Revise to Final Drainage Report

~~PRELIMINARY DRAINAGE REPORT~~

FOR

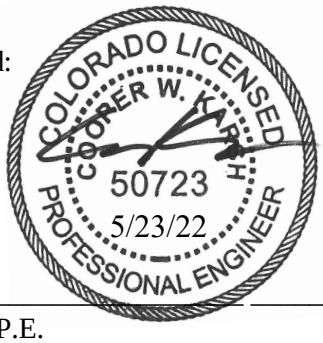
FALCON DISTRICT 49 TRANSPORTATION FACILITY, FALCON, CO

Owner: RTA Architects, 19 South Tejon St, Suite 300, Colorado Springs, CO. 80903.

Engineer: JVA, Inc.
1319 Spruce Street
Boulder, CO 80301
Attn. Cooper W. Karsh
(303)565-4961

May 23, 2022

Engineer of Record:



Cooper W. Karsh P.E.
Registered Professional Engineer
State of Colorado No.

Approved For One Year From This Date

City Engineer **Date**

Delete

Water Department **Date**

JVA, Incorporated

1319 Spruce Street

Boulder, CO 80302

Ph: 303.444.1951

Fax: 303.444.1957

Toll Free: 877.444.1951

Web site: www.jvajva.com

E-mail: info@jvajva.com

Remove and replace pages 2 and 3 with a single signature sheet containing all three of the following signature blocks.

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.

_____ _____

[Name, P.E. #_____] Date

Owner/Developer's Statement:

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

_____ _____

[Name, Title] Date
[Business Name]
[Address]

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.

_____ _____

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

Conditions:

ENGINEER'S STATEMENT:

"I hereby certify that this report and the enclosed plan for the preliminary drainage design of the Falcon District 49 Transportation Facility were prepared under my direct supervision in accordance with the provisions of the El Paso County Drainage Criteria Manual. I understand that El Paso County does not and shall not assume liability for drainage facilities designed by others."

Signature: 

Cooper W. Karsh, P.E.
Registered Professional Engineer
State of Colorado No. 50723

Table of Contents

A. GENERAL LOCATION AND DESCRIPTION

1. Location

District 49 (D49) Transportation Centre is in Falcon at 12050 Falcon Highway. The subject site is located east of Meridian Road, west of Chief Road and south of Highway 24.

The site is bound by Saint Benedict Church to the east, residential homes to the west and Highway 24 to the north. The site is in the jurisdiction of El Paso County. The property is accessed at two locations: via Falcon Highway south of the subject site and Swingline Road, north of the site. Refer to Figure 1 for the site location.

The subject site is in the Falcon CHWS1400 drainage basin. There is an existing creek which runs in a north-south direction, along the western boundary of the site and parallel to Gelbvieh Road.

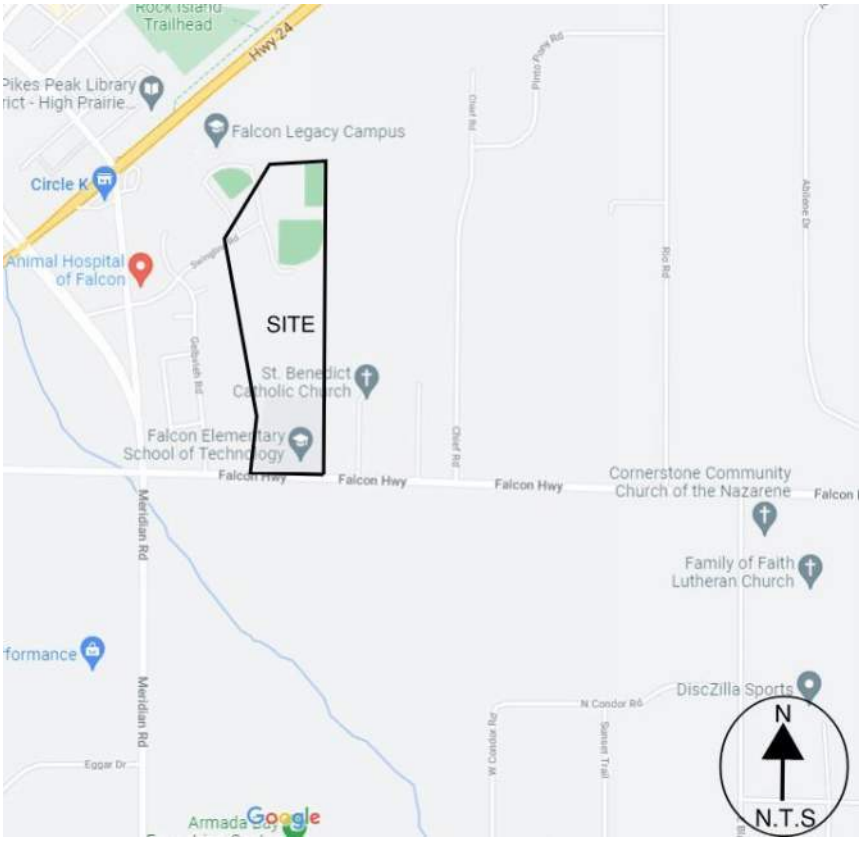


Figure 1- Site Location Map (Google © 2022 Imagery)

2. Description of Existing Site

The existing development site area is 30.51 acres and approximately 25% of impermeable surfaces. The site comprises of an elementary school building, a running track with granular finish, a baseball field and a maintenance yard building.

The site generally falls in a north-south direction, from an existing elevation of 6,820 ft northwest of the site to 6,782 ft southwest of the site. This fall in elevation is over 2,714 ft in length or 1.4% in gradient. An internal gravel access road within the site acts as catchment

divide with one basin discharging in a south easterly direction and a second in a south westerly direction. Refer to the JVA General Location Map drawing which shows Basin H-1 discharging into a local depression and Basin H-2 discharging into a wetland on-site.

The site is covered with soils found in hydrologic soil group A.

There is an existing creek which runs along the western boundary of the site which is a tributary to the Black Squirrel Creek and forms part of the Falcon CHWS1400 drainage basin. Refer to Appendix A which shows the site on El Paso Drainage Basins Map, extract from the Muller Engineering Company (1988).

Refer to the JVA General Location Map drawing for the existing development and site boundary.

Delete/modify statement. The "do nothing alternative" was not the selected alternative in the DBPS. See Chapter 6 for the selected alternative and associated DBPS improvements.

See the proposed drainage map for additional comments.

B. DRAINAGE B

1. Major Basin D

D49 Transp nd a review of the Falcon Dra 015 was carried out. The main findings were:

- The Falcon watershed flows southeasterly from the southern slope of the Black Forest. The subject site is in the Middle Tributary Basin as shown on Figure 3-2 of the Falcon DBPS report.
- Figure 2-1 Environmental Features from the Falcon DBPS indicates that the subject site lies outside of the shallow (greater than 20 ft below surface) ground water area.
- Figure 5-1 Do Nothing Alternative from the Falcon DBPS indicates no immediate action required to preserve existing condition. It also indicates that drop structures with toe protection is needed as part of the Reach Phasing Priority.

The project is located within FEMA flood map number 08041C0561G effective July 12, 2018. Part of the site is located within Zone AE, which is defined by FEMA as areas predicted to be in special flood hazard zone with base flood elevations determined. Note, the FEMA maps display information on a larger scale. A survey was commissioned to plot the predicted flooding Zone AE on the subject site boundary and this information is available in Appendix C. There are no proposed structures within the predicted flooding Zone AE. Refer to the JVA Grading & Drainage Plan drawings for further information.

There are limited irrigation facilities on site. There are no encumbrances that will impact the proposed development.

Rename to Existing Sub-Basin Description

2. Sub-basin Description

D49 Transportation Centre is split into two drainage catchments. An internal gravel access road within the site acts as catchment divide with one basin discharging in a south easterly direction and a second in a south westerly direction. Refer to the JVA General Location Map drawing which shows Basin H-1 discharging into a local depression and Basin H-2 discharging into a wetland on-site.

The basin in the northeast portion of the site includes gravel parking areas, gravel and grass fields and four existing small buildings. The basin drains to the existing surface depression southeast of the baseball field via overland sheet flows. This existing surface depression is not connected to a storm sewer network. Surface water runoff from this basin percolates into the ground.

The basin in the western portion of the site includes gravel finish access road, gravel and grass fields. The basin drains to the existing wetland south of the running track via overland sheet flows. This existing wetland discharges into the creek running along the western boundary of the site. This creek is a tributary of the Black Squirrel Creek.

The property has an off-site drainage basin which is an existing educational facility north of the property that discharges to the existing creek along the western boundary. The offsite basin consists of 2.75 acres of landscape and 4.55 acres of impermeable surfaces. Runoff from this basin will be intercepted at the property boundary and di creek running along the western boundary of the site.

Add a section for "Proposed sub-basin description" and describe each of the proposed sub-basin shown on the proposed drainage map.

C. DRAINAGE DESIGN CRITERIA

1. Development Criteria Reference

- El Paso County Colorado Drainage Criteria Manual.
- Falcon Drainage Basin Planning Study – Selected Plan Report – Final – September 2015.
- Intensity, Duration, Frequency (IDF) values for the 2-year, 5-year, 10-year & 100-year from NOAA Atlas for Falcon were used for the analysis for the site. A copy of the IDF data is provided in Appendix B.

nage map shows and the adjacent are both at 6808.

Replace with City of Colorado Springs Drainage Criteria Manual Vol 1, May 2014

. Previous Drainage Studies

D49 Transportation Centre lies in the Falcon CHW review of the Falcon Drainage Basin Planning Study (DBPS) – I was carried out. The proposed site layout takes cognizance of the fi report. Proposed structures and access are located outside of the predicted flooding Zone AE. In addition, proposed finished elevations are above base flood zone elevations in the vicinity. The proposed Maintenance Building is located approximately 220 ft away from the predicted flooding zone. Refer to the JVA Grading & Drainage Plan drawing which shows outline of the predicted flooding Zone AE and the proposed site layout, outside of this zone.

3. Hydrologic Criteria

Rainfall data and intensity values were determined using the criteria in El Paso County Drainage Criteria Manual and the Mile High Flood District Urban Storm Drainage Criteria Manual (USDCM). Intensity, Duration, Frequency (IDF) values for the 2, 5, 10 & 100-year events from NOAA Atlas for the subject site location were utilized for the analysis. A copy of IDF data is provided in Appendix B. Output calculation spreadsheets are also provided in Appendix B.

The Rational Method (Q=CIA) was used to determine the storm runoff (Q) from the areas tributary to the proposed storm system, with composite runoff coefficients (C) and contributing

Replace with the City's 2014 DCM IDF adopted by the County per Resolution 15-042.

Minor design storm only needs to based on the 5-yr design storm.

areas (A) given for desig ed
site characteristics are shown in Appendix B.

The design frequencies are the 10- and 100-year events for the minor and major storms respectively. The 10-year storm with a 1-hour point rainfall of 1.48 inches and the 100-year storm, with a 1-hour point rainfall of 2.54 inches were used.

Detention volume was obtained by calculating the required volume of storage for Water Quality Capture Volume (WQCV) and the difference between the allowable discharge rate based on historic runoff rates and the developed runoff rates, in line with El Paso County drainage requirements. WQCV was determined using total imperviousness ratio and watershed inches from Figure EDB-2. The proposed detention basin is an extended 40-hour drain time. A full WQCV is provided for the minor storm and half for the major storm. The rational formula based Modified FAA Procedure was used to estimate storage requirements. The proposed detention basin is also designed to accommodate future phases of the development. Output calculation spreadsheets are provided in Appendix B.

Revise rainfall depths per City DCM Table 6-2

Table 6-2. Rainfall Dep

Return Period	1-Hour Depth
2	1.19
5	1.50
10	1.75
25	2.00
50	2.25
100	2.52

Where Z=

n be applied to the design storms or
ribed below. However, as the basin a

Revise. Rational Formula and c-values based on City DCM

D. DRAIN SIGN

1. Gener

The proposed development has been designed to meet the requirements of El Paso Count Drainage Criteria Manual. Off-site flow analysis was carried out for the fully developed conditions. The hydrologic analysis was based on existing site characteristics as the site is fully developed. The off-site area forms part of the Falcon major drainage basin. As part of the proposed works, runoff from this basin will be intercepted at the property boundary and diverted to discharge into the creek running along the western boundary of the site. Refer to the JVA drawing Drainage Plan which shows off-site drainage diversion and discharge into the creek.

The proposed development includes the construction of a maintenance building, an internal access road and car parking equivalent to 8.5 acres on a 30.45-acre site. The proposed development will also include the construction of a new detention basin as part of the proposed drainage system. The proposed works form part of a phased development. Refer to the Architect drawings and report for an outline of the phased works. Runoff from the site will be collected through a series of inlets and swales. Onsite run off will be routed to a new detention basin which will provide attenuation and water quality enhancement. Overflow from the detention basin will discharge onto the existing creek running along the western boundary of the site. The onsite detention basin will treat rainfall runoff for water quality and provide attenuation for most of the site. Storm discharges from the detention basin are as per historic rates and comply with El Paso County criteria for allowable release rates. The detention basin is designed to cater for the future development as part of phased works. Due to site constraints including site elevation, storm runoff from the southern portion of the site equivalent to 8.7 acres will not be routed to the new detention basin.

Soils on the property have been classified by the Natural Resources Conservation Service (NRCS) as hydrologic soil type ‘A’. Group A soils are described as soil with high infiltration rate and low runoff potential. Appendix A of this report provides more information on the soil type, report obtained from the NRCS.

Part of the site area is located within Zone AE of the FEMA flood map number 08041C0561G effective July 12, 2018. Zone AE is defined by FEMA as areas determined to be in special flood hazard zone with base flood elevations determined. The proposed site layout is located outside of this zone. The proposed maintenance building is located 220 ft away from the flooding zone. The subject site is in the Falcon CHWS1400 drainage basin, see Figure 2 and Appendix A for further information.

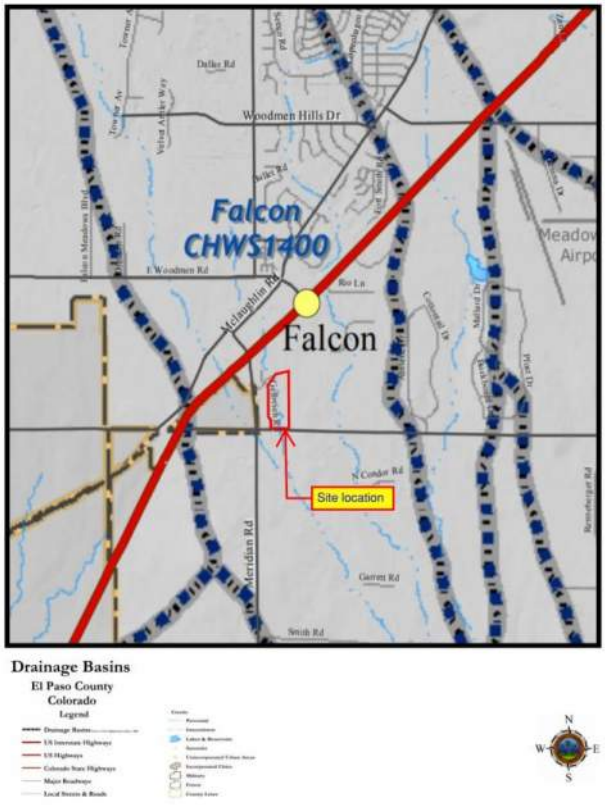


Figure 2 - Subject Site's Major Basin - Source Falcon Drainage Basin Planning Study report

The existing site is comprised of two basins designated as Basins H-1 and H-2. Basin H-1 consists of a baseball field with gravel and grass finish, limited amount of concrete finish, series of small buildings and a maintenance yard. Drainage from this basin sheet flows north to south-east at 1.3% gradient to discharge into a local depression within the site boundary. Basin H-2 consists of a running track with gravel and grass finish, limited amount of asphalt finish. Drainage from this basin sheet flows north to south-west at 10% gradient to discharge into the creek within the site boundary. Pre-development runoff calculations are summarized in Table 1 and detail information is provided in Appendix B.

discuss the drainage basin to the south where the new road and parking area is proposed.

Table 1- Historic / Pre-Developed Runoff Calculations

Basin	Area (acres)	Return Period	'C' Value	Runoff (cfs)
H-1	16.66	10-Year	0.30	14.59
		100-Year	0.43	35.99
H-2	13.85	10-Year	0.37	13.62
		100-Year	0.50	30.85

The property has an off-site drainage basin which is an existing educational facility north of the property that discharges to the existing creek along the western boundary. The offsite basin consists of 2.75 acres of landscape and 4.55 acres of impermeable surfaces. Runoff from this basin will be intercepted at the property boundary and diverted to discharge into the creek running along the western boundary of the site. Off-site developed runoff calculations are summarized in Table 2.

Clarify. Is this with the first phase?

Table 2- Offsite Runoff Calculations

Basin	Area (acres)	Return Period	'C' Value	Runoff (cfs)
O-1	7.30	10-Year	0.58	12.66
		100-Year	0.67	24.49

The proposed works form part of a phased development. The first phase consists of the construction ~~the construction~~ of a maintenance building, an internal access road and car parking equivalent to 8.5 acres on a 30.45-acre site. The proposed development will also include the construction of a new detention basin as part of the proposed drainage system. Storm runoff will be collected via series of inlets and swales to be conveyed into the new pond using below ground pipework system. Overflow from the detention basin will discharge into the existing creek running along the western boundary of the site. Post-development runoff including future phases calculations are summarized Table 3 and detail information is provided in Appendix B.

See prior comments. rainfall inches is per City DCM Table 6-2

Table 3 - Post Developed Runoff Calculations

Basin	Area (acres)	Return Period	'C' Value	Runoff (cfs)
1	30.42	10-Year	0.60	61.50
		100-Year	0.69	103.03

Detention volume requirements for the project and future expansion were calculated using the El Paso County Drainage Criteria Manual. Detention with water quality will be provided for the site. The proposed detention basin is an extended 40-hour drain time. WQCV was determined using total imperviousness ratio and watershed inches from Figure EDB-2 of the El Paso County Drainage Criteria Manual. The allowable discharge rates are equal to the historic runoff rates. Top water elevation for the critical storm and WQCV is 6,794.70 ft. Detailed calculations for the detention volumes are provided in Appendix B of this report and are summarized in Table 4.

Modify. Doesn't make sense. Did you mean "The proposed detention basin is designed as an extended detention basin with 40-hr drain time for the WQCV."

Update. Doesn't make sense. Top WSE would be for the major storm.

Table 4 - Detention Pond Volume Summary

Basin	Area (acres)	Return Period	Basin Imperviousness Percentage (%)	Water Capture Volume (cf)	Detention Volume (cf)	Storage Requirements (cf) (Det Vol + WQCV)
1	30.42	10-Year	73.9	24,481	47,640	72,121
		100-Year	73.9	12,241	54,290	66,531

The outlet structure has an 18-inch RCP FES that will discharge into the creek along the western boundary of the site.

and parking area?

2. Specific Details

The existing storm system south of the subject site will be maintained and will not be collected for treatment and or detention. Proposed works in this part of the site equivalent to 8.3 acres is limited to a new access road. Existing constraints including finished elevations will not allow the new road to drain into the proposed detention basin. Runoff from the new road in this portion of the site will drain into ground.

water quality will be required for this area of disturbance

Description of existing and proposed hydrologic conditions are included in Sections B & D of this report.

A limited amount of irrigation is proposed as part of the improvements.

ate in your own words that e storm drain system and tention facilities are private d will be maintained by hool District 49 [change if somebody else]

roposed improvements will provide adequate storage and water quality enhancement xtended detention basin, which will limit peak runoff rates to historic rates. In addition, roposed drainage system will have no impact to adjacent properties and or storm eyance systems in the vicinity.

tormwater detention pond facility and all its components will be constructed by the icant in accordance with the plans and specifications described in this report and Final tructure Plans. The detention pond and its outlet structure will operate and be maintained in good working order and as directed by El Paso County. The detention pond and its outlet structure will be inspected quarterly and after any significant rainfall during the first years of operation. Inspection and maintenance will be carried out by the Operation Crew on-site. At any time during the inspections appropriate means will be selected to clean and maintain the facility to its intended working order. The Post-Construction Stormwater Control Operations and Maintenance Agreement entered by the Applicant and El Paso County shall constitute a contract or as directed by El Paso County.

Show the "Four-Step Process" for selecting structural BMPs (ECM Section I.7.2 BMP Selection). Under each step, summarize how the step was considered or implemented.

Add a section for Drainage Fee.
- Identify which basin the site is located in and state that drainage and bridge fees are not assessed with site development plan application.

E. CONCLUSION

The above drainage reports have been prepared in accordance with the El Paso County Drainage Criteria Manual.

1. Summary of Concept

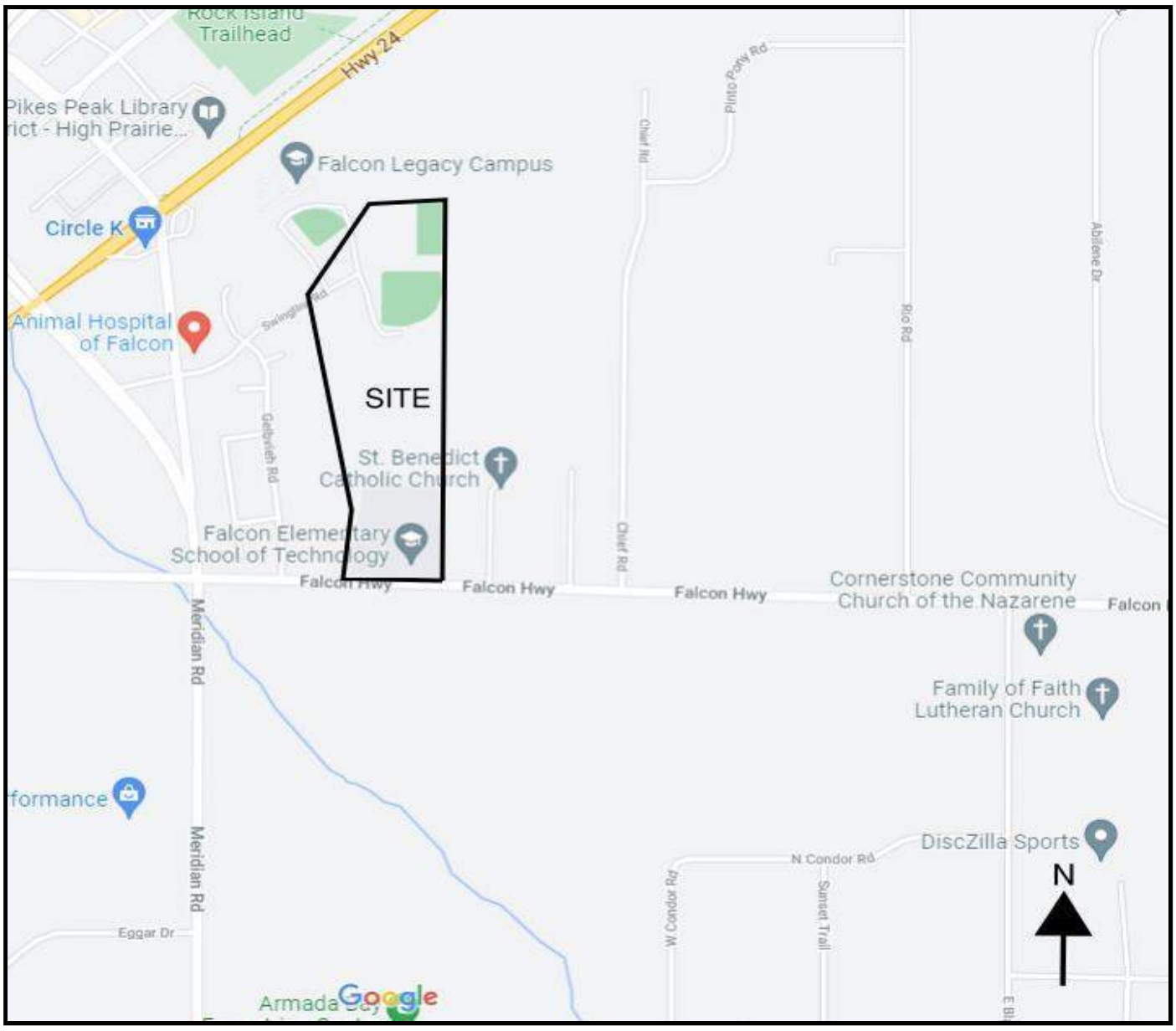
- The site is protected from adverse stormwater drainage impacts to the maximum extent possible.
- Measures are proposed to provide adequate on-site drainage and enhancement to stormwater quality. Stormwater quality is provided through extended detention basin.
- The proposed development has no effect on adjacent, upstream, and downstream sites.

F. REFERENCES

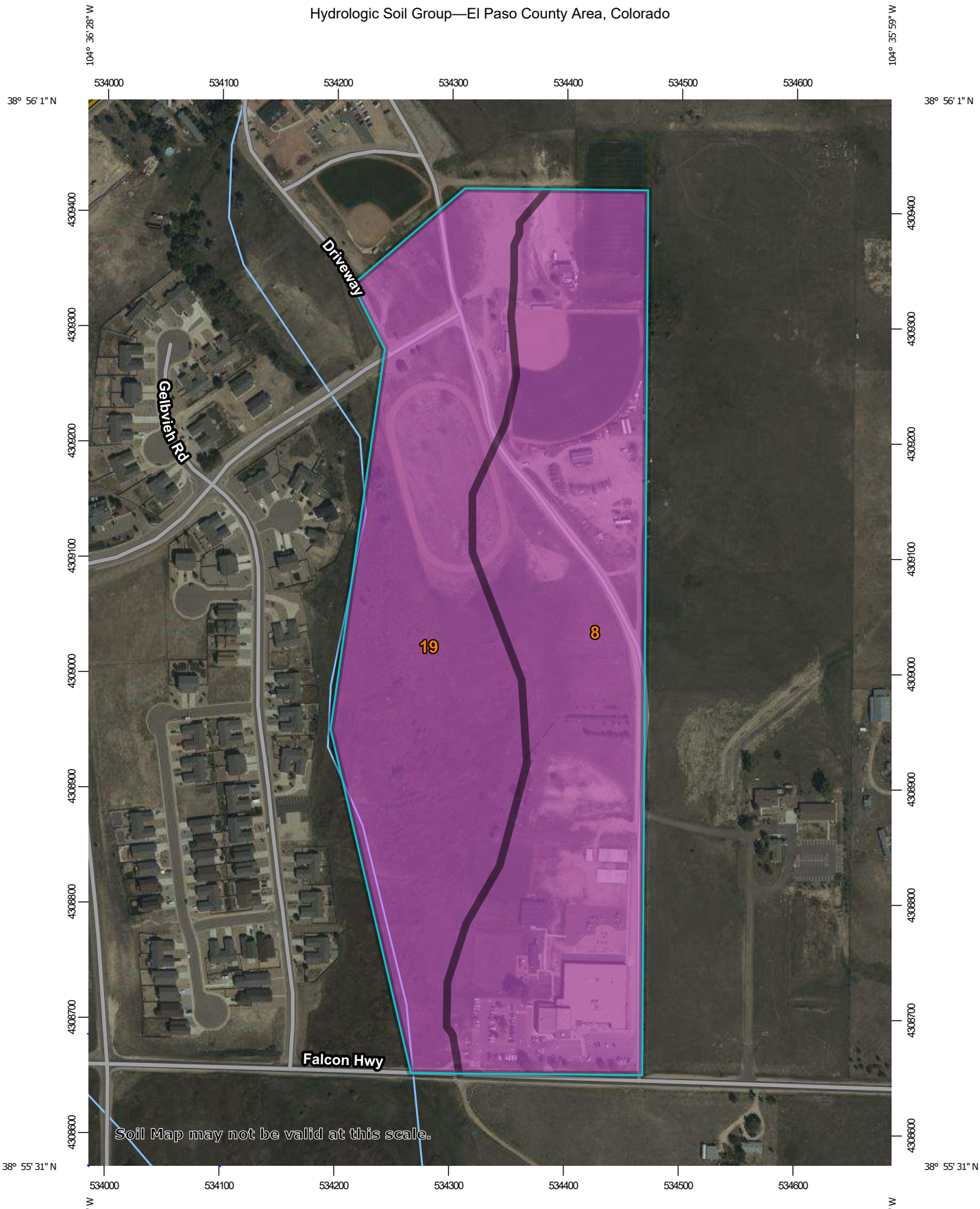
- "El Paso County Drainage Criteria Manual," October 2018.
- "Urban Storm Drainage Criteria Manual," Urban Drainage and Flood Control District, Revised 2018.
- Point Precipitation Frequency Estimates, NOAA National Weather Service. Online at https://hdsc.nws.noaa.gov, accessed February 2022.
- FEMA Flood Map Service Center. Online at https://msc.fema.gov/portal, accessed February 2022.
- Web Soil Survey, Natural Resources Conservation Service, United States Department of Agriculture. Online at: http://websoilsurvey.nrcs.usda.gov, accessed February 2022.

APPENDIX A – SITE MAPS

Appendix A - Site Location Map



Appendix A - NRCS Soil Information



Map Scale: 1:4,510 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 50 100 200 300

Feet
0 200 400 800 1200

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil 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 19, Aug 31, 2021

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

Date(s) aerial images were photographed: Sep 11, 2018—Oct 20, 2018

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
8	Blakeland loamy sand, 1 to 9 percent slopes	A	24.7	54.0%
19	Columbine gravelly sandy loam, 0 to 3 percent slopes	A	21.0	46.0%
Totals for Area of Interest			**45.8**	**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

Appendix A - FEMA Floodplain Map Information

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.

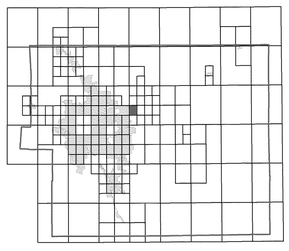
Contact **FEMA Map Service Center** (MSC) via the FEMA Map Information eXchange (FMIX) 1-877-336-2627 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this 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

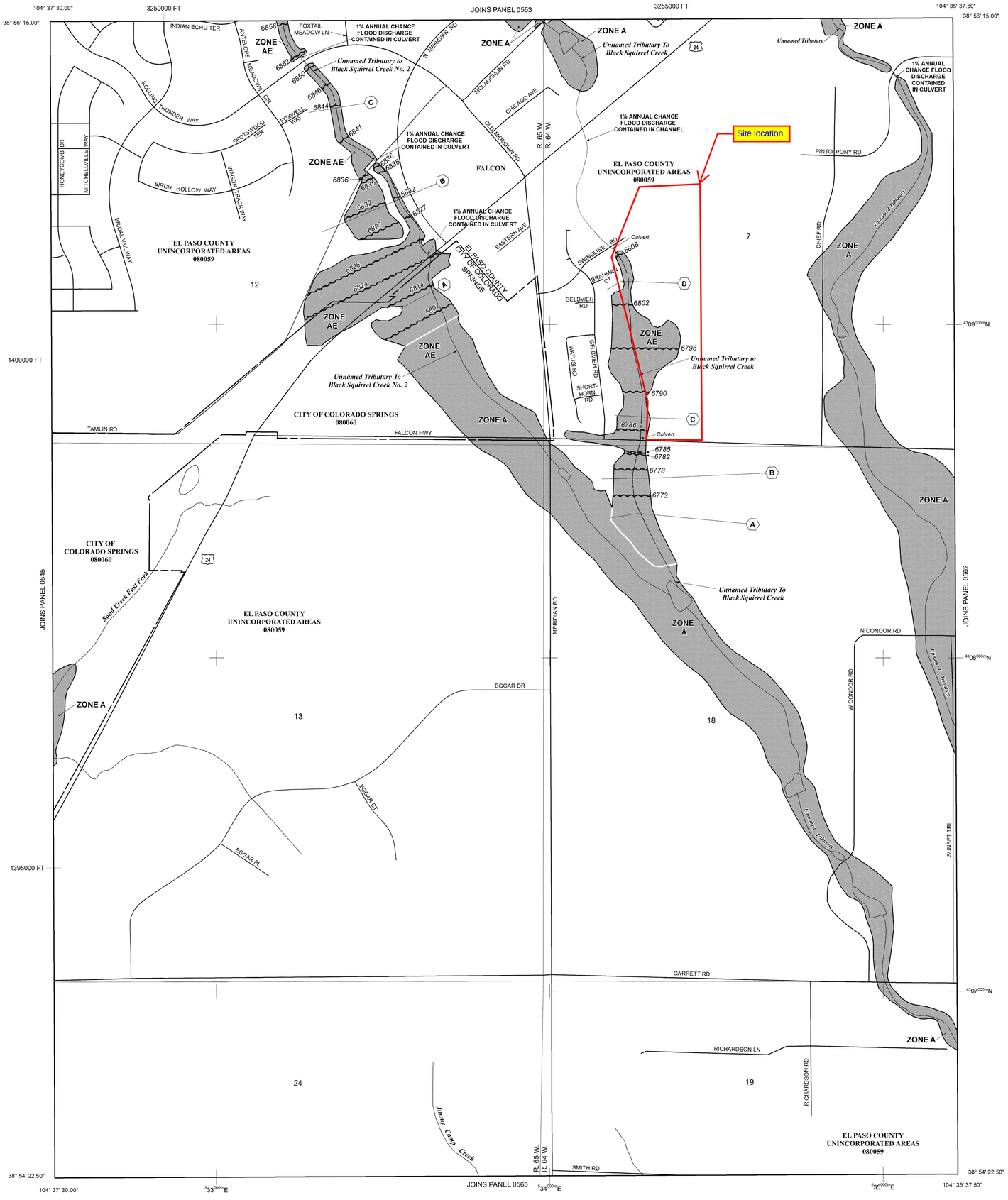
Flooding Source	Vertical Datum Offset (ft)
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION	

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 13 SOUTH, RANGE 64 WEST, AND TOWNSHIP 13 SOUTH, RANGE 65 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)
4275000mN 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 0561G

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

PANEL 561 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS, CITY OF	080060	0561	G
EL PASO COUNTY	080059	0561	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
08041C0561G

MAP REVISED
DECEMBER 7, 2018

Federal Emergency Management Agency

Appendix A - Drainage Basins El Paso County , Co.

Drainage Basins

El Paso County
Colorado

Legend

- Drainage Basins Source: Muller Engineering Company (1988)
- US Interstate Highways
- US Highways
- Colorado State Highways
- Major Roadways
- Local Streets & Roads

Creeks

- Perennial
- Intermittent
- Lakes & Reservoirs
- Summits
- Unincorporated Urban Areas
- Incorporated Cities
- Military
- Forest
- County Lines

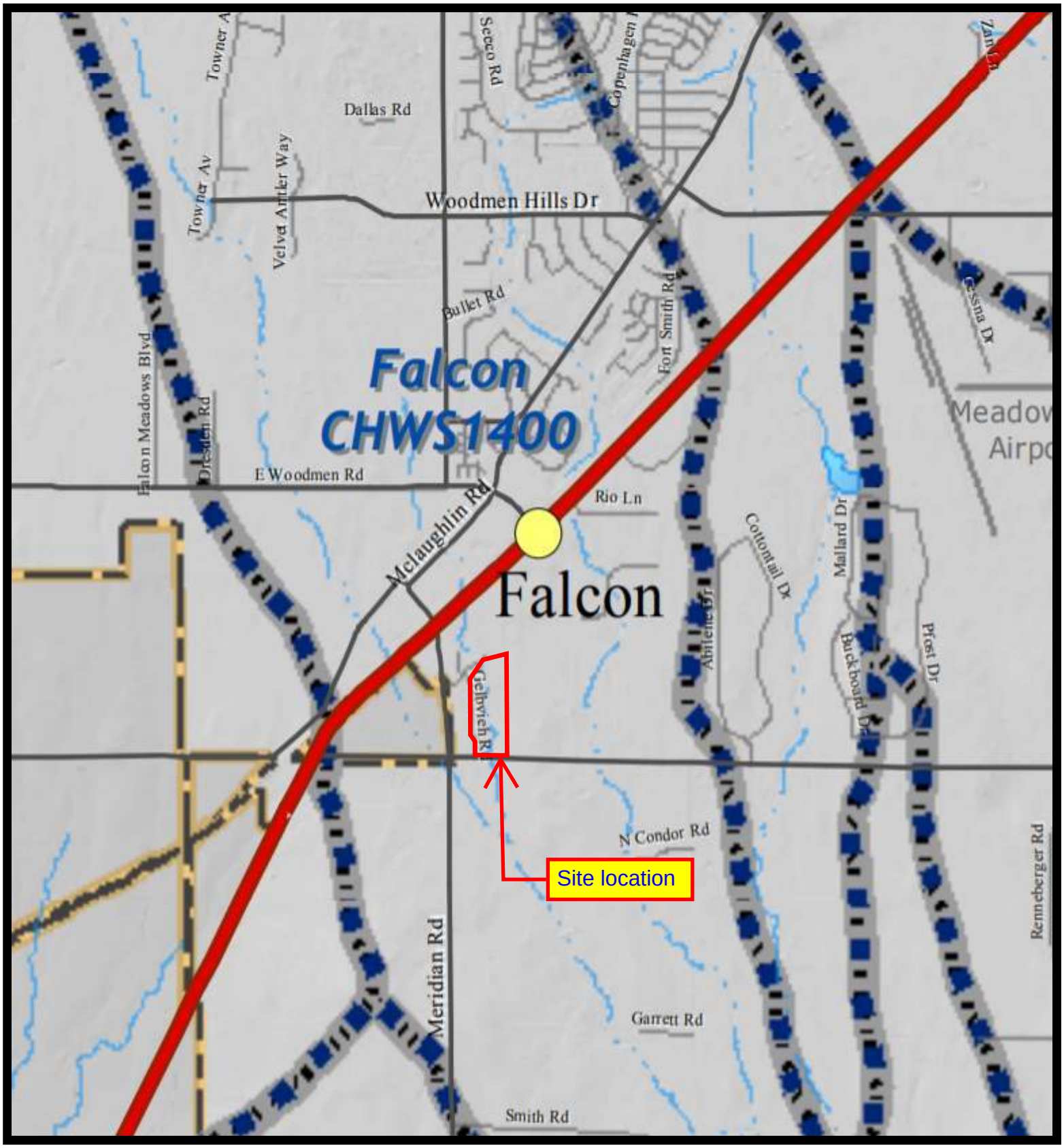
N W E S

Miles

0 0.5 1 2 3 4 5

Douglas County
Elbert County
Teller County
Lincoln County
Fremont County
Pueblo County

Upper Monument Creek FOMO5800
Monument Rock FOMO5000
Dirty Woman Creek FOMO5200
West Cherry Creek CYCY0400
East Cherry Creek CYCY0200
West Kiowa Creek KIKI0200
East Kiowa Creek KIKI0400
Bijou Creek BIBI0200
Upper Big Sandy Creek BGBG1400
Lenard BGBG1200
Antelope Creek BGBG0800
Simla BGBG0400
Ramah BGBG0600
Calhan BGBG1000
Mustang Creek BGBG0200
Jackson Creek FOMO4400
Black Forest FOMO4200
Black Squirrel Creek FOMO3600
Monument Branch FOMO3800
Beaver Creek FOMO4600
Pike National Forest
Air Force Academy FOMO3200
USAF Academy
Kettle Creek FOMO3000
Upper Black Squirrel CHBS2000
Upper Bracket Creek CHBR0600
North Fork HOHO0400
Peyton
Bennett Ranch CHWS1200
Geick Ranch CHMS0400
La Vega Ranch CHBR0400
Horse Creek HOHO0600
Hook And Line Ranch CHBS1800
Falcon CHWS1400
Falcon
Baggett CHBR0200
Little Horse Creek HOHO0200
Steels Fork HOPO1000
Cottonwood Creek FOMO2200
Pine Creek FOMO2800
South Pine Creek FOMO2600
Dry Creek FOMO2400
Crystola
Upper Fountain FOFO7600
Cheyenne Canon FOFO5800
Douglas Creek FOMO1000
Templeton Gap FOMO1200
Cascade
Williams Canyon FOFO7200
Manitou Reservoir FOFO7400
MANITOU SPRINGS
COLORADO SPRINGS
Shooks Run FOFO4400
Sand Creek FOFO4000
Solbers Ranch CHWS0800
Haegler Ranch CHMS0200
Curtis Ranch CHWS1000
West Big Springs Creek CHBG0200
Upper Big Springs Creek CHBG0400
Rush HOPO0800
Livestock Company CHWS0400
West Squirrel CHWS0600
Ellicott
Yoder
Rush
Ellicott CHBS1600
Lower Big Springs Creek CHBS1400
Telephone Exchange CHWS0200
Ellicott Consolidated CHBS1200
Upper Pond Creek HOPO0600
Lower Pond Creek HOPO0400
Ruxton Creek FOFO7000
Upper Beaver Creek BEBE0400
Sutherland Creek FOFO6400
Bear Creek FOFO4800
Spring Creek FOFO4200
Peterson AFB
Peterson Field FOFO3400
Municipal Airport
Jimmy Camp Creek FOFO2000
Upper East Chico CHEC0400
Schriever AFB
AFA Aux Field
Crows Roost CHBS1000
Drennan CHDS0400
Middle East Chico CHEC0200
Truckton
Windmill Gulch FOFO3000
Fishers Canyon FOFO3600
Southwest Area FOFO4600
Pike National Forest
Big Johnson FOFO2600
Upper Williams Creek FOWI0600
Upper Chico Creek CHCH1600
Upper Dry Squirrel CHDS0200
Haynes Creek HAHA0600
St.lukes HOPO0200
Lower Black Squirrel CHBS0600
Squirrel Creek CHBS0200
Fort Carson FOFO2200
Little Fountain Creek FOFO1800
Upper Williams Tributary FOWI0400
West Chico Tributary CHCH1200
Chico Creek CHCH1400
Calhan Reservoir FOFO1400
FOUNTAIN
Fort Carson
Lower Williams Creek FOFO1000
Lower Williams Tributary FOWI0200
Sand Canyon FOFO1600
Lower Dry Squirrel CHDS0400
Lower East Chico CHCH0800
East Kramer KRKR0600
Kramer Creek KRKR0400
East Haynes HAHA0400
Turkey Creek TUTU0200
Hammer Ranch CHCH0600
Finch Ranch CHCH0400
Windmill CHCH0200
West Haynes HAHA0200
West Kramer KRKR0200
Sand Creek FOFO0600
Williams Ranch FOFO0400
Midway Ranch FOFO0800
Red Creek BEBE0200
West Chico Creek CHCH0600
Young Hollow FOFO0200



Drainage Basins

El Paso County
Colorado

Legend

- Drainage Basins
- US Interstate Highways
- US Highways
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Creeks

- Perennial
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- Lakes & Reservoirs
- Summits
- Unincorporated Urban Areas
- Incorporated Cities
- Military
- Forest
- County Lines

N
W E
S

APPENDIX B – CALCULATIONS

Please include calculation forms from MHFD for EDB (UD-BMP-Version 3.07 and MHFD-Detention-Version 4.04)

Include calculations for proposed swales and any required outlet protection (including riprap sizing)

NOAA Atlas 14, Volume 8, Version 2
Location name: Peyton, Colorado, USA*
Latitude: 38.9294°, Longitude: -104.6039°
Elevation: 6804.14 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Deborah [illegible] Laurent, Carl Trypaluk, Dale

[illegible] Maryland

[illegible] | [illegible] | [illegible] aerials

Delete

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	2.86 (2.30-3.55)	3.48 (2.81-4.33)	4.55 (3.67-5.69)	5.51 (4.40-6.91)	6.90 (5.36-9.04)	8.04 (6.10-10.7)	9.24 (6.76-12.5)	10.5 (7.37-14.7)	12.3 (8.27-17.6)	13.7 (8.95-19.8)
10-min	2.09 (1.69-2.60)	2.54 (2.06-3.17)	3.34 (2.69-4.16)	4.03 (3.23-5.06)	5.05 (3.93-6.62)	5.89 (4.46-7.80)	6.77 (4.94-9.18)	7.70 (5.39-10.7)	9.01 (6.05-12.9)	10.0 (6.56-14.5)
15-min	1.70 (1.38-2.12)	2.07 (1.67-2.58)	2.71 (2.18-3.39)	3.28 (2.62-4.11)	4.11 (3.20-5.38)	4.79 (3.63-6.34)	5.50 (4.02-7.46)	6.26 (4.38-8.72)	7.32 (4.92-10.5)	8.16 (5.33-11.8)
30-min	1.23 (0.992-1.53)	1.49 (1.21-1.86)	1.95 (1.57-2.44)	2.36 (1.89-2.96)	2.95 (2.30-3.87)	3.44 (2.61-4.56)	3.95 (2.89-5.36)	4.49 (3.14-6.25)	5.25 (3.53-7.50)	5.85 (3.82-8.45)
60-min	0.791 (0.640-0.985)	0.946 (0.765-1.18)	1.23 (0.987-1.53)	1.48 (1.19-1.86)	1.87 (1.46-2.46)	2.19 (1.67-2.92)	2.54 (1.86-3.47)	2.92 (2.05-4.09)	3.46 (2.33-4.97)	3.90 (2.55-5.63)
2-hr	0.484 (0.395-0.598)	0.573 (0.467-0.708)	0.737 (0.598-0.914)	0.890 (0.719-1.11)	1.13 (0.892-1.48)	1.33 (1.02-1.77)	1.56 (1.15-2.11)	1.80 (1.28-2.51)	2.15 (1.46-3.07)	2.44 (1.61-3.50)
3-hr	0.354 (0.290-0.436)	0.414 (0.339-0.509)	0.528 (0.431-0.652)	0.638 (0.517-0.792)	0.814 (0.649-1.07)	0.968 (0.748-1.28)	1.14 (0.848-1.54)	1.33 (0.947-1.85)	1.60 (1.10-2.28)	1.83 (1.21-2.62)
6-hr	0.206 (0.170-0.251)	0.237 (0.196-0.290)	0.301 (0.247-0.368)	0.364 (0.297-0.447)	0.466 (0.375-0.611)	0.557 (0.435-0.734)	0.658 (0.495-0.888)	0.772 (0.556-1.07)	0.939 (0.649-1.33)	1.08 (0.719-1.53)
12-hr	0.117 (0.097-0.142)	0.136 (0.113-0.165)	0.173 (0.143-0.210)	0.208 (0.172-0.254)	0.266 (0.215-0.344)	0.316 (0.248-0.413)	0.372 (0.282-0.497)	0.434 (0.315-0.595)	0.525 (0.365-0.739)	0.600 (0.404-0.847)
24-hr	0.067 (0.057-0.081)	0.079 (0.066-0.095)	0.101 (0.084-0.121)	0.121 (0.101-0.147)	0.153 (0.124-0.195)	0.180 (0.142-0.232)	0.209 (0.160-0.277)	0.242 (0.177-0.328)	0.289 (0.202-0.402)	0.327 (0.222-0.458)
2-day	0.039 (0.033-0.046)	0.046 (0.039-0.055)	0.058 (0.049-0.070)	0.070 (0.059-0.084)	0.087 (0.071-0.110)	0.101 (0.081-0.129)	0.117 (0.090-0.153)	0.133 (0.098-0.179)	0.157 (0.111-0.217)	0.176 (0.120-0.245)
3-day	0.029 (0.024-0.034)	0.034 (0.029-0.040)	0.043 (0.036-0.051)	0.051 (0.043-0.061)	0.063 (0.051-0.079)	0.073 (0.058-0.092)	0.084 (0.064-0.109)	0.095 (0.070-0.127)	0.111 (0.079-0.153)	0.125 (0.086-0.173)
4-day	0.023 (0.020-0.027)	0.027 (0.023-0.032)	0.034 (0.029-0.040)	0.040 (0.034-0.048)	0.050 (0.041-0.062)	0.058 (0.046-0.073)	0.066 (0.051-0.085)	0.075 (0.055-0.100)	0.088 (0.062-0.120)	0.098 (0.067-0.135)
7-day	0.016 (0.013-0.018)	0.018 (0.015-0.021)	0.022 (0.019-0.026)	0.026 (0.022-0.031)	0.032 (0.026-0.039)	0.037 (0.030-0.046)	0.042 (0.032-0.054)	0.047 (0.035-0.062)	0.055 (0.039-0.075)	0.061 (0.042-0.084)
10-day	0.012 (0.011-0.014)	0.014 (0.012-0.017)	0.017 (0.015-0.020)	0.020 (0.017-0.024)	0.025 (0.020-0.030)	0.028 (0.023-0.035)	0.032 (0.025-0.041)	0.036 (0.027-0.047)	0.041 (0.030-0.056)	0.046 (0.032-0.063)
20-day	0.008 (0.007-0.010)	0.010 (0.008-0.011)	0.012 (0.010-0.014)	0.013 (0.012-0.016)	0.016 (0.013-0.019)	0.018 (0.015-0.022)	0.020 (0.016-0.025)	0.022 (0.017-0.029)	0.025 (0.018-0.034)	0.028 (0.019-0.038)
30-day	0.007 (0.006-0.008)	0.008 (0.007-0.009)	0.009 (0.008-0.011)	0.011 (0.009-0.012)	0.013 (0.011-0.015)	0.014 (0.012-0.017)	0.016 (0.012-0.020)	0.017 (0.013-0.022)	0.019 (0.014-0.026)	0.021 (0.015-0.028)
45-day	0.005 (0.005-0.006)	0.006 (0.005-0.007)	0.008 (0.007-0.009)	0.009 (0.007-0.010)	0.010 (0.008-0.012)	0.011 (0.009-0.013)	0.012 (0.010-0.015)	0.013 (0.010-0.017)	0.015 (0.011-0.019)	0.016 (0.011-0.021)
60-day	0.005 (0.004-0.005)	0.005 (0.005-0.006)	0.006 (0.006-0.007)	0.007 (0.006-0.008)	0.008 (0.007-0.010)	0.009 (0.008-0.011)	0.010 (0.008-0.013)	0.011 (0.008-0.014)	0.012 (0.009-0.016)	0.013 (0.009-0.017)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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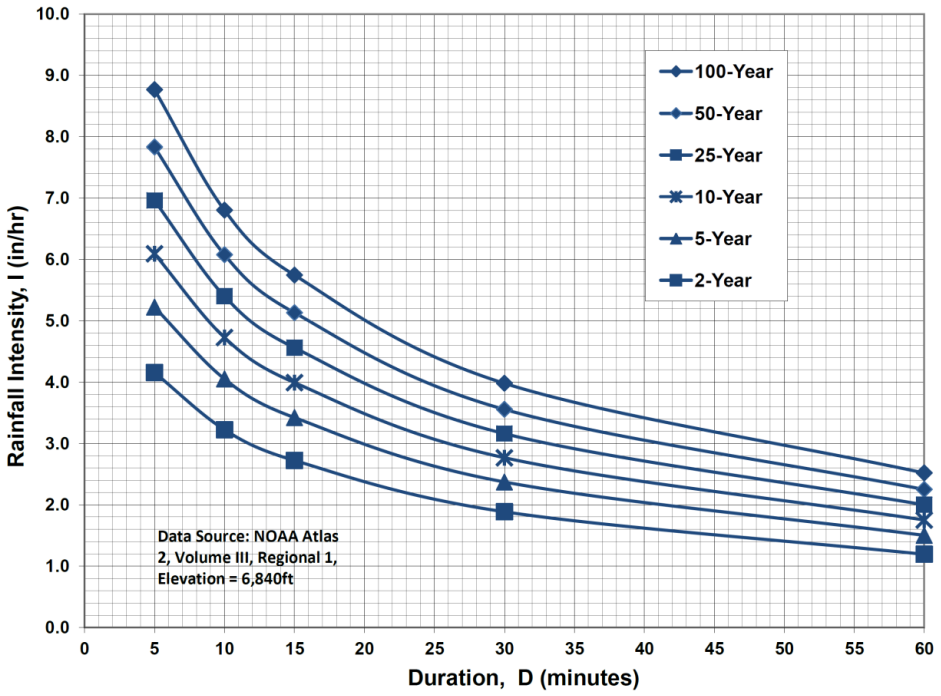
PF graphical

Replace with the City's May 2014 IDF which was adopted by the County per resolution 15-042.

Figure 6-5. Colorado Springs Rainfall Intensity Duration Frequency



IDF Equations

$I_{100} = -2.52 \ln(D) + 12.735$

$I_{50} = -2.25 \ln(D) + 11.375$

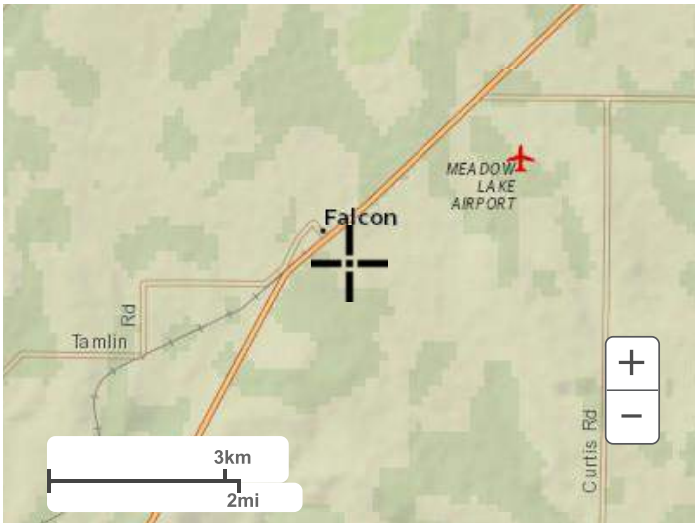
$I_{25} = -2.00 \ln(D) + 10.111$

$I_{10} = -1.75 \ln(D) + 8.847$

$I_{5} = -1.50 \ln(D) + 7.583$

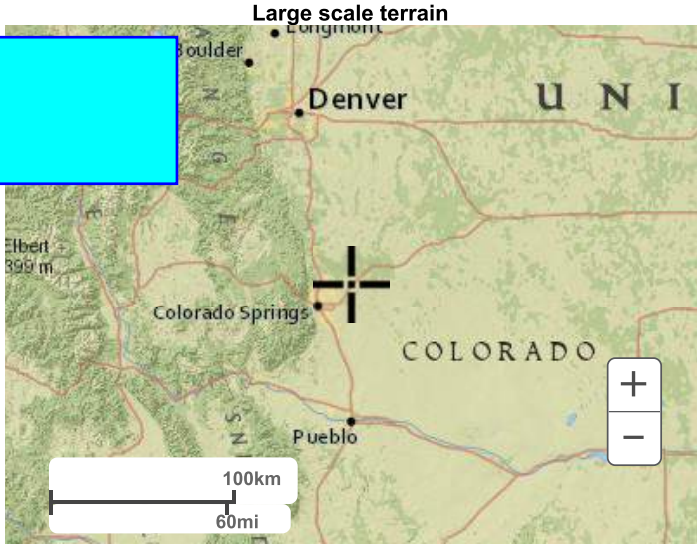
$I_{2} = -1.19 \ln(D) + 6.035$

Note: Values calculated by equations may not precisely duplicate values read from figure.

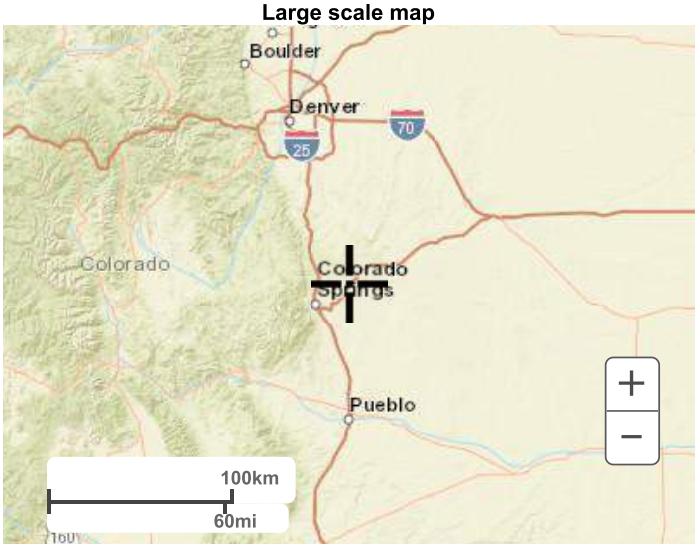


Large scale terrain

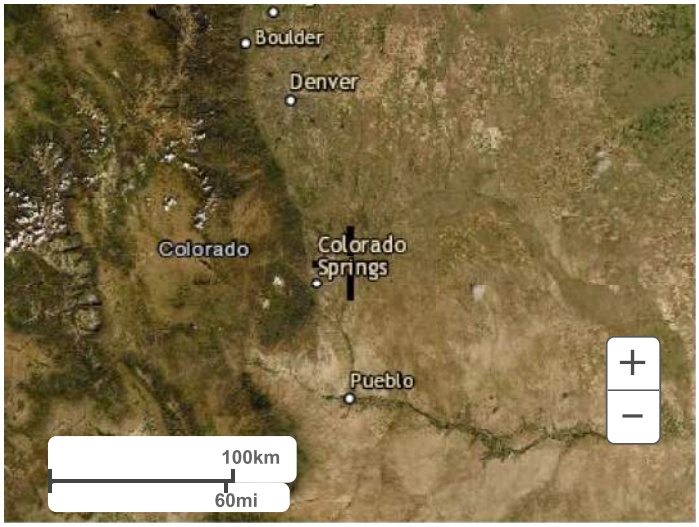
Delete



Large scale map



Large scale aerial



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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
est Highway
MD 20910
uestions@noaa.gov
imer

Delete

Revise percent impervious per City DCM Table 6-6

FYI: Criteria only requires minor design storm to be based on a 5yr design storm. Either revise or add a a statement in the drainage design criteria (pg 7) acknowledging the minimum design storm and explaining why you've elected to use the 10 yr design storm.

Add footnote showing the formula used.

JVA Incorporated
214 8th Street, S 210
Glenwood Springs, CO 81601
Ph: (970) 404 3100

D49 Transportation Center

Historic Runoff Coefficient & Time of Concentration Calculations

Location: El Paso County
Minor Design Storm: 10
Major Design Storm: 100
Soil Type: A

Basin Design Data

	I (%) =	95%	90%	90%	85%	25%	25%	35%	2%			I (%)	Runoff Coeff's				Initial Overland Time (t_i)			Travel Time (t_t) x 60) t_t=Length/(Velocity						t_c Comp	tc Urbanized Check ON		t_c Final
Basin Name	Design Point	$A_{paved\ streets}$ (sf)	$A_{drives/conc}$ (sf)	A_{roof} (sf)	A_{gravel} (sf)	A_{plygnd} (sf)	$A_{art.\ turf}$ (sf)	$A_{lscape\ (A\ soil)}$ (sf)	$A_{lscape\ (C/D\ soil)}$ (sf)	A_{Total} (sf)	A_{Total} (ac)	Imp (%)	C2	C5	C10	C100	Upper most Length (ft)	Slope (%)	t_i (min)	Length (ft)	Slope (%)	Type of Land Surface	K	Velocity (fps)	t_t (min)	Time of Conc $t_i + t_t = t_c$	Total Length (ft)	t_c=(L/180)+ 10 (min.)	Min t_c
1	1	15,185			77,447			633,070		725,702	16.66	41.6%	0.27	0.28	0.30	0.43	300	1.3%	24.0	1515	0.8%	Short Pasture and lawns	7	0.6	40.3	64.3	1815	20.1	20.1
2	2	2,939			175507			424,663		603,109	13.85	49.8%	0.34	0.35	0.37	0.50	300	9.9%	11.0	2406	1.3%	Short Pasture and lawns	7	0.8	51.2	62.3	2706	25.0	25.0
										0	0.00											Paved areas & shallow paved swales	20				0	10.0	
										0	0.00											Paved areas & shallow paved swales	20				0	10.0	
										0	0.00											Paved areas & shallow paved swales	20				0	10.0	
	TOTAL SITE	18,124	0	0	252,954	0	0	1,057,733	0	1,328,811	30.51	45.3%	0.30	0.31	0.33	0.46													

Update basin names to be consistent with the existing drainage map. (H1 & H2).

Include the offsite basin in the calculation.

	Runoff Coeff's				Rainfall Intensities (in/hr)				Area		Flow Rates (cfs)			
	C2	C5	C10	C100	2	5	10	100	A_{Total} (sf)	A_{Total} (ac)	Q2	Q5	Q10	Q100
	0.27	0.28	0.30	0.43	1.87	2.45	2.97	4.97	725,702	16.66	8.36	11.47	14.59	35.99
	0.34	0.35	0.37	0.50	1.68	2.20	2.67	4.47	603,109	13.85	7.91	10.79	13.62	30.85
									0	0.00				
									0	0.00				
									0	0.00				
								TOTAL SITE	1,328,811	30.51	16.27	22.26	28.22	66.84

Include the offsite basin.

3.2.1 Overland (Initial) Flow Time

The overland flow time, t_i, may be calculated using Equation 6-8.

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L}}{S^{0.33}} \quad \text{(Eq. 6-8)}$$

Where:

t_i = overland (initial) flow time (min)
C_5 = runoff coefficient for 5-year frequency (see Table 6-6)
L = length of overland flow (300 ft maximum for non-urban land uses, 100 ft maximum for urban land uses)
S = average basin slope (ft/ft)

Note that in some urban watersheds, the overland flow time may be very small because flows quickly concentrate and channelize.

3.2.2 Travel Time

For catchments with overland and channelized flow, the time of concentration needs to be considered in combination with the travel time, t_t, which is calculated using the hydraulic properties of the swale, ditch, or channel. For preliminary work, the overland travel time, t_t, can be estimated with the help of Figure 6-25 or Equation 6-9 (Guo 1999).

$$V = C_v S_w^{0.5} \quad \text{(Eq. 6-9)}$$

Where:

V = velocity (ft/s)
C_v = conveyance coefficient (from Table 6-7)
S_w = watercourse slope (ft/ft)

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Job Name: D49 Transportation Center
Job Number: 3456c
Date: 2/28/22
By: AMB

D49 Transportation Center

Composite Runoff Coefficient Calculations

Location: El Paso County
Minor Design Storm: 10
Major Design Storm: 100
Soil Type: A

CA 100yr = 0.78i + 0.11
CB 100yr = 0.47i + 0.426
CC/D 100yr = 0.41i + 0.484)

Basin Design Data

	I (%) =	95%	95%	95%	63%	25%	25%	35%	2%			I (%)	Runoff Coeff's			
Basin Name	Design Point	A_{paved} streets (sf)	$A_{drives/conc}$ (sf)	A_{roof} (sf)	A_{gravel} (sf)	A_{plygnd} (sf)	$A_{art. turf}$ (sf)	$A_{lscape (A soil)}$ (sf)	$A_{lscape (C/D soil)}$ (sf)	A_{Total} (sf)	A_{Total} (ac)	Imp (%)	C2	C5	C10	C100
1	1	779,789	43,183	37,089				465,035		1,325,096	30.42	73.9%	0.57	0.59	0.60	0.69

Provide calculation for the composite calculation based on Table 6-6 and chapter 6 of the City DCM, not the above equation.

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Job Name: D49 Transportation Center
Job Number: 3456c
Date: 2/28/22
By: AMB

D49 Transportation Center

Time of Concentration Calculations

Location: El Paso County
Minor Design Storm: 10
Major Design Storm: 100
Soil Type: A

Sub-Basin Data				Initial Overland Time (t_i)			Travel Time (t_t) t_t=Length/(Velocity x 60)						t_c Comp	tc Urbanized Check ON		t_c Final
Basin Name	Design Point	A_{Total} (ac)	C5	Upper most Length (ft)	Slope (%)	t_i (min)	Length (ft)	Slope (%)	Type of Land Surface	C_v	Velocity (fps)	t_t (min)	Time of Conc $t_i + t_t = t_c$	Total Length (ft)	t_c=(L/180)+ 10 (min)	Min t_c
1	1	30.42	0.59	800	2.0%	21.2	1696	0.5%	Paved areas & shallow paved swales	20	1.4	20.0	41.2	2496	23.9	23.9

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Job Name: D49 Transportation Center
Job Number: 3456c
Date: 2/28/22
By: AMB

D49 Transportation Center

Developed Storm Runoff Calculations

Design Storm : **10 Year**

Point Hour Rainfall (P_1) : **1.48**

	Direct Runoff							Total Runoff				Inlets				Pipe					Pipe/Swale Travel Time				
Basin Name	Design Point	Area (ac)	Runoff Coeff	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	Total tc (min)	ΣC*A (ac)	I (in/hr)	Q (cfs)	Inlet Type	Q intercepted	Q carryover	Q bypass	Pipe Size (in) or equivalent	Pipe Material	Slope (%)	Pipe Flow (cfs)	Max Pipe Capacity (cfs)	Length (ft)	Velocity (fps)	tt (min)	Total Time (min)	Notes
1	1	30.42	0.60	23.90	18.25	2.73	49.89	23.90	22.49	2.73	61.50														

Include all the basins shown on the proposed drainage map.

Update the proposed sub-basin description to describe all assumptions made.

Example: Basin 1 calculation assumed 100% impervious for the being constructed with phase 2.

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Job Number: 3456c
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By: AMB

See prior comments

D49 Transportation Center

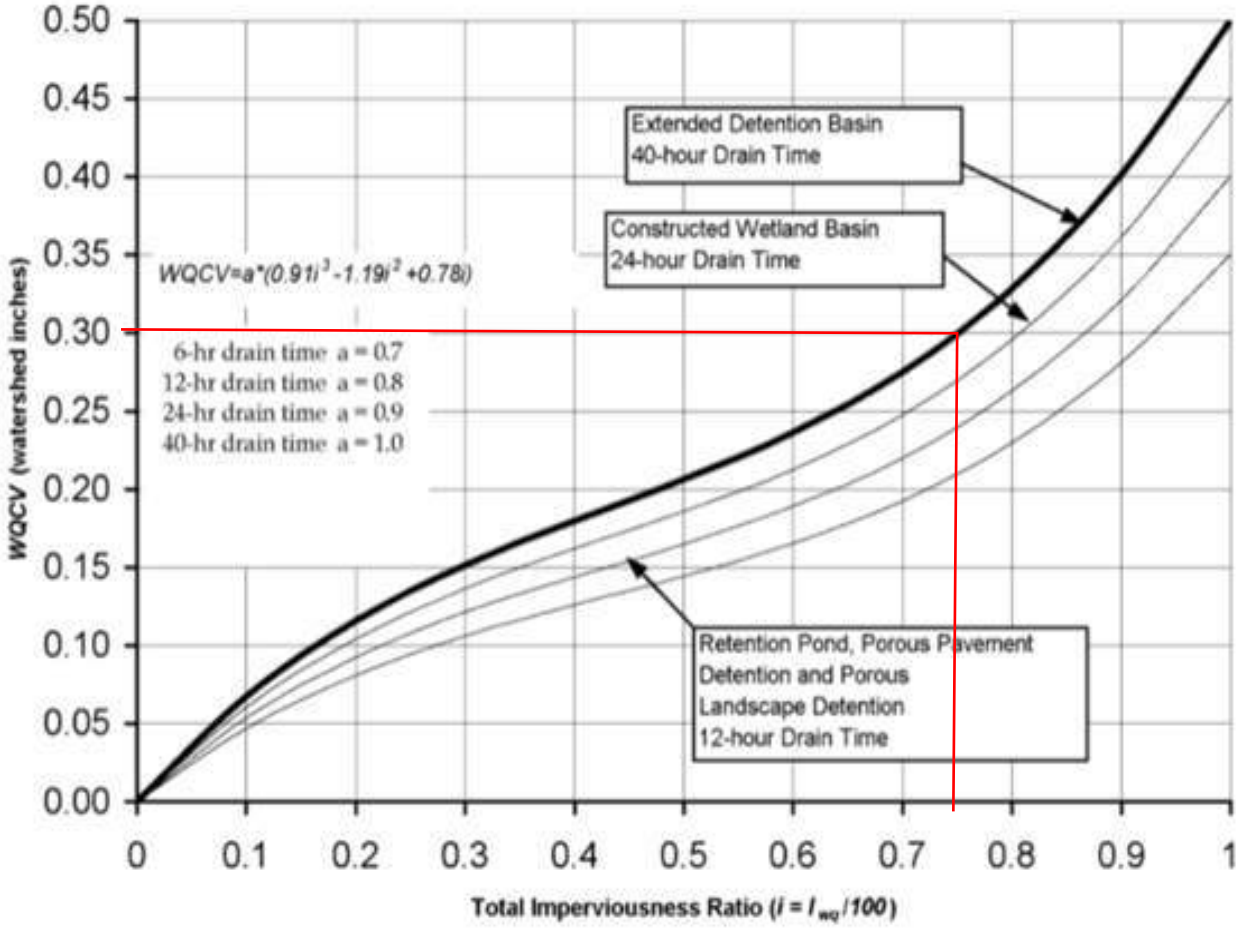
Developed Storm Runoff Calculations

Design Storm : **100 Year**

Point Hour Rainfall (P_1) : **2.54**

	Direct Runoff							Total Runoff				Inlets				Pipe					Pipe/Swale Travel Time				
Basin Name	Design Point	Area (ac)	Runoff Coeff	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	Total tc (min)	ΣC*A (ac)	I (in/hr)	Q (cfs)	Inlet Type	Q intercepted	Q carryover	Q bypass	Pipe Size (in) or equivalent	Pipe Material	Slope (%)	Pipe Flow (cfs)	Max Pipe Capacity (cfs)	Length (ft)	Velocity (fps)	tt (min)	Total Time (min)	Notes
1	1	30.42	0.69	23.90	20.89	4.58	95.69	23.90	22.49	4.58	103.03														

Appendix B - Water Quality Capture Volume



WQCV (Watershed-inches) = 0.30 or 0.025 ft

Total WQ Area (sf) = 979,240 or 22.48Ac including Phase 2 of the proposed works

WQCV (Cu. Ft.) = 24,481

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Ph: (970) 404 3100

Job Name: D49 Transportation Cent
Job Number: 3456c
Date: 2/28/22
By: AMB

D49 Transportation Center

Detention Pond Volume Calculations: FAA Procedure

Based on FAA Procedure, per Federal Aviation Agency "Airport Drainage" Manual

Drainage Basin	A	
Design Storm	**10 year**	
Composite "C" Factor	0.74	
Basin Size	30.42	

For pond design/sizing replace with UD-Detention.

Release Rate Calculations

Allowable Release Rate for Site		28.22	cfs	(Historic Flows for Basin H1)
Less Undetained Offsite Flows	-	0.00	cfs	(From Basin X)
Allowable Release Rate for Pond		28.22	cfs	

Rainfall Intensity Calculations

Point Hour Rainfall (P_1) : **1.48**

Rainfall Intensity: ElPasoCountyIDF

Volume Calculations

Inflow Volume = C * I * A * time (sec)
Outflow Volume = Alowable Release Rate * time (sec)
Storage Volume = Invflow Volume - Outflow Volume

Detention Storage Calculations

Time t (min)	Time t (sec)	Intensity I (in/hr)	Inflow Vin (ft^3)	Outflow Vout (ft^3)	Storage Vstor (ft^3)
5.0	300	5.51	37,177	8,465	28,712
10.0	600	4.03	54,382	16,929	37,453
15.0	900	3.28	66,392	25,394	40,999
20.0	1,200	2.97	80,246	33,858	46,388
25.0	1,500	2.67	89,962	42,323	47,640
30.0	1,800	2.36	95,540	50,787	44,753
35.0	2,100	2.22	104,675	59,252	45,423
40.0	2,400	2.07	111,712	67,716	43,995
45.0	2,700	1.92	116,769	76,181	40,589
50.0	3,000	1.78	119,848	84,645	35,203
55.0	3,300	1.63	120,947	93,110	27,837
60.0	3,600	1.48	119,830	101,575	18,255
			Maximum Volume (ft^3)		**47,640**

		100%	WQCV	24,481	ft^3
Required 10-yr Volume +		**100%**	**WQCV**	**72,121**	**ft^3**

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Job Name: D49 Transportation Cent
Job Number: 3456c
Date: 2/28/22
By: AMB

D49 Transportation Center

Detention Pond Volume Calculations: FAA Procedure

Based on FAA Procedure, per Federal Aviation Agency "Airport Drainage" Manual

Drainage Basin		A	
Design Storm		**100 year**	
Composite "C" Factor		0.74	
Basin Size		30.42	

Release Rate Calculations

Allowable Release Rate for Site		66.84 cfs	(Historic Flows for Basin H1)
Less Undetained Offsite Flows	-	0.00 cfs	(From Basin X)
Allowable Release Rate for Pond		66.84 cfs	

Rainfall Intensity Calculations

Point Hour Rainfall (P_1) : **2.54**

Rainfall Intensity: ElPasoCountyIDF

Volume Calculations

Inflow Volume = C * I * A * time (sec)
Outflow Volume = Alowable Release Rate * time (sec)
Storage Volume = Invflow Volume - Outflow Volume

Detention Storage Calculations

Time t (min)	Time t (sec)	Intensity I (in/hr)	Inflow Vin (ft^3)	Outflow Vout (ft^3)	Storage Vstor (ft^3)
5.0	300	9.24	62,344	20,051	42,293
10.0	600	6.77	91,357	40,102	51,255
15.0	900	5.50	111,328	60,153	51,176
20.0	1,200	4.98	134,494	80,204	54,290
25.0	1,500	4.47	150,687	100,255	50,432
30.0	1,800	3.95	159,908	120,306	39,603
35.0	2,100	3.72	175,682	140,357	35,326
40.0	2,400	3.48	188,095	160,408	27,688
45.0	2,700	3.25	197,337	180,459	16,878
50.0	3,000	3.01	203,407	200,509	2,898
55.0	3,300	2.78	206,307	220,560	-14,254
60.0	3,600	2.54	205,654	240,611	-34,957
			Maximum Volume (ft^3)		**54,290**

	50%	WQCV	12,241	ft^3
Required 100-yr Volume +	**50%**	**WQCV**	**66,531**	**ft^3**

APPENDIX C – FIGURES

NOT FOR CONSTRUCTION

include information for this basin

Clarify. Is the diversion an existing condition or with the new development design.

Remove the note from the existing condition map if diversion does not occur until the proposed site is constructed.

OFF-SITE RUNOFF INTERCEPTED AT THE NEW DEVELOPMENT SITE BOUNDARY AND DIVERTED TO DISCHARGE INTO THE CREEK

H-1
43 | 16.7

H-2
50 | 13.8

provide design point

OFF-SITE RUNOFF

ZONE AE BOUNDARY

Delineate all offsite basins draining onto the site. Update runoff calculations to include offsite basin.

OFF-SITE RUNOFF DISCHARGE POINT INTO THE EXISTING CREEK RUNNING ALONG THE BOUNDARY

include information for offsite basin

Rename to Existing Condition Drainage Map

DRAINAGE MAP LEGEND

- EXISTING INDEX CONTOUR
- EXISTING INTERMEDIATE CONTOUR
- PROPOSED INDEX CONTOUR
- PROPOSED INTERMEDIATE CONTOUR
- +03.3 EXISTING SPOT ELEVATION
- +03.54 PROPOSED SPOT ELEVATION
- HISTORIC DRAINAGE BASIN BOUNDARY (MAJOR BASIN)
- HISTORIC DRAINAGE BASIN BOUNDARY (SUB BASIN)
- DEVELOPED DRAINAGE BASIN BOUNDARY (MAJOR BASIN)
- DEVELOPED DRAINAGE BASIN BOUNDARY (SUB BASIN)
- DIRECTION OF FLOW (HISTORIC)
- DIRECTION OF FLOW (DEVELOPED)
- BASIN DESIGN POINT
- DRAINAGE BASIN IDENTIFICATION BUBBLE

A = DEVELOPED BASIN DESIGNATION
.50 = 100-YR RUNOFF COEFFICIENT
1.0 = AREA ACRES

100 0 100 200
SCALE IN FEET

RTA ARCHITECTS
19 SOUTH TEJON ST., SUITE 300
COLORADO SPRINGS, CO. 80903
TELE. 719-471-7566
FAX. 719-471-1174
www.rtaarchitects.com

NO.	DATE	DES'D	D'WN

REVISION DESCRIPTION

DESIGNED BY:	AMB
DRAWN BY:	AMB
CHECKED BY:	CWK
JOB #:	3456c
DATE:	MAY 23, 2022

D49 TRANSPORTATION CENTER
SCHOOL DISTRICT NO 49

GENERAL LOCATION MAP

SHEET NO.
FIG 1

It appears offsite flows is being diverted off site at this location. If this is correct then downstream analysis is needed to verify downstream properties are not negatively impacted. Explain in the sub-basin narrative.
Add a design point

Label or include the dotted hatch in the legend.

provide all hydraulic calculations in the appendix (inlets, pipes, swales, riprap sizing, emergency overflow, pond outlet structure, etc.)

Delineate the sub-basin draining to the permanent WQ facility.

disturbance in this basin requires water quality treatment prior to discharge to the creek.

PROPOSED INLET

ASSUMED 100% IMPERVIOUS WITH FULL BUIL-OUT WITHIN THIS BOUNDARY

Break up sub basin 1. There should be a separate basin for this proposed inlet and culvert

Also, identify the overflow path if this is clogged and describe in the narrative.

Elaborate in the narrative why this is assumed at 80%.

Include the solid hatch in the legend or provide a label describing what the solid hatch means.

Add design point for the inlet

Design point for combined flow

PROPOSED BUILDING
FFE=6808.00'

This basin should be split into two basin. The southern basin should include a design point for the combined flows with the pond release.

Label the subbasin. WQ/Detention is required unless exclusion from WQ applies.

design point

Design point

Design point.

FALCON HIGHWAY

STORM FES

PROPOSED EXTENDED DETENTION BASIN

OFF-SITE RUNOFF INTERCEPTED AT THE NEW DEVELOPMENT SITE BOUNDARY AND DIVERTED TO DISCHARGE INTO THE CREEK

Permanent WQ and Detention required for this basin before discharging offsite.

Design point for discharge.

Drainage report to include hydraulic analysis of the drainage path from the pond outfall to the suitable outfall location defined in ECM Chapter 3 section 3.2.4. Analysis will likely be to the culvert at Falcon Hwy.

Identify and provide construction plans for necessary offsite improvements so the conveyance is hydraulically adequate.

FUTURE BUILDOUT AREA ASSUMED 80% IMPERVIOUS EQUIVALENT TO 2.69AC

OFF-SITE RUNOFF DISCHARGE POINT INTO THE EXISTING CREEK RUNNING ALONG THE BOUNDARY

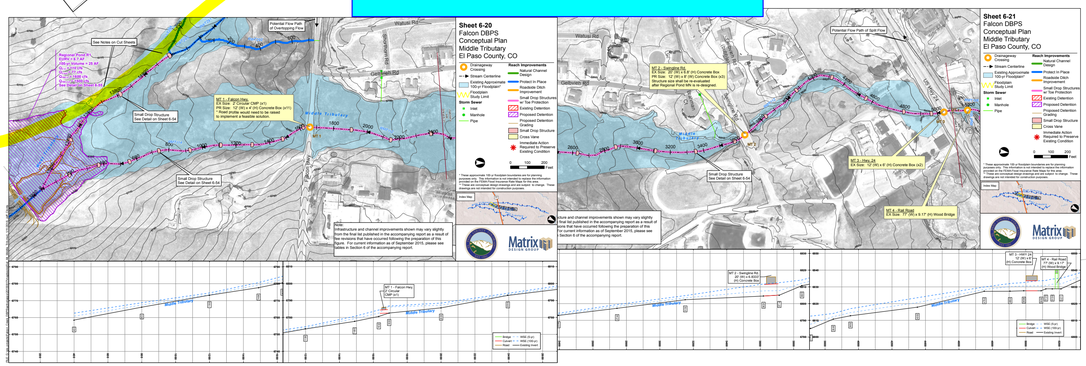
ZONE AE BOUNDARY

SWINGLINE ROAD
(80 FEET WIDE)

Delineate all offsite basins draining onto the site. Update runoff calculations to include offsite basin.

Since the grading and drainage plan is diverting flows then channel analysis (highlighted in blue) must be provided to ensure the receiving channel does not have negative impacts to the channel. Offsite improvements may be required to the receiving channel.

DBPS Selected alternative adjacent to the school site and the required improvements.



3.2.4. **Suitable Outfall Location Definition**

A suitable outfall location refers to a stream which is a hydraulically adequate historic natural stream or channel segment which developed conveyance systems (i.e. storm drain systems, channels, and detention basin outlets) shall utilize for ultimate discharge of stormwater runoff from development. A suitable outfall stream may be a perennial or ephemeral stream in its previously undeveloped, natural condition. The other choice for a new stormwater outfall is a connection to an existing hydrologically and hydraulically adequate man-made system.

iupp. No. 1 CD3:5

ENGINEERING CRITERIA MANUAL

Any and all proposed man-made systems for stormwater conveyance shall outfall to a location as identified above, which is capable of receiving developed flows without negative impacts to streambed stability and/or natural sediment transport functions. Man-made conveyance systems are not limited to storm drain systems, detention basin outlets, and lined channels, but also include any change in the land configuration by grading which results in a new runoff pattern in terms of flow direction and quantity of runoff.

All suitable outfall streams as defined above shall be defined on a map of the basin and included in the applicable drainage basin planning study. In the event an older planning study does not define a suitable discharge point for a new stormwater discharge in the basin, the above criteria shall still apply.

LEGEND

- EXISTING INDEX CONTOUR
- EXISTING INTERMEDIATE CONTOUR
- PROPOSED INDEX CONTOUR
- PROPOSED INTERMEDIATE CONTOUR
- EXISTING SPOT ELEVATION
- PROPOSED SPOT ELEVATION
- HISTORIC DRAINAGE BASIN BOUNDARY (MAJOR BASIN)
- HISTORIC DRAINAGE BASIN BOUNDARY (SUB BASIN)
- DEVELOPED DRAINAGE BASIN BOUNDARY (MAJOR BASIN)
- DEVELOPED DRAINAGE BASIN BOUNDARY (SUB BASIN)
- DIRECTION OF FLOW (HISTORIC)
- DIRECTION OF FLOW (DEVELOPED)
- BASIN DESIGN POINT
- DRAINAGE BASIN IDENTIFICATION BUBBLE

A = DEVELOPED BASIN DESIGNATION
.50 = 100-YR RUNOFF COEFFICIENT
1.0 = AREA ACRES

100 0 100 200
SCALE IN FEET

NOT FOR CONSTRUCTION

RTA ARCHITECTS
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COLORADO SPRINGS, CO. 80903
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FAX: 719-471-1174
www.rtaarchitects.com

NO.	DATE	DES'D	D'WN	REVISION DESCRIPTION

DESIGNED BY:	AMB
DRAWN BY:	AMB
CHECKED BY:	CWK
JOB #:	3456c
DATE:	MAY 23, 2022

D49 TRANSPORTATION CENTER
SCHOOL DISTRICT NO 49

DRAINAGE PLAN

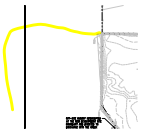
Revise to Proposed drainage plan or developed condition drainage plan

SHEET NO.
FIG 2

J:\3456c\Drawings\Exhibits-Figures\3456c- Proposed Drainage Plan.dwg, 5/25/2022 - 12:16 PM, AMB

Drainage Report Final_V1.pdf Markup Summary

8/10/2022 7:06:49 AM (1)



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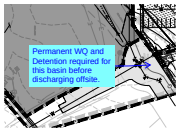

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Page Label: [1] 24x36
Author: dsdlaforce
Date: 8/10/2022 7:09:47 AM
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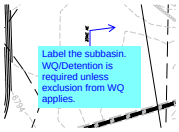
Permanent WQ and Detention required for this basin before discharging offsite.

8/10/2022 7:11:55 AM (1)



Subject: Callout
Page Label: [1] 24x36
Author: dsdlaforce
Date: 8/10/2022 7:11:55 AM
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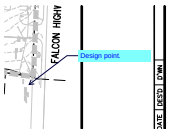
Label the subbasin. WQ/Detention is required unless exclusion from WQ applies.

8/10/2022 7:12:43 AM (1)



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Page Label: [1] 24x36
Author: dsdlaforce
Date: 8/10/2022 7:12:43 AM
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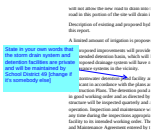
Design point.

8/10/2022 7:25:53 AM (1)



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Page Label: 11
Author: dsdlaforce
Date: 8/10/2022 7:25:53 AM
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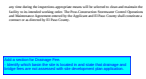
State in your own words that the storm drain system and detention facilities are private and will be maintained by School District 49 [change if it's somebody else]

8/10/2022 7:28:09 AM (1)



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Page Label: 11
Author: dsdlaforce
Date: 8/10/2022 7:28:09 AM
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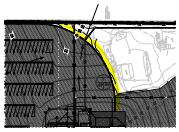
Space:

Add a section for Drainage Fee.
- Identify which basin the site is located in and state that drainage and bridge fees are not assessed with site development plan application.

8/10/2022 9:29:34 AM (1)



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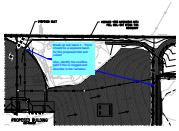

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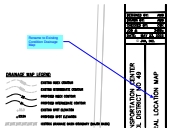
Break up sub basin 1. There should be a separate basin for this proposed inlet and culvert

Also, identify the overflow path if this is clogged and describe in the narrative.

8/8/2022 1:45:31 PM (1)



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Rename to Existing Condition Drainage Map

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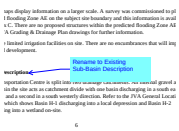

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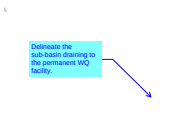
Date: 8/8/2022 1:45:37 PM
Status:
Color:
Layer:
Space:

Rename to Existing Sub-Basin Description

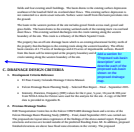
8/8/2022 1:55:06 PM (1)



Subject: Callout
Page Label: [1] 24x36
Author: dsdlaforce
Date: 8/8/2022 1:55:06 PM
Status:
Color:
Layer:
Space:

Delineate the sub-basin draining to the permanent WQ facility.

8/8/2022 1:56:08 PM (1)



Subject: Callout
Page Label: 7
Author: dsdlaforce
Date: 8/8/2022 1:56:08 PM
Status:
Color:
Layer:
Space:

Add a section for "Proposed sub-basin description" and describe each of the proposed sub-basin shown on the proposed drainage map.

8/8/2022 1:56:41 PM (1)

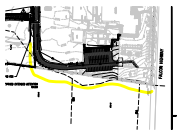
Subject: Highlight
Page Label: [1] 24x36
Author: dsdlaforce
Date: 8/8/2022 1:56:41 PM
Status:
Color:
Layer:
Space:

8/8/2022 1:57:31 PM (1)

Subject: Text Box
Page Label: [1] 24x36
Author: dsdlaforce
Date: 8/8/2022 1:57:31 PM
Status:
Color:
Layer:
Space:

Delineate all offsite basins draining onto the site. Update runoff calculations to include offsite basin.

8/8/2022 10:17:23 AM (1)



Subject: Highlight
Page Label: [1] 24x36
Author: dsdlaforce
Date: 8/8/2022 10:17:23 AM
Status:
Color:
Layer:
Space:

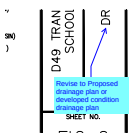
8/8/2022 11:53:51 AM (1)

Subject: Cloud+
Page Label: 6
Author: dsdlaforce
Date: 8/8/2022 11:53:51 AM
Status:
Color:
Layer:
Space:

Delete/modify statement. The "do nothing alternative" was not the selected alternative in the DBPS. See Chapter 6 for the selected alternative and associated DBPS improvements.

See the proposed drainage map for additional comments.

8/8/2022 11:54:47 AM (1)



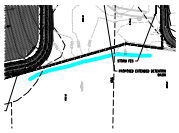
Subject: Callout
Page Label: [1] 24x36
Author: dsdlaforce
Date: 8/8/2022 11:54:47 AM
Status:
Color:
Layer:
Space:

Revise to Proposed drainage plan or developed condition drainage plan

8/8/2022 12:00:55 PM (1)

Subject: Image
Page Label: [1] 24x36
Author: dsdlaforce
Date: 8/8/2022 12:00:55 PM
Status:
Color:
Layer:
Space:

8/8/2022 12:05:43 PM (1)



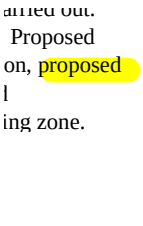
Subject: Highlight
Page Label: [1] 24x36
Author: dsdlaforce
Date: 8/8/2022 12:05:43 PM
Status:
Color:
Layer:
Space:

8/8/2022 12:10:16 PM (1)

Subject: Text Box
Page Label: [1] 24x36
Author: dsdlaforce
Date: 8/8/2022 12:10:16 PM
Status:
Color:
Layer:
Space:

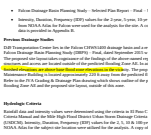
DBPS Selected alternative adjacent to the school site and the required improvements.

8/8/2022 3:48:20 PM (1)



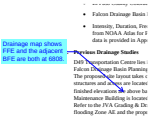
Subject: Highlight
Page Label: 7
Author: dsdlaforce
Date: 8/8/2022 3:48:20 PM
Status:
Color:
Layer:
Space:

8/8/2022 3:48:28 PM (1)



Subject: Highlight
Page Label: 7
Author: dsdlaforce
Date: 8/8/2022 3:48:28 PM
Status:
Color:
Layer:
Space:

8/8/2022 3:49:19 PM (1)



Subject: Callout
Page Label: 7
Author: dsdlaforce
Date: 8/8/2022 3:49:19 PM
Status:
Color:
Layer:
Space:

Drainage map shows FFE and the adjacent BFE are both at 6808.

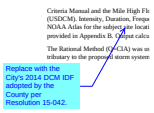
8/8/2022 3:49:45 PM (1)

Subject: Line
Page Label: 7
Author: dsdlaforce
Date: 8/8/2022 3:49:45 PM
Status:
Color:
Layer:
Space:

8/8/2022 3:49:49 PM (1)

Subject: Line
Page Label: 7
Author: dsdlaforce
Date: 8/8/2022 3:49:49 PM
Status:
Color:
Layer:
Space:

8/8/2022 3:52:19 PM (1)



Subject: Callout
Page Label: 7
Author: dsdlaforce
Date: 8/8/2022 3:52:19 PM
Status:
Color:
Layer:
Space:

Replace with the City's 2014 DCM IDF adopted by the County per Resolution 15-042.

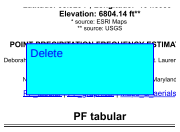
8/8/2022 3:53:03 PM (1)

Subject: Line
Page Label: 14
Author: dsdlaforce
Date: 8/8/2022 3:53:03 PM
Status:
Color:
Layer:
Space:

8/8/2022 3:53:06 PM (1)

Subject: Line
Page Label: 14
Author: dsdlaforce
Date: 8/8/2022 3:53:06 PM
Status:
Color:
Layer:
Space:

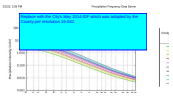
8/8/2022 3:53:17 PM (1)



Subject: Text Box
Page Label: 14
Author: dsdlaforce
Date: 8/8/2022 3:53:17 PM
Status:
Color:
Layer:
Space:

Delete

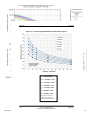
8/8/2022 3:54:10 PM (1)



Subject: Text Box
Page Label: 15
Author: dsdlaforce
Date: 8/8/2022 3:54:10 PM
Status:
Color:
Layer:
Space:

Replace with the City's May 2014 IDF which was adopted by the County per resolution 15-042.

8/8/2022 3:54:24 PM (1)



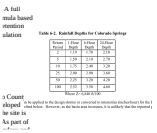
Subject: Snapshot
Page Label: 15
Author: dsdlaforce
Date: 8/8/2022 3:54:24 PM
Status:
Color:
Layer:
Space:

8/8/2022 3:56:11 PM (1)

Subject: Callout
Page Label: 8
Author: dsdlaforce
Date: 8/8/2022 3:56:11 PM
Status:
Color:
Layer:
Space:

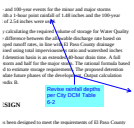
Minor design storm only needs to based on the 5-yr design storm.

8/8/2022 3:58:05 PM (1)



Subject: Image
Page Label: 8
Author: dsdlaforce
Date: 8/8/2022 3:58:05 PM
Status:
Color:
Layer:
Space:

8/8/2022 3:58:24 PM (1)



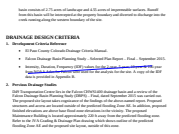
Subject: Callout
Page Label: 8
Author: dsdlaforce
Date: 8/8/2022 3:58:24 PM
Status:
Color:
Layer:
Space:

Revise rainfall depths per City DCM Table 6-2

8/8/2022 3:59:28 PM (1)

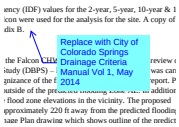
Subject: Line
Page Label: 7
Author: dsdlaforce
Date: 8/8/2022 3:59:28 PM
Status:
Color:
Layer:
Space:

8/8/2022 3:59:32 PM (1)



Subject: Line
Page Label: 7
Author: dsdlaforce
Date: 8/8/2022 3:59:32 PM
Status:
Color:
Layer:
Space:

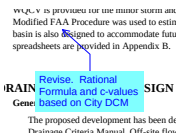
8/8/2022 3:59:59 PM (1)



Subject: Callout
Page Label: 7
Author: dsdlaforce
Date: 8/8/2022 3:59:59 PM
Status:
Color:
Layer:
Space:

Replace with City of Colorado Springs Drainage Criteria Manual Vol 1, May 2014

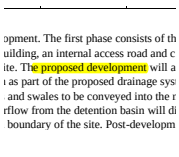
8/8/2022 4:02:25 PM (1)



Subject: Callout
Page Label: 8
Author: dsdlaforce
Date: 8/8/2022 4:02:25 PM
Status:
Color:
Layer:
Space:

Revise. Rational Formula and c-values based on City DCM

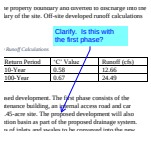
8/8/2022 4:12:27 PM (1)



Subject: Highlight
Page Label: 10
Author: dsdlaforce
Date: 8/8/2022 4:12:27 PM
Status:
Color:
Layer:
Space:

e proposed development

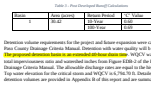
8/8/2022 4:13:05 PM (1)



Subject: Callout
Page Label: 10
Author: dsdlaforce
Date: 8/8/2022 4:13:05 PM
Status:
Color:
Layer:
Space:

Clarify. Is this with the first phase?

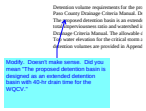
8/8/2022 4:14:17 PM (1)



Subject: Highlight
Page Label: 10
Author: dsdlaforce
Date: 8/8/2022 4:14:17 PM
Status:
Color:
Layer:
Space:

The proposed detention basin is an extended 40-hour drain tim

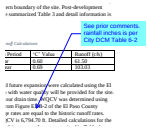
8/8/2022 4:15:58 PM (1)



Subject: Callout
Page Label: 10
Author: dsdlaforce
Date: 8/8/2022 4:15:58 PM
Status:
Color:
Layer:
Space:

Modify. Doesn't make sense. Did you mean "The proposed detention basin is designed as an extended detention basin with 40-hr drain time for the WQCV."

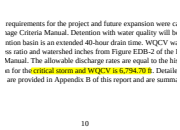
8/8/2022 4:17:03 PM (1)



Subject: Callout
Page Label: 10
Author: dsdlaforce
Date: 8/8/2022 4:17:03 PM
Status:
Color:
Layer:
Space:

See prior comments. rainfall inches is per City DCM Table 6-2

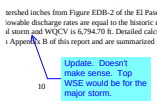
8/8/2022 4:17:36 PM (1)



Subject: Highlight
Page Label: 10
Author: dsdlaforce
Date: 8/8/2022 4:17:36 PM
Status:
Color:
Layer:
Space:

critical storm and WQCV is 6,794.70 f

8/8/2022 4:18:43 PM (1)



Subject: Callout
Page Label: 10
Author: dsdlaforce
Date: 8/8/2022 4:18:43 PM
Status:
Color:
Layer:
Space:

Update. Doesn't make sense. Top WSE would be for the major storm.

8/8/2022 4:27:38 PM (1)

Subject: Callout
Page Label: [1] 24x36
Author: dsdlaforce
Date: 8/8/2022 4:27:38 PM
Status:
Color:
Layer:
Space:

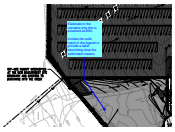
Label or include the dotted hatch in the legend.

8/8/2022 4:28:09 PM (1)

Subject: Callout
Page Label: [1] 24x36
Author: dsdlaforce
Date: 8/8/2022 4:28:09 PM
Status:
Color:
Layer:
Space:

Since the grading and drainage plan is diverting flows then channel analysis (highlighted in blue) must be provided to ensure the receiving channel does not have negative impacts to the channel. Offsite improvements may be required to the receiving channel.

8/8/2022 4:29:47 PM (1)

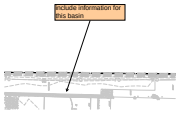


Subject: Callout
Page Label: [1] 24x36
Author: dsdlaforce
Date: 8/8/2022 4:29:47 PM
Status:
Color:
Layer:
Space:

Elaborate in the narrative why this is assumed at 80%.

Include the solid hatch in the legend or provide a label describing what the solid hatch means.

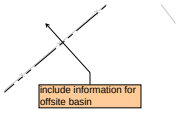
8/8/2022 8:54:27 AM (1)



Subject: Engineer
Page Label: [1] 24x36
Author: dotprete
Date: 8/8/2022 8:54:27 AM
Status:
Color:
Layer:
Space:

include information for this basin

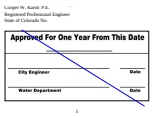
8/8/2022 8:54:40 AM (1)



Subject: Engineer
Page Label: [1] 24x36
Author: dotprete
Date: 8/8/2022 8:54:40 AM
Status:
Color:
Layer:
Space:

include information for offsite basin

8/8/2022 9:08:55 AM (1)

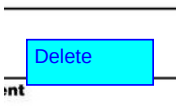


Subject: Line
Page Label: 1
Author: dsdlaforce
Date: 8/8/2022 9:08:55 AM
Status:
Color:
Layer:
Space:

8/8/2022 9:08:59 AM (1)

Subject: Line
Page Label: 1
Author: dsdlaforce
Date: 8/8/2022 9:08:59 AM
Status:
Color:
Layer:
Space:

8/8/2022 9:09:09 AM (1)



Subject: Text Box
Page Label: 1
Author: dsdlaforce
Date: 8/8/2022 9:09:09 AM
Status:
Color:
Layer:
Space:

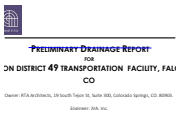
Delete

8/8/2022 9:09:25 AM (1)

Subject: Callout
Page Label: 1
Author: dsdlaforce
Date: 8/8/2022 9:09:25 AM
Status:
Color:
Layer:
Space:

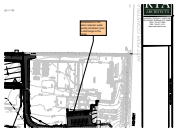
Revise to Final Drainage Report

8/8/2022 9:09:36 AM (1)



Subject: Line
Page Label: 1
Author: dsdlaforce
Date: 8/8/2022 9:09:36 AM
Status:
Color:
Layer:
Space:

8/8/2022 9:10:53 AM (1)



Subject: Engineer
Page Label: [1] 24x36
Author: dotprete
Date: 8/8/2022 9:10:53 AM
Status:
Color:
Layer:
Space:

disturbance in this basin requires water quality treatment prior to discharge to the creek.

8/8/2022 9:22:04 AM (1)

Subject: Text Box
Page Label: 2
Author: dsdlaforce
Date: 8/8/2022 9:22:04 AM
Status:
Color:
Layer:
Space:

Remove and replace pages 2 and 3 with a single signature sheet containing all three of the following signature blocks.

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.

_____
_____
[Name, P.E. #_____]
Date

Owner/Developer's Statement:

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

_____
_____
[Name, Title]
Date
[Business Name]
[Address]

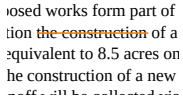
El Paso County:

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.

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

Conditions:

8/8/2022 9:23:12 AM (1)



Subject: Line
Page Label: 10
Author: dotprete
Date: 8/8/2022 9:23:12 AM
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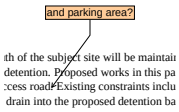
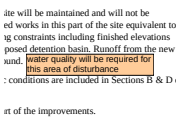
8/8/2022 9:27:06 AM (1)



Subject: Engineer
Page Label: 11
Author: dotprete
Date: 8/8/2022 9:27:06 AM
Status:
Color:
Layer:
Space:

and parking area?

8/8/2022 9:30:35 AM (1)



Subject: Engineer
Page Label: 11
Author: dotprete
Date: 8/8/2022 9:30:35 AM
Status:
Color:
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Space:

water quality will be required for this area of disturbance

8/8/2022 9:35:47 AM (1)

Subject: Engineer
Page Label: 9
Author: dotprete
Date: 8/8/2022 9:35:47 AM
Status:
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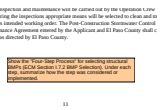
Space:

discuss the drainage basin to the south where the new road and parking area is proposed.

8/8/2022 9:36:07 AM (1)



Subject: Engineer
Page Label: 11
Author: dotprete
Date: 8/8/2022 9:36:07 AM
Status:
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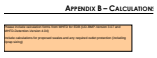
Show the "Four-Step Process" for selecting structural BMPs (ECM Section I.7.2 BMP Selection). Under each step, summarize how the step was considered or implemented.

8/8/2022 9:44:55 AM (1)



Subject: Engineer
Page Label: 13
Author: dotprete
Date: 8/8/2022 9:44:55 AM
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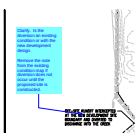
Please include calculation forms from MHFD for EDB (UD-BMP-Version 3.07 and MHFD-Detention-Version 4.04)

Include calculations for proposed swales and any required outlet protection (including riprap sizing)

8/8/2022 9:57:34 AM (1)



Subject: Callout
Page Label: [1] 24x36
Author: dsdlaforce
Date: 8/8/2022 9:57:34 AM
Status:
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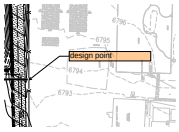
Clarify. Is the diversion an existing condition or with the new development design.

Remove the note from the existing condition map if diversion does not occur until the proposed site is constructed.

8/9/2022 1:46:44 PM (1)



Subject: Engineer
Page Label: [1] 24x36
Author: dotprete
Date: 8/9/2022 1:46:44 PM
Status:
Color:
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Space:

design point

8/9/2022 10:07:26 AM (1)

Subject: Cloud+
Page Label: 19
Author: dsdlaforce
Date: 8/9/2022 10:07:26 AM
Status:
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Provide calculation for the composite calculation based on Table 6-6 and chapter 6 of the City DCM, not the above equation.

8/9/2022 10:10:22 AM (1)

Subject: Image
Page Label: 18
Author: dsdlaforce
Date: 8/9/2022 10:10:22 AM
Status:
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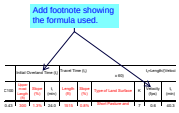
8/9/2022 10:11:15 AM (1)



Subject: Callout
Page Label: 18
Author: dsdlaforce
Date: 8/9/2022 10:11:15 AM
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Add footnote showing the formula used.

8/9/2022 10:11:39 AM (1)

Subject: Image
Page Label: 18
Author: dsdlaforce
Date: 8/9/2022 10:11:39 AM
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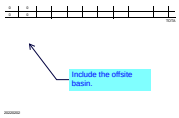
8/9/2022 10:12:47 AM (1)



Subject: Callout
Page Label: 18
Author: dsdlaforce
Date: 8/9/2022 10:12:47 AM
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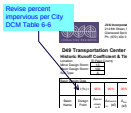
Include the offsite basin.

8/9/2022 10:12:54 AM (1)



Subject: Callout
Page Label: 18
Author: dsdlaforce
Date: 8/9/2022 10:12:54 AM
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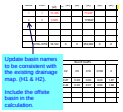
Revise percent impervious per City DCM Table 6-6

8/9/2022 10:13:41 AM (1)



Subject: Callout
Page Label: 18
Author: dsdlaforce
Date: 8/9/2022 10:13:41 AM
Status:
Color:
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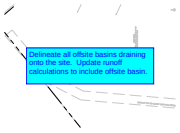
Update basin names to be consistent with the existing drainage map. (H1 & H2).

Include the offsite basin in the calculation.

8/9/2022 10:14:18 AM (2)



Subject: Text Box
Page Label: [1] 24x36
Author: dsdlaforce
Date: 8/9/2022 10:14:18 AM
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Delineate all offsite basins draining onto the site. Update runoff calculations to include offsite basin.

Subject: Highlight
Page Label: [1] 24x36
Author: dsdlaforce
Date: 8/9/2022 10:14:18 AM
Status:
Color:
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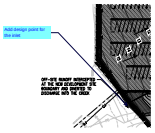
Space:

8/9/2022 10:14:46 AM (1)



Subject: Callout
Page Label: [1] 24x36
Author: dsdlaforce
Date: 8/9/2022 10:14:46 AM
Status:
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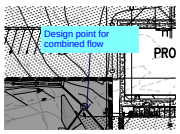
Space:

Add design point for the inlet

8/9/2022 10:15:22 AM (1)



Subject: Callout
Page Label: [1] 24x36
Author: dsdlaforce
Date: 8/9/2022 10:15:22 AM
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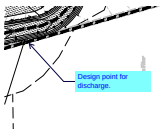
Design point for combined flow

8/9/2022 10:15:56 AM (1)



Subject: Callout
Page Label: [1] 24x36
Author: dsdlaforce
Date: 8/9/2022 10:15:56 AM
Status:
Color:
Layer:
Space:

Design point for discharge.

8/9/2022 10:16:15 AM (1)

Subject: Highlight
Page Label: [1] 24x36
Author: dsdlaforce
Date: 8/9/2022 10:16:15 AM
Status:
Color:
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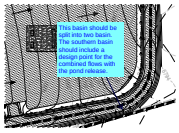
8/9/2022 10:17:36 AM (1)



Subject: Callout
Page Label: [1] 24x36
Author: dsdlaforce
Date: 8/9/2022 10:17:36 AM
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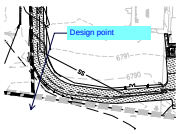
This basin should be split into two basin. The southern basin should include a design point for the combined flows with the pond release.

8/9/2022 10:18:05 AM (1)



Subject: Callout
Page Label: [1] 24x36
Author: dsdlaforce
Date: 8/9/2022 10:18:05 AM
Status:
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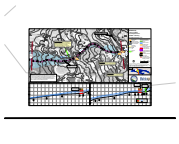
Design point

8/9/2022 10:18:20 AM (1)



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Page Label: [1] 24x36
Author: dsdlaforce
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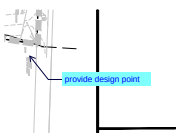
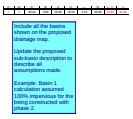
8/9/2022 10:18:56 AM (1)



Subject: Callout
Page Label: [1] 24x36
Author: dsdlaforce
Date: 8/9/2022 10:18:56 AM
Status:
Color:
Layer:
Space:

provide design point

8/9/2022 10:21:30 AM (1)



Subject: Text Box
Page Label: 21
Author: dsdlaforce
Date: 8/9/2022 10:21:30 AM
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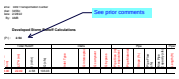
Include all the basins shown on the proposed drainage map.

Update the proposed sub-basin description to describe all assumptions made.

Example: Basin 1 calculation assumed 100% impervious for the being constructed with phase 2.

8/9/2022 10:22:09 AM (1)



Subject: Callout
Page Label: 22
Author: dsdlaforce
Date: 8/9/2022 10:22:09 AM
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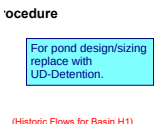
See prior comments

8/9/2022 10:23:43 AM (1)



Subject: Text Box
Page Label: 24
Author: dsdlaforce
Date: 8/9/2022 10:23:43 AM
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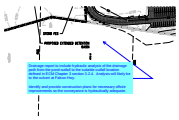
For pond design/sizing replace with UD-Detention.

8/9/2022 10:26:59 AM (1)



Subject: Callout
Page Label: [1] 24x36
Author: dsdlaforce
Date: 8/9/2022 10:26:59 AM
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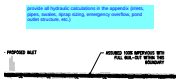
Drainage report to include hydraulic analysis of the drainage path from the pond outfall to the suitable outfall location defined in ECM Chapter 3 section 3.2.4. Analysis will likely be to the culvert at Falcon Hwy.

Identify and provide construction plans for necessary offsite improvements so the conveyance is hydraulically adequate.

8/9/2022 10:27:28 AM (1)



Subject: Callout
Page Label: [1] 24x36
Author: dsdlaforce
Date: 8/9/2022 10:27:28 AM
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provide all hydraulic calculations in the appendix (inlets, pipes, swales, riprap sizing, emergency overflow, pond outlet structure, etc.)

8/9/2022 3:24:46 PM (1)

Subject: Highlight
Page Label: [1] 24x36
Author: dsdlaforce
Date: 8/9/2022 3:24:46 PM
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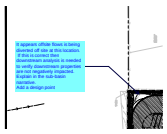
8/9/2022 3:27:12 PM (1)



Subject: Callout
Page Label: [1] 24x36
Author: dsdlaforce
Date: 8/9/2022 3:27:12 PM
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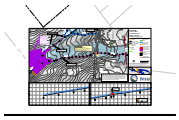
It appears offsite flows is being diverted off site at this location. If this is correct then downstream analysis is needed to verify downstream properties are not negatively impacted. Explain in the sub-basin narrative.
Add a design point

8/9/2022 9:23:25 AM (1)



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8/9/2022 9:53:09 AM (1)

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Page Label: 16
Author: dsdlaforce
Date: 8/9/2022 9:53:09 AM
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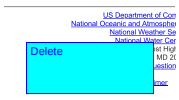
Delete

8/9/2022 9:53:12 AM (1)



Subject: Text Box
Page Label: 17
Author: dsdlaforce
Date: 8/9/2022 9:53:12 AM
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Delete

8/9/2022 9:58:53 AM (1)

Subject: Callout
Page Label: 18
Author: dsdlaforce
Date: 8/9/2022 9:58:53 AM
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FYI: Criteria only requires minor design storm to be based on a 5yr design storm. Either revise or add a a statement in the drainage design criteria (pg 7) acknowledging the minimum design storm and explaining why you've elected to use the 10 yr design storm.