PRELIMINARY DRAINAGE REPORT

FOR

GRANDWOOD RANCH SUBDIVISION

Prepared For**:**

Grandwood Enterprises, LLC
270 Lodgepole Way
Monument, Colorado 80132

Prepared by:

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20329 Vista Circle
Parker, Colorado 80138
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Prepared: March, 2019
Revised:November 2019

PCD File No. SP195

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Certification

Engineer's Statement:

This attached drainage plan and report for Grandwood Ranch Subdivision 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 El Paso County for drainage reports and said report is in conformity with the master plan of the Jackson's Creek Drainage Basin. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparing this report.

_____

Reese Lundgren, P.E. #35730
For and on behalf of EDG, LLC

Developer's Statement:

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

_____ _____

Grandwood Enterprises, LLC Date
By: Mr. Willian Herebic II
Title: Manager
Address: 790 Lodgepole Way
Monument, CO 80132

El Paso County, Colorado:

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.

_____ _____

Jennifer Irvine, P.E. Date
County Engineer/ECM Administrator

Conditions

PURPOSE

The purpose of this Preliminary Drainage Report is to identify drainage patterns and quantities within and affecting the proposed Grandwood Ranch subdivision. The development project is a residential subdivision with 2.5 +/- acre lots. The report will identify specific solutions to problems on-site and off-site resulting from the proposed development. The report and included maps present results of hydrologic and drainage facilities analysis. The report will discuss the recommended drainage improvements to the site and identify drainage requirements relative to the proposed development. This report has been prepared and submitted in accordance with the requirements of the El Paso County Zoning change and Preliminary Plan Approval Process. The appendices included with this report provide the pertinent calculations and graphs used in the facility design and drainage analyses.

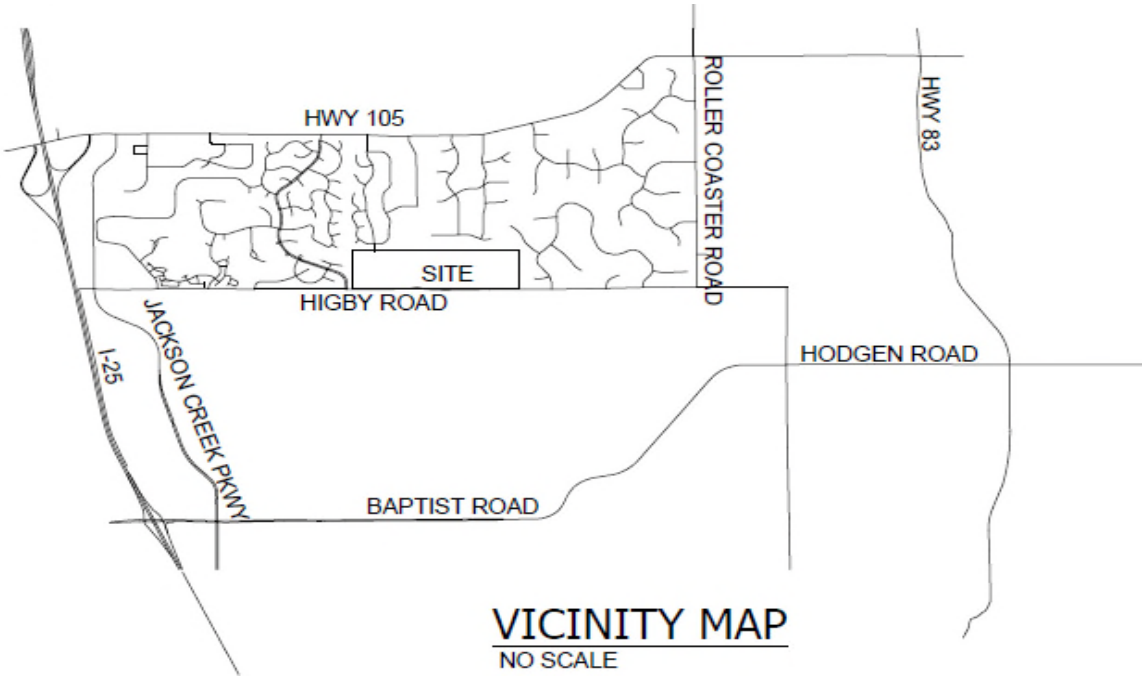
GENERAL LOCATION AND DESCRIPTION

Location

The Grandwood Ranch Subdivision property is located in the south half of the north half of Section 19, Township 11 South, Range 65 West of the 6th Principal Meridian, El Paso County, Colorado.

The site is bordered immediately to the west by Woodmoor Summit Subdivision and Fairplay Drive. Timberview, Mills Timber, Arrowwood, and Bent Tree Subdivisions border the property to the north. The eastern boundary is bordered by Bent Tree Subdivision and to the south is Higby Road.

A vicinity map is shown below.



Description of Property

The site encompasses approximately 147 acres and is currently zoned RR5 (5 acre minimum lot size). This drainage report considers the entire 147 acres being rezoned to RR2.5 (2.5 acre minimum lot size) to allow for the development of 48 single family residential lots at a minimum of 2.5 Acres each. The 48 lots will comprise approximately 121 acres of the proposed development along with 18 acres of open space and 5920 feet of roadway.

Currently, the site is undeveloped and covered with native grasses sparse brush and mature coniferous trees. The existing topography of the site generally slopes toward the south with grades ranging from 2% to 30%. There is a ridge running north-south through the center of the property that concentrates the drainage of the site in 2 locations along Higby Road. Existing culverts under Higby road allow stormwater to continue flowing south. Offsite drainage sheet flows from the north onto the property, and there is concentrated flow at the north west corner of the property from Timberview Subdivision and midway along the eastern boundary from the Bent Tree Subdivision.

Soils on the site are generally conducive for land development. According to the National Resources Conservation Service (NRCS), there are 5 types of soil in the Grandwood Ranch area, consisting of gravely sandy loam and rock outcroppings. The predominate soil group classification is Group B, comprised of Alamosa Loam (map unit 1) 1 to 3 percent slopes, Kettle gravelly loamy sand (map unit 41), 8 to 40 percent slopes, Kettle-Rock outcrop complex (map unit 42), Pring

coarse sandy loam (map unit 71) , 3 to 8 percent slopes, and Tomah-Crowfoot complex (map unit 93), 8 to 15 percent slopes. All are characterized as moderately well-draining materials. A copy of the soil map for the site can be found in the Appendix A.

Construction activities will consist of clearing, grubbing, cutting and filling areas for roadways, utilities and building preparation. The total size of the land disturbing activities for the construction of the development will be approximately 23 acres.

DRAINAGE BASINS AND SUB-BASINS

Major Basin Descriptions

The major drainageway for Grandwood Ranch is Jackson Creek, a tributary of Monument Creek. Most drainage from the eastern half of the site enters the main channel of Jackson Creek on site and then flows south and west to an existing culvert under Higby Road. The western half of Grandwood Ranch drains to a low point just east of the intersection of Higby Road and Fairplay Drive. It then flows south through an existing culvert in Higby Road and eventually into the main channel of Jackson Creek.

The FEMA Flood Insurance Rate Map (FIRM # 08041C0279G) shows that the proposed development is not located within a mapped 100-year flood plain. A copy of the flood plain map has been included in the Appendix B.

Sub-Basin Description

The existing topography of the sight slopes generally from north to south. There are two ridges running north-south that split the site into 4 existing Drainage basins:

Basin EX1 consist of 64.2 acres on the eastern side of the site. Runoff values for EX-1 are Q_{100}=119.0 cfs and Q_5=16.0 cfs which drain to the main channel of Jackson Creek. The main channel continues south to Higby Road where it flows through an existing 48” culvert at DP-4 and continues to the south. Offsite drainage from the Bent Tree subdivision (OS-1) sheet flows on the property from the north, while concentrated flows enter the site from the east at DP O-1.

Basin EX-2 consists of 61.0 acres in the central portion of the site with existing runoff values of Q_{100}=95.2 cfs and Q_5=12.8 cfs which drains south to Higby Road, where it combines with drainage from basin EX-3 before continuing south through the existing 36” culvert under Higby Road at design point 10 and ultimately into the main Channel of Jackson Creek. Offsite sheet flows and concentrated drainage enter the site at DP O-2 on the northern boundary from OS-2.

Basin EX-3 contains 17.7 acres with existing runoff values of Q_{100}=12.1 cfs and Q_5=4.4 cfs. The drainage from EX-3 flows south under Higby Road through an existing 18" culvert at design point 11. Offsite flows from OS-3 enter into EX-3 via sheet flow on the eastern boundary and concentrated flow at DP O-3 from the north. See Appendix D for existing drainage basins and conditions.

Basin EX-4 contains 8.1 acres with existing runoff values of Q_{100}=16.2 cfs and Q_5=2.2 cfs. The drainage from EX-4 flows south under Higby Road through an existing 18" culvert at design point 12. See Appendix D for existing drainage basins and conditions.

The proposed development will be designed to follow the existing drainage patterns without any significant changes. All offsite flows will be safely routed through Grandwood Ranch and ultimately into Jackson Creek.

DRAINAGE DESIGN CRITERIA

Development Criteria Reference

The analysis and design of the storm drainage system for this project was prepared in accordance with the criteria set forth in the latest edition of the City of Colorado Springs/El Paso County City of Colorado Springs and El Paso County Drainage Criteria Manual (DCM). The onsite hydrologic analysis is based on a collection of data from the DCM, the NRCS Web Soil Survey, a partial topographic survey performed by LWA Land Surveying combined with publicly available topographic information, and property boundary information provided by LWA Land Surveying.

Hydrologic Criteria

The minor design storm analyzed by this report is the 5-year recurrent storm event. The major design storm analyzed was the 100-year recurrent storm event. Since all basins within this project are less than 100 acres, the Rational Method is used to estimate the peak stormwater runoff discharge. The runoff coefficients are determined based on a weighted average of the various impervious areas in a given basin. The detailed calculations can be found in Appendix C. Rainfall intensities are obtained from Figure 5-1 of the DCM.

The following Rational Method equation was used to estimate peak storm water runoff:

$$Q = CIA$$

Where Q = Storm runoff in cubic feet per second (cfs)
A = Drainage area in acres
I = Runoff intensity in inches per hour

C = Runoff coefficient

The runoff intensity for the appropriate design storm is based upon the time of concentration and was generated by procedures outlined in Volume I of the DCM.

DRAINAGE FACILITY DESIGN

General Concept

The drainage design for the Grandwood Ranch Subdivision intends to convey offsite flows safely through the site while directing on site flows to water quality ponds and ultimately to Jackson Creek.

The proposed streets will have roadside ditches to convey stormwater through and around proposed residential lots. The ditches have been designed to collect and convey the design storm flows without exceeding the street capacity. Road culvert placement has been designed to keep the storm runoff flow below the street capacity for both the 5 and 100 year events.

Appendix C contains all hydrology and street capacity calculations. The hydrology calculations included are the "C" factors for each basin, the time of concentration for each basin, and the flows based on 100-yr and 5-yr storm events. Detailed hydraulic calculations will be provided with the Final Drainage Report.

The intent of the proposed drainage system design is to safely convey all storm runoff generated from the proposed development to the main channel of Jackson Creek. Runoff generated as a result of the residential development will sheet flow into the roads and be collected by the conveyance system. Onsite detention within the limits of Grandwood Ranch will be provided to ensure the development will release at or less than historic flows.

Specific Details

The proposed development is evaluated and divided into 11 drainage sub-basins in order to assist in the design of the ditch capacity, culverts, and water quality ponds.

PROPOSED DRAINAGE BASINS AND SUB-BASINS

On-site Basin Description

There are 11 onsite sub-basins associated with Grandwood Ranch, totaling 147 acres. Runoff in these basins is generated by landscape areas, trails, streets, and residential roof tops and hardscape. The low density of the Grandwood Racnh development does not increase the runoff tremendously and the runoff generated by the development will be allowed to continue overland on existing topology where possible and will be collected and directed in roadside swales where necessary. Culverts will allow flows collected at low points along the proposed roadway to flow under the road and continue to the two existing culverts under Higby Road. In general, runoff from the sites will eventually be directed as follows:

Basin A consists of 11.2 acres of residential lots and proposed roadway. The calculated flows for this basin are Q_5=9.0 cfs and Q_{100}=31.3 cfs. The runoff from Basin A flows east through residential lots and is collected in the roadside ditch on the north and east side of the Grandwood Drive and eventually to design point 1. The flow then runs through the proposed culvert under Grandwood Drive and into Basin D. Flow continues in the main channel of Jackson Creek through the open space tract to Design Point 4, where it leaves the site through the existing culvert under Higby Road.

Basin B consists of 6.6 acres of residential lots and proposed roadway. The calculated flows for this basin are Q_5=5.3 cfs and Q_{100}=17.8 cfs. The runoff from Basin B flows south through residential lots and is collected in the roadside ditch on the north side of the Grandwood Drive and eventually to design point 2. The run-off from the grass lined swale will flow through a proposed culvert under Grandwood Drive and into Basin D. Flow continues in the main channel of Jackson Creek through the open space tract to Design Point 4, where it leaves the site through the existing culvert under Higby Road.

Basin C consists of 6.4 acres of residential lots and proposed roadway. The calculated flows for this basin are Q_5=5.3 cfs and Q_{100}=9.5 cfs. The runoff from Basin C flows through residential lots and is collected in the roadside ditch on the north and east side of the Grandwood Drive. The run-off from the grass lined swale will flow into a proposed culvert at a low point in the swale (Design Point 3). The flow is then discharged through residential lots and open space in Basin D where it continues in the main channel of Jackson Creek through the open space tract to Design Point 4, where it leaves the site through the existing culvert under Higby Road.

Basin D consists of 30.6 acres residential lots, proposed roadway and open space. The calculated flows for this basin are Q_5=23.6 cfs and Q_{100}=76.8 cfs. The runoff from Basin D sheet flows through residential lots and open space, where it is collected in the main channel of Jackson Creek. It continues to Design Point 4, where it leaves the site through the existing culvert under Higby Road.

Basin E consists of 9.1 acres of residential lots and proposed roadway. The calculated flows for this basin are Q_5=7.4 cfs and Q_{100}=24.4 cfs. The runoff from Basin E flows through residential lots to a low point at the northwest corner of the intersection of Higby Road and Grandwood Drive (Design Point 5). It is directed through a culvert under Grandwood Drive and flow to Design Point 4, where it leaves the site through the existing culvert under Higby Road.

Basin F consists of 15.0 acres of residential lots and proposed roadway. The calculated flows for this basin are Q_5=10.2 cfs and Q_{100}=35.0 cfs. The runoff from Basin F through residential lots and is collected in the roadside ditch on the north side of the Copper Valley Court East. The run-off from the grass lined swale will flow into a proposed culvert at a low point in the swale (Design Point 6) and into Basin G.

Basin G consists of 31.2 acres of residential lots and proposed roadway. The calculated flows for this basin are Q_5=19.0 cfs and Q_{100}=66.3 cfs. The runoff from Basin G flows generally to the east through residential lots where is collects in a low point on the east side of Furrow Road (Design Point 7). It then flows through the proposed culvert under Furrow Road into Basin J where it flows south to the existing culvert under Higby Road at Design Point 10.

Basin H consists of 3.5 acres of residential lots and proposed roadway. The calculated flows for this basin are Q_5=3.0 cfs and Q_{100}=9.7 cfs. The runoff from Basin H flows west through the residential lots and into the roadside ditch on the east side of Furrow Road. It is collected in the low point at

Design Point 8 and flows west through the proposed culvert under Furrow Road into Basin J where it flows west to the existing culvert under Higby Road at Design Point 10.

Basin I consists of 6.6 acres of residential lots and proposed roadway. The calculated flows for this basin are Q_5=5.1 cfs and Q_{100}=17.2.3 cfs. The runoff from Basin I flows south through the residential lots and into the roadside ditch on the north side of Copper Valley Court West, ultimately collecting at the low point at Design Point 9. It then flows through the proposed culvert under Copper Valley Court West and into Basin J where it flows south to the existing culvert under Higby Road at Design Point 10.

Basin J consists of 7.3 acres of open space, residential lots, and proposed roadway. The calculated flows for this basin are Q_5=8.3 cfs and Q_{100}=22.1 cfs. The runoff from Basin J flows south over residential lots and open space to Design Point 10 where it flows south to the existing culvert under Higby Road.

Basin K consists of 16.2 acres of residential lots, open space and proposed roadway. The calculated flows for this basin are Q_5=11.6 cfs and Q_{100}=40.4 cfs. The runoff from Basin K flows over residential lots and open space to Design Point 11 where is directed east along the north side of Higby Road into Basin J. It then continues east to Design Point 10 where it flows south to the existing culvert under Higby Road.

Basin L consists of 8.1 acres of residential lots. The calculated flows for this basin are Q_5=5.7 cfs and Q_{100}=21.3 cfs. The runoff from Basin I flows south through the residential lots and into the roadside ditch on the north side of Copper Valley Court West, ultimately collecting at the low point at Design Point 9. It then flows through the proposed culvert under Copper Valley Court West and into Basin J where it flows south to the existing culvert under Higby Road at Design Point 10.

Basin M consists of 7.0 acres of residential lots and proposed roadway. The calculated flows for this basin are Q_5=5.4 cfs and Q_{100}=18.2 cfs. The runoff from Basin L flows south through the residential lots and into the roadside ditch on the north side of Copper Valley Court West, ultimately collecting at the low point at Design Point 13. It then flows through the proposed culvert under Furrow Road and into Basin I.

Off-site Basin Description

Three offsite basins contribute flow to the Grandwood Subdivision. Offisite flows will be safely passed through the site and ultimately to Jackson Creek, south of the proposed subdivision. In general, runoff from offsite will eventually be directed as follows:

Basin OS-1 contributes flows of Q_5=19.0 cfs and Q_{100}=71.6 cfs. The runoff from Basin OS-1 sheet flows into Basin A and Basin B and also contributes Q_{100} = 137 cfs concentrated flow into the main channel of Jackson Creek at Design Point O1.

Basin OS-2 contributes flows of Q_5=15.8 cfs and Q_{100}=59.4 cfs. The runoff from Basin OS-2 contributes concentrated flow into Basin F Design Point O2. The flows from Basin OS-2 will be diverted between residential lots to Design point 6.

Basin OS-3 contributes flows of Q_5=33.6 cfs and Q_{100}=8.9 cfs. The runoff from Basin OS-1 sheet flows into Basin K and also contributes concentrated flow into into Basin K at Design Point O-3. The flows from Basin OS-2 will be diverted between residential lots to to the roadside ditch on the south side of Copper Valley Court West, where it will eventually end up at Design point 11.

Water Quality and Erosion Control

Best Management Practices (BMP's) will be utilized in this development per the requirements of Volume 2 of the DCM. Water Quality will be addressed by grass swales along the proposed roadway and water quality ponds in the open spaces. The final design of the water quality outfall structures for each pond will be in the drainage letters submitted with each of the construction documents

Temporary BMP's such as straw bales, silt fence, inlet protection and seeding will be utilized in accordance with the separate Erosion Control Plan.

A Storm Water Quality Plan will be written and submitted with the final grading plan.

Operations and Maintenance will be in accordance Volume 2 of the DCM.

CONCLUSIONS

Compliance with Standards

The proposed drainage facility design is in accordance with the City of Colorado Springs and El Paso County Drainage Criteria Manual (DCM). We are addressing water quality for the run-off from the proposed development by minimizing the directly connected impervious areas by implementing grass-lined swales and a proposed water quality ponds. As a result, the run-off from this development will have no adverse impacts on any downstream facilities.

Summary of Concept

No adverse effects to surrounding properties are anticipated from the development of this site. The design, if properly maintained and constructed, conveys and releases the storm water runoff up to, and including, the 100-year storm event, in a safe manner to protect life and property from damage.

REFERENCES

1. Drainage Criteria Manual. City of Colorado Springs and El Paso County. Volume 1 and Volume 2; latest revisions.

2. Flood Insurance Rate Map, El Paso County, Colorado and Incorporated Areas. Map Number 08041C0279GF. Federal Emergency Management Agency (December 07, 2018).

3. Final Drainage Report for Woodmoor Summit 1A. Woodmoor W&S (June 2006).

4. Final Drainage Report for Timberview Subdivision – Phase 1. PEI (August 1999).

5. Final Drainage Report for Timberview Subdivision – Phase II. PEI (August 1999).

6. Final Drainage Report for Bent Tree Filing 3. RTW (March 1993).

7. Web Soil Survey – National Cooperative Soil Survey. NRCS (March 2019).

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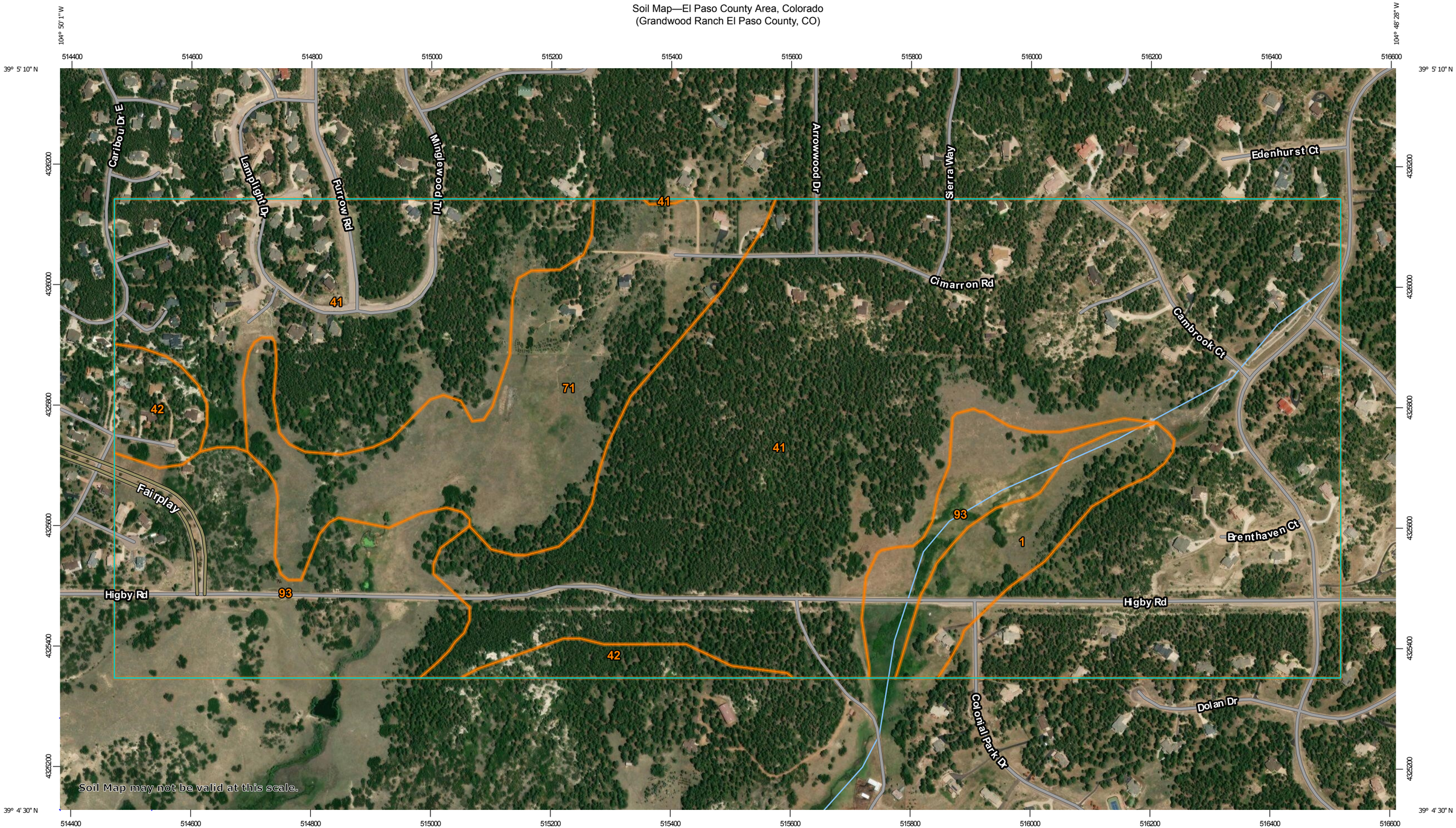
APPENDIX A:

SOILS MAP

Soil Map—El Paso County Area, Colorado
(Grandwood Ranch El Paso County, CO)



Map Scale: 1:6,000 if printed on B landscape (17" x 11") sheet.

Meters: 0 50 100 200 300

Feet: 0 250 500 1000 1500

N

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 16, Sep 10, 2018

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

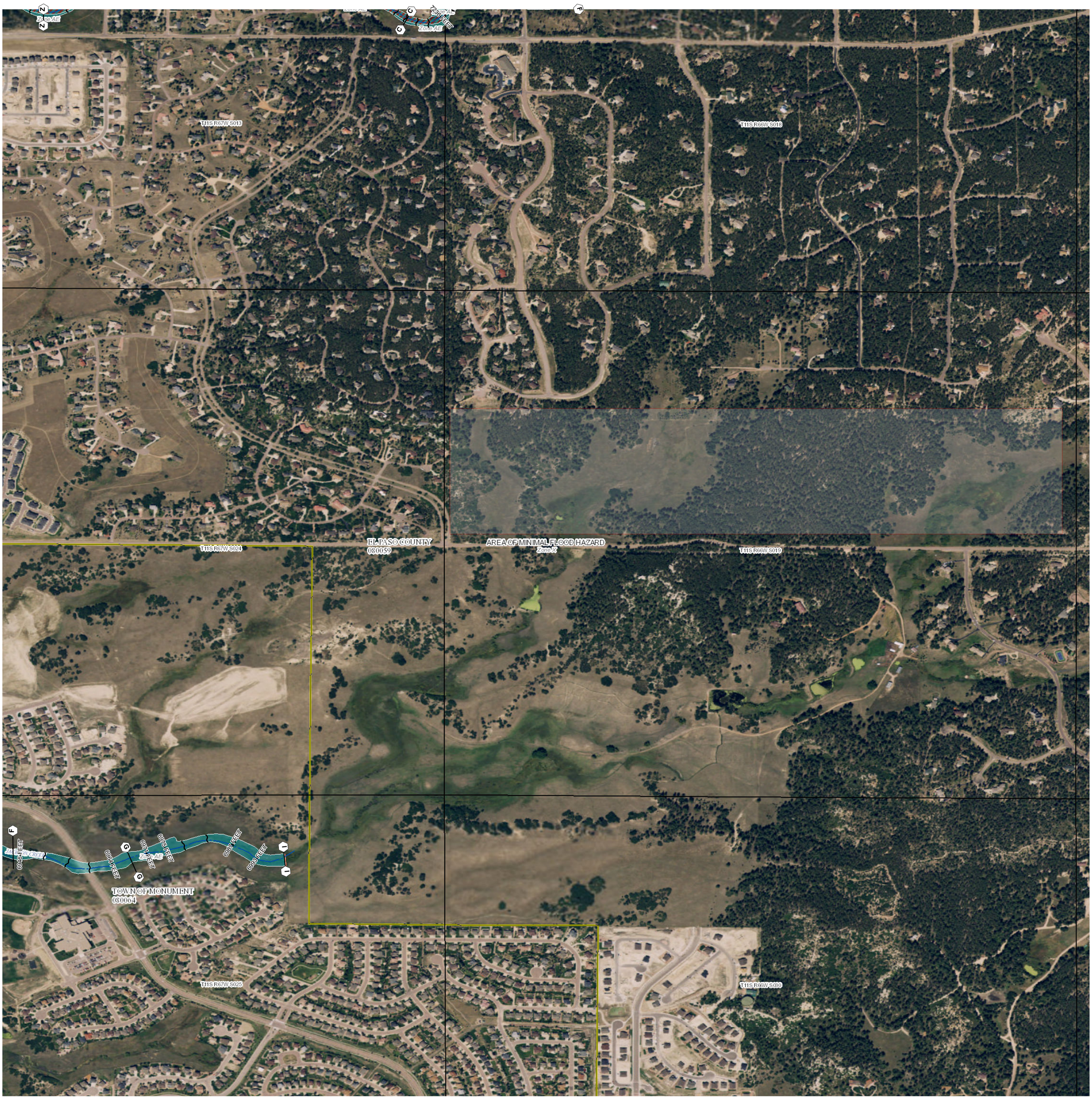
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
1	Alamosa loam, 1 to 3 percent slopes	14.0	3.5%
41	Kettle gravelly loamy sand, 8 to 40 percent slopes	270.7	67.1%
42	Kettle-Rock outcrop complex	11.8	2.9%
71	Pring coarse sandy loam, 3 to 8 percent slopes	52.0	12.9%
93	Tomah-Crowfoot complex, 8 to 15 percent slopes	54.6	13.5%
Totals for Area of Interest		**403.2**	**100.0%**

APPENDIX B:

FLOODPLAIN MAP

39°5'44.21"N

104°50'38.03"W



39°3'38.39"N

104°48'14.54"W

USGS The National Map: Orthoimagery. Data refreshed October, 2017.

FLOOD HAZARD INFORMATION

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

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

NOTES TO USERS

For information and questions about this Flood Insurance Rate Map (FIRM), available products associated with this FIRM, including historic versions, the current map date for each FIRM panel, how to order products, or the National Flood Insurance Program (NFIP) in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Flood Map Service Center website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can beordered or obtained directly from the website.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Flood Map Service Center at the number listed above.

For community and countywide map dates refer to the Flood Insurance Study Report for this jurisdiction.

To determine if flood insurance is available in this community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

Basemap information shown on this FIRM was provided in digital format by USDA, Farm Service Agency (FSA). This information was derived from NAIP, dated April 11, 2018.

This map was exported from FEMA's National Flood Hazard Layer (NFHL) on **3/8/2019 10:41:59 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. For additional information, please see the Flood Hazard Mapping Updates Overview Fact Sheet at https://www.fema.gov/media-library/assets/documents/118418

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

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.

SCALE

N

Map Projection:
GCS, Geodetic Reference System 1980;
Vertical Datum: NAVD88
For information about the specific vertical datum for elevation features, datum conversions, or vertical monuments used to create this map please see the Flood Insurance Study(FIS) Report for your community at https://msc.fema.gov

1 inch = 500 feet 1:6,000

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

0 50 100 200 300 400 Meters

FEMA

National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 279 OF 1275

Panel Contains:

COMMUNITY	NUMBER	PANEL
EL PASO COUNTY COLORADO	080059	0279
TOWN OF MONUMENT COLORADO	080064	0279

MAP NUMBER
08041C0279G
EFFECTIVE DATE
12/07/2018

APPENDIX C:

HYDROLOGY

COMPOSITE IMPERVIOUS AND "C" FACTORS FIGURE C1

LOCATION:

BASIN	AREAS (ACRES)									IMPERVIOUS PERCENTAGE			IMPERVIOUS PERCENTAGE						COMPOSITE IMPERVIOUS FACTOR	
DESIGNATION	SF	SF >1/2 A	GREEN-BELTS	ROOFS	SCHOOLS	ROADS	OPEN-PASTURE	POND	TOTAL	SF	SF >1 A	COMM	GREEN-BELTS	ROOFS	SCHOOLS	ROADS	OPEN-PASTURE	POND		5 YR B
EX-1			64.20						64.20	0.65	0.20	0.95	0.02	0.90	0.50	1.00	0.05	1.00	0.02	0.08
EX-2			61.00						61.00	0.65	0.20	0.95	0.02	0.90	0.50	1.00	0.05	1.00	0.02	0.08
EX-3			17.70						17.70	0.65	0.20	0.95	0.02	0.90	0.50	1.00	0.05	1.00	0.02	0.08
EX-4			8.10						8.10	0.65	0.20	0.95	0.02	0.90	0.50	1.00	0.05	1.00	0.02	0.08
OFFSITE BASINS																				
OS1		33.90							33.90	0.65	0.20	0.95	0.02	0.90	0.50	1.00	0.05	1.00	0.20	0.20
OS2		28.11							28.11	0.65	0.20	0.95	0.02	0.90	0.50	1.00	0.05	1.00	0.20	0.20
OS3		15.90							15.90	0.65	0.20	0.95	0.02	0.90	0.50	1.00	0.05	1.00	0.20	0.20

TIME OF CONCENTRATION FIGRUE C2

LOCATION: Grandwood Ranch | **Initial** | **BY: RML** | **DATE: 3/9/2019**

SUB-BASIN DATA			INIT./OVERLAND TIME (Ti)			TRAVEL TIME (Tt)															TOTAL	Tc Check (Urbanized Basins		FINAL Tc
DESIGNATION	C5	AREA (AC)	LENGTH (FT)	SLOPE %	Ti (Min.)*	GRASS/ PAVED	LENGTH (FT)	SLOPE %	VEL. (FPS)**	Tt(Min.)	GRASS/ PAVED	LENGTH (FT)	SLOPE %	VEL. (FPS)**	Tt(Min.)	GRASS/ PAVED	LENGTH (FT)	SLOPE %	VEL. (FPS)**	Tt(Min.)	Ti+Tt(Min.)	LGTH. (FT)	Tc = (L/180) + 10	(minutes)
EX-1	0.08	64.20	300	8.00	15.88	GRASS	1285	8.00	4.28	5.00											20.9	1585.00	18.8	19
EX-2	0.08	61.00	300	8.00	15.88	GRASS	2571	8.00	4.28	10.01											25.9	2871.00	26.0	26
EX-3	0.08	17.70	300	7.00	16.60	GRASS	1298	7.00	4.00	5.40											22.0	1598.00	18.9	19
EX-4	0.08	8.10	300	8.00	15.88	GRASS	822	8.00	4.28	3.20											19.1	1121.70	16.2	16
OFFSITE BASINS																								
OS1	0.20	33.90	300	8.00	14.08	GRASS	1750	7.00	4.00	7.28											21.4	2050.00	21.4	21
OS2	0.20	28.11	300	8.00	14.08	GRASS	1750	7.00	4.00	7.28											21.4	2050.00	21.4	21
OS3	0.20	15.90	300	8.00	14.08	GRASS	1750	7.00	4.00	7.28											21.4	2050.00	21.4	21

REMARKS

FORMULAS:

*** Ti = 1.8 (1.1-C5)L^0.5/S^1/3**

**** V=10^(.5 log(S/100)+k where k=1.18 for grassed waterways and 1.3 for gutter flow**

STORM DRAINAGE SYSTEM DESIGN FIGURE C3
(RATIONAL METHOD PROCEDURE)
DESIGN STORM: 100-YEAR DEVELOPED

Calc. by: RML
Chk'd by: RML
Date: 3/9/2019

LOCATION: Grandwood Ranch Initial El Paso County

STATION	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF					REMARKS
		BASIN	AREA (AC)	COEFF. (C)	Tc (Min.)	C*A	I (in./ hr.)	Q (cfs)	Sum AREA	Sum Tc (min.)	I (in./hr.)	Sum CA	Total Q (cfs)	
	4	EX-1	64.20	0.36	19	23.26	5.12	119.0						
	10	EX-2	61.00	0.36	26	22.10	4.31	95.2						
	11	EX-3	17.70	0.13	19	2.36	5.11	12.1						
	12	EX-4	8.10	0.36	16	2.93	5.51	16.2						
		OFFSITE BASINS												
	6	OS1	33.90	0.44	21	14.95	4.79	71.6						
	5	OS2	28.11	0.44	21	12.40	4.79	59.4						
	4	OS3	15.90	0.44	21	7.01	4.79	33.6						

STORM DRAINAGE SYSTEM DESIGN FIRGURE C4
(RATIONAL METHOD PROCEDURE)
DESIGN STORM: 5-YEAR DEVELOPED

Calc. by: RML
Chk'd by: RML
Date: 3/9/2019

LOCATION: Grandwood Ranch Initial El Paso County

STATION	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF					REMARKS
		BASIN	AREA (AC)	COEFF. (C)	Tc (Min.)	C*A	I (in./ hr.)	Q (cfs)	Sum AREA	Sum Tc (min.)	I (in./hr.)	Sum CA	Total Q (cfs)	
	4	EX-1	64.20	0.08	19	5.24	3.05	16.0						
	10	EX-2	61.00	0.08	26	4.98	2.56	12.8						
	11	EX-3	17.70	0.08	19	1.44	3.04	4.4						
	12	EX-4	8.10	0.08	16	0.66	3.28	2.2						
		OFFSITE BASINS												
	6	OS1	33.90	0.20	21	6.68	2.85	19.0						
	5	OS2	28.11	0.20	21	5.54	2.85	15.8						
	4	OS3	15.90	0.20	21	3.13	2.85	8.9						

COMPOSITE IMPERVIOUS AND "C" FACTORS FIGURE C1

LOCATION:

BASIN	AREAS (ACRES)									IMPERVIOUS PERCENTAGE			IMPERVIOUS PERCENTAGE						COMPOSITE IMPERVIOUS FACTOR	
DESIGNATION	SF	SF >1/2 A	GREEN-BELTS	ROOFS	SCHOOLS	ROADS	OPEN-PASTURE	POND	TOTAL	SF	SF >1 A	COMM	GREEN-BELTS	ROOFS	SCHOOLS	ROADS	OPEN-PASTURE	POND		5 YR B
A		10.56		0.46		0.18			11.20	0.65	0.20	0.95	0.02	0.90	0.50	1.00	0.05	1.00	0.24	0.22
B		6.02		0.28		0.30			6.60	0.65	0.20	0.95	0.02	0.90	0.50	1.00	0.05	1.00	0.27	0.23
C		5.84		0.28		0.28			6.40	0.65	0.20	0.95	0.02	0.90	0.50	1.00	0.05	1.00	0.27	0.23
D		19.03		0.57		1.00	7.00	3.00	30.60	0.65	0.20	0.95	0.02	0.90	0.50	1.00	0.05	1.00	0.28	0.24
E		8.20		0.46		0.44			9.10	0.65	0.20	0.95	0.02	0.90	0.50	1.00	0.05	1.00	0.27	0.24
F		13.97		0.63		0.40			15.00	0.65	0.20	0.95	0.02	0.90	0.50	1.00	0.05	1.00	0.25	0.22
G		21.53		0.57		1.00			23.10	0.65	0.20	0.95	0.02	0.90	0.50	1.00	0.05	1.00	0.25	0.22
H		3.13		0.23		0.14			3.50	0.65	0.20	0.95	0.02	0.90	0.50	1.00	0.05	1.00	0.28	0.24
I		12.60		0.52		0.48			13.60	0.65	0.20	0.95	0.02	0.90	0.50	1.00	0.05	1.00	0.26	0.23
J		3.07		0.11		0.44	1.68	2.00	7.30	0.65	0.20	0.95	0.02	0.90	0.50	1.00	0.05	1.00	0.44	0.32
K		15.31		0.67		0.22			16.20	0.65	0.20	0.95	0.02	0.90	0.50	1.00	0.05	1.00	0.24	0.22
L		8.10							8.10	0.65	0.20	0.95	0.02	0.90	0.50	1.00	0.05	1.00	0.20	0.20
OFFSITE BASINS																				
OS1		33.90							33.90	0.65	0.20	0.95	0.02	0.90	0.50	1.00	0.05	1.00	0.20	0.20
OS2		28.11							28.11	0.65	0.20	0.95	0.02	0.90	0.50	1.00	0.05	1.00	0.20	0.20
OS3		15.90							15.90	0.65	0.20	0.95	0.02	0.90	0.50	1.00	0.05	1.00	0.20	0.20

TIME OF CONCENTRATION FIGRUE C2

LOCATION: Grandwood Ranch **Preliminary/Final** **BY: RML** **DATE: 3/9/2019**

SUB-BASIN DATA			INIT./OVERLAND TIME (Ti)			TRAVEL TIME (Tt)															TOTAL	Tc Check (Urbanized Basins		FINAL Tc
DESIGNATION	C5	AREA (AC)	LENGTH (FT)	SLOPE %	Ti (Min.)*	GRASS/ PAVED	LENGTH (FT)	SLOPE %	VEL. (FPS)**	Tt(Min.)	GRASS/ PAVED	LENGTH (FT)	SLOPE %	VEL. (FPS)**	Tt(Min.)	GRASS/ PAVED	LENGTH (FT)	SLOPE %	VEL. (FPS)**	Tt(Min.)	Ti+Tt(Min.)	LGTH. (FT)	Tc = (L/180) + 10	(minutes)
A	0.22	11.20	300	11.00	12.35	GRASS	196	10.00	4.79	0.68											13.0	496.00	12.8	13
B	0.23	6.60	300	12.00	11.83	GRASS	460	4.00	3.03	2.53											14.4	760.00	14.2	14
C	0.23	6.40	300	12.00	11.83	GRASS	375	4.00	3.03	2.06											13.9	675.00	13.8	14
D	0.24	30.60	300	8.00	13.40	GRASS	947	4.00	3.03	5.21											18.6	1247.00	16.9	17
E	0.24	9.10	300	21.00	9.77	GRASS	969	5.00	3.38	4.77											14.5	1269.00	17.1	15
F	0.22	15.00	300	11.00	12.28	GRASS	1452	6.00	3.71	6.53											18.8	1752.00	19.7	19
G	0.22	23.10	300	10.00	12.67	GRASS	1905	5.00	3.38	9.38											22.1	2205.00	22.3	22
H	0.24	3.50	300	9.00	12.93	GRASS	332	4.00	3.03	1.83											14.8	632.00	13.5	14
I	0.23	13.60	300	11.00	12.25	GRASS	648	5.00	3.38	3.19											15.4	948.00	15.3	15
J	0.32	7.30	300	8.00	12.17	GRASS	355	3.00	2.62	2.26											14.4	655.00	13.6	14
K	0.22	16.20	300	11.00	12.36	GRASS	831	5.00	3.38	4.09											16.5	1131.00	16.3	16
L	0.20	8.10	300	8.00	14.08	GRASS	831	8.00	4.28	3.24											17.3	1131.00	16.3	16
OFFSITE BASINS																								
OS1	0.20	33.90	300	8.00	14.08	GRASS	1750	7.00	4.00	7.28											21.4	2050.00	21.4	21
OS2	0.20	28.11	300	8.00	14.08	GRASS	1750	7.00	4.00	7.28											21.4	2050.00	21.4	21
OS3	0.20	15.90	300	8.00	14.08	GRASS	1750	7.00	4.00	7.28											21.4	2050.00	21.4	21

REMARKS

FORMULAS:

*** Ti = 1.8 (1.1-C5)L^0.5/S^1/3**

**** V=10^(.5 log(S/100)+k where k=1.18 for grassed waterways and 1.3 for gutter flow**

STORM DRAINAGE SYSTEM DESIGN FIGURE C3
(RATIONAL METHOD PROCEDURE)
DESIGN STORM: 100-YEAR DEVELOPED

Calc. by: RML
Chk'd by: RML
Date: 3/9/2019

LOCATION: Grandwood Ranch Preliminary/Final El Paso County

STATION	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF					REMARKS
		BASIN	AREA (AC)	COEFF. (C)	Tc (Min.)	C*A	I (in./ hr.)	Q (cfs)	Sum AREA	Sum Tc (min.)	I (in./hr.)	Sum CA	Total Q (cfs)	
	1	A	11.20	0.45	13	5.08	6.16	31.3						
	2	B	6.60	0.46	14	3.04	5.86	17.8						
	3	C	6.40	0.25	14	1.59	5.96	9.5						
	4	D	30.60	0.47	17	14.23	5.40	76.8	63.90	32	3.81	28.15	107.1	
	5	E	9.10	0.46	15	4.21	5.81	24.4						
	6	F	15.00	0.46	19	6.84	5.12	35.0						
	7	G	23.10	0.46	22	10.55	4.71	49.6						
	8	H	3.50	0.46	14	1.62	6.00	9.7						
	9	I	13.60	0.46	15	6.22	5.67	35.3						
	10	J	7.30	0.51	14	3.70	5.98	22.1	78.70	41	3.27	36.27	118.49	
	11	K	16.20	0.45	16	7.34	5.50	40.4						
	12	L	8.10	0.44	16	3.57	5.50	19.6						
		OFFSITE BASINS												
	6	OS1	33.90	0.44	21	14.95	4.79	71.6						
	5	OS2	28.11	0.44	21	12.40	4.79	59.4						
	4	OS3	15.90	0.44	21	7.01	4.79	33.6						

STORM DRAINAGE SYSTEM DESIGN FIRGURE C4
(RATIONAL METHOD PROCEDURE)
DESIGN STORM: 5-YEAR DEVELOPED

Calc. by: RML
Chk'd by: RML
Date: 3/9/2019

LOCATION: Grandwood Ranch Preliminary/Final El Paso County

STATION	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF					REMARKS
		BASIN	AREA (AC)	COEFF. (C)	Tc (Min.)	C*A	I (in./ hr.)	Q (cfs)	Sum AREA	Sum Tc (min.)	I (in./hr.)	Sum CA	Total Q (cfs)	
	1	A	11.20	0.22	13	2.45	3.67	9.0						
	2	B	6.60	0.23	14	1.53	3.49	5.3						
	3	C	6.40	0.23	14	1.48	3.55	5.3						
	4	D	30.60	0.24	17	7.35	3.21	23.6	63.90	32	3.81	14.96	56.93	
	5	E	9.10	0.24	15	2.14	3.46	7.4						
	6	F	15.00	0.22	19	3.36	3.05	10.2						
	7	G	23.10	0.22	22	5.19	2.80	14.5						
	8	H	3.50	0.24	14	0.83	3.57	3.0						
	9	I	13.60	0.23	15	3.07	3.38	10.4						
	10	J	7.30	0.32	14	2.33	3.56	8.3	78.70	41	3.27	18.31	59.82	
	11	K	16.20	0.22	16	3.54	3.27	11.6						
	12	L	8.10	0.20	16	1.60	3.27	5.2						
		OFFSITE BASINS												
	6	OS1	33.90	0.20	21	6.68	2.85	19.0						
	5	OS2	28.11	0.20	21	5.54	2.85	15.8						
	4	OS3	15.90	0.20	21	3.13	2.85	8.9						

For Colorado Springs and much of the Fountain Creek watershed, the 1-hour depths are fairly uniform and are summarized in Table 6-2. Depending on the location of the project, rainfall depths may be calculated using the described method and the NOAA Atlas maps shown in Figures 6-6 through 6-17.

Table 6-2. Rainfall Depths for Colorado Springs

Return Period	1-Hour Depth	6-Hour Depth	24-Hour Depth
2	1.19	1.70	2.10
5	1.50	2.10	2.70
10	1.75	2.40	3.20
25	2.00	2.90	3.60
50	2.25	3.20	4.20
100	2.52	3.50	4.60

Where Z= 6,840 ft/100

These depths can be applied to the design storms or converted to intensities (inches/hour) for the Rational Method as described below. However, as the basin area increases, it is unlikely that the reported point rainfalls will occur uniformly over the entire basin. To account for this characteristic of rain storms an adjustment factor, the Depth Area Reduction Factor (DARF) is applied. This adjustment to rainfall depth and its effect on design storms is also described below. The UDFCD UD-Rain spreadsheet, available on UDFCD's website, also provides tools to calculate point rainfall depths and Intensity-Duration-Frequency curves[2] and should produce similar depth calculation results.

2.2 Design Storms

Design storms are used as input into rainfall/runoff models and provide a representation of the typical temporal distribution of rainfall events when the creation or routing of runoff hydrographs is required. It has long been observed that rainstorms in the Front Range of Colorado tend to occur as either short-duration, high-intensity, localized, convective thunderstorms (cloud bursts) or longer-duration, lower-intensity, broader, frontal (general) storms. The significance of these two types of events is primarily determined by the size of the drainage basin being studied. Thunderstorms can create high rates of runoff within a relatively small area, quickly, but their influence may not be significant very far downstream. Frontal storms may not create high rates of runoff within smaller drainage basins due to their lower intensity, but tend to produce larger flood flows that can be hazardous over a broader area and extend further downstream.

- **Thunderstorms**: Based on the extensive evaluation of rain storms completed in the Carlton study (Carlton 2011), it was determined that typical thunderstorms have a duration of about 2 hours. The study evaluated over 300,000 storm cells using gage-adjusted NEXRAD data, collected over a 14-year period (1994 to 2008). Storms lasting longer than 3 hours were rarely found. Therefore, the results of the Carlton study have been used to define the shorter duration design storms.

  To determine the temporal distribution of thunderstorms, 22 gage-adjusted NEXRAD storm cells were studied in detail. Through a process described in a technical memorandum prepared by the City of Colorado Springs (City of Colorado Springs 2012), the results of this analysis were interpreted and normalized to the 1-hour rainfall depth to create the distribution shown in Table 6-3 with a 5 minute time interval for drainage basins up to 1 square mile in size. This distribution represents the rainfall

Table 6-6. Runoff Coefficients for Rational Method
(Source: UDFCD 2001)

Land Use or Surface Characteristics	Percent Impervious	Runoff Coefficients											
		2-year		5-year		10-year		25-year		50-year		100-year	
		HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D
Business													
Commercial Areas	95	0.79	0.80	0.81	0.82	0.83	0.84	0.85	0.87	0.87	0.88	0.88	0.89
Neighborhood Areas	70	0.45	0.49	0.49	0.53	0.53	0.57	0.58	0.62	0.60	0.65	0.62	0.68
Residential													
1/8 Acre or less	65	0.41	0.45	0.45	0.49	0.49	0.54	0.54	0.59	0.57	0.62	0.59	0.65
1/4 Acre	40	0.23	0.28	0.30	0.35	0.36	0.42	0.42	0.50	0.46	0.54	0.50	0.58
1/3 Acre	30	0.18	0.22	0.25	0.30	0.32	0.38	0.39	0.47	0.43	0.52	0.47	0.57
1/2 Acre	25	0.15	0.20	0.22	0.28	0.30	0.36	0.37	0.46	0.41	0.51	0.46	0.56
1 Acre	20	0.12	0.17	0.20	0.26	0.27	0.34	0.35	0.44	0.40	0.50	0.44	0.55
Industrial													
Light Areas	80	0.57	0.60	0.59	0.63	0.63	0.66	0.66	0.70	0.68	0.72	0.70	0.74
Heavy Areas	90	0.71	0.73	0.73	0.75	0.75	0.77	0.78	0.80	0.80	0.82	0.81	0.83
Parks and Cemeteries	7	0.05	0.09	0.12	0.19	0.20	0.29	0.30	0.40	0.34	0.46	0.39	0.52
Playgrounds	13	0.07	0.13	0.16	0.23	0.24	0.31	0.32	0.42	0.37	0.48	0.41	0.54
Railroad Yard Areas	40	0.23	0.28	0.30	0.35	0.36	0.42	0.42	0.50	0.46	0.54	0.50	0.58
Undeveloped Areas													
Historic Flow Analysis-- Greenbelts, Agriculture	2	0.03	0.05	0.09	0.16	0.17	0.26	0.26	0.38	0.31	0.45	0.36	0.51
Pasture/Meadow	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50
Forest	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50
Exposed Rock	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Offsite Flow Analysis (when landuse is undefined)	45	0.26	0.31	0.32	0.37	0.38	0.44	0.44	0.51	0.48	0.55	0.51	0.59
Streets													
Paved	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Gravel	80	0.57	0.60	0.59	0.63	0.63	0.66	0.66	0.70	0.68	0.72	0.70	0.74
Drive and Walks	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Roofs	90	0.71	0.73	0.73	0.75	0.75	0.77	0.78	0.80	0.80	0.82	0.81	0.83
Lawns	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50

3.2 Time of Concentration

One of the basic assumptions underlying the Rational Method is that runoff is a function of the average rainfall rate during the time required for water to flow from the hydraulically most remote part of the drainage area under consideration to the design point. However, in practice, the time of concentration can be an empirical value that results in reasonable and acceptable peak flow calculations.

For urban areas, the time of concentration (t_c) consists of an initial time or overland flow time (t_i) plus the travel time (t_t) in the storm sewer, paved gutter, roadside drainage ditch, or drainage channel. For non-urban areas, the time of concentration consists of an overland flow time (t_i) plus the time of travel in a concentrated form, such as a swale or drainageway. The travel portion (t_t) of the time of concentration can be estimated from the hydraulic properties of the storm sewer, gutter, swale, ditch, or drainageway. Initial time, on the other hand, will vary with surface slope, depression storage, surface cover, antecedent rainfall, and infiltration capacity of the soil, as well as distance of surface flow. The time of concentration is represented by Equation 6-7 for both urban and non-urban areas.

APPENDIX E:

DRAINAGE MAP

GRANDWOOD RANCH
S2 OF N2 SEC 19, TS 11S, RANGE 66W
EL PASO COUNTY COLORADO

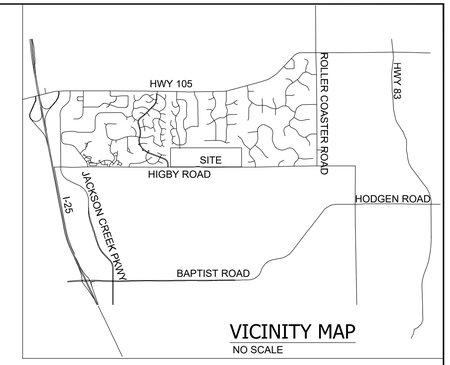
DRAINAGE BASIN TAG

DRAINAGE BASIN OUTLET TAG

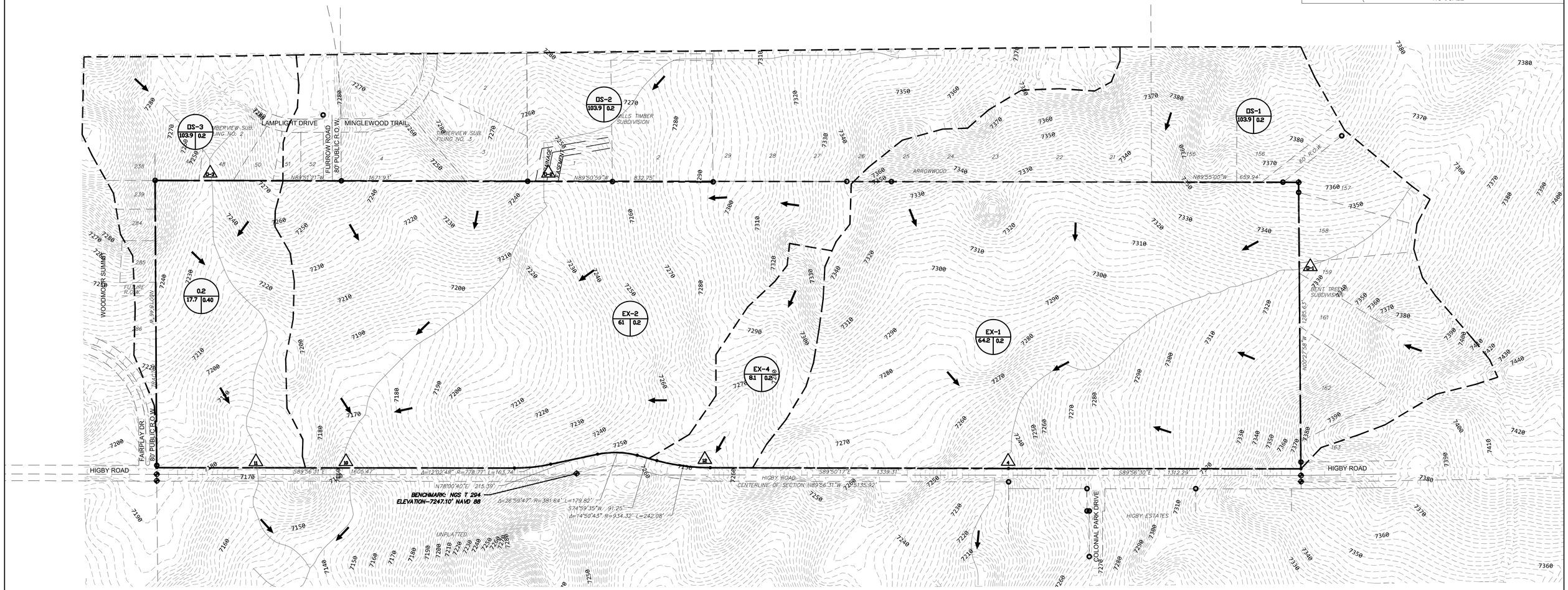
DRAINAGE FLOW ARROW

DRAINAGE BASIN BOUNDARY

DRAINAGE CULVERT



VICINITY MAP
NO SCALE



0 200 400 Feet

DRWN CEF	CHKD RML	DSGN CEF	DATE 09/16/19

Evolution Design Group LLC
20329 Vista Cir Parker, CO 80138 - 303.514.5774

Grandwood Enterprises, LLC
William F. Herebic II, Manager
270 Lodgepole Way, Monument, CO 80132

Grandwood Ranch Subdivision
Tax Schedule No. 61190-00-003
Part of S2 of N2 of Sec 19, TS 11S,
Range 66W, El Paso County, CO

GRANDWOOD RANCH
EXISTING DRAINAGE MAP

SCALE: | DWG. NUMBER: C-40 | REV: 1

C-40.dwg 3/19/2007

GRANDWOOD RANCH
S2 OF N2 SEC 19, TS 11S, RANGE 66W
EL PASO COUNTY COLORADO

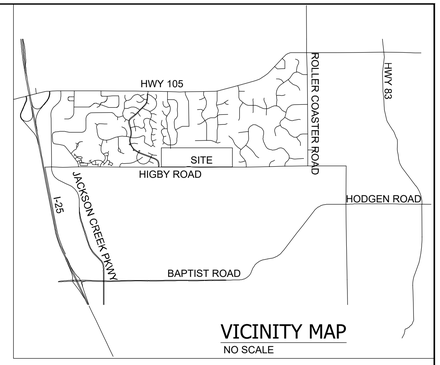
OS–1 | 0.2 — DRAINAGE BASIN TAG

O–1 — DRAINAGE BASIN OUTLET TAG

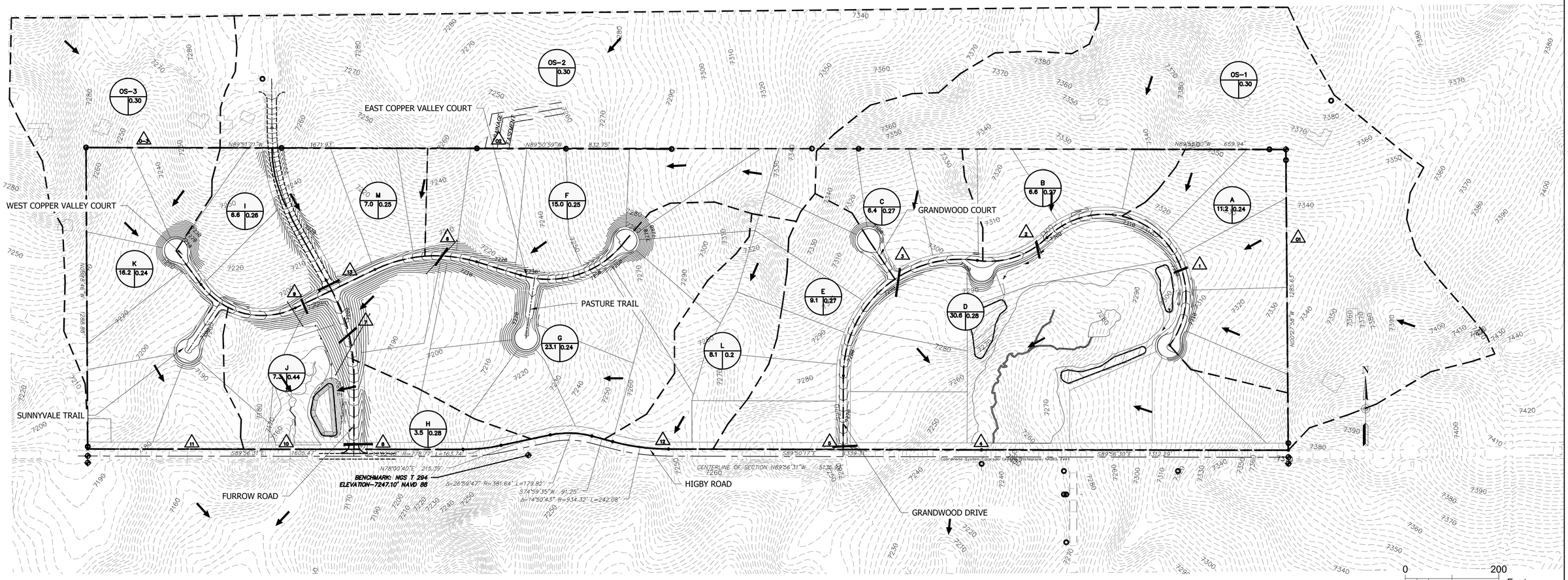
DRAINAGE FLOW ARROW

DRAINAGE BASIN BOUNDARY

DRAINAGE CULVERT



VICINITY MAP
NO SCALE



DRWN CEF	CHKD RML	DSGN CEF	DATE 09/16/19

Evolution Design Group LLC
20329 Vista Cir Parker, CO 80138 - 303.514.5774

Grandwood Enterprises, LLC
William F. Herebic II, Manager
270 Lodgepole Way, Monument, CO 80132

Grandwood Ranch Subdivision
Tax Schedule No. 61190-00-003
Part of S2 of N2 of Sec 19, TS 11S,
Range 66W, El Paso County, CO

GRANDWOOD RANCH
PROPOSED DRAINAGE MAP

SCALE:	DWG. NUMBER: C-50	REV: 1

C-50.dwg 3/19/2007