Final Drainage Report

Citizen on Constitution
El Paso County, Colorado

Prepared for:

The Citizen on Constitution, LLC
c/o: The Garrett Companies, Inc.
Andrew White
1051 Greenwood Springs Blvd,
Suite 101
Greenwood, IN 46143
Contact: (317) 497-8275

Prepared by:

Kimley-Horn and Associates, Inc.
4582 South Ulster Street, Suite 1500
Denver, Colorado 80237
(303) 228-2300
Contact: Mitchell Hess, P.E.

Project #: 096481004

Prepared: December 6th, 2022

PCD File Number: SF-226 & PPR-2229

Kimley»Horn

CERTIFICATION

DESIGN ENGINEER'S STATEMENT

The attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by the County for drainage reports and said report is in conformity with the master plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparation of this report.

SIGNATURE (Affix Seal): ______________________________
Colorado P.E. No. 53916

COLORADO LICENSED PROFESSIONAL ENGINEER
53916
12/06/2022

OWNER/DEVELOPER'S STATEMENT

I, the developer, have read and will comply with all of the requirements specified in this Drainage Report and Plan.

The Citizen on Constitution, LLC.
Name of Developer

______________________________ 12.8.22
Authorized Signature Date

Karl Stout
Printed Name

Director of Civil Engineering
Title

1051 Greenwood Springs Blvd. Greenwood, IN 46143
Address:

EL PASO COUNTY

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

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

Conditions:

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INTRODUCTION

PURPOSE AND SCOPE OF STUDY

The purpose of this Final Drainage Report (FDR) is to provide the hydrologic and hydraulic calculations and to document and finalize the drainage design methodology in support of the proposed Tracts M & N of Urban Collection at Palmer Village Filing No. 2 (the "Site") for The Citizen on Constitution, LLC (the "Project"). The Project is located within the jurisdictional limits of El Paso County (the "County"). Thus, the guidelines for the hydrologic and hydraulic design components were based on the criteria for the County and City of Colorado Springs, described below.

LOCATION

The two parcels totaling 12.26-acres (TSN: 54051-04-075 & 54051-04-074) are located at the southwest corner of the Marksheffel Road and Constitution Avenue intersections. A vicinity map has been provided in the **Appendix A** of this report.

DESCRIPTION OF PROPERTY

The Project is located on approximately 12.26 acres of land consisting of vacant land with native vegetation and is classified as "Undeveloped" per Table 6-6 of the City of Colorado Springs Drainage Criteria Manual. The Project consists of 2 multi-family buildings, 3 detached garage buildings, and a clubhouse amenity space with a pool deck. The Site does not currently provide water quality or detention for the Project area. The existing land use is undeveloped vacant land.

The existing topography consists of slopes ranging from 1% to 35% and generally slopes from North to South.

NRCS soil data is available for this Site and it has been noted that soils onsite are generally USCS Type A/B. The NRCS soil data can be found in **Appendix B**. There is an existing twin 12-foot by 6-foot concrete box culvert which flows from the north side of Constitution Avenue (Hannah Ridge) to the south side where it transitions to a twin 10-foot by 6-foot box culvert before crossing the project site and discharging into an existing gulch near the southwest corner of the Site which contributes to East Fork Sand Creek.

Improvements will consist of mowing, clearing and grubbing, weed control, paved access road construction, roadway grading, a detention pond, culverts, drainage swales, and native seeding.

An updated Topographic field survey was completed for the Project by Barren Land, LLC. dated October 11, 2021 and is the basis for design for the drainage improvements.

DRAINAGE BASINS

MAJOR BASIN DESCRIPTIONS

The Site improvements are located in Zone X, as determined by the Flood Insurance Rate Map (FIRM) number 08041C0756G effective date, December 7, 2018 (see **Appendix A**).

The Project is located within El Paso County's Sand Creek Drainage Basin.

EXISTING SUB-BASIN DESCRIPTIONS

Site runoff flows from north to south via sheet flow over vacant land to adjacent southern property owners and eventually to the gulch to the southwest that eventually contributes to the East Fork Sand Creek. Below is a description of the existing onsite sub-basin.

Sub-Basin EX1

Sub-Basin EX1 consists of the western half of the multi-family development. Drainage flows overland from north to south and conveys along the southern boundary to the west at Design Point EX1. Runoff during the 5-year and 100-year events are 1.38 cfs and 9.24 cfs, respectively. Cumulative flows from this basin, including the flows from Sub-Basin OS1 and OS2, are 5.35 and 16.90 cfs, respectively. Runoff from this basin is currently directed to design point EX1 where it will drain into the existing gulch to the southwest that runs to the south eventually contributing to the East Fork Sand Creek. This sub-basin has an area of 4.05 acres. The impervious value for this basin is 2%. Refer to **Appendix D** for the Existing Conditions Drainage Map.

Sub-Basin EX2

Sub-Basin EX2 consists of the eastern half of the multi-family development. Drainage flows overland from north to south and sheet flows off the site near Design Point EX2. Runoff during the 5-year and 100-year events are 2.80 cfs and 18.81 cfs, respectively. Cumulative flows from this basin, including the flows from Sub-Basin OS3 are 2.80 cfs and 18.81 cfs, respectively. Runoff from this basin is currently directed to design point EX2 where it will sheet flow to the southern adjacent properties currently owned by El Paso County Board of County Commissioners and Waste Connections of Colorado, Inc. This sub-basin has an area of 7.67 acres. The impervious value for this basin is 2%. Refer to **Appendix D** for the Existing Conditions Drainage Map.

Sub-Basin OS1

Sub-Basin OS1 consists of an offsite basin to the northwest of the Property. Drainage flows overland from north to south and conveys to the northern line of Sub-basin EX1 at Design Point OS1. Direct runoff during the 5-year and 100-year events are 0.09 cfs and 0.60 cfs, respectively. Runoff from this basin is currently directed to design point OS1 where it will drain into the Sub-basin EX1, which is on-site. This sub-basin has an area of 0.20 acres. The impervious value for this basin is 2%. Refer to **Appendix D** for the Existing Conditions Drainage Map.

Sub-Basin OS2

Sub-Basin OS2 consists of an offsite basin within Constitution Avenue north of the project site. Drainage is collected in a curb and gutter system and enters the site at the driveway cut to the site at Design Point OS2. Direct runoff during the 5-year and 100-year events are 3.89 cfs and 7.05 cfs, respectively. Runoff from this basin is currently directed to design point OS2 where it will drain into the Sub-basin OS1 and then Sub-basin EX1. This sub-basin has an area of 1.21 acres. The impervious value for this basin is 95%. Refer to **Appendix D** for the Existing

Conditions Drainage Map.

Sub-Basin OS3

Sub-Basin OS3 consists of an offsite basin to the northeast of the Property. Drainage flows overland from north to south and conveys to the northern line of Sub-basin EX2 at Design Point OS3. Direct runoff during the 5-year and 100-year events are 0.20 cfs and 1.33 cfs, respectively. Runoff from this basin is currently directed to design point OS3 where it will drain into the Sub-basin EX2, which is on-site. This sub-basin has an area of 0.46 acres. The impervious value for this basin is 2%. Refer to **Appendix D** for the Existing Conditions Drainage Map.

PROPOSED RATIONAL SUB-BASIN DESCRIPTIONS

Sub-Basin A1 consists of landscaping and a gravel emergency access road and is the westmost portion of the site which will have minimal grading to tie into the rest of the multi-family development on site. Runoff from this basin will be directed to design point A1 and will follow the historical drainage pattern by sheet flowing from north to south and eventually flowing to the existing gulch. This sub-basin has an area of 0.87 acres. The impervious value for this basin is 2%. The basin will generate runoff of 0.26 cfs and 1.92 cfs in the minor and major storm event. Cumulative flows from this basin, including the flows from Sub-Basins OA1 and OA2, are 0.75 and 2.15 cfs, respectively. Please see below discussion in the Municipal Separate Storm Sewer System (MS4) discussion for additional information on how stormwater quality is being addressed for basins that run offsite.

Sub-Basin A2 consists of a portion of landscaping and the existing gulch on the south side of the site. Runoff from this basin will follow the historical drainage pattern by sheet flowing to adjacent southern property and eventually flowing to the gulch. This sub-basin has an area of 0.41 acres. The impervious value for this basin is 42%. The basin will generate runoff of 0.89 cfs and 2.15 cfs in the minor and major storm event. Please see below discussion in the Municipal Separate Storm Sewer System (MS4) discussion for additional information on how stormwater quality is being addressed for basins that run offsite.

Sub-Basin B1 consists of a portion of landscaping, roadway, and sidewalk. Runoff from this basin will be directed into design point B1 where it will be captured by inlet B1 and directed to the West Pond located in sub-basin C1 via storm drain system. Inlet B1 has been adequately sized to convey anticipated onsite flows from this sub-basin. This sub-basin has an area of 0.13 acres. The impervious value for this basin is 83%. The basin will generate runoff of 0.51 cfs and 0.97 cfs in the minor and major storm event. Cumulative flows from this basin, including the flows from Sub-Basin OB1, are 0.86 and 1.60 cfs, respectively.

Sub-Basin B2 consists of a portion of landscaping, roadway, and sidewalk. Runoff from this basin will be directed into design point B2 where it will be captured by inlet B2 and directed to the West Pond located in sub-basin C1 via storm drain system. Inlet B2 has been sized to accept the 5-year flow completely and will allow approximately 0.2 cfs to bypass onto inlet D1a in the 100-year event. This sub-basin has an area of 0.17 acres. The impervious value for this basin is 79%. The basin will generate runoff of 0.62 cfs and 1.20 cfs in the minor and major storm event. Cumulative flows from this basin, including the flows from Sub-Basin OB2, are 0.96 and 1.82 cfs, respectively.

Sub-Basin B3 consists of a portion of landscaping, roadway, and sidewalk. Runoff from this basin will be directed into design point B3 where it will be captured by inlet B3 and directly discharged to the existing gulch located in sub-basin A2 via storm drain system. Inlet B3 has been adequately sized to convey anticipated onsite flows from this sub-basin. This sub-basin has an area of 0.35 acres. The impervious value for this basin is 84%. The basin will generate runoff of 1.36 cfs and 2.57 cfs in the minor and major storm event. Please see below discussion in the Municipal Separate Storm Sewer System (MS4) discussion for additional information on how stormwater quality is being addressed for basins that run offsite.

Sub-Basin B4 consists of a portion of landscaping, roadway, and sidewalk. Runoff from this basin will be directed into design point B4 where it will be captured by inlet B4 and directly discharged to the existing gulch located in sub-basin A2 via storm drain system. Inlet B3 has been adequately sized to convey anticipated onsite flows from this sub-basin. This sub-basin has an area of 0.18 acres. The impervious value for this basin is 84%. The basin will generate runoff of 0.72 cfs and 1.36 cfs in the minor and major storm event. Please see below discussion in the Municipal Separate Storm Sewer System (MS4) discussion for additional information on how stormwater quality is being addressed for basins that run offsite.

Sub-Basin B5 consists of a portion of landscaping, roadway, and sidewalk. Runoff from this basin will be directed to design point B5 and will follow the historical drainage pattern by sheet flowing from north to south and eventually flowing to the existing gulch. This sub-basin has an area of 0.03 acres. The impervious value for this basin is 75%. The basin will generate runoff of 0.11 cfs and 0.21 cfs in the minor and major storm event. Please see below discussion in the Municipal Separate Storm Sewer System (MS4) discussion for additional information on how stormwater quality is being addressed for basins that run offsite.

Sub-Basin C1 consists of the on-site detention pond or the “West Pond” and a portion of landscaping. Runoff from this basin will be directed into the West Pond. This sub-basin has an area of 0.84 acres. The impervious value for this basin is 4%. The basin will generate runoff of 0.43 cfs and 2.64 cfs in the minor and major storm event. Cumulative flows from this basin, including the flows from Sub-Basin OC1, are 0.60 and 3.07 cfs, respectively.

Sub-Basin C2 consists of a portion of landscaping, parking lot, sidewalk, and roof area. Runoff from this basin will be directed into design point C2 where it will be directed through a curb cut to the West Pond located in sub-basin C1. The curb cut has been adequately sized to convey anticipated onsite flows from this sub-basin. This sub-basin has an area of 0.26 acres. The impervious value for this basin is 73%. The basin will generate runoff of 0.89 cfs and 1.76 cfs in the minor and major storm event. Cumulative flows from this basin, including the flows from Sub-Basin OC2, are 0.89 and 1.76 cfs, respectively. Cumulative flows from this basin, including the flows from Sub-Basin OC2, are 0.97 and 2.01 cfs, respectively.

Sub-Basin C3 consists of a portion of landscaping, parking lot, sidewalk, and roof area. Runoff from this basin will be directed into design point C3 where it will be directed through a curb cut to the West Pond located in sub-basin C1. The curb cut has been adequately sized to convey anticipated onsite flows from this sub-basin. This sub-basin has an area of 0.62 acres. The impervious value for this basin is 92%. The basin will generate runoff of 2.61 cfs and 4.79 cfs in the minor and major storm event.

Sub-Basin D1 consists of a portion of landscaping, roadway, parking lot, and sidewalk. Runoff from this basin will be directed into design point D1 where it will be captured by inlet D1 and directed to the West Pond located in sub-basin C1 via storm drain system. Inlet D1 has been adequately sized to convey anticipated onsite flows from this sub-basin. This sub-basin has an area of 0.58 acres. The impervious value for this basin is 97%. The basin will generate runoff of 2.61 cfs and 4.72 cfs in the minor and major storm event.

Sub-Basin D1a consists of a portion of landscaping, roadway, and sidewalk. Runoff from this basin will be directed into design point D1a where it will be captured by inlet D1a and directed to the West Pond located in sub-basin C1 via storm drain system. In the 100-year event Inlet D1a will receive 0.2cfs of bypass flow from inlet B2. Inlet D1a has been adequately sized to convey anticipated onsite flows from this sub-basin and the bypass flow. This sub-basin has an area of 0.18 acres. The impervious value for this basin is 87%. The basin will generate runoff of 0.73 cfs and 1.37 cfs in the minor and major storm event.

Sub-Basin D2 consists of a portion of landscaping, roadway, parking lot, sidewalk, and roof area. Runoff from this basin will be captured by inlet D2 and directed to the West Pond located in sub-basin C1 via storm drain system. Inlet D2 has been adequately sized to convey anticipated onsite flows from this sub-basin. This sub-basin has an area of 1.08 acres. The impervious value for this basin is 90%. The basin will generate runoff of 4.42 cfs and 8.17 cfs in the minor and major storm event.

Sub-Basin D3 consists of a portion of landscaping, sidewalk, and roof area. Runoff from this basin will be captured by inlet D3 and directed to the West Pond located in sub-basin C1 via storm drain system. Inlet D3 has been adequately sized to convey anticipated onsite flows from this sub-basin. This sub-basin has an area of 0.30 acres. The impervious value for this basin is 55%. The basin will generate runoff of 0.72 cfs and 1.59 cfs in the minor and major storm event.

Sub-Basin D4 consists of a portion of landscaping, sidewalk, and roof area. Runoff from this basin will be captured by inlet D4 and directed to the West Pond located in sub-basin C1 via storm drain system. Inlet D4 has been adequately sized to convey anticipated onsite flows from this sub-basin. This sub-basin has an area of 0.30 acres. The impervious value for this basin is 55%. The basin will generate runoff of 0.73 cfs and 1.63 cfs in the minor and major storm event.

Sub-Basin D5 consists of a portion of landscaping, roadway, parking lot, sidewalk, and roof area. Runoff from this basin will be captured by inlet D5 and directed to the West Pond located in sub-basin C1 via storm drain system. Inlet D5 has been adequately sized to convey anticipated onsite flows from this sub-basin. This sub-basin has an area of 0.51 acres. The impervious value for this basin is 90%. The basin will generate runoff of 2.08 cfs and 3.85 cfs in the minor and major storm event.

Sub-Basin D6 consists of a portion of landscaping, roadway, parking lot, sidewalk, and roof area. Runoff from this basin will be captured by inlet D6 and directed to the West Pond located in sub-basin C1 via storm drain system. Inlet D6 has been adequately sized to convey anticipated onsite flows from this sub-basin. This sub-basin has an area of 0.81 acres. The impervious value for this basin is 91%. The basin will generate runoff of 3.32 cfs and 6.11 cfs in the minor and major storm event.

Sub-Basin D7 consists of a portion of landscaping, roadway, parking lot, sidewalk, and roof area. Runoff from this basin will be captured by inlet D7 and directed to the West Pond located in sub-basin C1 via storm drain system. Inlet D7 has been adequately sized to convey anticipated onsite flows from this sub-basin. This sub-basin has an area of 0.39 acres. The impervious value for this basin is 85%. The basin will generate runoff of 1.53 cfs and 2.88 cfs in the minor and major storm event.

Sub-Basin D8 consists of a portion of landscaping, roadway, parking lot, sidewalk, and roof area. Runoff from this basin will be captured by inlet D8 and directed to the West Pond located in sub-basin C1 via storm drain system. Inlet D8 has been adequately sized to convey anticipated onsite flows from this sub-basin. This sub-basin has an area of 0.54 acres. The impervious value for this basin is 84%. The basin will generate runoff of 2.07 cfs and 3.92 cfs in the minor and major storm event.

Sub-Basin D9 consists of a portion of landscaping, roadway, parking lot, sidewalk, and roof area. Runoff from this basin will be captured by inlet D9 and directed to the West Pond located in sub-basin C1 via storm drain system. Inlet D9 has been adequately sized to convey anticipated onsite flows from this sub-basin. This sub-basin has an area of 0.43 acres. The impervious value for this basin is 83%. The basin will generate runoff of 1.58 cfs and 3.00 cfs in the minor and major storm event.

Sub-Basin D10 consists of a portion of landscaping, roadway, parking lot, sidewalk, and roof area. Runoff from this basin will be captured by inlet D10 and directed to the West Pond located in sub-basin C1 via storm drain system. Inlet D10 has been adequately sized to convey anticipated onsite flows from this sub-basin. This sub-basin has an area of 0.37 acres. The impervious value for this basin is 82%. The basin will generate runoff of 1.33 cfs and 2.54 cfs in the minor and major storm event.

Sub-Basin D11 consists of a portion of landscaping, roadway, parking lot, sidewalk, and roof area. Runoff from this basin will be captured by inlet D11 and directed to the West Pond located in sub-basin C1 via storm drain system. Inlet D11 has been adequately sized to convey anticipated onsite flows from this sub-basin. This sub-basin has an area of 0.50 acres. The impervious value for this basin is 89%. The basin will generate runoff of 2.03 cfs and 3.78 cfs in the minor and major storm event.

Sub-Basin D12 consists of a portion of landscaping and roof area. Runoff from this basin will be captured by inlet D12 and directed to the West Pond located in sub-basin C1 via storm drain system. Inlet D12 has been adequately sized to convey anticipated onsite flows from this sub-basin. This sub-basin has an area of 0.66 acres. The impervious value for this basin is 30%. The basin will generate runoff of 0.99 cfs and 2.86 cfs in the minor and major storm event. Cumulative flows from this basin, including the flows from Sub-Basin OD12, are 0.99 and 2.90 cfs, respectively.

Sub-Basin E1 consists of a portion of landscaping and roof area. Runoff from this basin will be captured by inlet E1 and directed to the West Pond located in sub-basin C1 via storm drain system. Inlet E1 has been adequately sized to convey anticipated onsite flows from this sub-basin. This sub-basin has an area of 0.18 acres. The impervious value for this basin is 46%. The basin will generate runoff of 0.37 cfs and 0.88 cfs in the minor and major storm event. Cumulative flows from this basin, including the flows from Sub-Basin OE1, are 0.49 and 1.27 cfs, respectively.

Sub-Basin E2 consists of a portion of landscaping and roof area. Runoff from this basin will be captured by inlet E2 and directed to the West Pond located in sub-basin C1 via storm drain system. Inlet E2 has been adequately sized to convey anticipated onsite flows from this sub-basin. This sub-basin has an area of 0.21 acres. The impervious value for this basin is 39%. The basin will generate runoff of 0.38 cfs and 0.98 cfs in the minor and major storm event. Cumulative flows from this basin, including the flows from Sub-Basin OE2, are 0.57 and 1.56 cfs, respectively.

Sub-Basin E3 consists of a portion of landscaping and roof area. Runoff from this basin will be captured by inlet E3 and directed to the West Pond located in sub-basin C1 via storm drain system. Inlet E3 has been adequately sized to convey anticipated onsite flows from this sub-basin. This sub-basin has an area of 0.22 acres. The impervious value for this basin is 40%. The basin will generate runoff of 0.41 cfs and 1.04 cfs in the minor and major storm event. Cumulative flows from this basin, including the flows from Sub-Basin OE3, are 0.60 and 1.63 cfs, respectively.

Sub-Basin E4 consists of a portion of landscaping and roof area. Runoff from this basin will be captured by inlet E4 and directed to the West Pond located in sub-basin C1 via storm drain system. Inlet E4 has been adequately sized to convey anticipated onsite flows from this sub-basin. This sub-basin has an area of 0.18 acres. The impervious value for this basin is 46%. The basin will generate runoff of 0.38 cfs and 0.92 cfs in the minor and major storm event. Cumulative flows from this basin, including the flows from Sub-Basin OE4, are 0.53 and 1.34 cfs, respectively.

Sub-Basin OA1 consists of landscaping offsite to the north of the Property. Runoff from this basin will be directed into design point A1 and travels through Basin A1 to follow the historical drainage pattern by sheet flowing from north to south and eventually flowing to the existing gulch. This sub-basin has an area of 0.05 acres. The impervious value for this basin is 46%. The basin will generate runoff of 0.1 cfs and 0.24 cfs in the minor and major storm event.

Sub-Basin OA2 consists of landscaped area, sidewalks, and 1,870 square feet of asphalt roadway within Urban Collection at Palmer Village offsite to the west of the Property. Runoff from this basin will be directed to design point A1 and travels through Basin A1 to follow the historic drainage pattern by sheet flowing north to south and eventually flowing to the existing gulch. Runoff values for basin OA2 were obtained from the approved Final Drainage Report for Urban Collection at Palmer Village by JR Engineering dated April 2021. The Final Drainage Report states that basins B14, B15, and B16 total 0.45 acres and will generate runoff of 0.60 cfs and 1.90 cfs in the minor and major storm events. Design Points 28, 29, and 30 correspond to basins B14, B15, and B16 on the Final Drainage Report.

Sub-Basin OB1 consists of a portion Constitution Avenue to the north of the Property. Runoff from this basin will be directed into design point B1 and travels via curb and gutter through Basin B1 to a curb inlet at design point B1. This sub-basin has an area of 0.08 acres. The impervious value for this basin is 96%. The basin will generate runoff of 0.35 cfs and 0.63 cfs in the minor and major storm event.

Sub-Basin OB2 consists of a portion of Constitution Avenue to the north of the Property. Runoff from this basin will be directed into design point B2 and travels via curb and gutter through Basin B2 to a curb inlet at design point B2. This sub-basin has an area of 0.08 acres. The impervious value for this basin is 90%. The basin will generate runoff of 0.34 cfs and 0.62 cfs in the minor and major storm event.

Sub-Basin OC1 consists of a portion of landscaping and sidewalk offsite to the north of the Property. Runoff from this basin will be directed into design point C1 and overland flows directly into the West Pond, sub-basin C1. This sub-basin has an area of 0.08 acres. The impervious value for this basin is 41%. The basin will generate runoff of 0.17 cfs and 0.42 cfs in the minor and major storm event.

Sub-Basin OC2 consists of a portion of landscaping and sidewalk offsite to the north of the Property. Runoff from this basin will be directed into design point C2 and travels through Basin C2 where it will be directed through a curb cut to the West Pond located in sub-basin C1. This sub-basin has an area of 0.06 acres. The impervious value for this basin is 25%. The basin will generate runoff of 0.08 cfs and 0.25 cfs in the minor and major storm event.

Sub-Basin OD12 consists of landscaping offsite to the northeast of the Property. Runoff from this basin will travel through Basin D12 to be captured by inlet D12 and directed to the West Pond located in sub-basin C1 via storm drain system. This sub-basin has an area of 0.01 acres. The impervious value for this basin is 2%. The basin will generate runoff of 0.01 cfs and 0.04 cfs in the minor and major storm event.

Sub-Basin OE1 consists of sidewalk and landscaping offsite to the north of the Property. Runoff from this basin will travel through Basin E1 to be captured by inlet E1 and directed to the West Pond located in sub-basin C1 via storm drain system. This sub-basin has an area of 0.09 acres. The impervious value for this basin is 25%. The basin will generate runoff of 0.13 cfs and 0.39 cfs in the minor and major storm event.

Sub-Basin OE2 consists of sidewalk and landscaping offsite to the north of the Property. Runoff from this basin will travel through Basin E2 to be captured by inlet E2 and directed to the West Pond located in sub-basin C1 via storm drain system. This sub-basin has an area of 0.14 acres. The impervious value for this basin is 25%. The basin will generate runoff of 0.19 cfs and 0.58 cfs in the minor and major storm event.

Sub-Basin OE3 consists of sidewalk and landscaping offsite to the north of the Property. Runoff from this basin will travel through Basin E3 to be captured by inlet E3 and directed to the West Pond located in sub-basin C1 via storm drain system. This sub-basin has an area of 0.14 acres. The impervious value for this basin is 25%. The basin will generate runoff of 0.19 cfs and 0.59 cfs in the minor and major storm event.

Sub-Basin OE4 consists of sidewalk and landscaping offsite to the north of the Property. Runoff from this basin will travel through Basin E4 to be captured by inlet E4 and directed to the West Pond located in sub-basin C1 via storm drain system. This sub-basin has an area of 0.09 acres. The impervious value for this basin is 28%. The basin will generate runoff of 0.14 cfs and 0.41 cfs in the minor and major storm event.

Sub-Basin OF1 consists of an offsite basin within Constitution Avenue north of the project site. Drainage is collected in a curb and gutter system and routed to a proposed curb inlet at the entrance to the site. This sub-basin has an area of 1.12 acres. The impervious value for this basin is 100%. The basin will generate runoff of 3.56 cfs and 6.36 cfs in the minor and major storm event.

Sub-Basin OF2 consists of the southern-most portion of the Site that drains to the south off-site and consists of entirely landscaping. This sub-basin has an area of 0.42 acres. The impervious value for this basin is 2%. The basin will generate runoff of 0.15 cfs and 1.09 cfs in the minor and major storm event.

Sub-Basin OS1 consists of an offsite basin to the northwest of the site within Constitution Avenue and the adjacent landscaping. Drainage is collected in a curb and gutter system and routed to an existing curb inlet to the west in Constitution Ave, following its historical flow pattern. This sub-basin has an area of 0.25 acres. The impervious value for this basin is 83%. The basin will generate runoff of 0.99 cfs and 1.87 cfs in the minor and major storm event.

Design point UO represents the ultimate outfall for the site into the existing drainageway. The flows at this point include the detained flow release from the detention pond as well as the flows from sub-basins A1, A2, B2, B3, and B4. This design point is utilized to show that the combined flows entering the gulch from the site are less than the historical flows entering the gulch from the Site.

DRAINAGE DESIGN CRITERIA

DEVELOPMENT CRITERIA REFERENCE

The proposed storm facilities are designed to be in compliance with the City of Colorado Springs and El Paso County “Drainage Criteria Manual (DCM)” (Current Adopted Version) (”the MANUAL”), El Paso County “Engineering Criteria Manual” (“the Engineering Manual”), Chapter 6 and Section 3.2.1 of Chapter 13 of the City of Colorado Springs Drainage Criteria Manual dated May 2014 (“the Colorado Springs MANUAL”).

HYDROLOGIC CRITERIA

The 5-year and 100-year design storm events were used in determining rainfall and runoff for the existing and proposed drainage analysis per the MANUAL. The rainfall depths for site were determined from equation 6-1, equation 6-2 utilizing Figures 6-6, 6-11, 6-12, and 6 -17 from the DCM. Refer to **Table 1** below for the rainfall depths utilized for the site and **Appendix B** for the hydrologic calculations for the site.

Table 1: ***Rainfall Depths***

	Duration (HRS)
Storm Event	**1 HR**
2 Year	1.19
5 Year	1.52
10 Year	1.75
100 Year	2.55

Calculations for the runoff coefficients and percent impervious are included in the **Appendix B**. Rational method was used to determine the peak flows for the project. These flows were used to determine the size of the proposed curb cuts, inlets, and storm drain system.

The proposed impervious values in Table 6-6 of the DCM were utilized in this report for the final design. Refer to **Appendix B** of this report for Table 6-6.

The Site is providing one full spectrum detention pond. The Site is maintaining the historic drainage patterns as much as possible. The site is reducing onsite runoff flows during the 100-year storm from 16.9 cfs to 14.01 cfs for existing to proposed conditions respectively. This is a 2.92 cfs reduction in onsite runoff flows at design point EX1.

There are no additional provisions selected or deviations from the criteria in both the MANUAL and Colorado Springs MANUAL.

HYDRAULIC CRITERIA

Applicable design methods were utilized to size the proposed pond, which includes the use of the UD-Detention spreadsheet, UD-Inlet spreadsheet, rational calculations spreadsheet, StormCAD, and FlowMaster.

Proposed drainage features on-site have been analyzed and sized for the following design storm events:

- Major Storm: 100-year Storm Event

One full spectrum on-site detention pond is proposed in order to maintain historic flows and water quality. The detention pond is on the west side of the Site and is referred to as "West Pond" in this report, with a required volume of 1.466 ac-ft and a proposed volume of 1.481 ac-ft (at the 100-year water surface elevation) and designed for the 100-year storm event. With a discharge rate of 4.4 cfs, water from the West Pond is discharged into an existing gulch located at the southwest corner of the site and ultimately out falling to Sand Creek (Sand Creek's East Fork). West Pond calculations are provided in the **Appendix C**.

The ultimate outfall for the Site is into an existing gulch that runs through the site within a concrete box culvert. The detention pond will outlet into an existing riprap channel at the end of the concrete box culvert to dissipate energy and reduce erosion. The existing riprap has been observed and no signs of erosion have been identified. This reach of Sand Creek's East Fork was determined to be a suitable outfall and is shown to have approximately 1076 cfs in the 100-year event, per the Hydrology Analysis for East Fork Sand Creek Tributary 6. The 100-year storm contribution from the site will be reduced by 3.12 cfs from the existing and the Site will not have an adverse effect on the existing gulch.

Curb cuts, inlets, and storm drain pipes are designed to carry flows to the West Pond. The curb cuts, inlets, swales, and storm drain pipes calculations are provided in the **Appendix C** and the design points are provided in the Proposed Drainage Map located in **Appendix D**. The West Pond is designed to release the 100-year flow at 4.4 cfs, which in combination with undetained flows totals to 13.78 cfs, 3.12 cfs below the pre-development flow rate.

Emergency overflows will be routed through the overflow weir located within the outlet structure of the West Pond. It will follow existing drainage conditions and flow to the gulch to the southwest that eventually contributes to the East Fork Sand Creek to the South.

THE FOUR STEP PROCESS

The Project was designed in accordance with the four-step process to minimize adverse impacts of urbanization, as outlined in the County's "Four-Step Process" for selecting structural BMPs (ECM Section I.7.2 BMP Selection).

Step 1. **Employ Runoff Reduction Practices**- The project is proposing a residential development that will be designed to minimize the impact to the current existing terrain. The Site's proposed paved roadways will increase the Site's impervious area; however, a full spectrum detention pond will be used to capture stormwater and maintain flows discharging off site at or below historic levels.

Step 2. Stabilize Drainageways– Stabilizing proposed drainage paths with landscape will slow flow rates. Rock chutes will be constructed to reduce the velocities of runoff entering the ponds at the curb cut locations. We anticipate this will minimize erosion.

Step 3. Provide Water Quality Capture Volume (WQCV) –Permanent water quality measures and detention facilities will be provided with the Project. More specifically, this project proposes the construction of an Extended Detention Basin to provide for the required water quality capture volume.

Step 4. Consider Need for Industrial and Commercial BMPs – The proposed project is proposing a residential development; therefore, covering of storage/handling areas and spill containment and control will not need to be provided.

DRAINAGE FACILITY DESIGN

GENERAL CONCEPT

The proposed drainage patterns will match the historic patterns. To maintain historic flows, a full spectrum detention pond is being proposed and will capture and control the flows from the proposed development to convey flows with landscape sheet flow, parking lot sheet flow, and a storm drain system.

Provided in the **Appendix B** are hydrologic calculations utilizing the Rational method for the existing and proposed conditions. Provided in **Appendix C** are the hydraulic calculations for the proposed conditions, Flowmaster details, and cross sections for the proposed drainage features. As previously mentioned, the existing drainage map and proposed drainage map can be found in **Appendix D.**

MUNICIPAL SEPARATE STORM SEWER SYSTEMS (MS4)

The Site will handle post construction stormwater by meeting the water quality capture volume design standard from the MS4. Basins B1, B2, C1-C3, D1-D12, and E1-E4 will be captured onsite and directed to the onsite extended detention basin to treat the WQCV. The design standard allows for up to 20 percent (not to exceed 1 acre) to be excluded from the capture are when not practicable to capture runoff. Basins B3 and B4 which include the southern down gradient portion of Akers Drive will be captured by two Type R Inlets and discharged directly into the existing gulch onsite. Basin B5 which includes the southern most portion of Akers drive will sheet flow to the pervious site to the south and ultimately end up in the existing gulch.

Basins A1 and A2 are proposed to be excluded sites as they are land disturbance to undeveloped land that will remain undeveloped. The Site will utilize informal runoff reduction (shown in the following section) "Best Management Practices" as separate pervious area that does not receive runoff from impervious surfaces. Runoff reduction calculations are not provided for these basins as they meet the exclusion from needing water quality per ECM Appendix I.7.1.B.7. The basins will be stabilized after construction and are primarily made up of Type A hydrologic soil group which has low runoff potential due to high infiltration rates.

SPECIFIC DETAILS

The existing conditions of the Site have flows from north to south via sheet flow over vacant land to adjacent southern property and eventually to the gulch to the southwest. Runoff conditions for the Site were developed utilizing the Rational Method described in the Hydrologic Criteria section of this report.

Sub-basins D1 through D12 consist of future multi-family buildings and associated infrastructure. Sub-basins C1 through C3 consist of a portion of landscaping, pavement, and the detention pond. All basins have flows being captured and conveyed onsite. Flows are conveyed from the north and east sides of the Site to the west side of the Site. On site flows enter the detention pond which then discharges into a proposed 24-inch storm drain pipe at the southwest corner of the site.

Overall the site is reducing onsite runoff flows during the 100-year storm from 33 cfs to 13.98 cfs for existing to proposed conditions respectively (includes pond discharge and Basins A1, A2, B3, B4, and B5 which drain directly offsite). This is a 19.02 cfs reduction in onsite runoff flows, and will provide stormwater flood protection for the properties located downstream of the Site. This reduction in flow will also allow portions of the Site to maintain historical drainage patterns, by allowing un-detained runoff from Sub-basins A1, A2, B3, B4 and B5. Furthermore, by maintaining the historical drainage patterns for the aforementioned sub-basins, imported fill for this project is minimized, allowing established vegetation to continue to provide infiltration and informal runoff reduction.

The hydrologic calculations, hydraulic calculations, and Drainage Maps are included in the **Appendix B, Appendix C,** and **Appendix D** of this report for reference.

The Site will disturb more than 1 acre and will require a Colorado Discharge Permit System (CDPS) General Permit for Stormwater Discharge Associated with Construction Activities from the Colorado Department of Public Health and Environment (CDPHE).

The required fees for the Sand Creek Drainage Basin based upon the 2022 fee schedule, are listed below. Fees will be paid prior to plat recordation.

-	Drainage Fee/Impervious Acre =	$21,814	x	7.85 acres =	$171,239.90
-	Bridge Fee/Impervious Acre =	$8,923	x	7.85 acres =	$ 70,045.55
				Total =	**$241,285.45**

Kimley»Horn

SUMMARY

The proposed drainage design is to maintain the historic drainage patterns, the overall imperviousness and release rates for the Site. Runoff from the Site will be controllably discharged through the proposed drainage system and will continue through the existing gulch to an existing El Paso County drainage basin: The Sand Creek Basin. The drainage design presented within this report conforms to the criteria presented in both the MANUAL and the Colorado Springs MANUAL. Additionally, the Site runoff and storm drain facilities will not adversely affect the downstream and surrounding developments, including Sand Creek.

REFERENCES

1. City of Colorado Springs “Drainage Criteria Manual (DCM) Volume 1”, dated May, 2014

2. El Paso County “Drainage Criteria Manual”, dated October 31, 2018

3. El Paso County “Engineering Criteria Manual” Revision 6, dated June, 23, 2020

4. Chapter 6 and Section 3.2.1. of Chapter 13-City of Colorado Springs Drainage Criteria Manual, May 2014.

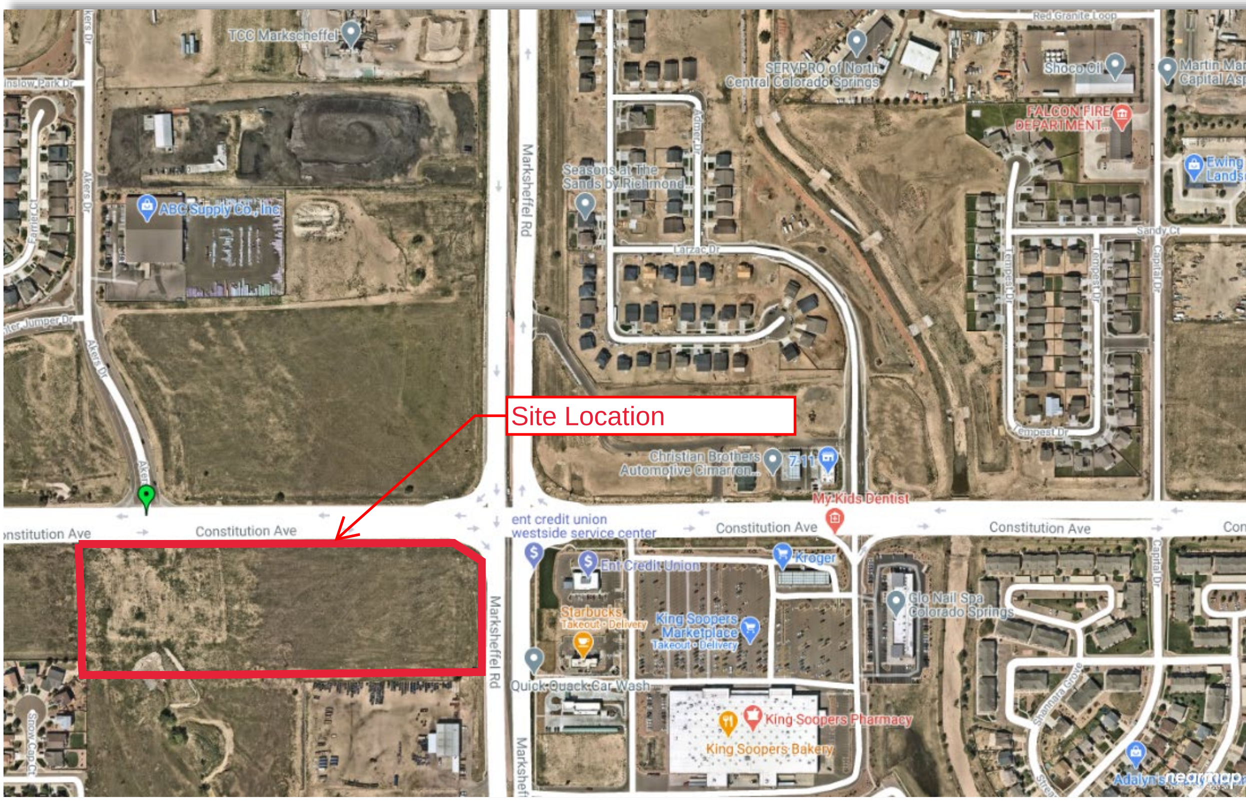
5. Urban Drainage and Flood Control District Drainage Criteria Manual (UDFCDCM), Vol. 1, prepared by Wright-McLaughlin Engineers, June 2001, with latest revisions.

6. Flood Insurance Rate Map, El Paso County, Colorado and Incorporated Areas, Map Number 08041C0756G, Effective Date December 7, 2018, prepared by the Federal Emergency Management Agency (FEMA).

APPENDIX

APPENDIX A: FIGURES

Vicinity Map



National Flood Hazard Layer FIRMette

FEMA

104°41'25"W 38°52'21"N

104°40'48"W 38°51'53"N

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

1:6,000

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
- B 20.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- 8 Coastal Transect
- 513 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 1/5/2021 at 5:09 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: HYDROLOGY

United States Department of Agriculture

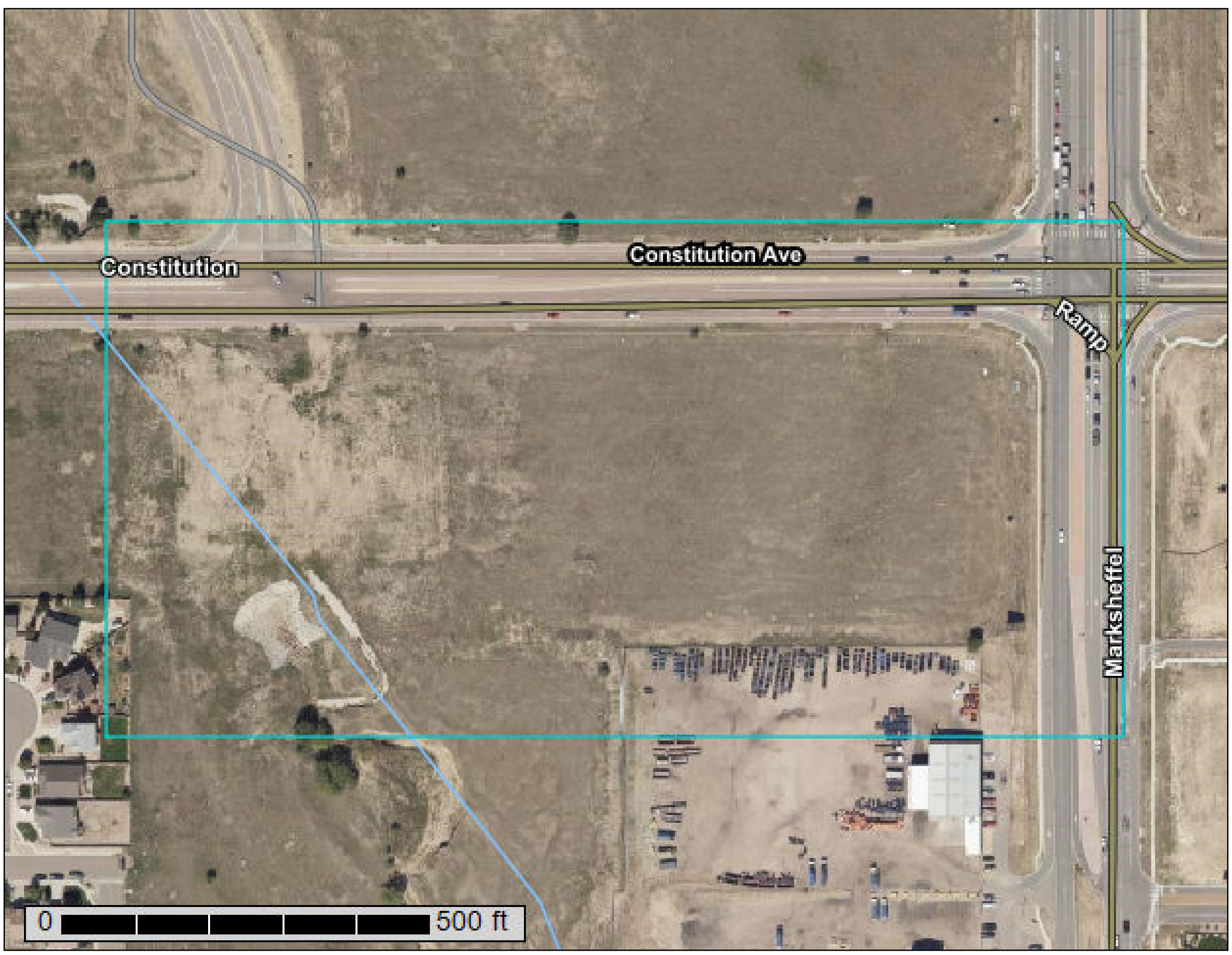
NRCS

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



January 18, 2022

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 alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

How Soil Surveys Are Made

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

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

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

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

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

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

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

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

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

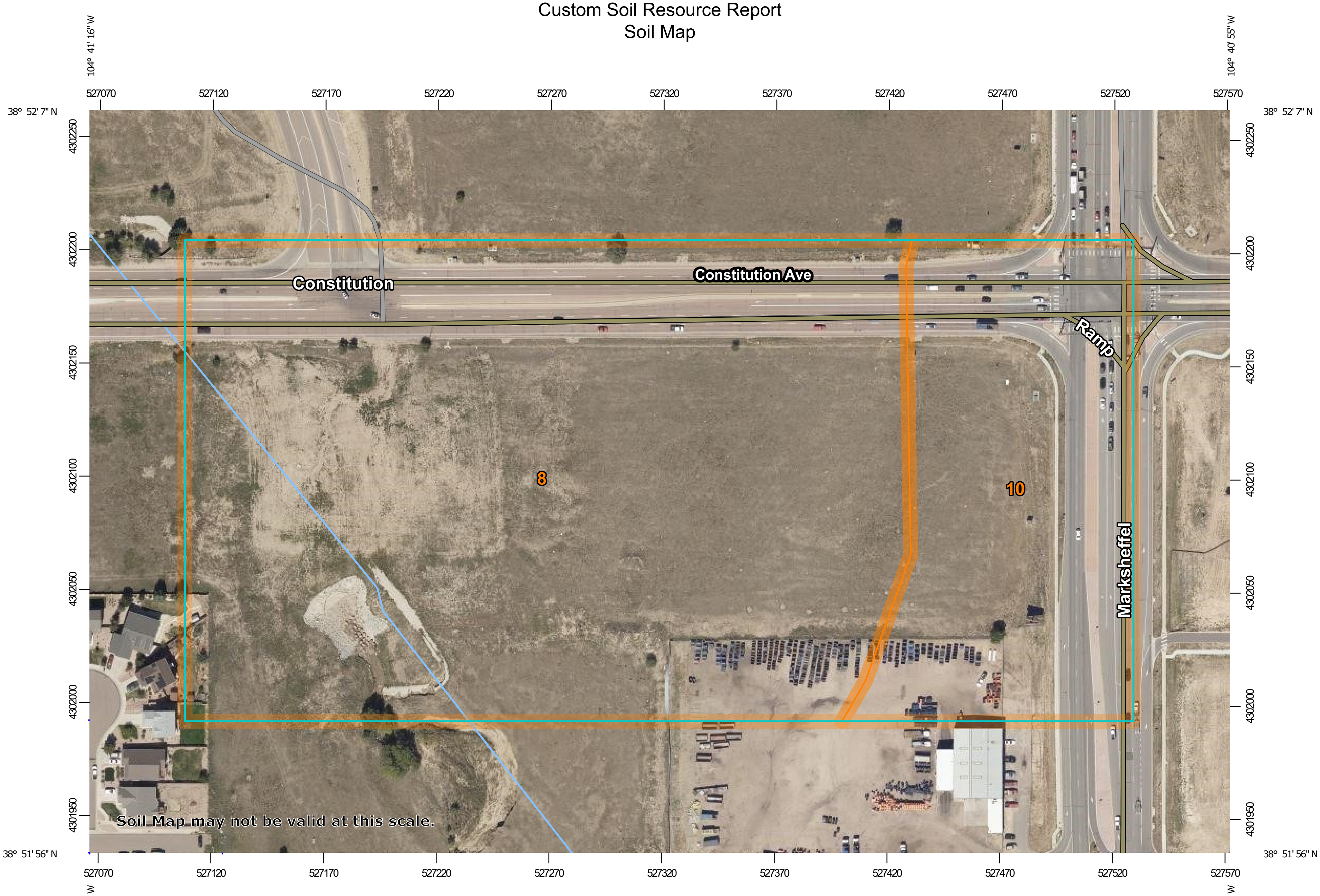
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree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

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

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

Soil Map



Map Scale: 1:2,310 if printed on A landscape (11" x 8.5") sheet.

Meters: 0, 30, 60, 120, 180

Feet: 0, 100, 200, 400, 600

N

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 19, Aug 31, 2021

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

Date(s) aerial images were photographed: 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
8	Blakeland loamy sand, 1 to 9 percent slopes	16.7	75.2%
10	Blendon sandy loam, 0 to 3 percent slopes	5.5	24.8%
Totals for Area of Interest		**22.2**	**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

8—Blakeland loamy sand, 1 to 9 percent slopes

Map Unit Setting

National map unit symbol: 369v
Elevation: 4,600 to 5,800 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 46 to 48 degrees F
Frost-free period: 125 to 145 days
Farmland classification: Not prime farmland

Map Unit Composition

Blakeland and similar soils: 98 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Blakeland

Setting

Landform: Hills, flats
Landform position (three-dimensional): Side slope, talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sedimentary rock and/or eolian deposits derived from sedimentary rock

Typical profile

A - 0 to 11 inches: loamy sand
AC - 11 to 27 inches: loamy sand
C - 27 to 60 inches: sand

Properties and qualities

Slope: 1 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Available water supply, 0 to 60 inches: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: R049XB210CO - Sandy Foothill
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit: 1 percent

Hydric soil rating: No

Pleasant

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

10—Blendon sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 3671
Elevation: 6,000 to 6,800 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 46 to 48 degrees F
Frost-free period: 125 to 145 days
Farmland classification: Not prime farmland

Map Unit Composition

Blendon and similar soils: 98 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Blendon

Setting

Landform: Terraces, alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy alluvium derived from arkose

Typical profile

A - 0 to 10 inches: sandy loam
Bw - 10 to 36 inches: sandy loam
C - 36 to 60 inches: gravelly sandy loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
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: 2 percent
Available water supply, 0 to 60 inches: Moderate (about 6.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e

Hydrologic Soil Group: B
Ecological site: R049XB210CO - Sandy Foothill
Hydric soil rating: No

Minor Components

Other soils

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

Pleasant

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

References

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

The methods described in this Manual require only that the 1-hour, 6-hour and 24-hours depths be used as input. The storm return periods required for the application of methods in this Manual are the 2-, 5-, 10-, 25-, 50- and 100-year events. The 6-hour and 24-hour depths for these return periods can be read directly from Figures 6-6 through 6-17 at the end of this chapter. The1-hour depth for return periods can be calculated for all design return periods following this procedure:

Step 1: Calculate 2-year, 1-hour rainfall based on 2-year, 6-hour and 24-hour values.

$$Y_2 = 0.218 + 0.709 \cdot (X_1 \cdot X_1 / X_2) \qquad \text{(Eq. 6-1)}$$

Where:

Y_2 = 2-year, 1-hour rainfall (in)

X_1 = 2-year, 6-hour rainfall (in) from Figure 6-6

X_2 = 2-year, 24-hour rainfall (in) from Figure 6-12

Step 2: Calculate 100-year, 1-hour rainfall based on 2-year 6-hour and 24-hour values

$$Y_{100} = 1.897 + 0.439 \cdot (X_3 \cdot X_3 / X_4) - 0.008\ Z \qquad \text{(Eq. 6-2)}$$

Where

Y_{100} = 100-year, 1-hour rainfall (in)

X_3 = 100-year, 6-hour rainfall (in) from Figure 6-11

X_4 = 100-year, 24-hour rainfall (in) from Figure 6-17

Z = Elevation in hundreds of feet above sea level

Step 3: Plot the 2-year and 100-year, 1-hour values on the diagram provided in Figure 6-18 and connect the points with a straight line. The 1-hour point rainfall values for other recurrence intervals can be read directly from the straight line drawn on Figure 6-18.

Example: Determine the 10-year, 1-hour rainfall depth for downtown Colorado Springs.

Step 1*:* Calculate 2-year, 1-hour rainfall (Y_2) based on 2-year, 6-hour and 24-hour values. From Figure 6-6, the 2-year, 6-hour rainfall depth for downtown Colorado Springs is approximately 1.7 inches (X_1), and from Figure 6-12, the 2-year 24-hour depth is approximately 2.1 inches (X_2). The 2-year, 1-hour rainfall is calculated as follows:

$$Y_2 = 0.218 + 0.709 \cdot (1.7 \cdot 1.7 / 2.1) = 1.19 \text{ in} \qquad \text{(Eq. 6-3)}$$

Step 2*:* Calculate 100-year, 1-hour rainfall (Y_{100}) based on 100-year, 6-hour and 24-hour values. From Figure 6-11, the 100-year, 6-hour rainfall depth for downtown Colorado Springs is approximately 3.5 inches (X_3), and from Figure 6-17, the 100-year 24-hour depth is approximately 4.5 inches (X_4). Assume an elevation of 6,840 feet for Colorado Springs. The 100-year, 1-hour rainfall is calculated as follows:

$$Y_{100} = 1.897 + 0.439 \cdot (3.5 \cdot 3.5 / 4.6) - 0.008 \cdot (6{,}840/100) = 2.52 \text{ in} \qquad \text{(Eq. 6-4)}$$

Step 3*:* Plot 2-year and 100-year, 1-hour rainfall depths on Figure 6-18 and read 10-year value from straight line. This example is illustrated on Figure 6-18, with a 1-hour, 10-year rainfall depth of approximately 1.75 inches. Figure 6-18a provides the example, and Figure 6-18b provides a blank chart.

Figure 6-6. 2-Year, 6-Hour Precipitation Tenths of an Inch (NOAA Atlas 2)

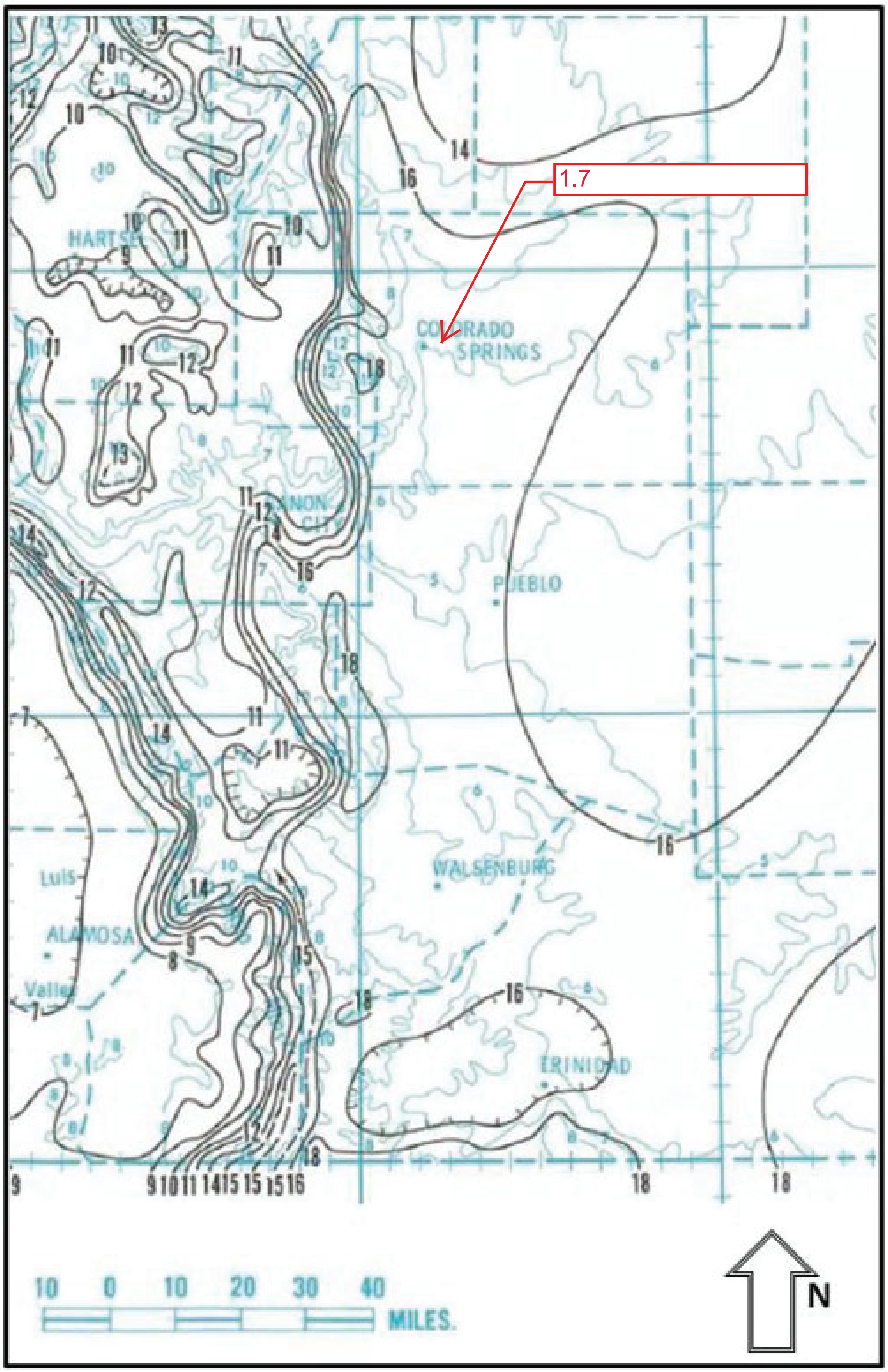


Figure 6-12. 2-Year, 24-Hour Precipitation Tenths of an Inch (NOAA Atlas 2)

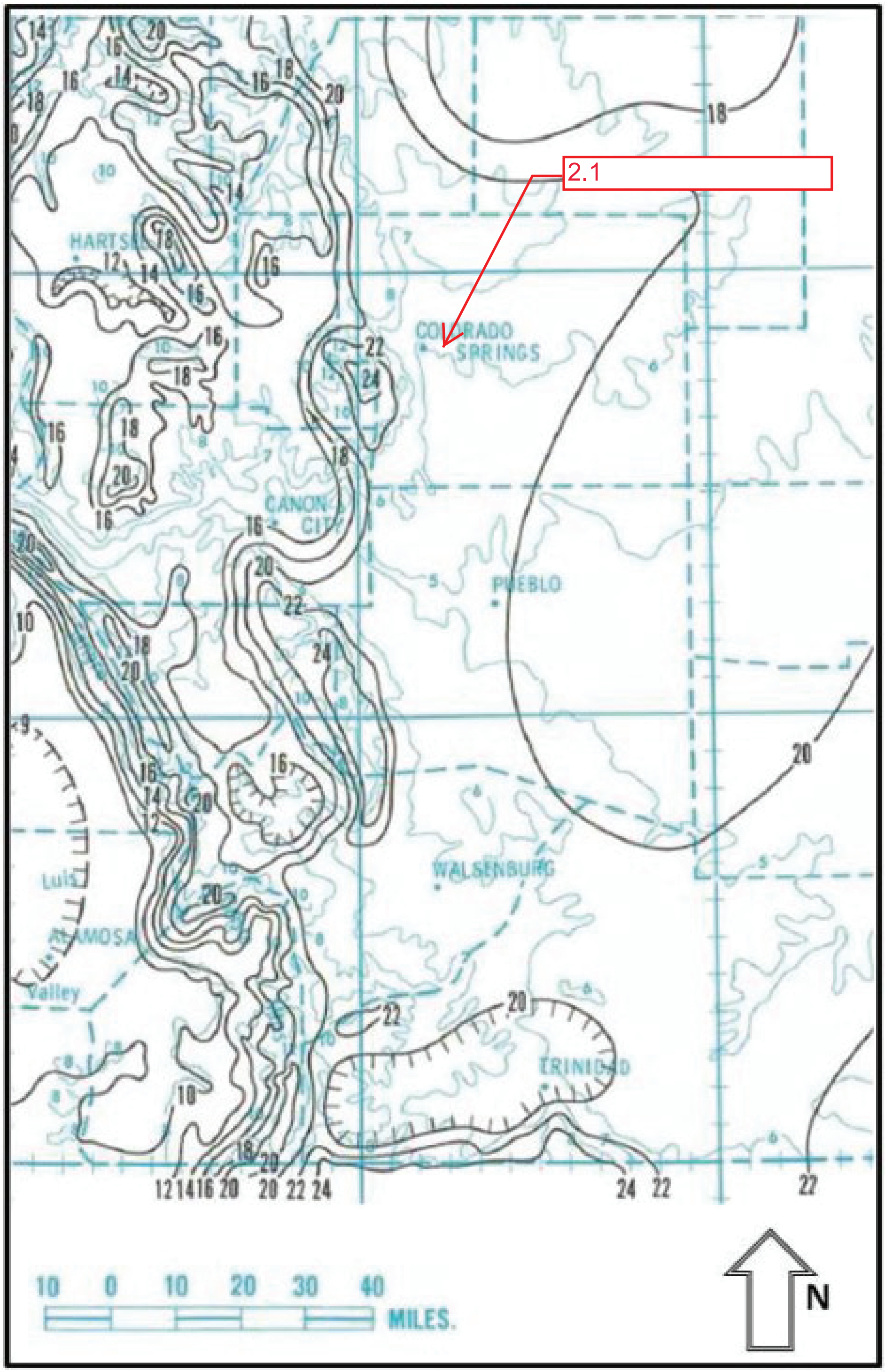


Figure 6-11. 100-Year, 6-Hour Precipitation Tenths of an Inch (NOAA Atlas 2)

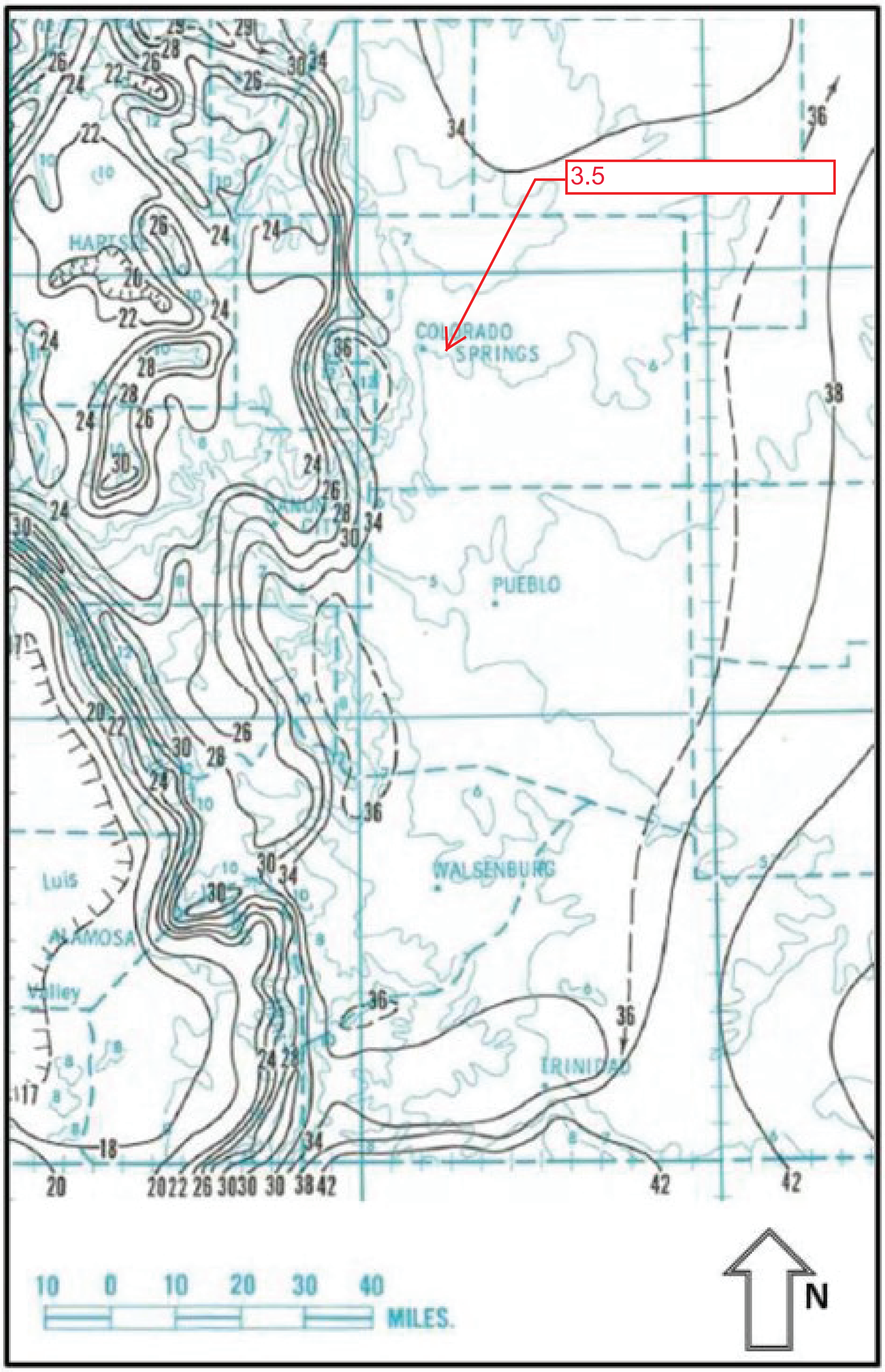
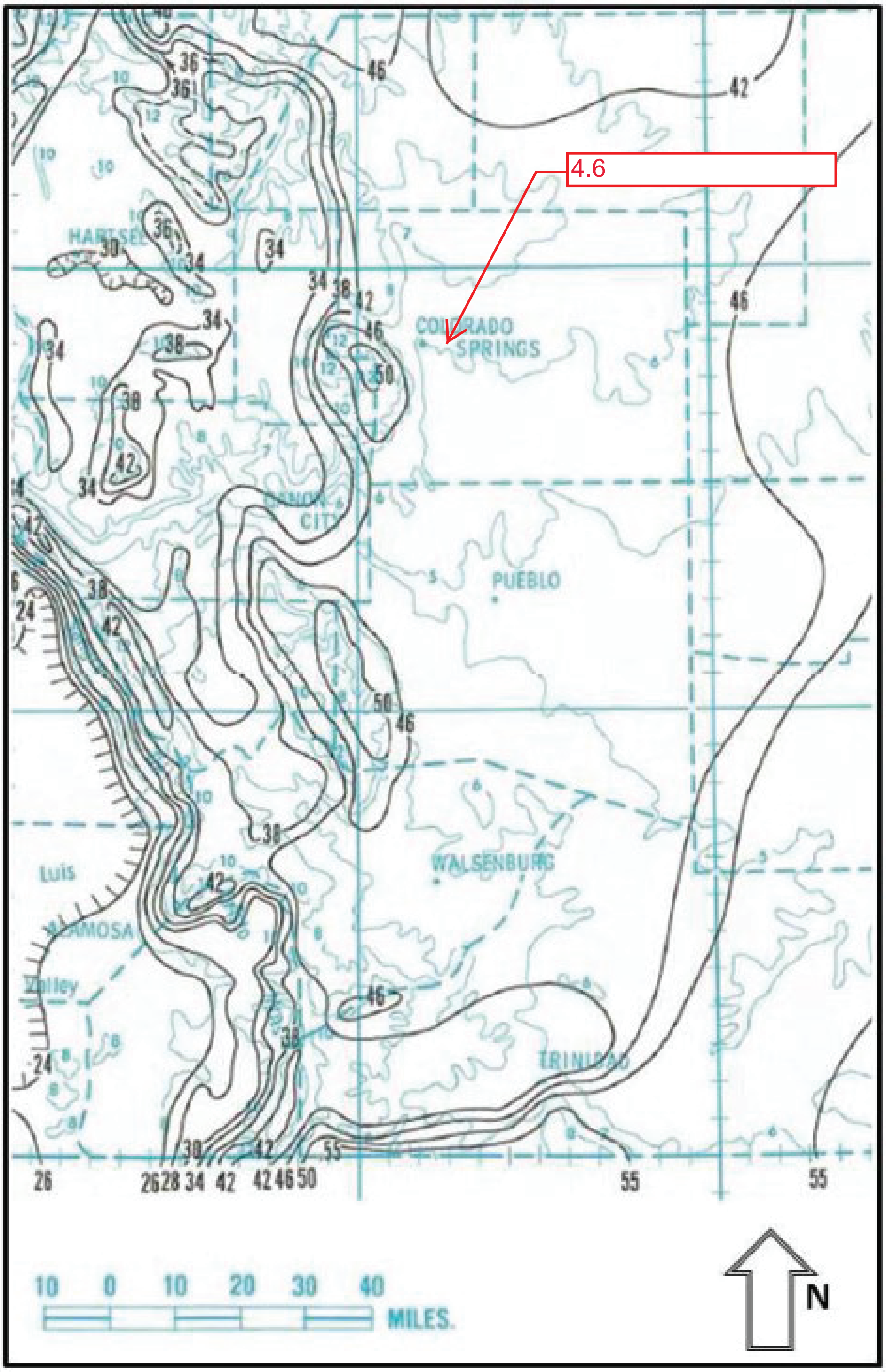
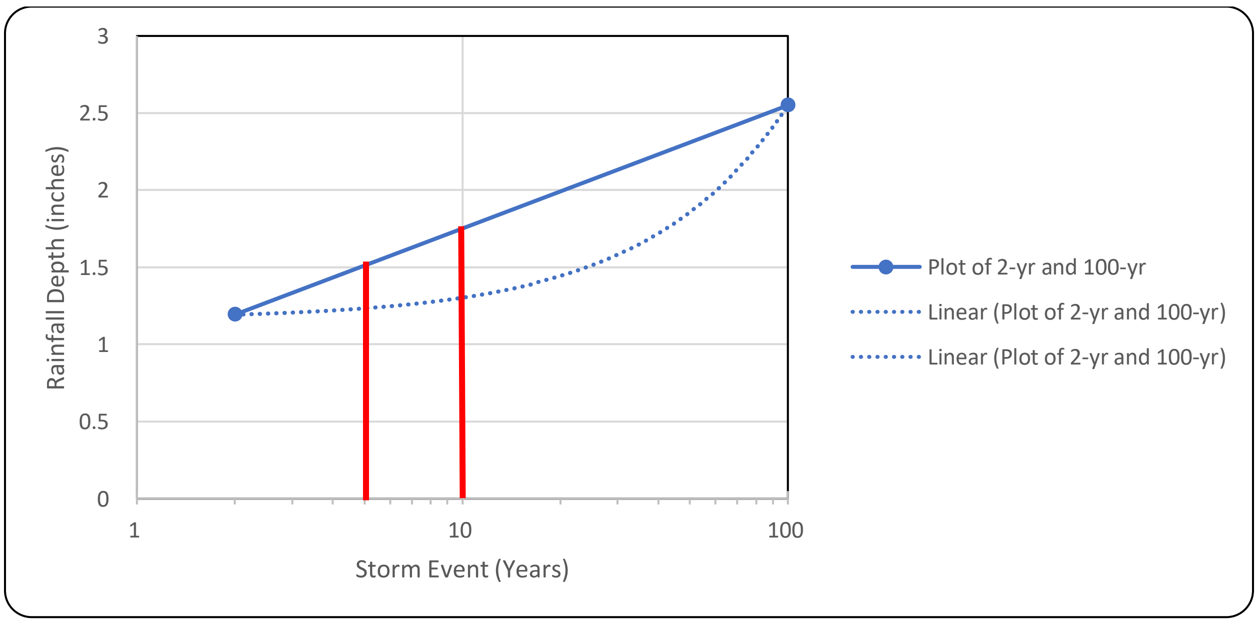


Figure 6-17. 100-Year, 24-Hour Precipitation Tenths of an Inch (NOAA Atlas 2)



Rainfall Depths			
			Notes
2 yr, 6 hr rainfall (in)	X_1 =	1.7	From Figure 6-6
2 yr, 24 hr rainfall (in)	X_2 =	2.1	From Figure 6-12
100 yr, 6 hr rainfall (in)	X_3 =	3.5	From Figure 6-11
100 yr, 24 hr rainfall (in)	X_4 =	4.6	From Figure 6-17
Elevation (hundreds of feet)]	Z =	64.5	
2 yr, 1 hr rainfall (in)	Y_2 =	1.193719	Equation 6-1
100 yr, 1 hr rainfall (in)	Y_{100} =	2.550076	Equation 6-2
Graph			
X-axis		Y-axis	
2	Y2	1.193719	Calculated from Eq 6-1
100	Y100	2.550076	Calculated from Eq 6-2
	Y5	1.52	Determined From Graph below
	Y10	1.75	Determined From Graph below



$$I = \frac{28.5\ P_1}{(10+T_D)^{0.786}}$$

Where:

I = rainfall intensity (inches per hour)

P_1 = one-hour rainfall depth (inches) from Table 6-2 One-hour Point Rainfall D
City of Colorado Springs Drainage Design

T_C = storm duration (minutes)

	2-yr	5-yr	10-yr	100-yr
P_1 =	1.19	1.52	1.75	2.55

Time Intensity Frequency Tabulation

TIME	2 YR	5 YR	10 YR	100 YR
5	4.05	5.16	5.94	8.65
10	3.23	4.11	4.73	6.90
15	2.71	3.45	3.97	5.79
30	1.87	2.38	2.75	4.00
60	1.21	1.54	1.77	2.58
120	0.74	0.94	1.09	1.58

Table 6-6. Runoff Coefficients for Rational Method

(Source: UDFCD 2001)

Land Use or Surface Characteristics	Percent Impervious	Runoff Coefficients											
		2-year		5-year		10-year		25-year		50-year		100-year	
		HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D
Business													
Commercial Areas	95	0.79	0.80	0.81	0.82	0.83	0.84	0.85	0.87	0.87	0.88	0.88	0.89
Neighborhood Areas	70	0.45	0.49	0.49	0.53	0.53	0.57	0.58	0.62	0.60	0.65	0.62	0.68
Residential													
1/8 Acre or less	65	0.41	0.45	0.45	0.49	0.49	0.54	0.54	0.59	0.57	0.62	0.59	0.65
1/4 Acre	40	0.23	0.28	0.30	0.35	0.36	0.42	0.42	0.50	0.46	0.54	0.50	0.58
1/3 Acre	30	0.18	0.22	0.25	0.30	0.32	0.38	0.39	0.47	0.43	0.52	0.47	0.57
1/2 Acre	25	0.15	0.20	0.22	0.28	0.30	0.36	0.37	0.46	0.41	0.51	0.46	0.56
1 Acre	20	0.12	0.17	0.20	0.26	0.27	0.34	0.35	0.44	0.40	0.50	0.44	0.55
Industrial													
Light Areas	80	0.57	0.60	0.59	0.63	0.63	0.66	0.66	0.70	0.68	0.72	0.70	0.74
Heavy Areas	90	0.71	0.73	0.73	0.75	0.75	0.77	0.78	0.80	0.80	0.82	0.81	0.83
Parks and Cemeteries	7	0.05	0.09	0.12	0.19	0.20	0.29	0.30	0.40	0.34	0.46	0.39	0.52
Playgrounds	13	0.07	0.13	0.16	0.23	0.24	0.31	0.32	0.42	0.37	0.48	0.41	0.54
Railroad Yard Areas	40	0.23	0.28	0.30	0.35	0.36	0.42	0.42	0.50	0.46	0.54	0.50	0.58
Undeveloped Areas													
Historic Flow Analysis-- Greenbelts, Agriculture	2	0.03	0.05	0.09	0.16	0.17	0.26	0.26	0.38	0.31	0.45	0.36	0.51
Pasture/Meadow	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50
Forest	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50
Exposed Rock	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Offsite Flow Analysis (when landuse is undefined)	45	0.26	0.31	0.32	0.37	0.38	0.44	0.44	0.51	0.48	0.55	0.51	0.59
Streets													
Paved	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Gravel	80	0.57	0.60	0.59	0.63	0.63	0.66	0.66	0.70	0.68	0.72	0.70	0.74
Drive and Walks	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Roofs	90	0.71	0.73	0.73	0.75	0.75	0.77	0.78	0.80	0.80	0.82	0.81	0.83
Lawns	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50

3.2 Time of Concentration

One of the basic assumptions underlying the Rational Method is that runoff is a function of the average rainfall rate during the time required for water to flow from the hydraulically most remote part of the drainage area under consideration to the design point. However, in practice, the time of concentration can be an empirical value that results in reasonable and acceptable peak flow calculations.

For urban areas, the time of concentration (t_c) consists of an initial time or overland flow time (t_i) plus the travel time (t_t) in the storm sewer, paved gutter, roadside drainage ditch, or drainage channel. For non-urban areas, the time of concentration consists of an overland flow time (t_i) plus the time of travel in a concentrated form, such as a swale or drainageway. The travel portion (t_t) of the time of concentration can be estimated from the hydraulic properties of the storm sewer, gutter, swale, ditch, or drainageway. Initial time, on the other hand, will vary with surface slope, depression storage, surface cover, antecedent rainfall, and infiltration capacity of the soil, as well as distance of surface flow. The time of concentration is represented by Equation 6-7 for both urban and non-urban areas.

Weighted Imperviousness Calculations

SUB-BASIN	AREA (SF)	AREA (Acres)	ROOF AREA	ROOF IMPERVIOUSNESS	ROOF				LANDSCAPE AREA	LANDSCAPE IMPERVIOUSNESS	LANDSCAPE				PAVEMENT AREA	PAVEMENT IMPERVIOUSNESS	PAVEMENT				WEIGHTED IMPERVIOUSNESS	WEIGHTED COEFFICIENTS			
					C2	C5	C10	C100			C2	C5	C10	C100			C2	C5	C10	C100		C2	C5	C10	C100
EX1	176612	4.05	0	90%	0.71	0.73	0.75	0.81	4.054449	2%	0.03	0.09	0.17	0.36	0	100%	0.89	0.90	0.92	0.96	2%	0.03	0.09	0.17	0.36
EX2	334022	7.67	0	90%	0.71	0.73	0.75	0.81	7.668084	2%	0.03	0.09	0.17	0.36	0	100%	0.89	0.90	0.92	0.96	2%	0.03	0.09	0.17	0.36
OS1	8569.09	0.20	0	90%	0.71	0.73	0.75	0.81	0.196719	2%	0.03	0.09	0.17	0.36	0	100%	0.89	0.90	0.92	0.96	2%	0.03	0.09	0.17	0.36
OS2	52548.9	1.21	0	90%	0.71	0.73	0.75	0.81	0.06	2%	0.03	0.09	0.17	0.36	1.15	100%	0.89	0.90	0.92	0.96	95%	0.85	0.86	0.89	0.93
OS3	20104.2	0.46	0	90%	0.71	0.73	0.75	0.81	0.461529	2%	0.03	0.09	0.17	0.36	0	100%	0.89	0.90	0.92	0.96	2%	0.03	0.09	0.17	0.36
TOTAL	415,244	9.53	0.00	90%	0.71	0.73	0.75	0.81	8.39	2%	0.03	0.09	0.17	0.36	1.15	100%	0.89	0.90	0.92	0.96	14%	0.13	0.19	0.26	0.43

Citizen on Constitution - Drainage Report																
Existing Runoff Calculations									Watercourse Coefficient							
Time of Concentration					Forest & Meadow		2.50	Short Grass Pasture & Lawns		7.00				Grassed Waterway		15.00
					Fallow or Cultivation		5.00	Nearly Bare Ground		10.00				Paved Area & Shallow Gutter		20.00
	SUB-BASIN DATA				INITIAL / OVERLAND TIME			TRAVEL TIME T(t)					T(c) CHECK (URBANIZED BASINS)			FINAL T(c)
DESIGN POINT	DRAIN BASIN	AREA sq. ft.	AREA ac.	C(5)	Length ft.	Slope %	T(i) min	Length ft.	Slope %	Coeff.	Velocity fps	T(t) min.	COMP. T(c)	TOTAL LENGTH	L/180+10	min.
1	EX1	176,612	4.05	0.09	141	1.7%	18.4	275	2.3%	5.00	0.8	6.1	24.5	416	12.3	12.3
2	EX2	334,022	7.67	0.09	100	2.2%	14.2	315	2.3%	5.00	0.8	7.0	21.2	415	12.3	12.3
3	OS1	8,569	0.20	0.09	20	3.5%	5.4	0	2.0%	5.00	0.7	0.0	5.4	20	10.1	5.4
4	OS2	52,549	1.21	0.86	57	2.0%	2.6	849	0.5%	20.00	1.4	10.0	12.6	906	15.0	12.6
5	OS3	20,104	0.46	0.09	20	2.0%	6.6	0	0.5%	5.00	0.4	0.0	6.6	20	10.1	6.6

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Existing Runoff Calculations **Design Storm** ***5 Year***
(Rational Method Procedure)

BASIN INFORMATION				DIRECT RUNOFF				CUMULATIVE RUNOFF				NOTES
DESIGN POINT	DRAIN BASIN	AREA ac.	RUNOFF COEFF	T(c) min	C x A	I in/hr	Q cfs	T(c) min	C x A	I in/hr	Q cfs	
1	EX1	4.05	0.09	12.3	0.36	3.78	1.38				5.35	Includes flow from OS1 & OS2
2	EX2	7.67	0.09	12.3	0.69	3.78	2.61				2.80	Includes flow from OS3
3	OS1	0.20	0.09	5.4	0.02	5.05	0.09				0.09	
4	OS2	1.21	0.86	12.6	1.04	3.73	3.89				3.89	
5	OS3	0.46	0.09	6.6	0.04	4.76	0.20				0.20	

Citizen on Constitution - Drainage Report

Existing Runoff Calculations **Design Storm** ***100 Year***

(Rational Method Procedure)

BASIN INFORMATION				DIRECT RUNOFF				CUMULATIVE RUNOFF				NOTES
DESIGN POINT	DRAIN BASIN	AREA ac.	RUNOFF COEFF	T(c) min	C x A	I in/hr	Q cfs	T(c) min	C x A	I in/hr	Q cfs	
1	EX1	4.05	0.36	12.3	1.46	6.33	9.24				16.90	Includes flow from OS1 & OS2
2	EX2	7.67	0.36	12.3	2.76	6.33	17.48				18.81	Includes flow from OS3
3	OS1	0.20	0.36	5.4	0.07	8.47	0.60				0.60	
4	OS2	1.21	0.93	12.6	1.13	6.26	7.05				7.05	
5	OS3	0.46	0.36	6.6	0.17	7.99	1.33				1.33	

SUMMARY - EXISTING RUNOFF TABLE						
DESIGN POINT	BASIN DESIGNATION	BASIN AREA (ACRES)	DIRECT 5-YR RUNOFF (CFS)	DIRECT 100-YR RUNOFF (CFS)	CUMULATIVE 5-YR RUNOFF (CFS)	CUMULATIVE 100-YR RUNOFF (CFS)
1	EX1	4.05	1.38	9.24	5.35	16.90
2	EX2	7.67	2.61	17.48	2.80	18.81
3	OS1	0.20	0.09	0.60	3.97	7.65
4	OS2	1.21	3.89	7.05	3.89	7.05
5	OS3	0.46	0.20	1.33	0.20	1.33

Weighted Imperviousness Calculations

SUB-BASIN	AREA (SF)	AREA (Acres)	ROOF AREA	ROOF IMPERVIOUSNESS	ROOF				LANDSCAPE AREA	LANDSCAPE IMPERVIOUSNESS	LANDSCAPE				PAVEMENT/GRAVEL AREA	PAVEMENT/GRAVEL IMPERVIOUSNESS	PAVEMENT				WEIGHTED IMPERVIOUSNESS	WEIGHTED COEFFICIENTS			
					C2	C5	C10	C100			C2	C5	C10	C100			C2	C5	C10	C100		C2	C5	C10	C100
A1*	38032	0.87	0.00	90%	0.71	0.73	0.75	0.81	0.87	2%	0.02	0.08	0.15	0.35	0.00	100%	0.89	0.90	0.92	0.96	2%	0.02	0.08	0.15	0.35
A2*	18072	0.41	0.00	90%	0.71	0.73	0.75	0.81	0.24	2%	0.02	0.08	0.15	0.35	0.17	100%	0.89	0.90	0.92	0.96	42%	0.38	0.42	0.47	0.60
B1	5733	0.13	0.00	90%	0.71	0.73	0.75	0.81	0.02	2%	0.02	0.08	0.15	0.35	0.11	100%	0.89	0.90	0.92	0.96	83%	0.74	0.76	0.79	0.85
B2	7269	0.17	0.00	90%	0.71	0.73	0.75	0.81	0.04	2%	0.02	0.08	0.15	0.35	0.13	100%	0.89	0.90	0.92	0.96	79%	0.70	0.72	0.75	0.83
B3*	15035	0.35	0.00	90%	0.71	0.73	0.75	0.81	0.06	2%	0.02	0.08	0.15	0.35	0.29	100%	0.89	0.90	0.92	0.96	84%	0.75	0.77	0.79	0.86
B4*	7927	0.18	0.00	90%	0.71	0.73	0.75	0.81	0.03	2%	0.02	0.08	0.15	0.35	0.15	100%	0.89	0.90	0.92	0.96	84%	0.75	0.77	0.80	0.86
B5*	1347	0.03	0.00	90%	0.71	0.73	0.75	0.81	0.01	2%	0.02	0.08	0.15	0.35	0.02	100%	0.89	0.90	0.92	0.96	75%	0.67	0.69	0.72	0.80
C1	36584	0.84	0.00	90%	0.71	0.73	0.75	0.81	0.82	2%	0.02	0.08	0.15	0.35	0.02	100%	0.89	0.90	0.92	0.96	4%	0.04	0.10	0.17	0.36
C2	11364	0.26	0.04	90%	0.71	0.73	0.75	0.81	0.07	2%	0.02	0.08	0.15	0.35	0.15	100%	0.89	0.90	0.92	0.96	73%	0.64	0.66	0.69	0.78
C3	27135	0.62	0.15	90%	0.71	0.73	0.75	0.81	0.03	2%	0.02	0.08	0.15	0.35	0.44	100%	0.89	0.90	0.92	0.96	92%	0.80	0.81	0.84	0.89
D1	25466	0.58	0.07	90%	0.71	0.73	0.75	0.81	0.01	2%	0.02	0.08	0.15	0.35	0.51	100%	0.89	0.90	0.92	0.96	97%	0.85	0.87	0.89	0.93
D1a	7879	0.18	0.00	90%	0.71	0.73	0.75	0.81	0.02	2%	0.02	0.08	0.15	0.35	0.16	100%	0.89	0.90	0.92	0.96	87%	0.77	0.79	0.81	0.88
D2	46995	1.08	0.30	90%	0.71	0.73	0.75	0.81	0.08	2%	0.02	0.08	0.15	0.35	0.70	100%	0.89	0.90	0.92	0.96	90%	0.78	0.79	0.82	0.88
D3	12867	0.30	0.16	90%	0.71	0.73	0.75	0.81	0.12	2%	0.02	0.08	0.15	0.35	0.02	100%	0.89	0.90	0.92	0.96	55%	0.44	0.48	0.52	0.63
D4	13087	0.30	0.16	90%	0.71	0.73	0.75	0.81	0.12	2%	0.02	0.08	0.15	0.35	0.02	100%	0.89	0.90	0.92	0.96	55%	0.44	0.48	0.52	0.63
D5	22186	0.51	0.13	90%	0.71	0.73	0.75	0.81	0.04	2%	0.02	0.08	0.15	0.35	0.34	100%	0.89	0.90	0.92	0.96	90%	0.78	0.79	0.82	0.87
D6	35089	0.81	0.25	90%	0.71	0.73	0.75	0.81	0.05	2%	0.02	0.08	0.15	0.35	0.51	100%	0.89	0.90	0.92	0.96	91%	0.78	0.80	0.82	0.88
D7	17176	0.39	0.10	90%	0.71	0.73	0.75	0.81	0.05	2%	0.02	0.08	0.15	0.35	0.24	100%	0.89	0.90	0.92	0.96	85%	0.73	0.75	0.78	0.84
D8	23507	0.54	0.11	90%	0.71	0.73	0.75	0.81	0.08	2%	0.02	0.08	0.15	0.35	0.35	100%	0.89	0.90	0.92	0.96	84%	0.73	0.75	0.77	0.84
D9	18641	0.43	0.21	90%	0.71	0.73	0.75	0.81	0.05	2%	0.02	0.08	0.15	0.35	0.16	100%	0.89	0.90	0.92	0.96	83%	0.69	0.72	0.74	0.81
D10	15901	0.37	0.19	90%	0.71	0.73	0.75	0.81	0.05	2%	0.02	0.08	0.15	0.35	0.13	100%	0.89	0.90	0.92	0.96	82%	0.68	0.71	0.73	0.80
D11	21854	0.50	0.11	90%	0.71	0.73	0.75	0.81	0.05	2%	0.02	0.08	0.15	0.35	0.34	100%	0.89	0.90	0.92	0.96	89%	0.77	0.79	0.81	0.87
D12	28925	0.66	0.21	90%	0.71	0.73	0.75	0.81	0.45	2%	0.02	0.08	0.15	0.35	0.00	100%	0.89	0.90	0.92	0.96	30%	0.24	0.29	0.34	0.50
E1	7637	0.18	0.09	90%	0.71	0.73	0.75	0.81	0.09	2%	0.02	0.08	0.15	0.35	0.00	100%	0.89	0.90	0.92	0.96	46%	0.36	0.40	0.45	0.58
E2	9127	0.21	0.09	90%	0.71	0.73	0.75	0.81	0.12	2%	0.02	0.08	0.15	0.35	0.00	100%	0.89	0.90	0.92	0.96	39%	0.31	0.35	0.40	0.54
E3	9520	0.22	0.09	90%	0.71	0.73	0.75	0.81	0.12	2%	0.02	0.08	0.15	0.35	0.00	100%	0.89	0.90	0.92	0.96	40%	0.32	0.36	0.41	0.55
E4	8040	0.18	0.09	90%	0.71	0.73	0.75	0.81	0.09	2%	0.02	0.08	0.15	0.35	0.00	100%	0.89	0.90	0.92	0.96	46%	0.36	0.40	0.45	0.58
OA1*	2118	0.05	0.00	90%	0.71	0.73	0.75	0.81	0.03	2%	0.02	0.08	0.15	0.35	0.02	100%	0.89	0.90	0.92	0.96	46%	0.41	0.45	0.50	0.63
OA2*^	19602	0.45																							
OB1	3388	0.08	0.00	90%	0.71	0.73	0.75	0.81	0.00	2%	0.02	0.08	0.15	0.35	0.07	100%	0.89	0.90	0.92	0.96	96%	0.86	0.87	0.89	0.94
OB2	3503	0.08	0.00	90%	0.71	0.73	0.75	0.81	0.01	2%	0.02	0.08	0.15	0.35	0.07	100%	0.89	0.90	0.92	0.96	90%	0.80	0.82	0.84	0.90
OC1	3590	0.08	0.00	90%	0.71	0.73	0.75	0.81	0.05	2%	0.02	0.08	0.15	0.35	0.03	100%	0.89	0.90	0.92	0.96	41%	0.37	0.41	0.46	0.59
OC2	2589	0.06	0.00	90%	0.71	0.73	0.75	0.81	0.05	2%	0.02	0.08	0.15	0.35	0.01	100%	0.89	0.90	0.92	0.96	25%	0.23	0.27	0.33	0.49
OD12	653	0.01	0.00	90%	0.71	0.73	0.75	0.81	0.01	2%	0.02	0.08	0.15	0.35	0.00	100%	0.89	0.90	0.92	0.96	2%	0.02	0.08	0.15	0.35
OE1	4000	0.09	0.00	90%	0.71	0.73	0.75	0.81	0.07	2%	0.02	0.08	0.15	0.35	0.02	100%	0.89	0.90	0.92	0.96	25%	0.22	0.27	0.33	0.49
OE2	5897	0.14	0.00	90%	0.71	0.73	0.75	0.81	0.10	2%	0.02	0.08	0.15	0.35	0.03	100%	0.89	0.90	0.92	0.96	25%	0.22	0.27	0.33	0.49
OE3	6053	0.14	0.00	90%	0.71	0.73	0.75	0.81	0.11	2%	0.02	0.08	0.15	0.35	0.03	100%	0.89	0.90	0.92	0.96	25%	0.22	0.27	0.33	0.49
OE4	4075	0.09	0.00	90%	0.71	0.73	0.75	0.81	0.07	2%	0.02	0.08	0.15	0.35	0.02	100%	0.89	0.90	0.92	0.96	28%	0.25	0.30	0.35	0.51
OF1	48921	1.12	0.00	90%	0.71	0.73	0.75	0.81	0.00	2%	0.02	0.08	0.15	0.35	1.12	100%	0.89	0.90	0.92	0.96	100%	0.89	0.90	0.92	0.96
OF2	18232	0.42	0.00	90%	0.71	0.73	0.75	0.81	0.42	2%	0.02	0.08	0.15	0.35	0.00	100%	0.89	0.90	0.92	0.96	2%	0.02	0.08	0.15	0.35
OS1*	10993	0.25	0.00	90%	0.71	0.73	0.75	0.81	0.04	2%	0.02	0.08	0.15	0.35	0.21	100%	0.89	0.90	0.92	0.96	83%	0.74	0.76	0.79	0.85
TOTAL		14.37	2.55	90%	0.71	0.73	0.75	0.81	4.75	2%	0.02	0.08	0.15	0.35	6.63	100%	0.89	0.90	0.92	0.96	63%	0.54	0.57	0.61	0.70

*flows from sub-basin are undetained

^sub-basin area and flows were obtained from previously approved drainage report from adjacent property

Citizen on Constitution - Drainage Report
Proposed Runoff Calculations
Time of Concentration

Watercourse Coefficient

Forest & Meadow	2.50	Short Grass Pasture & Lawns	7.00	Grassed Waterway	15.00
Fallow or Cultivation	5.00	Nearly Bare Ground	10.00	Paved Area & Shallow Gutter	20.00

	SUB-BASIN DATA				INITIAL / OVERLAND TIME			TRAVEL TIME T(t)					T(c) CHECK (URBANIZED BASINS)			FINAL T(c)
DESIGN POINT	DRAIN BASIN	AREA sq. ft.	AREA ac.	C(5)	Length ft.	Slope %	T(i) min	Length ft.	Slope %	Coeff.	Velocity fps	T(t) min.	COMP. T(c)	TOTAL LENGTH	/180+10	min.
A1*	A1*	38,032	0.87	0.08	100	1.6%	16.0	344	1.6%	7.00	0.9	6.5	22.5	444	12.5	12.5
A2*	A2*	18,072	0.41	0.42	40	33.0%	2.5	0	15.0%	7.00	2.7	0.0	5.0	40	10.2	5.0
B1	B1	5,733	0.13	0.76	20	2.0%	2.2	150	2.0%	20.00	2.8	0.9	5.0	170	10.9	5.0
B2	B2	7,269	0.17	0.72	20	2.0%	2.4	150	2.0%	20.00	2.8	0.9	5.0	170	10.9	5.0
B3*	B3*	15,035	0.35	0.77	20	2.0%	2.2	150	2.0%	20.00	2.8	0.9	5.0	170	10.9	5.0
B4*	B4*	7,927	0.18	0.77	20	2.0%	2.1	150	2.0%	20.00	2.8	0.9	5.0	170	10.9	5.0
B5*	B5*	1,347	0.03	0.69	20	2.0%	2.7	150	2.0%	20.00	2.8	0.9	5.0	170	10.9	5.0
C1	C1	36,584	0.84	0.10	60	33.0%	4.4	0	2.0%	20.00	2.8	0.0	5.0	60	10.3	5.0
C2	C2	11,364	0.26	0.66	30	25.0%	1.5	100	2.0%	20.00	2.8	0.6	5.0	130	10.7	5.0
C3	C3	27,135	0.62	0.81	20	3.0%	1.6	80	2.0%	20.00	2.8	0.5	5.0	100	10.6	5.0
D1	D1	25,466	0.58	0.87	30	4.0%	1.5	150	2.0%	20.00	2.8	0.9	5.0	180	11.0	5.0
D1a	D1a	7,879	0.18	0.79	20	5.0%	1.5	50	2.0%	20.00	2.8	0.3	5.0	70	10.4	5.0
D2	D2	46,995	1.08	0.79	40	3.0%	2.5	50	2.0%	20.00	2.8	0.3	5.0	90	10.5	5.0
D3	D3	12,867	0.30	0.48	40	3.0%	5.0	40	2.0%	20.00	2.8	0.2	5.2	80	10.4	5.2
D4	D4	13,087	0.30	0.48	40	3.0%	5.0	40	2.0%	20.00	2.8	0.2	5.2	80	10.4	5.2
D5	D5	22,186	0.51	0.79	40	3.0%	2.5	15	2.0%	20.00	2.8	0.1	5.0	55	10.3	5.0
D6	D6	35,089	0.81	0.80	40	3.0%	2.4	15	2.0%	20.00	2.8	0.1	5.0	55	10.3	5.0
D7	D7	17,176	0.39	0.75	40	3.0%	2.8	15	2.0%	20.00	2.8	0.1	5.0	55	10.3	5.0
D8	D8	23,507	0.54	0.75	40	3.0%	2.8	15	2.0%	20.00	2.8	0.1	5.0	55	10.3	5.0
D9	D9	18,641	0.43	0.72	40	3.0%	3.1	15	2.0%	20.00	2.8	0.1	5.0	55	10.3	5.0
D10	D10	15,901	0.37	0.71	40	3.0%	3.2	15	2.0%	20.00	2.8	0.1	5.0	55	10.3	5.0
D11	D11	21,854	0.50	0.79	40	3.0%	2.5	15	2.0%	20.00	2.8	0.1	5.0	55	10.3	5.0
D12	D12	28,925	0.66	0.29	25	5.0%	4.3	15	2.0%	20.00	2.8	0.1	5.0	40	10.2	5.0
E1	E1	7,637	0.18	0.40	30	25.0%	2.4	0	2.0%	7.00	1.0	0.0	5.0	30	10.2	5.0
E2	E2	9,127	0.21	0.35	30	25.0%	2.6	0	2.0%	7.00	1.0	0.0	5.0	30	10.2	5.0
E3	E3	9,520	0.22	0.36	30	25.0%	2.5	0	2.0%	7.00	1.0	0.0	5.0	30	10.2	5.0
E4	E4	8,040	0.18	0.40	30	25.0%	2.4	0	2.0%	7.00	1.0	0.0	5.0	30	10.2	5.0
OA1*	OA1*	2,118	0.05	0.45	75	5.0%	6.0	50	2.0%	7.00	1.0	0.8	6.8	125	10.7	6.8
OA2*^	OA2*^	19,602	0.45	0.00	75	5.0%	10.2	50	2.0%	7.00	1.0	0.8	11.0	125	10.7	10.7
OB1	OB1	3,388	0.08	0.87	60	2.0%	2.6	0	2.0%	7.00	1.0	0.0	5.0	60	10.3	5.0
OB2	OB2	3,503	0.08	0.82	60	2.0%	3.2	0	2.0%	7.00	1.0	0.0	5.0	60	10.3	5.0
OC1	OC1	3,590	0.08	0.41	25	5.0%	3.7	0	2.0%	7.00	1.0	0.0	5.0	25	10.1	5.0
OC2	OC2	2,589	0.06	0.27	25	15.0%	3.1	0	2.0%	7.00	1.0	0.0	5.0	25	10.1	5.0
OD12	OD12	653	0.01	0.08	25	5.0%	5.5	0	2.0%	7.00	1.0	0.0	5.5	25	10.1	5.5
OE1	OE1	4,000	0.09	0.27	0	25.0%	0.2	70	2.0%	7.00	1.0	1.2	5.0	70	10.4	5.0
OE2	OE2	5,897	0.14	0.27	0	25.0%	0.2	70	2.0%	7.00	1.0	1.2	5.0	70	10.4	5.0
OE3	OE3	6,053	0.14	0.27	0	25.0%	0.2	70	2.0%	7.00	1.0	1.2	5.0	70	10.4	5.0
OE4	OE4	4,075	0.09	0.30	0	25.0%	0.2	70	2.0%	7.00	1.0	1.2	5.0	70	10.4	5.0
OF1	OF1	48,921	1.12	0.90	50	2.0%	2.1	750	2.0%	7.00	1.0	12.6	14.7	800	14.4	14.4
OF2	OF2	18,232	0.42	0.08	30	2.0%	8.1	0	2.0%	7.00	1.0	0.0	8.1	30	10.2	8.1
OS1*	OS1*	10,993	0.25	0.76	50	2.0%	3.5	75	5.0%	20.00	4.5	0.3	5.0	125	10.7	5.0

Citizen on Constitution - Drainage Report
Proposed Runoff Calculations **Design Storm** ***5 Year***
(Rational Method Procedure)

BASIN INFORMATION				DIRECT RUNOFF				CUMULATIVE RUNOFF				NOTES
DESIGN POINT	DRAIN BASIN	AREA ac.	RUNOFF COEFF	T(c) min	C x A	I in/hr	Q cfs	T(c) min	C x A	I in/hr	Q cfs	
A1*	A1*	0.87	0.08	12.5	0.07	3.75	0.26				0.75	A1 + OA1 + OA2
A2*	A2*	0.41	0.42	5.0	0.17	5.16	0.89					
B1	B1	0.13	0.76	5.0	0.10	5.16	0.51				0.86	B1 + OB1
B2	B2	0.17	0.72	5.0	0.12	5.16	0.62				0.96	B2 + OB2
B3*	B3*	0.35	0.77	5.0	0.26	5.16	1.36					
B4*	B4*	0.18	0.77	5.0	0.14	5.16	0.72					
B5*	B5*	0.03	0.69	5.0	0.02	5.16	0.11					
C1	C1	0.84	0.10	5.0	0.08	5.16	0.43				0.60	C1 + OC1
C2	C2	0.26	0.66	5.0	0.17	5.16	0.89				0.97	C2 + OC2
C3	C3	0.62	0.81	5.0	0.51	5.16	2.61					
D1	D1	0.58	0.87	5.0	0.51	5.16	2.61					
D1a	D1a	0.18	0.79	5.0	0.14	5.16	0.73					
D2	D2	1.08	0.79	5.0	0.86	5.16	4.42					
D3	D3	0.30	0.48	5.2	0.14	5.09	0.72					
D4	D4	0.30	0.48	5.2	0.14	5.09	0.73					
D5	D5	0.51	0.79	5.0	0.40	5.16	2.08					
D6	D6	0.81	0.80	5.0	0.64	5.16	3.32					
D7	D7	0.39	0.75	5.0	0.30	5.16	1.53					
D8	D8	0.54	0.75	5.0	0.40	5.16	2.07					
D9	D9	0.43	0.72	5.0	0.31	5.16	1.58					
D10	D10	0.37	0.71	5.0	0.26	5.16	1.33					
D11	D11	0.50	0.79	5.0	0.39	5.16	2.03					
D12	D12	0.66	0.29	5.0	0.19	5.16	0.99				0.99	D12 + OD12
E1	E1	0.18	0.40	5.0	0.07	5.16	0.37				0.49	E1 + OE1
E2	E2	0.21	0.35	5.0	0.07	5.16	0.38				0.57	E2 + OE2
E3	E3	0.22	0.36	5.0	0.08	5.16	0.41				0.60	E3 + OE3
E4	E4	0.18	0.40	5.0	0.07	5.16	0.38				0.53	E4 + OE4
OA1*	OA1*	0.05	0.45	6.8	0.02	4.71	0.10					
OA2*^	OA2*^	0.45	0.00		0.00	4.00					0.60	Flows from previous FDR
OB1	OB1	0.08	0.87	5.0	0.07	5.16	0.35					
OB2	OB2	0.08	0.82	5.0	0.07	5.16	0.34					
OC1	OC1	0.08	0.41	5.0	0.03	5.16	0.17					
OC2	OC2	0.06	0.27	5.0	0.02	5.16	0.08					
OD12	OD12	0.01	0.08	5.5	0.00	5.02	0.01					
OE1	OE1	0.09	0.27	5.0	0.02	5.16	0.13					
OE2	OE2	0.14	0.27	5.0	0.04	5.16	0.19					
OE3	OE3	0.14	0.27	5.0	0.04	5.16	0.19					
OE4	OE4	0.09	0.30	5.0	0.03	5.16	0.14					
OF1	OF1	1.12	0.90	14.4	1.01	3.52	3.56					
OF2	OF2	0.42	0.08	8.1	0.03	4.45	0.15					
OS1*	OS1*	0.25	0.76	5.0	0.19	5.16	0.99					

Citizen on Constitution - Drainage Report
Proposed Runoff Calculations **Design Storm** ***100 Year***
(Rational Method Procedure)

BASIN INFORMATION				DIRECT RUNOFF				CUMULATIVE RUNOFF				NOTES
DESIGN POINT	DRAIN BASIN	AREA ac.	RUNOFF COEFF	T(c) min	C x A	I in/hr	Q cfs	T(c) min	C x A	I in/hr	Q cfs	
A1*	A1*	0.87	0.35	12.5	0.31	6.29	1.92				3.09	A1 + OA1 + OA2
A2*	A2*	0.41	0.60	5.0	0.25	8.65	2.15					
B1	B1	0.13	0.85	5.0	0.11	8.65	0.97				1.60	B1 + OB1
B2	B2	0.17	0.83	5.0	0.14	8.65	1.20				1.82	B2 + OB2
B3*	B3*	0.35	0.86	5.0	0.30	8.65	2.57					
B4*	B4*	0.18	0.86	5.0	0.16	8.65	1.36					
B5*	B5*	0.03	0.80	5.0	0.02	8.65	0.21					
C1	C1	0.84	0.36	5.0	0.31	8.65	2.64				3.07	C1 + OC1
C2	C2	0.26	0.78	5.0	0.20	8.65	1.76				2.01	C2 + OC2
C3	C3	0.62	0.89	5.0	0.55	8.65	4.79					
D1	D1	0.58	0.93	5.0	0.55	8.65	4.72					
D1a	D1a	0.18	0.88	5.0	0.16	8.65	1.37					
D2	D2	1.08	0.88	5.0	0.94	8.65	8.17					
D3	D3	0.30	0.63	5.2	0.19	8.54	1.59					
D4	D4	0.30	0.63	5.2	0.19	8.54	1.63					
D5	D5	0.51	0.87	5.0	0.45	8.65	3.85					
D6	D6	0.81	0.88	5.0	0.71	8.65	6.11					
D7	D7	0.39	0.84	5.0	0.33	8.65	2.88					
D8	D8	0.54	0.84	5.0	0.45	8.65	3.92					
D9	D9	0.43	0.81	5.0	0.35	8.65	3.00					
D10	D10	0.37	0.80	5.0	0.29	8.65	2.54					
D11	D11	0.50	0.87	5.0	0.44	8.65	3.78					
D12	D12	0.66	0.50	5.0	0.33	8.65	2.86				2.90	D12 + OD12
E1	E1	0.18	0.58	5.0	0.10	8.65	0.88				1.27	E1 + OE1
E2	E2	0.21	0.54	5.0	0.11	8.65	0.98				1.56	E2 + OE2
E3	E3	0.22	0.55	5.0	0.12	8.65	1.04				1.63	E3 + OE3
E4	E4	0.18	0.58	5.0	0.11	8.65	0.92				1.34	E4 + OE4
OA1*	OA1*	0.05	0.63	6.8	0.03	7.90	0.24					
OA2*^	OA2*^	0.45	0.00	10.7	0.00	6.71					1.90	Flows from previous FDR
OB1	OB1	0.08	0.94	5.0	0.07	8.65	0.63					
OB2	OB2	0.08	0.90	5.0	0.07	8.65	0.62					
OC1	OC1	0.08	0.59	5.0	0.05	8.65	0.42					
OC2	OC2	0.06	0.49	5.0	0.03	8.65	0.25					
OD12	OD12	0.01	0.35	5.5	0.01	8.43	0.04					
OE1	OE1	0.09	0.49	5.0	0.05	8.65	0.39					
OE2	OE2	0.14	0.49	5.0	0.07	8.65	0.58					
OE3	OE3	0.14	0.49	5.0	0.07	8.65	0.59					
OE4	OE4	0.09	0.51	5.0	0.05	8.65	0.41					
OF1	OF1	1.12	0.96	14.4	1.08	5.90	6.36					
OF2	OF2	0.42	0.35	8.1	0.15	7.46	1.09					
OS1*	OS1*	0.25	0.85	5.0	0.22	8.65	1.87					

SUMMARY - PROPOSED RUNOFF TABLE						
DESIGN POINT	BASIN DESIGNATION	BASIN AREA (ACRES)	DIRECT 5-YR RUNOFF (CFS)	DIRECT 100-YR RUNOFF (CFS)	CUMULATIVE 5-YR RUNOFF (CFS)	CUMULATIVE 100-YR RUNOFF (CFS)
A1*	A1*	0.87	0.26	1.92	0.75	3.09
A2*	A2*	0.41	0.89	2.15	0.89	2.15
B1	B1	0.13	0.51	0.97	0.86	1.60
B2	B2	0.17	0.62	1.20	0.96	1.82
B3*	B3*	0.35	1.36	2.57	1.36	2.57
B4*	B4*	0.18	0.72	1.36	0.72	1.36
B5*	B5*	0.03	0.11	0.21	0.11	0.21
C1	C1	0.84	0.43	2.64	0.60	3.07
C2	C2	0.26	0.89	1.76	0.97	2.01
C3	C3	0.62	2.61	4.79	2.61	4.79
D1	D1	0.58	2.61	4.72	2.61	4.72
D1a	D1a	0.18	0.73	1.37	0.73	1.37
D2	D2	1.08	4.42	8.17	4.42	8.17
D3	D3	0.30	0.72	1.59	0.72	1.59
D4	D4	0.30	0.73	1.63	0.73	1.63
D5	D5	0.51	2.08	3.85	2.08	3.85
D6	D6	0.81	3.32	6.11	3.32	6.11
D7	D7	0.39	1.53	2.88	1.53	2.88
D8	D8	0.54	2.07	3.92	2.07	3.92
D9	D9	0.43	1.58	3.00	1.58	3.00
D10	D10	0.37	1.33	2.54	1.33	2.54
D11	D11	0.50	2.03	3.78	2.03	3.78
D12	D12	0.66	0.99	2.86	0.99	2.90
E1	E1	0.18	0.37	0.88	0.49	1.27
E2	E2	0.21	0.38	0.98	0.57	1.56
E3	E3	0.22	0.41	1.04	0.60	1.63
E4	E4	0.18	0.38	0.92	0.53	1.34
OA1*	OA1*	0.05	0.10	0.24	0.10	0.24
OA2*^	OA2*^	0.45	0.00	0.00	0.60	1.90
OB1	OB1	0.08	0.35	0.63	0.35	0.63
OB2	OB2	0.08	0.34	0.62	0.34	0.62
OC1	OC1	0.08	0.17	0.42	0.17	0.42
OC2	OC2	0.06	0.08	0.25	0.08	0.25
OD12	OD12	0.01	0.01	0.04	0.01	0.04
OE1	OE1	0.09	0.13	0.39	0.13	0.39
OE2	OE2	0.14	0.19	0.58	0.19	0.58
OE3	OE3	0.14	0.19	0.59	0.19	0.59
OE4	OE4	0.09	0.14	0.41	0.14	0.41
OF1	OF1	1.12	3.56	6.36	3.56	6.36
OF2	OF2	0.42	0.15	1.09	0.15	1.09
OS1*	OS1*	0.25	0.99	1.87	0.99	1.87

*flows from sub-basin are undetained

^sub-basin area and flows were obtained from previously approved drainage report from adjacent property

APPENDIX C: HYDRAULICS

Worksheet for Curb Cut Anlaysis (Largest Proposed Discharge)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	0.020 ft/ft
Bottom Width	3.00 ft
Discharge	4.79 cfs

Results

Normal Depth	3.2 in
Flow Area	0.8 ft²
Wetted Perimeter	3.5 ft
Hydraulic Radius	2.7 in
Top Width	3.00 ft
Critical Depth	5.2 in
Critical Slope	0.005 ft/ft
Velocity	6.00 ft/s
Velocity Head	0.56 ft
Specific Energy	0.83 ft
Froude Number	2.050
Flow Type	Supercritical

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	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	3.2 in
Critical Depth	5.2 in
Channel Slope	0.020 ft/ft
Critical Slope	0.005 ft/ft

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INLET MANAGEMENT

Worksheet Protected

INLET NAME	B1	B2	B3
Site Type (Urban or Rural)			
Inlet Application (Street or Area)	STREET	STREET	STREET
Hydraulic Condition	On Grade	On Grade	On Grade
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	0.9	1.0	1.4
Major Q_{Known} (cfs)	1.6	1.8	2.6

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	No Bypass Flow Received	OF1	B1
Minor Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.0
Major Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.1

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)	**0.9**	**1.0**	**1.4**
Major Total Design Peak Flow, Q (cfs)	**1.6**	**1.8**	**2.7**
Minor Flow Bypassed Downstream, Q_b (cfs)	0.0	0.0	0.0
Major Flow Bypassed Downstream, Q_b (cfs)	0.1	0.2	0.6

MHFD-Inlet, Version 5.01 (April 2021)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	B4	D1	D2
Site Type (Urban or Rural)			
Inlet Application (Street or Area)	STREET	STREET	STREET
Hydraulic Condition	On Grade	In Sump	In Sump
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	0.7	2.6	4.4
Major Q_{Known} (cfs)	0.4	4.7	8.2

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	No Bypass Flow Received	D1a	No Bypass Flow Received
Minor Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.0
Major Bypass Flow Received, Q_b (cfs)	0.0	0.1	0.0

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)	**0.7**	**2.6**	**4.4**
Major Total Design Peak Flow, Q (cfs)	**0.4**	**4.8**	**8.2**
Minor Flow Bypassed Downstream, Q_b (cfs)	0.0	N/A	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	0.0	N/A	N/A

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INLET MANAGEMENT

Worksheet Protected

INLET NAME	D5	D6	D7
Site Type (Urban or Rural)			
Inlet Application (Street or Area)	STREET	STREET	STREET
Hydraulic Condition	In Sump	In Sump	In Sump
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	2.1	3.3	1.5
Major Q_{Known} (cfs)	3.9	6.1	2.9

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received
Minor Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.0
Major Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.0

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)	**2.1**	**3.3**	**1.5**
Major Total Design Peak Flow, Q (cfs)	**3.9**	**6.1**	**2.9**
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

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INLET MANAGEMENT

Worksheet Protected

INLET NAME	D8	D9	D10
Site Type (Urban or Rural)			
Inlet Application (Street or Area)	STREET	STREET	STREET
Hydraulic Condition	In Sump	In Sump	In Sump
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	2.1	1.6	1.3
Major Q_{Known} (cfs)	3.9	3.0	2.5

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received
Minor Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.0
Major Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.0

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)	**2.1**	**1.6**	**1.3**
Major Total Design Peak Flow, Q (cfs)	**3.9**	**3.0**	**2.5**
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

MHFD-Inlet, Version 5.01 (April 2021)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	D11	OF1	D1a
Site Type (Urban or Rural)		URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	STREET
Hydraulic Condition	In Sump	On Grade	On Grade
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	2.0	3.6	0.7
Major Q_{Known} (cfs)	3.8	6.4	1.4

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	No Bypass Flow Received	No Bypass Flow Received	B2
Minor Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.0
Major Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.2

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)			

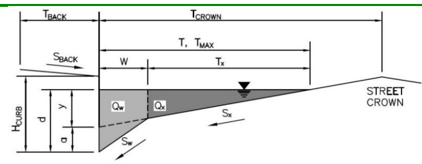
CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**2.0**	**3.6**	**0.7**
Major Total Design Peak Flow, Q (cfs)	**3.8**	**6.4**	**1.6**
Minor Flow Bypassed Downstream, Q_b (cfs)	N/A	0.0	0.0
Major Flow Bypassed Downstream, Q_b (cfs)	N/A	0.0	0.1

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

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

Project: Citizen On Constitution
Inlet ID: B1



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	18.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	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 =	0.005	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

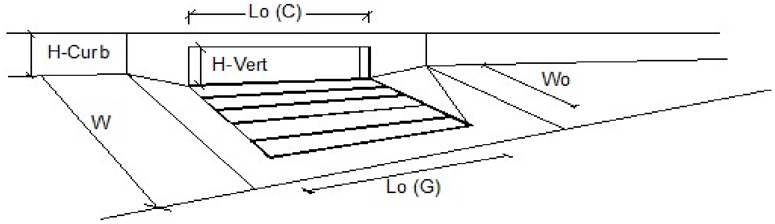
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	9.0	18.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	3.0	6.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**0.9**	**8.9**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.01 (April 2021)

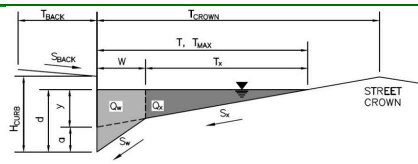


Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'			MINOR	MAJOR	
Total Inlet Interception Capacity		**Q =**	**0.9**	**1.5**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)		**Q_b =**	**0.0**	**0.1**	**cfs**
Capture Percentage = Q_a/Q_o =		**C% =**	**100**	**93**	**%**

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

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

Project: **Citizen On Constitution**
Inlet ID: **B2**



<u>Gutter Geometry:</u>

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	18.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	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 =	0.020	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

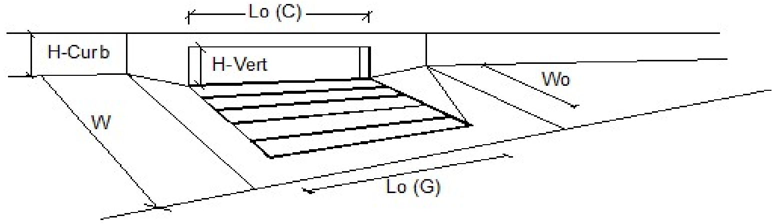
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	9.0	18.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	3.0	6.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**1.7**	**16.3**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.01 (April 2021)

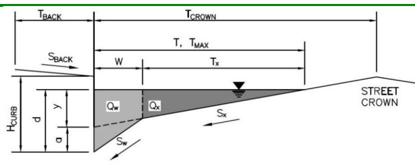


Design Information (Input)		MINOR	MAJOR	
Type of Inlet — CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**1.0**	**1.6**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.2**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**90**	**%**

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

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

Project: **Citizen On Constitution**
Inlet ID: **B3**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
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 =	0.020	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 =	0.020	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

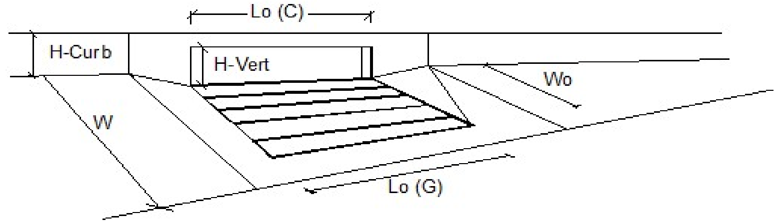
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	10.0	10.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	3.0	6.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**1.7**	**4.4**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.01 (April 2021)

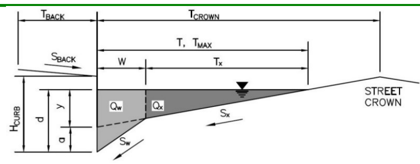


Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'			MINOR	MAJOR	
Total Inlet Interception Capacity		**Q =**	**1.3**	**2.1**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)		**Q_b =**	**0.0**	**0.6**	**cfs**
Capture Percentage = Q_a/Q_o =		**C% =**	**97**	**77**	**%**

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

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

Project: Citizen On Constitution
Inlet ID: B4



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	20.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
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 =	0.020	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 =	0.020	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

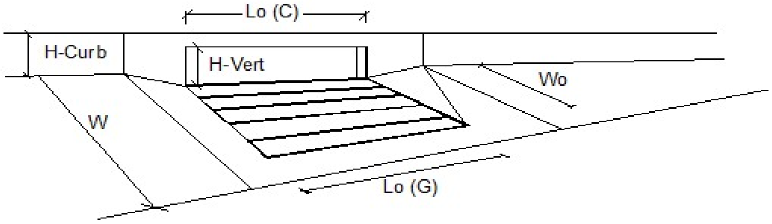
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	10.0	20.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	3.0	6.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**1.7**	**16.3**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.01 (April 2021)

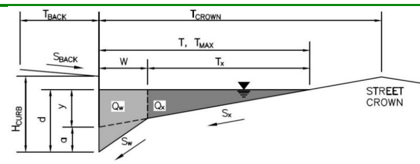


Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'			MINOR	MAJOR	
Total Inlet Interception Capacity		**Q =**	**0.7**	**0.4**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)		**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/Q_o =		**C% =**	**100**	**100**	**%**

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

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

Project: Citizen On Constitution
Inlet ID: D1



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	18.0	ft
Gutter Width	W =	1.00	ft
Street Transverse Slope	S_X =	0.040	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	

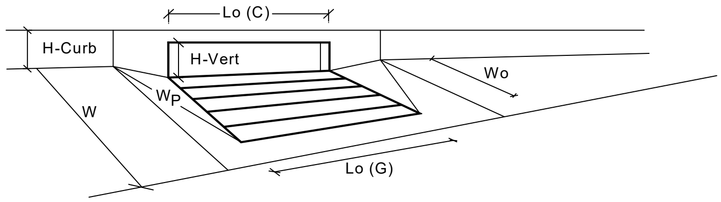
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	18.0	18.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

MINOR STORM Allowable Capacity is based on Depth Criterion
MAJOR STORM Allowable Capacity is based on Depth Criterion

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

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)

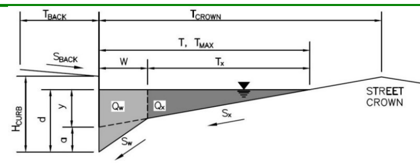


Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	6.0	6.0	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
Area Opening 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 (see USDCM Figure ST-5)		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	1.00	1.00	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} =	0.42	0.42	ft
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	0.77	0.77	
Curb Opening Performance Reduction Factor for Long Inlets		RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets		RF_{Grate} =	N/A	N/A	
			MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)		**Q_a =**	**5.9**	**5.9**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK\ REQUIRED}$ =	2.6	4.8	cfs

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

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

Project: **Citizen On Constitution**
Inlet ID: **D2**



Gutter Geometry:

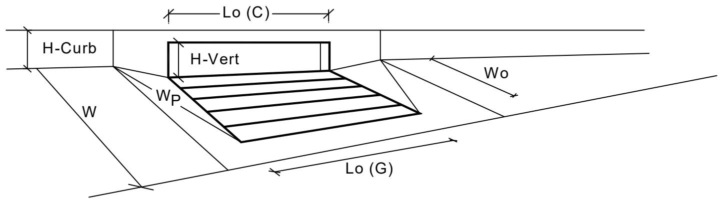
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	22.0	ft
Gutter Width	W =	1.00	ft
Street Transverse Slope	S_X =	0.020	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} =	18.0	22.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	8.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



Design Information (Input)	CDOT Type R Curb Opening		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 =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	5.1	6.0	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
Area Opening 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) =	10.00	10.00	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 (see USDCM Figure ST-5)		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	1.00	1.00	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} =	0.34	0.42	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.48	0.57	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.88	0.94	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	

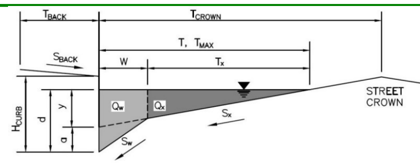
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**6.9**	**10.2**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	4.4	8.2	cfs

Warning 5: The width of unit is greater than the gutter width.

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

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

Project: Citizen On Constitution
Inlet ID: D5



Gutter Geometry:

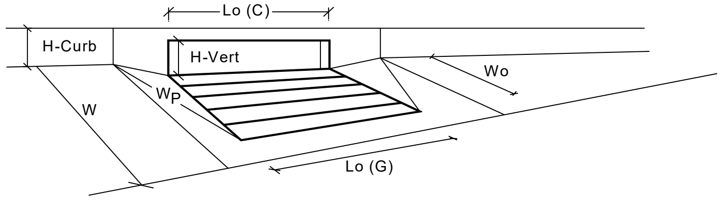
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	18.0	ft
Gutter Width	W =	1.00	ft
Street Transverse Slope	S_X =	0.030	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} =	18.0	18.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)

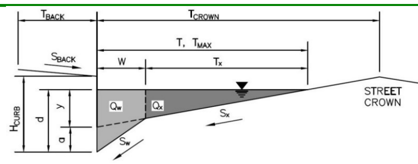


		MINOR	MAJOR	
Design Information (Input)				
Type of Inlet (CDOT Type R Curb Opening)	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.0	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
Area Opening 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 (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	1.00	1.00	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} =	0.42	0.42	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.77	0.77	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**5.9**	**5.9**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	2.1	3.9	cfs

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

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

Project: **Citizen On Constitution**
Inlet ID: **D6**

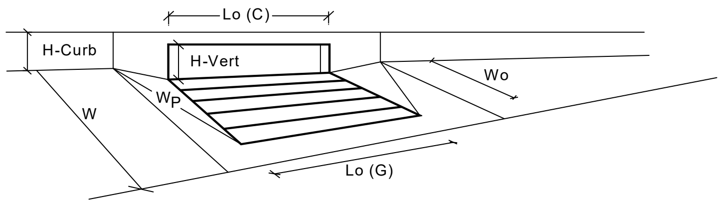


Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0		ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =			ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020		
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00		inches
Distance from Curb Face to Street Crown	T_{CROWN} =	18.0		ft
Gutter Width	W =	1.00		ft
Street Transverse Slope	S_X =	0.030		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} =	18.0	18.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	8.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



Design Information (Input)	CDOT Type R Curb Opening		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 =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	6.0	7.1	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
Area Opening 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 (see USDCM Figure ST-5)		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	1.00	1.00	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	

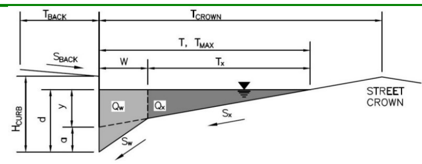
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.42	0.51	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.77	0.91	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**5.9**	**8.0**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	3.3	6.1	cfs

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

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

Project: Citizen On Constitution
Inlet ID: D7



Gutter Geometry:

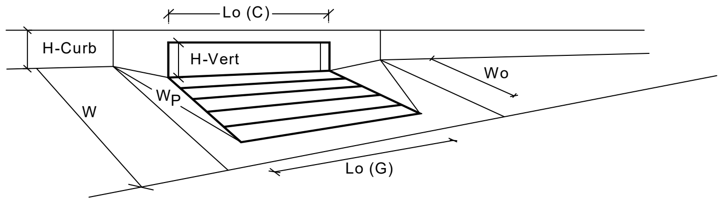
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	18.0	ft
Gutter Width	W =	1.00	ft
Street Transverse Slope	S_X =	0.030	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} =	18.0	18.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



Design Information (Input)	CDOT Type R Curb Opening		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 =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	6.0	6.0	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
Area Opening 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 (see USDCM Figure ST-5)		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	1.00	1.00	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	

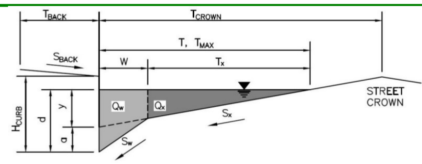
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.42	0.42	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.77	0.77	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**5.9**	**5.9**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.5	2.9	cfs

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

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

Project: **Citizen On Constitution**
Inlet ID: **D8**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	18.0	ft
Gutter Width	W =	1.00	ft
Street Transverse Slope	S_X =	0.030	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	

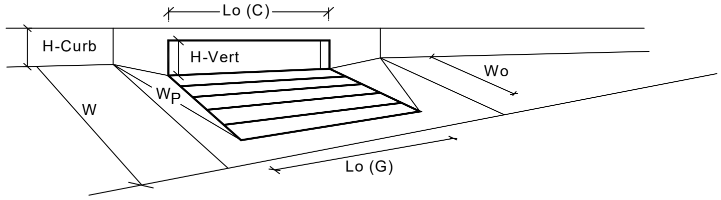
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	18.0	18.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

MINOR STORM Allowable Capacity is based on Depth Criterion
MAJOR STORM Allowable Capacity is based on Depth Criterion

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

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



		MINOR	MAJOR	
Design Information (Input) — CDOT Type R Curb Opening				
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 =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.0	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
Area Opening 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 (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	1.00	1.00	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	

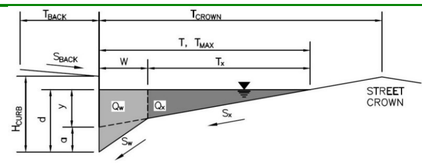
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.42	0.42	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.77	0.77	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**5.9**	**5.9**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	2.1	3.9	cfs

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

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

Project: Citizen On Constitution
Inlet ID: D9



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	18.0	ft
Gutter Width	W =	1.00	ft
Street Transverse Slope	S_X =	0.030	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	

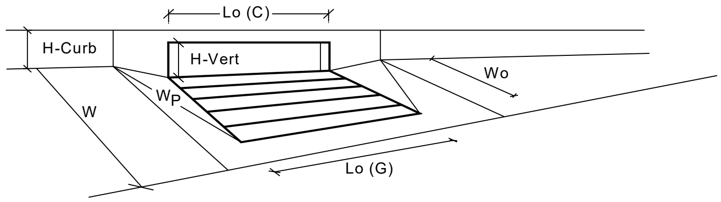
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	18.0	18.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

MINOR STORM Allowable Capacity is based on Depth Criterion
MAJOR STORM Allowable Capacity is based on Depth Criterion

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

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



Design Information (Input)	CDOT Type R Curb Opening		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 =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	6.0	6.0	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
Area Opening 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 (see USDCM Figure ST-5)		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	1.00	1.00	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	

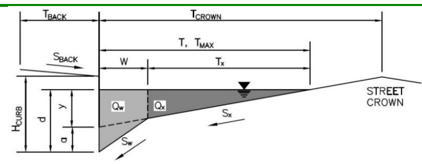
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.42	0.42	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.77	0.77	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**5.9**	**5.9**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.6	3.0	cfs

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

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

Project: Citizen On Constitution
Inlet ID: D10



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	18.0	ft
Gutter Width	W =	1.00	ft
Street Transverse Slope	S_X =	0.030	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	

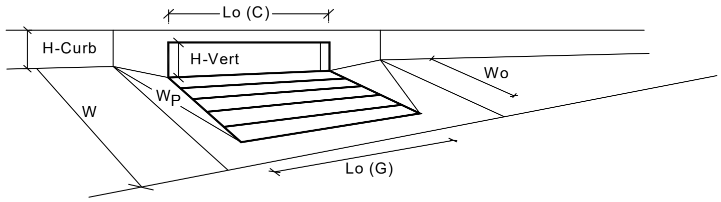
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	18.0	18.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

MINOR STORM Allowable Capacity is based on Depth Criterion
MAJOR STORM Allowable Capacity is based on Depth Criterion

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

INLEET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



Design Information (Input)	CDOT Type R Curb Opening	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 =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.0	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
Area Opening 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 (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	1.00	1.00	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	

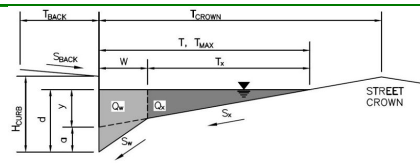
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.42	0.42	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.77	0.77	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**5.9**	**5.9**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.3	2.5	cfs

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

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

Project: Citizen On Constitution
Inlet ID: D11



Gutter Geometry:

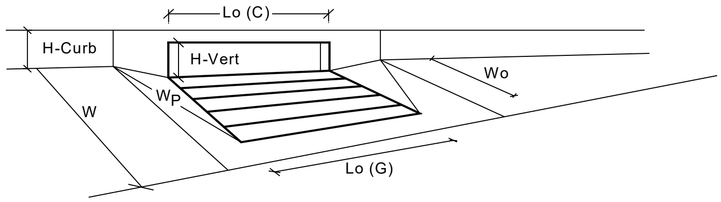
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	18.0	ft
Gutter Width	W =	1.00	ft
Street Transverse Slope	S_X =	0.020	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} =	18.0	18.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLETIN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



Design Information (Input)	CDOT Type R Curb Opening		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 =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	5.1	5.1	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
Area Opening 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 (see USDCM Figure ST-5)		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	1.00	1.00	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} =	0.34	0.34	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.65	0.65	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**4.4**	**4.4**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	2.0	3.8	cfs

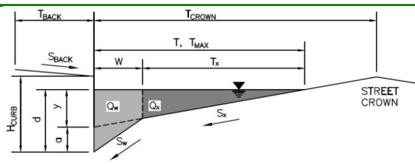
MHFD-Inlet, Version 5.01 (April 2021)

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

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

Project: Citizen On Constitution

Inlet ID: OF1



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.060	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	30.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	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 =	0.005	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} =	15.0	30.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.0	6.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

Maximum Capacity for 1/2 Street based On Allowable Spread

		Minor Storm	Major Storm	
Water Depth without Gutter Depression (Eq. ST-2)	y =	3.60	7.20	inches
Vertical Depth between Gutter Lip and Gutter Flowline (usually 2")	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline	d =	5.11	8.71	inches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	T_X =	13.0	28.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.397	0.194	
Discharge outside the Gutter Section W, carried in Section T_X	Q_X =	3.4	26.4	cfs
Discharge within the Gutter Section W (Q_T - Q_X)	Q_W =	2.2	6.3	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**5.7**	**32.7**	**cfs**
Flow Velocity within the Gutter Section	V =	3.3	4.9	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	1.4	3.6	

Maximum Capacity for 1/2 Street based on Allowable Depth

		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	14.5	18.7	ft
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	$T_{X\,TH}$ =	12.5	16.7	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.409	0.318	
Theoretical Discharge outside the Gutter Section W, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	3.1	6.6	cfs
Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN})	Q_X =	3.1	6.6	cfs
Discharge within the Gutter Section W (Q_d - Q_X)	Q_W =	2.1	3.1	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	5.2	9.7	cfs
Average Flow Velocity Within the Gutter Section	V =	3.2	3.7	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	1.3	1.9	
Slope-Based Depth Safety Reduction Factor for Major & Minor ($d \geq 6"$) Storm	R =	1.00	1.00	
Max Flow Based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**5.2**	**9.7**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	5.00	6.00	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	0.00	inches

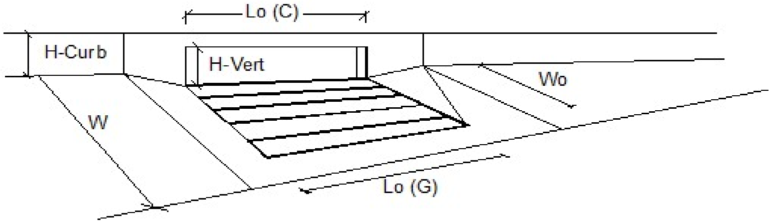
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**5.2**	**9.7**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.01 (April 2021)

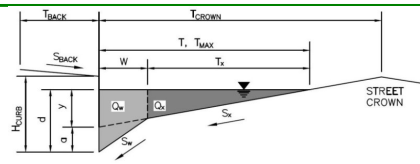


Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'			MINOR	MAJOR	
Total Inlet Interception Capacity		**Q =**	**3.6**	**6.4**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)		**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/Q_o =		**C% =**	**100**	**100**	**%**

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

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

Project: Citizen On Constitution
Inlet ID: D1a



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	15.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	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 =	0.020	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

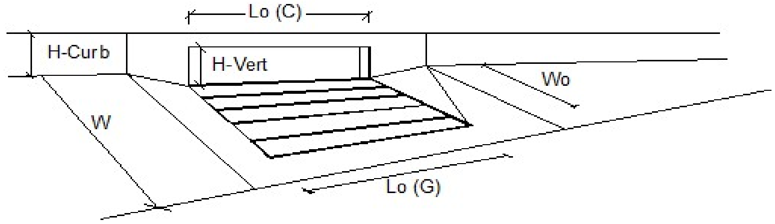
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	15.0	15.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	3.0	6.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**1.7**	**11.3**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.01 (April 2021)



Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'			MINOR	MAJOR	
Total Inlet Interception Capacity		**Q =**	**0.7**	**1.5**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)		**Q_b =**	**0.0**	**0.1**	**cfs**
Capture Percentage = Q_a/Q_o =		**C% =**	**100**	**94**	**%**

Worksheet for D3 & D4 Inlet Analysis

Project Description	
Solve For	Spread

Input Data	
Discharge	3.22 cfs
Left Side Slope	0.050 H:V
Right Side Slope	0.050 H:V
Bottom Width	0.00 ft
Grate Width	1.91 ft
Grate Length	3.3 ft
Local Depression	0.0 in
Local Depression Width	24.0 in
Grate Type	Curved Vaned
Clogging	75.0 %

Results	
Spread	0.1 ft
Depth	14.2 in
Wetted Perimeter	2.4 ft
Top Width	0.12 ft
Open Grate Area	0.6 ft²
Active Grate Weir Length	7.6 ft

Worksheet for D12 Inlet Analysis

Project Description	
Solve For	Spread

Input Data	
Discharge	2.90 cfs
Left Side Slope	5.000 H:V
Right Side Slope	5.000 H:V
Bottom Width	0.00 ft
Grate Width	1.91 ft
Grate Length	3.3 ft
Local Depression	0.0 in
Local Depression Width	24.0 in
Grate Type	Curved Vaned
Clogging	75.0 %

Results	
Spread	9.6 ft
Depth	11.5 in
Wetted Perimeter	9.8 ft
Top Width	9.57 ft
Open Grate Area	0.6 ft²
Active Grate Weir Length	7.6 ft

Worksheet for E1 E2 E3 & E4 Inlet Analysis

Project Description	
Solve For	Spread

Input Data	
Discharge	1.63 cfs
Left Side Slope	4.000 H:V
Right Side Slope	6.000 H:V
Bottom Width	0.00 ft
Grate Width	1.91 ft
Grate Length	3.3 ft
Local Depression	0.0 in
Local Depression Width	24.0 in
Grate Type	Curved Vaned
Clogging	75.0 %

Results	
Spread	3.0 ft
Depth	3.6 in
Wetted Perimeter	3.1 ft
Top Width	3.02 ft
Open Grate Area	0.6 ft²
Active Grate Weir Length	7.6 ft

FlexTable: Catch Basin Table

Active Scenario: 5 YR

Label	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Headloss Method	Headloss (ft)	Flow (Additional Subsurface) (cfs)	Flow (Total Out) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
E1	6,435.50	6,431.13	Standard	0.09	0.00	0.62	6,431.55	6,431.47
E2	6,436.03	6,432.13	Standard	0.10	0.00	0.76	6,432.60	6,432.50
E3	6,437.31	6,433.41	Standard	0.10	0.00	0.79	6,433.90	6,433.80
E4	6,437.81	6,434.51	Standard	0.09	0.00	0.67	6,434.96	6,434.87
B2	6,436.08	6,432.33	Standard	0.12	0.00	1.30	6,432.88	6,432.75
B1	6,436.64	6,433.10	Standard	0.12	0.00	1.21	6,433.63	6,433.51
B4	6,431.98	6,422.13	Standard	0.09	0.00	0.72	6,422.53	6,422.45
B3	6,431.71	6,426.71	Standard	0.13	0.00	1.36	6,427.28	6,427.15
POND	6,430.88	6,423.72	Standard	0.14	0.00	2.01	6,424.35	6,424.21
D1	6,432.34	6,428.49	Standard	0.18	0.00	2.61	6,429.29	6,429.10
D2	6,435.00	6,430.61	Standard	0.26	0.00	4.42	6,431.68	6,431.42
D4	6,437.96	6,433.07	Standard	0.10	0.00	0.73	6,433.53	6,433.42
D5	6,436.11	6,430.16	Standard	0.05	0.00	2.08	6,431.04	6,430.99
D6	6,436.48	6,430.78	Standard	0.21	0.00	3.32	6,431.69	6,431.48
D7	6,435.86	6,431.75	Standard	0.13	0.00	1.53	6,432.35	6,432.21
D8	6,437.70	6,433.37	Standard	0.16	0.00	2.07	6,434.07	6,433.91
D9	6,438.88	6,434.85	Standard	0.14	0.00	1.58	6,435.45	6,435.32
D10	6,439.09	6,435.37	Standard	0.12	0.00	1.33	6,435.92	6,435.80
D11	6,437.27	6,432.02	Standard	0.16	0.00	2.03	6,432.71	6,432.56
D12	6,436.95	6,433.73	Standard	0.11	0.00	0.99	6,434.21	6,434.10
L1	6,440.93	6,432.84	Standard	0.22	0.00	3.56	6,433.79	6,433.56
D1a	6,433.43	6,429.43	Standard	0.09	0.00	0.73	6,429.84	6,429.75

FlexTable: Conduit Table

Active Scenario: 5 YR

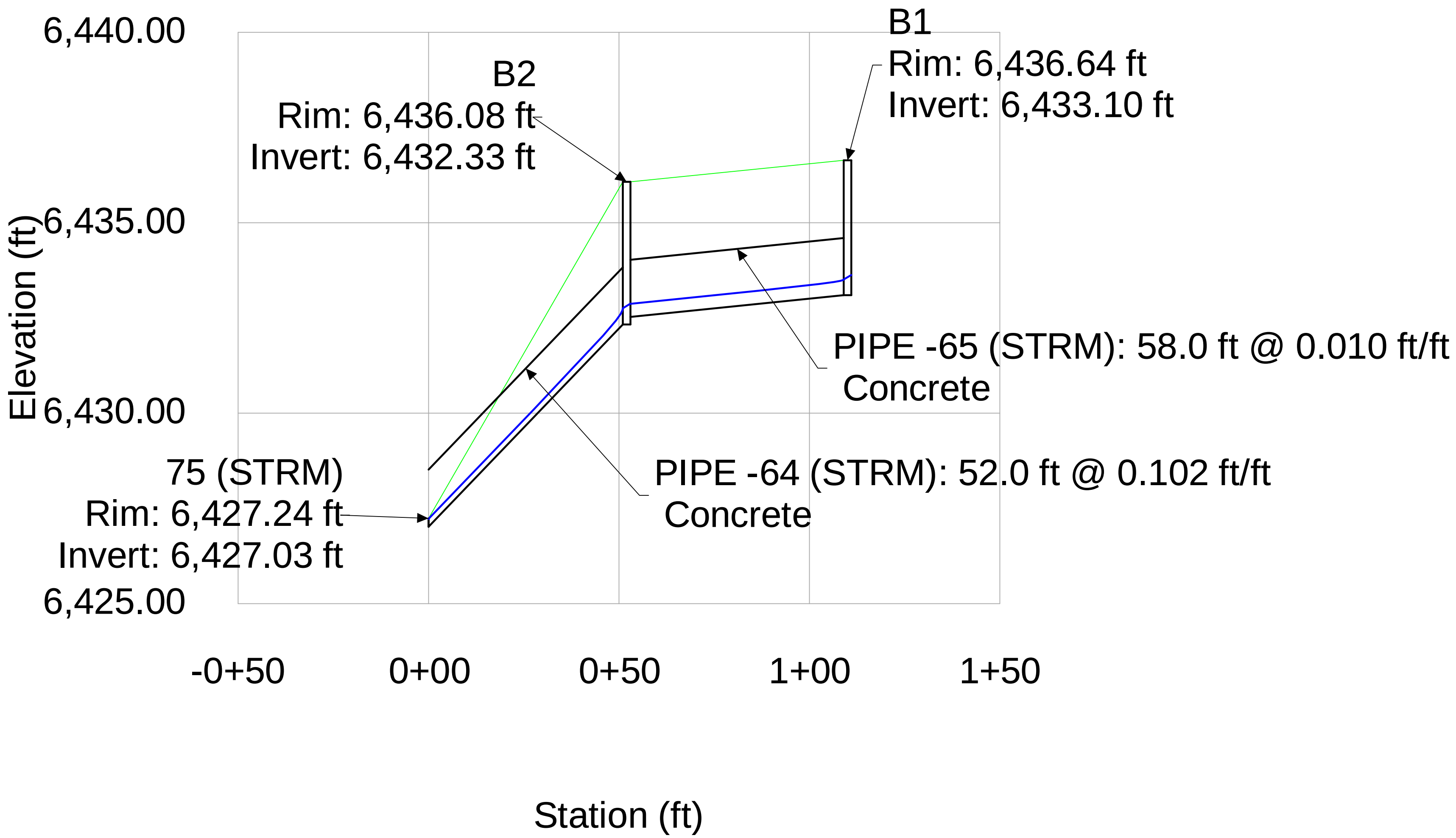
Start Node	Stop Node	Invert (Start) (ft)	Invert (Stop) (ft)	Length (ft)	Slope (Calculated) (ft/ft)	Diameter (in)	Flow (cfs)	Velocity (ft/s)	Capacity (Design) (cfs)	Flow / Capacity (Design) (%)	Manning's n	Headloss (ft)	Froude Number (Normal)
D12	34 (STRM)	6,433.73	6,432.95	155.7	0.005	18.0	0.99	2.92	7.44	13.3	0.013	0.78	1.008
34 (STRM)	D11	6,432.85	6,432.22	126.1	0.005	18.0	0.99	2.92	7.43	13.3	0.013	0.51	1.007
D10	D9	6,435.37	6,434.95	42.2	0.010	18.0	1.33	4.07	10.50	12.7	0.013	0.35	1.421
D9	D8	6,434.85	6,433.47	137.7	0.010	18.0	1.58	4.28	10.51	15.0	0.013	1.24	1.426
E1	67 (STRM)	6,431.13	6,430.15	196.1	0.005	12.0	0.62	2.65	2.52	24.6	0.013	0.99	0.941
67 (STRM)	68 (STRM)	6,427.49	6,427.15	33.5	0.010	18.0	4.18	5.60	10.50	39.8	0.013	0.45	1.396
D11	36 (STRM)	6,432.02	6,431.71	62.4	0.005	18.0	2.03	3.58	7.43	27.3	0.013	0.31	1.005
36 (STRM)	37 (STRM)	6,431.21	6,430.04	232.7	0.005	24.0	4.10	4.26	16.00	25.6	0.013	0.93	1.057
D8	36 (STRM)	6,433.37	6,433.15	22.2	0.010	18.0	2.07	4.60	10.45	19.8	0.013	0.31	1.421
E4	E3	6,434.51	6,433.51	200.0	0.005	12.0	0.67	2.71	2.52	26.6	0.013	0.97	0.940
E3	E2	6,433.41	6,432.23	237.2	0.005	12.0	0.79	2.84	2.52	31.4	0.013	1.20	0.934
D4	45 (STRM)	6,433.07	6,431.94	113.0	0.010	12.0	0.73	3.57	3.57	20.5	0.013	1.18	1.337
45 (STRM)	D2	6,431.74	6,431.13	59.3	0.010	12.0	0.73	3.60	3.61	20.2	0.013	0.41	1.352
37 (STRM)	38 (STRM)	6,429.84	6,429.03	159.6	0.005	24.0	6.18	4.79	16.10	38.4	0.013	0.33	1.045
D5	37 (STRM)	6,430.16	6,430.04	22.2	0.005	18.0	2.08	3.65	7.56	27.5	0.013	0.00	1.023
B1	B2	6,433.10	6,432.53	58.0	0.010	18.0	1.21	3.94	10.43	11.6	0.013	0.64	1.409
B2	75 (STRM)	6,432.33	6,427.03	52.0	0.102	18.0	1.30	9.17	33.54	3.9	0.013	5.53	4.344
D6	D5	6,430.78	6,430.26	105.1	0.005	18.0	3.32	4.08	7.43	44.7	0.013	0.44	0.977
38 (STRM)	39 (STRM)	6,428.83	6,427.64	240.5	0.005	24.0	10.60	5.42	15.93	66.6	0.013	1.22	0.958
D2	38 (STRM)	6,430.61	6,430.36	12.8	0.020	18.0	4.42	7.33	14.84	29.8	0.013	0.44	2.005
E2	E1	6,432.13	6,431.23	179.7	0.005	12.0	0.76	2.81	2.52	30.2	0.013	0.91	0.937
D7	D6	6,431.75	6,430.88	174.0	0.005	18.0	1.53	3.31	7.43	20.6	0.013	0.52	1.010
39 (STRM)	40 (STRM)	6,426.66	6,426.13	101.1	0.005	30.0	13.21	5.89	29.84	44.3	0.013	0.35	1.096
40 (STRM)	41 (STRM)	6,425.93	6,425.68	49.3	0.005	30.0	13.21	5.78	29.03	45.5	0.013	0.29	1.064
D1	39 (STRM)	6,428.49	6,427.63	79.8	0.011	18.0	2.61	5.06	10.89	24.0	0.013	0.84	1.477
B3	B4	6,426.71	6,422.33	52.0	0.084	18.0	1.36	8.69	30.49	4.5	0.013	4.60	3.975
B4	129 (STRM)	6,422.13	6,421.17	58.0	0.017	18.0	0.72	4.06	13.52	5.3	0.013	1.04	1.777
POND	32 (STRM)	6,423.72	6,423.00	102.0	0.007	24.0	2.01	4.73	24.71	8.1	0.010	0.83	1.609
L1	67 (STRM)	6,432.84	6,427.69	52.0	0.099	18.0	3.56	12.23	33.07	10.8	0.013	5.04	4.460
D1a	D1	6,429.43	6,428.69	67.7	0.011	18.0	0.73	4.24	14.27	5.1	0.010	0.46	1.872

FlexTable: Manhole Table

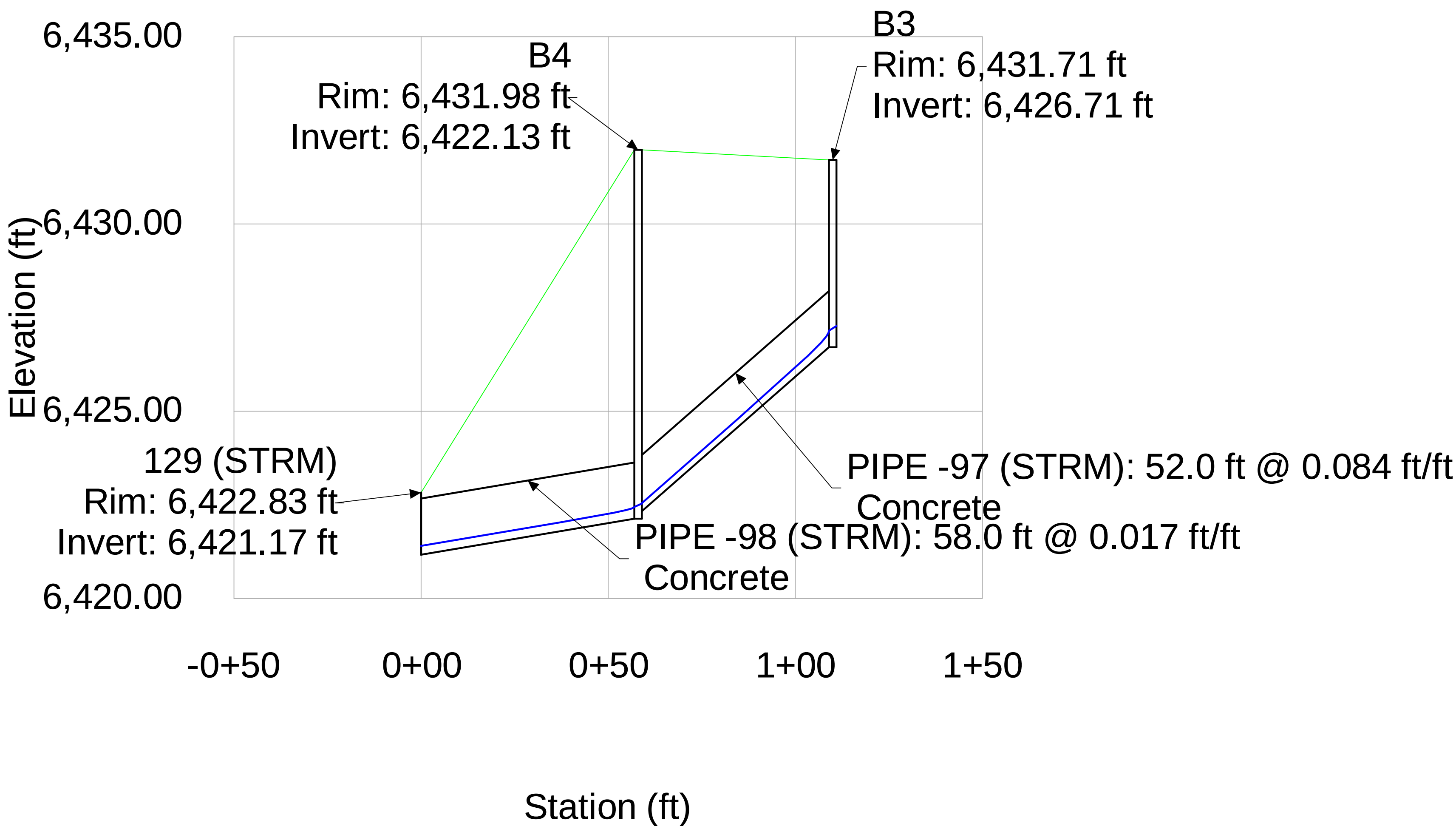
Active Scenario: 5 YR

Label	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Headloss Method	Headloss Coefficient (Standard)	Headloss (ft)	Flow (Total Out) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
34 (STRM)	6,439.98	6,432.85	Standard	0.800	0.11	0.99	6,433.33	6,433.22
67 (STRM)	6,437.03	6,427.49	Standard	0.800	0.25	4.18	6,428.52	6,428.27
36 (STRM)	6,438.00	6,431.21	Standard	0.800	0.21	4.10	6,432.13	6,431.92
45 (STRM)	6,436.59	6,431.74	Standard	0.800	0.10	0.73	6,432.20	6,432.09
37 (STRM)	6,436.84	6,429.84	Standard	0.800	0.27	6.18	6,430.99	6,430.72
38 (STRM)	6,436.12	6,428.83	Standard	0.800	0.37	10.60	6,430.39	6,430.03
40 (STRM)	6,434.09	6,425.93	Standard	0.800	0.38	13.21	6,427.53	6,427.15
39 (STRM)	6,433.75	6,426.66	Standard	0.800	0.38	13.21	6,428.27	6,427.88

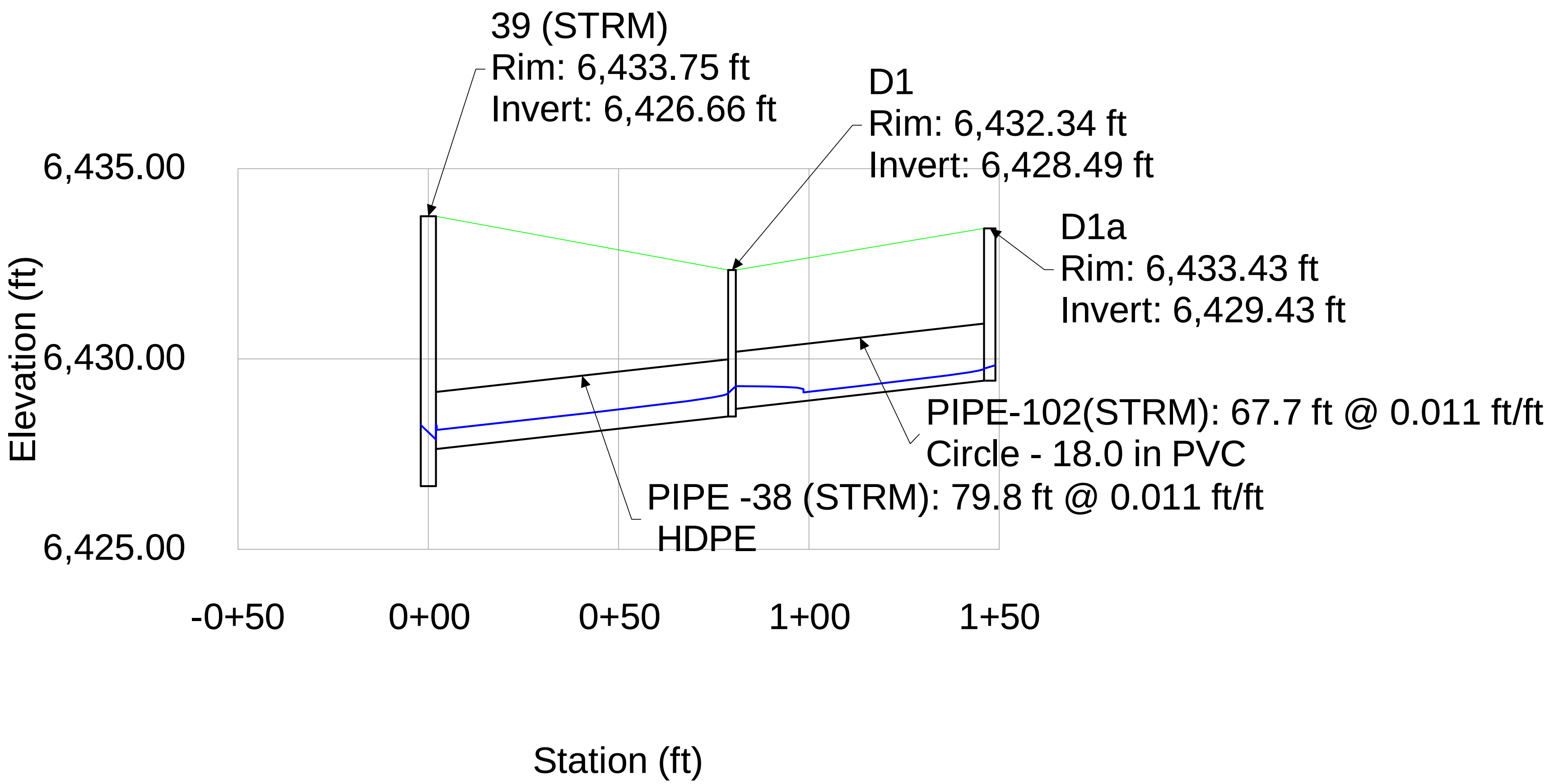
Profile Report
Engineering Profile - B1 (Untitled1.stsw)
Active Scenario: 5 YR



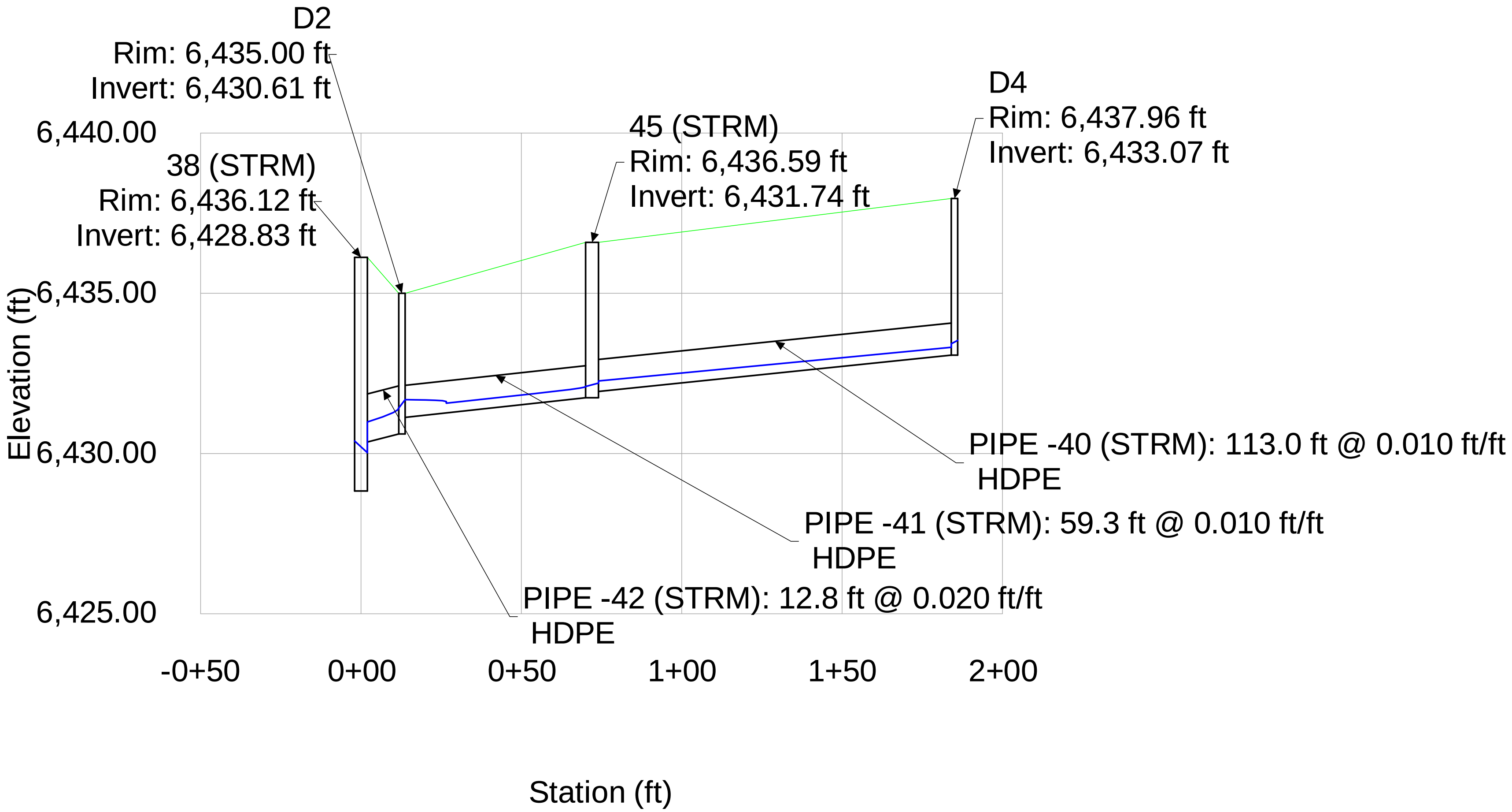
Profile Report
Engineering Profile - B3 (Untitled1.stsw)
Active Scenario: 5 YR



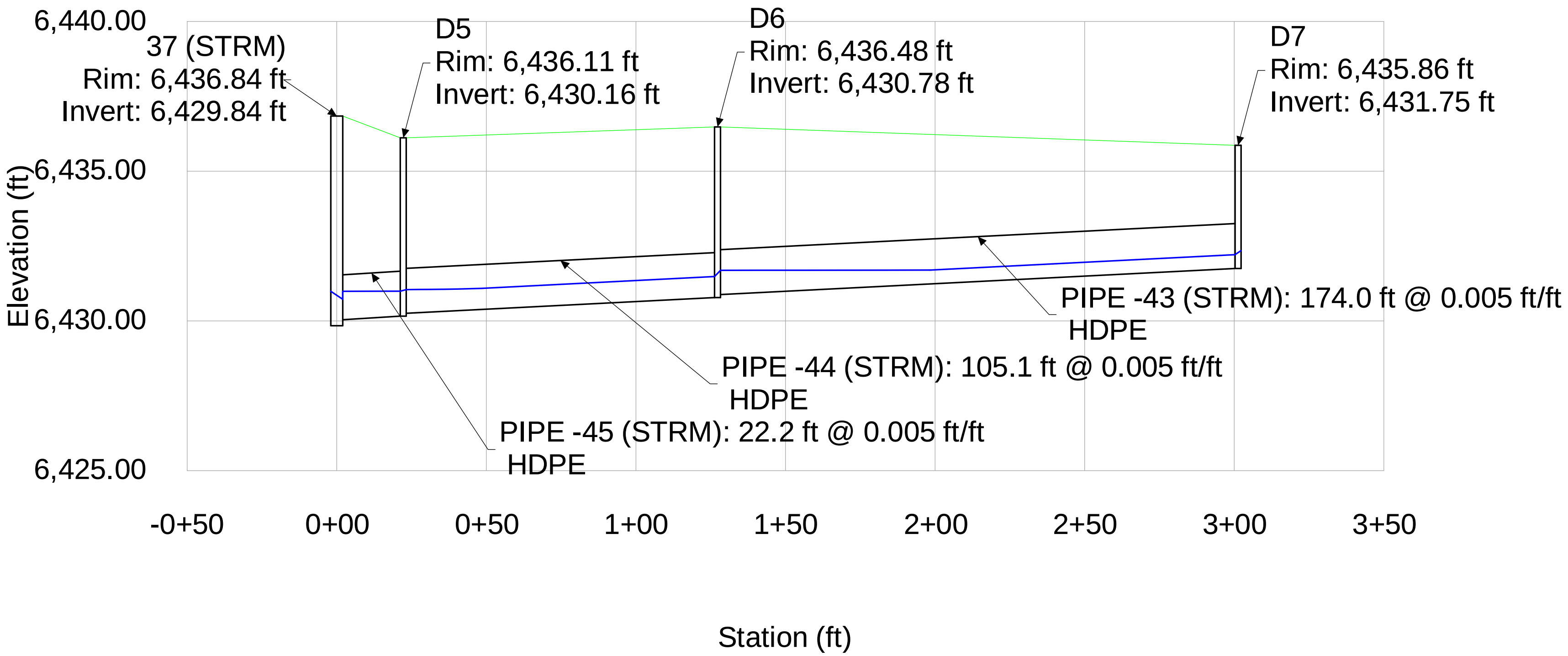
Profile Report
Engineering Profile - D1 (Untitled1.stsw)
Active Scenario: 5 YR



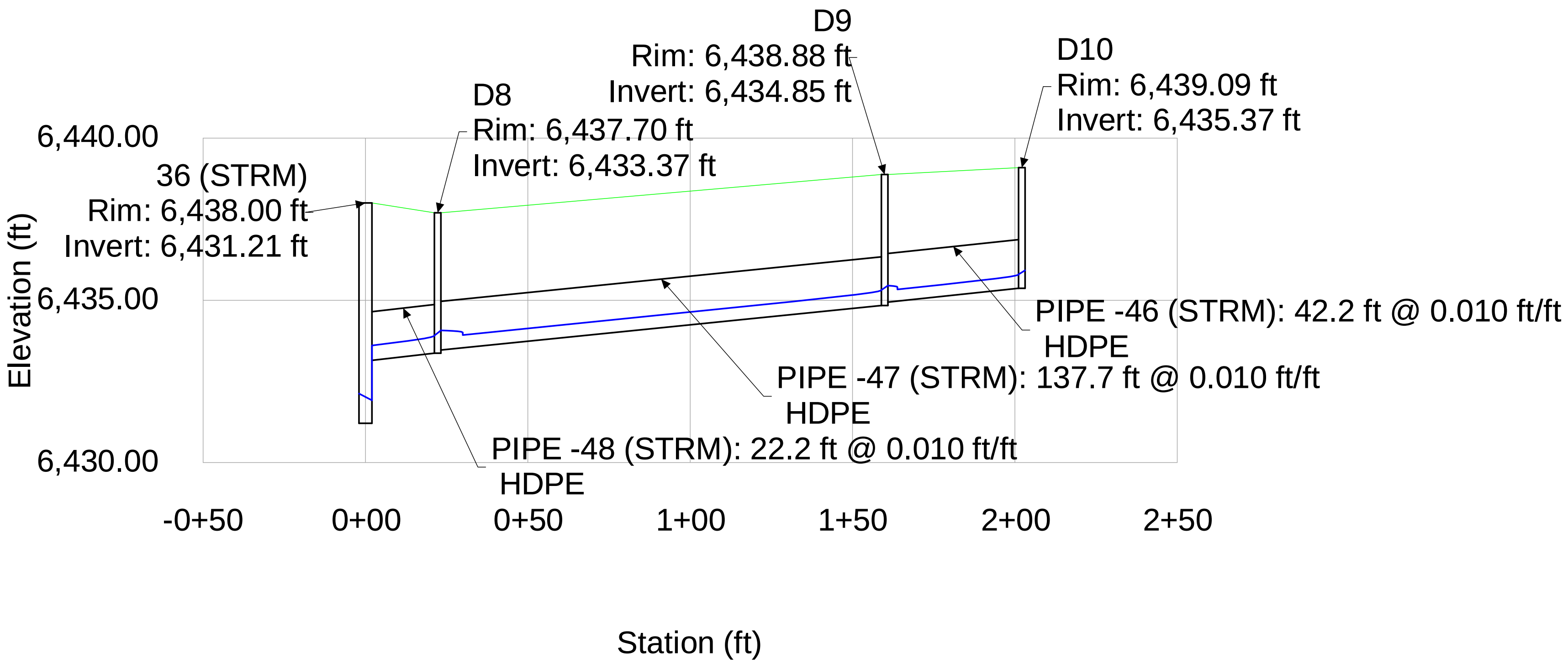
Profile Report
Engineering Profile - D3 (Untitled1.stsw)
Active Scenario: 5 YR



Profile Report
Engineering Profile - D7 (Untitled1.stsw)
Active Scenario: 5 YR



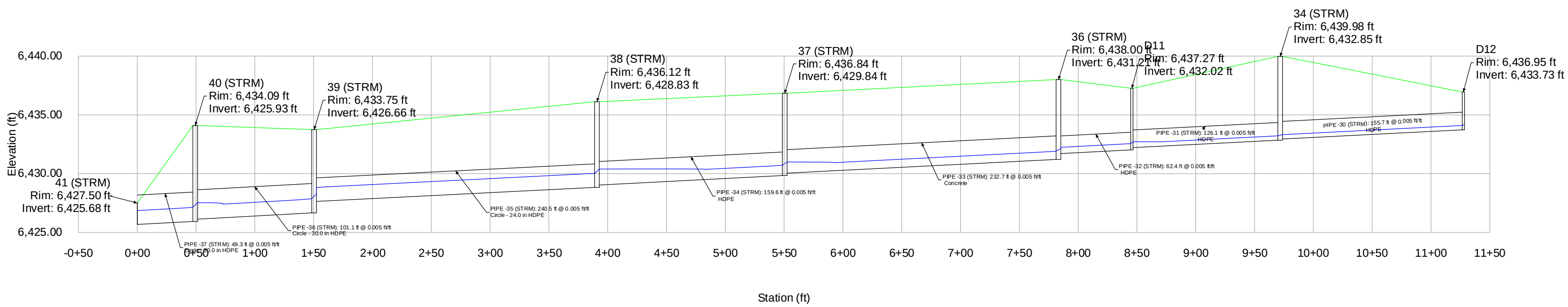
Profile Report
Engineering Profile - D10 (Untitled1.stsw)
Active Scenario: 5 YR



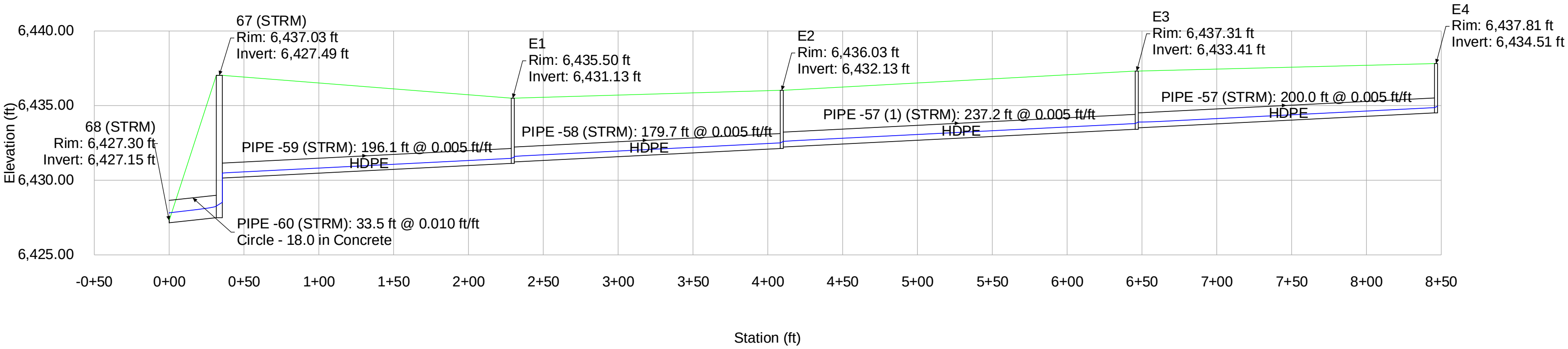
Profile Report

Engineering Profile - D12 (Untitled1.stsw)

Active Scenario: 5 YR



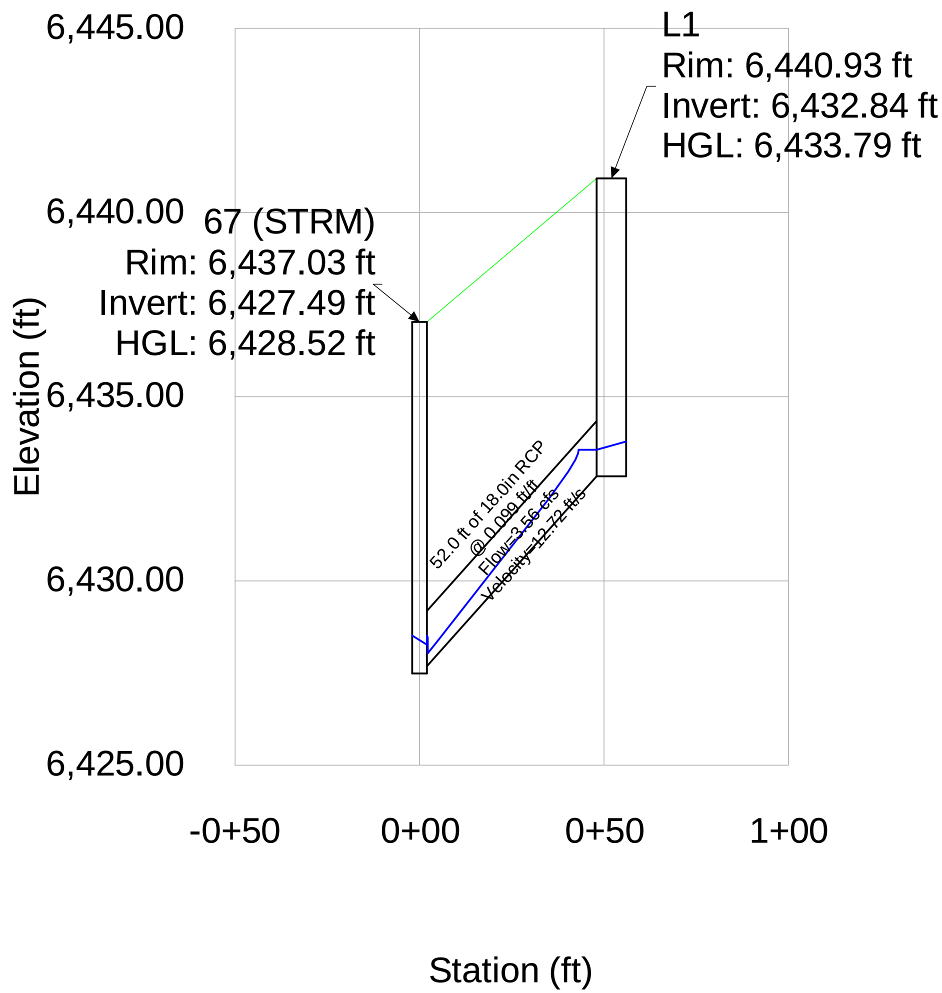
Profile Report
Engineering Profile - E (Untitled1.stsw)
Active Scenario: 5 YR



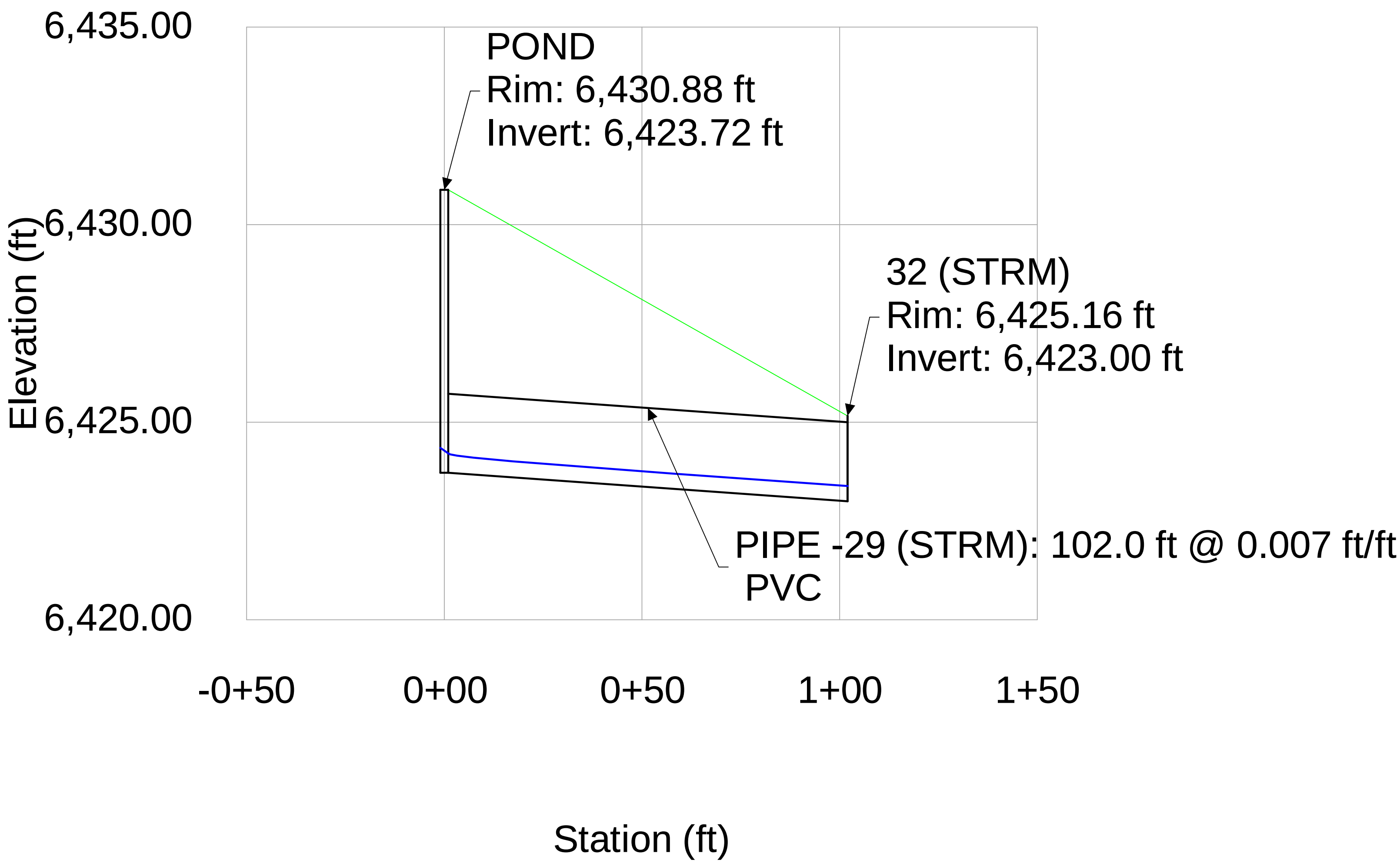
Profile Report

Engineering Profile - L (Untitled1.stsw)

Active Scenario: 5 YR



Profile Report
Engineering Profile - POND (Untitled1.stsw)
Active Scenario: 5 YR



FlexTable: Catch Basin Table

Active Scenario: 100 YR

Label	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Headloss Method	Headloss (ft)	Flow (Additional Subsurface) (cfs)	Flow (Total Out) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
E1	6,435.50	6,431.13	Standard	0.15	0.00	1.66	6,431.87	6,431.72
E2	6,436.03	6,432.13	Standard	0.16	0.00	2.14	6,433.00	6,432.83
E3	6,437.31	6,433.41	Standard	0.16	0.00	2.22	6,434.30	6,434.14
E4	6,437.81	6,434.51	Standard	0.15	0.00	1.75	6,435.28	6,435.13
B2	6,436.08	6,432.33	Standard	0.18	0.00	2.44	6,433.10	6,432.92
B1	6,436.64	6,433.10	Standard	0.17	0.00	2.23	6,433.83	6,433.66
B4	6,431.98	6,422.13	Standard	0.13	0.00	1.36	6,422.69	6,422.57
B3	6,431.71	6,426.71	Standard	0.18	0.00	2.57	6,427.50	6,427.32
POND	6,430.88	6,423.72	Standard	0.19	0.00	7.82	6,425.13	6,424.95
D1	6,432.34	6,428.49	Standard	0.27	0.00	4.72	6,429.60	6,429.32
D2	6,435.00	6,430.61	Standard	0.42	0.00	8.17	6,432.15	6,431.72
D4	6,437.96	6,433.07	Standard	0.17	0.00	1.63	6,433.78	6,433.61
D5	6,436.11	6,430.16	Standard	0.06	0.00	3.85	6,432.39	6,432.33
D6	6,436.48	6,430.78	Standard	0.15	0.00	6.11	6,432.89	6,432.74
D7	6,435.86	6,431.75	Standard	0.04	0.00	2.88	6,433.05	6,433.01
D8	6,437.70	6,433.37	Standard	0.24	0.00	3.92	6,434.37	6,434.13
D9	6,438.88	6,434.85	Standard	0.20	0.00	3.00	6,435.70	6,435.50
D10	6,439.09	6,435.37	Standard	0.18	0.00	2.54	6,436.15	6,435.97
D11	6,437.27	6,432.02	Standard	0.22	0.00	3.78	6,433.00	6,432.78
D12	6,436.95	6,433.73	Standard	0.19	0.00	2.90	6,434.57	6,434.38
L1	6,440.93	6,432.84	Standard	0.34	0.00	6.36	6,434.16	6,433.82
D1a	6,433.43	6,429.43	Standard	0.13	0.00	1.37	6,429.99	6,429.87

FlexTable: Conduit Table

Active Scenario: 100 YR

Start Node	Stop Node	Invert (Start) (ft)	Invert (Stop) (ft)	Length (ft)	Slope (Calculated) (ft/ft)	Diameter (in)	Flow (cfs)	Velocity (ft/s)	Capacity (Design) (cfs)	Flow / Capacity (Design) (%)	Manning's n	Headloss (ft)	Froude Number (Normal)
D12	34 (STRM)	6,433.73	6,432.95	155.7	0.005	18.0	2.90	3.95	7.44	39.0	0.013	0.69	0.990
34 (STRM)	D11	6,432.85	6,432.22	126.1	0.005	18.0	2.90	3.94	7.43	39.0	0.013	0.50	0.988
D10	D9	6,435.37	6,434.95	42.2	0.010	18.0	2.54	4.89	10.50	24.2	0.013	0.27	1.424
D9	D8	6,434.85	6,433.47	137.7	0.010	18.0	3.00	5.13	10.51	28.6	0.013	1.14	1.420
E1	67 (STRM)	6,431.13	6,430.15	196.1	0.005	12.0	1.66	3.42	2.52	65.9	0.013	1.03	0.860
67 (STRM)	68 (STRM)	6,427.49	6,427.15	33.5	0.010	18.0	8.02	6.55	10.50	76.4	0.013	0.11	1.245
D11	36 (STRM)	6,432.02	6,431.71	62.4	0.005	18.0	3.78	4.22	7.43	50.9	0.013	0.13	0.963
36 (STRM)	37 (STRM)	6,431.21	6,430.04	232.7	0.005	24.0	7.70	5.04	16.00	48.1	0.013	0.18	1.017
D8	36 (STRM)	6,433.37	6,433.15	22.2	0.010	18.0	3.92	5.49	10.45	37.5	0.013	0.33	1.395
E4	E3	6,434.51	6,433.51	200.0	0.005	12.0	1.75	3.46	2.52	69.5	0.013	0.82	0.848
E3	E2	6,433.41	6,432.23	237.2	0.005	12.0	2.22	3.62	2.52	88.1	0.013	1.15	0.768
D4	45 (STRM)	6,433.07	6,431.94	113.0	0.010	12.0	1.63	4.44	3.57	45.7	0.013	1.20	1.291
45 (STRM)	D2	6,431.74	6,431.13	59.3	0.010	12.0	1.63	4.48	3.61	45.2	0.013	0.13	1.308
37 (STRM)	38 (STRM)	6,429.84	6,429.03	159.6	0.005	24.0	11.55	3.68	16.10	71.7	0.013	0.42	0.950
D5	37 (STRM)	6,430.16	6,430.04	22.2	0.005	18.0	3.85	2.18	7.56	51.0	0.013	0.03	0.980
B1	B2	6,433.10	6,432.53	58.0	0.010	18.0	2.23	4.70	10.43	21.4	0.013	0.57	1.418
B2	75 (STRM)	6,432.33	6,427.03	52.0	0.102	18.0	2.44	11.06	33.54	7.3	0.013	4.39	4.466
D6	D5	6,430.78	6,430.26	105.1	0.005	18.0	6.11	3.46	7.43	82.3	0.013	0.36	0.854
38 (STRM)	39 (STRM)	6,428.83	6,427.64	240.5	0.005	24.0	19.72	6.28	15.93	123.8	0.013	1.94	0.783
D2	38 (STRM)	6,430.61	6,430.36	12.8	0.020	18.0	8.17	8.60	14.84	55.0	0.013	0.01	1.904
E2	E1	6,432.13	6,431.23	179.7	0.005	12.0	2.14	3.60	2.52	84.9	0.013	0.97	0.785
D7	D6	6,431.75	6,430.88	174.0	0.005	18.0	2.88	3.93	7.43	38.8	0.013	0.12	0.989
39 (STRM)	40 (STRM)	6,426.66	6,426.13	101.1	0.005	30.0	24.44	6.78	29.84	81.9	0.013	0.30	0.958
40 (STRM)	41 (STRM)	6,425.93	6,425.68	49.3	0.005	30.0	24.44	6.63	29.03	84.2	0.013	0.15	0.920
D1	39 (STRM)	6,428.49	6,427.63	79.8	0.011	18.0	4.72	5.94	10.89	43.4	0.013	0.04	1.438
B3	B4	6,426.71	6,422.33	52.0	0.084	18.0	2.57	10.49	30.49	8.4	0.013	4.70	4.081
B4	129 (STRM)	6,422.13	6,421.17	58.0	0.017	18.0	1.36	4.90	13.52	10.1	0.013	-0.10	1.820
POND	32 (STRM)	6,423.72	6,423.00	102.0	0.007	24.0	7.82	6.98	24.71	31.7	0.010	-0.05	1.621
L1	67 (STRM)	6,432.84	6,427.69	52.0	0.099	18.0	6.36	14.45	33.07	19.2	0.013	4.75	4.496
D1a	D1	6,429.43	6,428.69	67.7	0.011	18.0	1.37	5.10	14.27	9.6	0.010	0.27	1.918

FlexTable: Manhole Table

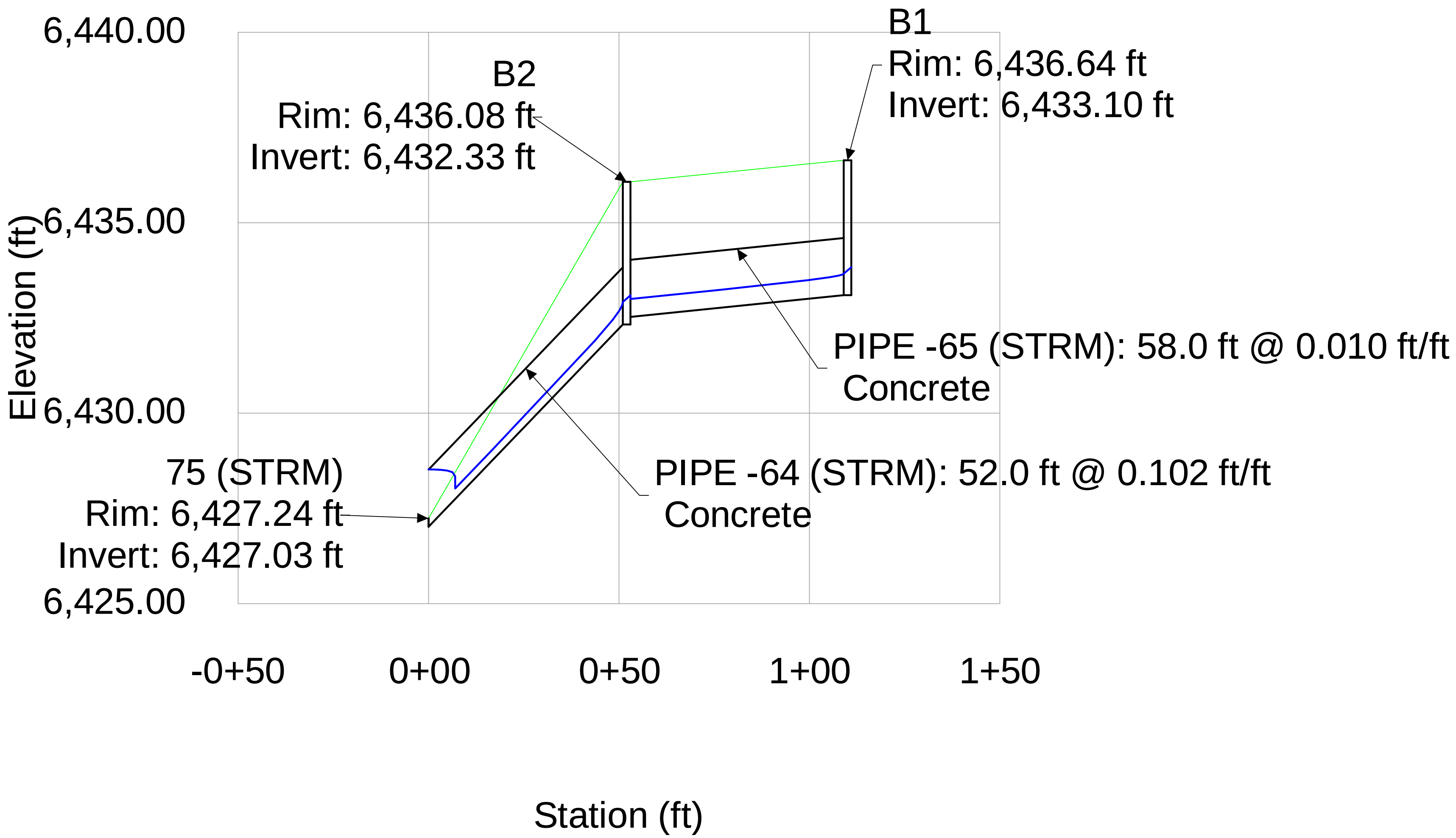
Active Scenario: 100 YR

Label	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Headloss Method	Headloss Coefficient (Standard)	Headloss (ft)	Flow (Total Out) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
34 (STRM)	6,439.98	6,432.85	Standard	0.800	0.19	2.90	6,433.69	6,433.50
67 (STRM)	6,437.03	6,427.49	Standard	0.800	0.31	8.02	6,429.07	6,428.76
36 (STRM)	6,438.00	6,431.21	Standard	0.800	0.17	7.70	6,432.65	6,432.48
45 (STRM)	6,436.59	6,431.74	Standard	0.800	0.17	1.63	6,432.45	6,432.28
37 (STRM)	6,436.84	6,429.84	Standard	0.800	0.17	11.55	6,432.30	6,432.13
38 (STRM)	6,436.12	6,428.83	Standard	0.800	0.49	19.72	6,431.71	6,431.22
40 (STRM)	6,434.09	6,425.93	Standard	0.800	0.32	24.44	6,428.65	6,428.34
39 (STRM)	6,433.75	6,426.66	Standard	0.800	0.33	24.44	6,429.29	6,428.95

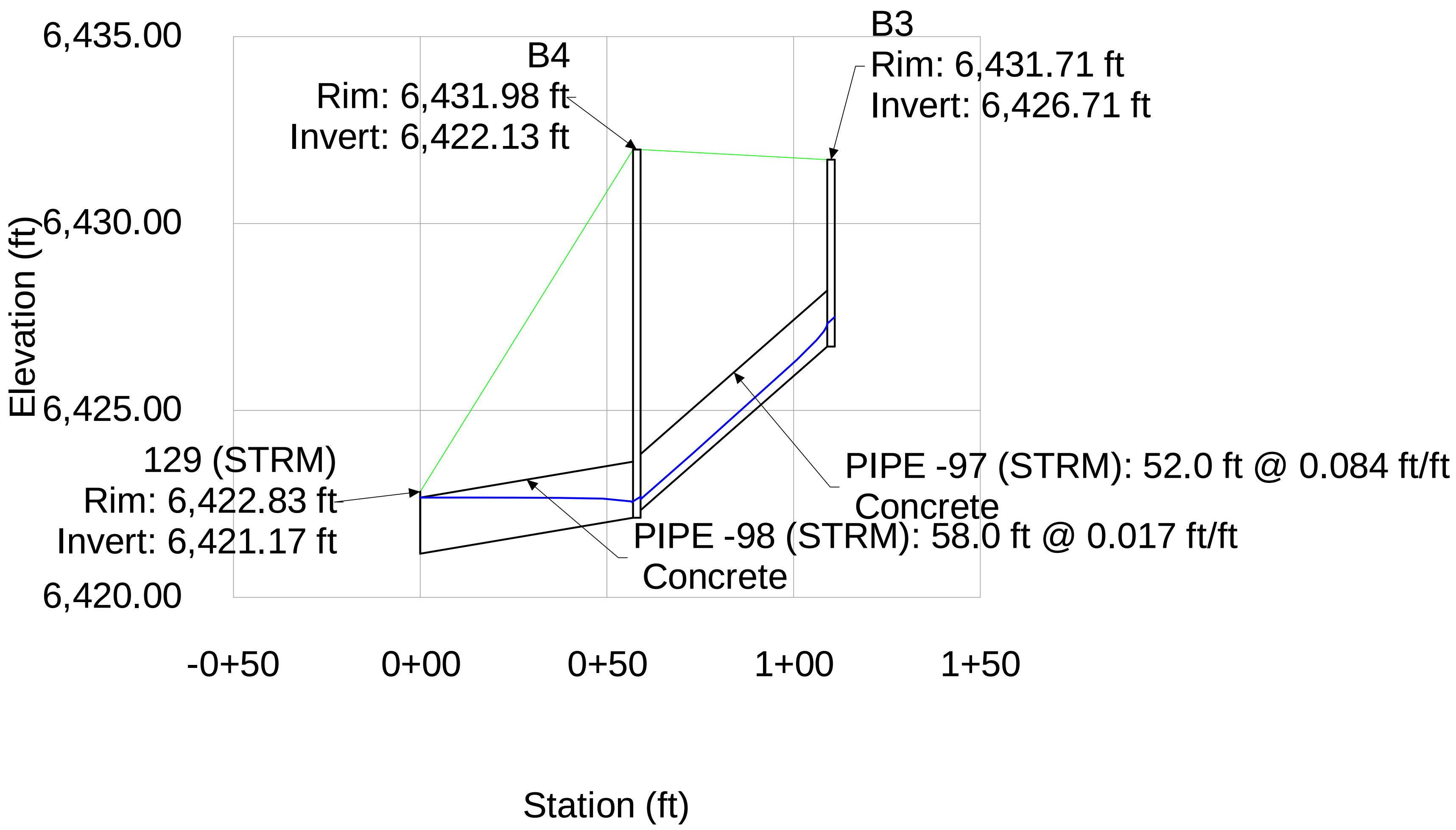
Profile Report

Engineering Profile - B1 (Untitled1.stsw)

Active Scenario: 100 YR



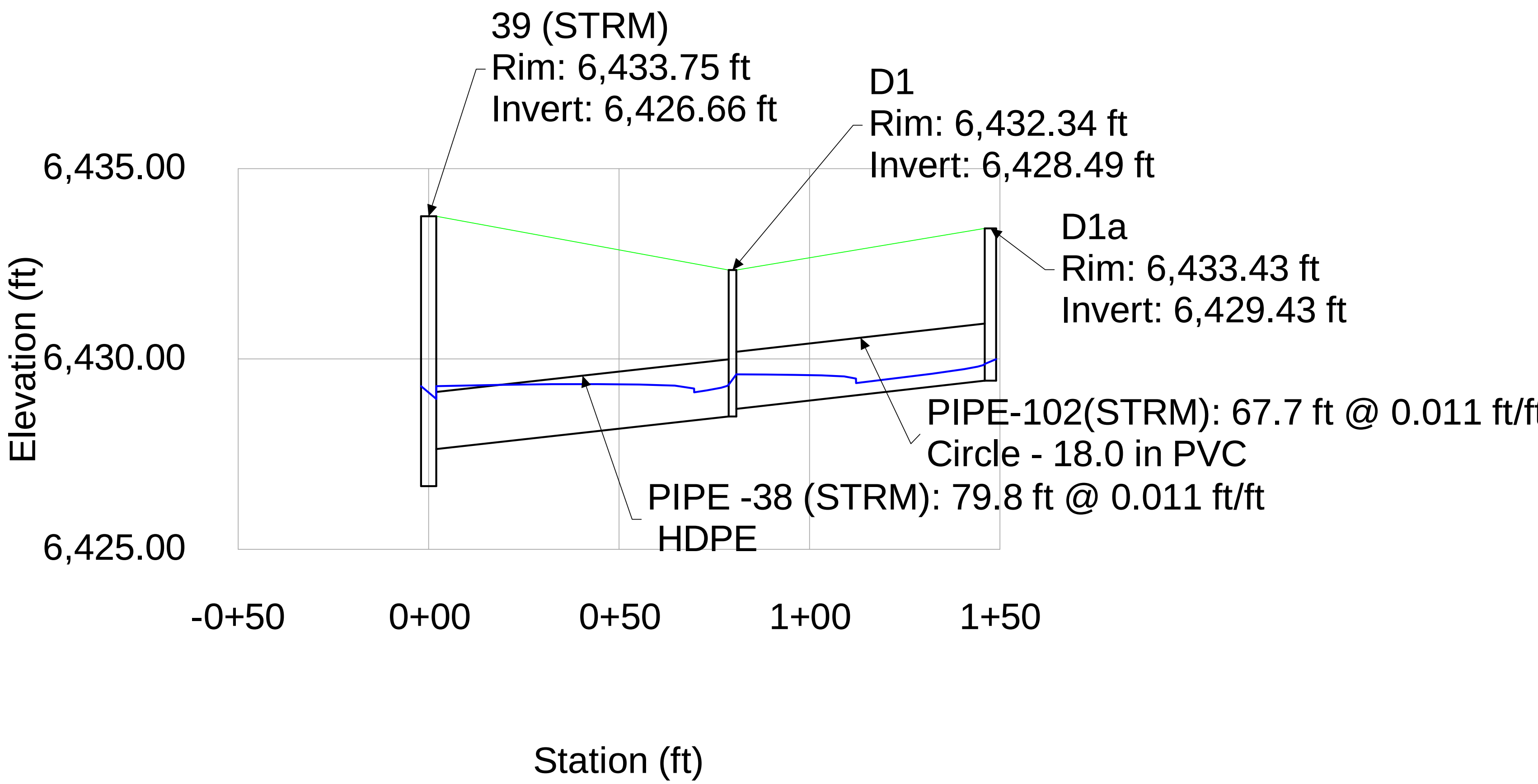
Profile Report
Engineering Profile - B3 (Untitled1.stsw)
Active Scenario: 100 YR



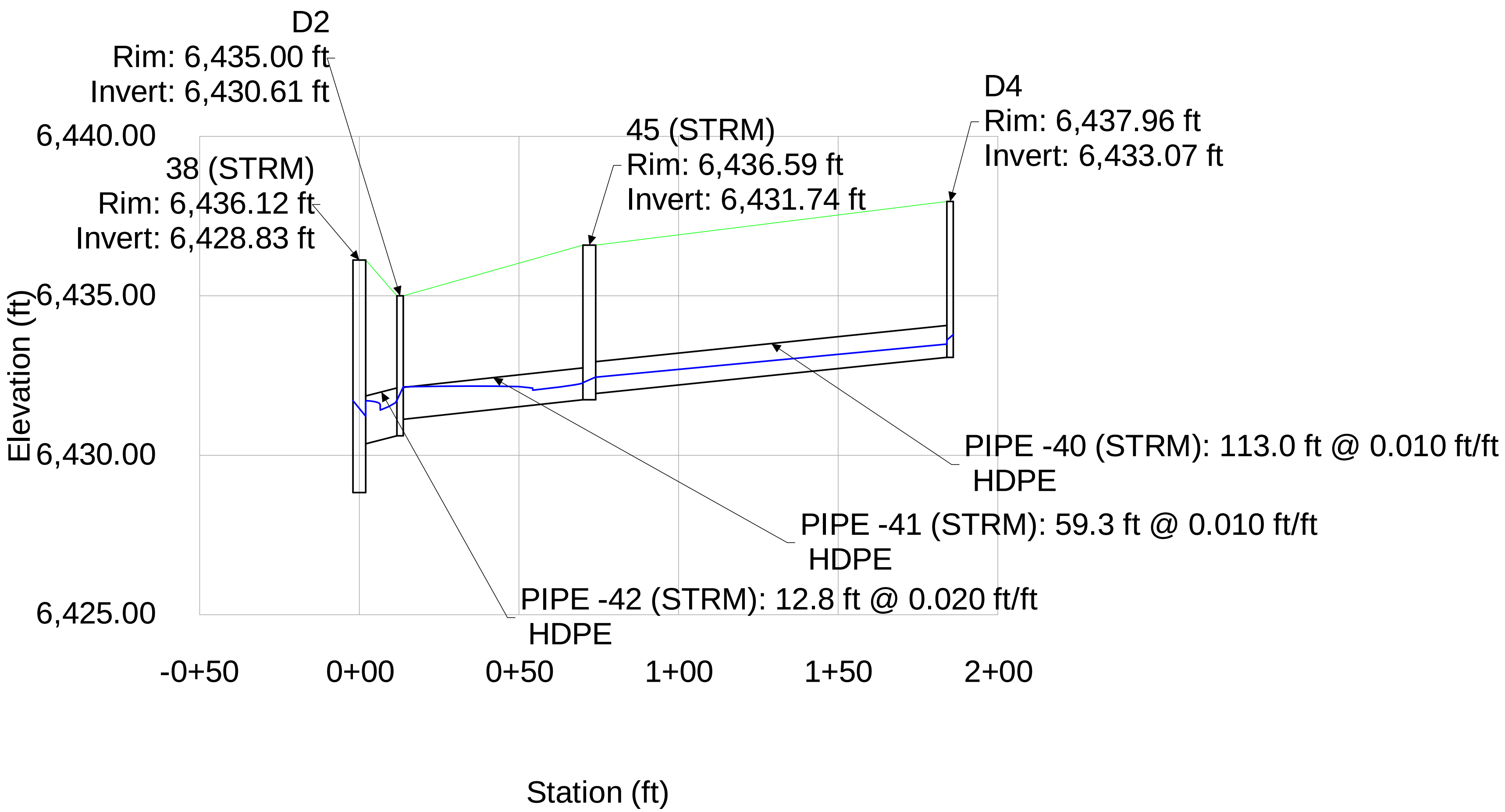
Profile Report

Engineering Profile - D1 (Untitled1.stsw)

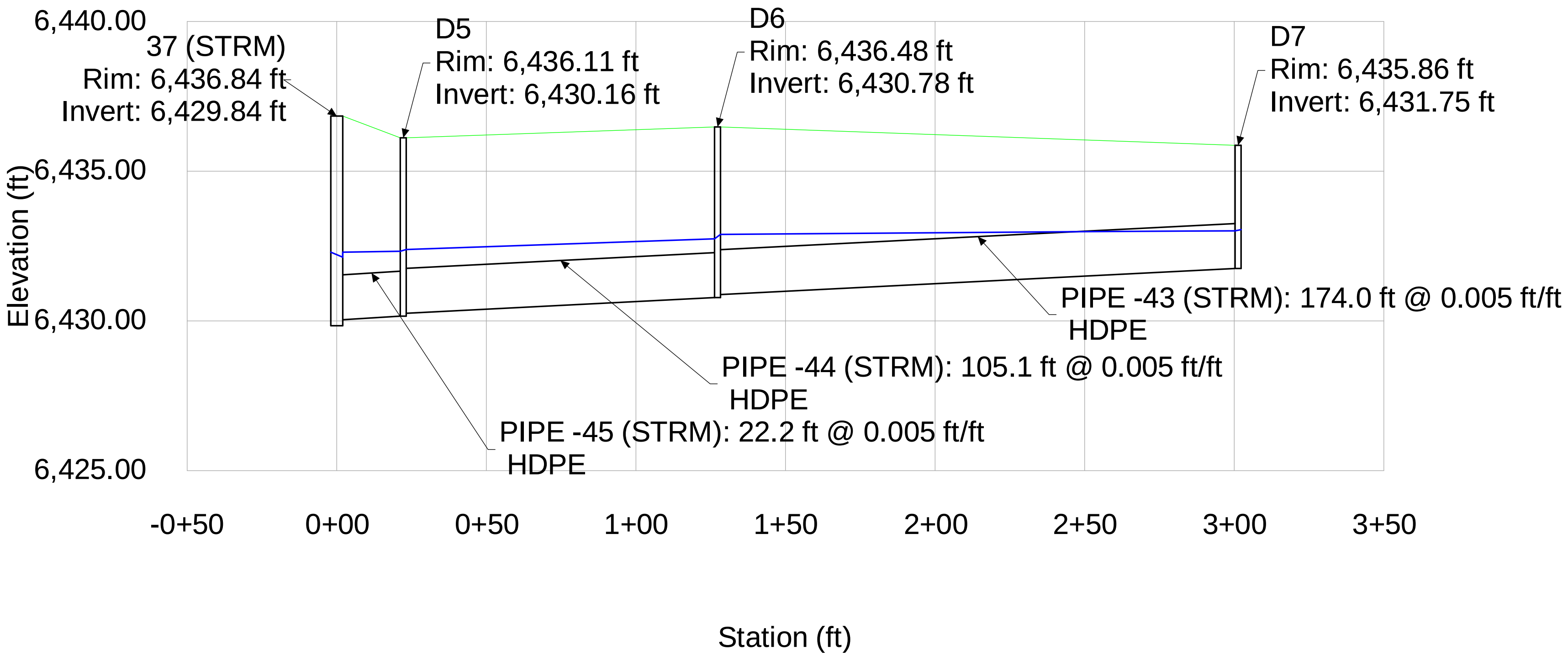
Active Scenario: 100 YR



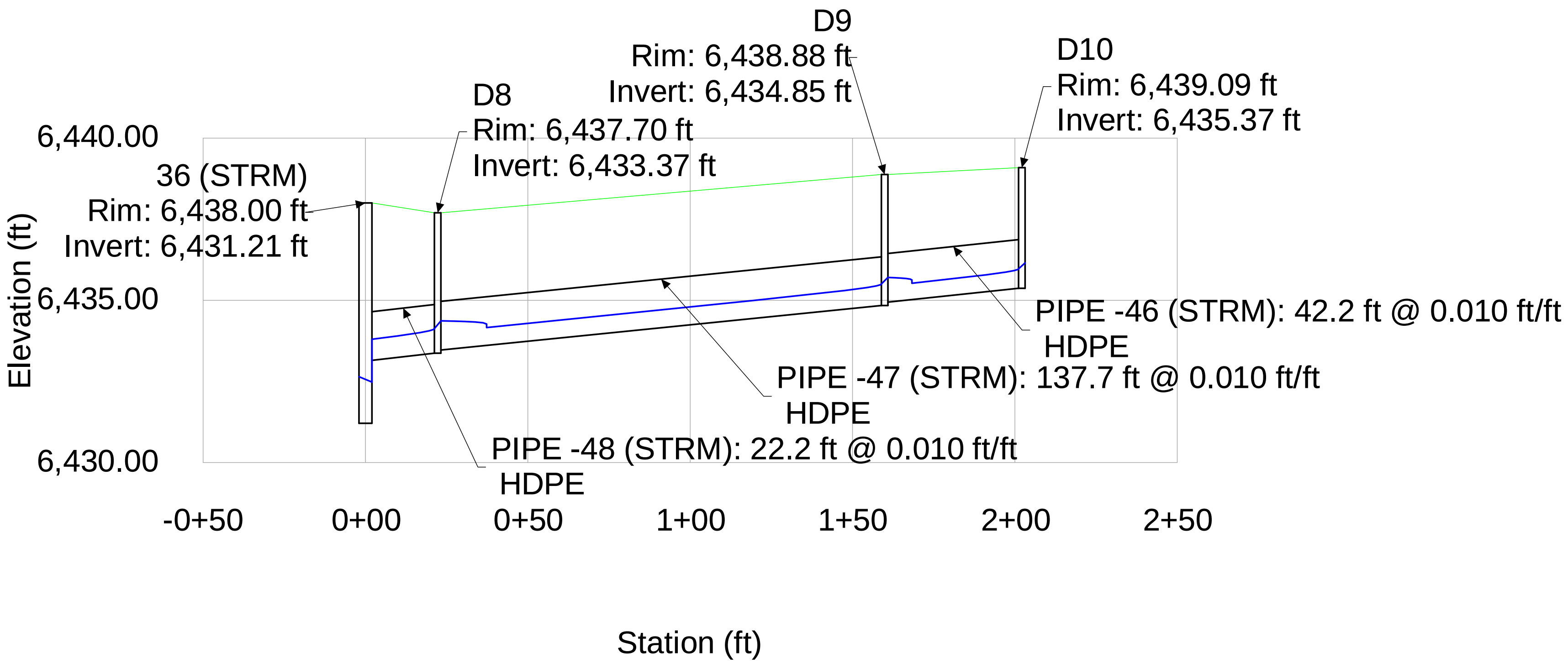
Profile Report
Engineering Profile - D3 (Untitled1.stsw)
Active Scenario: 100 YR



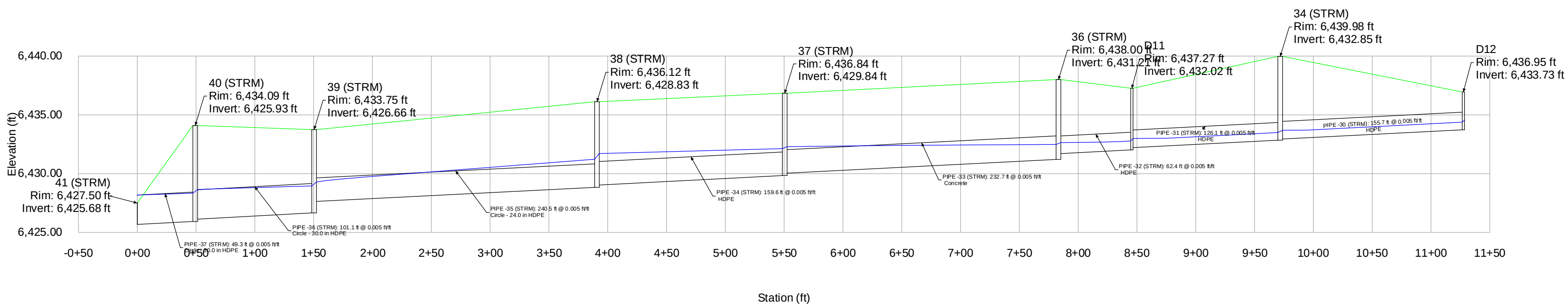
Profile Report
Engineering Profile - D7 (Untitled1.stsw)
Active Scenario: 100 YR



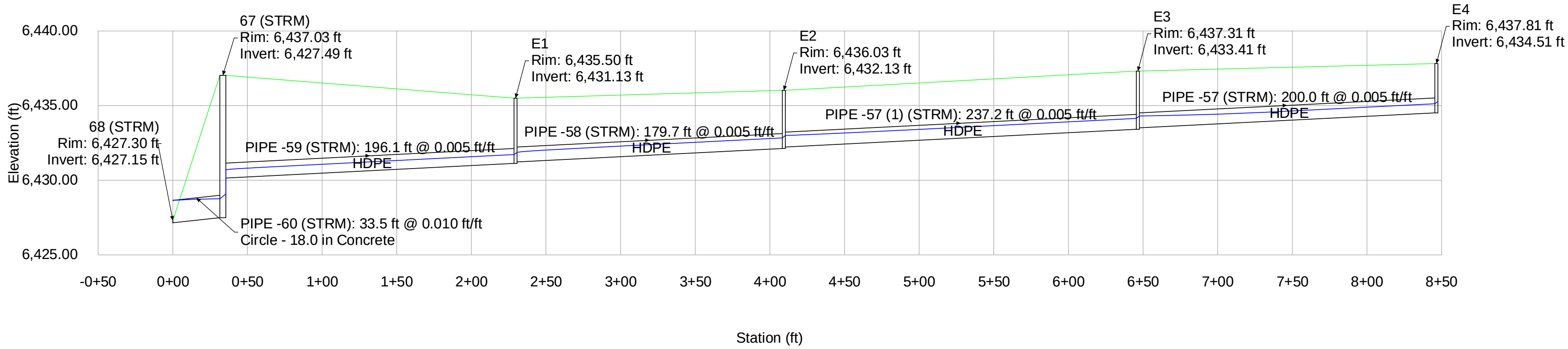
Profile Report
Engineering Profile - D10 (Untitled1.stsw)
Active Scenario: 100 YR



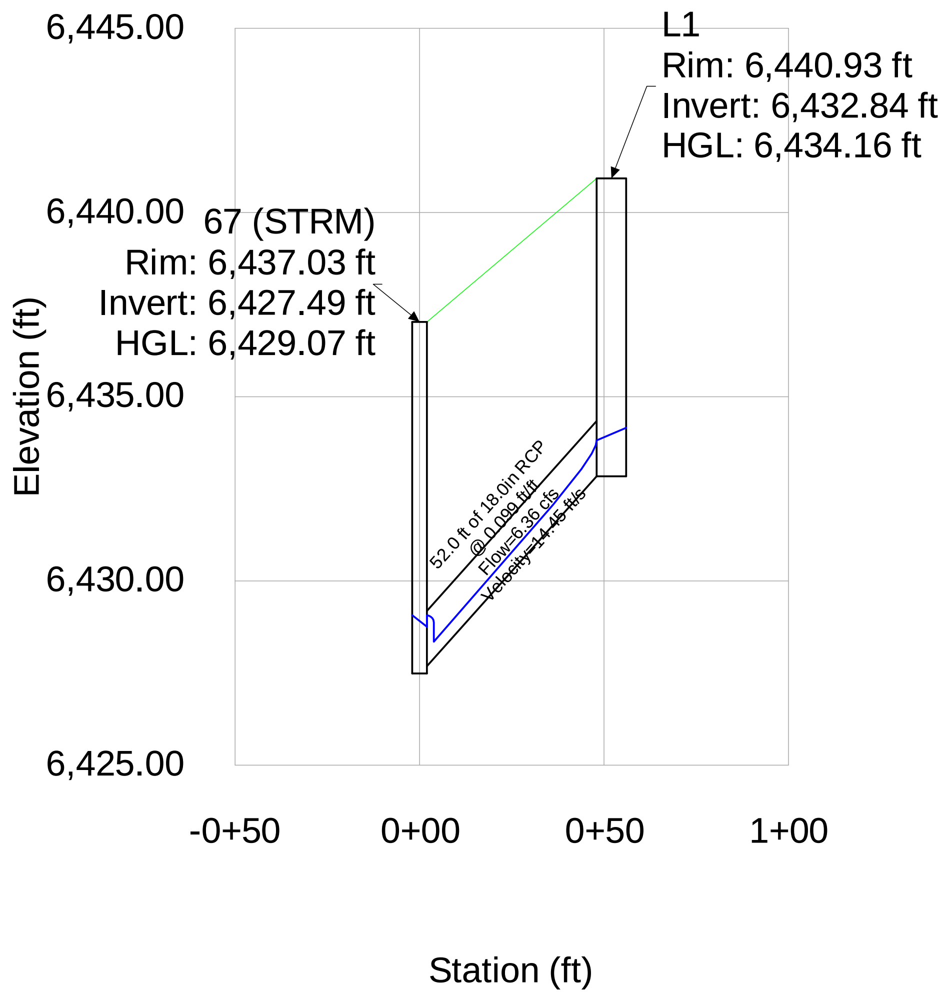
Profile Report
Engineering Profile - D12 (Untitled1.stsw)
Active Scenario: 100 YR



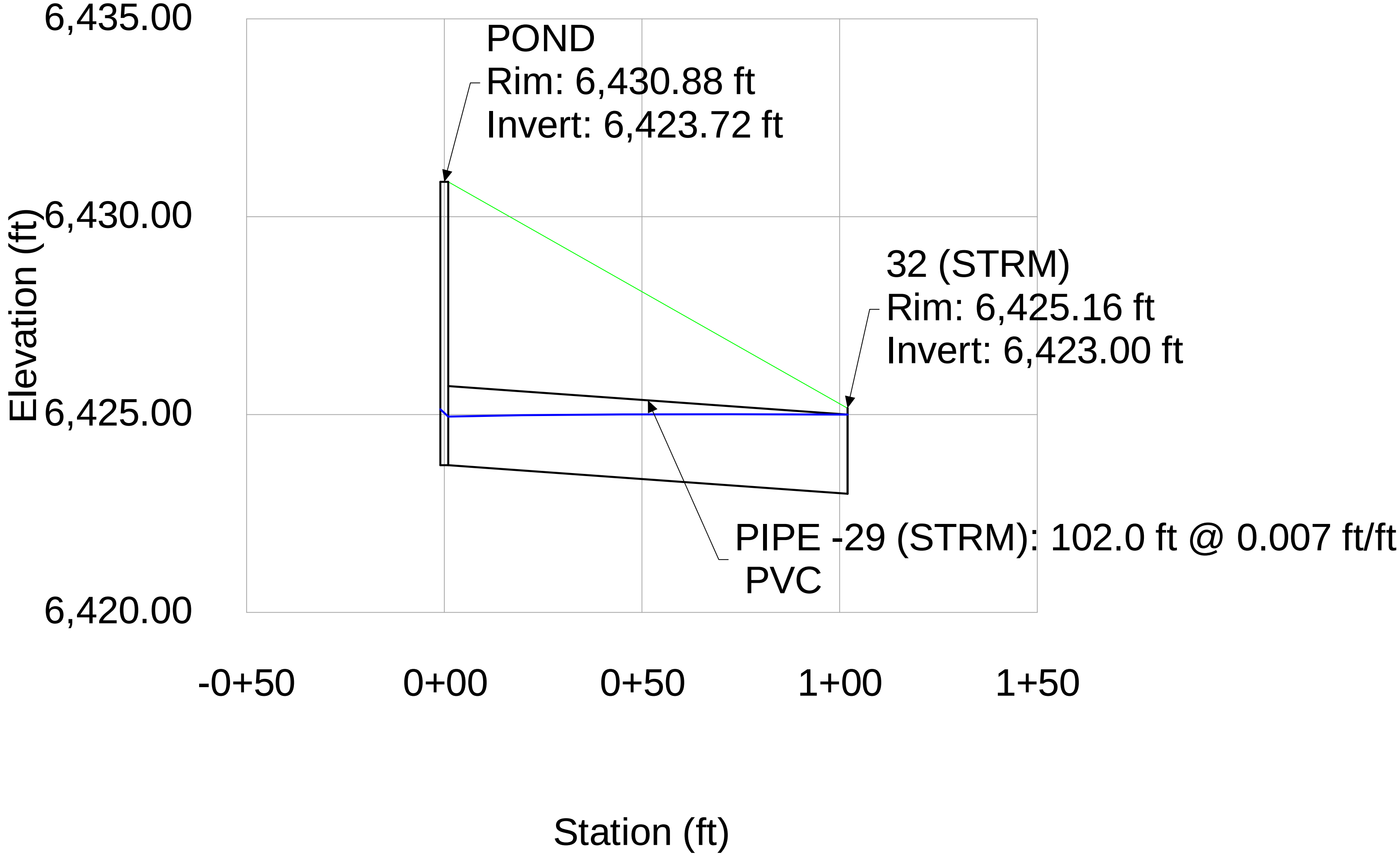
Profile Report
Engineering Profile - E (Untitled1.stsw)
Active Scenario: 100 YR



Profile Report
Engineering Profile - L (Untitled1.stsw)
Active Scenario: 100 YR



Profile Report
Engineering Profile - POND (Untitled1.stsw)
Active Scenario: 100 YR



Stormwater Detention and Infiltration Design Data Sheet

SDI-Design Data v2.00, Released January 2020

Stormwater Facility Name: **Citizen On Constitution-Extended Detention Facility**

Facility Location & Jurisdiction: **SWC of Constitution Avenue and Marksheffel Road- El Paso County, CO**

User Input: Watershed Characteristics

Extended Detention Basin (EDB)	EDB	
Watershed Area =	11.25	acres
Watershed Length =	1,200	ft
Watershed Length to Centroid =	600	ft
Watershed Slope =	0.020	ft/ft
Watershed Imperviousness =	71.0%	percent
Percentage Hydrologic Soil Group A =	66.5%	percent
Percentage Hydrologic Soil Group B =	33.5%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours

Location for 1-hr Rainfall Depths (use dropdown):

User Input

User Defined Stage [ft]	User Defined Area [ft^2]	User Defined Stage [ft]	User Defined Discharge [cfs]
0.00	10	0.00	0.00
1.23	1,075	1.23	0.05
2.23	5,842	2.23	0.07
3.23	8,472	3.23	0.13
4.23	10,582	4.23	0.18
5.23	12,841	5.23	0.32
6.23	15,225	6.23	0.51
7.23	17,729	7.23	0.61
8.23	20,348	8.23	0.70
9.23	23,172	9.23	0.78
10.03	25,384	10.03	0.84

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

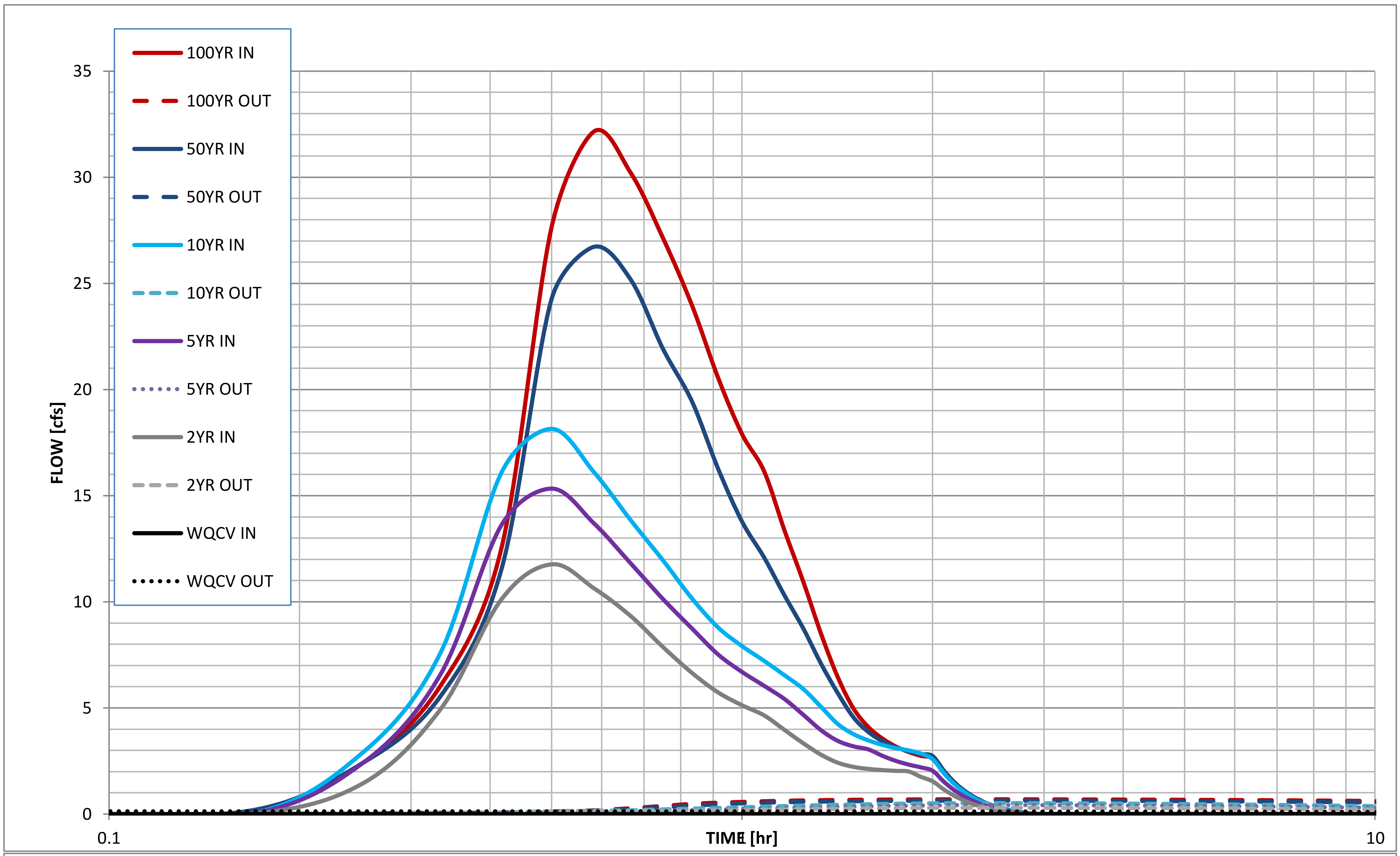
Once CUHP has been run and the Stage-Area-Discharge information has been provided, click 'Process Data' to interpolate the Stage-Area-Volume-Discharge data and generate summary results in the table below. Once this is complete, click 'Print to PDF'.

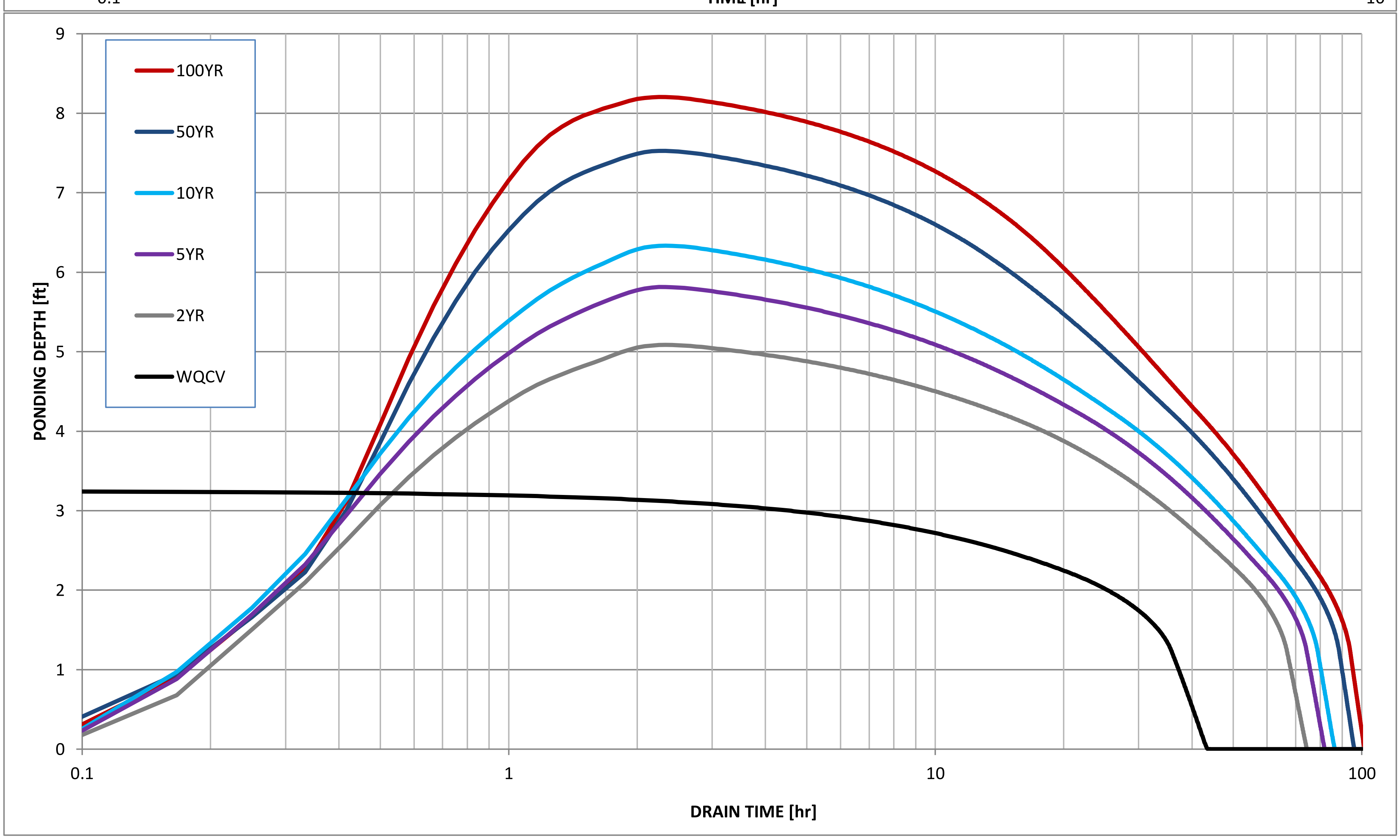
After completing and printing this worksheet to a pdf, go to:
https://maperture.digitaldataservices.com/gvh/?viewer=cswdif
Create a new stormwater facility, and attach the PDF of this worksheet to that record.

Routed Hydrograph Results

Design Storm Return Period =	WQCV	2 Year	5 Year	10 Year	50 Year	100 Year	
One-Hour Rainfall Depth =	N/A	1.19	1.52	1.75	2.25	2.55	in
CUHP Runoff Volume =	0.262	0.746	0.986	1.177	1.663	1.974	acre-ft
Inflow Hydrograph Volume =	N/A	0.746	0.986	1.177	1.663	1.974	acre-ft
Time to Drain 97% of Inflow Volume =	38.0	65.2	**71.2**	74.5	81.3	84.8	hours
Time to Drain 99% of Inflow Volume =	40.3	69.1	75.8	79.8	88.3	**92.9**	hours
Maximum Ponding Depth =	3.25	5.09	5.81	6.33	7.53	8.20	ft
Maximum Ponded Area =	0.20	0.29	0.33	0.36	0.42	**0.47**	acres
Maximum Volume Stored =	0.263	0.703	0.926	1.104	1.567	1.868	acre-ft

Stormwater Detention and Infiltration Design Data Sheet



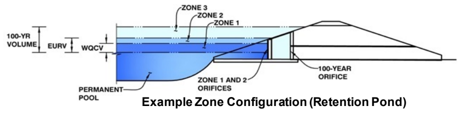


DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

Project: **Citizen On Constitution (El Paso)**

Basin ID: **Extended Detention Basin**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**			
Watershed Area =	11.25	acres		
Watershed Length =	1,200	ft		
Watershed Length to Centroid =	600	ft		
Watershed Slope =	0.020	ft/ft		
Watershed Imperviousness =	71.00%	percent		
Percentage Hydrologic Soil Group A =	66.5%	percent		
Percentage Hydrologic Soil Group B =	33.5%	percent		
Percentage Hydrologic Soil Groups C/D =	0.0%	percent		
Target WQCV Drain Time =	40.0	hours		
Location for 1-hr Rainfall Depths =	User Input			

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

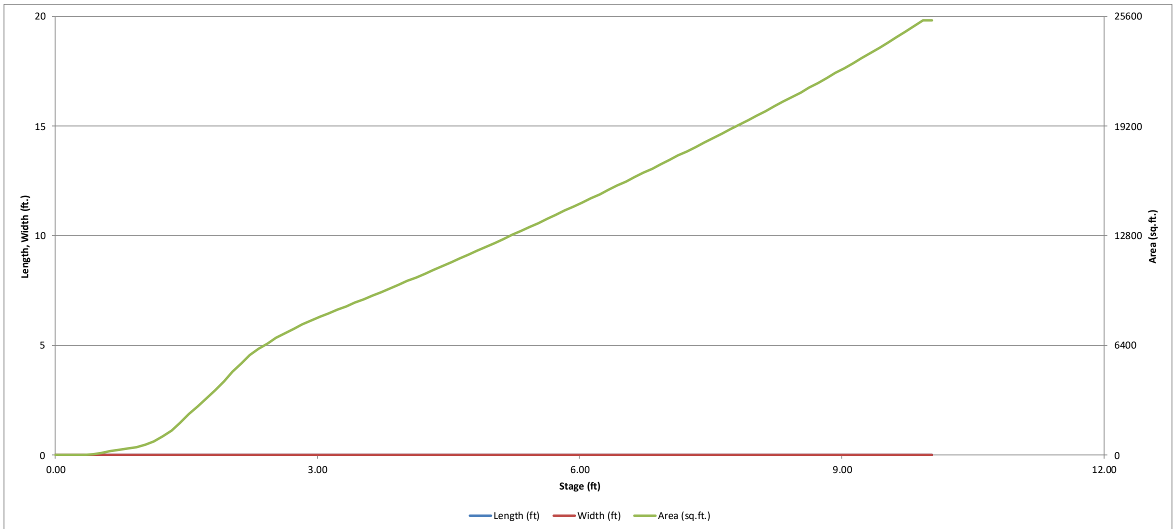
			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.262	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	0.970	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.746	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.52 in.) =	0.986	acre-feet	1.52	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	1.177	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	1.437	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	1.663	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.55 in.) =	1.974	acre-feet	2.55	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	2.537	acre-feet		inches
Approximate 2-yr Detention Volume =	0.671	acre-feet		
Approximate 5-yr Detention Volume =	0.894	acre-feet		
Approximate 10-yr Detention Volume =	1.077	acre-feet		
Approximate 25-yr Detention Volume =	1.241	acre-feet		
Approximate 50-yr Detention Volume =	1.339	acre-feet		
Approximate 100-yr Detention Volume =	1.466	acre-feet		

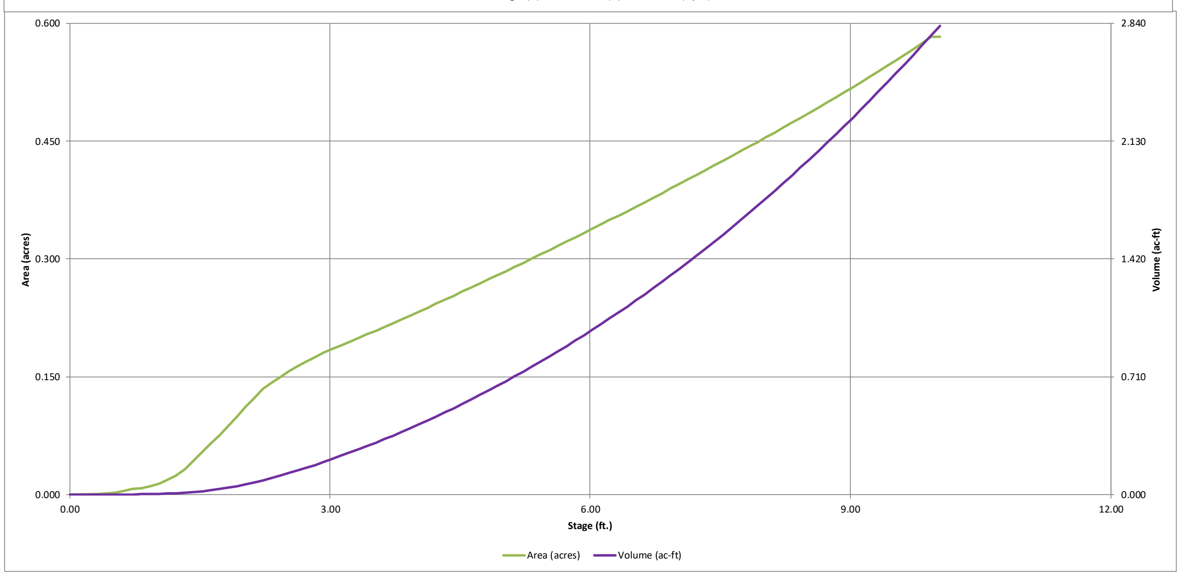
Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.262	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.708	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.496	acre-feet
Total Detention Basin Volume =	1.466	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	10	0.000		
6425.4	--	0.33	--	--	--	14	0.000	4	0.000
6425.5	--	0.43	--	--	--	51	0.001	7	0.000
6425.6	--	0.53	--	--	--	105	0.002	15	0.000
6425.7	--	0.63	--	--	--	216	0.005	31	0.001
6425.8	--	0.73	--	--	--	306	0.007	57	0.001
6425.9	--	0.83	--	--	--	366	0.008	91	0.002
6426	--	0.93	--	--	--	443	0.010	131	0.003
6426.1	--	1.03	--	--	--	581	0.013	183	0.004
6426.2	--	1.13	--	--	--	794	0.018	251	0.006
6426.3	--	1.23	--	--	--	1,075	0.025	345	0.008
6426.4	--	1.33	--	--	--	1,409	0.032	469	0.011
6426.5	--	1.43	--	--	--	1,874	0.043	633	0.015
6426.6	--	1.53	--	--	--	2,385	0.055	846	0.019
6426.7	--	1.63	--	--	--	2,845	0.065	1,107	0.025
6426.8	--	1.73	--	--	--	3,303	0.076	1,415	0.032
6426.9	--	1.83	--	--	--	3,778	0.087	1,769	0.041
6427	--	1.93	--	--	--	4,309	0.099	2,173	0.050
6427.1	--	2.03	--	--	--	4,843	0.111	2,631	0.060
6427.2	--	2.13	--	--	--	5,343	0.123	3,140	0.072
6427.3	--	2.23	--	--	--	5,842	0.134	3,699	0.085
6427.4	--	2.33	--	--	--	6,190	0.142	4,301	0.099
6427.5	--	2.43	--	--	--	6,514	0.150	4,936	0.113
6427.6	--	2.53	--	--	--	6,828	0.157	5,603	0.129
6427.7	--	2.63	--	--	--	7,114	0.163	6,300	0.145
6427.8	--	2.73	--	--	--	7,380	0.169	7,025	0.161
6427.9	--	2.83	--	--	--	7,628	0.175	7,775	0.179
6428	--	2.93	--	--	--	7,861	0.180	8,550	0.196
6428.1	--	3.03	--	--	--	8,064	0.185	9,346	0.215
6428.2	--	3.13	--	--	--	8,268	0.190	10,163	0.233
6428.3	--	3.23	--	--	--	8,472	0.194	11,000	0.253
6428.4	--	3.33	--	--	--	8,677	0.199	11,857	0.272
6428.5	--	3.43	--	--	--	8,883	0.204	12,735	0.292
6428.6	--	3.53	--	--	--	9,090	0.209	13,634	0.313
6428.7	--	3.63	--	--	--	9,298	0.213	14,553	0.334
6428.8	--	3.73	--	--	--	9,507	0.218	15,493	0.356
6428.9	--	3.83	--	--	--	9,720	0.223	16,455	0.378
6429	--	3.93	--	--	--	9,934	0.228	17,437	0.400
6429.1	--	4.03	--	--	--	10,149	0.233	18,442	0.423
6429.2	--	4.13	--	--	--	10,364	0.238	19,467	0.447
6429.3	--	4.23	--	--	--	10,582	0.243	20,514	0.471
6429.4	--	4.33	--	--	--	10,812	0.248	21,584	0.496
6429.5	--	4.43	--	--	--	11,033	0.253	22,676	0.521
6429.6	--	4.53	--	--	--	11,255	0.258	23,791	0.546
6429.7	--	4.63	--	--	--	11,478	0.264	24,927	0.572
6429.8	--	4.73	--	--	--	11,703	0.269	26,086	0.599
6429.9	--	4.83	--	--	--	11,928	0.274	27,268	0.626
6430	--	4.93	--	--	--	12,155	0.279	28,472	0.654
6430.1	--	5.03	--	--	--	12,382	0.284	29,699	0.682
6430.2	--	5.13	--	--	--	12,610	0.289	30,949	0.710
6430.3	--	5.23	--	--	--	12,841	0.295	32,221	0.740
6430.4	--	5.33	--	--	--	13,075	0.300	33,517	0.769
6430.5	--	5.43	--	--	--	13,309	0.306	34,836	0.800
6430.6	--	5.53	--	--	--	13,545	0.311	36,179	0.831
6430.7	--	5.63	--	--	--	13,781	0.316	37,545	0.862
6430.8	--	5.73	--	--	--	14,019	0.322	38,935	0.894
6430.9	--	5.83	--	--	--	14,258	0.327	40,349	0.926
6431	--	5.93	--	--	--	14,497	0.333	41,787	0.959
6431.1 (EURV)	--	6.03	--	--	--	14,739	0.338	43,249	0.993
6431.2	--	6.13	--	--	--	14,981	0.344	44,735	1.027
6431.3	--	6.23	--	--	--	15,225	0.350	46,245	1.062
6431.4	--	6.33	--	--	--	15,470	0.355	47,780	1.097
6431.5	--	6.43	--	--	--	15,716	0.361	49,339	1.133
6431.6	--	6.53	--	--	--	15,963	0.366	50,923	1.169
6431.7	--	6.63	--	--	--	16,212	0.372	52,532	1.206
6431.8	--	6.73	--	--	--	16,461	0.378	54,165	1.243
6431.9	--	6.83	--	--	--	16,712	0.384	55,824	1.282
6432	--	6.93	--	--	--	16,964	0.389	57,508	1.320
6432.1	--	7.03	--	--	--	17,219	0.395	59,217	1.359
6432.2	--	7.13	--	--	--	17,474	0.401	60,952	1.399
6432.3	--	7.23	--	--	--	17,729	0.407	62,712	1.440
6432.4	--	7.33	--	--	--	17,985	0.413	64,497	1.481
6432.5 (100-YR)	--	7.43	--	--	--	18,242	0.419	66,309	1.522
6432.6	--	7.53	--	--	--	18,499	0.425	68,146	1.564
6432.7	--	7.63	--	--	--	18,757	0.431	70,009	1.607
6432.8	--	7.73	--	--	--	19,018	0.437	71,897	1.651
6432.9	--	7.83	--	--	--	19,281	0.443	73,812	1.694
6433	--	7.93	--	--	--	19,545	0.449	75,754	1.739
6433.1	--	8.03	--	--	--	19,811	0.455	77,721	1.784
6433.2	--	8.13	--	--	--	20,079	0.461	79,716	1.830
6433.3	--	8.23	--	--	--	20,348	0.467	81,737	1.876
6433.4	--	8.33	--	--	--	20,618	0.473	83,786	1.923
6433.5	--	8.43	--	--	--	20,892	0.480	85,861	1.971
6433.6	--	8.53	--	--	--	21,167	0.486	87,964	2.019
6433.7	--	8.63	--	--	--	21,446	0.492	90,095	2.068
6433.8	--	8.73	--	--	--	21,727	0.499	92,253	2.118
6433.9	--	8.83	--	--	--	22,010	0.505	94,440	2.168
6434	--	8.93	--	--	--	22,296	0.512	96,656	2.219
6434.1	--	9.03	--	--	--	22,584	0.518	98,899	2.270
6434.2	--	9.13	--	--	--	22,876	0.525	101,172	2.323
6434.3	--	9.23	--	--	--	23,172	0.532	103,475	2.375
6434.4	--	9.33	--	--	--	23,472	0.539	105,807	2.429
6434.5	--	9.43	--	--	--	23,775	0.546	108,169	2.483
6434.6	--	9.53	--	--	--	24,082	0.553	110,562	2.538
6434.7	--	9.63	--	--	--	24,396	0.560	112,986	2.594
6434.8	--	9.73	--	--	--	24,716	0.567	115,442	2.650
6434.9	--	9.83	--	--	--	25,044	0.575	117,930	2.707
6435	--	9.93	--	--	--	25,384	0.583	120,451	2.765
6435.1	--	10.03	--	--	--	25,384	0.583	122,990	2.823


Length, Width (ft.)
Area (sq.ft.)
Stage (ft)
0
5
10
15
20
0
6400
12800
19200
25600
0.00
3.00
6.00
9.00
12.00
Length (ft)
Width (ft)
Area (sq.ft.)

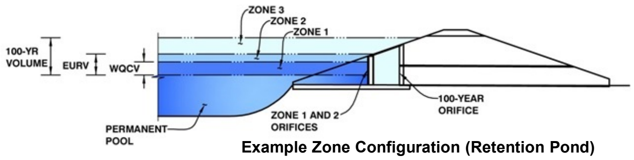

Area (acres)
Volume (ac-ft)
Stage (ft.)
0.000
0.150
0.300
0.450
0.600
0.000
0.710
1.420
2.130
2.840
0.00
3.00
6.00
9.00
12.00
Area (acres)
Volume (ac-ft)

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Project: Citizen On Constitution (El Paso)

Basin ID: Extended Detention Basin



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.28	0.262	Orifice Plate
Zone 2 (EURV)	5.97	0.708	Orifice Plate
Zone 3 (100-year)	7.30	0.496	Weir&Pipe (Restrict)
Total (all zones)		1.466	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)
Underdrain Orifice Diameter =	N/A	inches

Calculated Parameters for Underdrain

Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	6.03	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	N/A	inches
Orifice Plate: Orifice Area per Row =	N/A	inches

Calculated Parameters for Plate

WQ Orifice Area per Row =	N/A	ft^2
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft^2

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	2.85	4.23	5.23				
Orifice Area (sq. inches)	1.40	2.00	3.30	3.30				

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	N/A	N/A	inches

Calculated Parameters for Vertical Orifice

	Not Selected	Not Selected	
Vertical Orifice Area =	N/A	N/A	ft^2
Vertical Orifice Centroid =	N/A	N/A	feet

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe)

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	6.03	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	4.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V
Horiz. Length of Weir Sides =	4.00	N/A	feet
Overflow Grate Type =	Type C Grate	N/A	
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H_t =	6.03	N/A	feet
Overflow Weir Slope Length =	4.00	N/A	feet
Grate Open Area / 100-yr Orifice Area =	32.36	N/A	
Overflow Grate Open Area w/o Debris =	11.14	N/A	ft^2
Overflow Grate Open Area w/ Debris =	5.57	N/A	ft^2

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	1.35	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	24.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	4.00		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	0.34	N/A	ft^2
Outlet Orifice Centroid =	0.20	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	0.84	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	8.68	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	60.00	feet
Spillway End Slopes =	3.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway

Spillway Design Flow Depth=	0.31	feet
Stage at Top of Freeboard =	9.99	feet
Basin Area at Top of Freeboard =	0.58	acres
Basin Volume at Top of Freeboard =	2.80	acre-ft

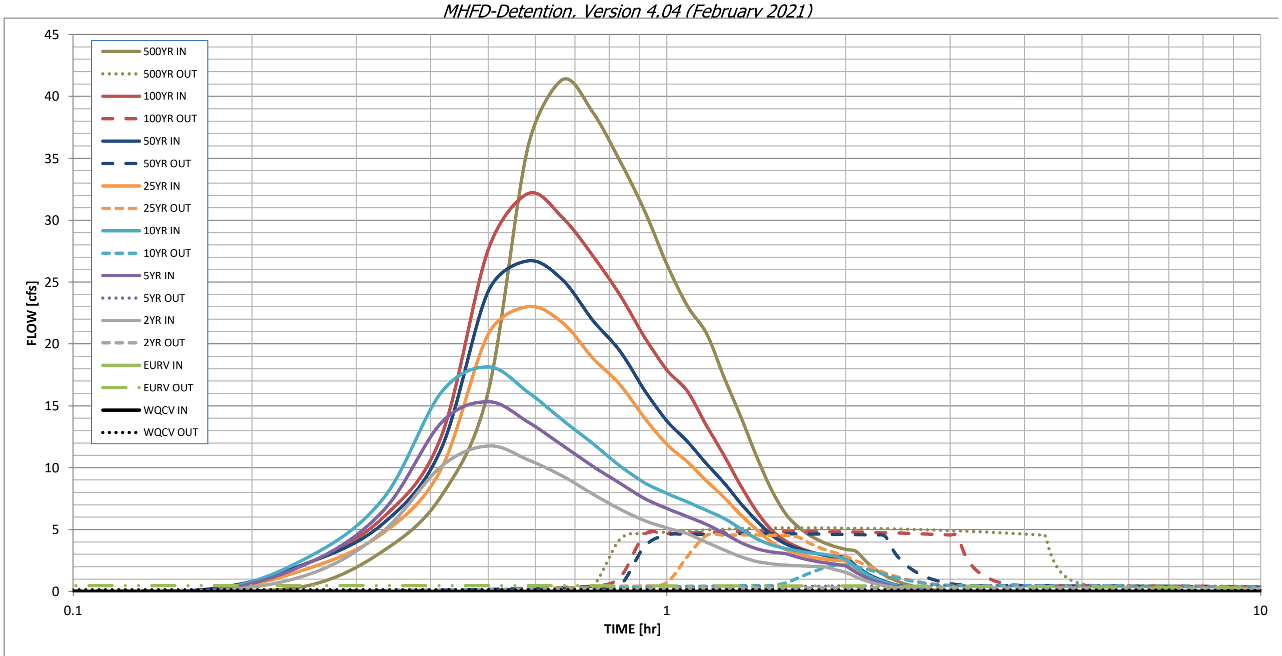
Routed Hydrograph Results

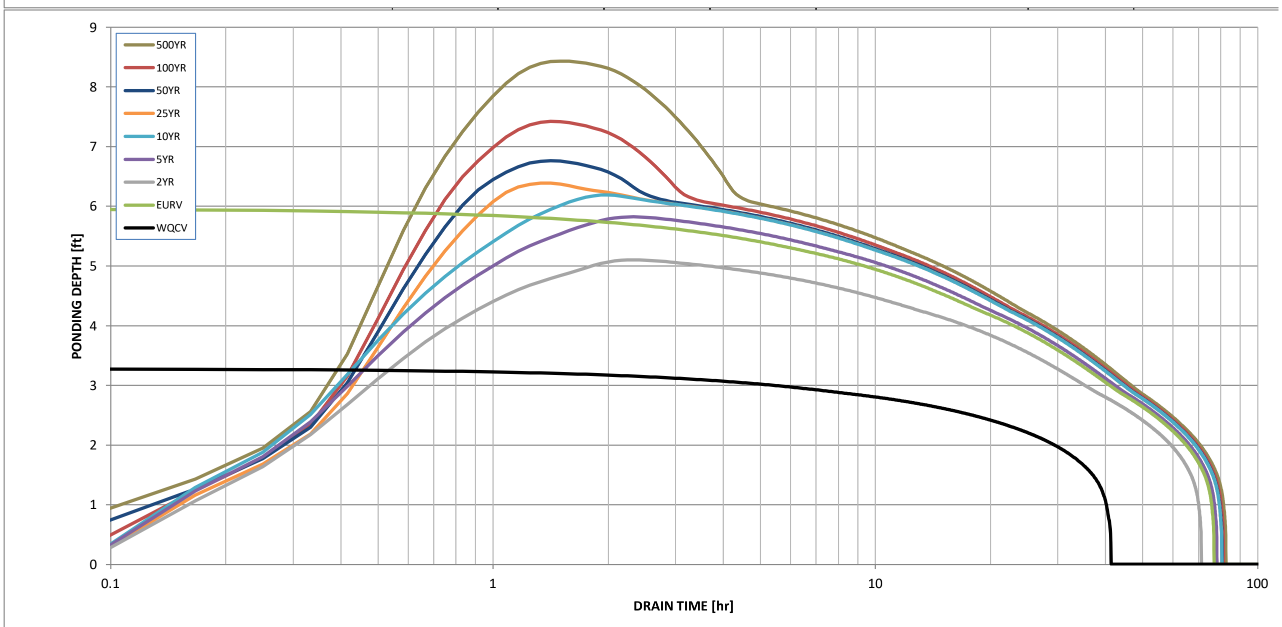
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

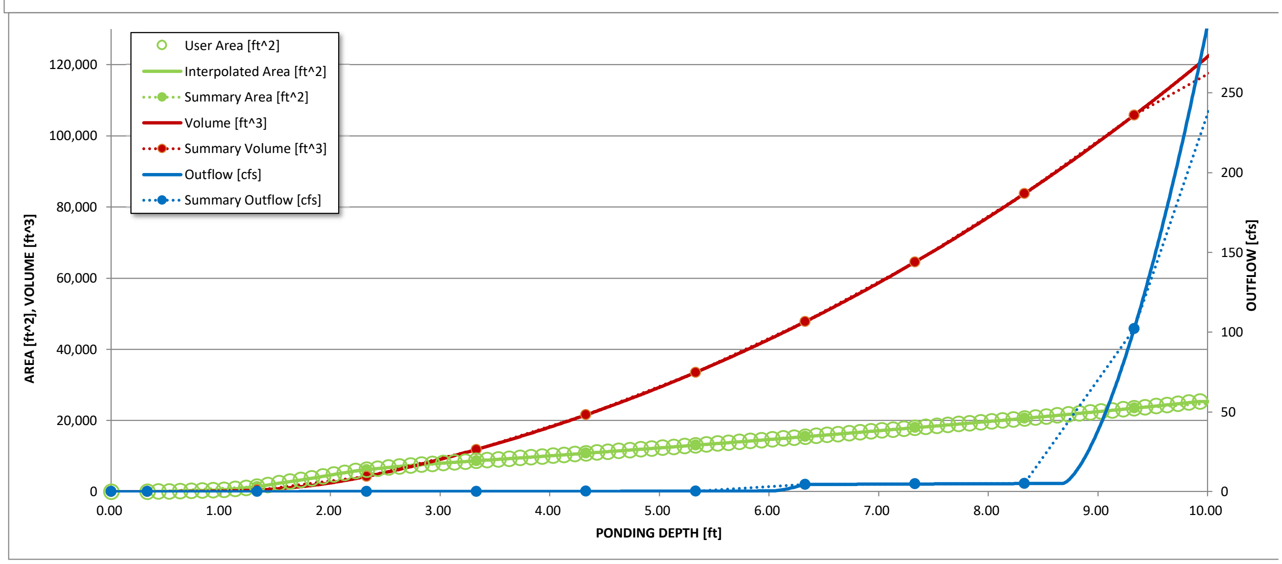
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.52	1.75	2.00	2.25	2.55	3.14
CUHP Runoff Volume (acre-ft) =	0.262	0.970	0.746	0.986	1.177	1.437	1.663	1.974	2.537
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.746	0.986	1.177	1.437	1.663	1.974	2.537
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.1	0.2	1.4	4.4	6.2	9.3	14.2
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A		5.4	7.8			16.9	
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.48	0.69	0.39	0.55	1.50	1.27
Peak Inflow Q (cfs) =	N/A	N/A	11.8	15.3	18.1	23.0	26.7	32.2	41.4
Peak Outflow Q (cfs) =	0.1	0.5	0.3	0.5	2.1	4.5	4.7	4.9	5.1
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.1	0.3	1.0	0.8	0.3	0.4
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.1	0.4	0.4	0.4	0.4
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	39	70	66	72	73	71	70	69	67
Time to Drain 99% of Inflow Volume (hours) =	**41**	75	69	76	78	77	77	77	77
Maximum Ponding Depth (ft) =	3.28	5.97	5.10	5.82	6.19	6.39	6.76	7.42	8.43
Area at Maximum Ponding Depth (acres) =	0.20	0.34	0.29	0.33	0.35	0.36	0.38	0.42	0.48
Maximum Volume Stored (acre-ft) =	0.262	0.973	0.699	0.923	1.044	1.115	1.255	1.514	1.966

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)







S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.16	0.04	0.51
	0:15:00	0.00	0.00	1.40	2.34	2.83	1.90	2.36	2.36	3.29
	0:20:00	0.00	0.00	4.91	6.54	7.55	4.75	5.52	6.01	7.69
	0:25:00	0.00	0.00	10.11	13.61	16.08	9.90	11.52	12.51	16.16
	0:30:00	0.00	0.00	11.77	15.33	18.15	20.78	24.25	27.63	35.91
	0:35:00	0.00	0.00	10.64	13.70	16.11	23.01	26.72	32.15	41.35
	0:40:00	0.00	0.00	9.33	11.82	13.85	21.72	25.19	30.22	38.75
	0:45:00	0.00	0.00	7.87	10.13	11.95	18.88	21.92	27.14	34.81
	0:50:00	0.00	0.00	6.65	8.75	10.16	16.73	19.45	23.97	30.77
	0:55:00	0.00	0.00	5.73	7.52	8.79	14.02	16.27	20.55	26.42
	1:00:00	0.00	0.00	5.13	6.70	7.91	11.89	13.78	17.90	23.05
	1:05:00	0.00	0.00	4.65	6.04	7.22	10.46	12.09	16.16	20.83
	1:10:00	0.00	0.00	3.97	5.42	6.54	8.92	10.31	13.37	17.22
	1:15:00	0.00	0.00	3.33	4.67	5.89	7.57	8.74	10.93	14.07
	1:20:00	0.00	0.00	2.80	3.95	5.05	6.15	7.08	8.48	10.87
	1:25:00	0.00	0.00	2.42	3.45	4.24	4.98	5.70	6.45	8.21
	1:30:00	0.00	0.00	2.22	3.19	3.77	3.99	4.55	4.97	6.31
	1:35:00	0.00	0.00	2.13	3.05	3.47	3.40	3.87	4.10	5.18
	1:40:00	0.00	0.00	2.07	2.74	3.26	3.03	3.44	3.56	4.47
	1:45:00	0.00	0.00	2.04	2.51	3.11	2.79	3.15	3.18	3.98
	1:50:00	0.00	0.00	2.01	2.33	3.00	2.62	2.96	2.93	3.64
	1:55:00	0.00	0.00	1.75	2.20	2.85	2.51	2.83	2.74	3.40
	2:00:00	0.00	0.00	1.54	2.04	2.59	2.43	2.74	2.62	3.24
	2:05:00	0.00	0.00	1.16	1.53	1.93	1.82	2.05	1.95	2.41
	2:10:00	0.00	0.00	0.85	1.12	1.40	1.33	1.49	1.42	1.75
	2:15:00	0.00	0.00	0.62	0.81	1.02	0.97	1.09	1.04	1.28
	2:20:00	0.00	0.00	0.45	0.58	0.73	0.70	0.78	0.76	0.93
	2:25:00	0.00	0.00	0.32	0.40	0.52	0.49	0.55	0.54	0.66
	2:30:00	0.00	0.00	0.22	0.28	0.36	0.35	0.39	0.38	0.46
	2:35:00	0.00	0.00	0.14	0.19	0.25	0.24	0.27	0.26	0.32
	2:40:00	0.00	0.00	0.09	0.12	0.15	0.16	0.17	0.17	0.21
	2:45:00	0.00	0.00	0.04	0.07	0.08	0.09	0.10	0.10	0.12
	2:50:00	0.00	0.00	0.02	0.03	0.04	0.04	0.04	0.04	0.05
	2:55:00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	3:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

RUNOFF SUMMARY: EXISTING VS PROPOSED		
	5-YEAR STORM (CFS)	100-YEAR STORM (CFS)
TOTAL EXISTING ON-SITE FLOWS:	8.17	33
EXISTING ON-SITE FLOWS AT DP EX1:	5.35	16.9
EXISTING ON-SITE FLOWS AT DP EX2:	2.8	18.81
*PROPOSED TOTAL ON-SITE FLOWS AT DP UO:	7.33	13.78
NET RESULT:	1.98	-3.12

*PROPOSED FLOWS INCLUDE POND DISCHARGE AND BASINS A1, A2, B3, B4, B5

Rock Chute Design Data

(Version WI-Nov. 2017, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)

Project: *Urban Collection at Palmer Village F2* **County:** *El Paso County*
Designer: *SMW* **Checked by:**
Date: *March 28, 2022* **Date:**

Input Geometry:

Upstream Channel	Chute		Downstream Channel
Bw = *3.0* ft.	Bw = *3.0* ft.		Bw = *30.0* ft.
Side slopes = *2.0* (m:1)	Factor of safety = *1.20* (F_s)	***1.2 Min***	Side slopes = *4.0* (m:1)
Velocity n-value = *0.016*	Side slopes = *2.0* (m:1)	***2.0:1 max.***	Velocity n-value = *0.012*
Bed slope = *0.0200* ft./ft.	Bed slope (4:1) = *0.250* ft./ft	***3.0:1 max.***	Bed slope = *0.0100* ft./ft.
Note: n value = a) velocity n from waterway program	Freeboard = *0.5* ft.		
or b) computed mannings n for channel	Outlet apron depth, d = *1.0* ft.		Base flow = *0.0* cfs

Design Storm Data (Table 2, FOTG, WI-NRCS Grade Stabilization Structure No. 410):

Apron elev. --- Inlet =*6434.0* ft. ------ Outlet*6427.0* ft. --- (H_{drop} = 6 ft.)

***Note**: The total required capacity is routed through the chute (principal spillway) or in combination with an auxiliary spillway.*

Q_{high} = Runoff from design storm capacity from Table 2, FOTG Standard 410

Q_5 = Runofff from a 5-year,24-hour storm.

***Input tailwater (Tw)**:* 0.25 1.20

Q_{high}= *3.4* cfs High flow storm through chute → Tw (ft.) = *Program*

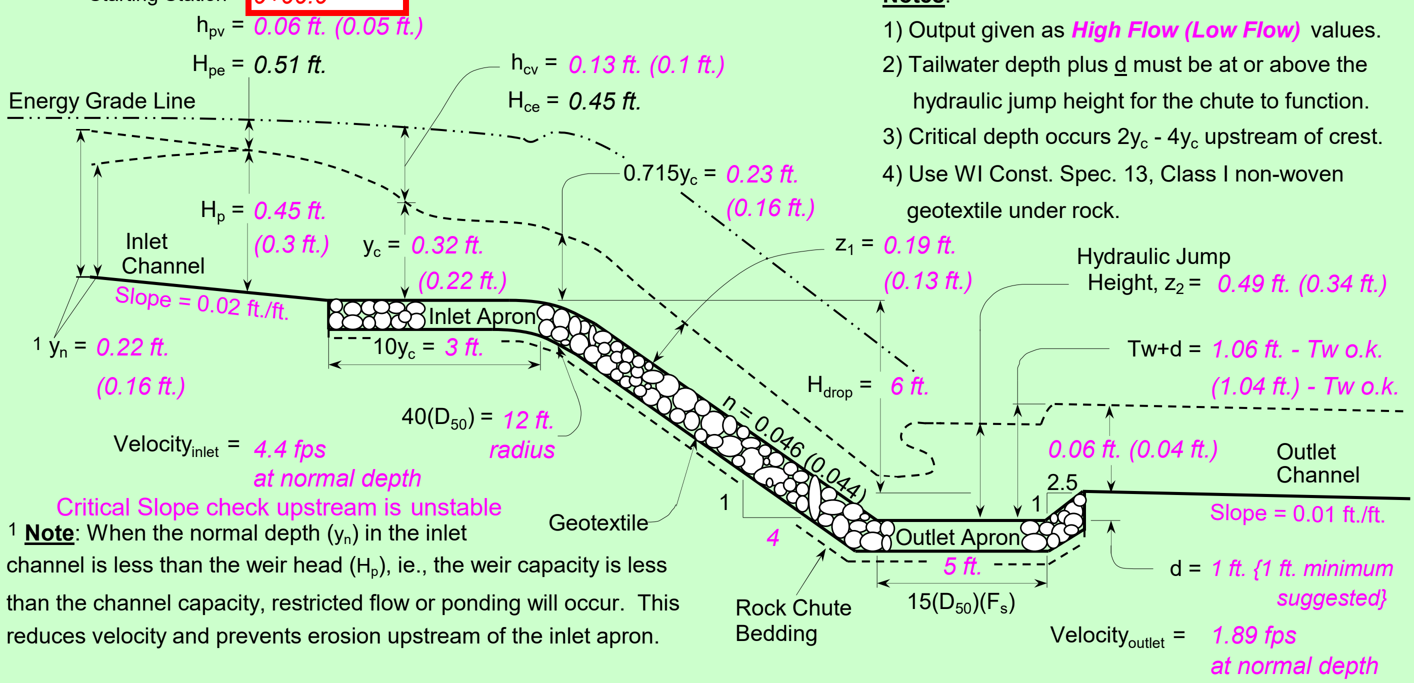
Q_5 = *1.9* cfs Low flow storm through chute → Tw (ft.) = *Program*

Profile and Cross Section (Output):

Starting Station = *0+00.0*

Notes:

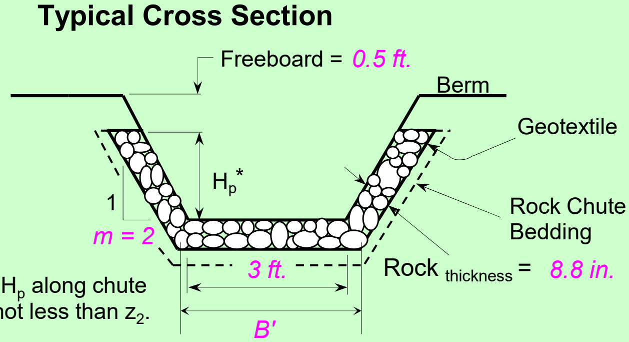
1) Output given as ***High Flow (Low Flow)*** values.
2) Tailwater depth plus d must be at or above the hydraulic jump height for the chute to function.
3) Critical depth occurs $2y_c$ - $4y_c$ upstream of crest.
4) Use WI Const. Spec. 13, Class I non-woven geotextile under rock.



[1] **Note**: When the normal depth (y_n) in the inlet channel is less than the weir head (H_p), ie., the weir capacity is less than the channel capacity, restricted flow or ponding will occur. This reduces velocity and prevents erosion upstream of the inlet apron.

Profile Along Centerline of Chute

Typical Cross Section



* Use H_p along chute but not less than z_2.

	1.01 cfs/ft.	Equivalent unit discharge
F_S =	*1.20*	Factor of safety (multiplier)
z_1 =	*0.19 ft.*	Normal depth in chute
n-value =	*0.046*	Manning's roughness coefficient
$D_{50}(F_s)$ =	*4.4 in.*	Minimum Design D50*
$2(D_{50})(F_s)$ =	*8.8 in.*	Rock chute thickness
Tw + d =	*1.06 ft.*	Tailwater above outlet apron
z_2 =	*0.49 ft.*	Hydraulic jump height
****** The outlet***	***will***	***function adequately***

High Flow Storm Information

Rock Chute Design - Cut/Paste Plan

(Version WI-Nov. 2017, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)

Project: Urban Collection at Palmer Village F2 **County:** El Paso County
Designer: SMW **Checked by:**
Date: 3/28/2022 **Date:**

Design Values

D_{50} dia. =	6.0 in.
$Rock_{chute}$ thickness =	12.0 in.
Inlet apron length =	10 ft.
Outlet apron length =	5 ft.
Radius =	17 ft.
Will bedding be used?	No

Rock Gradation Envelope

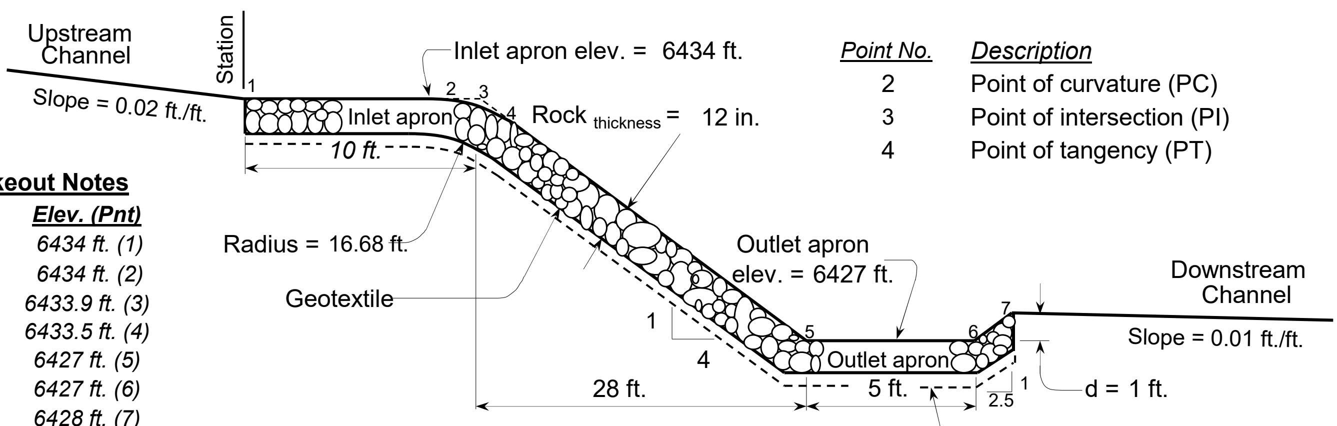
% Passing		*Diameter, in. (weight, lbs.)*
D_{100}	---------	9 - 12 (52 - 122)
D_{85}	---------	8 - 11 (34 - 89)
D_{50}	---------	6 - 9 (15 - 52)
D_{10}	---------	5 - 8 (8 - 34)

Coefficient of Uniformity, $(D_{60})/(D_{10})$ < 1.7

Quantities [a]

Rock =	14 yd^3
Geotextile (WCS-13)[b] =	53 yd^2
Bedding =	0 yd^3
Excavation =	0 yd^3
Earthfill =	0 yd^3
Seeding =	0.0 acres

Notes: [a] *Rock, bedding, and geotextile quantities are determined from x-section below (neglect radius).*
[b] *Geotextile Class I (Non-woven) shall be overlapped and anchored (18-in. minimum along sides and 24-in. minimum on the ends) --- quantity not included.*

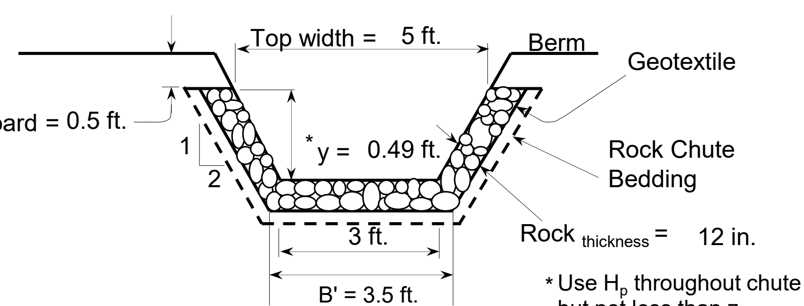


Point No.	*Description*
2	Point of curvature (PC)
3	Point of intersection (PI)
4	Point of tangency (PT)

Stakeout Notes

Sta.	***Elev. (Pnt)***
0+00.0	*6434 ft. (1)*
0+07.9	*6434 ft. (2)*
0+10.0	*6433.9 ft. (3)*
0+12.0	*6433.5 ft. (4)*
0+38.0	*6427 ft. (5)*
0+43.0	*6427 ft. (6)*
0+45.5	*6428 ft. (7)*

Profile Along Centerline of Rock Chute



Rock Chute Cross Section

Notes:
Rock gradation envelope can be met with
DOT Light riprap Gradation

Profile, Cross Sections, and Quantities

NRCS
Natural Resources Conservation Service
United States Department of Agriculture

Urban Collection at Palmer Village F2

El Paso County County

		Date
Designed	SMW	
Drawn		
Checked		
Approved		

File Name
Drawing Name
Sheet __ of __

Rock Chute Design Calculations

(Version WI-Nov. 2017, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)

Project: Urban Collection at Palmer Village F2 **County:** El Paso County
Designer: SMW **Checked by:** ____________
Date: 3/28/2022 **Date:** ________

I. Calculate the normal depth in the inlet channel

	High Flow			***Low Flow***		
y_n =	**0.22**	**ft.**	**y_n =**	**0.16**	**ft.**	(Normal depth)
Area =	0.8	ft^2	Area =	0.5	ft^2	(Flow area in channel)
Q_{high} =	3.4	cfs	Q_{low} =	1.9	cfs	(Capacity in channel)
Scupstreamchannel =	0.007	ft/ft				

II. Calculate the critical depth in the chute

	High Flow			***Low Flow***		
y_c =	**0.32**	**ft.**	**y_c =**	**0.22**	**ft.**	(Critical depth in chute)
Area =	1.2	ft^2	Area =	0.8	ft^2	(Flow area in channel)
Q_{high} =	3.4	cfs	Q_{low} =	1.9	cfs	(Capacity in channel)
H_{ce} =	0.45	ft.	H_{ce} =	0.32	ft.	(Total minimum specific energy head)
h_{cv} =	0.13	ft.	h_{cv} =	0.10	ft.	(Velocity head corresponding to y_c)
$10y_c$ =	**3.17**	**ft.**	---	---		(Required inlet apron length)
$0.715y_c$ =	**0.23**	**ft.**	**$0.715y_c$ =**	**0.16**	**ft.**	(Depth of flow over the weir crest or brink)

III. Calculate the tailwater depth in the outlet channel

	High Flow			***Low Flow***		
Tw =	**0.06**	**ft.**	**Tw =**	**0.04**	**ft.**	(Tailwater depth)
Area =	1.8	ft^2	Area =	1.3	ft^2	(Flow area in channel)
Q_{high} =	3.4	cfs	Q_{low} =	1.9	cfs	(Capacity in channel)
H_2 =	0.00	ft.	H_2 =	0.00	ft.	(Downstream head above weir crest, H_2 = 0, if $H_2 < 0.715*y_c$)

IV. Calculate the head for a trapezoidal shaped broadcrested weir

Cd = 1.00 (Coefficient of discharge for broadcrested weirs)

	High Flow				
H_p =	0.49	ft.	**0.45**	**ft.**	(Weir head)
Area =	1.9	ft^2	1.7	ft^2	(Flow area in channel)
V_o =	0.00	fps	**1.95**	**fps**	(Approach velocity)
h_{pv} =	0.00	ft.	0.06	ft.	(Velocity head corresponding to H_p)
Q_{high} =	3.4	cfs	3.4	cfs	(Capacity in channel)

Trial and error procedure solving simultaneously for velocity and head

	Low Flow				
H_p =	0.34	ft.	**0.30**	**ft.**	(Weir head)
Area =	1.2	ft^2	1.1	ft^2	(Flow area in channel)
V_o =	0.00	fps	**1.73**	**fps**	(Approach velocity)
h_{pv} =	0.00	ft.	0.05	ft.	(Velocity head corresponding to H_p)
Q_{low} =	1.9	cfs	1.9	cfs	(Capacity in channel)

Trial and error procedure solving simultaneously for velocity and head

Rock Chute Design Calculations

(Version WI-Nov. 2017, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)

Project: Urban Collection at Palmer Village F2 **County:** El Paso County
Designer: SMW **Checked by:** ____
Date: 3/28/2022 **Date:** ____

V. Calculate the rock chute parameters (w/o a factor of safety applied)

	High Flow			***Low Flow***		
q_t =	0.09	cms/m	q_t =	0.05	cms/m	(Equivalent unit discharge)
D_{50} (mm) =	92.71	→ ***(3.65 in.)***	D_{50} =	69.41	mm	(Median ***angular*** rock size)
n =	0.046		n =	0.044		(Manning's roughness coefficient)
z_1 =	0.19	ft.	z_1 =	0.13	ft.	(Normal depth in the chute)
A_1 =	0.6	ft^2	A_1 =	0.4	ft^2	(Area associated with normal depth)
Velocity =	5.27	fps	Velocity =	4.34	fps	(Velocity in chute slope)
z_{mean} =	0.17	ft.	z_{mean} =	0.12	ft.	(Mean depth)
F_1 =	2.24		F_1 =	2.17		(Froude number)
$L_{rock\ apron}$ =	4.56	ft.	----	----		(Length of rock outlet apron = 15*D_{50})

VI. Calculate the height of hydraulic jump height (conjugate depth)

	High Flow			***Low Flow***		
z_2 =	**0.49**	**ft.**	**z_2 =**	**0.34**	**ft.**	(Hydraulic jump height)
Q_{high} =	3.4	cfs	Q_{high} =	1.9	cfs	(Capacity in channel)
A_2 =	1.9	ft^2	A_2 =	1.2	ft^2	(Flow area in channel)

VII. Calculate the energy lost through the jump (absorbed by the rock)

	High Flow			***Low Flow***		
E_1 =	0.62	ft.	E_1 =	0.43	ft.	(Total energy before the jump)
E_2 =	0.53	ft.	E_2 =	0.37	ft.	(Total energy after the jump)
R_E =	14.21	%	R_E =	12.75	%	(Relative loss of energy)

Calculate Quantities for Rock Chute

-------Rock Riprap Volume-------

Area Calculations	**Length @ Rock CL**
h = 0.49	Inlet = 9.94
x_1 = 2.24	Outlet = 5.16
L = 1.10	Slope = 28.86
A_s = 1.10	2.5:1 Lip = 2.59
x_2 = 2.00	**Total = 46.55 ft.**
A_b = 5.47	**Rock Volume**
A_b+2*A_s = 7.66 ft^2	**13.21 yd^3**

-------Bedding Volume-------

Area Calculations	
h = 1.49	**Bedding Thickness**
x_1 = 0.00	t_1, t_2 = ***0.00*** in.
L = 3.33	
A_s = 0.00	**Length @ Bed CL**
x_2 = 0.00	**Total = 46.54 ft.**
A_b = 0.00	**Bedding Volume**
A_b+2*A_s = 0.00 ft^2	**0.00 yd^3**

-------Geotextile Quantity-------

Width	**Length @ Bot. Rock**
2*Slope = 6.66	**Total = 46.54 ft.**
Bottom = 3.47	**Geotextile Area**
Total = 10.14 ft.	**52.41 yd^2**

Note: 1) The radius is not considered when calculating quantities of riprap, bedding, or geotextile.
2) The geotextile quantity does not include over-overlapping (18-in. min.) or anchoring material (18-in. min. along sides, 24-in. min. on ends).

Kimley»Horn

Forebay Sizing Calculations - Forebay A

Contributing Sub-Basins: E1-E4, OE1-OE4, OF1

Date	6/6/2022
Prepared By	JWM
Checked By	MOH

		Forebay B	
	Required	Flow: Q_{100} = (cfs)	Release Rate
Forebay Release and Configuration	Release 2% of the undetained 100-year peak discharge by way of a wall/notch or berm/pipe configuration	3.37	0.07

			Required (CF)	Provided (CF)
Minimum Forebay Volume Required	1% of the WQCV	40hr drain time a = 1 I = 0.79 A = 0.46 AC	5.38	24.00

	Required	Provided	
Maximum Forebay Depth	12" Max	12"	Concrete Forebay Structure

Forebay Notch Calculations			
$Q = C_o A_o (2gH_o)^{0.5}$			
Q_a	0.07	cfs	2% of Peak 100 YR Discharge for contributing Sub-Basins
C_o	0.6		
H_o	0.5	ft	
g	32.2	ft/s^2	
A_a	0.02	ft^2	
L_a	0.01	ft	
	0.16	**in**	3" Minimum per Criteria

$$\text{WQCV} = a(0.91I^3 - 1.19I^2 + 0.78I) \qquad \text{Equation 3-1}$$

Where:

WQCV = Water Quality Capture Volume (watershed inches)

a = Coefficient corresponding to WQCV drain time (Table 3-2)

I = Imperviousness (%/100) (see Figures 3-3 through 3-5 [single family land use] and /or the *Runoff* chapter of Volume 1[other typical land uses])

Table 3-2. Drain Time Coefficients for WQCV Calculations

Drain Time (hrs)	Coefficient, a
12 hours	0.8
24 hours	0.9
40 hours	1.0

Kimley»Horn

Forebay Sizing Calculations - Forebay B

Contributing Sub-Basins: B1, B2, OB1, OB2

Date	6/6/2022
Prepared By	JWM
Checked By	MOH

		Forebay A	
	Required	Flow: Q_{100} = (cfs)	Release Rate
Forebay Release and Configuration	Release 2% of the undetained 100-year peak discharge by way of a wall/notch or berm/pipe configuration	16.00	0.32

			Required (CF)	Provided (CF)
Minimum Forebay Volume Required	1% of the WQCV	40hr drain time a = 1 I = 0.66 A = 2.27 AC	21.26	24.00

	Required	Provided	
Maximum Forebay Depth	12" Max	12"	Concrete Forebay Structure

Forebay Notch Calculations			
$Q = C_o A_o (2gH_o)^{0.5}$			
Q_a	0.32	cfs	2% of Peak 100 YR Discharge for contributing Sub-Basins
C_o	0.6		
H_o	0.5	ft	
g	32.2	ft/s^2	
A_a	0.09	ft^2	
L_a	0.06	ft	
	0.75	**in**	3" Minimum per Criteria

$$\text{WQCV} = a(0.91I^3 - 1.19I^2 + 0.78I) \quad \text{Equation 3-1}$$

Where:

WQCV = Water Quality Capture Volume (watershed inches)

a = Coefficient corresponding to WQCV drain time (Table 3-2)

I = Imperviousness (%/100) (see Figures 3-3 through 3-5 [single family land use] and /or the *Runoff* chapter of Volume 1[other typical land uses])

Table 3-2. Drain Time Coefficients for WQCV Calculations

Drain Time (hrs)	Coefficient, a
12 hours	0.8
24 hours	0.9
40 hours	1.0

Kimley»Horn

Date	6/6/2022
Prepared By	JWM
Checked By	MOH

Forebay Sizing Calculations - Forebay C

Contributing Sub-Basins: D1-D12, OD 12

	Required	Forebay C Flow: Q_{100} = (cfs)	Release Rate
Forebay Release and Configuration	Release 2% of the undetained 100-year peak discharge by way of a wall/notch or berm/pipe configuration	43.57	1.31

			Required (CF)	Provided (CF)
Minimum Forebay Volume Required	3% of the WQCV for contributing basins	40hr drain time a = 1 I = 0.78 A = 6.31 AC	144.87	147.00

	Required	Provided	
Maximum Forebay Depth	18" Max	18"	Concrete Forebay Structure

Forebay Notch Calculations			
$Q = C_o A_o (2gH_o)^{0.5}$			
Q_a	1.31	cfs	2% of Peak 100 YR Discharge for contributing Sub-Basins
C_o	0.6		
H_o	0.5	ft	
g	32.2	ft/s^2	
A_a	0.38	ft^2	
L_a	0.26	ft	
	3.07	**in**	3" Minimum per Criteria

$$\text{WQCV} = a(0.91I^3 - 1.19I^2 + 0.78I) \quad \text{Equation 3-1}$$

Where:

WQCV = Water Quality Capture Volume (watershed inches)

a = Coefficient corresponding to WQCV drain time (Table 3-2)

I = Imperviousness (%/100) (see Figures 3-3 through 3-5 [single family land use] and /or the *Runoff* chapter of Volume 1[other typical land uses])

Table 3-2. Drain Time Coefficients for WQCV Calculations

Drain Time (hrs)	Coefficient, a
12 hours	0.8
24 hours	0.9
40 hours	1.0

APPENDIX D: SITE PHOTOS

Photo 1

Photo 2

Photo 3

Photo 4

Photo 5

Photo 6

Photo 7

Photo 8

APPENDIX E: EXCEPRTS FROM ADJACENT PROPERTY DRAINAGE REPORTS

FINAL DRAINAGE REPORT
FOR
URBAN COLLECTION AT PALMER VILLAGE

Prepared For:

MDC Holdings – Richmond American Homes
4350 South Monaco Street
Denver, CO 80237
720-977-3827

PCD Filing No.:
SF-20-028

April 23, 2021
Project No. 25149.01

Prepared By:

JR Engineering, LLC
5475 Tech Center Drive, Suite 235
Colorado Springs, CO 80919
719-593-2593

J·R ENGINEERING

FINAL DRAINAGE REPORT FOR
URBAN COLLECTION AT PALMER VILLAGE April 2021

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 El Paso 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.

COLORADO LICENSED
GLENN DEAN ELLIS
38861
4/28/21
PROFESSIONAL ENGINEER

Glenn D. Ellis, Colorado P.E. 38861
For and On Behalf of JR Engineering, LLC

DEVELOPER'S STATEMENT:

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

Business Name: MDC Holdings – Richmond American Homes

By: Jason J.W. Pack

Title: VP of Land Acquisition + Entitlements

Address: 4350 South Monaco Street
Denver, CO 80237

El Paso County:

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

Approved
by Jeff Rice
El Paso County Planning and Community Development
on behalf of Elizabeth Nijkamp, Engineering Review Manager
09/07/2021 10:32:14 AM

Jennifer Irvine, P.E. Date
County Engineer/ ECM Administrator

Conditions:

J·R ENGINEERING

north to the sump Double Type 16 inlet at DP23. In the event that the inlet at DP22 becomes clogged, the flow would follow the curb flowline north to the sump Double Type 16 inlet at DP23.

The total combined flow at DP23 from Basin B7, DP20, and DP22 flow-by is Q_5=2.6 cfs and Q_{100}=5.6 cfs. All flow at DP23 is captured and combines with flow from DP18.1 at DP23.1. In the event the inlet at DP23 becomes clogged, the flow will overtop the road crown to the north and enter the sump Triple Type 16 inlet at DP24.

Total flows at DP22.1 are Q_5=1.7 cfs and Q_{100}=3.5 cfs. The flow is conveyed via 18" RCP to DP23.1, where it combines with flow from DP23.

Total flows at DP23.1 from DP18.1, DP22.1, and DP23 are Q_5=8.2 cfs and Q_{100}=16.5 cfs. The flow is conveyed via 24" RCP to DP24.1, where it combines with flow from DP19 and DP24.

Total flows at DP24.1 are Q_5=10.2 cfs and Q_{100}=21.5 cfs. The flow is conveyed via 30" RCP to Pond B at DP25, where it combines with flow from Basin B11.

Basin B11 consists of approximately 0.55 acres of walks and landscaped areas and contains Full-Spectrum Water Quality and Detention Pond B. Flow from this basin (Q_5=0.3 cfs and Q_{100}=1.7 cfs) sheet flows directly into Pond B where it combines with flow from DP24.1 at DP25. A detailed discussion of Full-Spectrum Water Quality and Detention Pond B is presented in the Water Quality section later in this report.

Total flows at DP25 are Q_5=10.4 cfs and Q_{100}=22.9 cfs. All flow at DP25 is routed through the Pond B outlet structure and proposed RCP (various sizes) before discharging into the existing double 10'x6' concrete box culvert that conveys a tributary to the East Fork Sand Creek.

Basin B12 consists of approximately 0.06 acres of landscaped areas and sidewalk. Due to topographical constraints, flow from this basin (Q_5=0.1 cfs and Q_{100}=0.3 cfs) will discharge directly into Constitution Avenue curb and gutter at DP26, which conveys the flow east to an existing Type R inlet about 670 feet east of Hannah Ridge Drive.

Basin B13 consists of approximately 0.18 acres of landscaped areas and sidewalk. Due to topographical constraints, flow from this basin (Q_5=0.3 cfs and Q_{100}=0.9 cfs) will discharge directly into Constitution Avenue curb and gutter at DP27, and will follow the same flow path as Basin B12.

Basin B14 consists of approximately 0.17 acres of landscaped areas and contains approximately 1,870 square feet of asphalt roadway. Flow from this basin (Q_5=0.2 cfs and Q_{100}=0.7 cfs) follows historic drainage patterns and sheet flows offsite at DP28, along the eastern site boundary, eventually flowing directly into the Tributary to Sand Creek – East Fork Reach No. 6.

Basin B15 consists of approximately 0.17 acres of walks and landscaped areas. Flow from this basin (Q_5=0.2 cfs and Q_{100}=0.6 cfs) follows historic drainage patterns and sheet flows easterly offsite at DP29 to Tributary to Sand Creek – East Fork Reach No. 6.

Basin B16 consists of approximately 0.11 acres of landscaped areas and will remain undeveloped. Flow from this basin (Q_5=0.1 cfs and Q_{100}=0.3 cfs) is conveyed in a grass-lined swale onsite before discharging to the east property line at DP30. From here, the flow follows historic drainage patterns to the Tributary to Sand Creek – East Fork Reach No. 6.

DRAINAGE DESIGN CRITERIA

DEVELOPMENT CRITERIA REFERENCE

Storm drainage analysis and design criteria for this project were taken from the "*City of Colorado Springs/El Paso County Drainage Criteria Manual*" Volumes 1 and 2 (EPCDCM), dated October 12, 1994, the "*Urban Storm Drainage Criteria Manual*" Volumes 1 to 3 (USDCM) and Chapter 6 and Section 3.2.1 of Chapter 13 of the "*Colorado Springs Drainage Criteria Manual*" (CSDCM), dated May 2014, as adopted by El Paso County.

HYDROLOGIC CRITERIA

All hydrologic data was obtained from the "*El Paso Drainage Criteria Manual*" Volumes 1 and 2, and the "*Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual*" Volumes 1, 2, and 3. Onsite drainage improvements were designed based on the 5-year (minor) storm event and the 100-year (major) storm event. Runoff was calculated using the Rational Method, and rainfall intensities for the 5-year and the 100-year storm return frequencies were obtained from Table 6-2 of the CSDCM. One hour point rainfall data for the storm events is identified in the chart below. Runoff coefficients were determined based on proposed land use and from data in Table 6-6 from the CSDCM. Time of concentrations were developed using equations from CSDCM. All runoff calculations and applicable charts and graphs are included in the Appendices.

Table 2 - 1-hr Point Rainfall Data

Storm	Rainfall (in.)
5-year	1.50
100-year	2.52

HYDRAULIC CRITERIA

The Rational Method and USDCM's SF-2 and SF-3 forms were used to determine the runoff from the minor and major storms on the site, and the UDFCD UD-Detention v4.04 spreadsheet was utilized for evaluating proposed detention and water quality pond. Sump and on-grade inlets were sized using UDFCD UD-Inlet v4.05. Manning's equation was used to size the proposed pipes in this report and StormCAD was used to model the proposed storm sewer system and to analyze the

PALRMER VILLAGE - PROPOSED DRAINAGE
SUMMARY

BASIN 'A' SUMMARY TABLE

Tributary Sub-basin	Area (acres)	Percent Impervious	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
EX1	0.15	0%	0.08	0.35	7.9	0.0	0.2
EX2	0.46	0%	0.08	0.35	8.1	0.2	0.7
A1	0.78	75%	0.65	0.77	5.5	2.6	5.1
A2	0.22	67%	0.63	0.76	7.8	0.6	1.3
A3	0.11	63%	0.60	0.74	6.2	0.3	0.7
A4	0.62	75%	0.65	0.76	5.2	2.0	4.0
A5	0.83	55%	0.50	0.65	7.0	2.0	4.2
A6	0.18	84%	0.74	0.84	7.9	0.6	1.1
A7	0.46	67%	0.60	0.73	5.8	1.3	2.7
A8	0.75	48%	0.44	0.61	7.8	1.5	3.5
A9	0.57	72%	0.66	0.77	6.9	1.8	3.5
A10	0.78	5%	0.12	0.38	9.4	0.4	2.1
A11	0.16	40%	0.41	0.60	9.8	0.3	0.6
A12	0.13	39%	0.40	0.59	7.8	0.2	0.6

DESIGN POINT SUMMARY TABLE

Design Point	Q_5 (cfs)	Q_{100} (cfs)
EX1	0.04	0.2
EX2	0.2	0.7
1	2.3	4.9
2	2.0	4.7
3	3.0	6.2
4	2.4	5.7
4.1	4.8	9.4
5	2.0	4.2
5.1	6.7	13.5
6	1.8	4.8
7	1.5	3.5
8	2.4	5.9
8.1	8.8	15.0
9	3.4	9.2
9.1	11.9	23.9
10	12.1	25.7
11	0.3	0.6
12	0.2	0.6

BASIN 'B' SUMMARY TABLE

Tributary Sub-basin	Area (acres)	Percent Impervious	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
B1	0.61	55%	0.50	0.65	6.3	1.4	3.2
B2	0.08	100%	0.90	0.96	5.0	0.4	0.6
B3	0.12	87%	0.79	0.88	5.0	0.5	0.9
B4	0.76	75%	0.66	0.77	5.9	2.5	4.9
B5	0.66	53%	0.49	0.64	6.2	1.6	3.5
B6	0.08	84%	0.77	0.87	5.0	0.3	0.6
B7	0.13	88%	0.80	0.89	5.0	0.5	1.0
B8	0.72	68%	0.60	0.72	5.5	2.2	4.4
B9	0.31	2%	0.10	0.36	5.6	0.1	0.9
B10	0.55	65%	0.59	0.72	6.4	1.6	3.2
B11	0.55	3%	0.10	0.37	5.6	0.3	1.7
B12	0.06	36%	0.37	0.57	5.0	0.1	0.3
B13	0.18	39%	0.40	0.59	7.0	0.3	0.9
B14	0.17	21%	0.25	0.48	5.6	0.2	0.7
B15	0.17	11%	0.17	0.42	5.0	0.2	0.6
B16	0.11	0%	0.08	0.35	5.0	0.1	0.3

DESIGN POINT SUMMARY TABLE

Design Point	Q_5 (cfs)	Q_{100} (cfs)
15	1.4	3.2
16	2.5	4.9
17	1.7	3.6
18	2.8	5.4
18.1	4.2	7.8
19	1.9	4.8
20	2.2	4.4
21	0.1	0.9
22	1.6	3.2
22.1	1.7	3.5
23	2.6	5.6
23.1	8.2	16.5
24	1.0	3.2
24.1	10.2	21.5
25	10.4	22.9
26	0.3	1.7
27	0.1	0.3
28	0.3	0.9
29	0.2	0.7
30	0.1	0.3

COMPOSITE % IMPERVIOUS CALCULATIONS

Subdivision: PALMER VILLAGE
Location: Colorado Springs

Project Name: PALMER VILLAGE
Project No.: 2514901
Calculated By: RPD
Checked By:
Date: 1/27/21

Basin ID	Total Area (ac)	Drives/Walks			Roofs			Lawns			Basins Total Weighted % Imp.
		% Imp.	Area (ac)	Weighted % Imp.	% Imp.	Area (ac)	Weighted % Imp.	% Imp.	Area (ac)	Weighted % Imp.	
EX1	0.15	100%	0.00	0.0%	90%	0.00	0.0%	0%	0.15	0.0%	0.0%
EX2	0.46	100%	0.00	0.0%	90%	0.00	0.0%	0%	0.46	0.0%	0.0%
A1	0.78	100%	0.28	36.2%	90%	0.33	38.3%	0%	0.17	0.0%	74.5%
A2	0.22	100%	0.15	67.3%	90%	0.00	0.0%	0%	0.07	0.0%	67.3%
A3	0.11	100%	0.07	63.3%	90%	0.00	0.0%	0%	0.04	0.0%	63.3%
A4	0.62	100%	0.16	26.6%	90%	0.33	48.3%	0%	0.12	0.0%	74.8%
A5	0.83	100%	0.21	24.8%	90%	0.28	29.9%	0%	0.35	0.0%	54.7%
A6	0.18	100%	0.11	59.4%	90%	0.05	24.5%	0%	0.02	0.0%	83.9%
A7	0.46	100%	0.16	34.5%	90%	0.17	32.7%	0%	0.13	0.0%	67.1%
A8	0.75	100%	0.16	20.9%	90%	0.22	26.6%	0%	0.37	0.0%	47.5%
A9	0.57	100%	0.32	54.9%	90%	0.11	17.4%	0%	0.15	0.0%	72.3%
A10	0.78	100%	0.04	5.2%	90%	0.00	0.0%	0%	0.74	0.0%	5.2%
A11	0.16	100%	0.06	40.5%	90%	0.00	0.0%	0%	0.09	0.0%	40.5%
A12	0.13	100%	0.05	38.9%	90%	0.00	0.0%	0%	0.08	0.0%	38.9%
B1	0.61	100%	0.13	21.6%	90%	0.22	33.0%	0%	0.25	0.0%	54.6%
B2	0.08	100%	0.08	100.0%	90%	0.00	0.0%	0%	0.00	0.0%	100.0%
B3	0.12	100%	0.10	87.0%	90%	0.00	0.0%	0%	0.02	0.0%	87.0%
B4	0.76	100%	0.27	35.8%	90%	0.33	39.2%	0%	0.16	0.0%	75.0%
B5	0.66	100%	0.15	23.0%	90%	0.22	30.0%	0%	0.29	0.0%	53.0%
B6	0.08	100%	0.07	84.4%	90%	0.00	0.0%	0%	0.01	0.0%	84.4%
B7	0.13	100%	0.11	87.9%	90%	0.00	0.0%	0%	0.02	0.0%	87.9%
B8	0.72	100%	0.19	26.4%	90%	0.33	41.6%	0%	0.20	0.0%	68.0%
B9	0.31	100%	0.01	2.2%	90%	0.00	0.0%	0%	0.30	0.0%	2.2%
B10	0.55	100%	0.21	38.0%	90%	0.17	27.0%	0%	0.18	0.0%	65.0%
B11	0.55	100%	0.02	2.8%	90%	0.00	0.0%	0%	0.54	0.0%	2.8%
B12	0.06	100%	0.02	36.0%	90%	0.00	0.0%	0%	0.04	0.0%	36.0%
B13	0.18	100%	0.07	39.3%	90%	0.00	0.0%	0%	0.11	0.0%	39.3%
B14	0.17	100%	0.04	20.7%	90%	0.00	0.0%	0%	0.14	0.0%	20.7%
B15	0.17	100%	0.02	11.0%	90%	0.00	0.0%	0%	0.15	0.0%	11.0%
B16	0.11	100%	0.00	0.0%	90%	0.00	0.0%	0%	0.11	0.0%	0.0%
SITE TOTAL	11.46									SITE	50.0%
WEST POND	5.92									WEST POND	50.5%
EAST POND	4.57									EAST POND	54.3%

COMPOSITE RUNOFF COEFFICIENT CALCULATIONS

Subdivision: PALMER VILLAGE
Location: Colorado Springs

Project Name: PALMER VILLAGE
Project No.: 2514901
Calculated By: RPD
Checked By:
Date: 1/27/21

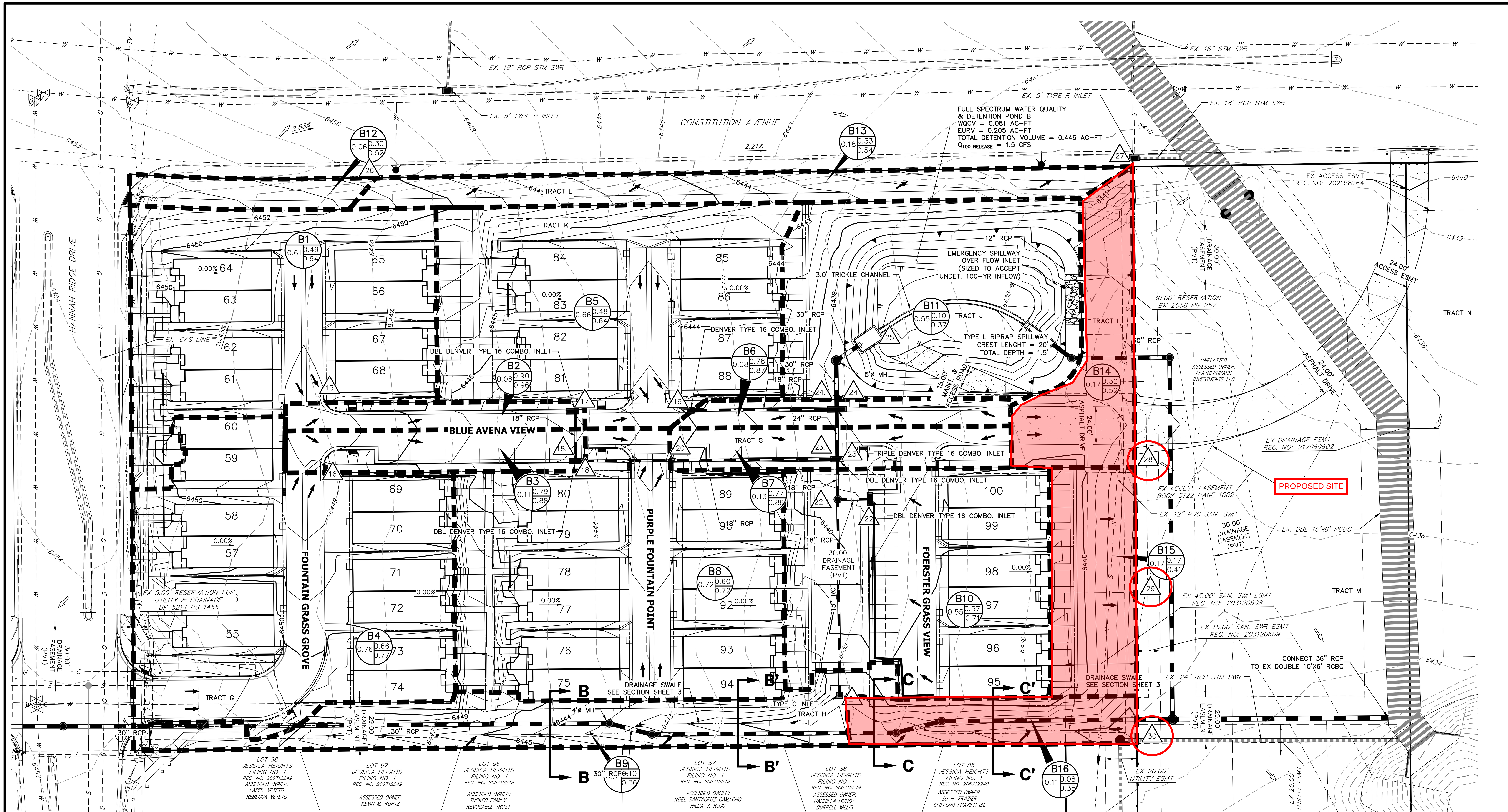
Basin ID	Total Area (ac)	Basins Total Weighted % Imp.	Hydrologic Soil Group			Land Use			Minor Coefficients			Major Coefficients			Basins Total Weighted C_5	Basins Total Weighted C_{100}
			Area A (ac)	Area B (ac)	Area C/D (ac)	Area Walks & Drives (ac)	Area Roofs (ac)	Area Lawns (ac)	$C_{5,A,WALKS\ \&\ DRIVES}$	$C_{5,A,ROOFS}$	$C_{5,A,LAWNS}$	$C_{100,A,WALKS\ \&\ DRIVES}$	$C_{100,A,ROOFS}$	$C_{100,A,LAWNS}$		
EX1	0.15	0%	0.15	0.00	0.00	0.00	0.00	0.15	0.90	0.73	0.08	0.96	0.81	0.35	0.08	0.35
EX2	0.46	0%	0.46	0.00	0.00	0.00	0.00	0.46	0.90	0.73	0.08	0.96	0.81	0.35	0.08	0.35
A1	0.78	75%	0.78	0.00	0.00	0.28	0.33	0.17	0.90	0.73	0.08	0.96	0.81	0.35	0.65	0.77
A2	0.22	67%	0.22	0.00	0.00	0.15	0.00	0.07	0.90	0.73	0.08	0.96	0.81	0.35	0.63	0.76
A3	0.11	63%	0.11	0.00	0.00	0.07	0.00	0.04	0.90	0.73	0.08	0.96	0.81	0.35	0.60	0.74
A4	0.62	75%	0.62	0.00	0.00	0.16	0.33	0.12	0.90	0.73	0.08	0.96	0.81	0.35	0.65	0.76
A5	0.83	55%	0.83	0.00	0.00	0.21	0.28	0.35	0.90	0.73	0.08	0.96	0.81	0.35	0.50	0.65
A6	0.18	84%	0.18	0.00	0.00	0.11	0.05	0.02	0.90	0.73	0.08	0.96	0.81	0.35	0.74	0.84
A7	0.46	67%	0.46	0.00	0.00	0.16	0.17	0.13	0.90	0.73	0.08	0.96	0.81	0.35	0.60	0.73
A8	0.75	48%	0.75	0.00	0.00	0.16	0.22	0.37	0.90	0.73	0.08	0.96	0.81	0.35	0.44	0.61
A9	0.57	72%	0.57	0.00	0.00	0.32	0.11	0.15	0.90	0.73	0.08	0.96	0.81	0.35	0.66	0.77
A10	0.78	5%	0.78	0.00	0.00	0.04	0.00	0.74	0.90	0.73	0.08	0.96	0.81	0.35	0.12	0.38
A11	0.16	40%	0.16	0.00	0.00	0.06	0.00	0.09	0.90	0.73	0.08	0.96	0.81	0.35	0.41	0.60
A12	0.13	39%	0.13	0.00	0.00	0.05	0.00	0.08	0.90	0.73	0.08	0.96	0.81	0.35	0.40	0.59
B1	0.61	55%	0.61	0.00	0.00	0.13	0.22	0.25	0.90	0.73	0.08	0.96	0.81	0.35	0.50	0.65
B2	0.08	100%	0.08	0.00	0.00	0.08	0.00	0.00	0.90	0.73	0.08	0.96	0.81	0.35	0.90	0.96
B3	0.12	87%	0.12	0.00	0.00	0.10	0.00	0.02	0.90	0.73	0.08	0.96	0.81	0.35	0.79	0.88
B4	0.76	75%	0.76	0.00	0.00	0.27	0.33	0.16	0.90	0.73	0.08	0.96	0.81	0.35	0.66	0.77
B5	0.66	53%	0.66	0.00	0.00	0.15	0.22	0.29	0.90	0.73	0.08	0.96	0.81	0.35	0.49	0.64
B6	0.08	84%	0.08	0.00	0.00	0.07	0.00	0.01	0.90	0.73	0.08	0.96	0.81	0.35	0.77	0.87
B7	0.13	88%	0.13	0.00	0.00	0.11	0.00	0.02	0.90	0.73	0.08	0.96	0.81	0.35	0.80	0.89
B8	0.72	68%	0.72	0.00	0.00	0.19	0.33	0.20	0.90	0.73	0.08	0.96	0.81	0.35	0.60	0.72
B9	0.31	2%	0.31	0.00	0.00	0.01	0.00	0.30	0.90	0.73	0.08	0.96	0.81	0.35	0.10	0.36
B10	0.55	65%	0.55	0.00	0.00	0.21	0.17	0.18	0.90	0.73	0.08	0.96	0.81	0.35	0.59	0.72
B11	0.55	3%	0.55	0.00	0.00	0.02	0.00	0.54	0.90	0.73	0.08	0.96	0.81	0.35	0.10	0.37
B12	0.06	36%	0.06	0.00	0.00	0.02	0.00	0.04	0.90	0.73	0.08	0.96	0.81	0.35	0.37	0.57
B13	0.18	39%	0.18	0.00	0.00	0.07	0.00	0.11	0.90	0.73	0.08	0.96	0.81	0.35	0.40	0.59
B14	0.17	21%	0.17	0.00	0.00	0.04	0.00	0.14	0.90	0.73	0.08	0.96	0.81	0.35	0.25	0.48
B15	0.17	11%	0.17	0.00	0.00	0.02	0.00	0.15	0.90	0.73	0.08	0.96	0.81	0.35	0.17	0.42
B16	0.11	0%	0.11	0.00	0.00	0.00	0.00	0.11	0.90	0.73	0.08	0.96	0.81	0.35	0.08	0.35
TOTAL	11.46	50.0%	11.46	0.00	0.00	3.24	2.76	5.45	---	---	---	---	---	---	0.47	0.63

STANDARD FORM SF-2
TIME OF CONCENTRATION

Subdivision: PALMER VILLAGE
Location: Colorado Springs

Project Name: PALMER VILLAGE
Project No.: 2514901
Calculated By: RPD
Checked By:
Date: 1/27/21

SUB-BASIN DATA						INITIAL/OVERLAND (T_i)			TRAVEL TIME (T_t)					*tc* CHECK (URBANIZED BASINS)			FINAL
BASIN ID	D.A. (ac)	Hydrologic Soils Group	Impervious (%)	C_5	C_{100}	L (ft)	S_o (%)	t_i (min)	L_t (ft)	S_t (%)	K	VEL. (ft/s)	t_t (min)	COMP. t_c (min)	TOTAL LENGTH (ft)	Urbanized t_c (min)	t_c (min)
EX1	0.15	A	0%	0.08	0.35	50	5.0%	7.7	26	5.0%	10.0	2.2	0.2	7.9	76.0	26.2	7.9
EX2	0.46	A	0%	0.08	0.35	50	5.0%	7.7	56	5.0%	10.0	2.2	0.4	8.1	106.0	26.5	8.1
A1	0.78	A	75%	0.65	0.77	87	5.0%	4.4	155	1.4%	20.0	2.4	1.1	5.5	242.0	14.4	5.5
A2	0.22	A	67%	0.63	0.76	87	2.0%	6.3	180	1.0%	20.0	2.0	1.5	7.8	267.0	16.2	7.8
A3	0.11	A	63%	0.60	0.74	87	6.0%	4.7	180	1.0%	20.0	2.0	1.5	6.2	267.0	16.9	6.2
A4	0.62	A	75%	0.65	0.76	87	6.0%	4.2	150	1.6%	20.0	2.5	1.0	5.2	237.0	14.3	5.2
A5	0.83	A	55%	0.50	0.65	87	5.0%	5.9	150	1.6%	20.0	2.5	1.0	7.0	237.0	17.9	7.0
A6	0.18	A	84%	0.74	0.84	99	1.0%	6.4	178	1.0%	20.0	2.0	1.5	7.9	277.0	13.2	7.9
A7	0.46	A	67%	0.60	0.73	87	5.5%	4.8	153	1.6%	20.0	2.5	1.0	5.8	240.0	15.7	5.8
A8	0.75	A	48%	0.44	0.61	90	4.5%	6.8	115	1.1%	20.0	2.1	0.9	7.8	205.0	19.1	7.8
A9	0.57	A	72%	0.66	0.77	87	3.0%	5.2	200	1.0%	20.0	2.0	1.7	6.9	287.0	15.5	6.9
A10	0.78	A	5%	0.12	0.38	50	15.0%	5.1	325	0.7%	15.0	1.3	4.3	9.4	375.0	31.8	9.4
A11	0.16	A	40%	0.41	0.60	90	2.0%	9.4	55	1.0%	20.0	2.0	0.5	9.8	145.0	19.7	9.8
A12	0.13	A	39%	0.40	0.59	20	2.0%	4.5	280	0.5%	20.0	1.4	3.3	7.8	300.0	24.0	7.8
B1	0.61	A	55%	0.50	0.65	97	8.0%	5.4	105	1.0%	20.0	2.0	0.9	6.3	202.0	17.8	6.3
B2	0.08	A	100%	0.90	0.96	12	2.0%	1.0	182	2.3%	20.0	3.1	1.0	2.0	194.0	9.9	5.0
B3	0.12	A	87%	0.79	0.88	12	2.0%	1.5	190	2.3%	20.0	3.0	1.0	2.6	202.0	12.2	5.0
B4	0.76	A	75%	0.66	0.77	120	6.0%	4.9	183	2.0%	20.0	2.8	1.1	5.9	303.0	14.4	5.9
B5	0.66	A	53%	0.49	0.64	97	8.0%	5.5	103	1.6%	20.0	2.5	0.7	6.2	200.0	17.8	6.2
B6	0.08	A	84%	0.77	0.87	12	2.0%	1.6	160	2.5%	20.0	3.2	0.8	2.5	172.0	12.5	5.0
B7	0.13	A	88%	0.80	0.89	12	2.0%	1.5	170	2.5%	20.0	3.2	0.9	2.4	182.0	11.9	5.0
B8	0.72	A	68%	0.60	0.72	97	9.0%	4.3	145	1.0%	20.0	2.0	1.2	5.5	242.0	15.7	5.5
B9	0.31	A	2%	0.10	0.36	15	10.0%	3.3	365	3.0%	15.0	2.6	2.3	5.6	380.0	29.4	5.6
B10	0.55	A	65%	0.59	0.72	87	5.0%	5.1	155	1.0%	20.0	2.0	1.3	6.4	242.0	16.4	6.4
B11	0.55	A	3%	0.10	0.37	15	2.0%	5.5	40	33.0%	15.0	8.6	0.1	5.6	55.0	25.6	5.6
B12	0.06	A	36%	0.37	0.57	20	2.0%	4.7	19	2.5%	20.0	3.2	0.1	4.8	39.0	20.0	5.0
B13	0.18	A	39%	0.40	0.59	20	2.0%	4.5	450	2.2%	20.0	3.0	2.5	7.0	470.0	22.8	7.0
B14	0.17	A	21%	0.25	0.48	20	2.0%	5.5	20	2.0%	20.0	2.8	0.1	5.6	40.0	22.7	5.6
B15	0.17	A	11%	0.17	0.42	20	25.0%	2.6	35	25.0%	15.0	7.5	0.1	2.7	55.0	24.2	5.0
B16	0.11	A	0%	0.08	0.35	15	10.0%	3.3	150	1.5%	15.0	1.9	1.3	4.7	165.0	28.2	5.0



BASIN 'B' SUMMARY TABLE

Tributary Sub-basin	Area (acres)	Percent Impervious	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
B1	0.61	55%	0.50	0.65	6.3	1.4	3.2
B2	0.08	100%	0.90	0.96	5.0	0.4	0.6
B3	0.12	87%	0.79	0.88	5.0	0.5	0.9
B4	0.76	75%	0.66	0.77	5.9	2.5	4.9
B5	0.66	53%	0.49	0.64	6.2	1.6	3.5
B6	0.08	84%	0.77	0.87	5.0	0.3	0.6
B7	0.13	88%	0.80	0.89	5.0	0.5	1.0
B8	0.72	68%	0.60	0.72	5.5	2.2	4.4
B9	0.31	2%	0.10	0.36	5.6	0.1	0.9
B10	0.55	65%	0.59	0.72	6.4	1.6	3.2
B11	0.55	3%	0.10	0.37	5.6	0.3	1.7
B12	0.06	36%	0.37	0.57	5.0	0.1	0.3
B13	0.18	39%	0.40	0.59	7.0	0.3	0.9
B14	0.17	21%	0.25	0.48	5.6	0.2	0.7
B15	0.17	11%	0.17	0.42	5.0	0.2	0.6
B16	0.11	0%	0.08	0.35	5.0	0.1	0.3

DESIGN POINT SUMMARY TABLE

Design Point	Q_5 (cfs)	Q_{100} (cfs)
15	1.4	3.2
16	2.5	4.9
17	1.7	3.6
18	2.8	5.4
18.1	4.2	7.8
19	1.9	4.8
20	2.2	4.4
21	0.1	0.9
22	1.6	3.2
22.1	1.7	3.5
23	2.6	5.6
23.1	8.2	16.5
24	1.0	3.2
24.1	10.2	21.5
25	10.4	22.9
26	0.3	1.7
27	0.1	0.3
28	0.3	0.9
29	0.2	0.7
30	0.1	0.3

DP Summary Table used for runoff in proposed basin OA-2 as they are more conservative than the Basin Summary Table.

LEGEND

- BASIN DESIGNATION — I.D.: BASIN IDENTIFIER; A: BASIN AREA; B: C_5; C: C_{100}
- DESIGN POINT
- BASIN DELINEATION
- EXISTING INDEX CONTOURS
- EXISTING INTERMEDIATE CONTOURS
- PROPOSED INDEX CONTOURS
- PROPOSED INTERMEDIATE CONTOURS
- PROPOSED SANITARY SEWER
- PROPOSED STORM SEWER
- PROPOSED WATER LINE
- EXISTING FLOW DIRECTION
- PROPOSED FLOW DIRECTION

ORIGINAL SCALE: 1" = 30'

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ENGINEER'S STATEMENT

PREPARED UNDER MY DIRECT SUPERVISION AND ON BEHALF OF JR ENGINEERING

GLENN D. ELLIS, P.E.
COLORADO P.E. 38861
FOR AND ON BEHALF OF JR ENGINEERING, LLC

DATE

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

PREPARED FOR
RICHMOND AMERICAN HOMES
4350 S. MONACO STREET
DENVER, CO 80237
(720) 977-3827
JASON.POCK@MDCH.COM

J·R ENGINEERING
A Westrian Company
Centennial 303-740-9393 • Colorado Springs 719-593-2593
Fort Collins 970-491-9888 • www.jrengineering.com

No.	REVISION	BY	DATE

H-SCALE	1"=30'
V-SCALE	N/A
DATE	01/27/21
DESIGNED BY	RPD
DRAWN BY	RPD
CHECKED BY	

URBAN COLLECTION AT PALMER VILLAGE
EAST DRAINAGE MAP

SHEET 2 OF 4
JOB NO. 25149.01

MP96001

HYDROLOGY ANALYSIS
EAST FORK SAND CREEK
TRIBUTARY 6

EL PASO COUNTY, COLORADO

Prepared for

Mr. Chuck Crum

MVE, Inc.

1903 Lelaray Street Suite 200

Colorado Springs, Colorado 80909

Prepared by

Kiowa Engineering Corporation

1604 South 21st Street

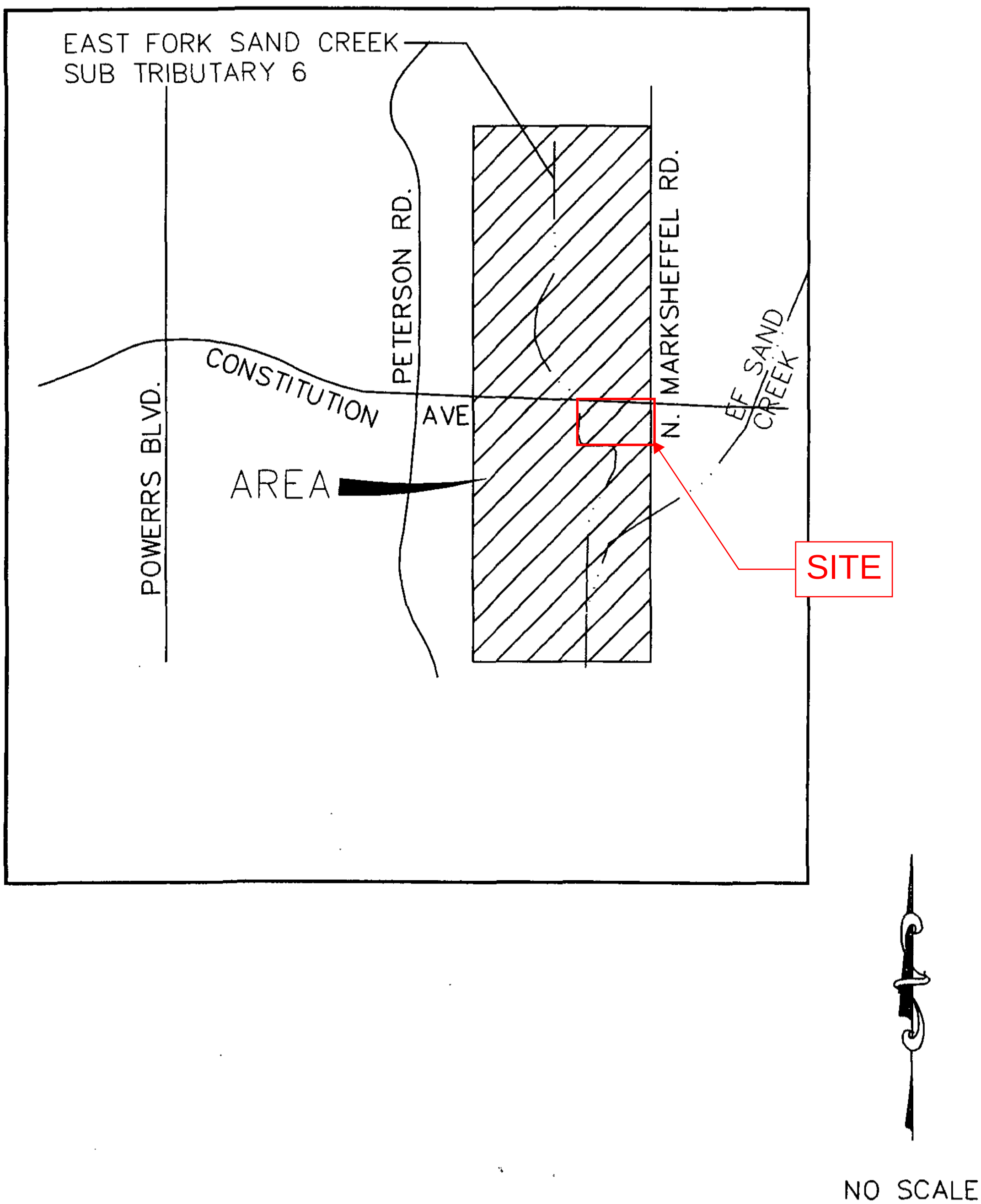
Colorado Springs, Colorado 80904

Project number 06040

August 31, 2006

Revised December 15, 2006

Revised January 18, 2007



Kiowa Engineering Corporation
1604 South 21st Street
Colorado Springs, Colorado
80904-4208
(719) 630-7342

SAND CREEK DBPS UPDATE
VICINITY MAP
COLORADO SPRINGS, COLORADO

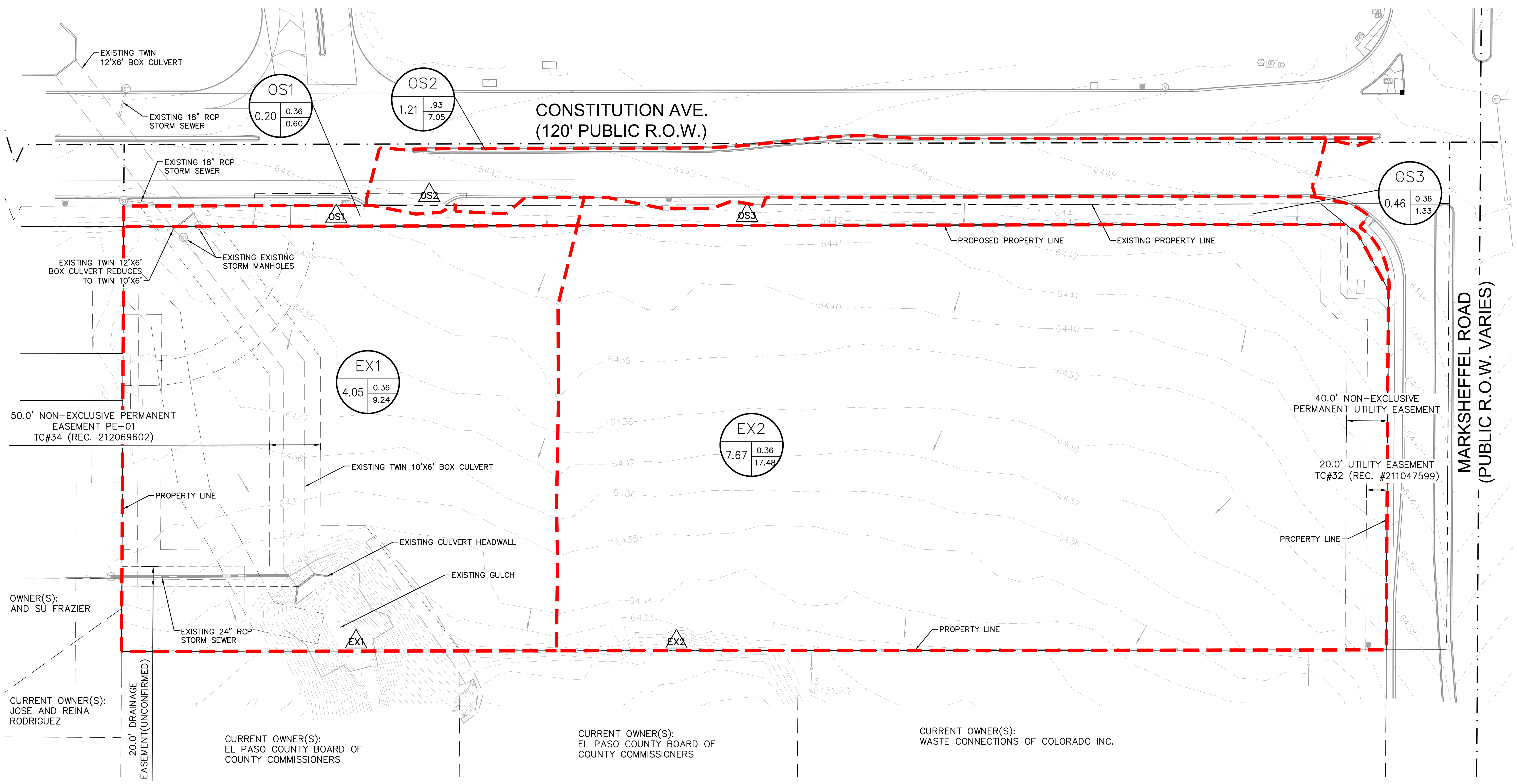
FIGURE 1

PROJECT NO.: 06040
DATE: 08/18/06
DESIGN: RNW
REVISIONS:

Table 1: Comparisons of Future Development Condition Peak Discharges

Location	1996 Sand Creek DBPS Drainage Area (mi²)	1996 Sand Creek DBPS Peak Discharge (cfs) 100-year	100yr cfs/ac	10-year	Design Point	2006 Hydrology Update Drainage Area (mi²)	2006 Hydrology Update Peak Discharge (cfs) 100-year	100yr cfs/ac	10-year
Tributary 6- East Fork Sand Creek									
at Outfall East Fork Sand Creek	1.43	1,671	1.83	702	8A	1.91	2,088	1.71	925
at Constitution Avenue	1.14	1,581	2.17	640	8	1.07	1,076	1.57	457
at Railroad embankment (inflow)	0.69	990	2.24	490	14	0.66	915	2.17	374
at Railroad embankment (outflow)	0.69	NA	NA	NA	14	0.66	640	1.52	360
at North Carefree Circle	0.39	613	2.46	280	1	0.34	551	2.53	255

APPENDIX F: DRAINAGE MAPS



LEGEND

A = BASIN DESIGNATION
B = AREA (ACRES)
C = 100-YR COMPOSITE RUNOFF COEFFICIENT
D = 100-YR DESIGN STORM RUNOFF (CFS)

DESIGN POINT
FLOW DIRECTION
DRAINAGE BASIN BOUNDARY
PROPERTY LINE
XXXX PROPOSED MAJOR CONTOUR
XXXX PROPOSED MINOR CONTOUR
XXXX EXISTING MAJOR CONTOUR
XXXX EXISTING MAJOR CONTOUR

NOTES

1. THESE DETAILED PLANS AND SPECIFICATIONS WERE PREPARED UNDER MY DIRECTION AND SUPERVISION. SAID DETAILED PLANS AND SPECIFICATIONS HAVE BEEN PREPARED ACCORDING TO THE ESTABLISHED CRITERIA FOR DETAILED DRAINAGE PLANS AND SPECIFICATIONS, AND SAID DETAILED PLANS AND SPECIFICATIONS ARE IN CONFORMITY WITH THE MASTER PLAN OF THE DRAINAGE BASIN. SAID DETAILED DRAINAGE PLANS AND SPECIFICATIONS MEET THE PURPOSES FOR WHICH THE PARTICULAR DRAINAGE FACILITY(S) IS DESIGNED. I ACCEPT RESPONSIBILITY FOR ANY LIABILITY CAUSED BY ANY NEGLIGENT ACTS, ERRORS OR COMMISSIONS ON MY PART IN PREPARATION OF THE DETAILED DRAINAGE PLANS AND SPECIFICATIONS.
2. PLAN REVIEW BY EL PASO COUNTY IS PROVIDED ONLY FOR GENERAL CONFORMANCE WITH DESIGN CRITERIA. EL PASO COUNTY IS NOT RESPONSIBLE FOR THE ACCURACY AND ADEQUACY OF THE DESIGN, DIMENSIONS, AND/OR ELEVATIONS WHICH SHALL BE CONFIRMED AT THE JOB SITE. EL PASO COUNTY, THROUGH APPROVAL OF THIS DOCUMENT, ASSUMES NO RESPONSIBILITY FOR COMPLETENESS AND/OR ACCURACY OF THIS DOCUMENT.

SUMMARY - EXISTING RUNOFF TABLE

DESIGN POINT	BASIN DESIGNATION	BASIN AREA (ACRES)	DIRECT 5-YR RUNOFF (CFS)	DIRECT 100-YR RUNOFF (CFS)	CUMULATIVE 5-YR RUNOFF (CFS)	CUMULATIVE 100-YR RUNOFF (CFS)
1	EX1	4.05	1.38	9.24	5.35	16.90
2	EX2	7.67	2.61	17.48	2.80	18.81
3	OS1	0.20	0.09	0.60	3.97	7.65
4	OS2	1.21	3.89	7.05	3.89	7.05
5	OS3	0.46	0.20	1.33	0.20	1.33

*ADDITIONAL FLOWS THROUGH THE SITE WITHIN EXISTING GULCH EQUAL TO APPROXIMATELY 1076 CFS IN THE 100-YEAR EVENT PER "HYDROLOGY ANALYSIS EAST FORK SAND CREEK TRIBUTARY 6 (MP96001)". THIS INCLUDES THE FLOWS ENTERING THE CULVERT FROM THE NORTH SIDE OF CONSTITUTION, NOT THE OVERLAND FLOWS ENTERING THE GULCH TO THE SOUTH OF CONSTITUTION FROM THE EXISTING SITE.

NORTH

GRAPHIC SCALE IN FEET
0 30 60 120

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K:\DEN_Civil\096481004 - El Paso Constitution\CADD\PlanSheets\DR\096481004_EDR.dwg Menke, Joseph 8/19/2022 6:51 AM

NO.	REVISION	BY	DATE	APPR.

Kimley»Horn
© 2022 KIMLEY-HORN AND ASSOCIATES, INC.
2 North Nevada Avenue, Suite 300
Colorado Springs, CO 80903 (303) 228-2300

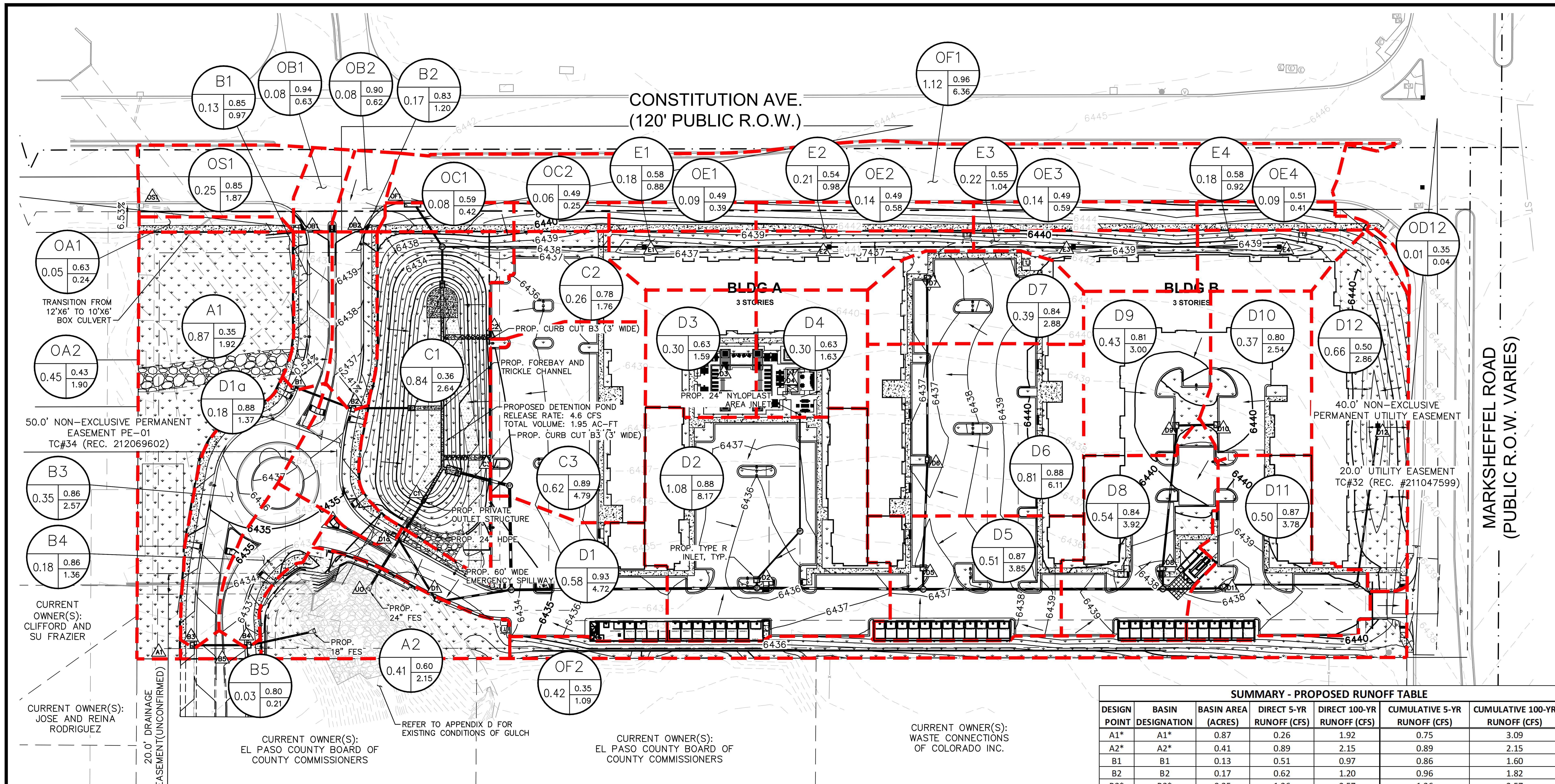
DESIGNED BY: MOH
DRAWN BY: JWM
CHECKED BY: DLS
DATE: 8/19/2022

THE CITIZEN ON CONSTITUTION
EL PASO COUNTY, COLORADO
GRADING EROSION CONTROL AND PUBLIC IMPROVEMENT PLAN
EXISTING DRAINAGE MAP

PRELIMINARY
FOR REVIEW ONLY
NOT FOR CONSTRUCTION
Kimley»Horn
Kimley-Horn and Associates, Inc.

PROJECT NO. 096481004

SHEET
C7.0



LEGEND

A = BASIN DESIGNATION
B = AREA (ACRES)
C = 100-YR COMPOSITE RUNOFF COEFFICIENT
D = 100-YR DESIGN STORM RUNOFF (CFS)

DESIGN POINT
FLOW DIRECTION
DRAINAGE BASIN BOUNDARY
PROPERTY LINE
PROPOSED MAJOR CONTOUR
PROPOSED MINOR CONTOUR
EXISTING MAJOR CONTOUR
EXISTING MAJOR CONTOUR

NOTES

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SUMMARY - PROPOSED RUNOFF TABLE

DESIGN POINT	BASIN DESIGNATION	BASIN AREA (ACRES)	DIRECT 5-YR RUNOFF (CFS)	DIRECT 100-YR RUNOFF (CFS)	CUMULATIVE 5-YR RUNOFF (CFS)	CUMULATIVE 100-YR RUNOFF (CFS)
A1*	A1*	0.87	0.26	1.92	0.75	3.09
A2*	A2*	0.41	0.89	2.15	0.89	2.15
B1	B1	0.13	0.51	0.97	0.86	1.60
B2	B2	0.17	0.62	1.20	0.96	1.82
B3*	B3*	0.35	1.36	2.57	1.36	2.57
B4*	B4*	0.18	0.72	1.36	0.72	1.36
B5*	B5*	0.03	0.11	0.21	0.11	0.21
C1	C1	0.84	0.43	2.64	0.60	3.07
C2	C2	0.26	0.89	1.76	0.97	2.01
C3	C3	0.62	2.61	4.79	2.61	4.79
D1	D1	0.58	2.61	4.72	2.61	4.72
D1a	D1a	0.18	0.73	1.37	0.73	1.37
D2	D2	1.08	4.42	8.17	4.42	8.17
D3	D3	0.30	0.72	1.59	0.72	1.59
D4	D4	0.30	0.73	1.63	0.73	1.63
D5	D5	0.51	2.08	3.85	2.08	3.85
D6	D6	0.81	3.32	6.11	3.32	6.11
D7	D7	0.39	1.53	2.88	1.53	2.88
D8	D8	0.54	2.07	3.92	2.07	3.92
D9	D9	0.43	1.58	3.00	1.58	3.00
D10	D10	0.37	1.33	2.54	1.33	2.54
D11	D11	0.50	2.03	3.78	2.03	3.78
D12	D12	0.66	0.99	2.86	0.99	2.90
E1	E1	0.18	0.37	0.88	0.49	1.27
E2	E2	0.21	0.38	0.98	0.57	1.56
E3	E3	0.22	0.41	1.04	0.60	1.63
E4	E4	0.18	0.38	0.92	0.53	1.34
OA1*	OA1*	0.05	0.10	0.24	0.10	0.24
OA2*^	OA2*^	0.45	0.00	0.00	0.60	1.90
OB1	OB1	0.08	0.35	0.63	0.35	0.63
OB2	OB2	0.08	0.34	0.62	0.34	0.62
OC1	OC1	0.08	0.17	0.42	0.17	0.42
OC2	OC2	0.06	0.08	0.25	0.08	0.25
OD12	OD12	0.01	0.01	0.04	0.01	0.04
OE1	OE1	0.09	0.13	0.39	0.13	0.39
OE2	OE2	0.14	0.19	0.58	0.19	0.58
OE3	OE3	0.14	0.19	0.59	0.19	0.59
OE4	OE4	0.09	0.14	0.41	0.14	0.41
OF1	OF1	1.12	3.56	6.36	3.56	6.36
OF2	OF2	0.42	0.15	1.09	0.15	1.09
OS1*	OS1*	0.25	0.99	1.87	0.99	1.87

*flows from sub-basin are undetained
^sub-basin area and flows were obtained from previously approved drainage report from adjacent property

ONSITE PBMP SUMMARY TABLE

BASIN	PBMP TRIBUTARY AREA (ACRES)	PBMP
B1, B2, C1-C4, D1-D12, E1-E4, OB1-2, OC1-2, OD12, OE1-4, OF1	11.17	EDB
A1, A2	1.29	EXCLUDED PER ECM APPENDIX I.7.1.B.7
OF2, B3, B4, B5	0.98	EXCLUDED PER ECM APPENDIX I.7.1.C.1

RUNOFF SUMMARY: EXISTING VS PROPOSED

	5-YEAR STORM (CFS)	100-YEAR STORM (CFS)
TOTAL EXISTING ON-SITE FLOWS:	8.17	33
EXISTING ON-SITE FLOWS AT DP EX1:	5.35	16.9
EXISTING ON-SITE FLOWS AT DP EX2:	2.8	18.81
*PROPOSED TOTAL ON-SITE FLOWS AT DP UO:	7.33	13.78
NET RESULT:	1.98	-3.12

*PROPOSED FLOWS INCLUDE POND DISCHARGE AND BASINS A1, A2, B3, B4, B5

*ADDITIONAL FLOWS THROUGH THE SITE WITHIN EXISTING GULCH EQUAL TO APPROXIMATELY 1076 CFS IN THE 100-YEAR EVENT PER "HYDROLOGY ANALYSIS EAST FORK SAND CREEK TRIBUTARY 6 (MP96001)". THIS INCLUDES THE FLOWS ENTERING THE CULVERT FROM THE NORTH SIDE OF CONSTITUTION, NOT THE OVERLAND FLOWS ENTERING THE GULCH TO THE SOUTH OF CONSTITUTION FROM THE EXISTING SITE.

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NORTH

GRAPHIC SCALE IN FEET
0 30 60 120

NO.	REVISION	BY	DATE	APPR.

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2 North Nevada Avenue, Suite 300
Colorado Springs, CO 80903 (303) 228-2300

DESIGNED BY: MOH
DRAWN BY: JWM
CHECKED BY: DLS
DATE: 10/26/2022

THE CITIZEN ON CONSTITUTION
EL PASO COUNTY, COLORADO
GRADING EROSION CONTROL AND CONSTRUCTION DOCUMENTS
PROPOSED DRAINAGE MAP

COLORADO LICENSED PROFESSIONAL ENGINEER MITCHELL O. HESS 53916 10/26/2022

PROJECT NO. 096481004

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