J·R ENGINEERING

DRAINAGE LETTER
FOR
LEWIS PALMER SD38 TRAIL SYSTEM

Prepared For:

Lewis Palmer School District 38
146 N. Jefferson Street
Monument, CO 80132

March 2, 2023
Project No. 25203.00

Prepared By:
JR Engineering, LLC
5475 Tech Center Drive, Suite 235
Colorado Springs, CO 80919
719-593-2593

Design 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.

COLORADO LICENSED
GLENN DEAN ELLIS
38861
March 2, 2023
PROFESSIONAL ENGINEER

Glenn Ellis, Colorado P.E. # 38861
For and On Behalf of JR Engineering, LLC

Owner/Developer's Statement:

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

Lewis Palmer Schools #38 — 3-10-2023
Business Name — Date
By: Ricky Vestal
Title: Grounds Supervisor
Address: 36 Jefferson Street
P.O Box 40 80132 Monument, CO

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.

Daniel Torres, P.E. Digitally signed by Daniel Torres, P.E. Reason: Authorized signatory as County Engineer designee Date: 2026.05.26 14:01:40-06'00' — 5/26/2026

Joshua Palmer, P.E. — Date
County Engineer/ ECM Administrator

Conditions:

Purpose
This drainage letter will address the impact the Lewis Palmer SD38 Trail System project will have within the Dirty Woman Creek drainage basin. The Dirty Woman Creek and Crystal Creek Drainage Basin Planning Study was prepared in September 1993 by Kiowa Engineering Corporation. This letter will address the impacts within Basins CC153, CC157, DWC79, DWC117, LFDW105, LFDW107, LFDW109, and LFDW111 of the approved study. The purpose of this letter is to determine impacts to the drainage conditions within these basins due to the placement of a 4 foot wide asphalt milling trail.

General Location
The site is located in El Paso County, adjacent to Monument, and the Woodmoor Improvement Association. See Appendix A for the Vicinity Map. The proposed project is comprised of a 4 foot wide trail, with varying width dirt shoulders to blend into the existing grades, and is approximately 2.5 miles long within existing roadway right-of-way, easements, maintenance roads, and open space tracts. The trail will be installed along Woodmoor Drive, Willow Park Way, below Woodmoor Lake on maintenance access paths, Lake Woodmoor Drive, through open tracts owned by the Woodmoor Improvement Association, and along Deer Creek Drive; within School District, and Woodmoor Improvement Association property, or on properties where easements have been obtained. The project will also install a pedestrian bridge across the spillway of Woodmoor Lake. The total disturbed area associated with the project will be 1.34 acres. Only 1.7 miles of the trail will cause disturbance. The remaining 0.8 miles will be on existing sidewalks or gravel maintenance roads. See Appendix C for the Basin map from the Dirty Woman Creek and Crystal Creek Drainage Basin Planning Study.

Soil Conditions
Soil characteristics are comprised of various soils throughout the project limits of the trail. Soils are comprised of Pring coarse sandy loam (Group B) (31.9% of trail), Tomah-Crowfoot loamy sands (Group B) (29.7% of trail), Kettle gravelly loamy sand (Group B) (20.4% of trail), and Alamosa loam (Group D) (18.0% of trail). Group B soils exhibit a moderate infiltration rate when thoroughly wet and consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission. Group D soils exhibit a very slow infiltration rate when thoroughly wet and consist chiefly of clays that have a high shrink-swell potential, have a high water table, have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission. Refer to the soil survey mapping in Appendix B.

Drainage Design Criteria
Storm drainage analysis and design criteria for the project were taken from the "City of Colorado Springs/El Paso County Drainage Criteria Manual", Volumes 1 and 2 (EPCDCM), dated October 12, 1994, and Chapter 6 of the "Colorado Springs Drainage Criteria Manual (CCSDCM)", dated May 2014, as adopted by El Paso County.

Existing and Proposed Drainage Characteristics
The proposed trail will be constructed within existing right-of-way, easements, access roads, and open space tracts. The existing drainage patterns within these areas will be maintained once the trail is constructed. In areas where the trail will potentially impact a drainage path (i.e. roadside ditch), the project's contractor will install 18" RCP culvert pipe to allow for the continued flow of runoff. Most

of the trail crossings of roadways cross where there is not a defined roadside ditch. The grades sheetflow into the open space adjacent to the roadway. These crossings will not require a culvert. It was determined that only once crossing (Sta. 99+59) would require a culvert. One other location (Sta. 77+28) has a minor roadside ditch, but due to its proximity to the roadway and shallow depth, installing a culvert would not be feasible. As a result, the adjacent area will be graded to maintain the historic flow pattern through the trail section. Overall, the historic flow patterns and paths will not be impeded by the construction of the trial. The adequacy of the existing roadside ditches to prevent overtopping, or erosion has not been evaluated, but would not be impacted by the project.

Due to limited survey and analysis information, the size of the existing downstream culvert was measured to determine the sizing of the proposed culvert at Sta. 99+59. The existing downstream culvert is 18" CMP, therefore an 18" culvert is proposed. Based on the capacity of the culvert, Type H riprap will be installed at the outlet of the culvert. Drainage plans have not been developed for the project, but information has been included in the construction documents related to the installation of the culvert and riprap. See Table 1 below for the proposed culvert location, size and capacity.

Table 1 – Proposed Culvert

Location	Basin	Culvert Size	Slope (%)	Capacity (cfs)
NE intersection of trail crossing and Toboggan Hill Road (Sta. 99+59).	LFDW111	18" RCP	9%	31.5 cfs

According to CCSDCM, Table 6-10, the Curve Number is 85 for gravel streets and 82 for dirt. The Curve Numbers associated with the impacted basins is shown in Table 2 below. The table also shows the area of each basin, the disturbed area in each basin as a result of this project, the overall basin disturbance as a percentage, as well as the 100-yr flows within each basin. As shown in the table, the trail disturbs between 0.02% and 0.65% of the overall basin areas.

Table 2 – Basin Summary

Basin	Area (acres)**	Curve Number**	Trail Length (ft) in Basin	Area Disturbed (acres)	Basin Disturbance (%)	Basin Flows Q_{100} (cfs)
CC153	34.0	85	406	0.096	0.28	77
CC157	56.5	88	1,375	0.179	0.32	111
DWC79	78.1	84	1,625	0.227	0.29	118
DWC117	79.2	88	1,078	0.153	0.19	198
LFDW105	51.7	87	1,991	0.336	0.65	95
LFDW107	26.8	85	37	0.005	0.02	47
LFDW109	55.9	87	1,421	0.217	0.39	131
LFDW111	122.0	88	1,041	0.126	0.10	215

** - Information taken from the Dirty Woman Creek and Crystal Creek DBPS. See Appendix C (Appendix Table 1 from the Study).

*** - Information taken from the Dirty Woman Creek and Crystal Creek DBPS. See Appendix C (Table 1 from the Study).

Calculating a composite Curve Number for each of these basins as a result of adding a 4' trail, results in a reduction to all of the basin's Curve Numbers, as shown in Table 3 on the next page.

Table 3 – Revised Curve Numbers

Basin	Existing		Proposed	
	Disturbance Area (acres)	Curve Number*	Curve Number**	Revised Basin Curve Number***
CC153	0.096	85	83.17	84.995
CC157	0.179	88	84.12	87.988
DWC79	0.227	84	83.97	84.000
DWC117	0.153	88	83.94	87.992
LFDW105	0.336	87	83.63	86.978
LFDW107	0.005	85	83.98	85.000
LFDW109	0.217	87	83.81	86.988
LFDW111	0.126	88	84.27	87.996

* - Information taken from the Dirty Woman Creek and Crystal Creek DBPS. This number represents the entire basin, but is used for the disturbance area comparison. Some areas of disturbance area are dirt, gravel, or vegetated.
** - Composite Curve Number calculated based on a Curve Number of 85 for gravel streets (4' wide), and 82 for dirt (varying width to tie into existing grades alongside the trail).
*** - Revised Basin Curve Number is a composite number calculated from the overall basin Curve Number and the proposed Curve Number resulting from the trail installation.

Floodplain

A portion of the site is within the FEMA 100-year floodplain totaling approximately 0.11 acres. Within this area, approximately 8.07 cubic yards (CY) of cut and 7.11 CY of fill is expected for a net of 0.96 cy cut. No net fill is expected within the 100-year floodplain. See Appendix B for FIRM Map Number 08041C0276G, revised December 7, 2018. This information was conveyed to the County's Floodplain Administrator. Since the project will not be altering the grade, no Floodplain Development permit is needed for this project.

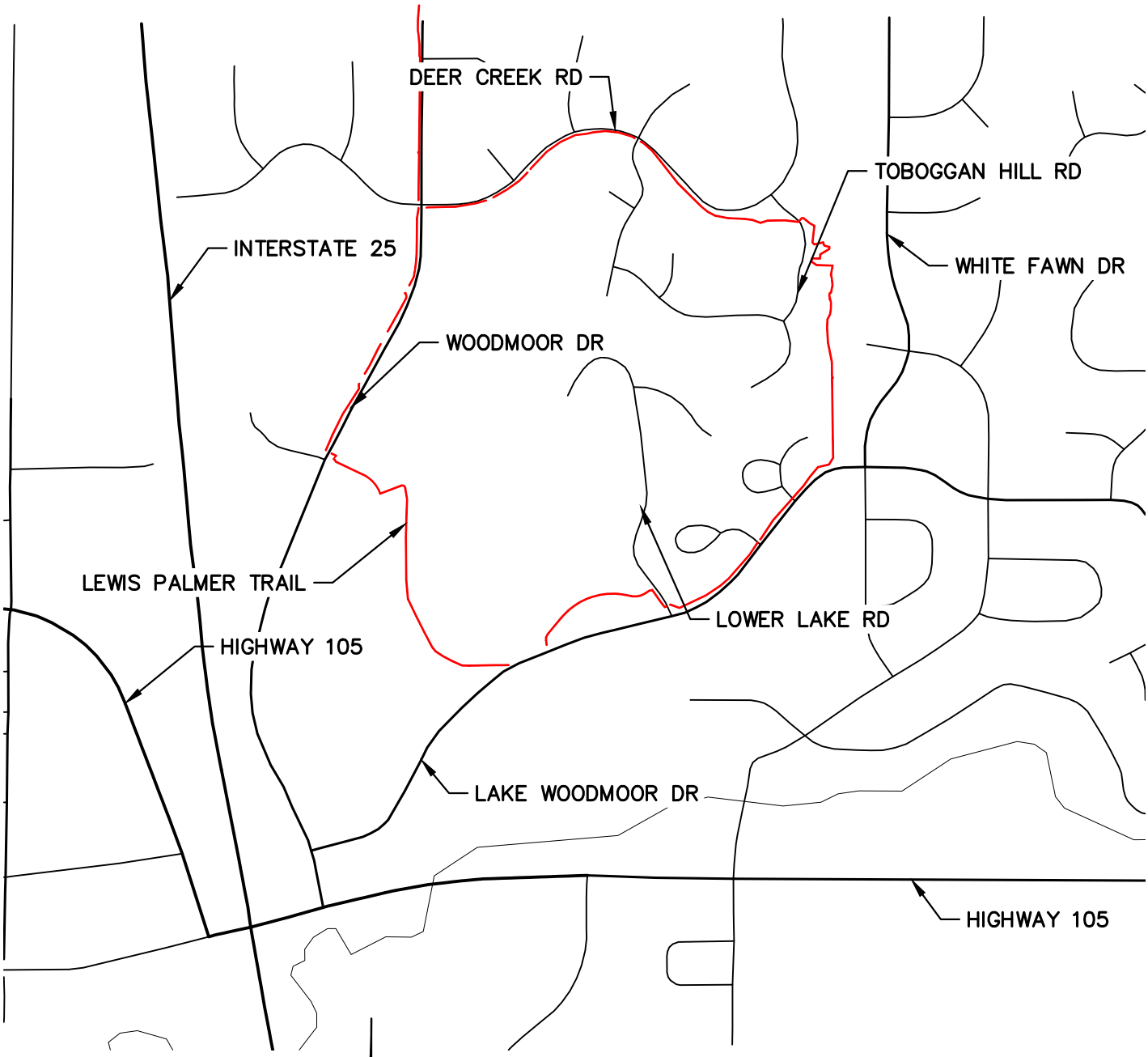
Drainage Fees

The site is located within the Dirty Woman Creek drainage basin. The drainage fee associated with the Dirty Woman Creek Drainage Basin is $21,134 per impervious acre, and the bridge fee is $1,156 per impervious acre. This project is not associated with any land development efforts, therefore, no fee is required at this time.

Conclusion

The proposed changes resulting from the trail will have minimal to no effect on the overall runoff conditions within each of the basins identified in Table 2, therefore no additional drainage improvements are needed other than the localized improvements associated with roadside ditches. The site runoff associated with the proposed project will not adversely affect the downstream developments or properties.

Appendix A



1000 500 0 1000 2000

ORIGINAL SCALE: 1" = 1000'

VICINITY MAP
LEWIS PALMER TRAIL
JOB NO. 25203.00
11/23/22
SHEET 1 OF 1

J·R ENGINEERING
A Westrian Company

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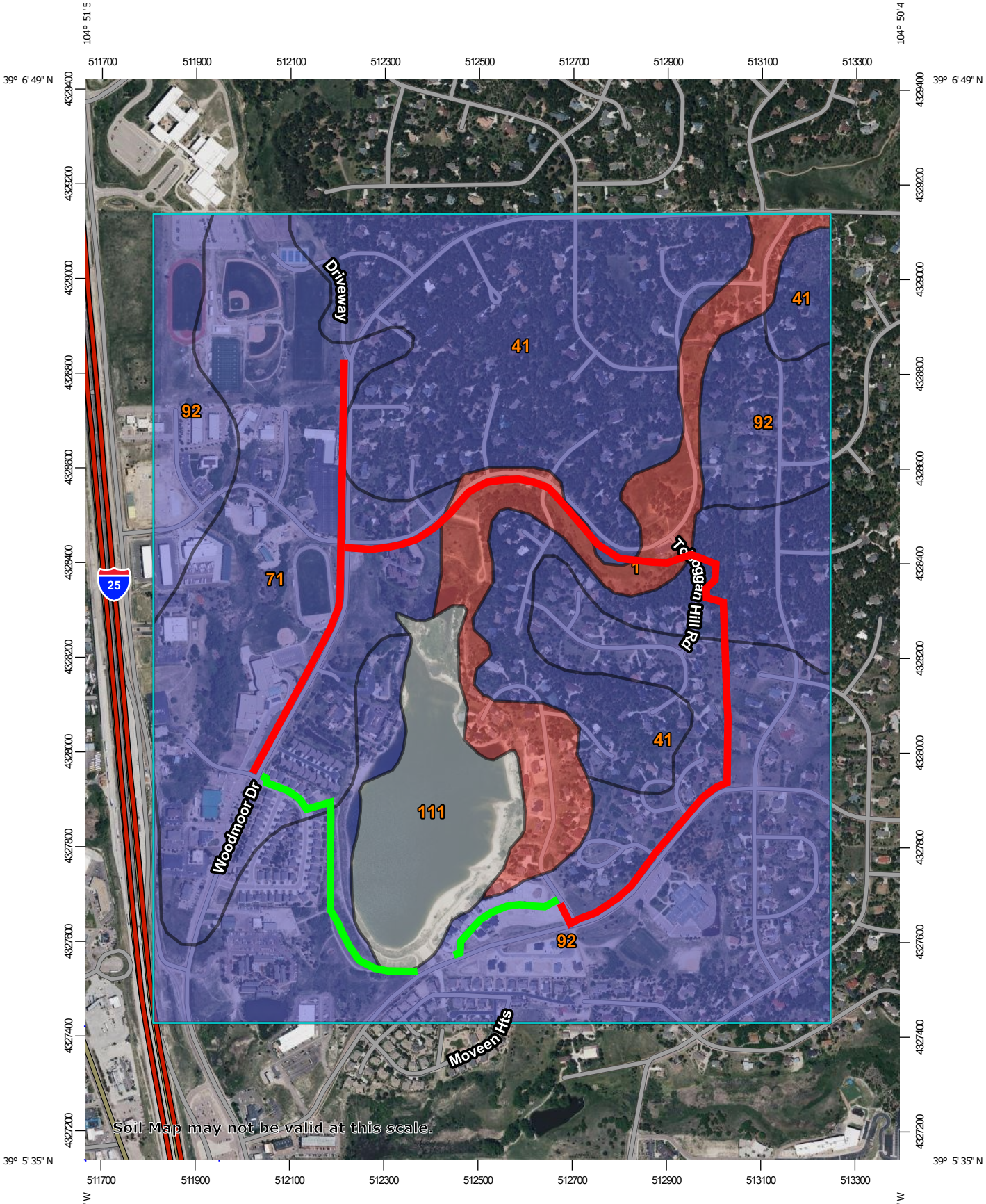
Fort Collins 970-491-9888 • www.jrengineering.com

Appendix B

TRAIL DISTURBANCE

TRAIL ON EXISTING CONCRETE OR MAINTENANCE ACCESS ROAD (NO DISTURBANCE)



MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

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 20, Sep 2, 2022

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

Date(s) aerial images were photographed: Jun 9, 2021—Jun 12, 2021

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.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
1	Alamosa loam, 1 to 3 percent slopes	D	49.5	8.1%
41	Kettle gravelly loamy sand, 8 to 40 percent slopes	B	172.3	28.3%
71	Pring coarse sandy loam, 3 to 8 percent slopes	B	130.6	21.5%
92	Tomah-Crowfoot loamy sands, 3 to 8 percent slopes	B	216.4	35.5%
111	Water		40.0	6.6%
Totals for Area of Interest			**608.9**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

NOTES TO USERS

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

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

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

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

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

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

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

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, MD 20910-3282

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

Base Map information shown on this FIRM was provided in digital format by El Paso County, Colorado Springs Utilities, City of Fountain, Bureau of Land Management, National Oceanic and Atmospheric Administration, United States Geological Survey, and Anderson Consulting Engineers, Inc. These data are current as of 2006.

This map reflects more detailed and up-to-date **stream channel configurations and floodplain delineations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map. The profile baselines depicted on this map represent the hydraulic modeling baselines that match the flood profiles and Floodway Data Tables if applicable, in the FIS report. As a result, the profile baselines may deviate significantly from the new base map channel representation and may appear outside of the floodplain.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

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

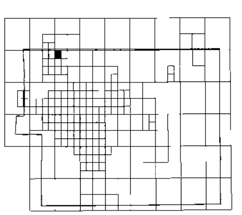
Contact **FEMA Map Service Center** (MSC) via the FEMA Map Information eXchange (FMIX) 1-877-336-2627 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this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

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

El Paso County Vertical Datum Offset Table

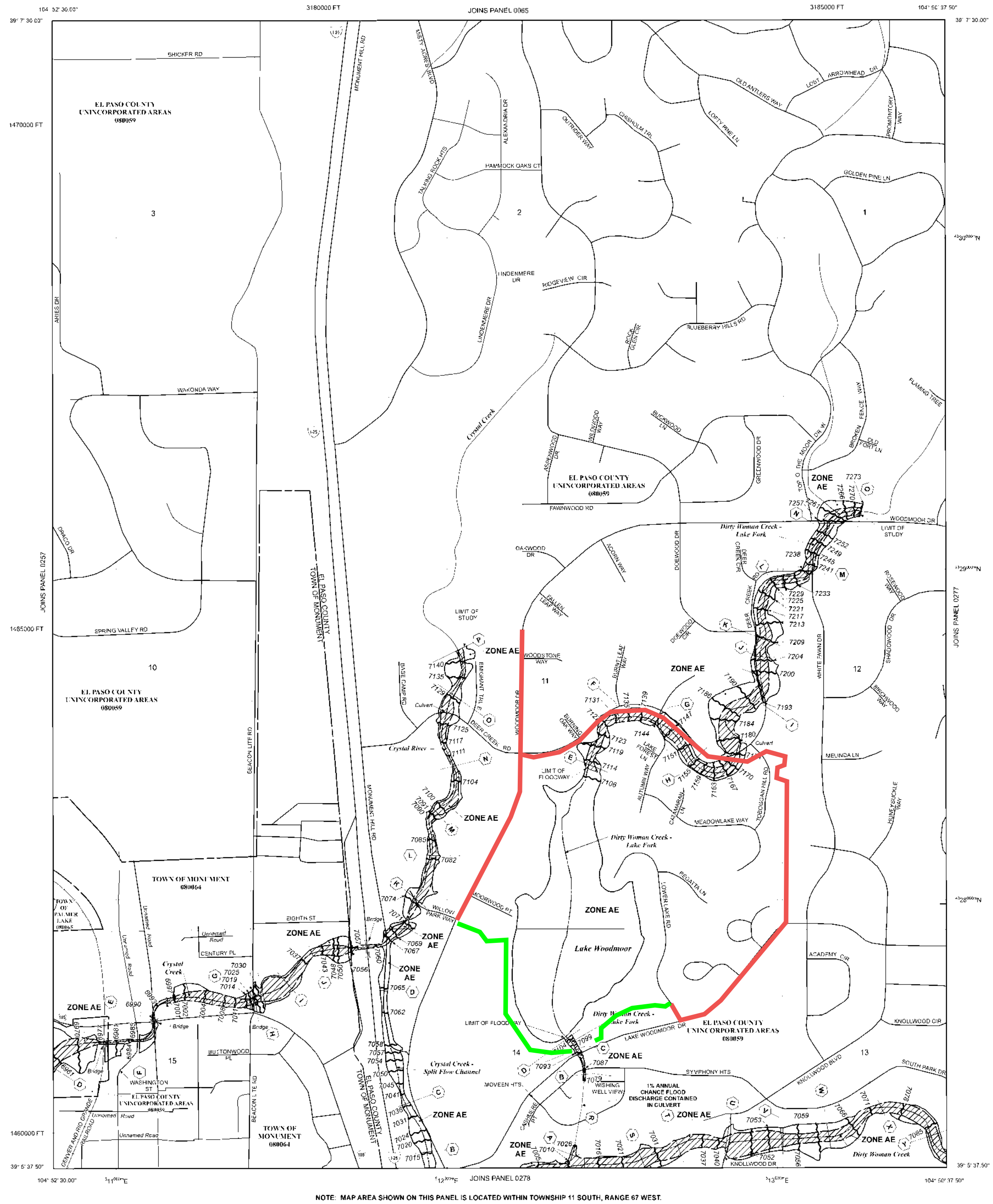
Flooding Source	Vertical Datum Offset (ft)
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION	

Panel Location Map



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

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



NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 11 SOUTH, RANGE 67 WEST.

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAS) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A No Base Flood Elevations determined.
ZONE AE Base Flood Elevations determined.
ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99 Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

Floodplain boundary
Floodway boundary
Zone D Boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
513 Base Flood Elevation line and value; elevation in feet*
(EL 987) Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

(A)——(A) Cross section line
(23)- - - -(23) Transect line
97° 07' 30.00", 32° 22' 30.00" Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
$^{42}76^{000m}$N 1000 meter Universal Transverse Mercator grid ticks, zone 13
6000000 FT 5000 foot grid ticks: Colorado State Plane coordinate system, central zone (FIPSZONE 0502), Lambert Conformal Conic Projection
DX5510 × Bench mark (see explanation in Notes to Users section of this FIRM panel)
• M1.5 River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
MARCH 17, 1997

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
DECEMBER 7, 2018 - to update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

For community map revision history prior to countywide mapping, refer to the Community Map History Table located in the Flood Insurance Study report for this jurisdiction.

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

MAP SCALE 1" = 500'
250 0 500 1000 FEET
150 0 150 300 METERS

NFIP

PANEL 0276G

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP
EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 276 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
EL PASO COUNTY	080059	0276	G
MONUMENT, TOWN OF	080064	0276	G
PALMER LAKE, TOWN OF	080065	0276	G

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

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
08041C0276G

MAP REVISED
DECEMBER 7, 2018

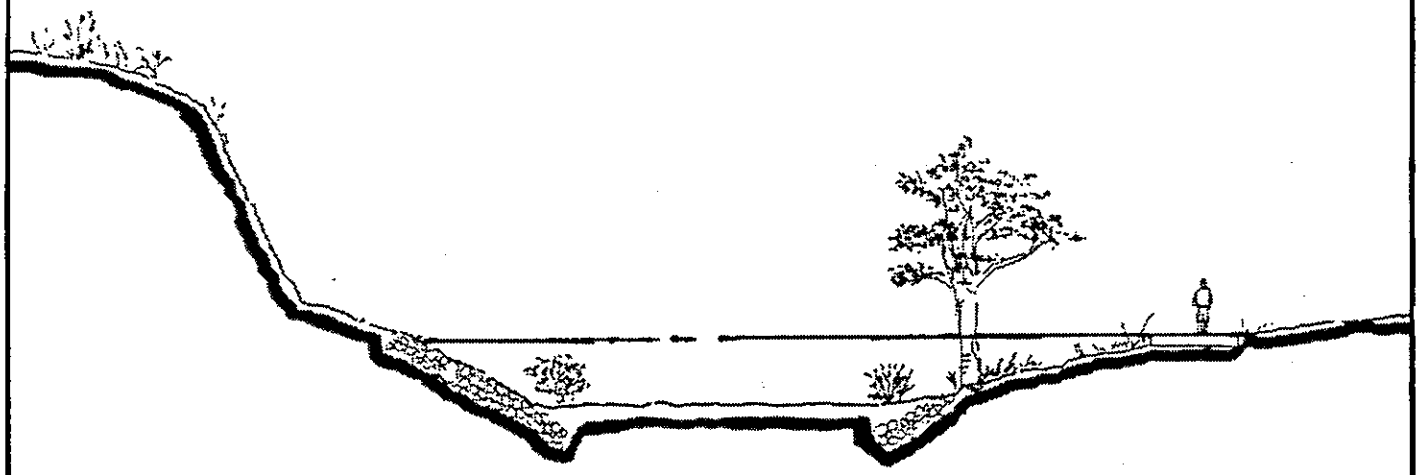
Federal Emergency Management Agency

TRAIL DISTURBANCE
TRAIL ON EXISTING CONCRETE OR MAINTENANCE ACCESS ROAD (NO DISTURBANCE)

Appendix C

Drainage Basin Planning Study

Dirty Woman Creek and Crystal Creek
El Paso County, Colorado



Prepared for:

El Paso County Department of Public Works
3105 North Stone
Colorado Springs, Colorado 80907

Prepared by:

Kiowa Engineering Corporation
419 West Bijou
Colorado Springs, Colorado 80905

September, 1993

TABLE 1
Summary of Sub-basin Peak Discharges

Basin Designation	Future 100 Year 2 Hour	Future 10 Year 2 Hour	Basin Designation	Future 100 Year 2 Hour	Future 10 Year 2 Hour	Basin Designation	Future 100 Year 2 Hour	Future 10 Year 2 Hour
SDW01	147	49	DWC79	118	42	CC157	111	46
SDW03	90	31	LDW81	136	54	CC159	22	9
SDW05	120	40	LDW83	74	28	CC161	132	57
SDW07	91	38	LDW85	47	18	CC163	127	51
UDW09	103	34	LDW87	112	43	CC165	121	52
UDW11	57	20	LDW89	94	35	CC167	116	49
UDW13	32	12	LDW91	26	10	CC169	119	37
UDW15	76	25	LDW93	46	18	CC171	90	40
UDW17	26	9	LDW95	53	20	CC173	56	24
UDW19	33	11	LDW97	50	19	CC175	46	15
UDW21	47	16	LDW99	57	25	CC177	89	32
UDW23	24	8	LDW101	170	66	CC179	42	13
UDW25	44	15	LDW103	136	50	CC181	49	15
UDW27	80	29	LDW105	95	38	CC183	136	50
UDW29	80	27	LDW107	47	18	CC185	111	36
UDW31	82	35	LDW109	131	53	CC187	96	37
MDW33	131	47	LDW111	215	89	CC189	64	23
MDW35	33	11	DWC113	44	15			
MDW37	81	29	DWC115	91	40			
MDW39	116	46	DWC117	198	84			
NDW41	146	56	DWC119	72	31			
NDW43	61	23	DWC121	211	88			
NDW45	87	33	DWC123	77	34			
NDW47	62	23	DWC125	73	31			
NDW49	14	5	DWC127	102	32			
NDW51	32	12	DWC129	137	58			
NDW53	17	6	DWC131	58	18			
NDW55	18	7	DWC133	102	38			
NDW57	153	57	DWC135	81	26			
NDW59	129	50	DWC137	65	25			
DWC61	76	29	DWC139	117	47			
DWC63	130	50	DWC141	79	32			
DWC65	59	23	DWC143	101	38			
DWC67	42	15	CC145	89	33			
DWC69	41	17	CC147	103	35			
DWC71	72	29	CC149	69	22			
DWC73	81	30	CC151	114	38			
DWC75	153	61	CC153	77	29			
DWC77	50	19	CC155	43	19			

Impacted Basins

APPENDIX TABLE 1
Summary of Sub-basin Hydrologic Data

Basin Designation	Area (Acres)	Curve Number	Tc (min)	Basin Designation	Area (Acres)	Curve Number	Tc (min)	Basin Designation	Area (Acres)	Curve Number	Tc (min)
SDW01	119.6	82	39.2	DWC79	78.1	84	32.9	CC157	56.5	88	29.9
SDW03	60.0	83	28.6	LDW81	54.6	86	12.9	CC159	7.8	88	11.6
SDW05	69.7	82	17.5	LDW83	40.5	85	23.8	CC161	47.2	88	12.0
SDW07	37.7	88	18.3	LDW85	24.2	86	24.0	CC163	47.5	86	9.7
UDW09	61.2	82	19.3	LDW87	65.3	86	31.7	CC165	43.2	88	12.0
UDW11	27.2	83	12.6	LDW89	61.8	85	35.8	CC167	45.9	88	16.8
UDW13	18.6	84	23.4	LDW91	11.6	86	16.5	CC169	67.6	80	9.4
UDW15	62.0	82	39.7	LDW93	21.1	86	17.8	CC171	27.3	88	5.5
UDW17	19.6	82	33.3	LDW95	28.7	85	22.9	CC173	20.1	88	11.5
UDW19	23.0	83	32.7	LDW97	17.8	85	6.5	CC175	22.4	82	9.5
UDW21	21.1	83	9.3	LDW99	21.1	88	14.5	CC177	45.6	84	17.2
UDW23	11.9	83	13.8	LDW101	79.9	86	19.7	CC179	37.2	80	37.9
UDW25	33.6	83	39.6	LDW103	81.2	85	29.1	CC181	24.1	80	5.5
UDW27	42.4	84	19.5	LDW105	51.7	87	30.2	CC183	54.3	84	8.2
UDW29	51.1	83	26.8	LDW107	26.8	85	26.7	CC185	53.0	82	8.9
UDW31	30.5	88	14.6	LDW109	55.9	87	17.1	CC187	47.6	86	22.1
MDW33	90.8	84	35.5	LDW111	122.0	88	37.3	CC189	30.6	83	12.2
MDW35	18.1	83	18.6	DWC113	19.6	83	9.0				
MDW37	56.1	84	36.2	DWC115	27.7	88	7.7				
MDW39	58.6	87	26.8	DWC117	79.2	88	17.1				
NDW41	61.8	85	11.0	DWC119	28.2	88	16.6				
NDW43	37.1	85	30.7	DWC121	98.4	88	24.2				
NDW45	56.4	86	39.8	DWC123	21.5	88	3.8				
NDW47	31.2	85	20.4	DWC125	30.2	88	18.6				
NDW49	7.1	85	18.8	DWC127	57.6	81	13.8				
NDW51	23.8	84	40.5	DWC129	58.7	88	20.8				
NDW53	7.5	85	14.7	DWC131	33.7	80	11.8				
NDW55	6.4	85	6.1	DWC133	48.5	85	16.5				
NDW57	89.0	85	27.8	DWC135	54.5	82	26.3				
NDW59	69.2	86	26.9	DWC137	33.9	86	25.2				
DWC61	43.4	86	29.6	DWC139	50.6	87	17.4				
DWC63	81.7	86	36.4	DWC141	29.3	87	10.9				
DWC65	34.4	86	31.7	DWC143	40.2	85	9.7				
DWC67	26.2	85	33.3	CC145	54.8	85	32.0				
DWC69	13.1	87	7.2	CC147	68.8	83	28.8				
DWC71	31.9	87	19.3	CC149	52.1	81	29.1				
DWC73	48.5	85	29.7	CC151	87.6	82	35.0				
DWC75	60.5	86	10.8	CC153	34.0	85	14.2				
DWC77	30.1	85	29.7	CC155	15.5	88	11.3				

Impacted Basins

TRAIL DISTURBANCE

TRAIL ON EXISTING CONCRETE OR MAINTENANCE ACCESS ROAD (NO DISTURBANCE)

PROJECT AREA

LEGEND

- MAJOR BASIN BOUNDARY
- MAJOR TRIBUTARY BOUNDARY
- SUB-BASIN BOUNDARY
- DRAINAGEWAY
- CC 169 — BASIN DESIGNATION
- 55 — DESIGN POINT

N

0' 250' 500' 750' 1,000' 1,250' 1,500'
SCALE IN FEET

PROJECT No. 91.07.17

DIRTY WOMAN/CRYSTAL CREEK DRAINAGE BASIN PLANNING STUDY EL PASO COUNTY, COLORADO

HYDROLOGIC BASIN MAP

Kiowa Engineering Corporation