

# **APPALOOSA HWY 24 SUBDIVISION, FILING NO. 1A, LOT 2**

## **FINAL DRAINAGE REPORT**

### **PREPARED BY**

Mike Bartusek  
RESPEC  
3520 Austin Bluffs Parkway, Suite 102  
Colorado Springs, CO 80918  
719-266-5212

### **PREPARED FOR**

Copetstone General Contractors  
1624 S. 21<sup>st</sup> St.  
Colorado Springs, CO 80904  
719-325-6155

**JULY 1, 2019**

Project Number 03437







**ENGINEER'S STATEMENT:**

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

\_\_\_\_\_  
Michael A. Bartusek, P.E. #23329



**DEVELOPER'S STATEMENT:**

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

By: Nathan Derwick

Nathan Derwick

Title: President

Address: Copestone General Contractors  
1624 S. 21<sup>st</sup> St  
Colorado Springs, CO 80904

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

\_\_\_\_\_  
Jennifer Irvine, County Engineer/ECM Administrator

\_\_\_\_\_  
Date

Conditions:



**FINAL DRAINAGE REPORT**  
**APPALOOSA HWY 24 SUBDIVISION**  
**FILING No. 1A, Lot 2**

**PROJECT DESCRIPTION**

This drainage report is for the development of the Appaloosa Hwy 24 Subdivision, Filing No. 1A, Lot 2. The currently vacant 1.008 acre site is located north of U.S. Hwy 24 and east of Amelia Street. It is further described as the southern portion of Section 7, Township 14 South, Range 65 West of the 6<sup>th</sup> Principal Meridian in El Paso County, Colorado.

All of this lot is located in Sand Creek drainage basin and drains onto Lot 3 and into the central tributary of Sand Creek. An existing 4'x4' box culvert is located at the southeast corner of U.S. Hwy 24 and Amelia St.

**SOILS**

The soil on the site can be described as having a rapid permeability, medium-surface runoff, and moderate to high hazard of erosion. The soils within the site are Truckton Sandy Loams. These soils are classified as Hydrologic Group 'B'.

**FLOODPLAIN STATEMENT**

A small portion of the developed site is located within a designated FEMA 100-year floodplain according to the information published in the Federal Emergency Management Agency Flood Plain Map No. 08041C0754F, dated March 17, 1997, and LOMR 05-08-0368P dated May 23, 2007. This area falls within the existing concrete channel.

**METHOD OF COMPUTATION**

The methodology utilized for this report is in accordance with the *El Paso County Drainage Criteria Manual, Volumes 1*, dated May 2014. The Rational Method for computation of runoff was used for determining Sub-Basin flows.

$Q = c i a$

Where

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

**EXISTING DRAINAGE CONDITIONS**

The existing site has been overlotted graded and is covered with rangeland grasses. The site drains in a southerly direction toward the existing 4' x 4' box culvert under U.S. Hwy 24. Per the Appaloosa Hwy 24 subdivision Filing 1A Drainage Report for Lots 1, 2 & 3 the drainage improvements for the lots will be installed at the time of platting

Lot 1, Sub-basin A1, is located in the northern portion of the subdivision. Sub-basin A1EX will produce flows of 0.2 cfs for the 5-year storm and 1.9 cfs for the 100-year storm. These flows will continue south and be intercepted by a proposed swale located along the southerly property line. The flows will then travel west to a proposed type 'C' inlet at the southwest corner of the lot. An 18" HDPE storm sewer will transport these flows through Lot 2.



Lot 2, Sub-basin A2EX, is located in the center of the site. Sub-basin A2EX will produce flows of 0.3 cfs for the 5-year storm and 1.9 cfs for the 100-year storm. As with Lot 1 the site flows will be intercepted by a swale located along the southerly property line. These flows will be intercepted by a type 'C' inlet at the southwest corner of the lot. These flows will combine with the flows from Sub-basin A1 at DP1 to produce flows of 0.5 cfs for the 5-year storm and 3.7 cfs for the 100-year storm. An 18" HDPE storm sewer will transport these flows into the proposed EDB in Lot 3.

Lot 3, Sub-basin A3EX, is located in the southern portion of the site. Sub-basin A3EX will produce flows of 0.6 cfs and 4.2 cfs respectively. These flows will be intercepted by a proposed swale located along the south property line and into the proposed EDB. The combined flows into the basin at DP2 will be 1.0 cfs for the 5-year storm and 7.5 cfs for the 100-year storm.

### **DEVELOPED DRAINAGE CONDITIONS**

The developed site will encompass 1.008 acres. The proposed land is zoned I-2 (Limited Industrial). Drainage from the lot will be self-contained with flows intercepted by swales along the property lines and directed into a Type C inlet and transported to an extended detention basin (EDB) facility in the southwest corner of Lot 3 through a private storm sewer

Lot 1, Sub-basin A1, is located in the northern portion of the site. Sub-basin A1 will produce flows of 2.1 cfs for the 5-year storm and 4.5 cfs for the 100-year storm. These flows will continue south and be intercepted by a proposed swale located along the southerly property line. The flows will then travel west to a proposed type 'C' inlet at the southwest corner of the lot. An 18" HDPE storm sewer will transport these flows through Lot 2.

Lot 2, Sub-basin A2, is located in the center of the site. Sub-basin A2 will produce flows of 2.2 cfs for the 5-year storm and 4.5 cfs for the 100-year storm. As with Lot 1 the site flows will be intercepted by a swale located along the southerly property line. These flows will be intercepted by a type 'C' inlet at the southwest corner of the lot. These flows will combine with the flows from Sub-basin A1 at DP1 to produce flows of 4.3 cfs for the 5-year storm and 8.9 cfs for the 100-year storm. An 18" HDPE storm sewer will transport these flows into the proposed EDB in Lot 3. These flows are in conformance with the overall final drainage report for the Appaloosa Hwy 24 Subdivision Filing 1A.

Lot 3, Sub-basin A3, is located in the southern portion of the site. Sub-basin A3 will produce flows of 5.9 cfs and 10.8 cfs respectively. These flows will be intercepted by a proposed swale located along the south property line and into the proposed EDB. The combined flows into the basin at DP2 will be 9.3 cfs for the 5-year storm and 19.2 cfs for the 100-year storm.

The proposed 0.648 ac.ft. Private EDB will reduce the site flows into the existing 4' x 4' box culvert to 0.1 cfs for the 5-year storm and 5.2 cfs for the 100-year storm at DP3.

### **WATER QUALITY AND DETENTION**

Water quality for the site will be achieved within by 0.116 acre-feet of storage, 1.87 ft deep within the 0.648 ac. ft. private extended detention basin (EDB) which will be maintained by the owner of Lot 3. The remainder of the basin will provide the storage volume required for detention. The facility will have an 18" RCP outlet pipe with a 24" restrictor plate located 4.7" above the pipe invert.



## **PRIVATE DRAINAGE FACILITIES**

The proposed drainage improvements will be constructed at the time of plat approval. The storm sewer improvement construction and maintenance will be the responsibility of Platte Valley, LLC until such time as this property is sold. At that time the new adjacent property owners of Lots 1, 2 and 3 will assume the maintenance responsibilities, including the EDB which will be maintained by the owner of Lot 3.

## **DRAINAGE BASIN FEES**

The proposed development is located within the Sand Creek drainage basin. The drainage basin fee for this lot were paid at the time of platting, no additional fees are due at this time.

## **CONCLUSION**

The proposed development and subsequent lot developments follow the "Four Step Process" as mandated by the EPA as follows:

### Step 1: Employ runoff reduction practices

Runoff has been reduced by disconnecting impervious areas where possible, eliminating "unnecessary" impervious areas and encouraging infiltration into suitable soils.

- Impervious areas have been directed to earth swales to encourage infiltration.
- Gravel has been used in portions of the lot to reduce the impervious of the areas.

### Step 2: Stabilize drainageways

All drainageways, ditches and channels have been stabilized by the following methods:

- Tributaries have been left in their relatively natural state where possible.
- New drainageways and swales have been stabilized with either riprap or erosion control fabric depending on the erosion potential.
- No new roadside ditches are proposed for the development.

### Step 3: Provide water quality capture volume (WQCV)

The proposed development will disturb approximately 1.00 acres.

### Step 4: Consider need for industrial and commercial BMP's.

The development of this project will not affect sensitive waters.

The development of this site will have little impact on downstream properties once the EDB is constructed.



## REFERENCES

1. City of Colorado Springs and El Paso County (1994). ***Drainage Criteria Manual Volume 1*** (DCM).
2. City of Colorado Springs and El Paso County (1994). ***Drainage Criteria Manual Volume II*** (DCM).
3. Soil Survey of El Paso County Area, Colorado by USDA, NRCS.
4. ***El Paso County (January 2006) Engineering Criteria Manual.***
5. Urban Drainage and Flood Control District (June 2011). ***Urban Storm Drainage Criteria Manual, Volume 1-3.***
6. Sand Creek Drainage Basin Planning Study (DBPS).
7. Preliminary/Final Drainage Plan and Report for the Appaloosa Hwy 24 Subdivision by Oliver E. Watts, Consulting Engineer, dated November, 2000.
8. Resolution No. 16-336. Board of County Commissioners, County of El Paso, State of Colorado.
9. Preliminary/Final Drainage Report for the Appaloosa Hwy 24 Subdivision Filing 1A by Associated Design Professionals, Inc., dated December, 2018.



## **APPENDIX A**

### **MAPS**





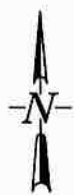
## VICINITY MAP

N.T.S.



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## SOILS MAP

N.T.S.



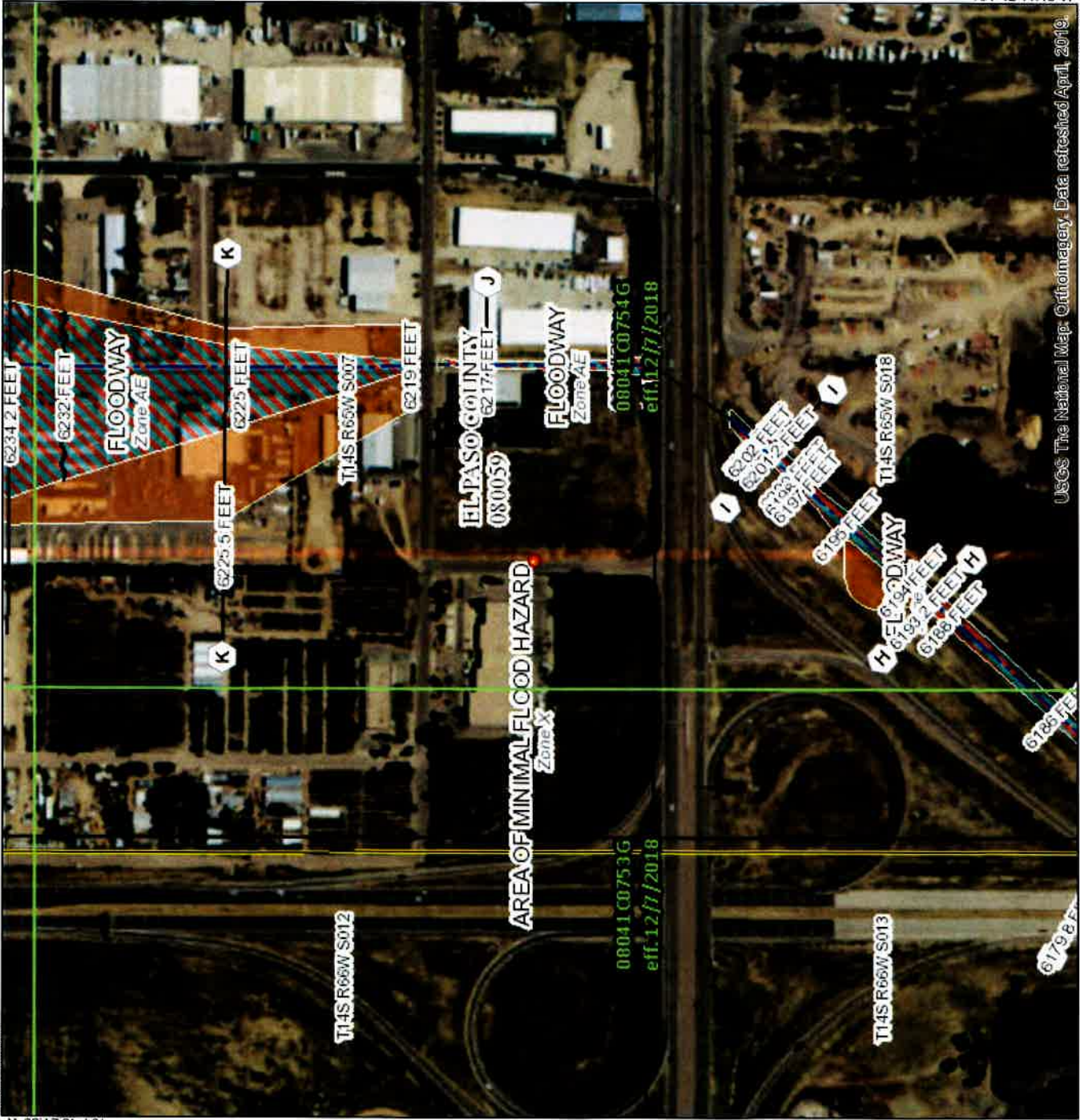
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# National Flood Hazard Layer FIRMette

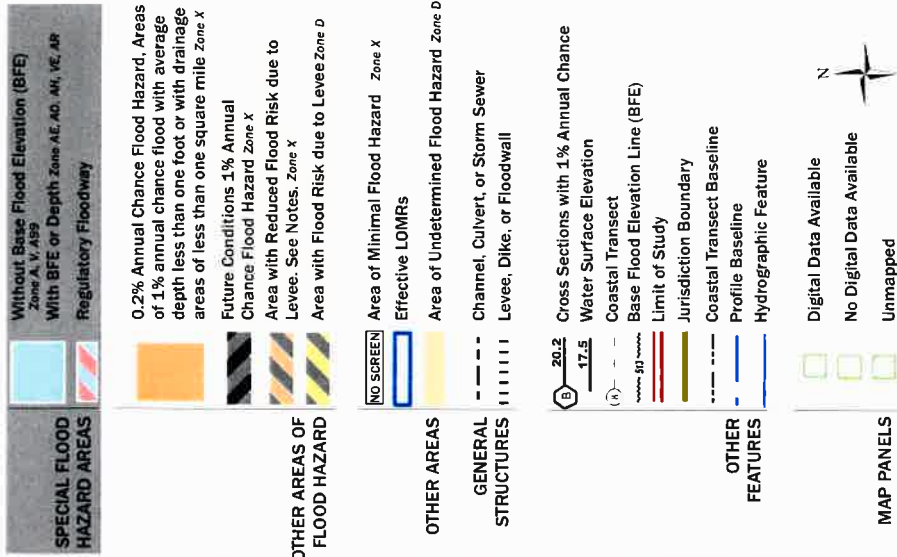


38°50'38.35"N



## Legend

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



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

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

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 8/8/2019 at 1:54:20 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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



**APPENDIX B**

**DESIGN CALCULATIONS**



APPALOOSA SUBDIVISION																					
PROJ. #03437																					
DRAINAGE CALCULATION SHEET																					
file:appaloosa dr																					
12/26/18																					
AREA DESIG	AREA (acre)	C5 (5 yr)	C100 (100 yr)	C5 X A	C100 X A	Initial Tci		Travel Time				TC (min)	I5 (in/hr)	I100 (in/hr)	Q5 (cfs)	Q100 (cfs)	length L (feet)	vel V (fps)	^t (min)	AREA DESIG	
EXISTING CONDITIONS																					
A1	1.00	0.08	0.35	0.08	0.35	100	2.00	15.17	200	1.00	1.00	3.33	18.51	3.04	5.30	0.24	1.86	150	10.00	0.25	A1
A2	1.01	0.08	0.35	0.08	0.35	100	2.00	15.17	200	1.00	1.00	3.33	18.51	3.04	5.30	0.25	1.87			A2	
DP1	2.01			0.16	0.70								18.76	3.01	5.26	0.48	3.70	175	10.00	0.29	DP1
A3	2.57	0.08	0.35	0.21	0.90	100	1.20	17.96	400	1.30	1.20	5.56	23.52	2.67	4.66	0.55	4.19			A3	
DP2	4.58			0.37	1.60								23.52	2.67	4.66	0.98	7.47			DP2	
DEVELOPED CONDITIONS																					
A1	1.00	0.08	0.35	0.08	0.35	100	2.00	15.17	200	1.00	1.00	3.33	18.51	3.04	5.30	0.24	1.86	150	10.00	0.25	A1
A2	1.01	0.08	0.70	0.60	0.71	100	2.00	7.59	300	1.00	1.00	5.00	12.59	3.66	6.40	2.18	4.52			A2	
DP1	2.01			0.68	1.06								18.76	3.01	5.26	2.04	5.56	175	10.00	0.29	DP1
A3	2.57	0.08	0.35	0.21	0.90	100	1.20	17.96	400	1.30	1.20	5.56	23.52	2.67	4.66	0.55	4.19			A3	
DP2	4.58			0.88	1.96								23.52	2.67	4.66	2.35	9.12			DP2	
DP3	4.58			1.46	1.14	Adjusted C Factor for Detention Basin A							23.52	2.67	4.66	3.90	5.30			DP3	
IMPERVIOUS AREA CALC																					
Description	Imperv %																				
UNDEV	0																				
LOOSE GRAVEL	80																				
PAVED PARKING	100																				
BUILDINGS	100																				



**APPENDIX C**

**DESIGN CHARTS**



**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
<b>Business</b>													
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
<b>Residential</b>													
1/8 Acre or less	65	0.41	0.45	0.45	0.49	0.49	0.54	0.54	0.59	0.57	0.62	0.59	0.65
1/4 Acre	40	0.23	0.28	0.30	0.35	0.36	0.42	0.42	0.50	0.46	0.54	0.50	0.58
1/3 Acre	30	0.18	0.22	0.25	0.30	0.32	0.38	0.39	0.47	0.43	0.52	0.47	0.57
1/2 Acre	25	0.15	0.20	0.22	0.28	0.30	0.36	0.37	0.46	0.41	0.51	0.46	0.56
1 Acre	20	0.12	0.17	0.20	0.26	0.27	0.34	0.35	0.44	0.40	0.50	0.44	0.55
<b>Industrial</b>													
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
<b>Parks and Cemeteries</b>	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
<b>Undeveloped Areas</b>													
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
<b>Streets</b>													
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
<b>Drive and Walks</b>	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



Figure 6-25. Estimate of Average Concentrated Shallow Flow

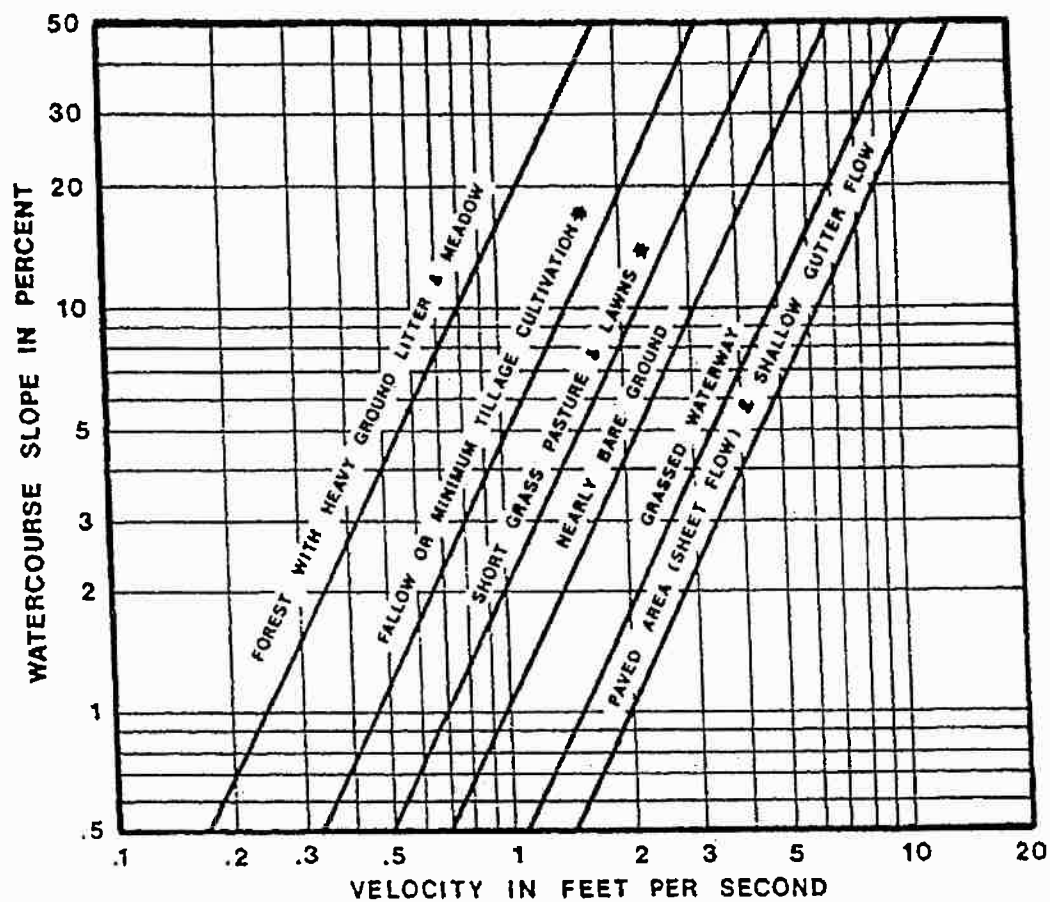
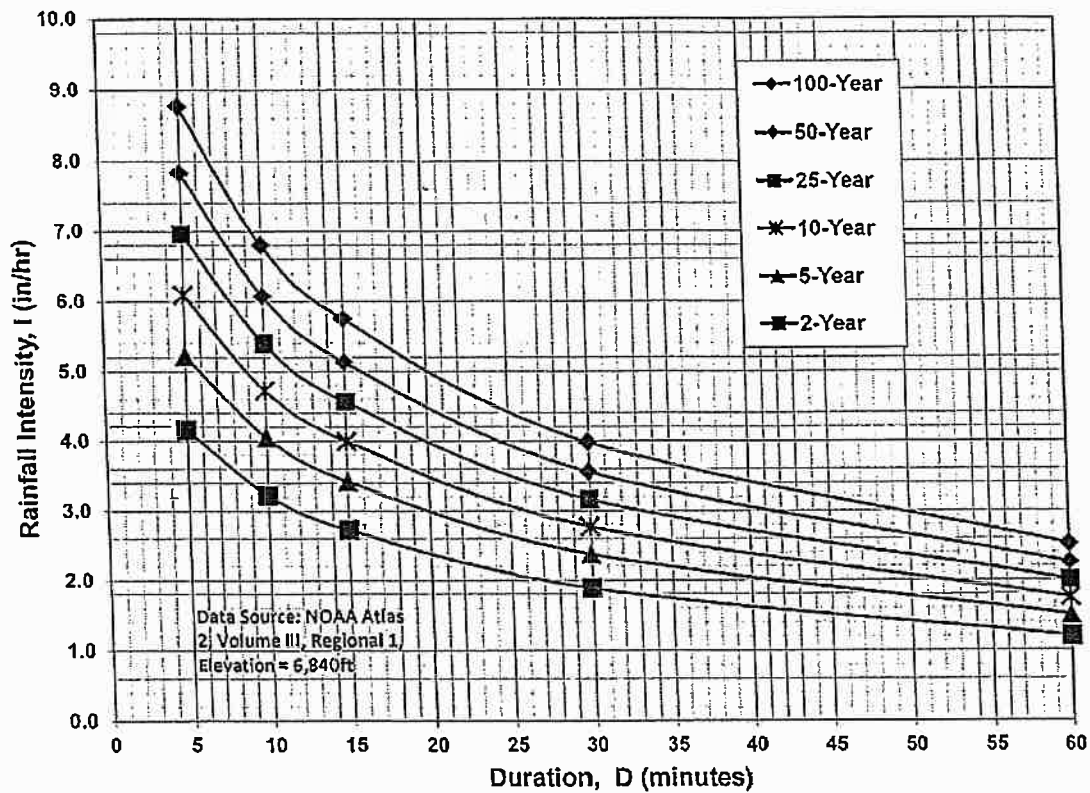




Figure 6-5. Colorado Springs Rainfall Intensity Duration Frequency



## IDF Equations

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

$$I_{50} = -2.25 \ln(D) + 11.375$$

$$I_{25} = -2.00 \ln(D) + 10.111$$

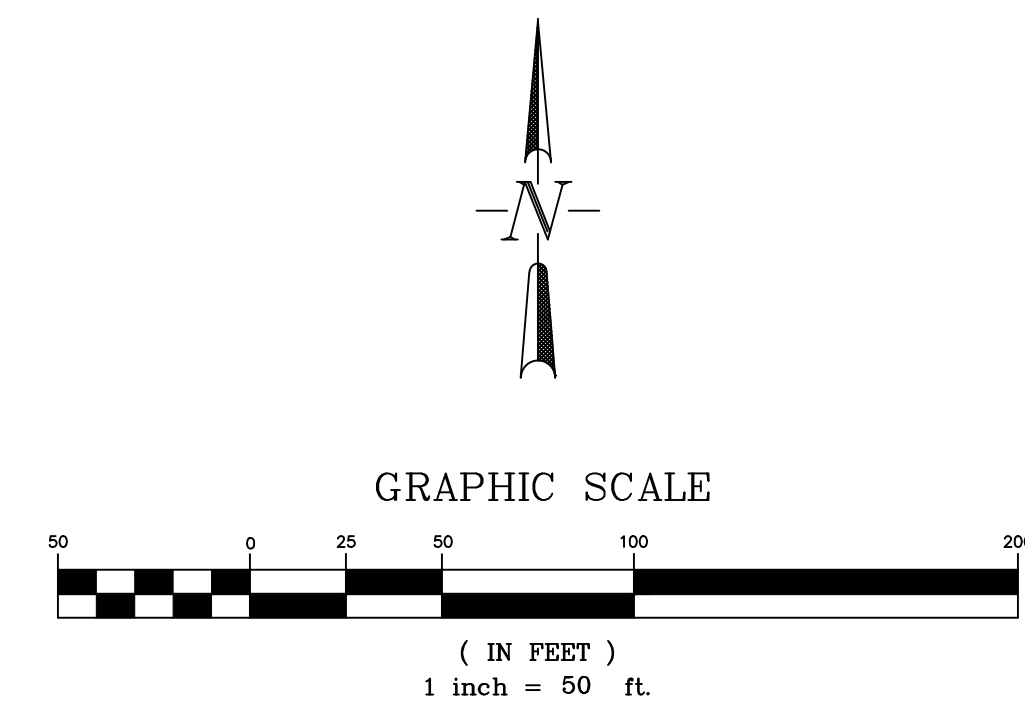
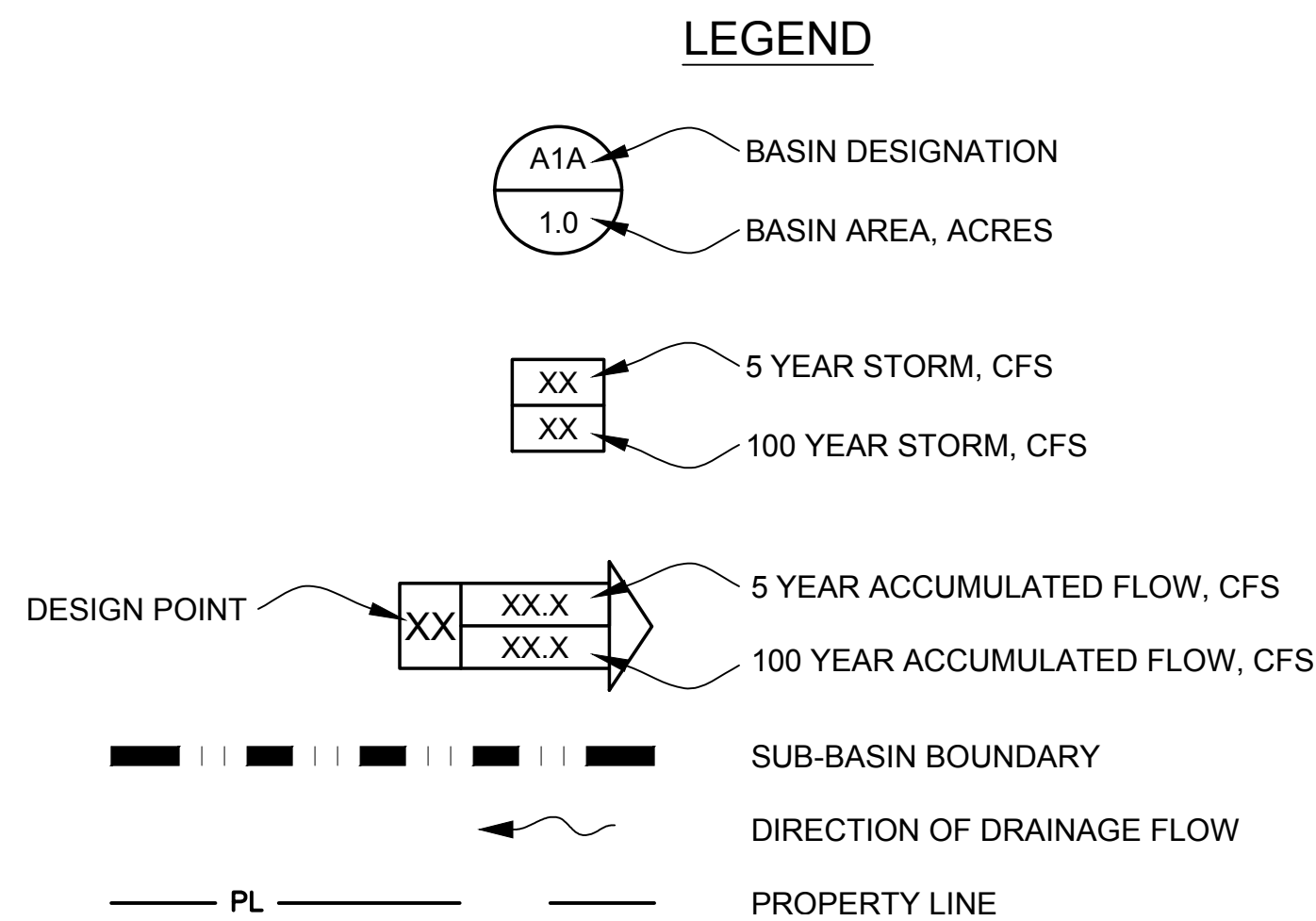
$$I_{10} = -1.75 \ln(D) + 8.847$$

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

$$I_2 = -1.19 \ln(D) + 6.035$$

Note: Values calculated by equations may not precisely duplicate values read from figure.





	RESPEC	MAB
	720 S COLORADO BLVD	
	SUITE 410S	HJG
	DENVER, CO 80246	MAB
	PHONE (303) 757-3655	7/6/18
DATE		
CHECKED		
DRAWN		
DESIGNED		
<div>STAMP</div>		



