

**APPENDIX B**  
**CROSS-SECTION DATA**

Assume:

- $\rho_{\text{water}}$  (slug/ft<sup>3</sup>) = 2
- $g$  = gravity (ft/s<sup>2</sup>) = 32.2
- $s$  =  $\rho_s/\rho$  (quartz particles) = 2.65
- $d$  = particle dia. (ft) = 0.005
- $\rho_{\text{water}}$  (slug/ft<sup>3</sup>) = 5.3
- $\nu$  = viscosity<sub>water</sub> (ft<sup>2</sup>/s) = 1.00E-05

Big Chico Creek

1-year, 6-month, and 3-month flows over 24 year period, 1/16-inch gravels

HEC-RAS Plan: Imported Pla River: RIVER-1 Reach: Reach-1

Reach	River Sta	Q Total (cfs)	E.G. Slope (ft/ft)	Mannings Coefficient	Flow Area (sq ft)	Hydraulic Radius (R <sub>h</sub> )* (ft)	Shear Stress (lb/ft <sup>2</sup> )	Shield's Parameter Y	Reynolds Number (R <sub>e</sub> ) If $Y < 0.06$ , $Y > 0.06$ , Y	Erosion	Critical Depth (Y <sub>c</sub> ) (ft)	Bed Load Transport (C <sub>b</sub> ) (ft <sup>2</sup> /s)	Bed Load Transport Vol. (cu. yards)
Reach-1	2810	266	0.003767	0.08	88.44	4.3	1.035	1.87	375	Yes	0.14	0.05	12,604
Reach-1	2800	266	0.002571	0.08	102.2	4.6	0.758	1.37	321	Yes	0.20	0.03	7,745
Reach-1	2790	266	0.002271	0.08	99.48	5.2	0.765	1.38	322	Yes	0.23	0.03	7,861
Reach-1	2780	266	0.004814	0.08	79.1	4.2	1.301	2.35	420	Yes	0.11	0.08	17,944
Reach-1	2770	266	0.001711	0.08	113.11	5.3	0.588	1.06	282	Yes	0.30	0.02	5,187
Reach-1	2760	266	0.002763	0.08	92.88	5.0	0.890	1.61	347	Yes	0.19	0.04	9,969
Reach-1	2750	266	0.002293	0.08	98.18	5.3	0.782	1.41	326	Yes	0.22	0.03	8,138
Reach-1	2740	266	0.002808	0.08	96.64	4.7	0.842	1.52	338	Yes	0.18	0.04	9,142
Reach-1	2730	266	0.002138	0.08	123.06	4.0	0.548	0.99	273	Yes	0.24	0.02	4,634
Reach-1	2720	266	0.048063	0.08	32.64	2.8	8.728	15.77	1088	Yes	0.01	1.36	322,085
Reach-1	2710	266	0.047462	0.08	36.06	2.5	7.492	13.54	1008	Yes	0.01	1.08	255,942
Reach-1	2700	266	0.001415	0.08	164.85	3.5	0.319	0.58	208	Yes	0.36	0.01	1,915
Reach-1	2690	266	0.002945	0.08	115.85	3.4	0.649	1.17	297	Yes	0.18	0.03	6,077
Reach-1	2680	266	0.006211	0.08	116.59	1.9	0.775	1.40	324	Yes	0.08	0.03	8,029
Reach-1	5490	169	0.031999	0.045	31.41	0.9	1.784	3.22	492	Yes	0.02	0.12	29,110
Reach-1	5480	169	0.000474	0.045	143.34	2.1	0.064	0.12	93	Yes	1.09	0.00	67
Reach-1	5470	169	0.002067	0.045	72.99	1.9	0.254	0.46	186	Yes	0.25	0.01	1,303
Reach-1	5460	Culvert											0
Reach-1	5450	169	0.0056	0.045	57.08	1.3	0.471	0.85	253	Yes	0.09	0.02	3,640
Reach-1	5440	169	0.011321	0.045	50.62	0.9	0.673	1.22	302	Yes	0.05	0.03	6,423
Reach-1	5430	169	0.00257	0.07	299.01	2.1	0.035	0.06	69	Yes	2.01	0.00	1
Reach-1	5420	169	0.000318	0.07	292.65	2.8	0.058	0.10	89	Yes	1.62	0.00	49
Reach-1	5355	169	0.001751	0.07	111.89	2.2	0.249	0.45	184	Yes	0.29	0.01	1,260
Reach-1	5350	169	0.004578	0.09	98.93	1.9	0.555	1.00	274	Yes	0.11	0.02	4,739
Reach-1	5330	Bridge											0
Reach-1	5310	169	0.125978	0.09	30.85	0.9	7.303	13.20	995	Yes	0.00	1.04	246,255
Reach-1	4500	169	0.000653	0.09	212.09	2.6	0.109	0.20	121	Yes	0.79	0.00	261
Reach-1	4491	169	0.016319	0.09	58.42	1.6	1.681	3.04	478	Yes	0.03	0.11	26,581

Assume:

$\rho_{\text{water}} \text{ (slug/ft}^3\text{)} = 2$   
 $g = \text{gravity (ft/s}^2\text{)} = 32.2$   
 $s = \text{sgf (quartz particles)} = 2.65$   
 $d = \text{particle dia. (ft)} = 0.005$   
 $\rho_{\text{water}} \text{ (slug/ft}^3\text{)} = 5.3$   
 $\mu = \text{viscosity water (ft}^2\text{/s)} = 1.00\text{E-}05$

Big Chico Creek

1-year, 6-month, and 3-month flows over 24 year period, 1/16-inch gravels

HEC-RAS Plan: Imported Pla River: RIVER-1 Reach: Reach-1

Reach	River Sta	Q Total (cfs)	E.G. Slope (ft/ft)	Mannings Coefficient	Flow Area (sq ft)	Hydraulic Radius (R <sub>h</sub> )* (ft)	Shear Stress (lb/ft <sup>2</sup> )	Shield's Parameter Y	Reynolds Number (R <sub>e</sub> ) If Y < 0.06, Y > 0.06, Y	Erosion	Critical Depth (Y <sub>c</sub> ) (ft)	Bed Load Transport (q <sub>b</sub> ) (ft <sup>2</sup> /s)	Bed Load Transport Vol. (cu. yards)
Reach-1	4490	169	0.006222	0.09	98	1.5	0.608	1.10	287	Yes	0.08	0.02	5,476
Reach-1	4480	169	0.002028	0.09	144.08	2.0	0.258	0.47	187	Yes	0.25	0.01	1,337
Reach-1	4470	169	0.00916	0.09	91.11	1.3	0.747	1.35	318	Yes	0.06	0.03	7,579
Reach-1	4460	169	0.000964	0.09	325.02	1.0	0.063	0.11	93	Yes	0.53	0.00	65
Reach-1	4455	169	0.023962	0.09	61.94	1.1	1.695	3.06	480	Yes	0.02	0.11	26,919
Reach-1	4450	169	0.004281	0.09	122.7	1.4	0.395	0.71	232	Yes	0.12	0.01	2,737
Reach-1	4440	169	0.004341	0.09	91.2	2.2	0.619	1.12	290	Yes	0.12	0.02	5,633
Reach-1	4430	Bridge											0
Reach-1	4420	169	0.004622	0.09	89.3	2.2	0.649	1.17	297	Yes	0.11	0.03	6,071
Reach-1	4410	169	0.003996	0.09	111.38	2.2	0.418	0.76	238	Yes	0.17	0.01	2,999
Reach-1	4401	169	0.024437	0.09	58.17	1.2	1.872	3.38	504	Yes	0.02	0.13	31,322
Reach-1	4400	169	0.131796	0.09	34.38	0.7	6.278	11.34	923	Yes	0.00	0.83	196,059
Reach-1	4390	169	0.000763	0.09	183.84	2.9	0.140	0.25	138	Yes	0.68	0.00	439
Reach-1	4386	169	0.004593	0.09	85.05	2.4	0.697	1.26	307	Yes	0.11	0.03	6,797
Reach-1	4385.5	Bridge											0
Reach-1	4385	169	0.004871	0.09	83.35	2.3	0.729	1.32	314	Yes	0.11	0.03	7,295
Reach-1	4380	169	0.004099	0.09	96.44	2.1	0.561	1.01	276	Yes	0.13	0.02	4,820
Reach-1	4370	169	0.002553	0.09	135.21	1.8	0.300	0.54	202	Yes	0.20	0.01	1,734
Reach-1	4360	169	0.0022	0.09	135.48	2.0	0.288	0.52	198	Yes	0.23	0.01	1,620
Reach-1	4350	169	0.000423	0.09	270.4	2.5	0.068	0.12	96	Yes	1.22	0.00	81
Reach-1	4349	169	0.137781	0.09	36.43	0.7	5.820	10.52	888	Yes	0.00	0.74	174,885
Reach-1	4340	169	0.002264	0.09	148.51	1.7	0.253	0.46	185	Yes	0.23	0.01	1,296
Reach-1	4330	169	0.002307	0.09	142.29	1.8	0.271	0.49	192	Yes	0.22	0.01	1,459
Reach-1	4329	169	0.002316	0.09	142.12	1.8	0.272	0.49	192	Yes	0.22	0.01	1,466
Reach-1	4327	Bridge											0
Reach-1	4325	169	0.002758	0.09	134.11	1.7	0.310	0.56	205	Yes	0.19	0.01	1,829
Reach-1	4320	169	0.002225	0.09	154.62	1.7	0.237	0.43	179	Yes	0.23	0.00	1,158
Reach-1	4315	169	0.002002	0.09	160.27	1.7	0.219	0.40	172	Yes	0.26	0.00	1,006

Assume:

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- $s$  =  $\rho_s / \rho$  (quartz particles) = 2.65
- $d$  = particle dia. (ft) = 0.005
- $\rho_{\text{water}}$  (slug/ft<sup>3</sup>) = 5.3
- $\mu$  = viscosity water (ft<sup>2</sup>/s) = 1.00E-05

Big Chico Creek

1-year, 6-month, and 3-month flows over 24 year period, 1/16-inch gravels

HEC-RAS Plan: Imported Pla River: RIVER-1 Reach: Reach-1

Reach	River Sta	Q Total (cfs)	E.G. Slope (ft/ft)	Mannings Coefficient	Flow Area (sq ft)	Hydraulic Radius (R <sub>h</sub> )* (ft)	Shear Stress (lb/ft <sup>2</sup> )	Shield's Parameter Y	Reynolds Number (R <sub>e</sub> ) If $Y > 0.06$ , $Y < 0.06$ ,	Erosion	Critical Depth (y <sub>c</sub> ) (ft)	Bed Load Transport (q <sub>b</sub> ) (ft <sup>2</sup> /s)	Bed Load Transport Vol. (cu. yards)
Reach-1	4313	Bridge											
Reach-1	4311	169	0.009339	0.09	151.99	1.6	0.247	0.45	183	Yes	0.22	0.01	0
Reach-1	4310	169	0.009349	0.09	151.78	1.6	0.247	0.45	183	Yes	0.22	0.01	1,238
Reach-1	4297	169	0.017966	0.09	55.22	1.6	1.874	3.39	504	Yes	0.03	0.13	1,244
Reach-1	4295.5	Bridge											31,378
Reach-1	4294	169	0.123029	0.09	29.32	1.0	7.835	14.16	1031	Yes	0.00	1.16	0
Reach-1	4290	169	0.000636	0.09	296.87	1.6	0.065	0.12	94	Yes	0.81	0.00	273,801
Reach-1	4280	169	0.002109	0.07	115.38	1.8	0.249	0.45	184	Yes	0.24	0.01	72
Reach-1	4271	169	0.010116	0.07	74.47	1.1	0.711	1.28	311	Yes	0.05	0.03	1,260
Reach-1	4270	169	0.001569	0.07	172.41	1.3	0.127	0.23	131	Yes	0.33	0.00	7,011
Reach-1	4269	169	0.000173	0.07	341.79	2.3	0.026	0.05	60	No	0.00	0.00	359
Reach-1	4268	169	0.000207	0.07	284.85	2.7	0.036	0.06	70	Yes	2.49	0.00	0
Reach-1	4267	169	0.000567	0.07	157.6	3.1	0.112	0.20	123	Yes	0.91	0.00	2
Reach-1	4265.5	Bridge											280
Reach-1	4264	169	0.000567	0.07	157.58	3.1	0.112	0.20	123	Yes	0.91	0.00	0
Reach-1	4260	169	0.000127	0.07	295.94	3.7	0.030	0.05	64	No	0.00	0.00	280
Reach-1	4250	169	0.000006	0.065	1162.8	4.2	0.002	0.00	15	No	0.00	0.00	0
Reach-1	4241	169	0.000028	0.065	422.75	6.0	0.011	0.02	38	No	0.00	0.00	0
Reach-1	4230	Bridge											0
Reach-1	4219	169	0.000028	0.065	422.67	6.0	0.011	0.02	38	No	0.00	0.00	0
Reach-1	4210	169	0.000004	0.065	1323.5	4.6	0.001	0.00	13	No	0.00	0.00	0
Reach-1	4200	169	0.000001	0.065	2134.9	6.4	0.000	0.00	7	No	0.00	0.00	0
Reach-1	4190	169	0.000003	0.07	1248.98	7.0	0.001	0.00	14	No	0.00	0.00	0
Reach-1	4184	169	0.003673	0.07	162.76	0.7	0.171	0.31	152	Yes	0.14	0.00	641
Reach-1	4183	169	0.09287	0.07	44.24	0.5	2.703	4.88	605	Yes	0.01	0.23	54,804
Reach-1	4182	169	0.000505	0.07	229.46	1.9	0.062	0.11	92	Yes	1.02	0.00	62
Reach-1	4181	169	0.001874	0.07	107.31	2.2	0.270	0.49	191	Yes	0.28	0.01	1,445
Reach-1	4180	169	0.001629	0.07	116	2.2	0.232	0.42	177	Yes	0.32	0.00	1,111

Assume:

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- $g = \text{gravity (ft/s}^2\text{)} = 32.2$
- $s = \rho / \text{(quartz particles)} = 2.65$
- $d = \text{particle dia. (ft)} = 0.005$
- $\rho_{\text{water}} \text{ (slug/ft}^3\text{)} = 5.3$
- $\mu = \text{viscosity water (ft}^2\text{/s)} = 1.00E-05$

Big Chico Creek

1-year, 6-month, and 3-month flows over 24 year period, 1/16-inch gravels

HEC-RAS Plan: Imported Pla River: RIVER-1 Reach: Reach-1

Reach	River Sta	Q Total (cfs)	E.G. Slope (ft/ft)	Mannings Coefficient	Flow Area (sq ft)	Hydraulic Radius (R <sub>h</sub> )* (ft)	Shear Stress (lb/ft <sup>2</sup> )	Shield's Parameter Y	Reynolds Number (R <sub>e</sub> )	Erosion Y > 0.06, Y If Y < 0.06,	Critical Depth (Y <sub>c</sub> ) (ft)	Bed Load Transport (q <sub>b</sub> ) (ft <sup>2</sup> /s)	Bed Load Transport Vol. (cu. yards)
Reach-1	4179	169	0.009028	0.07	60.75	1.6	0.938	1.69	357	Yes	0.06	0.05	10,811
Reach-1	4170	Bridge											0
Reach-1	4161	169	0.071346	0.07	28	1.1	5.026	9.08	826	Yes	0.01	0.59	140,146
Reach-1	4160	169	0.004849	0.07	92.67	1.4	0.426	0.77	240	Yes	0.11	0.01	3,095
Reach-1	4150	169	0.031178	0.07	48.98	0.9	1.766	3.19	489	Yes	0.02	0.12	28,660
Reach-1	4140	169	0.001089	0.07	142.69	2.2	0.154	0.28	144	Yes	0.47	0.00	525
Reach-1	4130	169	0.049878	0.07	39.44	0.9	2.749	4.97	611	Yes	0.01	0.24	56,925
Reach-1	4120	169	0.003492	0.07	85.91	2.0	0.440	0.79	244	Yes	0.15	0.01	3,258
Reach-1	4117.5	Bridge											0
Reach-1	4115	169	0.003659	0.07	84.58	1.9	0.456	0.82	249	Yes	0.14	0.01	3,448
Reach-1	4105	169	0.003467	0.07	91.97	1.8	0.396	0.72	232	Yes	0.15	0.01	2,750
Reach-1	4102.5	Bridge											0
Reach-1	4100	169	0.005327	0.07	80.53	1.6	0.539	0.97	270	Yes	0.10	0.02	4,514
Reach-1	4090	169	0.002385	0.07	97.52	2.2	0.331	0.60	212	Yes	0.22	0.01	2,038
Reach-1	4080	169	0.0012	0.07	113.81	2.9	0.221	0.40	173	Yes	0.43	0.00	1,021
Reach-1	4076	169	0.003218	0.07	82.97	2.2	0.454	0.82	248	Yes	0.16	0.01	3,430
Reach-1	4075.5	Bridge											0
Reach-1	4075	169	0.00329	0.07	82.34	2.2	0.462	0.83	250	Yes	0.16	0.01	3,525
Reach-1	4070	169	0.000378	0.07	223.27	2.5	0.060	0.11	90	Yes	1.36	0.00	56
Reach-1	4067	169	0.001039	0.07	148.55	2.1	0.143	0.26	139	Yes	0.50	0.00	456
Reach-1	4066	169	0.001043	0.07	148.23	2.1	0.143	0.26	139	Yes	0.49	0.00	460
Reach-1	4065.5	Bridge											0
Reach-1	4065	169	0.001051	0.07	147.8	2.1	0.144	0.26	140	Yes	0.49	0.00	466
Reach-1	4064	169	0.001051	0.07	147.98	2.1	0.144	0.26	140	Yes	0.49	0.00	464
Reach-1	4060	169	0.000076	0.07	405.46	3.4	0.016	0.03	47	No	0.00	0.00	0
Reach-1	4059	169	0.003254	0.07	74.75	2.5	0.532	0.96	269	Yes	0.16	0.02	4,432
Reach-1	4058	169	0.003273	0.07	74.4	2.5	0.537	0.97	270	Yes	0.16	0.02	4,492
Reach-1	4057.5	Bridge											0

Assume:

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Big Chico Creek

1-year, 6-month, and 3-month flows over 24 year period, 1/16-inch gravels

Reach	River Sta	Q Total (cfs)	E.G. Slope (ft/ft)	Mannings Coefficient	Flow Area (sq ft)	Hydraulic Radius (R <sub>h</sub> )* (ft)	Shear Stress (lb/ft <sup>2</sup> )	Shield's Parameter Y	Reynolds Number (R <sub>e</sub> )	Erosion If Y < 0.06, Y	Critical Depth (y <sub>c</sub> ) (ft)	Bed Load Transport (q <sub>b</sub> ) (ft <sup>2</sup> /s)	Bed Load Transport Vol. (cu. yards)
HEC-RAS Plan: Imported Pla River: RIVER-1 Reach: Reach-1													
Reach-1	4057	169	0.003343	0.07	73.83	2.5	0.546	0.99	272	Yes	0.15	0.02	4,615
Reach-1	4056	169	0.003349	0.07	73.98	2.5	0.545	0.98	272	Yes	0.15	0.02	4,596
Reach-1	4054	169	0.018625	0.07	42.79	1.6	1.901	3.44	508	Yes	0.03	0.14	32,083
Reach-1	4053	169	0.019605	0.07	42.05	1.6	1.977	3.57	518	Yes	0.03	0.14	34,050
Reach-1	4052.5	Bridge											0
Reach-1	4052	169	0.029212	0.07	36.75	1.4	2.674	4.83	602	Yes	0.02	0.23	53,902
Reach-1	4051	169	0.071577	0.07	26.98	1.2	5.318	9.61	849	Yes	0.01	0.65	152,619
Reach-1	4050	169	0.001609	0.07	127.98	1.9	0.199	0.36	164	Yes	0.32	0.00	850
Reach-1	4040	169	0.005762	0.07	68.35	1.9	0.702	1.27	309	Yes	0.09	0.03	6,879
Reach-1	4030	Bridge											0
Reach-1	4020	169	0.008252	0.07	60.77	1.7	0.917	1.66	353	Yes	0.06	0.04	10,432
Reach-1	4010	169	0.004753	0.07	82.9	1.6	0.501	0.91	261	Yes	0.11	0.02	4,022
Reach-1	4000	169	0.002892	0.07	115.35	1.4	0.270	0.49	191	Yes	0.18	0.01	1,445
Reach-1	3066	169	0.000436	0.07	161	3.6	0.102	0.18	118	Yes	1.18	0.00	226
Reach-1	3065	169	0.000439	0.07	160.26	3.6	0.103	0.19	118	Yes	1.17	0.00	231
Reach-1	3064	169	0.001742	0.07	107.09	2.4	0.266	0.48	190	Yes	0.30	0.01	1,407
Reach-1	3050	169	0.000464	0.07	157.21	3.6	0.107	0.19	121	Yes	1.11	0.00	253
Reach-1	3049	169	0.000465	0.07	157.51	3.6	0.107	0.19	120	Yes	1.11	0.00	252
Reach-1	3030	169	0.000896	0.07	118.47	3.4	0.193	0.35	162	Yes	0.58	0.00	805
Reach-1	3023	Bridge											0
Reach-1	3016	169	0.000905	0.07	118.03	3.3	0.195	0.35	163	Yes	0.57	0.00	817
Reach-1	2991	169	0.001818	0.07	106.85	2.3	0.269	0.49	191	Yes	0.28	0.01	1,442
Reach-1	2990	169	0.002979	0.07	96.69	1.8	0.354	0.64	219	Yes	0.17	0.01	2,283
Reach-1	2982.5	Bridge											0
Reach-1	2975	169	0.003161	0.07	94.7	1.8	0.371	0.67	224	Yes	0.16	0.01	2,463
Reach-1	2974	169	0.001956	0.07	104.13	2.3	0.285	0.52	197	Yes	0.26	0.01	1,589
Reach-1	2950	169	0.004528	0.1	99.07	2.2	0.647	1.17	296	Yes	0.11	0.03	6,044
Reach-1	2942.5	Bridge											0

Assume:

- $\rho_{\text{water}} \text{ (slug/ft}^3\text{)} = 2$
- $g = \text{gravity (ft/s}^2\text{)} = 32.2$
- $s = \rho_r / \text{(quartz particles)} = 2.65$
- $d = \text{particle dia. (ft)} = 0.005$
- $\rho_{\text{water}} \text{ (slug/ft}^3\text{)} = 5.3$
- $\mu = \text{viscosity water (ft}^2\text{/s)} = 1.00\text{E-}05$

Big Chico Creek

1-year, 6-month, and 3-month flows over 24 year period, 1/16-inch gravels

HEC-RAS Plan: Imported Pla River: RIVER-1 Reach: Reach-1

Reach	River Sta	Q Total (cfs)	E.G. Slope (ft/ft)	Mannings Coefficient	Flow Area (sq ft)	Hydraulic Radius (R <sub>h</sub> )* (ft)	Shear Stress (lb/ft <sup>2</sup> )	Shield's Parameter Y	Reynolds Number (R <sub>e</sub> ) If Y < 0.06, Y > 0.06, Y	Erosion	Critical Depth (Y <sub>c</sub> ) (ft)	Bed Load Transport (q <sub>b</sub> ) (ft <sup>2</sup> /s)	Bed Load Transport Vol. (cu. yards)
Reach-1	2935	169	0.004549	0.1	98.91	2.2	0.649	1.17	997	Yes	0.11	0.03	6,078
Reach-1	2925	169	0.005673	0.1	89.76	2.2	0.794	1.43	328	Yes	0.09	0.04	8,335
Reach-1	2910	169	0.001593	0.1	134.14	3.1	0.316	0.57	207	Yes	0.32	0.01	1,893
Reach-1	2905	169	0.00264	0.1	120.57	2.5	0.421	0.76	239	Yes	0.20	0.01	3,036
Reach-1	2900	169	0.003719	0.1	103.14	2.4	0.580	1.05	280	Yes	0.14	0.02	5,079
Reach-1	2890	169	0.002019	0.08	105.07	2.7	0.346	0.63	217	Yes	0.26	0.01	2,203
Reach-1	2880	169	0.003092	0.08	83.71	2.7	0.542	0.98	271	Yes	0.17	0.02	4,559
Reach-1	2870	169	0.002014	0.08	95.61	3.1	0.399	0.72	233	Yes	0.26	0.01	2,778
Reach-1	2845	169	0.001907	0.08	99.59	3.0	0.370	0.67	224	Yes	0.27	0.01	2,457
Reach-1	2844	169	0.008043	0.08	65.05	1.9	1.005	1.82	369	Yes	0.06	0.05	12,031
Reach-1	2837.5	Bridge											0
Reach-1	2831	169	0.060848	0.08	32.06	1.2	4.816	8.70	808	Yes	0.01	0.56	131,414
Reach-1	2830	169	0.01363	0.08	52.04	1.8	1.602	2.89	466	Yes	0.04	0.10	24,689
Reach-1	2820	169	0.001559	0.08	92.67	3.9	0.392	0.71	231	Yes	0.33	0.01	2,701
Reach-1	2810	169	0.004207	0.08	61.9	3.4	0.921	1.66	353	Yes	0.12	0.04	10,501
Reach-1	2800	169	0.002766	0.08	72.38	3.7	0.656	1.18	298	Yes	0.19	0.03	6,168
Reach-1	2790	169	0.001986	0.08	75.68	4.4	0.564	1.02	277	Yes	0.26	0.02	4,864
Reach-1	2780	169	0.005894	0.08	54.46	3.2	1.214	2.19	406	Yes	0.09	0.07	16,111
Reach-1	2770	169	0.001675	0.08	83.39	4.3	0.468	0.84	252	Yes	0.31	0.02	3,597
Reach-1	2760	169	0.002896	0.08	67.11	4.0	0.743	1.34	317	Yes	0.18	0.03	7,509
Reach-1	2750	169	0.001935	0.08	75.54	4.5	0.562	1.02	276	Yes	0.27	0.02	4,835
Reach-1	2740	169	0.00241	0.08	74.45	3.9	0.607	1.10	287	Yes	0.21	0.02	5,463
Reach-1	2730	169	0.002203	0.08	91.25	3.1	0.437	0.79	244	Yes	0.23	0.01	3,230
Reach-1	2720	169	0.050781	0.08	23.41	2.3	7.377	13.33	1000	Yes	0.01	1.06	250,046
Reach-1	2710	169	0.051122	0.08	25.73	1.9	6.413	11.59	933	Yes	0.01	0.86	202,456
Reach-1	2700	169	0.001588	0.08	118.93	2.6	0.271	0.49	192	Yes	0.32	0.01	1,456
Reach-1	2690	169	0.002458	0.08	91.7	2.8	0.446	0.81	246	Yes	0.21	0.01	3,336
Reach-1	2680	169	0.006208	0.08	87.42	1.5	0.604	1.09	286	Yes	0.08	0.02	5,425

Assume:

- $\rho_{\text{water}}$  (slug/ft<sup>3</sup>) = 2
- $g$  = gravity (ft/s<sup>2</sup>) = 32.2
- $s$  =  $n_f$  (quartz particles) = 2.65
- $d$  = particle dia. (ft) = 0.005
- $\rho_{\text{water}}$  (slug/ft<sup>3</sup>) = 5.3
- $\nu$  = viscosity/water (ft<sup>2</sup>/s) = 1.00E-05

Big Chico Creek

1-year, 6-month, and 3-month flows over 24 year period, 1/16-inch gravels

Reach	River Sta	Q Total (cfs)	HEC-RAS Plan: Imported Pla River: RIVER-1 Reach: Reach-1		Mannings Coefficient	Flow Area (sq ft)	Hydraulic		Shield's Parameter $\gamma$	Reynolds Number ( $R_e$ )	Erosion If $\gamma < 0.06$ , $\gamma$ Yes	Critical Depth ( $\gamma_c$ ) (ft)	Bed Load Transport ( $q_b$ ) (ft <sup>2</sup> /s)	Bed Load Transport Vol. (cu. yards)
			E.G. Slope (ft/ft)	Radius ( $R_h$ ) * Shear Stress (lb/ft <sup>2</sup> )			Radius (ft)	Shear Stress (lb/ft <sup>2</sup> )						
Reach-1	5490	90	0.035884	0.045	19.73	0.6	1.433	2.59	441	Yes	0.01	0.09	20,813	
Reach-1	5480	90	0.000493	0.045	95.28	1.5	0.046	0.08	79	Yes	1.05	0.00	19	
Reach-1	5470	90	0.002213	0.045	47.8	1.3	0.189	0.34	160	Yes	0.23	0.00	776	
Reach-1	5460	Culvert											0	
Reach-1	5450	90	0.003618	0.045	44.18	1.0	0.241	0.44	181	Yes	0.14	0.01	1,190	
Reach-1	5440	90	0.038574	0.045	23.58	0.4	1.117	2.02	389	Yes	0.01	0.06	14,175	
Reach-1	5430	90	0.000298	0.07	189.15	1.5	0.028	0.05	62	No	0.00	0.00	0	
Reach-1	5420	90	0.000238	0.07	160.54	2.2	0.034	0.06	68	Yes	2.17	0.00	0	
Reach-1	5355	90	0.001448	0.07	78	1.7	0.159	0.29	147	Yes	0.36	0.00	558	
Reach-1	5350	90	0.003589	0.09	66.81	1.6	0.366	0.66	223	Yes	0.14	0.01	2,410	
Reach-1	5330	Bridge											0	
Reach-1	5310	90	0.138864	0.09	19.16	0.7	5.941	10.74	898	Yes	0.00	0.76	180,426	
Reach-1	4500	90	0.000565	0.09	148.07	1.9	0.070	0.13	97	Yes	0.91	0.00	88	
Reach-1	4491	90	0.015133	0.09	39.99	1.2	1.132	2.05	392	Yes	0.03	0.06	14,473	
Reach-1	4490	90	0.007096	0.09	62.99	1.0	0.474	0.86	254	Yes	0.07	0.02	3,675	
Reach-1	4480	90	0.00202	0.09	96	1.4	0.184	0.33	158	Yes	0.26	0.00	736	
Reach-1	4470	90	0.007733	0.09	63.41	1.0	0.479	0.87	255	Yes	0.07	0.02	3,744	
Reach-1	4460	90	0.001002	0.09	176.37	1.0	0.062	0.11	92	Yes	0.51	0.00	61	
Reach-1	4455	90	0.015169	0.09	47.3	0.9	0.881	1.59	346	Yes	0.03	0.04	9,801	
Reach-1	4450	90	0.006712	0.09	63.28	1.1	0.464	0.84	251	Yes	0.08	0.02	3,554	
Reach-1	4440	90	0.003912	0.09	62.02	1.7	0.418	0.76	238	Yes	0.13	0.01	2,998	
Reach-1	4430	Bridge											0	
Reach-1	4420	90	0.004227	0.09	60.46	1.6	0.443	0.80	245	Yes	0.12	0.01	3,293	
Reach-1	4410	90	0.002853	0.09	75.07	1.6	0.290	0.52	198	Yes	0.18	0.01	1,635	
Reach-1	4401	90	0.022153	0.09	39.9	0.9	1.249	2.26	412	Yes	0.02	0.07	16,853	
Reach-1	4400	90	0.14727	0.09	21.31	0.5	5.140	9.29	835	Yes	0.00	0.61	145,003	
Reach-1	4390	90	0.000676	0.09	125.88	2.1	0.093	0.17	112	Yes	0.76	0.00	185	
Reach-1	4386	90	0.004042	0.09	57.85	1.8	0.468	0.85	252	Yes	0.13	0.02	3,599	

Assume:

$\rho_{\text{water}} (\text{slug/ft}^3) = 2$   
 $g = \text{gravity} (\text{ft/s}^2) = 32.2$   
 $s = \text{sp. gr. (quartz particles)} = 2.65$   
 $d = \text{particle dia. (ft)} = 0.005$   
 $\rho_{\text{water}} (\text{slug/ft}^3) = 5.3$   
 $\nu = \text{viscosity water} (\text{ft}^2/\text{s}) = 1.00\text{E-}05$

Big Chico Creek

1-year, 6-month, and 3-month flows over 2.4 year period, 1/16-inch gravels

HEC-RAS Plan: Imported Pla River: RIVER-1 Reach: Reach-1

Reach	River Sta	Q Total (cfs)	E.G. Slope (ft/ft)	Manning's Coefficient	Flow Area (sq ft)	Hydraulic Radius (R <sub>h</sub> )* (ft)	Shear Stress (lb/ft <sup>2</sup> )	Shield's Parameter Y	Reynolds Number (R <sub>e</sub> )	Erosion If Y > 0.06, Y If Y < 0.06,	Critical Depth (Y <sub>c</sub> ) (ft)	Bed Load Transport (q <sub>b</sub> ) (ft <sup>3</sup> /s)	Bed Load Transport Vol. (cu. yards)
Reach-1	4385.5	Bridge											
Reach-1	4385	90	0.004333	0.09	56.52	1.8	0.493	0.89	259	Yes	0.12	0.02	0
Reach-1	4380	90	0.004027	0.09	64.5	1.5	0.397	0.72	232	Yes	0.13	0.01	3,915
Reach-1	4370	90	0.002411	0.09	91.3	1.3	0.207	0.37	168	Yes	0.21	0.00	2,756
Reach-1	4360	90	0.002772	0.09	83.35	1.4	0.246	0.44	183	Yes	0.19	0.01	913
Reach-1	4350	90	0.000314	0.09	193.44	2.0	0.040	0.07	74	Yes	1.64	0.00	1,234
Reach-1	4349	90	0.15368	0.09	22.32	0.5	4.847	8.76	811	Yes	0.00	0.56	8
Reach-1	4340	90	0.00212	0.09	98.09	1.3	0.180	0.33	156	Yes	0.24	0.00	132,681
Reach-1	4330	90	0.002116	0.09	96.71	1.4	0.184	0.33	158	Yes	0.24	0.00	709
Reach-1	4329	90	0.002126	0.09	96.56	1.3	0.185	0.33	158	Yes	0.24	0.00	736
Reach-1	4327	Bridge											741
Reach-1	4325	90	0.00267	0.09	89.67	1.3	0.219	0.39	172	Yes	0.19	0.00	0
Reach-1	4320	90	0.002221	0.09	101.2	1.2	0.174	0.31	154	Yes	0.23	0.00	1,002
Reach-1	4315	90	0.001916	0.09	106.31	1.3	0.156	0.28	145	Yes	0.27	0.00	664
Reach-1	4313	Bridge											539
Reach-1	4311	90	0.002367	0.09	99.08	1.2	0.183	0.33	157	Yes	0.22	0.00	0
Reach-1	4310	90	0.002381	0.09	98.89	1.2	0.183	0.33	158	Yes	0.22	0.00	725
Reach-1	4297	90	0.015334	0.09	38.32	1.2	1.211	2.19	405	Yes	0.03	0.07	731
Reach-1	4295.5	Bridge											16,057
Reach-1	4294	90	0.137561	0.09	18.63	0.7	6.182	11.17	916	Yes	0.00	0.81	0
Reach-1	4290	90	0.000749	0.09	177.79	1.2	0.057	0.10	88	Yes	0.69	0.00	191,565
Reach-1	4280	90	0.001687	0.07	79.52	1.5	0.160	0.29	147	Yes	0.31	0.00	46
Reach-1	4271	90	0.014526	0.07	44.13	0.7	0.663	1.20	300	Yes	0.04	0.03	567
Reach-1	4270	90	0.001264	0.07	114.19	1.1	0.087	0.16	108	Yes	0.41	0.00	6,280
Reach-1	4269	90	0.000095	0.07	279.12	1.9	0.012	0.02	40	No	0.00	0.00	155
Reach-1	4268	90	0.000099	0.07	242.52	2.3	0.015	0.03	45	No	0.00	0.00	0
Reach-1	4267	90	0.000226	0.07	141.51	2.8	0.041	0.07	74	Yes	2.28	0.00	0
Reach-1	4265.5	Bridge											8
Reach-1													0

Assume:

$\rho_{\text{water}} (\text{slug/ft}^3) = 2$   
 $g = \text{gravity} (\text{ft/s}^2) = 32.2$   
 $s = \text{sf} (\text{quartz particles}) = 2.65$   
 $d = \text{particle dia. (ft)} = 0.005$   
 $\rho_{\text{water}} (\text{slug/ft}^3) = 5.3$   
 $\nu = \text{viscosity/water} (\text{ft}^2/\text{s}) = 1.00\text{E-}05$

Big Chico Creek

1-year, 6-month, and 3-month flows over 2.4 year period, 1/16-inch gravels

HEC-RAS Plan: Imported Pla River: RIVER-1 Reach: Reach-1

Reach	River Sta	Q Total (cfs)	E.G. Slope (ft/ft)	Manning's Coefficient	Flow Area (sq ft)	Hydraulic Radius (R <sub>h</sub> )* (ft)	Shear Stress (lb/ft <sup>2</sup> )	Shield's Parameter	Reynolds Number (R <sub>s</sub> )	Erosion	Critical Depth (y <sub>c</sub> ) (ft)	Bed Load Transport (q <sub>b</sub> ) (ft <sup>2</sup> /s)	Bed Load Transport Vol. (cu. yards)
Reach-1	4264	90	0.000226	0.07	141.5	2.8	0.041	Y	74	If Y < 0.06, Y	2.28	0.00	8
Reach-1	4260	90	0.000046	0.07	272.27	3.5	0.010	0.02	37	No	0.00	0.00	0
Reach-1	4250	90	0.000002	0.065	1066.23	4.2	0.001	0.00	9	No	0.00	0.00	0
Reach-1	4241	90	0.000009	0.065	406.21	5.8	0.003	0.01	21	No	0.00	0.00	0
Reach-1	4230	Bridge											
Reach-1	4219	90	0.000009	0.065	406.18	5.8	0.003	0.01	21	No	0.00	0.00	0
Reach-1	4210	90	0.000001	0.065	1237.25	5.7	0.000	0.00	7	No	0.00	0.00	0
Reach-1	4200	90	0	0.065	2004.9	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Reach-1	4190	90	0.000001	0.07	1184.47	6.7	0.000	0.00	8	No	0.00	0.00	0
Reach-1	4184	90	0.003475	0.07	104.02	0.6	0.128	0.23	132	Yes	0.15	0.00	367
Reach-1	4183	90	0.10603	0.07	28.86	0.3	2.061	3.72	529	Yes	0.00	0.15	36,273
Reach-1	4182	90	0.000572	0.07	147.33	1.3	0.048	0.09	81	Yes	0.90	0.00	24
Reach-1	4181	90	0.001421	0.07	78.56	1.7	0.156	0.28	146	Yes	0.36	0.00	541
Reach-1	4180	90	0.001073	0.07	85.82	1.8	0.127	0.23	131	Yes	0.48	0.00	364
Reach-1	4179	90	0.00733	0.07	40.93	1.3	0.626	1.13	291	Yes	0.07	0.02	5,729
Reach-1	4170	Bridge											
Reach-1	4161	90	0.078656	0.07	16.83	0.8	4.295	7.76	763	Yes	0.01	0.47	110,521
Reach-1	4160	90	0.003683	0.07	66.86	1.1	0.252	0.46	185	Yes	0.14	0.01	1,288
Reach-1	4150	90	0.092079	0.07	22.08	0.5	2.973	5.37	635	Yes	0.01	0.27	63,320
Reach-1	4140	90	0.000826	0.07	100.97	1.8	0.094	0.17	113	Yes	0.62	0.00	186
Reach-1	4130	90	0.089768	0.07	21.49	0.5	3.076	5.56	646	Yes	0.01	0.28	66,698
Reach-1	4120	90	0.003064	0.07	58.51	1.5	0.294	0.53	200	Yes	0.17	0.01	1,676
Reach-1	4117.5	Bridge											
Reach-1	4115	90	0.003187	0.07	57.73	1.5	0.303	0.55	203	Yes	0.16	0.01	1,763
Reach-1	4105	90	0.004062	0.07	59.47	1.2	0.308	0.56	204	Yes	0.13	0.01	1,812
Reach-1	4102.5	Bridge											
Reach-1	4100	90	0.018085	0.07	37.61	0.8	0.890	1.61	347	Yes	0.03	0.04	9,968
Reach-1	4090	90	0.003188	0.07	56.77	1.5	0.311	0.56	205	Yes	0.16	0.01	1,840

Assume:

- $\rho_{\text{water}} (\text{slug/ft}^3) = 2$
- $g = \text{gravity} (\text{ft/s}^2) = 32.2$
- $s = \rho_f / \rho (\text{quartz particles}) = 2.65$
- $d = \text{particle dia. (ft)} = 0.005$
- $\rho_{\text{water}} (\text{slug/ft}^3) = 5.3$
- $\nu = \text{viscosity water (ft}^2/\text{s)} = 1.00\text{E-}05$

Big Chico Creek

1-year, 6-month, and 3-month flows over 2.4 year period, 1/16-inch gravels

HEC-RAS Plan: Imported Pla River: RIVER-1 Reach: Reach-1

Reach	River Sta	Q Total (cfs)	E.G. Slope (ft/ft)	Manning's Coefficient	Flow Area (sq ft)	Hydraulic Radius (R <sub>h</sub> ) (ft)	Shear Stress (lb/ft <sup>2</sup> )	Shield's Parameter	Reynolds Number (R <sub>e</sub> )	Erosion	Critical Depth (y <sub>c</sub> ) (ft)	Bed Load Transport (q <sub>b</sub> ) (ft <sup>2</sup> /s)	Bed Load Transport Vol. (cu. yards)
Reach-1	4080	90	0.000952	0.07	80.01	2.2	0.137	Y	137	Yes	0.54	0.00	423
Reach-1	4076	90	0.003876	0.07	50.76	1.5	0.386	Y	229	Yes	0.13	0.01	2,636
Reach-1	4075.5	Bridge											0
Reach-1	4075	90	0.004034	0.07	50.08	1.5	0.398	Y	232	Yes	0.13	0.01	2,770
Reach-1	4070	90	0.000415	0.07	141.65	1.8	0.047	Y	80	Yes	1.24	0.00	21
Reach-1	4067	90	0.00139	0.07	86.71	1.5	0.134	Y	135	Yes	0.37	0.00	401
Reach-1	4066	90	0.001395	0.07	86.55	1.5	0.134	Y	135	Yes	0.37	0.00	404
Reach-1	4065.5	Bridge											0
Reach-1	4065	90	0.001418	0.07	86.06	1.5	0.136	Y	136	Yes	0.36	0.00	415
Reach-1	4064	90	0.001421	0.07	86.06	1.5	0.136	Y	136	Yes	0.36	0.00	415
Reach-1	4060	90	0.000059	0.07	292.7	2.6	0.010	Y	36	No	0.00	0.00	0
Reach-1	4059	90	0.002696	0.07	50.97	2.0	0.351	Y	218	Yes	0.19	0.01	2,247
Reach-1	4058	90	0.002704	0.07	50.82	2.0	0.352	Y	219	Yes	0.19	0.01	2,266
Reach-1	4057.5	Bridge											0
Reach-1	4057	90	0.002766	0.07	50.42	2.0	0.359	Y	221	Yes	0.19	0.01	2,333
Reach-1	4056	90	0.002778	0.07	50.43	2.0	0.359	Y	221	Yes	0.19	0.01	2,336
Reach-1	4054	90	0.018048	0.07	28.16	1.2	1.373	Y	432	Yes	0.03	0.08	19,491
Reach-1	4053	90	0.0192	0.07	27.55	1.2	1.441	Y	442	Yes	0.03	0.09	20,993
Reach-1	4052.5	Bridge											0
Reach-1	4052	90	0.030506	0.07	23.16	1.1	2.099	Y	534	Yes	0.02	0.16	37,316
Reach-1	4051	90	0.077138	0.07	16.36	0.9	4.459	Y	778	Yes	0.01	0.50	116,987
Reach-1	4050	90	0.001455	0.07	88.1	1.4	0.132	Y	134	Yes	0.35	0.00	392
Reach-1	4040	90	0.004436	0.07	49.37	1.5	0.417	Y	238	Yes	0.12	0.01	2,982
Reach-1	4030	Bridge											0
Reach-1	4020	90	0.006284	0.07	44.14	1.3	0.538	Y	270	Yes	0.08	0.02	4,500
Reach-1	4010	90	0.003315	0.07	62.05	1.3	0.275	Y	193	Yes	0.16	0.01	1,493
Reach-1	4000	90	0.034213	0.07	33.89	0.6	1.221	Y	407	Yes	0.02	0.07	16,255
Reach-1	3066	90	0.000317	0.07	118.62	2.8	0.058	Y	89	Yes	1.63	0.00	49

Assume:

- n<sub>water</sub> (slug/ft<sup>3</sup>) = 2
- g = gravity (ft/s<sup>2</sup>) = 32.2
- s =  $\rho_p / (\rho_p - \rho_s)$  = 2.65
- d = particle dia. (ft) = 0.005
- n<sub>water</sub> (slug/ft<sup>3</sup>) = 5.3
- u = viscosity<sub>water</sub> (ft<sup>2</sup>/s) = 1.00E-05

Big Chico Creek

1-year, 6-month, and 3-month flows over 24 year period, 1/16-inch gravels

HEC-RAS Plan: Imported Pla River: RIVER-1 Reach: Reach-1

Reach	River Sta	Q Total (cfs)	E.G. Slope (ft/ft)	Mannings Coefficient	Flow Area (sq ft)	Hydraulic Radius (R <sub>h</sub> )* (ft)	Shear Stress (lb/ft <sup>2</sup> )	Shield's Parameter Y	Reynolds Number (R <sub>e</sub> ) If Y < 0.06, Y > 0.06, Y	Erosion	Critical Depth (Y <sub>c</sub> ) (ft)	Bed Load Transport (q <sub>b</sub> ) (ft <sup>2</sup> /s)	Bed Load Transport Vol. (cu. yards)
Reach-1	3065	90	0.000317	0.07	118.46	2.8	0.058	0.10	89	Yes	1.63	0.00	49
Reach-1	3064	90	0.002772	0.07	60.92	1.5	0.270	0.49	191	Yes	0.19	0.01	1,449
Reach-1	3050	90	0.000342	0.07	115.54	2.8	0.061	0.11	91	Yes	1.51	0.00	59
Reach-1	3049	90	0.000344	0.07	115.4	2.8	0.062	0.11	91	Yes	1.50	0.00	60
Reach-1	3030	90	0.000604	0.07	87.12	2.8	0.108	0.20	121	Yes	0.85	0.00	257
Reach-1	3023	Bridge											0
Reach-1	3016	90	0.000609	0.07	86.85	2.8	0.109	0.20	121	Yes	0.85	0.00	260
Reach-1	2991	90	0.001691	0.07	70.69	1.8	0.191	0.35	161	Yes	0.30	0.00	788
Reach-1	2990	90	0.002573	0.07	64.11	1.5	0.246	0.44	183	Yes	0.20	0.01	1,230
Reach-1	2982.5	Bridge											0
Reach-1	2975	90	0.002757	0.07	62.62	1.5	0.259	0.47	187	Yes	0.19	0.01	1,347
Reach-1	2974	90	0.001836	0.07	68.71	1.7	0.203	0.37	166	Yes	0.28	0.00	883
Reach-1	2950	90	0.003801	0.1	69.3	1.7	0.411	0.74	236	Yes	0.14	0.01	2,923
Reach-1	2942.5	Bridge											0
Reach-1	2935	90	0.003814	0.1	69.22	1.7	0.413	0.75	237	Yes	0.14	0.01	2,935
Reach-1	2925	90	0.009388	0.1	50.4	1.4	0.832	1.50	336	Yes	0.05	0.04	8,964
Reach-1	2910	90	0.001353	0.1	91.61	2.4	0.209	0.38	168	Yes	0.38	0.00	927
Reach-1	2905	90	0.001896	0.1	84.85	2.1	0.255	0.46	186	Yes	0.27	0.01	1,314
Reach-1	2900	90	0.00392	0.1	70.41	1.9	0.385	0.70	229	Yes	0.16	0.01	2,627
Reach-1	2890	90	0.00216	0.08	69.16	1.8	0.256	0.46	186	Yes	0.24	0.01	1,325
Reach-1	2880	90	0.003351	0.08	53.63	1.9	0.419	0.76	238	Yes	0.15	0.01	3,011
Reach-1	2870	90	0.001664	0.08	67.65	2.3	0.248	0.45	184	Yes	0.31	0.01	1,253
Reach-1	2845	90	0.001323	0.08	75.04	2.4	0.201	0.36	165	Yes	0.39	0.00	861
Reach-1	2844	90	0.007656	0.08	43.31	1.4	0.710	1.28	310	Yes	0.07	0.03	6,994
Reach-1	2837.5	Bridge											0
Reach-1	2831	90	0.06707	0.08	20.06	0.9	3.875	7.00	725	Yes	0.01	0.40	94,596
Reach-1	2830	90	0.027006	0.08	28.64	1.0	1.809	3.27	495	Yes	0.02	0.13	29,738
Reach-1	2820	90	0.001499	0.08	62.19	2.8	0.274	0.50	193	Yes	0.34	0.01	1,489

Assume:

$\rho_{\text{water}} \text{ (slug/ft}^3\text{)} = 2$   
 $g = \text{gravity (ft/s}^2\text{)} = 32.2$   
 $s = \text{sgf (quartz particles)} = 2.65$   
 $d = \text{particle dia. (ft)} = 0.005$   
 $\rho_{\text{water}} \text{ (slug/ft}^3\text{)} = 5.3$   
 $\mu = \text{viscosity water (ft}^2\text{/s)} = 1.00\text{E-}05$

Big Chico Creek

1-year, 6-month, and 3-month flows over 24 year period, 1/16-inch gravels

Reach	River Sta	Q Total (cfs)	Reach: Reach-1		Mannings Coefficient	Flow Area (sq ft)	Hydraulic Radius (R <sub>h</sub> ) * (ft)	Shear Stress (lb/ft <sup>2</sup> )	Shields Parameter	Reynolds Number (R <sub>e</sub> )	Erosion If Y > 0.06, Y If Y < 0.06, Y	Critical Depth (y <sub>c</sub> ) (ft)	Bed Load Transport (q <sub>b</sub> ) (ft <sup>2</sup> /s)	Bed Load Transport Vol. (cu. yards)
			E.G. Slope (ft/ft)	E.G. Slope										
Reach-1	2810	90	0.004665	0.08	38.8	2.5	0.740	Y	317	Yes	0.11	0.03	7,461	
Reach-1	2800	90	0.00327	0.08	44.31	2.6	0.555	1.00	274	Yes	0.16	0.02	4,730	
Reach-1	2790	90	0.001557	0.08	53.15	3.5	0.351	0.63	218	Yes	0.33	0.01	2,247	
Reach-1	2780	90	0.008255	0.08	32.29	2.1	1.124	2.03	390	Yes	0.06	0.06	14,309	
Reach-1	2770	90	0.001576	0.08	55.7	3.2	0.328	0.59	211	Yes	0.33	0.01	2,010	
Reach-1	2760	90	0.003521	0.08	41.43	2.8	0.625	1.13	291	Yes	0.15	0.02	5,718	
Reach-1	2750	90	0.001521	0.08	52.94	3.6	0.351	0.63	218	Yes	0.34	0.01	2,248	
Reach-1	2740	90	0.001867	0.08	52.91	3.1	0.369	0.67	224	Yes	0.28	0.01	2,450	
Reach-1	2730	90	0.002374	0.08	59.98	2.1	0.325	0.59	210	Yes	0.22	0.01	1,981	
Reach-1	2720	90	0.047081	0.08	15.69	1.7	5.127	9.26	834	Yes	0.01	0.61	144,447	
Reach-1	2710	90	0.056631	0.08	16.27	1.4	5.085	9.19	830	Yes	0.01	0.60	142,653	
Reach-1	2700	90	0.001829	0.08	76.57	1.8	0.211	0.38	169	Yes	0.28	0.00	943	
Reach-1	2690	90	0.002057	0.08	65.05	2.1	0.278	0.50	194	Yes	0.25	0.01	1,519	
Reach-1	2680	90	0.006209	0.08	54.49	1.2	0.477	0.86	254	Yes	0.08	0.02	3,719	

Assume:

$\rho_{\text{water}} \text{ (slug/ft}^3\text{)} = 2$   
 $g = \text{gravity (ft/s}^2\text{)} = 32.2$   
 $s = \text{nsf (quartz particles)} = 2.65$   
 $d = \text{particle dia. (ft)} = 0.333$   
 $\rho_{\text{water}} \text{ (slug/ft}^3\text{)} = 5.3$   
 $\mu = \text{viscosity water (ft}^2\text{/s)} = 1.00\text{E-}05$

Lindo Channel

1-year, 6-month, and 3-month flows over 24 year period, 4-inch gravels

Reach	River Sta	Q Total (cfs)	E.G. Slope (ft/ft)	Manning's Coefficient	Flow Area (sq ft)	Hydraulic radius (ft)	Shear Stress (lb/ft <sup>2</sup> )	Shield's Parameter Y	Reynolds Number (Re)	Erosion If Y > 0.06, Y If Y < 0.06,	Critical Depth (yc) (ft)	Bed Load Transport (qt) (ft <sup>2</sup> /s)	Bed Load Transport Potential (cu. Yards/year)
Reach-1	5430	196	0.001461	0.045	112.8	1.6	0.151	0.00	9170	No	0.00	0.00	0
Reach-1	5425	196	0.004941	0.045	80.18	1.1	0.343	0.01	13794	No	0.00	0.00	0
Reach-1	5420	196	0.007999	0.045	70.79	1.0	0.455	0.01	15902	No	0.00	0.00	0
Reach-1	5410	196	0.001778	0.045	98.51	1.7	0.195	0.01	10403	No	0.00	0.00	0
Reach-1	5400	Culvert											
Reach-1	5390	196	0.034307	0.045	40.36	0.7	1.557	0.04	29409	No	0.00	0.00	0
Reach-1	5380	196	0.005399	0.045	74.59	1.1	0.390	0.01	14795	No	0.00	0.00	0
Reach-1	5370	196	0.002435	0.045	94.52	1.4	0.324	0.01	11161	No	0.00	0.00	0
Reach-1	5360	196	0.032666	0.045	38.74	0.8	1.635	0.05	30141	No	0.00	0.00	0
Reach-1	5350	196	0.003267	0.045	85.89	1.3	0.279	0.01	12440	No	0.00	0.00	0
Reach-1	5340	196	0.002519	0.045	83.32	1.7	0.273	0.01	12320	No	0.00	0.00	0
Reach-1	5330	Bridge											
Reach-1	5320	196	0.031093	0.045	34.92	0.9	1.887	0.05	32381	No	0.00	0.00	0
Reach-1	5310	196	0.003435	0.045	77.23	1.5	0.331	0.01	13557	No	0.00	0.00	0
Reach-1	5300	196	0.00227	0.045	119.31	1.1	0.155	0.00	9290	No	0.00	0.00	0
Reach-1	5290	196	0.003267	0.045	96.08	1.1	0.235	0.01	11437	No	0.00	0.00	0
Reach-1	5280	196	0.031871	0.045	39.45	0.8	1.582	0.04	29642	No	0.00	0.00	0
Reach-1	5271	196	0.001175	0.045	168.82	1.0	0.078	0.00	6595	No	0.00	0.00	0
Reach-1	5270	196	0.015836	0.045	59.12	0.7	0.724	0.02	20053	No	0.00	0.00	0
Reach-1	5260	196	0.002226	0.045	125.65	1.0	0.143	0.00	8914	No	0.00	0.00	0
Reach-1	5250	196	0.032677	0.045	40.45	0.7	1.533	0.04	29182	No	0.00	0.00	0
Reach-1	5241	196	0.000392	0.045	203.48	1.8	0.045	0.00	4998	No	0.00	0.00	0
Reach-1	5240	196	0.001486	0.04	108.53	1.4	0.135	0.00	8660	No	0.00	0.00	0
Reach-1	5230	196	0.020664	0.04	47.02	0.7	0.914	0.03	22534	No	0.00	0.00	0
Reach-1	5220	Bridge											
Reach-1	5210	196	0.00467	0.04	67.66	1.2	0.365	0.01	14242	No	0.00	0.00	0
Reach-1	5200	196	0.001428	0.04	100.39	1.6	0.150	0.00	9135	No	0.00	0.00	0
Reach-1	5190	196	0.030457	0.045	42.45	0.7	1.401	0.04	27898	No	0.00	0.00	0

Assume:

- $\rho_{\text{water}} (\text{slug/ft}^3) = 2$
- $g = \text{gravity} (\text{ft/s}^2) = 32.2$
- $s = \rho_s / \rho (\text{quartz particles}) = 2.65$
- $d = \text{particle dia. (ft)} = 0.333$
- $\rho_{\text{water}} (\text{slug/ft}^3) = 5.3$
- $\mu = \text{viscosity water (ft}^2/\text{s)} = 1.00\text{E-}05$

Lindo Channel

1-year, 6-month, and 3-month flows over 24 year period, 4-inch gravels

HEC-RAS Plan: Imported Pla River: RIVER-1 Reach: Reach-1

Reach	River Sta	Q Total (cfs)	E.G. Slope (ft/ft)	Mannings Coefficient	Flow Area (sq ft)	Hydraulic radius (ft)	Shear Stress (lb/ft <sup>2</sup> )	Shield's Parameter	Reynolds Number (R <sub>s</sub> )	Erosion	Critical Depth (y <sub>c</sub> ) (ft)	Bed Load Transport (q <sub>b</sub> ) (ft <sup>3</sup> /s)	Bed Load Transport Potential (cu. Yards/year)
Reach-1	5180	196	0.001747	0.04	100.3	1.4	0.158	Y	9375	No	0.00	0.00	0
Reach-1	5170	196	0.000494	0.04	136.63	2.3	0.073	Y	6349	No	0.00	0.00	0
Reach-1	5160	Bridge											
Reach-1	5150	196	0.002304	0.04	83.42	1.5	0.224	Y	11143	No	0.00	0.00	0
Reach-1	5140	196	0.002125	0.04	95.54	1.3	0.179	Y	9964	No	0.00	0.00	0
Reach-1	5130	196	0.001595	0.04	108.26	1.3	0.138	Y	8753	No	0.00	0.00	0
Reach-1	5120	196	0.026467	0.04	40.81	0.7	1.203	Y	25847	No	0.00	0.00	0
Reach-1	5111	196	0.000736	0.04	171.49	1.2	0.057	Y	5628	No	0.00	0.00	0
Reach-1	5110	196	0.003829	0.04	84.07	1.0	0.251	Y	11805	No	0.00	0.00	0
Reach-1	5100	196	0.007663	0.04	79.79	0.7	0.323	Y	13389	No	0.00	0.00	0
Reach-1	5099.5	Bridge											
Reach-1	5099	196	0.005499	0.04	87.88	0.7	0.257	Y	11947	No	0.00	0.00	0
Reach-1	5071	196	0.02347	0.04	42.32	0.7	1.105	Y	24778	No	0.00	0.00	0
Reach-1	5070.5	Bridge											
Reach-1	5070	196	0.0064	0.04	65.39	1.0	0.416	Y	15198	No	0.00	0.00	0
Reach-1	5060	196	0.007814	0.04	60.07	1.0	0.496	Y	16606	No	0.00	0.00	0
Reach-1	5050	196	0.002456	0.04	70.73	1.8	0.291	Y	12712	No	0.00	0.00	0
Reach-1	5040	196	0.002477	0.045	87.99	1.6	0.251	Y	11801	No	0.00	0.00	0
Reach-1	5030	196	0.006813	0.045	65.24	1.2	0.506	Y	16761	No	0.00	0.00	0
Reach-1	5020	Bridge											
Reach-1	5010	196	0.001182	0.045	112.26	1.9	0.145	Y	8962	No	0.00	0.00	0
Reach-1	5000	196	0.001655	0.045	101.72	1.7	0.182	Y	10065	No	0.00	0.00	0
Reach-1	2700	196	0.001977	0.045	108.14	1.4	0.174	Y	9829	No	0.00	0.00	0
Reach-1	2685	196	0.005981	0.045	67.39	1.2	0.466	Y	16094	No	0.00	0.00	0
Reach-1	2670	196	0.001377	0.045	102.6	1.9	0.172	Y	9773	No	0.00	0.00	0
Reach-1	2640	196	0.000531	0.045	148.36	2.3	0.078	Y	6579	No	0.00	0.00	0
Reach-1	2630	Bridge											
Reach-1	2620	196	0.001025	0.045	121.26	1.9	0.124	Y	8309	No	0.00	0.00	0



