FINAL DRAINAGE REPORT

EPC Drainage Intersections

Hampton S at Ericson & Calle Corvo

El Paso County, CO

Prepared for:

El Paso County
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Project #: 196441003

Prepared: July 9, 2025

Kimley»Horn

ENGINEER'S STATEMENT

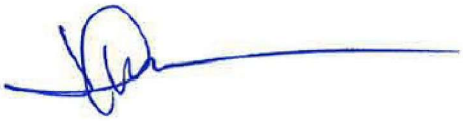
The attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by the city/county for drainage reports and said report is in conformity with the 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.

SIGNATURE (Affix Seal): _____ 7/9/25

Colorado P.E. No.: 58655 Date

EL PASO COUNTY STATEMENT

Filed in accordance with Section 51.1 of the El Paso Land Development Code as amended.



10/15/25

Joshua J. Palmer, PE Date

County Engineer

Conditions:

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APPENDIX

INTRODUCTION

PURPOSE

The purpose of this report is to summarize the final drainage design at each site for the *El Paso County Drainage Improvement Project* (the "Project"). This Final Drainage Report (the "Report") will identify and analyze the existing and proposed drainage patterns and runoff quantities for Hampton S/Ericson Dr (Site 1) and Calle Corvo (Site 2) and detail proposed improvements to ensure a higher level of service is being provided compared to the existing condition.

GENERAL LOCATION

Site 1 is located in the SE Section 5, Township 15S, Range 66W within El Paso County (the "County"), Colorado. Site 1 is bound by Clover Ditch to the north, Hampton South to the south, and private residences to the east and west.

Site 2 is located in the NW Section 14 and SW Section 11, Township 16S, Range 67W Within El Paso County, Colorado. Site 2 is bound by private residences to the north, south, east, and west.

See **Appendix A** for the Vicinity Maps.

DESCRIPTION OF PROPERTY

Site 1 consists of asphalt roadway and parking lot, concrete sidewalk, and landscaping. Site 1 outfalls to Clover Ditch to the north. According to the Natural Resources Conservation Service (NRCS), the on-site soils consist primarily of Midway-Razor clay loams, which is classified as Hydrologic Soil Group (HSG) D. According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) panel 08041C0743G for El Paso County and incorporated areas (eff. 12/07/2018), the entire Site is located in an area of minimal flood hazard (Zone X).

Site 2 consists of asphalt roadway and landscaping. A portion of Site 2 outfalls to a tributary to Little Fountain Creek (North Tributary). According to the NRCS the on-site soils consist primarily of Neville fine sandy loam, which is classified as HSG B, and Rizozo-Neville complex, which is classified as HSG D. HSG D was used for all hydrologic calculations. According to the FEMA FIRM Panel 08041C0950G for El Paso County and incorporated areas (eff. 12/07/2018), the entire Site is located in an area of minimal flood hazard (Zone X).

See Appendix A for the NRCS Web Soil Surveys and FEMA FIRM Panels.

DRAINAGE BASIN FEES

Improvements at both Site 1 and Site 2 are considered redevelopment; therefore, no drainage basin fees are required.

EXISTING SITE DRAINAGE

SITE 1 – HAMPTON AT ERICSON

In the existing condition, GIS contours show flow from basins HE-2 and HE-5 flowing north on B Street and Chamberlin South, respectively; however, to be conservative, half the flow from each basin was assumed to flow onsite during the 10- and 100-year storm events due to the limited capacity of the cross pans along each street. A quarter of flow from HE-2 was assumed to flow to sub-basins HE-1 and HE-3 each. Additionally, a quarter of flow from HE-5 was assumed to flow to sub-basins HE-1 and HE-4 each. During the 5-year storm event, it was assumed that no runoff from basins HE-2 or HE-5 flows onsite and will instead continue north on B Street and Chamberlin South.

Runoff generally flows south to north via overland sheet flow and concentrated flow in curb and gutters before ultimately outfalling to Clover Ditch. The existing runoff within each sub-basin follows the flow patterns as described in **Table 1**.

***Table 1**. Existing Flow Patterns Tributary to Site 1.*

Existing Design Point	Contributing Sub-Basins	Q5 (cfs); Q10 (cfs); Q100 (cfs)	Area Description	Existing Flow Pattern
HE-1	HE-1 ¼ HE-2 ¼ HE-5	7.0; 8.4; 12.7 0; 7.2; 11.2 0; 11.3; 18.6	Paved roads, parking lot, and sidewalk; roof; and landscaping	Sheet flow across paved road and landscaping; concentrated flow along curb and gutter
HE-3	HE-3 ¼ HE-2	46.47; 73.23 0; 7.2; 11.2	Paved roads and sidewalk, roof, and landscaping	Sheet flow across paved road and landscaping; concentrated flow along curb and gutter
HE-4	HE-4 ¼ HE-5	23.84; 40.64 0; 11.3; 18.6	Paved roads and sidewalk, roof, and landscaping	Sheet flow across paved road and landscaping; concentrated flow along curb and gutter
TOTAL to Clover Ditch		**64.2; 115.7; 186.2**		

SITE 2 – CALLE CORVO

In the existing condition, runoff generally flows southwest to northeast via overland sheet flow and concentrated flow in thalwegs and culverts.

Based on existing GIS contours and site visits, flow from basin CC-9 is conveyed to 11580 Calle Corvo. Additionally, it was assumed that flow from basin CC-10 is also conveyed to 11580 Calle Corvo via existing roadside ditch to be conservative. In the existing condition, this accounts for approximately 5 cfs and 8 cfs total in the 10-year and 100-year storm event, respectively.

Based on survey contours and site visits, the steep slopes up the driveway of 11545 Calle Corvo paired with the lack of driveway culvert at this residence, it appears that runoff from basin CC-8b, CC-7b, CC-6b, CC-11, and CC-12 is conveyed to the existing flow paths south and west of 11520 Calle Corvo within basin CC-5.

The existing runoff within each sub-basin follows the flow patterns as described in **Table 2**.

***Table 2**. Existing Flow Patterns Tributary to Site 2.*

Existing Design Point	Contributing Sub-Basins	Q5 (cfs); Q10 (cfs); Q100 (cfs)	Area Description	Existing Flow Pattern
CC-1 (Ex North Culvert Inlet)	CC-1 CC-2 **TOTAL**	14.3; 46.7; 67.2 0.6; 1.1; 1.6 **15.0; 47.8; 68.8**	Paved roads, roof, and landscaping	Sheet flow across paved road and landscaping; concentrated flow within channels
CC-4 (North Tributary)	CC-1 CC-2 CC-3 CC-4 **TOTAL**	14.3; 46.7; 67.2 0.6; 1.1; 1.6 0.6; 0.9; 1.3 0.5; 1.8; 2.5 **16.0; 50.5; 72.2**	Paved roads, roof, and landscaping	Sheet flow across paved road and landscaping; concentrated flow within channels
CC-6b (11520 Calle Corvo)	CC-6b CC-7b CC-8b CC-11 CC-12 **TOTAL**	0.6; 1.0; 1.4 0.6; 1.0; 1.5 3.4; 6.3; 9.1 2.6; 4.2; 6.1 1.7; 3.3; 4.7 **8.9; 15.8; 22.7**	Paved roads, roof, and landscaping	Sheet flow across paved road and landscaping; concentrated flow within channels
CC-9 (11580 Calle Corvo)	CC-9 CC-10 **TOTAL**	0.6; 1.1; 1.6 2.5; 4.3; 6.1 **3.1; 5.4; 7.7**	Paved roads, roof, and landscaping	Sheet flow across paved road and landscaping; concentrated flow within channels
CC-5 (Ex South Culvert Inlet)	CC-5 CC-6a CC-6b CC-7b CC-8b CC-9 CC-10 CC-11 CC-12 **TOTAL**	62.4; 188.1; 270.6 0.9; 1.5; 2.2 0.6; 1.0; 1.4 0.6; 1.0; 1.5 3.4; 6.3; 9.1 0.6; 1.1; 1.6 2.5; 4.3; 6.1 2.6; 4.2; 6.1 1.7; 3.3; 4.7 **75.3; 210.8; 303.3**	Paved roads, roof, and landscaping	Sheet flow across paved road and landscaping; concentrated flow within channels
CC-8a (South Tributary)	CC-5 CC-6a CC-6b CC-7a CC-7b CC-8a CC-8b CC-9 CC-10 CC-11 CC-12 **TOTAL**	62.4; 188.1; 270.6 0.9; 1.5; 2.2 0.6; 1.0; 1.4 1.0; 1.7; 2.4 0.6; 1.0; 1.5 5.3; 14.3; 20.5 3.4; 6.3; 9.1 0.6; 1.1; 1.6 2.5; 4.3; 6.1 2.6; 4.2; 6.1 1.7; 3.3; 4.7 **81.7; 226.8; 326.3**	Paved roads, roof, and landscaping	Sheet flow across paved road and landscaping; concentrated flow within channels

See **Appendix E** for the Existing Drainage Maps and **Appendix B** for existing hydrologic calculations for both Site 1 and Site 2.

DRAINAGE DESIGN CRITERIA

The objective of the proposed Site drainage improvements is to ensure that the proposed design provides a higher level of service and meets current El Paso County Municipal Separate Storm Sewer System (MS4) requirements. In addition, design standards from the El Paso County Engineering Criteria Manual (ECM), City of Colorado Springs and El Paso County Drainage Criteria Manual (DCM), and the Mile High Flood District (MHFD) Urban Storm Drainage Criteria Manual (USDCM) are applicable to this project. The proposed improvements prioritize meeting the MS4 requirements and implementing the design standards from the other drainage criteria as applicable and practicable given Site constraints.

HYDROLOGIC CRITERIA

The hydrologic calculations completed for the existing and proposed conditions of Site 1 and Site 2 adheres to the criteria outlined below and are provided in **Appendix B.**

It should be noted that El Paso County defers to the DCM (City of Colorado Springs criteria) for hydrology. See below for the current hydrologic criteria as outlined in the DCM.

EPC DCM Vol. 1 Ch. 5.1 - Ch. 5.3 / EPC ECM Vol. 1 Ch. 3.3 / COS DCM Ch. 6.3.2

- Utilize the rational method (100 acres or less)
- The initial (minor) design storm will be the 10-year event. The major design storm will be the 100-year event.
- *Table 6-6* will be used for the runoff coefficients and percent impervious.

HYDRAULIC CRITERIA

CULVERTS

EPC DCM Vol 1 Ch 2.4 / Ch 6.4 / Ch 9

- Culverts will be designed to pass the 10-year storm event.
- The 100-year flow must meet the criteria outlined in *Tables 6-4* and *6-5* of the EPC DCM.
- Minimum velocity though the culvert is 2.5 fps.
- The minimum size culvert will be 18 inches in diameter or its hydraulic equivalent. The use of culverts less than 18" in diameter for driveways must have the approval of the County.

STORM DRAIN

EPC DCM Vol 1 Ch 6.3 / Ch 8

- The storm drain must be analyzed for the 10-year and 100-year storm runoff and provide passage with no loss of life or major property damage.
  - The hydraulic grade line will in no case be closer than one (1) foot to the ground or street surface unless otherwise approved by the County.
- A mean velocity between 2.5 fps and 18 fps must be maintained though the storm drain.
- Pipes which are to become an integral part of the public storm drain system will have a minimum diameter of 15 inches.
- Instances in which a pipe changes size, the crowns will be matched.
- Manhole spacing will be in accordance with *Table 6-2.*
- Minimum pipe slope will be in accordance with *Table 6-3.*

STREET DRAINAGE AND STORM INLETS

ECM Vol 1 Ch 2.3 / Ch 6.2 / Ch 7

- Determination of street capacity for the minor storm shall be based upon pavement encroachment. The pavement encroachment for the minor storm shall be limited as set forth in Table 6-1.
    - In all cases the flow encroachment shall not extend past the street right-of-way for the minor storm event. The storm drain system should begin at or before the point where the maximum encroachment is reached.
- Determination of the allowable capacity for major storm shall be based upon allowable depth and inundated area. The allowable depth and inundated area for the major storm shall be limited as set forth in Table 6-1.
- Allowable use and cross flow for streets to meet the criteria outlined in Table 6-1 of the ECM.
- Where gutter or street capacity as shown on Table 6-1 is exceeded, inlets shall be installed to effectively intercept runoff.
    - Inlet type, sizing, and location shall be selected based on the geometry and characteristics of the gutter flow as defined in Chapter 7 of the ECM.

EL PASO COUNTY MS4 CRITERIA

The Site lies within the existing 2024 El Paso County MS4 permit area for the Colorado Department of Public Health and Environment (CDPHE) Colorado Discharge Permit System (CDPS) permit No COR-090011. Therefore, if the Site improvements disturb one (1) acre or more, each Site will need to comply with current El Paso County MS4 requirements.

CONSTRUCTION SITE STORMWATER RUNOFF CONTROL

A pollutant control program must be implemented on Site to reduce pollutants in stormwater runoff to the storm system from construction activities that result in land disturbance of one or more acres. The program must include requirements for construction site owners or operators to implement appropriate erosion and sediment control measures (CMs), such as silt fences, temporary detention ponds and hay bales, and to control other waste such as discarded building materials, procedures for site plan review, procedures for receipt and consideration of information provided by the public, procedures for inspections during construction, and penalties to ensure compliance.

This control is covered by the County's Erosion and Stormwater Quality Control Program. As a part of this program, the proposed construction associated with this Site will develop Grading and Erosion Control Plans, a Construction Stormwater Management Plan, and the contractor will obtain an Erosion and Stormwater Quality Control Permit (ESQCP).

POST-CONSTRUCTION STORMWATER MANAGEMENT IN DEVELOPMENT/REDEVELOPMENT

The quality of stormwater discharge entering the MS4 from the Site must be addressed on Sites that result in land disturbance of one or more acres, less applicable exclusions. This includes implementation of structural and non-structural CMs, as appropriate for the Site.

FOUR STEP PROCESS

Existing grade and surface conditions will be re-established in the proposed condition of this Project at Site 1 upon the installation of the proposed storm infrastructure, with the exception of curb and gutter transitions where proposed curb inlets will be placed and the installation of the overflow swale. Additionally, Site 1 improvements will not be associated with development or redevelopment as this Project will be funded by El Paso County. The total disturbance associated with Site 1 is 0.12 acres.

Disturbance at Site 2 will include the installation of a driveway culvert at 11580 Calle Corvo and providing stream stabilization at the existing 36" CMP North culvert outfall. The total disturbance associated with Site 2 is 0.08 acres.

Since the total disturbance associated with this Project is less than 1 acre per Site, the provisions of the Four Step Process do not apply for this Project and Post-Construction (Permanent) Stormwater Management will not be required.

PROPOSED SITE DRAINAGE

The proposed drainage patterns will remain the same as in the existing condition and there are no proposed changes to the tributary area to either Site 1 or Site 2; therefore, the sub-basins and hydrology in the proposed condition remain exactly the same as the existing condition and have not been repeated. Please refer to **Table 1** and **Table 2** for the description of the proposed drainage sub-basins.

See **Appendix E** for the Proposed Drainage Maps.

SITE 1 – HAMPTON AT ERICSON

The selected alternative for Site 1 includes replacing the existing grate inlet with a 25' double-sided Type R inlet with a proposed 48" RCP parallel outfall pipe and FES to Clover Ditch, which will tie into the existing riprap and run parallel to the existing 30"CMP outfall pipe, at the intersection of Hampton South and Ericson Drive. Additionally, an overflow path (curb chase) connected to the double-sided inlet will be constructed with an overflow soil riprap swale, and curb and gutter transitions for the proposed double-sided Type R inlet.

All construction activity for Site 1 will remain outside of the 100-year and regulatory floodways; therefore, a floodplain development permit will not be required. Additionally, all construction activity will remain within the Public Right-of-Way (ROW) and existing Public Drainage Easements.

Below is a summary of how the proposed improvements will increase the level of service for Site 1:

- Replacing the existing grate inlets with a double-sided Type R inlet:
    - In the existing condition, the four (4) existing grate inlets do not have capacity in the 10- or 100-year storm events.
    - In the proposed condition, the proposed 25' double-sided Type R inlet has capacity in the 10- and 100-year storm events; however, the existing grate inlets at the southwest and southeast corners of the Hampton South and Ericson Drive intersection do not have capacity during these events so overflow will continue to be conveyed to the sump where the proposed inlet will be installed.

- Construction of a designated overflow path:
    - In the existing condition, there is no designated overflow path so after ponding in Hampton South, runoff flows through the drive access to the east, through the parking lot to the existing grass landscaping before flowing into Clover Ditch to the north.
    - In the proposed condition, overflow from the proposed 25' double-sided Type R inlet will be conveyed through the back of the inlet, through a proposed curb chase, through the parking lot, to a proposed soil riprap-line swale before flowing to Clover Ditch.
- Installation of a 48" RCP parallel outfall pipe:
    - In the existing condition, the existing 30" CMP outfall pipe surcharges in the 5-year and larger rainfall events.
    - In the proposed condition, the proposed 48" RCP outfall on its own contains the 5- and 10-yr HGLs within the pipe and only surcharges in the 100-year event. Additionally, the velocity within the pipe is less than 18 fps.

While the above improvements will not adhere to EPC criteria, they will be providing a higher level of service to the community and local residents when compared to the existing condition.

SITE 2 – CALLE CORVO

The selected alternative for Site 2 includes installing a 12" RCP driveway culvert at 11580 Calle Corvo, in addition to constructing a headwall and wingwall with a grouted riprap pad at the existing 36" CMP North culvert to the North Tributary.

All construction activity for Site 2 will remain within the Public ROW. Additionally, the North Tributary does not lie within a mapped floodplain; therefore, a floodplain development permit will not be required.

Below is a summary of how the proposed improvements will increase the level of service for Site 2:

- 11580 Calle Corvo driveway culvert:
    - In existing condition, there is no driveway culvert at this location, so all runoff is conveyed directly over the driveway.
    - In proposed condition, the proposed 12" RCP driveway culvert is designed to contain runoff from the 5-year event. The driveway will overtop during larger events; however, a designated flow path at the downstream end of the driveway culvert provides a clear path for runoff when this happens. Additionally, grading at the upstream end of the driveway culvert will allow for runoff to pond before overtopping driveway.
- Existing north culvert outfall improvements:
    - In existing condition, the existing 36" CMP north culvert is protruding from the embankment out to the North tributary due to undercutting and unstable banks.
    - In the proposed condition, the installation of a headwall and wingwall, and a grouted riprap pad at the downstream end of the existing north culvert will help mitigate the existing undercutting of the existing 36" CMP culvert and protect the Calle Corvo roadway subgrade. These improvements will also provide stabilization to the portion of the North Tributary directly downstream from the existing north culvert.

While the above improvements will not adhere to EPC criteria, they will be providing a higher level of service to the community and local residents when compared the existing condition.

ENGINEER'S OPINION OF PROBABLE COST

The total estimated cost for the selected alternatives at each Site is approximately $670,000. Detailed costs and assumptions for the selected alternatives are provided in **Appendix D**. The cost estimates utilized the 2024 CDOT Cost Data Book and other recent project bids. All unit values were increased by 6.5% for inflation to adjust to 2025 dollars.

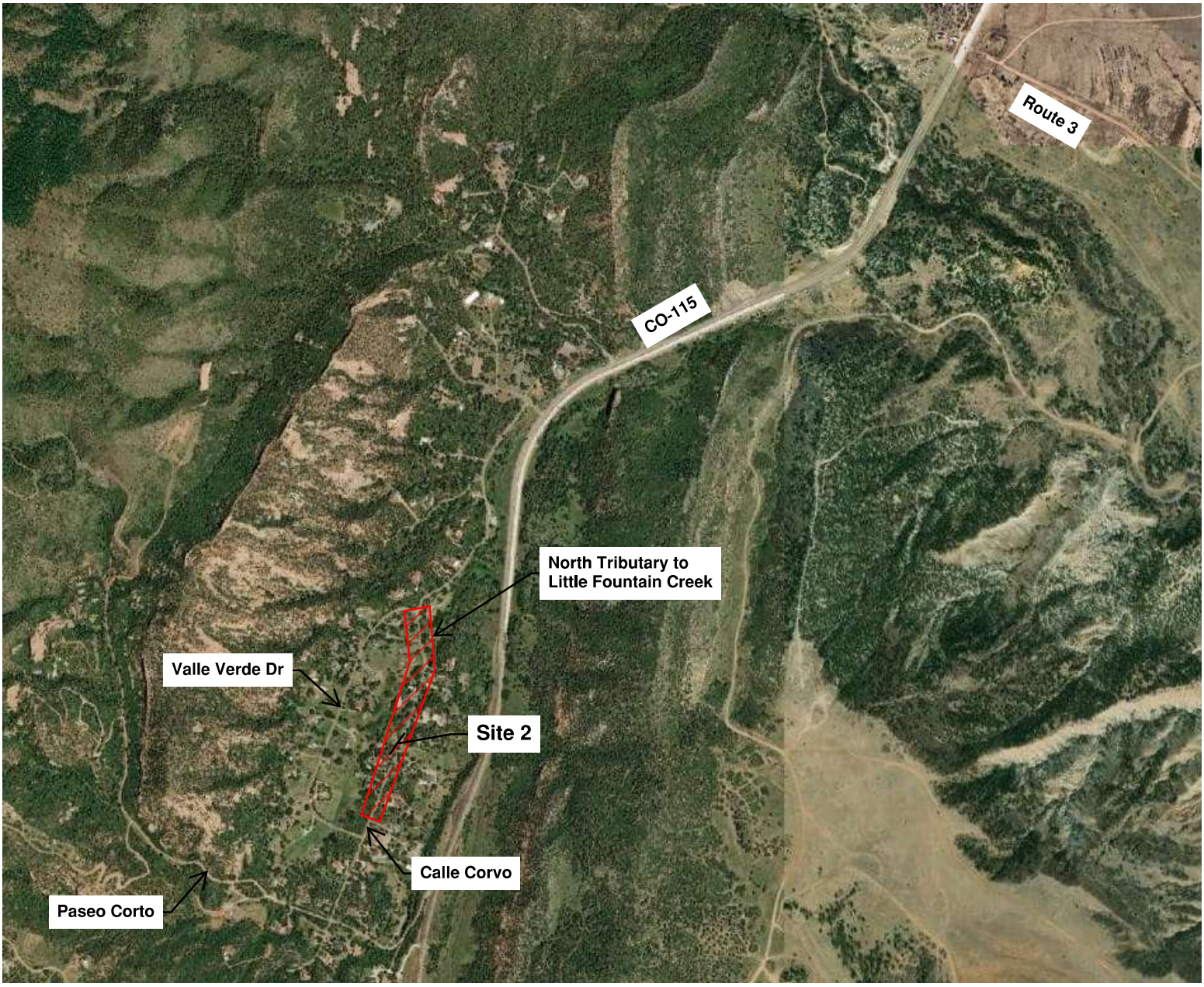
CONCLUSION

The drainage design presented within this report for the *El Paso County Drainage Improvement Project* conforms to current El Paso County Municipal Separate Storm Sewer System (MS4) requirements, and design standards from the El Paso County Engineering Criteria Manual (ECM), City of Colorado Springs and El Paso County Drainage Criteria Manual (DCM), and the Mile High Flood District (MHFD) Urban Storm Drainage Criteria Manual (USDCM) when possible.

APPENDIX A – VICINITY MAP, NRCS SOIL REPORT, AND FEMA FIRM

Site 1 Vicinity Map
N.T.S.

NORTH



Site 2 Vicinity Map
N.T.S.

NORTH

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

September 11, 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.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

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Contents

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: 1:1,090 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 15 30 60 90

Feet
0 50 100 200 300

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: Aug 19, 2018—Sep 23, 2018

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
127	Midway-Razor clay loams, dry, 1 to 18 percent slopes	1.5	100.0%
Totals for Area of Interest		**1.5**	**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

127—Midway-Razor clay loams, dry, 1 to 18 percent slopes

Map Unit Setting

National map unit symbol: 2t52f
Elevation: 3,700 to 6,400 feet
Mean annual precipitation: 12 to 14 inches
Mean annual air temperature: 48 to 54 degrees F
Frost-free period: 130 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition

Midway, dry, and similar soils: 46 percent
Razor, dry, and similar soils: 44 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Midway, Dry

Setting

Landform: Ridges, hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Slope alluvium and/or residuum weathered from shale

Typical profile

A - 0 to 3 inches: clay loam
AC - 3 to 9 inches: clay
C - 9 to 16 inches: paragravelly clay
Cr - 16 to 79 inches: bedrock

Properties and qualities

Slope: 3 to 18 percent
Depth to restrictive feature: 11 to 20 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.00 to 0.21 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Gypsum, maximum content: 5 percent
Maximum salinity: Very slightly saline to slightly saline (2.0 to 7.9 mmhos/cm)
Sodium adsorption ratio, maximum: 10.0
Available water supply, 0 to 60 inches: Very low (about 2.2 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: R069XY046CO - Shaly Plains

Hydric soil rating: No

Description of Razor, Dry

Setting

Landform: Pediments, hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Slope alluvium and/or residuum weathered from shale

Typical profile

A - 0 to 4 inches: clay loam
Bw - 4 to 15 inches: silty clay
Bky - 15 to 30 inches: clay
Cr - 30 to 79 inches: bedrock

Properties and qualities

Slope: 1 to 9 percent
Depth to restrictive feature: 20 to 39 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.00 to 0.21 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Gypsum, maximum content: 5 percent
Maximum salinity: Very slightly saline to slightly saline (2.0 to 7.9 mmhos/cm)
Sodium adsorption ratio, maximum: 10.0
Available water supply, 0 to 60 inches: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: R069XY047CO - Alkaline Plains
Hydric soil rating: No

Minor Components

Manzanola

Percent of map unit: 9 percent
Landform: Fan remnants, hillslopes
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Side slope, base slope
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R069XY042CO - Clayey Plains
Other vegetative classification: Loamy Plains #6 (069XY006CO_2)
Hydric soil rating: No

Rock outcrop

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

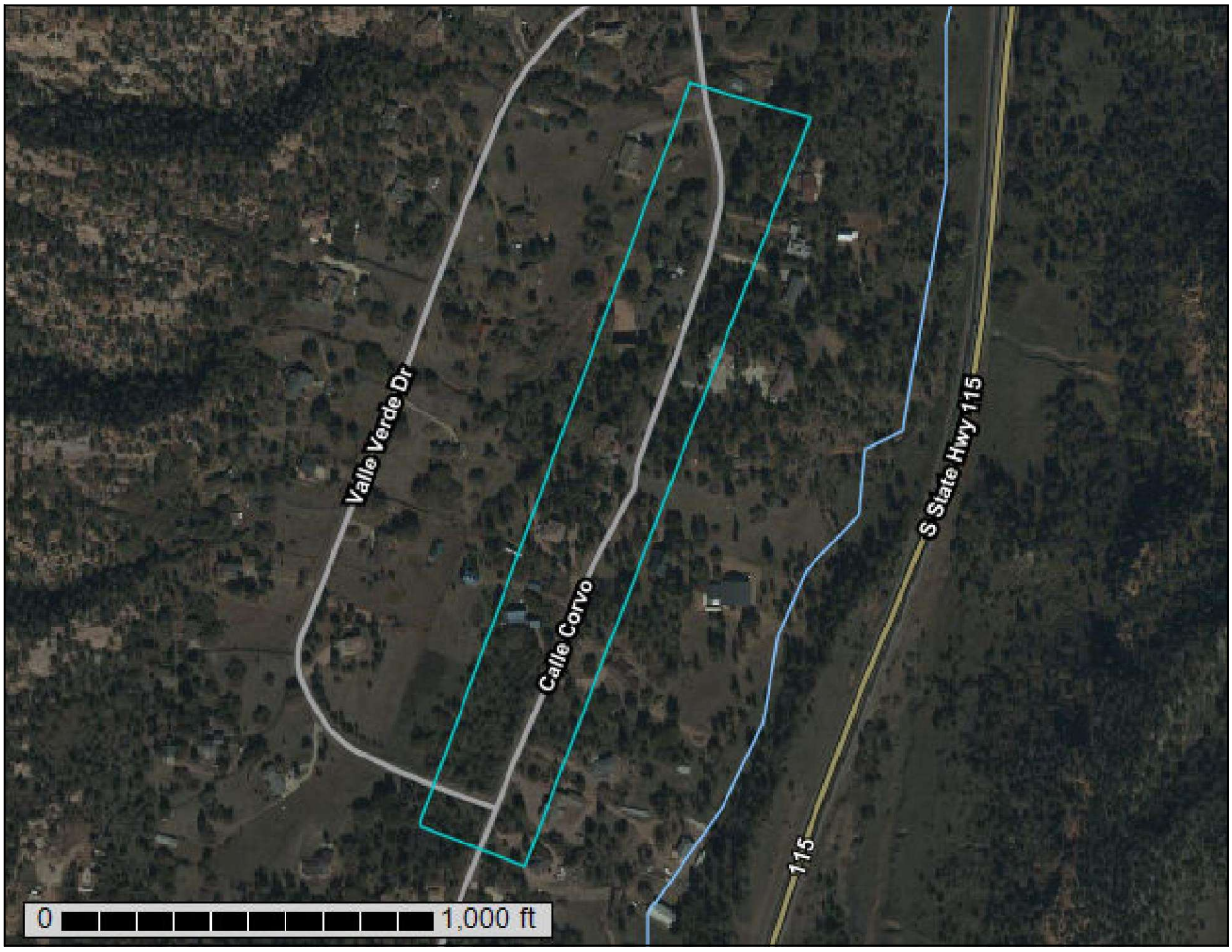
United States Department of Agriculture

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



September 16, 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.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

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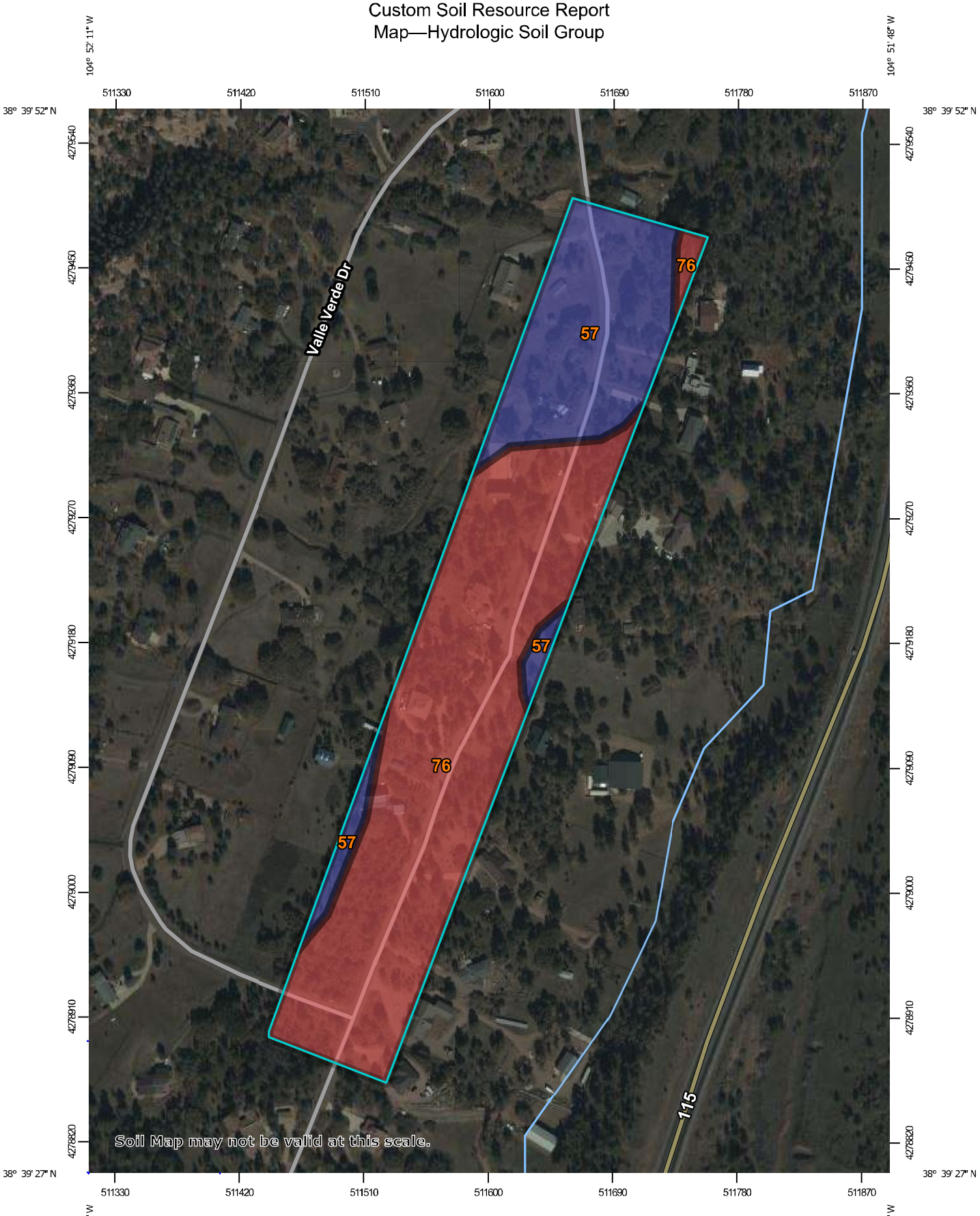
Contents

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
Map—Hydrologic Soil Group



Map Scale: 1:3,740 if printed on A portrait (8.5" x 11") 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 Rating Polygons

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

Soil Rating Lines

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

Soil Rating Points

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

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 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: Sep 11, 2018—Oct 20, 2018

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

Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
57	Neville fine sandy loam, 3 to 9 percent slopes	B	4.7	30.3%
76	Rizozo-Neville complex, 3 to 30 percent slopes	D	10.9	69.7%
Totals for Area of Interest			**15.6**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

El Paso County Area, Colorado

57—Neville fine sandy loam, 3 to 9 percent slopes

Map Unit Setting

National map unit symbol: 3691
Elevation: 5,900 to 6,500 feet
Mean annual precipitation: 13 to 15 inches
Mean annual air temperature: 46 to 50 degrees F
Frost-free period: 130 to 150 days
Farmland classification: Not prime farmland

Map Unit Composition

Neville and similar soils: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Neville

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Calcareous loamy alluvium

Typical profile

A - 0 to 10 inches: fine sandy loam
C - 10 to 60 inches: loam

Properties and qualities

Slope: 3 to 9 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
Calcium carbonate, maximum content: 10 percent
Gypsum, maximum content: 2 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 2.0
Available water supply, 0 to 60 inches: High (about 9.2 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: R049XB202CO - Loamy Foothill
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit: 4 percent
Hydric soil rating: No

Pleasant

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

76—Rizozo-Neville complex, 3 to 30 percent slopes

Map Unit Setting

National map unit symbol: 369q
Elevation: 6,000 to 6,500 feet
Mean annual precipitation: 13 to 15 inches
Mean annual air temperature: 46 to 50 degrees F
Frost-free period: 130 to 150 days
Farmland classification: Not prime farmland

Map Unit Composition

Rizozo and similar soils: 55 percent
Neville and similar soils: 40 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Rizozo

Setting

Landform: Fans, terraces, hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Medium-textured residuum weathered from sandstone

Typical profile

A - 0 to 3 inches: loam
C - 3 to 10 inches: loam
R - 10 to 20 inches: unweathered bedrock

Properties and qualities

Slope: 3 to 30 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None

Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 1.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: R049XB204CO - Shallow Foothill
Hydric soil rating: No

Description of Neville

Setting

Landform: Fans, hills, terraces
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Calcareous loamy alluvium derived from sandstone and shale

Typical profile

A - 0 to 10 inches: fine sandy loam
C - 10 to 60 inches: loam

Properties and qualities

Slope: 3 to 15 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
Calcium carbonate, maximum content: 10 percent
Gypsum, maximum content: 2 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 2.0
Available water supply, 0 to 60 inches: High (about 9.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: R049XC202CO - Loamy Foothill 14-19 PZ
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit: 4 percent
Hydric soil rating: No

Pleasant

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

National Flood Hazard Layer FIRMette

FEMA

104°48'1"W 38°46'27"N

104°47'23"W 38°45'59"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Basemap Imagery Source: USGS National Map 2023

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 9/11/2024 at 12:45 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

National Flood Hazard Layer FIRMette

FEMA

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Basemap Imagery Source: USGS National Map 2023

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) Zone A, V, A99
- With BFE or Depth Zone AE, AO, AH, VE, AR
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
- Future Conditions 1% Annual Chance Flood Hazard Zone X
- Area with Reduced Flood Risk due to Levee. See Notes. Zone X
- Area with Flood Risk due to Levee Zone D

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard Zone X
- Effective LOMRs
- Area of Undetermined Flood Hazard Zone D

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 9/16/2024 at 12:40 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

APPENDIX B – HYDROLOGIC CALCULATIONS

NOAA Atlas 14, Volume 8, Version 2
Location name: Colorado Springs, Colorado, USA*
Latitude: 38.7703°, Longitude: -104.795°
Elevation: 5856 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Deborah Martin, Sandra Pavlovic, Ishani Roy, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Michael Yekta, Geoffery Bonnin

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

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

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.242 (0.198-0.298)	0.290 (0.237-0.357)	0.374 (0.305-0.463)	0.449 (0.364-0.559)	0.561 (0.441-0.736)	0.654 (0.499-0.870)	0.753 (0.552-1.03)	0.858 (0.601-1.21)	1.01 (0.674-1.47)	1.12 (0.730-1.66)
10-min	0.354 (0.290-0.436)	0.424 (0.347-0.523)	0.548 (0.446-0.678)	0.658 (0.533-0.819)	0.822 (0.645-1.08)	0.958 (0.730-1.27)	1.10 (0.808-1.51)	1.26 (0.879-1.78)	1.47 (0.987-2.15)	1.65 (1.07-2.44)
15-min	0.432 (0.353-0.532)	0.517 (0.423-0.638)	0.668 (0.544-0.827)	0.803 (0.650-0.999)	1.00 (0.787-1.32)	1.17 (0.891-1.55)	1.34 (0.986-1.84)	1.53 (1.07-2.17)	1.80 (1.20-2.62)	2.01 (1.30-2.97)
30-min	0.632 (0.518-0.779)	0.760 (0.621-0.938)	0.984 (0.802-1.22)	1.18 (0.959-1.47)	1.48 (1.16-1.94)	1.73 (1.32-2.30)	1.99 (1.46-2.73)	2.27 (1.59-3.21)	2.67 (1.79-3.90)	2.98 (1.94-4.41)
60-min	0.819 (0.671-1.01)	0.964 (0.788-1.19)	1.23 (1.00-1.53)	1.49 (1.20-1.85)	1.88 (1.49-2.49)	2.22 (1.70-2.98)	2.59 (1.91-3.57)	3.00 (2.11-4.26)	3.59 (2.41-5.26)	4.07 (2.64-6.02)
2-hr	1.01 (0.829-1.23)	1.17 (0.961-1.43)	1.48 (1.21-1.82)	1.79 (1.46-2.21)	2.28 (1.82-3.02)	2.71 (2.10-3.62)	3.19 (2.37-4.39)	3.73 (2.64-5.28)	4.51 (3.06-6.59)	5.16 (3.38-7.57)
3-hr	1.10 (0.912-1.35)	1.26 (1.04-1.54)	1.58 (1.30-1.94)	1.91 (1.56-2.35)	2.46 (1.98-3.26)	2.95 (2.30-3.94)	3.50 (2.62-4.82)	4.13 (2.95-5.86)	5.06 (3.46-7.39)	5.84 (3.84-8.54)
6-hr	1.26 (1.05-1.53)	1.43 (1.19-1.73)	1.78 (1.48-2.17)	2.16 (1.77-2.64)	2.79 (2.27-3.70)	3.37 (2.65-4.50)	4.03 (3.05-5.53)	4.79 (3.45-6.76)	5.92 (4.08-8.60)	6.87 (4.56-9.98)
12-hr	1.43 (1.20-1.72)	1.64 (1.37-1.97)	2.06 (1.72-2.49)	2.49 (2.06-3.03)	3.21 (2.62-4.20)	3.86 (3.04-5.09)	4.58 (3.48-6.22)	5.40 (3.92-7.56)	6.62 (4.60-9.53)	7.64 (5.11-11.0)
24-hr	1.62 (1.36-1.94)	1.88 (1.58-2.26)	2.39 (2.00-2.88)	2.89 (2.41-3.49)	3.68 (3.01-4.75)	4.37 (3.46-5.70)	5.14 (3.92-6.89)	5.99 (4.37-8.29)	7.23 (5.06-10.3)	8.26 (5.58-11.8)
2-day	1.86 (1.57-2.20)	2.17 (1.84-2.58)	2.76 (2.33-3.30)	3.32 (2.78-3.98)	4.19 (3.43-5.34)	4.93 (3.93-6.36)	5.74 (4.41-7.63)	6.64 (4.88-9.10)	7.93 (5.58-11.2)	8.99 (6.12-12.8)
3-day	2.03 (1.73-2.40)	2.38 (2.02-2.82)	3.03 (2.56-3.60)	3.63 (3.05-4.34)	4.56 (3.75-5.78)	5.35 (4.28-6.87)	6.22 (4.79-8.21)	7.16 (5.28-9.77)	8.52 (6.03-12.0)	9.63 (6.60-13.7)
4-day	2.19 (1.86-2.58)	2.56 (2.18-3.02)	3.24 (2.74-3.84)	3.87 (3.26-4.61)	4.84 (3.99-6.12)	5.67 (4.54-7.26)	6.57 (5.08-8.65)	7.56 (5.59-10.3)	8.97 (6.37-12.6)	10.1 (6.96-14.3)
7-day	2.59 (2.22-3.04)	2.98 (2.55-3.51)	3.71 (3.16-4.37)	4.38 (3.72-5.20)	5.42 (4.49-6.79)	6.30 (5.07-8.00)	7.25 (5.64-9.48)	8.29 (6.17-11.2)	9.78 (6.99-13.6)	11.0 (7.62-15.5)
10-day	2.93 (2.52-3.42)	3.35 (2.88-3.92)	4.12 (3.53-4.84)	4.83 (4.11-5.70)	5.90 (4.90-7.36)	6.81 (5.51-8.61)	7.79 (6.08-10.1)	8.86 (6.62-11.9)	10.4 (7.45-14.4)	11.6 (8.07-16.3)
20-day	3.84 (3.32-4.46)	4.40 (3.80-5.11)	5.35 (4.61-6.24)	6.19 (5.30-7.26)	7.40 (6.15-9.08)	8.39 (6.80-10.5)	9.42 (7.38-12.1)	10.5 (7.89-13.9)	12.0 (8.68-16.5)	13.2 (9.28-18.4)
30-day	4.60 (3.99-5.32)	5.28 (4.58-6.11)	6.41 (5.54-7.44)	7.36 (6.32-8.60)	8.70 (7.24-10.6)	9.75 (7.92-12.1)	10.8 (8.50-13.8)	11.9 (8.98-15.7)	13.4 (9.72-18.3)	14.6 (10.3-20.2)
45-day	5.57 (4.86-6.42)	6.41 (5.58-7.40)	7.76 (6.74-8.99)	8.87 (7.66-10.3)	10.4 (8.63-12.5)	11.5 (9.37-14.1)	12.6 (9.94-16.0)	13.8 (10.4-18.0)	15.2 (11.1-20.6)	16.3 (11.6-22.5)
60-day	6.42 (5.61-7.38)	7.39 (6.45-8.50)	8.94 (7.78-10.3)	10.2 (8.80-11.8)	11.8 (9.84-14.1)	13.0 (10.6-15.9)	14.2 (11.2-17.8)	15.3 (11.6-19.9)	16.8 (12.2-22.6)	17.8 (12.7-24.5)

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

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

Please refer to NOAA Atlas 14 document for more information.

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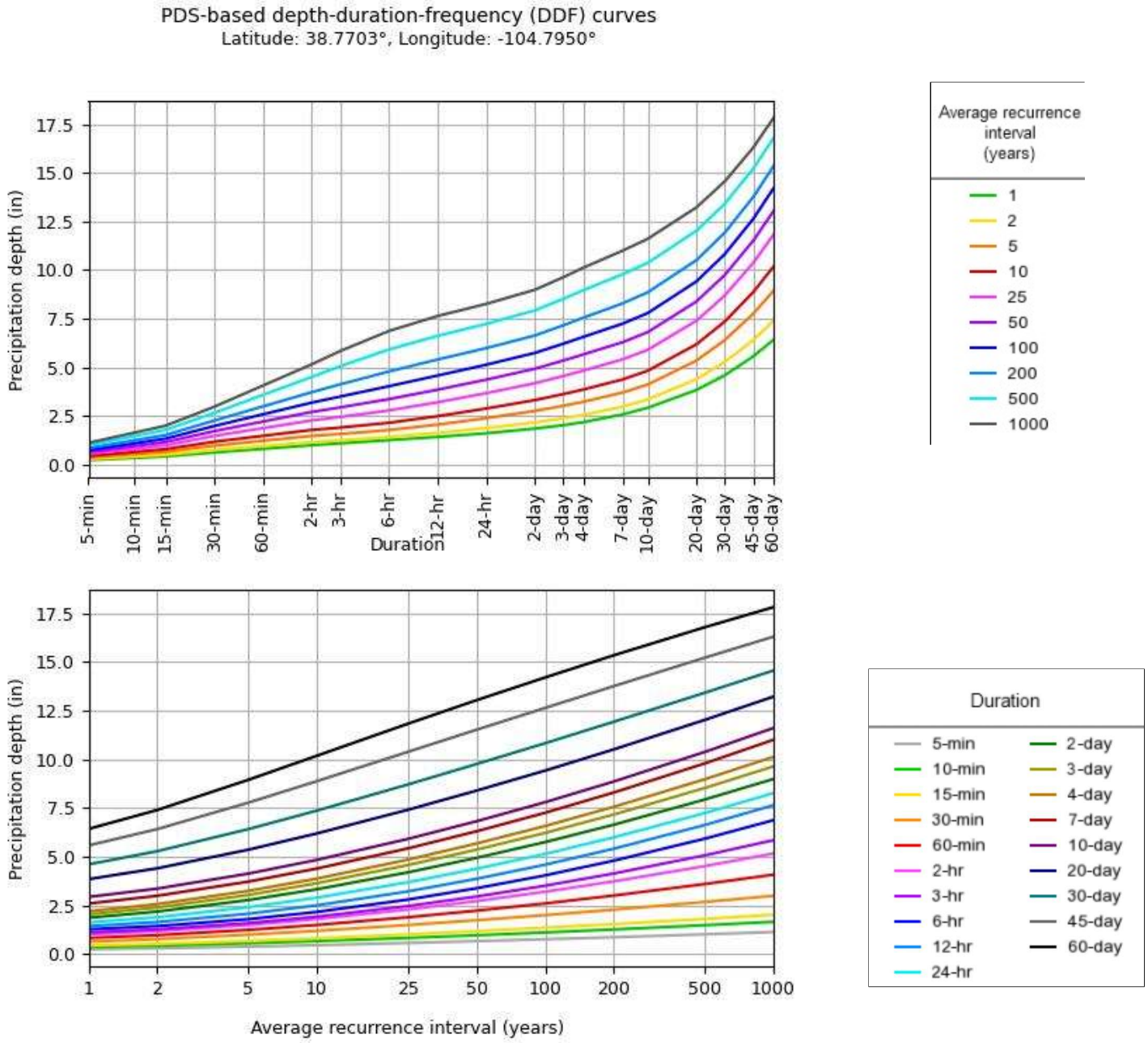
PF graphical



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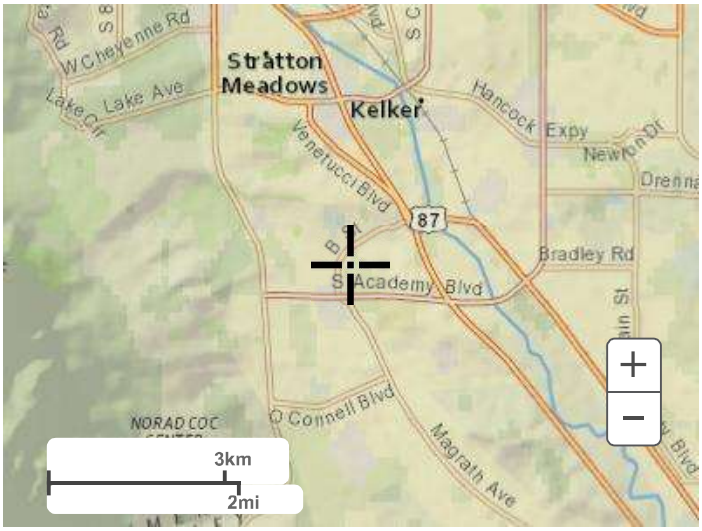
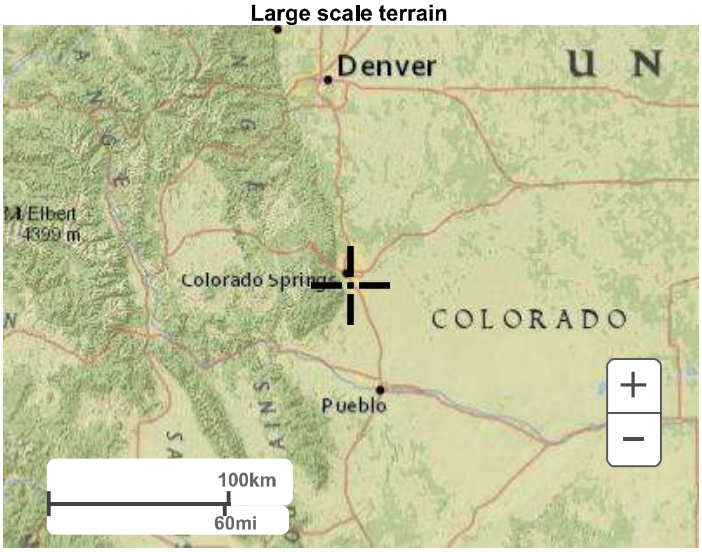
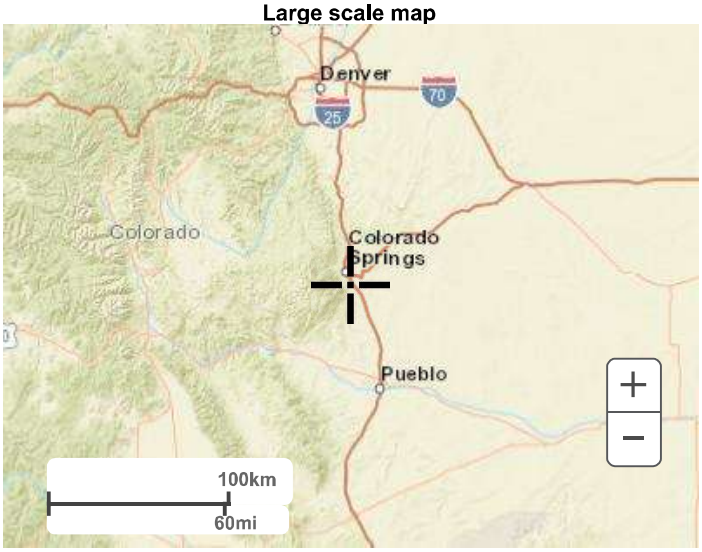


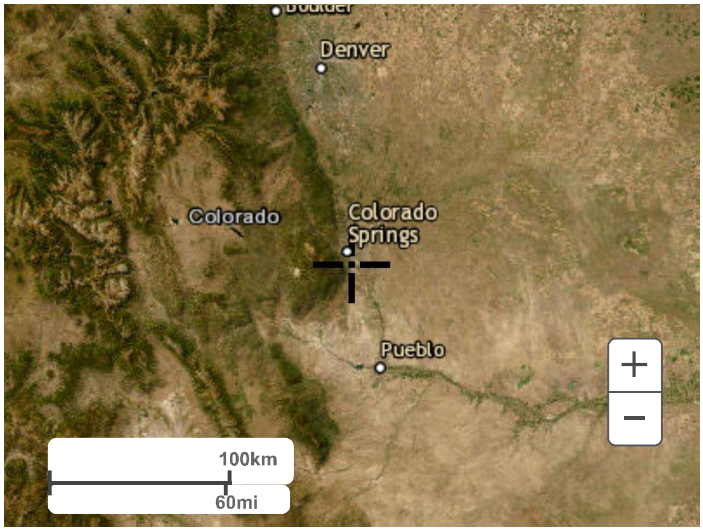
Large scale terrain



Large scale map



Large scale aerial



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Questions?: HDSC.Questions@noaa.gov

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NOAA Atlas 14, Volume 8, Version 2
Location name: Colorado Springs, Colorado, USA*
Latitude: 38.6615°, Longitude: -104.8673°
Elevation: 6407 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Deborah Martin, Sandra Pavlovic, Ishani Roy, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Michael Yekta, Geoffery Bonnin

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

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

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.256 (0.205-0.320)	0.305 (0.245-0.382)	0.393 (0.314-0.494)	0.472 (0.375-0.598)	0.592 (0.456-0.793)	0.691 (0.517-0.941)	0.798 (0.574-1.12)	0.913 (0.626-1.33)	1.08 (0.706-1.62)	1.21 (0.766-1.84)
10-min	0.375 (0.301-0.469)	0.447 (0.358-0.560)	0.575 (0.460-0.724)	0.692 (0.549-0.875)	0.866 (0.668-1.16)	1.01 (0.757-1.38)	1.17 (0.840-1.64)	1.34 (0.917-1.94)	1.58 (1.03-2.37)	1.77 (1.12-2.69)
15-min	0.457 (0.367-0.572)	0.545 (0.437-0.683)	0.702 (0.560-0.883)	0.844 (0.669-1.07)	1.06 (0.814-1.42)	1.24 (0.924-1.68)	1.42 (1.02-2.00)	1.63 (1.12-2.37)	1.92 (1.26-2.89)	2.16 (1.37-3.28)
30-min	0.672 (0.540-0.841)	0.804 (0.644-1.01)	1.04 (0.828-1.30)	1.25 (0.991-1.58)	1.57 (1.21-2.10)	1.83 (1.37-2.49)	2.11 (1.52-2.97)	2.42 (1.66-3.52)	2.85 (1.87-4.29)	3.20 (2.03-4.87)
60-min	0.864 (0.693-1.08)	1.02 (0.815-1.27)	1.30 (1.04-1.64)	1.57 (1.24-1.98)	1.99 (1.54-2.68)	2.35 (1.76-3.21)	2.74 (1.97-3.86)	3.17 (2.18-4.63)	3.79 (2.50-5.73)	4.30 (2.73-6.56)
2-hr	1.06 (0.853-1.31)	1.23 (0.992-1.53)	1.56 (1.26-1.95)	1.89 (1.51-2.37)	2.41 (1.88-3.24)	2.86 (2.17-3.90)	3.36 (2.45-4.73)	3.92 (2.72-5.70)	4.74 (3.15-7.11)	5.41 (3.47-8.18)
3-hr	1.15 (0.934-1.43)	1.32 (1.07-1.64)	1.67 (1.35-2.08)	2.02 (1.62-2.52)	2.59 (2.04-3.50)	3.10 (2.37-4.23)	3.68 (2.70-5.16)	4.32 (3.02-6.27)	5.28 (3.53-7.90)	6.07 (3.92-9.14)
6-hr	1.33 (1.09-1.64)	1.51 (1.23-1.86)	1.89 (1.53-2.33)	2.28 (1.84-2.83)	2.93 (2.34-3.95)	3.53 (2.72-4.80)	4.21 (3.12-5.89)	4.98 (3.53-7.20)	6.13 (4.15-9.14)	7.10 (4.63-10.6)
12-hr	1.54 (1.27-1.88)	1.75 (1.44-2.14)	2.18 (1.78-2.68)	2.63 (2.13-3.24)	3.36 (2.70-4.48)	4.03 (3.13-5.42)	4.78 (3.57-6.63)	5.64 (4.02-8.06)	6.90 (4.71-10.2)	7.96 (5.24-11.8)
24-hr	1.77 (1.46-2.15)	2.03 (1.67-2.46)	2.53 (2.08-3.08)	3.04 (2.48-3.72)	3.86 (3.11-5.08)	4.59 (3.58-6.11)	5.41 (4.06-7.41)	6.33 (4.55-8.96)	7.68 (5.29-11.2)	8.81 (5.86-12.9)
2-day	2.02 (1.68-2.42)	2.33 (1.93-2.80)	2.92 (2.42-3.53)	3.51 (2.88-4.26)	4.44 (3.60-5.78)	5.27 (4.14-6.94)	6.18 (4.68-8.39)	7.20 (5.22-10.1)	8.69 (6.05-12.6)	9.92 (6.67-14.5)
3-day	2.19 (1.83-2.62)	2.55 (2.12-3.05)	3.23 (2.68-3.88)	3.88 (3.20-4.69)	4.91 (3.99-6.35)	5.82 (4.58-7.61)	6.81 (5.17-9.18)	7.91 (5.76-11.0)	9.51 (6.65-13.7)	10.8 (7.33-15.7)
4-day	2.36 (1.97-2.81)	2.74 (2.29-3.27)	3.46 (2.88-4.15)	4.16 (3.44-5.01)	5.25 (4.27-6.76)	6.20 (4.90-8.09)	7.25 (5.53-9.74)	8.41 (6.14-11.7)	10.1 (7.08-14.5)	11.5 (7.79-16.6)
7-day	2.80 (2.35-3.32)	3.21 (2.69-3.80)	3.97 (3.32-4.73)	4.71 (3.92-5.64)	5.87 (4.80-7.50)	6.88 (5.47-8.90)	7.99 (6.13-10.7)	9.22 (6.79-12.7)	11.0 (7.79-15.7)	12.5 (8.55-17.9)
10-day	3.20 (2.70-3.78)	3.64 (3.06-4.30)	4.45 (3.74-5.28)	5.22 (4.36-6.23)	6.43 (5.27-8.15)	7.47 (5.96-9.61)	8.61 (6.63-11.4)	9.86 (7.30-13.5)	11.7 (8.31-16.6)	13.2 (9.07-18.8)
20-day	4.31 (3.66-5.05)	4.93 (4.18-5.78)	6.00 (5.07-7.06)	6.95 (5.84-8.22)	8.34 (6.83-10.4)	9.48 (7.58-12.0)	10.7 (8.26-13.9)	12.0 (8.89-16.1)	13.7 (9.84-19.2)	15.2 (10.6-21.5)
30-day	5.22 (4.45-6.09)	6.00 (5.11-7.01)	7.31 (6.20-8.56)	8.41 (7.10-9.91)	9.96 (8.16-12.2)	11.2 (8.96-14.0)	12.4 (9.64-16.1)	13.7 (10.2-18.3)	15.5 (11.1-21.4)	16.8 (11.8-23.7)
45-day	6.37 (5.44-7.39)	7.34 (6.27-8.53)	8.91 (7.59-10.4)	10.2 (8.64-12.0)	11.9 (9.78-14.5)	13.3 (10.6-16.4)	14.6 (11.3-18.6)	15.9 (11.9-21.0)	17.6 (12.7-24.1)	18.8 (13.3-26.5)
60-day	7.34 (6.29-8.49)	8.46 (7.24-9.80)	10.2 (8.74-11.9)	11.7 (9.90-13.6)	13.6 (11.1-16.4)	15.0 (12.0-18.4)	16.3 (12.7-20.7)	17.6 (13.2-23.2)	19.3 (14.0-26.4)	20.5 (14.5-28.7)

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

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

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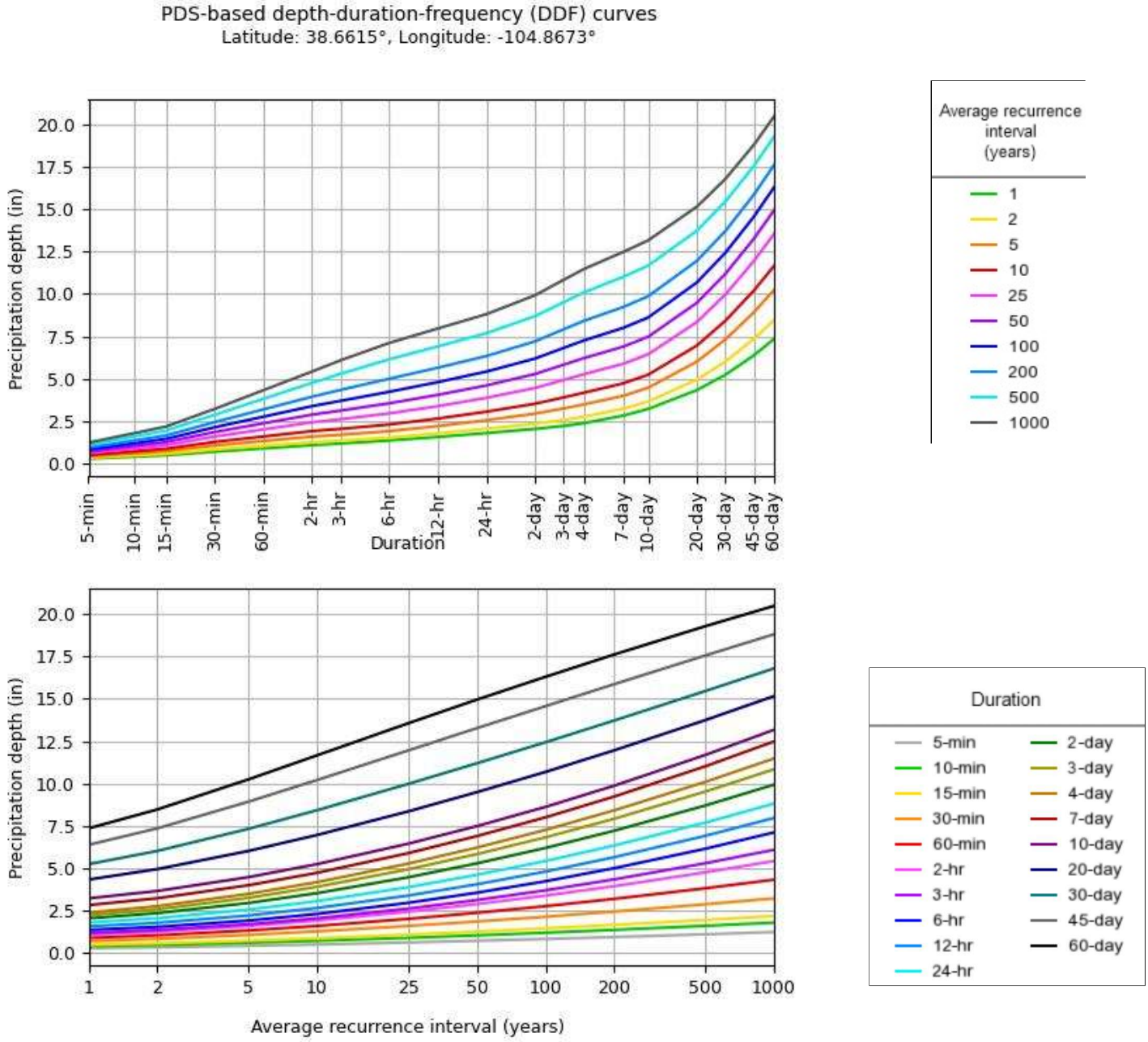
PF graphical



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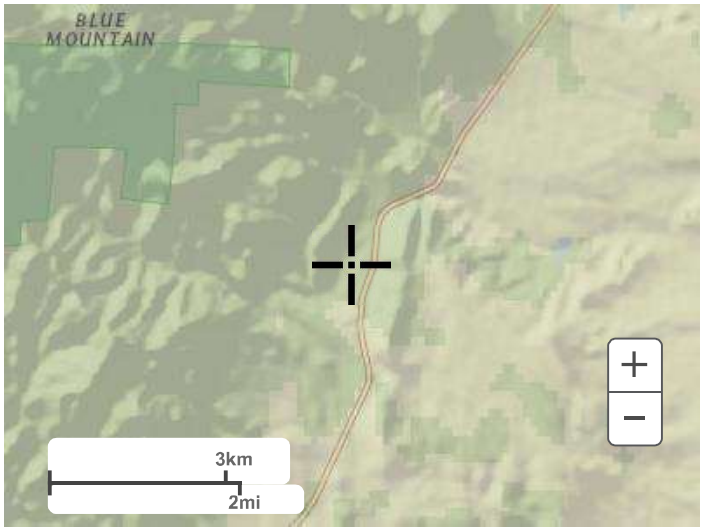

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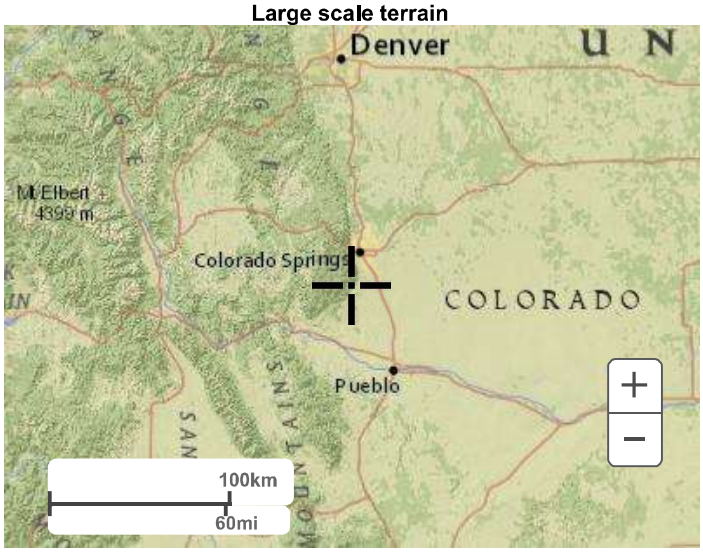

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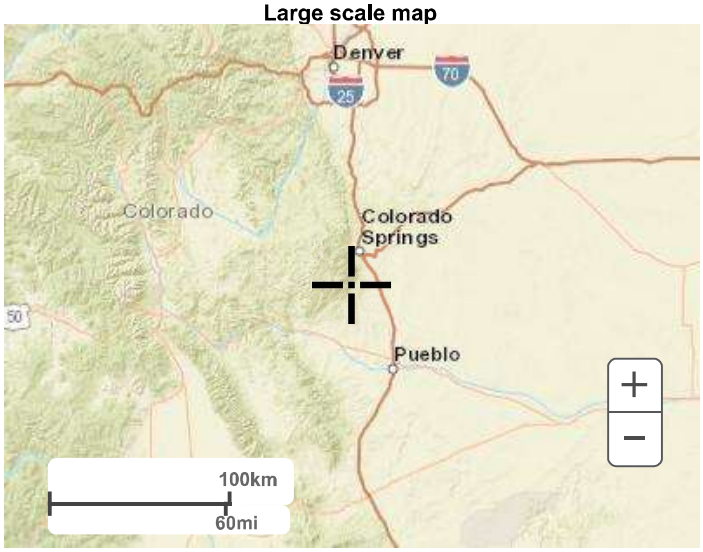
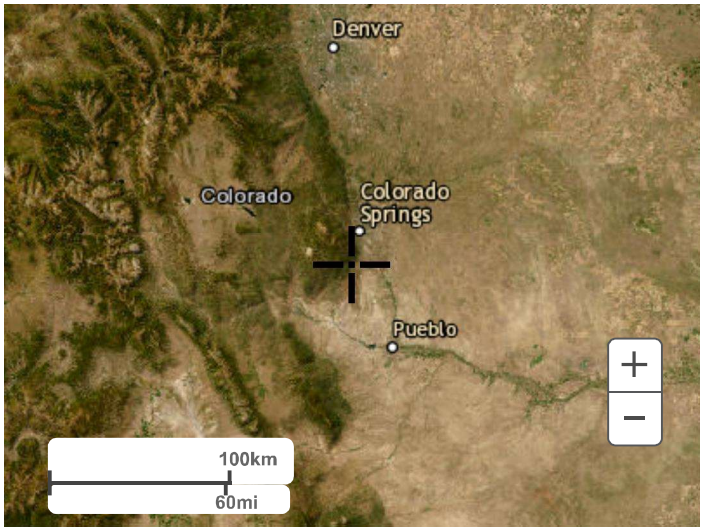


Large scale aerial



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Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

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Kimley»Horn

STANDARD FORM SF-1
RUNOFF COEFFICIENTS - IMPERVIOUS CALCULATION

PROJECT NAME: EPC Drainage Improvements - Existing Conditions
DATE: 4/24/2025
PROJECT NUMBER: 196441003
CALCULATED BY: AME
CHECKED BY: SNM

SOIL: D

LAND USE:	Roofs AREA	Streets (Paved) AREA	Lawns AREA
2-YEAR COEFF.	0.73	0.89	0.04
5-YEAR COEFF.	0.75	0.90	0.15
10-YEAR COEFF.	0.77	0.92	0.25
100-YEAR COEFF.	0.83	0.96	0.50
IMPERVIOUS %	90%	100%	0%

DESIGN BASIN	DESIGN POINT	Roofs AREA (AC)	Streets (Paved) AREA (AC)	Lawns AREA (AC)	TOTAL AREA (AC)	C(2)	C(5)	C(10)	C(100)	Imp %
Site 1 Basins										
HE-1	HE-1	0.40	1.42	0.00	**1.82**	0.85	0.87	0.89	0.93	98%
HE-2	HE-2	1.15	4.91	0.88	**6.94**	0.76	0.78	0.81	0.88	86%
HE-3	HE-3	2.66	6.48	1.51	**10.65**	0.73	0.76	0.79	0.86	83%
HE-4	HE-4	1.51	3.09	2.58	**7.18**	0.55	0.60	0.65	0.77	62%
HE-5	HE-5	2.44	6.55	3.34	**12.33**	0.63	0.67	0.71	0.81	71%
SITE 1 SUBTOTAL		**8.16**	**22.45**	**8.31**	**38.92**	**0.67**	**0.71**	**0.75**	**0.83**	**77%**
		21%	**58%**	**21%**	**100%**					
Site 2 Basins										
CC-1	CC-1	0.36	0.78	20.66	**21.80**	0.08	0.19	0.28	0.52	5%
CC-2	CC-2	0.00	0.11	0.16	**0.27**	0.39	0.46	0.52	0.69	41%
CC-3	CC-3	0.00	0.10	0.12	**0.22**	0.43	0.49	0.55	0.71	45%
CC-4	CC-4	0.00	0.00	0.65	**0.65**	0.04	0.15	0.25	0.50	0%
CC-5	CC-5	2.32	6.26	99.07	**107.65**	0.10	0.21	0.30	0.53	8%
CC-6a	CC-6a	0.00	0.18	0.22	**0.40**	0.42	0.49	0.55	0.71	45%
CC-6b	CC-6b	0.00	0.10	0.15	**0.25**	0.38	0.45	0.52	0.68	40%
CC-7a	CC-7a	0.00	0.20	0.21	**0.41**	0.45	0.52	0.58	0.72	49%
CC-7b	CC-7b	0.00	0.11	0.15	**0.26**	0.40	0.47	0.53	0.69	42%
CC-8a	CC-8a	0.27	0.45	4.68	**5.40**	0.15	0.24	0.33	0.55	13%
CC-8b	CC-8b	0.21	0.44	1.07	**1.72**	0.34	0.42	0.48	0.66	37%
CC-9	CC-9	0.00	0.09	0.22	**0.31**	0.29	0.37	0.44	0.63	29%
CC-10	CC-10	0.00	0.57	0.67	**1.24**	0.43	0.49	0.56	0.71	46%
CC-11	CC-11	0.00	0.60	0.59	**1.19**	0.47	0.53	0.59	0.73	50%
CC-12	CC-12	0.00	0.35	0.66	**1.01**	0.33	0.41	0.48	0.66	35%
SITE 2 SUBTOTAL		**3.16**	**10.34**	**129.28**	**142.78**	**0.12**	**0.22**	**0.31**	**0.54**	**9%**
		2%	**7%**	**91%**	**100%**					

Kimley»Horn

STANDARD FORM SF-2
Time of Concentration

PROJECT NAME: EPC Drainage Improvements - Existing Conditions
PROJECT NUMBER: 196441003
CALCULATED BY: AME
CHECKED BY: SNM

DATE: 4/24/2025

SUB-BASIN DATA			INITIAL TIME (T_i)			TRAVEL TIME (T_t)					T_c CHECK (URBANIZED BASINS)					FINAL T_c
DESIGN BASIN (1)	AREA Ac (2)	C10 (3)	LENGTH Ft (4)	SLOPE % (5)	T_i Min. (6)	LENGTH Ft. (7)	SLOPE % (8)	C_v (9)	VEL fps (11)	T_t Min. (12)	COMP. t_c (13)	TOTAL LENGTH (14)	TOTAL SLOPE (15)	TOTAL IMP. (16)	T_c Max. (17)	Min.
Site 1 Basins																
HE-1	1.82	0.89	42	1.0%	2.5	665	1.0%	20.0	2.0	5.5	8.1	707	1.0%	98%	13.9	8.1
HE-2	6.94	0.81	100	2.0%	4.2	890	3.0%	20.0	3.5	4.3	8.5	990	2.9%	86%	15.5	8.5
HE-3	10.65	0.79	45	3.0%	2.7	1,060	5.0%	20.0	4.5	4.0	6.6	1105	4.9%	83%	16.1	6.6
HE-4	7.18	0.65	20	3.0%	2.6	1,560	5.0%	20.0	4.5	5.8	8.4	1580	5.0%	62%	18.8	8.4
HE-5	12.33	0.71	25	3.5%	2.4	1,375	4.0%	20.0	4.0	5.7	8.1	1400	4.0%	71%	17.8	8.1
Site 2 Basins																
CC-1	21.80	0.28	100	35.0%	4.6	2,400	30.0%	7.0	3.8	10.4	15.0	2500	30.2%	5%	23.9	15.0
CC-2	0.27	0.52	30	16.6%	2.3	170	6.8%	20.0	5.2	0.5	2.8	200	8.3%	41%	11.1	5.0
CC-3	0.22	0.55	100	7.5%	5.1	25	22.0%	20.0	9.4	0.0	5.2	125	10.4%	45%	10.7	5.2
CC-4	0.65	0.25	100	23.0%	5.5	160	5.0%	7.0	1.6	1.7	7.2	260	11.9%		11.4	7.2
CC-5	107.65	0.30	100	10.0%	6.8	2,450	4.0%	7.0	1.4	29.2	36.0	2550	4.2%	8%	24.2	24.2
CC-6a	0.40	0.55	70	6.0%	4.6	760	7.0%	20.0	5.3	2.4	7.0	830	6.9%	45%	14.6	7.0
CC-6b	0.25	0.52	100	6.7%	5.7	35	15.3%	20.0	7.8	0.1	5.7	135	8.9%	40%	10.8	5.7
CC-7a	0.41	0.58	100	7.4%	4.9	385	8.0%	20.0	5.7	1.1	6.1	485	7.9%	49%	12.7	6.1
CC-7b	0.26	0.53	80	6.0%	5.1	295	3.8%	20.0	3.9	1.3	6.4	375	4.3%	42%	12.1	6.4
CC-8a	5.40	0.33	100	28.5%	4.6	700	8.5%	7.0	2.0	5.7	10.3	800	11.0%	13%	14.4	10.3
CC-8b	1.72	0.48	100	6.7%	6.0	215	11.0%	20.0	6.6	0.5	6.5	315	9.6%	37%	11.8	6.5
CC-9	0.31	0.44	100	10.0%	5.6	80	7.0%	7.0	1.9	0.7	6.3	180	8.7%	29%	11.0	6.3
CC-10	1.24	0.56	30	5.0%	3.2	1,610	4.0%	20.0	4.0	6.7	9.9	1640	4.0%	46%	19.1	9.9
CC-11	1.19	0.59	30	5.0%	3.0	1,610	4.0%	20.0	4.0	6.7	9.7	1640	4.0%	50%	19.1	9.7
CC-12	1.01	0.48	100	8.0%	5.7	230	2.0%	7.0	1.0	3.9	9.5	330	3.8%	35%	11.8	9.5

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L_i}}{S_o^{0.33}}$$ Equation 6-8

$$t_t = \frac{L_t}{60C_v\sqrt{S_w}} = \frac{L_t}{60V_t}$$ Equation 6-9 (rearranged)

$$t_c = \frac{L}{180} + 10$$ Equation 6-10

$$t_i + t_t = T_c$$ Equation 6-7

Kimley»Horn

STANDARD FORM SF-3
STORM DRAINAGE DESIGN - RATIONAL METHOD 5 YEAR EVENT

PROJECT NAME: EPC Drainage Improvements - Existing Conditions
PROJECT NUMBER: 1.96E+08
CALCULATED BY: AME
CHECKED BY: SNM

$$I_{10} = -1.75\ln(T_{i,min}) + 8.847$$

DATE: 4/24/2025

STORM LINE		DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			DESIGN BASIN	AREA (AC)	RUNOFF COEFF	tc (min)	C*A(ac)	I (in/hr)	Q (cfs)	tc(max)	S(C*A) (ac)	I (in/hr)	Q (cfs)	SLOPE (%)	STREET FLOW(cfs)	DESIGN FLOW(cfs)	SLOPE (%)	PIPE SIZE (in)	LENGTH (ft)	VELOCITY	tt (min)	
(1)		(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
Site 1 Basins																						
		HE-1	HE-1	1.82	0.87	8.1	1.58	4.45	7.0													
		HE-2	HE-2	6.94	0.78	8.5	5.41	5.10	27.6													
		HE-3	HE-3	10.65	0.76	6.6	8.05	5.54	44.6													
		HE-4	HE-4	7.18	0.60	8.4	4.30	5.13	22.0													
		HE-5	HE-5	12.33	0.67	8.1	8.23	5.19	42.7													
Site 2 Basins																						
		CC-1	CC-1	21.80	0.19	15.0	4.07	3.52	14.3													
		CC-2	CC-2	0.27	0.46	5.0	0.12	5.17	0.6													
		CC-3	CC-3	0.22	0.49	5.2	0.11	5.12	0.6													
		CC-4	CC-4	0.65	0.15	7.2	0.10	4.63	0.5													
		CC-5	CC-5	107.65	0.21	24.2	22.23	2.81	62.4													
		CC-6a	CC-6a	0.40	0.49	7.0	0.20	4.66	0.9													
		CC-6b	CC-6b	0.25	0.45	5.7	0.11	4.96	0.6													
		CC-7a	CC-7a	0.41	0.52	6.1	0.21	4.88	1.0													
		CC-7b	CC-7b	0.26	0.47	6.4	0.12	4.80	0.6													
		CC-8a	CC-8a	5.40	0.24	10.3	1.31	4.08	5.3													
		CC-8b	CC-8b	1.72	0.42	6.5	0.71	4.77	3.4													
		CC-9	CC-9	0.31	0.37	6.3	0.11	4.82	0.5													
		CC-10	CC-10	1.24	0.49	9.9	0.61	4.15	2.5													
		CC-11	CC-11	1.19	0.53	9.7	0.63	4.17	2.6													
		CC-12	CC-12	1.01	0.41	9.5	0.41	4.20	1.7													

Kimley»Horn

STANDARD FORM SF-3
STORM DRAINAGE DESIGN - RATIONAL METHOD 10 YEAR EVENT

PROJECT NAME: EPC Drainage Improvements - Existing Conditions
PROJECT NUMBER: 1.96E+08
CALCULATED BY: AME
CHECKED BY: SNM

$$I_{10} = -1.75\ln(T_{i,min}) + 8.847$$

DATE: 4/24/2025

STORM LINE		DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			DESIGN BASIN	AREA (AC)	RUNOFF COEFF	tc (min)	C*A(ac)	I (in/hr)	Q (cfs)	tc(max)	S(C*A) (ac)	I (in/hr)	Q (cfs)	SLOPE (%)	STREET FLOW(cfs)	DESIGN FLOW(cfs)	SLOPE (%)	PIPE SIZE (in)	LENGTH (ft)	VELOCITY	tt (min)	
(1)		(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
Site 1 Basins																						
		HE-1	HE-1	1.82	0.89	8.1	1.61	5.19	8.4													
		HE-2	HE-2	6.94	0.81	8.5	5.62	5.10	28.7													
		HE-3	HE-3	10.65	0.79	6.6	8.39	5.54	46.5													
		HE-4	HE-4	7.18	0.65	8.4	4.65	5.13	23.8													
		HE-5	HE-5	12.33	0.71	8.1	8.74	5.19	45.3													
Site 2 Basins																						
		CC-1	CC-1	21.80	0.52	15.0	11.38	4.11	46.7													
		CC-2	CC-2	0.27	0.69	5.0	0.19	6.03	1.1													
		CC-3	CC-3	0.22	0.71	5.2	0.16	5.98	0.9													
		CC-4	CC-4	0.65	0.50	7.2	0.33	5.40	1.8													
		CC-5	CC-5	107.65	0.53	24.2	57.47	3.27	188.1													
		CC-6a	CC-6a	0.40	0.71	7.0	0.28	5.44	1.5													
		CC-6b	CC-6b	0.25	0.68	5.7	0.17	5.79	1.0													
		CC-7a	CC-7a	0.41	0.72	6.1	0.30	5.70	1.7													
		CC-7b	CC-7b	0.26	0.69	6.4	0.18	5.61	1.0													
		CC-8a	CC-8a	5.40	0.55	10.3	3.00	4.76	14.3													
		CC-8b	CC-8b	1.72	0.66	6.5	1.13	5.57	6.3													
		CC-9	CC-9	0.31	0.63	6.3	0.20	5.63	1.1													
		CC-10	CC-10	1.24	0.71	9.9	0.88	4.84	4.3													
		CC-11	CC-11	1.19	0.73	9.7	0.87	4.87	4.2													
		CC-12	CC-12	1.01	0.66	9.5	0.67	4.90	3.3													

Kimley»Horn

STANDARD FORM SF-3
STORM DRAINAGE DESIGN - RATIONAL METHOD 100 YEAR EVENT

PROJECT NAME: EPC Drainage Improvements - Existing Conditions
PROJECT NUMBER: 1.96E+08
CALCULATED BY: AME
CHECKED BY: SNM

$$I_{100} = -2.52\ln(T_{i,min}) + 12.735$$

DATE: 4/24/2025

STORM LINE		DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			DESIGN BASIN	AREA (AC)	RUNOFF COEFF	tc (min)	C*A(ac)	I (in/hr)	Q (cfs)	tc(max)	S(C*A) (ac)	I (in/hr)	Q (cfs)	SLOPE (%)	STREET FLOW(cfs)	DESIGN FLOW(cfs)	SLOPE (%)	PIPE SIZE (in)	LENGTH (ft)	VELOCITY	tt (min)	
(1)		(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
Site 1 Basins																						
		HE-1	HE-1	1.82	0.93	8.1	1.70	7.47	12.7													
		HE-2	HE-2	6.94	0.88	8.5	6.11	7.34	44.8													
		HE-3	HE-3	10.65	0.86	6.6	9.18	7.97	73.2													
		HE-4	HE-4	7.18	0.77	8.4	5.51	7.38	40.6													
		HE-5	HE-5	12.33	0.81	8.1	9.98	7.47	74.5													
Site 2 Basins																						
		CC-1	CC-1	21.80	0.52	15.0	11.38	5.91	67.2													
		CC-2	CC-2	0.27	0.69	5.0	0.19	8.68	1.6													
		CC-3	CC-3	0.22	0.71	5.2	0.16	8.60	1.3													
		CC-4	CC-4	0.65	0.50	7.2	0.33	7.77	2.5													
		CC-5	CC-5	107.65	0.53	24.2	57.47	4.71	270.6													
		CC-6a	CC-6a	0.40	0.71	7.0	0.28	7.82	2.2													
		CC-6b	CC-6b	0.25	0.68	5.7	0.17	8.33	1.4													
		CC-7a	CC-7a	0.41	0.72	6.1	0.30	8.20	2.4													
		CC-7b	CC-7b	0.26	0.69	6.4	0.18	8.07	1.5													
		CC-8a	CC-8a	5.40	0.55	10.3	3.00	6.85	20.5													
		CC-8b	CC-8b	1.72	0.66	6.5	1.13	8.01	9.1													
		CC-9	CC-9	0.31	0.63	6.3	0.20	8.10	1.6													
		CC-10	CC-10	1.24	0.71	9.9	0.88	6.96	6.1													
		CC-11	CC-11	1.19	0.73	9.7	0.87	7.01	6.1													
		CC-12	CC-12	1.01	0.66	9.5	0.67	7.05	4.7													

Kimley»Horn

PROJECT NAME: EPC Drainage Improvements - Existing Conditions DATE: 4/24/2025
PROJECT NUMBER: 196441003
CALCULATED BY: AME
CHECKED BY: SNM

EXISTING RATIONAL CALCULATIONS SUMMARY

DESIGN POINT	TRIBUTARY BASINS	TRIBUTARY AREA (AC)	IMPERVIOUSNESS	PEAK FLOWS (CFS)			
				Q2	Q5	Q10	Q100
Site 1 Basins							
HE-1	HE-1	1.82	98%	5.52	7.02	8.38	12.67
HE-2[1]	HE-2	6.94	86%	18.30	23.67	28.69	44.85
HE-3	HE-3	10.65	83%	29.42	38.25	46.47	73.23
HE-4	HE-4	7.18	62%	13.86	18.89	23.84	40.64
HE-5[1]	HE-5	12.33	71%	27.47	36.58	45.34	74.54
	SITE 1 TOTAL	**38.92**	**77%**	**94.57**	**124.42**	**152.72**	**245.92**
Site 2 Basins							
CC-1	CC-1	21.80	5%	5.01	14.33	46.72	67.22
CC-2	CC-2	0.27	41%	0.43	0.64	1.12	1.61
CC-3	CC-3	0.22	45%	0.38	0.55	0.93	1.34
CC-4	CC-4	0.65	0%	0.10	0.45	1.75	2.52
CC-5	CC-5	107.65	8%	25.21	62.38	188.12	270.62
CC-6a	CC-6a	0.40	45%	0.63	0.91	1.54	2.21
CC-6b	CC-6b	0.25	40%	0.38	0.56	0.99	1.43
CC-7a	CC-7a	0.41	49%	0.73	1.03	1.69	2.43
CC-7b	CC-7b	0.26	42%	0.40	0.58	1.01	1.46
CC-8a	CC-8a	5.40	13%	2.56	5.34	14.26	20.53
CC-8b	CC-8b	1.72	37%	2.24	3.41	6.30	9.06
CC-9	CC-9	0.31	29%	0.34	0.55	1.11	1.59
CC-10	CC-10	1.24	46%	1.77	2.54	4.27	6.14
CC-11	CC-11	1.19	50%	1.86	2.62	4.24	6.10
CC-12	CC-12	1.01	35%	1.13	1.74	3.26	4.70
	SITE 2 TOTAL	**142.78**	**9%**	**43.14**	**97.63**	**277.31**	**398.97**

[1] Assumed half the calculated flow from this offsite basin will flow onsite for each storm event.

Kimley»Horn

STANDARD FORM SF-1
RUNOFF COEFFICIENTS - IMPERVIOUS CALCULATION

PROJECT NAME: EPC Drainage Improvements - Proposed Conditions
DATE: 4/24/2025
PROJECT NUMBER: 196441003
CALCULATED BY: AME
CHECKED BY: HMM

SOIL: D

LAND USE:	Roofs AREA	Streets (Paved) AREA	Lawns AREA
2-YEAR COEFF.	0.73	0.89	0.04
5-YEAR COEFF.	0.75	0.90	0.15
10-YEAR COEFF.	0.77	0.92	0.25
100-YEAR COEFF.	0.83	0.96	0.50
IMPERVIOUS %	90%	100%	0%

DESIGN BASIN	DESIGN POINT	Roofs AREA (AC)	Streets (Paved) AREA (AC)	Lawns AREA (AC)	TOTAL AREA (AC)	C(2)	C(5)	C(10)	C(100)	Imp %
Site 1 Basins										
HE-1	HE-1	0.40	1.42	0.00	**1.82**	0.85	0.87	0.89	0.93	98%
HE-2	HE-2	1.15	4.91	0.88	**6.94**	0.76	0.78	0.81	0.88	86%
HE-3	HE-3	2.66	6.48	1.51	**10.65**	0.73	0.76	0.79	0.86	83%
HE-4	HE-4	1.51	3.09	2.58	**7.18**	0.55	0.60	0.65	0.77	62%
HE-5	HE-5	2.44	6.55	3.34	**12.33**	0.63	0.67	0.71	0.81	71%
SITE 1 SUBTOTAL		**8.16**	**22.45**	**8.31**	**38.92**	**0.67**	**0.71**	**0.75**	**0.83**	**77%**
		21%	**58%**	**21%**	**100%**					
Site 2 Basins										
CC-1	CC-1	0.36	0.78	20.66	**21.80**	0.08	0.19	0.28	0.52	5%
CC-2	CC-2	0.00	0.11	0.16	**0.27**	0.39	0.46	0.52	0.69	41%
CC-3	CC-3	0.00	0.10	0.12	**0.22**	0.43	0.49	0.55	0.71	45%
CC-4	CC-4	0.00	0.00	0.65	**0.65**	0.04	0.15	0.25	0.50	0%
CC-5	CC-5	2.32	6.26	99.07	**107.65**	0.10	0.21	0.30	0.53	8%
CC-6a	CC-6a	0.00	0.18	0.22	**0.40**	0.42	0.49	0.55	0.71	45%
CC-6b	CC-6b	0.00	0.10	0.15	**0.25**	0.38	0.45	0.52	0.68	40%
CC-7a	CC-7a	0.00	0.20	0.21	**0.41**	0.45	0.52	0.58	0.72	49%
CC-7b	CC-7b	0.00	0.11	0.15	**0.26**	0.40	0.47	0.53	0.69	42%
CC-8a	CC-8a	0.27	0.45	4.68	**5.40**	0.15	0.24	0.33	0.55	13%
CC-8b	CC-8b	0.21	0.44	1.07	**1.72**	0.34	0.42	0.48	0.66	37%
CC-9	CC-9	0.00	0.09	0.22	**0.31**	0.29	0.37	0.44	0.63	29%
CC-10	CC-10	0.00	0.57	0.67	**1.24**	0.43	0.49	0.56	0.71	46%
CC-11	CC-11	0.00	0.60	0.59	**1.19**	0.47	0.53	0.59	0.73	50%
CC-12	CC-12	0.00	0.35	0.66	**1.01**	0.33	0.41	0.48	0.66	35%
SITE 2 SUBTOTAL		**3.16**	**10.34**	**129.28**	**142.78**	**0.12**	**0.22**	**0.31**	**0.54**	**9%**
		2%	**7%**	**91%**	**100%**					

Kimley»Horn

STANDARD FORM SF-2
Time of Concentration

PROJECT NAME: EPC Drainage Improvements - Proposed Conditions
PROJECT NUMBER: 196441003
CALCULATED BY: AME
CHECKED BY: HMM

DATE: 4/24/2025

SUB-BASIN DATA			INITIAL TIME (T_i)			TRAVEL TIME (T_t)					Tc CHECK (URBANIZED BASINS)					FINAL Tc
DESIGN BASIN (1)	AREA Ac (2)	C10 (3)	LENGTH Ft (4)	SLOPE % (5)	T_i Min. (6)	LENGTH Ft. (7)	SLOPE % (8)	C_v (9)	VEL fps (11)	T_t Min. (12)	COMP. tc (13)	TOTAL LENGTH (14)	TOTAL SLOPE (15)	TOTAL IMP. (16)	Tc Max. (17)	Min.
Site 1 Basins																
HE-1	1.82	0.89	42	1.0%	2.5	665	1.0%	20.0	2.0	5.5	8.1	707	1.0%	98%	13.9	8.1
HE-2	6.94	0.81	100	2.0%	4.2	890	3.0%	20.0	3.5	4.3	8.5	990	2.9%	86%	15.5	8.5
HE-3	10.65	0.79	45	3.0%	2.7	1,060	5.0%	20.0	4.5	4.0	6.6	1105	4.9%	83%	16.1	6.6
HE-4	7.18	0.65	20	3.0%	2.6	1,560	5.0%	20.0	4.5	5.8	8.4	1580	5.0%	62%	18.8	8.4
HE-5	12.33	0.71	25	3.5%	2.4	1,375	4.0%	20.0	4.0	5.7	8.1	1400	4.0%	71%	17.8	8.1
Site 2 Basins																
CC-1	21.80	0.28	100	35.0%	4.6	2,400	30.0%	7.0	3.8	10.4	15.0	2500	30.2%	5%	23.9	15.0
CC-2	0.27	0.52	30	16.6%	2.3	170	6.8%	20.0	5.2	0.5	2.8	200	8.3%	41%	11.1	5.0
CC-3	0.22	0.55	100	7.5%	5.1	25	22.0%	20.0	9.4	0.0	5.2	125	10.4%	45%	10.7	5.2
CC-4	0.65	0.25	100	23.0%	5.5	160	5.0%	7.0	1.6	1.7	7.2	260	11.9%		11.4	7.2
CC-5	107.65	0.30	100	10.0%	6.8	2,450	4.0%	7.0	1.4	29.2	36.0	2550	4.2%	8%	24.2	24.2
CC-6a	0.40	0.55	70	6.0%	4.6	760	7.0%	20.0	5.3	2.4	7.0	830	6.9%	45%	14.6	7.0
CC-6b	0.25	0.52	100	6.7%	5.7	35	15.3%	20.0	7.8	0.1	5.7	135	8.9%	40%	10.8	5.7
CC-7a	0.41	0.58	100	7.4%	4.9	385	8.0%	20.0	5.7	1.1	6.1	485	7.9%	49%	12.7	6.1
CC-7b	0.26	0.53	80	6.0%	5.1	295	3.8%	20.0	3.9	1.3	6.4	375	4.3%	42%	12.1	6.4
CC-8a	5.40	0.33	100	28.5%	4.6	700	8.5%	7.0	2.0	5.7	10.3	800	11.0%	13%	14.4	10.3
CC-8b	1.72	0.48	100	6.7%	6.0	215	11.0%	20.0	6.6	0.5	6.5	315	9.6%	37%	11.8	6.5
CC-9	0.31	0.44	100	10.0%	5.6	80	7.0%	7.0	1.9	0.7	6.3	180	8.7%	29%	11.0	6.3
CC-10	1.24	0.56	30	5.0%	3.2	1,610	4.0%	20.0	4.0	6.7	9.9	1640	4.0%	46%	19.1	9.9
CC-11	1.19	0.59	30	5.0%	3.0	1,610	4.0%	20.0	4.0	6.7	9.7	1640	4.0%	50%	19.1	9.7
CC-12	1.01	0.48	100	8.0%	5.7	230	2.0%	7.0	1.0	3.9	9.5	330	3.8%	35%	11.8	9.5

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L_i}}{S_o^{0.33}}$$

Equation 6-8

$$t_t = \frac{L_t}{60 C_v \sqrt{S_w}} = \frac{L_t}{60 V_t}$$

Equation 6-9 (rearranged)

$$t_c = \frac{L}{180} + 10$$

Equation 6-10

$$t_i + t_t = T_c$$

Equation 6-7

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STANDARD FORM SF-3
STORM DRAINAGE DESIGN - RATIONAL METHOD 5 YEAR EVENT

PROJECT NAME: EPC Drainage Improvements - Proposed Conditions
PROJECT NUMBER: 1.96E+08
CALCULATED BY: AME
CHECKED BY: HMM

$I_5 = -1.50\ln(T_{i,min}) + 7.583$

DATE: 4/24/2025

STORM LINE		DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			DESIGN BASIN	AREA (AC)	RUNOFF COEFF	tc (min)	C*A(ac)	I (in/hr)	Q (cfs)	tc(max)	S(C*A) (ac)	I (in/hr)	Q (cfs)	SLOPE (%)	STREET FLOW(cfs)	DESIGN FLOW(cfs)	SLOPE (%)	PIPE SIZE (in)	LENGTH (ft)	VELOCITY	tt (min)	
(1)		(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
Site 1 Basins																						
		HE-1	HE-1	1.82	0.87	8.1	1.58	4.45	7.0													
		HE-2	HE-2	6.94	0.78	8.5	5.41	4.37	23.7													
		HE-3	HE-3	10.65	0.76	6.6	8.05	4.75	38.2													
		HE-4	HE-4	7.18	0.60	8.4	4.30	4.39	18.9													
		HE-5	HE-5	12.33	0.67	8.1	8.23	4.45	36.6													
Site 2 Basins																						
		CC-1	CC-1	21.80	0.19	15.0	4.07	3.52	14.3													
		CC-2	CC-2	0.27	0.46	5.0	0.12	5.17	0.6													
		CC-3	CC-3	0.22	0.49	5.2	0.11	5.12	0.6													
		CC-4	CC-4	0.65	0.15	7.2	0.10	4.63	0.5													
		CC-5	CC-5	107.65	0.21	24.2	22.23	2.81	62.4													
		CC-6a	CC-6a	0.40	0.49	7.0	0.20	4.66	0.9													
		CC-6b	CC-6b	0.25	0.45	5.7	0.11	4.96	0.6													
		CC-7a	CC-7a	0.41	0.52	6.1	0.21	4.88	1.0													
		CC-7b	CC-7b	0.26	0.47	6.4	0.12	4.80	0.6													
		CC-8a	CC-8a	5.40	0.24	10.3	1.31	4.08	5.3													
		CC-8b	CC-8b	1.72	0.42	6.5	0.71	4.77	3.4													
		CC-9	CC-9	0.31	0.37	6.3	0.11	4.82	0.5													
		CC-10	CC-10	1.24	0.49	9.9	0.61	4.15	2.5													
		CC-11	CC-11	1.19	0.53	9.7	0.63	4.17	2.6													
		CC-12	CC-12	1.01	0.41	9.5	0.41	4.20	1.7													

Kimley»Horn

STANDARD FORM SF-3
STORM DRAINAGE DESIGN - RATIONAL METHOD 10 YEAR EVENT

PROJECT NAME: EPC Drainage Improvements - Proposed Conditions
PROJECT NUMBER: 1.96E+08
CALCULATED BY: AME
CHECKED BY: HMM

$I_{10} = -1.75\ln(T_{i,min}) + 8.847$

DATE: 4/24/2025

STORM LINE		DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			DESIGN BASIN	AREA (AC)	RUNOFF COEFF	tc (min)	C*A(ac)	I (in/hr)	Q (cfs)	tc(max)	S(C*A) (ac)	I (in/hr)	Q (cfs)	SLOPE (%)	STREET FLOW(cfs)	DESIGN FLOW(cfs)	SLOPE (%)	PIPE SIZE (in)	LENGTH (ft)	VELOCITY	tt (min)	
(1)		(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
Site 1 Basins																						
		HE-1	HE-1	1.82	0.89	8.1	1.61	5.19	8.4													
		HE-2	HE-2	6.94	0.81	8.5	5.62	5.10	28.7													
		HE-3	HE-3	10.65	0.79	6.6	8.39	5.54	46.5													
		HE-4	HE-4	7.18	0.65	8.4	4.65	5.13	23.8													
		HE-5	HE-5	12.33	0.71	8.1	8.74	5.19	45.3													
Site 2 Basins																						
		CC-1	CC-1	21.80	0.52	15.0	11.38	4.11	46.7													
		CC-2	CC-2	0.27	0.69	5.0	0.19	6.03	1.1													
		CC-3	CC-3	0.22	0.71	5.2	0.16	5.98	0.9													
		CC-4	CC-4	0.65	0.50	7.2	0.33	5.40	1.8													
		CC-5	CC-5	107.65	0.53	24.2	57.47	3.27	188.1													
		CC-6a	CC-6a	0.40	0.71	7.0	0.28	5.44	1.5													
		CC-6b	CC-6b	0.25	0.68	5.7	0.17	5.79	1.0													
		CC-7a	CC-7a	0.41	0.72	6.1	0.30	5.70	1.7													
		CC-7b	CC-7b	0.26	0.69	6.4	0.18	5.61	1.0													
		CC-8a	CC-8a	5.40	0.55	10.3	3.00	4.76	14.3													
		CC-8b	CC-8b	1.72	0.66	6.5	1.13	5.57	6.3													
		CC-9	CC-9	0.31	0.63	6.3	0.20	5.63	1.1													
		CC-10	CC-10	1.24	0.71	9.9	0.88	4.84	4.3													
		CC-11	CC-11	1.19	0.73	9.7	0.87	4.87	4.2													
		CC-12	CC-12	1.01	0.66	9.5	0.67	4.90	3.3													

Kimley»Horn

STANDARD FORM SF-3
STORM DRAINAGE DESIGN - RATIONAL METHOD 100 YEAR EVENT

PROJECT NAME: EPC Drainage Improvements - Proposed Conditions
PROJECT NUMBER: 1.96E+08
CALCULATED BY: AME
CHECKED BY: HMM

$$I_{100} = -2.52\ln(T_{i,min}) + 12.735$$

DATE: 4/24/2025

STORM LINE	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
		DESIGN BASIN	AREA (AC)	RUNOFF COEFF	tc (min)	C*A(ac)	I (in/hr)	Q (cfs)	tc(max)	S(C*A) (ac)	I (in/hr)	Q (cfs)	SLOPE (%)	STREET FLOW(cfs)	DESIGN FLOW(cfs)	SLOPE (%)	PIPE SIZE (in)	LENGTH (ft)	VELOCITY	tt (min)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
Site 1 Basins																					
		HE-1	HE-1	1.82	0.93	8.1	1.70	7.47	12.7												
		HE-2	HE-2	6.94	0.88	8.5	6.11	7.34	44.8												
		HE-3	HE-3	10.65	0.86	6.6	9.18	7.97	73.2												
		HE-4	HE-4	7.18	0.77	8.4	5.51	7.38	40.6												
		HE-5	HE-5	12.33	0.81	8.1	9.98	7.47	74.5												
Site 2 Basins																					
		CC-1	CC-1	21.80	0.52	15.0	11.38	5.91	67.2												
		CC-2	CC-2	0.27	0.69	5.0	0.19	8.68	1.6												
		CC-3	CC-3	0.22	0.71	5.2	0.16	8.60	1.3												
		CC-4	CC-4	0.65	0.50	7.2	0.33	7.77	2.5												
		CC-5	CC-5	107.65	0.53	24.2	57.47	4.71	270.6												
		CC-6a	CC-6a	0.40	0.71	7.0	0.28	7.82	2.2												
		CC-6b	CC-6b	0.25	0.68	5.7	0.17	8.33	1.4												
		CC-7a	CC-7a	0.41	0.72	6.1	0.30	8.20	2.4												
		CC-7b	CC-7b	0.26	0.69	6.4	0.18	8.07	1.5												
		CC-8a	CC-8a	5.40	0.55	10.3	3.00	6.85	20.5												
		CC-8b	CC-8b	1.72	0.66	6.5	1.13	8.01	9.1												
		CC-9	CC-9	0.31	0.63	6.3	0.20	8.10	1.6												
		CC-10	CC-10	1.24	0.71	9.9	0.88	6.96	6.1												
		CC-11	CC-11	1.19	0.73	9.7	0.87	7.01	6.1												
		CC-12	CC-12	1.01	0.66	9.5	0.67	7.05	4.7												

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PROJECT NAME: EPC Drainage Improvements - Proposed Conditions DATE: 4/24/2025
PROJECT NUMBER: 196441003
CALCULATED BY: AME
CHECKED BY: HMM

PROPOSED RATIONAL CALCULATIONS SUMMARY

DESIGN POINT	TRIBUTARY BASINS	TRIBUTARY AREA (AC)	IMPERVIOUSNESS	PEAK FLOWS (CFS)			
				Q2	Q5	Q10	Q100
Site 1 Basins							
HE-1	HE-1	1.82	98%	5.52	7.02	8.38	12.67
HE-2[1]	HE-2	6.94	86%	18.30	23.67	28.69	44.85
HE-3	HE-3	10.65	83%	29.42	38.25	46.47	73.23
HE-4	HE-4	7.18	62%	13.86	18.89	23.84	40.64
HE-5[1]	HE-5	12.33	71%	27.47	36.58	45.34	74.54
	SITE 1 TOTAL	**38.92**	**77%**	**94.57**	**124.42**	**152.72**	**245.92**
Site 2 Basins							
CC-1	CC-1	21.80	5%	5.01	14.33	46.72	67.22
CC-2	CC-2	0.27	41%	0.43	0.64	1.12	1.61
CC-3	CC-3	0.22	45%	0.38	0.55	0.93	1.34
CC-4	CC-4	0.65	0%	0.10	0.45	1.75	2.52
CC-5	CC-5	107.65	8%	25.21	62.38	188.12	270.62
CC-6a	CC-6a	0.40	45%	0.63	0.91	1.54	2.21
CC-6b	CC-6b	0.25	40%	0.38	0.56	0.99	1.43
CC-7a	CC-7a	0.41	49%	0.73	1.03	1.69	2.43
CC-7b	CC-7b	0.26	42%	0.40	0.58	1.01	1.46
CC-8a	CC-8a	5.40	13%	2.56	5.34	14.26	20.53
CC-8b	CC-8b	1.72	37%	2.24	3.41	6.30	9.06
CC-9	CC-9	0.31	29%	0.34	0.55	1.11	1.59
CC-10	CC-10	1.24	46%	1.77	2.54	4.27	6.14
CC-11	CC-11	1.19	50%	1.86	2.62	4.24	6.10
CC-12	CC-12	1.01	35%	1.13	1.74	3.26	4.70
	SITE 2 TOTAL	**142.78**	**9%**	**43.14**	**97.63**	**277.31**	**398.97**

[1] Assumed half the calculated flow from this offsite basin will flow onsite for each storm event.

APPENDIX C – HYDRAULIC CALULATIONS

MHFD-Inlet, Version 5.03 (August 2023)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	HE-1	EX HE-3	EX HE-4
Site Type (Urban or Rural)	URBAN		
Inlet Application (Street or Area)	STREET	STREET	STREET
Hydraulic Condition	In Sump	In Sump	In Sump
Inlet Type	CDOT Type R Curb Opening	Denver No. 16 Valley Grate	Denver No. 16 Valley Grate

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	8.4	46.5	23.8
Major Q_{Known} (cfs)	12.7	73.2	40.6

Bypass (Carry-Over) Flow from Upstream Inlets must be organized from upstream (left) to downstream (right) in order for bypass flows to be linked.

Receive Bypass Flow from:	User-Defined	User-Defined	User-Defined
Minor Bypass Flow Received, Q_b (cfs)	18.5	7.2	11.3
Major Bypass Flow Received, Q_b (cfs)	29.8	11.2	18.6

Watershed Characteristics

Subcatchment Area (acres)			
Percent Impervious			
NRCS Soil Type			

Watershed Profile

Overland Slope (ft/ft)			
Overland Length (ft)			
Channel Slope (ft/ft)			
Channel Length (ft)			

Minor Storm Rainfall Input

Design Storm Return Period, T_r (years)			
One-Hour Precipitation, P_1 (inches)			

Major Storm Rainfall Input

Design Storm Return Period, T_r (years)			
One-Hour Precipitation, P_1 (inches)			

CALCULATED OUTPUT

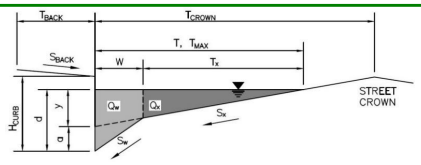
Minor Total Design Peak Flow, Q (cfs)	**26.9**	**53.7**	**35.1**
Major Total Design Peak Flow, Q (cfs)	**42.5**	**84.4**	**59.2**
Minor Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A	N/A

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project:

Inlet ID: **HE-1**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	15.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.047	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.012	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	20.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.061	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.137	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	20.0	20.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

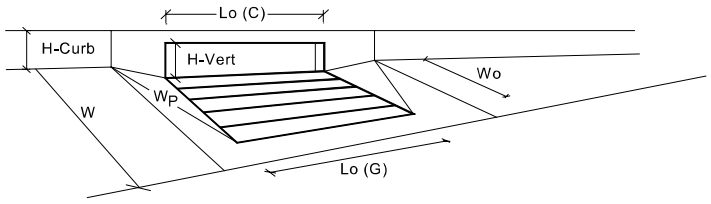
MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

	Minor Storm	Major Storm	
Q_{allow} =	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



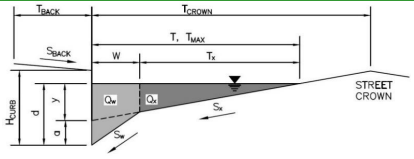
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	5	5	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	12.0	inches
Grate Information		MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.23	0.73	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.79	1.00	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**8.5**	**59.6**	**cfs**
WARNING: Inlet Capacity < Q Peak for Minor Storm	$Q_{PEAK\ REQUIRED}$ =	26.9	42.5	cfs

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project:

Inlet ID: **EX HE-3**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	6.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.046	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.012	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	20.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.015	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	20.0	20.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	8.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

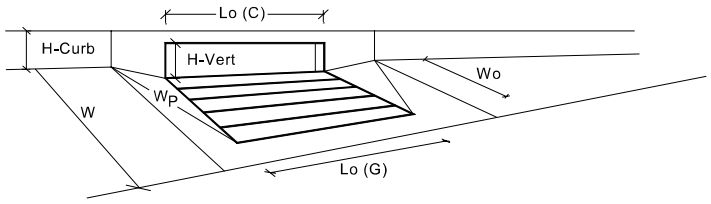
MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

	Minor Storm	Major Storm	
Q_{allow} =	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



			MINOR	MAJOR	
Design Information (Input)					
Type of Inlet		Type =	Denver No. 16 Valley Grate		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	2	2	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	4.0	5.2	inches
Grate Information			MINOR	MAJOR	Override Depths
Warning 1	Length of a Unit Grate	L_o (G) =	4.00	4.00	feet
	Width of a Unit Grate	W_o =	1.73	1.73	feet
	Open Area Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	0.31	0.31	
	Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	0.50	0.50	
	Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	3.60	3.60	
	Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	0.60	0.60	
Curb Opening Information			MINOR	MAJOR	
	Length of a Unit Curb Opening	L_o (C) =	N/A	N/A	feet
	Height of Vertical Curb Opening in Inches	H_{vert} =	N/A	N/A	inches
	Height of Curb Orifice Throat in Inches	H_{throat} =	N/A	N/A	inches
	Angle of Throat	Theta =	N/A	N/A	degrees
	Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	N/A	N/A	feet
	Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	N/A	N/A	
	Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	N/A	N/A	
	Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	N/A	N/A	
Low Head Performance Reduction (Calculated)			MINOR	MAJOR	
	Depth for Grate Midwidth	d_{Grate} =	0.36	0.46	ft
	Depth for Curb Opening Weir Equation	d_{Curb} =	N/A	N/A	ft
	Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	0.40	0.53	
	Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	N/A	N/A	
	Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	
			MINOR	MAJOR	
	Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**1.6**	**3.1**	**cfs**
	WARNING: Inlet Capacity < Q Peak for Minor and Major Storms	$Q_{PEAK\ REQUIRED}$ =	53.7	84.4	cfs

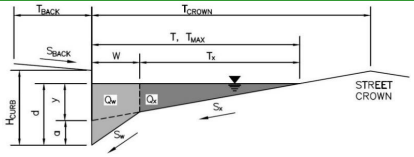
Warning 1: Dimension entered is not a typical dimension for inlet type specified.

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project:

Inlet ID: **EX HE-4**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	4.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.065	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.012	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	20.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.017	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	20.0	20.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	8.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

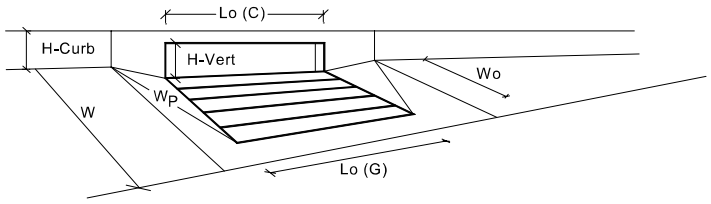
MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

	Minor Storm	Major Storm	
Q_{allow} =	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	Denver No. 16 Valley Grate		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	4.0	5.7	inches
Grate Information		MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate	L_o (G) =	3.00	3.00	feet
Width of a Unit Grate	W_o =	1.73	1.73	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	0.31	0.31	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	3.60	3.60	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	0.60	0.60	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	N/A	N/A	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	N/A	N/A	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	N/A	N/A	inches
Angle of Throat	Theta =	N/A	N/A	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	N/A	N/A	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	N/A	N/A	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	N/A	N/A	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	N/A	N/A	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	0.36	0.49	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	N/A	N/A	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	0.63	0.89	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	N/A	N/A	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**1.1**	**2.4**	**cfs**
WARNING: Inlet Capacity < Q Peak for Minor and Major Storms	$Q_{PEAK\ REQUIRED}$ =	35.1	59.2	cfs

Worksheet for Hampton - Prop Overflow Swale

Project Description	
Friction Method	Manning Formula
Solve For	Discharge

Input Data	
Channel Slope	0.040 ft/ft
Normal Depth	10.3 in

Section Definitions

Station (ft)	Elevation (ft)
510+12	56.50
510+18	55.00
510+30	54.34
510+35	55.20

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(510+12, 56.50)	(510+35, 55.20)	0.069

Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Discharge	22.66 cfs
Roughness Coefficient	0.069
Elevation Range	54.3 to 56.5 ft
Flow Area	8.6 ft²
Wetted Perimeter	17.9 ft
Hydraulic Radius	5.8 in
Top Width	17.80 ft
Normal Depth	10.3 in
Critical Depth	8.8 in
Critical Slope	0.096 ft/ft
Velocity	2.64 ft/s
Velocity Head	0.11 ft
Specific Energy	0.97 ft
Froude Number	0.670
Flow Type	Subcritical

GVF Input Data

Worksheet for Hampton - Prop Overflow Swale

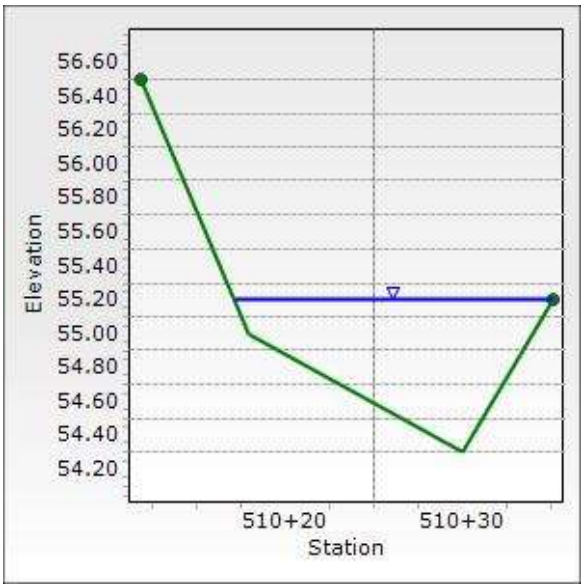
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

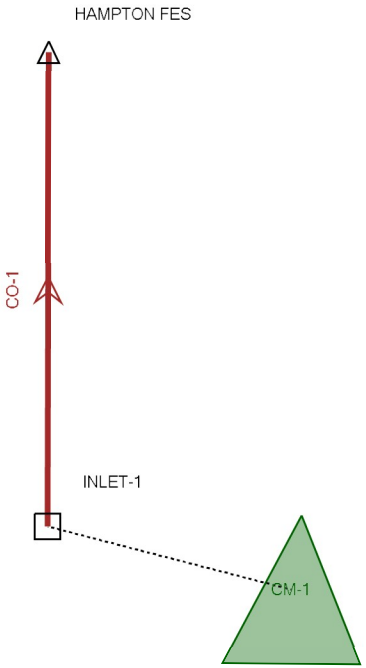
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	10.3 in
Critical Depth	8.8 in
Channel Slope	0.040 ft/ft
Critical Slope	0.096 ft/ft

Cross Section for Hampton - Prop Overflow Swale

Project Description	
Friction Method	Manning Formula
Solve For	Discharge

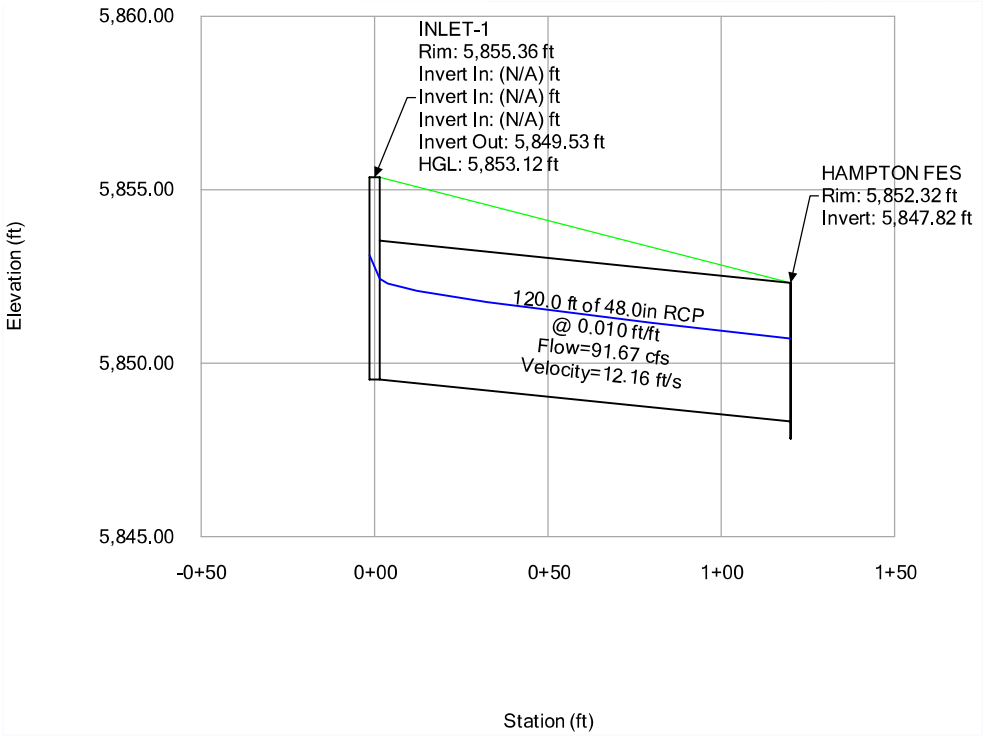
Input Data	
Channel Slope	0.040 ft/ft
Normal Depth	10.3 in
Discharge	22.66 cfs




HAMPTON FES
CO-1
INLET-1
CM-1

5-yr
Hampton Outfall

Profile Report
Engineering Profile - Hampton Outfall



5-yr
Hampton Outfall

FlexTable: Conduit Table

Label	Diameter (in)	Material	Manning's n	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (User Defined) (ft)	Slope (Calculated) (ft/ft)	Velocity (ft/s)	Flow (cfs)	Capacity (Full Flow) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
CO-1	48.0	Concrete	0.013	INLET-1	5,849.53	HAMPTON FES	5,848.32	120.0	0.010	12.16	91.67	144.23	5,852.43	5,850.71

5-yr
Hampton Outfall

FlexTable: Catchment Table

Label	Outflow Element	Area (User Defined) (acres)	Runoff Coefficient (Rational)	Time of Concentration (min)	Flow (Total Out) (cfs)
CM-1	INLET-1	29.290	0.710	8.500	91.67

5-yr
Hampton Outfall

FlexTable: Catch Basin Table

Label	Elevation (Ground) (ft)	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Headloss Method	Flow (Total Out) (cfs)	Headloss (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
INLET-1	5,855.36	5,855.36	5,849.53	Standard	91.67	0.68	5,853.12	5,852.43

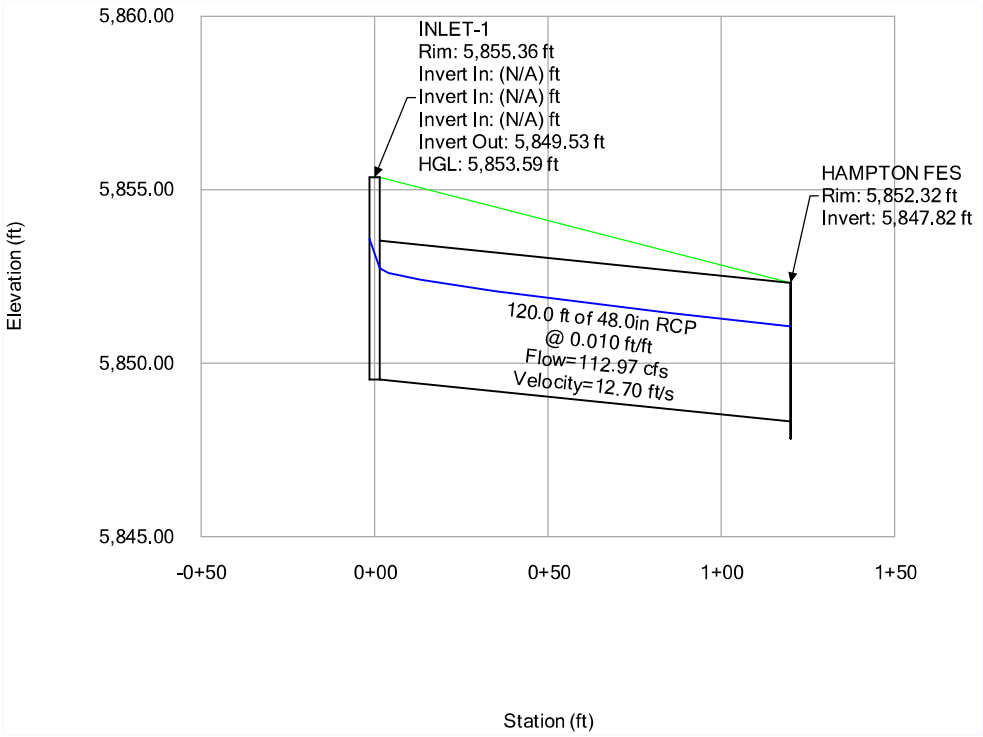
5-yr
Hampton Outfall

FlexTable: Outfall Table

Label	Elevation (Ground) (ft)	Elevation (Invert) (ft)	Boundary Condition Type	Elevation (User Defined Tailwater) (ft)	System Additional Flow (cfs)	System Flow Time (min)	Flow (Total Out) (cfs)	Hydraulic Grade (ft)
HAMPTON FES	5,852.32	5,847.82	Free Outfall		0.00	8.665	91.06	5,850.71

10-yr
Hampton Outfall

Profile Report
Engineering Profile - Hampton Outfall



10-yr
Hampton Outfall

FlexTable: Conduit Table

Label	Diameter (in)	Material	Manning's n	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (User Defined) (ft)	Slope (Calculated) (ft/ft)	Velocity (ft/s)	Flow (cfs)	Capacity (Full Flow) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
CO-1	48.0	Concrete	0.013	INLET-1	5,849.53	HAMPTON FES	5,848.32	120.0	0.010	12.74	114.84	144.23	5,852.76	5,851.09

10-yr
Hampton Outfall

FlexTable: Catchment Table

Label	Outflow Element	Area (User Defined) (acres)	Runoff Coefficient (Rational)	Time of Concentration (min)	Flow (Total Out) (cfs)
CM-1	INLET-1	29.290	0.750	8.500	112.97

10-yr
Hampton Outfall

FlexTable: Catch Basin Table

Label	Elevation (Ground) (ft)	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Headloss Method	Flow (Total Out) (cfs)	Headloss (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
INLET-1	5,855.36	5,855.36	5,849.53	Standard	112.97	0.85	5,853.59	5,852.74

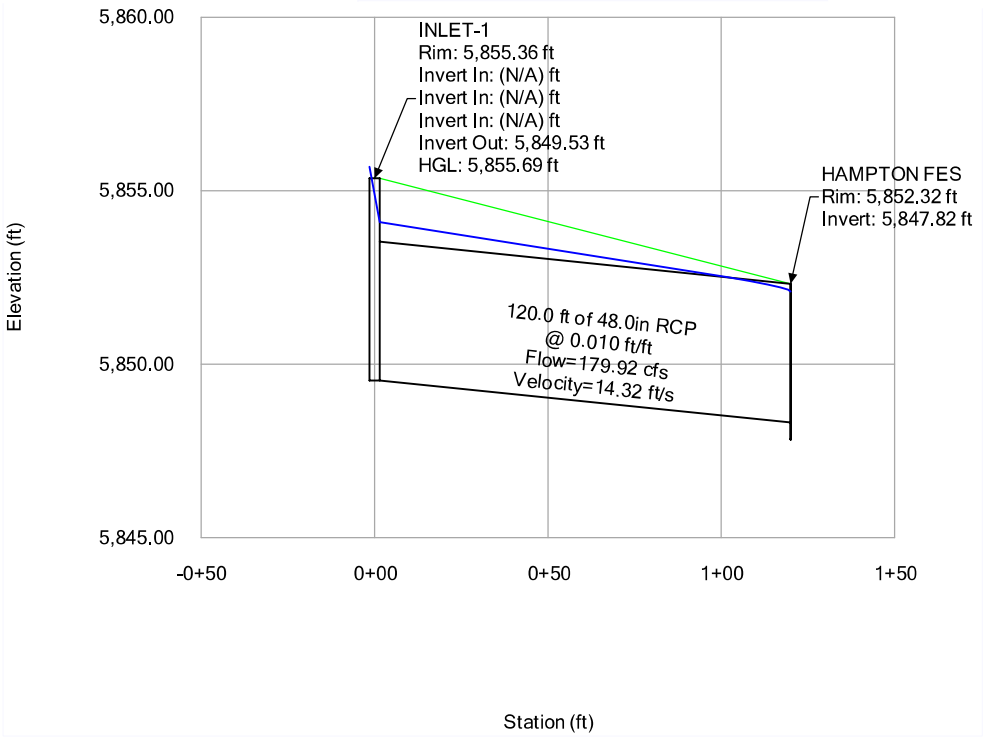
10-yr
Hampton Outfall

FlexTable: Outfall Table

Label	Elevation (Ground) (ft)	Elevation (Invert) (ft)	Boundary Condition Type	Elevation (User Defined Tailwater) (ft)	System Additional Flow (cfs)	System Flow Time (min)	Flow (Total Out) (cfs)	Hydraulic Grade (ft)
HAMPTON FES	5,852.32	5,847.82	Free Outfall		0.00	8.657	112.26	5,851.06

100-yr
Hampton Outfall

Profile Report
Engineering Profile - Hampton Outfall



100-yr
Hampton Outfall

FlexTable: Conduit Table

Label	Diameter (in)	Material	Manning's n	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (User Defined) (ft)	Slope (Calculated) (ft/ft)	Velocity (ft/s)	Flow (cfs)	Capacity (Full Flow) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
CO-1	48.0	Concrete	0.013	INLET-1	5,849.53	HAMPTON FES	5,848.32	120.0	0.010	14.55	182.89	144.23	5,854.17	5,852.11

100-yr
Hampton Outfall

FlexTable: Catchment Table

Label	Outflow Element	Area (User Defined) (acres)	Runoff Coefficient (Rational)	Time of Concentration (min)	Flow (Total Out) (cfs)
CM-1	INLET-1	29.290	0.830	8.500	179.92

100-yr
Hampton Outfall

FlexTable: Catch Basin Table

Label	Elevation (Ground) (ft)	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Headloss Method	Flow (Total Out) (cfs)	Headloss (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
INLET-1	5,855.36	5,855.36	5,849.53	Standard	179.92	1.59	5,855.69	5,854.10

100-yr
Hampton Outfall

FlexTable: Outfall Table

Label	Elevation (Ground) (ft)	Elevation (Invert) (ft)	Boundary Condition Type	Elevation (User Defined Tailwater) (ft)	System Additional Flow (cfs)	System Flow Time (min)	Flow (Total Out) (cfs)	Hydraulic Grade (ft)
HAMPTON FES	5,852.32	5,847.82	User Defined Tailwater	5,845.90	0.00	8.640	178.91	5,852.09

HY-8 Culvert Analysis Report

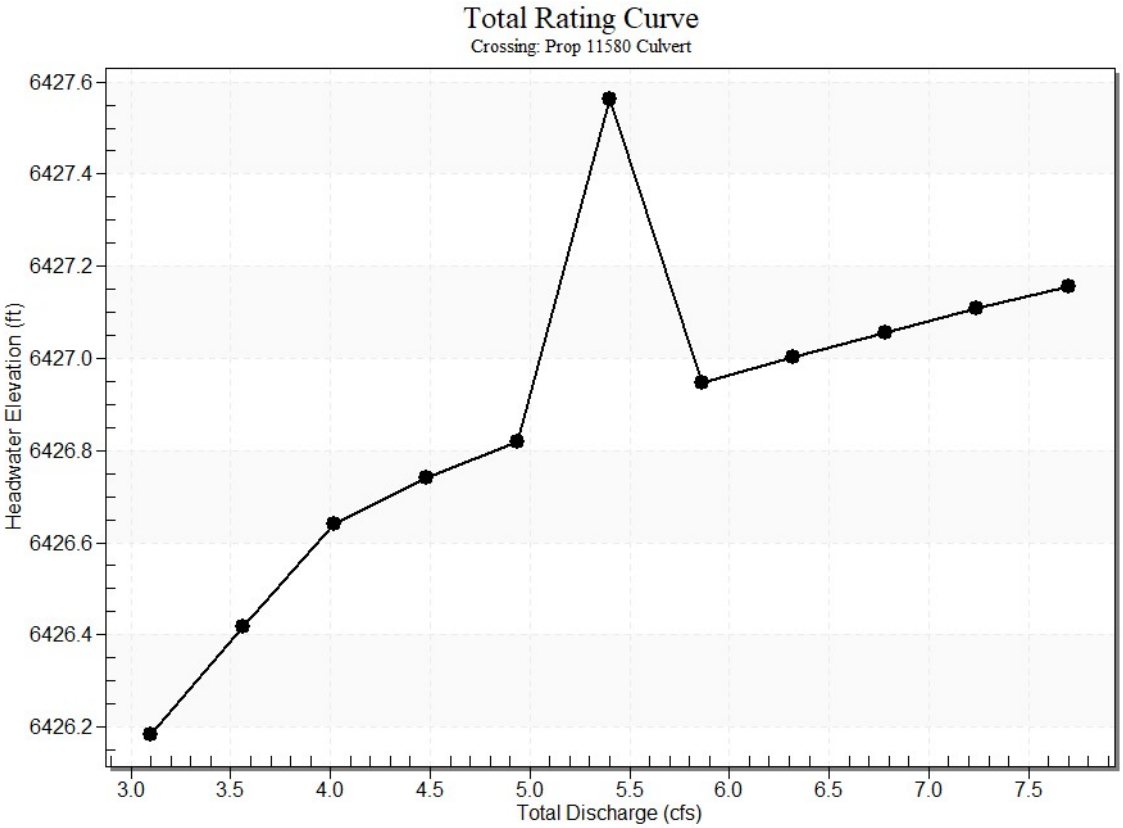
Crossing Input: Prop 11580 Culvert

Parameter	Value	Units
DISCHARGE DATA		
Discharge Method	Minimum, Design, and Maximum	
Minimum Flow	3.100	cfs
Design Flow	5.400	cfs
Maximum Flow	7.700	cfs
TAILWATER DATA		
Channel Type	Triangular Channel	
Side Slope (H:V)	3.000	_:1
Channel Slope	0.0050	ft/ft
Manning's n (channel)	0.078	
Channel Invert Elevation	6424.540	ft
Rating Curve	View...	
ROADWAY DATA		
Roadway Profile Shape	Constant Roadway Elevation	
First Roadway Station	43.690	ft
Crest Length	41.000	ft
Crest Elevation	6426.600	ft
Roadway Surface	Paved	
Top Width	14.000	ft

Culvert Input: Prop 11580 Culvert

Parameter	Value	Units
CULVERT DATA		
Name	Culvert 1	
Shape	Circular	
Material	Concrete	
Diameter	1.000	ft
Embedment Depth	0.000	in
Manning's n	0.012	
Culvert Type	Straight	
Inlet Configuration	Grooved End Projecting (Ke=0.2)	
Inlet Depression?	No	
SITE DATA		
Site Data Input Option	Culvert Invert Data	
Inlet Station	0.000	ft
Inlet Elevation	6424.660	ft
Outlet Station	41.000	ft
Outlet Elevation	6424.540	ft
Number of Barrels	1	
Computed Culvert Slope	0.002927	ft/ft

Rating Curve Plot for crossing: Prop 11580 Culvert



Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow
Minimum Flow: 3.10 cfs
Design Flow: 5.40 cfs
Maximum Flow: 7.70 cfs

Table 1 - Summary of Culvert Flows at crossing: Prop 11580 Culvert

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
6426.18	3.10	3.10	0.00	1
6426.42	3.56	3.56	0.00	1
6426.64	4.02	3.95	0.07	12
6426.74	4.48	4.06	0.42	7
6426.82	4.94	4.12	0.81	6
6427.56	5.40	4.17	1.22	6
6426.95	5.86	4.21	1.64	5
6427.00	6.32	4.25	2.07	5
6427.06	6.78	4.28	2.50	5
6427.11	7.24	4.31	2.93	5
6427.16	7.70	4.33	3.37	4
6426.60	3.89	3.89	0.00	Overtopping

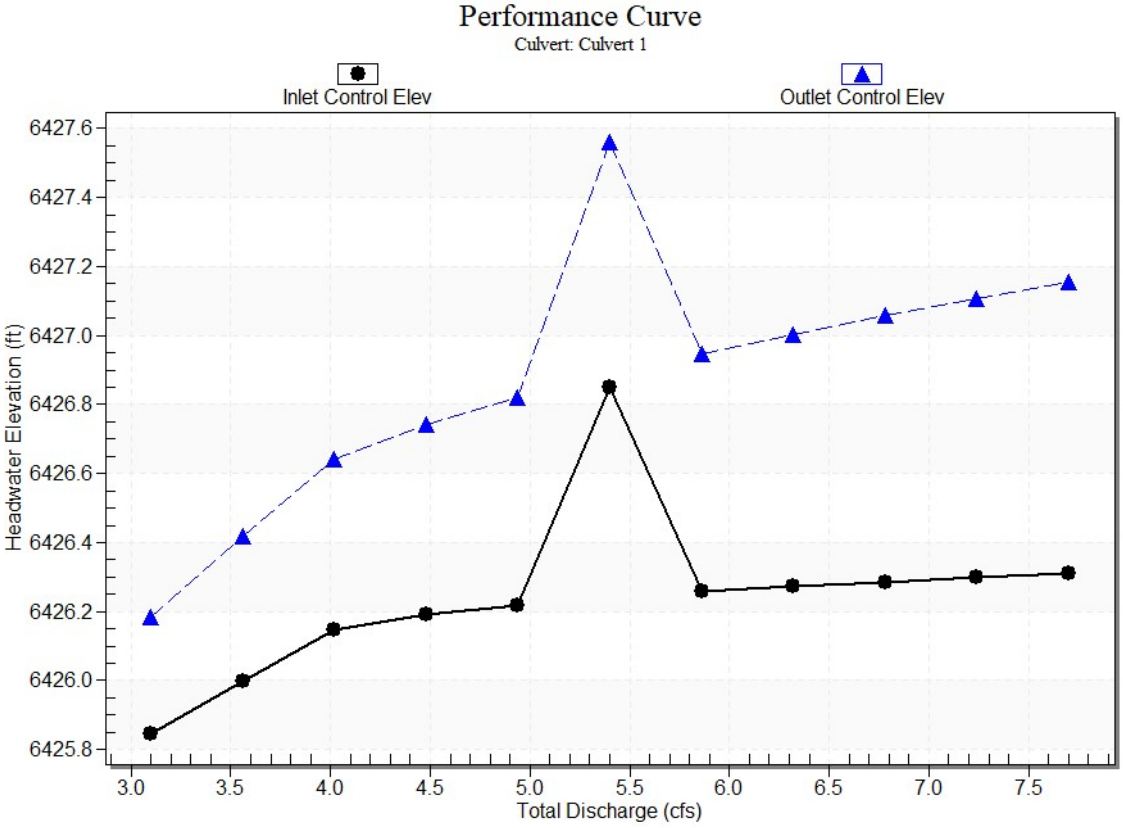
Table 2 - Culvert Summary Table: Culvert 1

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	HW / D (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
3.10	3.10	6426.18	1.18	1.524	1.52	4-FFf	1.00	0.75	1.00	1.09	3.95	0.87
3.56	3.56	6426.42	1.34	1.759	1.76	4-FFf	1.00	0.81	1.00	1.15	4.53	0.90
4.02	3.95	6426.64	1.49	1.982	1.98	4-FFf	1.00	0.84	1.00	1.20	5.03	0.93
4.48	4.06	6426.74	1.53	2.081	2.08	4-FFf	1.00	0.85	1.00	1.25	5.17	0.95
4.94	4.12	6426.82	1.56	2.159	2.16	4-FFf	1.00	0.86	1.00	1.30	5.25	0.98
5.40	4.17	6427.56	2.19	2.902	2.90	4-FFf	1.00	0.94	1.00	1.34	6.88	1.00
5.86	4.21	6426.95	1.60	2.287	2.29	4-FFf	1.00	0.87	1.00	1.39	5.36	1.02
6.32	4.25	6427.00	1.61	2.344	2.34	4-FFf	1.00	0.87	1.00	1.42	5.41	1.04
6.78	4.28	6427.06	1.63	2.397	2.40	4-FFf	1.00	0.87	1.00	1.46	5.45	1.06
7.24	4.31	6427.11	1.64	2.447	2.45	4-FFf	1.00	0.87	1.00	1.50	5.48	1.07
7.70	4.33	6427.16	1.65	2.496	2.50	4-FFf	1.00	0.87	1.00	1.53	5.52	1.09
7.70	4.33	6427.16	1.65	2.496	2.50	4-FFf	1.00	0.87	1.00	1.53	5.52	1.09

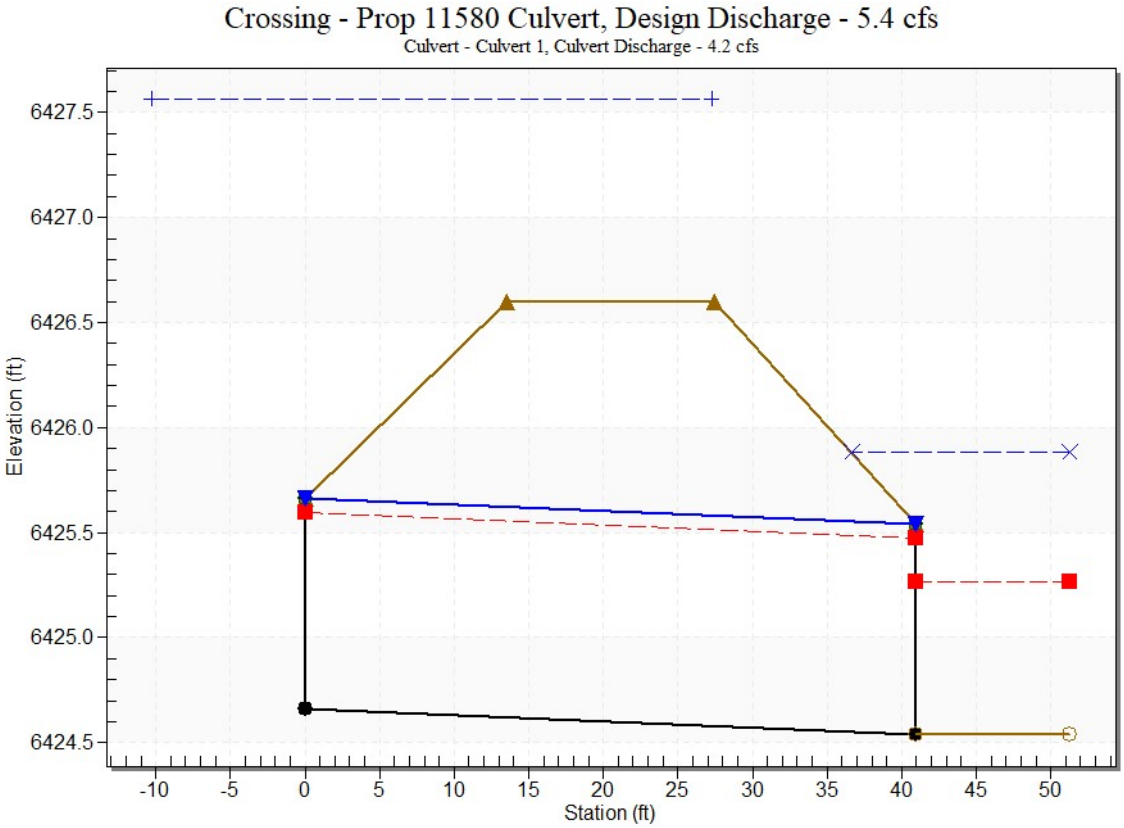
Culvert Barrel Data

Culvert Barrel Type: Straight Culvert
Inlet Elevation(invert): 6424.66 ft
Outlet Elevation (invert): 6424.54 ft
Culvert Length: 41.00 ft
Culvert Slope: 0.00 ft/ft

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 6424.66 ft
Outlet Station: 41.00 ft
Outlet Elevation: 6424.54 ft
Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Circular
Barrel Diameter: 1.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Grooved End Projecting (Ke=0.2)
Inlet Depression: None

Tailwater Channel Data for Crossing: Prop 11580 Culvert

Tailwater Channel Option: Triangular Channel
a_side Slope (H:V): 3.00 (_:1)
Channel Slope: 0.01 ft/ft
Channel Manning's n: 0.0780

Channel Invert Elevation: 6424.54 ft

Roadway Data for crossing: Prop 11580 Culvert

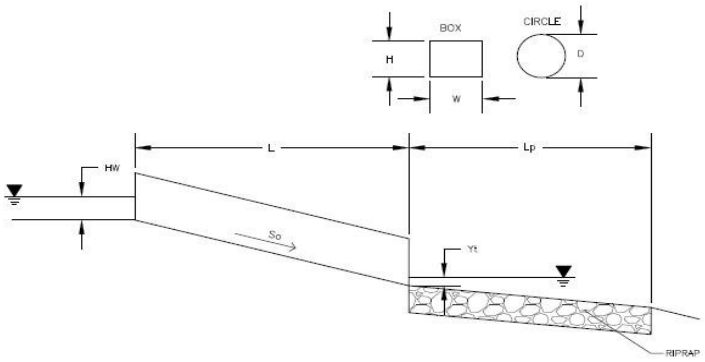
Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 41.00 ft
Crest Elevation: 6426.60 ft
Roadway Surface: Paved
Roadway Top Width: 14.00 ft

DETERMINATION OF CULVERT HEADWATER AND OUTLET PROTECTION

MHFD-Culvert, Version 4.00 (May 2020)

Project:

ID: Existing 36" CMP Culvert



Soil Type:
Choose One:
○ Sandy
◉ Non-Sandy

Supercritical Flow! Using Adjusted Diameter to calculate protection type.

Design Information:

Design Discharge	Q =	47.8	cfs
Circular Culvert:			
Barrel Diameter in Inches	D =	36	inches
Inlet Edge Type (Choose from pull-down list)		Square Edge with Headwall	
OR:			
Box Culvert:		**OR**	
Barrel Height (Rise) in Feet	H (Rise) =		ft
Barrel Width (Span) in Feet	W (Span) =		ft
Inlet Edge Type (Choose from pull-down list)			
Number of Barrels	# Barrels =	1	
Inlet Elevation	Elev IN =	6376.6	ft
Outlet Elevation **OR** Slope	Elev OUT =	6374.7	ft
Culvert Length	L =	32	ft
Manning's Roughness	n =	0.012	
Bend Loss Coefficient	k_b =	0	
Exit Loss Coefficient	k_x =	1	
Tailwater Surface Elevation	$Y_{t,\ Elevation}$ =		ft
Max Allowable Channel Velocity	V =	7	ft/s

Calculated Results:

Culvert Cross Sectional Area Available	A =	7.07	ft^2
Culvert Normal Depth	Y_n =	1.07	ft
Culvert Critical Depth	Y_c =	2.25	ft
Froude Number	Fr =	4.22	**Supercritical!**
Entrance Loss Coefficient	k_e =	0.50	
Friction Loss Coefficient	k_f =	0.20	
Sum of All Loss Coefficients	k_s =	1.70	ft
Headwater:			
Inlet Control Headwater	HW_I =	3.75	ft
Outlet Control Headwater	HW_O =	N/A	ft
Design Headwater Elevation	**HW =**	**6380.35**	**ft**
Headwater/Diameter OR Headwater/Rise Ratio	**HW/D =**	**1.25**	

Outlet Control Headwater Approximation Method Inaccurate for Low Flow - Backwater Calculations Required

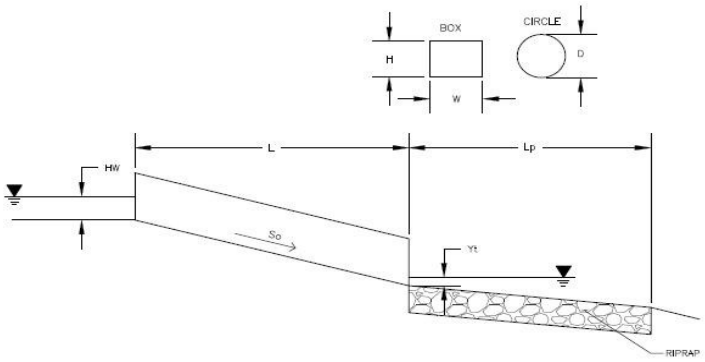
Outlet Protection:			
Flow/(Diameter^2.5)	Q/D^2.5 =	3.07	$ft^{0.5}/s$
Tailwater Surface Height	Y_t =	1.20	ft
Tailwater/Diameter	Yt/D =	0.40	
Expansion Factor	1/(2*tan(Θ)) =	4.32	
Flow Area at Max Channel Velocity	A_t =	6.83	ft^2
Width of Equivalent Conduit for Multiple Barrels	W_{eq} =	-	ft
Length of Riprap Protection	**L_p =**	**12**	**ft**
Width of Riprap Protection at Downstream End	**T =**	**6**	**ft**
Adjusted Diameter for Supercritical Flow	Da =	2.03	ft
Minimum Theoretical Riprap Size	d_{50} min=	9	in
Nominal Riprap Size	d_{50} nominal=	9	in
MHFD Riprap Type	**Type =**	**L**	

DETERMINATION OF CULVERT HEADWATER AND OUTLET PROTECTION

MHFD-Culvert, Version 4.00 (May 2020)

Project:

ID: Proposed Driveway Culvert



Soil Type:
Choose One:
- ○ Sandy
- ◉ Non-Sandy

Design Information:

Design Discharge	Q =	7.7	cfs
Circular Culvert:			
Barrel Diameter in Inches	D =	12	inches
Inlet Edge Type (Choose from pull-down list)		Square Edge with Headwall	
OR:			
Box Culvert:		**OR**	
Barrel Height (Rise) in Feet	H (Rise) =		ft
Barrel Width (Span) in Feet	W (Span) =		ft
Inlet Edge Type (Choose from pull-down list)			
Number of Barrels	# Barrels =	1	
Inlet Elevation	Elev IN =	6424.66	ft
Outlet Elevation **OR** Slope	Elev OUT =	6424.54	ft
Culvert Length	L =	41	ft
Manning's Roughness	n =	0.012	
Bend Loss Coefficient	k_b =	0	
Exit Loss Coefficient	k_x =	1	
Tailwater Surface Elevation	$Y_{t,\ Elevation}$ =		ft
Max Allowable Channel Velocity	V =	7	ft/s

Calculated Results:

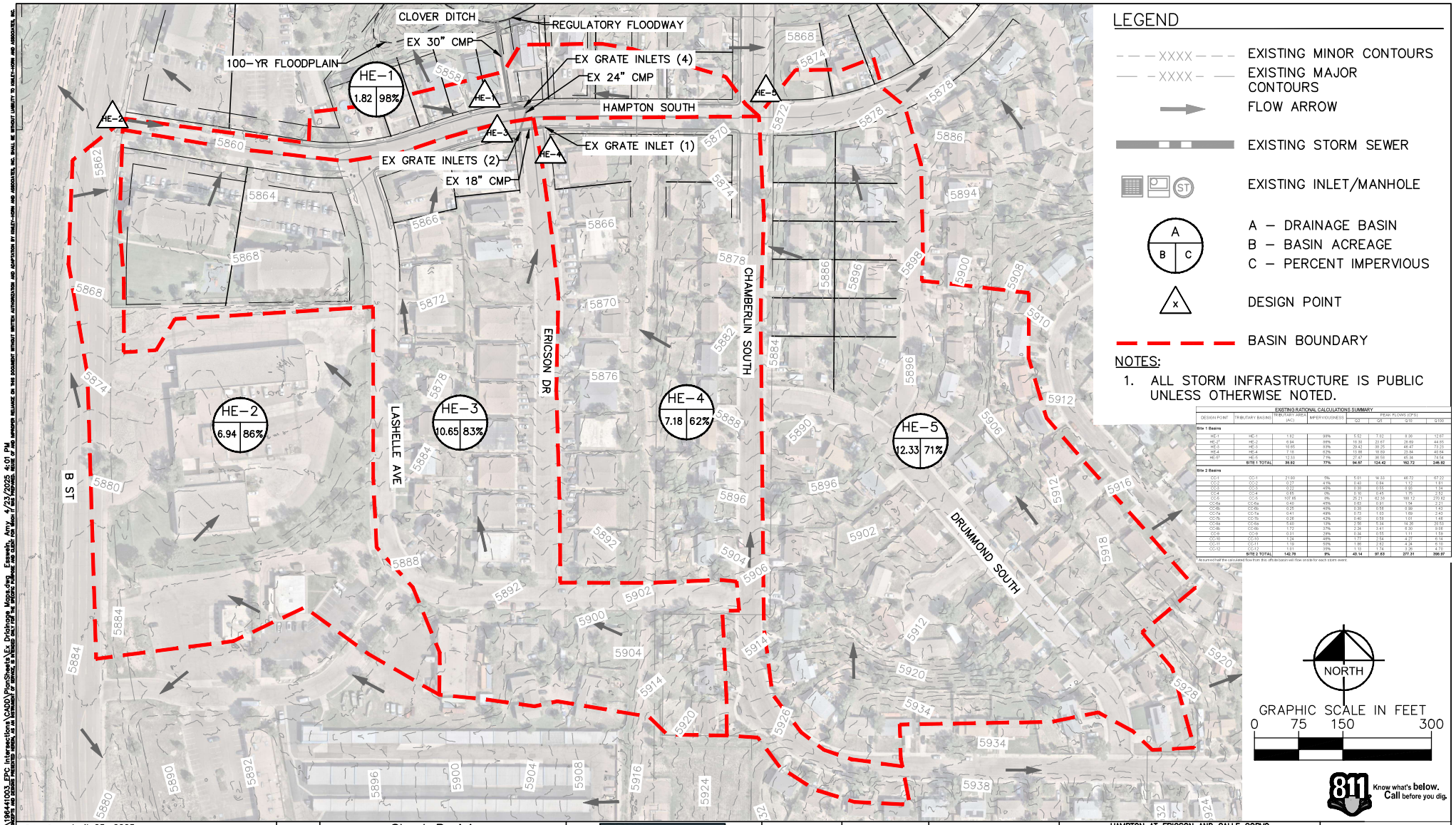
Culvert Cross Sectional Area Available	A =	0.79	ft^2
Culvert Normal Depth	Y_n =	1.00	ft
Culvert Critical Depth	Y_c =	0.98	ft
Froude Number	Fr =	-	**Pressure flow!**
Entrance Loss Coefficient	k_e =	0.50	
Friction Loss Coefficient	k_f =	1.09	
Sum of All Loss Coefficients	k_s =	2.59	ft
Headwater:			
Inlet Control Headwater	HW_I =	4.60	ft
Outlet Control Headwater	HW_O =	4.73	ft
Design Headwater Elevation	**HW =**	**6429.39**	**ft**
Headwater/Diameter OR Headwater/Rise Ratio	**HW/D =**	**4.73**	**HW/D > 1.5!**
Outlet Protection:			
Flow/(Diameter^2.5)	Q/D^2.5 =	7.70	$ft^{0.5}/s$
Tailwater Surface Height	Y_t =	0.40	ft
Tailwater/Diameter	Yt/D =	0.40	
Expansion Factor	1/(2*tan(Θ)) =	1.82	
Flow Area at Max Channel Velocity	A_t =	1.10	ft^2
Width of Equivalent Conduit for Multiple Barrels	W_{eq} =	-	ft
Length of Riprap Protection	**L_p =**	**4**	**ft**
Width of Riprap Protection at Downstream End	**T =**	**4**	**ft**
Adjusted Diameter for Supercritical Flow	Da =	-	ft
Minimum Theoretical Riprap Size	d_{50} min=	6	in
Nominal Riprap Size	d_{50} nominal=	9	in
MHFD Riprap Type	**Type =**	**L**	

APPENDIX D – ENGINEER'S OPINION OF PROBABLE COST

*all unit quantity costs are from 2024 CDOT Cost Data Book and were increased by 6.5% for inflation, if otherwise it is noted in assumption

	Bid Item No.	Bid Item Desc	Qty	Unit	Unit Cost	Unit Quantity + 6.5% (for inflation)	Extend Cost	Notes
Site 1 - Hampton/Ericson	100-00000	Mobilization	1	LS	$ 100,000.00	$ 106,500.00	$ 106,500.00	Includes mobilization for all of Site 1
	202-00200	Removal of Sidewalk	40	SY	$ 35.00	$ 37.28	$ 1,491.00	Removal of sidewalk
	202-00203	Removal of Curb and Gutter	65	LF	$ 20.00	$ 21.30	$ 1,384.50	Removal of curb and gutter along Hampton South and within the parking lot
	202-00210	Removal of Concrete Pavement	25	SY	$ 50.00	$ 53.25	$ 1,331.25	Removal of concrete for trash enclosure surface
	202-00220	Removal of Asphalt	40	SY	$ 15.00	$ 15.98	$ 639.00	Removal of asphalt in Hampton South and in the parking lot
	203-00000	Unclassified Excavation	30	CY	$ 50.00	$ 53.25	$ 1,597.50	Soil riprap-lined swale
	210-01000	Reset Fence	150	LF	$ 40.00	$ 42.60	$ 6,390.00	Fence adjacent to dumpster enclosure + fence along western edge of the proposed outfall swale and at the outfall
	212-00006	Seeding (native)	0.1	AC	$ 2,000.00	$ 2,130.00	$ 213.00	
	214-00201	Remove Tree (tubeling)	1	EA	$ 2,000.00	$ 2,130.00	$ 2,130.00	Includes removal of existing trees and planting of new tree
	304-06007	Aggregate Base Course (Class 6)	77	CY	$ 70.00	$ 74.55	$ 5,743.11	Swale subgrade (0.5' depth) & asphalt subgrade
	403-34722	Hot Mix Asphalt (Grading SX) (75) (PG 58-28)	120	SY	$ 50.00	$ 53.25	$ 6,390.00	Asphalt replacement on Hampton South and in the parking lot; Estimate based on CDOT 2025 FAE Form
	412-00600	Concrete Pavement (6 Inch)	65	SY	$ 150.00	$ 159.75	$ 10,383.75	Curb chase and trash enclosure
	506-00224	Riprap (24 Inch)	3	CY	$ 300.00	$ 319.50	$ 946.67	Riprap to tie into existing riprap at outfall. Assumed 1-ft thick
	506-00409	Soil Riprap (9-inch)	120	CY	$ 200.00	$ 213.00	$ 25,560.00	Swale lining (1.5' depth)
	603-01485	48-inch Reinforced Concrete Pipe (CIP)	119	LF	$ 1,000.00	$ 1,065.00	$ 126,735.00	
	603-05048	48" Flared End Section (RCP)	1	EA	$ 8,500.00	$ 9,052.50	$ 9,052.50	
	604-19000	Inlet Special (Type R 25 Foot)	1	EA	$ 30,000.00	$ 31,950.00	$ 31,950.00	Custom double-sided inlet
	608-00005	Concrete Sidewalk (Special)	20	SY	$ 180.00	$ 191.70	$ 3,834.00	Sidewalk replacement + 10-ft transitions
	609-21010	Curb and Gutter Type 2 (Section I-B)	15	LF	$ 50.00	$ 53.25	$ 798.75	Curb and gutter replacement within parking lot
	609-21900	Curb and Gutter Type 2 (Special)	45	LF	$ 100.00	$ 106.50	$ 4,792.50	Curb and gutter replacement + 10-ft transitions on either side along Hampton South
	625-99999	As-Built Surveying	1	LS	$ 15,000.00	$ 15,975.00	$ 15,975.00	
	630-00016	Traffic Control	1	LS	-	-	$ 34,790.00	10% of construction costs
	700-70310	F/A Landcape Removal and Restoration	1	F/A	-	-	$ 10,000.00	
	700-70530	F/A Drainage Improvement	1	F/A	-	-	$ 40,000.00	10% of sub-total; for unknowns related to the existing pipes to tie into the proposed double-sided linlet
	700-70380	F/A Erosion Control	1	F/A	-	-	$ 40,000.00	10% of sub-total
	Sub-Total		-	-	-		$ 398,700.00	
	Contingency		-	-	-		$ 40,000.00	10% of sub-total
		Site 1 Total	-	-	-		**$ 528,700.00**	
	Bid Alternative #1							
	412-00600	Concrete Pavement (6 Inch)	80	SY	$ 150.00	$ 159.75	$ 12,780.00	Bid alt #1 for parking lot asphalt replacement
		Bid Alternative #1 Site 1 Total	-	-	-		**$ 539,620.00**	
Site 2- Calle Corvo	100-00000	Mobilization	1	LS	$ 50,000.00	$ 53,250.00	$ 53,250.00	Includes mobilization for all of Site 2
	202-00035	Removal of Pipe	2	LF	$ 75.00	$ 79.88	$ 159.75	Partial Removal of Ex. 36" CMP Culvert for headwall/wingwall installation
	202-00220	Removal of Asphalt	76	CY	$ 15.00	$ 15.98	$ 1,214.10	Removal of driveway asphalt
	203-00000	Unclassified Excavation	20	CY	$ 50.00	$ 53.25	$ 1,065.00	Driveway culvert + outfall
	210-00010	Reset Mailbox Structure	2	EA	$ 1,000.00	$ 1,065.00	$ 2,130.00	
	210-01000	Reset Fence and Gate	120	LF	$ 50.00	$ 53.25	$ 6,390.00	Reset fence and gate on either side of the driveway at 11580 Calle Corvo
	212-00006	Seeding (native)	0.1	AC	$ 2,000.00	$ 2,130.00	$ 213.00	
	304-06007	Aggregate Base Course (Class 6)	13	CY	$ 70.00	$ 74.55	$ 951.20	Riprap pad subgrade (0.5' depth) & asphalt subgrade
	403-34722	Hot Mix Asphalt (Grading SX) (75) (PG 58-28)	75	SY	$ 50.00	$ 53.25	$ 3,993.75	Replace driveway asphalt
	506-00030	Grouted Riprap (18 Inch)	7	CY	$ 450.00	$ 479.25	$ 3,354.75	Grouted riprap pad at outfall
	506-00409	Soil Riprap (9-inch)	1	CY	$ 200.00	$ 213.00	$ 213.00	Driveway culvert outlet protection (1.5' depth)
	603-01125	12-inch Reinforced Concrete Pipe (CIP)	41	LF	$ 200.00	$ 213.00	$ 8,733.00	
	603-77001	Culvert Headwall (3-Sided Culvert)(Type 1)	230	SF	$ 220.00	$ 234.30	$ 53,889.00	Headwall/wingwall
	625-99999	As-Built Surveying	1	LS	$ 15,000.00	$ 15,975.00	$ 15,975.00	
	630-00016	Traffic Control	1	LS	-	-	$ 8,170.00	10% of construction costs
	700-70310	F/A Landcape Removal and Restoration	1	F/A	-	-	$ 5,000.00	
	700-70380	F/A Erosion Control	1	F/A	-	-	$ 16,000.00	10% of sub-total
	Sub-Total		-	-	-		$ 159,800.00	
	Contingency		-	-	-		$ 16,000.00	10% of sub-total
		Site 2 Total	-	-	-		**$ 196,800.00**	
		Project Total	-	-	-		**$ 725,500.00**	

APPENDIX E – DRAINAGE MAPS



EXISTING RATIONAL CALCULATIONS SUMMARY

DESIGN POINT	TRIBUTARY BASINS	TRIBUTARY AREA (AC)	IMPERVIOUSNESS	PEAK FLOWS (CFS) Q2	Q5	Q10	Q100
Site 1 Basins							
HE-1	HE-1	1.82	98%	5.92	7.62	8.98	12.67
HE-2*	HE-2	6.94	98%	16.58	22.67	29.99	44.66
HE-3	HE-3	10.65	83%	20.42	30.25	46.47	73.23
HE-4	HE-4	7.18	62%	13.98	20.69	33.94	60.64
HE-5*	HE-5	12.33	71%	27.47	39.55	60.34	94.54
	SITE 1 TOTAL	39.92	77%	94.97	124.42	192.72	246.92
Site 2 Basins							
CC-1	CC-1	21.80	5%	5.01	14.33	48.72	87.22
CC-2	CC-2	0.21	61%	0.49	0.64	1.12	1.81
CC-3	CC-3	0.22	49%	0.39	0.55	0.99	1.84
CC-4	CC-4	0.65	9%	0.30	0.85	1.75	2.82
CC-5	CC-5	107.65	9%	25.31	62.39	188.12	270.62
CC-6a	CC-6a	0.46	49%	0.83	1.31	1.94	2.51
CC-6b	CC-6b	0.25	49%	0.39	0.51	0.99	1.43
CC-7a	CC-7a	0.41	49%	0.73	1.15	1.80	2.43
CC-7b	CC-7b	0.49	49%	0.40	1.16	1.01	1.46
CC-8a	CC-8a	5.49	19%	2.36	5.24	14.26	20.53
CC-8b	CC-8b	1.77	37%	2.34	3.41	6.01	9.66
CC-9	CC-9	0.21	29%	0.34	0.55	1.11	1.59
CC-10	CC-10	1.24	49%	1.97	2.94	4.24	6.14
CC-11	CC-11	1.19	99%	1.86	2.82	4.24	6.10
CC-12	CC-12	0.81	39%	1.10	1.74	2.46	3.72
	SITE 2 TOTAL	142.79	9%	45.14	97.83	277.31	396.97

*Assumed half the calculated flow from this offsite basin will flow onsite for each storm event.

811 Know what's below. Call before you dig.

Print Date: April 23, 2025	Sheet Revisions		
Drawing File Name:	Date:	Comments:	Init.
	R-X		
	R-X		
	R-X		
	R-X		

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KIMLEY-HORN AND ASSOCIATES, INC.
2 NORTH NEVADA AVE., SUITE 900
COLORADO SPRINGS, COLORADO 80903
(719) 453-0180

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DEPARTMENT OF PUBLIC WORKS
3275 AKERS DRIVE, COLROADO SPRINGS, CO 80922
PHONE: (719) 520-6460

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FINAL DESIGN
No Revisions:
Revised:
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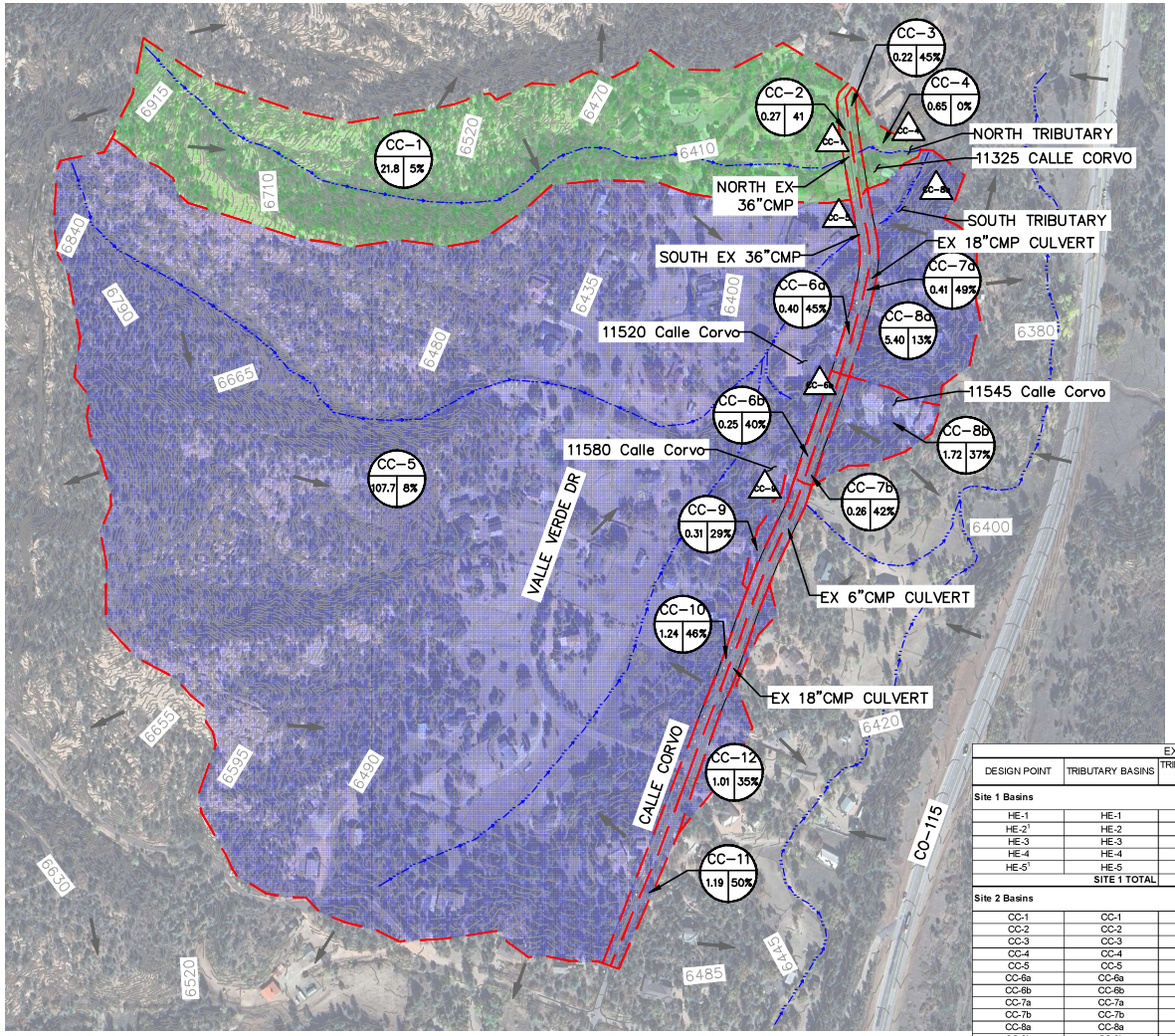
HAMPTON AT ERICSON AND CALLE CORVO
DRAINAGE IMPROVEMENTS
COUNTY OF EL PASO, COLORADO
EXISTING DRAINAGE MAP – HAMPTON AT ERICSON

Designer: HMM
Detailer: AME
Sheet Subset:
Subset Sheet: of

Project No./Code
PROJECT NO
196441003
Sheet Number 1



LEGEND

- EXISTING MINOR CONTOURS
- EXISTING MAJOR CONTOURS
- FLOW ARROW
- A – DRAINAGE BASIN
  B – BASIN ACREAGE
  C – PERCENT IMPERVIOUS
- DESIGN POINT
- BASIN BOUNDARY
- AREA TRIBUTARY TO THE NORTH TRIBUTARY
- AREA TRIBUTARY TO THE SOUTH TRIBUTARY
- EXISTING PRIMARY FLOW PATHS

NOTES:

1. ALL STORM INFRASTRUCTURE IS PUBLIC UNLESS OTHERWISE NOTED.

EXISTING RATIONAL CALCULATIONS SUMMARY

DESIGN POINT	TRIBUTARY BASINS	TRIBUTARY AREA (AC)	IMPERVIOUSNESS	PEAK FLOWS (CFS) Q2	Q5	Q10	Q100
Site 1 Basins							
HE-1	HE-1	1.82	98%	5.52	7.02	8.38	12.67
HE-2[1]	HE-2	6.94	86%	18.30	23.67	28.69	44.85
HE-3	HE-3	10.65	83%	29.42	38.25	46.47	73.23
HE-4	HE-4	7.18	62%	13.86	18.89	23.84	40.64
HE-5[1]	HE-5	12.33	71%	27.47	36.58	45.34	74.54
	SITE 1 TOTAL	**38.92**	**77%**	**94.57**	**124.42**	**152.72**	**245.92**
Site 2 Basins							
CC-1	CC-1	21.80	5%	5.01	14.33	46.72	67.22
CC-2	CC-2	0.27	41%	0.43	0.64	1.12	1.61
CC-3	CC-3	0.22	45%	0.38	0.55	0.93	1.34
CC-4	CC-4	0.65	0%	0.10	0.45	1.75	2.52
CC-5	CC-5	107.65	8%	25.21	62.38	188.12	270.62
CC-6a	CC-6a	0.40	45%	0.63	0.91	1.54	2.21
CC-6b	CC-6b	0.25	40%	0.38	0.56	0.99	1.43
CC-7a	CC-7a	0.41	49%	0.73	1.03	1.69	2.43
CC-7b	CC-7b	0.26	42%	0.40	0.58	1.01	1.46
CC-8a	CC-8a	5.40	13%	2.56	5.34	14.26	20.53
CC-8b	CC-8b	1.72	37%	2.24	3.41	6.30	9.06
CC-9	CC-9	0.31	29%	0.34	0.55	1.11	1.59
CC-10	CC-10	1.24	46%	1.77	2.54	4.27	6.14
CC-11	CC-11	1.19	50%	1.86	2.62	4.24	6.10
CC-12	CC-12	1.01	35%	1.13	1.74	3.26	4.70
	SITE 2 TOTAL	**142.78**	**9%**	**43.14**	**97.63**	**277.31**	**398.97**

[1] Assumed half the calculated flow from this offsite basin will flow onsite for each storm event.

NORTH

GRAPHIC SCALE IN FEET
0 200 400 800

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Print Date: April 23, 2025
Drawing File Name:

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COLORADO SPRINGS, COLORADO 80903
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	Sheet Revisions		
	Date:	Comments:	Init.
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DEPARTMENT OF PUBLIC WORKS
3275 AKERS DRIVE, COLROADO SPRINGS, CO 80922
PHONE: (719) 520-6460

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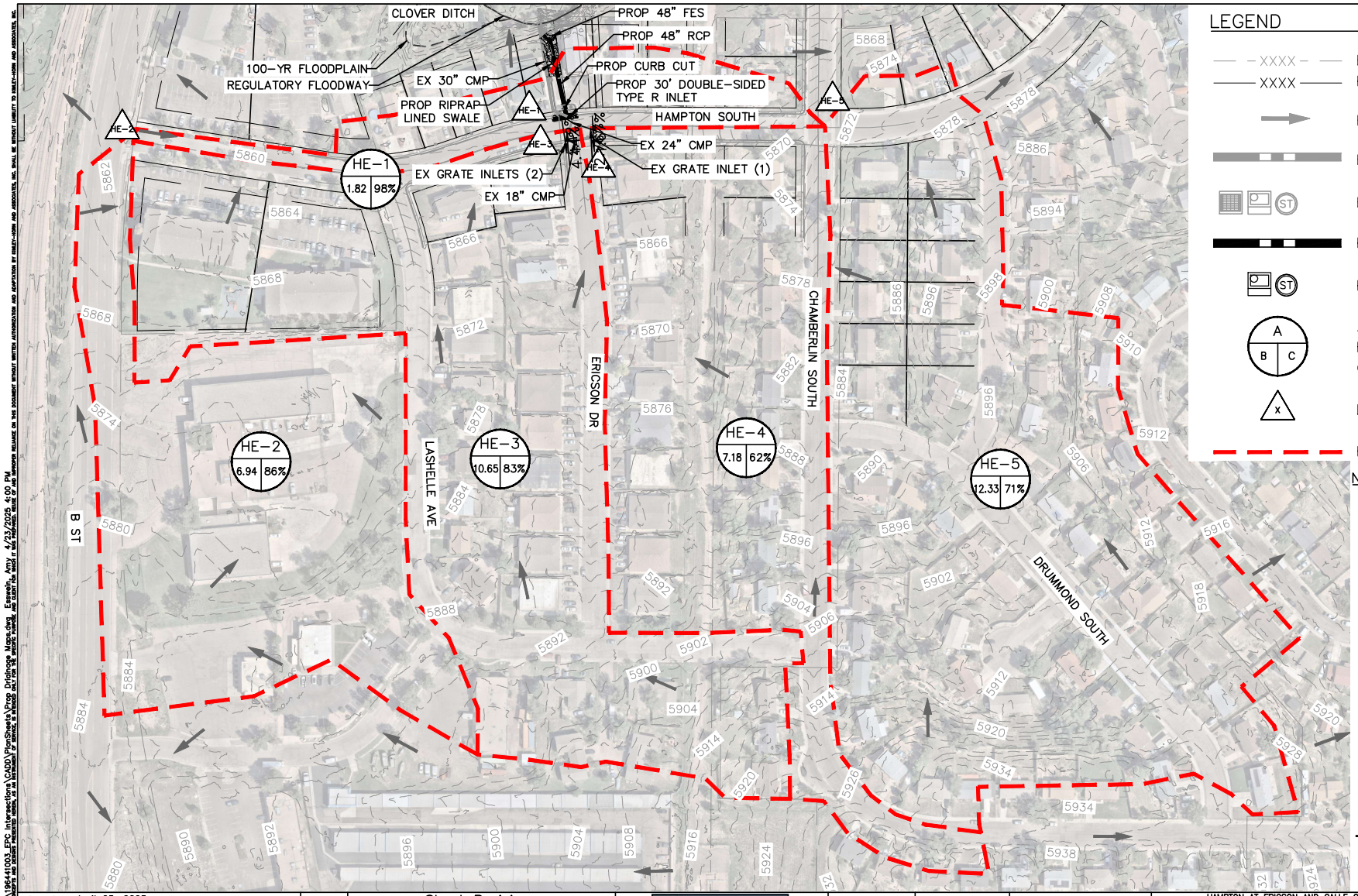
HAMPTON AT ERICSON AND CALLE CORVO
DRAINAGE IMPROVEMENTS
COUNTY OF EL PASO, COLORADO
EXISTING DRAINAGE MAP – CALLE CORVO

Designer: HMM
Detailer: AME
Sheet Subset:
Subset Sheet: of

Project No./Code
PROJECT NO
196441003
Sheet Number 2



LEGEND

- EXISTING CONTOURS
- PROPOSED CONTOURS
- FLOW ARROW
- EXISTING STORM SEWER
- EXISTING INLET/MANHOLE
- PROPOSED STORM SEWER
- PROPOSED INLET/MANHOLE
- A – DRAINAGE BASIN
  B – BASIN ACREAGE
  C – PERCENT IMPERVIOUS
- DESIGN POINT
- BASIN BOUNDARY

NOTES:

1. ALL STORM INFRASTRUCTURE IS PUBLIC UNLESS OTHERWISE NOTED.
2. ALL DISTURBANCE IS LOCATED WITHIN THE PUBLIC RIGHT-OF-WAY AND PUBLIC DRAINAGE EASEMENTS.
3. ALL DISTURBANCE IS TO REMAIN OUTSIDE OF THE REGULATORY FLOODWAY.

GRAPHIC SCALE IN FEET
0 75 150 300

NORTH

811 Know what's below. Call before you dig.

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Print Date: April 23, 2025
Drawing File Name:

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COLORADO SPRINGS, COLORADO 80903
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Sheet Revisions			
	Date:	Comments:	Init.
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PHONE: (719) 520-6460

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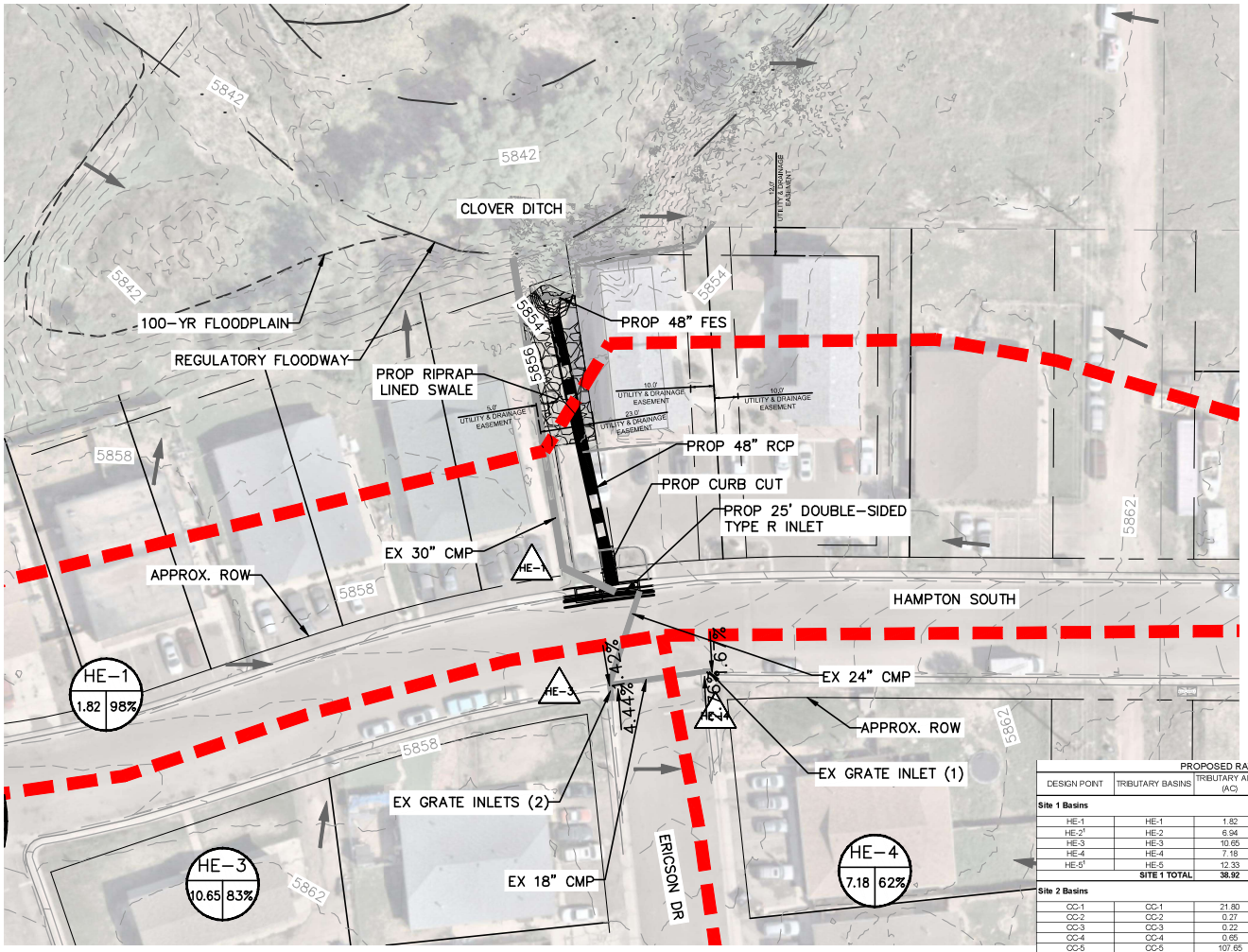
FINAL DESIGN
No Revisions:
Revised:
Void:

HAMPTON AT ERICSON AND CALLE CORVO
DRAINAGE IMPROVEMENTS
COUNTY OF EL PASO, COLORADO
PROPOSED DRAINAGE MAP OVERVIEW – HAMPTON AT ERICSON

Designer: HMM
Detailer: AME
Sheet Subset:
Subset Sheet: of

Project No./Code
PROJECT NO
196441003
Sheet Number 3



LEGEND

- EXISTING CONTOURS
- PROPOSED CONTOURS
- FLOW ARROW
- EXISTING STORM SEWER
- EXISTING INLET/MANHOLE
- PROPOSED STORM SEWER
- PROPOSED INLET/MANHOLE
- A – DRAINAGE BASIN
  B – BASIN ACREAGE
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- DESIGN POINT
- BASIN BOUNDARY

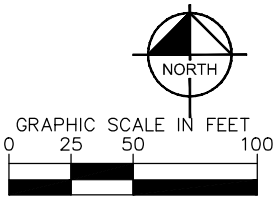
NOTES:

1. ALL STORM INFRASTRUCTURE IS PUBLIC UNLESS OTHERWISE NOTED.
2. ALL DISTURBANCE IS LOCATED WITHIN THE PUBLIC RIGHT-OF-WAY AND PUBLIC DRAINAGE EASEMENTS.
3. ALL DISTURBANCE IS TO REMAIN OUTSIDE OF THE REGULATORY FLOODWAY.

PROPOSED RATIONAL CALCULATIONS SUMMARY

DESIGN POINT	TRIBUTARY BASINS	TRIBUTARY AREA (AC)	IMPERVIOUSNESS	PEAK FLOWS (CFS) Q2	Q5	Q10	Q100
Site 1 Basins							
HE-1	HE-1	1.82	98%	5.52	7.02	8.38	12.67
HE-2†	HE-2	6.94	86%	18.30	23.67	28.69	44.85
HE-3	HE-3	10.65	83%	29.42	38.25	46.47	73.23
HE-4	HE-4	7.18	62%	13.86	18.89	23.94	40.64
HE-5†	HE-5	12.33	71%	27.47	36.58	45.34	74.54
	SITE 1 TOTAL	**38.92**	**77%**	**94.57**	**124.42**	**152.72**	**245.92**
Site 2 Basins							
CC-1	CC-1	21.80	5%	5.01	14.33	46.72	67.22
CC-2	CC-2	0.27	41%	0.43	0.64	1.12	1.61
CC-3	CC-3	0.22	45%	0.38	0.55	0.93	1.34
CC-4	CC-4	0.65	0%	0.10	0.45	1.75	2.52
CC-5	CC-5	107.65	8%	26.21	62.38	188.12	270.62
CC-6a	CC-6a	0.40	45%	0.63	0.91	1.54	2.21
CC-6b	CC-6b	0.25	40%	0.38	0.56	0.99	1.43
CC-7a	CC-7a	0.41	49%	0.73	1.03	1.69	2.43
CC-7b	CC-7b	0.26	42%	0.40	0.58	1.01	1.46
CC-8a	CC-8a	5.40	13%	2.56	5.34	14.26	20.53
CC-8b	CC-8b	1.72	37%	2.24	3.41	6.30	9.06
CC-9	CC-9	0.31	29%	0.34	0.55	1.11	1.59
CC-10	CC-10	1.24	46%	1.77	2.54	4.27	6.14
CC-11	CC-11	1.19	50%	1.86	2.62	4.24	6.10
CC-12	CC-12	1.01	35%	1.13	1.74	3.26	4.70
	SITE 2 TOTAL	**142.78**	**9%**	**43.14**	**97.63**	**277.31**	**398.97**

† Assumed half the calculated flow from this offsite basin will flow onsite for each storm event.



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Print Date: April 23, 2025
Drawing File Name:

Kimley»Horn
KIMLEY-HORN AND ASSOCIATES, INC.
2 NORTH NEVADA AVE., SUITE 900
COLORADO SPRINGS, COLORADO 80903
(719) 453-0180

	Sheet Revisions		
	Date:	Comments:	Init.
R-X			
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R-X			
R-X			

El Paso County COLORADO
DEPARTMENT OF PUBLIC WORKS
3275 AKERS DRIVE, COLROADO SPRINGS, CO 80922
PHONE: (719) 520-6460

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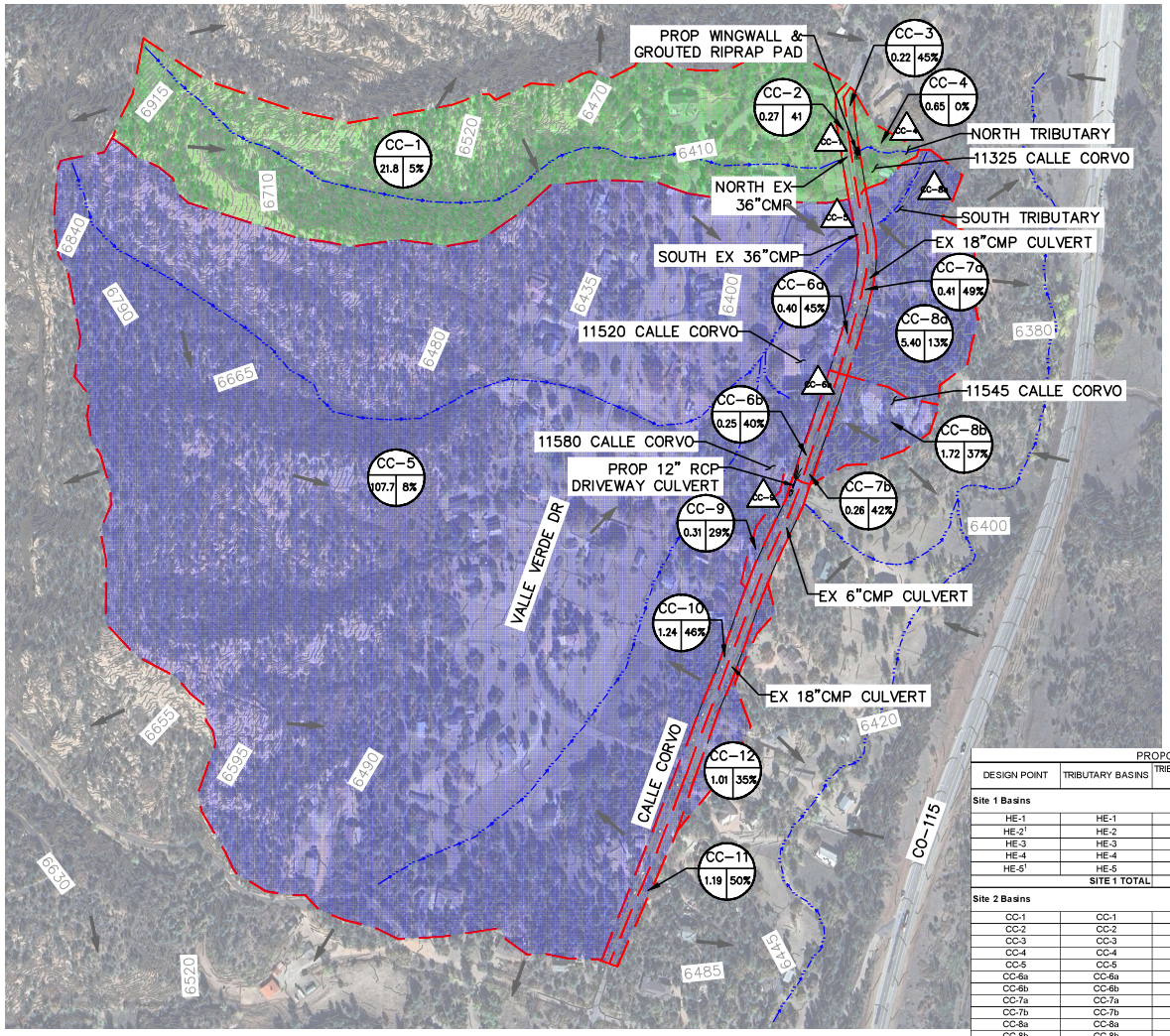
FINAL DESIGN
No Revisions:
Revised:
Void:

HAMPTON AT ERICSON AND CALLE CORVO DRAINAGE IMPROVEMENTS
COUNTY OF EL PASO, COLORADO
PROPOSED DRAINAGE MAP – HAMPTON AT ERICSON

Designer: HMM
Detailer: AME
Sheet Subset:
Subset Sheet: of

Project No./Code
PROJECT NO
196441003
Sheet Number 4



LEGEND

- EXISTING CONTOURS
- PROPOSED CONTOURS
- FLOW ARROW
- EXISTING STORM SEWER
- EXISTING INLET/MANHOLE
- PROPOSED STORM SEWER
- PROPOSED INLET/MANHOLE
- A – DRAINAGE BASIN
  B – BASIN ACREAGE
  C – PERCENT IMPERVIOUS
- DESIGN POINT
- BASIN BOUNDARY
- AREA TRIBUTARY TO THE NORTH TRIBUTARY
- AREA TRIBUTARY TO THE SOUTH TRIBUTARY
- EXISTING PRIMARY FLOW PATHS

PROPOSED RATIONAL CALCULATIONS SUMMARY

DESIGN POINT	TRIBUTARY BASINS	TRIBUTARY AREA (AC)	IMPERVIOUSNESS	PEAK FLOWS (CFS) Q2	Q5	Q10	Q100
Site 1 Basins							
HE-1	HE-1	1.82	98%	5.52	7.02	8.38	12.67
HE-2[1]	HE-2	6.94	86%	18.30	23.67	28.69	44.85
HE-3	HE-3	10.65	83%	29.42	38.25	46.47	73.23
HE-4	HE-4	7.18	62%	13.86	18.89	23.84	40.64
HE-5[1]	HE-5	12.33	71%	27.47	36.58	45.34	74.54
	SITE 1 TOTAL	**38.92**	**77%**	**94.57**	**124.42**	**152.72**	**245.92**
Site 2 Basins							
CC-1	CC-1	21.80	5%	5.01	14.33	46.72	67.22
CC-2	CC-2	0.27	41%	0.43	0.64	1.12	1.61
CC-3	CC-3	0.22	45%	0.38	0.55	0.93	1.34
CC-4	CC-4	0.65	0%	0.10	0.45	1.75	2.52
CC-5	CC-5	107.65	8%	25.21	62.38	188.12	270.62
CC-6a	CC-6a	0.40	45%	0.63	0.91	1.54	2.21
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CC-11	CC-11	1.19	50%	1.86	2.62	4.24	6.10
CC-12	CC-12	1.01	35%	1.13	1.74	3.26	4.70
	SITE 2 TOTAL	**142.78**	**9%**	**43.14**	**97.63**	**277.31**	**398.97**

[1] Assumed half the calculated flow from this offsite basin will flow onsite for each storm event.

NOTES:

1. ALL STORM INFRASTRUCTURE IS PUBLIC UNLESS OTHERWISE NOTED.
2. ALL DISTURBANCE IS LOCATED WITHIN THE PUBLIC RIGHT-OF-WAY AND PUBLIC DRAINAGE EASEMENTS.

GRAPHIC SCALE IN FEET
0 200 400 800

NORTH

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COLORADO SPRINGS, COLORADO 80903
(719) 453-0180

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PHONE: (719) 520-6460

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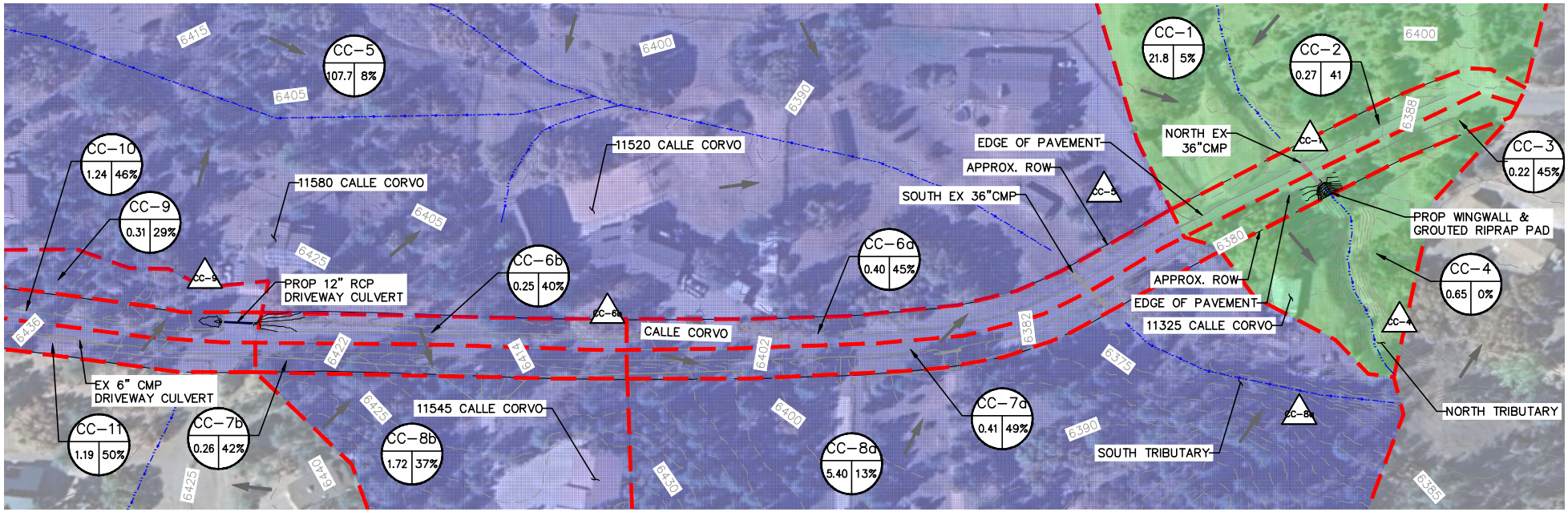
HAMPTON AT ERICSON AND CALLE CORVO DRAINAGE IMPROVEMENTS
COUNTY OF EL PASO, COLORADO
PROPOSED DRAINAGE MAP OVERVIEW – CALLE CORVO

Designer: HMM
Detailer: AME
Sheet Subset:
Subset Sheet: of

Project No./Code
PROJECT NO
196441003
Sheet Number 5



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NORTH

GRAPHIC SCALE IN FEET
0 50 100 200

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HAMPTON AT ERICSON AND CALLE CORVO
DRAINAGE IMPROVEMENTS
COUNTY OF EL PASO, COLORADO
PROPOSED DRAINAGE MAP – CALLE CORVO

Designer: HMM
Detailer: AME
Sheet Subset:
Subset Sheet: of

Project No./Code
PROJECT NO
196441003
Sheet Number 6

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K:\COS_WaterResources\196441003_EPC Intersections\CADD\PlanSheets\Prop Drainage Maps.dwg Easwein, Amy 4/23/2025 4:00 PM
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