

Trabajo Fin de Máster

ANÁLISIS CUALITATIVO Y CUANTITATIVO DE LA SEGURIDAD DE PRESAS. APLICACIÓN AL CASO DE LA PRESA DE LAS NAVAS (LOARRE, HUESCA)

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JULIO, 2024



UNIVERSITAT
POLITÈCNICA
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máster en ingeniería
hidráulica y medio ambiente
mihma



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Tabla 1.- Datos de los hidrogramas obtenidos en el estudio de diciembre de 2003 para las avenidas de 500 y 5.000 años de periodo de retorno. Fuente: documento XYZT de la presa (2003).

TIEMPO (h)	CAUDAL (m ³ /s)	
	T=500 años	T=5.000 años
1	0,00	0,00
2	0,00	0,00
3	0,00	0,00
4	0,00	0,00
5	0,00	0,00
6	0,00	0,05
7	0,16	0,47
8	0,90	1,80
9	2,94	4,80
10	8,41	12,13
11	29,53	38,79
12	57,46	73,29
13	61,53	77,60
14	48,47	60,71
15	37,23	46,38
16	28,61	35,48
17	22,23	27,45
18	17,55	21,59
19	14,11	17,30
20	10,94	13,38
21	7,47	9,12
22	4,60	5,62
23	2,80	3,41
24	1,52	1,85
25	0,89	1,08
26	0,52	0,63
27	0,30	0,36
28	0,17	0,20
29	0,09	0,11
30	0,04	0,05
31	0,02	0,02
32	0,00	0,00

TIEMPO (h)	CAUDAL (m ³ /s)	
	T=500 años	T=5.000 años
33	0,00	0,00
34	0,00	0,00
35	0,00	0,00
36	0,00	0,00
37	0,00	0,00
38	0,00	0,00
39	0,00	0,00
40	0,00	0,00
41	0,00	0,00
42	0,00	0,00
43	0,00	0,00
44	0,00	0,00
45	0,00	0,00
46	0,00	0,00
47	0,00	0,00
48	0,00	0,00
49	0,00	0,00
50	0,00	0,00
51	0,00	0,00
52	0,00	0,00
53	0,00	0,00
54	0,00	0,00
55	0,00	0,00
56	0,00	0,00
57	0,00	0,00
58	0,00	0,00
59	0,00	0,00
60	0,00	0,00
61	0,00	0,00
62	0,00	0,00
63	0,00	0,00
64	0,00	0,00
65	0,00	0,00
66	0,00	0,00
67	0,00	0,00

TIEMPO (h)	CAUDAL (m ³ /s)	
	T=500 años	T=5.000 años
68	0,00	0,00
69	0,00	0,00
70	0,00	0,00
71	0,00	0,00
72	0,00	0,00

Tabla 2.- Ley del desagüe del aliviadero de la presa. Fuente: documento XYTZ de la presa (2003).

COTA DE EMBALSE (m.s.n.m.)	ALTURA SOBRE ALIVIADERO He (m)	COEFICIENTE DE DESAGÜE Cd (m ^{0,50} /s)	ANCHURA DEL VERTIDO L (m)	CAUDAL POR ALIVIADERO Q (m ³ /s)
Q=Cd*L*He ^(3/2)				
647,32	0,00	1,71	25,447	0,00
647,34	0,02	1,72	25,447	0,12
647,36	0,04	1,79	25,447	0,36
647,38	0,06	1,83	25,447	0,68
647,40	0,08	1,86	25,447	1,07
647,42	0,10	1,88	25,447	1,52
647,44	0,12	1,91	25,447	2,02
647,46	0,14	1,94	25,447	2,58
647,48	0,16	1,96	25,447	3,20
647,50	0,18	1,98	25,447	3,85
647,52	0,20	2,00	25,447	4,56
647,54	0,22	2,02	25,447	5,32
647,56	0,24	2,05	25,447	6,12
647,58	0,26	2,06	25,447	6,96
647,60	0,28	2,08	25,447	7,85
647,62	0,30	2,10	25,447	8,79
647,64	0,32	2,12	25,447	9,76
647,66	0,34	2,13	25,447	10,77
647,68	0,36	2,15	25,447	11,82
647,70	0,38	2,10	25,447	12,55
647,72	0,40	2,12	25,447	13,65
647,74	0,42	2,13	25,447	14,77

COTA DE EMBALSE (m.s.n.m.)	ALTURA SOBRE ALIVIADERO He (m)	COEFICIENTE DE DESAGÜE Cd (m ^{0,50} /s)	ANCHURA DEL VERTIDO L (m)	CAUDAL POR ALIVIADERO Q (m ³ /s)
$Q = C_d * L * H_e^{(3/2)}$				
647,76	0,44	2,14	25,447	15,92
647,78	0,46	2,16	25,447	17,12
647,80	0,48	2,17	25,447	18,35
647,82	0,50	2,18	25,447	19,62
647,84	0,52	2,19	25,447	20,91
647,86	0,54	2,20	25,447	22,24
647,88	0,56	2,21	25,447	23,60
647,90	0,58	2,22	25,447	25,00
647,92	0,60	2,24	25,447	26,44
647,94	0,62	2,25	25,447	27,89
647,96	0,64	2,26	25,447	29,38
647,98	0,66	2,27	25,447	30,91
648,00	0,68	2,28	25,447	32,47
648,02	0,70	2,29	25,447	34,06
648,04	0,72	2,30	25,447	35,68
648,06	0,74	2,30	25,447	37,33
648,08	0,76	2,31	25,447	39,02
648,10	0,78	2,32	25,447	40,74
648,12	0,80	2,33	25,447	42,49
648,14	0,82	2,34	25,447	44,13
648,16	0,84	2,34	25,447	45,80
648,18	0,86	2,34	25,447	47,48
648,20	0,88	2,34	25,447	49,19
648,22	0,90	2,34	25,447	50,93
648,24	0,92	2,35	25,447	52,68
648,26	0,94	2,35	25,447	54,45
648,28	0,96	2,35	25,447	56,24
648,30	0,98	2,35	25,447	58,05
648,32	1,00	2,35	25,447	59,89
648,34	1,02	2,35	25,447	61,69
648,36	1,04	2,35	25,447	63,51
648,38	1,06	2,35	25,447	65,35

COTA DE EMBALSE (m.s.n.m.)	ALTURA SOBRE ALIVIADERO He (m)	COEFICIENTE DE DESAGÜE Cd (m ^{0,50} /s)	ANCHURA DEL VERTIDO L (m)	CAUDAL POR ALIVIADERO Q (m ³ /s)
$Q = C_d * L * H_e^{(3/2)}$				
648,40	1,08	2,35	25,447	67,21
648,42	1,10	2,35	25,447	69,08
648,44	1,12	2,35	25,447	70,97
648,46	1,14	2,35	25,447	72,88
648,48	1,16	2,35	25,447	74,81
648,50	1,18	2,35	25,447	76,75
648,52	1,20	2,35	25,447	78,71

Tabla 3.- Ley del desagüe de fondo de la presa de Las Navas después de la modificación. Fuente: documentación final, obras de emergencia para la reparación del aliviadero y desagüe de fondo de la presa de Las Navas (2003).

Cota de embalse (m.s.n.m.)	Altura embalse (m)	Caudal total (m ³ /s)	Caudal por conducto (m ³ /s)
647,30	7,2000	1,156	0,578
647,20	7,1000	1,151	0,575
647,00	6,9000	1,141	0,571
646,75	6,6500	1,129	0,565
646,50	6,4000	1,117	0,558
646,25	6,1500	1,105	0,552
646,00	5,9000	1,092	0,546
645,75	5,6500	1,080	0,540
645,50	5,4000	1,067	0,533
645,25	5,1500	1,054	0,527
645,00	4,9000	1,010	0,520
644,75	4,6500	1,028	0,514
644,50	4,4000	1,014	0,507
644,25	4,1500	1,001	0,500
644,00	3,9000	0,987	0,493
643,75	3,6500	0,973	0,486
643,50	3,4000	0,959	0,479

Cota de embalse (m.s.n.m.)	Altura embalse (m)	Caudal total (m³/s)	Caudal por conducto (m³/s)
643,25	3,1500	0,944	0,472
643,00	2,9000	0,930	0,465
642,75	2,6500	0,915	0,457
642,50	2,4000	0,900	0,450
642,25	2,1500	0,885	0,442
642,00	1,9000	0,869	0,434
641,75	1,6500	0,853	0,427
641,50	1,4000	0,837	0,418
641,25	1,1500	0,820	0,410
641,00	0,9000	0,803	0,402
640,75	0,6500	0,786	0,393
640,50	0,4000	0,769	0,384
640,25	0,1500	0,751	0,375
640,10	0,0000	0,740	0,370

Tabla 4.- Elevación de la lámina de agua por curva en los diferentes puntos para el caudal de proyecto. Fuente: elaboración propia.

Reach	River Sta	Profile	Q Total (m ³ /s)	Min Ch El (m.s.n.m.)	W.S. Elev (m.s.n.m.)	Crit W.S. (m.s.n.m.)	Vel Chnl (m/s)	Froude #	y (m)	B (m)	Radio curva (m)	$\Delta y (m) = \frac{v^2 b}{g r_c}$	$\Delta y/2 (m)$	h (m)	r (m)	$\Delta y (m) = 2,3 \frac{v^2}{g} \log \frac{r_0}{r_i}$	$\Delta y/2 (m)$	h (m)	r (m)
C1	- 29.236*	PF 1	13.7 7	644.2 8	645.3 1	645.1 6	2.42	0.76	1.03	7.06	98	0.04	0.02	2.75	1.70	0.04	0.02	2.75	1.70
C1	- 38.981*	PF 1	13.7 7	644.2 7	645.3	645.1 5	2.43	0.77	1.03	7.06	98	0.04	0.02	2.75	1.70	0.04	0.02	2.75	1.70
C1	- 48.726*	PF 1	13.7 7	644.2 6	645.2 8	645.1 4	2.44	0.77	1.02	7.04	98	0.04	0.02	2.75	1.71	0.04	0.02	2.75	1.71
C1	- 58.471*	PF 1	13.7 7	644.2 5	645.2 7	645.1 3	2.45	0.78	1.02	7.04	98	0.04	0.02	2.75	1.71	0.04	0.02	2.75	1.71
C1	- 68.217*	PF 1	13.7 7	644.2 4	645.2 5	645.1 2	2.47	0.78	1.01	7.02	98	0.04	0.02	2.75	1.72	0.04	0.02	2.75	1.72
C1	- 77.962*	PF 1	13.7 7	644.2 3	645.2 4	645.1 1	2.48	0.79	1.01	7.02	98	0.04	0.02	2.75	1.72	0.04	0.02	2.75	1.72
C1	- 87.707*	PF 1	13.7 7	644.2 2	645.2 2	645.1	2.5	0.8	1	7	98	0.05	0.02	2.75	1.73	0.05	0.02	2.75	1.73

C1	- 97.453*	PF 1	13.7 7	644.2 1	645.2 9	645.0 9	2.52	0.81	0.99	6.98	98	0.05	0.02	2.75	1.74	0.05	0.02	2.75	1.74
C1	- 107.19*	PF 1	13.7 7	644.2	645.1 9	645.0 8	2.54	0.82	0.99	6.98	98	0.05	0.02	2.75	1.74	0.05	0.02	2.75	1.74
C1	- 116.94*	PF 1	13.7 7	644.1 9	645.1 7	645.0 7	2.57	0.83	0.98	6.96	98	0.05	0.02	2.75	1.75	0.05	0.02	2.75	1.75
C1	- 126.68*	PF 1	13.7 7	644.1 8	645.1 5	645.0 6	2.6	0.85	0.97	6.94	98	0.05	0.02	2.75	1.76	0.05	0.02	2.75	1.76

Tabla 5.- Elevación de la lámina de agua por curva en los diferentes puntos para el caudal de avenida extrema. Fuente: elaboración propia.

Reach	River Sta	Profile	Q Total (m³/s)	Min Ch El (m.s.n.m.)	W.S. Elev (m.s.n.m.)	Crit W.S. (m.s.n.m.)	Vel Chnl (m/s)	Froude #	y (m)	B (m)	Radio curva (m)	$\Delta y (m) = \frac{v^2 b}{g r_c}$	$\Delta y/2 (m)$	h (m)	r (m)	$\Delta y (m) = 2,3 \frac{v^2}{g} \log \frac{r_0}{r_i}$	$\Delta y/2 (m)$	h (m)	r (m)
C1	-29.236*	PF 2	71.51	644.28	646.88	646.71	647.7	4.36	0.86	2.6	10.2	98	0.20	0.10	2.75	0.05	0.20	0.10	2.75
C1	-38.981*	PF 2	71.51	644.27	646.87	646.7	647.69	4.37	0.87	2.6	10.2	98	0.20	0.10	2.75	0.05	0.20	0.10	2.75
C1	-48.726*	PF 2	71.51	644.26	646.85	646.69	647.68	4.38	0.87	2.59	10.18	98	0.20	0.10	2.75	0.06	0.20	0.10	2.75
C1	-58.471*	PF 2	71.51	644.25	646.84	646.68	647.67	4.38	0.87	2.59	10.18	98	0.20	0.10	2.75	0.06	0.20	0.10	2.75
C1	-68.217*	PF 2	71.51	644.24	646.83	646.67	647.66	4.39	0.87	2.59	10.18	98	0.20	0.10	2.75	0.06	0.20	0.10	2.75
C1	-77.962*	PF 2	71.51	644.23	646.81	646.66	647.65	4.4	0.87	2.58	10.16	98	0.20	0.10	2.75	0.07	0.20	0.10	2.75
C1	-87.707*	PF 2	71.51	644.22	646.8	646.65	647.64	4.41	0.88	2.58	10.16	98	0.21	0.10	2.75	0.07	0.21	0.10	2.75
C1	-97.453*	PF 2	71.51	644.21	646.79	646.64	647.63	4.41	0.88	2.58	10.16	98	0.21	0.10	2.75	0.07	0.21	0.10	2.75

C1	-107.19*	PF 2	71.51	644.2	646.77	646.63	647.62	4.42	0.88	2.57	10.14	98	0.21	0.10	2.75	0.08	0.21	0.10	2.75
C1	-116.94*	PF 2	71.51	644.19	646.76	646.62	647.61	4.43	0.88	2.57	10.14	98	0.21	0.10	2.75	0.08	0.21	0.10	2.75
C1	-126.68*	PF 2	71.51	644.18	646.74	646.61	647.6	4.44	0.89	2.56	10.12	98	0.21	0.10	2.75	0.09	0.21	0.10	2.75

Tabla 6.- Elevación de la lámina de agua por efecto de emulsión para el caudal de proyecto Fuente: elaboración propia.

Reach	River Sta	Profile	Q Total (m³/s)	Min Ch El (m.s.n.m.)	W.S. Elev (m.s.n.m.)	Crit W.S. (m.s.n.m.)	Froude #	y (m)	C/1-C	C	Ymix (m)	h (m)	r (m)
C1	-170.69*	PF 1	13.77	643.42	643.81	644.15	2.59	0.39	0.05844827	0.05522071	0.41405742	2.3	1.88594258
C1	-180.20*	PF 1	13.77	642.68	643.01	643.41	3.31	0.33	0.10914303	0.09840302	0.36959605	2.3	1.93040395
C1	-189.72*	PF 1	13.77	641.94	642.24	642.67	3.78	0.3	0.13629674	0.11994819	0.34586518	2.3	1.95413482
C1	-199.23*	PF 1	13.77	641.2	641.49	641.93	4.09	0.29	0.15315417	0.13281327	0.34041949	2.3	1.95958051
C1	-208.74*	PF 1	13.77	640.46	640.74	641.19	4.31	0.28	0.16477925	0.14146822	0.33279857	2.3	1.96720143
C1	-218.26*	PF 1	13.77	639.72	639.99	640.45	4.45	0.27	0.17206104	0.14680211	0.3234266	2.3	1.9765734
C1	-227.77*	PF 1	13.77	638.98	639.25	639.71	4.55	0.27	0.17721456	0.15053718	0.32521784	2.3	1.97478216
C1	-237.28*	PF 1	13.77	638.24	638.5	638.97	4.61	0.26	0.18028921	0.15275003	0.31420644	2.3	1.98579356
C1	-246.8	PF 1	13.77	637.5	637.76	638.23	4.66	0.26	0.18284201	0.15457855	0.31506731	2.3	1.98493269
C1	-256.75*	PF 1	13.77	636.99	637.27	637.72	4.41	0.28	0.16998882	0.14529098	0.33466139	2.3	1.96533861
C1	-266.71*	PF 1	13.77	636.49	636.77	637.22	4.24	0.28	0.16110618	0.13875232	0.33149168	2.3	1.96850832
C1	-276.67*	PF 1	13.77	635.98	636.27	636.71	4.13	0.29	0.15528619	0.13441361	0.34119741	2.3	1.95880259
C1	-286.63*	PF 1	13.77	635.47	635.76	636.2	4.06	0.29	0.15154933	0.13160472	0.33983518	2.3	1.96016482
C1	-296.59*	PF 1	13.77	634.97	635.26	635.7	4.01	0.29	0.14886302	0.12957421	0.33885955	2.3	1.96114045
C1	-306.55*	PF 1	13.77	634.46	634.75	635.19	3.98	0.29	0.14724402	0.12834586	0.33827302	2.3	1.96172698

C1	-316.51*	PF 1	13.77	633.95	634.25	634.68	3.96	0.3	0.14616155	0.12752265	0.34953257	2.3	1.95046743
C1	-326.47*	PF 1	13.77	633.45	633.74	634.18	3.94	0.29	0.14507653	0.12669593	0.33748953	2.3	1.96251047
C1	-336.43	PF 1	13.77	632.94	633.23	633.67	3.94	0.29	0.14507653	0.12669593	0.33748953	2.3	1.96251047
C1	-345.65*	PF 1	13.77	632.85	633.17	633.58	3.48	0.32	0.119251	0.10654536	0.36227281	2.3	1.93772719
C1	-354.87*	PF 1	13.77	632.76	633.1	633.49	3.14	0.34	0.098586	0.08973899	0.37655164	2.3	1.92344836
C1	-364.09*	PF 1	13.77	632.67	633.03	633.4	2.87	0.36	0.08045993	0.07446822	0.39113462	2.3	1.90886538
C1	-373.31*	PF 1	13.77	632.58	632.96	633.31	2.66	0.38	0.06442981	0.06052988	0.40597075	2.3	1.89402925
C1	-382.53*	PF 1	13.77	632.49	632.89	633.22	2.5	0.4	0.05	0.04761905	0.42095455	2.3	1.87904545
C1	-391.75	PF 1	13.77	632.4	632.81	633.13	2.36	0.41	0.03375204	0.03265003	0.42429064	2.3	1.87570936

Tabla 7.- Elevación de la lámina de agua por efecto de emulsión para el caudal de avenida extrema. Fuente: elaboración propia.

Reach	River Sta	Profile	Q Total (m³/s)	Min Ch El (m.s.n.m.)	W.S. Elev (m.s.n.m.)	Crit W.S. (m.s.n.m.)	Froude #	y (m)	C/1-C	C	Ymix (m)	h (m)	r (m)
C1	-170.69*	PF 1	13.77	643.42	643.81	644.15	2.59	0.39	0.05844827	0.05522071	0.41405742	2.3	1.88594258
C1	-180.20*	PF 1	13.77	642.68	643.01	643.41	3.31	0.33	0.10914303	0.09840302	0.36959605	2.3	1.93040395
C1	-189.72*	PF 1	13.77	641.94	642.24	642.67	3.78	0.3	0.13629674	0.11994819	0.34586518	2.3	1.95413482
C1	-199.23*	PF 1	13.77	641.2	641.49	641.93	4.09	0.29	0.15315417	0.13281327	0.34041949	2.3	1.95958051
C1	-208.74*	PF 1	13.77	640.46	640.74	641.19	4.31	0.28	0.16477925	0.14146822	0.33279857	2.3	1.96720143
C1	-218.26*	PF 1	13.77	639.72	639.99	640.45	4.45	0.27	0.17206104	0.14680211	0.3234266	2.3	1.9765734
C1	-227.77*	PF 1	13.77	638.98	639.25	639.71	4.55	0.27	0.17721456	0.15053718	0.32521784	2.3	1.97478216
C1	-237.28*	PF 1	13.77	638.24	638.5	638.97	4.61	0.26	0.18028921	0.15275003	0.31420644	2.3	1.98579356
C1	-246.8	PF 1	13.77	637.5	637.76	638.23	4.66	0.26	0.18284201	0.15457855	0.31506731	2.3	1.98493269

C1	-256.75*	PF 1	13.77	636.99	637.27	637.72	4.41	0.28	0.16998882	0.14529098	0.33466139	2.3	1.96533861
C1	-266.71*	PF 1	13.77	636.49	636.77	637.22	4.24	0.28	0.16110618	0.13875232	0.33149168	2.3	1.96850832
C1	-276.67*	PF 1	13.77	635.98	636.27	636.71	4.13	0.29	0.15528619	0.13441361	0.34119741	2.3	1.95880259
C1	-286.63*	PF 1	13.77	635.47	635.76	636.2	4.06	0.29	0.15154933	0.13160472	0.33983518	2.3	1.96016482
C1	-296.59*	PF 1	13.77	634.97	635.26	635.7	4.01	0.29	0.14886302	0.12957421	0.33885955	2.3	1.96114045
C1	-306.55*	PF 1	13.77	634.46	634.75	635.19	3.98	0.29	0.14724402	0.12834586	0.33827302	2.3	1.96172698
C1	-316.51*	PF 1	13.77	633.95	634.25	634.68	3.96	0.3	0.14616155	0.12752265	0.34953257	2.3	1.95046743
C1	-326.47*	PF 1	13.77	633.45	633.74	634.18	3.94	0.29	0.14507653	0.12669593	0.33748953	2.3	1.96251047
C1	-336.43	PF 1	13.77	632.94	633.23	633.67	3.94	0.29	0.14507653	0.12669593	0.33748953	2.3	1.96251047
C1	-345.65*	PF 1	13.77	632.85	633.17	633.58	3.48	0.32	0.119251	0.10654536	0.36227281	2.3	1.93772719
C1	-354.87*	PF 1	13.77	632.76	633.1	633.49	3.14	0.34	0.098586	0.08973899	0.37655164	2.3	1.92344836
C1	-364.09*	PF 1	13.77	632.67	633.03	633.4	2.87	0.36	0.08045993	0.07446822	0.39113462	2.3	1.90886538
C1	-373.31*	PF 1	13.77	632.58	632.96	633.31	2.66	0.38	0.06442981	0.06052988	0.40597075	2.3	1.89402925
C1	-382.53*	PF 1	13.77	632.49	632.89	633.22	2.5	0.4	0.05	0.04761905	0.42095455	2.3	1.87904545
C1	-391.75	PF 1	13.77	632.4	632.81	633.13	2.36	0.41	0.03375204	0.03265003	0.42429064	2.3	1.87570936



Apéndice B. Documentación fotográfica



Figura 1.- Paramento de aguas abajo. Fuente: visita realizada a la presa.



Figura 2.- Paramento de aguas abajo. Fuente: visita realizada a la presa.



Figura 3.- Paramento de aguas abajo. Fuente: visita realizada a la presa.

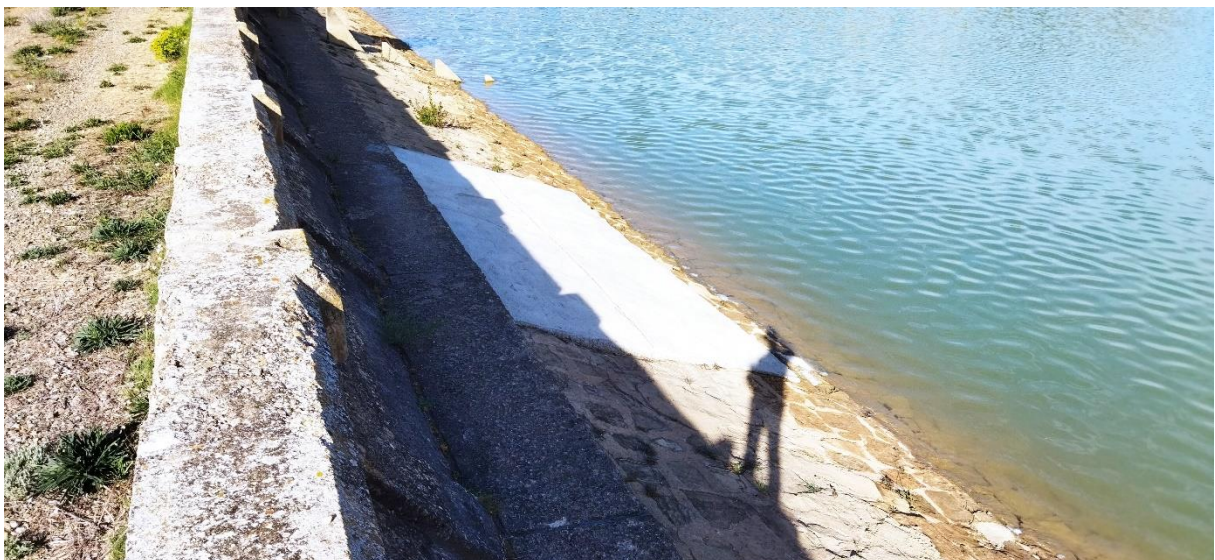


Figura 4.- Paramento de aguas arriba. Fuente: visita realizada a la presa.



Figura 5.- Paramento de aguas arriba. Fuente: visita realizada a la presa.



Figura 6.- Aliviadero. Fuente: visita realizada a la presa.



Figura 7.- Aliviadero. Fuente: visita realizada a la presa.



Figura 8.- Aliviadero. Fuente: visita realizada a la presa.



Figura 9.- Vegetación en canal de descarga del aliviadero después de los tubos. Fuente: visita realizada.



Figura 10.- Tramo con cajeros destruidos canal de descarga del aliviadero. Fuente: visita realizada.



Figura 11.- Antigua casa de administración. Fuente: visita realizada a la presa.



Figura 12.- Antigua casa de administración. Fuente: visita realizada a la presa.



Figura 13.- Coronación. Fuente: visita realizada a la presa.



Figura 14.- Coronación. Fuente: visita realizada a la presa.



Figura 15.- Coronación. Fuente: visita realizada a la presa.



Figura 16.- Coronación. Fuente: visita realizada a la presa.

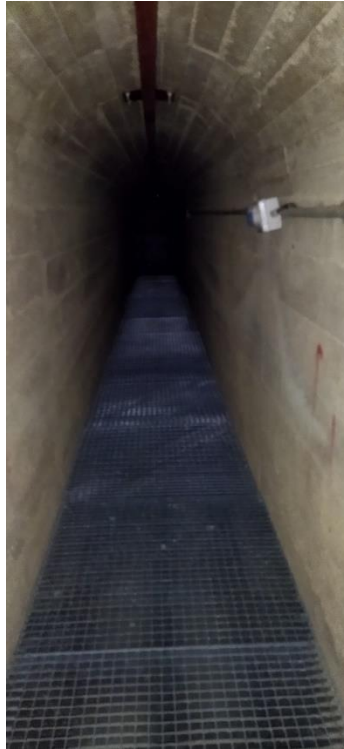


Figura 17.- Galería de acceso a la cámara de válvulas. Fuente: visita realizada a la presa.



Figura 18.- Válvulas de seguridad en la pequeña cámara de compuertas. Fuente: visita realizada.



Figura 19.- Caseta de desagüe de fondo y riegos vista desde coronación. Fuente: visita realizada a la presa.



Figura 20.- Zafareche de rotura de carga. Fuente: visita realizada a la presa.



Figura 21.- Canal de riego. Fuente: visita realizada a la presa.



Figura 22.- Gaviones rotos en el estribo derecha. Fuente: visita realizada a la presa.



Figura 23.- Entrada túnel de trasvase. Fuente: visita realizada a la presa.



Figura 24.- Aliviadero azud de derivación. Fuente: visita realizada a la presa.



Figura 25.- Río Astón. Fuente: visita realizada a la presa.



Figura 26.- Compuertas hacia canal de trasvase. Fuente: visita realizada a la presa.



Figura 27.- Caseta de derivación a la presa. Fuente: visita realizada.



Figura 28.- Cierres de regulación caseta de derivación a la presa. Fuente: visita realizada.



Figura 29.- Exterior e interior del edificio de compuertas de derivación hacia el río Astón. Fuente: visita realizada.



Figura 30.- Exterior e interior del edificio de compuertas de derivación hacia el río Astón. Fuente: visita realizada.



Figura 31.- Instalaciones azud de derivación. Fuente: visita realizada a la presa.



Apéndice C. Presa de Las Navas. Situación Actual. Planos

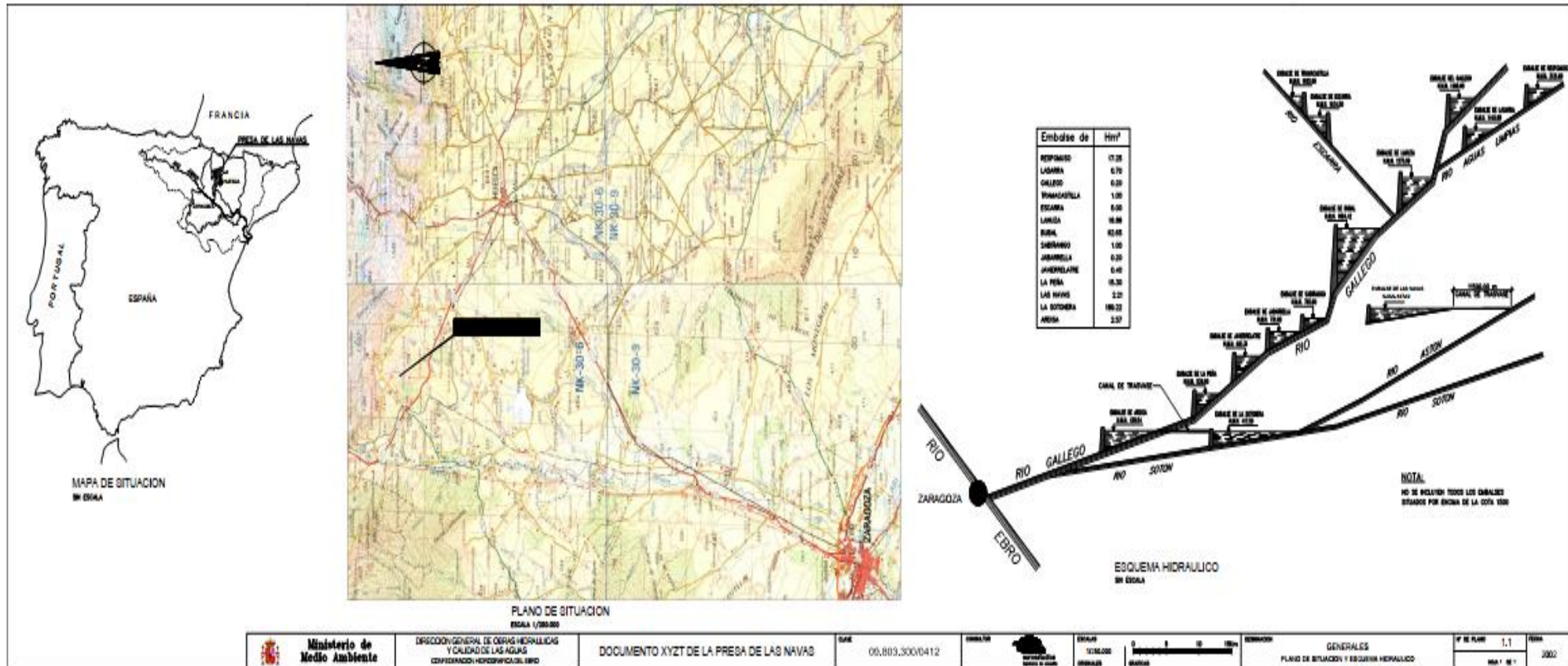


Figura 32.- Plano 1.1. Plano de situación y esquema hidráulico. Fuente: documento XYZT de la presa de Las Navas (2003).

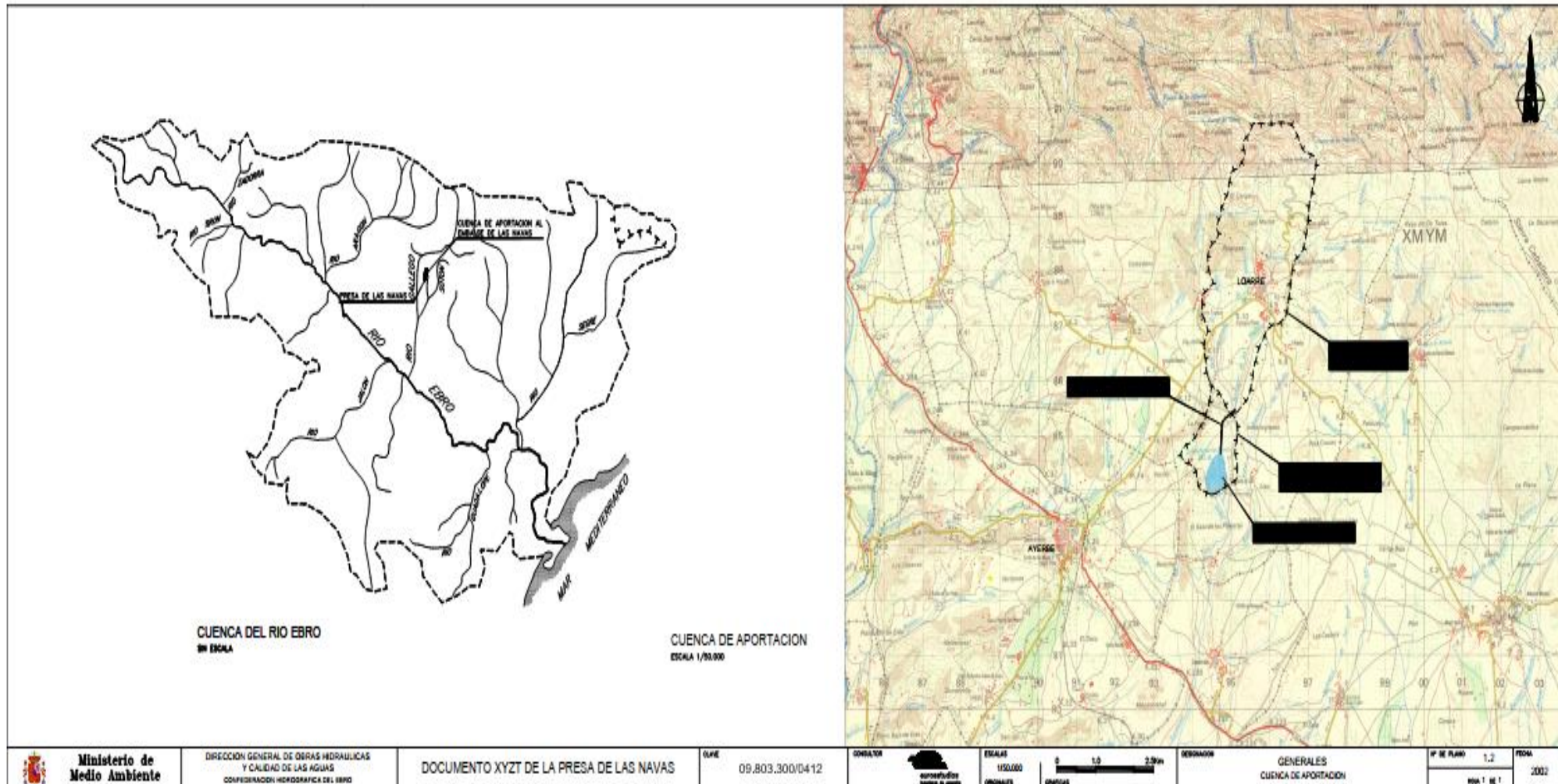


Figura 33.- Plano 1.2. Cuenca de aportación. Fuente: documento XYZT de la presa de Las Navas (2003).

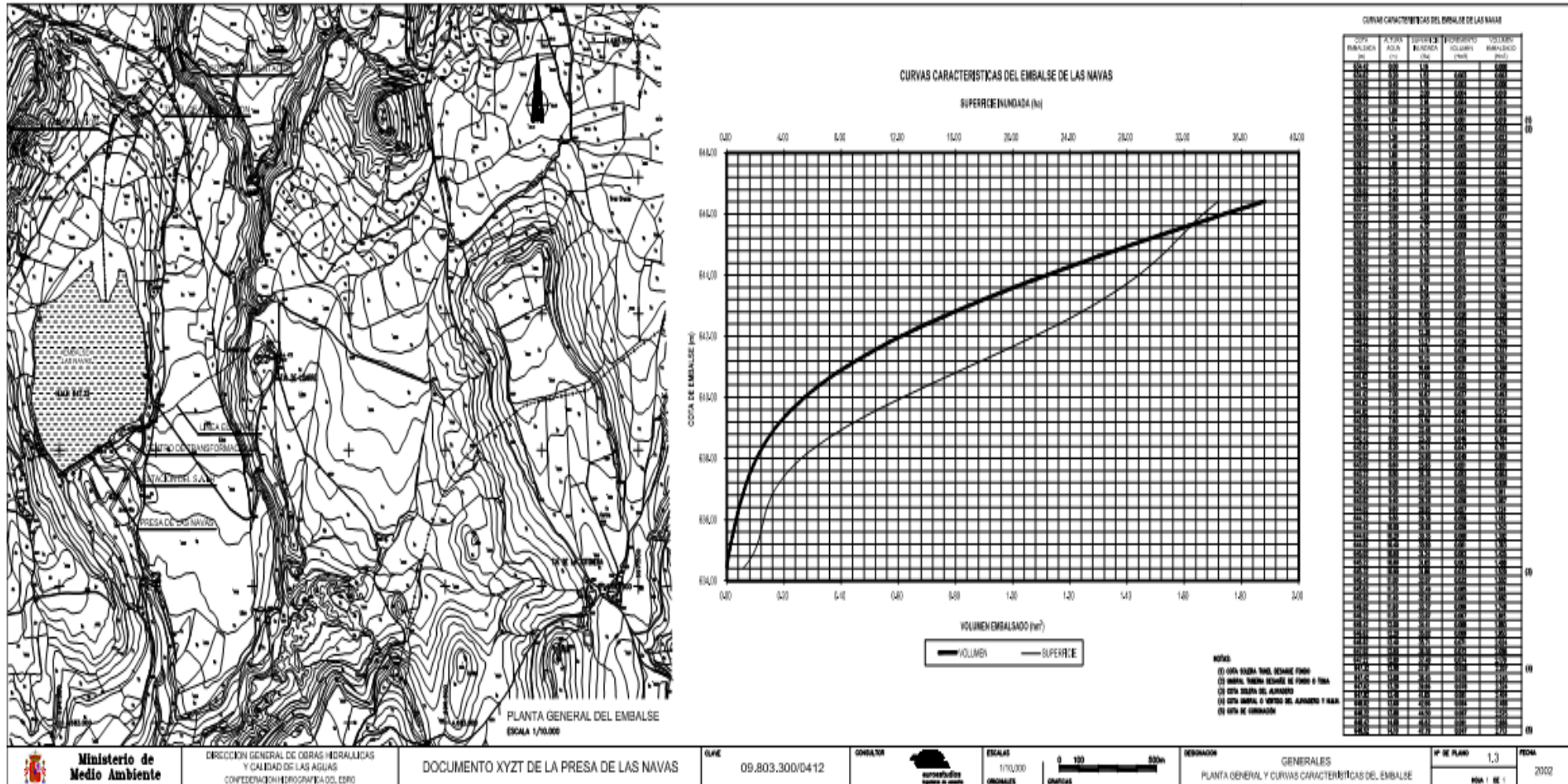


Figura 34.- Plano 1.3. Planta general y curvas características. Fuente: documento XYZT de la presa de Las Navas (2003).

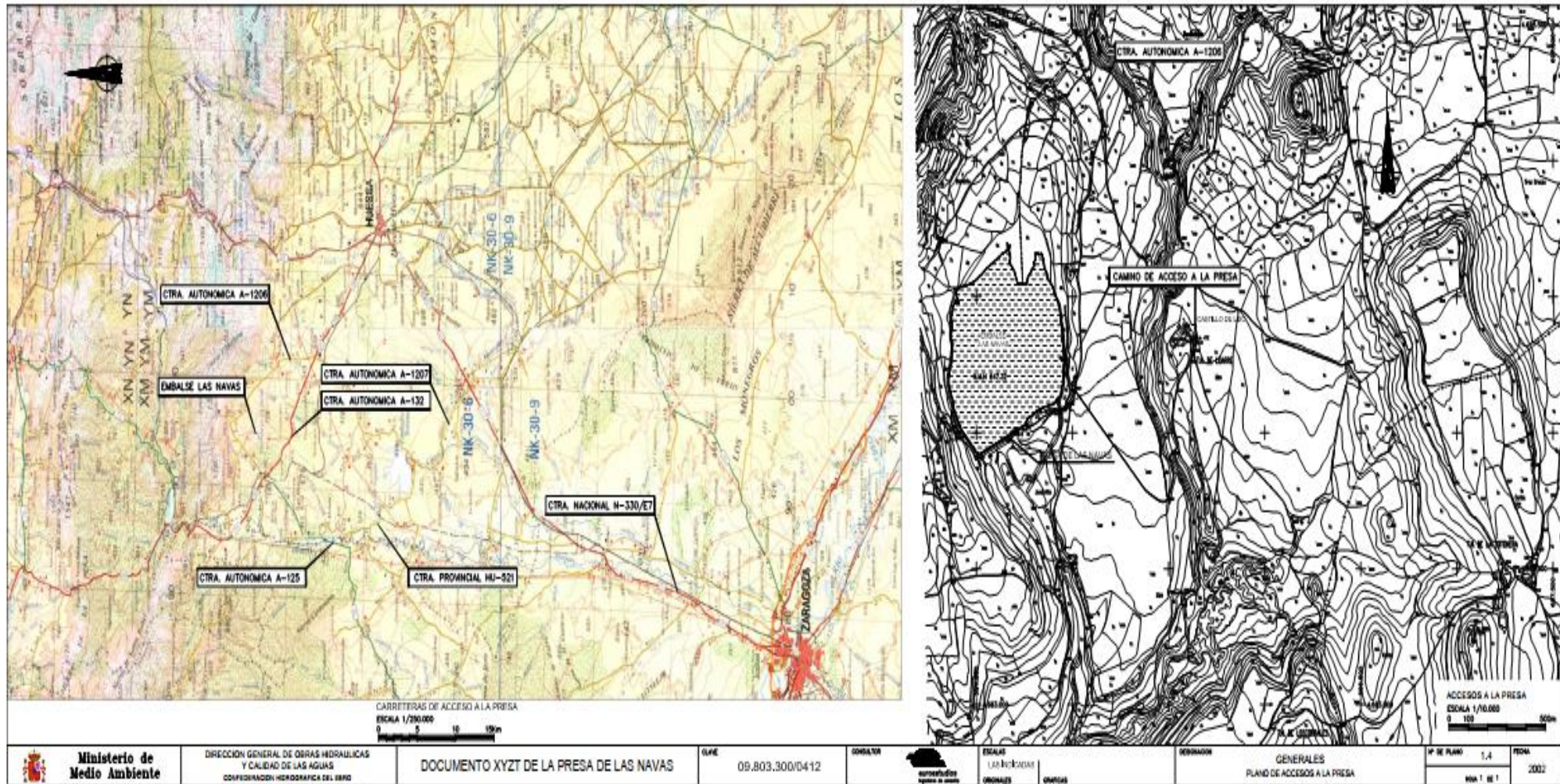


Figura 35.- Plano 1.4. Plano de acceso a la presa. Fuente: documento XYZT de la presa de Las Navas (2003).

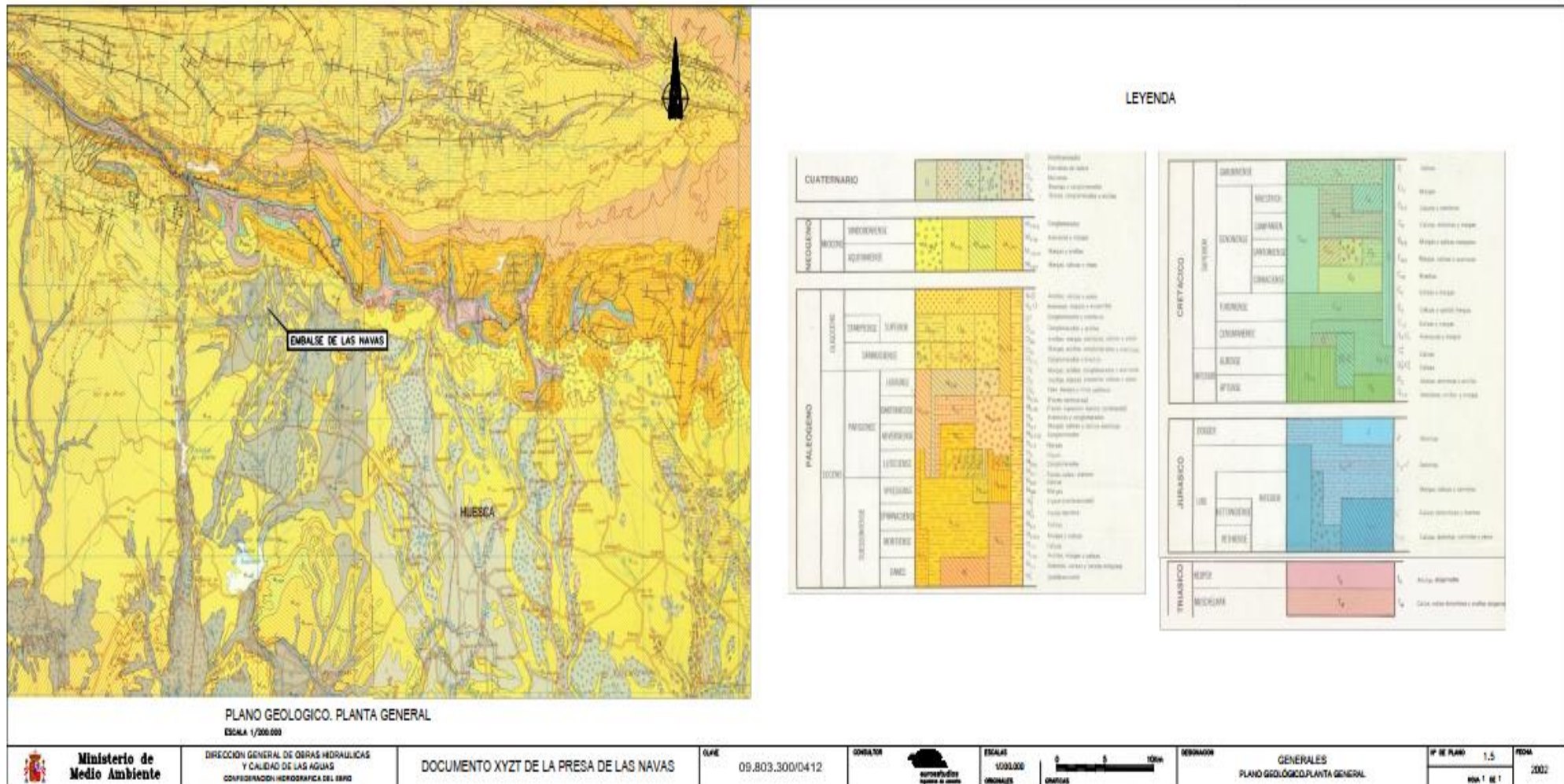


Figura 36.- Plano 1.5. Plano geológico. Plano general. Fuente: documento XYZT de la presa de Las Navas (2003).

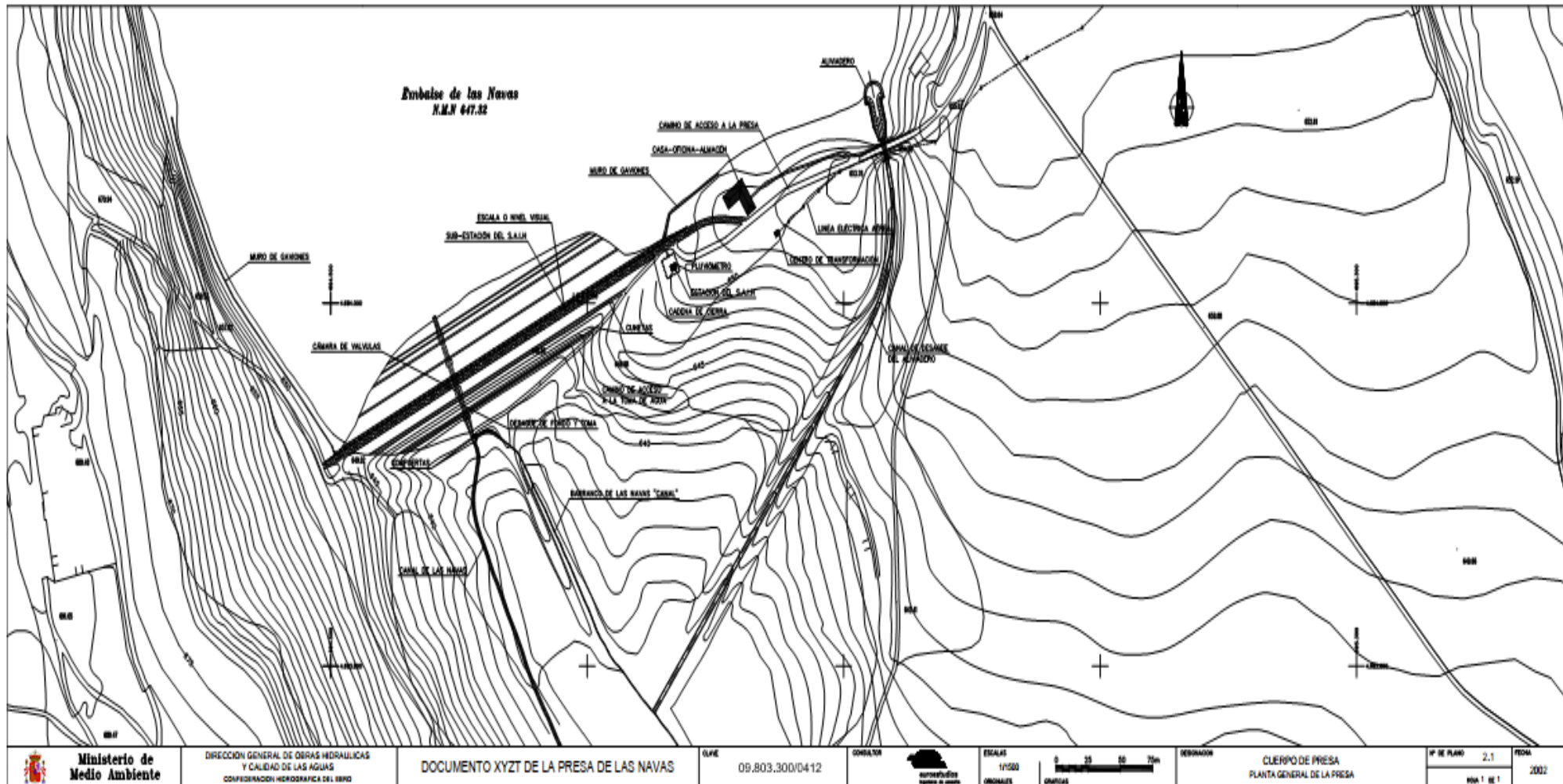


Figura 37.- Plano 2.1. Planta general de la presa. Fuente: documento XYZT de la presa de Las Navas (2003).

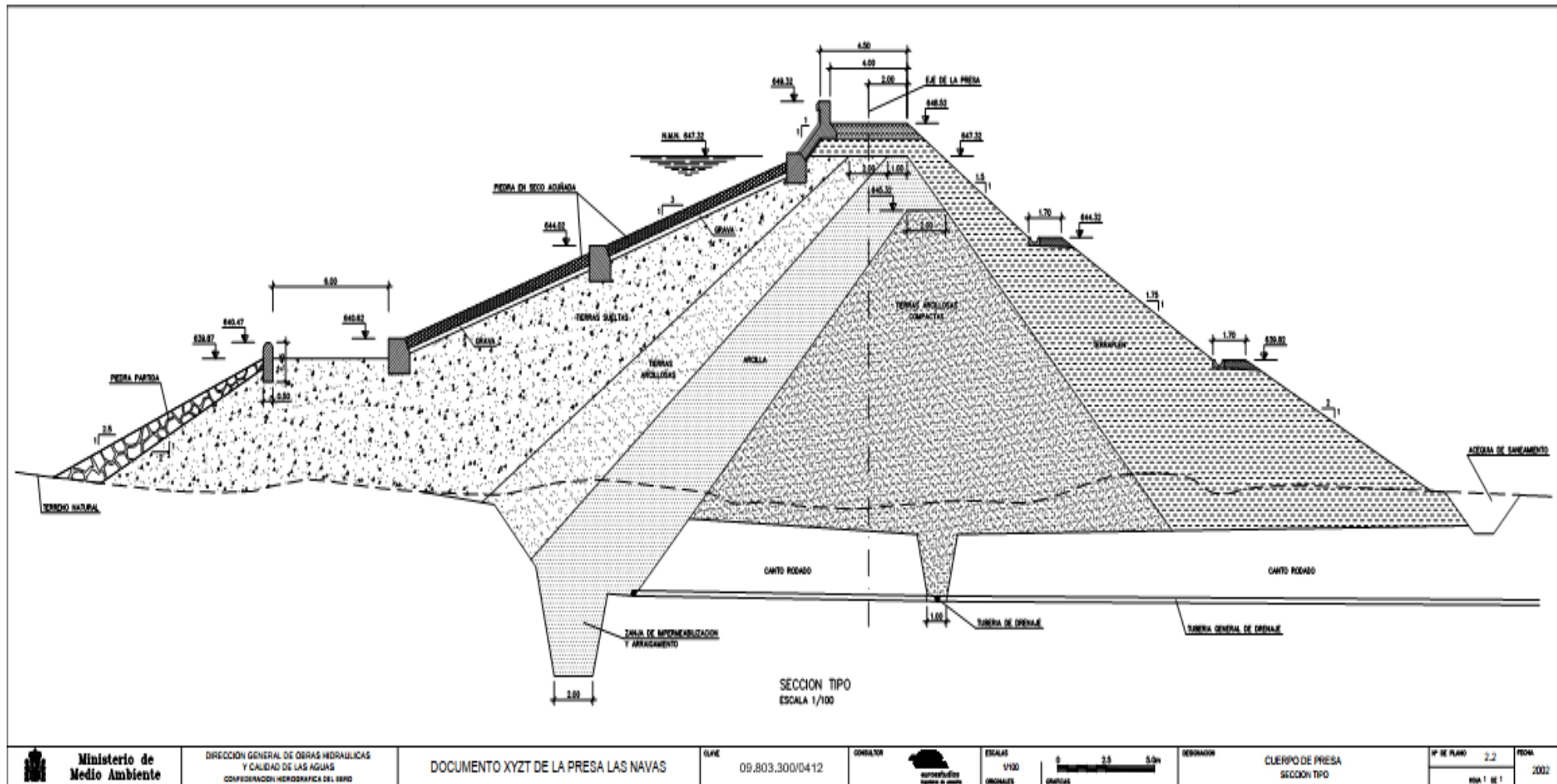


Figura 38.- Plano 2.2. Sección tipo. Fuente: documento XYZT de la presa de Las Navas (2003).

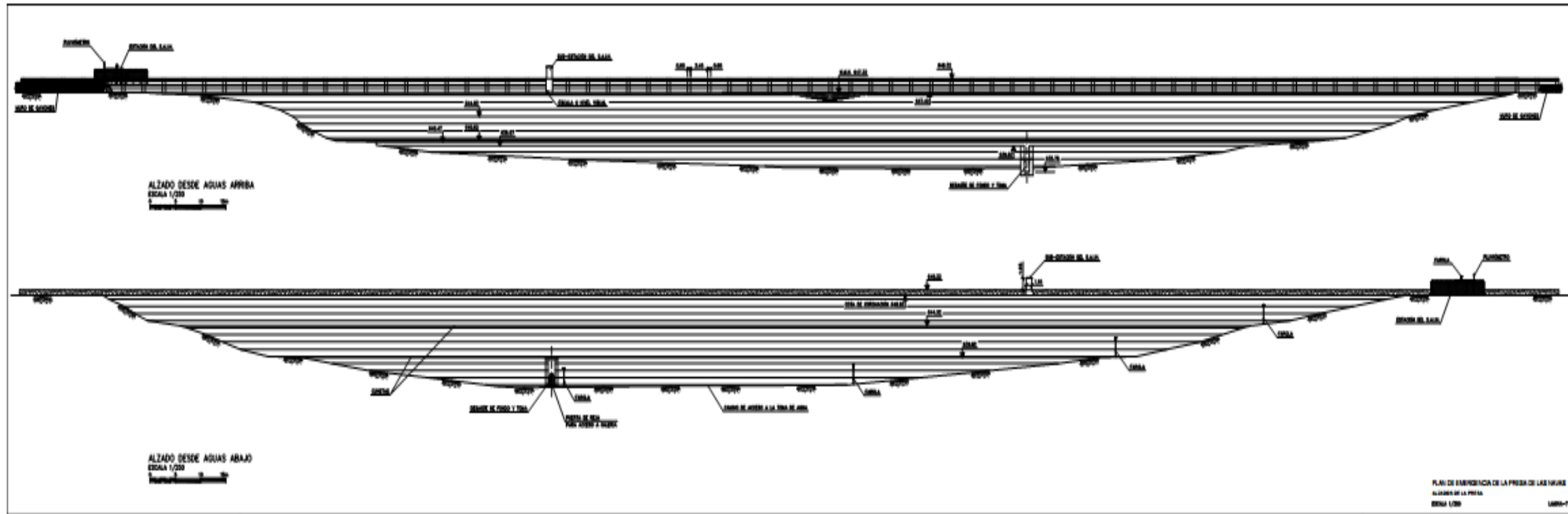


Figura 39.- Plano 2.3. Alzados de la presa. Fuente: documento XYZT de la presa de Las Navas (2003).

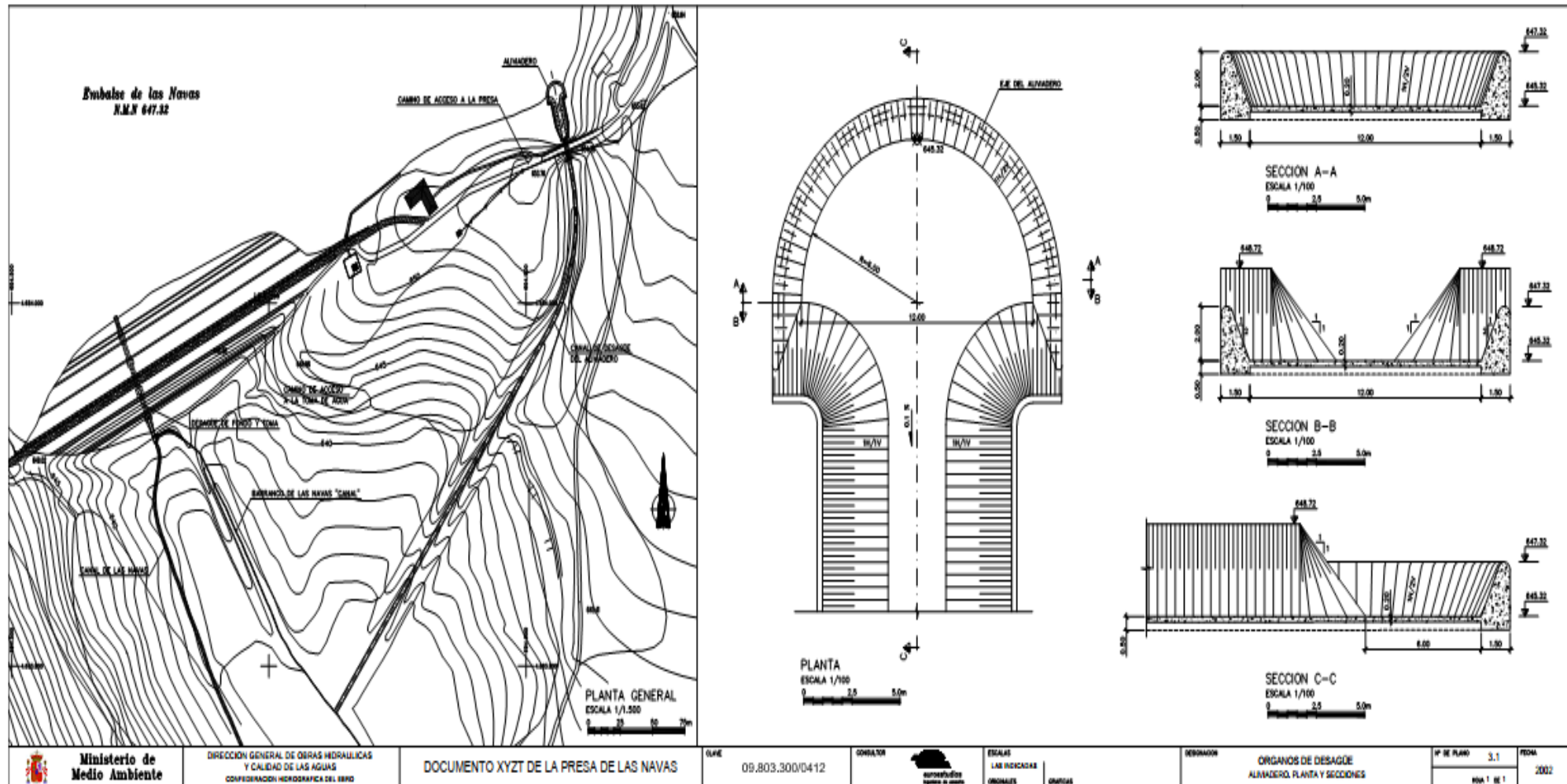


Figura 40.- Plano 3.1. Aliviadero. Planta y secciones. Fuente: documento XYTZ de la presa de Las Navas (2003).

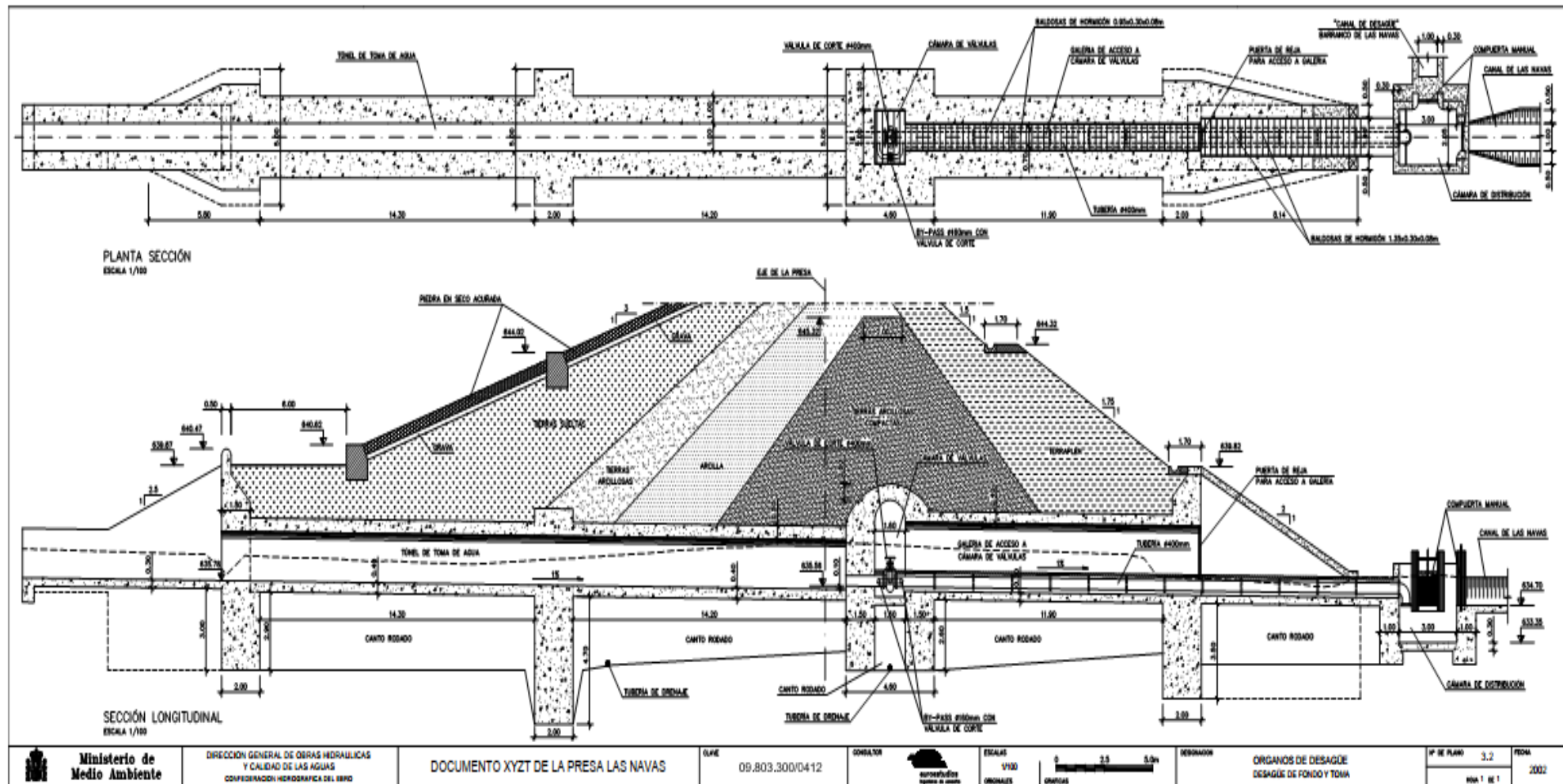


Figura 41.- Plano 3.2. Desagüe de fondo y toma. Fuente: documento XYZT de la presa de Las Navas (2003).

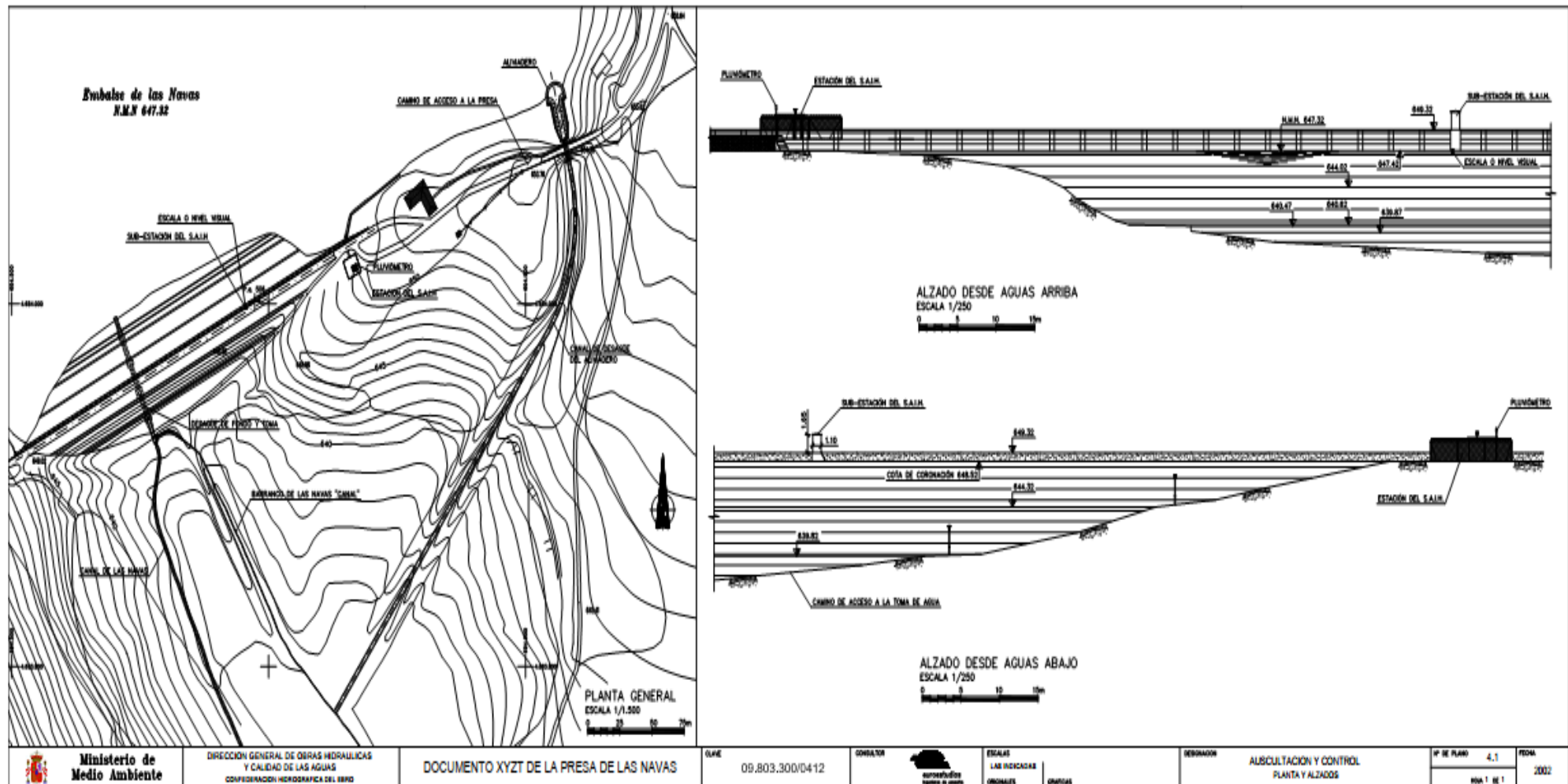


Figura 42.- Plano 4.1. Auscultación y control. Planta y alzados. Fuente: documento XYZT de la presa de Las Navas (2003).

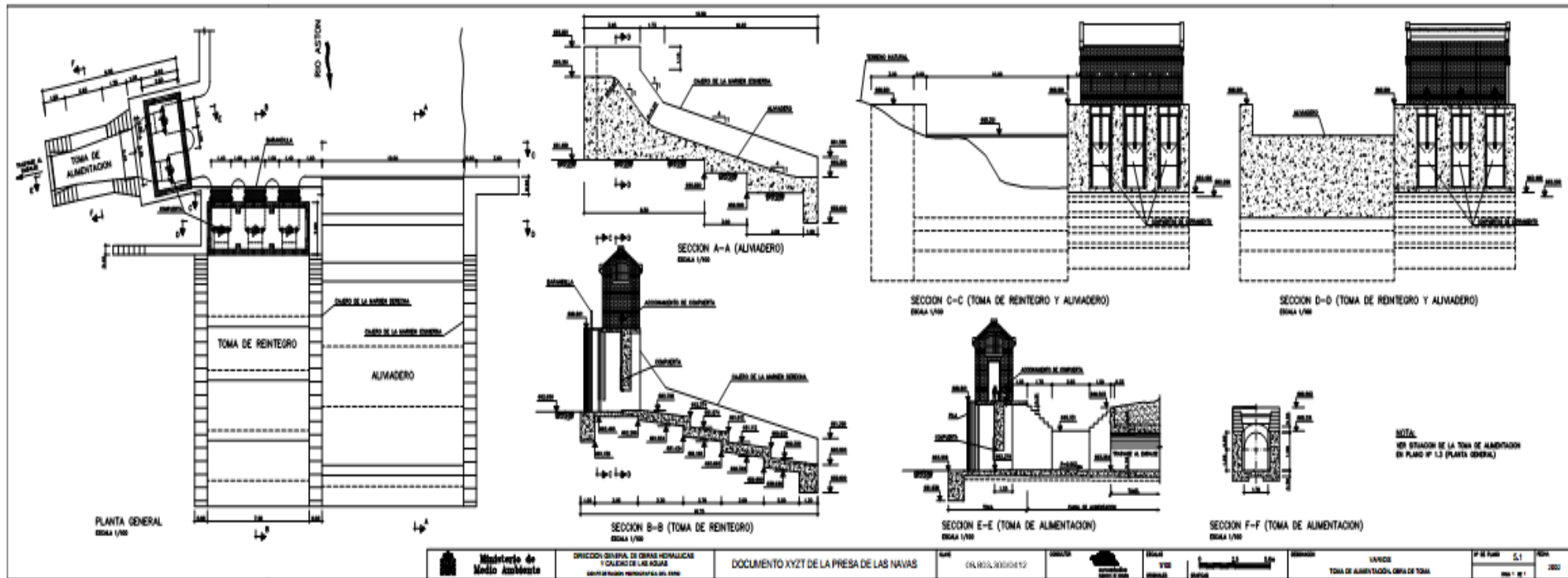


Figura 43.- Plano 5.1. Toma alimentación. Obra de toma. Fuente: documento XYZT de la presa de Las Navas (2003).

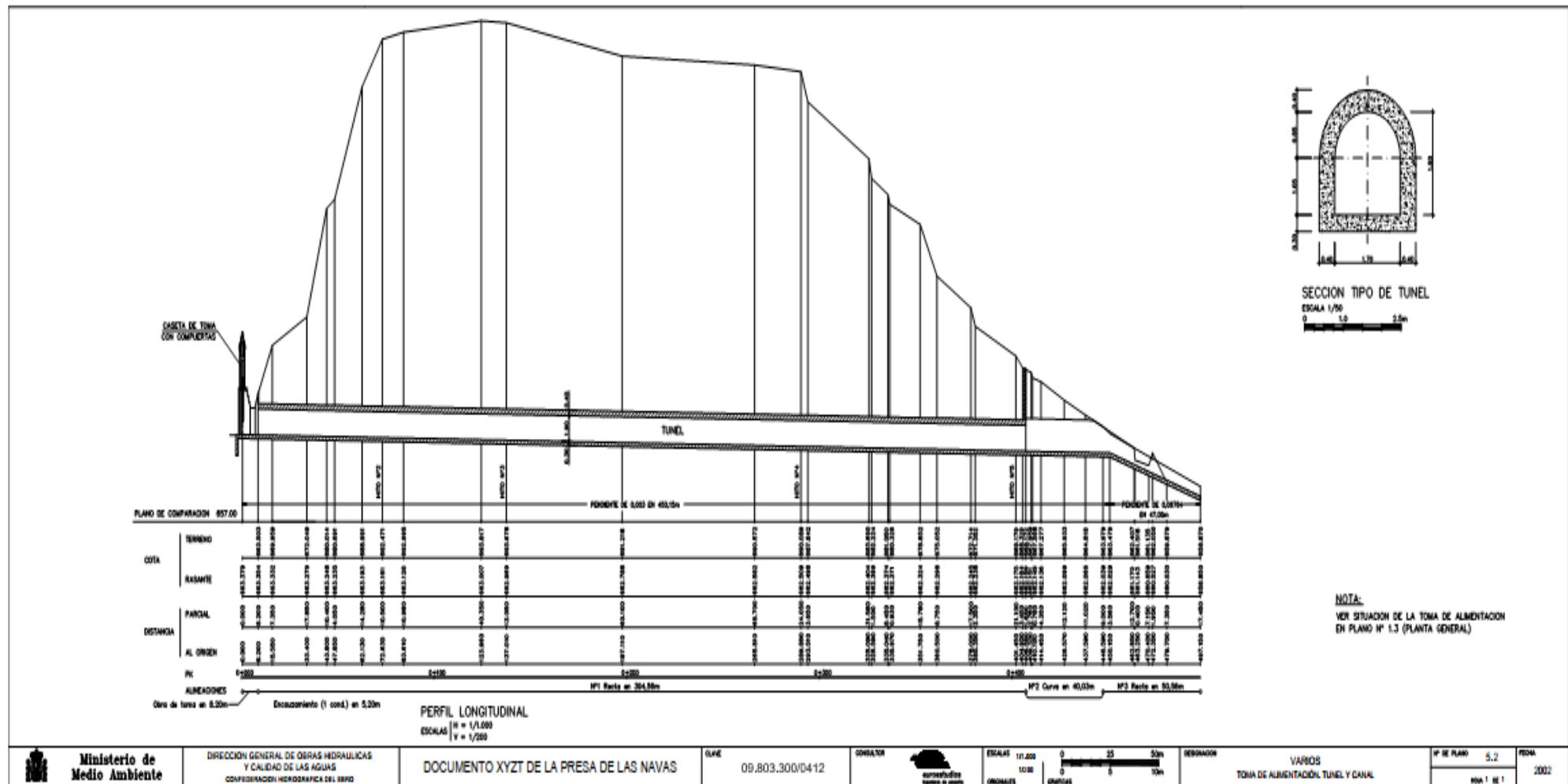


Figura 44.- Plano 5.2. Toma de alimentación. Túnel y canal. Fuente: documento XYZT de la presa de Las Navas (2003).

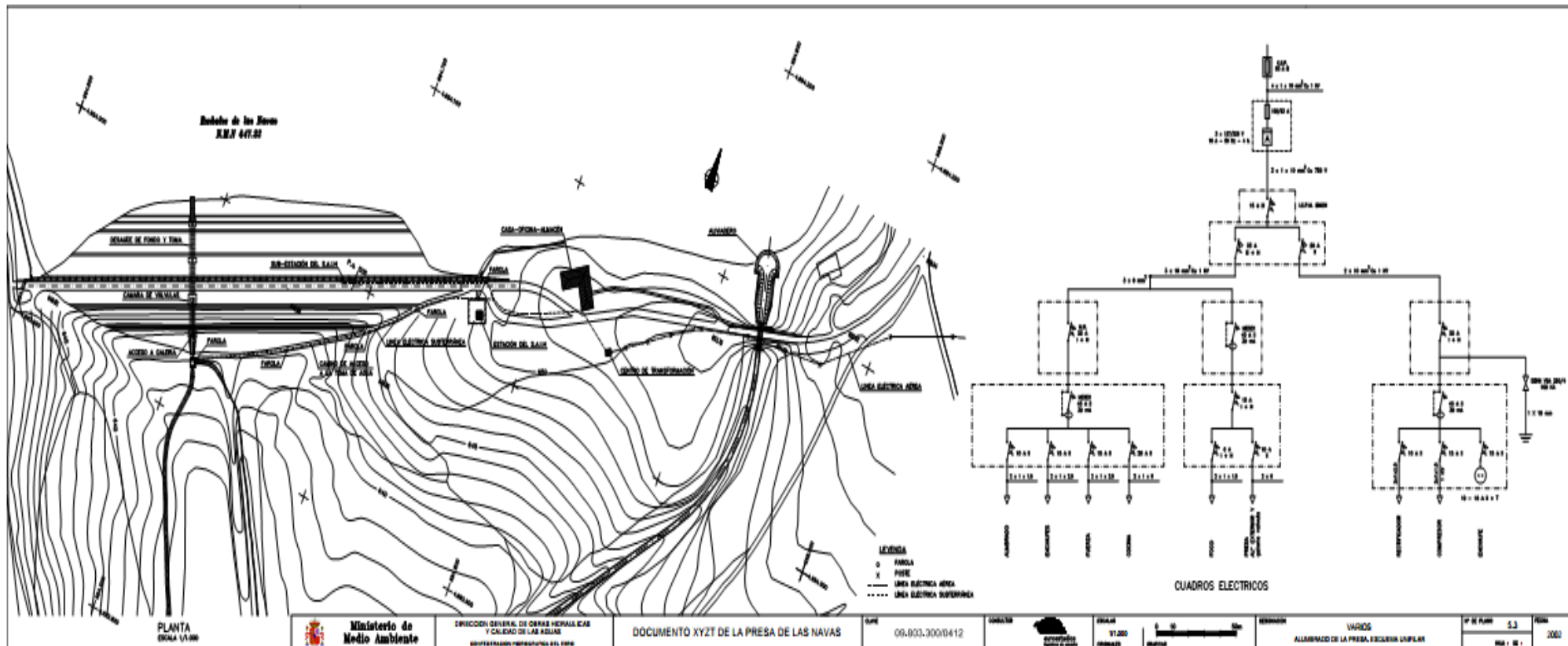


Figura 45.- Plano 5.3. Alumbardo de la presa. Esquema unifilar. Fuente: documento XYZT de la presa de Las Navas (2003).



Apéndice D. Resultados HEC-RAS

Tabla 8.- Resultados caudal de proyecto canal de descarga del aliviadero. Fuente: HEC-RAS.

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
C1	0	PF 1	13.77	644.31	645.35	645.19	645.62	0.001221	2.39	6.29	7.08	0.75
C1	-9.7453*	PF 1	13.77	644.3	645.34	645.18	645.61	0.001234	2.4	6.27	7.08	0.75
C1	-19.490*	PF 1	13.77	644.29	645.33	645.17	645.6	0.001249	2.41	6.25	7.07	0.76
C1	-29.236*	PF 1	13.77	644.28	645.31	645.16	645.59	0.001266	2.42	6.22	7.06	0.76
C1	-38.981*	PF 1	13.77	644.27	645.3	645.15	645.58	0.001284	2.43	6.19	7.05	0.77
C1	-48.726*	PF 1	13.77	644.26	645.28	645.14	645.57	0.001303	2.44	6.16	7.05	0.77
C1	-58.471*	PF 1	13.77	644.25	645.27	645.13	645.55	0.001323	2.45	6.13	7.04	0.78
C1	-68.217*	PF 1	13.77	644.24	645.25	645.12	645.54	0.001346	2.47	6.09	7.03	0.78
C1	-77.962*	PF 1	13.77	644.23	645.24	645.11	645.53	0.001372	2.48	6.05	7.02	0.79
C1	-87.707*	PF 1	13.77	644.22	645.22	645.1	645.52	0.001405	2.5	6.01	7	0.8
C1	-97.453*	PF 1	13.77	644.21	645.2	645.09	645.51	0.001438	2.52	5.96	6.99	0.81
C1	-107.19*	PF 1	13.77	644.2	645.19	645.08	645.49	0.001476	2.54	5.91	6.97	0.82
C1	-116.94*	PF 1	13.77	644.19	645.17	645.07	645.48	0.00153	2.57	5.84	6.95	0.83
C1	-126.68*	PF 1	13.77	644.18	645.15	645.06	645.47	0.001595	2.6	5.76	6.93	0.85
C1	-136.43*	PF 1	13.77	644.17	645.12	645.05	645.45	0.001695	2.65	5.65	6.9	0.87
C1	-146.18	PF 1	13.77	644.16	645.07	645.04	645.44	0.001956	2.77	5.38	6.82	0.93
C1	-146.28*	PF 1	13.77	644.16	645.07	645.04	645.44	0.001946	2.76	5.4	6.83	0.92
C1	-146.38*	PF 1	13.77	644.16	645.07	645.04	645.44	0.001957	2.77	5.39	6.82	0.93
C1	-146.48*	PF 1	13.77	644.16	645.07	645.03	645.43	0.00196	2.77	5.38	6.82	0.93
C1	-146.58*	PF 1	13.77	644.16	645.07	645.03	645.43	0.001952	2.76	5.39	6.83	0.93
C1	-146.68*	PF 1	13.77	644.16	645.07	645.03	645.43	0.001962	2.76	5.38	6.83	0.93
C1	-146.78*	PF 1	13.77	644.16	645.06	645.03	645.43	0.001965	2.76	5.38	6.83	0.93
C1	-146.88*	PF 1	13.77	644.16	645.06	645.03	645.43	0.001957	2.76	5.39	6.83	0.93
C1	-146.98*	PF 1	13.77	644.16	645.06	645.03	645.43	0.001973	2.76	5.38	6.83	0.93



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
C1	-147.08*	PF 1	13.77	644.16	645.06	645.03	645.43	0.00197	2.76	5.38	6.83	0.93
C1	-147.18*	PF 1	13.77	644.16	645.06	645.03	645.43	0.001961	2.75	5.39	6.83	0.93
C1	-147.28*	PF 1	13.77	644.16	645.06	645.02	645.42	0.001979	2.76	5.38	6.83	0.93
C1	-147.38*	PF 1	13.77	644.16	645.06	645.02	645.42	0.001971	2.75	5.38	6.83	0.93
C1	-147.48*	PF 1	13.77	644.16	645.06	645.02	645.42	0.00196	2.75	5.39	6.84	0.93
C1	-147.58*	PF 1	13.77	644.16	645.06	645.02	645.42	0.001978	2.75	5.38	6.83	0.93
C1	-147.68*	PF 1	13.77	644.16	645.05	645.02	645.42	0.00198	2.75	5.38	6.84	0.93
C1	-147.78*	PF 1	13.77	644.16	645.05	645.02	645.42	0.001978	2.75	5.38	6.84	0.93
C1	-147.88*	PF 1	13.77	644.16	645.05	645.02	645.42	0.001982	2.75	5.38	6.84	0.93
C1	-147.98*	PF 1	13.77	644.16	645.05	645.02	645.42	0.001985	2.75	5.38	6.84	0.93
C1	-148.08*	PF 1	13.77	644.16	645.05	645.02	645.41	0.001977	2.74	5.39	6.84	0.93
C1	-148.18*	PF 1	13.77	644.16	645.05	645.02	645.41	0.001991	2.75	5.37	6.84	0.93
C1	-148.28*	PF 1	13.77	644.16	645.05	645.01	645.41	0.001988	2.74	5.38	6.84	0.93
C1	-148.38*	PF 1	13.77	644.16	645.05	645.01	645.41	0.001981	2.74	5.39	6.85	0.93
C1	-148.48*	PF 1	13.77	644.16	645.05	645.01	645.41	0.001992	2.74	5.38	6.84	0.93
C1	-148.58*	PF 1	13.77	644.16	645.04	645.01	645.41	0.00199	2.74	5.38	6.85	0.93
C1	-148.68*	PF 1	13.77	644.16	645.04	645.01	645.41	0.001989	2.74	5.38	6.85	0.93
C1	-148.78*	PF 1	13.77	644.16	645.04	645.01	645.41	0.001998	2.74	5.38	6.85	0.93
C1	-148.88*	PF 1	13.77	644.16	645.04	645.01	645.4	0.001997	2.74	5.38	6.85	0.93
C1	-148.98*	PF 1	13.77	644.16	645.04	645.01	645.4	0.001989	2.73	5.39	6.85	0.93
C1	-149.08*	PF 1	13.77	644.16	645.04	645.01	645.4	0.002001	2.74	5.38	6.85	0.93
C1	-149.18*	PF 1	13.77	644.16	645.04	645	645.4	0.002005	2.74	5.37	6.85	0.93
C1	-149.28*	PF 1	13.77	644.16	645.04	645	645.4	0.001997	2.73	5.38	6.85	0.93
C1	-149.38*	PF 1	13.77	644.16	645.03	645	645.4	0.002015	2.74	5.37	6.85	0.93
C1	-149.48*	PF 1	13.77	644.16	645.03	645	645.4	0.002011	2.73	5.37	6.85	0.93



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
C1	-149.58*	PF 1	13.77	644.16	645.03	645	645.4	0.001999	2.73	5.38	6.86	0.93
C1	-149.68*	PF 1	13.77	644.16	645.03	645	645.4	0.002014	2.73	5.37	6.86	0.93
C1	-149.78*	PF 1	13.77	644.16	645.03	645	645.39	0.002008	2.73	5.38	6.86	0.93
C1	-149.88*	PF 1	13.77	644.16	645.03	645	645.39	0.002006	2.72	5.38	6.86	0.93
C1	-149.98*	PF 1	13.77	644.16	645.03	645	645.39	0.002021	2.73	5.37	6.86	0.93
C1	-150.08*	PF 1	13.77	644.16	645.03	645	645.39	0.00202	2.73	5.37	6.86	0.93
C1	-150.18*	PF 1	13.77	644.16	645.03	644.99	645.39	0.002011	2.72	5.38	6.87	0.93
C1	-150.28*	PF 1	13.77	644.16	645.03	644.99	645.39	0.002021	2.72	5.37	6.86	0.93
C1	-150.38*	PF 1	13.77	644.16	645.02	644.99	645.39	0.002025	2.72	5.37	6.86	0.93
C1	-150.48*	PF 1	13.77	644.16	645.02	644.99	645.39	0.002018	2.72	5.38	6.87	0.93
C1	-150.58*	PF 1	13.77	644.16	645.02	644.99	645.38	0.002024	2.72	5.37	6.87	0.93
C1	-150.68*	PF 1	13.77	644.16	645.02	644.99	645.38	0.002031	2.72	5.37	6.87	0.94
C1	-150.78*	PF 1	13.77	644.16	645.02	644.99	645.38	0.002023	2.71	5.38	6.87	0.93
C1	-150.88*	PF 1	13.77	644.16	645.02	644.99	645.38	0.002034	2.72	5.37	6.87	0.94
C1	-150.98*	PF 1	13.77	644.16	645.02	644.99	645.38	0.002035	2.72	5.37	6.87	0.94
C1	-151.08*	PF 1	13.77	644.16	645.02	644.98	645.38	0.002033	2.71	5.37	6.87	0.94
C1	-151.18*	PF 1	13.77	644.16	645.02	644.98	645.38	0.002037	2.71	5.37	6.87	0.94
C1	-151.28*	PF 1	13.77	644.16	645.02	644.98	645.38	0.002038	2.71	5.37	6.88	0.94
C1	-151.38*	PF 1	13.77	644.16	645.02	644.98	645.38	0.002025	2.7	5.38	6.88	0.93
C1	-151.48*	PF 1	13.77	644.16	645.01	644.98	645.37	0.002044	2.71	5.36	6.88	0.94
C1	-151.58*	PF 1	13.77	644.16	645.01	644.98	645.37	0.002047	2.71	5.36	6.88	0.94
C1	-151.68*	PF 1	13.77	644.16	645.01	644.98	645.37	0.002037	2.7	5.37	6.88	0.94
C1	-151.78*	PF 1	13.77	644.16	645.01	644.98	645.37	0.002048	2.71	5.36	6.88	0.94
C1	-151.88*	PF 1	13.77	644.16	645.01	644.98	645.37	0.002045	2.7	5.37	6.88	0.94
C1	-151.98*	PF 1	13.77	644.16	645.01	644.98	645.37	0.002036	2.7	5.38	6.89	0.93



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
C1	-152.08*	PF 1	13.77	644.16	645.01	644.97	645.37	0.00205	2.7	5.37	6.88	0.94
C1	-152.18*	PF 1	13.77	644.16	645.01	644.97	645.37	0.002054	2.7	5.36	6.89	0.94
C1	-152.28*	PF 1	13.77	644.16	645.01	644.97	645.37	0.002041	2.69	5.38	6.89	0.94
C1	-152.38*	PF 1	13.77	644.16	645	644.97	645.36	0.002055	2.7	5.36	6.89	0.94
C1	-152.48*	PF 1	13.77	644.16	645	644.97	645.36	0.002057	2.7	5.36	6.89	0.94
C1	-152.58*	PF 1	13.77	644.16	645	644.97	645.36	0.002045	2.69	5.38	6.89	0.94
C1	-152.68*	PF 1	13.77	644.16	645	644.97	645.36	0.002059	2.7	5.36	6.89	0.94
C1	-152.78*	PF 1	13.77	644.16	645	644.97	645.36	0.002062	2.69	5.36	6.89	0.94
C1	-152.88*	PF 1	13.77	644.16	645	644.97	645.36	0.00205	2.69	5.37	6.9	0.94
C1	-152.98*	PF 1	13.77	644.16	645	644.97	645.36	0.002069	2.69	5.36	6.9	0.94
C1	-153.08*	PF 1	13.77	644.16	645	644.97	645.36	0.00207	2.69	5.36	6.9	0.94
C1	-153.18*	PF 1	13.77	644.16	644.99	644.96	645.35	0.002098	2.7	5.34	6.9	0.95
C1	-153.28*	PF 1	13.77	644.16	644.99	644.96	645.35	0.002071	2.69	5.36	6.9	0.94
C1	-153.38*	PF 1	13.77	644.16	644.99	644.96	645.35	0.00207	2.69	5.36	6.9	0.94
C1	-153.48*	PF 1	13.77	644.16	644.99	644.96	645.35	0.002061	2.68	5.37	6.9	0.94
C1	-153.58*	PF 1	13.77	644.16	644.99	644.96	645.35	0.002076	2.69	5.36	6.9	0.94
C1	-153.68*	PF 1	13.77	644.16	644.99	644.96	645.35	0.002077	2.68	5.36	6.91	0.94
C1	-153.78*	PF 1	13.77	644.16	644.99	644.96	645.35	0.002071	2.68	5.37	6.91	0.94
C1	-153.88*	PF 1	13.77	644.16	644.99	644.96	645.35	0.002083	2.68	5.36	6.91	0.94
C1	-153.98*	PF 1	13.77	644.16	644.99	644.96	645.35	0.002075	2.68	5.36	6.91	0.94
C1	-154.08*	PF 1	13.77	644.16	644.99	644.96	645.34	0.002069	2.67	5.37	6.91	0.94
C1	-154.18*	PF 1	13.77	644.16	644.99	644.95	645.34	0.002082	2.68	5.36	6.91	0.94
C1	-154.28*	PF 1	13.77	644.16	644.98	644.95	645.34	0.002083	2.68	5.36	6.91	0.94
C1	-154.38*	PF 1	13.77	644.16	644.99	644.95	645.34	0.00207	2.67	5.37	6.92	0.94
C1	-154.48*	PF 1	13.77	644.16	644.98	644.95	645.34	0.002093	2.68	5.35	6.91	0.94



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
C1	-154.58*	PF 1	13.77	644.16	644.98	644.95	645.34	0.002083	2.67	5.36	6.92	0.94
C1	-154.68*	PF 1	13.77	644.16	644.98	644.95	645.34	0.002078	2.67	5.37	6.92	0.94
C1	-154.78*	PF 1	13.77	644.16	644.98	644.95	645.34	0.002086	2.67	5.36	6.92	0.94
C1	-154.88*	PF 1	13.77	644.16	644.98	644.95	645.34	0.002083	2.67	5.37	6.92	0.94
C1	-154.98*	PF 1	13.77	644.16	644.98	644.95	645.33	0.00208	2.66	5.37	6.92	0.94
C1	-155.08*	PF 1	13.77	644.16	644.98	644.95	645.33	0.002091	2.67	5.36	6.92	0.94
C1	-155.18*	PF 1	13.77	644.16	644.98	644.95	645.33	0.002088	2.66	5.36	6.93	0.94
C1	-155.28*	PF 1	13.77	644.16	644.98	644.94	645.33	0.002082	2.66	5.37	6.93	0.94
C1	-155.38*	PF 1	13.77	644.16	644.97	644.94	645.33	0.002097	2.66	5.36	6.93	0.94
C1	-155.48*	PF 1	13.77	644.16	644.97	644.94	645.33	0.002091	2.66	5.36	6.93	0.94
C1	-155.58*	PF 1	13.77	644.16	644.97	644.94	645.33	0.002084	2.65	5.37	6.93	0.94
C1	-155.68*	PF 1	13.77	644.16	644.97	644.94	645.33	0.002101	2.66	5.36	6.93	0.94
C1	-155.78*	PF 1	13.77	644.16	644.97	644.94	645.33	0.002097	2.66	5.36	6.93	0.94
C1	-155.88*	PF 1	13.77	644.16	644.97	644.94	645.32	0.00209	2.65	5.37	6.94	0.94
C1	-155.98*	PF 1	13.77	644.16	644.97	644.94	645.32	0.002104	2.66	5.36	6.93	0.94
C1	-156.08*	PF 1	13.77	644.16	644.97	644.94	645.32	0.002109	2.66	5.36	6.94	0.94
C1	-156.18*	PF 1	13.77	644.16	644.97	644.94	645.32	0.002101	2.65	5.36	6.94	0.94
C1	-156.28*	PF 1	13.77	644.16	644.96	644.94	645.32	0.002115	2.65	5.35	6.94	0.94
C1	-156.38*	PF 1	13.77	644.16	644.96	644.93	645.32	0.002115	2.65	5.35	6.94	0.94
C1	-156.48*	PF 1	13.77	644.16	644.96	644.93	645.32	0.002109	2.65	5.36	6.94	0.94
C1	-156.58*	PF 1	13.77	644.16	644.96	644.93	645.32	0.002115	2.65	5.35	6.94	0.94
C1	-156.68*	PF 1	13.77	644.16	644.96	644.93	645.31	0.002121	2.65	5.35	6.94	0.94
C1	-156.78*	PF 1	13.77	644.16	644.96	644.93	645.31	0.002109	2.64	5.36	6.95	0.94
C1	-156.88*	PF 1	13.77	644.16	644.96	644.93	645.31	0.002121	2.65	5.35	6.95	0.94
C1	-156.98*	PF 1	13.77	644.16	644.96	644.93	645.31	0.002125	2.65	5.35	6.95	0.95



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
C1	-157.08*	PF 1	13.77	644.16	644.96	644.93	645.31	0.002118	2.64	5.36	6.95	0.94
C1	-157.18*	PF 1	13.77	644.16	644.96	644.93	645.31	0.002129	2.64	5.35	6.95	0.95
C1	-157.28*	PF 1	13.77	644.16	644.96	644.93	645.31	0.00213	2.64	5.35	6.95	0.95
C1	-157.38*	PF 1	13.77	644.16	644.96	644.93	645.31	0.002117	2.64	5.36	6.95	0.94
C1	-157.48*	PF 1	13.77	644.16	644.95	644.92	645.31	0.002135	2.64	5.34	6.95	0.95
C1	-157.58*	PF 1	13.77	644.16	644.95	644.92	645.3	0.002129	2.64	5.35	6.96	0.95
C1	-157.68*	PF 1	13.77	644.16	644.95	644.92	645.3	0.002116	2.63	5.36	6.96	0.94
C1	-157.78*	PF 1	13.77	644.16	644.95	644.92	645.3	0.002137	2.64	5.34	6.96	0.95
C1	-157.88*	PF 1	13.77	644.16	644.95	644.92	645.3	0.002136	2.63	5.35	6.96	0.95
C1	-157.98*	PF 1	13.77	644.16	644.95	644.92	645.3	0.002131	2.63	5.35	6.96	0.94
C1	-158.08*	PF 1	13.77	644.16	644.95	644.92	645.3	0.002144	2.63	5.34	6.96	0.95
C1	-158.18*	PF 1	13.77	644.16	644.95	644.92	645.3	0.002142	2.63	5.34	6.96	0.95
C1	-158.28*	PF 1	13.77	644.16	644.95	644.92	645.3	0.002132	2.63	5.35	6.97	0.94
C1	-158.38*	PF 1	13.77	644.16	644.94	644.92	645.3	0.002146	2.63	5.34	6.96	0.95
C1	-158.48*	PF 1	13.77	644.16	644.94	644.91	645.29	0.002148	2.63	5.34	6.97	0.95
C1	-158.58*	PF 1	13.77	644.16	644.94	644.91	645.29	0.002138	2.62	5.35	6.97	0.95
C1	-158.68*	PF 1	13.77	644.16	644.94	644.91	645.29	0.002152	2.63	5.34	6.97	0.95
C1	-158.78*	PF 1	13.77	644.16	644.94	644.91	645.29	0.00215	2.62	5.34	6.97	0.95
C1	-158.88*	PF 1	13.77	644.16	644.94	644.91	645.29	0.002147	2.62	5.34	6.97	0.95
C1	-158.98*	PF 1	13.77	644.16	644.94	644.91	645.29	0.002165	2.63	5.33	6.97	0.95
C1	-159.08*	PF 1	13.77	644.16	644.94	644.91	645.29	0.002158	2.62	5.33	6.97	0.95
C1	-159.18*	PF 1	13.77	644.16	644.94	644.91	645.29	0.002146	2.62	5.34	6.98	0.95
C1	-159.28*	PF 1	13.77	644.16	644.94	644.91	645.28	0.002165	2.62	5.33	6.98	0.95
C1	-159.38*	PF 1	13.77	644.16	644.94	644.91	645.28	0.002162	2.62	5.33	6.98	0.95
C1	-159.48*	PF 1	13.77	644.16	644.94	644.91	645.28	0.00215	2.61	5.34	6.98	0.95



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
C1	-159.58*	PF 1	13.77	644.16	644.93	644.91	645.28	0.002167	2.62	5.33	6.98	0.95
C1	-159.68*	PF 1	13.77	644.16	644.93	644.9	645.28	0.002171	2.62	5.32	6.98	0.95
C1	-159.78*	PF 1	13.77	644.16	644.93	644.9	645.28	0.002156	2.61	5.34	6.98	0.95
C1	-159.88*	PF 1	13.77	644.16	644.93	644.9	645.28	0.002173	2.61	5.32	6.98	0.95
C1	-159.98*	PF 1	13.77	644.16	644.93	644.9	645.28	0.002174	2.61	5.32	6.99	0.95
C1	-160.08*	PF 1	13.77	644.16	644.93	644.9	645.28	0.002165	2.61	5.33	6.99	0.95
C1	-160.18*	PF 1	13.77	644.16	644.93	644.9	645.27	0.002184	2.61	5.31	6.99	0.95
C1	-160.28*	PF 1	13.77	644.16	644.93	644.9	645.27	0.002187	2.61	5.31	6.99	0.95
C1	-160.38*	PF 1	13.77	644.16	644.93	644.9	645.27	0.002177	2.6	5.32	6.99	0.95
C1	-160.48*	PF 1	13.77	644.16	644.92	644.9	645.27	0.002185	2.61	5.31	6.99	0.95
C1	-160.58*	PF 1	13.77	644.16	644.92	644.9	645.27	0.002174	2.6	5.32	6.99	0.95
C1	-160.68*	PF 1	13.77	644.16	644.92	644.89	645.27	0.002159	2.59	5.33	7	0.95
C1	-160.78*	PF 1	13.77	644.16	644.93	644.89	645.27	0.002146	2.59	5.34	7	0.94
C1	-160.88*	PF 1	13.77	644.16	644.93	644.89	645.27	0.00213	2.58	5.35	7	0.94
C1	-160.98*	PF 1	13.77	644.16	644.93	644.89	645.26	0.002115	2.57	5.37	7	0.94
C1	-161.08*	PF 1	13.77	644.16	644.93	644.89	645.26	0.002101	2.56	5.38	7	0.93
C1	-161.18	PF 1	13.77	644.16	644.89	644.89	645.26	0.002476	2.69	5.12	7	1.01
C1	-170.69*	PF 1	13.77	643.42	643.81	644.15	645.11	0.02032	5.06	2.72	7	2.59
C1	-180.20*	PF 1	13.77	642.68	643.01	643.41	644.82	0.034919	5.95	2.31	7	3.31
C1	-189.72*	PF 1	13.77	641.94	642.24	642.67	644.4	0.046936	6.51	2.12	7	3.78
C1	-199.23*	PF 1	13.77	641.2	641.49	641.93	643.89	0.056116	6.86	2.01	7	4.09
C1	-208.74*	PF 1	13.77	640.46	640.74	641.19	643.31	0.062753	7.1	1.94	7	4.31
C1	-218.26*	PF 1	13.77	639.72	639.99	640.45	642.68	0.067526	7.26	1.9	7	4.45
C1	-227.77*	PF 1	13.77	638.98	639.25	639.71	642.01	0.070906	7.36	1.87	7	4.55
C1	-237.28*	PF 1	13.77	638.24	638.5	638.97	641.32	0.073123	7.43	1.85	7	4.61



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
C1	-246.8	PF 1	13.77	637.5	637.76	638.23	640.62	0.074792	7.48	1.84	7	4.66
C1	-256.75*	PF 1	13.77	636.99	637.27	637.72	639.92	0.066184	7.21	1.91	7	4.41
C1	-266.71*	PF 1	13.77	636.49	636.77	637.22	639.29	0.060772	7.03	1.96	7	4.24
C1	-276.67*	PF 1	13.77	635.98	636.27	636.71	638.7	0.057298	6.91	1.99	7	4.13
C1	-286.63*	PF 1	13.77	635.47	635.76	636.2	638.14	0.055061	6.83	2.02	7	4.06
C1	-296.59*	PF 1	13.77	634.97	635.26	635.7	637.6	0.053617	6.77	2.03	7	4.01
C1	-306.55*	PF 1	13.77	634.46	634.75	635.19	637.07	0.052711	6.74	2.04	7	3.98
C1	-316.51*	PF 1	13.77	633.95	634.25	634.68	636.54	0.052089	6.71	2.05	7	3.96
C1	-326.47*	PF 1	13.77	633.45	633.74	634.18	636.03	0.051651	6.7	2.06	7	3.94
C1	-336.43	PF 1	13.77	632.94	633.23	633.67	635.52	0.051477	6.69	2.06	7	3.94
C1	-345.65*	PF 1	13.77	632.85	633.17	633.58	635.11	0.039157	6.16	2.23	7	3.48
C1	-354.87*	PF 1	13.77	632.76	633.1	633.49	634.79	0.031032	5.75	2.4	7	3.14
C1	-364.09*	PF 1	13.77	632.67	633.03	633.4	634.53	0.025467	5.42	2.54	7	2.87
C1	-373.31*	PF 1	13.77	632.58	632.96	633.31	634.31	0.021519	5.15	2.67	7	2.66
C1	-382.53*	PF 1	13.77	632.49	632.89	633.22	634.13	0.018663	4.93	2.79	7	2.5
C1	-391.75	PF 1	13.77	632.4	632.81	633.13	633.97	0.016547	4.76	2.89	7	2.36

Tabla 9.- Resultados caudal de avenida extrema canal de descarga del aliviadero. Fuente: HEC-RAS.

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
C1	0	PF 2	71.51	644.31	646.92	646.74	647.73	0.001183	4.35	19.86	10.22	0.86
C1	-9.7453*	PF 2	71.51	644.3	646.91	646.73	647.72	0.001188	4.35	19.83	10.21	0.86
C1	-19.490*	PF 2	71.51	644.29	646.89	646.72	647.71	0.001193	4.36	19.8	10.21	0.86
C1	-29.236*	PF 2	71.51	644.28	646.88	646.71	647.7	0.001199	4.36	19.76	10.2	0.86
C1	-38.981*	PF 2	71.51	644.27	646.87	646.7	647.69	0.001204	4.37	19.73	10.19	0.87
C1	-48.726*	PF 2	71.51	644.26	646.85	646.69	647.68	0.00121	4.38	19.7	10.19	0.87
C1	-58.471*	PF 2	71.51	644.25	646.84	646.68	647.67	0.001215	4.38	19.67	10.18	0.87
C1	-68.217*	PF 2	71.51	644.24	646.83	646.67	647.66	0.001221	4.39	19.63	10.17	0.87
C1	-77.962*	PF 2	71.51	644.23	646.81	646.66	647.65	0.001228	4.4	19.6	10.17	0.87
C1	-87.707*	PF 2	71.51	644.22	646.8	646.65	647.64	0.001235	4.41	19.56	10.16	0.88
C1	-97.453*	PF 2	71.51	644.21	646.79	646.64	647.63	0.001241	4.41	19.52	10.15	0.88
C1	-107.19*	PF 2	71.51	644.2	646.77	646.63	647.62	0.001249	4.42	19.48	10.14	0.88
C1	-116.94*	PF 2	71.51	644.19	646.76	646.62	647.61	0.001256	4.43	19.44	10.14	0.88
C1	-126.68*	PF 2	71.51	644.18	646.74	646.61	647.6	0.001264	4.44	19.39	10.13	0.89
C1	-136.43*	PF 2	71.51	644.17	646.73	646.6	647.58	0.001272	4.45	19.35	10.12	0.89
C1	-146.18	PF 2	71.51	644.16	646.71	646.59	647.57	0.001281	4.46	19.3	10.11	0.89
C1	-146.28*	PF 2	71.51	644.16	646.71	646.59	647.57	0.001281	4.46	19.29	10.09	0.89
C1	-146.38*	PF 2	71.51	644.16	646.71	646.59	647.57	0.001282	4.46	19.28	10.08	0.89
C1	-146.48*	PF 2	71.51	644.16	646.71	646.59	647.57	0.001284	4.46	19.25	10.06	0.89
C1	-146.58*	PF 2	71.51	644.16	646.71	646.59	647.57	0.001284	4.46	19.24	10.04	0.89
C1	-146.68*	PF 2	71.51	644.16	646.71	646.59	647.57	0.001285	4.46	19.23	10.02	0.89
C1	-146.78*	PF 2	71.51	644.16	646.71	646.59	647.57	0.001287	4.46	19.2	10	0.89
C1	-146.88*	PF 2	71.51	644.16	646.71	646.58	647.57	0.001288	4.46	19.19	9.98	0.89



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
C1	-146.98*	PF 2	71.51	644.16	646.7	646.58	647.57	0.001289	4.46	19.17	9.97	0.89
C1	-147.08*	PF 2	71.51	644.16	646.7	646.58	647.57	0.001289	4.46	19.16	9.95	0.89
C1	-147.18*	PF 2	71.51	644.16	646.7	646.58	647.57	0.00129	4.46	19.14	9.93	0.89
C1	-147.28*	PF 2	71.51	644.16	646.7	646.58	647.57	0.001291	4.46	19.13	9.91	0.89
C1	-147.38*	PF 2	71.51	644.16	646.7	646.58	647.57	0.001291	4.46	19.11	9.89	0.89
C1	-147.48*	PF 2	71.51	644.16	646.7	646.58	647.57	0.001293	4.46	19.09	9.88	0.89
C1	-147.58*	PF 2	71.51	644.16	646.7	646.58	647.57	0.001294	4.46	19.08	9.86	0.89
C1	-147.68*	PF 2	71.51	644.16	646.7	646.57	647.57	0.001294	4.46	19.07	9.84	0.89
C1	-147.78*	PF 2	71.51	644.16	646.69	646.57	647.57	0.001295	4.46	19.05	9.82	0.89
C1	-147.88*	PF 2	71.51	644.16	646.69	646.57	647.57	0.001296	4.46	19.04	9.8	0.89
C1	-147.98*	PF 2	71.51	644.16	646.69	646.57	647.57	0.001298	4.46	19.01	9.78	0.9
C1	-148.08*	PF 2	71.51	644.16	646.69	646.57	647.57	0.001299	4.46	19	9.77	0.9
C1	-148.18*	PF 2	71.51	644.16	646.69	646.57	647.57	0.001301	4.46	18.98	9.75	0.9
C1	-148.28*	PF 2	71.51	644.16	646.69	646.57	647.57	0.0013	4.46	18.97	9.73	0.9
C1	-148.38*	PF 2	71.51	644.16	646.69	646.56	647.57	0.001301	4.46	18.95	9.71	0.9
C1	-148.48*	PF 2	71.51	644.16	646.69	646.56	647.57	0.0013	4.46	18.94	9.69	0.9
C1	-148.58*	PF 2	71.51	644.16	646.69	646.56	647.57	0.0013	4.46	18.94	9.68	0.9
C1	-148.68*	PF 2	71.51	644.16	646.68	646.56	647.57	0.0013	4.46	18.92	9.66	0.9
C1	-148.78*	PF 2	71.51	644.16	646.68	646.56	647.57	0.001301	4.46	18.91	9.64	0.9
C1	-148.88*	PF 2	71.51	644.16	646.68	646.56	647.57	0.0013	4.46	18.9	9.62	0.9
C1	-148.98*	PF 2	71.51	644.16	646.68	646.56	647.57	0.001299	4.45	18.9	9.61	0.9
C1	-149.08*	PF 2	71.51	644.16	646.68	646.56	647.57	0.001305	4.46	18.85	9.58	0.9
C1	-149.18*	PF 2	71.51	644.16	646.68	646.55	647.57	0.001305	4.46	18.84	9.57	0.9
C1	-149.28*	PF 2	71.51	644.16	646.68	646.55	647.57	0.001303	4.45	18.84	9.55	0.9
C1	-149.38*	PF 2	71.51	644.16	646.68	646.55	647.57	0.001307	4.46	18.81	9.53	0.9



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
C1	-149.48*	PF 2	71.51	644.16	646.67	646.55	647.57	0.001308	4.46	18.79	9.51	0.9
C1	-149.58*	PF 2	71.51	644.16	646.67	646.55	647.57	0.001306	4.45	18.79	9.49	0.9
C1	-149.68*	PF 2	71.51	644.16	646.67	646.55	647.57	0.001312	4.46	18.75	9.47	0.9
C1	-149.78*	PF 2	71.51	644.16	646.67	646.55	647.57	0.001312	4.46	18.73	9.45	0.9
C1	-149.88*	PF 2	71.51	644.16	646.67	646.55	647.57	0.001311	4.46	18.73	9.43	0.9
C1	-149.98*	PF 2	71.51	644.16	646.67	646.55	647.57	0.001315	4.46	18.7	9.41	0.9
C1	-150.08*	PF 2	71.51	644.16	646.67	646.54	647.57	0.001314	4.46	18.69	9.39	0.9
C1	-150.18*	PF 2	71.51	644.16	646.67	646.54	647.57	0.001313	4.46	18.68	9.38	0.9
C1	-150.28*	PF 2	71.51	644.16	646.66	646.54	647.57	0.001319	4.46	18.64	9.35	0.9
C1	-150.38*	PF 2	71.51	644.16	646.66	646.54	647.57	0.001318	4.46	18.63	9.34	0.9
C1	-150.48*	PF 2	71.51	644.16	646.66	646.54	647.57	0.001316	4.46	18.63	9.32	0.9
C1	-150.58*	PF 2	71.51	644.16	646.66	646.54	647.57	0.001324	4.47	18.58	9.29	0.9
C1	-150.68*	PF 2	71.51	644.16	646.66	646.54	647.57	0.001323	4.46	18.57	9.28	0.9
C1	-150.78*	PF 2	71.51	644.16	646.66	646.53	647.57	0.001322	4.46	18.57	9.26	0.9
C1	-150.88*	PF 2	71.51	644.16	646.65	646.53	647.57	0.001328	4.47	18.53	9.24	0.9
C1	-150.98*	PF 2	71.51	644.16	646.65	646.53	647.57	0.001328	4.47	18.51	9.22	0.9
C1	-151.08*	PF 2	71.51	644.16	646.65	646.53	647.57	0.001326	4.46	18.51	9.2	0.9
C1	-151.18*	PF 2	71.51	644.16	646.65	646.53	647.57	0.001331	4.47	18.47	9.18	0.9
C1	-151.28*	PF 2	71.51	644.16	646.65	646.53	647.57	0.001332	4.47	18.46	9.16	0.9
C1	-151.38*	PF 2	71.51	644.16	646.65	646.53	647.57	0.00133	4.46	18.45	9.14	0.9
C1	-151.48*	PF 2	71.51	644.16	646.64	646.52	647.57	0.001337	4.47	18.41	9.12	0.91
C1	-151.58*	PF 2	71.51	644.16	646.64	646.52	647.57	0.001337	4.47	18.39	9.1	0.91
C1	-151.68*	PF 2	71.51	644.16	646.64	646.52	647.57	0.001336	4.47	18.39	9.08	0.91
C1	-151.78*	PF 2	71.51	644.16	646.64	646.52	647.57	0.00134	4.47	18.35	9.06	0.91
C1	-151.88*	PF 2	71.51	644.16	646.64	646.52	647.57	0.001339	4.47	18.34	9.04	0.91



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
C1	-151.98*	PF 2	71.51	644.16	646.64	646.52	647.57	0.001338	4.47	18.34	9.02	0.91
C1	-152.08*	PF 2	71.51	644.16	646.63	646.52	647.57	0.001345	4.47	18.29	9	0.91
C1	-152.18*	PF 2	71.51	644.16	646.63	646.51	647.57	0.001346	4.47	18.27	8.98	0.91
C1	-152.28*	PF 2	71.51	644.16	646.63	646.51	647.57	0.001344	4.47	18.27	8.96	0.91
C1	-152.38*	PF 2	71.51	644.16	646.63	646.51	647.57	0.00135	4.48	18.23	8.93	0.91
C1	-152.48*	PF 2	71.51	644.16	646.63	646.51	647.57	0.001349	4.47	18.22	8.92	0.91
C1	-152.58*	PF 2	71.51	644.16	646.63	646.51	647.57	0.001347	4.47	18.21	8.9	0.91
C1	-152.68*	PF 2	71.51	644.16	646.63	646.51	647.57	0.001353	4.48	18.17	8.87	0.91
C1	-152.78*	PF 2	71.51	644.16	646.62	646.51	647.57	0.001354	4.48	18.16	8.85	0.91
C1	-152.88*	PF 2	71.51	644.16	646.62	646.5	647.57	0.001352	4.47	18.15	8.84	0.91
C1	-152.98*	PF 2	71.51	644.16	646.62	646.5	647.57	0.001358	4.48	18.11	8.81	0.91
C1	-153.08*	PF 2	71.51	644.16	646.62	646.5	647.57	0.001362	4.48	18.08	8.79	0.91
C1	-153.18*	PF 2	71.51	644.16	646.61	646.5	647.57	0.001367	4.48	18.04	8.77	0.91
C1	-153.28*	PF 2	71.51	644.16	646.61	646.5	647.56	0.001364	4.48	18.04	8.75	0.91
C1	-153.38*	PF 2	71.51	644.16	646.61	646.5	647.56	0.001363	4.48	18.03	8.73	0.91
C1	-153.48*	PF 2	71.51	644.16	646.61	646.49	647.56	0.001361	4.48	18.03	8.71	0.91
C1	-153.58*	PF 2	71.51	644.16	646.61	646.49	647.56	0.001367	4.48	17.98	8.69	0.91
C1	-153.68*	PF 2	71.51	644.16	646.61	646.49	647.56	0.001367	4.48	17.97	8.67	0.91
C1	-153.78*	PF 2	71.51	644.16	646.61	646.49	647.56	0.001367	4.48	17.96	8.65	0.91
C1	-153.88*	PF 2	71.51	644.16	646.61	646.49	647.56	0.001372	4.48	17.92	8.63	0.92
C1	-153.98*	PF 2	71.51	644.16	646.6	646.49	647.56	0.001373	4.48	17.9	8.61	0.92
C1	-154.08*	PF 2	71.51	644.16	646.6	646.49	647.56	0.001372	4.48	17.89	8.59	0.92
C1	-154.18*	PF 2	71.51	644.16	646.6	646.48	647.56	0.001377	4.48	17.86	8.56	0.92
C1	-154.28*	PF 2	71.51	644.16	646.6	646.48	647.56	0.001378	4.49	17.84	8.54	0.92
C1	-154.38*	PF 2	71.51	644.16	646.6	646.48	647.56	0.001377	4.48	17.83	8.52	0.92



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
C1	-154.48*	PF 2	71.51	644.16	646.59	646.48	647.56	0.001384	4.49	17.78	8.5	0.92
C1	-154.58*	PF 2	71.51	644.16	646.59	646.48	647.56	0.001382	4.49	17.78	8.48	0.92
C1	-154.68*	PF 2	71.51	644.16	646.59	646.48	647.56	0.001383	4.49	17.76	8.46	0.92
C1	-154.78*	PF 2	71.51	644.16	646.59	646.48	647.56	0.001387	4.49	17.72	8.44	0.92
C1	-154.88*	PF 2	71.51	644.16	646.59	646.47	647.56	0.001385	4.49	17.72	8.42	0.92
C1	-154.98*	PF 2	71.51	644.16	646.59	646.47	647.56	0.001384	4.48	17.7	8.4	0.92
C1	-155.08*	PF 2	71.51	644.16	646.59	646.47	647.56	0.001391	4.49	17.66	8.37	0.92
C1	-155.18*	PF 2	71.51	644.16	646.59	646.47	647.56	0.001389	4.49	17.65	8.35	0.92
C1	-155.28*	PF 2	71.51	644.16	646.58	646.47	647.56	0.00139	4.49	17.63	8.33	0.92
C1	-155.38*	PF 2	71.51	644.16	646.58	646.47	647.56	0.001395	4.49	17.6	8.31	0.92
C1	-155.48*	PF 2	71.51	644.16	646.58	646.47	647.56	0.001392	4.48	17.59	8.29	0.92
C1	-155.58*	PF 2	71.51	644.16	646.58	646.46	647.56	0.001394	4.49	17.57	8.27	0.92
C1	-155.68*	PF 2	71.51	644.16	646.58	646.47	647.56	0.001394	4.49	17.55	8.25	0.92
C1	-155.78*	PF 2	71.51	644.16	646.58	646.46	647.56	0.001391	4.48	17.54	8.23	0.92
C1	-155.88*	PF 2	71.51	644.16	646.58	646.46	647.56	0.001389	4.48	17.54	8.21	0.92
C1	-155.98*	PF 2	71.51	644.16	646.57	646.46	647.56	0.001395	4.48	17.49	8.18	0.92
C1	-156.08*	PF 2	71.51	644.16	646.57	646.46	647.56	0.001392	4.48	17.49	8.16	0.92
C1	-156.18*	PF 2	71.51	644.16	646.57	646.45	647.56	0.001402	4.49	17.43	8.14	0.92
C1	-156.28*	PF 2	71.51	644.16	646.57	646.45	647.55	0.001402	4.49	17.41	8.12	0.92
C1	-156.38*	PF 2	71.51	644.16	646.57	646.46	647.55	0.001399	4.48	17.41	8.1	0.92
C1	-156.48*	PF 2	71.51	644.16	646.57	646.45	647.55	0.001397	4.48	17.4	8.08	0.92
C1	-156.58*	PF 2	71.51	644.16	646.56	646.45	647.55	0.001411	4.49	17.33	8.05	0.93
C1	-156.68*	PF 2	71.51	644.16	646.56	646.45	647.55	0.00141	4.49	17.31	8.03	0.92
C1	-156.78*	PF 2	71.51	644.16	646.56	646.45	647.55	0.001407	4.48	17.3	8.01	0.92
C1	-156.88*	PF 2	71.51	644.16	646.55	646.45	647.55	0.001417	4.49	17.25	7.98	0.93



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
C1	-156.98*	PF 2	71.51	644.16	646.55	646.44	647.55	0.001416	4.49	17.23	7.96	0.93
C1	-157.08*	PF 2	71.51	644.16	646.55	646.44	647.55	0.001413	4.48	17.23	7.94	0.93
C1	-157.18*	PF 2	71.51	644.16	646.55	646.44	647.55	0.001422	4.49	17.17	7.91	0.93
C1	-157.28*	PF 2	71.51	644.16	646.55	646.44	647.55	0.001424	4.49	17.15	7.89	0.93
C1	-157.38*	PF 2	71.51	644.16	646.55	646.43	647.55	0.001421	4.49	17.14	7.87	0.93
C1	-157.48*	PF 2	71.51	644.16	646.55	646.43	647.55	0.001419	4.48	17.13	7.85	0.93
C1	-157.58*	PF 2	71.51	644.16	646.55	646.44	647.54	0.001415	4.48	17.12	7.83	0.93
C1	-157.68*	PF 2	71.51	644.16	646.55	646.43	647.54	0.001411	4.47	17.12	7.81	0.92
C1	-157.78*	PF 2	71.51	644.16	646.54	646.43	647.54	0.001426	4.49	17.04	7.78	0.93
C1	-157.88*	PF 2	71.51	644.16	646.54	646.43	647.54	0.001421	4.48	17.04	7.76	0.93
C1	-157.98*	PF 2	71.51	644.16	646.54	646.43	647.54	0.001417	4.47	17.04	7.74	0.93
C1	-158.08*	PF 2	71.51	644.16	646.52	646.42	647.54	0.00145	4.5	16.89	7.71	0.94
C1	-158.18*	PF 2	71.51	644.16	646.52	646.42	647.54	0.001446	4.5	16.89	7.69	0.93
C1	-158.28*	PF 2	71.51	644.16	646.52	646.42	647.53	0.001442	4.49	16.88	7.67	0.93
C1	-158.38*	PF 2	71.51	644.16	646.52	646.42	647.53	0.001448	4.5	16.84	7.64	0.93
C1	-158.48*	PF 2	71.51	644.16	646.52	646.42	647.53	0.001447	4.49	16.82	7.62	0.93
C1	-158.58*	PF 2	71.51	644.16	646.51	646.41	647.53	0.001451	4.5	16.78	7.6	0.94
C1	-158.68*	PF 2	71.51	644.16	646.51	646.41	647.53	0.001459	4.5	16.73	7.57	0.94
C1	-158.78*	PF 2	71.51	644.16	646.51	646.41	647.53	0.001453	4.49	16.73	7.55	0.94
C1	-158.88*	PF 2	71.51	644.16	646.51	646.41	647.53	0.001453	4.49	16.71	7.53	0.94
C1	-158.98*	PF 2	71.51	644.16	646.5	646.4	647.52	0.001468	4.5	16.64	7.51	0.94
C1	-159.08*	PF 2	71.51	644.16	646.5	646.4	647.52	0.001469	4.5	16.61	7.48	0.94
C1	-159.18*	PF 2	71.51	644.16	646.5	646.4	647.52	0.001465	4.5	16.6	7.46	0.94
C1	-159.28*	PF 2	71.51	644.16	646.49	646.4	647.52	0.001473	4.5	16.55	7.44	0.94
C1	-159.38*	PF 2	71.51	644.16	646.49	646.4	647.52	0.00147	4.5	16.54	7.42	0.94



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
C1	-159.48*	PF 2	71.51	644.16	646.49	646.39	647.51	0.001474	4.5	16.5	7.39	0.94
C1	-159.58*	PF 2	71.51	644.16	646.48	646.39	647.51	0.00148	4.5	16.46	7.37	0.94
C1	-159.68*	PF 2	71.51	644.16	646.48	646.39	647.51	0.001475	4.49	16.45	7.35	0.94
C1	-159.78*	PF 2	71.51	644.16	646.48	646.39	647.51	0.001472	4.49	16.44	7.32	0.94
C1	-159.88*	PF 2	71.51	644.16	646.48	646.39	647.5	0.001478	4.49	16.39	7.3	0.94
C1	-159.98*	PF 2	71.51	644.16	646.48	646.39	647.5	0.001482	4.49	16.36	7.28	0.94
C1	-160.08*	PF 2	71.51	644.16	646.48	646.39	647.5	0.00148	4.49	16.34	7.25	0.94
C1	-160.18*	PF 2	71.51	644.16	646.47	646.38	647.5	0.00149	4.5	16.28	7.23	0.94
C1	-160.28*	PF 2	71.51	644.16	646.47	646.38	647.49	0.001492	4.49	16.25	7.21	0.95
C1	-160.38*	PF 2	71.51	644.16	646.46	646.37	647.49	0.0015	4.5	16.2	7.18	0.95
C1	-160.48*	PF 2	71.51	644.16	646.45	646.38	647.49	0.001519	4.51	16.11	7.16	0.95
C1	-160.58*	PF 2	71.51	644.16	646.45	646.37	647.48	0.001509	4.5	16.11	7.14	0.95
C1	-160.68*	PF 2	71.51	644.16	646.45	646.37	647.48	0.001501	4.49	16.11	7.12	0.95
C1	-160.78*	PF 2	71.51	644.16	646.45	646.37	647.48	0.001495	4.48	16.11	7.09	0.95
C1	-160.88*	PF 2	71.51	644.16	646.46	646.37	647.48	0.001482	4.47	16.12	7.07	0.94
C1	-160.98*	PF 2	71.51	644.16	646.46	646.36	647.47	0.001469	4.45	16.14	7.05	0.94
C1	-161.08*	PF 2	71.51	644.16	646.46	646.35	647.47	0.001458	4.44	16.15	7.03	0.93
C1	-161.18	PF 2	71.51	644.16	646.35	646.35	647.46	0.001711	4.66	15.36	7	1
C1	-170.69*	PF 2	71.51	643.42	644.91	645.61	647.3	0.006194	6.85	10.44	7	1.79
C1	-180.20*	PF 2	71.51	642.68	643.97	644.87	647.15	0.009936	7.89	9.06	7	2.22
C1	-189.72*	PF 2	71.51	641.94	643.11	644.13	646.97	0.013737	8.7	8.22	7	2.56
C1	-199.23*	PF 2	71.51	641.2	642.29	643.39	646.76	0.017581	9.37	7.64	7	2.86
C1	-208.74*	PF 2	71.51	640.46	641.49	642.65	646.52	0.021414	9.94	7.2	7	3.13
C1	-218.26*	PF 2	71.51	639.72	640.7	641.91	646.25	0.025203	10.43	6.85	7	3.37
C1	-227.77*	PF 2	71.51	638.98	639.92	641.17	645.95	0.028913	10.87	6.58	7	3.58



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
C1	-237.28*	PF 2	71.51	638.24	639.15	640.43	645.61	0.032507	11.26	6.35	7	3.78
C1	-246.8	PF 2	71.51	637.5	638.38	639.69	645.29	0.036321	11.64	6.14	7	3.97
C1	-256.75*	PF 2	71.51	636.99	637.86	639.19	644.92	0.037623	11.77	6.08	7	4.03
C1	-266.71*	PF 2	71.51	636.49	637.35	638.68	644.54	0.038819	11.88	6.02	7	4.09
C1	-276.67*	PF 2	71.51	635.98	636.83	638.17	644.15	0.039949	11.98	5.97	7	4.14
C1	-286.63*	PF 2	71.51	635.47	636.32	637.67	643.75	0.040965	12.07	5.92	7	4.19
C1	-296.59*	PF 2	71.51	634.97	635.81	637.16	643.34	0.041866	12.15	5.89	7	4.23
C1	-306.55*	PF 2	71.51	634.46	635.3	636.65	642.91	0.042704	12.22	5.85	7	4.27
C1	-316.51*	PF 2	71.51	633.95	634.78	636.15	642.49	0.043499	12.29	5.82	7	4.31
C1	-326.47*	PF 2	71.51	633.45	634.27	635.64	642.05	0.044195	12.35	5.79	7	4.34
C1	-336.43	PF 2	71.51	632.94	633.76	635.13	641.61	0.044837	12.4	5.77	7	4.36
C1	-345.65*	PF 2	71.51	632.85	633.69	635.04	641.21	0.041755	12.14	5.89	7	4.23
C1	-354.87*	PF 2	71.51	632.76	633.62	634.95	640.83	0.03901	11.9	6.01	7	4.1
C1	-364.09*	PF 2	71.51	632.67	633.55	634.86	640.48	0.036547	11.67	6.13	7	3.98
C1	-373.31*	PF 2	71.51	632.58	633.47	634.77	640.16	0.03434	11.45	6.25	7	3.87
C1	-382.53*	PF 2	71.51	632.49	633.4	634.68	639.85	0.032365	11.25	6.36	7	3.77
C1	-391.75	PF 2	71.51	632.4	633.32	634.59	639.56	0.030576	11.06	6.47	7	3.67

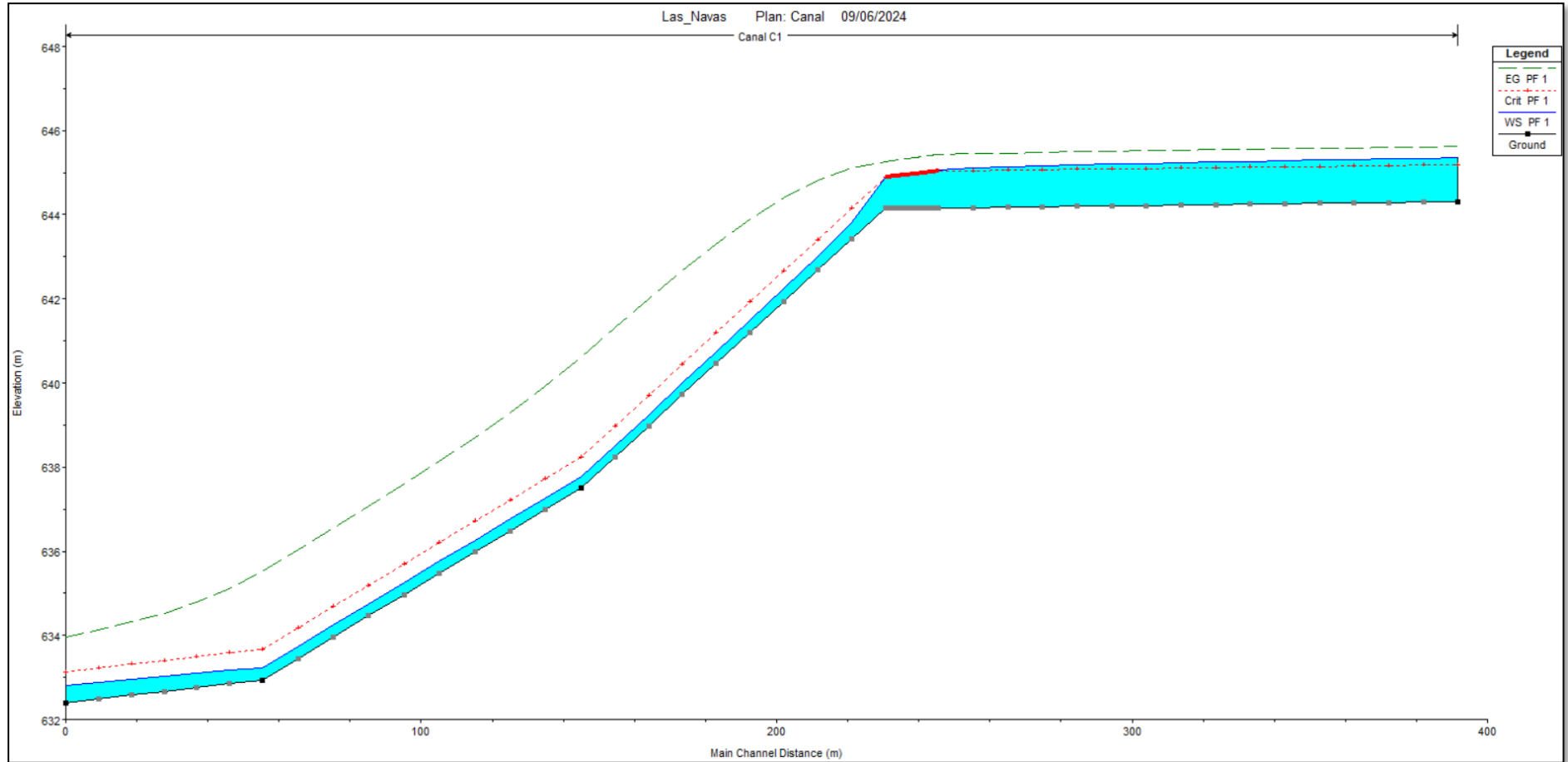


Figura 46.- Perfil longitudinal caudal de proyecto canal de descarga del aliviadero. Fuente: HEC-RAS.

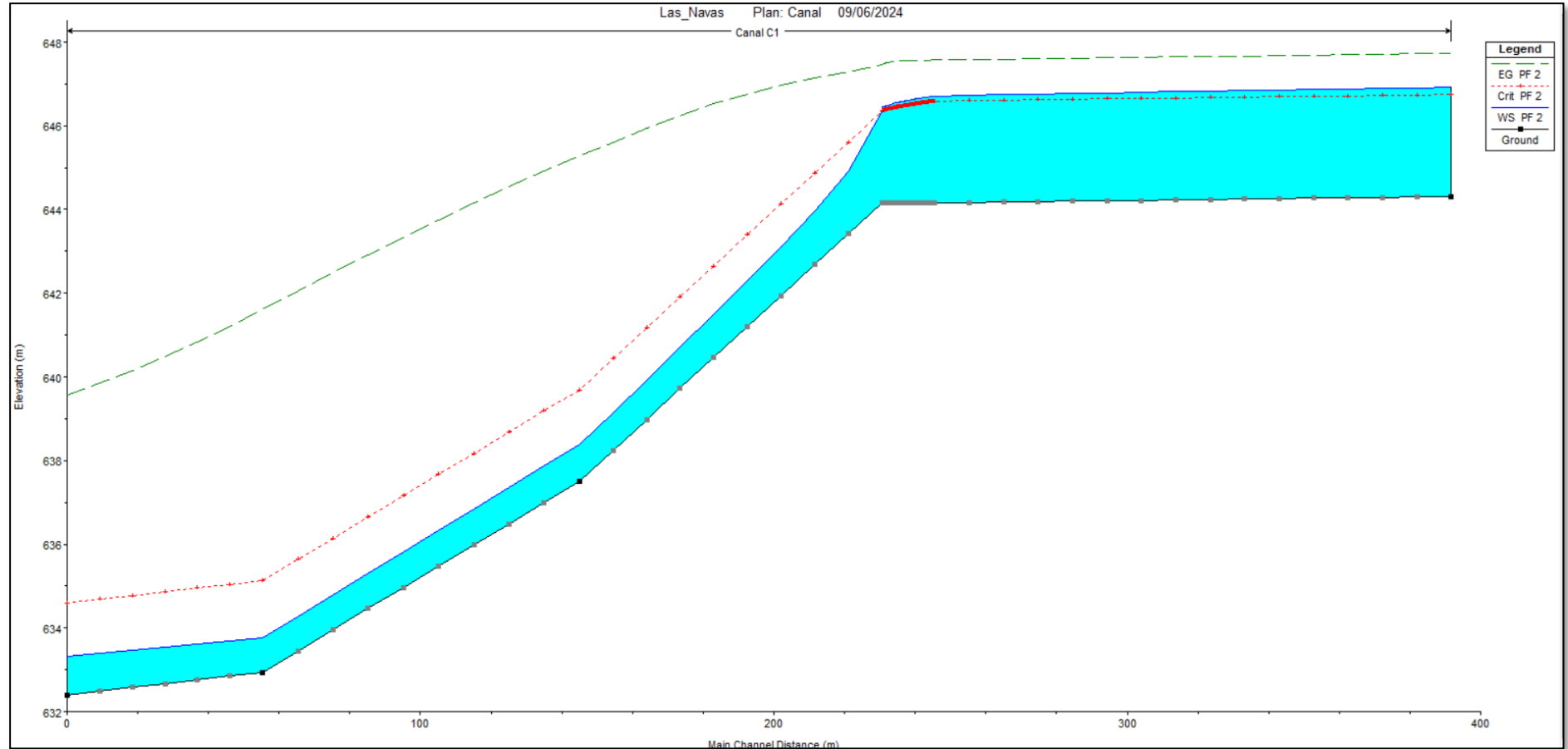


Figura 47.- Perfil longitudinal caudal de proyecto canal de descarga del aliviadero. Fuente: HEC-RAS.

Tabla 10.- Resultados caudal de proyecto barranco. Fuente: HEC-RAS.

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
Cauce	1040	PF 1	13.77	631.79	632.18	632.28	632.5	0.028519	3.39	6.12	26.91	1.74
Cauce	1035.00*	PF 1	13.77	631.78	632.32	632.24	632.41	0.0047	1.72	11.27	32.21	0.75
Cauce	1030.00*	PF 1	13.77	631.77	632.31	632.21	632.38	0.003719	1.52	12.21	33.88	0.66
Cauce	1025.00*	PF 1	13.77	631.75	632.3	632.17	632.36	0.002756	1.32	13.62	36.01	0.57
Cauce	1020	PF 1	13.77	631.74	632.3	632.12	632.35	0.001965	1.13	15.4	38.04	0.48
Cauce	1016.00*	PF 1	13.77	631.73	632.28	632.12	632.34	0.00228	1.21	14.55	36.92	0.52
Cauce	1012.00*	PF 1	13.77	631.72	632.26	632.13	632.33	0.002742	1.32	13.6	35.85	0.57
Cauce	1008.00*	PF 1	13.77	631.7	632.24	632.14	632.31	0.00357	1.47	12.44	35.05	0.65
Cauce	1004.00*	PF 1	13.77	631.69	632.17	632.15	632.29	0.006941	1.87	9.93	33.18	0.88
Cauce	1000	PF 1	13.77	631.68	632.18	632.16	632.25	0.005089	1.62	13.89	64.55	0.76
Cauce	995.00*	PF 1	13.77	631.61	632.07	632.07	632.21	0.008067	1.93	8.97	30.09	0.94
Cauce	990.00*	PF 1	13.77	631.54	631.91	631.97	632.15	0.016154	2.36	6.9	27.19	1.28
Cauce	985.00*	PF 1	13.77	631.47	631.8	631.88	632.06	0.01858	2.38	6.58	26.87	1.35
Cauce	980	PF 1	13.77	631.4	631.71	631.78	631.96	0.020298	2.35	6.46	27.15	1.4
Cauce	975.00*	PF 1	13.77	631.25	631.61	631.68	631.87	0.017824	2.35	6.57	27.07	1.33
Cauce	970.00*	PF 1	13.77	631.1	631.51	631.59	631.78	0.016697	2.38	6.59	27.53	1.3
Cauce	965.00*	PF 1	13.77	630.95	631.43	631.51	631.69	0.016063	2.41	6.69	29.14	1.29
Cauce	960	PF 1	13.77	630.8	631.59	631.42	631.63	0.001486	1.05	17.54	46.12	0.43
Cauce	955.00*	PF 1	13.77	630.83	631.59	631.39	631.62	0.001175	0.97	19.24	47.45	0.38
Cauce	950.00*	PF 1	13.77	630.85	631.59	631.35	631.62	0.000967	0.9	20.87	48.82	0.35
Cauce	945.00*	PF 1	13.77	630.88	631.59	631.32	631.61	0.000824	0.84	22.45	50.36	0.32
Cauce	940	PF 1	13.77	630.91	631.59	631.28	631.61	0.00072	0.78	23.97	51.93	0.3
Cauce	935.00*	PF 1	13.77	630.89	631.58	631.33	631.6	0.000947	0.9	21.72	51.55	0.35
Cauce	930.00*	PF 1	13.77	630.88	631.57	631.33	631.6	0.001103	0.97	20.86	53.45	0.38

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
Cauce	925.00*	PF 1	13.77	630.86	631.56	631.32	631.59	0.00108	0.97	21.31	54.56	0.37
Cauce	920	PF 1	13.77	630.84	631.38	631.38	631.56	0.008503	2.22	7.92	21.95	0.99
Cauce	915.00*	PF 1	13.77	630.77	631.12	631.23	631.47	0.031313	3.09	6	31.83	1.76
Cauce	910.00*	PF 1	13.77	630.69	631.1	631.17	631.33	0.015875	2.42	7.45	34.34	1.28
Cauce	905.00*	PF 1	13.77	630.62	631.02	631.09	631.25	0.015686	2.34	7.44	35.99	1.27
Cauce	900	PF 1	13.77	630.54	630.91	630.98	631.16	0.020633	2.43	6.94	33.56	1.42
Cauce	895.00*	PF 1	13.77	630.48	630.92	630.93	631.06	0.009097	1.84	9.22	36.16	0.97
Cauce	890.00*	PF 1	13.77	630.43	630.87	630.88	631.01	0.009595	1.86	9.01	35.59	0.99
Cauce	885.00*	PF 1	13.77	630.37	630.82	630.83	630.96	0.009389	1.83	9.09	35.66	0.98
Cauce	880	PF 1	13.77	630.32	630.78	630.78	630.91	0.009385	1.8	9.12	35.73	0.98
Cauce	875.00*	PF 1	13.77	630.24	630.65	630.7	630.85	0.015656	2.15	7.59	32.82	1.24
Cauce	870.00*	PF 1	13.77	630.16	630.56	630.61	630.77	0.016157	2.19	7.49	32.18	1.26
Cauce	865.00*	PF 1	13.77	630.09	630.48	630.53	630.68	0.016693	2.23	7.4	31.5	1.28
Cauce	860	PF 1	13.77	630.01	630.4	630.45	630.6	0.01696	2.25	7.35	30.86	1.29
Cauce	855.00*	PF 1	13.77	629.91	630.29	630.35	630.51	0.016958	2.32	7.1	29.14	1.3
Cauce	850.00*	PF 1	13.77	629.81	630.19	630.25	630.43	0.017548	2.39	6.86	27.96	1.33
Cauce	845.00*	PF 1	13.77	629.71	630.09	630.16	630.34	0.01787	2.42	6.75	27.4	1.34
Cauce	840	PF 1	13.77	629.61	630	630.06	630.25	0.018026	2.41	6.73	27.17	1.34
Cauce	835.00*	PF 1	13.77	629.44	629.9	629.97	630.16	0.014751	2.5	6.78	25.76	1.26
Cauce	830.00*	PF 1	13.77	629.28	629.81	629.89	630.09	0.012471	2.61	6.86	25.3	1.19
Cauce	825.00*	PF 1	13.77	629.12	629.74	629.83	630.04	0.01084	2.77	7.19	26.63	1.15
Cauce	820	PF 1	13.77	628.95	629.68	629.79	629.98	0.010659	3.09	7.62	28.56	1.17
Cauce	815.00*	PF 1	13.77	628.92	629.55	629.67	629.91	0.016354	3.42	6.75	28.06	1.41
Cauce	810.00*	PF 1	13.77	628.9	629.42	629.55	629.81	0.022867	3.61	6.28	28.27	1.62
Cauce	805.00*	PF 1	13.77	628.87	629.31	629.43	629.67	0.029019	3.58	6.11	29.15	1.77

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
Cauce	800	PF 1	13.77	628.84	629.42	629.3	629.48	0.003199	1.44	13.43	35.55	0.62
Cauce	795.00*	PF 1	13.77	628.72	629.28	629.28	629.45	0.008665	2.25	8.33	24.8	1
Cauce	790.00*	PF 1	13.77	628.59	629.13	629.19	629.38	0.013126	2.62	7.03	25.32	1.22
Cauce	785.00*	PF 1	13.77	628.47	628.96	629.06	629.3	0.018332	2.86	6.14	25.22	1.41
Cauce	780	PF 1	13.77	628.35	628.83	628.95	629.2	0.019862	2.87	5.63	20.02	1.46
Cauce	775.00*	PF 1	13.77	628.15	628.64	628.78	629.08	0.023907	3.2	5.25	21.88	1.6
Cauce	770.00*	PF 1	13.77	627.95	628.46	628.63	628.96	0.024249	3.4	5	17.75	1.64
Cauce	765.00*	PF 1	13.77	627.75	628.3	628.46	628.83	0.024327	3.6	4.94	17.36	1.66
Cauce	760	PF 1	13.77	627.55	628.15	628.34	628.7	0.024359	3.84	5.05	18.59	1.69
Cauce	755.00*	PF 1	13.77	627.52	628.12	628.25	628.57	0.018727	3.43	5.43	17.5	1.49
Cauce	750.00*	PF 1	13.77	627.49	628.07	628.19	628.46	0.016126	3.17	5.71	17.17	1.38
Cauce	745.00*	PF 1	13.77	627.46	628.02	628.1	628.37	0.014924	3	5.93	17.34	1.32
Cauce	740	PF 1	13.77	627.43	627.96	628.08	628.29	0.014569	2.89	6.08	17.77	1.3
Cauce	735.00*	PF 1	13.77	627.28	627.77	627.91	628.19	0.021177	3.23	5.33	17.61	1.54
Cauce	730.00*	PF 1	13.77	627.14	627.59	627.75	628.07	0.026003	3.39	5.04	18.36	1.68
Cauce	725.00*	PF 1	13.77	626.99	627.42	627.57	627.92	0.03066	3.46	4.91	19.8	1.8
Cauce	720	PF 1	13.77	626.85	627.25	627.4	627.76	0.0353	3.48	4.84	20.53	1.89
Cauce	715.00*	PF 1	13.77	626.57	627.05	627.23	627.6	0.026669	3.53	4.61	14.88	1.71
Cauce	710.00*	PF 1	13.77	626.3	626.83	627.06	627.46	0.025649	3.79	4.3	11.98	1.72
Cauce	705.00*	PF 1	13.77	626.03	626.64	626.88	627.33	0.023853	4.05	4.14	10.24	1.7
Cauce	700	PF 1	13.77	625.75	626.47	626.71	627.21	0.02343	4.42	4.53	16.12	1.72
Cauce	695.00*	PF 1	13.77	625.52	626.24	626.45	627.03	0.024804	4.5	4.39	15.92	1.77
Cauce	690.00*	PF 1	13.77	625.29	626.25	626.25	626.45	0.005188	2.49	8.2	17.79	0.85
Cauce	685.00*	PF 1	13.77	625.05	625.85	626.02	626.38	0.015628	3.74	5.33	16.36	1.42
Cauce	680	PF 1	13.77	624.82	625.59	625.79	626.27	0.021234	4.16	4.68	16.05	1.63



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
Cauce	675.00*	PF 1	13.77	624.76	625.23	625.49	626.1	0.044004	4.25	3.48	10.54	2.16
Cauce	670.00*	PF 1	13.77	624.71	625.07	625.28	625.82	0.056165	3.91	3.72	14.8	2.32
Cauce	665.00*	PF 1	13.77	624.65	624.98	625.12	625.48	0.049098	3.27	4.62	23.68	2.11
Cauce	660	PF 1	13.77	624.59	624.89	624.99	625.21	0.038406	2.61	5.61	28.5	1.82
Cauce	655.00*	PF 1	13.77	624.51	624.9	624.92	625.07	0.012089	1.94	7.82	28.37	1.1
Cauce	650.00*	PF 1	13.77	624.43	624.9	624.86	625.02	0.006008	1.63	9.59	28.55	0.81
Cauce	645.00*	PF 1	13.77	624.36	624.88	624.82	624.99	0.005148	1.6	10.02	28.31	0.76
Cauce	640	PF 1	13.77	624.28	624.8	624.8	624.95	0.009285	1.94	8.34	27.25	0.99
Cauce	635.00*	PF 1	13.77	624.19	624.67	624.72	624.89	0.015061	2.25	7.06	26.12	1.23
Cauce	630.00*	PF 1	13.77	624.11	624.59	624.64	624.81	0.015598	2.25	6.95	26.03	1.25
Cauce	625.00*	PF 1	13.77	624.02	624.51	624.56	624.73	0.015337	2.22	7	26.24	1.24
Cauce	620	PF 1	13.77	623.93	624.43	624.48	624.65	0.016353	2.23	6.86	26.15	1.27
Cauce	615.00*	PF 1	13.77	623.93	624.42	624.43	624.59	0.010881	1.97	7.95	28.05	1.06
Cauce	610.00*	PF 1	13.77	623.92	624.38	624.38	624.53	0.009863	1.9	8.28	28.89	1.01
Cauce	605.00*	PF 1	13.77	623.91	624.34	624.33	624.48	0.008746	1.81	8.71	29.93	0.95
Cauce	600	PF 1	13.77	623.91	624.29	624.29	624.44	0.009399	1.82	8.59	30.42	0.98
Cauce	595.00*	PF 1	13.77	623.84	624.21	624.23	624.39	0.010791	1.95	7.98	28.19	1.05
Cauce	590.00*	PF 1	13.77	623.78	624.16	624.17	624.33	0.009923	1.94	8.02	27.02	1.02
Cauce	585.00*	PF 1	13.77	623.71	624.13	624.12	624.28	0.008366	1.88	8.34	26.32	0.95
Cauce	580	PF 1	13.77	623.64	624.07	624.07	624.24	0.008942	1.95	8	25.05	0.98
Cauce	575.00*	PF 1	13.77	623.44	623.77	623.88	624.14	0.030715	2.82	5.33	22.88	1.71
Cauce	570.00*	PF 1	13.77	623.23	623.6	623.71	623.98	0.035204	2.83	5.24	23.73	1.8
Cauce	565.00*	PF 1	13.77	623.03	623.46	623.56	623.79	0.033045	2.64	5.53	25.21	1.73
Cauce	560	PF 1	13.77	622.83	623.34	623.42	623.62	0.028957	2.38	5.95	26.9	1.6
Cauce	555.00*	PF 1	13.77	622.66	623.34	623.35	623.5	0.010777	1.81	8.06	27.61	1.03

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
Cauce	550.00*	PF 1	13.77	622.49	623.25	623.28	623.44	0.01366	1.99	7.33	26.42	1.15
Cauce	545.00*	PF 1	13.77	622.32	623.16	623.2	623.37	0.014146	2.06	7.09	25.46	1.18
Cauce	540	PF 1	13.77	622.15	623.07	623.11	623.29	0.014771	2.13	6.81	24.33	1.21
Cauce	535.00*	PF 1	13.77	622.14	623.1	623.08	623.24	0.007212	1.75	8.59	25.32	0.88
Cauce	530.00*	PF 1	13.77	622.13	623.07	623.03	623.21	0.006865	1.75	8.66	25.07	0.86
Cauce	525.00*	PF 1	13.77	622.12	623.02	622.99	623.17	0.007155	1.82	8.6	25.56	0.88
Cauce	520	PF 1	13.77	622.11	622.96	622.96	623.13	0.008766	1.97	8.08	25.75	0.97
Cauce	515.00*	PF 1	13.77	621.97	622.72	622.81	623.05	0.0169	2.69	5.63	17.3	1.35
Cauce	510.00*	PF 1	13.77	621.84	622.59	622.7	622.97	0.014585	2.89	5.43	14.37	1.3
Cauce	505.00*	PF 1	13.77	621.7	622.75	622.66	622.9	0.00333	2	9.72	23.28	0.68
Cauce	500	PF 1	13.77	621.56	622.68	622.68	622.88	0.004188	2.44	9.12	22.93	0.78
Cauce	495.00*	PF 1	13.77	621.51	622.46	622.58	622.83	0.008552	3.2	6.58	18.39	1.09
Cauce	490.00*	PF 1	13.77	621.46	622.33	622.48	622.78	0.011155	3.53	5.88	16.57	1.23
Cauce	485.00*	PF 1	13.77	621.41	622.21	622.38	622.71	0.013899	3.79	5.4	15.04	1.36
Cauce	480	PF 1	13.77	621.36	622.09	622.29	622.63	0.016966	3.98	5.03	13.63	1.49
Cauce	475.00*	PF 1	13.77	621.16	621.98	622.18	622.55	0.01507	4.02	5.16	14.49	1.42
Cauce	470.00*	PF 1	13.77	620.95	621.86	622.07	622.47	0.014208	4.08	5.23	15.72	1.39
Cauce	465.00*	PF 1	13.77	620.75	622.17	621.96	622.23	0.001246	1.6	15.71	30.34	0.44
Cauce	460	PF 1	13.77	620.54	622.19	621.83	622.22	0.00062	1.21	21.11	36.12	0.31
Cauce	455.00*	PF 1	13.77	620.51	621.44	621.44	622.15	0.016156	4.19	4.34	9.14	1.47
Cauce	450.00*	PF 1	13.77	620.48	621.27	621.61	622.05	0.020137	4.32	4	8.47	1.61
Cauce	445.00*	PF 1	13.77	620.44	621.14	621.49	621.93	0.023233	4.34	3.89	8.72	1.71
Cauce	440	PF 1	13.77	620.41	621.02	621.34	621.81	0.025709	4.3	3.88	9.14	1.77
Cauce	435.00*	PF 1	13.77	620.33	621.01	621.28	621.66	0.01891	3.96	4.42	10.51	1.55
Cauce	430.00*	PF 1	13.77	620.24	620.99	621.2	621.55	0.015356	3.76	5.12	14.37	1.41

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
Cauce	425.00*	PF 1	13.77	620.15	620.91	621.1	621.47	0.016547	3.86	5.29	16.91	1.46
Cauce	420	PF 1	13.77	620.07	620.81	620.99	621.38	0.019307	4.02	5.25	18.07	1.56
Cauce	415.00*	PF 1	13.77	619.76	620.59	620.82	621.27	0.018791	4.13	4.72	14.56	1.55
Cauce	410.00*	PF 1	13.77	619.45	620.33	620.63	621.16	0.021574	4.38	3.97	9.88	1.65
Cauce	405.00*	PF 1	13.77	619.13	620.04	620.42	621.02	0.025807	4.63	3.47	7.73	1.78
Cauce	400	PF 1	13.77	618.82	619.74	620.11	620.87	0.031239	4.87	3.14	6.56	1.93
Cauce	395.00*	PF 1	13.77	618.91	619.82	620.14	620.65	0.021813	4.29	3.81	8.68	1.65
Cauce	390.00*	PF 1	13.77	619	619.84	620.09	620.5	0.018418	3.95	4.53	12.32	1.52
Cauce	385.00*	PF 1	13.77	619.1	619.79	619.99	620.38	0.020993	3.9	4.9	15.72	1.6
Cauce	380	PF 1	13.77	619.19	619.71	619.88	620.24	0.027493	3.91	5.13	19.88	1.78
Cauce	375.00*	PF 1	13.77	618.89	619.39	619.64	620.08	0.033757	4.3	4.32	13.94	1.96
Cauce	370.00*	PF 1	13.77	618.58	619.08	619.32	619.88	0.039868	4.62	3.98	12.56	2.13
Cauce	365.00*	PF 1	13.77	618.28	618.76	619.02	619.66	0.044563	4.85	3.79	11.89	2.25
Cauce	360	PF 1	13.77	617.97	618.45	618.73	619.42	0.047972	5.02	3.68	11.45	2.33
Cauce	355.00*	PF 1	13.77	617.85	618.31	618.55	619.16	0.043148	4.58	3.89	12.59	2.19
Cauce	350.00*	PF 1	13.77	617.74	618.16	618.38	618.92	0.040634	4.26	4.09	13.92	2.1
Cauce	345.00*	PF 1	13.77	617.63	618.02	618.22	618.7	0.03895	3.99	4.3	15.39	2.03
Cauce	340	PF 1	13.77	617.51	617.88	618.06	618.48	0.037652	3.75	4.51	16.84	1.98
Cauce	335.00*	PF 1	13.77	617.16	617.52	617.74	618.26	0.045983	4.05	4.02	15.01	2.17
Cauce	330.00*	PF 1	13.77	616.81	617.18	617.41	618	0.05412	4.26	3.73	13.88	2.34
Cauce	325.00*	PF 1	13.77	616.47	616.85	617.08	617.71	0.060856	4.36	3.6	13.49	2.46
Cauce	320	PF 1	13.77	616.12	616.53	616.76	617.39	0.065809	4.38	3.55	13.44	2.53
Cauce	315.00*	PF 1	13.77	616.02	616.45	616.63	617.07	0.03793	3.71	4.21	13.91	1.98
Cauce	310.00*	PF 1	13.77	615.91	616.37	616.52	616.87	0.027391	3.31	4.72	14.51	1.7
Cauce	305.00*	PF 1	13.77	615.81	616.32	616.43	616.72	0.021283	2.98	5.23	15.34	1.51



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
Cauce	300	PF 1	13.77	615.7	616.29	616.36	616.6	0.016212	2.65	5.91	16.69	1.32
Cauce	295.00*	PF 1	13.77	615.55	616.13	616.23	616.51	0.018394	2.93	5.46	15.24	1.42
Cauce	290.00*	PF 1	13.77	615.4	616	616.12	616.42	0.017777	3.11	5.34	14.18	1.42
Cauce	285.00*	PF 1	13.77	615.24	615.9	616.03	616.33	0.015866	3.25	5.44	14.01	1.38
Cauce	280	PF 1	13.77	615.09	615.82	615.96	616.26	0.014543	3.45	5.87	17.22	1.35
Cauce	275.00*	PF 1	13.77	614.9	615.68	615.84	616.18	0.014509	3.68	5.64	16.27	1.38
Cauce	270.00*	PF 1	13.77	614.7	615.88	615.73	615.99	0.002383	2	12.11	23.13	0.6
Cauce	265.00*	PF 1	13.77	614.51	615.9	615.63	615.97	0.001257	1.65	15.6	25.02	0.45
Cauce	260	PF 1	13.77	614.31	615.27	615.27	615.9	0.014167	4.31	4.94	9.45	1.42
Cauce	255.00*	PF 1	13.77	613.99	614.89	615.09	615.79	0.021652	4.98	4.02	7.79	1.72
Cauce	250.00*	PF 1	13.77	613.67	614.55	614.89	615.64	0.027159	5.37	3.59	7.09	1.91
Cauce	245.00*	PF 1	13.77	613.34	614.22	614.6	615.48	0.031838	5.66	3.31	6.58	2.04
Cauce	240	PF 1	13.77	613.02	613.91	614.32	615.3	0.035707	5.86	3.12	6.27	2.15
Cauce	235.00*	PF 1	13.77	612.77	613.59	614.02	615.1	0.041204	5.97	2.95	6.23	2.28
Cauce	230.00*	PF 1	13.77	612.53	614.3	613.72	614.4	0.001087	1.73	11.9	12.02	0.43
Cauce	225.00*	PF 1	13.77	612.28	614.32	613.42	614.38	0.000497	1.3	16.11	14.13	0.3
Cauce	220	PF 1	13.77	612.03	614.34	613.13	614.37	0.000256	1.01	21.05	16.88	0.22
Cauce	215.00*	PF 1	13.77	612.33	614.33	613.38	614.37	0.000401	1.16	18.44	16.88	0.27
Cauce	210.00*	PF 1	13.77	612.63	614.31	613.62	614.37	0.000687	1.35	15.74	16.88	0.34
Cauce	205.00*	PF 1	13.77	612.92	614.27	613.85	614.36	0.001375	1.66	12.81	16.8	0.47
Cauce	200	PF 1	13.77	613.22	614.07	614.07	614.33	0.007316	2.8	7.3	14.55	0.99
Cauce	195.00*	PF 1	13.77	612.96	613.5	613.73	614.22	0.031372	4.24	4.27	12.19	1.9
Cauce	190.00*	PF 1	13.77	612.69	613.15	613.4	614.01	0.046618	4.51	3.8	12.67	2.24
Cauce	185.00*	PF 1	13.77	612.42	612.84	613.09	613.75	0.058373	4.56	3.64	13.62	2.45
Cauce	180	PF 1	13.77	612.16	612.55	612.78	613.43	0.065282	4.46	3.64	14.95	2.54

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
Cauce	175.00*	PF 1	13.77	611.67	612.1	612.38	613.11	0.058787	4.73	3.42	11.97	2.48
Cauce	170.00*	PF 1	13.77	611.18	611.67	611.98	612.81	0.05407	5.07	3.25	9.92	2.44
Cauce	165.00*	PF 1	13.77	610.69	611.28	611.63	612.54	0.049129	5.48	3.15	8.31	2.4
Cauce	160	PF 1	13.77	610.2	610.94	611.33	612.3	0.046021	6.06	3.13	7.17	2.4
Cauce	155.00*	PF 1	13.77	610.11	610.77	611.14	612.04	0.045037	5.71	3.2	7.68	2.35
Cauce	150.00*	PF 1	13.77	610.02	610.62	610.92	611.79	0.044494	5.39	3.31	8.4	2.3
Cauce	145.00*	PF 1	13.77	609.94	610.48	610.8	611.53	0.043839	5.1	3.53	9.98	2.26
Cauce	140	PF 1	13.77	609.85	610.32	610.58	611.27	0.048078	4.91	3.78	12.83	2.32
Cauce	135.00*	PF 1	13.77	609.44	609.98	610.29	611.04	0.041979	5.09	3.56	10.19	2.22
Cauce	130.00*	PF 1	13.77	609.02	609.61	609.99	610.81	0.04319	5.44	3.32	8.5	2.28
Cauce	125.00*	PF 1	13.77	608.6	609.25	609.56	610.58	0.044997	5.83	3.17	7.6	2.36
Cauce	120	PF 1	13.77	608.19	608.89	609.28	610.33	0.047783	6.26	3.06	6.93	2.46
Cauce	115.00*	PF 1	13.77	607.94	608.61	609.03	610.08	0.050901	6.36	3.02	6.94	2.53
Cauce	110.00*	PF 1	13.77	607.7	608.34	608.74	609.82	0.053864	6.42	3	6.98	2.59
Cauce	105.00*	PF 1	13.77	607.46	608.07	608.46	609.54	0.056976	6.47	2.98	7.04	2.65
Cauce	100	PF 1	13.77	607.21	607.8	608.19	609.24	0.059479	6.45	2.98	7.11	2.69
Cauce	95.000*	PF 1	13.77	607.03	607.65	608.01	608.92	0.048505	6.05	3.19	7.26	2.45
Cauce	90.000*	PF 1	13.77	606.85	607.5	607.84	608.66	0.042466	5.81	3.34	7.42	2.31
Cauce	85.000*	PF 1	13.77	606.67	607.33	607.66	608.44	0.039552	5.68	3.45	7.71	2.24
Cauce	80	PF 1	13.77	606.49	607.14	607.46	608.24	0.040006	5.66	3.47	7.87	2.24
Cauce	75.000*	PF 1	13.77	606.51	607.13	607.4	608	0.030292	4.77	3.88	8.93	1.94
Cauce	70.000*	PF 1	13.77	606.52	607.14	607.35	607.81	0.02298	4.06	4.38	10.17	1.68
Cauce	65.000*	PF 1	13.77	606.54	607.18	607.31	607.66	0.016277	3.41	5.1	11.73	1.41
Cauce	60	PF 1	13.77	606.56	607.26	607.29	607.55	0.008858	2.65	6.57	14.14	1.05
Cauce	55.000*	PF 1	13.77	606.09	606.56	606.81	607.41	0.043644	4.36	3.71	11.79	2.17

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
Cauce	50.000*	PF 1	13.77	605.62	606.03	606.32	607.12	0.064838	4.86	3.26	11.65	2.59
Cauce	45.000*	PF 1	13.77	605.15	605.53	605.82	606.75	0.080527	5.1	3.06	11.75	2.84
Cauce	40	PF 1	13.77	604.68	605.04	605.34	606.31	0.091949	5.2	2.97	12.06	3
Cauce	35.000*	PF 1	13.77	604.4	604.84	605.13	605.89	0.057379	4.76	3.32	11.18	2.46
Cauce	30.000*	PF 1	13.77	604.12	604.64	604.92	605.62	0.044295	4.67	3.49	10.37	2.22
Cauce	25.000*	PF 1	13.77	603.84	604.43	604.73	605.42	0.038409	4.78	3.62	10.32	2.12
Cauce	20	PF 1	13.77	603.56	604.2	604.47	605.22	0.039956	5.14	3.97	14.05	2.18

Tabla 11.- Resultados caudal de avenida extrema barranco. Fuente: HEC-RAS.

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
Cauce	1040	PF 2	71.51	631.79	632.58	632.83	633.38	0.028539	5.45	18.97	36.57	1.96
Cauce	1035.00*	PF 2	71.51	631.78	632.63	632.81	633.21	0.017058	4.44	22.73	40.29	1.53
Cauce	1030.00*	PF 2	71.51	631.77	632.7	632.76	633.1	0.00964	3.55	27.99	45.34	1.17
Cauce	1025.00*	PF 2	71.51	631.75	632.64	632.7	633.05	0.010255	3.52	27.37	45.52	1.2
Cauce	1020	PF 2	71.51	631.74	632.83	632.67	632.92	0.002118	1.84	59.67	100.19	0.56
Cauce	1016.00*	PF 2	71.51	631.73	632.83	632.62	632.91	0.002013	1.8	61.13	100.04	0.55
Cauce	1012.00*	PF 2	71.51	631.72	632.82	632.6	632.9	0.001893	1.75	62.82	100.09	0.53
Cauce	1008.00*	PF 2	71.51	631.7	632.82	632.57	632.89	0.001774	1.7	64.59	100.36	0.52
Cauce	1004.00*	PF 2	71.51	631.69	632.82	632.53	632.88	0.001655	1.64	66.49	100.8	0.5
Cauce	1000	PF 2	71.51	631.68	632.81	632.5	632.88	0.001535	1.58	68.53	101.37	0.48
Cauce	995.00*	PF 2	71.51	631.61	632.8	632.49	632.87	0.001382	1.55	69.08	99.25	0.46
Cauce	990.00*	PF 2	71.51	631.54	632.8	632.55	632.86	0.001217	1.51	70.57	98.03	0.44
Cauce	985.00*	PF 2	71.51	631.47	632.46	632.46	632.82	0.006612	3.01	29.23	40.62	0.98
Cauce	979.9999	PF 2	71.51	631.4	632.24	632.37	632.76	0.011476	3.54	23.96	38.06	1.25



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
Cauce	975.00*	PF 2	71.51	631.25	632	632.21	632.67	0.01944	4.17	22.56	55.81	1.59
Cauce	970.00*	PF 2	71.51	631.1	631.95	632.15	632.57	0.015956	4.02	23.49	55.01	1.46
Cauce	965.00*	PF 2	71.51	630.95	631.85	632.08	632.49	0.01626	4.1	23.2	54.65	1.47
Cauce	960	PF 2	71.51	630.8	631.68	631.91	632.38	0.022202	4.44	21.7	49.06	1.69
Cauce	955.00*	PF 2	71.51	630.83	632.01	631.87	632.19	0.003638	2.38	42.96	67.67	0.73
Cauce	950.00*	PF 2	71.51	630.85	632	631.82	632.16	0.003213	2.27	45.17	68.47	0.69
Cauce	945.00*	PF 2	71.51	630.88	632	631.78	632.14	0.002883	2.16	47.23	68.99	0.66
Cauce	940	PF 2	71.51	630.91	632	631.74	632.12	0.002624	2.04	49.14	69.24	0.63
Cauce	935.00*	PF 2	71.51	630.89	631.95	631.79	632.11	0.003608	2.34	44.14	67.51	0.73
Cauce	930.00*	PF 2	71.51	630.88	631.88	631.8	632.08	0.005097	2.68	39.5	66.6	0.86
Cauce	925.00*	PF 2	71.51	630.86	631.85	631.8	632.05	0.005355	2.72	39.5	68.28	0.88
Cauce	920	PF 2	71.51	630.84	631.85	631.77	632.02	0.004382	2.47	42.43	68.14	0.8
Cauce	915.00*	PF 2	71.51	630.77	631.7	631.7	631.98	0.007597	3.05	33.27	57.95	1.03
Cauce	910.00*	PF 2	71.51	630.69	631.59	631.64	631.93	0.009427	3.28	30.37	55.8	1.14
Cauce	905.00*	PF 2	71.51	630.62	631.48	631.56	631.87	0.01074	3.4	28.55	53.85	1.21
Cauce	900	PF 2	71.51	630.54	631.36	631.47	631.81	0.012589	3.51	26.56	50.79	1.29
Cauce	895.00*	PF 2	71.51	630.48	631.39	631.42	631.73	0.008566	3.08	30.06	51.56	1.08
Cauce	890.00*	PF 2	71.51	630.43	631.36	631.37	631.68	0.007508	2.93	31.19	51.15	1.02
Cauce	885.00*	PF 2	71.51	630.37	631.28	631.32	631.63	0.008914	3.09	29.31	50.08	1.1
Cauce	879.9999	PF 2	71.51	630.32	631.26	631.27	631.58	0.007629	2.92	30.76	50.03	1.02
Cauce	875.00*	PF 2	71.51	630.24	631.12	631.2	631.53	0.010591	3.29	27.24	47.32	1.19
Cauce	870.00*	PF 2	71.51	630.16	631.03	631.12	631.47	0.011689	3.43	26.05	45.28	1.25
Cauce	865.00*	PF 2	71.51	630.09	630.94	631.04	631.4	0.012333	3.52	25.34	43.65	1.28
Cauce	859.9999	PF 2	71.51	630.01	630.86	630.97	631.34	0.012883	3.6	24.73	42.13	1.31
Cauce	855.00*	PF 2	71.51	629.91	630.77	630.89	631.27	0.012417	3.65	24.55	40.79	1.3

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
Cauce	850.00*	PF 2	71.51	629.81	630.67	630.8	631.2	0.013253	3.78	23.76	39.81	1.34
Cauce	845.00*	PF 2	71.51	629.71	630.57	630.72	631.13	0.013991	3.88	23.25	39.53	1.38
Cauce	839.9999	PF 2	71.51	629.61	630.47	630.63	631.06	0.014877	3.96	22.74	39.22	1.42
Cauce	835.00*	PF 2	71.51	629.44	630.39	630.55	630.98	0.013691	4.09	22.99	38.08	1.38
Cauce	830.00*	PF 2	71.51	629.28	630.31	630.48	630.92	0.012868	4.25	23.22	37.08	1.36
Cauce	825.00*	PF 2	71.51	629.12	630.24	630.41	630.85	0.012762	4.52	23.52	37.55	1.38
Cauce	820	PF 2	71.51	628.95	630.1	630.3	630.77	0.016504	5.24	22.46	39.22	1.58
Cauce	815.00*	PF 2	71.51	628.92	629.96	630.18	630.68	0.019708	5.34	21.28	38.55	1.69
Cauce	810.00*	PF 2	71.51	628.9	629.83	630.06	630.57	0.02276	5.35	20.41	38.09	1.79
Cauce	805.00*	PF 2	71.51	628.87	629.71	629.94	630.45	0.025285	5.23	19.87	37.89	1.85
Cauce	799.9999	PF 2	71.51	628.84	630.17	629.81	630.32	0.002319	2.17	43.59	44.01	0.61
Cauce	795.00*	PF 2	71.51	628.72	629.94	629.94	630.28	0.006848	3.49	30.43	42.79	1.02
Cauce	790.00*	PF 2	71.51	628.59	629.69	629.8	630.22	0.010777	4.01	23.93	33.62	1.26
Cauce	785.00*	PF 2	71.51	628.47	629.44	629.64	630.14	0.016314	4.49	21.12	34.44	1.51
Cauce	780	PF 2	71.51	628.35	629.22	629.47	630.03	0.022153	4.78	19.6	36.29	1.72
Cauce	775.00*	PF 2	71.51	628.15	629.12	629.37	629.93	0.018676	4.79	20.06	34.55	1.62
Cauce	770.00*	PF 2	71.51	627.95	629.01	629.26	629.84	0.017266	4.92	20.05	32.96	1.58
Cauce	765.00*	PF 2	71.51	627.75	628.88	629.15	629.74	0.017651	5.19	19.8	32.42	1.61
Cauce	759.9999	PF 2	71.51	627.55	628.64	628.94	629.63	0.023123	5.8	18.52	32.88	1.83
Cauce	755.00*	PF 2	71.51	627.52	628.64	628.9	629.48	0.018688	5.36	20.23	35.05	1.66
Cauce	750.00*	PF 2	71.51	627.49	628.62	628.84	629.37	0.016299	5.07	21.6	37.39	1.56
Cauce	745.00*	PF 2	71.51	627.46	628.57	628.78	629.28	0.015433	4.91	22.45	39.67	1.51
Cauce	739.9999	PF 2	71.51	627.43	628.49	628.72	629.2	0.01595	4.88	22.7	42.2	1.53
Cauce	735.00*	PF 2	71.51	627.28	628.33	628.57	629.11	0.017111	4.99	21.76	41.48	1.58
Cauce	730.00*	PF 2	71.51	627.14	628.12	628.43	629.01	0.020233	5.16	19.51	34.52	1.7



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
Cauce	725.00*	PF 2	71.51	626.99	627.93	628.28	628.89	0.022716	5.27	18.54	33.01	1.78
Cauce	719.9999	PF 2	71.51	626.85	627.75	628.12	628.76	0.025194	5.33	17.79	32	1.86
Cauce	715.00*	PF 2	71.51	626.57	627.7	627.98	628.64	0.017345	5.22	19.94	35.23	1.61
Cauce	710.00*	PF 2	71.51	626.3	627.53	627.85	628.54	0.017267	5.57	19.71	34.17	1.63
Cauce	705.00*	PF 2	71.51	626.03	627.25	627.62	628.43	0.021866	6.26	18.15	32.06	1.83
Cauce	699.9999	PF 2	71.51	625.75	626.9	627.27	628.27	0.033757	7.34	16.51	32.85	2.24
Cauce	695.00*	PF 2	71.51	625.52	626.82	627.21	628.1	0.024962	6.87	17.16	29.11	1.97
Cauce	690.00*	PF 2	71.51	625.29	626.63	627.04	627.97	0.02403	6.83	16.26	24.24	1.94
Cauce	685.00*	PF 2	71.51	625.05	626.39	626.85	627.84	0.025188	6.91	15.27	21.06	1.98
Cauce	680	PF 2	71.51	624.82	626.14	626.62	627.7	0.027099	7.05	14.55	19.58	2.04
Cauce	675.00*	PF 2	71.51	624.76	625.76	626.26	627.52	0.035722	6.74	13.59	22.04	2.24
Cauce	670.00*	PF 2	71.51	624.71	625.48	625.98	627.31	0.04856	6.57	13.01	25.08	2.5
Cauce	665.00*	PF 2	71.51	624.65	625.29	625.75	627.01	0.059423	6.27	13.09	28.85	2.67
Cauce	659.9999	PF 2	71.51	624.59	625.16	625.54	626.63	0.063105	5.78	13.96	34.73	2.67
Cauce	655.00*	PF 2	71.51	624.51	625.17	625.49	626.29	0.036892	5.1	16.34	35.51	2.12
Cauce	650.00*	PF 2	71.51	624.43	625.18	625.45	626.07	0.024278	4.61	18.55	35.77	1.77
Cauce	645.00*	PF 2	71.51	624.36	625.21	625.42	625.91	0.01687	4.17	21.05	36.87	1.5
Cauce	639.9999	PF 2	71.51	624.28	625.23	625.39	625.8	0.013938	3.9	23.21	39.67	1.38
Cauce	635.00*	PF 2	71.51	624.19	625.16	625.31	625.73	0.013521	3.86	23.05	38.09	1.36
Cauce	630.00*	PF 2	71.51	624.11	625.07	625.23	625.66	0.014039	3.88	22.68	37.6	1.38
Cauce	625.00*	PF 2	71.51	624.02	624.98	625.15	625.59	0.014912	3.93	22.25	37.62	1.41
Cauce	620	PF 2	71.51	623.93	624.89	625.06	625.51	0.015531	3.95	22.05	38.02	1.44
Cauce	615.00*	PF 2	71.51	623.93	624.86	625.01	625.42	0.013251	3.74	23.27	38.75	1.34
Cauce	610.00*	PF 2	71.51	623.92	624.83	624.95	625.34	0.011655	3.56	24.4	39.7	1.26
Cauce	605.00*	PF 2	71.51	623.91	624.77	624.89	625.28	0.011913	3.55	24.35	40.16	1.27



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
Cauce	600	PF 2	71.51	623.91	624.72	624.84	625.22	0.012259	3.54	24.34	40.96	1.28
Cauce	595.00*	PF 2	71.51	623.84	624.74	624.8	625.15	0.008639	3.21	27.21	41.93	1.1
Cauce	590.00*	PF 2	71.51	623.78	624.73	624.76	625.11	0.007313	3.09	28.7	42.64	1.02
Cauce	585.00*	PF 2	71.51	623.71	624.71	624.72	625.06	0.006317	2.98	30.16	43.32	0.96
Cauce	579.9999	PF 2	71.51	623.64	624.62	624.68	625.02	0.007769	3.23	28.14	43.05	1.05
Cauce	575.00*	PF 2	71.51	623.44	624.34	624.51	624.95	0.012902	3.86	23.04	40.06	1.33
Cauce	570.00*	PF 2	71.51	623.23	624.12	624.35	624.86	0.017483	4.2	20.42	36.43	1.53
Cauce	565.00*	PF 2	71.51	623.03	623.9	624.18	624.75	0.023037	4.44	18.59	34	1.72
Cauce	559.9999	PF 2	71.51	622.83	623.73	624.01	624.63	0.027376	4.52	17.79	33.78	1.84
Cauce	555.00*	PF 2	71.51	622.66	623.72	623.95	624.46	0.019745	4.14	19.74	34.6	1.59
Cauce	550.00*	PF 2	71.51	622.49	623.7	623.89	624.35	0.015594	3.91	21.26	35.28	1.43
Cauce	545.00*	PF 2	71.51	622.32	623.66	623.83	624.27	0.013333	3.78	22.31	35.83	1.34
Cauce	539.9999	PF 2	71.51	622.15	623.6	623.76	624.2	0.012668	3.79	22.52	35.82	1.31
Cauce	535.00*	PF 2	71.51	622.14	623.66	623.73	624.11	0.008426	3.36	26.27	38.78	1.1
Cauce	530.00*	PF 2	71.51	622.13	623.65	623.69	624.06	0.007441	3.25	27.72	40.05	1.04
Cauce	525.00*	PF 2	71.51	622.12	623.57	623.64	624.02	0.008491	3.42	26.67	39.74	1.1
Cauce	519.9999	PF 2	71.51	622.11	623.49	623.59	623.97	0.009696	3.58	25.66	39.37	1.17
Cauce	515.00*	PF 2	71.51	621.97	623.4	623.52	623.92	0.009106	3.8	25.56	38.52	1.16
Cauce	510.00*	PF 2	71.51	621.84	623.33	623.47	623.87	0.008451	4.01	25.84	37.95	1.15
Cauce	505.00*	PF 2	71.51	621.7	623.28	623.42	623.83	0.008011	4.25	26.3	37.51	1.14
Cauce	499.9999	PF 2	71.51	621.56	623.23	623.37	623.79	0.008651	4.69	26.1	37.03	1.2
Cauce	495.00*	PF 2	71.51	621.51	623.1	623.28	623.73	0.010109	5.01	24.64	35.93	1.29
Cauce	490.00*	PF 2	71.51	621.46	622.99	623.2	623.67	0.011546	5.29	23.5	35.03	1.38
Cauce	485.00*	PF 2	71.51	621.41	622.88	623.1	623.61	0.012944	5.52	22.62	34.3	1.46
Cauce	480	PF 2	71.51	621.36	622.77	623.01	623.53	0.014537	5.73	21.81	33.64	1.54



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
Cauce	475.00*	PF 2	71.51	621.16	622.63	622.88	623.45	0.015086	5.94	21.37	33.44	1.57
Cauce	470.00*	PF 2	71.51	620.95	622.97	622.75	623.18	0.002867	3.16	40.47	45.22	0.72
Cauce	465.00*	PF 2	71.51	620.75	623.02	622.65	623.14	0.001542	2.46	50.2	47.71	0.53
Cauce	460	PF 2	71.51	620.54	622.21	622.21	623.06	0.015246	6.04	21.94	36.93	1.56
Cauce	455.00*	PF 2	71.51	620.51	622.11	622.39	622.98	0.01477	5.94	21.91	37.77	1.55
Cauce	450.00*	PF 2	71.51	620.48	622	622.3	622.9	0.014764	5.87	21.69	36.65	1.55
Cauce	445.00*	PF 2	71.51	620.44	621.89	622.2	622.83	0.015127	5.84	21.34	36.49	1.57
Cauce	439.9999	PF 2	71.51	620.41	621.79	622.1	622.75	0.015659	5.8	20.99	36.4	1.59
Cauce	435.00*	PF 2	71.51	620.33	621.68	622	622.66	0.016873	5.94	20.54	35.83	1.64
Cauce	430.00*	PF 2	71.51	620.24	621.57	621.89	622.57	0.018403	6.09	20.01	35.14	1.7
Cauce	425.00*	PF 2	71.51	620.15	621.45	621.78	622.47	0.020258	6.22	19.41	34.26	1.78
Cauce	419.9999	PF 2	71.51	620.07	621.33	621.65	622.36	0.022391	6.33	18.79	33.31	1.85
Cauce	415.00*	PF 2	71.51	619.76	621.18	621.5	622.26	0.019741	6.3	19.05	32.67	1.76
Cauce	410.00*	PF 2	71.51	619.45	621.02	621.36	622.15	0.017965	6.28	19.07	31.85	1.69
Cauce	405.00*	PF 2	71.51	619.13	620.85	621.23	622.06	0.016748	6.29	18.91	30.94	1.64
Cauce	399.9999	PF 2	71.51	618.82	620.68	621.07	621.97	0.016006	6.32	18.53	29.9	1.6
Cauce	395.00*	PF 2	71.51	618.91	620.55	620.94	621.88	0.01934	6.53	17.92	30.35	1.75
Cauce	390.00*	PF 2	71.51	619	620.41	620.8	621.77	0.023949	6.73	17.24	30.72	1.92
Cauce	385.00*	PF 2	71.51	619.1	620.27	620.66	621.63	0.030274	6.89	16.52	31.11	2.12
Cauce	379.9999	PF 2	71.51	619.19	620.13	620.51	621.45	0.037825	6.87	15.89	31.43	2.3
Cauce	375.00*	PF 2	71.51	618.89	619.93	620.32	621.28	0.032407	6.9	16.51	30.79	2.18
Cauce	370.00*	PF 2	71.51	618.58	619.71	620.12	621.12	0.029381	6.97	16.76	29.59	2.1
Cauce	365.00*	PF 2	71.51	618.28	619.46	619.92	620.96	0.02882	7.13	16.42	26.81	2.1
Cauce	359.9999	PF 2	71.51	617.97	619.14	619.69	620.8	0.031814	7.43	15.38	22.92	2.2
Cauce	355.00*	PF 2	71.51	617.85	618.93	619.49	620.63	0.033071	7.2	14.97	22.67	2.22



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
Cauce	350.00*	PF 2	71.51	617.74	618.73	619.21	620.46	0.035526	7.05	14.57	22.69	2.27
Cauce	345.00*	PF 2	71.51	617.63	618.53	619.06	620.27	0.038315	6.93	14.32	23.22	2.32
Cauce	340	PF 2	71.51	617.51	618.35	618.85	620.07	0.040876	6.79	14.2	23.93	2.37
Cauce	335.00*	PF 2	71.51	617.16	618.04	618.56	619.86	0.039714	6.85	13.74	22.04	2.35
Cauce	330.00*	PF 2	71.51	616.81	617.72	618.26	619.64	0.040628	6.97	13.31	21.02	2.38
Cauce	325.00*	PF 2	71.51	616.47	617.39	617.96	619.42	0.042781	7.1	12.88	20.31	2.43
Cauce	319.9999	PF 2	71.51	616.12	617.07	617.65	619.19	0.046033	7.23	12.45	19.57	2.51
Cauce	315.00*	PF 2	71.51	616.02	616.98	617.55	618.93	0.038355	6.84	12.81	18.3	2.31
Cauce	310.00*	PF 2	71.51	615.91	616.89	617.42	618.71	0.034991	6.57	13.19	18.38	2.21
Cauce	305.00*	PF 2	71.51	615.81	616.8	617.31	618.5	0.033328	6.34	13.62	19.15	2.15
Cauce	299.9999	PF 2	71.51	615.7	616.73	617.21	618.3	0.032921	6.14	14.18	20.86	2.13
Cauce	295.00*	PF 2	71.51	615.55	616.66	617.12	618.12	0.026936	6.05	15.17	21.34	1.97
Cauce	290.00*	PF 2	71.51	615.4	616.59	617.03	617.97	0.023946	6.11	16.18	23.06	1.88
Cauce	285.00*	PF 2	71.51	615.24	616.47	616.9	617.85	0.024583	6.43	16.75	24.94	1.93
Cauce	280	PF 2	71.51	615.09	616.31	616.74	617.71	0.028612	7.01	16.78	26.18	2.08
Cauce	275.00*	PF 2	71.51	614.9	616.22	616.63	617.56	0.02526	7.01	17.51	26.48	1.99
Cauce	270.00*	PF 2	71.51	614.7	616.11	616.52	617.43	0.023295	7.11	18.03	26.59	1.94
Cauce	265.00*	PF 2	71.51	614.51	616.01	616.41	617.32	0.02243	7.31	18.32	26.52	1.92
Cauce	259.9999	PF 2	71.51	614.31	615.9	616.3	617.2	0.022209	7.58	18.49	26.33	1.93
Cauce	255.00*	PF 2	71.51	613.99	615.7	616.13	617.09	0.020643	7.59	18.21	24.77	1.88
Cauce	250.00*	PF 2	71.51	613.67	615.49	615.95	616.98	0.019605	7.63	17.91	23.67	1.84
Cauce	245.00*	PF 2	71.51	613.34	615.27	615.76	616.87	0.018905	7.69	17.54	22.63	1.82
Cauce	240	PF 2	71.51	613.02	615.05	615.57	616.76	0.018473	7.77	17.07	21.53	1.8
Cauce	235.00*	PF 2	71.51	612.77	614.83	615.4	616.66	0.017335	7.66	16.51	20.33	1.76
Cauce	230.00*	PF 2	71.51	612.53	614.48	615.2	616.55	0.019426	7.83	14.21	14.02	1.85



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
Cauce	225.00*	PF 2	71.51	612.28	614.09	614.95	616.42	0.023138	8.11	12.93	12.42	1.99
Cauce	219.9999	PF 2	71.51	612.03	615.37	614.35	615.57	0.00111	2.73	48.17	32.99	0.49
Cauce	215.00*	PF 2	71.51	612.33	615.33	614.8	615.56	0.001487	2.95	44.51	33.28	0.55
Cauce	210.00*	PF 2	71.51	612.63	615.28	614.91	615.55	0.002059	3.21	40.8	33.56	0.64
Cauce	205.00*	PF 2	71.51	612.92	615.22	614.99	615.53	0.003012	3.53	36.88	33.96	0.76
Cauce	200	PF 2	71.51	613.22	615.05	615.05	615.5	0.005786	4.23	30.01	32.42	1.01
Cauce	195.00*	PF 2	71.51	612.96	614.32	614.66	615.39	0.016621	5.85	18.88	23.61	1.63
Cauce	190.00*	PF 2	71.51	612.69	613.86	614.3	615.26	0.024617	6.37	16.24	22.57	1.93
Cauce	185.00*	PF 2	71.51	612.42	613.45	613.94	615.09	0.032975	6.69	14.67	22.17	2.17
Cauce	180	PF 2	71.51	612.16	613.08	613.61	614.89	0.041437	6.88	13.76	22.62	2.39
Cauce	175.00*	PF 2	71.51	611.67	612.74	613.3	614.68	0.035917	7.17	13.67	20.7	2.28
Cauce	170.00*	PF 2	71.51	611.18	612.42	613.02	614.5	0.031886	7.55	13.76	19.69	2.21
Cauce	165.00*	PF 2	71.51	610.69	612.14	612.77	614.33	0.029599	8.1	14.04	19.4	2.19
Cauce	159.9999	PF 2	71.51	610.2	611.89	612.52	614.17	0.031352	9.1	14.31	19.75	2.3
Cauce	155.00*	PF 2	71.51	610.11	611.61	612.25	614	0.034595	8.94	13.67	19.22	2.38
Cauce	150.00*	PF 2	71.51	610.02	611.34	611.99	613.8	0.039682	8.86	13.05	18.85	2.5
Cauce	145.00*	PF 2	71.51	609.94	611.08	611.73	613.58	0.046639	8.8	12.47	18.61	2.65
Cauce	140	PF 2	71.51	609.85	610.83	611.47	613.33	0.055442	8.71	11.97	18.51	2.82
Cauce	135.00*	PF 2	71.51	609.44	610.57	611.23	613.08	0.04626	8.79	12.35	17.88	2.64
Cauce	130.00*	PF 2	71.51	609.02	610.31	610.99	612.86	0.040969	8.98	12.56	17.27	2.54
Cauce	125.00*	PF 2	71.51	608.6	610.04	610.75	612.65	0.038197	9.29	12.65	16.63	2.49
Cauce	120	PF 2	71.51	608.19	609.77	610.51	612.46	0.037689	9.77	12.67	16.23	2.51
Cauce	115.00*	PF 2	71.51	607.94	609.51	610.27	612.26	0.038139	9.85	12.4	15.42	2.53
Cauce	110.00*	PF 2	71.51	607.7	609.24	610.04	612.06	0.039464	9.95	12.02	14.34	2.57
Cauce	105.00*	PF 2	71.51	607.46	608.95	609.79	611.85	0.041676	10.07	11.58	13.2	2.63



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
Cauce	100	PF 2	71.51	607.21	608.67	609.54	611.63	0.044175	10.19	11.24	12.5	2.7
Cauce	95.000*	PF 2	71.51	607.03	608.49	609.37	611.39	0.04299	10.09	11.42	12.8	2.66
Cauce	90.000*	PF 2	71.51	606.85	608.32	609.15	611.16	0.042396	10.03	11.62	13.33	2.64
Cauce	85.000*	PF 2	71.51	606.67	608.12	608.92	610.94	0.042808	10	11.68	13.62	2.65
Cauce	80	PF 2	71.51	606.49	607.92	608.73	610.72	0.043137	9.96	11.7	13.76	2.66
Cauce	75.000*	PF 2	71.51	606.51	607.84	608.6	610.46	0.039452	9.03	12.06	14.76	2.51
Cauce	70.000*	PF 2	71.51	606.52	607.77	608.49	610.21	0.037937	8.39	12.38	15.96	2.43
Cauce	65.000*	PF 2	71.51	606.54	607.71	608.37	609.97	0.036812	7.86	12.8	17.53	2.36
Cauce	60	PF 2	71.51	606.56	607.67	608.26	609.73	0.035658	7.38	13.35	19.53	2.29
Cauce	55.000*	PF 2	71.51	606.09	607.13	607.79	609.5	0.043552	7.77	12.08	17.42	2.51
Cauce	50.000*	PF 2	71.51	605.62	606.59	607.28	609.24	0.051181	8.08	11.33	16.93	2.69
Cauce	45.000*	PF 2	71.51	605.15	606.07	606.78	608.94	0.059172	8.34	10.75	16.62	2.86
Cauce	40	PF 2	71.51	604.68	605.55	606.28	608.6	0.067528	8.54	10.32	16.51	3.02
Cauce	35.000*	PF 2	71.51	604.4	605.39	606.1	608.24	0.054058	8.37	10.95	16.34	2.77
Cauce	30.000*	PF 2	71.51	604.12	605.22	605.96	607.95	0.047586	8.43	11.57	17.04	2.64
Cauce	25.000*	PF 2	71.51	603.84	605	605.69	607.7	0.048949	8.81	12.05	18.74	2.7
Cauce	19.99999	PF 2	71.51	603.56	604.65	605.28	607.42	0.064682	9.69	12.16	21.93	3.07

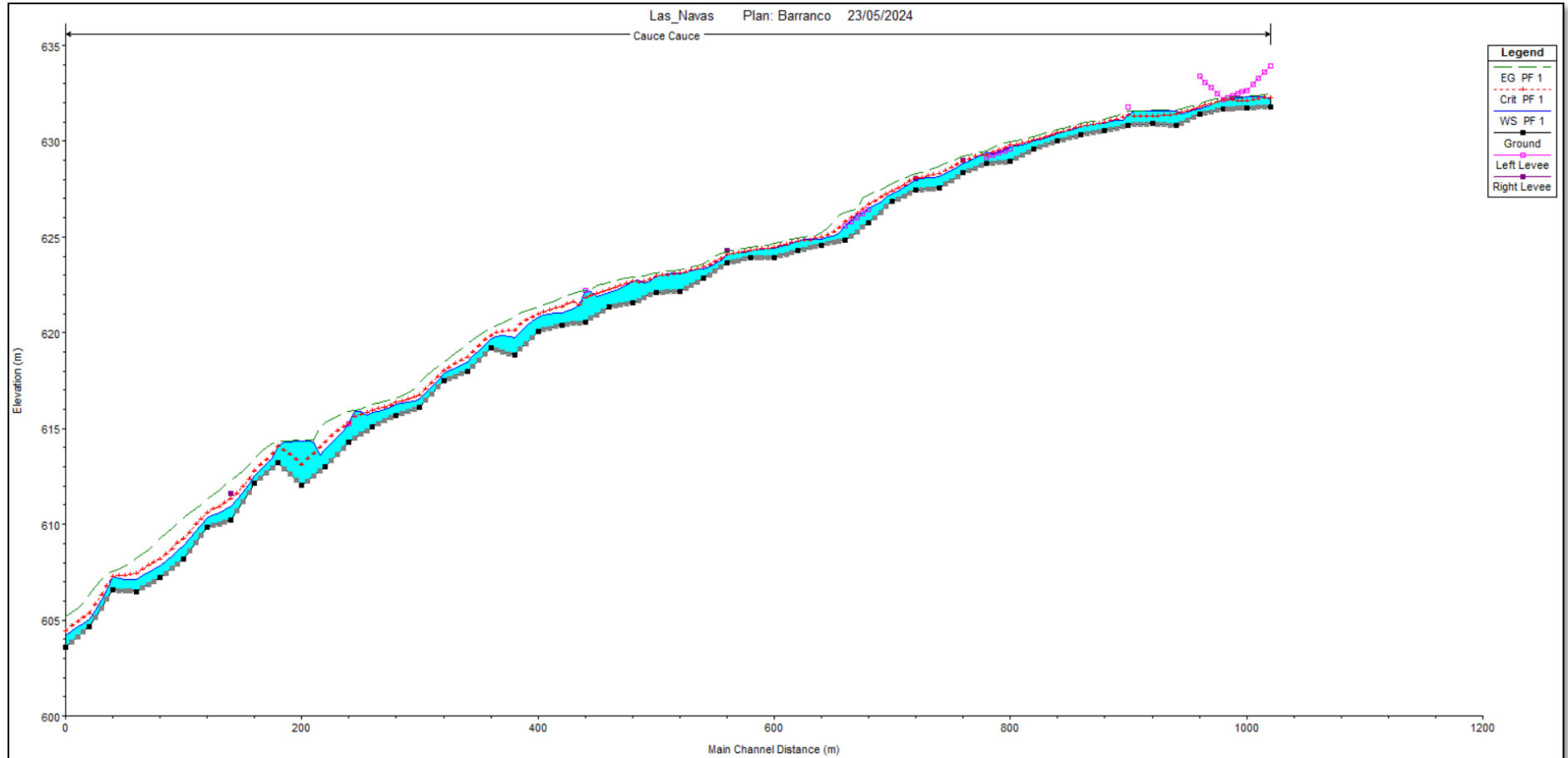


Figura 48.- Perfil longitudinal caudal de proyecto barranco. Fuente: HEC-RAS.

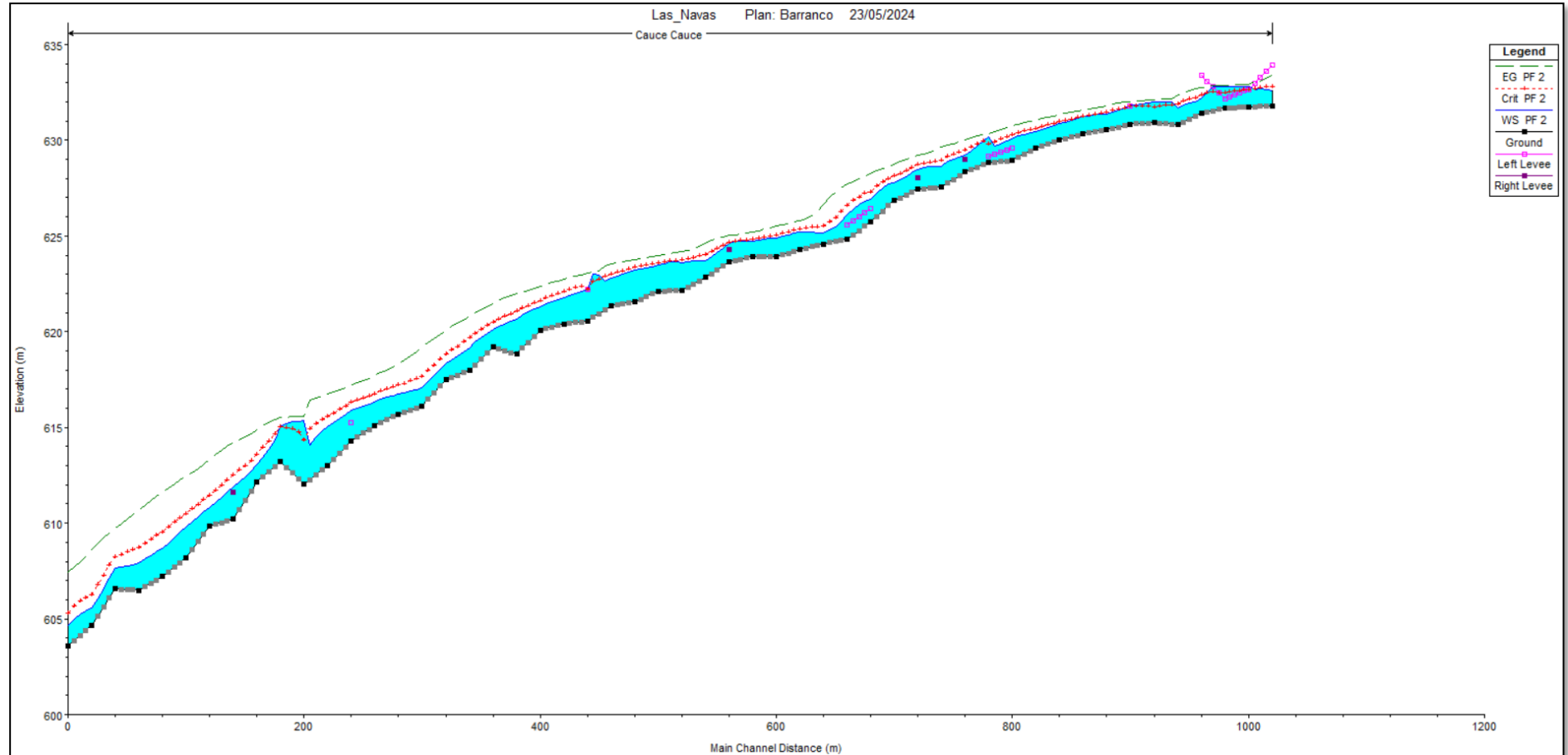


Figura 49.- Perfil longitudinal caudal de avenida extrema barranco. Fuente: HEC-RAS.