



TECHNICAL MEMORANDUM

PREPARED FOR: City of Colorado Springs Stormwater Enterprise

PREPARED BY: Dewberry Engineers, Inc.

DATE: Oct 09, 2024

SUBJECT: Candleflower Park Concrete Channel Conversion - Feasibility Study and Conceptual Design
Technical Memorandum - **DRAFT**

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1. Executive Summary

This memorandum presents the feasibility study and conceptual design of replacing a concrete channel with a natural channel near Candleflower Park in Colorado Springs, Colorado. The project would remove the concrete channel and replace it with a natural channel that contains the 100-year flow and improves water quality using a vegetated channel. The project has been split into two separate portions due to differing site conditions based on the location of a wastewater pipeline, neighboring homes, and the surrounding terrain. The southern portion of the project has increased constructability; however, the northern portion of the park was still evaluated. The northern portion of the project would result in a Water Quality Storage Volume (WQSV) credit of 4.22 acre-feet for the consent decree between the Environmental Protection Agency (EPA), on behalf of the Colorado Department of Public Health and the Environment (CDPHE) and the City of Colorado Springs. The cost per WQSV for the northern portion of the project is estimated to be \$890,983/ac-ft. The southern portion of the site would result in a WQSV of 6.96 acre/feet with a cost per WQSV of \$623,429/ac-ft. If the full project were to be completed, this would result in a WQSV of 11.18 and the cost per WQSV to be \$724,420/ac-ft. The cost for the northern portion of the project is approximately \$3,733,700 and the cost for the southern portion of the project is approximately \$3,747,313. Leading the total cost if the full project were to be completed to be \$7,481,013.

2. Site Information and Jurisdictional Requirements

2.1 Location

The project reach begins north of Research Pkwy. It continues under Research Pkwy through a culvert and is bordered to the east by Austin Bluffs Pkwy. The end of the concrete channel occurs at a culvert inlet where the channel goes underneath Meadow Ridge Dr. A conceptual design was only developed for the area beginning at Research Parkway until the channel flows along a neighborhood near Meadow Ridge Drive. The project reach was limited due to constraints by a combination of topography, wastewater lines, and nearby housing that would make it challenging to convert the channels to a vegetated state.

Within the area that was studied, the project was split into a north and south section. The delineation between the two was based upon where the wastewater line paralleling the creek moves away from the channel and into Austin Bluffs Pkwy. Additionally, the terrain in the south section is more conducive to developing a channel conversion design.

See Figure 1 for a depiction of the overall area with the north and south reaches delineated. The project site is situated within the park along the Templeton Gap Tributary to Shooks Run specifically in Section 02, Township 13 South, Range 66 West of the 6th Principal Meridian, El Paso County, Colorado Springs, Colorado. The project length extends approximately 2790 feet.

The project has two main goals:

- 1) replace the concrete channel with a more natural channel.
- 2) improve water quality for flows exiting the reach.



Figure 1. Location Map

Below are several photos of the project area. Portions of the concrete are damaged and have exposed rebar.





2.2 DBPS

There is an existing Drainage Basin Planning Study (DBPS) for Cottonwood Creek, entitled “Cottonwood Creek Drainage Basin Planning Study” prepared by Matrix Design Group in 2019. This tributary to Cottonwood Creek is included within that report. Information on the hydrology from that report is included in Section 3.

2.3 FEMA Regulations

The effective floodplain and floodway boundaries along the proposed Project reach are found on El Paso County Flood Insurance Rate Map (FIRM) panels 08041C0528G (effective March 17, 1997, effective dates of revisions to this December 7, 2018). The project does not lie within any flood zone. Refer to Appendix A for the location of the project on the FIRM. Based upon the lack of a mapped floodplain for the project site, this project would not require a Floodplain Development Permit, a no-rise certification or a CLOMR.

2.4 404 Permitting Requirements

A 404 permit may be required due to there being a baseflow in the channel. If the project progresses, additional jurisdictional determination will be required.

2.5 Property Ownership

The proposed reach is on parcel 6302100008, a City of Colorado Springs owned parcel. There are no foreseen issues with the property ownership for this project, as all improvements would be done within the park owned by the City. No permanent or temporary easements are necessary. Property ownership files can be found in Appendix A.

2.6 Utility Conflicts

Utility information for electric, gas, water, and wastewater lines were pulled from the Colorado Springs Utilities (CSU) Facility Information Management System (FIMS). The existing concrete channel that is north of Research Pkwy has a wastewater line that runs parallel and across it. Due to this line, it is unlikely that any design will be done to this portion of the channel. See Figure 2 for the location of the wastewater utility line. There are no utility lines crossing the existing channel within the project site, so utility crossings are not an issue for this prospective project. The remaining maps from the CSU FIMS system are included in Appendix A.

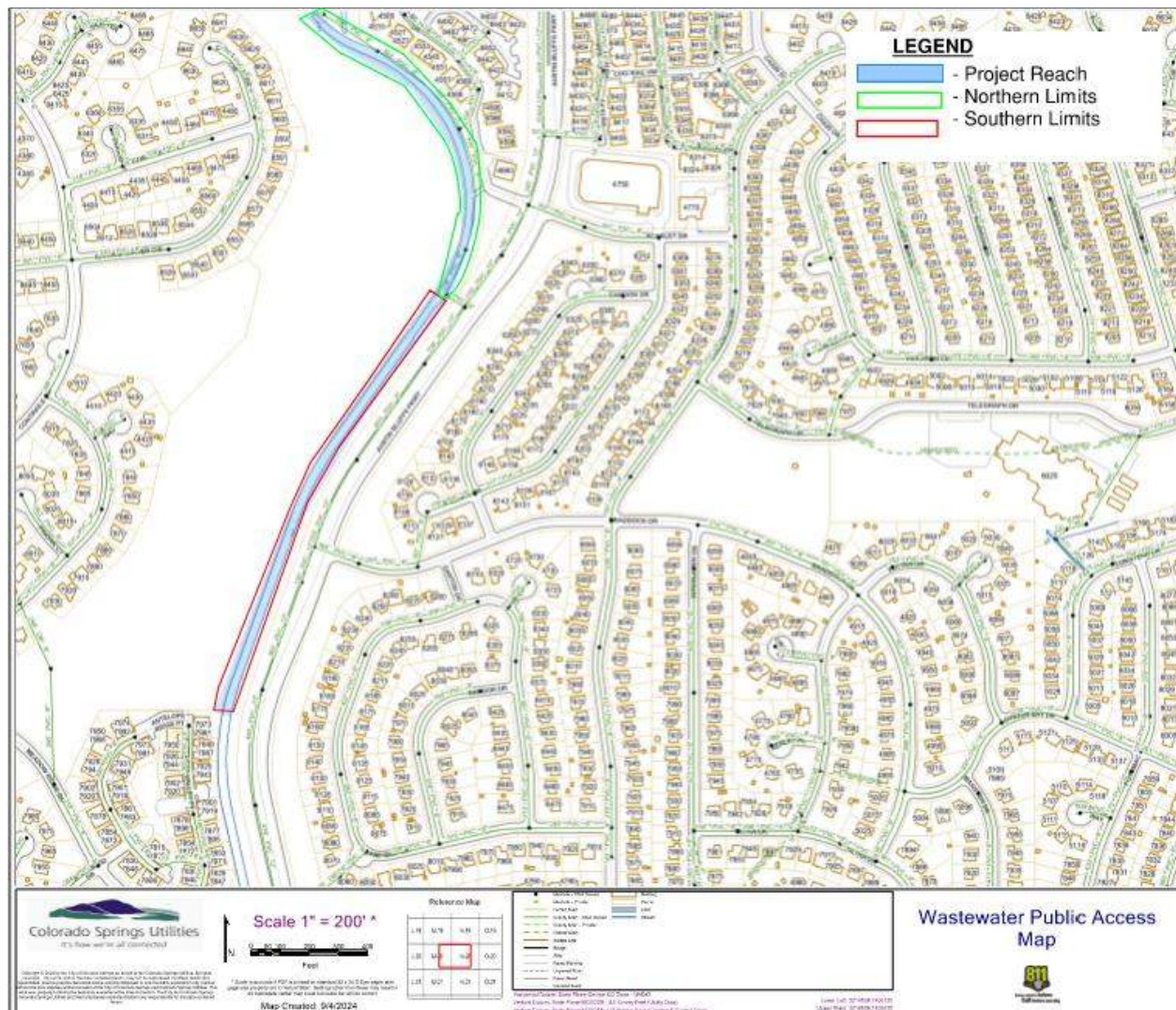


Figure 2. Wastewater Utility Line Map

3. Hydrology

3.1 2-Year and 100-Year Flowrate

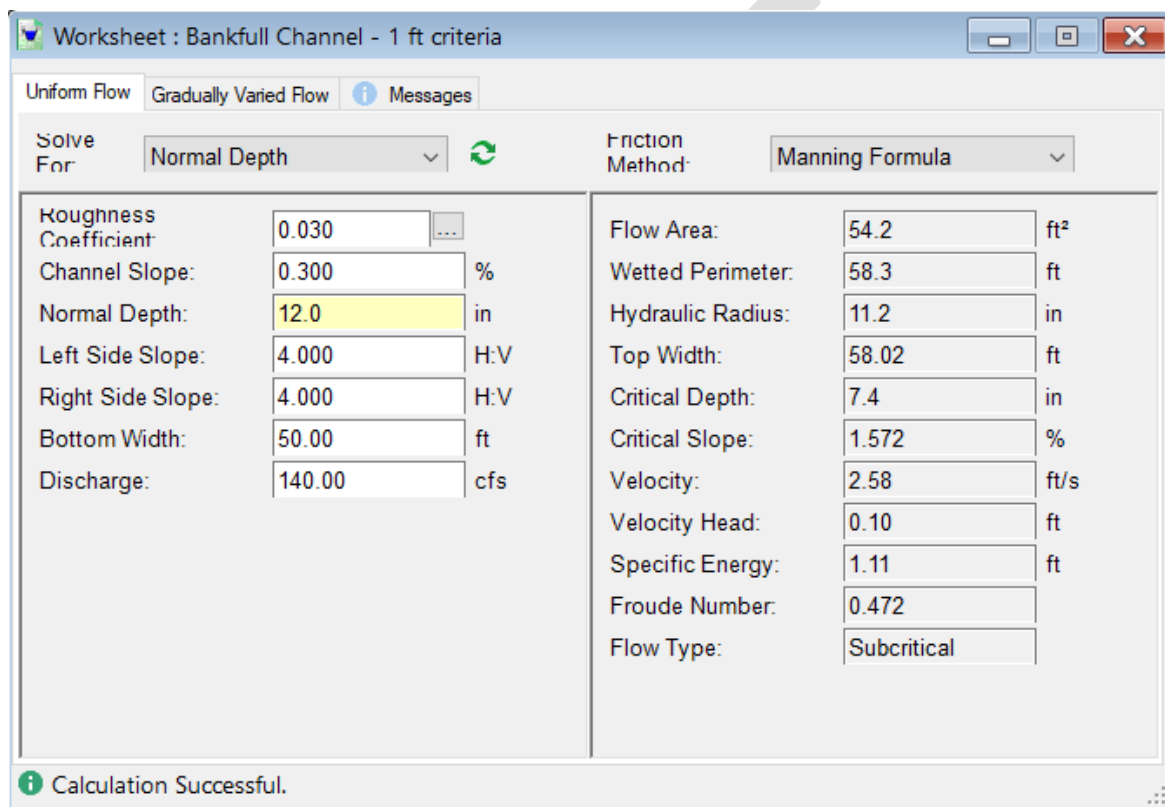
The relevant Drainage Basin Planning Study (DBPS) for this project is the *Cottonwood Creek Drainage Basin Planning Study (2019)*. To receive water quality credit, the consent decree requires that depth during the 2-year storm be 12 inches or less. The Cottonwood Creek DBPS identifies one basin contributing to this tributary: Basin MC220. Basin MC220 has a 2-year flow rate of 140 cfs and a 100-year flow rate as 300 cfs. Relevant pages from the 2019 Cottonwood Creek DPBS are included in Appendix B.

4. Typical Section Development

As part of compliance with the consent decree between the Environmental Protection Agency (EPA), on behalf of the Colorado Department of Public Health and the Environment (CDPHE) and the City of Colorado Springs, the channel's typical section was designed in FlowMaster version 10.03 to achieve a 1-

foot maximum normal depth in a 2-year storm. The trapezoid section for the typical section has a bottom width of 50-feet.

The design incorporates both bankfull and 100-year channel capacities, with a channel slope of 0.3%, derived from Figure 12-4 in Chapter 12 of the Colorado Springs Drainage Criteria Manual Volume 1. FlowMaster calculations determined the necessary bottom width to maintain the specified water depth during a 2-year storm. Calculations for a 1' depth in a trapezoidal channel resulted in a width of 50'. The cross-section features a 4:1 slope for the bankfull and top of the banks. The design has a minimum of 1 foot of freeboard above the 100-year water surface elevation. Detailed FlowMaster design calculations are provided in Figures 3 through 6.



Worksheet : Bankfull Channel - 1 ft criteria	
Uniform Flow Gradually Varied Flow Messages	
Solve For: Normal Depth	Friction Method: Manning Formula
Roughness Coefficient: 0.030	Flow Area: 54.2 ft²
Channel Slope: 0.300 %	Wetted Perimeter: 58.3 ft
Normal Depth: 12.0 in	Hydraulic Radius: 11.2 in
Left Side Slope: 4.000 H:V	Top Width: 58.02 ft
Right Side Slope: 4.000 H:V	Critical Depth: 7.4 in
Bottom Width: 50.00 ft	Critical Slope: 1.572 %
Discharge: 140.00 cfs	Velocity: 2.58 ft/s
	Velocity Head: 0.10 ft
	Specific Energy: 1.11 ft
	Froude Number: 0.472
	Flow Type: Subcritical
Calculation Successful.	

Figure 3. 2-Year/Bankfull Flow Calculations

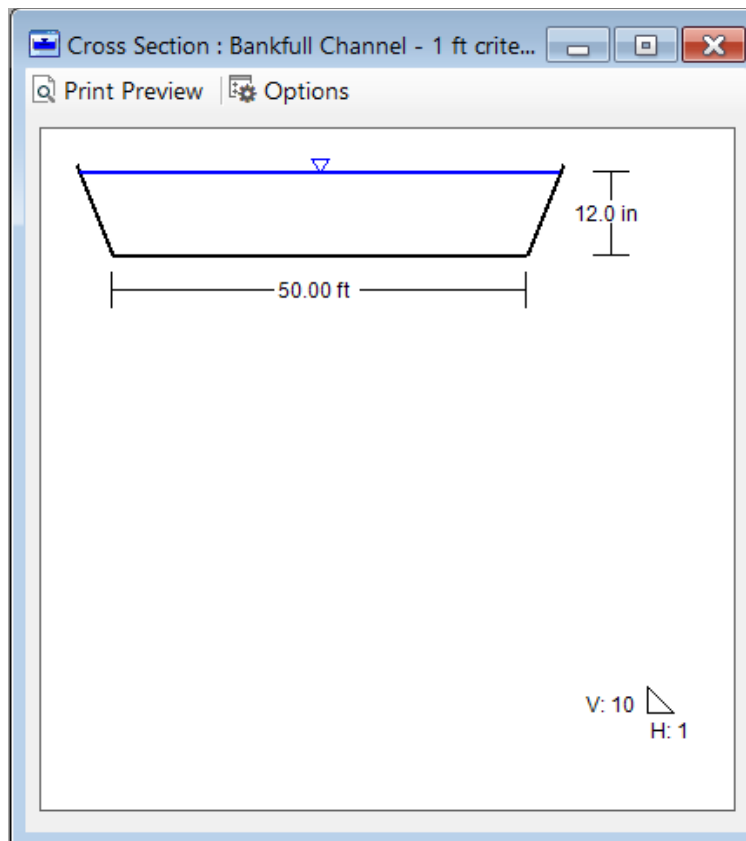



Figure 4. 2-Year/Bankfull Flow Cross Section

Worksheet : Irregular Section - 100 YR

Uniform Flow | Gradually Varied Flow | Messages

Solve For: Normal Depth  Friction Method: Manning Formula

Roughness Coefficient:	0.030	Flow Area:	93.6	ft ²
Channel Slope:	0.300 %	Wetted Perimeter:	72.9	ft
Elevation:	1.56 ft	Hydraulic Radius:	15.4	in
Elevation Range:	0.0 to 3.0 ft	Top Width:	72.51	ft
Discharge:	300.00 cfs	Normal Depth:	18.8	in
		Critical Depth:	12.6	in
		Critical Slope:	1.396	%
		Velocity:	3.21	ft/s
		Velocity Head:	0.16	ft
		Specific Energy:	1.72	ft
		Froude Number:	0.497	
		Flow Type:	Subcritical	



 Edit Section  Options

Figure 5. 100-Year Flow Calculations

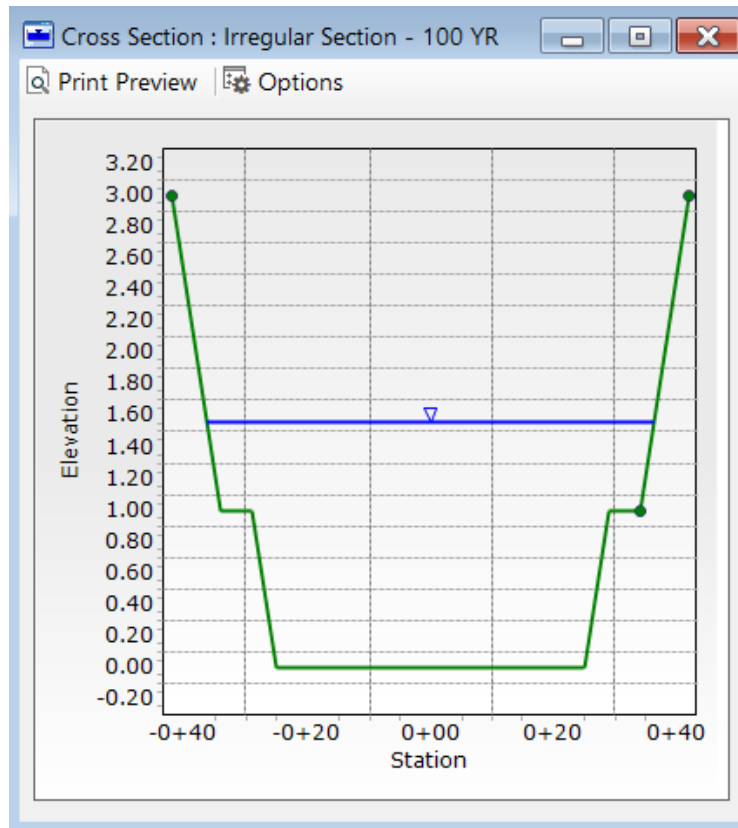


Figure 6. 100-Year Flow Cross Section

5. Conceptual Layout and Hydraulic Modeling

The proposed channel originates at the culvert under Research Pkwy and transitions from the culvert into a natural channel with a bottom width of 50 feet. Upon reaching Meadow Ridge Dr, the channel would convert back into a concrete channel. The centerline of the proposed channel closely follows the existing alignment but is offset to the left to prevent impacts to adjacent properties. Based upon LiDAR, the elevation at the upstream culvert is 6864.00 feet, while the downstream elevation is 6785.87 feet, resulting in a total elevation drop of 78.13 feet. To achieve the desired channel slope of 0.3%, 18 four-foot drop structures are incorporated into the proposed design. The conceptual design layout is detailed at the end of the report.

Hydraulic modeling for this project was conducted using the U.S. Army Corps of Engineers HEC-RAS (Version 6.5) software to analyze the 100-year and 2-year storm depths, velocities, and shear stresses for the proposed Candleflower Park Channel using a 2-D analysis. A Manning's n value of 0.030 was applied throughout the channel perimeter, based on the Manning's n for Channels table by Ven Te Chow.

The proposed grading was integrated with the existing surface to create a terrain model, with a 10x10-foot cell size and a refinement region around the active channel. No breaklines were used in the mesh.

The plan view of the model and the model results can be found below:

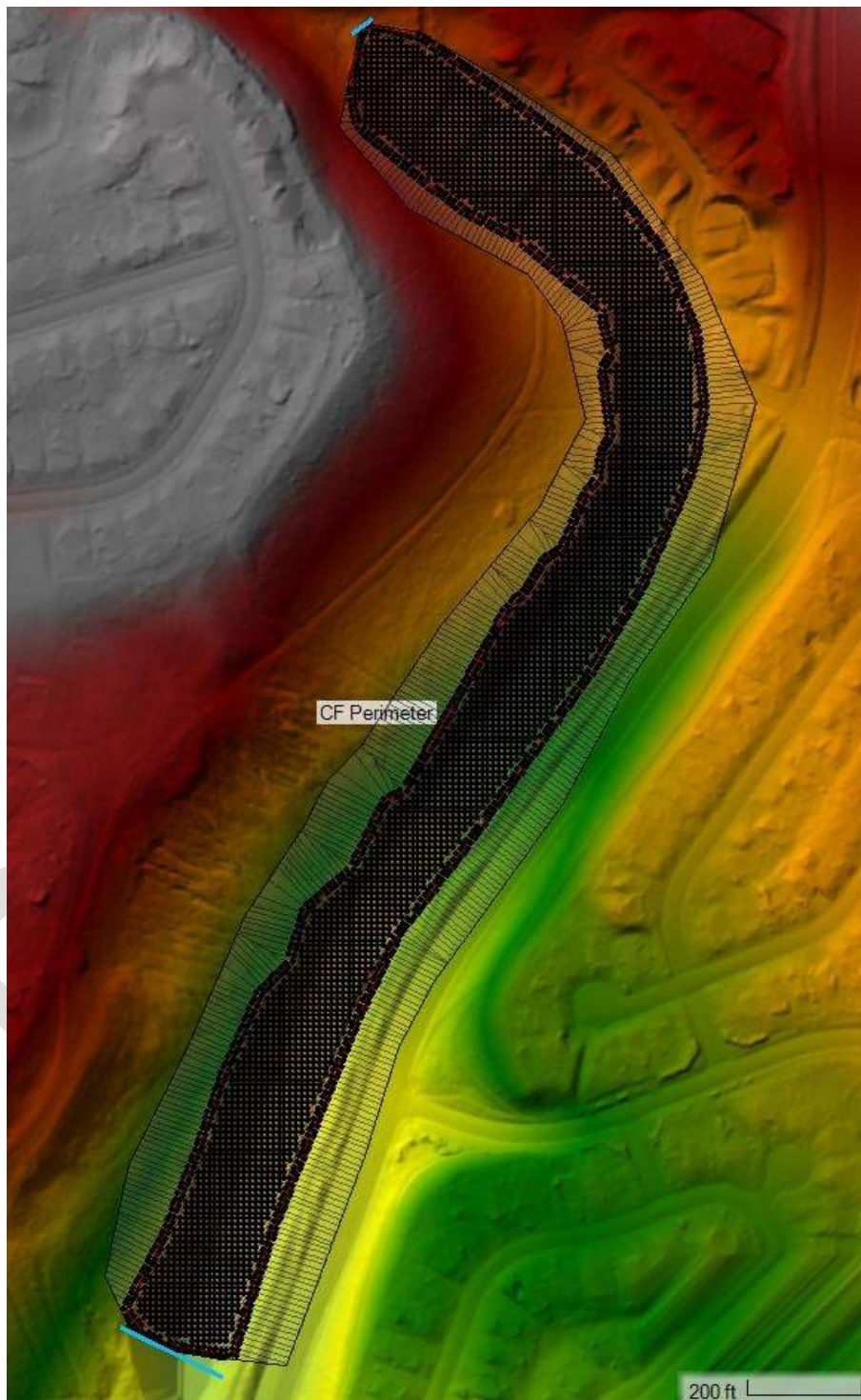


Figure 7. HEC-RAS Plan View

2-Year Storm

The figure below reveals the depth of the water during the 2-year storm. Anything 0-1 feet is colored light blue, and anything above 1-foot can be seen in the dark blue. As shown below, the depths increase to above 1 foot as the water flows down the proposed drops. The highest depth in this 2-year storm model is approximately 1.4 feet. If this project progresses, higher depths can be mitigated.

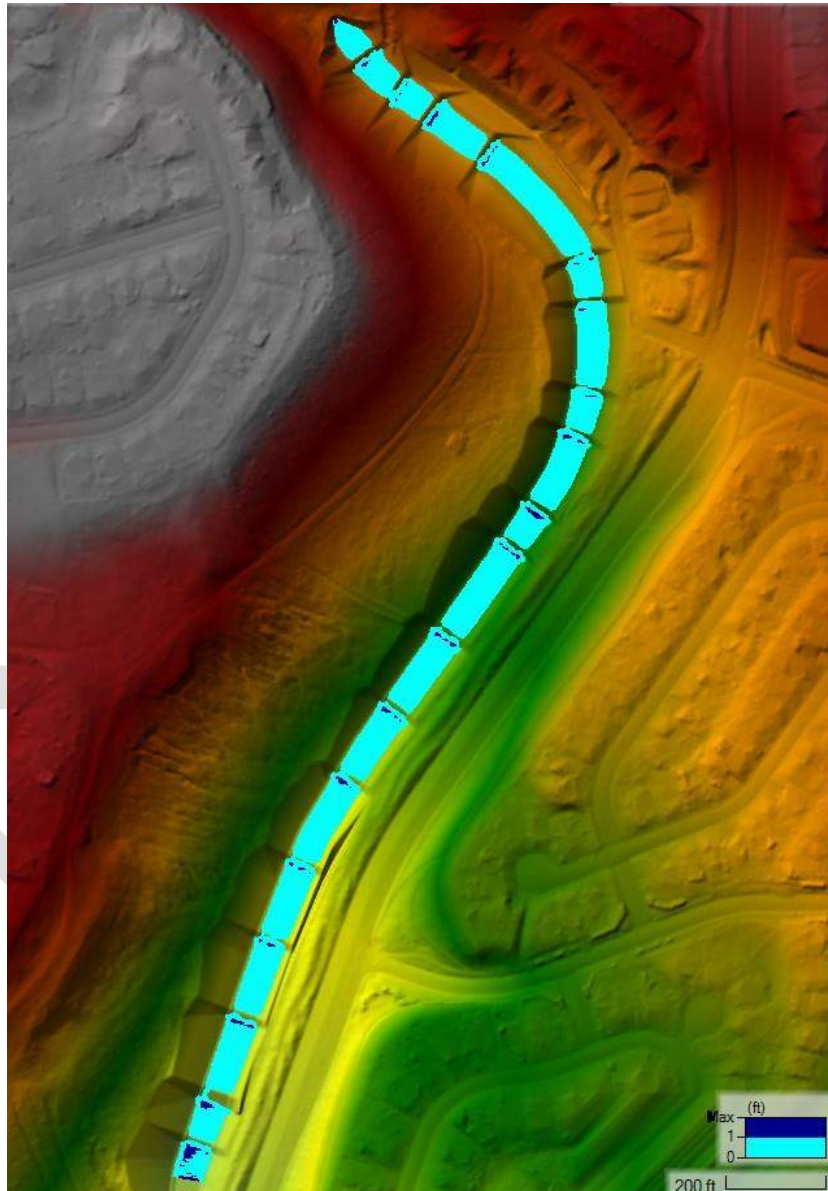


Figure 8. Model 1 2-Year Storm Depth

Figure 9 below shows the velocities for the 2-Year Storm event. There are higher velocities at the outfall as the flow enters the channel and at the proposed drop structures. The highest velocities during the 2-Year Storm are determined to be approximately 0-4 fps within the natural channel sections and 4-6 fps at the drops.

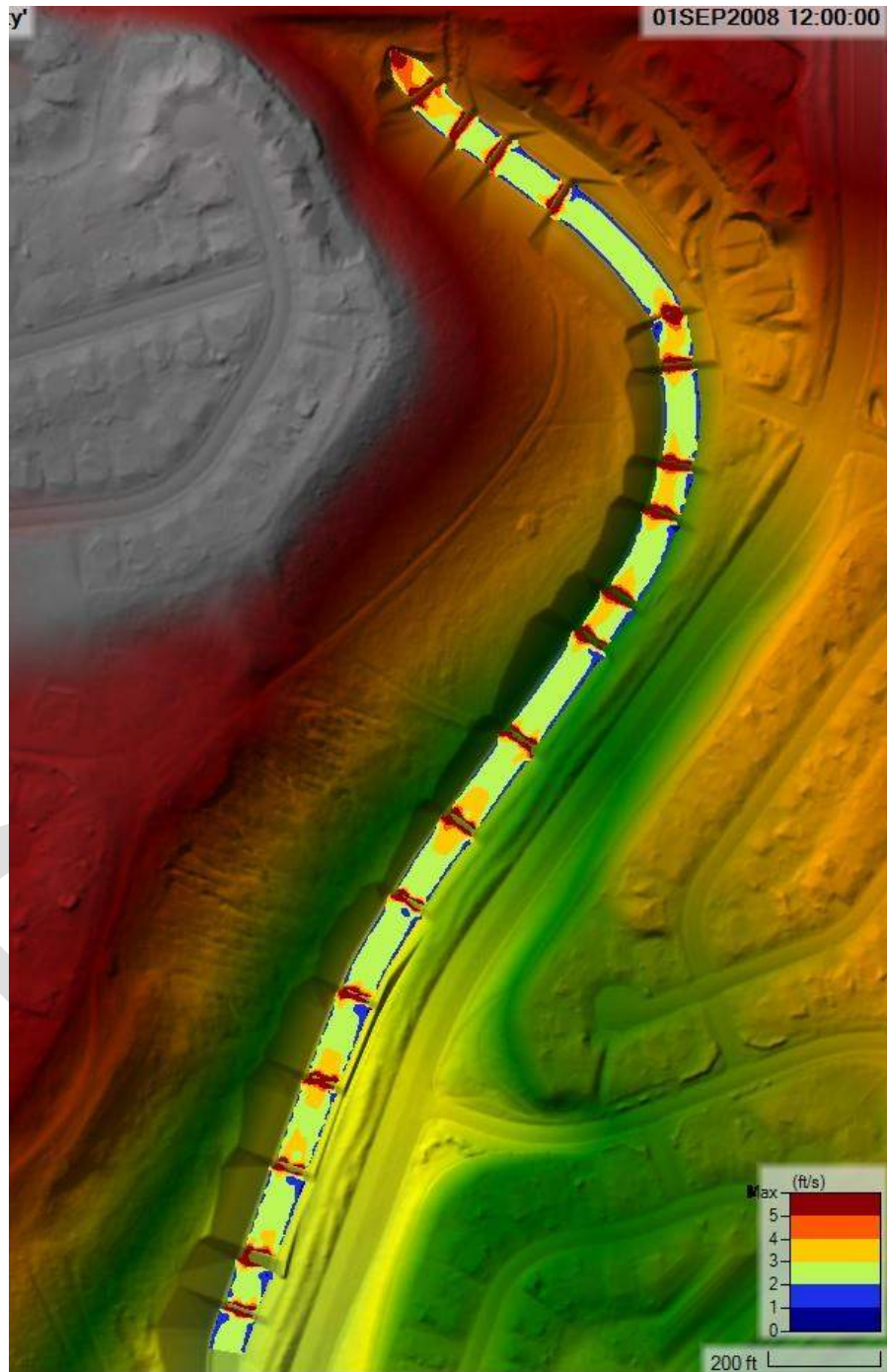


Figure 9. 2-Year Storm Velocities

Figure 10 below shows the Froude number results for the 2-year storm. Referring to Table 12-3 of the Colorado Springs Drainage Criteria Manual Volume 1, titled "Hydraulic Design Criteria for Natural Unlined Channels," the maximum Froude number for a low-flow channel with erosive soils or poor vegetation is 0.5. The term "erosive soils" applies to soils boasting a clay content less than 30%. We assume that these soils are considered erosive, however, if the project progresses to 30%, Geotech would be needed to determine the clay content. The channel is close to adhering to the criteria, however, to ensure that the Froude number values are under 0.5 the channel will need to be modified in future design phases. The channel will need to be widened or have a flatter slope to reduce the Froude number.

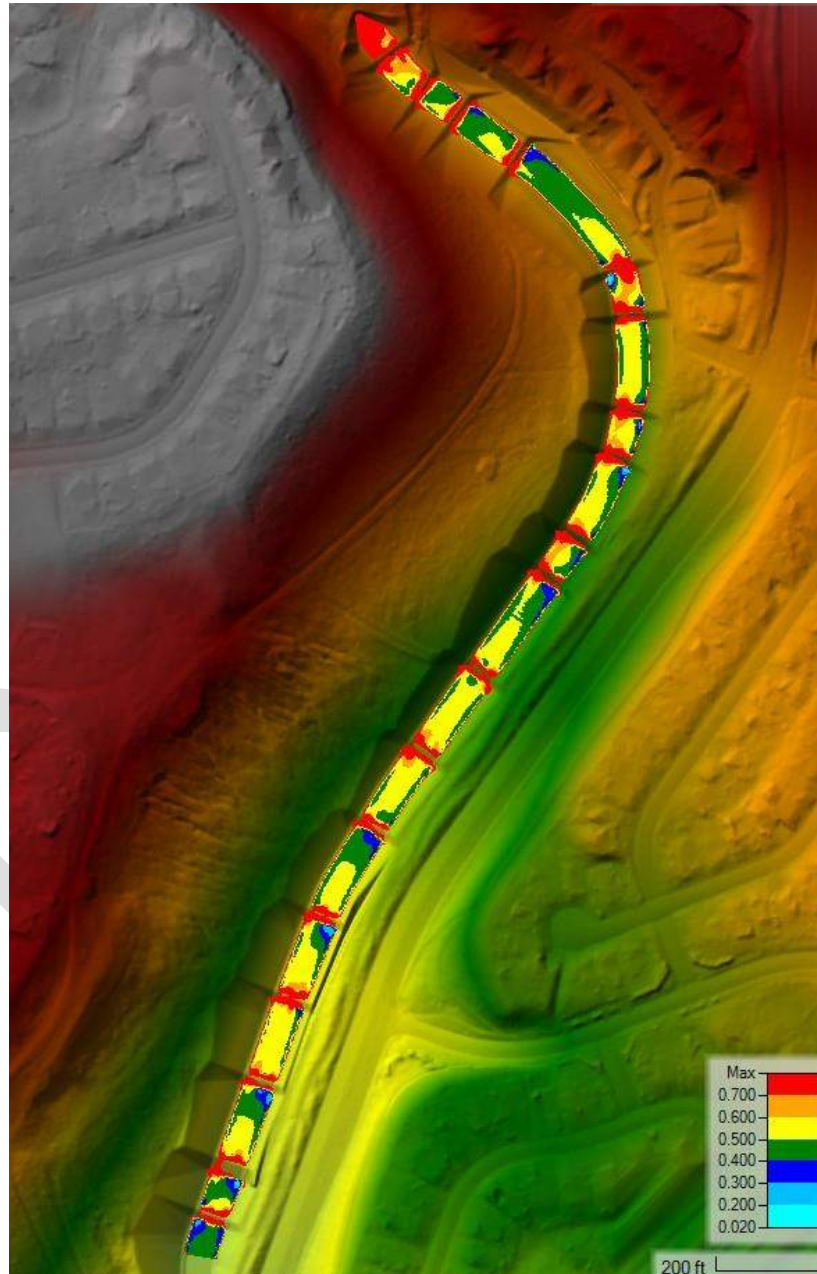


Figure 10. 2-Year Storm Froude

100-Year Storm:

Figure 11 illustrates the depths for the 100-Year storm. The water stays within the channel during a 100-year event and the depth is lower than 2.5 feet everywhere in the channel.

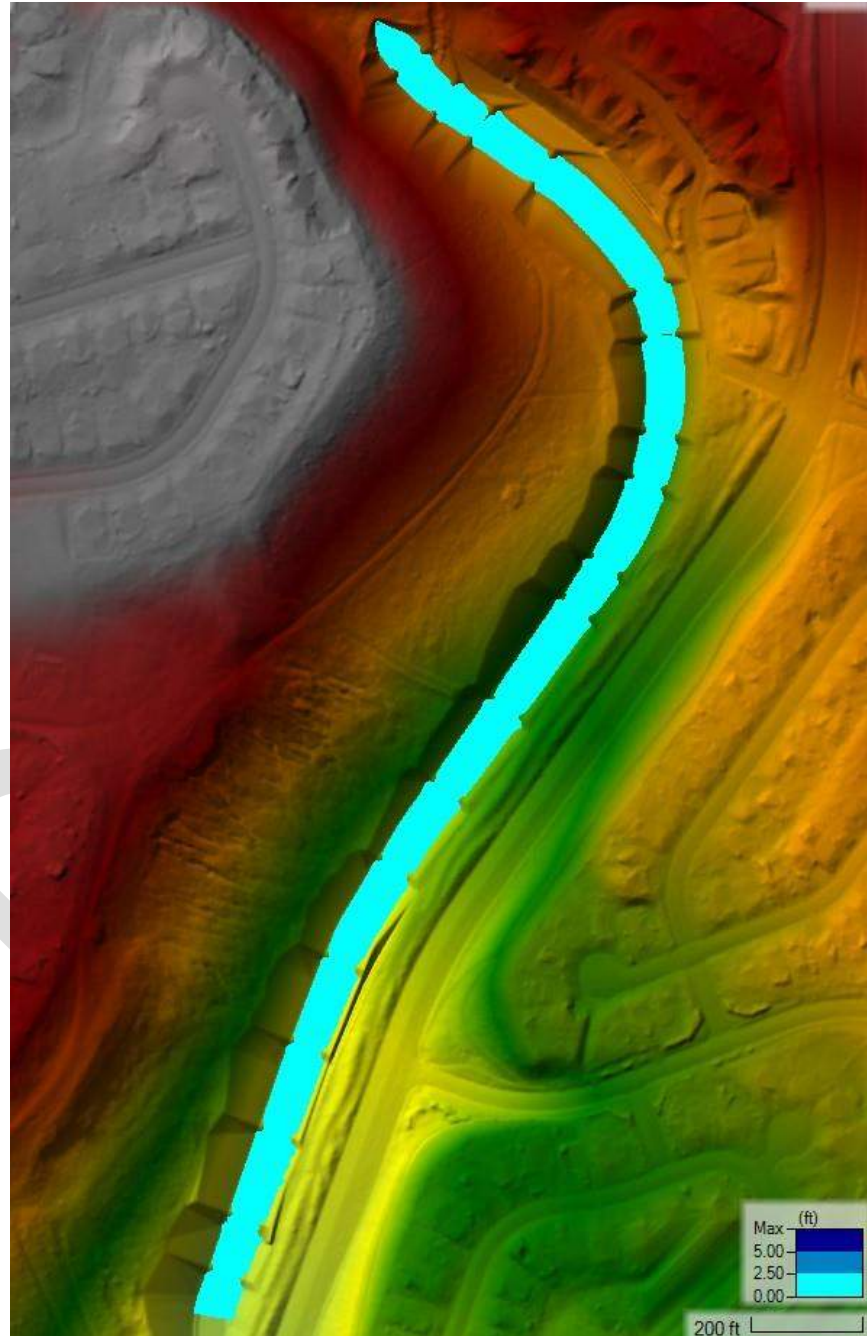


Figure 11. Model 1 100-Year Storm Depths

Figure 12 depicts the velocities associated with the 100-Year storm. The highest velocities align with the locations found in the 2-Year velocity model, concentrated at the outfall from the upstream culvert and the proposed drop structures. Referring to Table 12-3 of the Colorado Springs Drainage Criteria Manual Volume 1, titled "Hydraulic Design Criteria for Natural Unlined Channels," it is specified that the bankfull channel velocities during a 100-Year storm should not exceed 5 fps for soils categorized as erosive or poor vegetation and 7 fps for non-erosive soils. Geotechnical investigation would be required if the project progresses to determine the correct soil classification and if the velocity criteria is met or if changes to the channel design are required.

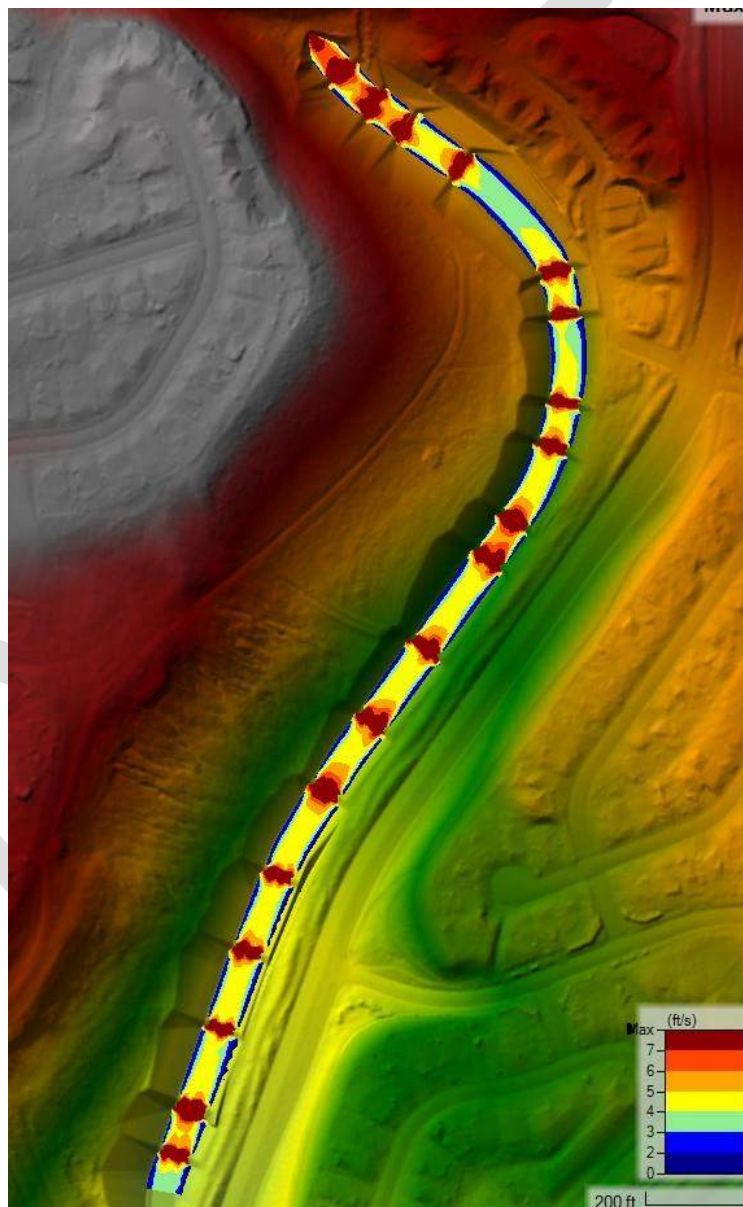


Figure 12. 100-Year Storm Velocities

Shear Stresses for the 100-Year storm are presented below in Figure 13. The high shear stresses coincide with the areas where high velocities are found. Some shear stresses are as high as 6 psi at the drops. The maximum shear stress in the channel should not exceed 0.60 lb/sf for erosive soils per criteria or 1.0 lb/sf for erosion resistant soils with vegetation. The channel outside of the drop structures adheres to this criteria.

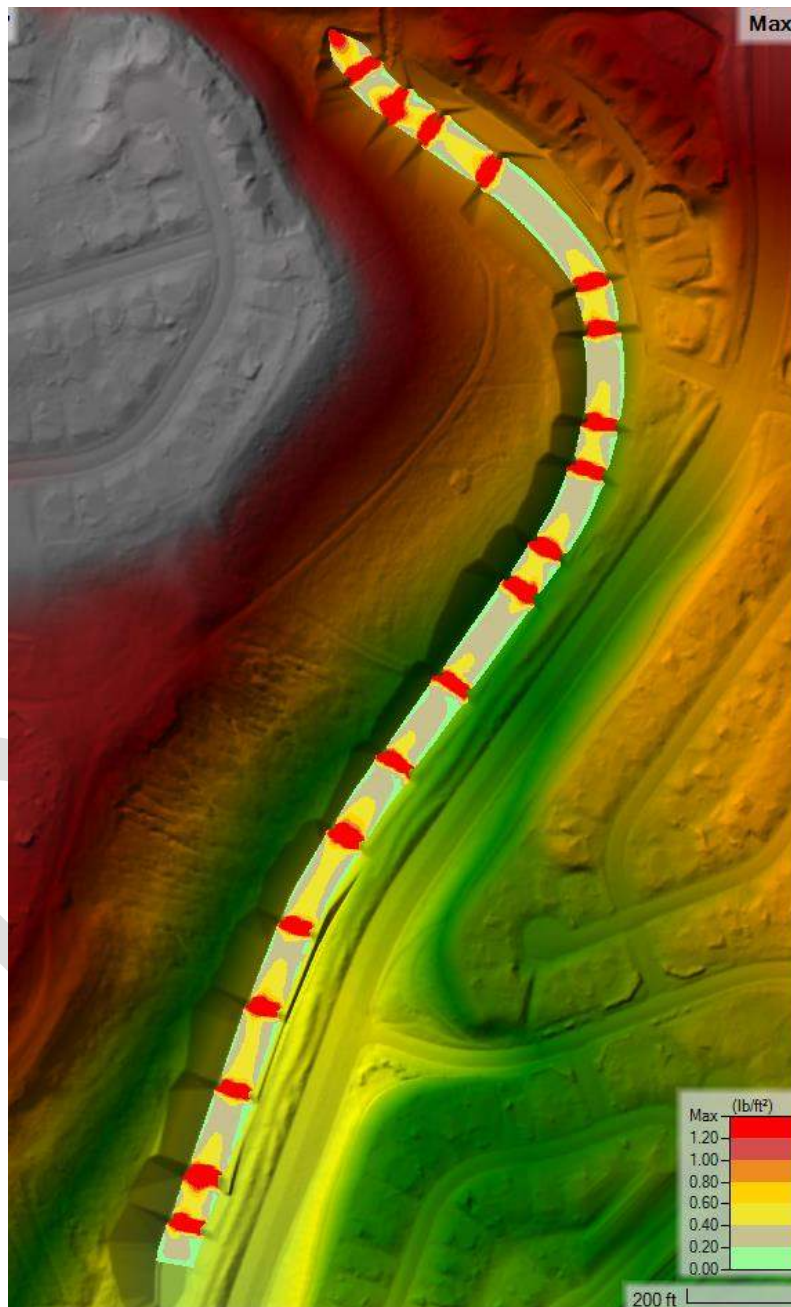


Figure 13. 100-Year Storm Shear Stresses

Figure 14 below presents the Froude results for the 100-year storm. According to Table 12-3 in the Colorado Springs DCM Vol 1, the maximum Froude Number for a 100-year storm in a channel with erosive soil should be 0.6. The channel is close to adhering to this guideline in areas outside of where the drop structure is located. If the project progresses to 30%, widening the channel or designing the channel with a flatter slope will allow for smaller Froude results to ensure these numbers match the criteria.

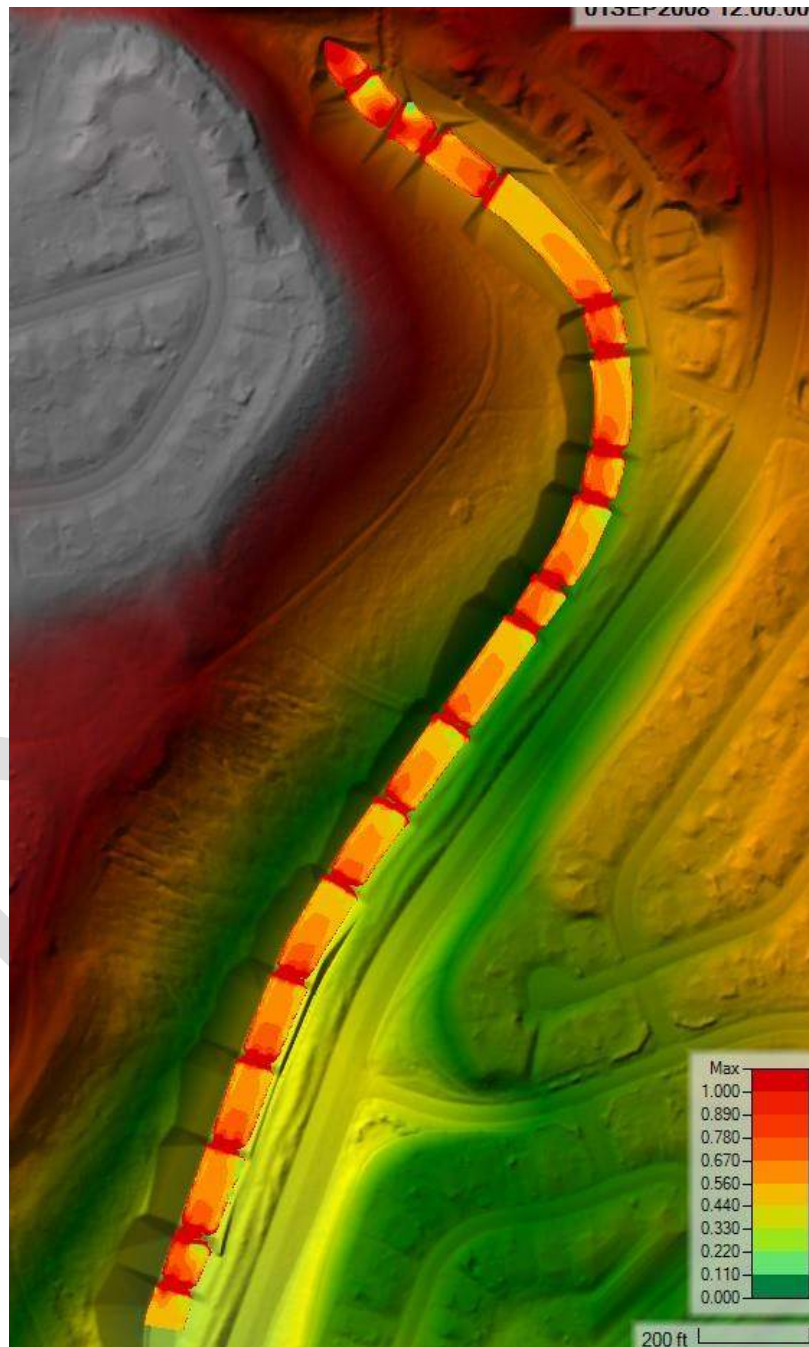


Figure 14. 100-Year Storm Froude

6. Water Quality Credit Calculations

Below is the calculated water quality credit based on the conceptual level design. The calculations were completed by separating the north and the south portions of the channel, where the depth is found to be less than 1 foot during the 2-year storm for the entire proposed channel. The length of the channel used in the calculations does not include the portions located within the proposed drop structures. If the project progresses to a 30% design, the water quality credit should be recalculated based on survey and an updated model.

WQ Credit

North Candleflower Park

Bankfull Channel- 1ft criteria

Bottom Width (b)	50	ft
Water Height (y)	1	ft
Left side slope (z ₁)	4	ft/ft
Right side slope (z ₂)	4	ft/ft
Wetted Perimeter (P _w)	58.24621	ft

Length of Channel	645.57	ft
P _w	58.24621	ft
Hydraulic Conductivity	1.08652	ft/hr
Residency Time	3	hr

WQ Credit	122566	ft ³
IWQ Credit	4.220592	acre/ft

1.5	Full Credit Calculation factor
92	Hydraulic Conductivity (micrometers/second)
0.01181	Conversion Factor (micrometers/sec to ft/hr)

Equations:

$$P_w = b + y \left(\sqrt{1 + z_1^2} + \sqrt{1 + z_2^2} \right)$$

WQ Credit

South Candleflower Park

Bankfull Channel- 1ft criteria

Bottom Width (b)	50	ft
Water Height (y)	1	ft
Left side slope (z ₁)	4	ft/ft
Right side slope (z ₂)	4	ft/ft
Wetted Perimeter (P _w)	58.24621	ft

Length of Channel	1064.05	ft
P _w	58.24621	ft
Hydraulic Conductivity	1.08652	ft/hr
Residency Time	3	hr

WQ Credit	202017.4	ft ³
IWQ Credit	6.956521	acre/ft

1.5	Full Credit Calculation factor
92	Hydraulic Conductivity (micrometers/second)
0.01181	Conversion Factor (micrometers/sec to ft/hr)

The total estimated water quality credit received from the northern portion of the project site is 4.22, the total WQSV from the southern site is 6.96. If the two were combined the total would be 11.18.

6.1 Hydraulic Conductivity

The hydraulic conductivity of the soil in the area was originally found using the NRCS (Natural Resources Conservation Service) Web Soil Survey, as shown in Appendix C, the Web Soil Survey states that the soil type within the park is Blakeland loamy sand and it has a hydraulic conductivity rating of 92 micrometers/second.

7. Cost Estimate

Two cost estimates have been provided for the northern and southern portions of the site.

DRAFT CONCEPTUAL COST ESTIMATE NORTHERN CANDLEFLOWER PARK				ENGINEERS ESTIMATE	
BID ITEM NO.	STANDARD ITEM DESCRIPTION	QUANTITY	PAY UNIT	UNIT PRICE	TOTAL COST OF BID ITEM
1	Earthwork – Fill Onsite	2600	CY	\$15	\$39,000
2	Earthwork – Haul Offsite	33200	CY	\$30	\$996,000
3	Sculpted Concrete Drop Structure	3050	SY	\$300	\$1,159,000
4	Type M Riprap	2000	CY	\$105	\$210,000
5	Blanket/Seeding	2600	SY	\$5	\$13,000
6	Hydromulch	90000	SF	\$0.13	\$11,700
	Subtotal				\$2,454,950
7	Mobilization	5	%		\$145,000
8	Contingency	30	%		\$870,000
9	Water Control	3	%		\$145,000
10	Erosion Control	5	%		\$145,000
	Total				\$3,733,700
	Low Range (-25%)				\$2,800,275
	High Range (+50%)				\$5,600,550

DRAFT CONCEPTUAL COST ESTIMATE SOUTHERN CANDLEFLOWER PARK				ENGINEERS ESTIMATE	
BID ITEM NO.	STANDARD ITEM DESCRIPTION	QUANTITY	PAY UNIT	UNIT PRICE	TOTAL COST OF BID ITEM
1	Earthwork – Fill Onsite	900	CY	\$15	\$13,500
2	Earthwork – Haul Offsite	20400	CY	\$30	\$612,000
3	Sculpted Concrete Drop Structure	4000	SY	\$300	\$1,520,000
4	Type M Riprap	2500	CY	\$105	\$262,500
5	Blanket/Seeding	4000	SY	\$5	\$20,000
6	Hydromulch	110100	SF	\$0.13	\$14,313
	Subtotal				\$2,442,313
7	Mobilization	5	%		\$145,000
8	Contingency	30	%		\$870,000
9	Water Control	3	%		\$145,000
10	Erosion Control	5	%		\$145,000
	Total				\$3,747,313
	Low Range (-25%)				\$2,810,485
	High Range (+50%)				\$5,620,970

Based on the two-cost estimate and the conceptual WQSV, the \$/ac-ft of WQSV for the northern site is anticipated to be roughly \$890,984/ac-ft, and \$623,429/ac-ft for the southern portion. If the full site is considered, then the \$/ac-ft of WQSV is expected to be \$724,420 ac-ft.

8. Summary

The proposed improvements for the Candleflower Park Concrete Conversion Feasibility Memo will replace part of the concrete channel with a natural channel to enhance stream and bank stability. The proposed improvements include 18 drop structures. Additionally, the proposed design will not negatively impact any downstream or adjacent properties.

9. Appendices

9.1 Appendix A – Site Information

9.2 Appendix B – Hydrology

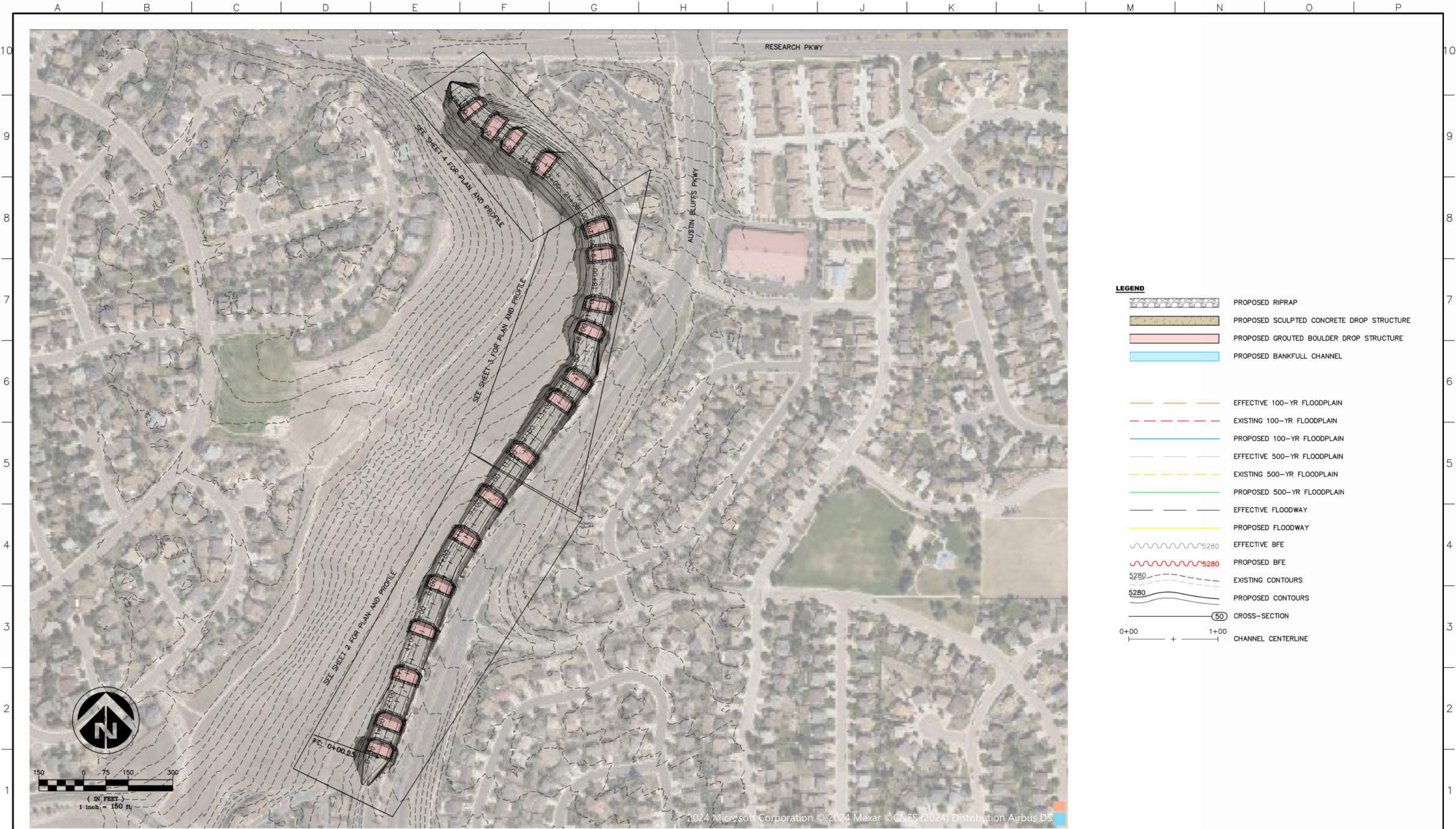
9.3 Appendix C – Hydraulic Analysis

10. References

City of Colorado Springs. (05/2014). *Drainage Criteria Manual Volumes 1 and 2*.

Urban Drainage and Flood Control District. (August 2018). *Urban Storm Drainage Criteria Manual, Volumes 1-3*.

[Manning's n Values \(orst.edu\)](http://orst.edu)





Dewberry
Dewberry Engineers Inc.
900 S BROADWAY, SUITE 400
DENVER, CO 80209
(303) 825-1802

LINE IS 2 INCHES
AT FULL SIZE
(IF NOT 2"=SCALE ACCORDINGLY)

DRAWING Candleflower Park 10% Exhibit
DRAWN ADM
DESIGNED KDH
CHECKED EDE

APPROVED:

PRINCIPAL _____

DATE: _____

REVISIONS					
REV.	DESCRIPTION	BY	DATE	APP.	
1	CANDLEFLOWER PARK 10%	ADM	10/9/24	KDH	
###	###	###	###	###	
###	###	###	###	###	
###	###	###	###	###	
###	###	###	###	###	
###	###	###	###	###	

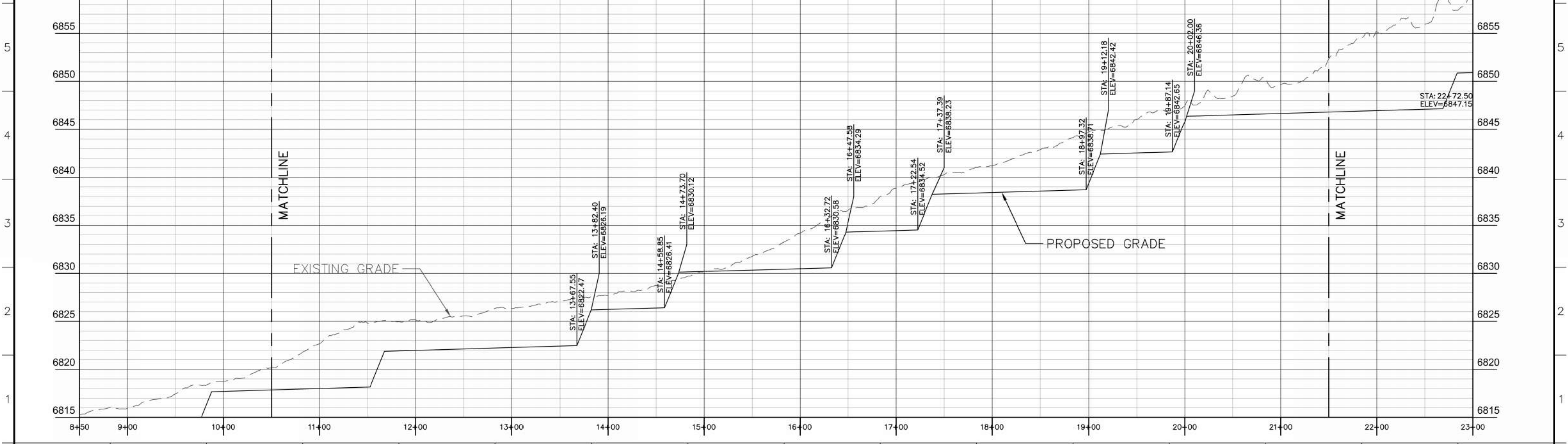
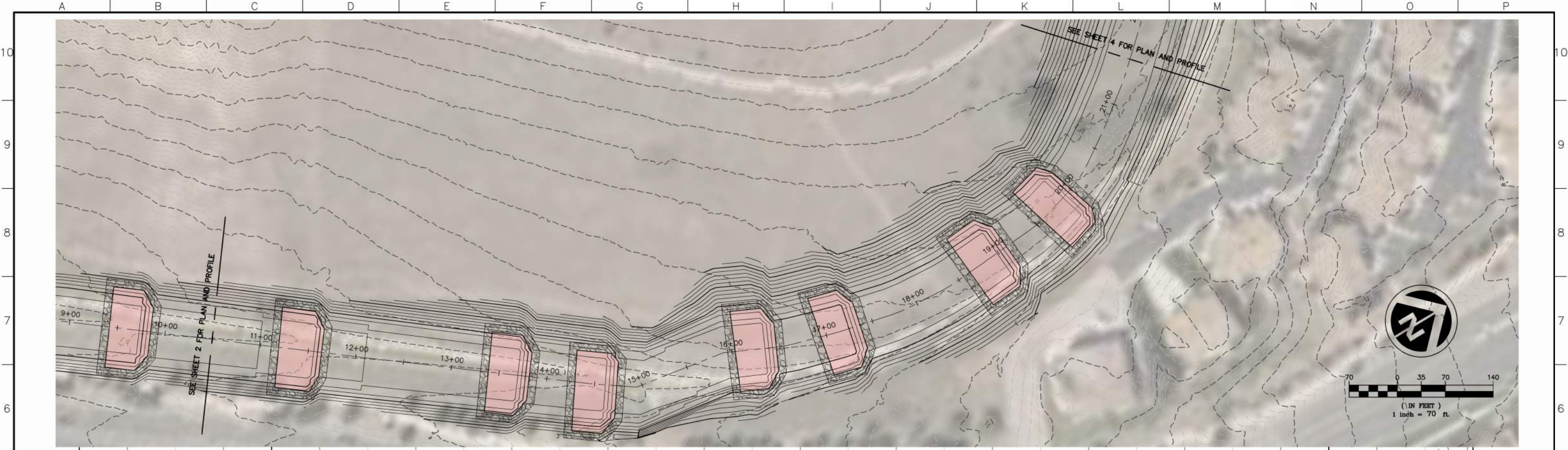
CITY OF COLORADO SPRINGS
STORMWATER ENTERPRISE

CONCRETE CHANNEL CONVERSIONS
CANDLEFLOWER PARK


CIVIL

10% KEYMAP

DATE: 10/9/24
PROJECT NUMBER: 50181722
REVISION NO. 1
DRAWING NUMBER 1
SHEET NUMBER



STA: 13+67.55 ELEV=6822.47	STA: 13+82.40 ELEV=6826.19	STA: 14+58.85 ELEV=6826.41	STA: 14+73.70 ELEV=6830.12	STA: 16+32.72 ELEV=6830.58	STA: 16+47.58 ELEV=6834.29	STA: 17+22.54 ELEV=6834.52	STA: 17+37.39 ELEV=6838.23	STA: 18+97.32 ELEV=6836.71	STA: 19+12.18 ELEV=6842.42	STA: 19+87.14 ELEV=6842.65	STA: 20+02.00 ELEV=6846.36	STA: 22+72.50 ELEV=6847.15
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Dewberry Engineers Inc.
900 S BROADWAY, SUITE 400
DENVER, CO 80209
(303) 825-1802

LINE IS 2 INCHES
AT FULL SIZE
(IF NOT 2"=SCALE ACCORDINGLY)

DRAWING Candleflower Park 10% Exhibit
DRAWN ADM
DESIGNED KDH
CHECKED EDE

APPROVED:

PRINCIPAL _____

DATE: _____

REV.	DESCRIPTION	BY	DATE	APP.
1	CANDLEFLOWER PARK 10%	ADM	10/9/24	KDH
###	###	###	###	###
###	###	###	###	###
###	###	###	###	###
###	###	###	###	###
###	###	###	###	###

CITY OF COLORADO SPRINGS
STORMWATER ENTERPRISE

CONCRETE CHANNEL CONVERSIONS
CANDLEFLOWER PARK

CIVIL

10% PLAN AND PROFILE
STA. 10+50.00 TO 21+50.00

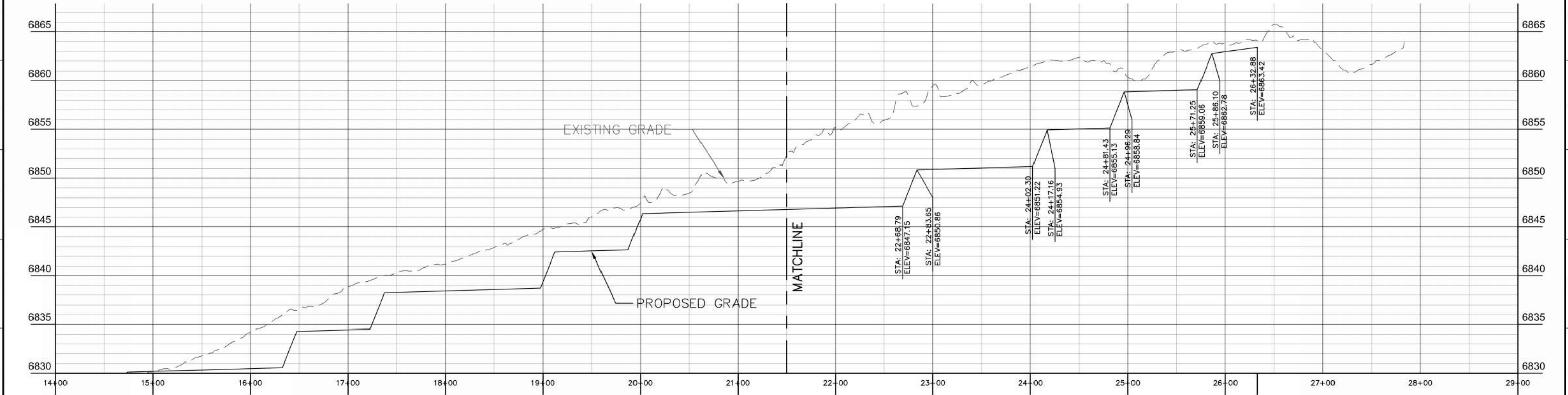
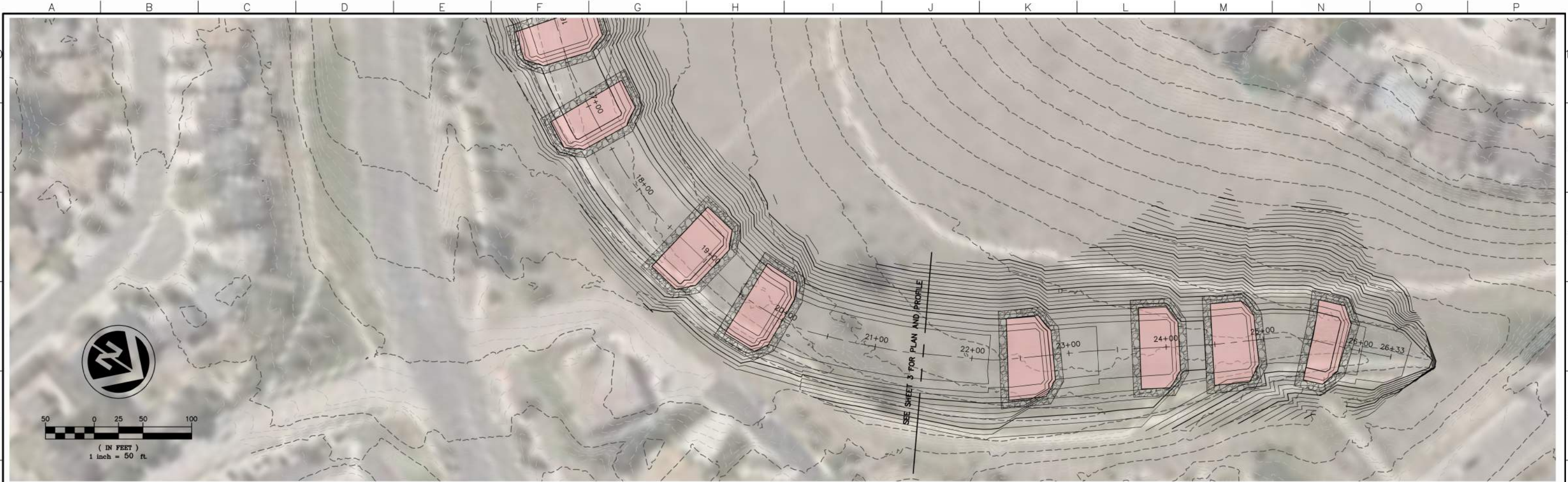
DATE: 10/9/24


PROJECT NUMBER: 50181722

REVISION NO. 1

DRAWING NUMBER 3

SHEET NUMBER





Dewberry
Dewberry Engineers Inc.
900 S BROADWAY, SUITE 400
DENVER, CO 80209
(303) 825-1802

LINE IS 2 INCHES
AT FULL SIZE
(IF NOT 2"=SCALE ACCORDINGLY)

DRAWING Candleflower Park 10% Exhibit
DRAWN ADM
DESIGNED KDH
CHECKED EDE

APPROVED:

PRINCIPAL

DATE:

REVISIONS				
REV.	DESCRIPTION	BY	DATE	APP.
1	CANDLEFLOWER PARK 10%	ADM	10/9/24	KDH
###	###	###	###	###
###	###	###	###	###
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###	###	###	###	###
###	###	###	###	###

CITY OF COLORADO SPRINGS
STORMWATER ENTERPRISE

CONCRETE CHANNEL CONVERSIONS
CANDLEFLOWER PARK

CIVIL

10% PLAN AND PROFILE
STA. 21+50.00 TO 26+33.00

DATE: 10/9/24
PROJECT NUMBER: 50181722
REVISION NO. 1
DRAWING NUMBER 4
SHEET NUMBER

APPENDIX A - SITE INFORMATION

NOTES TO USERS

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

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

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

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

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

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

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

NGS Information Services
NOAA, NIMS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, MD 20910-3282

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

Base Map information shown on this FIRM was provided in digital format by El Paso County, Colorado Spring 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.

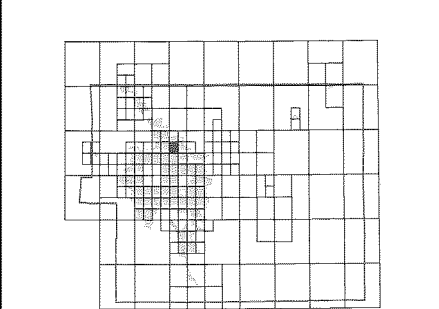
Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which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

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

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

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

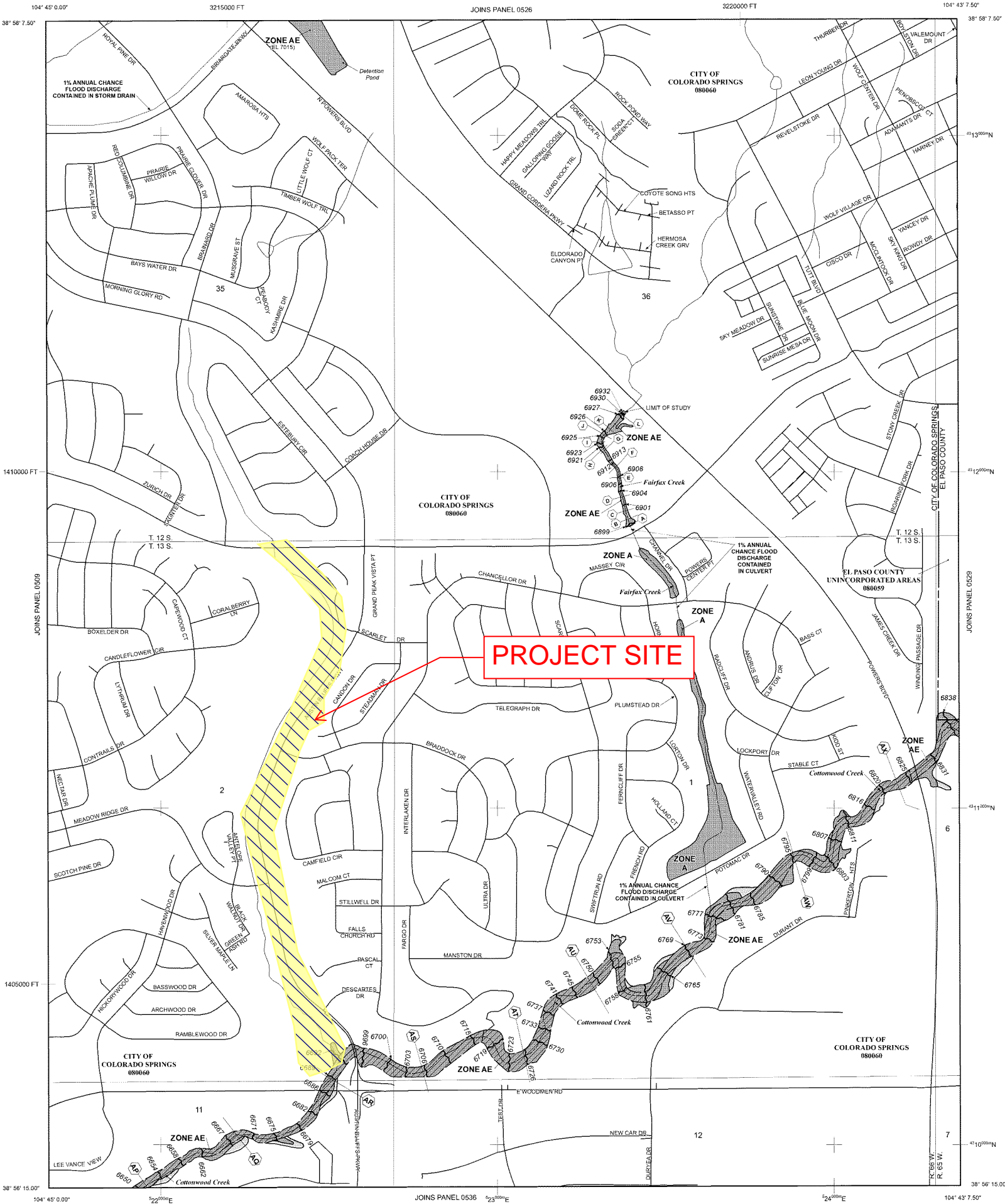
Panel Location Map



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



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



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.
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)

Cross section line
Transect line

Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
1000-meter Universal Transverse Mercator grid ticks, zone 13

5000-foot grid ticks: Colorado State Plane coordinate system, central zone (EPS:COECS-0502), Lambert Conformal Conic Projection

Bench mark (see explanation in Notes to Users section of this FIRM panel)

River Mile

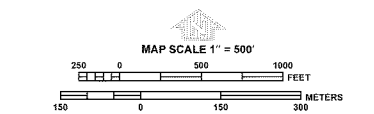
MAP REPOSITORIES
Refer to Map Repositories list on Map Index

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.



NFIP
PANEL 0528G

FIRM
FLOOD INSURANCE RATE MAP
EL PASO COUNTY, COLORADO AND INCORPORATED AREAS
PANEL 528 OF 1300
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS, CITY OF	080660	0528	G
EL PASO COUNTY	080528	0528	G

Notice: This map was reissued on 05/15/2020 to make a correction. This version replaces any previous versions. See the Notice-to-User Letter that accompanied this correction for details.

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
08041C0528G
MAP REVISED
DECEMBER 7, 2018
Federal Emergency Management Agency

EL PASO COUNTY - COLORADO

6302100008
AUSTIN BLUFFS PKWY

Total Market Value
\$667,804

OVERVIEW

Owner:	COLORADO SPRINGS CITY OF
Mailing Address:	PO BOX 1575 MAIL CODE 455 COLORADO SPRINGS CO, 80901-1575
Location:	AUSTIN BLUFFS PKWY
Tax Status:	Exempt
Zoning:	A AO
Plat No:	-
Legal Description:	TR OF LAND IN SEC 02-13-66 DES AS FOLS: COM AT NE COR OF SD SEC 2, TH S 83<05'48" W 1473.55 FT FOR POB OF TR HEREIN DES, TH ELY ON ARC OF CUR TO L HAVING A RAD OF 1877.00 FT A C/A OF 02<45'48" AN ARC DIST OF 90.53 FT WHICH CENTER BEARS N 02<12'14" E TO A PT OF TANG, N 89<26'26" E 150.43 FT TO MOST WLY COR OF BRIARGATE SUB FIL NO 47, TH SELY ALG ARC OF CUR TO L HAVING A RAD OF 418.00 FT A C/A OF 35<24'07" AN ARC DIST OF 258.27 FT WHICH CENTER BEARS N 59<50'33" E TO A PT OF TANG, S 65<33'34" E 83.48 FT TO A POC, TH ALG ARC OF CUR TO R HAVING A RAD OF 532.00 FT A C/A OF 100<59'56" AN ARC DIST OF 937.79 FT TO MOST NLY COR OF TR A FAIRFAX AT BRIARGATE FIL NO 2, S 35<26'22" W 626.19 FT TO A POC, TH ALG ARC OF CUR TO L HAVING A RAD OF 1130.00 FT A C/A OF 15<30'00" AN ARC DIST OF 305.69 FT, S 19<56'22" W 579.86 FT TO A POC, SWLY ALG ARC OF CUR TO L HAVING A RAD OF 830.00 FT A C/A OF 07<51'01" AN ARC DIST OF 113.72 FT, N 90<00'00" W 422.30 FT, S 25<22'44" W 285.05 FT TO NLY LN OF MEADOW RIDGE DR, S 62<26'22" W ACROSS SD MEADOW RIDGE DR 60.00 FT TO SLY LN OF SD MEADOW RIDGE DR, N 27<33'38" W 20.00 FT, TH ALG ARC OF CUR TO L HAVING A RAD OF 410.00 FT A C/A OF 24<38'42" AN ARC DIST OF 176.36 FT, S 42<06'14" W NON-RADIAL & NON-TANG TO LAST MENTIONED CUR A DIST OF 332.25 FT, S 28<27'22" W 156.81 FT, S 37<42'59" E 80.75 FT, S 52<17'01" W 35.00 FT, S 56<57'20" W 146.94 FT, S 30<37'02" W 306.00 FT, S 28<22'58" E 122.00 FT, S 85<07'02" W 26.44 FT, S 69<51'33" W 149.36 FT, S 61<58'51" W 204.28 FT, S 47<34'45" W 147.24 FT, S 37<28'51" W 277.95 FT, S 22<02'36" W 91.16 FT, N 89<06'44" W 87.17 FT, S 24<08'10" W 118.00 FT, TH ALG ARC OF CUR TO L HAVING A RAD OF 50.00 FT A C/A OF 22<55'06" AN ARC DIST OF 20.00 FT WHICH CHORD BEARS N 77<19'23" W, N 01<13'04" E RADIAL TO LAST MENTIONED CUR 112.00 FT, S 69<24'59" W 120.33 FT, S 28<24'33" W 122.72 FT, S 75<42'34" W 203.08 FT, S 31<55'16" W 121.88 FT, S 09<30'00" E 120.72 FT, S 75<23'28" W 130.01 FT, S 40<11'39" W 123.70 FT, S 02<02'59" E 154.00 FT, S 61<42'34" E 172.00 FT, SWLY ALG ARC OF CUR TO L HAVING A RAD OF 450.00 FT A C/A OF 01<06'28" AN ARC DIST OF 8.70 FT TO INTSEC A LN 300.00 FT NLY FROM & PARA WITH S LN OF SEC 2, S 89<26'26" W 220.67 FT TO INTSEC ELY LN OF SMOKE TREE TOWNHOMES AT BRIARGATE, N 18<19'40" W 491.61 FT M/L, N 00<01'05" W 240.00 FT, N 66<58'55" E 190.00 FT, N 32<00'00" E 280.00 FT, N 58<00'00" W 110.00 FT, N 32<00'00" E 100.00 FT, S 58<00'00" E 110.00 FT, N 32<00'00" E 200.00 FT, S 69<41'15" E 112.49 FT, N 63<00'00" E 154.20 FT, N 50<43'55" W 123.37 FT, TH NELY ALG ARC OF CUR TO L HAVING A RAD OF 50.00 FT A C/A OF 27<11'31" AN ARC DIST OF 23.73 FT WHICH CHORD BEARS N 25<40'20" E, S 74<05'09" E 105.92 FT, N 13<15'00" E 110.77 FT, N 79<45'00" E 110.00 FT, N 75<15'00" E 754.25 FT, N 49<30'00" E 105.70 FT, N 53<54'37" W 128.99 FT, NELY ALG ARC OF CUR TO L HAVING A RAD OF 160.00 FT A C/A OF 11<20'54" AN ARC DIST OF 31.69 FT WHICH CHORD BEARS N 30<24'56", S 65<15'31" E 126.08 FT, N 27<30'00" E 33.07 FT, N 06<30'00" E 90.00 FT, N 14<29'38" W 83.57 FT, N 18<42'00" W 221.35 FT, N 77<05'30" W 149.02 FT TO SLY LN OF MEADOW RIDGE DR, N 75<15'00" E 303.24 FT TO A POC, TH ALG ARC OF CUR TO R HAVING A RAD OF 410.00 FT A C/A OF 17<57'50" AN ARC DIST OF 128.55 FT, N 03<12'50" E 60.00 FT TO A PT ON BDRY LN OF MEADOW RIDGE AT BRIARGATE FIL NO 2, N 54<00'00" E 368.80 FT, N 25<00'54" W 113.31 FT, TH NELY ALG ARC OF CUR TO L HAVING A RAD OF 715.00 FT A C/A OF 04<57'06" AN ARC DIST OF 61.79 FT, S 57<43'45" E 112.66 FT, N 44<00'00" E 311.67 FT, N 29<02'06" E 166.32 FT, N 13<00'00" E 338.00 FT, N 44<15'0" E 370.34 FT, N 13<22'50" E 232.09 FT, N 46<15'07" W 65.00 FT, N 33<01'03" E 137.01 FT, N 29<16'19" E 125.92 FT, N 18<12'20" E 76.44 FT, N 06<56'36" E 154.71 FT, N 17<20'00" W 262.17 FT, N 43<06'41" W 251.30 FT TO POB, EX PT TO MEADOW RIDGE AT BRIARGATE FIL NO 5A, EX THAT PORT

MARKET & ASSESSMENT DETAILS

	Market Value	Assessed Value
Land	\$667,804	\$0
Improvement	\$0	\$0
Total	\$667,804	\$0

No buildings to show.

LAND DETAILS

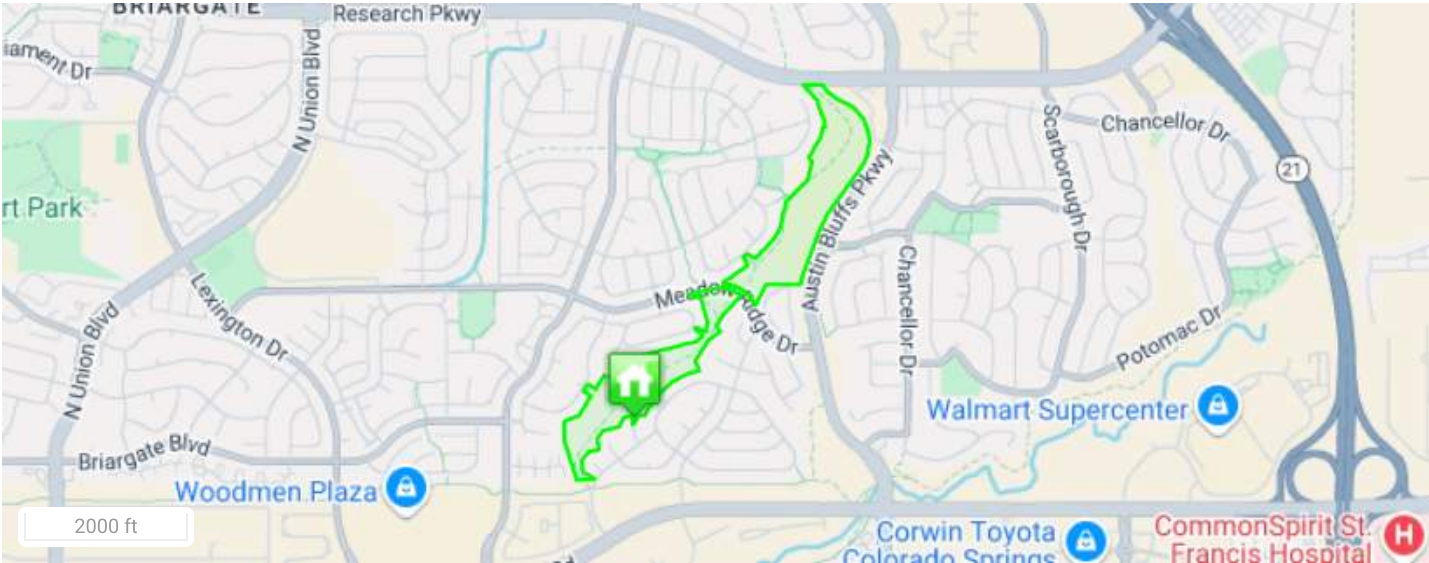
Sequence Number	Land Use	Assessment Rate	Area	Market Value
1	EXEMPT NONRESIDENTIAL LAND - POLITICAL SUBDIVISION	27.900	67.66 Acres	\$667,804

TAX ENTITY AND LEVY INFORMATION

County Treasurer Tax Information

Tax Area Code: **JHQ** Levy Year: **2023** Mill Levy: **66.996**

Taxing Entity	Levy	Contact Name/Organization	Contact Phone
EL PASO COUNTY	6.862	FINANCIAL SERVICES	(719)520-6400
EPC ROAD & BRIDGE SHARE	0.165	-	(719)520-6498
CITY OF COLORADO SPRINGS	3.579	CITY OF CS-CFO	(719)385-5224
EPC-COLORADO SPGS ROAD & BRIDGE SHARE	0.165	-	(719)520-6498
ACADEMY SCHOOL DISTRICT #20	47.867	BECKY ALLAN	(719)234-1200
PIKES PEAK LIBRARY DISTRICT	3.061	RANDALL A GREEN	(719)531-6333
SOUTHEASTERN COLO WATER CONSERVANCY DISTRICT	0.888	JAMES BRODERICK	(719)948-2400
EL PASO COUNTY CONSERVATION DISTRICT	0.000	MARIAH HUDSON	(719)600-4706
COLO SPGS BRIARGATE GID 2021	4.409	CITY OF CS-CFO	(719)385-5224



No Photo Available



Disclaimer

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EL PASO COUNTY - COLORADO

6235400006
RESEARCH PKWY

Total Market Value
\$133,000

OVERVIEW

Owner:	COLORADO SPRINGS CITY OF
Mailing Address:	PO BOX 1575 MAIL CODE 455 COLORADO SPRINGS CO, 80901-1575
Location:	RESEARCH PKWY
Tax Status:	Exempt
Zoning:	A AO
Plat No:	-
Legal Description:	TR IN SE4 SEC 35-12-66 DES AS FOLS: COM AT SE COR OF SD SEC 35, TH S 89<26'26" W ON S LN OF SD SEC 35 A DIST OF 1253.58 FT TO INTSEC OF NLY LN OF RESEARCH PKWY & WLY BDRY LN OF AUSTIN BLUFFS DRAINAGE CHANNEL FIL NO 1 FOR POB, TH S 89<26'26" W 120.56 FT TO A POC, WLY ALG ARC OF CUR TO R HAVING A RAD OF 1712.00 FT A C/A OF 15<04'16" AN ARC DIST OF 450.33 FT TO BDRY LN OF GATEHOUSE VILLAGE AT BRIARGATE FIL NO 3, N 55<02'15" E 118.94 FT, N 01<00'00" E 160.00 FT, N 30<00'00" W 160.00 FT, N 81<00'00" W 180.00 FT, N 02<00'00" E 175.00 FT, N 30<00'00" W 175.00 FT, N 43<00'00" W 230.00 FT, N 34<00'00" W 160.00 FT, N 10<30'00" W 368.08 FT TO SELY COR OF BRIARGATE SUB FIL NO 49, N 10<30'00" W 41.92 FT, N 15<29'49" E 665.53 FT TO SLY LN OF AUSTIN BLUFFS PKWY, TH S 78<03'34" E ON SD SLY LN 140.44 FT TO MOST NLY COR OF AUSTIN BLUFFS DRAINAGE CHANNEL FIL NO 1, S 06<30'48" E 167.08 FT, TH ALG ARC OF CUR TO R HAVING A RAD OF 460 FT A C/A OF 14<27'14" AN ARC DIST OF 116.04 FT, S 07<56'26" W 253.95 FT, TH ALG ARC OF CUR TO L HAVING A RAD OF 540.00 FT A C/A OF 35<00'00" AN ARC DIST OF 329.87 FT, S 27<03'34" E 1070.11 FT, TH ALG ARC OF CUR TO L HAVING A RAD OF 540.00 FT A C/A OF 41<57'06" AN ARC DIST OF 395.38 FT, S 00<33'34" E 25.95 FT TO POB

MARKET & ASSESSMENT DETAILS

	Market Value	Assessed Value
Land	\$133,000	\$0
Improvement	\$0	\$0
Total	\$133,000	\$0

No buildings to show.

LAND DETAILS

Sequence Number	Land Use	Assessment Rate	Area	Market Value
1	EXEMPT NONRESIDENTIAL LAND - POLITICAL SUBDIVISION	27.900	13.3 Acres	\$133,000

SALES HISTORY

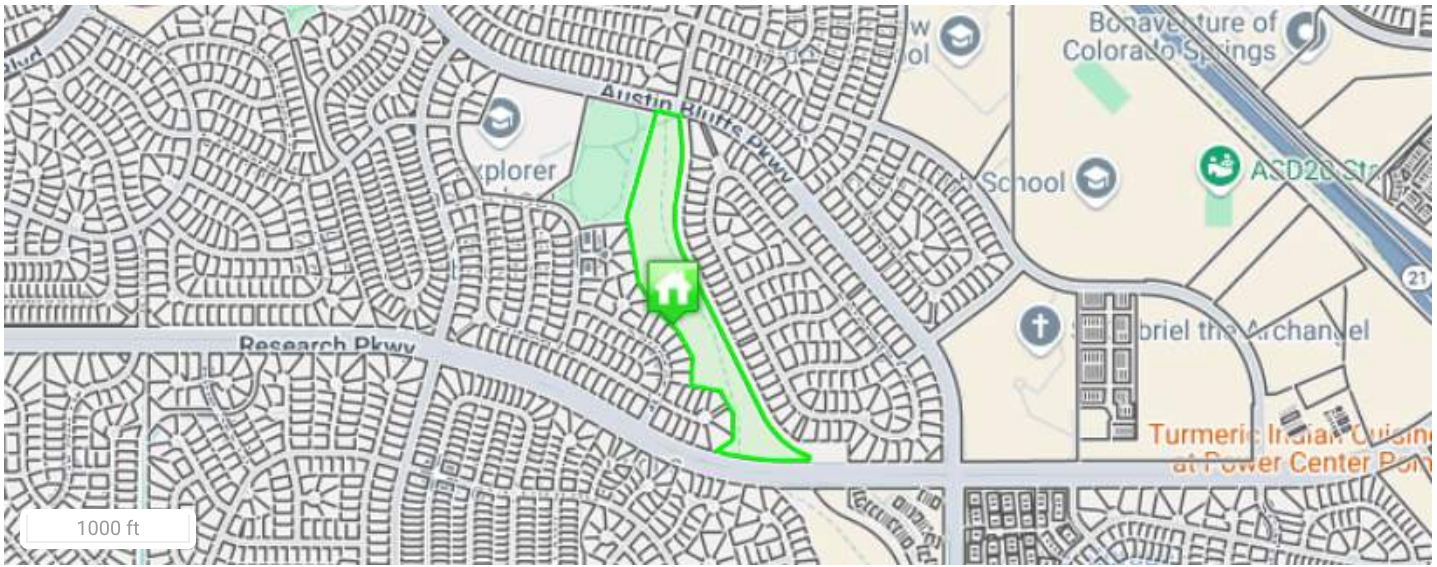
Sale Date	Sale Price	Sale Type	Reception
07/12/1995	\$0	-	-

TAX ENTITY AND LEVY INFORMATION

County Treasurer Tax Information

Tax Area Code: JHQ Levy Year: 2023 Mill Levy: 66.996

Taxing Entity	Levy	Contact Name/Organization	Contact Phone
EL PASO COUNTY	6.862	FINANCIAL SERVICES	(719)520-6400
EPC ROAD & BRIDGE SHARE	0.165	-	(719)520-6498
CITY OF COLORADO SPRINGS	3.579	CITY OF CS-CFO	(719)385-5224
EPC-COLORADO SPGS ROAD & BRIDGE SHARE	0.165	-	(719)520-6498
ACADEMY SCHOOL DISTRICT #20	47.867	BECKY ALLAN	(719)234-1200
PIKES PEAK LIBRARY DISTRICT	3.061	RANDALL A GREEN	(719)531-6333
SOUTHEASTERN COLO WATER CONSERVANCY DISTRICT	0.888	JAMES BRODERICK	(719)948-2400
EL PASO COUNTY CONSERVATION DISTRICT	0.000	MARIAH HUDSON	(719)600-4706
COLO SPGS BRIARGATE GID 2021	4.409	CITY OF CS-CFO	(719)385-5224



No Photo Available



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EL PASO COUNTY - COLORADO

6302101070
CANDLEFLOWER CIR

Total Market Value
\$86,563

OVERVIEW

Owner:	COLORADO SPRINGS CITY OF
Mailing Address:	PO BOX 1575 MAIL CODE 455 COLORADO SPRINGS CO, 80901-1575
Location:	CANDLEFLOWER CIR
Tax Status:	Exempt
Zoning:	PK AO
Plat No:	R08349
Legal Description:	TRACT "A" MEADOW RIDGE AT BRIARGATE FIL NO 5 COLO SPGS

MARKET & ASSESSMENT DETAILS

	Market Value	Assessed Value
Land	\$86,563	\$0
Improvement	\$0	\$0
Total	\$86,563	\$0

No buildings to show.

LAND DETAILS

Sequence Number	Land Use	Assessment Rate	Area	Market Value
1	EXEMPT NONRESIDENTIAL LAND - POLITICAL SUBDIVISION	27.900	4.91 Acres	\$86,563

TAX ENTITY AND LEVY INFORMATION

County Treasurer Tax Information

Tax Area Code: JHR Levy Year: 2023 Mill Levy: 66.996

Taxing Entity	Levy	Contact Name/Organization	Contact Phone
EL PASO COUNTY	6.862	FINANCIAL SERVICES	(719)520-6400
EPC ROAD & BRIDGE SHARE	0.165	-	(719)520-6498
CITY OF COLORADO SPRINGS	3.579	CITY OF CS-CFO	(719)385-5224
EPC-COLORADO SPGS ROAD & BRIDGE SHARE	0.165	-	(719)520-6498
ACADEMY SCHOOL DISTRICT #20	47.867	BECKY ALLAN	(719)234-1200
PIKES PEAK LIBRARY DISTRICT	3.061	RANDALL A GREEN	(719)531-6333
SOUTHEASTERN COLO WATER CONSERVANCY DISTRICT	0.888	JAMES BRODERICK	(719)948-2400
BRIARGATE SIMD	0.000	CITY OF CS-CFO	(719)385-5224
EL PASO COUNTY CONSERVATION DISTRICT	0.000	MARIAH HUDSON	(719)600-4706
COLO SPGS BRIARGATE GID 2021	4.409	CITY OF CS-CFO	(719)385-5224

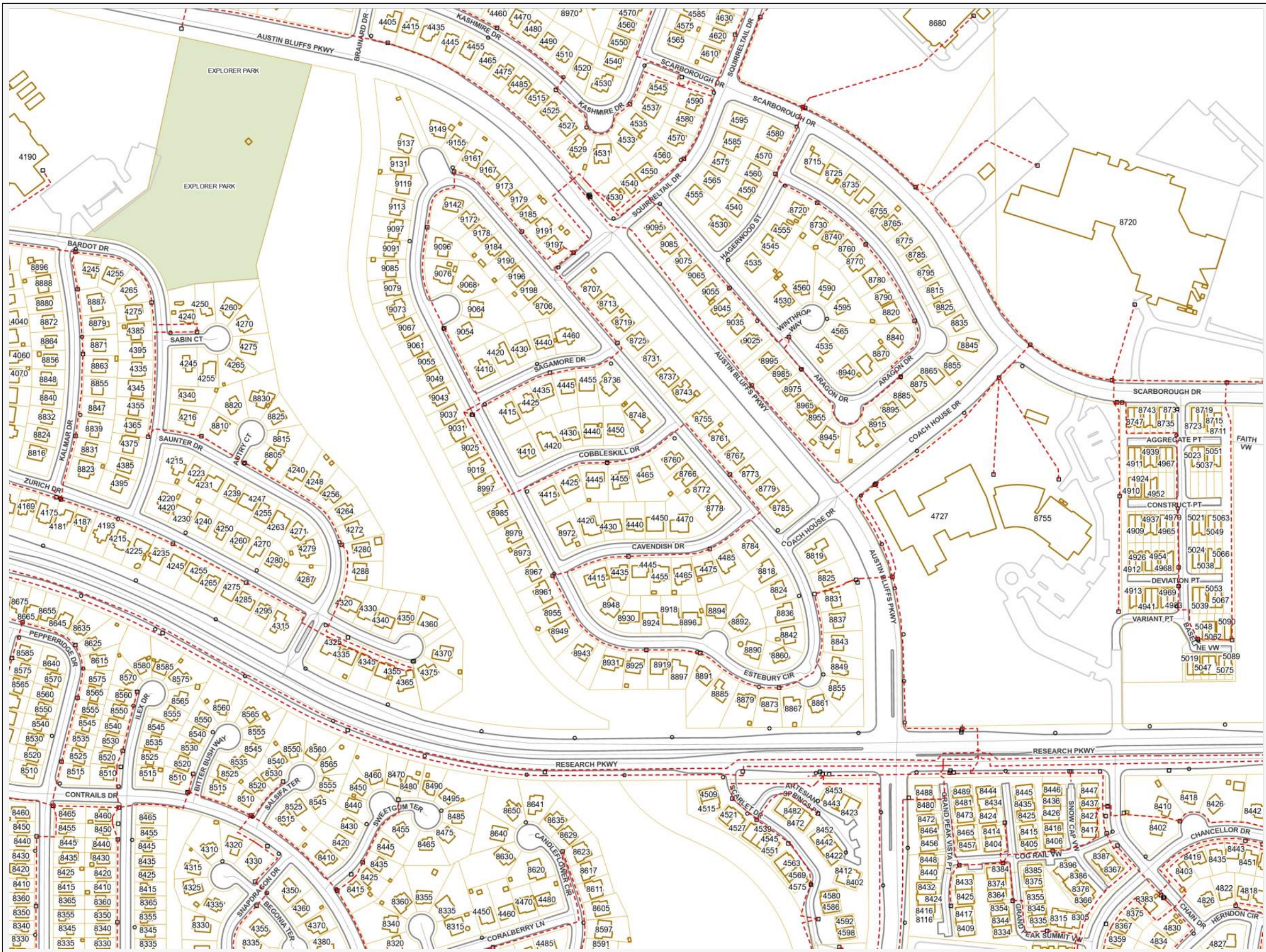



No Photo Available



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We have made a good-faith effort to provide you with the most recent and most accurate information available. However, if you need to use this information in any legal or official venue, you will need to obtain official copies from the Assessor's Office. Do be aware that this data is subject to change on a daily basis. If you believe that any of this information is incorrect, please call us at (719) 520-6600.





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Scale 1" = 200' *

0 50 100 200 300 400 Feet

Reference Map

L-18	M-18	N-18	O-18
L-19	M-19	N-19	O-19
L-20	M-20	N-20	O-20
L-21	M-21	N-21	O-21


- Street Light
- Primary Overhead Line
- Primary Underground Line
- Bridge
- Alley
- Paved Parking
- Unpaved Road
- Paved Road
- Railroad Track

- Building
- Parcel
- Lake
- Stream

Horizontal Datum: State Plane Central CO Zone - NAD83
Vertical Datum: State Plane NGVD29 - US Survey Feet (Utility Data)
Vertical Datum: State Plane NGVD88 - US Survey Feet (Contour & Control Data)

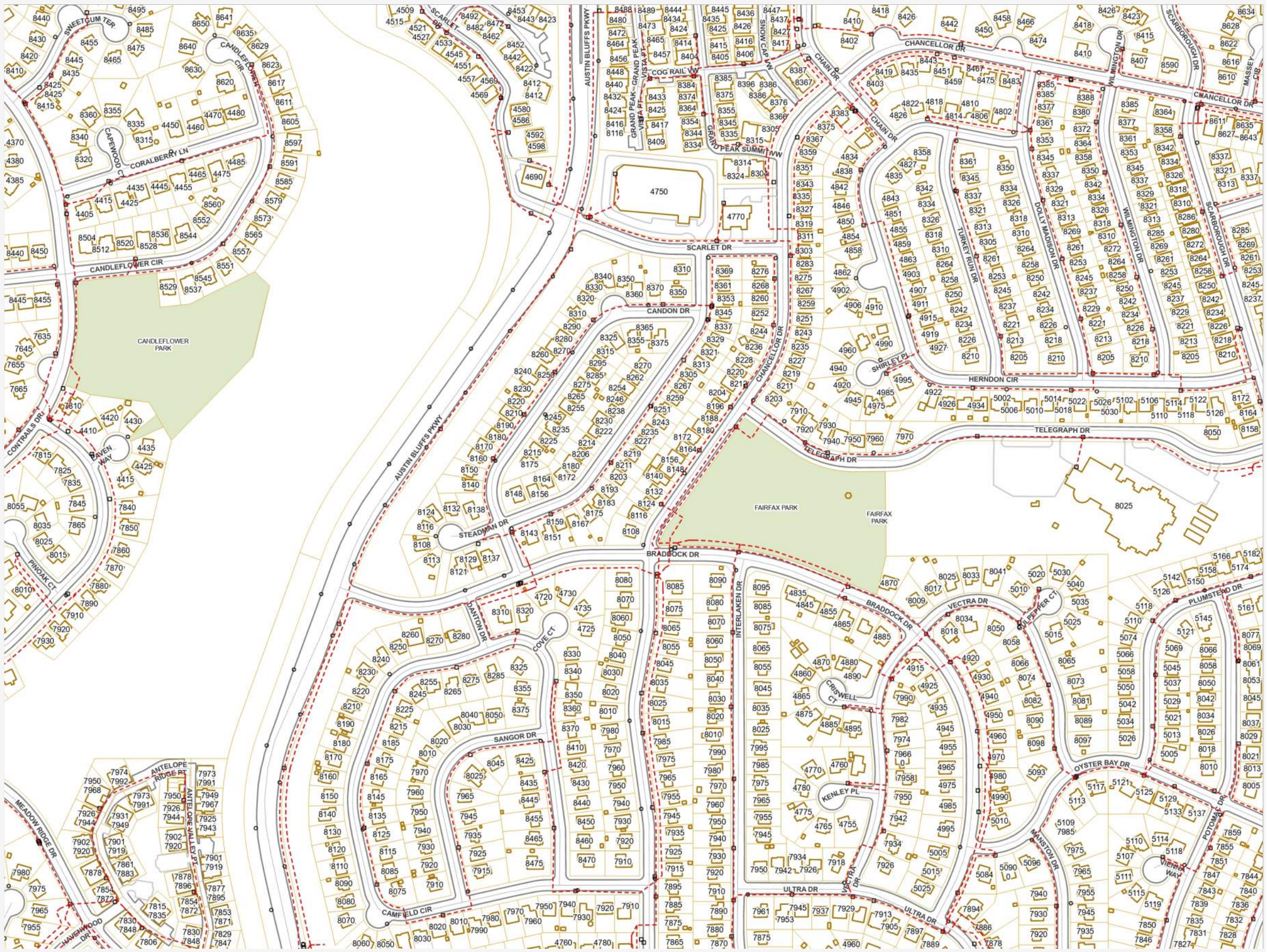
Lower Left: 3213525, 1408619
Upper Right: 3217525, 1411619

Electric Public Access Map

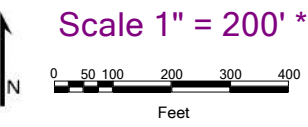


Know what's below. Call before you dig.

Map Created: 9/4/2024



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Reference Map			
L-19	M-19	N-19	O-19
L-20	M-20	N-20	O-20
L-21	M-21	N-21	O-21

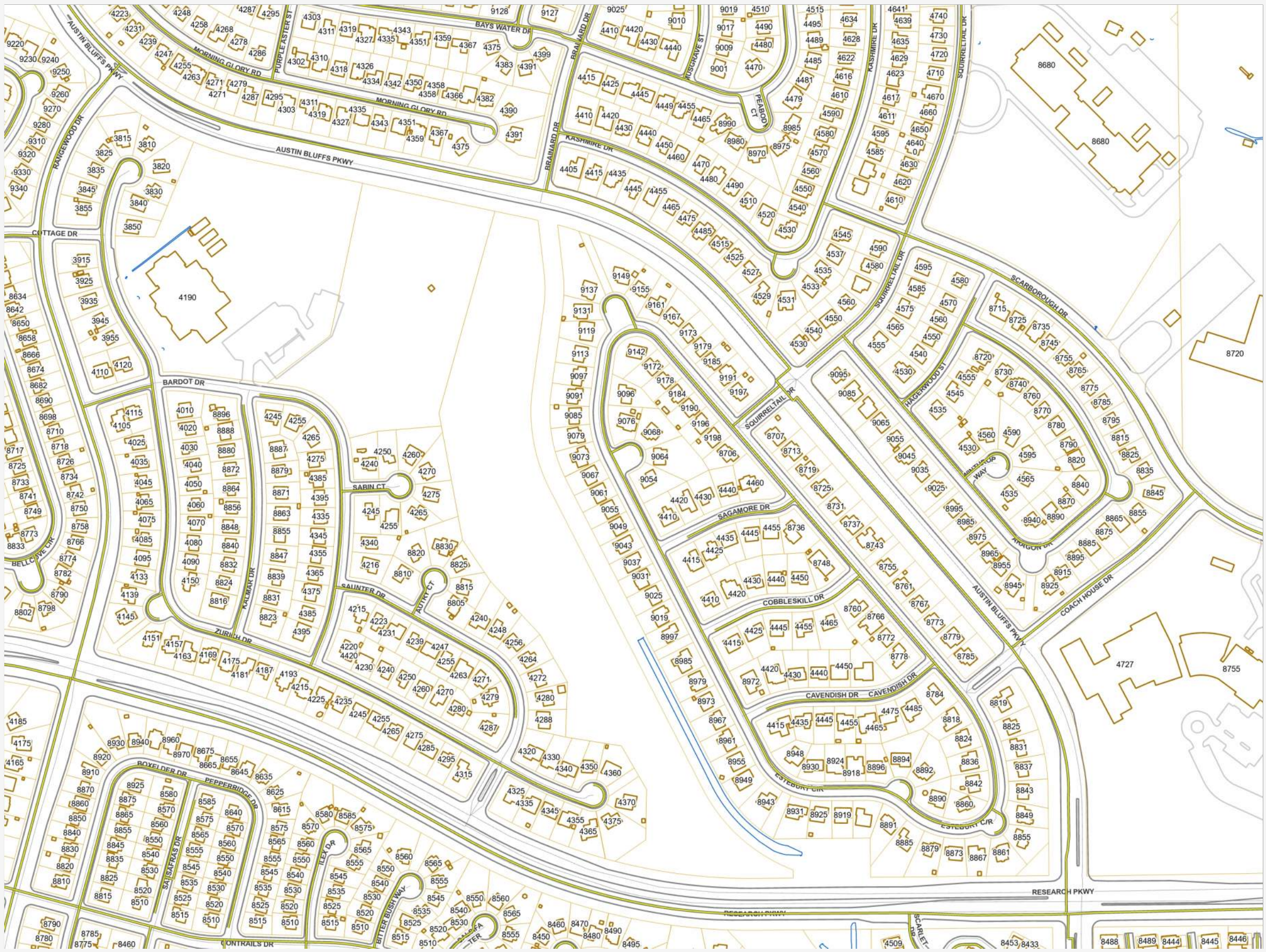
- | | | | |
|--|--------------------------|--|----------|
| | Street Light | | Building |
| | Primary Overhead Line | | Parcel |
| | Primary Underground Line | | Lake |
| | Bridge | | Stream |
| | Alley | | |
| | Paved Parking | | |
| | Unpaved Road | | |
| | Paved Road | | |
| | Railroad Track | | |

Horizontal Datum: State Plane Central CO Zone - NAD83
Vertical Datum: State Plane NGVD29 - US Survey Feet (Utility Data)
Vertical Datum: State Plane NGVD88 - US Survey Feet (Contour & Control Data)

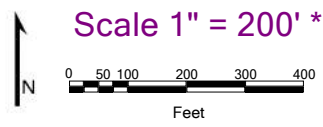
Lower Left: 3214504, 1406120
Upper Right: 3218504, 1409120

Electric Public Access Map





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Reference Map

L-18	M-18	N-18	O-18
L-19	M-19	N-19	O-19
L-20	M-20	N-20	O-20

- Gas Main
- Bridge
- Alley
- Paved Parking
- Unpaved Road
- Paved Road
- Railroad Track
- Building
- Parcel
- Lake
- Stream


Horizontal Datum: State Plane Central CO Zone - NAD83
Vertical Datum: State Plane NGVD29 - US Survey Feet (Utility Data)
Vertical Datum: State Plane NGVD88 - US Survey Feet (Contour & Control Data)

Lower Left: 3212932, 1409096
Upper Right: 3216932, 1412096

Gas Public Access Map







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Scale 1" = 200' *

0 50 100 200 300 400 Feet

Reference Map


L-19	M-19	N-19	O-19
L-20	M-20	N-20	O-20
L-21	M-21	N-21	O-21

	Gas Main		Building
	Bridge		Parcel
	Alley		Lake
	Paved Parking		Stream
	Unpaved Road		
	Paved Road		
	Railroad Track		

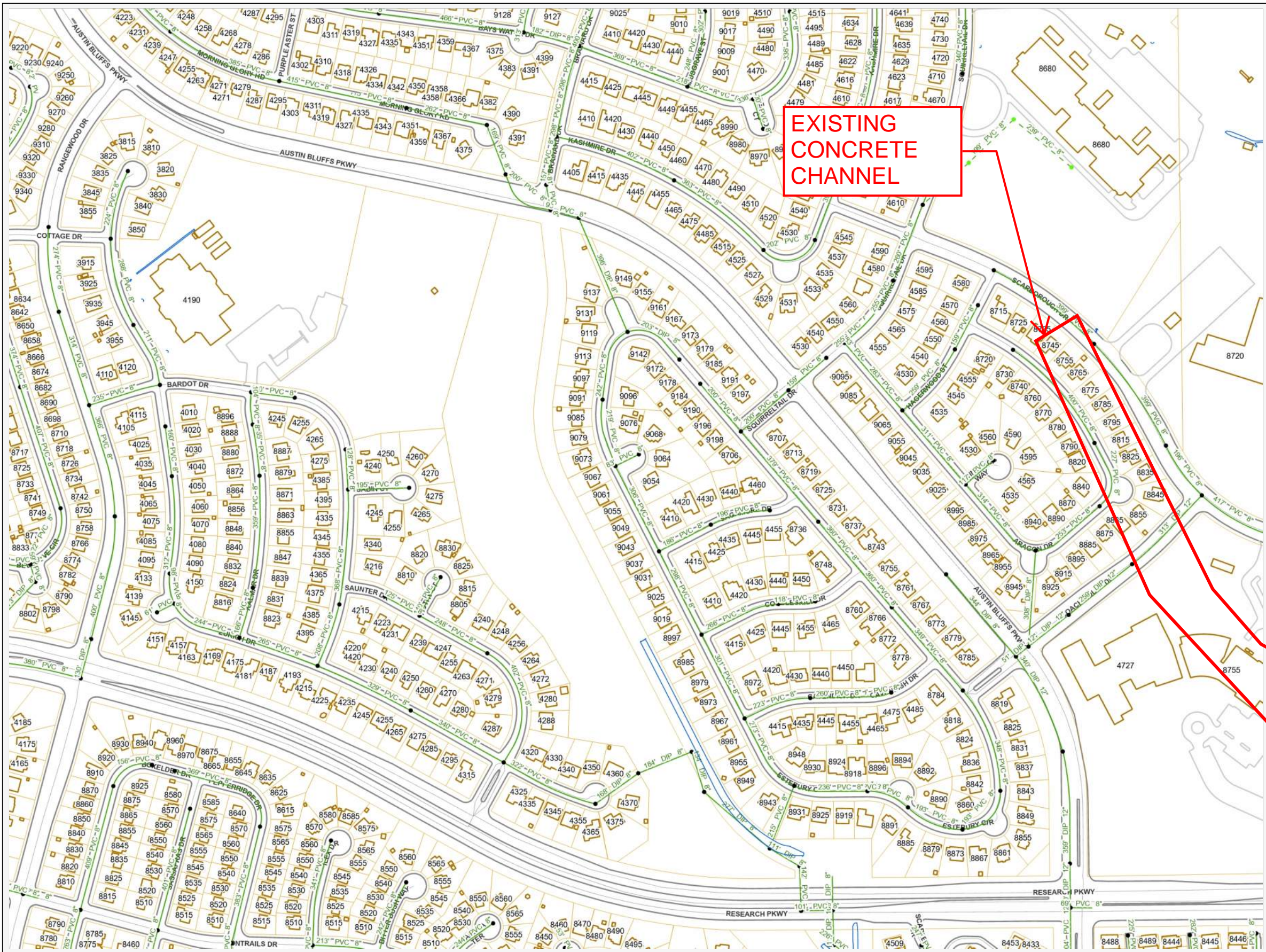
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Vertical Datum: State Plane NGVD29 - US Survey Feet (Utility Data)
Vertical Datum: State Plane NGVD88 - US Survey Feet (Contour & Control Data)

Lower Left: 3214504, 1406120
Upper Right: 3218504, 1409120

Gas Public Access Map



Map Created: 9/4/2024



EXISTING
CONCRETE
CHANNEL



Scale 1" = 200' *
0 50 100 200 300 400
Feet

Reference Map

L-18	M-18	N-18	O-18
L-19	M-19	N-19	O-19
L-20	M-20	N-20	O-20

- Manhole - CSU Owned
- Manhole - Private
- Forced Main
- Gravity Main - CSU Owned
- Gravity Main - Private
- Retired Main
- Sludge Line
- Bridge
- Alley
- Paved Parking
- Unpaved Road
- Paved Road
- Railroad Track
- Building
- Parcel
- Lake
- Stream

Wastewater Public Access Map



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Vertical Datum: State Plane NGVD29 - US Survey Feet (Utility Data)
Vertical Datum: State Plane NGVD88 - US Survey Feet (Contour & Control Data)

Lower Left: 3212932.1409096
Upper Right: 3216932.1412096





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Scale 1" = 200' *

0 50 100 200 300 400 Feet

Reference Map


L-19	M-19	N-19	O-19
L-20	M-20	N-20	O-20
L-21	M-21	N-21	O-21

Horizontal Datum: State Plane Central CO Zone - NAD83
Vertical Datum: State Plane NGVD29 - US Survey Feet (Utility Data)
Vertical Datum: State Plane NGVD88 - US Survey Feet (Contour & Control Data)

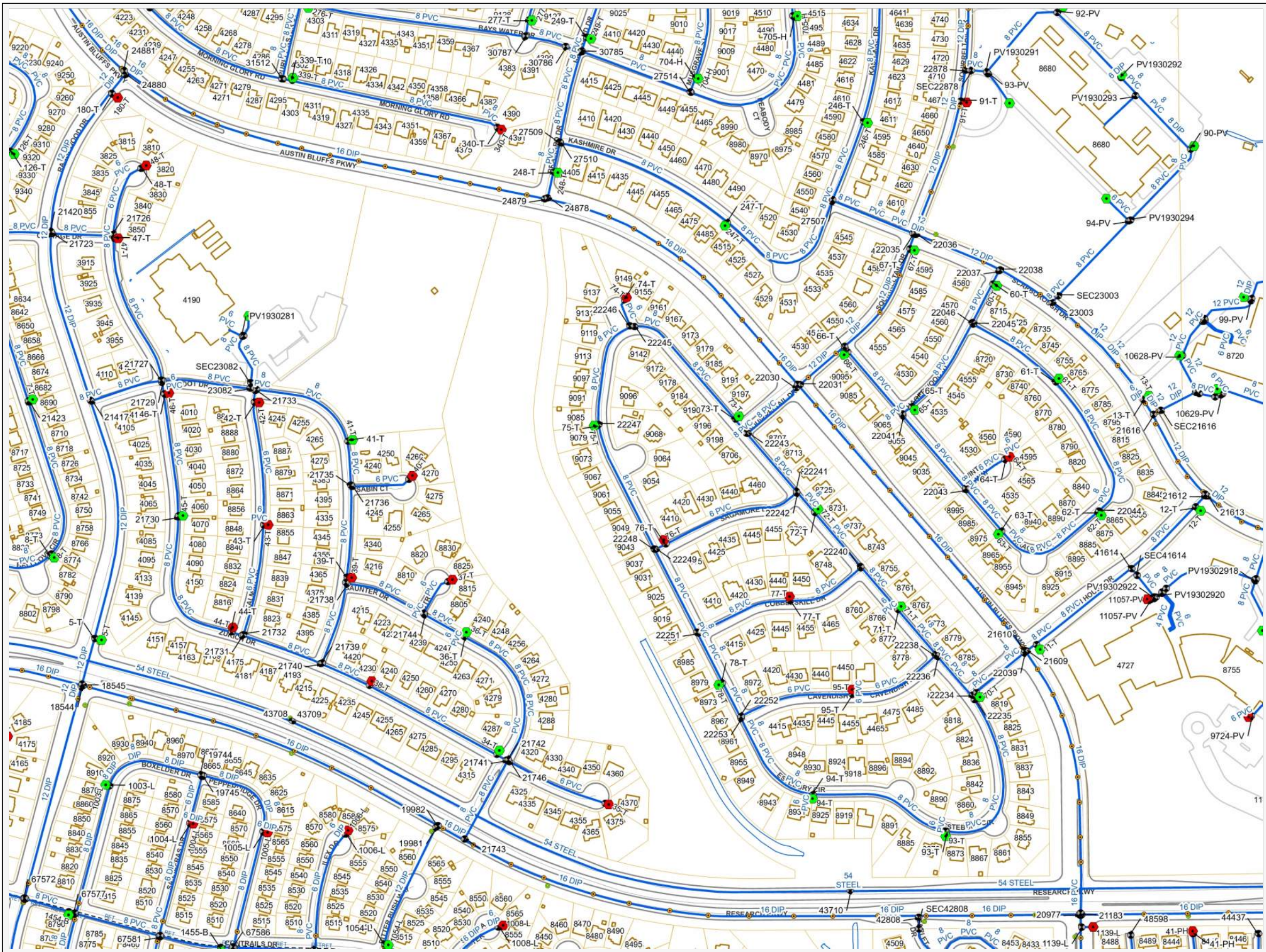
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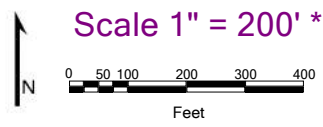
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Map Created: 9/4/2024

Reference Map

L-18	M-18	N-18	O-18
L-19	M-19	N-19	O-19
L-20	M-20	N-20	O-20

- Hydrant
- Potable Main
- Non-Potable Main
- Raw Main
- Abandoned Line
- Water Tank
- Bridge
- Alley
- Paved Parking
- Unpaved Road
- Railroad Track
- Building
- Parcel
- Lake
- Stream


Horizontal Datum: State Plane Central CO Zone - NAD83
Vertical Datum: State Plane NGVD29 - US Survey Feet (Utility Data)
Vertical Datum: State Plane NGVD88 - US Survey Feet (Contour & Control Data)

Water Public Access Map

Lower Left: 3212932.1409096
Upper Right: 3216932.1412096







Colorado Springs Utilities
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Scale 1" = 200' *

0 50 100 200 300 400
Feet

Reference Map

L-19	M-19	N-19	O-19
L-20	M-20	N-20	O-20
L-21	M-21	N-21	O-21

Hydrant
Potable Main
Non-Potable Main
Raw Main
Abandoned Line
Water Tank
Bridge
Alley
Paved Parking
Unpaved Road
Paved Road
Railroad Track

Building
Parcel
Lake
Stream

Horizontal Datum: State Plane Central CO Zone - NAD83
Vertical Datum: State Plane NGVD29 - US Survey Feet (Utility Data)
Vertical Datum: State Plane NGVD88 - US Survey Feet (Contour & Control Data)

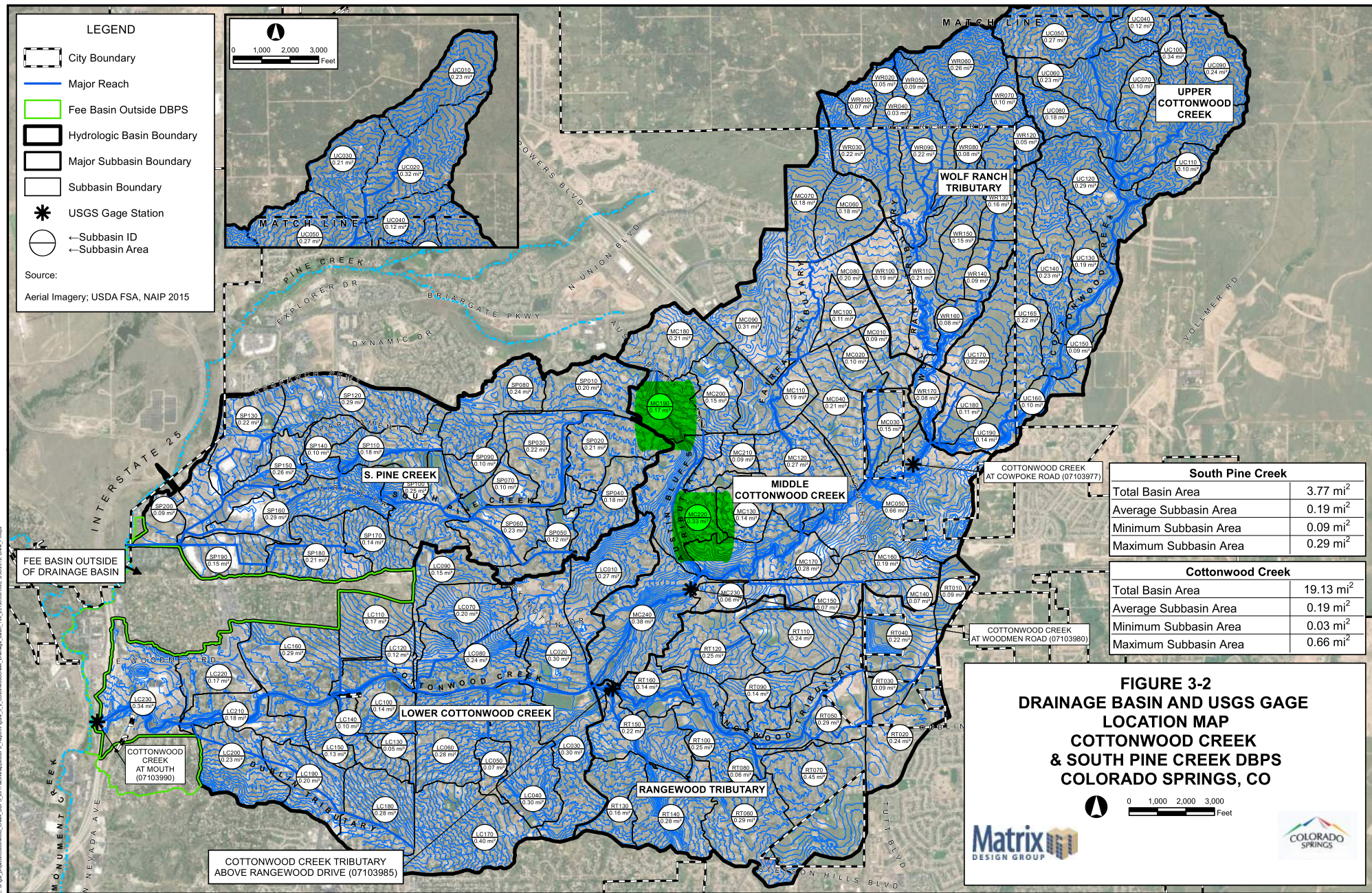
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APPENDIX B - HYDROLOGY



Cottonwood Creek Drainage Basin Planning Study
Existing Model Results

Hydrologic Element	Drainage Area (sq mi)	<u>Results</u>					
		2-Year Peak Discharge (cfs)	5-Year Peak Discharge (cfs)	10-Year Peak Discharge (cfs)	25-Year Peak Discharge (cfs)	50-Year Peak Discharge (cfs)	100-Year Peak Discharge (cfs)
LC010	0.27	100	140	160	180	200	230
LC020	0.3	230	310	360	400	460	510
LC030	0.3	140	190	220	250	280	320
LC040	0.3	130	170	200	230	260	290
LC050	0.07	36	47	55	61	70	78
LC060	0.28	110	140	160	180	210	230
LC070	0.2	54	71	83	93	110	120
LC080	0.24	100	140	160	180	200	220
LC090	0.15	66	87	100	110	130	140
LC100	0.14	71	93	110	120	140	150
LC110	0.17	29	38	45	50	57	63
LC120	0.12	67	88	100	110	130	140
LC130	0.05	34	44	52	58	66	73
LC140	0.1	48	63	73	82	94	100
LC150	0.13	49	65	76	85	97	110
LC160	0.29	140	180	210	240	270	300
LC170	0.4	250	330	390	430	500	550
LC180	0.28	150	200	230	260	300	330
LC190	0.2	140	180	210	240	270	300
LC200	0.23	160	210	240	270	310	340
LC210	0.18	72	96	110	120	140	160
LC220	0.17	120	160	180	210	240	260
LC230	0.34	240	310	370	410	470	520
MC010	0.09	62	82	96	110	120	140
MC020	0.1	56	73	86	96	110	120
MC030	0.15	1.3	1.7	2	5.6	10	17
MC040	0.21	92	120	140	160	180	200
MC050	0.66	82	110	130	160	190	230
MC060	0.18	85	110	130	150	170	190
MC070	0.18	86	110	130	150	170	190
MC080	0.2	120	150	180	200	230	250
MC090	0.31	64	85	99	110	130	150
MC100	0.11	45	59	69	77	88	97
MC110	0.19	160	220	250	280	320	360
MC120	0.27	120	160	190	210	240	270
MC130	0.14	110	140	160	180	210	230
MC140	0.07	60	79	93	100	120	130
MC150	0.07	16	21	25	28	32	35
MC160	0.19	51	68	79	89	100	110
MC170	0.28	170	220	260	290	340	370
MC180	0.21	130	170	200	220	250	280
MC190	0.17	75	99	120	130	150	160
MC200	0.15	67	88	100	120	130	150
MC210	0.09	51	68	79	88	100	110
MC220	0.33	140	180	210	240	270	300
MC230	0.06	56	74	86	97	110	120
MC240	0.38	98	130	150	170	190	230

Hydrologic Element	Drainage Area (sq mi)	<u>Results</u>					
		2-Year Peak Discharge (cfs)	5-Year Peak Discharge (cfs)	10-Year Peak Discharge (cfs)	25-Year Peak Discharge (cfs)	50-Year Peak Discharge (cfs)	100-Year Peak Discharge (cfs)
RLC032	14.26	1700	2300	2700	3600	4200	5100
RLC034	0.27	100	140	160	180	200	230
RLC036	14.53	1800	2400	2800	3700	4300	5200
RLC050	0.07	36	47	55	61	70	78
RLC082	15.13	1900	2500	2900	3900	4500	5300
RLC084	15.5	2000	2600	3100	4100	4800	5500
RLC086	0.2	54	71	83	93	110	120
RLC090	16.22	2100	2800	3300	4400	5100	5900
RLC122	16.37	2100	2800	3300	4400	5200	6000
RLC124	0.17	29	38	45	50	57	63
RLC126	16.54	2100	2800	3300	4500	5200	6000
RLC128	16.69	2100	2900	3400	4500	5300	6100
RLC140	0.05	34	44	52	58	66	73
RLC150	16.95	2200	2900	3400	4600	5300	6200
RLC180	0.4	250	330	390	430	500	550
RLC190	0.68	400	530	620	690	790	870
RLC200	0.88	540	710	830	930	1100	1200
RLC212	17.37	2200	3000	3500	4700	5500	6400
RLC214	18.48	2400	3200	3800	5100	6000	6900
RLC230	18.83	2200	3000	3600	4900	5800	6700
RMC020	0.09	62	82	96	110	120	140
RMC032	0	0	0	0	0	0	0
RMC034	0.19	13	15	35	54	79	99
RMC036	0.19	13	15	35	54	79	98
RMC052	6.06	560	750	880	1400	1900	2400
RMC054	6.4	570	760	900	1500	1900	2400
RMC056	0.21	92	120	140	160	180	200
RMC058	6.61	630	840	990	1500	2000	2500
RMC070	0.18	85	110	130	150	170	190
RMC082	0.36	160	210	250	280	320	350
RMC084	0.67	68	120	140	140	150	150
RMC086	0.11	45	59	69	77	88	97
RMC110	0.98	28	42	65	92	120	130
RMC120	1.17	150	190	230	250	290	320
RMC162	0.07	60	79	92	100	120	130
RMC164	0.07	16	21	25	28	32	35
RMC166	0.14	74	97	110	130	150	160
RMC171	8.71	810	1100	1300	1800	2400	3000
RMC172	0.14	110	140	160	180	210	230
RMC173	8.85	820	1100	1300	1900	2400	3000
RMC174	0.33	120	160	180	200	230	260
RMC175	9.18	890	1200	1400	1900	2500	3100
RMC190	0.21	130	170	200	220	250	280
RMC221	0.38	190	250	300	330	380	420
RMC222	0.15	67	88	100	120	130	150
RMC223	0.53	260	340	400	450	510	560
RMC224	0.09	51	67	79	88	100	110
RMC225	0.62	310	410	470	530	610	670
RMC242	10.41	790	1000	1200	2000	2600	3300
RMC244	10.47	820	1100	1300	2000	2700	3300

APPENDIX C - CONCEPTUAL LAYOUT AND HYDRAULIC ANALYSIS



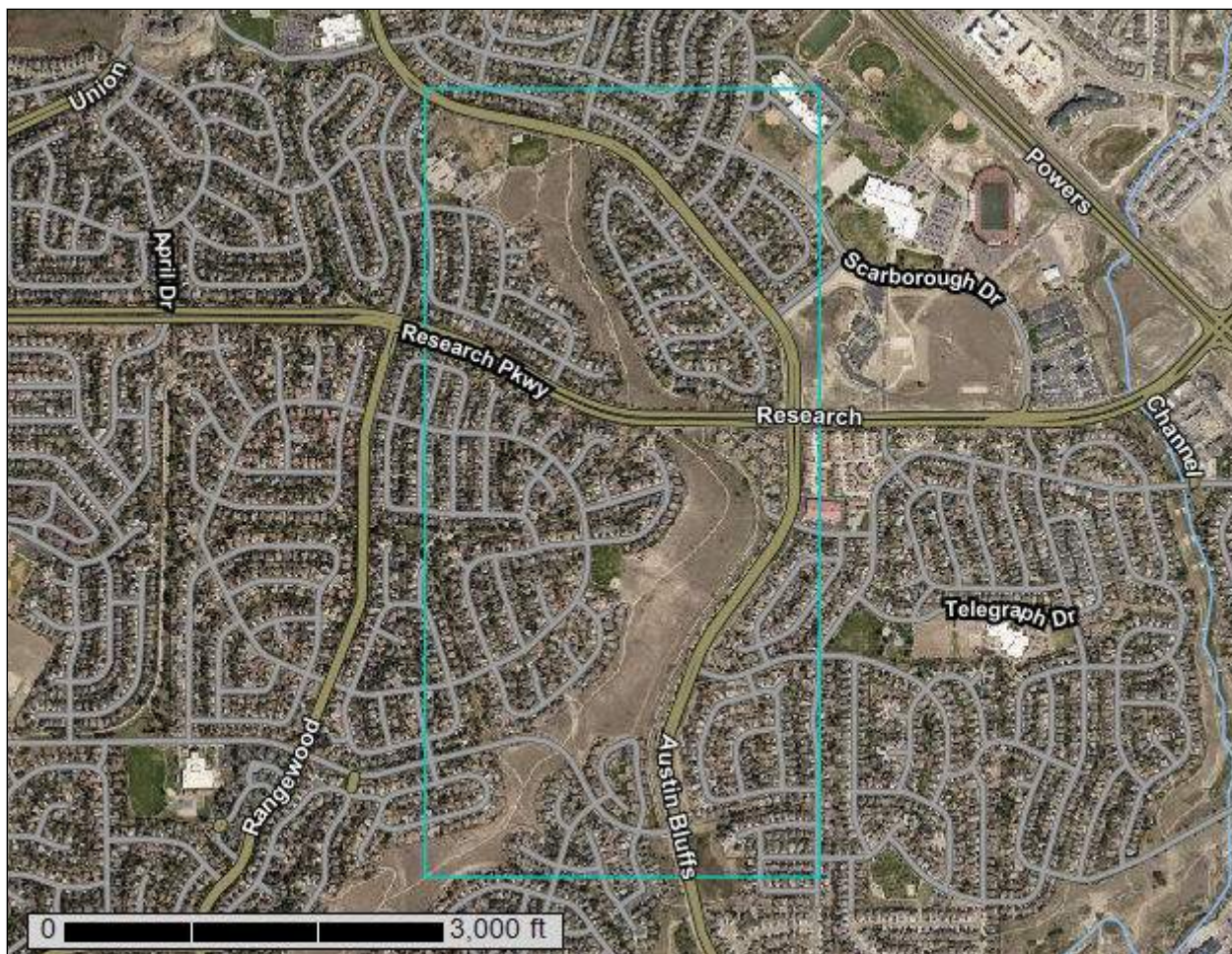
United States
Department of
Agriculture

NRCS

Natural
Resources
Conservation
Service

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

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



Preface

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

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

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

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

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

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

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How Soil Surveys Are Made

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

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

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

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

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

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

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

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

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

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

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

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

Custom Soil Resource Report

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

Soil Map

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

Custom Soil Resource Report Soil Map



Custom Soil Resource Report

MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)


Soils


 Soil Map Unit Polygons


 Soil Map Unit Lines


 Soil Map Unit Points

Special Point Features

 Blowout

 Borrow Pit


 Clay Spot


 Closed Depression

 Gravel Pit

 Gravelly Spot

 Landfill

 Lava Flow

 Marsh or swamp

 Mine or Quarry

 Miscellaneous Water

 Perennial Water

 Rock Outcrop


 Saline Spot

 Sandy Spot

 Severely Eroded Spot


 Sinkhole


 Slide or Slip

 Sodic Spot


 Spoil Area

 Stony Spot

 Very Stony Spot

 Wet Spot

 Other

 Special Line Features

Water Features

 Streams and Canals


Transportation

 Rails

 Interstate Highways

 US Routes

 Major Roads

 Local Roads

Background

 Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

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

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

Date(s) aerial images were photographed: Aug 19, 2018—Sep 23, 2018

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
8	Blakeland loamy sand, 1 to 9 percent slopes	346.2	77.3%
12	Bresser sandy loam, cool, 3 to 5 percent slopes	5.3	1.2%
85	Stapleton-Bernal sandy loams, 3 to 20 percent slopes	96.3	21.5%
Totals for Area of Interest		447.8	100.0%

Map Unit Descriptions

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

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

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

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or

landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

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

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

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

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

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

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

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

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

El Paso County Area, Colorado

8—Blakeland loamy sand, 1 to 9 percent slopes

Map Unit Setting

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

Map Unit Composition

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

Description of Blakeland

Setting

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

Typical profile

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

Properties and qualities

Slope: 1 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Available water supply, 0 to 60 inches: Low (about 4.5 inches)

Interpretive groups

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

Minor Components

Other soils

Percent of map unit: 1 percent

Hydric soil rating: No

Pleasant

Percent of map unit: 1 percent

Landform: Depressions

Hydric soil rating: Yes

12—Bresser sandy loam, cool, 3 to 5 percent slopes

Map Unit Setting

National map unit symbol: 2tlpd

Elevation: 6,300 to 6,800 feet

Mean annual precipitation: 13 to 19 inches

Mean annual air temperature: 46 to 50 degrees F

Frost-free period: 125 to 140 days

Farmland classification: Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60

Map Unit Composition

Bresser, cool, and similar soils: 85 percent

Minor components: 15 percent

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

Description of Bresser, Cool

Setting

Landform: Interfluves

Landform position (two-dimensional): Summit

Landform position (three-dimensional): Interfluve

Down-slope shape: Linear

Across-slope shape: Convex

Parent material: Tertiary aged alluvium derived from arkose

Typical profile

Ap - 0 to 5 inches: sandy loam

Bt1 - 5 to 8 inches: sandy loam

Bt2 - 8 to 27 inches: sandy clay loam

Bt3 - 27 to 36 inches: sandy loam

C - 36 to 80 inches: loamy coarse sand

Properties and qualities

Slope: 3 to 5 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained

Runoff class: Low

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.60 to 6.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum content: 5 percent

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

Available water supply, 0 to 60 inches: Low (about 5.4 inches)

Interpretive groups

Land capability classification (irrigated): 3e

Land capability classification (nonirrigated): 4s

Hydrologic Soil Group: B

Ecological site: R049XB210CO - Sandy Foothill

Hydric soil rating: No

Minor Components

Truckton

Percent of map unit: 10 percent

Landform: Interfluves

Landform position (two-dimensional): Summit

Landform position (three-dimensional): Interfluve

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: R049XB210CO - Sandy Foothill

Hydric soil rating: No

Yoder

Percent of map unit: 5 percent

Landform: Alluvial fans

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: R049XY214CO - Gravelly Foothill

Hydric soil rating: No

85—Stapleton-Bernal sandy loams, 3 to 20 percent slopes

Map Unit Setting

National map unit symbol: 36b1

Elevation: 6,500 to 6,800 feet

Mean annual precipitation: 14 to 16 inches

Mean annual air temperature: 46 to 48 degrees F

Frost-free period: 125 to 145 days

Farmland classification: Not prime farmland

Map Unit Composition

Stapleton and similar soils: 55 percent

Bernal and similar soils: 44 percent

Minor components: 1 percent

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

Description of Stapleton

Setting

Landform: Hills

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

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Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy alluvium derived from arkose

Typical profile

A - 0 to 11 inches: sandy loam
Bw - 11 to 17 inches: gravelly sandy loam
C - 17 to 60 inches: gravelly loamy sand

Properties and qualities

Slope: 3 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: R049XY214CO - Gravelly Foothill
Hydric soil rating: No

Description of Bernal

Setting

Landform: Hills
Landform position (three-dimensional): Crest, side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Residuum weathered from sandstone

Typical profile

A - 0 to 4 inches: sandy loam
Bt - 4 to 11 inches: sandy clay loam
C - 11 to 13 inches: sandy loam
R - 13 to 17 inches: unweathered bedrock

Properties and qualities

Slope: 3 to 20 percent
Depth to restrictive feature: 8 to 20 inches to lithic bedrock
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 1.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e

Custom Soil Resource Report

Hydrologic Soil Group: D

Ecological site: R049XB204CO - Shallow Foothill

Hydric soil rating: No

Minor Components

Other soils

Percent of map unit: 1 percent

Hydric soil rating: No

Soil Information for All Uses

Soil Properties and Qualities

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

Soil Physical Properties

Soil Physical Properties are measured or inferred from direct observations in the field or laboratory. Examples of soil physical properties include percent clay, organic matter, saturated hydraulic conductivity, available water capacity, and bulk density.

Saturated Hydraulic Conductivity (Ksat)

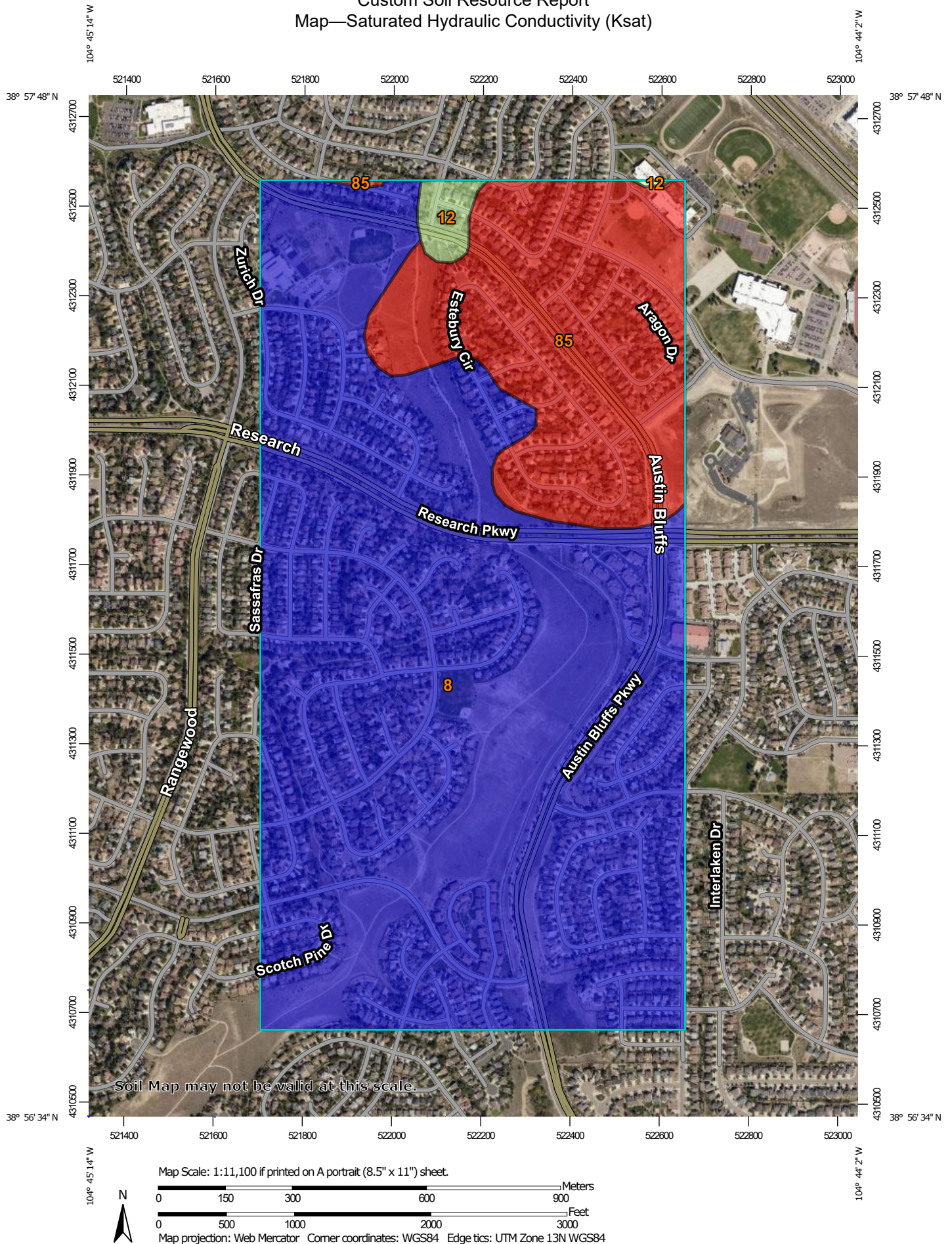
Saturated hydraulic conductivity (Ksat) refers to the ease with which pores in a saturated soil transmit water. The estimates are expressed in terms of micrometers per second. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Saturated hydraulic conductivity is considered in the design of soil drainage systems and septic tank absorption fields.

For each soil layer, this attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

The numeric Ksat values have been grouped according to standard Ksat class limits.

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Map—Saturated Hydraulic Conductivity (Ksat)




Custom Soil Resource Report

MAP LEGEND

Area of Interest (AOI)





 Area of Interest (AOI)

Background





 Aerial Photography

Soils





Soil Rating Polygons

-  ≤ 28.0000
-  > 28.0000 and ≤ 28.2250
-  > 28.2250 and ≤ 92.0000
-  Not rated or not available


Soil Rating Lines

-  ≤ 28.0000
-  > 28.0000 and ≤ 28.2250
-  > 28.2250 and ≤ 92.0000
-  Not rated or not available






Soil Rating Points

-  ≤ 28.0000
-  > 28.0000 and ≤ 28.2250
-  > 28.2250 and ≤ 92.0000
-  Not rated or not available

Water Features

 Streams and Canals

Transportation

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

MAP INFORMATION

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

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Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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

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

Date(s) aerial images were photographed: Aug 19, 2018—Sep 23, 2018

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

Table—Saturated Hydraulic Conductivity (Ksat)

Map unit symbol	Map unit name	Rating (micrometers per second)	Acres in AOI	Percent of AOI
8	Blakeland loamy sand, 1 to 9 percent slopes	92.0000	346.2	77.3%
12	Bresser sandy loam, cool, 3 to 5 percent slopes	28.2250	5.3	1.2%
85	Stapleton-Bernal sandy loams, 3 to 20 percent slopes	28.0000	96.3	21.5%
Totals for Area of Interest			447.8	100.0%

Rating Options—Saturated Hydraulic Conductivity (Ksat)

Units of Measure: micrometers per second

Aggregation Method: Dominant Component

Component Percent Cutoff: None Specified

Tie-break Rule: Fastest

Interpret Nulls as Zero: No

Layer Options (Horizon Aggregation Method): Depth Range (Weighted Average)

Top Depth: 1

Bottom Depth: 20

Units of Measure: Centimeters

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