~~Drainage Letter~~
~~Arroya Lane Minor Subdivision~~

April 9, 2026

Final Drainage Report for
Raff Subdivision

PCD File SF2621

Prepared for:

Land Development Consultants, Inc.
3898 Maizeland Road
Colorado Springs, Colorado 80909
Attention: Dan Kupferer, PLS

Prepared by:

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Colorado Professional Engineer
License No. 50745

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B Reference Material

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Certifications

Engineers 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 ~~city~~/county for drainage reports and said report is in conformity with the master plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparing this report.

_____

Name

Developers Statement

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

_____

Business Name

By:_____

Title:_____

Address:_____

_____

~~Filed in accordance with Section 51.1~~ of the El Paso Land Development Code as amended.

Please update and correct

_____

~~Director of Public Works~~

~~Date:~~

El Paso County:

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

_____ _____

County Engineer / ECM Administrator Date

Conditions:

1. Introduction and Purpose

This drainage letter is being prepared to support a minor subdivision application as required per El Paso County criteria. The subject parcel is located at 9420 Arroya Lane. The parcel is currently listed on the public records site as Schedule Number 5222000018 and is approximately 19.16 acres per the most recent land survey.

It is our understanding that this application is required to resolve an existing compl regarding it's non-conforming status. This subdivision process will correct the issue

Discuss if a prior drainage report has been completed and approved. If not then this should be labeled as a Final Drainage Report

It should be noted that the application will replat an existing parcel. No new parcels there is no development proposed for the property beyond what exists today. As the requirements listed in Chapter 4, Paragraph 4.5 suggests that a "Small Subdivis Format" or "Letter Type" report would be appropriate for this project.

As such, the following paragraphs will address these specific items:

a. General Property Description with Acreage

b. General Existing Drainage Characteristics

Again, since there is no proposed development associated with this application, there will be no evaluation necessary for "proposed" conditions.

We have attached to this letter a detailed drainage map which depicts the existing drainage divides present on the site along with calculations demonstrating the flow rates.

2. General Property Description with Acreage

As stated in the prior paragraph, the subject property is located at 9420 Arroya Lane in unincorporated El Paso County. The property is approximately 19.16 acres. The site is predominantly open space with an existing residence and several buildings located throughout the property to support agricultural type activities. There is also an existing livestock pond located in the south-central portion of the site.

Based on site topography, approximately one third of the property is tributary to the on-site livestock pond with the remainder draining to adjacent parcels as shallow concentrated or sheet flow along the eastern and western boundaries. A portion of flow in the southwest corner of the site will flow to a low point and be conveyed under Arroya Lane to an existing swale on the south side of the road.

3. General Existing Drainage Characteristics

As shown on the attached drainage map, the existing site is comprised of three minor drainage basins. Basin A is comprised of the easternmost portion of the site that sheet flows east onto the adjacent parcel. This area is largely open space with a mixture of buildings and paved/gravel driveways. Basin B and located in the northwest and central portion of the site and is tributary to the existing livestock pond mentioned in the prior section. This basin is overwhelmingly open space with a small amount of roof and driveway. Basin C is located in the southwest corner of the site and drains a low point on Arroya Lane where is it collected and conveyed underneath the existing road and into a swale on the neighboring property to the south.

As shown in the attached USDA Soil Report, all on-site soils are classified as Hydrologic Soil Group (HSG) B.

A detailed description of each basin is provided on the following page.

Discuss the drainage basin area and any prior drainage studies.

label on drainage map
discuss size and capacity to convey site flow at DP O3

Table 1 – On-Site Basin Characteristics

Sub Basin	Basin Description	DP	Area (acres)	HSG	IMP %	Land Cover	C_{10}	C_{100}	Q_{10}	Q_{100}
A	Westernmost portion of subject site that sheet flows onto neighboring property to the east	O1	7.81	B	11	Largely open space (meadow) with a mix of buildings and gravel driveway(s)	0.33	0.37	10.50	22.93
B	Northwest and central portion of site that flows into an existing livestock pond located within the parcel.	O2	7.40	B	3	Largely open space (meadow) with a mix of buildings and paved/gravel driveway(s)	0.27	0.37	6.66	15.65
C	Southwest portion of site draining to a localized sump along Arroya Lane where it is conveyed downstream.	O3	3.95	B	0	Open Space	0.25	0.35	2.72	6.54

5yr must still be provided ECM Code is 5yr and 100yr

This Study has been prepared using reference material available from the El Paso County, CDOT, and other local published and applicable information.

As shown in the table on the prior page, our analysis has focused on the minor event (10-Year) and the major event (100-year) per the Drainage Criteria Manual. Our C-values have been calculated in accordance with Paragraph 5.2.1 using Table 5-1.

To determine the flow rates, we input the calculated C-Values for the minor and major events into the Mile High Flood District's UD-Rational spreadsheet. Our team also utilized NOAA Atlas 14 rainfall depth data for the subject site.

4. Summary of Analysis and Conclusions

In the preceding paragraphs supported by the information contained in the appendices, we have provided a drainage analysis that details the existing site's characteristics. Given the flow rates calculated during the major and minor events, it is our opinion that the flow discharging from Basin's A and C during the minor and major events is insufficient as sheet or shallow concentrated flow to pose any issues for downstream properties. Our team has reviewed detailed aerial imagery dating back to September of 1999 and we cannot find any evidence of drainage-related issues.

As discussed in Section 1, with no development proposed on this site either as part of or subsequent to this application, we find no warrants for any drainage infrastructure to be constructed to deal with existing issues.

what are the issues?

5. References

a. Section II – Hydrology, El Paso County Drainage Criteria Manual, Volume 1

6. General

At the back of this report, maps and supporting calculations have been provided which support the design concepts and conclusions outlined in this report. A summary of the Appendices is provided on the following page:

Appendix	Title	Included Material
Appendix A	Hydrology	• C-Value Calculations per Table 5-1 • NOAA Atlas 14 Rainfall Data • UDFCD's UD Rational
Appendix B	Reference Material	• FEMA FIRMette
Appendix C	Drainage Maps	• Existing Development Drainage Map
Appendix D	Soils Information	• Web Soil Survey Report

Discuss what the total runoff is for each basin and what the suitable outfall is

Discuss Off-site Flows if any

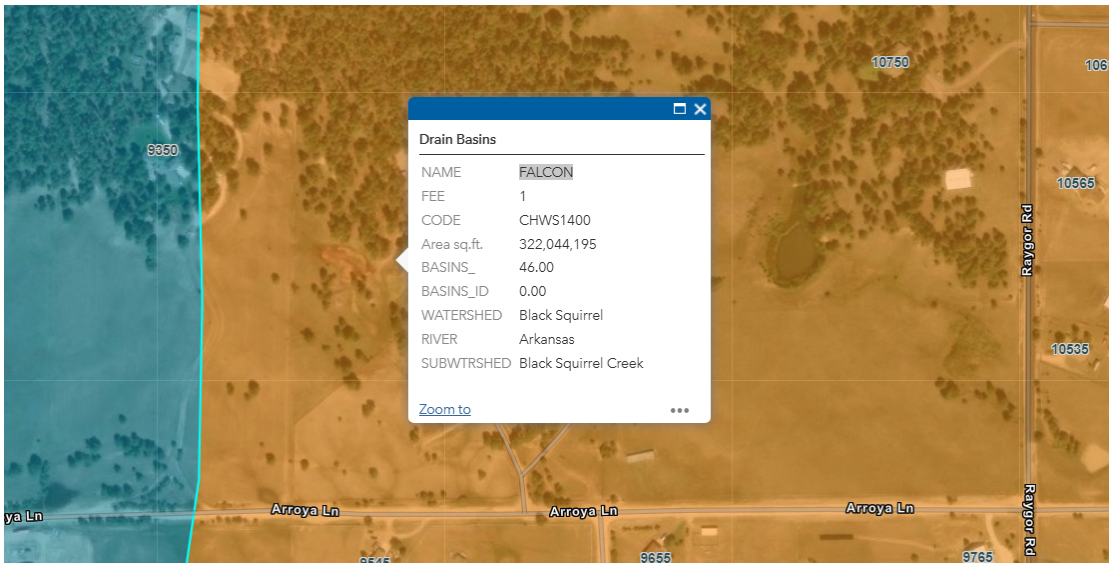
Provide floodplain cert statement.

Add 4 Step process

Discuss drainage basin and bridge fees if applicable.

Note from DPW Review Engineer
•Drainage Basin Fees will not be applicable based on residential development prior to Basin Fee Program and Falcon DBPS and no increase in impervious land area is anticipated. Future subdivision would be subject to drainage and bridge fees

Drainage Engineer conclusion statement to stipulate that the development will not have any adverse impacts to downstream or adjacent properties with respect to stormwater runoff.



APPENDIX A

Hydrology

Arroya Lane Minor Subdivision
Drainage Letter

Calculate C Values per Paragraph 5.2.1

Table 5-1 Values			
Land Cover	**% Imp**	**C_{10}**	**C_{100}**
Meadow	0%	0.25	0.35
Paved	100%	0.9	0.95
Gravel	80%	0.8	0.85
Roofs	90%	0.9	0.95

Basin		Land Cover				Composite Values		
Basin	Total Area	Pasture	Paved	Gravel	Roofs	C_{10}	C_{100}	% IMP
A	7.81	6.85	0.31	0.28	0.37	0.33	0.42	11%
B	7.40	7.14	0.14	0.00	0.12	0.27	0.37	3%
C	3.95	3.95	0.00	0.00	0.00	0.25	0.35	0%
Total	19.16	17.94	0.45	0.28	0.49			

Basin Summary					
Basin	Area	C_{10}	C_{100}	Q_{10}	Q_{100}
A	7.81	0.33	0.37	10.50	22.93
B	7.40	0.27	0.37	6.66	15.65
C	3.95	0.25	0.35	2.72	6.54

General Information
Homepage
Progress Reports
FAQ
Glossary

Precipitation Frequency
Data Server
GIS Grids
Maps
Time Series
Temporals
Documents

Probable Maximum Precipitation
Documents

Miscellaneous
Publications
Storm Analysis
Record Precipitation

Contact Us
Inquiries

NOAA ATLAS 14 POINT PRECIPITATION FREQUENCY ESTIMATES: CO

Data description

Data type: Precipitation depth Units: English Time series type: Partial duration

Select location

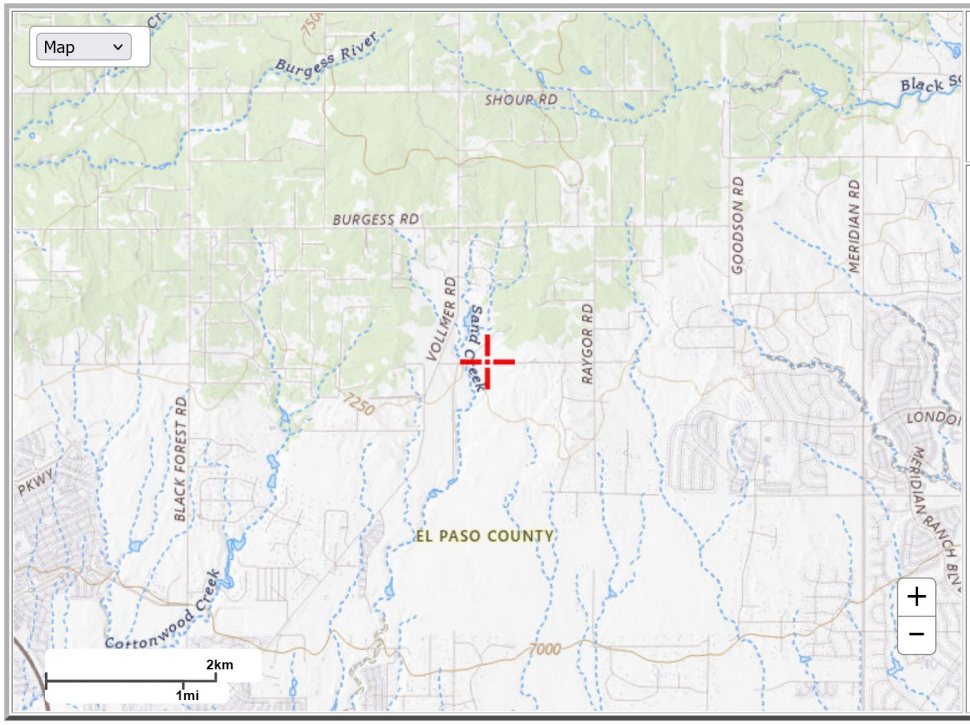
1) Manually:

a) By location (decimal degrees, use "-" for S and W): Latitude: Longitude: Submit

b) By station (list of CO stations): Select station

c) By address 9240 Arroya Ln, Colorado Springs, CO

2) Use map:



a) Select location
Move crosshair or double click

b) Click on station icon
Show stations on map

Location information:
Name: Colorado Springs, Colorado, USA*
Latitude: 38.9840°
Longitude: -104.6594°
Elevation: 7280 ft **

* Source: ESRI Maps
** Source: USGS

POINT PRECIPITATION FREQUENCY (PF) ESTIMATES

WITH 90% CONFIDENCE INTERVALS AND SUPPLEMENTARY INFORMATION
NOAA Atlas 14, Volume 8, Version 2

PF tabular PF graphical Supplementary information Print page

PDS-based precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.238 (0.193-0.295)	0.290 (0.235-0.360)	0.380 (0.308-0.473)	0.460 (0.370-0.575)	0.577 (0.450-0.753)	0.672 (0.511-0.887)	0.773 (0.566-1.04)	0.879 (0.617-1.22)	1.03 (0.692-1.46)	1.15 (0.749-1.65)
10-min	0.348 (0.283-0.432)	0.425 (0.345-0.527)	0.557 (0.450-0.693)	0.674 (0.541-0.842)	0.844 (0.659-1.10)	0.984 (0.748-1.30)	1.13 (0.829-1.53)	1.29 (0.903-1.79)	1.50 (1.01-2.14)	1.68 (1.10-2.42)
15-min	0.425 (0.345-0.527)	0.518 (0.420-0.643)	0.679 (0.549-0.845)	0.822 (0.660-1.03)	1.03 (0.804-1.34)	1.20 (0.912-1.58)	1.38 (1.01-1.86)	1.57 (1.10-2.18)	1.84 (1.24-2.62)	2.05 (1.34-2.95)
30-min	0.611 (0.497-0.758)	0.745 (0.605-0.924)	0.976 (0.789-1.21)	1.18 (0.948-1.47)	1.48 (1.15-1.93)	1.72 (1.31-2.27)	1.98 (1.45-2.67)	2.25 (1.58-3.12)	2.63 (1.77-3.74)	2.93 (1.91-4.21)
60-min	0.787 (0.639-0.975)	0.942 (0.764-1.17)	1.22 (0.987-1.52)	1.48 (1.18-1.84)	1.86 (1.46-2.44)	2.19 (1.67-2.90)	2.54 (1.86-3.44)	2.92 (2.05-4.06)	3.45 (2.33-4.94)	3.89 (2.54-5.60)
2-hr	0.962 (0.787-1.18)	1.14 (0.930-1.40)	1.46 (1.19-1.81)	1.77 (1.43-2.20)	2.24 (1.78-2.94)	2.65 (2.04-3.50)	3.09 (2.30-4.18)	3.58 (2.54-4.97)	4.28 (2.92-6.09)	4.86 (3.20-6.94)
3-hr	1.06 (0.870-1.30)	1.24 (1.01-1.51)	1.57 (1.29-1.93)	1.90 (1.55-2.35)	2.43 (1.94-3.18)	2.89 (2.24-3.81)	3.40 (2.54-4.59)	3.96 (2.83-5.49)	4.79 (3.28-6.80)	5.47 (3.62-7.80)
6-hr	1.24 (1.02-1.50)	1.42 (1.18-1.73)	1.79 (1.48-2.19)	2.17 (1.78-2.65)	2.78 (2.24-3.63)	3.32 (2.60-4.37)	3.93 (2.96-5.29)	4.62 (3.33-6.37)	5.63 (3.89-7.96)	6.47 (4.32-9.16)
12-hr	1.43 (1.20-1.73)	1.66 (1.38-2.00)	2.09 (1.74-2.53)	2.52 (2.08-3.06)	3.21 (2.61-4.16)	3.83 (3.02-4.99)	4.51 (3.43-6.02)	5.28 (3.84-7.23)	6.41 (4.46-8.99)	7.34 (4.94-10.3)

24-hr	**1.66** (1.40-1.99)	**1.95** (1.63-2.33)	**2.47** (2.07-2.97)	**2.97** (2.47-3.58)	**3.75** (3.06-4.78)	**4.42** (3.50-5.68)	**5.15** (3.93-6.78)	**5.95** (4.35-8.06)	**7.11** (4.99-9.89)	**8.07** (5.47-11.3)
2-day	**1.93** (1.64-2.29)	**2.29** (1.94-2.72)	**2.92** (2.47-3.48)	**3.50** (2.93-4.18)	**4.36** (3.56-5.46)	**5.07** (4.03-6.43)	**5.83** (4.47-7.59)	**6.66** (4.89-8.90)	**7.82** (5.51-10.8)	**8.75** (5.99-12.2)
3-day	**2.13** (1.81-2.51)	**2.52** (2.14-2.97)	**3.19** (2.70-3.78)	**3.80** (3.20-4.52)	**4.71** (3.86-5.87)	**5.46** (4.36-6.89)	**6.26** (4.82-8.10)	**7.12** (5.25-9.47)	**8.32** (5.90-11.4)	**9.29** (6.39-12.8)
4-day	**2.30** (1.96-2.70)	**2.69** (2.30-3.17)	**3.40** (2.88-4.01)	**4.02** (3.40-4.77)	**4.96** (4.08-6.17)	**5.74** (4.60-7.22)	**6.57** (5.08-8.47)	**7.46** (5.52-9.89)	**8.71** (6.19-11.9)	**9.71** (6.70-13.4)
7-day	**2.71** (2.33-3.17)	**3.13** (2.69-3.66)	**3.88** (3.32-4.54)	**4.54** (3.86-5.35)	**5.54** (4.59-6.83)	**6.37** (5.13-7.95)	**7.25** (5.64-9.29)	**8.20** (6.11-10.8)	**9.53** (6.82-12.9)	**10.6** (7.36-14.5)
10-day	**3.08** (2.66-3.59)	**3.54** (3.05-4.12)	**4.34** (3.72-5.06)	**5.05** (4.31-5.92)	**6.10** (5.07-7.48)	**6.98** (5.64-8.67)	**7.90** (6.17-10.1)	**8.89** (6.65-11.7)	**10.3** (7.39-13.9)	**11.4** (7.94-15.6)
20-day	**4.14** (3.60-4.77)	**4.75** (4.12-5.48)	**5.78** (5.00-6.70)	**6.67** (5.74-7.76)	**7.94** (6.61-9.59)	**8.95** (7.28-11.0)	**9.99** (7.84-12.6)	**11.1** (8.34-14.4)	**12.6** (9.09-16.8)	**13.7** (9.66-18.6)
30-day	**4.99** (4.36-5.73)	**5.74** (5.01-6.60)	**6.98** (6.07-8.04)	**8.01** (6.93-9.28)	**9.45** (7.89-11.3)	**10.6** (8.61-12.8)	**11.7** (9.20-14.6)	**12.8** (9.69-16.5)	**14.4** (10.4-19.1)	**15.5** (11.0-21.0)
45-day	**6.05** (5.31-6.91)	**6.97** (6.11-7.96)	**8.44** (7.37-9.68)	**9.64** (8.37-11.1)	**11.3** (9.42-13.4)	**12.5** (10.2-15.1)	**13.7** (10.8-17.0)	**14.9** (11.3-19.0)	**16.4** (12.0-21.7)	**17.6** (12.5-23.7)
60-day	**6.94** (6.10-7.89)	**7.98** (7.02-9.09)	**9.63** (8.44-11.0)	**11.0** (9.55-12.6)	**12.7** (10.7-15.0)	**14.0** (11.5-16.8)	**15.3** (12.1-18.8)	**16.5** (12.5-21.0)	**18.0** (13.2-23.6)	**19.1** (13.6-25.7)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

Estimates from the table in CSV format: Precipitation frequency estimates Submit

Note: Temporary disruptions may occur Wednesdays from 4-7 pm ET during routine maintenance.

Main Link Categories:
Home | OWP

US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
Office of Water Prediction (OWP)
1325 East West Highway
Silver Spring, MD 20910
Page Author: HDSC webmaster
Page last modified: August 4th, 2025 07:27:16 AM

Map Disclaimer
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Credits
Glossary

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Career Opportunities

Calculation of Peak Runoff using Rational Method

Designer: CLP
Company: Strategic Site Designs
Date: 4/9/2026
Project: Arroya Minor Subdivision
Location: 9420 Arroya Lane

MHFD-Rational, Version 3.00 (August 2025)

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

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

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

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

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

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

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

Select MHFD location for NOAA Atlas 14 Rainfall Depths from the pulldown list OR enter your own depths obtained from the NOAA website (click this link)

	WQE	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
1-hour rainfall depth, P1 (in) =	0.60	0.94	1.22	1.48	1.86	2.19	2.54	3.45

	a	b	c
Rainfall Intensity Equation Coefficients =	28.50	10.00	0.786

$$I(in/hr) = \frac{a * P_1}{(b + t_c)^c}$$

$$Q(cfs) = CIA$$

Provide input for area, soil type, and imperviousness on the Runoff Coeffs worksheet.

Subcatchment Name	Area (ac)	NRCS Hydrologic Soil Group(s)	Imperviousness	Runoff Coefficient, C							Overland (Initial) Flow Time					Channelized (Travel) Flow Time							Time of Concentration				Rainfall Intensity, I (in/hr)								Peak Flow, Q (cfs)							
				WQE & 2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr	Overland Flow Length L_i (ft)	U/S Elevation (ft) (Optional)	D/S Elevation (ft) (Optional)	Overland Flow Slope S_l (ft/ft)	Overland Flow Time t_i (min)	Channelized Flow Length L_t (ft)	U/S Elevation (ft) (Optional)	D/S Elevation (ft) (Optional)	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)	**(Optional)** Override t_c (min)	WQE	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr	WQE	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
Basin A	7.81	B	35.0%	0.24	0.27	0.33	0.47	0.52	0.42	0.66	50.00			0.055	6.01	393.00			0.069	7	1.84	3.56	9.57	21.84	9.57		1.65	2.59	3.36	4.07	5.12	6.03	6.99	9.49	3.16	4.95	7.17	10.50	18.74	24.63	22.93	49.24
Basin B	7.40	B	35.0%	0.24	0.27	0.27	0.47	0.52	0.37	0.66	100.00			0.040	9.44	595.00			0.059	7	1.70	5.83	15.28	22.99	15.28		1.35	2.12	2.75	3.33	4.19	4.93	5.72	7.76	2.45	3.84	5.56	6.66	14.52	19.09	15.65	38.16
Basin C	3.95	B	35.0%	0.24	0.27	0.25	0.47	0.52	0.35	0.66	135.00			0.005	21.79	455.00			0.066	7	1.80	4.22	26.01	22.17	22.17		1.12	1.75	2.27	2.76	3.46	4.08	4.73	6.42	1.08	1.70	2.45	2.72	6.41	8.43	6.54	16.85

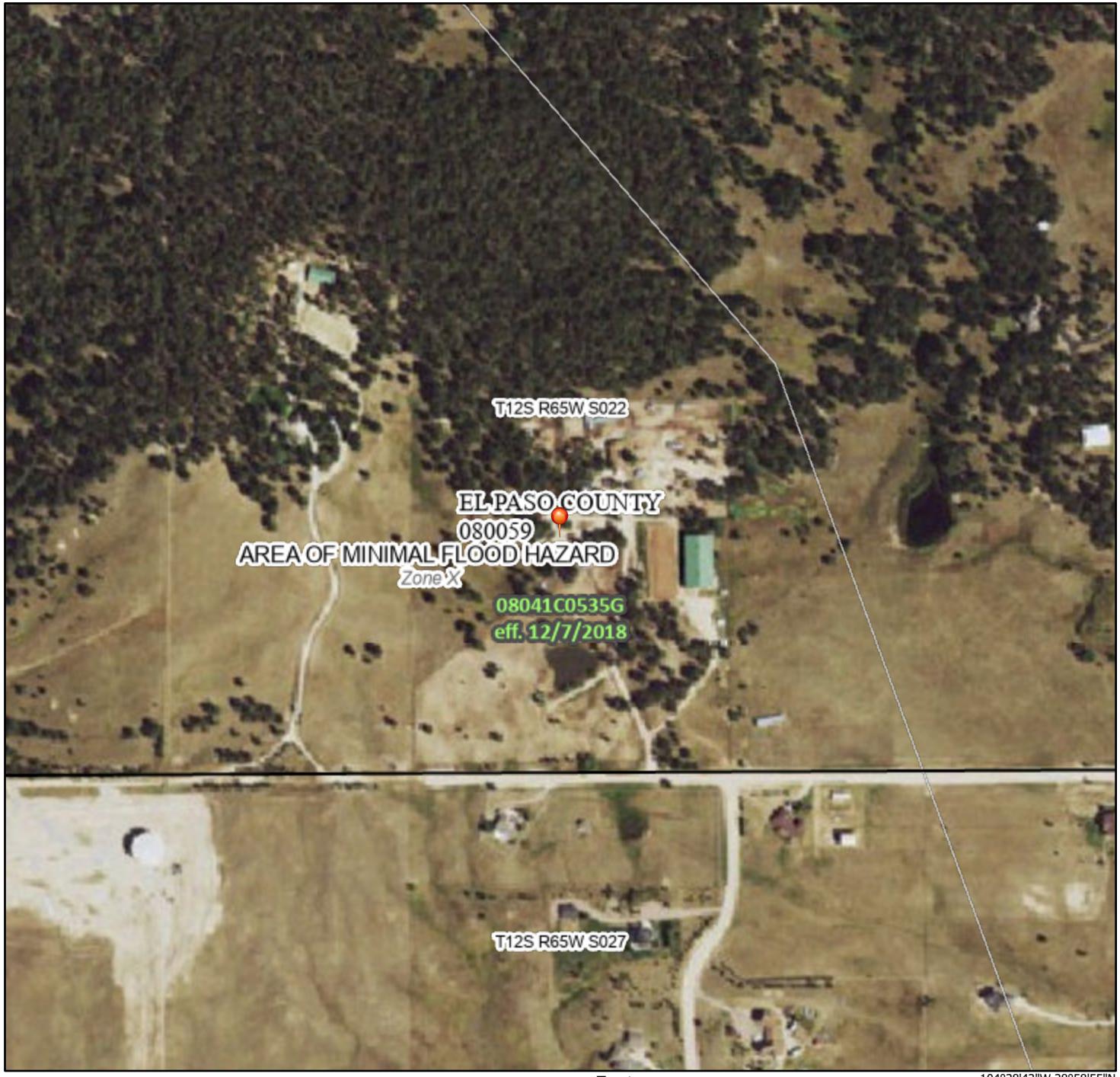
APPENDIX B

Reference Material

National Flood Hazard Layer FIRMette

FEMA

104°39'20"W 38°59'23"N



104°38'43"W 38°58'55"N

Feet

0 250 500 1,000 1,500 2,000

1:6,000

Basemap Imagery Source: USGS National Map 2023

Legend

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

SPECIAL FLOOD HAZARD AREAS

- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD

- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS

- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES

- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES

- B 20.2 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- 8 Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS

- Digital Data Available
- No Digital Data Available
- Unmapped

N

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

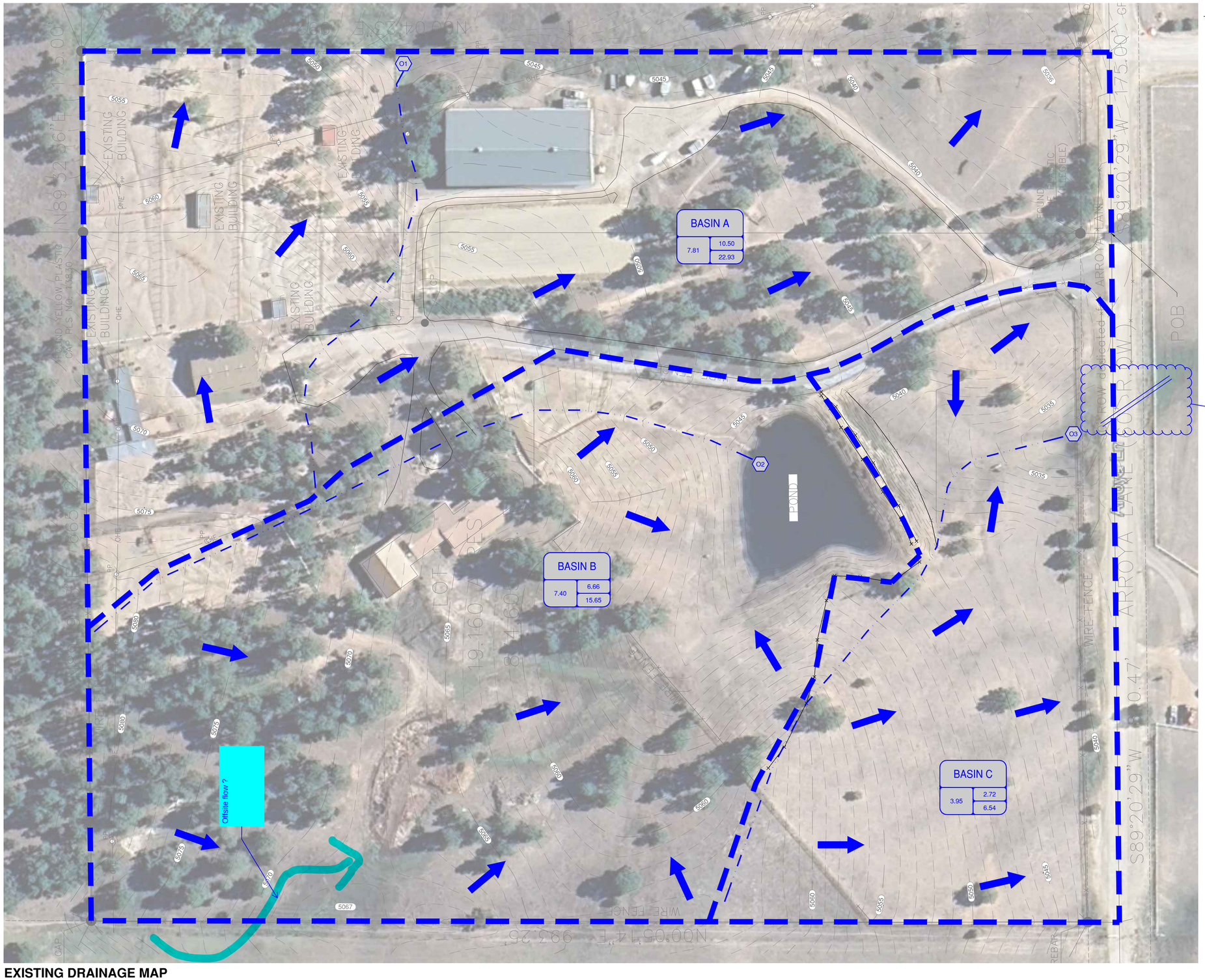
This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 4/9/2026 at 9:12 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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

APPENDIX C

Drainage Maps



DRAINAGE MAP LEGEND

- DESIGN POINT (JUNCTION)
- DESIGN POINT (OUTFALL)
- DESIGN POINT (INLET)
- T_C CRITICAL PATH
- DRAINAGE DIVIDE

BASIN NAME	
ACREAGE	Q10
	Q100

BASIN SUMMARY

BASIN	AREA	C10	C100	Q10	Q100
A	7.81	0.33	0.37	10.50	22.93
B	7.40	0.27	0.37	6.66	15.65
C	3.95	0.25	0.35	2.72	6.54

EXISTING DRAINAGE MAP

SCALE: 1" = 45'

0 45 90 Feet

ENGINEER IN CHARGE:

COLORADO PRELIMINARY NOT FOR CONSTRUCTION PROFESSIONAL ENGINEER

CONTACT INFORMATION
88 INVERNESS CIRCLE EAST, SUITE E-101
ENGLEWOOD, CO 80112
(720) 206-6931
CPERDUE@STRATEGICSITEDESIGNS.COM
ATTENTION: CHRISTOPHER PERDUE, P.E., M.B.A.

STRATEGIC SITE DESIGNS

ARROYA LANE MINOR SUBDIVISION
9420 ARROYA LANE
EL PASO COUNTY, COLORADO
EXISTING DRAINAGE MAP

REV	DESCRIPTION	BY	DATE

JOB NO:	2608-001
ORIGINAL ISSUE:	4/09/26
DESIGN BY:	SJT
CHECKED BY:	CLP
SCALE:	1" = 45'
SHEET NUMBER	DR-01

P:\P2608 RAFF ENGINEERING\DESIGN FILES

APPENDIX D

Soils Information

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

9420 Arroya Lane Minor Subdivision

April 9, 2026

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

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

Soil Map

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

Custom Soil Resource Report
Soil Map

MAP 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 23, Aug 29, 2025

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

Date(s) aerial images were photographed: Jul 23, 2024—Aug 4, 2024

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
41	Kettle gravelly loamy sand, 8 to 40 percent slopes	2.0	10.2%
71	Pring coarse sandy loam, 3 to 8 percent slopes	17.6	89.8%
Totals for Area of Interest		**19.6**	**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

41—Kettle gravelly loamy sand, 8 to 40 percent slopes

Map Unit Setting

National map unit symbol: 368h
Landscape: Uplands
Elevation: 7,000 to 7,700 feet
Farmland classification: Not prime farmland

Map Unit Composition

Kettle and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Kettle

Setting

Landscape: Uplands
Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy alluvium derived from arkose

Typical profile

E - 0 to 16 inches: gravelly loamy sand
Bt - 16 to 40 inches: gravelly sandy loam
C - 40 to 60 inches: extremely gravelly loamy sand

Properties and qualities

Slope: 8 to 40 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Medium
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 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Ecological site: F048AY908CO - Mixed Conifer
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit: 10 percent
Hydric soil rating: No

Pleasant

Percent of map unit: 5 percent
Landform: Depressions
Hydric soil rating: Yes

71—Pring coarse sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 369k
Landscape: Uplands
Elevation: 6,800 to 7,600 feet
Farmland classification: Not prime farmland

Map Unit Composition

Pring and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pring

Setting

Landscape: Uplands
Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Arkosic alluvium derived from sedimentary rock

Typical profile

A - 0 to 14 inches: coarse sandy loam
C - 14 to 60 inches: gravelly sandy loam

Properties and qualities

Slope: 3 to 8 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 6.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: R048AY222CO - Loamy Park
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit: 10 percent
Hydric soil rating: No

Pleasant

Percent of map unit: 5 percent
Landform: Depressions
Hydric soil rating: Yes

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