MASTER DEVELOPMENT DRAINAGE PLAN FOR
LOT 1177 WOODMEN HILLS FILING #10
EL PASO COUNTY, COLORADO

MAY 2020

Prepared For:

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TNE Job No. 2015.00
County Job No. #####

SKP-20-003

MASTER DEVELOPMENT DRAINAGE PLAN FOR
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EL PASO COUNTY, COLORADO

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APPENDIX

MASTER DEVELOPMENT DRAINAGE PLAN FOR
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EL PASO COUNTY, COLORADO

CERTIFICATION STATEMENT:

Engineers Statement

This 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 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.

_____

Dane Frank, P.E. 50207 Seal

Developers Statements

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

[developer name]
Business Name

By:_____
Title:_____
Address:_____
_____

El Paso County Approval:

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

_____ _____

Jennifer Irvine, Date
County Engineer / ECM Administrator

Conditions:

MASTER DEVELOPMENT DRAINAGE PLAN FOR LOT 1177 WOODMEN HILLS FILING #10 EL PASO COUNTY, COLORADO

Please elaborate in your description of the purpose of the MDDP. Refer to DCM Vol. 1 CH4.2 beginning paragraph.

PURPOSE

The purpose of this Master Development Drainage Plan (MDDP) is to implement the concepts identified in the overall basin plan on the site.

DBPS

The site lies within the Bennett Ranch Drainage Basin and is covered by the Bennett Ranch Pilot Project Drainage Basin Planning Study, dated November, 2001.

GENERAL DESCRIPTION

This MDDP for "LOT 1177 WOODMEN HILLS FILING #10" is an analysis of approximately 31.29 acres located in Section 32, Township 12 South, Range 64 West of the Sixth Principal Meridian, City of Colorado Springs, CO. The site is on the east corner of the intersection of Judge Orr Road and Eastonville Road. This lot is planned for commercial development.

The site is bounded on the west by Eastonville Road, on the south by Judge Orr Road, on the east by an unplatted parcel (undeveloped), and on the north by Lot 1179 Woodmen Hills Filing # 10 (residential).

The site has not previously been studied.

This site was studied with the Woodmen Hills 10 Preliminary and Final Plat applications (PCD File No. SP00013, SF00030). Please provide some background information regarding the previous drainage reports done on the site & the immediate area.

Soils in the study area are shown as mapped by the S.C.S. in the "Soils Survey of El Paso County Area" (see appendix). Soils for this project are 100% Columbine gravelly sandy loam 19 (HSG A).

The site lies within the Bennett Ranch Drainage Basin and runoff ultimately flows into the West Fork of Squirrel Creek.

The study area consists of undeveloped land that has existing vegetation consisting of established native grasses and some shrubs/trees in the existing drainage channels. The site drains from north to

south overland, with drainage ~~chann~~ average slopes of ~4%.

The Woodmen Hills final drainage report and CD's show multiple storm pipes discharging into basin EX-A. Provide discussion in your narrative of these offsite basins from the Woodmen Hills subdivision that discharge into the site. Include the flows from these basins in your analysis. Also provide discussion of the offsite flows entering the Bennett Ranch Drainageway upstream of the northerly property line at basin EX-C.

EXISTING DRAINAGE CONDITIONS

There are three existing offsite basins that drain onto the site, and the site itself is composed of three basins that drains from north to south. The Bennett Ranch Drainageway runs along the east side of the site, and a swale runs along the west and south sides of the site. The combined flows from the site, drainage channel, and swale leave the site at the southeast corner.

Offsite Basin OS-Z's 0.48 acres consists of a landscaping area on an adjacent developed parcel that flows onto the site. Runoff (Q_5 = 0.4 cfs, Q_{100} = 1.5 cfs) channel flows southwest into the swale on Basin EX-A.

EX-A

Offsite Basin OS-Y's 3.84 acres consists of residential land (single house). Runoff (Q_5 = 2.8 cfs, Q_{100} = 10.7 cfs) sheet/channel flows south onto Basin EX-B and then continues south overland and along a path that loosely resembles a swale.

Offsite Basin OS-X's 0.93 acres consists of a strip of land between the curb and the property line. Runoff (Q_5 = 0.4 cfs, Q_{100} = 2.9 cfs) sheet flows east or north into the swale in Basin EX-B and then follows the channel south or east.

Runoff (Q_5 = 0.8 cfs, Q_{100} = 4.8 cfs) from Basin EX-A's 6.30 acres sheet flows into a swale and then channel flows along the west and south sides of the site. Design Point A is located near the southeast corner of the site where the swale flows into the Bennett Ranch Drainageway.

Runoff (Q_5 = 5.2 cfs, Q_{100} = 34.1 cfs) from Basin EX-B's 21.1 acres sheet flows south across undeveloped land and into the swale in Basin EX-A. Design Point B is located in the southeast corner of the basin.

Runoff (Q_5 = 0.7 cfs, Q_{100} = 4.5 cfs) from Basin EX-C's 3.91 acres is the portion of Bennett Ranch Drainageway on the site. The drainageway flows from north to south on the eastern edge of the site. Design Point C is located at the southeast corner of the site where the drainageway leaves the site

and passes under Judge Orr Road in a culvert.

Please indicate what the new channel consisted of. Was it just the riprap check dams? Were all the recommended improvements installed? Please elaborate in your discussion of the DBPS improvements.

Wetlands have been identified in the drainage channels on three sides of the site. The areas are shown on the drainage maps (see appendix).

The Bennett Ranch DBPS calls out a new channel when the channel crosses the site and new box culverts at the Judge Orr Road crossing. Based on the existing riprap check dams in the channel, the new channel has been in place since at least 2006. The Judge Orr Road culvert crossing was improved between 2017 and 2019. Based on this, the DBPS channel improvements on or adjacent to the site appear to have been previously completed.

Indicate what size/type of culvert was installed.

Please identify the pond as a full spectrum detention pond

PROPOSED DRAINAGE CONDITIONS

The site is planned for commercial development. In the proposed condition the swale and drainageway onsite will remain largely unchanged, and the central portion of the site will be developed. There are currently no specific plans for development of the site. A possible layout for interior roads has been shown on the proposed drainage map, but this is only for a visual aid of how the site could be developed. A swale is proposed along the north property line to divert offsite runoff east to the drainageway, rather than having it flow across the entire site. A possible location and rough footprint for a stormwater pond has also been shown near the southeast corner of the site. It is expected that the general runoff patterns for the developed site will continue to direct runoff to the southeast corner of the site.

PR-1

Offsite Basin OS-Z's 0.48 acres consists of a landscaping area on an adjacent developed parcel that flows onto the site. Runoff (Q_5 = 0.4 cfs, Q_{100} = 1.5 cfs) channel flows southwest into the swale on Basin EX-A.

Offsite Basin OS-Y's 3.84 acres consists of residential land (single house). Runoff (Q_5 = 2.8 cfs, Q_{100} = 10.7 cfs) sheet/channel flows south onto Basin EX-B and then continues south overland and along a path that loosely resembles a swale.

EX-A

Offsite Basin OS-X's 0.93 acres consists of a strip of land between the curb and the property line. Runoff (Q_5 = 0.4 cfs, Q_{100} = 2.9 cfs) sheet flows east or north into the swale in Basin EX-B and then

Provide additional discussion on the channels on the west and south side of the channel. Are they adequate to convey the flows? what is its condition? Are any improvements required? Please address. State that a hydraulic analysis of these channels will be provided with final drainage report.

follows the channel south or east.

Basin EX-A will remain the same in the proposed condition. Runoff (Q_5 = 0.8 cfs, Q_{100} = 4.8 cfs) from Basin EX-A's 6.30 acres sheet flows into a swale and then channel flows along the west and south sides of the site. Design Point A is located near the southeast corner of the site where the swale flows into the Bennett Ranch Drainageway.

Basin EX-C will remain the same in the proposed condition. Runoff (Q_5 = 0.7 cfs, Q_{100} = 4.5 cfs) from Basin EX-C's 3.91 acres is the portion of Bennett Ranch Drainageway on the site. The drainageway flows from north to south on the eastern edge of the site. Design Point C is located at the southeast corner of the site where the drainageway leaves the site and passes under Judge Orr Road in a culvert.

Discuss the culvert capacity. Does it overtop? Was it built to convey all the flows at this location? Please address.

Basin PR-1's 21.1 acres consists of the central portion of the site. A percent impervious of 95% was assumed for this basin in the developed condition. Runoff (Q_5 = 89.2 cfs, Q_{100} = 177.3 cfs) is expected to flow south to Design Point 1. It is likely a stormwater treatment facility will be constructed near Design Point 1.

The southeast corner of the site is the low point of the site, so it's the most likely location for an onsite stormwater treatment facility. Based on basin PR-1 runoff a stormwater pond was roughly sized to have a footprint of 70,000 square feet (shown as 200'x350' on the drainage map). This assumes the entire basin will be treated at a single location.

The Bennett Ranch Drainageway currently receives runoff from the site and carries it south. Since the County drainage criteria will require runoff leaving the site be treated to release at predevelopment levels, development of the site is not expected to add any additional flows to the drainageway.

Any new roads on the site are expected to cross the existing swale onsite. Doing this will presumably require new culverts at the crossing locations.

DCM Vol 1 - Chap 4.2: discuss and analyze any other nearby existing and proposed downstream facilities besides Bennett Ranch Drainagrway, if applicable. For example what does the Drainageway drain into - is there a pond eventually? Also, describe the Drainageway in more detail --- is it a grassy swale? Does it have any riprap? Will it need riprap in the future to protect it from the outfall of the proposed pond onsite?

DCM Vol 1 - Chap 4.2: Discussion of drainage problems anticipated within the development and their solutions.

HYDROLOGIC CALCULATIONS

Hydrologic calculations were performed using the El Paso County Storm Drainage Design Criteria Manual - Volumes 1 & 2, latest editions. The Rational Method was used to estimate storm water runoff anticipated from design storms with 5-year and 100-year recurrence intervals.

Hydraulic calculations have not been provided and wouldn't be provided at this stage. Please revise.

HYDRAULIC CALCULATIONS

Hydraulic calculations were estimated using the Manning's Formula and the methods described in the El Paso County Storm Drainage Design Criteria Manual – Volumes 1 & 2, latest editions. The pertinent data sheets are included in the appendix of this report.

Provide discussion on Drainage Basin fees. It appears that due to the commercial development there would be an increase of impervious acreage and therefore the site would be subject to Drainage basin fees per ECM Appendix L 3.13a when platting.

FLOODPLAIN STATEMENT

A portion of this site is within a designated F.E.M.A. floodplain, as determined by Flood Insurance Rate Map No. 08041C0544 G dated December 7, 2018 (see appendix). The floodplain is shown on the drainage maps.

Please provide information from the Bennet Ranch DBPS that shows how this MDDP complies with or varies from that study.

SUMMARY

The site is planned for commercial development. The concepts presented in this MDDP are preliminary in nature and will need to be refined in the future final drainage report(s). The existing drainageway that crosses the site already carries runoff from the site.

PREPARED BY:
TERRA NOVA

Dane Frank, P.E.
Project Engineer

Please provide the following in your report. Note these items are listed in DCM Vol. 1 CH4.2.

-Discussion and analysis of existing and any proposed downstream facilities
-Discussion of drainage problems anticipated within the development and their solutions.
-As previously stated in the comments above discuss all offsite tributary drainage areas that discharge into this site. Be sure to include the flows that are entering the site in your analysis.
-Discuss any drainage problems that the DPBS identified for this site/location and present alternate solutions for these problems.

Specifically address ECM Section I.7.2.A -Four Step Process and show how these steps will be provided for on this site.

Provide discussion regarding the FEMA Flooplain in the site. As it appears that there will be development within the floodplain and therefore a CLOMR/LOMR is likely to be required. Discuss the problems/possible solutions to developing within the floodplain.

BIBLIOGRAPHY

"El Paso County Drainage Criteria Manual-Volumes 1 & 2", latest edition

"El Paso County Board Resolution No 15-042" (Adoption of Chapter 6 and Section 3.2.1 Chapter 13 of the City of Colorado Springs Drainage Criteria Manual dated May 2014, Hydrology and Full Spectrum Detention)

"Bennett Ranch Pilot Project Drainage Basin Planning Study", by Stormwater & Environmental Consultants, Inc., dated November, 2001

SCS Soils Map for El Paso County

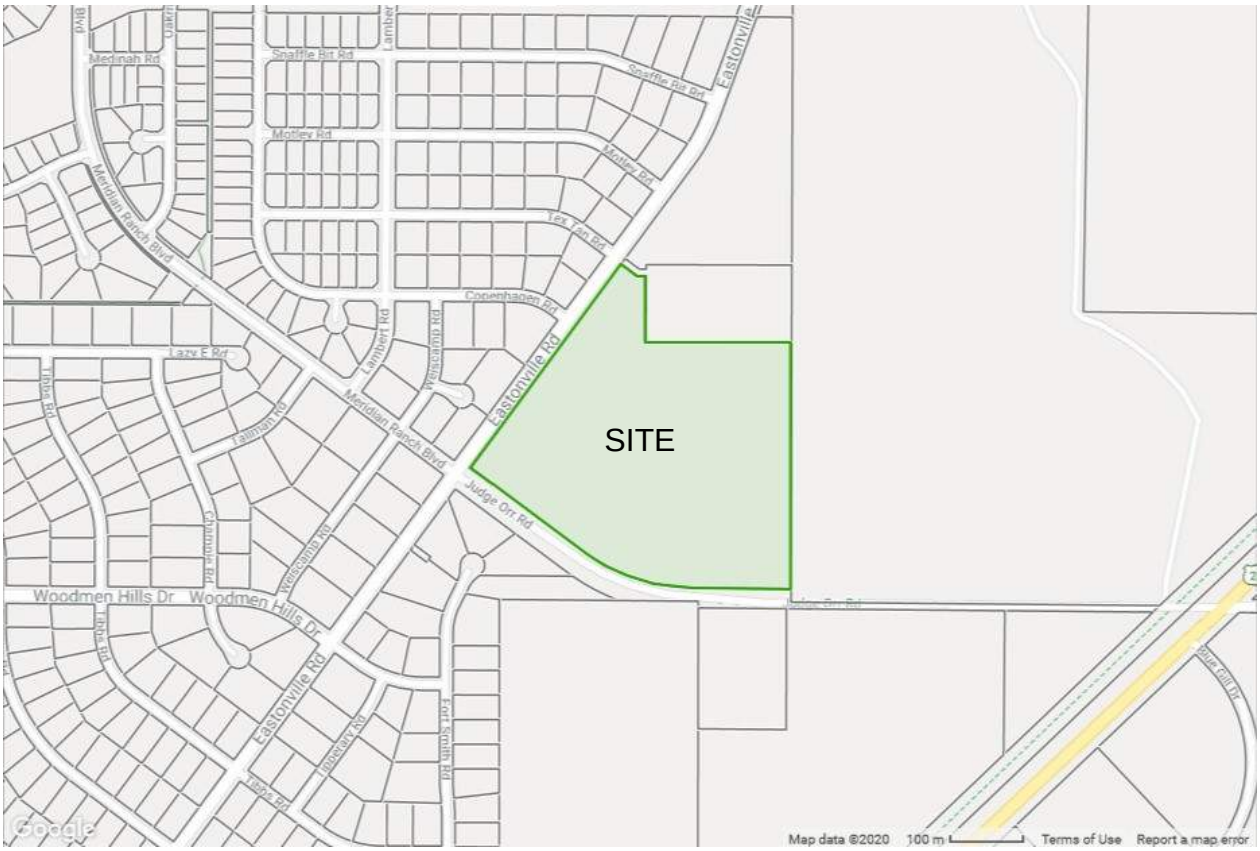
FEMA Floodplain Map

VICINITY MAP

El Paso County - Community: Property Search

Schedule Number: 4232302003

8507 Eastonville Road
Vicinity Map



North is up ^^^


8507 Eastonville Road
Image Dated Oct 2019
Motley Rd
Eastonville Rd
Tex Tan Rd
Copenhagen Rd
SITE
anch Blvd
Fort Smith Rd
Judge Orr Road
Google Earth
© 2020 Google
N
900 ft

S.C.S. SOILS MAP

Soil Map—El Paso County Area, Colorado
(8507 Eastonville Road)

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

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

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 17, Sep 13, 2019

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

Date(s) aerial images were photographed: Sep 8, 2018—May 26, 2019

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
19	Columbine gravelly sandy loam, 0 to 3 percent slopes	31.9	100.0%
Totals for Area of Interest		**31.9**	**100.0%**

El Paso County Area, Colorado

19—Columbine gravelly sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 367p
Elevation: 6,500 to 7,300 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 46 to 50 degrees F
Frost-free period: 125 to 145 days
Farmland classification: Not prime farmland

Map Unit Composition

Columbine and similar soils: 97 percent
Minor components: 3 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Columbine

Setting

Landform: Flood plains, fan terraces, fans
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

A - 0 to 14 inches: gravelly sandy loam
C - 14 to 60 inches: very gravelly loamy sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 2.5 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: Gravelly Foothill (R049BY214CO)
Hydric soil rating: No

Minor Components

Fluvaquentic haplaquolls

Percent of map unit: 1 percent

Landform: Swales
Hydric soil rating: Yes

Other soils
Percent of map unit: 1 percent
Hydric soil rating: No

Pleasant
Percent of map unit: 1 percent
Landform: Depressions
Hydric soil rating: Yes

Data Source Information

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 17, Sep 13, 2019

FEMA FIRM MAP

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. Those 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/.

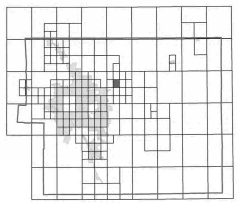
If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.

El Paso County Vertical Datum Offset Table

Flooding Source	Vertical Datum Offset (ft)

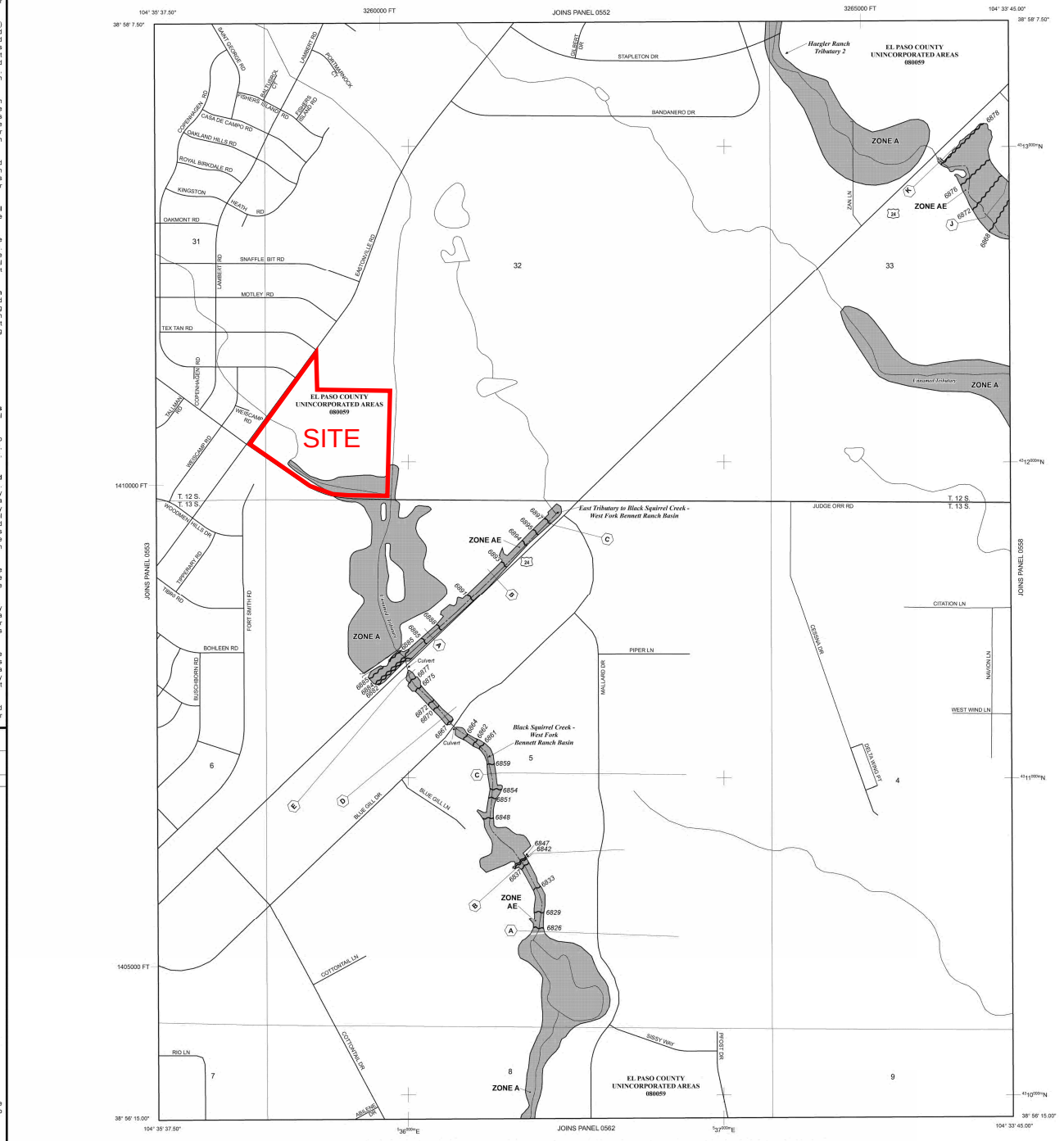
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION

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 12 SOUTH, RANGE 64 WEST, AND TOWNSHIP 13 SOUTH, RANGE 64 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)
4376000mN 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
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0554G

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

PANEL 554 OF 1300
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
EL PASO COUNTY	080059	0554	G

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
08041C0554G

MAP REVISED
DECEMBER 7, 2018

Federal Emergency Management Agency

HYDROLOGIC CALCULATIONS

LOT 1177 WOODMEN HILLS FILING #10
AREA RUNOFF COEFFICIENT (C) SUMMARY

EXISTING

		DEVELOPED			*UNDEVELOPED*			*WEIGHTED*		*WEIGHTED CA*	
BASIN	**TOTAL AREA**	**AREA**	**C5**	**C100**	**AREA**	**C5**	**C100**	**C5**	**C100**	**CA5**	**CA100**
	(Acres)	*(Acres)*			*(Acres)*						
OS-Z	0.48	0.48	0.20	0.44	0.00	0.09	0.36	0.20	0.44	0.10	0.21
OS-Y	3.84	3.84	0.20	0.44	0.00	0.09	0.36	0.20	0.44	0.77	1.69
OS-X	0.93	0.93	0.09	0.36	0.00	0.09	0.36	0.09	0.36	0.08	0.33
EX-A	6.30	0.00	0.09	0.36	6.30	0.09	0.36	0.09	0.36	0.57	2.27
EX-B	21.1	0.00	0.09	0.36	21.10	0.09	0.36	0.09	0.36	1.90	7.60
EX-C	3.91	0.00	0.90	0.96	3.91	0.09	0.36	0.09	0.36	0.35	1.41

DEVELOPED

		DEVELOPED			*UNDEVELOPED*			*WEIGHTED*		*WEIGHTED CA*	
BASIN	**TOTAL AREA**	**AREA**	**C5**	**C100**	**AREA**	**C5**	**C100**	**C5**	**C100**	**CA5**	**CA100**
	(Acres)	*(Acres)*			*(Acres)*						
OS-Z	0.48	0.48	0.20	0.44	0.00	0.09	0.36	0.20	0.44	0.10	0.21
OS-Y	3.84	3.84	0.20	0.44	0.00	0.09	0.36	0.20	0.44	0.77	1.69
OS-X	0.93	0.93	0.09	0.36	0.00	0.09	0.36	0.09	0.36	0.08	0.33
EX-A	6.30	0.00	0.09	0.36	6.30	0.09	0.36	0.09	0.36	0.57	2.27
PR-1	21.1	21.10	0.81	0.88	0.00	0.09	0.36	0.81	0.88	17.09	18.57
EX-C	3.91	0.00	0.90	0.96	3.91	0.09	0.36	0.09	0.36	0.35	1.41

Calculated by: DLF

Date: 5/6/2020

Checked by:

LOT 1177 WOODMEN HILLS FILING #10
RUNOFF SUMMARY

EXISTING

		WEIGHTED		*OVERLAND*				*STREET / CHANNEL FLOW*				T_C	*INTENSITY*		*TOTAL FLOWS*	
BASIN	**AREA TOTAL** *(Acres)*	C_5	C_{100}	C_5	**Length** *(ft)*	**Slope** *(ft/ft)*	T_t *(min)*	**Length** *(ft)*	**Slope** *(%)*	**Velocity** *(fps)*	T_t *(min)*	**TOTAL** *(min)*	I_5 *(in/hr)*	I_{100} *(in/hr)*	Q_5 *(c.f.s.)*	Q_{100} *(c.f.s.)*
		** For Calcs See Runoff Summary*														
OS-Z	0.48	0.20	0.44	0.20	100	0.04	10.3	0	4.0%	1.0	0.0	10.3	4.0	7.0	0.4	1.5
OS-Y	3.84	0.20	0.44	0.20	100	0.02	12.9	0	2.0%	0.7	0.0	12.9	3.7	6.3	2.8	10.7
OS-X	0.93	0.09	0.36	0.09	15	0.02	5.6	0	2.0%	0.7	0.0	5.6	4.9	8.7	0.4	2.9
EX-A	6.30	0.09	0.36	0.09	50	0.21	4.7	2300	1.0%	0.5	76.7	81.4	1.3	2.1	0.8	4.8
EX-B	21.10	0.09	0.36	0.09	300	0.02	25.1	0	2.0%	0.7	0.0	25.1	2.7	4.5	5.2	34.1
EX-C	3.91	0.09	0.36	0.09	75	0.08	8.0	1100	1.0%	0.5	36.7	44.6	2.0	3.2	0.7	4.5

DEVELOPED

		WEIGHTED		*OVERLAND*				*STREET / CHANNEL FLOW*				T_C	*INTENSITY*		*TOTAL FLOWS*	
BASIN	**AREA TOTAL** *(Acres)*	C_5	C_{100}	C_5	**Length** *(ft)*	**Slope** *(ft/ft)*	T_t *(min)*	**Length** *(ft)*	**Slope** *(%)*	**Velocity** *(fps)*	T_t *(min)*	**TOTAL** *(min)*	I_5 *(in/hr)*	I_{100} *(in/hr)*	Q_5 *(c.f.s.)*	Q_{100} *(c.f.s.)*
		** For Calcs See Runoff Summary*														
OS-Z	0.48	0.20	0.44	0.20	100	0.04	10.3	0	4.0%	1.0	0.0	10.3	4.0	7.0	0.4	1.5
OS-Y	3.84	0.20	0.44	0.20	100	0.02	12.9	0	2.0%	0.7	0.0	12.9	3.7	6.3	2.8	10.7
OS-X	0.93	0.09	0.36	0.09	15	0.02	5.6	0	2.0%	0.7	0.0	5.6	4.9	8.7	0.4	2.9
EX-A	6.30	0.09	0.36	0.09	50	0.21	4.7	2300	1.0%	0.5	76.7	81.4	1.3	2.1	0.8	4.8
PR-1	21.10	0.81	0.88	0.81	100	0.02	4.2	0	2.0%	0.7	0.0	4.2	5.2	9.5	89.2	177.3
EX-C	3.91	0.09	0.36	0.09	75	0.08	8.0	1100	1.0%	0.5	36.7	44.6	2.0	3.2	0.7	4.5

Calculated by: DLF

Date: 5/6/2020

Checked by: _____

LOT 1177 WOODMEN HILLS FILING #10
SURFACE ROUTING SUMMARY

Design Point(s)	*Contributing Basins*	*Area (ac)*	*Flow (cfs)*	
			Q_5	Q_{100}
Z	**OS-Z**	0.48	0.4	1.5
Y	**OS-Y**	3.84	2.8	10.7
X	**OS-X**	0.93	0.4	2.9
A	**OS-Z, OS-X, EX-A, PR-1**	22.5	90.8	186.5
1	**PR-1**	21.1	89.2	177.3
C	**ALL + Drainageway Flow**	-	~514	~2,062

Calculated by: DLF

Date: 5/6/2020

Checked by: _____

DRAINAGE MAPS

LOT 1177 WOODMEN HILLS FILING #10

EL PASO COUNTY, CO

EXISTING DRAINAGE MAP

MAY 2020

NOTES

1. A PORTION OF THE SITE IS WITHIN A 100 YEAR FEMA FLOOD PLAIN.
2. OFFSITE BASIN OS-X IS A STRIP OF LAND BETWEEN THE CURB AND PROPERTY LINE. THIS BASIN DRAINS INTO THE ADJACENT SWALE FOR ITS ENTIRE LENGTH.

PLAT NAME

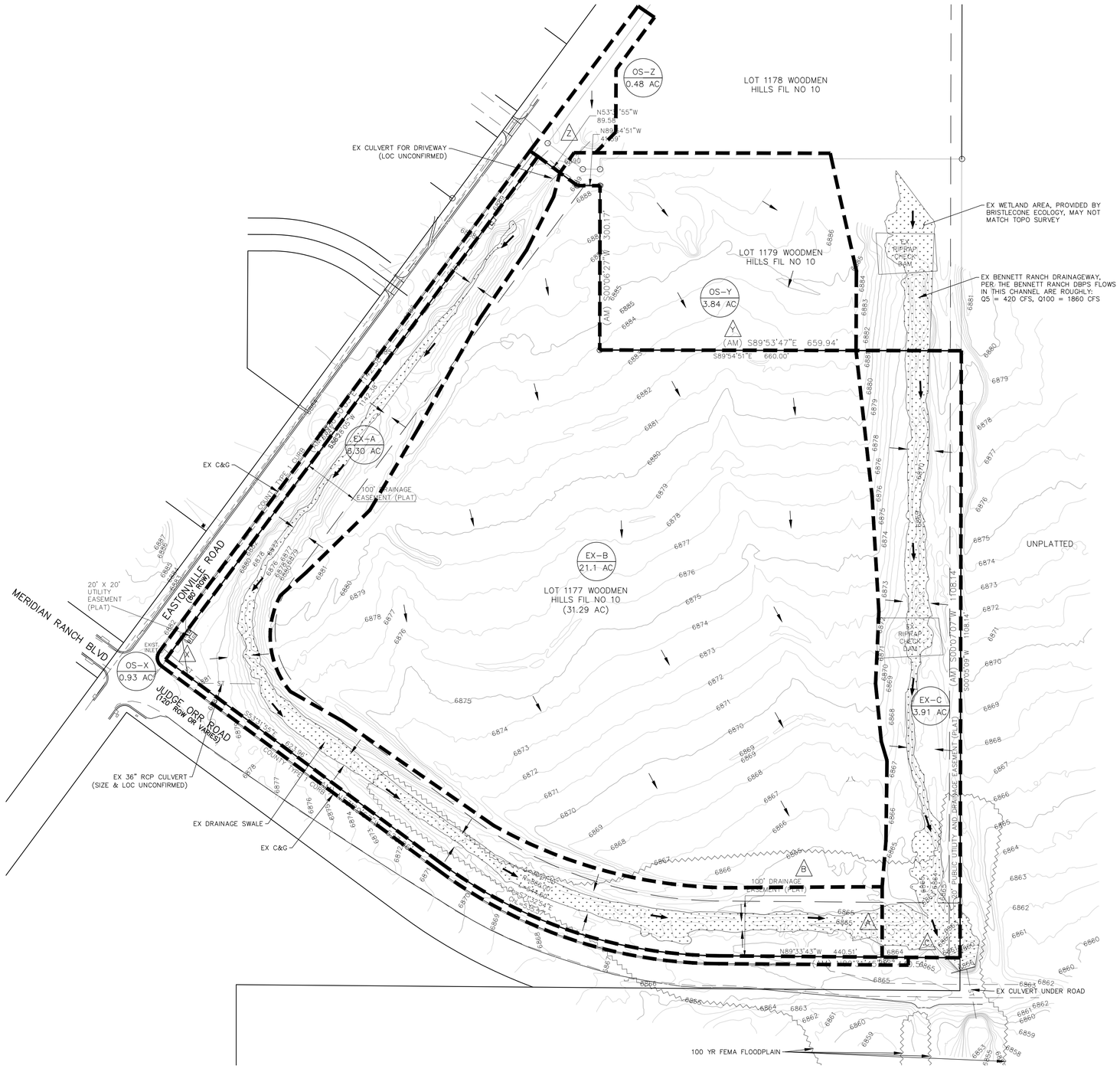
LOT 1177 WOODMEN HILLS FIL NO 10

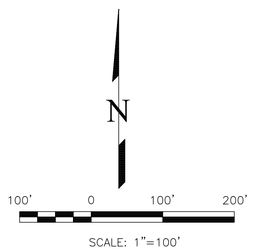
DRAINAGE SUMMARY

DESIGN POINT	BASIN TRIBUTARY	AREA (ACRES)	FLOW 5 YR (cfs)	FLOW 100 YR (cfs)
Z	OS-Z	0.48	0.4	1.5
Y	OS-Y	3.84	2.8	10.7
X	OS-X	0.93	0.4	2.9
A	EX-A	6.30	0.8	4.8
B	EX-B	21.1	5.2	34.1
C	EX-C	3.91	0.7	4.5

LEGEND

- P-7 / 12.22 — BASIN DESIGNATION / AREA IN BASIN (AC)
- D — DESIGN POINT
- BASIN BOUNDARY
- ROAD AND DITCH FLOW DIRECTION
- GROUND SURFACE FLOW DIRECTION
- 6132 — EXISTING CONTOURS – MINOR
- 6130 — EXISTING CONTOURS – MAJOR
- PR — PROPOSED
- EX — EXISTING
- SETBACK LINE
- UG — UNDERGROUND GAS LINE
- UE — UNDERGROUND ELECTRIC LINE
- X — BARBED WIRE FENCE
- V — UNDERGROUND WATER LINE
- SS — SANITARY SEWER LINE
- ST — STORM SEWER LINE
- SANITARY SEWER MANHOLE
- WATER VALVE
- FIRE HYDRANT
- 100 YEAR FLOODPLAIN





REVISIONS

NO.	DESCRIPTION	DATE

UNTIL SUCH TIME AS THESE DRAWINGS ARE APPROVED BY THE APPROPRIATE REVIEWING AGENCIES, TERRA NOVA ENGINEERING, INC. APPROVES THEIR USE ONLY FOR THE PURPOSES DESIGNATED BY WRITTEN AUTHORIZATION.

PREPARED FOR:
NES, INC.
ATTN: JOHN MAYNARD
619 N CASCADE AVE. #200
COLORADO SPRINGS, CO 80903
713.471.0073

Terra Nova Engineering, Inc.
721 S. 23RD STREET
COLORADO SPRINGS, CO 80904
OFFICE: 719-635-6422
FAX: 719-635-6426
www.tnesinc.com

LOT 1177 WOODMEN HILLS FILING #10

EXISTING DRAINAGE MAP

DESIGNED BY	DLF
DRAWN BY	DLF
CHECKED BY	LD
H-SCALE	AS NOTED
V-SCALE	N/A
JOB NO.	2015.00
DATE ISSUED	05/07/20
SHEET NO.	1 OF 2

N:\jobs\2015.00\Drawings\201500 FDM.dwg, 5/7/2020 3:46:38 PM

LOT 1177 WOODMEN HILLS FILING #10

EL PASO COUNTY, CO

PROPOSED DRAINAGE MAP

MAY 2020

NOTES

1. A PORTION OF THE SITE IS WITHIN A 100 YEAR FEMA FLOOD PLAIN.
2. OFFSITE BASIN OS-X IS A STRIP OF LAND BETWEEN THE CURB AND PROPERTY LINE. THIS BASIN DRAINS INTO THE ADJACENT SWALE FOR ITS ENTIRE LENGTH.

PLAT NAME

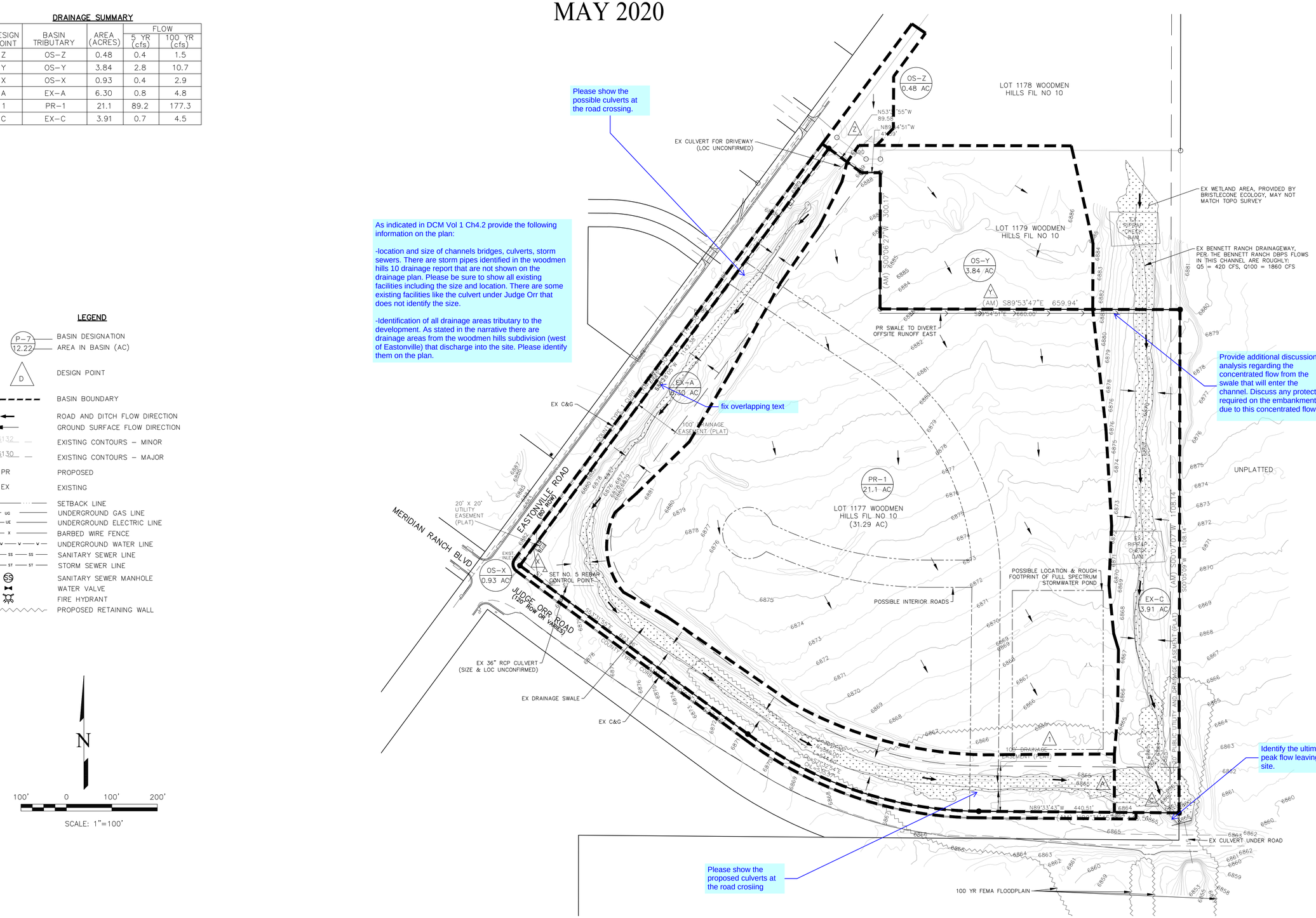
LOT 1177 WOODMEN HILLS FIL NO 10

DRAINAGE SUMMARY

DESIGN POINT	BASIN TRIBUTARY	AREA (ACRES)	FLOW 5 YR (cfs)	FLOW 100 YR (cfs)
Z	OS-Z	0.48	0.4	1.5
Y	OS-Y	3.84	2.8	10.7
X	OS-X	0.93	0.4	2.9
A	EX-A	6.30	0.8	4.8
1	PR-1	21.1	89.2	177.3
C	EX-C	3.91	0.7	4.5

LEGEND

- P-7 / 12.22 — BASIN DESIGNATION / AREA IN BASIN (AC)
- D — DESIGN POINT
- BASIN BOUNDARY
- ROAD AND DITCH FLOW DIRECTION
- GROUND SURFACE FLOW DIRECTION
- 6132 — EXISTING CONTOURS – MINOR
- 6130 — EXISTING CONTOURS – MAJOR
- PR — PROPOSED
- EX — EXISTING
- SETBACK LINE
- UG — UNDERGROUND GAS LINE
- UE — UNDERGROUND ELECTRIC LINE
- X — BARBED WIRE FENCE
- V — UNDERGROUND WATER LINE
- SS — SANITARY SEWER LINE
- ST — STORM SEWER LINE
- SANITARY SEWER MANHOLE
- WATER VALVE
- FIRE HYDRANT
- PROPOSED RETAINING WALL



REVISIONS

NO.	DESCRIPTION	DATE

UNTIL SUCH TIME AS THESE DRAWINGS ARE APPROVED BY THE APPROPRIATE REVIEWING AGENCIES, TERRA NOVA ENGINEERING, INC. APPROVES THEIR USE ONLY FOR THE PURPOSES DESIGNATED BY WRITTEN AUTHORIZATION.

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OFFICE: 719-635-6422
FAX: 719-635-6426
www.tneinc.com

LOT 1177 WOODMEN HILLS FILING #10

PROPOSED DRAINAGE MAP

DESIGNED BY DLF
DRAWN BY DLF
CHECKED BY LD
H-SCALE AS NOTED
V-SCALE N/A
JOB NO. 1973.00
DATE ISSUED 08/02/18
SHEET NO. 2 OF 2

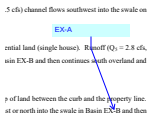
N:\jobs\2015.00\Drawings\201500 FDM.dwg, 5/7/2020 3:46:39 PM

MDDP_v1_redlines.pdf Markup Summary

Callout (17)

Subject: Callout
Page Label: 4
Author: Daniel Torres
Date: 9/29/2020 4:43:56 PM
Status:
Color:
Layer:
Space:

This site was studied with the Woodmen Hills 10 Preliminary and Final Plat applications (PCD File No. SP00013, SF00030). Please provide some background information regarding the previous drainage reports done on the site & the immediate area.



Subject: Callout
Page Label: 5
Author: Daniel Torres
Date: 9/29/2020 7:12:56 PM
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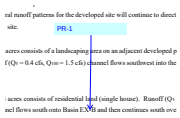
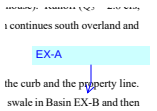
Color:
Layer:
Space:

EX-A



Subject: Callout
Page Label: 6
Author: Daniel Torres
Date: 9/29/2020 9:07:17 PM
Status:
Color:
Layer:
Space:

PR-1



Subject: Callout
Page Label: 6
Author: Daniel Torres
Date: 9/29/2020 9:08:14 PM
Status:
Color:
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EX-A

Subject: Callout
Page Label: 4
Author: Daniel Torres
Date: 9/29/2020 9:28:00 PM
Status:
Color:
Layer:
Space:

Please elaborate in your description of the purpose of the MDDP. Refer to DCM Vol. 1 CH4.2 beginning paragraph.

Subject: Callout
Page Label: 5
Author: Daniel Torres
Date: 9/29/2020 9:29:20 PM
Status:
Color:
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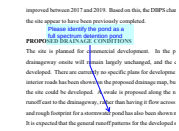
Space:

The Woodmen Hills final drainage report and CD's show multiple storm pipes discharging into basin EX-A. Provide discussion in your narrative of these offsite basins from the Woodmen Hills subdivision that discharge into the site. Include the flows from these basins in your analysis. Also provide discussion of the offsite flows entering the Bennett Ranch Drainageway upstream of the northerly property line at basin EX-C.

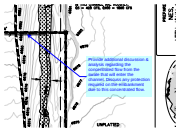
Subject: Callout
Page Label: [1] 201500 FDM-PR DRAIN
Author: Daniel Torres
Date: 9/29/2020 9:43:47 PM
Status:
Color:
Layer:
Space:

fix overlapping text



Subject: Callout
Page Label: 6
Author: Daniel Torres
Date: 9/30/2020 1:22:23 PM
Status:
Color:
Layer:
Space:

Please identify the pond as a full spectrum detention pond



Subject: Callout
Page Label: [1] 201500 FDM-PR DRAIN
Author: Daniel Torres
Date: 9/30/2020 1:41:42 PM
Status:
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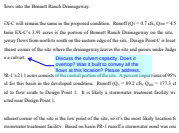
Provide additional discussion & analysis regarding the concentrated flow from the swale that will enter the channel. Discuss any protection required on the embankment due to this concentrated flow.



Subject: Callout
Page Label: 7
Author: Daniel Torres
Date: 9/30/2020 1:47:15 PM
Status:
Color:
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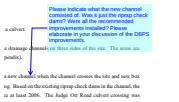
Space:

Discuss the culvert capacity. Does it overtop? Was it built to convey all the flows at this location? Please address.



Subject: Callout
Page Label: 6
Author: Daniel Torres
Date: 9/30/2020 1:55:24 PM
Status:
Color:
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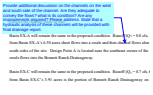
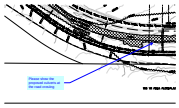
Space:

Please indicate what the new channel consisted of. Was it just the riprap check dams? Were all the recommended improvements installed? Please elaborate in your discussion of the DBPS improvements.



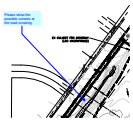
Subject: Callout
Page Label: 7
Author: Daniel Torres
Date: 9/30/2020 3:20:34 PM
Status:
Color:
Layer:
Space:

Provide additional discussion on the channels on the west and south side of the channel. Are they adequate to convey the flows? what is its condition? Are any improvements required? Please address. State that a hydraulic analysis of these channels will be provided with final drainage report.



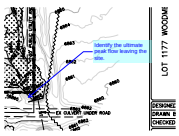
Subject: Callout
Page Label: [1] 201500 FDM-PR DRAIN
Author: Daniel Torres
Date: 9/30/2020 3:21:33 PM
Status:
Color:
Layer:
Space:

Please show the proposed culverts at the road crosiing



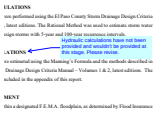
Subject: Callout
Page Label: [1] 201500 FDM-PR DRAIN
Author: Daniel Torres
Date: 9/30/2020 3:21:58 PM
Status:
Color:
Layer:
Space:

Please show the possible culverts at the road crossing.



Subject: Callout
Page Label: [1] 201500 FDM-PR DRAIN
Author: Daniel Torres
Date: 9/30/2020 7:09:33 AM
Status:
Color:
Layer:
Space:

Identify the ultimate peak flow leaving the site.



Subject: Callout
Page Label: 8
Author: Daniel Torres
Date: 9/30/2020 7:10:28 AM
Status:
Color:
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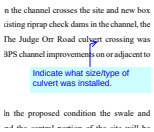
Hydraulic calculations have not been provided and wouldn't be provided at this stage. Please revise.



Subject: Callout
Page Label: 6
Author: Daniel Torres
Date: 9/30/2020 7:10:41 AM
Status:
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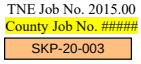
Indicate what size/type of culvert was installed.

Engineer (1)



Subject: Engineer
Page Label: 1
Author: GReese
Date: 9/22/2020 2:48:05 PM
Status:
Color:
Layer:
Space:

SKP-20-003

SW - Comment (1)

Subject: SW - Comment
Page Label: 7
Author: GReese
Date: 9/22/2020 2:39:25 PM
Status:
Color:
Layer:
Space:

DCM Vol 1 - Chap 4.2: discuss and analyze any other nearby existing and proposed downstream facilities besides Bennett Ranch Drainagrway, if applicable. For example what does the Drainageway drain into - is there a pond eventually? Also, describe the Drainageway in more detail --- is it a grassy swale? Does it have any riprap? Will it need riprap in the future to protect it from the outfall of the proposed pond onsite?

SW - Text Box (1)

Subject: SW - Text Box
Page Label: 8
Author: GReese
Date: 9/30/2020 10:16:47 AM
Status:
Color:
Layer:
Space:

DCM Vol 1 - Chap 4.2: Discussion of drainage problems anticipated within the development and their solutions.

Text Box (6)

Subject: Text Box
Page Label: 8
Author: Daniel Torres
Date: 9/30/2020 1:15:47 PM
Status:
Color:
Layer:
Space:

Please provide the following in your report. Note these items are listed in DCM Vol. 1 CH4.2.

-Discussion and analysis of existing and any proposed downstream facilities
-Discussion of drainage problems anticipated within the development and their solutions.
-As previously stated in the comments above discuss all offsite tributary drainage areas that discharge into this site. Be sure to include the flows that are entering the site in your analysis.
-Discuss any drainage problems that the DPBS identified for this site/location and present alternate solutions for these problems.

Subject: Text Box
Page Label: 8
Author: Daniel Torres
Date: 9/30/2020 1:33:35 PM
Status:
Color:
Layer:
Space:

Specifically address ECM Section I.7.2.A -Four Step Process and show how these steps will be provided for on this site.

Subject: Text Box
Page Label: 8
Author: Daniel Torres
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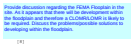
Please provide information from the Bennet Ranch DBPS that shows how this MDDP complies with or varies from that study.



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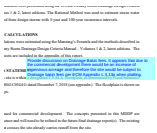
Provide discussion regarding the FEMA Flooplain in the site. As it appears that there will be development within the floodplain and therefore a CLOMR/LOMR is likely to be required. Discuss the problems/possible solutions to developing within the floodplain.



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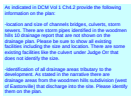
Provide discussion on Drainage Basin fees. It appears that due to the commercial development there would be an increase of impervious acreage and therefore the site would be subject to Drainage basin fees per ECM Appendix L 3.13a when platting.



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As indicated in DCM Vol 1 Ch4.2 provide the following information on the plan:

-location and size of channels bridges, culverts, storm sewers. There are storm pipes identified in the woodmen hills 10 drainage report that are not shown on the drainage plan. Please be sure to show all existing facilities including the size and location. There are some existing facilities like the culvert under Judge Orr that does not identify the size.

-Identification of all drainage areas tributary to the development. As stated in the narrative there are drainage areas from the woodmen hills subdivision (west of Eastonville) that discharge into the site. Please identify them on the plan.