Final Drainage Letter

7-Eleven Store #42975

PPR File No. PPR2614

SWC Bradley Road and Legacy Hill Drive
Colorado Springs, CO 80829
Lot 1, Waterview East Commercial Subdivision, Filing No. 1
Submitted: April 24, 2026
Resubmitted: August 2026

Prepared For:

LASCO Development

1207 Antoine Drive
Houston, TX 77055
Contact: Todd Womack
Phone: 713-961-0280

Prepared By:

K2 Civil Consultants Inc.

387 N Corona Street, Suite 605
Denver, CO 80218
Contact: Michael Drago, P.E.
Phone: 610-547-2267
Email: mdrago@K2civilconsultants.com

Design Engineer's Statement:

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

_____ _____
[Michael Drago, P.E. #59225] Date

Owner/Developer's Statement:

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

_____ _____
[Sharon Vickers, Vice President] Date
[LASCO Development]
[1207 Antoine Drive, Houston, TX 77055]

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

Conditions:

TABLE OF CONTENTS

I. General Location

The proposed 7-Eleven development is in El Paso County, Colorado bound to the north by Bradley Road, Legacy Hill Drive to the east, a private drive to the south, and Lot 2 of Waterview-East Commercial Subdivision Filing No. 1 to the west. The project falls within a part of the west ½ of Section 9, Township 15 South, Range 65 West of the 6th P.M., El Paso County, Colorado.

The proposed development is within Lot 1 Waterview-East Commercial Subdivision Filing No. 1, where a stormwater pond to be constructed with Waterview East Commercial Filing No. 1 Final Plat to receive all flows from the project and surrounding developments. The pond to be constructed with Waterview East Commercial Filing No. 1 Final Plat is described further in the Drainage Facility Design Portion of this letter. The ultimate outflow for this pond is Jimmy Camp Creek.

The proposed developer falls within the Waterview-East Commercial Subdivision is surrounded by the Trails at Aspen Ridge to west and south, Bradley Road to the north, and S Powers Blvd to the east.

II. Description of Property

The proposed development is located within a 1.99 acre parcel currently comprised of native cover and freshly graded soil. There are little to no trees, shrubs, or vegetation on site due to overlot grading performed by the Master Development as part of the Waterview East Commercial Filing No. 1 infrastructure improvements. The site generally slopes from west to east/southeast. The average slopes on-site are 2-5% and all stormwater drains towards an inlet to be constructed with Waterview East Commercial Filing No. 1 Final Plat within the private drive to the south of the development.

Soil data for the development was obtained from the United States Department of Agriculture Natural Resources Conservation Service (NRCS) Web Soil Survey. Soil within the site is Nelson-Tassel fine sandy loams, 3 to 18 percent slopes, which falls into hydraulic soil group B.

III. Major Basin Descriptions

The proposed lot falls within the Jimmy Camp Creek Major Basin, all basin and bridge fees will be paid by the owner at the time of final plat approval.

The proposed 7-Eleven lot has been analyzed within the "Final Drainage Report – Filing No. 1 Waterview East Commercial", by Kimley Horn, dated March 2026, herein referred to as "Master Drainage Report". Within the Master Drainage Report the proposed site is intended to drain into an extended detention pond to be built as part of the Waterview East Commercial Development, south of the 7-Eleven pad.

There are no recently reported cases of flooding within or around the development. The site is located within Zone "X", areas determined to be outside 0.2% annual chance floodplain, of the Flood Plain, as designated on the Flood Insurance Rate Map (FIRM Map No. 08041C0768G last revised 12/07/2018. Refer to the Appendix for the FIRMette.

The Extended Detention Pond to be constructed with Waterview East Commercial Filing No. 1 Final Plat is to capture 11.85 acres, detain, and treat all stormwater through the use of an extended detention basin. The basin is described within the report entitled, "Waterview East Commercial" by Kimley-Horn and Associates, Inc., project Number 196195001, prepared March 12, 2026 under PDC File No. SF269.

There are no irrigation facilities or other obstructions that could influence or be influenced by the local drainage on-site.

IV. Sub-Basin Descriptions

The proposed 7-Eleven development falls under sub-basin A1 as described in the Master Drainage Report:

> *The on-site sub-basin A1 consists of native vegetation in the northeast portion of the site. Sub-Basin A1 encompasses Lot 1 which is to be developed into a future convenience store. Detailed drainage design of the convenience store and drainage basins will be provided with a separate Site Development Plan and Final Drainage Report submittal. The sub-basin has an area of 2.00 acres and a weighted imperviousness of 95%. Runoff in this basin will be collected by future proposed storm sewer infrastructure and routed to the 18" RCP storm sewer stub (Design Point A1) to discharge to the pond. Runoff during the 5-year and 100-year events are 5.92 cfs and 13.93 cfs respectively.*

The proposed 7-Eleven development will be captured in 6 sub-basins. The proposed basins are listed below:

Basin A1.1

Basin A1.1 is 0.11 acres and consists of the proposed convenience store for an impervious value of 90.0%. The 5-year and 100-year runoff coefficients are 0.73 and 0.81, respectively. Runoff for the 5-year and 100-year is 0.35 cfs and 0.83 cfs, respectively. Runoff from the building is captured within roof drains and conveyed towards Design Point 1 via proposed private underground 6" PVC storm sewer. Captured runoff will continue towards the private extended detention basin south of the site through underground storm sewer.

Basin A1.2

Basin A1.2 is 0.12 acres and consists of drive aisles and landscape area to the west of the proposed convenience store for an impervious value of 75.0%. The 5-year and 100-year runoff coefficients are 0.70 and 0.81, respectively. Runoff for the 5-year and 100-year is 0.36 cfs and 0.90 cfs, respectively. Runoff from the basin is captured within a 5' Type R Inlet on the far west side of the site. Captured runoff will continue towards the private extended detention basin south of the site through underground storm sewer.

Basin A1.3

Basin A1.3 is 0.09 acres and consists of the proposed fueling canopy for an impervious value of 90.0%. The 5-year and 100-year runoff coefficients are 0.73 and 0.81, respectively. Runoff for the 5-year and 100-year is 0.29 cfs and 0.68 cfs, respectively. Runoff from the canopy is captured within roof drains and conveyed towards Design Point 2 via proposed private underground 8" PVC storm sewer. Captured runoff will continue towards the private extended detention basin south of the site through underground storm sewer.

Basin A1.4

Basin A1.4 is 1.64 acres and consists of the majority of the drive aisles, sidewalks, and landscape area on-site for an impervious value of 57.3%. The 5-year and 100-year runoff coefficients are 0.55 and 0.70, respectively. Runoff for the 5-year and 100-year is 3.95 cfs and 10.70 cfs, respectively. Runoff from the basin will drain through proposed 2' curb cuts along the eastern drive aisles and into a 3' grass swale on the east side of the site. Flows are conveyed towards a proposed 30" Nyloplast Basin at the end of the grass swale. Curb cut and swale calculations are provided within the appendix of this letter. Captured runoff

will continue towards the private extended detention basin south of the site through underground storm sewer.

Basin A1.5

Basin A1.5 is 0.03 acres and consists of the public sidewalk to be constructed with Waterview East Commercial Filing No. 1 Final Plat on the SE side of the property for an impervious value of 33.3%. The 5-year and 100-year runoff coefficients are 0.35 and 0.55, respectively. Runoff for the 5-year and 100-year is 0.05 cfs and 0.15 cfs, respectively. Runoff from the basin flows into the private drive south of the site and into a 10' Type R inlet to be constructed with Waterview East Commercial Filing No. 1 Final Plat (Design Point PR1 per the Master Drainage Report) on the south side of the drive. These flows cannot be captured on-site due to the public sidewalk draining away from the site. Captured runoff will continue towards the private extended detention basin south of the site through underground storm sewer.

Basin A1.6

Basin A1.6 is 0.06 acres and consists of the proposed access points and public sidewalk along the private drive for an impervious value of 83.3%. The 5-year and 100-year runoff coefficients are 0.76 and 0.86, respectively. Runoff for the 5-year and 100-year is 0.20 cfs and 0.48 cfs, respectively. Runoff from the basin will be captured by a 10' Type Inlet to be constructed with Waterview East Commercial Filing No. 1 Final Plat (Design Point PR1 per the Master Drainage Report) on the south side of the private drive. Captured runoff will continue towards the private extended detention basin south of the site through underground storm sewer.

V. Drainage Design Criteria

The proposed development utilizes the El Paso County Drainage Criteria Manual, current version as of October 31, 2018.

The basin falls within the Waterview East Commercial Master Drainage Report. Per the comparison table provided below, the proposed site will not negatively affect any downstream structures as the impervious percent and flows is less than what is allowed per the approved Master Drainage Report.

	Acres	Impervious	C_{100}	Q_{100} (cfs)
Per Master Drainage Report	2.00	95.0%	0.80	13.63
Proposed Development	2.05	62.0%	0.72	13.27
Difference	+0.05	-33.0%	-0.08	-0.36

As shown in the table above, there is a minor increase of area due to a portion of the improvements falling outside the A1 basin as described within the Master Drainage Report. Even with the additional area, the total flow generated from the development is less than what is allowed per the Master Drainage Report. Therefore, no negative downstream impacts are anticipated as a part of this development and no adjustments to existing or proposed storm sewer to be constructed with Waterview East Commercial Filing No. 1 Final Plat is required.

VI. Four Step Process

Step 1. Employ Runoff Reduction Practices

The proposed development will include the design and construction of a 3' grass swale that will capture a majority of the runoff generated on-site and provide runoff reduction. This will reduce the runoff flowing off-site as throughout the grass swale stormwater will slow down and infiltrate into the soil.

Step 2. Provide a Water Quality Capture Volume

Permanent Water Quality Capture Volume will be provided by the extended detention pond to be constructed with Waterview East Commercial Filing No. 1 Final Plat. Refer to the Master Drainage Report for additional information.

Step 3. Stabilize Drainageways

The proposed site is approximately a mile from Jimmy Camp Creek, there will be no open channels on or adjacent to the site, therefore no stabilization will be necessary as a part of this development.

Step 4. Implement Site Specific and Other Source Control BMPs

Erosion Control construction and design of BMPs are proposed as a part of this development and shown within the GEC drawings. BMPs include

vehicle tracking control, stockpile management, silt fence, stabilized staging areas, and inlet protection.

VII. Hydrologic Criteria

The design rainfall source for this project is the NOAA Atlas 14, one hour point rainfall data. The minor storm, 5-year rainfall value is 1.29 inches. The major storm, 100-year rainfall value is 2.75 inches.

The analysis and design of the Stormwater management system for this project was prepared in accordance with the criteria set forth by the El Paso County Drainage Criteria Manual (hereafter referred to as the DCM) and the Mile High Flood District (MHFD). The Rational Method was used to calculate runoff from the 5-year minor, and 100-year major design storm recurrence intervals. Peak runoff values were calculated using the rational method:

Q = CIA, where
Q = Storm runoff in cubic feet per second (cfs)
C = Rainfall coefficients – ratio runoff to rainfall
I = Rainfall intensity in inches per hour
A = Drainage area in acres

Table 6-6 of the El Paso County Drainage Criteria Manual was used for runoff coefficients.

The proposed storm sewers were modeled, and hydraulic grade lines generated, using Bentley StormCAD and FlowMaster software's. The user-defined design inputs for the software include peak flow runoff, pipe diameter, pipe slope & length, pipe material coefficient, and tailwater. For the onsite storm sewer system, the tailwater input was based on free outfall conditions. The hydraulic grade and energy lines have been designed to maintain a minimum of one foot below the final grade.

Inlet capacities calculations were based on utilizing the Mile High Flood District spreadsheet "MHFD_v6.0".

VIII. Conclusion

As described above, the proposed development will not negatively impact the proposed stormwater pond built to be constructed with Waterview East Commercial Filing No. 1 Final Plat. The proposed site reduces the impervious %, C value, and total flows draining into the basin. Refer to the Master Drainage Report for full details and information on the proposed pond.

IX. References

1. County of El Paso Drainage Criteria Manual, Volume 1, October 2018.
2. County of El Paso Drainage Criteria Manual Volume 2, October 2018.
3. NRCS Soil Survey for El Paso County, Colorado, dated February 2026.
4. Waterview East Commercial Final Drainage Report, Filing No. 1, prepared by Kimley-Horn and Associates, Inc., dated March 12, 2026.

APPENDIX A
General Site Information

1. FEMA Firm Map
2. NRCS Soil Report
3. Runoff C – Table 6-6
4. NOAA Rainfall Information

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 13. The **horizontal datum** was NAD83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the **North American Vertical Datum of 1988 (NAVD88)**. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, MD 20910-3282

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242 or visit its website at http://www.ngs.noaa.gov/.

Base Map information shown on this FIRM was provided in digital format by El Paso County, Colorado Springs Utilities, and Anderson Consulting Engineers, Inc. These data are current as of 2008.

This map reflects more detailed and up-to-date **stream channel configurations and floodplain delineations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map. The profile baselines depicted on this map represent the hydraulic modeling baselines that match the flood profiles and Floodway Data Tables if applicable, in the FIS report. As a result, the profile baselines may deviate significantly from the new base map channel representation and may appear outside of the floodplain.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

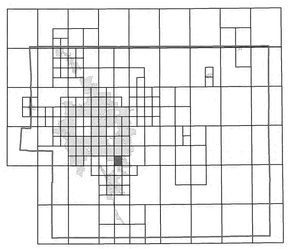
Contact **FEMA Map Service Center** (MSC) via the FEMA Map Information eXchange (FMIX) 1-877-336-2627 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. The MSC may also be reached by Fax at 1-800-358-9620 and its website at http://www.msc.fema.gov/.

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

El Paso County Vertical Datum Offset Table

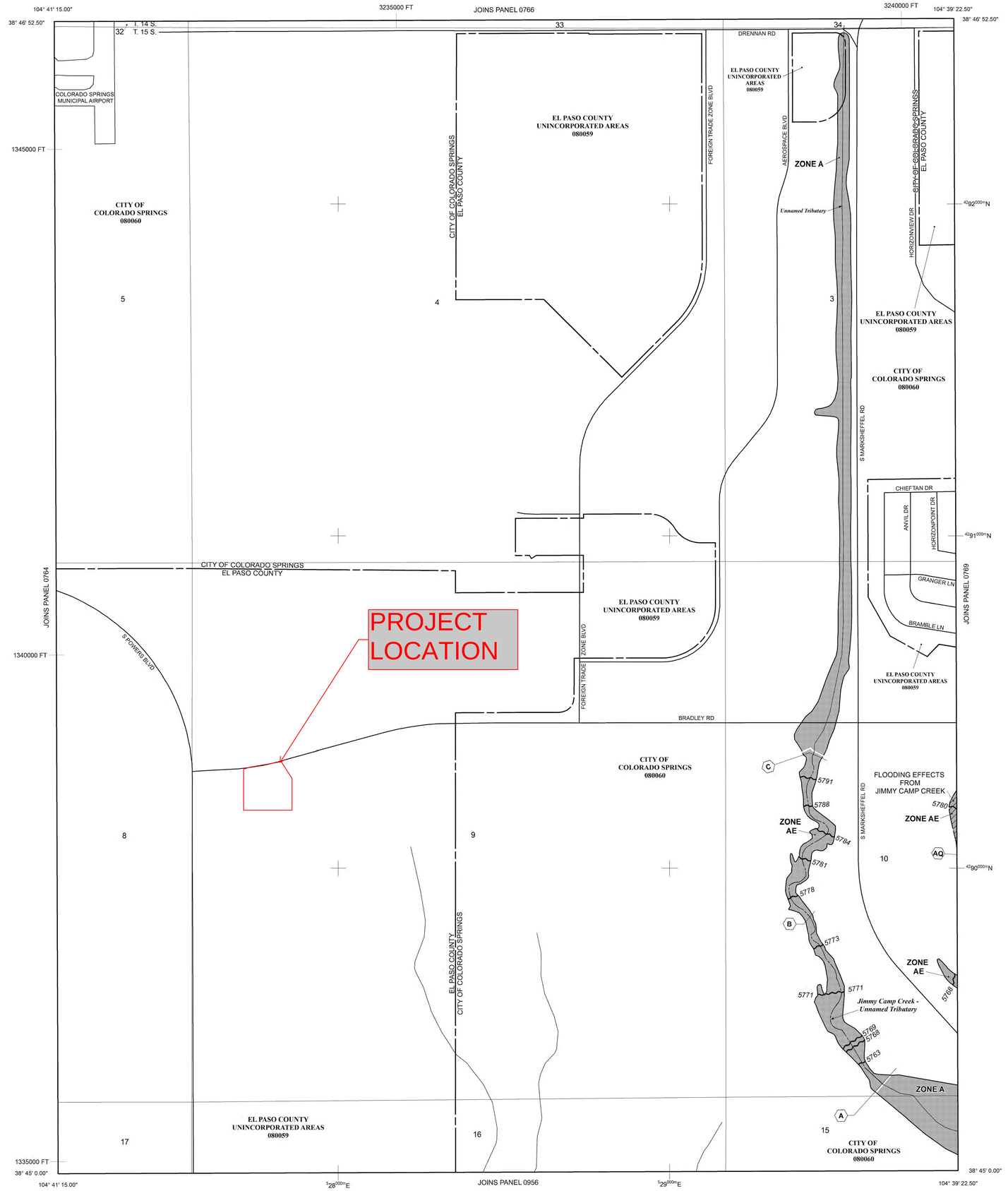
Flooding Source	Vertical Datum Offset (ft)
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION	

Panel Location Map



This Digital Flood Insurance Rate Map (DFIRM) was produced through a Cooperating Technical Partner (CTP) agreement between the State of Colorado Water Conservation Board (CWCB) and the Federal Emergency Management Agency (FEMA).

Additional Flood Hazard information and resources are available from local communities and the Colorado Water Conservation Board.



PROJECT LOCATION

NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 14 SOUTH, RANGE 65 WEST, AND TOWNSHIP 15 SOUTH, RANGE 65 WEST.

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAS) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area Formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

	Floodplain boundary
	Floodway boundary
	Zone D Boundary
	CBRS and OPA boundary
	Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

A — A	Cross section line
23 — 23	Transect line
97° 07' 30.00" 32° 22' 30.00"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
4275000mN	1000-meter Universal Transverse Mercator grid ticks, zone 13
6000000 FT	5000-foot grid ticks: Colorado State Plane coordinate system, central zone (FIPSZONE 0502), Lambert Conformal Conic Projection
DX5510	Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5	River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
MARCH 17, 1997

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
DECEMBER 7, 2018 - to update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

For community map revision history prior to countywide mapping, refer to the Community Map History Table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

250 0 500 1000 FEET
150 0 150 300 METERS

NFIP

PANEL 0768G

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 768 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS

COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS, CITY OF	080060	0768	G
EL PASO COUNTY	080059	0768	G

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
08041C0768G

MAP REVISED
DECEMBER 7, 2018

Federal Emergency Management Agency

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

February 26, 2026

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

Soil Map

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

Custom Soil Resource Report
Soil Map

Map Scale: 1:931 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 10 20 40 60

Feet
0 45 90 180 270

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 23, Aug 29, 2025

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

Date(s) aerial images were photographed: Jul 23, 2024—Aug 4, 2024

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
56	Nelson-Tassel fine sandy loams, 3 to 18 percent slopes	2.5	100.0%
Totals for Area of Interest		**2.5**	**100.0%**

Map Unit Descriptions

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

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

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

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

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

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

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

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

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

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

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

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

El Paso County Area, Colorado

56—Nelson-Tassel fine sandy loams, 3 to 18 percent slopes

Map Unit Setting

National map unit symbol: 3690
Elevation: 5,600 to 6,400 feet
Mean annual precipitation: 12 to 14 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 135 to 155 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Nelson

Setting

Landform: Upland hills
Landform position (three-dimensional): Crest, side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Calcareous residuum weathered from interbedded sedimentary rock

Typical profile

A - 0 to 5 inches: fine sandy loam
Ck - 5 to 23 inches: fine sandy loam
Cr - 23 to 27 inches: weathered bedrock

Properties and qualities

Slope: 3 to 12 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 2.8 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: R067BY045CO - Shaly Plains
Other vegetative classification: SHALY PLAINS (069AY046CO)
Hydric soil rating: No

Description of Tassel

Setting

Landform: Upland hills
Landform position (three-dimensional): Crest, side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Calcareous slope alluvium over residuum weathered from sandstone

Typical profile

A - 0 to 4 inches: fine sandy loam
C - 4 to 10 inches: fine sandy loam
Cr - 10 to 14 inches: weathered bedrock

Properties and qualities

Slope: 3 to 18 percent
Depth to restrictive feature: 6 to 20 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Available water supply, 0 to 60 inches: Very low (about 1.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Ecological site: R067BY045CO - Shaly Plains
Other vegetative classification: SHALY PLAINS (069AY046CO)
Hydric soil rating: No

Minor Components

Other soils

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

Pleasant

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

3.1. - Rational Method Runoff Coefficient (C)

The runoff coefficient represents the integrated effects of infiltration, detention storage, evaporation, retention, flow routing, and interception, all of which affect the time distribution and peak rate of runoff. Runoff coefficients are based on the imperviousness of a particular land use and the hydrologic soil type of the area and are to be selected in accordance with Table 6-6.

The procedure for determining the runoff coefficient includes these steps:

1. Categorize the site area into one or more similar land uses, each with a representative imperviousness, according to the information in Table 6-6.
2. Based on the dominant hydrologic soil type in the area, use Table 6-6 to estimate the runoff coefficient for the particular land use category for the design storms of interest.
3. Calculate an area-weighted average runoff coefficient for the site based on the runoff coefficients from individual land use areas of the site.

When analyzing an area for design purposes, urbanization of the full watershed, including both on-site and off-site areas, shall be assumed.

Gravel parking areas, storage areas, and access drives proposed on Site Improvement Plans shall be analyzed based on an imperviousness of 80%. This is due to the potential for gravel areas being paved over time by property owners and the resulting adverse impacts on the stormwater management facilities and adjacent properties.

There are some circumstances where the selection of impervious percentage values may require additional investigation due to unique land characteristics (e.g., recent burn areas). When these circumstances arise, it is the designer's responsibility to verify that the correct land use assumptions are made.

When multiple sub-basins are delineated, the composite C value calculation is:

$$C_c = (C_1 A_1 + C_2 A_2 + C_3 A_3 + \ldots C_i A_i)/A_t \qquad \text{(Eq. 6-6)}$$

Where:

C_c = composite runoff coefficient for total area

C_i = runoff coefficient for subarea corresponding to surface type or land use

A_i = area of surface type corresponding to Ci (units must be the same as those used for total area)

A_t = total area of all subareas for which composite runoff coefficient applies

i = number of surface types in the drainage area

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													
⅛ 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
¼ 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
⅓ 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
½ 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

NOAA Atlas 14, Volume 8, Version 2
Location name: Colorado Springs, Colorado, USA*
Latitude: 38.7606°, Longitude: -104.6804°
Elevation: 5929 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

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

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

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

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.245** (0.204-0.298)	**0.295** (0.246-0.359)	**0.384** (0.319-0.469)	**0.464** (0.383-0.570)	**0.584** (0.467-0.753)	**0.684** (0.531-0.892)	**0.791** (0.589-1.06)	**0.905** (0.643-1.25)	**1.07** (0.726-1.51)	**1.20** (0.788-1.71)
10-min	**0.359** (0.299-0.437)	**0.433** (0.360-0.526)	**0.563** (0.467-0.687)	**0.680** (0.560-0.834)	**0.856** (0.684-1.10)	**1.00** (0.777-1.31)	**1.16** (0.863-1.55)	**1.33** (0.942-1.82)	**1.56** (1.06-2.21)	**1.75** (1.15-2.51)
15-min	**0.438** (0.365-0.532)	**0.528** (0.439-0.642)	**0.686** (0.569-0.838)	**0.829** (0.683-1.02)	**1.04** (0.834-1.34)	**1.22** (0.948-1.59)	**1.41** (1.05-1.89)	**1.62** (1.15-2.23)	**1.91** (1.30-2.70)	**2.14** (1.41-3.06)
30-min	**0.654** (0.545-0.795)	**0.786** (0.654-0.957)	**1.02** (0.846-1.24)	**1.23** (1.02-1.51)	**1.55** (1.24-2.00)	**1.81** (1.41-2.36)	**2.10** (1.56-2.80)	**2.40** (1.71-3.30)	**2.83** (1.92-4.01)	**3.18** (2.09-4.54)
60-min	**0.863** (0.719-1.05)	**1.01** (0.843-1.23)	**1.29** (1.07-1.58)	**1.56** (1.29-1.92)	**1.98** (1.60-2.58)	**2.35** (1.83-3.08)	**2.75** (2.06-3.70)	**3.20** (2.28-4.42)	**3.84** (2.62-5.46)	**4.37** (2.87-6.24)
2-hr	**1.07** (0.900-1.30)	**1.24** (1.04-1.50)	**1.57** (1.31-1.90)	**1.89** (1.57-2.31)	**2.42** (1.97-3.15)	**2.89** (2.27-3.78)	**3.41** (2.57-4.57)	**3.99** (2.87-5.50)	**4.84** (3.34-6.86)	**5.56** (3.68-7.89)
3-hr	**1.18** (0.995-1.42)	**1.34** (1.13-1.62)	**1.68** (1.41-2.03)	**2.03** (1.69-2.46)	**2.61** (2.15-3.41)	**3.14** (2.49-4.12)	**3.75** (2.85-5.03)	**4.43** (3.21-6.11)	**5.44** (3.77-7.70)	**6.30** (4.19-8.91)
6-hr	**1.34** (1.14-1.61)	**1.51** (1.28-1.81)	**1.88** (1.59-2.26)	**2.28** (1.91-2.75)	**2.95** (2.45-3.84)	**3.56** (2.85-4.66)	**4.27** (3.28-5.72)	**5.08** (3.72-6.97)	**6.29** (4.39-8.85)	**7.30** (4.90-10.3)
12-hr	**1.48** (1.26-1.75)	**1.70** (1.45-2.02)	**2.14** (1.82-2.55)	**2.59** (2.19-3.10)	**3.32** (2.77-4.26)	**3.98** (3.20-5.14)	**4.72** (3.65-6.25)	**5.56** (4.09-7.56)	**6.80** (4.78-9.48)	**7.82** (5.30-10.9)
24-hr	**1.64** (1.41-1.93)	**1.91** (1.64-2.26)	**2.43** (2.08-2.88)	**2.92** (2.49-3.48)	**3.71** (3.10-4.70)	**4.40** (3.56-5.62)	**5.16** (4.00-6.75)	**6.00** (4.44-8.07)	**7.23** (5.11-9.98)	**8.24** (5.62-11.4)
2-day	**1.85** (1.61-2.17)	**2.17** (1.89-2.55)	**2.76** (2.39-3.25)	**3.31** (2.84-3.91)	**4.14** (3.46-5.17)	**4.85** (3.94-6.12)	**5.62** (4.39-7.28)	**6.47** (4.81-8.60)	**7.67** (5.46-10.5)	**8.66** (5.96-11.9)
3-day	**2.00** (1.75-2.34)	**2.35** (2.04-2.74)	**2.97** (2.58-3.48)	**3.53** (3.05-4.16)	**4.40** (3.69-5.45)	**5.12** (4.17-6.42)	**5.90** (4.62-7.59)	**6.75** (5.05-8.93)	**7.96** (5.69-10.8)	**8.94** (6.18-12.3)
4-day	**2.14** (1.87-2.49)	**2.50** (2.18-2.91)	**3.14** (2.73-3.67)	**3.72** (3.22-4.37)	**4.60** (3.87-5.68)	**5.34** (4.36-6.67)	**6.13** (4.82-7.86)	**6.99** (5.24-9.22)	**8.21** (5.89-11.1)	**9.19** (6.38-12.6)
7-day	**2.51** (2.21-2.91)	**2.90** (2.55-3.36)	**3.60** (3.15-4.18)	**4.22** (3.68-4.93)	**5.16** (4.36-6.31)	**5.93** (4.87-7.35)	**6.76** (5.34-8.60)	**7.65** (5.77-10.0)	**8.91** (6.43-12.0)	**9.92** (6.94-13.5)
10-day	**2.84** (2.51-3.28)	**3.27** (2.89-3.78)	**4.02** (3.54-4.65)	**4.68** (4.10-5.45)	**5.67** (4.81-6.90)	**6.49** (5.35-8.00)	**7.35** (5.83-9.30)	**8.27** (6.26-10.8)	**9.56** (6.93-12.8)	**10.6** (7.44-14.4)
20-day	**3.74** (3.33-4.29)	**4.30** (3.83-4.93)	**5.24** (4.65-6.03)	**6.05** (5.33-7.00)	**7.21** (6.13-8.65)	**8.13** (6.74-9.91)	**9.08** (7.24-11.4)	**10.1** (7.68-13.0)	**11.4** (8.34-15.2)	**12.5** (8.85-16.8)
30-day	**4.48** (4.01-5.12)	**5.16** (4.61-5.89)	**6.27** (5.59-7.19)	**7.21** (6.38-8.30)	**8.50** (7.25-10.1)	**9.52** (7.91-11.5)	**10.5** (8.43-13.1)	**11.6** (8.85-14.8)	**13.0** (9.50-17.1)	**14.0** (9.99-18.8)
45-day	**5.42** (4.88-6.17)	**6.25** (5.62-7.12)	**7.59** (6.80-8.66)	**8.68** (7.72-9.96)	**10.2** (8.68-12.0)	**11.3** (9.40-13.5)	**12.4** (9.94-15.3)	**13.5** (10.3-17.1)	**14.9** (10.9-19.5)	**15.9** (11.4-21.3)
60-day	**6.23** (5.63-7.07)	**7.20** (6.49-8.17)	**8.72** (7.84-9.93)	**9.95** (8.88-11.4)	**11.6** (9.90-13.6)	**12.8** (10.7-15.3)	**13.9** (11.2-17.1)	**15.1** (11.6-19.1)	**16.5** (12.2-21.5)	**17.5** (12.6-23.4)

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

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

Please refer to NOAA Atlas 14 document for more information.

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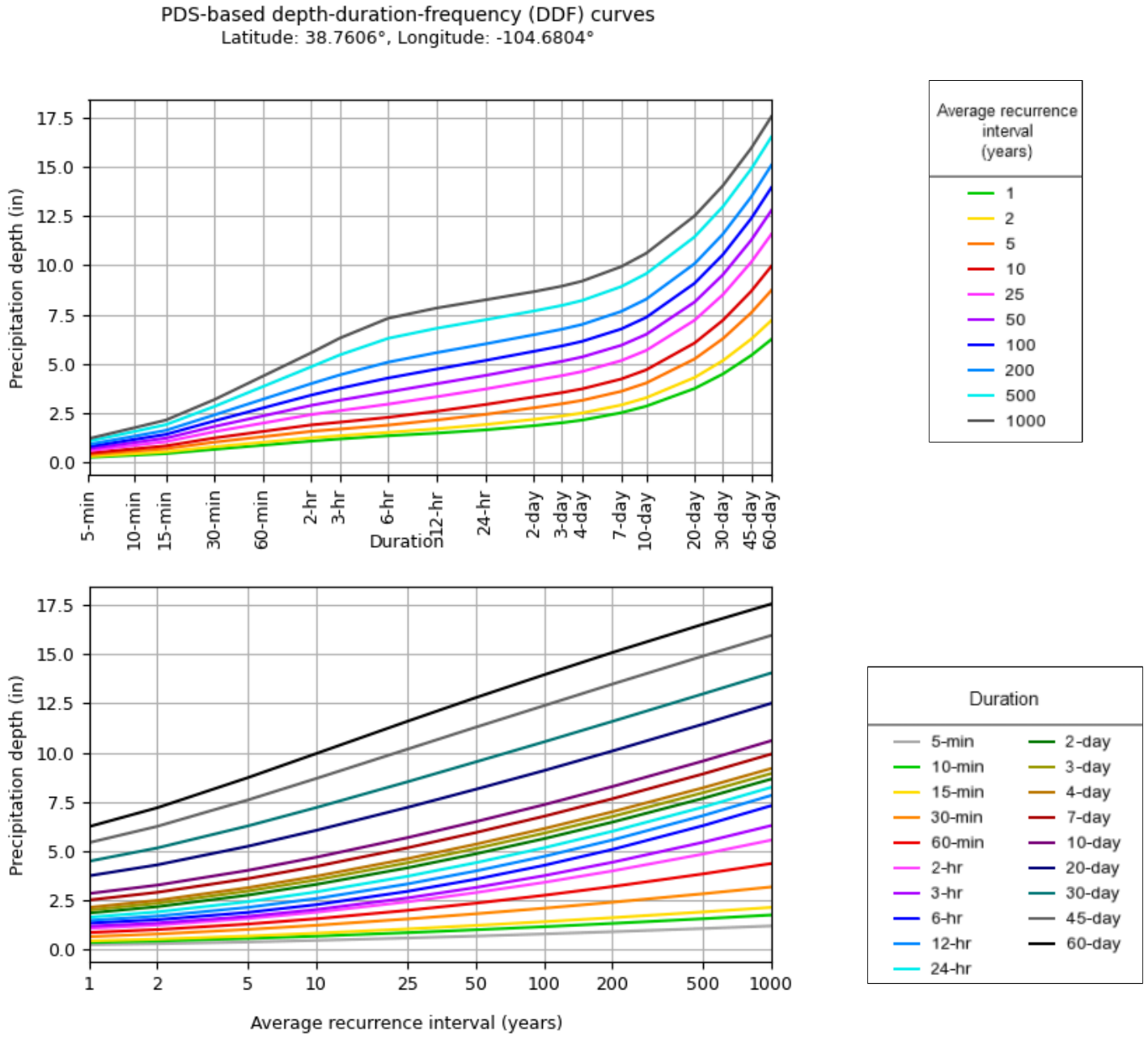
PF graphical



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Created (GMT): Thu Mar 12 14:39:23 2026

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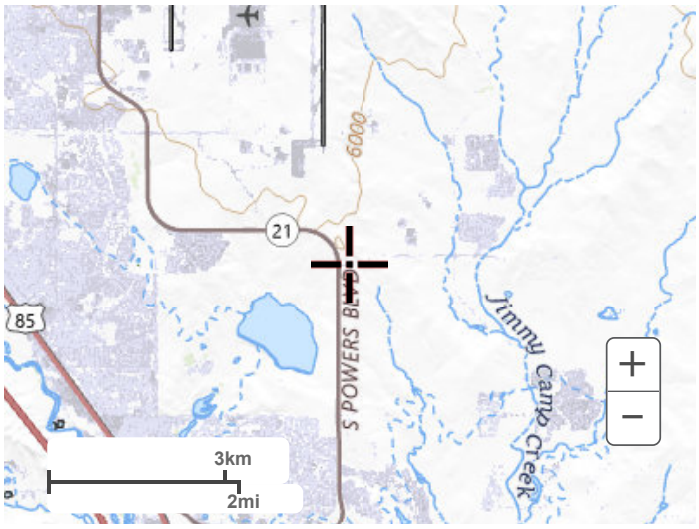
Maps & aerials

Small scale terrain



Large scale terrain

Large scale map

Large scale aerial

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National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

APPENDIX B
Hydrology

1. Master Report Drainage Subbasin Information
2. Developed Drainage Subbasin Information

SUMMARY - PROPOSED RUNOFF TABLE						
DESIGN POINT	BASIN DESIGNATION	BASIN AREA (ACRES)	DIRECT 5-YR RUNOFF (CFS)	DIRECT 100-YR RUNOFF (CFS)	CUMMULATIVE 5-YR RUNOFF (CFS)	CUMMULATIVE 100-YR RUNOFF (CFS)
A1	A1	2.00	5.92	13.63	5.92	13.63
A2	A2	1.50	4.48	10.32	4.48	10.32
FD 1	FD 1	2.91	8.41	19.39	8.41	19.39
FD 2	FD 2	3.19	9.17	21.14	9.17	21.14
PR 1	PR 1	0.26	1.02	2.30	1.02	2.30
PR 2	PR 2	0.61	2.38	5.37	2.38	5.37
P	P	1.38	0.82	5.22	31.48	48.16
FS1	UD 1	0.70	0.77	4.63	0.77	4.63
FS1	UD 2	0.03	0.13	0.17	0.13	0.17
FS 1	FS 1	0.31	1.23	2.76	1.23	2.76
FS 2	FS 2	0.29	1.15	2.58	1.15	2.58

DEVELOPED CONDITIONS

Time of Concentration

Project:	7-Eleven - Bradley and Legacy Ridge	City/State:	El Paso County, CO
Designed by:	MRD	Date:	7/28/2026
Reviewed by:	KMH	Date:	7/28/2026

Urban TOC $_{min}$ = 5 min
Rural TOC $_{min}$ = 10 min

	SUB-BASIN DATA			INITIAL/OVERLAND FLOW (t_o)			TRAVEL TIME (t_t)							TOTAL	Tc CHECK (Urbanized basins)				FINAL Tc (min)
									Type of Land Surface										
Basin ID Developed Onsite	Description	C_5	Area (ac)	Length (ft)	Slope (ft/ft)	t_o (min)	Length (ft)	S_w (ft/ft)	Code	Description	Convey Coef (C_v)	Velocity	t_t Travel Time (min)	$t_c = t_i + t_t$ (min)	Urban (Yes	Length (ft)	$T_{c\,max}$ (min)	$Tc_{max} > t_c$	
A1.1	PROPOSED C-STORE	0.73	0.11	100	0.02	1.90	0	0.00	6	Paved areas and shallow paved swales	20.00	0.00	0.00	1.90	YES	100.00	10.56	Regional Tc	5.00
A1.2	SW CORNER OF SITE	0.70	0.12	70	0.02	1.58	0	0.00	6	Paved areas and shallow paved swales	20.00	0.00	0.00	1.58	YES	70.00	10.39	Regional Tc	5.00
A1.3	FUELING CANOPY	0.73	0.09	35	0.02	1.13	0	0.00	6	Paved areas and shallow paved swales	20.00	0.00	0.00	1.13	YES	35.00	10.19	Regional Tc	5.00
A1.4	DRIVES, SIDEWALKS, AND LANDSCAPE AREAS	0.55	1.64	100	0.02	2.83	225	0.02	5	Grassed waterway	15.00	2.12	1.77	4.60	YES	325.00	11.81	Regional Tc	5.00
A1.5	PUBLIC SIDEWALK AND LANDSCAPE AREAS	0.35	0.03	25	0.02	1.92	0	0.00	5	Grassed waterway	15.00	0.00	0.00	1.92	YES	25.00	10.14	Regional Tc	5.00
A1.6	ACCESS POINTS AND PUBLIC SIDEWALK	0.76	0.06	70	0.01	1.15	0	0.00	6	Paved areas and shallow paved swales	20.00	0.00	0.00	1.15	YES	70.00	10.39	Regional Tc	5.00

Notes:

t_i= (1.87*(1.1-C10)*(L^0.5))/(S^-0.33), from El Paso County Drainage Manual

Velocity from V = C_v*S_w^0.5, from UDFCD Eqn 6-4, C_v from Table 6-2(See Sheet Design Info)

t_t=L/60V

t_i max = 10+L/180

Final Tc > 10 min for nonurban watersheds

UDFCD Table 6-2. NRCS Conveyance factors, K

Code	Type of Land Surface	Conveyance Factor, K
1	Heavy meadow	2.5
2	Tillage/field	5
3	Short pasture and lawns	7
4	Nearly bare ground	10
5	Grassed waterway	15
6	Paved areas and shallow paved swales	20

DEVELOPED CONDITIONS

Runoff (Q)

Project:	7-Eleven - Bradley and Legacy Ridge	City/State:	El Paso County, CO
Designed by:	MRD	Date:	7/28/2026
Reviewed by:	KMH	Date:	7/28/2026

5 YEAR MINOR STORM

Design Storm: 10-yr P = 1.29 in

	a	b	c
Rainfall Intensity Equation Coefficients:	28.5	10	0.786

LOCATION		BASIN DESCRIPTION	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME		
			BASIN NAME	AREA (AC)	RUNOFF COEFF (5 Yr)	t_c (MIN)	C.A. (AC)	I IN / HR	Q (CFS)	t_c (MIN)	SUM (C*A) (AC)	I (IN / HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE (in)	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)
DP	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
DEVELOPED																					
	A1.1	PROPOSED C-STORE	A1.1	0.11	0.73	5.00	0.08	4.38	0.35												
	A1.2	SW CORNER OF SITE	A1.2	0.12	0.70	5.00	0.08	4.38	0.36												
1	A1.1+A1.2									**5.00**	**0.16**	**4.38**	**0.72**								
	A1.3	FUELING CANOPY	A1.3	0.09	0.73	5.00	0.07	4.38	0.29												
2	DP1 + A1.3									**5.00**	**0.23**	**4.38**	**1.00**								
	A1.4	DRIVES, SIDEWALKS, AND LANDSCAPE AREAS	A1.4	1.64	0.55	5.00	0.90	4.38	3.95												
3	A1.4									**5.00**	**0.90**	**4.38**	**3.95**								
4	D3+D4									**5.00**	**1.13**	**4.38**	**4.95**								
	A1.5	PUBLIC SIDEWALK AND LANDSCAPE AREAS	A1.5	0.03	0.35	5.00	0.01	4.38	0.05												
	A1.6	ACCESS POINTS AND PUBLIC SIDEWALK	A1.6	0.06	0.76	5.00	0.05	4.38	0.20												
5	ALL IMPROVEMENTS									**5.00**	**1.14**	**4.38**	**5.00**								

(1) Enter the Basin Name from C Value Sheet
(2) Basin Description linked to C-Value Sheet
(3) Enter the Basin Name from C Value Sheet
(4) Basin Area linked to C-Value Sheet
(5) Composite C linked to C-Value Sheet
(6) Time of Concentration linked to C-Value Sheet
(7) =Column 4 x Column 5
(8) =a*P/(b+Column 6)^c
(9) =Column 7 x Column 8
(10) =Column 6 x Column 21
(11) Add the Basin Areas (7) to get the combined basin AC
(12) =28.5*P/(10+Column 10)^0.786
(13) Sum of Qs
(14) Additonal Street Overland Flow
(15) Additonal Street Overland Flow
(16) Additonal Pipe Flow
(17) Additonal Pipe Flow
(18) Additonal Pipe Flow
(19) Additional Flow Length
(20) Overland Velocity
(21) =Column 16 / Column 20 / 60

DEVELOPED CONDITIONS

Runoff (Q)

Project:	7-Eleven - Bradley and Legacy Ridge	City/State:	El Paso County, CO
Designed by:	MRD	Date:	7/28/2026
Reviewed by:	KMH	Date:	7/28/2026

100 YEAR MAJOR STORM

Design Storm: 100-yr P = 2.75 in

	a	b	c
Rainfall Intensity Equation Coefficients:	28.5	10	0.786

LOCATION		BASIN DESCRIPTION	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME		
			BASIN NAME	AREA (AC)	RUNOFF COEFF (100 Yr)	t_c (MIN)	C.A. (AC)	I IN / HR	Q (CFS)	t_c (MIN)	SUM (C*A) (AC)	I (IN / HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE (in)	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)
DP	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
DEVELOPED																					
	A1.1	PROPOSED C-STORE	A1.1	0.11	0.81	5.00	0.09	9.33	0.83												
	A1.2	SW CORNER OF SITE	A1.2	0.12	0.81	5.00	0.10	9.33	0.90												
1	A1.1+A1.2									**5.00**	**0.19**	**9.33**	**1.73**								
	A1.3	FUELING CANOPY	A1.3	0.09	0.81	5.00	0.07	9.33	0.68												
2	DP1 + A1.3									**5.00**	**0.26**	**9.33**	**2.41**								
	A1.4	DRIVES, SIDEWALKS, AND LANDSCAPE AREAS	A1.4	1.64	0.70	5.00	1.15	9.33	10.70												
3	A1.4									**5.00**	**1.15**	**9.33**	**10.70**								
4	D3+D4									**5.00**	**1.41**	**9.33**	**13.12**								
	A1.5	PUBLIC SIDEWALK AND LANDSCAPE AREAS	A1.5	0.03	0.55	5.00	0.02	9.33	0.15												
	A1.6	ACCESS POINTS AND PUBLIC SIDEWALK	A1.6	0.06	0.86	5.00	0.05	9.33	0.48												
5	ALL IMPROVEMENTS									**5.00**	**1.42**	**9.33**	**13.27**								

(1) Enter the Basin Name from C Value Sheet
(2) Basin Description linked to C-Value Sheet
(3) Enter the Basin Name from C Value Sheet
(4) Basin Area linked to C-Value Sheet
(5) Composite C linked to C-Value Sheet
(6) Time of Concentration linked to C-Value Sheet
(7) =Column 4 x Column 5
(8) =a*P/(b+Column 6)^c
(9) =Column 7 x Column 8
(10) =Column 6 x Column 21
(11) Add the Basin Areas (7) to get the combined basin AC
(12) =28.5*P/(10+Column 10)^0.786
(13) Sum of Qs
(14) Additonal Street Overland Flow
(15) Additonal Street Overland Flow
(16) Additonal Pipe Flow
(17) Additonal Pipe Flow
(18) Additonal Pipe Flow
(19) Additional Flow Length
(20) Overland Velocity
(21) =Column 16 / Column 20 / 60

APPENDIX C

Hydraulic Conveyance

1. Curb Cut Sizing Calculations
2. Inlet Capacity Calculations
3. Grass Swale Capacity and Design
4. Storm Drain Summary Table
5. Storm Drain Profiles
6. Riprap Sizing Calculations
7. Excerpts from Master Drainage Report

Weir Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Mar 16 2026

3FT CURB CUT

Rectangular Weir

Crest	= Sharp
Bottom Length (ft)	= 3.00
Total Depth (ft)	= 0.50

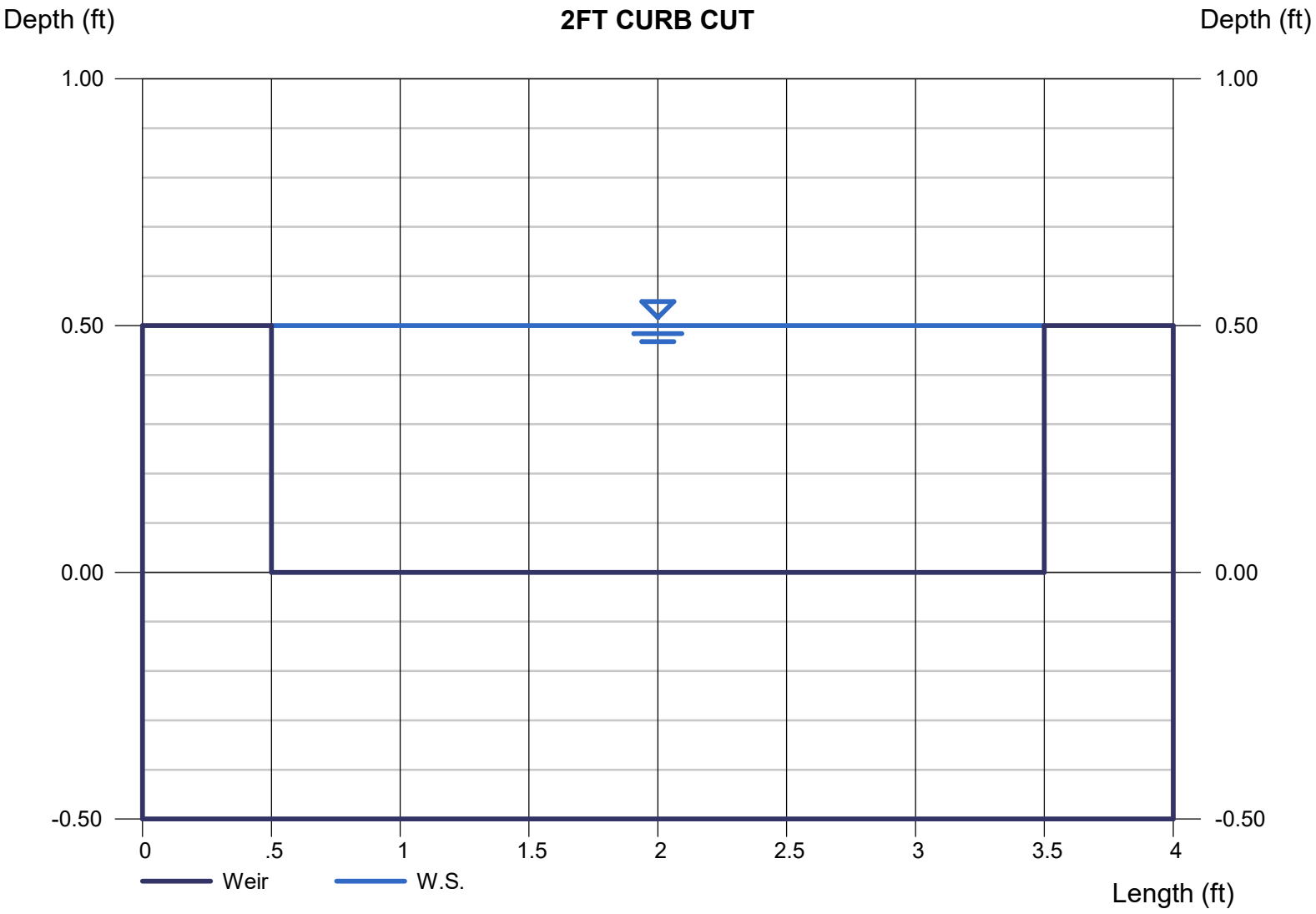
Calculations

Weir Coeff. Cw	= 3.33
Compute by:	Known Depth
Known Depth (ft)	= 0.50

Highlighted

Depth (ft)	= 0.50
Q (cfs)	= 3.532
Area (sqft)	= 1.50
Velocity (ft/s)	= 2.35
Top Width (ft)	= 3.00

4 CURB CUTS PROVIDED TO CONVEY 10.61 CFS.
4 * 3.53 = 14.13 CFS CAPCITY



MHFD-Inlet, Version 6.00 (August 2025)

INLET MANAGEMENT

Project: 7-Eleven - El Paso County - Bradley and Legacy Ridge
Minor: 10-year
Major: 100-year

Worksheet Protected

INLET NAME	IN-01
Inlet Application (Street or Area)	STREET
Hydraulic Condition	In Sump
Inlet Type	CDOT Type R Curb Opening
Number of Inlet Units	1

USER-DEFINED INPUT

User-Defined Peak Flows

Minor Peak Flow, Q (cfs)	0.47
Major Peak Flow, Q (cfs)	0.90

Bypass (Carry-Over) Flow from Upstream Inlets must be organized from upstream (left) t

Receive Bypass Flow from:	No Bypass Flow Received
Bypass Flow Description (Optional):	
Minor Bypass Flow Received, Q_b (cfs)	0.00
Major Bypass Flow Received, Q_b (cfs)	0.00

CALCULATED OUTPUT

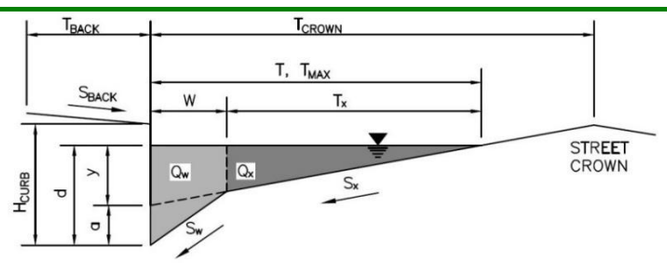
Minor Total Design Peak Flow, Q (cfs)	0.47
Major Total Design Peak Flow, Q (cfs)	0.90
Minor Inlet Interception Capacity, Q_a (cfs)	1.78
Major Inlet Interception Capacity, Q_a (cfs)	5.38
Minor Flow Bypassed Downstream, Qb (cfs)	N/A
Major Flow Bypassed Downstream, Qb (cfs)	N/A
Minor Flow Capture Percentage, C%	100%
Major Flow Capture Percentage, C%	100%

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

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

Project: **7-Eleven - El Paso County - Bradley and Legacy Ridge**

Inlet ID: **IN-01**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	10.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	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} =	35.0	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 =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.012	

		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} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

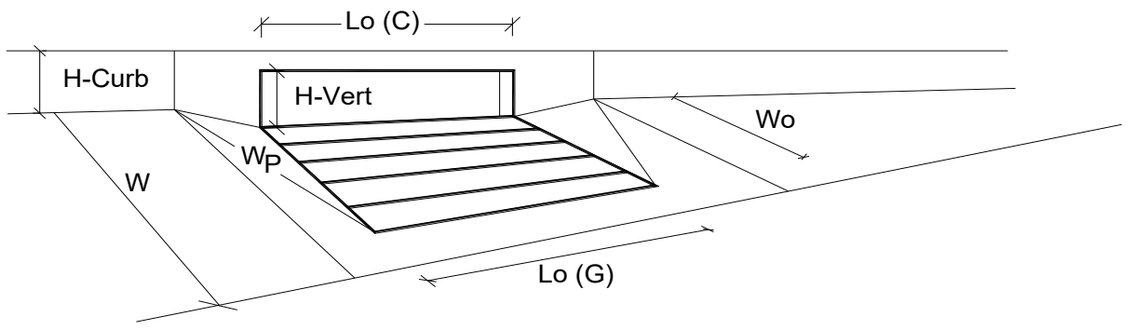
MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

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

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 6.00 (August 2025)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	3.9	6.0	inches

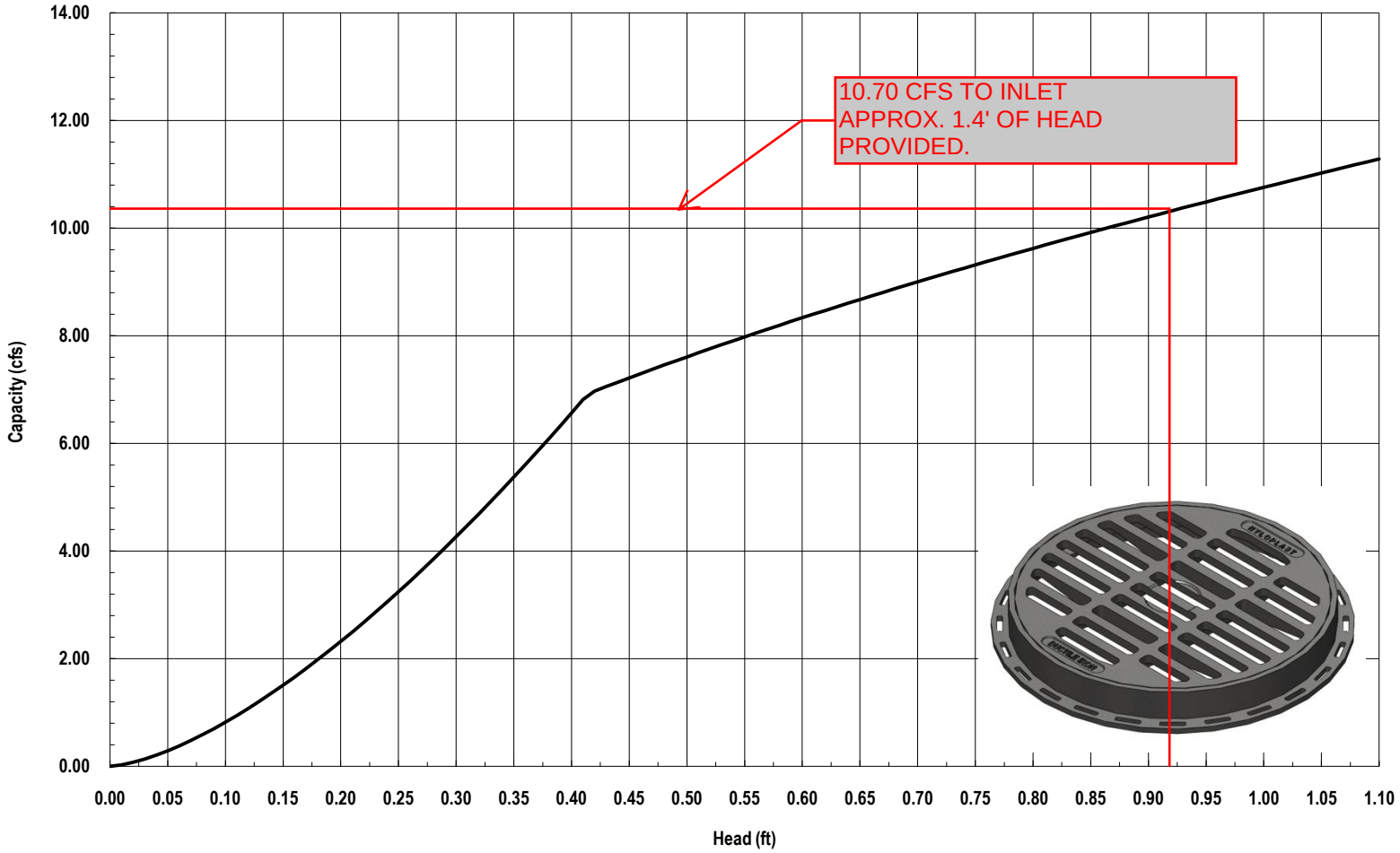
Grate Information		MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	

Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	

Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.16	0.33	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**1.8**	**5.4**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	0.5	0.9	cfs

Nyloplast 30" Standard Grate Inlet Capacity Chart



Nyloplast®
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Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Mar 16 2026

A1.4 GRASS SWALE

Trapezoidal

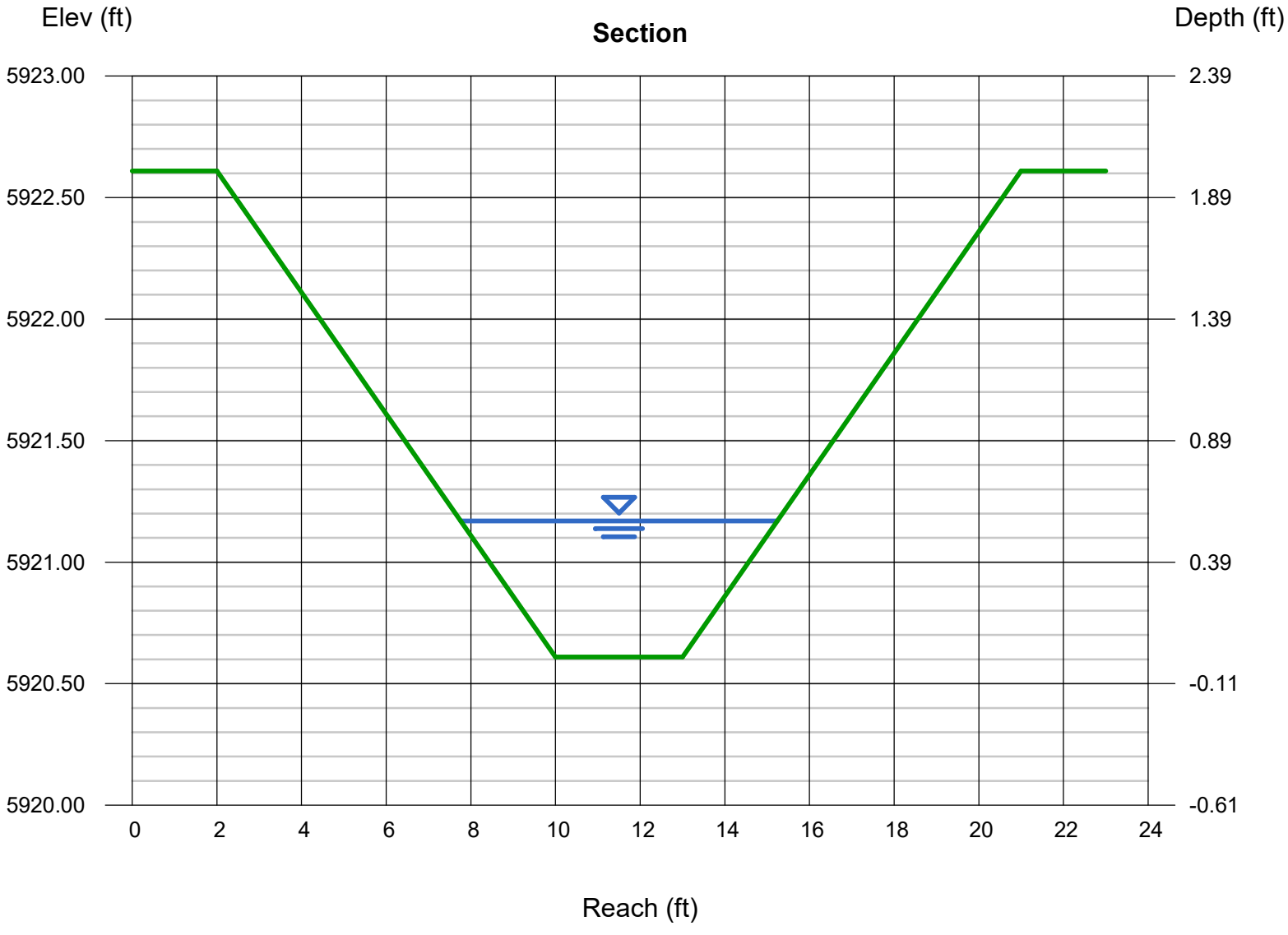
Bottom Width (ft)	= 3.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 5920.61
Slope (%)	= 2.00
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 10.61

Highlighted

Depth (ft)	= 0.56
Q (cfs)	= 10.61
Area (sqft)	= 2.93
Velocity (ft/s)	= 3.62
Wetted Perim (ft)	= 7.62
Crit Depth, Yc (ft)	= 0.57
Top Width (ft)	= 7.48
EGL (ft)	= 0.76



Scenario: 5-yr
Current Time Step: 0.000 h
FlexTable: Conduit Table

Invert (Start) (ft)	Start Node	Invert (Stop) (ft)	Stop Node	Length (User Defined) (ft)	Slope (Calculated) (ft/ft)	Diameter (in)	Manning's n	Flow (cfs)	Velocity (ft/s)	Depth (Out) (ft)	Capacity (Full Flow) (cfs)	Flow / Capacity (Design) (%)	Depth (Normal) / Rise (%)	Notes
5,917.39	MH-01 (STORM)	5,915.72	OUTFALL	27.9	0.060	18.0	0.013	6.82	12.30	1.63	25.72	26.5	35.2	18" RCP
5,918.92	IN-01 (STORM)	5,917.89	MH-01 (STORM)	205.1	0.005	12.0	0.010	1.42	4.03	0.51	3.28	43.3	46.0	12" PVC
5,918.15	IN-02 (STORM)	5,917.74	MH-01 (STORM)	82.0	0.005	18.0	0.010	5.40	5.59	0.80	9.66	55.9	53.7	18" PVC

P:\LASCO\CO, El Paso County - Bradley Rd at Legacy Hill\07 Design\Drainage\STORM.stsw

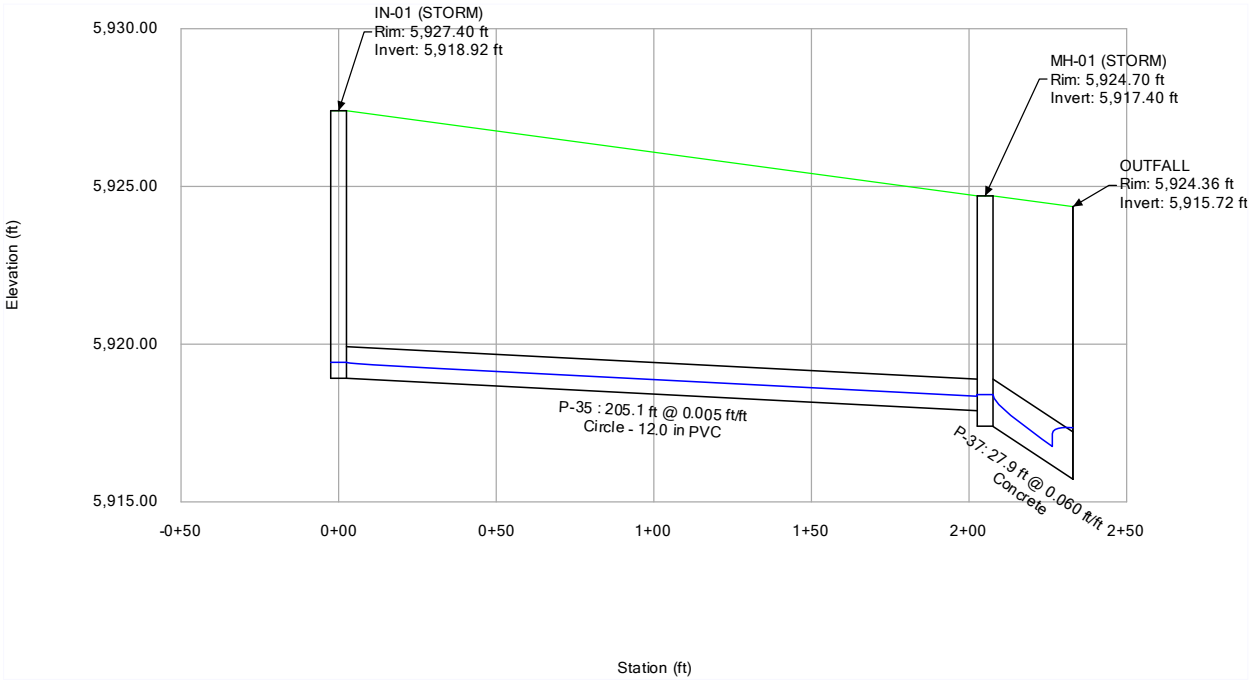
Scenario: 100-yr
Current Time Step: 0.000 h
FlexTable: Conduit Table

Invert (Start) (ft)	Start Node	Invert (Stop) (ft)	Stop Node	Length (User Defined) (ft)	Slope (Calculated) (ft/ft)	Diameter (in)	Manning's n	Flow (cfs)	Velocity (ft/s)	Depth (Out) (ft)	Capacity (Full Flow) (cfs)	Flow / Capacity (Design) (%)	Depth (Normal) / Rise (%)	Notes
5,917.39	MH-01 (STORM)	5,915.72	OUTFALL	27.9	0.060	18.0	0.013	13.28	14.67	2.63	25.72	51.6	51.0	18" RCP
5,918.92	IN-01 (STORM)	5,917.89	MH-01 (STORM)	205.1	0.005	12.0	0.010	2.67	4.66	0.86	3.28	81.4	68.5	12" PVC
5,918.15	IN-02 (STORM)	5,917.74	MH-01 (STORM)	82.0	0.005	18.0	0.010	10.61	6.00	1.25	9.66	109.9	(N/A)	18" PVC

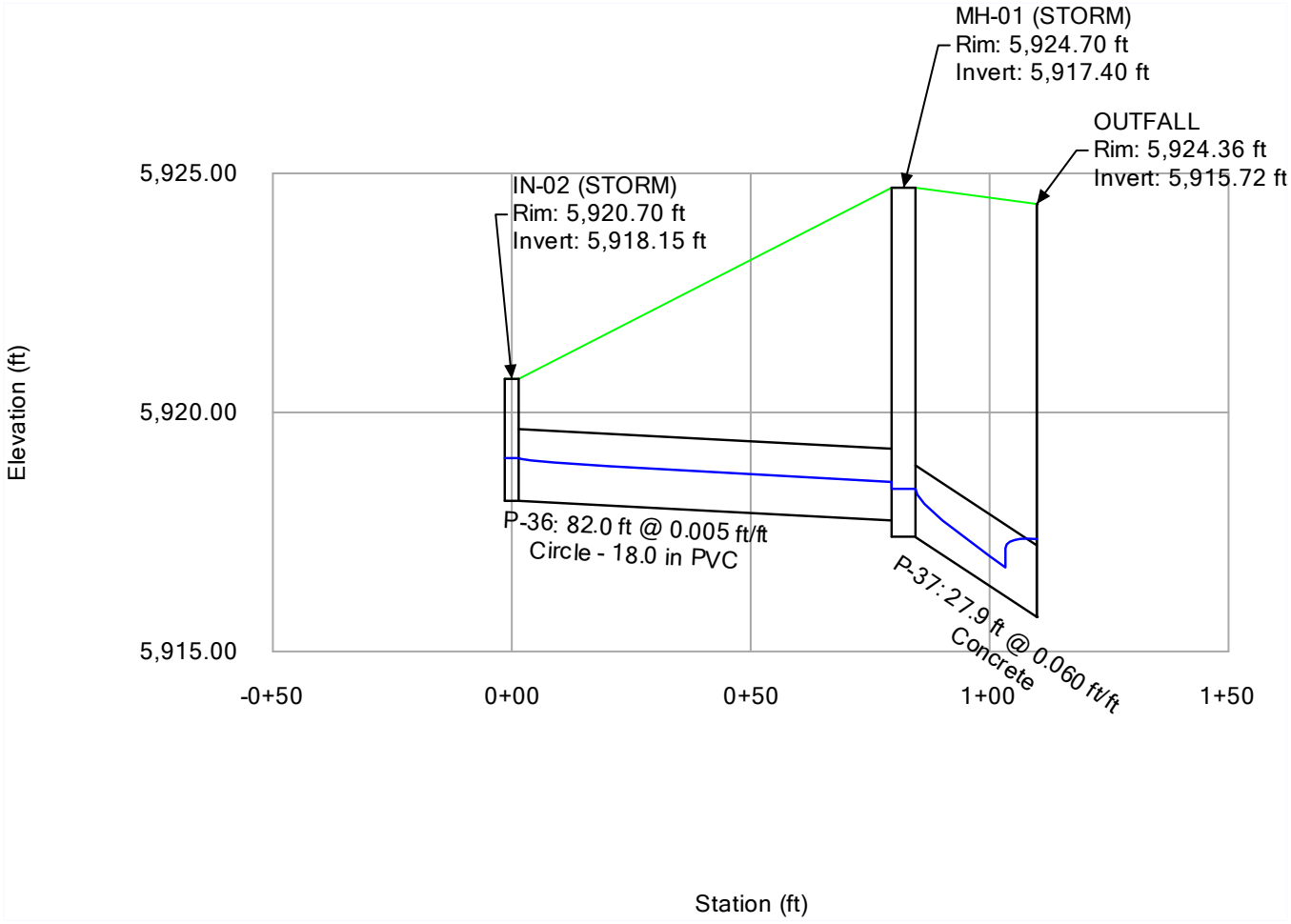
P:\LASCO\CO, El Paso County - Bradley Rd at Legacy Hill\07 Design\Drainage\STORM.stsw

Profile Report
Engineering Profile - IN-01-EX MH (STORM.stsw)

5-YEAR MINOR STORM

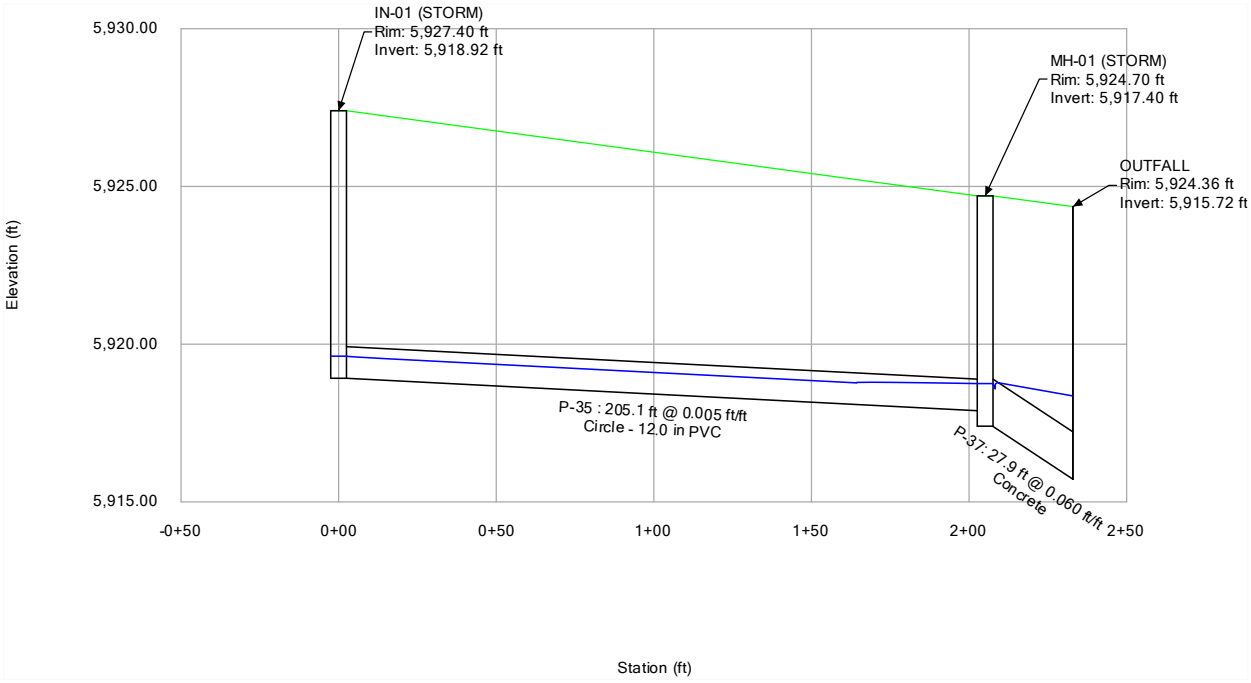


Profile Report
Engineering Profile - IN-02-EX MH (STORM.stsw)

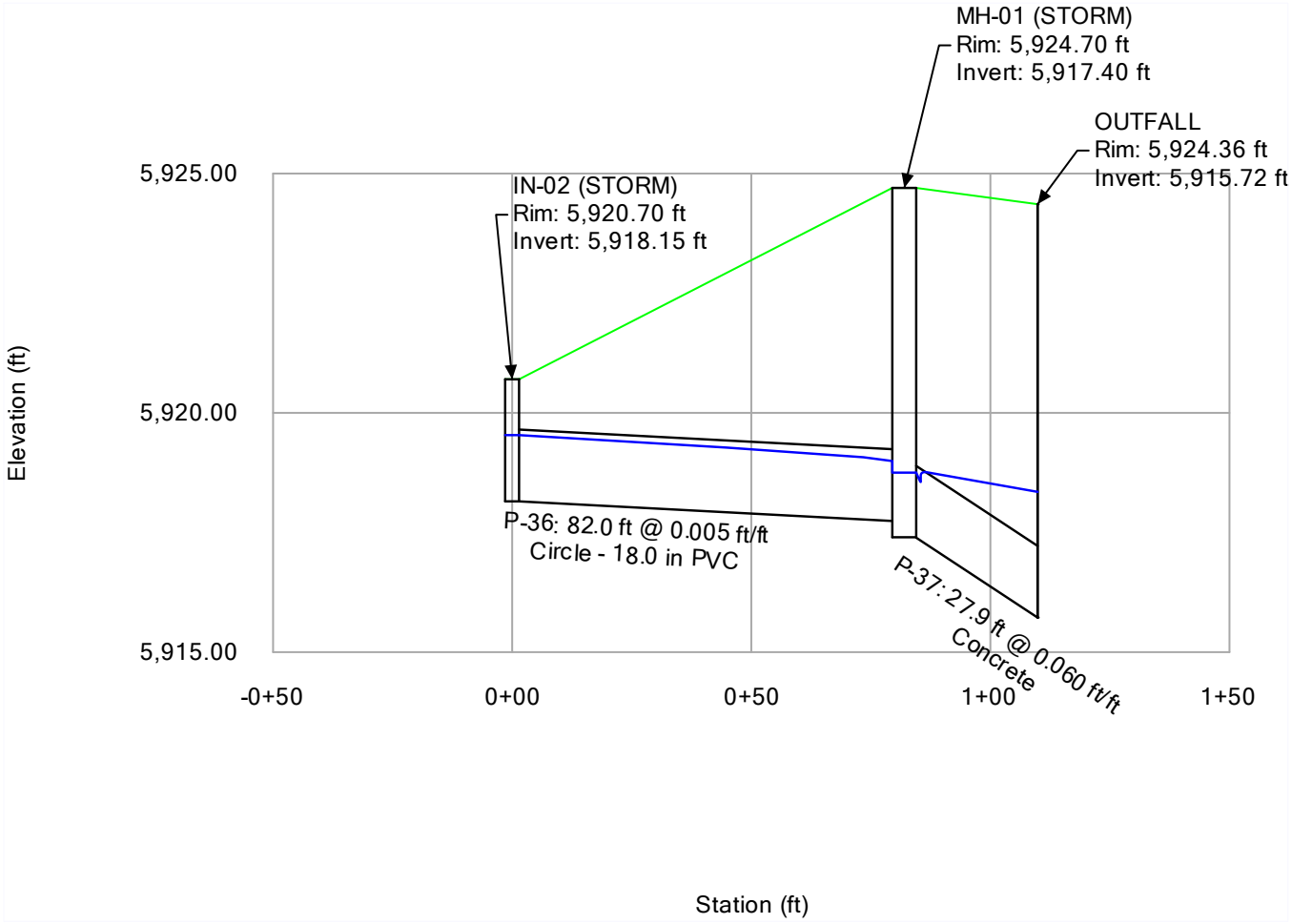


Profile Report
Engineering Profile - IN-01-EX MH (STORM.stsw)

100-YEAR MAJOR STORM



Profile Report
Engineering Profile - IN-02-EX MH (STORM.stsw)



Low Tail Water Basin and Riprap Design 2' CURB CUT

Project Name 7-11 - Legacy and Bradley

17-Mar-26

Instructions: Refer to Section 3.4.3.2 of Chap 8 Vol 2 in UD Manual. Enter values in blue cells. Green cells are calculated.

100-year design flows

Outlet Pipe Information:

Type of Pipe: Rectangular

Storm Sewer Height, H = 0.5 ft

Riprap Size:

Velocity = 2.35 ft/s (1) 100 Year

Design Depth, d = 0.5 ft (2)

Gravity, g = 32.2 ft/s^2

Eqn: HS-16e

P_d = 4.65 ft/s

Use Figure HS-20c to find the size and type of riprap to use in the outlet protection basin.

Riprap Selection: **Type L**

Riprap Diameter, D_{50} = 9 inches

Riprap Minimum Thickness:

Eqn: HS-17

Thickness, T = 1.31 ft

Basin Dimensions:

Storm Sewer Height, H = 0.5 ft

Length is defined as being the greater of the following:

L = 4H = 2 ft Eqn: HS-18

L=(H)^0.5(V/2) = 0.830850468 ft Eqn: HS-19

L = **2** ft

Width:

w = width of box culvert 2 ft

W = w+4H 4 ft Eqn: HS-20 or HS-21

Cutoff Wall:

B = 1.56 ft Eqn: HS-22

(1) Obtain Velocity from Section 3.4.3.1 of Vol 2 in the UD Manual or program such as FlowMaster or StormCad

(2) Obtain flow depth from Section 3.4.3.1 of Vol 2 in the UD Manual or program such as FlowMaster or StormCad

Final Drainage Report – Filing No. 1

Waterview East Commercial
El Paso County, Colorado

Prepared for:
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Prepared by:
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Project #: 196195001

Prepared: March 12, 2026

Kimley»Horn

sub-basin descriptions.

Sub-Basin A1

The on-site sub-basin A1 consists of native vegetation in the northeast portion of the site. Sub-Basin A1 encompasses Lot 1 which is to be developed into a future convenience store. Detailed drainage design of the convenience store and drainage basins will be provided with a separate Site Development Plan and Final Drainage Report submittal. The sub-basin has an area of 2.00 acres and a weighted imperviousness of 95%. Runoff in this basin will be collected by future proposed storm sewer infrastructure and routed to the 18" RCP storm sewer stub (Design Point A1) to discharge to the pond. Runoff during the 5-year and 100-year events are 5.92 cfs and 13.93 cfs respectively.

Sub-Basin A2

The on-site sub-basin A2 consists of native vegetation in the north portion of the site. Sub-Basin A2 encompasses Lot 2 which is to be developed into a commercial user. Detailed drainage design of the commercial store and drainage basins will be provided with a separate Site Development Plan and Final Drainage Report submittal. The sub-basin has an area of 1.50 acres and a weighted imperviousness of 95%. Runoff in this basin will be collected by future proposed storm sewer infrastructure and routed to the 18" RCP storm sewer stub (Design Point A2) to discharge to the pond. Runoff during the 5-year and 100-year events are 4.48 cfs and 10.32 cfs respectively.

Sub-Basin FD1

The on-site sub-basin FD1 consists of native vegetation in the northwest portion of the site and is a future development for commercial uses. The sub-basin has an area of 2.91 acres and a weighted imperviousness of 95%. Runoff in this basin will be collected by future proposed storm sewer infrastructure and routed to the 24" RCP storm sewer stub (Design Point FD1) to discharge to the pond. Runoff during the 5-year and 100-year events are 8.41 cfs and 19.39 cfs respectively.

Sub-Basin FD2

The on-site sub-basin FD2 consists of native vegetation in the west portion of the site and is a future development for commercial uses. The sub-basin has an area of 3.19 acres and a weighted imperviousness of 95%. Runoff in this basin will be collected by future proposed storm sewer infrastructure and routed to the 24" RCP storm sewer stub (Design Point FD2) to discharge to the pond. Runoff during the 5-year and 100-year events are 9.17 cfs and 21.14 cfs respectively.

Sub-Basin PR1

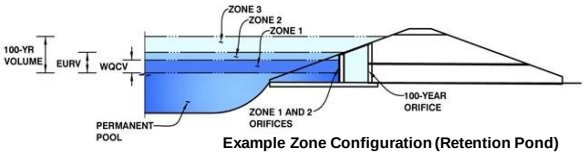
The on-site sub-basin PR1 consists of the proposed private drive. The sub-basin has an area of 0.26 acres and a weighted imperviousness of 100%. Runoff in this basin will be collected by curb and gutter and routed to a proposed private 10' Type 2 curb inlet (Design Point PR1) to discharge to the pond. Runoff during the 5-year and 100-year events are 1.02 cfs and 2.30 cfs respectively.

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.07 (June 2025)

Project: Waterview East Commercial Final Plat 1

Basin ID: A1, A2, FD1, FD2, PR1, PR2, P



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.13	0.353	Orifice Plate
Zone 2 (EURV)	3.21	0.827	Orifice Plate
Zone 3 (100-year)	4.63	0.714	Weir&Pipe (Restrict)
Total (all zones)		1.893	

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

Underdrain Orifice Invert Depth = [ ] ft (distance below the filtration media surface)

Underdrain Orifice Diameter = [ ] inches

Calculated Parameters for Underdrain

Underdrain Orifice Area = [ ] ft^2

Underdrain Orifice Centroid = [ ] 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 SCM)

Centroid of Lowest Orifice = 0.00 ft (relative to basin bottom at Stage = 0 ft)

Depth at top of Zone using Orifice Plate = 3.21 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 sq. 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	1.60	2.75					
Orifice Area (sq. inches)	5.00	3.00	3.00					

	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 =	3.50	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	6.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V
Horiz. Length of Weir Sides =	6.00	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 =	3.50	N/A	feet
Overflow Weir Slope Length =	6.00	N/A	feet
Grate Open Area / 100-yr Orifice Area =	14.18	N/A	
Overflow Grate Open Area w/o Debris =	25.06	N/A	ft^2
Overflow Grate Open Area w/ Debris =	12.53	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 =	0.00	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	18.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	18.00		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	1.77	N/A	ft^2
Outlet Orifice Centroid =	0.75	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	3.14	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage= 4.10 ft (relative to basin bottom at Stage = 0 ft)

Spillway Crest Length = 17.00 feet

Spillway End Slopes = 4.00 H:V

Freeboard above Max Water Surface = 1.00 feet

Calculated Parameters for Spillway

Spillway Design Flow Depth= 0.89 feet

Stage at Top of Freeboard = 5.99 feet

Basin Area at Top of Freeboard = 0.63 acres

Basin Volume at Top of Freeboard = 2.69 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).

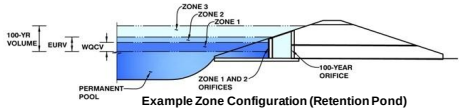
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.01	1.29	1.56	2.00	2.25	2.75	3.14
CUHP Runoff Volume (acre-ft) =	0.353	1.179	0.774	1.021	1.277	1.724	1.972	2.486	2.878
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.774	1.021	1.277	1.724	1.972	2.486	2.878
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.4	0.8	3.2	10.0	12.9	19.2	23.6
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.03	0.07	0.27	0.84	1.09	1.62	2.00
Peak Inflow Q (cfs) =	N/A	N/A	15.8	20.3	25.4	35.5	40.7	50.0	57.6
Peak Outflow Q (cfs) =	0.2	0.5	0.3	0.4	0.5	4.3	7.9	16.1	22.5
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.5	0.2	0.4	0.6	0.8	1.0
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	0.1	0.3	0.6	0.6
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	66	57	63	68	69	68	65	64
Time to Drain 99% of Inflow Volume (hours) =	42	72	62	69	74	76	76	74	73
Maximum Ponding Depth (ft) =	1.14	3.21	2.15	2.72	3.27	3.71	3.83	4.14	4.34
Area at Maximum Ponding Depth (acres) =	0.34	0.46	0.40	0.43	0.46	0.49	0.50	0.52	0.53
Maximum Volume Stored (acre-ft) =	0.356	1.183	0.730	0.966	1.206	1.420	1.475	1.636	1.741

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.07 (June 2025)

Project: Waterview East Commercial Final Plat 1

Basin ID: A1, A2, FD1, FD2, PR1, PR2, P



Example Zone Configuration (Retention Pond)

Watershed Information

Selected SCM Type =	EDB	
Watershed Area =	11.85	acres
Watershed Length =	985	ft
Watershed Length to Centroid =	415	ft
Watershed Slope =	0.030	ft/ft
Watershed Imperviousness =	84.30%	percent
Percentage Hydrologic Soil Group A =	30.0%	percent
Percentage Hydrologic Soil Group B =	70.0%	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) =	0.353	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	1.179	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 1.01 in.) =	0.774	acre-feet	1.01 inches
5-yr Runoff Volume (P1 = 1.29 in.) =	1.021	acre-feet	1.29 inches
10-yr Runoff Volume (P1 = 1.56 in.) =	1.277	acre-feet	1.56 inches
25-yr Runoff Volume (P1 = 2 in.) =	1.724	acre-feet	2.00 inches
50-yr Runoff Volume (P1 = 2.25 in.) =	1.972	acre-feet	2.25 inches
100-yr Runoff Volume (P1 = 2.75 in.) =	2.486	acre-feet	2.75 inches
500-yr Runoff Volume (P1 = 3.14 in.) =	2.878	acre-feet	inches
Approximate 2-yr Detention Volume =	0.750	acre-feet	
Approximate 5-yr Detention Volume =	0.994	acre-feet	
Approximate 10-yr Detention Volume =	1.259	acre-feet	
Approximate 25-yr Detention Volume =	1.559	acre-feet	
Approximate 50-yr Detention Volume =	1.643	acre-feet	
Approximate 100-yr Detention Volume =	1.893	acre-feet	

Define Zones and Basin Geometry

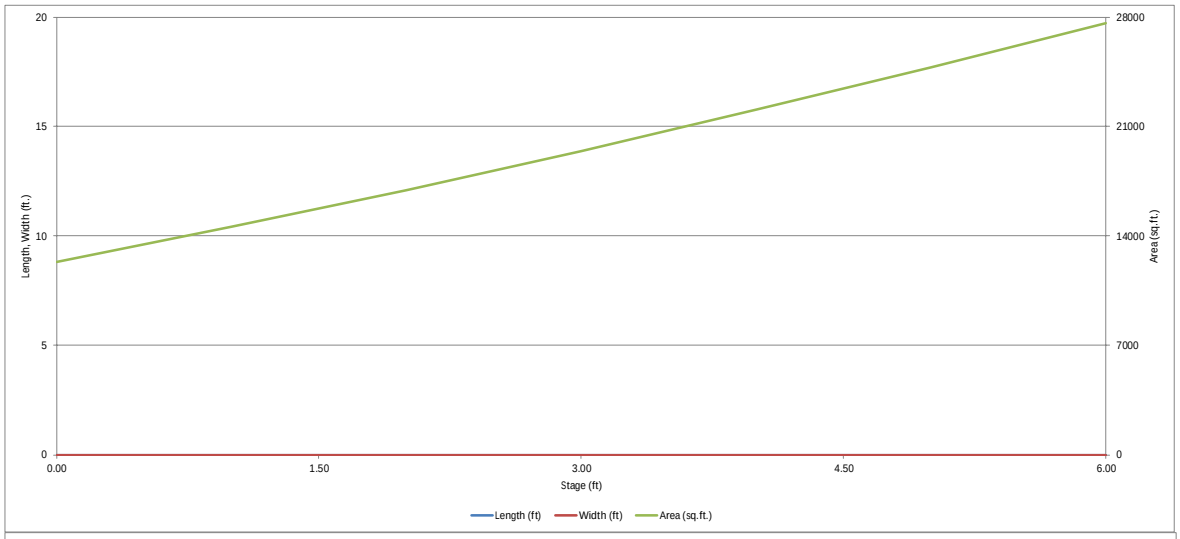
Zone 1 Volume (WQCV) =	0.353	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.827	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.714	acre-feet
Total Detention Basin Volume =	1.893	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (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_{LW}) =	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

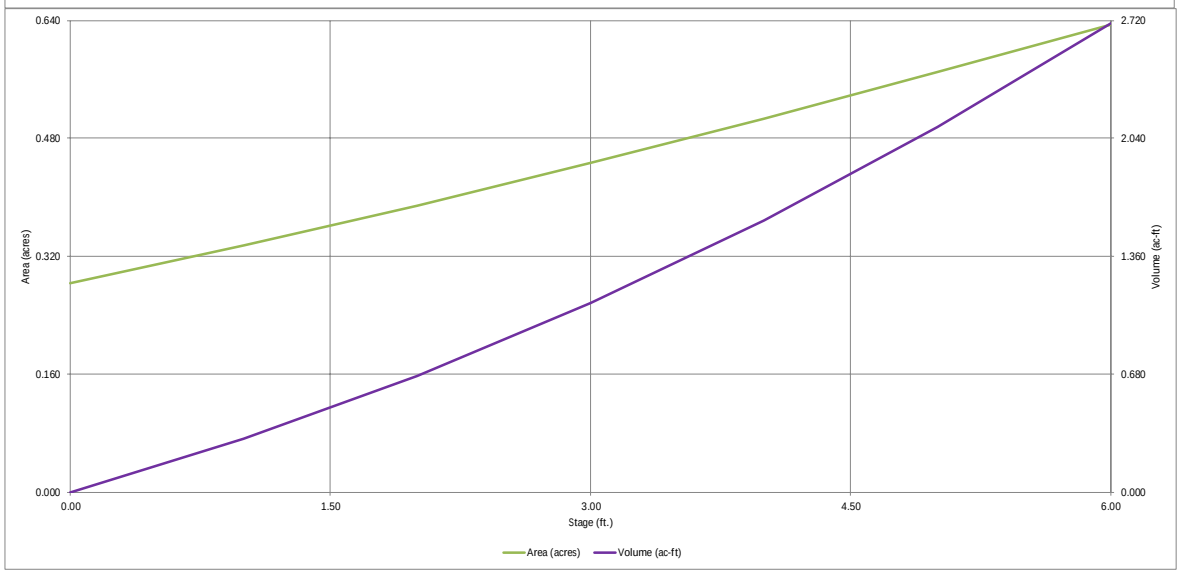
Depth Increment = ft

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	--	--	--	12,348	0.283		
	--	1.00	--	--	--	14,575	0.335	13,461	0.309
	--	2.00	--	--	--	16,938	0.389	29,218	0.671
	--	3.00	--	--	--	19,438	0.446	47,406	1.088
	--	4.00	--	--	--	22,068	0.507	68,159	1.565
	--	5.00	--	--	--	24,804	0.569	91,595	2.103
	--	6.00	--	--	--	27,640	0.635	117,817	2.705

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

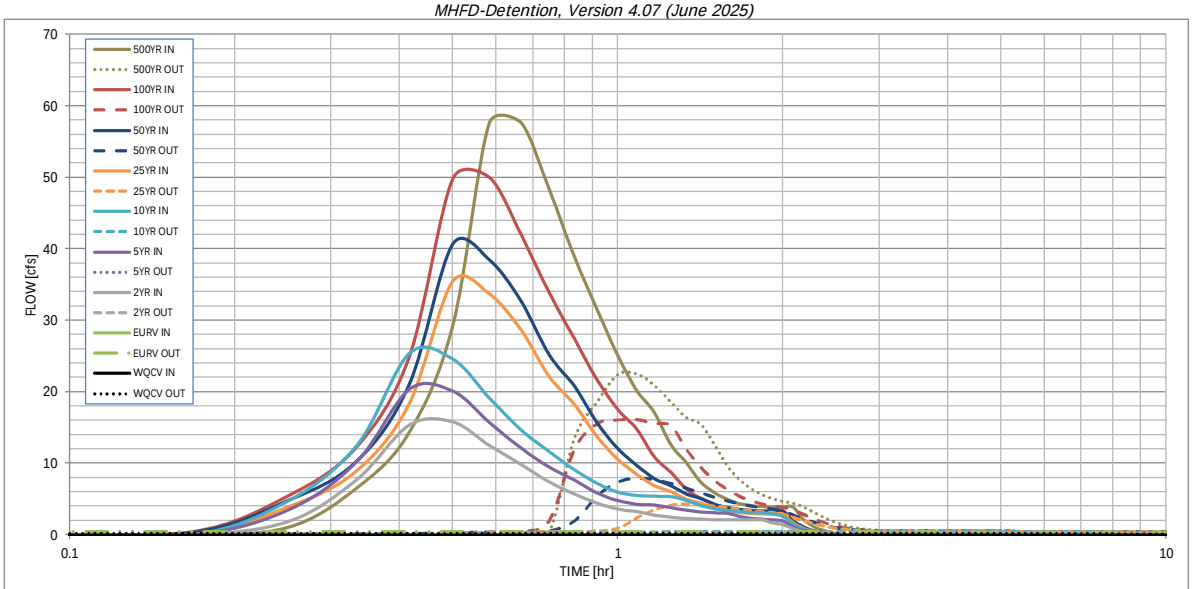
MHFD-Detention, Version 4.07 (June 2025)

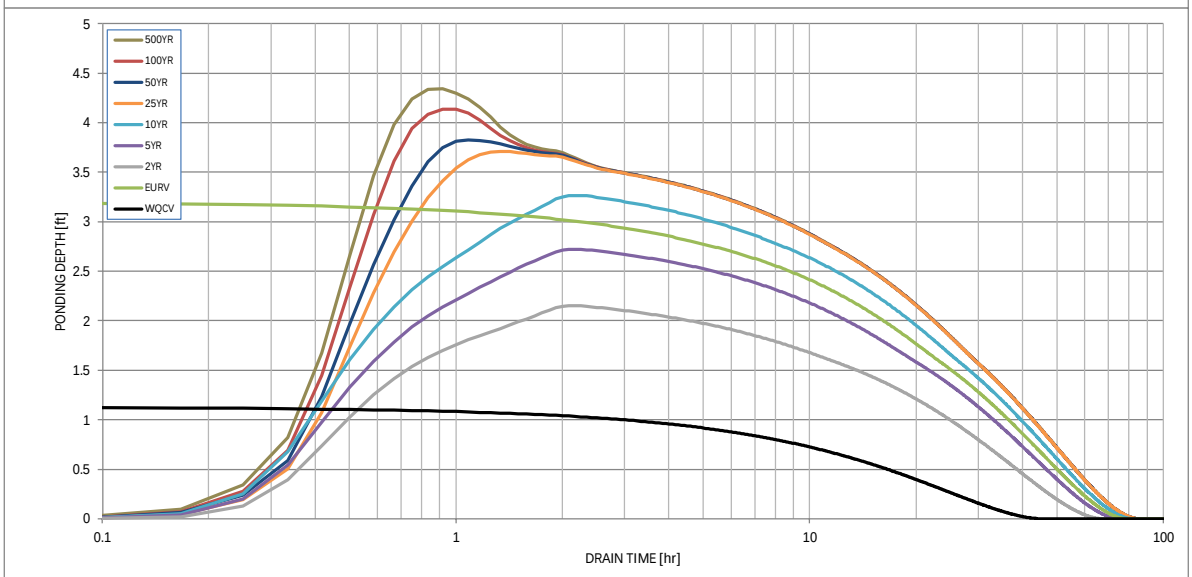


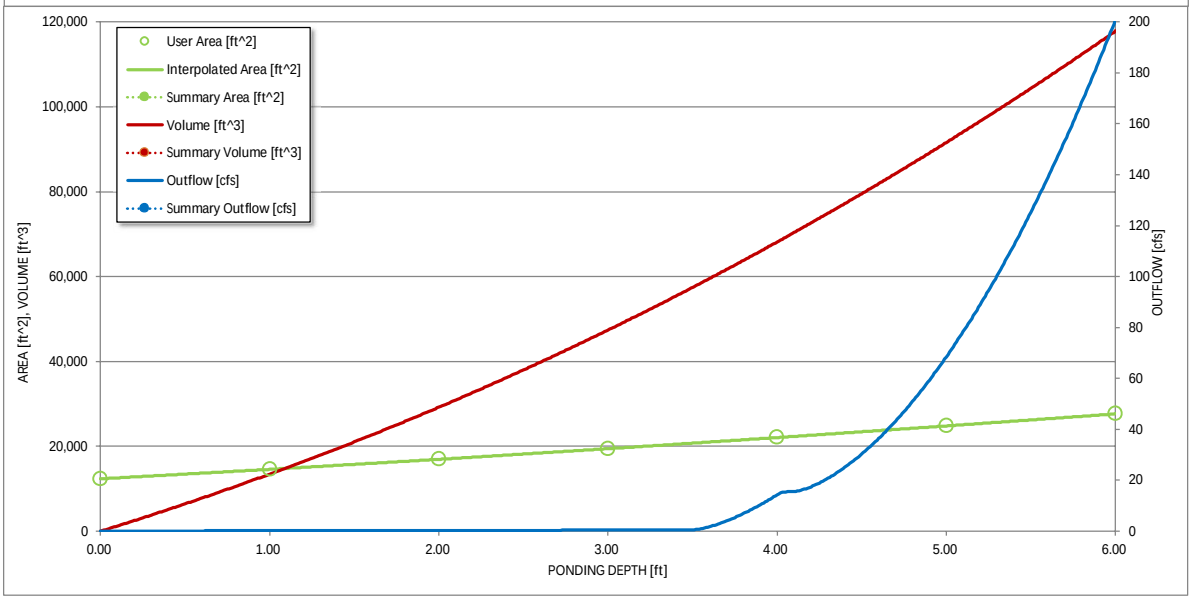


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.07 (June 2025)







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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0	0.00	0.00	0.00	0.00	0.00	0.32	0.41	1.04
	0:15:00	0	0.00	1.84	3.47	4.73	3.89	4.77	5.39	6.51
	0:20:00	0	0.00	7.66	10.13	12.40	8.89	10.25	12.26	14.36
	0:25:00	0	0.00	15.38	20.34	25.35	18.37	21.10	24.90	29.30
	0:30:00	0	0.00	15.77	20.08	24.55	35.50	40.71	49.87	57.60
	0:35:00	0	0.00	12.52	15.74	19.17	33.68	38.45	50.01	57.61
	0:40:00	0	0.00	9.84	12.10	14.66	28.65	32.65	41.91	48.23
	0:45:00	0	0.00	7.38	9.46	11.64	22.09	25.16	33.83	38.93
	0:50:00	0	0.00	5.71	7.65	9.11	18.26	20.81	27.41	31.56
	0:55:00	0	0.00	4.42	5.88	7.19	13.75	15.68	21.72	25.02
	1:00:00	0	0.00	3.60	4.75	5.96	10.56	12.06	17.53	20.21
	1:05:00	0	0.00	3.26	4.30	5.53	8.49	9.72	14.81	17.10
	1:10:00	0	0.00	2.74	4.15	5.39	6.89	7.87	10.89	12.58
	1:15:00	0	0.00	2.46	3.79	5.34	6.03	6.88	8.71	10.07
	1:20:00	0	0.00	2.29	3.43	4.83	5.02	5.72	6.41	7.41
	1:25:00	0	0.00	2.20	3.21	4.12	4.44	5.06	5.11	5.91
	1:30:00	0	0.00	2.13	3.08	3.68	3.77	4.29	4.29	4.95
	1:35:00	0	0.00	2.09	3.00	3.40	3.37	3.82	3.79	4.38
	1:40:00	0	0.00	2.08	2.59	3.23	3.13	3.53	3.53	4.07
	1:45:00	0	0.00	2.08	2.33	3.12	3.00	3.38	3.43	3.96
	1:50:00	0	0.00	2.08	2.18	3.06	2.92	3.29	3.39	3.92
	1:55:00	0	0.00	1.67	2.10	2.92	2.89	3.25	3.39	3.92
	2:00:00	0	0.00	1.42	1.94	2.59	2.88	3.24	3.39	3.92
	2:05:00	0	0.00	0.85	1.16	1.56	1.74	1.96	2.05	2.37
	2:10:00	0	0.00	0.50	0.68	0.92	1.04	1.17	1.23	1.42
	2:15:00	0	0.00	0.27	0.39	0.52	0.59	0.66	0.69	0.80
	2:20:00	0	0.00	0.14	0.21	0.28	0.33	0.37	0.39	0.45
	2:25:00	0	0.00	0.06	0.10	0.12	0.16	0.17	0.18	0.21
	2:30:00	0	0.00	0.02	0.03	0.03	0.05	0.05	0.05	0.06
	2:35:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:40:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:45:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:50:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:55:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:00:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:05:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:10:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

PROJECT NAME: Waterview East Commercial
PROJECT NUMBER: 19659001

CALCULATED BY: JJM
CHECKED BY: JJM

Kimley»Horn

DATE STARTED: 3/11/2026

*This spreadsheet is based on the UD-BMP EDB tab. Yellow cells are for user input

Formulas

$WQCV_{DESIGN}$= $a*((0.91*i^3 - 1.19i^2 + 0.78i)/12)*TCA$

Input the proper drain time coefficient (TBL 3-2, Ch. 3 Vol 3, USDCM)

a= 1.0

12 hrs, a = 0.8
24 hrs, a= 0.9
40 hrs*, a=1.0

*Use 1.0 if there is No attenuation

Min. Forebay Vol 3% Source: Tbl EDB 4 UDFCD

FOREBAY NAME	TOTAL CONTRIBUTING AREA (TCA) (ac)	i	$WQCV_{DESIGN}$ (ac-ft)	V_{FMIN} (ac-ft)	V_{FMIN} (cf)	D_F (ft)	A_{FMIN} (SF)
A	6.67	0.95	0.25	0.0075	326.3	1.0	326.3
B	3.80	0.96	0.14	0.0043	188.4	1.0	188.4

Forebay A

Basin(s)	Area (acres)	Weighting Factors (A_i/A_{TOTAL})	i (I%/100%)	(Weighting Factors) * i
A1	2.00	0.30	0.95	0.28
A2	1.50	0.22	0.95	0.21
PR 1	0.26	0.04	1.00	0.04
FD1	2.91	0.44	0.95	0.41
A_{TOTAL}	6.67	acres	$i_{weighted}$	0.95

Forebay B

Basin(s)	Area (acres)	Weighting Factors (A_i/A_{TOTAL})	i (I%/100%)	(Weighting Factors) * i
PR 2	0.61	0.16	1.00	0.16
FD 2	3.19	0.84	0.95	0.80
B_{TOTAL}	3.80	acres	$i_{weighted}$	0.96

PROJECT NAME: Waterview East Commercial
PROJECT NUMBER: 19659001

CALCULATED BY: JJM
CHECKED BY: JJM

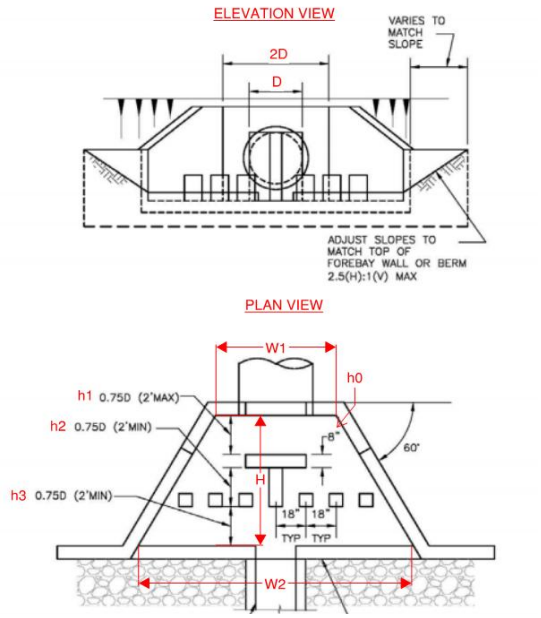
MINIMUM DIMENSIONS FOREBAY A

FOREBAY MINIMUM DIMENSIONS

*Check Incoming Pipe size fits requirements of Figure 9-43

* Sizing follows trapezoidal formula. Need to solve for base width

Min. Area (A)	326.25	SF	
Incoming Pipe Diameter (D)	2.50	ft	
W_1 (2*D)	5.00	ft	FORMULA
h_1	1.88	ft	0.75D (2' MAX)
h_2	2.00	ft	0.75D (2' MIN.)
h_3	2.00	ft	0.75D (2' MIN.)
h_0	0.67	ft	*h_0 is a constant 8"
H (Eh_i)	6.54	ft	



W_2=	W_1 +[2*H*tan(30°)]	
tan(30°)=	0.58	*This formula ensures degree output
W_2=	12.55	ft

Actual Area=	$((W_1+W_2)/2)*H$	
A=	57.42	SF
Greater than minimum Area?	No. Calculate H using formula below	

*If your actual area is smaller than the required forebay area, back-calculate H from required forebay area and determine h3 by subtracting all hi values

A=	$((W_1+W_2)/2)*H$	
W_2=	W_1 +[2*H*tan(30°)]	
0=	$\tan 30° H^2 + W_1 H - A$	
0=	119.13	Goal Seek
New H=	23.7	ft
New W_2=	32.4	ft
New h_3=	19.2	ft
$A_{PROVIDED}$	476	SF from CAD

HEADWALL TOP ELEV.= Pipe IE + 1.5*D

Pipe IE=	5910.00	ft
HEADWALL TOP ELEV.=	5913.75	ft

FOREBAY NOTCH SIZING: FOREBAY A

Wall with Rect. Notch (W_N equation from UD-BMP spreadsheet)

Undet. 100-year Peak Discharge	45.64	cfs (input from StormCAD)
Forebay Discharge Flow %	2%	
Q_F =	Undet. 100-yr discharge * Forebay Disch. %	
Q_F =	0.91	cfs
Width of Notch(W_N)=	$Q_F/(3.33*D_F^{1.5})*12 + 0.2*(D_F*12)$	
D_F=	1	ft (Taken from input above)
W_N=	5.7	in

PROJECT NAME: Waterview East Commercial
PROJECT NUMBER: 19659001

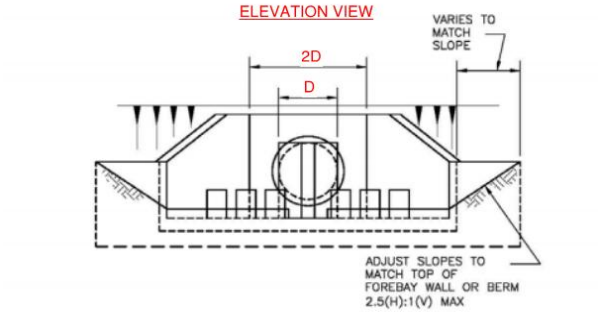
CALCULATED BY: JJM
CHECKED BY: JJM

MINIMUM DIMENSIONS FOREBAY B

FOREBAY MINIMUM DIMENSIONS

*Check Incoming Pipe size fits requirements of Figure 9-43

* Sizing follows trapezoidal formula. Need to solve for base width



Min. Area (A)	188.38	SF	
Incoming Pipe Diameter (D)	2.00	ft	
W_1 (2*D)	4.00	ft	FORMULA
h_1	1.50	ft	0.75D (2' MAX)
h_2	2.00	ft	0.75D (2' MIN.)
h_3	2.00	ft	0.75D (2' MIN.)
h_0	0.67	ft	*h_0 is a constant 8"
H (Eh_i)	6.17	ft	

W_2= W_1 +[2*H*tan(30°)]

tan(30°)= 0.58 *This formula ensures degree output

W_2= 11.12 ft

Actual Area= $((W_1+W_2)/2)*H$

A= 46.62 SF

Greater than minimum Area? No. Calculate W2 using formula below

*If your actual area is smaller than the required forebay area, back-calculate H from required forebay area and determine h3 by subtracting all hi values

A= $((W_1+W_2)/2)*H$

W_2= W_1 +[2*H*tan(30°)]

0= $\tan 30° H^2 + W_1 H - A$

0= 217.04 Goal Seek

New H= 23.3 ft

New W_2= 30.9 ft

New h_3= 19.1 ft

$A_{PROVIDED}$ 488 SF from CAD

HEADWALL TOP ELEV.= Pipe IE + 1.5*D

Pipe IE= 5910.00 ft

HEADWALL TOP ELEV.= 5913.00 ft

FOREBAY NOTCH SIZING: FOREBAY B

Wall with Rect. Notch (W_N equation from UD-BMP spreadsheet)

Undet. 100-year Peak Discharge 26.51 cfs (input from StormCAD)

Forebay Discharge Flow % 2%

Q_F = Undet. 100-yr discharge * Forebay Disch. %

Q_F = 0.53 cfs

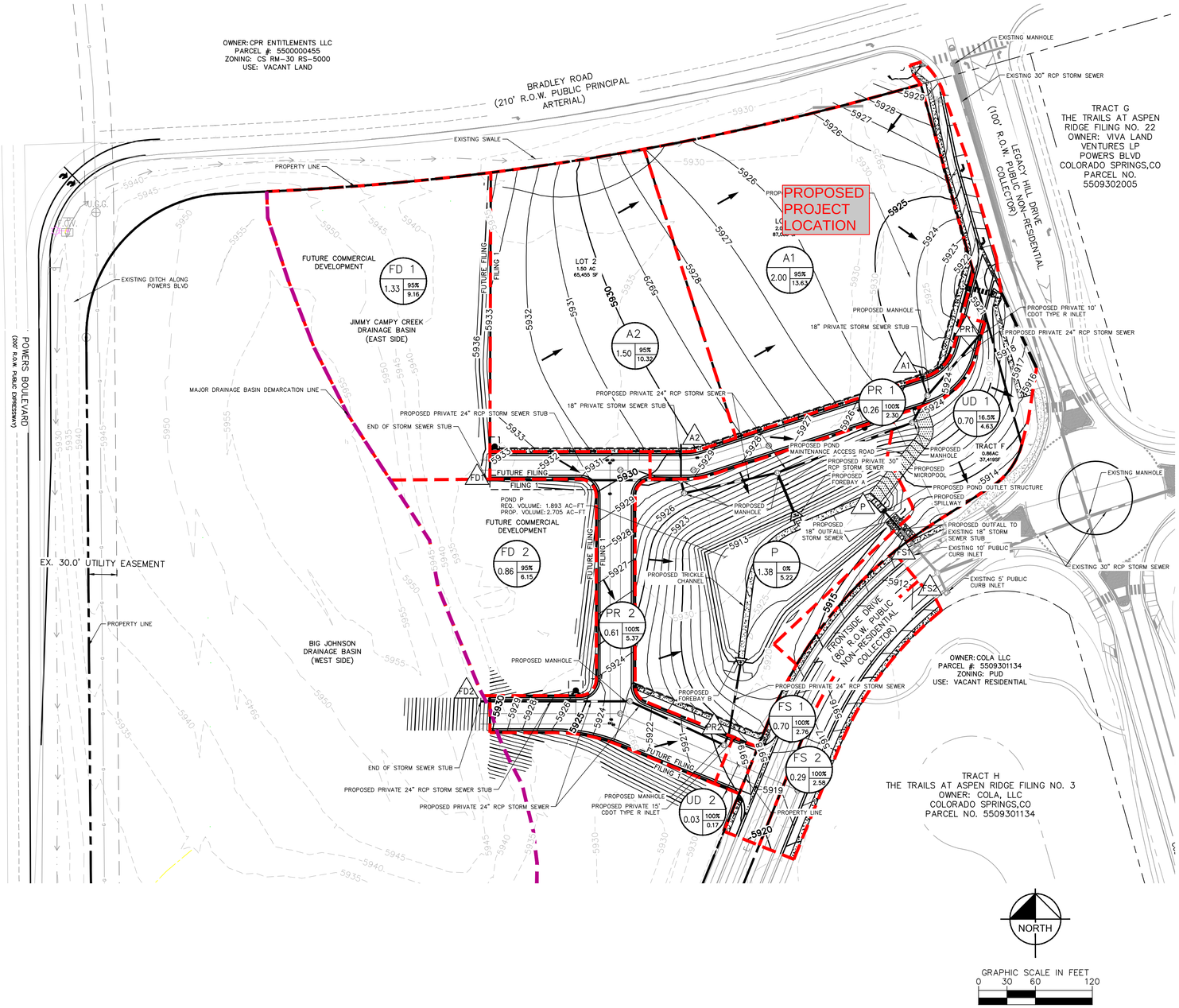
Width of Notch(W_N)= $Q_F/(3.33*D_F^{1.5})*12 + 0.2*(D_F*12)$

D_F= 1 ft (Taken from input above)

W_N= 4.3 in

APPENDIX D
Drainage Maps

1. Master Drainage Report Drainage Map
2. Developed Drainage Map



LEGEND

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

DESIGN POINT
FLOW DIRECTION
MAJOR DRAINAGE BASIN BOUNDARY
DRAINAGE BASIN BOUNDARY
PROPERTY LINE
PROPOSED MAJOR CONTOUR
PROPOSED MINOR CONTOUR
EXISTING MAJOR CONTOUR
EXISTING MAJOR CONTOUR
EXISTING DITCH/SWALE
PROPOSED SWALE
PROPOSED STORM SEWER
PROPOSED STORM MANHOLE
PROPOSED STORM INLET
EXISTING STORM SEWER
EXISTING STORM MANHOLE
EXISTING STORM INLET

SUMMARY - PROPOSED RUNOFF TABLE

DESIGN POINT	BASIN DESIGNATION	BASIN AREA (ACRES)	DIRECT 5-YR RUNOFF (CFS)	DIRECT 100-YR RUNOFF (CFS)	CUMMULATIVE 5-YR RUNOFF (CFS)	CUMMULATIVE 100-YR RUNOFF (CFS)
A1	A1	2.00	5.92	13.63	5.92	13.63
A2	A2	1.50	4.48	10.32	4.48	10.32
FD 1	FD 1	1.33	3.97	9.16	3.97	9.16
FD 2	FD 2	0.86	2.67	6.15	2.67	6.15
PR 1	PR 1	0.26	1.02	2.30	1.02	2.30
PR 2	PR 2	0.61	2.38	5.37	2.38	5.37
P	P	1.38	0.82	5.22	20.44	32.00
FS1	UD 1	0.70	0.77	4.54	0.77	4.54
FS1	UD 2	0.03	0.13	0.17	0.13	0.17
FS 1	FS 1	0.31	1.23	2.76	1.23	2.76
FS 2	FS 2	0.29	1.15	2.58	1.15	2.58

PBMP SUMMARY TABLE

BASINS	PBMP TRIBUTARY AREA (AC)	PBMP
A1-A2, FD 1, FD 2, PR 1-PR 2, P	7.9400	EDB - P

NOTES:
1. SUB-BASINS FS1 AND FS2 NOT TREATED BY A PBMP ARE EXCLUDED BASED ON ECM APP I.7.1.B.2.1 AND I.7.1.B.7.
2. SUB-BASINS UD1 AND UD2 NOT TREATED BY A PBMP ARE EXCLUDED BASED ON ECM APP I.7.1.C.1.A.

NO.	REVISION	BY	DATE	APPR.

Kimley»Horn
2026 KIMLEY-HORN AND ASSOCIATES, INC.
2 North Nevada Avenue, Suite 900
Colorado Springs, Colorado 80903 (719) 453-0180

DESIGNED BY: ANF
DRAWN BY: ANF
CHECKED BY: JJM
DATE: 04/21/2026

WATERVIEW EAST COMMERCIAL FILING NO. 1
CONSTRUCTION DOCUMENTS
PROPOSED DRAINAGE MAP

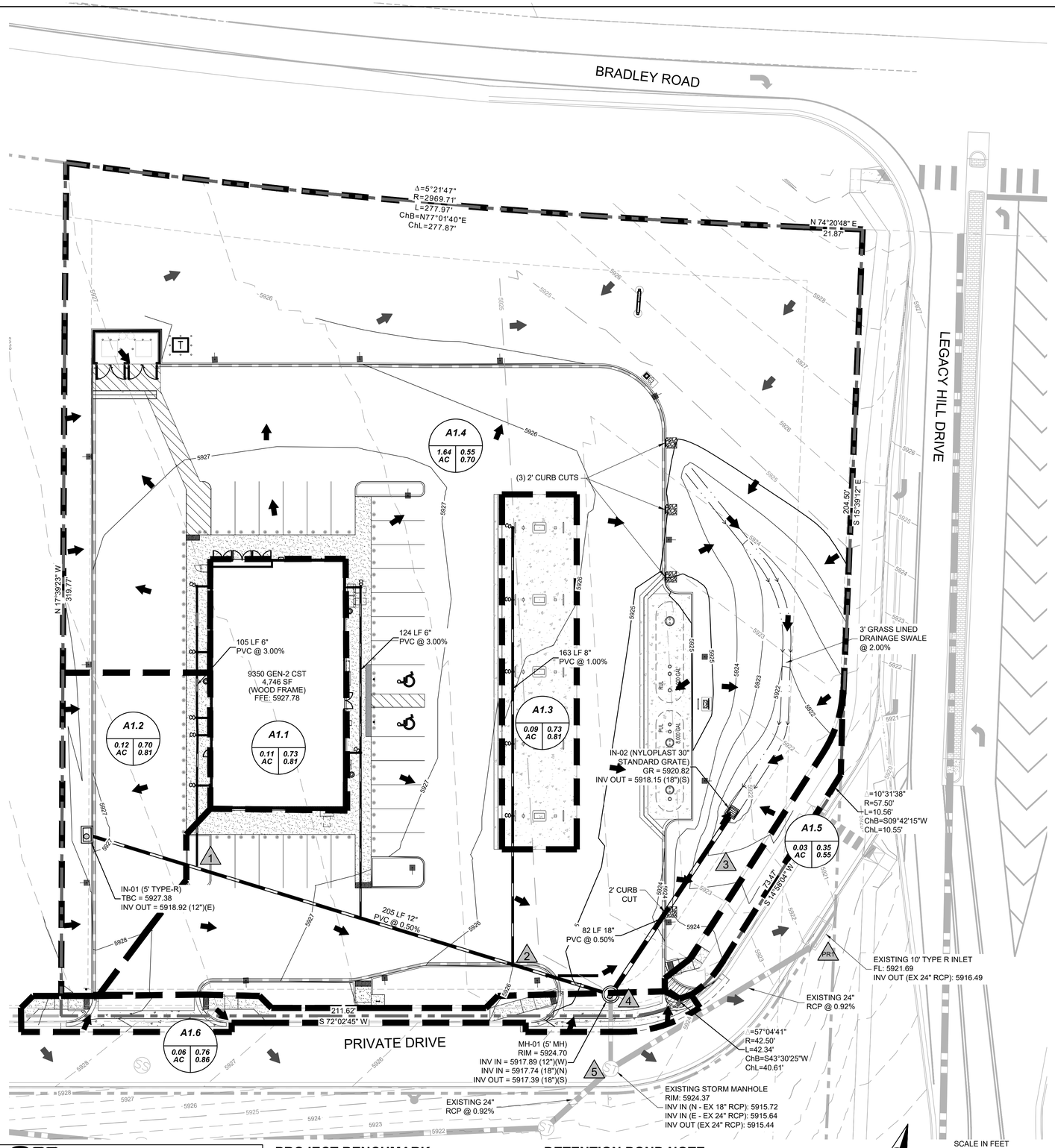
PRELIMINARY
FOR REVIEW ONLY
NOT FOR CONSTRUCTION
Kimley»Horn
Kimley-Horn and Associates, Inc.

PROJECT NO.
196195000

SHEET
DR-1

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

K:\COS_LA\196195000 - Waterview East Commercial\CADD\Exhibits\2026-0310_Final Plat Drainage Exhibit\Final Plat Drainage Exhibit.dwg McCallum, Jessica 7/13/2026 1:21 PM



LEGEND

- BASIN DELINEATION
- EXISTING STORM SEWER LINE
- EXISTING STORM INLET
- FLOW ARROW
- DESIGN POINT
- BASIN DESIGNATION
- 5-YEAR RUNOFF COEFFICIENT
- 100-YEAR RUNOFF COEFFICIENT
- BASIN AREA IN ACRES

DEVELOPED RUNOFF SUMMARY TABLE

DESIGN POINT	TRIBUTARY BASIN	TRIBUTARY AREA (AC)	PERCENT IMPERVIOUSNESS	COEFFICIENT C10	COEFFICIENT C100	TOTAL RUNOFF Q10 (CFS)	TOTAL RUNOFF Q100 (CFS)
1	A1.1	0.11	90.0	0.75	0.81	0.44	0.83
	A1.2	0.12	75.0	0.73	0.81	0.46	0.90
						A1.1+A1.2	**0.90**	**1.73**
2	A1.3	0.09	90.0	0.75	0.81	0.36	0.68
						DP1 + A1.3	**1.26**	**2.41**
3	A1.4	1.64	57.3	0.59	0.70	5.13	10.70
						A1.4	**5.13**	**10.70**
						D3+D4	**6.39**	**13.12**
PR1	A1.5	0.03	33.3	0.41	0.55	0.06	0.15
	A1.6	0.06	83.3	0.79	0.86	0.25	0.48
5	Composite	2.05	62.0	0.62	0.72	**6.45**	**13.27**

SCALE IN FEET
0 20 40
1" = 20'
IF BAR DOES NOT MEASURE 1 INCH THEN DRAWING IS NOT TO SCALE

CALL UTILITY NOTIFICATION CENTER OF COLORADO
1-800-922-1987 or 811
CALL 3-BUSINESS DAYS (NOT INCLUDING INITIAL DAY OF CONTACT) IN ADVANCE BEFORE YOU DIG, GRADE, OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES.
Know what's below. Call before you dig.

PROJECT BENCHMARK

COLORADO SPRINGS UTILITY (FIMS) MONUMENT F206
A BERNTSEN TOP SECURITY MONUMENT SYSTEM WITH A 3.5 INCH DIAMETER ALUMINUM CAP IN A ROAD BOX, LOCATED AT THE NORTHWEST CORNER OF FONTAINE BOULEVARD AND POWERS BOULEVARD (NOW HIGHWAY 21)
ELEVATION - 5897.89' (NGVD 1929)

DETENTION POND NOTE

EXISTING STORMWATER POND SOUTH OF PRIVATE DRIVE TO TREAT AND DETAIN STORMWATER RUNOFF - REVIEW TO WATERVIEW-EAST COMMERCIAL PLAN FOR ADDITIONAL INFORMATION

PCD FILE NO. PPR-2614

P:\LASCO\CO, EL PASO COUNTY - BRADLEY RD AT LEGACY HILL\09 CAD\DRAINAGE\CX-X-DEVELOPED DRAINAGE MAP.DWG - Michael D'agg - 7/28/2026 10:43:25 AM

K2 CIVIL CONSULTANTS

PRELIMINARY NOT FOR CONSTRUCTION

MAJOR SITE DEVELOPMENT PLAN
7-ELEVEN - STORE #42975
SITE #1057022
BRADLEY ROAD AND LEGACY DRIVE

DEVELOPED DRAINAGE MAP

No.	REVISION	BY	DATE

PROJECT NO: LAS008.01
DESIGNED BY: MRD
REVIEWED BY: MRD
DATE: 04/24/2026

D1.2