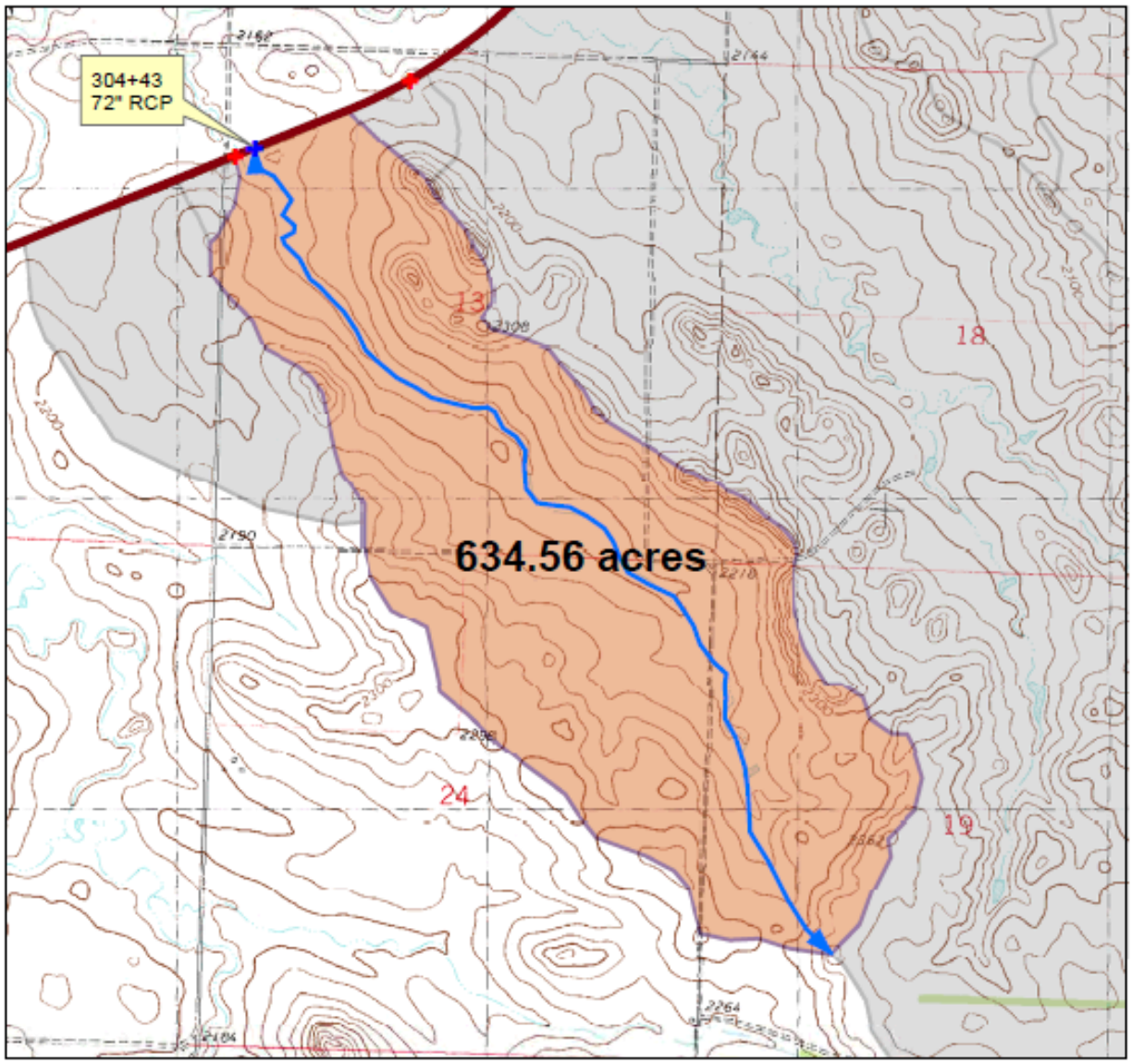
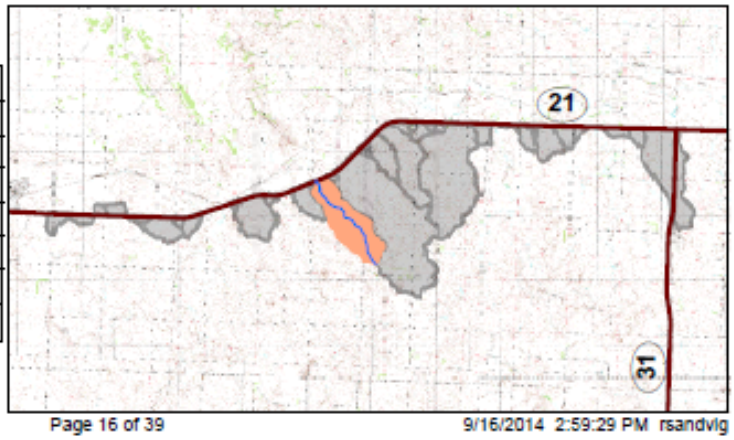


304+43

Region	B
Slope	51.15 ft/mi
Q2	24.76 cfs
Q10	103.35 cfs
Q25	162.23 cfs
Q50	212.89 cfs
Q100	267.41 cfs
Q500	418.5 cfs



HY-8 Culvert Analysis Report

Table 1 - Summary of Culvert Flows at Crossing: 304+43

Headwater Elevation (ft)	Total Discharge (cfs)	72"x86' RCP Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2142.15	24.80	24.80	0.00	1
2143.01	49.06	49.06	0.00	1
2143.70	73.32	73.32	0.00	1
2144.30	97.58	97.58	0.00	1
2144.86	121.84	121.84	0.00	1
2145.38	146.10	146.10	0.00	1
2145.72	162.20	162.20	0.00	1
2146.38	194.62	194.62	0.00	1
2146.87	218.88	218.88	0.00	1
2147.36	243.14	243.14	0.00	1
2147.87	267.40	267.40	0.00	1
2151.99	397.11	397.11	0.00	Overtopping

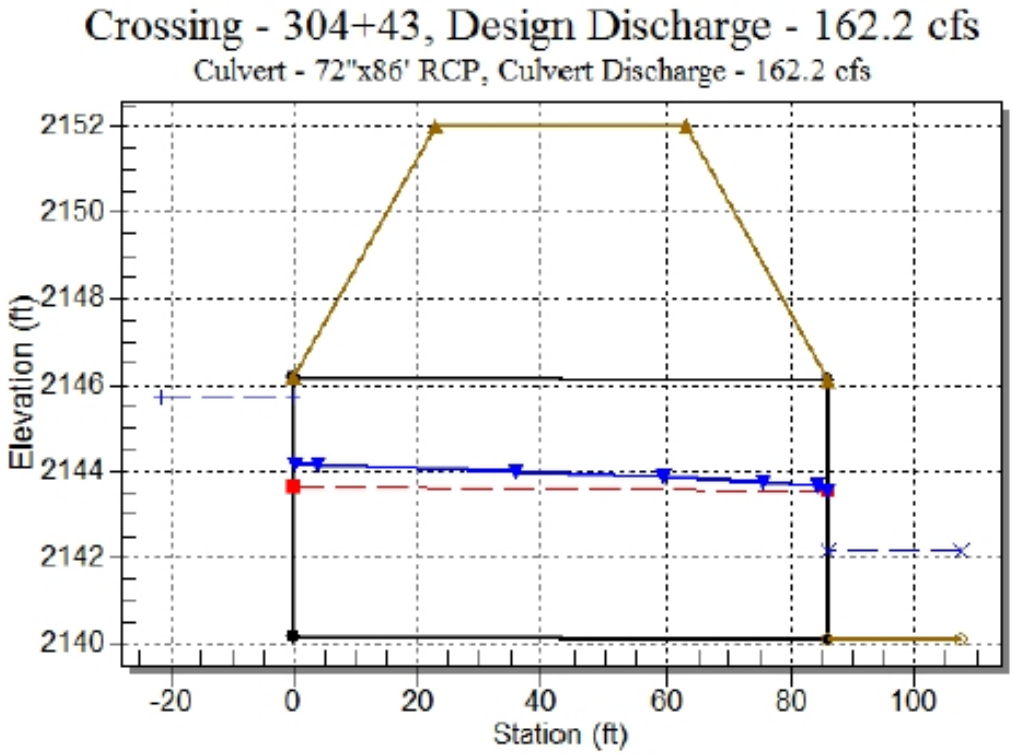
Table 2 - Culvert Summary Table: 72"x86' RCP

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
24.80	24.80	2142.15	1.785	1.965	2-M2c	1.639	1.292	1.292	0.715	5.506	3.035
49.06	49.06	2143.01	2.561	2.820	2-M2c	2.370	1.852	1.852	1.061	6.603	3.814
73.32	73.32	2143.70	3.208	3.507	2-M2c	2.974	2.277	2.277	1.334	7.436	4.340
97.58	97.58	2144.30	3.837	4.112	2-M2c	3.545	2.642	2.642	1.566	8.130	4.744
121.84	121.84	2144.86	4.397	4.667	2-M2c	4.135	2.982	2.982	1.772	8.685	5.075
146.10	146.10	2145.38	4.914	5.190	2-M2c	4.833	3.268	3.268	1.958	9.284	5.361
162.20	162.20	2145.72	5.246	5.528	2-M2c	6.000	3.457	3.457	2.074	9.621	5.529
194.62	194.62	2146.38	5.915	6.189	2-M2c	6.000	3.799	3.799	2.289	10.325	5.832
218.88	218.88	2146.87	6.436	6.678	2-M2c	6.000	4.039	4.039	2.439	10.825	6.032
243.14	243.14	2147.36	6.991	7.169	2-M2c	6.000	4.264	4.264	2.579	11.323	6.219
267.40	267.40	2147.87	7.591	7.676	2-M2c	6.000	4.461	4.461	2.714	11.889	6.388

Inlet Elevation (Invert): 2140.19 ft, Outlet Elevation (invert): 2140.10 ft

Culvert Length: 86.00 ft, Culvert Slope: 0.0010

Water Surface Profile Plot for Culvert: 72"x86' RCP



Site Data - 72"x86' RCP

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 2140.19 ft
Outlet Station: 86.00 ft
Outlet Elevation: 2140.10 ft
Number of Barrels: 1

Culvert Data Summary - 72"x86' RCP

Barrel Shape: Circular
Barrel Diameter: 6.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Inlet Type: Conventional
Inlet Edge Condition: Square Edge with Headwall
Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: 304+43)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
24.80	2140.81	0.71	3.04	0.43	0.67
49.06	2141.16	1.06	3.81	0.64	0.71
73.32	2141.43	1.33	4.34	0.81	0.73
97.58	2141.67	1.57	4.74	0.95	0.74
121.84	2141.87	1.77	5.08	1.07	0.75
146.10	2142.06	1.96	5.36	1.18	0.76
162.20	2142.17	2.07	5.53	1.25	0.77
194.62	2142.39	2.29	5.83	1.38	0.78
218.88	2142.54	2.44	6.03	1.47	0.78
243.14	2142.68	2.58	6.22	1.56	0.79
267.40	2142.81	2.71	6.39	1.64	0.79

Tailwater Channel Data - 304+43

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 10.00 ft

Side Slope (H:V): 2.00 (_:1)

Channel Slope: 0.0097

Channel Manning's n: 0.0350

Channel Invert Elevation: 2140.10 ft

Roadway Data for Crossing: 304+43

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 500.00 ft

Crest Elevation: 2151.99 ft

Roadway Surface: Paved

Roadway Top Width: 40.00 ft

Table 4 - Summary of Culvert Flows at Crossing: 304+43 (Corrugated Alternate)

Headwater Elevation (ft)	Total Discharge (cfs)	78"x86' CSP Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2142.24	24.80	24.80	0.00	1
2143.08	49.06	49.06	0.00	1
2143.75	73.32	73.32	0.00	1
2144.34	97.58	97.58	0.00	1
2144.87	121.84	121.84	0.00	1
2145.38	146.10	146.10	0.00	1
2145.70	162.20	162.20	0.00	1
2146.34	194.62	194.62	0.00	1
2146.81	218.88	218.88	0.00	1
2147.29	243.14	243.14	0.00	1
2147.76	267.40	267.40	0.00	1
2151.99	427.64	427.64	0.00	Overtopping

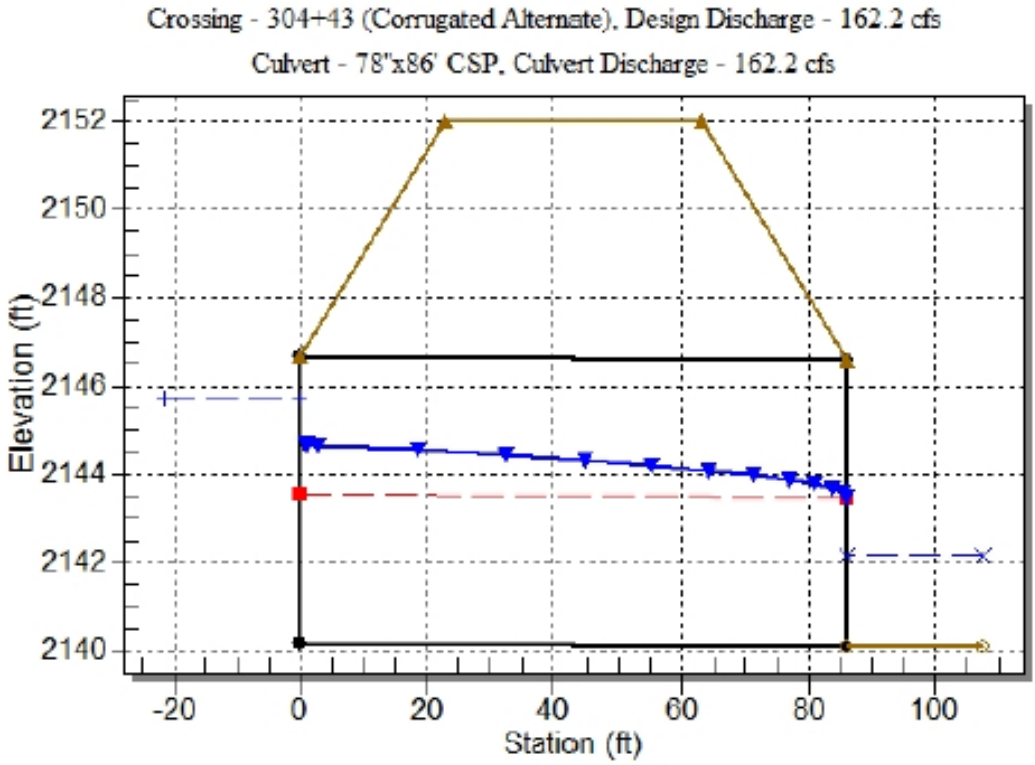
Table 5 - Culvert Summary Table: 78"x86' CSP

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
24.80	24.80	2142.24	1.751	2.049	2-M2c	2.289	1.274	1.274	0.715	5.385	3.035
49.06	49.06	2143.08	2.498	2.885	2-M2c	3.375	1.797	1.797	1.061	6.531	3.814
73.32	73.32	2143.75	3.097	3.558	2-M2c	4.390	2.214	2.214	1.334	7.326	4.340
97.58	97.58	2144.34	3.634	4.146	2-M2c	5.808	2.592	2.592	1.566	7.906	4.744
121.84	121.84	2144.87	4.136	4.678	2-M2c	6.500	2.895	2.895	1.772	8.521	5.075
146.10	146.10	2145.38	4.610	5.189	2-M2c	6.500	3.196	3.196	1.958	8.994	5.361
162.20	162.20	2145.70	4.915	5.513	2-M2c	6.500	3.372	3.372	2.074	9.333	5.529
194.62	194.62	2146.34	5.518	6.151	2-M2c	6.500	3.708	3.708	2.289	9.955	5.832
218.88	218.88	2146.81	5.970	6.619	2-M2c	6.500	3.950	3.950	2.439	10.373	6.032
243.14	243.14	2147.29	6.431	7.096	2-M2c	6.500	4.163	4.163	2.579	10.847	6.219
267.40	267.40	2147.76	6.908	7.573	2-M2c	6.500	4.376	4.376	2.714	11.268	6.388

Inlet Elevation (invert): 2140.19 ft, Outlet Elevation (invert): 2140.10 ft

Culvert Length: 86.00 ft, Culvert Slope: 0.0010

Water Surface Profile Plot for Culvert: 78"x86' CSP



Site Data - 78"x86' CSP

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 2140.19 ft
Outlet Station: 86.00 ft
Outlet Elevation: 2140.10 ft
Number of Barrels: 1

Culvert Data Summary - 78"x86' CSP

Barrel Shape: Circular
Barrel Diameter: 6.50 ft
Barrel Material: Corrugated Steel
Embedment: 0.00 in
Barrel Manning's n: 0.0240
Inlet Type: Conventional
Inlet Edge Condition: Square Edge with Headwall
Inlet Depression: None

Table 6 - Downstream Channel Rating Curve (Crossing: 304+43 (Corrugated Alternate))

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
24.80	2140.81	0.71	3.04	0.43	0.67
49.06	2141.16	1.06	3.81	0.64	0.71
73.32	2141.43	1.33	4.34	0.81	0.73
97.58	2141.67	1.57	4.74	0.95	0.74
121.84	2141.87	1.77	5.08	1.07	0.75
146.10	2142.06	1.96	5.36	1.18	0.76
162.20	2142.17	2.07	5.53	1.25	0.77
194.62	2142.39	2.29	5.83	1.38	0.78
218.88	2142.54	2.44	6.03	1.47	0.78
243.14	2142.68	2.58	6.22	1.56	0.79
267.40	2142.81	2.71	6.39	1.64	0.79

Tailwater Channel Data - 304+43 (Corrugated Alternate)

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 10.00 ft

Side Slope (H:V): 2.00 (_:1)

Channel Slope: 0.0097

Channel Manning's n: 0.0350

Channel Invert Elevation: 2140.10 ft

Roadway Data for Crossing: 304+43 (Corrugated Alternate)

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 500.00 ft

Crest Elevation: 2151.99 ft

Roadway Surface: Paved

Roadway Top Width: 40.00 ft

HYDRAULIC DATA FOR PROJECT ### (A)									
				25-YEAR DATA				100-YEAR DATA	
STATION	EXISTING PIPE	PROPOSED PIPE SIZE	DRAINAGE AREA (ACRES)	DESIGN DISCHARGE (CFS)	DESIGN HEADWATER (FT)	DESIGN VELOCITY (FPS)	DESIGN STAGE (NAVD 88)	100-YEAR DISCHARGE (CFS)	100-YEAR STAGE (NAVD 88)
304+43	72" RCP	72"	634.6	162.2	5.53	9.62	2145.72	267.4	2147.87

(A) Hydraulic data provided is for smooth-walled (Manning's n=0.012) type conduits.