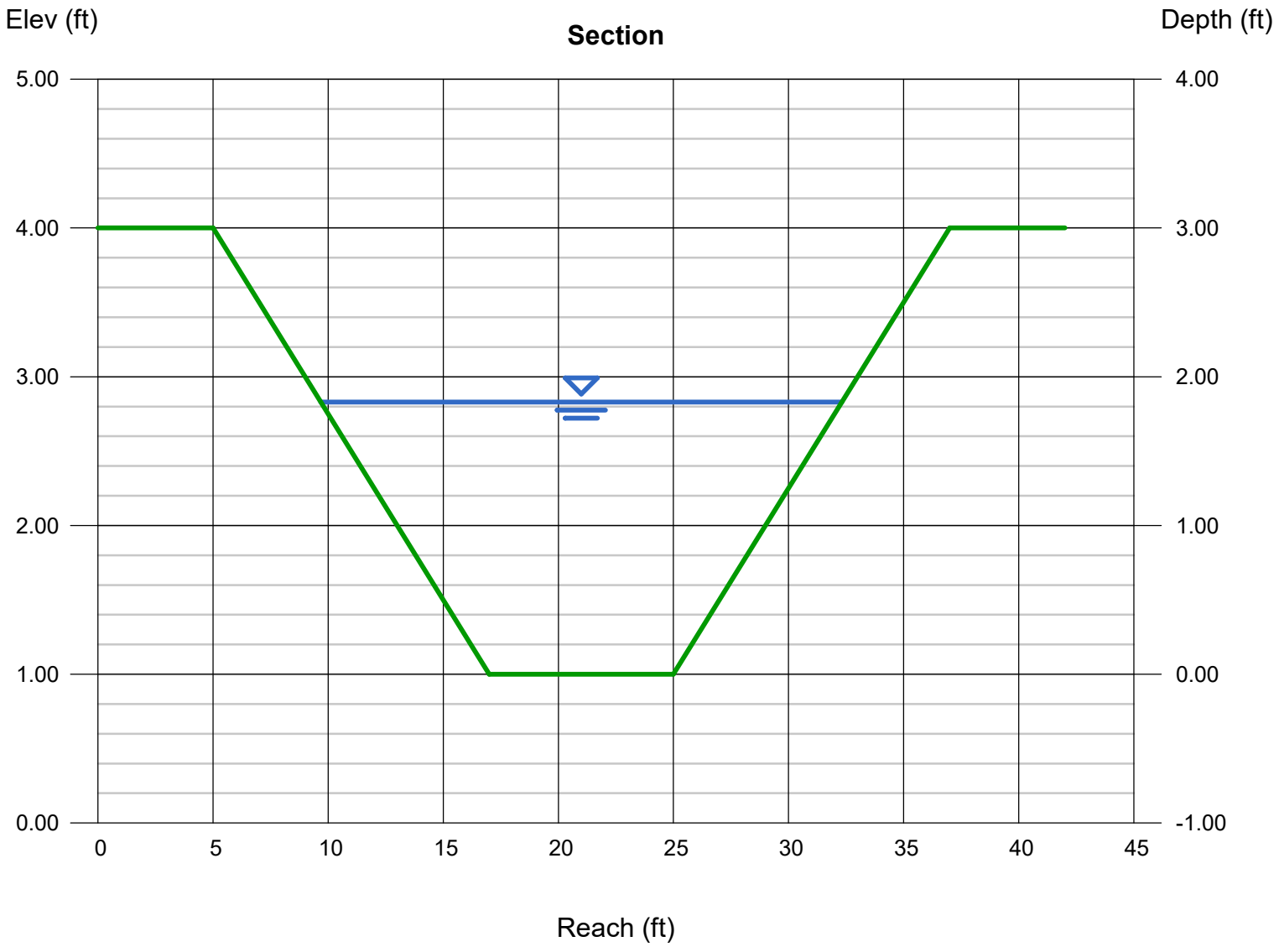
Bottom Width (ft)	= 8.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 1.00
Slope (%)	= 0.60
N-Value	= 0.030

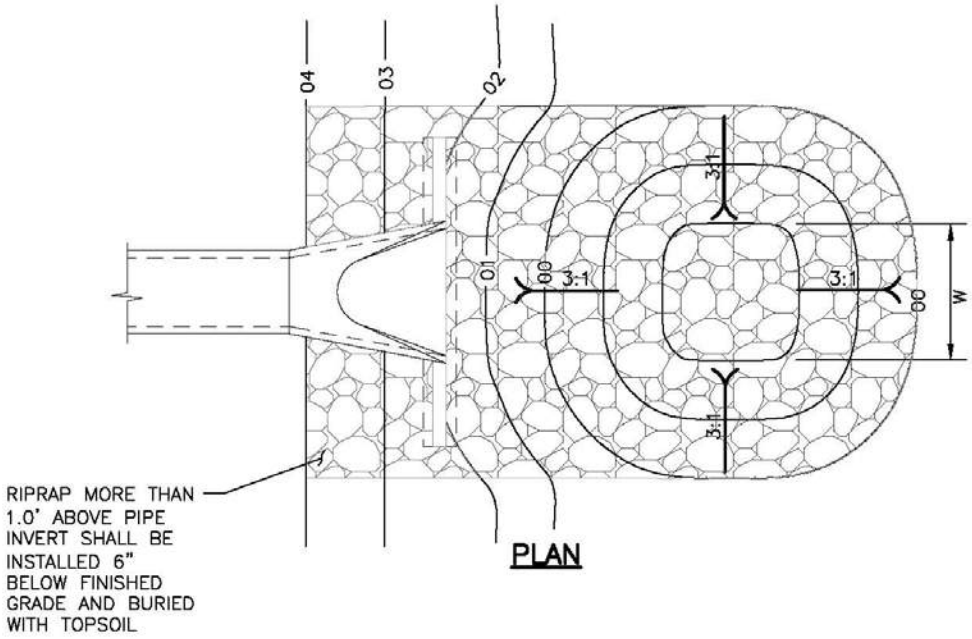
Calculations

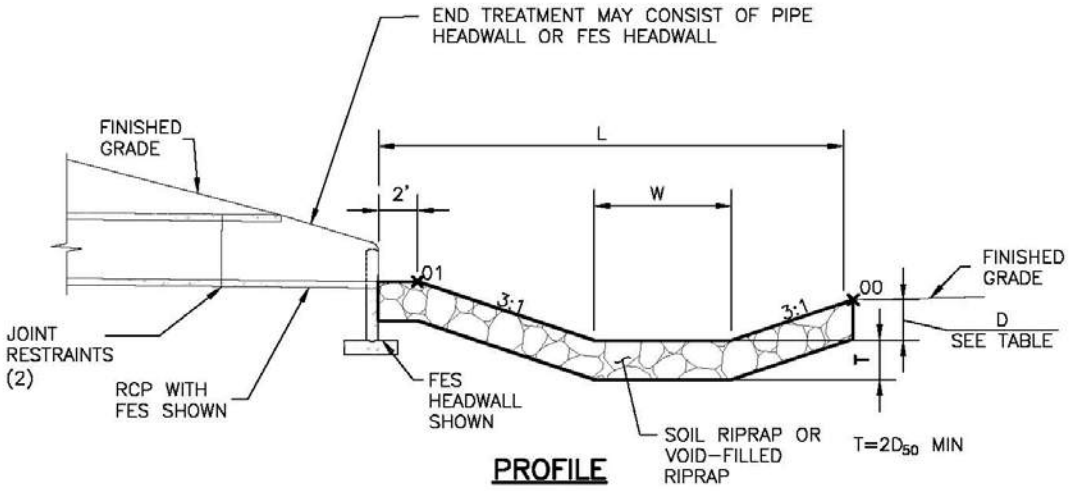
Compute by:	Known Q
Known Q (cfs)	= 121.70

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







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

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, May 2 2023

CULVERT 1 - OFFSITE F1

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

Embankment

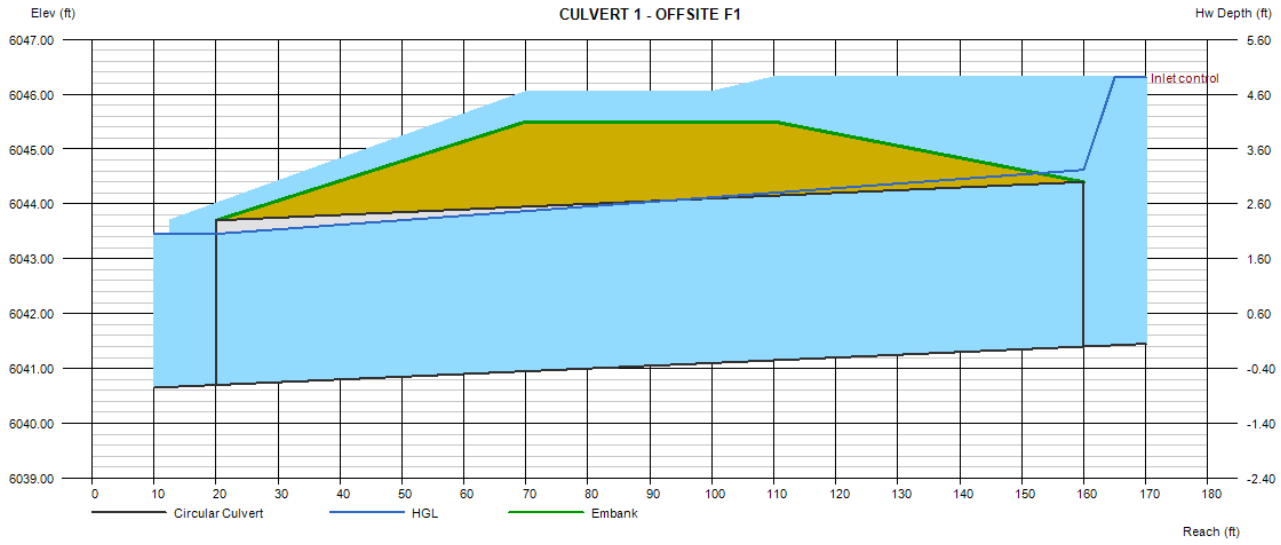
Top Elevation (ft)	=	6045.50
Top Width (ft)	=	40.00
Crest Width (ft)	=	40.00

Calculations

Qmin (cfs)	=	49.50
Qmax (cfs)	=	149.50
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	149.50
Qpipe (cfs)	=	60.39
Qovertop (cfs)	=	89.11
Veloc Dn (ft/s)	=	8.89
Veloc Up (ft/s)	=	8.54
HGL Dn (ft)	=	6043.45
HGL Up (ft)	=	6044.62
Hw Elev (ft)	=	6046.31
Hw/D (ft)	=	1.64
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, May 2 2023

CULVERT 2 - OFFSITE F1 & 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

Embankment

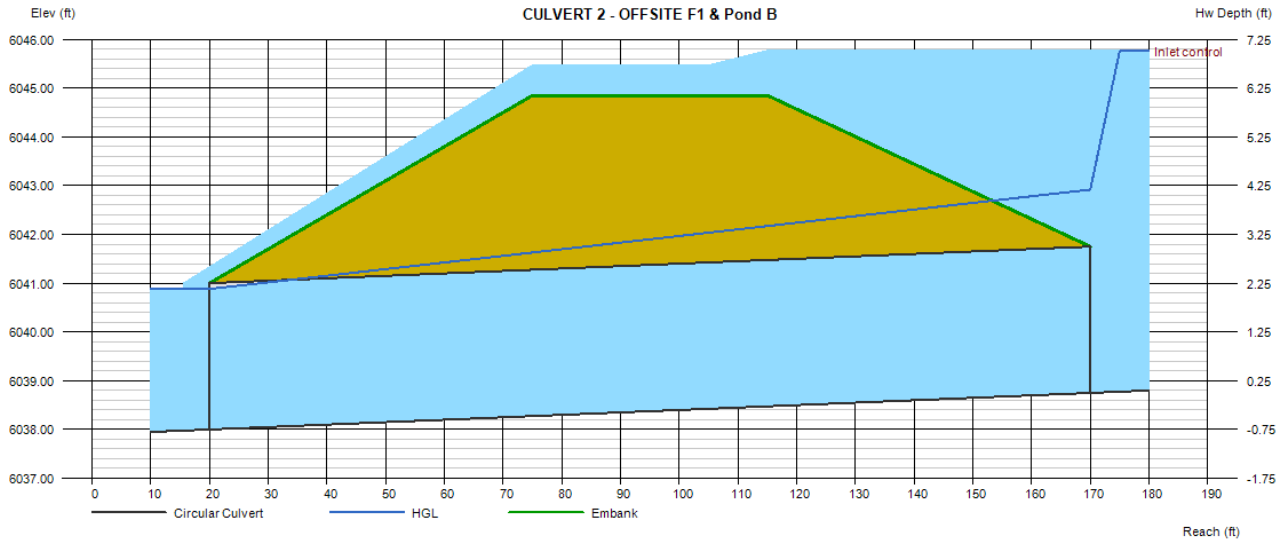
Top Elevation (ft)	=	6044.85
Top Width (ft)	=	40.00
Crest Width (ft)	=	40.00

Calculations

Qmin (cfs)	=	85.70
Qmax (cfs)	=	185.70
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	185.70
Qpipe (cfs)	=	79.29
Qovertop (cfs)	=	106.41
Veloc Dn (ft/s)	=	11.37
Veloc Up (ft/s)	=	11.22
HGL Dn (ft)	=	6040.88
HGL Up (ft)	=	6042.92
Hw Elev (ft)	=	6045.76
Hw/D (ft)	=	2.34
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, May 2 2023

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

Embankment

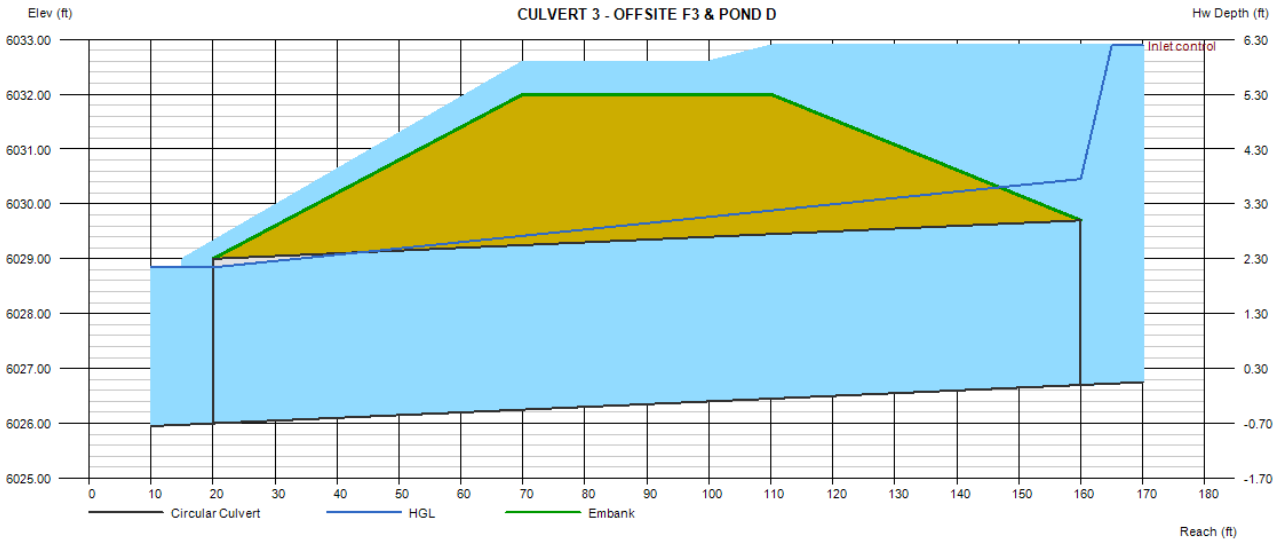
Top Elevation (ft)	=	6032.00
Top Width (ft)	=	40.00
Crest Width (ft)	=	40.00

Calculations

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

Highlighted

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

Embankment

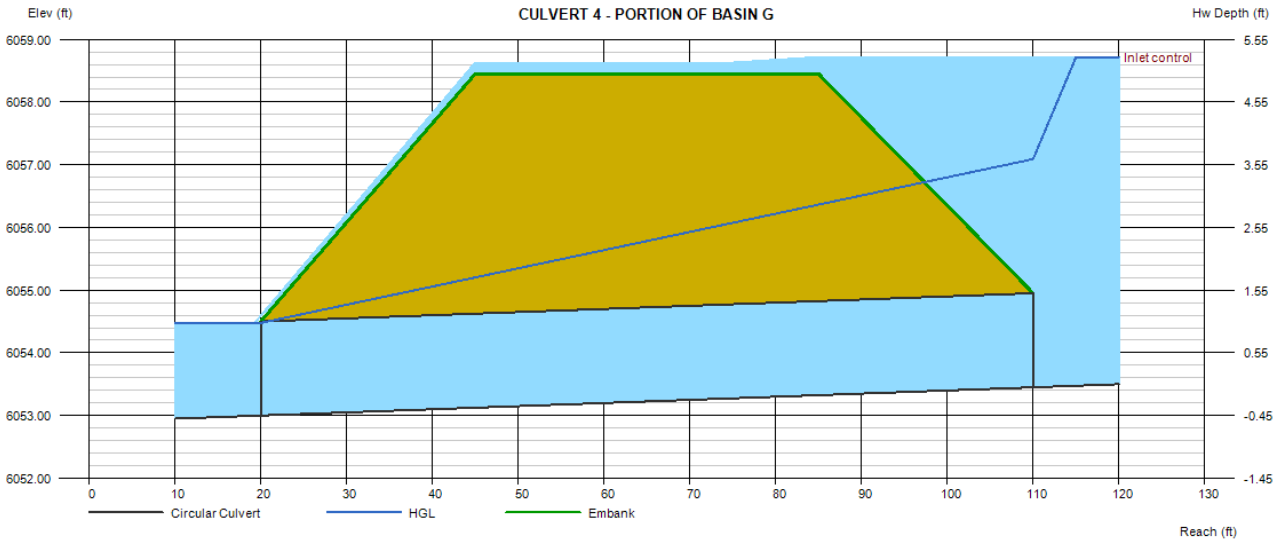
Top Elevation (ft)	=	6058.45
Top Width (ft)	=	40.00
Crest Width (ft)	=	40.00

Calculations

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

Highlighted

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

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, May 2 2023

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

Embankment

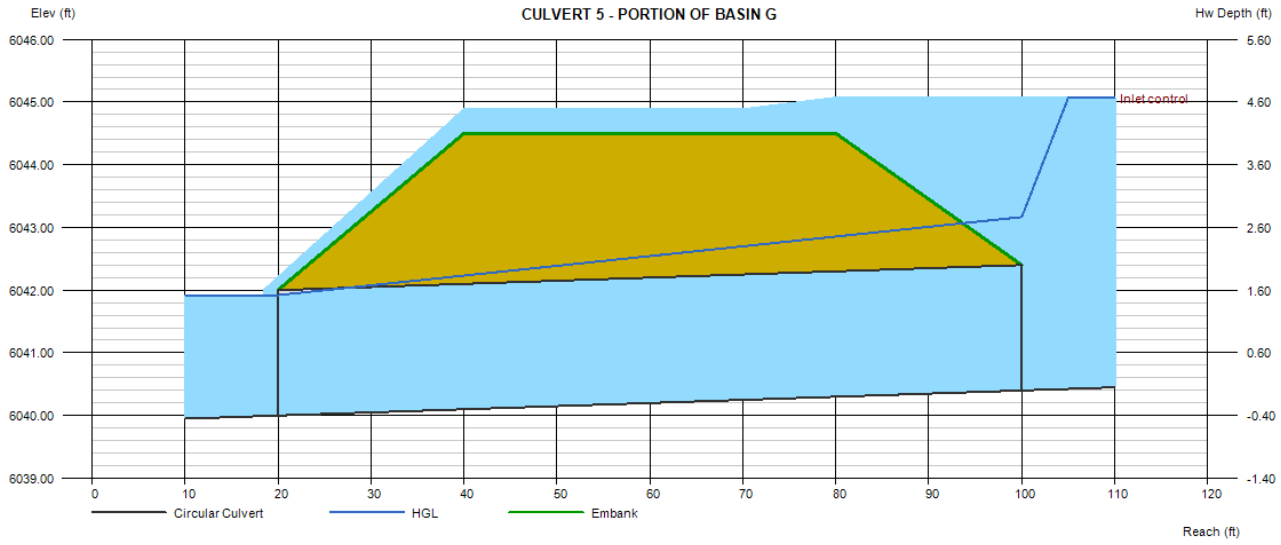
Top Elevation (ft)	=	6044.50
Top Width (ft)	=	40.00
Crest Width (ft)	=	40.00

Calculations

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

Highlighted

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

Embankment

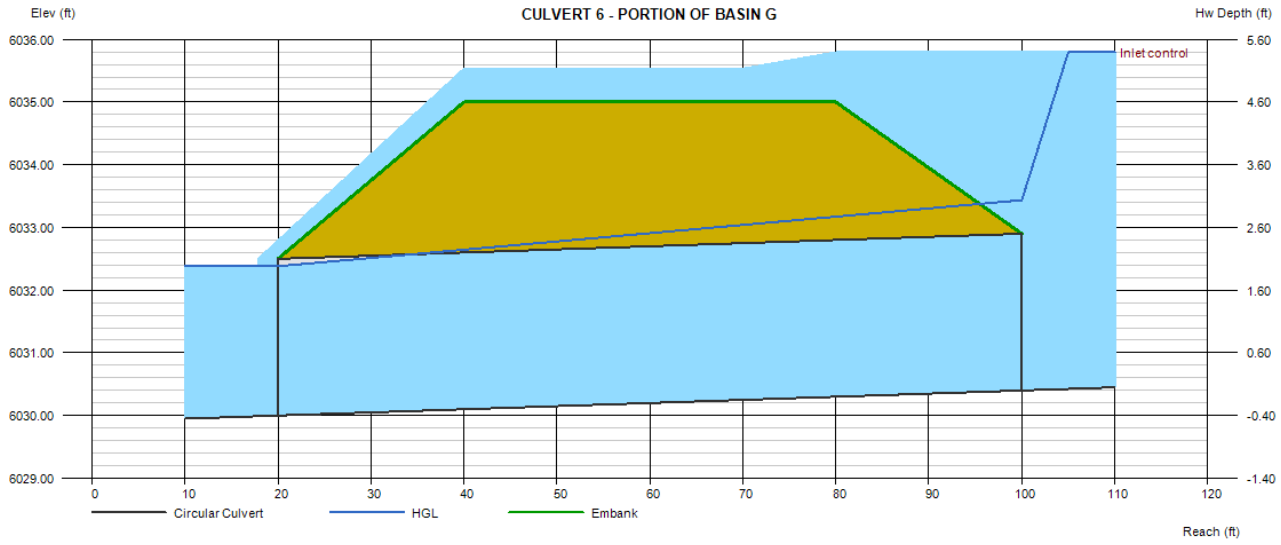
Top Elevation (ft)	=	6035.00
Top Width (ft)	=	40.00
Crest Width (ft)	=	40.00

Calculations

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

Highlighted

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

Embankment

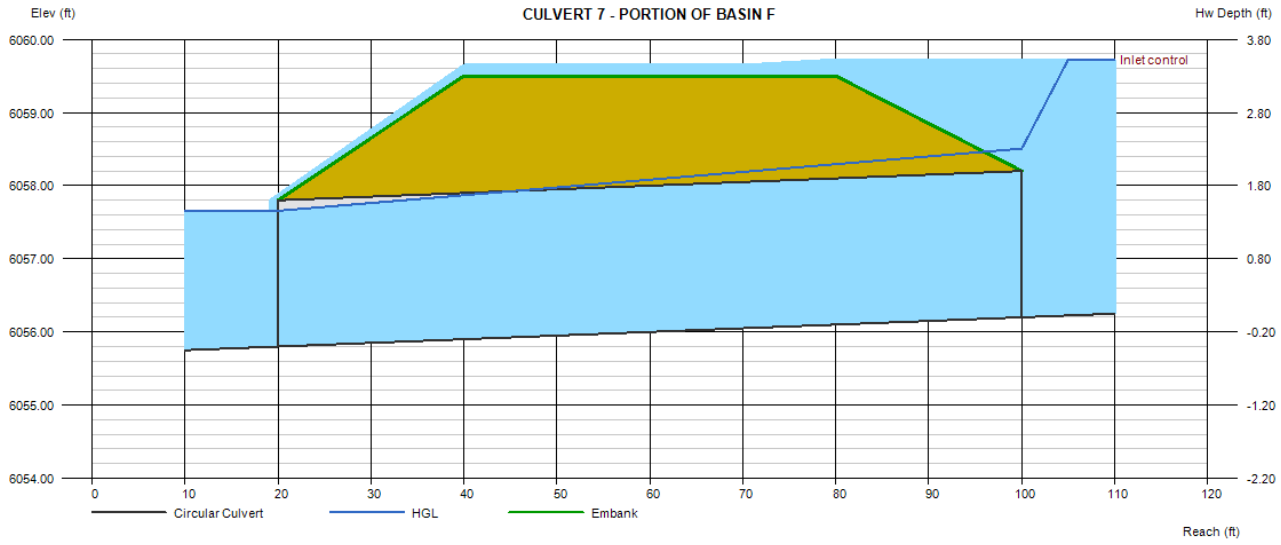
Top Elevation (ft)	=	6059.50
Top Width (ft)	=	40.00
Crest Width (ft)	=	40.00

Calculations

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

Highlighted

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

Embankment

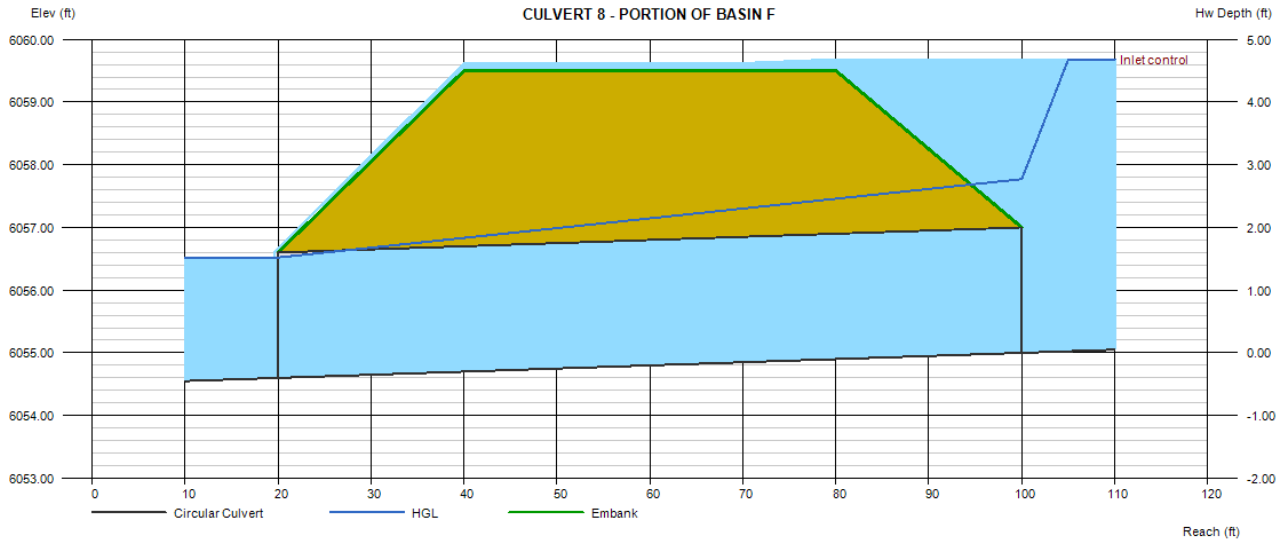
Top Elevation (ft)	=	6059.50
Top Width (ft)	=	40.00
Crest Width (ft)	=	40.00

Calculations

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

Highlighted

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



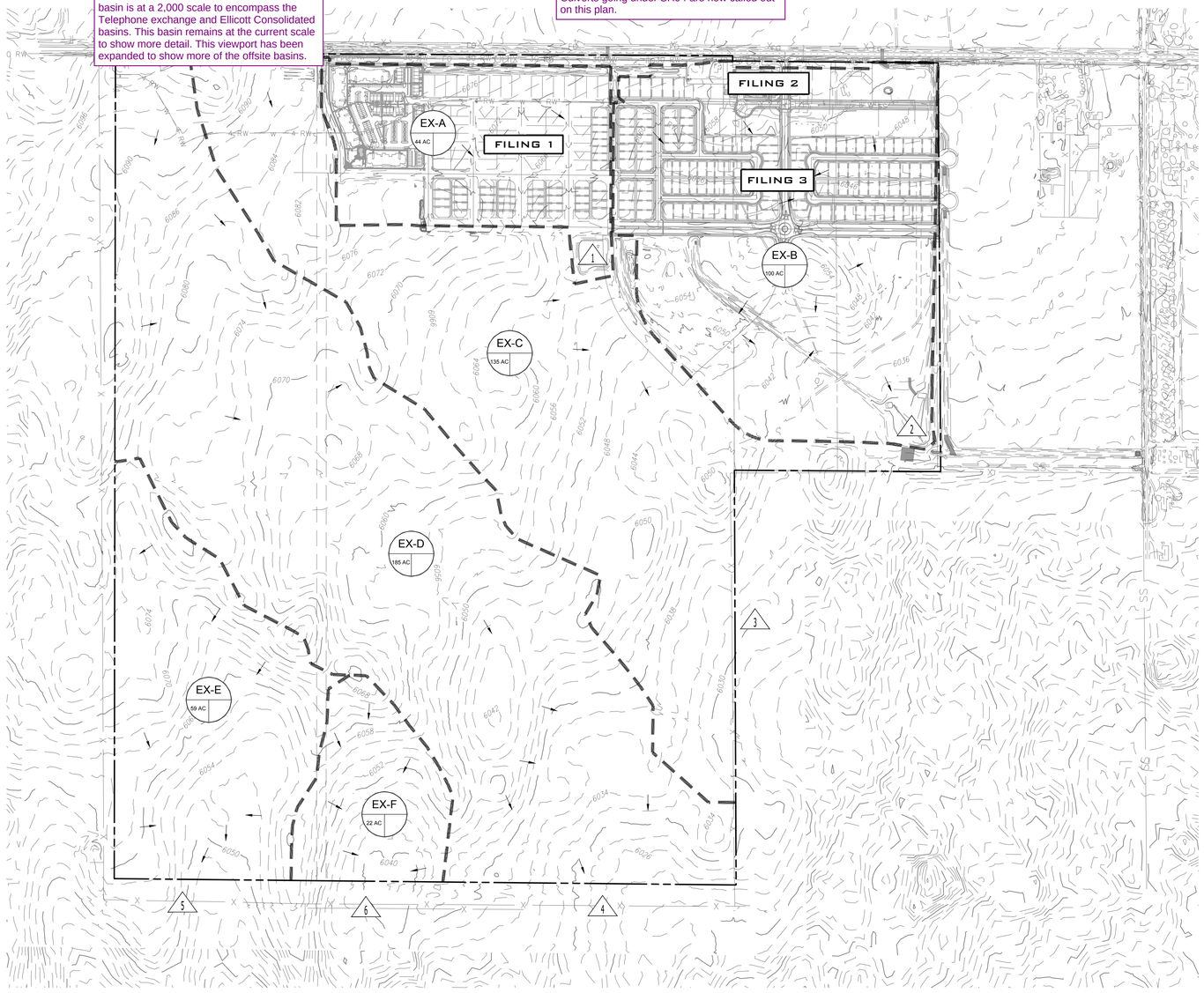
APPENDIX D – DRAINAGE MAPS

please also show offsite basins with flow arrows on the existing drainage maps

An additional sheet called "Overall Historic Drainage Basin" has been added as DR1 and this sheet is now DR2. The overall historic basin is at a 2,000 scale to encompass the Telephone exchange and Ellicott Consolidated basins. This basin remains at the current scale to show more detail. This viewport has been expanded to show more of the offsite basins.

label the locations of the existing CMP on the northern boundary conveying off-site flow onto the site.

Culverts going under SH94 are now called out on this plan.



EXISTING	DESCRIPTION	PROPOSED
	PROPERTY LINE	
5825	MAJOR CONTOUR	5825
5822	MINOR CONTOUR	5822
	DRAINAGE BASIN LABEL * BASIN LABEL ** TRIBUTARY AREA (AC)	C–1* 1**
	FLOW ARROW	
	DESIGN POINT	1
	DRAINAGE AREA BOUNDARY	

BASIN SUMMARY TABLE

BASIN	AREA (AC)	5-YR (CFS)	100-YR (CFS)
EX-A	44.00	151.65	184.80
EX-B	100.00	169.04	271.50
EX-C	135.00	34.51	151
EX-D	185.00	40.27	176.20
EX-E	59.00	14.14	61.80
EX-F	22.00	6.65	29.10
OFF-1	44.00	5.90	25.80

provide a design point summary table with 5 and 100yr flows

Design point summary table has been provided.

0 400' 800' 1200'

SCALE: 1" = 400'

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

HISTORIC DRAINAGE PLAN

NO. DR1

label the locations of the existing CMP on the northern boundary conveying off-site flow onto the site and provide design points with runoff values.

Culverts are now labeled accordingly.

The road names have changed in the Sketch plan.

Road names have been updated accordingly.

call out Pond C (Interim Condition)

Pond C will now remain in the same location, but re-shaped for aesthetics.

please identify in the narrative how this offsite flow from EC10 will be conveyed to the south to channel E. Filing 3 indicated a channel and series of culverts. Will this be piped under what appears to be a roadway? please address and provide the appropriate analysis for the conveyance. Please also address the emergency overflow conveyances through the site per ECM 6.2.12.0

The flow from EC10 is proposed to be piped along the same alignment as channel E as identified in the Filing 3 report. This description can be found in section IV.A.

text states 110 acres

Basin D bubble has been corrected.

Channel E (see SF2219)

Channel label has been added with a note that stormwater will be piped in ultimate condition.

Channel F? (see SF2219)

Channel label has been revised accordingly.

Show Telephone Exchange and Ellicott Consolidated drainage basin limits

The Telephone Exchange and Ellicott Consolidated drainage basin limits are now shown. These basins are better seen on the newly provided overall historic drainage map.

Approved Plans already call out a Channel F onsite

This channel F is now called Channel H.

provide a design point summary table with 5 and 100yr flows

Design point summary table has been provided.

EXISTING	DESCRIPTION	PROPOSED
	PROPERTY LINE	
	EASEMENT	
	EDGE OF PAVEMENT	
	VERTICAL CURB AND GUTTER	
	SPILL GUTTER	
	TRANSITION GUTTER	
5825	MAJOR CONTOUR	5825
5822	MINOR CONTOUR	5822
	STORM SEWER PIPE	
	DRAINAGE BASIN LABEL * BASIN LABEL ** TRIBUTARY AREA (AC)	
	FLOW ARROW	
	DESIGN POINT	
	DRAINAGE AREA BOUNDARY	

BASIN SUMMARY TABLE

Basin	Area (acres)	5-yr (cfs)	100-yr (cfs)
A	81.00	77.52	141.3
B	106.00	95.10	195.3
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

SCALE: 1" = 300'

NO.	REVISION	BY	DATE

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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
OVERALL PROPOSED DRAINAGE MAP

NO.
DR2

EC12
30.3 AC

EC11
354 AC

OFF-1
44 AC

A
81 AC

B
106 AC

EC
10
32
0 A
C

CO 94

NEW LOG ROAD

FILING 5

FILING 1

MAYBERRY DRIVE

BOULEVARD A

POND A

1

PROPOSED VARYING BERM TO MITIGATE OFFSITE FLOWS

CHANNEL A

CULVERT 4 (APPROX. 18")

MATCH SHEET DR3

MATCH SHEET DR5

6100
6090
6080
6074
6072
6076
6060
6050

EXISTING	DESCRIPTION	PROPOSED
	PROPERTY LINE	
	EASEMENT	
	EDGE OF PAVEMENT	
	VERTICAL CURB AND GUTTER	
	SPILL GUTTER	
	TRANSITION GUTTER	
5825	MAJOR CONTOUR	5825
5822	MINOR CONTOUR	5822
	STORM SEWER PIPE	
	DRAINAGE BASIN LABEL * BASIN LABEL ** TRIBUTARY AREA (AC)	X* X**
	FLOW ARROW	
	DESIGN POINT	1
	DRAINAGE AREA BOUNDARY	

BASIN SUMMARY TABLE

Basin	Area (acres)	5-yr (cfs)	100-yr (cfs)
A	81.00	77.52	141.3
B	106.00	95.10	195.3
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

NORTH

0 200' 400' 600'

SCALE: 1" = 200'

NO.	REVISION	BY	DATE

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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.
DR3

EXISTING	DESCRIPTION	PROPOSED
	PROPERTY LINE	
	EASEMENT	
	EDGE OF PAVEMENT	
	VERTICAL CURB AND GUTTER	
	SPILL GUTTER	
	TRANSITION GUTTER	
5825	MAJOR CONTOUR	5825
5822	MINOR CONTOUR	5822
	STORM SEWER PIPE	
	DRAINAGE BASIN LABEL * BASIN LABEL ** TRIBUTARY AREA (AC)	X* X**
	FLOW ARROW	
	DESIGN POINT	1
	DRAINAGE AREA BOUNDARY	

BASIN SUMMARY TABLE

Basin	Area (acres)	5-yr (cfs)	100-yr (cfs)
A	81.00	77.52	141.3
B	106.00	95.10	195.3
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

0 200' 400' 600'

SCALE: 1" = 200'

NO.	REVISION	BY	DATE

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DENVER, COLORADO 80204
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MAYBERRY SKETCH PLAN

SITE ADDRESS: MAYBERRY, COLORADO SPRINGS
EL PASO COUNTY

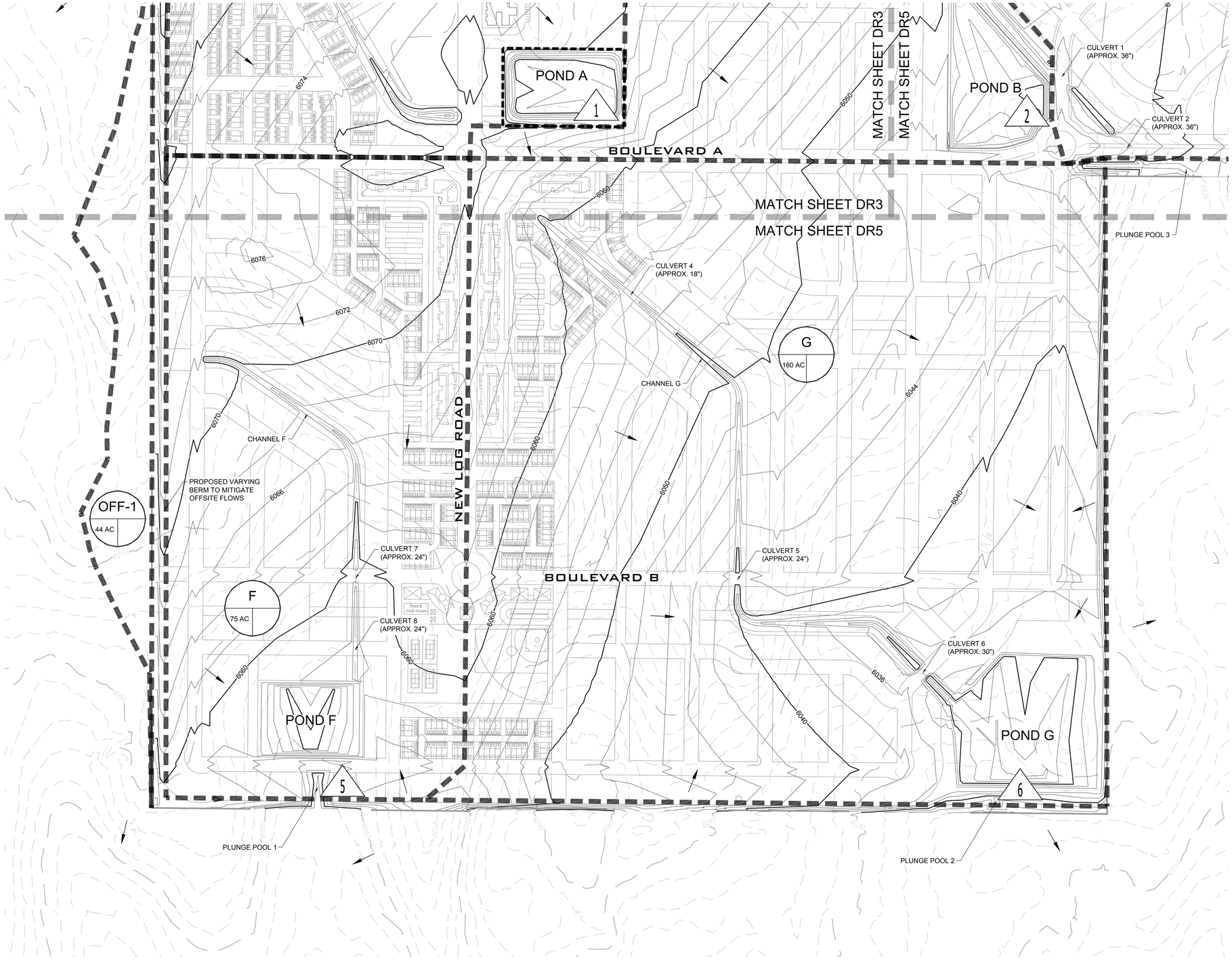
PREPARED FOR: MAYBERRY COMMUNITIES, LLC
3296 DEVINE HEIGHTS #208
COLORADO SPRINGS, CO 80922

EXHIBIT

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

PROPOSED DRAINAGE MAP

NO. DR4



EXISTING	DESCRIPTION	PROPOSED
5825	MAJOR CONTOUR	5825
5822	MINOR CONTOUR	5822
	STORM SEWER PIPE	
	DRAINAGE BASIN LABEL * BASIN LABEL ** TRIBUTARY AREA (AC)	X* X**
	FLOW ARROW	
	DESIGN POINT	1
	DRAINAGE AREA BOUNDARY	

BASIN SUMMARY TABLE

Basin	Area (acres)	5-yr (cfs)	100-yr (cfs)
A	81.00	77.52	141.3
B	106.00	95.10	195.3
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

0 200' 400' 600'

SCALE: 1" = 200'

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. DR5

APPENDIX E – REFERENCED DRAINAGE REPORTS

SKP-05-005
Rev. app.

NEW DOC

MASTER DEVELOPMENT DRAINAGE PLAN
FOR
ELLICOTT 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:

JPS ENGINEERING

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

JPS Project No. 030502

ELLICOTT TOWN CENTER

MAJOR BASIN / HISTORIC DRAINAGE PLAN

ELLICOTT DRAINAGE BASIN (CHBS 1600)

ELLICOTT HIGHWAY

HANDLE ROAD

MIDDLE FORK BLACK SQUIRREL CREEK

LOG ROAD

ELLICOTT CONSOLIDATED DRAINAGE BASIN (CHBS 1200)

ELLICOTT TOWN CENTER PARCEL

FUTURE LOG ROAD

McDANIELS ROAD

SH 94

GIECK RANCH DRAINAGE BASIN (CHMS 0400)

HAEGLER RANCH DRAINAGE BASIN (CHMS 0200)

VIEWPOINT ESTATES PARCEL

ANTELOPE PARK RANCHETTES

TELEPHONE EXCHANGE DRAINAGE BASIN (CHWS 0200)

FUTURE BOX CULVERT CROSSING (3EA 10'X6' RCB'S)

APPROXIMATE 100-YEAR FLOODPLAIN LIMITS

WEST TRIBUTARY TO MIDDLE FORK OF BLACK SQUIRREL CREEK

EXISTING 3EA-30" CMP CULVERTS

EXISTING DETENTION POND

EXISTING 30" CMP CULVERTS (2 EA.)

EXISTING 30" CMP CULVERTS (3 EA.)

EC10 142.7 AC.

EC11 296 AC.

EC12 284 AC.

EC15 78 AC.

EC20 148 AC.

EC50 1258 AC.

OA1 66.8 AC.

OA2 257.88 AC.

OB1 33.7 AC.

A 58.20 AC.

A29 – AC.

A30 – AC.

A32 – AC.

B 183.8 AC.

C 123.04 AC.

D 154.8 AC.

BB 22.45 AC.

20 225 | 381

30 44 | 409

40 212 | 358

50 830 | 1405

1 5.0 | 34.8

RS 10000

RS 8565

RS 5584

RS 4361

RS 2115

RS 8587

RS 10969

RS 12835

RS 13635

RS 14986

LEGEND

OD1 296 AC. — DRAINAGE BASIN AREA (AC)

2 410 | 694 — DESIGN POINT 05 / 0100 (CFS)

MAJOR BASIN LINE

BASIN LINE

ORIGINAL SCALE: 1"=1000'

1000 0 1000 2000

JPS ENGINEERING

19 E. Willamette Ave.
Colorado Springs, CO
80903

PH: 719-477-9429
FAX: 719-471-0766

No	REVISION	BY	DATE

HORZ. 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
SHEET: EX1	

J:\projects\090001_Ellicott\CAD\dwg\Civil\Ex1.dwg Dec 01, 2005 - 8:59am

ELLICOTT TOWN CENTER
RATIONAL METHOD - DRAINAGE CALCULATIONS

DEVELOPED FLOWS

BASIN	DESIGN POINT	AREA (AC)	C		OVERLAND LENGTH (FT)	SLOPE (%)	Tco [1] (MIN)	CHANNEL LENGTH (FT)	CONVEYANCE COEFFICIENT K	SLOPE (%)	SCS [2] VELOCITY (FT/S)	Tt [3] (MIN)	TOTAL Tc [4] (MIN)	INTENSITY [5]		PEAK FLOW	
			5-YEAR [7]	100-YEAR [7]										5-YR (IN/HR)	100-YR (IN/HR)	Q5 [6] (CFS)	Q100 [6] (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 Tco = (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, Tt = (CHANNEL LENGTH/ SCS VELOCITY) / 60 SEC
4) Tc = Tco + Tt
*** 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

JPS Project No. 030502
PCD File No. VR2113

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

HISTORIC FLOWS

									Overland Flow			Channel flow							Time of	Total	Total	Peak Flow SCS	
BASIN	DESIGN POINT	AREA (AC)	AREA (SM)	RUNOFF COEFFICIENT (C5)	CURVE No. (CN)	S	Ia	PERCENT IMPERVIOUS (%)	LENGTH (FT)	SLOPE (%)	Tco [1] (MIN)	HIGH ELEV. (FT)	LOW ELEV. (FT)	H (FT)	CHANNEL LENGTH (FT)	CHANNEL LENGTH (MI)	SLOPE (%)	Tt [1] (MIN)	Concentration Tc [2] (MIN)	Lag Time Tl [2] (HR)	Lag Time Tl [2] (MIN)	Q5 [3] (CFS)	Q100 [3] (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 SCS	
BASIN	DESIGN POINT	AREA (AC)	AREA (SM)	RUNOFF COEFFICIENT (C5)	CURVE No. (CN)	S	Ia	PERCENT IMPERVIOUS (%)	LENGTH (FT)	SLOPE (%)	Tco [1] (MIN)	HIGH ELEV. (FT)	LOW ELEV. (FT)	H (FT)	CHANNEL LENGTH (FT)	CHANNEL LENGTH (MI)	SLOPE (%)	Tt [1] (MIN)	Concentration Tc [2] (MIN)	Lag Time Tl [2] (HR)	Lag Time Tl [2] (MIN)	Q5 [3] (CFS)	Q100 [3] (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 SCS	
BASIN	DESIGN POINT	AREA (AC)	AREA (SM)	RUNOFF COEFFICIENT (C5)	CURVE No. (CN)	S	Ia	PERCENT IMPERVIOUS (%)	LENGTH (FT)	SLOPE (%)	Tco [1] (MIN)	HIGH ELEV. (FT)	LOW ELEV. (FT)	H (FT)	CHANNEL LENGTH (FT)	CHANNEL LENGTH (MI)	SLOPE (%)	Tt [1] (MIN)	Concentration Tc [2] (MIN)	Lag Time Tl [2] (HR)	Lag Time Tl [2] (MIN)	Q5 [3] (CFS)	Q100 [3] (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

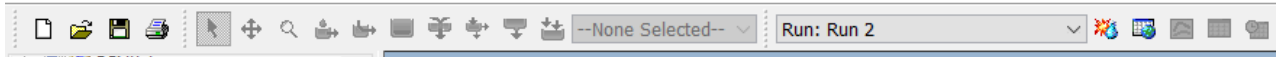
									Overland Flow			Channel flow							Time of	Total	Total	Peak Flow SCS	
BASIN	DESIGN POINT	AREA (AC)	AREA (SM)	RUNOFF COEFFICIENT (C5)	CURVE No. (CN)	S	Ia	PERCENT IMPERVIOUS (%)	LENGTH (FT)	SLOPE (%)	Tco [1] (MIN)	HIGH ELEV. (FT)	LOW ELEV. (FT)	H (FT)	CHANNEL LENGTH (FT)	CHANNEL LENGTH (MI)	SLOPE (%)	Tt [1] (MIN)	Concentration Tc [2] (MIN)	Lag Time Tl [2] (HR)	Lag Time Tl [2] (MIN)	Q5 [3] (CFS)	Q100 [3] (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**

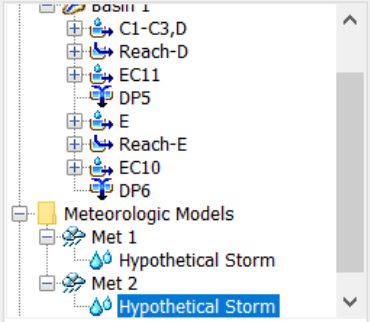
* Tc from Rational Method Calculation Spreadsheet
** Pond Discharge Flows from MHFD-Detention Calculations

1) OVERLAND FLOW Tco = (1.8*(1.1-RUNOFF COEFFICIENT)*(OVERLAND FLOW LENGTH^(0.5)/(SLOPE^(0.333))
2) TRAVEL TIME, Tt = ((11.9*L^3)/H)^(0.385)
3) Tc = Tco + Tt
4) SCS LAG TIME, Tl = 0.6 * Tt
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)

HEC-HMS 4.3 [G:\jpsprojects\030502.etc\ETC_D\ETC_D.hms]

File Edit View Components GIS Parameters Compute Results Tools Help





Components | Compute | Results

Hypothetical Storm

Met Name: Met 2

Method: SCS Type 2

*Point Depth (IN) 2.6

Area Reduction: --None--

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 (MI2)	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

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.

HEC-HMS 4.3 [G:\jpsprojects\030502.etc\ETC_D\ETC_D.hms]

File Edit View Components GIS Parameters Compute Results Tools Help

--None Selected-- Run: Run 1

- 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--

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 (MI2)	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

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
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
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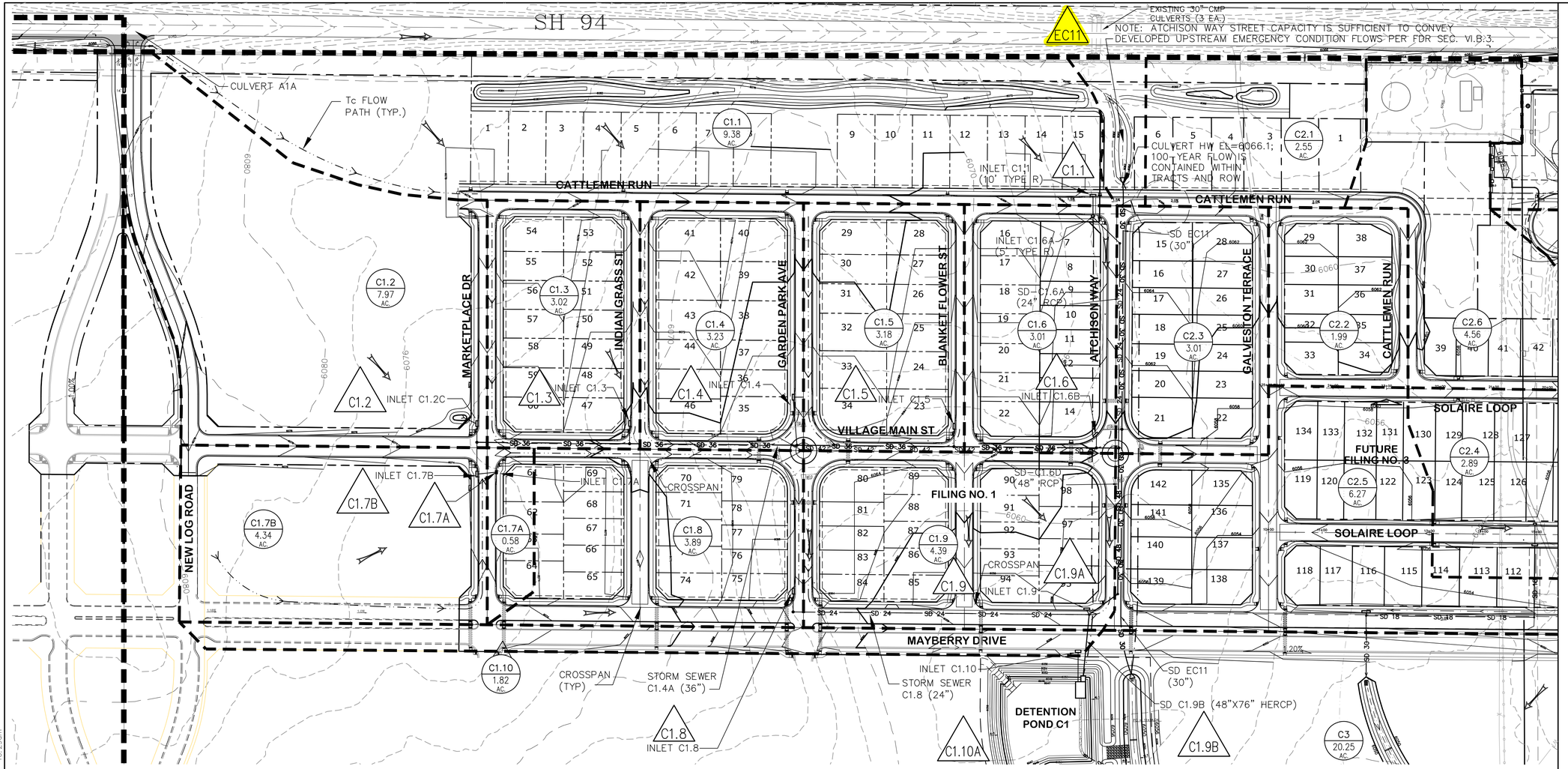
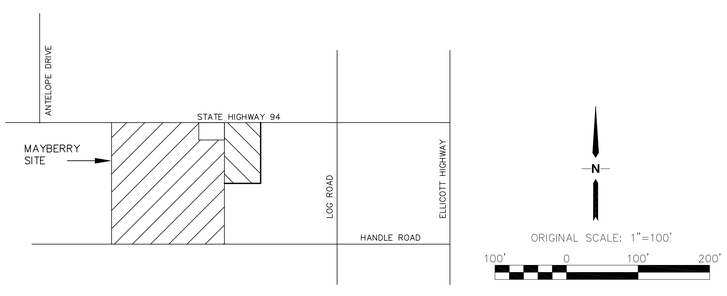
NOTE 42413: Unit hydrograph volume for subbasin "EC11" is 1.0000 in.
NOTE 42413: Unit hydrograph volume for subbasin "C1-C3,D" is 1.0000 in.
NOTE 42413: Unit hydrograph volume for subbasin "EC10" is 1.0000 in.





VICINITY MAP
NTS

SUMMARY HYDROLOGY TABLE

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
- 5 — DESIGN POINT
- OA1 / 66.8 AC. — 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

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

CALL UTILITY NOTIFICATION CENTER OF COLORADO
1-800-922-1987
CALL 2-BUSINESS DAYS IN ADVANCE BEFORE YOU DIG, GRADE, OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES.

NO.	REVISION	BY	DATE

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

SHEET: **D2.1**

G:\Users\Owner\Dropbox\jpsprojects\090001 Ellicott TFC\dwg\Civil\02-1.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. 13TH 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
2ND SUBMITTAL: SEPTEMBER 2022
3RD SUBMITTAL: JANUARY 2023
4TH SUBMITTAL: APRIL 2023

Hydrograph Summary Report

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

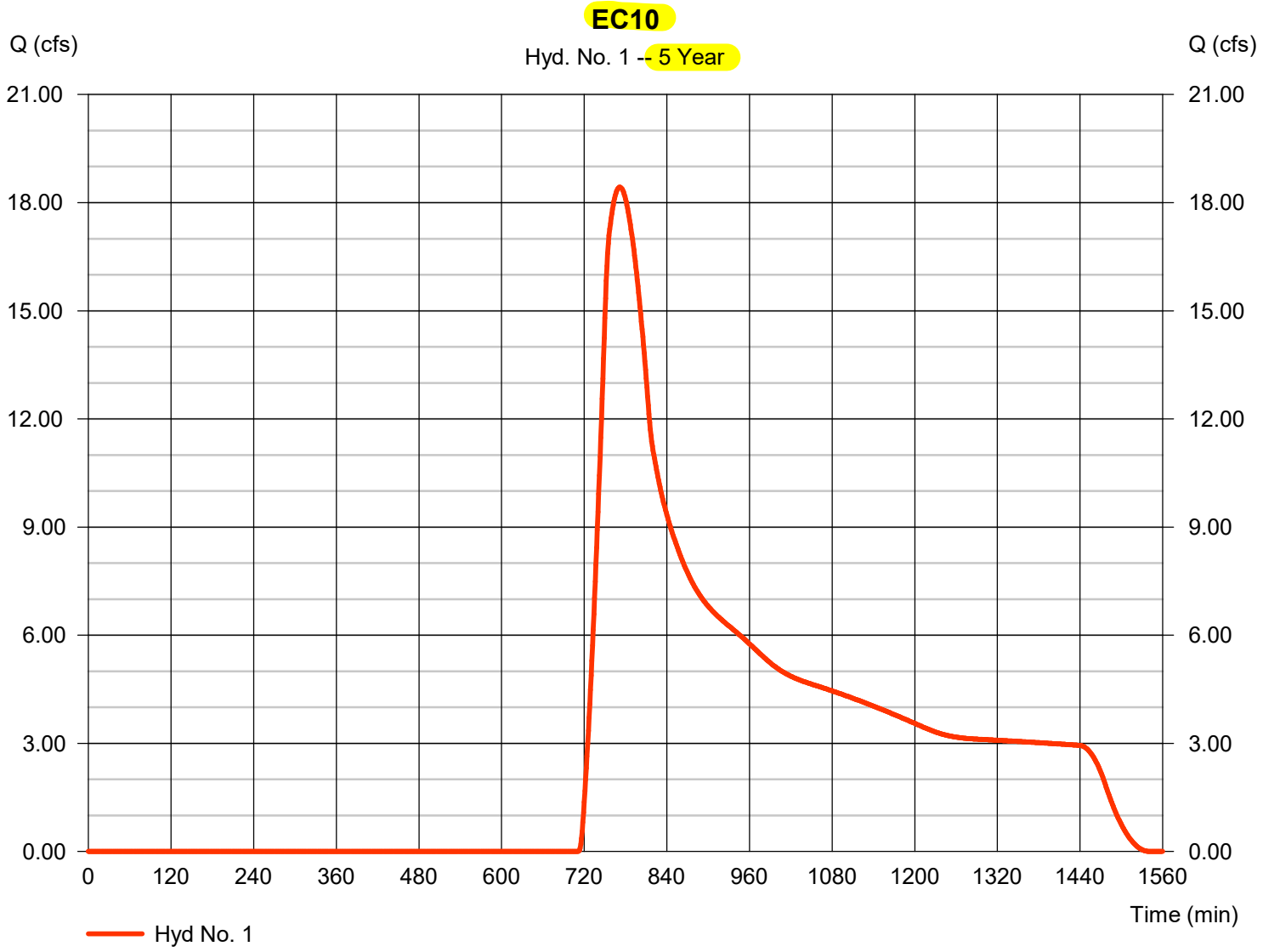
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	18.43	1	772	262,007	------	------	------	EC10
2	SCS Runoff	1.349	1	734	6,442	------	------	------	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

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



Hydrograph Summary Report

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

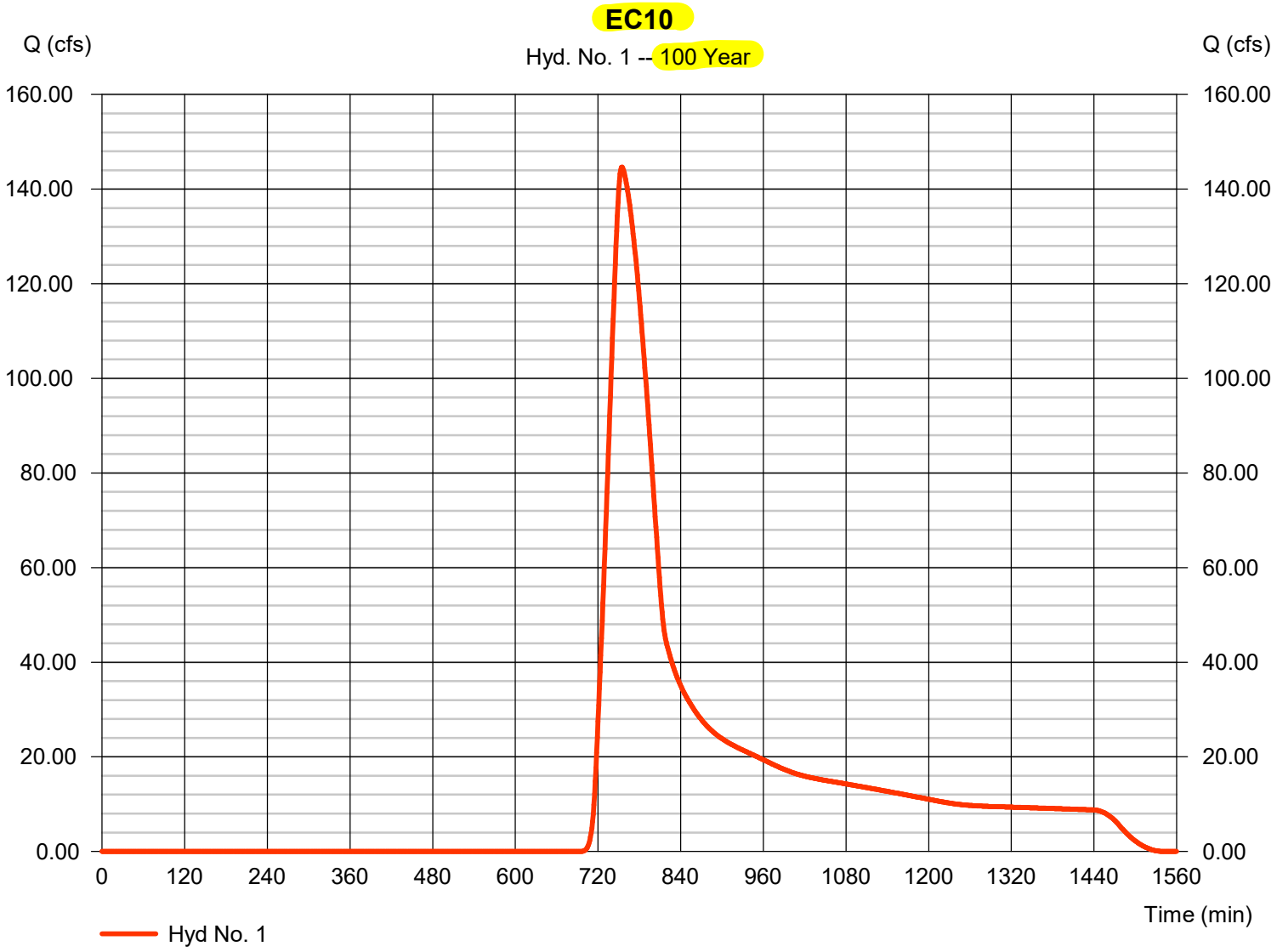
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	144.67	1	755	1,185,497	------	------	------	EC10
2	SCS Runoff	4.333	1	733	18,356	------	------	------	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

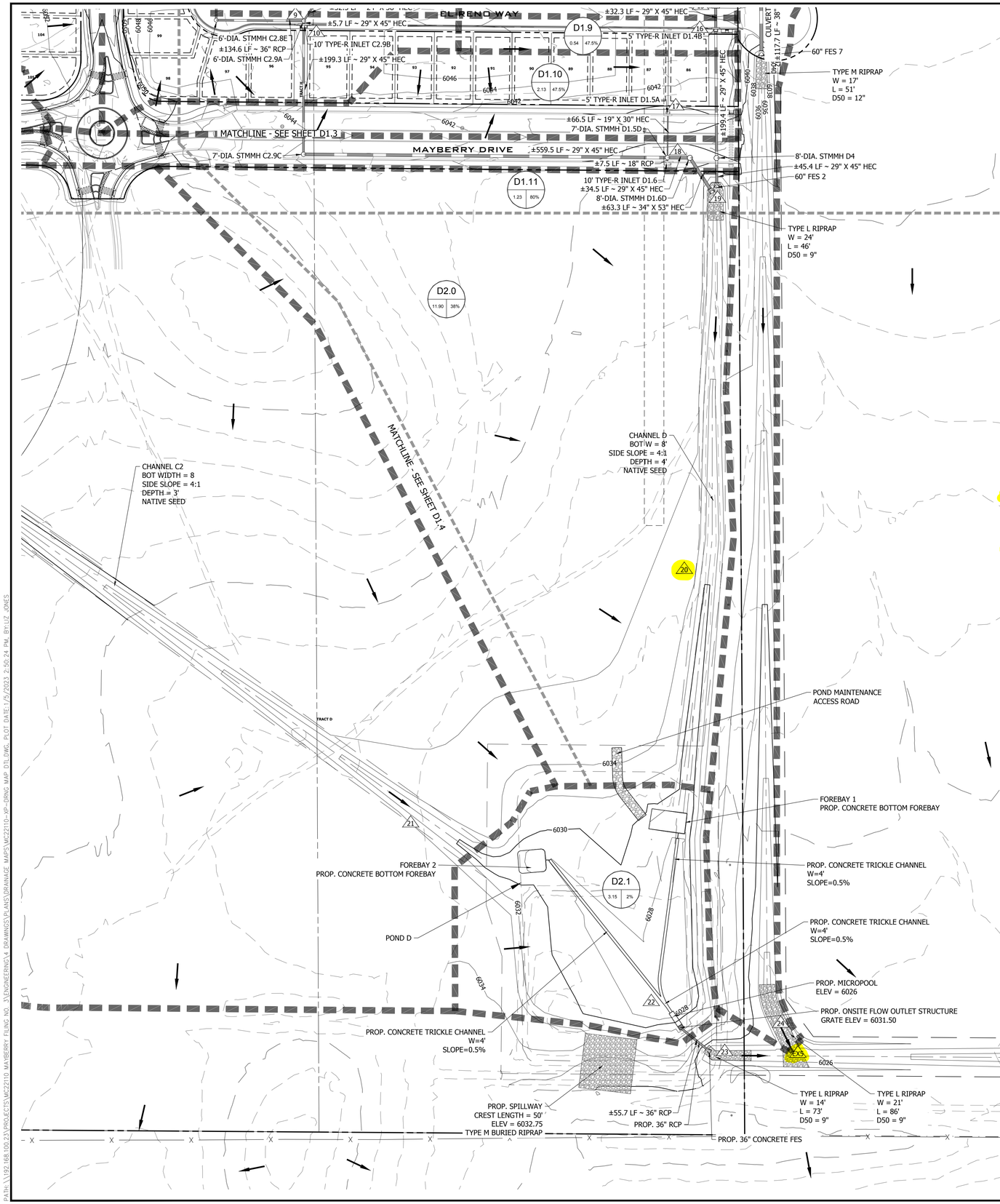
Hydrograph Report

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





R&R

0 60' 120' 180'

SCALE: 1" = 80'

CDOT NOTE: MAINTAIN EXISTING ROADSIDE DITCH DRAINAGE PATTERSN & EXTEND EXISTING CULVERTS AS REQUIRED BASED ON SH94 IMPROVEMENTS; PROVIDE RIPRAP APRONS & EROSION CONTROL FOR ALL CULVERT EXTENSIONS

NOTE: DETAILED BASIN MAPS REPRESENT THE FULL ANTICIPATED BUILD OUT OF ALL AREAS TRIBUTARY TO POND D

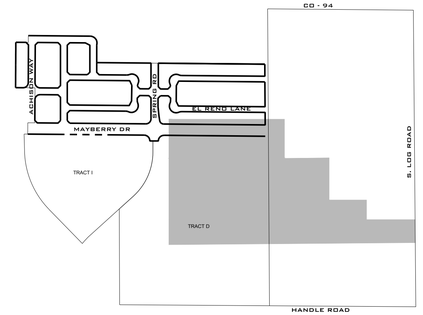
811 Know what's below. Call before you dig.

DESIGN POINT SUMMARY TABLE

Design Point	Contributing Basins	Area (acres)	5-yr (cfs)	100-yr (cfs)
1	C2.1	0.8	1.1	2.7
2	DP1, C2.2	1.1	1.6	3.9
3A	C2.5	9.6	14.2	34.6
3B	C2.3, DP3A	12.5	14.9	36.2
4	C2.4, DP3B	13.7	17.4	41.1
5A	D1.12	3.4	3.8	9.3
5B	D1.14, DP5A	4.3	5.2	12.2
6	D1.2	2.6	3.4	8.3
7A	DP5B, DP6	6.9	8.0	19.0
7B	D1.13	3.1	10.9	19.9
7C	D1.1	1.7	6.7	12.2
7D	DP7B, DP7C	4.8	16.7	30.3
7E	DP7D, DP7A	11.7	19.3	39.7
8	D1.3	2.0	3.1	7.5
9	DP7, DP8	13.7	20.5	42.7
10	DP9, D1.4	17.5	24.8	52.6
11	EC10, OS-1, E1	0.0	18.9	148.3
12	D1.5	9.9	31.6	57.6
13	DP12, D1.6	11.8	30.9	57.9
14	DP13, D1.7	13.4	32.9	62.8
15	DP14, D1.8	14.7	33.6	64.9
16	DP15, D1.9	15.2	34.2	66.4
17	D1.10	2.1	3.3	8.0
18	D1.11, DP17, DP10	20.8	27.4	57.8
19	DP16, DP18	36.0	53.1	106.8
20	DP19, D2.0	47.9	57.5	121.6
21	DP4, C3.0	49.1	36.7	104.9
22	D2.1, DP20, DP21	100.2	98.5	237.8
23	POND D OUTFLOW		1.2	39.6
24	CHANNEL E OUTFLOW		17.6	138.5
EX5	DP23, DP24		18.7	177.4

BASIN SUMMARY TABLE

Basin	Area (acres)	5-yr (cfs)	100-yr (cfs)
C2.1	0.77	1.1	2.7
C2.2	0.33	0.6	1.4
C2.3	1.81	2.1	5.2
C2.4	1.16	4.1	7.8
C2.5	9.61	14.2	34.6
C3.0	35.40	22.0	72.7
D1.1	1.73	6.7	12.2
D1.2	2.56	3.4	8.3
D1.3	2.02	3.1	7.5
D1.4	3.75	5.4	12.7
D1.5	9.88	31.6	57.6
D1.6	1.96	2.6	6.3
D1.7	1.56	2.1	5.0
D1.8	1.27	1.8	4.3
D1.9	0.54	0.9	2.1
D1.10	2.13	3.3	8.0
D1.11	1.23	4.0	7.7
D1.12	3.42	3.8	9.3
D1.13	3.07	10.9	19.9
D1.14	0.91	1.8	3.9
D2.0	11.90	10.30	27.7
D2.1	3.15	0.90	6.6
E1	3.92	0.30	2.8
OS-1	2.65	0.40	2.6
EC10	320.0	18.40	144.7



KEY MAP
N.T.S.

EXISTING	DESCRIPTION	PROPOSED
	PROPERTY LINE	
	EASEMENT	
	EDGE OF PAVEMENT	
	VERTICAL CURB AND GUTTER	
	SPILL GUTTER	
	TRANSITION GUTTER	
5825	MAJOR CONTOUR	5825
5822	MINOR CONTOUR	5822
	STORM SEWER PIPE	
	STORM SEWER MANHOLE	
	STORM SEWER INLET	
	STORM SEWER FLARED END SECTION	
	STORM SEWER HEADWALL	

DRAINAGE BASIN LABEL
* BASIN LABEL
** TRIBUTARY AREA (AC)
*** PERCENT IMPERVIOUS (%)
(FULL BUILDOUT)

C-1* | 1** | 50%***

FLOW ARROW

DESIGN POINT 1

DRAINAGE AREA BOUNDARY

NO.	REVISION	BY	DATE
	2ND SUBMISSION		9/1/22
	3RD SUBMISSION		01/09/23

R&R ENGINEERS SURVEYORS INC

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

WWW.RRENGINEERS.COM

MAYBERRY PUD PH1 - FILING NO. 3

SITE ADDRESS: MAYBERRY, COLORADO SPRINGS
EL PASO COUNTY

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

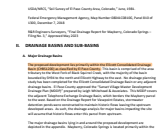
CONSTRUCTION DOCUMENTS

JOB NO. MC22110
ORG. SUBM. DATE 06/16/2022
DWN: LAO CHKD: CJD
NAME FILING 3 DETAILED DRAINAGE PLAN - SOUTH EAST
NO. D1.5

PATH: \\192.168.100.23\PROJECTS\MC22110 MAYBERRY FILING NO. 3\ENGINEERING\4 DRAWINGS\PLANS\DRAINAGE MAPS\MC22110-xP-DRNG MAP D1.DWG, PLOT DATE: 1/5/2023, 2:50:24 PM, BY: LIZ JONES

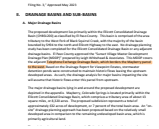
V1_Master Development Drainage Plan (MDDP).pdf Markup Summary

Christina Prete (16)



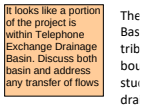
Subject: Highlight
Page Label: 7
Author: Christina Prete
Date: 11/15/2023 1:44:08 PM
Status:
Color:
Layer:
Space:

The proposed development lies primarily within the Ellicott Consolidated Drainage
Basin (CHBS1200) as classified by El Paso County.



Subject: Highlight
Page Label: 7
Author: Christina Prete
Date: 11/15/2023 1:44:05 PM
Status:
Color:
Layer:
Space:

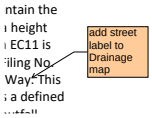
Telephone Exchange Drainage Basin, which borders the Mayberry parcel
to the west.



Subject: Contractor
Page Label: 7
Author: Christina Prete
Date: 11/15/2023 1:44:01 PM
Status:
Color:
Layer:
Space:

It looks like a portion of the project is within Telephone Exchange Drainage Basin. Discuss both basin and address any transfer of flows

---



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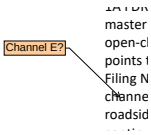
Page Label: 10
Author: Christina Prete
Date: 11/15/2023 11:40:19 AM
Status:
Color:
Layer:
Space:

add street label to Drainage map



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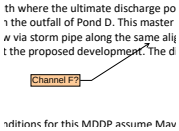
Page Label: 10
Author: Christina Prete
Date: 11/15/2023 11:44:58 AM
Status:
Color:
Layer:
Space:

Channel E?



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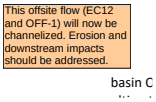
Page Label: 10
Author: Christina Prete
Date: 11/15/2023 11:45:45 AM
Status:
Color:
Layer:
Space:

Channel F?



Subject: Contractor
Page Label: 10
Author: Christina Prete
Date: 11/15/2023 11:48:39 AM
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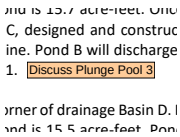
Color:
Layer:
Space:

This offsite flow (EC12 and OFF-1) will now be channelized. Erosion and downstream impacts should be addressed.



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Page Label: 11
Author: Christina Prete
Date: 11/15/2023 12:15:07 PM
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Color:
Layer:
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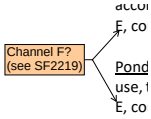
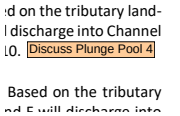
Discuss Plunge Pool 3



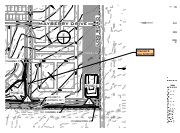
Subject: Contractor
Page Label: 12
Author: Christina Prete
Date: 11/15/2023 12:14:14 PM
Status:
Color:
Layer:
Space:

Channel F?
(see SF2219)



Subject: Contractor
Page Label: 12
Author: Christina Prete
Date: 11/15/2023 12:18:48 PM
Status:
Color:
Layer:
Space:

Discuss Plunge Pool 4



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Page Label: [1] MC22110-DEVELOPED DRN PLAN-OVERALL
Author: Christina Prete
Date: 11/15/2023 11:54:17 AM
Status:
Color:
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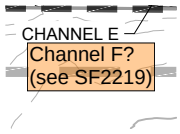
Space:

Channel E
(see SF2219)



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Page Label: [1] MC22110-DEVELOPED DRN PLAN-OVERALL
Author: Christina Prete
Date: 11/15/2023 11:54:24 AM
Status:
Color:
Layer:
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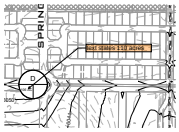
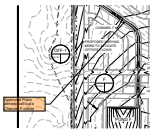
Channel F?
(see SF2219)



Subject: Contractor
Page Label: [1] MC22110-DEVELOPED DRN PLAN-OVERALL
Author: Christina Prete
Date: 11/15/2023 11:56:56 AM
Status:
Color:
Layer:
Space:

text states 110 acres



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Page Label: [1] MC22110-DEVELOPED DRN PLAN-OVERALL
Author: Christina Prete
Date: 11/15/2023 12:09:25 PM
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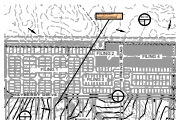
Color:
Layer:
Space:

Approved Plans already call out a Channel F onsite



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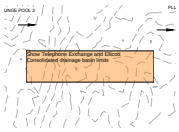
Page Label: [1] MC22110-DEVELOPED DRN PLAN-OVERALL
Author: Christina Prete
Date: 11/15/2023 12:11:32 PM
Status:
Color:
Layer:
Space:

call out Pond C (Interim Condition)



Subject: Contractor
Page Label: [1] MC22110-DEVELOPED DRN PLAN-OVERALL
Author: Christina Prete
Date: 11/15/2023 1:43:09 PM
Status:
Color:
Layer:
Space:

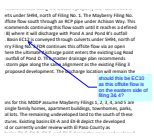
Show Telephone Exchange and Ellicott Consolidated drainage basin limits

---

Daniel Torres (17)

Subject: Callout
Page Label: 1
Author: Daniel Torres
Date: 11/14/2023 10:57:08 AM
Status:
Color:
Layer:
Space:

SKP236

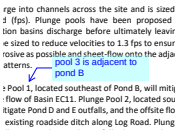


Subject: Callout
Page Label: 10
Author: Daniel Torres
Date: 11/14/2023 3:19:30 PM
Status:
Color:
Layer:
Space:

should this be EC10 as this offsite flow is on the eastern side of filing 3& 4?

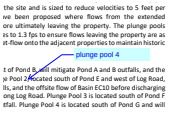
Subject: Callout
Page Label: 10
Author: Daniel Torres
Date: 11/14/2023 5:57:27 PM
Status:
Color:
Layer:
Space:

Please identify where this flow will be directed if prevented from entering the site as done in historic conditions. Provide design points and flows of the offsite basins entering the development.



Subject: Callout
Page Label: 13
Author: Daniel Torres
Date: 11/14/2023 2:29:06 PM
Status:
Color:
Layer:
Space:

pool 3 is adjacent to pond B



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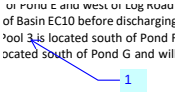
Page Label: 13
Author: Daniel Torres
Date: 11/14/2023 2:32:32 PM
Status:
Color:
Layer:
Space:

plunge pool 4



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Date: 11/14/2023 2:33:10 PM
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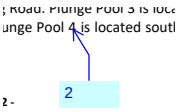

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Author: Daniel Torres
Date: 11/14/2023 2:33:07 PM
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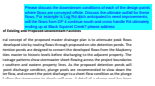
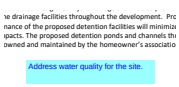
2



Subject: Text Box
Page Label: 14
Author: Daniel Torres
Date: 11/15/2023 7:44:37 AM
Status:
Color:
Layer:
Space:

Please discuss the downstream conditions of each of the design points where flows are conveyed offsite. Discuss the ultimate outfall for these flows. For example is Log Rd ditch anticipated to need improvements; will the flows from DP 4 continue south and cross handle Rd ultimately ending up at Black Squirrel Creek? please address



Subject: Text Box
Page Label: 14
Author: Daniel Torres
Date: 11/14/2023 5:50:15 PM
Status:
Color:
Layer:
Space:

Address water quality for the site.

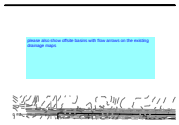
Subject: Text Box
Page Label: 14
Author: Daniel Torres
Date: 11/14/2023 5:53:44 PM
Status:
Color:
Layer:
Space:

please include in the narrative the total flows at the design points. These will be the basis for future final drainage reports

---

Subject: Text Box
Page Label: [1] DR1 HISTORIC DRAINAGE MAP
Author: Daniel Torres
Date: 11/14/2023 11:52:09 AM
Status:
Color:
Layer:
Space:

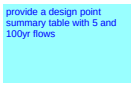
label the locations of the existing CMP on the northern boundary conveying off-site flow onto the site.



Subject: Text Box
Page Label: [1] DR1 HISTORIC DRAINAGE MAP
Author: Daniel Torres
Date: 11/14/2023 4:03:04 PM
Status:
Color:
Layer:
Space:

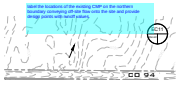
please also show offsite basins with flow arrows on the existing drainage maps

---



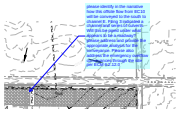
Subject: Text Box
Page Label: [1] DR1 HISTORIC DRAINAGE MAP
Author: Daniel Torres
Date: 11/14/2023 5:31:20 PM
Status:
Color:
Layer:
Space:

provide a design point summary table with 5 and 100yr flows



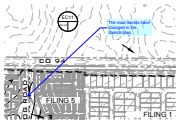
Subject: Text Box
Page Label: [1] MC22110-DEVELOPED DRN PLAN-OVERALL
Author: Daniel Torres
Date: 11/14/2023 5:55:09 PM
Status:
Color:
Layer:
Space:

label the locations of the existing CMP on the northern boundary conveying off-site flow onto the site and provide design points with runoff values.



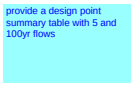
Subject: Callout
Page Label: [1] MC22110-DEVELOPED DRN PLAN-OVERALL
Author: Daniel Torres
Date: 11/14/2023 5:46:32 PM
Status:
Color:
Layer:
Space:

please identify in the narrative how this offsite flow from EC10 will be conveyed to the south to channel E. Filing 3 indicated a channel and series of culverts. Will this be piped under what appears to be a roadway? please address and provide the appropriate analysis for the conveyance. Please also address the emergency overflow conveyances through the site per ECM 6.2.12.0



Subject: Callout
Page Label: [1] MC22110-DEVELOPED DRN PLAN-OVERALL
Author: Daniel Torres
Date: 11/14/2023 3:27:48 PM
Status:
Color:
Layer:
Space:

The road names have changed in the Sketch plan.



Subject: Text Box
Page Label: [1] MC22110-DEVELOPED DRN PLAN-OVERALL
Author: Daniel Torres
Date: 11/14/2023 5:31:29 PM
Status:
Color:
Layer:
Space:

provide a design point summary table with 5 and 100yr flows