

RIP-RAP CALCULATIONS FOR EXISTING ARCH CULVERT FROM ELL RD DISCHARGE POINT TO CONC HW & WETLAND

Q_{DESIGN} = Q₂₅ = 32.3 cfs + Q₁₀₀ System B = 1.97 cfs at time of peak 12.4166 h
 Q_{CHECK} = Q₁₀₀ = 48 cfs + Q₁₀₀ System B = 3.5 cfs at time of peak 12.4166 h

Invert EL. = 101.4
 Backwater EL. = 104.1 from stone culvert 16" x 32" (H x W) Inv. 101.1

Apron Dimensions: Tw = 2.7 ft

Tw > 3.0 ft
 Q_{CHECK} = Q₂₅ = 34.17 cfs
 Q_{CHECK} = Q₁₀₀ = 51.5 cfs

1. Length La at the apron: W = 3.0 x (La/4)
 W = 3.0 x (9.4/4) = 7.05 FT
 OR 1' ABOVE EL. 104.3

W = 43" = 3.58 ft
 Do = 27" = 2.25 ft

9.25 = 34.17 / 3.58
 9.100 = 51.5 / 3.58 = 14.33 for stone size only

La₂₅ = 3 - 9.54 = 19
 La = 19 ft

With well defined channel, lining shall extend at least to 105.1 elevation (1 foot above tailwater elevation)

2. Rip-Rap median stone diameter D₅₀

D₅₀(25) = 0.016 x 14.33^{1.33} = 0.016 x (9.54)^{1.33} = 0.119 ft = 1.43 inch Use D₅₀ MIN = 6 inch

D₅₀(100) = 0.016 x 14.33^{1.33} = 0.016 x (2.45)^{1.33} = 0.204 ft = 2.45 inch Use D₅₀ MIN = 6 inch

ROAD ROUTED TOTAL OUTFLOW HYD...

Time hrs	Flow cfs	Depth ft	Velocity ft/sec
0.0000	0.00	0.00	0.00
0.5000	0.00	0.00	0.00
1.0000	0.00	0.00	0.00
1.5000	0.00	0.00	0.00
2.0000	0.00	0.00	0.00
2.5000	0.00	0.00	0.00
3.0000	0.00	0.00	0.00
3.5000	0.00	0.00	0.00
4.0000	0.00	0.00	0.00
4.5000	0.00	0.00	0.00
5.0000	0.00	0.00	0.00
5.5000	0.00	0.00	0.00
6.0000	0.00	0.00	0.00
6.5000	0.00	0.00	0.00
7.0000	0.00	0.00	0.00
7.5000	0.00	0.00	0.00
8.0000	0.00	0.00	0.00
8.5000	0.00	0.00	0.00
9.0000	0.00	0.00	0.00
9.5000	0.00	0.00	0.00
10.0000	0.00	0.00	0.00
10.5000	0.00	0.00	0.00
11.0000	0.00	0.00	0.00
11.5000	0.00	0.00	0.00
12.0000	0.00	0.00	0.00
12.5000	0.00	0.00	0.00
13.0000	0.00	0.00	0.00
13.5000	0.00	0.00	0.00
14.0000	0.00	0.00	0.00
14.5000	0.00	0.00	0.00
15.0000	0.00	0.00	0.00
15.5000	0.00	0.00	0.00
16.0000	0.00	0.00	0.00
16.5000	0.00	0.00	0.00
17.0000	0.00	0.00	0.00
17.5000	0.00	0.00	0.00
18.0000	0.00	0.00	0.00
18.5000	0.00	0.00	0.00
19.0000	0.00	0.00	0.00
19.5000	0.00	0.00	0.00
20.0000	0.00	0.00	0.00

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 25 year storm Rain depth = 4.3300 in
 Duration = 24.0000 hrs Rain Depth = 4.3300 in
 Rain Dis = 0 Documents and Settings\Bentley\Project\Rain Dis - 10 - Typical Data
 Unit Hyd Type = Default Convolution
 HYD File = C:\Documents and Settings\Bentley\Project\HYD File - 10 - ELL RD CULVERT 3 25
 TC = 4.622 Hrs
 Drainage Area = 14.410 acres Runoff Coef = 70

HYDROGRAPH ordinates (cfs)

Time hrs	Flow cfs
0.0000	0.00
0.2500	0.00
0.5000	0.00
0.7500	0.00
1.0000	0.00
1.2500	0.00
1.5000	0.00
1.7500	0.00
2.0000	0.00
2.2500	0.00
2.5000	0.00
2.7500	0.00
3.0000	0.00
3.2500	0.00
3.5000	0.00
3.7500	0.00
4.0000	0.00
4.2500	0.00
4.5000	0.00
4.7500	0.00
5.0000	0.00
5.2500	0.00
5.5000	0.00
5.7500	0.00
6.0000	0.00
6.2500	0.00
6.5000	0.00
6.7500	0.00
7.0000	0.00
7.2500	0.00
7.5000	0.00
7.7500	0.00
8.0000	0.00
8.2500	0.00
8.5000	0.00
8.7500	0.00
9.0000	0.00
9.2500	0.00
9.5000	0.00
9.7500	0.00
10.0000	0.00
10.2500	0.00
10.5000	0.00
10.7500	0.00
11.0000	0.00
11.2500	0.00
11.5000	0.00
11.7500	0.00
12.0000	0.00
12.2500	0.00
12.5000	0.00
12.7500	0.00
13.0000	0.00
13.2500	0.00
13.5000	0.00
13.7500	0.00
14.0000	0.00
14.2500	0.00
14.5000	0.00
14.7500	0.00
15.0000	0.00
15.2500	0.00
15.5000	0.00
15.7500	0.00
16.0000	0.00
16.2500	0.00
16.5000	0.00
16.7500	0.00
17.0000	0.00
17.2500	0.00
17.5000	0.00
17.7500	0.00
18.0000	0.00
18.2500	0.00
18.5000	0.00
18.7500	0.00
19.0000	0.00
19.2500	0.00
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3.5000	0.00	0.00	0.00
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16.0000	0.00	0.00	0.00
16.5000	0.00	0.00	0.00
17.0000	0.00	0.00	0.00
17.5000	0.00	0.00	0.00
18.0000	0.00	0.00	0.00
18.5000	0.00	0.00	0.00
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 Drainage Area = 14.410 acres Runoff Coef = 70

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0.5000	0.00
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1.2500	0.00
1.5000	0.00
1.7500	0.00
2.0000	0.00
2.2500	0.00
2.5000	0.00
2.7500	0.00
3.0000	0.00
3.2500	0.00
3.5000	0.00
3.7500	0.00
4.0000	0.00
4.2500	0.00
4.5000	0.00
4.7500	0.00
5.0000	0.00
5.2500	0.00
5.5000	0.00
5.7500	0.00
6.0000	0.00
6.2500	0.00
6.5000	0.00
6.7500	0.00
7.0000	0.00
7.2500	0.00
7.5000	0.00
7.7500	0.00
8.0000	0.00
8.2500	0.00
8.5000	0.00
8.7500	0.00
9.0000	0.00
9.2500	0.00
9.5000	0.00
9.7500	0.00
10.0000	0.00
10.2500	0.00
10.5000	0.00
10.7500	0.00
11.0000	0.00
11.2500	0.00
11.5000	0.00
11.7500	0.00
12.0000	0.00
12.2500	0.00
12.5000	0.00
12.7500	0.00
13.0000	0.00
13.2500	0.00
13.5000	0.00
13.7500	0.00
14.0000	0.00
14.2500	0.00
14.5000	0.00
14.7500	0.00
15.0000	0.00
15.2500	0.00
15.5000	0.00
15.7500	0.00
16.0000	0.00
16.2500	0.00
16.5000	0.00
16.7500	0.00
17.0000	0.00
17.2500	0.00
17.5000	0.00
17.7500	0.00
18.0000	0.00
18.2500	0.00
18.5000	0.00
18.7500	0.00
19.0000	0.00
19.2500	0.00
19.5000	0.00
19.7500	0.00
20.0000	0.00

TYPE OF CONCENTRATION CALCULATOR

Segment #1 Time: .3974 hrs

Segment #2 Time: .0792 hrs

Segment #3 Time: .1029 hrs

Segment #4 Time: .0427 hrs

Segment #5 Time: .0427 hrs

SOIL SURFACE DESCRIPTION

Area	Impervious Adj	Adjusted CN
Residential Districts - 1/3 acre	72	72.00
Residential Districts - 1/3 acre	81	81.00
Woods - good	10	70.00
COMPOSITE AREA & WEIGHTED CN	14.410	78.33 (78)

SCS Channel Flow

Segment #1 Time: .3974 hrs

Segment #2 Time: .0792 hrs

Segment #3 Time: .1029 hrs

Segment #4 Time: .0427 hrs

Segment #5 Time: .0427 hrs

SCS TR-55 Sheet Flow

Segment #1 Time: .3974 hrs

Segment #2 Time: .0792 hrs

Segment #3 Time: .1029 hrs

Segment #4 Time: .0427 hrs

Segment #5 Time: .0427 hrs

STORM SEWER CHART

PIPE SECTION FROM TO	LENGTH FT	PIPE SLOPE %	INVERT FROM TO	UPSTREAM RM OR STATE
CB B1a CB B1b	73	15'	111.87 111.50	115.00
CB B1b CB B1c	98	15'	111.43 110.94	115.50
CB B1c CB B1d	157	15'	110.84 110.06	116.00
CB B1d WO B1a	33	15'	109.56 109.20	116.50
WO B1a DS B	7	15'	107.40 106.90	117.00
WO B1b DS B	10	15'	104.00 103.50	108.30
WO B1c DS B	10	15'	104.00 103.50	108.30
FB B1b DS B	135	15'	105.75 105.07	109.00
DS B OCS B	100	0.00	101.00 103.00	112.00
OCS B MH B2	42	21' PVC	103.75 103.44	109.00
MH B2 MH B3	142	21' PVC	103.34 102.66	106.70
CB C1a CB C1b	73	15'	117.55 117.07	120.00
CB C1b CB C1c	80	15'	116.47 116.23	118.00
CB C1c WO C1d	85	15'	116.43 112.00	116.50
WO C1d DS C	10	15'	110.00 109.99	115.20
CB C1e WO C1f	16	15'	111.56 111.67	115.00
WO C1f DS C	16	15'	110.50 109.96	115.00
DS C OCS C	30	2 x 48" Perfor	109.50 109.50	115.00
OCS C CULVERT C	33	15'	109.50 109.24	115.10
HV C2 HW C1	40	15'	0.65 112.26 110.00	115.20
CB D1a CB D1b	70	15'	120.45 120.10	123.70
CB D1b CB D1c	164	15'	120.00 119.03	120.50
CB D1c OCB D1d	82	15'	118.03 118.22	127.50
OCB D1d HW D1e	78	15'	119.42 118.72	124.50
FB D1a HW D1b	70	15'	118.29 118.00	118.00
DBL F13a F13 b	47	15'	0.85 115.00 114.60	119.50
F13 b F13 c	70	15'	114.50 114.60	119.50
F13 c F13 d	47	15'	114.50 114.60	119.50
DBL F13d DS D	135	18'	0.50 118.55 118.00	121.80
DBL F13e DS D	160	15'	2.22 118.55 115.00	121.80
DS D OCS D	80	3 x 60" Perfor	0.00 118.50 118.60	125.00
OCS D SHW4	18	18'	0.50 118.67 118.60	125.00

