DRAINAGE LETTER

for

WILLOW SPRINGS RANCH FILING NO. 2 AT FOREST LAKES DRIVE
CATTAIL DRIVE ACCESS

Forest Lakes Drive
Monument, Colorado

May 19, 2022
PCD File No. CDR224

Prepared for:

Polo Brown Company
514 Pike Avenue
Canon City, CO 81212
Contact: Daniel Brown
(303) 999-5533

Prepared by:

Drexel, Barrell & Co.
3 South Seventh Street
Colorado Springs, CO 80905
Contact: Tim McConnell, P.E.
(719) 260-0887

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DRAINAGE LETTER

for

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1.0 CERTIFICATION STATEMENTS

Engineer's Statement

The attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by the County for drainage reports and said report is in conformity with the applicable 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.

SIGNATURE (Affix Seal): _____

For and on behalf of Drexel, Barrell & Co. Date

Tim D. McConnell, P.E. #33797

COLORADO REGISTERED PROFESSIONAL ENGINEER McCONNELL 33797 5-19-22

Developer's Statement

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

_____ 2/2/2022

Authorized Signature Date

Daniel Brown

Polo Brown Company

514 Pike Avenue, Canon City, CO 81212

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.

APPROVED

Engineering Department

12/15/2022 6:53:48 AM

dsdnijkamp

EPC Planning & Community Development Department

_____ _____

Joshua Palmer, P.E.

County Engineer/ECM Administrator

Conditions:

DRAINAGE LETTER

for

WILLOW SPRINGS RANCH FILING NO. 2 AT FOREST LAKES DRIVE
CATTAIL DRIVE ACCESS

2.0 PURPOSE

The purpose of this letter is to supplement the Preliminary Drainage Report for Willow Springs Ranch (December 12, 2019) with regards to the Cattail Drive (Willow Springs Ranch Filing No. 2) connection to Forest Lakes Drive, an El Paso County owned right-of-way. Runoff patterns, drainage facilities and the ability to safely pass developed runoff to historic downstream facilities shall be presented.

3.0 GENERAL SITE DESCRIPTION

Location

Willow Springs Ranch Filing No. 2 is located in the Town of Monument, El Paso County, Colorado, within the Southeast Quarter Section 27, Township 11 South, Range 67 West of the 6th P.M., north of Forest Lakes Drive

Proposed Development

Willow Springs Ranch Filing No. 2 is approximately 6.15 acres in size. The development is proposed to consist of approximately 27 single-family residential lots, open space tracts, roads, and other improvements.

Soils

According to the Soil Survey of El Paso County Area, Colorado, prepared by the U.S. Department of Agriculture Soil Conservation Service, the following soils are found on the project site:

Tomah-Crowfoot loamy sands (B) and Tomah-Crowfoot complex (B). Runoff coefficients corresponding to group B were used for the purposes of the site drainage analysis. See appendix for Soils map.

Climate

This area of El Paso County can be described as the foothills, with total precipitation amounts typical of a semi-arid region. Winters are generally cold and dry, and summers relatively warm and dry. Precipitation ranges from 12 to 14 inches per year, with the majorityof this moisture occurring in the spring and summer in the form of rainfall. Thunderstorms are common during the summer months.

Floodplain Statement

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Panels 08041CO278G and 08041CO286G (December 7, 2018), no portion of the site lies within the designated 100-year floodplain along Monument Creek or Teachout Creek.

4.0 DRAINAGE CRITERIA

The drainage analysis has been prepared in accordance with the current El Paso County Drainage Criteria Manual. Calculations were performed to determine runoff quantities during the 5-year and 100-year frequency storms for existing and developed conditions using the Rational Method as required for basins containing less than 100 acres.

5.0 EXISTING CONDITION

For the purposes of this analysis, the study area was limited to the northern portion of the Forest Lakes Drive public right-of-way, along the length of the Willow Springs Ranch Filing No. 2 property. Drainage basins were established to determine flows that are directly tributary to the public right-of-way, versus those that drain offsite to the northeast to be captured by the proposed Willow Springs Ranch drainage system. Reference the drainage map in the appendix.

The study area primarily consists of natively vegetated open space, with a 10' gravel trail running along the length of Forest Lakes Drive.

See below for a basin summary and table:

BASIN	DP	AREA (AC)	Q5 (cfs)	Q100 (cfs)
EXISTING				
E1	DPE1	0.48	0.5	1.3
E2	DPE2	0.52	1.7	3.3

Basin E1 consists of a portion of the Willow Springs Ranch Filing No. 2 property, and drains directly into the public right-of-way. Runoff travels via roughly defined roadside swale towards a low point to the northwest where it then discharges overland to the north.

Basin E2 drains directly into the public right-of-way. Runoff travels to the northwest towards an existing public 10' curb inlet, located at Design Point DPE2. Flows then discharge to the southeast via the existing storm system installed as part of the Forest Lakes Subdivision development.

6.0 DEVELOPED CONDITION

Development of the Willow Springs Ranch Filing No. 2 subdivision has resulted in a proposed roadway connection (Cattail Drive) to Forest Lakes Drive. As with the existing condition, the study area has been generally limited to the public right-of-way on the north side of Forest Lakes Drive. Grading for the Willow Springs Ranch Filing No. 2 subdivision will remain outside of the public right-of-way with exception of the roadway connection.

See below for a basin summary and table:

BASIN	DP	AREA (AC)	Q5 (cfs)	Q100 (cfs)
PROPOSED				
A1	DPA1	0.41	1.5	2.9
A2	DPA2	0.11	0.4	0.8

Basin A1 is located southeast of the Cattail Drive connection point. Runoff generated by this basin will travel from the southeasterly high point to the northwest along Forest Lakes Drive. In contrast to the existing condition, this flow will now be directed onto the Willow Springs Ranch Filing No. 2 property, where is will be collected by the onsite storm system and treated for water quality by the existing detention facility installed as part of Willow Springs Filing No. 1. Design Point A1 represents this offsite flow entering the Willow Springs Ranch property.

Basin A2 represents the northwestern portion of existing basin E1 that will still reach the existing inlet on Forest Lakes Drive. The minor increase in basin imperviousness, as a result of the concrete trail addition is offset by the reduction in tributary area reaching the inlet.

7.0 DRAINAGE & BRIDGE FEES

Drainage and bridge fees are not required as the site has been previously platted.

8.0 SUMMARY

Development of the Willow Springs Ranch Filing No. 2 and associated connection to the Forest Lakes Drive public right-of-way will not adversely affect surrounding or downstream developments.

The minor increase in imperviousness as a result of the concrete trail addition, is offset by the flows now directed to the north on to the Willow Springs Ranch property.

9.0 REFERENCES

The sources of information used in the development of this study are listed below:

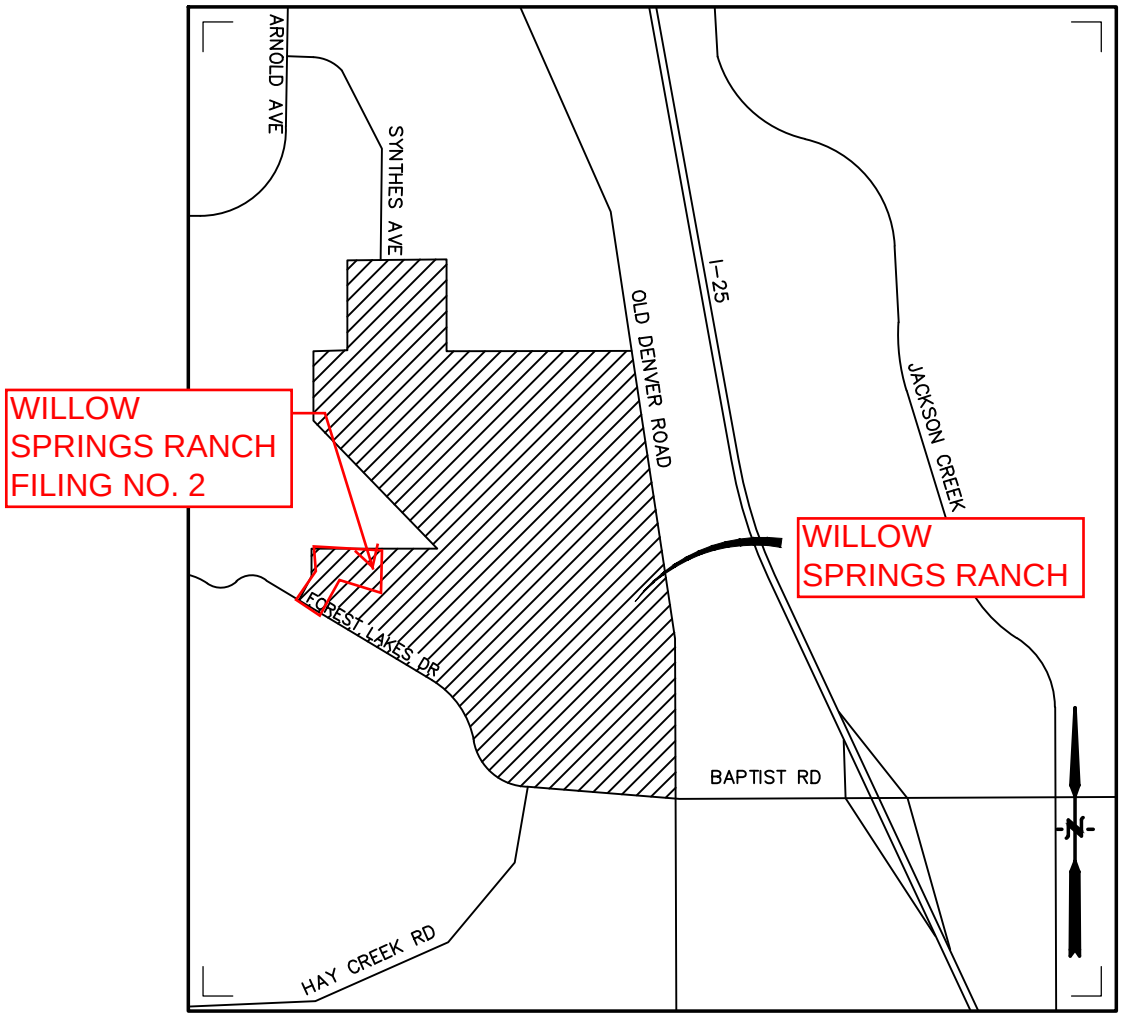
1. El Paso County Drainage Criteria Manual, October 31, 2018.

2. Final Drainage Report For Baptist Road West, El Paso County, Colorado (Felsburg, Holt & Ullevig), March 19, 2015.

3. Preliminary Drainage Report for Willow Springs Ranch (Drexel, Barrell & Co.), December 9, 2019.

4. Preliminary & Final Drainage Report for Forest Lakes Filings 2A & 2B (Classic Consulting Engineers & Surveyors) December 2015.

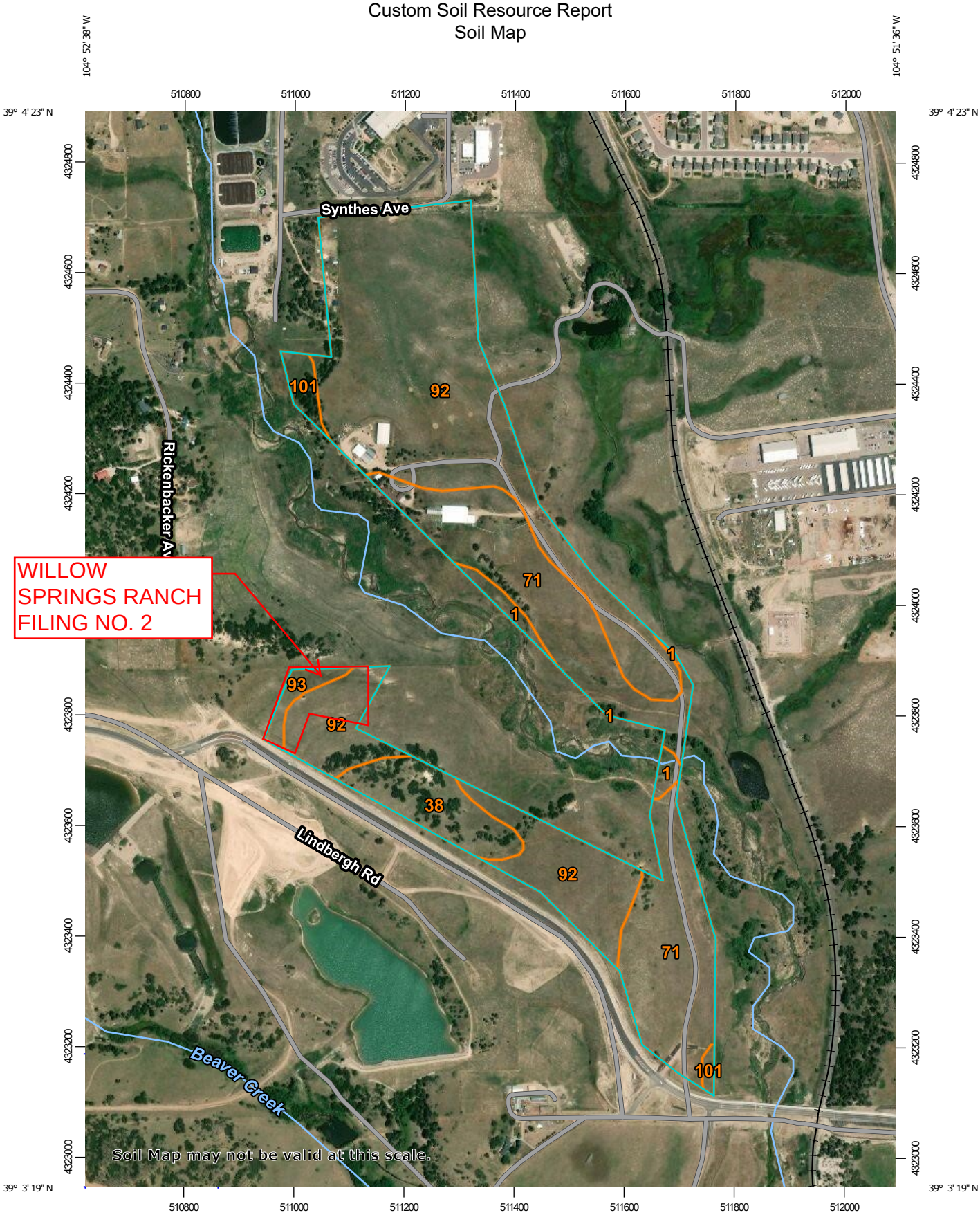
Appendix



Vicinity Map
Not to scale

	WILLOW SPRINGS RANCH MONUMENT, CO VICINITY MAP	Drexel, Barrell & Co. Engineers • Surveyors
		DATE:
		JOB NO: 20876-05CSCV
		DWG. NO. VMAP
		SHEET 1 OF 1

Custom Soil Resource Report
Soil Map



Map Scale: 1:9,490 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 100 200 400 600

Feet: 0 450 900 1800 2700

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

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

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

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 17, Sep 13, 2019

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

Date(s) aerial images were photographed: Jul 4, 2010—Oct 16, 2017

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
1	Alamosa loam, 1 to 3 percent slopes	1.9	1.9%
38	Jarre-Tecolote complex, 8 to 65 percent slopes	7.1	6.8%
71	Pring coarse sandy loam, 3 to 8 percent slopes	32.2	31.1%
92	Tomah-Crowfoot loamy sands, 3 to 8 percent slopes	58.8	56.9%
93	Tomah-Crowfoot complex, 8 to 15 percent slopes	1.5	1.5%
101	Ustic Torrifluvents, loamy	1.9	1.8%
Totals for Area of Interest		**103.4**	**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.

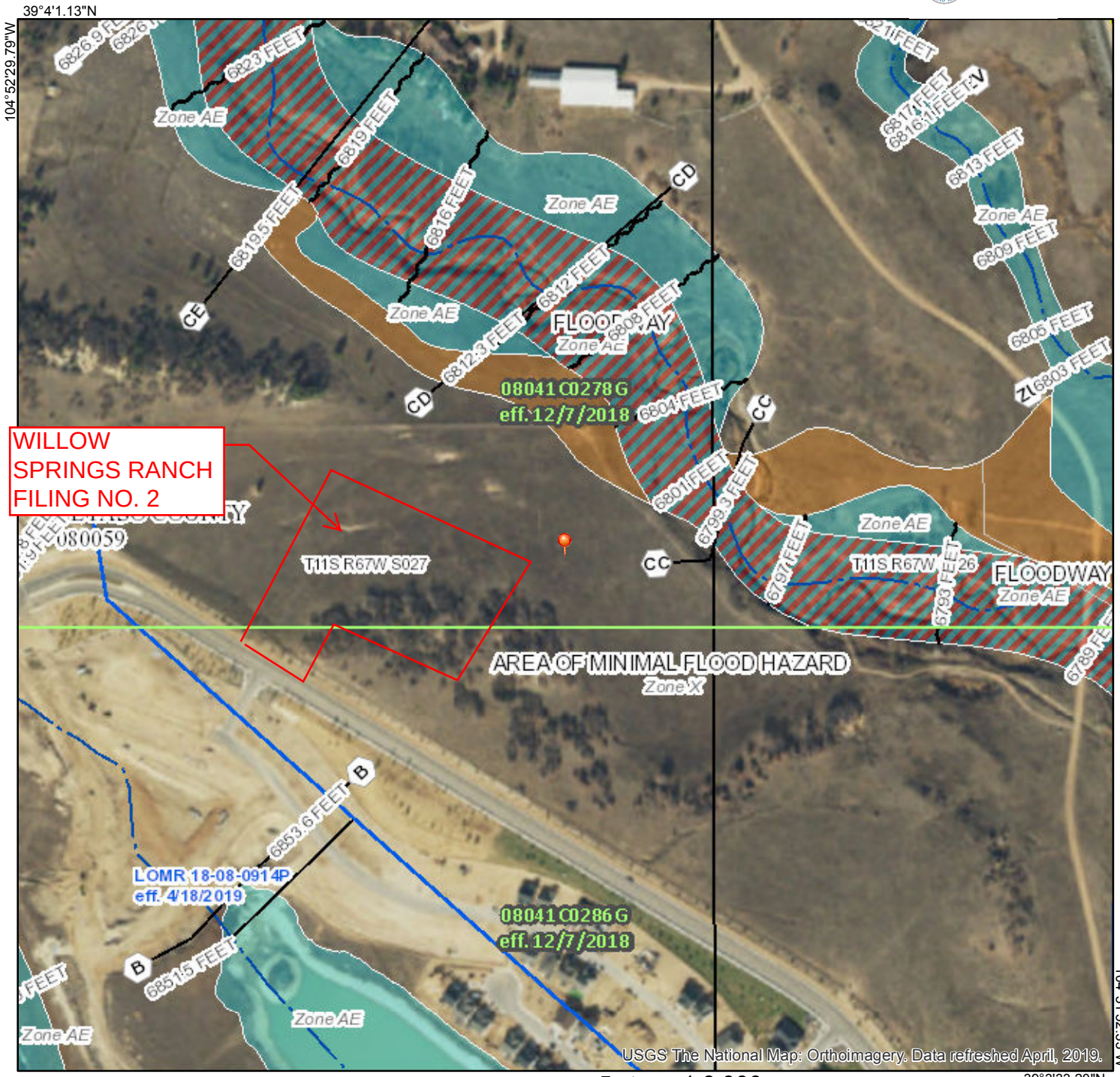
An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. 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.

National Flood Hazard Layer FIRMette

FEMA



Feet 1:6,000

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

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 10/15/2019 at 10:04:30 AM 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.

PROJECT INFORMATION								
PROJECT:	Willow Springs Ranch Filing No. 2							
PROJECT NO:	20876-05							
DESIGN BY:	KGV						Drexel, Barrell & Co.	
REV. BY:	TDM							
AGENCY:	El Paso County							
REPORT TYPE:	Final							
DATE:	2/2/2022							
Soil Type: B								
				C2*	C5*	C10*	C100*	% IMPERV
Pasture/Meadow					0.25		0.35	0
Gravel					0.80		0.85	80
Asphalt/Sidewalk					0.90		0.96	100
*C-Values and Basin Imperviousness based on Table 5-1, El Paso County Drainage Criteria Manual								
EXISTING								
SUB-BASIN	SURFACE DESIGNATION		AREA	COMPOSITE RUNOFF COEFFICIENTS				% IMPERV
			ACRE	**C2**	**C5**	**C10**	**C100**	
E1	Pasture/Meadow		0.48		0.25		0.35	0
	Gravel		0.00		0.80		0.85	80
	Asphalt/Sidewalk		0.00		0.90		0.96	100
	WEIGHTED AVERAGE				0.25		0.35	0%
TOTAL E1			0.48					
E2	Pasture/Meadow		0.19		0.25		0.35	0
	Gravel		0.11		0.80		0.85	80
	Asphalt/Sidewalk		0.21		0.90		0.96	100
	WEIGHTED AVERAGE				0.64		0.71	58%
TOTAL E2			0.52					
PROPOSED								
A1	Pasture/Meadow		0.11		0.25		0.35	0
	Gravel		0.04		0.80		0.85	80
	Asphalt/Sidewalk		0.26		0.90		0.96	100
	WEIGHTED AVERAGE				0.71		0.78	70%
TOTAL A1			0.41					
A2	Pasture/Meadow		0.03		0.25		0.35	0
	Gravel		0.01		0.80		0.85	80
	Asphalt/Sidewalk		0.07		0.90		0.96	100
	WEIGHTED AVERAGE				0.72		0.79	72%
TOTAL A2			0.11					

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REV. BY: TDM
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REPORT TYPE: Final
DATE: 2/2/2022

Drexel, Barrell & Co.

RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

EXISTING & PROPOSED TIME OF CONCENTRATION STANDARD FORM SF-2

SUB-BASIN DATA					INITIAL/OVERLAND TIME (t_i)				TRAVEL TIME (t_t)					TIME OF CONC. t_c		FINAL t_c
BASIN	DESIGN PT:	C_5	C_{100}	AREA	LENGTH	HT	SLOPE	t_i	LENGTH	HT	SLOPE	VEL.	t_t	COMP.	MINIMUM	
				Ac	Ft	FT	%	Min	Ft	FT	%	FPS	Min	t_c	t_c	Min
E1	DPE1	0.25	0.35	0.48	30	0.6	2.0	6.9	482	9.6	2.0	5.2	1.5	8.5	5	8.5
E2	DPE2	0.64	0.71	0.52	75	12	16.0	3.0	240	4.8	2.0	5.2	0.8	3.7	5	5.0
A1	DPA1	0.71	0.78	0.41	30	0.6	2.0	3.2	382	7.6	2.0	5.2	1.2	4.4	5	5.0
A2	DPA2	0.72	0.79	0.11	30	0.6	2.0	3.1	100	2.00	2.0	5.2	0.3	3.4	5	5.0

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Drexel, Barrell & Co.

RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

EXISTING RUNOFF 5 YR STORM P1= **1.50**

			DIRECT RUNOFF				
BASIN (S)	DESIGN POINT	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C * A	I (IN/HR)	Q (CFS)
E1	DPE1	0.48	0.25	8.5	0.12	4.36	0.5
E2	DPE2	0.52	0.64	5.0	0.33	5.10	1.7

PROPOSED RUNOFF 5 YR STORM P1= **1.50**

			DIRECT RUNOFF				
BASIN (S)	DESIGN POINT	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C * A	I (IN/HR)	Q (CFS)
A1	DPA1	0.41	0.71	5.0	0.29	5.10	1.5
A2	DPA2	0.11	0.72	5.0	0.08	5.10	0.4

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Drexel, Barrell & Co.

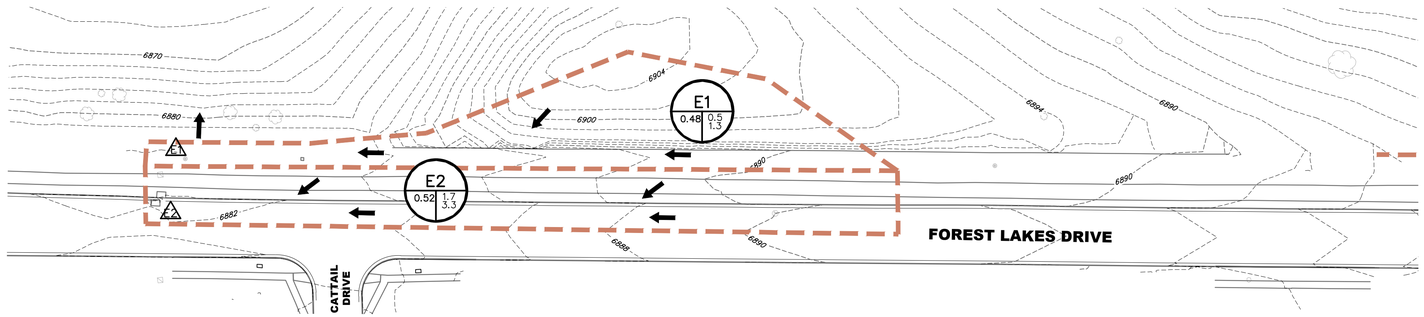
RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

EXISTING — RUNOFF — 100 YR STORM — P1= **2.67**

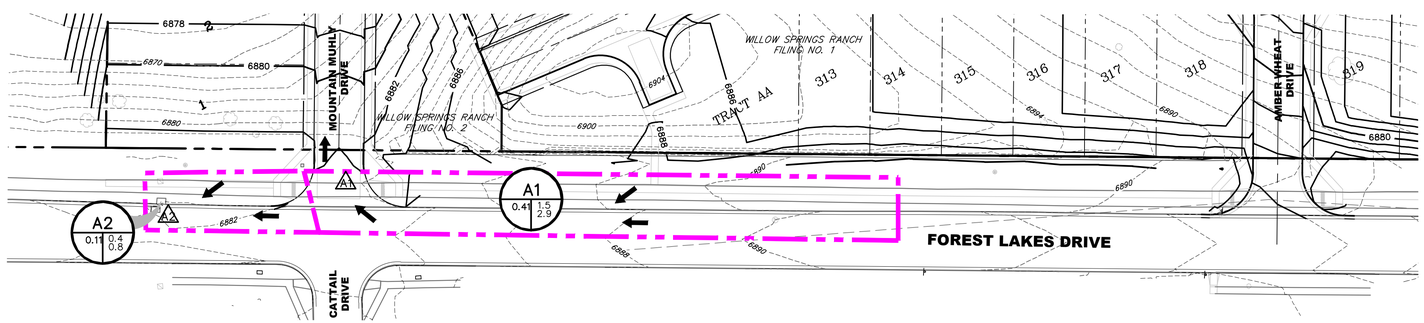
			DIRECT RUNOFF				
BASIN (S)	DESIGN POINT	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C * A	I (IN/HR)	Q (CFS)
E1	DPE1	0.48	0.35	8.5	0.17	7.76	1.3
E2	DPE2	0.52	0.71	5.0	0.37	9.09	3.3

PROPOSED — RUNOFF — 100 YR STORM — P1= **2.67**

			DIRECT RUNOFF				
BASIN (S)	DESIGN POINT	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C * A	I (IN/HR)	Q (CFS)
A1	DPA1	0.41	0.78	5.0	0.32	9.09	2.9
A2	DPA2	0.11	0.79	5.0	0.09	9.09	0.8



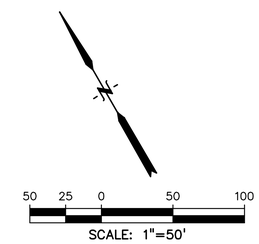
EXISTING DRAINAGE CONDITIONS



PROPOSED DRAINAGE CONDITIONS

LEGEND

- PROPERTY LINE
- BASIN JURISDICTION BOUNDARY
- EXISTING DRAINAGE BASIN BOUNDARY
- PROPOSED DRAINAGE BASIN BOUNDARY
- DRAINAGE BASIN DESIGN POINT (1)
- BASIN I.D. — 1
- BASIN AREA (Acres) — 0.42
- 5 YEAR DEVELOPED FLOW (CFS) — 1.2
- 100 YEAR DEVELOPED FLOW (CFS) — 2.6
- PROPOSED INTERMEDIATE CONTOUR — 6203
- PROPOSED INDEX CONTOUR — 6205
- *EX. INTERMEDIATE CONTOUR* — 6203
- *EX. INDEX CONTOUR* — 6205
- DIRECTION OF FLOW



BASIN	DP	AREA (AC)	Q5 (cfs)	Q100 (cfs)
EXISTING				
E1	DPE1	0.48	0.5	1.3
E2	DPE2	0.52	1.7	3.3

BASIN	DP	AREA (AC)	Q5 (cfs)	Q100 (cfs)
PROPOSED				
A1	DPA1	0.41	1.5	2.9
A2	DPA2	0.11	0.4	0.8

PREPARED BY:

DREXEL, BARRELL & CO.
Engineers • Surveyors
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CLIENT:

POLO BROWN COMPANY
514 PIKE AVENUE
CANON CITY, COLORADO 81212
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DRAINAGE PLANS FOR:

WILLOW SPRINGS RANCH

BAPTIST ROAD & FOREST LAKES DRIVE
MONUMENT, COLORADO

ISSUE	DATE
INITIAL ISSUE	2-2-22

DESIGNED BY:	TDM
DRAWN BY:	KGV
CHECKED BY:	TDM
FILE NAME:	

DRAWING SCALE:
HORIZONTAL: 1" = 50"
VERTICAL: N/A

DRAINAGE PLAN

PROJECT NO. 20876-05CSCV
DRAWING NO.

DRN

SHEET: 1 OF 1