APPENDIX C

Hydraulic Analysis Data, Calculations, and Results

Pipe Hydraulic Evaluation

Pipe Hydraulic Evaluation

			Pipe Properties					Drainage Area			Design Flows					Pipe Hydraulics									Future Condition Flows					
												Existing Condition		Future Condition		Existing Condition Flows															
Sub-Basin	Pipe ID (stmain)	Pipe Length	Pipe Diameter (D)	Flow Area, (A)	Roughness Coefficient, (k_s)	Full-pipe Capacity	Pipe Slope	Contributing Drainage Area, (a)	Sub-Basin Drainage Area, (A)	Area Ratio (a/A)	Flow Ratio, (q/Q)	Sub-Basin Peak Flow, ($Q_{EX10-YR}$)	Design Flow in Respective Pipe, (q_{10-YR})	Sub-Basin Peak Flow, ($Q_{FU10-YR}$)	Design Flow in Respective Pipe, (q_{10-YR})	Average Velocity, (V)	Reynolds Number, (Re)	Darcy Friction Factor, (f)	Friction Head loss, (h_f)	q/Qfull	h_f/L	h_f over length of pipe	"Freeboard"	Deficiency Rating	Average Velocity, (V)	Reynolds Number, (Re)	Darcy Friction Factor, (f)	Friction Head loss, (h_f)	q/Qfull	h_f/L
		ft	in	ft2	ft		ft/ft		(acres)			cfs	cfs	cfs	cfs	ft/s	unitless	--	ft						ft/s	unitless	--	ft		
				πr^2	Diagram	Eq.						HMS		HMS		Eq.	Calculated	White Equation	Wiesbach Eq.						Eq.	Calculated	White Equation	Wiesbach Eq.		
E-N10	**1**	50	21	2.4	0.001	7.2	0.0021	37.6	84	45%	0.56	49	27.3	50	27.8	11.4	1198607	0.013	0.7	3.8	0.01445	0.7	na	2	11.6	1220530	0.013	0.7	3.9	0.0
E-L30	**7**	672	15	1.2	0.001	3.0	0.0021	10.6	96	11%	0.18	57	10.1	58	10.3	8.2	619402	0.013	7.6	3.4	0.01132	7.6	na	2	8.4	630360	0.013	7.9	3.5	0.0
E-L40	**8**	492	18	1.8	0.001	4.7	0.0020	28.5	89	32%	0.41	45	18.5	52	21.4	10.4	944244	0.013	7.2	3.9	0.01468	7.2	na	2	12.1	1092570	0.013	9.7	4.5	0.0
E-F	**15**	118	12	0.8	0.001	2.4	0.0044	8.4	21	40%	0.50	11	5.4	13	6.4	6.9	414396	0.014	1.2	2.3	0.01036	1.2	-1.2	2	8.2	492670	0.014	1.7	2.7	0.0
E-F	**17**	103	15	1.2	0.001	27.9	0.1872	21.1	21	100%	1.29	11	13.9	13	16.5	11.3	852473	0.013	2.2	0.5	0.02144	2.2	-2.2	0	13.5	1013500	0.013	3.1	0.6	0.0
SY-A10	**19**	730	36	7.1	0.001	21.1	0.0010	84.1	84	100%	100%	62	61.6	62	61.6	8.7	1574962	0.011	3.3	2.9	0.00447	3.3	-0.3	1	8.7	1574960	0.011	3.3	2.9	0.0
SY-C0	**31**	245	54	15.9	0.001	313.0	0.0254	67.1	67	100%	175%	41	71.0	41	71.7	4.5	1211044	0.011	0.2	0.2	0.00073	0.2	2.3	0	4.5	1222680	0.011	0.2	0.2	0.0
H-25R	**40**	65	18	1.8	0.001	12.7	0.0146	10.3	27	38%	46%	20	9.2	20	9.2	5.2	468304	0.013	0.2	0.7	0.00361	0.2	2.5	0	5.2	468300	0.013	0.2	0.7	0.0
H-25R1L	**51**	135	15	1.2	0.001	20.6	0.1020	11.3	23	50%	59%	13	7.4	13	7.4	6.0	453853	0.013	0.8	0.4	0.00608	0.8	2.6	0	6.0	453850	0.013	0.8	0.4	0.0
SY-E	**71**	109	21	2.4	0.001	7.2	0.0021	36.8	46	80%	87%	20	17.7	21	18.4	7.4	777194	0.013	0.7	2.5	0.00608	0.7	5.5	1	7.6	806460	0.013	0.7	2.6	0.0
SY-E	**73**	369	12	0.8	0.001	3.8	0.0114		46		13%	20	2.7	21	2.8	3.5	209245	0.014	1.0	0.7	0.00264	1.0	3.2	0	3.6	217120	0.014	1.1	0.7	0.0
SY-E	**74**	389	12	0.8	0.001	2.6	0.0054	25.3	46	55%	65%	20	13.4	21	13.9	17.0	1025299	0.014	24.7	5.1	0.06340	24.7	-20.8	3	17.7	1063900	0.014	26.6	5.3	0.1
SY-E	**75**	141	12	0.8	0.001	2.0	0.0030	11.0	46	24%	32%	20	6.5	21	6.8	8.3	502187	0.014	2.1	3.3	0.01521	2.1	0.3	2	8.7	521100	0.014	2.3	3.5	0.0
SY-F	**77**	341	18	1.8	0.001	15.8	0.0228	16.4	91	18%	26%	38	9.7	40	10.3	5.5	496686	0.013	1.4	0.6	0.00406	1.4	5.0	0	5.8	525150	0.013	1.5	0.6	0.0
C-30L	**84**	261	12	0.8	0.001	2.1	0.0036	6.9	69	10%	0.17	44	7.3	46	7.7	9.3	560586	0.014	4.9	3.4	0.01895	4.9	-2.5	2	9.8	587570	0.014	5.4	3.6	0.0
C-30L	**85**	386	12	0.8	0.001	3.7	0.0106	8.3	69	12%	19%	44	8.2	46	8.6	10.5	630660	0.014	9.3	2.2	0.02399	9.3	-6.7	3	11.0	661020	0.014	10.2	2.4	0.0
C-30L	**86**	182	24	3.1	0.001	18.0	0.0063	42.0	69	61%	0.71	44	31.0	46	32.5	9.9	1191246	0.012	1.7	1.7	0.00932	1.7	1.3	1	10.4	1248590	0.012	1.9	1.8	0.0
C-30L	**87**	139	12	0.8	0.001	2.5	0.0049	3.4	69	5%	0.10	44	4.4	46	4.6	5.6	336352	0.014	0.9	1.8	0.00682	0.9	4.6	1	5.9	352540	0.014	1.0	1.8	0.0
C-30	**90**	113	24	3.1	0.001	23.1	0.0104	93.3	93	100%	1.04	46	47.6	47	48.4	15.2	1826071	0.012	2.5	2.1	0.02189	2.5	1.6	3	15.4	1858260	0.012	2.6	2.1	0.0
C-30	**91**	285	24	3.1	0.001	20.4	0.0081	93.3	93	100%	1.04	46	47.6	47	48.4	15.2	1826071	0.012	6.2	2.3	0.02189	6.2	-3.3	3	15.4	1858260	0.012	6.5	2.4	0.0
C-30R	**93**	137	12	0.8	0.001	2.4	0.0044	23.2	26	90%	95%	14	13.8	15	14.1	17.5	1056366	0.014	9.2	5.9	0.06730	9.2	na	3	18.0	1085530	0.014	9.7	6.0	0.1
C-30R	**94**	49	14	1.1	0.001	10.2	0.0358	25.8	26	100%	100%	14	14.5	15	14.9	13.6	953112	0.014	1.6	1.4	0.03343	1.6	7.6	3	13.9	979420	0.014	1.7	1.5	0.0
N-0RR	**97**	63	14	1.1	0.001	4.5	0.0071	37.2	39	95%	97%	18	17.6	18	17.6	16.5	1159396	0.014	3.1	3.9	0.04946	3.1	0.8	3	16.5	1159400	0.014	3.1	3.9	0.0
N-0	**99**	29	14	1.1	0.001	4.1	0.0060	12.0	12	100%	460%	7	31.1	7	31.1	29.1	2048434	0.014	4.5	7.5	0.15441	4.5	-0.7	3	29.1	2048430	0.014	4.5	7.5	0.2
N-0	**101**	82	14	1.1	0.001	23.5	0.1916	12.0	12	100%	460%	7	31.1	7	31.1	29.1	2048434	0.014	12.7	1.3	0.15441	12.7	-9.8	2	29.1	2048430	0.014	12.7	1.3	0.2
N-0RR	**102**	63	14	1.1	0.001	22.5	0.1754	39.2	39	100%	100%	18	18.1	18	18.1	16.9	1190505	0.014	3.3	0.8	0.05215	3.3	1.3	0	16.9	1190510	0.014	3.3	0.8	0.1
C-40R	**103**	146	18	1.8	0.001	10.2	0.0094	6.2	52	12%	0.19	20	3.9	21	4.1	2.2	201601	0.013	0.1	0.4	0.00067	0.1	4.3	0	2.3	208450	0.013	0.1	0.4	0.0
N-10RR	**107**	227	12	0.8	0.001	3.4	0.0093	9.4	28	33%	42%	11	4.6	11	4.6	5.9	353644	0.014	1.7	1.3	0.00754	1.7	3.8	1	5.9	353640	0.014	1.7	1.3	0.0
N-10R	**109**	388	12	0.8	0.001	2.0	0.0031	8.0	42	19%	26%	19	4.9	19	4.9	6.2	374885	0.014	3.3	2.4	0.00848	3.3	-0.2	1	6.2	374880	0.014	3.3	2.4	0.0
N-10R	**110**	218	12	0.8	0.001	1.9	0.0030	8.0	42	19%	26%	19	4.9	19	4.9	6.2	374885	0.014	1.8	2.5	0.00848	1.8	2.5	1	6.2	374880	0.014	1.8	2.5	0.0
N-10R	**111**	309	12	0.8	0.001	4.2	0.0141	12.6	42	30%	38%	19	7.1	19	7.1	9.0	544476	0.014	5.5	1.7	0.01788	5.5	1.4	2	9.0	544480	0.014	5.5	1.7	0.0
N-10	**114**	293	30	4.9	0.001	17.6	0.0018		46		344%	18	61.2	18	63.0	12.5	1879893	0.012	3.3	3.5	0.01139	3.3	0.0	2	12.8	1932760	0.012	3.5	3.6	0.0
N-10R	**115**	565	12	0.8	0.001	0.9	0.0007	17.3	42	41%	51%	19	9.4	19	9.4	12.0	722992	0.014	17.8	10.1	0.03152	17.8	-11.9	3	12.0	722990	0.014	17.8	10.1	0.0
N-20R	**117**	244	15	1.2	0.001	5.2	0.0066	18.9	37	51%	61%	15	9.0	15	9.0	7.4	553993	0.013	2.2	1.7	0.00905	2.2	0.3	1	7.4	553990	0.013	2.2	1.7	0.0
N-20R	**118**	314	12	0.8	0.001	2.3	0.0043	7.8	37	21%	29%	15	4.2	15	4.2	5.3	322089	0.014	2.0	1.8	0.00626	2.0	1.1	1	5.3	322090	0.014	2.0	1.8	0.0
N-10R1R	**119**	343	12	0.8	0.001	2.0	0.0032	2.2	54	4%	8%	19	1.5	19	1.5	2.0	117890	0.014	0.3	0.8	0.00084	0.3	4.7	0	2.0	117890	0.014	0.3	0.8	0.0
B-C	**121**	778	15	1.2	0.001	3.2	0.0025	6.6	94	7%	0.13	33	4.2	33	4.2	3.4	258952	0.013	1.5	1.3	0.00198	1.5	1.6	1	3.4	258950	0.013	1.5	1.3	0.0
N-40	**127**	433	21	2.4	0.001	14.1	0.0079	8.3	92	9%	15%	28	4.2	28	4.2	1.8	184708	0.013	0.1	0.3	0.00034	0.1	1.3	0	1.8	186040	0.013	0.2	0.3	0.0
N-30L	**129**	303	30	4.9	0.001	25.2	0.0038		53		350%	24	82.6	24	82.6	16.8	2535492	0.012	6.3	3.3	0.02071	6.3	-5.5	3	16.8	2535490	0.012	6.3	3.3	0.0
W-0	**140**	437	12	0.8	0.001	4.0	0.0125	8.0	73	11%	18%	42	7.5	45	8.2	9.6	575459	0.014	8.7	1.9	0.01997	8.7	-1.3	3	10.4	626840	0.014	10.4	2.1	0.0
W-0	**142**	248	12	0.8	0.001	6.5	0.0328		73		15%	42	6.2	45	6.8	8.0	479549	0.014	3.4	1.0	0.01387	3.4	0.2	0	8.7	522370	0.014	4.1	1.1	0.0
W-0	**144**	304	12	0.8	0.001	1.3	0.0014		73		10%	42	4.2	45	4.5	5.3	319699	0.014	1.9	3.1	0.00616	1.9	4.9	1	5.8	348250	0.014	2.2	3.4	0.0
W-10	**149**	375	18	1.8	0.001	8.4	0.0064	27.5	69	40%	50%	37	18.3	38	19.0	10.3	934438	0.013	5.4	2.2	0.01438	5.4	-1.7	2	10.8	972810	0.013	5.8	2.3	0.0
W-10R	**160**	170	24	3.1	0.001	39.5	0.0306	31.6	72	44%	54%	45	24.3	45	24.3	7.8	934231	0.012	1.0	0.6	0.00573	1.0	3.9	0	7.8	934230	0.012	1.0	0.6	0.0
W-10R	**161**	186	21	2.4	0.001	12.0	0.0057	28.8	72	40%	50%	45	22.5	45	22.5	9.3	985562	0.013	1.8	1.9	0.00977	1.8	2.1	2	9.3	985560	0.013	1.8	1.9	0.0
W-10R	**162**	179	18	1.8	0.001	7.8	0.0055	16.5	72	23%	30%	45	13.7	45	13.7	7.7	699475	0.013	1.4	1.7	0.00805	1.4	3.5	1	7.7	699480	0.013	1.4	1.7	0.0
W-10	**163**	105	12	0.8	0.001	15.0	0.1783	1.4	69	2%	5%	37	1.8	38	1.9	2.3	140166	0.014	0.1	0.1	0.00118	0.1	-0.1	0	2.4	145920	0.014	0.1	0.1	0.0
W-10	**164**	113	12	0.8	0.001	8.4	0.0559	1.4	69	2%	5%	37	1.8	38	1.9	2.3	140166	0.014	0.1	0.2	0.00118	0.1	1.8	0	2.4	145920	0.014	0.1	0.2	0.0
W-20	**166**	205	12	0.8	0.001	2.6	0.0053	14.6	91	16%	23%	54	12.6	54	12.6	16.1	967453	0.014	11.6	4.9	0.05644	11.6	-8.6	3	16.1	967450	0.014	11.6	4.9	0.1
N-10R	**179**	225	27	4.0	0.001	19.6	0.0040		42		200%	19	37.2	19	37.2	9.4	1269451	0.012	1.6	1.9	0.00727	1.6	1.9	1	9.4	1269450	0.012	1.6	1.9	0.0
SY-D	**188**	114	10	0.5	0.001	9.3	0.1790	3.1	45	7%	13%	23	3.0	28	3.7	5.6	279699	0.015	1.0	0.3	0.00847	1.0	8.2	0	6.7	338330	0.015	1.4	0.4	0.0
C-30L	**189**	239	24	3.1	0.001	7.5	0.0011	20.0	69	29%	0.38	44	16.4	46	17.2	5.2	630660	0.012	0.6	2.2	0.00261	0.6	2.6	1	5.5	661020	0.012	0.7	2.3	0.0
C-30L	**190**	453	24	3.1	0.001	10.1	0.0020	27.6	69	40%	0.50	44	21.9	46	23.0	7.0	840879	0.012	2.1	2.2	0.00464	2.1	-0.5	1	7.3	881360	0.012	2.3	2.3	0.0
N-20R	**194**	207	18	1.8	0.001	4.1	0.0015	32.2	37	87%	93%	15	13.6	15	13.6	7.7	697860	0.013	1.7	3.4	0.00802	1.7	1.5	1	7.7	697860	0.013	1.7	3.4	0.0
C-30	**197**	187	12	0.8	0.001	9.0	0.0643	46.6	93	50%	0.61	46	27.9	47	28.4	35.5	2140911	0.014	51.7	3.1	0.27641	51.7	-45.5	3	36.2	2178650	0.014	53.5	3.1	0.3
N-10RR	**198**	330	12	0.8	0.001	4.5	0.0156	4.0	28	14%	21%	11	2.3	11	2.3	2.9	176822	0.014	0.6	0.5	0.00189	0.6	4.8	0	2.9	176820	0.014	0.6	0.5	0.0
SY-E	**202**	252	18	1.8	0.001	5.3	0.0025	25.7	46	56%	67%	20	13.6	21	14.1	7.7	697482	0.013	2.0	2.6	0.00801	2.0	3.1	1	8.0	723740	0.013	2.2	2.7	0.0
C-30	**223**	192	15	1.2	0.001	3.7	0.0032	1.9	93	2%	0.05	46	2.5	47	2.5	2.0	151123	0.013	0.1	0.7	0.00067	0.1	12.2	0	2.0	153790	0.013	0.1	0.7	0.0
N-10RR	**227**	118	12	0.8	0.001	14.4	0.1634	28.4	28	100%	100%	11	11.0	11	11.0	14.0	844502	0.014	5.1	0.8	0.04301	5.1	1.1	0	14.0	844500	0.014	5.1	0.8	0.0
N-20	**229**	159	24	3.1	0.001	34.8	0.0237	48.2	48	100%	129%	16	20.7	16	20.7	6.6	795975	0.012	0.7	0.6	0.00416	0.7	1.6	0	6.6	795980	0.012	0.7	0.6	0.0
N-20	**230**	405	18	1.8	0.001	15.5	0.0219	32.3	48	67%	76%	16	12.3	16	12.3	6.9	627132	0.013	2.6	0.8	0.00647	2.6	4.0	0	6.9	627130	0.013	2.6	0.8	0.0
N-20	**231**	1185	18	1.8	0.001	9.6	0.0084	32.3	48	67%	76%	16	12.3	16	12.3	6.9	627132	0.013	7.7	1.3	0.00647	7.7	-2.7	1	6.9	627130	0.013	7.7	1.3	0.0
M-40	**232**	189	12	0.8	0.001	1.9	0.0029	8.6	51	17%	24%	31	7.4	31	7.4	9.4	567631	0.014	3.7	3.8	0.01943	3.7	-2.0	3	9.4	567630	0.014	3.7	3.8	0.0
N-30L	**241**	466	15	1.2	0.001	2.3	0.0012	26.5	53	50%	60%	24	14.2	24	14.2	11.5	869312	0.013	10.4	6.3	0.02230	10.4	-3.0	3	11.5	869310	0.013	10.4	6.3	0.0
N-30L	**243**	201	30	4.9	0.001	87.7	0.0458	53.0	53	100%	400%	24	94.4	24	94.4	19.2	2897705	0.012	5.5	1.1	0.02705	5.5	-3.3	1	19.2	2897710	0.012	5.5	1.1	0.0
N-30L	**244**	134	15	1.2	0.001	17.6	0.0746	2.6	53	5%	11%	24	2.6	24	2.6	2.1	159374	0.013	0.1	0.1	0.00075	0.1	7.0	0	2.1	159370	0.013	0.1	0.1	0.0
W-20	**326**	225	15	1.2	0.001	3.1	0.0023	11.9	91	13%	20%	54	10.9	54	10.9	8.9	667209	0.013	2.9	3.5	0.01313	2.9	4.5	2	8.9	667210	0.013	2.9	3.5	0.0
W-20	**334**	175	12	0.8	0.001	2.5	0.0049	14.6	91	16%	23%	54	12.6	54	12.6	16.1	967453	0.014	9.9	5.0	0.05644	9.9	-6.9	3	16.1	967450	0.014	9.9	5.0	0.1
W-20	**335**	381	12	0.8	0.001	2.5	0.0048	5.5	91	6%	12%	54	6.5	54	6.5	8.3	500407	0.014	5.7	2.6	0.01510	5.7	-2.7	2	8.3	500410	0.014	5.7	2.6	0.0
W-20	**336**	203	12	0.8	0.001	2.8	0.0062	2.7	91	3%	6%	54	3.3	54	3.3	4.2	250203	0.014	0.8	1.2	0.00378	0.8	2.2	1	4.2	250200	0.014	0.8	1.2	0.0
W-20	**338**	261	12	0.8	0.001	1.9	0.0029	4.6	91	5%	10%	54	5.4	54	5.4	6.9	417006	0.014	2.7	2.8	0.01049	2.7	1.0	2	6.9	417010	0.014	2.7	2.8	0.0
W-30	**351**	301	30	4.9	0.001	26.2	0.0041	110.7	111	100%	165%	66	108.8	66	108.8	22.2	3340437	0.012	10.8	4.2	0.03595	10.8	-7.2	3	22.2	3340440	0.012	10.8	4.2	0.0

Pipe Hydraulic Evaluation

			Pipe Properties					Drainage Area			Design Flows					Pipe Hydraulics									Future Condition Flows					
												Existing Condition		Future Condition		Existing Condition Flows															
Sub-Basin	Pipe ID (stmain)	Pipe Length	Pipe Diameter (D)	Flow Area, (A)	Roughness Coefficient, (k_s)	Full-pipe Capacity	Pipe Slope	Contributing Drainage Area, (a)	Sub-Basin Drainage Area, (A)	Area Ratio (a/A)	Flow Ratio, (q/Q)	Sub-Basin Peak Flow, ($Q_{EX10-YR}$)	Design Flow in Respective Pipe, (q_{10-YR})	Sub-Basin Peak Flow, ($Q_{FU10-YR}$)	Design Flow in Respective Pipe, (q_{10-YR})	Average Velocity, (V)	Reynolds Number, (Re)	Darcy Friction Factor, (f)	Friction Head loss, (h_f)	q/Qfull	h_f/L	h_f over length of pipe	"Freeboard"	Deficiency Rating	Average Velocity, (V)	Reynolds Number, (Re)	Darcy Friction Factor, (f)	Friction Head loss, (h_f)	q/Qfull	h_f/L
		ft	in	ft2	ft		ft/ft		(acres)			cfs	cfs	cfs	cfs	ft/s	unitless	--	ft						ft/s	unitless	--	ft		
				πr^2	Diagram	Eq.						HMS		HMS		Eq.	Calculated	White Equation	Wiesbach Eq.						Eq.	Calculated	White Equation	Wiesbach Eq.		
W-30	**352**	349	30	4.9	0.001	23.7	0.0034	110.7	111	100%	165%	66	108.8	66	108.8	22.2	3340437	0.012	12.6	4.6	0.03595	12.6	-10.6	3	22.2	3340440	0.012	12.6	4.6	0.0
W-30	**353**	584	36	7.1	0.001	38.7	0.0034	110.7	111	100%	165%	66	108.8	66	108.8	15.4	2783697	0.011	8.2	2.8	0.01396	8.2	-6.9	2	15.4	2783700	0.011	8.2	2.8	0.0
N-20R	**391**	230	15	1.2	0.001	4.9	0.0057	18.9	37	51%	61%	15	9.0	15	9.0	7.4	553993	0.013	2.1	1.9	0.00905	2.1	0.7	1	7.4	553990	0.013	2.1	1.9	0.0
N-10R1R	**392**	316	12	0.8	0.001	3.3	0.0088	1.6	54	3%	8%	19	1.5	19	1.5	1.9	112277	0.014	0.2	0.4	0.00076	0.2	5.5	0	1.9	112280	0.014	0.2	0.4	0.0
N-10R1R	**393**	243	12	0.8	0.001	4.3	0.0144	2.2	54	4%	8%	19	1.5	19	1.5	2.0	117890	0.014	0.2	0.4	0.00084	0.2	4.5	0	2.0	117890	0.014	0.2	0.4	0.0
N-10R1R	**396**	242	12	0.8	0.001	5.0	0.0194	1.1	54	2%	5%	19	1.0	19	1.0	1.2	72980	0.014	0.1	0.2	0.00032	0.1	5.0	0	1.2	72980	0.014	0.1	0.2	0.0
N-10R1	**398**	231	12	0.8	0.001	4.5	0.0158	3.7	31	12%	19%	13	2.4	13	2.4	3.0	183423	0.014	0.5	0.5	0.00203	0.5	2.1	0	3.0	183420	0.014	0.5	0.5	0.0
N-10R1	**400**	261	12	0.8	0.001	2.8	0.0064	1.9	31	6%	12%	13	1.5	13	1.5	1.9	113547	0.014	0.2	0.5	0.00078	0.2	4.5	0	1.9	113550	0.014	0.2	0.5	0.0
N-20R	**401**	317	10	0.5	0.001	2.0	0.0080	7.8	37	21%	29%	15	4.2	15	4.2	7.7	386507	0.015	5.1	2.1	0.01617	5.1	-0.6	2	7.7	386510	0.015	5.1	2.1	0.0
B-D	**407**	201	12	0.8	0.001	3.5	0.0096	4.3	33	13%	0.20	15	3.0	15	3.0	3.8	231755	0.014	0.7	0.9	0.00324	0.7	4.5	0	3.9	232220	0.014	0.7	0.9	0.0
B-C	**410**	820	15	1.2	0.001	5.6	0.0075	6.6	94	7%	0.13	33	4.2	33	4.2	3.4	258952	0.013	1.6	0.8	0.00198	1.6	2.0	0	3.4	258950	0.013	1.6	0.8	0.0
B-C	**417**	135	12	0.8	0.001	4.3	0.0146	2.8	94	3%	0.07	33	2.2	33	2.2	2.8	170363	0.014	0.2	0.5	0.00175	0.2	1.5	0	2.8	170360	0.014	0.2	0.5	0.0
SY-C0	**469**	252	10	0.5	0.001	1.6	0.0056	8.0	67	12%	19%	41	7.6	41	7.7	14.0	700675	0.015	13.4	4.7	0.05314	13.4	-7.6	3	14.1	707410	0.015	13.7	4.7	0.1
SY-C10	**471**	273	24	3.1	0.001	36.2	0.0257	33.0	33	100%	280%	18	49.5	18	49.5	15.8	1900545	0.012	6.5	1.4	0.02372	6.5	-1.4	2	15.8	1900540	0.012	6.5	1.4	0.0
M-0	**475**	173	18	1.8	0.001	5.3	0.0025	46.5	46	100%	100%	33	33.2	33	33.2	18.8	1698002	0.013	8.2	6.3	0.04747	8.2	5.9	3	18.8	1698000	0.013	8.2	6.3	0.0
H-25R	**492**	132	18	1.8	0.001	5.3	0.0025	12.2	27	45%	54%	20	10.8	20	10.8	6.1	551308	0.013	0.7	2.0	0.00500	0.7	na	1	6.1	551310	0.013	0.7	2.0	0.0
H-25R1L	**511**	392	15	1.2	0.001	3.3	0.0027	9.0	23	40%	48%	13	6.0	13	6.0	4.9	368467	0.013	1.6	1.8	0.00401	1.6	3.1	1	4.9	368470	0.013	1.6	1.8	0.0
E-N10	**518**	594	12	0.8	0.001	2.4	0.0044	19.2	84	23%	0.30	49	14.9	50	15.2	19.0	1146667	0.014	47.1	6.4	0.07929	47.1	na	3	19.4	1167640	0.014	48.8	6.5	0.1
E-N10	**519**	581	18	1.8	0.001	5.3	0.0025	26.7	84	32%	0.41	49	20.0	50	20.4	11.3	1025475	0.013	10.1	3.8	0.01731	10.1	na	2	11.6	1044230	0.013	10.4	3.9	0.0
E-L30	**523**	693	15	1.2	0.001	2.9	0.0020	10.6	96	11%	0.18	57	10.1	58	10.3	8.2	619402	0.013	7.8	3.5	0.01132	7.8	na	2	8.4	630360	0.013	8.1	3.6	0.0
E-L40	**524**	595	15	1.2	0.001	3.0	0.0022	21.4	89	24%	0.32	45	14.5	52	16.8	11.8	890287	0.013	13.9	4.8	0.02338	13.9	na	3	13.7	1030130	0.013	18.6	5.5	0.0
M-40	**530**	472	12	0.8	0.001	2.0	0.0031	15.7	51	31%	40%	31	12.3	31	12.3	15.7	946052	0.014	25.5	6.2	0.05397	25.5	-23.2	3	15.7	946050	0.014	25.5	6.2	0.1
N-10	**546**	272	30	4.9	0.001	34.1	0.0069		46		350%	18	62.2	18	64.0	12.7	1910214	0.012	3.2	1.8	0.01176	3.2	3.7	2	13.0	1963930	0.012	3.4	1.9	0.0
N-30L	**549**	165	15	1.2	0.001	3.1	0.0022	16.4	53	31%	40%	24	9.4	24	9.4	7.7	579541	0.013	1.6	3.1	0.00991	1.6	2.5	2	7.7	579540	0.013	1.6	3.1	0.0
W-0	**552**	185	15	1.2	0.001	2.7	0.0017	9.5	73	13%	20%	42	8.3	45	9.1	6.8	511519	0.013	1.4	3.1	0.00772	1.4	2.9	1	7.4	557190	0.013	1.7	3.4	0.0
C-60	**558**	94	12	0.8	0.001	5.1	0.0207	1.7	172	1%	0.03	65	2.0	68	2.1	2.5	150935	0.014	0.1	0.4	0.00137	0.1	2.2	0	2.6	158020	0.014	0.1	0.4	0.0
C-60	**560**	88	12	0.8	0.001	2.7	0.0060	1.7	172	1%	0.02	65	1.2	68	1.2	1.5	88786	0.014	0.0	0.4	0.00048	0.0	3.4	0	1.5	92950	0.014	0.0	0.4	0.0
W-10R	**561**	118	12	0.8	0.001	7.2	0.0407	6.5	72	9%	15%	45	6.7	45	6.7	8.6	517420	0.014	1.9	0.9	0.01615	1.9	3.2	0	8.6	517420	0.014	1.9	0.9	0.0
M-0	**570**	422	48	12.6	0.001	92.5	0.0042	46.5	46	100%	100%	33	33.2	33	33.2	2.6	636751	0.011	0.1	0.4	0.00029	0.1	13.8	0	2.6	636750	0.011	0.1	0.4	0.0
B-C	**571**	274	18	1.8	0.001	10.6	0.0103	29.1	94	31%	0.40	33	13.3	33	13.3	7.5	681452	0.013	2.1	1.3	0.00764	2.1	2.6	1	7.5	681450	0.013	2.1	1.3	0.0
M-10	**576**	276	12	0.8	0.001	3.6	0.0103	18.7	34	55%	65%	20	13.1	20	13.1	16.6	1002959	0.014	16.8	3.6	0.06066	16.8	-12.9	3	16.6	1002960	0.014	16.8	3.6	0.1
M-10	**577**	116	12	0.8	0.001	2.4	0.0044	17.0	34	50%	59%	20	11.8	20	11.8	15.1	907344	0.014	5.8	5.0	0.04965	5.8	0.5	3	15.1	907340	0.014	5.8	5.0	0.0
M-30R	**578**	251	12	0.8	0.001	2.2	0.0039	41.9	42	100%	100%	26	25.4	26	25.4	32.4	1949378	0.014	57.6	11.4	0.22917	57.6	-51.9	3	32.4	1949380	0.014	57.6	11.4	0.2
C-0	**582**	230	12	0.8	0.001	4.7	0.0173	15.0	38	40%	0.50	14	7.1	14	7.1	9.1	546389	0.014	4.1	1.5	0.01800	4.1	0.2	2	9.1	546390	0.014	4.1	1.5	0.0
C-20	**585**	707	12	0.8	0.001	5.0	0.0200	19.2	62	31%	0.40	27	11.0	28	11.2	14.0	843834	0.014	30.4	2.2	0.04294	30.4	-28.2	3	14.2	857340	0.014	31.3	2.2	0.0
C-30R	**587**	39	14	1.1	0.001	26.0	0.2341	25.3	26	98%	99%	14	14.3	15	14.7	13.4	938815	0.014	1.3	0.5	0.03243	1.3	3.5	0	13.7	964730	0.014	1.3	0.6	0.0
C-40R	**588**	303	18	1.8	0.001	10.5	0.0100	22.3	52	43%	0.53	20	10.7	21	11.1	6.1	549820	0.013	1.5	1.0	0.00498	1.5	7.5	1	6.3	568510	0.013	1.6	1.1	0.0
N-10	**589**	194	24	3.1	0.001	52.6	0.0541	46.0	46	100%	211%	18	37.5	18	38.6	12.0	1440241	0.012	2.6	0.7	0.01362	2.6	4.4	0	12.3	1480740	0.012	2.8	0.7	0.0
N-10R	**591**	243	12	0.8	0.001	2.0	0.0033	17.3	42	41%	51%	19	9.4	19	9.4	12.0	722992	0.014	7.7	4.6	0.03152	7.7	-3.8	3	12.0	722990	0.014	7.7	4.6	0.0
C-60	**593**	218	12	0.8	0.001	2.7	0.0056	1.7	172	1%	0.03	65	2.0	68	2.1	2.5	150935	0.014	0.3	0.7	0.00137	0.3	3.3	0	2.6	158020	0.014	0.3	0.8	0.0
C-60	**597**	236	15	1.2	0.001	13.7	0.0450	5.2	172	3%	0.07	65	4.6	68	4.8	3.8	284114	0.013	0.6	0.3	0.00238	0.6	2.2	0	4.0	297440	0.013	0.6	0.4	0.0
C-40R	**600**	204	30	4.9	0.001	45.5	0.0123	51.8	52	100%	1.00	20	20.3	21	21.0	4.1	623129	0.012	0.3	0.4	0.00125	0.3	8.7	0	4.3	644310	0.012	0.3	0.5	0.0
C-10	**602**	207	12	0.8	0.001	3.0	0.0070	18.2	32	56%	0.67	14	9.1	14	9.3	11.6	700893	0.014	6.1	3.1	0.02963	6.1	-3.8	3	11.8	712150	0.014	6.3	3.1	0.0
C-30	**611**	159	24	3.1	0.001	21.7	0.0092	93.3	93	100%	1.04	46	47.6	47	48.4	15.2	1826071	0.012	3.5	2.2	0.02189	3.5	-1.0	3	15.4	1858260	0.012	3.6	2.2	0.0
C-40R	**612**	445	18	1.8	0.001	16.5	0.0247	22.3	52	43%	0.53	20	10.7	21	11.1	6.1	549820	0.013	2.2	0.7	0.00498	2.2	8.1	0	6.3	568510	0.013	2.4	0.7	0.0
C-40R	**614**	425	12	0.8	0.001	2.2	0.0037	4.1	52	8%	0.15	20	3.0	21	3.1	3.8	229092	0.014	1.3	1.4	0.00317	1.3	1.8	1	3.9	236880	0.014	1.4	1.4	0.0
W-0	**618**	110	12	0.8	0.001	8.1	0.0516		73		15%	42	6.2	45	6.8	8.0	479549	0.014	1.5	0.8	0.01387	1.5	3.0	0	8.7	522370	0.014	1.8	0.8	0.0
C-60	**621**	211	12	0.8	0.001	2.8	0.0061	15.5	172	9%	0.15	65	9.7	68	10.2	12.4	745798	0.014	7.1	3.5	0.03354	7.1	-0.4	3	13.0	780790	0.014	7.8	3.7	0.0
C-60	**622**	197	12	0.8	0.001	3.4	0.0091	15.5	172	9%	0.15	65	9.7	68	10.2	12.4	745798	0.014	6.6	2.9	0.03354	6.6	-0.3	3	13.0	780790	0.014	7.2	3.0	0.0
M-10	**624**	95	12	0.8	0.001	2.4	0.0044	18.7	34	55%	65%	20	13.1	20	13.1	16.6	1002959	0.014	5.8	5.6	0.06066	5.8	na	3	16.6	1002960	0.014	5.8	5.6	0.1
M-10	**630**	252	10	0.5	0.001	1.9	0.0079	7.8	34	23%	30%	20	6.1	20	6.1	11.2	561657	0.015	8.6	3.1	0.03415	8.6	-2.9	3	11.2	561660	0.015	8.6	3.1	0.0
N-10R1R	**633**	419	18	1.8	0.001	4.6	0.0019	31.4	54	58%	67%	19	12.7	19	12.7	7.2	650007	0.013	2.9	2.8	0.00696	2.9	0.8	1	7.2	650010	0.013	2.9	2.8	0.0
N-10R1	**634**	234	15	1.2	0.001	8.4	0.0171	26.5	31	85%	90%	13	11.2	13	11.2	9.2	689460	0.013	3.3	1.3	0.01402	3.3	2.9	2	9.2	689460	0.013	3.3	1.3	0.0
N-0RR	**645**	228	12	0.8	0.001	3.0	0.0073	20.4	39	52%	63%	18	11.5	18	11.5	14.6	878901	0.014	10.6	3.8	0.04658	10.6	-4.9	3	14.6	878900	0.014	10.6	3.8	0.0
N-10R1R	**646**	449	15	1.2	0.001	4.1	0.0040	4.3	54	8%	15%	19	2.8	19	2.8	2.3	170660	0.013	0.4	0.7	0.00086	0.4	3.1	0	2.3	170660	0.013	0.4	0.7	0.0
N-10R1R	**647**	436	21	2.4	0.001	10.9	0.0047		54		96%	19	18.3	19	18.3	7.6	801976	0.013	2.8	1.7	0.00647	2.8	3.5	1	7.6	801980	0.013	2.8	1.7	0.0
N-10R1	**648**	200	15	1.2	0.001	6.8	0.0112	31.2	31	100%	100%	13	12.5	13	12.5	10.2	764786	0.013	3.5	1.8	0.01726	3.5	4.3	2	10.2	764790	0.013	3.5	1.8	0.0
W-10	**650**	320	18	1.8	0.001	19.4	0.0343	20.0	69	29%	38%	37	13.8	38	14.4	7.8	706020	0.013	2.6	0.7	0.00821	2.6	-2.6	0	8.1	735010	0.013	2.8	0.7	0.0
M-30	**652**	238	12	0.8	0.001	2.0	0.0031	9.5	50	19%	26%	30	8.0	31	8.0	10.2	613796	0.014	5.4	4.0	0.02272	5.4	-2.3	3	10.2	615210	0.014	5.4	4.0	0.0
M-30	**653**	227	12	0.8	0.001	1.9	0.0029	9.5	50	19%	26%	30	8.0	31	8.0	10.2	613796	0.014	5.2	4.1	0.02272	5.2	0.0	3	10.2	615210	0.014	5.2	4.2	0.0
M-30R	**658**	250	12	0.8	0.001	2.3	0.0041	39.8	42	95%	97%	26	24.7	26	24.7	31.5	1898440	0.014	54.3	10.9	0.21735	54.3	-49.3	3	31.5	1898440	0.014	54.3	10.9	0.2
N-0R1	**683**	264	15	1.2	0.001	3.7	0.0032	8.0	35	23%	31%	15	4.8	15	4.8	3.9	295091	0.013	0.7	1.3	0.00257	0.7	na	1	3.9	295090	0.013	0.7	1.3	0.0
N-0R1	**686**	251	15	1.2	0.001	3.7	0.0032	13.9	35	40%	50%	15	7.7	15	7.7	6.3	474254	0.013	1.7	2.1	0.00664	1.7	na	1	6.3	474250	0.013	1.7	2.1	0.0
N-0R1	**693**	255	18	1.8	0.001	5.3	0.0025	20.8	35	60%	70%	15	10.8	15	10.8	6.1	553296	0.013	1.3	2.0	0.00504	1.3	na	1	6.1	553300	0.013	1.3	2.0	0.0
N-0R1	**699**	284	12	0.8	0.001	2.4	0.0044	4.5	35	13%	20%	15	3.1	15	3.1	3.9	237127	0.014	1.0	1.3	0.00339	1.0	7.0	1	3.9	237130	0.014	1.0	1.3	0.0
N-0R1	**700**	268	21	2.4	0.001	7.2	0.0021	28.4	35	82%	89%	15	13.7	15	13.7	5.7	602227	0.013	1.0	1.9	0.00365	1.0	na	1	5.7	602230	0.013	1.0	1.9	0.0
N-0R1	**702**	157	21	2.4	0.001	7.2	0.0021	28.4	35	82%	89%	15	13.7	15	13.7	5.7	602227	0.013	0.6	1.9	0.00365	0.6	na	1	5.7	602230	0.013	0.6	1.9	0.0
N-0R	**703**	93	21	2.4	0.001	7.2	0.0021	22.7	23	100%	178%	10	18.5	10	18.5	7.7	813104	0.013	0.6	2.6	0.00665	0.6	na	1	7.7	813100	0.013	0.6	2.6	0.0
N-0R1R	**704**	295	12	0.8	0.001	2.4	0.0046	3.5	35	10%	17%	16	2.7	16	2.7	3.4	205711	0.014	0.8	1.1	0.00255	0.8	5.8	1	3.4	205710	0.014	0.8	1.1	0.0
N-0R1R	**705**	291	12	0.8	0.001	2.3	0.0041	8.3	35	24%	32%	16	5.1	16	5.1	6.5	392720	0.014	2.7	2.2	0.00930	2.7	4.3	1	6.5	392720	0.014	2.7	2.2	0.0
N-0R1R	**706**	257	15	1.2	0.001	8.7	0.0183	13.8	35	40%	50%	16	7.9	16	7.9	6.5	486225	0.013	1.8	0.9	0.00697	1.8	5.6	0	6.5	486230	0.013	1.8	0.9	0.0
C-30R	**716**	291	12	0.8	0.001	2.6	0.0054	10.3	26	40%	50%	14	7.2	15	7.4	9.2	555982	0.014	5.4	2.8	0.01864	5.4	-1.7	2	9.5	571330	0.014	5.7	2.8	0.0

Pipe Hydraulic Evaluation

			Pipe Properties					Drainage Area			Design Flows					Pipe Hydraulics														
												Existing Condition		Future Condition		Existing Condition Flows									Future Condition Flows					
Sub-Basin	Pipe ID (stmain)	Pipe Length	Pipe Diameter (D)	Flow Area, (A)	Roughness Coefficient, (k_s)	Full-pipe Capacity	Pipe Slope	Contributing Drainage Area, (a)	Sub-Basin Drainage Area, (A)	Area Ratio (a/A)	Flow Ratio, (q/Q)	Sub-Basin Peak Flow, ($Q_{EX10-YR}$)	Design Flow in Respective Pipe, (q_{10-YR})	Sub-Basin Peak Flow, ($Q_{FU10-YR}$)	Design Flow in Respective Pipe, (q_{10-YR})	Average Velocity, (V)	Reynolds Number, (Re)	Darcy Friction Factor, (f)	Friction Head loss, (h_f)	q/Qfull	h_f/L	h_f over length of pipe	"Freeboard"	Deficiency Rating	Average Velocity, (V)	Reynolds Number, (Re)	Darcy Friction Factor, (f)	Friction Head loss, (h_f)	q/Qfull	h_f/L
		ft	in	ft2	ft		ft/ft		(acres)			cfs	cfs	cfs	cfs	ft/s	unitless	--	ft						ft/s	unitless	--	ft		
				πr^2	Diagram	Eq.						HMS		HMS		Eq.	Calculated	White Equation	Wiesbach Eq.						Eq.	Calculated	White Equation	Wiesbach Eq.		
C-0	**722**	254	10	0.5	0.001	1.6	0.0051	4.9	38	13%	0.20	14	2.8	14	2.8	5.2	262267	0.015	1.9	1.8	0.00745	1.9	1.2	1	5.2	262270	0.015	1.9	1.8	0.0
SY-E	**724**	579	12	0.8	0.001	1.9	0.0028		46		12%	20	2.5	21	2.5	3.1	188320	0.014	1.2	1.3	0.00214	1.2	1.5	1	3.2	195410	0.014	1.3	1.4	0.0
SY-E	**725**	389	15	1.2	0.001	3.0	0.0021	20.7	46	45%	55%	20	11.3	21	11.7	9.2	694692	0.013	5.5	3.8	0.01424	5.5	-3.6	2	9.6	720850	0.013	6.0	4.0	0.0
SY-E	**726**	379	12	0.8	0.001	2.1	0.0034	22.1	46	48%	59%	20	12.0	21	12.4	15.3	920676	0.014	19.4	5.8	0.05112	19.4	-17.1	3	15.9	955340	0.014	20.9	6.0	0.1
SY-E	**727**	292	10	0.5	0.001	1.6	0.0056	4.1	46	9%	15%	20	3.1	21	3.3	5.8	288758	0.015	2.6	1.9	0.00903	2.6	na	1	6.0	299630	0.015	2.8	2.0	0.0
SY-F	**728**	216	10	0.5	0.001	1.2	0.0028	1.8	91	2%	6%	38	2.2	40	2.3	4.0	203190	0.015	1.0	1.9	0.00447	1.0	0.7	1	4.3	214840	0.015	1.1	2.0	0.0
SY-F	**730**	218	18	1.8	0.001	7.3	0.0049	4.6	91	5%	10%	38	3.8	40	4.0	2.1	191901	0.013	0.1	0.5	0.00061	0.1	2.7	0	2.2	202900	0.013	0.1	0.5	0.0
SY-F	**731**	174	15	1.2	0.001	5.7	0.0077	1.8	91	2%	5%	38	1.9	40	2.0	1.5	115141	0.013	0.1	0.3	0.00039	0.1	2.7	0	1.6	121740	0.013	0.1	0.3	0.0
SY-F	**732**	110	12	0.8	0.001	3.9	0.0120	8.2	91	9%	15%	38	5.6	40	5.9	7.2	431778	0.014	1.2	1.4	0.01124	1.2	3.9	2	7.6	456530	0.014	1.4	1.5	0.0
SY-F	**733**	172	12	0.8	0.001	2.5	0.0048	8.2	91	9%	15%	38	5.6	40	5.9	7.2	431778	0.014	1.9	2.3	0.01124	1.9	1.2	2	7.6	456530	0.014	2.2	2.4	0.0
SY-F	**736**	301	15	1.2	0.001	8.1	0.0158	2.7	91	3%	7%	38	2.6	40	2.8	2.2	162552	0.013	0.2	0.3	0.00078	0.2	1.9	0	2.3	171870	0.013	0.3	0.3	0.0
SY-F	**737**	168	10	0.5	0.001	1.5	0.0048	2.7	91	3%	7%	38	2.6	40	2.8	4.9	243828	0.015	1.1	1.7	0.00644	1.1	2.1	1	5.1	257800	0.015	1.2	1.8	0.0
C-30L	**740**	217	12	0.8	0.001	2.2	0.0037	3.4	69	5%	0.10	44	4.4	46	4.6	5.6	336352	0.014	1.5	2.0	0.00682	1.5	1.9	1	5.9	352540	0.014	1.6	2.1	0.0
N-0R	**744**	247	15	1.2	0.001	4.0	0.0039	18.6	23	82%	89%	10	9.3	10	9.3	7.6	569173	0.013	2.4	2.3	0.00956	2.4	8.1	2	7.6	569170	0.013	2.4	2.3	0.0
N-0R	**745**	252	24	3.1	0.001	14.4	0.0040	22.7	23	100%	122%	10	12.7	10	12.7	4.1	489133	0.012	0.4	0.9	0.00157	0.4	9.0	0	4.1	489130	0.012	0.4	0.9	0.0
N-0R	**748**	226	24	3.1	0.001	14.2	0.0039	22.7	23	100%	333%	10	34.8	10	34.8	11.1	1333998	0.012	2.6	2.5	0.01168	2.6	5.7	2	11.1	1334000	0.012	2.6	2.5	0.0
N-10RR	**751**	270	12	0.8	0.001	2.6	0.0052	4.0	28	14%	21%	11	2.3	11	2.3	2.9	176822	0.014	0.5	0.9	0.00189	0.5	3.1	0	2.9	176820	0.014	0.5	0.9	0.0
N-10RR	**752**	251	12	0.8	0.001	4.0	0.0126	9.4	28	33%	42%	11	4.6	11	4.6	5.9	353644	0.014	1.9	1.2	0.00754	1.9	2.5	1	5.9	353640	0.014	1.9	1.2	0.0
N-10RR	**763**	226	12	0.8	0.001	3.5	0.0099	9.4	28	33%	42%	11	4.6	11	4.6	5.9	353644	0.014	1.7	1.3	0.00754	1.7	2.7	1	5.9	353640	0.014	1.7	1.3	0.0
N-10RR	**764**	278	12	0.8	0.001	2.3	0.0041	2.3	28	8%	14%	11	1.6	11	1.6	2.0	120239	0.014	0.2	0.7	0.00087	0.2	2.9	0	2.0	120240	0.014	0.2	0.7	0.0
N-10RR	**765**	215	12	0.8	0.001	3.0	0.0070	1.4	28	5%	11%	11	1.2	11	1.2	1.5	91947	0.014	0.1	0.4	0.00051	0.1	2.3	0	1.5	91950	0.014	0.1	0.4	0.0
N-10R	**766**	317	12	0.8	0.001	2.0	0.0032	12.6	42	30%	38%	19	7.1	19	7.1	9.0	544476	0.014	5.7	3.5	0.01788	5.7	0.6	2	9.0	544480	0.014	5.7	3.5	0.0
N-10R1R	**771**	252	12	0.8	0.001	3.6	0.0102	2.2	54	4%	8%	19	1.5	19	1.5	2.0	117890	0.014	0.2	0.4	0.00084	0.2	3.7	0	2.0	117890	0.014	0.2	0.4	0.0
N-10R1R	**772**	282	21	2.4	0.001	3.5	0.0005		54		100%	19	19.0	19	19.0	7.9	834055	0.013	2.0	5.4	0.00700	2.0	8.2	1	7.9	834060	0.013	2.0	5.4	0.0
N-10R	**774**	239	27	4.0	0.001	16.1	0.0027		42		185%	19	34.4	19	34.4	8.7	1174243	0.012	1.5	2.1	0.00622	1.5	2.7	1	8.7	1174240	0.012	1.5	2.1	0.0
N-10R	**775**	422	27	4.0	0.001	14.4	0.0022		42		160%	19	29.8	19	29.8	7.5	1015561	0.012	2.0	2.1	0.00465	2.0	5.1	1	7.5	1015560	0.012	2.0	2.1	0.0
N-30L	**776**	428	30	4.9	0.001	23.8	0.0034	53.0	53	100%	350%	24	82.6	24	82.6	16.8	2535492	0.012	8.9	3.5	0.02071	8.9	-8.1	3	16.8	2535490	0.012	8.9	3.5	0.0
N-30L	**785**	252	12	0.8	0.001	2.4	0.0047	26.5	53	50%	60%	24	14.2	24	14.2	18.0	1086640	0.014	18.0	5.8	0.07121	18.0	-12.4	3	18.0	1086640	0.014	18.0	5.8	0.1
N-30L	**786**	265	12	0.8	0.001	2.4	0.0045	6.9	53	13%	20%	24	4.7	24	4.7	6.0	362213	0.014	2.1	2.0	0.00791	2.1	2.5	1	6.0	362210	0.014	2.1	2.0	0.0
N-30L	**801**	298	12	0.8	0.001	2.3	0.0043	2.6	53	5%	10%	24	2.4	24	2.4	3.0	181107	0.014	0.6	1.0	0.00198	0.6	5.0	1	3.0	181110	0.014	0.6	1.0	0.0
W-0	**810**	204	12	0.8	0.001	4.7	0.0178	5.1	73	7%	13%	42	5.2	45	5.7	6.6	399624	0.014	2.0	1.1	0.00963	2.0	2.2	1	7.2	435310	0.014	2.3	1.2	0.0
W-10	**811**	384	18	1.8	0.001	6.8	0.0042	20.0	69	29%	38%	37	13.8	38	14.4	7.8	706020	0.013	3.2	2.0	0.00821	3.2	0.8	1	8.1	735010	0.013	3.4	2.1	0.0
C-60	**814**	161	12	0.8	0.001	3.7	0.0107	1.7	172	1%	0.03	65	2.0	68	2.1	2.5	150935	0.014	0.2	0.5	0.00137	0.2	2.4	0	2.6	158020	0.014	0.2	0.6	0.0
C-60	**825**	265	12	0.8	0.001	4.0	0.0123	3.4	172	2%	0.05	65	3.5	68	3.6	4.4	266357	0.014	1.1	0.9	0.00428	1.1	2.4	0	4.6	278850	0.014	1.2	0.9	0.0
C-60	**828**	108	12	0.8	0.001	3.0	0.0073	1.7	172	1%	0.02	65	1.2	68	1.2	1.5	88786	0.014	0.1	0.4	0.00048	0.1	5.9	0	1.5	92950	0.014	0.1	0.4	0.0
C-60	**829**	165	12	0.8	0.001	3.0	0.0073	1.7	172	1%	0.02	65	1.2	68	1.2	1.5	88786	0.014	0.1	0.4	0.00048	0.1	5.5	0	1.5	92950	0.014	0.1	0.4	0.0
C-60	**830**	86	12	0.8	0.001	4.3	0.0143	1.7	172	1%	0.02	65	1.2	68	1.2	1.5	88786	0.014	0.0	0.3	0.00048	0.0	4.6	0	1.5	92950	0.014	0.0	0.3	0.0
W-20	**840**	297	18	1.8	0.001	6.3	0.0036	27.4	91	30%	38%	54	20.6	54	20.6	11.7	1056414	0.013	5.5	3.3	0.01837	5.5	-2.1	2	11.7	1056410	0.013	5.5	3.3	0.0
W-20	**843**	300	15	1.2	0.001	4.8	0.0056	15.5	91	17%	25%	54	13.5	54	13.5	11.0	827339	0.013	6.1	2.8	0.02019	6.1	-1.3	3	11.0	827340	0.013	6.1	2.8	0.0
W-20	**844**	145	15	1.2	0.001	4.9	0.0059	15.5	91	17%	25%	54	13.5	54	13.5	11.0	827339	0.013	2.9	2.7	0.02019	2.9	3.8	3	11.0	827340	0.013	2.9	2.7	0.0
W-10R	**847**	158	12	0.8	0.001	2.7	0.0057		72		42%	45	18.7	45	18.7	23.9	1437278	0.014	19.7	6.9	0.12458	19.7	-15.5	3	23.9	1437280	0.014	19.7	6.9	0.1
W-10R	**850**	93	15	1.2	0.001	7.2	0.0125	10.1	72	14%	21%	45	9.4	45	9.4	7.6	574911	0.013	0.9	1.3	0.00975	0.9	3.8	2	7.6	574910	0.013	0.9	1.3	0.0
W-20	**851**	145	15	1.2	0.001	5.7	0.0077	11.9	91	13%	20%	54	10.9	54	10.9	8.9	667209	0.013	1.9	1.9	0.01313	1.9	4.6	2	8.9	667210	0.013	1.9	1.9	0.0
W-10R	**854**	68	18	1.8	0.001	8.9	0.0072	16.5	72	23%	30%	45	13.7	45	13.7	7.7	699475	0.013	0.5	1.5	0.00805	0.5	4.0	1	7.7	699480	0.013	0.5	1.5	0.0
W-20	**857**	267	12	0.8	0.001	2.6	0.0054	3.7	91	4%	8%	54	4.3	54	4.3	5.5	333604	0.014	1.8	1.7	0.00671	1.8	0.3	1	5.5	333600	0.014	1.8	1.7	0.0
W-20	**858**	270	12	0.8	0.001	3.0	0.0070	3.7	91	4%	9%	54	5.0	54	5.0	6.4	383645	0.014	2.4	1.7	0.00888	2.4	-0.2	1	6.4	383650	0.014	2.4	1.7	0.0
W-20	**859**	304	12	0.8	0.001	2.4	0.0046	3.7	91	4%	9%	54	5.0	54	5.0	6.4	383645	0.014	2.7	2.1	0.00888	2.7	-0.2	1	6.4	383650	0.014	2.7	2.1	0.0
W-20	**860**	343	15	1.2	0.001	1.6	0.0006	11.9	91	13%	20%	54	10.9	54	10.9	8.9	667209	0.013	4.5	7.0	0.01313	4.5	-1.7	2	8.9	667210	0.013	4.5	7.0	0.0
M-10	**862**	234	10	0.5	0.001	2.0	0.0087	5.4	34	16%	23%	20	4.6	20	4.6	8.5	425255	0.015	4.6	2.3	0.01957	4.6	0.5	3	8.5	425250	0.015	4.6	2.3	0.0
N-0RR	**876**	292	12	0.8	0.001	2.4	0.0044	20.4	39	52%	63%	18	11.5	18	11.5	14.6	878901	0.014	13.6	4.9	0.04658	13.6	-5.6	3	14.6	878900	0.014	13.6	4.9	0.0
N-10R1R	**879**	426	12	0.8	0.001	3.3	0.0086	4.3	54	8%	14%	19	2.6	19	2.6	3.4	202098	0.014	1.0	0.8	0.00246	1.0	3.0	0	3.4	202100	0.014	1.0	0.8	0.0
N-10R1R	**880**	453	18	1.8	0.001	5.5	0.0027	20.0	54	37%	46%	19	8.8	19	8.8	5.0	449107	0.013	1.5	1.6	0.00332	1.5	4.9	1	5.0	449110	0.013	1.5	1.6	0.0
B-C	**936**	130	15	1.2	0.001	2.5	0.0015	6.6	94	7%	0.13	33	4.4	33	4.4	3.6	272581	0.013	0.3	1.8	0.00219	0.3	1.2	1	3.6	272580	0.013	0.3	1.8	0.0
B-C	**940**	253	12	0.8	0.001	0.9	0.0007	0.9	94	1%	0.03	33	1.1	33	1.1	1.4	85181	0.014	0.1	1.2	0.00044	0.1	2.0	1	1.4	85180	0.014	0.1	1.2	0.0
M-40	**947**	270	12	0.8	0.001	2.6	0.0052	1.5	51	3%	7%	31	2.2	31	2.2	2.7	165559	0.014	0.4	0.8	0.00165	0.4	2.4	0	2.7	165560	0.014	0.4	0.8	0.0
M-40	**949**	278	12	0.8	0.001	2.0	0.0031	6.6	51	13%	20%	31	6.2	31	6.2	7.9	473026	0.014	3.8	3.1	0.01349	3.8	0.3	2	7.9	473030	0.014	3.8	3.1	0.0
N-10R1R	**954**	296	18	1.8	0.001	4.2	0.0016	12.4	54	23%	31%	19	5.9	19	5.9	3.3	299404	0.013	0.4	1.4	0.00148	0.4	4.1	1	3.3	299400	0.013	0.4	1.4	0.0
N-40R	**966**	131	18	1.8	0.001	8.1	0.0059	10.1	85	12%	19%	30	5.8	30	5.8	3.3	294191	0.013	0.2	0.7	0.00142	0.2	1.7	0	3.3	294190	0.013	0.2	0.7	0.0
H-50	**968**	363	12	0.8	0.001	2.5	0.0050	13.9	23	60%	69%	13	9.0	13	9.0	11.5	691738	0.014	10.5	3.6	0.02886	10.5	-8.2	3	11.5	691740	0.014	10.5	3.6	0.0
E-L30	**969**	592	24	3.1	0.001	10.1	0.0020	75.8	96	79%	0.86	57	48.4	58	49.3	15.4	1858206	0.012	13.4	4.8	0.02267	13.4	na	3	15.7	1891090	0.012	13.9	4.9	0.0
E-L30	**971**	586	18	1.8	0.001	4.8	0.0021	2.9	96	3%	0.07	57	4.0	58	4.1	2.3	206467	0.013	0.4	0.8	0.00070	0.4	na	0	2.3	210120	0.013	0.4	0.9	0.0
SY-C20R	**973**	422	18	1.8	0.001	6.8	0.0042	32.6	33	100%	109%	19	20.9	19	20.9	11.9	1071560	0.013	8.0	3.1	0.01890	8.0	-0.5	2	11.9	1071560	0.013	8.0	3.1	0.0
E-L30	**975**	586	18	1.8	0.001	4.9	0.0022	10.6	96	11%	0.18	57	10.1	58	10.3	5.7	516168	0.013	2.6	2.0	0.00439	2.6	na	1	5.8	525300	0.013	2.7	2.1	0.0
E-L30	**976**	587	18	1.8	0.001	4.9	0.0022	10.6	96	11%	0.18	57	10.1	58	10.3	5.7	516168	0.013	2.6	2.0	0.00439	2.6	na	1	5.8	525300	0.013	2.7	2.1	0.0
E-F	**977**	397	10	0.5	0.001	1.5	0.0045	1.7	21	8%	0.14	11	1.5	13	1.8	2.8	142079	0.015	0.9	1.0	0.00218	0.9	-0.9	1	3.4	168920	0.015	1.2	1.2	0.0
E-F	**980**	261	15	1.2	0.001	4.2	0.0043	21.1	21	100%	1.03	11	11.1	13	13.2	9.1	681978	0.013	3.6	2.6	0.01372	3.6	-3.6	2	10.8	810800	0.013	5.1	3.1	0.0
M-10	**981**	262	12	0.8	0.001	3.2	0.0082	18.7	34	55%	65%	20	13.1	20	13.1	16.6	1002959	0.014	15.9	4.1	0.06066	15.9	-8.6	3	16.6	1002960	0.014	15.9	4.1	0.1
SY-C10	**982**	165	24	3.1	0.001	55.2	0.0596	7.3	33	22%	30%	18	5.3	18	5.3	1.7	203630	0.012	0.0	0.1	0.00027	0.0	5.5	0	1.7	203630	0.012	0.0	0.1	0.0
SY-C0	**983**	632	12	0.8	0.001	1.4	0.0016	14.1	67	21%	28%	41	11.4	41	11.5	14.5	875844	0.014	29.3	7.9	0.04626	29.3	-25.9	3	14.7	884260	0.014	29.8	8.0	0.0
M-0L	**986**	436	10	0.5	0.001	3.4	0.0243	3.2	16	20%	28%	6	1.7	6	1.7	3.1	154945	0.015	1.1	0.5	0.00260	1.1	5.6	0	3.1	154940	0.015	1.1	0.5	0.0
SY-C10	**989**	280	24	3.1	0.001	34.8	0.0237	23.4	33	71%	80%	18	14.2	18	14.2	4.5	543013	0.012	0.5	0.4	0.00194	0.5	7.7	0	4.5	543010	0.012	0.5	0.4	0.0
M-20	**994**	279	12	0.8	0.001	1.9	0.0029	7.4	49	15%	22%	30	6.7	30	6.7	8.6	516546	0.014	4.5	3.5	0.01609	4.5	-3.1	2	8.6	516550	0.014	4.5	3.5	0.0

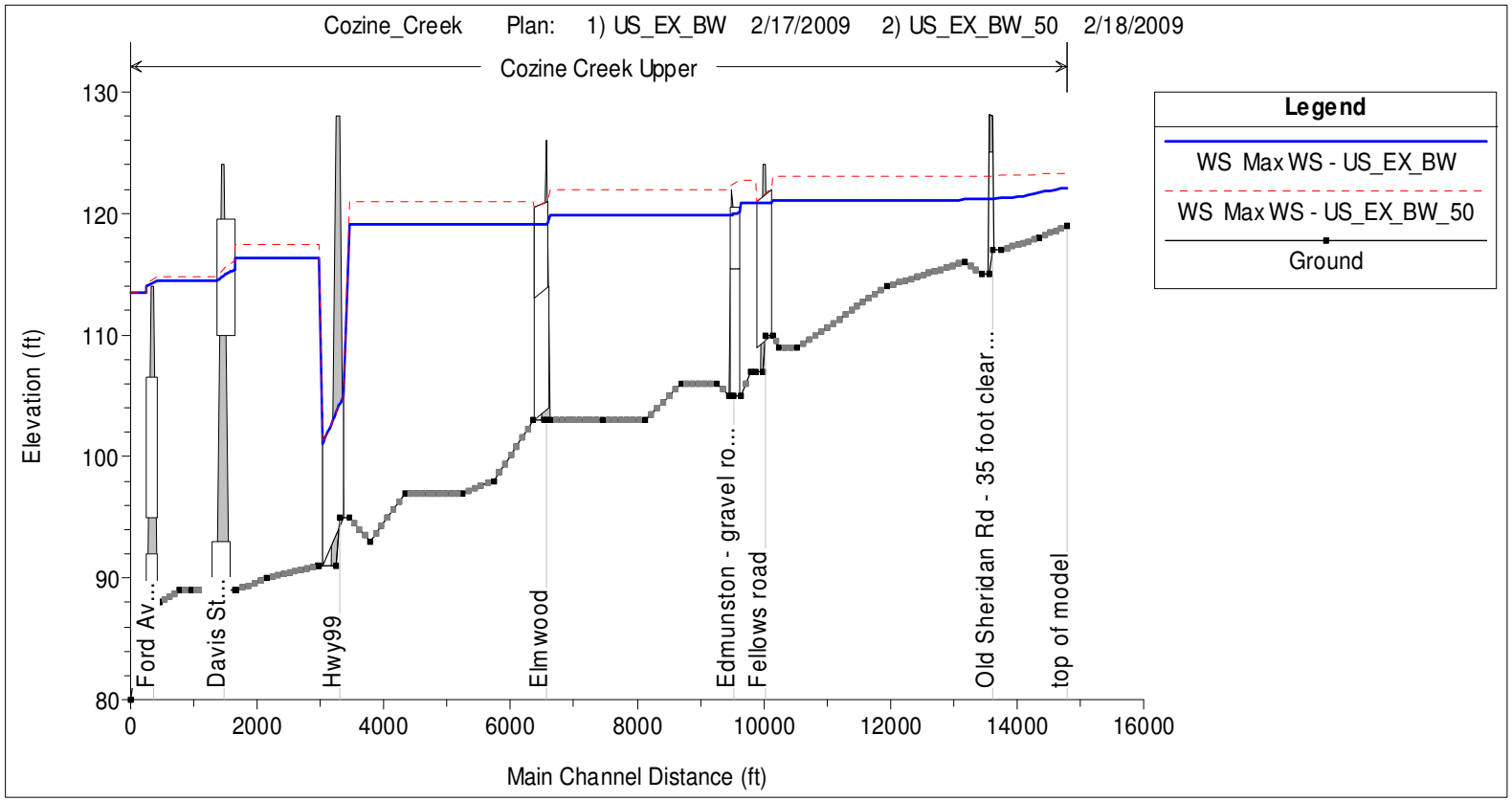
Pipe Hydraulic Evaluation

			Pipe Properties					Drainage Area			Design Flows					Pipe Hydraulics														
												Existing Condition		Future Condition		Existing Condition Flows									Future Condition Flows					
Sub-Basin	Pipe ID (stmain)	Pipe Length	Pipe Diameter (D)	Flow Area, (A)	Roughness Coefficient, (k_s)	Full-pipe Capacity	Pipe Slope	Contributing Drainage Area, (a)	Sub-Basin Drainage Area, (A)	Area Ratio (a/A)	Flow Ratio, (q/Q)	Sub-Basin Peak Flow, ($Q_{EX10-YR}$)	Design Flow in Respective Pipe, (q_{10-YR})	Sub-Basin Peak Flow, ($Q_{FU10-YR}$)	Design Flow in Respective Pipe, (q_{10-YR})	Average Velocity, (V)	Reynolds Number, (Re)	Darcy Friction Factor, (f)	Friction Head loss, (h_f)	q/Qfull	h_f/L	h_f over length of pipe	"Freeboard"	Deficiency Rating	Average Velocity, (V)	Reynolds Number, (Re)	Darcy Friction Factor, (f)	Friction Head loss, (h_f)	q/Qfull	h_f/L
		ft	in	ft2	ft		ft/ft		(acres)			cfs	cfs	cfs	cfs	ft/s	unitless	--	ft						ft/s	unitless	--	ft		
				πr^2	Diagram	Eq.						HMS		HMS		Eq.	Calculated	White Equation	Wiesbach Eq.						Eq.	Calculated	White Equation	Wiesbach Eq.		
M-20	**995**	251	12	0.8	0.001	2.6	0.0053	9.8	49	20%	27%	30	8.2	30	8.2	10.5	632769	0.014	6.1	3.2	0.02415	6.1	0.2	3	10.5	632770	0.014	6.1	3.2	0.0
M-20	**998**	259	12	0.8	0.001	8.6	0.0580	8.8	49	18%	25%	30	7.6	30	7.6	9.6	581114	0.014	5.3	0.9	0.02036	5.3	1.6	0	9.6	581110	0.014	5.3	0.9	0.0
M-0L	**1003**	306	10	0.5	0.001	1.4	0.0044	1.4	16	9%	15%	6	0.9	6	0.9	1.7	83432	0.015	0.2	0.6	0.00075	0.2	1.9	0	1.7	83430	0.015	0.2	0.6	0.0
M-10	**1004**	253	12	0.8	0.001	3.1	0.0076	11.5	34	34%	43%	20	8.7	20	8.7	11.1	668640	0.014	6.8	2.8	0.02696	6.8	-0.2	3	11.1	668640	0.014	6.8	2.8	0.0
SY-C20R	**1014**	318	18	1.8	0.001	5.3	0.0025	16.3	33	50%	60%	19	11.6	19	11.6	6.5	591206	0.013	1.8	2.2	0.00575	1.8	4.0	1	6.5	591210	0.013	1.8	2.2	0.0
E-D	**1016**	275	12	0.8	0.001	2.3	0.0042	10.7	27	40%	0.50	13	6.6	15	7.7	8.3	502648	0.014	4.2	2.8	0.01524	4.2	-4.2	2	9.8	592430	0.014	5.8	3.3	0.0
E-D	**1019**	253	18	1.8	0.001	8.8	0.0070	16.1	27	60%	0.70	13	9.2	15	10.8	5.2	469138	0.013	0.9	1.0	0.00362	0.9	4.7	1	6.1	552940	0.013	1.3	1.2	0.0
E-D	**1020**	185	18	1.8	0.001	5.5	0.0028	7.8	27	29%	0.38	13	4.9	15	5.8	2.8	251324	0.013	0.2	0.9	0.00104	0.2	7.0	0	3.3	296220	0.013	0.3	1.1	0.0
E-L30	**1036**	593	24	3.1	0.001	10.1	0.0020	75.8	96	79%	0.86	57	48.4	58	49.3	15.4	1858206	0.012	13.4	4.8	0.02267	13.4	na	3	15.7	1891090	0.012	13.9	4.9	0.0
E-L30	**1037**	454	24	3.1	0.001	10.1	0.0020	75.8	96	79%	0.86	57	48.4	58	49.3	15.4	1858206	0.012	10.3	4.8	0.02267	10.3	na	3	15.7	1891090	0.012	10.7	4.9	0.0
E-L40	**1040**	492	18	1.8	0.001	4.7	0.0020	28.5	89	32%	0.41	45	18.5	52	21.4	10.4	944244	0.013	7.2	3.9	0.01468	7.2	na	2	12.1	1092570	0.013	9.7	4.5	0.0
E-L40	**1042**	595	15	1.2	0.001	2.9	0.0020	21.4	89	24%	0.32	45	14.5	52	16.8	11.8	890287	0.013	13.9	5.0	0.02338	13.9	na	3	13.7	1030130	0.013	18.6	5.8	0.0
H-30R	**1059**	292	18	1.8	0.001	5.3	0.0026	35.0	55	64%	72%	28	20.5	28	20.5	11.6	1047549	0.013	5.3	3.8	0.01807	5.3	-0.8	2	11.6	1047550	0.013	5.3	3.8	0.0
H-30R	**1064**	343	18	1.8	0.001	8.1	0.0059	36.6	55	67%	75%	28	21.2	28	21.2	12.0	1086723	0.013	6.7	2.6	0.01944	6.7	-2.3	3	12.0	1086720	0.013	6.7	2.6	0.0
W-10R	**1079**	30	12	0.8	0.001	2.5	0.0050		72		88%	45	39.3	45	39.3	50.1	3018283	0.014	16.4	15.6	0.54939	16.4	-10.8	3	50.1	3018280	0.014	16.4	15.6	0.5
C-60	**1081**	378	12	0.8	0.001	5.9	0.0278	8.6	172	5%	0.10	65	6.7	68	7.0	8.5	514956	0.014	6.0	1.1	0.01599	6.0	-3.1	1	8.9	539120	0.014	6.6	1.2	0.0
H-25R	**1097**	95	18	1.8	0.001	5.3	0.0025	10.8	27	40%	48%	20	9.6	20	9.6	5.4	490848	0.013	0.4	1.8	0.00397	0.4	2.5	1	5.4	490850	0.013	0.4	1.8	0.0
W-10	**1119**	233	36	7.1	0.001	145.6	0.0477		69		133%	37	48.7	38	50.7	6.9	1245918	0.011	0.7	0.3	0.00280	0.7	5.0	0	7.2	1297080	0.011	0.7	0.3	0.0
C-20	**1133**	231	12	0.8	0.001	2.4	0.0044	2.5	62	4%	0.10	27	2.6	28	2.7	3.3	200913	0.014	0.6	1.1	0.00243	0.6	na	1	3.4	204130	0.014	0.6	1.1	0.0
M-0	**1152**	296	12	0.8	0.001	2.5	0.0048	6.0	46	13%	20%	33	6.6	33	6.6	8.5	509401	0.014	4.6	2.7	0.01565	4.6	3.2	2	8.5	509400	0.014	4.6	2.7	0.0
E-L20	**1157**	192	18	1.8	0.001	4.7	0.0020	13.8	115	12%	0.19	68	13.2	70	13.5	7.5	676303	0.013	1.4	2.8	0.00753	1.4	na	1	7.6	689870	0.013	1.5	2.9	0.0
E-L30	**1160**	547	15	1.2	0.001	2.9	0.0020	2.9	96	3%	0.07	57	4.0	58	4.1	3.3	247761	0.013	1.0	1.4	0.00181	1.0	na	1	3.3	252150	0.013	1.0	1.4	0.0
E-L30	**1162**	602	15	1.2	0.001	2.9	0.0020	2.9	96	3%	0.07	57	4.0	58	4.1	3.3	247761	0.013	1.1	1.4	0.00181	1.1	na	1	3.3	252150	0.013	1.1	1.4	0.0
E-L20	**1163**	315	30	4.9	0.001	18.3	0.0020	114.6	115	100%	1.68	68	114.6	70	116.9	23.4	3516775	0.012	12.6	6.2	0.03985	12.6	na	3	23.8	3587320	0.012	13.1	6.4	0.0
SY-D	**1200**	233	10	0.5	0.001	2.1	0.0093	30.9	45	69%	77%	23	18.0	28	21.8	33.0	1657723	0.015	69.3	8.5	0.29745	69.3	-59.1	3	39.9	2005230	0.015	101.5	10.3	0.4
SY-D	**1202**	278	10	0.5	0.001	2.5	0.0125	2.7	45	6%	12%	23	2.8	28	3.3	5.1	254271	0.015	1.9	1.1	0.00700	1.9	2.0	1	6.1	307570	0.015	2.8	1.4	0.0
C-30	**1347**	248	12	0.8	0.001	1.9	0.0029	1.9	93	2%	5%	46	2.5	47	2.5	3.1	188904	0.014	0.5	1.3	0.00215	0.5	9.9	1	3.2	192230	0.014	0.6	1.3	0.0
C-30	**1349**	392	12	0.8	0.001	1.9	0.0030	1.9	93	2%	5%	46	2.5	47	2.5	3.1	188904	0.014	0.8	1.3	0.00215	0.8	9.9	1	3.2	192230	0.014	0.9	1.3	0.0
C-30	**1351**	312	15	1.2	0.001	13.0	0.0404	2.8	93	3%	0.07	46	3.3	47	3.3	2.7	201498	0.013	0.4	0.3	0.00120	0.4	4.4	0	2.7	205050	0.013	0.4	0.3	0.0
SY-F	**1364**	78	15	1.2	0.001	3.7	0.0032	2.7	91	3%	7%	38	2.6	40	2.8	2.2	162552	0.013	0.1	0.7	0.00078	0.1	na	0	2.3	171870	0.013	0.1	0.8	0.0
SY-F	**1365**	97	12	0.8	0.001	2.4	0.0044	3.6	91	4%	9%	38	3.3	40	3.5	4.2	253987	0.014	0.4	1.4	0.00389	0.4	na	1	4.5	268550	0.014	0.4	1.5	0.0
M-40	**1416**	277	12	0.8	0.001	2.4	0.0044	5.1	51	10%	16%	31	4.9	31	4.9	6.3	378421	0.014	2.4	2.1	0.00864	2.4	na	1	6.3	378420	0.014	2.4	2.1	0.0
E-L30	**1429**	549	15	1.2	0.001	3.0	0.0021	2.9	96	3%	0.07	57	4.0	58	4.1	3.3	247761	0.013	1.0	1.4	0.00181	1.0	na	1	3.3	252150	0.013	1.0	1.4	0.0
E-L30	**1431**	606	15	1.2	0.001	3.0	0.0022	2.9	96	3%	0.07	57	4.0	58	4.1	3.3	247761	0.013	1.1	1.3	0.00181	1.1	na	1	3.3	252150	0.013	1.1	1.4	0.0
E-L30	**1437**	590	18	1.8	0.001	4.7	0.0020	2.9	96	3%	0.07	57	4.0	58	4.1	2.3	206467	0.013	0.4	0.9	0.00070	0.4	na	0	2.3	210120	0.013	0.4	0.9	0.0
SY-D	**1474**	171	12	0.8	0.001	5.3	0.0223	14.3	45	32%	41%	23	9.7	28	11.7	12.3	741625	0.014	5.7	1.8	0.03317	5.7	-0.6	3	14.9	897090	0.014	8.3	2.2	0.0
SY-D	**1487**	241	12	0.8	0.001	2.4	0.0044	12.1	45	27%	35%	23	8.3	28	10.0	10.6	635679	0.014	5.9	3.5	0.02437	5.9	-2.8	3	12.8	768940	0.014	8.6	4.3	0.0
C-20	**1516**	436	12	0.8	0.001	1.6	0.0021	2.5	62	4%	0.10	27	2.6	28	2.7	3.3	200913	0.014	1.1	1.6	0.00243	1.1	1.5	1	3.4	204130	0.014	1.1	1.6	0.0
C-70	**1520**	125	12	0.8	0.001	6.7	0.0358	2.5	64	4%	0.09	26	2.3	27	2.3	2.9	174434	0.014	0.2	0.3	0.00183	0.2	2.9	0	3.0	177770	0.014	0.2	0.3	0.0
N-40R	**1648**	421	15	1.2	0.001	3.2	0.0025	6.8	85	8%	14%	30	4.2	30	4.2	3.4	257417	0.013	0.8	1.3	0.00195	0.8	4.4	1	3.4	257420	0.013	0.8	1.3	0.0
C-40R	**1798**	18	30	4.9	0.001	14.7	0.0013	51.8	52	100%	1.00	20	20.3	21	21.0	4.1	623129	0.012	0.0	1.4	0.00125	0.0	na	1	4.3	644310	0.012	0.0	1.4	0.0
C-40R	**1799**	36	30	4.9	0.001	14.7	0.0013	51.8	52	100%	1.00	20	20.3	21	21.0	4.1	623129	0.012	0.0	1.4	0.00125	0.0	na	1	4.3	644310	0.012	0.0	1.4	0.0
H-25R	**2283**	92	18	1.8	0.001	5.3	0.0025	13.0	27	48%	57%	20	11.4	20	11.4	6.5	584099	0.013	0.5	2.2	0.00562	0.5	na	1	6.5	584100	0.013	0.5	2.2	0.0
H-25R	**2284**	71	18	1.8	0.001	5.3	0.0025	13.5	27	50%	59%	20	11.8	20	11.8	6.7	604594	0.013	0.4	2.2	0.00602	0.4	na	1	6.7	604590	0.013	0.4	2.2	0.0
E-N10	**2330**	592	12	0.8	0.001	2.4	0.0044	19.2	84	23%	0.30	49	14.9	50	15.2	19.0	1146667	0.014	46.9	6.4	0.07929	46.9	na	3	19.4	1167640	0.014	48.6	6.5	0.1
N-0R	**3098**	500	24	3.1	0.001	38.7	0.0293	22.7	23	100%	333%	10	34.8	10	34.8	11.1	1333998	0.012	5.8	0.9	0.01168	5.8	-2.4	0	11.1	1334000	0.012	5.8	0.9	0.0
N-0R	**3100**	80	24	3.1	0.001	8.8	0.0015	16.1	23	71%	80%	10	8.3	10	8.3	2.7	320160	0.012	0.1	1.0	0.00067	0.1	3.5	0	2.7	320160	0.012	0.1	1.0	0.0
M-30R	**3132**	190	12	0.8	0.001	na	negative	27.2	42	65%	73%	26	18.7	26	18.7	23.8	1432156	0.014	23.5	na	0.12369	23.5	-18.5	3	23.8	1432160	0.014	23.5	######	0.1
M-30R	**3133**	189	12	0.8	0.001	2.4	0.0044	29.3	42	70%	78%	26	19.8	26	19.8	25.2	1520319	0.014	26.3	8.4	0.13939	26.3	na	3	25.2	1520320	0.014	26.3	8.4	0.1
B-C	**3699**	222	18	1.8	0.001	17.2	0.0269	66.6	94	71%	0.80	33	26.6	33	26.6	15.1	1362904	0.013	6.8	1.5	0.03058	6.8	-0.6	3	15.1	1362900	0.013	6.8	1.5	0.0
SY-D	**3702**	243	12	0.8	0.001	2.4	0.0044	12.1	45	27%	35%	23	8.3	28	10.0	10.6	635679	0.014	5.9	3.5	0.02437	5.9	na	3	12.8	768940	0.014	8.7	4.3	0.0
SY-D	**3703**	179	12	0.8	0.001	2.4	0.0044	12.1	45	27%	35%	23	8.3	28	10.0	10.6	635679	0.014	4.4	3.5	0.02437	4.4	na	3	12.8	768940	0.014	6.4	4.3	0.0
SY-D	**3704**	73	12	0.8	0.001	2.8	0.0061	12.1	45	27%	35%	23	8.3	28	10.0	10.6	635679	0.014	1.8	3.0	0.02437	1.8	2.2	3	12.8	768940	0.014	2.6	3.6	0.0
N-30L	**3831**	139	30	4.9	0.001	137.2	0.1121		53		350%	24	82.6	24	82.6	16.8	2535492	0.012	2.9	0.6	0.02071	2.9	-2.1	0	16.8	2535490	0.012	2.9	0.6	0.0
W-10	**3833**	407	36	7.1	0.001	21.7	0.0011		69		133%	37	48.7	38	50.7	6.9	1245918	0.011	1.1	2.2	0.00280	1.1	5.0	1	7.2	1297080	0.011	1.2	2.3	0.0
W-0	**3834**	553	15	1.2	0.001	3.7	0.0032		73		50%	42	20.8	45	22.7	17.0	1278797	0.013	26.7	5.7	0.04825	26.7	-17.8	3	18.5	1392990	0.013	31.7	6.2	0.1

HEC-RAS Hydraulic Model Results
Cozine Creek

Comparison Between 10-year and 50-year Maximum Water Surface Profiles

Note: Red dashed line represents 50-year profile; Blue Solid Line represents the 10-year profile.



HEC-RAS River: Cozine Creek Reach: Upper Profile: Max WS

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Upper	13592	Max WS	US_EX_BW	357.27	119.00	122.07		122.14	0.000527	2.19	219.98	117.84	0.24
Upper	13592	Max WS	US_EX_BW_50	420.78	119.00	123.30		123.33	0.000177	1.63	403.69	182.14	0.15
Upper	13506.8*	Max WS	US_EX_BW	356.93	118.80	122.02		122.09	0.000632	2.31	211.74	123.91	0.26
Upper	13506.8*	Max WS	US_EX_BW_50	420.06	118.80	123.28		123.31	0.000184	1.63	416.95	202.84	0.15
Upper	13421.6*	Max WS	US_EX_BW	355.95	118.60	121.96		122.04	0.000758	2.45	203.06	133.33	0.28
Upper	13421.6*	Max WS	US_EX_BW_50	418.97	118.60	123.27		123.30	0.000183	1.61	435.49	222.52	0.15
Upper	13336.4*	Max WS	US_EX_BW	353.71	118.40	121.88		121.97	0.000879	2.56	195.20	144.12	0.30
Upper	13336.4*	Max WS	US_EX_BW_50	418.22	118.40	123.26		123.28	0.000174	1.55	458.93	241.99	0.14
Upper	13251.2*	Max WS	US_EX_BW	352.67	118.20	121.80		121.90	0.000976	2.63	190.56	156.31	0.31
Upper	13251.2*	Max WS	US_EX_BW_50	417.74	118.20	123.25		123.27	0.000164	1.50	497.62	284.88	0.14
Upper	13166	Max WS	US_EX_BW	348.33	118.00	121.74		121.82	0.000935	2.55	204.54	170.82	0.30
Upper	13166	Max WS	US_EX_BW_50	417.02	118.00	123.24		123.26	0.000131	1.35	572.83	325.44	0.12
Upper	13124.7*	Max WS	US_EX_BW	348.55	117.86	121.62		121.74	0.001160	2.87	156.46	136.29	0.34
Upper	13124.7*	Max WS	US_EX_BW_50	430.32	117.86	123.22		123.25	0.000153	1.49	540.83	327.33	0.13
Upper	13083.4*	Max WS	US_EX_BW	339.39	117.71	121.52		121.64	0.001117	2.86	132.69	89.59	0.33
Upper	13083.4*	Max WS	US_EX_BW_50	429.44	117.71	123.20		123.23	0.000164	1.58	505.28	327.91	0.14
Upper	13042.1*	Max WS	US_EX_BW	333.92	117.57	121.44		121.55	0.000987	2.75	132.77	85.50	0.31
Upper	13042.1*	Max WS	US_EX_BW_50	428.93	117.57	123.19		123.22	0.000170	1.65	465.32	324.46	0.14
Upper	13000.8*	Max WS	US_EX_BW	330.56	117.43	121.37		121.48	0.000839	2.61	139.36	85.86	0.29
Upper	13000.8*	Max WS	US_EX_BW_50	428.06	117.43	123.17		123.21	0.000169	1.69	424.49	315.99	0.14
Upper	12959.5*	Max WS	US_EX_BW	327.97	117.29	121.32		121.41	0.000694	2.45	149.28	86.86	0.27
Upper	12959.5*	Max WS	US_EX_BW_50	427.41	117.29	123.16		123.20	0.000156	1.66	392.75	233.08	0.14
Upper	12918.2*	Max WS	US_EX_BW	326.69	117.14	121.28		121.36	0.000566	2.30	161.36	88.17	0.24
Upper	12918.2*	Max WS	US_EX_BW_50	427.07	117.14	123.15		123.18	0.000134	1.58	398.93	178.15	0.13
Upper	12877	Max WS	US_EX_BW	324.41	117.00	121.25	119.29	121.31	0.000457	2.14	174.49	88.88	0.22
Upper	12877	Max WS	US_EX_BW_50	426.97	117.00	123.14	119.56	123.17	0.000116	1.51	408.81	171.55	0.12
Upper	12712			Bridge									
Upper	12565	Max WS	US_EX_BW	321.71	115.00	121.16		121.18	0.000150	1.32	353.44	245.57	0.13
Upper	12565	Max WS	US_EX_BW_50	425.66	115.00	123.11		123.12	0.000021	0.67	914.54	309.68	0.05
Upper	12476.*	Max WS	US_EX_BW	321.42	115.33	121.15		121.17	0.000106	1.22	380.60	234.77	0.11
Upper	12476.*	Max WS	US_EX_BW_50	425.51	115.33	123.11		123.11	0.000019	0.69	891.32	279.83	0.05
Upper	12387.*	Max WS	US_EX_BW	321.17	115.67	121.14		121.16	0.000081	1.13	405.42	227.25	0.10
Upper	12387.*	Max WS	US_EX_BW_50	425.60	115.67	123.11		123.11	0.000018	0.68	891.55	264.51	0.05
Upper	12298	Max WS	US_EX_BW	321.16	116.00	121.14		121.15	0.000066	1.06	427.84	220.09	0.09
Upper	12298	Max WS	US_EX_BW_50	425.41	116.00	123.11		123.11	0.000016	0.67	893.15	250.39	0.05
Upper	12203.6*	Max WS	US_EX_BW	335.50	115.85	121.13		121.15	0.000060	1.04	464.28	221.15	0.09
Upper	12203.6*	Max WS	US_EX_BW_50	444.13	115.85	123.10		123.11	0.000017	0.69	935.59	254.88	0.05
Upper	12109.2*	Max WS	US_EX_BW	335.36	115.69	121.13		121.14	0.000049	0.97	505.59	223.65	0.08
Upper	12109.2*	Max WS	US_EX_BW_50	444.07	115.69	123.10		123.11	0.000015	0.67	985.44	260.52	0.05
Upper	12014.8*	Max WS	US_EX_BW	335.25	115.54	121.13		121.14	0.000041	0.91	550.68	227.89	0.07
Upper	12014.8*	Max WS	US_EX_BW_50	443.98	115.54	123.10		123.11	0.000013	0.65	1041.66	265.72	0.04
Upper	11920.4*	Max WS	US_EX_BW	335.25	115.38	121.12		121.13	0.000034	0.86	601.29	234.10	0.07
Upper	11920.4*	Max WS	US_EX_BW_50	443.87	115.38	123.10		123.11	0.000012	0.63	1105.76	272.44	0.04
Upper	11826.0*	Max WS	US_EX_BW	335.24	115.23	121.12		121.13	0.000028	0.80	658.07	242.92	0.06
Upper	11826.0*	Max WS	US_EX_BW_50	443.92	115.23	123.10		123.10	0.000011	0.60	1178.95	280.17	0.04
Upper	11731.6*	Max WS	US_EX_BW	335.14	115.08	121.12		121.13	0.000024	0.75	722.32	253.13	0.06
Upper	11731.6*	Max WS	US_EX_BW_50	443.73	115.08	123.10		123.10	0.000009	0.58	1261.89	289.74	0.04
Upper	11637.3*	Max WS	US_EX_BW	335.04	114.92	121.12		121.12	0.000020	0.70	795.94	263.01	0.05
Upper	11637.3*	Max WS	US_EX_BW_50	443.87	114.92	123.10		123.10	0.000008	0.56	1358.22	301.79	0.04
Upper	11542.9*	Max WS	US_EX_BW	334.97	114.77	121.12		121.12	0.000016	0.65	879.43	276.38	0.05
Upper	11542.9*	Max WS	US_EX_BW_50	443.95	114.77	123.10		123.10	0.000007	0.53	1468.03	313.28	0.03
Upper	11448.5*	Max WS	US_EX_BW	334.84	114.62	121.12		121.12	0.000013	0.61	975.75	293.52	0.04
Upper	11448.5*	Max WS	US_EX_BW_50	443.82	114.62	123.10		123.10	0.000006	0.50	1593.02	327.09	0.03
Upper	11354.1*	Max WS	US_EX_BW	335.03	114.46	121.12		121.12	0.000011	0.56	1089.64	309.83	0.04
Upper	11354.1*	Max WS	US_EX_BW_50	444.02	114.46	123.10		123.10	0.000005	0.47	1735.79	339.96	0.03
Upper	11259.7*	Max WS	US_EX_BW	334.93	114.31	121.12		121.12	0.000009	0.52	1218.26	326.25	0.04
Upper	11259.7*	Max WS	US_EX_BW_50	443.85	114.31	123.10		123.10	0.000005	0.44	1891.74	349.56	0.03
Upper	11165.3*	Max WS	US_EX_BW	335.05	114.15	121.12		121.12	0.000007	0.47	1366.10	342.68	0.03

HEC-RAS River: Cozine Creek Reach: Upper Profile: Max WS (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Upper	11165.3*	Max WS	US_EX_BW_50	443.98	114.15	123.10		123.10	0.000004	0.41	2061.82	359.07	0.02
Upper	11071	Max WS	US_EX_BW	335.01	114.00	121.12		121.12	0.000006	0.43	1528.71	353.65	0.03
Upper	11071	Max WS	US_EX_BW_50	443.97	114.00	123.10		123.10	0.000003	0.38	2244.67	368.46	0.02
Upper	10976.3*	Max WS	US_EX_BW	344.33	113.67	121.11		121.12	0.000006	0.44	1520.47	356.34	0.03
Upper	10976.3*	Max WS	US_EX_BW_50	455.57	113.67	123.10		123.10	0.000003	0.39	2244.34	373.82	0.02
Upper	10881.6*	Max WS	US_EX_BW	344.26	113.33	121.11		121.12	0.000005	0.43	1535.26	354.39	0.03
Upper	10881.6*	Max WS	US_EX_BW_50	455.40	113.33	123.10		123.10	0.000003	0.38	2266.82	378.89	0.02
Upper	10787.*	Max WS	US_EX_BW	344.19	113.00	121.11		121.12	0.000004	0.41	1578.30	353.29	0.03
Upper	10787.*	Max WS	US_EX_BW_50	455.24	113.00	123.10		123.10	0.000003	0.37	2312.72	383.72	0.02
Upper	10692.3*	Max WS	US_EX_BW	344.29	112.67	121.11		121.12	0.000004	0.38	1650.21	350.54	0.02
Upper	10692.3*	Max WS	US_EX_BW_50	455.48	112.67	123.10		123.10	0.000002	0.36	2383.90	384.75	0.02
Upper	10597.6*	Max WS	US_EX_BW	344.11	112.33	121.11		121.11	0.000003	0.35	1752.52	352.21	0.02
Upper	10597.6*	Max WS	US_EX_BW_50	455.47	112.33	123.10		123.10	0.000002	0.34	2484.31	384.75	0.02
Upper	10503.*	Max WS	US_EX_BW	344.22	112.00	121.11		121.11	0.000002	0.33	1877.76	353.28	0.02
Upper	10503.*	Max WS	US_EX_BW_50	455.32	112.00	123.10		123.10	0.000002	0.32	2611.38	385.97	0.02
Upper	10408.3*	Max WS	US_EX_BW	344.04	111.67	121.11		121.11	0.000002	0.30	2024.07	358.46	0.02
Upper	10408.3*	Max WS	US_EX_BW_50	455.53	111.67	123.10		123.10	0.000001	0.29	2765.93	389.25	0.02
Upper	10313.6*	Max WS	US_EX_BW	344.24	111.33	121.11		121.11	0.000002	0.27	2190.33	365.89	0.02
Upper	10313.6*	Max WS	US_EX_BW_50	455.49	111.33	123.10		123.10	0.000001	0.27	2944.64	396.47	0.01
Upper	10219.*	Max WS	US_EX_BW	344.19	111.00	121.11		121.11	0.000001	0.25	2374.41	375.29	0.01
Upper	10219.*	Max WS	US_EX_BW_50	455.37	111.00	123.10		123.10	0.000001	0.25	3145.59	402.63	0.01
Upper	10124.3*	Max WS	US_EX_BW	344.25	110.67	121.11		121.11	0.000001	0.23	2574.82	386.97	0.01
Upper	10124.3*	Max WS	US_EX_BW_50	455.41	110.67	123.10		123.10	0.000001	0.23	3366.21	410.54	0.01
Upper	10029.6*	Max WS	US_EX_BW	344.20	110.33	121.11		121.11	0.000001	0.21	2793.31	399.61	0.01
Upper	10029.6*	Max WS	US_EX_BW_50	455.39	110.33	123.10		123.10	0.000001	0.22	3606.90	420.20	0.01
Upper	9935.*	Max WS	US_EX_BW	344.19	110.00	121.11		121.11	0.000001	0.19	3028.79	413.05	0.01
Upper	9935.*	Max WS	US_EX_BW_50	455.42	110.00	123.10		123.10	0.000001	0.20	3865.80	430.71	0.01
Upper	9840.33*	Max WS	US_EX_BW	344.11	109.67	121.11		121.11	0.000001	0.18	3281.35	425.37	0.01
Upper	9840.33*	Max WS	US_EX_BW_50	455.27	109.67	123.10		123.10	0.000001	0.19	4142.24	441.33	0.01
Upper	9745.66*	Max WS	US_EX_BW	344.16	109.33	121.11		121.11	0.000000	0.16	3550.29	437.43	0.01
Upper	9745.66*	Max WS	US_EX_BW_50	455.37	109.33	123.10		123.10	0.000000	0.17	4435.26	452.71	0.01
Upper	9651	Max WS	US_EX_BW	344.16	109.00	121.11		121.11	0.000000	0.15	3835.30	450.13	0.01
Upper	9651	Max WS	US_EX_BW_50	455.41	109.00	123.10		123.10	0.000000	0.16	4744.66	464.48	0.01
Upper	9556.33*	Max WS	US_EX_BW	344.15	109.00	121.11		121.11	0.000001	0.20	2961.63	386.70	0.01
Upper	9556.33*	Max WS	US_EX_BW_50	455.39	109.00	123.10		123.10	0.000001	0.21	3748.17	406.14	0.01
Upper	9461.66*	Max WS	US_EX_BW	344.17	109.00	121.11		121.11	0.000001	0.24	2523.23	313.73	0.01
Upper	9461.66*	Max WS	US_EX_BW_50	455.27	109.00	123.10		123.10	0.000001	0.25	3173.85	342.71	0.01
Upper	9367	Max WS	US_EX_BW	344.11	109.00	121.11		121.11	0.000001	0.26	2458.07	303.91	0.01
Upper	9367	Max WS	US_EX_BW_50	455.37	109.00	123.10		123.10	0.000001	0.28	3088.97	328.04	0.01
Upper	9312.5*	Max WS	US_EX_BW	344.10	109.50	121.11		121.11	0.000001	0.27	2244.34	266.79	0.01
Upper	9312.5*	Max WS	US_EX_BW_50	455.36	109.50	123.10		123.10	0.000001	0.30	2796.58	289.70	0.01
Upper	9258	Max WS	US_EX_BW	344.09	110.00	121.11		121.12	0.000010	0.78	443.79	251.20	0.04
Upper	9258	Max WS	US_EX_BW_50	455.18	110.00	123.09		123.10	0.000010	0.88	523.07	264.63	0.04
Upper	9135			Culvert									
Upper	8992	Max WS	US_EX_BW	343.52	107.00	120.88		120.89	0.000003	0.49	751.71	247.00	0.02
Upper	8992	Max WS	US_EX_BW_50	453.89	107.00	122.72		122.72	0.000004	0.57	861.91	259.49	0.03
Upper	8920	Max WS	US_EX_BW	343.53	107.00	120.88		120.89	0.000001	0.27	2256.46	244.66	0.01
Upper	8920	Max WS	US_EX_BW_50	453.92	107.00	122.72		122.72	0.000001	0.29	2716.86	256.42	0.01
Upper	8865.*	Max WS	US_EX_BW	343.49	106.00	120.88		120.89	0.000001	0.27	2218.09	249.44	0.01
Upper	8865.*	Max WS	US_EX_BW_50	453.90	106.00	122.72		122.72	0.000001	0.30	2688.41	262.34	0.01
Upper	8810	Max WS	US_EX_BW	343.47	105.00	120.88		120.89	0.000003	0.46	794.44	257.00	0.02
Upper	8810	Max WS	US_EX_BW_50	453.84	105.00	122.72		122.72	0.000003	0.54	900.98	269.49	0.02
Upper	8684			Culvert									
Upper	8614	Max WS	US_EX_BW	341.48	105.00	119.88		119.88	0.000002	0.39	1158.05	246.34	0.02
Upper	8614	Max WS	US_EX_BW_50	451.08	105.00	121.98		121.98	0.000002	0.43	1397.62	261.86	0.02
Upper	8520.*	Max WS	US_EX_BW	341.51	105.50	119.88		119.88	0.000001	0.25	2470.24	276.62	0.01
Upper	8520.*	Max WS	US_EX_BW_50	451.06	105.50	121.98		121.98	0.000001	0.27	3077.31	300.70	0.01

HEC-RAS River: Cozine Creek Reach: Upper Profile: Max WS (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Upper	8426	Max WS	US_EX_BW	341.50	106.00	119.88		119.88	0.000001	0.21	2931.03	301.93	0.01
Upper	8426	Max WS	US_EX_BW_50	451.06	106.00	121.98		121.98	0.000001	0.23	3581.50	316.88	0.01
Upper	8331.5*	Max WS	US_EX_BW	343.54	106.00	119.88		119.88	0.000001	0.22	2886.97	292.79	0.01
Upper	8331.5*	Max WS	US_EX_BW_50	453.76	106.00	121.98		121.98	0.000001	0.24	3518.95	308.11	0.01
Upper	8237.*	Max WS	US_EX_BW	343.57	106.00	119.88		119.88	0.000001	0.22	2845.24	284.01	0.01
Upper	8237.*	Max WS	US_EX_BW_50	453.76	106.00	121.98		121.98	0.000001	0.24	3459.03	299.55	0.01
Upper	8142.5*	Max WS	US_EX_BW	343.51	106.00	119.88		119.88	0.000001	0.22	2806.10	275.54	0.01
Upper	8142.5*	Max WS	US_EX_BW_50	453.74	106.00	121.98		121.98	0.000001	0.24	3401.98	291.11	0.01
Upper	8048.*	Max WS	US_EX_BW	343.55	106.00	119.88		119.88	0.000001	0.22	2768.68	267.46	0.01
Upper	8048.*	Max WS	US_EX_BW_50	453.76	106.00	121.98		121.98	0.000001	0.24	3347.18	282.86	0.01
Upper	7953.5*	Max WS	US_EX_BW	343.54	106.00	119.88		119.88	0.000001	0.22	2733.55	259.70	0.01
Upper	7953.5*	Max WS	US_EX_BW_50	453.73	106.00	121.98		121.98	0.000001	0.24	3295.32	274.82	0.01
Upper	7859	Max WS	US_EX_BW	343.53	106.00	119.88		119.88	0.000001	0.22	2699.85	252.45	0.01
Upper	7859	Max WS	US_EX_BW_50	453.77	106.00	121.98		121.98	0.000001	0.25	3245.50	267.08	0.01
Upper	7766.*	Max WS	US_EX_BW	343.52	105.50	119.88		119.88	0.000001	0.24	2521.66	255.07	0.01
Upper	7766.*	Max WS	US_EX_BW_50	453.75	105.50	121.98		121.98	0.000001	0.27	3071.30	268.33	0.01
Upper	7673.*	Max WS	US_EX_BW	343.53	105.00	119.88		119.88	0.000001	0.26	2391.19	258.74	0.01
Upper	7673.*	Max WS	US_EX_BW_50	453.76	105.00	121.98		121.98	0.000001	0.28	2952.87	275.76	0.01
Upper	7580.*	Max WS	US_EX_BW	343.51	104.50	119.88		119.88	0.000001	0.26	2335.48	252.33	0.01
Upper	7580.*	Max WS	US_EX_BW_50	453.70	104.50	121.98		121.98	0.000001	0.29	2910.64	288.50	0.01
Upper	7487.*	Max WS	US_EX_BW	343.52	104.00	119.88		119.88	0.000001	0.26	2438.70	264.61	0.01
Upper	7487.*	Max WS	US_EX_BW_50	453.75	104.00	121.98		121.98	0.000001	0.28	3025.13	292.27	0.01
Upper	7394.*	Max WS	US_EX_BW	343.53	103.50	119.88		119.88	0.000001	0.24	2693.63	289.99	0.01
Upper	7394.*	Max WS	US_EX_BW_50	453.71	103.50	121.98		121.98	0.000001	0.26	3335.57	321.61	0.01
Upper	7301	Max WS	US_EX_BW	343.51	103.00	119.88		119.88	0.000000	0.21	3134.68	336.21	0.01
Upper	7301	Max WS	US_EX_BW_50	453.72	103.00	121.98		121.98	0.000000	0.23	3853.17	346.32	0.01
Upper	7203.28*	Max WS	US_EX_BW	397.74	103.00	119.88		119.88	0.000001	0.27	2795.61	300.60	0.01
Upper	7203.28*	Max WS	US_EX_BW_50	522.96	103.00	121.98		121.98	0.000001	0.29	3460.62	332.40	0.01
Upper	7105.57*	Max WS	US_EX_BW	397.69	103.00	119.88		119.88	0.000001	0.28	2584.52	270.56	0.01
Upper	7105.57*	Max WS	US_EX_BW_50	523.01	103.00	121.98		121.98	0.000001	0.31	3188.88	303.76	0.01
Upper	7007.85*	Max WS	US_EX_BW	397.73	103.00	119.88		119.88	0.000001	0.28	2519.94	242.27	0.01
Upper	7007.85*	Max WS	US_EX_BW_50	523.00	103.00	121.98		121.98	0.000001	0.32	3064.03	284.63	0.01
Upper	6910.14*	Max WS	US_EX_BW	397.70	103.00	119.88		119.88	0.000001	0.28	2574.79	256.48	0.01
Upper	6910.14*	Max WS	US_EX_BW_50	522.99	103.00	121.98		121.98	0.000001	0.30	3132.86	273.77	0.01
Upper	6812.42*	Max WS	US_EX_BW	397.72	103.00	119.88		119.88	0.000001	0.26	2730.29	257.24	0.01
Upper	6812.42*	Max WS	US_EX_BW_50	523.01	103.00	121.98		121.98	0.000001	0.29	3285.12	270.75	0.01
Upper	6714.71*	Max WS	US_EX_BW	397.70	103.00	119.88		119.88	0.000001	0.24	2930.73	256.62	0.01
Upper	6714.71*	Max WS	US_EX_BW_50	522.98	103.00	121.98		121.98	0.000001	0.27	3481.93	267.94	0.01
Upper	6617	Max WS	US_EX_BW	397.72	103.00	119.88		119.88	0.000000	0.22	3162.78	255.38	0.01
Upper	6617	Max WS	US_EX_BW_50	522.93	103.00	121.98		121.98	0.000001	0.25	3710.57	265.91	0.01
Upper	6526.55*	Max WS	US_EX_BW	405.94	103.00	119.88		119.88	0.000001	0.23	3060.85	252.97	0.01
Upper	6526.55*	Max WS	US_EX_BW_50	533.64	103.00	121.98		121.98	0.000001	0.26	3603.43	263.57	0.01
Upper	6436.11*	Max WS	US_EX_BW	405.95	103.00	119.88		119.88	0.000001	0.24	2973.64	250.96	0.01
Upper	6436.11*	Max WS	US_EX_BW_50	533.59	103.00	121.98		121.98	0.000001	0.27	3512.76	262.04	0.01
Upper	6345.66*	Max WS	US_EX_BW	405.97	103.00	119.88		119.88	0.000001	0.25	2903.84	249.70	0.01
Upper	6345.66*	Max WS	US_EX_BW_50	533.61	103.00	121.98		121.98	0.000001	0.28	3441.50	261.96	0.01
Upper	6255.22*	Max WS	US_EX_BW	405.94	103.00	119.88		119.88	0.000001	0.25	2855.29	249.50	0.01
Upper	6255.22*	Max WS	US_EX_BW_50	533.62	103.00	121.98		121.98	0.000001	0.28	3397.35	268.06	0.01
Upper	6164.77*	Max WS	US_EX_BW	405.95	103.00	119.88		119.88	0.000001	0.26	2841.49	258.79	0.01
Upper	6164.77*	Max WS	US_EX_BW_50	533.60	103.00	121.98		121.98	0.000001	0.28	3401.73	273.47	0.01
Upper	6074.33*	Max WS	US_EX_BW	405.93	103.00	119.88		119.88	0.000001	0.25	2875.13	259.90	0.01
Upper	6074.33*	Max WS	US_EX_BW_50	533.60	103.00	121.98		121.98	0.000001	0.28	3434.47	272.39	0.01
Upper	5983.88*	Max WS	US_EX_BW	405.95	103.00	119.88		119.88	0.000001	0.25	2936.41	256.14	0.01
Upper	5983.88*	Max WS	US_EX_BW_50	533.58	103.00	121.98		121.98	0.000001	0.27	3490.78	270.30	0.01
Upper	5893.44*	Max WS	US_EX_BW	405.94	103.00	119.88		119.88	0.000001	0.23	3024.39	250.46	0.01
Upper	5893.44*	Max WS	US_EX_BW_50	533.63	103.00	121.98		121.98	0.000001	0.27	3567.76	266.41	0.01
Upper	5803	Max WS	US_EX_BW	405.94	103.00	119.88		119.88	0.000001	0.30	1895.48	245.47	0.01
Upper	5803	Max WS	US_EX_BW_50	533.63	103.00	121.98		121.98	0.000001	0.34	2153.97	260.46	0.01

HEC-RAS River: Cozine Creek Reach: Upper Profile: Max WS (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Upper	5641			Culvert									
Upper	5600	Max WS	US_EX_BW	405.71	103.00	119.05		119.05	0.000001	0.31	1793.62	241.82	0.01
Upper	5600	Max WS	US_EX_BW_50	533.23	103.00	120.97		120.97	0.000001	0.36	2029.10	253.05	0.02
Upper	5588.28*	Max WS	US_EX_BW	405.68	102.29	119.05		119.05	0.000001	0.30	1892.75	235.78	0.01
Upper	5588.28*	Max WS	US_EX_BW_50	533.24	102.29	120.97		120.97	0.000001	0.35	2132.60	249.02	0.01
Upper	5576.57*	Max WS	US_EX_BW	405.70	101.57	119.05		119.05	0.000001	0.29	1990.81	231.36	0.01
Upper	5576.57*	Max WS	US_EX_BW_50	533.23	101.57	120.97		120.97	0.000001	0.34	2235.04	244.20	0.01
Upper	5564.85*	Max WS	US_EX_BW	405.69	100.86	119.05		119.05	0.000001	0.28	2085.10	226.36	0.01
Upper	5564.85*	Max WS	US_EX_BW_50	533.24	100.86	120.97		120.97	0.000001	0.32	2333.70	238.82	0.01
Upper	5553.14*	Max WS	US_EX_BW	405.68	100.14	119.05		119.05	0.000001	0.27	2173.83	220.52	0.01
Upper	5553.14*	Max WS	US_EX_BW_50	533.24	100.14	120.97		120.97	0.000001	0.31	2426.80	232.91	0.01
Upper	5541.42*	Max WS	US_EX_BW	405.69	99.43	119.05		119.05	0.000001	0.26	2253.20	213.89	0.01
Upper	5541.42*	Max WS	US_EX_BW_50	533.23	99.43	120.97		120.97	0.000001	0.31	2510.55	226.40	0.01
Upper	5529.71*	Max WS	US_EX_BW	405.69	98.71	119.05		119.05	0.000001	0.25	2318.30	208.01	0.01
Upper	5529.71*	Max WS	US_EX_BW_50	533.24	98.71	120.97		120.97	0.000001	0.30	2580.04	218.79	0.01
Upper	5518	Max WS	US_EX_BW	405.69	98.00	119.05		119.05	0.000000	0.25	2355.30	202.16	0.01
Upper	5518	Max WS	US_EX_BW_50	533.23	98.00	120.97		120.97	0.000001	0.30	2621.41	211.92	0.01
Upper	5420.8*	Max WS	US_EX_BW	407.82	97.80	119.05		119.05	0.000000	0.25	2644.44	194.70	0.01
Upper	5420.8*	Max WS	US_EX_BW_50	535.94	97.80	120.97		120.97	0.000001	0.30	3026.42	204.33	0.01
Upper	5323.6*	Max WS	US_EX_BW	407.82	97.60	119.05		119.05	0.000001	0.26	2494.89	186.95	0.01
Upper	5323.6*	Max WS	US_EX_BW_50	535.95	97.60	120.96		120.97	0.000001	0.31	2861.90	196.47	0.01
Upper	5226.4*	Max WS	US_EX_BW	407.81	97.40	119.05		119.05	0.000001	0.27	2349.45	178.89	0.01
Upper	5226.4*	Max WS	US_EX_BW_50	535.94	97.40	120.96		120.97	0.000001	0.32	2700.94	188.32	0.01
Upper	5129.2*	Max WS	US_EX_BW	407.82	97.20	119.05		119.05	0.000001	0.28	2208.43	170.50	0.01
Upper	5129.2*	Max WS	US_EX_BW_50	535.94	97.20	120.96		120.97	0.000001	0.33	2543.60	179.75	0.01
Upper	5032	Max WS	US_EX_BW	407.81	97.00	119.05		119.05	0.000001	0.29	2073.67	162.11	0.01
Upper	5032	Max WS	US_EX_BW_50	535.94	97.00	120.96		120.97	0.000001	0.34	2391.89	170.73	0.01
Upper	4940.4*	Max WS	US_EX_BW	500.57	97.00	119.05		119.05	0.000001	0.34	2268.61	177.79	0.01
Upper	4940.4*	Max WS	US_EX_BW_50	655.33	97.00	120.96		120.97	0.000001	0.40	2619.24	188.56	0.02
Upper	4848.8*	Max WS	US_EX_BW	500.53	97.00	119.05		119.05	0.000001	0.32	2488.69	196.29	0.01
Upper	4848.8*	Max WS	US_EX_BW_50	655.31	97.00	120.96		120.97	0.000001	0.37	2876.16	208.52	0.01
Upper	4757.2*	Max WS	US_EX_BW	500.55	97.00	119.05		119.05	0.000001	0.30	2738.55	217.01	0.01
Upper	4757.2*	Max WS	US_EX_BW_50	655.26	97.00	120.96		120.97	0.000001	0.35	3167.31	230.96	0.01
Upper	4665.6*	Max WS	US_EX_BW	500.54	97.00	119.05		119.05	0.000001	0.28	3023.86	240.51	0.01
Upper	4665.6*	Max WS	US_EX_BW_50	655.23	97.00	120.96		120.96	0.000001	0.33	3499.41	256.33	0.01
Upper	4574.*	Max WS	US_EX_BW	500.56	97.00	119.05		119.05	0.000001	0.27	3351.96	267.30	0.01
Upper	4574.*	Max WS	US_EX_BW_50	655.30	97.00	120.96		120.96	0.000001	0.31	3880.93	284.44	0.01
Upper	4482.4*	Max WS	US_EX_BW	500.52	97.00	119.05		119.05	0.000000	0.25	3732.47	296.84	0.01
Upper	4482.4*	Max WS	US_EX_BW_50	655.29	97.00	120.96		120.96	0.000001	0.28	4314.28	310.99	0.01
Upper	4390.8*	Max WS	US_EX_BW	500.53	97.00	119.05		119.05	0.000000	0.23	4164.78	323.52	0.01
Upper	4390.8*	Max WS	US_EX_BW_50	655.30	97.00	120.96		120.96	0.000000	0.26	4798.35	338.53	0.01
Upper	4299.2*	Max WS	US_EX_BW	500.55	97.00	119.05		119.05	0.000000	0.21	4648.91	351.16	0.01
Upper	4299.2*	Max WS	US_EX_BW_50	655.24	97.00	120.96		120.96	0.000000	0.24	5336.65	367.12	0.01
Upper	4207.6*	Max WS	US_EX_BW	500.48	97.00	119.05		119.05	0.000000	0.19	5185.78	380.05	0.01
Upper	4207.6*	Max WS	US_EX_BW_50	655.28	97.00	120.96		120.96	0.000000	0.22	5926.72	393.51	0.01
Upper	4116	Max WS	US_EX_BW	500.53	97.00	119.05		119.05	0.000000	0.17	5776.50	406.82	0.01
Upper	4116	Max WS	US_EX_BW_50	655.29	97.00	120.96		120.96	0.000000	0.20	6569.10	423.12	0.01
Upper	4024.33*	Max WS	US_EX_BW	500.52	96.33	119.05		119.05	0.000000	0.17	5586.18	397.49	0.01
Upper	4024.33*	Max WS	US_EX_BW_50	655.20	96.33	120.96		120.96	0.000000	0.20	6363.72	415.46	0.01
Upper	3932.66*	Max WS	US_EX_BW	500.48	95.67	119.05		119.05	0.000000	0.18	5386.60	387.93	0.01
Upper	3932.66*	Max WS	US_EX_BW_50	655.27	95.67	120.96		120.96	0.000000	0.20	6146.56	405.29	0.01
Upper	3841.*	Max WS	US_EX_BW	500.50	95.00	119.05		119.05	0.000000	0.18	5173.48	378.05	0.01
Upper	3841.*	Max WS	US_EX_BW_50	655.24	95.00	120.96		120.96	0.000000	0.21	5913.80	394.48	0.01
Upper	3749.33*	Max WS	US_EX_BW	500.51	94.33	119.05		119.05	0.000000	0.19	4945.42	367.93	0.01
Upper	3749.33*	Max WS	US_EX_BW_50	655.23	94.33	120.96		120.96	0.000000	0.21	5665.63	384.22	0.01
Upper	3657.66*	Max WS	US_EX_BW	500.48	93.67	119.05		119.05	0.000000	0.19	4701.66	357.50	0.01
Upper	3657.66*	Max WS	US_EX_BW_50	655.25	93.67	120.96		120.96	0.000000	0.22	5402.58	374.61	0.01
Upper	3566	Max WS	US_EX_BW	500.49	93.00	119.05		119.05	0.000000	0.20	4441.95	348.12	0.01

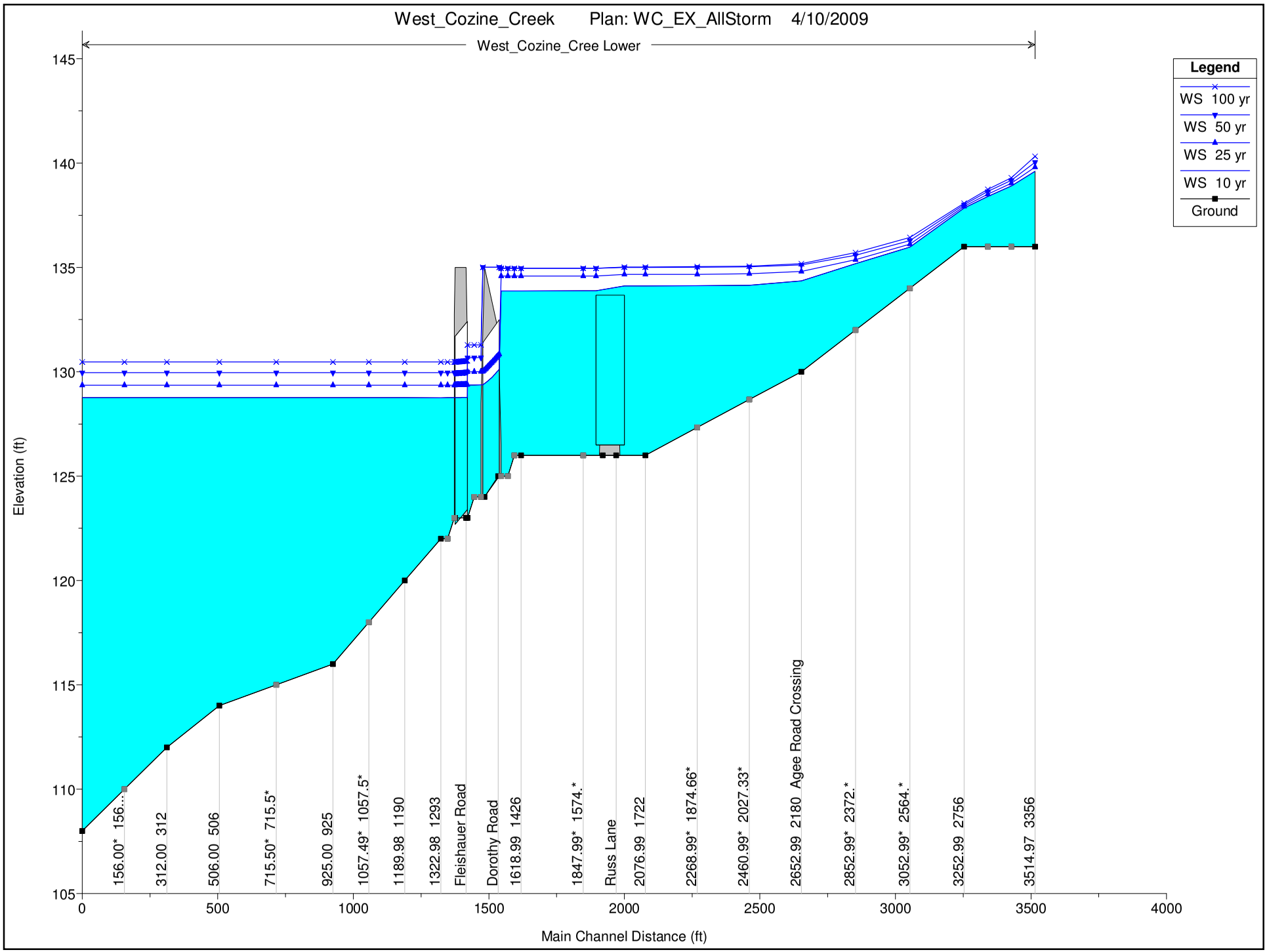
HEC-RAS River: Cozine Creek Reach: Upper Profile: Max WS (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Upper	3566	Max WS	US_EX_BW_50	655.21	93.00	120.96		120.96	0.000000	0.22	5123.31	359.45	0.01
Upper	3483.5*	Max WS	US_EX_BW	508.11	93.50	119.05		119.05	0.000000	0.20	4360.28	321.62	0.01
Upper	3483.5*	Max WS	US_EX_BW_50	665.02	93.50	120.96		120.96	0.000000	0.23	4992.94	338.97	0.01
Upper	3401.*	Max WS	US_EX_BW	508.10	94.00	119.05		119.05	0.000000	0.20	4255.80	298.53	0.01
Upper	3401.*	Max WS	US_EX_BW_50	665.03	94.00	120.96		120.96	0.000000	0.23	4843.01	314.96	0.01
Upper	3318.5*	Max WS	US_EX_BW	508.11	94.50	119.05		119.05	0.000000	0.19	4162.24	259.18	0.01
Upper	3318.5*	Max WS	US_EX_BW_50	665.01	94.50	120.96		120.96	0.000000	0.23	4679.79	283.93	0.01
Upper	3236	Max WS	US_EX_BW	508.10	95.00	119.05		119.05	0.000000	0.19	3732.91	239.43	0.01
Upper	3236	Max WS	US_EX_BW_50	665.02	95.00	120.96		120.96	0.000000	0.22	4096.63	247.11	0.01
Upper	3049			Culvert									
Upper	2765	Max WS	US_EX_BW	507.62	91.00	116.37		116.37	0.000000	0.17	5892.84	381.14	0.01
Upper	2765	Max WS	US_EX_BW_50	664.39	91.00	117.46		117.46	0.000000	0.21	6310.34	386.40	0.01
Upper	2755	Max WS	US_EX_BW	507.62	91.00	116.37		116.37	0.000000	0.17	5892.84	381.14	0.01
Upper	2755	Max WS	US_EX_BW_50	664.37	91.00	117.46		117.46	0.000000	0.21	6310.34	386.40	0.01
Upper	2665.*	Max WS	US_EX_BW	513.44	90.89	116.37		116.37	0.000000	0.17	5970.03	383.66	0.01
Upper	2665.*	Max WS	US_EX_BW_50	671.68	90.89	117.46		117.46	0.000000	0.21	6390.47	389.29	0.01
Upper	2575.*	Max WS	US_EX_BW	513.43	90.78	116.37		116.37	0.000000	0.17	6052.50	386.78	0.01
Upper	2575.*	Max WS	US_EX_BW_50	671.74	90.78	117.46		117.46	0.000000	0.21	6476.69	393.76	0.01
Upper	2485.*	Max WS	US_EX_BW	513.45	90.67	116.37		116.37	0.000000	0.17	6140.77	390.94	0.01
Upper	2485.*	Max WS	US_EX_BW_50	671.73	90.67	117.46		117.46	0.000000	0.20	6570.79	400.19	0.01
Upper	2395.*	Max WS	US_EX_BW	513.43	90.56	116.37		116.37	0.000000	0.16	6238.23	397.03	0.01
Upper	2395.*	Max WS	US_EX_BW_50	671.72	90.56	117.46		117.46	0.000000	0.20	6676.05	407.78	0.01
Upper	2305.*	Max WS	US_EX_BW	513.42	90.44	116.37		116.37	0.000000	0.16	6347.89	405.64	0.01
Upper	2305.*	Max WS	US_EX_BW_50	671.68	90.44	117.46		117.46	0.000000	0.20	6795.22	416.32	0.01
Upper	2215.*	Max WS	US_EX_BW	513.42	90.33	116.37		116.37	0.000000	0.16	6472.81	413.86	0.01
Upper	2215.*	Max WS	US_EX_BW_50	671.69	90.33	117.46		117.46	0.000000	0.20	6928.22	423.08	0.01
Upper	2125.*	Max WS	US_EX_BW	513.41	90.22	116.37		116.37	0.000000	0.16	6610.85	421.23	0.01
Upper	2125.*	Max WS	US_EX_BW_50	671.68	90.22	117.46		117.46	0.000000	0.19	7073.96	429.49	0.01
Upper	2035.*	Max WS	US_EX_BW	513.41	90.11	116.37		116.37	0.000000	0.16	6764.50	429.81	0.01
Upper	2035.*	Max WS	US_EX_BW_50	671.68	90.11	117.46		117.46	0.000000	0.19	7236.19	437.20	0.01
Upper	1945	Max WS	US_EX_BW	513.41	90.00	116.37		116.37	0.000000	0.15	6936.06	437.43	0.01
Upper	1945	Max WS	US_EX_BW_50	671.68	90.00	117.46		117.46	0.000000	0.19	7415.78	444.50	0.01
Upper	1847.*	Max WS	US_EX_BW	513.41	89.80	116.37		116.37	0.000000	0.16	6594.01	417.93	0.01
Upper	1847.*	Max WS	US_EX_BW_50	671.67	89.80	117.46		117.46	0.000000	0.20	7054.47	428.00	0.01
Upper	1749.*	Max WS	US_EX_BW	513.42	89.60	116.37		116.37	0.000000	0.16	6304.85	397.19	0.01
Upper	1749.*	Max WS	US_EX_BW_50	671.66	89.60	117.46		117.46	0.000000	0.20	6742.34	407.00	0.01
Upper	1651.*	Max WS	US_EX_BW	513.40	89.40	116.37		116.37	0.000000	0.17	6074.37	374.98	0.01
Upper	1651.*	Max WS	US_EX_BW_50	671.65	89.40	117.46		117.46	0.000000	0.21	6486.98	383.64	0.01
Upper	1553.*	Max WS	US_EX_BW	513.41	89.20	116.37		116.37	0.000000	0.17	5879.97	367.05	0.01
Upper	1553.*	Max WS	US_EX_BW_50	671.67	89.20	117.46		117.46	0.000000	0.21	6281.06	370.44	0.01
Upper	1455	Max WS	US_EX_BW	513.40	89.00	116.37		116.37	0.000000	0.20	3951.84	360.31	0.01
Upper	1455	Max WS	US_EX_BW_50	671.66	89.00	117.46		117.46	0.000000	0.25	4136.75	364.11	0.01
Upper	1445	Max WS	US_EX_BW	518.69	89.00	116.37		116.37	0.000000	0.20	3951.82	360.31	0.01
Upper	1445	Max WS	US_EX_BW_50	678.42	89.00	117.46		117.46	0.000000	0.25	4136.75	364.11	0.01
Upper	1263			Culvert									
Upper	1050	Max WS	US_EX_BW	518.69	89.00	114.46		114.46	0.000000	0.20	4022.23	559.75	0.01
Upper	1050	Max WS	US_EX_BW_50	678.42	89.00	114.76		114.76	0.000000	0.26	4079.02	566.65	0.01
Upper	973.75*	Max WS	US_EX_BW	518.68	89.00	114.46		114.46	0.000000	0.16	7290.90	558.55	0.01
Upper	973.75*	Max WS	US_EX_BW_50	678.41	89.00	114.76		114.76	0.000000	0.20	7456.80	563.14	0.01
Upper	897.5*	Max WS	US_EX_BW	518.69	89.00	114.46		114.46	0.000000	0.17	6578.84	512.91	0.01
Upper	897.5*	Max WS	US_EX_BW_50	678.42	89.00	114.76		114.76	0.000000	0.22	6731.57	519.39	0.01
Upper	821.25*	Max WS	US_EX_BW	518.69	89.00	114.46		114.46	0.000000	0.18	6011.80	455.08	0.01
Upper	821.25*	Max WS	US_EX_BW_50	678.41	89.00	114.76		114.76	0.000000	0.24	6146.91	458.43	0.01
Upper	745	Max WS	US_EX_BW	518.68	89.00	114.46		114.46	0.000000	0.19	5532.46	395.92	0.01
Upper	745	Max WS	US_EX_BW_50	678.43	89.00	114.76		114.76	0.000000	0.25	5649.94	398.43	0.01
Upper	653.*	Max WS	US_EX_BW	521.11	89.00	114.46		114.46	0.000000	0.20	5344.84	374.65	0.01
Upper	653.*	Max WS	US_EX_BW_50	681.56	89.00	114.76		114.76	0.000000	0.25	5456.17	378.09	0.01

HEC-RAS River: Cozine Creek Reach: Upper Profile: Max WS (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Upper	561	Max WS	US_EX_BW	521.11	89.00	114.46		114.46	0.000000	0.19	5238.28	344.91	0.01
Upper	561	Max WS	US_EX_BW_50	681.56	89.00	114.76		114.76	0.000000	0.25	5340.96	349.35	0.01
Upper	534.*	Max WS	US_EX_BW	521.11	88.75	114.46		114.46	0.000000	0.21	4952.86	335.04	0.01
Upper	534.*	Max WS	US_EX_BW_50	681.56	88.75	114.76		114.76	0.000000	0.26	5052.47	338.44	0.01
Upper	507.*	Max WS	US_EX_BW	521.12	88.50	114.46		114.46	0.000000	0.21	4678.03	313.71	0.01
Upper	507.*	Max WS	US_EX_BW_50	681.55	88.50	114.76		114.76	0.000000	0.27	4771.28	316.99	0.01
Upper	480.*	Max WS	US_EX_BW	521.10	88.25	114.46		114.46	0.000000	0.22	4403.64	283.09	0.01
Upper	480.*	Max WS	US_EX_BW_50	681.55	88.25	114.76		114.76	0.000000	0.28	4487.85	286.43	0.01
Upper	453	Max WS	US_EX_BW	521.11	88.00	114.46		114.46	0.000001	0.37	1538.56	256.07	0.01
Upper	453	Max WS	US_EX_BW_50	681.55	88.00	114.75		114.76	0.000001	0.47	1556.25	257.39	0.02
Upper	443	Max WS	US_EX_BW	523.94	88.00	114.46		114.46	0.000001	0.37	1538.56	256.07	0.01
Upper	443	Max WS	US_EX_BW_50	685.25	88.00	114.75		114.76	0.000001	0.48	1556.25	257.39	0.02
Upper	367			Culvert									
Upper	246	Max WS	US_EX_BW	191.05	88.00	113.50		113.50	0.000000	0.08	3871.74	352.90	0.00
Upper	246	Max WS	US_EX_BW_50	241.72	88.00	113.50		113.50	0.000000	0.10	3871.74	352.90	0.00
Upper	164.*	Max WS	US_EX_BW	188.36	85.33	113.50		113.50	0.000000	0.07	5211.21	336.10	0.00
Upper	164.*	Max WS	US_EX_BW_50	238.54	85.33	113.50		113.50	0.000000	0.09	5211.21	336.10	0.00
Upper	81.9999*	Max WS	US_EX_BW	171.02	82.67	113.50		113.50	0.000000	0.06	5594.88	327.49	0.00
Upper	81.9999*	Max WS	US_EX_BW_50	249.58	82.67	113.50		113.50	0.000000	0.09	5594.88	327.49	0.00
Upper	0	Max WS	US_EX_BW	50.01	80.00	113.50	80.41	113.50	0.000000	0.02	6014.38	321.50	0.00
Upper	0	Max WS	US_EX_BW_50	50.01	80.00	113.50	80.41	113.50	0.000000	0.02	6014.38	321.50	0.00

HEC-RAS Hydraulic Model Results
West Cozine Creek


West_Cozine_Creek Plan: WC_EX_AllStorm 4/10/2009
West_Cozine_Cree Lower
Legend
WS 100 yr
WS 50 yr
WS 25 yr
WS 10 yr
Ground
Elevation (ft)
Main Channel Distance (ft)
156.00* 156....
312.00 312
506.00 506
715.50* 715.5*
925.00 925
1057.49* 1057.5*
1189.98 1190
1322.98 1293
Fleishauer Road
Dorothy Road
1618.99 1426
1847.99* 1574.*
Russ Lane
2076.99 1722
2268.99* 1874.66*
2460.99* 2027.33*
2652.99 2180 Agee Road Crossing
2852.99* 2372.*
3052.99* 2564.*
3252.99 2756
3514.97 3356

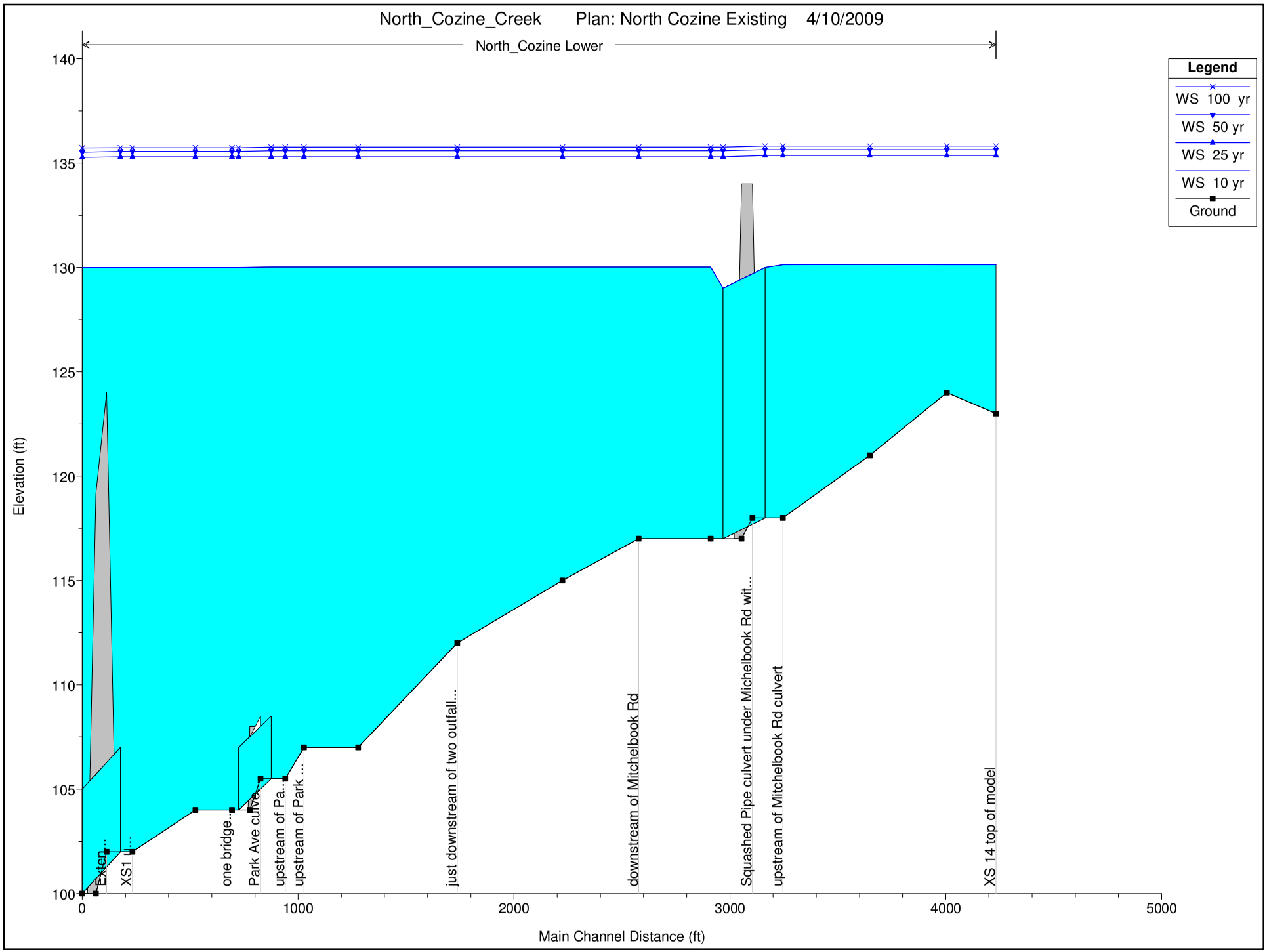
HEC-RAS Plan: WC_EX_All River: West_Cozine_Cree Reach: Lower

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Lower	3515	10 yr	293.70	136.00	139.61	139.61	140.55	0.020875	7.79	37.70	20.03	1.00
Lower	3515	25 yr	336.50	136.00	139.81	139.81	140.81	0.020500	8.01	41.98	21.07	1.00
Lower	3515	50 yr	390.30	136.00	140.04	140.04	141.12	0.020131	8.31	46.99	23.65	1.00
Lower	3515	100 yr	444.90	136.00	140.32	140.32	141.40	0.017333	8.36	54.92	34.08	0.95
Lower	3427.66*	10 yr	293.70	136.00	138.90		139.20	0.007941	4.39	66.97	43.52	0.62
Lower	3427.66*	25 yr	336.50	136.00	139.03		139.36	0.008375	4.63	72.65	45.26	0.64
Lower	3427.66*	50 yr	390.30	136.00	139.18		139.55	0.008872	4.92	79.41	47.25	0.67
Lower	3427.66*	100 yr	444.90	136.00	139.30		139.72	0.009507	5.21	85.32	48.93	0.70
Lower	3340.33*	10 yr	293.70	136.00	138.40		138.58	0.005788	3.31	88.60	69.58	0.52
Lower	3340.33*	25 yr	336.50	136.00	138.51		138.70	0.006102	3.50	96.16	72.42	0.54
Lower	3340.33*	50 yr	390.30	136.00	138.64		138.85	0.006373	3.69	105.69	75.86	0.55
Lower	3340.33*	100 yr	444.90	136.00	138.74		138.98	0.006647	3.92	113.47	79.57	0.57
Lower	3253	10 yr	293.70	136.00	137.85		138.00	0.007419	3.14	93.64	96.41	0.56
Lower	3253	25 yr	336.50	136.00	137.92		138.09	0.007934	3.33	101.12	100.18	0.58
Lower	3253	50 yr	390.30	136.00	138.01		138.20	0.008540	3.56	109.75	104.35	0.61
Lower	3253	100 yr	444.90	136.00	138.08		138.30	0.008857	3.79	117.58	107.97	0.63
Lower	3053*	10 yr	293.70	134.00	135.98		136.22	0.010797	3.95	74.44	71.92	0.68
Lower	3053*	25 yr	336.50	134.00	136.12		136.36	0.009443	3.98	84.62	76.09	0.65
Lower	3053*	50 yr	390.30	134.00	136.29		136.54	0.008043	4.03	97.94	81.09	0.62
Lower	3053*	100 yr	444.90	134.00	136.43		136.70	0.007293	4.12	110.36	85.50	0.60
Lower	2853*	10 yr	293.70	132.00	135.18		135.32	0.002331	3.04	109.05	70.56	0.36
Lower	2853*	25 yr	336.50	132.00	135.38		135.52	0.002238	3.15	123.39	75.42	0.36
Lower	2853*	50 yr	390.30	132.00	135.59		135.75	0.002218	3.32	140.48	88.17	0.36
Lower	2853*	100 yr	444.90	132.00	135.71		135.89	0.002420	3.57	151.86	96.47	0.38
Lower	2653	10 yr	293.70	130.00	134.35		134.65	0.004962	5.35	99.07	88.20	0.52
Lower	2653	25 yr	336.50	130.00	134.81		135.00	0.003093	4.60	148.94	132.12	0.42
Lower	2653	50 yr	390.30	130.00	135.13		135.28	0.002460	4.33	196.24	163.19	0.38
Lower	2653	100 yr	444.90	130.00	135.18		135.36	0.002914	4.76	205.72	168.73	0.41
Lower	2461*	10 yr	293.70	128.67	134.14		134.22	0.000977	2.99	219.30	169.48	0.25
Lower	2461*	25 yr	336.50	128.67	134.69		134.74	0.000566	2.46	325.72	212.97	0.19
Lower	2461*	50 yr	390.30	128.67	135.03		135.07	0.000465	2.33	400.55	227.24	0.18
Lower	2461*	100 yr	444.90	128.67	135.06		135.11	0.000578	2.61	407.73	228.39	0.20
Lower	2269*	10 yr	293.70	127.33	134.12		134.14	0.000173	1.52	431.21	201.22	0.11
Lower	2269*	25 yr	336.50	127.33	134.67		134.68	0.000121	1.35	544.95	210.31	0.09
Lower	2269*	50 yr	390.30	127.33	135.01		135.02	0.000116	1.37	616.96	215.86	0.09
Lower	2269*	100 yr	444.90	127.33	135.04		135.05	0.000147	1.55	622.39	216.27	0.11
Lower	2077	10 yr	293.70	126.00	134.11	129.32	134.12	0.000053	0.98	608.35	186.47	0.06
Lower	2077	25 yr	336.50	126.00	134.66	129.52	134.67	0.000047	0.96	714.93	198.92	0.06
Lower	2077	50 yr	390.30	126.00	135.00	129.78	135.01	0.000050	1.02	783.26	206.50	0.06
Lower	2077	100 yr	444.90	126.00	135.02	129.88	135.03	0.000064	1.16	787.84	207.00	0.07
Lower	1945		Culvert									
Lower	1848*	10 yr	293.70	126.00	133.88		133.88	0.000025	0.66	861.11	227.10	0.04
Lower	1848*	25 yr	336.50	126.00	134.59		134.59	0.000020	0.63	1027.96	241.38	0.04
Lower	1848*	50 yr	390.30	126.00	134.96		134.97	0.000021	0.67	1118.84	248.12	0.04
Lower	1848*	100 yr	444.90	126.00	134.96		134.97	0.000028	0.77	1119.02	248.14	0.05
Lower	1619	10 yr	362.80	126.00	133.88		133.88	0.000016	0.54	1232.58	277.50	0.04
Lower	1619	25 yr	416.10	126.00	134.59		134.59	0.000014	0.53	1434.03	287.77	0.03
Lower	1619	50 yr	483.40	126.00	134.96		134.96	0.000015	0.57	1541.76	292.93	0.04
Lower	1619	100 yr	551.70	126.00	134.96		134.96	0.000020	0.65	1541.67	292.93	0.04
Lower	1594.33*	10 yr	362.80	126.00	133.88		133.88	0.000016	0.54	1220.45	272.72	0.04
Lower	1594.33*	25 yr	416.10	126.00	134.59		134.59	0.000014	0.53	1420.10	288.43	0.03
Lower	1594.33*	50 yr	483.40	126.00	134.96		134.96	0.000015	0.58	1528.69	297.04	0.04
Lower	1594.33*	100 yr	551.70	126.00	134.96		134.96	0.000020	0.66	1528.56	297.03	0.04
Lower	1569.66*	10 yr	362.80	125.00	133.87		133.88	0.000013	0.53	1300.15	279.84	0.03
Lower	1569.66*	25 yr	416.10	125.00	134.59		134.59	0.000011	0.52	1502.97	289.58	0.03
Lower	1569.66*	50 yr	483.40	125.00	134.96		134.96	0.000012	0.56	1611.33	294.68	0.03
Lower	1569.66*	100 yr	551.70	125.00	134.96		134.96	0.000016	0.64	1611.18	294.67	0.04
Lower	1545.*	10 yr	362.80	125.00	133.87	127.91	133.88	0.000012	0.50	1351.60	281.27	0.03
Lower	1545.*	25 yr	416.10	125.00	134.59	128.00	134.59	0.000010	0.50	1556.19	292.22	0.03
Lower	1545.*	50 yr	483.40	125.00	134.96	128.46	134.96	0.000011	0.54	1665.54	297.41	0.03
Lower	1545.*	100 yr	551.70	125.00	134.96	128.67	134.96	0.000015	0.61	1665.38	297.41	0.04

HEC-RAS Plan: WC_EX_All River: West_Cozine_Cree Reach: Lower (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Lower	1505		Culvert									
Lower	1471.*	10 yr	362.80	124.00	129.38		129.41	0.000286	1.70	396.07	208.64	0.14
Lower	1471.*	25 yr	416.10	124.00	130.01		130.03	0.000178	1.47	530.19	217.61	0.11
Lower	1471.*	50 yr	483.40	124.00	130.68		130.70	0.000123	1.32	680.16	227.55	0.10
Lower	1471.*	100 yr	551.70	124.00	131.29		131.30	0.000095	1.24	821.42	236.53	0.09
Lower	1446.33*	10 yr	362.80	124.00	129.37		129.40	0.000281	1.69	391.10	204.65	0.14
Lower	1446.33*	25 yr	416.10	124.00	130.00		130.02	0.000177	1.47	523.27	213.74	0.11
Lower	1446.33*	50 yr	483.40	124.00	130.68		130.69	0.000125	1.34	673.50	231.51	0.10
Lower	1446.33*	100 yr	551.70	124.00	131.29		131.30	0.000098	1.26	819.28	245.94	0.09
Lower	1425	10 yr	362.80	123.00	129.37	125.47	129.39	0.000157	1.45	448.90	205.60	0.11
Lower	1425	25 yr	416.10	123.00	130.00	125.64	130.02	0.000111	1.31	581.28	214.03	0.09
Lower	1425	50 yr	483.40	123.00	130.68	125.84	130.69	0.000086	1.23	731.23	230.45	0.08
Lower	1425	100 yr	551.70	123.00	131.29	126.03	131.30	0.000071	1.19	876.07	244.14	0.08
Lower	1400		Culvert									
Lower	1372.33*	10 yr	362.80	123.00	128.76		128.78	0.000162	1.37	454.57	190.42	0.11
Lower	1372.33*	25 yr	416.10	123.00	129.36		129.38	0.000121	1.28	575.58	210.93	0.10
Lower	1372.33*	50 yr	483.40	123.00	129.96		129.98	0.000097	1.23	706.33	224.15	0.09
Lower	1372.33*	100 yr	551.70	123.00	130.47		130.48	0.000085	1.21	823.32	233.97	0.08
Lower	1347.66*	10 yr	362.80	122.00	128.76		128.77	0.000099	1.21	504.31	185.05	0.09
Lower	1347.66*	25 yr	416.10	122.00	129.36		129.37	0.000081	1.16	621.44	204.62	0.08
Lower	1347.66*	50 yr	483.40	122.00	129.96		129.97	0.000070	1.15	748.70	219.04	0.08
Lower	1347.66*	100 yr	551.70	122.00	130.47		130.48	0.000065	1.16	869.09	240.58	0.07
Lower	1323	10 yr	362.80	122.00	128.76		128.77	0.000097	1.20	512.35	198.32	0.09
Lower	1323	25 yr	416.10	122.00	129.36		129.37	0.000078	1.15	637.70	218.47	0.08
Lower	1323	50 yr	483.40	122.00	129.96		129.97	0.000067	1.13	775.06	238.61	0.07
Lower	1323	100 yr	551.70	122.00	130.47		130.48	0.000060	1.11	897.90	240.94	0.07
Lower	1190	10 yr	362.80	120.00	128.76		128.76	0.000015	0.58	898.80	168.84	0.04
Lower	1190	25 yr	416.10	120.00	129.36		129.36	0.000015	0.60	1001.72	174.24	0.04
Lower	1190	50 yr	483.40	120.00	129.96		129.96	0.000015	0.63	1107.89	179.64	0.04
Lower	1190	100 yr	551.70	120.00	130.47		130.48	0.000016	0.67	1200.85	184.94	0.04
Lower	1057*	10 yr	362.80	118.00	128.76		128.76	0.000009	0.51	1180.08	189.07	0.03
Lower	1057*	25 yr	416.10	118.00	129.36		129.36	0.000009	0.53	1295.68	196.00	0.03
Lower	1057*	50 yr	483.40	118.00	129.96		129.96	0.000009	0.57	1414.82	201.08	0.03
Lower	1057*	100 yr	551.70	118.00	130.47		130.47	0.000010	0.61	1518.46	205.37	0.03
Lower	925	10 yr	362.80	116.00	128.76		128.76	0.000004	0.38	1676.92	204.94	0.02
Lower	925	25 yr	416.10	116.00	129.36		129.36	0.000004	0.40	1801.06	208.84	0.02
Lower	925	50 yr	483.40	116.00	129.96		129.96	0.000005	0.44	1927.55	212.74	0.02
Lower	925	100 yr	551.70	116.00	130.47		130.47	0.000005	0.47	2036.89	216.06	0.02
Lower	716*	10 yr	362.80	115.00	128.76		128.76	0.000001	0.25	2315.13	265.44	0.01
Lower	716*	25 yr	416.10	115.00	129.36		129.36	0.000002	0.27	2476.36	271.90	0.01
Lower	716*	50 yr	483.40	115.00	129.96		129.96	0.000002	0.29	2641.38	278.25	0.01
Lower	716*	100 yr	551.70	115.00	130.47		130.47	0.000002	0.32	2784.74	283.95	0.01
Lower	506	10 yr	362.80	114.00	128.76		128.76	0.000001	0.18	3035.82	313.80	0.01
Lower	506	25 yr	416.10	114.00	129.36		129.36	0.000001	0.19	3229.50	331.80	0.01
Lower	506	50 yr	483.40	114.00	129.96		129.96	0.000001	0.21	3433.99	349.80	0.01
Lower	506	100 yr	551.70	114.00	130.47		130.47	0.000001	0.23	3612.98	351.00	0.01
Lower	312	10 yr	362.80	112.00	128.76		128.76	0.000000	0.15	3000.79	231.05	0.01
Lower	312	25 yr	416.10	112.00	129.36		129.36	0.000000	0.16	3140.28	233.93	0.01
Lower	312	50 yr	483.40	112.00	129.96		129.96	0.000001	0.18	3281.50	236.81	0.01
Lower	312	100 yr	551.70	112.00	130.47		130.47	0.000001	0.20	3404.23	244.99	0.01
Lower	156*	10 yr	362.80	110.00	128.76		128.76	0.000000	0.11	3938.78	272.36	0.00
Lower	156*	25 yr	416.10	110.00	129.36		129.36	0.000000	0.12	4103.09	275.34	0.01
Lower	156*	50 yr	483.40	110.00	129.96		129.96	0.000000	0.14	4269.19	278.33	0.01
Lower	156*	100 yr	551.70	110.00	130.47		130.47	0.000000	0.15	4411.79	280.87	0.01
Lower	0	10 yr	362.80	108.00	128.76	108.82	128.76	0.000000	0.09	4899.13	282.83	0.00
Lower	0	25 yr	416.10	108.00	129.36	108.89	129.36	0.000000	0.10	5069.22	284.12	0.00
Lower	0	50 yr	483.40	108.00	129.96	108.97	129.96	0.000000	0.11	5240.08	285.41	0.00
Lower	0	100 yr	551.70	108.00	130.47	109.06	130.47	0.000000	0.12	5386.40	288.53	0.00

HEC-RAS Hydraulic Model Results
North Cozine Creek


North_Cozine_Creek Plan: North Cozine Existing 4/10/2009
North_Cozine Lower
Legend
WS 100 yr
WS 50 yr
WS 25 yr
WS 10 yr
Ground
Elevation (ft)
Main Channel Distance (ft)
140
135
130
125
120
115
110
105
100
0
1000
2000
3000
4000
5000
Exten...
XS1 ...
one bridge...
Park Ave culve...
upstream of Pa...
upstream of Park ...
just downstream of two outfall...
downstream of Mitchelbook Rd
Squashed Pipe culvert under Michelbook Rd wit...
upstream of Mitchelbook Rd culvert
XS 14 top of model

HEC-RAS Plan: NC_EX River: North_Cozine Reach: Lower

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Lower	3399	10 yr	264.99	123.00	130.13	125.46	130.15	0.000069	1.33	300.31	113.84	0.10
Lower	3399	25 yr	307.70	123.00	135.36	125.65	135.36	0.000005	0.52	1081.73	180.30	0.03
Lower	3399	50 yr	362.40	123.00	135.64	125.86	135.65	0.000006	0.59	1132.73	183.24	0.03
Lower	3399	100 yr	417.60	123.00	135.81	126.05	135.82	0.000007	0.66	1164.55	185.06	0.03
Lower	3171	10 yr	264.99	124.00	130.14		130.14	0.000012	0.47	706.34	210.55	0.04
Lower	3171	25 yr	307.70	124.00	135.36		135.36	0.000001	0.22	2005.67	287.30	0.01
Lower	3171	50 yr	362.40	124.00	135.64		135.64	0.000001	0.25	2086.77	290.25	0.01
Lower	3171	100 yr	417.60	124.00	135.82		135.82	0.000001	0.28	2137.17	292.07	0.02
Lower	2814	10 yr	295.71	121.00	130.14		130.14	0.000001	0.18	1853.96	287.18	0.01
Lower	2814	25 yr	343.50	121.00	135.36		135.36	0.000000	0.12	3540.84	352.67	0.01
Lower	2814	50 yr	404.60	121.00	135.64		135.64	0.000000	0.14	3640.35	355.90	0.01
Lower	2814	100 yr	466.40	121.00	135.82		135.82	0.000000	0.16	3702.13	357.89	0.01
Lower	2680	10 yr	295.71	118.00	130.14	119.54	130.14	0.000001	0.22	1671.02	234.95	0.01
Lower	2680	25 yr	343.50	118.00	135.36	119.64	135.36	0.000000	0.17	2528.17	268.04	0.01
Lower	2680	50 yr	404.60	118.00	135.64	119.75	135.64	0.000000	0.19	2574.22	269.49	0.01
Lower	2680	100 yr	466.40	118.00	135.82	119.86	135.82	0.000000	0.22	2602.59	270.38	0.01
Lower	2514		Culvert									
Lower	2372	10 yr	295.71	117.00	130.02		130.02	0.000000	0.15	2882.72	292.28	0.01
Lower	2372	25 yr	343.50	117.00	135.31		135.31	0.000000	0.12	4631.71	365.71	0.00
Lower	2372	50 yr	404.60	117.00	135.59		135.59	0.000000	0.14	4736.78	368.72	0.01
Lower	2372	100 yr	466.40	117.00	135.76		135.77	0.000000	0.16	4800.58	370.53	0.01
Lower	2346	10 yr	313.49	117.00	130.02		130.02	0.000000	0.11	3058.78	297.14	0.01
Lower	2346	25 yr	364.30	117.00	135.31		135.31	0.000000	0.09	4754.72	353.16	0.00
Lower	2346	50 yr	429.20	117.00	135.59		135.59	0.000000	0.10	4856.37	357.35	0.00
Lower	2346	100 yr	494.90	117.00	135.76		135.77	0.000000	0.11	4918.27	359.88	0.00
Lower	1996	10 yr	363.64	115.00	130.02		130.02	0.000000	0.06	6618.72	527.00	0.00
Lower	1996	25 yr	422.80	115.00	135.31		135.31	0.000000	0.05	9607.74	603.80	0.00
Lower	1996	50 yr	498.40	115.00	135.59		135.59	0.000000	0.06	9781.10	607.96	0.00
Lower	1996	100 yr	574.90	115.00	135.76		135.76	0.000000	0.06	9886.26	610.47	0.00
Lower	1505	10 yr	363.64	112.00	130.02		130.02	0.000000	0.11	4250.39	329.21	0.00
Lower	1505	25 yr	422.80	112.00	135.31		135.31	0.000000	0.09	6133.02	379.88	0.00
Lower	1505	50 yr	498.40	112.00	135.59		135.59	0.000000	0.11	6242.05	382.27	0.00
Lower	1505	100 yr	574.90	112.00	135.76		135.76	0.000000	0.12	6308.15	383.71	0.00
Lower	1046	10 yr	374.70	107.00	130.02		130.02	0.000000	0.11	3963.29	274.08	0.00
Lower	1046	25 yr	435.70	107.00	135.31		135.31	0.000000	0.10	5515.81	323.00	0.00
Lower	1046	50 yr	513.70	107.00	135.59		135.59	0.000000	0.12	5608.22	323.00	0.00
Lower	1046	100 yr	592.60	107.00	135.76		135.76	0.000000	0.13	5663.96	323.00	0.00
Lower	795	10 yr	374.70	107.00	130.02		130.02	0.000000	0.07	6292.11	392.93	0.00
Lower	795	25 yr	435.70	107.00	135.31		135.31	0.000000	0.06	8609.66	445.00	0.00
Lower	795	50 yr	513.70	107.00	135.59		135.59	0.000000	0.07	8736.98	445.00	0.00
Lower	795	100 yr	592.60	107.00	135.76		135.76	0.000000	0.09	8813.78	445.00	0.00
Lower	708	10 yr	434.61	105.50	130.02	107.75	130.02	0.000000	0.15	2964.48	434.11	0.01
Lower	708	25 yr	504.50	105.50	135.31	107.86	135.31	0.000000	0.14	3651.74	454.57	0.00
Lower	708	50 yr	593.70	105.50	135.59	108.07	135.59	0.000000	0.16	3688.92	455.57	0.01
Lower	708	100 yr	683.90	105.50	135.76	108.16	135.76	0.000000	0.18	3711.34	456.17	0.01
Lower	578		Culvert									
Lower	462	10 yr	434.61	104.00	130.00		130.00	0.000000	0.09	6492.38	393.07	0.00
Lower	462	25 yr	504.50	104.00	135.30		135.30	0.000000	0.08	8387.55	521.80	0.00
Lower	462	50 yr	593.70	104.00	135.57		135.57	0.000000	0.09	8483.55	523.41	0.00
Lower	462	100 yr	683.90	104.00	135.74		135.74	0.000000	0.10	8543.37	524.41	0.00
Lower	292	10 yr	441.38	104.00	130.00		130.00	0.000000	0.09	6000.49	319.04	0.00
Lower	292	25 yr	512.30	104.00	135.30		135.30	0.000000	0.08	7805.42	361.45	0.00
Lower	292	50 yr	602.90	104.00	135.57		135.57	0.000000	0.09	7902.58	363.19	0.00
Lower	292	100 yr	694.50	104.00	135.74		135.74	0.000000	0.11	7963.36	364.28	0.00
Lower	55	10 yr	441.38	102.00	130.00	103.28	130.00	0.000000	0.15	2986.95	379.12	0.00
Lower	55	25 yr	512.30	102.00	135.30	103.40	135.30	0.000000	0.14	3569.44	454.50	0.00
Lower	55	50 yr	602.90	102.00	135.57	103.54	135.57	0.000000	0.17	3598.93	455.84	0.01
Lower	55	100 yr	694.50	102.00	135.73	103.67	135.74	0.000000	0.19	3617.30	456.67	0.01
Lower	-92		Culvert									

HEC-RAS Plan: NC_EX River: North_Cozine Reach: Lower (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Lower	-180	10 yr	441.38	100.00	130.00	104.04	130.00	0.000000	0.00	11880.00	419.00	0.00
Lower	-180	25 yr	512.30	100.00	135.27	104.30	135.27	0.000000	0.00	14088.13	419.00	0.00
Lower	-180	50 yr	602.90	100.00	135.52	104.65	135.52	0.000000	0.00	14192.88	419.00	0.00
Lower	-180	100 yr	694.50	100.00	135.72	104.95	135.72	0.000000	0.00	14276.68	419.00	0.00

HY-8 Culvert Analysis Report
Highway 99 Crossing at North Yamhill Tributary

Table 1 - Summary of Culvert Flows at Crossing: Hwy99_NYtrib_H20

Headwater Elevation (ft)	Total Discharge (cfs)	Hwy99_NYtrib_H20 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
135.00	0.00	0.00	0.00	1
137.33	30.60	30.60	0.00	1
138.58	61.20	61.20	0.00	1
139.81	91.80	91.80	0.00	1
141.41	122.40	122.40	0.00	1
143.53	153.00	153.00	0.00	1
145.94	183.60	181.42	0.00	50
146.09	208.00	183.02	24.46	8
146.17	244.80	183.83	60.63	5
146.22	275.40	184.36	90.66	4
146.26	306.00	184.86	120.99	4

Rating Curve Plot for Crossing: Hwy99_NYtrib_H20

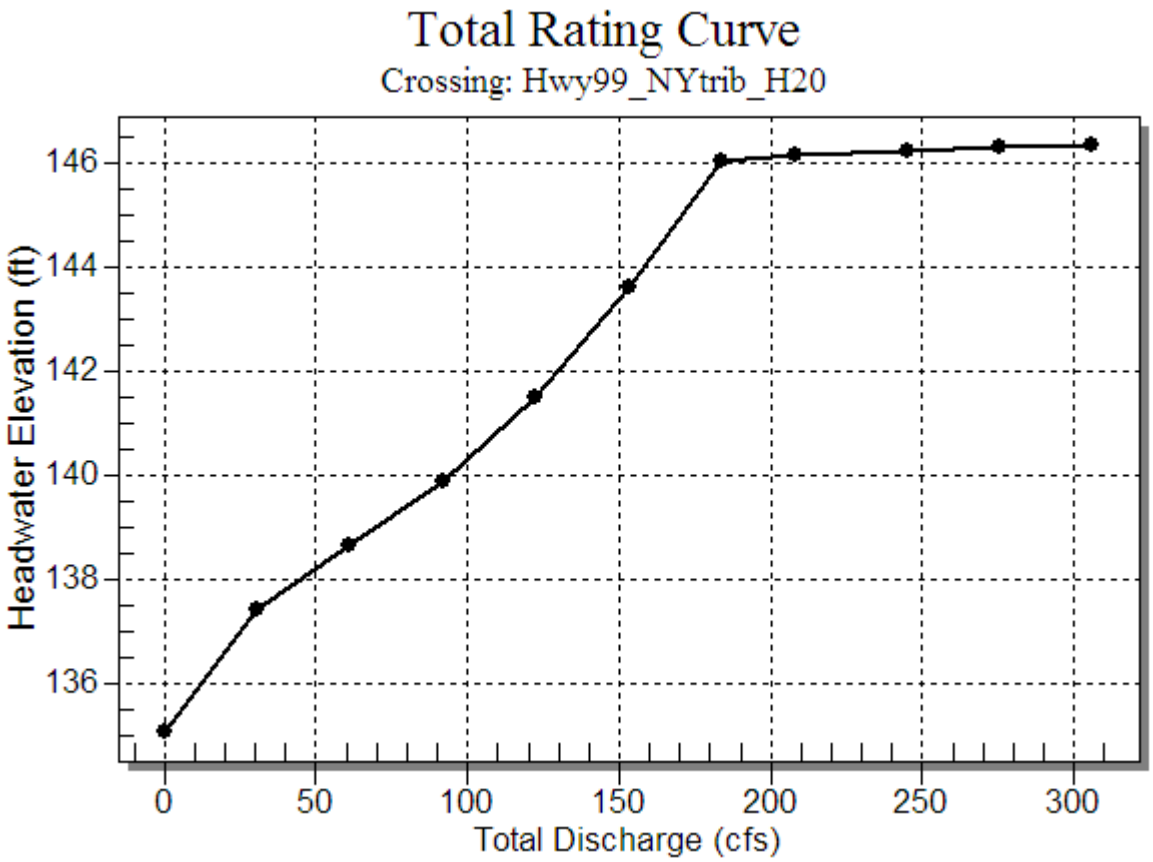


Table 2 - Culvert Summary Table: Hwy99_NYtrib_H20

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)
0.00	0.00	135.00	0.000	0.000	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
30.60	30.60	137.33	2.327	2.327	1-S2n	1.391	1.637	1.401	0.959	7.772	1.298
61.20	61.20	138.58	3.576	3.576	1-S2n	2.062	2.355	2.067	1.360	9.343	1.574
91.80	91.80	139.81	4.810	1.657	5-S2n	2.685	2.896	2.686	1.657	10.244	1.756
122.40	122.40	141.41	6.412	6.071	2-M2c	3.543	3.306	3.306	1.899	11.049	1.896
153.00	153.00	143.53	8.526	8.012	7-M2c	4.000	3.625	3.625	2.109	12.768	2.011
183.60	181.42	145.94	10.944	10.276	7-M2c	4.000	3.921	3.921	2.295	14.586	2.108
208.00	183.02	146.09	11.092	10.408	7-M2c	4.000	3.938	3.938	2.430	14.683	2.178
244.80	183.83	146.17	11.167	10.475	7-M2c	4.000	3.946	3.946	2.617	14.731	2.271
275.40	184.36	146.22	11.217	10.520	7-M2c	4.000	3.952	3.952	2.759	14.763	2.343
306.00	184.86	146.26	11.264	10.561	7-M2c	4.000	3.957	3.957	2.894	14.793	2.407

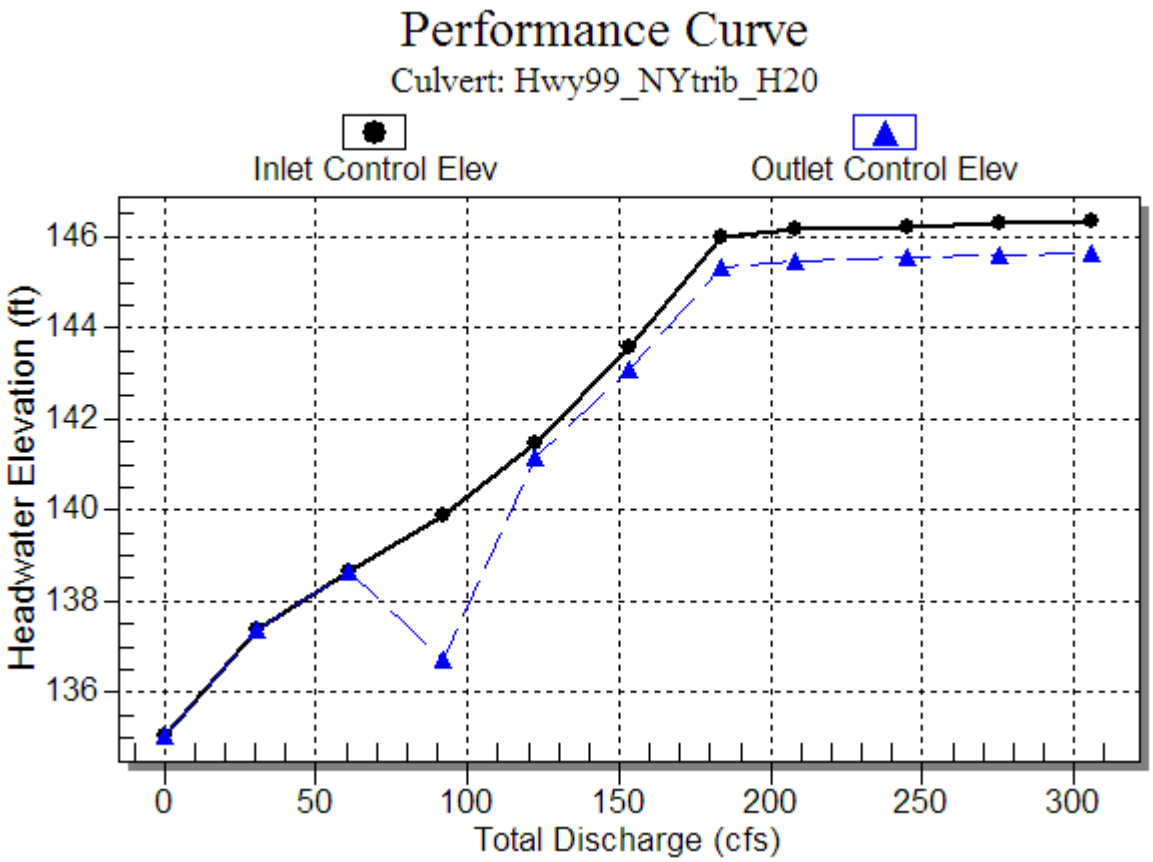
****

Inlet Elevation (invert): 135.00 ft, Outlet Elevation (invert): 134.00 ft

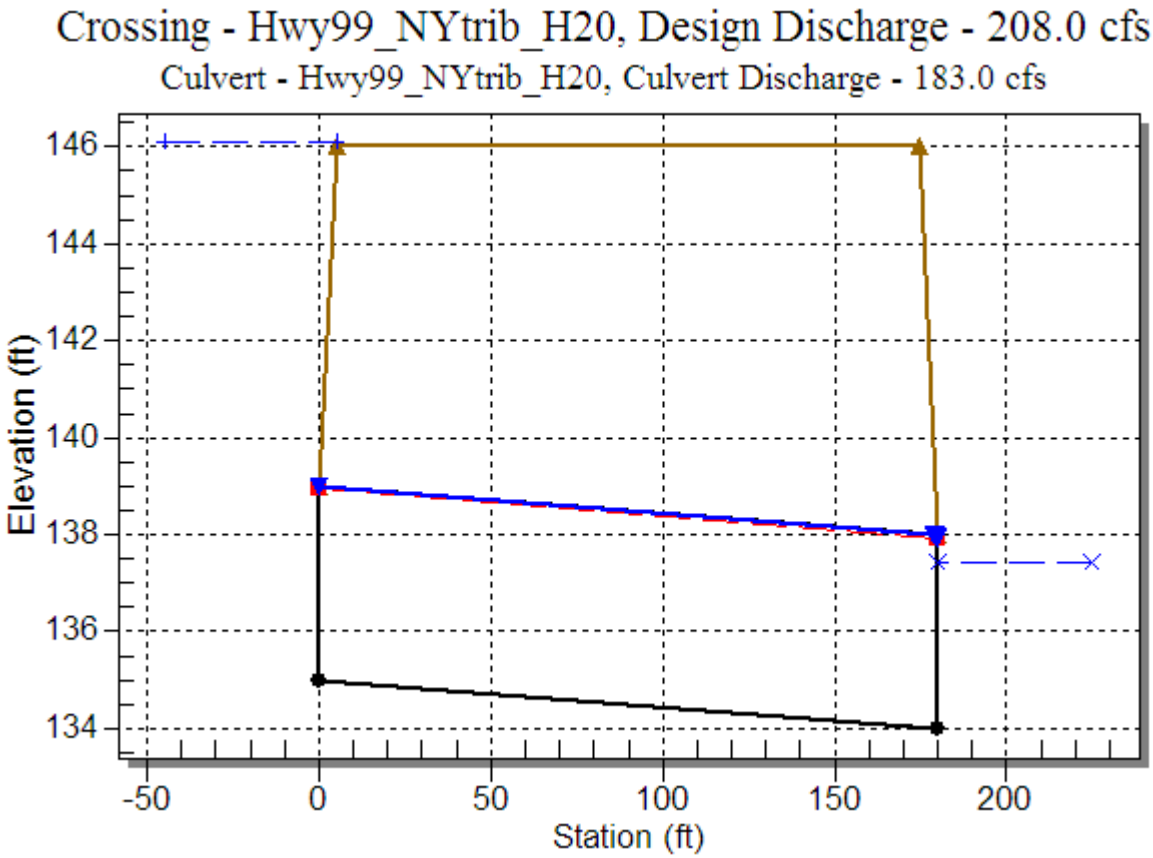
Culvert Length: 180.00 ft, Culvert Slope: 0.0056

****

Culvert Performance Curve Plot: Hwy99_NYtrib_H20



Water Surface Profile Plot for Culvert: Hwy99_NYtrib_H20



Site Data - Hwy99_NYtrib_H20

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 135.00 ft

Outlet Station: 180.00 ft

Outlet Elevation: 134.00 ft

Number of Barrels: 1

Culvert Data Summary - Hwy99_NYtrib_H20

Barrel Shape: Circular

Barrel Diameter: 4.00 ft

Barrel Material:

Barrel Manning's n: 0.0120

Inlet Type:

Inlet Edge Condition:

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: Hwy99_NYtrib_H20)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	135.00	0.00	0.00	0.00	0.00
30.60	135.96	0.96	1.30	0.23	0.28
61.20	136.36	1.36	1.57	0.32	0.29
91.80	136.66	1.66	1.76	0.39	0.30
122.40	136.90	1.90	1.90	0.45	0.30
153.00	137.11	2.11	2.01	0.50	0.31
183.60	137.29	2.29	2.11	0.54	0.31
208.00	137.43	2.43	2.18	0.58	0.31
244.80	137.62	2.62	2.27	0.62	0.32
275.40	137.76	2.76	2.34	0.65	0.32
306.00	137.89	2.89	2.41	0.69	0.32

Tailwater Channel Data - Hwy99_NYtrib_H20

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 15.00 ft

Side Slope (H:V): 10.00 (_:1)

Channel Slope: 0.0038

Channel Manning's n: 0.0550

Channel Invert Elevation: 135.00 ft

Roadway Data for Crossing: Hwy99_NYtrib_H20

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 300.00 ft

Crest Elevation: 146.00 ft

Roadway Surface: Paved

Roadway Top Width: 170.00 ft

HY-8 Culvert Analysis Report
NE Riverside Drive Crossing of South Yamhill Tributary

Table 1 - Summary of Culvert Flows at Crossing: NE Riverside DR_SY_Trib

Headwater Elevation (ft)	Total Discharge (cfs)	Riverside_SYtrib Discharge (cfs)	Roadway Discharge (cfs)	Iterations
137.43	52.00	52.00	0.00	1
137.50	54.20	54.20	0.00	1
137.56	56.40	56.40	0.00	1
137.61	58.00	58.00	0.00	1
137.69	60.80	60.80	0.00	1
137.75	63.00	63.00	0.00	1
137.82	65.20	65.20	0.00	1
137.88	67.40	67.40	0.00	1
137.95	69.60	69.60	0.00	1
138.00	71.80	71.37	0.01	19
138.02	74.00	71.90	1.85	6

Rating Curve Plot for Crossing: NE Riverside DR_SY_Trib

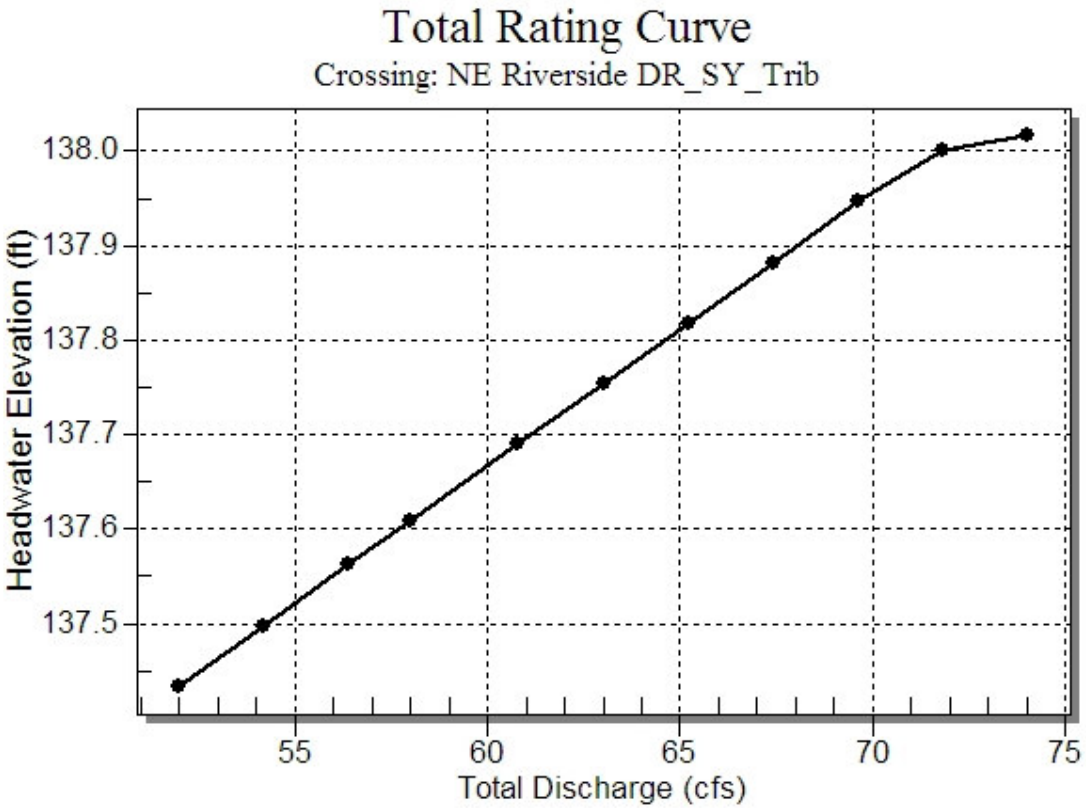


Table 2 - Culvert Summary Table: Riverside_SYtrib

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)
52.00	52.00	137.43	2.434	0.000	1-S2n	1.026	1.640	1.154	0.928	10.364	2.413
54.20	54.20	137.50	2.498	0.000	1-S2n	1.049	1.676	1.183	0.943	10.453	2.439
56.40	56.40	137.56	2.562	0.000	1-S2n	1.072	1.713	1.210	0.957	10.570	2.463
58.00	58.00	137.61	2.608	0.000	1-S2n	1.089	1.739	1.231	0.967	10.626	2.480
60.80	60.80	137.69	2.690	0.000	1-S2n	1.118	1.785	1.265	0.984	10.723	2.510
63.00	63.00	137.75	2.754	0.000	1-S2n	1.141	1.818	1.292	0.998	10.804	2.532
65.20	65.20	137.82	2.818	0.011	1-S2n	1.164	1.849	1.319	1.011	10.884	2.554
67.40	67.40	137.88	2.882	0.023	1-S2n	1.187	1.880	1.346	1.023	10.960	2.575
69.60	69.60	137.95	2.948	0.036	1-S2n	1.208	1.911	1.372	1.036	11.042	2.596
71.80	71.37	138.00	3.001	0.048	5-S2n	1.224	1.935	1.392	1.048	11.105	2.616
74.00	71.90	138.02	3.017	0.060	5-S2n	1.229	1.943	1.399	1.060	11.122	2.636

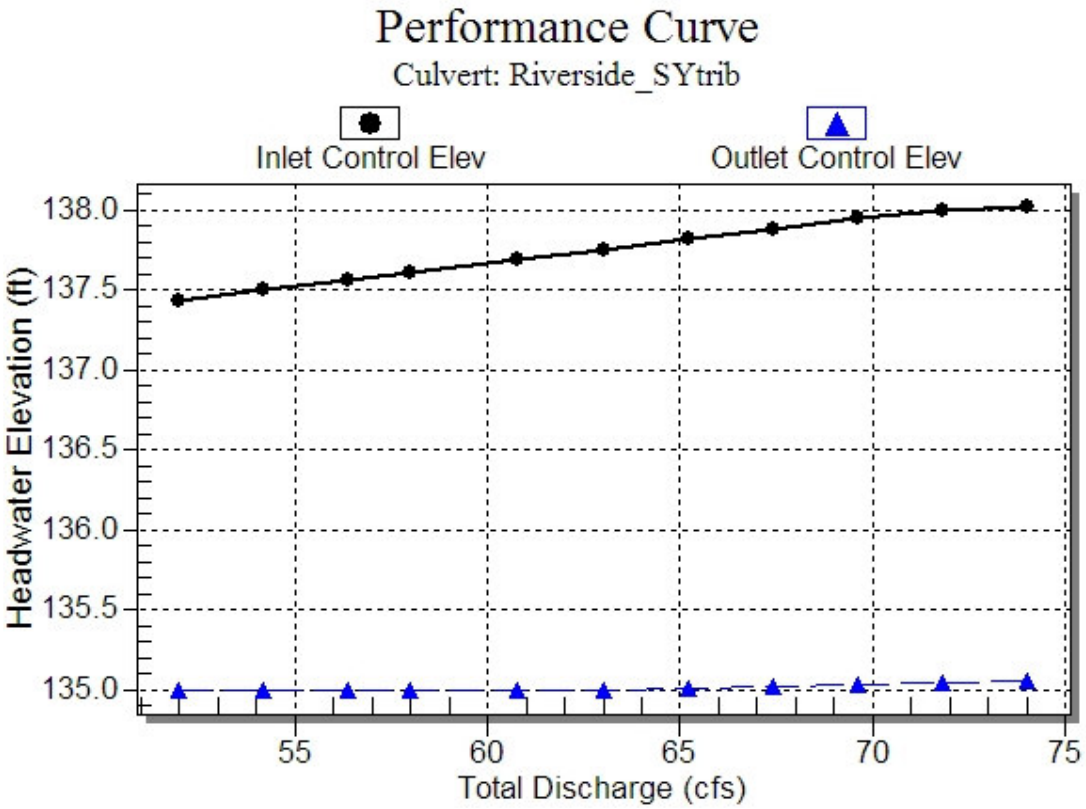
****

Inlet Elevation (invert): 135.00 ft, Outlet Elevation (invert): 134.00 ft

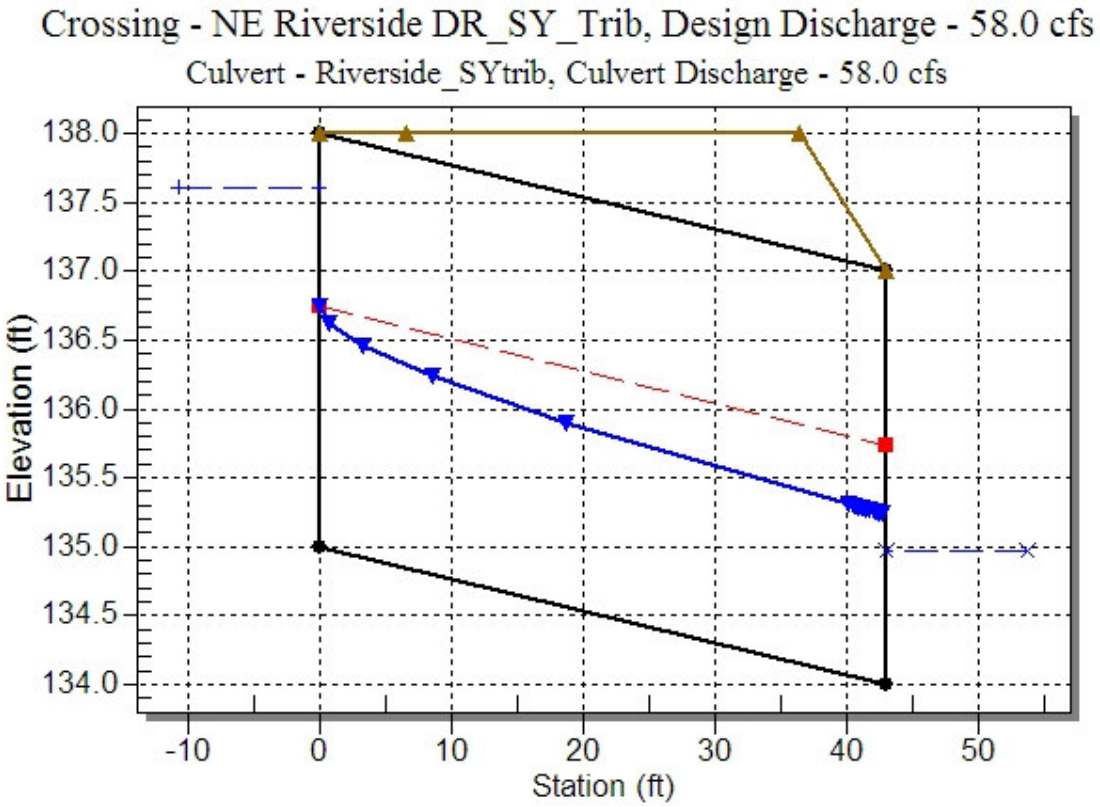
Culvert Length: 43.01 ft, Culvert Slope: 0.0233

****

Culvert Performance Curve Plot: Riverside_SYtrib



Water Surface Profile Plot for Culvert: Riverside_SYtrib



Site Data - Riverside_SYtrib

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 135.00 ft

Outlet Station: 43.00 ft

Outlet Elevation: 134.00 ft

Number of Barrels: 2

Culvert Data Summary - Riverside_SYtrib

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Concrete

Barrel Manning's n: 0.0130

Inlet Type: Conventional

Inlet Edge Condition: Square Edge with Headwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: NE Riverside DR_SY_Trib)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
52.00	134.93	0.93	2.41	0.52	0.62
54.20	134.94	0.94	2.44	0.53	0.63
56.40	134.96	0.96	2.46	0.54	0.63
58.00	134.97	0.97	2.48	0.54	0.63
60.80	134.98	0.98	2.51	0.55	0.63
63.00	135.00	1.00	2.53	0.56	0.63
65.20	135.01	1.01	2.55	0.57	0.63
67.40	135.02	1.02	2.58	0.57	0.63
69.60	135.04	1.04	2.60	0.58	0.64
71.80	135.05	1.05	2.62	0.59	0.64
74.00	135.06	1.06	2.64	0.60	0.64

Tailwater Channel Data - NE Riverside DR_SY_Trib

Tailwater Channel Option: Triangular Channel

Side Slope (H:V): 25.00 (_:1)

Channel Slope: 0.0090

Channel Manning's n: 0.0350

Channel Invert Elevation: 134.00 ft

Roadway Data for Crossing: NE Riverside DR_SY_Trib

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 300.00 ft

Crest Elevation: 138.00 ft

Roadway Surface: Paved

Roadway Top Width: 30.00 ft

HY-8 Culvert Analysis Report
Waggoner Crossing of North Yamhill Tributary

Table 1 - Summary of Culvert Flows at Crossing: Waggoner_NYtrib_H10R

Headwater Elevation (ft)	Total Discharge (cfs)	Waggoner_NYtrib_H10R Discharge (cfs)	Roadway Discharge (cfs)	Iterations
126.50	0.00	0.00	0.00	1
127.93	10.80	10.80	0.00	1
128.69	21.60	21.60	0.00	1
129.33	32.40	32.40	0.00	1
129.99	43.20	43.03	0.00	38
130.10	54.00	44.62	9.24	7
130.16	64.80	45.51	19.17	5
130.20	72.00	46.01	25.86	4
130.26	86.40	46.88	39.43	4
130.30	97.20	47.45	49.53	3
130.34	108.00	47.98	59.88	3

Rating Curve Plot for Crossing: Waggoner_NYtrib_H10R

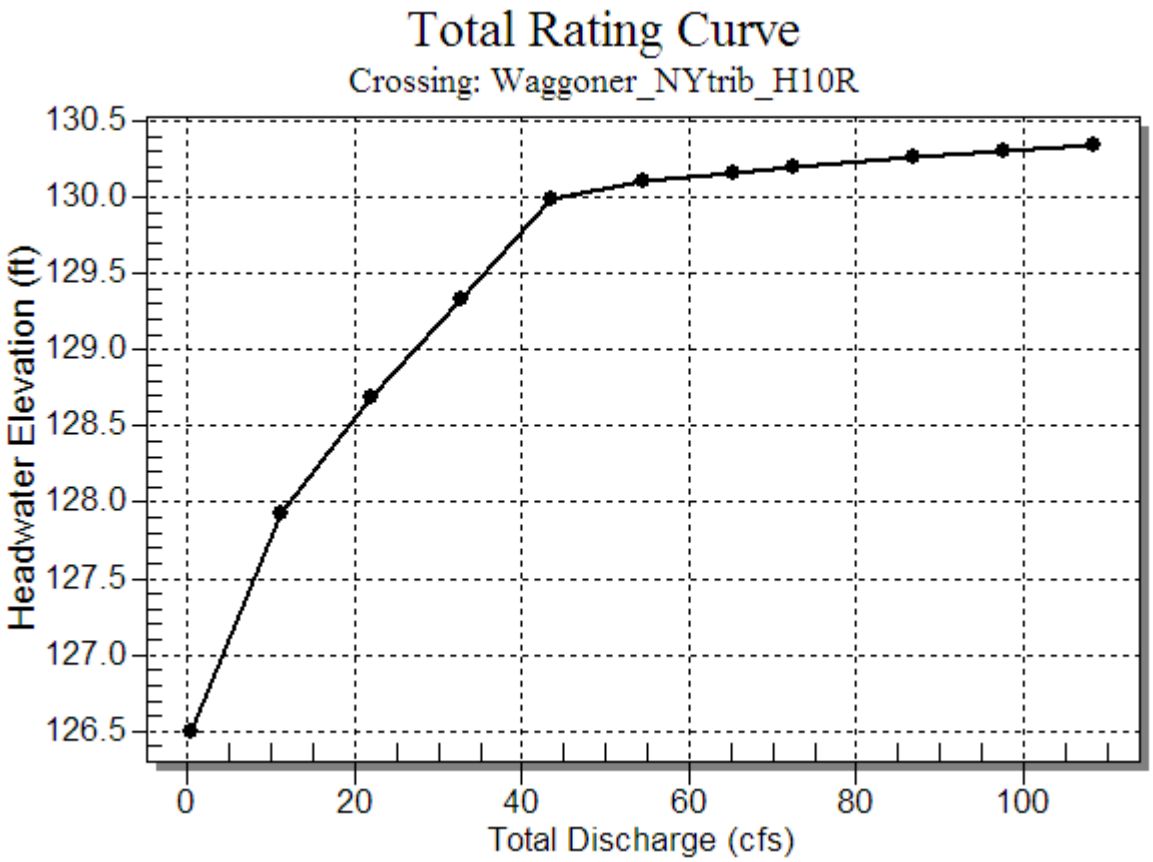


Table 2 - Culvert Summary Table: Waggoner_NYtrib_H10R

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)
0.00	0.00	126.50	0.000	0.000	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
10.80	10.80	127.93	1.432	0.000	1-S2n	0.874	1.031	0.880	0.368	6.233	1.288
21.60	21.60	128.69	2.194	0.046	1-S2n	1.266	1.493	1.272	0.546	7.563	1.643
32.40	32.40	129.33	2.831	0.184	1-S2n	1.603	1.844	1.608	0.684	8.401	1.884
43.20	43.03	129.99	3.491	0.302	5-S2n	1.928	2.133	1.951	0.802	8.854	2.071
54.00	44.62	130.10	3.599	0.406	5-S2n	1.978	2.170	1.984	0.906	9.009	2.226
64.80	45.51	130.16	3.662	0.499	5-S2n	2.006	2.190	2.009	0.999	9.056	2.358
72.00	46.01	130.20	3.696	0.558	5-S2n	2.021	2.201	2.026	1.058	9.066	2.437
86.40	46.88	130.26	3.759	0.666	5-S2n	2.048	2.221	2.053	1.166	9.101	2.579
97.20	47.45	130.30	3.800	0.741	5-S2n	2.066	2.234	2.068	1.241	9.133	2.673
108.00	47.98	130.34	3.839	0.812	5-S2n	2.083	2.247	2.086	1.312	9.149	2.759

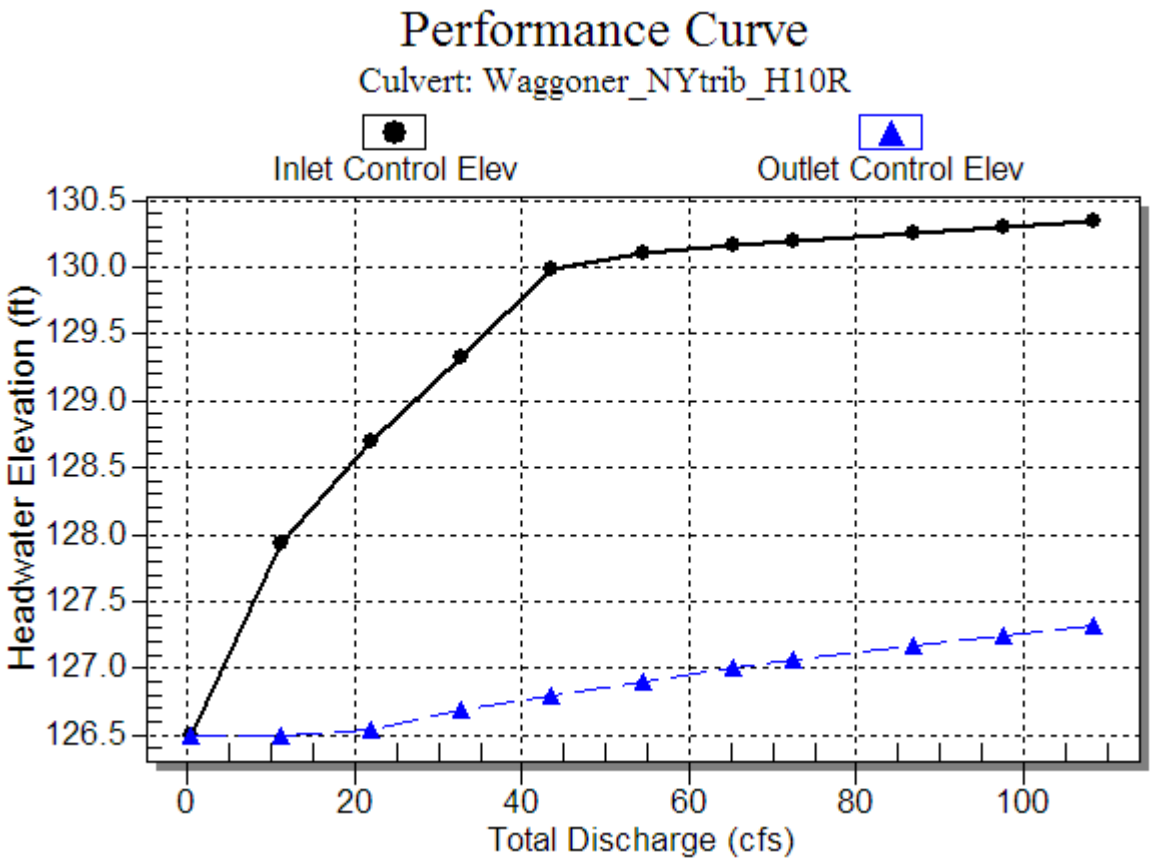
****

Inlet Elevation (invert): 126.50 ft, Outlet Elevation (invert): 126.00 ft

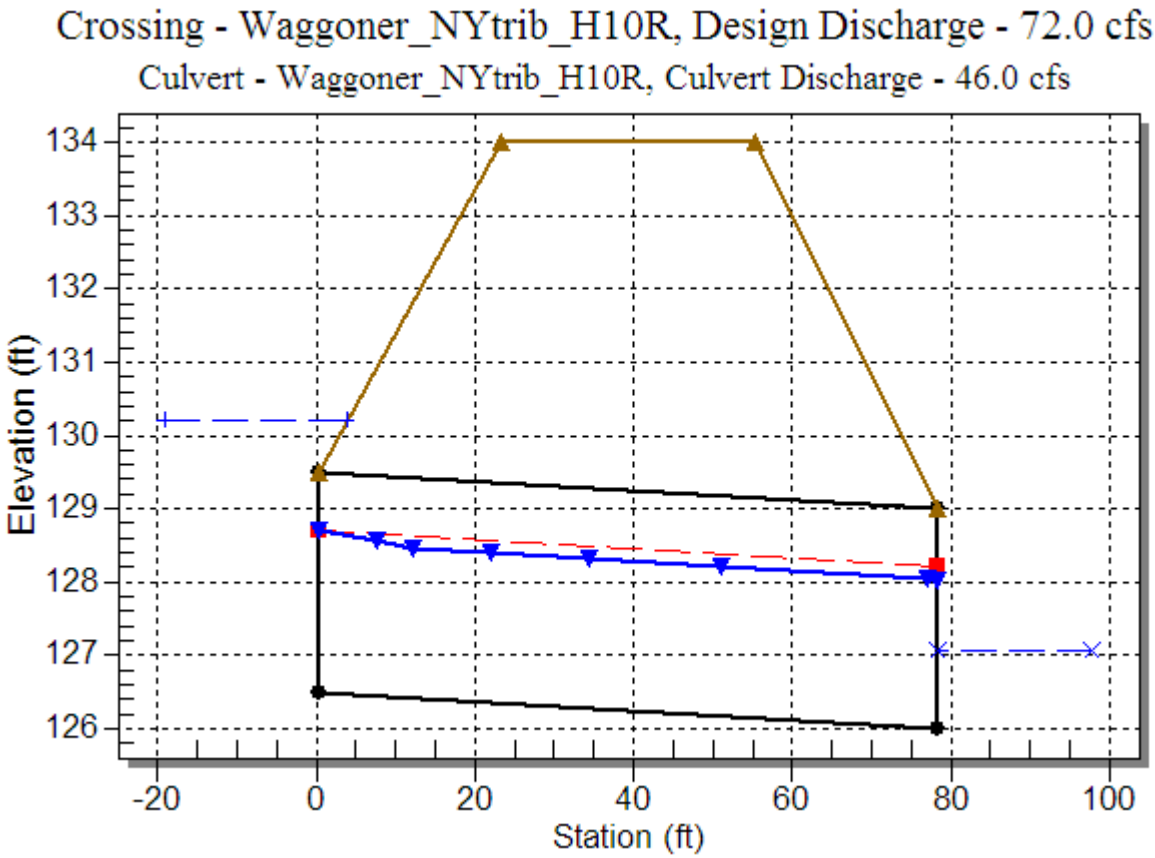
Culvert Length: 78.00 ft, Culvert Slope: 0.0064

****

Culvert Performance Curve Plot: Waggoner_NYtrib_H10R



Water Surface Profile Plot for Culvert: Waggoner_NYtrib_H10R



Site Data - Waggoner_NYtrib_H10R

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 126.50 ft

Outlet Station: 78.00 ft

Outlet Elevation: 126.00 ft

Number of Barrels: 1

Culvert Data Summary - Waggoner_NYtrib_H10R

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material:

Barrel Manning's n: 0.0120

Inlet Type:

Inlet Edge Condition:

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: Waggoner_NYtrib_H10R)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	126.00	0.00	0.00	0.00	0.00
10.80	126.37	0.37	1.29	0.11	0.40
21.60	126.55	0.55	1.64	0.17	0.42
32.40	126.68	0.68	1.88	0.21	0.44
43.20	126.80	0.80	2.07	0.25	0.45
54.00	126.91	0.91	2.23	0.28	0.46
64.80	127.00	1.00	2.36	0.31	0.47
72.00	127.06	1.06	2.44	0.33	0.47
86.40	127.17	1.17	2.58	0.36	0.48
97.20	127.24	1.24	2.67	0.39	0.49
108.00	127.31	1.31	2.76	0.41	0.49

Tailwater Channel Data - Waggoner_NYtrib_H10R

Tailwater Channel Option: Irregular Channel

Roadway Data for Crossing: Waggoner_NYtrib_H10R

Roadway Profile Shape: Irregular Roadway Shape (coordinates)

Roadway Surface: Paved

Roadway Top Width: 32.00 ft

Cost Estimate Supporting Materials

Cost Background

A critical element of a planning project is to determine an appropriate cost estimating methodology. It is the purpose of this cost estimating methodology to provide planning-level cost estimates for the projects identified as capital improvements under this master plan.

Introduction

In every planning project, it is necessary to estimate project construction costs, operations and maintenance costs for proposed facilities, and allowances for engineering, administrative costs, and contingencies. These initial estimates of project construction costs are important since they are used for budgeting CIP projects for the future. At the alternative analysis and planning stage, project-specific detailed engineering data are limited to preliminary design criteria and layouts, so costing methods must be developed to make use of this limited engineering data in best approximating project construction costs. This section establishes the criteria that were used in completing alternative analyses and preparing order-of-magnitude construction cost estimates at the alternative analysis and planning stage.

For this master plan, unit prices from the 1991 Plan were updated to reflect current construction costs.

Types of Cost Estimates

The Association for the Advancement of Cost Engineering, International (AACEI) and the American National Standards Institute have developed definitions for levels of accuracy commonly used by professional cost estimators. The AACEI has defined three distinct levels of cost estimates: *order-of-magnitude, budget, and definitive*. The master plan incorporated order-of-magnitude cost estimates.

An order-of-magnitude estimate is made without detailed engineering data. Some examples include estimates developed from cost-capacity curves, scale-up and scale-down factors, and approximate ratios. Typically, an order-of-magnitude estimate is prepared at the *end of the schematic design phase* of the design delivery process. An estimate of this type would be accurate within +30 percent to -25 percent of the estimated cost.

Basis for Adjustment of Costs over Time

Any cost estimate is time sensitive. Future changes in the costs of the components of construction will cause changes in the costs presented in the exhibits of this report. Because these costs are time sensitive, they are typically associated with a present time costing index that allows one to monitor and reflect the change of construction costs over time. The costs developed in this report are based on an *Engineering News-Record* Seattle Construction Cost Index for November 2007 of 8092. The costs presented in this report may be updated to future date costs by applying the ratio of the current cost index at that time to 8092. Because the relative cost-effectiveness of alternative projects can be expected to change only slightly with changes in the estimated costs, alternative selection decisions based on comparisons of present costs will produce valid results for at least 5 years. At that time, O&M and construction costs should be reviewed and updated as appropriate.

Basis for Development of Pipe Costing Tables

The following is a description of the process used to develop the pipeline costing tables included in this report. It should be noted that these tables have been modified from the previous plan, completed in 1991. The purpose of this narrative is to aid the user in understanding the scope included in the costing and the assumptions and methodology used in the development of the tables. In addition, this provides a procedure for future updating of the tables to fill a unique project-specific need or as a periodic global update.

Given the non-detailed nature of the master plan, the costing is parametric, that is, the unit prices for each type of improvement are categorized based on basic size or features, and not explicitly estimated as a detailed construction bid would be. The major parameters employed are pipe type, pipe diameter, and depth of installation. Simplifying assumptions are made concerning some variable elements (manhole and catch basin spacing, for example) and allowances are made on a linear foot basis to cover these elements and others. Because of their project-specific nature and variability, some parameters are listed as being outside the scope of the estimate.

The General Conditions allowance specifically includes the following items:

- Bonds, insurance, licenses, and permits
- Move in personnel and equipment
- Set up all offices, buildings, and facilities
- All required construction facilities
- Demobilization including removal of all facilities and clean up
- All other work not included in other bid items

The following items are specifically included in the lineal foot price:

- Excavation, hauling, and disposal
- Labor
- Materials and equipment for excavation, installation, compaction, etc.
- Pipe and pipe installation including bedding and backfill
- Laterals and lateral installation
- Manhole and manhole installation
- Overhead and profit

The following items are considered incidental and therefore are included in the costing for the installation of sewer pipe in city streets:

- Clearing and grubbing
- Adjustment of incidental structures to grade
- Landscaping
- Restoration and cleanup
- Removal and replacement of curbs, driveways, and sidewalks

The following major areas are excluded from the unit cost tables and must be added by the project estimator on a project specific basis:

- Traffic Control—a highly variable and project-specific element that will vary by location, type of traffic, and volume of traffic.

- Rock and concrete excavation must be added on a project-specific basis since it is also highly variable and not suited to general assumptions.
- Foundation stabilization is not included and must be added where required.
- Controlled density fill (CDF) backfill—all backfill is assumed to be granular imported material.
- Trench dewatering—another highly variable and project-specific element should be added where required.
- Erosion control.
- Tunneling, boring, and jacking are not included.
- Land acquisition—All work is assumed to be completed within the right-of-way; therefore, land acquisition is not an issue.
- Other excluded items that may potentially be costly include, but are not limited to, flow diversion, contaminated media, public involvement, right-of-way acquisition, noise abatement, public art allowance, permits (special), utility relocations, and interagency costs.

Standard Sewer Costing Worksheets

The 1991 Plan provided the unit costs for pipe construction shown in Table 1 using 1989 dollars (ENR construction cost index = 4615).

TABLE 1. 1991 PLAN UNIT COSTS
ENR CCI = 4615

Diameter	Cost
12	$38
15	$44
18	$48
21	$54
24	$58
27	$67
30	$72
36	$90
42	$98
48	$114
54	$154

These costs did not include manholes, catch basins, mobilization, engineering, administration or contingencies.

To create a new cost table, the following steps were taken:

- The previous costs were adjusted to current costs using the ENR Construction Cost Index (CCI) of 8092.
- An allowance was assumed of one manhole every 250 linear feet of replaced pipe at an average cost of $5,000 per manhole.
- An allowance was assumed of one catch basin and lateral assembly every 100 linear feet of replaced pipe at an average cost of $1,500 per assembly.
- A 10% allowance was added for design engineering.
- A 15% allowance was added for field engineering.
- A 10% allowance was added for project administration, mobilization, and contingency.

These allowances bring the adjusted unit costs in line with the methodology used for the previous plan and result in the unit costs shown in Table 2. Larger pipe size costs were extrapolated from regression of the reported cost data.

TABLE 2. 2007 PLAN UNIT COSTS INCLUDING ALLOWANCES FOR MANHOLES, CATCH BASINS, AND 35% NON-CONSTRUCTION COSTS
ENR CCI = 8092

Diameter	Cost
12	$137
15	$151
18	$161
21	$175
24	$185
27	$206
30	$218
36	$260
42	$279
48	$317
54	$412
60	$471
66	$558
72	$663
78	$790

Pipe Cost Worksheet

McMinnville Storm Drainage Master Plan
Pipe Cost Worksheet

Major Basin	STMAIN ID	Length of Pipe	Replacement Size	Unit Cost	Replacement Cost	CIP Ranking	Tier - 1 Cost	Tier - 2 Cost	Tier - 3 Cost	Tier - 4 Cost
Baker Creek										
	571	177	36	$ 260	$ 45,934	3			$ 45,934	
	935	190	36	$ 260	$ 49,314	3			$ 49,314	
	3699	211	48	$ 317	$ 66,782	3			$ 66,782	
	417	292	12	$ 137	$ 40,035	4				$ 40,035
	410	233	18	$ 161	$ 37,566	4				$ 37,566
	121	272	18	$ 161	$ 43,729	4				$ 43,729
	936	293	18	$ 161	$ 47,167	4				$ 47,167
	932	244	18	$ 161	$ 39,270	4				$ 39,270
	933	467	21	$ 175	$ 81,666	4				$ 81,666
	934	63	21	$ 175	$ 11,050	4				$ 11,050
	407	369	15	$ 151	$ 55,777	4				$ 55,777
	930	291	12	$ 137	$ 39,888	5				
	940	137	12	$ 137	$ 18,782	5				
	931	230	18	$ 161	$ 37,029	5				
						Sub-Total	**$ -**	**$ -**	**$ 162,029**	**$ 356,261**
Cozine Creek										
	87	284	15	$ 151	$ 42,901	1	$ 42,901			
	740	293	15	$ 151	$ 44,268	1	$ 44,268			
	714	293	15	$ 151	$ 44,265	1	$ 44,265			
	85	394	21	$ 175	$ 68,950	1	$ 68,950			
	84	317	21	$ 175	$ 55,536	1	$ 55,536			
	716	291	21	$ 175	$ 50,949	1	$ 50,949			
	540	107	24	$ 185	$ 19,795	1	$ 19,795			
	218	57	24	$ 185	$ 10,545	1	$ 10,545			
	717	291	27	$ 206	$ 59,977	1	$ 59,977			
	189	169	36	$ 260	$ 43,854	1	$ 43,854			
	94	49	36	$ 260	$ 12,781	1	$ 12,781			
	93	137	36	$ 260	$ 35,645	1	$ 35,645			
	95	56	36	$ 260	$ 14,521	1	$ 14,521			
	587	39	36	$ 260	$ 10,142	1	$ 10,142			
	190	187	42	$ 279	$ 52,080	1	$ 52,080			
	86	208	48	$ 317	$ 65,831	1	$ 65,831			
	597	262	18	$ 161	$ 42,158	2		$ 42,158		
	1081	421	21	$ 175	$ 73,734	2		$ 73,734		
	585	178	27	$ 206	$ 36,600	2		$ 36,600		
	90	225	60	$ 471	$ 105,819	2		$ 105,819		
	91	226	60	$ 471	$ 106,290	2		$ 106,290		
	722	579	12	$ 137	$ 79,277	3			$ 79,277	
	1133	252	12	$ 137	$ 34,539	3			$ 34,539	
	1516	226	12	$ 137	$ 30,977	3			$ 30,977	
	825	71	15	$ 151	$ 10,655	3			$ 10,655	
	582	188	21	$ 175	$ 32,842	3			$ 32,842	
	602	205	24	$ 185	$ 37,864	3			$ 37,864	
	621	135	24	$ 185	$ 24,908	3			$ 24,908	
	622	419	24	$ 185	$ 77,536	3			$ 77,536	
	197	202	48	$ 317	$ 63,929	3			$ 63,929	
	611	227	60	$ 471	$ 106,761	3			$ 106,761	
	1347	248	12	$ 137	$ 33,978	4				$ 33,978
	1349	392	12	$ 137	$ 53,696	4				$ 53,696
	223	92	12	$ 137	$ 12,641	4				$ 12,641
	1520	82	12	$ 137	$ 11,252	4				$ 11,252
	614	422	15	$ 151	$ 63,791	4				$ 63,791
	588	194	27	$ 206	$ 39,896	4				$ 39,896
	612	195	27	$ 206	$ 40,102	4				$ 40,102
	828	248	12	$ 137	$ 33,978	5				
	829	392	12	$ 137	$ 53,696	5				
	830	49	12	$ 137	$ 6,735	5				
	560	394	12	$ 137	$ 53,978	5				
	814	162	12	$ 137	$ 22,253	5				
	558	293	12	$ 137	$ 40,161	5				
	593	291	12	$ 137	$ 39,886	5				
	1351	252	15	$ 151	$ 38,099	5				
	103	122	15	$ 151	$ 18,367	5				
	599	220	42	$ 279	$ 61,287	5				
	600	221	42	$ 279	$ 61,566	5				
	1798	222	42	$ 279	$ 61,845	5				
	1799	223	42	$ 279	$ 62,124	5				
						Sub-Total	**$ 632,040**	**$ 364,600**	**$ 499,286**	**$ 255,357**

McMinnville Storm Drainage Master Plan

Pipe Cost Worksheet

Major Basin	STMAIN ID	Length of Pipe	Replacement Size	Unit Cost	Replacement Cost	CIP Ranking	Tier - 1 Cost	Tier - 2 Cost	Tier - 3 Cost	Tier - 4 Cost
East End										
	15	184	18	$ 161	$ 29,571	3			$ 29,571	
	1016	191	21	$ 175	$ 33,367	3			$ 33,367	
	7	252	24	$ 185	$ 46,644	3			$ 46,644	
	523	367	24	$ 185	$ 67,963	3			$ 67,963	
	980	224	27	$ 206	$ 46,076	3			$ 46,076	
	17	229	30	$ 218	$ 49,850	3			$ 49,850	
	518	155	30	$ 218	$ 33,718	3			$ 33,718	
	2330	156	30	$ 218	$ 33,936	3			$ 33,936	
	524	162	36	$ 260	$ 42,034	3			$ 42,034	
	1042	163	36	$ 260	$ 42,294	3			$ 42,294	
	8	180	36	$ 260	$ 46,714	3			$ 46,714	
	1040	181	36	$ 260	$ 46,974	3			$ 46,974	
	519	179	36	$ 260	$ 46,454	3			$ 46,454	
	1	198	42	$ 279	$ 55,149	3			$ 55,149	
	969	213	60	$ 471	$ 100,167	3			$ 100,167	
	1036	214	60	$ 471	$ 100,638	3			$ 100,638	
	1037	215	60	$ 471	$ 101,109	3			$ 101,109	
	1163	234	78	$ 790	$ 184,598	3			$ 184,598	
	1534	235	78	$ 790	$ 185,388	3			$ 185,388	
	1008	118	21	$ 175	$ 20,726	4				$ 20,726
	1019	207	24	$ 185	$ 38,234	4				$ 38,234
	975	428	24	$ 185	$ 79,108	4				$ 79,108
	976	342	24	$ 185	$ 63,253	4				$ 63,253
	1157	278	27	$ 206	$ 57,299	4				$ 57,299
	977	85	12	$ 137	$ 11,661	5				
	1160	276	15	$ 151	$ 41,715	5				
	1162	95	15	$ 151	$ 14,401	5				
	971	116	15	$ 151	$ 17,547	5				
	1429	190	15	$ 151	$ 28,727	5				
	1431	250	15	$ 151	$ 37,713	5				
	1437	251	15	$ 151	$ 37,940	5				
	1020	170	18	$ 161	$ 27,317	5				
						Sub-Total	**$ -**	**$ -**	**$ 1,292,642**	**$ 258,619**
Highway Basin										
	1059	292	36	$ 260	$ 75,980	2		$ 75,980		
	1064	343	36	$ 260	$ 89,213	2		$ 89,213		
	968	363	21	$ 175	$ 63,558	2		$ 63,558		
	1097	95	24	$ 185	$ 17,595	3			$ 17,595	
	40	65	21	$ 175	$ 11,350	3			$ 11,350	
	492	132	24	$ 185	$ 24,334	3			$ 24,334	
	2283	92	24	$ 185	$ 17,070	3			$ 17,070	
	2284	71	24	$ 185	$ 13,054	3			$ 13,054	
	51	135	21	$ 175	$ 23,554	3			$ 23,554	
	511	392	18	$ 161	$ 63,105	3			$ 63,105	
						Sub-Total	**$ -**	**$ 228,751**	**$ 170,062**	**$ -**
Midtown										
	862	46	15	$ 151	$ 6,914	1	$ 6,914			
	630	252	18	$ 161	$ 40,611	1	$ 40,611			
	1004	253	21	$ 175	$ 44,297	1	$ 44,297			
	1006	252	21	$ 175	$ 44,155	1	$ 44,155			
	577	116	24	$ 185	$ 21,498	1	$ 21,498			
	576	276	27	$ 206	$ 56,909	1	$ 56,909			
	624	95	27	$ 206	$ 19,646	1	$ 19,646			
	981	262	27	$ 206	$ 53,941	1	$ 53,941			
	651	160	36	$ 260	$ 41,600	1	$ 41,600			
	3133	189	36	$ 260	$ 49,139	1	$ 49,139			
	658	250	42	$ 279	$ 69,682	1	$ 69,682			
	578	251	42	$ 279	$ 70,102	1	$ 70,102			
	652	148	21	$ 175	$ 25,842	2		$ 25,842		
	653	149	21	$ 175	$ 26,017	2		$ 26,017		
	232	189	21	$ 175	$ 33,028	2		$ 33,028		
	530	472	27	$ 206	$ 97,155	2		$ 97,155		
	1152	139	18	$ 161	$ 22,426	3			$ 22,426	
	994	110	18	$ 161	$ 17,772	3			$ 17,772	
	3156	553	18	$ 161	$ 89,058	3			$ 89,058	
	949	248	18	$ 161	$ 39,857	3			$ 39,857	
	998	158	21	$ 175	$ 27,721	3			$ 27,721	
	995	150	21	$ 175	$ 26,192	3			$ 26,192	
	3132	190	36	$ 260	$ 49,463	3			$ 49,463	

McMinnville Storm Drainage Master Plan

Pipe Cost Worksheet

Major Basin	STMAIN ID	Length of Pipe	Replacement Size	Unit Cost	Replacement Cost	CIP Ranking	Tier - 1 Cost	Tier - 2 Cost	Tier - 3 Cost	Tier - 4 Cost
	475	243	48	$ 317	$ 76,926	3			$ 76,926	
	997	240	78	$ 790	$ 189,338	3			$ 189,338	
	986	151	12	$ 137	$ 20,642	4				$ 20,642
	1416	251	15	$ 151	$ 37,945	4				$ 37,945
	947	343	12	$ 137	$ 47,008	5				
	1003	436	12	$ 137	$ 59,770	5				
	3152	282	15	$ 151	$ 42,599	5				
	3134	182	36	$ 260	$ 47,320	5				
	570	242	48	$ 317	$ 76,609	5				
						Sub-Total	**$ 518,493**	**$ 182,042**	**$ 538,753**	**$ 58,586**
North Cozine Creek										
	699	284	15	$ 151	$ 42,901	1	$ 42,901			
	704	207	15	$ 151	$ 31,243	1	$ 31,243			
	683	160	18	$ 161	$ 25,707	1	$ 25,707			
	705	164	18	$ 161	$ 26,351	1	$ 26,351			
	401	317	18	$ 161	$ 51,093	1	$ 51,093			
	3100	80	24	$ 185	$ 14,818	1	$ 14,818			
	686	189	24	$ 185	$ 34,904	1	$ 34,904			
	706	257	24	$ 185	$ 47,581	1	$ 47,581			
	880	135	24	$ 185	$ 24,908	1	$ 24,908			
	391	230	24	$ 185	$ 42,548	1	$ 42,548			
	117	244	24	$ 185	$ 45,124	1	$ 45,124			
	744	247	27	$ 206	$ 50,904	1	$ 50,904			
	634	234	27	$ 206	$ 48,200	1	$ 48,200			
	CIP004	840	27	$ 206	$ 173,040	1	$ 173,040			
	693	206	30	$ 218	$ 44,836	1	$ 44,836			
	876	292	30	$ 218	$ 63,674	1	$ 63,674			
	645	228	30	$ 218	$ 49,742	1	$ 49,742			
	648	200	30	$ 218	$ 43,681	1	$ 43,681			
	633	419	30	$ 218	$ 91,367	1	$ 91,367			
	745	252	36	$ 260	$ 65,548	1	$ 65,548			
	700	217	36	$ 260	$ 56,334	1	$ 56,334			
	702	218	36	$ 260	$ 56,594	1	$ 56,594			
	194	207	36	$ 260	$ 53,796	1	$ 53,796			
	100	421	36	$ 260	$ 109,547	1	$ 109,547			
	707	30	36	$ 260	$ 7,795	1	$ 7,795			
	703	237	42	$ 279	$ 66,030	1	$ 66,030			
	102	63	42	$ 279	$ 17,612	1	$ 17,612			
	97	63	42	$ 279	$ 17,587	1	$ 17,587			
	773	85	42	$ 279	$ 23,748	1	$ 23,748			
	647	436	42	$ 279	$ 121,721	1	$ 121,721			
	772	282	42	$ 279	$ 78,709	1	$ 78,709			
	99	29	48	$ 317	$ 9,150	1	$ 9,150			
	101	82	48	$ 317	$ 26,036	1	$ 26,036			
	775	422	48	$ 317	$ 133,919	1	$ 133,919			
	748	226	54	$ 412	$ 93,157	1	$ 93,157			
	3098	500	54	$ 412	$ 206,040	1	$ 206,040			
	774	239	54	$ 412	$ 98,447	1	$ 98,447			
	179	225	54	$ 412	$ 92,554	1	$ 92,554			
	114	293	72	$ 663	$ 194,233	1	$ 194,233			
	546	272	72	$ 663	$ 180,354	1	$ 180,354			
	112	290	72	$ 663	$ 192,270	1	$ 192,270			
	1193	390	72	$ 663	$ 258,570	1	$ 258,570			
	198	330	12	$ 137	$ 45,201	2		$ 45,201		
	762	18	18	$ 161	$ 2,898	2		$ 2,898		
	107	227	18	$ 161	$ 36,626	2		$ 36,626		
	752	251	18	$ 161	$ 40,457	2		$ 40,457		
	763	183	18	$ 161	$ 29,410	2		$ 29,410		
	226	90	27	$ 206	$ 18,540	2		$ 18,540		
	225	69	27	$ 206	$ 14,214	2		$ 14,214		
	785	252	36	$ 260	$ 65,554	2		$ 65,554		
	1682	35	36	$ 260	$ 9,196	2		$ 9,196		
	1683	24	36	$ 260	$ 6,268	2		$ 6,268		
	776	428	78	$ 790	$ 337,813	2		$ 337,813		
	129	303	78	$ 790	$ 239,071	2		$ 239,071		
	3831	139	78	$ 790	$ 109,656	2		$ 109,656		
	243	241	78	$ 790	$ 190,128	2		$ 190,128		
	3830	105	78	$ 790	$ 82,942	2		$ 82,942		
	801	228	12	$ 137	$ 31,260	3			$ 31,260	
	109	146	18	$ 161	$ 23,453	3			$ 23,453	
	110	147	18	$ 161	$ 23,614	3			$ 23,614	

McMinnville Storm Drainage Master Plan

Pipe Cost Worksheet

Major Basin	STMAIN ID	Length of Pipe	Replacement Size	Unit Cost	Replacement Cost	CIP Ranking	Tier - 1 Cost	Tier - 2 Cost	Tier - 3 Cost	Tier - 4 Cost
	786	268	18	$ 161	$ 43,169	3			$ 43,169	
	802	30	21	$ 175	$ 5,218	3			$ 5,218	
	111	174	24	$ 185	$ 32,129	3			$ 32,129	
	766	175	24	$ 185	$ 32,314	3			$ 32,314	
	115	192	27	$ 206	$ 39,484	3			$ 39,484	
	591	193	27	$ 206	$ 39,690	3			$ 39,690	
	227	118	27	$ 206	$ 24,397	3			$ 24,397	
	549	176	27	$ 206	$ 36,188	3			$ 36,188	
	649	55	30	$ 218	$ 11,904	3			$ 11,904	
	230	209	36	$ 260	$ 54,254	3			$ 54,254	
	231	210	36	$ 260	$ 54,514	3			$ 54,514	
	241	200	36	$ 260	$ 51,914	3			$ 51,914	
	589	238	60	$ 471	$ 111,942	3			$ 111,942	
	398	24	12	$ 137	$ 3,303	4				$ 3,303
	879	425	12	$ 137	$ 58,225	4				$ 58,225
	879	425	12	$ 137	$ 58,225	4				$ 58,225
	751	304	12	$ 137	$ 41,671	4				$ 41,671
	118	314	18	$ 161	$ 50,606	4				$ 50,606
	1648	225	18	$ 161	$ 36,168	4				$ 36,168
	1639	139	21	$ 175	$ 24,291	4				$ 24,291
	229	230	42	$ 279	$ 64,077	4				$ 64,077
	400	250	12	$ 137	$ 34,254	5				
	392	189	12	$ 137	$ 25,892	5				
	393	189	12	$ 137	$ 25,856	5				
	119	472	12	$ 137	$ 64,613	5				
	771	29	12	$ 137	$ 3,954	5				
	764	55	12	$ 137	$ 7,481	5				
	396	65	12	$ 137	$ 8,885	5				
	646	239	12	$ 137	$ 32,736	5				
	765	63	12	$ 137	$ 8,636	5				
	244	269	12	$ 137	$ 36,787	5				
	127	330	18	$ 161	$ 53,120	5				
	954	159	21	$ 175	$ 27,767	5				
	966	105	21	$ 175	$ 18,373	5				
	1647	30	21	$ 175	$ 5,246	5				
						Sub-Total	**$ 3,112,369**	**$ 1,227,976**	**$ 615,440**	**$ 336,566**
South Yamhill										
	724	579	12	$ 137	$ 79,277	1	$ 79,277			
	1202	278	12	$ 137	$ 38,107	2		$ 38,107		
	188	122	15	$ 151	$ 18,367	2		$ 18,367		
	1200	233	36	$ 260	$ 60,613	2		$ 60,613		
	75	161	18	$ 161	$ 25,868	3			$ 25,868	
	732	234	18	$ 161	$ 37,671	3			$ 37,671	
	733	200	18	$ 161	$ 32,260	3			$ 32,260	
	469	35	21	$ 175	$ 6,190	3			$ 6,190	
	983	152	24	$ 185	$ 28,059	3			$ 28,059	
	3702	165	24	$ 185	$ 30,464	3			$ 30,464	
	3703	166	24	$ 185	$ 30,649	3			$ 30,649	
	3704	167	24	$ 185	$ 30,834	3			$ 30,834	
	1487	168	24	$ 185	$ 31,019	3			$ 31,019	
	1474	182	24	$ 185	$ 33,609	3			$ 33,609	
	725	197	24	$ 185	$ 36,384	3			$ 36,384	
	989	212	27	$ 206	$ 43,604	3			$ 43,604	
	726	199	27	$ 206	$ 40,926	3			$ 40,926	
	74	203	27	$ 206	$ 41,750	3			$ 41,750	
	973	228	36	$ 260	$ 59,194	3			$ 59,194	
	471	239	54	$ 412	$ 98,331	3			$ 98,331	
	728	135	12	$ 137	$ 18,439	4				$ 18,439
	73	369	12	$ 137	$ 50,606	4				$ 50,606
	727	227	12	$ 137	$ 31,167	4				$ 31,167
	737	252	12	$ 137	$ 34,557	4				$ 34,557
	1365	63	12	$ 137	$ 8,648	4				$ 8,648
	1012	154	18	$ 161	$ 24,741	4				$ 24,741
	1014	201	24	$ 185	$ 37,124	4				$ 37,124
	77	145	24	$ 185	$ 26,764	4				$ 26,764
	202	204	27	$ 206	$ 41,956	4				$ 41,956
	71	216	36	$ 260	$ 56,074	4				$ 56,074
	19	219	60	$ 471	$ 102,993	4				$ 102,993
	731	56	12	$ 137	$ 7,651	5				
	736	363	12	$ 137	$ 49,757	5				
	1364	253	12	$ 137	$ 34,679	5				

McMinnville Storm Drainage Master Plan

Pipe Cost Worksheet

Major Basin	STMAIN ID	Length of Pipe	Replacement Size	Unit Cost	Replacement Cost	CIP Ranking	Tier - 1 Cost	Tier - 2 Cost	Tier - 3 Cost	Tier - 4 Cost
	730	500	15	$ 151	$ 75,515	5				
	982	153	18	$ 161	$ 24,580	5				
	31	236	66	$ 558	$ 131,503	5				
						Sub-Total	**$ 79,277**	**$ 117,087**	**$ 606,808**	**$ 433,067**
West Cozine										
	146	91	12	$ 137	$ 12,471	1	$ 12,471			
	144	304	15	$ 151	$ 45,929	1	$ 45,929			
	145	201	15	$ 151	$ 30,386	1	$ 30,386			
	142	248	18	$ 161	$ 39,857	1	$ 39,857			
	618	110	18	$ 161	$ 17,772	1	$ 17,772			
	853	46	21	$ 175	$ 8,013	1	$ 8,013			
	3834	553	36	$ 260	$ 143,821	1	$ 143,821			
	160	196	36	$ 260	$ 50,874	1	$ 50,874			
	1119	233	54	$ 412	$ 95,991	1	$ 95,991			
	3833	407	54	$ 412	$ 167,485	1	$ 167,485			
	336	392	12	$ 137	$ 53,698	2		$ 53,698		
	810	84	15	$ 151	$ 12,706	2		$ 12,706		
	338	292	15	$ 151	$ 44,104	2		$ 44,104		
	140	303	18	$ 161	$ 48,722	2		$ 48,722		
	561	319	18	$ 161	$ 51,292	2		$ 51,292		
	553	314	18	$ 161	$ 50,606	2		$ 50,606		
	335	264	18	$ 161	$ 42,580	2		$ 42,580		
	552	181	21	$ 175	$ 31,639	2		$ 31,639		
	850	93	21	$ 175	$ 16,282	2		$ 16,282		
	851	145	21	$ 175	$ 25,317	2		$ 25,317		
	860	196	21	$ 175	$ 34,289	2		$ 34,289		
	162	157	24	$ 185	$ 28,984	2		$ 28,984		
	166	91	24	$ 185	$ 16,840	2		$ 16,840		
	334	233	24	$ 185	$ 43,103	2		$ 43,103		
	811	171	27	$ 206	$ 35,158	2		$ 35,158		
	650	172	27	$ 206	$ 35,364	2		$ 35,364		
	149	185	30	$ 218	$ 40,258	2		$ 40,258		
	847	158	30	$ 218	$ 34,533	2		$ 34,533		
	161	186	36	$ 260	$ 48,274	2		$ 48,274		
	CIP002	410	36	$ 260	$ 106,600	2		$ 106,600		
	351	231	78	$ 790	$ 182,228	2		$ 182,228		
	352	232	78	$ 790	$ 183,018	2		$ 183,018		
	843	407	24	$ 185	$ 75,206	3			$ 75,206	
	844	93	24	$ 185	$ 17,212	3			$ 17,212	
	840	173	36	$ 260	$ 44,894	3			$ 44,894	
	1079	30	48	$ 317	$ 9,452	3			$ 9,452	
	882	257	12	$ 137	$ 35,236	4				$ 35,236
	857	112	12	$ 137	$ 15,351	4				$ 15,351
	858	80	15	$ 151	$ 12,095	4				$ 12,095
	859	247	15	$ 151	$ 37,313	4				$ 37,313
	852	201	21	$ 175	$ 35,215	4				$ 35,215
	326	233	21	$ 175	$ 40,798	4				$ 40,798
	854	158	24	$ 185	$ 29,169	4				$ 29,169
	353	233	78	$ 790	$ 183,808	4				$ 183,808
	163	39	12	$ 137	$ 5,344	5				
	164	95	12	$ 137	$ 13,030	5				
	1732	132	12	$ 137	$ 18,020	5				
						Sub-Total	**$ 612,599**	**$ 1,165,591**	**$ 146,764**	**$ 388,984**
						Total	**$ 4,954,778**	**$ 3,286,047**	**$ 4,031,785**	**$ 2,087,439**

Project Cost Worksheet

McMinnville Storm Drainage Plan

Project Cost Worksheet

STMAINS_ID	Major Basin	Sub Basin	Exist. Dia.	Exist Q10	Future Q10	Tier Rank	Length	Prop. Dia.	Unit Cost	Replacement Cost	Proj_Name
714	Cozine Creek	C-30R	12.0	5	5	1	293	15	$151	$44,266	1st Street from Adams to Evans
716	Cozine Creek	C-30R	12.0	9	9	1	291	21	$175	$50,951	1st Street from Adams to Evans
717	Cozine Creek	C-30R	12.0	14	15	1	291	27	$206	$59,979	1st Street from Adams to Evans
93	Cozine Creek	C-30R	12.0	17	17	1	137	36	$260	$35,645	1st Street from Adams to Evans
94	Cozine Creek	C-30R	14.0	17	18	1	49	36	$260	$12,782	1st Street from Adams to Evans
95	Cozine Creek	C-30R	15.0	17	18	1	56	36	$260	$14,522	1st Street from Adams to Evans
587	Cozine Creek	C-30R	14.0	17	18	1	39	36	$260	$10,142	1st Street from Adams to Evans
Sub-Total Cost										**$228,287**	
876	North Cozine	N-0RR	12.0	15	15	1	292	30	$218	$63,675	4th Street from Birch to Cowls
645	North Cozine	N-0RR	12.0	15	15	1	228	30	$218	$49,743	4th Street from Birch to Cowls
100	North Cozine	N-0RR	14.0	21	21	1	421	36	$260	$109,551	4th Street from Birch to Cowls
97	North Cozine	N-0RR	14.0	24	24	1	63	42	$279	$17,588	4th Street from Birch to Cowls
102	North Cozine	N-0RR	14.0	24	24	1	63	42	$279	$17,612	4th Street from Birch to Cowls
99	North Cozine	N-0	14.0	35	35	1	29	48	$317	$9,150	4th Street from Birch to Cowls
101	North Cozine	N-0	14.0	35	35	1	82	48	$317	$26,036	4th Street from Birch to Cowls
Sub-Total Cost										**$293,356**	
699	North Cozine	N-0R1	12.0	4	4	1	284	15	$151	$42,902	7th Street and Cedar Street System
704	North Cozine	N-0R1R	12.0	4	4	1	295	15	$151	$44,567	7th Street and Cedar Street System
683	North Cozine	N-0R1	15.0	7	7	1	264	18	$161	$42,552	7th Street and Cedar Street System
705	North Cozine	N-0R1R	12.0	7	7	1	291	18	$161	$46,873	7th Street and Cedar Street System
686	North Cozine	N-0R1	15.0	11	11	1	251	24	$185	$46,433	7th Street and Cedar Street System
706	North Cozine	N-0R1R	15.0	11	11	1	257	24	$185	$47,583	7th Street and Cedar Street System
3100	North Cozine	N-0R	24.0	11	11	1	80	24	$185	$14,819	7th Street and Cedar Street System
744	North Cozine	N-0R	15.0	12	12	1	247	27	$206	$50,905	7th Street and Cedar Street System
693	North Cozine	N-0R1	18.0	15	15	1	255	30	$218	$55,624	7th Street and Cedar Street System
700	North Cozine	N-0R1	21.0	19	19	1	268	36	$260	$69,752	7th Street and Cedar Street System
702	North Cozine	N-0R1	21.0	19	19	1	157	36	$260	$40,869	7th Street and Cedar Street System
745	North Cozine	N-0R	24.0	17	17	1	252	36	$260	$65,550	7th Street and Cedar Street System
707	North Cozine	N-0R1R	15.0	22	22	1	30	36	$260	$7,795	7th Street and Cedar Street System
703	North Cozine	N-0R	21.0	24	24	1	93	42	$279	$26,010	7th Street and Cedar Street System
748	North Cozine	N-0R	24.0	46	46	1	226	54	$412	$93,159	7th Street and Cedar Street System
3098	North Cozine	N-0R	24.0	46	46	1	500	54	$412	$206,039	7th Street and Cedar Street System
Sub-Total Cost										**$901,432**	
862	Midtown	M-10	10.0	5	5	1	234	15	$151	$35,352	Alpine Street from 7th to 12th
630	Midtown	M-10	10.0	6	6	1	252	18	$161	$40,611	Alpine Street from 7th to 12th
1004	Midtown	M-10	12.0	9	9	1	253	21	$175	$44,298	Alpine Street from 7th to 12th
1006	Midtown	M-10	10.0	9	9	1	252	21	$175	$44,155	Alpine Street from 7th to 12th
577	Midtown	M-10	12.0	12	12	1	116	24	$185	$21,498	Alpine Street from 7th to 12th
576	Midtown	M-10	12.0	13	13	1	276	27	$206	$56,909	Alpine Street from 7th to 12th
624	Midtown	M-10	12.0	13	13	1	95	27	$206	$19,647	Alpine Street from 7th to 12th
981	Midtown	M-10	12.0	13	13	1	262	27	$206	$53,942	Alpine Street from 7th to 12th
Sub-Total Cost										**$316,410**	
401	North Cozine	N-20R	10.0	5	5	1	317	18	$161	$51,093	Elm Street System
118	North Cozine	N-20R	12.0	5	5	4	314	18	$161	$50,605	Elm Street System
880	North Cozine	N-10R1R	18.0	11	11	1	453	24	$185	$83,845	Elm Street System
391	North Cozine	N-20R	15.0	11	11	1	230	24	$185	$42,548	Elm Street System
117	North Cozine	N-20R	15.0	11	11	1	244	24	$185	$45,124	Elm Street System
634	North Cozine	N-10R1	15.0	14	14	1	234	27	$206	$48,200	Elm Street System
633	North Cozine	N-10R1R	18.0	16	16	1	419	30	$218	$91,366	Elm Street System
648	North Cozine	N-10R1	15.0	16	16	1	200	30	$218	$43,680	Elm Street System
649	North Cozine	N-10R	15.0	16	16	3	55	30	$218	$11,903	Elm Street System
194	North Cozine	N-20R	18.0	17	17	1	207	36	$260	$53,795	Elm Street System
647	North Cozine	N-10R1R	21.0	24	24	1	436	42	$279	$121,725	Elm Street System
772	North Cozine	N-10R1R	21.0	25	25	1	282	42	$279	$78,711	Elm Street System
773	North Cozine	N-10R1R	21.0	24	24	1	85	42	$279	$23,749	Elm Street System
775	North Cozine	N-10R	27.0	40	40	1	422	48	$317	$133,918	Elm Street System
774	North Cozine	N-10R	27.0	46	46	1	239	54	$412	$98,446	Elm Street System
179	North Cozine	N-10R	27.0	50	50	1	225	54	$412	$92,553	Elm Street System
114	North Cozine	N-10	30.0	80	84	1	293	72	$663	$194,231	Elm Street System
546	North Cozine	N-10	30.0	82	86	1	272	72	$663	$180,352	Elm Street System
112	North Cozine		0.0	0	0	1	291	72	$663	$192,932	Elm Street System
1193	North Cozine		0.0	0	0	1	391	72	$663	$259,219	Elm Street System
Sub-Total Cost										**$1,897,996**	
3132	Midtown	M-30R	12.0	19	19	3	190	36	$260	$49,463	Galloway Street from 12th to 17th
651	Midtown		0.0	0	0	1	160	36	$260	$41,573	Galloway Street from 12th to 17th
3133	Midtown	M-30R	12.0	20	20	1	189	36	$260	$49,138	Galloway Street from 12th to 17th
3134	Midtown		0.0	0	0	5	183	36	$260	$47,571	Galloway Street from 12th to 17th
578	Midtown	M-30R	12.0	25	25	1	251	42	$279	$70,102	Galloway Street from 12th to 17th
658	Midtown	M-30R	12.0	25	25	1	250	42	$279	$69,681	Galloway Street from 12th to 17th
Sub-Total Cost										**$327,528**	
146	West Cozine	W-10	12.0	3	3	1	91	12	$137	$12,471	Gouchen Street to Fleishaven
144	West Cozine	W-0	12.0	4	4	1	304	15	$151	$45,930	Gouchen Street to Fleishaven
145	West Cozine	W-0	12.0	4	4	1	201	15	$151	$30,386	Gouchen Street to Fleishaven
142	West Cozine	W-0	12.0	5	6	1	248	18	$161	$39,857	Gouchen Street to Fleishaven
618	West Cozine	W-0	12.0	5	6	1	110	18	$161	$17,772	Gouchen Street to Fleishaven
3834	West Cozine	W-0	15.0	18	19	1	553	36	$260	$143,825	Gouchen Street to Fleishaven
1119	West Cozine	W-10	36.0	43	44	1	233	54	$412	$95,991	Gouchen Street to Fleishaven
3833	West Cozine	W-10	36.0	43	44	1	407	54	$412	$167,484	Gouchen Street to Fleishaven
Sub-Total Cost										**$553,717**	
87	Cozine Creek	C-30L	12.0	5	5	1	139	15	$151	$20,964	Linfield Avenue near Hwy 99
740	Cozine Creek	C-30L	12.0	5	5	1	217	15	$151	$32,704	Linfield Avenue near Hwy 99
84	Cozine Creek	C-30L	12.0	8	8	1	261	21	$175	$45,707	Linfield Avenue near Hwy 99
85	Cozine Creek	C-30L	12.0	9	9	1	386	21	$175	$67,596	Linfield Avenue near Hwy 99
218	Cozine Creek		0.0	0	0	1	57	24	$185	$10,556	Linfield Avenue near Hwy 99
540	Cozine Creek		0.0	0	0	1	108	24	$185	$19,950	Linfield Avenue near Hwy 99
189	Cozine Creek	C-30L	24.0	18	19	1	239	36	$260	$62,034	Linfield Avenue near Hwy 99
190	Cozine Creek	C-30L	24.0	25	25	1	453	42	$279	$126,484	Linfield Avenue near Hwy 99
86	Cozine Creek	C-30L	24.0	35	35	1	182	48	$317	$57,686	Linfield Avenue near Hwy 99
Sub-Total Cost										**$443,680**	
Total Cost										**$4,962,406**	