

A final drainage  
report is required at  
this Site Development  
stage

**PRELIMINARY DRAINAGE STUDY  
FOR  
MAVERIK INC. – SITE CODE CO-0258  
1-25 & COUNTY LINE ROAD  
MONUMENT, CO**

Add PCD File No.  
PPR-21-054

Jun 10, 2021

Prepared for:  
**Maverik, Inc.**  
**185 South State Street**  
**Salt Lake City, Utah 84111**

Prepared by:  
**Horrocks Engineering**  
**2162 West Grove Pkwy., Suite 400**  
**Pleasant Grove, UT 84062**  
**801-763-5100**  
**[www.horrocks.com](http://www.horrocks.com)**

## ENGINEER'S STATEMENT

This report for the final design of Maverik Store CO-0258 was prepared by me or under my direct supervision in accordance with the provisions of the Urban Storm Drainage Criteria Manual and Environmental Criteria Manual. I understand that Alamosa City does not and will not assume liability for drainage facilities designed by others.

\_\_\_\_\_  
Scott Duffin  
P.E. # 48018  
State of Colorado

Date \_\_\_\_\_

Include EPC Engineer's Statement, Developer's Statement & El Paso County Approval Statement/Signature Block.

see link below:  
<https://planningdevelopment.elpasoco.com/planning-community-development/engineering/#1519834362627-c268a2b9-61ec>

# TABLE OF CONTENTS

---

<b>GENERAL LOCATION AND DESCRIPTION .....</b>	<b>6</b>
Site Location .....	6
Site Description .....	6
Proposed Project Description .....	6
<b>DRAINAGE BASINS AND SUB-BASINS .....</b>	<b>6</b>
Major Basin Description .....	6
Site Sub-Basin Description .....	6
<b>DRAINAGE DESIGN CRITERIA .....</b>	<b>6</b>
Hydrology Criteria .....	6
Hydraulic Criteria .....	7
<b>DRAINAGE FACILITY DESIGN .....</b>	<b>7</b>
General Concept .....	7
Specific Details .....	7
Retention .....	8
Storm Sewer and Culverts .....	8
<b>ENVIRONMENTAL PROTECTION CRITERIA .....</b>	<b>9</b>
General .....	9
Sedimentation and Erosion Control Measures .....	9
<b>CONCLUSION .....</b>	<b>9</b>
Compliance with Standards .....	9
Drainage Concept .....	9
Sediment and Erosion Control Concept .....	9
<b>REFERENCES .....</b>	<b>10</b>

Show the "Four-Step Process" for selecting structural BMPs (ECM Section I.7.2 BMP Selection)

## **Index of Figures**

All figures are presented in the appendices

### **Appendix A**

Vicinity Map

Flood Insurance Rate Map

Rainfall Depth-Duration-Frequency-2 and 100-Year, 1-Hour Rainfall

### **Appendix B**

Standard SF-3 Form

Weighted C Coefficient

Rational Method Calculations

ADS SC-740 Stormtech Chamber

final drainage report  
required at this stage

## GENERAL LOCATION AND DESCRIPTION

This report presents the Maverik Convenience preliminary drainage study and drainage system design. The design and analysis of this site has been performed in accordance with the **Drainage Criteria Manual County of El Paso, Colorado, Volume 1, October 2018**. Drawings, tables, and design calculations are included in the appendix of this report.

### Site Location

The site is located at the southwest corner of 1-25 and El Paso County, CO (APN: 71022-00-001).

There are no adjacent developments at the time of this report.

City of Colorado Springs/El Paso County Drainage Criteria Manual, as revised November 1991 & October 1994 with County adopted Chapter 6 & Section 3.2.1 of Chapter 13 of the City of Colorado Springs Drainage Criteria Manual as revised in May 2014 & Chapter 3 of the El Paso County Engineering Criteria Manual revised November 2019.

### Site Description

The site is approximately 4.98 acres in size. The topography slopes ranging from 2% to 15%. The soils within the site are mostly clayey sand in nature (GeoStrata, No. 1092-06). There is a moderate amount of brush, trees, and grasses on the site.

### Proposed Project Description

Include hydrologic soil group.

The project consists of a 5,951 sf convenience store, parking, patio, and (2) fuel canopies. The area will also include miscellaneous fuel systems, underground tanks, pumps and facilities typical to the operation of an automotive fuel center.

## DRAINAGE BASINS AND SUB-BASINS

### Major Basin Description

The site is located within El Paso, County adjacent to I-25. The drainage basins established previously by the existing center will be maintained. The basins, which drain into two separate designed underground detention systems.

What existing center? Need existing drainage calculations & map. Reference any previous reports if used. Discuss offsite drainage.

The site is located outside the 100-year floodplain as indicated on the Flood Insurance Rate Map Community-Panel Number 08041C0065G, dated April 7, 2018 for El Paso County, Colorado (Appendix A).

### Site Sub-Basin Description

There are two major basins on site and it will be used for storm sewer systems. The north major basin will be sub-basin E and the south major basin will be sub-basin F (Appendix B).

Include statement about what major drainage basin site is located in.

the effective date is December 7, 2018. please revise

(Bald Mountain PLPL0200)

## DRAINAGE DESIGN CRITERIA

### Hydrology Criteria

Drainage Criteria Manual Volume 1 of El Paso County, Colorado was used for the storm drainage system design.

The following criteria were utilized in developing the proposed drainage system.

- The proposed drainage system is designed to retain stormwater on site.

detain

detention

- The proposed drainage system attempts to limit the diversion of storm runoff from one basin to another (basin transfer).
- Runoff generated from drainage sub-basins is conveyed either directly or via storm sewer systems or channels to outfall locations into the proposed retention facility.

Design Rainfall: El Paso County rainfall frequency storm is used as the  
 Runoff Calculation: Peak storm runoff  
 see link for runoff coefficients table 6-6  
[https://library.municode.com/co/el\\_paso\\_county/codes/drainage\\_criteria\\_manual?nodeId=VO1UP\\_CH6HY\\_3.0RAME](https://library.municode.com/co/el_paso_county/codes/drainage_criteria_manual?nodeId=VO1UP_CH6HY_3.0RAME)

refer to table 6-2 for rainfall depths

Q = CIA:  
 Q = storm runoff in CFS;  
 C = runoff coefficient based on surface impermeability  
 I = rainfall intensity in inches per hour; and  
 A = drainage basin area in acres

Update references to Tables from EPC DCM.

El Paso County Imperviousness Values (Table RO-3) and Runoff Coefficients (Table RO-5) are used to develop basin runoff coefficients. The runoff coefficients are weighted for each applicable sub-basin to more accurately reflect the runoff characteristics of the site.

Also, underground storm water quality is not allowed per criteria (ECM App. I.7.3) without a deviation request. Be aware that submittal of a deviation request does not imply that it will be approved.

...determined using the criteria in Sections 5.2.3 of the Drainage Criteria

Refer to CSDCM Vol 1 chapter 6 for time of concentration calculation criteria

...determined using NOAA Point Puff Method...  
 The recurrence intervals used for this study were based on a commercial land use. The major drainage system is designed for a 100-year recurrence interval

Per Table 6-1 for local street, max depth at gutter line is 12 inches.

### Hydraulic Criteria

The following criteria were utilized in determining allowable street flow.

Major Storm (100-yr)

Local Street – Maximum 18-inch flow depth at the gutter line.

Minor storm criteria (5-year)?

...capacities were determined using Section 6.2 of the design manual for Maximum Allowable Gutter Capacity for Initial Storm Runoff.

## DRAINAGE FACILITY DESIGN

Show location of UG detention facilities on Drainage Map and on GEC Plans. A deviation request will also need to be submitted for EPC review, since UG detention is not an approved alternative to above ground full-spectrum detention pond(s).

### General Concept

All runoff from the site will be conveyed to designed underground detention facilities on the north and south side of the site. Runoff will then be released into a drainage ditch to the east at a rate that will not exceed historical flows.

address water quality. refer to ECM appendix I

Include Variance write up for underground detention.

### Specific Details

The proposed development has been divided into six basins: Basin A, B, D, Basin E, and Basin F. Drainage maps, presenting the drainage basin delineations as well as existing and proposed drainage facilities, can be found in Appendix B.

The following text generally describes basin conveyance to design points. Hydrologic calculations for each sub-basin are presented in the rational method SF-3 forms in Appendix B of this report.

please provide existing drainage map and description of the existing sub-basins

State project site is approximately 4.9 acres, but basins only add to 3.5 acres. Where is the additional 1.4 acres?

You discuss open space flow within each basin, but majority of basins are not open space. Please expand and clarify basin descriptions.

*Basin A*, 0.37 acres, is located at the northwest portion of the site. The open space flow is directed to a catch basin west of the parking stalls, noted as Design Point 4 and then flows north to the north underground detention facility.

*Basin B*, 0.60 acres, is located at the northeast portion of the site and east of the forecourt fuel island. The open space flow travels to a catch basin on the northeast side of the site, noted as Design Point 5 and then flows west to the north underground detention facility.

*Basin C*, is 0.28 acres, is a small area located directly south of the building. The open space flow is directed to an area drain that is southeast of the trash enclosure, noted as Design Point 1, which then flows north through a series of pipes and structures to the north underground detention facility. **Please discuss and analyze the proposed disturbance for the access from Beacon Lite Rd to this lot. Identify how this area is being captured by your water quality facility or if an exclusion applies (refer to ECM appendix I.7).**

*Basin D*, is 0.51 acres, is located south of Basin C and covers the southwest area of the site. The open space flow is directed towards a waterway on the west side of the forecourt fuel island. The waterway then takes the runoff north towards an area drain on the south side of the forecourt fuel island, noted as Design Point 2 and then flows north through a series of pipes and structures to the north underground detention facility. **label on the drainage plan**

*Basin E* is 0.46 acres, is located directly east of the building. The open space flow is directed to the waterway on the west side of the forecourt fuel island and will then continue north to an area drain, noted as Design Point 3. Flows will continue north and west towards the north underground detention facility. **List which detention facility.**

*Basin F* is 1.27 acres, is located on the most southern and southeastern portion of the site. Open space flow will travel east and northeast to a catch basin, noted as Design Point 6, and will then be directed to the southern underground detention facility.

### Detention

show this release point and subsequent conveyance to CDOT ditch on Drainage Map below.

Discuss where existing ditch goes and releases at.

Runoff from the proposed site will be collected by an underground ADS stormtech chamber and then released into the drainage ditch in the CDOT right-of-way below historical flow rates. Based on calculations in this report, the historical flow rate for the 100-year storm is 6.53 cfs. Calculations for the north chamber show that it will require a storage of 10,305 cu. ft. and the south chamber will require a storage of 2,656 cu. ft. Once stormwater has entered the chambers, it will then be release into the drainage ditch on the east side as it has historically done. Specifications, calculations, and installation information for the stormtech chambers has been provided to show that is has been property sized for the site (see Appendix B).

Need to include calculations for sizing detention facilities.

Please include stormtech information in the appendix

### Storm Sewer and Culverts

Storm sewer piping will be generally designed to accommodate the 10-year storm event. In all cases, pipe velocities at the outlet are kept below 12 fps to minimize the need for energy dissipation or reinforcement at bends. Pipe velocities greater than 3 fps during a 2-year event are desirable to keep the pipe free of debris. To determine required pipe sizes, pipe networks will be modeled using Manning's Equation based upon worst case flow.

Pipe	Slope	n	Diam	Q calc	V (Full Flow)
	(%)		(in)	(cfs)	(fps)
8" HDPE	0.74	0.01	8	1.35	3.87
12" HDPE	0.85	0.01	12	4.27	5.44
18" HDPE	0.75	0.01	18	6.69	11.83

There are no culverts proposed for the site.



# ENVIRONMENTAL PROTECTION CRITERIA

---

## General

Please clarify sentence.

There are no wetland areas on the site or are there any threatened or endangered species.

## Sedimentation and Erosion Control Measures

During construction, silt fence, inlet and outlet protection and vehicle tracking pads will be utilized to prevent sediment entering the storm sewer system or sediment leaving the site. All other open space areas will be landscaped. The erosion control plan is part of the Final Construction Plans for Maverik. All erosion and sediment control methods shall be maintained and repaired by the owner during construction and shall be inspected after each heavy precipitation event.

Please indicate whether or not the drainage due to this development will adversely affect the surrounding or downstream properties

## CONCLUSION

---

### Compliance with Standards

The drainage system for Maverik Site Code CO-0258 was designed to meet the Drainage Criteria Manual Volume 1 of El Paso County. The site does not include any F.E.M.A. mapped floodplains. The existing Flood Insurance Rate Map (F.I.R.M) is presented in Appendix A and shows no portion of the site to be in a flood hazard area. No map revisions are required as part of this development.

### Drainage Concept

detained

The drainage system for Maverik Site Code CO-0258 was designed to allow stormwater to be safely conveyed away from the building and retained onsite. The drainage concepts proposed for this site are in accordance with those presented in this report.

### Sediment and Erosion Control Concept

The construction BMP's proposed for this site follow the Attention to proper installation and maintenance are control practices to function properly.

Please be sure to address the following in your deviation request for the underground detention/water quality facility.

- Outlet structure design
- How does it meet the County's full spectrum detention criteria?
- How does it meet the County's stormwater quality criteria? What base design standard from ECM appendix I.7 is the facility providing?
- O&M manual that answers the following:
  - How is water quality component cleaned/maintained?
  - How is detention component cleaned/maintained
  - How are inspections performed. Is a confined space entry required? Are special tools required?
  - Frequency of inspections/maintenance
- Compliance with the State (water rights, release rates, any other state requirements)

Include section for Drainage Fees. Can simply state that no fees will be due unless the site is platted.

Include section on maintenance of detention facilities.

Please refer to Drainage criteria manual Volume 1 Ch4 for final drainage report guidelines.

[https://library.municode.com/co/el\\_paso\\_county/codes/drainage\\_criteria\\_manual?nodeId=DRCRMAVO1ELPACO\\_SIDRPOCRFI\\_CH4REGU\\_4.4FIDRREFD](https://library.municode.com/co/el_paso_county/codes/drainage_criteria_manual?nodeId=DRCRMAVO1ELPACO_SIDRPOCRFI_CH4REGU_4.4FIDRREFD)

## REFERENCES

---

1. Drainage Criteria Manual of El Paso County, Colorado, *Drainage Criteria Manual, Volumes 1 & 2*, October 2018.

Include all references used & update this reference based on previous comment.

## APPENDIX A

---

- **VICINITY MAP**
- **FLOOD INSURANCE RATE MAP**
- **NOAA RAINFALL DEPTH-DURATION-FREQUENCY—2 AND 100-YEAR, 1-HOUR RAINFALL**

Include a NRCS soils map





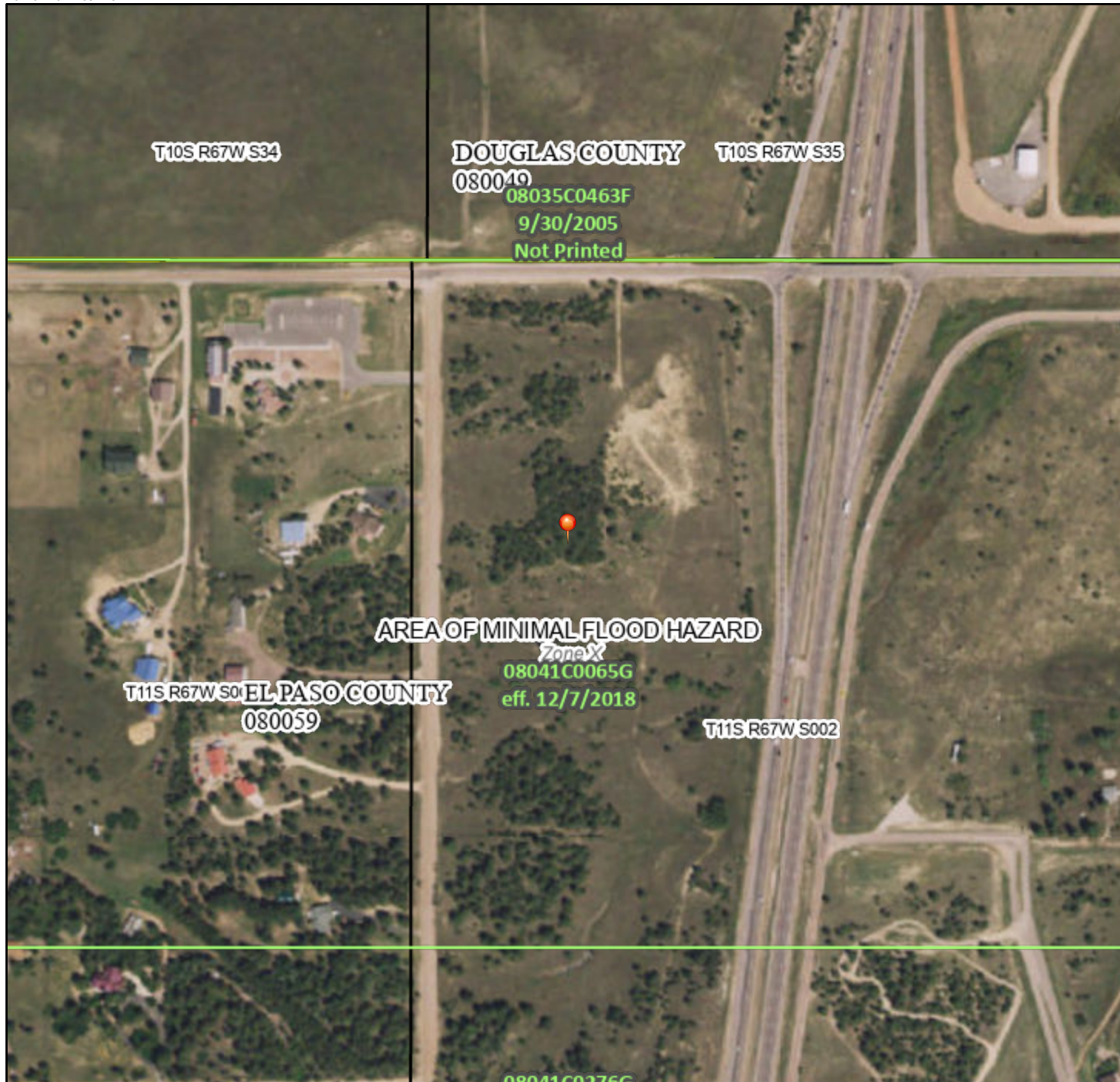
VICINITY MAP  
NOT TO SCALE



# National Flood Hazard Layer FIRMette



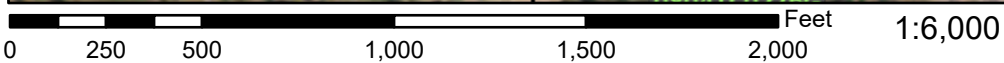
104°52'18"W 39°7'54"N



## Legend

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

- |                                    |  |  |
|------------------------------------|--|--|
| <b>SPECIAL FLOOD HAZARD AREAS</b>  |  | Without Base Flood Elevation (BFE)<br><i>Zone A, V, A99</i>  |
|                                    |  | With BFE or Depth <i>Zone AE, AO, AH, VE, AR</i>   |
|                                    |  | Regulatory Floodway  |
| <b>OTHER AREAS OF FLOOD HAZARD</b> |  | 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile <i>Zone X</i> |
|                                    |  | Future Conditions 1% Annual Chance Flood Hazard <i>Zone X</i>  |
|                                    |  | Area with Reduced Flood Risk due to Levee. See Notes. <i>Zone X</i>  |
|                                    |  | Area with Flood Risk due to Levee <i>Zone D</i>  |
| <b>OTHER AREAS</b>                 |  | NO SCREEN Area of Minimal Flood Hazard <i>Zone X</i>   |
|                                    |  | Effective LOMRs  |
| <b>GENERAL STRUCTURES</b>          |  | Area of Undetermined Flood Hazard <i>Zone D</i>  |
|                                    |  | Channel, Culvert, or Storm Sewer   |
|                                    |  | Levee, Dike, or Floodwall  |
| <b>OTHER FEATURES</b>              |  | 20.2 Cross Sections with 1% Annual Chance  |
|                                    |  | 17.5 Water Surface Elevation   |
|                                    |  | Coastal Transect   |
|                                    |  | Base Flood Elevation Line (BFE)  |
|                                    |  | Limit of Study   |
| <b>MAP PANELS</b>                  |  | Jurisdiction Boundary  |
|                                    |  | Coastal Transect Baseline  |
|                                    |  | Profile Baseline   |
|                                    |  | Hydrographic Feature   |
|                                    |  | Digital Data Available   |
|                                    |  | No Digital Data Available  |
|                                    |  | Unmapped   |
|                                    |  | The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.                                     |



104°51'41"W 39°7'27"N

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

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

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 6/10/2021 at 3:05 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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



**NOAA Atlas 14, Volume 8, Version 2**  
**Location name: Colorado, USA\***  
**Latitude: 39.1288°, Longitude: -104.8659°**  
**Elevation: 7344.01 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**

<b>PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)<sup>1</sup></b>										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
<b>5-min</b>	<b>0.247</b> (0.202-0.299)	<b>0.315</b> (0.258-0.383)	<b>0.430</b> (0.351-0.523)	<b>0.527</b> (0.428-0.643)	<b>0.665</b> (0.521-0.835)	<b>0.773</b> (0.591-0.981)	<b>0.885</b> (0.653-1.14)	<b>1.00</b> (0.707-1.32)	<b>1.16</b> (0.785-1.56)	<b>1.28</b> (0.844-1.74)
<b>10-min</b>	<b>0.361</b> (0.296-0.438)	<b>0.461</b> (0.378-0.560)	<b>0.629</b> (0.513-0.765)	<b>0.772</b> (0.626-0.942)	<b>0.973</b> (0.763-1.22)	<b>1.13</b> (0.866-1.44)	<b>1.30</b> (0.956-1.67)	<b>1.47</b> (1.03-1.93)	<b>1.69</b> (1.15-2.28)	<b>1.87</b> (1.24-2.54)
<b>15-min</b>	<b>0.440</b> (0.361-0.535)	<b>0.563</b> (0.461-0.683)	<b>0.767</b> (0.626-0.934)	<b>0.941</b> (0.764-1.15)	<b>1.19</b> (0.930-1.49)	<b>1.38</b> (1.06-1.75)	<b>1.58</b> (1.17-2.04)	<b>1.79</b> (1.26-2.35)	<b>2.07</b> (1.40-2.78)	<b>2.28</b> (1.51-3.10)
<b>30-min</b>	<b>0.576</b> (0.472-0.699)	<b>0.737</b> (0.604-0.895)	<b>1.01</b> (0.821-1.23)	<b>1.24</b> (1.00-1.51)	<b>1.56</b> (1.22-1.96)	<b>1.81</b> (1.38-2.30)	<b>2.07</b> (1.53-2.67)	<b>2.34</b> (1.65-3.08)	<b>2.70</b> (1.83-3.63)	<b>2.98</b> (1.97-4.05)
<b>60-min</b>	<b>0.725</b> (0.594-0.880)	<b>0.895</b> (0.733-1.09)	<b>1.19</b> (0.973-1.45)	<b>1.46</b> (1.18-1.78)	<b>1.85</b> (1.46-2.34)	<b>2.17</b> (1.66-2.77)	<b>2.51</b> (1.86-3.26)	<b>2.87</b> (2.04-3.80)	<b>3.38</b> (2.30-4.56)	<b>3.78</b> (2.50-5.14)
<b>2-hr</b>	<b>0.873</b> (0.721-1.05)	<b>1.05</b> (0.868-1.27)	<b>1.38</b> (1.13-1.66)	<b>1.68</b> (1.37-2.03)	<b>2.13</b> (1.70-2.70)	<b>2.52</b> (1.96-3.21)	<b>2.94</b> (2.20-3.81)	<b>3.40</b> (2.43-4.49)	<b>4.05</b> (2.78-5.45)	<b>4.58</b> (3.05-6.18)
<b>3-hr</b>	<b>0.981</b> (0.813-1.18)	<b>1.15</b> (0.953-1.38)	<b>1.48</b> (1.22-1.77)	<b>1.79</b> (1.47-2.16)	<b>2.29</b> (1.84-2.90)	<b>2.73</b> (2.13-3.47)	<b>3.21</b> (2.41-4.15)	<b>3.74</b> (2.69-4.93)	<b>4.51</b> (3.12-6.07)	<b>5.15</b> (3.44-6.92)
<b>6-hr</b>	<b>1.19</b> (0.995-1.42)	<b>1.38</b> (1.15-1.64)	<b>1.76</b> (1.46-2.09)	<b>2.12</b> (1.75-2.53)	<b>2.71</b> (2.20-3.42)	<b>3.23</b> (2.54-4.09)	<b>3.81</b> (2.89-4.90)	<b>4.46</b> (3.24-5.85)	<b>5.41</b> (3.76-7.23)	<b>6.20</b> (4.16-8.27)
<b>12-hr</b>	<b>1.45</b> (1.22-1.71)	<b>1.72</b> (1.44-2.02)	<b>2.21</b> (1.84-2.60)	<b>2.67</b> (2.21-3.16)	<b>3.38</b> (2.74-4.19)	<b>3.98</b> (3.14-4.97)	<b>4.65</b> (3.53-5.90)	<b>5.37</b> (3.91-6.96)	<b>6.41</b> (4.48-8.49)	<b>7.27</b> (4.92-9.64)
<b>24-hr</b>	<b>1.76</b> (1.48-2.05)	<b>2.09</b> (1.76-2.44)	<b>2.68</b> (2.26-3.14)	<b>3.22</b> (2.69-3.78)	<b>4.03</b> (3.28-4.93)	<b>4.70</b> (3.73-5.79)	<b>5.42</b> (4.14-6.81)	<b>6.20</b> (4.54-7.95)	<b>7.30</b> (5.13-9.57)	<b>8.19</b> (5.58-10.8)
<b>2-day</b>	<b>2.09</b> (1.78-2.42)	<b>2.45</b> (2.08-2.83)	<b>3.08</b> (2.61-3.57)	<b>3.65</b> (3.07-4.25)	<b>4.51</b> (3.69-5.46)	<b>5.22</b> (4.16-6.38)	<b>5.99</b> (4.60-7.45)	<b>6.81</b> (5.01-8.66)	<b>7.97</b> (5.64-10.4)	<b>8.91</b> (6.11-11.7)
<b>3-day</b>	<b>2.26</b> (1.93-2.60)	<b>2.66</b> (2.27-3.06)	<b>3.35</b> (2.85-3.87)	<b>3.97</b> (3.35-4.60)	<b>4.88</b> (4.01-5.87)	<b>5.63</b> (4.50-6.83)	<b>6.43</b> (4.96-7.95)	<b>7.27</b> (5.37-9.20)	<b>8.46</b> (6.00-10.9)	<b>9.40</b> (6.47-12.3)
<b>4-day</b>	<b>2.40</b> (2.05-2.75)	<b>2.83</b> (2.41-3.24)	<b>3.57</b> (3.04-4.10)	<b>4.22</b> (3.57-4.86)	<b>5.17</b> (4.25-6.18)	<b>5.95</b> (4.77-7.18)	<b>6.77</b> (5.23-8.34)	<b>7.64</b> (5.65-9.62)	<b>8.85</b> (6.29-11.4)	<b>9.81</b> (6.77-12.8)
<b>7-day</b>	<b>2.80</b> (2.41-3.18)	<b>3.25</b> (2.79-3.70)	<b>4.03</b> (3.45-4.60)	<b>4.73</b> (4.02-5.41)	<b>5.75</b> (4.75-6.82)	<b>6.58</b> (5.30-7.89)	<b>7.47</b> (5.80-9.14)	<b>8.40</b> (6.26-10.5)	<b>9.72</b> (6.95-12.5)	<b>10.8</b> (7.47-13.9)
<b>10-day</b>	<b>3.17</b> (2.73-3.58)	<b>3.64</b> (3.14-4.12)	<b>4.46</b> (3.83-5.07)	<b>5.20</b> (4.44-5.92)	<b>6.27</b> (5.21-7.41)	<b>7.16</b> (5.79-8.54)	<b>8.09</b> (6.31-9.86)	<b>9.09</b> (6.79-11.3)	<b>10.5</b> (7.52-13.4)	<b>11.6</b> (8.07-14.9)
<b>20-day</b>	<b>4.19</b> (3.64-4.70)	<b>4.80</b> (4.17-5.39)	<b>5.83</b> (5.04-6.56)	<b>6.73</b> (5.78-7.59)	<b>8.01</b> (6.67-9.33)	<b>9.03</b> (7.34-10.7)	<b>10.1</b> (7.92-12.2)	<b>11.2</b> (8.42-13.8)	<b>12.7</b> (9.19-16.1)	<b>13.9</b> (9.78-17.8)
<b>30-day</b>	<b>5.03</b> (4.38-5.60)	<b>5.77</b> (5.02-6.43)	<b>6.99</b> (6.06-7.81)	<b>8.02</b> (6.92-9.00)	<b>9.46</b> (7.88-10.9)	<b>10.6</b> (8.62-12.4)	<b>11.7</b> (9.21-14.0)	<b>12.9</b> (9.71-15.8)	<b>14.5</b> (10.5-18.2)	<b>15.7</b> (11.0-20.0)
<b>45-day</b>	<b>6.07</b> (5.31-6.72)	<b>6.96</b> (6.09-7.72)	<b>8.41</b> (7.33-9.35)	<b>9.60</b> (8.31-10.7)	<b>11.2</b> (9.36-12.8)	<b>12.4</b> (10.1-14.4)	<b>13.6</b> (10.7-16.2)	<b>14.9</b> (11.2-18.1)	<b>16.4</b> (11.9-20.5)	<b>17.6</b> (12.5-22.4)
<b>60-day</b>	<b>6.94</b> (6.09-7.67)	<b>7.96</b> (6.98-8.80)	<b>9.59</b> (8.38-10.6)	<b>10.9</b> (9.46-12.1)	<b>12.6</b> (10.5-14.4)	<b>13.9</b> (11.4-16.0)	<b>15.2</b> (12.0-17.9)	<b>16.4</b> (12.4-19.8)	<b>17.9</b> (13.0-22.3)	<b>19.1</b> (13.5-24.1)

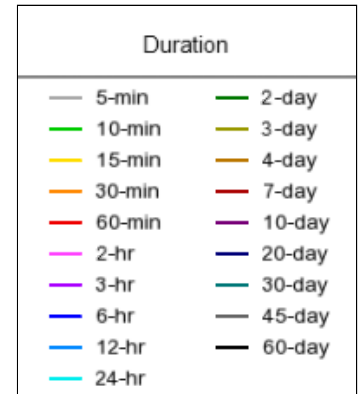
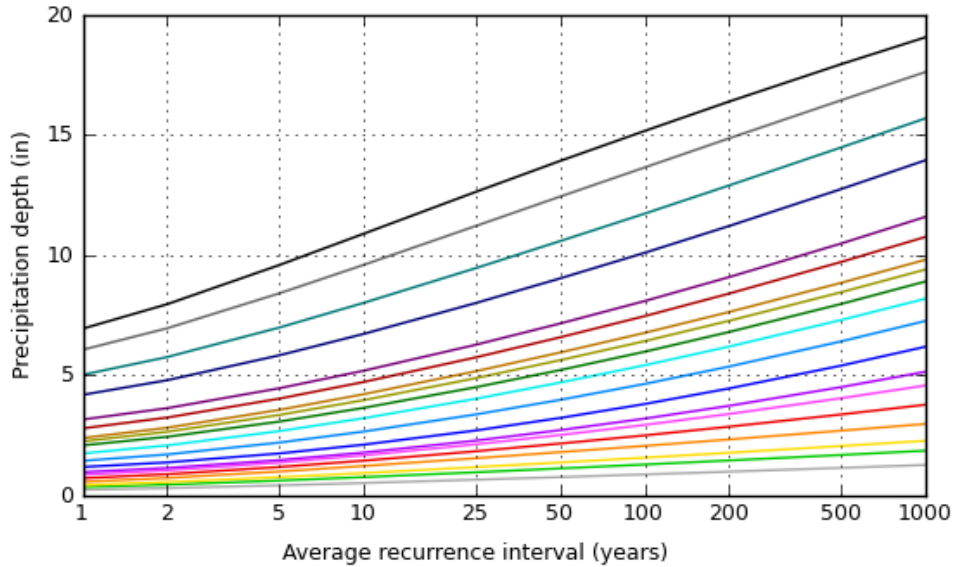
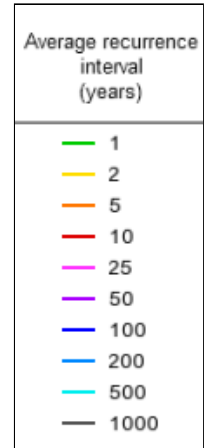
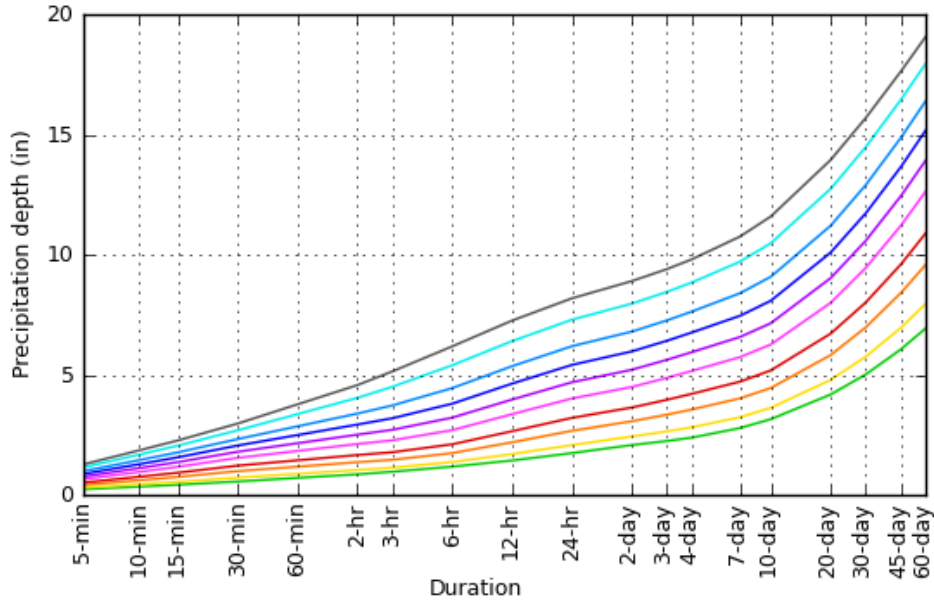
<sup>1</sup> Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration 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.

[Back to Top](#)

**PF graphical**

### PDS-based depth-duration-frequency (DDF) curves

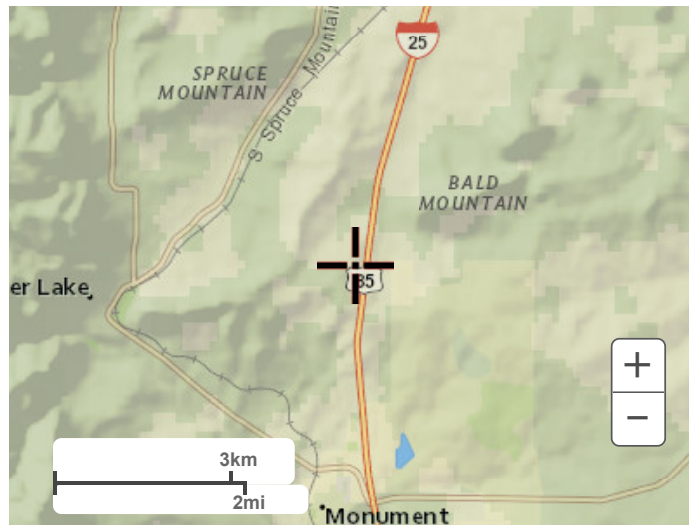
Latitude: 39.1288°, Longitude: -104.8659°



[Back to Top](#)

### Maps & aerials

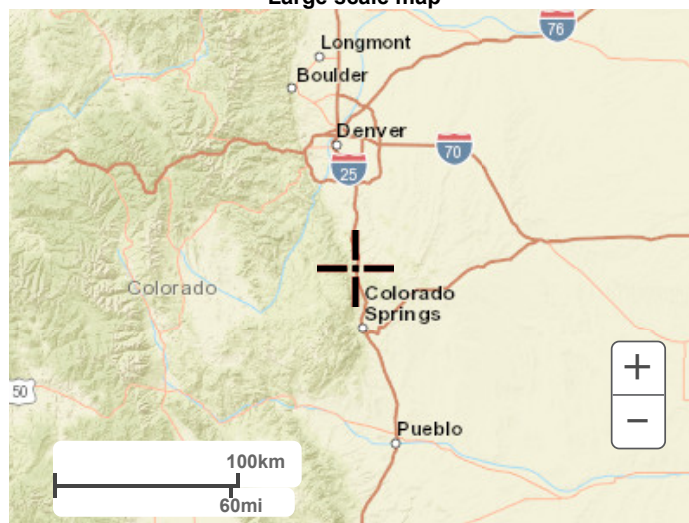
Small scale terrain



Large scale terrain

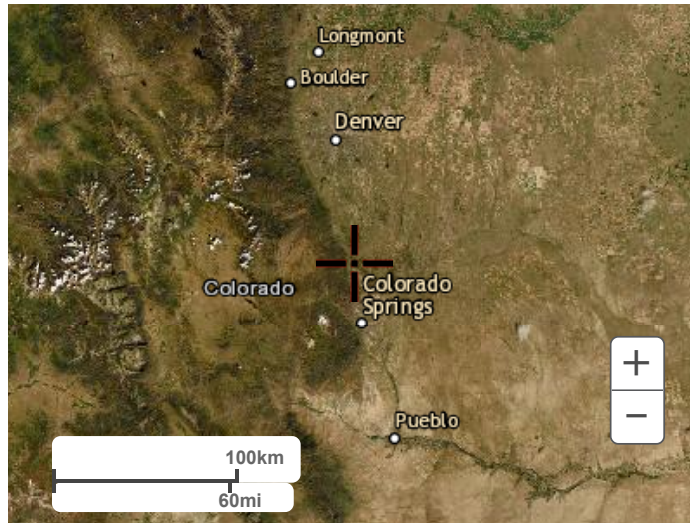


Large scale map



Large scale aerial





[Back to Top](#)

---

[US Department of Commerce](#)  
[National Oceanic and Atmospheric Administration](#)  
[National Weather Service](#)  
[National Water Center](#)  
1325 East West Highway  
Silver Spring, MD 20910  
Questions?: [HDSC.Questions@noaa.gov](mailto:HDSC.Questions@noaa.gov)

[Disclaimer](#)

## APPENDIX B

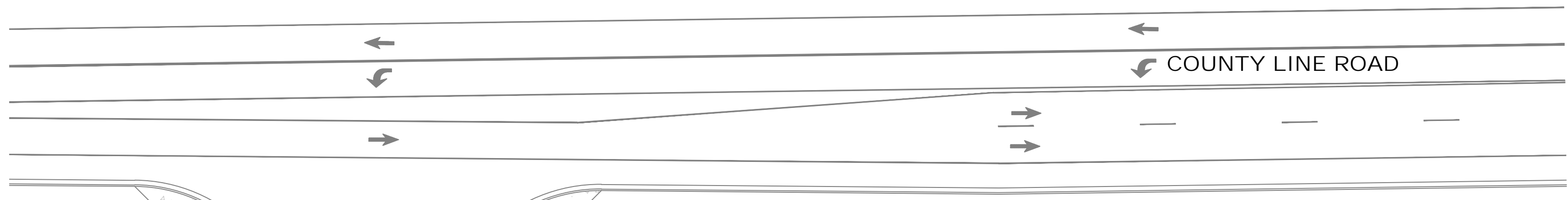
---

- **STANDARD SF-3 FORM**
- **WEIGHTED C COEFFICIENT**
- **RATIONAL METHOD CALCULATIONS**
- **ADS SC-740 STORMTECH CHAMBER**

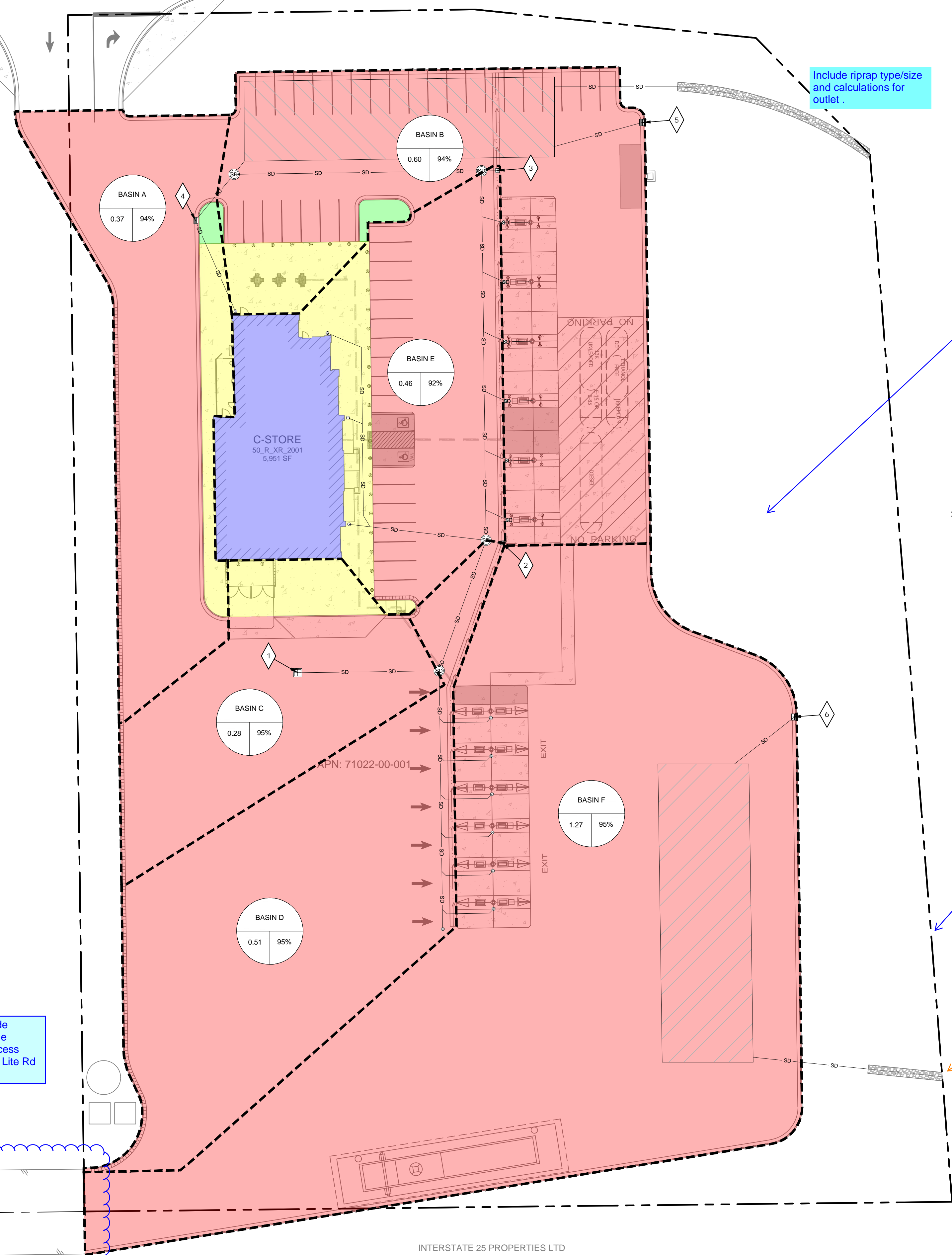
Missing SF-3 form, rational Method spreadsheets and StormTech information sheets. Please include.

Include detention pond spreadsheets for sizing of facilities.

include hydraulic calculations



please place the drainage maps at the end of the report so that they are the last pages.



- Add existing and proposed grading.
- Include flow arrows.
- Label all high and low points.
- Label detention facilities
- Label all storm drain
- Include all linetypes & symbols used in legend
- Label all existing and proposed easements
- Expand map to west to include access connect at Beacon Light
- Include an existing drainage conditions map.

All land disturbance proposed shall be shown and addressed in the drainage report

Include riprap type/size and calculations for outlet .

Where does this area drain?

Include minor flows in basin table

INTERSTATE - 25

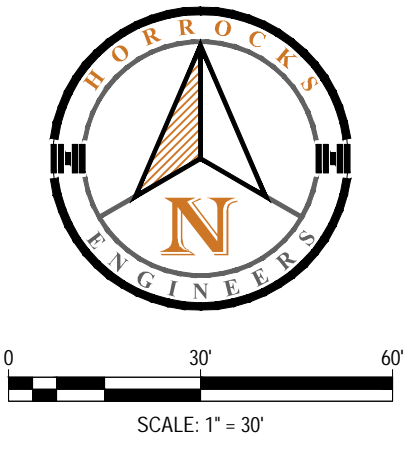
Show ditch that UG detention facility will discharge into, as discussed on Page 7 above.

Label property boundary

Show suitable outfall and discuss in text above.

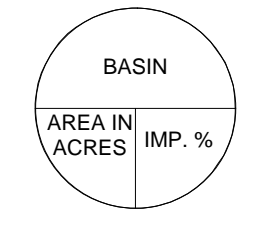
Include riprap type/size and calculations for outlet .

Please include analysis of the proposed access from Beacon Lite Rd to the site



LEGEND

- ROOFS
- PAVEMENT
- OPEN SPACE
- WALKS



BASIN SUMMARY

BASIN	Tc (MIN)	Q100 (CFS)
A	5.44	3.59
B	4.03	1.38
C	3.46	2.61
D	5.88	4.93
E	5.06	4.48
F	4.51	12.83

-Show design point summary table

**HORROCKS ENGINEERS**  
 555 South Bluff St., Suite 101  
 St. George, UT 84770  
 (435) 966-7888  
 www.horrocks.com

**WARNING**  
 IF THIS BAR DOES NOT MEASURE 2" THEN DRAWING IS NOT TO SCALE

DRAWING INFO	REVISIONS
DATE: JUN 11, 2021	REV # DATE
DESIGNED: TMD	
DRAWN: TMD	
CHECKED: ###	
PROJECT: CO-2658-2008	

**MAVERIK GAS STATION**  
 MONUMENT, EL PASO COUNTY, CO  
**DRAINAGE CALCULATION EXHIBIT**

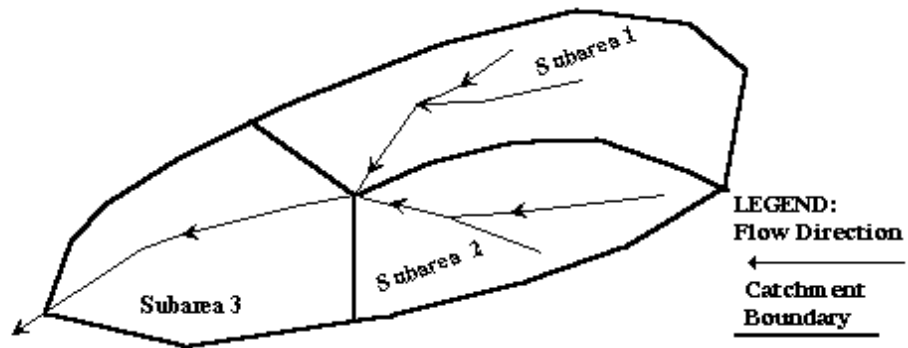


**EXT**  
 PAGE #

## Area-Weighting for Runoff Coefficient Calculation

Project Title: MAVERIK - MONUMENT  
 Catchment ID:  

### Illustration



Instructions: For each catchment subarea, enter values for A and C.

Subarea ID	Area acres	Runoff Coeff.	Product
	A	C*	CA
input	input	input	output
A	0.37	0.94	0.34
B	0.60	0.94	0.56
C	0.28	0.95	0.26
D	0.51	0.95	0.49
E	0.46	0.92	0.42
F	1.27	0.95	1.21
Sum:	3.49	Sum:	3.29

Area-Weighted Runoff Coefficient (sum CA/sum A) = 0.94

\*See sheet "Design Info" for imperviousness-based runoff coefficient values.

**Weighted Runoff Coefficients**  
**Project**  
 Job Number: CO-2658-2008

Calculated By: TMD  
 Checked By: RP  
 Date: 6/11/2021

Include 'C' value corresponding to each % impervious

Proposed/Existing	Roof	IMP%	Soil Types:	Hydrologic Grouping:	Runoff Coefficients:
Existing	Concrete Drive/Walk	90	Numn-Urban, 0-2 % Numn-Urban, 2-5 %	Type D	$C = Kc + (.858i^{1/3} \cdot 786i^{2+ .774i + .04})$ $Kc(2\text{year}) = 0$ $Kc(5\text{year}) = -.10i + .11$ $Kc(10\text{year}) = -.18i + .21$ $Kc(100\text{year}) = -.39i + .46$
	Landscaping	20			
	Paved Street	100			
	Multi-family (attached)	75			
	Commercial	95			
Undeveloped Historical		45			

100%

Historic Basins (existing conditions)	Land Use (Acres)				Weighted Runoff Coefficient							
	Total Area	Roof	Concrete Drive/Walk	Undeveloped Historical	Paved Street	Multi-family	Commercial	C2	C5	C10	C100	%Imp
Basin EX	3.50	0.00	0.00	2.82	0.00	0.00	0.00	0.26	0.33	0.40	0.58	36.3

Proposed Basins (proposed conditions)	Land Use (Acres)				Weighted Runoff Coefficient							
	Total Area	Roof	Concrete Drive/Walk	Landscaping	Paved Street	Multi-family	Commercial	C2	C5	C10	C100	%Imp
Basin A	0.37	0.00	0.00	0.01	0.36	0.00	0.00	0.87	0.88	0.90	0.94	98.9
Basin B	0.60	0.00	0.00	0.01	0.59	0.00	0.00	0.87	0.88	0.90	0.94	99.2
Basin C	0.28	0.00	0.00	0.00	0.28	0.00	0.00	0.89	0.90	0.92	0.96	100.0
Basin D	0.51	0.00	0.00	0.00	0.51	0.00	0.00	0.89	0.90	0.92	0.96	100.0
Basin E	0.46	0.14	0.00	0.00	0.32	0.00	0.00	0.83	0.85	0.87	0.92	96.9
Basin F	1.27	0.00	0.00	0.00	1.27	0.00	0.00	0.89	0.90	0.92	0.96	100.0

TOTAL AREA:  
 TOTAL IMPERVIOUS:

3.49  
 86.56

Report states project area is approximately 4.9 acres. where is additional 1.5 acres?