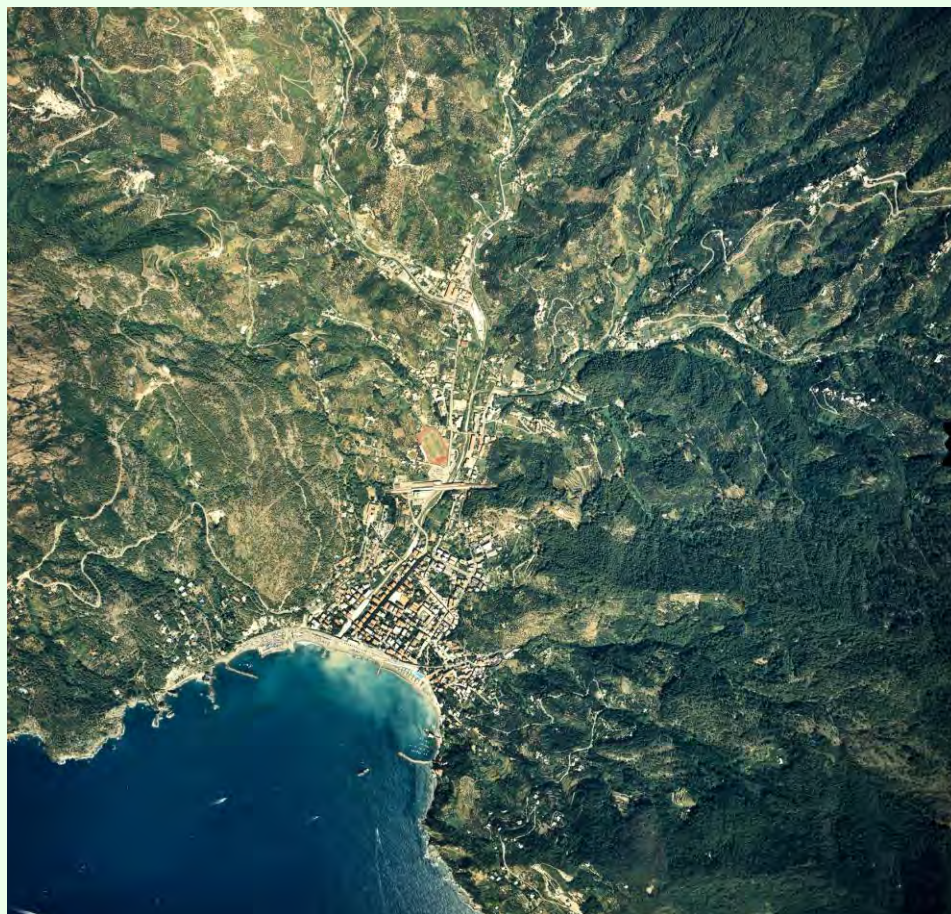




**PIANO DI BACINO STRALCIO  
PER LA TUTELA DAL RISCHIO IDROGEOLOGICO**  
(ai sensi dell'art. 1, comma 1, del D.L. 180/1998 convertito con L. 267/1998)

**AMBITO 18 – Ghiararo**



**ALLEGATO – VERIFICHE IDRAULICHE  
TORRENTI SAN GIORGIO E ROSSOLA  
BONASSOLA**

APPROVAZIONE	Delibera del Consiglio Provinciale della Spezia n. 51 del 05/05/2003
ULTIMA MODIFICA DELL'ELABORATO	Decreto del Direttore Generale n. 1663 del 05/03/2020
ENTRATA IN VIGORE	Pubblicazione sul BURL n. 13 del 25/03/2020 – parte II



**Committente:**  
Comune di  
Bonassola

**Titolo:**  
ANALISI DEL RISCHIO IDRAULICO DEI TORRENTI  
SAN GIORGIO E ROSSOLA A BONASSOLA

**Livello di Progetto:**  
Studio

**Oggetto:**

ANALISI RISCHIO IDRAULICO

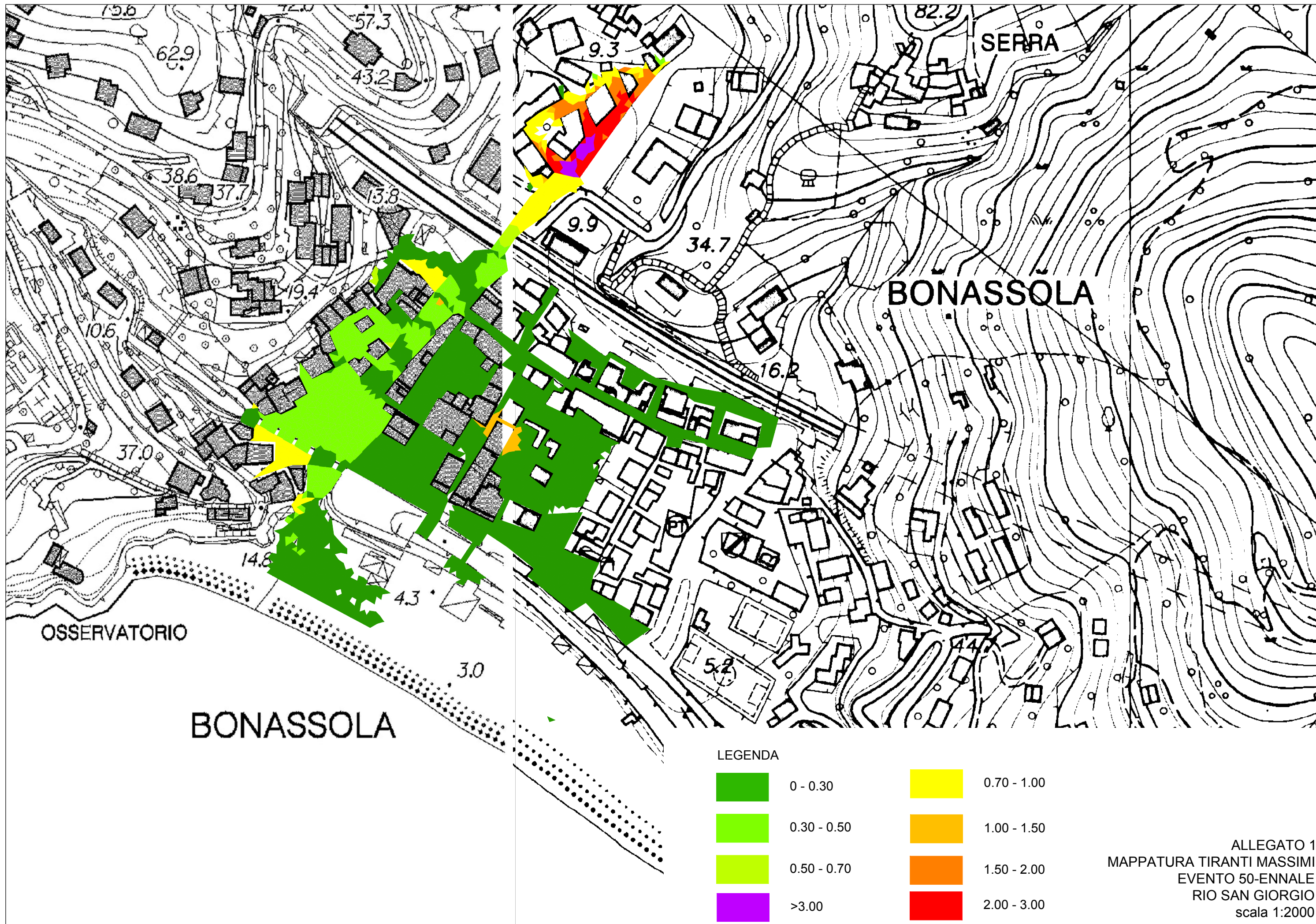
**Codice Progetto:**  
P098-17

**Firme:**

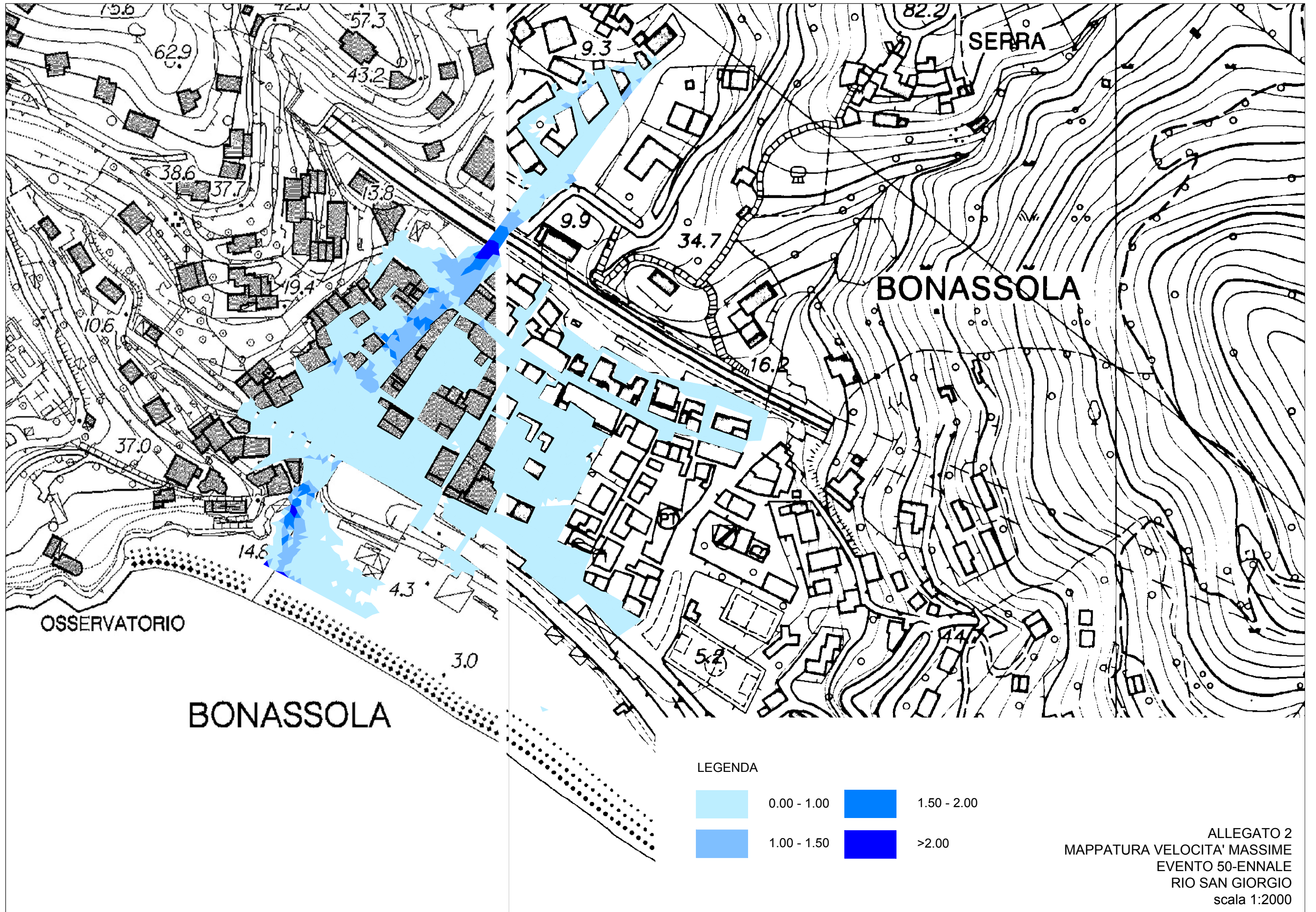
**Nome File:**  
P114-17-I-RE-IDR-001-  
B.DOCX

Rev.	Modifiche/Revisioni	Redatto	Data	Contr./Appr.	Data
A	PRIMA EMISSIONE	MI	26/02/18	PM	26/02/18
B	Revisione degli allegati	MI	26/03/18	PM	26/03/18



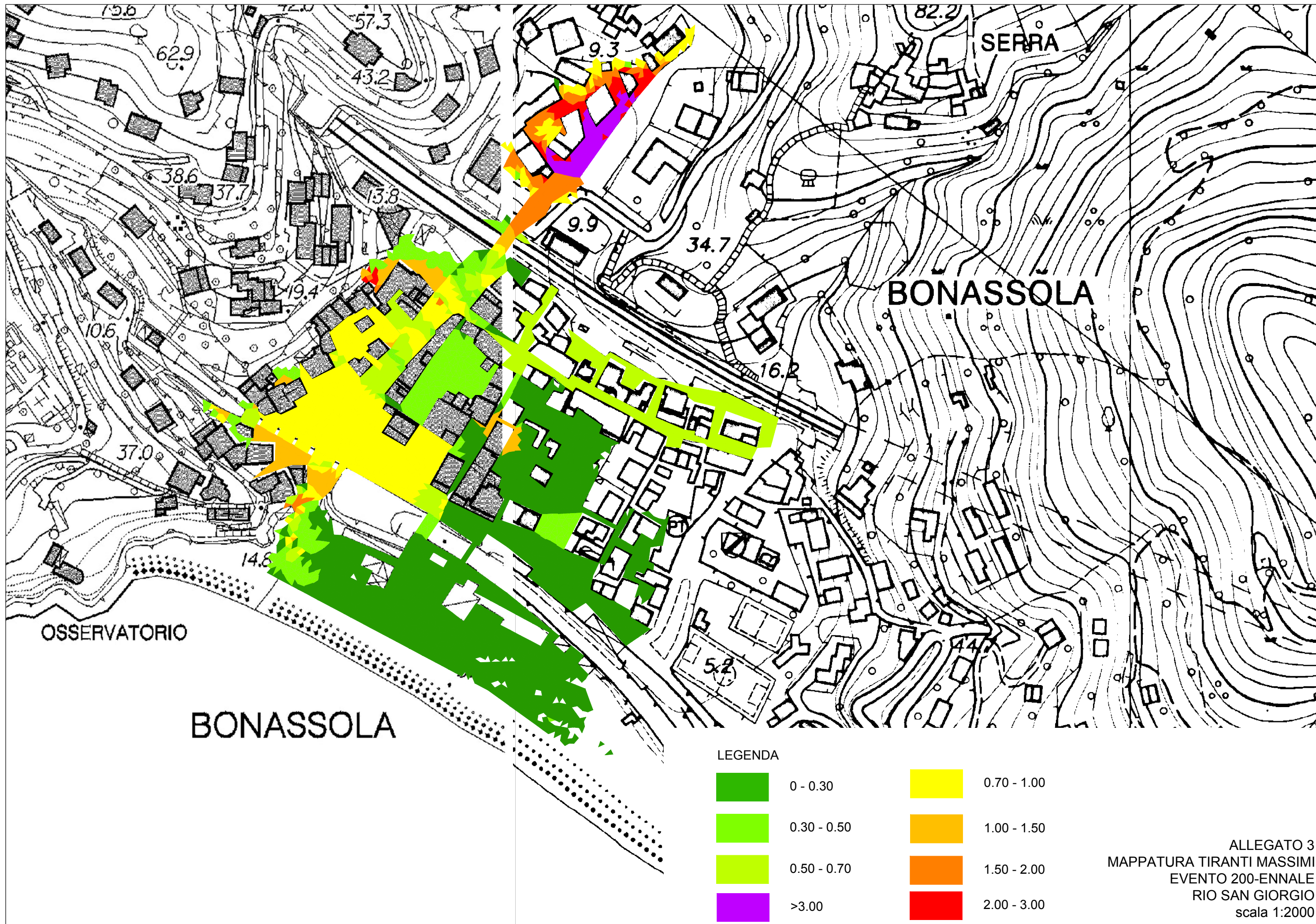






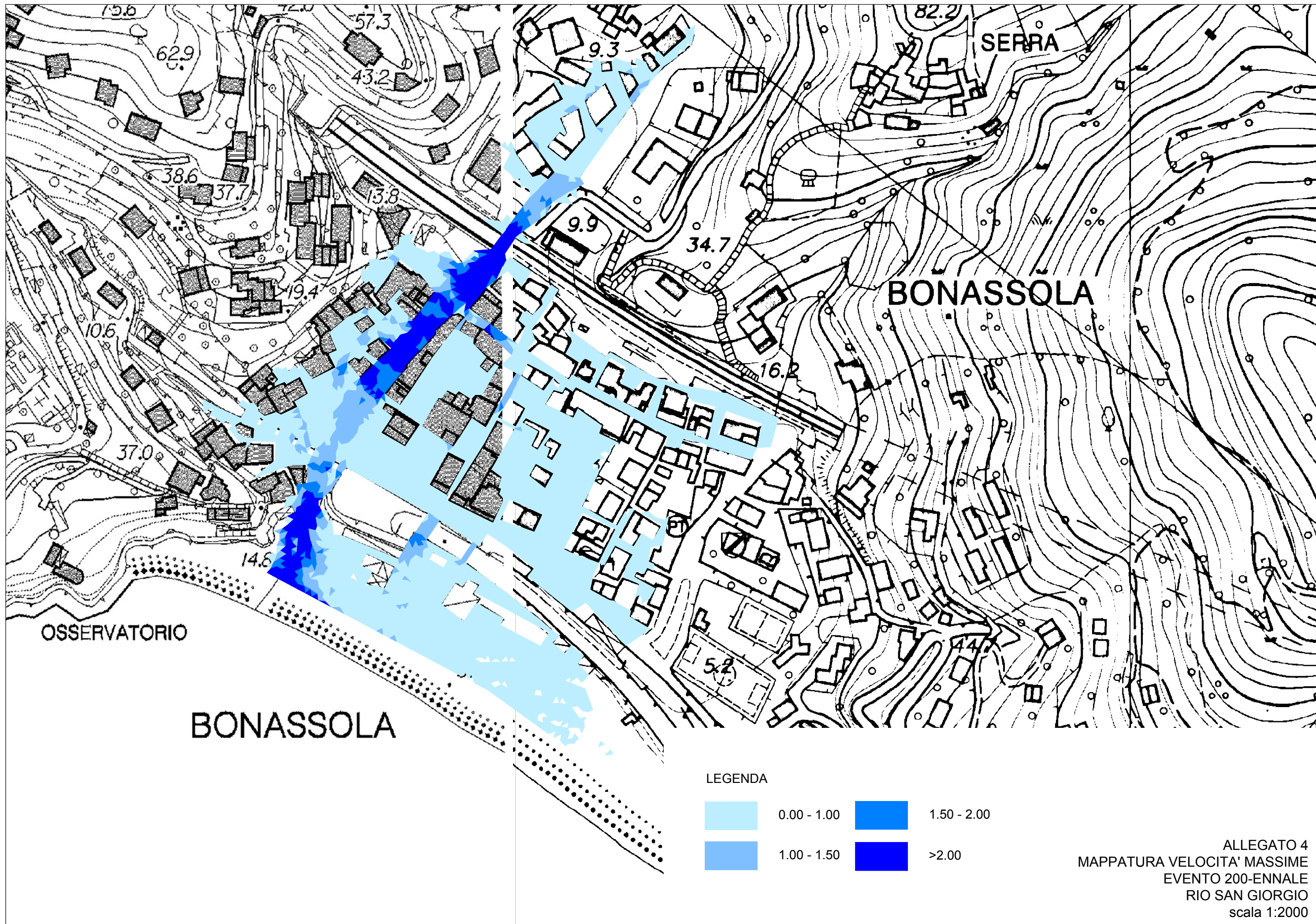
ALLEGATO 2  
 MAPPATURA VELOCITA' MASSIME  
 EVENTO 50-ENNALE  
 RIO SAN GIORGIO  
 scala 1:2000



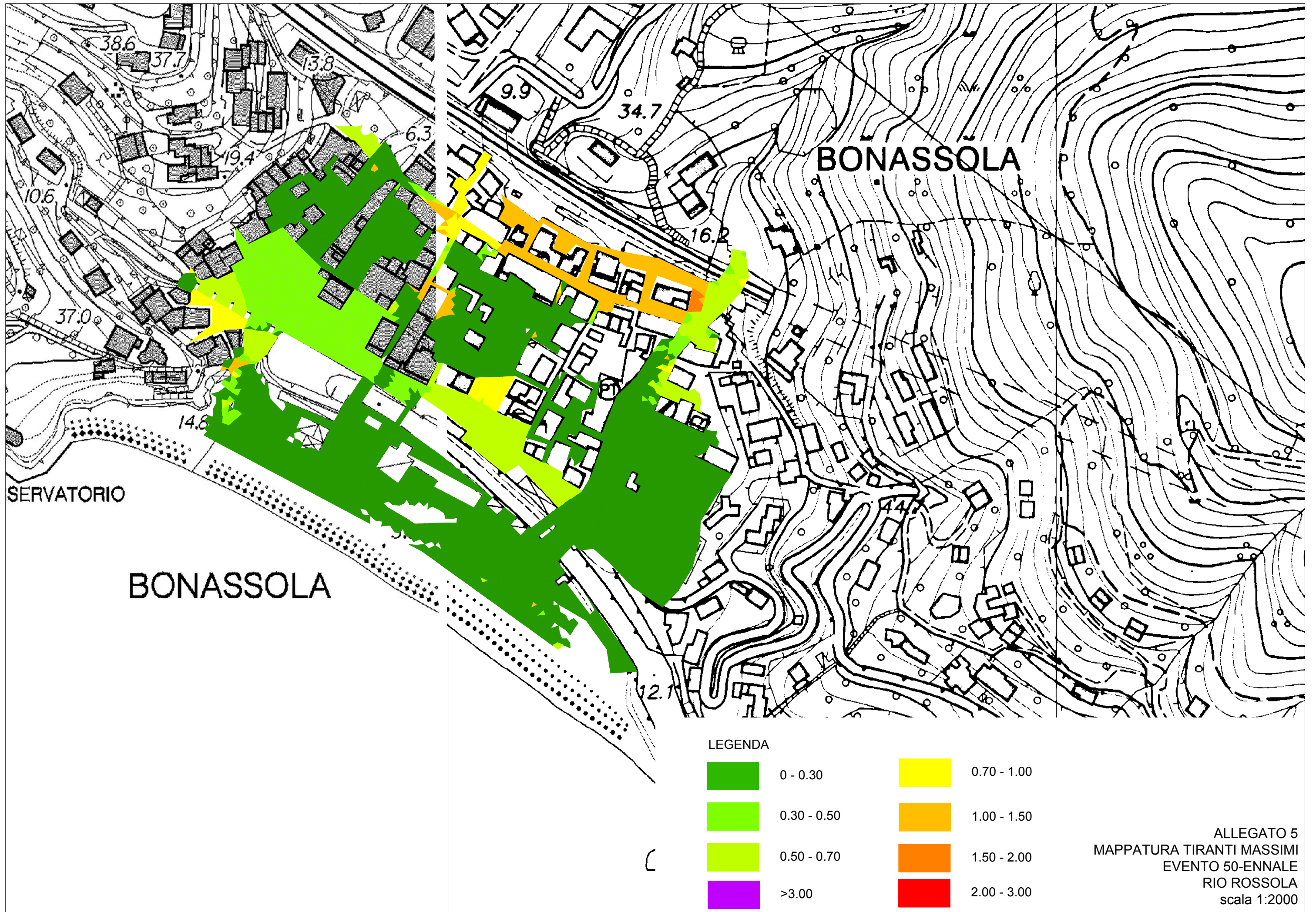


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 MAPPATURA TIRANTI MASSIMI  
 EVENTO 200-ENNALE  
 RIO SAN GIORGIO  
 scala 1:2000

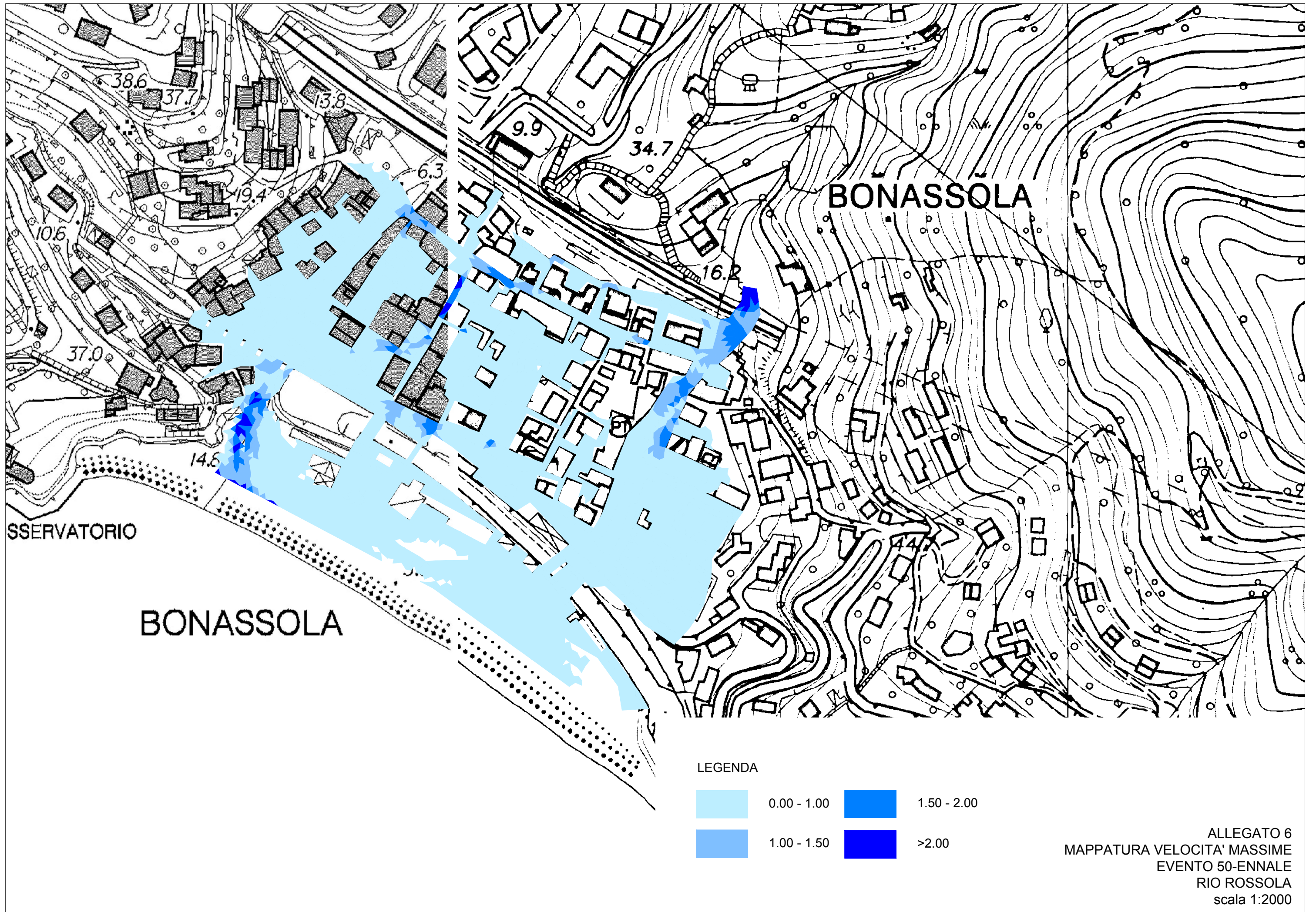






















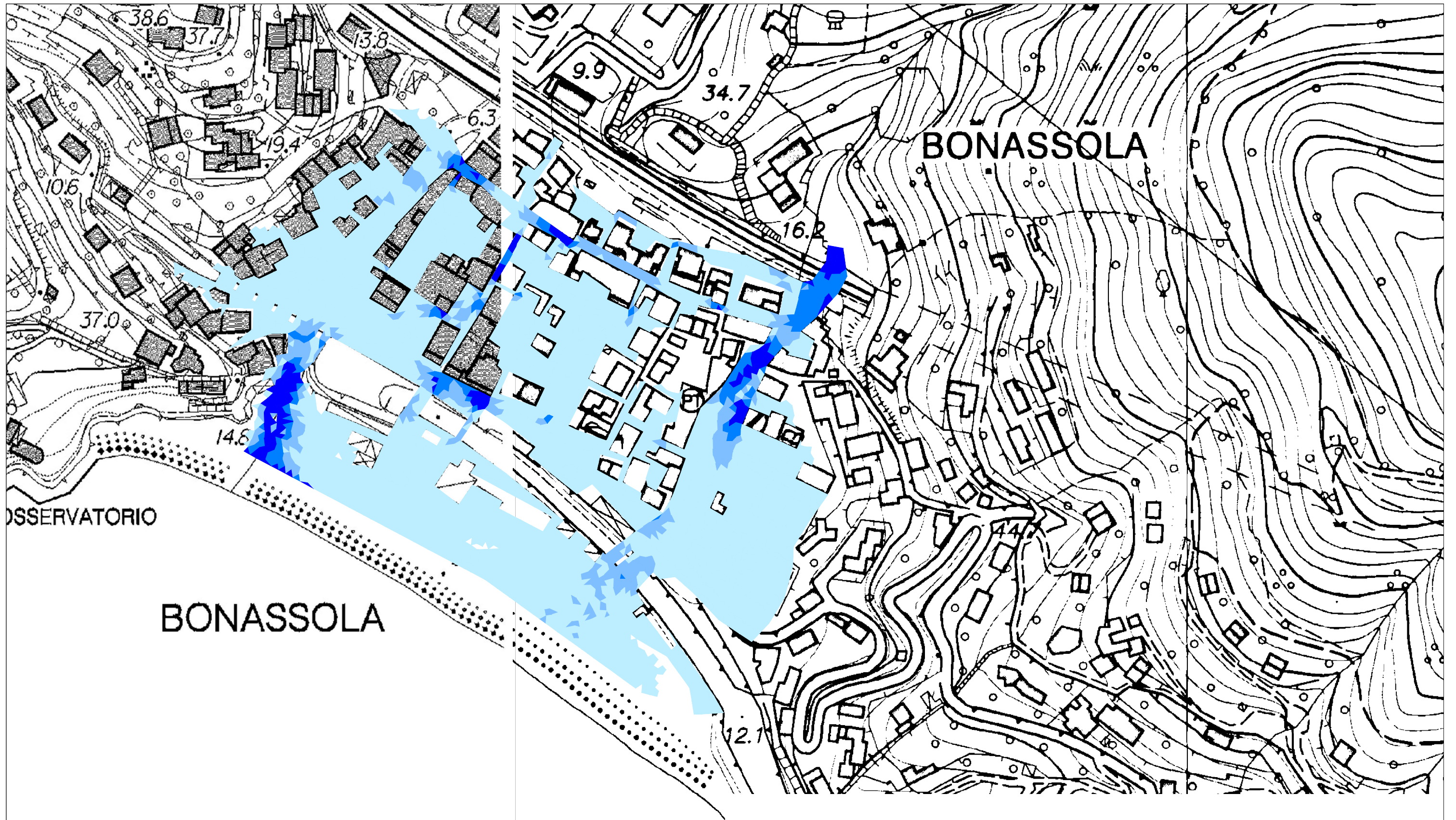


LEGENDA

	0 - 0.30		0.70 - 1.00
	0.30 - 0.50		1.00 - 1.50
	0.50 - 0.70		1.50 - 2.00
	>3.00		2.00 - 3.00

ALLEGATO 7  
 MAPPATURA TIRANTI MASSIMI  
 EVENTO 200-ENNALE  
 RIO ROSSOLA  
 scala 1:2000

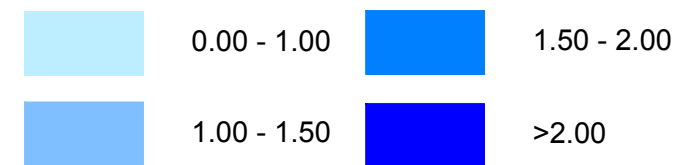




BONASSOLA

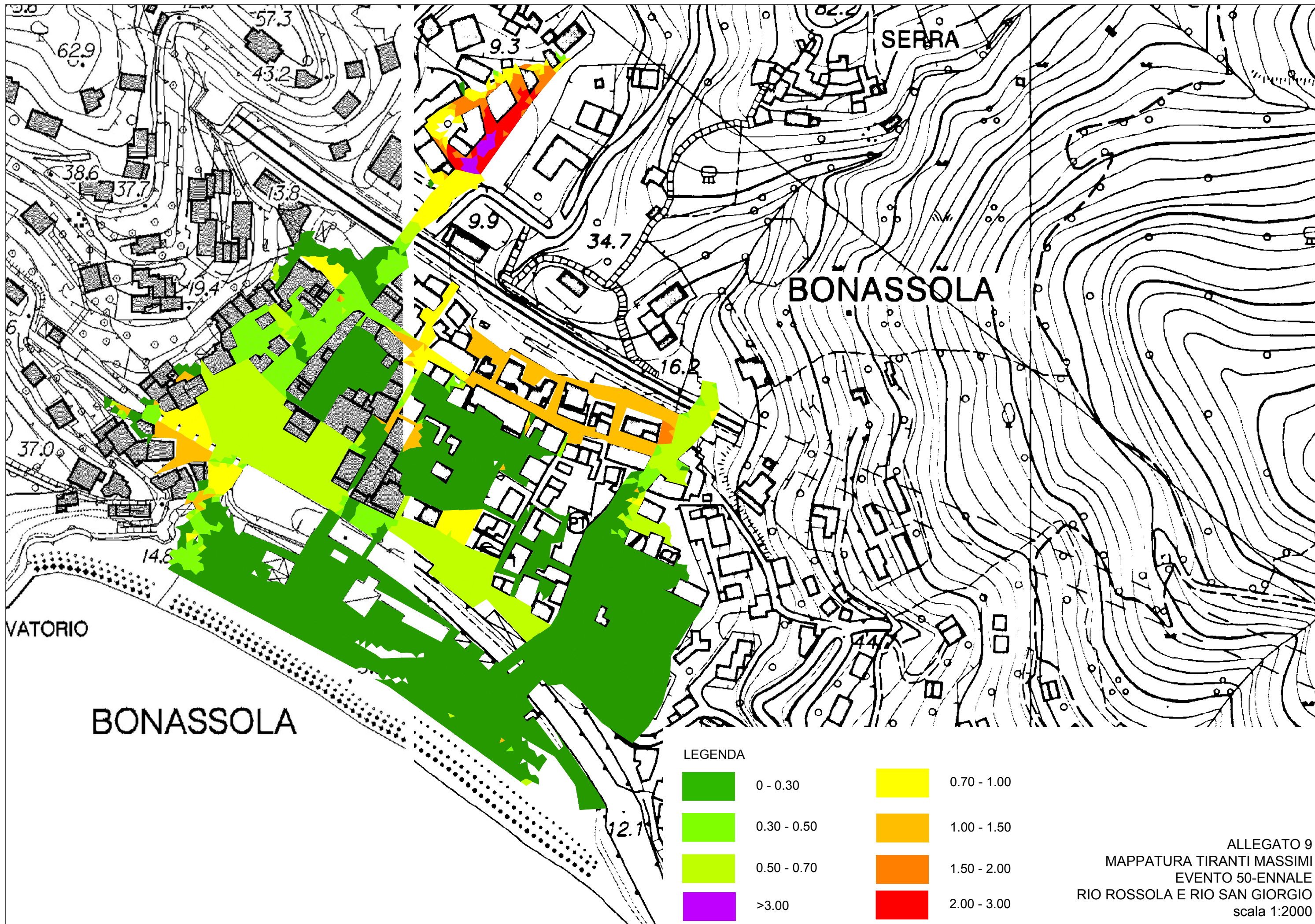
BONASSOLA

LEGENDA

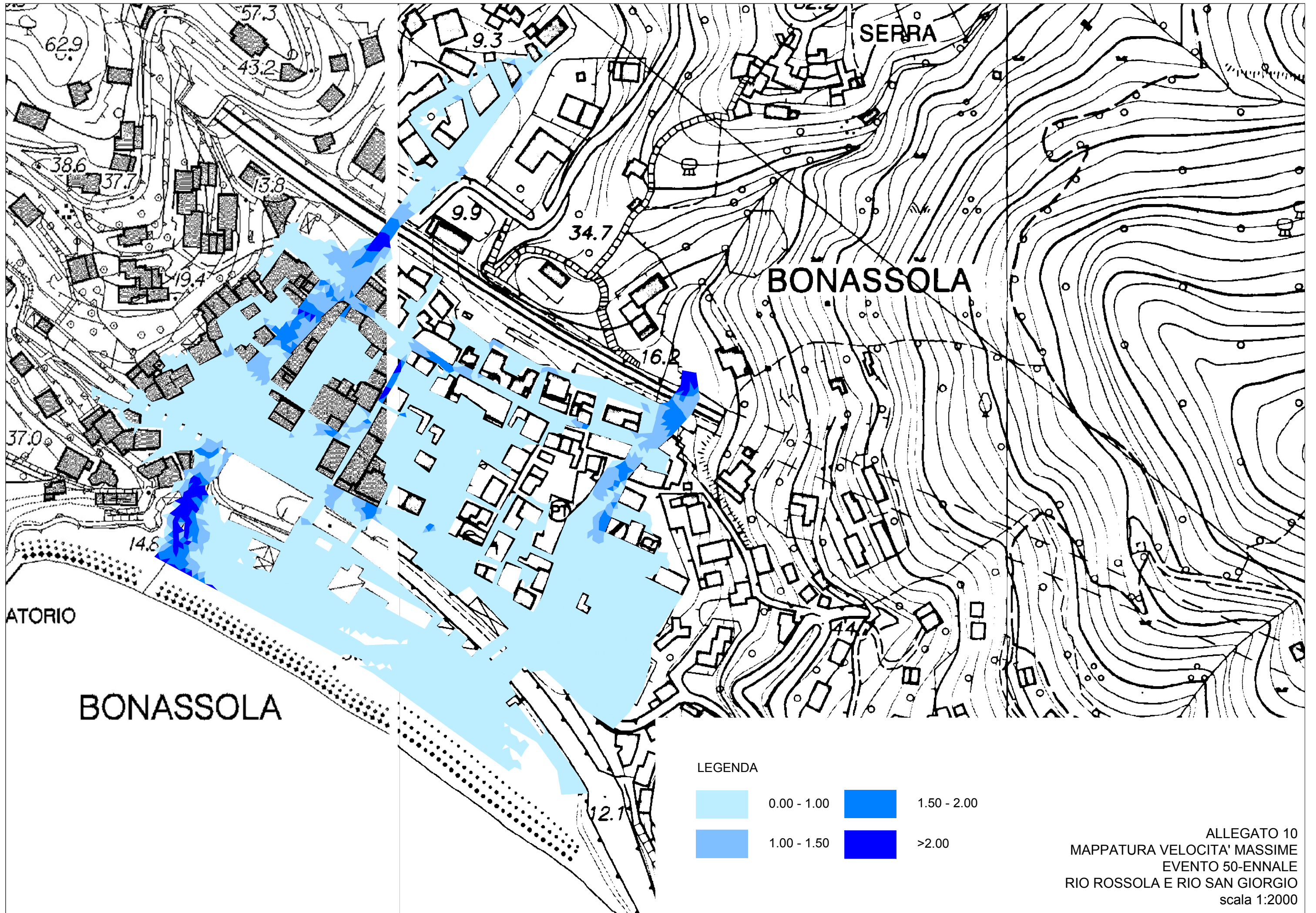


ALLEGATO 8  
 MAPPATURA VELOCITA' MASSIME  
 EVENTO 200-ENNALE  
 RIO ROSSOLA  
 scala 1:2000



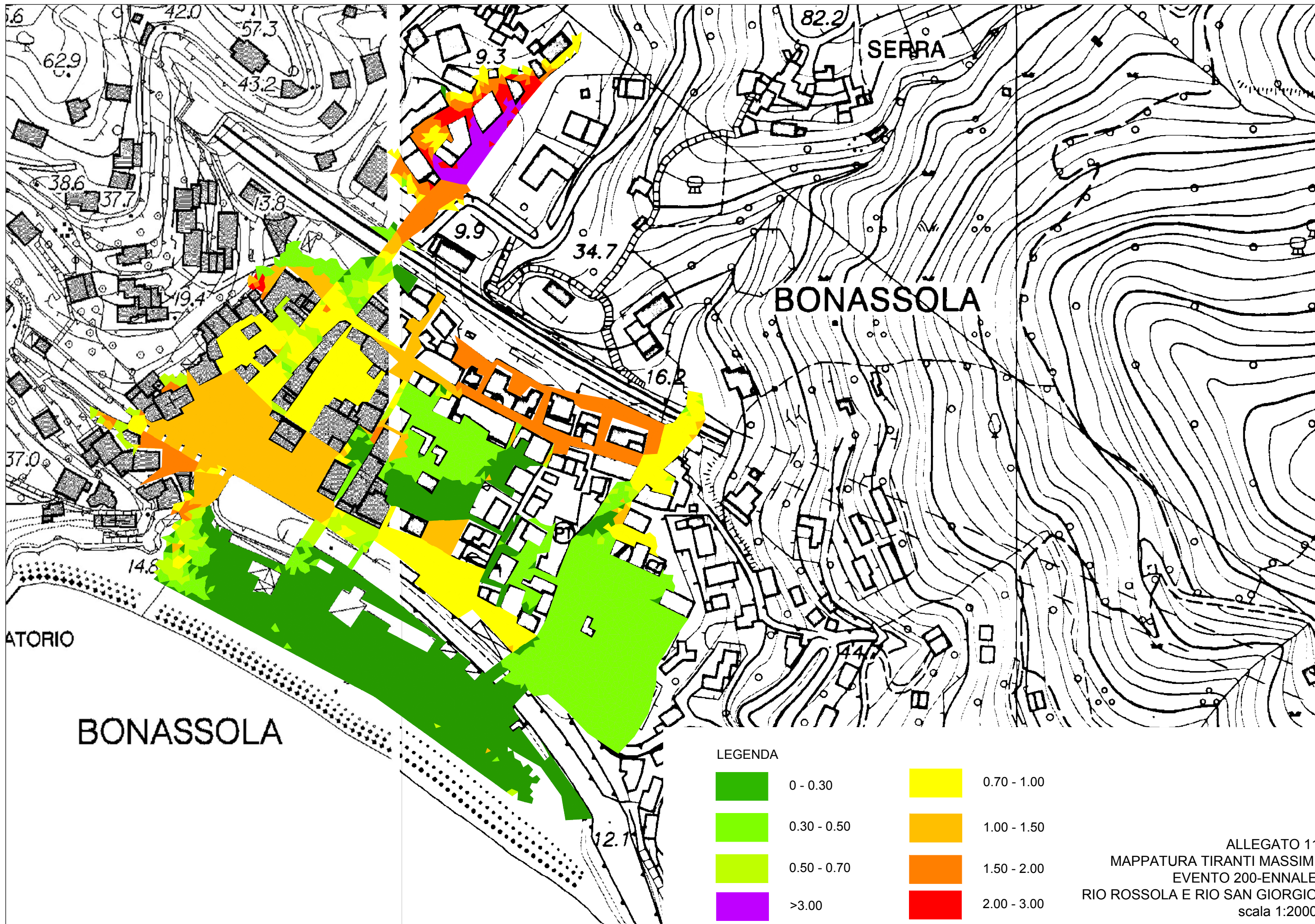






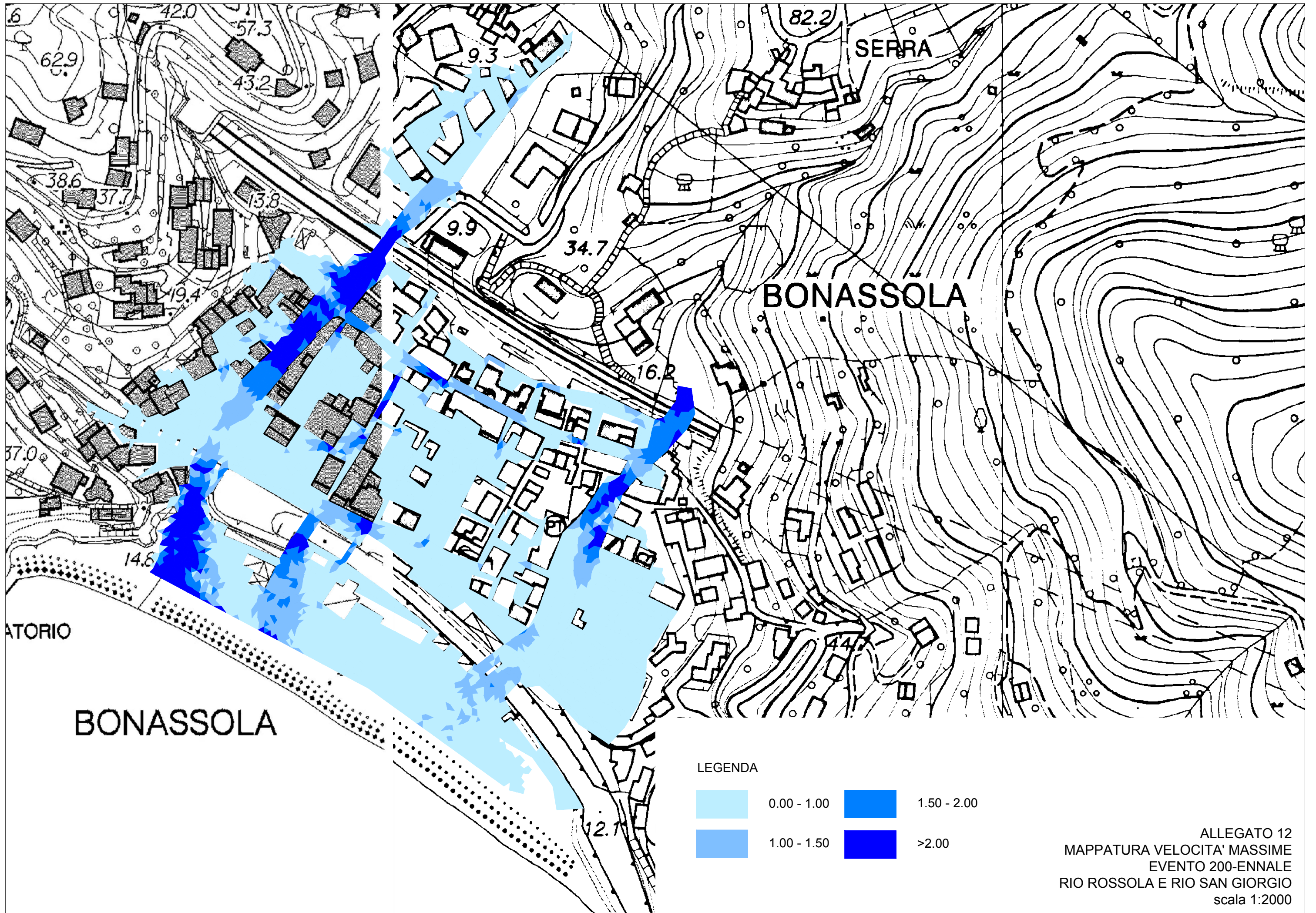
ALLEGATO 10  
 MAPPATURA VELOCITA' MASSIME  
 EVENTO 50-ENNALE  
 RIO ROSSOLA E RIO SAN GIORGIO  
 scala 1:2000





ALLEGATO 11  
 MAPPATURA TIRANTI MASSIMI  
 EVENTO 200-ENNALE  
 RIO ROSSOLA E RIO SAN GIORGIO  
 scala 1:2000





ALLEGATO 12  
 MAPPATURA VELOCITA' MASSIME  
 EVENTO 200-ENNALE  
 RIO ROSSOLA E RIO SAN GIORGIO  
 scala 1:2000

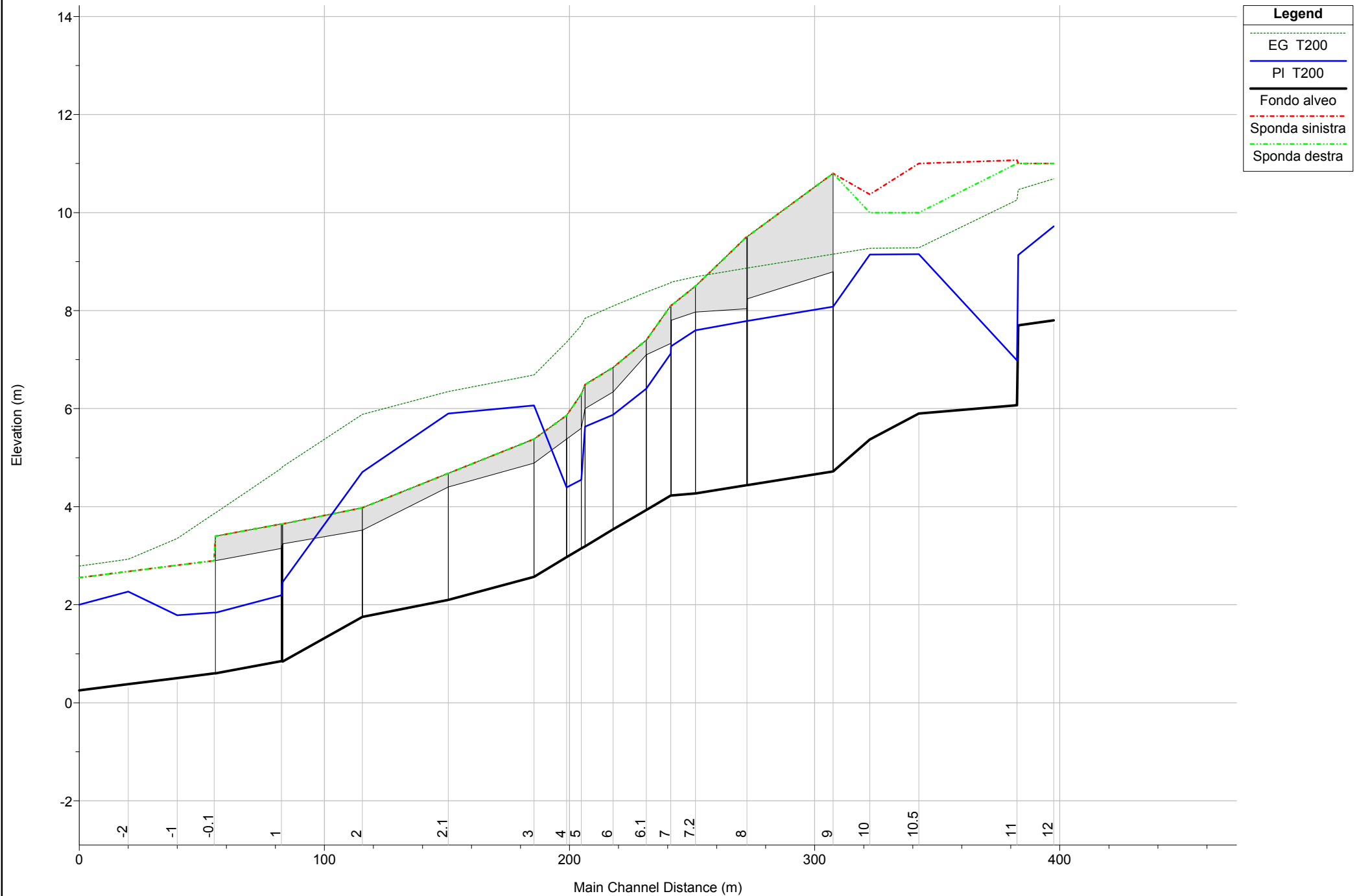


# **ALLEGATO A**

## **VERIFICHE IDRAULICHE IN MOTO PERMANENTE GRADUALMENTE VARIATO DEL RIO SAN GIROGIO E DEL RIO ROSSOLA**



# Rio San Giorgio



Comune di Bonassola Prot. n. 00016333 del 07-03-2019 in partenza

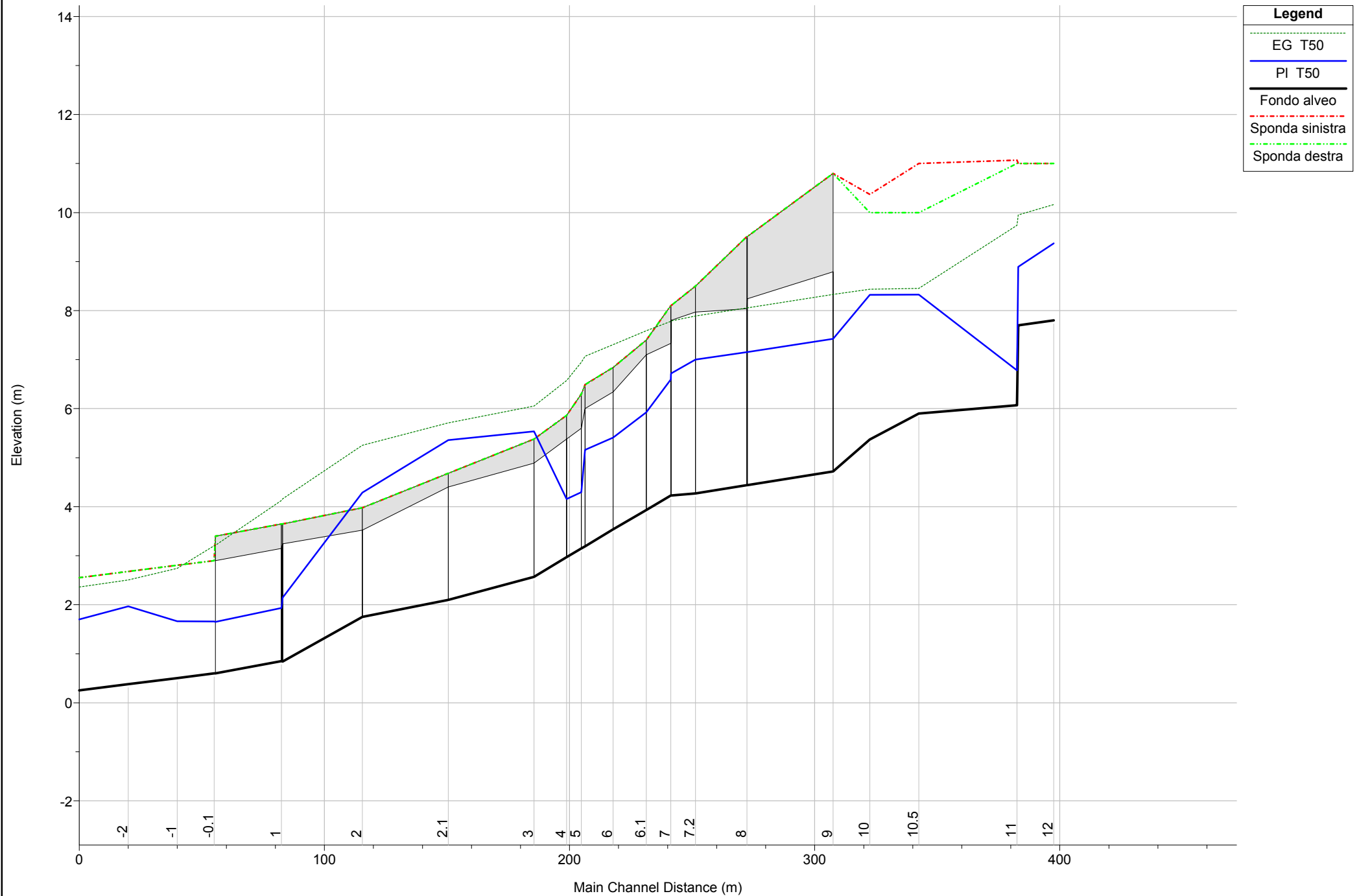
1 cm Horiz. = 20 m 1 cm Vert. = 1 m



Reach	River Sta	Profile	Cum Ch Len	Q Total	Min Ch El	LOB Elev	ROB Elev	W.S. Elev	Hydr Depth	Max Chl Dpth	E.G. Elev	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m)	(m3/s)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m/s)	(m2)	(m)	
tratto tobinato	12	T200	397.50	77.00	7.80	11.00	11.00	9.72	1.91	1.92	10.69	4.36	17.68	9.24	1.00
tratto tobinato	11.1	T200	383.00	77.00	7.70	11.00	11.00	9.13	1.43	1.43	10.47	5.11	15.07	10.51	1.36
tratto tobinato	11	T200	382.50	77.00	6.07	11.07	11.00	6.99	0.92	0.92	10.26	8.01	9.61	10.50	2.67
tratto tobinato	10.5	T200	342.50	77.00	5.90	11.00	10.00	9.15	3.24	3.25	9.28	1.59	48.51	14.96	0.28
tratto tobinato	10	T200	322.50	77.00	5.37	10.37	10.00	9.14	3.76	3.77	9.27	1.57	49.12	13.07	0.26
tratto tobinato	9	T200	307.50	77.00	4.72	8.79	8.79	8.08	3.36	3.36	9.15	4.58	16.80	5.00	0.80
tratto tobinato	8.1	T200	272.50	77.00	4.44	8.24	8.24	7.79	3.35	3.35	8.87	4.60	16.75	5.00	0.80
tratto tobinato	8	T200	272.40	77.00	4.44	8.04	8.04	7.79	3.35	3.35	8.87	4.60	16.74	5.00	0.80
tratto tobinato	7.2	T200	251.40	77.00	4.27	7.97	7.97	7.60	3.33	3.33	8.69	4.63	16.63	5.00	0.81
tratto tobinato	7.1	T200	241.40	77.00	4.23	7.80	7.80	7.27	3.04	3.04	8.58	5.06	15.20	5.00	0.93
tratto tobinato	7	T200	241.30	77.00	4.23	7.33	7.33	7.12	2.89	2.89	8.57	5.33	14.46	5.00	1.00
tratto tobinato	6.1	T200	231.30	77.00	3.93	7.10	7.10	6.41	2.48	2.48	8.38	6.21	12.39	5.00	1.26
tratto tobinato	6	T200	217.80	77.00	3.54	6.34	6.34	5.88	2.34	2.34	8.09	6.59	11.68	5.00	1.38
tratto tobinato	5.1	T200	206.30	77.00	3.19	6.00	6.00	5.64	2.34	2.45	7.84	6.58	11.70	5.00	1.37
tratto tobinato	5	T200	204.80	77.00	3.15	5.60	5.60	4.55	1.31	1.40	7.70	7.86	9.79	7.48	2.19
tratto tobinato	4	T200	198.80	86.00	2.97	5.38	5.38	4.39	1.34	1.42	7.36	7.63	11.28	8.40	2.10
tratto tobinato	3	T200	185.50	86.00	2.57	4.89	4.89	6.06	2.92	3.49	6.69	3.50	24.56	8.40	0.60
tratto tobinato	2.1	T200	150.50	86.00	2.10	4.40	4.40	5.90	3.44	3.80	6.35	2.98	28.90	8.40	0.49
tratto tobinato	2	T200	115.50	86.00	1.75	3.52	3.18	4.70	2.35	2.96	5.88	4.81	17.90	7.60	0.89
tratto tobinato	1.1	T200	83.00	86.00	0.84	3.24	3.24	2.46	1.62	1.62	4.82	6.79	12.66	7.80	1.70
tratto tobinato	1	T200	82.50	86.00	0.85	3.15	3.15	2.19	1.34	1.34	4.78	7.13	12.07	9.00	1.97
tratto tobinato	0	T200	55.50	86.00	0.60	2.90	2.90	1.84	1.24	1.24	3.87	6.32	13.61	11.00	1.81
tratto tobinato	-0.1	T200	55.00	86.00	0.60	2.90	2.90	1.84	1.24	1.24	3.86	6.29	13.67	11.00	1.80
tratto tobinato	-1	T200	40.00	86.00	0.50	2.80	2.80	1.78	1.17	1.28	3.35	5.54	15.51	13.23	1.63
tratto tobinato	-2	T200	20.00	86.00	0.38	2.68	2.68	2.27	1.67	1.89	2.93	3.60	23.87	14.28	0.89
tratto tobinato	-3	T200		86.00	0.25	2.55	2.55	2.00	1.56	1.75	2.79	3.93	21.88	14.04	1.01



# Rio San Giorgio



Comune di Bonassola Prot. n. 00016333 del 07-03-2019 in partenza

1 cm Horiz. = 20 m 1 cm Vert. = 1 m

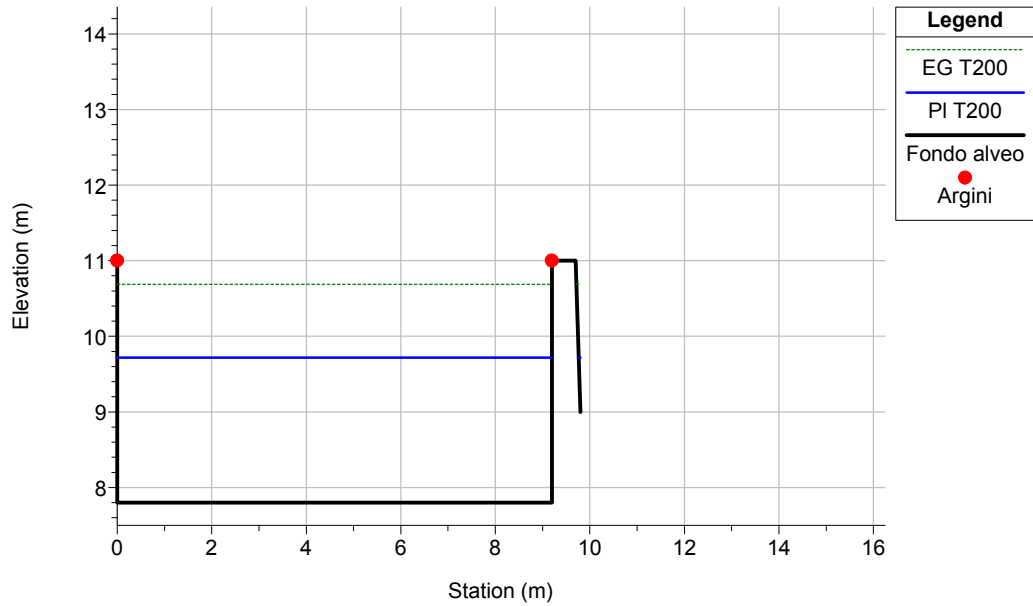


Reach	River Sta	Profile	Cum Ch Len	Q Total	Min Ch El	LOB Elev	ROB Elev	W.S. Elev	Hydr Depth	Max Chl Dpth	E.G. Elev	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m)	(m3/s)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m/s)	(m2)	(m)	
tratto tominato	12	T50	397.50	57.00	7.80	11.00	11.00	9.37	1.57	1.57	10.16	3.94	14.46	9.22	1.00
tratto tominato	11.1	T50	383.00	57.00	7.70	11.00	11.00	8.89	1.19	1.19	9.95	4.55	12.52	10.50	1.33
tratto tominato	11	T50	382.50	57.00	6.07	11.07	11.00	6.78	0.71	0.71	9.74	7.62	7.48	10.50	2.88
tratto tominato	10.5	T50	342.50	57.00	5.90	11.00	10.00	8.33	2.42	2.43	8.45	1.58	36.17	14.92	0.32
tratto tominato	10	T50	322.50	57.00	5.37	10.37	10.00	8.32	2.94	2.95	8.43	1.49	38.40	13.04	0.28
tratto tominato	9	T50	307.50	57.00	4.72	8.79	8.79	7.42	2.70	2.70	8.33	4.21	13.52	5.00	0.82
tratto tominato	8.1	T50	272.50	57.00	4.44	8.24	8.24	7.15	2.71	2.71	8.05	4.20	13.57	5.00	0.81
tratto tominato	8	T50	272.40	57.00	4.44	8.04	8.04	7.15	2.71	2.71	8.05	4.20	13.56	5.00	0.82
tratto tominato	7.2	T50	251.40	57.00	4.27	7.97	7.97	7.00	2.73	2.73	7.89	4.17	13.66	5.00	0.81
tratto tominato	7.1	T50	241.40	57.00	4.23	7.80	7.80	6.72	2.49	2.49	7.79	4.58	12.44	5.00	0.93
tratto tominato	7	T50	241.30	57.00	4.23	7.33	7.33	6.60	2.37	2.37	7.78	4.82	11.83	5.00	1.00
tratto tominato	6.1	T50	231.30	57.00	3.93	7.10	7.10	5.92	1.99	1.99	7.59	5.72	9.97	5.00	1.29
tratto tominato	6	T50	217.80	57.00	3.54	6.34	6.34	5.41	1.87	1.87	7.30	6.09	9.35	5.00	1.42
tratto tominato	5.1	T50	206.30	57.00	3.19	6.00	6.00	5.16	1.86	1.97	7.07	6.12	9.31	5.00	1.43
tratto tominato	5	T50	204.80	57.00	3.15	5.60	5.60	4.30	1.06	1.15	6.94	7.21	7.91	7.48	2.24
tratto tominato	4	T50	198.80	64.00	2.97	5.38	5.38	4.16	1.11	1.19	6.57	6.88	9.30	8.40	2.09
tratto tominato	3	T50	185.50	64.00	2.57	4.89	4.89	5.54	2.40	2.97	6.05	3.18	20.13	8.40	0.59
tratto tominato	2.1	T50	150.50	64.00	2.10	4.40	4.40	5.36	2.90	3.26	5.71	2.63	24.35	8.40	0.46
tratto tominato	2	T50	115.50	64.00	1.75	3.52	3.18	4.29	1.94	2.54	5.25	4.35	14.71	7.60	0.87
tratto tominato	1.1	T50	83.00	64.00	0.84	3.24	3.24	2.15	1.31	1.31	4.16	6.29	10.18	7.80	1.76
tratto tominato	1	T50	82.50	64.00	0.85	3.15	3.15	1.93	1.08	1.08	4.13	6.56	9.76	9.00	2.01
tratto tominato	0	T50	55.50	64.00	0.60	2.90	2.90	1.65	1.05	1.05	3.21	5.53	11.56	11.00	1.72
tratto tominato	-0.1	T50	55.00	64.00	0.60	2.90	2.90	1.66	1.06	1.06	3.20	5.51	11.62	11.00	1.71
tratto tominato	-1	T50	40.00	64.00	0.50	2.80	2.80	1.66	1.07	1.16	2.74	4.61	13.88	13.01	1.42
tratto tominato	-2	T50	20.00	64.00	0.38	2.68	2.68	1.97	1.43	1.59	2.51	3.25	19.67	13.76	0.87
tratto tominato	-3	T50		64.00	0.25	2.55	2.55	1.70	1.31	1.45	2.36	3.61	17.74	13.52	1.01



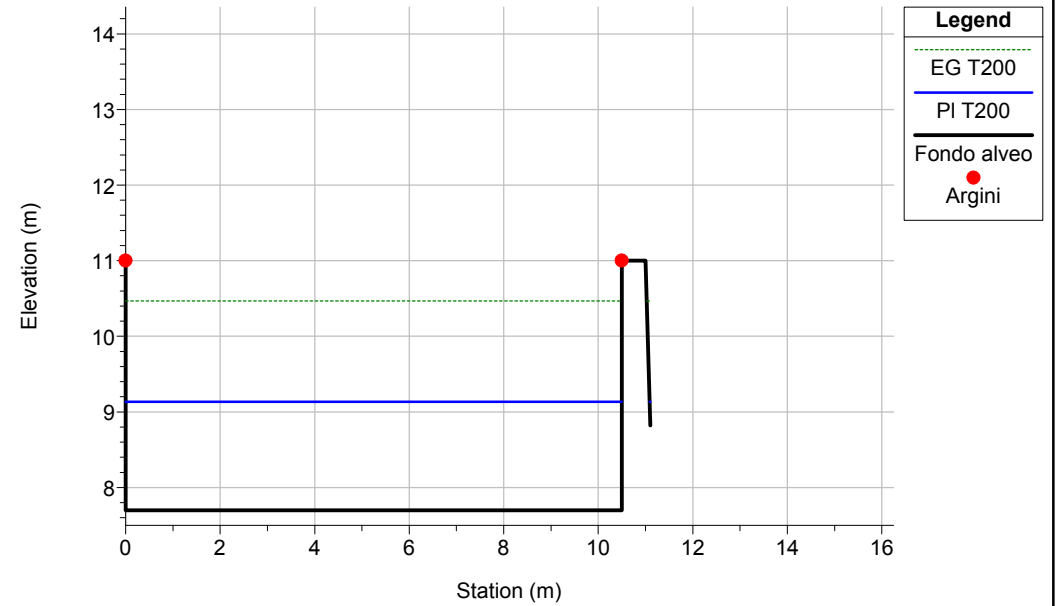
### Rio San Giorgio

River = san giorgio Reach = tratto tominato RS = 12



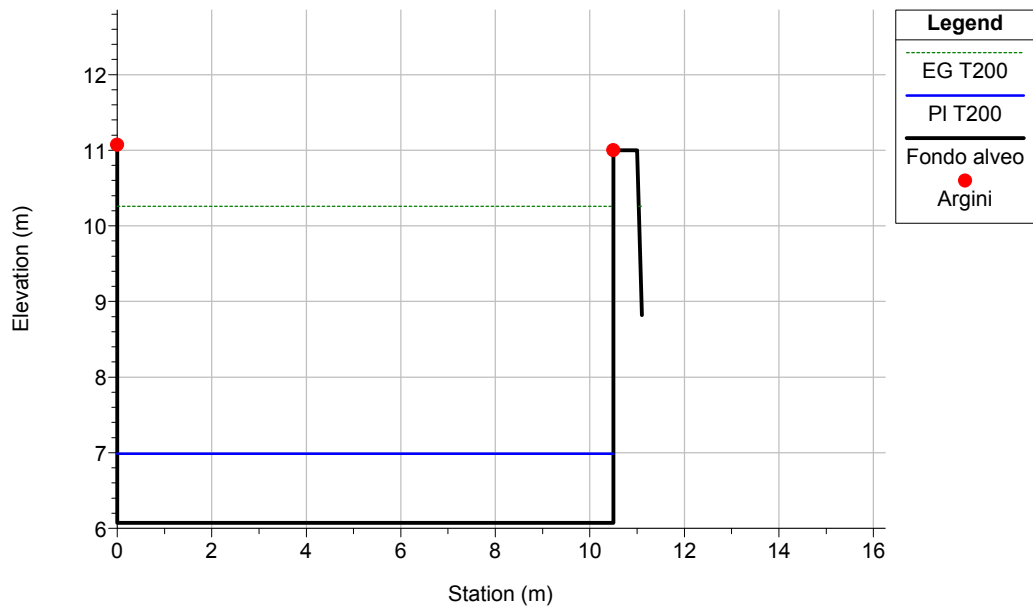
### Rio San Giorgio

River = san giorgio Reach = tratto tominato RS = 11.1



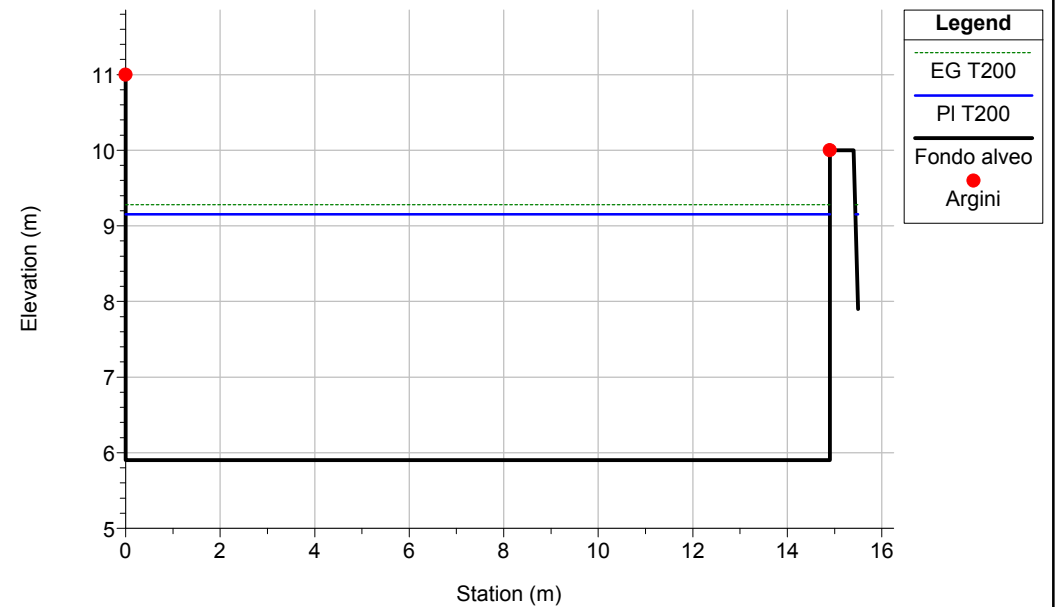
### Rio San Giorgio

River = san giorgio Reach = tratto tominato RS = 11



### Rio San Giorgio

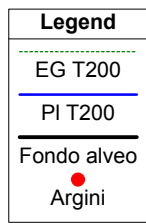
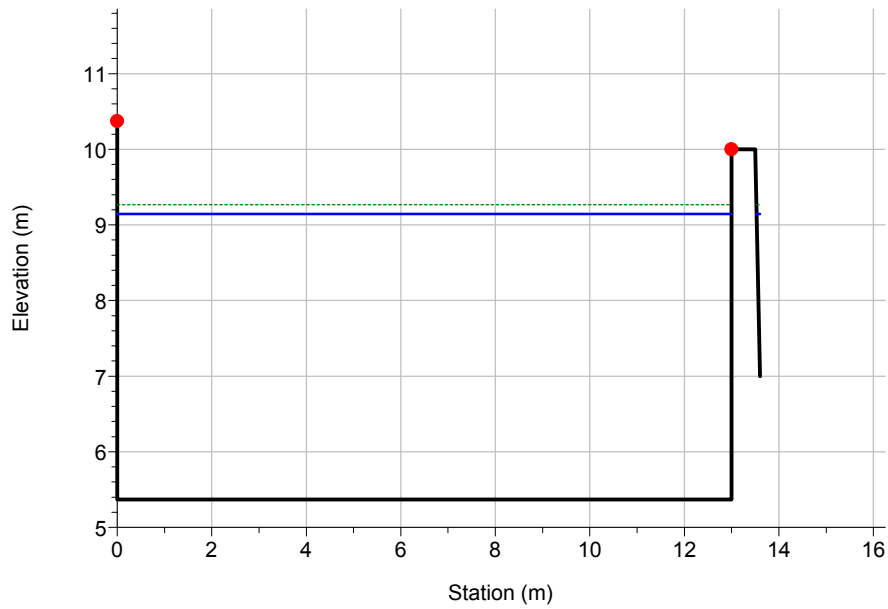
River = san giorgio Reach = tratto tominato RS = 10.5





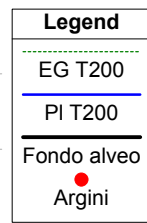
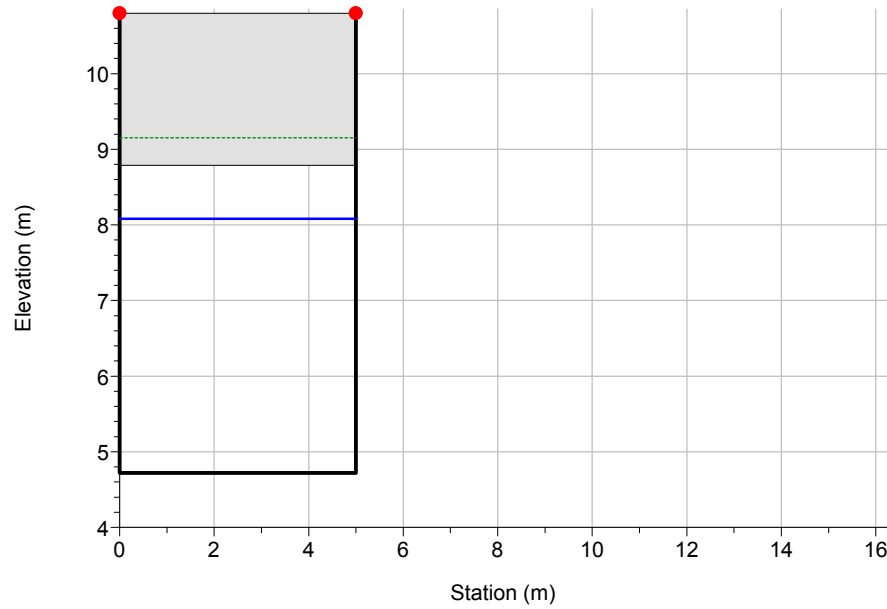
### Rio San Giorgio

River = san giorgio Reach = tratto tobinato RS = 10



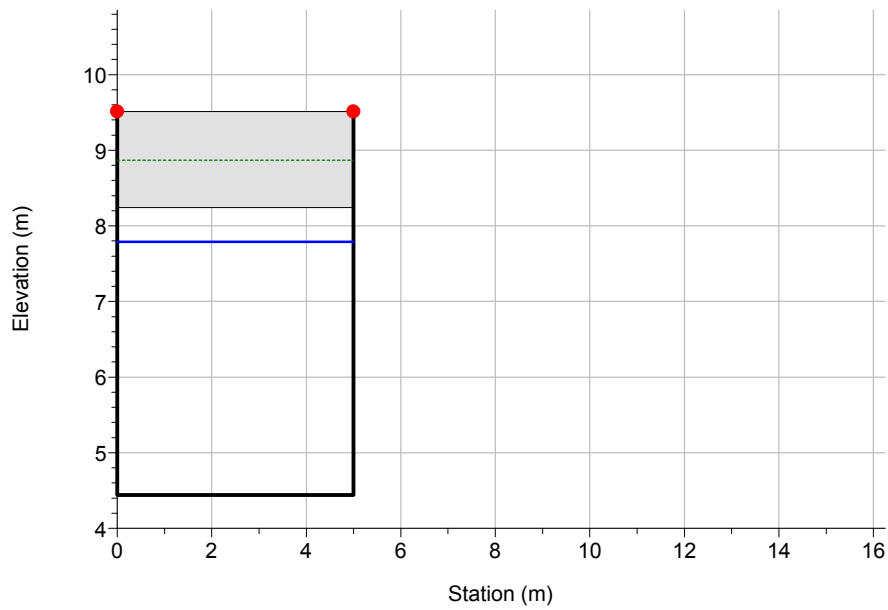
### Rio San Giorgio

River = san giorgio Reach = tratto tobinato RS = 9



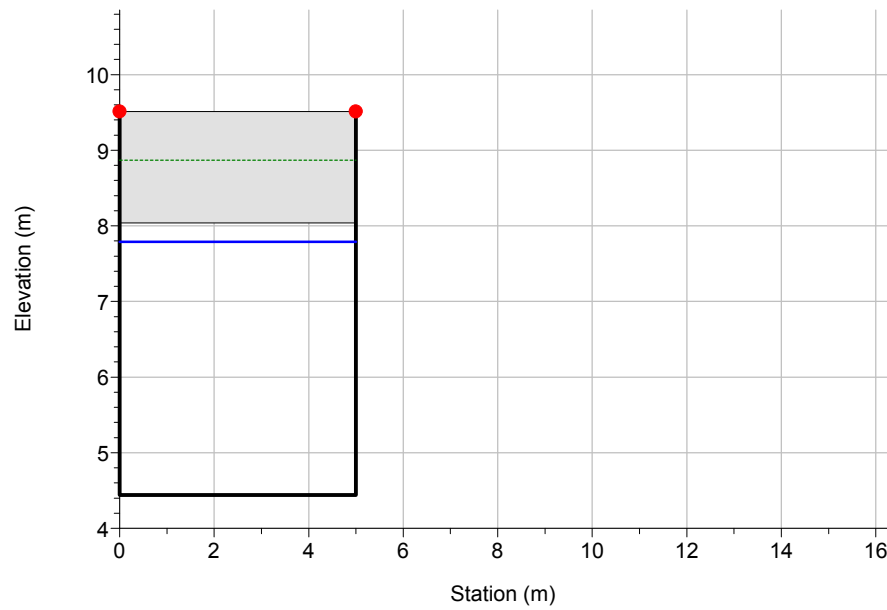
### Rio San Giorgio

River = san giorgio Reach = tratto tobinato RS = 8.1



### Rio San Giorgio

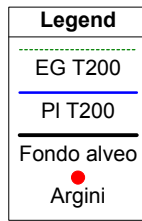
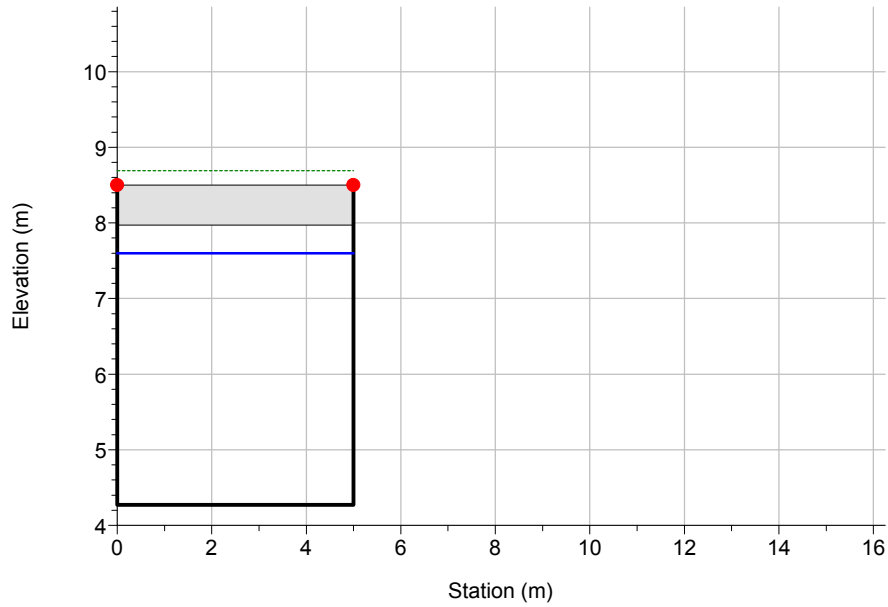
River = san giorgio Reach = tratto tobinato RS = 8





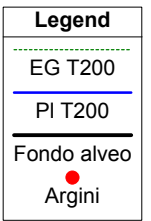
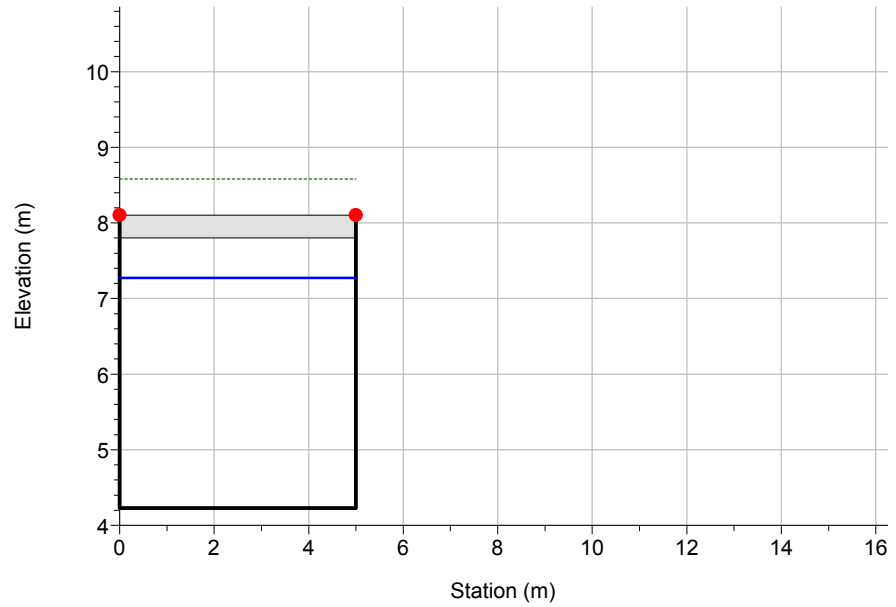
### Rio San Giorgio

River = san giorgio Reach = tratto tobinato RS = 7.2



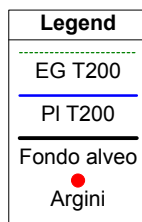
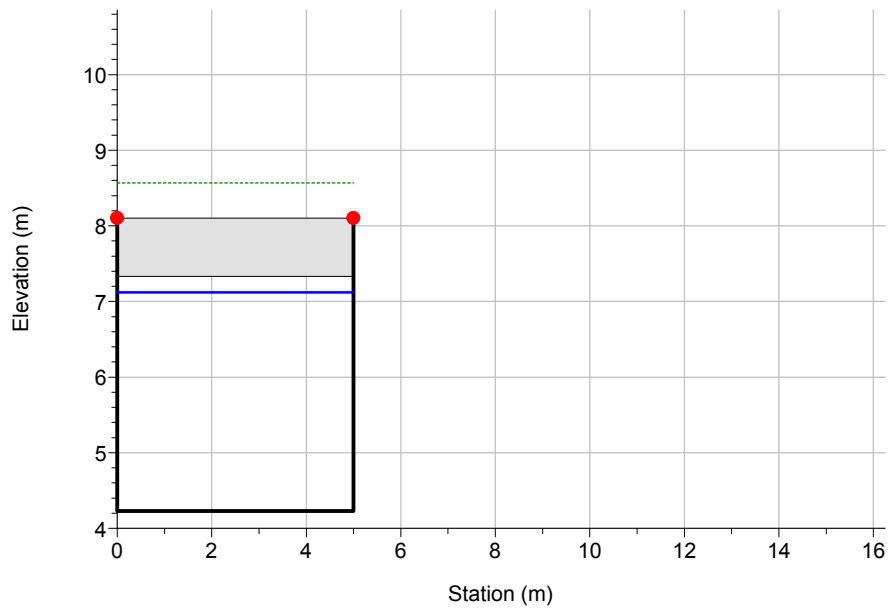
### Rio San Giorgio

River = san giorgio Reach = tratto tobinato RS = 7.1



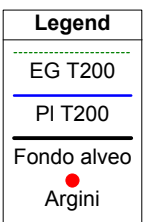
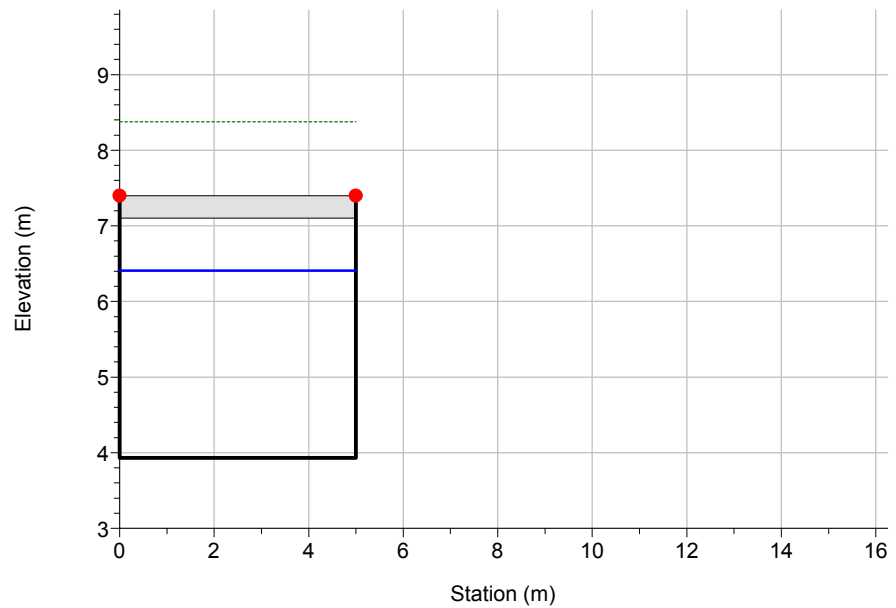
### Rio San Giorgio

River = san giorgio Reach = tratto tobinato RS = 7



### Rio San Giorgio

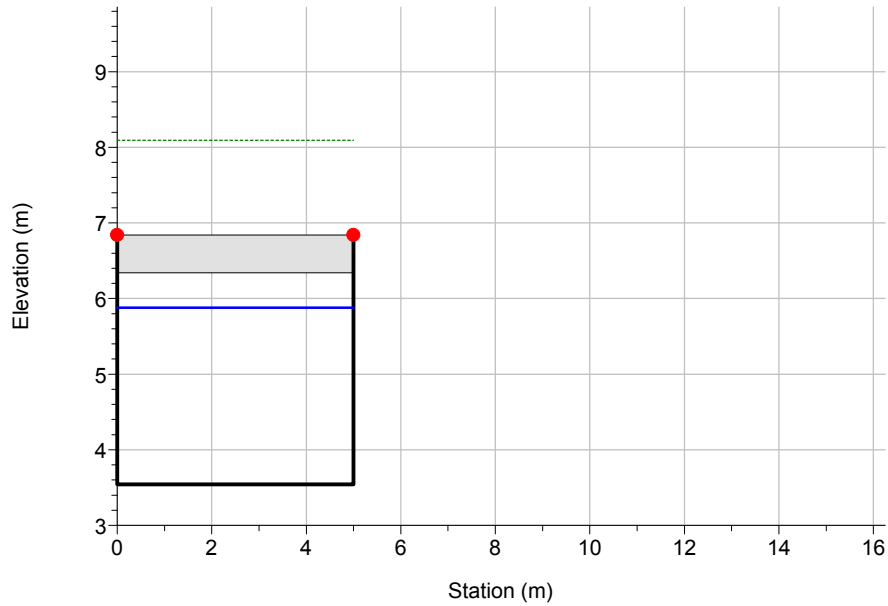
River = san giorgio Reach = tratto tobinato RS = 6.1





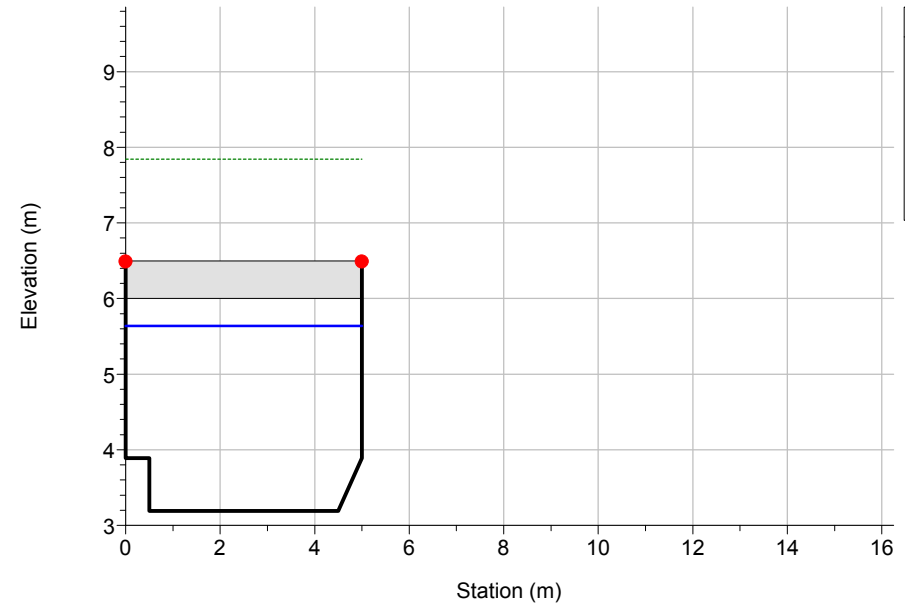
### Rio San Giorgio

River = san giorgio Reach = tratto tominato RS = 6



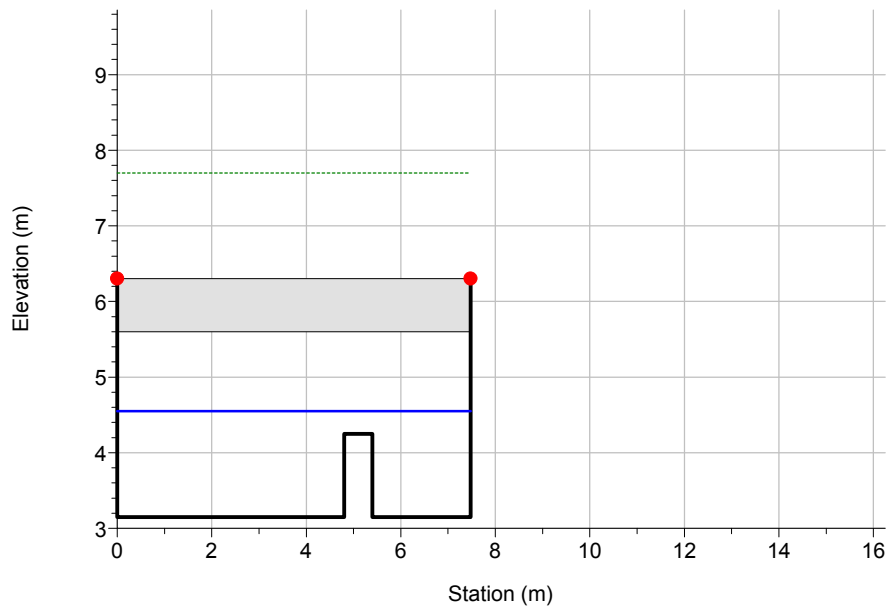
### Rio San Giorgio

River = san giorgio Reach = tratto tominato RS = 5.1



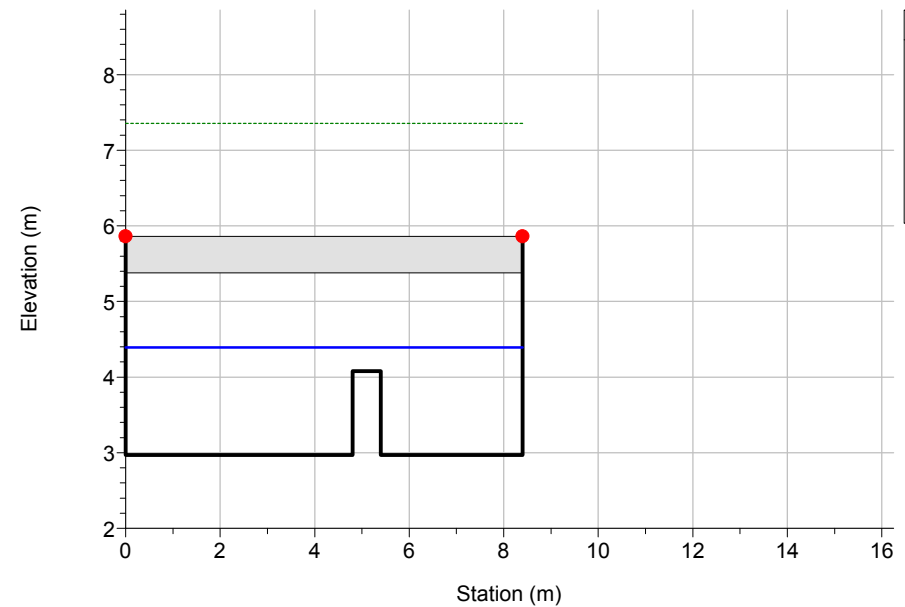
### Rio San Giorgio

River = san giorgio Reach = tratto tominato RS = 5



### Rio San Giorgio

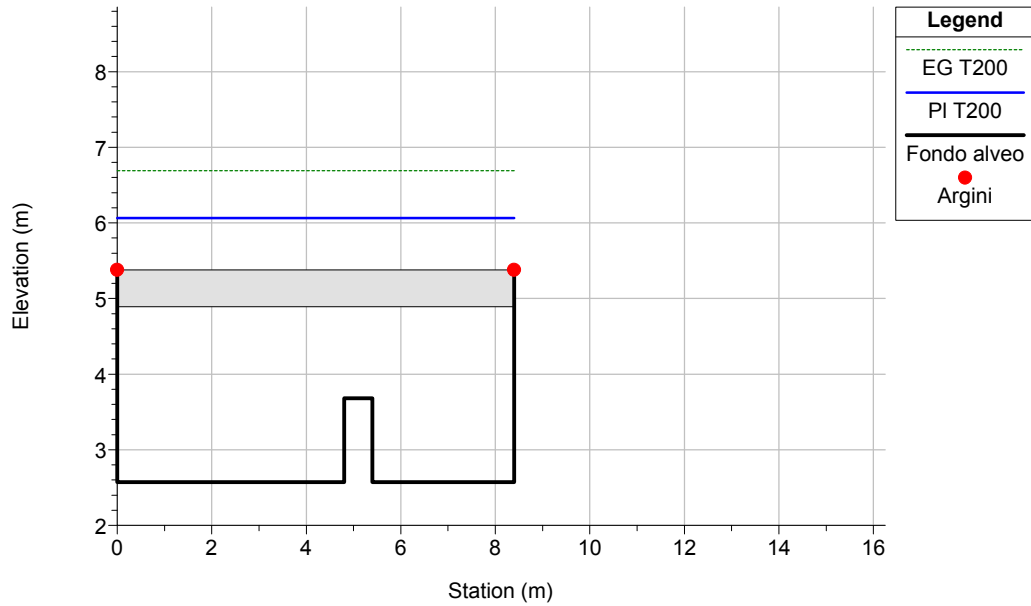
River = san giorgio Reach = tratto tominato RS = 4





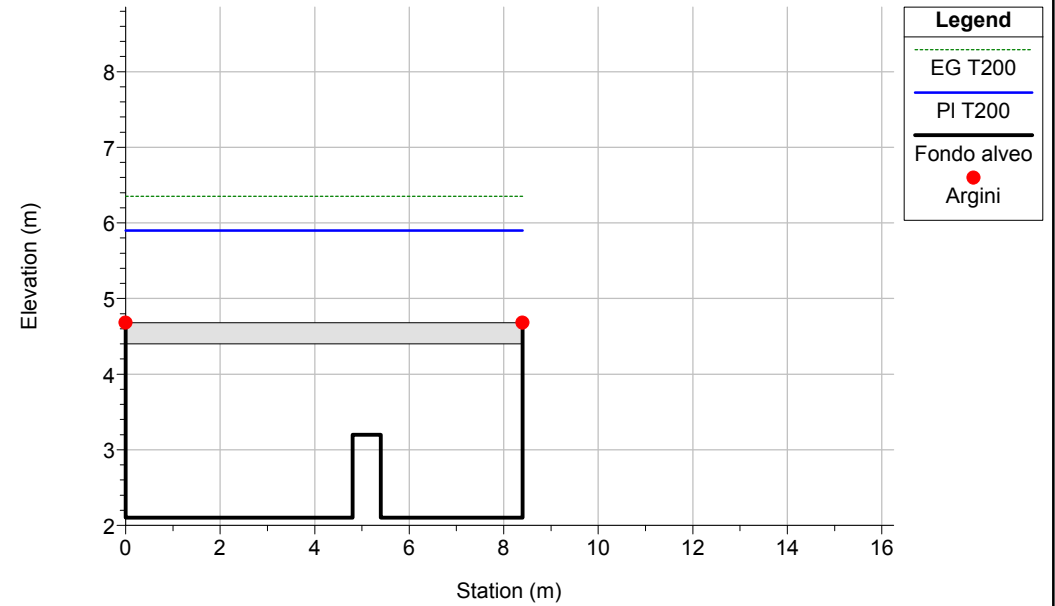
### Rio San Giorgio

River = san giorgio Reach = tratto tominato RS = 3



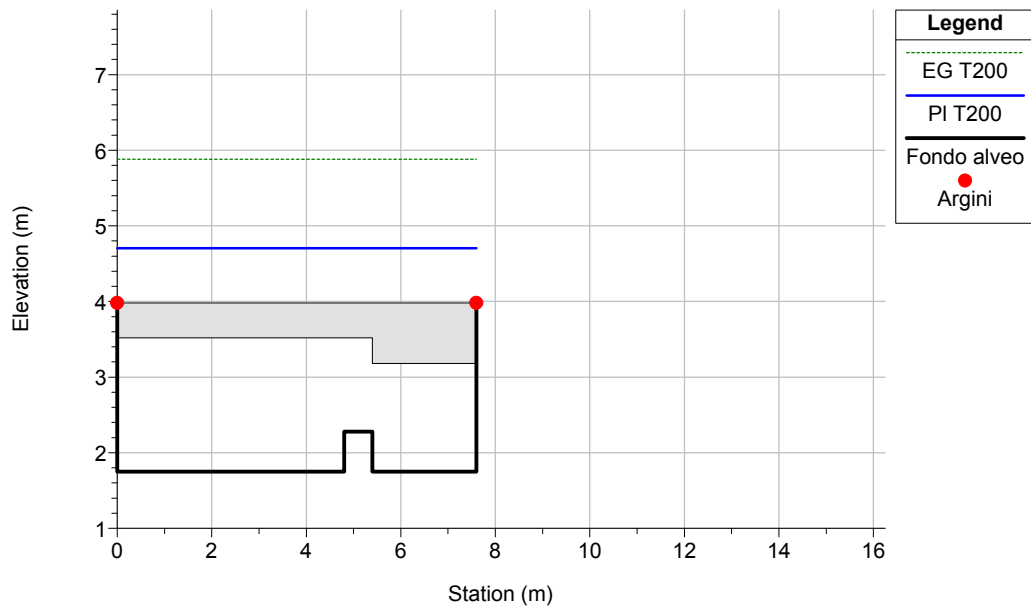
### Rio San Giorgio

River = san giorgio Reach = tratto tominato RS = 2.1



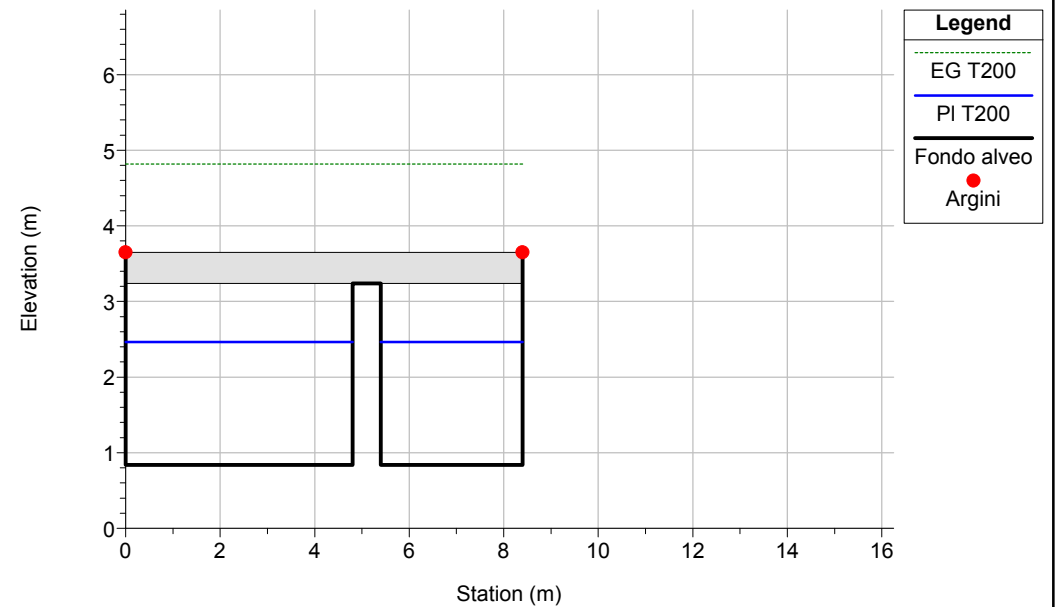
### Rio San Giorgio

River = san giorgio Reach = tratto tominato RS = 2



### Rio San Giorgio

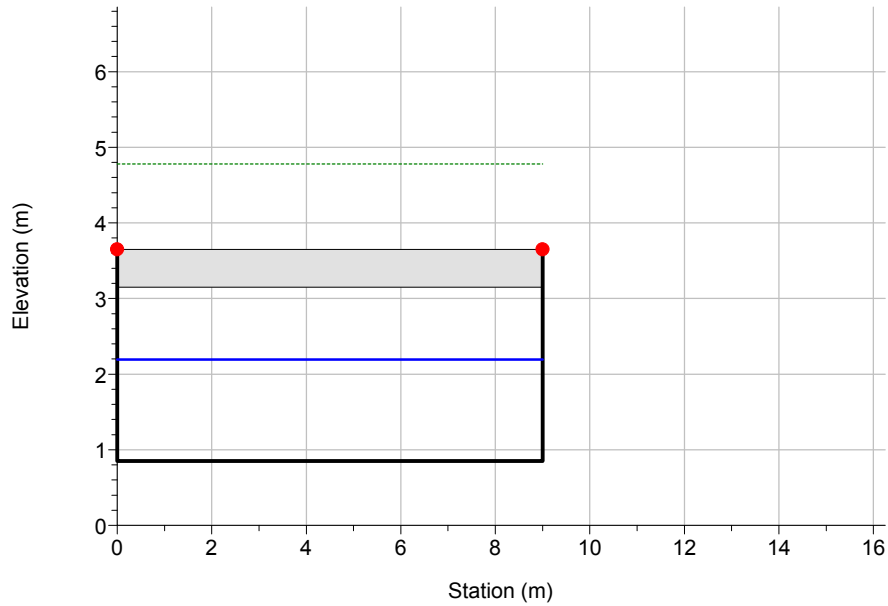
River = san giorgio Reach = tratto tominato RS = 1.1





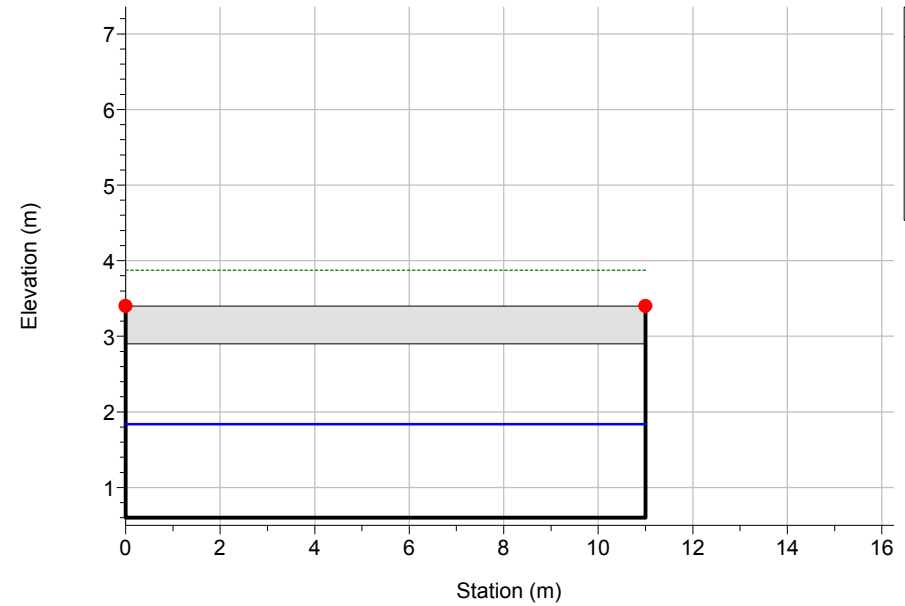
### Rio San Giorgio

River = san giorgio Reach = tratto tombinato RS = 1



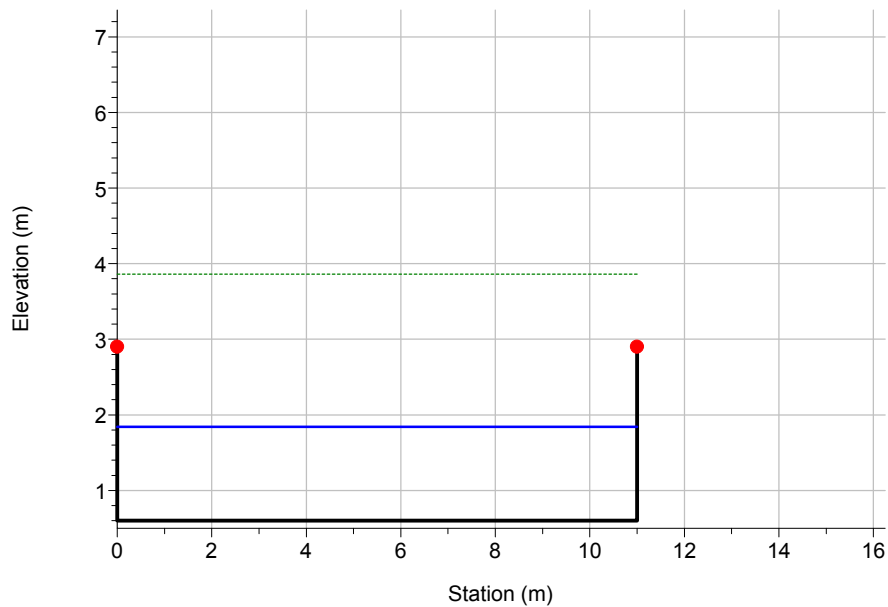
### Rio San Giorgio

River = san giorgio Reach = tratto tombinato RS = 0



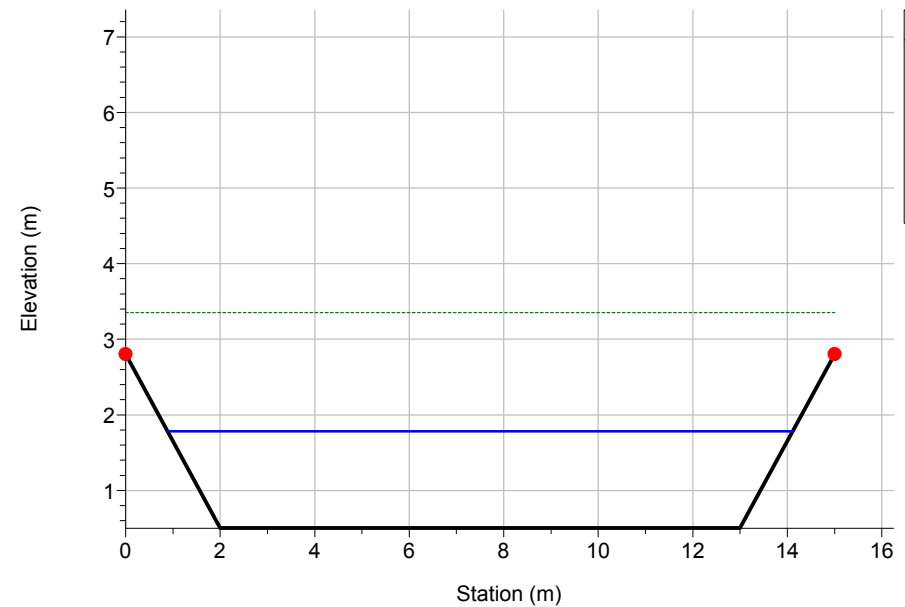
### Rio San Giorgio

River = san giorgio Reach = tratto tombinato RS = -0.1



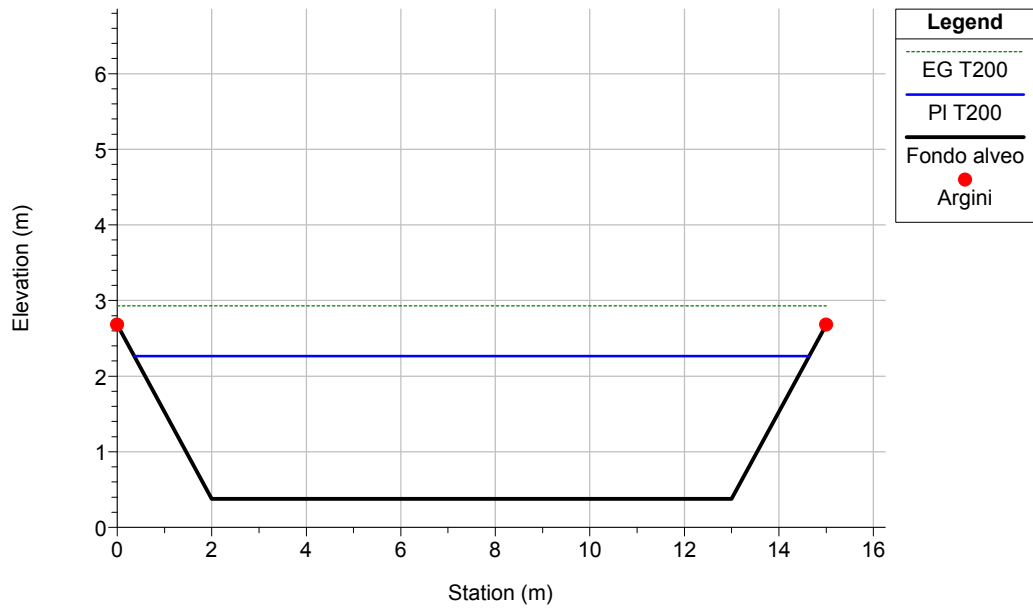
### Rio San Giorgio

River = san giorgio Reach = tratto tombinato RS = -1



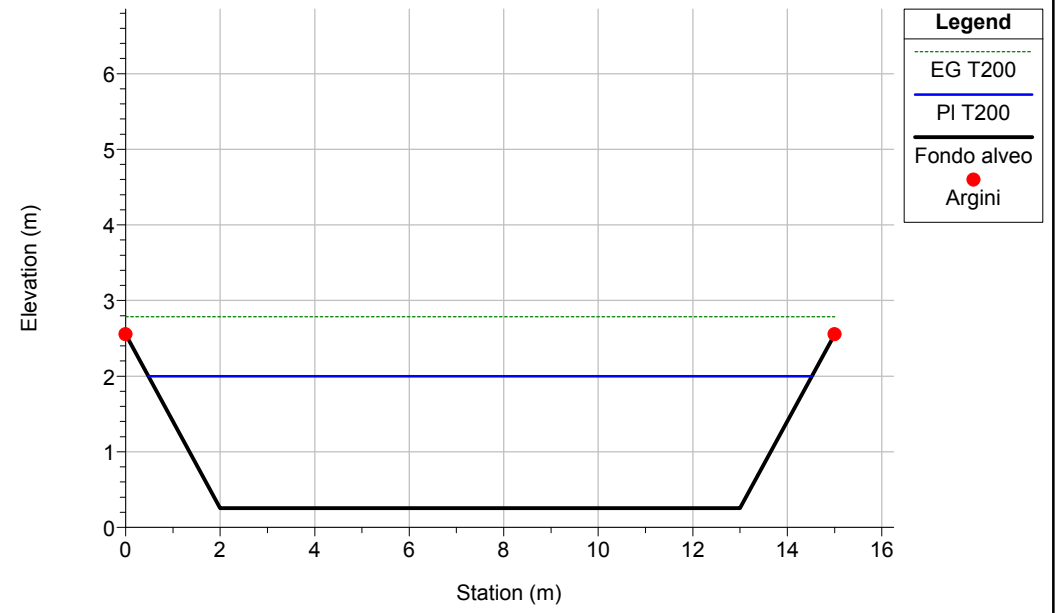
### Rio San Giorgio

River = san giorgio Reach = tratto tobinato RS = -2



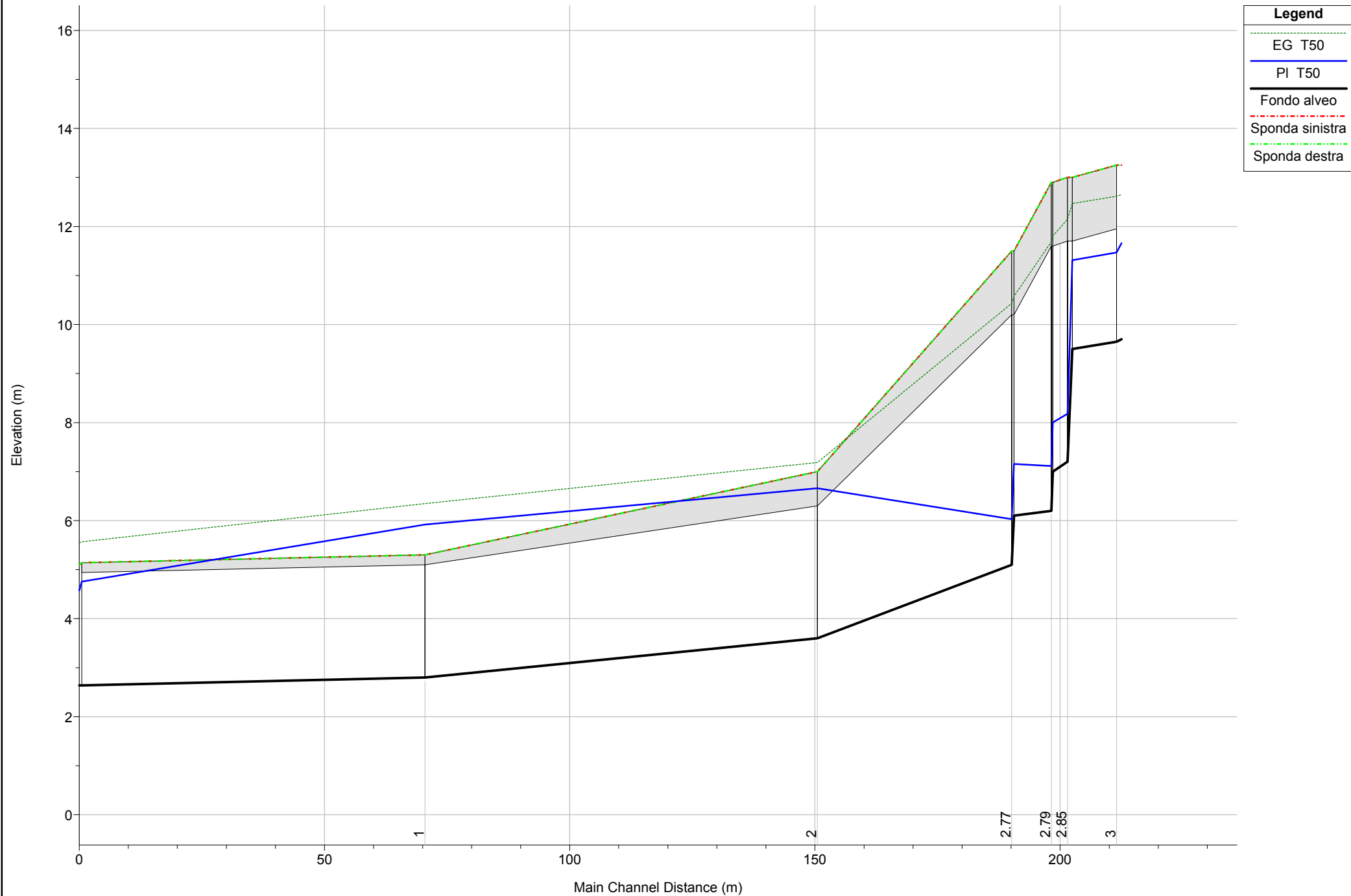
### Rio San Giorgio

River = san giorgio Reach = tratto tobinato RS = -3





# Rio Rossola



Comune di Bonassola Prot. n. 00016333 del 07-03-2019 in partenza

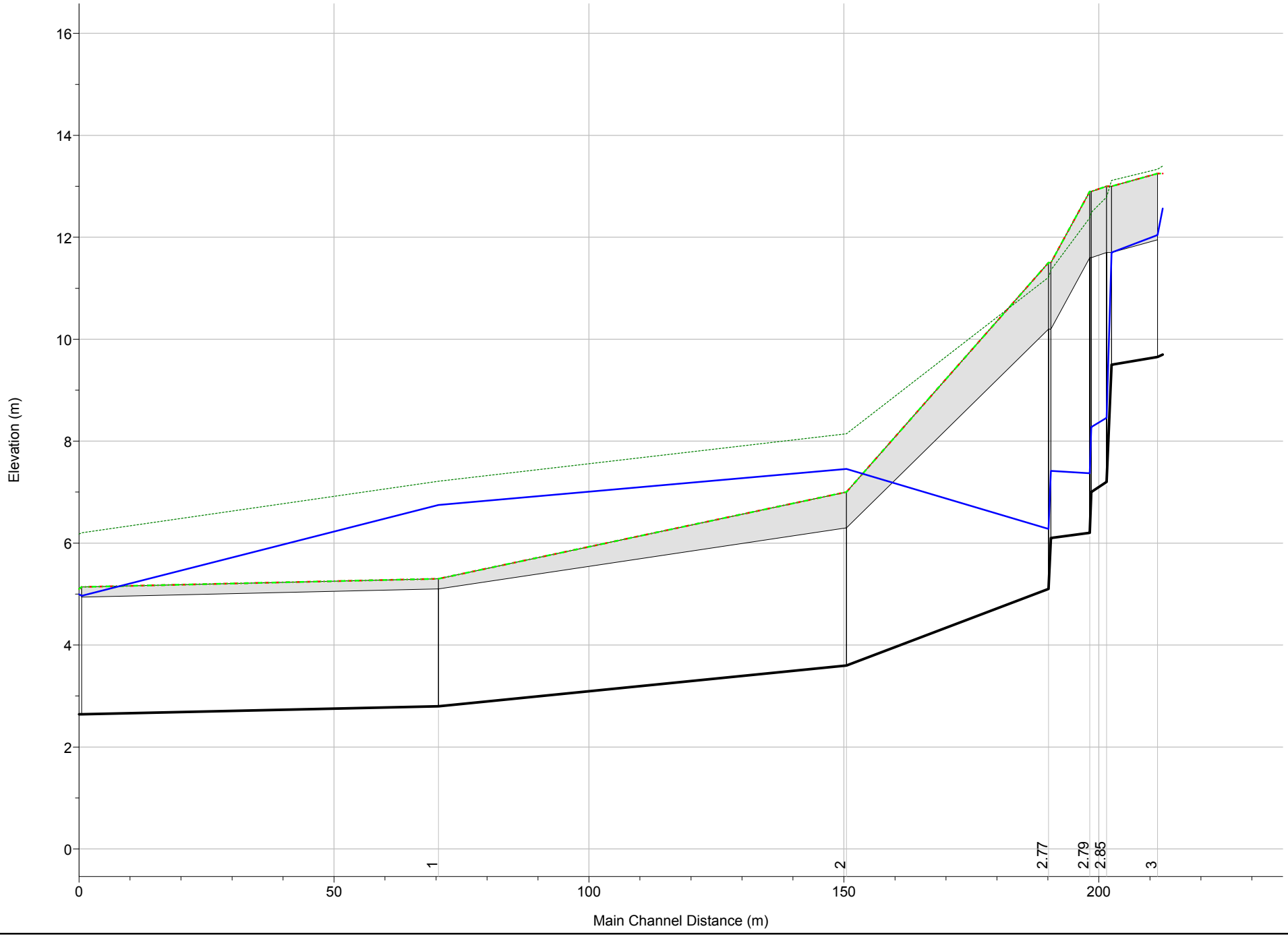
1 cm Horiz. = 10 m 1 cm Vert. = 1 m

HEC-RAS Plan: rossola-2018 River: Rossola Reach: Rossola Profile: T50

Reach	River Sta	Profile	Cum Ch Len	Q Total	Min Ch El	LOB Elev	ROB Elev	W.S. Elev	Hydr Depth	Max Chl Dpth	E.G. Elev	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m)	(m3/s)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m/s)	(m2)	(m)	
Rossola	3.1	T50	212.50	38.00	9.70	13.25	13.25	11.66	1.96	1.96	12.65	4.41	8.62	4.40	1.00
Rossola	3	T50	211.50	38.00	9.65	11.95	11.95	11.47	1.82	1.82	12.62	4.75	8.00	4.40	1.12
Rossola	2.9	T50	202.50	38.00	9.50	11.70	11.70	11.31	1.81	1.81	12.47	4.76	7.98	4.40	1.13
Rossola	2.85	T50	201.50	38.00	7.20	11.70	11.70	8.18	0.98	0.98	12.15	8.83	4.30	4.40	2.85
Rossola	2.8	T50	198.50	38.00	7.00	11.60	11.60	8.00	1.00	1.00	11.80	8.64	4.40	4.40	2.76
Rossola	2.79	T50	198.20	38.00	6.20	11.60	11.60	7.11	0.91	0.91	11.69	9.48	4.01	4.40	3.17
Rossola	2.78	T50	190.60	38.00	6.10	10.20	10.20	7.15	1.05	1.05	10.58	8.19	4.64	4.40	2.55
Rossola	2.77	T50	190.10	38.00	5.10	10.20	10.20	6.03	0.93	0.93	10.43	9.29	4.09	4.40	3.08
Rossola	2	T50	150.50	38.00	3.60	6.30	6.30	6.66		3.06	7.18	3.20	11.88		0.58
Rossola	1	T50	70.50	38.00	2.80	5.10	5.10	5.92	2.92	3.12	6.35	2.89	13.14	4.50	0.52
Rossola	0.1	T50	0.50	38.00	2.64	4.94	4.94	4.76	2.12	2.12	5.57	3.99	9.53	4.50	0.88
Rossola	0	T50		38.00	2.64	5.10	5.10	4.58	1.94	1.94	5.55	4.36	8.71	4.50	1.00



# Rio Rossola



Legend	
EG T200	(Green dotted line)
PI T200	(Blue solid line)
Fondo alveo	(Thick black solid line)
Sponda sinistra	(Red dashed line)
Sponda destra	(Green dotted line)

Comune di Bonassola Prot. n. 00016333 del 07-03-2019 in partenza

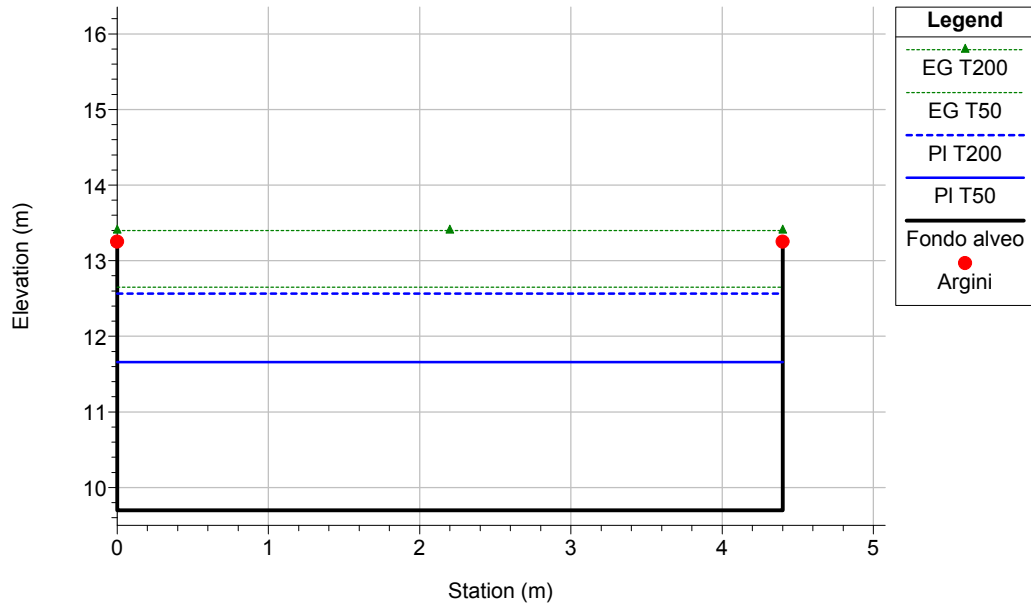
1 cm Horiz. = 10 m 1 cm Vert. = 1 m

HEC-RAS Plan: rossola-2018 River: Rossola Reach: Rossola Profile: T200

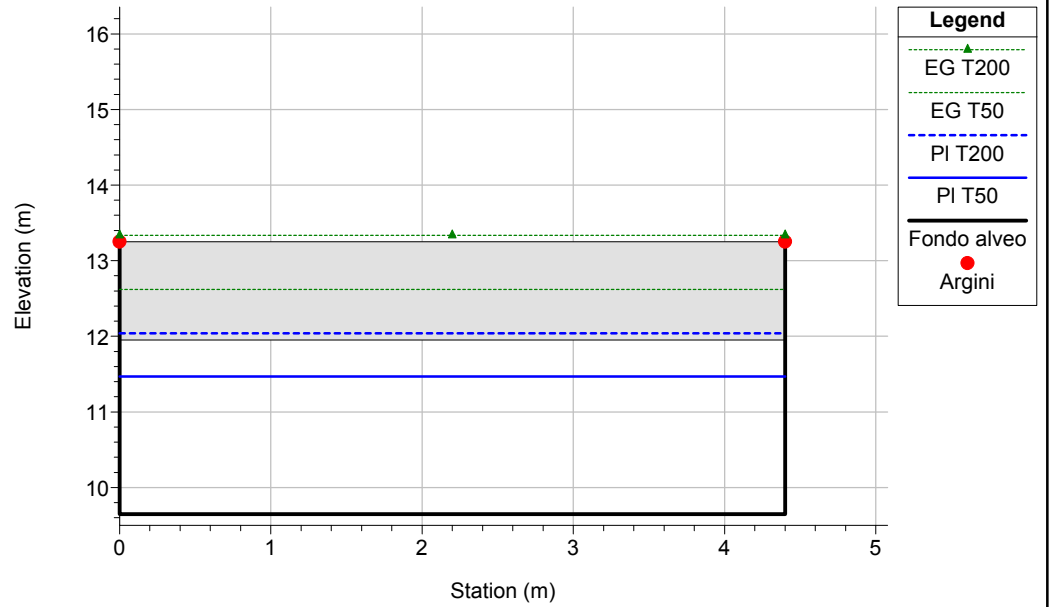
Reach	River Sta	Profile	Cum Ch Len	Q Total	Min Ch El	LOB Elev	ROB Elev	W.S. Elev	Hydr Depth	Max Chl Dpth	E.G. Elev	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m)	(m3/s)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m/s)	(m2)	(m)	
Rossola	3.1	T200	212.50	51.00	9.70	13.25	13.25	12.57	2.87	2.87	13.40	4.04	12.61	4.40	0.76
Rossola	3	T200	211.50	51.00	9.65	11.95	11.95	12.04		2.39	13.34	5.04	10.12		1.04
Rossola	2.9	T200	202.50	51.00	9.50	11.70	11.70	11.70	2.20	2.20	13.12	5.27	9.68	4.40	1.13
Rossola	2.85	T200	201.50	51.00	7.20	11.70	11.70	8.46	1.26	1.26	12.79	9.22	5.53	4.40	2.62
Rossola	2.8	T200	198.50	51.00	7.00	11.60	11.60	8.27	1.27	1.27	12.49	9.09	5.61	4.40	2.57
Rossola	2.79	T200	198.20	51.00	6.20	11.60	11.60	7.37	1.17	1.17	12.38	9.92	5.14	4.40	2.93
Rossola	2.78	T200	190.60	51.00	6.10	10.20	10.20	7.42	1.32	1.32	11.36	8.79	5.80	4.40	2.45
Rossola	2.77	T200	190.10	51.00	5.10	10.20	10.20	6.28	1.18	1.18	11.21	9.84	5.18	4.40	2.89
Rossola	2	T200	150.50	51.00	3.60	6.30	6.30	7.45	3.15	3.85	8.14	3.67	13.88	4.40	0.60
Rossola	1	T200	70.50	51.00	2.80	5.10	5.10	6.75	3.75	3.95	7.21	3.02	16.87	4.50	0.49
Rossola	0.1	T200	0.50	51.00	2.64	4.94	4.94	4.97		2.33	6.20	4.93	10.35		1.03
Rossola	0	T200		51.00	2.64	5.10	5.10	5.00	2.36	2.36	6.18	4.81	10.60	4.50	1.00



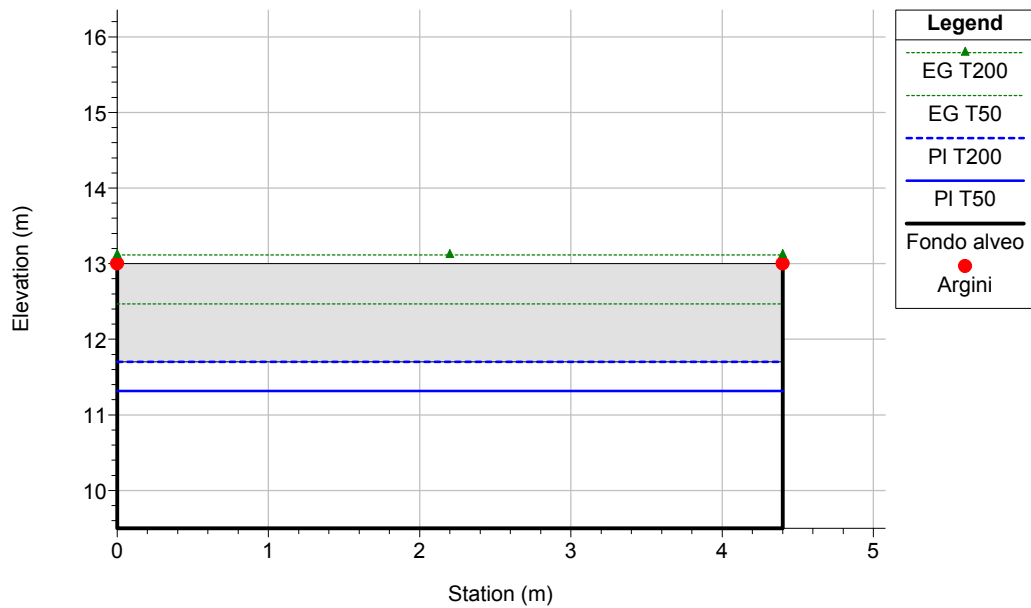
Rio Rossola  
River = Rossola Reach = Rossola RS = 3.1



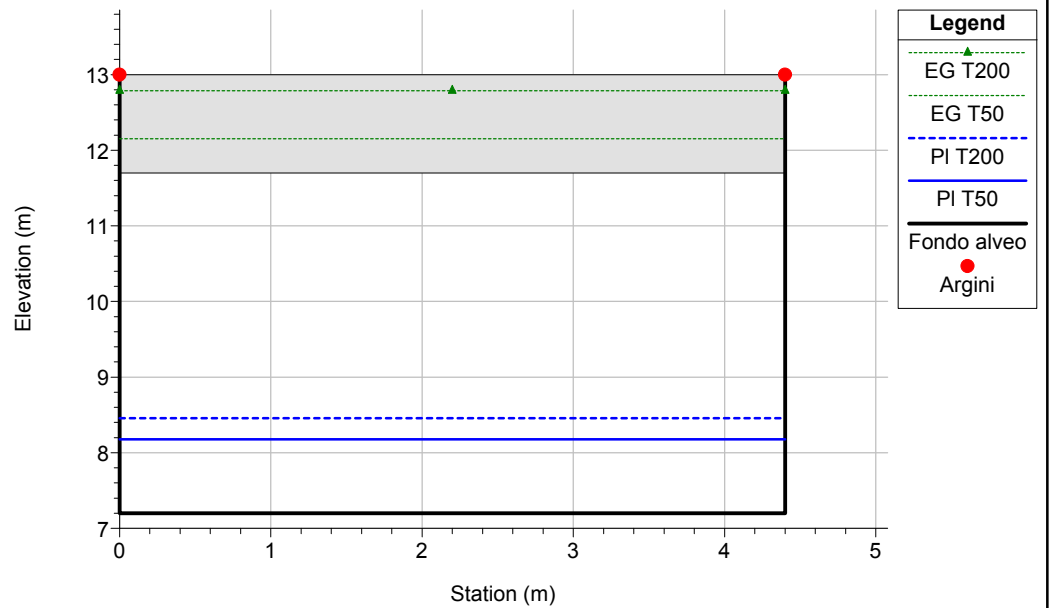
Rio Rossola  
River = Rossola Reach = Rossola RS = 3



Rio Rossola  
River = Rossola Reach = Rossola RS = 2.9

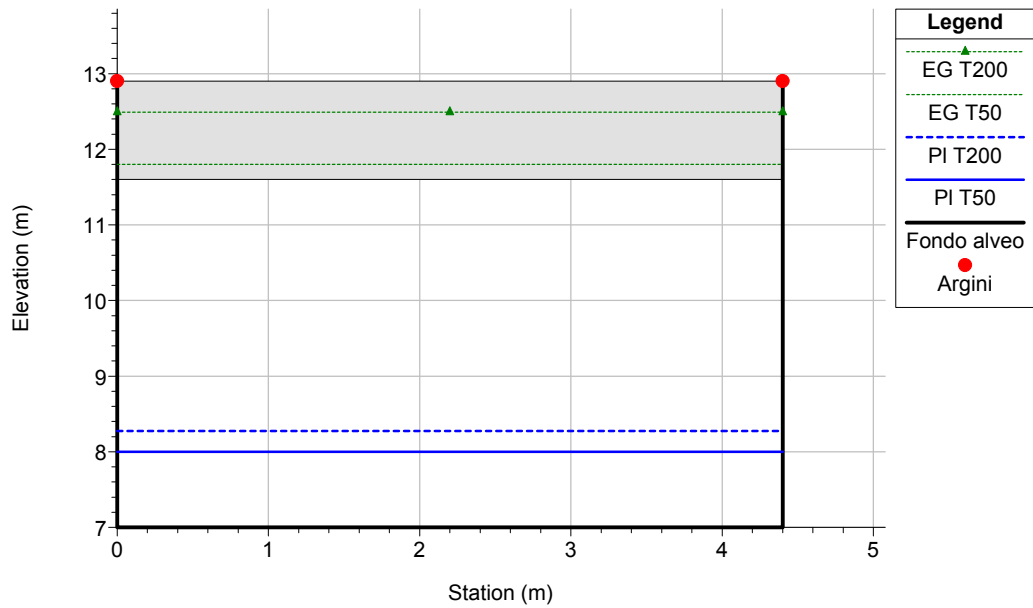


Rio Rossola  
River = Rossola Reach = Rossola RS = 2.85



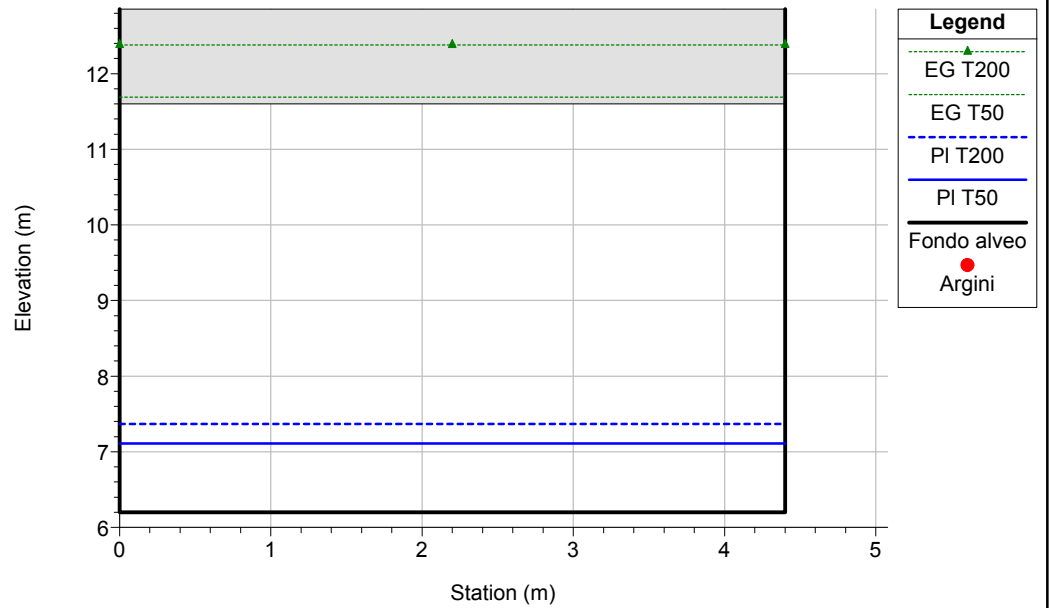
### Rio Rossola

River = Rossola Reach = Rossola RS = 2.8



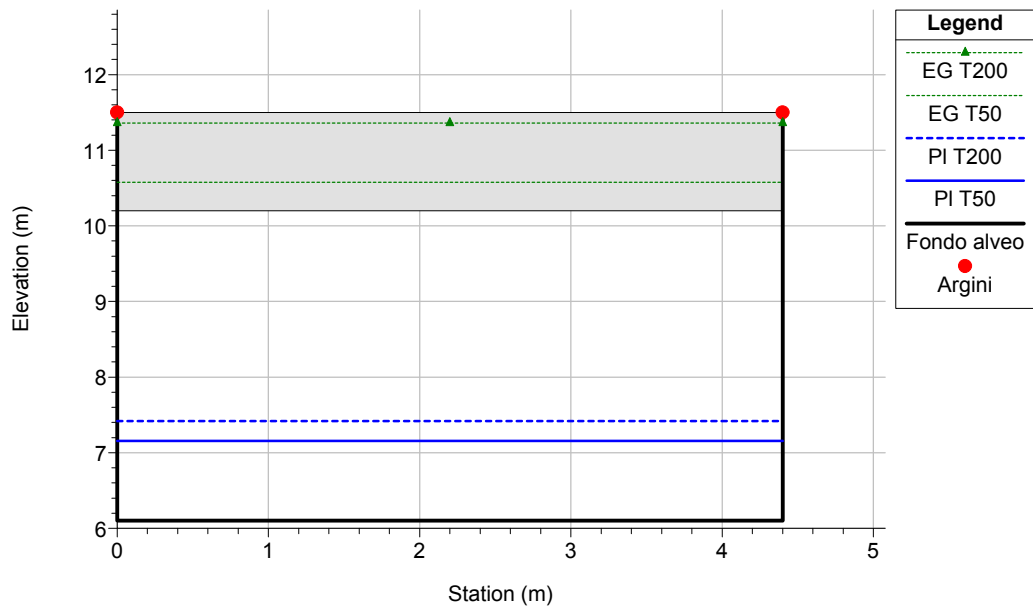
### Rio Rossola

River = Rossola Reach = Rossola RS = 2.79



### Rio Rossola

River = Rossola Reach = Rossola RS = 2.78



### Rio Rossola

River = Rossola Reach = Rossola RS = 2.77

