The intent of the diversion channel is to safely direct offsite high flows from the adjacent parcel to south to the main stem of Fountain Creek. The proposed diversion channel is not intended to convey flows from the Rivervbend Crossing development and consists of a grass lined swale at 0.4% longitudinal slope and will provide some water quality treatment for the area of the swale prior to direct outfall to Fountain Creek in accordance with ECM section I.7.1.B. Basin A1 does not require water quality control measures since it is an open space area with land disturbance to undeveloped land that will remain undeveloped per ECM Appendix I Section I.7.1.B.7

'B Basins'

'B' designated basins consist of the majority of the residential development. Runoff from 'B' basins will primarily sheetflow to residential street sections, be collected in Type 'R' inlets and conveyed in public storm drainage systems to the extended detention basin.

Basin B17 (0.87 acres) contains the rear portions of lots adjacent to Fountain Creek. Runoff generated within Basin B17 will be collected in private area drains placed along rear lot lines. Flows will be conveyed in a private 8" HDPE storm sewer to confluence with the 48" HDPE at storm design point 12.

Basin B18 (4.86 acres) consists of rear portions of lots adjacent to the proposed extended detention basin and the extended detention basin. Runoff generated within Basin B18 will sheet flow overland directly to the proposed extended detention basin.

BASIN	AREA	Q_2	Q_5	Q_{10}	Q_{25}	Q_{50}	Q_{100}	Type R Inlet
B1	1.70	2.1	2.9	3.8	4.9	5.8	6.9	10'
B2	1.33	2.0	2.7	3.4	4.3	5.1	6.0	10'
B3	2.29	2.9	4.0	5.2	6.6	7.9	9.3	10'
B4	1.26	1.8	2.5	3.2	4.0	4.8	5.6	5'
B5	3.57	4.8	6.6	8.4	10.5	12.5	14.6	10'
B6	1.67	2.1	2.9	3.7	4.6	5.5	6.4	10'
B7	3.79	4.0	5.7	7.7	9.9	11.9	14.2	10'
B8	0.33	0.5	0.7	0.9	1.1	1.3	1.6	5'
B9	3.19	4.3	5.9	7.6	9.5	11.3	13.2	10'
B10	2.15	3.0	4.0	5.2	6.5	7.6	9.0	10'
B11	4.41	6.0	8.2	10.6	13.2	15.7	18.4	15'
B12	3.74	5.1	7.0	9.0	11.3	13.3	15.6	12'
B13	1.96	2.6	3.5	4.6	5.7	6.7	7.9	DP-A1
B14	1.35	1.8	2.5	3.2	4.0	4.7	5.5	5'
B15	1.15	1.2	1.6	2.1	2.6	3.1	3.7	5'
B16	2.19	2.4	3.3	4.2	5.3	6.3	7.4	DP-A1
B17	0.87	1.2	1.7	2.2	2.7	3.2	3.7	AREA
B18	4.86	1.9	3.6	5.8	8.5	10.7	13.3	POND

B12 inlet size is 15' per the inlet calculation.
Unresolved. Update to 15'

REVISED THIS TABLE TO 15'

4	185.51	9.45	34.95	8.80	32.22	9.73	1.17	Supercritical	104.50	0.00	
3	96.42	19.64	23.66	8.09	12.22	17.88	3.60	Supercritical	33.60	0.00	
2A	26.74	8.51	16.52	6.33	12.65	8.70	1.67	Supercritical Jump	14.60	42.44	
2B	29.66	9.44	16.52	6.33	11.89	9.40	1.88	Supercritical	14.60	0.00	
2C	37.68	12.00	16.52	6.33	10.37	11.23	2.44	Supercritical	14.60	0.00	
7	101.84	8.10	31.81	8.68	31.10	8.90	1.04	Supercritical	76.70	0.00	
6	67.58	13.77	24.57	8.48	15.70	14.03	2.42	Supercritical	36.50	0.00	
5A	26.45	8.42	17.03	6.50	13.20	8.75	1.63	Supercritical Jump	15.50	36.33	
5B	18.29	5.82	17.03	6.50	16.96	6.53	1.01	Supercritical	15.50	0.00	
11	71.33	7.41	25.70	7.63	24.92	7.92	1.06	Supercritical	47.10	0.00	
10	71.33	7.41	25.36	7.56	24.51	7.88	1.07	Supercritical	45.90	0.00	
9A	72.75	7.56	23.32	7.13	21.92	7.70	1.13	Supercritical	39.10	0.00	
9B	71.33	7.41	23.32	7.13	22.18	7.58	1.10	Supercritical	39.10	0.00	
8A	49.60	7.02	22.69	7.22	21.85	7.55	1.08	Supercritical	33.90	0.00	
8B	49.60	7.02	22.69	7.22	21.85	7.55	1.08	Supercritical	33.90	0.00	
1A	233.34	24.25	32.79	9.47	16.53	21.70	3.77	Supercritical Jump	76.30	19.67	Velocity is Too High
1B	101.38	10.54	32.79	9.47	27.20	11.57	1.45	Supercritical	76.30	0.00	
1C	100.88	10.49	32.79	9.47	27.30	11.53	1.44	Supercritical Jump	76.30	34.02	
P4B	71.33	7.41	31.50	9.07	33.84	8.45	0.86	Subcritical	70.20	0.00	
P4A	89.73	12.69	31.92	10.59	23.97	14.04	1.86	Pressurized	70.20	141.16	

- A Froude number of 0 indicates that pressured flow occurs (adverse slope or undersized pipe).
- If the sewer is not pressurized, full flow represents the maximum gravity flow in the sewer.
- If the sewer is pressurized, full flow represents the pressurized flow conditions.

Adjust. Max velocity is 18fps. Unresolved.

Update pipe design. See ECM 3.3.1.D.

VARIANCE REQUESTED

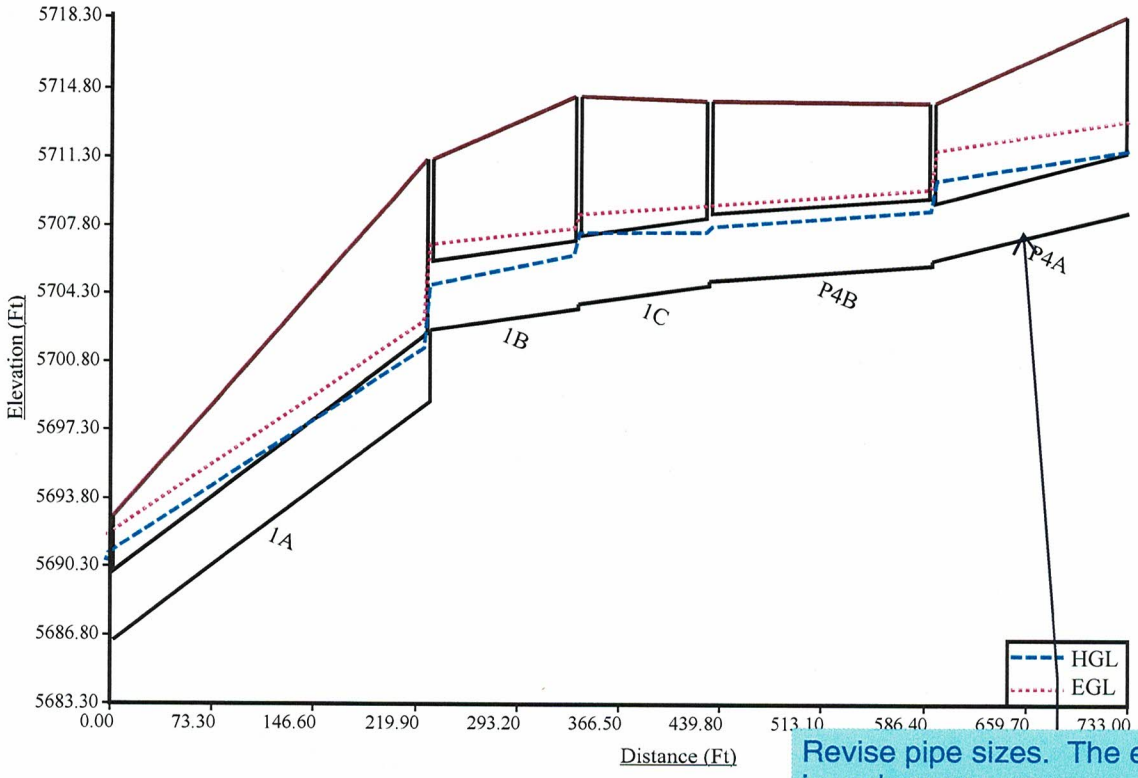
REVISED FROM 36" TO 42"

Sewer Sizing Summary:

D. **Minimum Gradient.**
The minimum gradient shall be 0.5% or a minimum velocity of 4 feet per second (fps) with the pipe flowing one quarter full. Storm sewer pipes shall be designed to flow full and free of pressure heads except for short runs where the grade changes and a small pressure head cannot be avoided. Where it is necessary to design for a pressure head, it shall be approved by the ECM Administrator and shall use pressure pipe with watertight joints with a 100-year service life.

Element Name	Peak Flow (cfs)	Cross Section	F							nment
12	104.50	CIRCULAR	60.00 in	60.00 in	54.00 in	54.00 in	60.00 in	60.00 in	19.63	
4	104.50	CIRCULAR	60.00 in	60.00 in	54.00 in	54.00 in	60.00 in	60.00 in	19.63	
3	33.60	CIRCULAR	30.00 in	30.00 in	21.00 in	21.00 in	30.00 in	30.00 in	4.91	
2A	14.60	CIRCULAR	24.00 in	24.00 in	21.00 in	21.00 in	24.00 in	24.00 in	3.14	
2B	14.60	CIRCULAR	24.00 in	24.00 in	21.00 in	21.00 in	24.00 in	24.00 in	3.14	
2C	14.60	CIRCULAR	24.00 in	24.00 in	18.00 in	18.00 in	24.00 in	24.00 in	3.14	
7	76.70	CIRCULAR	48.00 in	48.00 in	48.00 in	48.00 in	48.00 in	48.00 in	12.57	
6	36.50	CIRCULAR	30.00 in	30.00 in	24.00 in	24.00 in	30.00 in	30.00 in	4.91	
5A	15.50	CIRCULAR	24.00 in	24.00 in	21.00 in	21.00 in	24.00 in	24.00 in	3.14	

EAST



REVISED TO 42"
FROM 36"

Revise pipe sizes. The entire section is under pressure.

Per ECM Section 3.3.1.D Unresolved.

pipe.

D. Minimum Gradient

The minimum gradient shall be 0.5% or a minimum velocity of 4 feet per second (fps) with the pipe flowing one quarter full. Storm sewer pipes shall be designed to flow full and free of pressure heads except for short runs where the grade changes and a small pressure head cannot be avoided. Where it is necessary to design for a pressure head, it shall be approved by the ECM Administrator and shall use pressure pipe with watertight joints with a 100-year service life.

Design Procedure Form: Extended Detention Basin (EDB)

Designer: David Mijares
Company: Catamount
Date: August 17, 2020
Project: Riverbend Crossing
Location: Extended Detention Basin 1

5. Forebay

A) Minimum Forebay Volume (V_{FMIN} = 3% of the WQCV)
V_{FMIN} = 0.035 ac-ft

B) Actual Forebay Volume
V_F = 0.035 ac-ft

C) Forebay Depth (D_F = 30 inch maximum)
D_F = 30.0

Update. Does not match construction plans

REVISED

D) Forebay Discharge

i) Undetained 100-year Peak Discharge
Q_{100} = 180.80 cfs

ii) Forebay Discharge Design Flow ($Q_F = 0.02 * Q_{100}$)
Q_F = 3.62 cfs

E) Forebay Discharge Design

Choose One
- ○ Berm With Pipe
- ◉ Wall with Rect. Notch
- ○ Wall with V-Notch Weir

This forebay calculation is for Forebay 'A'.

Provide the calculation for Forebay 'B'

ADDED B CALCULATIONS

F) Discharge Pipe Size (minimum 8-inches)
Calculated D_F = in

G) Rectangular Notch Width
Calculated W_N = 9.3 in

6. Trickle Channel

A) Type of Trickle Channel

Choose One
- ◉ Concrete
- ○ Soft Bottom

F) Slope of Trickle Channel
S = ft / ft

7. Micropool and Outlet Structure

APPORTIONED AREAS BASED ON WHAT WAS TRIBUTARY TO EACH FOREBAY.

A) Depth of Micropool (2.5-feet minimum)
D_M = 2.5 ft

B) Surface Area of Micropool (10 ft^2 minimum)
A_M = 153 sq ft

C) Outlet Type

Choose One
- ◉ Orifice Plate
- ○ Other (Describe):

D) Smallest Dimension of Orifice Opening Based on Hydrograph Routing (Use UD-Detention)
$D_{orifice}$ = 1.69 inches

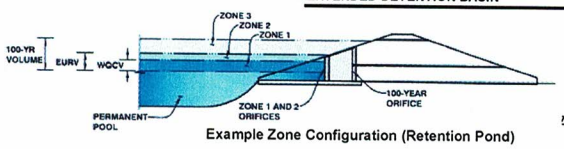
E) Total Outlet Area
A_{ot} = 6.77 square inches

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Project: RIVERBEND CROSSING

Basin ID: EXTENDED DETENTION BASIN



Example Zone Configuration (Retention Pond)

	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.56	1.170	Orifice Plate
Zone 2 (EURV)	6.57	2.542	Orifice Plate
Zone 3 (100-year)	8.65	2.458	Weir&Pipe (Restrict)
		6.169	Total

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 Diameter =	N/A	inches

Calculated Parameters for Underdrain

Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Centroid =	N/A	feet

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)

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	6.57	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	26.30	inches
Orifice Plate: Orifice Area per Row =	N/A	inches

Calculated Parameters for Plate

WQ Orifice Area per Row =	N/A	ft^2
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft^2

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	2.19	4.38					
Orifice Area (sq. inches)	5.51	5.51	6.00					

	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	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	N/A	N/A	inches

Calculated Parameters for Vertical Orifice

	Not Selected	Not Selected	
Vertical Orifice Area =	N/A	N/A	ft^2
Vertical Orifice Centroid =	N/A	N/A	feet

User Input: Overflow Weir (Dropbox) and Grate (Flat or Sloped)

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	6.57	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	7.00	N/A	feet
Overflow Weir Slope =	0.00	N/A	H:V (enter zero for flat grate)
Horiz. Length of Weir Sides =	7.00	N/A	feet
Overflow Grate Open Area % =	70%	N/A	%, grate open area/total area
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H_t =	6.57	N/A	feet
Over Flow Weir Slope Length =	7.00	N/A	feet
Grate Open Area / 100-yr Orifice Area =	6.85	N/A	should be ≥ 4
Overflow Grate Open Area w/o Debris =	34.30	N/A	ft^2
Overflow Grate Open Area w/ Debris =	17.15	N/A	ft^2

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 =	2.00	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	36.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	24.00		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	5.01	N/A	ft^2
Outlet Orifice Centroid =	1.12	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	1.91	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	8.70	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	60.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway

Spillway Design Flow Depth=	0.94	feet
Stage at Top of Freeboard =	10.64	feet
Basin Area at Top of Freeboard =	1.56	acres

Routed Hydrograph Results

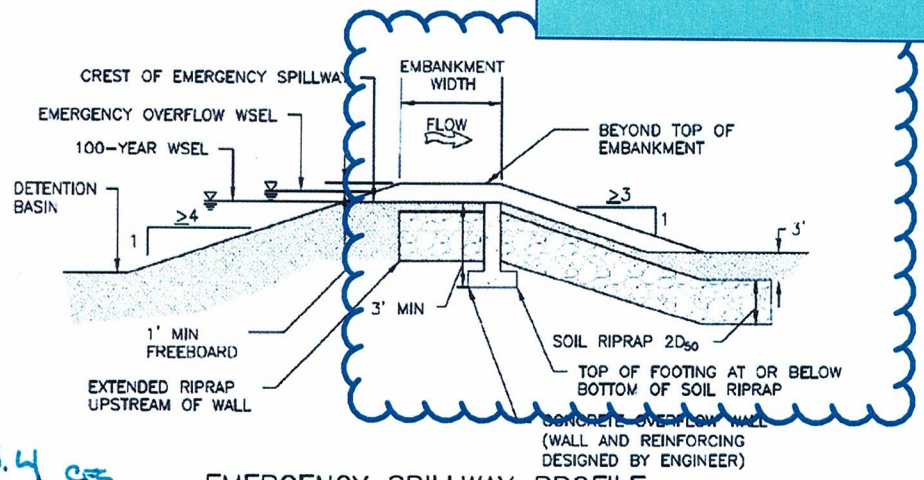
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	0.53	1.07	1.19	1.50	1.75	2.00	2.25	2.52	3.14
Calculated Runoff Volume (acre-ft) =	1.170	3.712	3.254	4.504	5.530	6.972	8.198	9.691	12.843
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	1.169	3.707	3.250	4.499	5.516	6.964	8.180	9.671	12.826
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.01	0.11	0.30	0.70	0.97	1.32	2.01
Predevelopment Peak Q (cfs) =	0.0	0.0	0.7	6.1	16.7	38.3	53.1	72.3	110.4
Peak Inflow Q (cfs) =	21.8	68.2	60.0	82.5	100.7	126.4	147.8	173.9	228.4
Peak Outflow Q (cfs) =	0.5	1.1	1.1	9.3	27.1	52.3	70.6	72.7	123.4
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.5	1.6	1.4	1.3	1.0	1.1
Structure Controlling Flow =	Plate	Plate	Plate	Overflow Grate 1	Overflow Grate 1	Overflow Grate 1	Outlet Plate 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	0.2	0.8	1.5	2.0	2.1	2.2
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) =	39	71	66	72	71	68	67	65	61
Time to Drain 99% of Inflow Volume (hours) =	40	75	70	77	76	75	75	74	73
Maximum Ponding Depth (ft) =	3.43	6.42	5.99	6.83	7.14	7.46	7.69	8.22	9.10
Area at Maximum Ponding Depth (acres) =	0.62	1.05	1.01	1.10	1.13	1.17	1.19	1.25	1.36
Maximum Volume Stored (acre-ft) =	1.093	3.543	3.160	3.995	4.329	4.708	4.979	5.625	6.775

Update outlet structure. FSD must release at or below historic Qs

OUTLET STRUCTURE REVISED TO BELOW Q PRE DEVELOPMENT PEAK FOR ALL STORMS.

Update construction plans to show this profile which shows soil riprap extending beyond the to and burried 3' below and the concrete overflow wall.

SECTION A-A'

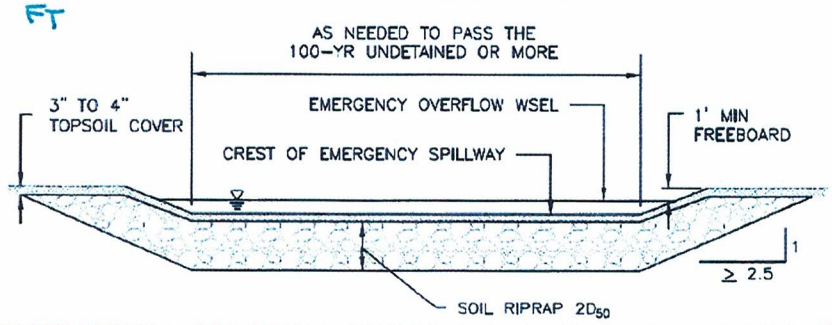


EMERGENCY SPILLWAY PROFILE

$Q_{100} = 165.4$ CFS

WEIR LENGTH = 60 FT

$\frac{165.4}{60} = 2.76$



EMERGENCY SPILLWAY SECTION AND SPILLWAY CHANNEL

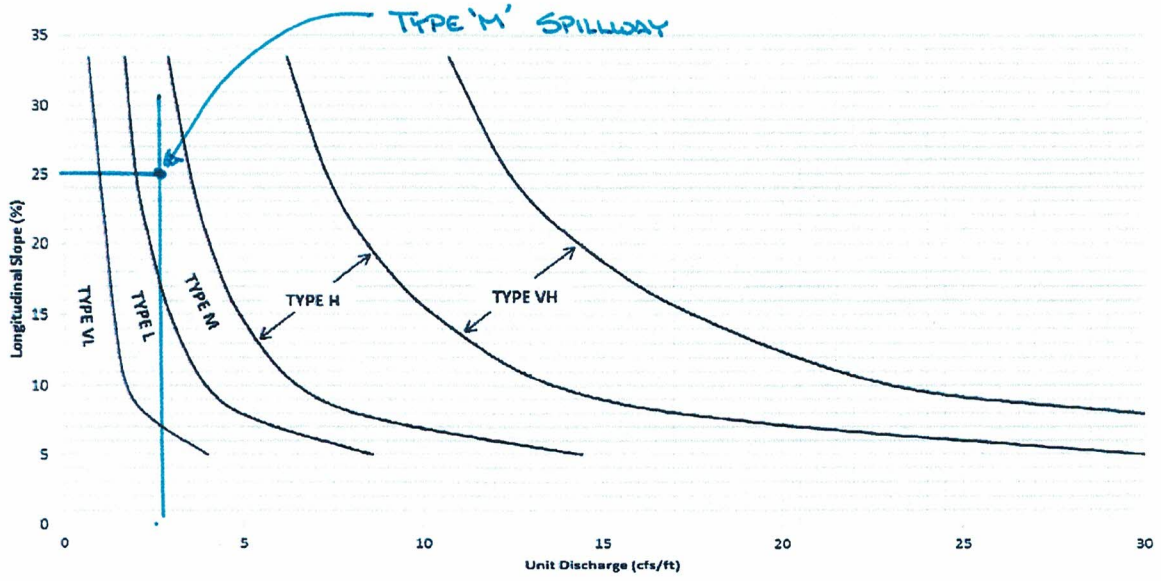
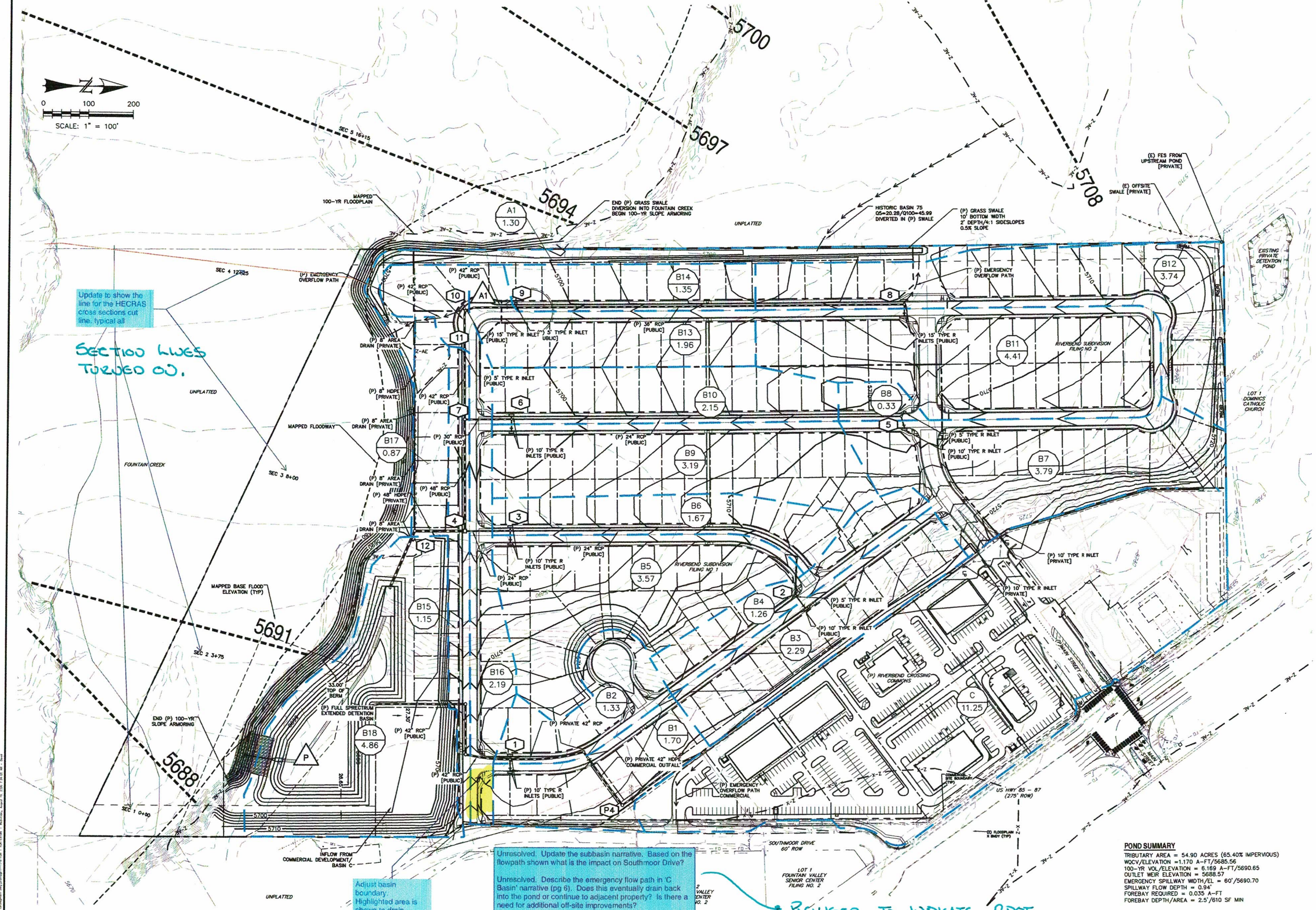
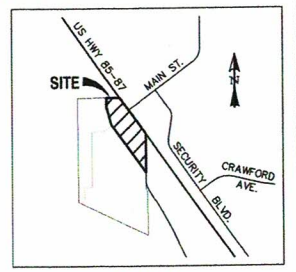


Figure 12-21. Embankment protection details and rock sizing chart (adapted from Arapahoe County)





VICINITY MAP
SCALE: N.T.S.

PROPOSED DRAINAGE BASINS

BASIN	AREA (ACRES)	Q2 (CFS)	Q5 (CFS)	Q10 (CFS)	Q25 (CFS)	Q50 (CFS)	Q100 (CFS)
A1	1.30	0.2	0.6	1.1	1.8	2.3	2.9
B1	1.70	2.1	2.9	3.8	4.9	5.8	6.9
B2	1.33	2.0	2.7	3.4	4.3	5.1	6.0
B3	2.29	2.9	4.0	5.2	6.6	7.9	9.3
B4	1.26	1.8	2.5	3.2	4.0	4.8	5.6
B5	3.57	4.8	6.6	8.4	10.5	12.5	14.6
B6	1.67	2.1	2.8	3.7	4.6	5.5	6.4
B7	3.79	4.0	5.7	7.7	9.9	11.9	14.2
B8	0.33	0.5	0.7	0.9	1.1	1.3	1.6
B9	3.19	4.3	5.9	7.6	9.5	11.3	13.2
B10	2.15	3.0	4.0	5.2	6.5	7.6	9.0
B11	4.41	6.0	8.2	10.6	13.2	15.7	18.4
B12	3.74	5.1	7.0	9.0	11.3	13.3	15.6
B13	1.96	2.8	3.5	4.8	5.7	6.7	7.9
B14	1.35	1.8	2.5	3.2	4.0	4.7	5.5
B15	1.15	1.2	1.6	2.1	2.6	3.1	3.7
B16	2.19	2.4	3.3	4.2	5.3	6.3	7.4
B17	0.87	1.2	1.7	2.2	2.7	3.2	3.7
B18	4.86	1.9	3.8	5.8	8.5	10.7	13.3
C	11.25	30.0	38.5	48.0	54.5	62.0	70.2

PROPOSED DESIGN POINTS

DESIGN POINT	Q2 (CFS)	Q5 (CFS)	Q10 (CFS)	Q25 (CFS)	Q50 (CFS)	Q100 (CFS)
P1	30.0	38.5	46.1	54.5	62.1	70.2
1	31.2	40.5	49.0	58.5	67.0	76.3
2	4.6	6.4	8.3	10.4	12.4	14.6
3	10.9	14.9	19.2	24.1	28.6	33.6
4	35.7	48.9	63.2	79.3	93.9	110.3
5	4.4	6.3	8.4	10.9	13.0	15.5
6	11.3	15.8	20.6	26.0	31.0	36.5
7	26.7	36.5	47.2	59.3	70.2	82.5
8	11.2	15.2	19.6	24.5	28.9	33.9
9	12.9	17.5	22.5	28.2	33.3	39.1
10	15.1	20.6	26.5	33.1	39.1	45.9
11	15.5	21.2	27.2	34.0	40.2	47.1
12	34.7	47.5	61.4	77.0	91.3	107.3
A1	4.6	6.3	8.1	10.1	11.9	13.9
P-IN	51.1	71.1	92.9	117.8	140.2	165.4
P-OUT	1.0	2.6	7.8	18.2	27.2	38.4

DRAINAGE LEGEND

BASIN IDENTIFIER / BASIN AREA [AC] — F / 0.38
DESIGN POINT IDENTIFIERS — 3
STORM SEWER DESIGN POINT IDENTIFIERS — P5
DRAINAGE BASIN BOUNDARY
SURFACE SHEET FLOW DIRECTION
EXISTING MAJOR CONTOUR (10')
EXISTING MINOR CONTOUR (2')
PROPOSED MAJOR CONTOUR (10')
PROPOSED MINOR CONTOUR (2')
EXISTING (E)
PROPOSED (P)
FUTURE (F)
SLOPE/DIRECTION 1.00%
(E) STORM SEWER
(P) STORM SEWER, INLET, OUTFALL

POND SUMMARY
TRIBUTARY AREA = 54.90 ACRES (65.40% IMPERVIOUS)
WQCV/ELEVATION =1.170 A-FT/5685.56
100-YR VOL/ELEVATION = 6.189 A-FT/5690.65
OUTLET WEIR ELEVATION = 5688.57
EMERGENCY SPILLWAY WIDTH/EL = 60'/5690.70
SPILLWAY FLOW DEPTH = 0.94'
FOREBAY REQUIRED = 0.035 A-FT
FOREBAY DEPTH/AREA = 2.5'/610 SF MIN

REV.	DESCRIPTION	DATE

REVISED BOUNDARY AS REQUESTED

PREPARED FOR:
AVATAR EQUITIES
6800 JERICHO TURNPIKE
SUITE 120W, #204
SYSOSSET, NY 11791

TYPE D INLETS ADD PIPE TO CONVEY FLOWS WITH INLET FAILURE.

CATAMOUNT ENGINEERING
321 N HENRIETTA AVE WOODLAND PARK, CO 80863
PO BOX 221 (719)429-0324

RIVERBEND CROSSING

PROPOSED DRAINAGE PLAN

DESIGNED BY:	DLM	DRAWN BY:	DBM
SCALE:	1" = 100'	DATE:	09/12/19
JOB NUMBER		SHEET	
17-115		1 OF X	