FINAL DRAINAGE REPORT

FOR

MAYBERRY, COLORADO SPRINGS – FILING NO. 2A

PREPARED FOR:

MAYBERRY COMMUNITIES, 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: TIM STACKHOUSE, P.E.
(303) 753-6730

R&R JOB #MC22249
EPC PROJECT NO. VR2323

JANUARY 2024

ENGINEER'S STATEMENT:

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

SIGNATURE: _____

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

DEVELOPER'S STATEMENT:

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

SIGNATURE: _____

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

EL PASO COUNTY'S STATEMENT:

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

SIGNATURE: _____

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

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I. GENERAL LOCATION AND DESCRIPTION

A. Background

Mayberry Filing 2A encompasses 4.48 acres southwest of the Springs Road and Highway 94 intersection. Filing 2A is adjacent to Filing 3 along its west and south borders. The previous layout/design of this area was named Mayberry Filing 2 by JPS Engineering. JPS had submitted construction documents, a SWMP report, and a Final Drainage Report for Filing 2 which was approved by El Paso County in November of 2020.

Final Drainage Report for Mayberry Colorado Springs – Filing No. 3 (referred to as Filing 3 FDR hereon) by R&R Engineers-Surveyors has been approved by El Paso County and is currently under construction. Filing 3 FDR has designed and sized all drainage infrastructure that Filing 2A is tributary to. This Drainage Conformance Letter will include documentation and calculations to support that the new layout of this area is still in compliance with the in process Filing 3 FDR.

B. Scope

This Drainage Conformance Letter has been prepared to fulfill the El Paso County requirements for a "Letter Type" drainage report, as this area is within Mayberry Filing 2, which incorporated a previously approved Filing 2 FDR by JPS Engineering and is tributary to the Filing 3 FDR by R&R Engineers-Surveyors.

Mayberry Filing 2A proposes a cul-de-sac in place of the previously extended road. The previous design in Filing 2 extended Cattlemen Run through Filing 2, connecting to Positive Place. This cul-de-sac will include a six-inch vertical curb and adjacent sidewalk. Like Filing 2, Filing 2A has three total lots. These lots are configured differently as each lot fronts the cul-de-sac instead of being separated by an intersection.

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 compliance letter was prepared based on the guidelines and criteria presented in the El Paso County Drainage Criteria Manual, providing design of required drainage facilities for this phase of the project.

C. Site Location and Description

The Mayberry, Colorado Springs (Ellicott Town Center) parcel comprises the west half of Section 14 along with the contiguous east quarter of Section 15, as well the west half of the northeast quarter of Section 14, Township 14 South, Range 63 West of the 6th Principal Meridian. The site is located at an elevation of approximately 6,060 feet above mean sea level. Filing No. 2A comprises 4.48-acres in the north/central area of the Mayberry development.

State Highway 94 borders Filing 2A to the north, Filing 3 to the south and west, and Filing 4 to the east.

The primary access to Filing 2A will be provided by Business Park Drive via Springs Road.

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. The entire site is covered with native grasses.

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 series (type 8) and Truckton series (type 95) soils. Both soils are characterized as well-drained loamy sand with rapid permeability, slow surface runoff rates, and moderate hazard of erosion. These soils are classified as hydrologic soils group "A" for drainage analysis purposes.

E. References

El Paso County "Engineering Criteria Manual," January 9, 2006.

El Paso County "Drainage Criteria Manual County of El Paso, Colorado – Volumes 1 and 2" dated October 31, 2018.

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, "Final Drainage Report for Mayberry, Colorado Springs - Filing No. 2," revised October 27, 2020 (approved by El Paso County November 5, 2020).

R&R Engineers-Surveyors, "Final Drainage Report for Mayberry Colorado Springs – Filing No. 3," *Approved June 14th, 2023.*

II. DRAINAGE BASINS AND SUB-BASINS

A. Major Drainage Basins

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.

The major drainage basins lying in and around the proposed development are depicted in the Phase 1 PUD Amended Drainage Report. 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. Filing 2A represents a total of 9.48 acres of development, or less than one percent of the total basin area. An "on-site" drainage planning approach has been proposed in Filing 2A based on the relatively small developed area in comparison to the remaining undeveloped basin area, which is primarily agricultural land.

B. Floodplain Impacts

Mayberry – Filing 2A, 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.

C. Sub-Basin Description

The developed drainage basins lying within Filing 2A are depicted in Figure D1.1. The interior site layout has been delineated into three drainage basins based on the proposed interior road layout and grading scheme. The natural drainage patterns will be impacted through development by site grading and concentration of runoff in the street gutters, storm drains, and channels. Most sub-basins drain to the southeast, collecting in the interior roadway, Business Park Drive, and drainage channels. On-site flows will be diverted to an extended detention basin (EDB), Pond D, assumed as existing per the approved Mayberry Filing 3 Final Drainage Report, and detained flows will discharge to the east, following historic drainage paths.

III. DRAINAGE DESIGN CRITERIA

A. Development Criteria Reference

The Ellicott Consolidated Drainage Basin has not had a Drainage Basin Planning Study performed for the basin. Most areas within the basin are comprised of agricultural lands and rural residential uses.

A "Master Development Drainage Plan (MDDP) for Ellicott Town Center" was approved concurrent with the original Overall PUD, and a Preliminary Drainage Report for Ellicott Town Center Phase One was approved with the original Phase One PUD and Preliminary Plan.

JPS Engineering prepared the "Preliminary & Final Drainage Report for Mayberry, Colorado Springs - Filing No. 1," revised October 27, 2020 (approved by El Paso County November 5, 2020) in support of the final approval and recording of Filing No. 1.

The "Final Drainage Report for Mayberry, Colorado Springs – Filing No. 3" fully conforms to the previously approved MDDP and Preliminary/Final Drainage Reports, along with the "Preliminary Drainage Report Amendment for Mayberry, Colorado Springs Phase 1 PUD" dated February, 2022 prepared in support of the Phase 1 PUD Amendment.

This, "Final Drainage Report for Mayberry, Colorado Springs – Filing No. 2A" fully conforms to the approved "Final Drainage Report for Mayberry, Colorado Springs – Filing No. 3".

B. Hydrologic Criteria

Rational method procedures were utilized for calculation of peak flows within the 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

Composite runoff coefficients for the developed commercial areas have been calculated based *Table 6-6 Runoff Coefficients for Rational Method* in Chapter 6, Section 3.1 in the El Paso County Drainage Criteria Manual. A rational method spreadsheet was utilized for modeling these flows.

C. Hydraulic Criteria

Most of the hydraulic elements of Filing 2A have already been analyzed and provided in the approved Filing 3 Final Drainage Report as it relates to inlet and street capacity and storm pipe capacity. The supporting pages from the Filing 3 Final Drainage Report are provided within the appendix.

One grass lined swale is proposed as part of the Filing 2A development. The swale will be lined in wetland native seed. The grass swale, located along the southern property boundary, was calculated using flow master, the supporting calculation sheet and cross section can be found in Appendix B.

IV. DRAINAGE PLANNING FOUR STEP PROCESS

El Paso County Drainage Criteria require drainage planning to include a Four Step Process for receiving water protection that focuses on reducing runoff volumes, treating the water quality capture volume (WQCV), stabilizing drainageways, and implementing long-term source controls. A new ESQCP will be acquired for Mayberry Filing 2A.

As stated in DCM Volume 2, the Four Step Process is applicable to all new and re-development projects with construction activities that disturb 1 acre or greater or that disturb less than 1 acre but are part of a larger common plan of development. The Four Step Process has been implemented as follows in the planning of this project:

<u>Step 1: Employ Runoff Reduction Practices</u>

- Minimize Impacts: The approved Planned Unit Development includes commercial use areas resulting in a moderate level of impervious site development.
- Minimize Directly Connected Impervious Areas (MDCIA): The proposed development will include landscaped areas adjoining the proposed building and parking lots, providing for impervious areas to drain across pervious areas where feasible.
- Grass Swales: The proposed drainage plan incorporates grass-lined swales in selected locations to encourage stormwater infiltration while providing positive drainage through the site.

<u>Step 2: Stabilize Drainageways</u>

- Proper erosion control measures will be implemented along the grass-lined drainage swale to provide stabilized drainageways within the site.

<u>Step 3: Provide Water Quality Capture Volume (WQCV)</u>

- EDB: This development will drain through an existing Full-Spectrum Extended

Unresolved from Submittal 1 - Engineer must confirm in the Drainage Report that the existing offsite or onsite PBMPs that the site is tributary to are functioning as intended. Provide design calcs and verify that the existing pond was designed to accept the proposed flows.

Per email correspondence with Mikayla on 02/20/2024, it was understood that the design calcs referenced in the Appendices from the approved Filing 3 FDR were sufficient but more detail needed to be added into the narrative to state that the pond will be functioning to accept the runoff from Filing 2A. The last bullet of this section has been modified accordingly to describe that state of the pond.

Detention Basins (EDB) southeast of the developed areas. Site drainage will be ough the extended detention basin, which will capture and slowly e WQCV over an extended release period.
er detention and WQCV for Filing 2A will be provided by the existing signed within the Filing 3 Final Drainage Report.
g offsite detention basin and a

er Need for Industrial and Commercial BMPs
al land uses are proposed as part of Filing No. 2A development. The commercial site owners for each lot will be encouraged to provide water quality treatment such as grass lined swales, porous landscape, pavement, etc. however this is not required if the developed lot compliance with the pre-determined impervious area set forth in this drainage report. Water quality is treated in the down stream grass lined swales and existing extended detention pond.

V. GENERAL DRAINAGE RECOMMENDATIONS

The developed drainage plan for the site is to provide and maintain positive drainage away from structures and conform to the established drainage patterns for the overall site. Positive drainage shall be established and maintained away from all structures within the site in conformance with applicable building codes and geotechnical engineering recommendations.

In general, it is recommended that positive drainage slopes should be maintained away from all structures, with a minimum recommended slope of 5 percent for the first 10 feet away from buildings in landscaped areas, a minimum recommended slope of 2 percent for the first 10 feet away from buildings in paved areas, and a minimum slope of 1 percent for paved areas beyond buildings.

VI. DRAINAGE FACILITY DESIGN

A. General Concept

Consistent with generally accepted practices in eastern El Paso County, the general concept for stormwater management from development of Mayberry – Filing 2A will be to construct curb and gutter and a grass swale to connect to the existing storm sewer system, channels, and extended detention basin constructed in Mayberry Filing No. 3.

Runoff from Lot 1A, which includes the existing InteliFab building and associated

asphalt parking lot, will drain to Business Park Drive primarily through the existing sidewalk chase designed and constructed per the approved Filing 2 construction documents and Final Drainage Report by JPS. Runoff from Lots 2A and 3A will drain toward the southeast, and be captured by the proposed grass swale. Depending on the future developers' preference for Lots 2A and 3A, he or she can choose to keep the open ditch, or choose to fill in the ditch and replace with an underground storm pipe. Should one lot owner choose to provide an underground storm pipe and the other lot owner choose to keep the provided open ditch, a flared end section must be constructed to keep the positive drainage to the overall stormwater network.

B. Specific Details

Existing Drainage

The existing site spans three basins defined in the Filing 3 FDR: Basins D1.1, D1.13, and D1.14. The site generally drains from northwest to southeast. Undeveloped flows sheet flow generally towards Springs Road and Besseyi Way, ultimately entering multiple existing inlets (Design Points 5B and 7B per Filing 3 FDR). Existing inlets exist near the intersection of Business Park Drive and Springs Road and the intersection of Besseyi Way and Springs Road. An existing 24" RCP stub exists in the southwest corner of the site. There is no other existing stormwater conveyance infrastructure currently on site (piping, inlets, channels, etc) and no detention/water quality facilities existing on the site.

Proposed Drainage

The proposed site is split between Filing 3 FDR Basins D1.1, D1.13, and D1.14. Runoff from the site will generally flow northwest to southeast and flow into either Business Park Drive or a swale on the southern property line, ultimately being conveyed to the existing storm sewer system.

The existing detention basin, Pond D (designed with the approvedbu Filing 3 FDR) has been designed to detain and treat flows from the entirety of Filing 2A. Therefore, no stormwater quality or detention facilities will be installed on the site.

Basin D1.1 is a 1.73 acre basin originally defined in the Filing 3 FDR. It comprises the southern commercial developments of Filing 2A. The basin drains towards the southern property line and is collected by a swale which conveys water to a proposed flared end section in the southeast corner of the site at design point 7C, and ultimately enters the existing storm sewer system within Springs Road. The 5 year and 100 year developed peak flows are 6.7 and 12.2 cfs respectively.

Basin D1.13 is a 3.07 acre basin originally defined in the Filing 3 FDR. It comprises the northern commercial development of Filing 2A and a portion of Springs Road. The basin ultimately drains into existing storm sewer system within Springs Road via an existing Type R curb inlet at design point 7B. The 5 year and 100 year developed peak flows are 9.2 and 17.6 cfs respectively.

Basin D1.14 is a 0.91 acre basin originally defined in the Filing 3 FDR. It comprises the south eastern commercial portion of Filing 2 and a portion of single family housing in Filing 3. The basin drains into Springs Road and is collected by an existing Type R curb inlet at design point 5B near the intersection of Besseyi Way and Springs Road. The 5 year and 100 year developed peak flows are 1.8 and 3.9 cfs respectively.

C. Comparison of Developed to Filing 3 FDR

The development of Filing 2A is in compliance with Filing 3 FDR in regard to both impervious percentages and peak flows. All Filing 2A impervious percentages and peak flows are equal to or below the limits listed in Filing 3 FDR. The following table provides a comparison of these value.

	Basin D1.1		Basin D1.13		Basin D1.14	
	Filing 3	Filing 2A	Filing 3	Filing 2A	Filing 3	Filing 2A
5 Year Flow	6.7	6.7	10.9	9.2	1.8	1.8
100 Year Flow	12.2	12.2	19.9	17.6	3.9	3.9
% Impervious	95%	95%	95%	80%	64%	64%

D. Onsite Drainage Facility Design

Curb and Gutter

Basin D1.13 will drain towards Business Park Drive and be captured by the existing and proposed curb and gutter. Business Park Drive is pitched to drain toward the east, and be ultimately captured by the existing cross pan designed and constructed per the Filing 2 plans by JPS. Flows will continue south and be captured by the existing type R inlet designed and constructed per the approved Filing 3 plans. The cross section of Business Park Drive is designed as the typical 2%, pushing water from the centerlines to curb and gutter systems.

Open Channel System Layout

One grass swale is proposed as part of the Filing 2A development located along the southern boundary which will capture all stormwater runoff from lots 2A and 3A. The V-

shaped swale is designed with side slopes of 4:1. The swale will convey stormwater runoff to the southeast corner of the Filing 2A boundary, and ultimately to the existing stormwater network designed within Filing 3.

E. Analysis of Existing and Proposed Downstream Facilities

The general concept of the proposed drainage plan is to attenuate peak flows from the developed site by routing flows to the existing detention pond, Pond D. An analysis of drainage patterns downstream of the subdivision was performed as part of the approved Filing 3 report to ensure historic drainage patterns are maintained. Filing 2A will remain in compliance with Filing 3, as the developed flows associated with this project remain equal or below what was anticipated within the approved Filing 3 Final Drainage report.

F. Anticipated Drainage Problems and Solutions

The existing stormwater detention pond is designed to mitigate the impacts of developed drainage from this project. The overall drainage plan for Filing 2A includes a public street with curb and gutter, an existing cross-pan at Business Park Drive and Springs Road, an existing sidewalk chase, and a grass swale. The primary drainage problems anticipated within this development will consist of maintenance of the sidewalk chase and drainage swale. The sidewalk chase will convey the 100-year flow and not overtop the sidewalk. Please refer to Appendix B for additional calculations. Care will need to be taken to implement proper erosion control measures in the proposed swale, which will be designed to meet allowable velocity criteria.

VII. EROSION CONTROL

The Contractor will be required to implement best management practices (BMP's) for erosion control during construction. The proposed erosion control plan is included in the Grading & Erosion Control (GEC) Plans submitted with the subdivision construction drawings. Erosion control measures will include installation of silt fence at the toe of disturbed slopes and hay bales protecting drainage ditches. Cut and fill slopes will be stabilized during excavation if necessary and vegetation will be established for stabilization of the disturbed areas. All ditches have been designed to meet El Paso County criteria for slope and velocity. Additionally, a gravel vehicle tracking pad will be installed at construction access point and inlet protection will be provided to minimize conveyance of sediment into storm inlets.

VIII. COST ESTIMATE AND DRAINAGE FEES

The developer will pay all capital costs for roadway and drainage improvements. As detailed in Appendix C. The engineer's estimate for Filing 2A drainage improvements is approximately $627.90. Filing 2A is located entirely within the Ellicott Consolidated Drainage Basin, which currently does not have a drainage or bridge fee requirement. As such, no drainage basin fees are applicable.

IX. MAINTENANCE

All proposed road and drainage construction within the Mayberry – Filing 2A, Colorado Springs project will be performed to El Paso County Standards. Interior roads will be dedicated as public right-of-way. Roads and drainage facilities within the public right-of-way will be maintained by El Paso County upon final acceptance of these facilities after the warranty period. The Metropolitan District will maintain drainage channels and stormwater detention pond within the proposed open space areas.

X. SUMMARY

The Mayberry – Filing 2A, Colorado Springs consists of 3 commercial lots in the northwest of Springs Road and Business Park Drive, with access connections to State Highway 94 at Springs Road. The commercial lots are platted within Filing 2A. The development will generate an increase in developed runoff from the site, which will be mitigated through an existing stormwater detention and water quality facility designed and constructed within Filing 3, which accounted for these developed flows.

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. The existing detention pond, Pond D southeast of the development areas will ensure that developed flows remain below historic levels. Construction and proper maintenance of the proposed drainage and erosion control facilities will ensure that this development has no significant adverse drainage impacts on downstream or surrounding areas.

XI. APPENDICES

Appendix A - Hydrologic Computations

1. Hydrologic References from Approved Filing 3 FDR
2. Filing 2A Post Developed Flow Rates

Appendix B – Hydraulic Computations

1. MHFD Spreadsheet from Approved Filing 3 FDR
2. Sidewalk Chase
3. Swale Design

Appendix C – Reference Information

1. Vicinity Map
2. Cost Estimate
3. NRCS Soils Report
4. FEMA Flood Insurance Maps
5. Referenced Narrative and Drainage Maps from Filing 3
6. Filing 2A Developed Drainage Map

APPENDIX A - HYDROLOGIC COMPUTATIONS

FROM THE APPROVED FILING 3 FDR

POST-DEVELOPMENT C VALUES

Designer: ESJ
Company: R&R Engineers-Surveyors
Date: 1/5/2023
Project: Mayberry Filing 3
Location: El Paso County

Global Parameters[1]			
Land Use	% Imp.	C_5	C_{100}
SF LOTS (1/6 AC)	47.5	0.375	0.545
Hardscape	100	0.9	0.96
Commercial	95	0.81	0.88
Landscape/Park	2	0.08	0.35

Summary	
Total Area (ac)	561.92
Composite Impervious	33.1%

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

[1] From Table 6-6 in El Paso County DCM
[2] From Table 6-6 in El Paso County DCM

Basin Name	Area (ac)	NRCS Hydrologic Soil Group	SF LOTS (1/6 AC)		Hardscape		Commercial		Landscape/Park		% Check	Percent Imperviousness	Runoff Coefficient, C[2]				
			Area (ac)	%	Area (ac)	%	Area (ac)	%	Area (ac)	%			2-yr	5-yr	10-yr	25-yr	100-yr
C2.1	0.77	A	0.77	100.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	100.00%	47.5%		0.38			0.55
C2.2	0.33	A	0.33	100.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	100.00%	47.5%		0.38			0.55
C2.3	1.81	A	1.81	100.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	100.00%	47.5%		0.38			0.55
C2.4	1.16	A	0.00	0.0%	0.93	80.0%	0.00	0.0%	0.23	20.0%	100.00%	80%		0.74			0.84
C2.5	9.61	A	9.61	100.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	100.00%	47.5%		0.38			0.55
C3.0	35.40	A	17.70	50.0%	0.00	0.0%	0.00	0.0%	17.70	50.0%	100.00%	25%		0.23			0.45
D1.1	1.73	A	0.00	0.0%	0.00	0.0%	1.73	100.0%	0.00	0.0%	100.00%	95%		0.81			0.88
D1.2	2.56	A	2.56	100.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	100.00%	47.5%		0.38			0.55
D1.3	2.02	A	2.02	100.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	100.00%	47.5%		0.38			0.55
D1.4	3.75	A	3.52	93.9%	0.00	0.0%	0.23	6.1%	0.00	0.0%	100.00%	50%		0.40			0.57
D1.5	9.88	A	0.00	0.0%	0.00	0.0%	9.88	100.0%	0.00	0.0%	100.00%	95%		0.81			0.88
D1.6	1.96	A	1.96	100.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	100.00%	47.5%		0.38			0.55
D1.7	1.56	A	1.56	100.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	100.00%	47.5%		0.38			0.55
D1.8	1.27	A	1.27	100.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	100.00%	47.5%		0.38			0.55
D1.9	0.54	A	0.54	100.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	100.00%	47.5%		0.38			0.55
D1.10	2.13	A	2.13	100.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	100.00%	47.5%		0.38			0.55
D1.11	1.23	A	0.00	0.0%	0.98	80.0%	0.00	0.0%	0.25	20.0%	100.00%	80%		0.74			0.84
D1.12	3.42	A	3.42	100.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	100.00%	47.5%		0.38			0.55
D1.13	3.07	A	0.00	0.0%	0.00	0.0%	3.07	100.0%	0.00	0.0%	100.00%	95%		0.81			0.88
D1.14	0.91	A	0.60	65.9%	0.00	0.0%	0.31	34.1%	0.00		100.00%	64%		0.52			0.66
D2.0	11.90	A	9.50	79.8%	0.00	0.0%	0.00	0.0%	2.40	20.2%	100.00%	38%		0.32			0.51
E1	3.92	A	0.00	0.0%	0.00	0.0%	0.00	0.0%	3.92	100.0%	100.00%	2%		0.08			0.35
D2.1	3.15	A	0.00	0.0%	0.00	0.0%	0.00	0.0%	3.15	100.0%	100.00%	2%		0.08			0.35
OS-1	2.65	A	0.00	0.0%	0.91	34.3%	0.00	0.0%	1.74	65.7%	100.00%	36%		0.36			0.56
C Basins	49.08	A	30.22	61.6%	0.93	1.9%	0.00	0.0%	17.93	36.5%	100.00%	32%		0.28			0.48
D Basins	51.08	A	29.08	56.9%	0.98	1.9%	15.22	29.8%	2.65	5.2%	93.83%	57%		0.48			0.61
Pond - Developed	100.16	A	59.30	59.2%	1.91	1.9%	15.22	15.2%	20.58	20.5%	96.86%	45%		0.38			0.55
D1.5 (pre-dev)	9.88	A	0.00	0.0%	0.00	0.0%	0.00	0.0%	9.88	100.0%	100.00%	2%		0.08			0.35
D2.0 (pre-dev)	11.90	A	0.00	0.0%	0.00	0.0%	0.00	0.0%	11.90	100.0%	100.00%	2%		0.08			0.35
C3.0 (pre-dev)	35.40	A	0.00	0.0%	0.00	0.0%	0.00	0.0%	35.40	100.0%	100.00%	2%		0.08			0.35
Pond - F2 & F3 Dev only	100.16	A	32.10	32.0%	1.91	1.9%	5.34	5.3%	60.81	60.7%	100.00%	23%					
*highlighted basins are tributary to Pond D in Interim condition																	
GALV	4.44	A	4.44	100.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	100.00%	47.5%		0.38			0.55
C Basins - Pre Dev	49.08	A	12.52	25.5%	0.93	1.9%	0.00	0.0%	35.63	72.6%	100.00%	15.5%		0.17			0.41
D Basins - Pre Dev	47.93	A	19.58	40.9%	0.98	2.1%	5.34	11.1%	22.03	46.0%	100.00%	33.0%		0.30			0.50

Pond D was sized for Filing 2A

FROM THE APPROVED FILING 3 FDR

TIME OF CONCENTRATION

Designer: ESJ
Company: R&R Engineers-Surveyors
Date: 1/5/2023
Project: Mayberry Filing 3
Location: El Paso County

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

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

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

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

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

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

Non Urban Li max = 300'
Urban Li Max = 100'

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
C2.1	0.77	47.5%	0.38	100.00	0.020	10.41	242.00	0.020	20	2.83	1.43	11.84	19.75	11.84	
C2.2	0.33	47.5%	0.38	36.00	0.020	6.25	152.00	0.020	20	2.83	0.90	7.14	19.07	7.14	
C2.3	1.81	47.5%	0.38	100.00	0.020	10.41	1033.00	0.010	20	2.00	8.61	19.02	28.93	19.02	
C2.4	1.16	80.4%	0.74	12.00	0.020	1.81	534.00	0.009	20	1.90	4.69	6.50	16.96	6.50	
C2.5	9.61	47.5%	0.38	36.00	0.020	6.25	513.00	0.007	20	1.67	5.11	11.36	24.45	11.36	
C3.0	35.40	24.8%	0.23	100.00	0.020	12.53	1536.00	0.010	20	2.00	12.80	25.33	42.33	25.33	
D1.1	1.73	95.0%	0.81	100.00	0.020	4.17	405.00	0.020	20	2.83	2.39	6.55	11.99	6.55	
D1.2	2.56	47.5%	0.38	100.00	0.020	10.41	533.00	0.010	20	2.00	4.44	14.86	23.60	14.86	
D1.3	2.02	47.5%	0.38	36.00	0.020	6.25	495.00	0.010	20	2.00	4.13	10.37	23.20	10.37	
D1.4	3.75	50.4%	0.40	100.00	0.020	10.03	634.00	0.014	20	2.37	4.47	14.50	22.99	14.50	
D1.5	9.88	95.0%	0.81	100.00	0.020	4.17	856.00	0.010	20	2.00	7.13	11.30	16.25	11.30	
D1.6	1.96	47.5%	0.38	100.00	0.020	10.41	534.00	0.010	20	2.00	4.45	14.86	23.61	14.86	
D1.7	1.56	47.5%	0.38	100.00	0.020	10.41	530.00	0.010	20	2.00	4.42	14.83	23.57	14.83	
D1.8	1.27	47.5%	0.38	100.00	0.020	10.41	325.00	0.010	20	2.00	2.71	13.12	21.39	13.12	
D1.9	0.54	47.5%	0.38	36.00	0.020	6.25	389.00	0.010	20	2.00	3.24	9.49	22.07	9.49	
D1.10	2.13	47.5%	0.38	36.00	0.020	6.25	465.00	0.010	20	2.00	3.88	10.12	22.88	10.12	
D1.11	1.23	80.4%	0.74	12.00	0.020	1.81	962.00	0.017	20	2.61	6.15	7.96	18.40	7.96	
D1.12	3.42	47.5%	0.38	100.00	0.020	10.41	1356.00	0.010	20	2.00	11.30	21.71	32.37	21.71	
D1.13	3.07	95.0%	0.81	100.00	0.020	4.17	456.00	0.008	20	1.79	4.25	8.41	13.66	8.41	
D1.14	0.91	63.7%	0.52	100.00	0.020	8.28	400.00	0.008	20	1.79	3.73	12.01	19.33	12.01	
D2.0	11.90	38.3%	0.32	100.00	0.020	11.27	1750.00	0.011	20	2.10	13.90	25.17	38.84	25.17	
D2.1	3.15	2.0%	0.08	100.00	0.021	14.42						14.42		14.42	
E1	3.92	2.0%	0.08				2811.00	0.008							Tc calculated using TR55 - see Hydraflow Hydrographs Model
EC10	320.00		0.08	300.00	0.020		5250.00	0.013							Tc calculated using TR55 - see Hydraflow Hydrographs Model
OS-1	2.65	35.7%	0.36	50.00	0.020		2525.00	0.007							Tc calculated using TR55 - see Hydraflow Hydrographs Model
GALV	4.44	47.5%	0.38	36.00	0.020	6.25	1007.00	0.010	20	2.00	8.39	14.64	28.65	14.64	
D2.0 (pre-dev)	11.90	2.0%	0.08	100.00	0.020	14.65	1750.00	0.011	20	2.10	13.90	28.56	55.63	28.56	
C3.0 (pre-dev)	35.40	2.0%	0.08	100.00	0.020	14.65	1536.00	0.010	20	2.00	12.80	27.45	53.25	27.45	

FROM THE APPROVED FILING 3 FDR

PROPOSED STORM DRAINAGE SYSTEM DESIGN - 5-YEAR DESIGN STORM

Designer: ESJ
Company: R&R Engineers-Surveyors
Date: 1/5/2023
Project: Mayberry Filing 3
Location: El Paso County

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	Slope %	Street Q cfs	Design Q cfs	Slope %	PIPE SIZE	L ft	VEL ft/sec	Tt min	Q add'l	
		C2.1	0.77	0.38	11.8	0.29	3.88	1.12															
1	C2.1								11.8	0.77	0.29	3.88	1.12						33	4	0.10		
		C2.2	0.33	0.38	7.1	0.12	4.63	0.57															
2	DP1, C2.2								11.9	1.10	0.41	3.86	1.59						450	4	1.90		
		C2.5	9.61	0.38	11.4	3.60	3.94	14.19											10	4	0.00		
3A	C2.5								11.4	9.61	3.60	3.94	14.19						196	4	0.80		
		C2.3	1.81	0.38	19.0	0.68	3.16	2.15															
3B	C2.3, DP3A								19.0	12.52	4.70	3.16	14.86						70	4	0.30		
		C2.4	1.16	0.74	6.5	0.85	4.77	4.08															
4	C2.4, DP3B								19.3	13.68	5.55	3.14	17.43						1590	4	6.60		
		D1.12	3.42	0.38	21.7	1.28	2.97	3.80															
5A	D1.12								21.7	3.42	1.28	2.97	3.80						72	4	0.30		
		D1.14	0.91	0.52	12.0	0.48	3.85	1.83															
5B	D1.14, DP5A								22.0	4.33	1.76	2.95	5.18						28	4	0.10		
		D1.2	2.56	0.38	14.9	0.96	3.54	3.39															
6	D1.2								14.9	2.56	0.96	3.54	3.39						10	4	0.00		
7A	DP5B, DP6								22.1	6.89	2.72	2.94	7.99						44	4	0.20		
		D1.13	3.07	0.81	8.4	2.49	4.39	10.91															
7B	D1.13								8.4	3.07	2.49	4.39	10.91						150	4	0.60		
		D1.1	1.73	0.81	6.6	1.40	4.76	6.67															
7C	D1.1								6.6	1.73	1.40	4.76	6.67						63	4	0.30		
7D	DP7B, DP7C								9.0	4.80	3.89	4.28	16.66						280	4	1.20		
7E	DP7D, DP7A								22.3	11.69	6.61	2.93	19.33						513	4	2.10		
		D1.3	2.02	0.38	10.4	0.76	4.07	3.09															
8	D1.3								10.4	2.02	0.76	4.07	3.09						27	4	0.10		
9	DP7, DP8								24.41	13.71	7.36	2.79	20.55						10	4	0.00		
		D1.4	3.75	0.40	14.5	1.51	3.57	5.38															
10	DP9, D1.4								24.41	17.5	8.9	2.79	24.75						827	4	3.40		
		EC10	320.00		0.0								18.43										Offsite flow, Input from Hydraflow Hydrographs, Calculated via SCS Method
		OS-1	2.65		0.0								1.40										Offsite flow, Input from Hydraflow Hydrographs, Calculated via SCS Method
		E1	3.92		0.0								0.30										Input from Hydraflow Hydrographs, Calculated via SCS Method
11	EC10, OS-1, E1												18.90						2811.6	4	11.70		Input from Hydraflow Hydrographs, Calculated via SCS Method

FROM THE APPROVED FILING 3 FDR

PROPOSED STORM DRAINAGE SYSTEM DESIGN - 100-YEAR DESIGN STORM

Designer: ESJ
Company: R&R Engineers-Surveyors
Date: 1/5/2023
Project: Mayberry Filing 3
Location: El Paso County

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	Slope %	Street Q cfs	Design Q cfs	Slope %	PIPE SIZE	L ft	VEL ft/sec	Tt min	Q add'l	
		C2.1	0.77	0.55	11.8	0.42	6.51	2.73															
1	C2.1								11.8	0.77	0.42	6.51	2.73						33	4	0.10		
		C2.2	0.33	0.55	7.1	0.18	7.78	1.40															
2	DP1, C2.2								11.9	1.10	0.60	6.49	3.89						450	4	1.90		
		C2.5	9.61	0.55	11.4	5.24	6.61	34.63											10	4	0.00		
3A	C2.5								11.4	9.61	5.24	6.61	34.63						196	4	0.80		
		C2.3	1.81	0.55	19.0	0.99	5.31	5.24															
3B	C2.3, DP3A								19.0	12.52	6.82	5.31	36.25						70	4	0.30		
		C2.4	1.16	0.84	6.5	0.97	8.02	7.79															
4	C2.4, DP3B								19.3	13.68	7.80	5.27	41.10						1590	4	7.60		
		D1.12	3.42	0.55	21.7	1.86	4.98	9.28															
5A	D1.12								21.7	3.42	1.86	4.98	9.28						72	4	0.30		
		D1.14	0.91	0.66	12.0	0.60	6.47	3.88															
5B	D1.14, DP5A								22.0	4.33	2.46	4.94	12.18						28	4	0.10		
		D1.2	2.56	0.55	14.9	1.40	5.94	8.28															
6	D1.2								14.9	2.56	1.40	5.94	8.28						10	4	0.00		
7A	DP5B, DP6								22.1	6.89	3.86	4.93	19.03						44	4	0.20		
		D1.13	3.07	0.88	8.4	2.70	7.37	19.90															
7B	D1.13								8.4	3.07	2.70	7.37	19.90						150	4	0.70		
		D1.1	1.73	0.88	6.6	1.52	8.00	12.18															
7C	D1.1								6.6	1.73	1.52	8.00	12.18						63	4	0.30		
7D	DP7B, DP7C								9.1	4.80	4.22	7.17	30.27						280	4	1.30		
7E	DP7D, DP7A								22.3	11.69	8.08	4.91	39.69						513	4	2.40		
		D1.3	2.02	0.55	10.4	1.10	6.84	7.53															
8	D1.3								10.4	2.02	1.10	6.84	7.53						27	4	0.10		
9	DP7E, DP8								24.71	13.71	9.18	4.65	42.73						10	4	0.00		
		D1.4	3.75	0.57	14.5	2.12	6.00	12.72															
10	DP9, D1.4								24.71	17.5	11.3	4.65	52.59						827	4	3.90		
		EC10	320.00		0.0								144.70										Offsite flow, Input from Hydraflow Hydrographs, Calculated via SCS Method
		OS-1	2.65		0.0								4.30										Offsite flow, Input from Hydraflow Hydrographs, Calculated via SCS Method
		E1	3.92		0.0								2.90										Input from Hydraflow Hydrographs, Calculated via SCS Method
11	EC10, OS-1, E1												148.50						2811.6	4	11.70		Input from Hydraflow Hydrographs, Calculated via SCS Method
		D1.5	9.88	0.88	11.3	8.69	6.62	57.6															

POST-DEVELOPMENT C VALUES

Designer: LAO
Company: R&R Engineers-Surveyors
Date: 1/16/2024
Project: Mayberry Filing 2A
Location: El Paso County

Global Parameters[1]			
Land Use	% Imp.	C_5	C_{100}
SF LOTS (1/6 AC)	47.5	0.375	0.545
Hardscape	100	0.9	0.96
Commercial/Industrial	95	0.81	0.88
Landscape	0	0.08	0.35
Roof	90	0.73	0.81

Summary	
Total Area (ac)	0.91
Composite Impervious	64%

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

[1] From Table 6-6 in El Paso County DCM
[2] From Table 6-6 in El Paso County DCM

Basin Name	Area (ac)	NRCS Hydrologic Soil Group	SF LOTS (1/6 AC)		Hardscape		Commercial/Industrial		Landscape		Roof		% Check	Percent Imperviousness	Runoff Coefficient, C[2]				
			Area (ac)	%	Area (ac)	%	Area (ac)	%	Area (ac)	%	Area (ac)	%			2-yr	5-yr	10-yr	25-yr	100-yr
D1.1	1.73	A	0.00	0.0%	0.00	0.0%	1.73	100.0%	0.00	0.0%	0.00	0.0%	100.00%	95.0%		0.81			0.88
D1.13	3.07	A	0.00	0.0%	1.17	38.1%	0.92	30.0%	0.52	16.9%	0.46	15.0%	100.00%	80.1%		0.71			0.81
D1.14	0.91	A	0.60	65.9%	0.00	0.0%	0.31	34.1%	0.00	0.0%	0.00	0.0%	100.00%	63.7%		0.52			0.66
Sidewalk Chase	1.15	A	0.00	0.0%	0.69	60.0%	0.00	0.0%	0.00	0.0%	0.46	40.0%	100.00%	96.0%		0.83			0.90

TIME OF CONCENTRATION

Designer:	LAO
Company:	R&R Engineers-Surveyors
Date:	1/16/2024
Project:	Mayberry Filing 2A
Location:	El Paso County

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

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

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

Non Urban Li max = 300'
Urban Li Max = 100'

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

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

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

Cells of this color are for required user-input

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
D1.1	1.73	95.0%	0.81	100.00	0.020	4.17	405.00	0.020	20	2.83	2.39	6.55	11.99	6.55	
D1.13	3.07	80.1%	0.71	100.00	0.020	5.62	456.00	0.010	20	2.00	3.80	9.42	16.15	9.42	
D1.14	0.91	63.7%	0.52	100.00	0.020	8.28	400.00	0.008	20	1.79	3.73	12.01	19.33	12.01	
Sidewalk Chase	1.15	96.0%	0.83	115.00	0.020	4.13	300.00	0.010	20	2.00	2.50	6.63	11.91	6.63	

PROPOSED STORM DRAINAGE SYSTEM DESIGN - 5-YEAR DESIGN STORM

Designer: LAO
Company: R&R Engineers-Surveyors
Date: 1/16/2024
Project: Mayberry Filing 2A
Location: El Paso County

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	Slope %	Street Q cfs	Design Q cfs	Slope %	PIPE SIZE	L ft	VEL ft/sec	Tt min	Q add'l	
		D1.14	0.91	0.52	12.0	0.48	3.85	1.83															
5B	D1.14								12.0	0.91	0.48	3.85	1.83										
		D1.13	3.07	0.71	9.4	2.18	4.22	9.18															
7B	D1.13								9.4	3.07	2.18	4.22	9.18										
		D1.1	1.73	0.81	6.6	1.40	4.76	6.67															
7C	D1.1								6.6	1.73	1.40	4.76	6.67										
		Sidewalk Chase	1.15	0.83	6.6	0.96	4.75	4.54															
1cc	Sidewalk Chase								6.6	1.15	0.96	4.75	4.54										

PROPOSED STORM DRAINAGE SYSTEM DESIGN - 100-YEAR DESIGN STORM

Designer: LAO
Company: R&R Engineers-Surveyors
Date: 1/16/2024
Project: Mayberry Filing 2A
Location: El Paso County

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	Slope %	Street Q cfs	Design Q cfs	Slope %	PIPE SIZE	L ft	VEL ft/sec	Tt min	Q add'l	
		D1.14	0.91	0.66	12.0	0.60	6.47	3.88															
5B	D1.14								12.0	0.91	0.60	6.47	3.88										
		D1.13	3.07	0.81	9.4	2.49	7.08	17.62															
7B	D1.13								9.4	3.07	2.49	7.08	17.62										
		D1.1	1.73	0.88	6.6	1.52	8.00	12.18															
7C	D1.1								6.6	1.73	1.52	8.00	12.18										
		Sidewalk Chase	1.15	0.90	6.6	1.04	7.97	8.25															
1cc	Sidewalk Chase								6.6	1.15	1.04	7.97	8.25										

APPENDIX B - HYDRAULIC COMPUTATIONS

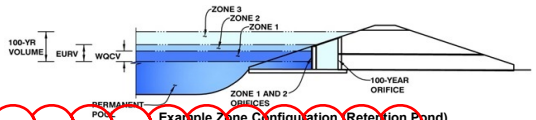
FROM THE APPROVED FILING 3 FDR

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: MAYBERRY FILING 3

Basin ID: INTERIM DETENTION POND D



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	100.20	acres
Watershed Length =	2,867	ft
Watershed Length to Centroid =	1,433	ft
Watershed Slope =	0.010	ft/ft
Watershed Imperviousness =	23.00%	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.

Includes developed Filing 2A

		Optional User Overrides	
Water Quality Capture Volume (WQCV) =	1.065 acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	2.138 acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	1.404 acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	1.992 acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	2.522 acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	4.117 acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	5.623 acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	7.666 acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	12.108 acre-feet	3.14	inches
Approximate 2-yr Detention Volume =	1.329 acre-feet		
Approximate 5-yr Detention Volume =	1.785 acre-feet		
Approximate 10-yr Detention Volume =	2.259 acre-feet		
Approximate 25-yr Detention Volume =	2.902 acre-feet		
Approximate 50-yr Detention Volume =	3.440 acre-feet		
Approximate 100-yr Detention Volume =	4.428 acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	1.065	acre-feet
Zone 2 Volume (EURV - Zone 1) =	1.073	acre-feet
Zone 3 (100yr + 1 / 2 WQCV - Zones 1 & 2) =	2.823	acre-feet
Total Detention Basin Volume =	4.961	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

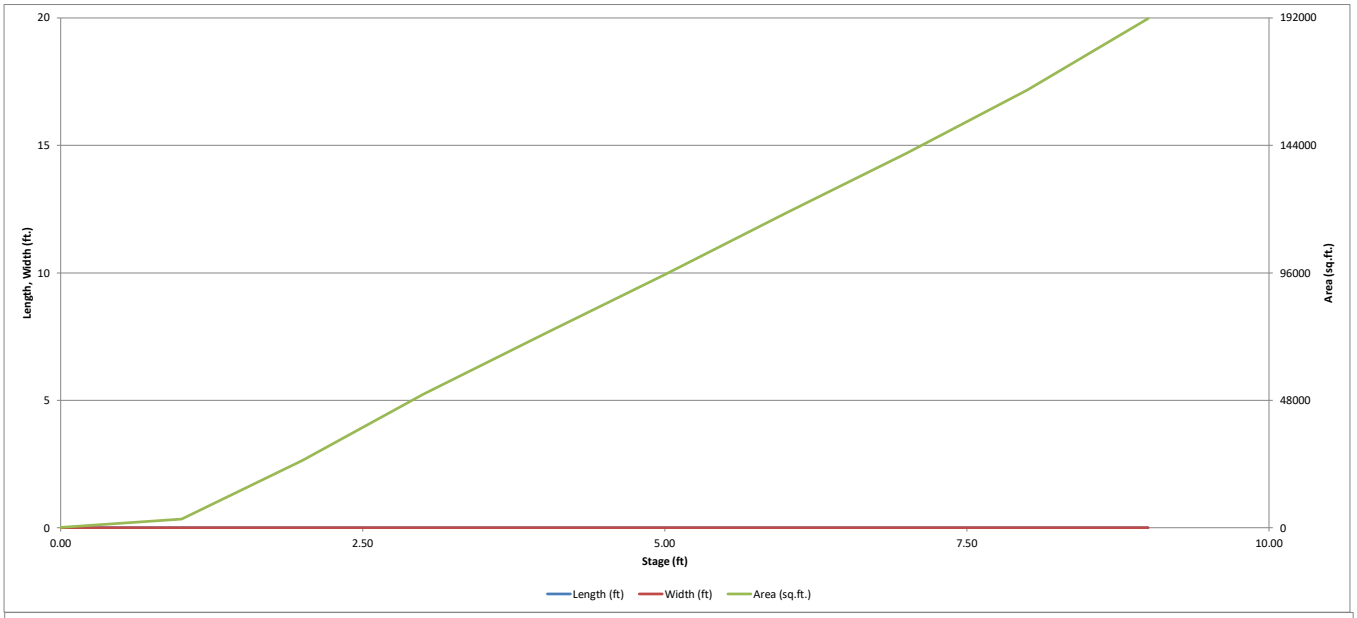
Depth Increment = ft

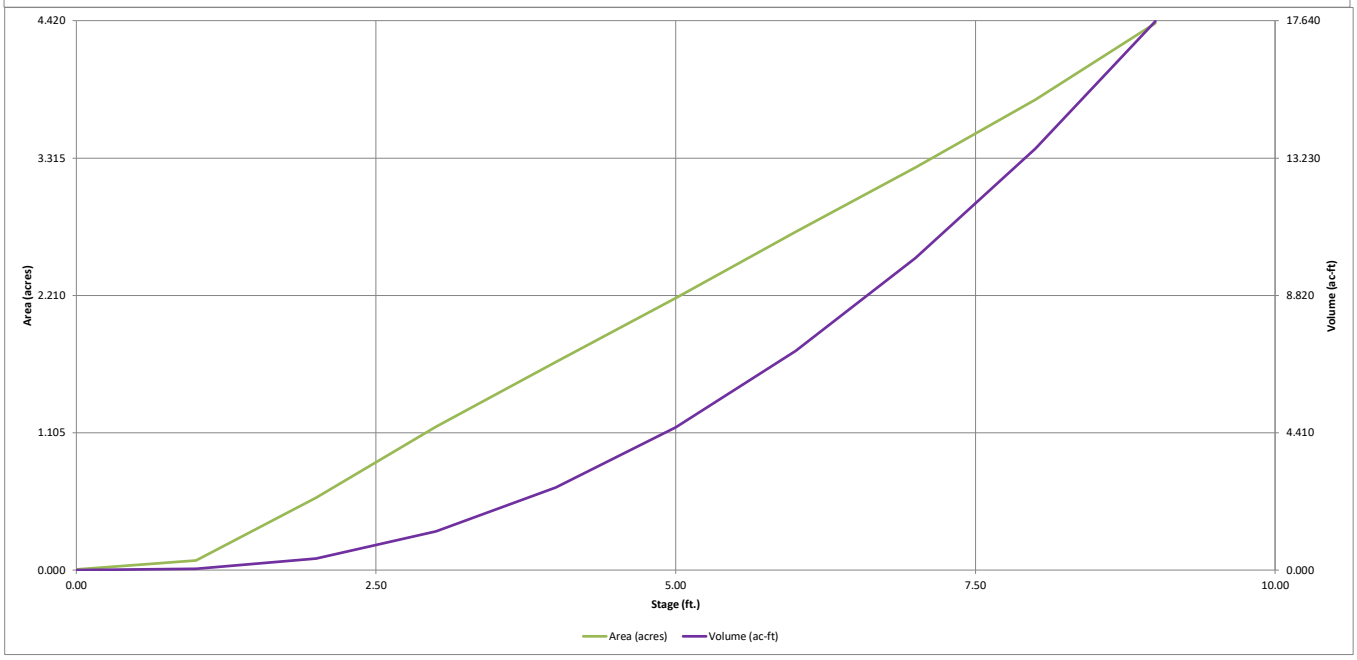
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	170	0.004		
6027	--	1.00	--	--	--	3,344	0.077	1,757	0.040
6028	--	2.00	--	--	--	25,396	0.583	16,127	0.370
6029	--	3.00	--	--	--	50,286	1.154	53,968	1.239
6030	--	4.00	--	--	--	72,956	1.675	115,589	2.654
6031	--	5.00	--	--	--	95,393	2.190	199,763	4.586
6032	--	6.00	--	--	--	118,525	2.721	306,722	7.041
6033	--	7.00	--	--	--	141,085	3.239	436,527	10.021
6034	--	8.00	--	--	--	164,866	3.785	589,503	13.533
6035	--	9.00	--	--	--	191,669	4.400	767,770	17.626

FROM THE APPROVED FILING 3 FDR

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)





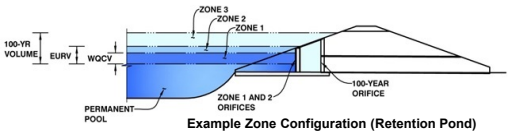
FROM THE APPROVED FILING 3 FDR

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: MAYBERRY FILING 3

Basin ID: INTERIM DETENTION POND D



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.85	1.065	Orifice Plate
Zone 2 (EURV)	3.68	1.073	Orifice Plate
Z3 (100+1/2WQCV)	5.17	2.823	Weir&Pipe (Restrict)
Total (all zones)		4.961	

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

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft²
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

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

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft²
Depth at top of Zone using Orifice Plate =	3.60	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	14.40	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	sq. inches	Elliptical Slot Area =	N/A	ft²

Calculated Parameters for Plate

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.20	2.40					
Orifice Area (sq. inches)	4.00	4.00	4.00					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected			Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A	N/A	ft²
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A	N/A	feet
Vertical Orifice Diameter =	N/A	N/A	inches				

Calculated Parameters for Vertical Orifice

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

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	5.50	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	5.50	N/A	feet
Overflow Weir Front Edge Length =	7.00	N/A	feet	Overflow Weir Slope Length =	6.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	6.46	N/A	
Horiz. Length of Weir Sides =	6.00	N/A	feet	Overflow Grate Open Area w/o Debris =	29.23	N/A	ft²
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	14.62	N/A	ft²
Debris Clogging % =	50%	N/A	%				

Calculated Parameters for Overflow Weir

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.00	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	4.53	N/A	ft²
Outlet Pipe Diameter =	36.00	N/A	inches	Outlet Orifice Centroid =	1.04	N/A	feet
Restrictor Plate Height Above Pipe Invert =	22.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.79	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	6.75	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.65	feet
Spillway Crest Length =	50.00	feet	Stage at Top of Freeboard =	8.40	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	4.03	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	15.10	acre-ft

Calculated Parameters for Spillway

Routed Hydrograph Results

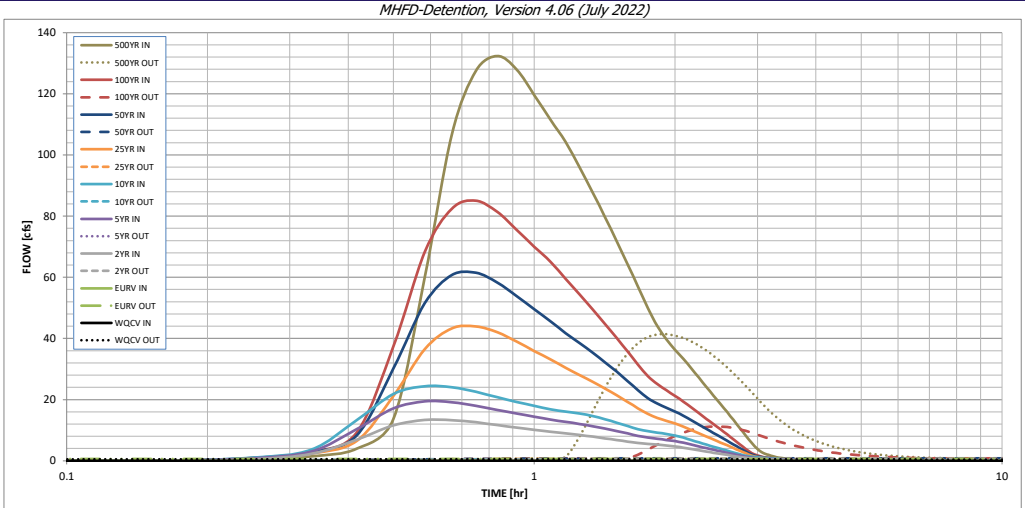
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

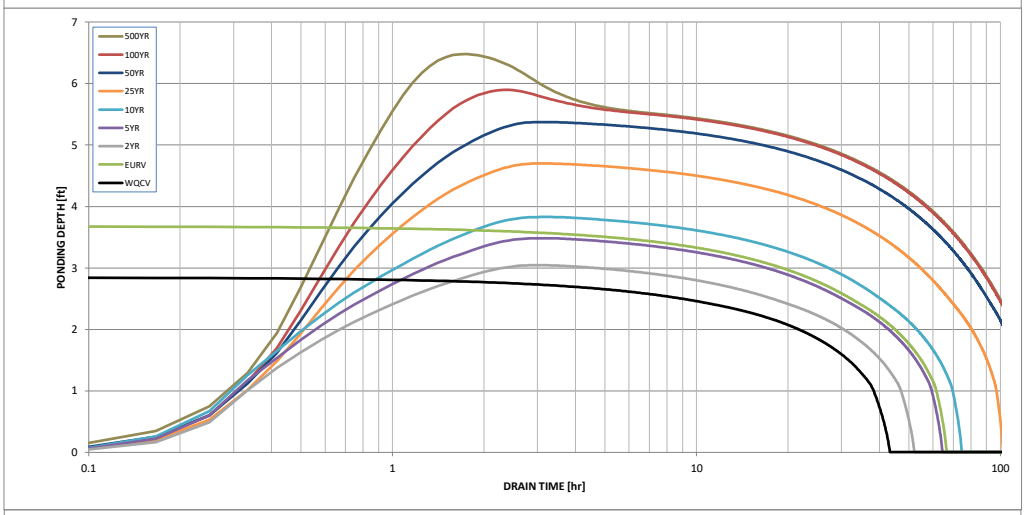
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
CUHP Runoff Volume (acre-ft) =	1.065	2.138	1.404	1.992	2.522	4.117	5.623	7.666	12.108
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	1.404	1.992	2.522	4.117	5.623	7.666	12.108
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.6	1.2	1.7	15.6	31.3	51.8	94.2
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.01	0.02	0.16	0.31	0.52	0.94
Peak Inflow Q (cfs) =	N/A	N/A	13.3	19.4	24.4	43.9	61.4	85.0	132.3
Peak Outflow Q (cfs) =	0.5	0.6	0.5	0.6	0.6	0.7	0.8	11.2	41.4
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.5	0.4	0.0	0.0	0.2	0.4
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.3	1.4
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	39	60	47	58	67	92	112	118	113
Time to Drain 99% of Inflow Volume (hours) =	**42**	64	50	62	71	97	119	>120	>120
Maximum Ponding Depth (ft) =	2.85	3.68	3.04	3.48	3.83	4.70	5.37	5.89	6.48
Area at Maximum Ponding Depth (acres) =	1.07	1.51	1.18	1.40	1.58	2.03	2.39	2.66	2.96
Maximum Volume Stored (acre-ft) =	1.072	2.144	1.286	1.853	2.361	3.932	5.433	6.745	8.377

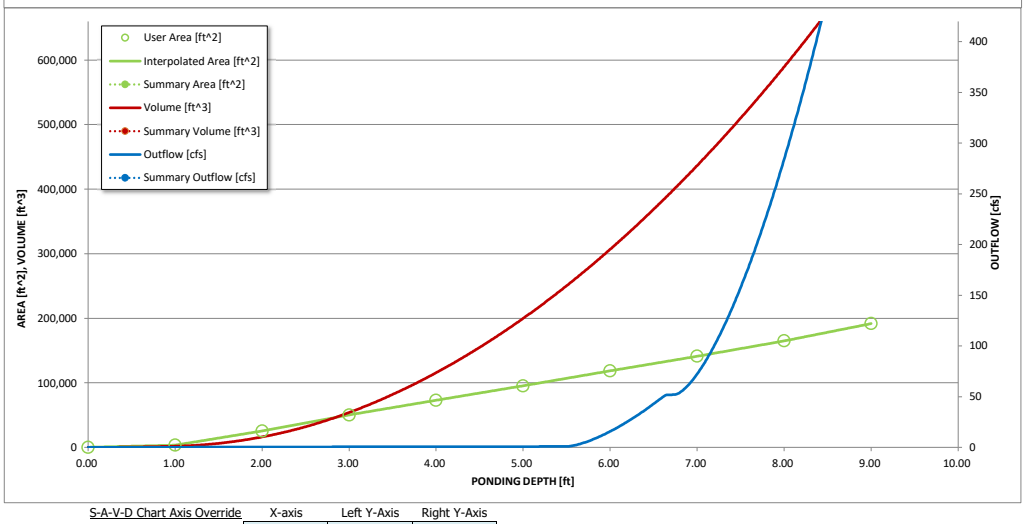
FROM THE APPROVED FILING 3 FDR

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)







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

FROM THE APPROVED FILING 3 FDR

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.01	0.19
	0:15:00	0.00	0.00	0.52	0.84	1.05	0.71	0.93	0.88	1.40
	0:20:00	0.00	0.00	2.21	3.02	3.61	2.32	2.77	2.90	3.93
	0:25:00	0.00	0.00	6.84	10.28	13.24	6.42	8.22	9.22	13.63
	0:30:00	0.00	0.00	11.56	17.17	21.81	21.20	30.19	37.45	60.06
	0:35:00	0.00	0.00	13.31	19.38	24.37	36.53	51.53	68.30	106.83
	0:40:00	0.00	0.00	13.29	19.14	24.06	43.28	60.70	82.43	127.49
	0:45:00	0.00	0.00	12.57	17.98	22.51	43.90	61.45	85.01	132.35
	0:50:00	0.00	0.00	11.64	16.64	20.75	42.00	58.29	81.36	127.98
	0:55:00	0.00	0.00	10.85	15.49	19.26	38.96	53.86	75.47	119.59
	1:00:00	0.00	0.00	10.15	14.42	17.93	35.90	49.52	70.00	111.45
	1:05:00	0.00	0.00	9.52	13.44	16.79	33.17	45.60	65.06	104.31
	1:10:00	0.00	0.00	8.96	12.71	16.05	30.40	41.73	59.52	95.89
	1:15:00	0.00	0.00	8.42	12.03	15.46	27.99	38.44	54.32	87.69
	1:20:00	0.00	0.00	7.88	11.28	14.65	25.79	35.33	49.47	79.73
	1:25:00	0.00	0.00	7.34	10.49	13.59	23.60	32.22	44.70	71.79
	1:30:00	0.00	0.00	6.79	9.69	12.44	21.40	29.10	40.13	64.24
	1:35:00	0.00	0.00	6.27	8.93	11.32	19.25	26.03	35.71	56.97
	1:40:00	0.00	0.00	5.80	8.15	10.32	17.16	23.07	31.46	50.01
	1:45:00	0.00	0.00	5.49	7.60	9.69	15.30	20.46	27.72	44.02
	1:50:00	0.00	0.00	5.29	7.19	9.21	14.00	18.67	25.06	39.74
	1:55:00	0.00	0.00	5.01	6.80	8.75	13.02	17.30	23.03	36.32
	2:00:00	0.00	0.00	4.69	6.41	8.24	12.16	16.09	21.24	33.29
	2:05:00	0.00	0.00	4.29	5.88	7.55	11.14	14.71	19.36	30.22
	2:10:00	0.00	0.00	3.84	5.28	6.76	10.04	13.25	17.41	27.12
	2:15:00	0.00	0.00	3.41	4.68	5.99	8.96	11.81	15.51	24.13
	2:20:00	0.00	0.00	3.00	4.12	5.25	7.92	10.42	13.70	21.28
	2:25:00	0.00	0.00	2.62	3.58	4.55	6.93	9.09	11.97	18.58
	2:30:00	0.00	0.00	2.26	3.08	3.90	5.98	7.81	10.28	15.92
	2:35:00	0.00	0.00	1.91	2.59	3.29	5.05	6.56	8.62	13.31
	2:40:00	0.00	0.00	1.58	2.13	2.70	4.14	5.34	6.99	10.74
	2:45:00	0.00	0.00	1.26	1.69	2.14	3.27	4.15	5.39	8.22
	2:50:00	0.00	0.00	0.98	1.30	1.64	2.43	3.01	3.85	5.80
	2:55:00	0.00	0.00	0.77	1.02	1.32	1.68	2.01	2.50	3.79
	3:00:00	0.00	0.00	0.64	0.85	1.10	1.21	1.44	1.70	2.62
	3:05:00	0.00	0.00	0.54	0.72	0.93	0.94	1.11	1.26	1.90
	3:10:00	0.00	0.00	0.46	0.61	0.79	0.75	0.88	0.95	1.40
	3:15:00	0.00	0.00	0.39	0.51	0.67	0.61	0.71	0.74	1.04
	3:20:00	0.00	0.00	0.33	0.43	0.56	0.50	0.58	0.57	0.78
	3:25:00	0.00	0.00	0.28	0.36	0.47	0.41	0.47	0.44	0.57
	3:30:00	0.00	0.00	0.23	0.30	0.38	0.33	0.38	0.34	0.43
	3:35:00	0.00	0.00	0.19	0.24	0.31	0.27	0.30	0.28	0.35
	3:40:00	0.00	0.00	0.15	0.20	0.24	0.22	0.24	0.23	0.28
	3:45:00	0.00	0.00	0.12	0.15	0.19	0.17	0.19	0.18	0.22
	3:50:00	0.00	0.00	0.09	0.12	0.15	0.13	0.15	0.14	0.17
	3:55:00	0.00	0.00	0.07	0.09	0.11	0.10	0.11	0.10	0.13
	4:00:00	0.00	0.00	0.05	0.06	0.08	0.07	0.08	0.07	0.09
	4:05:00	0.00	0.00	0.03	0.04	0.05	0.05	0.05	0.05	0.06
	4:10:00	0.00	0.00	0.02	0.03	0.03	0.03	0.03	0.03	0.03
	4:15:00	0.00	0.00	0.01	0.01	0.02	0.01	0.02	0.01	0.02
	4:20:00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Worksheet for FILING 2A 5-YEAR

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.017 ft/ft
Discharge	6.67 cfs

Section Definitions

Station (ft)	Elevation (ft)
1+00	3.00
1+05	2.50
1+11	0.50
1+16	1.50
1+41	2.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(1+00, 3.00)	(1+41, 2.00)	0.045

Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	10.1 in
Roughness Coefficient	0.045
Elevation	1.34 ft
Elevation Range	0.5 to 3.0 ft
Flow Area	2.8 ft²
Wetted Perimeter	6.9 ft
Hydraulic Radius	4.9 in
Top Width	6.72 ft
Normal Depth	10.1 in
Critical Depth	8.4 in
Critical Slope	0.044 ft/ft
Velocity	2.36 ft/s
Velocity Head	0.09 ft
Specific Energy	0.93 ft
Froude Number	0.643
Flow Type	Subcritical

Worksheet for FILING 2A 5-YEAR

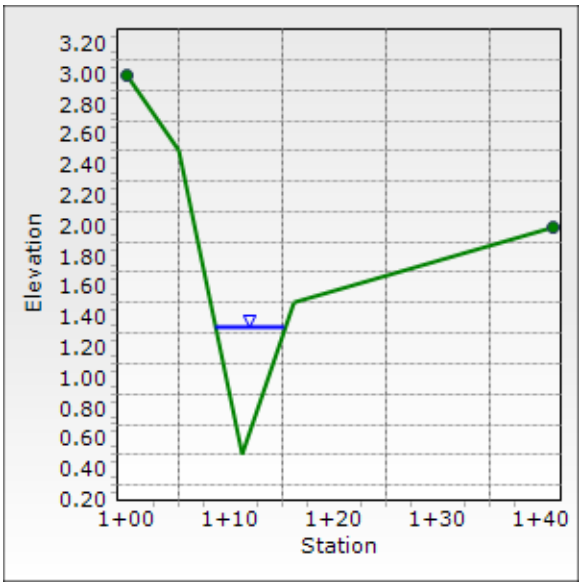
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	10.1 in
Critical Depth	8.4 in
Channel Slope	0.017 ft/ft
Critical Slope	0.044 ft/ft

Cross Section for FILING 2A 5-YEAR

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.017 ft/ft
Normal Depth	10.1 in
Discharge	6.67 cfs



Worksheet for FILING 2A 100-YEAR

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.017 ft/ft
Discharge	12.18 cfs

Section Definitions

Station (ft)	Elevation (ft)
1+00	3.00
1+05	2.50
1+11	0.50
1+16	1.50
1+41	2.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(1+00, 3.00)	(1+41, 2.00)	0.045

Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	13.6 in
Roughness Coefficient	0.045
Elevation	1.64 ft
Elevation Range	0.5 to 3.0 ft
Flow Area	5.6 ft²
Wetted Perimeter	15.5 ft
Hydraulic Radius	4.3 in
Top Width	15.26 ft
Normal Depth	13.6 in
Critical Depth	10.7 in
Critical Slope	0.040 ft/ft
Velocity	2.18 ft/s
Velocity Head	0.07 ft
Specific Energy	1.21 ft
Froude Number	0.634
Flow Type	Subcritical

Worksheet for FILING 2A 100-YEAR

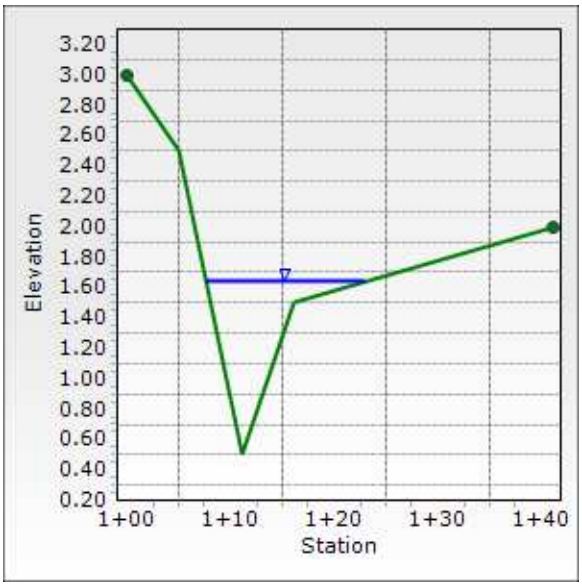
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	13.6 in
Critical Depth	10.7 in
Channel Slope	0.017 ft/ft
Critical Slope	0.040 ft/ft

Cross Section for FILING 2A 100-YEAR

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.017 ft/ft
Normal Depth	13.6 in
Discharge	12.18 cfs



Worksheet for Sidewalk Chase (5-YEAR)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.010
Channel Slope	0.030 ft/ft
Height	0.5 ft
Bottom Width	2.00 ft
Discharge	4.54 cfs

Results	
Normal Depth	3.1 in
Flow Area	0.5 ft²
Wetted Perimeter	2.5 ft
Hydraulic Radius	2.4 in
Top Width	2.00 ft
Critical Depth	6.0 in
Percent Full	51.0 %
Critical Slope	0.003 ft/ft
Velocity	8.90 ft/s
Velocity Head	1.23 ft
Specific Energy	1.49 ft
Froude Number	3.106
Discharge Full	8.80 cfs
Slope Full	0.030 ft/ft
Flow Type	Supercritical

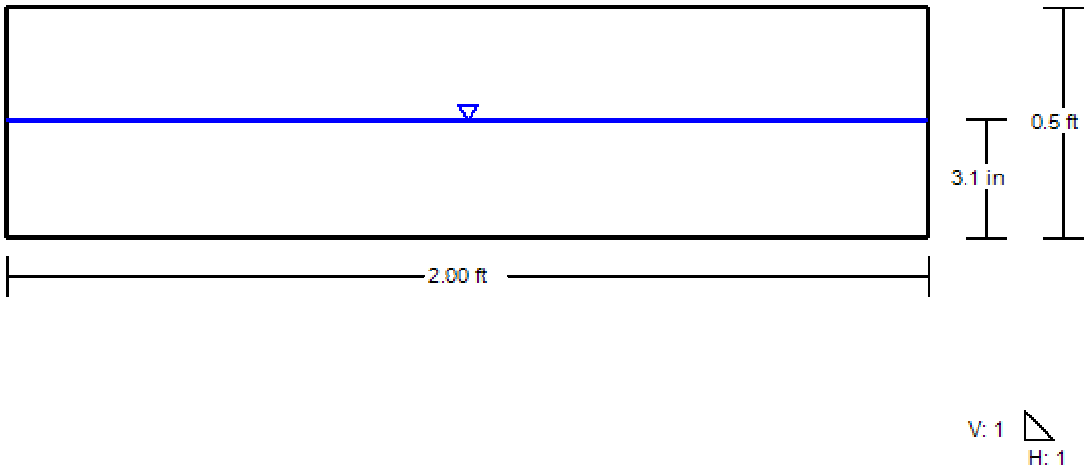
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	51.0 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	3.1 in
Critical Depth	6.0 in
Channel Slope	0.030 ft/ft
Critical Slope	0.003 ft/ft

Cross Section for Sidewalk Chase (5-YEAR)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.010
Channel Slope	0.030 ft/ft
Normal Depth	3.1 in
Height	0.5 ft
Bottom Width	2.00 ft
Discharge	4.54 cfs



Worksheet for Sidewalk Chase (100-YEAR)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.010
Channel Slope	0.030 ft/ft
Height	0.5 ft
Bottom Width	2.00 ft
Discharge	8.25 cfs

Results	
Normal Depth	4.6 in
Flow Area	0.8 ft²
Wetted Perimeter	2.8 ft
Hydraulic Radius	3.3 in
Top Width	2.00 ft
Critical Depth	6.0 in
Percent Full	75.9 %
Critical Slope	0.006 ft/ft
Velocity	10.88 ft/s
Velocity Head	1.84 ft
Specific Energy	2.22 ft
Froude Number	3.114
Discharge Full	8.80 cfs
Slope Full	0.030 ft/ft
Flow Type	Supercritical

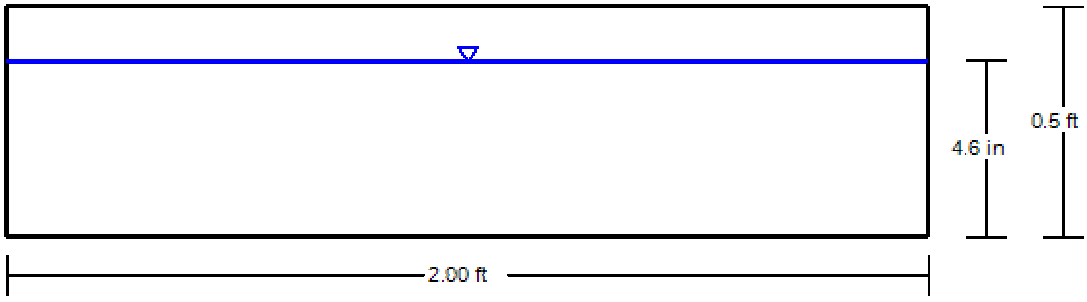
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

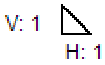
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	75.9 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	4.6 in
Critical Depth	6.0 in
Channel Slope	0.030 ft/ft
Critical Slope	0.006 ft/ft

Cross Section for Sidewalk Chase (100-YEAR)

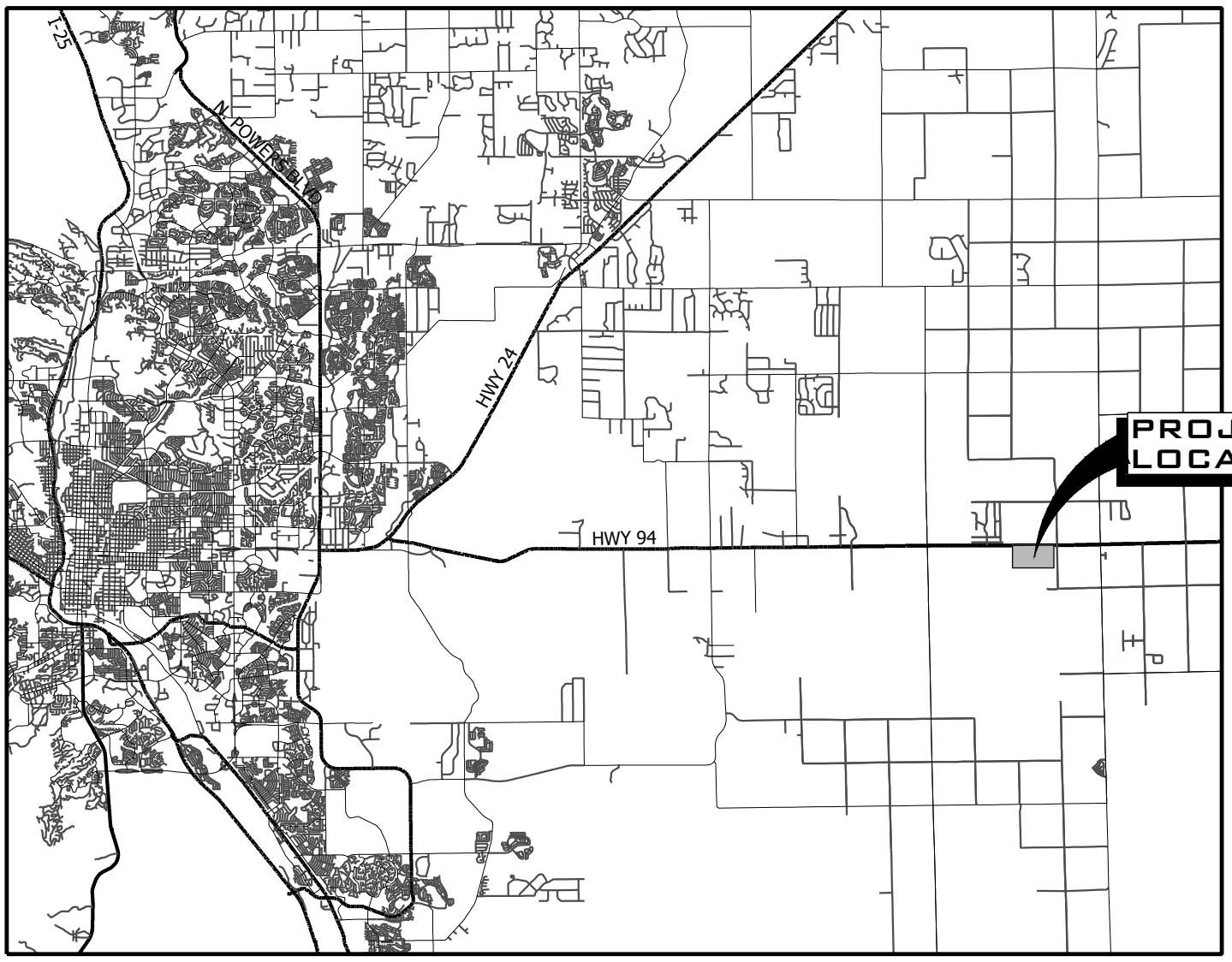
Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.010
Channel Slope	0.030 ft/ft
Normal Depth	4.6 in
Height	0.5 ft
Bottom Width	2.00 ft
Discharge	8.25 cfs



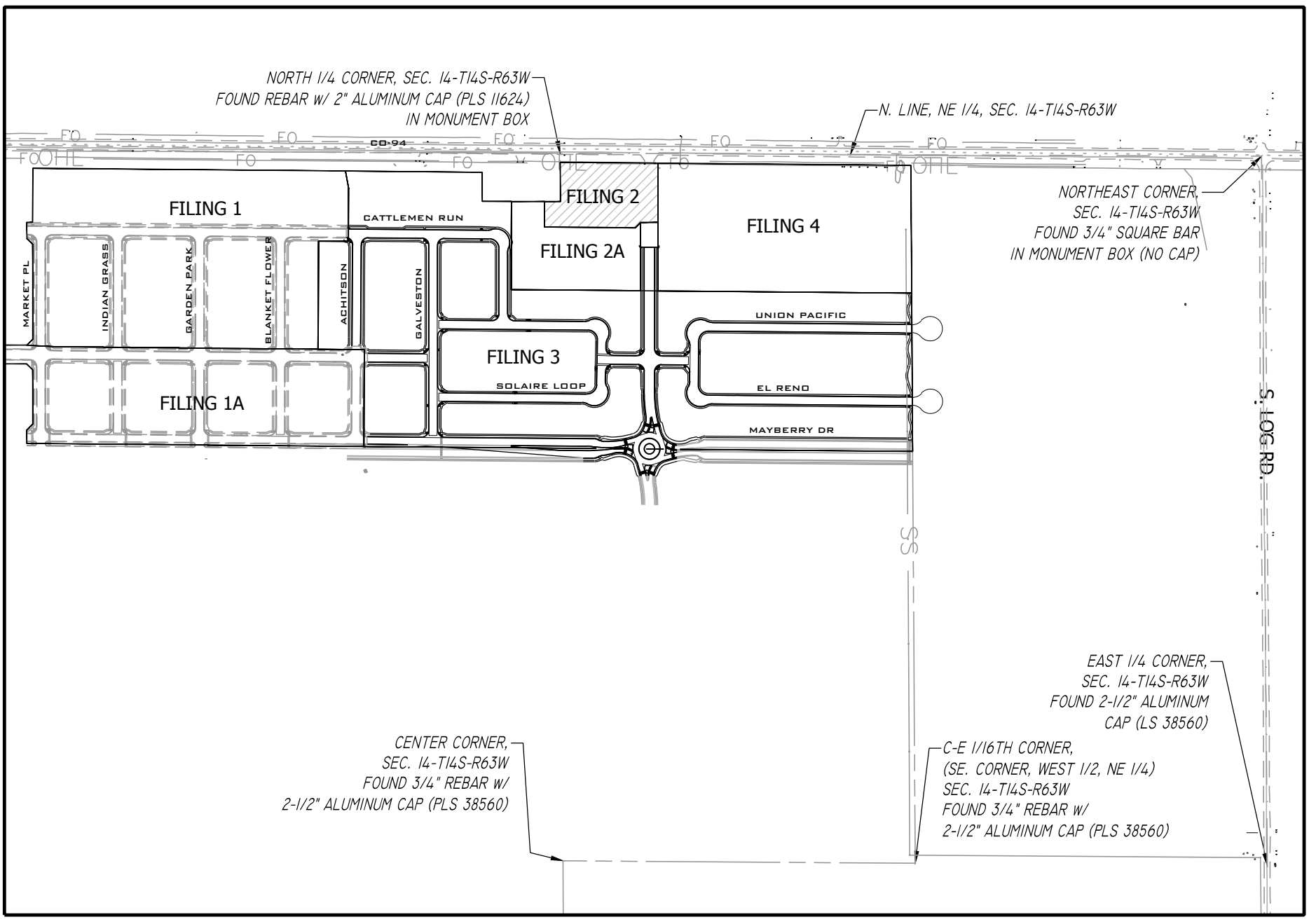


APPENDIX C – REFERENCE INFORMATION



VICINITY MAP

SCALE 1" = 20,000'



SITE MAP

SCALE 1" = 500'

REVISIONS

R&R ENGINEERS SURVEYORS INC
WWW.RRENGINEERS.COM

SITE MAP

MAYBERRY FILING NO. 2A

3296 DEVINE HEIGHTS #208
COLORADO SPRINGS, CO 80922

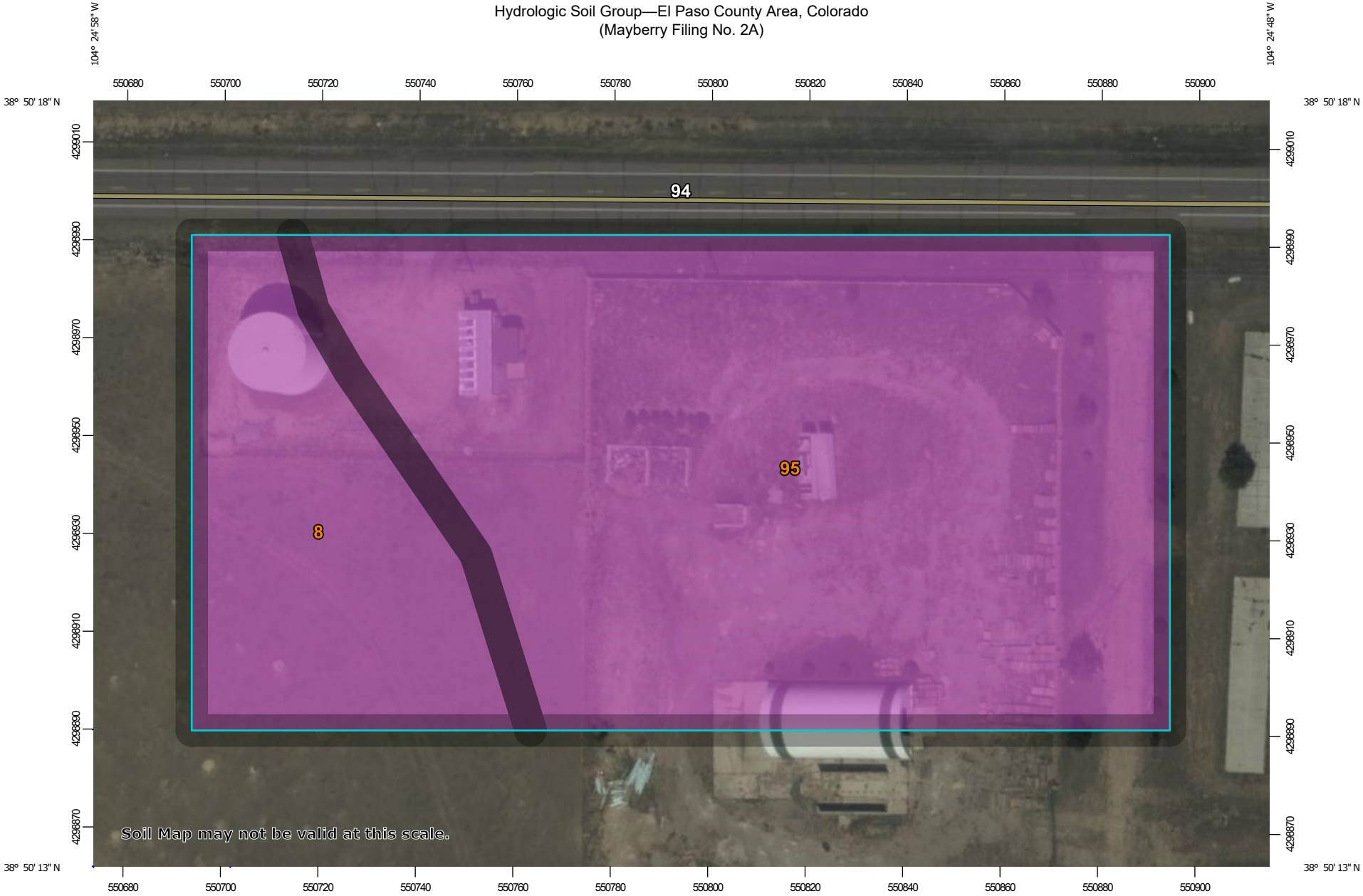
R&R

JOB NO.	MC22199
DATE	09-25-2023
DRN LAO	CHK CD
EXHIBIT NAME	SITE MAP
SHEET NO.	1 OF 1

ENGINEER'S OPINION OF PROBABLE COSTS
FOR
Mayberry Filing 2A - Drainage Improvements

Item	Description	Total Work Units	Unit Price ($)	Total Cost ($)
Riprap		0 Ton	97.00 Ton	0.00
18" RCP		0 LF	$ 76.00 LF	$ 0.00
24" RCP		0 LF	$ 91.00 LF	$ 0.00
30" RCP		0 LF	$ 114.00 LF	$ 0.00
60" RCP		0 LF	$ 348.00 LF	$ 0.00
5' Type R		0 EA	$ 6,703.00 EA	$ 0.00
Storm Manhole		0 EA	$ 7,734.00 EA	$ 0.00
24" FES		1 EA	$ 546.00 EA	$ 546.00
60" FES		0 EA	$ 2,088.00 EA	$ 0.00
Grass Channels		0.22 AC	$ 1,520.00 EA	$ 334.40
SUBTOTAL				$ 546.00
Contingency (15%)				$ 81.90
TOTAL				**$ 627.90**

Hydrologic Soil Group—El Paso County Area, Colorado
(Mayberry Filing No. 2A)



Map Scale: 1:1,100 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 15 30 60 90

Feet
0 50 100 200 300

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.

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

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

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

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

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

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

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 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.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
8	Blakeland loamy sand, 1 to 9 percent slopes	A	1.2	23.2%
95	Truckton loamy sand, 1 to 9 percent slopes	A	3.9	76.8%
Totals for Area of Interest			**5.0**	**100.0%**

Description

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.

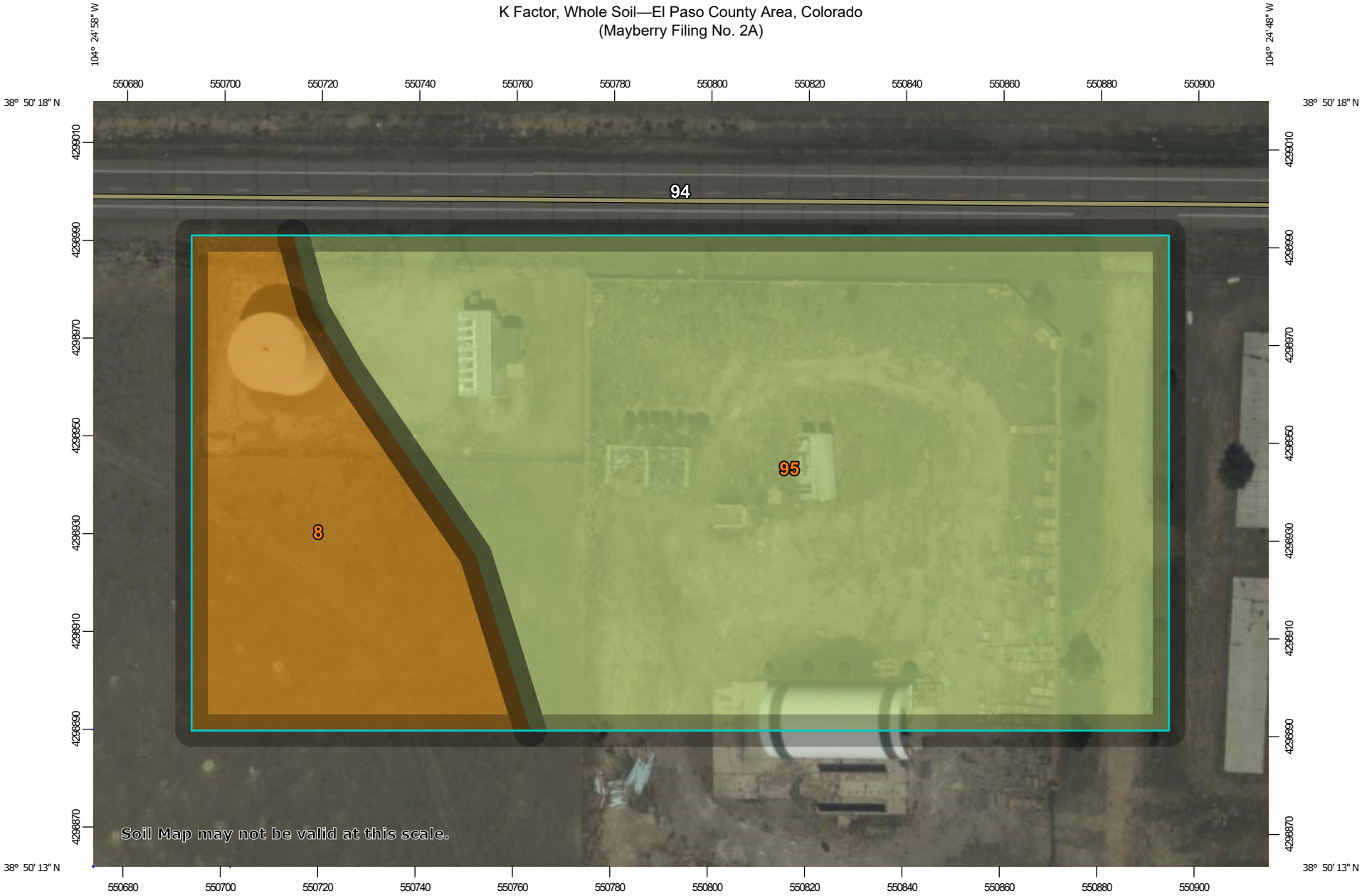
If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher



Map Scale: 1:1,100 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 15 30 60 90

Feet
0 50 100 200 300

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.

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

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

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

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

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

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

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 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.

K Factor, Whole Soil

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
8	Blakeland loamy sand, 1 to 9 percent slopes	.10	1.2	23.2%
95	Truckton loamy sand, 1 to 9 percent slopes	.24	3.9	76.8%
Totals for Area of Interest			**5.0**	**100.0%**

Description

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.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

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

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.

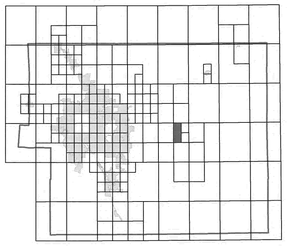
Contact **FEMA Map Service Center** (MSC) via the FEMA Map Information eXchange (FMIX) 1-877-336-2627 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this 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

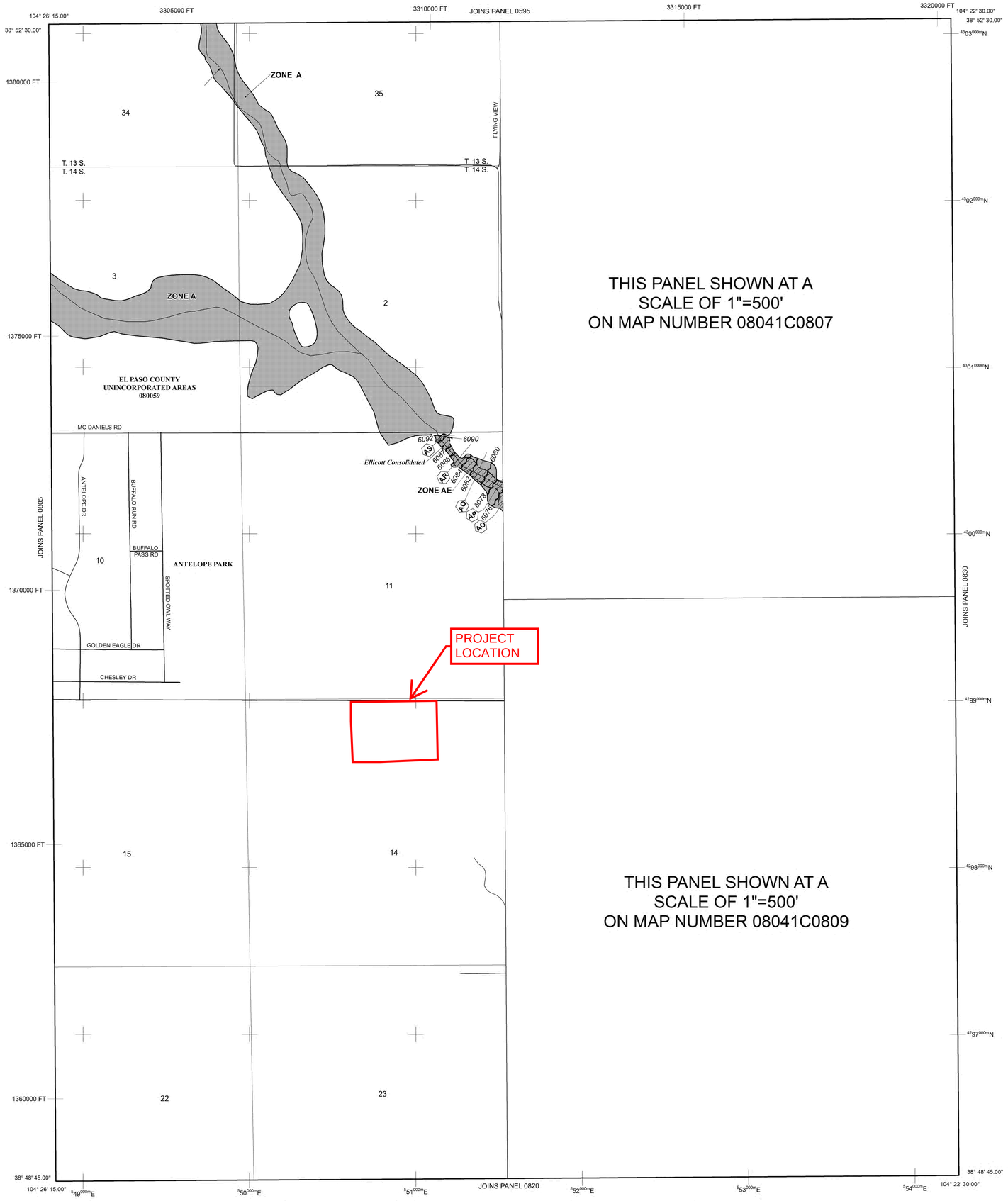
Flooding Source	Vertical Datum Offset (ft)
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION	

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

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

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:

Approved
by Jeff Rice
El Paso County Department of Public Works
on behalf of Elizabeth Nijkamp, Deputy County Engineer
06/14/2023 10:22:10 AM

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

respectively.

Sub-basin C2.5 is a 9.61 acre onsite area that is collected by a curb inlet in Mayberry Drive. This basin consists of single family lots and a portion of Solaire Loop, Galveston Terrace, Cattlemen Run, Achison Way, and Village Main Street. Runoff from this basin is routed via curb/gutter and crosspans, enters a Type R curb inlet, and is discharged into the piped storm sewer system. The 5 year and 100 year developed peak flows are 14.2 and 34.6 cfs respectively.

Sub-basin C3.0* is a 35.40 acre basin south of the Filing 3 development. The basin was analyzed for future development and assumed to comprise both single family lots and park area. During the interim condition the basin will be undeveloped with part of the basin bypassing Pond D following existing drainage patterns. Once fully developed, the entire basin will ultimately drain to Pond D via future storm sewer improvements. The 5 year and 100 year developed peak flows are 22 and 72.7 cfs respectively.

***C3.0** was also analyzed using an interim condition that represents the runoff patterns prior to development. Under this condition the basin would flow southeast and southwest into Channel C2, ultimately discharging into Pond D. The 5 year and 100 year undeveloped peak flows are 7.4 and 54.4 cfs respectively.

Sub-basin D1.1 is a 1.73 acre basin comprising commercial lots of Filing 2. The basin was analyzed for future development of Filing 2. The developed basin will drain via a swale along the southern Filing 2 boundary and enter the Springs Road storm system via a flared end section. The 5 year and 100 year developed peak flows are 6.7 and 12.2 cfs respectively.

Sub-basin D1.2 is a 2.56 acre basin comprising single family lots and portions of Solaire Loop and Besseyi Way. Runoff from this basin is routed via curb/gutter and crosspans, enters a Type R curb inlet on the south side of Besseyi Way, and is discharged into the piped storm sewer system. The 5 year and 100 year developed peak flows are 3.4 and 8.3 cfs respectively.

Sub-basin D1.3 is a 2.02 acre basin comprising single family lots and portions of Union Pacific Way and El Reno Way. Runoff from this basin is routed via curb/gutter and crosspans, enters a Type R curb inlet on the north side of El Reno Way, and is discharged into the piped storm sewer system. The 5 year and 100 year developed peak flows are 3.1 and 7.5 cfs respectively.

Sub-basin D1.4 is a 3.75 acre basin comprising single family lots and portions of Besseyi Way, Union Pacific Way, Springs Road and El Reno Way. Runoff from this basin is routed via curb/gutter and crosspans, enters a Type R curb inlet on the south side of El Reno Way, and is discharged into the piped storm sewer system. The 5 year and 100 year developed peak flows are 5.4 and 12.7 cfs respectively.

Filing 3 and the future Type R inlet will discharge to the main storm sewer system via this stub. The 5 year and 100 year developed peak flows are 3.3 and 8.0 cfs respectively.

Sub-basin D1.11 is a 1.23 acre onsite area that will not be fully developed until future phases. In the future the basin will be collected by a curb inlet on the south side of Mayberry Drive. This basin consists of the south section of the Mayberry Drive ROW. Runoff from this basin will be routed via curb/gutter, enter a Type R curb inlet, and will be discharged into the piped storm sewer system. A stub will be installed during Filing 3 and the future Type R inlet will discharge to the main storm sewer system via this stub. The 5 year and 100 year developed peak flows are 4 and 7.7 cfs respectively.

Sub-basin D1.12 is a 3.42 acre basin comprising single family lots and portions of Cattlemen Run, Solaire Loop, and Besseyi Way. The basin drains via curb and gutter to a Type R inlet on the north side of Besseyi Way. The 5 year and 100 year developed peak flows are 3.8 and 9.3 cfs respectively.

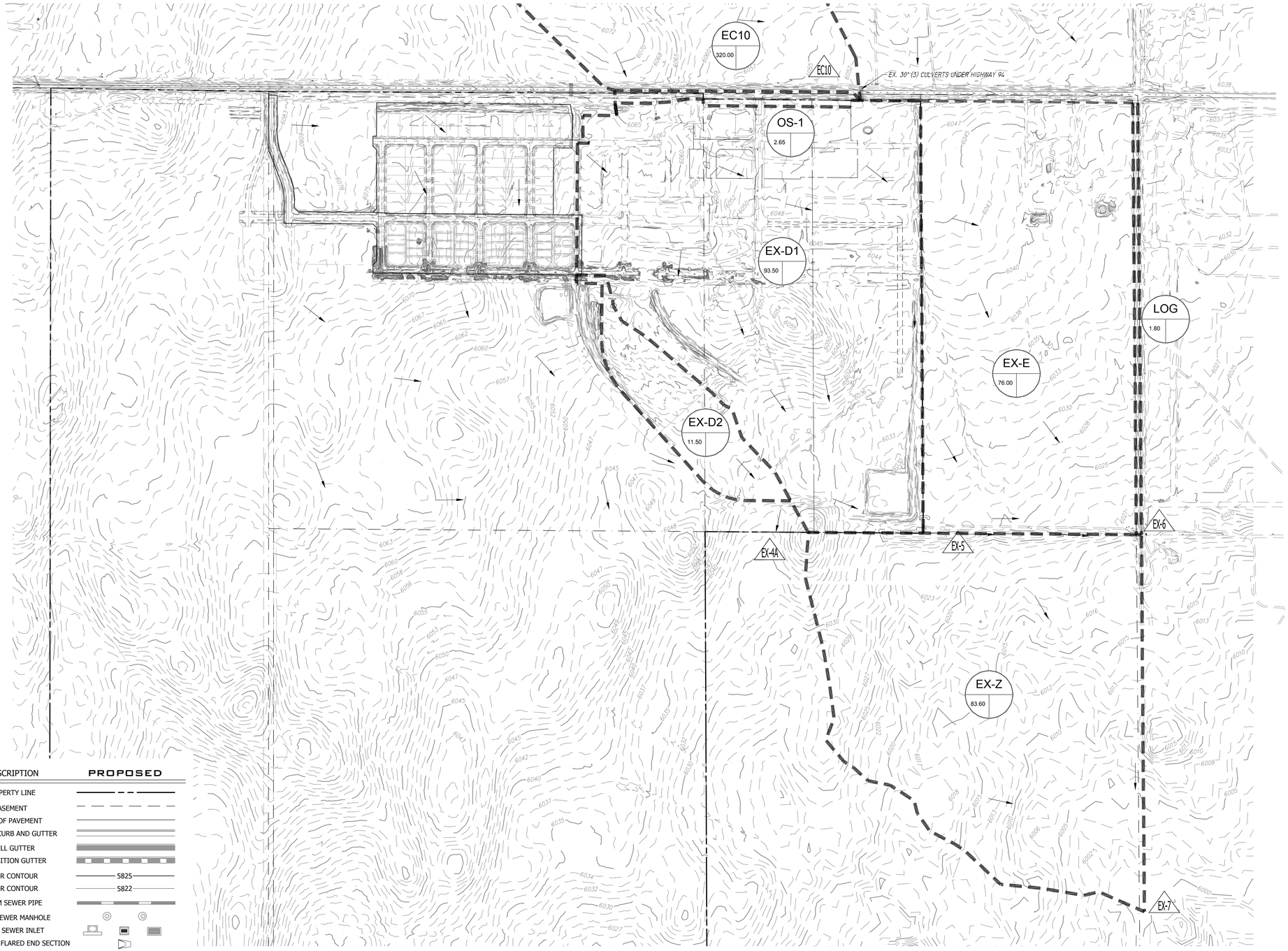
Sub-basin D1.13 is a 3.07 acre basin comprising commercial lots of Filing 2. The basin was analyzed for future development of Filing 2. The developed basin will drain into a future road's curb and gutter system and enter the Springs Road storm system via a Type R inlet within Springs Road. The 5 year and 100 year developed peak flows are 10.9 and 19.9 cfs respectively.

Sub-basin D1.14 is a 0.91 acre basin comprising both single family lots and the southeast commercial lots of Filing 2. The basin was analyzed for future development of Filing 2. The basin drains via curb and gutter to a Type R inlet on the north side of Besseyi Way. The 5 year and 100 year developed peak flows are 1.8 and 3.9 cfs respectively.

Sub-basin D2.0* is a 11.90 acre basin south of the Filing 3 development. The basin was analyzed for future development and assumed to comprise both single family lots and park area. The basin will ultimately drain to Pond D via future storm sewer improvements. The 5 year and 100 year developed peak flows are 10.3 and 27.7 cfs respectively.

***D3.0** was also analyzed using an interim condition that represents the runoff patterns prior to development. Under this condition the basin would flow southeast into Channel D, ultimately discharging into Pond D. The 5 year and 100 year undeveloped peak flows are 2.4 and 17.9 cfs respectively.

Sub-basin D2.1 is a 3.15 acre basin south of the Filing 3 development. The basin comprises the area around Detention Pond D. The basin will ultimately surface flow. The 5 year and 100 year developed peak flows are 0.9 and 6.6 cfs respectively.



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)	C – 1* 1**
	FLOW ARROW	
	DESIGN POINT	1
	DRAINAGE AREA BOUNDARY	

BASIN SUMMARY TABLE

BASIN	AREA (AC)	5-YR (CFS)	100-YR (CFS)
EC-10	320.00	18.40	144.70
OS-1	2.65	1.40	4.30
EX-D1	93.50	8.40	76.23
EX-D2	11.50	1.40	12.50
EX-E	76.00	6.10	53.30
LOG	1.80	3.70	6.30
EX-Z	83.60	8.20	63.40

DESIGN POINT SUMMARY TABLE

DESIGN POINT	CONTRIBUTING BASINS	5-YR (CFS)	100-YR (CFS)
EC-10	EC-10	18.40	144.70
EX-4A	EX-D2	1.40	12.50
EX-5	EC-10, EX-D1	23.70	183.90
EX-6	DP EX-5, EX-E, LOG	30.50	231.40
EX-7	DP EX-6, EX-Z	38.20	289.90

0 300' 600' 900'

SCALE: 1" = 300'

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

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

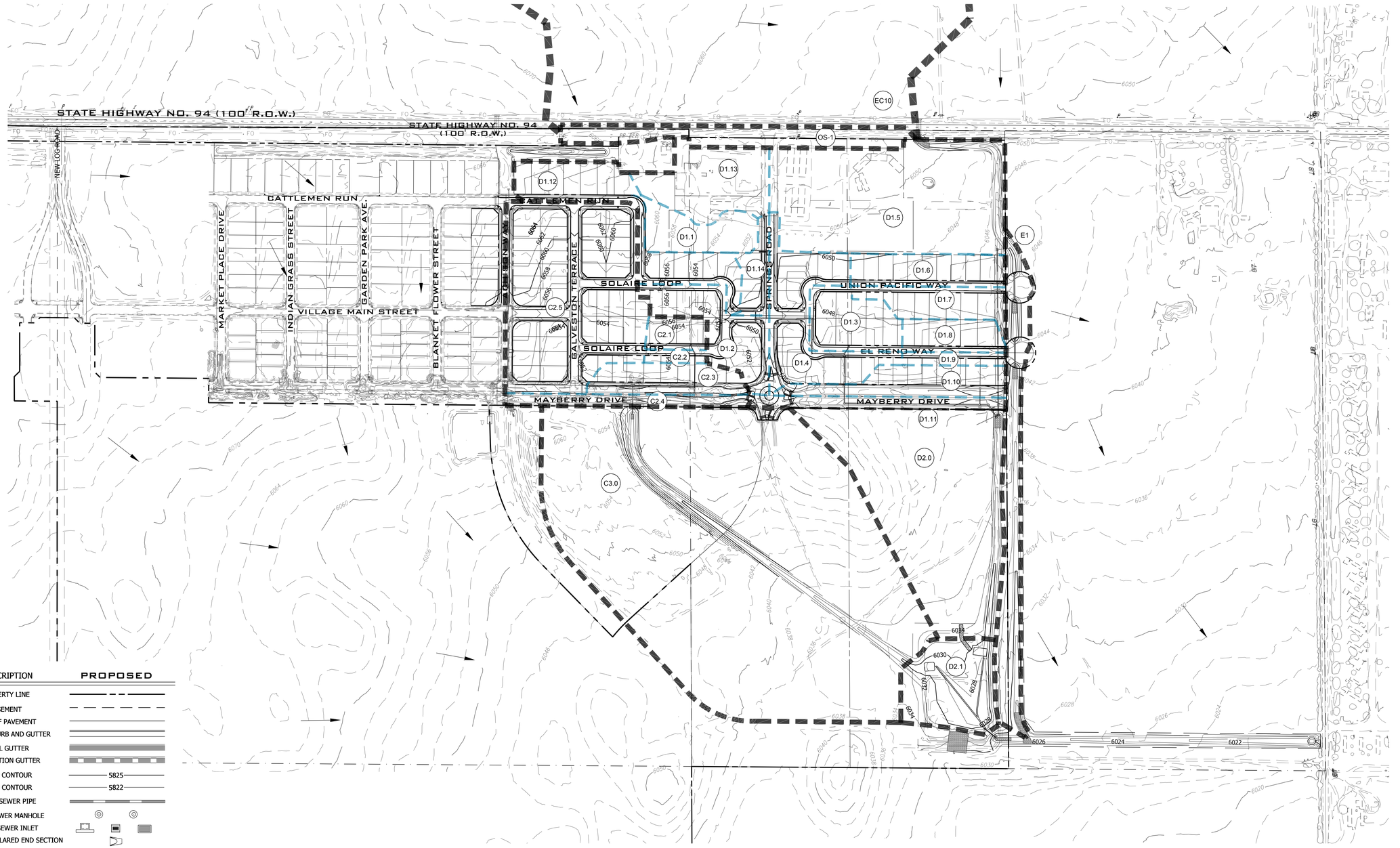
JOB NO. MC22110
ORG. SUBM. DATE 06/16/2022
DWN: LAO CHKD: CJD
NAME

FILING 3 HISTORIC DRAINAGE PLAN

NO. EX2

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

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



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 (%)

C-1*
** 50%***

FLOW ARROW

DESIGN POINT

DRAINAGE AREA BOUNDARY

0 200' 400' 600'

SCALE: 1" = 200'

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

OVERALL FILING 3
PROPOSED
DRAINAGE PLAN

NO. D1.1

PATH: \\192.168.100.23\PROJECTS\MC22110_MAYBERRY FILING NO. 3\ENGINEERING\4_DRAWINGS\PLANS\DRAINAGE MAPS\MC22110-XP-DRNG_MAP.DWG, PLOT DATE: 1/5/2023, 10:57:16 AM, BY: LIZ_JONES

EXISTING 30" CMP CULVERTS (3 EA.)

STATE HIGHWAY NO. 94 (100' R.O.W.)

EC10 | 320 | 61%

OS-1 | 2.65 | 36%

D1.13 | 3.07 | 95%

D1.12 | 3.42 | 47.5%

D1.1 | 1.73 | 95%

D1.14 | 0.91 | 64%

D1.2 | 2.56 | 47.5%

C2.1 | 0.77 | 47.5%

C2.2 | 0.33 | 47.5%

C2.3 | 1.81 | 47.5%

C2.4 | 1.16 | 80%

C2.5 | 9.61 | 47.5%

D1.4 | 3.75 | 50%

TRACT B

TRACT A

CATTLEMEN RUN

ACHISON WAY

GALVESTON TERRACE

SOLAIRE LOOP

SPRINGS ROAD

MAYBERRY DRIVE

±7.5 LF ~ 24" RCP

15' TYPE-R INLET C2.8 H

5'-DIA. STMMH C2.8H

±139.8 LF ~ 24" RCP

±62.4 LF ~ 24" RCP

F2 24-IN FES

5'-DIA. STMMH C2.8G

±279.8 LF ~ 30" RCP

15' TYPE-R INLET C2.8A-2

±68.1 LF ~ 24" RCP

6'-DIA. STMMH C2.8F

BESSEYI WAL

±189.3 LF ~ 36" RCP

15' TYPE-R INLET C2.8A-1

±27.5 LF ~ 30" RCP

6'-DIA. STMMH 2.8C

±6.5 LF ~ 18" RCP

5' TYPE-R INLET C2.8C

±44.2 LF ~ 36" RCP

5' TYPE-R INLET C2.4A

±37.3 LF ~ 18" RCP

5' TYPE-R INLET C2.4B

15' TYPE R INLET C2.5A

10' TYPE-R INLET C2.5F

±5.5 LF ~ 24" RCP

36.9 LF ~ 24" RCP

±5.5 LF ~ 30" RCP

±255.7 LF ~ 24" RCP

±138.3 LF ~ 24" RCP

5'-DIA. STMMH C2.5E

5'-DIA. STMMH C2.5B

5'-DIA. STMMH C2.4C

±70.7 LF ~ 36" RCP

5'-DIA. STMMH C2.5C

±43.6 LF ~ 36" RCP

36" FES 5

TYPE L RIPRAP
W = 6'
L = 12'
D50 = 9"

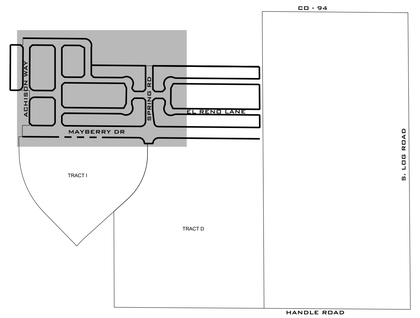
MATCHLINE - SEE SHEET D1.4

MATCHLINE - SEE SHEET D1.3

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.



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

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

0 60' 120' 180'

SCALE: 1" = 60'

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: LAQ CHKD: CJD

NAME FILING 3 DETAILED DRAINAGE PLAN - NORTH WEST

NO. D1.2

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, 2:50:12 PM, BY: LIZ JONES

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

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 (%)

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

FLOW ARROW

DESIGN POINT (1)

MAJOR DRAINAGE AREA BOUNDARY

MINOR DRAINAGE AREA BOUNDARY

FILING 2A TO FILING 3 COMPARISON TABLE		
	BASIN D1.1 ALLOWABLE FLOW PER FIL. 3	BASIN D1.1 ACTUAL DEVELOPED FLOW WITH FIL. 2A
5 YEAR FLOW	6.7 CFS	6.7 CFS
100 YEAR FLOW	12.2 CFS	12.2 CFS
	BASIN D1.13 ALLOWABLE FLOW PER FIL. 3	BASIN D1.13 ACTUAL DEVELOPED FLOW WITH FIL. 2A
5 YEAR FLOW	10.9 CFS	9.2 CFS
100 YEAR FLOW	19.9 CFS	17.6 CFS
	BASIN D1.14 ALLOWABLE FLOW PER FIL. 3	BASIN D1.14 ACTUAL DEVELOPED FLOW WITH FIL. 2A
5 YEAR FLOW	1.8 CFS	1.8 CFS
100 YEAR FLOW	3.9 CFS	3.9 CFS

0 40' 80' 120'
SCALE: 1" = 40'

TRACT B
CHEROKEE WATER & SANITATION DISTRICT BK. 5527, PG. 376
FILING 2A
FILING 3
FILING 4
BUSINESS PARK
CATTLEMEN RUN
SOLAIRE LOOP
SPRINGS ROAD
BESSEYI WAY
D1.13 — 3.07 — 80%
D1.1 — 1.73 — 95%
D1.14 — 0.91 — 64%
PROP. 20.0' DRAINAGE EASEMENT
PROPOSED GRASS SWALE
PROP. 24" RCP FLARED END SECTION
EX. 30" RCP
EX. 5' STORM MH
EX. 15' TYPE R CURB INLET
EX. 24" RCP
EX. 6' STORM MH
EX. 36" RCP
7B
7C
5B

NO.	REVISION	BY	DATE

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. 2A

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. MC22199
ORG. SUBM. DATE 09/25/2023
DWN: LO CHKD: TW
NAME

FILING 2A PROP. DRAINAGE MAP

NO. D1.1