WYOMING ESTATES SUBDIVISION

FINAL DRAINAGE REPORT

PREPARED BY
Mike Bartusek
RESPEC
102 S Tejon St., Suite 1110
Colorado Springs, CO 80903
719-266-5212

PREPARED FOR
Home Run Restorations, Inc.
5090 Wiley Road
Peyton, CO 80904
719-325-6155

FEBRUARY 8, 2021

Project Number 03433

PCD File No. MS 196

RESPEC

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

COLORADO REGISTERED MICHAEL A. BARTUSEK 23329 2/11/21 PROFESSIONAL ENGINEER

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

By: _____
Shawn Shafer
Title: Owner

Address: Home Run Restorations, Inc.
5090 Wiley Road
Peyton, 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
WYOMING ESTATES SUBDIVISION

PROJECT DESCRIPTION

This drainage report is for the development of the Wyoming Estates Subdivision. The currently vacant 40.01 acres site is located west of Curtis Road approximately 2.5 mile north of SH 94. Of the 40.01 acres 3.53 acres is being dedicated to El Paso County for future Curtis Road expansion. It is further described as the southern portion of Section 33, Township 13 South, Range 64 West of the 6th Principal Meridian in El Paso County, Colorado.

All of this lot is located in the Curtis Ranch and Livestock Company drainage basin. Flows from the site drain into the west ditch of Curtis Road and flow north to the West Fork of 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 A
- 95 Truckton Sandy Loams B

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. 08041C0785G, dated December 7, 2018.

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 site is undeveloped except for a gravel road located along the north property line located within a 60 ft. Access Easement. Approximately 90% of the parcel is covered with rangeland grasses with slopes varying from 2% to 8%. The parcel generally slopes to the northeast except for the southwest corner which drains to the southwest. Also a large 2.5' deep sump area exists in the south central portion of the site. The overflow swale for this sump area directs the flows to the northeast.

Sub-Basin Aex contains 3.66 acres and drains the southwest corner of the site. It produces flows of 0.9 cfs for the 5-year storm and 7.1 cfs for the 100-year storm. These flows travel off the site to the south.

Sub-Basin B1ex contains 19.80 acres and drains the southcentral area of the site. This area drains to the east and northeast and is tributary Sub-Basin OS1 which contains the west ditch along Curtis Road. This sub-basin produces flows of 4.5 cfs for the 5-year storm and 34.0 cfs for the 100-year storm.

Sub-basin OS1 contains 3.53 acres and is located east of the site and contains the Curtis Road ROW. Sub-basin will produce flows of 1.9 cfs and 8.4 cfs respectively. The combined flows from Sub-Basin B1ex and OS1 at DP1 will be 6.0 cfs for the 5-year storm and 41.1 cfs for the 100-year storm.

Sub-basin OS2 contains 6.86 acres and is located in the northwest area of the site. This undeveloped area sheet flows onto the site and produces flows of 3.32 cfs for the 5-year storm and 13.1 cfs for the 100-year storm. These flows sheet flow into Sub-Basin B2ex.

Sub-Basin B2ex contains 13.02 acres and drains the northeast portion of the site. This area drains to the east and southeast toward the existing ditch along the existing gravel access road which serves the properties to the west. This sub-basin produces flows of 3.0 cfs for the 5-year storm and 18.6 cfs for the 100-year storm. These flows will combine with the flows from Sub-basin OS2 at DP2 to produce flows of 5.9 cfs for the 5-year storm and 30.3 cfs for the 100-year storm.

The flows from DP1 and DP2 will combine at DP3 to produce flows of 10.8 cfs for the 5-year storm and 63.5 cfs for the 100-year storm. These flows will continue within the west Curtis Road ditch to the West Fork of Squirrel Creek.

DEVELOPED DRAINAGE CONDITIONS

The proposed subdivision will consist of four (4) lots with Lot 1 containing 5.15 acres, Lot 2 containing 5.08 acres, Lot 3 containing 5.06 acres and Lot 4 containing 21.19 acres. It will also contain an asphalt cul-de-sac located across from Patton Drive with a private gravel road extending from the cul-de-sac and connecting to the existing access road to the west. 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.

Sub-Basin A contains 3.66 acres and will continue to drain to the southwest corner of the site. It produces flows of 0.9 cfs for the 5-year storm and 7.1 cfs for the 100-year storm. These flows travel off the site to the south.

Sub-Basin B1 contains 4.75 acres and drains the eastern area of the site adjacent to Curtis Road. This area drains to the east and northeast and is tributary Sub-Basin OS1 which contains the west ditch along Curtis Road. This sub-basin produces flows of 1.6 cfs for the 5-year storm and 10.1 cfs for the 100-year storm.

Sub-basin OS1A contains 2.62 acres and is located east of the site and contains the Curtis Road ROW. Sub-basin will produce flows of 1.5 cfs and 6.6 cfs respectively. The combined flows from Sub-Basins B1 and OS1A at DP1 will be 3.0 cfs for the 5-year storm and 16.4 cfs for the 100-year storm.

Sub-basin B2A1 contains 0.20 acres and is located in the area northcentral area of the site, along the south side of the gravel road. This roadway area sheet flows into the ditch in Sub-

basin B2B1 and produces flows of 0.4 cfs for the 5-year storm and 1.0 cfs for the 100-year storm.

Sub-Basin B2B1 contains 1.20 acres and drains the northcentral portion of the site and contains a small portion of Lot 1. This area drains to the northeast toward the proposed ditch along Teleo Point. This sub-basin produces flows of 0.8 cfs for the 5-year storm and 3.1 cfs for the 100-year storm. These flows will combine with the flows from Sub-basin B2A1at DP2 to produce flows of 1.1 cfs for the 5-year storm and 3.8 cfs for the 100-year storm. These flows continue east into Sub-Basin B2B2.

Sub-basin OS2A contains 1.26 acres and is located northwest of the site. This undeveloped area sheet flows onto the site and produces flows of 0.3 cfs for the 5-year storm and 1.9 cfs for the 100-year storm. These flows sheet flow into Sub-Basin B2.

Sub-Basin B2B2 contains 16.31 acres and drains the northcentral portion of the site and contains a large portion of Lots 3 and 4 and a small portion of Lot 1. This area drains to the northeast toward the proposed ditch along Teleo Point. This sub-basin produces flows of 3.6 cfs for the 5-year storm and 27.2 cfs for the 100-year storm. These flows will combine with the flows from Sub-basin OS2A at DP3 to produce flows of 3.5 cfs for the 5-year storm and 26.9 cfs for the 100-year storm. These flows will combine with the flows from DP2 at DP4 to produce flows of 4.8 cfs for the 5-year storm and 30.6 cfs for the 100-year storm. These ditch flow continue east toward the Curtis Road ditch. They will then combine with the flows from DP1 at the proposed public 30"x19" RCEP culvert under the Teleo Point cul-de-sac. The combined flows of DP1 and DP4 at DP5 will be 7.0 cfs for the 5-year storm and 42.8 cfs for the 100-year storm. These flows continue north into Sub-Basin OS1B.

Sub-basin B3A1 contains 0.165 acres and is located in the area northwest of the site, along the south side of the gravel road. This roadway area sheet flows into the ditch in Sub-basin B3B and produces flows of 0.4 cfs for the 5-year storm and 0.9 cfs for the 100-year storm.

Sub-basin B3A2 contains 0.165 acres and is located in the area northwest of the site approximately 275 ft from the west property line along the south side of the gravel road. This roadway area sheet flows into the ditch in Sub-basin B3B and produces flows of 0.4 cfs for the 5-year storm and 0.9 cfs for the 100-year storm.

Sub-basin OS2B contains 5.60 acres and is located in the area northwest of the site. This undeveloped area sheet flows onto the site and produces flows of 1.1 cfs for the 5-year storm and 8.2 cfs for the 100-year storm. These flows sheet flow into Sub-Basin B3.

Sub-Basin B3B contains 4.11 acres and drains the northwestern portion of the site and contains a large portion of Lot 1. This area drains to the east toward the proposed ditch and sump along the new gravel access road. This sub-basin produces flows of 1.1 cfs for the 5-year storm and 8.0 cfs for the 100-year storm. The flows from Sub-basin B3B will combine with the flows from Sub-basin OS2B at DP8 to produce flows of 1.9 cfs for the 5-year storm and 13.7 cfs for the 100-year storm. These flows will combine with the flows from Sub-basins B3A1 and B3A2 at DP9 to produce flows of 2.2 cfs for the 5-year storm and 14.6 cfs for the 100-year storm. These flows travel into Sub-Basin B4A2 through a private 30" cmp.

Sub-basin B4A1 contains 0.44 acres and is located in the area northwest of the site, along the north side of the gravel road. This roadway area sheet flows south along the roadway and into Sub-basin B4A2 and produces flows of 0.7 cfs for the 5-year storm and 2.1 cfs for the 100-year

storm. These flows will combine with the flows from DP9 at DP10 to produce flows of 2.5 cfs for the 5-year storm and 15.4 cfs for the 100-year storm.

Sub-Basin B4A2 contains 4.40 acres and drains the northeastern portion of the site and contains a Lot 2. This area drains to the east toward the existing ditch along the west property line which will be enlarged and stabilized. This sub-basin produces flows of 1.3 cfs for the 5-year storm and 9.0 cfs for the 100-year storm. These flows will combine with the flows from DP10 at DP11 to produce flows of 3.1 cfs for the 5-year storm and 19.2 cfs for the 100-year storm. These flows will then flow into the ditch along Curtis Road.

Sub-Basin B4B1 contains 0.38 acres and drains the northern portion of the Teleo Point gravel road. This area drains to the east toward Curtis Road. This sub-basin produces flows of 0.5 cfs for the 5-year storm and 1.6 cfs for the 100-year storm. These flows will then flow into Sub-basin B4B2.

Sub-Basin B4B2 contains 0.56 acres and drains the northern portion of the Teleo Point asphalt road. This area drains to the east toward Curtis Road. This sub-basin produces flows of 1.4 cfs for the 5-year storm and 3.3 cfs for the 100-year storm. These flows will combine with the flows from Sub-basin B4B1at DP6 to produce flows of 7.8 cfs for the 5-year storm and 44.8 cfs for the 100-year storm. These flows will then flow into the ditch along Curtis Road.

Sub-basin OS1B contains 0.91 acres and is located east of the site and north of Teleo Point cul-de-sac and contains the Curtis Road ROW. Sub-basin will produce flows of 0.6 cfs and 2.6 cfs respectively. These flows will combine with the flows from DP6 at DP7 to produce flows of 7.8 cfs for the 5-year storm and 44.1 cfs for the 100-year storm.

The combined flows of OS1B, DP7 and DP11 at DP12 will be 9.8 cfs for the 5-year storm and 57.5 cfs for the 100-year storm. These flows will continue within the west Curtis Road ditch to the West Fork of Squirrel Creek.

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 public cul-de-sac and private access road.

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.

PRIVATE DRAINAGE FACILITIES

The proposed drainage improvements will be constructed at the time of plat approval. The private culvert and ditch improvements construction and maintenance will be the responsibility of Wyoming Estates Subdivision HOA.

DRAINAGE BASIN FEES

The proposed development is located within the Curtis Ranch and Livestock Company drainage basin. The Livestock Company drainage basin encompasses 3.66 acres of the site has fees associated with it. The Curtis Ranch drainage basin encompasses the remainder of the area and has no fees associated with it.

2021 Livestock Company Drainage Fees

Impervious Coverage = 3.6%
Area Subject to Fees = 0.036 x 3.66 = 0.13 Acres
Livestock Company Fee = $18,273/Acre
Drainage Basin Fee = $18,273 x 0.13 = $2,375

2021 Livestock Company Bridge Fees

Impervious Coverage = 3.6%
Area Subject to Fees = 0.036 x 3.66 = 0.13 Acres
Livestock Company Fee = $217/Acre
Drainage Basin Fee = $217 x 0.13 = $28

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 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)

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.

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.

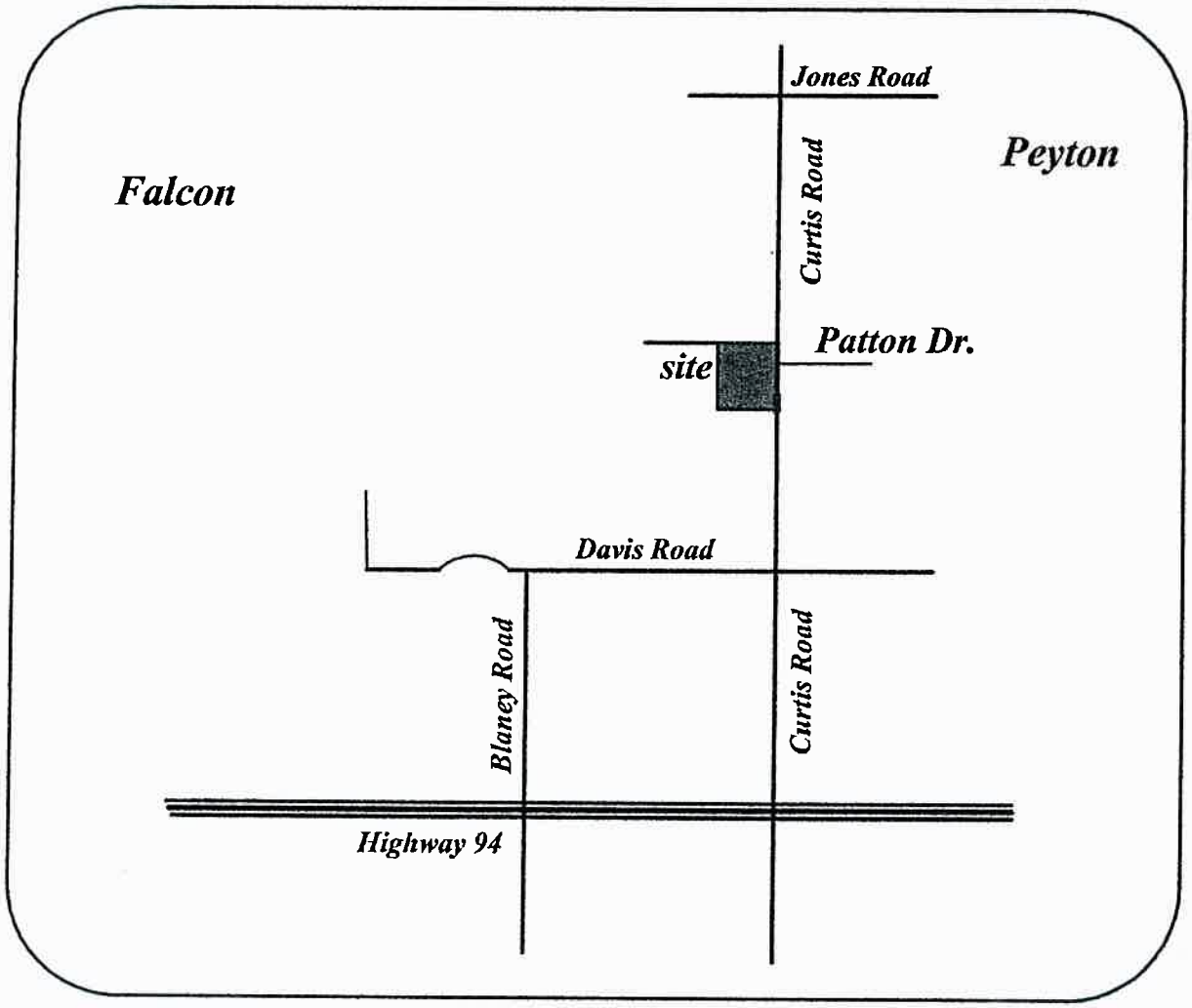
4. Soil Survey of El Paso County Area, Colorado by USDA, NRCS.

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

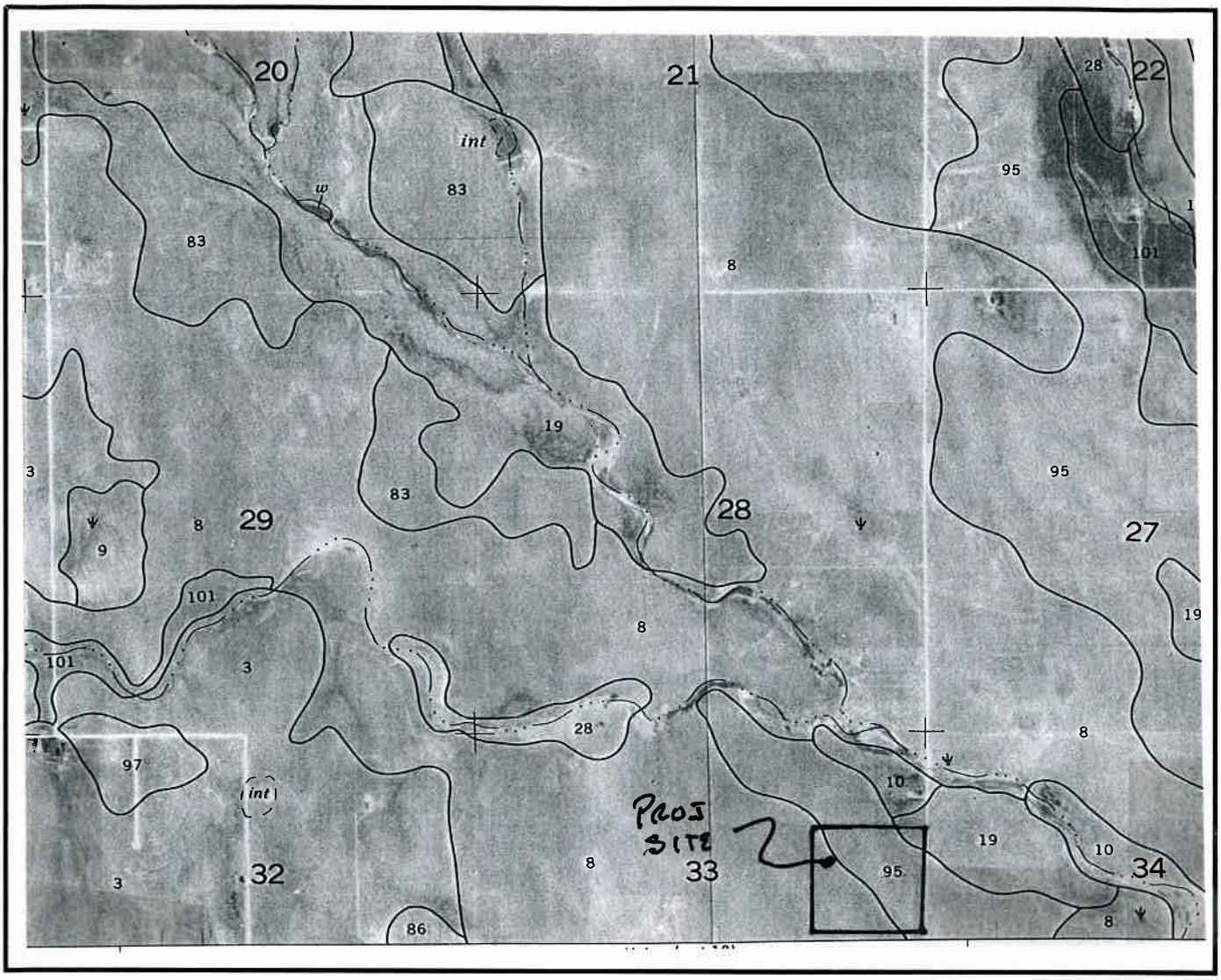


VICINITY MAP

N.T.S.

RESPEC

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



SOILS MAP

N.T.S.

RESPEC

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

National Flood Hazard Layer FIRMette

FEMA

Legend

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

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

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

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard Zone X
- Effective LOMRs
- Area of Undetermined Flood Hazard Zone

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance / Water Surface Elevation
- Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represe 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 2/26/2019 at 9:19:46 AM 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.

WYOMING ESTATES 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
Aex	3.66	3.66	0.00	0.00	0.00	**0.08**	**0.35**
B1ex	19.80	19.80	0.00	0.00	0.00	**0.08**	**0.35**
B2ex	13.02	12.47	0.55	0.00	0.00	**0.10**	**0.36**
OS1	3.53	3.17	0.00	0.36	0.00	**0.16**	**0.41**
OS2	6.20	6.20	0.00	0.00	0.00	**0.08**	**0.35**
Aex+B1ex+B2ex	36.48	35.93	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							
	TOTAL	SURFACE CONDITION AREAS				CALCULATED C	
AREA DESIG.	AREA (acre)	UNDEV	GRAVEL ROAD	ASPHALT ROAD	ROOFS	5 YR	100 YR
A	3.66	3.66	0.00	0.00	0.00	**0.08**	**0.35**
B1	4.75	4.62	0.06	0.00	0.07	**0.10**	**0.36**
B2A1	0.20	0.08	0.12	0.00	0.00	**0.39**	**0.56**
B2A2	0.35	0.16	0.00	0.19	0.00	**0.53**	**0.68**
B2B1	1.20	0.95	0.25	0.00	0.00	**0.19**	**0.42**
B2B2	16.31	16.31	0.00	0.00	0.00	**0.08**	**0.35**
B3A	0.17	0.04	0.13	0.00	0.00	**0.47**	**0.62**
B3A	0.17	0.04	0.13	0.00	0.00	**0.47**	**0.62**
B3B	4.11	4.04	0.00	0.00	0.07	**0.09**	**0.36**
B4A1	0.44	0.23	0.21	0.00	0.00	**0.32**	**0.52**
B4A2	4.40	4.33	0.00	0.00	0.07	**0.09**	**0.36**
B4B1	0.38	0.26	0.12	0.00	0.00	**0.24**	**0.46**
B4B2	0.56	0.28	0.00	0.21	0.07	**0.47**	**0.64**
OS1A	2.62	2.35	0.00	0.27	0.00	**0.16**	**0.41**
OS1B	0.91	0.82	0.00	0.09	0.00	**0.16**	**0.41**
OS2A	1.26	1.26	0.00	0.00	0.00	**0.08**	**0.35**
OS2B	5.60	5.60	0.00	0.00	0.00	**0.08**	**0.35**
Avg House = 3000 sf w/ avg 250'x12' gravel driveway							

Wyoming Estates Subdivision
PROJ. #03433
DRAINAGE CALCULATION SHEET
file:curtis rd dr
11/23/20

							Initial Tci			Travel Time								length	vel.		
AREA	AREA	C5	C100	C5 X A	C100 X A		Slope	ti		Slope	V	Tt	TC	I5	I100	Q5	Q100	L	V	^t	AREA
DESIG.	(acre)	(5 yr)	(100 yr)			L (ft)	(%)	(min)	L (ft)	(%)	(fps)	(min)	(min)	(in/hr)	(in/hr)	(cfs)	(cfs)	(feet)	(fps)	(min)	DESIG.
EXISTING CONDITIONS																					
Aex	3.66	0.08	0.35	0.29	1.28	100	3.00	13.27	440	4.50	2.00	3.67	16.94	3.18	5.55	0.93	7.11				Aex
B1ex	19.80	0.08	0.35	1.58	6.93	100	3.50	12.62	1270	6.00	2.40	8.82	21.43	2.81	4.90	4.45	33.98				B1ex
OS1	3.53	0.16	0.41	0.56	1.45	100	7.00	9.25	1230	4.40	3.20	6.41	15.66	3.30	5.77	1.87	8.35	450	3.40	2.21	OS1
DP1	23.33			2.15	8.38								21.43	2.81	4.90	6.03	41.08				DP1
OS2	6.86	0.19	0.43	1.30	2.95	300	2.00	23.45	200	2.00	1.50	2.22	25.67	2.54	4.43	3.31	13.08				OS2
B2ex	13.02	0.10	0.36	1.30	4.69	300	3.00	22.54	1130	5.50	2.20	8.56	31.10	2.27	3.96	2.95	18.58				B2ex
DP2	19.88			2.61	7.64								31.10	2.27	3.96	5.91	30.27				DP2
DP3	43.21			4.75	16.01								31.10	2.27	3.96	10.79	63.48				DP3
DEVELOPED CONDITIONS																					
A	3.66	0.08	0.35	0.29	1.28	100	3.00	13.27	440	4.50	2.00	3.67	16.94	3.18	5.55	0.93	7.11				A
B1	4.75	0.10	0.36	0.48	1.71	100	3.50	12.37	450	7.70	2.80	2.68	15.05	3.37	5.88	1.60	10.06				B1
OS1A	2.62	0.16	0.41	0.42	1.07	100	7.00	9.25	890	4.40	3.20	4.64	13.88	3.50	6.11	1.47	6.57				OS1A
DP1	7.37			0.89	2.78								15.05	3.37	5.88	3.01	16.38				DP1
B2A1	0.20	0.39	0.56	0.08	0.11	26	10.00	3.17	0	4.40	3.20	0.00	5.00	5.19	9.06	0.40	1.02				B2A1
B2B1	1.20	0.19	0.42	0.23	0.50	100	7.00	8.95	890	4.40	3.20	4.64	13.59	3.54	6.18	0.81	3.11				B2B1
DP2	1.40			0.31	0.62								13.59	3.54	6.18	1.08	3.80				DP2
OS2A	1.26	0.08	0.35	0.10	0.44	300	2.00	26.28	0	3.00	1.80	0.00	26.28	2.50	4.38	0.25	1.93				OS2A
B2B2	16.31	0.08	0.35	1.30	5.71	100	3.00	13.27	1230	5.20	2.20	9.32	22.59	2.73	4.76	3.56	27.20				B2B2
DP3	17.57			1.41	6.15								26.28	2.50	4.38	3.52	26.91				DP3
B2A2	0.35	0.53	0.68	0.19	0.24	26	10.00	2.54	890	4.40	3.20	4.64	7.18	4.61	8.05	0.85	1.91				B2A2
DP4	19.32			1.90	7.00								26.28	2.50	4.38	4.75	30.64				DP4
DP5	26.69			2.79	9.79								26.28	2.50	4.38	6.99	42.82	100	5.00	0.33	DP5
B4B1	0.38	0.24	0.46	0.09	0.17	26	10.00	3.84	0	6.00	2.30	0.00	5.00	5.19	9.06	0.47	1.58	475	2.30	3.44	B4B1
B4B2	0.56	0.47	0.64	0.26	0.36	26	10.00	2.81	0	6.00	2.30	0.00	5.00	5.19	9.06	1.37	3.25				B4B2
DP6	27.63			3.15	10.32								26.62	2.49	4.34	7.82	44.83	300	2.00	2.50	DP6
OS1B	0.91	0.16	0.41	0.15	0.37	80	6.00	8.70	250	2.00	2.10	1.98	10.69	3.94	6.88	0.57	2.57				OS1B
DP7	28.54			3.29	10.69								29.12	2.36	4.12	7.77	44.08				DP7
OS2B	5.60	0.08	0.35	0.45	1.96	300	2.00	26.28	200	2.00	1.50	2.22	28.50	2.39	4.17	1.07	8.18	450	3.40	2.21	OS2B
B3B	4.11	0.09	0.36	0.37	1.48	100	4.00	11.95	650	3.40	1.90	5.70	17.65	3.11	5.43	1.15	8.04				B3B
DP8	9.71			0.82	3.44								30.71	2.29	3.99	1.87	13.74				DP8
B3A1	0.17	0.47	0.62	0.08	0.10	26	10.00	2.81	0	4.40	3.20	0.00	5.00	5.19	9.06	0.40	0.93				B3A1
B3A2	0.17	0.47	0.62	0.08	0.10	26	10.00	2.81	0	4.40	3.20	0.00	5.00	5.19	9.06	0.40	0.93				B3A2
DP9	10.04			0.97	3.64								30.71	2.29	3.99	2.22	14.56	100	5.00	0.33	DP9
B4A1	0.44	0.32	0.52	0.14	0.23	26	10.00	3.48	0	6.00	2.30	0.00	5.00	5.19	9.06	0.73	2.07				B4A1
DP10	10.48			1.11	3.87								31.04	2.27	3.97	2.53	15.37	800	2.30	5.80	DP10
B4A2	4.19	0.09	0.36	0.38	1.51	100	7.00	9.94	890	4.40	3.20	4.64	14.57	3.42	5.97	1.29	9.01				B4A2
DP11	14.67			1.49	5.38								36.84	2.05	3.58	3.05	19.24				DP11
DP12	43.21			4.78	16.08								36.84	2.05	3.58	9.79	57.47				DP12

DITCH CAPACITY CALCULATION SHEET

Location	Q5 cfs	Q100 cfs	S %	B ft	Z	D ft	d100 ft	V fps	Froude #	Riprap Size	
A1 (DP9)	2.2	14.6	4.5	0.0	4:1,3:1	1.5	0.9	5.2	1.35	ECM	
A2 (DP2)	1.1	3.1	6.4	0.0	4:1,3:1	2.0	0.5	4.0	1.45	ECM	
A3 (B4B1)	0.5	1.6	6.4	0.0	4:1,3:1	1.5	0.4	3.4	1.39	ECM	
B (DP10)	2.5	15.4	6.0	2.0	4:1	1.5	0.6	5.5	1.55	0.34	Use Type D50=12" Riprap
C (DP11)	3.1	19.2	10.0	2.0	4:1	1.5	0.6	7.1	2.00	0.67	Use Type D50=12" Riprap
D2 (DP5)	4.8	30.6	8.0	0.0	4:1,3:1	2.0	1.1	7.7	1.86	0.73	Use Type D50=12" Riprap
E (DP1)	3.0	16.4	4.4	2.0	4:1,3:1	2.0	0.7	5.2	1.35	Existing Curtis Rd Ditch	
F2 (DP6)	1.5	4.0	8.0	0.0	4:1,3:1	1.5	0.5	4.6	1.63	ECM	
G (D7)	7.8	44.4	1.0	2.0	4:1,3:1	2.0	1.6	3.9	0.72		

Riprap Size D50=(((VS^0.17)/4.5(2.5-1)^0.66))^2

Note: In ditches with low velocities & flows but higher Froude Numbers, Erosion Control Mats used in lieu of riprap

Design Procedure Form: Runoff Reduction

UD-BMP (Version 3.07, March 2018)

Designer: Mike Bartusek
Company: Respec
Date: February 8, 2021
Project: Wyoming Estates Sub
Location: 3050 Curtis 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	UIA:RPA	SPA	UIA:RPA	UIA:RPA	SPA	UIA:RPA	UIA:RPA	UIA:RPA	SPA	
Area ID	B2A1	B2B1	B2A2	B2B2+OS2A	B3A1	B3A2	B3B+OS28	B4A1	B4B1	B4B2	B4A2	
Downstream Design Point ID	2	2	4	4	9	9	9	10	6	6	11	
Downstream BMP Type												
DCIA (ft^2)	--	--	--	--	--	--	--	--	--	--	--	
UIA (ft^2)	5,230	--	8,275	--	4,575	4,575	--	9,150	5,230	9,150	--	
RPA (ft^2)	3,500	--	6,970	--	3,485	3,485	--	10,020	22,770	12,200	--	
SPA (ft^2)	--	5,225	--	76,500	--	--	42,300	--	--	--	191,600	
HSG A (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
HSG B (%)	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%	
Average Slope of RPA (ft/ft)	0.250	--	0.250	--	0.250	0.250	--	0.250	0.250	0.250	--	
UIA:RPA Interface Width (ft)	300.00	--	480.00	--	275.00	275.00	--	550.00	300.00	480.00	--	

CALCULATED RUNOFF RESULTS

Area ID	B2A1	B2B1	B2A2	B2B2+OS2A	B3A1	B3A2	B3B+OS28	B4A1	B4B1	B4B2	B4A2	
UIA:RPA Area (ft^2)	8,730	--	15,245	--	8,060	8,060	--	19,170	28,000	21,350	--	
L / W Ratio	0.10	--	0.07	--	0.11	0.11	--	0.06	0.31	0.09	--	
UIA / Area	0.5991	--	0.5428	--	0.5676	0.5676	--	0.4773	0.1868	0.4286	--	
Runoff (in)	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	
Runoff Reduction (ft^3)	218	261	345	3825	191	191	2115	381	218	381	9580	

CALCULATED WQCV RESULTS

Area ID	B2A1	B2B1	B2A2	B2B2+OS2A	B3A1	B3A2	B3B+OS28	B4A1	B4B1	B4B2	B4A2	
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)	5,230	5,230	8,275	8,275	9,150	9,150	9,150	9,150	14,380	14,380	0	
RPA (ft^2)	3,500	3,500	6,970	6,970	6,970	6,970	6,970	10,020	34,970	34,970	0	
SPA (ft^2)	5,225	5,225	76,500	76,500	42,300	42,300	42,300	0	0	0	191,600	
Total Area (ft^2)	13,955	13,955	91,745	91,745	58,420	58,420	58,420	19,170	49,350	49,350	191,600	
Total Impervious Area (ft^2)	5,230	5,230	8,275	8,275	9,150	9,150	9,150	9,150	14,380	14,380	0	
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)	696,130
Total Impervious Area (ft^2)	92,370
WQCV (ft^3)	0
WQCV Reduction (ft^3)	0
WQCV Reduction (%)	0%
Untreated WQCV (ft^3)	0

PROJECT: Wyoming Estates Sub

STATION: 9+58.86

SHEET 1 OF 1

CULVERT DESIGN FORM

DESIGNER / DATE: MNB / 9/25

REVIEWER / DATE: /

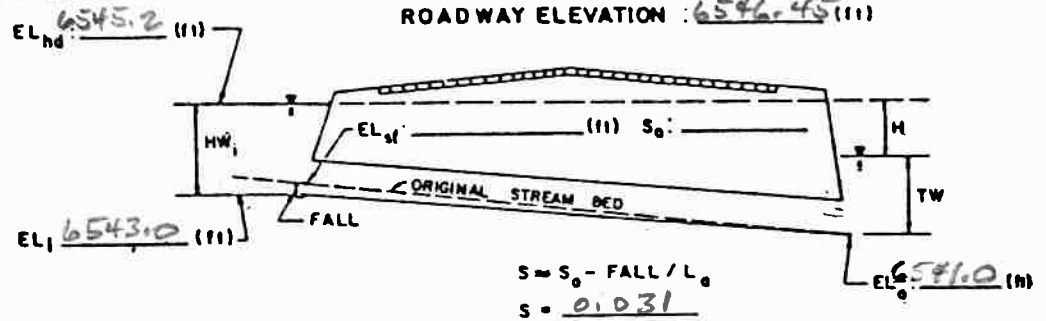
HYDROLOGICAL DATA

SEE ADD'L SHTS.

- ☐ METHOD: RATIONAL
- ☐ DRAINAGE AREA: 10.16 ☐ STREAM SLOPE: 6%
- ☐ CHANNEL SHAPE: Trap
- ☐ ROUTING: _____ ☐ OTHER: _____

DESIGN FLOWS/TAILWATER

R.I. (YEARS)	FLOW (cfs)	TW (ft)
5	2.2	0.2
100	14.6	0.6



$S \approx S_o - FALL / L_o$

$S = 0.031$

$L_o = 65$

CULVERT DESCRIPTION: MATERIAL - SHAPE - SIZE - ENTRANCE	TOTAL FLOW Q (cfs)	FLOW PER BARREL Q/N (1)	HEADWATER CALCULATIONS: INLET CONTROL HW_i/D (2)	INLET CONTROL HW_i	INLET CONTROL FALL (3)	INLET CONTROL EL_hi (4)	OUTLET CONTROL TW (5)	OUTLET CONTROL d_c	OUTLET CONTROL (d_c+D)/2	OUTLET CONTROL h_o (6)	OUTLET CONTROL k_e	OUTLET CONTROL H (7)	OUTLET CONTROL EL_ho (8)	CONTROL HEADWATER ELEVATION	OUTLET VELOCITY	COMMENTS
24" CMP w/FES	2.2	2.2	0.3	0.6	2.0	41.6	0.2	0.75	1.38	1.38	0.2	0.1	42.48	42.48	5	
	14.6	14.6	1.1	2.20	2.0	43.2	0.6	1.40	1.70	1.70	0.2	1.6	44.3	44.30	5	5'x3' RIPRAP RD

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

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

SUBSCRIPT DEFINITIONS:

- a. 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: _____

PROJECT: WYOMING ESTATES SUB

STATION: 0+37

SHEET ____ OF ____

CULVERT DESIGN FORM

DESIGNER / DATE: MAB / 9/25

REVIEWER / DATE: ____ / ____

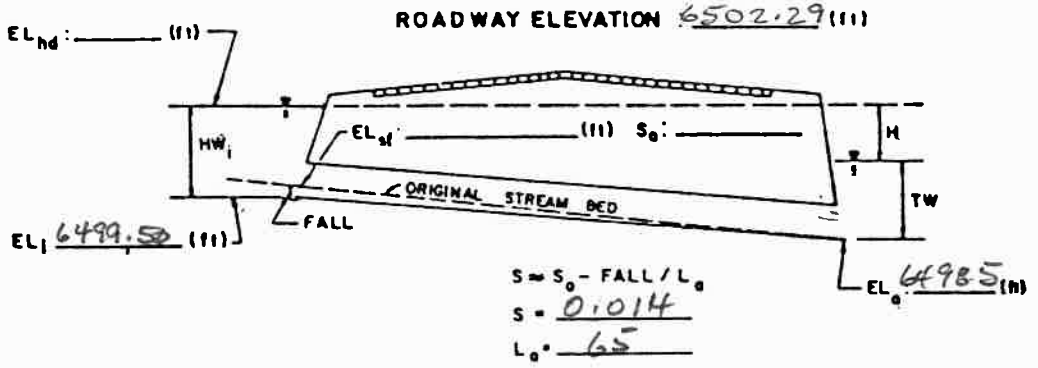
HYDROLOGICAL DATA

SEE ADD'L ENTS.

- ☐ METHOD: RATIONAL
- ☐ DRAINAGE AREA: 26.57 ☐ STREAM SLOPE: 1.0
- ☐ CHANNEL SHAPE: TRAP
- ☐ ROUTING: ____ ☐ OTHER: ____

DESIGN FLOWS / TAILWATER

R.I. (YEARS)	FLOW (cfs)	TW (ft)
5	7.8	0.7
100	44.1	1.5



$S \approx S_o - FALL / L_o$

$S = 0.014$

$L_o = 65$

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-RCEP-30"x19" w/FES	7.8	3.9	0.44	0.70	1.0	99.2	0.7	0.6	1.3	1.30	0.2	0.1	99.9	99.9		
	44.1	22.1	1.38	2.19	1.0	100.69	1.5	1.3	1.65	1.65	0.2	1.25	101.4	101.4	5	4'x5' RIPRAP RD

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

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

SUBSCRIPT DEFINITIONS:

a. 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: ____

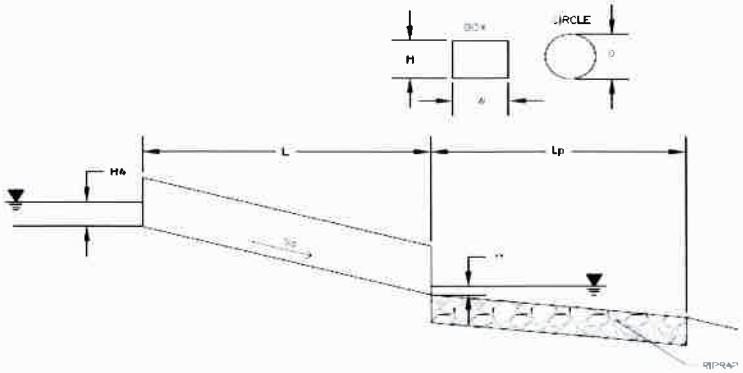
SHAPE: ____

MATERIAL: ____

ENTRANCE: ____

Determination of Culvert Headwater and Outlet Protection

Project: Wyoming Subdivision
Basin ID: DP7



Soil Type:
Choose One:
(●) Sandy
( ) Non-Sandy

Supercritical Flow! Using Ha to calculate protection type.

Design Information (Input):

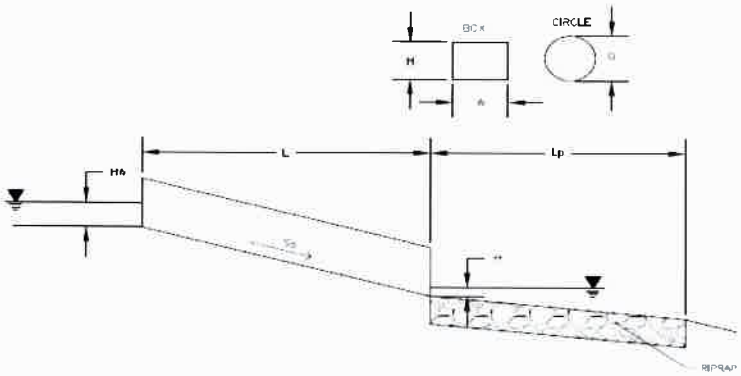
Design Discharge	Q =	44.1	cfs
Circular Culvert:			
Barrel Diameter in Inches	D =		inches
Inlet Edge Type (Choose from pull-down list)		Square End Projection	
Box Culvert:		OR	
Barrel Height (Rise) in Feet	Height (Rise) =	1.58	ft
Barrel Width (Span) in Feet	Width (Span) =	2.5	ft
Inlet Edge Type (Choose from pull-down list)		1.5 : 1 Bevel w/ 90 Deg. Headwall	
Number of Barrels	No =	2	
Inlet Elevation	Elev IN =	6499.5	ft
Outlet Elevation **OR** Slope	Elev OUT =	6498.5	ft
Culvert Length	L =	65	ft
Manning's Roughness	n =	0.012	
Bend Loss Coefficient	k_b =	0	
Exit Loss Coefficient	k_x =	1	
Tailwater Surface Elevation	Elev Y_t =	6499.9	ft
Max Allowable Channel Velocity	V =	5	ft/s

Required Protection (Output):

Tailwater Surface Height	Y_t =	1.40	ft
Flow Area at Max Channel Velocity	A_t =	4.41	ft^2
Culvert Cross Sectional Area Available	A =	3.95	ft^2
Entrance Loss Coefficient	k_e =	0.20	
Friction Loss Coefficient	k_f =	0.94	
Sum of All Losses Coefficients	k_s =	2.14	ft
Culvert Normal Depth	Y_n =	0.89	ft
Culvert Critical Depth	Y_c =	1.34	ft
Tailwater Depth for Design	d =	1.46	ft
Adjusted Diameter **OR** Adjusted Rise	H_a =	1.23	ft
Expansion Factor	1/(2*tan(Θ)) =	6.45	
Flow/Diameter$^{2.5}$ **OR** Flow/(Span * Rise$^{1.5}$)	Q/WH^1.5 =	4.44	$ft^{0.5}/s$
Froude Number	Fr =	1.86	Supercritical!
Tailwater/Adjusted Diameter **OR** Tailwater/Adjusted Rise	Yt/H =	1.13	
Inlet Control Headwater	HW_I =	2.11	ft
Outlet Control Headwater	HW_O =	1.49	
Design Headwater Elevation	**HW =**	**6,501.61**	ft
Headwater/Diameter OR Headwater/Rise Ratio	**HW/H =**	**1.33**	
Minimum Theoretical Riprap Size	d_{50} =	1	in
Nominal Riprap Size	d_{50} =	6	in
UDFCD Riprap Type	**Type =**	VL	
Length of Protection	**L_p =**	5	ft
Width of Protection	**T =**	4	ft

Determination of Culvert Headwater and Outlet Protection

Project: Wyoming Subdivision
Basin ID: DP9



Soil Type:
Choose One:
(●) Sandy
( ) Non-Sandy

Supercritical Flow! Using Da to calculate protection type.

Design Information (Input):

Design Discharge	Q =	14.6	cfs
Circular Culvert:			
Barrel Diameter in Inches	D =	24	inches
Inlet Edge Type (Choose from pull-down list)		Grooved End Projection	
Box Culvert:		OR	
Barrel Height (Rise) in Feet	Height (Rise) =		ft
Barrel Width (Span) in Feet	Width (Span) =		ft
Inlet Edge Type (Choose from pull-down list)			
Number of Barrels	No =	1	
Inlet Elevation	Elev IN =	6543	ft
Outlet Elevation **OR** Slope	Elev OUT =	6541	ft
Culvert Length	L =	65	ft
Manning's Roughness	n =	0.024	
Bend Loss Coefficient	k_b =	0	
Exit Loss Coefficient	k_x =	1	
Tailwater Surface Elevation	Elev Y_t =	6541.7	ft
Max Allowable Channel Velocity	V =	5	ft/s

Required Protection (Output):

Tailwater Surface Height	Y_t =	0.70	ft
Flow Area at Max Channel Velocity	A_t =	2.92	ft^2
Culvert Cross Sectional Area Available	A =	3.14	ft^2
Entrance Loss Coefficient	k_e =	0.20	
Friction Loss Coefficient	k_f =	2.74	
Sum of All Losses Coefficients	k_s =	3.94	ft
Culvert Normal Depth	Y_n =	1.21	ft
Culvert Critical Depth	Y_c =	1.38	ft
Tailwater Depth for Design	d =	1.69	ft
Adjusted Diameter **OR** Adjusted Rise	D_a =	1.60	ft
Expansion Factor	1/(2*tan(Θ)) =	5.50	
Flow/Diameter$^{2.5}$ **OR** Flow/(Span * Rise$^{1.5}$)	Q/D^2.5 =	2.58	$ft^{0.5}/s$
Froude Number	Fr =	1.29	Supercritical!
Tailwater/Adjusted Diameter **OR** Tailwater/Adjusted Rise	Yt/D =	0.44	
Inlet Control Headwater	HW_i =	2.04	ft
Outlet Control Headwater	HW_o =	1.01	
Design Headwater Elevation	**HW =**	**6,545.04**	ft
Headwater/Diameter OR Headwater/Rise Ratio	**HW/D =**	**1.02**	
Minimum Theoretical Riprap Size	d_{50} =	5	in
Nominal Riprap Size	d_{50} =	6	in
UDFCD Riprap Type	**Type =**	VL	
Length of Protection	**L_p =**	12	ft
Width of Protection	**T =**	5	ft

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
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

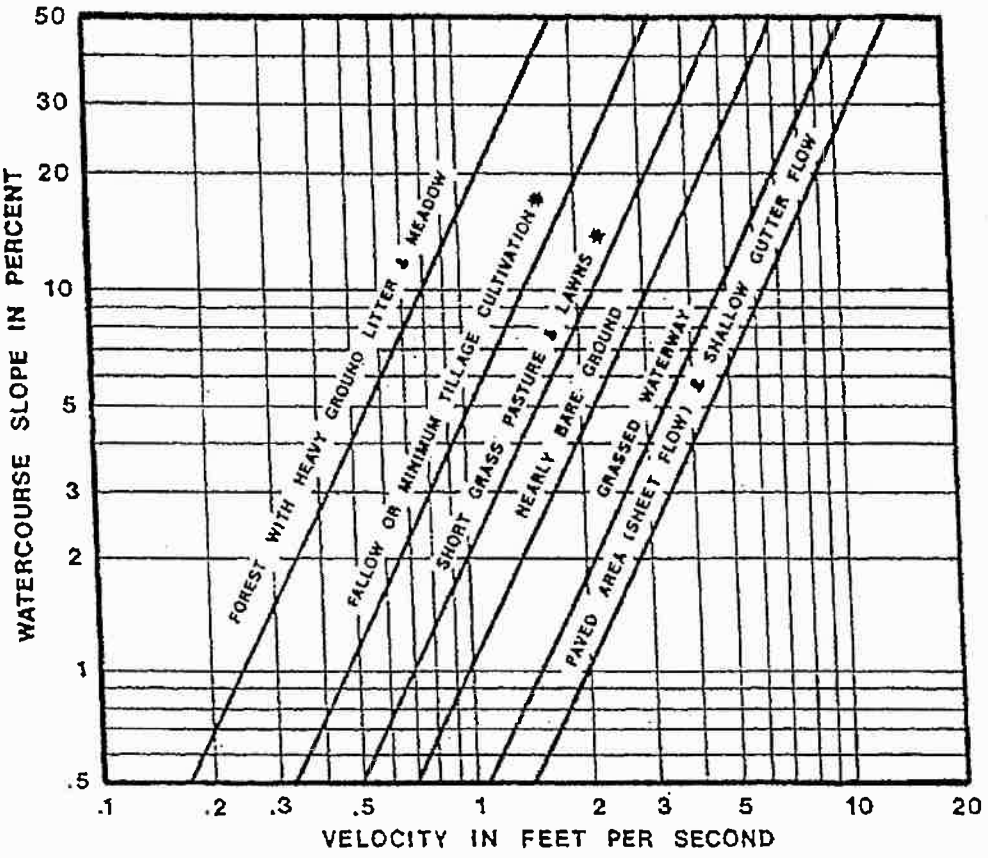
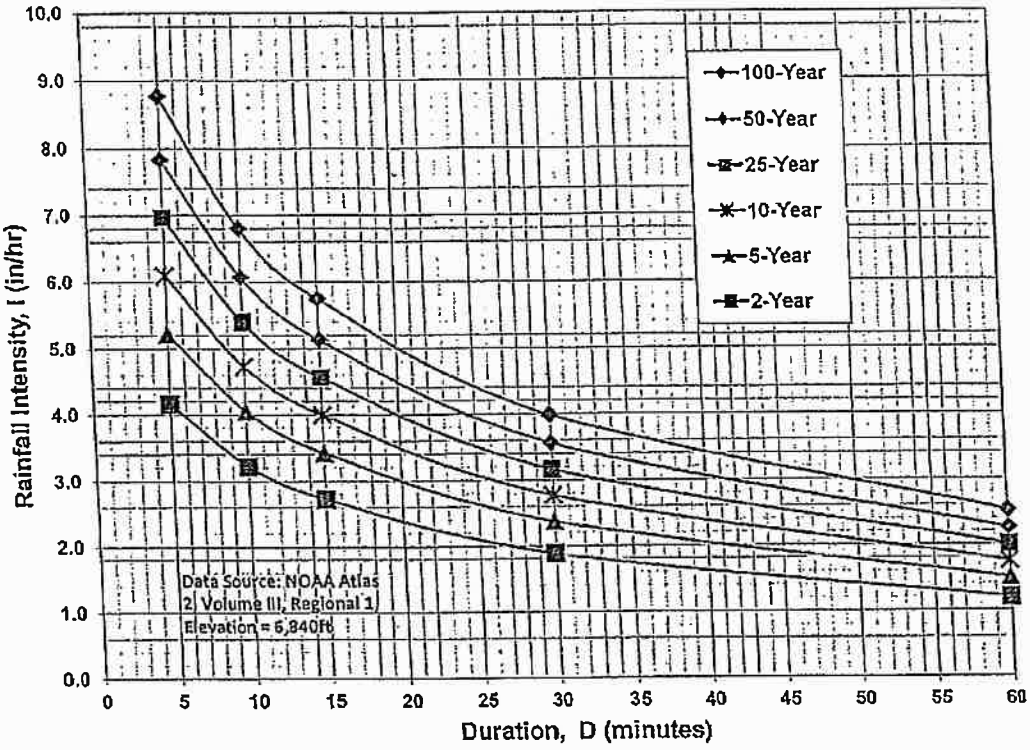


Figure 6-5. Colorado Springs Rainfall Intensity Duration Frequency



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.

DOZIER JO ELLEN @ WILLIAM
3350 CURTIS RD
PEYTON, CO 80831. 4333003001

SOLBERG LIVING TRUST*. 2550 SLOCUM RD
PEYTON, CO 80831. 4300000556

SCRIBNER JUDITH L. 15910 WILLIE LN
PEYTON, CO 80831. 4300000559

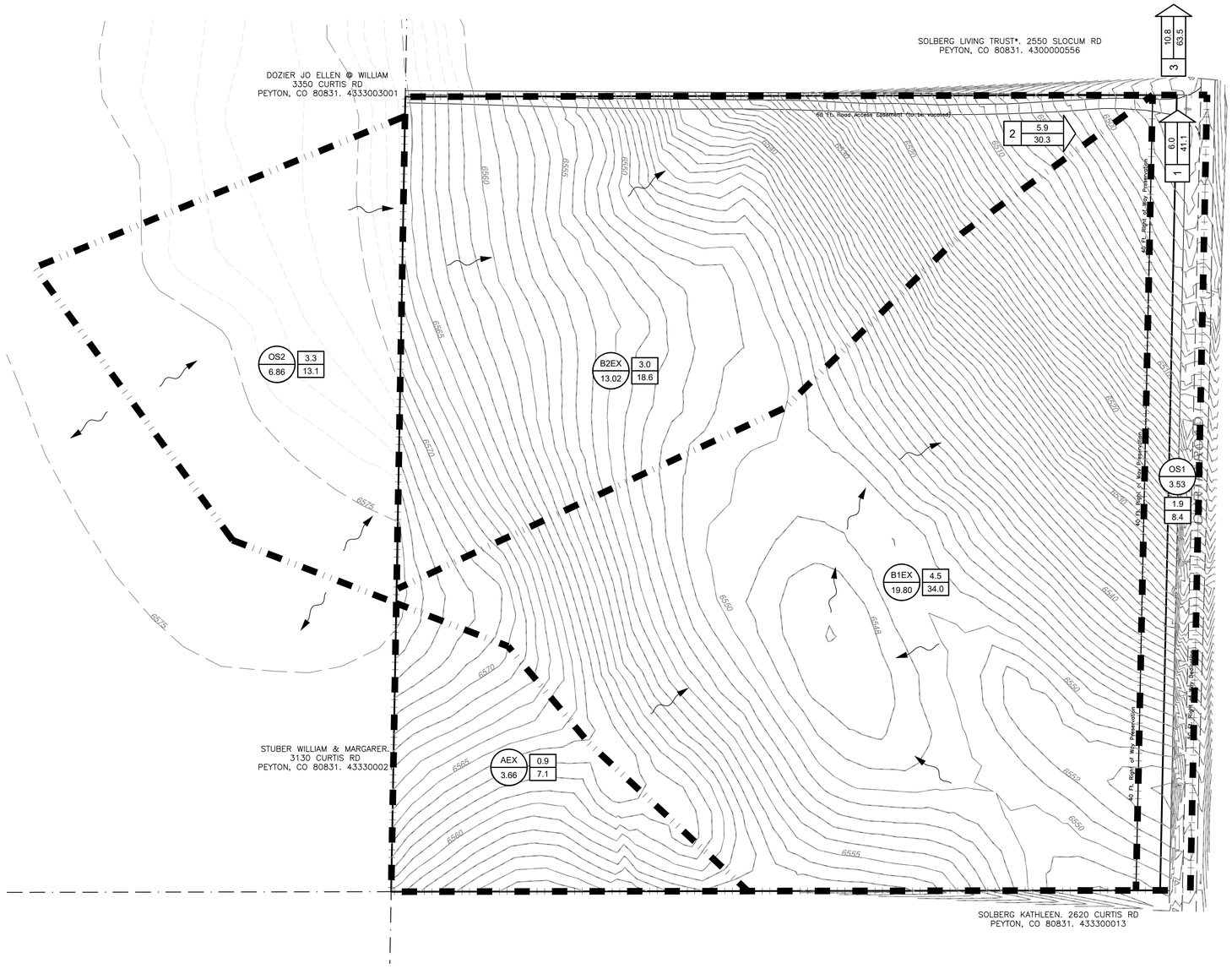
ORTH SHAUNA. 14870 PATTON DR
PEYTON, CO 80831. 4334001001

STUBER WILLIAM & MARGARER
3130 CURTIS RD
PEYTON, CO 80831. 43330002

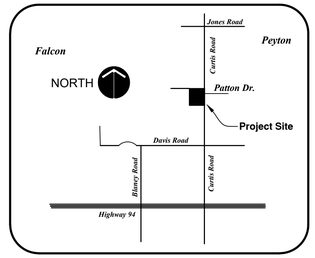
SWAFFAR VEMON & CHERYL.
3025 CURTIS RD
PEYTON, CO 80831. 4334002008

SOLBERG KATHLEEN. 2620 CURTIS RD
PEYTON, CO 80831. 433300013

ABEMETHY DENRISE. P.O BOX 77137
COLORADO SPRINGS, CO 80970. 4334002007



VICINITY MAP:



LEGEND

A1A — BASIN DESIGNATION
XX — BASIN AREA, ACRES

XX — 5 YEAR STORM, CFS
XX — 100 YEAR STORM, CFS

DESIGN POINT — XX — XX.X (5 YEAR ACCUMULATED FLOW, CFS) / XX.X (100 YEAR ACCUMULATED FLOW, CFS)

SUB–BASIN BOUNDARY

DIRECTION OF DRAINAGE FLOW

EXISTING CONDITIONS			
AREA DESIGNATION	Q5	Q100	ACRES
AEX	0.9	7.1	3.66
B1EX	4.5	34.0	19.80
B2EX	3.0	18.6	13.02
OS1	1.9	8.4	3.53
OS2	3.3	13.1	6.86
DP1(B1EX&OS1)	6.0	41.1	23.33
DP2(B2EX&OS2)	5.9	30.3	19.88
DP3(DP1&DP2)	10.8	63.5	43.21

N

GRAPHIC SCALE

100 0 50 100 200 400

(IN FEET)
1 inch = 100 ft.

PCD PROJECT NO. MS196

NAME: N:\PROJECTS\03433 - 3050 CURTIS ROAD\DWG\03433-DRNGEXIST.DWG
PLOT DATE: February 9, 2021 7:28 AM, BY: MICHAEL (MIKE) BARTUSEK

REVISION	
DESIGNED	MAB
DRAWN	HJG
CHECKED	MAB
DATE	02/08/21

RESPEC (FORMERLY ADP)
121 S. TEJON ST
SUITE 1110
COLORADO SPRINGS, CO 80918
PHONE (719) 266-5212

STAMP

Know what's below. Call before you dig.

PROJ NO. 03433
DWG NM. 03433-GrdgEros

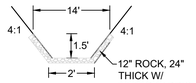
HOME RUN RESTORATIONS, INC
5090 WILEY RD
PEYTON, CO 80831

WYOMING ESTATES
SUBDIVISION
EL PASO COUNTY, CO

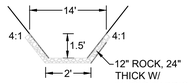
DRAINAGE PLAN
EXISTING CONDITIONS

DRAWING NUMBER:
C
SHEET 1

DITCH A1, A2, A3
TYP SEC



DITCH B
TYP SEC



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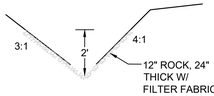
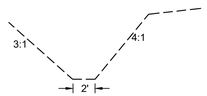
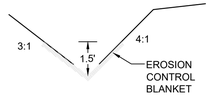


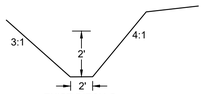
DITCH D
TYP SEC



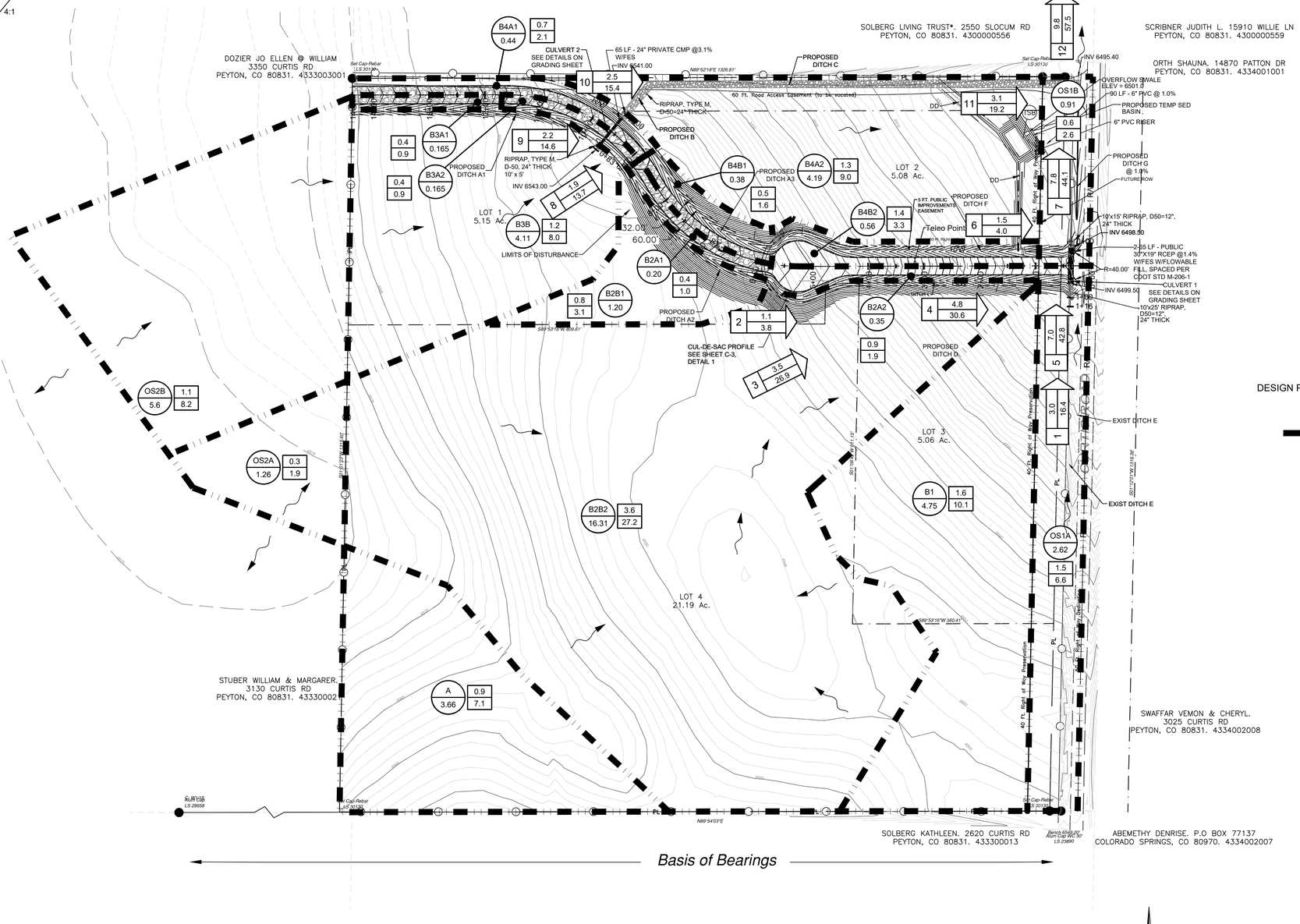
DITCH E
TYP SEC



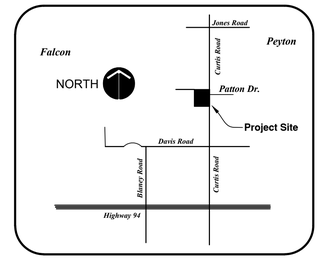
DITCH F
TYP SEC



EXIST DITCH G
TYP SEC



VICINITY MAP:



LEGEND

A1A / XX — BASIN DESIGNATION; BASIN AREA, ACRES

XX / XX — 5 YEAR STORM, CFS; 100 YEAR STORM, CFS

DESIGN POINT — XX / XX.X / XX.X — 5 YEAR ACCUMULATED FLOW, CFS; 100 YEAR ACCUMULATED FLOW, CFS

SUB-BASIN BOUNDARY

DIRECTION OF DRAINAGE FLOW

PROPOSED CONDITIONS			
AREA DESIGNATION	Q5	Q100	ACRES
A	0.9	7.1	3.66
B1	1.6	10.1	4.75
B2A1	0.4	1.0	0.20
B2A2	0.9	1.9	0.35
B2B1	0.8	3.1	1.20
B2B2	3.6	27.2	16.31
B3A1	0.4	0.9	0.165
B3A2	0.4	0.9	0.165
B3B	1.2	8.0	4.11
B4A1	0.7	2.1	0.44
B4A2	1.3	9.0	4.19
B4B1	0.5	1.6	0.38
B4B2	1.4	3.3	0.56
OS1A	1.5	6.6	2.62
OS1B	0.6	2.6	0.91
OS2A	0.3	1.9	1.26
OS2B	1.1	8.2	5.60
DP1(OS1A&B1)	3.0	16.3	7.37
DP2(B2A1+B2B1)	1.1	3.8	1.40
DP3(OS2A+B2B2)	3.5	26.9	17.57
DP4(DP2+DP3+ B2A2)	4.8	30.6	19.32
DP5(DP1+DP4)	7.0	42.8	26.69
DP6(B4B1+B4B2)	1.5	4.0	0.94
DP7(DP5+DP6+ OS1B)	7.8	44.1	27.63
DP8(OS2B+B3B)	1.9	13.7	28.54
DP9(DP8+B3A)	2.2	14.6	9.71
DP10(DP9+B4A1)	2.5	15.4	10.04
DP11(DP10+B4A2	3.1	19.2	10.48
DP12(DP7+DP11)	9.8	57.5	43.21

GRAPHIC SCALE
100 0 50 100 200 400
(IN FEET)
1 inch = 100 ft.

PCD PROJECT NO. MS196

REVISION		
DESIGNED	MAB	
DRAWN	HJG	
CHECKED	MAB	
DATE	02/08/21	

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5090 WILEY RD
PEYTON, CO 80831

WYOMING ESTATES
SUBDIVISION
EL PASO COUNTY, CO

DRAINAGE PLAN
DEVELOPED
CONDITIONS

DRAWING NUMBER:
C
SHEET 2