

**FINAL DRAINAGE REPORT**  
for  
**7205 MAINE LANE**  
Colorado Springs, Colorado

**December 6, 2017**

Prepared for:

**Mountain Splendor Services**  
7205 Maine Lane  
Colorado Springs, CO 80923  
Contact: Dan Combs

Prepared by:

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

PCD Project No: VA-17-010

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## FINAL DRAINAGE REPORT

for

**7205 MAINE LANE**

Colorado Springs, Colorado

### 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 El Paso 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 omission on my part in preparing this report.

  
Tim D. McConnell, P.E.

Colorado P.E. License No. 33797

For and on Behalf of Drexel, Barrell & Co.



12-11-17  
Date

#### DEVELOPER'S STATEMENT

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

Business Name: Mountain Splendor Services

By:

\_\_\_\_\_  
Dan Combs Date

Title:

Owner

Address:

7205 Maine Lane  
Colorado Springs, CO 80923

#### EL PASO COUNTY

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

\_\_\_\_\_  
Jennifer Irvine, P.E.

Date

County Engineer/ECM Administrator


CONDITIONS:

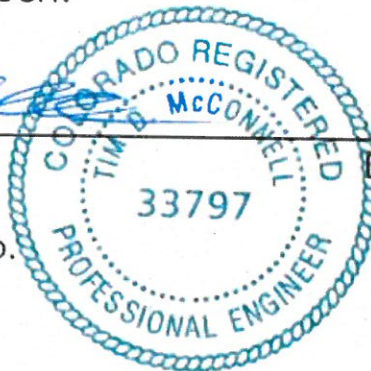
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Title: Owner  
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CONDITIONS:

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**FINAL DRAINAGE REPORT**  
for  
**7205 MAINE LANE**  
Colorado Springs, Colorado

## **2.0 PURPOSE**

The purpose of this report is to identify the existing runoff patterns and drainage facilities at 7205 Maine Lane, and to present that the change in use of the property will not adversely affect downstream facilities.

## **3.0 GENERAL SITE DESCRIPTION**

### Location

The project is located at the S ½ of the E ½ of the N ½ of the SE ¼ of the NW ¼ of Section 8, Township 13 S, Range 65 W of the 6<sup>th</sup> P.M., El Paso County, Colorado. East of Maine Lane, at approximately one mile southeast of the Woodmen Road and Black Forest Road intersection, immediately north of the Quail Brush Filing No. 2 subdivision

The project contains approximately 5.0 acres, sloping from northwest to southeast at approximately 2% grade. The property currently functions as a landscaping company with plant and vehicle storage, existing structures and irrigation facilities on the property that will remain. The site lies within the Sand Creek Drainage Basin.

### Soils

According to the Soil Survey of El Paso County Area, Colorado, prepared by the U.S. Department of Agriculture Soil Conservation Service, the east half of site is underlain by the Blakeland loamy sand (Soil No. 8, Hydrologic Group A) and the west half by the Blakeland-Fluvaquentic Haplaquolis (Soil No. 9, Hydrologic Group A). See appendix for 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 majority of 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) Panel 08041CO537F (March 17, 1997), no portion of the site lies within a designated 100-year floodplain.

## 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 current conditions using the Rational Method as required for basins containing less than 100 acres.

This project conforms to the El Paso County Four Step Process. The process focuses on reducing runoff volumes, treating the water quality capture volume (WQCV), stabilizing drainage ways, and implementing long-term source controls.

1. *Employ Runoff Reduction Practices:* Impervious areas on this site (roofs, asphalt/sidewalk) currently sheet flow across landscaped ground to slow runoff and increase time of concentration prior to being discharged offsite. This minimizes directly connected impervious areas within the project site.
2. *Implement BMP's that provide a Water Quality Capture Volume with slow release:* No change in the existing topography is proposed for the project site. Runoff will follow historic drainage patterns, at historic rates. As such no additional capture of flows is required.
3. *Stabilize Drainage Ways:* Flows from this project follow historically established drainage ways at historic rates. No changes in water flow characteristics are anticipated. Existing drainage ways appear to be stable and in good condition.
4. *Implement Site Specific and Other Source Control BMP's:* A site specific storm water quality and erosion control plan will be submitted and approved by El Paso County.

## 5.0 EXISTING CONDITION

The project site was included as part of the following studies, as tributary to reach 147 of Upper Sand Creek:

- "Sand Creek Drainage Basin Planning Study (DBPS), Preliminary Design Report" by Kiowa Engineering Corporation, Revised March 1996.
- "Master Development Drainage Report (MDDP) – Woodmen Heights Additions 7, 8 and 9 Annexation" by Terra Nova Engineering, Inc. Revised March 2007.

The southern portion of the established project site, basin (E1) is considered an offsite basin for the Quail Brush Creek subdivision, and was studied as part of the "Quail Brush Creek Filing No. 1, 1A, 2 & 3 Final Drainage Report" by M&S Civil Consultants, Inc. June 2014. Drainage from basin E1 is diverted by a berm system around the northern boundary of the Quail Brush Creek property to a historic collection point within Upper Sand Creek reach 147.

A Rational Method analysis was performed for the site, in accordance with El Paso County drainage criteria. Analyzed flows for Basin E1 ( $Q_5=3.5\text{cfs}$  and  $Q_{100}=9.1\text{cfs}$ ) are considered to be comparable to those established by the Quail Brush Creek Final Drainage Report ( $Q_5=1.9\text{cfs}$  and  $Q_{100}=8.3\text{cfs}$ ), and as such, no adverse downstream effects are anticipated.

The remaining portion of the site, basin E2 is directly tributary to the existing reach of Upper Sand Creek, and generates flows of  $Q_5=1.0\text{cfs}$  and  $Q_{100}=3.7\text{cfs}$  that flow offsite to the east.

## **6.0 EXISTING POLLUTANT SOURCES**

A site inspection verified that sufficient vegetated landscape buffer exists around the downhill perimeter of the site to mitigate any pollutant runoff from the site, including any potential increase generated by the change in zoning use.

This non-fertilized vegetated buffer should be maintained in order to control runoff, thereby slowing velocity and increasing retention and percolation opportunities. In addition to this, material stockpiles should continue to be stored in separate containers facing north, so that runoff is not able to pass directly offsite to the southeast.

Through these existing features, there is no anticipated water quality impact as a result of the change in use.

## **7.0 SUMMARY**

The change in zoning use of the property, will not adversely affect surrounding or downstream developments.

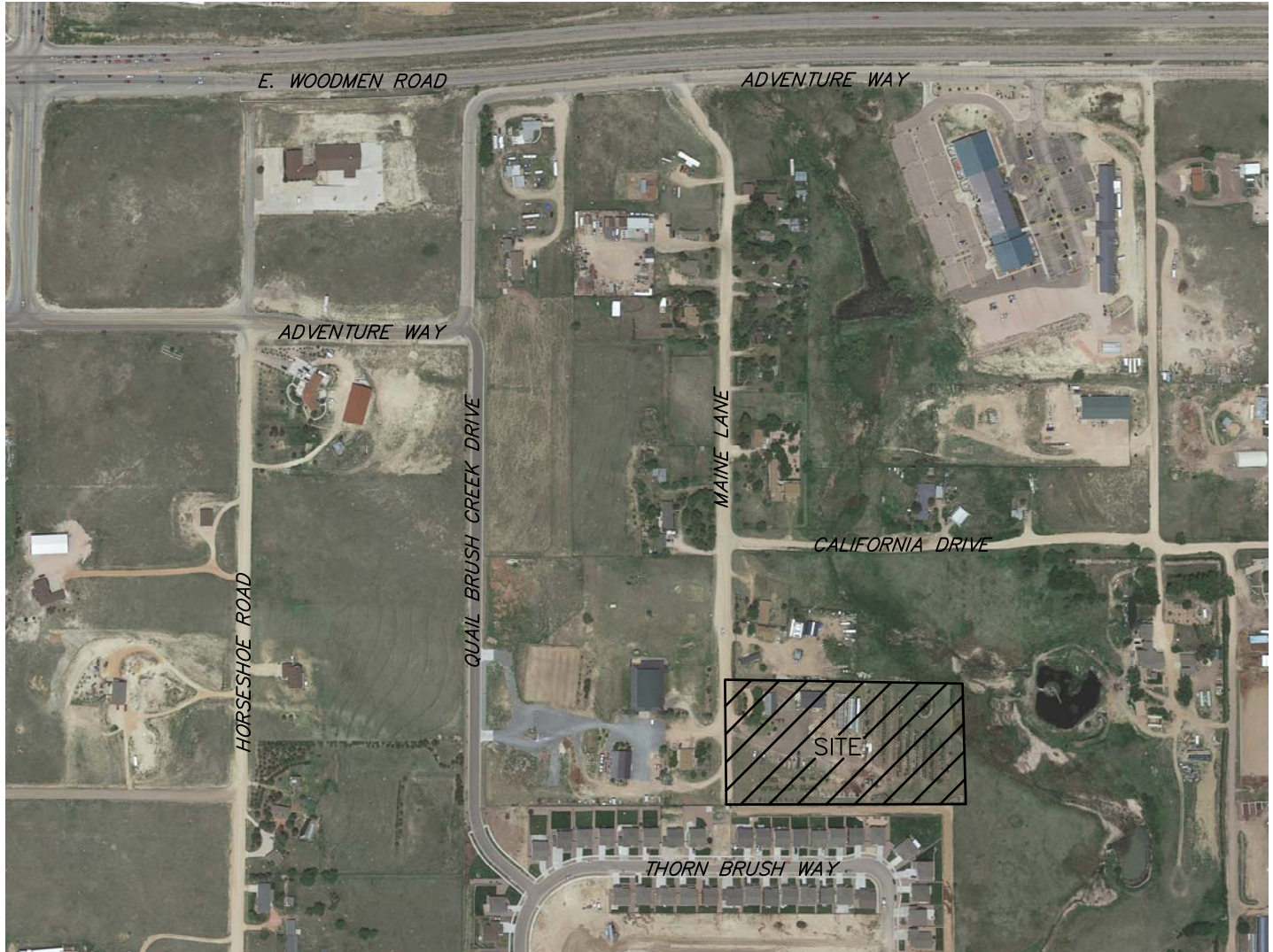
## **8.0 REFERENCES**

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

1. City of Colorado Springs/El Paso County Drainage Criteria Manual, May 2014.
2. Urban Storm Drainage Criteria Manuals, Urban Drainage and Flood Control District. June 2001, Revised April 2008.
3. Sand Creek Drainage Basin Planning Study, Preliminary Design Report. By Kiowa Engineering Corporation, Revised March 1996.
4. Master Development Drainage Report – Woodmen Heights Additions 7, 8 and 9 Annexation. By Terra Nova Engineering, Inc. Revised March 2007.
5. Quail Brush Creek Filing No. 1, 1A, 2 & 3 Final Drainage Report. By M&S Civil Consultants, Inc. June 2014.

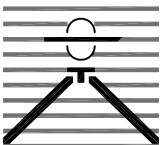
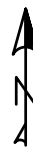
Vicinity Map





# Vicinity Map

NTS



## 7205 MAINE LANE VICINITY MAP

**Drexel, Barrell & Co.**  
Engineers • Surveyors

DATE:  
10-16-17

JOB NO:  
21114-00

DWG. NO.

**VMAP**

SHEET 1 OF 1

## Soils Map

# 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 14, Sep 23, 2016

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

Date(s) aerial images were photographed: May 22, 2016—Mar 9, 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

El Paso County Area, Colorado (CO625)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
8	Blakeland loamy sand, 1 to 9 percent slopes	1.8	42.5%
9	Blakeland-Fluvaquentic Haplaquolls	2.4	57.5%
<b>Totals for Area of Interest</b>		<b>4.2</b>	<b>100.0%</b>

## 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



## Custom Soil Resource Report

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:* 85 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

#### Description of Blakeland

##### Setting

*Landform:* Flats, hills  
*Landform position (three-dimensional):* Side slope, tal  
*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  
*Natural 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 in profile:* 5 percent  
*Available water storage in profile:* Low (about 4.5 inches)

##### Interpretive groups

*Land capability classification (irrigated):* 3e  
*Land capability classification (nonirrigated):* 6e  
*Hydrologic Soil Group:* A  
*Ecological site:* Sandy Foothill (R049BY210CO)  
*Hydric soil rating:* No

#### Minor Components

##### Other soils

*Percent of map unit:*  
*Hydric soil rating:* No

**Pleasant**

*Percent of map unit:*

*Landform:* Depressions

*Hydric soil rating:* Yes

**9—Blakeland-Fluvaquentic Haplaquolls**

**Map Unit Setting**

*National map unit symbol:* 36b6

*Elevation:* 3,500 to 5,800 feet

*Mean annual precipitation:* 13 to 17 inches

*Mean annual air temperature:* 46 to 55 degrees F

*Frost-free period:* 110 to 165 days

*Farmland classification:* Not prime farmland

**Map Unit Composition**

*Blakeland and similar soils:* 60 percent

*Fluvaquentic haplaquolls and similar soils:* 30 percent

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

**Description of Blakeland**

**Setting**

*Landform:* Flats, hills

*Landform position (three-dimensional):* Side slope, tal

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Parent material:* Sandy alluvium derived from arkose and/or eolian deposits  
derived from arkose

**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

*Natural 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 in profile:* 5 percent

*Available water storage in profile:* Low (about 4.5 inches)

**Interpretive groups**

*Land capability classification (irrigated):* 3e



## Custom Soil Resource Report

*Land capability classification (nonirrigated): 6e*  
*Hydrologic Soil Group: A*  
*Ecological site: Sandy Foothill (R049BY210CO)*  
*Hydric soil rating: No*

### Description of Fluvaquentic Haplaquolls

#### Setting

*Landform: Swales*  
*Down-slope shape: Linear*  
*Across-slope shape: Linear*  
*Parent material: Alluvium*

#### Typical profile

*H1 - 0 to 12 inches: variable*

#### Properties and qualities

*Slope: 1 to 2 percent*  
*Depth to restrictive feature: More than 80 inches*  
*Natural drainage class: Poorly drained*  
*Runoff class: Very high*  
*Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 6.00 in/hr)*  
*Depth to water table: About 0 to 24 inches*  
*Frequency of flooding: Occasional*  
*Frequency of ponding: None*  
*Salinity, maximum in profile: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)*

#### Interpretive groups

*Land capability classification (irrigated): 6w*  
*Land capability classification (nonirrigated): 6w*  
*Hydrologic Soil Group: D*  
*Hydric soil rating: Yes*

### Minor Components

#### Other soils

*Percent of map unit:*  
*Hydric soil rating: No*

#### Pleasant

*Percent of map unit:*  
*Landform: Depressions*  
*Hydric soil rating: Yes*

## Floodplain Map



## Hydrology Calculations

## PROJECT INFORMATION

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 PROJECT NO: 21114-00  
 DESIGN BY: KGV  
 REV. BY: TDM  
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	C2*	C5*	C10*	C100*	% IMPERV
Landscaped/Open Space		0.09		0.36	2
Gravel Roadway		0.59		0.70	80
Asphalt Roadway/Roofs		0.90		0.96	100

\*C-Values and Basin Imperviousness based on Table 5-1, City of Colorado Springs and El Paso County "Drainage Criteria Manual"

SUB-BASIN	SURFACE DESIGNATION	AREA ACRE	COMPOSITE RUNOFF COEFFICIENTS				% IMPERV
			C2	C5	C10	C100	
E1	Landscaped/Open Space	2.44		0.09		0.36	2
	Gravel Roadway	1.04		0.59		0.70	80
	Asphalt Roadway/Roofs	0.72		0.90		0.96	100
TOTAL OS1	WEIGHTED AVERAGE	4.20		0.35		0.55	38
E2	Landscaped/Open Space	2.06		0.09		0.36	2
	Gravel Roadway	0.17		0.59		0.70	80
	Asphalt Roadway/Roofs	0.25		0.90		0.96	100
TOTAL E1	WEIGHTED AVERAGE	2.48		0.21		0.44	17

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Drexel, Barrell & Co.

## RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

### EXISTING

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	SLOPE	$t_i$	LENGTH	SLOPE	VEL.	$C_v$	$t_t$	COMP.	<i>MINIMUM</i>	
				$A_c$	$F_t$	%	Min	$F_t$	%	FPS	COEFF	Min	$t_c$	$t_c$	Min
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
E1		0.35	0.55	4.20	300	2%	18.8	800	2%	1.0	7	13.5	32.3	10.0	32.3
E2		0.21	0.44	2.48	300	2%	22.5	1100	2%	1.0	7	18.5	41.1	10.0	41.1

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## RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

EXISTING RUNOFF 5 YR STORM P1= 1.50

BASIN (S)	DIRECT RUNOFF							TOTAL RUNOFF			
	DESIGN POINT	AREA (AC)	RUNOFF COEFF	t <sub>c</sub> (MIN)	C * A	I (IN/HR)	Q (CFS)	t <sub>c</sub> (MIN)	S (C * A)	I (IN/HR)	Q (CFS)
	(2)	(4)	(5)	(6)	(7)	(8)*	(9)	(10)	(11)	(12)	(13)
E1		4.20	0.35	32.3	1.48	2.37	3.5				
E2		2.48	0.21	41.1	0.51	2.01	1.0				

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Drexel, Barrell & Co.

## RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

EXISTING	RUNOFF		100 YR	STORM				P1=	2.52		
BASIN (S)	DIRECT RUNOFF							TOTAL RUNOFF			
	DESIGN POINT	AREA (AC)	RUNOFF COEFF	t <sub>c</sub> (MIN)	C * A	I (IN/HR)	Q (CFS)	t <sub>c</sub> (MIN)	S (C * A)	I (IN/HR)	Q (CFS)
	(2)	(4)	(5)	(6)	(7)	(8)*	(9)	(10)	(11)	(12)	(13)
E1		4.20	0.55	32.3	2.30	3.98	9.1				
E2		2.48	0.44	41.1	1.10	3.37	3.7				



## Drainage Map

