CULVERT - LINE 'U' DESIGN CALCULATIONS

Culvert Location:	Culvert - Line 'U'			RDWY. Elev.	599.50	U.S. Culv. F.L.	592.5
				U.S. Culv. F.L.	592.90	D.S. Culv. F.L.	592.2
Total Discharge, Q (cfs)	165.4	Design Storm Freq.	100 yr	Difference	6.60 ft	Difference	0.3
Roughness Coeff., n	0.015	Max. Vel. (ft/s)	12.0	Req'd Freeboard	1.00 ft	Length (ft)	67
Tailwater (ft)	2.0	D.S. Channel Width (ft)	12.0	Allow. Headwater	5.60 ft	Culv. Slope, $S_o = \frac{\text{Diff.Ft}}{\text{Length Ft}}$	
Entrance Description:	Type 2A, 90° Headwall					So=	0.45%

TRIAL CULVERT										HEADWATER CALCULATION																				
		DEPTH RANGE			POSSIBLE CULVERT SIZES					INLET CONTROL					OUTLET CONTROL															
																CASE III					CASE IV									
																					ho=dc+D/2 or ho=TW (use larger)									
Trial Area of Opening T*A=Q/V (sq. ft.)	Channel Width "W" (feet)	T*Ac/W (feet)	AHW (feet)	Trial Depth "D" (feet)	No. Openings	Width of Box "B" (feet)	Box Depth or Pipe Diameter "D" (feet)	Total Culvert Area "Ac" (sq.ft.)	"Q" Each Opening (c.f.s.)	Entrance Type	Case NO.	Q/B (c.f.s.)	HW/D	"HW" (feet)	Entrance Coeff, Ke	"H" (feet)	"TW" (feet)	LxSo (feet)	"HW" (feet)	"H" (feet)	dc (feet)	dc+D/2 (feet)	TW (feet)	ho (feet)	LxSo	"HW" (feet)	The Greater Controlling Head Water (Inlet or Outlet) (feet)	Selected Conduit Size (feet)		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29		
13.78	12.00	1.15	5.60	3.00	1.00	7.00	3.00	21.00	165.40	Type 2A	Case 2	23.63	1.60	4.80	0.50	1.80	2.00	0.30	3.50	1.80	2.60	2.80	2.00	2.80	0.30	4.30	4.80	7'x3' Box		

CULVERT - LINE 'V' DESIGN CALCULATIONS

Culvert Location:	Culvert - Line 'V'			RDWY. Elev.	581.31	U.S. Culv. F.L.	575.3
				U.S. Culv. F.L.	575.30	D.S. Culv. F.L.	575
Total Discharge, Q (cfs)	199.6	Design Storm Freq.	100 yr	Difference	6.01 ft	Difference	0.3
Roughness Coeff., n	0.015	Max. Vel. (ft/s)	12.0	Req'd Freeboard	1.00 ft	Length (ft)	67
Tailwater (ft)	2.5	D.S. Channel Width (ft)	12.0	Allow. Headwater	5.01 ft	Culv. Slope, $S_o = \frac{\text{Diff.Ft}}{\text{Length Ft}}$	
Entrance Description:	Type 2A, 90° Headwall					So=	0.45%

TRIAL CULVERT										HEADWATER CALCULATION																				
		DEPTH RANGE			POSSIBLE CULVERT SIZES					INLET CONTROL					OUTLET CONTROL															
																CASE III					CASE IV									
																					ho=dc+D/2 or ho=TW (use larger)									
Trial Area of Opening T*A=Q/V (sq. ft.)	Channel Width "W" (feet)	T*Ac/W (feet)	AHW (feet)	Trial Depth "D" (feet)	No. Openings	Width of Box "B" (feet)	Box Depth or Pipe Diameter "D" (feet)	Total Culvert Area "Ac" (sq.ft.)	"Q" Each Opening (c.f.s.)	Entrance Type	Case NO.	Q/B (c.f.s.)	HW/D	"HW" (feet)	Entrance Coeff, Ke	"H" (feet)	"TW" (feet)	LxSo (feet)	"HW" (feet)	"H" (feet)	dc (feet)	dc+D/2 (feet)	TW (feet)	ho (feet)	LxSo	"HW" (feet)	The Greater Controlling Head Water (Inlet or Outlet) (feet)	Selected Conduit Size (feet)		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29		
16.63	12.00	1.39	5.01	3.00	2.00	5.00	3.00	30.00	99.80	Type 2A	Case 2	19.96	1.36	4.08	0.50	1.20	2.53	0.30	3.43	1.20	2.30	2.65	2.53	2.65	0.30	3.55	4.08	(2) 5'x3' Box		

CULVERT - LINE 'W' DESIGN CALCULATIONS

Culvert Location:	Culvert - Line 'W'			RDWY. Elev.	589.05	U.S. Culv. F.L.	582.3
				U.S. Culv. F.L.	582.30	D.S. Culv. F.L.	582
Total Discharge, Q (cfs)	369.6	Design Storm Freq.	100 yr	Difference	6.75 ft	Difference	0.3
Roughness Coeff., n	0.015	Max. Vel. (ft/s)	12.0	Req'd Freeboard	1.00 ft	Length (ft)	67
Tailwater (ft)	2.6	D.S. Channel Width (ft)	12.0	Allow. Headwater	5.75 ft	Culv. Slope, $S_o = \frac{\text{Diff.Ft}}{\text{Length Ft}}$	
Entrance Description:	Type 2A, 90° Headwall					So=	0.45%

TRIAL CULVERT										HEADWATER CALCULATION																				
		DEPTH RANGE			POSSIBLE CULVERT SIZES					INLET CONTROL					OUTLET CONTROL															
																CASE III					CASE IV									
																					ho=dc+D/2 or ho=TW (use larger)									
Trial Area of Opening T*A=Q/V (sq. ft.)	Channel Width "W" (feet)	T*Ac/W (feet)	AHW (feet)	Trial Depth "D" (feet)	No. Openings	Width of Box "B" (feet)	Box Depth or Pipe Diameter "D" (feet)	Total Culvert Area "Ac" (sq.ft.)	"Q" Each Opening (c.f.s.)	Entrance Type	Case NO.	Q/B (c.f.s.)	HW/D	"HW" (feet)	Entrance Coeff, Ke	"H" (feet)	"TW" (feet)	LxSo (feet)	"HW" (feet)	"H" (feet)	dc (feet)	dc+D/2 (feet)	TW (feet)	ho (feet)	LxSo	"HW" (feet)	The Greater Controlling Head Water (Inlet or Outlet) (feet)	Selected Conduit Size (feet)		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29		
30.80	12.00	2.57	5.75	3.00	2.00	6.00	4.00	48.00	184.80	Type 2A	Case 2	30.80	1.38	5.52	0.50	1.50	2.59	0.30	3.79	1.50	3.20	3.60	2.59	3.60	0.30	4.80	5.52	(2) 6'x4' Box		

RECORD DRAWING 02/02/2015

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ROCKWALL TECHNOLOGY PARK PHASE IV

CULVERT HYDRAULIC CALCULATIONS

DARRELL J. BOSWORTH 112702 REGISTERED PROFESSIONAL ENGINEER 2-2-15

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