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

SEPTEMBER 26, 2020

Project Number 03433

PCD File No. MS 196

RESPEC

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

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 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 B2 contains 17.94 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 4.5 cfs for the 5-year storm and 31.3 cfs for the 100-year storm. These flows will combine with the flows from Sub-basin OS2A at DP2 to produce flows of 4.4 cfs for the 5-year storm and 30.9 cfs for the 100-year storm. These ditch flow continue east toward the Curtis Road ditch and be intercepted by a 900 cf Water Quality Basin. They will then combine with the flows from DP1 at the proposed public 38"x24" RCEP culvert under the Teleo Point cul-de-sac. The combined flows of DP1 and DP2 at DP3 will be 6.5 cfs for the 5-year storm and 42.4 cfs for the 100-year storm. These flows continue north into Sub-Basin OS1B.

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 B3 contains 4.56 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 1.7 cfs for the 5-year storm and 9.5 cfs for the 100-year storm. The flows from Sub-basin B3 will combine with the flows from Sub-basin OS2B at DP4 to produce flows of 2.3 cfs for the 5-year storm and 14.8 cfs for the 100-year storm. These flows travel into Sub-Basin B4 through a private 30" cmp.

Sub-Basin B4A contains 4.83 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 1.4 cfs for the 5-year storm and 9.8 cfs for the 100-year storm. These flows will combine with the flows from DP4 at DP5 to produce flows of 3.0 cfs for the 5-year storm and 19.5 cfs for the 100-year storm. These flows will be intercepted by a 1500 cf Water Quality Basin.

Sub-Basin B4B contains 0.74 acres and drains the northern portion of Teleo Point. This area drains to the east toward Curtis Road but it is intercepted by a proposed ditch and diverted into the 1500 cf Water Quality Basin. This sub-basin produces flows of 1.6 cfs for the 5-year storm and 3.4 cfs for the 100-year storm. These flows will combine with the flows from DP4 and DP5 at DP6 to produce flows of 3.9 cfs for the 5-year storm and 21.4 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. The combined flows of OS1B, DP3 and DP6 at DP7 will be 9.5 cfs for the 5-year storm and 57.6 cfs for the 100-year storm. These flows will continue within the west Curtis Road ditch to the West Fork of Squirrel Creek.

Please state the exclusion, ECM I.7.1.B.5, for not requiring water quality for the large lot single family sites

WATER QUALITY AND DETENTION

Although water quality basins are not required for subdivisions containing lots greater than 5.0 acres, however water quality basins are required for the roadway improvements. Also. a

Please address detention.

Please revise the text as it refers to West Johnson Basin instead of Livestock Company. Also, Please verify/revise the fee calculations. Per the County GIS it appears that Livestock Company drainage basin only encompasses a small portion of the site (much less than 36 acres). Revise accordingly.

temporary sedimentation to mitigate sediment from the construction of the public cul-de-sac and private access road is required. This basin will be located in the northeast area of the site with diversion ditches directing the site flows into the basin until the roadways are completed at which time it will be converted to a water quality basin.

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 2020 drainage basin fee calculation is as follows:

Drainage Fees

Impervious Coverage	=	3.6%
Area Subject to Fee	=	0.036 x 36.48 acres = 1.313 acre
West Little Johnson Basin Fee	=	$17,655/acre
Drainage Basin Fee	=	$17,655 x 1.313 = $23,181

Bridge Fees

Impervious Coverage	=	3.6%
Area Subject to Fee	=	0.036 x 36.48 acres = 1.313 acre
West Little Johnson Basin Fee	=	$210/acre
Drainage Basin Fee	=	$210 x 1.313 = $276

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)

The proposed development will disturb approximately 2.2 acres for the asphalt and gravel roadway construction which will be mitigated through two water quality basins as well as a temporary sedimentation basin.

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 will not increase flows above historic levels. In addition, the construction of two (2) Water Quality Basins will improve water quality for the site. Therefore, the proposed development will not adversely affect downstream or surrounding properties.

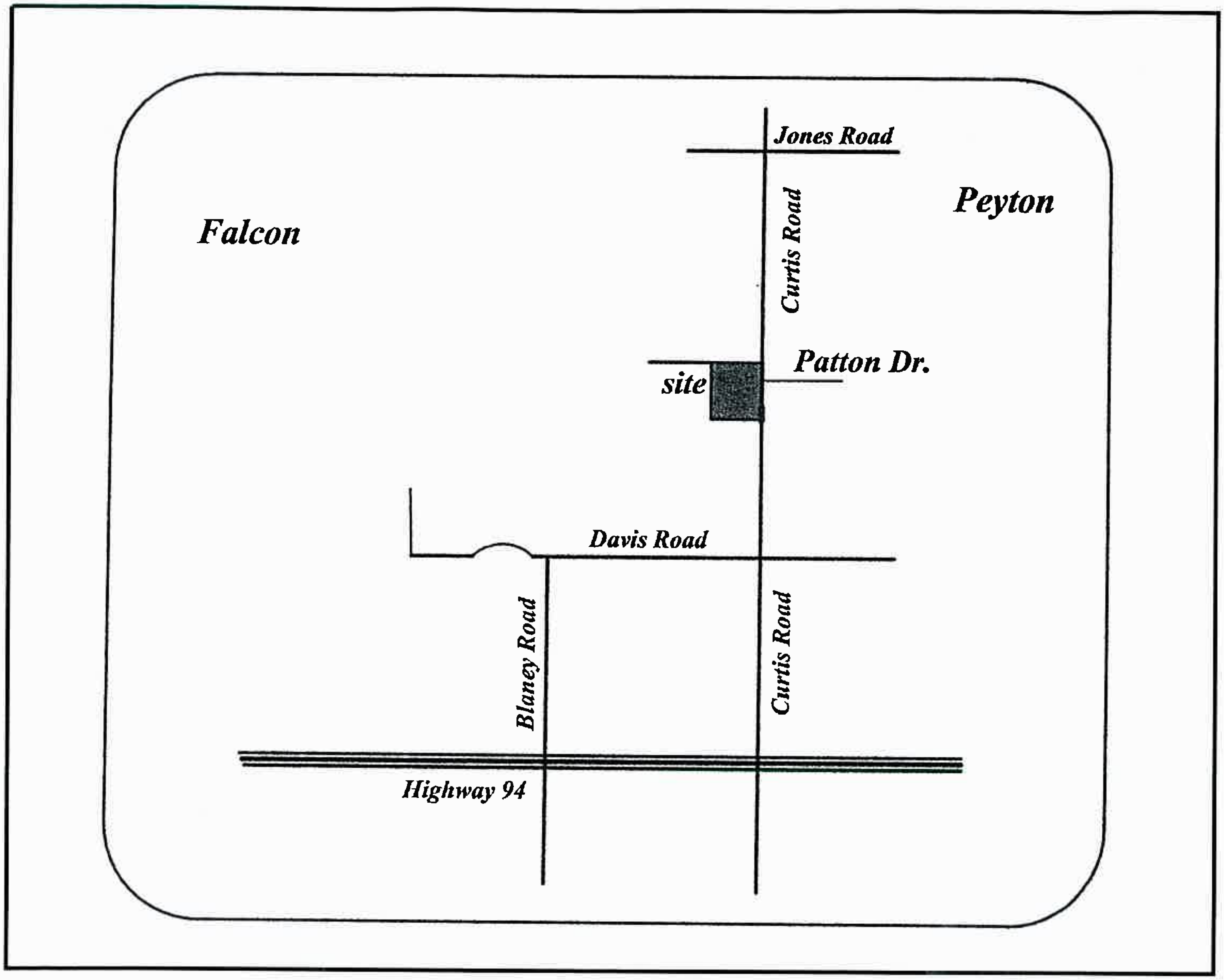
As indicated in review 2 comment, please state the historic flows leaving the site and the developed flows leaving the site to show in the narrative that the site is not increasing flows above historic.

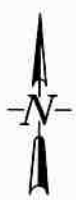
REFERENCES

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



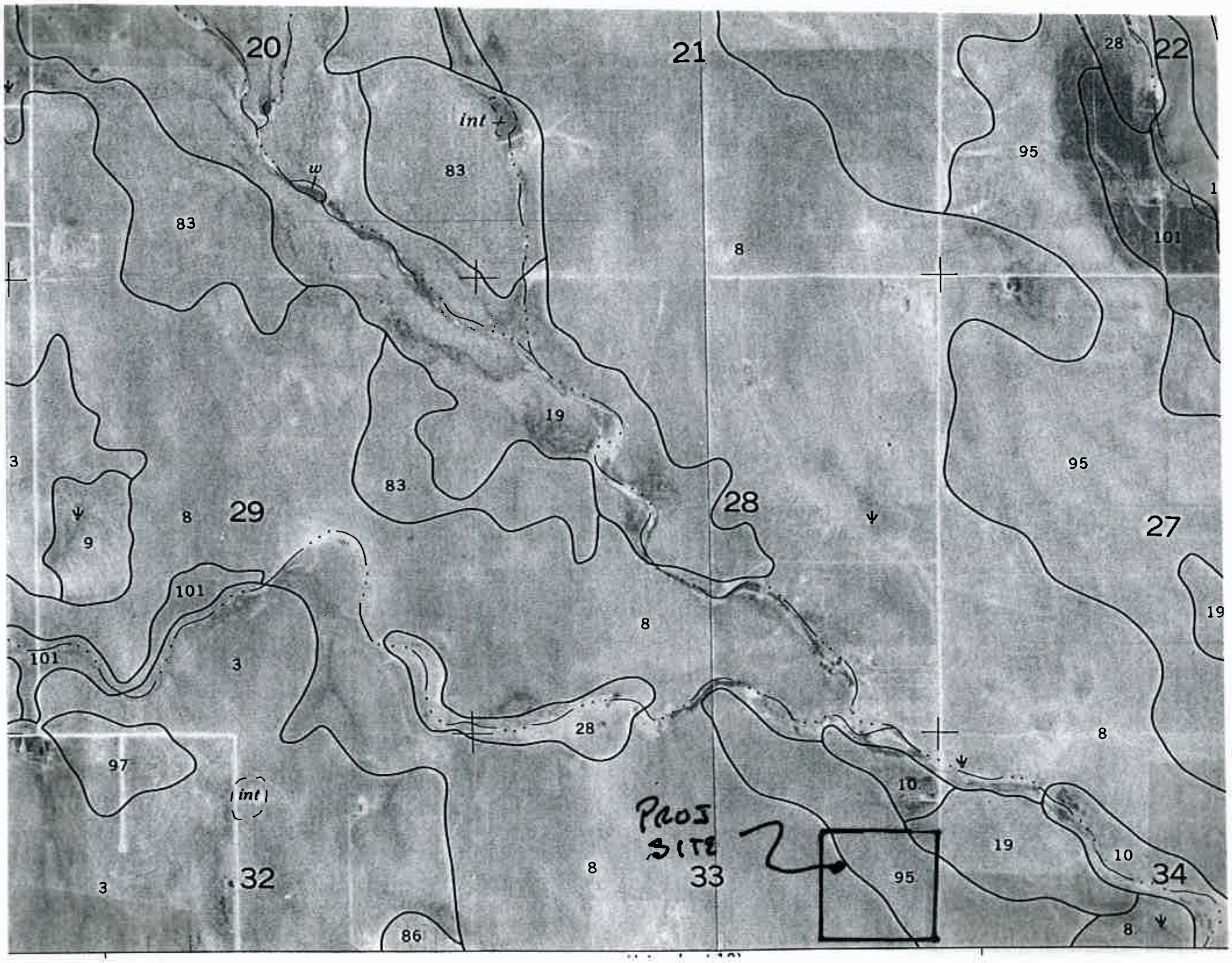


VICINITY MAP

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

38°52'49.55"N

0 250 500 1,000 1,500 2,000 Feet 1:6,000

38°52'21.54"N

104°32'55.16"W

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, 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*
- 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
- 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 represent an authoritative property location.

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

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 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.

APPENDIX B

DESIGN CALCULATIONS

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	AREA	UNDEV	GRAVEL	ASPHALT	ROOFS	5	100
DESIG.	(acre)		ROAD	ROAD		YR	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**
B2	17.94	17.56	0.12	0.19	0.07	**0.09**	**0.36**
B3	4.56	4.24	0.25	0.00	0.07	**0.12**	**0.38**
B4A	4.83	4.76	0.00	0.00	0.07	**0.09**	**0.36**
B4B	0.74	0.13	0.33	0.21	0.07	**0.60**	**0.72**
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							
Drainage Fee Impervious Calculation							
	Sub Area		Impervious Acreage				
A+B1+B2+B3	36.48	34.97	0.76	0.40	0.35		
+B4A+B4B	1.32	0.00	0.61	0.40	0.32		
	Imperviousness = (1.32)/36.48 =3.6%						
Water Quality Basin Impervious Calculations							
	Sub Area		Impervious Acreage				
OS2A+B2	19.20	18.82	0.12	0.19	0.07		
	0.35	0.00	0.10	0.19	0.06		
	Imperviousness = (0.35)/19.2 =1.8%						
OS2B+B3+B4A	15.73	14.73	0.58	0.21	0.21		
+B4B	0.86	0.00	0.46	0.21	0.19		
	Imperviousness = (0.86)/15.73 =5.5%						

Wyoming Estates Subdivision
PROJ. #03433
DRAINAGE CALCULATION SHEET
file:curtis rd dr
09/25/20

AREA DESIG.	AREA (acre)	C5 (5 yr)	C100 (100 yr)	C5 X A	C100 X A	Initial Tci L (ft)	Initial Tci Slope (%)	ti (min)	Travel Time L (ft)	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.
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
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
B2	17.94	0.09	0.36	1.61	6.46	100	3.00	13.14	1230	5.20	2.20	9.32	22.46	2.74	4.78	4.42	30.87				B2
DP2	19.20			1.72	6.90								26.28	2.50	4.38	4.30	30.19				DP2
DP3	26.57			2.61	9.68								26.28	2.50	4.38	6.54	42.37	340	2.10	2.70	DP3
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
B3	4.56	0.12	0.38	0.55	1.73	100	4.00	11.60	650	3.40	1.90	5.70	17.30	3.14	5.49	1.72	9.51				B3
DP4	10.16			1.00	3.69								30.71	2.29	3.99	2.28	14.75	800	2.30	5.80	DP4
B4A	4.83	0.09	0.36	0.43	1.74	100	5.00	11.10	750	6.00	2.30	5.43	16.54	3.21	5.61	1.40	9.76				B4A
DP5	14.99			1.43	5.43								36.51	2.06	3.60	2.94	19.53				DP5
B4B	0.74	0.60	0.72	0.44	0.53	20	0.20	7.11	750	6.00	2.30	5.43	12.55	3.67	6.41	1.63	3.41				B4B
DP6	15.73			1.87	5.96								36.51	2.06	3.60	3.86	21.44				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	43.21			4.63	16.02								36.51	2.06	3.60	9.53	57.60				DP7

DITCH CAPACITY CALCULATION SHEET

Location	Q5 cfs	Q100 cfs	S %	B ft	Z	D ft	d100 ft	V fps	Froude #	Riprap Size	
A (DP4)	2.3	14.8	4.5	0.0	4:1,3:1	1.5	0.9	5.2	1.37	ECM	
B (DP4)	2.3	14.8	6.0	2.0	4:1	1.5	0.6	5.5	1.55	0.34	Use Type M Riprap
C (DP5)	3.0	19.5	10.0	2.0	4:1	1.5	0.6	7.1	2.00	0.67	Use Type M Riprap
D (DP2)	4.3	30.2	8.0	0.0	4:1,3:1	2.0	1.1	7.7	1.85	0.73	Use Type M 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	
F (B4B)	1.6	3.4	8.0	0.0	4:1,3:1	1.5	0.5	4.4	1.62	ECM	
G (DP3)	6.5	42.4	1.0	2.0	4:1,3:1	2.0	1.5	3.8	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

PROJECT: Wyoming Estates Sub	STATION: 0+37 SHEET ____ OF ____	**CULVERT DESIGN FORM** DESIGNER / DATE: MAB / 9/25 REVIEWER / DATE: ____ / ____

HYDROLOGICAL DATA

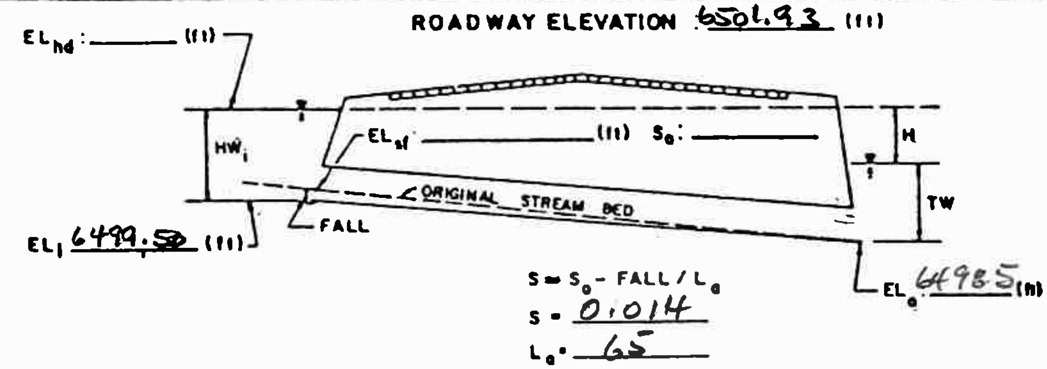
SEE ADD'L SHTS.

- ☐ 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	6.5	0.7
100	42.4	1.5

ROADWAY ELEVATION: 6501.93 (ft)



$S = S_o - FALL / L_o$

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	$\frac{d_c+D}{2}$	h_o (6)	k_e	H (7)	EL_{ho} (8)	CONTROL HEADWATER ELEVATION	OUTLET VELOCITY	COMMENTS
2-RCEP-38"x24" w/FES	6.5	3.3	0.3	0.6	1.0	99.1	0.7	0.6	1.3	1.30	0.2	0.1	99.9	99.9		
	42.4	21.2	0.97	1.94	1.0	100.44	1.5	1.3	1.65	1.65	0.2	0.48	100.63	100.63	5	5'x6' 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: 9+58.86

SHEET 1 **OF** 1

CULVERT DESIGN FORM

DESIGNER / DATE: MAB / 9/25

REVIEWER / DATE: ___ / ___

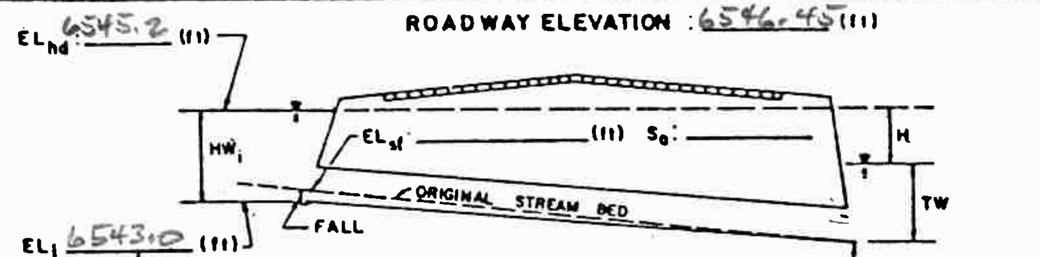
HYDROLOGICAL DATA

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	2.3	0.2
100	14.8	0.6



$S = S_o - FALL / L_a$

S = 0.031

L_a = 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	$\frac{d_c+D}{2}$	h_o (6)	k_e	H (7)	EL_{ho} (8)	CONTROL HEADWATER ELEVATION	OUTLET VELOCITY	COMMENTS
24" CMP w/FES	2.3	2.3	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	
	14.8	14.8	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'x13' Riprap Req

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: ___

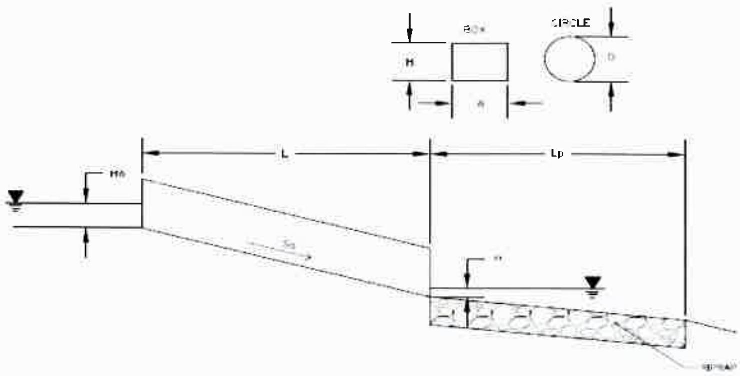
SHAPE: ___

MATERIAL: ___

ENTRANCE: ___

Determination of Culvert Headwater and Outlet Protection

Project: Wyoming Subdivision
Basin ID: Basin B3 (DP4)



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

Supercritical Flow! Using Da to calculate protection type.

Design Information (Input):

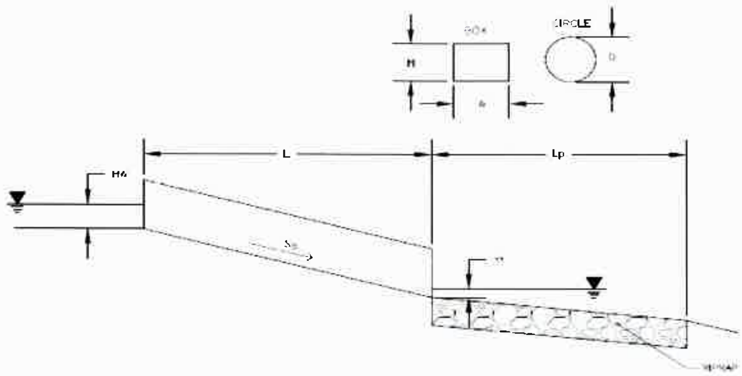
Design Discharge	Q =	14.8	cfs
Circular Culvert:			
Barrel Diameter in Inches	D =	24	inches
Inlet Edge Type (Choose from pull-down list)	Grooved End Projection		
Box Culvert:		OR	
Barrel Height (Rise) in Feet	Height (Rise) =		ft
Barrel Width (Span) in Feet	Width (Span) =		ft
Inlet Edge Type (Choose from 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 =	2.96	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 =	1.22	ft
Culvert Critical Depth	Y_c =	1.39	ft
Tailwater Depth for Design	d =	1.69	ft
Adjusted Diameter OR Adjusted Rise	D_a =	1.61	ft
Expansion Factor	1/(2*tan(Θ)) =	5.44	
Flow/Diameter$^{2.5}$ OR Flow/(Span * Rise$^{1.5}$)	Q/D^2.5 =	2.62	$ft^{0.5}/s$
Froude Number	Fr =	1.29	Supercritical!
Tailwater/Adjusted Diameter OR Tailwater/Adjusted Rise	Yt/D =	0.44	
Inlet Control Headwater	HW_I =	2.06	ft
Outlet Control Headwater	HW_O =	1.05	
Design Headwater Elevation	**HW =**	**6,545.06**	**ft**
Headwater/Diameter OR Headwater/Rise Ratio	**HW/D =**	**1.03**	
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 =**	**13**	**ft**
Width of Protection	**T =**	**5**	**ft**

Determination of Culvert Headwater and Outlet Protection

Project: Wyoming Subdivision
Basin ID: Basin OS1A (DP3)



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

Supercritical Flow! Using Ha to calculate protection type.

Design Information (Input):

Design Discharge	Q =	42.4	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) =	2	ft
Barrel Width (Span) in Feet	Width (Span) =	3.17	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 =	4.24	ft^2
Culvert Cross Sectional Area Available	A =	6.34	ft^2
Entrance Loss Coefficient	k_e =	0.20	
Friction Loss Coefficient	k_f =	0.68	
Sum of All Losses Coefficients	k_s =	1.88	ft
Culvert Normal Depth	Y_n =	0.70	ft
Culvert Critical Depth	Y_c =	1.12	ft
Tailwater Depth for Design	d =	1.56	ft
Adjusted Diameter **OR** Adjusted Rise	H_a =	1.35	ft
Expansion Factor	1/(2*tan(Θ)) =	6.65	
Flow/Diameter$^{2.5}$ **OR** Flow/(Span * Rise$^{1.5}$)	Q/WH^1.5 =	2.36	$ft^{0.5}/s$
Froude Number	Fr =	2.00	Supercritical!
Tailwater/Adjusted Diameter **OR** Tailwater/Adjusted Rise	Yt/H =	1.04	
Inlet Control Headwater	HW_I =	1.70	ft
Outlet Control Headwater	HW_O =	0.89	
Design Headwater Elevation	**HW =**	**6,501.20**	**ft**
Headwater/Diameter OR Headwater/Rise Ratio	**HW/H =**	**0.85**	
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 =	**6**	**ft**
Width of Protection	**T =**	**5**	**ft**

Design Procedure Form: Rain Garden (RG)

UD-BMP (Version 3.06, November 2016)

Designer:	MAB
Company:	Respec
Date:	September 27, 2020
Project:	Wyoming Estates Sub
Location:	DP2

1. Basin Storage Volume	
A) Effective Imperviousness of Tributary Area, I_a (100% if all paved and roofed areas upstream of rain garden)	I_a = 1.8 %
B) Tributary Area's Imperviousness Ratio ($i = I_a/100$)	i = 0.018
C) Water Quality Capture Volume (WQCV) for a 12-hour Drain Time ($WQCV= 0.8 * (0.91* i^3 - 1.19 * i^2 + 0.78 * i)$)	WQCV = 0.01 watershed inches
D) Contributing Watershed Area (including rain garden area)	Area = 836,350 sq ft
E) Water Quality Capture Volume (WQCV) Design Volume Vol = (WQCV / 12) * Area	V_{WQCV} = 762 cu ft
F) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm	d_6 = ____ in
G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume	$V_{WQCV\ OTHER}$ = ____ cu ft
H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired)	$V_{WQCV\ USER}$ = ____ cu ft
2. Basin Geometry	
A) WQCV Depth (12-inch maximum)	D_{WQCV} = 12 in
B) Rain Garden Side Slopes (Z = 4 min., horiz. dist per unit vertical) (Use "0" if rain garden has vertical walls)	Z = 3.00 ft / ft Z < 4:1
C) Mimimum Flat Surface Area	A_{Min} = 301 sq ft
D) Actual Flat Surface Area	A_{Actual} = 900 sq ft
E) Area at Design Depth (Top Surface Area)	A_{Top} = 1326 sq ft
F) Rain Garden Total Volume ($V_T= ((A_{Top} + A_{Actual}) / 2) * Depth$)	V_T= 1,113 cu ft
3. Growing Media	Choose One: (●) 18" Rain Garden Growing Media ( ) Other (Explain): ____
4. Underdrain System	
A) Are underdrains provided?	Choose One: ( ) YES (●) NO
B) Underdrain system orifice diameter for 12 hour drain time	
i) Distance From Lowest Elevation of the Storage Volume to the Center of the Orifice	y = N/A ft
ii) Volume to Drain in 12 Hours	Vol_{12} = N/A cu ft
iii) Orifice Diameter, 3/8" Minimum	D_O = N/A in

Design Procedure Form: Rain Garden (RG)

Designer: MAB
Company: Respec
Date: September 27, 2020
Project: Wyoming Estates Sub
Location: DP2

5. Impermeable Geomembrane Liner and Geotextile Separator Fabric A) Is an impermeable liner provided due to proximity of structures or groundwater contamination?	Choose One ○ YES ○ NO
6. Inlet / Outlet Control A) Inlet Control	Choose One ◉ Sheet Flow- No Energy Dissipation Required ○ Concentrated Flow- Energy Dissipation Provided
7. Vegetation	Choose One ◉ Seed (Plan for frequent weed control) ○ Plantings ○ Sand Grown or Other High Infiltration Sod
8. Irrigation A) Will the rain garden be irrigated?	Choose One ○ YES ◉ NO

Notes:

Design Procedure Form: Rain Garden (RG)

UD-BMP (Version 3.06, November 2016)

Designer:	MAB
Company:	Respec
Date:	September 27, 2020
Project:	Wyoming Estates Sub
Location:	DP6

1. Basin Storage Volume	
A) Effective Imperviousness of Tributary Area, I_a (100% if all paved and roofed areas upstream of rain garden)	I_a = 5.5 %
B) Tributary Area's Imperviousness Ratio ($i = I_a/100$)	i = 0.055
C) Water Quality Capture Volume (WQCV) for a 12-hour Drain Time ($WQCV = 0.8 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i)$)	WQCV = 0.03 watershed inches
D) Contributing Watershed Area (including rain garden area)	Area = 685,200 sq ft
E) Water Quality Capture Volume (WQCV) Design Volume Vol = (WQCV / 12) * Area	V_{WQCV} = 1,802 cu ft
F) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm	d_6 = ______ in
G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume	$V_{WQCV\ OTHER}$ = ______ cu ft
H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired)	$V_{WQCV\ USER}$ = ______ cu ft
2. Basin Geometry	
A) WQCV Depth (12-inch maximum)	D_{WQCV} = 12 in
B) Rain Garden Side Slopes (Z = 4 min., horiz. dist per unit vertical) (Use "0" if rain garden has vertical walls)	Z = 3.00 ft / ft Z < 4:1
C) Mimimum Flat Surface Area	A_{Min} = 754 sq ft
D) Actual Flat Surface Area	A_{Actual} = 1625 sq ft
E) Area at Design Depth (Top Surface Area)	A_{Top} = 2201 sq ft
F) Rain Garden Total Volume ($V_T = ((A_{Top} + A_{Actual}) / 2) * Depth$)	V_T = 1,913 cu ft
3. Growing Media	Choose One: (●) 18" Rain Garden Growing Media; ( ) Other (Explain):
4. Underdrain System	
A) Are underdrains provided?	Choose One: ( ) YES; (●) NO
B) Underdrain system orifice diameter for 12 hour drain time	
i) Distance From Lowest Elevation of the Storage Volume to the Center of the Orifice	y = N/A ft
ii) Volume to Drain in 12 Hours	Vol_{12} = N/A cu ft
iii) Orifice Diameter, 3/8" Minimum	D_O = N/A in

Design Procedure Form: Rain Garden (RG)

Designer: MAB
Company: Respec
Date: September 27, 2020
Project: Wyoming Estates Sub
Location: DP6

5. Impermeable Geomembrane Liner and Geotextile Separator Fabric A) Is an impermeable liner provided due to proximity of structures or groundwater contamination?	Choose One ○ YES ○ NO
6. Inlet / Outlet Control A) Inlet Control	Choose One ◉ Sheet Flow- No Energy Dissipation Required ○ Concentrated Flow- Energy Dissipation Provided
7. Vegetation	Choose One ◉ Seed (Plan for frequent weed control) ○ Plantings ○ Sand Grown or Other High Infiltration Sod
8. Irrigation A) Will the rain garden be irrigated?	Choose One ○ YES ◉ NO

Notes:

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

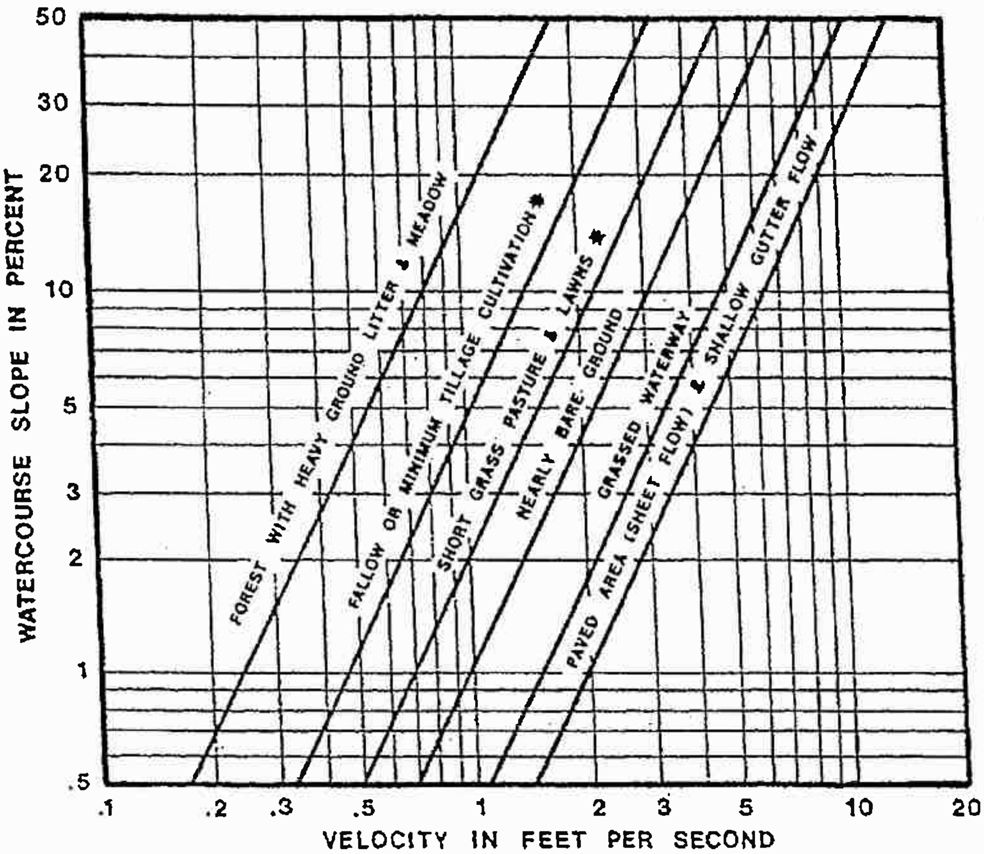
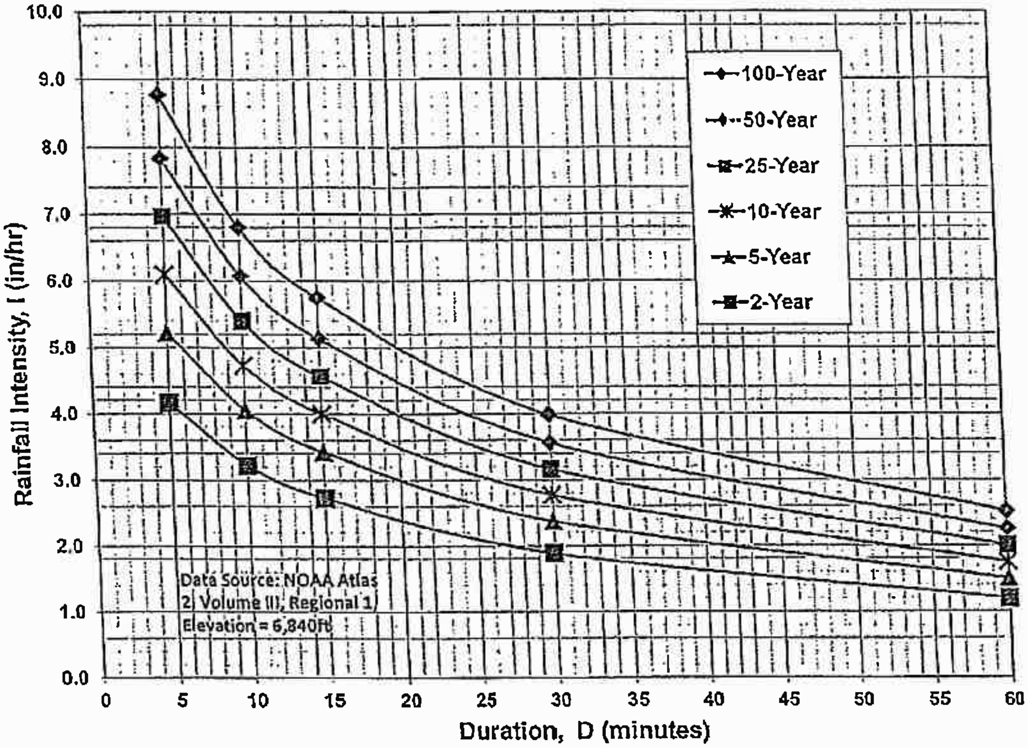
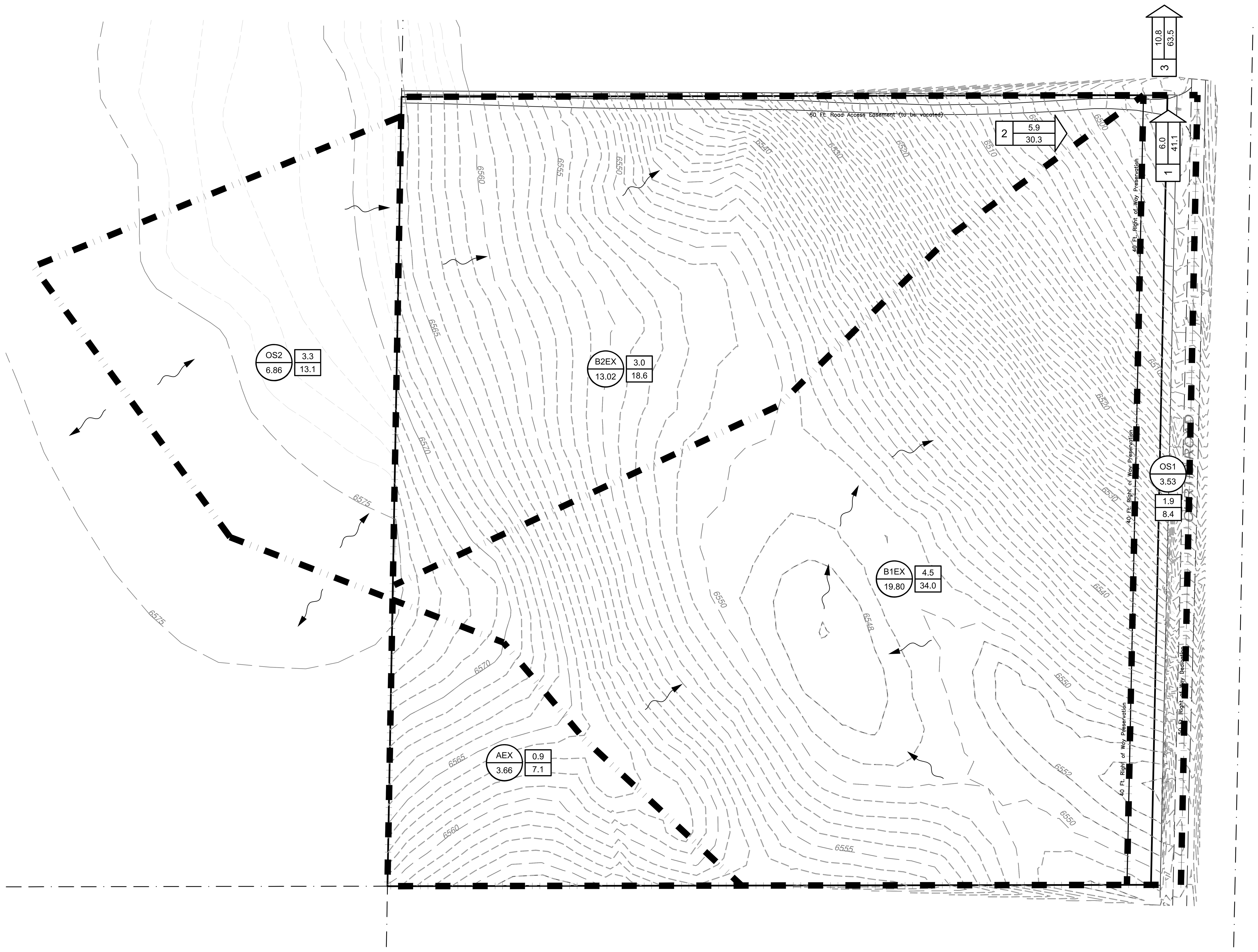


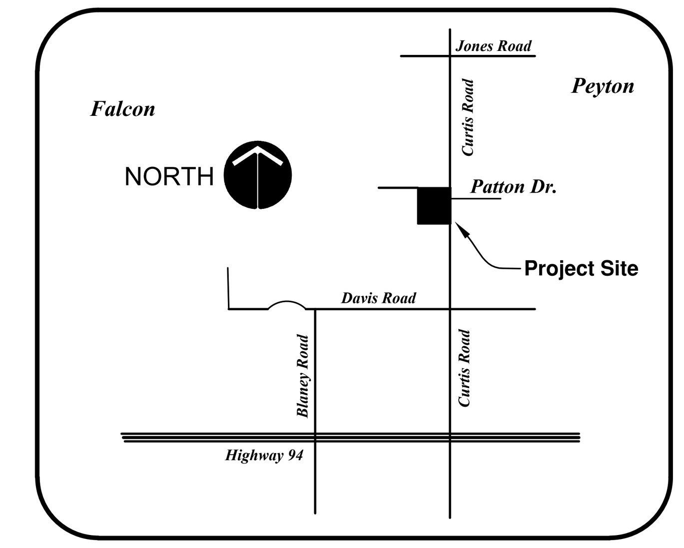
Figure 6-5. Colorado Springs Rainfall Intensity Duration Frequency



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.



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 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

RESPEC (FORMERLY ADP)
3520 AUSTIN BLUFFS PKWY
SUITE 102
COLORADO SPRINGS, CO 80918
PHONE (719) 266-5212

DESIGNED	MAB
DRAWN	HJG
CHECKED	MAB
DATE	09/25/2020

REVISION

STAMP

811 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

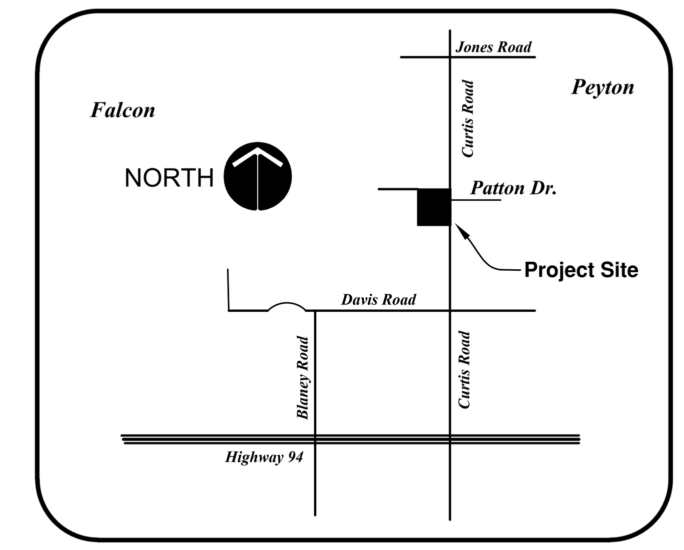
DRAWING NUMBER:
C
SHEET 1

NAME: K:\LAND PROJECTS\2018\03433-3050 CURTIS ROAD\DWG\03433-DRNGEXIST.DWG
PLOT DATE: September 30, 2020 1:17 PM, BY: ADAN CAMANO

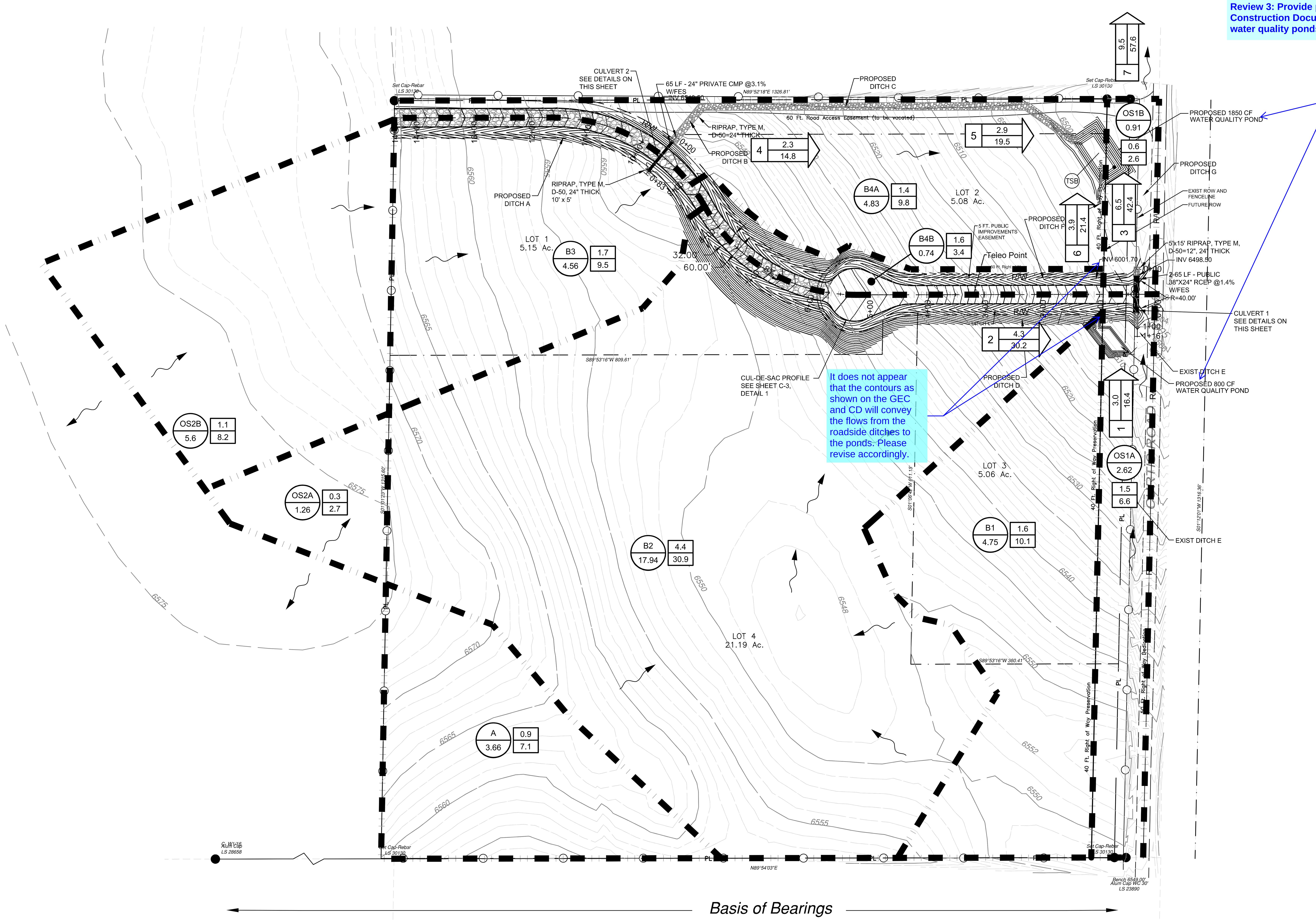
Review 2 comment: Please address any permanent stormwater quality control measure in your narrative and provide discussion on how the developed runoff will be conveyed to the permanent control measure. Additionally provide the appropriate construction documents for any permanent water quality facilities.

Review 3: Provide pond details in your Construction Documents for the proposed water quality ponds

VICINITY MAP:



Per the rain garden calculations it appears that an underdrain will not be provided and that a full infiltration section will be be provided. Please refer to urban drainage flood control district Volume 3 fact sheets T-3 for requirements for a full infiltration section. For instance it indicates that on-site infiltration tests using a double-ring infiltrometer shall be performed. Please be sure to provide a note on the construction documents of the pond that on-site infiltration test as stated above shall be performed.



It does not appear that the contours as shown on the GEC and CD will convey the flows from the roadside ditches to the ponds. Please revise accordingly.

LEGEND

- A1A / XX — BASIN DESIGNATION / BASIN AREA, ACRES
- XX / XX — 5 YEAR STORM, CFS / 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

PROPOSED CONDITIONS			
AREA DESIGNATION	Q5	Q100	ACRES
A	0.9	7.1	3.66
B1	1.6	10.1	4.75
B2	4.4	30.9	17.94
B3	1.7	9.5	4.56
B4A	1.4	9.8	4.83
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(OS2A&B2)	4.3	30.3	17.94
DP3(DP1&DP2)	6.5	42.3	26.57
DP4(OS2B&B3)	2.3	14.8	10.16
DP5(DP4&B4A)	2.9	19.5	15.73
DP6(DP5&B4B)	3.9	21.4	15.73
DP7(DP2&DP6)	6.5	42.4	43.21

GRAPHIC SCALE

100 0 50 100 200 400

(IN FEET)
1 inch = 100 ft.

PCD PROJECT NO. MS196

NAME: K:\LAND PROJECTS\2018\03433-3050 CURTIS ROAD\DWG\03433-DRNGDEV.DWG
PLOT DATE: September 30, 2020 1:24 PM, BY: ADAN CAMANO

REVISION

DESIGNED MAB
DRAWN HJG
CHECKED MAB
DATE 09/25/2020

RESPEC (FORMERLY ADP)
3520 AUSTIN BLUFFS PKWY
SUITE 102
COLORADO SPRINGS, CO 80918
PHONE (719) 266-5212

STAMP

811 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 DEVELOPED CONDITIONS

DRAWING NUMBER:
C
SHEET 2