3980 Walker Road
Final Drainage Report

Subdivision: Walker Reserve (Lot 3)

Prepared For: Valens Capital, LLC

Prepared By: Brett Louk, PE, Eric Maxwell, IE

Date Prepared: June 2024

PCD No. PPR2350

SMH CONSULTANTS

620 North Tejon Street, Suite 201
Colorado Springs, Colorado 80903
719-465-2145
blouk@smhconsultants.com

STATEMENT SHEET

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 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.

_____ _____

Brett Louk, P.E. #_____ Date

Developer's Statement:

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

_____ _____

Donna Shell, Title: Date

Owner: Valens Capital, LLC
Address: 3980 Walker Road
Colorado Springs, CO 80908

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

Conditions:

TABLE OF CONTENTS

1. INTRODUCTION

The owner of 3980 Walker Road has asked SMH Consultants, P.A. (SMH) to conduct a stormwater drainage analysis, for the proposed religious institution to be constructed on the site, to satisfy El Paso County drainage criteria manual requirements. This analysis will determine potential impacts resulting from the proposed improvements to the existing property.

a. Development Location

The approximately 28.5-acre property is currently platted and zoned RR5. The site is located in the West Quarter of Section 11, Township 11 South, Range 66 West of the Sixth Principal Meridian in El Paso County, Colorado. Otherwise known as Lot 3, Walker Reserve, County of El Paso, State of Colorado. The site is bordered by Walker Road on the west and south and residential property to the north, south, and east, and open farm ground to the west. The residential property to the east is unplatted. The residential property to the south is platted as Walker Reserve. The open farm ground to the west is unplatted. The residential property to the north is unplatted. A vicinity map of the site and adjacent properties has been included in the appendix of this report.

b. Description of Property

The existing site consists of a parsonage, three barns, paved driveways and parking, and asphalt millings driveway. The existing vegetation on the site consists of native pasture and forested areas. With this Site Plan, approximately 2.47 acres will be disturbed for a new modular building, asphalt millings parking lot, and widened asphalt millings driveways.

Based on a Custom Soil Resource Report, obtained from the USDA NRCS Web Soil Survey for the site, the primary soils on site are Kettle gravelly loamy sand, and Tomah-Crowfoot loamy sands. Both of these soil types are classified as Hydrologic Soils Group B and range in slope from 3-8 percent. Group B soils include soils that have a moderate infiltration rate (medium to low runoff potential) when thoroughly wet, consist mainly of moderately deep or deep, moderately well drained or well drained soils and have a moderate rate of water transmission. The Custom Soil Report for the site has been included in the appendix of the report.

The nearest major drainageway is Cherry Creek. West Cherry Creek flows through the western portion of the site and eventually flows to Cherry Creek northwest of the site.

2. DRAINAGE BASINS AND SUB-BASINS

a. Major Basin Descriptions

The existing site is located entirely in the West Cherry Creek drainage basin. Existing runoff from the site generally flows west/northwest into West Cherry Creek. West Cherry

Creek then flows north to West Cherry Creek Detention Number 5 Reservoir, located NW of the subject site, and then into Cherry Creek and Douglas County. The site was previously studied as part of the Preliminary/Final Drainage Report for Walker Reserve, completed by Associated Design Professionals, Inc., and approved on July 23, 2019. The site can be split into four smaller sub-basins and receives runoff from three different offsite sub-basins. The entirety of the site flows towards the northwest to West Cherry Creek. Per the previous report, West Cherry Creek has a tributary of approximately 850 acres consisting mostly of rangeland, homes, and ranches. Relevant excerpts from Preliminary/Final Drainage Report for Walker Reserve have been included in the appendix of this report.

b. Sub-Basin Descriptions

Offsite Drainage Area OS-1, depicted as part of Basin A in the previous report, is approximately 13.34 acres and is located east of the site on neighboring residential property. Stormwater runoff flows southwest at slopes ranging from 4-25 percent and flows along existing terrain patterns through drainage area EX-1 and leaves the site at Design Point 1. OS-1 consists of an existing building, pasture, and forested areas. This offsite sub-basin has existing 5-year and 100-year flows of 3.12 cfs and 21.60 cfs, respectively.

Offsite Drainage Area OS-2, depicted as part of Basin C in the previous report, is approximately 1.67 acres and is located east of the site on neighboring residential property. Stormwater runoff flows southwest at slopes ranging from 4-14 percent and flows along existing terrain patterns through drainage area EX-2 and leaves the site at Design Point 2. OS-2 consists of pasture and forested areas. This offsite sub-basin has existing 5-year and 100-year flows of 0.45 cfs and 3.33 cfs, respectively.

Offsite Drainage Area OS-3 is approximately 1.43 acres and is located west of the site on neighboring residential property and a portion of Walker Road. Stormwater runoff flows northeast at slopes ranging from 2-10 percent and flows along existing terrain patterns through drainage area EX-3 and leaves the site at Design Point 3. OS-3 consists of an existing gravel road, pasture, and forested areas. This offsite sub-basin has existing 5-year and 100-year flows of 0.93 cfs and 3.85 cfs, respectively.

Drainage Area EX-1 is approximately 1.67 acres located in the southeast corner of the site. Stormwater flows southwest at slopes ranging from 3-7 percent and flows along existing terrain patterns to Design Point 1 south of the site. EX-1 consists of an asphalt driveway and pasture area. This sub-basin has existing 5-year and 100-year flows of 1.02 cfs and 4.32 cfs, respectively.

Drainage Area EX-2 is approximately 5.24 acres located in the southeast portion of the site. Stormwater flows southwest at slopes ranging from 2-12 percent and flows along existing terrain patterns to Design Point 2 south of the site. EX-2 consists of an asphalt driveway, existing barns and single-story residence, pasture, and forested area. This sub-basin has existing 5-year and 100-year flows of 2.36 cfs and 10.42 cfs, respectively.

Drainage Area EX-3 is approximately 17.29 acres located in the central and western portions of the site. Stormwater flows northwest at slopes ranging from 3-9 percent and flows along existing terrain patterns to Design Point 3 north of the site. EX-3 consists of an asphalt millings driveway, existing barns, and pasture area. This sub-basin has existing 5-year and 100-year flows of 3.69 cfs and 25.46 cfs, respectively.

Drainage Area EX-4 is approximately 4.32 acres located in the northeast corner of the site. Stormwater flows northwest at slopes ranging from 3-19 percent and flows along existing terrain patterns to Design Point 4 north of the site. EX-4 consists of an asphalt millings driveway, pasture, and forested area. This sub-basin has existing 5-year and 100-year flows of 1.37 cfs and 9.03 cfs, respectively.

3. DRAINAGE DESIGN CRITERIA

a. Development Criteria Reference

Pre- and post-development drainage characteristics were reviewed, studied, and analyzed using the *El Paso County Drainage Criteria Manual,* Federal Emergency Management Agency's Flood Insurance Rate Map and USDA NRCS Web Soil Survey.

b. Hydrologic Criteria

Hydrology calculations in this report were performed following the methodologies outlined in the El Paso County Engineering Criteria Manual and the El Paso Drainage Criteria Manual (DCM) Volumes 1 and 2. Drainage characteristics were delineated based on existing topographic information from a topographical survey, Lidar, and USGS topographical maps. The existing and proposed drainage maps have been included in the appendix of this report.

Since the watershed area encompassing the development site is less than 100 acres, the Rational Method was used to determine peak flows for the 5-year and 100-year storm events. Weighted C values were determined for each drainage area within the proposed site based on the amount of impervious and pervious areas. A runoff coefficient (C) was chosen from Table 6-6 of the *El Paso County Drainage Criteria Manual, Volume 1 Update.* As mentioned earlier, the site consists of Hydrological Soil Group B. The Weighted C values are shown in the appendix of this report.

The time of concentration was calculated for each drainage area based off methods found in Chapter 6, Section 3.2 of the *El Paso County Drainage Criteria Manual, Volume 1 update*. The first 300 feet of unconcentrated overland flow time was calculated and added to the subsequent channelized flow times. Channelized flow times were calculated using channel flow time equation. All times of concentration for existing and proposed sub-basins has been included in the appendix of this report.

Rainfall intensity was calculated for each drainage area based off methods found in Chapter 6, Section 3.3 of the *El Paso County Drainage Criteria Manual, Volume 1 update.* The intensity value for each basin was determined using the equations from Figure 6-5. Each drainage area's time of concentration was used to determine the respective intensity. All intensity calculations for existing and proposed sub-basins have been included in the appendix of this report.

4. DRAINAGE FACILITY DESIGN

a. General Concept

Proposed improvements to the site include widening of the existing asphalt driveway, the addition of an approximately 11,000 sq. ft. modular building, and accompanying asphalt millings parking lot and sidewalk to serve the new building. Runoff will largely follow existing terrain patterns and the C values for the site will increase minimally due to the addition of impervious area. All offsite flow will be allowed to enter the site as it currently does, where it will continue to flow through to West Cherry Creek on the west side of the site. The 5-year and 100-year runoff calculations can be seen in the appendix of this report.

Drainage Area P-1 is approximately 1.67 acres located in the southeast corner of the site. Stormwater flows southwest at slopes ranging from 3-7 percent and flows along existing terrain patterns to Design Point 1 south of the site at which point the runoff enters West Cherry Creek and flows back through the property to Design Point 3. Proposed improvements in drainage area P-1 consist of the existing asphalt driveway being widened with asphalt millings. This sub-basin has proposed 5-year and 100-year flows of 1.36 cfs and 4.81 cfs, respectively.

Drainage Area P-2 is approximately 5.24 acres located in the southeast portion of the site. Stormwater flows southwest at slopes ranging from 2-12 percent and flows along existing terrain patterns to Design Point 2 south of the site at which point the runoff enters West Cherry Creek and flows back through the property to Design Point 3. Proposed improvements in drainage area P-2 consist of the existing asphalt driveway being widened with asphalt millings. This sub-basin has proposed 5-year and 100-year flows of 2.60 cfs and 10.76 cfs, respectively.

Drainage Area P-3 is approximately 20.03 acres located in the central and western portions of the site. Stormwater flows northwest at slopes ranging from 3-18 percent and flows along existing terrain patterns to West Cherry Creek and eventually leaves the site at Design Point 3 north of the site. The existing flow path will be altered by the addition of the modular building, a swale on the east side of the proposed retaining wall will be installed to route runoff around the building. Capacity calculations for the swale can be seen in the appendix. Proposed improvements in drainage area P-3 consist of the modular building addition, a portion of the parking lot to service the building, and a retaining wall on the east side of the building addition. This sub-basin has proposed 5-year and 100-year flows of 5.81 cfs and 31.58 cfs, respectively.

Drainage Area P-4 is approximately 1.58 acres located in the northeast corner of the site. Stormwater flows northwest at slopes ranging from 3-19 percent and flows to Design Point 4 north of the site. Due to the proposed swale and parking lot, this basin has decreased in size compared to existing basin EX-4. This sub-basin has proposed 5-year and 100-year flows of 0.43 cfs and 3.13 cfs, respectively.

Table 1 below shows a comparison between existing and proposed runoff rates at each design point.

Existing Runoff Summary			
Design Point	Area (ac)	Existing Q5 (cfs)	Existing Q100 (cfs)
DP-1	15.01	3.63	23.30
DP-2	6.91	2.56	12.36
DP-3	18.72	4.28	27.92
DP-4	4.32	1.37	9.03
Total Basin	850	137	600

Table 1. Existing Design Point Summary

Proposed Runoff Summary			
Design Point	Area (ac)	Proposed Q5 (cfs)	Proposed Q100 (cfs)
DP-1	15.01	3.86	23.58
DP-2	6.91	2.76	12.62
DP-3	21.46	6.41	34.07
DP-4	1.58	0.43	3.13
Total Basin	850	137	600

Table 2. Proposed Design Point Summary

As mentioned previously, West Cherry Creek, that runs through the subject property, has a tributary area of approximately 850 acres. Per the previous report, the 5-yr and 100-yr runoff rates for this tributary area are 137 cfs and 600 cfs, respectively. It appears as though some of this runoff is being reduced by an existing retention pond on Lot 1 of Walker Reserve. However, with no information being available for this pond, it is unknown how much the flows are being reduced from what was shown in the previous report. Regardless, the flows flowing into West Cherry Creek are significant. The minimal increase in runoff from the proposed improvements will be negligible in comparison to the tributary area flows. Also, as West Cherry Creek flows to the north, it flows into a regional detention pond. This regional detention pond is known as West Cherry Creek Detention Number 5 Reservoir. Per the construction plans for this regional detention pond, approved on May 22, 1959, the pond has a tributary area of 2 sq. mi., an inflow of 1,680 cfs, and a storage capacity of 55.38 ac-ft.

Since there is already a retention pond on West Cherry Creek south of the site and a regional detention pond downstream of the site, onsite detention has not been proposed

for the subject site. The minimal increase in runoff from the proposed improvements are negligible compared to the amount of runoff currently flowing to the retention and detention ponds.

5. FOUR STEP PROCESS

El Paso County requires a four-step process for stormwater quality management: reducing runoff volumes, treating the water quality capture volume, stabilizing streams, and implementing long-term source controls. These steps are further outlined in Volumes 1 and 2 of the County's Drainage Criteria Manual.

Step 1: Employ Runoff Reduction Practices. The site has been designed so that all runoff runs through native pasture before leaving the site and entering downstream receiving waters. This will minimize directly connected impervious areas within the site.

Step 2: Implement BMPs that Provide Water Quality Capture Volume (WQCV) with Slow Release. Per the Phase II Stormwater Regulations in Volume II of the Drainage Criteria Manual, this site is not required to provide permanent stormwater quality facilities. Per the County's Post Construction Stormwater Management Applicability (PBMP) Evaluation Form, permanent BMPs are not required as the project is considered a Large Lot Single-Family site with greater than 2.5 acres per dwelling and less than 10% impervious area for each lot. With the proposed improvements, the site would have approximately 6% impervious area.

Step 3: Stabilize Drainageways. The existing West Cherry Creek, that runs through the property, is currently stabilized with native vegetation. The increase in flows from the site are negligible, especially considering that the tributary area to West Cherry Creek is approximately 800 acres. There is also an existing retention pond on West Cherry Creek, south of the site, that helps to reduce flows in West Cherry Creek. West Cherry Creek Detention Pond Number 5 is also located downstream of the subject site. Due to all of this, there is suitable outfall for the slight increase in runoff from the site, thus no downstream improvements are proposed.

Step 4: Implement Site Specific and Other Source Control BMPs. Soil erosion control measures will be implemented during construction of the proposed improvements. Some of the measures to be implemented during construction include: silt fence, temporary construction entrance, permanent/temporary seeding, etc.

6. FLOODPLAIN STATEMENT

No portion of the site is located within a 100-year floodplain as determined by the Flood Insurance Rate Maps (FIRM) number 08041C0305G and 08041C0285G effective date December 7, 2018. Both FIRM maps can be seen in the appendix of this report.

7. DRAINAGE BASIN FEES

The site has been previously platted, thus no drainage basin fees are required.

8. SUMMARY

A drainage analysis was conducted for a 28.5-acre residential site. Proposed improvements include addition of a proposed modular building and parking lot.
The site is located in the West Cherry Creek drainage basin. Based on the analysis, the 5-year & 100-year post-development stormwater peak flow rates will be slightly higher than the pre-developed stormwater peak flow rates. Water quality for the site will be provided via receiving pervious area. Detention is not proposed for the site, as West Cherry Creek Detention Pond Number 5 is located downstream of the site. The tributary area for West Cherry Creek Detention Pond Number 5 is 2 sq. mi. The anticipated increase in runoff from the site will be negligible compared to the tributary area and West Cherry Creek Detention Pond Number 5 has enough capacity to handle the increase. Due to all this, there are no anticipated negative impacts to downstream developments or property.

REFERENCES

Associated Design Professionals, Inc. (2019). *Preliminary/Final Drainage Report for Walker Reserve.* Retrieved from https://epcdevplanreview.com/

El Paso County Assessor (2020). *El Paso County Assessor's Real Property Search.* Retrieved from https://www.elpasoco.com/search-el-paso-county/

El Paso County Clerk and Recorder (2001-2020). *El Paso County Clerk and Recorder Web Access.* Retrieved from publicrecordsearch.elpasoco.com/

El Paso County (2018). *Drainage Criteria Manual, Volumes 1 & 2.* Drainage Criteria Manual | El Paso County, CO | Municode Library

El Paso County (2020). *Engineering Criteria Manual.* Engineering Criteria Manual | El Paso County, CO | Municode Library

El Paso County (2023). *Land Development Code.* Land Development Code | El Paso County, CO | Municode Library

United States Department of Agriculture Natural Resources Conservation Service (2024, May 3). *Web Soil Survey.* Retrieved from https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx

APPENDIX

VICINITY MAP

SMH
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3980 WALKER ROAD

DRAINAGE STUDY

EL PASO COUNTY, COLORADO

REVISION DATE		REVISION DESCRIPTION
00/00/00	△	(DESCRIPTION)

VICINITY MAP

NORTH

SCALE: NTS

PROJECT #: 2310-0398
CHECKED BY: BML
DRAWN BY: EDM

DATE: 6/17/2024

SHEET # 1

TOTAL SHEETS 1

SOILS REPORT

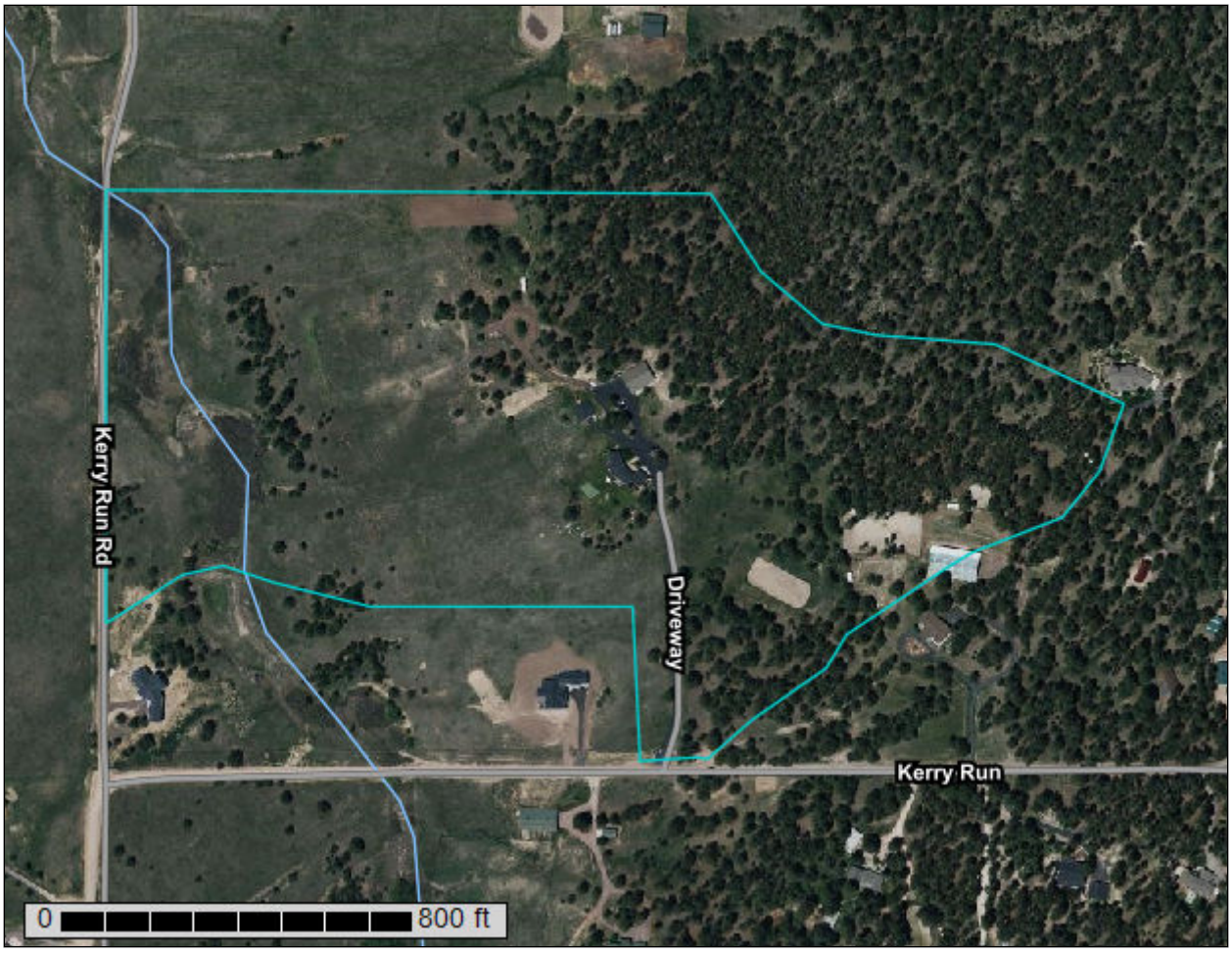
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for El Paso County Area, Colorado



May 3, 2024

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

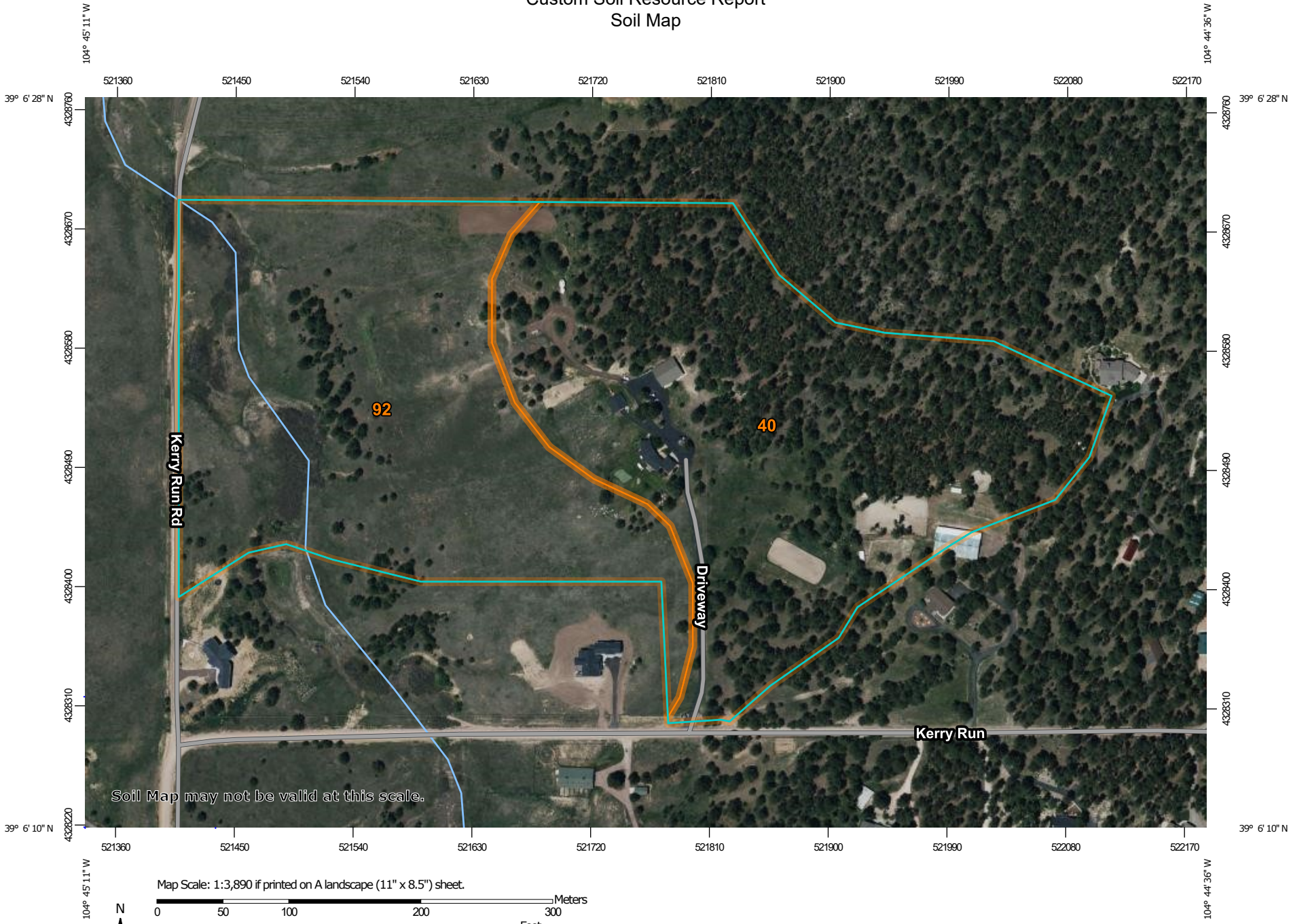
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



Map Scale: 1:3,890 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 150 300 600 900

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

MAP LEGEND

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

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

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 21, Aug 24, 2023

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

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

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
40	Kettle gravelly loamy sand, 3 to 8 percent slopes	23.7	54.0%
92	Tomah-Crowfoot loamy sands, 3 to 8 percent slopes	20.2	46.0%
Totals for Area of Interest		**43.9**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however,

onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

El Paso County Area, Colorado

40—Kettle gravelly loamy sand, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 368g
Elevation: 7,000 to 7,700 feet
Farmland classification: Not prime farmland

Map Unit Composition

Kettle and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Kettle

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy alluvium derived from arkose

Typical profile

E - 0 to 16 inches: gravelly loamy sand
Bt - 16 to 40 inches: gravelly sandy loam
C - 40 to 60 inches: extremely gravelly loamy sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: F048AY908CO - Mixed Conifer
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit:
Hydric soil rating: No

Pleasant

Percent of map unit:
Landform: Depressions
Hydric soil rating: Yes

92—Tomah-Crowfoot loamy sands, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 36b9
Elevation: 7,300 to 7,600 feet
Farmland classification: Not prime farmland

Map Unit Composition

Tomah and similar soils: 50 percent
Crowfoot and similar soils: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Tomah

Setting

Landform: Hills, alluvial fans
Landform position (three-dimensional): Crest, side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from arkose and/or residuum weathered from arkose

Typical profile

A - 0 to 10 inches: loamy sand
E - 10 to 22 inches: coarse sand
Bt - 22 to 48 inches: stratified coarse sand to sandy clay loam
C - 48 to 60 inches: coarse sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: R049XY216CO - Sandy Divide
Hydric soil rating: No

Description of Crowfoot

Setting

Landform: Alluvial fans, hills
Landform position (three-dimensional): Crest, side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

A - 0 to 12 inches: loamy sand
E - 12 to 23 inches: sand
Bt - 23 to 36 inches: sandy clay loam
C - 36 to 60 inches: coarse sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: R049XY216CO - Sandy Divide
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit:
Hydric soil rating: No

Pleasant

Percent of map unit:
Landform: Depressions
Hydric soil rating: Yes

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

FEMA FLOODPLAIN MAP

NOTES TO USERS

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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.

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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.

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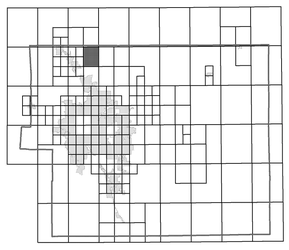
El Paso County Vertical Datum Offset Table

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



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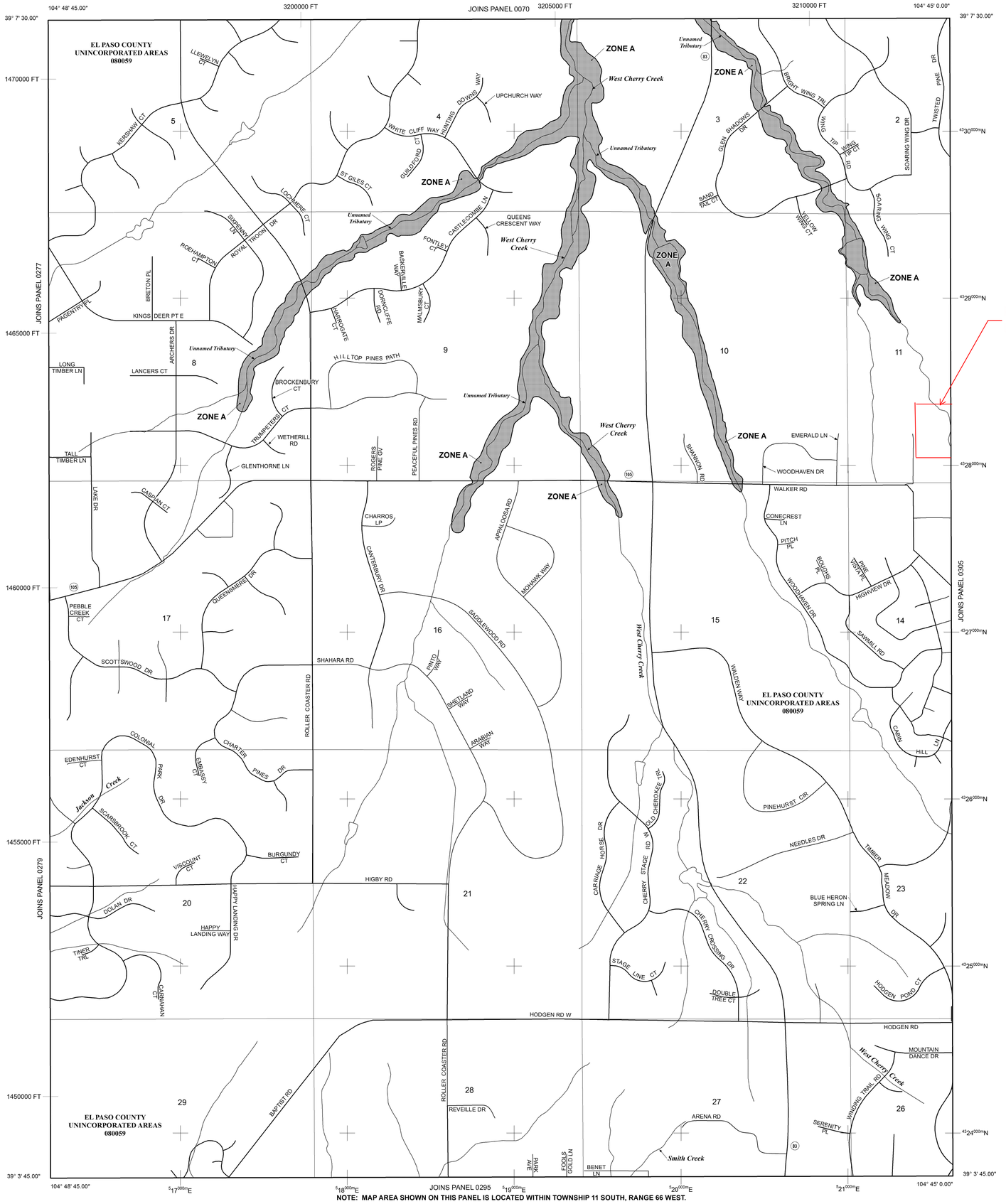

LEGEND

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" = 1000'
500 0 1000 2000 FEET
300 0 300 600 METERS

NFIP NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0285G

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

PANEL 285 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
EL PASO COUNTY	080059	0285	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
08041C0285G

MAP REVISED
DECEMBER 7, 2018

Federal Emergency Management Agency

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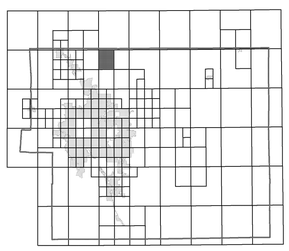

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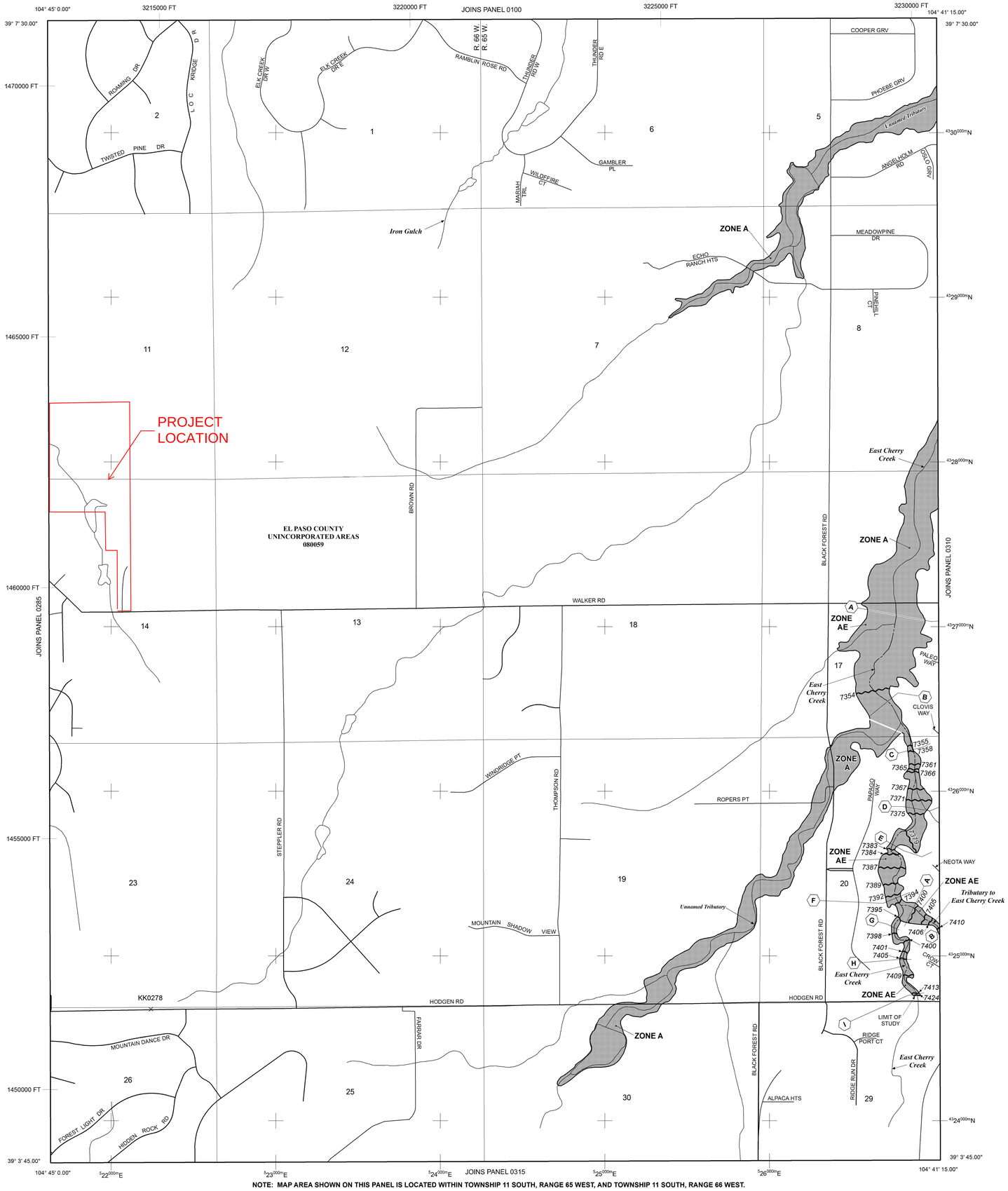

NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 11 SOUTH, RANGE 65 WEST, AND TOWNSHIP 11 SOUTH, RANGE 66 WEST.

LEGEND

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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" = 1000'
500 0 1000 2000 FEET
300 0 300 600 METERS

NFIP

PANEL 0305G

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 305 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
EL PASO COUNTY	080059	0305	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
08041C0305G

MAP REVISED
DECEMBER 7, 2018

Federal Emergency Management Agency

HYDROLOGIC CALCULATIONS

EXISTING C-CALCULATIONS (HSG B)

Existing C Calcs (HSG B)

Basin	Land Cover	Area (sf)	Area (ac)	C5	C100	C5 x A	C100 x A	**Weighted C5**
EX-1	Pavement	7178	0.17	0.90	0.96	0.153	0.163	**0.16**
	Pasture/Meadow	65489	1.50	0.08	0.35	0.120	0.526	**Weighted C100**
	Total	72667	1.67			0.273	0.689	**0.41**

Basin	Land Cover	Area (sf)	Area (ac)	C5	C100	C5 x A	C100 x A	**Weighted C5**
EX-2	Pavement	14569	0.33	0.90	0.96	0.301	0.321	**0.15**
	Roof	7442	0.17	0.73	0.81	0.125	0.138	**Weighted C100**
	Pasture/Meadow	191749	4.40	0.08	0.35	0.352	1.541	**0.40**
	Forested	14560	0.33	0.08	0.35	0.027	0.117	
	Total	228320	5.24			0.805	2.117	

Basin	Land Cover	Area (sf)	Area (ac)	C5	C100	C5 x A	C100 x A	**Weighted C5**
EX-3	Pavement	4385	0.10	0.90	0.96	0.091	0.097	**0.09**
	Roof	1757	0.04	0.73	0.81	0.029	0.033	**Weighted C100**
	Pasture/Meadow	740608	17.00	0.08	0.35	1.360	5.951	**0.35**
	Forested	6587	0.15	0.08	0.35	0.012	0.053	
	Total	753337	17.29			1.492	6.133	

Basin	Land Cover	Area (sf)	Area (ac)	C5	C100	C5 x A	C100 x A	**Weighted C5**
EX-4	Pavement	2608	0.06	0.90	0.96	0.054	0.057	**0.09**
	Pasture/Meadow	78401	1.80	0.08	0.35	0.144	0.630	**Weighted C100**
	Forested	106985	2.46	0.08	0.35	0.196	0.860	**0.36**
	Total	187994	4.32			0.394	1.547	

Basin	Land Cover	Area (sf)	Area (ac)	C5	C100	C5 x A	C100 x A	**Weighted C5**
OS-1	Roof	5274	0.12	0.73	0.81	0.088	0.098	**0.09**
	Pasture/Meadow	143517	3.29	0.08	0.35	0.264	1.153	**Weighted C100**
	Forested	432291	9.92	0.08	0.35	0.794	3.473	**0.35**
	Total	581082	13.34			1.146	4.725	

Basin	Land Cover	Area (sf)	Area (ac)	C5	C100	C5 x A	C100 x A	**Weighted C5**
OS-2	Pasture/Meadow	6072	0.14	0.08	0.35	0.011	0.049	**0.08**
	Forested	66583	1.53	0.08	0.35	0.122	0.535	**Weighted C100**
	Total	72655	1.67			0.133	0.584	**0.35**

Basin	Land Cover	Area (sf)	Area (ac)	C5	C100	C5 x A	C100 x A	**Weighted C5**
OS-3	Pavement	6663	0.15	0.9	0.96	0.138	0.147	**0.17**
	Pasture/Meadow	55602	1.28	0.08	0.35	0.102	0.447	**Weighted C100**
	Total	62265	1.43			0.240	0.594	**0.42**

Design Point	Contrib. Basins	Land Cover	Area (sf)	Area (ac)	C5	C100	C5 x A	C100 x A	**Weighted C5**
DP-1	EX-1, OS-1	Pavement	7178	0.16	0.9	0.96	0.148	0.158	**0.09**
		Roof	5274	0.12	0.73	0.81	0.088	0.098	**Weighted C100**
		Pasture/Meadow	209006	4.80	0.08	0.35	0.384	1.679	**0.36**
		Forested	432291	9.92	0.08	0.35	0.794	3.473	
		Total	653749	15.01			1.414	5.409	

Design Point	Contrib. Basins	Land Cover	Area (sf)	Area (ac)	C5	C100	C5 x A	C100 x A	**Weighted C5**
DP-2	EX-2, OS-2	Pavement	14569	0.33	0.9	0.96	0.301	0.321	**0.14**
		Roof	7442	0.17	0.73	0.81	0.125	0.138	**Weighted C100**
		Pasture/Meadow	197821	4.54	0.08	0.35	0.363	1.589	**0.39**
		Forested	81143	1.86	0.08	0.35	0.149	0.652	
		Total	300975	6.91			0.938	2.701	

Design Point	Contrib. Basins	Land Cover	Area (sf)	Area (ac)	C5	C100	C5 x A	C100 x A	**Weighted C5**
DP-3	EX-3, OS-3	Pavement	11048	0.25	0.9	0.96	0.228	0.243	**0.09**
		Roof	1757	0.04	0.73	0.81	0.029	0.033	**Weighted C100**
		Pasture/Meadow	796210	18.28	0.08	0.35	1.462	6.397	**0.36**
		Forested	6587	0.15	0.08	0.35	0.012	0.053	
		Total	815602	18.72			1.732	6.727	

Design Point	Contrib. Basins	Land Cover	Area (sf)	Area (ac)	C5	C100	C5 x A	C100 x A	**Weighted C5**
DP-4	EX-4	Pavement	2608	0.06	0.90	0.96	0.054	0.057	**0.09**
		Pasture/Meadow	78401	1.80	0.08	0.35	0.144	0.630	**Weighted C100**
		Forested	106985	2.46	0.08	0.35	0.196	0.860	**0.36**
		Total	187994	4.32			0.394	1.547	

Existing Summary Table			
Basin	Area (ac)	C5	C100
EX-1	1.67	0.16	0.41
EX-2	5.24	0.15	0.40
EX-3	17.29	0.09	0.35
EX-4	4.32	0.09	0.36
OS-1	13.34	0.09	0.35
OS-2	1.67	0.08	0.35
OS-3	1.43	0.17	0.42
DP-1	15.01	0.09	0.36
DP-2	6.91	0.14	0.39
DP-3	18.72	0.09	0.36
DP-4	4.32	0.09	0.36

PROPOSED C-CALCULATIONS (HSG B)

Proposed C Calcs (HSG B)

Basin	Land Cover	Area (sf)	Area (ac)	C5	C100	C5 x A	C100 x A	**Weighted C5**
P-1	Pavement	11850	0.27	0.90	0.96	0.245	0.261	**0.21**
	Pasture/Meadow	60817	1.40	0.08	0.35	0.112	0.489	**Weighted C100**
	Total	72667	1.67			0.357	0.750	**0.45**
Basin	Land Cover	Area (sf)	Area (ac)	C5	C100	C5 x A	C100 x A	**Weighted C5**
P-2	Pavement	18584	0.43	0.90	0.96	0.384	0.410	**0.17**
	Roof	7442	0.17	0.73	0.81	0.125	0.138	**Weighted C100**
	Pasture/Meadow	187734	4.31	0.08	0.35	0.345	1.508	**0.41**
	Forested	14560	0.33	0.08	0.35	0.027	0.117	
	Total	228320	5.24			0.880	2.173	
Basin	Land Cover	Area (sf)	Area (ac)	C5	C100	C5 x A	C100 x A	**Weighted C5**
P-3	Pavement	28510	0.65	0.90	0.96	0.589	0.628	**0.12**
	Roof	12881	0.30	0.73	0.81	0.216	0.240	**Weighted C100**
	Pasture/Meadow	819576	18.81	0.08	0.35	1.505	6.585	**0.38**
	Forested	11439	0.26	0.08	0.35	0.021	0.092	
	Total	872406	20.03			2.331	7.545	
Basin	Land Cover	Area (sf)	Area (ac)	C5	C100	C5 x A	C100 x A	**Weighted C5**
P-4	Pasture/Meadow	30498	0.70	0.08	0.35	0.056	0.245	**0.08**
	Forested	38427	0.88	0.08	0.35	0.071	0.309	**Weighted C100**
	Total	68925	1.58			0.127	0.554	**0.35**
Basin	Land Cover	Area (sf)	Area (ac)	C5	C100	C5 x A	C100 x A	**Weighted C5**
OS-1	Roof	5274	0.12	0.73	0.81	0.088	0.098	**0.09**
	Pasture/Meadow	143517	3.29	0.08	0.35	0.264	1.153	**Weighted C100**
	Forested	432291	9.92	0.08	0.35	0.794	3.473	**0.35**
	Total	581082	13.34			1.146	4.725	
Basin	Land Cover	Area (sf)	Area (ac)	C5	C100	C5 x A	C100 x A	**Weighted C5**
OS-2	Pasture/Meadow	6072	0.14	0.08	0.35	0.011	0.049	**0.08**
	Forested	66583	1.53	0.08	0.35	0.122	0.535	**Weighted C100**
	Total	72655	1.67			0.133	0.584	**0.35**
Basin	Land Cover	Area (sf)	Area (ac)	C5	C100	C5 x A	C100 x A	**Weighted C5**
OS-3	Pavement	6663	0.15	0.9	0.96	0.138	0.147	**0.17**
	Pasture/Meadow	55602	1.28	0.08	0.35	0.102	0.447	**Weighted C100**
	Total	62265	1.43			0.240	0.594	**0.42**

Design Point	Contrib. Basins	Land Cover	Area (sf)	Area (ac)	C5	C100	C5 x A	C100 x A	**Weighted C5**
DP-1	P-1, OS-1	Pavement	11850	0.27	0.90	0.96	0.245	0.261	**0.10**
		Roof	5274	0.12	0.73	0.81	0.088	0.098	**Weighted C100**
		Pasture/Meadow	204334	4.69	0.08	0.35	0.375	1.642	**0.36**
		Forested	432291	9.92	0.08	0.35	0.794	3.473	
		Total	653749	15.01			1.502	5.474	
Design Point	Contrib. Basins	Land Cover	Area (sf)	Area (ac)	C5	C100	C5 x A	C100 x A	**Weighted C5**
DP-2	P-2, OS-2	Pavement	18584	0.43	0.90	0.96	0.384	0.410	**0.15**
		Roof	7442	0.17	0.73	0.81	0.125	0.138	**Weighted C100**
		Pasture/Meadow	193806	4.45	0.08	0.35	0.356	1.557	**0.40**
		Forested	81143	1.86	0.08	0.35	0.149	0.652	
		Total	300975	6.91			1.014	2.757	
Design Point	Contrib. Basins	Land Cover	Area (sf)	Area (ac)	C5	C100	C5 x A	C100 x A	**Weighted C5**
DP-3	P-3, OS-3	Pavement	35173	0.81	0.90	0.96	0.727	0.775	**0.12**
		Roof	12881	0.30	0.73	0.81	0.216	0.240	**Weighted C100**
		Pasture/Meadow	875178	20.09	0.08	0.35	1.607	7.032	**0.38**
		Forested	11439	0.26	0.08	0.35	0.021	0.092	
		Total	934671	21.46			2.571	8.139	
Design Point	Contrib. Basins	Land Cover	Area (sf)	Area (ac)	C5	C100	C5 x A	C100 x A	**Weighted C5**
DP-4	P-4	Pasture/Meadow	30498	0.70	0.08	0.35	0.056	0.245	**0.08**
		Forested	38427	0.88	0.08	0.35	0.071	0.309	**Weighted C100**
		Total	68925	1.58			0.127	0.554	**0.35**

Proposed Summary Table			
Basin	Area (ac)	C5	C100
P-1	1.67	0.21	0.45
P-2	5.24	0.17	0.41
P-3	20.03	0.12	0.38
P-4	1.58	0.08	0.35
OS-1	13.34	0.09	0.35
OS-2	1.67	0.08	0.35
OS-3	1.43	0.17	0.42
DP-1	15.01	0.10	0.36
DP-2	6.91	0.15	0.40
DP-3	21.46	0.12	0.38
DP-4	1.58	0.08	0.35

PROPOSED SITE IMERVIOUSNESS

COVER TYPE	AREA (AC)	%
IMPERVIOUS	1.82	6.38%
PERVIOUS	26.70	93.62%
TOTAL	28.52	100.00%

Existing Time of Concentration Calculations												
Sub-Basin Date			Time of Concentration Estimate									
Basin	Area (ac)	C5	Initial/Overland Time (t_i)			Travel Time (t_t)						Final
			Length (ft)	Slope	t_i (min)	Length (ft)	Slope	Land Type	C_v	Velocity (ft/sec)	t_t (min)	t_c (min)
EX-1	1.67	0.16	171	0.050	13.00	0	-	-	-	-	0.00	13.00
EX-2	5.24	0.15	300	0.066	15.89	658	0.061	SP	7	1.73	6.32	22.21
EX-3	17.29	0.09	300	0.119	14.02	1495	0.049	SP	7	1.54	16.14	30.16
EX-4	4.32	0.09	300	0.178	12.20	330	0.059	SP	7	1.70	3.23	15.43
OS-1	13.34	0.09	300	0.066	17.00	894	0.063	SP	7	1.75	8.51	25.51
OS-2	1.67	0.08	300	0.081	16.01	26	0.080	SP	7	1.98	0.22	16.23
OS-3	1.43	0.17	232	0.101	11.94	0	-	-	-	-	0.00	11.94
DP-1	15.01	0.09	300	0.066	17.00	1065	0.050	SP	7	1.57	11.33	28.34
DP-2	6.91	0.14	300	0.081	16.01	984	0.061	SP	7	1.73	9.46	25.47
DP-3	18.72	0.09	300	0.119	14.02	1495	0.049	SP	7	1.54	16.14	30.16
DP-4	4.32	0.09	300	0.178	12.20	330	0.059	SP	7	1.70	3.23	15.43

Equations:

t_i (overland) = $0.395(1.1-C_5)L^{0.5}S^{-0.333}$

C = Runoff Coefficient

L = Length of overland flow

S = Slope

Travel Time: $V = CvS^{0.5}$

V = Velocity (ft/s)

C_v = Conveyance Coefficient

S = Slope

t_c Check: (L/180) + 10 (developed condition only)

L = Overall Length

Type of Land Surface	Land Type	C_v
Heavy Meadow	HM	2.5
Tillage/Fields	TF	5
Riprap (Not Buried)	RR	6.5
Short Pasture/Lawns	SP	7
Nearly Bare Ground	NBG	10
Grassed Waterway	GW	15
Paved Areas & Shallow Paved Swales	PV	20

Proposed Time of Concentration Calculations												
Sub-Basin Date			Time of Concentration Estimate									
Basin	Area (ac)	C5	Initial/Overland Time (t_i)			Travel Time (t_t)						Final
			Length (ft)	Slope	t_i (min)	Length (ft)	Slope	Land Type	C_v	Velocity (ft/sec)	t_t (min)	t_c (min)
P-1	1.67	0.21	171	0.050	12.30	0	-	-	-	-	0.00	12.30
P-2	5.24	0.17	300	0.066	15.64	658	0.061	SP	7	1.73	6.32	21.97
P-3	20.03	0.12	300	0.119	13.60	1495	0.049	SP	7	1.54	16.14	29.74
P-4	1.58	0.08	300	0.151	13.02	355	0.055	SP	7	1.64	3.61	16.63
OS-1	13.34	0.09	300	0.066	17.00	894	0.063	SP	7	1.75	8.51	25.51
OS-2	1.67	0.08	300	0.081	16.01	26	0.080	SP	7	1.98	0.22	16.23
OS-3	1.43	0.17	232	0.101	11.94	0	-	-	-	-	0.00	11.94
DP-1	15.01	0.10	300	0.066	17.00	1065	0.050	SP	7	1.57	11.33	28.34
DP-2	6.91	0.15	300	0.081	16.01	984	0.061	SP	7	1.73	9.46	25.47
DP-3	21.46	0.12	300	0.119	13.60	1495	0.049	SP	7	1.54	16.14	29.74
DP-4	1.58	0.08	300	0.151	13.02	355	0.055	SP	7	1.64	3.61	16.63

Equations:

t_i (overland) = $0.395(1.1-C_5)L^{0.5}S^{-0.333}$

C = Runoff Coefficient

L = Length of overland flow

S = Slope

Travel Time: $V = CvS^{0.5}$

V = Velocity (ft/s)

C_v = Conveyance Coefficient

S = Slope

t_c Check: (L/180) + 10 (developed condition only)

L = Overall Length

Type of Land Surface	Land Type	C_v
Heavy Meadow	HM	2.5
Tillage/Fields	TF	5
Riprap (Not Buried)	RR	6.5
Short Pasture/Lawns	SP	7
Nearly Bare Ground	NBG	10
Grassed Waterway	GW	15
Paved Areas & Shallow Paved Swales	PV	20

EXISTING INTENSITY AND RUNOFF

Intensity Calculations			
Basin	$D = t_c$	I5	I100
EX-1	13.00	3.74	6.27
EX-2	22.21	2.93	4.92
EX-3	30.16	2.47	4.15
EX-4	15.43	3.48	5.84
OS-1	25.51	2.72	4.57
OS-2	16.23	3.40	5.71
OS-3	11.94	3.86	6.49
DP-1	28.34	2.57	4.31
DP-2	25.47	2.73	4.58
DP-3	30.16	2.47	4.15
DP-4	15.43	3.48	5.84

$I_5 = -1.50\ln(D) + 7.583$

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

(Figure 6-5 El Paso Co DCM)

Existing Runoff Calculations (Q = CIA)							
Basin	C5	C100	I5	I100	A	Q5 (cfs)	Q100 (cfs)
EX-1	0.16	0.41	3.74	6.27	1.67	1.02	4.32
EX-2	0.15	0.40	2.93	4.92	5.24	2.36	10.42
EX-3	0.09	0.35	2.47	4.15	17.29	3.69	25.46
EX-4	0.09	0.36	3.48	5.84	4.32	1.37	9.03
OS-1	0.09	0.35	2.72	4.57	13.34	3.12	21.60
OS-2	0.08	0.35	3.40	5.71	1.67	0.45	3.33
OS-3	0.17	0.42	3.86	6.49	1.43	0.93	3.85
DP-1	0.09	0.36	2.57	4.31	15.01	**3.63**	**23.30**
DP-2	0.14	0.39	2.73	4.58	6.91	**2.56**	**12.36**
DP-3	0.09	0.36	2.47	4.15	18.72	**4.28**	**27.92**
DP-4	0.09	0.36	3.48	5.84	4.32	**1.37**	**9.03**

PROPOSED INTENSITY AND RUNOFF

Intensity Calculations			
Basin	$D = t_c$	I5	I100
P-1	12.30	3.82	6.41
P-2	21.97	2.95	4.95
P-3	29.74	2.49	4.19
P-4	16.63	3.37	5.65
OS-1	25.51	2.72	4.57
OS-2	16.23	3.40	5.71
OS-3	11.94	3.86	6.49
DP-1	28.34	2.57	4.31
DP-2	25.47	2.73	4.58
DP-3	29.74	2.49	4.19
DP-4	16.63	3.37	5.65

$I_5 = -1.50\ln(D) + 7.583$

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

(Figure 6-5 El Paso Co DCM)

Proposed Runoff Calculations (Q = CIA)							
Basin	C5	C100	I5	I100	A	Q5 (cfs)	Q100 (cfs)
P-1	0.21	0.45	3.82	6.41	1.67	1.36	4.81
P-2	0.17	0.41	2.95	4.95	5.24	2.60	10.76
P-3	0.12	0.38	2.49	4.19	20.03	5.81	31.58
P-4	0.08	0.35	3.37	5.65	1.58	0.43	3.13
OS-1	0.09	0.35	2.72	4.57	13.34	3.12	21.60
OS-2	0.08	0.35	3.40	5.71	1.67	0.45	3.33
OS-3	0.17	0.42	3.86	6.49	1.43	0.93	3.85
DP-1	0.10	0.36	2.57	4.31	15.01	**3.86**	**23.58**
DP-2	0.15	0.40	2.73	4.58	6.91	**2.76**	**12.62**
DP-3	0.12	0.38	2.49	4.19	21.46	**6.41**	**34.07**
DP-4	0.08	0.35	3.37	5.65	1.58	**0.43**	**3.13**

Design Procedure Form: Runoff Reduction

UD-BMP (Version 3.07, March 2018) **Sheet 1 of 1**

Designer:	**E. Maxwell**
Company:	**SMH Consultants**
Date:	**June 28, 2024**
Project:	**3980 Walker Road**
Location:	**El Paso County, CO**

SITE INFORMATION (User Input in Blue Cells)

WQCV Rainfall Depth: 0.60 inches

Depth of Average Runoff Producing Storm, d_6 = 0.43 inches (for Watersheds Outside of the Denver Region, Figure 3-1 in USDCM Vol. 3)

Area Type	UIA:RPA	UIA:RPA	UIA:RPA	UIA:RPA	UIA:RPA	UIA:RPA						
Area ID	1 (BLDG)	2 (PARKING+N SIDEWALK)	3 (S SIDEWALK + PARKING)	4 (NORTH DRIVE WIDENING)	5 (CENTRAL DRIVE IMPROVEMENTS)	6 (SOUTH DRIVE WIDENING)						
Downstream Design Point ID	DP-3	DP-3	DP-3	DP-3	DP-2	DP-1						
Downstream BMP Type	None	None	None	None	None	None						
DCIA (ft^2)	--	--	--	--	--	--						
UIA (ft^2)	11,124	17,414	1,686	2,409	3,648	4,939						
RPA (ft^2)	4,417	18,963	1,159	2,523	4,975	4,916						
SPA (ft^2)	--	--	--	--	--	--						
HSG A (%)	0%	0%	0%	0%	0%	0%						
HSG B (%)	100%	100%	100%	100%	100%	100%						
HSG C/D (%)	0%	0%	0%	0%	0%	0%						
Average Slope of RPA (ft/ft)	0.050	0.030	0.050	0.070	0.050	0.040						
UIA:RPA Interface Width (ft)	224.00	415.00	148.00	250.00	138.00	350.00						

CALCULATED RUNOFF RESULTS

Area ID	1 (BLDG)	2 (PARKING+N SIDEWALK)	3 (S SIDEWALK + PARKING)	4 (NORTH DRIVE WIDENING)	5 (CENTRAL DRIVE IMPROVEMENTS)	6 (SOUTH DRIVE WIDENING)						
UIA:RPA Area (ft^2)	15,541	36,377	2,845	4,932	8,623	9,855						
L / W Ratio	0.31	0.21	0.13	0.08	0.45	0.08						
UIA / Area	0.7158	0.4787	0.5926	0.4884	0.4231	0.5012						
Runoff (in)	0.06	0.00	0.00	0.00	0.00	0.00						
Runoff (ft^3)	78	0	0	0	0	0						
Runoff Reduction (ft^3)	385	726	70	100	152	206						

CALCULATED WQCV RESULTS

Area ID	1 (BLDG)	2 (PARKING+N SIDEWALK)	3 (S SIDEWALK + PARKING)	4 (NORTH DRIVE WIDENING)	5 (CENTRAL DRIVE IMPROVEMENTS)	6 (SOUTH DRIVE WIDENING)						
WQCV (ft^3)	464	726	70	100	152	206						
WQCV Reduction (ft^3)	385	726	70	100	152	206						
WQCV Reduction (%)	83%	100%	100%	100%	100%	100%						
Untreated WQCV (ft^3)	78	0	0	0	0	0						

CALCULATED DESIGN POINT RESULTS (sums results from all columns with the same Downstream Design Point ID)

Downstream Design Point ID	DP-4	DP-3	DP-2	DP-1								
DCIA (ft^2)	0	0	0	0								
UIA (ft^2)	0	32,633	3,648	4,939								
RPA (ft^2)	0	27,062	4,975	4,916								
SPA (ft^2)	0	0	0	0								
Total Area (ft^2)	0	59,695	8,623	9,855								
Total Impervious Area (ft^2)	0	32,633	3,648	4,939								
WQCV (ft^3)	0	1,360	152	206								
WQCV Reduction (ft^3)	0	1,281	152	206								
WQCV Reduction (%)	0%	94%	100%	100%								
Untreated WQCV (ft^3)	0	78	0	0								

CALCULATED SITE RESULTS (sums results from all columns in worksheet)

Total Area (ft^2)	78,173
Total Impervious Area (ft^2)	41,220
WQCV (ft^3)	1,718
WQCV Reduction (ft^3)	1,639
WQCV Reduction (%)	95%
Untreated WQCV (ft^3)	78

BRIAN G & JULIE A BRAATEN
ZONED: RR-5
REC. NO. 6111000018

YOUNGER FAMILY PARTNERSHIP
ZONED: RR-5
REC. NO. 6100000420

ALBERTO JIMENEZ REYNOSO
ZONED: RR-5
REC. NO. 6111000020

JAMES AND KATIE SPENCE
ZONED: RR-5
REC. NO. 6111005001

ANTHONY J FELTMAN
ZONED: RR-5
REC. NO. 6111005002

EXISTING CHANNEL

EXISTING CHANNEL

EXISTING BUILDING

EXISTING PARSONAGE

LEGEND

- EXISTING MAJOR CONTOUR (10')
- EXISTING MINOR CONTOUR (2')
- PROPOSED MAJOR CONTOUR (10')
- PROPOSED MINOR CONTOUR (2')
- UNCONNECTED IMPERVIOUS AREA (UIA)
- RECEIVING PERVIOUS AREA (RPA)

NORTH

60' 30' 0' 60'
SCALE: 1" = 60'

SMH CONSULTANTS
www.smhconsultants.com
Civil Engineering • Land Surveying
Landscape Architecture
Manhattan, KS - HQ
(785) 776-0541
Dodge City, KS
(620) 255-1952
Kansas City
(913) 444-9615
Colorado Springs, CO
(719) 465-2145

3980 WALKER ROAD

DRAINAGE STUDY

EL PASO COUNTY, COLORADO

REVISION DATE		REVISION DESCRIPTION
00/00/00	△	(DESCRIPTION)

RUNOFF REDUCTION MAP

PROJECT #: 2310-0398
CHECKED BY: BML
DRAWN BY: EDM

DATE: 6/21/2024

SHEET # 1

TOTAL SHEETS 1

HYDRAULIC CALCULATIONS

Swale C Calcs						
Cover Type	Area (sf)	Area (ac)	C5	C100	C5 X A	C100 X A
Forest/Meadow	66001	1.52	0.08	0.35	0.12	0.53
Pavement	17813	0.41	0.90	0.96	0.37	0.39
Roof	11124	0.26	0.73	0.81	0.19	0.21
Total	94938	2.18			0.68	1.13

Weighted C5 = 0.31

Weighted C100 = 0.52

Basin	Area (ac)	C5	Initial/Overland Time (t_i)			Travel Time (t_t)						Final
			Length (ft)	Slope	t_i (min)	Length (ft)	Slope	Land Type	C_v	Velocity (ft/sec)	t_t (min)	t_c (min)
SWALE	2.18	0.31	300	0.189	9.37	407	0.060	SP	7	1.71	3.96	13.32

Intensity Calculations			
Basin	D = t_c	I5	I100
SWALE	13.32	3.70	6.21

$I_5 = -1.50\ln(D) + 7.583$

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

(Figure 6-5 El Paso Co DCM)

Proposed Runoff Calculations (Q = CIA)							
Basin	C5	C100	I5	I100	A	Q5 (cfs)	Q100 (cfs)
SWALE	0.31	0.52	3.70	6.21	2.18	2.50	7.02

P-3 SWALE CALCULATIONS

Q_{100} = 7.02 CFS

Avg Slope = 6%

Side Slopes = 25%

Min depth = 1 ft

n = 0.035 (grassy meadow)

EQ. 7-13 FROM UDCM VOL. 1

$S_X = (S_{X1} \times S_{X2})/(S_{X1} + S_{X2})$

$S_X = (0.25 \times 0.25)/(0.25 + 0.25)$

S_X = 0.125 FT/FT

EQ. 7-2 FROM UDCM VOL. 1

T = TOP WIDTH

$y = TS_X$ = 1.0 FT

T = 1.0/0.125 = 8 FT

EQ. 7-1 FROM UDCM VOL. 1

$Q = (0.56/n) \times S_X^{5/3} \times S_O^{1/2} \times T^{8/3}$

$Q = (0.56/0.035) \times (0.125)^{5/3} \times (0.06)^{1/2} \times (8)^{8/3}$

Q = 31.35 CFS > Q_{100} = 7.02 CFS

PREVIOUS DRAINAGE STUDY EXCERPTS

PRELIMINARY/FINAL

DRAINAGE REPORT

FOR

WALKER RESERVE

Prepared For:
G3 Investments, Inc
3980 Walker Road
Colorado Springs, CO 80908

Prepared By:
Associated Design Professionals, Inc.
3520 Austin Bluffs Parkway, Suite 102
Colorado Springs, CO 80918
719.266-5212

ADP Project No. 180404
July 23, 2019

ADPCIVIL
ENGINEERING FOR THE FUTURE

WALKER RESERVE
PRELIMINARY/FINAL
DRAINAGE REPORT

GENERAL

This project is for the platting of a 40.77-acre site into three (3) individual lots. The project is located east of SH 83 and north of Walker Road. The project is further described as being in the western quarter of Section 11, Township 11 South, Range 66 West of the 6th Principal Meridian in El Paso County, Colorado.

Drainage from the site is tributary to West Cherry Creek. No portion of this subdivision is contained within a FEMA 100-year floodplain as delineated on the Flood Insurance Rate Map (FIRM) No. 08041C0305G and No. 08041C0285G, dated December 7, 2018. The soil on the site is classified as Kettle gravelly loamy sand and Tomah-Crowfoot loamy sand by the *Soil Survey of El Paso County Area, Colorado*, prepared by the Soil Conservation Service. The soils are classified as Hydrologic Soil Group B.

METHOD OF COMPUTATION

The methodology utilized for this report is in accordance with *County Drainage Criteria Manual.* The Rational Method for computation of runoff was used for areas of 20 acres or less.

$Q = cia$

Where
- Q = maximum rate of runoff in cubic feet per second
- c = runoff coefficient representing drainage area characteristics
- i = average rainfall intensity, in inches per hour, for the duration required for the runoff to become established
- a = drainage basin size in acres

The overall drainage for the area including off-site flows was calculated using TR-20 Program for Project Formulated Hydrology, developed by the Soil Conservation Service (NRCS).

Times of concentration were estimated using the SCS procedures described in the DCM, based upon the hydrologic soil type, the natural conditions found in the basins and the runoff curve numbers (CN) chart from Table 5-4 of the DCM.

The 100-year, 24-hour storm precipitation selected from the NOAA isopluvial map in Figure 5-4e from the DCM was 4.6 inches. The ten-year, 24-hour storm precipitation selected from the rainfall depth-duration relationship chart in Figure 5-6 from the DCM was 3.1 inches. The five-year, 24-hour storm precipitation was derived from Figure 5-6 of the *County Drainage Criteria Manual.* The calculated rainfall amount was 2.6 inches. These numbers, along with SCS information, were used as input.

EXISTING AND DEVELOPED DRAINAGE CHARACTERISTICS

The proposed site is located within Black Forest and is comprised mostly of meadows. The 40.77-acre area contains a residence and some outbuildings. Several broad swales traverse the area along with a broad drainageway. The site has been divided into two (2) drainage basins which flow southwesterly. They are tributary to West Cherry Creek, which flows into Douglas County.

The southeastern portion of the site receives runoff from Sub-Basin A. This sub-basin produces runoff of 4.7 cfs for the five-year storm and 33.4 cfs for the 100-year storm. The runoff continues west along Walker Road to the channel.

Sub-Basin B is tributary to the southwestern part of the site. The sub-basin produces runoff amounts of 1.9 cfs for the five-year storm and 13.9 cfs for the 100-year storm. The storm runoff flows east through a broad swale into the channel. Storm runoff from the two basins combine at DP1 and produce total runoff of 6.0 cfs and 43.2 cfs for the five- and 100-year storms, respectively.

Sub-Basin C drains the remainder of the site and produces runoff amounts of 4.2 cfs for the five-year storm and 30.3 cfs for the 100-year storm. The combined runoff of the three sub-basins at DP2 is 9.7 cfs and 69.2 cfs for the five- and 100-year storms, respectively.

The drainageway which flows through the site drains approximately 850 acres of mostly rangeland with a few homes and ranches scattered through the basin. The estimated flows through the proposed site are 137 cfs for the five-year storm and 600 cfs for the 100-year storm. Based on these flows the estimated flow depth within the drainageway is 3.2 ft. with a 100-year velocity of 3.7 fps.

The estimated existing and developed on-site runoff produced by these basins is shown in Table 1 below.

Table 1

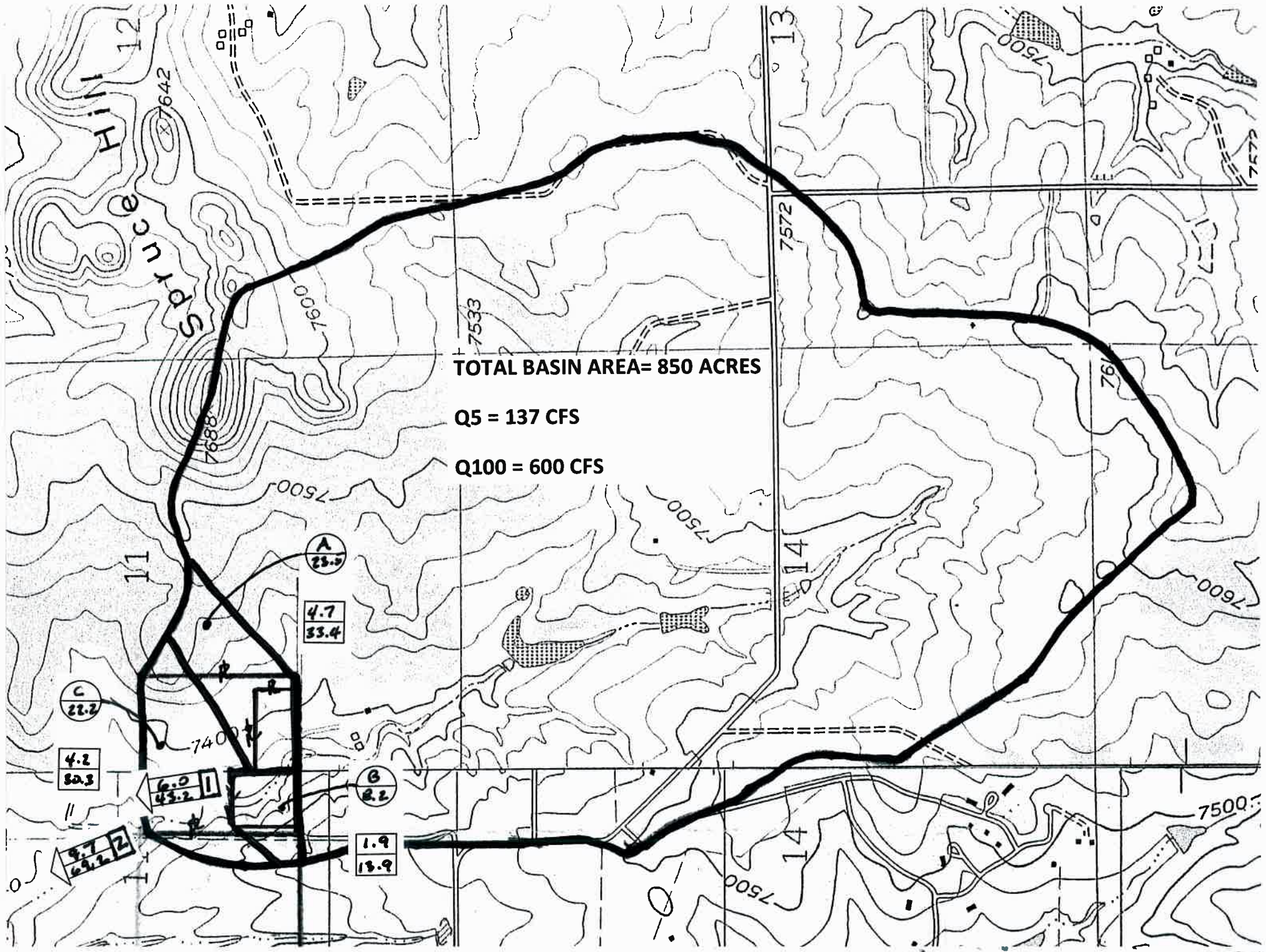
Sub-Basin	5-Year Storm Runoff (cfs)	100-Year Storm Runoff (cfs)
A	4.7	33.4
B	1.9	13.9
C	4.2	30.3
DP1(A+B)	6.0	43.2
DP2(DP1+C)	9.7	69.2
OVERALL BASIN	137	600

BASIN FEE DETERMINATION

The unplatted site consists of 40.77 acres in northern El Paso County. The project is tributary to West Cherry Creek, which is an unstudied basin that flows into Douglas County. There are no drainage basin fees associated with the project.

CONCLUSION

The platting of the 40.77 acres into three (3) individual lots has no impact on the downstream facilities. Only a minor increase in the imperviousness of the area – less than one percent (1%) – is expected. Consequently, no drainage improvements are required at this time.



LEGEND:

- A1A / XX — BASIN DESIGNATION; BASIN AREA, ACRES
- XX / XX — 5 YEAR STORM, CFS; 100 YEAR STORM, CFS
- DESIGN POINT — XX | XX.X / XX.X — 5 YEAR ACCUMULATED FLOW, CFS; 100 YEAR ACCUMULATED FLOW, CFS
- SUB-BASIN BOUNDARY
- DIRECTION OF DRAINAGE FLOW

SCALE: 1" = 1000'

DESIGNED BY MAB | PROJECT ENGINEER MAB | PROJECT MANAGER MAB
DATE 4/19/18 | JOB NO. 180404 | CAD FILE NO. | SCALE: HORZ. 1"=1000' VERT. N/A
SITE | DRAWN BY HJG

PREPARED BY:

ADPCIVIL ENGINEERING FOR THE FUTURE
3520 Austin Bluffs Parkway
Suite 102
Colorado Springs, CO 80918
(719) 266-3212
fax: (719) 266-5341

NO.	DATE	REVISION	BY

3980 WALKER ROAD

COLORADO SPRINGS, COLORADO
DRAINAGE PLAN

SHEET 1 of 1

3980 WALKER ROAD

PROJ. #180404

DRAINAGE CALCULATION SHEET

file:3980 walker dr

04/27/18

							Initial Tc			Travel Time								length	vel.		
AREA DESIG.	AREA (acre)	C5 (5 yr)	C100 (100 yr)	C5 X A	C100 X A	L (ft)	Slope (%)	ti (min)	L (ft)	Slope (%)	V (fps)	Tt (min)	TC (min)	I5 (in/hr)	I100 (in/hr)	Q5 (cfs)	Q100 (cfs)	L (feet)	V (fps)	^t (min)	AREA DESIG.
EXISTING & DEVELOPED CONDITIONS																					
A	23.50	0.09	0.35	2.03	8.33	300	6.00	18.17	1700	6.00	2.30	12.32	30.49	2.30	4.01	4.67	33.42	500	3.70	2.25	A
B	8.20	0.09	0.35	0.71	2.91	300	6.00	18.17	600	6.00	2.30	4.35	22.52	2.73	4.77	1.94	13.88				B
DP1	31.70			2.74	11.24								32.74	2.20	3.84	6.03	43.20	750	3.70	3.38	DP1
C	22.20	0.09	0.35	1.92	7.87	300	6.00	18.17	2000	6.00	2.30	14.49	32.67	2.20	3.85	4.23	30.30				C
DP2	53.90			4.66	19.11								36.12	2.07	3.62	9.66	69.17				DP2

TR20 CALCULATIONS

A = 850 Ac = 1.30 SM

Elev Diff = 310 Ft

L = 9700 Ft

Soil Type = B

CN = 61

Ti = 10 Min

Tt =34.2 Min

TC = 44.2 Min + 0.737 Hr

Q5 = 137 CFS

Q100 = 600 CFS

CHANNEL CALCULATIONS

b = 40Ft

z = 3:1

n = 0.08

s = 1.1%

Q100 = 600 CFS

d =3.2 Ft

v = 3.7 FPS

1

```
 ******************80-80 LIST OF INPUT DATA FOR TR-20 HYDROLOGY******************

 JOB TR-20                                                SUMMARY   NOPLOTS
 TITLE       3980 WALKER RD - TR20 RUN  24 HR.5&100YR. STORM
 TITLE       DEVELOPED CONDITIONS  INPUT : walker
  5 RAINFL 7                  0.5
  8               0.0000      0.0040      0.0080     0.0100       0.0140
  8               0.0190      0.0220      0.0260     0.0300       0.0450
  8               0.0600      0.1000      0.7100     0.7500       0.7750
  8               0.8000      0.8200      0.8300     0.8400       0.8500
  8               0.8600      0.8700      0.8750     0.8850       0.8900
  8               0.9000      0.9050      0.9100     0.9200       0.9250
  8               0.9300      0.9350      0.9400     0.9450       0.9500
  8               0.9550      0.9600      0.9650     0.9700       0.9730
  8               0.9750      0.9800      0.9830     0.9870       0.9900
  8               0.9930      0.9960      0.9999     1.0000       1.0000
  9 ENDTBL
  2 XSECTN   005              1.0
  8                       7330.00         0.0        0.00
  8                       7331.14       100.0       49.65
  8                       7332.91       500.0      141.99
  8                       7334.30      1000.0      227.61
  8                       7336.28      2000.0      369.35
  9 ENDTBL
  2 XSECTN   010              1.0
  8                       7340.00         0.0        0.00
  8                       7341.14       100.0       49.65
  8                       7342.91       500.0      141.99
  8                       7344.30      1000.0      227.61
  8                       7346.28      2000.0      369.35
  9 ENDTBL
  6 RUNOFF 1 010       2    1.3000      61.0         0.737   1 1
  6 REACH  3 005   2   1    100.0                             1 1
    ENDATA
  7 INCREM 6                0.1
  7 COMPUT 7 010   005        0.0          3.00        1.0   7 2  01  01
    ENDCMP 1
  7 COMPUT 7 010   005        0.0          4.60        1.0   7 2  01  02
    ENDCMP 1
    ENDJOB 2
0*******************************END OF 80-80 LIST*********************************


 EXECUTIVE CONTROL OPERATION INCREM
                             RECORD ID
+                                      MAIN TIME INCREMENT =    .10 HOURS


 EXECUTIVE CONTROL OPERATION COMPUT
                             RECORD ID
+                                      FROM XSECTION  10
+                                                        TO XSECTION   5
         STARTING TIME =    .00    RAIN DEPTH =  3.00    RAIN DURATION=  1.00    RAIN
TABLE NO.= 7    ANT. MOIST. COND= 2
         ALTERNATE NO.= 1          STORM NO.= 1    MAIN TIME INCREMENT =    .10 HOURS


 OPERATION RUNOFF   CROSS SECTION  10
```

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
6.41	137.10	(RUNOFF)
10.48	15.51	(RUNOFF)
11.71	13.68	(RUNOFF)
12.71	13.87	(RUNOFF)
14.23	13.97	(RUNOFF)
18.95	9.10	(RUNOFF)
20.77	7.58	(RUNOFF)
21.70	6.96	(RUNOFF)
23.59	6.59	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .10 HOURS
DRAINAGE AREA = 1.30 SQ.MI.

5.00	DISCHG	.00	.00	.00	.00	.00	.00	.00
.00	.00	.35	5.34					
6.00	DISCHG	23.62	57.37	99.22	128.30	137.04	130.86	114.72
94.63	78.59	66.98						
7.00	DISCHG	58.03	50.88	45.69	41.99	39.49	37.81	36.58
35.51	34.40	33.26						
8.00	DISCHG	32.11	30.85	29.27	27.24	24.95	22.68	20.61
18.94	17.72	16.88						
9.00	DISCHG	16.30	15.90	15.62	15.44	15.33	15.26	15.23
15.22	15.23	15.26						
10.00	DISCHG	15.29	15.33	15.37	15.42	15.47	15.51	15.43
15.08	14.33	13.26						
11.00	DISCHG	12.11	11.17	10.68	10.87	11.59	12.51	13.29
13.68	13.42	12.67						
12.00	DISCHG	11.76	10.99	10.64	10.93	11.71	12.67	13.48
13.87	13.64	12.93						
13.00	DISCHG	12.01	11.10	10.33	9.77	9.38	9.13	9.10
9.42	10.17	11.26						
14.00	DISCHG	12.45	13.44	13.94	13.81	13.16	12.27	11.36
10.59	10.02	9.63						
15.00	DISCHG	9.36	9.16	9.03	8.93	8.87	8.83	8.80
8.78	8.77	8.77						
16.00	DISCHG	8.77	8.77	8.78	8.79	8.80	8.81	8.82
8.83	8.85	8.86						
17.00	DISCHG	8.87	8.88	8.90	8.91	8.92	8.93	8.95
8.96	8.97	8.98						
18.00	DISCHG	8.99	9.01	9.02	9.03	9.04	9.05	9.07
9.08	9.09	9.10						
19.00	DISCHG	9.10	9.04	8.86	8.50	8.01	7.47	6.94
6.43	5.95	5.49						
20.00	DISCHG	5.09	4.83	4.85	5.19	5.80	6.51	7.13
7.51	7.57	7.37						
21.00	DISCHG	7.04	6.73	6.52	6.48	6.58	6.75	6.90
6.96	6.89	6.71						
22.00	DISCHG	6.50	6.28	6.10	5.97	5.88	5.82	5.77
5.74	5.72	5.71						
23.00	DISCHG	5.70	5.73	5.81	5.98	6.23	6.47	6.58
6.41	5.82	4.92						
24.00	DISCHG	3.91	2.96	2.16	1.57	1.14	.83	.60
.43	.30	.22						
25.00	DISCHG	.15	.11	.08	.05	.04	.02	.01
.01	.00							

*** WARNING REACH 5 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***
1

OPERATION REACH CROSS SECTION 5

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
6.41	137.10	7331.30
10.48	15.51	7330.18
11.71	13.68	7330.16
12.71	13.87	7330.16
14.23	13.97	7330.16
18.95	9.10	7330.10
20.77	7.58	7330.09
21.70	6.96	7330.08
23.59	6.59	7330.08

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .10 HOURS
DRAINAGE AREA = 1.30 SQ.MI.

5.00	DISCHG	.00	.00	.00	.00	.00	.00	.00	.00
6.00	DISCHG	23.62	57.37	99.22	128.30	137.04	130.86	114.72	94.63
7.00	DISCHG	78.59	66.98	58.03	50.88	45.69	41.99	39.49	37.81
8.00	DISCHG	36.58	35.51	34.40	33.26	32.11	30.85	29.27	27.24
9.00	DISCHG	24.95	22.68	20.61	18.94	17.72	16.88	16.30	15.90
10.00	DISCHG	15.62	15.44	15.33	15.26	15.23	15.22	15.23	15.26
11.00	DISCHG	15.29	15.33	15.37	15.42	15.47	15.51	15.43	15.08
12.00	DISCHG	14.33	13.26	12.11	11.17	10.68	10.87	11.59	12.51
13.00	DISCHG	13.29	13.68	13.42	12.67	11.76	10.99	10.64	10.93
14.00	DISCHG	11.71	12.67	13.48	13.87	13.64	12.93	12.01	11.10
15.00	DISCHG	10.33	9.77	9.38	9.13	9.10	9.42	10.17	11.26
16.00	DISCHG	12.45	13.44	13.94	13.81	13.16	12.27	11.36	10.59
17.00	DISCHG	10.02	9.63	9.36	9.16	9.03	8.93	8.87	8.83
18.00	DISCHG	8.80	8.78	8.77	8.77	8.77	8.78	8.79	8.80
19.00	DISCHG	8.81	8.82	8.83	8.85	8.86	8.87	8.88	8.90
20.00	DISCHG	8.91	8.92	8.93	8.95	8.96	8.97	8.98	8.99
21.00	DISCHG	9.01	9.02	9.03	9.04	9.05	9.07	9.08	9.09
22.00	DISCHG	9.10	9.04	8.86	8.50	8.01	7.47	6.94	6.43
23.00	DISCHG	5.95	5.49	5.09	4.83	4.85	5.19	5.80	6.51
24.00	DISCHG	7.13	7.51	7.57	7.37	7.04	6.73	6.52	6.48

```
  .60       .43       .30       .22
   25.00    DISCHG          .15       .11       .08       .05       .04       .02
  .01       .01       .00


 EXECUTIVE CONTROL OPERATION ENDCMP
                             RECORD ID
+                                    COMPUTATIONS COMPLETED FOR PASS   1



 EXECUTIVE CONTROL OPERATION COMPUT
                             RECORD ID
+                                    FROM XSECTION  10
+                                                      TO XSECTION   5
         STARTING TIME =   .00    RAIN DEPTH =  4.60    RAIN DURATION=  1.00    RAIN
TABLE NO.= 7    ANT. MOIST. COND= 2
         ALTERNATE NO.= 1         STORM NO.= 2    MAIN TIME INCREMENT =   .10 HOURS
1



 TR20 XEQ 04-27-18  07:20          3980 WALKER RD - TR20 RUN  24 HR.5&100YR. STORM
                            JOB  1   PASS   2
      REV PC 09/83(.2)              DEVELOPED CONDITIONS  INPUT : walker
                                    PAGE   2



 OPERATION RUNOFF   CROSS SECTION  10

            PEAK TIME(HRS)              PEAK DISCHARGE(CFS)           PEAK
ELEVATION(FEET)
                6.35                         598.18                        (RUNOFF)
               10.46                          38.72                        (RUNOFF)
               11.71                          33.64                        (RUNOFF)
               12.71                          33.77                        (RUNOFF)
               14.23                          33.56                        (RUNOFF)
               18.91                          21.26                        (RUNOFF)
               20.77                          17.57                        (RUNOFF)
               21.70                          16.08                        (RUNOFF)
               23.59                          15.12                        (RUNOFF)

 TIME(HRS)          FIRST HYDROGRAPH POINT =   .00 HOURS      TIME INCREMENT =  .10
HOURS      DRAINAGE AREA =   1.30 SQ.MI.
    5.00    DISCHG          .00       .00       .00       .00       .00       .00
  .00       1.82     17.60     69.84
    6.00    DISCHG       185.22    346.21    503.09    587.86    587.11    527.54
438.87    348.26    279.46    229.84
    7.00    DISCHG       192.24    163.01    141.74    126.43    115.75    108.29
102.72     98.13     93.86     89.77
    8.00    DISCHG        85.81     81.66     76.81     71.07     64.86     58.79
53.30     48.84     45.58     43.32
    9.00    DISCHG        41.74     40.61     39.83     39.29     38.93     38.69
38.54     38.46     38.42     38.42
   10.00    DISCHG        38.44     38.48     38.53     38.59     38.66     38.70
38.44     37.52     35.61     32.93
   11.00    DISCHG        30.05     27.68     26.44     26.87     28.60     30.83
32.72     33.64     32.97     31.11
   12.00    DISCHG        28.84     26.94     26.06     26.73     28.60     30.90
32.84     33.76     33.17     31.42
```

13.00	DISCHG	29.17	26.94	25.05	23.66	22.70	22.08	
21.99	22.73	24.53	27.15					
14.00	DISCHG	29.98	32.32	33.50	33.15	31.57	29.41	
27.23	25.36	23.99	23.03					
15.00	DISCHG	22.36	21.87	21.53	21.29	21.13	21.01	
20.94	20.89	20.85	20.83					
16.00	DISCHG	20.82	20.81	20.81	20.82	20.84	20.85	
20.87	20.89	20.90	20.92					
17.00	DISCHG	20.94	20.96	20.97	20.99	21.01	21.02	
21.04	21.06	21.08	21.09					
18.00	DISCHG	21.11	21.13	21.14	21.16	21.18	21.19	
21.21	21.23	21.24	21.26					
19.00	DISCHG	21.25	21.10	20.66	19.82	18.67	17.40	
16.15	14.97	13.83	12.76					
20.00	DISCHG	11.82	11.24	11.26	12.06	13.47	15.10	
16.53	17.41	17.55	17.07					
21.00	DISCHG	16.31	15.57	15.09	14.99	15.22	15.60	
15.93	16.08	15.91	15.50					
22.00	DISCHG	14.99	14.49	14.07	13.77	13.56	13.40	
13.30	13.22	13.17	13.14					
23.00	DISCHG	13.12	13.17	13.36	13.76	14.31	14.87	
15.12	14.71	13.36	11.28					
24.00	DISCHG	8.96	6.78	4.96	3.60	2.62	1.90	
1.37	.98	.69	.49					
25.00	DISCHG	.35	.25	.17	.12	.08	.05	
.03	.02	.01	.00					

*** WARNING REACH 5 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

OPERATION REACH CROSS SECTION 5
1

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
6.35	598.18	7333.18
10.46	38.72	7330.44
11.71	33.64	7330.38
12.71	33.77	7330.38
14.23	33.56	7330.38
18.91	21.26	7330.24
20.77	17.57	7330.20
21.70	16.08	7330.18
23.59	15.12	7330.17

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .10 HOURS DRAINAGE AREA = 1.30 SQ.MI.

5.00	DISCHG	.00	.00	.00	.00	.00	.00	
.00	1.82	17.60	69.84					
6.00	DISCHG	185.22	346.21	503.09	587.86	587.11	527.54	
438.87	348.26	279.46	229.84					
7.00	DISCHG	192.24	163.01	141.74	126.43	115.75	108.29	
102.72	98.13	93.86	89.77					

8.00	DISCHG	85.81	81.66	76.81	71.07	64.86	58.79
53.30	48.84	45.58	43.32				
9.00	DISCHG	41.74	40.61	39.83	39.29	38.93	38.69
38.54	38.46	38.42	38.42				
10.00	DISCHG	38.44	38.48	38.53	38.59	38.66	38.70
38.44	37.52	35.61	32.93				
11.00	DISCHG	30.05	27.68	26.44	26.87	28.60	30.83
32.72	33.64	32.97	31.11				
12.00	DISCHG	28.84	26.94	26.06	26.73	28.60	30.90
32.84	33.76	33.17	31.42				
13.00	DISCHG	29.17	26.94	25.05	23.66	22.70	22.08
21.99	22.73	24.53	27.15				
14.00	DISCHG	29.98	32.32	33.50	33.15	31.57	29.41
27.23	25.36	23.99	23.03				
15.00	DISCHG	22.36	21.87	21.53	21.29	21.13	21.01
20.94	20.89	20.85	20.83				
16.00	DISCHG	20.82	20.81	20.81	20.82	20.84	20.85
20.87	20.89	20.90	20.92				
17.00	DISCHG	20.94	20.96	20.97	20.99	21.01	21.02
21.04	21.06	21.08	21.09				
18.00	DISCHG	21.11	21.13	21.14	21.16	21.18	21.19
21.21	21.23	21.24	21.26				
19.00	DISCHG	21.25	21.10	20.66	19.82	18.67	17.40
16.15	14.97	13.83	12.76				
20.00	DISCHG	11.82	11.24	11.26	12.06	13.47	15.10
16.53	17.41	17.55	17.07				
21.00	DISCHG	16.31	15.57	15.09	14.99	15.22	15.60
15.93	16.08	15.91	15.50				
22.00	DISCHG	14.99	14.49	14.07	13.77	13.56	13.40
13.30	13.22	13.17	13.14				
23.00	DISCHG	13.12	13.17	13.36	13.76	14.31	14.87
15.12	14.71	13.36	11.28				
24.00	DISCHG	8.96	6.78	4.96	3.60	2.62	1.90
1.37	.98	.69	.49				
25.00	DISCHG	.35	.25	.17	.12	.08	.05
.03	.02	.01	.00				

EXECUTIVE CONTROL OPERATION ENDCMP
RECORD ID
+ COMPUTATIONS COMPLETED FOR PASS 2

EXECUTIVE CONTROL OPERATION ENDJOB
RECORD ID
1

TR20 XEQ 04-27-18 07:20 3980 WALKER RD - TR20 RUN 24 HR.5&100YR. STORM
JOB 1 SUMMARY
REV PC 09/83(.2) DEVELOPED CONDITIONS INPUT : walker
PAGE 4

SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST

POINT.)

SECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	PEAK DISCHARGE DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN (HR)	AMOUNT (IN)	DURATION (HR)	RUNOFF AMOUNT (IN)	ELEVATION (FT)	TIME (HR)	RATE (CFS)	RATE (CSM)
ALTERNATE 1 STORM 1													
XSECTION 10	RUNOFF	1.30	7	2	.10	.0	3.00	24.00	.36	---	6.41	137.10	105.5
XSECTION 5	REACH	1.30	7	2	.10	.0	3.00	24.00	.36	7331.30	6.41	137.10	105.5
ALTERNATE 1 STORM 2													
XSECTION 10	RUNOFF	1.30	7	2	.10	.0	4.60	24.00	1.13	---	6.35	598.18	460.1
XSECTION 5	REACH	1.30	7	2	.10	.0	4.60	24.00	1.13	7333.18	6.35	598.18	460.1

1

SUMMARY TABLE 2 - SELECTED MODIFIED ATT-KIN REACH ROUTINGS IN ORDER OF STANDARD EXECUTIVE CONTROL INSTRUCTIONS
(A STAR(*) AFTER VOLUME ABOVE BASE(IN) INDICATES A HYDROGRAPH TRUNCATED AT A VALUE EXCEEDING BASE + 10% OF PEAK
A QUESTION MARK(?) AFTER COEFF.(C) INDICATES PARAMETERS OUTSIDE ACCEPTABLE LIMITS, SEE PREVIOUS WARNINGS)

ROUTING PARAMETERS						HYDROGRAPH INFORMATION PEAK OUTFLOW+			VOLUME	MAIN	ITER-	Q AND A						
XSEC ID	REACH LENGTH (FT)	INFLOW PEAK (CFS)	TIME (HR)	OUTFLOW PEAK (CFS)	TIME (HR)	INTERV.AREA PEAK (CFS)	TIME (HR)	BASE-FLOW (CFS)	ABOVE BASE (IN)	TIME INCR (HR)	ATION #	EQUATION COEFF (X)	S/Q POWER (M)	ATT- FACTOR (K*)	TRAVEL TIME O/I (Q*)	(K) (SEC)	COEFF (C)	AGE (HR)	MATIC (HR)
ALTERNATE 1 STORM 1																		

```
.253
+  5    100      137   6.4      137   6.4                    0       .36    .10    0
    1.53   .000  1.000      29 1.00?   .00   .00
+                                          ---   ---

    ALTERNATE    1   STORM    2
+   ____________________________

.260
+  5    100      588   6.3      588   6.3                    0      1.13    .10    0
    1.52   .000  1.000      18 1.00?   .00   .00
+                                          ---   ---
1
```

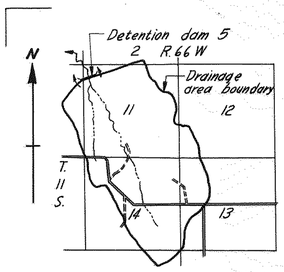
TR20 XEQ 04-27-18 07:20 — 3980 WALKER RD - TR20 RUN 24 HR.5&100YR. STORM
REV PC 09/83(.2) — JOB 1 SUMMARY — DEVELOPED CONDITIONS — INPUT : walker
PAGE 6

SUMMARY TABLE 3 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL STORMS AND ALTERNATES

XSECTION/ STRUCTURE ID	DRAINAGE AREA (SQ MI)	STORM NUMBERS..... 1	2
0 XSECTION 5	1.30		
+ ALTERNATE 1		137.10	598.18
0 XSECTION 10	1.30		
+ ALTERNATE 1		137.10	598.18

1END OF 1 JOBS IN THIS RUN

EXCERPT FROM WEST CHERRY CREEK DETENTION RESERVIOR NO. 5 CONSTRUCTION DOCUMENTS(APPROVED 1959)



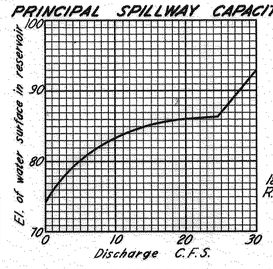
LOCATION MAP
Scale: 1" = 4000'

Drainage area	2.00 Sq.mi.
Maximum expected run-off	1680 C.F.S.
Approximate elevation	7310 Ft.
Surface area of reservoir at crest of spillway	9.52 Acres
Capacity of reservoir at crest of spillway	55.38 Ac.ft.
"Q" considering spillway storage	1355 C.F.S.

STORAGE CAPACITY TABLE

	Water Surface Elev.	Surface area in acres	Depth in feet	Capacity in acre feet
	72.5	0	0	0
Drawdown	74.2	.13	1.7	0.11
	76.0	.26	3.5	0.96
	80.0	1.30	7.5	3.58
Orifice	82.3	2.99	9.8	8.57
	84.0	4.25	11.5	19.67
Crest of Weir	85.3	5.33	12.8	20.90
	88.0	7.56	15.5	38.30
Crest of emerg. spwy.	90.0	9.52	17.5	55.38
	92.0	11.48	19.5	76.38
	94.0	13.21	21.5	101.07

PRINCIPAL SPILLWAY CAPACITY



EMERGENCY SPILLWAY CAPACITY

Water surface EL. in reservoir	Hp	Quantity C.F.S.
90.0	0	0
90.5	0.5	70
91.0	1.0	215
91.5	1.5	465
92.0	2.0	825
92.5	2.5	1270
92.55	2.55	1325
93.0	3.0	1830

Spillway capacity computed on the basis of critical flow at the down stream end of the level section. Backwater curves were computed to give the depth of water in the reservoir above the spillway crest. (Hp)

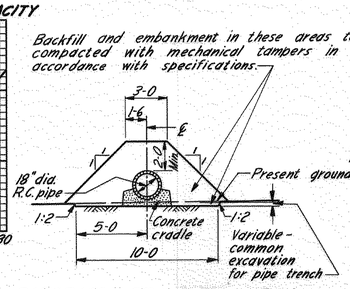
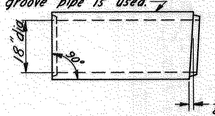
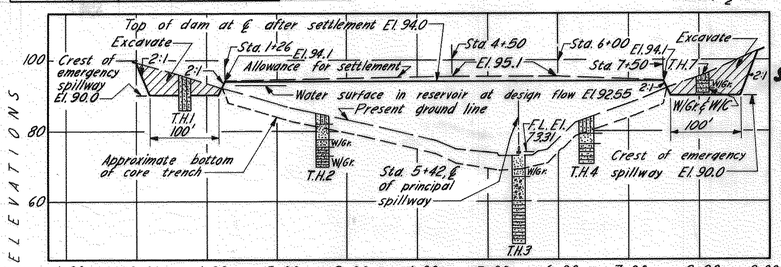


DIAGRAM OF PIPE TRENCH EXCAVATION, BACKFILL AND EMBANKMENT
Scale: 1" = 5'

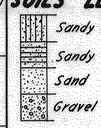


DETAIL OF DROPPED END FOR TONGUE AND GROOVE PIPE
Scale: 1/2" = 1'-0"



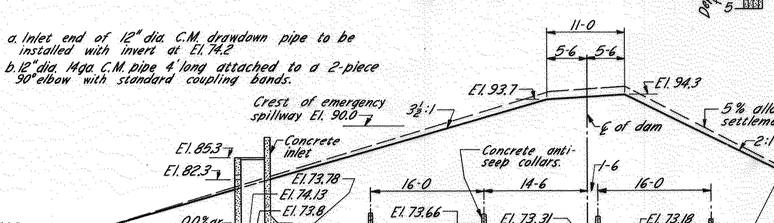
SECTION A-A
PROFILE ALONG ℄ OF DAM
Scale: Horiz. 1" = 100', Vert. 1" = 20'

SOILS LEGEND



Modifiers
W = With
Gr = Gravel
C = Clay

Borrow Area Test Hole

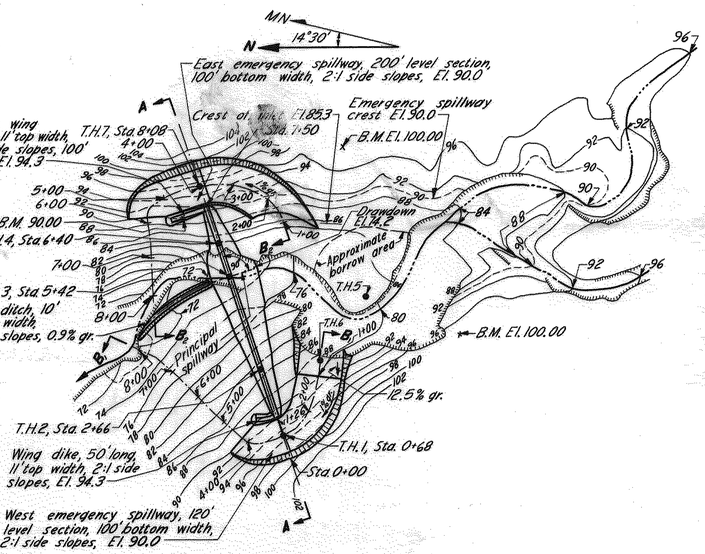


CROSS SECTION OF DAM ON ℄ OF PRINCIPAL SPILLWAY (STA. 5+42)
(Trash rack not shown)
Scale: 1" = 10'

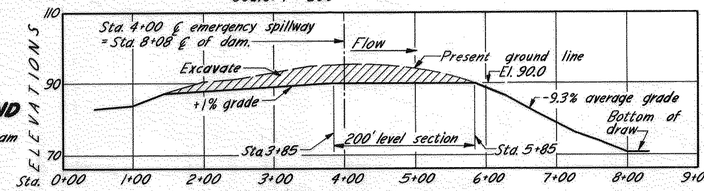
Approved: [signature] State Conservation Engineer
U.S. Department of Agriculture, Soil Conservation Service, Lincoln, Nebraska

Approved: [signature] Head E.C.W.P. Unit, S.C.S.

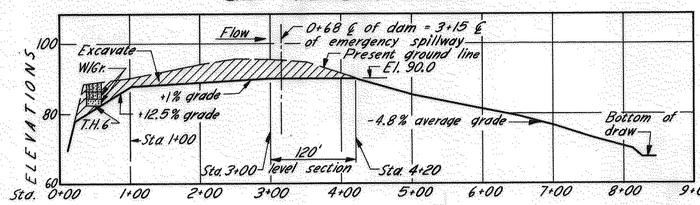
Date: March 4, 1959



TOPOGRAPHIC MAP OF RESERVOIR AREA AND DAM SITE
Scale: 1" = 200'



SECTION B_2 - B_2
EAST EMERGENCY SPILLWAY



SECTION B_1 - B_1
WEST EMERGENCY SPILLWAY
PROFILE ALONG ℄ OF EMERGENCY SPILLWAYS
Scale: Horiz. 1" = 100' Vert. 1" = 20'

TABLE OF PIPE GRADES

Inlet to E.J. #2	0.5%
E.J. #2 to E.J. #3	2.0%
E.J. #3 to E.J. #4	3.5%
E.J. #4 to Joint block	5.0%
Joint block to outlet	1.1%
E.J. = Expansion joint	

TABLE OF QUANTITIES

Item No.	Item	Unit	Quan.
1.	Embankment (class II) in dam and wing dikes	Cu.Yd.	16,860
2.	Embankment (class II) in core trench	Cu.Yd.	1,370
3.	Excavation:		
	Emerg. spwy. and outlet ditch	Cu.Yd.	17,960
	Pipe Trench	Cu.Yd.	18
	Core trench	Cu.Yd.	1,300
	Structural	Cu.Yd.	8
4.	Pipe trench backfill	Cu.Yd.	12
5.	Concrete (class B)	Cu.Yd.	24
6.	Reinforcing steel	Lbs.	1,694
7.	Trash rack for inlet (per detail)	Each	1
8.	18" dia. 2000 D (class IV) R.C. Pipe with rubber gaskets	L.ft.	84
9.	18" dia. 14 ga. C.M. Pipe, asbestos bonded and asphalt coated	L.ft.	22
10.	12" dia. 14 ga. C.M. Pipe (galv.)	L.ft.	30
11.	12" dia. 14 ga. standard galv. connecting band	Each	3
12.	12" dia. 14 ga. standard 90° galv. elbow	Each	1

ENGINEER'S AFFIDAVIT

STATE OF COLORADO } S. S.
COUNTY OF EL PASO }

I hereby certify that these plans for the construction of the West Cherry Creek Watershed Protection Project Dam No. 5 were prepared under my direct supervision for the owners thereof.

[signature] Registered Engineer

Subscribed and sworn to before me this 12 day of May, 1959.

[signature] Notary Public

My commission expires on the 4 day of April, 1963.

OWNER'S STATEMENT

These plans for the construction of the West Cherry Creek Watershed Protection Project Dam No.5 are hereby approved and accepted.

Cherry Creek Soil Conservation District
El Paso County, Colorado
Holder of Easement

By: [signature] President, Board of Supervisors

By: [signature] Chairman, Board of County Commissioners

PLANS FOR THE DETENTION DAM 5
WEST CHERRY CREEK WATERSHED
EL PASO COUNTY, COLORADO
IRRIGATION DIVISION NO. 1 WATER DISTRICT NO. 8
COURSES REFERRED TO-TRUE MERIDIAN
Scale: As shown

SHEET 1 OF 5 SHEETS

Approved on the 22nd day of MAY 1959

[signature] State Engineer

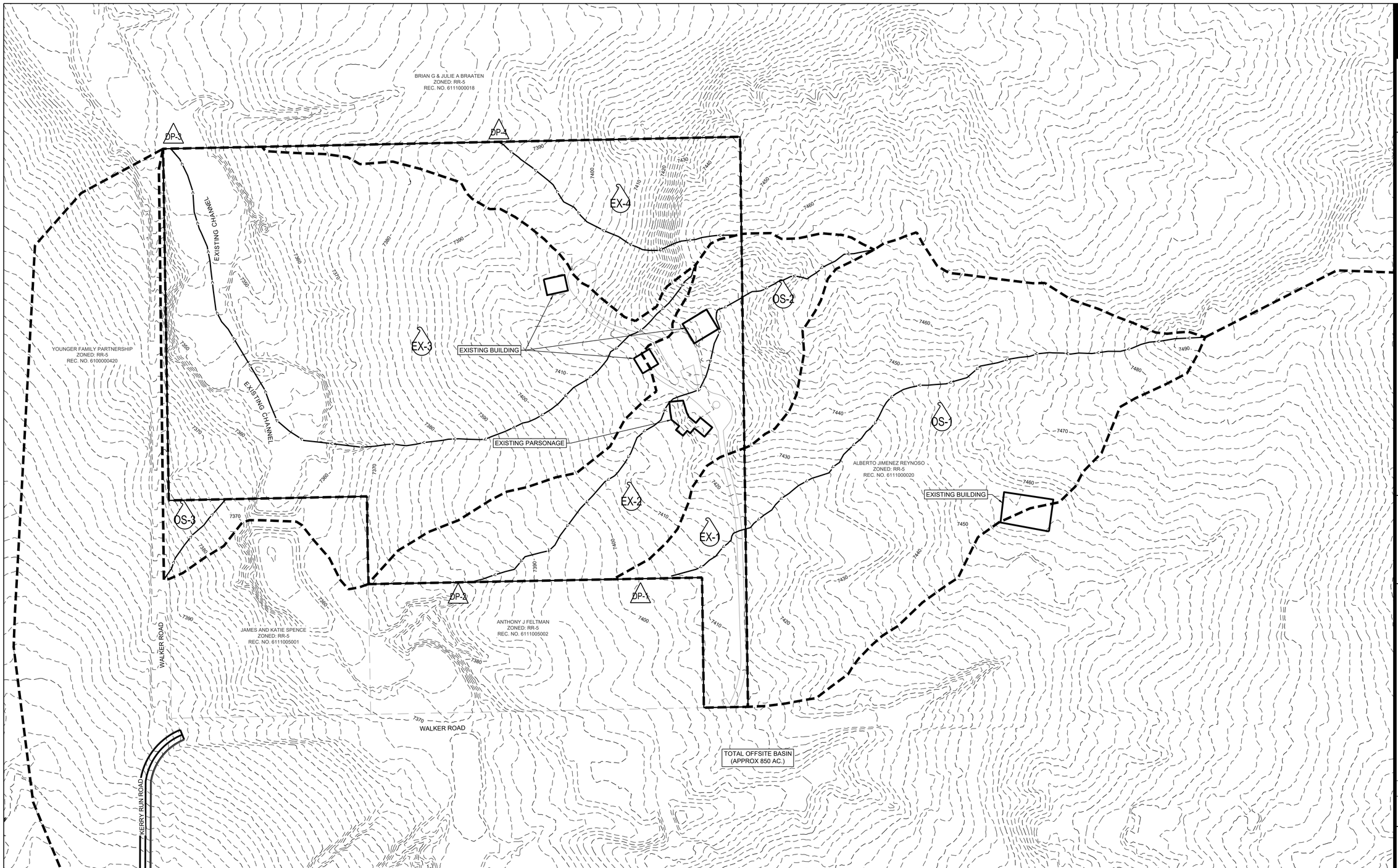
By [signature] Deputy

C-921

5,E-15,63

059451

DRAINAGE MAPS



PRE-DEVELOPMENT DRAINAGE MAP TABLE

DRAINAGE AREA ID	AREA (ACRE)	C5	C100	TIME OF CONCENTRATION (TC)	Q5 (CFS)	Q100 (CFS)
EX-1	1.67	0.16	0.41	13.00	1.02	4.32
EX-2	5.24	0.15	0.40	22.21	2.36	10.42
EX-3	17.29	0.09	0.35	30.16	3.69	25.46
EX-4	4.32	0.09	0.36	15.43	1.37	9.03
OS-1	13.34	0.09	0.35	25.51	3.12	21.60
OS-2	1.67	0.08	0.35	16.23	0.45	3.33
OS-3	1.43	0.17	0.42	11.94	0.93	3.85

PRE-DEVELOPMENT DESIGN POINT TABLE

DRAINAGE AREA ID	CONTRIBUTING BASINS	AREA (ACRE)	C5	C100	TIME OF CONCENTRATION (TC)	Q5 (CFS)	Q100 (CFS)
DP-1	EX-1, OS-1	15.01	0.09	0.36	28.34	3.63	23.30
DP-2	EX-2, OS-2	6.91	0.14	0.39	25.47	2.56	12.36
DP-3	EX-3, OS-3	18.72	0.09	0.36	30.16	4.28	27.92
DP-4	EX-4	4.32	0.09	0.36	15.43	1.37	9.03

LEGEND

- 6960 — EXISTING MAJOR CONTOUR (10')
- 6962 — EXISTING MINOR CONTOUR (2')
- FLOW PATH
- DRAINAGE BOUNDARY
- XX — DRAINAGE AREA
- XX — DESIGN POINT

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3980 WALKER ROAD

DRAINAGE STUDY

EL PASO COUNTY, COLORADO

REVISION DATE		REVISION DESCRIPTION
00/00/00		(DESCRIPTION)

EXISTING DRAINAGE MAP

NORTH

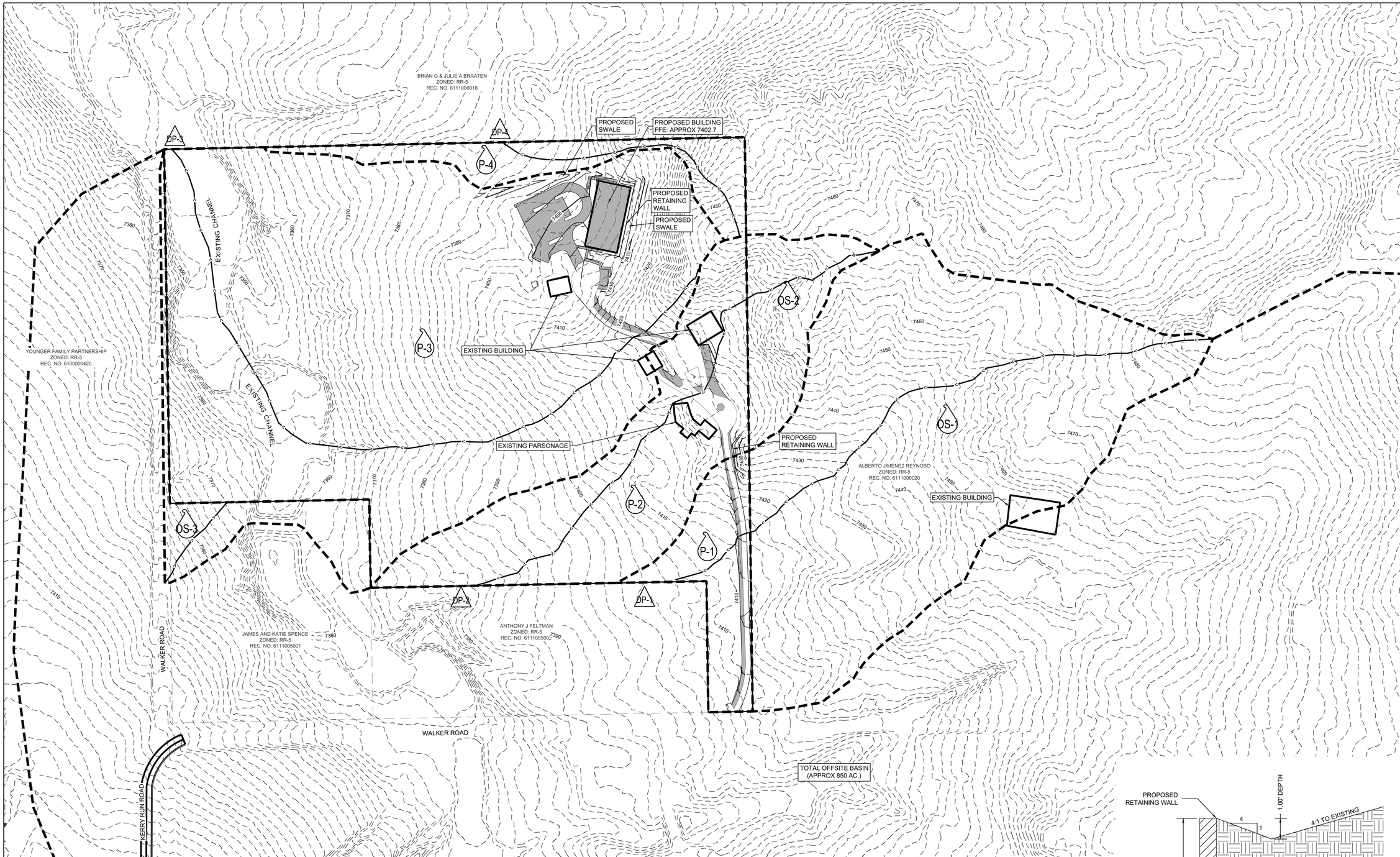
100' 50' 0' 100'
SCALE: 1" = 100'

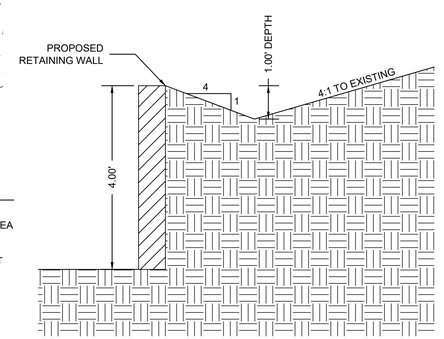
PROJECT #: 2310-0398
CHECKED BY: BML
DRAWN BY: EDM

DATE: 6/17/2024

SHEET # 1

TOTAL SHEETS 1





PROPOSED SWALE DETAIL
NOT TO SCALE

POST-DEVELOPMENT DRAINAGE MAP TABLE

DRAINAGE AREA ID	AREA (ACRE)	C5	C100	TIME OF CONCENTRATION (TC)	Q5 (CFS)	Q100 (CFS)
P-1	1.67	0.21	0.45	12.30	1.36	4.81
P-2	5.24	0.17	0.41	21.97	2.60	10.76
P-3	20.03	0.12	0.38	29.74	5.81	31.58
P-4	1.58	0.08	0.35	16.63	0.43	3.13
OS-1	13.34	0.09	0.35	25.51	3.12	21.60
OS-2	1.67	0.08	0.35	16.23	0.45	3.33
OS-3	1.43	0.17	0.42	11.94	0.93	3.85

POST-DEVELOPMENT DESIGN POINT TABLE

DRAINAGE AREA ID	CONTRIBUTING BASINS	AREA (ACRE)	C5	C100	TIME OF CONCENTRATION (TC)	Q5 (CFS)	Q100 (CFS)
DP-1	P-1, OS-1	15.01	0.10	0.36	28.34	3.86	23.58
DP-2	P-2, OS-2	6.91	0.15	0.40	25.47	2.76	12.62
DP-3	P-3, OS-3	21.46	0.12	0.38	29.74	6.41	34.07
DP-4	P-4	1.58	0.08	0.35	16.63	0.43	3.13

PROPOSED SITE IMERVIOUSNESS

COVER TYPE	AREA (AC)	%
IMPERVIOUS	1.82	6.38%
PERVIOUS	26.70	93.62%
TOTAL	28.52	100.00%

LEGEND

- EXISTING MAJOR CONTOUR (10')
- EXISTING MINOR CONTOUR (2')
- PROPOSED MAJOR CONTOUR (10')
- PROPOSED MINOR CONTOUR (2')
- FLOW PATH
- DRAINAGE BOUNDARY
- PROPOSED IMPERVIOUS AREA
- XX DRAINAGE AREA
- XX DESIGN POINT

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3980 WALKER ROAD

DRAINAGE STUDY

EL PASO COUNTY, COLORADO

REVISION	DATE	DESCRIPTION
	00/00/00	(DESCRIPTION)

PROPOSED DRAINAGE MAP

NORTH

SCALE: 1" = 100'

PROJECT #: 2310-0398
CHECKED BY: BML
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SHEET # 1

TOTAL SHEETS 1