JOYFUL VIEW SUBDIVISION

FINAL DRAINAGE REPORT

PREPARED BY
RESPEC
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Colorado Springs, CO 80903
719-266-5212

PREPARED FOR
Kevin O'Neil
PO Box 1385
Colorado Springs, CO 80901-1385
719-445-5050

SEPTEMBER 28, 2021

Project Number W008.1

PCD File No. MS SF2231

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.

Richard G. Gallegos, Jr., P.E. #36247

COLORADO REGISTERED RICHARD G. GALLEGOS JR. 36247 PROFESSIONAL ENGINEER

04.28.2022

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

By: _____
Kevin O'Neil
Title: Owner
Address: PO Box1385
Colorado Springs, CO 80901-1385

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

_____ _____
County Engineer Date

Conditions:

Please add table of contents

FINAL DRAINAGE REPORT
JOYFUL VIEW SUBDIVISION

Please indicate if there are any improvement identified in the DBPS that are required.

PROJECT DESCRIPTION

This drainage report is for the development of the Joyful View Subdivision. The currently vacant 70.18 acres site is located approximately 600 feet east of North Peyton Hwy and approximately 2.0 mile north of SH 94. It is currently part of the Grandview Subdivision, Tracts 2 and 3. It is further described as the southern portion of Section 33, Township 13 South, Range 63 West of the 6th Principal Meridian in El Paso County, Colorado.

All of this subdivision is located in the Haegler Ranch drainage basin. Flows from the site drain directly into the Haegler Channel which is tributary to the West Fork of Black Squirrel Creek.

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:

- 8 Blakeland Loamy Sand
- 10 Blendon Sandy Loams

Please revise this statement as lot 7 and lot 9 which will be developed with a residential home have the floodplain going through their property

FLOODPLAIN STATEMENT

No 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. 08041CO805G, dated December 7, 2018 and LOMR #20-08-0369P-080059 dated February 16, 2021. Detailed Base Flood Elevations (BFE) are delineated on the plans.

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.

$Q = cia$

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 70.18 acre site is currently undeveloped. An existing gravel drive is located off of N. Peyton Hwy within the adjacent Tract 1 area to service an existing home within that Tract. A 60 ft. Access Easement is located along the north property line but currently no road exists within Tracts 2 and 3. Approximately 90% of the parcel is covered with rangeland grasses with slopes varying from 2% to 4%. Haegler Creek flows across the parcel from west to east in a southeasterly direction. According to the FEMS Study done in this area Haegler Creek carries a 100-yr flow of 1,862 cfs. The northern portion of the parcel generally slopes to the southeast toward Haegler Creek and the southern area drains to the northwest. No improvements will occur within the existing Floodplain.

per the drainage plan OS4 and OS5 both flow into the site

Two off-site basins flow into the area from the north and one basin flows into the parcel from Tract 1. Although the northwestern off-site basin does not flow into our site it is tributary to the existing culvert crossing at N. Peyton Hwy and Joyful View Road.

Sub-Basin OS1 contains 9.20 acres and drains the area along N. Peyton Hwy just north of Joyful View Road and Tract 1 of the Grandview Subdivision. It produces flows of 2.7 cfs for the 5-year storm and 15.0 cfs for the 100-year storm. These flows travel under Joyful View Road through a 23"x15" cmp arch. These ditch flows continue through Sub-Basin OS3 south along N. Peyton Hwy.

Per the above description of OS3, OS3 flows will be conveyed to OS5. Please also provide the cumulative flows of these two basins

Sub-Basin OS3 contains 0.90 acres and drains the area along N. Peyton Hwy just south of Joyful View Road and Tract 1 of the Grandview Subdivision. It produces flows of 0.8 cfs for the 5-year storm and 2.0 cfs for the 100-year storm. The combined ditch flows at DP3 are 2.6 cfs and 10.6 cfs respectively. These ditch flows continue to Sub-Basin OS5 and Heagler Creek.

Sub-Basin OS2 contains 45.00 acres and drains the area just north of Joyful View Road It produces flows of 6.8 cfs for the 5-year storm and 51.8 cfs for the 100-year storm. These flows travel under the dirt tracks within the Joyful View Road easement through an 18" cmp. These ditch flows continue into Sub-Basin A1ex.

Sub-Basin A1ex contains 11.70 acres and drains the northeastern area of the site. This area drains to the southeast and into Tract 4 of the Grandview Subdivision. It produces flows of 2.0 cfs for the 5-year storm and 14.3 cfs for the 100-year storm. They will combine with the flows from Sub-Basin OS2 at DP1 to produce flows into Tract 4 of 7.3 cfs for the 5-year storm and 55.9 cfs for the 100-year storm.

Sub-Basin OS4 contains 10.10 acres and is located east of Sub-Basin OS3 and south of the existing Joyful View Drive. It currently contains a gravel driveway and a single-family home. It will produce flows of 2.2 cfs and 15.1 cfs respectively. These flows continue southeast into Sub-Basin A2ex.

DP1 is on the east side of the property and flows into Tract 4. Per the narrative, it appears that flows from DP3, OS5 and OS6 will combine at DP4. Revise accordingly

Sub-Basin A2ex contains 27.40 acres and drains the central portion of the site to the southeast and into Tract 4 of the Grandview Subdivision. It produces flows of 4.8 cfs for the 5-year storm and 26.1 cfs for the 100-year storm. They will combine with the flows from Sub-Basin OS4 at DP2 to produce flows into Tract 4 of 4.8 cfs for the 5-year storm and 36.0 cfs for the 100-year storm.

Sub-Basin OS5 contains 10.60 acres and is located in the southwest portion of Tract 1 north of Heagler Creek. This undeveloped area sheet flows into Heagler Creek and produces flows of 2.0 cfs for the 5-year storm and 15.0 cfs for the 100-year storm.

Sub-Basin OS6 contains 13.90 acres and is located in the southwest corner of Tract 1 south of Heagler Creek. This undeveloped area sheet flows into Heagler Creek and produces flows of 3.5 cfs for the 5-year storm and 21.8 cfs for the 100-year storm. These flows will combine with the flows from DP1 and Sub-Basin OS5 at DP4 to produce flows into the Joyful View Subdivision of 5.1 cfs for the 5-year storm and 30.3 cfs for the 100-year storm.

Sub-Basin A3ex contains 20.50 acres and is located south of Sub-Basin A2ex and north of Heagler Creek. This undeveloped area sheet flows into Heagler Creek and produces flows of 3.7 cfs for the 5-year storm and 28.0 cfs for the 100-year storm.

Please see the above comment on basin OS6 and revise if necessary

DP5

Sub-Basin A4ex contains 10.60 acres and is located in the southern corner of the Joyful View Subdivision south of Heagler Creek. This undeveloped area sheet flows into Heagler Creek and produces flows of 2.0 cfs for the 5-year storm and 15.2 cfs for the 100-year storm. These flows will combine with the flows from DP4 and Sub-Basin A3ex at DP4 to produce flows into Tract 4 of the Grandview Subdivision of 7.4 cfs for the 5-year storm and 49.2 cfs for the 100-year storm.

The CD's identifies low grade pavement. Please design for the worst case.

DEVELOPED DRAINAGE CONDITIONS

The proposed subdivision will consist of nine (9) lots ranging from 5.05 acres to18.2 acres. It will contain a private gravel road extending from Joyful View Drive to a proposed Cul-De-Sac. These new lots are assumed to be developed with 3000 sf homes and 12 ft gravel drives. No overlot grading will take place within the proposed subdivision. Ditches will only be provided along the north side of Joyful View Drive and the west side of Joyful View Circle.

Flows from Sub-Basins OS1, OS3, OS5 and OS6 will remain the same with flows of 5.1 cfs for the 5-year storm and 30.3 cfs for the 100-year storm entering Joyful View Subdivision within Heagler Creek. With a new culvert constructed at the intersection of N. Peyton Hwy consisting of two 23”x14” RCEP pipes to carry to total 100-year flow of 15.0 cfs.

Sub-Basin OS2 will be subdivided into several subbasins along Joyful View Drive to provide the required Runoff Reduction for the addition of gravel pavement. The subbasins along the proposed roadway have been further divided to calculate flows from the centerline of the roadway to the centerline of the proposed ditch and from the subbasin boundary to the centerline of the proposed ditch.

Sub-Basin OS2A1 contains 0.20 acres and is located just east of N. Peyton Hwy, along the north side of Joyful View Drive. This roadway area sheet flows into the ditch in Sub-Basin OS2A2 and produces flows of 0.4 cfs for the 5-year storm and 0.9 cfs for the 100-year storm.

Sub-Basin OS2A2 contains 0.80 acres and drains the area north of Joyful View Drive. This sub-basin produces flows of 0.2 cfs for the 5-year storm and 1.7 cfs for the 100-year storm. These flows will combine with the flows from Sub-basin OS2A1at DP8 to produce flows of 0.5 cfs for the 5-year storm and 2.4 cfs for the 100-year storm. These flows continue east into Sub-Basin OS2B2.

Sub-Basin OS2B1 contains 0.20 acres and is located just east of Sub-Basin OS2A2 along the north side of Joyful View Drive. This roadway area sheet flows into the ditch in Sub-Basin OS2B2 and produces flows of 0.4 cfs for the 5-year storm and 0.9 cfs for the 100-year storm.

Sub-Basin OS2B2 contains 0.70 acres and drains the area north of Joyful View Drive. This sub-basin produces flows of 0.2 cfs for the 5-year storm and 1.5 cfs for the 100-year storm. These flows will combine with the flows from Sub-basin OS2B1and DP8 at DP9 to produce flows of 0.9 cfs for the 5-year storm and 4.1 cfs for the 100-year storm. These flows continue east into Sub-Basin OS2C2.

Sub-Basin OS2C1 contains 0.20 acres and is located just east of Sub-Basin OS2B2 along the north side of Joyful View Drive. This roadway area sheet flows into the ditch in Sub-Basin OS2B2 and produces flows of 0.4 cfs for the 5-year storm and 0.9 cfs for the 100-year storm.

This depth does not meet criteria for cross flow at the roadway. Please refer to DCMV1 Ch6 table 6-1 and revise accordingly.

Sub-Basin OS2C2 contains 0.50 acres and drains the area north of Joyful View Drive. This sub-basin produces flows of 0.1 cfs for the 5-year storm and 1.0 cfs for the 100-year storm. These flows will combine with the flows from Sub-Basin OS2C1and DP9 at DP10 to produce flows of 1.2 cfs for the 5-year storm and 5.3 cfs for the 100-year storm. These flows will then combine with the flows from Sub-Basin OS2D.

Sub-Basin OS2D contains 42.40 acres and drains the area just north of Joyful View Road. It produces flows of 6.4 cfs for the 5-year storm and 48.8 cfs for the 100-year storm. These flows will combine with the flows from DP10 at DP11 to produce flows of 7.2 cfs for the 5-year storm and 52.4 cfs for the 100-year storm. These flows continue south under Joyful View Drive through two proposed 30"x19" RECP pipes and into Sub-Basin A1. Due to the topography the culverts are designed to pick up approximately 42.4 cfs with the remaining 10.0 cfs flowing over the roadway at a depth of 0.68 '.

Sub-Basin A1 contains 15.00 acres and will drain the east half of the proposed gravel road and will also contain two single family homes. It will continue to drain to the southeast and into Tract 4 of the Grandview Subdivision. It produces flows of 2.1 cfs for the 5-year storm and 14.8 cfs for the 100-year storm. These flows will combine with the flows from DP11 at DP12 to produce flows of 7.5 cfs for the 5-year storm and 54.1 cfs for the 100-year storm. The existing flow from this area was 55.9 cfs for the 100-year storm.

A2 is 15 acres per the drainage plan. revise accordingly

Sub-Basin A2 contains 9.10 acres and will drain the east half of the proposed gravel road and will also contain two single family homes. It will continue to drain to the southeast and into Tract 4 of the Grandview Subdivision. It produces flows of 3.1 cfs for the 5-year storm and 19.8 cfs for the 100-year storm. The existing flow from this area was 34.0 cfs for the 100-year storm.

36 per the drainage plan

Sub-Basin A3A1 contains 0.20 acres and is located just east of Joyful View Drive, along the west side of Joyful View Circle. This roadway area sheet flows into the ditch in Sub-Basin A3A2 and produces flows of 0.4 cfs for the 5-year storm and 0.9 cfs for the 100-year storm.

Sub-Basin A3A2 contains 2.60 acres and drains the area south of Joyful View Drive and west of Joyful View Circle. This sub-basin produces flows of 1.1 cfs for the 5-year storm and 5.6 cfs for the 100-year storm. These flows will combine with the flows from Sub-basin A3A1at DP3 to produce flows of 1.4 cfs for the 5-year storm and 6.3 cfs for the 100-year storm. These flows continue east into Sub-Basin A3B2.

Sub-Basin OS4A contains 2.50 acres and is located east of Sub-Basin OS3 and south of the existing Joyful View Drive and currently contains a gravel driveway. It will produce flows of 0.8 cfs and 4.5 cfs respectively. These flows continue southeast into Sub-Basin A3B2.

Sub-Basin A3B1 contains 0.20 acres and is located just east of Joyful View Drive, along the west side of Joyful View Circle. This roadway area sheet flows into the ditch in Sub-Basin A3B2 and produces flows of 0.4 cfs for the 5-year storm and 0.9 cfs for the 100-year storm.

Sub-Basin A3B2 contains 5.50 acres and drains the area south of Sub-Basin A3A2 and west of Joyful View Circle. This sub-basin produces flows of 1.6 cfs for the 5-year storm and 11.0 cfs for the 100-year storm. These flows will combine with the flows from Sub-Basin A3A1, Sub-Basin OS4A and DP3 at DP4 to produce flows of 3.1 cfs for the 5-year storm and 17.1 cfs for the 100-year storm. These flows continue east into Sub-Basin A3C2.

Sub-Basin OS4B contains 7.80 acres and is located east of Sub-Basin OS3 and south of the existing Joyful View Drive and currently contains a gravel driveway as well as a single-family home. It will produce flows of 1.7 cfs and 12.2 cfs respectively. These flows continue southeast into Sub-Basin A3C2.

Sub-Basin A3C1 contains 0.20 acres and is located just east of Joyful View Drive, along the west side of Joyful View Circle. This roadway area sheet flows into the ditch in Sub-Basin A3C2 and produces flows of 0.4 cfs for the 5-year storm and 0.9 cfs for the 100-year storm.

Sub-Basin A3C2 contains 5.40 acres and drains the area south of Sub-Basin A3B2 and west of Joyful View Circle. This sub-basin produces flows of 1.5 cfs for the 5-year storm and 10.4 cfs for the 100-year storm. These flows will combine with the flows from Sub-Basin A3C1, Sub-Basin OS4B and DP4 at DP5 to produce flows of 5.4 cfs for the 5-year storm and 32.8 cfs for the 100-year storm. These flows continue east into Sub-Basin A3D2.

Sub-Basin A3D1 contains 0.20 acres and is located just east of Joyful View Drive, along the west side of Joyful View Circle. This roadway area sheet flows into the ditch in Sub-Basin A3D2 and produces flows of 0.3 cfs for the 5-year storm and 0.8 cfs for the 100-year storm.

Sub-Basin A3D2 contains 2.60 acres and drains the area south of Sub-Basin A3C2 and west of Joyful View Circle. This sub-basin produces flows of 0.8 cfs for the 5-year storm and 5.2 cfs for the 100-year storm. These flows will combine with the flows from Sub-Basin A3D1 and DP5 at DP6 to produce flows of 5.6 cfs for the 5-year storm and 34.0 cfs for the 100-year storm. These flows continue east into Sub-Basin A3E.

Sub-Basin A3E contains 18.7 acres and is located in the south of Joyful View Circle and north of Heagler Creek. This undeveloped area sheet flows into Heagler Creek and produces flows of 3.3 cfs for the 5-year storm and 25.6 cfs for the 100-year storm.

Sub-Basin A4 contains 10.6 acres and is located in the southeast corner of Joyful View Subdivision and Tract 1 south of Heagler Creek. This undeveloped area sheet flows into Heagler Creek and produces flows of 2.0 cfs for the 5-year storm and 15.2 cfs for the 100-year storm. These flows will combine with the flows from DP2, DP6 and Sub-Basin A3E at DP7 to produce flows of 10.7 cfs for the 5-year storm and 68.9 cfs for the 100-year storm. These flows travel east in Heagler Creek and into Tract 4 of the Grandview Subdivision. The existing site flows at this location were 49.2 cfs for the 100-year storm. The additional flows into the main channel of Heagler Creek were diverted from the area east of Joyful View Circle which previously flowed to the southeast and into Tract 4, further north of this main channel location. The total estimated flow in the main channel is approximately 1862 cfs as delineated in the FEMA report for the area west of N. Peyton Hwy.

Note that per clarification from CDPHE, this exclusion only pertains to the lots and does not include roadways, hence RR is needed.

WATER QUALITY AND DETENTION

Water quality basins are not required for subdivisions containing lots greater than 5.0 acres per the Engineering Criteria Manual Section 1.7.1.B.5. Runoff Reduction calculations have been provided to eliminate the need for water quality basins. However temporary sedimentation basin will be added to mitigate sediment from the construction of the private access roads.

Based on the large lots and longer Time of Concentration distances, the estimated Developed flows are less than the Existing Conditions flows so no detention facilities are warranted.

This is not correct. The above paragraph indicates an increase in flows from 49.2 to 68.9 cfs at DP7. The increase in flows must be mitigated. Justification for not providing detention has not been provided. Please revise accordingly.

Show on GEC Plans

Include section on existing floodplain area and channel. Provide status of the channel condition and stability and if any improvement or stabilizations are needed.

Per DCMV1 Ch1.4.2:
DEVELOPERS IN AND ALONG A DRAINAGEWAY ARE REQUIRED TO IMPLEMENT THE PROPER MEASURES TO MAINTAIN OR CREATE STABLE CHARACTERISTICS OF THE DRAINAGEWAY. THE PRINCIPAL OBJECTIVE IS TO LIMIT EXCESSIVE EROSION IN AND ALONG THE CHANNEL. HISTORICAL CHANNEL RELOCATIONS/REALIGNMENTS SHALL NOT BE ALLOWED UNLESS ENGINEERING DESIGNS FOR STABLE SYSTEMS UNDER FLOOD FLOW CONDITIONS ARE ACHIEVED AND APPROVED.

Include Joy View Rd in impervious calcs
Please correct fees

There is ~107Ksf of road for Tract A ~2.45ac. This needs to be broken out separate for fees

A 25% fee reduction applies for Low Density Lots (2.5 acres and greater lot sizes). Large lot reduction does not apply to bridge fee or roads.

Single Family 5ac parcels have a ~impervious area basis of 7% per ECM Ref Appdx L
Appendix L

DRAINAGE BASIN FEES

The proposed development is located within the Haegler Ranch Drainag

2022 Haegler Ranch Drainage Fees
Impervious Coverage = 2.0%
Area Subject to Fees = 0.020 x 70.18 = 1.40 Acres
Haegler Ranch Fee = $11,891/Acre
Drainage Basin Fee = $11,891 x 1.40 = $16,647

2022 Haegler Ranch Bridge Fees
Impervious Coverage = 2.0%
Area Subject to Fees = 0.020 x 70.18 = 1.40 Acres
Haegler Ranch Fee = $1,755/Acre
Bridge Fee = $1,755 x 1.40 = $2,457

CONCLUSION

The proposed development and subsequent lot developments follow the 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 the existing earth swales and ditches to encourage infiltration.
- A gravel roadway has been used for the upper portion of the project 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 ditches have been stabilized with either riprap or erosion control fabric depending on the erosion potential.

Step 3: Provide water quality capture volume (WQCV)

This does not match what calcs show: a 0% reduction, which is not sufficient.

Based on the Runoff Reduction calculations performed for the proposed development, the 2.2 acres for the asphalt and gravel roadway construction does not require any water quality basins, however a temporary sedimentation basin will be constructed.

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

No industrial and commercial development is proposed for the site.

Based on longer times of concentration and minimal development, the proposed development flows of 57.5 cfs for the 100-year storm are below the historic levels of 63.5 cfs for the 100-year storm. Therefore, the proposed development will not adversely affect downstream or surrounding properties.

Please see previous comments and revise accordingly.

REFERENCES

1. City of Colorado Springs and El Paso County (2014). ***Drainage Criteria Manual Volume 1*** (DCM).

2. City of Colorado Springs and El Paso County (2014)

3. ***Drainage Criteria Manual Volume II*** (DCM) as amended.

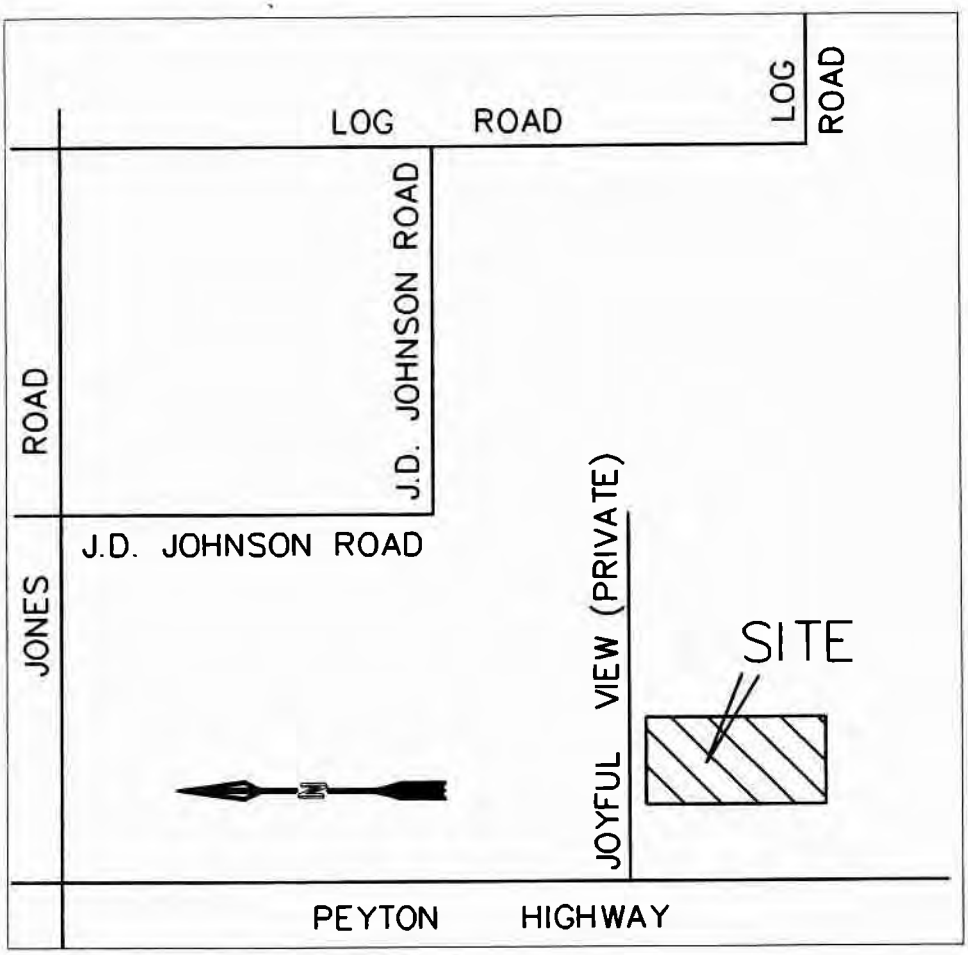
4. Soil Survey of El Paso County Area, Colorado by USDA, NRCS.

5. ***El Paso County (January 2016) Engineering Criteria Manual***.

6. Urban Drainage and Flood Control District (June 2017). ***Urban Storm Drainage Criteria Manual, Volume 1-3***.

APPENDIX A

MAPS

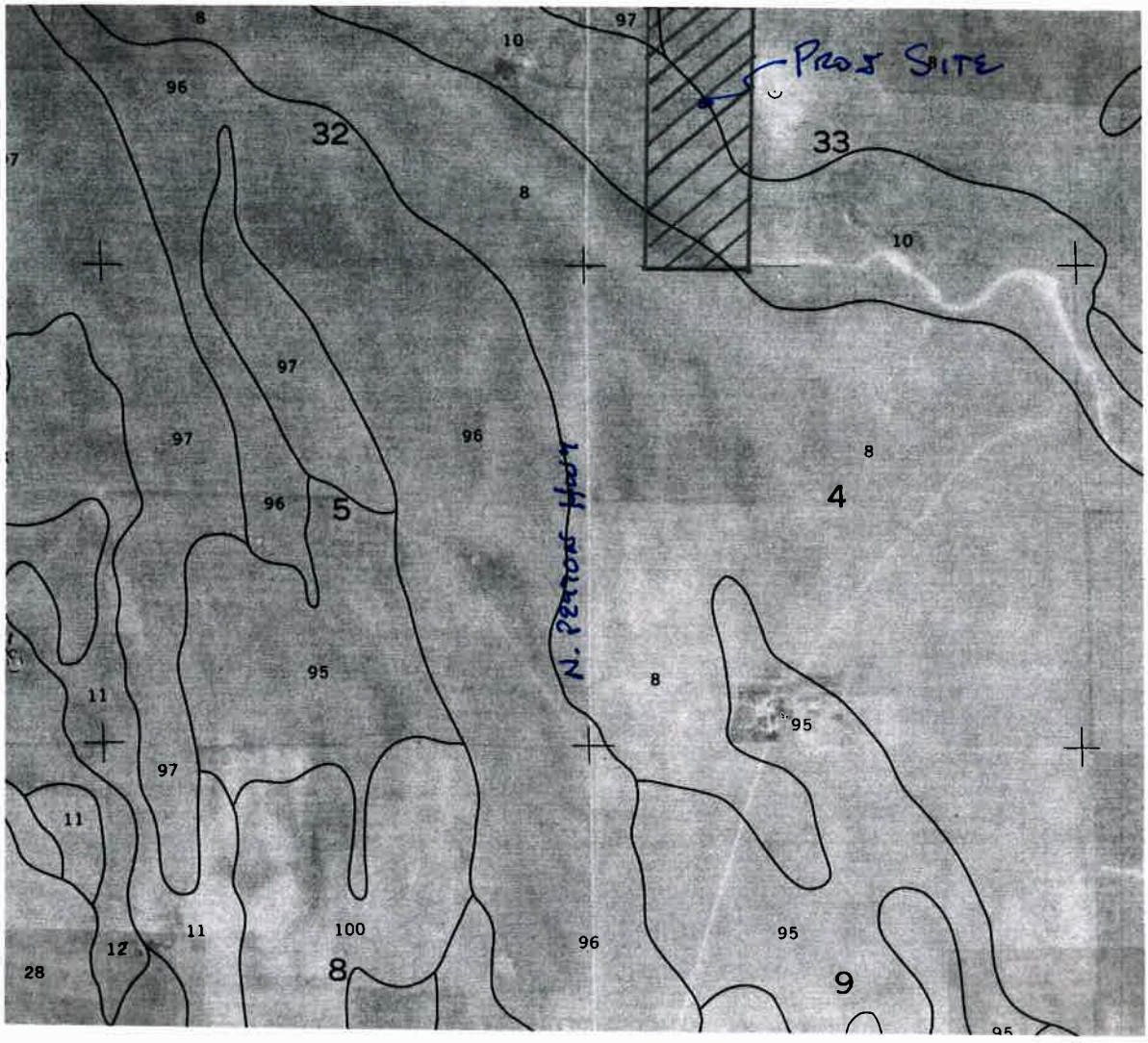


VICINITY MAP

N.T.S.

RESPEC

121 S Tejon St., Suite 1110 Colorado Springs, CO 80903
Phone: (719) 283-7671



SOILS MAP

N.T.S.

RESPEC

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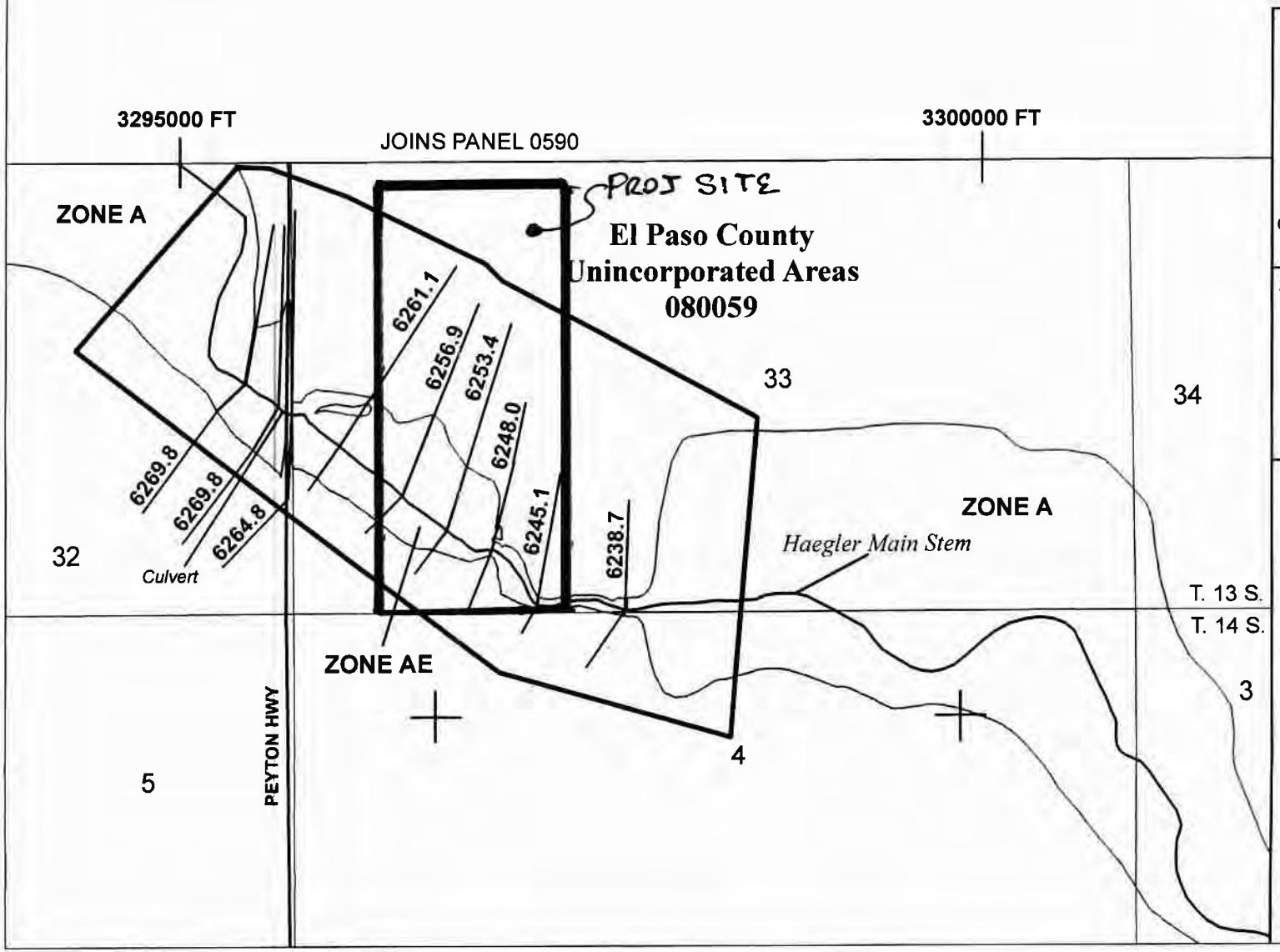


SPECIAL FLOOD HAZARD AREAS	Without Base Flood Elevation (BFE) Zone A, V, A99
	With BFE or Depth Zone AE, AO, AH, VE, AR
	Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD	0.2 % Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
	Future Conditions 1% Annual Chance Flood Hazard Zone X
	Area with Reduced Flood Risk due to Levee See Notes. Zone X

SCALE

Map Projection:
Universal Transverse MercatorNAD 1983 UTM Zone 13N
Western Hemisphere Vertical Datum NAVD 88

1 inch = 1,000 feet 1:12,000

0 500 1,000 2,000 Feet

0 125 250 500 Meters

FEMA

National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO
and Incorporated Areas

PANEL 805 OF 1300

FEMA

Panel Contains:

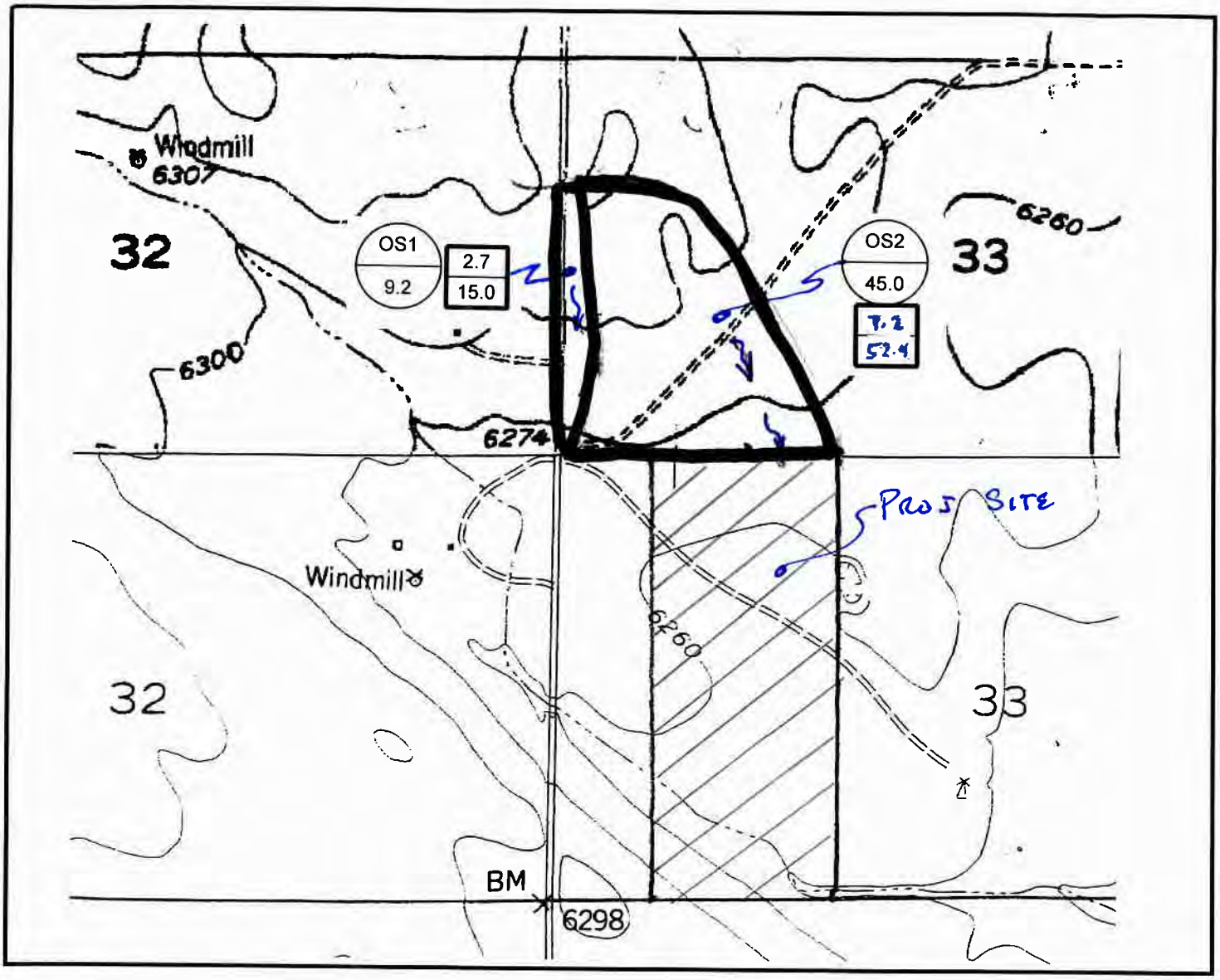
COMMUNITY	NUMBER	PANEL	SUFFIX
EL PASO COUNTY	080059	0805	G

REVISED TO REFLECT LOMR
EFFECTIVE: February 16, 2021

VERSION NUMBER
1.1.1.0
MAP NUMBER
08041C0805G
MAP REVISED
DECEMBER 7, 2018

APPENDIX B

DESIGN CALCULATIONS



OFFSITE DRAINAGE MAP

SCALE; 1'=1000'

RESPEC

121 S Tejon St., Suite 1110 Colorado Springs, CO 80903
Phone: (719) 283-7671

JOYFUL VIEW SUBDIVISION

C FACTOR CALCULATION SHEET

EXISTING CONDITIONS

RUNOFF COEFICIENT

TYPE A/B SOILS

LAND USE	Imperv %	5 YR	100 YR
UNDEV	0	0.08	0.35
GRAVEL ROAD	80	0.59	0.7
ASPHALT ROAD	100	0.9	0.96
ROOFS	90	0.73	0.81

AREA DESIG.	TOTAL AREA (acre)	SURFACE CONDITION AREAS UNDEV	GRAVEL ROAD	ASPHALT ROAD	ROOFS	CALCULATED C 5 YR	100 YR	% IMPERVIOUS
A1ex	11.70	11.70	0.00	0.00	0.00	**0.08**	**0.35**	**0.00**
A2ex	27.40	27.40	0.00	0.00	0.00	**0.08**	**0.35**	**0.00**
A3ex	20.50	19.95	0.55	0.00	0.00	**0.09**	**0.36**	**2.15**
A4ex	10.60	10.24	0.00	0.36	0.00	**0.11**	**0.37**	**3.40**
OS1	9.20	8.73	0.00	0.47	0.00	**0.12**	**0.38**	**5.11**
OS2	45.00	45.00	0.00	0.00	0.00	**0.08**	**0.35**	**0.00**
OS3	0.90	0.51	0.00	0.39	0.00	**0.44**	**0.61**	**43.33**
OS4	10.10	9.91	0.14	0.00	0.05	**0.09**	**0.36**	**1.55**
OS5	10.60	10.60	0.00	0.00	0.00	**0.08**	**0.35**	**0.00**
OS6	13.90	13.62	0.00	0.28	0.00	**0.10**	**0.36**	**2.01**
Aex+B1ex+B2ex	59.60	59.05	0.55	0.36	0.00			
	0.8	0.00	0.44	0.36	0.00			
	Imperviousness = (0.44)/37.29 = 2.2%							

DEVELOPED CONDITIONS

RUNOFF COEFICIENT

TYPE A/B SOILS

LAND USE	Imperv %	5 YR	100 YR
UNDEV	0	0.08	0.35
GRAVEL ROAD	80	0.59	0.7
ASPHALT ROAD	100	0.9	0.96
ROOFS	90	0.73	0.81

Developed Conditions

AREA DESIG.	TOTAL AREA (acre)	SURFACE CONDITION AREAS UNDEV	GRAVEL ROAD	ASPHALT ROAD	ROOFS	CALCULATED C 5 YR	100 YR	% IMPERVIOUS
A1	9.20	8.97	0.16	0.00	0.07	**0.09**	**0.36**	**2.08**
A2	15.00	14.58	0.21	0.00	0.21	**0.10**	**0.36**	**2.38**
A3A1	0.20	0.05	0.15	0.00	0.00	**0.46**	**0.61**	**60.00**
A3A2	2.60	2.38	0.15	0.00	0.07	**0.13**	**0.38**	**7.04**
A3B1	0.20	0.05	0.15	0.00	0.00	**0.46**	**0.61**	**60.00**
A3B2	5.50	5.43	0.00	0.00	0.07	**0.09**	**0.36**	**1.15**
A3C1	0.20	0.05	0.15	0.00	0.00	**0.46**	**0.61**	**60.00**
A3C2	5.40	5.33	0.00	0.00	0.07	**0.09**	**0.36**	**1.17**
A3D1	0.30	0.11	0.19	0.00	0.00	**0.41**	**0.58**	**51.73**
A3D2	2.30	2.23	0.00	0.00	0.07	**0.10**	**0.36**	**2.74**
A3E	18.70	18.70	0.00	0.00	0.00	**0.08**	**0.35**	**0.00**
A4	10.60	10.60	0.00	0.00	0.00	**0.08**	**0.35**	**0.00**
	70.20	68.48	1.16	0.00	0.56	**TOTAL SITE IMPERVIOUSNESS**		**2.04**
OS1	9.20	8.73	0.00	0.47	0.00	**0.12**	**0.38**	**5.11**
OS2A1	0.20	0.05	0.15	0.00	0.00	**0.46**	**0.61**	**60.00**
OS2A2	0.80	0.80	0.00	0.00	0.00	**0.08**	**0.35**	**0.00**
OS2B1	0.20	0.05	0.15	0.00	0.00	**0.46**	**0.61**	**60.00**
OS2B2	0.70	0.70	0.00	0.00	0.00	**0.08**	**0.35**	**0.00**
OS2B1	0.20	0.05	0.15	0.00	0.00	**0.46**	**0.61**	**60.00**
OS2B2	0.50	0.50	0.00	0.00	0.00	**0.08**	**0.35**	**0.00**
OS2D	42.40	42.40	0.00	0.00	0.00	**0.08**	**0.35**	**0.00**
OS3	0.90	0.51	0.00	0.39	0.00	**0.44**	**0.61**	**43.33**
OS4A	2.50	2.35	0.15	0.00	0.00	**0.11**	**0.37**	**4.80**
OS4B	7.80	7.64	0.09	0.00	0.07	**0.09**	**0.36**	**1.73**
OS5	10.60	10.60	0.00	0.00	0.00	**0.08**	**0.35**	**0.00**
OS6	13.90	13.62	0.00	0.28	0.00	**0.10**	**0.36**	**2.01**

Avg House = 3000 sf w/ avg 250'x12' gravel driveway

Please account for development of Lot 9 in this basin

JOYFUL VIEW SUBDIVISION
PROJ.W008.1
DRAINAGE CALCULATION SHEET
file:joyful viewdr
07/16/21

AREA DESIG.	AREA (acre)	C5 (5 yr)	C100 (100 yr)	C5 X A	C100 X A		Initial Tci Slope (%)	ti (min)		Travel Time Slope (%)	V (fps)	Tt (min)	TC (min)	I5 (in/hr)	I100 (in/hr)	Q5 (cfs)	Q100 (cfs)	length L (feet)	vel. V (fps)	^t (min)	AREA DESIG.
						L (ft)			L (ft)												
EXISTING CONDITIONS																					
OS2	45.00	0.08	0.35	3.60	15.75	300	2.00	26.28	1700	2.00	1.80	15.74	42.02	1.88	3.29	6.78	51.83	1150	1.70	11.27	OS2
A1ex	11.70	0.08	0.35	0.94	4.10	300	2.00	26.28	1230	1.70	1.70	12.06	38.34	2.00	3.49	1.87	14.28				A1ex
DP1	56.70			4.54	19.85								53.30	1.61	2.82	7.32	55.94				DP1
OS4	10.10	0.09	0.36	0.91	3.64	150	2.00	18.40	750	1.30	1.20	10.42	28.82	2.37	4.15	2.16	15.08				OS4
A2ex	27.40	0.08	0.35	2.19	9.59	300	2.00	26.28	1800	1.10	1.00	30.00	56.28	1.56	2.72	3.41	26.07				A2ex
DP2	37.50			3.10	13.23								56.28	1.56	2.72	4.83	35.95				DP2
OS1	9.20	0.12	0.38	1.10	3.50	100	2.00	14.58	1500	2.50	2.00	12.50	27.08	2.46	4.30	2.72	15.03	1350	0.70	32.14	OS1
OS3	0.90	0.44	0.61	0.40	0.55	20	2.00	4.39	1350	0.80	0.70	32.14	36.53	2.06	3.59	0.81	1.97				OS3
DP3	10.10			1.50	4.05								59.22	1.50	2.63	2.26	10.62	700	1.25	9.33	DP3
OS5	10.60	0.08	0.35	0.85	3.71	150	1.30	21.42	650	1.40	1.25	8.67	30.09	2.31	4.04	1.96	15.00				OS5
OS6	13.90	0.10	0.36	1.39	5.00	300	4.00	20.50	800	4.60	2.20	6.06	26.56	2.49	4.35	3.46	21.76				OS6
DP4	34.60			3.74	12.76								68.56	1.36	2.38	5.09	30.32	1450	1.70	14.22	DP4
A3ex	20.50	0.08	0.35	1.64	7.18	250	1.20	28.40	400	1.60	1.90	3.51	31.91	2.23	3.90	3.67	28.01				A3ex
A4ex	10.60	0.08	0.35	0.85	3.71	300	8.00	16.63	1300	1.20	1.70	12.75	29.38	2.35	4.10	1.99	15.21				A4ex
DP5	65.70			6.23	23.64								82.77	1.19	2.08	7.42	49.24				DP5
DEVELOPED CONDITIONS																					
OS1	9.20	0.12	0.38	1.10	3.50	100	2.00	14.58	1500	2.50	2.00	12.50	27.08	2.46	4.30	2.72	15.03	1350	0.70	32.14	OS1
OS3	0.90	0.44	0.61	0.40	0.55	20	2.00	4.39	1350	0.80	0.70	32.14	36.53	2.06	3.59	0.81	1.97				OS3
DP1	10.10			1.50	4.05								59.22	1.50	2.63	2.26	10.62	700	1.25	9.33	DP1
OS5	10.60	0.08	0.35	0.85	3.71	150	1.30	21.42	650	1.40	1.25	8.67	30.09	2.31	4.04	1.96	15.00				OS5
OS6	13.90	0.10	0.36	1.39	5.00	300	4.00	20.50	800	4.60	2.20	6.06	26.56	2.49	4.35	3.46	21.76				OS6
DP2	34.60			3.74	12.76								68.56	1.36	2.38	5.09	30.32	1450	1.70	14.22	DP2
A3A1	0.20	0.46	0.61	0.09	0.12	26	2.00	4.85	400	0.50	1.40	4.76	9.62	4.12	7.19	0.38	0.88				A3A1
A3A2	2.60	0.13	0.38	0.34	0.99	100	3.00	12.62	400	3.00	1.75	3.81	16.43	3.23	5.63	1.09	5.57				A3A2
DP3	2.80			0.43	1.11								16.43	3.23	5.63	1.39	6.25	400	1.40	4.76	DP3
A3B1	0.20	0.46	0.61	0.09	0.12	26	2.00	4.85	400	0.50	1.40	4.76	9.62	4.12	7.19	0.38	0.88				A3B1
A3B2	5.50	0.09	0.36	0.50	1.98	100	3.00	13.14	400	3.00	1.75	3.81	16.95	3.17	5.55	1.57	10.98				A3B2
OS4A	2.50	0.11	0.37	0.28	0.93	150	2.00	18.04	300	1.30	1.20	4.17	22.20	2.75	4.81	0.76	4.45	700	1.75	6.67	OS4A
DP4	11.00			1.29	4.14								28.87	2.37	4.14	3.06	17.14	400	1.40	4.76	DP4
A3C1	0.20	0.46	0.61	0.09	0.12	26	2.00	4.85	400	0.50	1.40	4.76	9.62	4.12	7.19	0.38	0.88				A3C1
A3C2	5.40	0.09	0.36	0.49	1.94	100	3.00	13.14	400	1.30	1.30	5.13	18.27	3.06	5.34	1.48	10.37				A3C2
OS4B	7.80	0.09	0.36	0.70	2.81	150	2.00	18.40	650	1.30	1.30	8.33	26.74	2.48	4.33	1.74	12.17	700	1.30	8.97	OS4B
DP5	24.40			2.57	9.01								35.71	2.09	3.64	5.37	32.84	500	1.80	4.63	DP5
A3D1	0.20	0.41	0.58	0.08	0.12	26	2.00	5.23	400	0.50	1.40	4.76	10.00	4.05	7.08	0.33	0.82				A3D1
A3D2	2.60	0.10	0.36	0.26	0.94	100	3.00	13.01	400	3.00	1.75	3.81	16.82	3.19	5.57	0.83	5.21				A3D2
DP6	27.20			2.91	10.06								40.34	1.93	3.38	5.63	33.99				DP6
A3E	18.70	0.08	0.35	1.50	6.55	250	1.20	28.40	400	1.60	1.90	3.51	31.91	2.23	3.90	3.34	25.55				A3E
A4	10.60	0.08	0.35	0.85	3.71	300	8.00	16.63	1300	1.20	1.70	12.75	29.38	2.35	4.10	1.99	15.21				A4

DP7	91.10			9.00	33.08								82.77	1.19	2.08	10.73	68.89				DP7
OS2A1	0.20	0.46	0.61	0.09	0.12	26	2.00	4.85	400	0.50	1.40	4.76	9.62	4.12	7.19	0.38	0.88				OS2A1
OS2A2	0.80	0.08	0.35	0.06	0.28	80	4.00	10.80	400	0.80	1.75	3.81	14.61	3.42	5.97	0.22	1.67				OS2A2
DP8	1.00			0.16	0.40								14.61	3.42	5.97	0.53	2.40	400	1.75	3.81	DP8
OS2B1	0.20	0.46	0.61	0.09	0.12	26	2.00	4.85	400	0.50	1.40	4.76	9.62	4.12	7.19	0.38	0.88				OS2B1
OS2B2	0.70	0.08	0.35	0.06	0.25	80	4.00	10.80	400	1.40	2.40	2.78	13.57	3.54	6.18	0.20	1.51				OS2B2
DP9	1.90			0.30	0.77								18.42	3.04	5.32	0.93	4.09	400	2.40	2.78	DP9
OS2C1	0.20	0.46	0.61	0.09	0.12	26	2.00	4.85	400	0.50	1.40	4.76	9.62	4.12	7.19	0.38	0.88				OS2C1
OS2C2	0.50	0.08	0.35	0.04	0.18	80	4.00	10.80	400	0.80	1.75	3.81	14.61	3.42	5.97	0.14	1.04				OS2C2
DP10	2.60			0.44	1.07								21.19	2.82	4.93	1.23	5.26				DP10
OS2D	42.40	0.08	0.35	3.39	14.84	300	2.00	26.28	1700	2.00	1.80	15.74	42.02	1.88	3.29	6.39	48.84				OS2D
DP11	45.00			3.83	15.91								42.02	1.88	3.29	7.21	52.35	1150	1.70	11.27	DP11
A1	9.10	0.09	0.36	0.82	3.28	100	2.00	15.03	1000	1.70	1.70	9.80	24.83	2.59	4.52	2.12	14.81				A1
DP12	54.10			4.65	19.18								53.30	1.61	2.82	7.50	54.07				DP12
A2	15.00	0.10	0.36	1.50	5.40	100	1.30	17.15	1100	1.20	1.00	18.33	35.48	2.09	3.66	3.14	19.76				A2

DITCH CAPACITY CALCULATION SHEET

Location	Q5 cfs	Q100 cfs	S %	B ft	Z	D ft	d100 ft	V fps	Froude #	Riprap Size
OS1	2.7	15.0	0.8	0.0	4:1,3:1	1.5	1.3	2.7	0.60	Existing N Peyton Hwy Ditch
DP1	2.3	10.6	0.8	0.0	4:1,3:1	2.0	1.1	2.5	0.59	Existing N Peyton Hwy Ditch
DP2	5.1	30.3	1.0	20.0	20:1	2.0	0.5	2.2	0.63	
DP3	1.4	6.3	1.0	0.0	6:1,3:1	1.5	0.8	2.2	0.63	
DP4	3.1	17.2	0.5	0.0	6:1,3:1	1.5	1.4	2.2	0.48	
DP5	5.4	32.8	1.0	0.0	6:1,3:1	1.5	1.5	3.4	0.70	
DP6	5.6	34.0	0.5	0.0	6:1,3:1	2.0	1.7	2.7	0.51	
DP7	10.7	68.9	1.0	20.0	20:1	2.0	0.7	2.7	0.67	
DP8	0.5	2.4	1.4	0.0	4:1,3:1	2.0	0.2	1.7	0.68	
DP9	0.9	4.1	0.5	0.0	4:1,3:1	1.5	0.4	1.5	0.44	
DP10	1.2	5.3	0.8	0.0	4:1,3:1	2.0	0.9	2.1	0.57	
DP11	7.2	52.4	1.0	5.0	6:1	2.0	1.2	3.5	0.71	
DP12	7.5	54.1	1.0	5.0	6:1	2.0	1.2	3.6	0.76	

materials may be considered on a case-by-case basis. In either case, the protection shall be constructed to convey the 100-year developed condition flow from the upstream watershed without accounting for any flow attenuation within the detention facility.

The crest elevation of the emergency spillway shall be set at or above the calculated 100-year water surface elevation. A concrete wall shall be constructed at the emergency spillway crest extending at least to the bottom of the riprap and bedding layers located immediately downstream for regional and sub-regional ponds. On-site ponds do not require a concrete crest wall. The crest wall shall be extended at the sides up to 1 foot above the emergency spillway design water surface as shown in Figure 13-12c.

Riprap embankment protection shall be sized based on methodologies described in *Development of Riprap Testing in Flumes: Phase II Follow-up Investigations* (Apt et al. 1988) to determine the D_{50} dimension. According to this method:

$$D_{50} = 5.23\, S^{0.43} (1.35\, C_f\, q)^{0.56} \qquad \text{Equation 13-9}$$

Where:

D_{50}	=	median rock size (in)
S	=	longitudinal slope (ft/ft)
C_f	=	concentration factor (1.0 to 3.0)
q	=	unit discharge (cfs/ft)

When:

η (porosity) = 0.0 (i.e., for buried soil riprap)

The unit discharge shall be determined by dividing the design flow by the crest width, excluding the side slopes. According to this method, the types of riprap needed for typical embankment slopes and design flows are shown in Figure 13-12d. The riprap types shown were determined assuming that there is no interstitial flow (i.e., no flow between the rocks—soil riprap with filled voids and porosity = 0) and that the "concentration factor" (C_f) is equal to 2.0. For plain riprap with interstitial flow, the method requires an interactive process described in Apt et al. (1988). The range for each type shown is based on the D_{50} dimension at the midpoint between the D_{50} for adjacent types. Riprap characteristics such as rock size distributions, thickness, hardness, specific gravity, angle of repose, etc., shall be as required in the Major Drainage chapter of Volume 1 in the UDFCD Manual. For design conditions outside of the parameters or conditions represented in Figure 13-12d, the designer shall propose an appropriate alternative approach that may include grouted boulders or concrete protection. Alternative approaches must be submitted for approval prior to incorporation into designs.

The emergency spillway is also needed to control the location and direction of any overflows. The emergency spillway and the path of the emergency overflow downstream of the spillway and embankment shall be clearly depicted on the drainage plan. Structures shall not be permitted in the path of the emergency spillway or overflow. The emergency overflow water surface shall be shown on the detention facility construction drawings. When emergency overflows will pass over a roadway, the depth of flow shall not be greater than 1 foot over the street crown.

5.13 **Retaining Walls**

The use of retaining walls within detention basins is discouraged due to the potential increase in long-term maintenance costs and concerns regarding the safety of the general public and maintenance personnel. Retaining walls shall only be considered for on-site facilities. If retaining walls are proposed, footings shall be located above the WQCV or EURV. Wall heights not exceeding 30 inches are

PROJECT: Joyful View Sub

STATION: _____

SHEET _____ OF _____

CULVERT DESIGN FORM

DESIGNER / DATE: _____ / _____

REVIEWER / DATE: _____ / _____

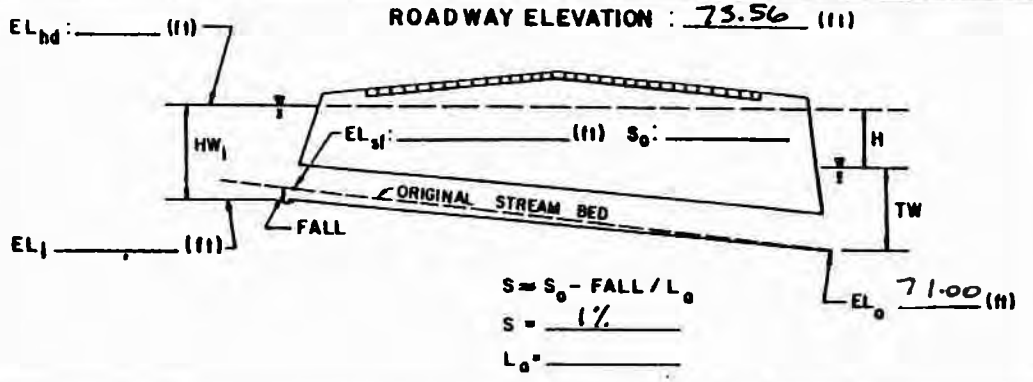
HYDROLOGICAL DATA

SEE ADD'L SHTS.

- ☐ METHOD: Rational
- ☐ DRAINAGE AREA: 9.2 ☐ STREAM SLOPE: 0.8%
- ☐ CHANNEL SHAPE: 4:1, 3:1
- ☐ ROUTING: _____ ☐ OTHER: _____

DESIGN FLOWS/TAILWATER

R.I. (YEARS)	FLOW (cfs)	TW (ft)
5	2.7	
100	15.0	



CULVERT DESCRIPTION: MATERIAL - SHAPE - SIZE - ENTRANCE	TOTAL FLOW Q (cfs)	FLOW PER BARREL Q/N (1)	HEADWATER CALCULATIONS: INLET CONTROL HW_i/D (2)	HW_i	FALL (3)	EL_hi (4)	OUTLET CONTROL TW (5)	d_c	(d_c+D)/2	h_o (6)	h_e	H (7)	EL_ho (8)	CONTROL HEADWATER ELEVATION	OUTLET VELOCITY	COMMENTS
2 - RCBP - 23"X14" PROJ	15.0	7.5	1.2	1.4		73.0	1.3	0.85	1.0(	1.3	0.2	0.5	72.8	72.8	6.5	

TECHNICAL FOOTNOTES:

(1) USE Q/NB FOR BOX CULVERTS

(2) $HW_i/D = HW/D$ OR HW_i/D FROM DESIGN CHARTS

(3) $FALL = HW_i - (EL_{hd} - EL_{sf})$; FALL IS ZERO FOR CULVERTS ON GRADE

(4) $EL_{hi} = HW_i + EL_i$ (INVERT OF INLET CONTROL SECTION)

(5) TW BASED ON DOWN STREAM CONTROL OR FLOW DEPTH IN CHANNEL.

(6) $h_o = TW$ or $(d_c + D/2)$ (WHICHEVER IS GREATER)

(7) $H = \left[1 + h_e + (29n^2 L)/R^{1.33}\right] V^2/2g$

(8) $EL_{ho} = EL_o + H + h_o$

SUBSCRIPT DEFINITIONS:

- e. APPROXIMATE
- f. CULVERT FACE
- hd. DESIGN HEADWATER
- hi. HEADWATER IN INLET CONTROL
- ho. HEADWATER IN OUTLET CONTROL
- i. INLET CONTROL SECTION
- o. OUTLET
- sf. STREAMBED AT CULVERT FACE
- tw. TAILWATER

COMMENTS / DISCUSSION:

CULVERT BARREL SELECTED:

SIZE: _____

SHAPE: _____

MATERIAL: _____

ENTRANCE: _____

REFERENCE: Federal Highway Administration, Hydraulic Design of Highway Culver

Hydraulic Design Series No. 5 1985

PROJECT: Joyful View Sub

STATION: _____

SHEET _____ OF _____

CULVERT DESIGN FORM

DESIGNER / DATE: _____ / _____

REVIEWER / DATE: _____ / _____

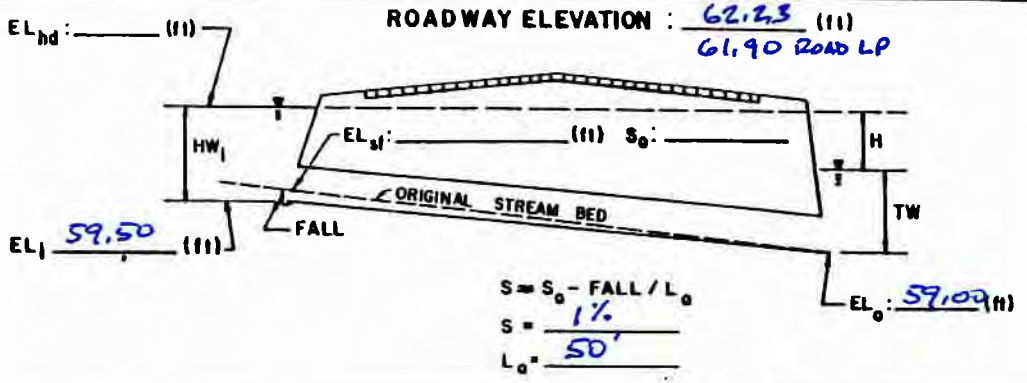
HYDROLOGICAL DATA

SEE ADD'L SHTS.

- ☐ METHOD: RATIONAL
- ☐ DRAINAGE AREA: 45.0 ☐ STREAM SLOPE: 1.0%
- ☐ CHANNEL SHAPE: TRAP b=5' Z=C:1
- ☐ ROUTING: _____ ☐ OTHER: _____

DESIGN FLOWS/TAILWATER

R.I. (YEARS)	FLOW (cfs)	TW (ft)
5	7.2	
100	52.4	



CULVERT DESCRIPTION: MATERIAL - SHAPE - SIZE - ENTRANCE	TOTAL FLOW Q (cfs)	FLOW PER BARREL Q/N (1)	HEADWATER CALCULATIONS: INLET CONTROL HW_i/D (2)	HW_i	FALL (3)	EL_hi (4)	OUTLET CONTROL TW (5)	d_c	(d_c+D)/2	h_o (6)	h_e	H (7)	EL_ho (8)	CONTROL HEADWATER ELEVATION	OUTLET VELOCITY	COMMENTS
2 - RCBP 30"X19" PROJ	52.4	26.2	1.71	2.68	0.5	62.58	1.2	1.35	1.46	1.46	0.2	1.2	62.12	62.58	8.0	0.68' FLOW ABOVE LP OF ROAD

TECHNICAL FOOTNOTES:

(1) USE Q/NB FOR BOX CULVERTS

(2) HW_i/D = HW/D OR HW_i/D FROM DESIGN CHARTS

(3) FALL = $HW_i - (EL_{hd} - EL_{sf})$; FALL IS ZERO FOR CULVERTS ON GRADE

(4) $EL_{hi} = HW_i + EL_i$ (INVERT OF INLET CONTROL SECTION)

(5) TW BASED ON DOWN STREAM CONTROL OR FLOW DEPTH IN CHANNEL.

(6) h_o = TW or $(d_c + D/2)$ (WHICHEVER IS GREATER)

(7) $H = \left[1 + h_e + (29n^2 L)/R^{1.33}\right] V^2/2g$

(8) $EL_{ho} = EL_o + H + h_o$

SUBSCRIPT DEFINITIONS:

- e. APPROXIMATE
- f. CULVERT FACE
- hd. DESIGN HEADWATER
- hi. HEADWATER IN INLET CONTROL
- ho. HEADWATER IN OUTLET CONTROL
- i. INLET CONTROL SECTION
- o. OUTLET
- sf. STREAMBED AT CULVERT FACE
- tw. TAILWATER

COMMENTS / DISCUSSION:

CULVERT BARREL SELECTED:

SIZE: _____

SHAPE: _____

MATERIAL: _____

ENTRANCE: _____

REFERENCE: Federal Highway Administration, Hydraulic Design of Highway Culvert

Hydraulic Design Series No. 5 1985

Design Procedure Form: Runoff Reduction

UD-BMP (Version 3.07, March 2018) — Sheet 1 of 1

Designer:	**Mike Bartusek**
Company:	**Respec**
Date:	**September 23, 2022**
Project:	**Joyful View Sub - Work Sheet 1**
Location:	**Joyful View Road**

SITE INFORMATION (User Input in Blue Cells)

WQCV Rainfall Depth: 0.60 inches

Depth of Average Runoff Producing Storm, d_8 = 0.43 inches (for Watersheds Outside of the Denver Region, Figure 3-1 in USDCM Vol. 3)

Note that per MHFD Detail T-0 page RR-8, 0.6 is for the Denver Metro region. Research what is appropriate for this site.

Area Type	UIA:RPA	SPA	UIA:RPA	SPA	UIA:RPA	SPA	UIA:RPA	SPA	UIA:RPA	SPA	UIA:RPA	SPA
Area ID	OS2A1	OSA2A2	OS2B1	OS2B2	OS2C1	OS2C2	A3A1	A3A2	A3B1	A3B2	A3C1	A3C2
Downstream Design Point ID	2	2	4	4	9	9	9	10	6	6	11	
Downstream BMP Type												
DCIA (ft^2)	--	--	--	--	--	--	--	--	--	--	--	--
UIA (ft^2)	6,400	--	6,400	--	6,400	--	6,400	--	6,400	--	6,400	--
RPA (ft^2)	4,000	--	4,000	--	4,000	--	4,000	--	4,000	--	4,000	--
SPA (ft^2)	--	34,850	--	30,500	--	21,800	--	113,250	--	348,500	--	57,500
HSG A (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
HSG B (%)	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
HSG C/D (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Average Slope of RPA (ft/ft)	0.250	--	0.250	--	0.250	--	0.250	--	0.250	--	0.250	--
UIA:RPA Interface Width (ft)	400.00	--	400.00	--	400.00	--	400.00	--	400.00	--	400.00	--

CALCULATED RUNOFF RESULTS

Area ID	OS2A1	OSA2A2	OS2B1	OS2B2	OS2C1	OS2C2	A3A1	A3A2	A3B1	A3B2	A3C1	A3C2
UIA:RPA Area (ft^2)	10,400	--	10,400	--	10,400	--	10,400	--	10,400	--	10,400	--
L / W Ratio	0.07	--	0.07	--	0.07	--	0.07	--	0.07	--	0.07	--
UIA / Area	0.6154	--	0.6154	--	0.6154	--	0.6154	--	0.6154	--	0.6154	--
Runoff (in)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Runoff (ft^3)	0	0	0	0	0	0	0	0	0	0	0	0
Runoff Reduction (ft^3)	267	1743	267	1525	267	1090	267	5663	267	17425	267	2875

CALCULATED WQCV RESULTS

Area ID	OS2A1	OSA2A2	OS2B1	OS2B2	OS2C1	OS2C2	A3A1	A3A2	A3B1	A3B2	A3C1	A3C2
WQCV (ft^3)												
WQCV Reduction (ft^3)												
WQCV Reduction (%)												
Untreated WQCV (ft^3)												

CALCULATED DESIGN POINT RESULTS (sums results from all columns with the same Downstream Design Point ID)

Downstream Design Point ID	2	2	4	4	9	9	9	10	6	6	11	
DCIA (ft^2)	0	0	0	0	0	0	0	0	0	0	0	
UIA (ft^2)	6,400	6,400	6,400	6,400	12,800	12,800	12,800	0	6,400	6,400	6,400	
RPA (ft^2)	4,000	4,000	4,000	4,000	8,000	8,000	8,000	0	4,000	4,000	4,000	
SPA (ft^2)	34,850	34,850	30,500	30,500	21,800	21,800	21,800	113,250	348,500	348,500	0	
Total Area (ft^2)	45,250	45,250	40,900	40,900	42,600	42,600	42,600	113,250	358,900	358,900	10,400	
Total Impervious Area (ft^2)	6,400	6,400	6,400	6,400	12,800	12,800	12,800	0	6,400	6,400	6,400	
WQCV (ft^3)	0	0	0	0	0	0	0	0	0	0	0	
WQCV Reduction (ft^3)	0	0	0	0	0	0	0	0	0	0	0	
WQCV Reduction (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Untreated WQCV (ft^3)	0	0	0	0	0	0	0	0	0	0	0	

CALCULATED SITE RESULTS (sums results from all columns in worksheet)

Total Area (ft^2)	1,141,550
Total Impervious Area (ft^2)	83,200
WQCV (ft^3)	0
WQCV Reduction (ft^3)	0
WQCV Reduction (%)	0%
Untreated WQCV (ft^3)	0

Per MS4 permit page 29, this should be a minimum 60%. Check calcs and revise as needed to meet minimum or else combine with an additional/alternative PBMP.

Provide a figure showing all proposed UIA and RPA areas to be utilized for runoff reduction. All RPA areas will need to be within a no build/drainage easement (add to Plat) and discussed in the maintenance agreement and O&M manual. Wetlands are not an acceptable RPA per the MS4 Permit and MHFD guidelines. Also make sure to show RPA limits on GEC Plans (not just FDR) so our SW inspectors and the QSM know that these areas are to remain pervious and vegetated post-construction.

I don't see the value of including SPA's in this spreadsheet as they don't actually contribute to treating any runoff from UIA's. Remove them unless you see value in having them on here and add a discuss of them to the report text above.

Design Procedure Form: Runoff Reduction

UD-BMP (Version 3.07, March 2018) — Sheet 1 of 1

Designer:	Mike Bartusek
Company:	Respec
Date:	September 23, 2022
Project:	Joyful View Sub - Work Sheet 2
Location:	Joyful View Road

SITE INFORMATION (User Input in Blue Cells)

WQCV Rainfall Depth: 0.60 inches

Depth of Average Runoff Producing Storm, d_6 = 0.43 inches (for Watersheds Outside of the Denver Region, Figure 3-1 in USDCM Vol. 3)

Area Type	UIA:RPA	SPA										
Area ID	A3D1	A3D2										
Downstream Design Point ID	2	2										
Downstream BMP Type												
DCIA (ft^2)	--	--										
UIA (ft^2)	8,450	--										
RPA (ft^2)	4,750	--										
SPA (ft^2)	--	10,000										
HSG A (%)	0%	0%										
HSG B (%)	100%	100%										
HSG C/D (%)	0%	0%										
Average Slope of RPA (ft/ft)	0.250	--										
UIA:RPA Interface Width (ft)	455.00	--										

CALCULATED RUNOFF RESULTS

Area ID	A3D1	A3D2										
UIA:RPA Area (ft^2)	13,200	--										
L / W Ratio	0.06	--										
UIA / Area	0.6402	--										
Runoff (in)	0.00	0.00										
Runoff (ft^3)	0	0										
Runoff Reduction (ft^3)	352	500										

CALCULATED WQCV RESULTS

Area ID	A3D1	A3D2										
WQCV (ft^3)												
WQCV Reduction (ft^3)												
WQCV Reduction (%)												
Untreated WQCV (ft^3)												

CALCULATED DESIGN POINT RESULTS (sums results from all columns with the same Downstream Design Point ID)

Downstream Design Point ID	2	2										
DCIA (ft^2)	0	0										
UIA (ft^2)	8,450	8,450										
RPA (ft^2)	4,750	4,750										
SPA (ft^2)	10,000	10,000										
Total Area (ft^2)	23,200	23,200										
Total Impervious Area (ft^2)	8,450	8,450										
WQCV (ft^3)	0	0										
WQCV Reduction (ft^3)	0	0										
WQCV Reduction (%)	0%	0%										
Untreated WQCV (ft^3)	0	0										

CALCULATED SITE RESULTS (sums results from all columns in worksheet)

Total Area (ft^2)	46,400
Total Impervious Area (ft^2)	16,900
WQCV (ft^3)	0
WQCV Reduction (ft^3)	0
WQCV Reduction (%)	0%
Untreated WQCV (ft^3)	0

- Specify soil mixture on GEC Plans, like is done for seeding and mulching details. Look at Table RR-3 in MHFD Detail T-0 for specific soil characteristics.
- Specify in GEC Plans that RPA vegetation should be turf grass (from seed or sod)
- Specify in GEC Plans that turf grass vegetation should have a uniform density of at least 80%.
- In Drainage Report summarize (if already discussed at length in Soils Report) suitability of topsoil of RPA and steps for proper preparation of RPA soil per recommendations in MHFD detail T-0.
- Provide an O&M manual for the RPAs. See the City's template for grass buffers / grass swales to use as a starting point: https://coloradosprings.gov/stormwater-enterprise/page/operations-and-maintenance-permanent-bmps?mlid=6126

- Note on GEC Plans that irrigation (temp or permanent) is necessary to establish sufficient vegetation and not just weeds.

APPENDIX C

FEMA LOMR

Federal Emergency Management Agency

Washington, D.C. 20472

LETTER OF MAP REVISION DETERMINATION DOCUMENT

COMMUNITY AND REVISION INFORMATION		PROJECT DESCRIPTION	BASIS OF REQUEST
COMMUNITY	El Paso County Colorado (Unincorporated Areas)	NO PROJECT	HYDRAULIC ANALYSIS HYDROLOGIC ANALYSIS UPDATED TOPOGRAPHIC DATA BASEMAP CHANGES
	COMMUNITY NO.: 080059		
IDENTIFIER	Joyful View Subdivision - Haegler	APPROXIMATE LATITUDE & LONGITUDE: 38.870, -104.460 SOURCE: USGS QUADRANGLE DATUM: NAD 83	

ANNOTATED MAPPING ENCLOSURES	ANNOTATED STUDY ENCLOSURES
TYPE: FIRM* NO.: 08041C0805G DATE: December 7, 2018	DATE OF EFFECTIVE FLOOD INSURANCE STUDY: December 7, 2018 PROFILE: 451P SUMMARY OF DISCHARGE TABLE: 4

Enclosures reflect changes to flooding sources affected by this revision
* FIRM - Flood Insurance Rate Map;

FLOODING SOURCE AND REVISED REACH

Haegler Main Stem - From approximately 3,330 feet downstream of Peyton Highway to approximately 1,750 feet upstream of Peyton Highway

SUMMARY OF REVISIONS

Flooding Source	Effective Flooding	Revised Flooding	Increases	Decreases
Haegler Main Stem	No BFEs*	BFEs	YES	NONE
	Zone A	Zone AE	YES	YES
	Zone A	Zone A	YES	YES

* BFEs - Base Flood Elevations

DETERMINATION

This document provides the determination from the Department of Homeland Security's Federal Emergency Management Agency (FEMA) regarding a request for a Letter of Map Revision (LOMR) for the area described above. Using the information submitted, we have determined that a revision to the flood hazards depicted in the Flood Insurance Study (FIS) report and/or National Flood Insurance Program (NFIP) map is warranted. This document revises the effective NFIP map, as indicated in the attached documentation. Please use the enclosed annotated map panels revised by this LOMR for floodplain management purposes and for all flood insurance policies and renewals in your community.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Mapping and Insurance eXchange toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 3601 Eisenhower Avenue, Suite 500, Alexandria, VA 22304-6426. Additional Information about the NFIP is available on our website at https://www.fema.gov/flood-insurance.

Patrick "Rick" F. Sacbibit, P.E., Branch Chief
Engineering Services Branch
Federal Insurance and Mitigation Administration

Federal Emergency Management Agency
Washington, D.C. 20472

LETTER OF MAP REVISION
DETERMINATION DOCUMENT (CONTINUED)

COMMUNITY INFORMATION

APPLICABLE NFIP REGULATIONS/COMMUNITY OBLIGATION

We have made this determination pursuant to Section 206 of the Flood Disaster Protection Act of 1973 (P.L. 93-234) and in accordance with the National Flood Insurance Act of 1968, as amended (Title XIII of the Housing and Urban Development Act of 1968, P.L. 90-448), 42 U.S.C. 4001-4128, and 44 CFR Part 65. Pursuant to Section 1361 of the National Flood Insurance Act of 1968, as amended, communities participating in the NFIP are required to adopt and enforce floodplain management regulations that meet or exceed NFIP criteria. These criteria, including adoption of the FIS report and FIRM, and the modifications made by this LOMR, are the minimum requirements for continued NFIP participation and do not supersede more stringent State/Commonwealth or local requirements to which the regulations apply.

COMMUNITY REMINDERS

We based this determination on the 1-percent-annual-chance discharges computed in the submitted hydrologic model. Future development of projects upstream could cause increased discharges, which could cause increased flood hazards. A comprehensive restudy of your community's flood hazards would consider the cumulative effects of development on discharges and could, therefore, indicate that greater flood hazards exist in this area.

Your community must regulate all proposed floodplain development and ensure that permits required by Federal and/or State/Commonwealth law have been obtained. State/Commonwealth or community officials, based on knowledge of local conditions and in the interest of safety, may set higher standards for construction or may limit development in floodplain areas. If your State/Commonwealth or community has adopted more restrictive or comprehensive floodplain management criteria, those criteria take precedence over the minimum NFIP requirements.

We will not print and distribute this LOMR to primary users, such as local insurance agents or mortgage lenders; instead, the community will serve as a repository for the new data. We encourage you to disseminate the information in this LOMR by preparing a news release for publication in your community's newspaper that describes the revision and explains how your community will provide the data and help interpret the NFIP maps. In that way, interested persons, such as property owners, insurance agents, and mortgage lenders, can benefit from the information.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination If you have any questions about this document, please contact the FEMA Mapping and Insurance eXchange toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 3601 Eisenhower Avenue, Suite 500, Alexandria, VA 22304-6426 Additional Information about the NFIP is available on our website at https://www.fema.gov/flood-insurance.

Patrick "Rick" F. Sacbibit, P.E., Branch Chief
Engineering Services Branch
Federal Insurance and Mitigation Administration

Federal Emergency Management Agency
Washington, D.C. 20472

LETTER OF MAP REVISION
DETERMINATION DOCUMENT (CONTINUED)

We have designated a Consultation Coordination Officer (CCO) to assist your community. The CCO will be the primary liaison between your community and FEMA. For information regarding your CCO, please contact:

Ms. Jeanine D. Petterson
Director, Mitigation Division
Federal Emergency Management Agency, Region VIII
Denver Federal Center, Building 710
P.O. Box 25267
Denver, CO 80225-0267
(303) 235-4830

STATUS OF THE COMMUNITY NFIP MAPS

We will not physically revise and republish the FIRM and FIS report for your community to reflect the modifications made by this LOMR at this time. When changes to the previously cited FIRM panel(s) and FIS report warrant physical revision and republication in the future, we will incorporate the modifications made by this LOMR at that time.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Mapping and Insurance eXchange toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 3601 Eisenhower Avenue, Suite 500, Alexandria, VA 22304-6426. Additional Information about the NFIP is available on our website at https://www.fema.gov/flood-insurance.

Patrick "Rick" F. Sacbibit, P.E., Branch Chief
Engineering Services Branch
Federal Insurance and Mitigation Administration

Federal Emergency Management Agency
Washington, D.C. 20472

LETTER OF MAP REVISION
DETERMINATION DOCUMENT (CONTINUED)

PUBLIC NOTIFICATION OF REVISION

A notice of changes will be published in the *Federal Register*. This information also will be published in your local newspaper on or about the dates listed below, and through FEMA's Flood Hazard Mapping website at https://www.floodmaps.fema.gov/fhm/bfe_status/bfe_main.asp

Name: *The Gazette*

Dates: October 12, 2020 and October 19, 2020

Within 90 days of the second publication in the local newspaper, any interested party may request that we reconsider this determination. Any request for reconsideration must be based on scientific or technical data. Therefore, this letter will be effective only after the 90-day appeal period has elapsed and we have resolved any appeals that we receive during this appeal period. Until this LOMR is effective, the revised flood hazard determination presented in this LOMR may be changed.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Mapping and Insurance eXchange toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 3601 Eisenhower Avenue, Suite 500, Alexandria, VA 22304-6426. Additional Information about the NFIP is available on our website at https://www.fema.gov/flood-insurance.

Patrick "Rick" F. Sacbibit, P.E., Branch Chief
Engineering Services Branch
Federal Insurance and Mitigation Administration

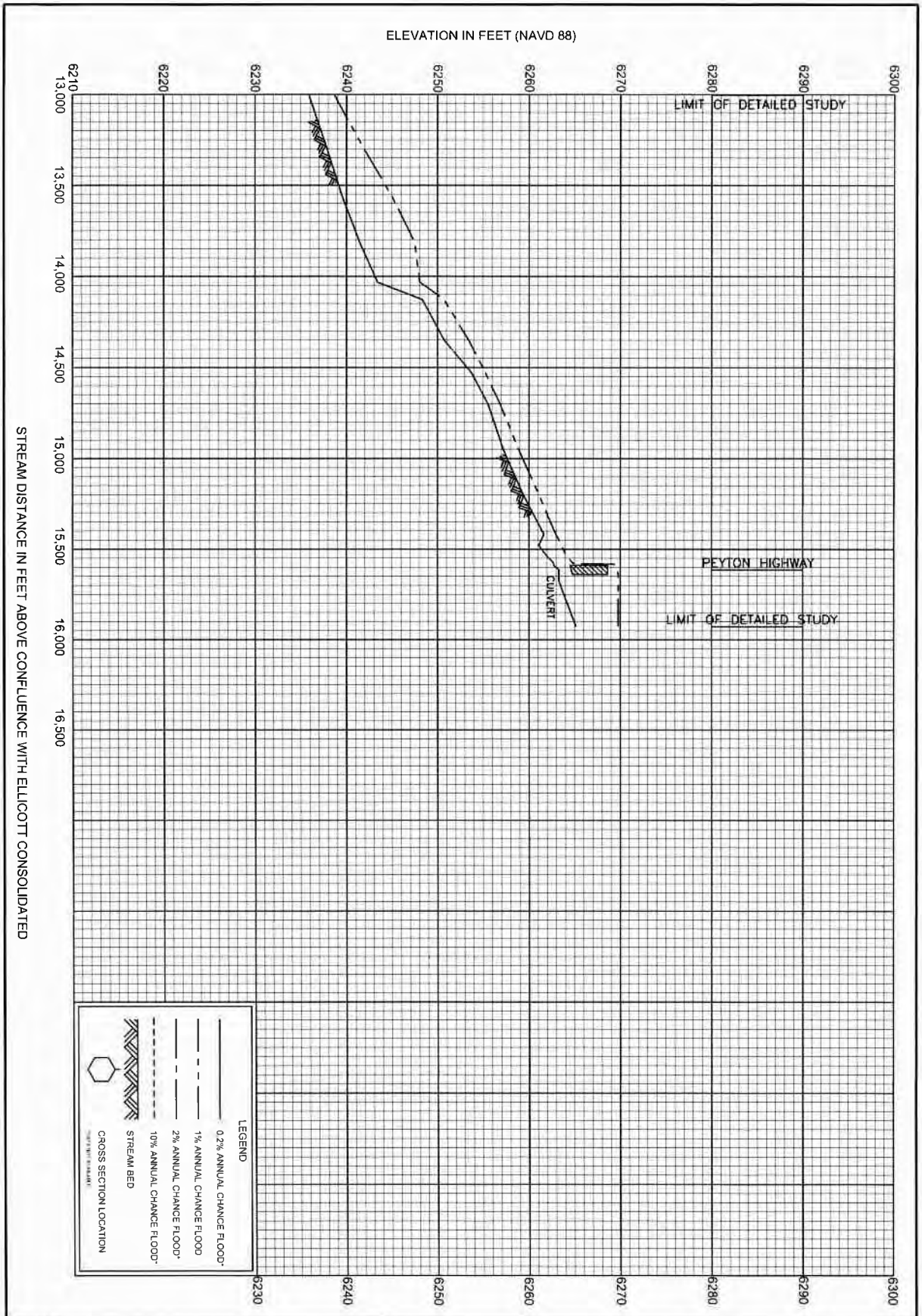
Table 4. Summary of Discharges (cont.)

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (Cubic Feet Per Second) 10-Year	50-Year	100-Year	500-Year
Fountain Creek					
Near Colorado Springs, CO	103	1,300	2,800	3,700	6,500
At Colorado Springs, CO	392	7,900	14,300	18,000	29,400
At Janitell, CO	413	11,800	18,800	22,400	32,200
At Security, CO	495	11,900	21,000	25,800	39,500
At Fountain, CO	681	14,700	29,900	39,400	71,300
Near Pinon, CO	849	10,700	24,200	33,300	66,800
Near Pueblo, CO	926	14,400	30,200	39,600	70,000
Franceville Tributary to Jimmy Camp Creek					
At confluence with Jimmy Camp Creek	4.1	1,700	2,800	3,500	4,300
Haegler Main Stem					
At Peyton Highway	10.67	--[1]	--[1]	1,862	--[1]
At approximately 3,200 feet downstream of Peyton Highway	11.02	--[1]	--[1]	1,900	--[1]
Haegler Ranch Tributary 1					
At Eastonville Road	0.96	--[1]	--[1]	80	--[1]
Haegler Ranch Tributary 1A					
At Eastonville Road	0.07	--[1]	--[1]	70	--[1]
Haegler Ranch Tributary 2					
At Eastonville Road	0.96	--[1]	--[1]	40	--[1]
Haegler Ranch Tributary 2					
At confluence with Geick Ranch West Tributary	1.47	--[1]	--[1]	592	--[1]
Haegler Ranch Tributary 3					
At approximately 2,300 feet upstream of the confluence with Haegler Ranch Tributary 4	1.09	--[1]	--[1]	505	--[1]
Haegler Ranch Tributary 4					
At approximately 3,700 feet upstream of the confluence with Haegler Ranch Tributary 3	0.60	--[1]	--[1]	130	--[1]
Jackson Creek					
At Assembly Road	2.44	--[1]	--[1]	1,313	--[1]

REVISED DATA

[1]Data not available

REVISED TO REFLECT LOMR EFFECTIVE: February 16, 2021



451P

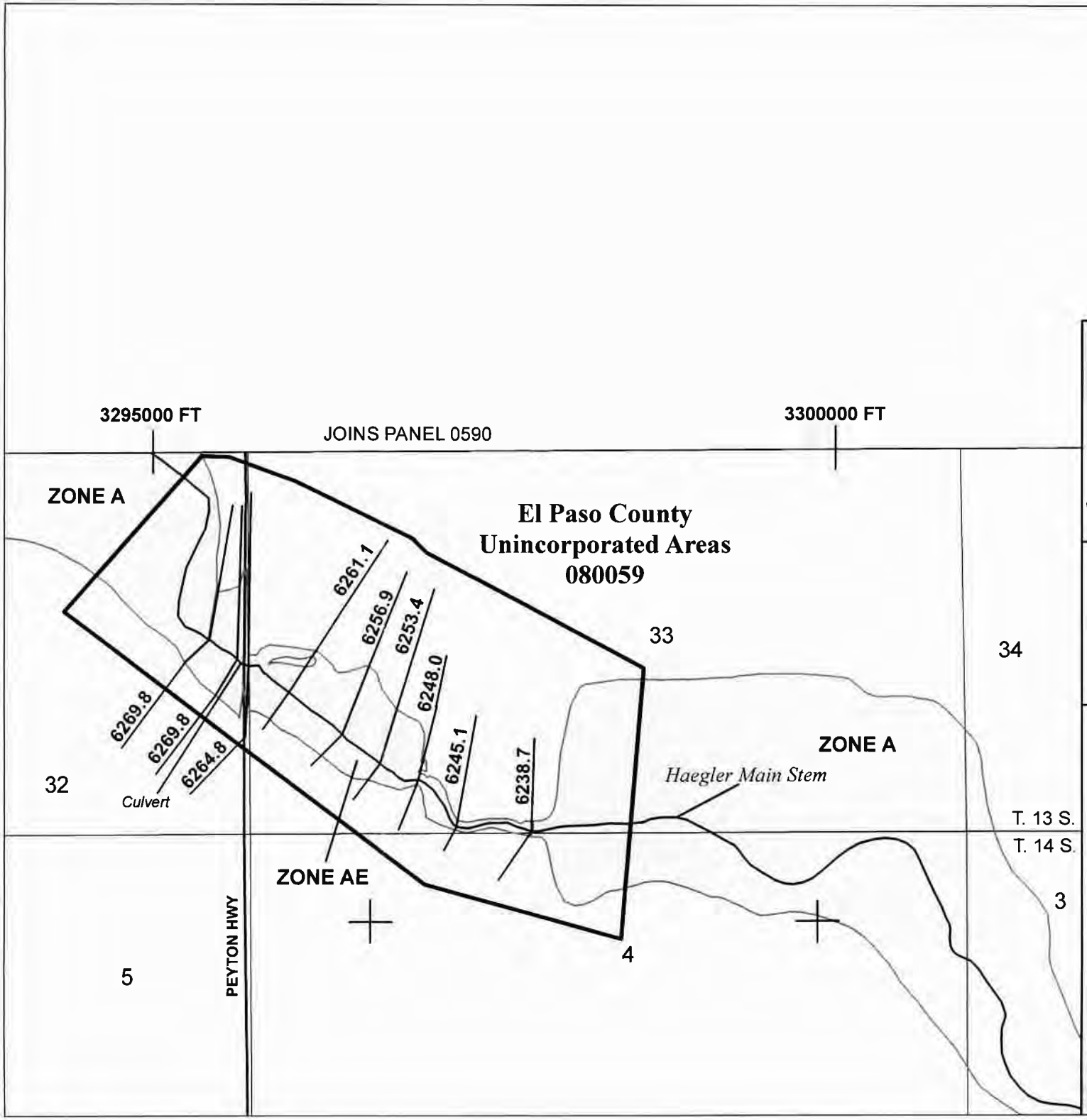
FEDERAL EMERGENCY MANAGEMENT AGENCY

EL PASO COUNTY, CO
(AND INCORPORATED AREAS)

FLOOD PROFILES

REVISED TO
REFLECT LOMR
EFFECTIVE: February 16, 2021

HAEGLER MAIN STEM



SPECIAL FLOOD HAZARD AREAS

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

OTHER AREAS OF FLOOD HAZARD

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

SCALE

Map Projection:
Universal Transverse MercatorNAD 1983 UTM Zone 13N
Western Hemisphere Vertical Datum: NAVD 88

1 inch = 1,000 feet 1:12,000

0 500 1,000 2,000 Feet

0 125 250 500 Meters

FEMA

National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO
and Incorporated Areas

PANEL 805 OF 1300

FEMA

Panel Contains:

COMMUNITY	NUMBER	PANEL	SUFFIX
EL PASO COUNTY	080059	0805	C

REVISED TO
REFLECT LOMR
EFFECTIVE: February 16, 2021

VERSION NUMBER
1.1.1.0

MAP NUMBER
08041C0805G

MAP REVISED
DECEMBER 7, 2018

APPENDIX D

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

Figure 6-25. Estimate of Average Concentrated Shallow Flow

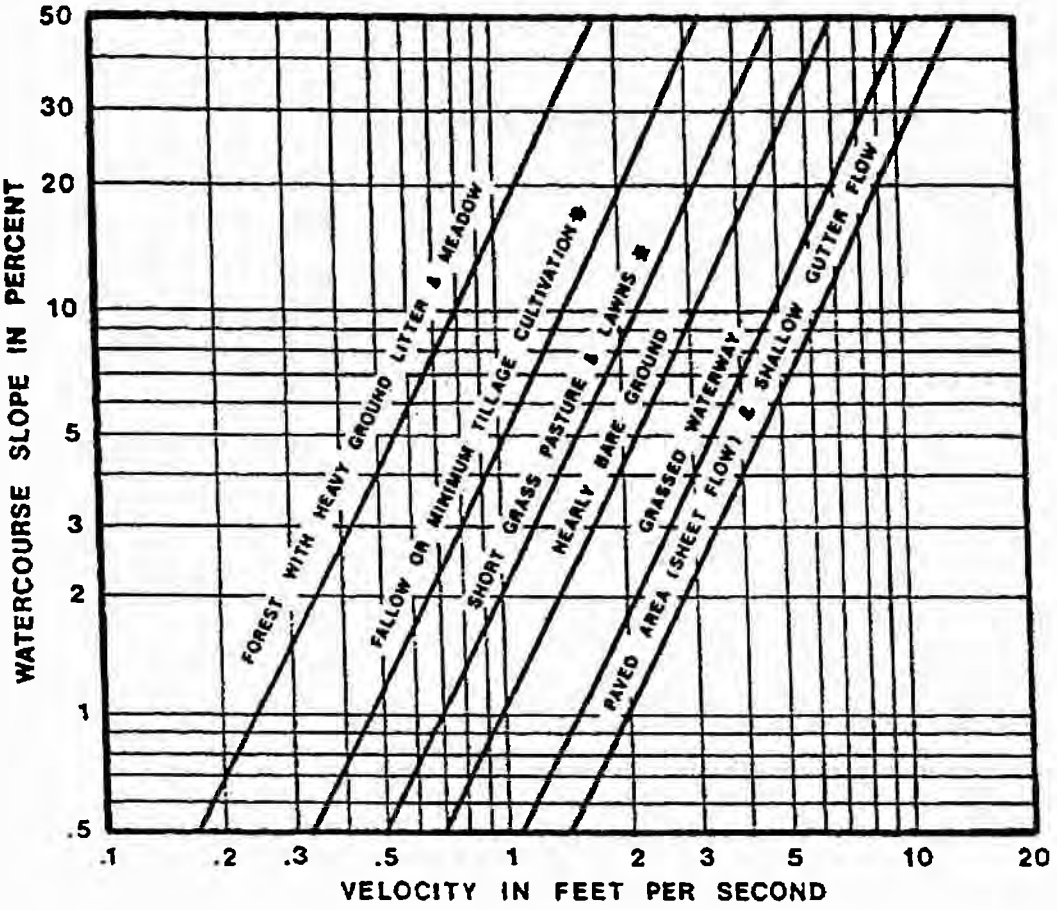
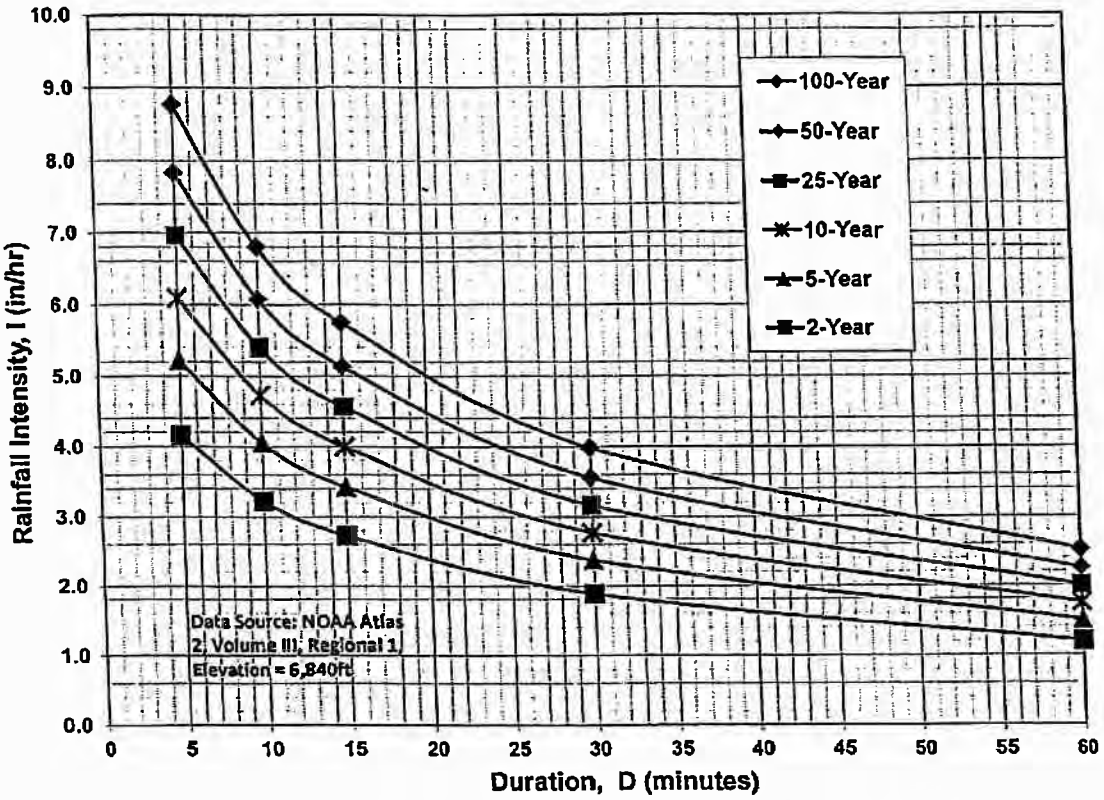


Figure 6-5. Colorado Springs Rainfall Intensity Duration Frequency



IDF Equations

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

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

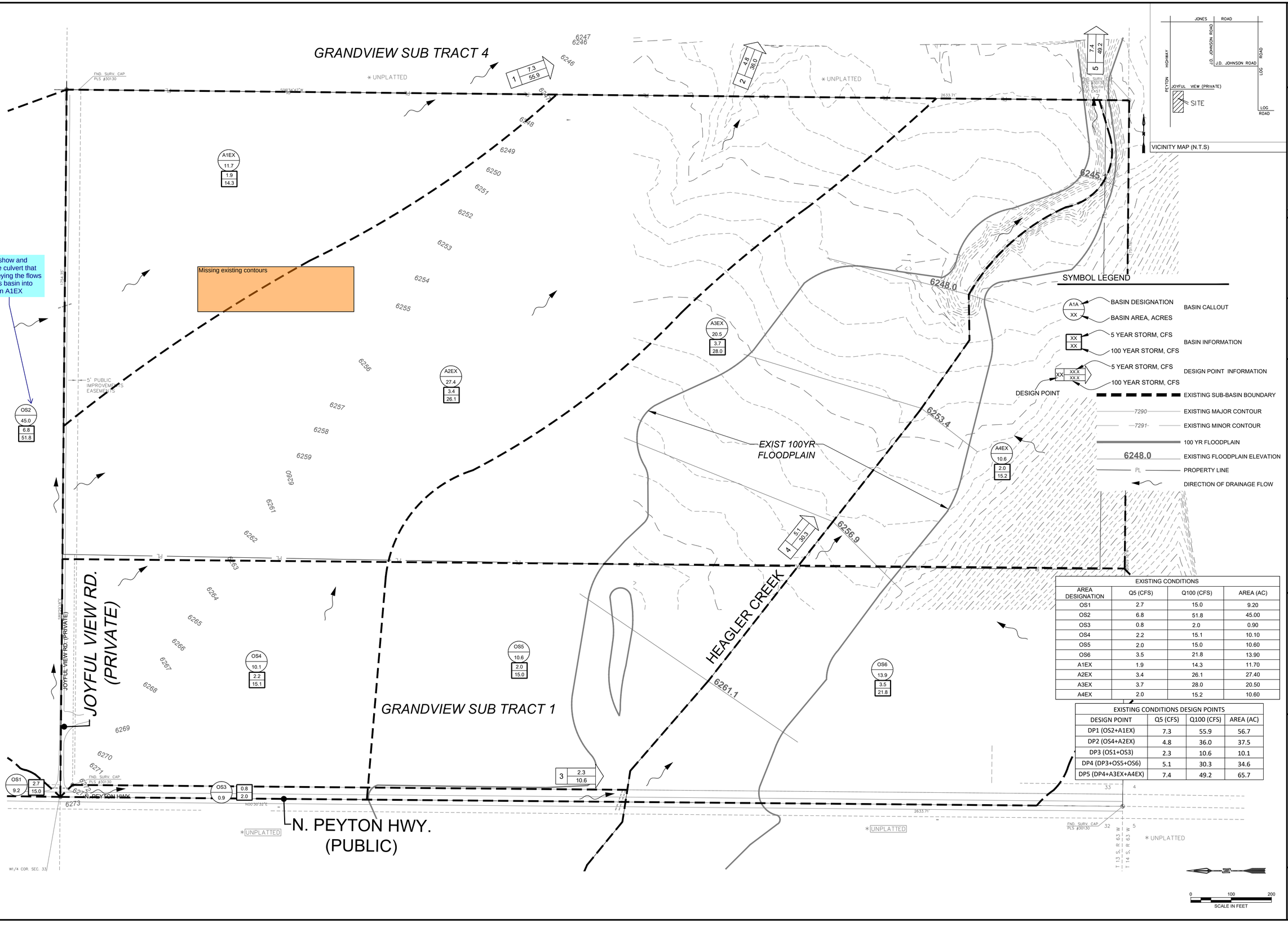
$I_{25} = -2.00 \ln(D) + 10.111$

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

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

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

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



EXISTING CONDITIONS			
AREA DESIGNATION	Q5 (CFS)	Q100 (CFS)	AREA (AC)
OS1	2.7	15.0	9.20
OS2	6.8	51.8	45.00
OS3	0.8	2.0	0.90
OS4	2.2	15.1	10.10
OS5	2.0	15.0	10.60
OS6	3.5	21.8	13.90
A1EX	1.9	14.3	11.70
A2EX	3.4	26.1	27.40
A3EX	3.7	28.0	20.50
A4EX	2.0	15.2	10.60

EXISTING CONDITIONS DESIGN POINTS			
DESIGN POINT	Q5 (CFS)	Q100 (CFS)	AREA (AC)
DP1 (OS2+A1EX)	7.3	55.9	56.7
DP2 (OS4+A2EX)	4.8	36.0	37.5
DP3 (OS1+OS3)	2.3	10.6	10.1
DP4 (DP3+OS5+OS6)	5.1	30.3	34.6
DP5 (DP4+A3EX+A4EX)	7.4	49.2	65.7

NAME: N:\PROJECTS\W0008 - GUMAN & ASSOCIATES\W0008.0001 JOYFUL VIEW\3. DWG\1. SHEETS\DRAINAGE PLANS\EXISTING DRAINAGE PLAN.DWG
PLOT DATE: September 22, 2022 3:21 PM, BY: REBECKA MCCONNELL

RESPEC (FORMERLY ADP)
121 S. TEJON ST
SUITE 1110
COLORADO SPRINGS, CO 80903
PHONE (719) 266-5212

DESIGNED	MAB
DRAWN	AAC
CHECKED	RGG
DATE	9/22/2022

REVISION

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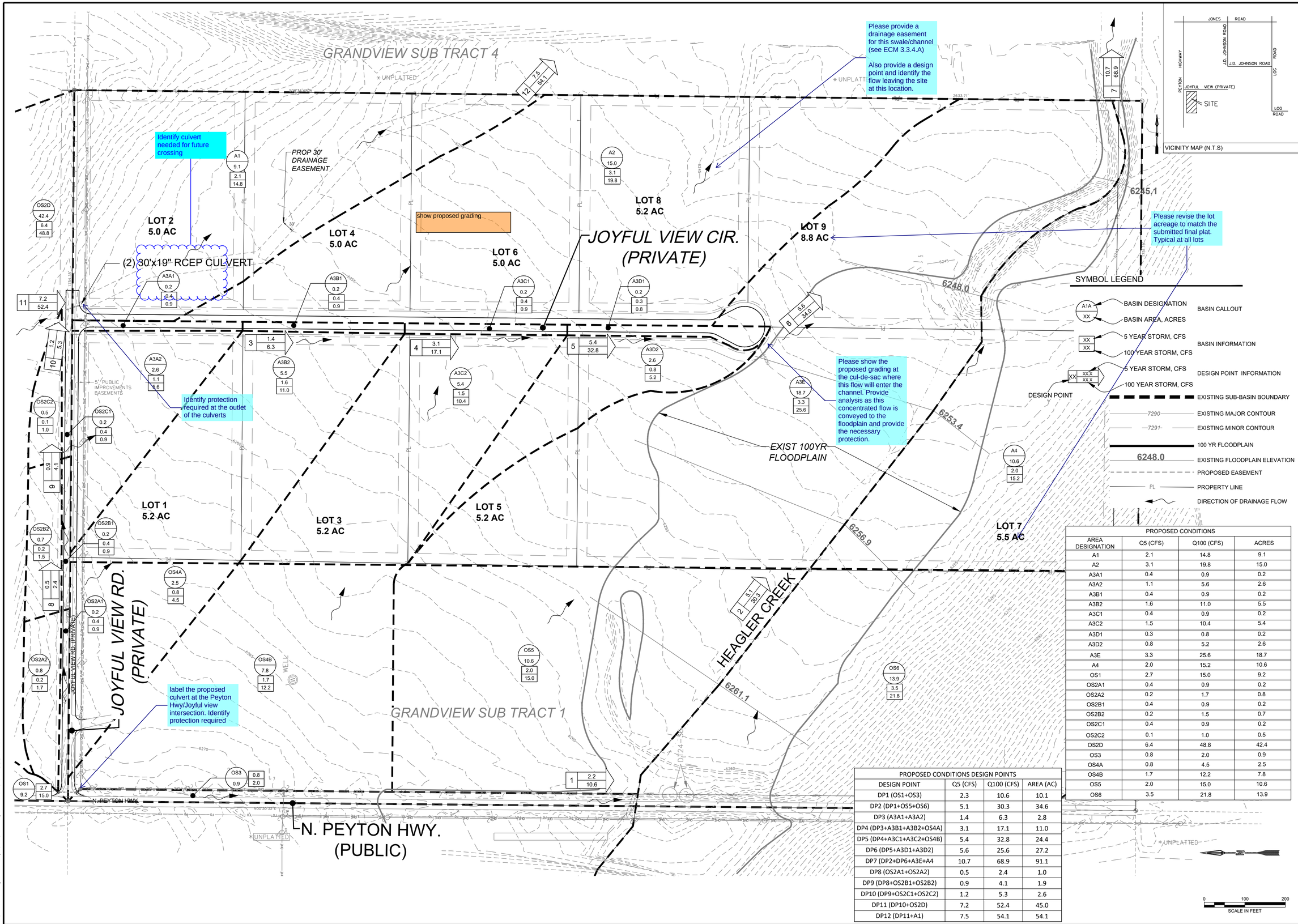
KEVIN O'NEIL
P.O. BOX 1385
COLORADO SPRINGS, CO 809010

JOYFUL VIEW
SUBDIVISION
EL PASO COUNTY, CO

EXISTING DRAINAGE PLAN

DRAWING NUMBER:
C
SHEET 1



PROPOSED CONDITIONS

AREA DESIGNATION	Q5 (CFS)	Q100 (CFS)	ACRES
A1	2.1	14.8	9.1
A2	3.1	19.8	15.0
A3A1	0.4	0.9	0.2
A3A2	1.1	5.6	2.6
A3B1	0.4	0.9	0.2
A3B2	1.6	11.0	5.5
A3C1	0.4	0.9	0.2
A3C2	1.5	10.4	5.4
A3D1	0.3	0.8	0.2
A3D2	0.8	5.2	2.6
A3E	3.3	25.6	18.7
A4	2.0	15.2	10.6
OS1	2.7	15.0	9.2
OS2A1	0.4	0.9	0.2
OS2A2	0.2	1.7	0.8
OS2B1	0.4	0.9	0.2
OS2B2	0.2	1.5	0.7
OS2C1	0.4	0.9	0.2
OS2C2	0.1	1.0	0.5
OS2D	6.4	48.8	42.4
OS3	0.8	2.0	0.9
OS4A	0.8	4.5	2.5
OS4B	1.7	12.2	7.8
OS5	2.0	15.0	10.6
OS6	3.5	21.8	13.9

PROPOSED CONDITIONS DESIGN POINTS

DESIGN POINT	Q5 (CFS)	Q100 (CFS)	AREA (AC)
DP1 (OS1+OS3)	2.3	10.6	10.1
DP2 (DP1+OS5+OS6)	5.1	30.3	34.6
DP3 (A3A1+A3A2)	1.4	6.3	2.8
DP4 (DP3+A3B1+A3B2+OS4A)	3.1	17.1	11.0
DP5 (DP4+A3C1+A3C2+OS4B)	5.4	32.8	24.4
DP6 (DP5+A3D1+A3D2)	5.6	25.6	27.2
DP7 (DP2+DP6+A3E+A4	10.7	68.9	91.1
DP8 (OS2A1+OS2A2)	0.5	2.4	1.0
DP9 (DP8+OS2B1+OS2B2)	0.9	4.1	1.9
DP10 (DP9+OS2C1+OS2C2)	1.2	5.3	2.6
DP11 (DP10+OS2D)	7.2	52.4	45.0
DP12 (DP11+A1)	7.5	54.1	54.1

DESIGNED	MAB
DRAWN	AAC
CHECKED	RGG
DATE	9/22/2022

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EL PASO COUNTY, CO

PROPOSED DRAINAGE PLAN

DRAWING NUMBER:
C
SHEET 2

NAME: N:\PROJECTS\W0008 - GUMAN & ASSOCIATES\W0008.0001 JOYFUL VIEW\3. DWG\1. SHEETS\DRAINAGE PLANS\PROPOSED DRAINAGE PLAN.DWG
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