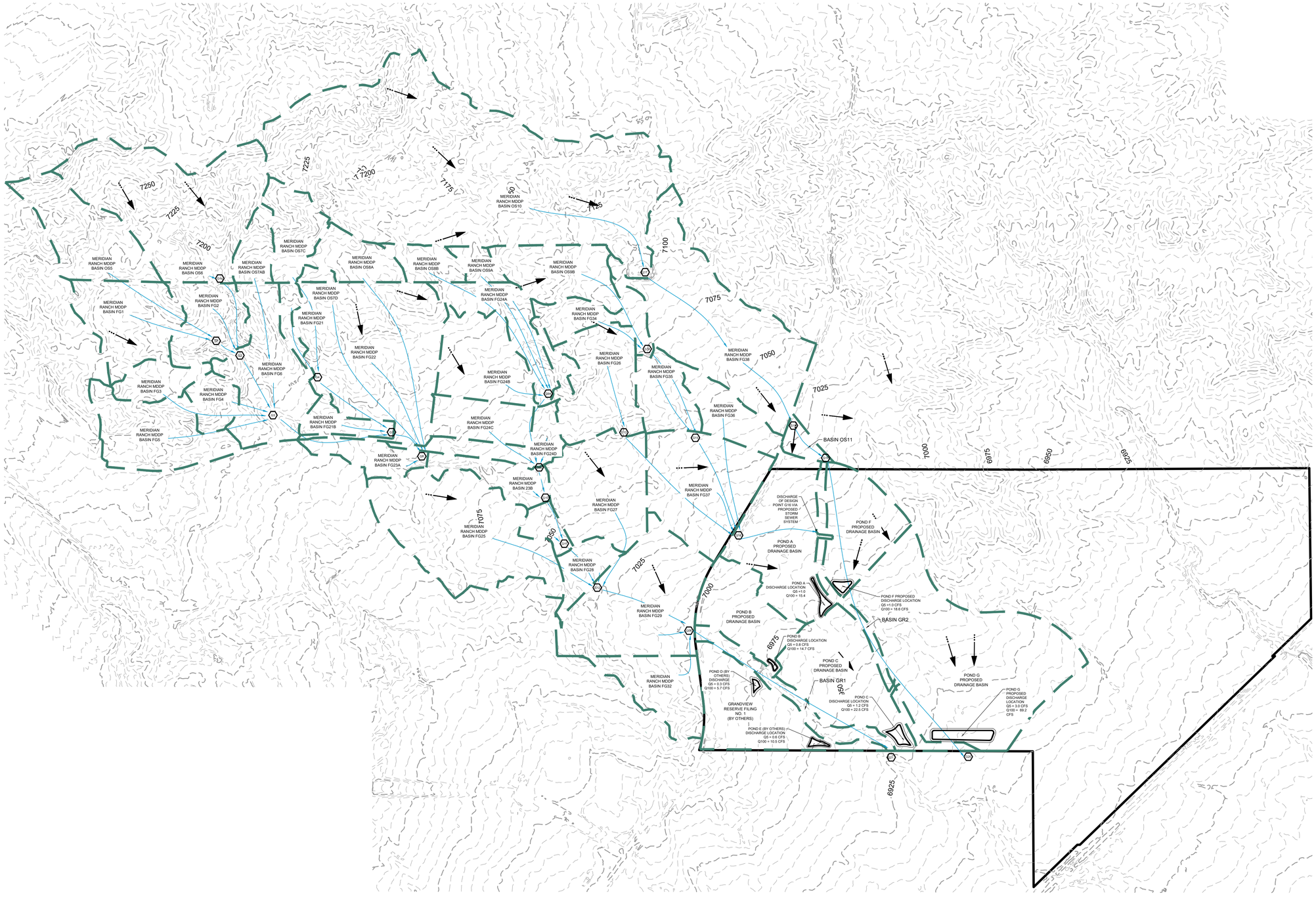
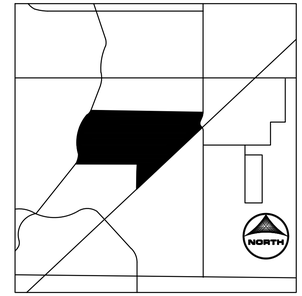
Appendix J
Proposed Hydrology Calculations and Reference Materials





KEYMAP

PROJECT LEGEND:

- PROPERTY LINE
- ROAD CENTERLINE
- RIGHT-OF-WAY LINE
- PROPOSED DETENTION BASIN
- 5250 PROPOSED MAJOR CONTOUR
- PROPOSED MINOR CONTOUR
- 5250 EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- FLOW ARROW
- PROPOSED BASIN LINE
- G06 DESIGN POINT

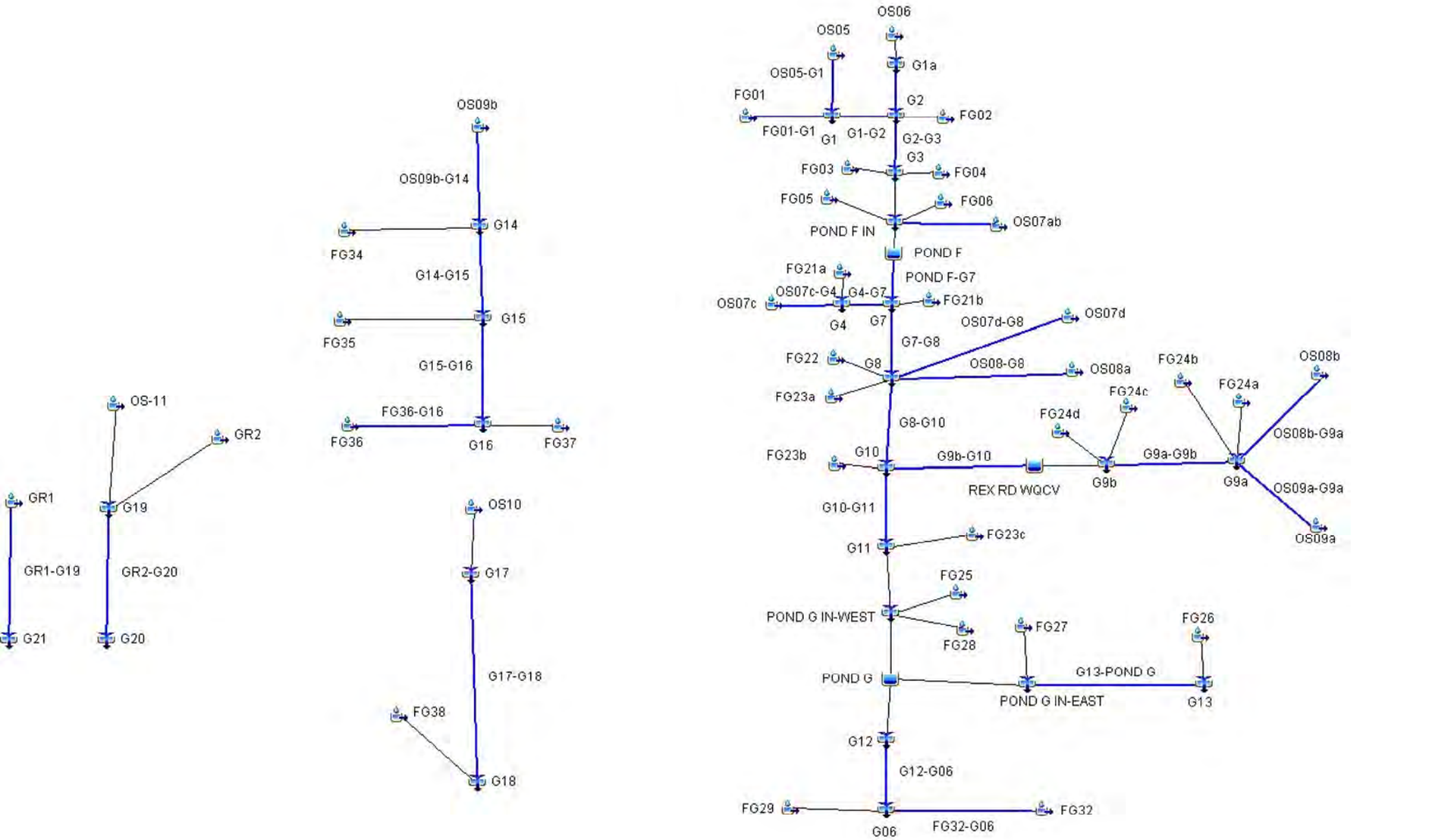
NOTE:

1. BASINS WEST OF EASTONVILLE ROAD ARE FROM THE LOCALLY APPROVED AND ACCEPTED BASIN STUDY REFERRED TO AS THE MERIDIAN RANCH MASTER DEVELOPMENT DRAINAGE PLAN
2. ALL PONDS ARE SIZED AND HAVE DISCHARGE RATES BASED OFF OF MHFD UD-DETENTION SPREADSHEET LOCATED IN APPENDIX K.
3. VERTICAL DATUM IS NAVD88.

811 UNCC CALL BEFORE YOU DIG 811 OR 1-800-922-1987 Utility Notification Center of Colorado

COLORADO LICENSED GREGORY L. PAYNE 37081 PROFESSIONAL ENGINEER 08-25-23

HEC-HMS STICK MODEL



COMPOSITE 'C' FACTORS

PROJECT: **The Sanctuary PDR-FDR** Date 3/21/2023

BASIN DESIGNATION	AREA (AC.)																AREA (MI^2)	COMPOSITE 'C' FACTOR	PERCENT IMPERV.
	UNDEV	LATIGO UNDEV.	GRADED	2.5 AC	1 DU/AC	2 DU/AC	3 DU/AC	4 DU/AC	5 DU/AC	6 DU/AC	8 DU/AC or more	STREETS	SCHOOL, CLUB HSE, REC CTR	OPEN SPACE PARKS/GC	COMM.	TOTAL			
FUTURE																			
OS05	37															37	0.0578	**61.0**	**0.0%**
OS06	84															84	0.1313	**61.0**	**0.0%**
OS07ab	11															11	0.0170	**61.0**	**0.0%**
OS07c	19															19	0.0296	**61.0**	**0.0%**
OS07d	2.2															2.2	0.0034	**61.0**	**0.0%**
OS08a	16															16	0.0251	**61.0**	**0.0%**
OS08b	11															11	0.0165	**61.0**	**0.0%**
OS09a	5.9															5.9	0.0093	**61.0**	**0.0%**
OS09b	28															28	0.0435	**61.0**	**0.0%**
FG01	13				19										2.1	34	0.0538	**66.4**	**16.9%**
FG02	12				13											25	0.0391	**64.6**	**10.4%**
FG03					13											13	0.0203	**68.0**	**20.0%**
FG04					11											11	0.0172	**68.0**	**20.0%**
FG05	1.5				33							3.0				37	0.0580	**70.1**	**25.7%**
FG06	15				27							0.9		0.5		43	0.0675	**66.1**	**14.4%**
FG21a	4.7				1.4											6.1	0.0095	**62.6**	**4.6%**
FG21b						3.8								2.5	3.3	9.6	0.0150	**73.1**	**43.1%**
FG22	17				16	48						2.1		0.9	3.3	87	0.1354	**69.0**	**23.4%**
FG23a	3.1					2.8	5.0					0.6		2.3		14	0.0216	**68.6**	**20.6%**
FG23b	14							0.9								15	0.0236	**61.8**	**2.4%**
FG23c	4.9							2.1								7.0	0.0109	**65.2**	**12.0%**
FG24a	18							2.3	2.4							22	0.0348	**64.3**	**8.8%**
FG24b	0.2				4.1	2.7	11.3	14	5.7					0.1		38	0.0589	**73.4**	**34.0%**
FG24c								19								19	0.0291	**75.0**	**40.0%**
FG24d	5.5							5.7				4.8		0.8		17	0.0262	**76.4**	**42.3%**
FG25							9.3	57	0.9					2.6		69	0.1084	**74.1**	**37.3%**
FG26									36			0.4		0.5		36	0.0570	**78.0**	**43.1%**
FG27	2.5								1.7		35	2.8		1.7		43	0.0679	**83.3**	**56.2%**
FG28								1.7			0.1			10		12	0.0184	**64.1**	**8.0%**
FG29	62							0.7								63	0.0983	**61.2**	**0.4%**
FG32													26			26	0.0402	**80.0**	**52.0%**
FG34	16								1.8							18	0.0275	**62.7**	**4.4%**
FG35	15								1.6			1.5				18	0.0282	**65.5**	**11.9%**
FG36	16											2.4				18	0.0286	**65.9**	**13.1%**
FG37	48											3.4				51	0.0797	**63.5**	**6.7%**
OS11	4.5															4	0.0070	**61.0**	**2.0%**

Additional Time of Concentration Calcs

Name	Sheet Flow						Shallow Concentrated Flow (Unpaved)						Shallow Concentrated Flow (Paved)					
	Length (ft)	US Elev	DS Elev	Slope (ft/ft)	Manning's n	Travel Time (hr)	Length (ft)	US Elev	DS Elev	Slope (ft/ft)	Velocity (fps)	Travel Time (hr)	Length (ft)	US Elev	DS Elev	Slope (ft/ft)	Velocity (fps)	Travel Time (hr)
OS10	300.0	7266.0	7258.0	0.027	0.04	0.16	3061.0	7258.0	7140.0	0.039	3.2	0.27				0.000	0.0	0.00
FG38	300.0	7134.0	7120.0	0.047	0.15	0.37	1572.0	7120.0	7075.0	0.029	2.7	0.16				0.000	0.0	0.00
OS11	500.0	7030.0	7020.0	0.020	0.04	0.27	248.0	7020.0	7014.0	0.024	2.5	0.03				0.000	0.0	0.00

Channel Flow											
Length (ft)	US Elev	DS Elev	Slope (ft/ft)	Manning's n	Bottom Width (ft)	Side Slopes (X:1)	Depth (ft)	Hydraulic Radius (ft)	Velocity (fps)	Travel Time (hr)	Time of Conc. (hr)
2168.0	7140.0	7098.0	0.019	0.035	10	5	5.0	2.9	12.0	0.05	0.48
2152.4	7075.0	7029.0	0.021	0.035	28	20	1.5	1.0	6.2	0.10	0.62
3782.3	6994.9	6917.9	0.020	0.035	10	4	2.0	1.4	7.5	0.14	0.14
7728.5	7051.8	6903.3	0.019	0.035	25	4	2.5	1.9	9.1	0.24	0.24

Name	Time of Conc. (min)	Lag Time (min)
OS10	28.66	17.19
FG38	37.34	22.41
OS11	0.30	0.18
GR1	8.46	5.08
GR2	14.14	8.49

HEC-HMS Input Data			
Subbasin	Area (sq.mi.)	Curve Number	Lag Time (min)
FG01	0.0538	66.4	33.8
FG02	0.0391	64.6	16.1
FG03	0.0203	68	11.6
FG04	0.0172	68	7.6
FG05	0.058	70.1	28.4
FG06	0.0675	66.1	18.4
FG21a	0.0095	62.6	21.4
FG21b	0.015	73.1	12.7
FG22	0.1354	69	20.3
FG23a	0.0216	68.6	18
FG23b	0.0236	61.8	15
FG23c	0.0109	65.2	12.1
FG24a	0.0348	64.3	21.9
FG24b	0.0589	73.4	14.5
FG24c	0.0291	75	14.7
FG24d	0.0262	76.4	13.9
FG25	0.1084	74.1	23.8
FG26	0.057	78	25.5
FG27	0.0679	83.3	22.1
FG28	0.0184	64.1	14.8
FG29	0.0983	61.2	19.1
FG32	0.0402	80	23.9
FG34	0.0275	62.7	16.8
FG35	0.0292	65.3	15
FG36	0.0295	65.1	25.8
FG37	0.0754	61.4	21
FG38	0.133064	61	22.41
GR1	0.028	61	5.08
GR2	0.021	61	22.6
OS05	0.0578	61	15.2
OS06	0.1313	61	18.7
OS07ab	0.017	61	13.9
OS07c	0.0296	61	17.4
OS07d	0.0034	61	13.1
OS08a	0.0251	61	16.7
OS08b	0.0165	61	20.3
OS09a	0.0093	61	20.9
OS09b	0.0435	61	25.4
OS10	0.369334	64.72	17.19
OS11	0.0077	61	0.18

HEC-HMS Proposed 5-Year Flows				
Hydrologic Element	Area	Peak Discharge	Time of Peak	Volume
	(sq.mi.)	CFS	(min)	(in)
FG01	0.0538	3.4	01Jul2015, 12:36	0.28
FG01-G1	0.0538	3.4	01Jul2015, 12:36	0.28
FG02	0.0391	2.7	01Jul2015, 12:18	0.24
FG03	0.0203	3	01Jul2015, 12:06	0.33
FG04	0.0172	3.1	01Jul2015, 12:06	0.34
FG05	0.058	6.7	01Jul2015, 12:30	0.4
FG06	0.0675	5.8	01Jul2015, 12:18	0.28
FG21a	0.0095	0.4	01Jul2015, 12:24	0.19
FG21b	0.015	3.9	01Jul2015, 12:06	0.5
FG22	0.1354	16.8	01Jul2015, 12:18	0.36
FG23a	0.0216	2.7	01Jul2015, 12:18	0.35
FG23b	0.0236	0.9	01Jul2015, 12:18	0.18
FG23c	0.0109	1	01Jul2015, 12:12	0.26
FG24a	0.0348	2	01Jul2015, 12:24	0.23
FG24b	0.0589	14.8	01Jul2015, 12:12	0.52
FG24c	0.0291	8.4	01Jul2015, 12:12	0.58
FG24d	0.0262	8.7	01Jul2015, 12:06	0.64
FG25	0.1084	21.8	01Jul2015, 12:18	0.54
FG26	0.057	15.6	01Jul2015, 12:18	0.7
FG27	0.0679	30	01Jul2015, 12:18	0.97
FG28	0.0184	1.2	01Jul2015, 12:12	0.23
FG29	0.0983	2.9	01Jul2015, 12:24	0.16
FG32	0.0402	13.6	01Jul2015, 12:18	0.8
FG32-G06	0.0402	13.2	01Jul2015, 12:24	0.8
FG34	0.0275	1.3	01Jul2015, 12:18	0.2
FG35	0.0292	2.4	01Jul2015, 12:12	0.26
FG36	0.0295	1.7	01Jul2015, 12:30	0.25
FG36-G16	0.0295	1.7	01Jul2015, 12:36	0.25
FG37	0.0754	2.3	01Jul2015, 12:30	0.17
FG38	0.133064	3.5	01Jul2015, 12:30	0.16
GR1	0.028	1.2	01Jul2015, 12:06	0.16
GR1-G19	0.028	1.2	01Jul2015, 12:36	0.16
GR2	0.021	0.6	01Jul2015, 12:30	0.16
GR2-G20	0.0287	0.7	01Jul2015, 14:06	0.15
G06	1.3011	22.4	01Jul2015, 15:30	0.24
G1	0.1116	4.9	01Jul2015, 12:36	0.22
G1a	0.1313	3.8	01Jul2015, 12:24	0.16
G1a-G2	0.1313	3.7	01Jul2015, 12:30	0.16
G1-G2	0.1116	4.8	01Jul2015, 12:36	0.22
G10	0.9	45.9	01Jul2015, 12:30	0.26
G10-G11	0.9	43.8	01Jul2015, 12:36	0.26
G11	0.9109	44.3	01Jul2015, 12:36	0.26
G12	1.1626	20.5	01Jul2015, 15:24	0.23
G12-G06	1.1626	20.5	01Jul2015, 15:36	0.23

G13	0.057	15.6	01Jul2015, 12:18	0.7
G13-POND G	0.057	15.6	01Jul2015, 12:24	0.7
G14	0.071	2	01Jul2015, 12:36	0.17
G14-G15	0.071	1.9	01Jul2015, 12:54	0.17
G15	0.1002	3	01Jul2015, 12:48	0.19
G15-G16	0.1002	3	01Jul2015, 13:06	0.19
G16	0.2051	6.1	01Jul2015, 12:36	0.19
G17	0.369334	25.5	01Jul2015, 12:18	0.24
G17-G18	0.369334	24.7	01Jul2015, 12:30	0.24
G18	0.502397	28.3	01Jul2015, 12:30	0.22
G19	0.0287	0.7	01Jul2015, 12:30	0.16
G2	0.282	10.3	01Jul2015, 12:30	0.19
G2-G3	0.282	10.2	01Jul2015, 12:42	0.19
G20	0.0287	0.7	01Jul2015, 14:06	0.15
G21	0.028	1.2	01Jul2015, 12:36	0.16
G3	0.3195	12.1	01Jul2015, 12:36	0.21
G4	0.0391	1.2	01Jul2015, 12:36	0.16
G4-G7	0.0391	1.2	01Jul2015, 12:36	0.16
G7	0.5161	8.9	01Jul2015, 14:12	0.2
G7-G8	0.5161	8.9	01Jul2015, 14:18	0.2
G8	0.7016	24	01Jul2015, 12:18	0.23
G8-G10	0.7016	23.8	01Jul2015, 12:30	0.23
G9a	0.1195	16.2	01Jul2015, 12:12	0.35
G9a-G9b	0.1195	15.5	01Jul2015, 12:18	0.35
G9b	0.1748	32.3	01Jul2015, 12:12	0.43
G9b-G10	0.1748	30.8	01Jul2015, 12:18	0.42
OS05	0.0578	1.8	01Jul2015, 12:18	0.16
OS05-G1	0.0578	1.7	01Jul2015, 12:24	0.16
OS06	0.1313	3.8	01Jul2015, 12:24	0.16
OS07ab	0.017	0.5	01Jul2015, 12:18	0.16
OS07ab-POND F	0.017	0.5	01Jul2015, 12:42	0.16
OS07c	0.0296	0.9	01Jul2015, 12:24	0.16
OS07c-G4	0.0296	0.9	01Jul2015, 12:36	0.16
OS07d	0.0034	0.1	01Jul2015, 12:18	0.16
OS07d-G8	0.0034	0.1	01Jul2015, 12:30	0.16
OS08a	0.0251	0.7	01Jul2015, 12:24	0.16
OS08b	0.0165	0.4	01Jul2015, 12:24	0.16
OS08b-G9a	0.0165	0.4	01Jul2015, 13:00	0.15
OS08-G8	0.0251	0.7	01Jul2015, 12:30	0.16
OS09a	0.0093	0.3	01Jul2015, 12:30	0.16
OS09a-G9a	0.0093	0.2	01Jul2015, 13:00	0.15
OS09b	0.0435	1.1	01Jul2015, 12:36	0.16
OS09b-G14	0.0435	1.1	01Jul2015, 12:42	0.16
OS10	0.369334	25.5	01Jul2015, 12:18	0.24
OS11	0.0077	0.5	01Jul2015, 12:00	0.16
POND F	0.462	8	01Jul2015, 14:12	0.2
POND F IN	0.462	22.8	01Jul2015, 12:36	0.24

POND F-G7	0.462	8	01Jul2015, 14:24	0.19
POND G	1.1626	20.5	01Jul2015, 15:24	0.23
POND G IN-EAST	0.1249	44.3	01Jul2015, 12:18	0.85
POND G IN-WEST	1.0377	63.3	01Jul2015, 12:30	0.29
REX RD WQCV	0.1748	30.9	01Jul2015, 12:18	0.42

HEC-HMS Proposed 100-Year Flows				
Hydrologic Element	Area	Peak Discharge	Time of Peak	Volume
	(sq.mi.)	CFS	(min)	(in)
FG01	0.0538	31.2	01Jul2015, 12:30	1.7
FG01-G1	0.0538	31.1	01Jul2015, 12:30	1.7
FG02	0.0391	32	01Jul2015, 12:12	1.58
FG03	0.0203	23.6	01Jul2015, 12:06	1.84
FG04	0.0172	22.2	01Jul2015, 12:00	1.84
FG05	0.058	45	01Jul2015, 12:24	1.98
FG06	0.0675	56.2	01Jul2015, 12:12	1.69
FG21a	0.0095	5.9	01Jul2015, 12:18	1.43
FG21b	0.015	20.7	01Jul2015, 12:06	2.24
FG22	0.1354	121.3	01Jul2015, 12:12	1.91
FG23a	0.0216	20.6	01Jul2015, 12:12	1.88
FG23b	0.0236	16.9	01Jul2015, 12:12	1.38
FG23c	0.0109	10.8	01Jul2015, 12:06	1.63
FG24a	0.0348	23.6	01Jul2015, 12:18	1.55
FG24b	0.0589	75.9	01Jul2015, 12:06	2.26
FG24c	0.0291	39.5	01Jul2015, 12:06	2.4
FG24d	0.0262	39	01Jul2015, 12:06	2.52
FG25	0.1084	111.4	01Jul2015, 12:18	2.31
FG26	0.057	65	01Jul2015, 12:18	2.65
FG27	0.0679	98.2	01Jul2015, 12:12	3.14
FG28	0.0184	15	01Jul2015, 12:12	1.55
FG29	0.0983	59.5	01Jul2015, 12:12	1.34
FG32	0.0402	50.9	01Jul2015, 12:18	2.83
FG32-G06	0.0402	50.3	01Jul2015, 12:18	2.82
FG34	0.0275	19.9	01Jul2015, 12:12	1.45
FG35	0.0292	25.3	01Jul2015, 12:12	1.63
FG36	0.0295	18.8	01Jul2015, 12:18	1.61
FG36-G16	0.0295	18.7	01Jul2015, 12:24	1.6
FG37	0.0754	43.8	01Jul2015, 12:18	1.35
FG38	0.133064	72.9	01Jul2015, 12:18	1.32
GR1	0.028	30	01Jul2015, 12:00	1.34
GR1-G19	0.028	26.8	01Jul2015, 12:12	1.3
GR2	0.021	11.5	01Jul2015, 12:18	1.32
GR2-G20	0.0287	13	01Jul2015, 12:54	1.38
G06	1.3011	491	01Jul2015, 12:48	1.66
G1	0.1116	61	01Jul2015, 12:18	1.51
G1a	0.1313	79.8	01Jul2015, 12:12	1.33
G1a-G2	0.1313	78.6	01Jul2015, 12:18	1.32
G1-G2	0.1116	60.6	01Jul2015, 12:18	1.5
G10	0.9	390.3	01Jul2015, 12:24	1.63
G10-G11	0.9	389.1	01Jul2015, 12:30	1.62
G11	0.9109	392.7	01Jul2015, 12:30	1.62
G12	1.1626	449.6	01Jul2015, 12:48	1.66
G12-G06	1.1626	448.7	01Jul2015, 12:54	1.65

G13	0.057	65	01Jul2015, 12:18	2.65
G13-POND G	0.057	63.5	01Jul2015, 12:24	2.64
G14	0.071	37.3	01Jul2015, 12:18	1.36
G14-G15	0.071	37.1	01Jul2015, 12:24	1.35
G15	0.1002	54.9	01Jul2015, 12:18	1.43
G15-G16	0.1002	53.8	01Jul2015, 12:24	1.41
G16	0.2051	112.1	01Jul2015, 12:24	1.41
G17	0.369334	296.1	01Jul2015, 12:12	1.59
G17-G18	0.369334	292.3	01Jul2015, 12:18	1.57
G18	0.502397	365.2	01Jul2015, 12:18	1.51
G19	0.0287	14	01Jul2015, 12:00	1.33
G2	0.282	166.7	01Jul2015, 12:18	1.43
G2-G3	0.282	163.4	01Jul2015, 12:18	1.42
G20	0.0287	13	01Jul2015, 12:54	1.38
G21	0.028	26.8	01Jul2015, 12:12	1.3
G3	0.3195	184.9	01Jul2015, 12:18	1.47
G4	0.0391	24.7	01Jul2015, 12:18	1.35
G4-G7	0.0391	23.8	01Jul2015, 12:18	1.34
G7	0.5161	194.5	01Jul2015, 12:42	1.47
G7-G8	0.5161	194	01Jul2015, 12:42	1.46
G8	0.7016	279	01Jul2015, 12:30	1.55
G8-G10	0.7016	277.7	01Jul2015, 12:36	1.54
G9a	0.1195	97.2	01Jul2015, 12:12	1.85
G9a-G9b	0.1195	95.7	01Jul2015, 12:12	1.84
G9b	0.1748	170.1	01Jul2015, 12:12	2.04
G9b-G10	0.1748	157.9	01Jul2015, 12:18	2.02
OS05	0.0578	39.1	01Jul2015, 12:12	1.33
OS05-G1	0.0578	38.6	01Jul2015, 12:12	1.33
OS06	0.1313	79.8	01Jul2015, 12:12	1.33
OS07ab	0.017	11.9	01Jul2015, 12:06	1.33
OS07ab-POND F	0.017	11.8	01Jul2015, 12:18	1.31
OS07c	0.0296	18.9	01Jul2015, 12:12	1.33
OS07c-G4	0.0296	18.8	01Jul2015, 12:18	1.32
OS07d	0.0034	2.5	01Jul2015, 12:06	1.33
OS07d-G8	0.0034	2.4	01Jul2015, 12:12	1.32
OS08a	0.0251	16.3	01Jul2015, 12:12	1.33
OS08b	0.0165	9.5	01Jul2015, 12:18	1.33
OS08b-G9a	0.0165	9.4	01Jul2015, 12:30	1.29
OS08-G8	0.0251	15.6	01Jul2015, 12:18	1.32
OS09a	0.0093	5.3	01Jul2015, 12:18	1.33
OS09a-G9a	0.0093	5.2	01Jul2015, 12:30	1.3
OS09b	0.0435	21.8	01Jul2015, 12:24	1.32
OS09b-G14	0.0435	21.7	01Jul2015, 12:24	1.31
OS10	0.369334	296.1	01Jul2015, 12:12	1.59
OS11	0.0077	9.4	01Jul2015, 12:00	1.34
POND F	0.462	177.6	01Jul2015, 12:42	1.46
POND F IN	0.462	293	01Jul2015, 12:18	1.56

POND F-G7	0.462	177.3	01Jul2015, 12:42	1.45
POND G	1.1626	449.6	01Jul2015, 12:48	1.66
POND G IN-EAST	0.1249	160.3	01Jul2015, 12:18	2.91
POND G IN-WEST	1.0377	503.2	01Jul2015, 12:24	1.69
REX RD WQCV	0.1748	158.1	01Jul2015, 12:18	2.02

Appendix K
Preliminary Onsite Pond Sizing Spreadsheets

MILE HIGH FLOOD DISTRICT

DETENTION BASIN DESIGN WORKBOOK

MHFD-Detention, Version 4.06 (July 2022)
Mile High Flood District
Denver, Colorado
www.mhfd.org

Purpose:

This workbook aids in the estimation of stormwater detention basin sizing and outlet routing based on the modified puls routing method for urban watersheds. Several different BMP types and various outlet configurations can be sized.

Function:

1. Approximates the stage-area-volume relationship for a detention basin based on watershed parameters and basin geometry parameters. Also evaluates existing user-defined basin stage-area relationships.

2. Sizes filtration media orifice, outlet orifices, elliptical slots, weirs, trash racks, and develops stage-discharge relationships. Uses the Modified Puls method to route a series of hydrographs (i.e., 2-, 5-, 10-, 25-, 50-, 100- and 500-year) and calibrates the peak discharge out of the basin to match the pre-development peak discharges for the watershed.

Content: **This workbook consists of the following sheets:**

Basin	Tabulates stage-area-volume relationship estimates based on watershed parameters
Outlet Structure	Tabulates a stage-discharge relationship for the user-defined outlet structure (inlet control).
Reference	Provides reference equations and figures.
User Tips and Tools	Provides instructions and video links to assist in using this workbook. Includes a stage-area calculator.
BMP Zone Images	Provides images of typical BMP zone confirgurations corresponding with Zone pulldown selections.

Acknowledgements: ***Spreadsheet Development Team:***
Ken MacKenzie, P.E., Holly Piza, P.E.
Mile High Flood District

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Peak Stormwater Engineering, LLC

Dr. James C.Y. Guo, Ph.D., P.E.
Professor, Department of Civil Engineering, University of Colorado at Denver

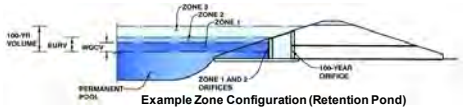
Comments? Direct all comments regarding this spreadsheet workbook to: **MHFD E-Mail**
Revisions? Check for revised versions of this or any other workbook at: **Downloads**

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: Grandview - Filing 2

Basin ID: Basin A



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	36.13	acres
Watershed Length =	2,360	ft
Watershed Length to Centroid =	1,180	ft
Watershed Slope =	0.020	ft/ft
Watershed Imperviousness =	64.30%	percent
Percentage Hydrologic Soil Group A =	100.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.757	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	2.874	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	2.126	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	2.790	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	3.322	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	4.022	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	4.709	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	5.545	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.68 in.) =	9.033	acre-feet	3.68	inches
Approximate 2-yr Detention Volume =	1.869	acre-feet		
Approximate 5-yr Detention Volume =	2.444	acre-feet		
Approximate 10-yr Detention Volume =	2.948	acre-feet		
Approximate 25-yr Detention Volume =	3.549	acre-feet		
Approximate 50-yr Detention Volume =	3.912	acre-feet		
Approximate 100-yr Detention Volume =	4.293	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.757	acre-feet
Zone 2 Volume (EURV - Zone 1) =	2.117	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	1.419	acre-feet
Total Detention Basin Volume =	4.293	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

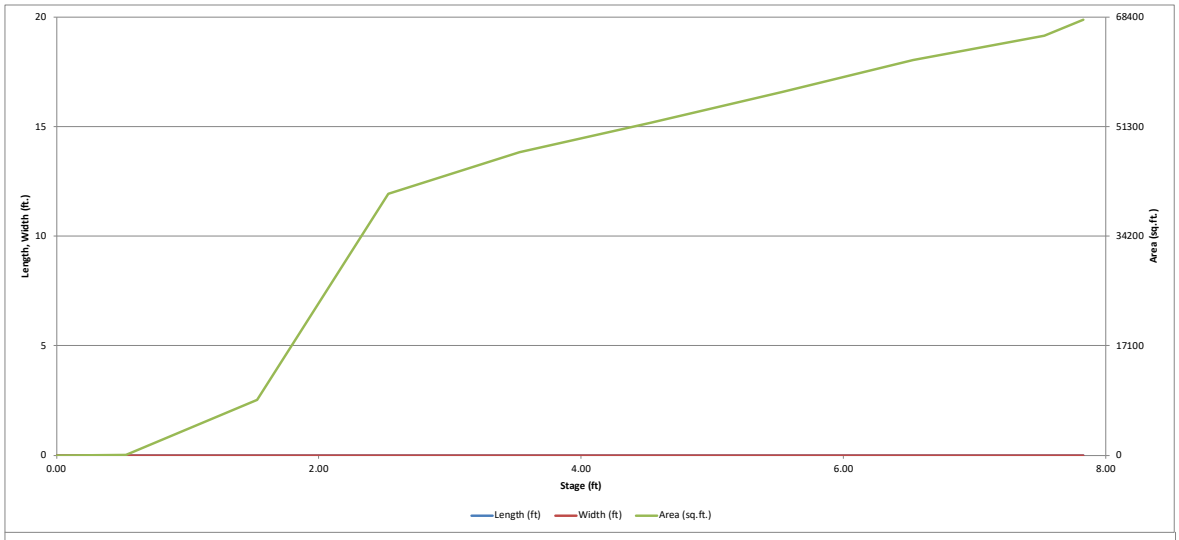
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

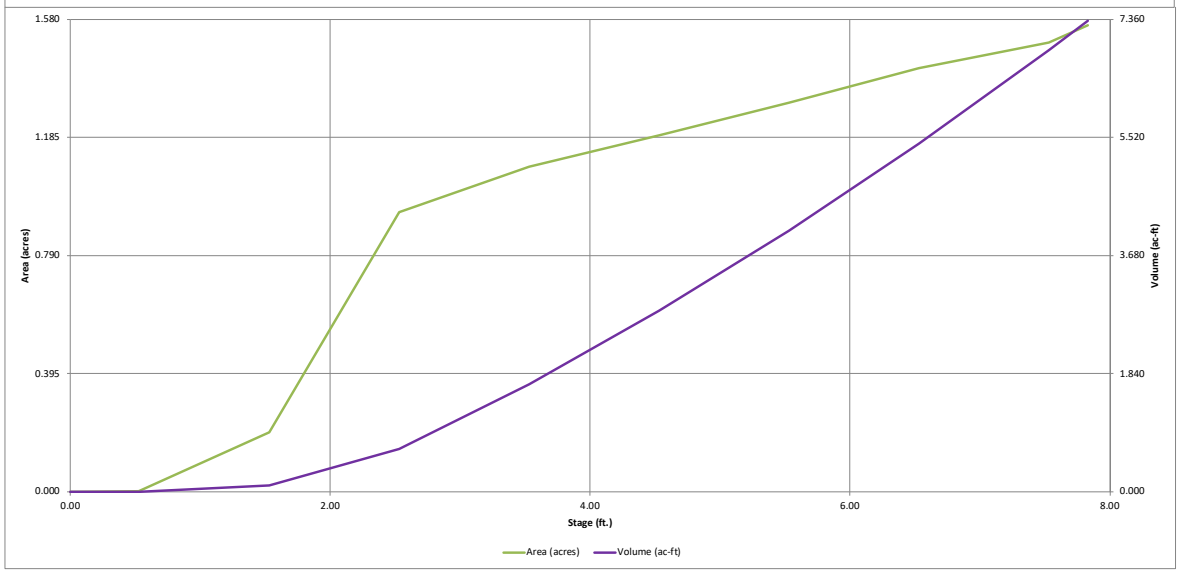
Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
6967.47 **Top of Micropool**	--	0.00	--	--	--	0	0.000		
6968	--	0.53	--	--	--	68	0.002	18	0.000
	--	1.53	--	--	--	8,624	0.198	4,364	0.100
	--	2.53	--	--	--	40,781	0.936	29,066	0.667
	--	3.53	--	--	--	47,311	1.086	73,112	1.678
	--	4.53	--	--	--	51,922	1.192	122,729	2.817
	--	5.53	--	--	--	56,697	1.302	177,038	4.064
	--	6.53	--	--	--	61,730	1.417	236,252	5.424
6975	--	7.53	--	--	--	65,473	1.503	299,853	6.884
6975.3	--	7.83	--	--	--	68,045	1.562	319,881	7.343

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)



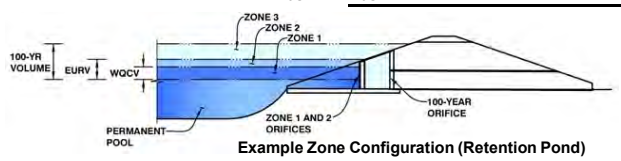


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: Grandview - Filing 2

Basin ID: Basin A



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.63	0.757	Orifice Plate
Zone 2 (EURV)	4.58	2.117	Rectangular Orifice
Zone 3 (100-year)	5.71	1.419	Weir&Pipe (Restrict)
Total (all zones)		4.293	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	1.681E-02	ft^2
Depth at top of Zone using Orifice Plate =	2.63	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	10.50	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	2.42	sq. inches (diameter = 1-3/4 inches)	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.88	1.75					
Orifice Area (sq. inches)	2.42	2.42	2.42					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Rectangular	Not Selected				
Invert of Vertical Orifice =	2.63	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	0.10	N/A
Depth at top of Zone using Vertical Orifice =	4.58	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	0.08	N/A
Vertical Orifice Height =	2.00	N/A	inches			
Vertical Orifice Width =	6.89		inches			

Calculated Parameters for Vertical Orif

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 3 Weir	Not Selected				
Overflow Weir Front Edge Height, Ho =	4.58	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	4.58	N/A
Overflow Weir Front Edge Length =	4.00	N/A	feet	Overflow Weir Slope Length =	4.00	N/A
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	8.02	N/A
Horiz. Length of Weir Sides =	4.00	N/A	feet	Overflow Grate Open Area w/o Debris =	11.14	N/A
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	5.57	N/A
Debris Clogging % =	50%	N/A	%			

Calculated Parameters for Overflow W

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Restrictor	Not Selected				
Depth to Invert of Outlet Pipe =	0.25	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	1.39	N/A
Outlet Pipe Diameter =	18.00	N/A	inches	Outlet Orifice Centroid =	0.61	N/A
Restrictor Plate Height Above Pipe Invert =	13.20		inches	Half-Central Angle of Restrictor Plate on Pipe =	2.06	N/A

Calculated Parameters for Outlet Pipe w/ Flow Restriction Pla

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	5.70	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.97	feet
Spillway Crest Length =	25.00	feet	Stage at Top of Freeboard =	7.67	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	1.53	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	7.10	acre-ft

Calculated Parameters for Spillway

Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AI

Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52
CUHP Runoff Volume (acre-ft) =	0.757	2.874	2.126	2.790	3.322	4.022	4.709	5.545
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	2.126	2.790	3.322	4.022	4.709	5.545
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.2	0.4	0.6	5.0	10.1	16.9
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A						
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.01	0.02	0.14	0.28	0.47
Peak Inflow Q (cfs) =	N/A	N/A	28.8	37.7	44.5	57.1	68.1	81.4
Peak Outflow Q (cfs) =	0.3	1.1	0.9	1.0	2.8	8.0	14.3	15.4
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	2.6	5.0	1.6	1.4	0.9
Structure Controlling Flow =	Vertical Orifice 1	Overflow Weir 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.1	0.6	1.2	1.3
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	67	61	67	70	69	68	66
Time to Drain 99% of Inflow Volume (hours) =	**40**	72	65	72	76	75	75	75
Maximum Ponding Depth (ft) =	2.63	4.58	3.81	4.36	4.74	4.99	5.22	5.64
Area at Maximum Ponding Depth (acres) =	0.95	1.20	1.11	1.17	1.21	1.24	1.27	1.31
Maximum Volume Stored (acre-ft) =	0.762	2.877	1.976	2.616	3.070	3.377	3.653	4.208

ice

ft^2
feet

eir

feet
feet

ft^2
ft^2

ate

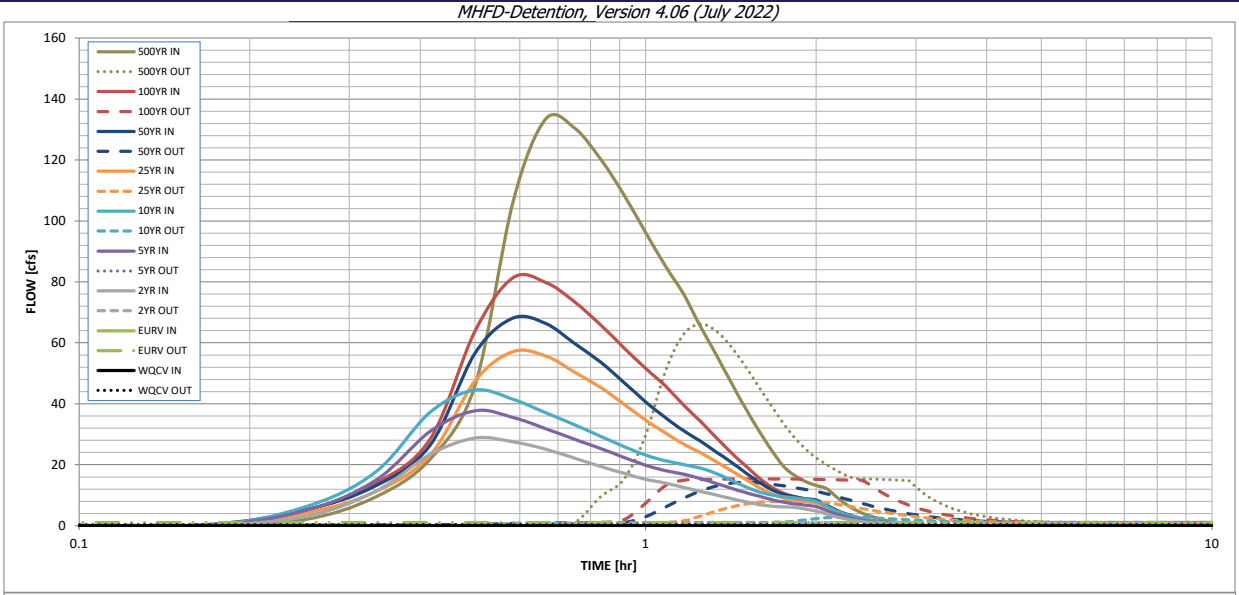
ft^2
feet
radians

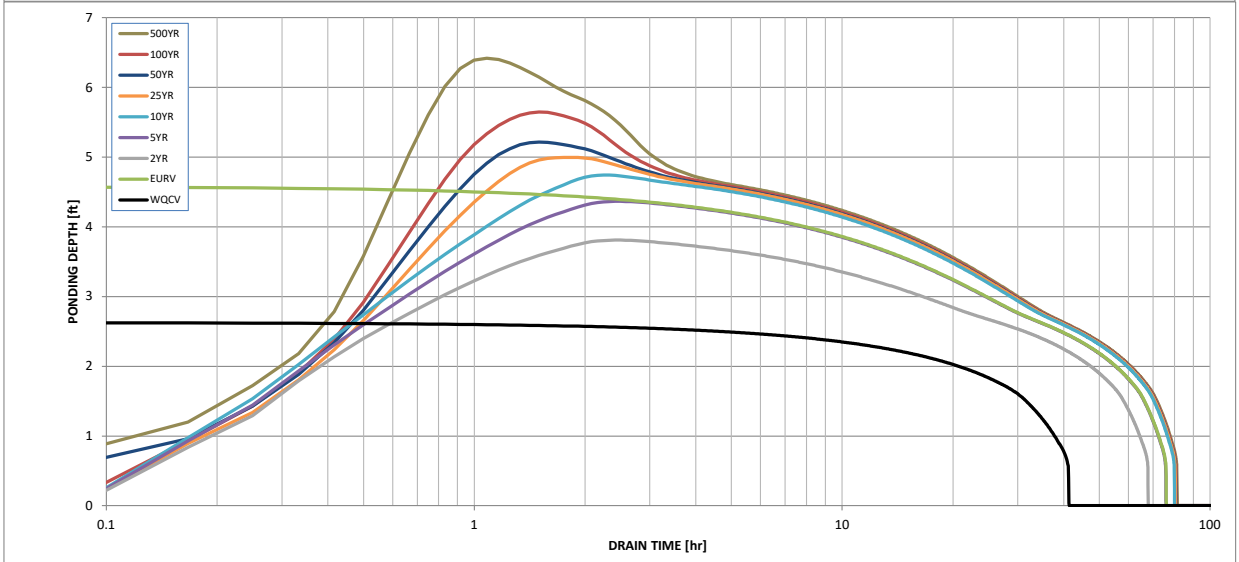
5).

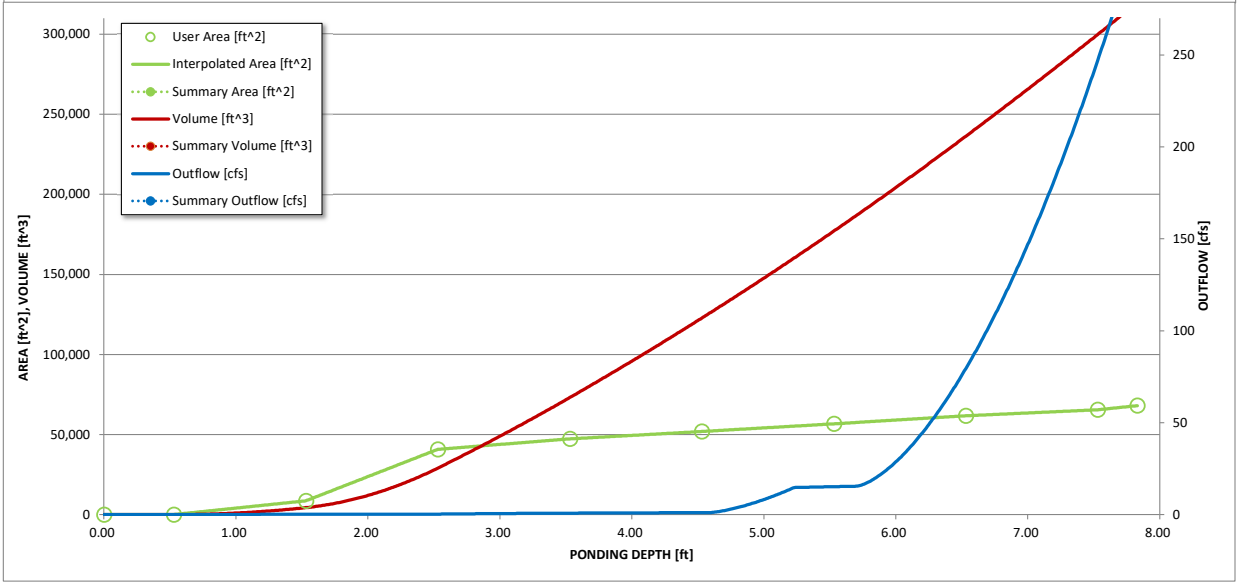
500 Year
3.68
9.033
9.033
44.1
1.22
133.4
66.1
1.5
Spillway
1.3
N/A
61
72
6.42
1.40
5.254

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)







S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.34	0.03	2.03
	0:15:00	0.00	0.00	3.01	4.89	6.06	4.08	5.15	4.99	9.39
	0:20:00	0.00	0.00	11.19	14.81	17.48	11.07	12.96	13.82	21.85
	0:25:00	0.00	0.00	23.40	30.92	37.22	23.15	26.47	28.47	45.97
	0:30:00	0.00	0.00	28.77	37.72	44.48	47.43	56.58	63.83	106.22
	0:35:00	0.00	0.00	27.53	35.53	41.46	57.08	68.10	81.36	133.45
	0:40:00	0.00	0.00	25.09	31.83	37.05	55.68	66.30	79.83	130.37
	0:45:00	0.00	0.00	22.11	28.32	33.07	50.29	59.71	73.41	120.23
	0:50:00	0.00	0.00	19.45	25.34	29.32	45.33	53.61	65.87	108.49
	0:55:00	0.00	0.00	17.16	22.39	25.96	39.83	46.94	58.31	96.22
	1:00:00	0.00	0.00	15.26	19.81	23.15	34.68	40.66	51.61	85.23
	1:05:00	0.00	0.00	13.99	18.10	21.35	30.40	35.45	45.91	76.01
	1:10:00	0.00	0.00	12.58	16.88	20.07	26.81	31.18	39.61	65.35
	1:15:00	0.00	0.00	11.24	15.46	18.87	23.92	27.71	34.22	56.01
	1:20:00	0.00	0.00	10.05	13.85	17.13	20.94	24.19	28.88	46.87
	1:25:00	0.00	0.00	8.90	12.27	14.89	18.10	20.82	23.98	38.59
	1:30:00	0.00	0.00	7.83	10.86	12.81	15.24	17.47	19.69	31.36
	1:35:00	0.00	0.00	6.96	9.71	11.15	12.64	14.40	15.87	24.92
	1:40:00	0.00	0.00	6.42	8.55	10.11	10.51	11.88	12.70	19.60
	1:45:00	0.00	0.00	6.16	7.72	9.51	9.17	10.33	10.73	16.46
	1:50:00	0.00	0.00	6.01	7.15	9.10	8.36	9.41	9.56	14.51
	1:55:00	0.00	0.00	5.42	6.73	8.66	7.85	8.83	8.79	13.19
	2:00:00	0.00	0.00	4.82	6.27	8.00	7.49	8.42	8.25	12.25
	2:05:00	0.00	0.00	3.87	5.05	6.44	6.05	6.80	6.57	9.68
	2:10:00	0.00	0.00	2.98	3.88	4.95	4.63	5.20	4.93	7.22
	2:15:00	0.00	0.00	2.30	2.99	3.80	3.54	3.97	3.72	5.41
	2:20:00	0.00	0.00	1.76	2.28	2.88	2.69	3.02	2.83	4.10
	2:25:00	0.00	0.00	1.33	1.73	2.17	2.03	2.28	2.14	3.10
	2:30:00	0.00	0.00	1.01	1.28	1.61	1.51	1.69	1.60	2.31
	2:35:00	0.00	0.00	0.74	0.93	1.20	1.11	1.24	1.19	1.71
	2:40:00	0.00	0.00	0.54	0.68	0.89	0.83	0.93	0.89	1.28
	2:45:00	0.00	0.00	0.38	0.48	0.63	0.60	0.68	0.64	0.92
	2:50:00	0.00	0.00	0.24	0.33	0.42	0.41	0.46	0.44	0.62
	2:55:00	0.00	0.00	0.14	0.20	0.26	0.26	0.28	0.27	0.38
	3:00:00	0.00	0.00	0.07	0.11	0.13	0.14	0.15	0.14	0.20
	3:05:00	0.00	0.00	0.03	0.04	0.05	0.05	0.06	0.05	0.07
	3:10:00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

MILE HIGH FLOOD DISTRICT

DETENTION BASIN DESIGN WORKBOOK

MHFD-Detention, Version 4.06 (July 2022)
Mile High Flood District
Denver, Colorado
www.mhfd.org

Purpose:

This workbook aids in the estimation of stormwater detention basin sizing and outlet routing based on the modified puls routing method for urban watersheds. Several different BMP types and various outlet configurations can be sized.

Function:

1. Approximates the stage-area-volume relationship for a detention basin based on watershed parameters and basin geometry parameters. Also evaluates existing user-defined basin stage-area relationships.

2. Sizes filtration media orifice, outlet orifices, elliptical slots, weirs, trash racks, and develops stage-discharge relationships. Uses the Modified Puls method to route a series of hydrographs (i.e., 2-, 5-, 10-, 25-, 50-, 100- and 500-year) and calibrates the peak discharge out of the basin to match the pre-development peak discharges for the watershed.

Content: **This workbook consists of the following sheets:**

Basin	Tabulates stage-area-volume relationship estimates based on watershed parameters
Outlet Structure	Tabulates a stage-discharge relationship for the user-defined outlet structure (inlet control).
Reference	Provides reference equations and figures.
User Tips and Tools	Provides instructions and video links to assist in using this workbook. Includes a stage-area calculator.
BMP Zone Images	Provides images of typical BMP zone confirgurations corresponding with Zone pulldown selections.

Acknowledgements: ***Spreadsheet Development Team:***
Ken MacKenzie, P.E., Holly Piza, P.E.
Mile High Flood District

Derek N. Rapp, P.E.
Peak Stormwater Engineering, LLC

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Professor, Department of Civil Engineering, University of Colorado at Denver

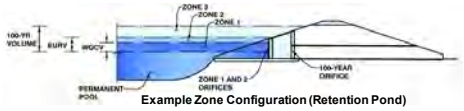
Comments? Direct all comments regarding this spreadsheet workbook to: **MHFD E-Mail**
Revisions? Check for revised versions of this or any other workbook at: **Downloads**

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: **Grandview - Filing 2**

Basin ID: **Basin B**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	28.83	acres
Watershed Length =	1,700	ft
Watershed Length to Centroid =	850	ft
Watershed Slope =	0.020	ft/ft
Watershed Imperviousness =	61.90%	percent
Percentage Hydrologic Soil Group A =	100.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.583	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	2.184	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	1.618	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	2.128	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	2.537	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	3.086	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	3.627	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	4.289	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	5.737	acre-feet		inches
Approximate 2-yr Detention Volume =	1.418	acre-feet		
Approximate 5-yr Detention Volume =	1.856	acre-feet		
Approximate 10-yr Detention Volume =	2.243	acre-feet		
Approximate 25-yr Detention Volume =	2.707	acre-feet		
Approximate 50-yr Detention Volume =	2.989	acre-feet		
Approximate 100-yr Detention Volume =	3.292	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.583	acre-feet
Zone 2 Volume (EURV - Zone 1) =	1.601	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	1.107	acre-feet
Total Detention Basin Volume =	3.292	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

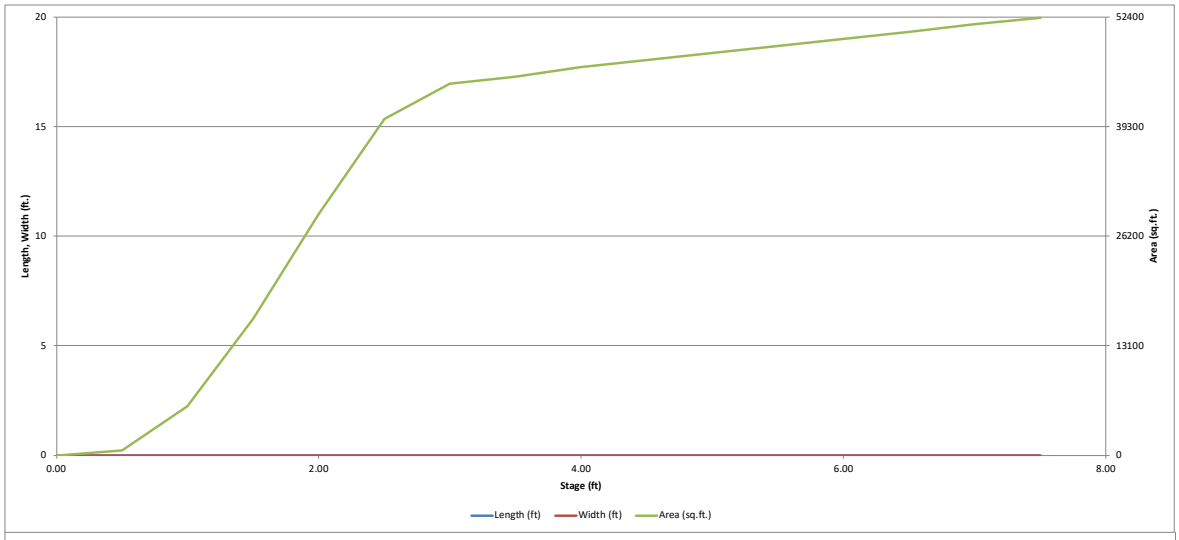
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

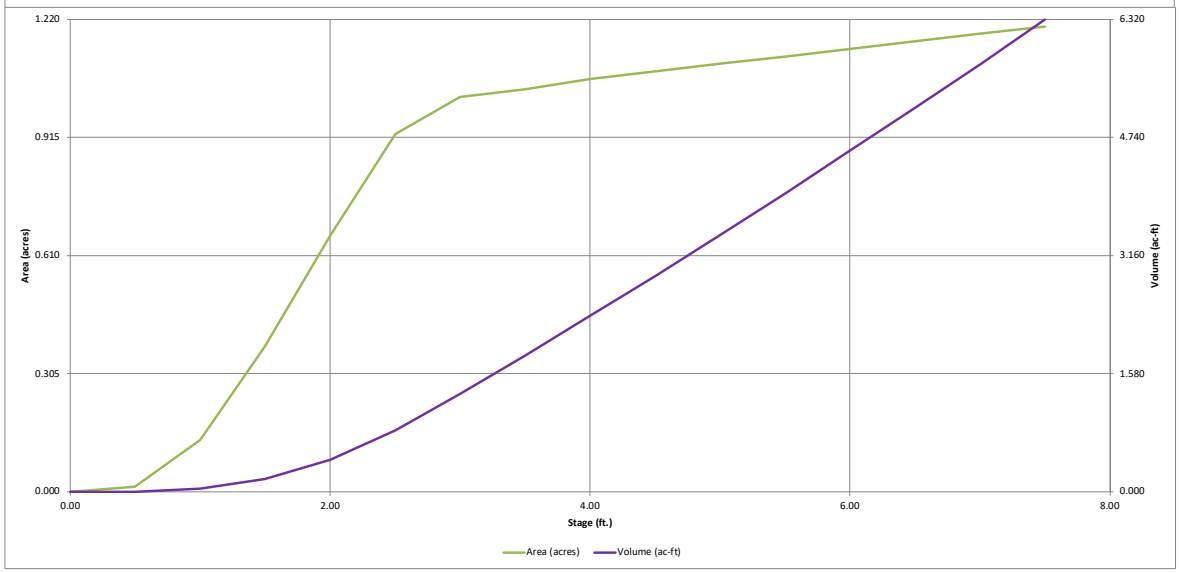
Depth Increment = 0.50 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
6962.5 **Top of Micropool**	--	0.00	--	--	--	0	0.000		
6963	--	0.50	--	--	--	544	0.012	136	0.003
6963.5	--	1.00	--	--	--	5,847	0.134	1,734	0.040
6964	--	1.50	--	--	--	16,307	0.374	7,272	0.167
6964.5	--	2.00	--	--	--	28,817	0.662	18,553	0.426
6965	--	2.50	--	--	--	40,205	0.923	35,808	0.822
6965.5	--	3.00	--	--	--	44,431	1.020	56,967	1.308
6966	--	3.50	--	--	--	45,303	1.040	79,401	1.823
6966.5	--	4.00	--	--	--	46,440	1.066	102,337	2.349
6967	--	4.50	--	--	--	47,282	1.085	125,767	2.887
6967.5	--	5.00	--	--	--	48,125	1.105	149,619	3.435
6968	--	5.50	--	--	--	48,969	1.124	173,892	3.992
6968.5	--	6.00	--	--	--	49,816	1.144	198,589	4.559
6969	--	6.50	--	--	--	50,666	1.163	223,709	5.136
6969.5	--	7.00	--	--	--	51,522	1.183	249,256	5.722
6970	--	7.50	--	--	--	52,387	1.203	275,233	6.318

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)



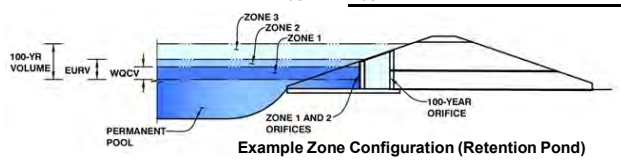


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: Grandview - Filing 2

Basin ID: Basin B



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.22	0.583	Orifice Plate
Zone 2 (EURV)	3.85	1.601	Rectangular Orifice
Zone 3 (100-year)	4.88	1.107	Weir&Pipe (Restrict)
Total (all zones)		3.292	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft²
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft²
Depth at top of Zone using Orifice Plate =	2.18	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	sq. inches	Elliptical Slot Area =	N/A	ft²

Calculated Parameters for Plate

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.73	1.50					
Orifice Area (sq. inches)	2.11	2.11	2.11					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Rectangular	Not Selected			Calculated Parameters for Vertical Orif	
					Zone 2 Rectangular	Not Selected
Invert of Vertical Orifice =	2.22	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	0.08	N/A
Depth at top of Zone using Vertical Orifice =	3.85	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	0.08	N/A
Vertical Orifice Height =	2.00	N/A	inches			
Vertical Orifice Width =	5.46		inches			

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 3 Weir	Not Selected			Calculated Parameters for Overflow W	
					Zone 3 Weir	Not Selected
Overflow Weir Front Edge Height, Ho =	3.83	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	3.83	N/A
Overflow Weir Front Edge Length =	4.00	N/A	feet	Overflow Weir Slope Length =	4.00	N/A
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	7.60	N/A
Horiz. Length of Weir Sides =	4.00	N/A	feet	Overflow Grate Open Area w/o Debris =	11.14	N/A
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	5.57	N/A
Debris Clogging % =	50%	N/A	%			

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Restrictor	Not Selected			Calculated Parameters for Outlet Pipe w/ Flow Restriction Pla	
					Zone 3 Restrictor	Not Selected
Depth to Invert of Outlet Pipe =	0.25	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	1.46	N/A
Outlet Pipe Diameter =	18.00	N/A	inches	Outlet Orifice Centroid =	0.64	N/A
Restrictor Plate Height Above Pipe Invert =	13.90		inches	Half-Central Angle of Restrictor Plate on Pipe =	2.15	N/A

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	4.80	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.67	feet
Spillway Crest Length =	38.00	feet	Stage at Top of Freeboard =	6.47	feet
Spillway End Slopes =	10.00	H:V	Basin Area at Top of Freeboard =	1.16	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	5.10	acre-ft

Calculated Parameters for Spillway

Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AI

Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52
CUHP Runoff Volume (acre-ft) =	0.583	2.184	1.618	2.128	2.537	3.086	3.627	4.289
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	1.618	2.128	2.537	3.086	3.627	4.289
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.2	0.4	0.5	4.9	9.8	16.1
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A						
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.01	0.02	0.17	0.34	0.56
Peak Inflow Q (cfs) =	N/A	N/A	24.9	32.7	38.5	49.7	59.6	72.1
Peak Outflow Q (cfs) =	0.3	0.9	0.7	0.8	2.5	6.6	12.0	14.7
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	2.0	4.7	1.3	1.2	0.9
Structure Controlling Flow =	Vertical Orifice 1	Overflow Weir 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1
Max Velocity through Grate 1 (fps) =	N/A	0.01	N/A	N/A	0.1	0.5	1.0	1.2
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	67	61	67	70	69	67	66
Time to Drain 99% of Inflow Volume (hours) =	**40**	72	65	72	75	75	75	74
Maximum Ponding Depth (ft) =	2.22	3.85	3.20	3.67	3.99	4.19	4.40	4.76
Area at Maximum Ponding Depth (acres) =	0.78	1.06	1.03	1.05	1.07	1.07	1.08	1.10
Maximum Volume Stored (acre-ft) =	0.584	2.190	1.513	2.000	2.339	2.553	2.768	3.171

ice

ft^2
feet

eir

feet
feet

ft^2
ft^2

ate

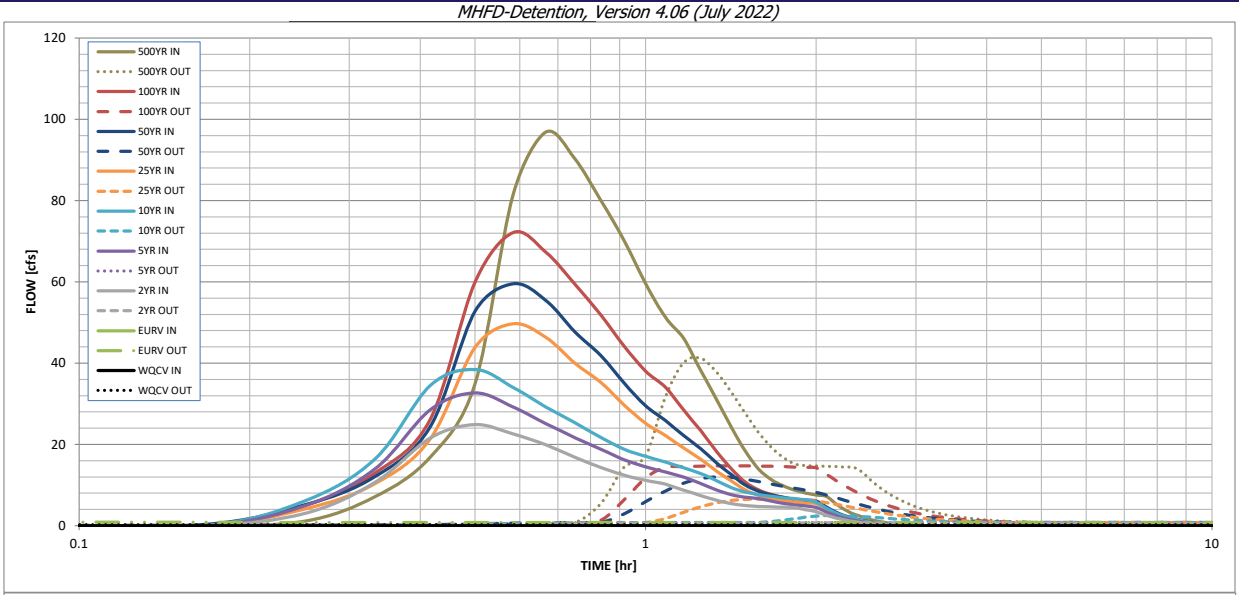
ft^2
feet
radians

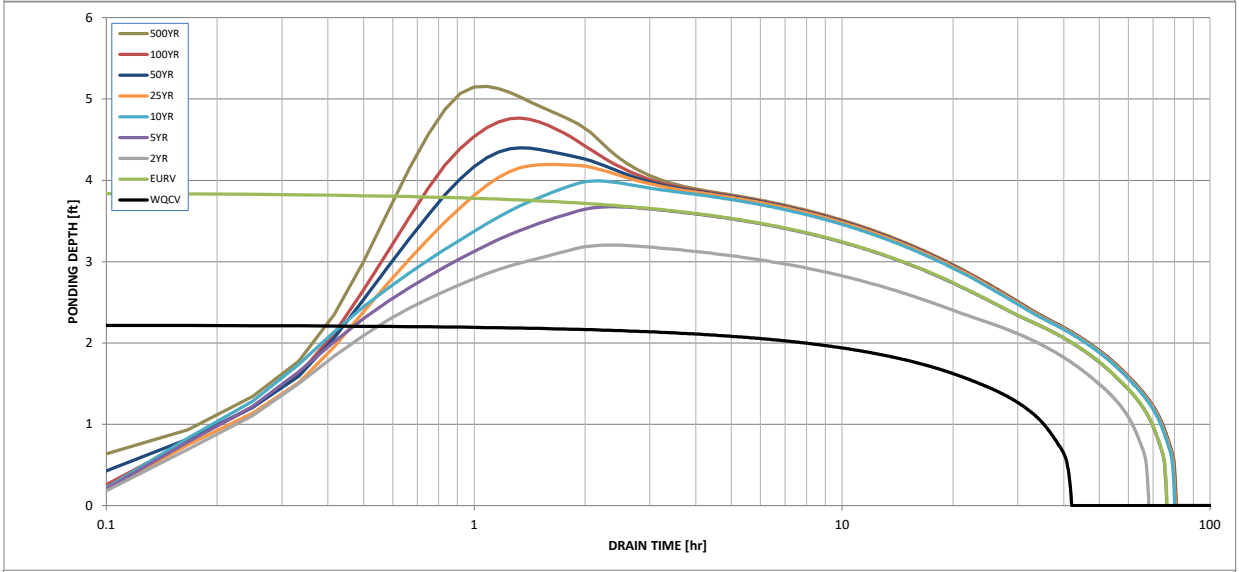
5).

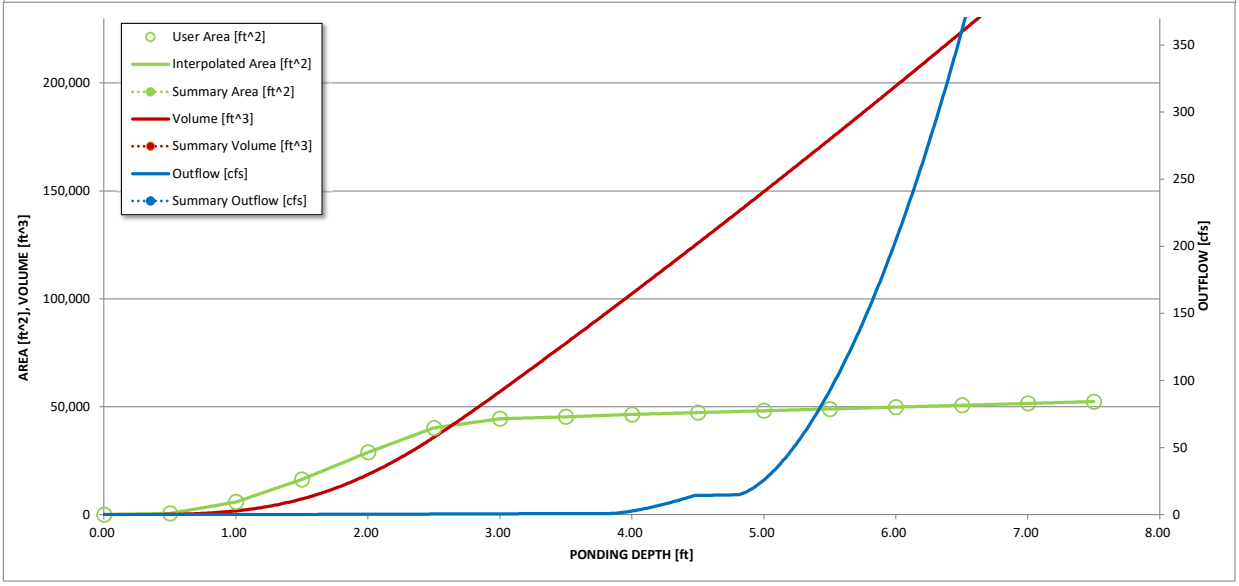
500 Year
3.14
5.737
5.737
29.2
1.01
96.8
41.2
1.4
Spillway
1.3
N/A
62
73
5.15
1.11
3.601

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)







S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.34	0.03	1.09
	0:15:00	0.00	0.00	3.00	4.87	6.04	4.06	5.08	4.96	7.13
	0:20:00	0.00	0.00	10.67	13.98	16.45	10.38	12.09	12.97	16.87
	0:25:00	0.00	0.00	21.56	28.51	34.45	21.33	24.33	26.17	34.87
	0:30:00	0.00	0.00	24.85	32.66	38.46	43.83	52.74	59.96	81.45
	0:35:00	0.00	0.00	22.59	29.18	34.04	49.69	59.55	72.15	96.83
	0:40:00	0.00	0.00	19.88	25.15	29.24	46.35	55.47	67.35	90.29
	0:45:00	0.00	0.00	16.87	21.67	25.35	40.00	47.70	59.47	80.09
	0:50:00	0.00	0.00	14.33	18.83	21.71	35.26	41.88	51.87	70.16
	0:55:00	0.00	0.00	12.41	16.24	18.84	29.72	35.08	44.19	59.60
	1:00:00	0.00	0.00	11.16	14.51	17.05	25.19	29.53	38.05	51.31
	1:05:00	0.00	0.00	10.19	13.20	15.63	22.18	25.89	34.10	46.13
	1:10:00	0.00	0.00	8.78	11.95	14.24	19.14	22.24	28.50	38.29
	1:15:00	0.00	0.00	7.43	10.39	12.85	16.40	18.96	23.43	31.20
	1:20:00	0.00	0.00	6.26	8.81	11.11	13.49	15.51	18.34	24.25
	1:25:00	0.00	0.00	5.42	7.64	9.33	11.01	12.56	14.01	18.36
	1:30:00	0.00	0.00	4.97	7.03	8.29	8.81	9.97	10.71	13.91
	1:35:00	0.00	0.00	4.74	6.71	7.66	7.50	8.47	8.79	11.34
	1:40:00	0.00	0.00	4.61	6.05	7.21	6.71	7.55	7.67	9.81
	1:45:00	0.00	0.00	4.53	5.52	6.88	6.19	6.96	6.91	8.76
	1:50:00	0.00	0.00	4.47	5.14	6.65	5.83	6.56	6.40	8.06
	1:55:00	0.00	0.00	3.92	4.85	6.34	5.59	6.29	6.03	7.55
	2:00:00	0.00	0.00	3.44	4.50	5.77	5.42	6.09	5.77	7.20
	2:05:00	0.00	0.00	2.60	3.40	4.35	4.11	4.62	4.34	5.41
	2:10:00	0.00	0.00	1.92	2.48	3.16	2.98	3.35	3.15	3.92
	2:15:00	0.00	0.00	1.40	1.81	2.30	2.17	2.44	2.31	2.87
	2:20:00	0.00	0.00	1.02	1.31	1.67	1.58	1.77	1.69	2.10
	2:25:00	0.00	0.00	0.72	0.92	1.19	1.12	1.26	1.20	1.49
	2:30:00	0.00	0.00	0.50	0.63	0.83	0.79	0.88	0.85	1.05
	2:35:00	0.00	0.00	0.34	0.44	0.58	0.56	0.62	0.60	0.74
	2:40:00	0.00	0.00	0.21	0.29	0.37	0.37	0.41	0.39	0.48
	2:45:00	0.00	0.00	0.11	0.17	0.21	0.22	0.24	0.23	0.28
	2:50:00	0.00	0.00	0.05	0.08	0.10	0.10	0.11	0.11	0.13
	2:55:00	0.00	0.00	0.02	0.02	0.03	0.03	0.03	0.03	0.04
	3:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

MILE HIGH FLOOD DISTRICT

DETENTION BASIN DESIGN WORKBOOK

MHFD-Detention, Version 4.06 (July 2022)
Mile High Flood District
Denver, Colorado
www.mhfd.org

Purpose:

This workbook aids in the estimation of stormwater detention basin sizing and outlet routing based on the modified puls routing method for urban watersheds. Several different BMP types and various outlet configurations can be sized.

Function:

1. Approximates the stage-area-volume relationship for a detention basin based on watershed parameters and basin geometry parameters. Also evaluates existing user-defined basin stage-area relationships.

2. Sizes filtration media orifice, outlet orifices, elliptical slots, weirs, trash racks, and develops stage-discharge relationships. Uses the Modified Puls method to route a series of hydrographs (i.e., 2-, 5-, 10-, 25-, 50-, 100- and 500-year) and calibrates the peak discharge out of the basin to match the pre-development peak discharges for the watershed.

Content: **This workbook consists of the following sheets:**

Basin	Tabulates stage-area-volume relationship estimates based on watershed parameters
Outlet Structure	Tabulates a stage-discharge relationship for the user-defined outlet structure (inlet control).
Reference	Provides reference equations and figures.
User Tips and Tools	Provides instructions and video links to assist in using this workbook. Includes a stage-area calculator.
BMP Zone Images	Provides images of typical BMP zone confirgurations corresponding with Zone pulldown selections.

Acknowledgements: ***Spreadsheet Development Team:***
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Peak Stormwater Engineering, LLC

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Professor, Department of Civil Engineering, University of Colorado at Denver

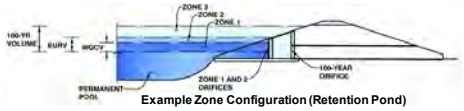
Comments? Direct all comments regarding this spreadsheet workbook to: **MHFD E-Mail**
Revisions? Check for revised versions of this or any other workbook at: **Downloads**

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: Grandview

Basin ID: Basin C



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	43.52	acres
Watershed Length =	1,890	ft
Watershed Length to Centroid =	1,050	ft
Watershed Slope =	0.020	ft/ft
Watershed Imperviousness =	61.20%	percent
Percentage Hydrologic Soil Group A =	100.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.871	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	3.250	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	2.420	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	3.184	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	3.797	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	4.625	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	5.440	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	6.440	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.68 in.) =	10.618	acre-feet	3.68	inches
Approximate 2-yr Detention Volume =	2.109	acre-feet		
Approximate 5-yr Detention Volume =	2.761	acre-feet		
Approximate 10-yr Detention Volume =	3.338	acre-feet		
Approximate 25-yr Detention Volume =	4.031	acre-feet		
Approximate 50-yr Detention Volume =	4.454	acre-feet		
Approximate 100-yr Detention Volume =	4.910	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.871	acre-feet
Zone 2 Volume (EURV - Zone 1) =	2.379	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	1.661	acre-feet
Total Detention Basin Volume =	4.910	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

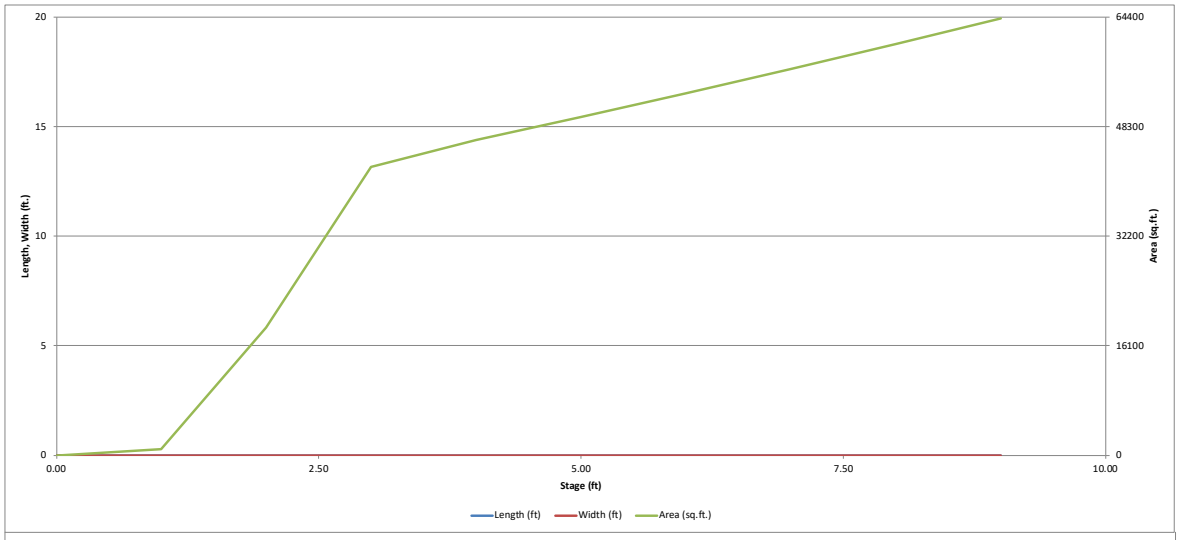
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

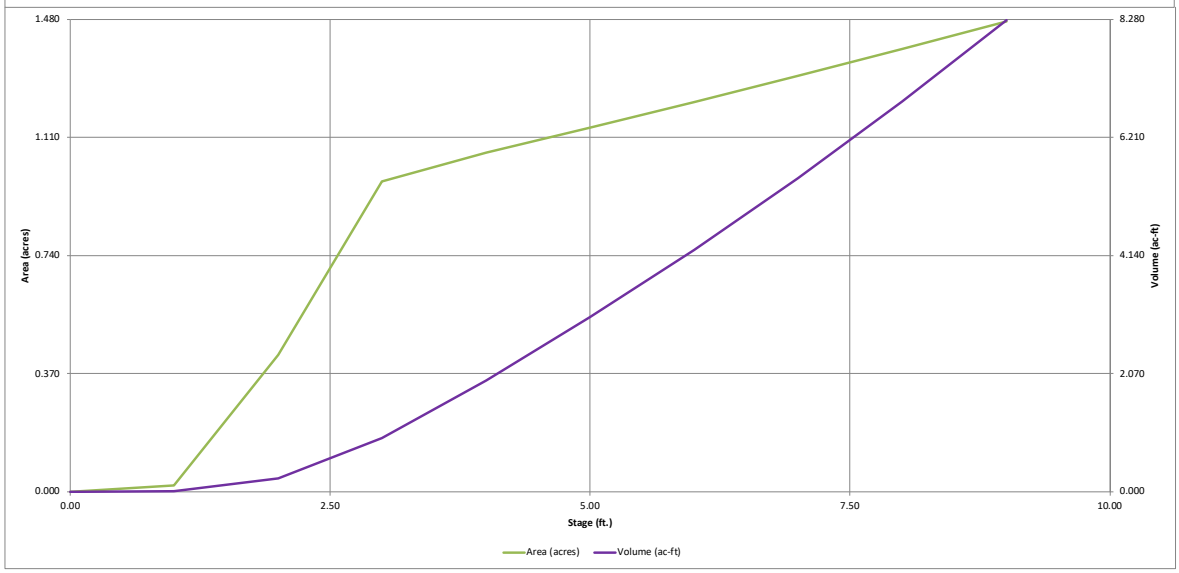
Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
6925 **Top of Micropool**	--	0.00	--	--	--	0	0.000		
	--	1.00	--	--	--	885	0.020	442	0.010
	--	2.00	--	--	--	18,707	0.429	10,238	0.235
	--	3.00	--	--	--	42,382	0.973	40,783	0.936
	--	4.00	--	--	--	46,291	1.063	85,119	1.954
	--	5.00	--	--	--	49,702	1.141	133,116	3.056
	--	6.00	--	--	--	53,188	1.221	184,561	4.237
	--	7.00	--	--	--	56,755	1.303	239,532	5.499
	--	8.00	--	--	--	60,439	1.387	298,129	6.844
	--	9.00	--	--	--	64,244	1.475	360,471	8.275

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)



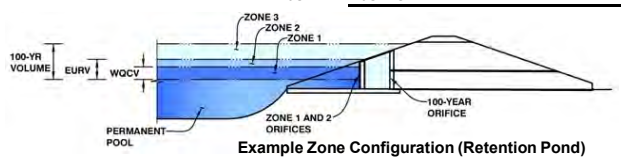


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: **Grandview**

Basin ID: **Basin C**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.94	0.871	Orifice Plate
Zone 2 (EURV)	5.17	2.379	Rectangular Orifice
Zone 3 (100-year)	6.55	1.661	Weir&Pipe (Restrict)
Total (all zones)		4.910	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	1.840E-02	ft^2
Depth at top of Zone using Orifice Plate =	2.94	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	11.80	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	2.65	sq. inches (diameter = 1-13/16 inches)	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.98	1.96					
Orifice Area (sq. inches)	2.65	2.65	2.65					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Rectangular	Not Selected			Zone 2 Rectangular	Not Selected
Invert of Vertical Orifice =	2.94	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	0.10	N/A
Depth at top of Zone using Vertical Orifice =	5.19	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	0.08	N/A
Vertical Orifice Height =	2.00	N/A	inches			
Vertical Orifice Width =	7.19		inches			

Calculated Parameters for Vertical Orif

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected
Overflow Weir Front Edge Height, Ho =	5.19	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	5.19	N/A
Overflow Weir Front Edge Length =	4.00	N/A	feet	Overflow Weir Slope Length =	4.00	N/A
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	5.85	N/A
Horiz. Length of Weir Sides =	4.00	N/A	feet	Overflow Grate Open Area w/o Debris =	11.14	N/A
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	5.57	N/A
Debris Clogging % =	50%	N/A	%			

Calculated Parameters for Overflow W

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected
Depth to Invert of Outlet Pipe =	0.25	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	1.90	N/A
Outlet Pipe Diameter =	24.00	N/A	inches	Outlet Orifice Centroid =	0.66	N/A
Restrictor Plate Height Above Pipe Invert =	14.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.74	N/A

Calculated Parameters for Outlet Pipe w/ Flow Restriction Pla

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	6.50	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.94	feet
Spillway Crest Length =	37.00	feet	Stage at Top of Freeboard =	8.44	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	1.43	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	7.46	acre-ft

Calculated Parameters for Spillway

Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AI

Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52
CUHP Runoff Volume (acre-ft) =	0.871	3.250	2.420	3.184	3.797	4.625	5.440	6.440
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	2.420	3.184	3.797	4.625	5.440	6.440
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.3	0.6	0.8	7.7	15.3	25.1
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A						
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.01	0.02	0.18	0.35	0.58
Peak Inflow Q (cfs) =	N/A	N/A	38.0	50.0	59.0	76.3	91.6	111.0
Peak Outflow Q (cfs) =	0.4	1.2	1.0	1.2	3.6	9.8	18.2	22.5
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	2.0	4.3	1.3	1.2	0.9
Structure Controlling Flow =	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.2	0.8	1.5	1.9
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	67	61	68	70	69	68	66
Time to Drain 99% of Inflow Volume (hours) =	**40**	72	65	72	76	75	75	74
Maximum Ponding Depth (ft) =	2.94	5.17	4.29	4.95	5.39	5.67	5.94	6.42
Area at Maximum Ponding Depth (acres) =	0.94	1.15	1.09	1.14	1.17	1.19	1.22	1.26
Maximum Volume Stored (acre-ft) =	0.879	3.251	2.266	2.988	3.507	3.826	4.164	4.757

ice

ft^2
feet

eir

feet
feet

ft^2
ft^2

ate

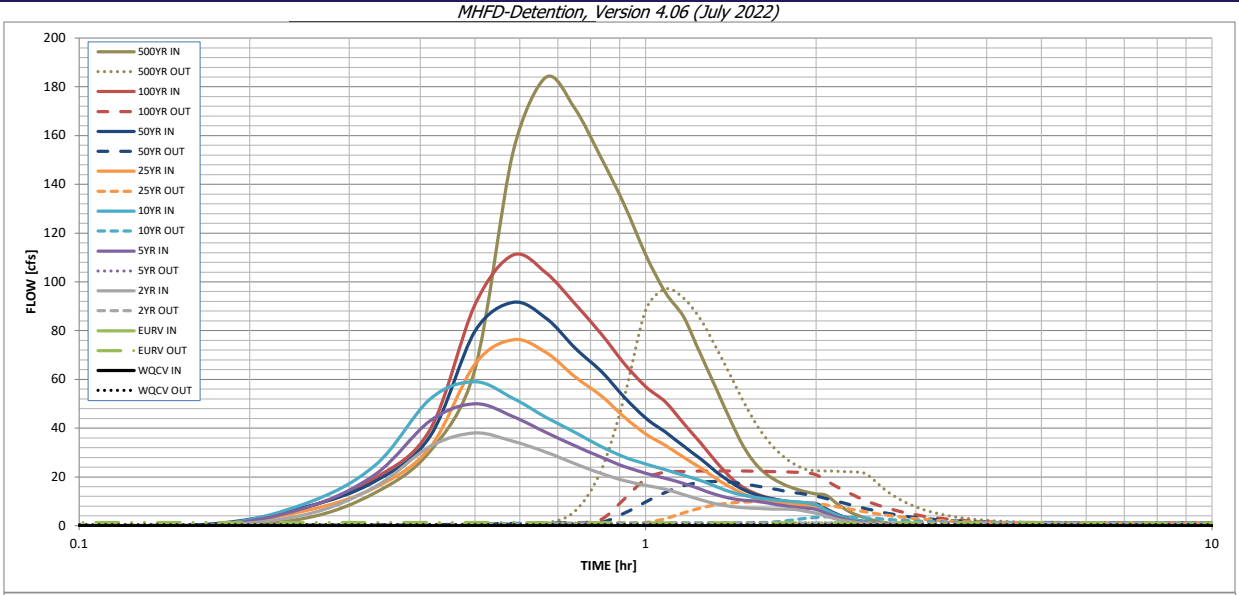
ft^2
feet
radians

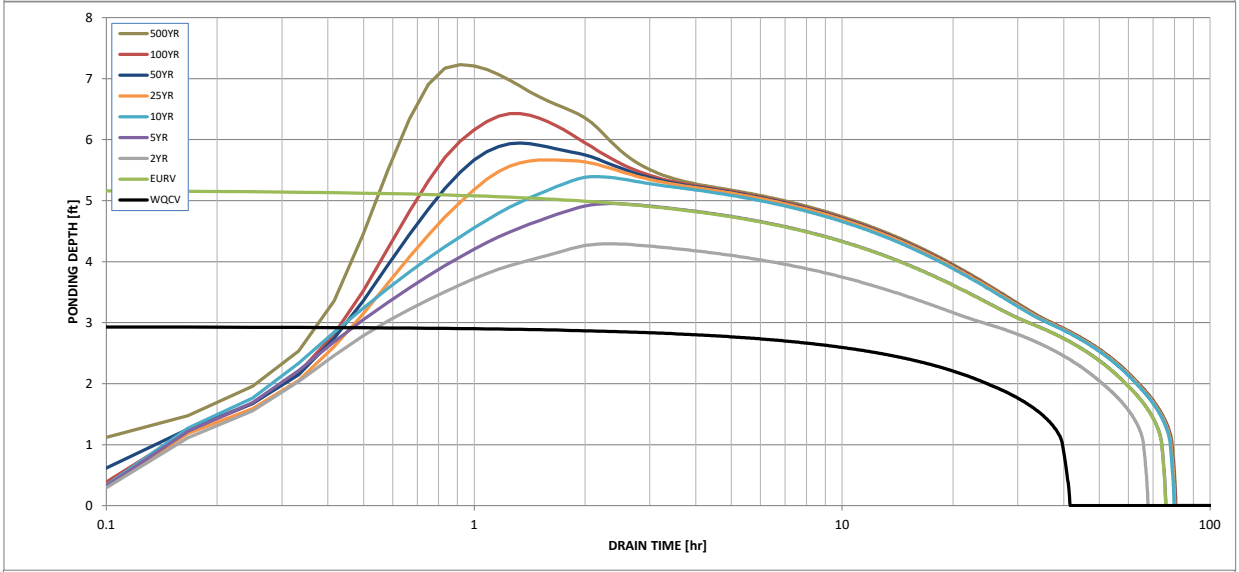
5).

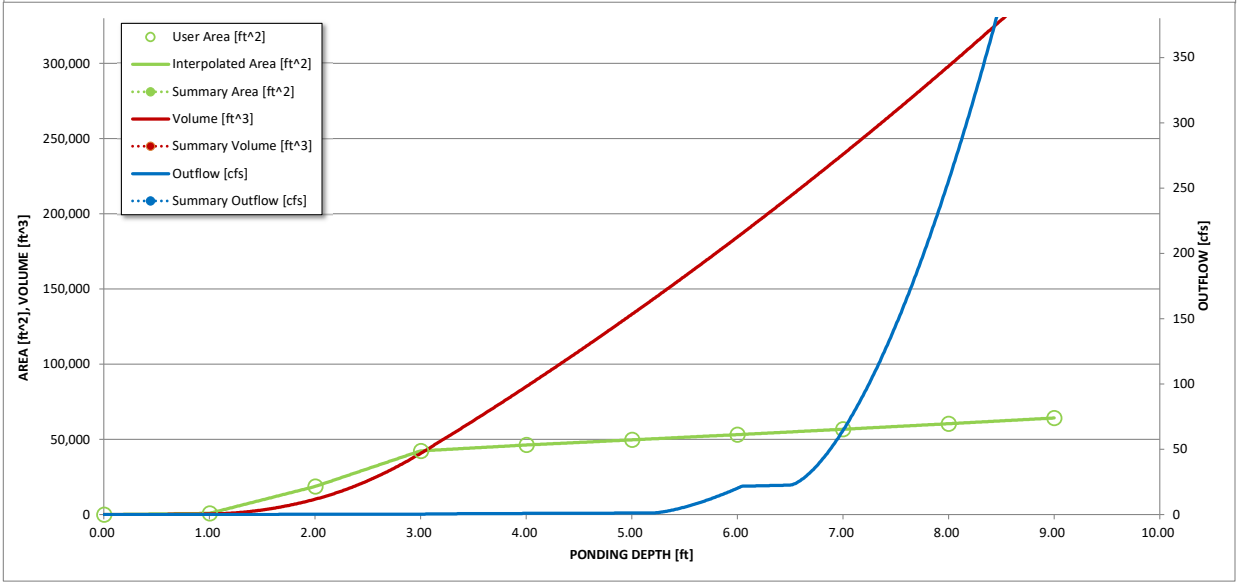
500 Year
3.68
10.618
10.618
65.3
1.50
183.8
97.0
1.5
Spillway
2.0
N/A
60
72
7.23
1.32
5.788

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)







S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.05	2.99
	0:15:00	0.00	0.00	4.43	7.20	8.94	6.01	7.53	7.34	13.50
	0:20:00	0.00	0.00	15.99	21.02	24.75	15.65	18.24	19.54	30.61
	0:25:00	0.00	0.00	32.57	43.04	52.02	32.20	36.74	39.50	64.21
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	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

APPENDIX F
EASTONVILLE PDR

HRGreen

HRGREEN.COM

Eastonville Road – Londonderry Dr. to Rex Rd.
Preliminary Drainage Report

September 2023

HR Green Project No: 201662.08

Prepared For:

D.R. Horton

Contact: Riley Hillen, P.E.

9555 S. Kingston Ct.

Englewood, CO 80112

Prepared By:

HR Green Development, LLC

Contact: Colleen Monahan, P.E., LEED AP

cmonahan@hrgreen.com

(719) 394-2433

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 applicable 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.

_____

Colleen Monahan, P.E., LEED AP Date

State of Colorado No. 56067

For and on behalf of HR Green Development, LLC

Owner/Developer's Statement:

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

By: _____ _____

Authorized Signature Date

Address: D.R. Horton

9555 S. Kingston Court

Englewood, CO

El Paso County Statement

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

_____

Joshua Palmer, P.E. Date

County Engineer/ECM Administrator

Conditions:

Table of Contents

Appendices

I. General Purpose, Location and Description

a. Purpose

The purpose of this Preliminary Drainage Report (PDR) for Eastonville Road is to describe the onsite and offsite drainage patterns, size drainage infrastructure to safely capture and convey developed runoff to water quality and detention facilities, and to safely route detained stormwater to adequate outfalls. This drainage report will detail the improvements of Eastonville Road from Londonderry Drive to Rex Road.

b. Location

Eastonville Road from Londonderry Drive to Rex Road, referred to as 'the site' herein, is an existing road in El Paso County, Colorado. The site lies within a tract of land within Sections 21 and 28, Township 12 South, Range 64 West of the 6th Principal Meridian, in El Paso County, State of Colorado.

The site is bound by undeveloped land to the east and west that has historically been used as ranching lands. Falcon Regional Park, which contains ballparks and parking, and Falcon High School also border the site to the west. All lands to the east and west of the site are unplatted. A vicinity map is presented in Appendix A.

c. Description of Property

The site is approximately 1.3 miles (15.8 acres) of existing temporary pavement roadway north of Londonderry Drive and south of Rex Road. The temporary pavement width for the length of the project is 26' wide. 4' wide sand shoulders and weedy swales are located on both sides of the roadway. Offsite stormwater is bypassed under the road through a series of existing culverts. See Appendix A for existing condition photo.

The existing roadway has slopes ranging from 0.3% up to about 4%. The general topography of the surrounding area is typical of high desert, short prairie grass with gently rolling hillside with slopes ranging from 2% to 4%. The project site drains generally from the west to the east and is tributary to Black Squirrel Creek.

Per a NRCS soil survey, the site is made up of Type A Columbine gravelly sandy loam, Type A Blakeland loamy sand and Type B Stapleton sandy loam. The NRCS soil survey is presented in Appendix A.

Gieck Ranch Tributary #1 (Channel A) is the only drainageway that traverses the site in the west to east direction through an existing culvert under Eastonville Road. The channel is a mapped wetland and a wetland permit will be required for a part of this Eastonville Road improvement project. Channel A is not within a FEMA floodplain.

Gieck Ranch Tributary #2 is located north of the project site and will not be impacted by this project. There are no known irrigation facilities in the area.

Existing utilities include an underground gas line that runs along the east and western sides of Eastonville, an existing raw water line that follows the west side of Eastonville north of Falcon Regional Park, and an existing aboveground electrical line along the western side of Eastonville Road. An existing drainage map with these facilities is presented in Appendix F.

d. Floodplain Statement

Based on FEMA Firm map 08041C0552G December 7, 2018, the site is not located in any FEMA designated floodplain. See FEMA Firm Map in Appendix A. There is a Zone A floodplain north of the site and a Zone AE south of the site, both of which will not be altered with the associated Eastonville Road improvements.

II. Drainage Design Criteria

a. Drainage Criteria

Hydrologic data and calculations were performed using Drainage Criteria Manual Volume 1 of El Paso County (EPCDCM), with County adopted Chapter 6 and Section 3.2.1 of Chapter 13 of the City of Colorado Springs Drainage Criteria Manual (CCSDCM), May 2014 revised January 2021.

Onsite drainage improvements are designed for the 5-year storm (minor event) and 100-year storm (major event) using rainfall values from CCSDCM Table 6-2 below. Runoff was calculated per CCSDCM Section 6.3.0 - Rational Method. Private, full spectrum pond design was completed using the latest version of Mile High Flood District's (MHFD) UD-Detention per CCSDCM Section 13.3.2.1 – Private, full spectrum Detention. Detention pond allowable release rate will be limited to less than historic rates.

Table 6-2: Rainfall Depths for Colorado Springs		
Return Period (yr)	5	100
1-hr Rainfall Depth (in)	1.50	2.52

Inlet sizing was performed per the methods described in EPCDCM Section III Chapter 7 – Street Drainage and Storm Water Inlets. Storm sewer sizing was performed per the methods described in EPCDCM Section III Chapter 8 – Storm Drains and Appurtenances.

III. Drainage Basins and Subbasins

a. Major Basin Description

The site is located within the Gieck Ranch Drainage Basin. The site's drainage characteristics were previously studied in the following reports:

1. "Gieck Ranch Drainage Basin Planning Study" prepared by Drexel, Barrel & Co, February 2010.
2. "Master Development Drainage Plan Meridian Ranch" prepared by Tech Contractors, July 2021.
3. "Final Drainage Report for The Sanctuary Filing 1 at Meridian Ranch" by Tech Contractors, August 2022.

Gieck Ranch Drainage Basin is a 22.05 square mile watershed located in El Paso County, Colorado. Gieck Ranch Drainage Basin is tributary to Black Squirrel Creek which drains to the Arkansas River. The majority of the basin is undeveloped and is rolling range land typical of Colorado's semi-arid climates. It should be noted that the Gieck Ranch DBPS has not been approved at the time of this report.

The Meridian Ranch MDDP and The Final Drainage Report for The Sanctuary Filing 1 at Meridian Ranch indicate that the Eastonville Road culvert crossing at the Gieck Ranch Tributary #1, within the project boundary, does not provide enough capacity for the historic flow rates. This culvert will be upgraded as part of this project.

Within the Gieck Ranch Drainage Basin, ranching has historically dominated the area, with rolling topography between 2%-4% slopes. However, more recently urbanization is occurring, most notably for this project are Meridian Ranch and Latigo Trails Developments. Both are single family residential neighborhoods located upstream to the west and northwest of the Eastonville project site.

b. Existing Subbasin Description

Eastonville Road from Londonderry Drive to Rex Road (the site) accepts flows from areas to the west and northwest of the site, including portions of Meridian Ranch and Latigo Development. The flows and design points used in the following descriptions are taken from the approved Meridian Ranch MDDP and The Final Drainage Report for The Sanctuary Filing 1 at Meridian Ranch which provide the detailed analysis of the pond releases and flows as they outfall from those developments upstream of this Eastonville Road site. For the purpose of this report, full buildout of the Meridian Ranch development was assumed; hence the developed peak flow rates from the “future buildout conditions” for the entirety of Meridian Ranch were used to evaluate the existing conditions below.

Basin EX1 (The Sanctuary Filing 1 FG-38) is 85.16 acres of undeveloped area and temporary pavement area to the crown of Eastonville Road roadway. Stormwater from this basin combines with flows from Latigo Trails South Pond (The Sanctuary Filing 1 G-17) is conveyed overland to DP1 for a total area of 321.5 acres (The Sanctuary Filing 1 G18). Flows at DP1 (Q_5 = 28.3 cfs Q_{100} = 365.2 cfs) are conveyed across Eastonville Road in an existing 24" CMP culvert and discharges to Gieck Ranch Tributary #2 (Channel B). This basin is located upstream of the Eastonville project and is presented here to show where flows go that are upstream of the project site. The Eastonville project will have no impact on this basin.

Basin EX2 (The Sanctuary Filing 1 FG36) is 18.88 acres undeveloped area, parking lot, and temporary pavement to the crown of Eastonville Road roadway. Stormwater from this basin is conveyed overland to DP2 (The Sanctuary Filing 1 FG36). Flows at DP2 (Q_5 = 1.7 cfs Q_{100} = 18.8 cfs) are conveyed southerly across Rex Road in an existing 24" RCP culvert and discharges to Basin EX3.

Basin EX3 is 51.06 acres of undeveloped area and the Falcon Regional Park ball fields and temporary pavement to the crown of Eastonville Road roadway. Stormwater from this basin combines with flows from The Sanctuary Filing 1 Design Point G15 via an existing roadside swale where it then combines with DP2 flows. Flows travel to DP3 for a total area of 131.3 acres (The Sanctuary Filing 1 Design Point G16) where they are conveyed across Eastonville Road in an existing 24" CMP culvert (Q_5 = 6.1 cfs Q_{100} = 112.1 cfs).

Basin EX4 is 62.87 acres of undeveloped area and temporary pavement to the crown of Eastonville Road roadway. Stormwater from this basin combines with flows from The Sanctuary Filing 1 Design Point G12 (Meridian Ranch Pond G) to Gieck Ranch Tributary #1 and an existing roadside swale to DP 4 for a total area of 832.7 acres (The Sanctuary Filing 1 Design Point G06) (Q_5 = 22.4 cfs Q_{100} = 491 cfs). Flows at DP4 are conveyed across Eastonville Road in an existing 18" CMP culvert and discharges to Gieck Ranch Tributary #1 (Channel A).

Basin EX5 is 22.35 acres of undeveloped area and temporary pavement to the crown of Eastonville Road roadway. Stormwater from this basin (Q_5 = 7.0 cfs Q_{100} = 43.3 cfs) is conveyed in an existing roadside swale to DP5. Flows at DP5 are conveyed across Eastonville Road in an existing 18" CMP culvert.

Basin EX6 is 3.05 acres of undeveloped area and temporary pavement. to the crown of Eastonville Road roadway Stormwater from this basin (Q_5 = 1.2 cfs Q_{100} = 6.9 cfs) is conveyed in an existing roadside swale to DP6. Flows at DP6 are conveyed across Eastonville Road in an existing 18” CMP culvert.

Basin EX7 is 1.47 acres of undeveloped area and temporary pavement to the crown of Eastonville Road roadway. Stormwater from this basin (Q_5 = 0.9 cfs Q_{100} = 4.2 cfs) is conveyed in an existing roadside swale to DP7. Flows at DP7 are conveyed across Eastonville Road in an 18” CMP culvert.

Basin EX8 is 13.13 acres of undeveloped area and temporary pavement to the crown of Eastonville Road roadway. Stormwater from this basin (Q_5 = 3.8 cfs Q_{100} = 22.6 cfs) is conveyed in an existing roadside swale to DP8. Flows at DP8 are conveyed across Eastonville Road in an existing an existing 24” CMP culvert.

Basin EX9 is 1.59 acres of undeveloped area and temporary pavement to the crown of Eastonville Road roadway. Stormwater from this basin (Q_5 = 0.9 cfs Q_{100} = 3.7 cfs) is conveyed in an existing roadside swale to DP9. Flows at DP9 are conveyed across Eastonville Road in an existing an existing 36" CMP culvert.

c. Proposed Subbasin Description

Description of Proposed Project

The proposed project includes improvements to Eastonville Road from Londonderry Drive to Rex Road. As described above, the current condition of the existing roadway in this area consists of 26’ wide temporary pavement roadway with 4’ wide sand shoulders and weedy swales located on both sides of the roadway. Offsite stormwater is bypassed under the road through a series of existing culverts.

The proposed improvements from Rex Road south to the southern property line of the proposed Grandview Reserve Filing 1 include removal of the 26’ wide temporary pavement and replacing the road with a Modified Urban Minor Arterial Roadway Cross-Section consisting of 48’ pavement and Type A EPC curb (53’ back of curb to back of curb). This includes Basins EA1-EA12.

The proposed improvements from southern property line of the proposed Grandview Reserve south to Londonderry Drive include resurfacing the existing temporary pavement by providing full-depth pavement to replace the temporary pavement along this length of roadway. This is anticipated to be an interim condition until the completion of the full roadway section by others. The proposed interim roadway will be consistent with the Modified Rural Major Collector Roadway Cross-Section, with two 12’ wide lanes and 4’ shoulders, with existing roadside swales on both sides. The total width of the roadway is 32’ including both shoulders, which adds 6’ of pavement to the existing 26’ temporary pavement roadway. Per ECM Appendix I.7.1.B.2.2, this area of the project is excluded from the requirements of Section 1.7 since the site does not add more than 8.25’ of paved width at any location of the existing roadway. This includes Basins EA13-EA15.

Eastonville Road Basins

Basin EA1 is 0.22 acres of proposed roadway (Modified Urban Minor Arterial Roadway Cross-Section). Stormwater (Q_5 = 0.7 cfs Q_{100} = 1.3 cfs) is conveyed in curb and gutter to DP2. Flows at DP2 are captured in a 5’ Type R sump inlet (Public) and piped to Pond A Sand Filter. Basin EA1 will be detained Pond A Sand Filter.

Basin EA2 is 0.25 acres of proposed roadway (Modified Urban Minor Arterial Roadway Cross-Section). Stormwater (Q_5 = 0.8 cfs Q_{100} = 1.5 cfs) is conveyed in curb and gutter to DP3. Flows at DP3 are captured in a 5' Type R sump inlet (Public) and piped to Pond A. Basin EA2 will be detained Pond A Sand Filter.

Basin EA3 is 0.20 acres of proposed roadway (Modified Urban Minor Arterial Roadway Cross-Section). Stormwater (Q_5 = 0.7 cfs Q_{100} = 1.4 cfs) is conveyed in curb and gutter to DP5. Flows at DP5 are captured in a 10' Type R sump inlet (Public) and piped to DP9.1. Basin EA3 will not be detained per the Meridian Ranch MDDP as this basin has been over-detained within Meridian Ranch.

Basin EA4 is 0.17 acres of proposed roadway (Modified Urban Minor Arterial Roadway Cross-Section). Stormwater (Q_5 = 0.5 cfs Q_{100} = 1.1 cfs) is conveyed in curb and gutter to DP6. Flows at DP6 are captured in a 5' Type R sump inlet (Public) and piped to DP9.1. Basin EA4 will not be detained per the Meridian Ranch MDDP as this basin has been over-detained within Meridian Ranch.

Basin EA5 is 0.16 acres of undeveloped area and includes Pond A Sand Filter. Stormwater (Q_5 = 0.1 cfs Q_{100} = 0.4 cfs) is flows directly into Pond A Sand Filter.

Basin EA6 is 0.70 acres of undeveloped area that will be future roadway (Rex Road) once the Grandview Filing 1 development is constructed. Stormwater (Q_5 = 3.1 cfs Q_{100} = 5.5 cfs) is conveyed in a swale to DP10: Temporary Sediment Basin #1 (TSB #1). TSB #1 has been sized for the paved area of the roundabout and the future paved area of Rex Road within Basin EA6. The swale will be removed with the construction of Rex Road curb and gutter. Basin EA6 will be detained in TSB #1.

Basin EA7 is 0.65 acres of undeveloped area that will be future roadway (Rex Road) once the Grandview Filing 1 development is constructed. Stormwater (Q_5 = 2.5 cfs Q_{100} = 4.7 cfs is conveyed in a swale to DP10: Temporary Sediment Basin #1 (TSB #1). TSB #1 has been sized for the paved area of the roundabout and the future paved area of Rex Road within Basin EA7. The swale will be removed with the construction of Rex Road curb and gutter. Basin EA7 will be detained in TSB #1.

Basin EA8 is 2.08 acres of proposed roadway (Modified Urban Minor Arterial Roadway Cross-Section). Stormwater (Q_5 = 5.0 cfs Q_{100} = 9.0 cfs) is conveyed in curb and gutter to DP14. Flows at DP14 are captured in a 10' Type R sump inlet (Public) and piped to Pond B. Basin EA8 will be detained Pond B Full Spectrum Detention Basin.

Basin EA9 is 2.99 acres of proposed roadway (Modified Urban Minor Arterial Roadway Cross-Section). Stormwater (Q_5 = 4.6 cfs Q_{100} = 9.5 cfs) is conveyed in curb and gutter to DP15. Flows at DP15 are captured in a 10' Type R sump inlet (Public) and piped to Pond B. Basin EA9 will be detained Pond B Full Spectrum Detention Basin.

Basin EA10 is 1.34 acres of proposed roadway (Modified Urban Minor Arterial Roadway Cross-Section). Stormwater (Q_5 = 4.0 cfs Q_{100} = 7.4 cfs) is conveyed in curb and gutter to DP17. Flows at DP17 are captured in a 10' Type R sump inlet (Public) and piped to Pond B. Basin EA10 will be detained Pond B Full Spectrum Detention Basin.

Basin EA11 is 1.99 acres of proposed roadway (Modified Urban Minor Arterial Roadway Cross-Section). Stormwater (Q_5 = 4.1 cfs Q_{100} = 8.5 cfs) is conveyed in curb and gutter to DP18. Flows at DP18 are captured in a 10' Type R sump inlet (Public) and piped to Pond B. Basin EA11 will be detained Pond B Full Spectrum Detention Basin.

Basin EA12 is 0.92 acres of undeveloped area and includes Pond B. Stormwater (Q_5 = 0.5 cfs Q_{100} = 2.9 cfs) flows directly into Pond B Full Spectrum Detention Basin.

Basin EA13 is 1.31 acres of undeveloped area and proposed pavement to the crown of Eastonville Road roadway (Modified Rural Major Collector Roadway Cross-Section). Stormwater (Q_5 = 1.0 cfs Q_{100} = 4.0 cfs) is conveyed in existing roadside swale to an existing 18" CMP storm pipe at DP22 (EX DP 7). Per ECM Appendix I.7.1.B.2.2, this area of the project is excluded from the requirements of Section 1.7.

Basin EA14 is 13.13 acres of undeveloped area and proposed pavement to the crown of Eastonville Road roadway (Modified Rural Major Collector Roadway Cross-Section). Stormwater (Q_5 = 4.0 cfs Q_{100} = 23.0 cfs) is conveyed in existing roadside swale to an existing 24" CMP storm pipe at DP23 (EX DP8). Per ECM Appendix I.7.1.B.2.2, this area of the project is excluded from the requirements of Section 1.7.

Basin EA15 is 1.59 acres of undeveloped area and proposed pavement to the crown of Eastonville Road roadway (Modified Rural Major Collector Roadway Cross-Section). Stormwater (Q_5 = 1.0 cfs Q_{100} = 3.9 cfs) is conveyed in existing roadside swale to an existing 36" CMP storm pipe at DP24 (EX DP 9). Per ECM Appendix I.7.1.B.2.2, this area of the project is excluded from the requirements of Section 1.7.

Offsite Basins

Basin OS1 (EX1) is 85.16 acres of undeveloped area. Stormwater from this basin combines with flows from Latigo Trails South Pond (The Sanctuary Filing 1 G-17) is conveyed overland to DP1 (The Sanctuary Filing 1 G18). Flows at DP1 (Q_5 = 28.3 cfs Q_{100} = 365.2 cfs) are conveyed across Eastonville Road in an existing 24" CMP culvert and discharges to Gieck Ranch Tributary #2 (Channel B). This basin is located upstream of the Eastonville project and is presented here to show where flows go that are upstream of the project site. The Eastonville project will have no impact on this basin.

Basin OS2 is 15.03 acres of undeveloped land and parking area north of Rex Road and contains a portion of Rex Road (Q_5 = 4.2 cfs Q_{100} = 21.6 cfs). Stormwater is conveyed to DP7 and is captured in a proposed 24" RCP culvert and piped south across Rex Road. No development associated with Eastonville Road will occur in Basin OS2.

Basin OS3 is 1.00 acre of undeveloped land (Q_5 = 0.2 cfs Q_{100} = 1.2 cfs) along the western edge of Eastonville Road. Stormwater is conveyed to DP8 and is captured in a proposed 15" RCP culvert and piped south across Rex Road. No development associated with Eastonville Road will occur in Basin OS3.

Basin OS4 is 9.60 acres of undeveloped land (Q_5 = 3.8 cfs Q_{100} = 17.3 cfs) along the western edge of Eastonville Road. Stormwater is conveyed to DP11 in a roadside swale where it combines with Meridian Ranch DP G15 flows (Q_5 = 8 cfs Q_{100} = 54.0 cfs) before being captured in a proposed 30" RCP culvert and piped to Channel B. The combined flows as it reaches DP11 is Q_5 = 10.5 cfs Q_{100} = 144.5 cfs.

Basin OS5 is 40.26 acres of undeveloped land and Falcon Regional Park (Q_5 = 13.3 cfs Q_{100} = 64.0 cfs) along the western edge of Eastonville Road. Stormwater is conveyed to DP12 in a roadside swale and is captured in a proposed 48" RCP culvert and piped to Channel B.

Basin OS6 is 60.97 acres of undeveloped land (Q_5 = 8.9 cfs Q_{100} = 60.6 cfs) along the western edge of Eastonville Road. Basin OS6 flows are adapted directly from the approved The Sanctuary Filing 1 FDR. Stormwater is conveyed to DP16 in a roadside swale where it combines with Meridian Ranch DP G12 flows before being conveyed across Eastonville Road in dual 10' x 3.5' RCBC to Channel A. The combined flows at DP16 (EX4) are Q_5 = 22.4 cfs Q_{100} = 491 cfs.

Basin OS7 is 23.46 acres of undeveloped land (Q_5 = 5.7 cfs Q_{100} = 38.6 cfs) along the western edge of Eastonville Road. Stormwater is conveyed to DP21 in a roadside swale and is captured in a proposed 30" RCP culvert and piped to Channel A.

Basin OS8 is future outflow of 11.42 acres of a future stormwater detention pond outflow developed land that will be detained to meet existing conditions (Q_5 = 3.4 cfs Q_{100} = 22.7 cfs) in the southeast corner of Eastonville Road and Rex Road. From there, stormwater is piped to Channel B.

IV. Drainage Facility Design

a. General Concept

The proposed improvements from Rex Road south to the southern property line of the proposed Grandview Reserve Filing 1 include removal of the 26' wide temporary pavement and replacing the road with a Modified Urban Minor Arterial Roadway Cross-Section consisting of 48' pavement and Type A EPC curb (53' back of curb to back of curb). Inlets will be placed at low points and roundabout entrances. Stormwater from this roadway will be piped to either a full spectrum detention pond, sand filter or temporary sediment basin. All ponds and water quality features will discharge at less than historic rates.

The proposed improvements from southern property line of the proposed Grandview Reserve south to Londonderry Drive include resurfacing the existing temporary pavement by providing full-depth pavement to replace the temporary pavement along this length of roadway. This is anticipated to be an interim condition until the completion of the full roadway section by others. The proposed interim roadway will be consistent with the Modified Rural Major Collector Roadway Cross-Section, with two 12' wide lanes and 4' shoulders, with existing roadside swales on both sides. The total width of the roadway is 32' including both shoulders, which adds 6' of pavement to the existing 26' temporary pavement roadway. Per ECM Appendix I.7.1.B.2.2, this area of the project is excluded from the requirements of Section 1.7 since the site does not add more than 8.25' of paved width at any location of the existing roadway. This includes Basins EA13-EA15.

b. Water Quality & Detention

Pond A (Sand Filter)

Water quality for Basins EA1, EA2 & EA5 is provided in Pond A; a water quality sand filter. A total of 0.63 acres at 54.0% composite imperviousness will be treated. The WQCV is 523 ft^3 and is released in 12 hours. A 12" PVC underdrain with 5/8" orifices will run beneath the filter material to facilitate the discharge to Channel B. The sand filter design calculations are presented in Appendix D.

Pond B (Full Spectrum Detention Basin)

Water quality and detention for Basins EA8 – EA12 is provided in Pond B; a private, full spectrum detention pond within Filing 1 of Grandview Reserve. A total of 9.32 acres at 70% composite imperviousness will be detained. The WQCV is 0.215 ac-ft, the EURV is 0.832 ac-ft, and the 100-year volume is 1.230 ac-ft. The WQCV, EURV and 100-year storms are released in 40, 72 and 76 hours, respectively. A forebay is located at the outfall into the pond and a 2.0' trickle channel conveys flow towards the outlet structure. A 10' access and maintenance road is provided to the bottom of the pond to facilitate maintenance of the pond facilities. A 6' emergency overflow spillway is provided that conveys the developed, peak 100-yr flow rate with 2.0' of freeboard towards Channel A.

Temporary Sediment Basin #1 (TSB #1)

Basin EA6 and EA7 will be detained in a temporary sediment basin (TSB #1) at the end of the Rex Road improvements, in the interim condition. When Rex Road develops further to the east, a permanent, full

spectrum extended detention basin will be required. TSB #1 detains 1.35 acres at 90% composite imperviousness. A Type L riprap emergency spillway is provided with a crest length of 5.0' and a 1.0' of freeboard. The WQCV, EURV and 100-year volume are released in 40, 67 and 71 hours respectively. TSB #1 releases at less than historic rates for the design storms.

c. Inspection and Maintenance

After completion of construction and upon the Board of County Commissioners acceptance, it is anticipated that all drainage facilities within the public Right-of-Way are to be owned and maintained by El Paso County.

All private detention ponds are to be owned and maintained by the Grandview Reserve Metropolitan District NO. 2 (DISTRICT), once established, unless an agreement is reached stating otherwise. Maintenance access for all full spectrum detention facilities will be provided from public Right-of-Way. Maintenance access for the drainageways will be provided through the proposed tracts.

V. Wetlands Mitigation

There is an existing wetland in Gieck Ranch Tributary #1 (Channel A). The wetland is contained entirely within the channel and is classified as jurisdictional. A Nationwide Wetland Permit will be applied for due to the disturbed area at the Dawlish Roundabout. Wetlands maintenance will be the responsibility of the DISTRICT.

VI. Four Step Method to Minimize Adverse Impacts of Urbanization

Step 1 – Reducing Runoff Volumes: Low impact development (LID) practices are utilized to reduce runoff at the source. In general, stormwater discharges are routed across pervious areas prior to capture in storm sewer. This practice promotes infiltration and reduces peak runoff rates. The Impervious Reduction Factor (IRF) method was used and is presented in Appendix D.

Step 2 – Treat and slowly release the WQCV: This step utilizes full spectrum water quality and detention to capture the WQCV and slowly release runoff from the site. Onsite full spectrum detention pond provides water quality treatment for the site. The WQCV is released over a period of 40 hours while the EURV is release over a period of 72 hours.

Step 3 – Stabilize stream channels: This step establishes practices to stabilize drainageways and provide scour protection at stormwater outfalls. Erosion protection is provided at all concentrated stormwater discharge points in the form of riprap pads.

Step 4 – Consider the need for source controls: No industrial or commercial uses are proposed within this development and therefore no source controls are proposed.

VII. Drainage and Bridge Fees

Gieck Ranch drainage basin has not been established as a fee basin within El Paso County. Therefore, no drainage basin fees are due at time of platting.

VIII. Opinion of Probable Cost

An engineer's opinion of probable cost will be provided with subsequent submittals of the Final Drainage Report.

IX. Hydraulic Grade Line Analysis

Hydraulic grade line analysis and final pipe sizes will be presented in a subsequent submittal of the Final Drainage Report.

X. Summary

Eastonville Road lies within the Gieck Ranch Drainage Basin. Water quality and detention for the site is provided in full spectrum water quality and detention ponds, sand filters and temporary sediment basins. There is one major drainageway that traverses the site: Gieck Ranch Tributary 1. The water quality and detention features ponds will be maintained by the Grandview Reserve Metropolitan District No. 2 (DISTRICT). All drainage facilities were sized per the El Paso County Drainage Criteria Manuals.

Based on following EPC methodology for hydrology in the existing and proposed conditions, the development of this project will not adversely affect downstream properties.

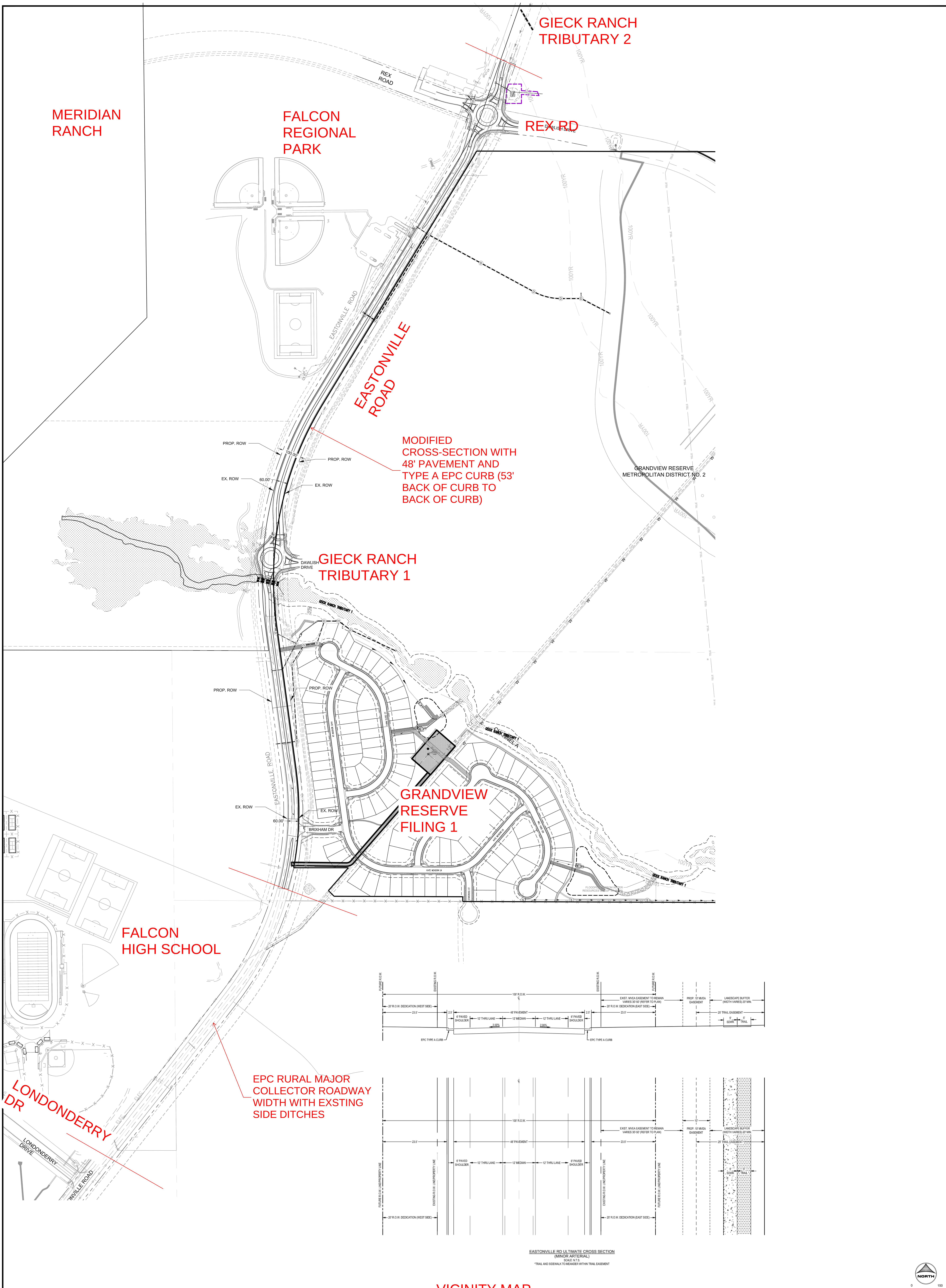
XI. Drawings

Please refer to the appendices for vicinity and drainage basin maps.

XII. References

1. City of Colorado Springs – Drainage Criteria Manual, May 2014, Revised January 2021.
2. Drainage Criteria Manual of El Paso, Colorado, October 2018.
3. Urban Storm Drainage Criteria Manual, Urban Drainage Flood Control District, January 2018.
4. "Gieck Ranch Drainage Basin Planning Study" prepared by Drexel, Barrel & Co, February 2010.
5. "Master Development Drainage Plan Meridian Ranch" prepared by Tech Contractors, July 2021.
6. "The Sanctuary Filing 1 at Meridian Ranch" prepared by Tech Contactors, August 2022.

APPENDIX A – VICINITY MAP, PHOTOS, SOIL MAP, FEMA MAP



VICINITY MAP
N.T.S.

DRAWN BY:	CPM	JOB DATE:	8/29/2023
APPROVED:		JOB NUMBER:	201662.08
CAD DATE:	8/29/2023		
CAD FILE:	J:\2020\201662.08\CAD\Dwgs\Exhibits\-Overall-Exhibit		

BAR IS ONE INCH ON OFFICIAL DRAWINGS. IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.

NO.	DATE	BY	REVISION DESCRIPTION

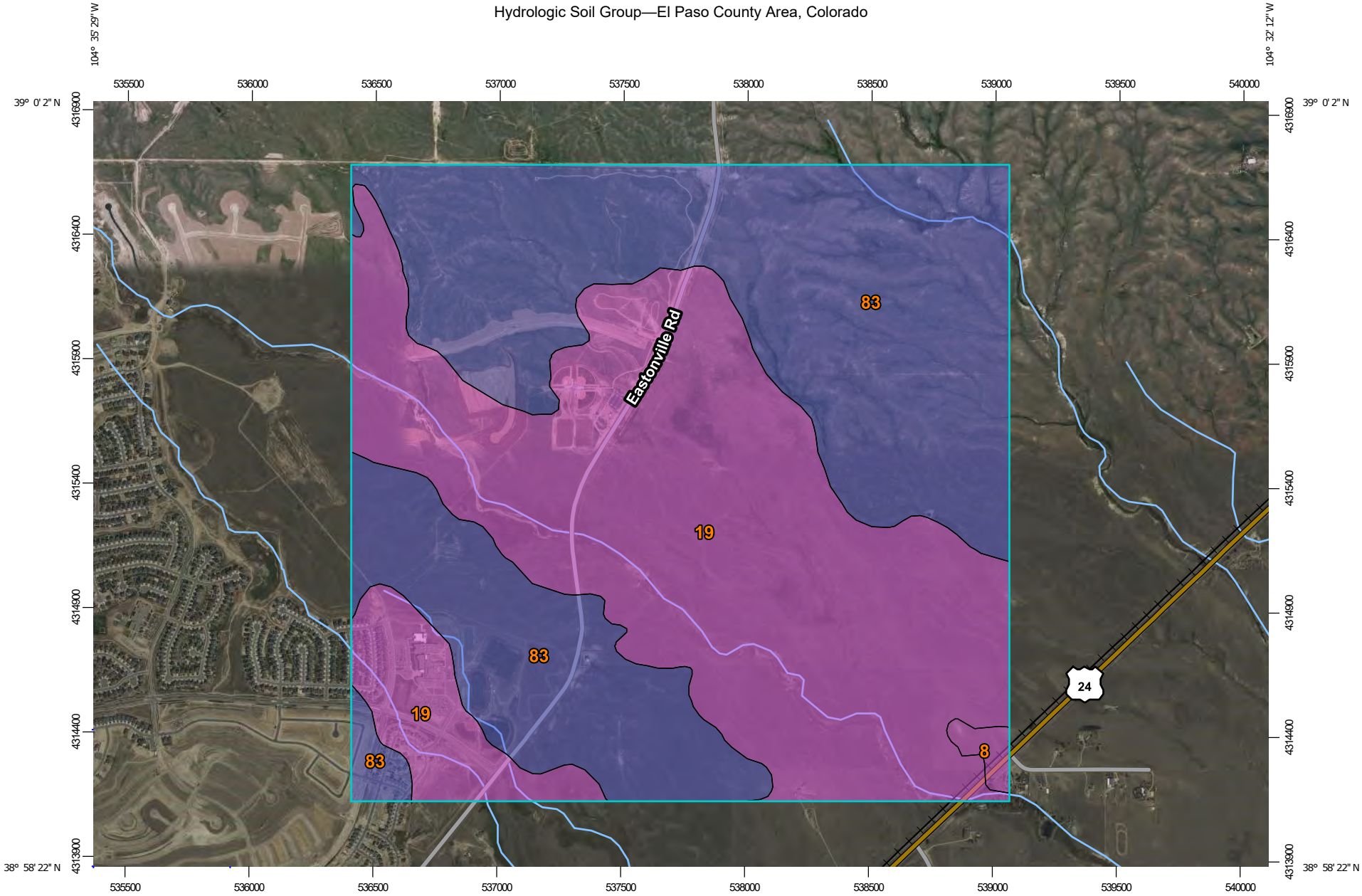
HRGreen
HR GREEN - COLORADO SPRINGS
7222 COMMERCE CENTER DR. SUITE 220
COLORADO SPRINGS CO 80919
PHONE: 719.622.6222
FAX: 844.273.1057

EASTONVILLE ROAD
DR HORTON
EL PASO COUNTY, CO

OVERALL EASTONVILLE PLAN

SHEET
1
1

Photo - at Londonderry and Eastonville looking north


104° 35' 29" W
104° 32' 12" W
39° 0' 2" N
38° 58' 22" N
535500
536000
536500
537000
537500
538000
538500
539000
539500
540000
4316900
4316400
4315900
4315400
4314900
4314400
4313900
Eastonville Rd
83
19
83
19
83
8
24
Map Scale: 1:21,700 if printed on A landscape (11" x 8.5") sheet.
N
Meters
0 300 600 1200 1800
Feet
0 1000 2000 4000 6000
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 19, Aug 31, 2021

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 11, 2018—Jun 12, 2021

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
8	Blakeland loamy sand, 1 to 9 percent slopes	A	10.4	0.6%
19	Columbine gravelly sandy loam, 0 to 3 percent slopes	A	839.5	49.8%
83	Stapleton sandy loam, 3 to 8 percent slopes	B	835.7	49.6%
Totals for Area of Interest			**1,685.6**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 13. The **horizontal datum** was NAD83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the **North American Vertical Datum of 1988 (NAVD88)**. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, MD 20910-3282

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242 or visit its website at http://www.ngs.noaa.gov/.

Base Map information shown on this FIRM was provided in digital format by El Paso County, Colorado Springs Utilities, City of Fountain, Bureau of Land Management, National Oceanic and Atmospheric Administration, United States Geological Survey, and Anderson Consulting Engineers, Inc. These data are current as of 2006.

This map reflects more detailed and up-to-date **stream channel configurations and floodplain delineations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map. The profile baselines depicted on this map represent the hydraulic modeling baselines that match the flood profiles and Floodway Data Tables if applicable, in the FIS report. As a result, the profile baselines may deviate significantly from the new base map channel representation and may appear outside of the floodplain.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact **FEMA Map Service Center** (MSC) via the FEMA Map Information eXchange (FMIX) 1-877-336-2627 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. The MSC may also be reached by Fax at 1-800-358-9620 and its website at http://www.msc.fema.gov/.

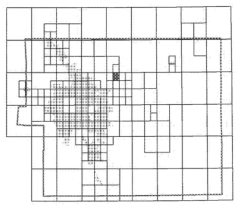
If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.

El Paso County Vertical Datum Offset Table

Flooding Source	Vertical Datum Offset (ft)

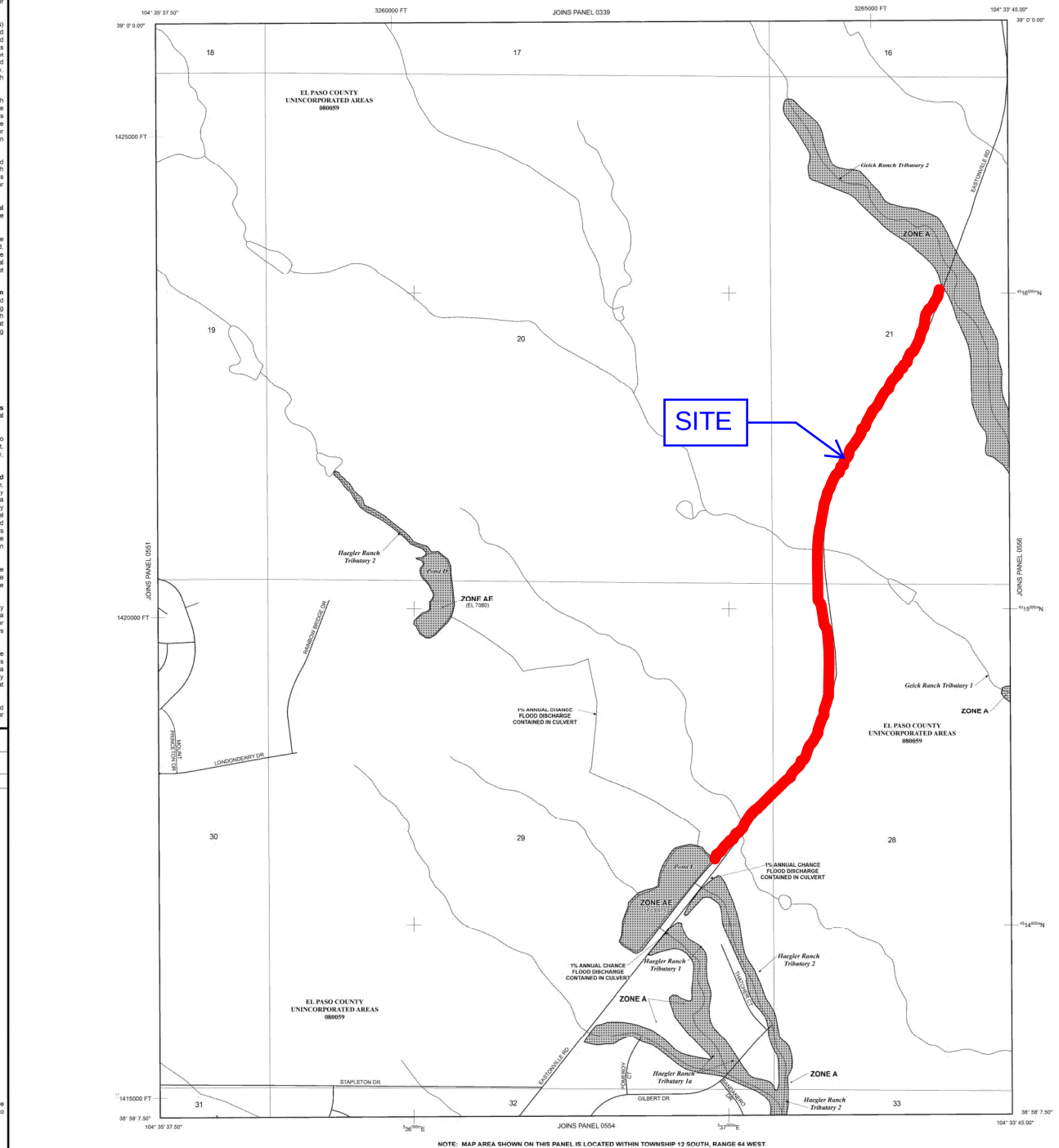
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION

Panel Location Map



This Digital Flood Insurance Rate Map (DFIRM) was produced through a Cooperating Technical Partner (CTP) agreement between the State of Colorado Water Conservation Board (CWCB) and the Federal Emergency Management Agency (FEMA).

Additional Flood Hazard information and resources are available from local communities and the Colorado Water Conservation Board.



NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 12 SOUTH, RANGE 64 WEST.

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAS) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A No Base Flood Elevations determined.
ZONE AE Base Flood Elevations determined.
ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR Special Flood Hazard Area Formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99 Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

Floodplain boundary
Floodway boundary
Zone D Boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
513 — Base Flood Elevation line and value; elevation in feet*
(EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

A — A — Cross section line
23 — 23 — Transect line
97° 07' 30.00" / 32° 22' 30.00" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
4175000mN — 1000-meter Universal Transverse Mercator grid ticks, zone 13
6000000 FT — 5000-foot grid ticks: Colorado State Plane coordinate system, central zone (FIPSZONE 0502), Lambert Conformal Conic Projection
DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
MARCH 17, 1997

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
DECEMBER 7, 2018 - to update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

For community map revision history prior to countywide mapping, refer to the Community Map History Table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

250 0 500 1000 FEET
150 0 150 300 METERS

PANEL 0552G

FIRM
FLOOD INSURANCE RATE MAP
EL PASO COUNTY, COLORADO
AND INCORPORATED AREAS

PANEL 552 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
EL PASO COUNTY	080059	0552	G

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
08041C0552G

MAP REVISED
DECEMBER 7, 2018

Federal Emergency Management Agency

NATIONAL FLOOD INSURANCE PROGRAM

APPENDIX B – HYDROLOGIC CALCULATIONS

HRGreen	**EASTONVILLE ROAD**	**Calc'd by:**	**CM**
	EXISTING CONDITIONS	**Checked by:**	**CM**
	EL PASO COUNTY, CO	**Date:**	**9/8/2023**

SUMMARY RUNOFF TABLE

BASIN	AREA (ac)	% IMPERVIOUS	Q_5 (cfs)	Q_{100} (cfs)
G18*	321.53	-	28.3	365.2
FG36*	18.88	-	1.7	18.8
G16*	131.26	-	6.1	112.1
G06*	832.70	-	22.4	491.0
EX5	22.35	3	7.0	43.3
EX6	3.05	5	1.2	6.9
EX7	1.47	9	0.9	4.2
EX8	13.13	4	3.8	22.6
EX9	1.59	12	0.9	3.7

DESIGN POINT SUMMARY TABLE

DESIGN POINT	CONTRIBUTING BASINS	ΣQ_5 (cfs)	ΣQ_{100} (cfs)
1	G18*	28.3	365.2
2	FG36*	1.7	18.8
3	G16*	6.1	112.1
4	G06*	22.4	491.0
5	EX5	7.0	43.3
6	EX6	1.2	6.9
7	EX7	0.9	4.2
8	EX8	3.8	22.6
9	EX9	0.9	3.7

*** AREA AND Q TAKEN FROM THE SANCTUARY FILING 1 FDR**

HRGreen	**EASTONVILLE ROAD**							**Calc'd by:**	**CM**										
	EXISTING CONDITIONS							**Checked by:**	**CM**										
	EL PASO COUNTY, CO							**Date:**	**9/8/2023**										

COMPOSITE 'C' FACTORS

BASIN	UNDEVELOPED	WALKS & DRIVES	SINGLE FAMILY	TOTAL	SOIL TYPE	UNDEVELOPED			WALKS & DRIVES			SINGLE FAMILY			COMPOSITE IMPERVIOUSNESS & C		
	ACRES					%I	C_5	C_{100}	%I	C_5	C_{100}	%I	C_5	C_{100}	%I	C_5	C_{100}
EX1 - EX4*																	
EX5	22.09	0.26	0.00	22.35	A/B	2	0.09	0.36	100	0.90	0.96	65	0.73	0.81	3	0.10	0.37
EX6	2.96	0.09	0.00	3.05	A/B	2	0.09	0.36	100	0.90	0.96	65	0.73	0.81	5	0.11	0.38
EX7	1.36	0.11	0.00	1.47	A/B	2	0.09	0.36	100	0.90	0.96	65	0.73	0.81	9	0.15	0.40
EX8	12.88	0.25	0.00	13.13	A/B	2	0.09	0.36	100	0.90	0.96	65	0.73	0.81	4	0.11	0.37
EX9	1.43	0.16	0.00	1.59	A/B	2	0.09	0.36	100	0.90	0.96	65	0.73	0.81	12	0.17	0.42

* FLOWS TO DESIGN POINTS 1-4 WERE TAKEN FROM "THE SANCTUARY FILING 1 FDR" SO C WAS NOT CALCULATED FOR CONTRIBUTING AREAS EX1 - EX4

HRGreen	**EASTONVILLE ROAD**	**Calc'd by:**	**CM**
	EXISTING CONDITIONS	**Checked by:**	**CM**
	EL PASO COUNTY, CO	**Date:**	**9/8/2023**

TIME OF CONCENTRATION

BASIN DATA			OVERLAND TIME (T_i)			TRAVEL TIME (T_t)					TOTAL
DESIGNATION	C_5	AREA (ac)	LENGTH (ft)	SLOPE %	t_i (min)	C_V	LENGTH (ft)	SLOPE %	V (ft/s)	t_t (min)	t_c (min)
EX1-EX4*											
EX5	0.10	22.35	117	11.6	8.8	10	1162	3.4	1.8	10.5	19.3
EX6	0.11	3.05	207	9.0	12.5	10	250	4.0	2.0	2.1	14.6
EX7	0.15	1.47	50	3.4	8.2	10	174	4.4	2.1	1.4	9.6
EX8	0.11	13.13	125	3.1	14.0	10	1219	3.5	1.9	10.9	24.8
EX9	0.17	1.59	148	4.0	13.0	10	418	3.0	1.7	4.0	17.1

* FLOWS TO THESE DESIGN POINTS WERE TAKEN FROM "THE SANCTUARY FILING 1 FDR" SO TC WAS NOT CALCULATED FOR CONTRIBUTING AREAS EX1 - EX4

FORMULAS:

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L}}{S^{0.33}} \qquad V = C_v S_w^{0.5}$$

Table 6-7. Conveyance Coefficient, C_v

Type of Land Surface	C_v
Heavy meadow	2.5
Tillage/field	5
Riprap (not buried)*	6.5
Short pasture and lawns	7
Nearly bare ground	10
Grassed waterway	15
Paved areas and shallow paved swales	20

* For buried riprap, select C_v value based on type of vegetative cover.

HRGreen

EASTONVILLE ROAD
EXISTING CONDITIONS
DESIGN STORM: 5-YEAR

Calc'd by:	CM
Checked by:	CM
Date:	9/8/2023

			DIRECT RUNOFF						TOTAL RUNOFF				STREET			PIPE				TRAVEL TIME			REMARKS
STREET	DESIGN POINT	BASIN ID	AREA (ac)	C_5	t_c (min)	C_5*A (ac)	I (in./ hr.)	Q (cfs)	t_c (min)	C_5*A (ac)	I (in./ hr.)	Q (cfs)	Q_{street} (cfs)	C_5*A (ac)	SLOPE %	Q_{PIPE} (cfs)	C_5*A (ac)	SLOPE %	PIPE SIZE (in)	LENGTH (FT)	VEL. (FPS)	TRAVEL TIME (min	
	1	G18*	321.53									28.3											DP 1 CAPTURED IN GIECK RANCH TRIB #2 (CHANNEL B)
	2	FG36*	18.88									1.7											DP 2 CAPTURED IN 24" RCP CULVERT, PIPED TO BASIN EX3
	3	G16*	131.26									6.1											BASIN EX2, DP2 & DPG15 (SANCTUARY FDR Q5=3 CFS) CAPTURED IN 24" CMP CULVERT, PIPED ACROSS EASTONVILLE ROAD
	4	G06*	832.70									22.4											BASIN EX4 & DPG12 (SANCTUARY FDR Q5 = 21 CFS) CAPTURED IN 18" CMP CULVERT, PIPED ACROSS EASTONVILLE ROAD TO GIECK RANCH TRIB #1 (CHANNEL A)
	5	EX5	22.35	0.10	19.3	2.22	3.15	7.0															BASIN EX5 CAPTURED IN 18" CMP, PIPED ACROSS EASTONVILLE ROAD
	6	EX6	3.05	0.11	14.6	0.35	3.56	1.2															BASIN EX6 CAPTURED IN 18" CMP, PIPED ACROSS EASTONVILLE ROAD
	7	EX7	1.47	0.15	9.6	0.22	4.20	0.9															BASIN EX7 CAPTURED IN 18" CMP, PIPED ACROSS EASTONVILLE ROAD
	8	EX8	13.13	0.11	24.8	1.38	2.76	3.8															BASIN EX8 CAPTURED IN 24" CMP, PIPED ACROSS EASTONVILLE ROAD
	9	EX9	1.59	0.17	17.1	0.27	3.33	0.9															BASIN EX9 CAPTURED IN 36" CMP, PIPED ACROSS EASTONVILLE ROAD
																							* AREA AND Q TAKEN FROM THE SANCTUARY FILING 1 FDR

HRGreen

EASTONVILLE ROAD
EXISTING CONDITIONS
DESIGN STORM: 100-YEAR

Calc'd by:	CM
Checked by:	CM
Date:	9/8/2023

			DIRECT RUNOFF						TOTAL RUNOFF				STREET			PIPE				TRAVEL TIME			REMARKS
STREET	DESIGN POINT	BASIN ID	AREA (ac)	C_{100}	t_c (min)	C_{100}*A (ac)	I (in./ hr.)	Q (cfs)	t_c (min)	C_{100}*A (ac)	I (in./ hr.)	Q (cfs)	Q_{street} (cfs)	C_{100}*A (ac)	SLOPE %	Q_{PIPE} (cfs)	C_{100}*A (ac)	SLOPE %	PIPE SIZE (ft)	LENGTH (ft)	VEL. (ft/s)	TRAVEL TIME (min)	
	1	G18*	321.53									365.2											DP 1 CAPTURED IN GIECK RANCH TRIB #2 (CHANNEL B)
	2	FG36*	18.88									18.8											DP 2 CAPTURED IN 24" RCP CULVERT, PIPED TO BASIN EX3
	3	G16*	131.26									112.1											BASIN EX2, DP2 & DPG15 (SANCTUARY FDR Q5=3 CFS) CAPTURED IN 24" CMP CULVERT, PIPED ACROSS EASTONVILLE ROAD
	4	G06*	832.70									491.0											BASIN EX4 & DPG12 (SANCTUARY FDR Q5 = 21 CFS) CAPTURED IN 18" CMP CULVERT, PIPED ACROSS EASTONVILLE ROAD TO GIECK RANCH TRIB #1 (CHANNEL A)
	5	EX5	22.35	0.37	19.3	8.20	5.28	43.3															BASIN EX5 CAPTURED IN 18" CMP, PIPED ACROSS EASTONVILLE ROAD
	6	EX6	3.05	0.38	14.6	1.15	5.98	6.9															BASIN EX6 CAPTURED IN 18" CMP, PIPED ACROSS EASTONVILLE ROAD
	7	EX7	1.47	0.40	9.6	0.60	7.04	4.2															BASIN EX7 CAPTURED IN 18" CMP, PIPED ACROSS EASTONVILLE ROAD
	8	EX8	13.13	0.37	24.8	4.88	4.64	22.6															BASIN EX8 CAPTURED IN 24" CMP, PIPED ACROSS EASTONVILLE ROAD
	9	EX9	1.59	0.42	17.1	0.67	5.59	3.7															BASIN EX9 CAPTURED IN 36" CMP, PIPED ACROSS EASTONVILLE ROAD
																							* AREA AND Q TAKEN FROM THE SANCTUARY FILING 1 FDR

HRGreen	**EASTONVILLE ROAD**	**Calc'd by:**	**CM**
	PROPOSED CONDITIONS	**Checked by:**	**CM**
	EL PASO COUNTY, CO	**Date:**	**9/8/2023**

BASIN SUMMARY TABLE

BASIN	AREA (ac)	% IMPERVIOUS	Q_5 (cfs)	Q_{100} (cfs)
OS1	85.16	-	-	-
OS2	15.03	7	4.2	21.6
OS3	1.00	2	0.2	1.7
OS4	9.60	9	3.8	17.3
OS5	40.26	8	13.3	64.0
OS6	60.97	2	8.9	60.6
OS7	23.46	2	5.7	38.6
OS8	11.42	2	3.4	22.7
EA1	0.22	73	0.8	1.5
EA2	0.25	73	0.9	1.7
EA3	0.20	71	0.7	1.4
EA4	0.17	65	0.5	1.1
EA5	0.16	2	0.1	0.5
EA6	0.70	100	3.2	5.7
EA7	0.65	89	2.6	4.8
EA8	2.08	99	5.0	9.0
EA9	2.99	64	4.6	9.5
EA10	1.34	94	4.0	7.4
EA11	1.99	66	4.1	8.5
EA12	0.92	4	0.5	3.0
EA13	1.31	12	1.0	4.0
EA14	13.13	4	4.0	23.0
EA15	1.59	14	1.0	3.9

DESIGN POINT SUMMARY TABLE

DESIGN POINT	CONTRIBUTING BASINS	ΣQ_5 (cfs)	ΣQ_{100} (cfs)
1	OS1 & G17	28.3	365.2
2	EA1	0.8	1.5
3	EA2	0.9	1.7
3.1	DP2 & DP3	1.6	3.2
4	EA5 & DP3.1	1.6	3.4
5	EA3	0.7	1.4
6	EA4	0.5	1.1
6.1	DP5 & DP6	1.2	2.4
7	OS2	4.2	21.6
8	OS3	0.2	1.7
8.1	DP7 & DP8	4.4	22.9
9.1	DP6.1 & DP8.1	4.9	23.8
10	EA7 & EA6	5.6	10.3
11	OS4 & G15 & DP9.1	10.5	144.3
12	OS5	13.3	64.0
12.1	DP11 & DP12	21.6	103.1
13	OS8	3.4	22.7
13.1	DP12.1 & DP13	23.4	115.2
14	EA8	5.0	9.0
15	EA9	4.6	9.5
15.1	DP14 & DP15	9.3	17.9
16	OS6 & G12 (G6*)	22.4	491.0
17	EA10	4.0	7.4
18	EA11	4.1	8.5
18.1	DP17 & DP18	8.0	15.4
19.1	DP15.1 & DP18.1	15.0	28.8
20	EA12	0.5	3.0
21	OS7	5.7	38.6
22	EA13	1.0	4.0
23	EA14	4.0	23.0
24	EA15	1.0	3.9

HRGreen	**EASTONVILLE ROAD**							**Calc'd by:**	**CM**									
	PROPOSED CONDITIONS							**Checked by:**	**CM**									
	EL PASO COUNTY, CO							**Date:**	**9/8/2023**									

COMPOSITE 'C' FACTORS

BASIN	UNDEVELOPED	PAVED	SINGLE FAMILY	TOTAL	SOIL TYPE	UNDEVELOPED			PAVED			SINGLE FAMILY			COMPOSITE IMPERVIOUSNESS & C		
	ACRES					%I	C_5	C_{100}	%I	C_5	C_{100}	%I	C_5	C_{100}	%I	C_5	C_{100}
OS1	85.16	0.00	0.00	85.16	A/B	2	0.09	0.36	100	0.90	0.96	65	0.73	0.81	2	0.09	0.36
OS2	14.33	0.70	0.00	15.03	A/B	2	0.09	0.36	100	0.90	0.96	65	0.73	0.81	7	0.13	0.39
OS3	1.00	0.00	0.00	1.00	A/B	2	0.09	0.36	100	0.90	0.96	65	0.73	0.81	2	0.09	0.36
OS4	8.90	0.70	0.00	9.60	A/B	2	0.09	0.36	100	0.90	0.96	65	0.73	0.81	9	0.15	0.40
OS5	37.90	2.36	0.00	40.26	A/B	2	0.09	0.36	100	0.90	0.96	65	0.73	0.81	8	0.14	0.40
OS6	60.97	0.00	0.00	60.97	A/B	2	0.09	0.36	100	0.90	0.96	65	0.73	0.81	2	0.09	0.36
OS7	23.46	0.00	0.00	23.46	A/B	2	0.09	0.36	100	0.90	0.96	65	0.73	0.81	2	0.09	0.36
OS8	11.42	0.00	0.00	11.42	A/B	2	0.09	0.36	100	0.90	0.96	65	0.73	0.81	2	0.09	0.36
EA1	0.06	0.16	0.00	0.22	A/B	2	0.09	0.36	100	0.90	0.96	65	0.73	0.81	73	0.68	0.80
EA2	0.07	0.18	0.00	0.25	A/B	2	0.09	0.36	100	0.90	0.96	65	0.73	0.81	73	0.67	0.79
EA3	0.06	0.14	0.00	0.20	A/B	2	0.09	0.36	100	0.90	0.96	65	0.73	0.81	71	0.66	0.78
EA4	0.06	0.11	0.00	0.17	A/B	2	0.09	0.36	100	0.90	0.96	65	0.73	0.81	65	0.61	0.75
EA5	0.16	0.00	0.00	0.16	A/B	2	0.09	0.36	100	0.90	0.96	65	0.73	0.81	2	0.09	0.36
EA6	0.00	0.70	0.00	0.70	A/B	2	0.09	0.36	100	0.90	0.96	65	0.73	0.81	100	0.90	0.96
EA7	0.07	0.58	0.00	0.65	A/B	2	0.09	0.36	100	0.90	0.96	65	0.73	0.81	89	0.81	0.90
EA8	0.02	2.06	0.00	2.08	A/B	2	0.09	0.36	100	0.90	0.96	65	0.73	0.81	99	0.89	0.95
EA9	1.11	1.88	0.00	2.99	A/B	2	0.09	0.36	100	0.90	0.96	65	0.73	0.81	64	0.60	0.74
EA10	0.08	1.26	0.00	1.34	A/B	2	0.09	0.36	100	0.90	0.96	65	0.73	0.81	94	0.85	0.92
EA11	0.69	1.30	0.00	1.99	A/B	2	0.09	0.36	100	0.90	0.96	65	0.73	0.81	66	0.62	0.75
EA12	0.90	0.02	0.00	0.92	A/B	2	0.09	0.36	100	0.90	0.96	65	0.73	0.81	4	0.11	0.37
EA13	1.17	0.14	0.00	1.31	A/B	2	0.09	0.36	100	0.90	0.96	65	0.73	0.81	12	0.18	0.42
EA14	12.82	0.31	0.00	13.13	A/B	2	0.09	0.36	100	0.90	0.96	65	0.73	0.81	4	0.11	0.37
EA15	1.39	0.20	0.00	1.59	A/B	2	0.09	0.36	100	0.90	0.96	65	0.73	0.81	14	0.19	0.44
POND A				0.63											54		
POND B				9.32											70		
TSB #1				1.35											90		
Total				11.30													

HRGreen	**EASTONVILLE ROAD**	**Calc'd by:**	**CM**
	PROPOSED CONDITIONS	**Checked by:**	**CM**
	EL PASO COUNTY, CO	**Date:**	**9/8/2023**

TIME OF CONCENTRATION

BASIN DATA			OVERLAND TIME (T_i)			TRAVEL TIME (T_t)					TOTAL
DESIGNATION	C_5	AREA (ac)	LENGTH (ft)	SLOPE %	t_i (min)	C_V	LENGTH (ft)	SLOPE %	V (ft/s)	t_t (min)	t_c (min)
OS1 (EX1)*											
OS2	0.13	15.03	220	2.3	20.0	10	1450	2.3	1.5	15.9	36.0
OS3	0.09	1.00	220	2.1	21.4	10	345	2.3	1.5	3.8	25.2
OS4	0.15	9.60	153	3.1	14.8	10	1124	2.5	1.6	11.8	26.6
OS5	0.14	40.26	300	4.4	18.7	10	1267	2.6	1.6	13.1	31.7
OS6	0.09	60.97	300	1.0	32.1	10	1790	2.0	1.4	21.1	53.2
OS7	0.09	23.46	300	11.6	14.2	10	1300	3.4	1.8	11.8	25.9
OS8	0.09	11.42	200	11.6	11.6	10	675	3.4	1.8	6.1	17.7
EA1	0.68	0.22	34	2.0	3.6	20	137	1.4	2.4	1.0	5.0
EA2	0.67	0.25	34	2.0	3.6	20	60	1.4	2.4	0.4	5.0
EA3	0.66	0.20	34	2.0	3.8	20	126	1.4	2.4	0.9	5.0
EA4	0.61	0.17	34	2.0	4.1	20	126	3.8	3.9	0.5	5.0
EA5	0.09	0.16	20	2.0	6.6	20	20	33.0	11.5	0.0	6.6
EA6	0.90	0.70	26	2.0	1.5	20	630	1.7	2.6	4.0	5.5
EA7	0.81	0.65	24	2.0	2.0	20	630	1.7	2.6	4.0	6.1
EA8	0.89	2.08	26	2.0	1.5	20	2500	0.7	1.7	24.9	26.4
EA9	0.60	2.99	26	2.0	3.7	20	2500	0.7	1.7	24.9	28.6
EA10	0.85	1.34	26	2.0	1.8	20	1220	0.6	1.5	13.1	15.0
EA11	0.62	1.99	26	2.0	3.6	20	1220	0.6	1.5	13.1	16.7
EA12	0.11	0.92	30	10.0	4.6	20	95	33.0	11.5	0.1	5.0
EA13	0.18	1.31	50	3.4	8.0	10	174	4.4	2.1	1.4	9.3
EA14	0.11	13.13	125	3.1	13.9	10	1219	3.5	1.9	10.9	24.8
EA15	0.19	1.59	148	4.0	12.8	10	418	3.0	1.7	4.0	16.8

* FLOWS TO THESE DESIGN POINTS WERE TAKEN FROM "THE SANCTUARY FILING 1 FDR" SO TC WAS NOT CALCULATED

FORMULAS:

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L}}{S^{0.33}} \qquad V = C_v S_w^{0.5}$$

Table 6-7. Conveyance Coefficient, C_v

Type of Land Surface	C_v
Heavy meadow	2.5
Tillage/field	5
Riprap (not buried)*	6.5
Short pasture and lawns	7
Nearly bare ground	10
Grassed waterway	15
Paved areas and shallow paved swales	20

* For buried riprap, select C_v value based on type of vegetative cover.

HRGreen

EASTONVILLE ROAD
PROPOSED CONDITIONS
DESIGN STORM: 5-YEAR

Calc'd by: NQJ
Checked by:
Date: 9/8/2023

		DIRECT RUNOFF						TOTAL RUNOFF				SWALE			PIPE				TRAVEL TIME			REMARKS
DESIGN POINT	BASIN ID	AREA (ac)	C_5	t_c (min)	C_5*A (ac)	I (in./ hr.)	Q (cfs)	t_c (min)	C_5*A (ac)	I (in./ hr.)	Q (cfs)	Q_{swale} (cfs)	C_5*A (ac)	SLOPE %	Q_{PIPE} (cfs)	C_5*A (ac)	SLOPE %	PIPE SIZE (ft)	LENGTH (FT)	VEL. (FPS)	TRAVEL TIME (min	
	OS1	85.16																				
1	G18*	321.53					28.3															BASIN OS1 AND G17 FLOW TO DP1 (DPG18), FOLLOWS HISTORIC DRAINAGE PATTERNS TO CHANNEL B
2	EA1	0.22	0.68	5.0	0.15	5.17	0.8								0.8	0.15	2.0	1.5	56	10.2	0.09	BASIN EA1 CAPTURED IN 5' TYPE R INLET @ DP2, PIPE TO DP3.1
3	EA2	0.25	0.67	5.0	0.17	5.17	0.9								0.9	0.17						BASIN EA2 CAPTURED IN 5' TYPE R INLET@ DP3, PIPE TO DP3.1
3.1								5.1	0.32	5.14	1.6				1.6	0.32	2.0	1.5	85	10.2	0.14	COMBINED DP2 & DP3 @ DP3.1, PIPE TO DP4 (POND A)
4	EA5	0.16	0.09	6.6	0.01	4.75	0.1	6.6	0.33	4.75	1.6											**COMBINED DP3.1 & BASIN EA5, TOTAL FLOW ENTERING POND A**
5	EA3	0.20	0.66	5.0	0.13	5.17	0.7								0.7	0.13	2.0	1.5	48	10.2	0.08	BASIN EA3 CAPTURED IN 5' TYPE R INLET @ DP5, PIPE TO DP6.1
6	EA4	0.17	0.61	5.0	0.10	5.17	0.5								0.5	0.10	2.0	1.5				BASIN EA4 CAPTURED IN 5' TYPE R INLET @ DP6, PIPE TO DP6.1
6.1								5.1	0.24	5.15	1.2				0.0	0.24	2.0	1.5	1146	10.2	1.88	DP3 & DP4 FLOW @ DP5.1, PIPE TO DP9.1
7	OS2	15.03	0.13	36.0	1.92	2.21	4.2								4.2	1.92	2.0	1.5	44	10.2	0.07	BASIN OS2 CAPTURED IN 18" FES, PIPE TO DP8.1
8	OS3	1.00	0.09	25.2	0.09	2.74	0.2								0.2	0.09	2.0	1.5	38	10.2	0.06	BASIN OS3 CAPTURED IN 18" FES, PIPE TO DP8.1
8.1								36.0	2.01	2.21	4.4				4.4	2.01	2.0	1.5	55	10.2	0.09	COMBINED DP7 & DP8 @ DP8.1, PIPE TO DP9.1
9.1								36.1	2.25	2.20	4.9	4.9	2.25	1.7					620	2.6	3.96	COMBINED DP6.1 & DP8.1 @ DP9.1, DISCHARGE TO ROADSIDE SWALE TO DP11
	EA6	0.70	0.90	5.5	0.63	5.02	3.2															BASIN EA6 @ DP10 (TEMPORARY SEDIMENT BASIN #1)
10	EA7	0.65	0.81	6.1	0.53	4.88	2.6	6.1	1.16	4.88	5.6											BASIN EA6 & EA7 @ DP10 (TEMPORARY SEDIMENT BASIN #1)
11	OS4	9.60	0.15	26.6	1.43	2.66	3.8	40.1	3.68	2.05	7.5	3.0	3.68	1.7	10.5	3.68	2.0	2.0	85	10.2	0.14	BASIN OS4, DP9.1 CAPTURED & MERIDIAN RANCH DPG15 (3 CFS) IN 30" FES @ DP11, PIPE TO DP12.1
12	OS5	40.26	0.14	31.7	5.54	2.40	13.3								13.3	5.54	2.0	2.0	616	10.2	1.01	BASIN OS5 CAPTUREDI N 48" FES @ DP12, PIPE TO DP12.1
12.1								32.8	9.21	2.35	21.6				21.6	9.21	2.0	3.5	891	10.2	1.46	COMBINED DP11 & DP12 @ DP12.1, PIPE TO DP13.1
13	OS8	11.42	0.09	17.7	1.03	3.28	3.4								3.4	1.03	2.0	2.0	28	10.2	0.05	BASIN OS8 CAPTURED @ DP13 IN TYPE C INLET, PIPE TO DP13.1
13.1								34.2	10.24	2.28	23.4											COMBINED DP12.1 & DP13, PIPE TO CHANNEL B
14	EA8	2.08	0.89	26.4	1.86	2.67	5.0								5.0	1.86	2.0	2.0	8	10.2	0.01	BASIN EA8 CAPTURED IN 10' TYPE R SUMP @ DP14, PIPE TO DP15.1
15	EA9	2.99	0.60	28.6	1.79	2.55	4.6								4.6	1.79	2.0	2.0	54	10.2	0.09	BASIN EA8 CAPTURED IN 10' TYPE R SUMP @ DP15, PIPE TO DP15.1
15.1								28.7	3.65	2.55	9.3				9.3	3.65	2.0	2.0	641	10.2	1.05	COMBINED DP14 & DP15, PIPE TO DP19.1
	OS6	60.97	0.09	53.2	5.49	1.62	8.9															
16	G06*	832.7									22.4											THE SANCTUARY FILING 1 DPG06 (22.4 CFS), BYPASSED UNDER EASTONVILLE ROAD IN DUAL 10' x 3.5' CULVERTS
17	EA10	1.34	0.85	15.0	1.14	3.52	4.0								4.0	1.14	2.0	2.0	52	10.2	0.09	BASIN EA10 CAPTURED IN 5' TYPE R SUMP, PIPE TO DP18.1
18	EA11	1.99	0.62	16.7	1.23	3.36	4.1								4.1	1.23	2.0	2.0	52	10.2	0.09	BASIN EA11 CAPTURED IN 5' TYPE R SUMP, PIPE TO DP18.1
18.1								16.8	2.37	3.35	8.0				8.0	2.37	2.0	2.0	157	10.2	0.26	COMBINED DP17 & DP18 @ DP18.1, PIPE TO DP19.1
19.1								29.8	6.02	2.49	15.0				15.0	6.02	2.0	2.0	42	10.2	0.07	COMBINED DP15.1 & DP18.1, PIPE TO DP20

HRGreen

EASTONVILLE ROAD
PROPOSED CONDITIONS
DESIGN STORM: 5-YEAR

Calc'd by:	NQJ
Checked by:	
Date:	9/8/2023

		DIRECT RUNOFF						TOTAL RUNOFF				SWALE			PIPE				TRAVEL TIME			REMARKS
DESIGN POINT	BASIN ID	AREA (ac)	C_5	t_c (min)	C_5*A (ac)	I (in./ hr.)	Q (cfs)	t_c (min)	C_5*A (ac)	I (in./ hr.)	Q (cfs)	Q_{swale} (cfs)	C_5*A (ac)	SLOPE %	Q_{PIPE} (cfs)	C_5*A (ac)	SLOPE %	PIPE SIZE (ft)	LENGTH (FT)	VEL. (FPS)	TRAVEL TIME (min	
20	EA12	0.92	0.11	5.0	0.10	5.17	0.5	29.8	6.12	2.49	15.2											COMBINED DP19.1 & BASIN EA12, TOTAL FLOW ENTERING POND B
21	OS7	23.46	0.09	25.9	2.11	2.70	5.7															BASIN OS7 TO DP21 BYPASS TO CHANNEL A
22	EA13	1.31	0.18	9.3	0.23	4.23	1.0															BASIN EA13 CAPTURED IN EX 18" CMP, PIPED ACROSS EASTONVILLE ROAD
23	EA14	13.13	0.11	24.8	1.43	2.77	4.0															BASIN EA14 CAPTURED IN EX 24" CMP, PIPED ACROSS EASTONVILLE ROAD
24	EA15	1.59	0.19	16.8	0.31	3.35	1.0															BASIN EA15 CAPTURED IN EX 36" CMP, PIPED ACROSS EASTONVILLE ROAD
																						* FLOWS TO THESE DESIGN POINTS WERE TAKEN FROM "THE SANCTUARY FILING 1 FDR" SO TC WAS NOT CALCULATED

EASTONVILLE ROAD

PROPOSED CONDITIONS

DESIGN STORM: 100-YEAR

Calc'd by:	CM
Checked by:	CM
Date:	9/8/2023

HRGreen

		DIRECT RUNOFF						TOTAL RUNOFF				SWALE			PIPE				TRAVEL TIME			REMARKS
DESIGN POINT	BASIN ID	AREA (ac)	C_{100}	t_c (min)	C_{100}*A (ac)	I (in./ hr.)	Q (cfs)	t_c (min)	C_{100}*A (ac)	I (in./ hr.)	Q (cfs)	Q_{swale} (cfs)	C_{100}*A (ac)	SLOPE %	Q_{PIPE} (cfs)	C_{100}*A (ac)	SLOPE %	PIPE SIZE (ft)	LENGTH (ft)	VEL. (ft/s)	TRAVEL TIME (min)	
	OS1	85.16																				
1	G18*	321.53					365.2															BASIN OS1 AND G17 FLOW TO DP1 (DPG18), FOLLOWS HISTORIC DRAINAGE PATTERNS TO CHANNEL B
2	EA1	0.22	0.80	5.0	0.18	8.68	1.5								1.5	0.18	2.0	1.5	56	8.4	0.11	BASIN EA1 CAPTURED IN 5' TYPE R INLET @ DP2, PIPE TO DP3.1
3	EA2	0.25	0.79	5.0	0.20	8.68	1.7								1.7	0.20						BASIN EA2 CAPTURED IN 5' TYPE R INLET@ DP3, PIPE TO DP3.1
3.1								5.1	0.37	8.62	3.2				3.2	0.37	2.0	1.5	85	8.4	0.17	COMBINED DP2 & DP3 @ DP3.1, PIPE TO DP4 (POND A)
4	EA5	0.16	0.36	6.6	0.06	7.98	0.5	6.6	0.43	7.98	3.4											**COMBINED DP3.1 & BASIN EA5, TOTAL FLOW ENTERING POND A**
5	EA3	0.20	0.78	5.0	0.16	8.68	1.4								1.4	0.16	2.0	1.5	48	8.4	0.10	BASIN EA3 CAPTURED IN 5' TYPE R INLET @ DP5, PIPE TO DP6.1
6	EA4	0.17	0.75	5.0	0.13	8.68	1.1								1.1	0.13	2.0	1.5				BASIN EA4 CAPTURED IN 5' TYPE R INLET @ DP6, PIPE TO DP6.1
6.1								5.1	0.28	8.63	2.4				0.0	0.28	2.0	1.5	1146	8.4	2.27	DP3 & DP4 FLOW @ DP5.1, PIPE TO DP9.1
7	OS2	15.03	0.39	36.0	5.83	3.71	21.6								21.6	5.83	2.0	1.5	44	8.4	0.09	BASIN OS2 CAPTURED IN 18" FES, PIPE TO DP8.1
8	OS3	1.00	0.36	25.2	0.36	4.60	1.7								1.7	0.36	2.0	1.5	38	8.4	0.08	BASIN OS3 CAPTURED IN 18" FES, PIPE TO DP8.1
8.1								36.0	6.19	3.71	22.9				0.0	6.19	2.0	1.5	183	8.4	0.36	COMBINED DP7 & DP8 @ DP8.1, PIPE TO DP9.1
9.1								36.3	6.47	3.68	23.8	23.8	6.47	1.7					620	2.6	3.96	COMBINED DP6.1 & DP8.1 @ DP9.1, DISCHARGE TO ROADSIDE SWALE TO DP11
	EA6	0.70	0.96	5.5	0.67	8.43	5.7															BASIN EA6 @ DP10 (TEMPORARY SEDIMENT BASIN #1)
10	EA7	0.65	0.90	6.1	0.58	8.19	4.8	6.1	1.25	8.19	10.3											BASIN EA6 & EA7 @ DP10 (TEMPORARY SEDIMENT BASIN #1)
11	OS4	9.60	0.40	26.6	3.88	4.46	17.3	40.3	10.35	3.42	89.4	54.9	10.35	1.7	144.3	10.35	2.0	2.0	85	8.4	0.17	BASIN OS4, DP9.1 CAPTURED & MERIDIAN RANCH DPG15 (54.9 CFS) IN 30" FES @ DP11, PIPE TO DP12.1
12	OS5	40.26	0.40	31.7	15.91	4.02	64.0								64.0	15.91	2.0	2.0	616	8.4	1.22	BASIN OS5 CAPTUREDI N 48" FES @ DP12, PIPE TO DP12.1
12.1								33.0	26.26	3.93	103.1				103.1	26.26	2.0	3.5	891	8.4	1.77	COMBINED DP11 & DP12 @ DP12.1, PIPE TO DP13.1
13	OS8	11.42	0.36	17.7	4.11	5.53	22.7								22.7	4.11	2.0	2.0	28	8.4	0.06	BASIN OS8 CAPTURED @ DP13 IN TYPE C INLET, PIPE TO DP13.1
13.1								34.7	30.37	3.79	115.2											COMBINED DP12.1 & DP13, PIPE TO CHANNEL B
14	EA8	2.08	0.95	26.4	1.98	4.51	9.0								9.0	1.98	2.0	2.0	8	8.4	0.02	BASIN EA8 CAPTURED IN 10' TYPE R SUMP @ DP14, PIPE TO DP15.1
15	EA9	2.99	0.74	28.6	2.20	4.32	9.5								9.5	2.20	2.0	2.0	54	8.4	0.11	BASIN EA8 CAPTURED IN 10' TYPE R SUMP @ DP15, PIPE TO DP15.1
15.1								28.7	4.19	4.27	17.9				17.9	4.19	2.0	2.0	641	8.4	1.27	COMBINED DP14 & DP15, PIPE TO DP19.1
	OS6	60.97	0.36	53.2	21.95	2.76	60.6															
16	G06*	832.7									491.0											THE SANCTUARY FILING 1 DPG06 (491 CFS), BYPASSED UNDER EASTONVILLE ROAD IN DUAL 10' x 3.5' CULVERTS
17	EA10	1.34	0.92	15.0	1.24	5.94	7.4								7.4	1.24	2.0	2.0	52	8.4	0.10	BASIN EA10 CAPTURED IN 5' TYPE R SUMP, PIPE TO DP18.1
18	EA11	1.99	0.75	16.7	1.50	5.67	8.5								8.5	1.50	2.0	2.0	52	8.4	0.10	BASIN EA11 CAPTURED IN 5' TYPE R SUMP, PIPE TO DP18.1
18.1								16.8	2.73	5.63	15.4				15.4	2.73	2.0	2.0	157	8.4	0.31	COMBINED DP17 & DP18 @ DP18.1, PIPE TO DP19.1
19.1								30.0	6.92	4.16	28.8				28.8	6.92	2.0	2.0	42	8.4	0.08	COMBINED DP15.1 & DP18.1, PIPE TO DP20

HRGreen

EASTONVILLE ROAD
PROPOSED CONDITIONS
DESIGN STORM: 100-YEAR

Calc'd by:	CM
Checked by:	CM
Date:	9/8/2023

		DIRECT RUNOFF						TOTAL RUNOFF				SWALE			PIPE				TRAVEL TIME			REMARKS
DESIGN POINT	BASIN ID	AREA (ac)	C_{100}	t_c (min)	C_{100}*A (ac)	I (in./ hr.)	Q (cfs)	t_c (min)	C_{100}*A (ac)	I (in./ hr.)	Q (cfs)	Q_{swale} (cfs)	C_{100}*A (ac)	SLOPE %	Q_{PIPE} (cfs)	C_{100}*A (ac)	SLOPE %	PIPE SIZE (ft)	LENGTH (ft)	VEL. (ft/s)	TRAVEL TIME (min)	
20	EA12	0.92	0.37	5.0	0.34	8.70	3.0	30.1	7.27	4.16	30.2											COMBINED DP19.1 & BASIN EA12, TOTAL FLOW ENTERING POND B
21	OS7	23.46	0.36	25.9	8.45	4.57	38.6															BASIN OS7 CAPTURED IN 30" FES, PIPED TO CHANNEL A
22	EA13	1.31	0.42	9.3	0.56	7.13	4.0															BASIN EA13 CAPTURED IN EX 18" CMP, PIPED ACROSS EASTONVILLE ROAD
23	EA14	13.13	0.37	24.8	4.91	4.68	23.0															BASIN EA14 CAPTURED IN EX 24" CMP, PIPED ACROSS EASTONVILLE ROAD
24	EA15	1.59	0.44	16.8	0.69	5.66	3.9															BASIN EA15 CAPTURED IN EX 36" CMP, PIPED ACROSS EASTONVILLE ROAD
																						* FLOWS TO THESE DESIGN POINTS WERE TAKEN FROM "THE SANCTUARY FILING 1 FDR" SO TC WAS NOT CALCULATED

APPENDIX C – HYDRAULIC CALCULATIONS

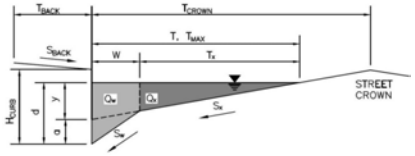
MHFD-Inlet, Version 5.01 (April 2021)

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **Eastonville Road**

Inlet ID: **DP2**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	12.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	24.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.013	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	24.0	24.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.9	8.8	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Spread Criterion

	Minor Storm	Major Storm	
Q_{allow} =	**14.7**	**30.0**	**cfs**

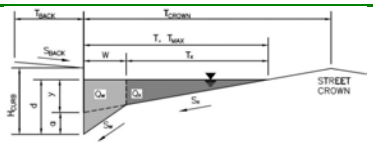
Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Eastonville Road
Inlet ID: DP2



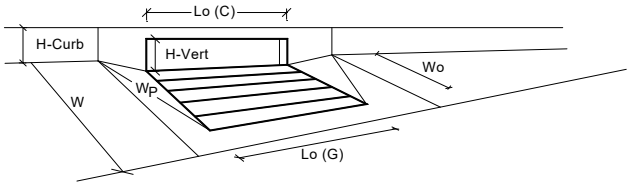
Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	12.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	24.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	24.0	24.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.9	8.8	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



Design Information (Input) — CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.9	7.3	inches
Grate Information		MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.32	0.44	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.75	0.93	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**5.1**	**8.1**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	0.8	1.5	cfs

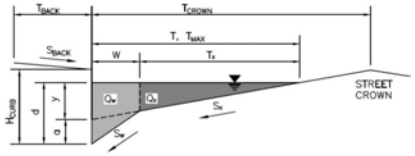
MHFD-Inlet, Version 5.01 (April 2021)

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **Eastonville Road**

Inlet ID: **DP3**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	11.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	24.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.013	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	24.0	24.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.9	8.8	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Spread Criterion

	Minor Storm	Major Storm	
Q_{allow} =	**14.7**	**30.0**	**cfs**

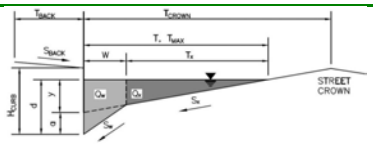
Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Eastonville Road
Inlet ID: DP3



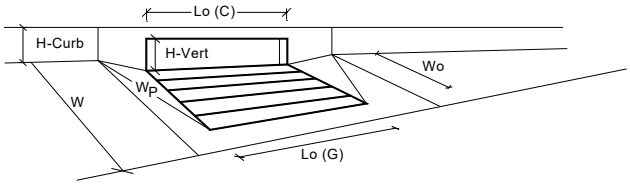
Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	11.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	24.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	24.0	24.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.9	8.8	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =			
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =			inches
Number of Unit Inlets (Grate or Curb Opening)	No =			
Water Depth at Flowline (outside of local depression)	Ponding Depth =			inches

Grate Information		MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate	L_o (G) =			feet
Width of a Unit Grate	W_o =			feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =			
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =			
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =			
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =			

Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =			feet
Height of Vertical Curb Opening in Inches	H_{vert} =			inches
Height of Curb Orifice Throat in Inches	H_{throat} =			inches
Angle of Throat (see USDCM Figure ST-5)	Theta =			degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =			feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =			
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =			
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =			

Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	N/A	N/A	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	N/A	N/A	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**			**cfs**
	$Q_{PEAK\ REQUIRED}$ =			cfs

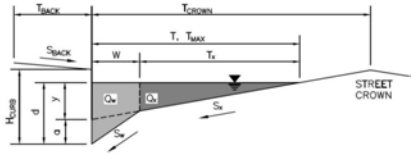
MHFD-Inlet, Version 5.01 (April 2021)

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **Eastonville Road**

Inlet ID: **DP5**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	11.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	24.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.017	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	24.0	24.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.9	8.8	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**16.8**	**34.3**	**cfs**

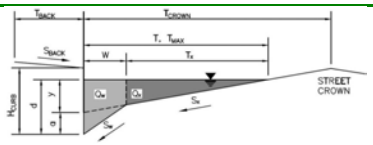
Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Eastonville Road
Inlet ID: DP5



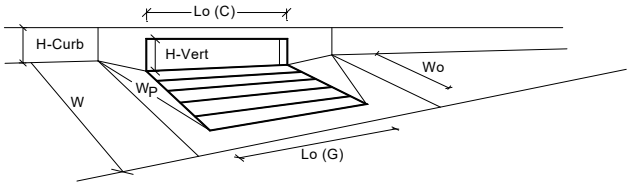
Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	11.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	24.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	24.0	24.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.9	8.8	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



Design Information (Input) — CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.9	7.3	inches
Grate Information		MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.32	0.44	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.75	0.93	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**5.1**	**8.1**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	0.7	1.4	cfs

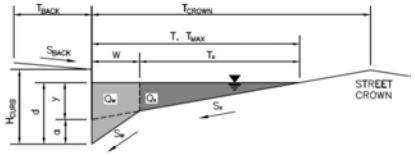
MHFD-Inlet, Version 5.01 (April 2021)

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **Eastonville Road**

Inlet ID: **DP6**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	11.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	24.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.017	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	24.0	24.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.9	8.8	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**17.0**	**34.3**	**cfs**

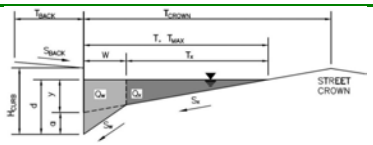
Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Eastonville Road
Inlet ID: DP6



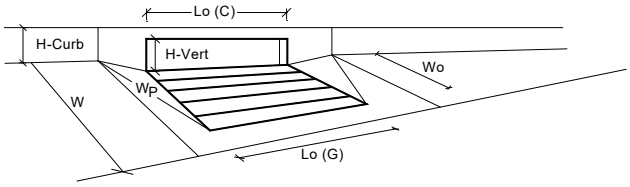
Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	11.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	24.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	24.0	24.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	3.5	3.5	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



Design Information (Input) — CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	3.5	3.5	inches

Grate Information		MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	

Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	

Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.13	0.13	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.45	0.45	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.99	0.99	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**1.2**	**1.2**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	0.5	1.1	cfs

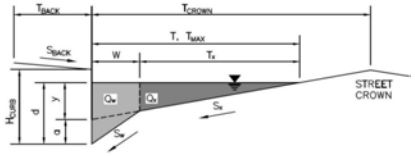
MHFD-Inlet, Version 5.01 (April 2021)

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **Eastonville Road**

Inlet ID: **DP14**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	26.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.007	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	26.0	26.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.9	8.8	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**10.8**	**27.4**	**cfs**

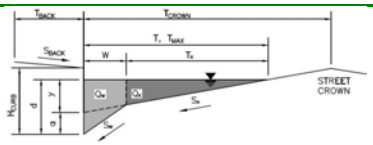
Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Eastonville Road
Inlet ID: DP14



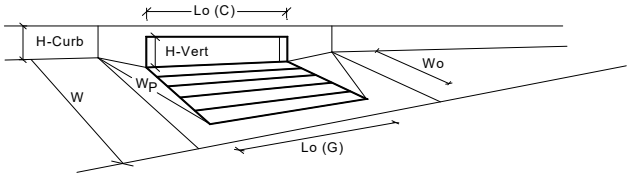
Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	26.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	26.0	26.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.9	8.8	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



Design Information (Input)	CDOT Type R Curb Opening	MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	2	2	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.9	7.8	inches

Grate Information		MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	

Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	

Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.32	0.48	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.55	0.73	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.93	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	

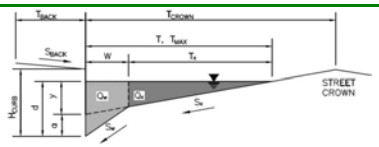
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**9.9**	**18.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	5.0	9.0	cfs

MHFD-Inlet, Version 5.01 (April 2021)

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **Eastonville Road**
Inlet ID: **DP15**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	26.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.007	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	26.0	26.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.9	8.8	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

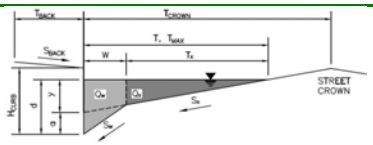
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	Q_{allow} =	**10.8**	**27.4**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Eastonville Road
Inlet ID: DP15



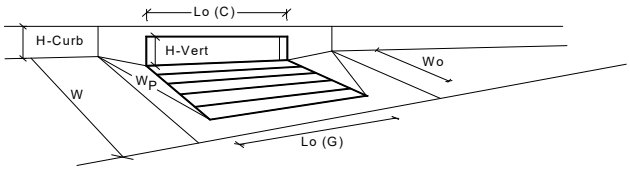
Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	26.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	26.0	26.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.9	8.8	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	2	2	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	5.9	7.8	inches
Grate Information			MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate		L_o (G) =	N/A	N/A	feet
Width of a Unit Grate		W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C_o (G) =	N/A	N/A	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches		H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)			MINOR	MAJOR	
Depth for Grate Midwidth		d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation		d_{Curb} =	0.32	0.48	ft
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	0.55	0.73	
Curb Opening Performance Reduction Factor for Long Inlets		RF_{Curb} =	0.93	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets		RF_{Grate} =	N/A	N/A	
			MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)		**Q_a =**	**9.9**	**18.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK\ REQUIRED}$ =	4.6	9.5	cfs

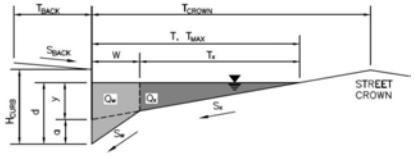
MHFD-Inlet, Version 5.01 (April 2021)

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **Eastonville Road**

Inlet ID: **DP17**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	26.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.006	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	26.0	26.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.9	8.8	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Spread Criterion

	Minor Storm	Major Storm	
Q_{allow} =	**10.0**	**25.4**	**cfs**

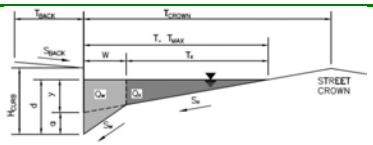
Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

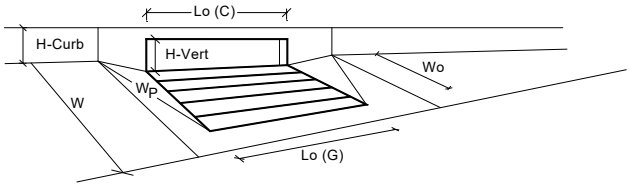
Project: **Eastonville Road**
Inlet ID: **DP17**



Gutter Geometry:				
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0		ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020		
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00		inches
Distance from Curb Face to Street Crown	T_{CROWN} =	26.0		ft
Gutter Width	W =	2.00		ft
Street Transverse Slope	S_X =	0.020		ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083		ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000		ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016		
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	26.0	26.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.9	8.8	inches
Check boxes are not applicable in SUMP conditions		☐	☐	
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



Design Information (Input)	CDOT Type R Curb Opening			
		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.9	7.8	inches
Grate Information		MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.32	0.48	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.75	0.99	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**5.1**	**8.9**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	4.0	7.4	cfs

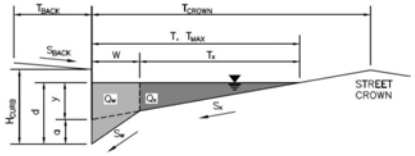
MHFD-Inlet, Version 5.01 (April 2021)

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **Eastonville Road**

Inlet ID: **DP18**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	26.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.006	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	26.0	26.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.9	8.8	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**10.0**	**25.4**	**cfs**

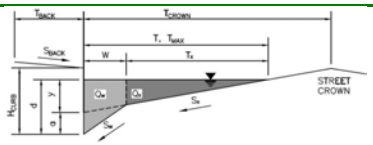
Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Eastonville Road
Inlet ID: DP18



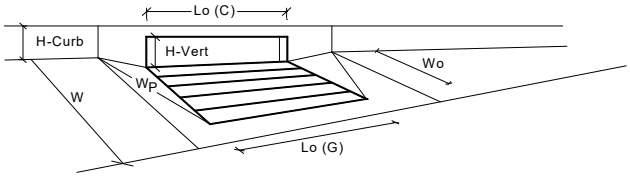
Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	26.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	26.0	26.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.9	8.8	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



Design Information (Input)	CDOT Type R Curb Opening	MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.9	7.8	inches

Grate Information		MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	

Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	

Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.32	0.48	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.75	0.99	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	

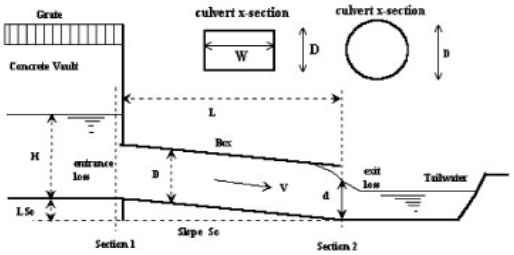
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**5.1**	**8.9**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	4.1	8.5	cfs

CULVERT SIZING (INLET vs. OUTLET CONTROL WITH TAILWATER EFFECTS)

MHFD-Culvert, Version 4.00 (May 2020)

Project: **EASTONVILLE ROAD**

ID: **DP7**



Design Information (Input):

Circular Culvert:	Barrel Diameter in Inches	D =	24	inches
	Inlet Edge Type (Choose from pull-down list)		Grooved Edge Projecting	
	OR:			
Box Culvert:	Barrel Height (Rise) in Feet	H (Rise) =		ft
	Barrel Width (Span) in Feet	W (Span) =		ft
	Inlet Edge Type (Choose from pull-down list)			
	Number of Barrels	# Barrels =	1	
	Inlet Elevation at Culvert Invert	Elev IN =	7022	ft
	Outlet Elevation **OR** Slope	Elev OUT =	7021.65	ft
	Culvert Length	L =	44	ft
	Manning's Roughness	n =	0.012	
	Bend Loss Coefficient	K_b =	0	
	Exit Loss Coefficient	K_x =	1	

Design Information (calculated):

Entrance Loss Coefficient	K_e =	0.20
Friction Loss Coefficient	K_f =	0.46
Sum of All Loss Coefficients	K_s =	1.66
Minimum Energy Condition Coefficient	KE_{low} =	-0.0119
Orifice Inlet Condition Coefficient	C_d =	0.67

Calculations of Culvert Capacity (output):

Backwater calculations required to obtain Outlet Control Flowrate when HWo < 0.75 * Culvert Rise

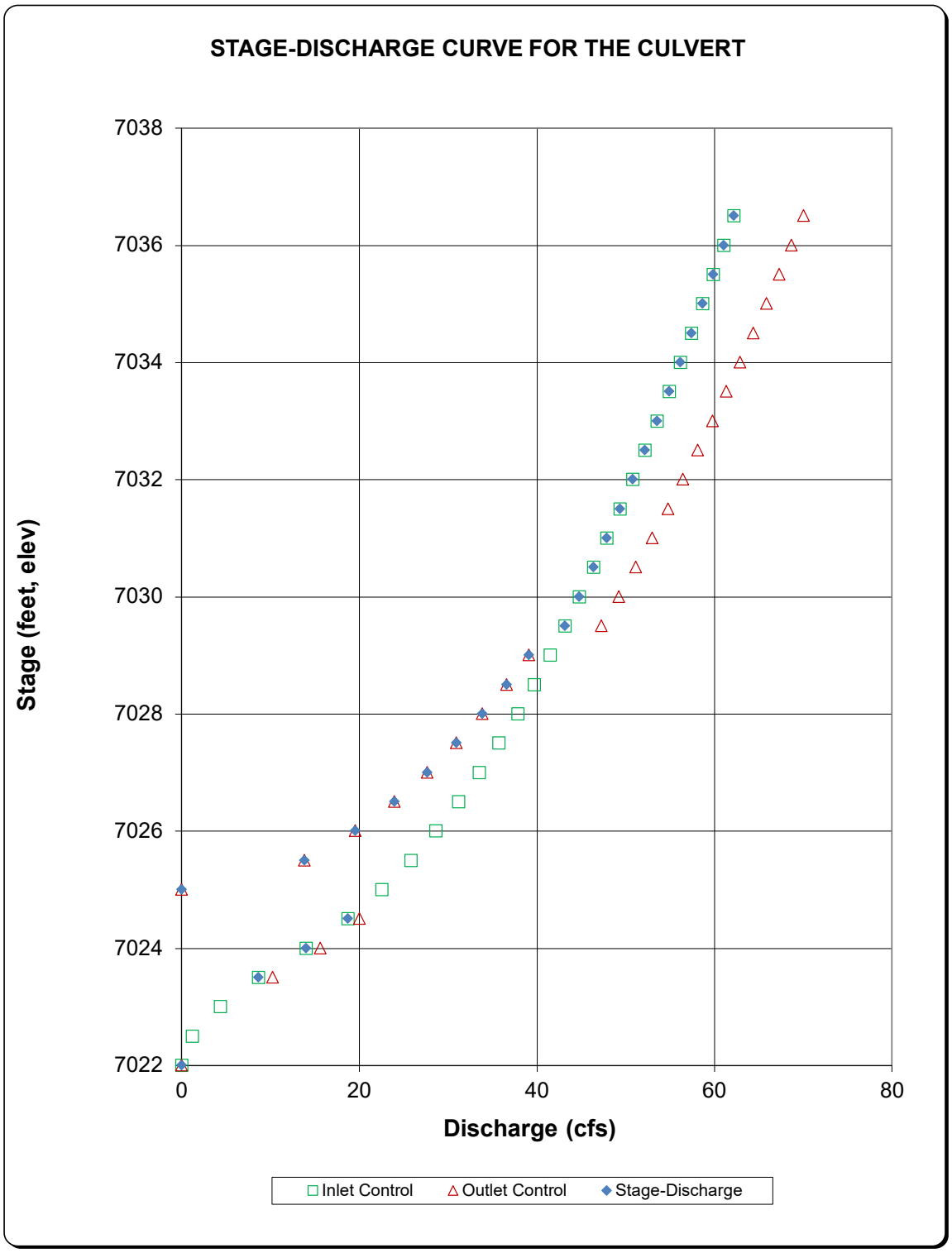
DP7
Q100 = 21.6 cfs

Headwater Surface Elevation (ft)	Tailwater Surface Elevation (ft)	Inlet Control Equation Used	Inlet Control Flowrate (cfs)	Outlet Control Flowrate (cfs)	Controlling Culvert Flowrate (cfs)	Flow Control Used
7022.00		No Flow (WS < inlet)	0.00	0.00	**0.00**	N/A
7022.50		Min. Energy. Eqn.	1.21	#N/A	#N/A	#N/A
7023.00		Min. Energy. Eqn.	4.36	#N/A	#N/A	#N/A
7023.50		Regression Eqn.	8.67	10.29	**8.67**	INLET
7024.00		Regression Eqn.	14.01	15.63	**14.01**	INLET
7024.50		Regression Eqn.	18.74	20.01	**18.74**	INLET
7025.00	7025.00	Regression Eqn.	22.57	0.00	**0.00**	N/A
7025.50	7025.00	Regression Eqn.	25.81	13.85	**13.85**	OUTLET
7026.00	7025.00	Regression Eqn.	28.61	19.57	**19.57**	OUTLET
7026.50	7025.00	Regression Eqn.	31.21	23.96	**23.96**	OUTLET
7027.00	7025.00	Regression Eqn.	33.53	27.66	**27.66**	OUTLET
7027.50	7025.00	Regression Eqn.	35.75	30.92	**30.92**	OUTLET
7028.00	7025.00	Regression Eqn.	37.86	33.87	**33.87**	OUTLET
7028.50	7025.00	Orifice Eqn.	39.71	36.59	**36.59**	OUTLET
7029.00	7025.00	Orifice Eqn.	41.48	39.11	**39.11**	OUTLET
7029.50		Orifice Eqn.	43.17	47.29	**43.17**	INLET
7030.00		Orifice Eqn.	44.80	49.27	**44.80**	INLET
7030.50		Orifice Eqn.	46.37	51.18	**46.37**	INLET
7031.00		Orifice Eqn.	47.89	53.01	**47.89**	INLET
7031.50		Orifice Eqn.	49.37	54.78	**49.37**	INLET
7032.00		Orifice Eqn.	50.81	56.50	**50.81**	INLET
7032.50		Orifice Eqn.	52.19	58.17	**52.19**	INLET
7033.00		Orifice Eqn.	53.55	59.79	**53.55**	INLET
7033.50		Orifice Eqn.	54.91	61.36	**54.91**	INLET
7034.00		Orifice Eqn.	56.16	62.90	**56.16**	INLET
7034.50		Orifice Eqn.	57.42	64.40	**57.42**	INLET
7035.00		Orifice Eqn.	58.66	65.87	**58.66**	INLET
7035.50		Orifice Eqn.	59.87	67.31	**59.87**	INLET
7036.00		Orifice Eqn.	61.05	68.71	**61.05**	INLET
7036.50		Orifice Eqn.	62.22	70.09	**62.22**	INLET
				Processing Time:	**01.04 Seconds**	

CULVERT SIZING (INLET vs. OUTLET CONTROL WITH TAILWATER EFFECTS)

MHFD-Culvert, Version 4.00 (May 2020)

Project: EASTONVILLE ROAD
ID: DP7



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Sep 8 2023

DP9.1 SWALE

Trapezoidal

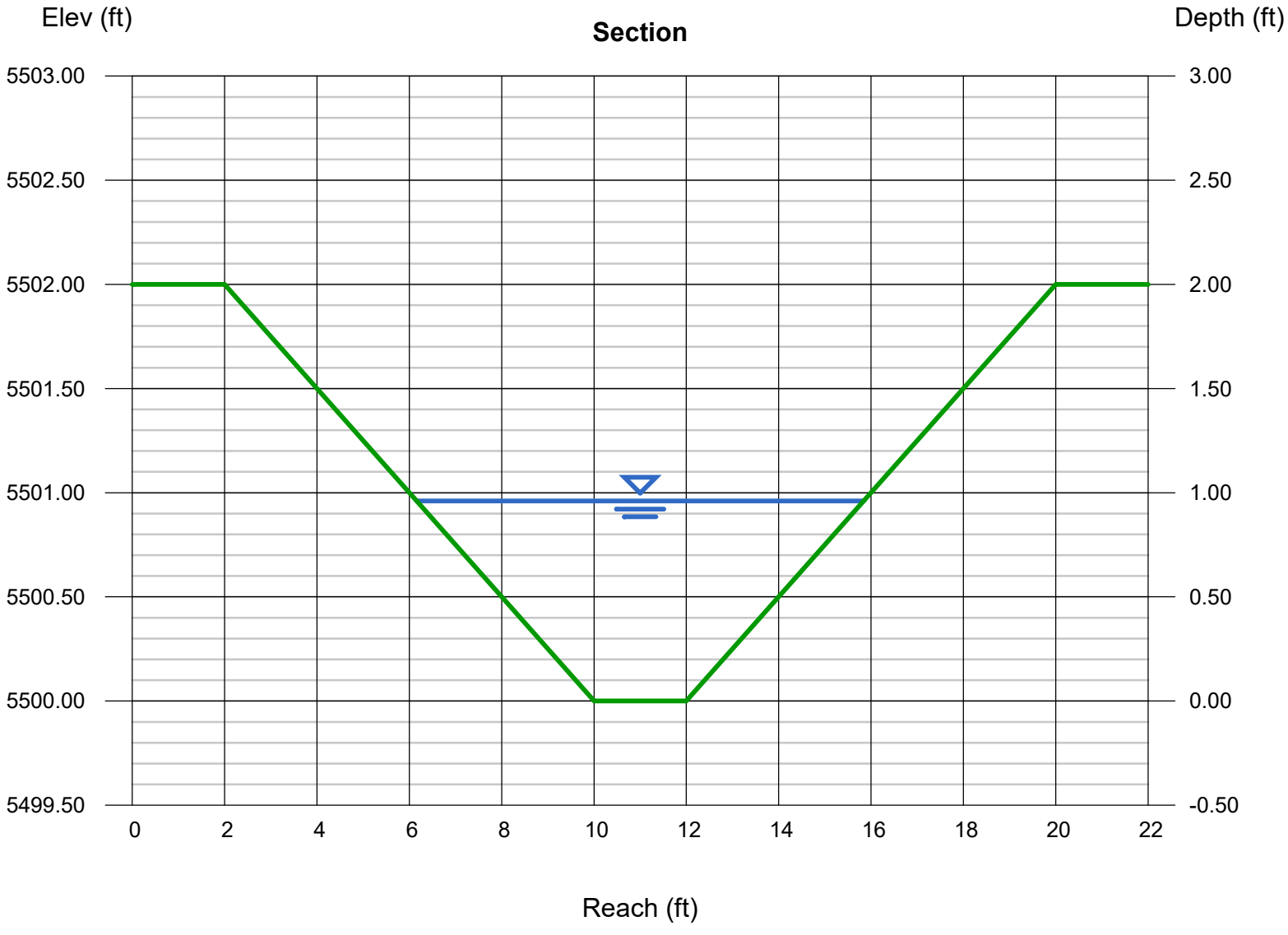
Bottom Width (ft)	= 2.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 5500.00
Slope (%)	= 1.60
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 23.80

Highlighted

Depth (ft)	= 0.96
Q (cfs)	= 23.80
Area (sqft)	= 5.61
Velocity (ft/s)	= 4.25
Wetted Perim (ft)	= 9.92
Crit Depth, Yc (ft)	= 0.96
Top Width (ft)	= 9.68
EGL (ft)	= 1.24



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Sep 8 2023

DP10 Swale

Triangular

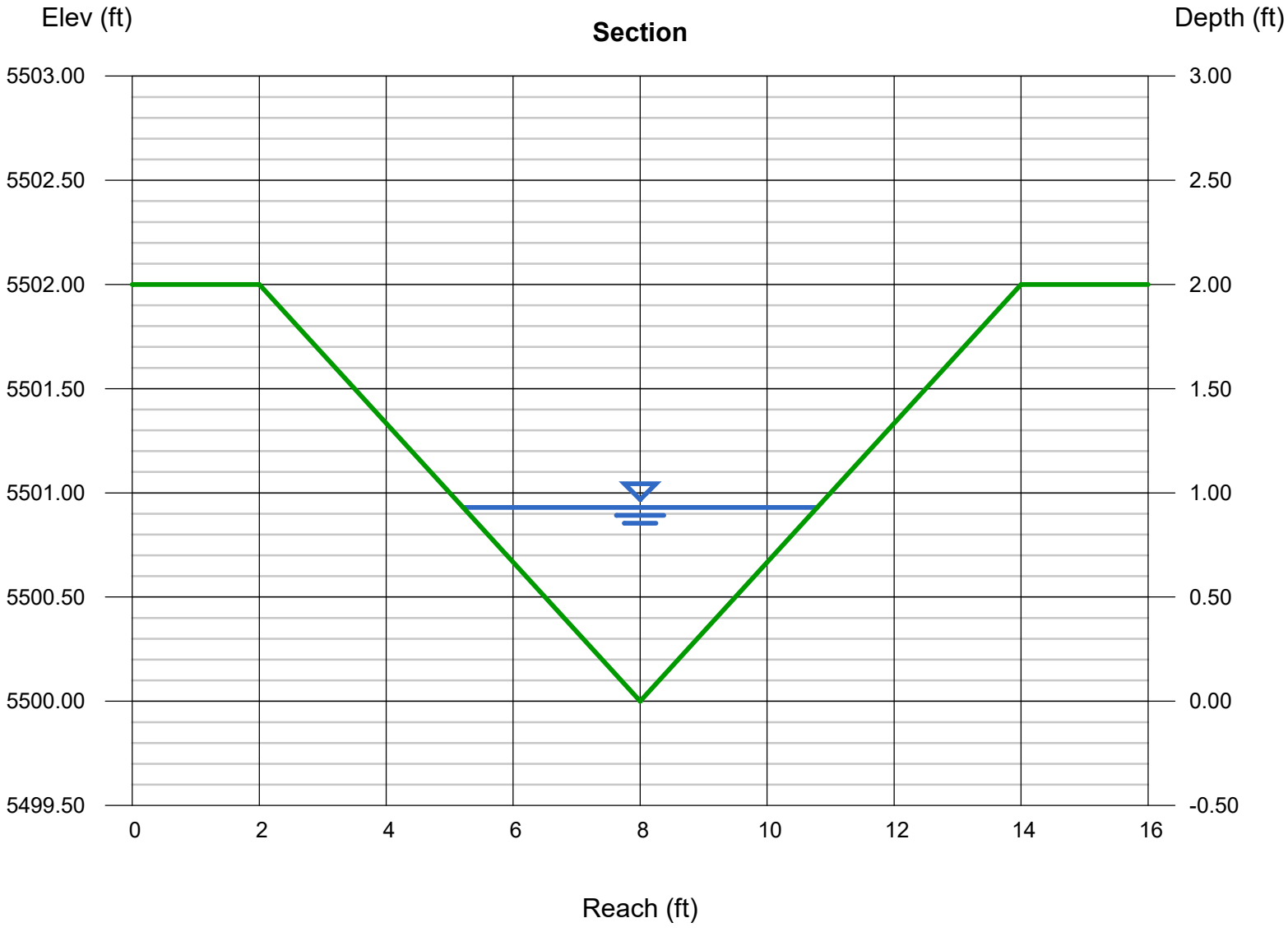
Side Slopes (z:1)	= 3.00, 3.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 5500.00
Slope (%)	= 2.00
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 10.30

Highlighted

Depth (ft)	= 0.93
Q (cfs)	= 10.30
Area (sqft)	= 2.59
Velocity (ft/s)	= 3.97
Wetted Perim (ft)	= 5.88
Crit Depth, Yc (ft)	= 0.94
Top Width (ft)	= 5.58
EGL (ft)	= 1.17

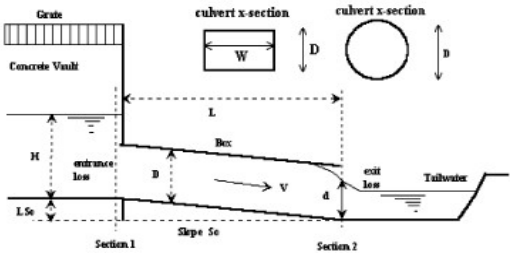


CULVERT SIZING (INLET vs. OUTLET CONTROL WITH TAILWATER EFFECTS)

MHFD-Culvert, Version 4.00 (May 2020)

Project: EASTONVILLE ROAD

ID: DP11



Design Information (Input):

Circular Culvert:	Barrel Diameter in Inches	D =	30	inches
	Inlet Edge Type (Choose from pull-down list)		Grooved Edge Projecting	
OR:				
Box Culvert:	Barrel Height (Rise) in Feet	H (Rise) =		ft
	Barrel Width (Span) in Feet	W (Span) =		ft
	Inlet Edge Type (Choose from pull-down list)			
	Number of Barrels	# Barrels =	2	
	Inlet Elevation at Culvert Invert	Elev IN =	7010	ft
	Outlet Elevation **OR** Slope	Elev OUT =	7001	ft
	Culvert Length	L =	77	ft
	Manning's Roughness	n =	0.012	
	Bend Loss Coefficient	K_b =	0	
	Exit Loss Coefficient	K_x =	1	

Design Information (calculated):

Entrance Loss Coefficient	K_e =	0.20
Friction Loss Coefficient	K_f =	0.60
Sum of All Loss Coefficients	K_s =	1.80
Minimum Energy Condition Coefficient	KE_{low} =	-0.3344
Orifice Inlet Condition Coefficient	C_d =	0.68

Calculations of Culvert Capacity (output):

Backwater calculations required to obtain Outlet Control Flowrate when HWo < 0.75 * Culvert Rise

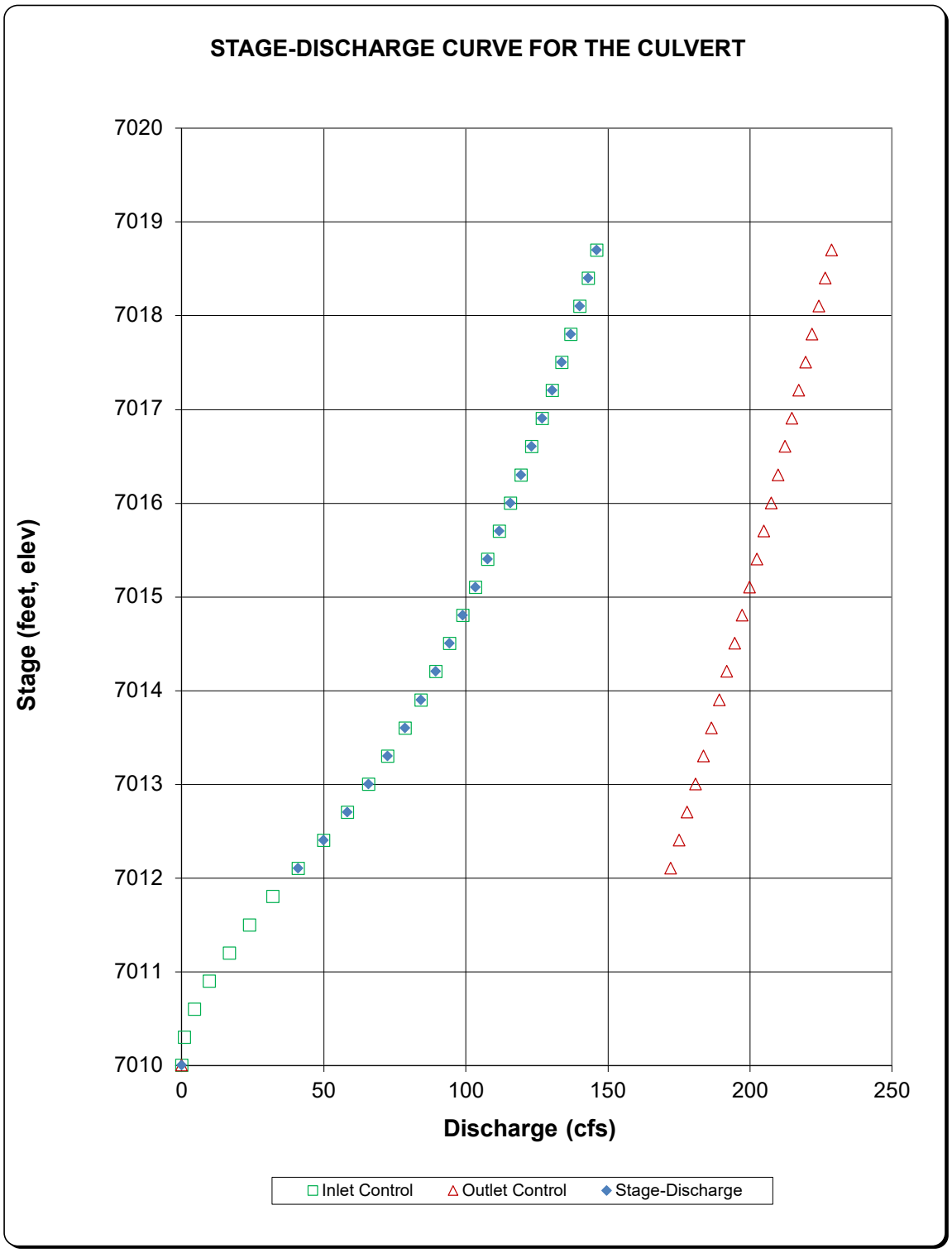
Headwater Surface Elevation (ft)	Tailwater Surface Elevation (ft)	Inlet Control Equation Used	Inlet Control Flowrate (cfs)	Outlet Control Flowrate (cfs)	Controlling Culvert Flowrate (cfs)	Flow Control Used
7010.00		No Flow (WS < inlet)	0.00	0.00	**0.00**	N/A
7010.30		Min. Energy. Eqn.	1.02	#N/A	#N/A	#N/A
7010.60		Min. Energy. Eqn.	4.46	#N/A	#N/A	#N/A
7010.90		Min. Energy. Eqn.	9.70	#N/A	#N/A	#N/A
7011.20		Min. Energy. Eqn.	16.72	#N/A	#N/A	#N/A
7011.50		Regression Eqn.	23.88	#N/A	#N/A	#N/A
7011.80		Regression Eqn.	32.02	#N/A	#N/A	#N/A
7012.10		Regression Eqn.	41.02	172.27	**41.02**	INLET
7012.40		Regression Eqn.	49.94	175.13	**49.94**	INLET
7012.70		Regression Eqn.	58.26	178.04	**58.26**	INLET
7013.00		Regression Eqn.	65.74	180.93	**65.74**	INLET
7013.30		Regression Eqn.	72.46	183.76	**72.46**	INLET
7013.60		Regression Eqn.	78.58	186.55	**78.58**	INLET
7013.90		Regression Eqn.	84.22	189.30	**84.22**	INLET
7014.20		Regression Eqn.	89.42	192.02	**89.42**	INLET
7014.50		Regression Eqn.	94.34	194.68	**94.34**	INLET
7014.80		Regression Eqn.	99.02	197.32	**99.02**	INLET
7015.10		Regression Eqn.	103.42	199.92	**103.42**	INLET
7015.40		Regression Eqn.	107.66	202.49	**107.66**	INLET
7015.70		Regression Eqn.	111.74	205.03	**111.74**	INLET
7016.00		Regression Eqn.	115.68	207.53	**115.68**	INLET
7016.30		Regression Eqn.	119.50	210.01	**119.50**	INLET
7016.60		Regression Eqn.	123.22	212.45	**123.22**	INLET
7016.90		Regression Eqn.	126.84	214.87	**126.84**	INLET
7017.20		Regression Eqn.	130.42	217.27	**130.42**	INLET
7017.50		Regression Eqn.	133.82	219.63	**133.82**	INLET
7017.80		Orifice Eqn.	137.00	221.97	**137.00**	INLET
7018.10		Orifice Eqn.	140.10	224.29	**140.10**	INLET
7018.40		Orifice Eqn.	143.14	226.58	**143.14**	INLET
7018.70		Orifice Eqn.	146.12	228.85	**146.12**	INLET
				Processing Time:	**00.70 Seconds**	

DP11
Q100 = 144.3 cfs

CULVERT SIZING (INLET vs. OUTLET CONTROL WITH TAILWATER EFFECTS)

MHFD-Culvert, Version 4.00 (May 2020)

Project: EASTONVILLE ROAD
ID: DP11



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Sep 8 2023

DP11 SWALE

Trapezoidal

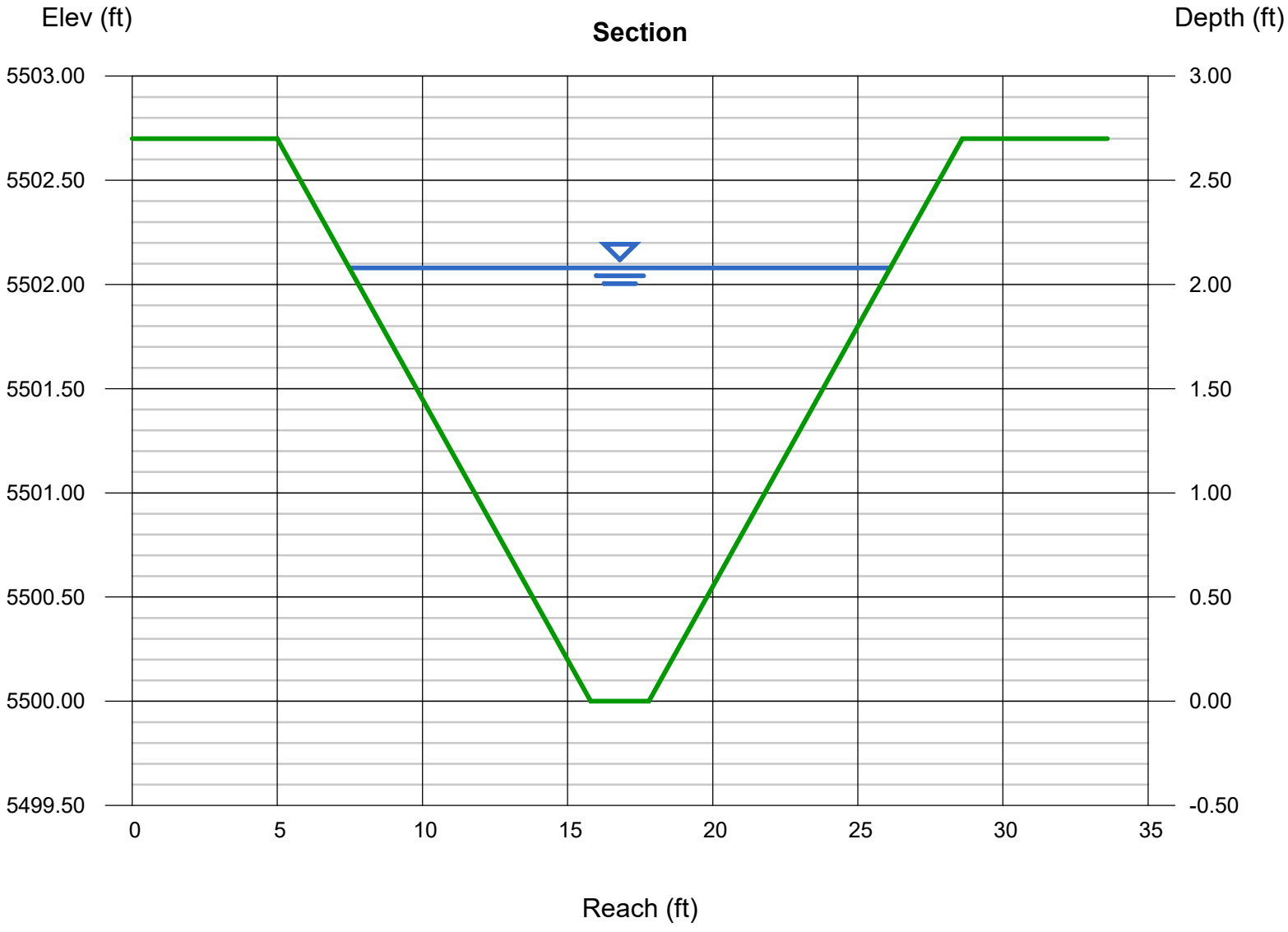
Bottom Width (ft)	= 2.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 2.70
Invert Elev (ft)	= 5500.00
Slope (%)	= 1.60
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 144.30

Highlighted

Depth (ft)	= 2.08
Q (cfs)	= 144.30
Area (sqft)	= 21.47
Velocity (ft/s)	= 6.72
Wetted Perim (ft)	= 19.15
Crit Depth, Yc (ft)	= 2.18
Top Width (ft)	= 18.64
EGL (ft)	= 2.78

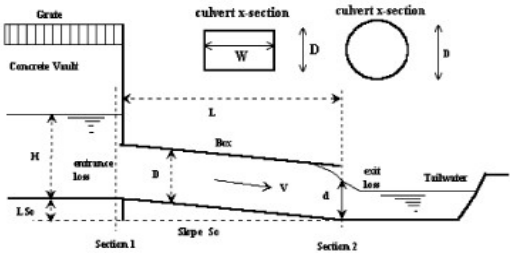


CULVERT SIZING (INLET vs. OUTLET CONTROL WITH TAILWATER EFFECTS)

MHFD-Culvert, Version 4.00 (May 2020)

Project: EASTONVILLE ROAD

ID: DP12



Design Information (Input):

Circular Culvert:	Barrel Diameter in Inches	D =	48	inches
	Inlet Edge Type (Choose from pull-down list)		Grooved Edge Projecting	
	OR:			
Box Culvert:	Barrel Height (Rise) in Feet	H (Rise) =		ft
	Barrel Width (Span) in Feet	W (Span) =		ft
	Inlet Edge Type (Choose from pull-down list)			
	Number of Barrels	# Barrels =	1	
	Inlet Elevation at Culvert Invert	Elev IN =	7005	ft
	Outlet Elevation **OR** Slope	Elev OUT =	7004.03	ft
	Culvert Length	L =	82	ft
	Manning's Roughness	n =	0.012	
	Bend Loss Coefficient	K_b =	0	
	Exit Loss Coefficient	K_x =	1	

Design Information (calculated):

Entrance Loss Coefficient	K_e =	0.20
Friction Loss Coefficient	K_f =	0.34
Sum of All Loss Coefficients	K_s =	1.54
Minimum Energy Condition Coefficient	KE_{low} =	-0.0218
Orifice Inlet Condition Coefficient	C_d =	0.67

Calculations of Culvert Capacity (output):

Backwater calculations required to obtain Outlet Control Flowrate when HWo < 0.75 * Culvert Rise

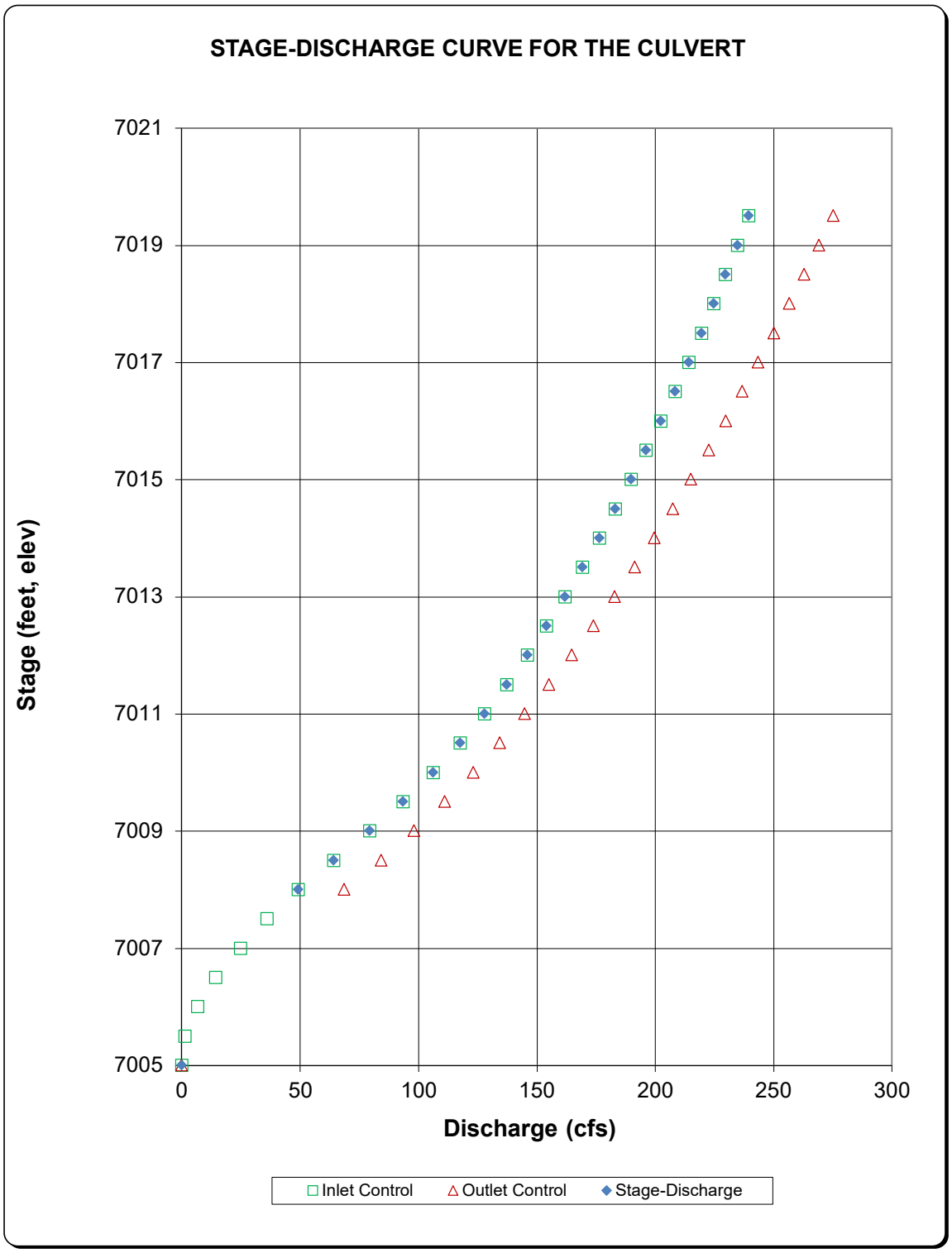
Headwater Surface Elevation (ft)	Tailwater Surface Elevation (ft)	Inlet Control Equation Used	Inlet Control Flowrate (cfs)	Outlet Control Flowrate (cfs)	Controlling Culvert Flowrate (cfs)	Flow Control Used
7005.00		No Flow (WS < inlet)	0.00	0.00	**0.00**	N/A
7005.50		Min. Energy. Eqn.	1.41	#N/A	#N/A	#N/A
7006.00		Min. Energy. Eqn.	6.62	#N/A	#N/A	#N/A
7006.50		Min. Energy. Eqn.	14.42	#N/A	#N/A	#N/A
7007.00		Min. Energy. Eqn.	24.74	#N/A	#N/A	#N/A
7007.50		Regression Eqn.	35.91	#N/A	#N/A	#N/A
7008.00		Regression Eqn.	49.22	68.69	**49.22**	INLET
7008.50		Regression Eqn.	64.21	84.22	**64.21**	INLET
7009.00		Regression Eqn.	79.41	98.27	**79.41**	INLET
7009.50		Regression Eqn.	93.51	111.15	**93.51**	INLET
7010.00		Regression Eqn.	106.17	123.14	**106.17**	INLET
7010.50		Regression Eqn.	117.52	134.36	**117.52**	INLET
7011.00		Regression Eqn.	127.81	145.02	**127.81**	INLET
7011.50		Regression Eqn.	137.22	155.13	**137.22**	INLET
7012.00		Regression Eqn.	145.96	164.77	**145.96**	INLET
7012.50		Regression Eqn.	154.16	174.03	**154.16**	INLET
7013.00		Regression Eqn.	161.92	182.90	**161.92**	INLET
7013.50		Regression Eqn.	169.31	191.43	**169.31**	INLET
7014.00		Regression Eqn.	176.41	199.62	**176.41**	INLET
7014.50		Regression Eqn.	183.21	207.56	**183.21**	INLET
7015.00		Regression Eqn.	189.76	215.23	**189.76**	INLET
7015.50		Regression Eqn.	196.13	222.63	**196.13**	INLET
7016.00		Regression Eqn.	202.33	229.83	**202.33**	INLET
7016.50		Regression Eqn.	208.36	236.84	**208.36**	INLET
7017.00		Regression Eqn.	214.24	243.62	**214.24**	INLET
7017.50		Orifice Eqn.	219.54	250.27	**219.54**	INLET
7018.00		Orifice Eqn.	224.70	256.72	**224.70**	INLET
7018.50		Orifice Eqn.	229.75	263.03	**229.75**	INLET
7019.00		Orifice Eqn.	234.71	269.20	**234.71**	INLET
7019.50		Orifice Eqn.	239.53	275.24	**239.53**	INLET
				Processing Time:	**01.06 Seconds**	

DP12
Q100 = 64.0 cfs

CULVERT SIZING (INLET vs. OUTLET CONTROL WITH TAILWATER EFFECTS)

MHFD-Culvert, Version 4.00 (May 2020)

Project: EASTONVILLE ROAD
ID: DP12



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Sep 8 2023

DP12 SWALE

Trapezoidal

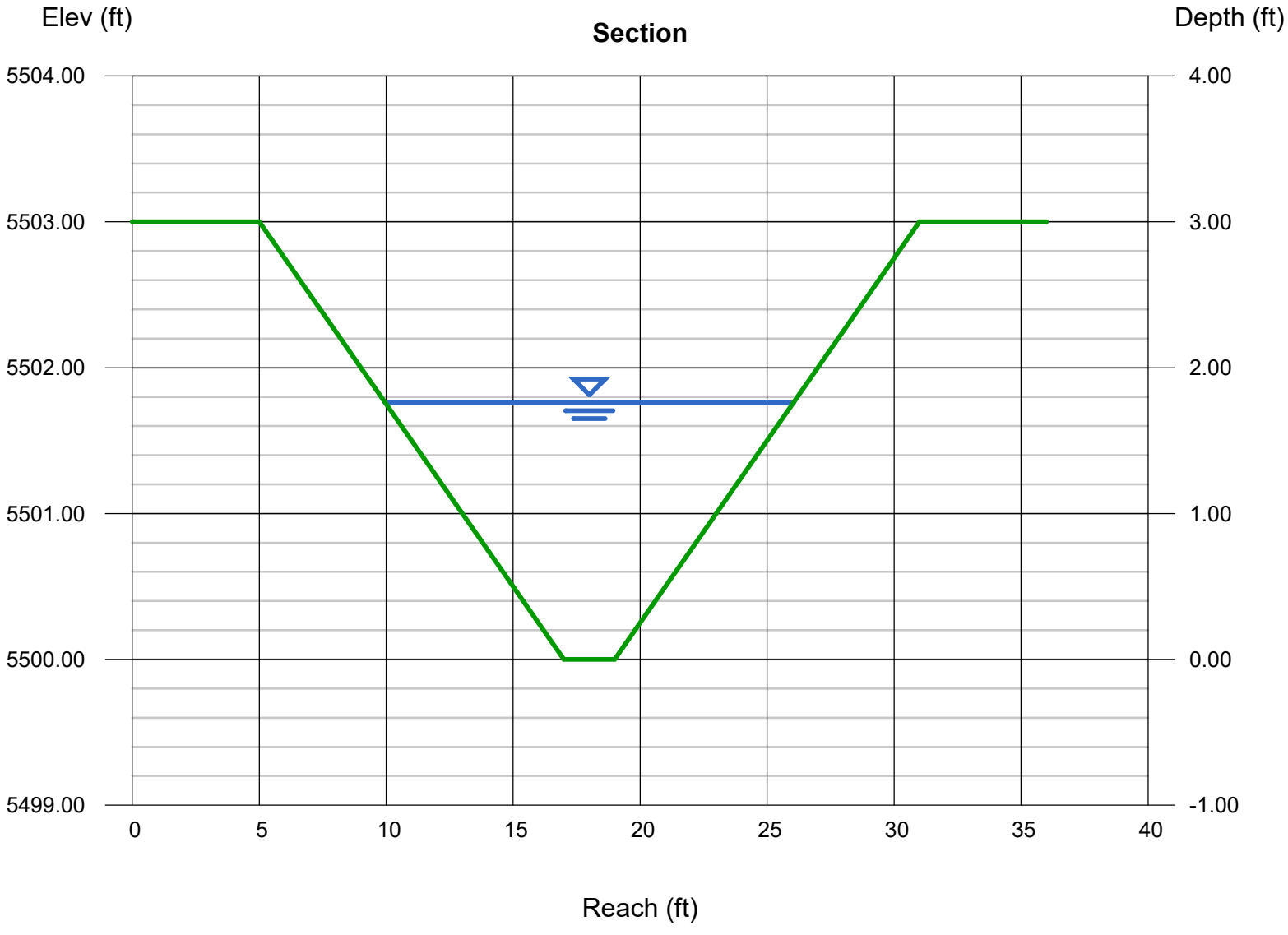
Bottom Width (ft)	= 2.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 5500.00
Slope (%)	= 0.70
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 64.00

Highlighted

Depth (ft)	= 1.76
Q (cfs)	= 64.00
Area (sqft)	= 15.91
Velocity (ft/s)	= 4.02
Wetted Perim (ft)	= 16.51
Crit Depth, Yc (ft)	= 1.52
Top Width (ft)	= 16.08
EGL (ft)	= 2.01

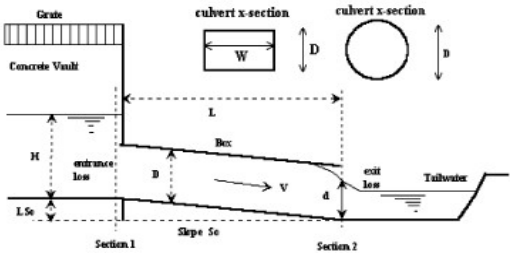


CULVERT SIZING (INLET vs. OUTLET CONTROL WITH TAILWATER EFFECTS)

MHFD-Culvert, Version 4.00 (May 2020)

Project: **Eastonville Road**

ID: **DP16**



Design Information (Input):

Circular Culvert:

Barrel Diameter in Inches	D =		inches
Inlet Edge Type (Choose from pull-down list)			

OR:

Box Culvert:

Barrel Height (Rise) in Feet	H (Rise) =	3.50	ft
Barrel Width (Span) in Feet	W (Span) =	10.00	ft
Inlet Edge Type (Choose from pull-down list)		1:1 Bevel w/ 45 deg. Flared Wingwall	
Number of Barrels	# Barrels =	2	
Inlet Elevation at Culvert Invert	Elev IN =	6997	ft
Outlet Elevation **OR** Slope	So =	0.0165	ft/ft
Culvert Length	L =	110	ft
Manning's Roughness	n =	0.013	
Bend Loss Coefficient	K_b =	0	
Exit Loss Coefficient	K_x =	1	

Design Information (calculated):

Entrance Loss Coefficient	K_e =	0.50
Friction Loss Coefficient	K_f =	0.38
Sum of All Loss Coefficients	K_s =	1.88
Minimum Energy Condition Coefficient	KE_{low} =	-0.0001
Orifice Inlet Condition Coefficient	C_d =	0.65

Calculations of Culvert Capacity (output):

Backwater calculations required to obtain Outlet Control Flowrate when HWo < 0.75 * Culvert Rise

DP16
Q100 = 491.0 cfs

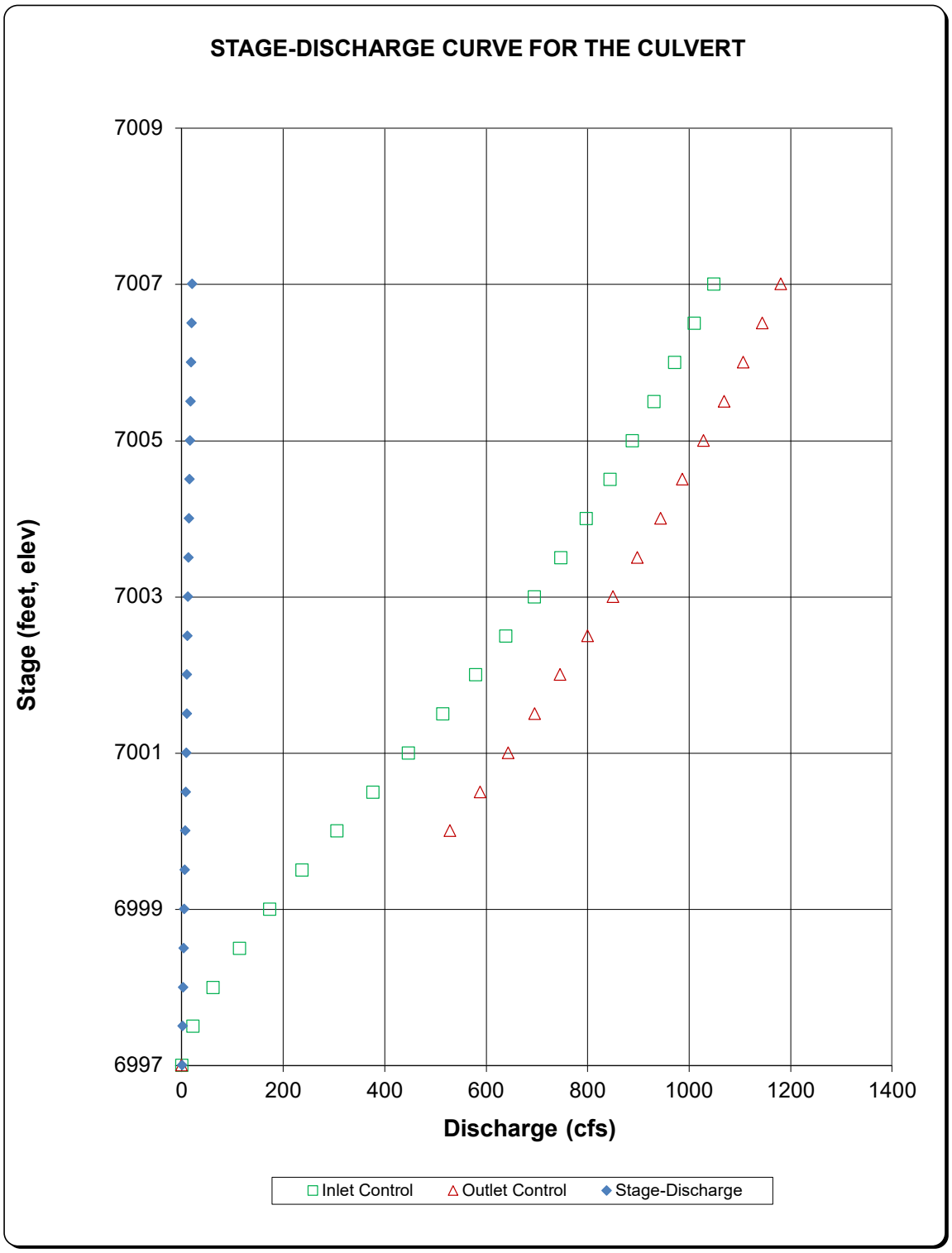
Headwater Surface Elevation (ft)	Tailwater Surface Elevation (ft)	Inlet Control Equation Used	Inlet Control Flowrate (cfs)	Outlet Control Flowrate (cfs)	Controlling Culvert Flowrate (cfs)	Flow Control Used
6997.00	6995.25	No Flow (WS < inlet)	0.00	0.00	**0.00**	N/A
6997.50		Min. Energy. Eqn.	21.86	#N/A	#N/A	#N/A
6998.00		Min. Energy. Eqn.	61.82	#N/A	#N/A	#N/A
6998.50		Min. Energy. Eqn.	113.50	#N/A	#N/A	#N/A
6999.00		Regression Eqn.	172.94	#N/A	#N/A	#N/A
6999.50		Regression Eqn.	237.14	#N/A	#N/A	#N/A
7000.00		Regression Eqn.	305.86	529.17	**305.86**	INLET
7000.50		Regression Eqn.	376.74	588.75	**376.74**	INLET
7001.00		Regression Eqn.	447.08	644.17	**447.08**	INLET
7001.50		Regression Eqn.	514.76	696.17	**514.76**	INLET
7002.00		Regression Eqn.	578.74	745.66	**578.74**	INLET
7002.50		Regression Eqn.	638.70	799.92	**638.70**	INLET
7003.00		Regression Eqn.	694.82	850.72	**694.82**	INLET
7003.50		Regression Eqn.	747.46	898.67	**747.46**	INLET
7004.00		Regression Eqn.	797.02	944.17	**797.02**	INLET
7004.50		Regression Eqn.	843.90	987.58	**843.90**	INLET
7005.00		Regression Eqn.	888.42	1,029.17	**888.42**	INLET
7005.50		Regression Eqn.	930.88	1,069.13	**930.88**	INLET
7006.00		Regression Eqn.	971.54	1,107.66	**971.54**	INLET
7006.50		Regression Eqn.	1,010.62	1,144.89	**1,010.62**	INLET
7007.00		Regression Eqn.	1,048.26	1,180.95	**1,048.26**	INLET

Processing Time: **00.16 Seconds**

CULVERT SIZING (INLET vs. OUTLET CONTROL WITH TAILWATER EFFECTS)

MHFD-Culvert, Version 4.00 (May 2020)

Project: Eastonville Road
ID: DP16

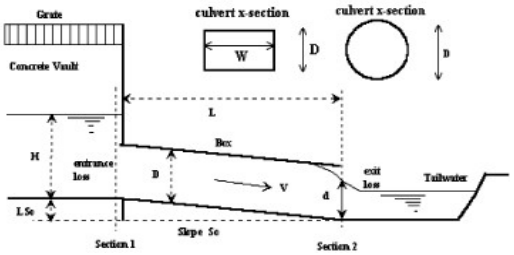


CULVERT SIZING (INLET vs. OUTLET CONTROL WITH TAILWATER EFFECTS)

MHFD-Culvert, Version 4.00 (May 2020)

Project: EASTONVILLE ROAD

ID: DP21



Design Information (Input):

Circular Culvert:	Barrel Diameter in Inches	D =	30	inches
	Inlet Edge Type (Choose from pull-down list)		Grooved Edge Projecting	
OR:				
Box Culvert:	Barrel Height (Rise) in Feet	H (Rise) =		ft
	Barrel Width (Span) in Feet	W (Span) =		ft
	Inlet Edge Type (Choose from pull-down list)			
	Number of Barrels	# Barrels =	1	
	Inlet Elevation at Culvert Invert	Elev IN =	6992.64	ft
	Outlet Elevation **OR** Slope	Elev OUT =	6991.36	ft
	Culvert Length	L =	113	ft
	Manning's Roughness	n =	0.012	
	Bend Loss Coefficient	K_b =	0	
	Exit Loss Coefficient	K_x =	1	

Design Information (calculated):

Entrance Loss Coefficient	K_e =	0.20
Friction Loss Coefficient	K_f =	0.88
Sum of All Loss Coefficients	K_s =	2.08
Minimum Energy Condition Coefficient	KE_{low} =	-0.0218
Orifice Inlet Condition Coefficient	C_d =	0.67

Calculations of Culvert Capacity (output):

Backwater calculations required to obtain Outlet Control Flowrate when HWo < 0.75 * Culvert Rise

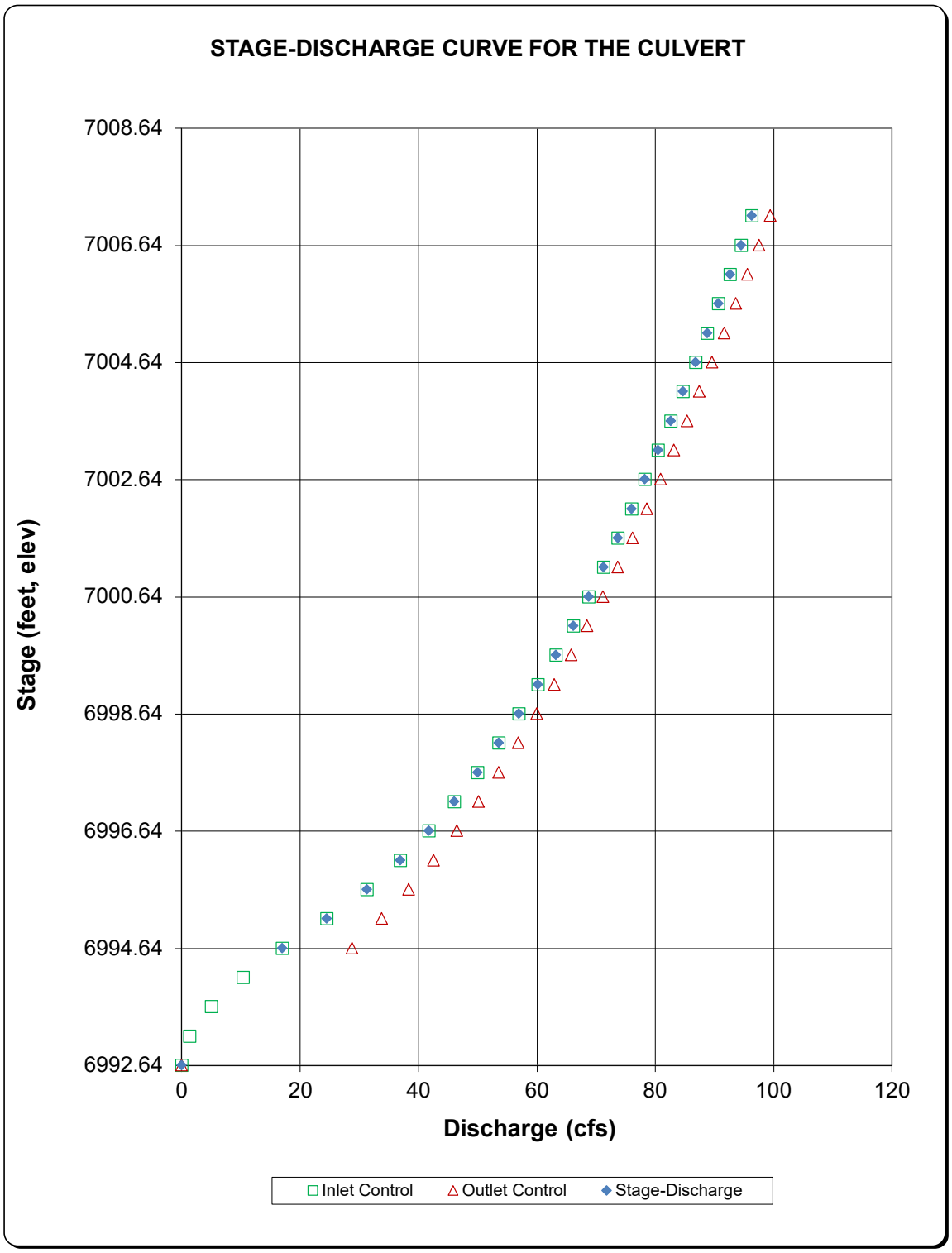
DP16
Q100 = 38.6 cfs

Headwater Surface Elevation (ft)	Tailwater Surface Elevation (ft)	Inlet Control Equation Used	Inlet Control Flowrate (cfs)	Outlet Control Flowrate (cfs)	Controlling Culvert Flowrate (cfs)	Flow Control Used
6992.64		No Flow (WS < inlet)	0.00	0.00	**0.00**	N/A
6993.14		Min. Energy. Eqn.	1.33	#N/A	#N/A	#N/A
6993.64		Min. Energy. Eqn.	5.03	#N/A	#N/A	#N/A
6994.14		Regression Eqn.	10.34	#N/A	#N/A	#N/A
6994.64		Regression Eqn.	17.00	28.78	**17.00**	INLET
6995.14		Regression Eqn.	24.51	33.84	**24.51**	INLET
6995.64		Regression Eqn.	31.27	38.40	**31.27**	INLET
6996.14		Regression Eqn.	36.95	42.60	**36.95**	INLET
6996.64		Regression Eqn.	41.81	46.50	**41.81**	INLET
6997.14		Regression Eqn.	46.11	50.15	**46.11**	INLET
6997.64		Regression Eqn.	50.00	53.59	**50.00**	INLET
6998.14		Regression Eqn.	53.61	56.86	**53.61**	INLET
6998.64		Regression Eqn.	57.01	59.98	**57.01**	INLET
6999.14		Regression Eqn.	60.18	62.96	**60.18**	INLET
6999.64		Regression Eqn.	63.23	65.82	**63.23**	INLET
7000.14		Regression Eqn.	66.16	68.55	**66.16**	INLET
7000.64		Orifice Eqn.	68.76	71.20	**68.76**	INLET
7001.14		Orifice Eqn.	71.26	73.75	**71.26**	INLET
7001.64		Orifice Eqn.	73.71	76.22	**73.71**	INLET
7002.14		Orifice Eqn.	76.02	78.61	**76.02**	INLET
7002.64		Orifice Eqn.	78.31	80.94	**78.31**	INLET
7003.14		Orifice Eqn.	80.51	83.20	**80.51**	INLET
7003.64		Orifice Eqn.	82.64	85.40	**82.64**	INLET
7004.14		Orifice Eqn.	84.73	87.50	**84.73**	INLET
7004.64		Orifice Eqn.	86.81	89.60	**86.81**	INLET
7005.14		Orifice Eqn.	88.81	91.66	**88.81**	INLET
7005.64		Orifice Eqn.	90.72	93.67	**90.72**	INLET
7006.14		Orifice Eqn.	92.63	95.63	**92.63**	INLET
7006.64		Orifice Eqn.	94.51	97.56	**94.51**	INLET
7007.14		Orifice Eqn.	96.34	99.45	**96.34**	INLET
				Processing Time:	**00.96 Seconds**	

CULVERT SIZING (INLET vs. OUTLET CONTROL WITH TAILWATER EFFECTS)

MHFD-Culvert, Version 4.00 (May 2020)

Project: **EASTONVILLE ROAD**
ID: **DP21**



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Sep 8 2023

DP21 SWALE

Trapezoidal

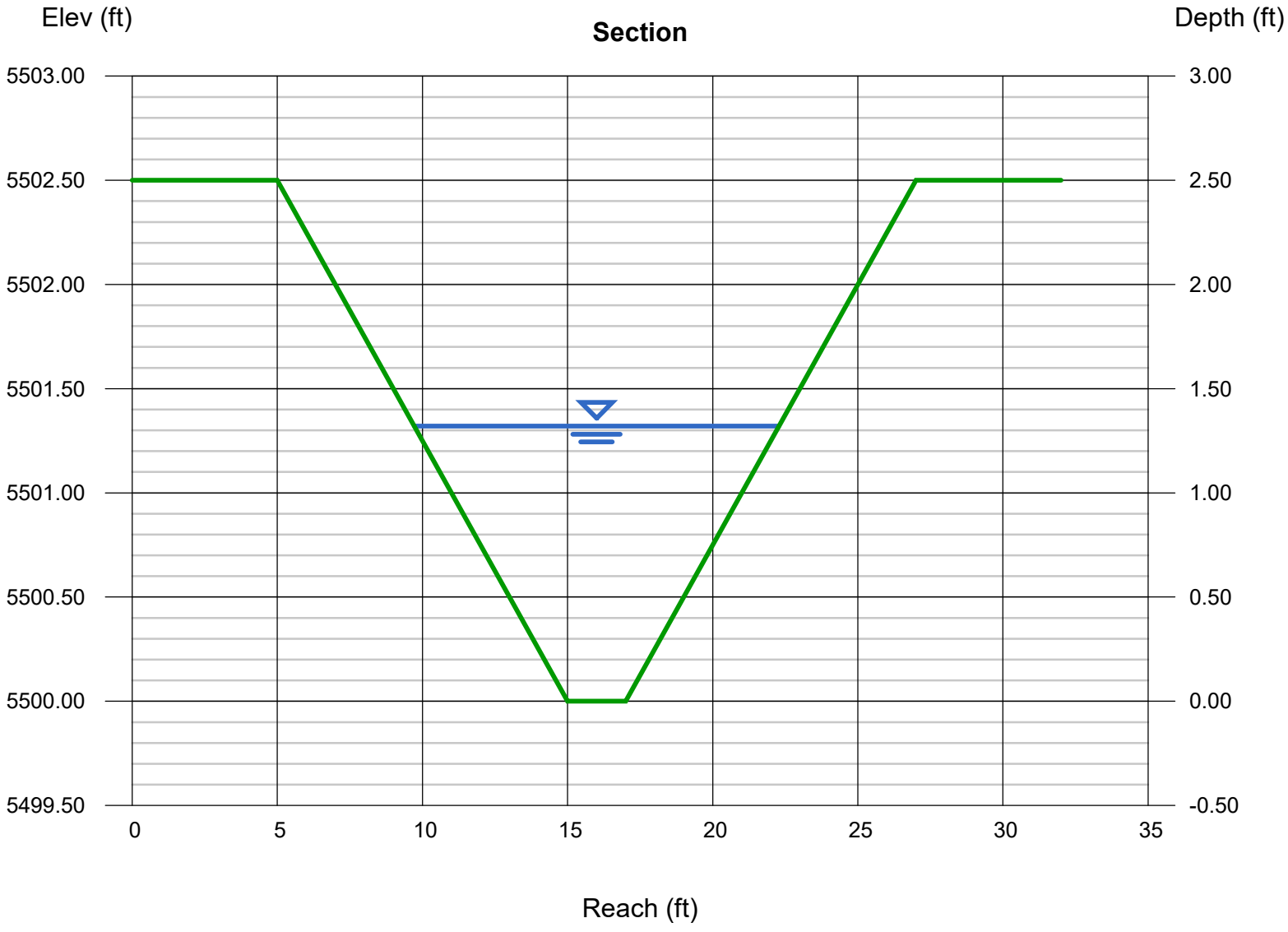
Bottom Width (ft)	= 2.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 2.50
Invert Elev (ft)	= 5500.00
Slope (%)	= 1.00
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 38.60

Highlighted

Depth (ft)	= 1.32
Q (cfs)	= 38.60
Area (sqft)	= 9.61
Velocity (ft/s)	= 4.02
Wetted Perim (ft)	= 12.88
Crit Depth, Yc (ft)	= 1.20
Top Width (ft)	= 12.56
EGL (ft)	= 1.57



APPENDIX D – WATER QUALITY & DETENTION

Site-Level Low Impact Development (LID) Design Effective Impervious Calculator

LID Credit by Impervious Reduction Factor (IRF) Method

UD-BMP (Version 3.06, November 2016)

User Input

Calculated cells

				Designer:	**NQJ**
				Company:	**HR GREEN**
***Design Storm: 1-Hour Rain Depth	WQCV Event	0.60	inches	**Date:**	**September 2, 2022**
***Minor Storm: 1-Hour Rain Depth	5-Year Event	1.50	inches	**Project:**	**EASTONVILLE ROAD**
***Major Storm: 1-Hour Rain Depth	100-Year Event	2.52	inches	**Location:**	**POND A**
Optional User Defined Storm	CUHP				
(CUHP) NOAA 1 Hour Rainfall Depth and Frequency for User Defined Storm	100-Year Event				
Max Intensity for Optional User Defined Storm	0				

SITE INFORMATION (USER-INPUT)

Sub-basin Identifier	**EA1**	**EA2**	**EA5**											
Receiving Pervious Area Soil Type	Sandy Loam	Sandy Loam	Sandy Loam											
Total Area (ac., Sum of DCIA, UIA, RPA, & SPA)	0.220	0.250	0.160											
Directly Connected Impervious Area (DCIA, acres)	0.160	0.180	0.000											
Unconnected Impervious Area (UIA, acres)	0.000	0.000	0.000											
Receiving Pervious Area (RPA, acres)	0.000	0.000	0.160											
Separate Pervious Area (SPA, acres)	0.060	0.070	0.000											
RPA Treatment Type: Conveyance (C), Volume (V), or Permeable Pavement (PP)	C	C	V											

CALCULATED RESULTS (OUTPUT)

Total Calculated Area (ac, check against input)	0.220	0.250	0.160											
Directly Connected Impervious Area (DCIA, %)	72.7%	72.0%	0.0%											
Unconnected Impervious Area (UIA, %)	0.0%	0.0%	0.0%											
Receiving Pervious Area (RPA, %)	0.0%	0.0%	100.0%											
Separate Pervious Area (SPA, %)	27.3%	28.0%	0.0%											
A_R (RPA / UIA)	0.000	0.000	0.000											
I_a Check	1.000	1.000	1.000											
f / I for WQCV Event:	1.7	1.7	1.7											
f / I for 5-Year Event:	0.5	0.5	0.5											
f / I for 100-Year Event:	0.3	0.3	0.3											
f / I for Optional User Defined Storm CUHP:														
IRF for WQCV Event:	1.00	1.00	0.00											
IRF for 5-Year Event:	1.00	1.00	1.00											
IRF for 100-Year Event:	1.00	1.00	1.00											
IRF for Optional User Defined Storm CUHP:														
Total Site Imperviousness: I_{total}	72.7%	72.0%	0.0%											
Effective Imperviousness for WQCV Event:	72.7%	72.0%	0.0%											
Effective Imperviousness for 5-Year Event:	72.7%	72.0%	0.0%											
Effective Imperviousness for 100-Year Event:	72.7%	72.0%	0.0%											
Effective Imperviousness for Optional User Defined Storm CUHP:														

LID / EFFECTIVE IMPERVIOUSNESS CREDITS

WQCV Event CREDIT: Reduce Detention By:	0.0%	0.0%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
This line only for 10-Year Event	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
100-Year Event CREDIT**: Reduce Detention By:	0.0%	0.1%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
User Defined CUHP CREDIT: Reduce Detention By:														

Total Site Imperviousness:	**54.0%**
Total Site Effective Imperviousness for WQCV Event:	**54.0%**
Total Site Effective Imperviousness for 5-Year Event:	**54.0%**
Total Site Effective Imperviousness for 100-Year Event:	**54.0%**
Total Site Effective Imperviousness for Optional User Defined Storm CUHP:	

Notes:

* Use Green-Ampt average infiltration rate values from Table 3-3.

** Flood control detention volume credits based on empirical equations from Storage Chapter of USDCM.

*** Method assumes that 1-hour rainfall depth is equivalent to 1-hour intensity for calculation purposed

Design Procedure Form: Sand Filter (SF)

UD-BMP (Version 3.07, March 2018)

Designer: NQJ
Company: HR GREEN
Date: August 31, 2022
Project: EASTONVILLE ROAD
Location: EL PASO COUNTY, COLORADO

1. Basin Storage Volume	
A) Effective Imperviousness of Tributary Area, I_a (100% if all paved and roofed areas upstream of sand filter)	I_a = 24.1 %
B) Tributary Area's Imperviousness Ratio ($i = I_a/100$)	i = 0.241
C) Water Quality Capture Volume (WQCV) Based on 12-hour Drain Time $WQCV = 0.8 * (0.91* i^3 - 1.19 * i^2 + 0.78 * i)$	WQCV = 0.11 watershed inches
D) Contributing Watershed Area (including sand filter area)	Area = 61,420 sq ft
E) Water Quality Capture Volume (WQCV) Design Volume $V_{WQCV} = WQCV / 12 * Area$	V_{WQCV} = 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)	$V_{WQCV\ USER}$ = 523 cu ft
2. Basin Geometry	
A) WQCV Depth	D_{WQCV} = 1.5 ft
B) Sand Filter Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred). Use "0" if sand filter has vertical walls.	Z = 4.00 ft / ft
C) Minimum Filter Area (Flat Surface Area)	A_{Min} = 185 sq ft
D) Actual Filter Area	A_{Actual} = 703 sq ft
E) Volume Provided	V_T = cu ft
3. Filter Material	Choose One: (•) 18" CDOT Class B or C Filter Material; ( ) 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 = 1.0 ft
ii) Volume to Drain in 12 Hours	Vol_{12} = 523 cu ft
iii) Orifice Diameter, 3/8" Minimum	D_O = 5/8 in

Design Procedure Form: Sand Filter (SF)

Designer: NQJ
Company: HR GREEN
Date: August 31, 2022
Project: EASTONVILLE ROAD
Location: EL PASO COUNTY, COLORADO

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 Works

   A) Describe the type of energy dissipation at inlet points and means of conveying flows in excess of the WQCV through the outlet

Notes:

Site-Level Low Impact Development (LID) Design Effective Impervious Calculator

LID Credit by Impervious Reduction Factor (IRF) Method

UD-BMP (Version 3.06, November 2016)

User Input

Calculated cells

				Designer:	**NQJ**
				Company:	**HR GREEN**
***Design Storm: 1-Hour Rain Depth	WQCV Event	0.60	inches	**Date:**	**August 31, 2022**
***Minor Storm: 1-Hour Rain Depth	5-Year Event	1.50	inches	**Project:**	**EASTONVILLE ROAD**
***Major Storm: 1-Hour Rain Depth	100-Year Event	2.52	inches	**Location:**	**POND B**
Optional User Defined Storm	CUHP				
(CUHP) NOAA 1 Hour Rainfall Depth and Frequency for User Defined Storm	100-Year Event				
Max Intensity for Optional User Defined Storm	0				

SITE INFORMATION (USER-INPUT)

Sub-basin Identifier	**EA8**	**EA9**	**EA10**	**EA11**	**EA12**									
Receiving Pervious Area Soil Type	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam									
Total Area (ac., Sum of DCIA, UIA, RPA, & SPA)	2.080	2.990	1.340	1.990	0.920									
Directly Connected Impervious Area (DCIA, acres)	2.060	1.880	1.260	1.300	0.020									
Unconnected Impervious Area (UIA, acres)	0.000	0.000	0.000	0.000	0.000									
Receiving Pervious Area (RPA, acres)	0.000	0.000	0.000	0.000	0.000									
Separate Pervious Area (SPA, acres)	0.020	1.110	0.080	0.690	0.900									
RPA Treatment Type: Conveyance (C), Volume (V), or Permeable Pavement (PP)	C	C	C	C	V									

CALCULATED RESULTS (OUTPUT)

Total Calculated Area (ac, check against input)	2.080	2.990	1.340	1.990	0.920									
Directly Connected Impervious Area (DCIA, %)	99.0%	62.9%	94.0%	65.3%	2.2%									
Unconnected Impervious Area (UIA, %)	0.0%	0.0%	0.0%	0.0%	0.0%									
Receiving Pervious Area (RPA, %)	0.0%	0.0%	0.0%	0.0%	0.0%									
Separate Pervious Area (SPA, %)	1.0%	37.1%	6.0%	34.7%	97.8%									
A_R (RPA / UIA)	0.000	0.000	0.000	0.000	0.000									
I_a Check	1.000	1.000	1.000	1.000	1.000									
f / I for WQCV Event:	1.7	1.7	1.7	1.7	1.7									
f / I for 5-Year Event:	0.5	0.5	0.5	0.5	0.5									
f / I for 100-Year Event:	0.3	0.3	0.3	0.3	0.3									
f / I for Optional User Defined Storm CUHP:														
IRF for WQCV Event:	1.00	1.00	1.00	1.00	0.00									
IRF for 5-Year Event:	1.00	1.00	1.00	1.00	1.00									
IRF for 100-Year Event:	1.00	1.00	1.00	1.00	1.00									
IRF for Optional User Defined Storm CUHP:														
Total Site Imperviousness: I_{total}	99.0%	62.9%	94.0%	65.3%	2.2%									
Effective Imperviousness for WQCV Event:	99.0%	62.9%	94.0%	65.3%	2.2%									
Effective Imperviousness for 5-Year Event:	99.0%	62.9%	94.0%	65.3%	2.2%									
Effective Imperviousness for 100-Year Event:	99.0%	62.9%	94.0%	65.3%	2.2%									
Effective Imperviousness for Optional User Defined Storm CUHP:														

LID / EFFECTIVE IMPERVIOUSNESS CREDITS

WQCV Event CREDIT: Reduce Detention By:	0.0%	0.0%	0.0%	0.0%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
This line only for 10-Year Event	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
100-Year Event CREDIT**: Reduce Detention By:	0.0%	0.0%	0.0%	0.0%	11.6%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
User Defined CUHP CREDIT: Reduce Detention By:														

Total Site Imperviousness:	**70.0%**
Total Site Effective Imperviousness for WQCV Event:	**70.0%**
Total Site Effective Imperviousness for 5-Year Event:	**70.0%**
Total Site Effective Imperviousness for 100-Year Event:	**70.0%**
Total Site Effective Imperviousness for Optional User Defined Storm CUHP:	

Notes:

* Use Green-Ampt average infiltration rate values from Table 3-3.

** Flood control detention volume credits based on empirical equations from Storage Chapter of USDCM.

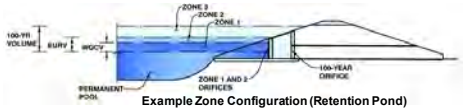
*** Method assumes that 1-hour rainfall depth is equivalent to 1-hour intensity for calculation purposed

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.05 (January 2022)

Project: Eastonville Road

Basin ID: POND B: BASIN EA8 - EA12



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	9.32	acres
Watershed Length =	1,750	ft
Watershed Length to Centroid =	500	ft
Watershed Slope =	0.009	ft/ft
Watershed Imperviousness =	70.00%	percent
Percentage Hydrologic Soil Group A =	100.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

		Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.214 acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	0.827 acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.605 acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	0.790 acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	0.938 acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	1.124 acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	1.306 acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	1.525 acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.68 in.) =	2.435 acre-feet	3.68	inches
Approximate 2-yr Detention Volume =	0.539 acre-feet		
Approximate 5-yr Detention Volume =	0.704 acre-feet		
Approximate 10-yr Detention Volume =	0.846 acre-feet		
Approximate 25-yr Detention Volume =	1.013 acre-feet		
Approximate 50-yr Detention Volume =	1.112 acre-feet		
Approximate 100-yr Detention Volume =	1.212 acre-feet		

Define Zones and Basin Geometry

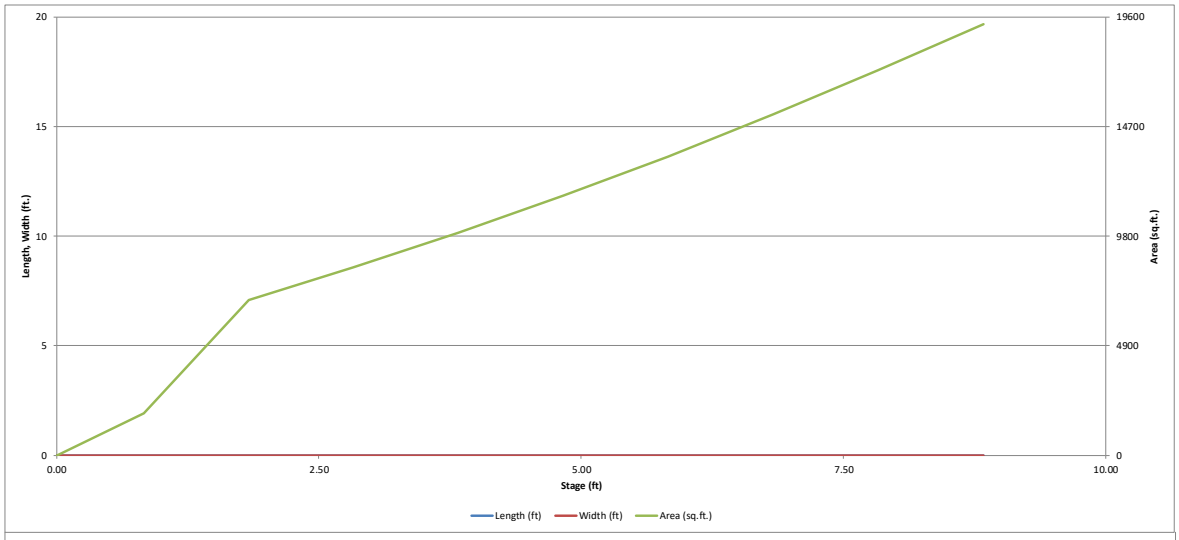
Zone 1 Volume (WQCV) =	0.214	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.613	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.385	acre-feet
Total Detention Basin Volume =	1.212	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

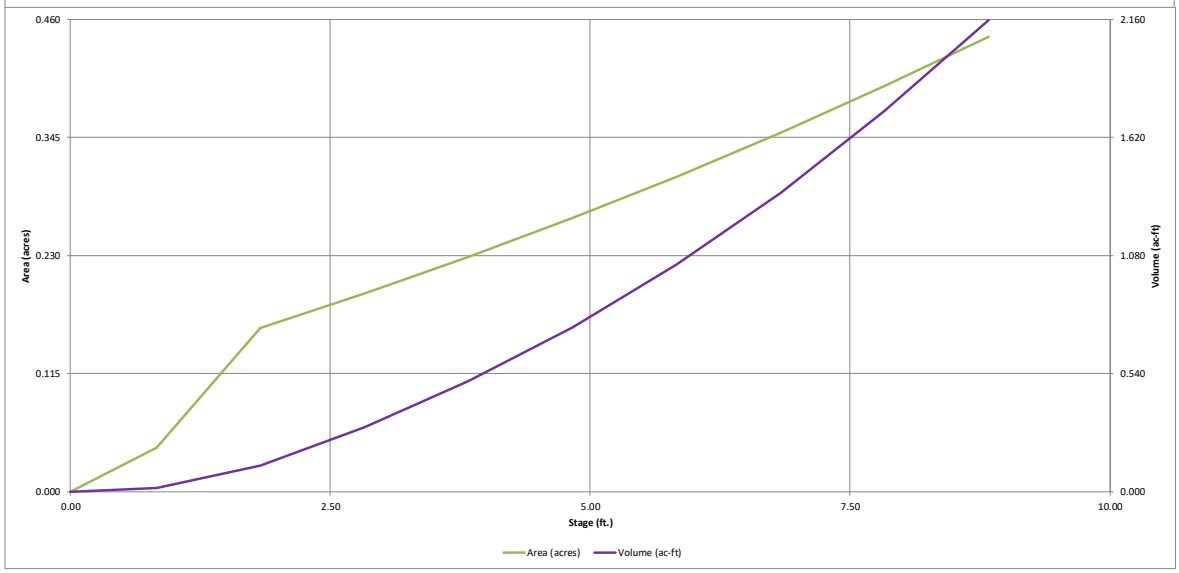
Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
6983.17 **Top of Micropool**	--	0.00	--	--	--	0	0.000		
6984	--	0.83	--	--	--	1,862	0.043	773	0.018
6985	--	1.83	--	--	--	6,937	0.159	5,172	0.119
6986	--	2.83	--	--	--	8,399	0.193	12,840	0.295
6987	--	3.83	--	--	--	9,955	0.229	22,017	0.505
6988	--	4.83	--	--	--	11,608	0.266	32,799	0.753
6989	--	5.83	--	--	--	13,342	0.306	45,274	1.039
6990	--	6.83	--	--	--	15,238	0.350	59,564	1.367
6991	--	7.83	--	--	--	17,212	0.395	75,789	1.740
6992	--	8.83	--	--	--	19,304	0.443	94,047	2.159

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.05 (January 2022)



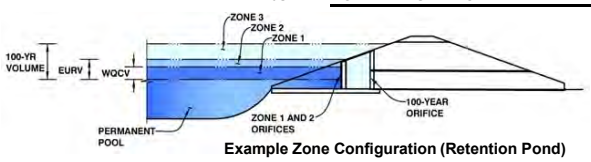


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.05 (January 2022)

Project: **Eastonville Road**

Basin ID: **POND B: BASIN EA8 - EA12**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.40	0.214	Orifice Plate
Zone 2 (EURV)	5.11	0.613	Circular Orifice
Zone 3 (100-year)	6.38	0.385	Weir&Pipe (Restrict)
Total (all zones)		1.212	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	6.319E-03	ft^2
Depth at top of Zone using Orifice Plate =	2.40	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	9.60	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	0.91	sq. inches (diameter = 1-1/16 inches)	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.80	1.60					
Orifice Area (sq. inches)	0.91	0.91	0.91					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Circular	Not Selected			Zone 2 Circular	Not Selected	
Invert of Vertical Orifice =	2.40	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	0.01	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	5.11	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	0.06	N/A	feet
Vertical Orifice Diameter =	1.45	N/A	inches				

Calculated Parameters for Vertical Orifice

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	5.11	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	5.11	N/A	feet
Overflow Weir Front Edge Length =	2.00	N/A	feet	Overflow Weir Slope Length =	2.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	12.01	N/A	
Horiz. Length of Weir Sides =	2.00	N/A	feet	Overflow Grate Open Area w/o Debris =	2.78	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	1.39	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

Calculated Parameters for Overflow Weir

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.17	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	0.23	N/A	ft^2
Outlet Pipe Diameter =	18.00	N/A	inches	Outlet Orifice Centroid =	0.17	N/A	feet
Restrictor Plate Height Above Pipe Invert =	3.40		inches	Half-Central Angle of Restrictor Plate on Pipe =	0.90	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	6.40	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.81	feet
Spillway Crest Length =	6.00	feet	Stage at Top of Freeboard =	8.21	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.41	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	1.89	acre-ft

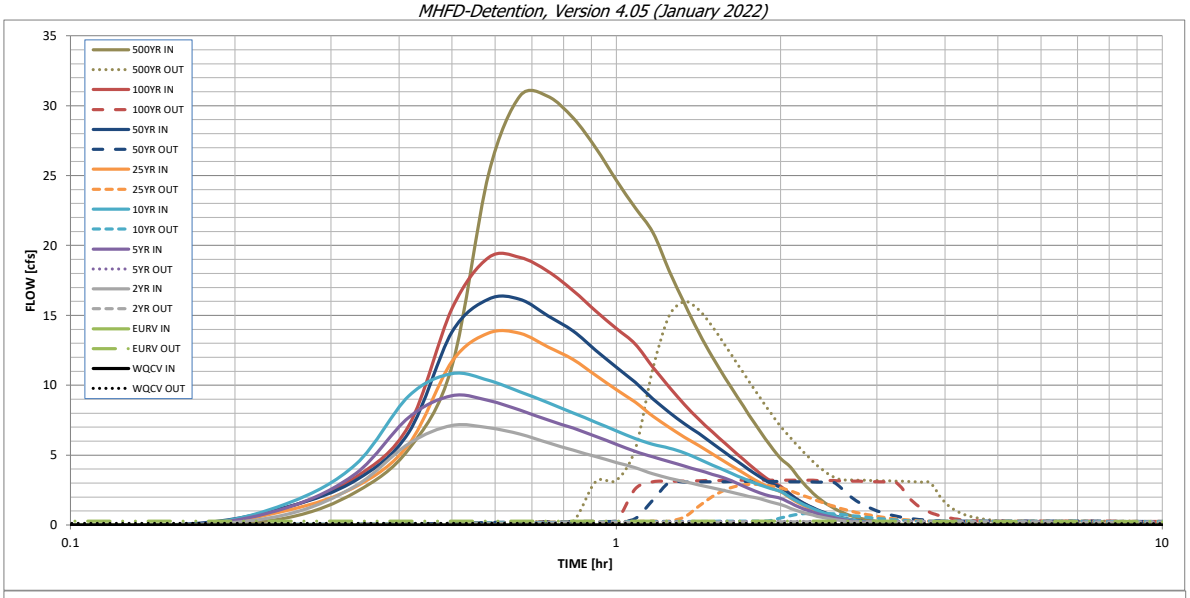
Calculated Parameters for Spillway

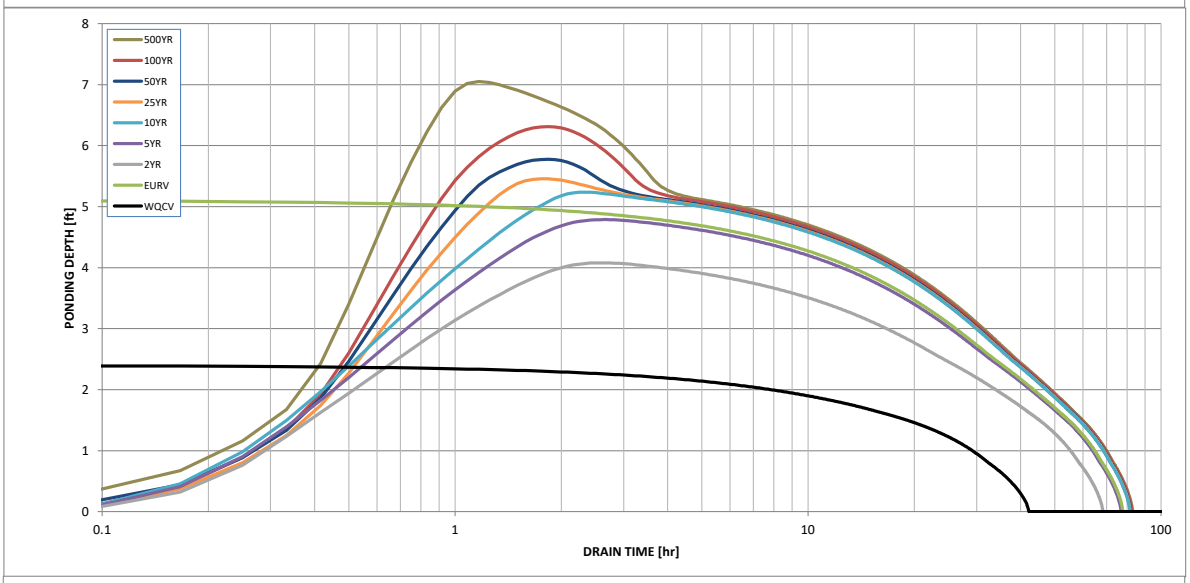
Routed Hydrograph Results *The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).*

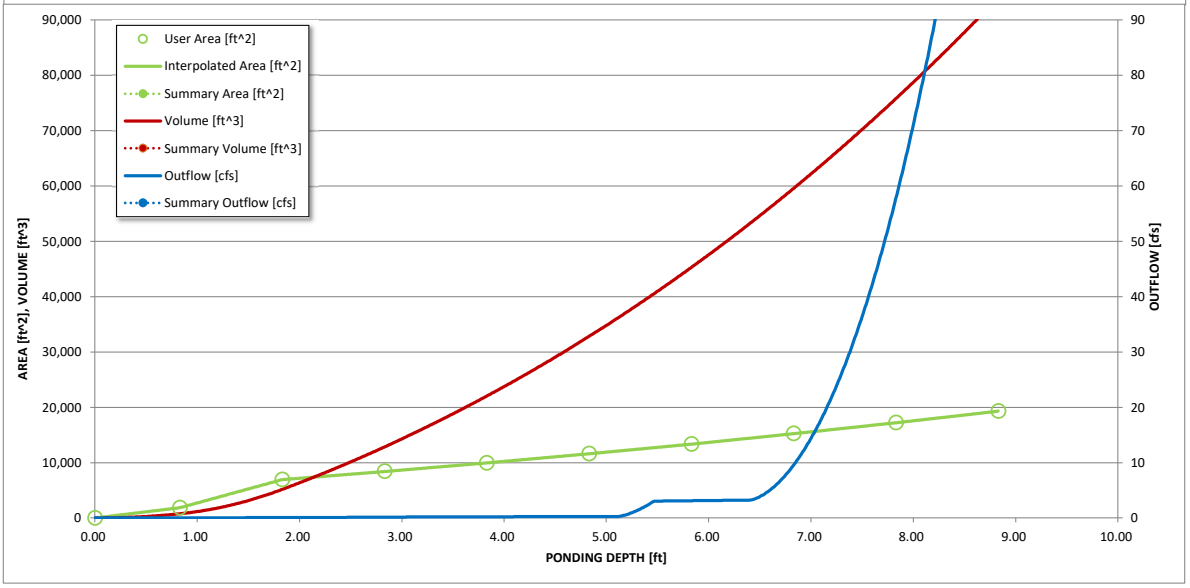
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.68
CUHP Runoff Volume (acre-ft) =	0.214	0.827	0.605	0.790	0.938	1.124	1.306	1.525	2.435
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.605	0.790	0.938	1.124	1.306	1.525	2.435
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.0	0.1	0.1	1.0	2.1	3.4	9.2
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.00	0.01	0.01	0.11	0.22	0.37	0.99
Peak Inflow Q (cfs) =	N/A	N/A	7.1	9.2	10.8	13.7	16.2	19.1	30.7
Peak Outflow Q (cfs) =	0.1	0.3	0.2	0.3	0.9	2.9	3.1	3.2	16.0
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	3.3	7.6	2.8	1.5	0.9	1.7
Structure Controlling Flow =	Plate	Overflow Weir 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.2	1.0	1.0	1.0	1.1
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	37	65	58	65	68	67	66	65	60
Time to Drain 99% of Inflow Volume (hours) =	**40**	72	64	71	75	75	74	74	71
Maximum Ponding Depth (ft) =	2.40	5.11	4.08	4.79	5.24	5.46	5.77	6.31	7.05
Area at Maximum Ponding Depth (acres) =	0.18	0.28	0.24	0.26	0.28	0.29	0.30	0.33	0.36
Maximum Volume Stored (acre-ft) =	0.215	0.829	0.561	0.740	0.863	0.926	1.021	1.188	1.442

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.05 (January 2022)







S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: _____

Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.01	0.52
	0:15:00	0.00	0.00	0.78	1.26	1.56	1.05	1.32	1.28	2.36
	0:20:00	0.00	0.00	2.81	3.70	4.35	2.75	3.22	3.43	5.43
	0:25:00	0.00	0.00	5.83	7.70	9.23	5.78	6.63	7.10	11.35
	0:30:00	0.00	0.00	7.12	9.25	10.83	11.69	13.81	15.47	25.15
	0:35:00	0.00	0.00	6.95	8.90	10.35	13.73	16.17	19.13	30.70
	0:40:00	0.00	0.00	6.51	8.21	9.53	13.71	16.14	19.14	30.65
	0:45:00	0.00	0.00	5.88	7.50	8.74	12.73	14.96	18.14	29.11
	0:50:00	0.00	0.00	5.35	6.93	8.01	11.84	13.87	16.77	26.99
	0:55:00	0.00	0.00	4.90	6.34	7.36	10.71	12.50	15.31	24.66
	1:00:00	0.00	0.00	4.48	5.78	6.74	9.69	11.28	14.06	22.69
	1:05:00	0.00	0.00	4.09	5.27	6.19	8.78	10.21	12.95	20.93
	1:10:00	0.00	0.00	3.66	4.87	5.77	7.79	9.03	11.29	18.18
	1:15:00	0.00	0.00	3.35	4.54	5.50	6.99	8.07	9.87	15.83
	1:20:00	0.00	0.00	3.10	4.21	5.16	6.28	7.24	8.61	13.76
	1:25:00	0.00	0.00	2.87	3.91	4.72	5.69	6.55	7.57	12.02
	1:30:00	0.00	0.00	2.66	3.63	4.29	5.08	5.83	6.66	10.52
	1:35:00	0.00	0.00	2.46	3.36	3.89	4.51	5.17	5.84	9.16
	1:40:00	0.00	0.00	2.25	2.97	3.51	3.98	4.55	5.06	7.89
	1:45:00	0.00	0.00	2.05	2.60	3.16	3.48	3.97	4.34	6.71
	1:50:00	0.00	0.00	1.88	2.29	2.86	3.03	3.44	3.70	5.65
	1:55:00	0.00	0.00	1.64	2.07	2.62	2.65	2.99	3.15	4.76
	2:00:00	0.00	0.00	1.46	1.91	2.40	2.39	2.69	2.76	4.16
	2:05:00	0.00	0.00	1.20	1.57	1.98	1.93	2.17	2.20	3.30
	2:10:00	0.00	0.00	0.97	1.27	1.61	1.54	1.73	1.73	2.58
	2:15:00	0.00	0.00	0.79	1.03	1.30	1.23	1.38	1.36	2.02
	2:20:00	0.00	0.00	0.63	0.83	1.05	0.98	1.10	1.06	1.57
	2:25:00	0.00	0.00	0.50	0.66	0.84	0.78	0.87	0.83	1.21
	2:30:00	0.00	0.00	0.40	0.52	0.66	0.61	0.69	0.64	0.93
	2:35:00	0.00	0.00	0.32	0.41	0.51	0.48	0.53	0.50	0.72
	2:40:00	0.00	0.00	0.25	0.32	0.40	0.37	0.41	0.39	0.56
	2:45:00	0.00	0.00	0.19	0.24	0.31	0.28	0.32	0.30	0.44
	2:50:00	0.00	0.00	0.15	0.19	0.24	0.22	0.25	0.24	0.34
	2:55:00	0.00	0.00	0.11	0.14	0.18	0.17	0.19	0.18	0.26
	3:00:00	0.00	0.00	0.08	0.10	0.13	0.12	0.14	0.13	0.19
	3:05:00	0.00	0.00	0.05	0.07	0.09	0.09	0.10	0.09	0.13
	3:10:00	0.00	0.00	0.03	0.04	0.05	0.05	0.06	0.06	0.08
	3:15:00	0.00	0.00	0.02	0.02	0.03	0.03	0.03	0.03	0.04
	3:20:00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.02
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.05 (January 2022)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.
The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

Stage - Storage Description	Stage [ft]	Area [ft²]	Area [acres]	Volume [ft³]	Volume [ac-ft]	Total Outflow [cfs]

For best results, include the stages of all grade slope changes (e.g. ISV and Floor) from the S-A-V table on Sheet 'Basin'.

Also include the inverts of all outlets (e.g. vertical orifice, overflow grate, and spillway, where applicable).

Site-Level Low Impact Development (LID) Design Effective Impervious Calculator

LID Credit by Impervious Reduction Factor (IRF) Method

UD-BMP (Version 3.06, November 2016)

User Input

Calculated cells

				Designer:	**NQJ**
				Company:	**HR GREEN**
***Design Storm: 1-Hour Rain Depth	WQCV Event	0.60	inches	**Date:**	**September 1, 2022**
***Minor Storm: 1-Hour Rain Depth	5-Year Event	1.50	inches	**Project:**	**EASTONVILLE ROAD**
***Major Storm: 1-Hour Rain Depth	100-Year Event	2.52	inches	**Location:**	**TSB #1**
Optional User Defined Storm	CUHP				
(CUHP) NOAA 1 Hour Rainfall Depth and Frequency for User Defined Storm	100-Year Event				
Max Intensity for Optional User Defined Storm	0				

SITE INFORMATION (USER-INPUT)

Sub-basin Identifier	**EA6**	**EA7**												
Receiving Pervious Area Soil Type	Sandy Loam	Sandy Loam												
Total Area (ac., Sum of DCIA, UIA, RPA, & SPA)	0.700	0.650												
Directly Connected Impervious Area (DCIA, acres)	0.700	0.580												
Unconnected Impervious Area (UIA, acres)	0.000	0.000												
Receiving Pervious Area (RPA, acres)	0.000	0.000												
Separate Pervious Area (SPA, acres)	0.000	0.070												
RPA Treatment Type: Conveyance (C), Volume (V), or Permeable Pavement (PP)	C	C												

CALCULATED RESULTS (OUTPUT)

Total Calculated Area (ac, check against input)	0.700	0.650												
Directly Connected Impervious Area (DCIA, %)	100.0%	89.2%												
Unconnected Impervious Area (UIA, %)	0.0%	0.0%												
Receiving Pervious Area (RPA, %)	0.0%	0.0%												
Separate Pervious Area (SPA, %)	0.0%	10.8%												
A_R (RPA / UIA)	0.000	0.000												
I_a Check	1.000	1.000												
f / I for WQCV Event:	1.7	1.7												
f / I for 5-Year Event:	0.5	0.5												
f / I for 100-Year Event:	0.3	0.3												
f / I for Optional User Defined Storm CUHP:														
IRF for WQCV Event:	1.00	1.00												
IRF for 5-Year Event:	1.00	1.00												
IRF for 100-Year Event:	1.00	1.00												
IRF for Optional User Defined Storm CUHP:														
Total Site Imperviousness: I_{total}	100.0%	89.2%												
Effective Imperviousness for WQCV Event:	100.0%	89.2%												
Effective Imperviousness for 5-Year Event:	100.0%	89.2%												
Effective Imperviousness for 100-Year Event:	100.0%	89.2%												
Effective Imperviousness for Optional User Defined Storm CUHP:														

LID / EFFECTIVE IMPERVIOUSNESS CREDITS

WQCV Event CREDIT: Reduce Detention By:	0.0%	0.0%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
This line only for 10-Year Event	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
100-Year Event CREDIT**: Reduce Detention By:	0.0%	0.0%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
User Defined CUHP CREDIT: Reduce Detention By:														

Total Site Imperviousness:	**94.8%**
Total Site Effective Imperviousness for WQCV Event:	**94.8%**
Total Site Effective Imperviousness for 5-Year Event:	**94.8%**
Total Site Effective Imperviousness for 100-Year Event:	**94.8%**
Total Site Effective Imperviousness for Optional User Defined Storm CUHP:	

Notes:

* Use Green-Ampt average infiltration rate values from Table 3-3.

** Flood control detention volume credits based on empirical equations from Storage Chapter of USDCM.

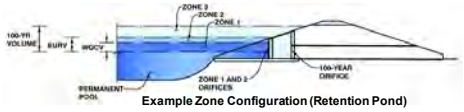
*** Method assumes that 1-hour rainfall depth is equivalent to 1-hour intensity for calculation purposed

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: EASTONVILLE ROAD

Basin ID: TSB #1



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	1.35	acres
Watershed Length =	500	ft
Watershed Length to Centroid =	50	ft
Watershed Slope =	0.010	ft/ft
Watershed Imperviousness =	94.80%	percent
Percentage Hydrologic Soil Group A =	100.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides
Water Quality Capture Volume (WQCV) =	0.050	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	0.177	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.114	acre-feet	1.19 inches
5-yr Runoff Volume (P1 = 1.5 in.) =	0.146	acre-feet	1.50 inches
10-yr Runoff Volume (P1 = 1.75 in.) =	0.172	acre-feet	1.75 inches
25-yr Runoff Volume (P1 = 2 in.) =	0.200	acre-feet	2.00 inches
50-yr Runoff Volume (P1 = 2.25 in.) =	0.227	acre-feet	2.25 inches
100-yr Runoff Volume (P1 = 2.52 in.) =	0.256	acre-feet	2.52 inches
500-yr Runoff Volume (P1 = 3.68 in.) =	0.383	acre-feet	3.68 inches
Approximate 2-yr Detention Volume =	0.117	acre-feet	
Approximate 5-yr Detention Volume =	0.151	acre-feet	
Approximate 10-yr Detention Volume =	0.179	acre-feet	
Approximate 25-yr Detention Volume =	0.210	acre-feet	
Approximate 50-yr Detention Volume =	0.228	acre-feet	
Approximate 100-yr Detention Volume =	0.244	acre-feet	

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.050	acre-feet
Select Zone 2 Storage Volume (Optional) =		acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	0.050	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

Total detention volume is less than 100-year volume.

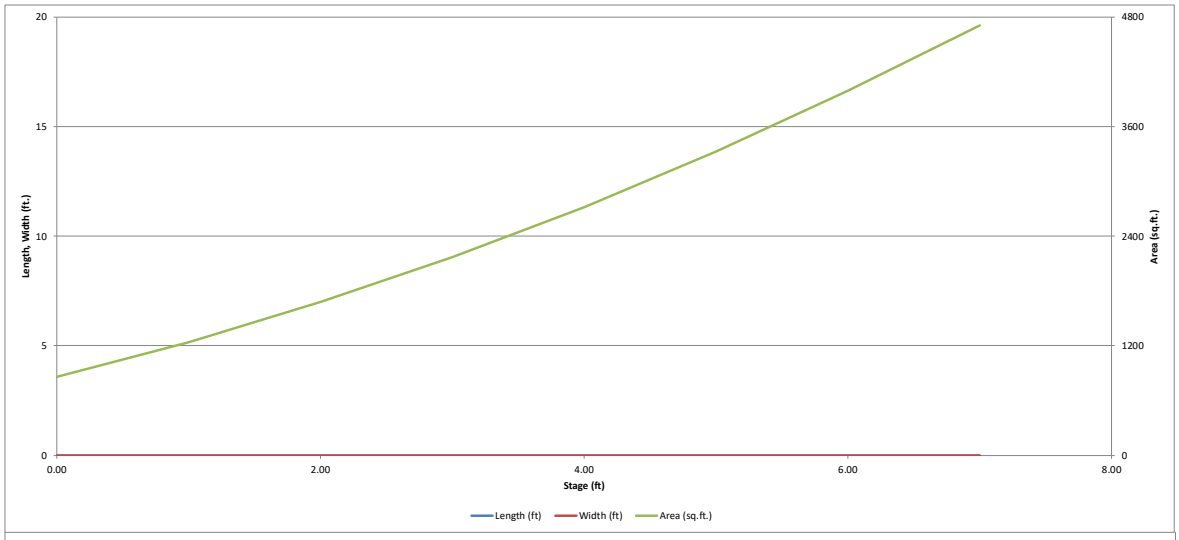
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

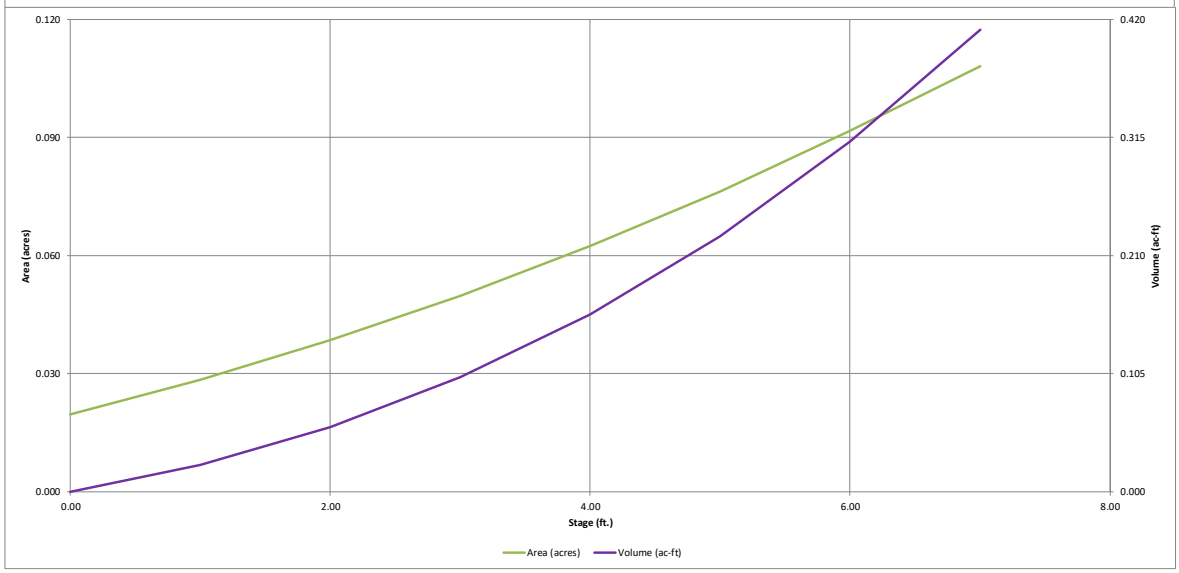
Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
7009 **Top of Micropool**	--	0.00	--	--	--	860	0.020		
7010	--	1.00	--	--	--	1,239	0.028	1,049	0.024
7011	--	2.00	--	--	--	1,676	0.038	2,507	0.058
7012	--	3.00	--	--	--	2,169	0.050	4,429	0.102
7013	--	4.00	--	--	--	2,718	0.062	6,873	0.158
7014	--	5.00	--	--	--	3,323	0.076	9,893	0.227
7015	--	6.00	--	--	--	3,992	0.092	13,551	0.311
	--	7.00	--	--	--	4,711	0.108	17,902	0.411

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)



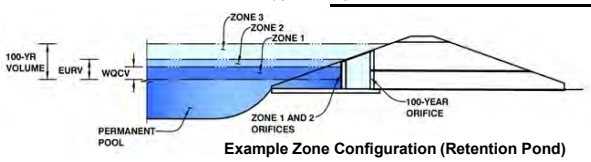


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: EASTONVILLE ROAD

Basin ID: TSB #1



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.81	0.050	Orifice Plate
Zone 2			
Zone 3			
Total (all zones)		0.050	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orific		
Depth at top of Zone using Orifice Plate =	2.42	ft (relative to basin bottom at Stage = 0 ft)	Ellip		
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptic		
Orifice Plate: Orifice Area per Row =	0.46	sq. inches (diameter = 3/4 inch)	Ell		

SEDIMENT BASIN WILL USE RISER PIPE WITH CORRESPONDING ORIFICES

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.81	1.75	2.25				
Orifice Area (sq. inches)	0.46	0.46	0.46	0.46				

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected			Not Selected	Not Selected	
Invert of Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =			ft^2
Depth at top of Zone using Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =			feet
Vertical Orifice Diameter =			inches				

Calculated Parameters for Vertical Orifice

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Not Selected	Not Selected			Not Selected	Not Selected	
Overflow Weir Front Edge Height, Ho =			ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =			feet
Overflow Weir Front Edge Length =			feet	Overflow Weir Slope Length =			feet
Overflow Weir Grate Slope =			H:V	Grate Open Area / 100-yr Orifice Area =			
Horiz. Length of Weir Sides =			feet	Overflow Grate Open Area w/o Debris =			ft^2
Overflow Grate Type =				Overflow Grate Open Area w/ Debris =			ft^2
Debris Clogging % =			%				

Calculated Parameters for Overflow Weir

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Not Selected	Not Selected			Not Selected	Not Selected	
Depth to Invert of Outlet Pipe =			ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =			ft^2
Circular Orifice Diameter =			inches	Outlet Orifice Centroid =			feet
				Half-Central Angle of Restrictor Plate on Pipe =	N/A	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	5.10	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.43	feet
Spillway Crest Length =	5.00	feet	Stage at Top of Freeboard =	6.53	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.10	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	0.36	acre-ft

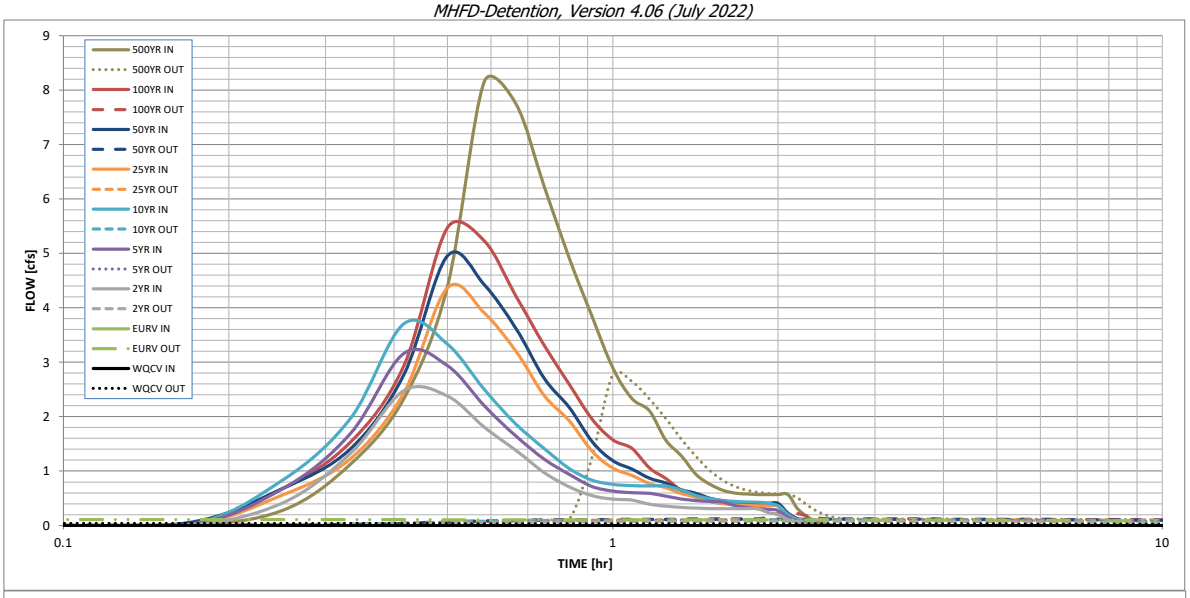
Calculated Parameters for Spillway

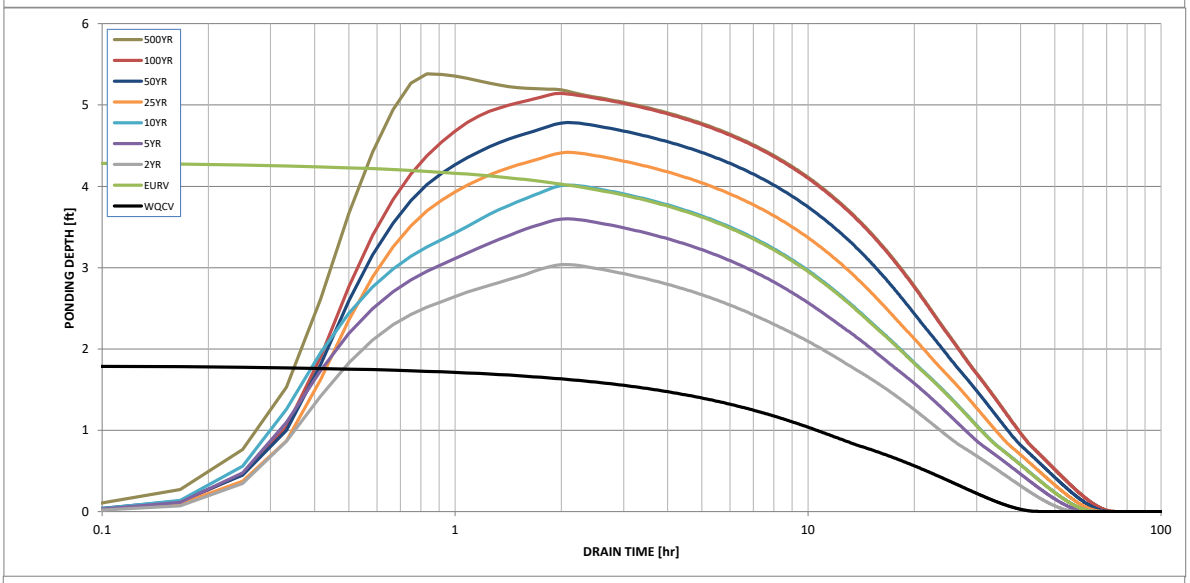
Routed Hydrograph Results *The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).*

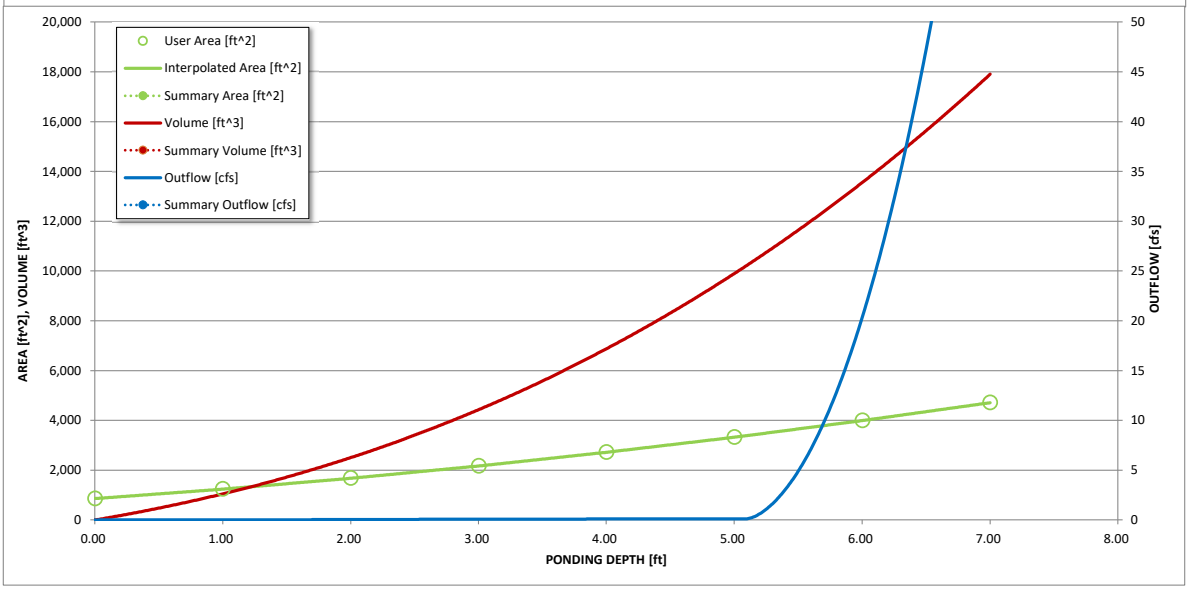
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.68
CUHP Runoff Volume (acre-ft) =	0.050	0.177	0.114	0.146	0.172	0.200	0.227	0.256	0.383
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.114	0.146	0.172	0.200	0.227	0.256	0.383
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.0	0.0	0.0	0.3	0.6	1.0	2.5
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.02	0.03	0.24	0.46	0.75	1.88
Peak Inflow Q (cfs) =	N/A	N/A	2.5	3.2	3.7	4.4	5.0	5.5	8.2
Peak Outflow Q (cfs) =	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.2	2.8
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	3.6	2.8	0.3	0.2	0.2	1.1
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Plate	Plate	Plate	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	37	49	45	48	50	51	53	54	50
Time to Drain 99% of Inflow Volume (hours) =	**40**	56	51	54	56	59	61	63	60
Maximum Ponding Depth (ft) =	1.80	4.30	3.04	3.60	4.01	4.42	4.78	5.14	5.38
Area at Maximum Ponding Depth (acres) =	0.04	0.07	0.05	0.06	0.06	0.07	0.07	0.08	0.08
Maximum Volume Stored (acre-ft) =	0.050	0.177	0.103	0.133	0.158	0.185	0.211	0.238	0.257

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)







S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: _____

Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.27
	0:15:00	0.00	0.00	0.41	0.67	0.83	0.55	0.67	0.67	1.13
	0:20:00	0.00	0.00	1.32	1.69	1.97	1.23	1.41	1.53	2.33
	0:25:00	0.00	0.00	2.48	3.16	3.71	2.44	2.77	2.94	4.39
	0:30:00	0.00	0.00	2.38	2.94	3.33	4.37	4.96	5.47	8.15
	0:35:00	0.00	0.00	1.81	2.20	2.50	3.91	4.43	5.23	7.75
	0:40:00	0.00	0.00	1.38	1.64	1.86	3.20	3.62	4.22	6.24
	0:45:00	0.00	0.00	0.97	1.22	1.42	2.39	2.71	3.32	4.91
	0:50:00	0.00	0.00	0.71	0.94	1.05	1.92	2.17	2.59	3.84
	0:55:00	0.00	0.00	0.55	0.72	0.83	1.37	1.54	1.95	2.90
	1:00:00	0.00	0.00	0.49	0.63	0.76	1.05	1.19	1.58	2.34
	1:05:00	0.00	0.00	0.47	0.60	0.73	0.92	1.04	1.42	2.10
	1:10:00	0.00	0.00	0.39	0.59	0.73	0.77	0.87	1.05	1.56
	1:15:00	0.00	0.00	0.35	0.54	0.72	0.69	0.78	0.86	1.28
	1:20:00	0.00	0.00	0.33	0.49	0.65	0.58	0.66	0.64	0.94
	1:25:00	0.00	0.00	0.32	0.46	0.55	0.53	0.59	0.52	0.76
	1:30:00	0.00	0.00	0.31	0.44	0.50	0.45	0.50	0.44	0.65
	1:35:00	0.00	0.00	0.31	0.43	0.46	0.40	0.45	0.41	0.60
	1:40:00	0.00	0.00	0.31	0.37	0.44	0.38	0.43	0.39	0.58
	1:45:00	0.00	0.00	0.31	0.33	0.43	0.37	0.41	0.39	0.57
	1:50:00	0.00	0.00	0.31	0.31	0.43	0.36	0.41	0.39	0.57
	1:55:00	0.00	0.00	0.24	0.30	0.41	0.36	0.41	0.39	0.57
	2:00:00	0.00	0.00	0.20	0.28	0.36	0.36	0.41	0.39	0.57
	2:05:00	0.00	0.00	0.11	0.15	0.20	0.20	0.22	0.22	0.31
	2:10:00	0.00	0.00	0.06	0.08	0.11	0.11	0.12	0.12	0.17
	2:15:00	0.00	0.00	0.03	0.04	0.05	0.06	0.06	0.06	0.09
	2:20:00	0.00	0.00	0.01	0.02	0.02	0.03	0.03	0.03	0.04
	2:25:00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
	2:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.

The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

Stage - Storage Description	Stage [ft]	Area [ft ^{2}]	Area [acres]	Volume [ft ^{3}]	Volume [ac-ft]	Total Outflow [cfs]

For best results, include the stages of all grade slope changes (e.g. ISV and Floor) from the S-A-V table on Sheet 'Basin'.

Also include the inverts of all outlets (e.g. vertical orifice, overflow grate, and spillway, where applicable).

APPENDIX E – REFERENCE MATERIAL

Final Drainage Report

for

The Sanctuary Filing 1

at

Meridian Ranch

EL PASO COUNTY, COLORADO

August 2022

Prepared For:

GTL DEVELOPMENT, INC.
P.O. Box 80036
San Diego, CA 92138

Prepared By:
Tech Contractors
11910 Tourmaline Dr., Ste 130
Falcon, CO 80831
719.495.7444

PCD Project No. SF22-020

Future Drainage - SCS Calculation Method

Following is a tabulation of the surface drainage characteristics for the future conditions using the SCS calculation method. Please refer to Figure 6 - Meridian Ranch SCS Calculations – Future Basins Map

Table 5: Future Drainage Basins-SCS

FUTURE SCS (Full Spectrum)						
	DRAINAGE AREA (SQ. MI.)	PEAK DISCHARGE Q100 (CFS)	PEAK DISCHARGE Q50 (CFS)	PEAK DISCHARGE Q10 (CFS)	PEAK DISCHARGE Q5 (CFS)	PEAK DISCHARGE Q2 (CFS)
OS06	0.1313	80	52	12	3.8	0.5
G1a	0.1313	80	52	12	3.8	0.5
G1a-G2	0.1313	79	52	11	3.7	0.5
OS05	0.0578	39	26	5.6	1.8	0.2
OS05-G1	0.0578	39	25	5.5	1.7	0.2
FG01	0.0538	31	22	7.0	3.4	0.9
FG01-G1	0.0538	31	22	7.0	3.4	0.9
G1	0.1116	61	41	11	4.9	1.1
G1-G2	0.1116	61	41	11	4.8	1.1
FG02	0.0391	32	22	6.4	2.7	0.5
G2	0.2820	167	112	27	10	1.9
G2-G3	0.2820	163	108	27	10	1.9
FG03	0.0203	24	17	5.9	3.0	0.8
FG04	0.0172	22	16	5.8	3.1	0.9
G3	0.3195	185	123	31	12	2.4
FG06	0.0675	56	40	12	5.8	1.3
FG05	0.0580	45	33	12	6.7	2.4
OS07ab	0.0170	12	7.9	1.8	0.5	0.07
OS07ab-POND F	0.0170	12	7.6	1.7	0.5	0.07
POND F IN	0.4620	293	200	54	23	5.1
POND F	0.4620	178	121	16	8.0	2.1
POND F-G7	0.4620	177	120	16	8.0	2.1
OS07c	0.0296	19	12	2.7	0.9	0.12
OS07c-G4	0.0296	19	12	2.6	0.9	0.12
FG21a	0.0095	5.9	4.0	1.0	0.4	0.06
G4	0.0391	25	16	3.6	1.2	0.2
G4-G7	0.0391	24	16	3.5	1.2	0.2
FG21b	0.0150	21	16	6.5	3.9	1.7
G7	0.5161	194	131	18	8.9	2.3
G7-G8	0.5161	194	131	18	8.9	2.3
FG22	0.1354	121	88	32	17	5.4
OS08a	0.0251	16	11	2.3	0.7	0.10
OS08-G8	0.0251	16	10	2.3	0.7	0.10
FG23a	0.0216	21	15	5.2	2.7	0.8
OS07d	0.0034	2.5	1.6	0.4	0.11	0.01
OS07d-G8	0.0034	2.4	1.6	0.3	0.11	0.01
G8	0.7016	279	178	46	24	7.7
G8-G10	0.7016	278	177	45	24	7.6
FG24b	0.0589	76	57	24	15	6.5
FG24a	0.0348	24	16	4.5	2.0	0.4
OS08b	0.0165	9.5	6.3	1.4	0.5	0.07
OS08b-G9a	0.0165	9.4	6.0	1.4	0.5	0.07
OS09a	0.0093	5.3	3.5	0.8	0.3	0.04
OS09a-G9a	0.0093	5.2	3.4	0.7	0.3	0.04
G9a	0.1195	97	71	28	16	6.7

FUTURE SCS (Full Spectrum)						
	DRAINAGE AREA (SQ. MI.)	PEAK DISCHARGE Q100 (CFS)	PEAK DISCHARGE Q50 (CFS)	PEAK DISCHARGE Q10 (CFS)	PEAK DISCHARGE Q5 (CFS)	PEAK DISCHARGE Q2 (CFS)
G9a-G9b	0.1195	96	70	27	16	6.6
FG24c	0.0291	40	30	13	8.4	4.0
FG24d	0.0262	39	30	14	8.7	4.4
G9b	0.1748	170	127	53	32	14
REX RD WQCV	0.1748	158	125	51	31	14
G9b-G10	0.1748	158	123	50	31	13
FG23b	0.0236	17	11	2.7	0.9	0.13
G10	0.9000	390	263	90	46	15
G10-G11	0.9000	389	254	85	44	15
FG23c	0.0109	11	7.6	2.2	1.0	0.2
G11	0.9109	393	258	86	44	15
FG25	0.1084	111	84	36	22	9.9
FG28	0.0184	15	10	3.0	1.2	0.2
POND G IN-WEST	1.0377	503	350	122	63	22
FG27	0.0679	98	79	42	30	18
FG26	0.0570	65	50	24	16	8.2
G13	0.0570	65	50	24	16	8.2
G13-POND G	0.0570	64	50	24	16	8.1
POND G IN-EAST	0.1249	160	127	64	44	25
POND G	1.1626	450	293	52	21	5.3
G12	1.1626	450	293	52	21	5.3
G12-G06	1.1626	449	293	52	21	5.3
FG29	0.0983	60	39	8.9	2.9	0.4
FG32	0.0402	51	40	20	14	7.5
FG32-G06	0.0402	50	40	19	13	7.4
G06	1.3011	491	317	57	22	7.5

Rational Calculations

The Rational Hydrologic Calculation Method was used to estimate the total runoff from the 5-year and the 100-year design storm and thus establish the storm drainage system design. Using the rational calculation methodology outlined in the Hydrology Section (Ch 6) of the COSDCM coupled with the El Paso County EPCDCM an effective storm drainage design for the Sanctuary Filing 1 has been designed. The storm drainage facilities have been designed such that the minor storm will be captured by the inlets and conveyed by the storm drain pipes such that the street flow does not overtop the curbs. The storm drainage facility has been designed such that the major storm will be captured by the inlets and conveyed by the storm drain pipes such that the street flow does not exceed the right-of-way widths for residential streets and the hydraulic grade line will be less than one foot below the surface.

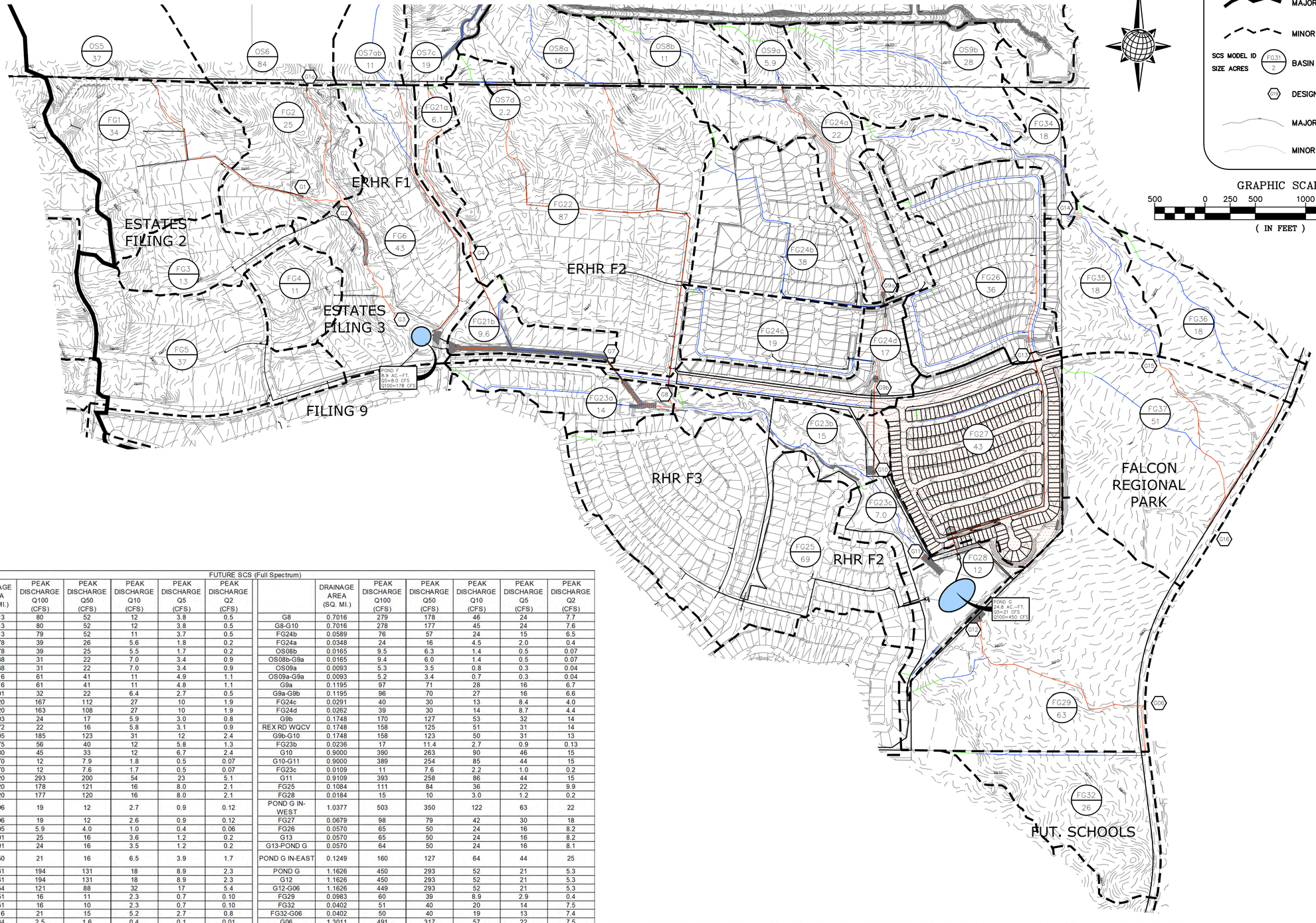
The site is located within the Gieck Ranch Drainage Basin. The storm drain runoff will be collected by a series of inlets and storm drain pipe then conveyed through the project and discharge directly into the existing Pond G that is properly sized to safely convey the storm water flows away from the project without damaging adjacent property.

Rational Narrative

The following is a detailed narrative of the storm drainage system located in the Sanctuary Filing 1. These storm drainage systems meet the requirements of as found in the El Paso

*NOTE: PRELIMINARY STORAGE VOLUMES AND OUTFLOW QUANTITIES HAVE BEEN PROVIDED FOR EACH OF THE FUTURE DETENTION FACILITIES LOCATED WITHIN THE DEVELOPMENT. THE ACTUAL STORAGE VOLUMES AND DISCHARGE RATES WILL BE DETERMINED UPON A COMPLETE ANALYSIS FOR EACH DETENTION FACILITY PRIOR TO CONSTRUCTION. THE VALUES GIVEN FOR DISCHARGE AND VOLUME ARE ESTIMATES FOR PLANNING PURPOSES ONLY.

THE SANCTUARY FILING 1



FUTURE SCS (Full Spectrum)

	DRAINAGE AREA (SQ. MI.)	PEAK DISCHARGE Q100 (CFS)	PEAK DISCHARGE Q50 (CFS)	PEAK DISCHARGE Q10 (CFS)	PEAK DISCHARGE Q5 (CFS)	PEAK DISCHARGE Q2 (CFS)
OS06	0.1313	80	52	12	3.8	0.5
G1a	0.1313	80	52	12	3.8	0.5
G1a-G2	0.1313	79	52	11	3.7	0.5
OS05	0.0578	39	26	5.6	1.8	0.2
OS05-G1	0.0578	39	25	5.5	1.7	0.2
FG01	0.0538	31	22	7.0	3.4	0.9
FG01-G1	0.0538	31	22	7.0	3.4	0.9
G1	0.1116	61	41	11	4.9	1.1
G1-G2	0.1116	61	41	11	4.8	1.1
FG02	0.0391	32	22	6.4	2.7	0.5
G2	0.2820	167	112	27	10	1.9
G2-G3	0.2820	163	108	27	10	1.9
FG03	0.0203	24	17	5.9	3.0	0.8
FG04	0.0172	22	16	5.8	3.1	0.9
G3	0.3195	185	123	31	12	2.4
FG06	0.0675	56	40	12	5.8	1.3
FG05	0.0580	45	33	12	6.7	2.4
OS07ab	0.0170	12	7.9	1.8	0.5	0.07
OS07ab-POND F	0.0170	12	7.6	1.7	0.5	0.07
POND F IN	0.4620	293	200	54	23	5.1
POND F	0.4620	178	121	16	8.0	2.1
POND F-G7	0.4620	177	120	16	8.0	2.1
OS07c	0.0296	19	12	2.7	0.9	0.12
OS07c-G4	0.0296	19	12	2.6	0.9	0.12
FG21a	0.0095	5.9	4.0	1.0	0.4	0.06
G4	0.0391	25	16	3.6	1.2	0.2
G4-G7	0.0391	24	16	3.5	1.2	0.2
FG21b	0.0150	21	16	6.5	3.9	1.7
G7	0.5161	194	131	18	8.9	2.3
G7-G8	0.5161	194	131	18	8.9	2.3
FG22	0.1354	121	88	32	17	5.4
OS08a	0.0251	16	11	2.3	0.7	0.10
OS08-G8	0.0251	16	10	2.3	0.7	0.10
FG23a	0.0216	21	15	5.2	2.7	0.8
OS07d	0.0034	2.5	1.6	0.4	0.1	0.01
OS07d-G8	0.0034	2.4	1.6	0.3	0.1	0.01

	DRAINAGE AREA (SQ. MI.)	PEAK DISCHARGE Q100 (CFS)	PEAK DISCHARGE Q50 (CFS)	PEAK DISCHARGE Q10 (CFS)	PEAK DISCHARGE Q5 (CFS)	PEAK DISCHARGE Q2 (CFS)
G8	0.7016	279	178	46	24	7.7
G8-G10	0.7016	278	177	45	24	7.6
FG24b	0.0589	76	57	24	15	6.5
FG24a	0.0348	24	16	4.5	2.0	0.4
OS08b	0.0165	9.5	6.3	1.4	0.5	0.07
OS08b-G9a	0.0165	9.4	6.0	1.4	0.5	0.07
OS09a	0.0093	5.3	3.5	0.8	0.3	0.04
OS09a-G9a	0.0093	5.2	3.4	0.7	0.3	0.04
G9a	0.1195	97	71	28	16	6.7
G9a-G9b	0.1195	96	70	27	16	6.6
FG24c	0.0291	40	30	13	8.4	4.0
FG24d	0.0262	39	30	14	8.7	4.4
G9b	0.1748	170	127	53	32	14
REX RD WQCV	0.1748	158	125	51	31	14
G9b-G10	0.1748	158	123	50	31	13
FG23b	0.0236	17	11.4	2.7	0.9	0.13
G10	0.9000	390	263	90	46	15
G10-G11	0.9000	389	254	85	44	15
FG23c	0.0109	11	7.6	2.2	1.0	0.2
G11	0.9109	393	258	86	44	15
FG25	0.1084	111	84	36	22	9.9
FG28	0.0184	15	10	3.0	1.2	0.2
POND G IN-WEST	1.0377	503	350	122	63	22
FG27	0.0679	98	79	42	30	18
FG26	0.0570	65	50	24	16	8.2
G13	0.0570	65	50	24	16	8.2
G13-POND G	0.0570	64	50	24	16	8.1
POND G IN-EAST	0.1249	160	127	64	44	25
POND G	1.1626	450	293	52	21	5.3
G12	1.1626	450	293	52	21	5.3
G12-G06	1.1626	449	293	52	21	5.3
FG29	0.0983	60	39	8.9	2.9	0.4
FG32	0.0402	51	40	20	14	7.5
FG32-G06	0.0402	50	40	19	13	7.4
G06	1.3011	491	317	57	22	7.5

FUTURE CONDITIONS - SCS MAP

FIGURE 6

No.	Revisions	Date	Init.	Appr.	Date
-	-	-	-	-	-

TECH CONTRACTORS
11910 TOURMALINE DR #130
FALCON, CO 80831
TELEPHONE: 719.495.7444

MERIDIAN RANCH

FUTURE CONDITIONS - SCS MAP
THE SANCTUARY FILING 1
FDR - FDR

Drawn by TAK | Checked by . | Date JUNE 2022

Scale AS SHOWN | - of -

APPENDIX F – DRAINAGE MAPS

BULLARD, ABBY, 9/8/2023 12:35 PM

SUMMARY RUNOFF TABLE

BASIN	AREA (ac)	% IMPERVIOUS	Q_5 (cfs)	Q_{100} (cfs)
G18*	321.53	-	28.3	365.2
FG36*	18.88	-	1.7	18.8
G16*	131.26	-	6.1	112.1
G06*	832.70	-	22.4	491.0
EX5	22.35	3	7.0	43.3
EX6	3.05	5	1.2	6.9
EX7	1.47	9	0.9	4.2
EX8	13.13	4	3.8	22.6
EX9	1.59	12	0.9	3.7

* AREA AND Q TAKEN FROM THE SANCTUARY FILING 1 FDR

DESIGN POINT SUMMARY TABLE

DESIGN POINT	CONTRIBUTING BASINS	ΣQ_5 (cfs)	ΣQ_{100} (cfs)
1	G18*	28.3	365.2
2	FG36*	1.7	18.8
3	G16*	6.1	112.1
4	G06*	22.4	491.0
5	EX5	7.0	43.3
6	EX6	1.2	6.9
7	EX7	0.9	4.2
8	EX8	3.8	22.6
9	EX9	0.9	3.7

MERIDIAN RANCH MDDP BASIN OS10
(DRAINS TO SOUTH POND)
SHOWN FOR REFERENCE ONLY

MR-OS10
236

MERIDIAN RANCH MDDP BASIN OS11
(DRAINS TO DP-MR)
SHOWN FOR REFERENCE ONLY

MR-OS11
64

G17

EX SOUTH POND
AREA=236.4 AC.
Q5_OUT= 25.5 CFS
Q100_OUT = 296.1 CFS
DISCHARGE PER THE FDR FOR LATIGO TRAILS FILING NO. 9
& ADDENDUM TO MDDP/FDR FOR LATIGO TRAILS

EX1
85.16

FG35
18.69

OWNER:
FALCON LATIGO LLC
UNPLATTED TRACT

FG36
EX2
18.88

EX LOWPOINT
(DRAINS BASIN OS11 ACROSS EASTONVILLE)

MR

EASTON VILLE ROAD

DESIGN POINT G18 = DP1
(THE SANCTUARY FILING 1 FDR)
AREA=321.5 AC.
Q5 = 28.3 CFS
Q100 = 365.2 CFS
DRAINS TO DP1

G18 1

NORTH

0 200
100

SEE SHEET 2

LEGEND:

- EXISTING MAJOR CONTOUR — 5250
- EXISTING MINOR CONTOUR
- EX STORM SEWER
- EX DRAINAGE SWALE
- EX PROPERTY LINE
- EXISTING FLOW DIRECTION
- PROPOSED DRAINAGE BASIN
- DESIGN POINT
- PROPOSED BASIN LABEL (NAME / AREA)

DRAWN BY: NQJ JOB DATE: 9/8/2023
APPROVED: CM JOB NUMBER: 201662.08
CAD DATE: 9/8/2023
CAD FILE: J:\2020\201662\CAD\Dwgs\C\Eastonville_Road_662.08\Drainage\201662.08_FDR_map_ex

BAR IS ONE INCH ON OFFICIAL DRAWINGS.
0 1"
IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.

NO.	DATE	BY	REVISION DESCRIPTION

HRGreen
HR GREEN - COLORADO SPRINGS
1975 RESEARCH PKWY SUITE 230
COLORADO SPRINGS CO 80920
PHONE: 719.300.4140
FAX: 713.965.0044

EASTONVILLE ROAD
D.R. HORTON
EL PASO COUNTY, CO

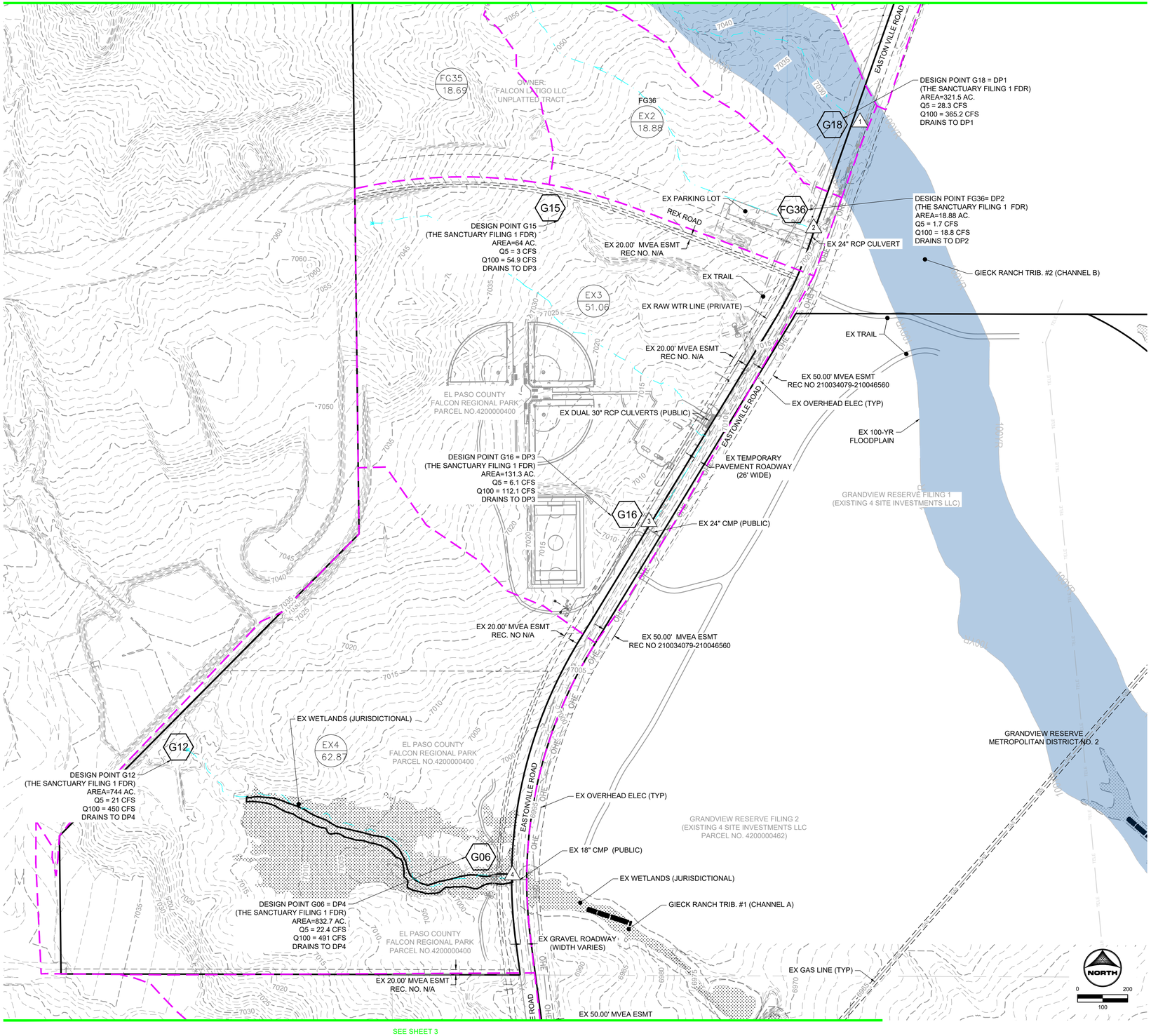
D·R·HORTON America's Builder

EXISTING CONDITIONS - DRAINAGE MAP

SHEET DRN 1

HR GREEN Xrefs: xgl-1-dh01_FDR_EX, ex_drain_map_legend, xv-dsgn_662, xv-util_662, xv-row-662

SEE SHEET 1



SEE SHEET 3

SUMMARY RUNOFF TABLE

BASIN	AREA (ac)	% IMPERVIOUS	Q_5 (cfs)	Q_{100} (cfs)
G18*	321.53	-	28.3	365.2
FG36*	18.88	-	1.7	18.8
G16*	131.26	-	6.1	112.1
G06*	832.70	-	22.4	491.0
EX5	22.35	3	7.0	43.3
EX6	3.05	5	1.2	6.9
EX7	1.47	9	0.9	4.2
EX8	13.13	4	3.8	22.6
EX9	1.59	12	0.9	3.7

* AREA AND Q TAKEN FROM THE SANCTUARY FILING 1 FDR

DESIGN POINT SUMMARY TABLE

DESIGN POINT	CONTRIBUTING BASINS	ΣQ_5 (cfs)	ΣQ_{100} (cfs)
1	G18*	28.3	365.2
2	FG36*	1.7	18.8
3	G16*	6.1	112.1
4	G06*	22.4	491.0
5	EX5	7.0	43.3
6	EX6	1.2	6.9
7	EX7	0.9	4.2
8	EX8	3.8	22.6
9	EX9	0.9	3.7

LEGEND:

- EXISTING MAJOR CONTOUR — 5250
- EXISTING MINOR CONTOUR
- EX STORM SEWER
- EX DRAINAGE SWALE
- EX PROPERTY LINE
- EXISTING FLOW DIRECTION
- PROPOSED DRAINAGE BASIN
- DESIGN POINT
- PROPOSED BASIN LABEL (NAME / AREA)

DRAWN BY: NQJ JOB DATE: 9/8/2023
APPROVED: CM JOB NUMBER: 201662.08
CAD DATE: 9/8/2023
CAD FILE: J:\2020\201662\CAD\Dwgs\C\Eastonville_Road_662.08\Drainage\201662.08_FDR_map_ex

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NO.	DATE	BY	REVISION DESCRIPTION

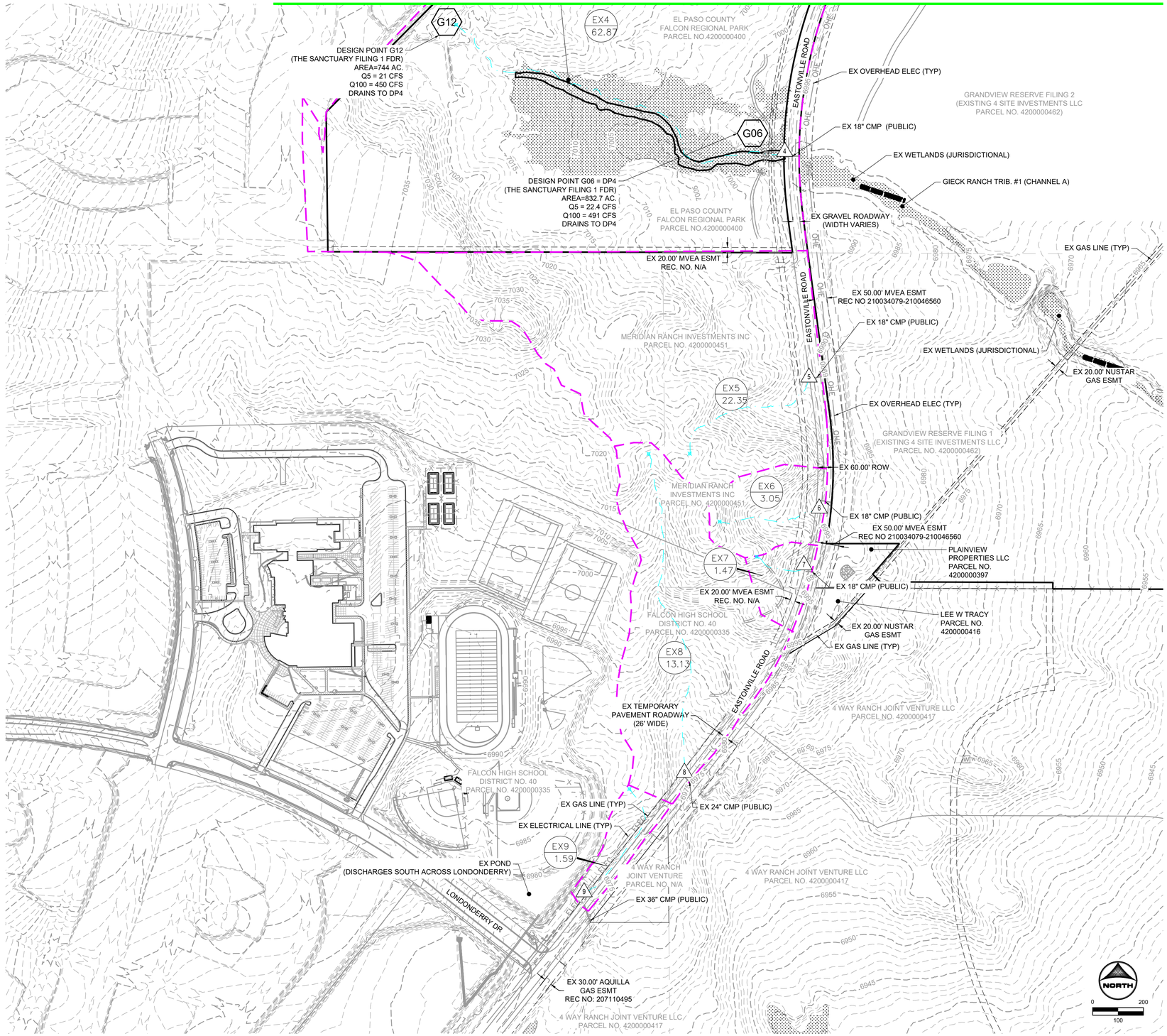
HR GREEN - COLORADO SPRINGS
1975 RESEARCH PKWY SUITE 230
COLORADO SPRINGS CO 80920
PHONE: 719.300.4140
FAX: 713.965.0044

EASTONVILLE ROAD
D.R. HORTON
EL PASO COUNTY, CO

EXISTING CONDITIONS - DRAINAGE MAP

SHEET DRN 2

SEE SHEET 2



SUMMARY RUNOFF TABLE

BASIN	AREA (ac)	% IMPERVIOUS	Q_5 (cfs)	Q_{100} (cfs)
G18*	321.53	-	28.3	365.2
FG36*	18.88	-	1.7	18.8
G16*	131.26	-	6.1	112.1
G06*	832.70	-	22.4	491.0
EX5	22.35	3	7.0	43.3
EX6	3.05	5	1.2	6.9
EX7	1.47	9	0.9	4.2
EX8	13.13	4	3.8	22.6
EX9	1.59	12	0.9	3.7

* AREA AND Q TAKEN FROM THE SANCTUARY FILING 1 FDR

DESIGN POINT SUMMARY TABLE

DESIGN POINT	CONTRIBUTING BASINS	ΣQ_5 (cfs)	ΣQ_{100} (cfs)
1	G18*	28.3	365.2
2	FG36*	1.7	18.8
3	G16*	6.1	112.1
4	G06*	22.4	491.0
5	EX5	7.0	43.3
6	EX6	1.2	6.9
7	EX7	0.9	4.2
8	EX8	3.8	22.6
9	EX9	0.9	3.7

LEGEND:

- EXISTING MAJOR CONTOUR (5250)
- EXISTING MINOR CONTOUR
- EX STORM SEWER
- EX DRAINAGE SWALE
- EX PROPERTY LINE
- EXISTING FLOW DIRECTION
- PROPOSED DRAINAGE BASIN
- DESIGN POINT
- PROPOSED BASIN LABEL (NAME / AREA)

DRAWN BY:	NQJ	JOB DATE:	9/8/2023
APPROVED:	CM	JOB NUMBER:	201662.08
CAD DATE:	9/8/2023		
CAD FILE:	J:\2020\201662\CAD\Dwgs\C\Eastonville_Road_662.08\Drainage\201662.08_FDR_map_ex		

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NO.	DATE	BY	REVISION DESCRIPTION

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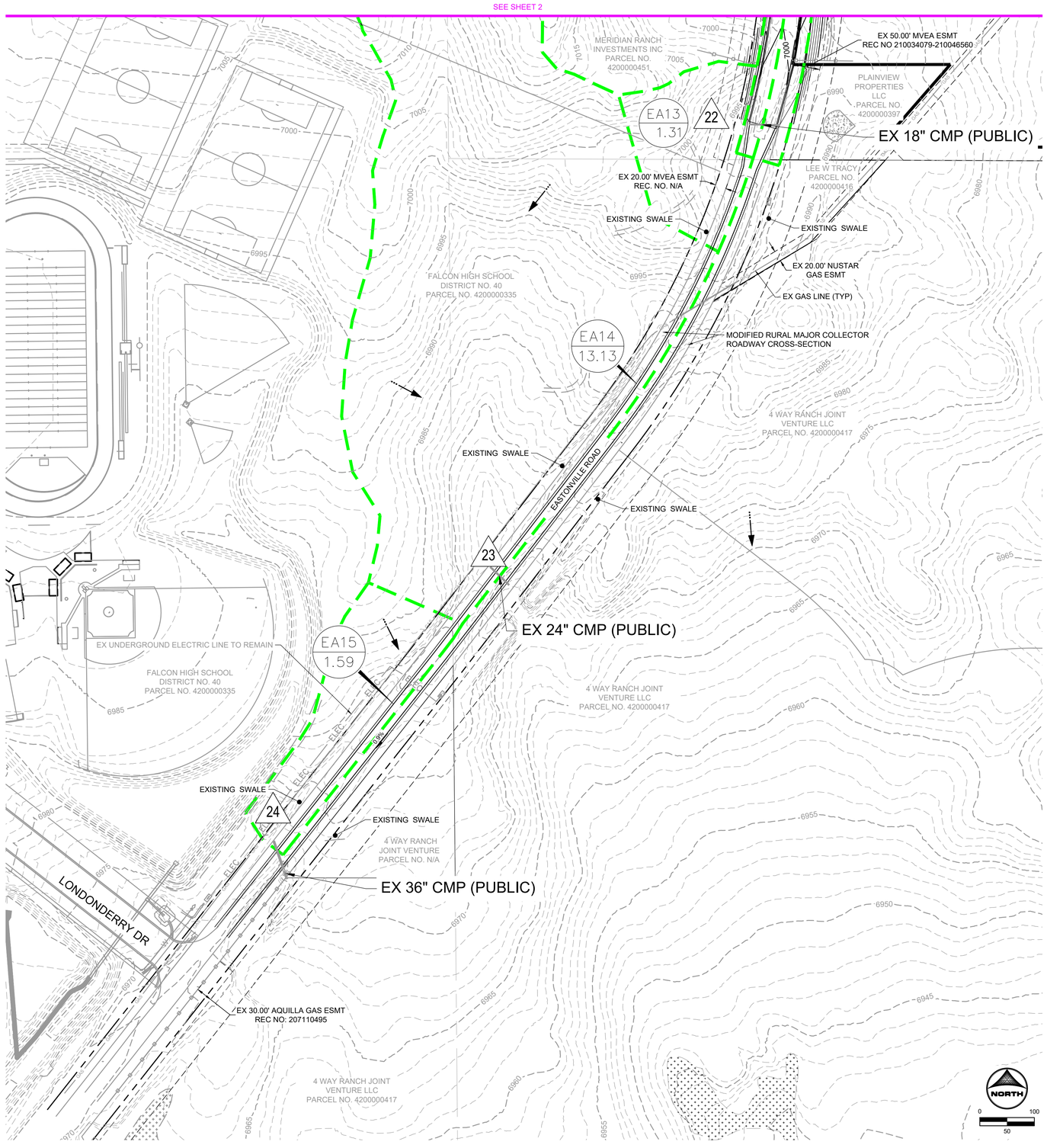
PHONE: 719.300.4140
FAX: 713.965.0044

EASTONVILLE ROAD
D.R. HORTON
EL PASO COUNTY, CO

D·R·HORTON America's Builder

EXISTING CONDITIONS - DRAINAGE MAP

SHEET DRN 3



BASIN SUMMARY TABLE

BASIN	AREA (ac)	% IMPERVIOUS	Q_5 (cfs)	Q_{100} (cfs)
OS1	85.16	-	-	-
OS2	15.03	7	4.2	21.6
OS3	1.00	2	0.2	1.7
OS4	9.60	9	3.8	17.3
OS5	40.26	8	13.3	64.0
OS6	60.97	2	8.9	60.6
OS7	23.46	2	5.7	38.6
OS8	11.42	2	3.4	22.7
EA1	0.22	73	0.8	1.5
EA2	0.25	73	0.9	1.7
EA3	0.20	71	0.7	1.4
EA4	0.17	65	0.5	1.1
EA5	0.16	2	0.1	0.5
EA6	0.70	100	3.2	5.7
EA7	0.65	89	2.6	4.8
EA8	2.08	99	5.0	9.0
EA9	2.99	64	4.6	9.5
EA10	1.34	94	4.0	7.4
EA11	1.99	66	4.1	8.5
EA12	0.92	4	0.5	3.0
EA13	1.31	12	1.0	4.0
EA14	13.13	4	4.0	23.0
EA15	1.59	14	1.0	3.9

DESIGN POINT SUMMARY TABLE

DESIGN POINT	CONTRIBUTING BASINS	ΣQ_5 (cfs)	ΣQ_{100} (cfs)
1	OS1 & G17	28.3	365.2
2	EA1	0.8	1.5
3	EA2	0.9	1.7
3.1	DP2 & DP3	1.6	3.2
4	EA5 & DP3.1	1.6	3.4
5	EA3	0.7	1.4
6	EA4	0.5	1.1
6.1	DP5 & DP6	1.2	2.4
7	OS2	4.2	21.6
8	OS3	0.2	1.7
8.1	DP7 & DP8	4.4	22.9
9.1	DP6.1 & DP8.1	4.9	23.8
10	EA7 & EA6	5.6	10.3
11	OS4 & G15 & DP9.1	10.5	144.3
12	OS5	13.3	64.0
12.1	DP11 & DP12	21.6	103.1
13	OS8	3.4	22.7
13.1	DP12.1 & DP13	23.4	115.2
14	EA8	5.0	9.0
15	EA9	4.6	9.5
15.1	DP14 & DP15	9.3	17.9
16	OS6 & G12 (G6*)	22.4	491.0
17	EA10	4.0	7.4
18	EA11	4.1	8.5
18.1	DP17 & DP18	8.0	15.4
19.1	DP15.1 & DP18.1	15.0	28.8
20	EA12	0.5	3.0
21	OS7	5.7	38.6
22	EA13	1.0	4.0
23	EA14	4.0	23.0
24	EA15	1.0	3.9

LEGEND:

- PROPOSED MAJOR CONTOUR — 5250
- PROPOSED MINOR CONTOUR
- EXISTING MAJOR CONTOUR — 5250
- EXISTING MINOR CONTOUR
- PROPOSED STORM SEWER
- PROPOSED DRAINAGE SWALE
- PROPERTY LINE
- PROPOSED FLOW DIRECTION
- EXISTING FLOW DIRECTION
- PROPOSED DRAINAGE BASIN
- DESIGN POINT (1)
- PROPOSED BASIN LABEL (NAME / AREA)

DRAWN BY: NQJ JOB DATE: 9/8/2023
APPROVED: CM JOB NUMBER: 201662.08
CAD DATE: 9/8/2023
CAD FILE: J:\2020\201662\CAD\Dwgs\C\Eastonville_Road_662.08\Drainage\201662.08_FDR_map

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NO.	DATE	BY	REVISION DESCRIPTION

HRGreen
HR GREEN - COLORADO SPRINGS
1975 RESEARCH PKWY SUITE 230
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FAX: 713.965.0044

EASTONVILLE ROAD
D.R. HORTON
EL PASO COUNTY, CO

D·R·HORTON America's Builder

PROPOSED CONDITIONS - DRAINAGE MAP

SHEET DRN 1

SEE SHEET 3

G12

DESIGN POINT G12
(MERIDIAN RANCH MDDP)
Q5 = 21 CFS
Q100 = 450 CFS
DRAINS TO DP16

OS6
60.97

EL PASO COUNTY
FALCON REGIONAL PARK
PARCEL NO.4200000400

DP16 Q100 HW
SURF. ELEV. = 7001.50

18" RCP (PUBLIC)

FUTURE
GRANDVIEW RESERVE

GRANDVIEW RESERVE
TO DETAIN REMAINING
ROUNDABOUT AREA

EX STORM PIPE
TO BE REMOVED

GRANDVIEW RESERVE FILING 2
(EXISTING 4 SITE INVESTMENTS LLC
PARCEL NO. 4200000462)

G06

DESIGN POINT G06 = DP4
(THE SANCTUARY FILING 1 FDR)
AREA=832.7 AC.
Q5 = 22.4 CFS
Q100 = 491 CFS
DRAINS TO DP4

EX CULVERTS
TO REMAIN

DUAL 10' X 3.5' RCBC
(PUBLIC)

CHANNEL A
(GIECK RANCH TRIBUTARY 1)

POND B
FULL SPECTRUM DETENTION
WQCV = 0.215 AC-FT
EURV = 0.832 AC-FT
100-YR = 1.230 AC FT
$Q_{EX,100}$= 3.4 CFS
$Q_{PR,100}$=3.2 CFS

EA12
0.92

TYPE L RIPRAP SPILLWAY

DP16 SWALE

MAINT. &
ACCESS RD

EL PASO COUNTY
FALCON REGIONAL PARK
PARCEL NO.4200000400

42" RCP (PUBLIC)

EX 20.00' MVEA ESMT
REC. NO. N/A

CONCRETE FOREBAY & 2.0' CONCRETE TRICKLE CHANNEL

30" RCP (PUBLIC)

24" RCP (PUBLIC)

EX 50.00' MVEA ESMT
REC NO 21[illegible]9-210046560

EA10
1.34

EA11
1.99

TYPE 2 C&G

DP21 SWALE

30" RCP (PUBLIC)

OS7
23.46

MERIDIAN RANCH
INVESTMENTS INC
PARCEL NO. 4200000451

EX STORM PIPE
TO BE REMOVED

DP21 Q100 HW
SURF. ELEV. = 6997.14

TYPE A C&G

PR 100.00' ROW

GRANDVIEW RESERVE FILING 1
(EXISTING 4 SITE INVESTMENTS LLC
PARCEL NO. 4200000462)

EX 60.00' ROW

EX 20.00' MVEA ESMT
REC. NO. N/A

EX STORM PIPE
TO BE REMOVED

SEE SHEET 1

BASIN SUMMARY TABLE

BASIN	AREA (ac)	% IMPERVIOUS	Q_5 (cfs)	Q_{100} (cfs)
OS1	85.16	-	-	-
OS2	15.03	7	4.2	21.6
OS3	1.00	2	0.2	1.7
OS4	9.60	9	3.8	17.3
OS5	40.26	8	13.3	64.0
OS6	60.97	2	8.9	60.6
OS7	23.46	2	5.7	38.6
OS8	11.42	2	3.4	22.7
EA1	0.22	73	0.8	1.5
EA2	0.25	73	0.9	1.7
EA3	0.20	71	0.7	1.4
EA4	0.17	65	0.5	1.1
EA5	0.16	2	0.1	0.5
EA6	0.70	100	3.2	5.7
EA7	0.65	89	2.6	4.8
EA8	2.08	99	5.0	9.0
EA9	2.99	64	4.6	9.5
EA10	1.34	94	4.0	7.4
EA11	1.99	66	4.1	8.5
EA12	0.92	4	0.5	3.0
EA13	1.31	12	1.0	4.0
EA14	13.13	4	4.0	23.0
EA15	1.59	14	1.0	3.9

DESIGN POINT SUMMARY TABLE

DESIGN POINT	CONTRIBUTING BASINS	ΣQ_5 (cfs)	ΣQ_{100} (cfs)
1	OS1 & G17	28.3	365.2
2	EA1	0.8	1.5
3	EA2	0.9	1.7
3.1	DP2 & DP3	1.6	3.2
4	EA5 & DP3.1	1.6	3.4
5	EA3	0.7	1.4
6	EA4	0.5	1.1
6.1	DP5 & DP6	1.2	2.4
7	OS2	4.2	21.6
8	OS3	0.2	1.7
8.1	DP7 & DP8	4.4	22.9
9.1	DP8.1 & DP8.1	4.9	23.8
10	EA7 & EA8	5.6	10.3
11	OS4 & G15 & DP9.1	10.5	144.3
12	OS5	13.3	64.0
12.1	DP11 & DP12	21.6	103.1
13	OS8	3.4	22.7
13.1	DP12.1 & DP13	23.4	115.2
14	EA6	5.0	9.0
15	EA9	4.6	9.5
15.1	DP14 & DP15	9.3	17.9
16	OS6 & G12 (G6*)	22.4	491.0
17	EA10	4.0	7.4
18	EA11	4.1	8.5
18.1	DP17 & DP18	8.0	15.4
19.1	DP15.1 & DP18.1	15.0	28.8
20	EA12	0.5	3.0
21	OS7	5.7	38.6
22	EA13	1.0	4.0
23	EA14	4.0	23.0
24	EA15	1.0	3.9

LEGEND:

- PROPOSED MAJOR CONTOUR — 5250
- PROPOSED MINOR CONTOUR
- EXISTING MAJOR CONTOUR — 5250
- EXISTING MINOR CONTOUR
- PROPOSED STORM SEWER
- PROPOSED DRAINAGE SWALE
- PROPERTY LINE
- PROPOSED FLOW DIRECTION
- EXISTING FLOW DIRECTION
- PROPOSED DRAINAGE BASIN
- DESIGN POINT
- PROPOSED BASIN LABEL — NAME / AREA

NORTH
0 100
50

SEE EXISTING CONDITIONS DRAINAGE MAP

DRAWN BY: NQJ	JOB DATE: 9/8/2023	BAR IS ONE INCH ON OFFICIAL DRAWINGS. 0 1"	
APPROVED: CM	JOB NUMBER: 201662.08	IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.	
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EASTONVILLE ROAD
D.R. HORTON
EL PASO COUNTY, CO

D·R·HORTON America's Builder

PROPOSED CONDITIONS - DRAINAGE MAP

SHEET DRN 2

SEE SHEET 4

REX ROAD

DP7 Q100 HW
SURF. ELEV. = 7026.50

DP8 Q100 HW
SURF. ELEV. = 7025.50

EA1
0.22

EA3
0.20

EA4
0.17

EA5
0.16

EA6
0.70

EA7
0.65

EA8
2.08

EA9
2.99

OS4
9.60

OS5
40.26

OS8
11.42

18" RCP (PUBLIC)

POND A
(WQ SAND FILTER)

12" PVC (PUBLIC)

PR. TEMPORARY SEDIMENT BASIN #1

PR 10' X 4' RCBC
(FUTURE)

DP10 SWALE

15" RCP (PUBLIC)

24" RCP (PUBLIC)

EX 20.00' MVEA ESMT
REC NO. N/A

EL PASO COUNTY
FALCON REGIONAL PARK
PARCEL NO.4200000400

DP9.1 SWALE

EX CULVERTS
TO REMAIN

FUTURE
REX
ROAD

TYPE L RIPRAP
W/ 12" PVC RISER PIPE

12" PVC (PRIVATE)

TYPE L RIPRAP
SPILLWAY

EX 100-YR FLOODPLAIN

EX 20.00' MVEA ESMT
REC NO. N/A

TYPE 2 C&G

DP11 SWALE

DP11 Q100 HW
SURF. ELEV. = 7014.20

EX 50.00' MVEA ESMT
REC NO 210034079-210046560

CHANNEL B - GIECK RANCH TRIB. 2
(NOT A PART OF THIS PROJECT,
SHOWN FOR REFERENCE)

36' CDOT FES

EX CULVERTS
(TO BE FLOW FILLED)

EX PARKING AREA TO REMAIN

36" RCP (PUBLIC)

GRANDVIEW RESERVE FILING 1
(EXISTING 4 SITE INVESTMENTS LLC)

48" RCP (PUBLIC)

48" RCP (PUBLIC)

DP12 SWALE

EX POND TO REMAIN

EL PASO COUNTY
FALCON REGIONAL PARK
PARCEL NO.4200000400

EASTONVILLE ROAD

EX 20.00' MVEA ESMT
REC. NO N/A

DP12 Q100 HW
SURF. ELEV. = 7008.50

48" RCP (PUBLIC)

48" RCP (PUBLIC)

DP12 SWALE

EX MVEA ABOVE GROUND
ELECTRICAL BOX TO REMAIN

EX WELL STATION

GRANDVIEW RESERVE FILING 1
(EXISTING 4 SITE INVESTMENTS LLC
PARCEL NO. 4200000462)

EX 50.00' MVEA ESMT
REC NO 210034079-210046560

DP16 SWALE

SEE SHEET 2

SEE EXISTING CONDITIONS DRAINAGE MAP

BASIN SUMMARY TABLE

BASIN	AREA (ac)	% IMPERVIOUS	Q_5 (cfs)	Q_{100} (cfs)
OS1	85.16	-	-	-
OS2	15.03	7	4.2	21.6
OS3	1.00	2	0.2	1.7
OS4	9.60	9	3.8	17.3
OS5	40.26	8	13.3	64.0
OS6	60.97	2	5.9	60.6
OS7	23.46	2	5.7	38.6
OS8	11.42	2	3.4	22.7
EA1	0.22	73	0.8	1.5
EA2	0.25	73	0.9	1.7
EA3	0.20	71	0.7	1.4
EA4	0.17	65	0.5	1.1
EA5	0.16	2	0.1	0.5
EA6	0.70	100	3.2	5.7
EA7	0.65	89	2.6	4.8
EA8	2.08	99	5.0	9.0
EA9	2.99	64	4.6	9.5
EA10	1.34	94	4.0	7.4
EA11	1.99	66	4.1	8.5
EA12	0.92	4	0.5	3.0
EA13	1.31	12	1.0	4.0
EA14	13.13	4	4.0	23.0
EA15	1.59	14	1.0	3.9

DESIGN POINT SUMMARY TABLE

DESIGN POINT	CONTRIBUTING BASINS	ΣQ_5 (cfs)	ΣQ_{100} (cfs)
1	OS1 & G17	28.3	365.2
2	EA1	0.8	1.5
3	EA2	0.9	1.7
3.1	DP2 & DP3	1.6	3.2
4	EA5 & DP3.1	1.6	3.4
5	EA3	0.7	1.4
6	EA4	0.5	1.1
6.1	DP5 & DP6	1.2	2.4
7	OS2	4.2	21.6
8	OS3	0.2	1.7
8.1	DP7 & DP8	4.4	22.9
9.1	DP8.1 & DP8.1	4.9	23.8
10	EA7 & EA6	5.6	10.3
11	OS4 & G15 & DP9.1	10.5	144.3
12	OS5	13.3	64.0
12.1	DP11 & DP12	21.6	103.1
13	OS8	3.4	22.7
13.1	DP12.1 & DP13	23.4	115.2
14	EA8	5.0	9.0
15	EA9	4.6	9.5
15.1	DP14 & DP15	9.3	17.9
16	OS6 & G12 (G6*)	22.4	491.0
17	EA10	4.0	7.4
18	EA11	4.1	8.5
18.1	DP17 & DP18	8.0	15.4
19.1	DP15.1 & DP18.1	15.0	28.8
20	EA12	0.5	3.0
21	OS7	5.7	38.6
22	EA13	1.0	4.0
23	EA14	4.0	23.0
24	EA15	1.0	3.9

LEGEND:

- PROPOSED MAJOR CONTOUR — 5250
- PROPOSED MINOR CONTOUR
- EXISTING MAJOR CONTOUR — 5250
- EXISTING MINOR CONTOUR
- PROPOSED STORM SEWER
- PROPOSED DRAINAGE SWALE
- PROPERTY LINE
- PROPOSED FLOW DIRECTION
- EXISTING FLOW DIRECTION
- PROPOSED DRAINAGE BASIN
- DESIGN POINT
- PROPOSED BASIN LABEL — NAME / AREA

NORTH

0 100
50

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EASTONVILLE ROAD
D.R. HORTON
EL PASO COUNTY, CO

PROPOSED CONDITIONS - DRAINAGE MAP

SHEET DRN 3

SEE EXISTING CONDITIONS DRAINAGE MAP

SEE EXISTING CONDITIONS DRAINAGE MAP

OS1
85.16

FG35
18.69

OS2
15.03

G15

DESIGN POINT G15
(THE SANCTUARY FILING 1 FDR)
AREA=64 AC.
Q5 = 3 CFS
Q100 = 54.9 CFS
DRAINS TO DP3

REX ROAD

EL PASO COUNTY
FALCON REGIONAL PARK
PARCEL NO 4200000400

OS4
9.60

DP9.1 SWALE

EX CULVERTS
TO REMAIN

SEE SHEET 3

MR

EX LOWPOINT
(DRAINS BASIN
OS11 ACROSS
EASTONVILLE)

DESIGN POINT G18 = DP1
(THE SANCTUARY FILING 1 FDR)
AREA=321.5 AC.
Q5 = 28.3 CFS
Q100 = 365.2 CFS
DRAINS TO DP1

G18

EX DRAINAGE SWALE
(REDIRECTS FG38 TO CHANNEL B)

CHANNEL B - GIECK RANCH TRIB. 2
(NOT A PART OF THIS PROJECT,
SHOWN FOR REFERENCE)

OS3
1.00

EA2
0.25

EA1
0.22

EA3
0.20

EA4
0.17

EA5
0.16

EA7
0.65

EA6
0.70

DP7 Q100 HW
SURF. ELEV. = 7026.50

DP8 Q100 HW
SURF. ELEV. =
7025.50

EX STORM PIPE
TO BE REMOVED

18" RCP (PUBLIC)

POND A
(WQ SAND FILTER)

PR. TEMPORARY SEDIMENT BASIN #1

12" PVC (PUBLIC)

PR 10' X 4' RCBC
(FUTURE)

DP10 SWALE

EX 20.00' MVEA ESMT
REC NO. N/A

15" RCP (PUBLIC)

24" RCP (PUBLIC)

FUTURE
REX
ROAD

TYPE L RIPRAP
W/ 12" PVC RISER PIPE

12" PVC (PRIVATE)

TYPE L RIPR
SPILLWAY

NORTH
0 100
50

BASIN SUMMARY TABLE

BASIN	AREA (ac)	% IMPERVIOUS	Q_5 (cfs)	Q_{100} (cfs)
OS1	85.16	-	-	-
OS2	15.03	7	4.2	21.6
OS3	1.00	2	0.2	1.7
OS4	9.60	9	3.8	17.3
OS5	40.26	8	13.3	64.0
OS6	60.97	2	8.9	60.6
OS7	23.46	2	5.7	38.6
OS8	11.42	2	3.4	22.7
EA1	0.22	73	0.8	1.5
EA2	0.25	73	0.9	1.7
EA3	0.20	71	0.7	1.4
EA4	0.17	65	0.5	1.1
EA5	0.16	2	0.1	0.5
EA6	0.70	100	3.2	5.7
EA7	0.65	89	2.6	4.8
EA8	2.08	99	5.0	9.0
EA9	2.99	64	4.6	9.5
EA10	1.34	94	4.0	7.4
EA11	1.99	66	4.1	8.5
EA12	0.92	4	0.5	3.0
EA13	1.31	12	1.0	4.0
EA14	13.13	4	4.0	23.0
EA15	1.59	14	1.0	3.9

DESIGN POINT SUMMARY TABLE

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2	EA1	0.8	1.5
3	EA2	0.9	1.7
3.1	DP2 & DP3	1.6	3.2
4	EA5 & DP3.1	1.6	3.4
5	EA3	0.7	1.4
6	EA4	0.5	1.1
6.1	DP5 & DP6	1.2	2.4
7	OS2	4.2	21.6
8	OS3	0.2	1.7
8.1	DP7 & DP8	4.4	22.9
9.1	DP8.1 & DP8.1	4.9	23.8
10	EA7 & EA6	5.6	10.3
11	OS4 & G15 & DP9.1	10.5	144.3
12	OS5	13.3	64.0
12.1	DP11 & DP12	21.6	103.1
13	OS8	3.4	22.7
13.1	DP12.1 & DP13	23.4	115.2
14	EA8	5.0	9.0
15	EA9	4.6	9.5
15.1	DP14 & DP15	9.3	17.9
16	OS6 & G12 (G6*)	22.4	491.0
17	EA10	4.0	7.4
18	EA11	4.1	8.5
18.1	DP17 & DP18	8.0	15.4
19.1	DP15.1 & DP18.1	15.0	28.8
20	EA12	0.5	3.0
21	OS7	5.7	38.6
22	EA13	1.0	4.0
23	EA14	4.0	23.0
24	EA15	1.0	3.9

LEGEND:

- PROPOSED MAJOR CONTOUR — 5250
- PROPOSED MINOR CONTOUR
- EXISTING MAJOR CONTOUR — 5250
- EXISTING MINOR CONTOUR
- PROPOSED STORM SEWER
- PROPOSED DRAINAGE SWALE
- PROPERTY LINE
- PROPOSED FLOW DIRECTION
- EXISTING FLOW DIRECTION
- PROPOSED DRAINAGE BASIN
- DESIGN POINT
- PROPOSED BASIN LABEL — NAME / AREA

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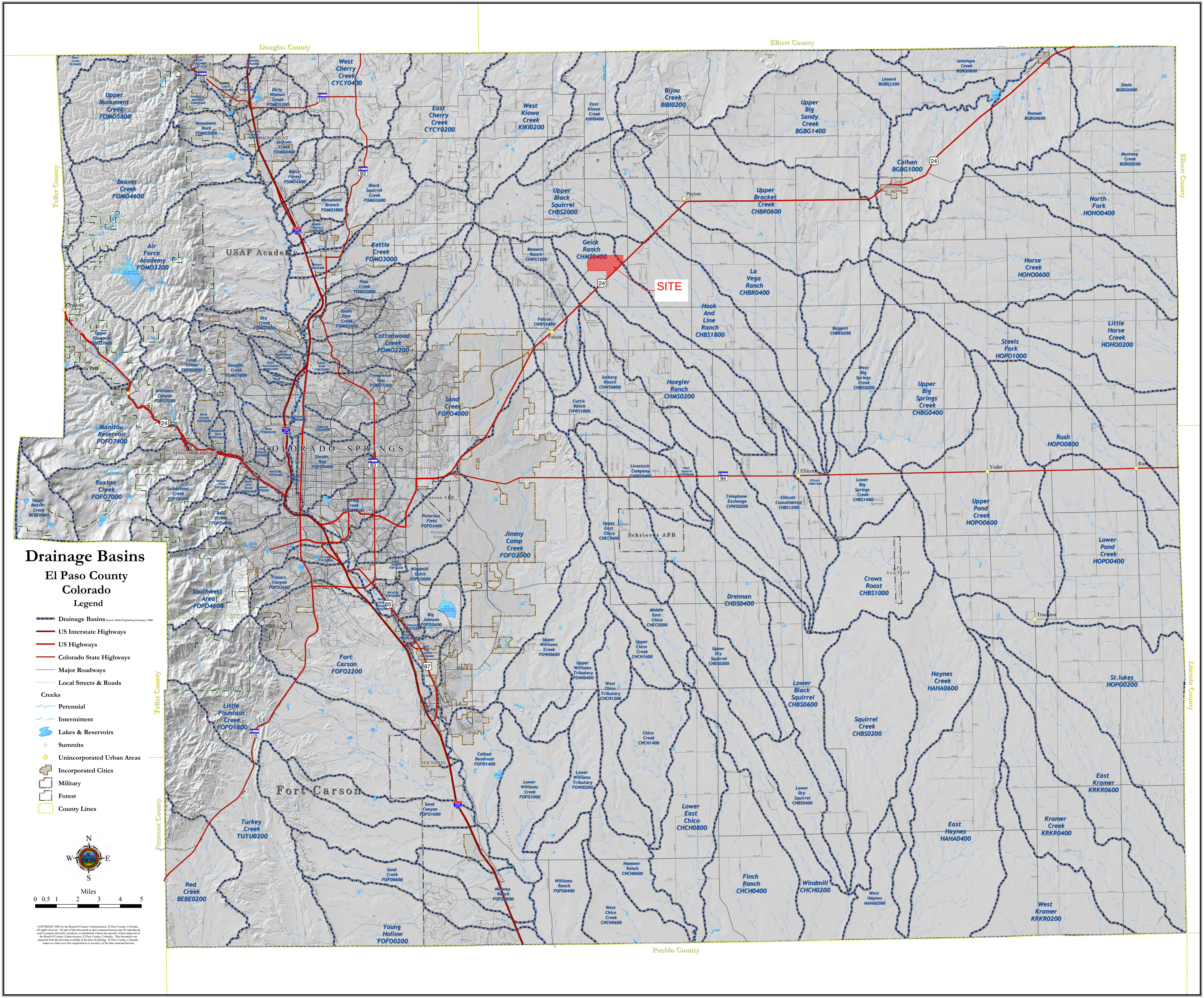
EASTONVILLE ROAD
D.R. HORTON
EL PASO COUNTY, CO

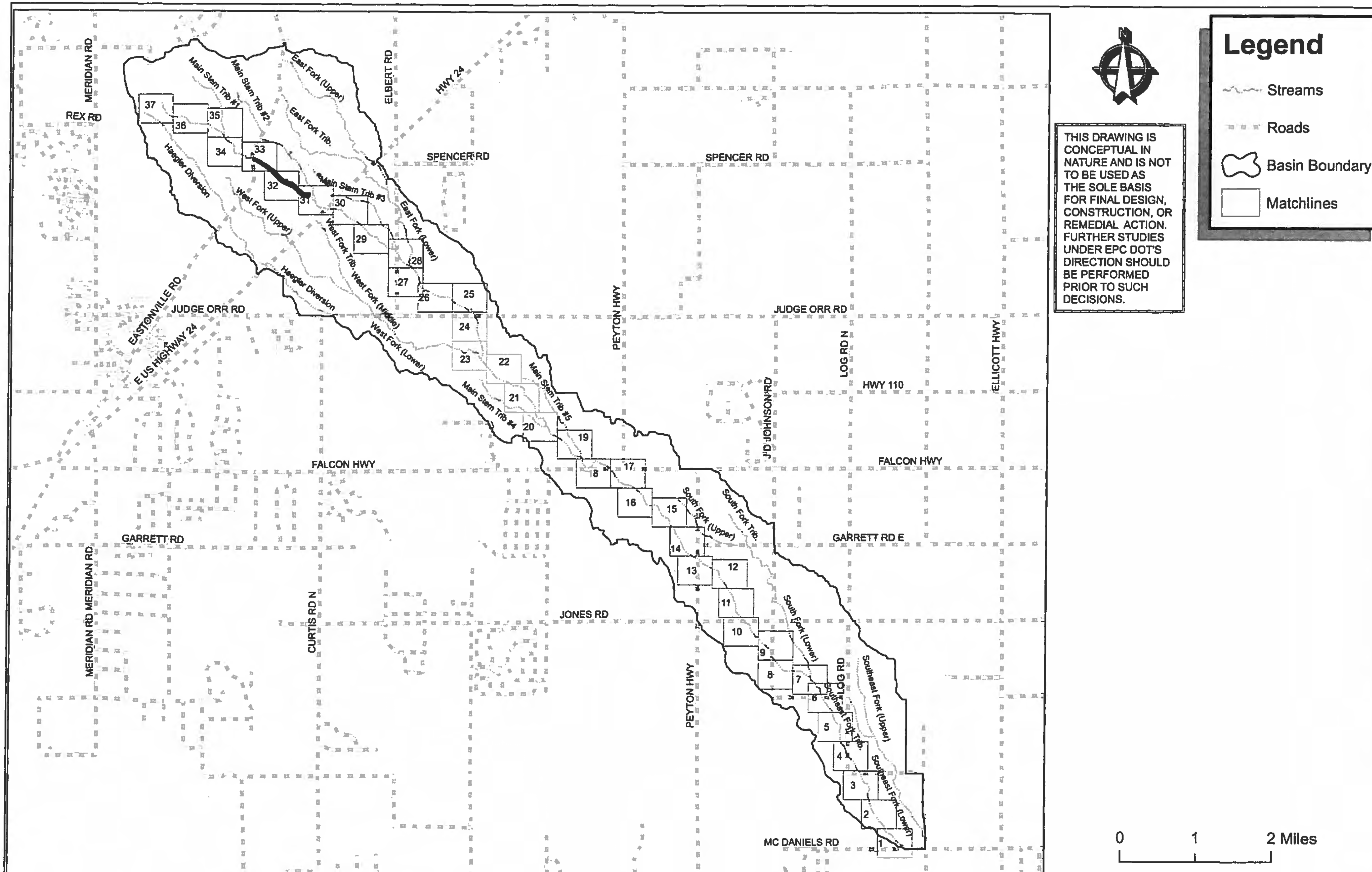
PROPOSED CONDITIONS - DRAINAGE MAP

SHEET DRN 4

APPENDIX G

DBPS &, MDDP Sheet References


Drainage Basins
El Paso County
Colorado
Legend
Drainage Basins
US Interstate Highways
US Highways
Colorado State Highways
Major Roadways
Local Streets & Roads
Creeks
Perennial
Intermittent
Lakes & Reservoirs
Summits
Unincorporated Urban Areas
Incorporated Cities
Military
Forest
County Lines
N
W
E
S
Miles
0 0.5 1 2 3 4 5
SITE
Douglas County
Elbert County
Teller County
Fremont County
Pueblo County
Lincoln County
USAF Academy
COLORADO SPRINGS
Fort Carson
Schriever AFB
Peyton
Falcon
Ellicott
Yoder
Truckton
West Cherry Creek CYCY0400
East Cherry Creek CYCY0200
West Kiowa Creek KIKI0200
Bijou Creek BIBI0200
Upper Big Sandy Creek BGBG1400
Calhan BGBG1000
Upper Monument Creek FOMO5800
Beaver Creek FOMO4600
Air Force Academy FOMO3200
Kettle Creek FOMO3000
Upper Black Squirrel CHBS2000
Geick Ranch CHMS0400
Upper Bracket Creek CHBR0600
North Fork HOHO0400
Horse Creek HOHO0600
La Vega Ranch CHBR0400
Hook And Line Ranch CHBS1800
Little Horse Creek HOHO0200
Steels Fork HOPO1000
Cottonwood Creek FOMO2200
Haegler Ranch CHMS0200
Upper Big Springs Creek CHBG0400
Sand Creek FOFO4000
Rush HOPO0800
Manitou Reservoir FOFO7400
Ruxton Creek FOFO7000
Upper Pond Creek HOPO0600
Jimmy Camp Creek FOFO2000
Lower Pond Creek HOPO0400
Crows Roost CHBS1000
Drennan CHDS0400
Southwest Area FOFO4600
Fort Carson FOFO2200
Haynes Creek HAHA0600
St.lukes HOPO0200
Lower Black Squirrel CHBS0600
Squirrel Creek CHBS0200
Little Fountain Creek FOFO1800
East Kramer KRKR0600
Kramer Creek KRKR0400
Turkey Creek TUTU0200
Lower East Chico CHCH0800
East Haynes HAHA0400
Red Creek BEBE0200
Finch Ranch CHCH0400
Windmill CHCH0200
Young Hollow FOFO0200
West Kramer KRKR0200



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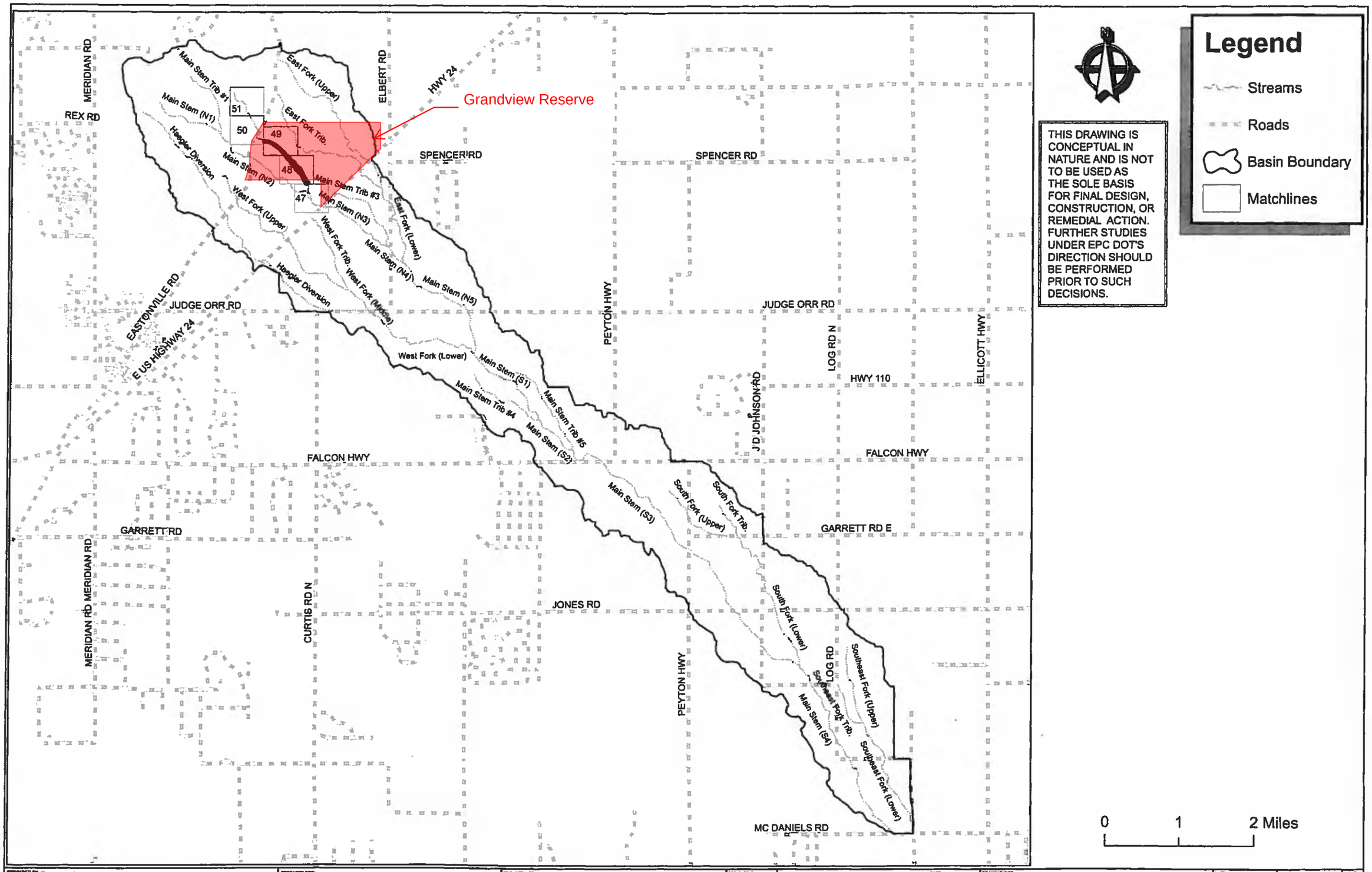
PREPARED BY:	PREPARED FOR:	PROJECT INFO:		DRAWING INFO:		
Drexel, Barrell & Co. Engineers · Surveyors 1800 38TH STREET BOULDER, COLORADO 80301 (303) 442-4338 3 S 7TH STREET COLORADO SPRINGS, COLORADO 80905 (719) 260-0887 6513 W 4TH STREET GREELEY, COLORADO 80634 (970) 351-0645 CONTACT: ROBERT BENNETT	REALTY DEVELOPMENT SERVICES 25 NORTH TEJON STREET, SUITE 300 COLORADO SPRINGS, COLORADO 80903 CONTACT: RAY O' SULLIVAN (719) 227-1022	GIECK RANCH DRAINAGE BASIN PLANNING STUDY EL PASO COUNTY, COLORADO	DESIGNED BY: RJB DRAWN BY: BLF CHECKED BY: RJB	GIECK RANCH KEY MAP MAIN STEM	DATE: AUGUST 2007 SCALE: H: 1" = 6000' V:	JOB NO: C7706-1 DRAWING NO.: 6D 038	SET: PL SHEET: K1



THIS DRAWING IS CONCEPTUAL IN NATURE AND IS NOT TO BE USED AS THE SOLE BASIS FOR FINAL DESIGN, CONSTRUCTION, OR REMEDIAL ACTION. FURTHER STUDIES UNDER EPC DOT'S DIRECTION SHOULD BE PERFORMED PRIOR TO SUCH DECISIONS.

Legend

- Streams
- Roads
- Basin Boundary
- Matchlines

PREPARED BY: Drexel, Barrell & Co. Engineers · Surveyors
1560 30TH STREET
3 S 7TH STREET
6513 W 4TH STREET
CONTACT: ROBERT BENNETT
SOULDER, COLORADO 80301 (303) 442-4338
COLORADO SPRINGS, COLORADO 80905 (719) 260-0887
GREELEY, COLORADO 80634 (970) 351-9646

PREPARED FOR: REALTY DEVELOPMENT SERVICES
25 NORTH TEJON STREET, SUITE 300
COLORADO SPRINGS, COLORADO 80903
CONTACT: RAY O' SULLIVAN (719) 227-1022

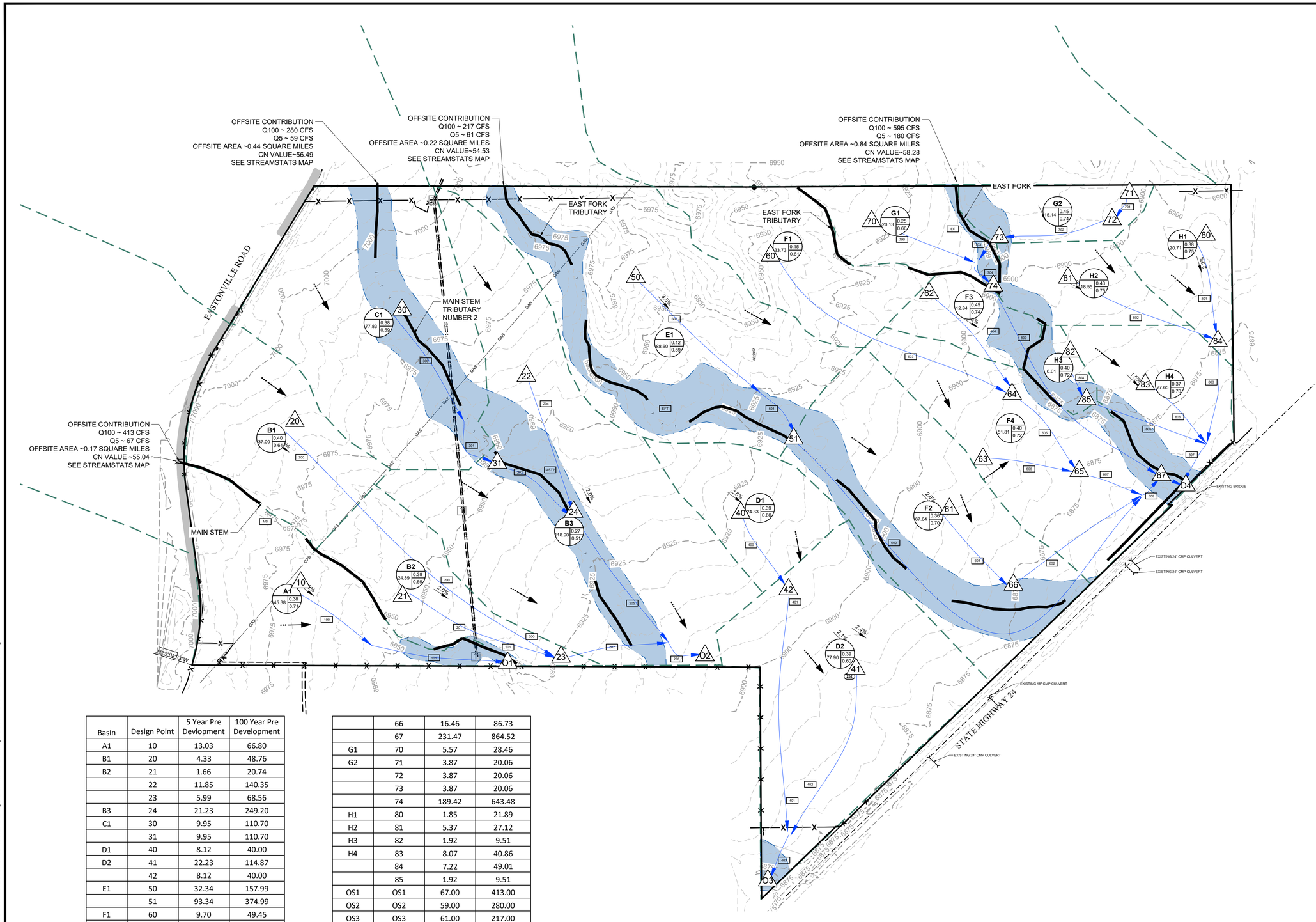
PROJECT INFO: GIECK RANCH
DRAINAGE BASIN PLANNING STUDY
EL PASO COUNTY, COLORADO

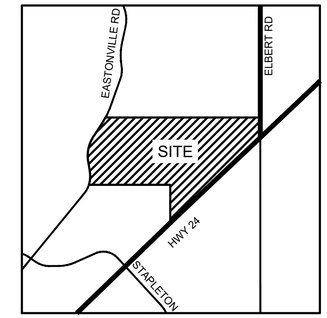
DESIGNED BY: RJB
DRAWN BY: BLF
CHECKED BY: RJB

REVISION DESCRIPTIONS	DATE

DRAWING INFO: GIECK RANCH
KEY MAP
MAIN STEM TRIBUTARY #2

DATE:	JOB NO:	SET
AUGUST 2007	C7706-1	PL
SCALE: 1" = 6000'	DRAWING NO.: 6D 038	SHEET: K5





VICINITY MAP

LEGEND:

- PROPOSED MAJOR CONTOUR — 5250
- PROPOSED MINOR CONTOUR
- EXISTING MAJOR CONTOUR — 5250
- EXISTING MINOR CONTOUR
- PROPOSED STORM DRAIN PIPE
- EXISTING STORM DRAIN PIPE
- PROPOSED DRAINAGE CHANNEL
- PROPOSED ROAD
- PROPERTY LINE
- DIRECTIONAL FLOW ARROW
- EMERGENCY OVERFLOW ARROW
- EXISTING 100-YR FLOODWAY
- EXISTING 100-YR FLOODPLAIN
- PROPOSED 100-YR FLOODPLAIN
- WATERSHED BOUNDARY
- MAJOR BASIN LINE
- 100YR ZONE A FLOODPLAIN
- PROPOSED DETENTION LOCATION (A)
- POTENTIAL WATER QUALITY LOCATION (WQ)
- SWMM CONVEYANCE ELEMENT (SWMM)
- PROPOSED PEAK FLOW RATE (CFS) (850)
- DESIGN POINT (X)
- PROPOSED BASIN LABEL (XX) — BASIN DESIGNATION; AREA (AC.) XX — C5 XX — C100

LAND USE

- LOW DENSITY
- MEDIUM DENSITY
- HIGH/MED DENSITY
- HIGH DENSITY
- CHURCH
- COMMERCIAL
- ELEMENTARY SCHOOL
- COMMUNITY PARK

NOTES:

Basin	Design Point	5 Year Pre Devlopment	100 Year Pre Development
A1	10	13.03	66.80
B1	20	4.33	48.76
B2	21	1.66	20.74
	22	11.85	140.35
	23	5.99	68.56
B3	24	21.23	249.20
C1	30	9.95	110.70
	31	9.95	110.70
D1	40	8.12	40.00
D2	41	22.23	114.87
	42	8.12	40.00
E1	50	32.34	157.99
	51	93.34	374.99
F1	60	9.70	49.45
F2	61	16.46	86.73
F3	62	3.65	18.42
F4	63	12.98	67.82
	64	13.35	67.87
	65	26.04	135.62
	66	16.46	86.73
	67	231.47	864.52
G1	70	5.57	28.46
G2	71	3.87	20.06
	72	3.87	20.06
	73	3.87	20.06
	74	189.42	643.48
H1	80	1.85	21.89
H2	81	5.37	27.12
H3	82	1.92	9.51
H4	83	8.07	40.86
	84	7.22	49.01
	85	1.92	9.51
OS1	OS1	67.00	413.00
OS2	OS2	59.00	280.00
OS3	OS3	61.00	217.00
OS4	OS4	180.00	595.00
	Outfall1	80.03	479.80
	Outfall2	85.96	597.41
	Outfall3	30.00	154.35
	Outfall4	341.05	1335.77

NORTH

0 200

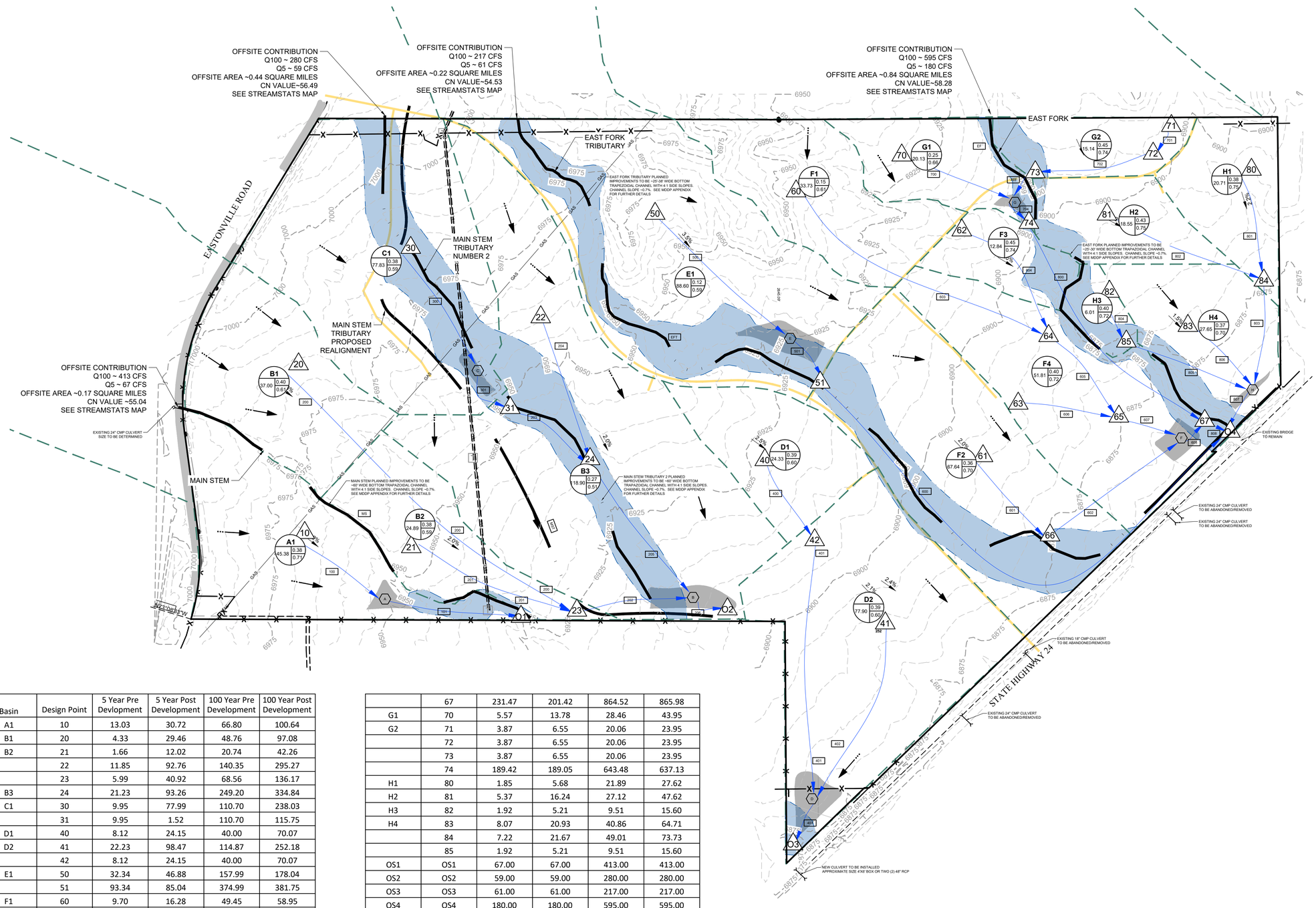
100

HRGreen

Job No.:	191897.01
Prepared By:	TBI
Date:	04/14/2020

EXISTING EX1

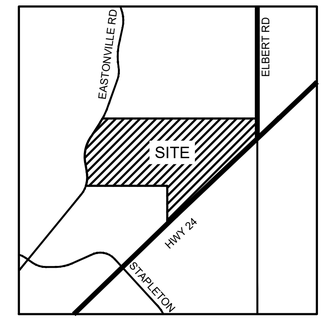
FIG.EX1



Basin	Design Point	5 Year Pre Devlopment	5 Year Post Development	100 Year Pre Development	100 Year Post Development
A1	10	13.03	30.72	66.80	100.64
B1	20	4.33	29.46	48.76	97.08
B2	21	1.66	12.02	20.74	42.26
	22	11.85	92.76	140.35	295.27
	23	5.99	40.92	68.56	136.17
B3	24	21.23	93.26	249.20	334.84
C1	30	9.95	77.99	110.70	238.03
	31	9.95	1.52	110.70	115.75
D1	40	8.12	24.15	40.00	70.07
D2	41	22.23	98.47	114.87	252.18
	42	8.12	24.15	40.00	70.07
E1	50	32.34	46.88	157.99	178.04
	51	93.34	85.04	374.99	381.75
F1	60	9.70	16.28	49.45	58.95
F2	61	16.46	60.11	86.73	170.90
F3	62	3.65	11.36	18.42	32.93
F4	63	12.98	42.32	67.82	124.89
	64	13.35	26.88	67.87	90.88
	65	26.04	69.12	135.62	215.63
	66	16.46	60.11	86.73	170.90

	67	231.47	201.42	864.52	865.98
G1	70	5.57	13.78	28.46	43.95
G2	71	3.87	6.55	20.06	23.95
	72	3.87	6.55	20.06	23.95
	73	3.87	6.55	20.06	23.95
	74	189.42	189.05	643.48	637.13
H1	80	1.85	5.68	21.89	27.62
H2	81	5.37	16.24	27.12	47.62
H3	82	1.92	5.21	9.51	15.60
H4	83	8.07	20.93	40.86	64.71
	84	7.22	21.67	49.01	73.73
	85	1.92	5.21	9.51	15.60
OS1	OS1	67.00	67.00	413.00	413.00
OS2	OS2	59.00	59.00	280.00	280.00
OS3	OS3	61.00	61.00	217.00	217.00
OS4	OS4	180.00	180.00	595.00	595.00
	Outfall1	80.03	67.69	479.80	466.95
	Outfall2	85.96	61.68	597.41	536.11
	Outfall3	30.00	8.58	154.35	160.70*
	Outfall4	341.05	276.10	1335.77	1291.25

*THIS VALUE IS HIGHER THAN PRE-EXISTING AND WILL BE ADJUSTED TO MEET CRITERIA WITH THE PRELIMINARY DRAINAGE REPORT



VICINITY MAP

LEGEND:

- PROPOSED MAJOR CONTOUR — 5250
- PROPOSED MINOR CONTOUR
- EXISTING MAJOR CONTOUR — 5250
- EXISTING MINOR CONTOUR
- PROPOSED STORM DRAIN PIPE
- EXISTING STORM DRAIN PIPE
- PROPOSED DRAINAGE CHANNEL
- PROPOSED ROAD
- PROPERTY LINE
- DIRECTIONAL FLOW ARROW
- EMERGENCY OVERFLOW ARROW
- EXISTING 100–YR FLOODWAY
- EXISTING 100–YR FLOODPLAIN
- PROPOSED 100–YR FLOODPLAIN
- WATERSHED BOUNDARY
- MAJOR BASIN LINE
- 100YR ZONE A FLOODPLAIN
- PROPOSED DETENTION LOCATION (A)
- POTENTIAL WATER QUALITY LOCATION (WQ)
- SWMM CONVEYANCE ELEMENT (SWMM)
- PROPOSED PEAK FLOW RATE (CFS) (850)
- DESIGN POINT (X)
- PROPOSED BASIN LABEL (XX) — BASIN DESIGNATION; AREA (AC.) XX — C5 XX — C100

LAND USE

- LOW DENSITY
- MEDIUM DENSITY
- HIGH/MED DENSITY
- HIGH DENSITY
- CHURCH
- COMMERCIAL
- ELEMENTARY SCHOOL
- COMMUNITY PARK

NOTES:

PRELIMINARY CHANNEL GEOMETRY (BY OTHERS)

MAIN STEM
BOTTOM WIDTH: 60'
SIDE SLOPES: 4:1

MAIN STEM TRIBUTARY 2
BOTTOM WIDTH: 60'
SIDE SLOPES: 4:1

EAST FORK TRIBUTARY 1 REACH 2
BOTTOM WIDTH: 38'
SIDE SLOPES: 4:1

EAST FORK TRIBUTARY 1 REACH 1
BOTTOM WIDTH: 25'
SIDE SLOPES: 4:1

NORTH
0 400
200

HRGreen

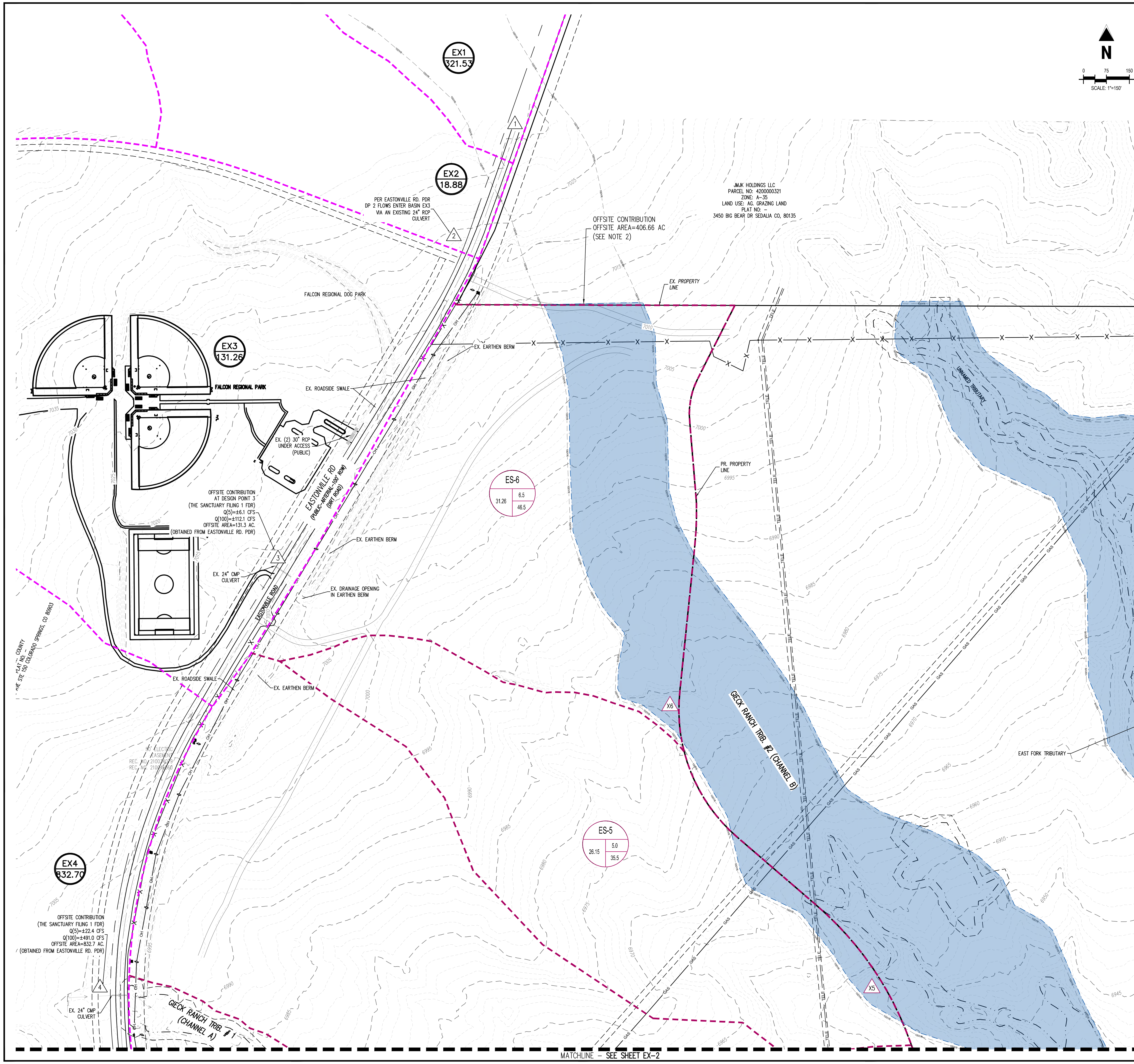
Job No.:	191897.01
Prepared By:	TBI
Date:	04/14/2020

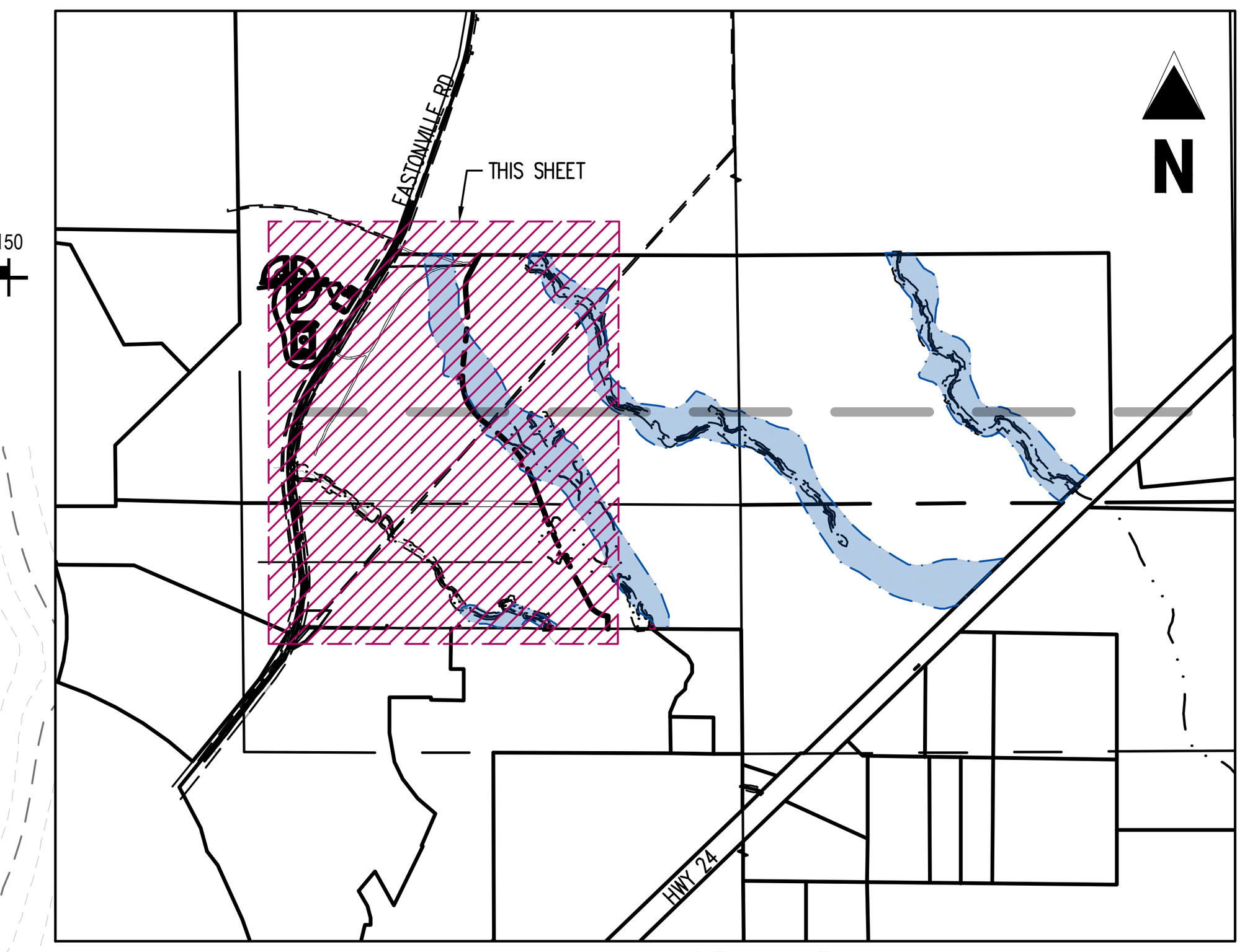
PROPOSED DR1

FIG.DR1

APPENDIX H

Drainage Maps & Water Quality Plan





KEY MAP SCALE: (1"=2,000')

DRAINAGE LEGEND

- EXISTING PROPERTY LINE
- PROPOSED PROPERTY LINE
- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- BASIN BOUNDARY LINE
- OFF-SITE BASIN DESIGNATION
- OFF-SITE BASIN TRIBUTARY AREA
- BASIN DESIGNATION
- 5-YEAR RUNOFF IN CUBIC FEET PER SECOND
- 100-YEAR RUNOFF IN CUBIC FEET PER SECOND
- BASIN AREA IN ACRES
- DESIGN POINT
- DIRECTION OF RUNOFF
- EXISTING BOUNDARY EASEMENT
- EXISTING TELEPHONE LINE
- EXISTING POWER LINE
- EXISTING FENCE
- EXISTING GAS LINE
- EXISTING WETLANDS
- EXISTING LIMITS OF WETLAND
- EXISTING WETLAND SETBACK
- EXISTING FEMA FLOOD PLAIN, ZONE A

NOTE:

1. FOR EXISTING WESTERN OFFSITE SUB-BASIN ANALYSIS AS WELL AS PROPOSED EASTONVILLE ROAD SUB-BASIN ANALYSIS, SEE "EASTONVILLE ROAD- LONDONDERRY DR. TO REX RD. PRELIMINARY DRAINAGE REPORT", BY HR GREEN, DATED SEPTEMBER 2023.
2. ALL OFF SITE FLOWS NORTHWEST OF REX ROAD NOTED IN THIS REPORT WILL VARY FROM THOSE IN THE CLOMR REPORT PRPARED BY HR GREEN. THIS IS DUE TO SLIGHT DIFFERENCES IN HYDROLOGIC MODELING. THE FLOW AT THE INLET OF THE PROPOSED REX ROAD CULVERT IS 262 CFS IN THE SUBMITTED CLOMR MODEL, AS OPPOSED TO 280 CFS FROM THE ACCEPTED MERIDIAN RANCH DEVELOPMENT DRAINAGE PLAN MODEL OUTPUT. THE FLOW AT THE OUTLET OF THE PROPOSED REX ROAD CULVERT IS 536 CFS. THIS VALUE COMES FROM THE NEXT DOWNSTREAM DESIGN POINT AT THE INLET OF THE PROPOSED DAWLISH ROAD AND IS CARRIED UPSTREAM TO THE PREVIOUS DESIGN POINT.

RUNOFF SUMMARY TABLE

Basin ID	Area (acres)	Q_5 (cfs)	Q_{100} (cfs)
*EX1	321.53	28.3	365.2
*EX2	18.88	1.7	18.8
*EX3	131.26	6.1	112.1
*EX4	832.70	22.4	491.0
*EX5	22.35	7.0	43.3
*EX6	3.05	1.2	6.9
*EX7	1.47	0.9	4.2
ES-1	16.37	3.5	24.7
ES-2	46.05	7.5	53.7
ES-3	64.30	10.0	71.5
ES-4	2.68	0.6	4.4
ES-5	26.15	5.0	35.5
ES-6	31.26	6.5	46.5

*Values taken from Eastonville Road PDR prepared by HR Green, Dated September 2023

DESIGN POINT SUMMARY TABLE

	Design Point	Q_5 (cfs)	Q_{100} (cfs)
	X1	4.7	31.6
	X2	36.9	588.0
	X3	10.0	71.5
	X4	0.6	4.4
	X5	5.0	35.5
	X6	40.9	523.8
	X7	56.5	635.2
*	1	28.3	365.2
*	2	1.7	18.8
*	3	6.1	112.1
*	4	22.4	491.0
*	5	7.0	43.3
*	6	1.2	6.9
*	7	0.9	4.2

*Values taken from Eastonville Road PDR prepared by HR Green, Dated September 2023

Galloway
6162 S. Willow Drive, Suite 320
Greenwood Village, CO 80111
303.770.8884
GallowayUS.com

PRELIMINARY
NOT FOR BIDDING
NOT FOR CONSTRUCTION

PRELIMINARY DRAINAGE PLAN
GRANDVIEW RESERVE
FOR
HR GREEN, INC

EASTONVILLE RD
EL PASO COUNTY, PEYTON, CO 80831

#	Date	Issue / Description	Init.

Project No: HRG 1.20
Drawn By: TJE
Checked By: GRD
Date: 1/23/2024

EXISTING DRAINAGE MAP

EX-1

RUNOFF SUMMARY TABLE			
Basin ID	Area (acres)	Q_5 (cfs)	Q_{100} (cfs)
*EX1	321.53	28.3	365.2
*EX2	18.88	1.7	18.8
*EX3	131.26	6.1	112.1
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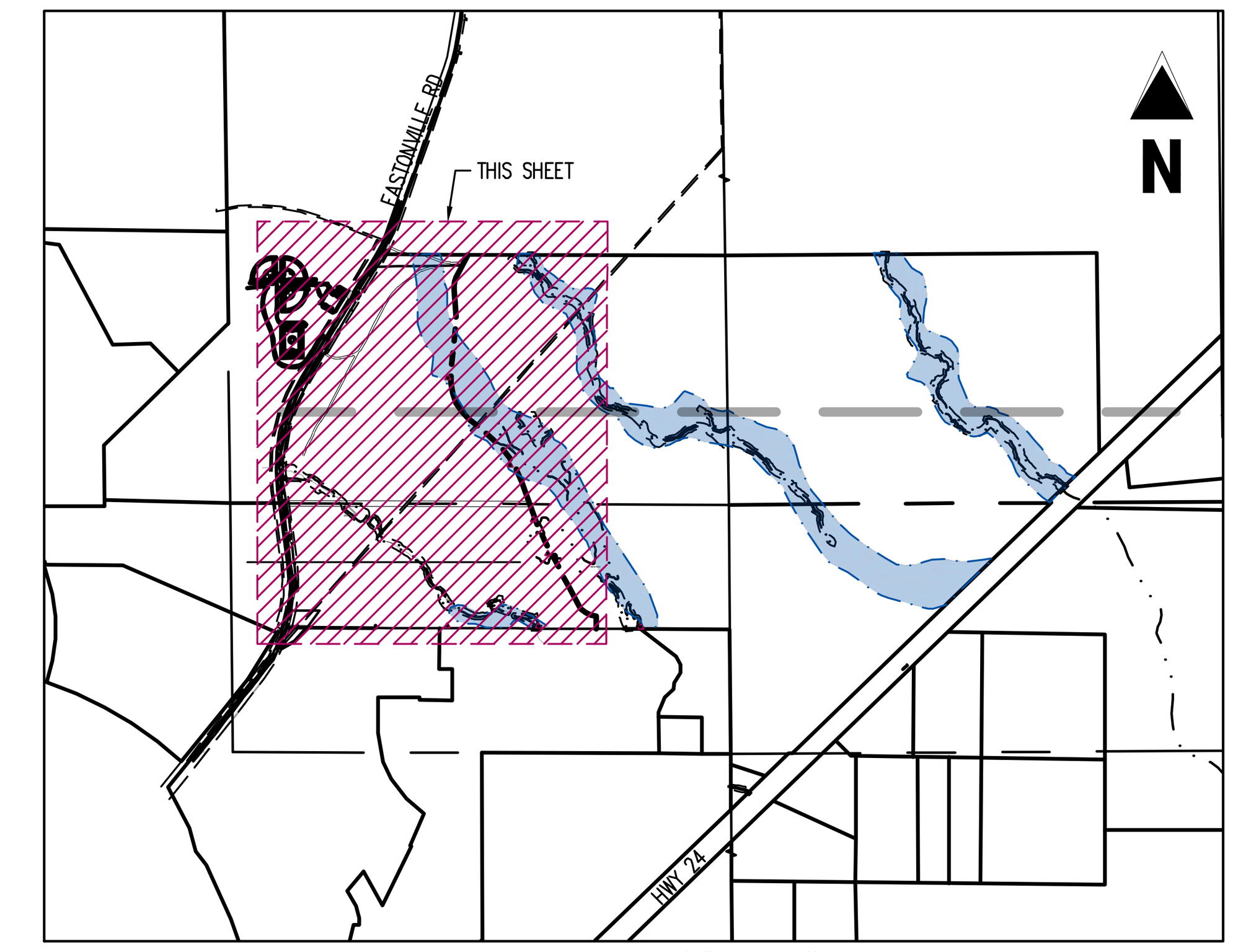
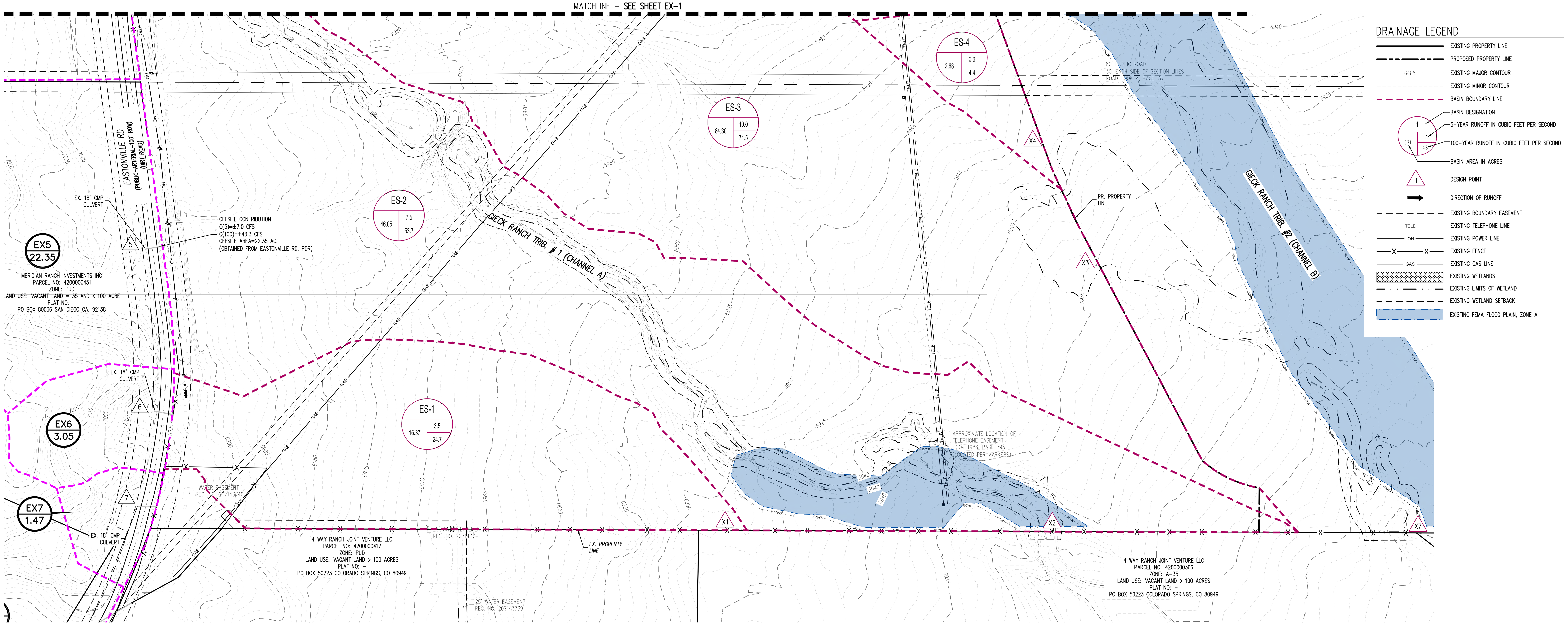
	X6	40.9	523.8
	X7	56.5	635.2
*	1	28.3	365.2
*	2	1.7	18.8
*	3	6.1	112.1
*	4	22.4	491.0
*	5	7.0	43.3
*	6	1.2	6.9
*	7	0.9	4.2

*Values taken from Eastonville Road PDR prepared by HR Green, Dated September 2023

NOTE:

1. FOR EXISTING WESTERN OFFSITE SUB-BASIN ANALYSIS AS WELL AS PROPOSED EASTONVILLE ROAD SUB-BASIN ANALYSIS, SEE "EASTONVILLE ROAD FINAL DRAINAGE REPORT", BY HR GREEN, SEPTEMBER 2022.





Galloway
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PRELIMINARY
NOT FOR BIDDING
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PRELIMINARY DRAINAGE PLAN
GRANDVIEW RESERVE
FOR
HR GREEN, INC

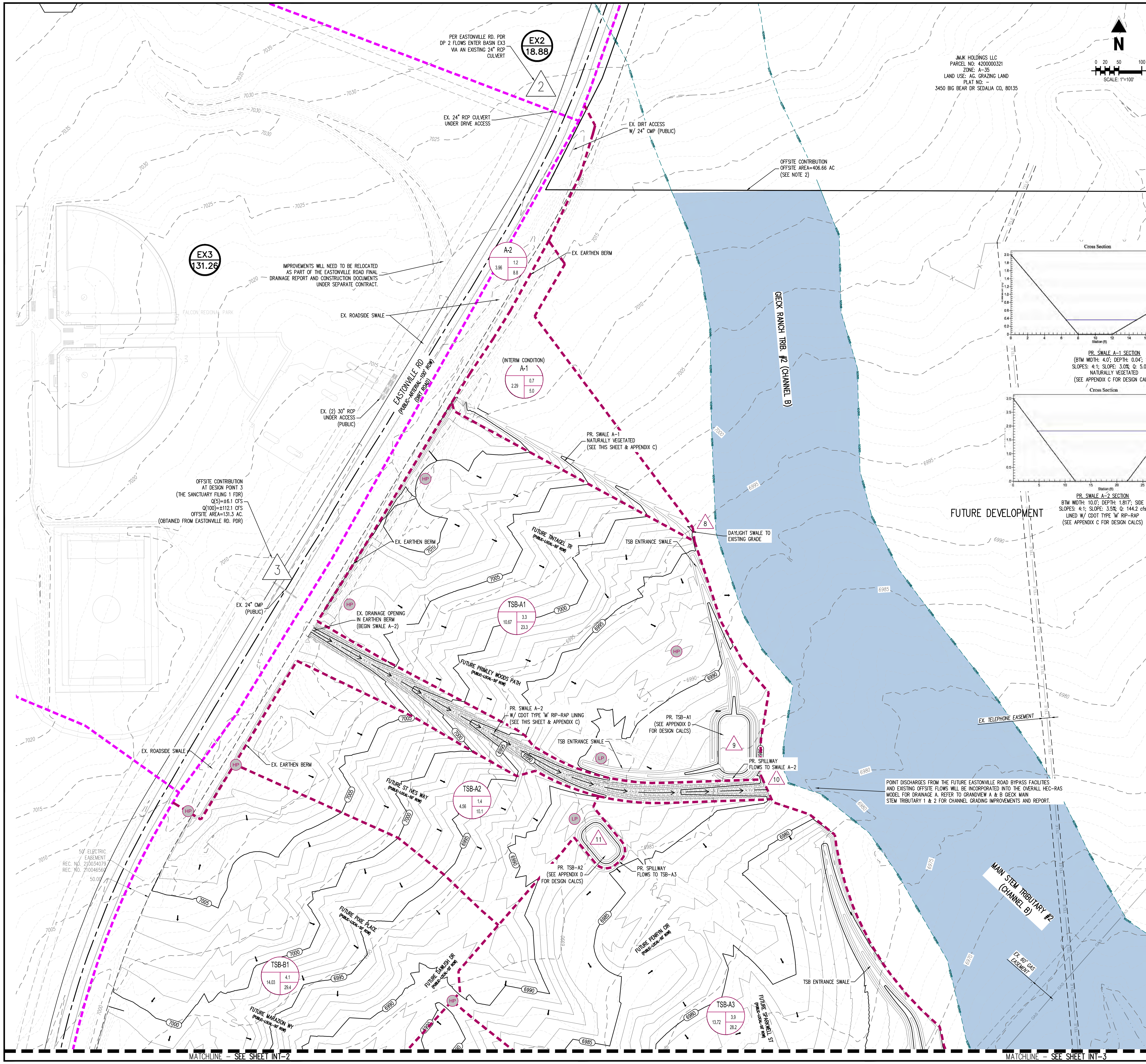
EASTONVILLE RD
EL PASO COUNTY, PEYTON, CO 80831

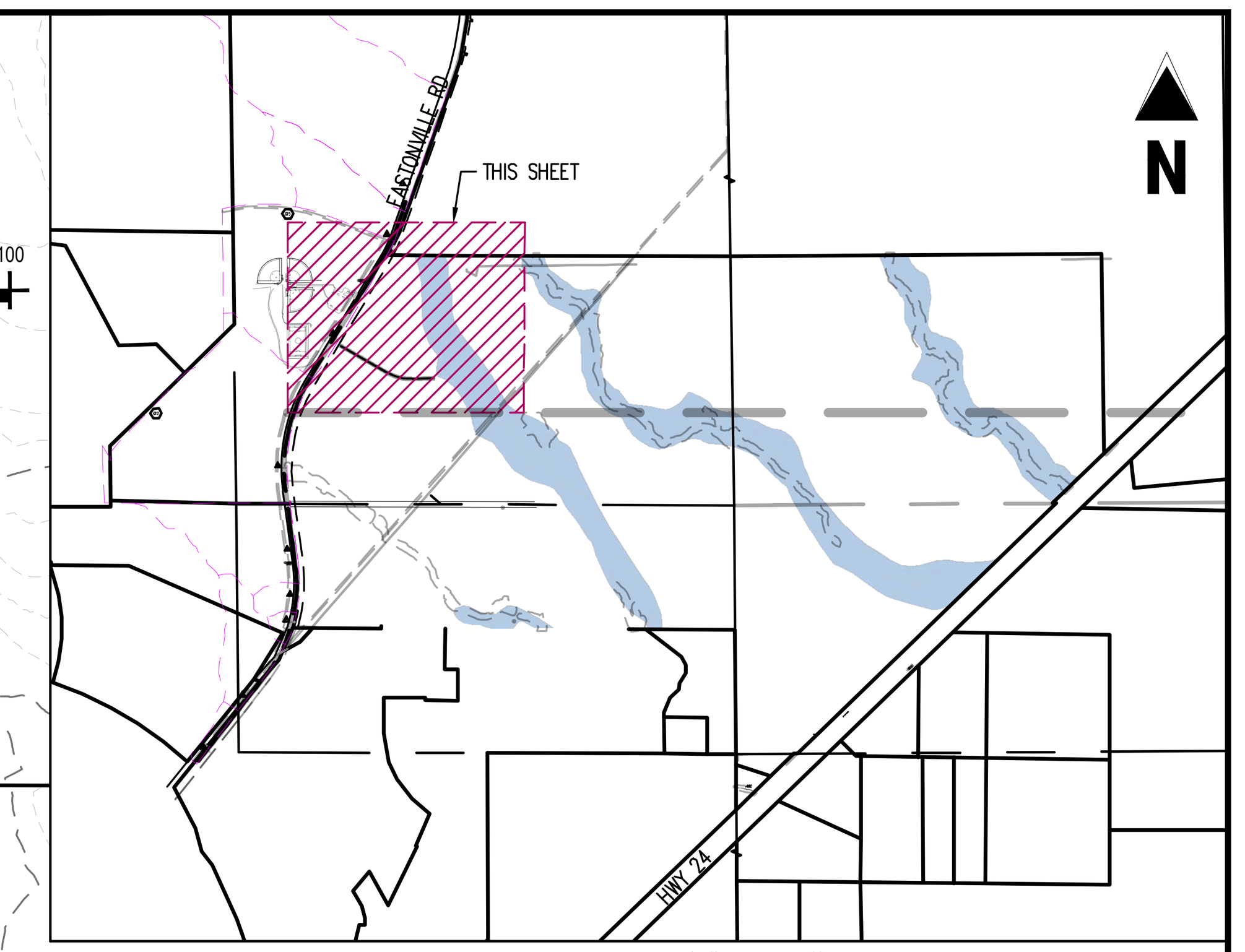
#	Date	Issue / Description	Init.

Project No:	HRG 1.20
Drawn By:	TJE
Checked By:	GRD
Date:	1/23/2024

EXISTING DRAINAGE MAP

EX-2


PER EASTONVILLE RD. PDR DP 2 FLOWS ENTER BASIN EX3 VIA AN EXISTING 24" RCP CULVERT
EX2
18.88
EX. 24" RCP CULVERT UNDER DRIVE ACCESS
EX. DIRT ACCESS W/ 24" CMP (PUBLIC)
OFFSITE CONTRIBUTION OFFSITE AREA=406.66 AC (SEE NOTE 2)
JMJK HOLDINGS LLC
PARCEL NO. 4200000321
ZONE: A-35
LAND USE: AG. GRAZING LAND
PLAT NO. -
3450 BIG BEAR DR SEDALIA CO, 80135
SCALE: 1"=100'
EX3
131.26
IMPROVEMENTS WILL NEED TO BE RELOCATED AS PART OF THE EASTONVILLE ROAD FINAL DRAINAGE REPORT AND CONSTRUCTION DOCUMENTS UNDER SEPARATE CONTRACT.
EX. EARTHEN BERM
EX. ROADSIDE SWALE
GIECK RANCH TRIB #2 (CHANNEL B)
EASTONVILLE RD (PUBLIC-ARTERIAL-100' ROW)
(INTERIM CONDITION)
EX. (2) 30" RCP UNDER ACCESS (PUBLIC)
PR. SWALE A-1 NATURALLY VEGETATED (SEE THIS SHEET & APPENDIX C)
Cross Section
PR. SWALE A-1 SECTION
(BTM WIDTH: 4.0'; DEPTH: 0.04'; SIDE SLOPES: 4:1; SLOPE: 3.0%; Q: 5.0 cfs)
NATURALLY VEGETATED
(SEE APPENDIX C FOR DESIGN CALCS)
PR. SWALE A-2 SECTION
BTM WIDTH: 10.0'; DEPTH: 1.817'; SIDE SLOPES: 4:1; SLOPE: 3.5%; Q: 144.2 cfs
LINED W/ CDOT TYPE 'M' RIP-RAP
(SEE APPENDIX C FOR DESIGN CALCS)
FUTURE DEVELOPMENT
OFFSITE CONTRIBUTION AT DESIGN POINT 3 (THE SANCTUARY FILING 1 FDR)
Q(5)=±6.1 CFS
Q(100)=±112.1 CFS
OFFSITE AREA=131.3 AC.
(OBTAINED FROM EASTONVILLE RD. PDR)
EX. EARTHEN BERM
FUTURE VINTAGE TR
TSB ENTRANCE SWALE
DAYLIGHT SWALE TO EXISTING GRADE
EX. 24" CMP (PUBLIC)
EX. DRAINAGE OPENING IN EARTHEN BERM (BEGIN SWALE A-2)
FUTURE PRIMLEY WOODS PATH
PR. SWALE A-2 W/ CDOT TYPE 'M' RIP-RAP LINING (SEE THIS SHEET & APPENDIX C)
PR. TSB-A1 (SEE APPENDIX D FOR DESIGN CALCS)
EX. TELEPHONE EASEMENT
EX. ROADSIDE SWALE
EX. EARTHEN BERM
TSB ENTRANCE SWALE
PR. SPILLWAY FLOWS TO SWALE A-2
POINT DISCHARGES FROM THE FUTURE EASTONVILLE ROAD BYPASS FACILITIES AND EXISTING OFFSITE FLOWS WILL BE INCORPORATED INTO THE OVERALL HEC-RAS MODEL FOR DRAINAGE A. REFER TO GRANDVIEW A & B GIECK MAIN STEM TRIBUTARY 1 & 2 FOR CHANNEL GRADING IMPROVEMENTS AND REPORT.
FUTURE ST IVES WAY
PR. TSB-A2 (SEE APPENDIX D FOR DESIGN CALCS)
PR. SPILLWAY FLOWS TO TSB-A3
50' ELECTRIC EASEMENT
MAIN STEM TRIBUTARY #2 (CHANNEL B)
FUTURE PIKE PLACE
FUTURE POPPYN DR
FUTURE DANAIAN DR
TSB ENTRANCE SWALE
EX. 60' GAS EASEMENT
FUTURE MARAZION WY
FUTURE SPARKWELL ST
MATCHLINE - SEE SHEET INT-2
MATCHLINE - SEE SHEET INT-3



DRAINAGE LEGEND

- EXISTING PROPERTY LINE
- EXISTING MAJOR CONTOUR (6480)
- EXISTING MINOR CONTOUR
- PROPOSED MAJOR CONTOUR (6480)
- PROPOSED MINOR CONTOUR
- TSB BASIN BOUNDARY LINE
- EXISTING WETLANDS
- EXISTING LIMITS OF WETLAND
- EXISTING WETLAND SETBACK
- EXISTING FEMA FLOOD PLAIN, ZONE A
- 100YR — 100-YEAR WATER SURFACE ELEVATION AND FLOODPLAIN
- EX3 — OFF-SITE BASIN DESIGNATION; 131.26 — OFF-SITE BASIN TRIBUTARY AREA
- 1 — BASIN DESIGNATION; 1.8 — 5-YEAR RUNOFF IN CUBIC FEET PER SECOND; 4.8 — 100-YEAR RUNOFF IN CUBIC FEET PER SECOND; 0.71 — BASIN AREA IN ACRES
- DESIGN POINT
- DIRECTION OF RUNOFF

NOTE:

1. FOR EXISTING WESTERN OFFSITE SUB-BASIN ANALYSIS AS WELL AS PROPOSED EASTONVILLE ROAD SUB-BASIN ANALYSIS, SEE "EASTONVILLE ROAD- LONDONDERRY DR. TO REX RD. PRELIMINARY DRAINAGE REPORT", BY HR GREEN, DATED SEPTEMBER 2023.
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RUNOFF SUMMARY TABLE

Basin ID	Area (acres)	Q_5 (cfs)	Q_{100} (cfs)
*EX2	18.88	1.7	18.8
*EX3	131.26	6.1	112.1
*EX4	832.70	22.4	491.0
*EX5	22.35	7.0	43.3
*EX6	3.05	1.2	6.9
*EX7	1.47	0.9	4.2
A-1	2.29	0.7	5.0
A-2	3.96	1.2	8.8
EA-1	2.50	0.7	5.1
TSB-A1	10.67	3.3	23.3
TSB-A2	4.56	1.4	10.1
TSB-A3	13.72	3.9	28.2
TSB-B1	14.03	4.1	29.4
TSB-B2	14.48	4.2	30.1
TSB-C1	11.26	3.2	23.0
TSB-C2	11.92	3.5	25.2
TSB-C3	15.29	4.1	29.0
TSB-D1	10.09	2.8	20.0
TSB-E1	8.21	2.5	18.0
TSB-E2	13.57	4.0	28.3

*Values taken from Eastonville Road PDR prepared by HR Green, Dated September 2023

DESIGN POINT SUMMARY TABLE

Design Point	Q_5 (cfs)	Q_{100} (cfs)
* 2	1.7	18.8
* 3	6.1	112.1
* 4	22.4	491.0
* 5	7.0	43.3
* 6	1.2	6.9
* 7	0.9	4.2
8	0.7	5.0
9	3.3	23.3
10	10.6	144.2
11	1.4	10.1
12	5.4	38.3
13	4.1	29.4
14	8.3	59.5
15	3.2	23.0
16	3.5	25.2
17	7.3	52.0
18	2.8	20.0
19	2.5	18.0
20	6.5	46.3
21	8.9	55.3

*Values taken from Eastonville Road PDR prepared by HR Green, Dated September 2023

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PRELIMINARY DRAINAGE PLAN
GRANDVIEW RESERVE FILING NO. 1
FOR
HR GREEN, INC

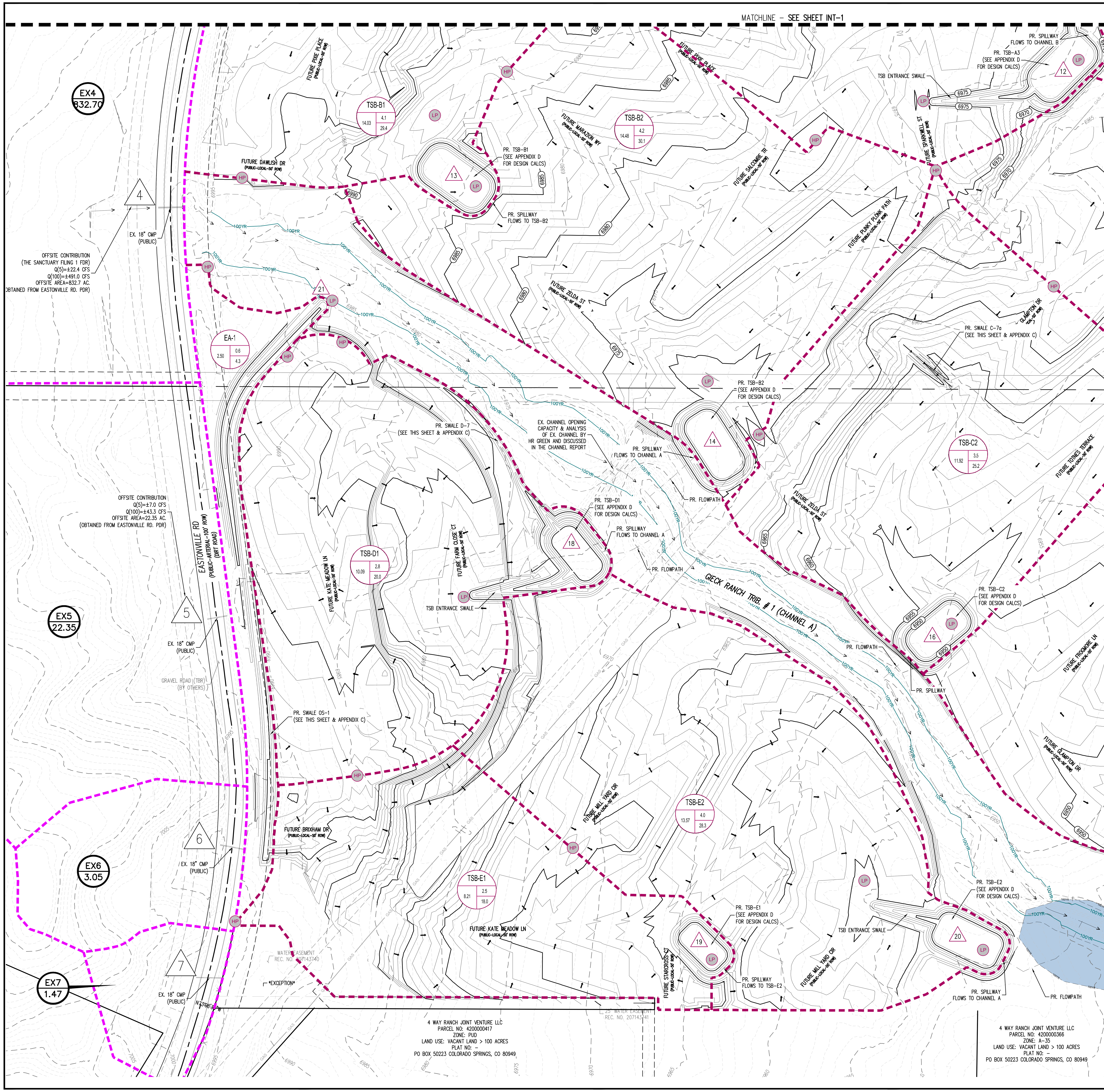
EASTONVILLE RD
EL PASO COUNTY, PEYTON, CO 80831

#	Date	Issue / Description	Init.

Project No:	HRG 1.20
Drawn By:	TJE
Checked By:	GRD
Date:	1/23/2024

INTERIM DRAINAGE MAP

INT-1



DESIGN POINT SUMMARY TABLE		
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* 2	1.7	18.8
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14	8.3	59.5
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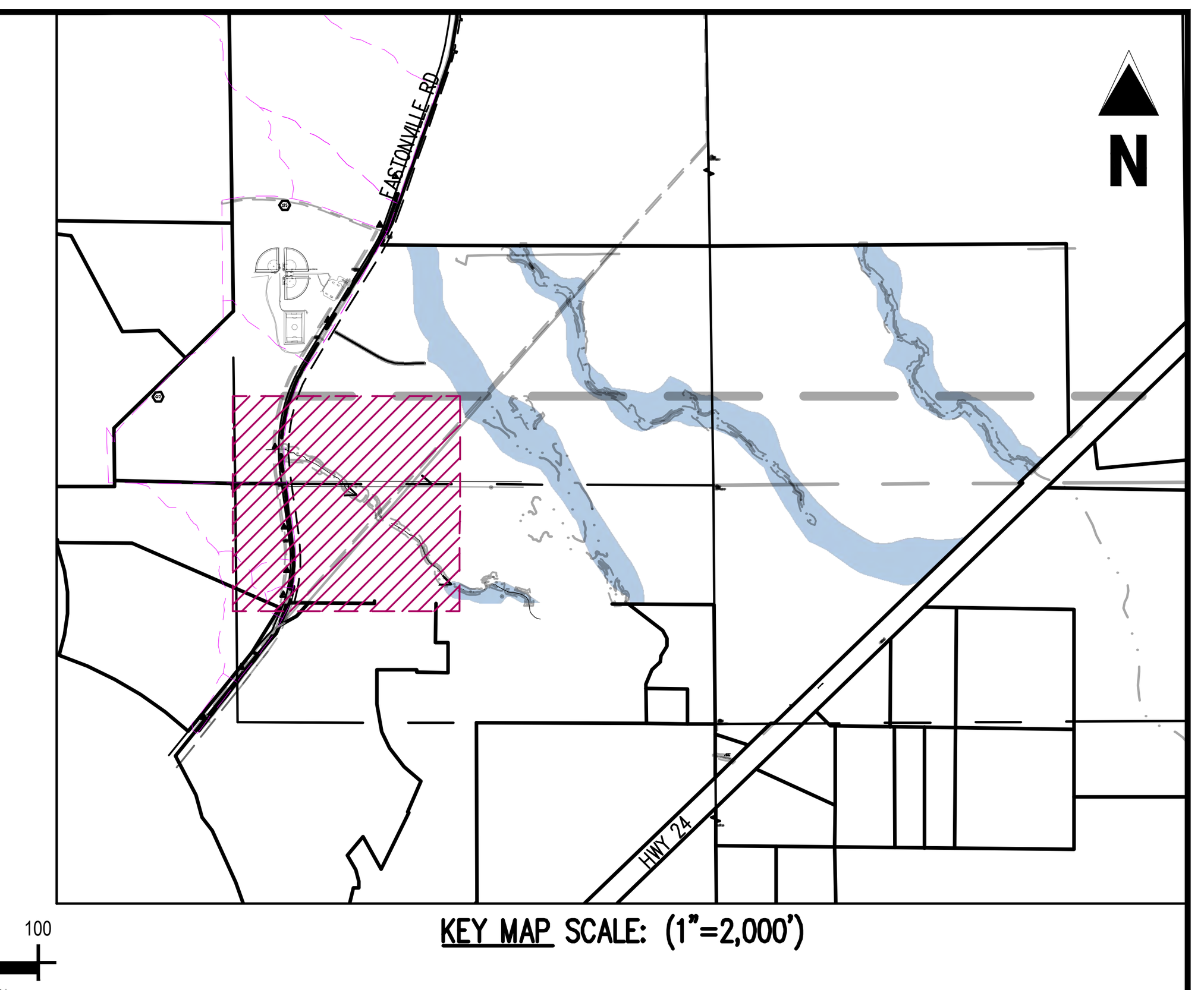

DRAINAGE LEGEND

- EXISTING PROPERTY LINE
- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- PROPOSED MAJOR CONTOUR
- PROPOSED MINOR CONTOUR
- TSB BASIN BOUNDARY LINE
- EXISTING WETLANDS
- EXISTING LIMITS OF WETLAND
- EXISTING WETLAND SETBACK
- EXISTING FEMA FLOOD PLAIN, ZONE A
- 100-YEAR WATER SURFACE ELEVATION AND FLOODPLAIN
- OFF-SITE BASIN DESIGNATION
- OFF-SITE BASIN TRIBUTARY AREA
- BASIN DESIGNATION
- 5-YEAR RUNOFF IN CUBIC FEET PER SECOND
- 100-YEAR RUNOFF IN CUBIC FEET PER SECOND
- BASIN AREA IN ACRES
- DESIGN POINT
- DIRECTION OF RUNOFF

NOTE:

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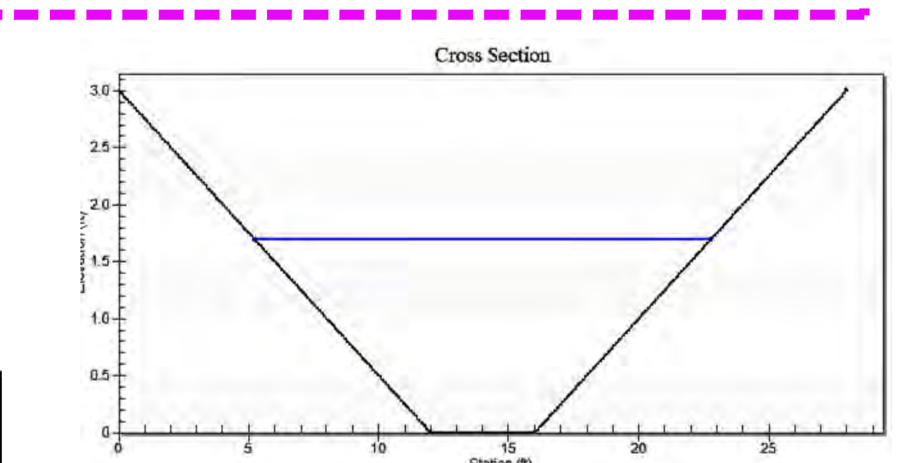
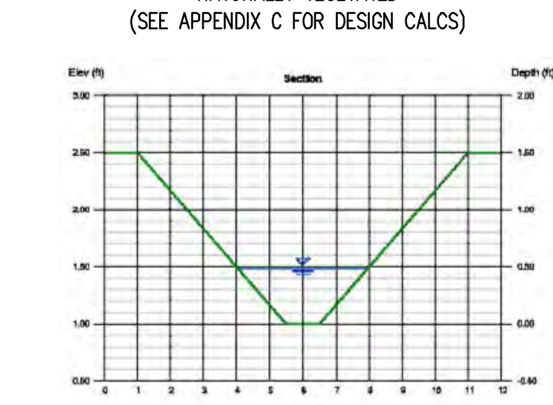
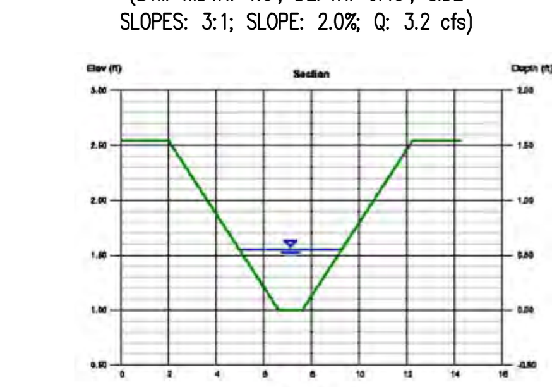


PR. SWALE OS-1 SECTION
BTM WIDTH: 4.0'; DEPTH: 2.03'; SIDE SLOPES: 4:1; SLOPE: 0.50%; Q: 55.3 cfs
NATURALLY VEGETATED
(SEE APPENDIX C FOR DESIGN CALCS)



PR. SWALE C-7a SECTION
(BTM WIDTH: 1.0'; DEPTH: 0.49'; SIDE SLOPES: 3:1; SLOPE: 2.0%; Q: 3.2 cfs)



PR. SWALE D-7 SECTION
(BTM WIDTH: 1.0'; DEPTH: 0.55'; SIDE SLOPES: 3:1; SLOPE: 2.0%; Q: 4.0 cfs)

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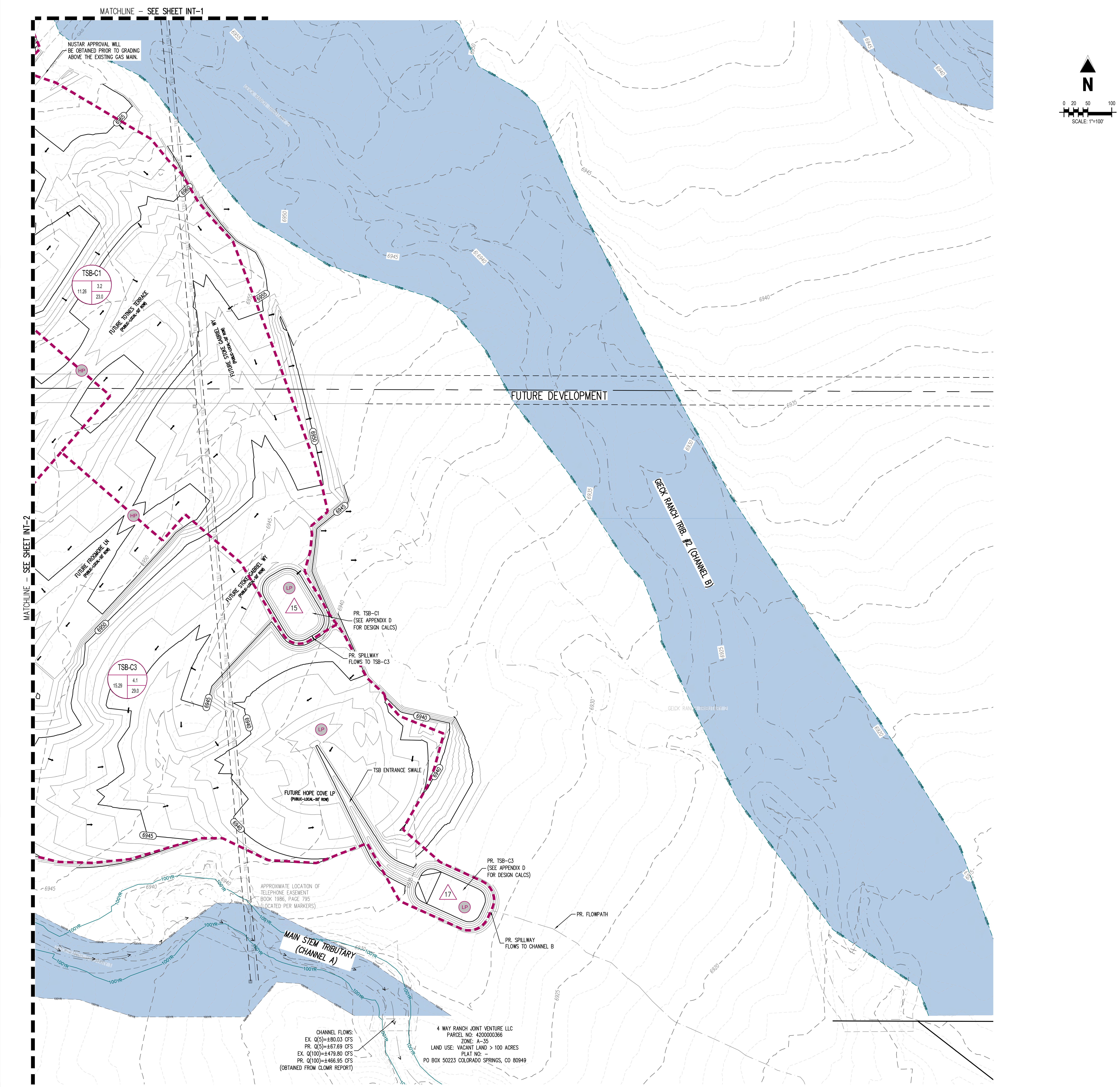
PRELIMINARY DRAINAGE PLAN
GRANDVIEW RESERVE FILING NO. 1
FOR
HR GREEN, INC

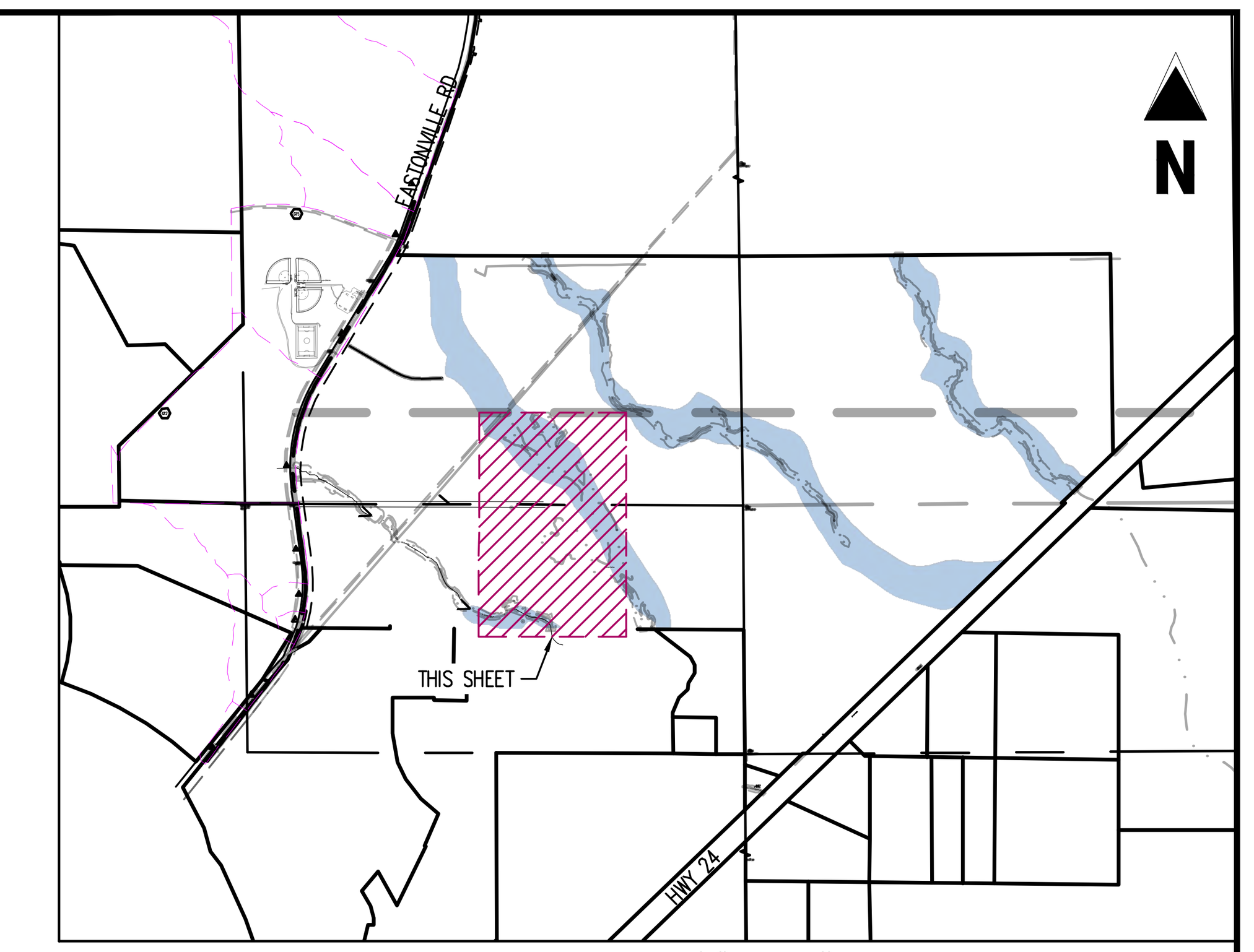
EASTONVILLE RD
EL PASO COUNTY, PEYTON, CO 80831

#	Date	Issue / Description	Init.

Project No:	HRG 1.20
Drawn By:	TJE
Checked By:	GRD
Date:	1/23/2024

INTERIM DRAINAGE MAP





KEY MAP SCALE: (1"=2,000')

DRAINAGE LEGEND

- EXISTING PROPERTY LINE
- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- PROPOSED MAJOR CONTOUR
- PROPOSED MINOR CONTOUR
- TSB BASIN BOUNDARY LINE
- EXISTING WETLANDS
- EXISTING LIMITS OF WETLAND
- EXISTING WETLAND SETBACK
- EXISTING FEMA FLOOD PLAIN, ZONE A
- 100-YEAR WATER SURFACE ELEVATION AND FLOODPLAIN
- OFF-SITE BASIN DESIGNATION
- OFF-SITE BASIN TRIBUTARY AREA
- BASIN DESIGNATION
- 5-YEAR RUNOFF IN CUBIC FEET PER SECOND
- 100-YEAR RUNOFF IN CUBIC FEET PER SECOND
- BASIN AREA IN ACRES
- DESIGN POINT
- DIRECTION OF RUNOFF

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Design Point	Q_5 (cfs)	Q_{100} (cfs)
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13	4.1	29.4
14	8.3	59.5
15	3.2	23.0
16	3.5	25.2
17	7.3	52.0
18	2.8	20.0
19	2.5	18.0
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21	8.9	55.3

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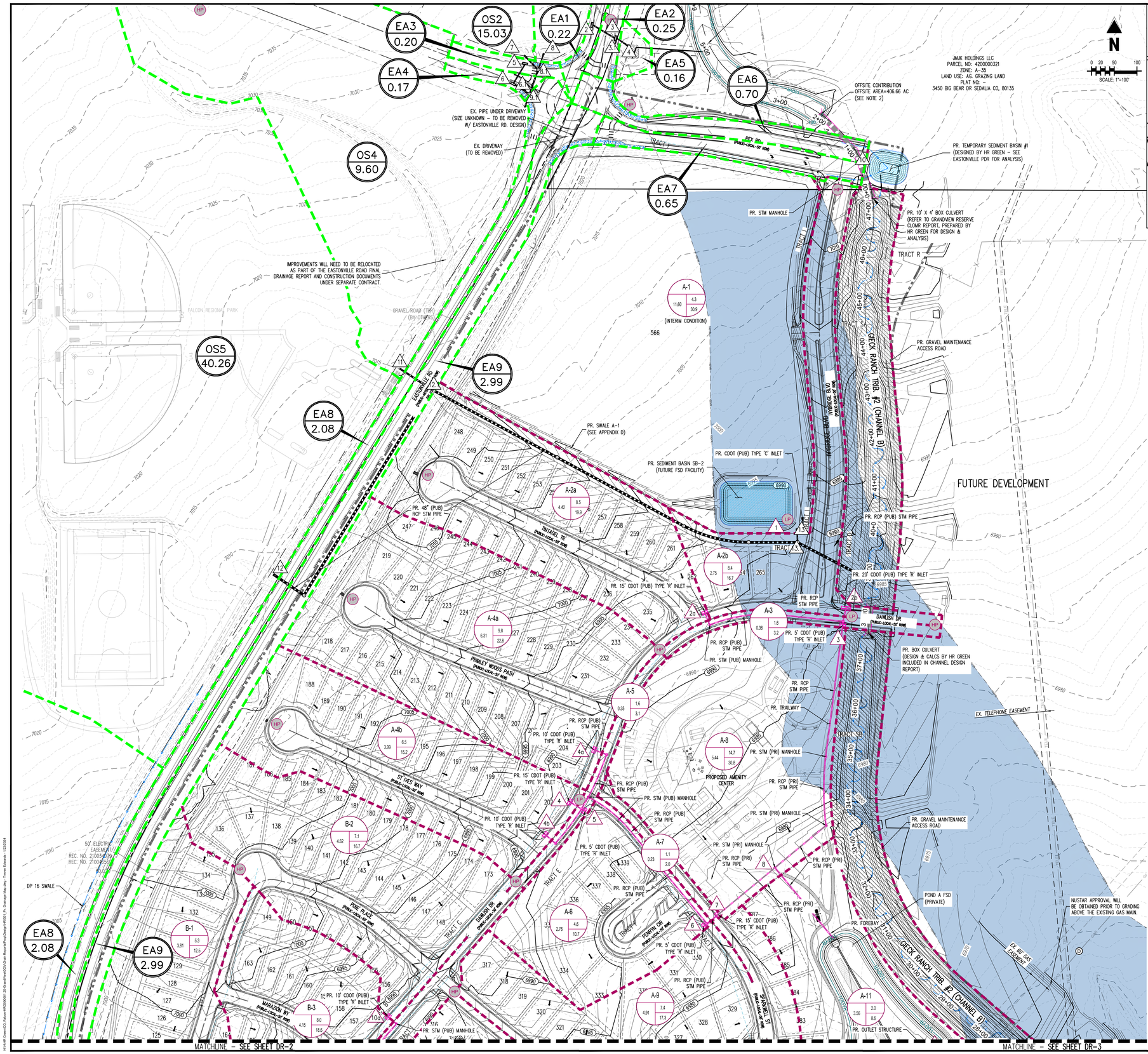
PRELIMINARY DRAINAGE PLAN GRANDVIEW RESERVE FILING NO. 1 FOR HR GREEN, INC

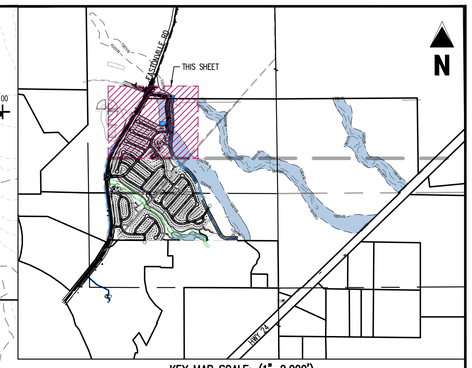
EASTONVILLE RD
EL PASO COUNTY, PEYTON, CO 80831

#	Date	Issue / Description	Init.

Project No: HRG 1.20
Drawn By: TJE
Checked By: GRD
Date: 1/23/2024

INTERIM DRAINAGE MAP





KEY MAP SCALE: (1"=2,000')

N

0 20 50 100
SCALE: 1"=100'

DRAINAGE LEGEND

- EXISTING PROPERTY LINE
- PROPOSED PROPERTY LINE
- LOT BOUNDARY LINE
- 6480 EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- 6480 PROPOSED MAJOR CONTOUR
- PROPOSED MINOR CONTOUR
- PROPOSED ROAD CENTERLINE
- BASIN BOUNDARY LINE
- PROPOSED STORM SEWER
- PROPOSED STORM STRUCTURES
- EXISTING WETLANDS
- EXISTING LIMITS OF WETLAND
- EXISTING WETLAND SETBACK
- EXISTING FEMA FLOOD PLAIN, ZONE A
- PROPOSED EMERGENCY OVERFLOW ROUTE
- CENTERLINE OF STREAM
- 100YR 100-YEAR WATER SURFACE ELEVATION AND FLOODPLAIN
- EMERGENCY FLOW CONDITION HIGH WATER LIMIT (100-YR)
- PROPOSED RIPRAP
- PROPOSED GRAVEL ACCESS
- BASIN DESIGNATION
- 5-YEAR RUNOFF IN CUBIC FEET PER SECOND
- 100-YEAR RUNOFF IN CUBIC FEET PER SECOND
- BASIN AREA IN ACRES
- DESIGN POINT
- DIRECTION OF RUNOFF
- PROPOSED CHANNEL ALIGNMENT (DESIGN BY OTHERS – SEE NOTE #1)

NOTE:

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RUNOFF SUMMARY TABLE

Basin ID	Area (acres)	Q_5 (cfs)	Q_{100} (cfs)
A-1	11.60	4.3	30.9
A-2a	4.42	8.5	19.9
A-2b	2.75	8.4	16.7
A-3	0.36	1.6	3.2
A-4a	6.31	9.8	22.8
A-4b	3.99	6.5	15.2
A-5	0.35	1.6	3.1
A-6	2.76	4.6	10.7
A-7	0.23	1.1	2.0
A-8	5.44	14.7	30.8
A-9	4.91	7.4	17.3
A-11	3.56	2.0	8.6
B-1	3.81	5.3	12.5
B-2	4.62	7.1	16.7
B-3	4.15	8.0	18.6

DESIGN POINT SUMMARY TABLE

Design Point	Q_5 (cfs)	Q_{100} (cfs)
1	4.3	30.9
2a	8.5	19.9
2b	9.0	23.7
3	1.6	3.2
4a	9.8	22.8
4b	6.5	15.2
4	2.5	16.1
5	1.6	3.1
6	4.6	10.7
7	1.1	2.0
8	14.7	30.8
10a	7.1	16.7

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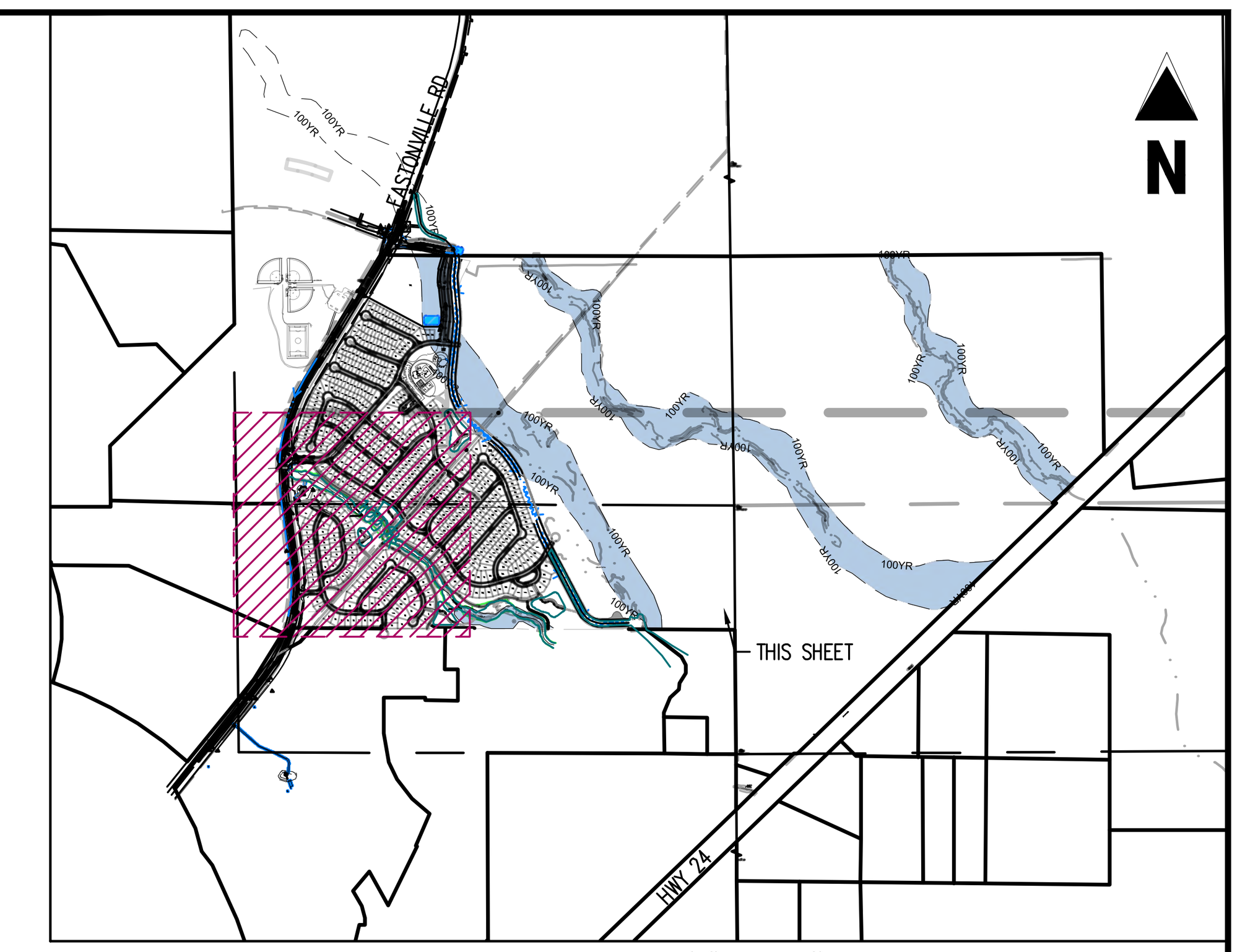
EASTONVILLE RD
EL PASO COUNTY, PEYTON, CO 80831

#	Date	Issue / Description	Init.

Project No:	HRG 1.20
Drawn By:	TJE
Checked By:	GRD
Date:	1/23/2024

PROPOSED DRAINAGE MAP

DR-1
Sheet 1 of 3



KEY MAP SCALE: (1"=2,000')

DRAINAGE LEGEND

- EXISTING PROPERTY LINE
- PROPOSED PROPERTY LINE
- LOT BOUNDARY LINE
- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- PROPOSED MAJOR CONTOUR
- PROPOSED MINOR CONTOUR
- PROPOSED ROAD CENTERLINE
- BASIN BOUNDARY LINE
- PROPOSED STORM SEWER
- PROPOSED STORM STRUCTURES
- EXISTING WETLANDS
- EXISTING LIMITS OF WETLAND
- EXISTING WETLAND SETBACK
- EXISTING FEMA FLOOD PLAIN, ZONE A
- PROPOSED EMERGENCY OVERFLOW ROUTE
- CENTERLINE OF STREAM
- 100-YEAR WATER SURFACE ELEVATION AND FLOODPLAIN
- EMERGENCY FLOW CONDITION HIGH WATER LIMIT (100-YR)
- PROPOSED RIPRAP
- PROPOSED GRAVEL ACCESS
- BASIN DESIGNATION
- 5-YEAR RUNOFF IN CUBIC FEET PER SECOND
- 100-YEAR RUNOFF IN CUBIC FEET PER SECOND
- BASIN AREA IN ACRES
- DESIGN POINT
- DIRECTION OF RUNOFF
- PROPOSED CHANNEL ALIGNMENT (DESIGN BY OTHERS - SEE NOTE #1)
- *** 663 CFS SHOULD BE USED FOR EMERGENCY CONDITIONS ANALYSIS PER MERIDIAN RANCH MDDP

NOTE:

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A-9	4.91	7.4	17.3
A-10	1.02	2.1	4.9
B-4	1.37	4.6	9.4
B-5	5.12	7.9	18.5
B-6	2.28	3.7	8.7
B-7	0.89	1.6	3.8
B-8	3.23	5.3	12.4
B-9	2.42	3.8	9.0
B-10	1.10	0.5	3.3
C-1	4.12	6.8	16.0
C-7a	0.81	1.1	3.2
C-7b	5.91	9.9	23.2
C-8	5.11	8.6	20.0
C-9a	3.50	5.6	13.1
C-10	3.47	5.2	12.1
D-1	3.48	5.4	12.7
D-2	0.87	1.7	4.0
D-3	3.69	6.0	14.1
D-4	1.75	3.3	7.6
D-5	1.53	2.0	6.0
D-6	0.83	0.3	2.1
D-7a	0.27	0.2	0.8
D-7b	0.88	1.7	4.0
E-1	5.33	9.8	22.9
E-2	5.42	10.1	23.6
E-3	3.20	6.0	14.0
E-4	6.28	9.0	21.0
E-5	1.13	0.4	3.0
E-6	0.74	0.3	1.8

DESIGN POINT SUMMARY TABLE

Design Point	Q_5 (cfs)	Q_{100} (cfs)
7a	7.8	21.1
7b	2.2	5.3
8a	58.9	134.9
9	5.3	12.5
10b	9.6	26.9
11	4.6	9.4
12a	7.9	18.5
12b	7.4	24.5
13	3.8	9.0
14	3.7	8.7
15	1.6	3.8
16	43.7	103.2
17f	8.6	20.0
17g	6.2	20.0
18a	1.1	3.2
18b	11.0	26.0
21	3.6	24.0
22	5.4	12.7
23	1.7	4.0
24	6.7	19.5
25	3.3	7.6
26	18.2	43.4
27	9.8	22.9
28	10.1	23.6
29	8.1	32.1
30	9.0	21.0
31	29.3	69.9

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PRELIMINARY DRAINAGE PLAN
GRANDVIEW RESERVE FILING NO. 1
FOR
HR GREEN, INC

EASTONVILLE RD
EL PASO COUNTY, PEYTON, CO 80831

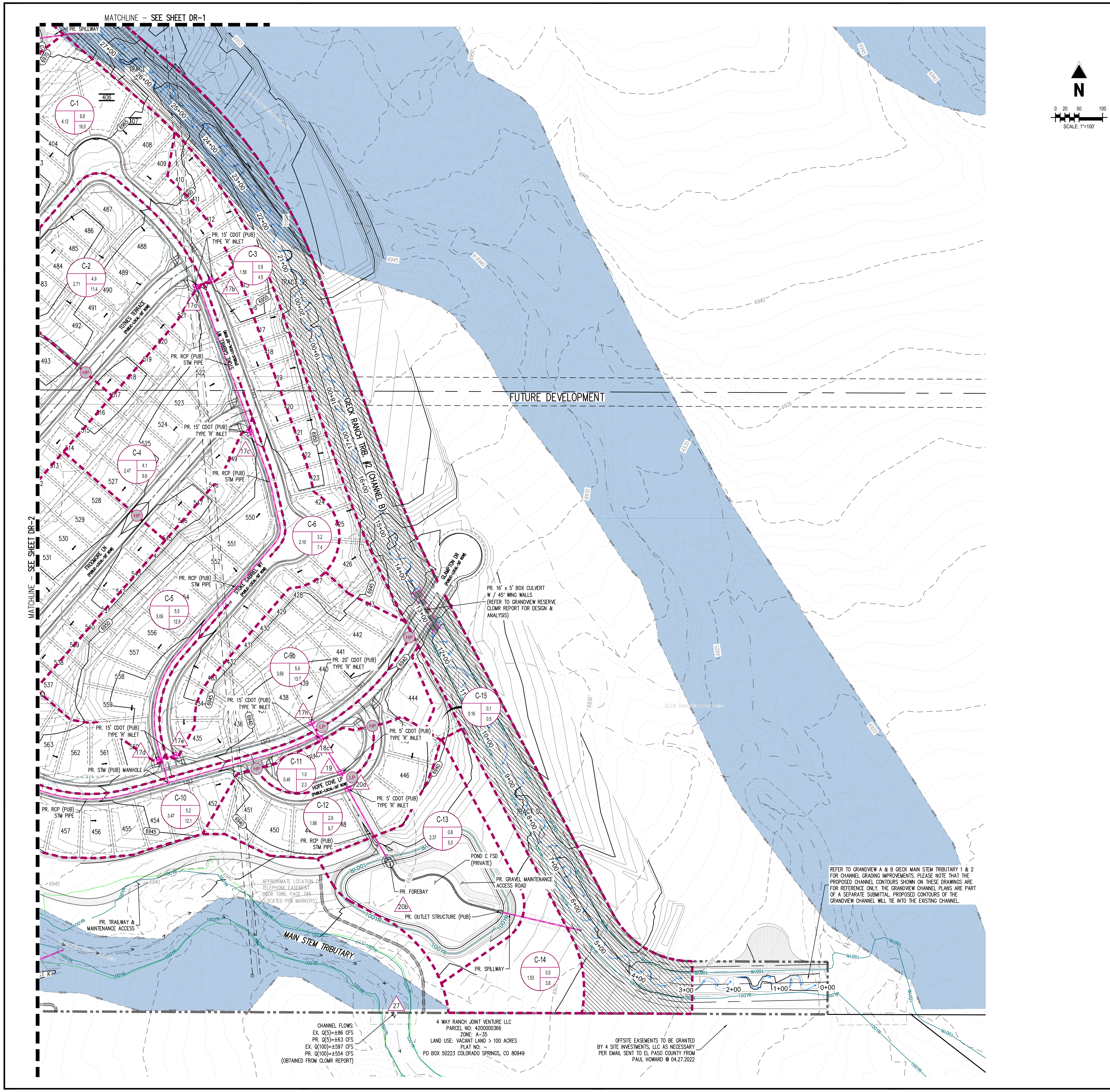
#	Date	Issue / Description	Init.

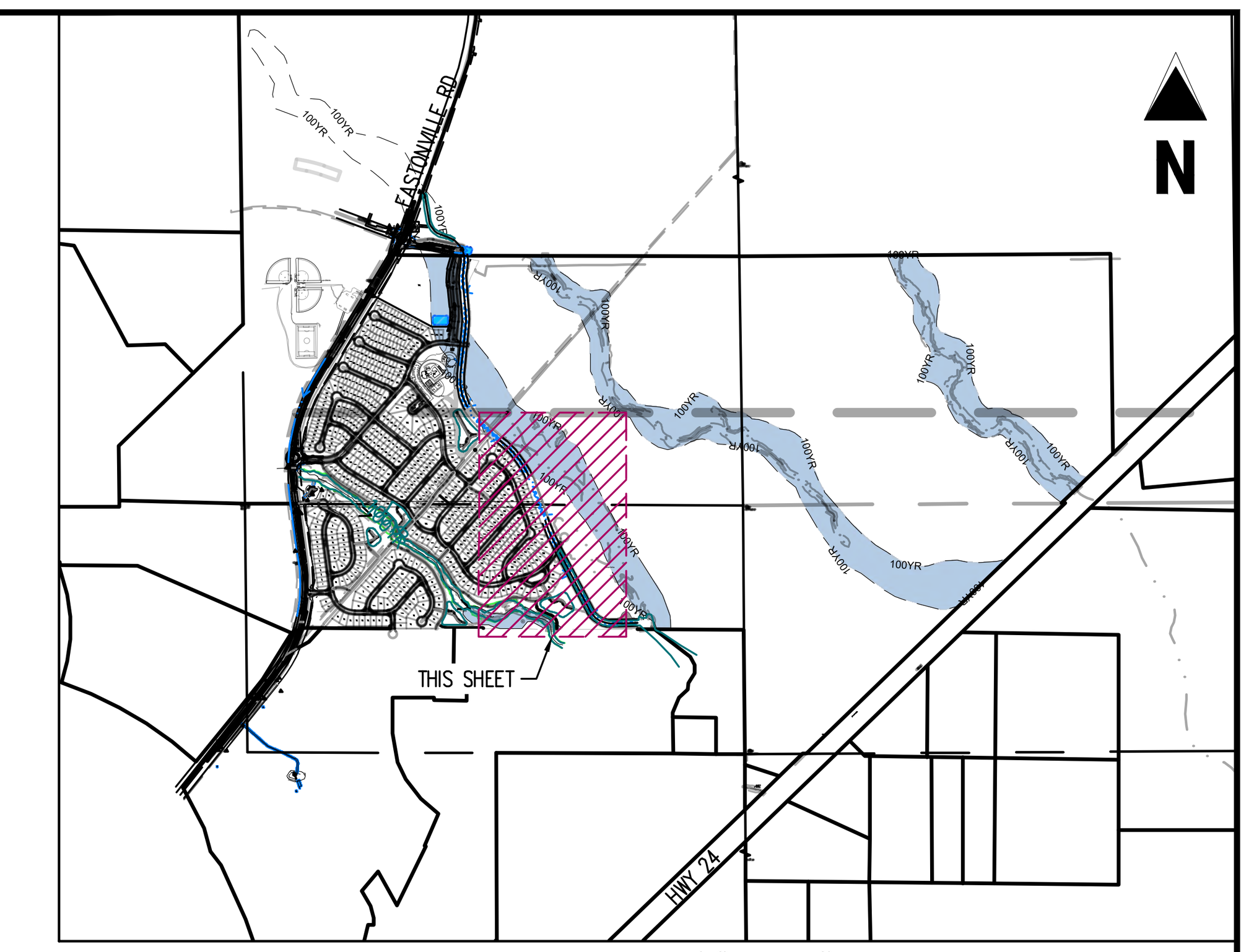
Project No:	HRG 1.20
Drawn By:	TJE
Checked By:	GRD
Date:	1/23/2024

PROPOSED DRAINAGE MAP

DR-2

Sheet 2 of 3





KEY MAP SCALE: (1"=2,000')

DRAINAGE LEGEND

- EXISTING PROPERTY LINE
- PROPOSED PROPERTY LINE
- LOT BOUNDARY LINE
- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- PROPOSED MAJOR CONTOUR
- PROPOSED MINOR CONTOUR
- PROPOSED ROAD CENTERLINE
- BASIN BOUNDARY LINE
- PROPOSED STORM SEWER
- PROPOSED STORM STRUCTURES
- EXISTING WETLANDS
- EXISTING LIMITS OF WETLAND
- EXISTING WETLAND SETBACK
- EXISTING FEMA FLOOD PLAIN, ZONE A
- PROPOSED EMERGENCY OVERFLOW ROUTE
- CENTERLINE OF STREAM
- 100-YEAR WATER SURFACE ELEVATION AND FLOODPLAIN
- EMERGENCY FLOW CONDITION HIGH WATER LIMIT (100-YR)
- PROPOSED RIPRAP
- PROPOSED GRAVEL ACCESS
- BASIN DESIGNATION
- 5-YEAR RUNOFF IN CUBIC FEET PER SECOND
- 100-YEAR RUNOFF IN CUBIC FEET PER SECOND
- BASIN AREA IN ACRES
- DESIGN POINT
- DIRECTION OF RUNOFF
- PROPOSED CHANNEL ALIGNMENT (DESIGN BY OTHERS - SEE NOTE #1)

NOTE:

1. FOR EXISTING WESTERN OFFSITE SUB-BASIN ANALYSIS AS WELL AS PROPOSED EASTONVILLE ROAD SUB-BASIN ANALYSIS, SEE "EASTONVILLE ROAD- LONDONDERRY DR. TO REX RD. PRELIMINARY DRAINAGE REPORT", BY HR GREEN, DATED SEPTEMBER 2023.
2. ALL OFF SITE FLOWS NORTHWEST OF REX ROAD NOTED IN THIS REPORT WILL VARY FROM THOSE IN THE CLOMR REPORT PRPARED BY HR GREEN. THIS IS DUE TO SLIGHT DIFFERENCES IN HYDROLOGIC MODELING. THE FLOW AT THE INLET OF THE PROPOSED REX ROAD CULVERT IS 262 CFS IN THE SUBMITTED CLOMR MODEL, AS OPPOSED TO 280 CFS FROM THE ACCEPTED MERIDIAN RANCH DEVELOPMENT DRAINAGE PLAN MODEL OUTPUT. THE FLOW AT THE OUTLET OF THE PROPOSED REX ROAD CULVERT IS 536 CFS. THIS VALUE COMES FROM THE NEXT DOWNSTREAM DESIGN POINT AT THE INLET OF THE PROPOSED DAWLISH ROAD AND IS CARRIED UPSTREAM TO THE PREVIOUS DESIGN POINT.
3. PROPOSED CHANNEL DESIGN AND ANALYSIS FOR BOTH ON-SITE TRIBUTARIES (MAIN STEM AND MAIN STEM TRIBUTARY NUMBER 2) IS PROVIDED IN A SEPARATE REPORT "GRANDVIEW RESERVE CLOMR REPORT", BY HR GREEN, DATED MARCH 22, 2023. ALL CHANNEL CULVERTS ARE SHOWN FOR REFERENCE ONLY AND ACTUAL SIZING AND ANALYSIS IS PROVIDED WITHIN THE CLOMR REPORT.

RUNOFF SUMMARY TABLE

Basin ID	Area (acres)	Q_5 (cfs)	Q_{100} (cfs)
C-1	4.12	6.8	16.0
C-2	2.71	4.9	11.4
C-3	1.56	0.8	4.5
C-4	2.47	4.1	9.6
C-5	3.09	5.5	12.8
C-6	2.10	3.2	7.4
C-9b	3.69	5.9	13.7
C-10	3.47	5.2	12.1
C-11	0.46	1.0	2.3
C-12	1.66	2.9	6.7
C-13	2.37	0.8	5.5
C-14	1.53	0.5	3.8
C-15	0.16	0.1	0.5

DESIGN POINT SUMMARY TABLE

Design Point	Q_5 (cfs)	Q_{100} (cfs)
17a	4.9	11.4
17b	6.8	16.0
17c	5.8	20.8
17d	5.5	20.2
17e	3.3	11.7
17h	5.9	29.5
18c	6.9	23.3
19	1.0	2.3
20a	2.9	6.7
20b	58.7	140.8

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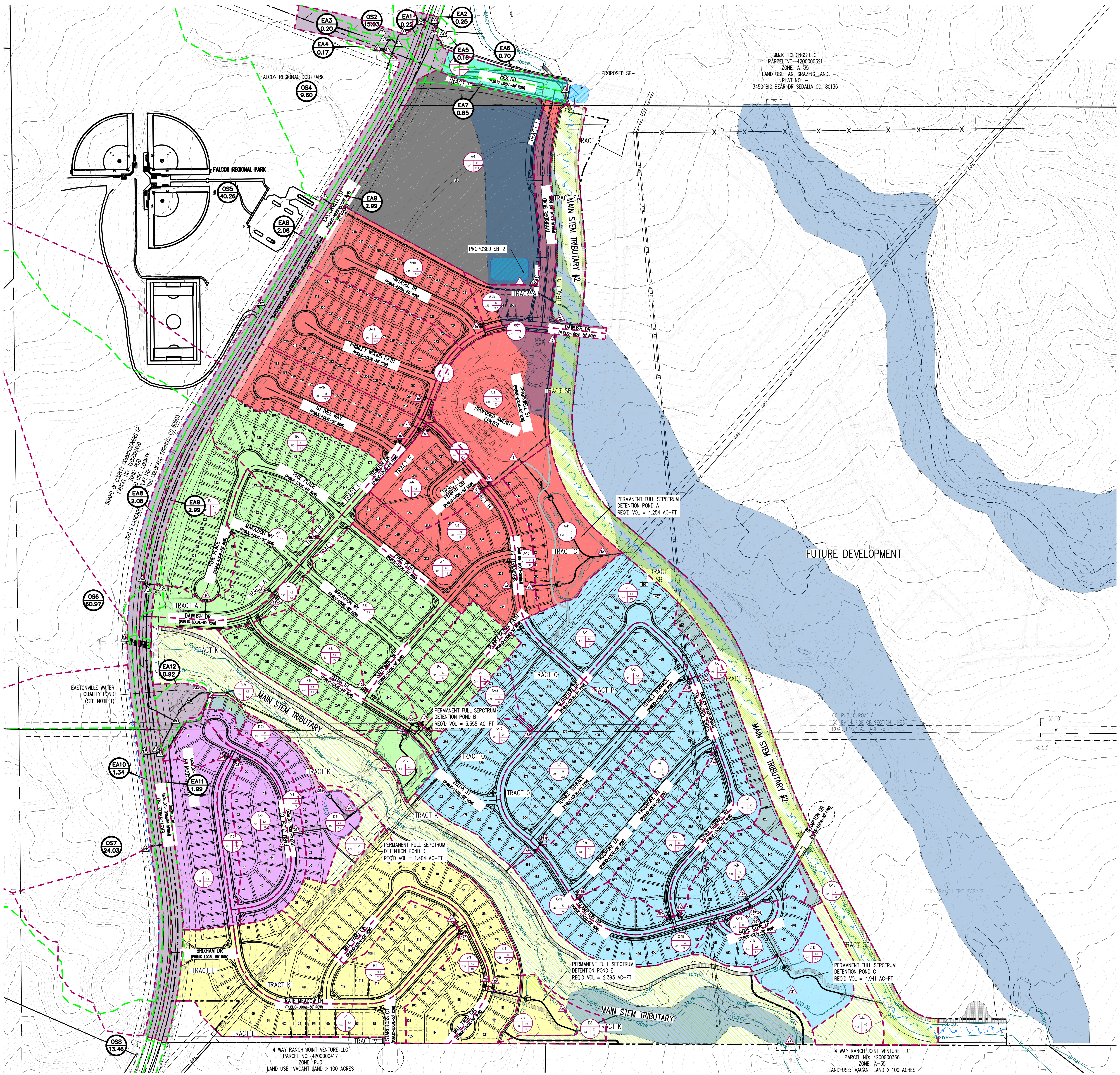
EASTONVILLE RD
EL PASO COUNTY, PEYTON, CO 80831

#	Date	Issue / Description	Init.

Project No:	HRG 1.20
Drawn By:	TJE
Checked By:	GRD
Date:	1/23/2024

PROPOSED DRAINAGE MAP

DR-3



DRAINAGE LEGEND

- PROPERTY LINE
- PROPOSED ROAD CENTERLINE
- BASIN BOUNDARY LINE
- EXISTING WETLANDS
- EXISTING LIMITS OF WETLAND
- EXISTING WETLAND SETBACK
- EXISTING FEMA FLOOD PLAIN, ZONE A
- CENTERLINE OF STREAM
- PROPOSED RIPRAP
- PROPOSED MAINTENANCE ACCESS
- BASIN DESIGNATION (1)
- 5-YEAR RUNOFF IN CUBIC FEET PER SECOND (1.8)
- 100-YEAR RUNOFF IN CUBIC FEET PER SECOND (4.8)
- BASIN AREA IN ACRES (0.71)
- FUTURE DEVELOPMENT (NOT PART – TSB PROVIDED)
- ROADWAY (DESIGN BY OTHERS – SEE NOTE 1)
- AREA TO BE DETAINED IN PBMP (POND A)
- AREA TO BE DETAINED IN PBMP (POND B)
- AREA TO BE DETAINED IN PBMP (POND C)
- AREA TO BE DETAINED IN PBMP (POND D)
- AREA TO BE DETAINED IN PBMP (POND E)
- AREA NOT TO BE DETAINED IN PBMP PER SECTION I.7.1.B.7 (LAND DISTURBANCE TO UNDEVELOPED LAND THAT WILL REMAIN UNDEVELOPED)
- AREA TO BE DETAINED IN FUTURE PBMP WITH THE REMAINDER OF THE REX RD DEVELOPMENT – TSB PROVIDED
- AREA WHERE WATER QUALITY IS ACHIEVED THROUGH RUNOFF REDUCTION (ROOF DRAINS & IMPERVIOUS SURFACES NOT PERMITTED ON BACK OF THESE LOTS)
- AREA TO BE DETAINED IN PUBLIC PBMP (EASTONVILLE ROAD)

NOTES:

1. EASTONVILLE ROAD AND THE WESTERN PORTION OF REX ROAD AT EASTONVILLE IS TO BE CONSTRUCTED CONCURRENTLY WITH THIS DEVELOPMENT. DRAINAGE FOR THESE AREAS WILL BE CAPTURED AND TREATED BY OFFSITE INFRASTRUCTURE AND PONDS AS DESCRIBED IN THE "FINAL DRAINAGE REPORT FOR EASTONVILLE ROAD FROM FUTURE REX ROAD TO LONDONDERRY DRIVE", BY HR GREEN, MARCH 2022. BASIN SHOWN ARE FOR REFERENCE ONLY.

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EASTONVILLE RD
EL PASO COUNTY, PEYTON, CO 80831

#	Date	Issue / Description	Init.

Project No:	HRG 1.20
Drawn By:	NJA
Checked By:	GRD
Date:	9/9/2022

WQ MAP

DR-4