

Letter Report

**DRAINAGE EASEMENT ANALYSIS  
FOR  
7950 MALLARD DRIVE**

August 2018

Prepared for:

Albert Wills  
8605 Explorer Drive, #250  
Colorado Springs, CO 80920

Prepared By:

  
321 W. Henrietta Ave, Suite A  
Woodland Park, CO 80863  
719-426-2124

DRAINAGE EASEMENT ANALYSIS  
7950 MALLARD DRIVE

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

**Certification Statement:**

This report and plan for the preliminary and final drainage design for the 7950 MALLARD DRIVE was prepared by me (or under my direct supervision) in accordance with the provisions of City of Colorado Springs/El Paso County Drainage Criteria Manual Volumes 1 and 2 Drainage Design and Technical Criteria for the owners thereof. I understand that El Paso County does not and will not assume liability for drainage facilities designed by others.

\_\_\_\_\_  
David L. Mijares, Colorado PE #40510  
For and on behalf of Catamount Engineering

\_\_\_\_\_  
Date

**Developer's Statement:**

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

CHAD WOLF hereby certifies that the drainage facilities for 7950 MALLARD DRIVE shall be constructed according to the design presented in this report. I understand that El Paso County does not and will not assume liability for the drainage facilities designed and or certified by my engineer and that the El Paso County reviews drainage plans pursuant to Colorado Revised Statutes, Title 30, Article 28; but cannot, on behalf of 7950 MALLARD DRIVE, guarantee that final drainage design review will absolve CHAD WOLF and/or their successors and/or assigns of future liability for improper design. I further understand that approval of the final plat does not imply approval of my engineer's drainage design.

\_\_\_\_\_  
Chad James Wolf  
Business Name

By: \_\_\_\_\_

Title: \_\_\_\_\_

Address: \_\_\_\_\_  
7860 Old Brook Circle S.

\_\_\_\_\_  
Colorado Springs, CO 80917

Conditions:

If improvements are necessary  
then construction drawings/GEC  
plan are required.

# **DRAINAGE EASEMENT ANALYSIS for 7950 MALLARD DRIVE**

## **PURPOSE**

The purpose of this drainage report is to identify a drainage easement width within a tributary of the Bennet Ranch Basin through an existing residential lot. Zone A 'unstudied' floodplain was removed from the parcel with LOMR Case number 12-08-0659P effective July 12, 2013. The LOMR identified a diversion along the western roadway embankment of State Highway 24 conveying flows south to the main stem of the Bennet Ranch Basin limiting flows conveyed within the site. With removal of Zone A floodplain on the parcel El Paso County has requested that a drainage easement be established for the tributary reach within the parcel.

## **GENERAL LOCATION AND DESCRIPTION**

The subject 5.30 acres is proposed to be replatted in order to remove the Zone A floodplain restrictions indicated in the original plat. The platted lot is located within a portion of Section 5, Township 13 South, Range 64 West of the 6<sup>th</sup> principal meridian El Paso County, Colorado. The parcel is bounded on the east by Mallard Drive (gravel roadway) and to north, south, and west by rural residential lots.

The site is sparsely vegetated with native grasses. The existing terrain generally slopes to the south and southeast at a 1.5% grade. The existing unimproved reach of the Bennet Ranch tributary runs through the central portion of the property from north to south. The site lies within the Bennet Ranch Basin.

Soils in the development parcel consist of Columbine gravelly sandy loam a Hydrologic Group 'A' soil, as determined by the Natural Resources Conservation Service Web Soil Survey. Hydrologic Group A soils were used in analysis.

No portion of the development lies within an F.E.M.A. designated floodplain, per FIRM 08041C0575 F, as revised to reflect LOMR Case No12-08-0659P. The revised F.E.M.A. Flood Insurance Rate Map and LOMR determination have been provided in the appendix.

## **DRAINAGE EASEMENT DEVELOPMENT**

### **Existing conditions?**

Upstream hydrology was developed utilizing USGS STREAMSTATS Application Version 4.2.1. The application identified a tributary drainage area of 0.22 square miles within the drainage basin tributary to the reach yielding a 100-YR peak flow of  $Q_{100}=49.9$  cfs. The application indicated inclusion of the reach of the tributary north of State Highway 24. As a check a rational analysis was developed for the portion of the reach south of State Highway 24. The rational analysis for the 55 acres south of highway 24 indicated a peak flow of  $Q_{100}=48.1$  cfs. Rational analysis was primarily developed for development of storm sewer system and peak flow analysis developed over large rural areas within natural streamways would yield

**Why not for the contributing  
area to the north as well?**

conservative results. A design flow of 50 CFS was utilized in developing easement width analysis.

A HEC-RAS model was developed to analyze flow within the reach crossing the property. The model indicated that the existing natural section is inadequate to convey modeled flow through the reach. A 6.0' bottom width section with 12:1 side slopes was modeled as adequate to convey the flows at a 0.8% longitudinal slope through the parcel. Flows will be conveyed in the main channel at a maximum depth of approximately 1.1'. Development of the excavated channel will require a 40' width drainage easement.

See Appendix for Calculations.

### **DRAINAGE FEE CALCULATION**

The development proposes to replat 5.30 acres within El Paso County, all contained within the Bennet Ranch Drainage Basin. No fees are due with replat.

### **DRAINAGE METHODOLOGY**

This drainage report was prepared in accordance to the criteria established in the City of Colorado Springs/El Paso County Drainage Criteria Manual Volumes 1 and 2, as revised May 2014.

USGS STREAMSTATS Application Version 4.2.1 was utilized in developing upstream flows within the reach of the Bennet Ranch Basin tributary. Rational method for drainage basin study areas of less than 100 acres was also developed in the analysis. For the Rational Method, flows were calculated for the 5 and 100-year recurrence intervals. The average runoff coefficients, 'C' values, are taken from Table 6-6 and the Intensity-Duration-Frequency curves are taken from Figure 6-5 of the City Drainage Criteria Manual. Time of concentration for overland flow and channel flow are calculated per Section 3.2 of the City Drainage Criteria Manual. Calculations for the Rational Method are shown in the Appendix of this report.

HEC-RAS Version 5.0.1 Was utilized in hydraulic analysis of the proposed developed reach through the property. Alignment and section geometry were developed from an existing conditions survey developed by Barron Land Surveys dated July 26, 2018. Roughness Coefficients were taken from the DCM Volume 1, Chapter 9, Table 12-2.

### **SUMMARY**

Anticipated 100-YR flows can be conveyed in the proposed design section contained within a 40' drainage easement across the existing parcel. The 40' drainage/no-build easement will be indicated on the plat.

**REFERENCES:**

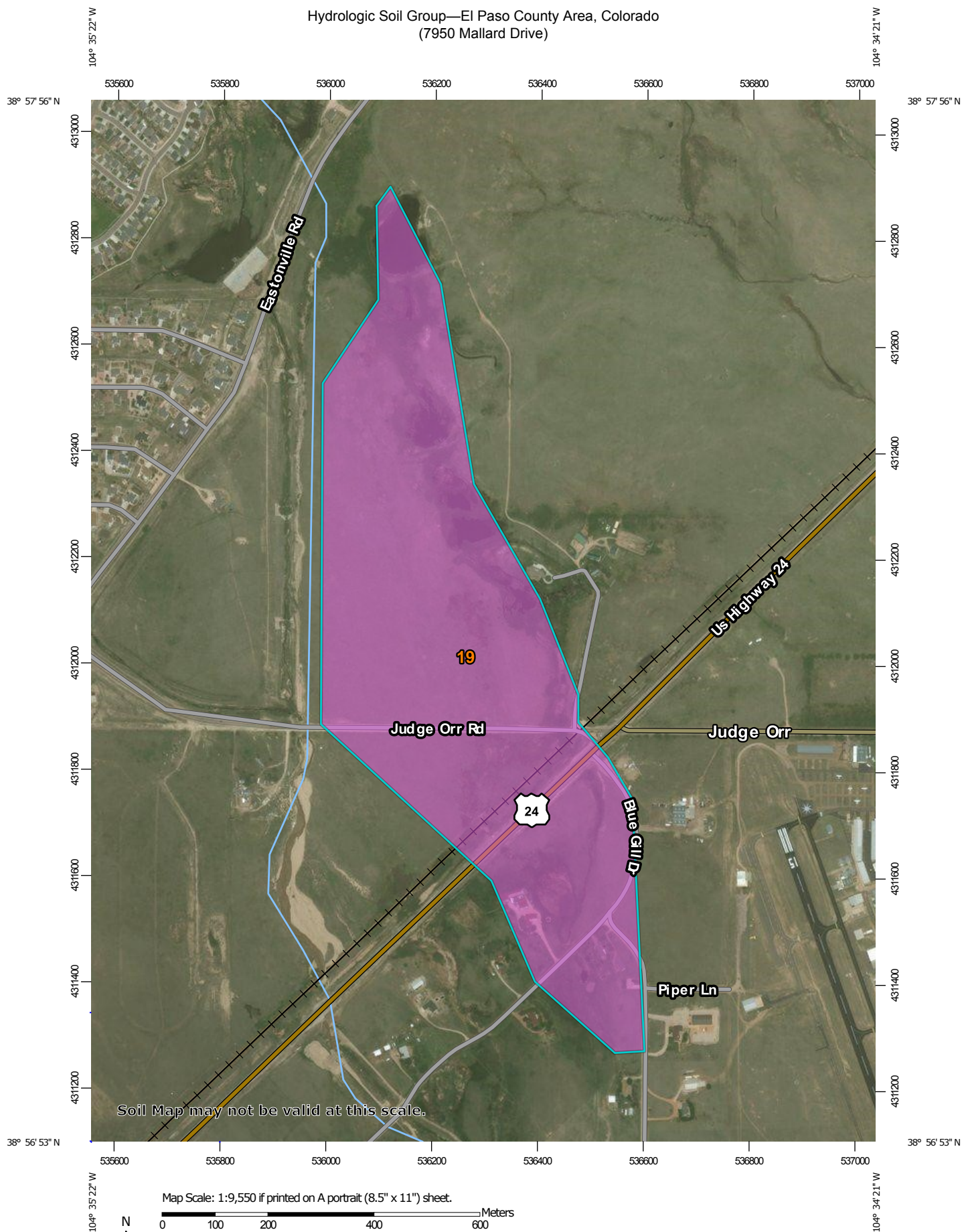
City of Colorado Springs Engineering Division Drainage Criteria Manual Volumes 1 and 2, revised May 2014

Flood Insurance rate map 08041C0575 F, as revised to reflect LOMR Case No. 16-08-1065P

Natural Resources Conservation Service Web Soil Survey

## APPENDIX

# Hydrologic Soil Group—El Paso County Area, Colorado (7950 Mallard Drive)




**Natural Resources  
Conservation Service**

Web Soil Survey  
National Cooperative Soil Survey

8/25/2018  
Page 1 of 4

## 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 15, Oct 10, 2017

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.



## Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
19	Columbine gravelly sandy loam, 0 to 3 percent slopes	A	115.0	100.0%
<b>Totals for Area of Interest</b>			<b>115.0</b>	<b>100.0%</b>

## 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*



# Federal Emergency Management Agency

Washington, D.C. 20472

## LETTER OF MAP REVISION DETERMINATION DOCUMENT

COMMUNITY AND REVISION INFORMATION		PROJECT DESCRIPTION	BASIS OF REQUEST
COMMUNITY	El Paso County Colorado (Unincorporated Areas)	CHANNELIZATION CULVERT DETENTION BASIN EXCAVATION	HYDRAULIC ANALYSIS HYDROLOGIC ANALYSIS NEW TOPOGRAPHIC DATA
	COMMUNITY NO.: 080059		
IDENTIFIER	State Highway 274 Channel Improvements	APPROXIMATE LATITUDE & LONGITUDE: 38.950, -104.584 SOURCE: Precision Mapping Streets      DATUM: NAD 83	
ANNOTATED MAPPING ENCLOSURES		ANNOTATED STUDY ENCLOSURES	
TYPE: FIRM*      NO.: 08041C0575F      DATE: March 17, 1997		DATE OF EFFECTIVE FLOOD INSURANCE STUDY: August 23, 1999 PROFILE(S): 382P, 383P SUMMARY OF DISCHARGES TABLE: 3	

Enclosures reflect changes to flooding sources affected by this revision.

\* FIRM - Flood Insurance Rate Map; \*\* FBFM - Flood Boundary and Floodway Map; \*\*\* FHBM - Flood Hazard Boundary Map

Black Squirrel Creek West Fork Bennett Ranch Basin- from approximately 3,280 feet downstream of State Highway 24 to just upstream of Cadillac and Lake City Rail Road.

East Tributary to Black Squirrel Creek West Fork Bennett Ranch Basin - from the confluence to approximately 2,150 feet upstream of the confluence with Black Squirrel Creek West Fork Bennett Ranch Basin

SUMMARY OF REVISIONS				
Flooding Source	Effective Flooding	Revised Flooding	Increases	Decreases
Black Squirrel Creek West Fork Bennett Ranch Basin	Zone A	Zone AE	YES	YES
	No BFEs*	BFEs	YES	NONE
East Tributary to Black Squirrel Creek West Fork Bennett Ranch Basin	Zone X (unshaded)	Zone AE	YES	NONE
	Zone A	Zone X (unshaded)	NONE	YES

\* BFEs - Base Flood Elevations

## DETERMINATION

This document provides the determination from the Department of Homeland Security's Federal Emergency Management Agency (FEMA) regarding a request for a Letter of Map Revision (LOMR) for the area described above. Using the information submitted, we have determined that a revision to the flood hazards depicted in the Flood Insurance Study (FIS) report and/or National Flood Insurance Program (NFIP) map is warranted. This document revises the effective NFIP map, as indicated in the attached documentation. Please use the enclosed annotated map panels revised by this LOMR for floodplain management purposes and for all flood insurance policies and renewals in your community.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Information eXchange (FMIX) toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 847 South Pickett Street, Alexandria, VA 22304-4605. Additional Information about the NFIP is available on our website at <http://www.fema.gov/business/nfip>.

*Erin E. Cobb*

Erin E. Cobb, CFM, Program Specialist  
Engineering Management Branch  
Federal Insurance and Mitigation Administration

132942 PT202.BKR.12080659PH20

102-I-A-C



# Federal Emergency Management Agency

Washington, D.C. 20472

## LETTER OF MAP REVISION DETERMINATION DOCUMENT (CONTINUED)

### OTHER FLOODING SOURCES AFFECTED BY THIS REVISION

#### FLOODING SOURCE(S) & REVISED REACH(ES)

East Tributary to Black Squirrel Creek West Fork Bennett Ranch Basin- from the confluence to approximately 2,150 feet upstream of the confluence with Black Squirrel Creek West Fork Bennett Ranch Basin

#### SUMMARY OF REVISIONS

Flooding Source	Effective Flooding	Revised Flooding	Increases	Decreases
East Tributary to Black Squirrel Creek West Fork Bennett Ranch Basin	No BFEs*	BFEs	YES	NONE

\* BFEs - Base Flood Elevations

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Information eXchange (FMIX) toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 847 South Pickett Street, Alexandria, VA 22304-4605. Additional Information about the NFIP is available on our website at <http://www.fema.gov/business/nfip>.

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132942 PT202.BKR.12080659PH20

102-I-A-C





# Federal Emergency Management Agency

Washington, D.C. 20472

## LETTER OF MAP REVISION DETERMINATION DOCUMENT (CONTINUED)

### COMMUNITY INFORMATION

#### APPLICABLE NFIP REGULATIONS/COMMUNITY OBLIGATION

We have made this determination pursuant to Section 206 of the Flood Disaster Protection Act of 1973 (P.L. 93-234) and in accordance with the National Flood Insurance Act of 1968, as amended (Title XIII of the Housing and Urban Development Act of 1968, P.L. 90-448), 42 U.S.C. 4001-4128, and 44 CFR Part 65. Pursuant to Section 1361 of the National Flood Insurance Act of 1968, as amended, communities participating in the NFIP are required to adopt and enforce floodplain management regulations that meet or exceed NFIP criteria. These criteria, including adoption of the FIS report and FIRM, and the modifications made by this LOMR, are the minimum requirements for continued NFIP participation and do not supersede more stringent State/Commonwealth or local requirements to which the regulations apply.

NFIP regulations Subparagraph 60.3(b)(7) requires communities to ensure that the flood-carrying capacity within the altered or relocated portion of any watercourse is maintained. This provision is incorporated into your community's existing floodplain management ordinances; therefore, responsibility for maintenance of the altered or relocated watercourse, including any related appurtenances such as bridges, culverts, and other drainage structures, rests with your community. We may request that your community submit a description and schedule of maintenance activities necessary to ensure this requirement.

#### COMMUNITY REMINDERS

We based this determination on the 1-percent-annual-chance discharges computed in the submitted hydrologic model. Future development of projects upstream could cause increased discharges, which could cause increased flood hazards. A comprehensive restudy of your community's flood hazards would consider the cumulative effects of development on discharges and could, therefore, indicate that greater flood hazards exist in this area.

Your community must regulate all proposed floodplain development and ensure that permits required by Federal and/or State/Commonwealth law have been obtained. State/Commonwealth or community officials, based on knowledge of local conditions and in the interest of safety, may set higher standards for construction or may limit development in floodplain areas. If your State/Commonwealth or community has adopted more restrictive or comprehensive floodplain management criteria, those criteria take precedence over the minimum NFIP requirements.

We will not print and distribute this LOMR to primary users, such as local insurance agents or mortgage lenders; instead, the community will serve as a repository for the new data. We encourage you to disseminate the information in this LOMR by preparing a news release for publication in your community's newspaper that describes the revision and explains how your community will provide the data and help interpret the NFIP maps. In that way, interested persons, such as property owners, insurance agents, and mortgage lenders, can benefit from the information.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Information eXchange (FMIX) toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 847 South Pickett Street, Alexandria, VA 22304-4605. Additional Information about the NFIP is available on our website at <http://www.fema.gov/business/nfip>.

A handwritten signature in cursive script that reads "Erin E. Cobb".

Erin E. Cobb, CFM, Program Specialist  
Engineering Management Branch  
Federal Insurance and Mitigation Administration



# Federal Emergency Management Agency

Washington, D.C. 20472

## LETTER OF MAP REVISION DETERMINATION DOCUMENT (CONTINUED)

We have designated a Consultation Coordination Officer (CCO) to assist your community. The CCO will be the primary liaison between your community and FEMA. For information regarding your CCO, please contact:

Ms. Jeanine D. Petterson  
Director, Mitigation Division  
Federal Emergency Management Agency, Region VIII  
Denver Federal Center, Building 710  
P.O. Box 25267  
Denver, CO 80225-0267  
(303) 235-4830

### STATUS OF THE COMMUNITY NFIP MAPS

We will not physically revise and republish the FIRM and FIS report for your community to reflect the modifications made by this LOMR at this time. When changes to the previously cited FIRM panel and FIS report warrant physical revision and republication in the future, we will incorporate the modifications made by this LOMR at that time.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Information eXchange (FMIX) toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 847 South Pickett Street, Alexandria, VA 22304-4605. Additional Information about the NFIP is available on our website at <http://www.fema.gov/business/nfip>.

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Erin E. Cobb, CFM, Program Specialist  
Engineering Management Branch  
Federal Insurance and Mitigation Administration





# Federal Emergency Management Agency

Washington, D.C. 20472

## LETTER OF MAP REVISION DETERMINATION DOCUMENT (CONTINUED)

### PUBLIC NOTIFICATION OF REVISION

#### PUBLIC NOTIFICATION

A notice of changes will be published in the *Federal Register*. This information also will be published in your local newspaper on or about the dates listed below and through FEMA's Flood Hazard Mapping website at [https://www.floodmaps.fema.gov/fhm/Scripts/bfe\\_main.asp](https://www.floodmaps.fema.gov/fhm/Scripts/bfe_main.asp).

LOCAL NEWSPAPER      Name: *The Gazette*  
Dates: March 7, 2013 and March 14, 2013

Within 90 days of the second publication in the local newspaper, a citizen may request that we reconsider this determination. Any request for reconsideration must be based on scientific or technical data. Therefore, this letter will be effective only after the 90-day appeal period has elapsed and we have resolved any appeals that we receive during this appeal period. Until this LOMR is effective, the revised flood hazard determination information presented in this LOMR may be changed.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Information eXchange (FMIX) toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 847 South Pickett Street, Alexandria, VA 22304-4605. Additional Information about the NFIP is available on our website at <http://www.fema.gov/business/nfip>.

A handwritten signature in cursive script that reads "Erin E. Cobb".

Erin E. Cobb, CFM, Program Specialist  
Engineering Management Branch  
Federal Insurance and Mitigation Administration

Table 3. Summary of Discharges

Flooding Source and Location	Drainage Area (square miles)	Peak Discharges (cubic feet per second)		
		10-Year	50-Year	100-Year
Bear Creek				500-Year
At confluence with Fountain Creek	10.7	1,140	2,940	4,140
8,200				
Beckers Lane Tributary				
At confluence with Fountain Creek	0.85	312	657	784
1,152				
Big Valley				
Above Confluence with Dry Creek	0.29	-- <sup>1</sup>	-- <sup>1</sup>	529
687				
Black Forest Creek				
At Interstate 25	1.97	-- <sup>1</sup>	-- <sup>1</sup>	2,090
-- <sup>1</sup>				
Approximately 4,050 feet downstream of				
The confluence with Baptist Road Tributary	1.46	-- <sup>1</sup>	-- <sup>1</sup>	1,520
-- <sup>1</sup>				
At Gleneagle Drive	0.57	-- <sup>1</sup>	-- <sup>1</sup>	630
-- <sup>1</sup>				
Black Forest Creek – Baptist Road Tributary				
At confluence with Black Forest Creek	1.14	-- <sup>1</sup>	-- <sup>1</sup>	1,230
-- <sup>1</sup>				
Black Forest Creek – Middle Tributary				
At confluence with Black Forest Creek	0.48	-- <sup>1</sup>	-- <sup>1</sup>	315
-- <sup>1</sup>				
Black Forest Creek West Fork Bennett Ranch Basin				
Approximately 6,970 feet upstream of Falcon Drive	5.18	-- <sup>1</sup>	-- <sup>1</sup>	1,073
-- <sup>1</sup>				
East Tributary to Black Forest Creek West Fork				
Bennett Ranch Basin at Black Forest Creek West				
Fork Bennett Ranch Basin	0.40	-- <sup>1</sup>	-- <sup>1</sup>	230
-- <sup>1</sup>				
Butler Canyon <sup>2</sup>	0.5	880	1,740	2,260
4,270				
Calhan Main Channel				
At Melasky Road	3.04	706	1,508	1,862
2,980				
At Highway 24	2.55	587	1,255	1,556
2,506				
At confluence with Calhan East Tributary	2.15	491	1,052	1,305
2,105				
Calhan East Tributary	0.28	71	151	186
297				
Calhan Fairground Tributary	0.08	20	44	55
88				
Camp Creek				
At confluence with Fountain Creek	10.26	30 <sup>3</sup>	1,800 <sup>3</sup>	2,680 <sup>3</sup>
5,810 <sup>3</sup>				
At Bijou Street	10.26	1,790	3,800	4,700
7,900				
Upstream of north end of 31st Street	9.41	1,750	3,700	4,600
7,600				

REVISED  
DATA

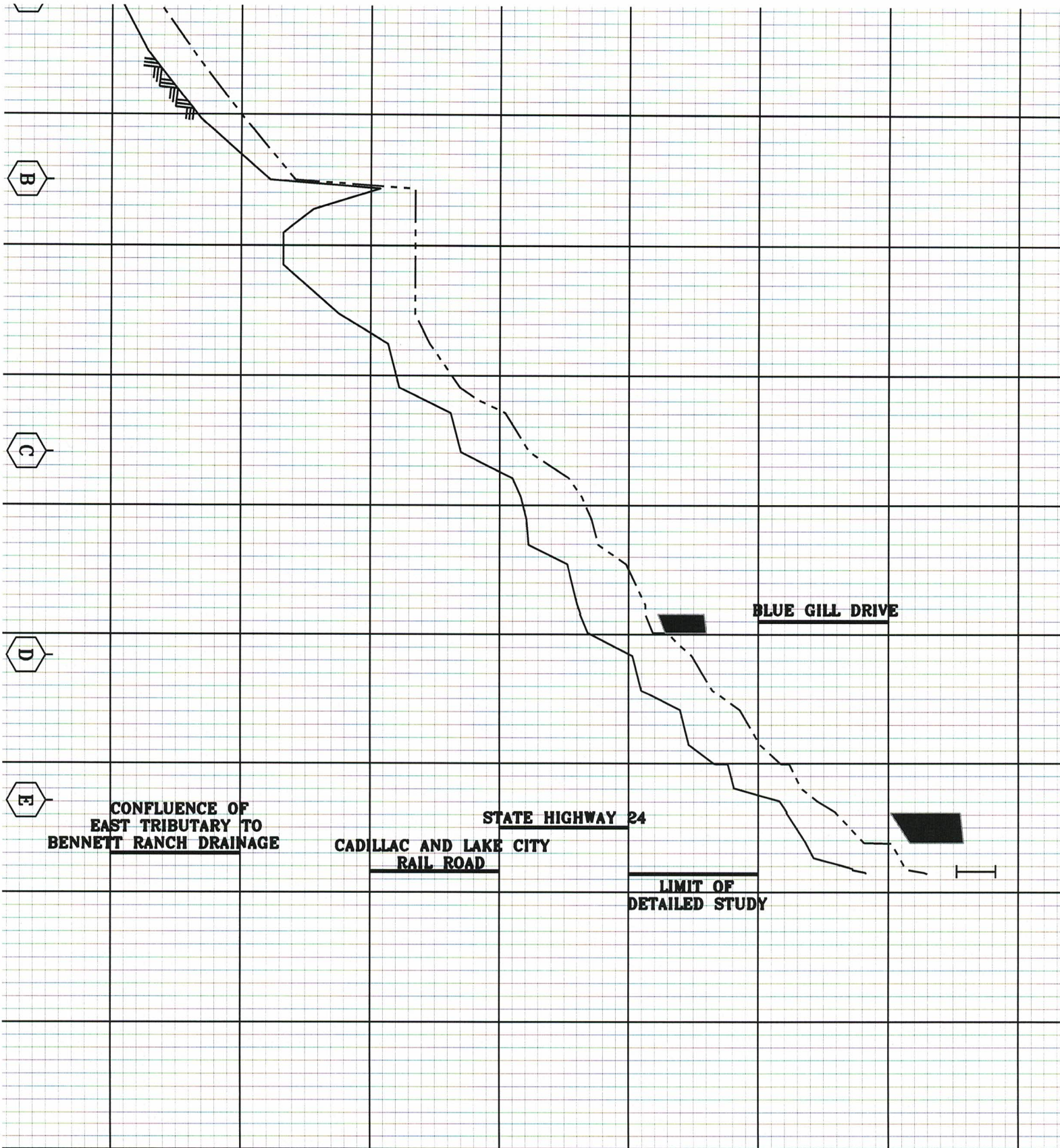
<sup>1</sup>Data not available

<sup>2</sup>Location description not available

<sup>3</sup>Reduction in flow rate due to partial conveyance in storm drain

REVISED TO  
REFLECT LOMR  
EFFECTIVE: July 12, 2013





**LEGEND**

0.2% AN  
1% ANNI  
2% ANNI  
10% ANH

STREAM

CROSS S




B


C

**LIMIT OF  
DETAILED STUDY**

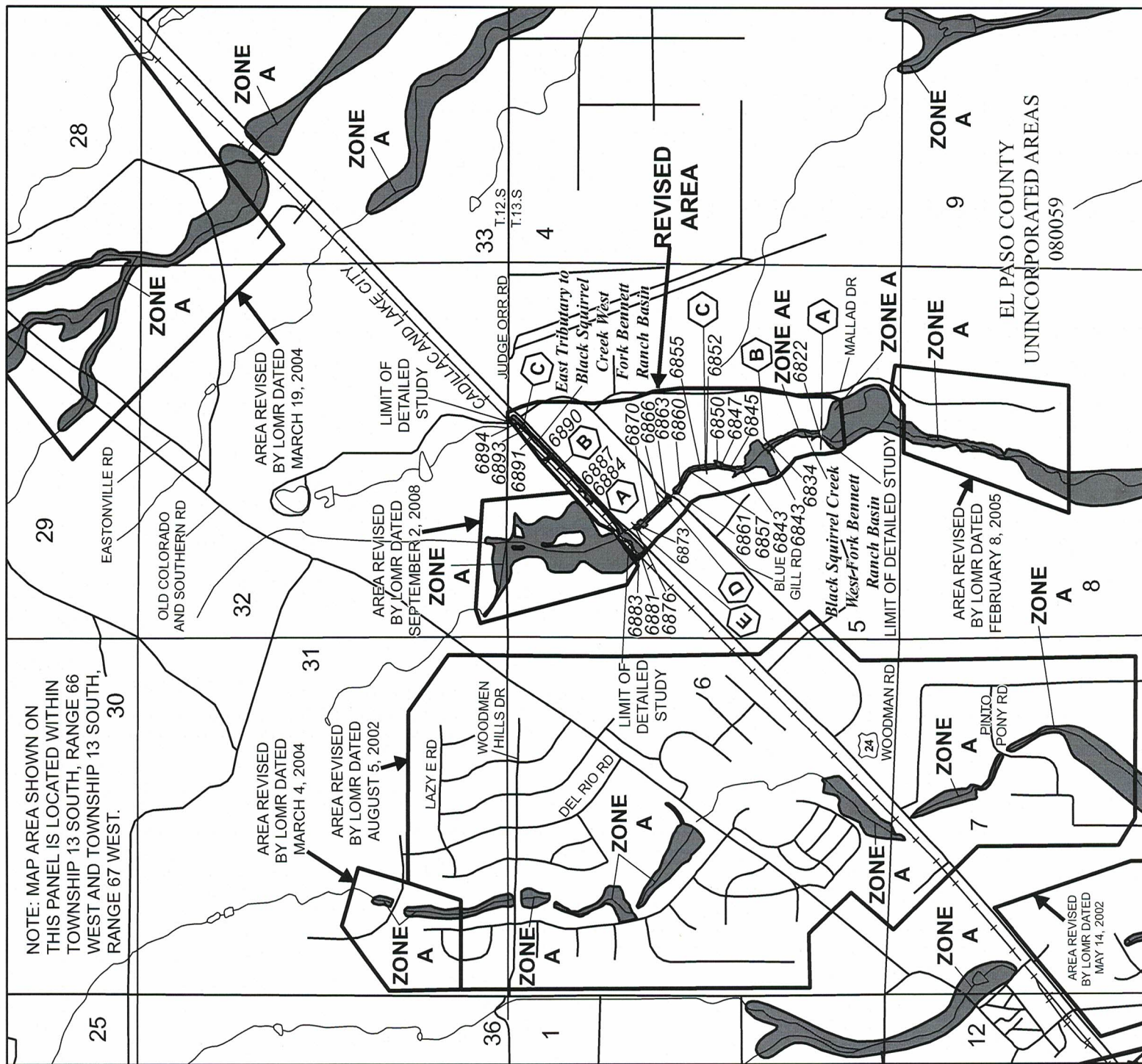
**LEGEND**

———— 0.2% AN  
- - - - 1% ANNI  
- - - - 2% ANNI  
- - - - 10% ANI

 STREAM

 CROSS S





NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 13 SOUTH, RANGE 66 WEST AND TOWNSHIP 13 SOUTH, RANGE 67 WEST.

EL PASO COUNTY  
UNINCORPORATED AREAS  
080059

- Legend**
- 1% annual chance (100-Year) Floodplain
  - 1% annual chance (100-Year) Floodway
  - 0.2% annual chance (500-Year) Floodplain



NATIONAL FLOOD INSURANCE PROGRAM

**FIRM**

FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 575 OF 1300  
(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS:	COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS, CITY OF	080060	0575	F	
EL PASO COUNTY	080059	0575	F	

**REVISED TO REFLECT LOMR**  
**EFFECTIVE: July 12, 2013**  
COMMUNITY-PANEL NUMBER 08041C0575 F

**EFFECTIVE DATE: MARCH 17, 1997**

Federal Emergency Management Agency

# HYDROLOGIC ANALYSIS

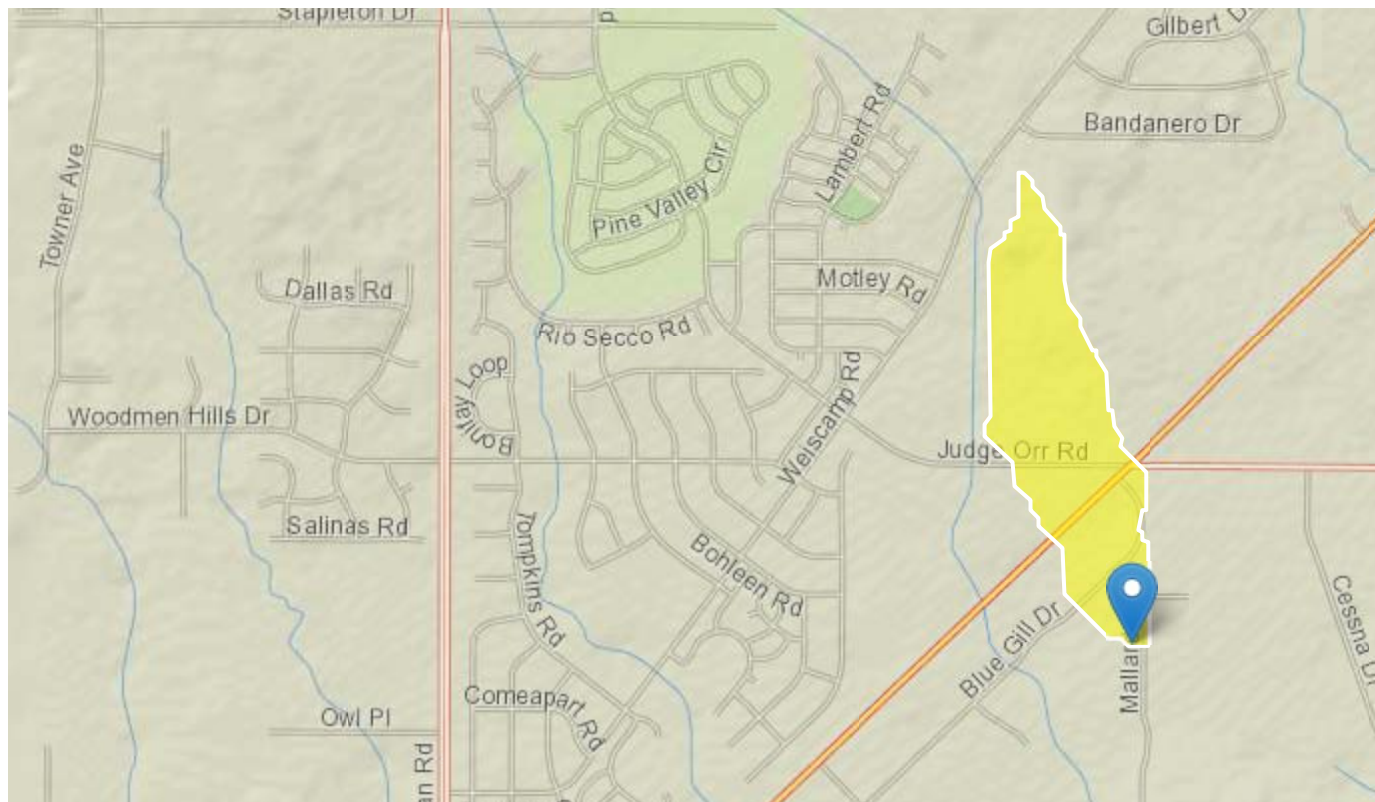
# StreamStats Report-7950 Mallard Drive

Region ID: CO

Workspace ID: CO20180823172302966000

Clicked Point (Latitude, Longitude): 38.94916, -104.57817

Time: 2018-08-23 11:23:09 -0600



## Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.22	square miles
I6H100Y	6-hour precipitation that is expected to occur on average once in 100 years	3.9	inches
STATSCLAY	Percentage of clay soils from STATSGO	7.3	percent
OUTLETELEV	Elevation of the stream outlet in thousands of feet above NAVD88.	6862	feet

Peak-Flow Statistics Parameters [Foothills Region Peak Flow 2016 5099]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.22	square miles	0.6	2850
I6H100Y	6 Hour 100 Year Precipitation	3.9	inches	2.38	4.89
STATSCLAY	STATSGO Percentage of Clay Soils	7.3	percent	9.87	37.5
OUTLETELEV	Elevation of Gage	6862	feet	4290	8270

Peak-Flow Statistics Disclaimers [Foothills Region Peak Flow 2016 5099]

Provide, verify CN value

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors

Peak-Flow Statistics Flow Report [Foothills Region Peak Flow 2016 5099]

Statistic	Value	Unit
2 Year Peak Flood	2.8	ft^3/s
5 Year Peak Flood	8.22	ft^3/s
10 Year Peak Flood	14.1	ft^3/s
25 Year Peak Flood	24.7	ft^3/s
50 Year Peak Flood	35.4	ft^3/s
100 Year Peak Flood	49.9	ft^3/s
200 Year Peak Flood	66.4	ft^3/s
500 Year Peak Flood	93.5	ft^3/s

Peak-Flow Statistics Citations

Kohn, M.S., Stevens, M.R., Harden, T.M., Godaire, J.E., Klinger, R.E., and Mommandi, A.,2016, Paleoflood investigations to improve peak-streamflow regional-regression equations for natural streamflow in eastern Colorado, 2015: U.S. Geological Survey Scientific Investigations Report 2016–5099, 58 p. (<http://dx.doi.org/10.3133/sir20165099>)

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Application Version: 4.2.1

For undeveloped conditions?  
See comment letter.

											CONVEYANCE TC						TT	INTENSITY						TOTAL FLOWS					
BASIN	AREA TOTAL (Acres)	C <sub>2</sub>	C <sub>5</sub>	C <sub>10</sub>	C <sub>25</sub>	C <sub>50</sub>	C <sub>100</sub>	Length	Height	TI	Length	Height	C <sub>V</sub>	Slope	Velocity	TC	TOTAL	I <sub>2</sub>	I <sub>5</sub>	I <sub>10</sub>	I <sub>25</sub>	I <sub>50</sub>	I <sub>100</sub>	Q <sub>2</sub>	Q <sub>5</sub>	Q <sub>10</sub>	Q <sub>25</sub>	Q <sub>50</sub>	Q <sub>100</sub>
								(ft)	(ft)	(min)	(ft)	(ft)		(%)	(fps)	(min)	(min)	(in/hr)	(in/hr)	(in/hr)	(in/hr)	(in/hr)	(in/hr)	(c.f.s.)	(c.f.s.)	(c.f.s.)	(c.f.s.)	(c.f.s.)	(c.f.s.)
EX-A	55.00		0.08				0.35	200	4	20.7	730 1487	14.6 10	5 15	2.0% 0.7%	0.7 1.2	17.2 20.1	58.1	1.2	1.5	1.7	2.0	2.2	2.5	0.0	6.6	0.0	0.0	0.0	48.1

Calculated by: DLM  
Date: 6/24/2018



# HYDRAULIC ANALYSIS

HEC-RAS HEC-RAS 5.0.1 April 2016  
U.S. Army Corps of Engineers  
Hydrologic Engineering Center  
609 Second Street  
Davis, California

```

X      X  XXXXXX   XXXX      XXXX      XX      XXXX
X      X  X        X      X      X  X      X  X      X
X      X  X        X        X  X      X  X      X
XXXXXXXX XXXX      X        XXX XXXX      XXXXXX      XXXX
X      X  X        X        X  X      X  X      X      X
X      X  X        X      X      X  X      X  X      X
X      X  XXXXXX   XXXX      X      X      X  X      XXXXX

```

PROJECT DATA

Project Title: MALLARD  
Project File : MALLARD.prj  
Run Date and Time: 8/26/2018 9:00:51 AM

Project in English units

PLAN DATA

Plan Title: Plan 01  
Plan File : m:\Catamount Dropbox\PROJECTS\18-164 Mallard Drive\Drainage  
Report\hecras\MALLARD.p01

Geometry Title: MALLARD  
Geometry File : m:\Catamount Dropbox\PROJECTS\18-164 Mallard  
Drive\Drainage Report\hecras\MALLARD.g01

Flow Title : Flow 01  
Flow File : m:\Catamount Dropbox\PROJECTS\18-164 Mallard  
Drive\Drainage Report\hecras\MALLARD.f01

Plan Summary Information:

Number of:	Cross Sections =	2	Multiple Openings =	0
	Culverts =	0	Inline Structures =	0
	Bridges =	0	Lateral Structures =	0

Computational Information

Water surface calculation tolerance	=	0.01
Critical depth calculation tolerance	=	0.01
Maximum number of iterations	=	20
Maximum difference tolerance	=	0.3
Flow tolerance factor	=	0.001

#### Computation Options

Critical depth computed only where necessary  
Conveyance Calculation Method: At breaks in n values only  
Friction Slope Method: Average Conveyance  
Computational Flow Regime: Subcritical Flow

#### FLOW DATA

Flow Title: Flow 01

Flow File : m:\Catamount Dropbox\PROJECTS\18-164 Mallard Drive\Drainage  
Report\hecras\MALLARD.f01

Flow Data (cfs)

River	Reach	RS	PF 1
MALLARD	1	350	49.9

#### Boundary Conditions

River	Reach	Profile	Upstream
Downstream			
MALLARD	1	PF 1	
Critical			

#### GEOMETRY DATA

Geometry Title: MALLARD

Geometry File : m:\Catamount Dropbox\PROJECTS\18-164 Mallard  
Drive\Drainage Report\hecras\MALLARD.g01

#### CROSS SECTION

RIVER: MALLARD

REACH: 1 RS: 350

#### INPUT

Description: STATION 350

Station	Elevation Data	num=	6					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta
Elev								
0	6858.51	8.5	6858.45	27	6856.91	33	6856.91	49.28
6858.27								
60	6858.21							

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val		
0	.042	8.5	.035	49.28	.042		

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.
Expan.						
	8.5	49.28		100	100	100
						.1

.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	6858.12	Element	Left OB
Channel Right OB			
Vel Head (ft)	0.08	Wt. n-Val.	
0.035			
W.S. Elev (ft)	6858.04	Reach Len. (ft)	100.00
100.00	100.00		
Crit W.S. (ft)	6857.71	Flow Area (sq ft)	
21.96			
E.G. Slope (ft/ft)	0.004951	Area (sq ft)	
21.96			
Q Total (cfs)	49.90	Flow (cfs)	
49.90			
Top Width (ft)	33.01	Top Width (ft)	
33.01			
Vel Total (ft/s)	2.27	Avg. Vel. (ft/s)	
2.27			
Max Chl Dpth (ft)	1.13	Hydr. Depth (ft)	
0.67			
Conv. Total (cfs)	709.2	Conv. (cfs)	
709.2			
Length Wtd. (ft)	100.00	Wetted Per. (ft)	
33.10			
Min Ch El (ft)	6856.91	Shear (lb/sq ft)	
0.21			
Alpha	1.00	Stream Power (lb/ft s)	
0.47			
Frctn Loss (ft)	0.92	Cum Volume (acre-ft)	
0.04			
C & E Loss (ft)	0.02	Cum SA (acres)	
0.07			

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: MALLARD  
REACH: 1

RS: 250

INPUT  
Description: 2+50

Station Elevation Data				num=	6				
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	
Elev									
0	6857.2	14.21	6857.19	27	6856.13	33	6856.13	45.43	
6857.16									
60	6857.07								

Manning's n Values				num=	3		
Sta	n Val	Sta	n Val	Sta	n Val		
0	.042	14.21	.035	45.43	.042		

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.
Expan.						
	14.21	45.43		0	0	.1

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	6857.18	Element	Left OB
Channel Right OB			
Vel Head (ft)	0.25	Wt. n-Val.	
0.035			
W.S. Elev (ft)	6856.93	Reach Len. (ft)	
Crit W.S. (ft)	6856.93	Flow Area (sq ft)	
12.54			
E.G. Slope (ft/ft)	0.022493	Area (sq ft)	
12.54			
Q Total (cfs)	49.90	Flow (cfs)	
49.90			
Top Width (ft)	25.32	Top Width (ft)	
25.32			
Vel Total (ft/s)	3.98	Avg. Vel. (ft/s)	
3.98			
Max Chl Dpth (ft)	0.80	Hydr. Depth (ft)	
0.50			
Conv. Total (cfs)	332.7	Conv. (cfs)	
332.7			
Length Wtd. (ft)		Wetted Per. (ft)	
25.39			
Min Ch El (ft)	6856.13	Shear (lb/sq ft)	
0.69			
Alpha	1.00	Stream Power (lb/ft s)	
2.76			
Frctn Loss (ft)		Cum Volume (acre-ft)	
C & E Loss (ft)		Cum SA (acres)	

SUMMARY OF MANNING'S N VALUES

River:MALLARD

Reach	River Sta.	n1	n2	n3
-------	------------	----	----	----

1	350	.042	.035	.042
1	250	.042	.035	.042

# SUMMARY OF REACH LENGTHS

River: MALLARD

Reach	River Sta.	Left	Channel	Right
1	350	100	100	100
1	250	0	0	0

# SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

River: MALLARD

Reach	River Sta.	Contr.	Expan.
1	350	.1	.3
1	250	.1	.3

MALLARD Plan: Plan 01 8/26/2018

MALLARD 1

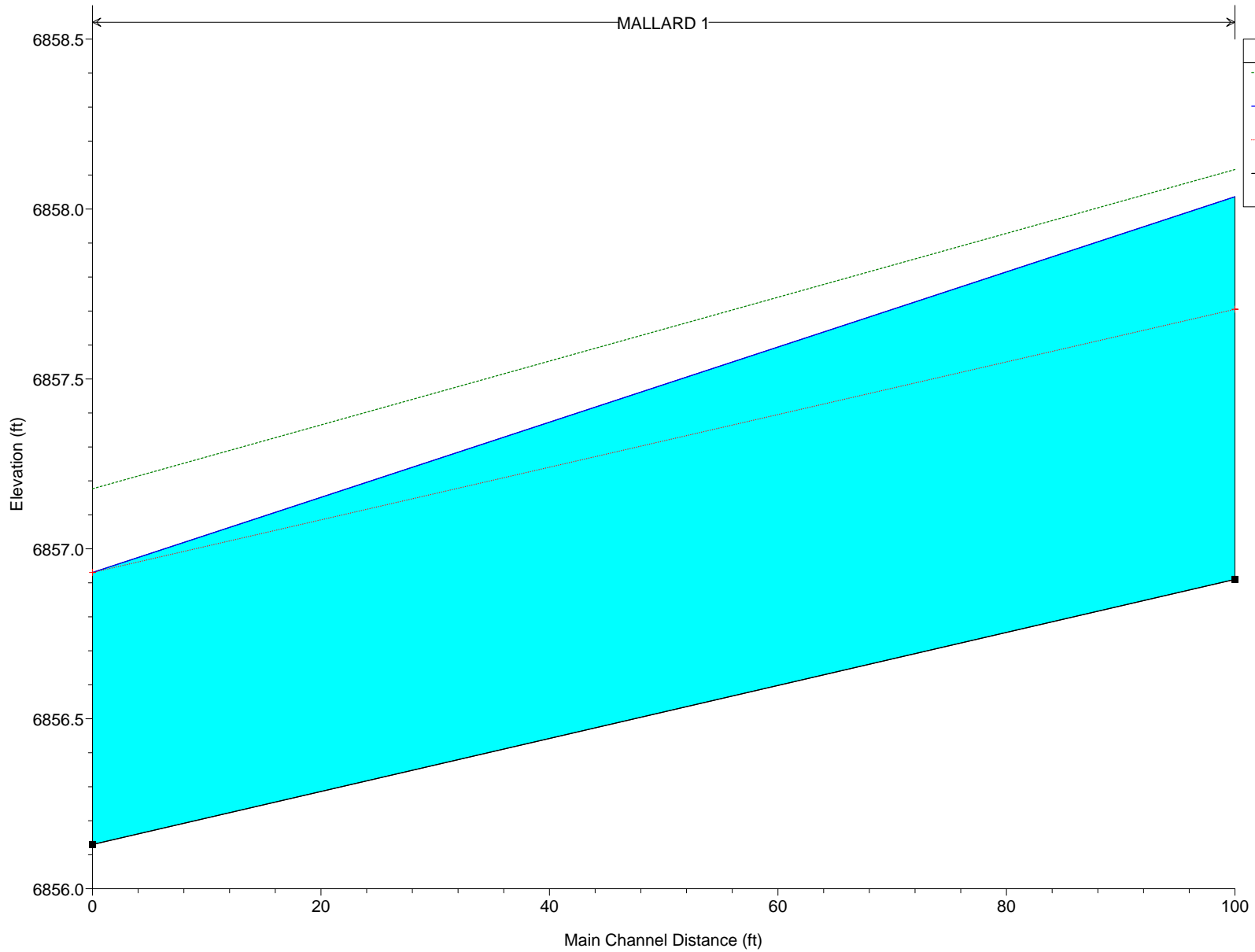
**Legend**

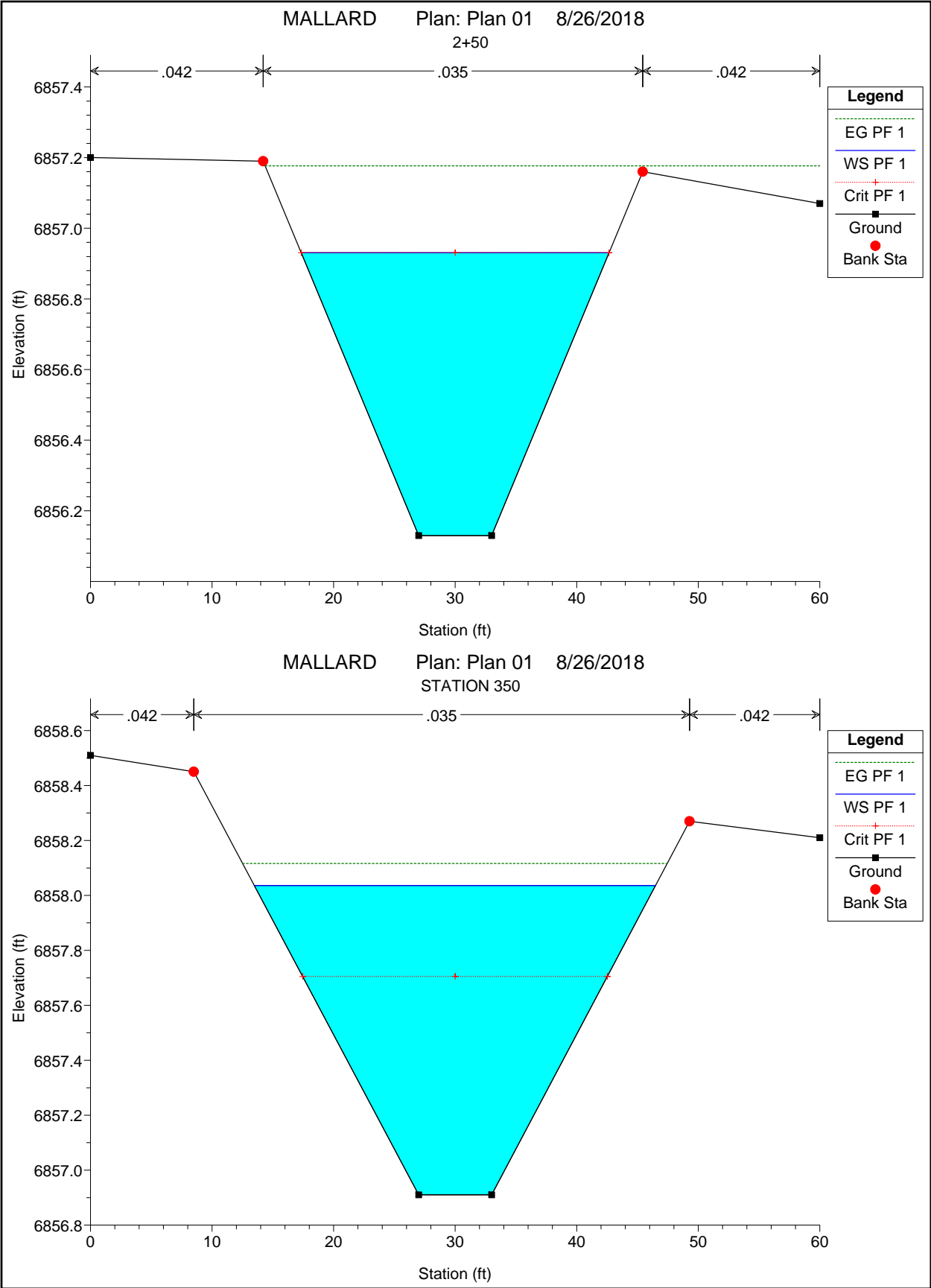
EG PF 1

WS PF 1

Crit PF 1

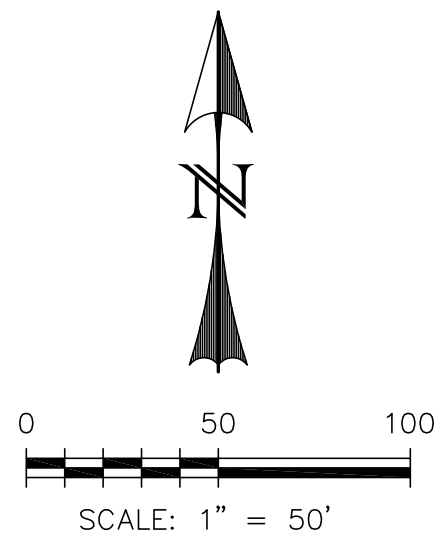
Ground







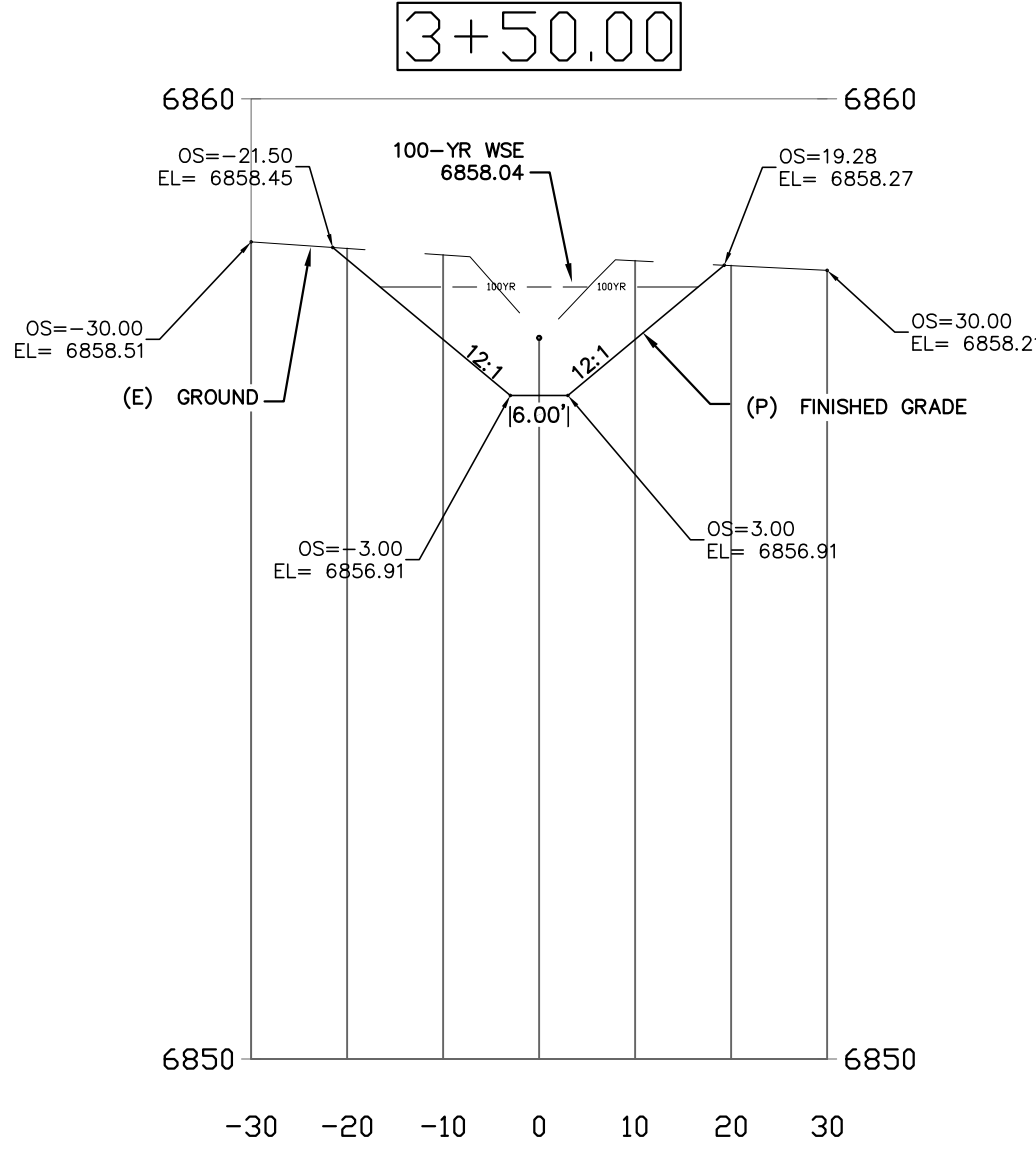
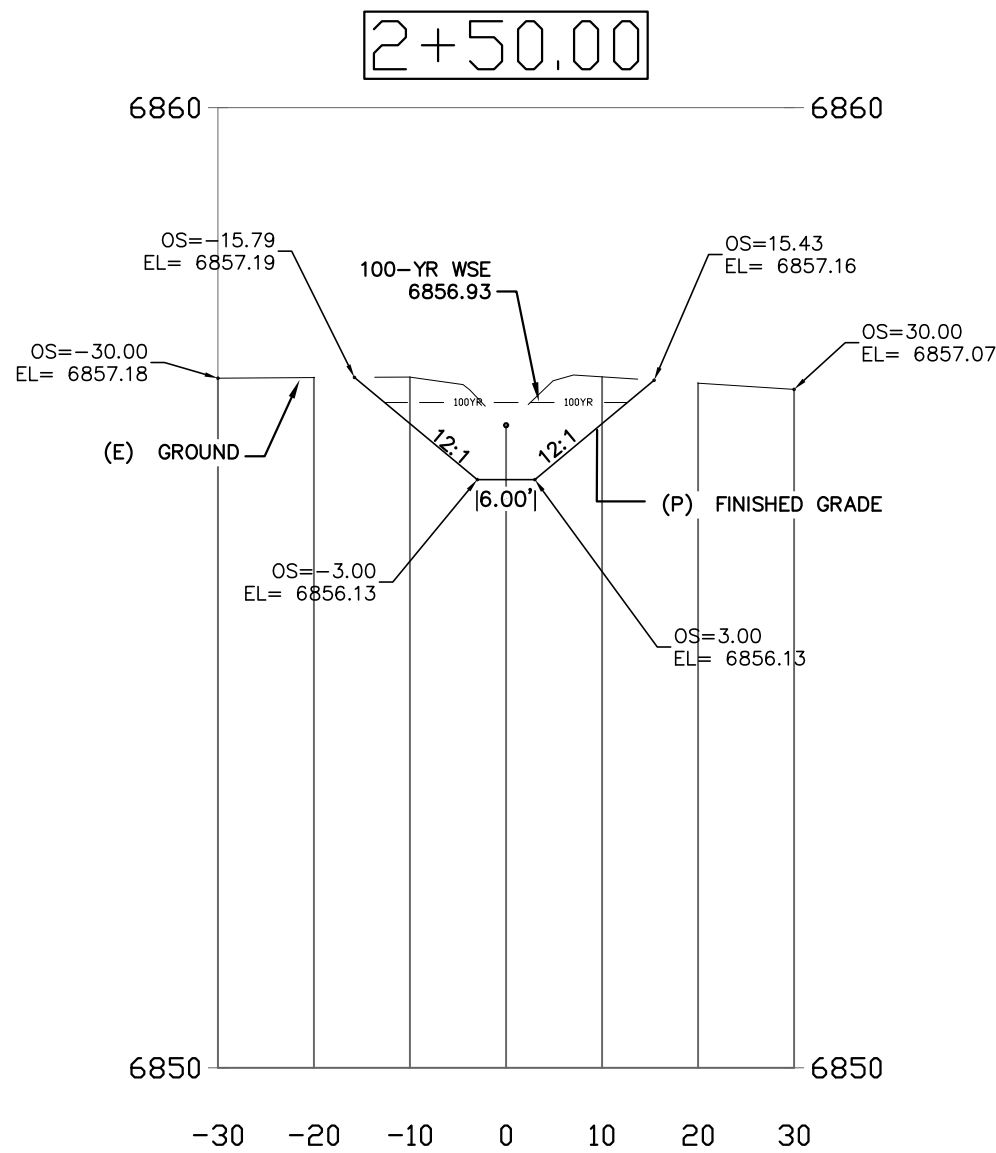
## DRAINAGE MAP



1  
140.8

If the channel does not have capacity, where will the 100-year flood and developed emergency condition flood from the north go?

If developed channel ends here, where will overtopping go?





Know what's below.  
Call 72 hours before you dig.  
For more details visit:  
[www.call811.com](http://www.call811.com)

REV.	DESCRIPTION	DATE



PREPARED FOR:
ALBERT WILLS
8605 EXPLORER DRIVE, #250 COLORADO SPRINGS, CO 80920




CATAMOUNT  
ENGINEERING  
321 W. HENRIETTA AVE WOODLAND PARK, CO 80966  
PO BOX 221 (719)425-2124

7950 MALLARD DRIVE
EASEMENT WIDTH ANALYSIS

DESIGNED BY: DLM	DRAWN BY: XXX
SCALE: VARIES	DATE: 08/24/18
JOB NUMBER: 18-164	SHEET: 1 OF 1

\\catamount\cadd\proj\2018\18-164 Mallard Drive - CAT - Construction - Safety August 16, 2018 11:31:12 AM - 2004

\\catamount\cadd\proj\2018\18-164 Mallard Drive

# Markup Summary

---

## Existing conditions? (1)

---

thin as F.E.M.A. designated floodplain, per F.R. Case No12-08-0659P. The revised F.E.M.A. Flood map has been provided in the appendix.

**EXIST** Existing conditions?

izing USGS STREAMSTATS Application Version 1.0.0.0. The analysis was performed using a 100-YR peak flow of Q=49.9 cfs. The 100-YR peak flow is shown in the appendix. The portion of the reach south of State Highway 24.

**Subject:** Text Box

**Page Label:** 3

**Lock:** Locked

**Author:** dsdrice

**Date:** 9/27/2018 11:53:38 AM

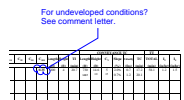
**Color:** ■

Existing conditions?

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## For undeveloped conditions? See comment letter. (1)

---



**Subject:** Cloud+

**Page Label:** 24

**Lock:** Locked

**Author:** dsdrice

**Date:** 9/27/2018 11:53:39 AM

**Color:** ■

For undeveloped conditions? See comment letter.

---

## If developed channel ends here, where will overtopping go? (1)

---



**Subject:** Callout

**Page Label:** 34

**Lock:** Locked

**Author:** dsdrice

**Date:** 9/27/2018 11:53:40 AM

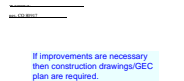
**Color:** ■

If developed channel ends here, where will overtopping go?

---

## If improvements are necessary then construction drawings/GEC plan are required. (1)

---



**Subject:** Text Box

**Page Label:** 2

**Lock:** Locked

**Author:** dsdrice

**Date:** 9/27/2018 11:53:40 AM

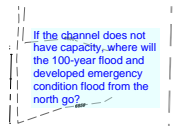
**Color:** ■

If improvements are necessary then construction drawings/GEC plan are required.

---

## If the channel does not have capacity, where will the 100-year flood and developed emergency condition flood from the north go? (1)

---



**Subject:** Text Box

**Page Label:** 34

**Lock:** Locked

**Author:** dsdrice

**Date:** 9/27/2018 11:53:41 AM

**Color:** ■

If the channel does not have capacity, where will the 100-year flood and developed emergency condition flood from the north go?

---

## Letter Report (1)

---



**Subject:** Cloud+

**Page Label:** 1

**Lock:** Locked

**Author:** dsdrice

**Date:** 9/27/2018 11:53:42 AM

**Color:** ■

Letter Report

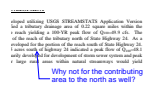
Provide, verify CN value (1)



**Subject:** Text Box  
**Page Label:** 22  
**Lock:** Locked  
**Author:** dsdrice  
**Date:** 9/27/2018 11:53:43 AM  
**Color:**

Provide, verify CN value

Why not for the contributing area to the north as well? (1)



**Subject:** Callout  
**Page Label:** 3  
**Lock:** Locked  
**Author:** dsdrice  
**Date:** 9/27/2018 11:53:44 AM  
**Color:**

Why not for the contributing area to the north as well?