

File 120033

May 4, 2020

Leigh Mugford
Resource Manager
James Dick Construction Limited
14442 Regional Road 50
Bolton, Ontario L7E 3E2
lmugford@jamesdick.com

Re: Reid Road Reservoir Quarry, Milton
Noise Control Berm Flood Impact Analysis

Dear Leigh:

Tatham Engineering Limited (Tatham) has been retained by James Dick Construction Limited to conduct a hydraulic analysis to evaluate the potential impact of proposed noise control berms for the Reid Road Reservoir Quarry on water levels in Kilbride Creek. The property is located about 1.5 km west of Campbellville at 9210 Twiss Road in Milton, Ontario. The property is enclosed by Highway 401 to the north, the Canadian Pacific Railway to the south and First Line Nassagaweya to the west. Kilbride Creek flows adjacent to First Line Nassagaweya near the western edge of the quarry property.

We understand that Conservation Halton has reviewed their latest flood plain mapping and advised that the proposed noise control berms could isolate portions of the flood plain. To ensure the water levels are not impacted, Tatham has reviewed and updated the hydraulic analysis of Kilbride Creek from Highway 401 to the Canadian Pacific Railway Crossing. The purpose of the hydraulic analysis is to:

- Confirm water levels from Highway 401 to the Canadian Pacific Railway;
- Confirm potential impact of proposed noise control berms on the water levels; and
- Confirm potential for noise control berms to isolate portions of the flood plain that are subject to backwater conditions and provide storage.

BACKGROUND INFORMATION

To facilitate this analysis, Conservation Halton provided the hydraulic modelling and associated flood plain shapefiles for Reaches 3 and 4 of Kilbride Creek. Reach 3 flows adjacent to First Line Nassagaweya and the flood plain has potential to be impacted by the noise control berms. Reach 4 is located further east and joins with Reach 3 at a confluence immediately upstream of Highway 9 (south of the quarry). The focus of the hydraulic analysis is Reach 3. Demonstration that the water levels in Reach 3 are not impacted will confirm that there is no impact on water levels in Reach 4.

For the hydraulic modelling, the original Conservation Halton HEC-RAS model and flood plain mapping were imported into GeoHECRAS. The quarry site plan AutoCAD drawing was overlaid to provide an accurate location of the proposed noise control berms. The area of analysis and the location of the noise control berms are shown on Figure 1 enclosed.

EXISTING CONDITONS ANALYSIS

During the Regulatory Storm Event, Reach 3 of Kilbride Creek conveys approximately 51.5 m³/s downstream of Highway 401. The flow increases to 55.8 m³/s upstream of the Canadian Pacific Railway crossing. For existing conditions, the cross-sections through the quarry property were evaluated to determine if divided flow should exist or whether levees should be added to the cross-sections. Levees were added as appropriate. The resultant water surface elevations were compared with the original Conservation Halton model. Water surface elevations were within one centimeter of the original model.

PROPOSED CONDITIONS ANALYSIS

To evaluate the potential impact of the noise control berms, the cross-sections through the quarry property were modified. Per the quarry site plans, the noise control berm geometry was approximated into the proposed conditions cross-section geometry. Generally, the berms are located outside the floodplain conveyance pathway. In the limited areas where the berm encroaches the conveyance pathway, the obstruction is negligible such that water surface elevations are not impacted and velocities remain within 0.02 m/s of the original values. Of note, the downstream Canadian Pacific Railway crossing forms a notable obstruction to flow creating a backwater effect that keeps water surface elevations relatively consistent upstream of the crossing. From XS 1700 to XS 843 (approximately 850 m) the water surface elevation only decreases by 4 cm under both existing and proposed conditions. The water surface elevations for the original Conservation Halton model, Tatham's updated existing conditions model and the proposed conditions model are presented in Table 1 below.



Table 1: Regulatory Storm Event Water Surface Elevations

CROSS-SECTION	ORIGINAL CA MODEL	EXISTING CONDITIONS	PROPOSED CONDITIONS
1700	291.58	291.58	291.58
1650.791	291.57	291.58	291.58
1623.897	291.57	291.58	291.58
1600	291.56	291.57	291.57
1553.808	291.55	291.56	291.56
1500	291.55	291.56	291.56
1465.380	291.55	291.56	291.56
1439.602	291.55	291.55	291.55
1413.825	291.54	291.55	291.55
1400	291.55	291.55	291.55
1300	291.55	291.55	291.55
1177.562	291.55	291.55	291.55
1102.523	291.54	291.55	291.55
1040.121	291.54	291.54	291.54
1000	291.54	291.54	291.54
883.7938	291.54	291.54	291.54
843.6022	291.54	291.54	291.54

A secondary concern for the noise control berms is the potential for the berms to cut off flood storage areas. The first area where this could occur is at the southwest corner of the west pond. This is considered a negligible storage area and a hydraulic connection to this area is considered unnecessary. The second area of flood plain storage impacted by the berms is northeast of the Canadian Pacific railway crossing. This area exists primarily due to the backwater created by the crossing. An analysis of the contours upstream of the crossing shows that the proposed berm is not located in an area that will cut off the



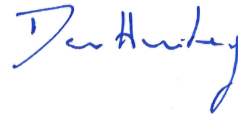
backwater. Therefore, water will still be able to back up around the berm and continue to use the flood plain storage area as per the existing condition under proposed conditions. In our opinion, there is no need to construct a flow pathway through the berm to facilitate this connection. A summary of the model results is attached and the hydraulic model has been included for reference.

In summary, the hydraulic analysis of the proposed noise control berms shows that the berms will have no impact on water surface elevations and that the berms will not cut off any of the significant flood plain storage that currently exists. Therefore, it is our opinion that the proposed noise control berms can proceed to construction with no negative impacts on the flood plain.

Yours truly,
Tatham Engineering Limited



David Marshall, B.A.Sc., P.Eng.
Intermediate Engineer
DAM:rlh



Dan Hurley, B.A.Sc., P.Eng., LEED AP
President



Existing Conditions Summary Output

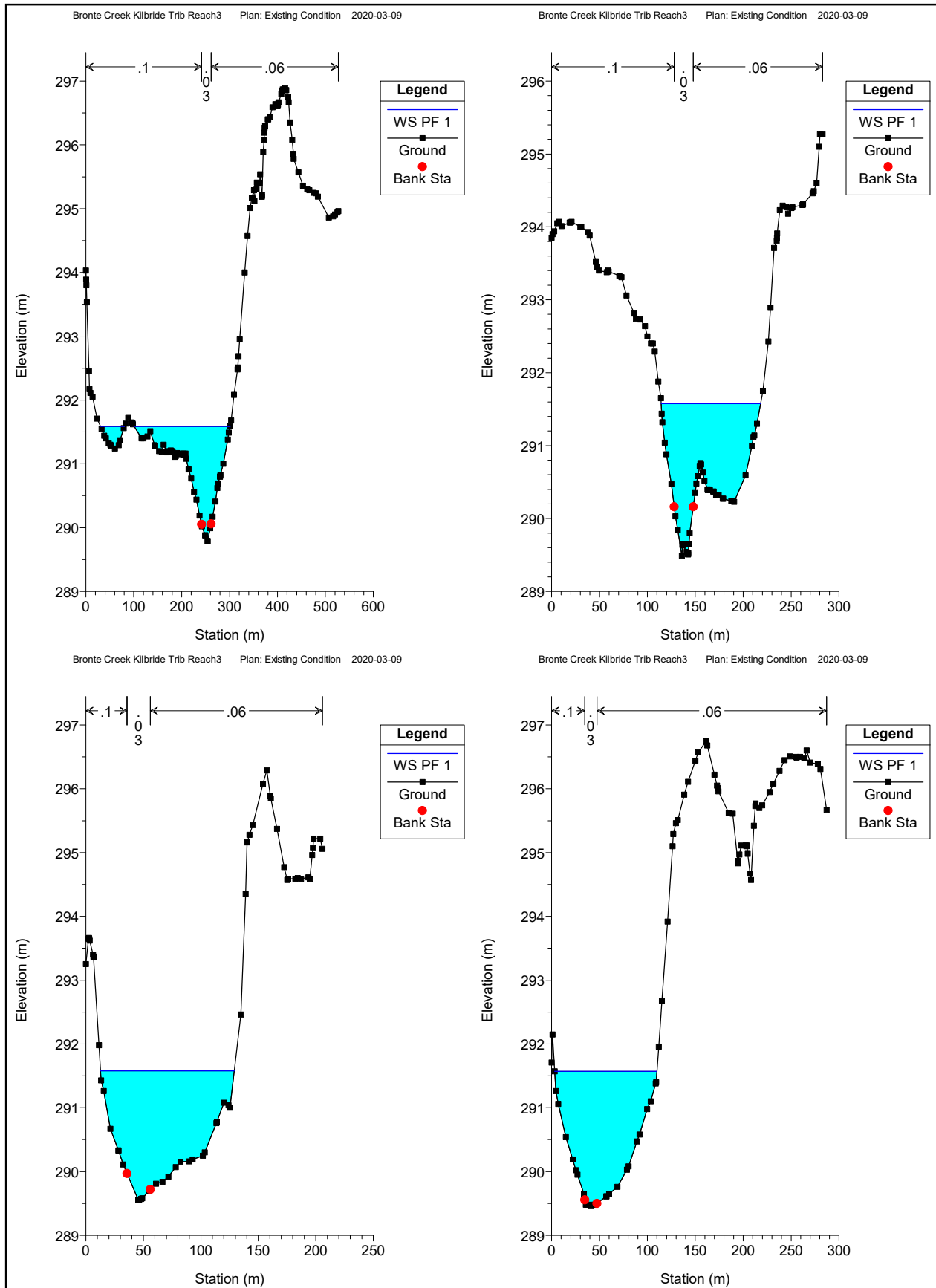
HEC-RAS Plan: Exist River: BronteKilbride Reach: Reach3 Profile: PF 1

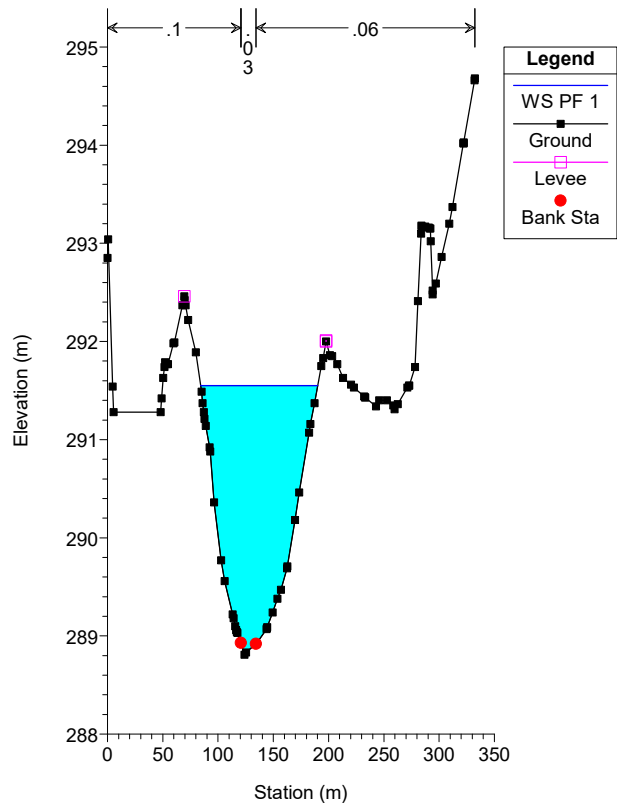
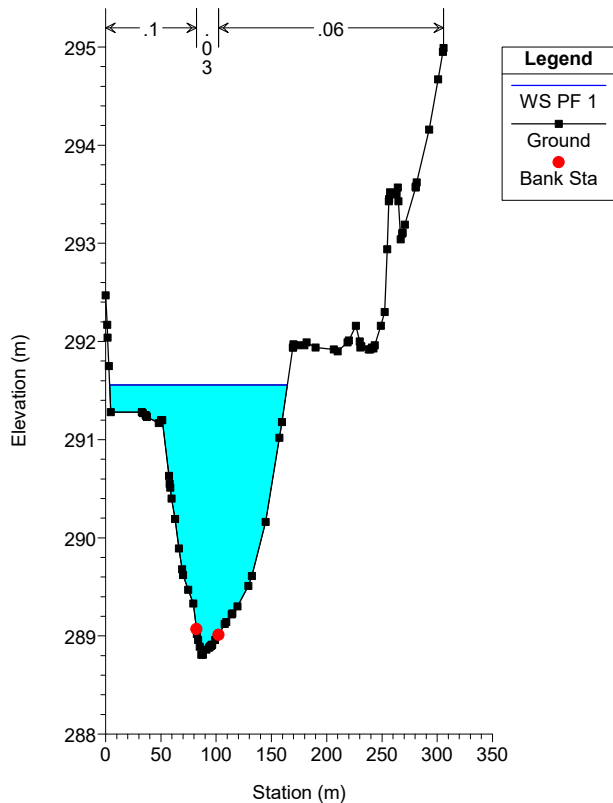
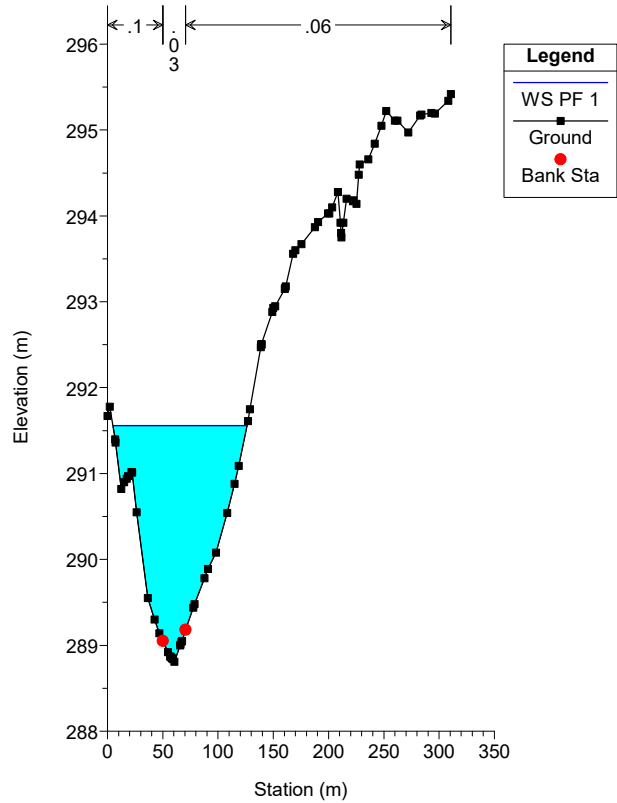
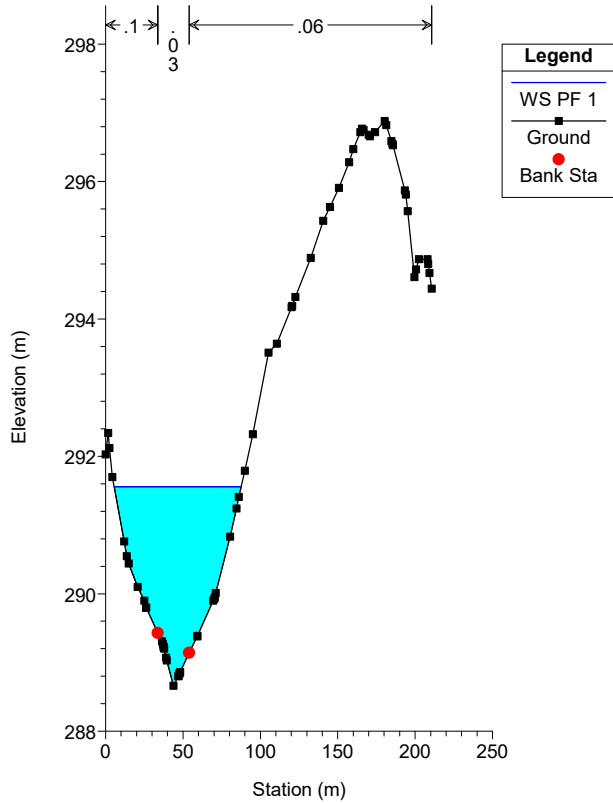
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
Reach3	9700	PF 1	6.99	326.16	327.05	326.99	327.12	0.004609	1.36	12.58	72.56	0.63
Reach3	9600	PF 1	6.99	325.85	326.30	326.30	326.45	0.010676	1.71	5.64	29.99	0.92
Reach3	9485.774	PF 1	6.99	325.10	325.83	325.38	325.84	0.000141	0.31	60.34	158.83	0.12
Reach3	9385.255	PF 1	7.38	324.85	325.83		325.83	0.000007	0.09	229.97	291.70	0.03
Reach3	9320.177	PF 1	7.38	324.85	325.83	325.24	325.83	0.000005	0.07	220.18	270.43	0.02
Reach3	9308.81		Culvert									
Reach3	9297.431	PF 1	7.38	324.78	325.25	325.03	325.28	0.001564	0.79	9.36	247.64	0.37
Reach3	9283.018	PF 1	7.38	324.63	325.26		325.26	0.000060	0.19	120.10	265.54	0.08
Reach3	9200	PF 1	7.38	324.56	325.25		325.25	0.000025	0.13	173.63	289.71	0.05
Reach3	9100	PF 1	9.03	324.58	325.25		325.25	0.000029	0.14	207.04	363.84	0.05
Reach3	9000	PF 1	9.03	324.68	325.25		325.25	0.000068	0.17	150.88	300.70	0.08
Reach3	8900	PF 1	13.12	324.33	325.24		325.24	0.000107	0.32	117.73	182.62	0.11
Reach3	8800	PF 1	13.12	323.76	325.23		325.23	0.000041	0.27	83.69	88.40	0.07
Reach3	8700	PF 1	14.22	324.07	324.96	324.96	325.19	0.010454	2.16	6.84	20.44	0.96
Reach3	8600	PF 1	14.22	323.13	323.57	323.50	323.63	0.005063	1.19	15.99	70.89	0.64
Reach3	8500	PF 1	14.22	322.86	323.11		323.13	0.006258	1.01	32.82	164.20	0.66
Reach3	8400	PF 1	14.88	322.46	322.86		322.87	0.001420	0.66	60.16	204.14	0.34
Reach3	8300	PF 1	14.88	322.37	322.77		322.78	0.000918	0.52	69.99	191.20	0.27
Reach3	8200	PF 1	15.45	322.13	322.75		322.75	0.000147	0.29	119.52	207.01	0.12
Reach3	8100	PF 1	15.45	321.83	322.74	322.17	322.74	0.000095	0.29	136.79	212.07	0.10
Reach3	8000	PF 1	15.45	321.90	322.72	322.17	322.73	0.000234	0.44	90.04	135.81	0.16
Reach3	7900	PF 1	17.81	321.78	322.70	322.13	322.71	0.000212	0.44	86.51	147.09	0.15
Reach3	7800	PF 1	17.81	321.83	322.42	322.42	322.62	0.010134	2.10	13.11	39.27	0.95
Reach3	7700	PF 1	18.21	320.39	320.95	321.02	321.24	0.020234	2.38	8.22	28.85	1.27
Reach3	7600	PF 1	18.21	319.61	319.94	319.94	320.06	0.014849	1.76	14.57	71.24	1.05
Reach3	7500	PF 1	18.21	319.25	319.74	319.42	319.75	0.000847	0.59	54.93	138.18	0.27
Reach3	7400	PF 1	19.53	319.06	319.68		319.69	0.000542	0.53	83.04	177.88	0.23
Reach3	7320.341	PF 1	19.53	318.75	319.31		319.36	0.004152	1.14	32.92	136.65	0.59
Reach3	7304.392	PF 1	19.53	318.76	319.22		319.29	0.004606	1.28	23.48	110.11	0.63
Reach3	7284.915	PF 1	19.53	318.60	319.13	319.03	319.19	0.004738	1.45	30.47	101.84	0.65
Reach3	7248.902	PF 1	19.53	318.48	318.80	318.80	318.90	0.016033	1.87	25.11	115.07	1.10
Reach3	7180.530	PF 1	19.92	317.99	318.64	318.42	318.66	0.001207	0.81	69.99	202.64	0.34
Reach3	7100	PF 1	19.92	317.94	318.59		318.59	0.000575	0.58	93.93	194.04	0.24
Reach3	7000	PF 1	19.92	318.07	318.40		318.46	0.009038	1.45	34.30	144.91	0.83
Reach3	6930.976	PF 1	19.92	317.87	318.36		318.36	0.000631	0.40	97.53	164.40	0.22
Reach3	6868.812	PF 1	22.79	316.70	318.35		318.36	0.000029	0.25	302.60	246.40	0.06
Reach3	6830.484	PF 1	22.79	316.26	318.35		318.35	0.000019	0.23	234.72	191.62	0.05
Reach3	6757.871	PF 1	22.79	316.10	318.34		318.35	0.000085	0.46	71.26	59.84	0.11
Reach3	6672.175	PF 1	24.31	316.26	318.34		318.35	0.000033	0.29	112.25	99.79	0.07
Reach3	6659.042	PF 1	24.31	316.71	318.34	317.75	318.34	0.000078	0.39	119.26	121.56	0.10
Reach3	6651.23		Culvert									
Reach3	6643.419	PF 1	24.31	316.52	317.85	317.85	317.89	0.000922	1.09	35.50	75.13	0.33
Reach3	6630.547	PF 1	24.31	316.36	316.72	316.92	317.44	0.073383	3.86	7.19	32.91	2.33
Reach3	6500	PF 1	24.79	315.93	316.41	316.41	316.41	0.000405	0.33	128.07	323.68	0.18
Reach3	6400	PF 1	24.79	314.85	315.30	315.36	316.18	0.083887	4.40	8.58	70.87	2.53
Reach3	6300	PF 1	24.79	313.68	314.17	313.84	314.18	0.001091	0.62	71.88	187.38	0.30
Reach3	6205.425	PF 1	24.79	312.92	314.01	313.71	314.05	0.001454	1.03	36.18	73.52	0.38
Reach3	6100	PF 1	28.84	312.93	313.84	313.49	313.90	0.001575	1.19	35.59	53.88	0.41
Reach3	6000	PF 1	28.84	312.81	313.42	313.42	313.59	0.009060	2.11	23.10	73.68	0.92
Reach3	5900	PF 1	29.18	311.49	312.09	312.13	312.35	0.012609	2.36	16.20	49.88	1.07
Reach3	5800	PF 1	29.18	310.51	311.80	311.36	311.87	0.001239	1.18	31.82	49.03	0.37
Reach3	5599.767	PF 1	29.18	309.77	310.54		310.60	0.002977	1.39	34.47	78.18	0.54
Reach3	5552.063	PF 1	30.51	309.68	310.56	310.20	310.56	0.000081	0.25	222.23	335.63	0.09
Reach3	5543.333		Bridge									
Reach3	5535.113	PF 1	30.51	309.50	310.20	310.20	310.20	0.000685	0.59	162.65	327.77	0.25
Reach3	5496.844	PF 1	30.51	309.42	309.84	309.46	309.85	0.002165	0.76	107.69	259.38	0.41
Reach3	5200	PF 1	30.51	308.35	309.27	308.98	309.35	0.001979	1.29	35.69	80.69	0.46
Reach3	5100	PF 1	33.82	307.97	308.71	308.71	308.96	0.009192	2.34	24.57	68.17	0.94
Reach3	5000	PF 1	33.82	307.46	308.23	308.05	308.35	0.004087	1.75	37.29	76.84	0.65
Reach3	4900	PF 1	33.82	307.14	307.95	307.76	308.02	0.002628	1.34	47.62	116.27	0.51
Reach3	4800	PF 1	33.82	306.31	307.29	307.29	307.59	0.007996	2.68	24.59	52.20	0.93
Reach3	4700	PF 1	39.88	305.73	306.57	306.30	306.64	0.001976	1.21	54.60	113.32	0.45
Reach3	4600	PF 1	39.88	305.40	306.13	306.13	306.30	0.006963	2.12	47.75	154.89	0.83
Reach3	4500	PF 1	39.88	305.25	305.65	305.32	305.66	0.003217	0.97	100.33	223.48	0.51
Reach3	4400	PF 1	40.41	304.79	304.93	304.93	305.10	0.147115	2.81	22.11	75.64	2.79
Reach3	4300	PF 1	40.41	303.51	304.01	303.72	304.02	0.000616	0.49	82.80	189.58	0.23
Reach3	4200	PF 1	41.08	303.51	303.86	303.73	303.90	0.003020	0.92	52.43	161.45	0.49
Reach3	4141.813	PF 1	41.08	303.51	303.53	303.53	303.56	0.014101	0.29	56.07	197.57	0.66
Reach3	4043.916	PF 1	41.08	299.72	301.74	300.55	301.76	0.000222	0.76	130.66	134.62	0.18
Reach3	3954.525	PF 1	41.52	299.08	301.75	299.62	301.75	0.000042	0.41	267.51	140.80	0.08
Reach3	3930.453	PF 1	41.52	299.11	301.74	300.75	301.75	0.000068	0.49	217.40	130.77	0.10
Reach3	3921.31		Culvert									
Reach3	3912.161	PF 1	41.52	299.50	301.18	301.18	301.22	0.000478	0.98	83.57	97.35	0.25
Reach3	3903.577	PF 1	41.52	299.09	299.95	300.20	300.74	0.031152	3.99	11.22	25.38	1.70
Reach3	3800	PF 1	41.52	298.74	299.64	299.64	300.00	0.008739	2.75	19.96	35.64	0.96
Reach3	3700	PF 1	42.00	298.13	298.68	298.73	298.89	0.012866	2.50	32.16	111.72	1.09
Reach3	3600	PF 1	42.00	297.59	298.37	298.08	298.40	0.001742	1.09	69.44	131.39	0.42

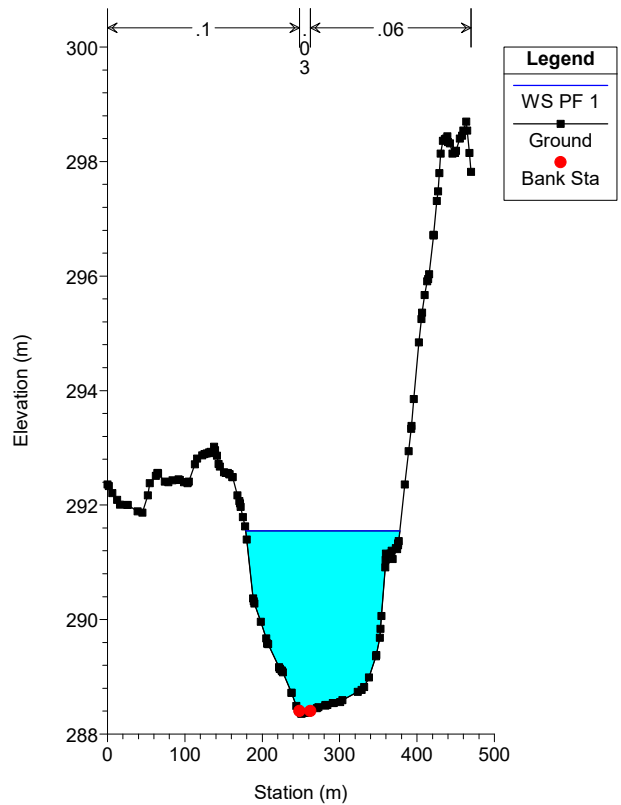
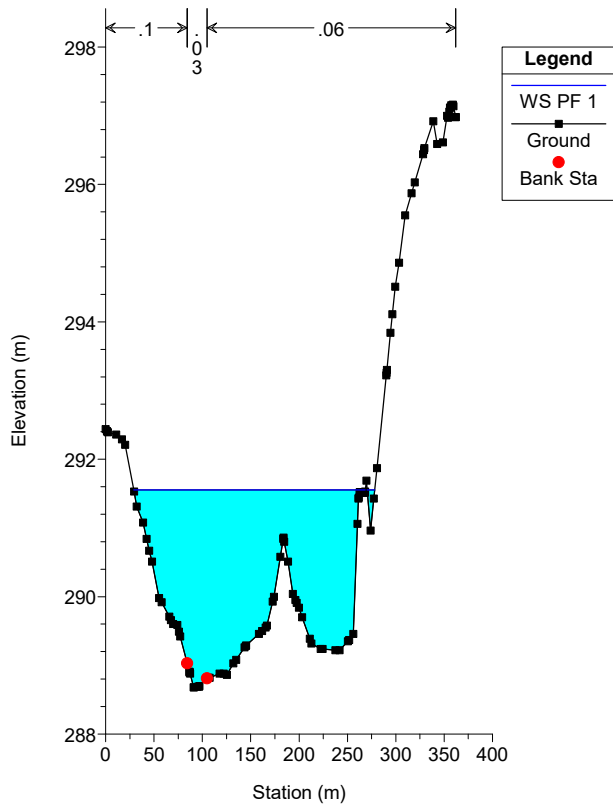
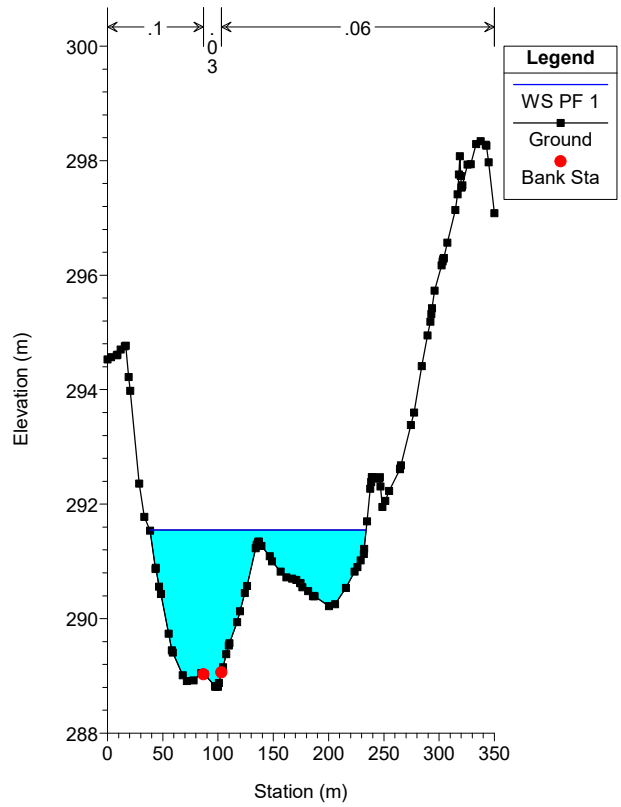
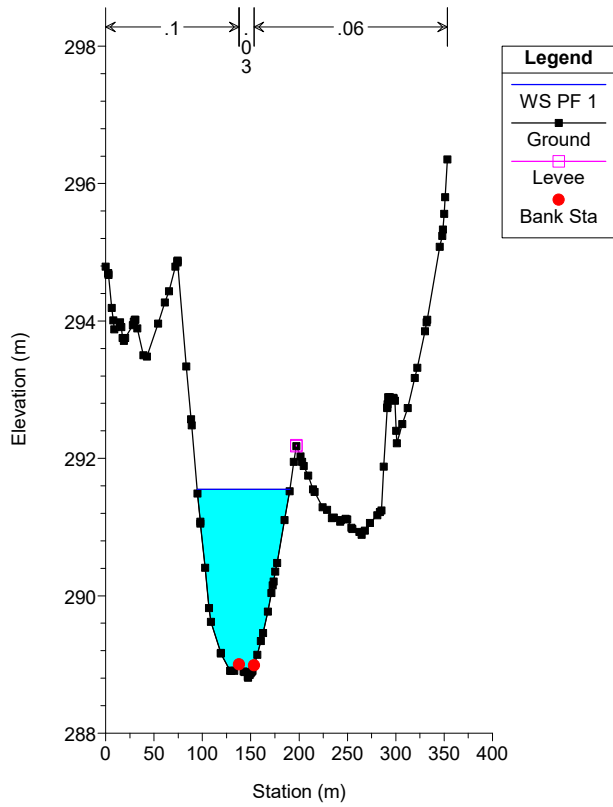
HEC-RAS Plan: Exist River: BronteKilbride Reach: Reach3 Profile: PF 1 (Continued)

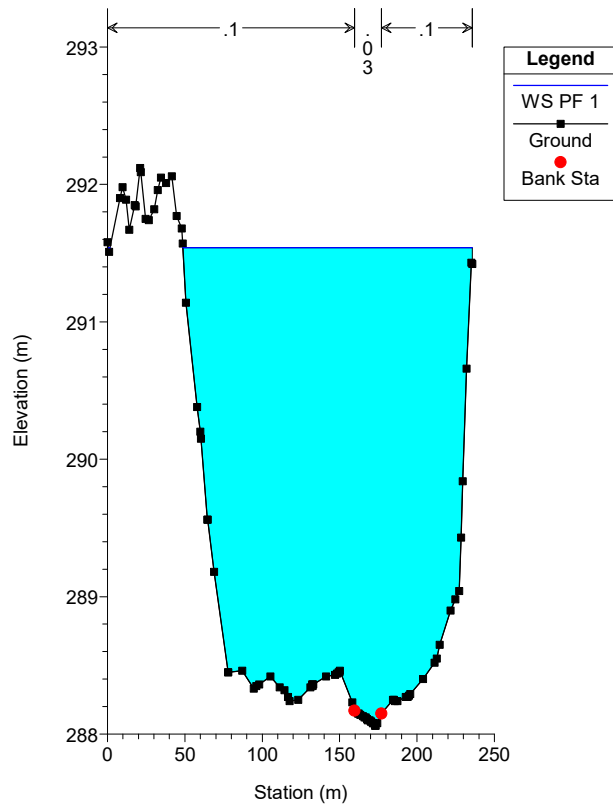
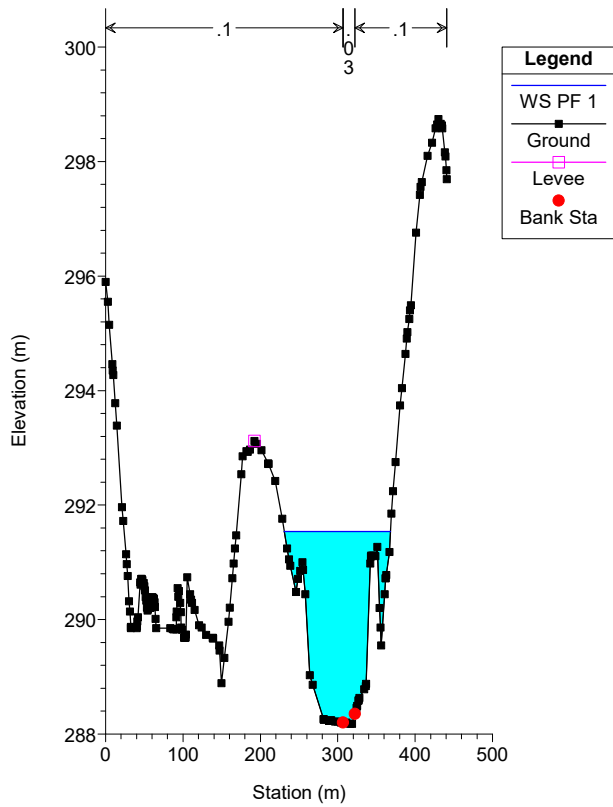
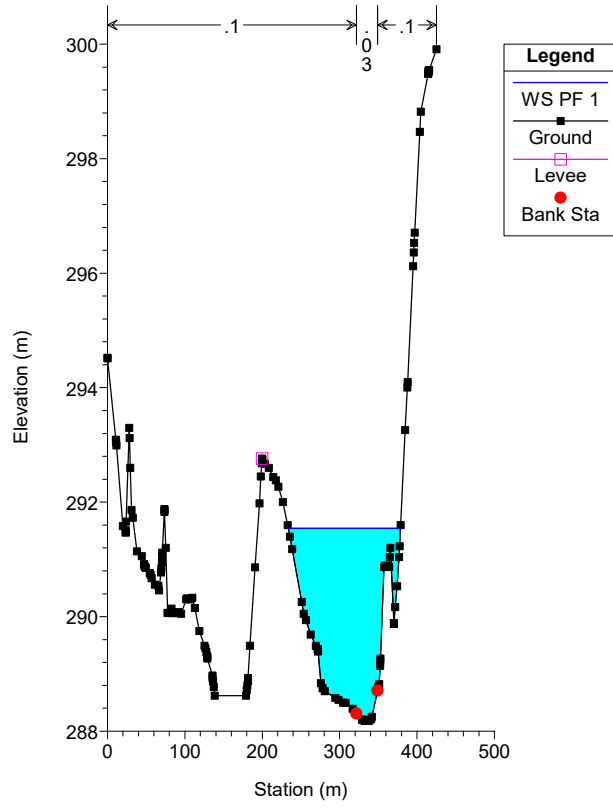
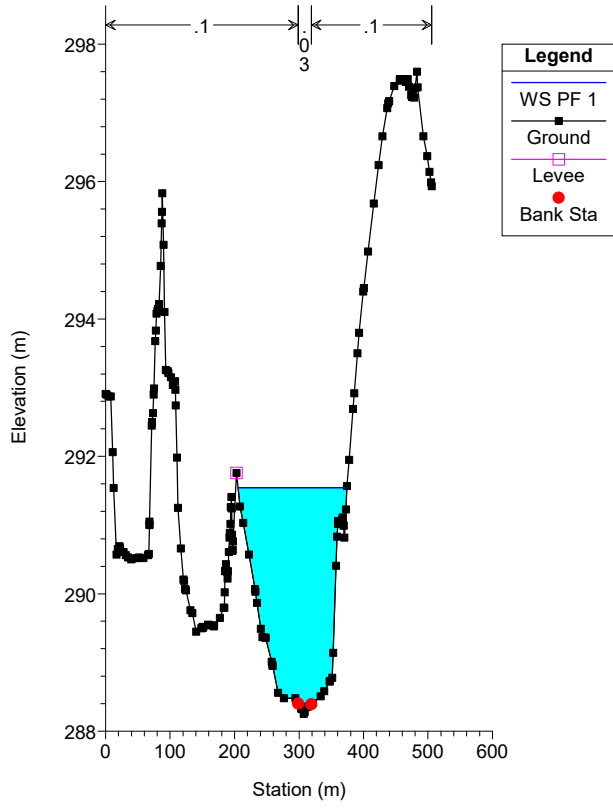
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
Reach3	3500	PF 1	42.44	297.21	298.24	297.86	298.27	0.001301	1.22	72.75	103.90	0.38
Reach3	3400	PF 1	42.44	296.61	298.07	297.58	298.14	0.001178	1.32	51.22	70.18	0.38
Reach3	3300	PF 1	42.44	296.02	297.42	297.42	297.86	0.008197	2.97	15.72	21.53	0.96
Reach3	3200	PF 1	46.20	293.98	294.62	294.97	295.88	0.073434	5.10	10.48	32.37	2.50
Reach3	3100	PF 1	46.20	292.72	294.65	293.47	294.67	0.000258	0.81	106.04	84.69	0.19
Reach3	3000	PF 1	46.20	291.96	294.66		294.66	0.000018	0.27	598.33	366.90	0.05
Reach3	2905.782	PF 1	47.04	291.81	294.66		294.66	0.000007	0.18	805.85	387.68	0.03
Reach3	2800	PF 1	47.04	291.66	294.66		294.66	0.000005	0.15	989.83	420.55	0.03
Reach3	2717.235	PF 1	47.04	291.10	294.66	291.82	294.66	0.000004	0.15	1023.88	447.80	0.02
Reach3	2600	PF 1	51.15	291.26	294.66	291.77	294.66	0.000010	0.23	653.03	306.56	0.04
Reach3	2458.773	PF 1	51.15	291.27	294.66	291.89	294.66	0.000007	0.19	840.71	493.97	0.03
Reach3	2445.08	PF 1	51.15	291.54	294.66	292.77	294.66	0.000016	0.27	395.92	258.13	0.05
Reach3	2414.96		Culvert									
Reach3	2384.841	PF 1	51.53	290.67	292.23	292.23	292.67	0.009410	2.93	17.61	108.27	1.00
Reach3	2372.45	PF 1	51.53	290.59	292.23	292.07	292.34	0.002943	1.82	52.48	97.52	0.58
Reach3	2300	PF 1	51.53	290.73	292.06		292.16	0.002445	1.79	53.62	71.38	0.54
Reach3	2200	PF 1	53.62	290.75	291.96		292.01	0.001066	1.17	81.29	136.04	0.35
Reach3	2100	PF 1	53.62	290.43	291.80		291.88	0.001730	1.66	71.38	112.39	0.46
Reach3	2000	PF 1	53.62	290.36	291.74		291.76	0.000584	0.97	204.73	306.53	0.27
Reach3	1900	PF 1	54.32	290.06	291.69		291.71	0.000558	1.06	188.98	309.43	0.27
Reach3	1800	PF 1	54.32	289.87	291.63		291.66	0.000363	0.89	156.22	288.81	0.22
Reach3	1700	PF 1	55.20	289.79	291.58		291.62	0.000530	1.08	138.17	249.87	0.27
Reach3	1650.791	PF 1	55.20	289.49	291.58		291.60	0.000310	0.87	119.79	103.75	0.21
Reach3	1623.897	PF 1	55.20	289.56	291.58		291.59	0.000196	0.71	152.42	116.37	0.17
Reach3	1600	PF 1	55.20	289.47	291.57		291.59	0.000237	0.84	148.77	106.76	0.19
Reach3	1553.808	PF 1	55.20	288.66	291.56		291.58	0.000139	0.74	135.98	82.08	0.15
Reach3	1500	PF 1	55.20	288.81	291.56		291.57	0.000098	0.62	186.25	121.50	0.12
Reach3	1465.380	PF 1	55.20	288.81	291.56		291.57	0.000076	0.56	219.25	160.82	0.11
Reach3	1439.602	PF 1	55.20	288.81	291.55	289.76	291.56	0.000113	0.68	183.25	105.98	0.13
Reach3	1413.825	PF 1	55.20	288.81	291.55	289.73	291.56	0.000121	0.70	177.66	95.89	0.14
Reach3	1400	PF 1	55.42	288.81	291.55		291.56	0.000076	0.56	267.17	195.69	0.11
Reach3	1300	PF 1	55.42	288.68	291.55		291.55	0.000017	0.27	460.86	247.24	0.05
Reach3	1177.562	PF 1	55.42	288.36	291.55		291.55	0.000017	0.30	454.83	199.34	0.05
Reach3	1102.523	PF 1	55.75	288.25	291.55	288.99	291.55	0.000032	0.41	380.50	168.84	0.07
Reach3	1040.121	PF 1	55.75	288.18	291.54	288.96	291.55	0.000030	0.40	318.45	145.06	0.07
Reach3	1000	PF 1	55.75	288.18	291.54	288.96	291.55	0.000056	0.56	285.56	137.41	0.10
Reach3	883.7938	PF 1	55.75	288.06	291.54		291.54	0.000016	0.30	533.33	188.16	0.05
Reach3	843.6022	PF 1	55.75	288.07	291.54	290.04	291.54	0.000017	0.30	498.41	198.25	0.05
Reach3	828.3132		Culvert									
Reach3	813.2550	PF 1	55.75	287.94	290.06	290.06	290.99	0.007474	4.27	13.06	161.79	1.00
Reach3	749.0974	PF 1	55.75	287.94	289.40	288.74	289.47	0.001097	1.42	99.51	131.88	0.38
Reach3	700	PF 1	116.05	287.79	289.19		289.36	0.002660	2.09	99.85	102.85	0.58
Reach3	599.9999	PF 1	116.05	287.56	288.96		289.07	0.004573	2.80	140.79	136.51	0.76
Reach3	500.0001	PF 1	116.28	287.13	288.37		288.48	0.005000	2.54	173.86	292.99	0.77
Reach3	400	PF 1	116.28	287.07	288.22		288.25	0.002047	1.61	277.66	383.27	0.49
Reach3	300	PF 1	116.28	286.97	288.07		288.09	0.001248	1.19	322.57	409.20	0.38
Reach3	200.0001	PF 1	116.28	286.81	287.91		287.94	0.002525	1.71	266.64	435.30	0.54
Reach3	99.99995	PF 1	116.28	286.81	287.67		287.69	0.002807	1.57	283.84	470.22	0.55
Reach3	10.82205	PF 1	117.31	286.90	287.05	287.05	287.19	0.062182	2.36	79.05	332.09	1.94

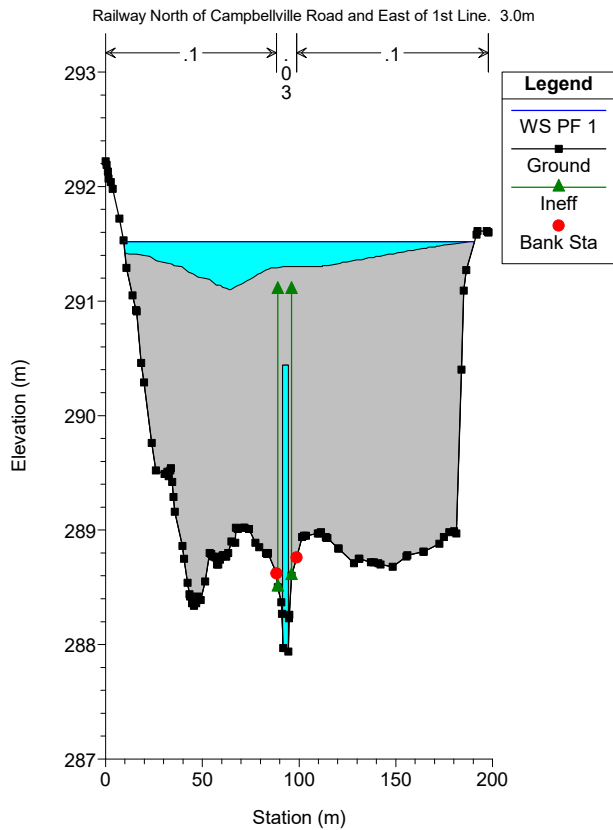
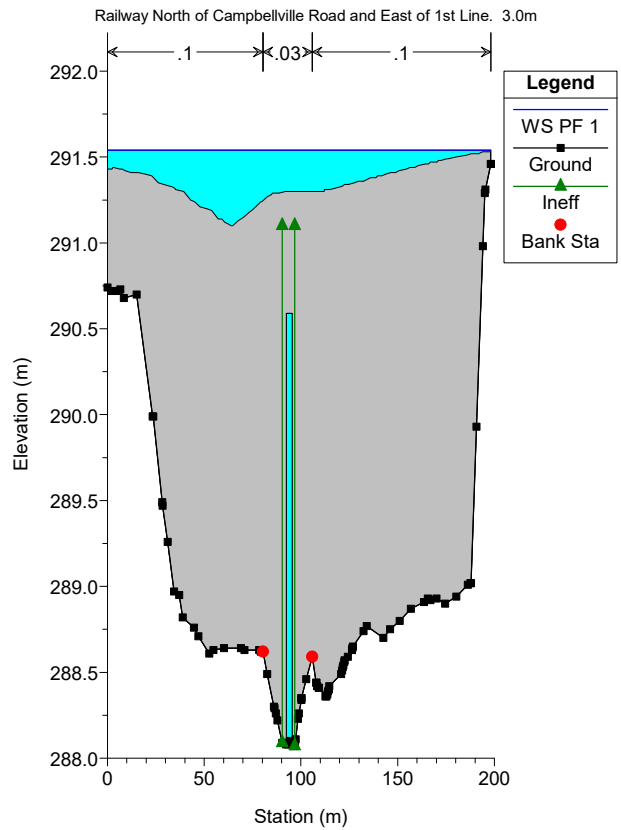
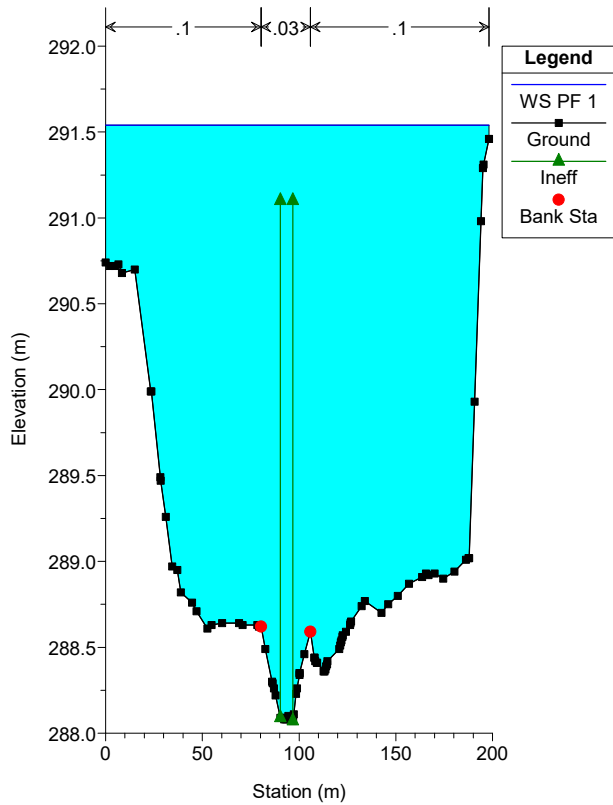
Existing Conditions - Cross-Sections 1700 to 843











Proposed Conditions Summary Output

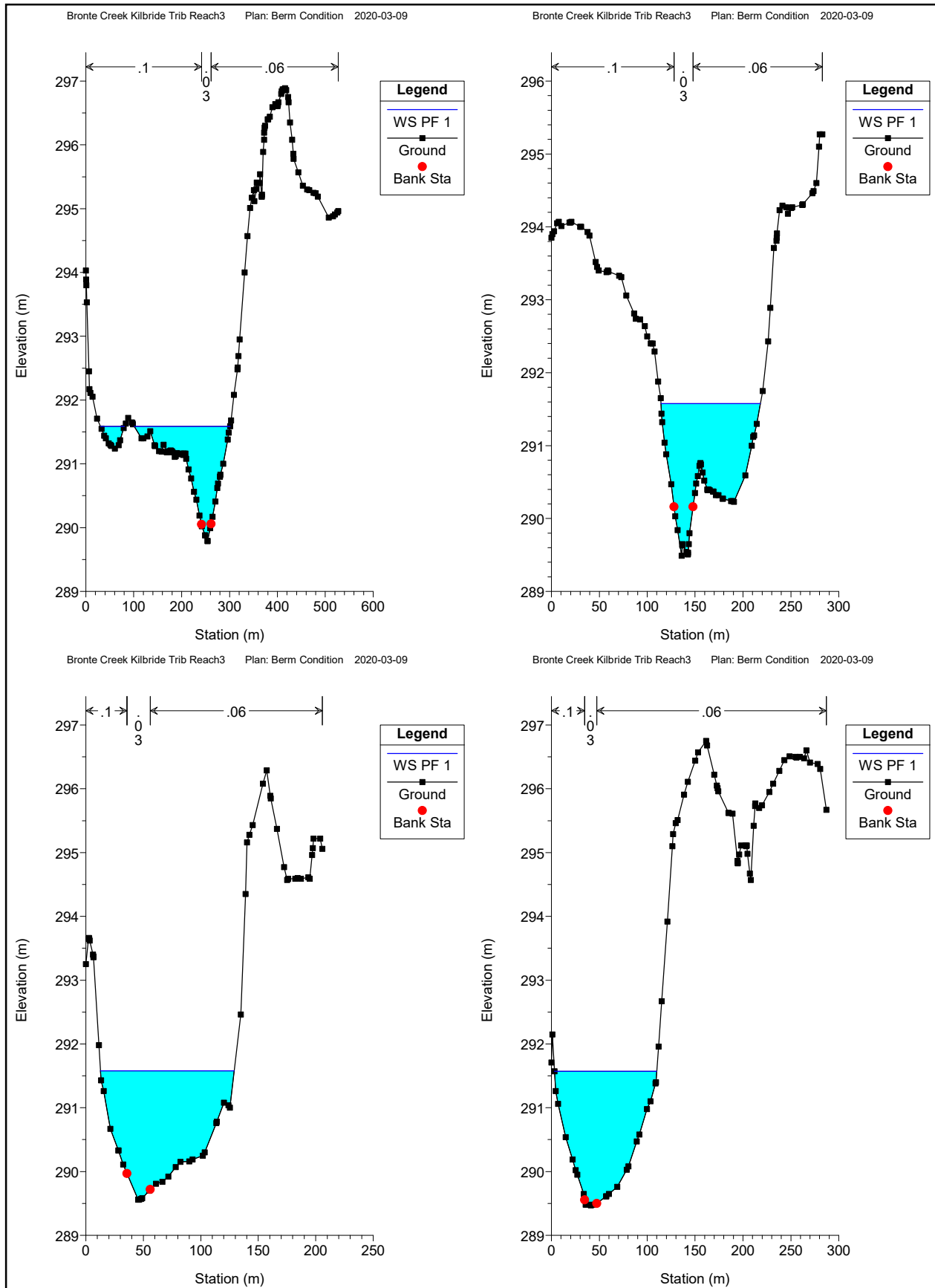
HEC-RAS Plan: Berm River: BronteKilbride Reach: Reach3 Profile: PF 1

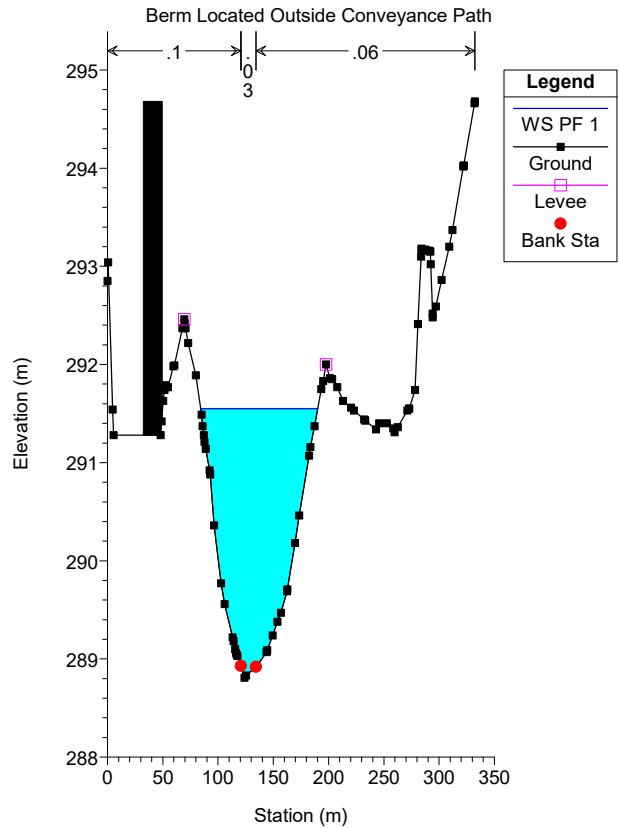
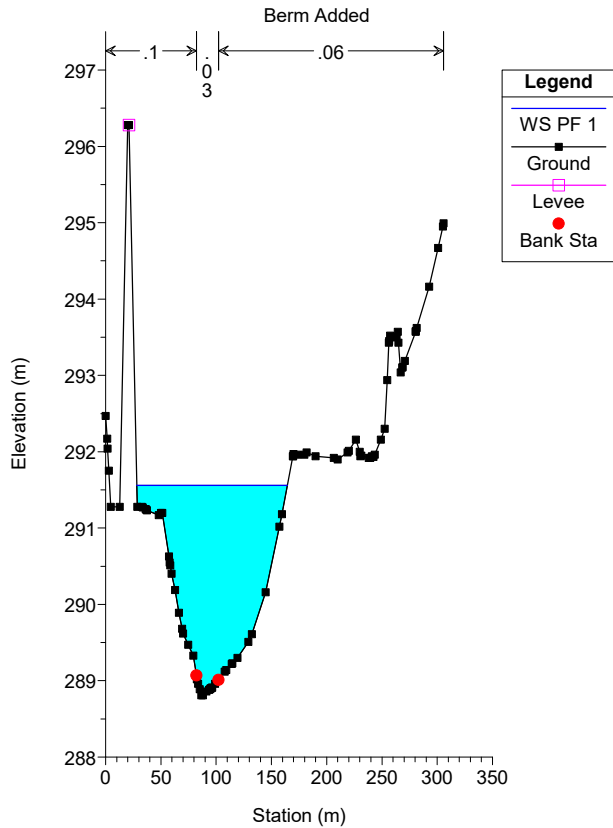
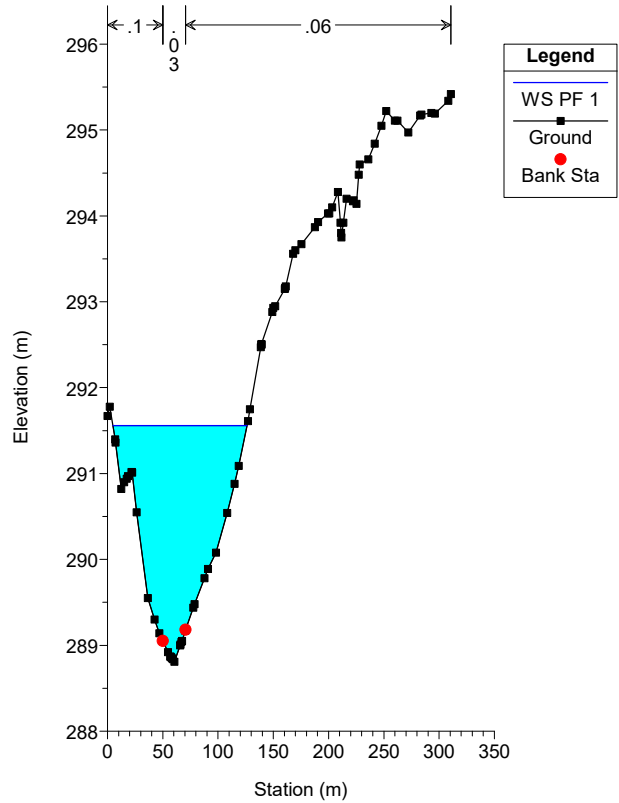
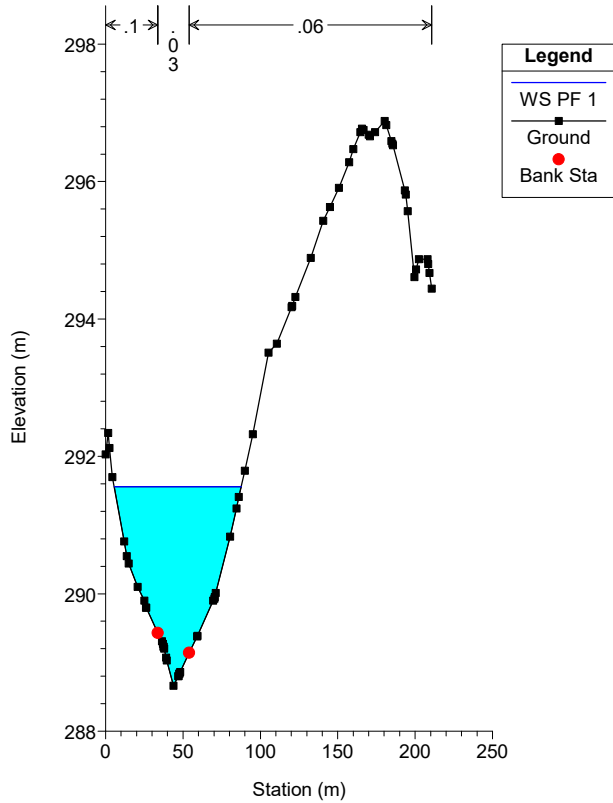
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
Reach3	9700	PF 1	6.99	326.16	327.05	326.99	327.12	0.004609	1.36	12.58	72.56	0.63
Reach3	9600	PF 1	6.99	325.85	326.30	326.30	326.45	0.010676	1.71	5.64	29.99	0.92
Reach3	9485.774	PF 1	6.99	325.10	325.83	325.38	325.84	0.000141	0.31	60.34	158.83	0.12
Reach3	9385.255	PF 1	7.38	324.85	325.83		325.83	0.000007	0.09	229.97	291.70	0.03
Reach3	9320.177	PF 1	7.38	324.85	325.83	325.24	325.83	0.000005	0.07	220.18	270.43	0.02
Reach3	9308.81			Culvert								
Reach3	9297.431	PF 1	7.38	324.78	325.25	325.03	325.28	0.001564	0.79	9.36	247.64	0.37
Reach3	9283.018	PF 1	7.38	324.63	325.26		325.26	0.000060	0.19	120.10	265.54	0.08
Reach3	9200	PF 1	7.38	324.56	325.25		325.25	0.000025	0.13	173.63	289.71	0.05
Reach3	9100	PF 1	9.03	324.58	325.25		325.25	0.000029	0.14	207.04	363.84	0.05
Reach3	9000	PF 1	9.03	324.68	325.25		325.25	0.000068	0.17	150.88	300.70	0.08
Reach3	8900	PF 1	13.12	324.33	325.24		325.24	0.000107	0.32	117.73	182.62	0.11
Reach3	8800	PF 1	13.12	323.76	325.23		325.23	0.000041	0.27	83.69	88.40	0.07
Reach3	8700	PF 1	14.22	324.07	324.96	324.96	325.19	0.010454	2.16	6.84	20.44	0.96
Reach3	8600	PF 1	14.22	323.13	323.57	323.50	323.63	0.005063	1.19	15.99	70.89	0.64
Reach3	8500	PF 1	14.22	322.86	323.11		323.13	0.006258	1.01	32.82	164.20	0.66
Reach3	8400	PF 1	14.88	322.46	322.86		322.87	0.001420	0.66	60.16	204.14	0.34
Reach3	8300	PF 1	14.88	322.37	322.77		322.78	0.000918	0.52	69.99	191.20	0.27
Reach3	8200	PF 1	15.45	322.13	322.75		322.75	0.000147	0.29	119.52	207.01	0.12
Reach3	8100	PF 1	15.45	321.83	322.74	322.17	322.74	0.000095	0.29	136.79	212.07	0.10
Reach3	8000	PF 1	15.45	321.90	322.72	322.17	322.73	0.000234	0.44	90.04	135.81	0.16
Reach3	7900	PF 1	17.81	321.78	322.70	322.13	322.71	0.000212	0.44	86.51	147.09	0.15
Reach3	7800	PF 1	17.81	321.83	322.42	322.42	322.62	0.010134	2.10	13.11	39.27	0.95
Reach3	7700	PF 1	18.21	320.39	320.95	321.02	321.24	0.020234	2.38	8.22	28.85	1.27
Reach3	7600	PF 1	18.21	319.61	319.94	319.94	320.06	0.014849	1.76	14.57	71.24	1.05
Reach3	7500	PF 1	18.21	319.25	319.74	319.42	319.75	0.000847	0.59	54.93	138.18	0.27
Reach3	7400	PF 1	19.53	319.06	319.68		319.69	0.000542	0.53	83.04	177.88	0.23
Reach3	7320.341	PF 1	19.53	318.75	319.31		319.36	0.004152	1.14	32.92	136.65	0.59
Reach3	7304.392	PF 1	19.53	318.76	319.22		319.29	0.004606	1.28	23.48	110.11	0.63
Reach3	7284.915	PF 1	19.53	318.60	319.13	319.03	319.19	0.004738	1.45	30.47	101.84	0.65
Reach3	7248.902	PF 1	19.53	318.48	318.80	318.80	318.90	0.016033	1.87	25.11	115.07	1.10
Reach3	7180.530	PF 1	19.92	317.99	318.64	318.42	318.66	0.001207	0.81	69.99	202.64	0.34
Reach3	7100	PF 1	19.92	317.94	318.59		318.59	0.000575	0.58	93.93	194.04	0.24
Reach3	7000	PF 1	19.92	318.07	318.40		318.46	0.009038	1.45	34.30	144.91	0.83
Reach3	6930.976	PF 1	19.92	317.87	318.36		318.36	0.000631	0.40	97.53	164.40	0.22
Reach3	6868.812	PF 1	22.79	316.70	318.35		318.36	0.000029	0.25	302.60	246.40	0.06
Reach3	6830.484	PF 1	22.79	316.26	318.35		318.35	0.000019	0.23	234.72	191.62	0.05
Reach3	6757.871	PF 1	22.79	316.10	318.34		318.35	0.000085	0.46	71.26	59.84	0.11
Reach3	6672.175	PF 1	24.31	316.26	318.34		318.35	0.000033	0.29	112.25	99.79	0.07
Reach3	6659.042	PF 1	24.31	316.71	318.34	317.75	318.34	0.000078	0.39	119.26	121.56	0.10
Reach3	6651.23			Culvert								
Reach3	6643.419	PF 1	24.31	316.52	317.85	317.85	317.89	0.000922	1.09	35.50	75.13	0.33
Reach3	6630.547	PF 1	24.31	316.36	316.72	316.92	317.44	0.073383	3.86	7.19	32.91	2.33
Reach3	6500	PF 1	24.79	315.93	316.41	316.41	316.41	0.000405	0.33	128.07	323.68	0.18
Reach3	6400	PF 1	24.79	314.85	315.30	315.36	316.18	0.083887	4.40	8.58	70.87	2.53
Reach3	6300	PF 1	24.79	313.68	314.17	313.84	314.18	0.001091	0.62	71.88	187.38	0.30
Reach3	6205.425	PF 1	24.79	312.92	314.01	313.71	314.05	0.001454	1.03	36.18	73.52	0.38
Reach3	6100	PF 1	28.84	312.93	313.84	313.49	313.90	0.001575	1.19	35.59	53.88	0.41
Reach3	6000	PF 1	28.84	312.81	313.42	313.42	313.59	0.009060	2.11	23.10	73.68	0.92
Reach3	5900	PF 1	29.18	311.49	312.09	312.13	312.35	0.012609	2.36	16.20	49.88	1.07
Reach3	5800	PF 1	29.18	310.51	311.80	311.36	311.87	0.001239	1.18	31.82	49.03	0.37
Reach3	5599.767	PF 1	29.18	309.77	310.54		310.60	0.002977	1.39	34.47	78.18	0.54
Reach3	5552.063	PF 1	30.51	309.68	310.56	310.20	310.56	0.000081	0.25	222.23	335.63	0.09
Reach3	5543.333			Culvert								
Reach3	5535.113	PF 1	30.51	309.50	310.20	310.20	310.20	0.000685	0.59	162.65	327.77	0.25
Reach3	5496.844	PF 1	30.51	309.42	309.84	309.46	309.85	0.002165	0.76	107.69	259.38	0.41
Reach3	5200	PF 1	30.51	308.35	309.27	308.98	309.35	0.001979	1.29	35.69	80.69	0.46
Reach3	5100	PF 1	33.82	307.97	308.71	308.71	308.96	0.009192	2.34	24.57	68.17	0.94
Reach3	5000	PF 1	33.82	307.46	308.23	308.05	308.35	0.004087	1.75	37.29	76.84	0.65
Reach3	4900	PF 1	33.82	307.14	307.95	307.76	308.02	0.002628	1.34	47.62	116.27	0.51
Reach3	4800	PF 1	33.82	306.31	307.29	307.29	307.59	0.007996	2.68	24.59	52.20	0.93
Reach3	4700	PF 1	39.88	305.73	306.57	306.30	306.64	0.001976	1.21	54.60	113.32	0.45
Reach3	4600	PF 1	39.88	305.40	306.13	306.13	306.30	0.006963	2.12	47.75	154.89	0.83
Reach3	4500	PF 1	39.88	305.25	305.65	305.32	305.66	0.003217	0.97	100.33	223.48	0.51
Reach3	4400	PF 1	40.41	304.79	304.93	304.93	305.10	0.147115	2.81	22.11	75.64	2.79
Reach3	4300	PF 1	40.41	303.51	304.01	303.72	304.02	0.000616	0.49	82.80	189.58	0.23
Reach3	4200	PF 1	41.08	303.51	303.86	303.73	303.90	0.003020	0.92	52.43	161.45	0.49
Reach3	4141.813	PF 1	41.08	303.51	303.53	303.53	303.56	0.014101	0.29	56.07	197.57	0.66
Reach3	4043.916	PF 1	41.08	299.72	301.74	300.55	301.76	0.000222	0.76	130.66	134.62	0.18
Reach3	3954.525	PF 1	41.52	299.08	301.75	299.62	301.75	0.000042	0.41	267.51	140.80	0.08
Reach3	3930.453	PF 1	41.52	299.11	301.74	300.75	301.75	0.000068	0.49	217.40	130.77	0.10
Reach3	3921.31			Culvert								
Reach3	3912.161	PF 1	41.52	299.50	301.18	301.18	301.22	0.000478	0.98	83.57	97.35	0.25
Reach3	3903.577	PF 1	41.52	299.09	299.95	300.20	300.74	0.031152	3.99	11.22	25.38	1.70
Reach3	3800	PF 1	41.52	298.74	299.64	299.64	300.00	0.008739	2.75	19.96	35.64	0.96
Reach3	3700	PF 1	42.00	298.13	298.68	298.73	298.89	0.012866	2.50	32.16	111.72	1.09
Reach3	3600	PF 1	42.00	297.59	298.37	298.08	298.40	0.001742	1.09	69.44	131.39	0.42

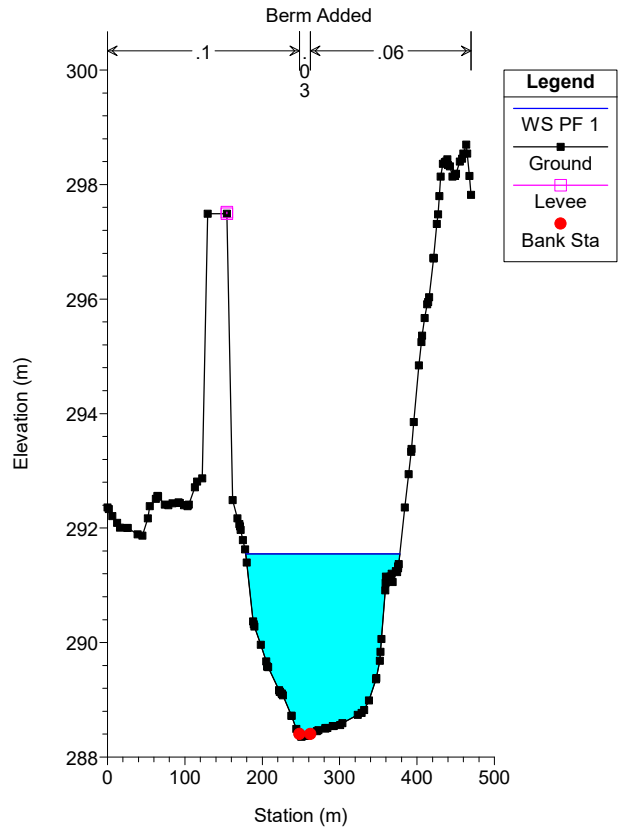
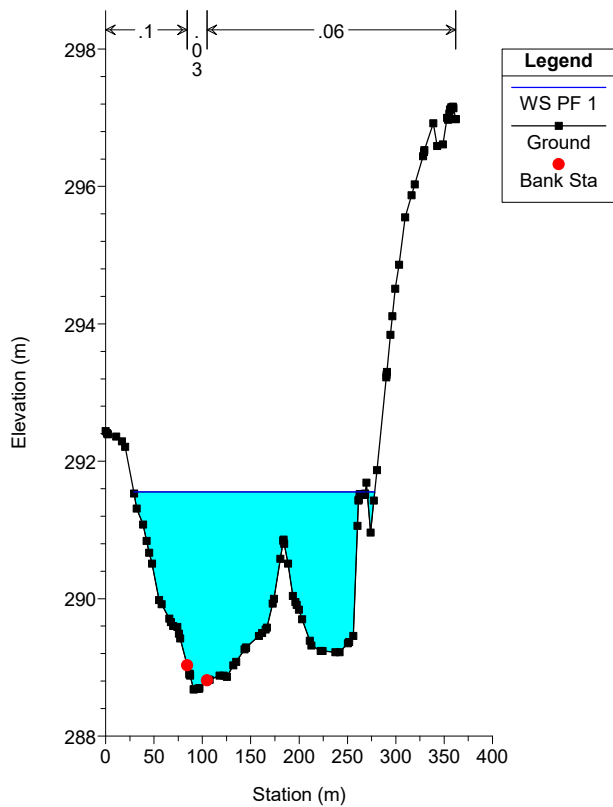
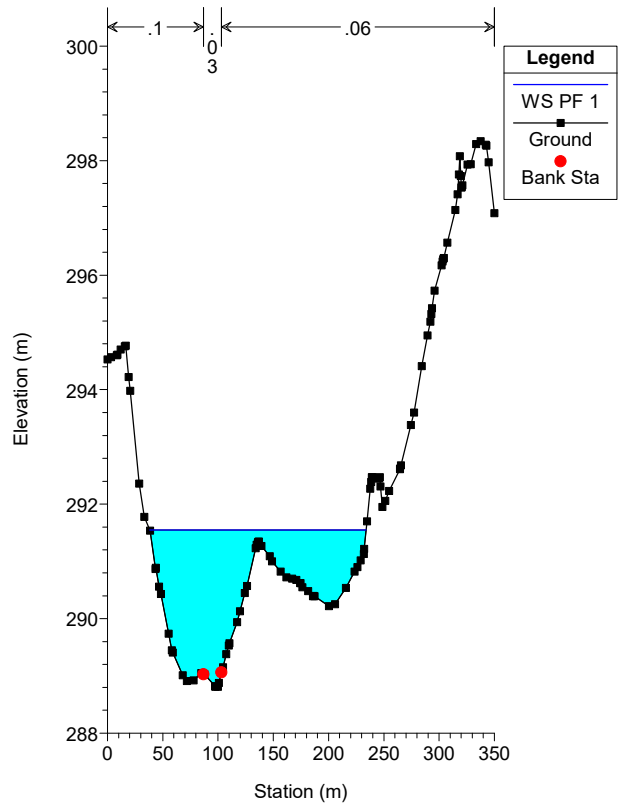
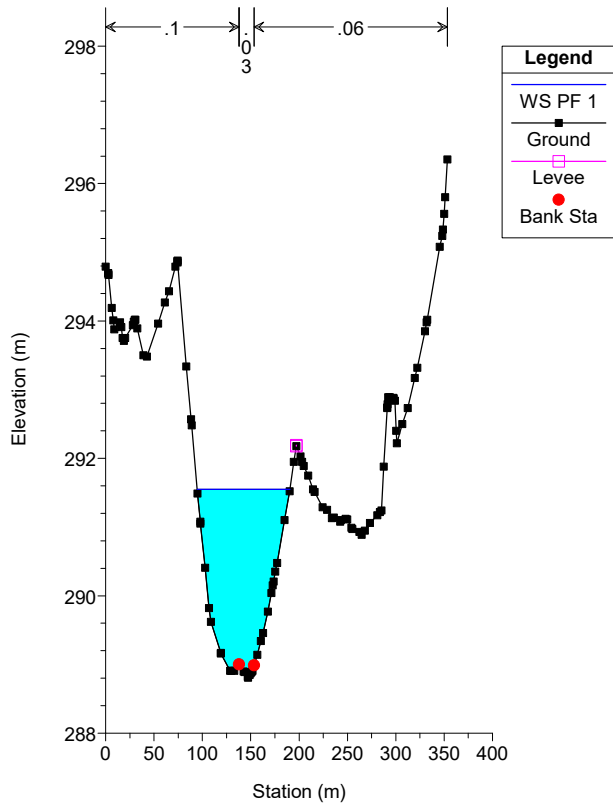
HEC-RAS Plan: Berm River: BronteKilbride Reach: Reach3 Profile: PF 1 (Continued)

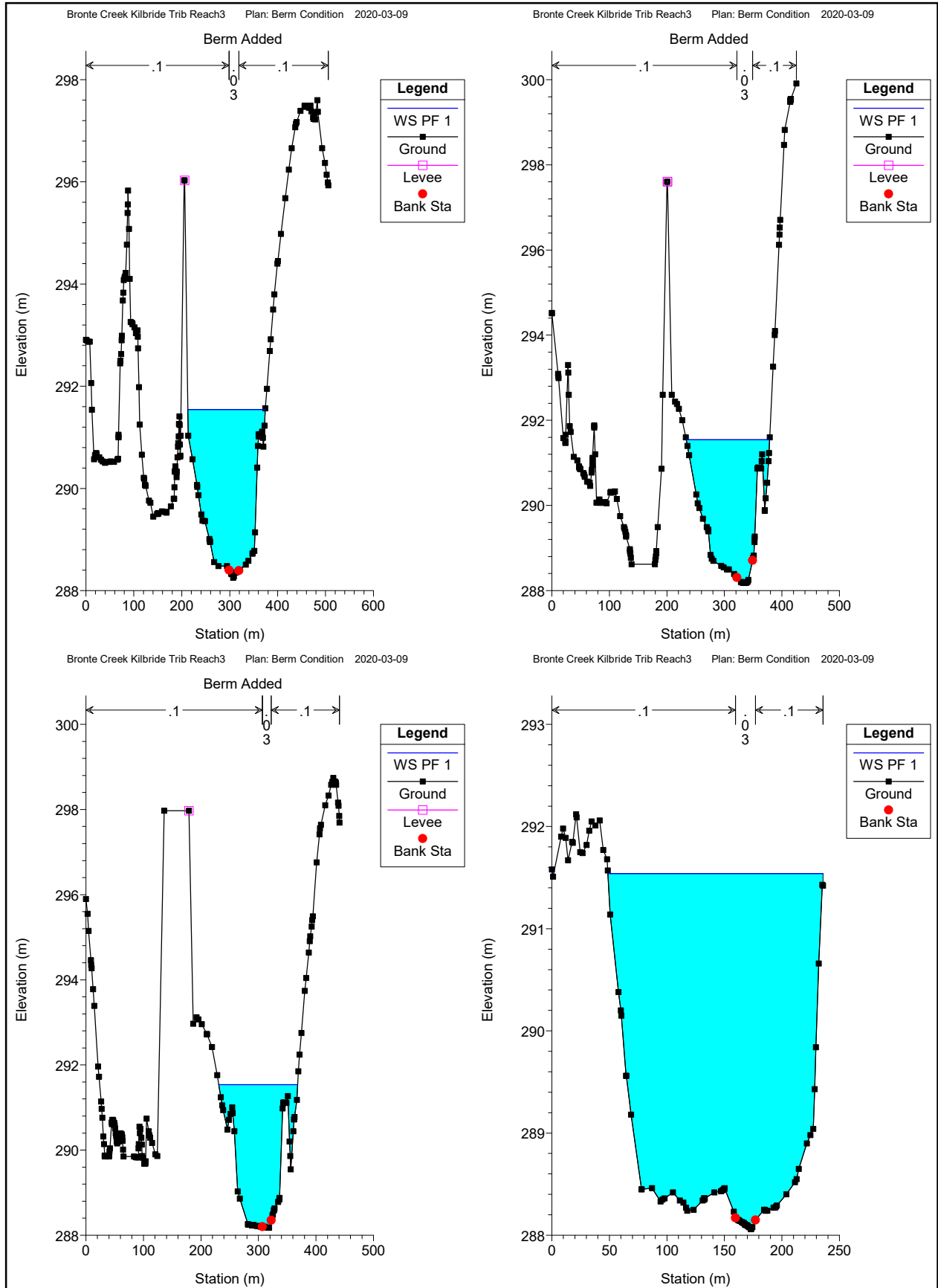
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
Reach3	3500	PF 1	42.44	297.21	298.24	297.86	298.27	0.001301	1.22	72.75	103.90	0.38
Reach3	3400	PF 1	42.44	296.61	298.07	297.58	298.14	0.001178	1.32	51.22	70.18	0.38
Reach3	3300	PF 1	42.44	296.02	297.42	297.42	297.86	0.008197	2.97	15.72	21.53	0.96
Reach3	3200	PF 1	46.20	293.98	294.62	294.97	295.88	0.073434	5.10	10.48	32.37	2.50
Reach3	3100	PF 1	46.20	292.72	294.65	293.47	294.67	0.000258	0.81	106.04	84.69	0.19
Reach3	3000	PF 1	46.20	291.96	294.66		294.66	0.000018	0.27	598.33	366.90	0.05
Reach3	2905.782	PF 1	47.04	291.81	294.66		294.66	0.000007	0.18	805.85	387.68	0.03
Reach3	2800	PF 1	47.04	291.66	294.66		294.66	0.000005	0.15	989.83	420.55	0.03
Reach3	2717.235	PF 1	47.04	291.10	294.66	291.82	294.66	0.000004	0.15	1023.88	447.80	0.02
Reach3	2600	PF 1	51.15	291.26	294.66	291.77	294.66	0.000010	0.23	653.03	306.56	0.04
Reach3	2458.773	PF 1	51.15	291.27	294.66	291.89	294.66	0.000007	0.19	840.71	493.97	0.03
Reach3	2445.08	PF 1	51.15	291.54	294.66	292.77	294.66	0.000016	0.27	395.92	258.13	0.05
Reach3	2414.96		Culvert									
Reach3	2384.841	PF 1	51.53	290.67	292.23	292.23	292.67	0.009410	2.93	17.61	108.27	1.00
Reach3	2372.45	PF 1	51.53	290.59	292.23	292.07	292.34	0.002943	1.82	52.48	97.52	0.58
Reach3	2300	PF 1	51.53	290.73	292.06		292.16	0.002445	1.79	53.62	71.38	0.54
Reach3	2200	PF 1	53.62	290.75	291.96		292.01	0.001066	1.17	81.29	136.04	0.35
Reach3	2100	PF 1	53.62	290.43	291.80		291.88	0.001730	1.66	71.38	112.39	0.46
Reach3	2000	PF 1	53.62	290.36	291.74		291.76	0.000584	0.97	204.73	306.53	0.27
Reach3	1900	PF 1	54.32	290.06	291.69		291.71	0.000558	1.06	188.98	309.43	0.27
Reach3	1800	PF 1	54.32	289.87	291.63		291.66	0.000363	0.89	156.22	288.81	0.22
Reach3	1700	PF 1	55.20	289.79	291.58		291.62	0.000530	1.08	138.17	249.87	0.27
Reach3	1650.791	PF 1	55.20	289.49	291.58		291.60	0.000310	0.87	119.79	103.75	0.21
Reach3	1623.897	PF 1	55.20	289.56	291.58		291.59	0.000196	0.71	152.42	116.37	0.17
Reach3	1600	PF 1	55.20	289.47	291.57		291.59	0.000237	0.84	148.77	106.76	0.19
Reach3	1553.808	PF 1	55.20	288.66	291.56		291.58	0.000139	0.74	135.97	82.08	0.15
Reach3	1500	PF 1	55.20	288.81	291.56		291.57	0.000098	0.62	186.25	121.50	0.12
Reach3	1465.380	PF 1	55.20	288.81	291.56	289.72	291.57	0.000075	0.55	212.54	136.26	0.11
Reach3	1439.602	PF 1	55.20	288.81	291.55	289.76	291.56	0.000113	0.68	183.25	105.98	0.13
Reach3	1413.825	PF 1	55.20	288.81	291.55	289.73	291.56	0.000121	0.70	177.66	95.89	0.14
Reach3	1400	PF 1	55.42	288.81	291.55		291.56	0.000076	0.56	267.16	195.69	0.11
Reach3	1300	PF 1	55.42	288.68	291.55		291.55	0.000017	0.27	460.85	247.24	0.05
Reach3	1177.562	PF 1	55.42	288.36	291.55	288.99	291.55	0.000017	0.30	454.82	199.34	0.05
Reach3	1102.523	PF 1	55.75	288.25	291.55	289.00	291.55	0.000031	0.40	378.34	161.68	0.07
Reach3	1040.121	PF 1	55.75	288.18	291.54	288.96	291.55	0.000030	0.40	318.45	145.06	0.07
Reach3	1000	PF 1	55.75	288.18	291.54	288.96	291.55	0.000056	0.56	285.56	137.41	0.10
Reach3	883.7938	PF 1	55.75	288.06	291.54		291.54	0.000016	0.30	533.33	188.16	0.05
Reach3	843.6022	PF 1	55.75	288.07	291.54	290.04	291.54	0.000017	0.30	498.41	198.25	0.05
Reach3	828.3132		Culvert									
Reach3	813.2550	PF 1	55.75	287.94	290.06	290.06	290.99	0.007474	4.27	13.06	161.79	1.00
Reach3	749.0974	PF 1	55.75	287.94	289.40	288.74	289.47	0.001097	1.42	99.51	131.88	0.38
Reach3	700	PF 1	116.05	287.79	289.19		289.36	0.002660	2.09	99.85	102.85	0.58
Reach3	599.9999	PF 1	116.05	287.56	288.96		289.07	0.004573	2.80	140.79	136.51	0.76
Reach3	500.0001	PF 1	116.28	287.13	288.37		288.48	0.005000	2.54	173.86	292.99	0.77
Reach3	400	PF 1	116.28	287.07	288.22		288.25	0.002047	1.61	277.66	383.27	0.49
Reach3	300	PF 1	116.28	286.97	288.07		288.09	0.001248	1.19	322.57	409.20	0.38
Reach3	200.0001	PF 1	116.28	286.81	287.91		287.94	0.002525	1.71	266.64	435.30	0.54
Reach3	99.99995	PF 1	116.28	286.81	287.67		287.69	0.002807	1.57	283.84	470.22	0.55
Reach3	10.82205	PF 1	117.31	286.90	287.05	287.05	287.19	0.062182	2.36	79.05	332.09	1.94

Proposed Conditions - Cross-Sections 1700 to 843









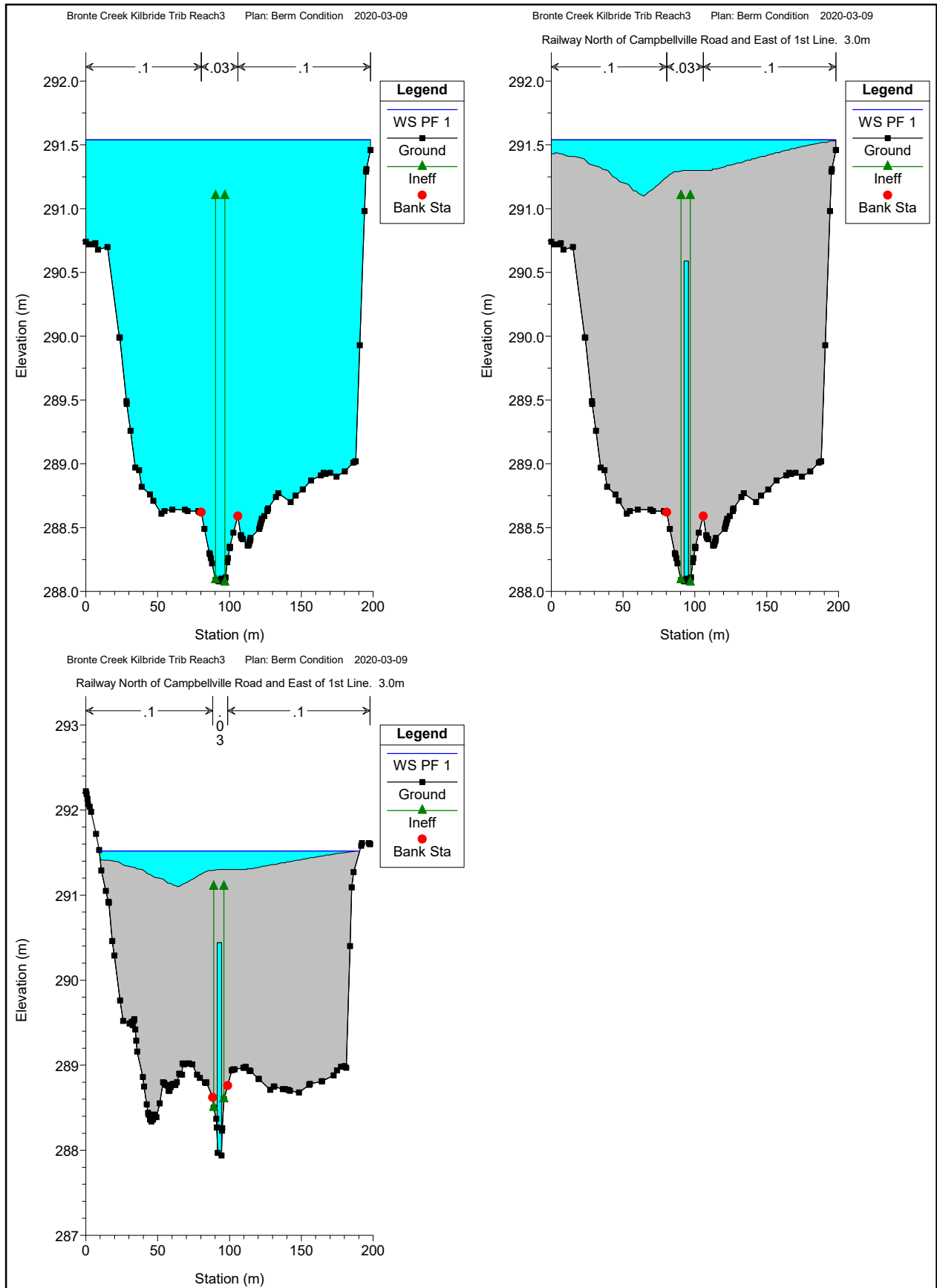


Figure 1 - HEC-RAS Model and CA Flood Plain Mapping

