



COMUNE DI ACQUI TERME

VERIFICA DI COMPATIBILITA' IDRAULICA DI
PREVISIONE DEGLI STRUMENTI URBANISTICI

Torino, Ottobre 2011	Agg.	S.2011.03
il tecnico incaricato Ing. Pietro CAVALLERO	 S tudio Associato I ngegneri A rchitetti C avallero C.so Vittorio Emanuele II, 167 10139 Torino tel. 011 - 0364820 Fax. 011 - 0364822 e-mail cavallerosiacitk@virgilio.it	
collaboratore: Ing. Cosimo Vinci		
ELAB. N. 2.3	TABULATI DI CALCOLO VECCHIO RIO MEDRIO	

Scenario B1)

Vecchio Rio Medrio Tempo di ritorno $T_r = 20$ anni

Portata a monte dello scolmatore $Q = 63$ mc/s

Portata a valle dello scolmatore $Q = 26$ mc/s

Fiume Bormida Tempo di ritorno $T_r = 20$ anni

$Q = 1740$ mc/s livello idrico 143.69 m

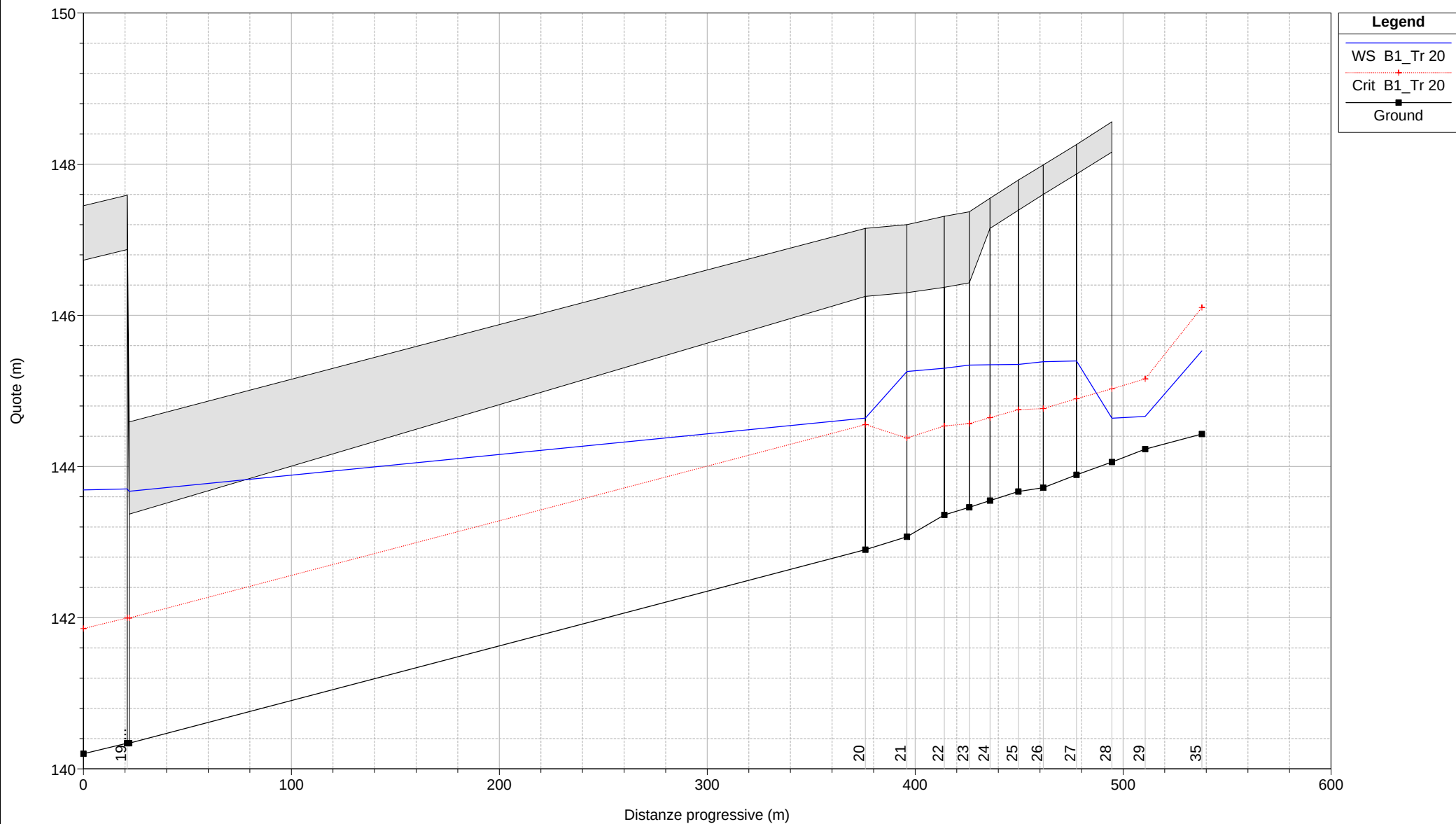
HEC-RAS Plan: Plan 07 River: medrio Reach: acqui Profile: B1_Tr 20

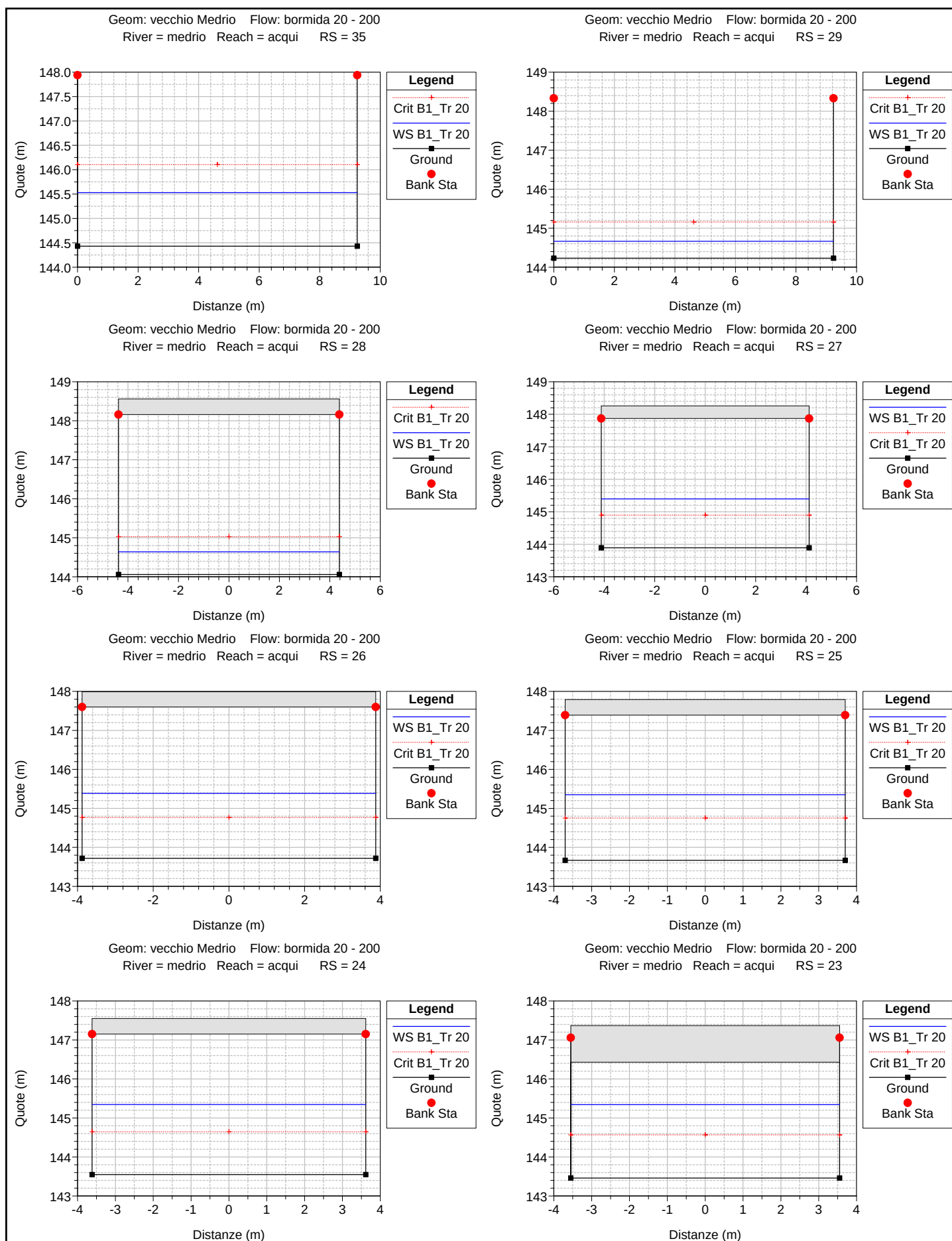
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
acqui	35	B1_Tr 20	63.00	144.43	145.53	146.10	147.49	0.017991	6.20	10.16	9.24	1.89
acqui	29	B1_Tr 20	26.00	144.23	144.66	145.16	146.82	0.058292	6.50	4.00	9.24	3.16
acqui	28	B1_Tr 20	26.00	144.06	144.64	145.03	145.98	0.025722	5.13	5.07	8.75	2.15
acqui	27	B1_Tr 20	26.00	143.89	145.40	144.90	145.62	0.001541	2.10	12.41	8.24	0.54
acqui	26	B1_Tr 20	26.00	143.72	145.39	144.77	145.59	0.001320	2.01	12.93	7.76	0.50
acqui	25	B1_Tr 20	26.00	143.67	145.35	144.75	145.57	0.001441	2.09	12.44	7.40	0.51
acqui	24	B1_Tr 20	26.00	143.55	145.35	144.65	145.55	0.001259	2.00	12.98	7.23	0.48
acqui	23	B1_Tr 20	26.00	143.46	145.34	144.57	145.53	0.001149	1.95	13.36	7.10	0.45
acqui	22	B1_Tr 20	26.00	143.36	145.30	144.54	145.52	0.001323	2.07	12.57	6.48	0.47
acqui	21	B1_Tr 20	26.00	143.07	145.26	144.38	145.49	0.001402	2.14	12.14	5.55	0.46
acqui	20	B1_Tr 20	26.00	142.90	144.64	144.56	145.39	0.006564	3.83	6.79	3.90	0.93
acqui	19.2	B1_Tr 20	26.00	140.34	143.67	142.00	143.92	0.002395	2.20	11.82		0.38
acqui	19.1	B1_Tr 20	26.00	140.34	143.70	142.00	143.90	0.001186	1.98	13.12	3.90	0.34
acqui	19	B1_Tr 20	26.00	140.20	143.69	141.86	143.88	0.001083	1.91	13.61	3.90	0.33

HEC-RAS Plan: Plan 07 River: medrio Reach: acqui Profile: B1_Tr 20

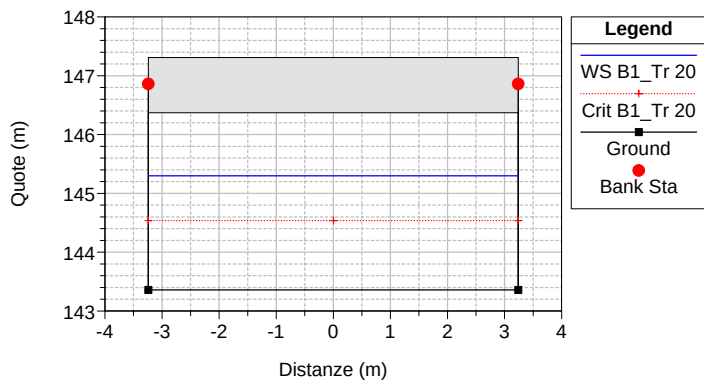
Reach	River Sta	Profile	E.G. Elev	W.S. Elev	Vel Head	Frctn Loss	C & E Loss	Q Left	Q Channel	Q Right	Top Width
			(m)	(m)	(m)	(m)	(m)	(m3/s)	(m3/s)	(m3/s)	(m)
acqui	35	B1_Tr 20	147.49	145.53	1.96				63.00		9.24
acqui	29	B1_Tr 20	146.82	144.66	2.16	0.65	0.02		26.00		9.24
acqui	28	B1_Tr 20	145.98	144.64	1.34	0.59	0.24		26.00		8.75
acqui	27	B1_Tr 20	145.62	145.40	0.22	0.02	0.01		26.00		8.24
acqui	26	B1_Tr 20	145.59	145.39	0.21	0.02	0.00		26.00		7.76
acqui	25	B1_Tr 20	145.57	145.35	0.22	0.02	0.01		26.00		7.40
acqui	24	B1_Tr 20	145.55	145.35	0.20	0.01	0.00		26.00		7.23
acqui	23	B1_Tr 20	145.53	145.34	0.19	0.01	0.00		26.00		7.10
acqui	22	B1_Tr 20	145.52	145.30	0.22	0.02	0.00		26.00		6.48
acqui	21	B1_Tr 20	145.49	145.26	0.23	0.05	0.05		26.00		5.55
acqui	20	B1_Tr 20	145.39	144.64	0.75	1.32	0.15		26.00		3.90
acqui	19.2	B1_Tr 20	143.92	143.67	0.25	0.00	0.01		26.00		
acqui	19.1	B1_Tr 20	143.90	143.70	0.20	0.02	0.00		26.00		3.90
acqui	19	B1_Tr 20	143.88	143.69	0.19				26.00		3.90

Geom: vecchio Medrio Flow: bormida 20 - 200

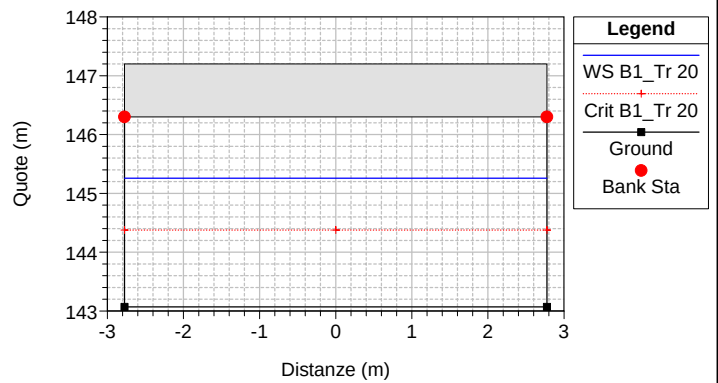




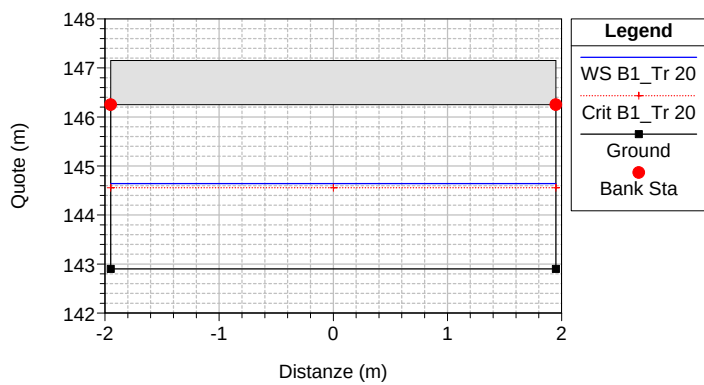
Geom: vecchio Medrio Flow: bormida 20 - 200
River = medrio Reach = acqui RS = 22



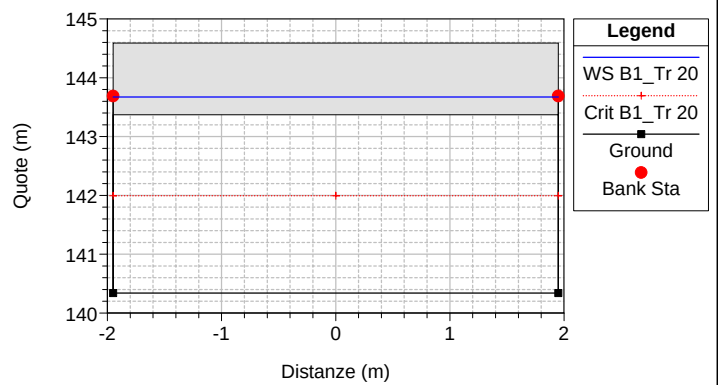
Geom: vecchio Medrio Flow: bormida 20 - 200
River = medrio Reach = acqui RS = 21



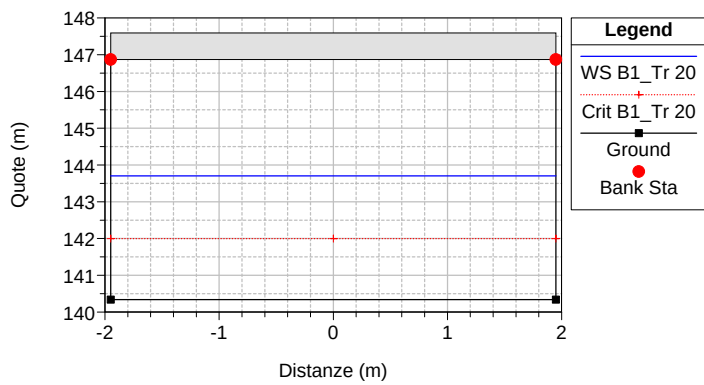
Geom: vecchio Medrio Flow: bormida 20 - 200
River = medrio Reach = acqui RS = 20



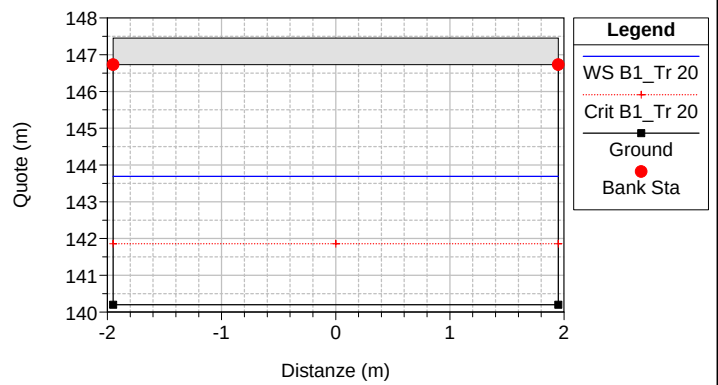
Geom: vecchio Medrio Flow: bormida 20 - 200
River = medrio Reach = acqui RS = 19.2



Geom: vecchio Medrio Flow: bormida 20 - 200
River = medrio Reach = acqui RS = 19.1



Geom: vecchio Medrio Flow: bormida 20 - 200
River = medrio Reach = acqui RS = 19



Scenario B2)

Vecchio Rio Medrio Tempo di ritorno $Tr = 200$ anni

Portata a monte dello scolmatore $Q = 120$ mc/s

Portata a valle dello scolmatore $Q = 26$ mc/s

Fiume Bormida Tempo di ritorno $Tr = 20$ anni

$Q = 1740$ mc/s livello idrico 143.69 m

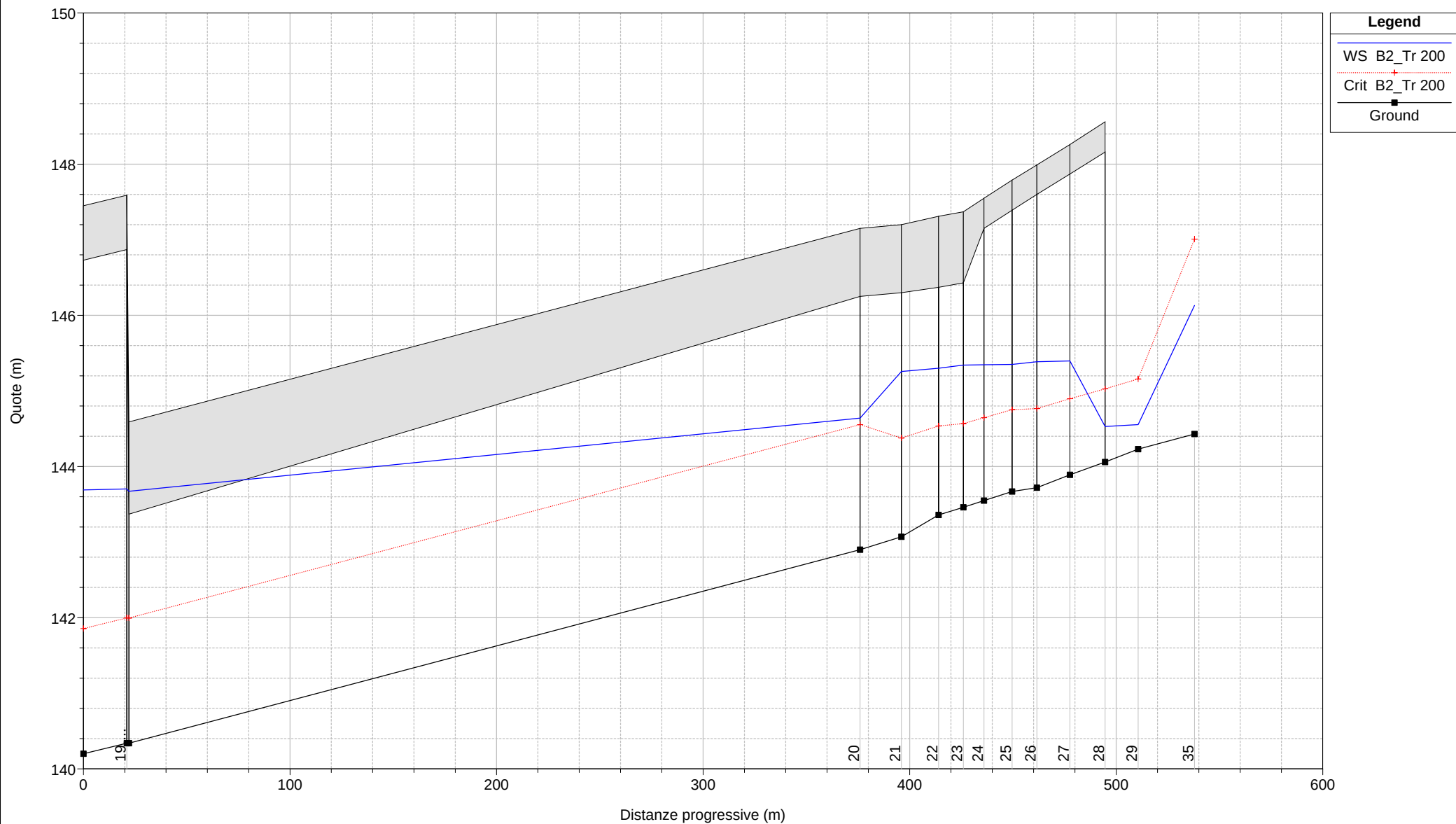
HEC-RAS Plan: Plan 07 River: medrio Reach: acqui Profile: B2_Tr 200

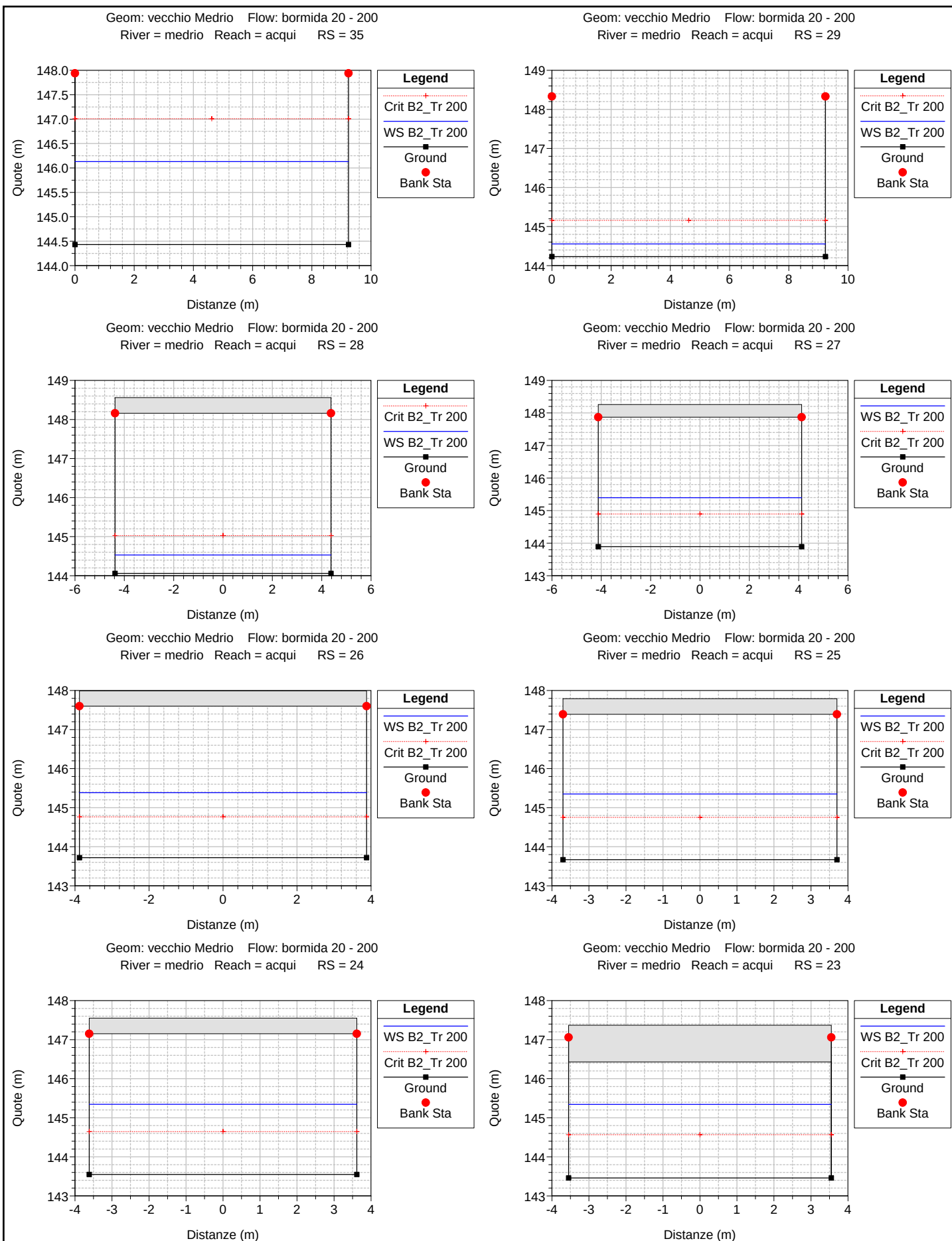
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
acqui	35	B2_Tr 200	120.00	144.43	146.13	147.01	149.10	0.017476	7.64	15.71	9.24	1.87
acqui	29	B2_Tr 200	26.00	144.23	144.55	145.16	148.40	0.148870	8.69	2.99	9.24	4.88
acqui	28	B2_Tr 200	26.00	144.06	144.53	145.03	146.57	0.050442	6.33	4.10	8.75	2.95
acqui	27	B2_Tr 200	26.00	143.89	145.40	144.90	145.62	0.001541	2.10	12.41	8.24	0.54
acqui	26	B2_Tr 200	26.00	143.72	145.39	144.77	145.59	0.001320	2.01	12.93	7.76	0.50
acqui	25	B2_Tr 200	26.00	143.67	145.35	144.75	145.57	0.001441	2.09	12.44	7.40	0.51
acqui	24	B2_Tr 200	26.00	143.55	145.35	144.65	145.55	0.001259	2.00	12.98	7.23	0.48
acqui	23	B2_Tr 200	26.00	143.46	145.34	144.57	145.53	0.001149	1.95	13.36	7.10	0.45
acqui	22	B2_Tr 200	26.00	143.36	145.30	144.54	145.52	0.001323	2.07	12.57	6.48	0.47
acqui	21	B2_Tr 200	26.00	143.07	145.26	144.38	145.49	0.001402	2.14	12.14	5.55	0.46
acqui	20	B2_Tr 200	26.00	142.90	144.64	144.56	145.39	0.006564	3.83	6.79	3.90	0.93
acqui	19.2	B2_Tr 200	26.00	140.34	143.67	142.00	143.92	0.002395	2.20	11.82		0.38
acqui	19.1	B2_Tr 200	26.00	140.34	143.70	142.00	143.90	0.001186	1.98	13.12	3.90	0.34
acqui	19	B2_Tr 200	26.00	140.20	143.69	141.86	143.88	0.001083	1.91	13.61	3.90	0.33

HEC-RAS Plan: Plan 07 River: medrio Reach: acqui Profile: B2_Tr 200

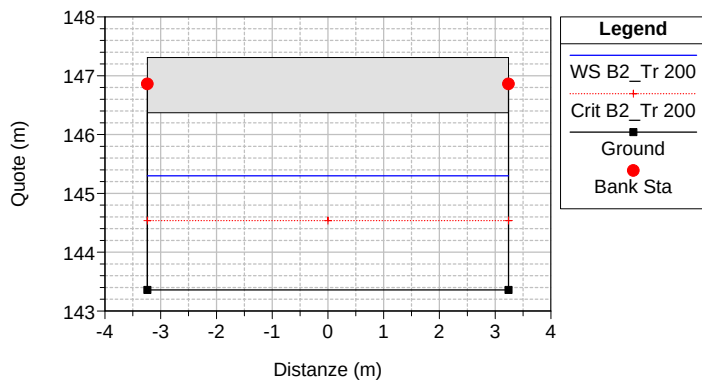
Reach	River Sta	Profile	E.G. Elev (m)	W.S. Elev (m)	Vel Head (m)	Frctn Loss (m)	C & E Loss (m)	Q Left (m3/s)	Q Channel (m3/s)	Q Right (m3/s)	Top Width (m)
acqui	35	B2_Tr 200	149.10	146.13	2.97				120.00		9.24
acqui	29	B2_Tr 200	148.40	144.55	3.85	0.61	0.09		26.00		9.24
acqui	28	B2_Tr 200	146.57	144.53	2.04	1.29	0.54		26.00		8.75
acqui	27	B2_Tr 200	145.62	145.40	0.22	0.02	0.01		26.00		8.24
acqui	26	B2_Tr 200	145.59	145.39	0.21	0.02	0.00		26.00		7.76
acqui	25	B2_Tr 200	145.57	145.35	0.22	0.02	0.01		26.00		7.40
acqui	24	B2_Tr 200	145.55	145.35	0.20	0.01	0.00		26.00		7.23
acqui	23	B2_Tr 200	145.53	145.34	0.19	0.01	0.00		26.00		7.10
acqui	22	B2_Tr 200	145.52	145.30	0.22	0.02	0.00		26.00		6.48
acqui	21	B2_Tr 200	145.49	145.26	0.23	0.05	0.05		26.00		5.55
acqui	20	B2_Tr 200	145.39	144.64	0.75	1.32	0.15		26.00		3.90
acqui	19.2	B2_Tr 200	143.92	143.67	0.25	0.00	0.01		26.00		
acqui	19.1	B2_Tr 200	143.90	143.70	0.20	0.02	0.00		26.00		3.90
acqui	19	B2_Tr 200	143.88	143.69	0.19				26.00		3.90

Geom: vecchio Medrio Flow: bormida 20 - 200

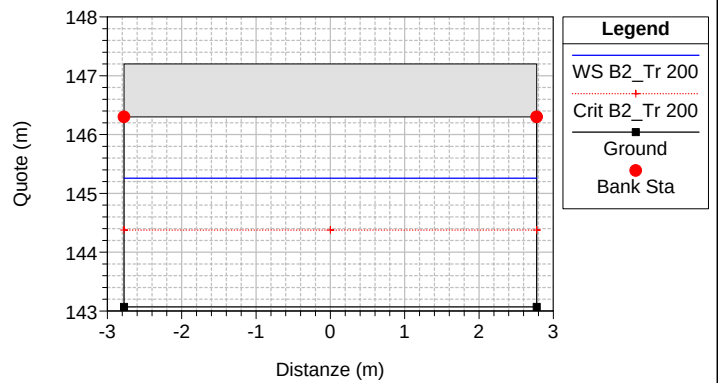




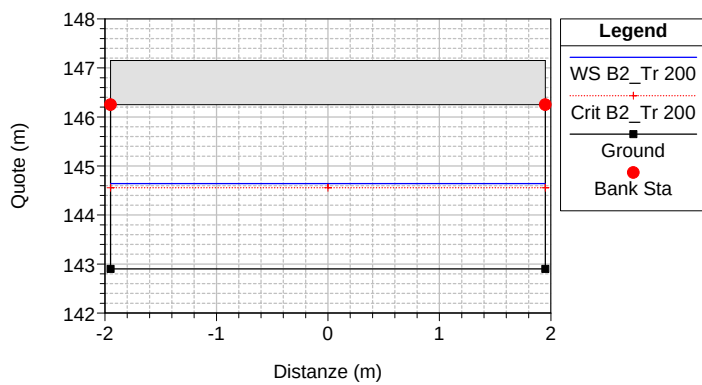
Geom: vecchio Medrio Flow: bormida 20 - 200
River = medrio Reach = acqui RS = 22



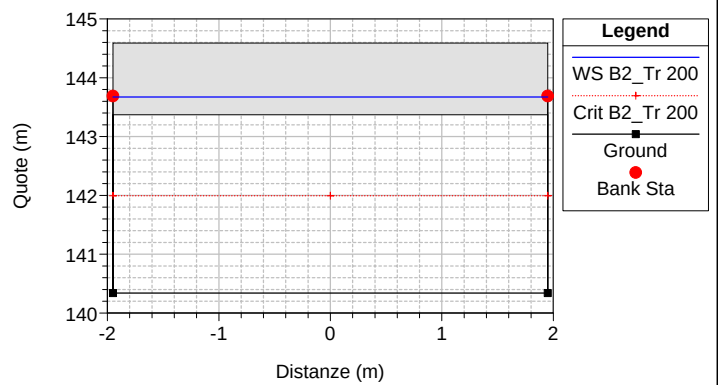
Geom: vecchio Medrio Flow: bormida 20 - 200
River = medrio Reach = acqui RS = 21



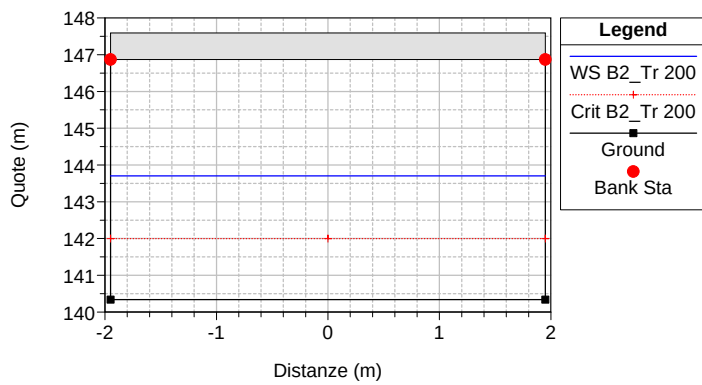
Geom: vecchio Medrio Flow: bormida 20 - 200
River = medrio Reach = acqui RS = 20



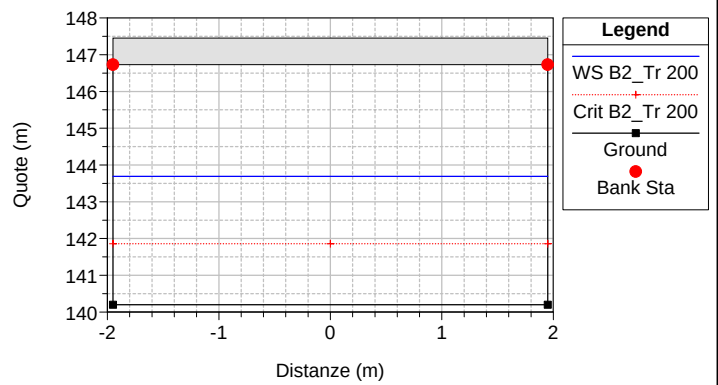
Geom: vecchio Medrio Flow: bormida 20 - 200
River = medrio Reach = acqui RS = 19.2



Geom: vecchio Medrio Flow: bormida 20 - 200
River = medrio Reach = acqui RS = 19.1



Geom: vecchio Medrio Flow: bormida 20 - 200
River = medrio Reach = acqui RS = 19



Scenario D1)

Vecchio Rio Medrio Tempo di ritorno $Tr = 20$ anni

Portata a monte dello scolmatore $Q = 63$ mc/s

Portata a valle dello scolmatore $Q = 26$ mc/s

Fiume Bormida Tempo di ritorno $Tr = 200$ anni

$Q = 2980$ mc/s livello idrico 145.55 m

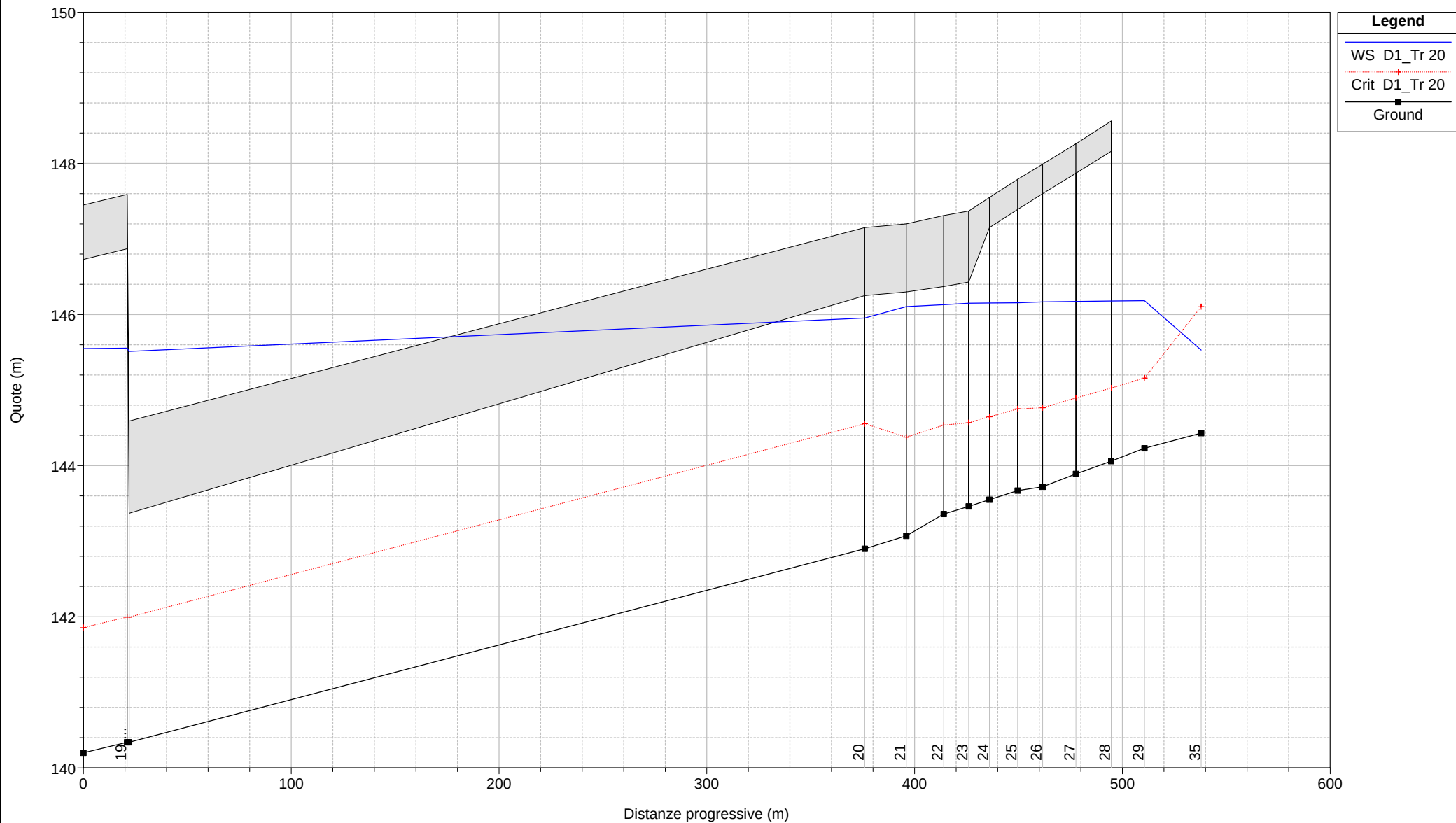
HEC-RAS Plan: Plan 07 River: medrio Reach: acqui Profile: D1_Tr 20

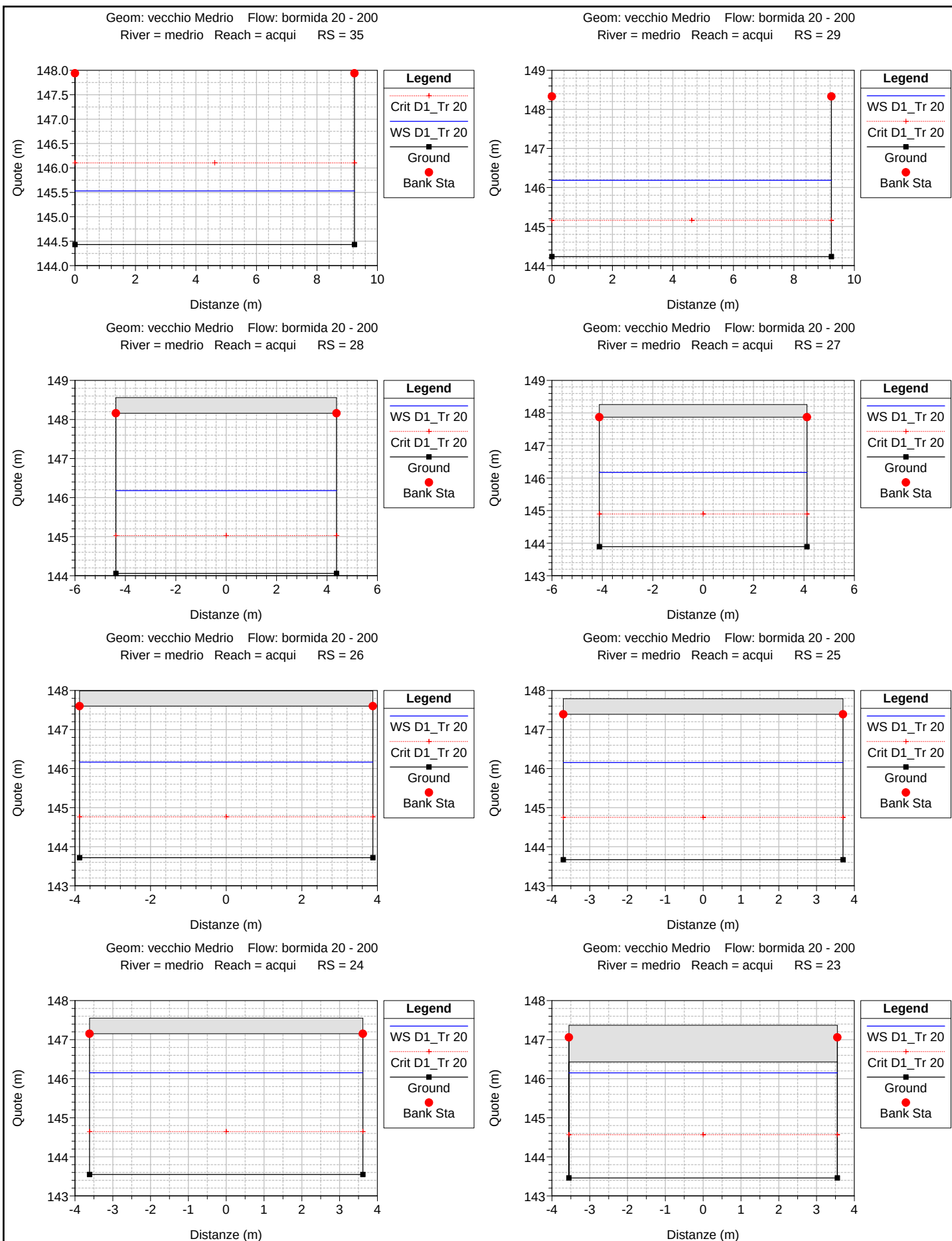
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
acqui	35	D1_Tr 20	63.00	144.43	145.53	146.10	147.49	0.017991	6.20	10.16	9.24	1.89
acqui	29	D1_Tr 20	26.00	144.23	146.18	145.16	146.29	0.000544	1.44	18.05	9.24	0.33
acqui	28	D1_Tr 20	26.00	144.06	146.18	145.03	146.28	0.000489	1.40	18.55	8.75	0.31
acqui	27	D1_Tr 20	26.00	143.89	146.17	144.90	146.27	0.000457	1.38	18.82	8.24	0.29
acqui	26	D1_Tr 20	26.00	143.72	146.17	144.77	146.26	0.000436	1.37	19.00	7.76	0.28
acqui	25	D1_Tr 20	26.00	143.67	146.16	144.75	146.26	0.000471	1.41	18.39	7.40	0.29
acqui	24	D1_Tr 20	26.00	143.55	146.15	144.65	146.25	0.000440	1.38	18.81	7.23	0.27
acqui	23	D1_Tr 20	26.00	143.46	146.15	144.57	146.24	0.000420	1.36	19.10	7.10	0.26
acqui	22	D1_Tr 20	26.00	143.36	146.13	144.54	146.24	0.000491	1.45	17.96	6.48	0.28
acqui	21	D1_Tr 20	26.00	143.07	146.11	144.38	146.23	0.000581	1.54	16.85	5.55	0.28
acqui	20	D1_Tr 20	26.00	142.90	145.95	144.56	146.20	0.001511	2.18	11.91	3.90	0.40
acqui	19.2	D1_Tr 20	26.00	140.34	145.51	142.00	145.66	0.001374	1.69	15.42	3.90	0.24
acqui	19.1	D1_Tr 20	26.00	140.34	145.56	142.00	145.64	0.000410	1.28	20.34	3.90	0.18
acqui	19	D1_Tr 20	26.00	140.20	145.55	141.86	145.63	0.000386	1.25	20.87	3.90	0.17

HEC-RAS Plan: Plan 07 River: medrio Reach: acqui Profile: D1_Tr 20

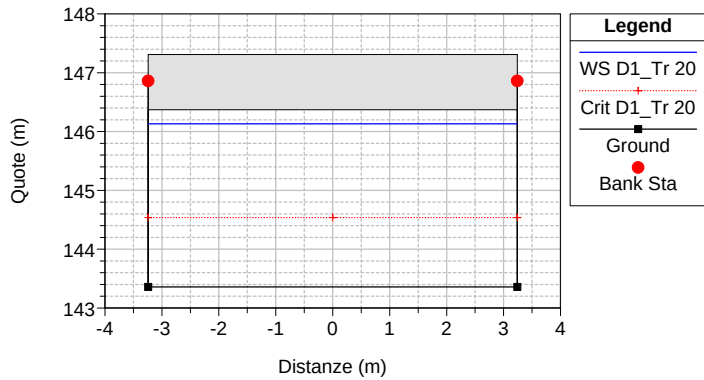
Reach	River Sta	Profile	E.G. Elev	W.S. Elev	Vel Head	Frctn Loss	C & E Loss	Q Left	Q Channel	Q Right	Top Width
			(m)	(m)	(m)	(m)	(m)	(m3/s)	(m3/s)	(m3/s)	(m)
acqui	35	D1_Tr 20	147.49	145.53	1.96				63.00		9.24
acqui	29	D1_Tr 20	146.29	146.18	0.11	0.01	0.00		26.00		9.24
acqui	28	D1_Tr 20	146.28	146.18	0.10	0.01	0.00		26.00		8.75
acqui	27	D1_Tr 20	146.27	146.17	0.10	0.01	0.00		26.00		8.24
acqui	26	D1_Tr 20	146.26	146.17	0.10	0.01	0.00		26.00		7.76
acqui	25	D1_Tr 20	146.26	146.16	0.10	0.01	0.00		26.00		7.40
acqui	24	D1_Tr 20	146.25	146.15	0.10	0.00	0.00		26.00		7.23
acqui	23	D1_Tr 20	146.24	146.15	0.09	0.01	0.00		26.00		7.10
acqui	22	D1_Tr 20	146.24	146.13	0.11	0.01	0.00		26.00		6.48
acqui	21	D1_Tr 20	146.23	146.11	0.12	0.02	0.01		26.00		5.55
acqui	20	D1_Tr 20	146.20	145.95	0.24	0.51	0.03		26.00		3.90
acqui	19.2	D1_Tr 20	145.66	145.51	0.14	0.00	0.02		26.00		3.90
acqui	19.1	D1_Tr 20	145.64	145.56	0.08	0.01	0.00		26.00		3.90
acqui	19	D1_Tr 20	145.63	145.55	0.08				26.00		3.90

Geom: vecchio Medrio Flow: bormida 20 - 200

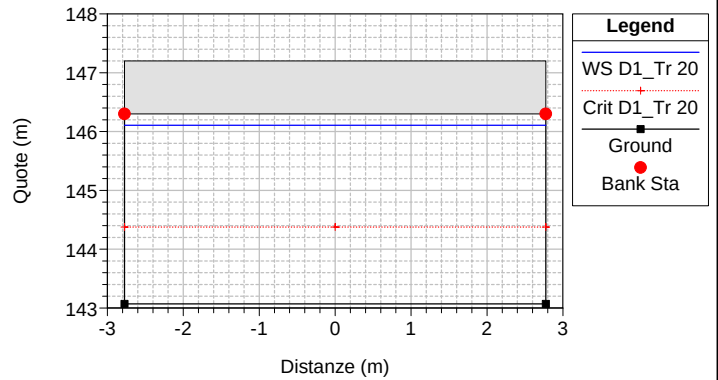




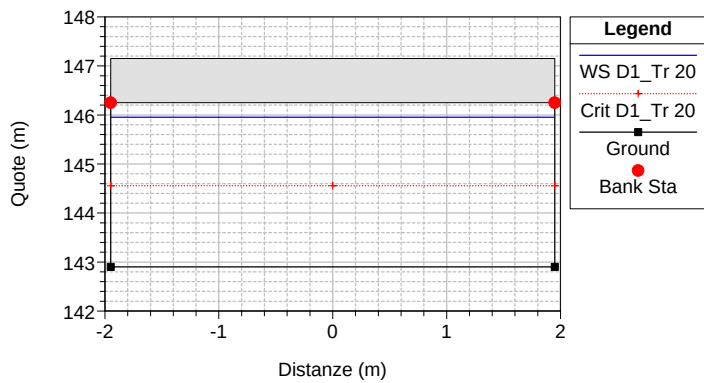
Geom: vecchio Medrio Flow: bormida 20 - 200
River = medrio Reach = acqui RS = 22



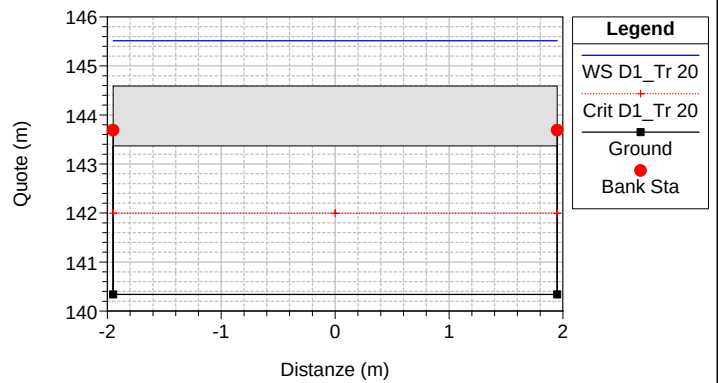
Geom: vecchio Medrio Flow: bormida 20 - 200
River = medrio Reach = acqui RS = 21



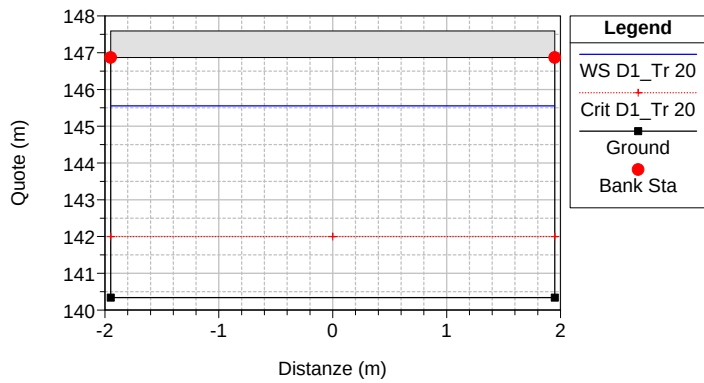
Geom: vecchio Medrio Flow: bormida 20 - 200
River = medrio Reach = acqui RS = 20



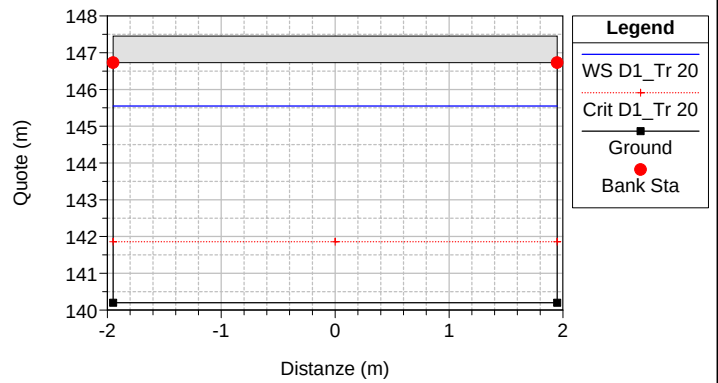
Geom: vecchio Medrio Flow: bormida 20 - 200
River = medrio Reach = acqui RS = 19.2



Geom: vecchio Medrio Flow: bormida 20 - 200
River = medrio Reach = acqui RS = 19.1



Geom: vecchio Medrio Flow: bormida 20 - 200
River = medrio Reach = acqui RS = 19



Scenario D2)

Vecchio Rio Medrio Tempo di ritorno $T_r = 200$ anni

Portata a monte dello scolmatore $Q = 120$ mc/s

Portata a valle dello scolmatore $Q = 26$ mc/s

Fiume Bormida Tempo di ritorno $T_r = 200$ anni

$Q = 2980$ mc/s livello idrico 145.55 m

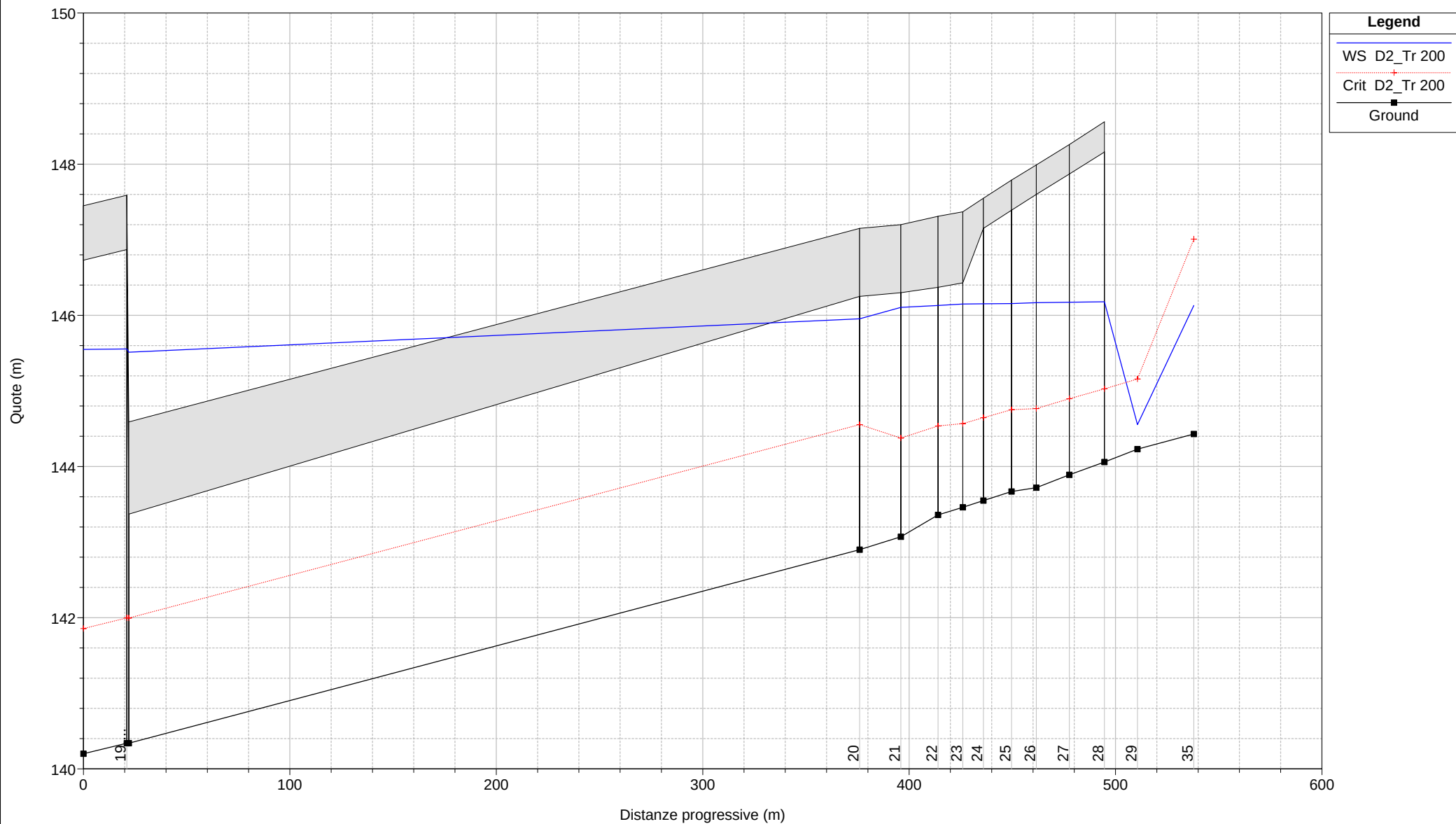
HEC-RAS Plan: Plan 07 River: medrio Reach: acqui Profile: D2_Tr 200

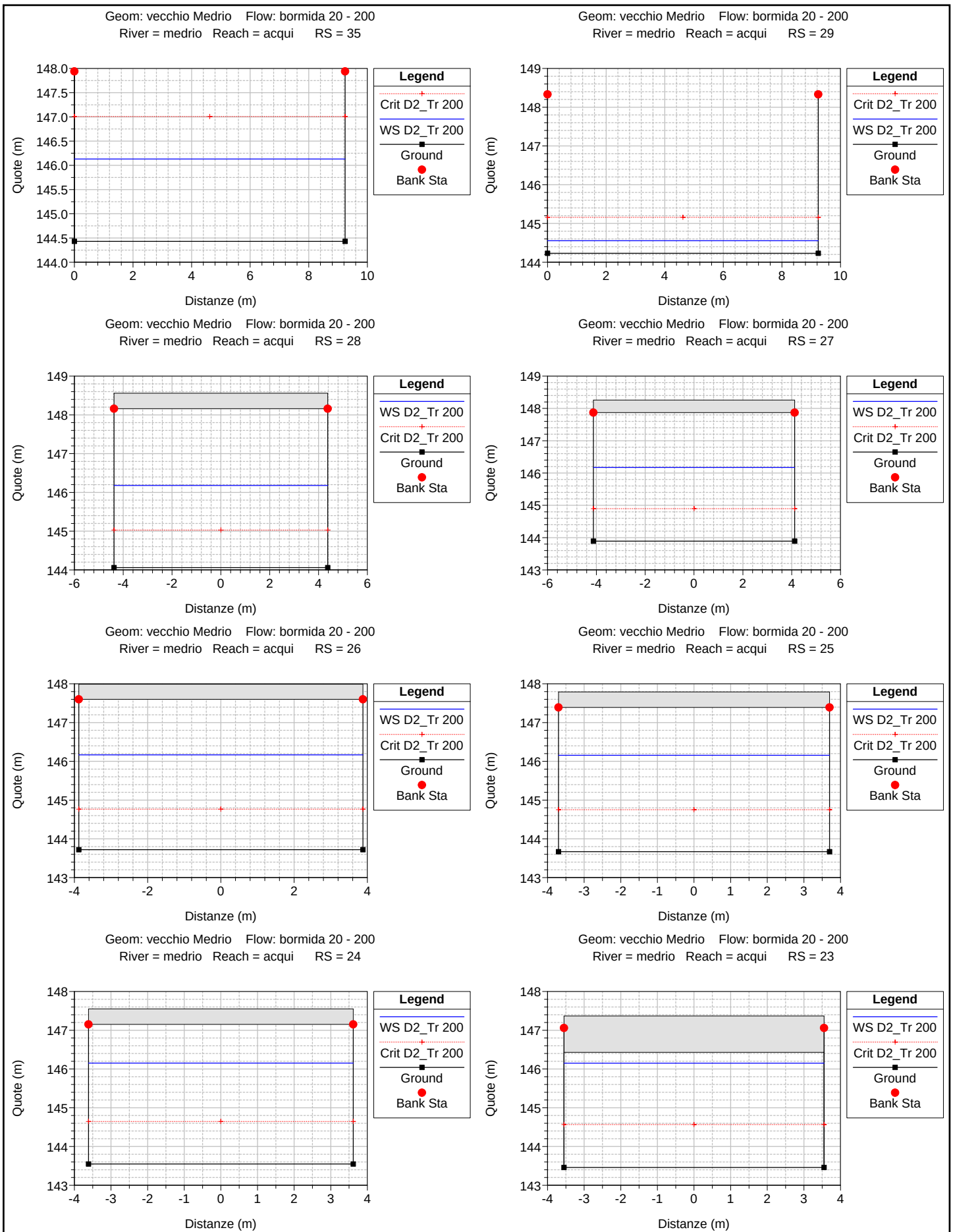
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
acqui	35	D2_Tr 200	120.00	144.43	146.13	147.01	149.10	0.017476	7.64	15.71	9.24	1.87
acqui	29	D2_Tr 200	26.00	144.23	144.55	145.16	148.40	0.148870	8.69	2.99	9.24	4.88
acqui	28	D2_Tr 200	26.00	144.06	146.18	145.03	146.28	0.000489	1.40	18.55	8.75	0.31
acqui	27	D2_Tr 200	26.00	143.89	146.17	144.90	146.27	0.000457	1.38	18.82	8.24	0.29
acqui	26	D2_Tr 200	26.00	143.72	146.17	144.77	146.26	0.000436	1.37	19.00	7.76	0.28
acqui	25	D2_Tr 200	26.00	143.67	146.16	144.75	146.26	0.000471	1.41	18.39	7.40	0.29
acqui	24	D2_Tr 200	26.00	143.55	146.15	144.65	146.25	0.000440	1.38	18.81	7.23	0.27
acqui	23	D2_Tr 200	26.00	143.46	146.15	144.57	146.24	0.000420	1.36	19.10	7.10	0.26
acqui	22	D2_Tr 200	26.00	143.36	146.13	144.54	146.24	0.000491	1.45	17.96	6.48	0.28
acqui	21	D2_Tr 200	26.00	143.07	146.11	144.38	146.23	0.000581	1.54	16.85	5.55	0.28
acqui	20	D2_Tr 200	26.00	142.90	145.95	144.56	146.20	0.001511	2.18	11.91	3.90	0.40
acqui	19.2	D2_Tr 200	26.00	140.34	145.51	142.00	145.66	0.001374	1.69	15.42	3.90	0.24
acqui	19.1	D2_Tr 200	26.00	140.34	145.56	142.00	145.64	0.000410	1.28	20.34	3.90	0.18
acqui	19	D2_Tr 200	26.00	140.20	145.55	141.86	145.63	0.000386	1.25	20.87	3.90	0.17

HEC-RAS Plan: Plan 07 River: medrio Reach: acqui Profile: D2_Tr 200

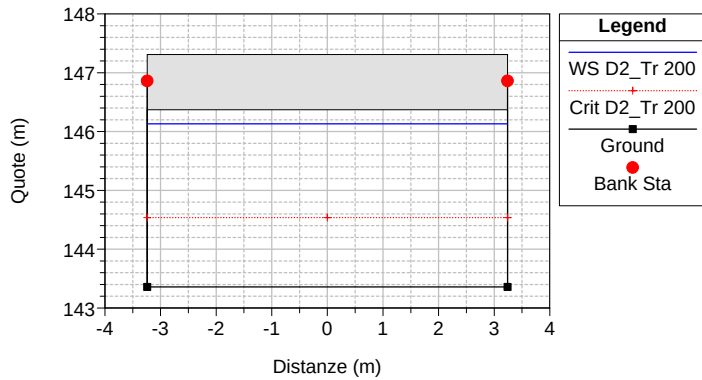
Reach	River Sta	Profile	E.G. Elev	W.S. Elev	Vel Head	Frctn Loss	C & E Loss	Q Left	Q Channel	Q Right	Top Width
			(m)	(m)	(m)	(m)	(m)	(m3/s)	(m3/s)	(m3/s)	(m)
acqui	35	D2_Tr 200	149.10	146.13	2.97				120.00		9.24
acqui	29	D2_Tr 200	148.40	144.55	3.85	0.61	0.09		26.00		9.24
acqui	28	D2_Tr 200	146.28	146.18	0.10	0.01	0.00		26.00		8.75
acqui	27	D2_Tr 200	146.27	146.17	0.10	0.01	0.00		26.00		8.24
acqui	26	D2_Tr 200	146.26	146.17	0.10	0.01	0.00		26.00		7.76
acqui	25	D2_Tr 200	146.26	146.16	0.10	0.01	0.00		26.00		7.40
acqui	24	D2_Tr 200	146.25	146.15	0.10	0.00	0.00		26.00		7.23
acqui	23	D2_Tr 200	146.24	146.15	0.09	0.01	0.00		26.00		7.10
acqui	22	D2_Tr 200	146.24	146.13	0.11	0.01	0.00		26.00		6.48
acqui	21	D2_Tr 200	146.23	146.11	0.12	0.02	0.01		26.00		5.55
acqui	20	D2_Tr 200	146.20	145.95	0.24	0.51	0.03		26.00		3.90
acqui	19.2	D2_Tr 200	145.66	145.51	0.14	0.00	0.02		26.00		3.90
acqui	19.1	D2_Tr 200	145.64	145.56	0.08	0.01	0.00		26.00		3.90
acqui	19	D2_Tr 200	145.63	145.55	0.08				26.00		3.90

Geom: vecchio Medrio Flow: bormida 20 - 200

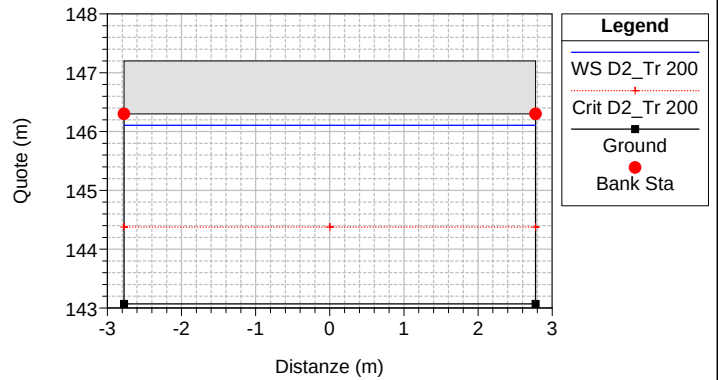




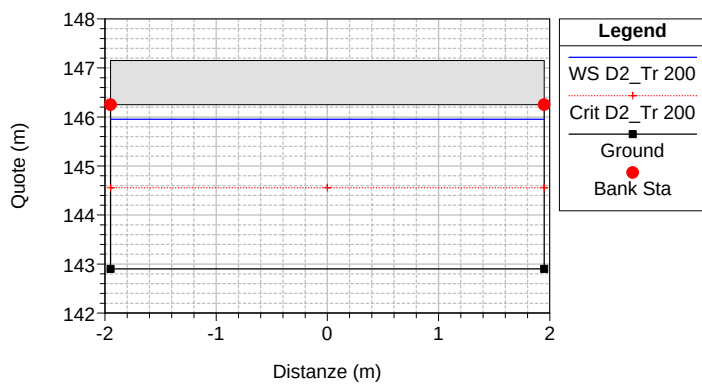
Geom: vecchio Medrio Flow: bormida 20 - 200
River = medrio Reach = acqui RS = 22



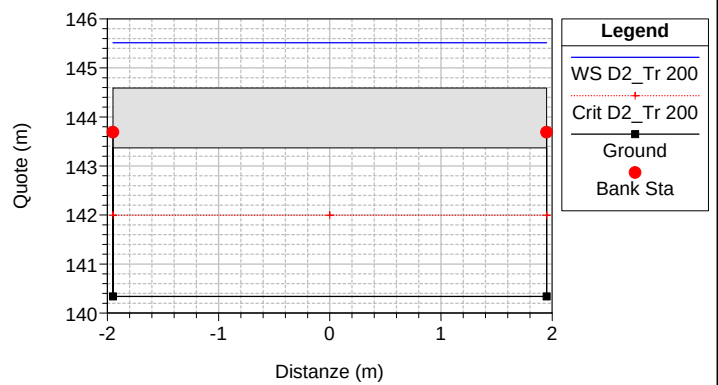
Geom: vecchio Medrio Flow: bormida 20 - 200
River = medrio Reach = acqui RS = 21



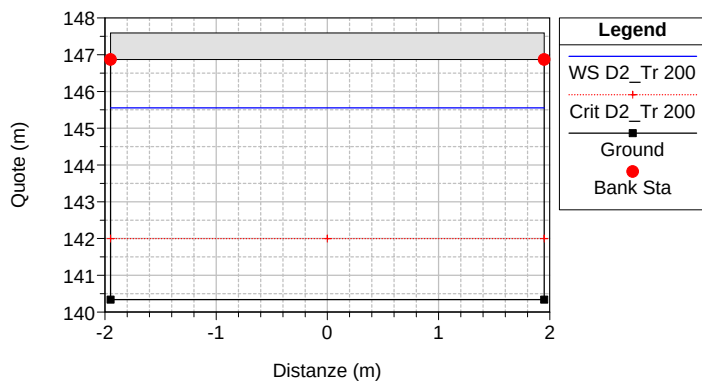
Geom: vecchio Medrio Flow: bormida 20 - 200
River = medrio Reach = acqui RS = 20



Geom: vecchio Medrio Flow: bormida 20 - 200
River = medrio Reach = acqui RS = 19.2



Geom: vecchio Medrio Flow: bormida 20 - 200
River = medrio Reach = acqui RS = 19.1



Geom: vecchio Medrio Flow: bormida 20 - 200
River = medrio Reach = acqui RS = 19

