TABLES

Table 3.1 Water Quality Conditions in the Study Area (1/7)

(St. 1) Daule Peripa Reservoir

Item	Date / Unit	1989 Average	1990 Average	1991 Average	1991 Nov. 23	1992 July 16	1993 Nov.	1994 Jan	1994 Jun	1994 Ago	Ave.
1)W. Temp	C	-	-	26.60	28.50	28.20	25.80	27.70	26.10	26.20	27.00
2)pH	-	-	-	6.80	8.50	7.50	7.30	7.46	7.00	7.43	7.43
3)EC	um/cm	-	-	125.00	-	87.00	117.00	182.33	189.00	196.66	149.50
4)DO	mg/l	-	-	2.80	4.60	5.60	0.00	0.00	0.00	0.00	1.86
5)DSS	mg/l	-	-	-	-	-	114.00	114.80	140.00	188.33	139.28
6)TSS	mg/l	-	-	-	160.00	-	120.00	10.00	120.00	128.00	107.60
7)BOD	mg/l	-	-	-	8.80	5.50	13.10	12.66	22.00	21.66	13.95
8)COD	mg/l	-	-	-	15.00	11.50	60.00	17.00	37.00	35.00	29.25
9)NH4-N	mg/l	-	-	0.19	0.10	0.07	1.00	0.97	0.60	0.50	0.49
10)NO2-N	mg/l	-	-	-	0.01	0.01	-	-	-	-	0.01
11)NO3-N	mg/l	-	-	-	0.40	0.28	2.10	0.83	1.20	1.33	1.02
12)T-N	mg/l	0.49	0.41	-	1.00	0.70	5.10	3.16	2.00	1.20	1.76
13)T-P	mg/l	0.11	0.11	0.05	0.13	0.09	0.15	0.16	0.40	0.20	0.16

note: Water quality data on Nov. 1991 and July 1992 are obtained by the water quality survey in the FS phase of this Project
Water quality data on Jun. 1994 and Agos. 1994 are obtained by the water quality survey in this Study at Conguillo Inlet

(St. 2) La Esperanza, Carrizal R.

Item	Date / Unit	1988 Mar. 16	1988 Apr. 27	1988 Jun. 16	1991 Nov. 21	1992 July 15	1993 Nov.	1994 Jan	1994 Jun	1994 Ago	Ave.
1)W. Temp	C	-	-	-	27.00	27.30	26.20	27.60	28.40	28.00	27.40
2)pH	-	-	-	-	7.60	7.20	7.40	7.40	7.30	7.50	7.40
3)EC	um/cm	-	-	-	-	400.00	573.00	509.66	480.00	620.66	516.66
4)DO	mg/l	-	-	-	6.80	9.20	6.60	6.00	8.06	5.23	6.98
5)DSS	mg/l	-	-	-	-	-	374.00	338.33	330.00	440.33	370.67
6)TSS	mg/l	-	-	-	430.00	-	0.00	12.50	284.00	418.33	228.97
7)BOD	mg/l	-	-	-	2.40	3.50	8.30	10.66	16.30	10.00	8.53
8)COD	mg/l	-	-	-	6.00	6.50	10.60	16.33	26.00	15.33	13.46
9)NH4-N	mg/l	-	-	-	0.18	0.22	0.75	1.80	0.70	1.06	0.78
10)NO2-N	mg/l	-	-	-	0.00	0.00	-	-	-	-	-
11)NO3-N	mg/l	-	-	-	1.00	1.20	2.10	0.61	1.20	1.36	1.25
12)T-N	mg/l	-	-	-	2.00	2.40	4.08	4.04	2.00	1.30	2.63
13)T-P	mg/l	-	-	-	0.18	0.22	0.26	0.14	0.30	0.16	0.21

(St. 3) Tosagua

Item	Date / Unit	1988 Mar. 16	1988 Apr. 27	1988 Jun. 16	1991 Nov. 21	1992 July 15	1993 Nov.	1994 Jan	1994 Jun	1994 Ago	Ave.
1)W. Temp	C	-	-	-	-	-	26.40	27.80	28.70	27.80	27.70
2)pH	-	-	-	-	-	-	6.60	7.46	7.26	7.73	7.26
3)EC	um/cm	-	-	-	-	-	1,200.00	460.00	875.00	100.00	883.75
4)DO	mg/l	-	-	-	-	-	8.00	6.93	7.43	5.83	7.05
5)DSS	mg/l	-	-	-	-	-	777.00	302.66	670.00	700.00	612.41
6)TSS	mg/l	-	-	-	-	-	0.00	26.66	596.00	678.00	325.17
7)BOD	mg/l	-	-	-	-	-	4.00	10.00	12.30	10.00	9.06
8)COD	mg/l	-	-	-	-	-	6.00	15.00	18.00	17.00	14.00
9)NH4-N	mg/l	-	-	-	-	-	0.86	0.85	1.16	1.23	1.03
10)NO2-N	mg/l	-	-	-	-	-	-	-	-	-	-
11)NO3-N	mg/l	-	-	-	-	-	1.50	0.66	1.66	1.56	1.35
12)T-N	mg/l	-	-	-	-	-	3.46	3.04	1.70	1.70	2.48
13)T-P	mg/l	-	-	-	-	-	0.40	0.15	0.13	0.26	0.24

Table 3.1 Water Quality Conditions in the Study Area (2/7)

(St. 4) Bachillero, Carrizal R.

Item	Date / Unit	1988 Mar. 16	1988 Apr. 27	1988 Jun. 15	1991 Nov. 21	1992 July 15	1993 Nov.	1994 Jan	1994 Jun	1994 Ago	Ave.
1)W. Temp	C	30.00	30.50	27.00	29.00	30.40	27.60	26.20	28.20	26.90	28.40
2)pH	-	7.90	7.50	7.80	8.80	7.40	7.40	7.53	7.30	7.80	7.71
3)EC	um/cm	471.00	465.00	750.00	-	750.00	1,267.00	470.00	914	1,334.66	802.71
4)DO	mg/l	6.80	6.90	7.40	7.40	6.80	5.30	7.13	7.13	5.26	6.68
5)DSS	mg/l	424.00	418.00	675.00	-	-	780.00	316.33	680.00	868.33	594.52
6)TSS	mg/l	434.00	433.00	715.00	1,800.00	-	0.00	25.00	611.00	849.66	608.46
7)BOD	mg/l	6.00	7.00	2.30	8.80	3.00	7.00	8.00	11.66	14.00	7.53
8)COD	mg/l	-	-	-	15.00	8.00	12.00	15.66	22.30	21.33	15.72
9)NH4-N	mg/l	0.26	0.20	0.45	0.22	0.09	0.80	0.67	0.70	0.73	0.46
10)NO2-N	mg/l	0.00	0.00	0.01	0.00	0.00	-	-	-	-	-
11)NO3-N	mg/l	0.00	1.00	-	0.70	0.28	3.10	0.66	2.00	0.90	1.08
12)T-N	mg/l	-	-	-	1.00	0.40	5.10	2.56	1.30	1.10	1.91
13)T-P	mg/l	0.42	0.43	0.43	0.29	0.12	0.30	0.20	0.20	0.30	0.30

(St. 5) H. Saida, Chone R.

Item	Date / Unit	1988 Mar. 16	1988 Apr. 26	1988 Jun. 17	1991 Nov. 21	1992 July 15	1993 Nov.	1994 Jan	1994 Jun	1994 Ago	Ave.
1)W. Temp	C	30.00	-	30.00	26.00	26.80	26.80	26.70	27.40	26.40	27.50
2)pH	-	7.90	-	8.00	7.20	7.40	7.40	7.43	7.50	8.00	7.60
3)EC	um/cm	405.00	-	532.00	-	660.00	860.00	412.33	794.00	840.00	614.76
4)DO	mg/l	7.50	-	8.10	2.00	5.60	5.00	5.06	6.76	7.66	5.96
5)DSS	mg/l	364.00	-	479.00	-	-	548.00	271.66	585.00	573.00	470.00
6)TSS	mg/l	369.00	-	494.00	1,100.00	-	0.00	306.66	521.00	555.00	477.95
7)BOD	mg/l	7.00	-	4.00	8.00	3.00	9.00	10.00	13.66	9.66	8.04
8)COD	mg/l	-	-	-	17.00	7.50	14.00	16.00	20.00	14.00	14.75
9)NH4-N	mg/l	0.18	-	0.25	0.31	0.12	0.59	0.54	0.50	0.90	0.42
10)NO2-N	mg/l	0.01	-	0.01	0.00	0.00	-	-	-	-	-
11)NO3-N	mg/l	0.70	-	-	0.70	0.28	4.00	0.96	1.56	1.63	1.40
12)T-N	mg/l	-	-	-	2.00	0.80	5.69	3.00	1.10	1.30	2.32
13)T-P	mg/l	0.35	-	0.14	0.31	0.12	0.30	0.14	0.33	0.23	0.24

(St. 6) Simbocal, Chone R. (prediction point: P-1)

Item	Date / Unit	1988 Mar. 15	1988 Apr. 7	1988 Jun. 18	1991 Nov. 21	1992 July 15	1993 Nov.	1994 Jan	1994 Jun	1994 Ago	Ave.
1)W. Temp	C	-	30.50	-	28.00	26.80	26.20	26.70	27.30	26.40	27.40
2)pH	-	-	8.10	-	8.50	7.40	7.40	7.50	7.46	8.03	7.77
3)EC	um/cm	-	16,234.00	-	-	660.00	946.60	998.66	873.00	850.00	3,426.71
4)DO	mg/l	-	7.20	-	6.40	5.60	5.33	4.00	5.90	5.50	5.70
5)DSS	mg/l	-	14,610.00	-	-	-	676.00	103.78	650.60	590.00	3,326.08
6)TSS	mg/l	-	14,640.00	-	4,000.00	-	10.00	50.00	571.00	567.00	3,306.32
7)BOD	mg/l	-	9.00	-	8.00	2.50	9.33	10.67	14.00	10.00	9.07
8)COD	mg/l	-	-	-	16.00	6.60	16.00	18.67	24.30	16.33	16.33
9)NH4-N	mg/l	-	1.65	-	0.28	0.11	0.75	0.56	0.96	0.93	0.75
10)NO2-N	mg/l	-	0.01	-	0.00	0.00	-	-	-	-	-
11)NO3-N	mg/l	-	0.20	-	0.90	0.36	2.56	0.61	1.73	1.53	1.13
12)T-N	mg/l	-	1.40	-	2.00	0.80	4.59	2.44	1.40	1.36	2.00
13)T-P	mg/l	-	0.35	-	0.21	0.08	0.39	0.25	0.20	0.22	0.24

Table 3.1 Water Quality Conditions in the Study Area (3/7)

(St. 7) Drained Water from Shrimp Pond

Item	Date / Unit	1988 Mar. 15	1988 Apr. 26	1988 Jun. 18	1991 Nov. 21	1992 July 14	1993 Nov.	1994 Jan	1994 Jun	1994 Ago	Ave.
1)W. Temp	C	-	-	-	-	27.50	26.60	27.20	27.60	26.40	27.60
2)pH	-	-	-	-	-	7.70	7.10	7.53	7.40	7.40	7.43
3)EC	um/cm	-	-	-	-	2,000.00	71,666.66	52,070.00	2,558.66	31,430.00	31,945.06
4)DO	mg/l	-	-	-	-	6.40	5.06	4.53	6.80	6.90	5.94
5)DSS	mg/l	-	-	-	-	-	40,658.30	29,456.00	1,616.66	18,117.00	22,477.00
6)TSS	mg/l	-	-	-	-	-	27.33	25.00	1,555.30	18,065.00	4,918.16
7)BOD	mg/l	-	-	-	-	13.00	15.30	9.67	23.00	22.00	16.59
8)COD	mg/l	-	-	-	-	17.50	27.30	16.00	47.30	35.30	28.68
9)NH4-N	mg/l	-	-	-	-	0.36	0.54	0.31	0.90	1.20	0.66
10)NO2-N	mg/l	-	-	-	-	0.01	-	-	-	-	-
11)NO3-N	mg/l	-	-	-	-	1.19	3.53	1.83	2.86	2.96	2.47
12)T-N	mg/l	-	-	-	-	2.64	5.63	3.34	2.43	2.23	3.25
13)T-P	mg/l	-	-	-	-	0.26	0.28	0.16	0.40	0.23	0.27

(St. 8) Punta Prieta, Estuary, Chone R. (prediction point:P-2)

Item	Date / Unit	1988 Mar. 15	1988 Apr. 7	1988 Jun. 18	1991 Nov. 21	1992 July 14	1993 Nov.	1994 Jan	1994 Jun	1994 Ago	Ave.
1)W. Temp	C	-	30.50	-	-	-	26.80	26.90	28.10	25.90	27.60
2)pH	-	-	8.00	-	-	-	6.80	7.63	7.30	7.30	7.41
3)EC	um/cm	-	51,515.00	-	-	-	64,666.60	52,130.00	34,333.00	51,233.00	50,775.52
4)DO	mg/l	-	8.30	-	-	-	3.73	4.80	6.23	5.80	5.77
5)DSS	mg/l	-	46,363.00	-	-	-	36,451.00	29,640.00	21,400.00	29,148.00	32,600.40
6)TSS	mg/l	-	46,378.00	-	-	-	38.30	40.00	21,187.00	29,127.00	19,354.06
7)BOD	mg/l	-	5.30	-	-	-	17.60	11.33	18.00	10.70	12.59
8)COD	mg/l	-	9.00	-	-	-	34.33	18.67	32.66	17.00	22.33
9)NH4-N	mg/l	-	1.60	-	-	-	0.69	0.44	0.55	1.10	0.88
10)NO2-N	mg/l	-	0.00	-	-	-	-	-	-	-	-
11)NO3-N	mg/l	-	0.10	-	-	-	2.96	0.30	1.90	2.03	1.46
12)T-N	mg/l	-	4.20	-	-	-	5.11	2.07	1.26	1.80	2.89
13)T-P	mg/l	-	0.18	-	-	-	0.28	0.00	0.30	0.23	0.20

(St. 9) Poza Honda Reservoir

Item	Date / Unit	1988 Mar. 15	1988 Apr. 7	1988 Jun. 18	1991 Nov. 21	1992 July 14	1993 Nov.	1994 Jan	1994 Jun	1994 Ago	Ave.
1)W. Temp	C	25.00	26.00	27.00	28.00	27.10	26.00	25.10	27.60	26.60	26.50
2)pH	-	7.30	7.70	6.80	9.30	7.70	7.63	7.50	7.10	7.83	7.65
3)EC	um/cm	295.00	194.00	184.00	-	700.00	383.30	299.33	254.00	373.33	335.37
4)DO	mg/l	0.90	5.30	1.40	7.40	9.20	7.20	6.93	7.13	7.20	5.85
5)DSS	mg/l	266.00	174.00	166.00	-	-	253.30	196.33	200.00	270.00	217.95
6)TSS	mg/l	271.00	194.00	176.00	500.00	-	7.50	17.67	169.00	254.33	211.19
7)BOD	mg/l	16.60	2.10	13.80	8.00	4.50	7.33	10.33	21.60	11.00	10.56
8)COD	mg/l	-	-	-	17.00	9.20	16.00	16.67	35.00	16.66	18.42
9)NH4-N	mg/l	1.80	2.00	0.95	0.30	0.15	1.47	0.36	0.80	0.83	0.96
10)NO2-N	mg/l	0.07	0.01	0.01	0.01	0.00	-	-	-	-	0.02
11)NO3-N	mg/l	0.50	1.00	-	0.90	0.45	2.50	0.90	2.00	1.26	1.19
12)T-N	mg/l	-	-	-	1.50	0.75	5.87	2.76	1.50	1.40	2.30
13)T-P	mg/l	0.17	0.22	0.18	0.16	0.08	0.22	0.20	0.40	0.16	0.20

Note : Water analysis of Agos. 94 is from Poza Honda inlet

Table 3.1 Water Quality Conditions in the Study Area (4/7)

(St. 10) Outlet Portal At Mancha Grande River

Item	Date / Unit	1988 Mar. 15	1988 Apr. 7	1988 Jun. 18	1991 Nov. 21	1992 July 14	1993 Nov.	1994 Jan	1994 Jun	1994 Ago	Ave.
1)W. Temp	C	-	-	-	-	-	28.10	26.60	27.70	27.30	27.40
2)pH	-	-	-	-	-	-	7.30	7.26	7.50	8.13	7.55
3)EC	um/cm	-	-	-	-	-	820.00	564.00	1,070.00	933.33	846.83
4)DO	mg/l	-	-	-	-	-	5.60	5.46	8.00	7.73	6.70
5)DSS	mg/l	-	-	-	-	-	531.00	382.33	800.00	-	571.11
6)TSS	mg/l	-	-	-	-	-	0.00	0.00	723.00	626.33	337.33
7)BOD	mg/l	-	-	-	-	-	8.00	10.67	10.00	10.66	9.83
8)COD	mg/l	-	-	-	-	-	10.00	17.00	17.30	15.66	14.99
9)NH4-N	mg/l	-	-	-	-	-	0.80	0.46	0.60	0.37	0.56
10)NO2-N	mg/l	-	-	-	-	-	-	-	-	-	-
11)NO3-N	mg/l	-	-	-	-	-	0.30	0.60	1.80	1.06	0.94
12)T-N	mg/l	-	-	-	-	-	2.40	2.36	1.00	1.10	1.72
13)T-P	mg/l	-	-	-	-	-	0.30	0.29	0.36	0.18	0.28

(St. 11) Rio Chico, Chico R., Portoviejo R.

Item	Date / Unit	1988 Mar. 15	1988 Apr. 26	1988 Jun. 15	1991 Nov. 22	1992 July 14	1993 Nov.	1994 Jan	1994 Jun	1994 Ago	Ave.
1)W. Temp	C	29.00	29.00	28.00	31.20	25.60	30.60	27.10	27.80	26.40	28.30
2)pH	-	8.00	8.10	8.10	8.10	7.20	7.35	7.33	7.50	7.63	7.70
3)EC	um/cm	1,346.00	602.00	1,419.00	-	1,050.00	1,750.00	7.90	1,095.00	1,980.00	1,156.24
4)DO	mg/l	7.30	2.90	7.70	5.40	9.60	7.20	6.33	7.00	5.60	6.56
5)DSS	mg/l	1,211.00	541.00	1,277.00	-	-	1,120.00	478.33	797.00	10.00	776.33
6)TSS	mg/l	1,221.00	611.00	1,327.00	1,520.00	-	8.00	35.00	718.00	1,286.66	840.83
7)BOD	mg/l	3.10	1.20	1.30	9.10	4.00	8.00	9.33	14.30	13.33	7.07
8)COD	mg/l	-	-	-	12.00	8.50	11.00	16.33	23.00	21.66	15.42
9)NH4-N	mg/l	0.42	0.25	0.45	0.17	0.10	1.23	0.50	0.16	0.80	0.45
10)NO2-N	mg/l	0.00	0.01	0.01	0.01	0.01	-	-	-	-	-
11)NO3-N	mg/l	0.10	0.20	-	0.60	0.36	2.05	0.48	1.50	0.83	0.77
12)T-N	mg/l	-	-	-	1.00	0.60	4.75	2.58	0.70	1.40	1.87
13)T-P	mg/l	0.25	0.32	0.28	0.14	0.08	0.17	0.21	0.23	0.18	0.21

(St. 12) Portoviejo River Downstream Poza Honda Dam

Item	Date / Unit	1988 Mar. 15	1988 Apr. 7	1988 Jun. 18	1991 Nov. 21	1992 July 14	1993 Nov.	1994 Jan	1994 Jun	1994 Ago	Ave.
1)W. Temp	C	-	-	-	-	-	26.80	25.30	26.30	25.60	26.00
2)pH	-	-	-	-	-	-	7.10	7.50	7.30	7.96	7.47
3)EC	um/cm	-	-	-	-	-	300.00	321.33	342.00	326.66	322.50
4)DO	mg/l	-	-	-	-	-	3.20	4.26	5.53	4.80	4.45
5)DSS	mg/l	-	-	-	-	-	185.00	217.33	240.00	228.33	217.67
6)TSS	mg/l	-	-	-	-	-	0.00	11.66	194.00	213.66	104.83
7)BOD	mg/l	-	-	-	-	-	8.00	15.00	33.00	17.33	18.33
8)COD	mg/l	-	-	-	-	-	12.00	24.00	43.60	30.33	27.48
9)NH4-N	mg/l	-	-	-	-	-	0.80	1.29	0.63	1.00	0.93
10)NO2-N	mg/l	-	-	-	-	-	-	-	-	-	-
11)NO3-N	mg/l	-	-	-	-	-	0.40	0.50	2.93	1.30	1.28
12)T-N	mg/l	-	-	-	-	-	2.40	4.06	1.80	2.03	2.57
13)T-P	mg/l	-	-	-	-	-	0.30	0.13	0.23	0.35	0.25

Table 3.1 Water Quality Conditions in the Study Area (5/7)

(St. 13) Santa Ana, Portoviejo R.

Item	Date / Unit	1988 Mar. 15	1988 Apr. 26	1988 Jun. 18	1991 Nov. 22	1992 July 13	1993 Nov.	1994 Jan	1994 Jun	1994 Ago	Ave.
1)W. Temp	C	27.00	26.50	28.00	27.20	24.20	26.80	26.10	26.50	26.00	26.50
2)pH	-	7.90	7.90	7.90	7.80	7.30	7.36	7.33	7.40	8.10	7.67
3)EC	um/cm	735.00	439.00	873.00	-	800.00	373.00	457.67	1,069.00	523.33	658.75
4)DO	mg/l	7.40	7.60	8.10	7.60	8.80	5.73	5.33	7.06	6.93	7.17
5)DSS	mg/l	662.00	395.00	786.00	-	-	235.00	310.00	810.00	365.00	509.00
6)TSS	mg/l	667.00	400.00	801.00	350.00	-	0	40.00	731.00	353.33	417.79
7)BOD	mg/l	1.50	1.00	0.70	7.30	5.00	6.66	12.67	12.60	10.66	6.45
8)COD	mg/l	-	-	-	14.00	9.00	8.93	19.33	23.33	16.33	15.15
9)NH4-N	mg/l	0.22	0.28	0.25	0.24	0.17	0.80	0.30	0.43	0.46	0.35
10)NO2-N	mg/l	0.01	0.08	0.01	0.01	0.01	-	-	-	-	0.02
11)NO3-N	mg/l	0.20	1.20	-	1.40	0.98	0.87	0.57	1.66	0.96	0.98
12)T-N	mg/l	-	-	-	2.00	1.40	2.83	1.90	1.06	1.26	1.74
13)T-P	mg/l	0.24	0.26	0.25	0.16	0.11	0.31	0.15	0.20	0.36	0.23

(St. 14) Portoviejo, Portoviejo R.

Item	Date / Unit	1988 Mar. 15	1988 Apr. 26	1988 Jun. 18	1991 Nov. 22	1992 July 13	1993 Nov.	1994 Jan	1994 Jun	1994 Ago	Ave.
1)W. Temp	C	29.00	28.50	30.00	27.00	25.30	27.00	27.60	27.00	27.20	27.60
2)pH	-	7.90	8.00	7.90	7.70	6.90	7.33	7.36	7.60	7.76	7.61
3)EC	um/cm	1,745.00	898.00	1,978.00	-	1,200.00	1,013.30	727.33	1,389.00	1,006.66	1,244.66
4)DO	mg/l	4.80	5.40	5.80	6.00	8.00	6.93	5.60	7.56	6.40	6.28
5)DSS	mg/l	1,570.00	808.00	1,780.00	-	-	738.60	485.33	1,000.00	673.30	1,007.89
6)TSS	mg/l	1,615.00	838.00	1,800.00	500.00	500.00	0	16.66	910.00	655.66	759.48
7)BOD	mg/l	2.40	1.50	6.90	7.50	3.20	7.66	13.67	14.66	15.00	8.05
8)COD	mg/l	-	-	-	10.00	7.00	11.00	20.33	25.00	22.00	15.89
9)NH4-N	mg/l	0.62	0.55	0.90	0.28	0.17	0.85	0.41	0.23	0.73	0.53
10)NO2-N	mg/l	0.05	0.03	0.02	0.01	0.01	-	-	-	-	0.03
11)NO3-N	mg/l	0.50	1.20	-	1.20	0.72	2.17	0.20	1.76	1.20	0.99
12)T-N	mg/l	-	-	-	2.00	1.20	4.62	1.84	0.93	1.56	2.03
13)T-P	mg/l	0.37	0.35	0.33	0.12	0.07	0.24	0.16	0.33	0.46	0.27

(St.15) Guayaba, Portoviejo R. (prediction Point: P-3)

Item	Date / Unit	1988 Mar. 15	1988 Apr. 26	1988 Jun. 18	1991 Nov. 21	1992 July 13	1993 Nov.	1994 Jan	1994 Jun	1994 Ago	Ave.
1)W. Temp	C	28.00	28.00	-	26.00	26.00	26.50	26.30	27.50	26.10	26.80
2)pH	-	7.80	7.90	-	7.70	6.80	7.23	7.40	7.56	7.83	7.53
3)EC	um/cm	1,499.00	737.00	-	-	1,140.00	1,000.00	713.33	1,420.00	1,149.33	1,094.09
4)DO	mg/l	7.40	7.60	-	1.20	7.20	5.26	6.40	9.66	6.66	6.42
5)DSS	mg/l	1,349.00	663.00	-	-	-	6.51	478.66	1,020.00	753.66	711.84
6)TSS	mg/l	1,394.00	678.00	-	800.00	-	0.00	33.33	920.00	736.33	651.67
7)BOD	mg/l	1.00	1.70	-	5.60	2.00	8.33	13.33	11.33	14.33	7.20
8)COD	mg/l	-	-	-	10.00	5.00	11.00	20.00	19.66	23.66	14.89
9)NH4-N	mg/l	0.42	0.26	-	0.11	0.04	0.89	0.30	0.20	0.60	0.42
10)NO2-N	mg/l	0.01	0.01	-	0.01	0.00	-	-	-	-	-
11)NO3-N	mg/l	0.20	0.20	-	0.80	0.32	2.80	0.53	1.70	1.03	0.95
12)T-N	mg/l	-	-	-	1.00	0.40	5.02	1.86	0.86	1.26	1.73
13)T-P	mg/l	0.38	0.38	-	0.18	0.07	0.27	0.24	0.13	0.40	0.26

Table 3.1 Water Quality Conditions in the Study Area (6/7)

(St. 16) Dario Guevara, Portoviejo R.

Item	Date / Unit	1988 Mar. 15	1988 Apr. 26	1988 Jun. 18	1991 Nov. 21	1992 July 13	1993 Nov.	1994 Jan	1994 Jun	1994 Ago	Ave.
1)W. Temp	C	-	-	-	26.00	25.40	27.10	26.30	27.10	26.20	26.40
2)pH	-	-	-	-	8.60	7.00	7.00	7.53	7.56	7.60	7.55
3)EC	um/cm	-	-	-	-	1,130.00	1,366.60	803.00	1,446.00	1,233.33	1,195.67
4)DO	mg/l	-	-	-	1.20	8.80	7.06	6.66	8.54	7.86	6.69
5)DSS	mg/l	-	-	-	-	-	834.60	534.33	1,050.00	835.33	813.57
6)TSS	mg/l	-	-	-	1,480.00	-	0.00	11.66	950.00	819.33	652.20
7)BOD	mg/l	-	-	-	6.40	3.00	7.86	17.33	10.66	11.66	9.49
8)COD	mg/l	-	-	-	12.00	6.50	9.66	25.33	49.00	18.00	20.08
9)NH4-N	mg/l	-	-	-	0.10	0.05	0.91	0.59	0.30	1.00	0.49
10)NO2-N	mg/l	-	-	-	0.00	0.00	-	-	-	-	-
11)NO3-N	mg/l	-	-	-	0.60	0.30	1.46	0.83	1.60	1.10	0.98
12)T-N	mg/l	-	-	-	1.00	0.50	3.66	2.85	0.83	1.36	1.70
13)T-P	mg/l	-	-	-	0.18	0.09	0.27	0.31	0.16	0.30	0.22

(St. 17) Portoviejo Estuary (Prediction Point: P-4)

Item	Date / Unit	1988 Mar. 15	1988 Apr. 7	1988 Jun. 18	1991 Nov. 21	1992 July 14	1993 Nov.	1994 Jan	1994 Jun	1994 Ago	Ave.
1)W. Temp	C	-	-	-	-	-	27.30	27.60	27.30	26.30	27.10
2)pH	-	-	-	-	-	-	7.00	7.67	7.60	7.93	7.55
3)EC	um/cm	-	-	-	-	-	4,500.00	2,387.33	1,772.00	1,889.00	2,637.08
4)DO	mg/l	-	-	-	-	-	2.40	6.27	6.63	4.56	4.97
5)DSS	mg/l	-	-	-	-	-	2,602.00	1,445.00	1,230.00	1,223.00	1,625.00
6)TSS	mg/l	-	-	-	-	-	0.00	12.33	1,120.00	1,165.33	574.42
7)BOD	mg/l	-	-	-	-	-	12.00	12.00	19.00	12.33	13.83
8)COD	mg/l	-	-	-	-	-	28.00	17.33	33.66	21.66	25.16
9)NH4-N	mg/l	-	-	-	-	-	0.53	0.49	0.36	1.16	0.64
10)NO2-N	mg/l	-	-	-	-	-	-	-	-	-	-
11)NO3-N	mg/l	-	-	-	-	-	0.30	0.50	1.60	1.13	0.88
12)T-N	mg/l	-	-	-	-	-	1.93	2.19	0.86	1.66	1.66
13)T-P	mg/l	-	-	-	-	-	0.20	0.43	0.30	0.63	0.39

note: Water quality data on Nov. 1991 and July 1992 are obtained by the water quality survey in the FS phase of this Project
Water quality data on Jun. 1994 and Agos. 1994 are obtained by the water quality survey in this Study

Table 3.1 Water Quality Conditions in the Study Area (7/7)

ADDITIONAL WATER QUALITY DATA OF INTEREST

(FROM JICA)

El Pasaje, Chico River

Item	Date / Unit	1988 Mar. 15	1988 Apr. 26	1988 Jun. 18	1991 Nov. 22	1992 July 13	1993 Nov.	1994 Jan	Ave.
1)W. Temp	C	-	-	-	31.90	25.40			28.65
2)pH	-	-	-	-	8.70	7.00	7.30		7.67
3)EC	um/cm	-	-	-	-	1,130.00	1,566.60		1,348.30
4)DO	mg/l	-	-	-	7.60	8.80	6.40		7.60
5)DSS	mg/l	-	-	-	-	-	1,000.30		1,000.30
6)TSS	mg/l	-	-	-	600.00	-	12.50		612.50
7)BOD	mg/l	-	-	-	5.90	3.00	9.60		6.17
8)COD	mg/l	-	-	-	10.00	7.00	14.00		10.33
9)NH4-N	mg/l	-	-	-	0.22	0.13	0.98		0.44
10)NO2-N	mg/l	-	-	-	0.01	0.01	-		0.01
11)NO3-N	mg/l	-	-	-	0.60	0.36	2.16		1.04
12)T-N	mg/l	-	-	-	1.00	0.60	4.40		2.00
13)T-P	mg/l	-	-	-	0.14	0.08	0.26		0.16

Punta Blanca, Chone River Estuary

Item	Date / Unit	1988 Mar. 15	1988 Apr. 7	1988 Jun. 18	1991 Nov. 21	1992 July 14	1993 Nov.	1994 Jan	Ave.
1)W. Temp	C	-	30.00	-	-	-	-		30.00
2)pH	-	-	8.00	-	-	-	7.00		7.50
3)EC	um/cm	-	64,486.00	-	-	-	57,300.00		60,893.00
4)DO	mg/l	-	10.80	-	-	-	4.00		7.40
5)DSS	mg/l	-	58,037.00	-	-	-	32,683.50		45,360.25
6)TSS	mg/l	-	58,047.00	-	-	-	27.50		29,037.25
7)BOD	mg/l	-	3.70	-	-	-	16.50		10.10
8)COD	mg/l	-	6.30	-	-	-	32.00		19.15
9)NH4-N	mg/l	-	1.40	-	-	-	0.76		1.08
10)NO2-N	mg/l	-	0.08	-	-	-	-		0.08
11)NO3-N	mg/l	-	0.20	-	-	-	1.10		0.65
12)T-N	mg/l	-	0.84	-	-	-	3.41		2.19
13)T-P	mg/l	-	0.13	-	-	-	0.22		0.17

Isla El Morro, Estuary, Chone R.

Item	Date / Unit	1988 Mar. 15	1988 Apr. 6	1988 Jun. 18	1991 Nov. 21	1992 July 14	1993 Nov.	1994 Jan	Ave.
1)W. Temp	C	-	30.00	-	-	-			30.00
2)pH	-	-	7.90	-	-	-			7.90
3)EC	um/cm	-	33,063.00	-	-	-			33,063.00
4)DO	mg/l	-	9.40	-	-	-			9.40
5)DSS	mg/l	-	29,756.00	-	-	-			29,756.00
6)TSS	mg/l	-	29,776.00	-	-	-			29,776.00
7)BOD	mg/l	-	6.00	-	-	-			6.00
8)COD	mg/l	-	10.20	-	-	-			10.20
9)NH4-N	mg/l	-	1.35	-	-	-			1.35
10)NO2-N	mg/l	-	0.00	-	-	-			0.00
11)NO3-N	mg/l	-	0.10	-	-	-			0.10
12)T-N	mg/l	-	1.40	-	-	-			1.40
13)T-P	mg/l	-	0.23	-	-	-			0.23

note: Water quality data on Nov. 1991 and July 1992 are obtained by the water quality survey in the FS phase of this Project
Water quality data on Jun. 1994 and Agos. 1994 are obtained by the water quality survey in this Study

Table 3.2 Estimation of Water Quality of la Esperanza and Poza Honda Dams

Item	Discharge (MCM/y)	Water Quality and Load BOD	COD	T-N	T-P
A. La Esperanza Dam					
1) QO(v. from Daule-Peripa)	336				
2) CO (w.q. from Daule Peripa) (mg/l)		13.95	29.25	1.76	0.16
3) LO=QO x CO (t/y)		4,687	9,828	591	54
4) Q1 (inflow to La Esperanza)	391				
5) C1 (w.q. of inflow w.) (mg/l)		8.53	13.46	2.63	0.21
6) L1=Q1 x C1 (t/y)		3,335	5,263	1,028	82
7) C2=(LO+L1)/(QO + Q1) (mg/l) (w.q. of La Esperanza)		11.03	20.76	2.23	0.19
B. Poza Honda Dam					
1) Q3(v. from La Esperanza)	213				
2) C2 (w.q. from La Esperanza) (mg/l)		11.03	20.76	2.23	0.19
3) L3=Q3 x C2 (t/y)		2,349	4,422	475	40.5
4) Q4 (inflow to Poza Honda)	102				
5) C4 (w.q. of inflow w.) (mg/l)		10.56	18.42	2.30	0.20
6) L4=Q4 x C4 (t/y)		1,077	1,879	235	20.40
7) C5=(L3+L4)/(Q3 + Q4) (mg/l) (w.q. of Poza Honda)		10.88	20.00	2.25	0.19

Source: JICA Study Team

Table 3.3 Possibility of Eutrophication in the reservoirs of La Esperanza Dam and Poza Honda Dam

Item	Unit	Daule-Peripa Dam (Existing)	La Esperanza Dam (Future)		Poza Honda Dam with Project	
			without project	with project	(Existing)	(Future)
1) Annual inflow (Q)	MCM	5,000.00	391.00	727.00	102.00	315.00
2) Reservoir volume (V)	MCM	5,260.00	455.00	455.00	98.00	98.00
3) Surface area (A)	Km2	200.00	32.00	32.00	5.00	5.00
4) Ave. depth (Z=V/A)	m	26.30	14.00	14.00	20.00	20.00
5) Conc'n of T-P (C)	mg/l	0.16	0.21	0.19	0.20	0.19
6) Retention time (r=Q/V)	times/y	0.95	0.86	1.60	1.04	3.21
7) Annual load of T-P (L=Q x C)	t/y	800.00	82.11	138.13	20.40	59.85
8) T-P surface load (Ls=L/A)	g/m2/y	4.00	2.57	4.32	4.08	11.97
9) Z x r	m. times/y	25.00	12.04	27.44	21.00	95.40
10) Retention time (r' = V/Q)	(years)	1.05	1.16	0.63	0.96	0.31

Source: JICA Study Team

Table 3.4 Existing and Future River Flow Conditions in the Study Area (1/2)
- without dilution flow -

	Chone R.						Portoviejo R.					
	(1) River Mouth		(2) Chone Upst'm		(3) Carrizal river		(4) Porto'jo downst'		(5) Porto'jo upst'm		(6) Chico River	
	Exist'g	Future	Exist'g	Future	Exist'g	Future	Exist'g	Future	Exist'g	Future	Exist'g	Future
I. C. A. (km2)	2,267	2,267	755	755	1,166	1,166	2,060	2,060	1,190	1,190	585	585
II. Dis'ge (MCM)												
a)Rainy sea'n												
Jan	99.67	99.67	36.54	36.54	61.63	71.93	59.34	63.04	36.23	42.83	17.87	22.42
Feb	220.81	220.81	83.87	83.87	135.30	138.42	94.70	98.62	62.34	68.31	31.29	33.91
Mar	305.52	344.61	101.93	101.93	199.68	252.43	119.71	144.27	80.37	107.73	38.77	44.31
Apr	283.16	322.49	79.81	79.81	179.65	241.54	104.95	129.21	64.96	95.07	32.53	42.47
May	202.85	242.18	33.78	33.78	117.86	190.26	57.55	112.40	44.59	74.71	25.19	40.37
Jun	136.23	136.23	19.22	19.22	77.92	101.32	72.03	76.99	32.13	40.26	18.67	27.50
Sub total	1,248.24	1,365.99	355.15	355.15	772.04	995.90	538.28	624.53	320.62	429.01	164.32	210.98
monthly m	208.04	227.67	59.19	59.19	128.67	165.98	89.71	104.09	53.44	71.50	27.39	35.16
b)Dry sea'n												
Jul	90.49	98.76	10.51	10.51	54.53	83.55	61.14	66.76	26.72	36.37	15.32	28.15
Aug	56.87	65.14	5.77	5.77	33.86	69.12	51.08	57.67	21.43	33.62	11.80	27.53
Sep	35.57	43.85	3.36	3.36	20.47	65.40	43.55	52.36	18.54	34.29	10.07	30.36
Oct	21.67	84.42	2.11	2.11	11.59	53.40	37.12	45.48	15.45	29.93	8.31	26.94
Nov	16.72	79.68	2.80	2.80	8.61	41.68	32.40	38.99	13.84	27.27	7.23	21.86
Dec	21.04	83.16	5.72	5.72	11.42	32.95	31.70	36.21	14.64	22.51	7.35	16.18
Sub total	242.36	455.01	30.27	30.27	140.48	346.10	256.99	297.47	110.62	181.99	60.08	151.02
monthly m	40.39	75.84	5.05	5.05	23.41	57.68	42.83	49.58	18.44	30.33	10.01	25.17
Total	1,490.67	1,821.00	385.42	385.42	912.52	1,342.00	795.27	922.00	431.24	611.00	224.39	362.00
monthly m	124.22	151.75	32.12	32.12	76.04	111.83	66.27	76.83	35.94	50.92	18.70	30.17

source: JICA Study Team
(1) Simbocal (St-6)
(2) H. Saida (St-5)
(3) Bachillero (St-4)
(4) Dario Guevara (St-16)
(5) Portoviejo (St-14)
(6) Río Chico (St-11)

Table 3.4 Existing and Future River Flow Conditions in the Study Area (2/2)
- with dilution flow -

	Chone R.						Portoviejo R.					
	(1) River Mouth		(2) Chone Upst'm		(3) Carrizal river		(4) Porto'jo downst'		(5) Porto'jo upst'm		(6) Chico River	
	Exist'g	Future	Exist'g	Future	Exist'g	Future	Exist'g	Future	Exist'g	Future	Exist'g	Future
I. C. A. (km2)	2,267	2,267	755	755	1,166	1,166	2,060	2,060	1,190	1,190	585	585
II. Dis'ge (MCM)												
a)Rainy sea'n												
Jan	99.67	99.67	36.54	36.54	61.63	75.40	59.34	70.94	36.23	46.47	17.87	22.82
Feb	220.81	220.81	83.87	83.87	135.30	139.50	94.70	107.00	62.34	71.60	31.29	34.14
Mar	305.52	344.61	101.93	101.93	199.68	257.07	119.71	160.12	80.37	115.18	38.77	44.82
Apr	283.16	322.49	79.81	79.81	179.65	249.64	104.95	143.27	64.96	100.11	32.53	43.33
May	202.85	242.18	33.78	33.78	117.86	201.71	87.55	127.20	44.59	81.57	25.19	41.69
Jun	136.23	136.23	19.22	19.22	77.92	109.42	72.03	87.57	32.13	44.74	18.67	28.27
Sub total	1,248.24	1,365.99	355.15	355.15	772.04	1,032.74	538.28	696.10	320.62	459.67	164.32	215.07
monthly m	208.04	227.67	59.19	59.19	128.67	172.12	89.71	116.02	53.44	76.61	27.39	35.85
b)Dry sea'n												
Jul	90.49	102.97	10.51	10.51	54.53	93.59	61.14	78.77	26.72	41.69	15.32	29.27
Aug	56.87	69.36	5.77	5.77	33.86	81.32	51.08	71.73	21.43	40.34	11.80	28.90
Sep	35.57	48.37	3.36	3.36	20.47	80.95	43.55	71.16	18.54	42.97	10.07	32.12
Oct	21.67	116.39	2.11	2.11	11.59	67.87	37.12	63.34	15.45	37.91	8.31	28.56
Nov	16.72	111.13	2.80	2.80	8.61	53.13	32.40	53.05	13.84	31.57	7.23	23.13
Dec	21.04	114.80	5.72	5.72	11.42	40.40	31.70	45.85	14.64	26.85	7.35	16.95
Sub total	242.36	563.01	30.27	30.27	140.48	417.26	256.99	383.9	110.62	221.33	60.08	158.93
monthly m	40.39	93.84	5.05	5.05	23.41	69.54	42.83	63.98	18.44	36.89	10.01	26.49
Total	1,490.60	1,929.00	385.42	385.42	912.52	1,450.00	795.27	1,080.00	431.24	681.00	224.40	374.00
monthly m	124.22	160.75	32.12	32.12	76.04	120.83	66.27	90.00	35.94	56.75	18.70	31.17

source: JICA Study Team
(1) Simbocal (St-6)
(2) H. Saida (St-5)
(3) Bachillero (St-4)
(4) Dario Guevara (St-16)
(5) Portoviejo (St-14)
(6) Rio Chico (St-11)

Table 3.5 Per Capita Pollition Load unit and Sewage Water Quality

	Item	Unit	1990	2020
I.	1) Water consumption	l/c/d	159	407
	2) Sewage Volume	l/c/d	64	265
II.	Unit load			
	BOD			
	1) Excretion	g/c/d	10	20
	2) Others	g/c/d	6	48
	3) Total	g/c/d	16	68
	4) Concentration	mg/l	252	257
	COD			
	1) Excretion	g/c/d	5	10
	2) Others	g/c/d	3	24
	3)Total	g/c/d	8	34
	4) Concentration	mg/l	126	128
	T-N			
	1)Excretion	g/c/d	2	7
	2) Others	g/c/d	1	6
	3) Total	g/c/d	3	13
	4) Concentration	mg/l	47	49
	T-P			
	1) Excretion	g/c/d	0.3	1.2
	2) Others	g/c/d	0.2	1
	3) Total	g/c/d	0.5	2.2
	4) Concentration	mg/l	7.9	8.3

Note 1) Sewage volume is assumed at 40% and 65% of water consumption in 1990 and 2020

2) Unit loas is assumed by considering the existing sewage water quality data.

Source: 1)JICA Study Team (51)

2) "A GUIDELINE FOR BASIN-WIDE SEWERAGE SYSTEM.

Table 3.6 Change of Load from Water Supply for Aquaculture

Item	Unit	Water Quality				Pollution Load					
		Pumped Water (mg/l)		Drained Water (mg/l)		1990 (t/y)		2020 (t/y)		Increase (t/y)	
		Dry Season	Rainy Season	Dry Season	Rainy Season	Dry Season	Rainy Season	Dry Season	Rainy Season	Dry Season	Rainy Season
a) Shrimp farm area	ha	5,097	5,097	5,547	5,547	-	-	-	-	-	-
b) Growthout pond ratio	%	80	80	80	80	-	-	-	-	-	-
c) Net water area	ha	4,078	4,078	4,438	4,438	-	-	-	-	-	-
d) Average depth	m	0.7	0.7	0.7	0.7	-	-	-	-	-	-
e) Water exchange rate	%/d	10	10	10	10	-	-	-	-	-	-
f) Discharge volume	MCM	1,042	1,042	1,134	1,134	-	-	-	-	-	-
g) Water quality item											
- BOD		18.00	11.33	23.0	16.33(*)	5,210	5,210	5,670	5,670	460	460
- COD		32.66	18.67	47.30	33.31(*)	15,255	15,255	16,602	16,602	1,347	1,347
- T-N		1.26	2.07	2.43	3.34	1,219	1,323	1,327	1,440	108	117
- T-P		0.30	0.00	0.40	0.16	104	167	113	181	9	14

note: 1) Water quality data are obtained by water quality survey.
Pumped water quality data from St. 8
Drained water quality data from St. 7
2) Data related to shrimp pond are quoted from Interim Report of this Project
(*) This value should be larger tham 11.33, then for calculation purpose if the dry season is correct then the value for rainy season for the drained water shoul be aroun 16.33=11.33+(23-18)

Source: JICA Study Team

Table 3.7 Pollution Load from Irrigation Water (1/6)

Sub-basin	Chone R.			Portoviejo R.		
	(1)	(2)	(3)	(4)	(5)	(6)
	River Mouth	Chone upstream	Carrizal River	Porto'jo downstrea	Porto'jo upstream	Chico River
Water req'nt (MCM/y)	0	0	272	121	147	31
Water quality						
a)BOD (mg/l)	-	11.03	11.03	10.88	10.88	10.88
b)COD (mg/l)	-	20.76	20.76	20.00	20.00	20.00
c)T-N (mg/l)	-	2.23	2.23	2.25	2.25	2.25
d)T-P (mg/l)	-	0.19	0.19	0.19	0.19	0.19
Pollution load						
a)BOD (t/y)	0	0	3,000	1,317	1,599	337
b)COD (t/y)	0	0	5,647	2,420	2,940	620
c)T-N (t/y)	0	0	607	272	331	70
d)T-P (t/y)	0	0	52	23.00	28	6

note: 1) Irrigation water of Chone and Carrizal comes from La Esperanza Dam.
2) Quality of La Esperanza (C2) is predicted by the following method
$C2=(Q0 \times C0 + Q1 \times C1)/(Q0 + Q1)$

where:
Q0,C0: Volume and quality of diverted water from Daule Peripa dam,
Q1,C1: Volume and quality of inflow water to La Esperanza dam.

3) Irrigation water of Portoviejo and Chico comes from Poza Honda Dam.
4) Quality of Poza Honda (C5) is predicted by the following method
$C5=(Q3 \times C2 + Q4 \times C4)/(Q3 + Q4)$

where:
Q3,C2: Volume and quality of diverted water from La Esperanza dam,
Q4,C4: Volume and quality of inflow water to Poza Honda dam.

5) Existing water quality data of Daule Peripa, La Esperanza and Poza Honda were obtained by water quality survey.

Source: JICA Study Team

Table 3.7 Incremental Pollution Load by Land Use Change (2/6)

	Irrigation Area		! Pollution	!	Pollution	
			! Load Unit	!	Load	
Year	1990	2020	! (kg/ha/y)	! 1990	2020	Balance
River	(ha)	(ha)	!	! (t/y)	(t/y)	(t/y)
I.Chone R.						
1)Paddy	30	2,390				
a)BOD			82	2	196	194
b)COD			102	3	244	241
c)T-N			32	1	76	76
d)T-P			3.2	0.1	7.6	7.6
2)Pasture	860	0				
a)BOD			59	51	0	-51
b)COD			106	91	0	-91
c)T-N			14	12	0	-12
d)T-P			1.6	1.4	0.0	-1.4
3)Perennial	770	2,090				
a)BOD			14	11	29	18
b)COD			18	14	38	24
c)T-N			73	56	153	96
d)T-P			0.7	0.5	1.5	0.9
4)Upland	630	1,520				
a)BOD			20	13	30	18
b)COD			26	16	40	23
c)T-N			28	18	43	25
d)T-P			0.9	0.6	1.4	0.8
5)Others	3,710	0				
a)BOD			12	45	0	-45
b)COD			15	56	0	-56
c)T-N			2	7	0	-7
d)T-P			0.4	1.5	0.0	-1.5
Total	6,000	6,000				
a)BOD				121	256	135
b)COD			-	180	321	141
c)T-N			-	94	272	177
d)T-P			-	4.1	10.5	6.4
II.Carrizal R.						
1)Paddy	40	3,980				
a)BOD			82	3	326	323
b)COD			102	4	406	402
c)T-N			32	1	127	126
d)T-P			3.2	0.1	12.7	12.6
2)Pasture	1,440	0				
a)BOD			59	85	0	-85
b)COD			106	153	0	-153
c)T-N			14	20	0	-20
d)T-P			1.6	2.3	0.0	-2.3

Table 3.7 Incremental Pollution Load by Land Use Change (3/6)

Year / River	Irrigation Area 1990 (ha)	Irrigation Area 2020 (ha)	Pollution Load Unit (kg/ha/y)	Pollution Load 1990 (t/y)	Pollution Load 2020 (t/y)	Balance (t/y)
3)Perennial	1,280	3,490				
a)BOD				14	18	49	31
b)COD				18	23	63	40
c)T-N				73	93	255	161
d)T-P				0.7	0.9	2.4	1.5
4)Upland	1,050	2,530				
a)BOD				20	21	51	30
b)COD				26	27	66	38
c)T-N				28	29	71	41
d)T-P				0.9	0.9	2.3	1.3
5)Others	6,190	0				
a)BOD				12	74	0	-74
b)COD				15	93	0	-93
c)T-N				2	12	0	-12
d)T-P				0.4	2.5	0.0	-2.5
Total	10,000	10,000				
a)BOD			-		201	426	224
b)COD			-		300	535	235
c)T-N			-		157	453	296
d)T-P			-		6.7	17.5	10.7
III.Portoviejo R. (upstream)						
1)Paddy	380	2,320				
a)BOD				82	31	190	159
b)COD				102	39	237	198
c)T-N				32	12	74	62
d)T-P				3.2	1.2	7.4	6.2
2)Pasture	760	0				
a)BOD				59	45	0	-45
b)COD				106	81	0	-81
c)T-N				14	11	0	-11
d)T-P				1.6	1.2	0.0	-1.2
3)Perennial	200	1,180				
a)BOD				14	3	17	14
b)COD				18	4	21	18
c)T-N				73	15	86	72
d)T-P				0.7	0.1	0.8	0.7
4)Upland	3,210	1,050				
a)BOD				20	64	21	-43
b)COD				26	83	27	-56
c)T-N				28	90	29	-60
d)T-P				0.9	2.9	0.9	-1.9

Table 3.7 Incremental Pollution Load by Land Use Change (4/6)

Year / River	Irrigation Area 1990 (ha)	Irrigation Area 2020 (ha)	Pollution Load Unit (kg/ha/y)	Pollution Load 1990 (t/y)	Pollution Load 2020 (t/y)	Balance (t/y)
5)Others	0	0				
a)BOD			12	0	0	0
b)COD			15	0	0	0
c)T-N			2	0	0	0
d)T-P			0.4	0.0	0.0	0.0
Total	4,550	4,550				
a)BOD				143	228	85
b)COD			-	206	285	79
c)T-N			-	127	190	63
d)T-P			-	5.5	9.2	3.7
IV.Portoviejo R. (downstream)						
1)Paddy	750	1,950				
a)BOD			82	62	160	98
b)COD			102	77	199	122
c)T-N			32	24	62	38
d)T-P			3.2	2.4	6.2	3.8
2)Pasture	790	0				
a)BOD			59	47	0	-47
b)COD			106	84	0	-84
c)T-N			14	11	0	-11
d)T-P			1.6	1.3	0.0	-1.3
3)Perennial	200	2,540				
a)BOD			14	3	36	33
b)COD			18	4	46	42
c)T-N			73	15	185	171
d)T-P			0.7	0.1	1.8	1.6
4)Upland	4,410	1,660				
a)BOD			20	88	33	-55
b)COD			26	115	43	-72
c)T-N			28	123	46	-77
d)T-P			0.9	4.0	1.5	-2.5
5)Others	0	0				
a)BOD			12	0	0	0
b)COD			15	0	0	0
c)T-N			2	0	0	0
d)T-P			0.4	0.0	0.0	0.0
Total	6,150	6,150				
a)BOD				199	229	30
b)COD			-	279	288	9
c)T-N			-	173	294	121
d)T-P			-	7.8	9.5	1.7

Table 3.7 Incremental Pollution Load by Land Use Change (5/6)

Year	Irrigation Area 1990	2020	Pollution Load Unit	Pollution Load 1990	2020	Balance
River	(ha)	(ha)	(kg/ha/y)	(t/y)	(t/y)	(t/y)
V.Chico R.						
1)Paddy	50	1,020				
a)BOD			82	4	84	80
b)COD			102	5	104	99
c)T-N			32	2	33	31
d)T-P			3.2	0.2	3.3	3.1
2)Pasture	1,050	0				
a)BOD			59	62	0	-62
b)COD			106	111	0	-111
c)T-N			14	15	0	-15
d)T-P			1.6	1.7	0.0	-1.7
3)Perennial	900	890				
a)BOD			14	13	12	0
b)COD			18	16	16	0
c)T-N			73	66	65	-1
d)T-P			0.7	0.6	0.6	0.0
4)Upland	550	640				
a)BOD			20	11	13	2
b)COD			26	14	17	2
c)T-N			28	15	18	3
d)T-P			0.9	0.5	0.6	0.1
5)Others	0	0				
a)BOD			12	0	0	0
b)COD			15	0	0	0
c)T-N			2	0	0	0
d)T-P			0.4	0.0	0.0	0.0
Total	2,550	2,550				
a)BOD				90	109	19
b)COD				147	137	-10
c)T-N				97	116	18
d)T-P				3.0	4.5	1.5

note: 1)I.Chone R. includes a part of Carrizal-Chone area.
2)II.Carrizal R. includes a rest of Carrizal-Chone irrigation area and Amarillos irrigation area.
3)III.Portoviejo R.(upstream) includes Santa Ana and Mejia irrigation area.
4)IV.Portoviejo R.(downstream) includes Guarango and Ceibal-Guayaba irrigation area.
5)V.Chico R. includes Rio Chico and Pechiche-Pasaje irrigation area.
6)Pollution load unit is quated from "A GUIDELINE FOR BASIN-WIDE SEWERAGE SYSTEM, M. OF CONSTRUCTION, JAPAN, 1979.

Source: JICA Study Team (51)

Table 3.7 Decrease of Pollution Load by Change of Cattle Heads (6/6)

Year / River	Pasture Area 1990 (ha)	Pasture Area 2020 (ha)	Pollution Load Unit (kg/ha/y)	Pollution Load 1990 (t/y)	Pollution Load 2020 (t/y)	Balance (t/y)
I.Chone R.	860	0				
a)Cattle heads	1,118	0				
b)BOD			234	262	0	-262
c)COD			193	216	0	-216
d)T-N			138	154	0	-154
e)T-P			20.0	22.0	0.0	-22.0
II.Carrizal R.	1,440	0				
a)Cattle heads	1,872	0				
b)BOD			234	438	0	-438
c)COD			193	361	0	-361
d)T-N			138	258	0	-258
e)T-P			20.0	37.0	0.0	-37.0
III.Portoviejo R. (upstream)	760	0				
a)Cattle heads	988	0				
b)BOD			234	231	0	-231
c)COD			193	191	0	-191
d)T-N			138	136	0	-136
e)T-P			20.0	20.0	0.0	-20.0
IV.Portoviejo R. (downstream)	790	0				
a)Cattle heads	1,027	0				
b)BOD			234	198	0	-198
c)COD			193	142	0	-142
d)T-N			138	21	0	-21
e)T-P			20.0	9.0	0.0	-9.0
V.Chico R.	1,050	0				
a)Cattle heads	1,365	0				
b)BOD			207	283	0	-283
c)COD			193	263	0	-263
d)T-N			66	90	0	-90
e)T-P			9	12.0	0.0	-12.0
Total	4,900	0				
a)Cattle heads	6,370	0				
b)BOD			207	1319	0	-1,319
c)COD			193	1229	0	-1229
d)T-N			66	420	0	-420
e)T-P			9	57.0	0.0	-57

note: 1)Pasture area is quoted from Table 3.6
2)Average heads of cattle is 1,3 heads/ha quoted from "PROYECTO MULTIPLE CARRIZAL-CHONE, SISTEMA DE RIEGO Y DRENAJE, 1988".
3)Pollution load unit is quoted from "A GUIDELINE FOR BASIN-WIDE SEWERAGE SYSTEM, M OF CONSTRUCTION, JAPAN, 1979".

Source: JICA Study Team (51)

Table 3.8 Estimation of Incremental Pollution Load by the Project

Sub-basin	Chone R. (1) River Mouth	Chone R. (2) Chone Upstream	Chone R. (3) Carrizal River	Portoviejo R. (4) Porto'jo downst'm	Portoviejo R. (5) Porto'jo upstream	Portoviejo R. (6) Chico River
Pollution Load	(t/y)	(t/y)	(t/y)	(t/y)	(t/y)	(t/y)
BOD						
a) Municipal water	0	1,364	1,611	684	4,829	790
b) Irrigation	0	15	1,524	634	796	122
c) Aquaculture	460	0	0	0	0	0
Total	460	1,379	3,135	1,318	5,625	912
COD						
a) Municipal water	0	682	806	342	2,422	395
b) Irrigation	0	27	2,869	1,187	1,471	252
c) Aquaculture	1,347	0	0	0	0	0
Total	1,347	709	3,675	1,529	3,893	647
T-N						
a) Municipal water	0	262	309	131	945	151
b) Irrigation	0	58	400	193	170	26
c) Aquaculture	117	0	0	0	0	0
Total	117	320	709	324	1,115	177
T-P						
a) Municipal water	0	44	52	22	160	26
b) Irrigation	0	-1	24	11	12	2
c) Aquaculture	14	0	0	0	0	0
Total	14	43	76	33	172	28

Source: JICA Study Team (51). For Municipal water pollution load

Table 3.9 Prediction of River Flow Discharge an Water Quality in 2020 (P-1, Simbocal, Chone River) - without dilution flow - (1/10)

Prediction Point / Item		Rainy Season	Dry Season (P-1)	Annual
River Flow Discharge				
I.Existing(Q3)	(MCM/y)	1,248.24	242.36	1,490.67
II.Future(Q3')	(MCM/y)	1,365.99	455.01	1,821.00
Pollution Load				
I.Existing(L3)				
a)BOD	(t/y)	13,319.00	3,393.00	16,712.00
b)COD	(t/y)	23,717.00	5,889.00	29,606.00
c)T-N	(t/y)	3,046.00	339.00	3,385.00
d)T-P	(t/y)	312.06	48.47	360.53
II.Additional Load(L1+L2)				
a)BOD	(t/y)	2,257.00	2,257.00	4,514.00
b)COD	(t/y)	2,192.00	2,192.00	4,384.00
c)T-N	(t/y)	515.00	515.00	1,029.00
d)T-P	(t/y)	60.00	60.00	119.00
III.Future Load(L3')				
a)BOD	(t/y)	15,576.00	5,650.00	21,226.00
b)COD	(t/y)	25,909.00	8,081.00	33,990.00
c)T-N	(t/y)	3,561.00	854.00	4,414.00
d)T-P	(t/y)	372.06	108.47	479.53
Water Quality				
I.Existing(C3)				
a)BOD	(mg/l)	10.67	14.00	12.34
b)COD	(mg/l)	19.00	24.30	21.65
c)T-N	(mg/l)	2.44	1.40	1.92
d)T-P	(mg/l)	0.25	0.20	0.23
II.Future(C3')				
a)BOD	(mg/l)	11.41	12.42	11.66
b)COD	(mg/l)	18.97	17.76	18.67
c)T-N	(mg/l)	2.61	1.88	2.42
d)T-P	(mg/l)	0.27	0.23	0.26

Source: JICA Study Team

(L1 + L2) = Total estimate of Incremental Pollution Load
by the Project in [(2) Chone Upstream] + [(3)Carrizal river]
See table 3.8

Table 3.9 Prediction of River Flow Discharge and Water Quality in 2020 (P-2, Chone Estuary) - without dilution flow - (2/10)

Prediction point		P-2		
Item		Rainy Season	Dry Season	Annual
Inflow Volume				
I.Existing Inflow				
a)River inflow(Q3)	(MCM/y)	1,248.24	242.36	1,490.67
b)Tidal inflow(Qs)	(MCM/y)	781.92	794.88	1,576.80
c)Total inflow	(MCM/y)	2,030.16	1,037.24	3,067.47
II.Future Inflow				
a)River inflow(Q3')	(MCM/y)	1,365.99	455.01	1,821.00
b)Tidal inflow(Qs)	(MCM/y)	781.92	794.88	1,576.80
c)Addit'l inflow(Q4)	(MCM/y)	41.04	41.04	82.08
d)Total inflow	(MCM/y)	2,188.95	1,290.93	3,479.88
Pollution Load				
I.Existing Load				
A.Load from river(L3)				
a)BOD	(t/y)	13,319.00	3,393.00	16,712.00
b)COD	(t/y)	23,717.00	5,889.00	29,606.00
c)T-N	(t/y)	3,046.00	339.00	3,385.00
d)T-P	(t/y)	312.06	48.47	360.53
B.Load from tidal action(Ls)				
a)BOD	(t/y)	2,893.00	13,115.00	16,008.00
b)COD	(t/y)	4,926.00	25,436.00	30,362.00
c)T-N	(t/y)	657.00	1,740.00	2,397.00
d)T-P	(t/y)	102.00	135.00	237.00
C.Total load				
a)BOD	(t/y)	16,212.00	16,508.00	32,720.00
b)COD	(t/y)	28,643.00	31,325.00	59,968.00
c)T-N	(t/y)	3,703.00	2,079.00	5,782.00
d)T-P	(t/y)	414.06	183.47	597.53
II.Future Load				
A.Load from river(L3')				
a)BOD	(t/y)	15,576.00	5,650.00	21,226.00
b)COD	(t/y)	25,909.00	8,081.00	33,990.00
c)T- N	(t/y)	3,561.00	854.00	4,414.00
d)T-P	(t/y)	372.06	108.47	479.53

Table 3.9 Prediction of River Flow Discharge and Water Quality in 2020 (P-2, Chone Estuary) - without dilution flow - (3/10)

Prediction point		P-2		
Item		Rainy Season	Dry Season	Annual
B.Load from tidal action(Ls)				
a)BOD	(t/y)	2,893.00	13,115.00	16,008.00
b)COD	(t/y)	4,926.00	25,436.00	30,362.00
c)T-N	(t/y)	657.00	1,740.00	2,397.00
d)T-P	(t/y)	102.00	135.00	237.00
C.Additional load (L4)				
a)BOD	(t/y)	230.00	230.00	460.00
b)COD	(t/y)	674.00	674.00	1,347.00
c)T-N	(t/y)	58.50	58.50	117.00
d)T-P	(t/y)	7.00	7.00	14.00
D.Total load				
a)BOD	(t/y)	18,699.00	18,995.00	37,694.00
b)COD	(t/y)	31,509.00	34,191.00	65,700.00
c)T-N	(t/y)	4,276.50	2,652.50	6,928.00
d)T-P	(t/y)	481.06	250.47	730.53
Water Quality				
I.Existing(C5)				
a)BOD	(mg/l)	11.33	18.00	14.67
b)COD	(mg/l)	18.67	32.66	25.67
c)T-N	(mg/l)	2.07	1.26	1.67
d)T-P	(mg/l)	0.00	0.30	0.15
II.Future(C5')				
a)BOD	(mg/l)	8.54	14.71	10.83
b)COD	(mg/l)	14.40	26.49	18.88
c)T-N	(mg/l)	1.95	2.06	1.99
d)T-P	(mg/l)	0.22	0.19	0.21

Source:JICA Study Team

Ls = (Qs)(Cs), Qs = tidal inflow
Cs = Water Quality Data from Punta Blanca, Chone river estuary

Table 3.9 Prediction of River Flow Discharge and Water (4/10) Quality in 2020 (P-3, Guayaba, Portoviejo River) - without dilution flow -

Prediction Point / Item		P-3 Rainy Season	P-3 Dry Season	P-3 Annual
River Flow Discharge				
I.Existing(Q8)	(MCM/y)	538.28	256.99	795.27
II.Future(Q8')	(MCM/y)	624.53	297.47	922.00
Pollution Load				
I.Existing(L8)				
a)BOD	(t/y)	7,175	3,675	10,850
b)COD	(t/y)	10,766	6,091	16,857
c)T-N	(t/y)	1,001	334	1,335
d)T-P	(t/y)	129.19	102.80	231.99
II.Additional Load(L6+L7)				
a)BOD	(t/y)	3,269	3,269	6,538
b)COD	(t/y)	2,270	2,270	4,540
c)T-N	(t/y)	646.00	646.00	1,292.00
d)T-P	(t/y)	100.00	100.00	200.00
III.Future Load (L8')				
a)BOD	(t/y)	10,444	6,944	17,388
b)COD	(t/y)	13,036	8,361	21,397
c)T-N	(t/y)	1,647	980	2,627
d)T-P	(t/y)	229.19	202.80	431.99
Water Quality				
I.Existing(C8)				
a)BOD	(mg/l)	13.33	14.30	13.80
b)COD	(mg/l)	20.00	23.70	21.90
c)T-N	(mg/l)	1.86	1.30	1.60
d)T-P	(mg/l)	0.24	0.40	0.32
II.Future(C8')				
a)BOD	(mg/l)	16.72	23.34	18.86
b)COD	(mg/l)	20.87	28.11	23.21
c)T-N	(mg/l)	2.64	3.29	2.85
d)T-P	(mg/l)	0.37	0.68	0.47

Source: JICA Study Team

- Aditional load (L6 + L7) = total incremental estimation of pollution load by Project in Portoviejo river upstream + Chico river See table 3.8
- L8' = (L6 + L7) + L8

Table 3.9 Prediction of River Flow Discharge and Water (5/10)
Quality in 2020 (P-4, Portoviejo Estuary)
- without dilution flow -

Prediction Point / Item		P-4 Rainy Season	P-4 Dry Season	P-4 Annual
River Flow Discharge				
I.Existing(Q8)	(MCM/y)	538.28	256.99	795.27
II.Future				
a)River discharge(Q8')	(MCM/y)	624.53	297.47	922.00
b)Additional flow(Q9+Q10)	(MCM/y)	14.23	14.23	28.46
c)Total flow	(MCM/y)	638.76	311.70	950.46
Pollution Load				
I.Existing(L11)				
a)BOD	(t/y)	6,459	4,883	11,342
b)COD	(t/y)	9,328	8,650	17,978
c)T-N	(t/y)	1,179	221	1,400
d)T-P	(t/y)	231.46	77.10	308.56
II.Future				
A.Load from river(L8')				
a)BOD	(t/y)	10,444	6,944	17,338.00
b)COD	(t/y)	13,036.00	8,361	21,397
c)T-N	(t/y)	1,647.00	980	2,627
d)T-P	(t/y)	229.19	202.80	431.99
B.Additional Load(L9+L10)				
a)BOD	(t/y)	659	659	1,318
b)COD	(t/y)	765	765	1,529
c)T-N	(t/y)	162.00	162.00	324.00
d)T-P	(t/y)	16.50	16.50	33.00
C.Total Load(L11')				
a)BOD	(t/y)	11,103.00	7,603.00	18,656.00
b)COD	(t/y)	13,801.00	9,126.00	22,926.00
c)T-N	(t/y)	1,809.00	1,142.00	2,951.00
d)T-P	(t/y)	245.69	219.30	464.99
Water Quality				
I.Existing(C11)				
a)BOD	(mg/l)	12.00	19.00	15.50
b)COD	(mg/l)	17.33	33.66	25.50
c)T-N	(mg/l)	2.19	0.86	1.53
d)T-P	(mg/l)	0.43	0.30	0.37
II.Future(C11')				
a)BOD	(mg/l)	17.38	24.39	19.63
b)COD	(mg/l)	21.61	29.28	24.12
c)T-N	(mg/l)	2.83	3.66	3.10
d)T-P	(mg/l)	0.39	0.70	0.49

Source: JICA Study Team

- Additional flow (Q9 + Q10) = irrigation and municipal.
- L11 = (Q8) (C11)

Table 3.9 Prediction of River Flow Discharge and Water Quality in 2020 (P-1, Simbocal, Chone River) - with dilution flow - (6/10)

Prediction Point / Item		(P-1) Rainy Season	Dry Season	Annual
River Flow Discharge				
I.Existing(Q3)	(MCM/y)	1,248.24	242.36	1,490.67
II.Future(Q3')	(MCM/y)	1,365.99	563.01	1929.00
Pollution Load				
I.Existing(L3)				
a)BOD	(t/y)	13,319	3,393	16,712
b)COD	(t/y)	23,717	5,889	29,606
c)T-N	(t/y)	3,046	339	3,385
d)T-P	(t/y)	312.06	48.47	360.53
II.Additional Load(L1+L2)				
a)BOD	(t/y)	2,257	2,257	4,514
b)COD	(t/y)	2,192	2,192	4,384
c)T-N	(t/y)	515	515	1,029
d)T-P	(t/y)	60	60	119
III.Future Load(L3')				
a)BOD	(t/y)	15,576	5,650	21,226
b)COD	(t/y)	25,909	8,081	33,990
c)T-N	(t/y)	3,561	854	4,414
d)T-P	(t/y)	372.06	108.47	479.53
Water Quality				
I.Existing(C3)				
a)BOD	(mg/l)	10.67	14	12.34
b)COD	(mg/l)	19	24.3	21.65
c)T-N	(mg/l)	2.44	1.4	1.92
d)T-P	(mg/l)	0.25	0.2	0.23
II.Future(C3')				
a)BOD	(mg/l)	11.41	10.04	11.00
b)COD	(mg/l)	18.97	14.35	17.62
c)T-N	(mg/l)	2.61	1.52	2.29
d)T-P	(mg/l)	0.27	0.19	0.25

Source: JICA Study Team

(L1 + L2) = Total estimate of Incremental Pollution Load
by the Project in [(2) Chone Upstream] + [(3)Carrizal river]
See table 3.8

Table 3.9 Prediction of River Flow Discharge and Water Quality in 2020 (P-2, Chone Estuary) - with dilution flow - (7/10)

Prediction point / Item		P-2 Rainy Season	P-2 Dry Season	P-2 Annual
Inflow Volume				
I.Existing Inflow				
a)River inflow(Q3)	(MCM/y)	1,248.24	242.36	1,490.67
b)Tidal inflow(Qs)	(MCM/y)	781.92	794.88	1,576.80
c)Total inflow	(MCM/y)	2,030.16	1,037.24	3,067.47
II.Future Inflow				
a)River inflow(Q3')	(MCM/y)	1,365.99	563.01	1,929.00
b)Tidal inflow(Qs)	(MCM/y)	781.92	794.88	1,576.80
c)Addit'l inflow(Q4)	(MCM/y)	41.04	41.04	82.08
d)Total inflow	(MCM/y)	2,188.95	1,398.93	3,587.88
Pollution Load				
I.Existing Load				
A.Load from river(L3)				
a)BOD	(t/y)	13,319.00	3,393.00	16,712.00
b)COD	(t/y)	23,717.00	5,889.00	29,606.00
c)T-N	(t/y)	3,046.00	339.00	3,385.00
d)T-P	(t/y)	312.06	48.47	360.53
B.Load from tidal action(Ls)				
a)BOD	(t/y)	2,893.00	13,115.00	16,008.00
b)COD	(t/y)	4,926.00	25,436.00	30,362.00
c)T-N	(t/y)	657.00	1,740.00	2,397.00
d)T-P	(t/y)	102.00	135.00	237.00
C.Total load				
a)BOD	(t/y)	16,212.00	16,508.00	32,720.00
b)COD	(t/y)	28,643.00	31,325.00	59,968.00
c)T-N	(t/y)	3,703.00	2,079.00	5,782.00
d)T-P	(t/y)	414.06	183.47	597.53
II.Future Load				
A.Load from river(L3')				
a)BOD	(t/y)	15,576.00	5,650.00	21,226.00
b)COD	(t/y)	25,909.00	8,081.00	33,990.00
c)T-N	(t/y)	3,561.00	854.00	4,414.00
d)T-P	(t/y)	372.06	108.47	479.53
B.Load from tidal action(Ls)				
a)BOD	(t/y)	2,893.00	13,115.00	16,008.00
b)COD	(t/y)	4,926.00	25,436.00	30,362.00
c)T-N	(t/y)	657.00	1,740.00	2,397.00
d)T-P	(t/y)	102.00	135.00	237.00
C.Additional load (L4)				
a)BOD	(t/y)	230	230	460

Table 3.9 Prediction of River Flow Discharge and Water Quality in 2020 (P-2, Chone Estuary) - with dilution flow - (8/10)

b)COD	(t/y)	674	674	1347
c)T-N	(t/y)	58.50	58.50	117.00
d)T-P	(t/y)	7.00	7.00	14.00
D.Total load				
a)BOD	(t/y)	18,699.00	18,995.00	37,694.00
b)COD	(t/y)	31,509.00	34,191.00	65,700.00
c)T-N	(t/y)	4,276.50	2,652.50	6,928.00
d)T-P	(t/y)	481.06	250.47	730.53
Water Quality				
I.Existing(C5)				
a)BOD	(mg/l)	11.30	18.00	14.67
b)COD	(mg/l)	18.67	32.66	25.65
c)T-N	(mg/l)	2.07	1.26	1.53
d)T-P	(mg/l)	0.00	0.30	0.15
II.Future(C5')				
a)BOD	(mg/l)	8.54	13.58	10.51
b)COD	(mg/l)	14.40	24.44	18.31
c)T-N	(mg/l)	1.95	1.90	1.93
d)T-P	(mg/l)	0.22	0.18	0.20

Source:JICA Study Team

Ls = (Qs)(Cs), Qs = tidal inflow
Cs = Water Quality Data from Punta Blanca, Chone river estuary

Table 3.9 Prediction of River Flow Discharge and Water (9/10) Quality in 2020 (P-3, Guayaba, Portoviejo River) - with dilution flow -

Prediction Point / Item		P-3 Rainy. Season	P-3 Dry Season	P-3 Annual
River Flow Discharge				
I.Existing(Q8)	(MCM/y)	538.28	256.99	795.27
II.Future(Q8')	(MCM/y)	696.10	383.90	1,080.00
Pollution Load				
I.Existing(L8)				
a)BOD	(t/y)	7,175	3,675	10,850
b)COD	(t/y)	10,766	6,091	16,857
c)T-N	(t/y)	1,001	334	1,335
d)T-P	(t/y)	129.19	102.80	231.99
II.Additional Load(L6+L7)				
a)BOD	(t/y)	3,269	3,269	6,538
b)COD	(t/y)	2,270	2,270	4,540
c)T-N	(t/y)	646.00	646.00	1,292.00
d)T-P	(t/y)	100.00	100.00	200.00
III.Future Load (L8')				
a)BOD	(t/y)	10,444	6,944	17,388
b)COD	(t/y)	13,036	8,361	21,397
c)T-N	(t/y)	1,647	980	2,627
d)T-P	(t/y)	229.19	202.80	431.99
Water Quality				
I.Existing(C8)				
a)BOD	(mg/l)	13.33	14.30	13.80
b)COD	(mg/l)	20.00	23.70	21.90
c)T-N	(mg/l)	1.86	1.30	1.60
d)T-P	(mg/l)	0.24	0.40	0.32
II.Future(C8')				
a)BOD	(mg/l)	15.00	18.09	16.10
b)COD	(mg/l)	18.73	21.78	19.81
c)T-N	(mg/l)	2.37	2.55	2.43
d)T-P	(mg/l)	0.33	0.53	0.40

Source: JICA Study Team

- Aditional load (L6 + L7) = total incremental estimation of pollution load by Project in Portoviejo river upstream + Chico river See table 3.8
- L8' = (L6 + L7) + L8

Table 3.9 Prediction of River Flow Discharge and Water Quality in 2020 (P-4, Portoviejo Estuary) - with dilution flow - (10/10)

Prediction Point / Item		P-4 Rainy Season	P-4 Dry Season	P-4 Annual
River Flow Discharge				
I.Existing(Q8)	(MCM/y)	538.28	256.99	795.27
II.Future				
a)River discharge(Q8')	(MCM/y)	696.10	383.90	1,080.00
b)Additional flow(Q9+Q10)	(MCM/y)	14.23	14.23	28.46
c)Total flow	(MCM/y)	710.33	398.13	1,108.46
Pollution Load				
I.Existing(L11)				
a)BOD	(t/y)	6,459.0	4,883	11,342
b)COD	(t/y)	9,328.0	8,650	17,978
c)T-N	(t/y)	1,179	221	1,400
d)T-P	(t/y)	231.5	77.10	308.6
II.Future				
A.Load from river(L8')				
a)BOD	(t/y)	10,444	6,944	17,388
b)COD	(t/y)	13,036	8,361	21,397
c)T-N	(t/y)	1,647.0	980	2,627
d)T-P	(t/y)	229.19	202.80	431.99
B.Additional Load(L9+L10)				
a)BOD	(t/y)	659.0	659.0	1,318
b)COD	(t/y)	764.50	764.50	1,529
c)T-N	(t/y)	162	162	324
d)T-P	(t/y)	16.5	16.5	33.00
C.Total Load(L11')				
a)BOD	(t/y)	11,103.0	7,603.00	18,656
b)COD	(t/y)	13,801.00	9,126.00	22,926
c)T-N	(t/y)	1,809.0	1,142.00	2,951
d)T-P	(t/y)	245.69	219.30	464.99
Water Quality				
I.Existing(C11)				
a)BOD	(mg/l)	12	19.00	15.50
b)COD	(mg/l)	17.33	33.66	25.50
c)T-N	(mg/l)	2.19	0.86	1.53
d)T-P	(mg/l)	0.43	0.30	0.37
II.Future(C11')				
a)BOD	(mg/l)	15.63	19.10	16.83
b)COD	(mg/l)	19.43	22.92	20.68
c)T-N	(mg/l)	2.55	2.87	2.66
d)T-P	(mg/l)	0.35	0.55	0.42

Source: JICA Study Team

- Additional flow (Q9 + Q10) = irrigation and municipal.

TABLE # 3.10 SUMMARY ON AVERAGE SALINITY (ppt), SURFACE AND BOTTOM (1/2) SAMPLINGS FOR ALL SATATIONS (JUNE)

		E S T A T I O N S						
Date	Hour	Bahía de Car·quez	Salinas ST-1	Quiroga ST-2	Ariaga ST-3	Barquero ST-4	Simbocal ST-5	Simbocal ST-5A
1994/3/6	8h00	26.62	.	.	.	0.23	0.23	0.52
	9h00	28.57	3.78	0.41	0.36	0.24	0.23	0.49
	10h00	28.80	5.10	0.52	0.39	0.24	0.23	0.47
	11h00	31.23	7.37	0.84	0.38	0.24	0.24	0.33
	12h00	30.65	9.02	1.38	0.40	0.24	0.23	0.38
	13h00	29.63	10.57	0.74	0.39	0.24	0.23	0.40
	14h00	28.71	11.12	0.57	0.43	0.23	0.23	0.42
	15h00	28.58	6.55	0.46	0.51	0.24	0.24	0.42
	16h00	26.28	2.70	0.44	0.70	0.24	0.24	0.43
	17h00	25.48	0.92	0.43	0.78	0.24	0.24	0.46
	18h00	25.48	0.73	0.42	0.87	0.24	0.24	0.54
	19h00	24.73	0.60	0.41	0.53	0.25	0.25	0.51
	20h00	25.51	0.93	0.40	0.30	0.25	0.25	0.52
	21h00	27.11	1.89	0.44	0.31	0.25	0.25	0.52
	22h00	27.11	4.38	0.49	0.34	0.25	0.25	0.47
	23h00	29.68	5.66	0.56	0.41	0.25	0.25	0.36
1994/4/6	24h00	30.55	6.27	0.79	0.42	0.25	0.24	0.32
	1h00	29.32	7.07	0.76	0.41	0.24	0.24	0.41
	2h00	29.22	6.70	0.51	0.41	0.24	0.24	0.42
	3h00	28.85	4.31	0.48	0.36	0.24	0.24	0.41
	4h00	27.51	2.99	0.47	0.40	0.26	0.25	0.42
	5h00	26.45	1.75	0.42	0.38	0.25	0.24	0.44
	6h00	26.23	1.34	0.38	0.39	0.25	0.25	0.46
	7h00	24.82	2.14	0.35	0.31	0.25	0.25	0.46
	8h00	26.33	1.57	0.36	0.29	0.25	0.25	0.51
	9h00	26.35	1.77	0.41	0.32	0.25	0.25	0.53
	10h00	27.65	4.21	0.46	0.33	0.25	0.25	0.48
	11h00	29.79	5.08	0.54	0.35	0.25	0.25	0.35
	12h00	29.94	9.21	2.41	0.39	0.25	0.25	0.31
	13h00	30.98	9.96	2.90	0.43	0.25	0.25	0.37
	14h00	30.55	11.22	2.55	0.42	0.25	0.25	0.38
	15h00	29.86	8.75	1.08	0.40	0.25	0.25	0.41
	16h00	29.65	4.82	0.53	0.43	0.25	0.25	0.39
	17h00	27.34	3.38	0.46	0.42	0.25	0.25	0.39
	18h00	25.85	2.08	0.42	0.48	0.25	0.25	0.42
	19h00	25.63	0.74	0.40	0.61	0.26	0.26	0.44
	20h00	25.07	0.67	0.40	0.32	0.26	0.26	0.63
	21h00	25.07	1.66	0.39	.	0.27	0.26	0.51
	22h00	26.46	2.55	0.41	0.33	0.27	0.26	0.49
	23h00	27.65	4.70	0.46	0.33	0.27	0.26	0.45
1994/5/6	24h00	28.94	5.72	0.54	0.39	0.26	0.25	0.37
	1h00	29.67	8.08	0.96	0.39	0.26	0.25	0.35
	2h00	28.82	9.96	1.30	0.42	0.26	0.25	0.36
	3h00	28.74	6.97	0.75	0.39	0.25	0.25	0.38
	4h00	29.33	5.13	0.49	0.47	0.25	0.25	0.39
	5h00	28.50	3.29	0.46	0.54	0.26	0.26	0.39
	6h00	27.22	2.20	0.43	0.57	0.26	0.26	0.40
	7h00	26.93	0.96	0.39	0.38	0.27	0.26	0.45
	8h00	26.25	0.71	0.39	0.33	0.27	0.26	0.48
	9h00	27.12	1.23	0.40	0.33	0.27	0.25	0.49
	10h00	28.48	2.33	0.42	0.34	0.27	0.26	0.50
	MAXIMUM	31.23	11.22	2.90	0.87	0.27	0.26	0.63
	MINIMUM	24.73	0.60	0.35	0.29	0.23	0.23	0.31
	AVERAGE	27.87	4.46	0.67	0.42	0.25	0.25	0.44

TABLE # 3.10 SUMMARY ON AVERAGE SALINITY (ppt), SURFACE AND BOTTON (2/2) SAMPLINGS FOR ALL STATIONS (AUGUST)

		ESTATIONS						
Date	Hour	Bahía de Car-quez	Salinas ST-1	Quiroga ST-2	Ariaga ST-3	Barquero ST-4	Simbocal ST-5	Simbocal ST-5A
1994/12/8	8h00	33.78	31.02	29.60	26.97	8.14	3.25	.
	9h00	33.87	29.69	28.94	24.74	6.08	4.42	6.90
	10h00	33.97	29.32	27.16	23.90	5.09	3.40	6.80
	11h00	33.97	28.00	24.82	20.31	4.70	2.04	6.59
	12h00	33.97	26.41	21.78	18.05	4.05	0.88	6.27
	13h00	33.49	24.92	19.58	16.07	4.75	0.67	6.61
	14h00	33.30	22.60	18.23	14.12	3.48	0.44	.
	15h00	33.68	22.05	16.88	13.59	3.23	0.37	.
	16h00	34.06	24.36	18.68	13.68	2.72	0.34	6.51
	17h00	34.06	26.50	21.14	16.61	6.48	0.32	5.55
	18h00	34.16	28.38	22.23	19.31	6.83	0.31	5.95
	19h00	34.26	29.13	26.13	21.96	8.05	0.33	6.06
	20h00	34.06	30.26	27.81	25.48	7.78	0.34	6.00
	21h00	33.87	30.17	26.88	24.09	8.26	1.17	6.05
	22h00	33.68	29.51	26.31	23.16	5.17	1.19	6.41
	23h00	33.68	28.38	23.80	19.86	4.48	1.55	6.09
13/8/94	24h00	33.68	27.06	21.23	18.32	2.59	0.75	5.98
	1h00	33.49	24.92	19.40	16.43	2.62	0.77	6.54
	2h00	33.21	23.16	17.77	14.29	3.23	0.80	.
	3h00	32.92	22.42	17.23	13.77	2.67	0.81	.
	4h00	33.01	23.43	17.77	14.12	4.32	0.31	6.78
	5h00	32.97	25.38	20.50	16.52	6.31	0.30	5.95
	6h00	33.11	27.34	22.33	18.68	7.00	0.27	6.05
	7h00	33.40	28.38	25.38	20.86	7.53	0.27	6.67
	8h00	33.49	29.60	28.28	23.53	6.83	0.30	6.93
	9h00	33.49	30.36	29.13	26.13	6.81	2.91	5.97
	10h00	33.68	29.22	28.19	24.83	5.94	3.93	6.00
	11h00	33.59	29.13	25.75	23.16	5.16	2.57	6.80
	12h00	33.87	27.72	23.34	19.86	4.65	1.89	6.05
	13h00	33.68	25.94	21.69	18.23	3.88	0.83	6.78
	14h00	33.30	24.36	19.49	16.34	3.80	0.55	6.53
	15h00	33.30	22.88	17.95	14.47	3.23	0.39	6.54
	16h00	33.49	22.79	18.05	13.41	2.72	0.32	5.84
	17h00	33.11	25.20	19.86	15.18	4.88	0.30	5.95
	18h00	33.49	26.32	21.87	17.50	6.93	0.29	6.11
	19h00	33.30	28.56	23.71	19.26	7.14	0.30	6.42
	20h00	33.40	29.41	27.06	20.04	7.69	0.28	6.72
	21h00	33.68	30.55	28.47	23.71	8.00	0.28	6.87
	22h00	33.87	30.36	28.47	22.52	6.65	1.29	7.01
	23h00	33.21	29.13	26.31	21.78	2.83	1.16	6.84
14/8/94	24h00	32.92	28.19	23.90	19.31	4.45	1.31	6.77
	1h00	32.92	26.22	20.86	17.14	3.58	0.65	6.56
	2h00	32.82	25.01	18.86	16.16	3.32	0.61	6.61
	3h00	32.92	23.16	18.41	14.12	2.61	0.68	.
	4h00	33.02	23.34	17.50	13.33	2.31	0.28	.
	5h00	32.92	24.36	19.13	14.91	2.82	0.27	6.89
	6h00	33.01	26.50	21.23	16.97	4.25	0.27	6.03
	7h00	33.01	28.56	23.11	18.27	6.54	0.27	6.57
	8h00	33.01	27.62	25.20	21.50	7.80	0.27	6.61
	9h00	33.49	30.36	26.69	22.79	8.14	0.27	6.72
	MAXIMUM	32.82	22.05	16.88	13.33	2.31	0.27	5.55
	MINIMUM	34.26	31.02	29.60	26.97	8.26	4.42	7.01
	AVERAGE	33.47	26.95	22.88	18.99	5.17	0.96	6.42

Table 3.11 Prediction of River Flow Discharge and water (1/2)
Quality in 2020 in Chico River
- Without dilution flow-
(P-11)

Prediction Point / Item		Rainy season	Dry season	Annual
River Flow Discharge				
I. Existing	(MCM/year)	164.32	60.08	224.39
II. Future	(MCM/year)	210.98	151.02	362.00
Pollution load				
I. Existing				
a) BOD	(t/year)	1,533.11	859.14	2,392.25
b) COD	(t/year)	2,683.35	1,381.84	4,065.19
c) T-N	(t/year)	423.95	42.06	466.01
d) T-P	(t/year)	34.51	13.82	48.33
II. Aditional load (L7)				
a) BOD	(t/year)	456,00	456,00	912,00
b) COD	(t/year)	323,50	323,50	647,00
c) T-N	(t/year)	88,50	88,50	177,00
d) T-P	(t/year)	14,00	14,00	28,00
III. Future load				
a) BOD	(t/year)	1,989.11	1,315.14	3,304.25
b) COD	(t/year)	3,006.85	1,705.34	4,712.19
c) T-N	(t/year)	512.45	130.56	643.01
d) T-P	(t/year)	48.51	27.82	76.33
Water Quality				
I. Existing				
a) BOD	(mg/l)	9.33	14.30	11.82
b) COD	(mg/l)	16.33	23.00	19.67
c) T-N	(mg/l)	2.58	0.70	1.64
d) T-P	(mg/l)	0.21	0.23	0.22
II. Future				
a) BOD	(mg/l)	9.43	8.71	9.13
b) COD	(mg/l)	14.25	11.3	13.02
c) T-N	(mg/l)	2.43	0.87	1.78
d) T-P	(mg/l)	0.23	0.19	0.21

Source: JICA Study Team
L7: Total estimated incremented load in the Chico river
before its confluence with the Portoviejo river
see table 3.8

Table 3.11 Prediction of River Flow Discharge and water (2/2)
Quality in 2020 in Chico River
- Without dilution flow-
(P-11)

Prediction Point / Item		Rainy season	Dry season	Annual
River Flow Discharge				
I. Existing	(MCM/year)	164.32	60.08	224.39
II. Future	(MCM/year)	215.07	158.93	374.00
Pollution load				
I. Existing				
a) BOD	(t/year)	1,533.11	859.14	2,392.25
b) COD	(t/year)	2,683.35	1,381.84	4,065.19
c) T-N	(t/year)	423.95	42.06	466.01
d) T-P	(t/year)	34.51	13.82	48.33
II. Aditional load (L7)				
a) BOD	(t/year)	456.00	456.00	912.00
b) COD	(t/year)	323.50	323.50	647.00
c) T-N	(t/year)	88.50	88.50	177.00
d) T-P	(t/year)	14.00	14.00	28.00
III. Future load				
a) BOD	(t/year)	1.989.11	1.315.14	3.304.25
b) COD	(t/year)	3.006.85	1.705.34	4.712.19
c) T-N	(t/year)	512.45	130.56	643.01
d) T-P	(t/year)	48.51	27.82	76.33
Water Quality				
I. Existing				
a) BOD	(mg/l)	9.33	14.30	11.82
b) COD	(mg/l)	16.33	23.00	19.67
c) T-N	(mg/l)	2.58	0.70	1.64
d) T-P	(mg/l)	0.21	0.23	0.22
II. Future				
a) BOD	(mg/l)	9.24	8.27	8.83
b) COD	(mg/l)	13.98	10.73	12.60
c) T-N	(mg/l)	2.38	0.82	1.71
d) T-P	(mg/l)	0.22	0.17	0.20

Source: JICA Study Team
L7: Total estimated incremented load in the Chico river
before its confluence with the Portoviejo river
see table 3.8

TABLE # 7.1 Tidal measurement in Chone river estuary, referred to IGM levels during (1/2) december 17, 18 and 19, 1993

Date	Hour	Time	Bahía de Caraquez	ST-1 Salinas	ST-2 Quiroga	ST-3 Ariaga	ST-4 Barquero	ST-5 Simbocal
Dec-17-1993	1	8	-	-	0.97	-	1.19	1.15
	2	9	0.30	0.42	0.51	-	0.65	0.59
	3	10	-0.22	-0.17	0.00	0.13	0.12	0.10
	4	11	-0.78	-0.69	-0.47	-0.34	-0.34	0.02
	5	12	-1.17	-1.10	-0.91	-0.81	-0.84	0.02
	6	13	-1.33	-1.32	-1.23	-1.13	-1.19	0.02
	7	14	-1.10	-1.35	-1.40	-1.32	-1.39	0.02
	8	15	-0.57	-0.90	-1.10	-1.05	-1.15	0.02
	9	16	0.00	-0.28	-0.44	-0.40	-0.54	0.02
	10	17	0.68	0.33	0.21	0.24	0.12	0.03
	11	18	1.10	1.02	0.88	0.88	0.72	0.67
	12	19	1.30	1.40	1.29	1.32	1.19	1.14
	13	20	1.15	1.25	1.29	1.40	1.38	1.33
	14	21	0.75	0.87	0.95	1.08	1.14	1.09
	15	22	0.28	0.37	0.44	0.58	0.58	0.54
	16	23	-0.31	-0.11	-0.40	0.12	0.06	0.07
	17	24	-0.73	-0.57	-0.50	-0.37	-0.38	0.02
Dec.-18-1993	18	1	-1.02	-1.02	-0.92	-0.82	0.88	0.02
	19	2	-0.97	-1.20	-1.20	-1.13	-1.21	0.02
	20	3	-0.60	-0.90	-1.07	-1.04	-1.12	0.02
	21	4	-0.10	-0.39	-0.50	-0.44	-0.56	0.02
	22	5	0.97	0.19	0.02	0.08	-0.03	0.02
	23	6	0.65	0.75	0.62	0.66	0.51	0.46
	24	7	0.10	1.12	1.04	1.10	0.98	0.92
	25	8	0.97	1.11	1.11	1.23	1.17	1.14
	26	9	0.65	0.72	0.78	0.92	0.91	0.86
	27	10	0.10	0.26	0.31	0.44	0.41	0.36
	28	11	-0.30	-0.12	-0.11	0.03	-0.02	0.02
	29	12	0.78	-0.65	-0.54	-0.47	-0.47	0.02
	30	13	-1.08	-1.05	-0.99	-0.87	-0.94	0.02
	31	14	-1.07	-1.27	-1.26	-1.16	-1.24	0.02
	32	15	-0.78	-1.05	-1.19	-1.14	-1.25	0.02
	33	16	-0.28	-0.56	-0.69	-0.66	-0.75	0.02
	34	17	0.31	-0.02	-0.13	-0.06	-0.16	0.02
	35	18	0.84	-0.62	0.48	0.50	-0.34	0.30
	36	19	1.17	1.15	1.01	1.04	-0.88	0.85
	37	20	1.18	1.33	1.29	1.35	1.24	1.18
	38	21	1.00	1.08	1.16	1.36	1.30	1.24
	39	22	0.62	0.71	0.76	0.38	0.91	0.86
	40	23	0.10	0.13	0.31	0.10	0.39	0.35
	41	24	-0.27	-0.19	-0.12	-0.02	-0.03	0.02
Dec.-19-1993	42	1	-0.65	-0.49	-0.56	-0.46	-0.50	0.02
	43	2	-0.09	-0.83	-0.91	-0.35	-0.90	0.02
	44	3	-0.71	-0.98	-1.09	-1.00	-1.12	0.02
	45	4	-0.34	-0.57	-0.69	-0.54	-0.76	0.02
	46	5	0.08	-0.15	-0.19	-0.14	-0.25	0.02
	47	6	0.51	0.37	0.27	0.32	0.17	0.08
	48	7	0.87	0.81	0.71	0.76	0.66	0.63
	49	8	0.99	1.01	0.96	1.06	1.07	0.92
	50	9	0.81	0.92	0.94	1.03	1.02	0.92
	51	10	0.47	0.51	0.57	-	0.67	0.61
	52	11	0.02	0.14	-	-	0.22	0.17
	53	12	-	-	-	-	-0.14	0.02

TABLE # 7.1 Tidal measurement in Chone river estuary, referred to IGM levels, during (2/2) january 28,29 and 30, 1994

Date	Hour	Time	Bahìa de Carauez	ST-1 Salinas	ST-2 Quiroga	ST-3 Ariaga	ST-4 Barquero	ST-5 Simbocal
January 28-1994	1	8	-0.43	-	-	-	-	-
	2	9	-1.06	-0.67	-0.51	-0.44	-0.34	-0.34
	3	10	-1.40	-1.10	-0.96	-0.97	-0.88	-0.83
	4	11	-1.51	-1.34	-1.28	-1.30	-1.22	-0.83
	5	12	-1.21	-1.41	-1.44	-1.47	-1.40	-0.83
	6	13	-0.71	-0.97	-1.15	-1.24	-1.35	-0.83
	7	14	0.01	-0.25	-0.41	-0.40	-0.49	-0.53
	8	15	0.65	0.50	0.37	0.27	0.15	0.18
	9	16	1.14	1.19	1.02	0.87	0.86	0.84
	10	17	1.29	1.53	1.42	1.30	1.27	1.27
	11	18	1.07	1.40	1.39	1.35	1.43	1.44
	12	19	0.54	0.85	0.97	1.05	1.33	1.31
	13	20	-0.03	0.30	0.42	0.50	0.71	0.72
	14	21	-0.61	-0.19	-0.09	-0.07	0.12	0.11
	15	22	-1.09	-0.75	-0.56	-0.61	-0.40	-0.42
	16	23	-1.33	-1.24	-1.03	-1.04	-0.91	-0.83
	17	24	-1.20	-1.39	-1.31	-1.34	-1.24	-0.83
January -29-1994	18	1	-0.73	-1.07	-1.18	-1.32	-1.38	-0.83
	19	2	-0.13	-0.46	-0.57	-0.67	-0.65	-0.66
	20	3	-0.49	0.27	0.22	-0.01	0.04	0.04
	21	4	1.01	0.97	0.95	0.73	0.73	0.74
	22	5	1.25	1.48	1.40	1.13	1.21	1.23
	23	6	1.09	1.40	1.35	1.33	1.43	0.11
	24	7	0.59	0.95	1.00	1.06	1.35	1.35
	25	8	-0.02	0.33	0.46	0.48	0.78	0.76
	26	9	-0.64	-0.21	-0.09	-0.08	0.16	0.17
	27	10	-1.21	-0.80	-0.60	-0.58	-0.40	-0.40
	28	11	-1.55	-1.17	-1.01	-1.06	-0.92	-0.83
	29	12	-1.56	-1.38	-1.30	-1.33	-1.22	-0.83
	30	13	-1.10	-1.40	-1.43	-1.48	-1.38	-0.83
	31	14	-0.45	-0.90	-1.01	-1.20	-1.19	-0.83
	32	15	0.27	-0.07	-0.21	-0.33	-0.29	-0.33
	33	16	0.89	0.80	0.63	0,40	0.44	0.45
	34	17	1.31	1.42	1.26	1.13	1.11	1.11
	35	18	1.34	1.55	1.53	1.39	1.43	1.42
	36	19	0.89	1.28	1.31	1.34	1.52	1.54
	37	20	0.39	0.75	0.81	0.93	1.28	1.24
	38	21	-0.23	0.20	0.30	0.36	0.66	0.64
	39	22	0.81	-0.37	-0.23	-0.20	0.05	0.00
	40	23	-1.26	-0.90	-0.73	-0.72	-0.50	-0.53
	41	24	-1.43	-1.21	-1.10	-1.10	-0.99	-0.83
January-30-1994	42	1	-1.18	-1.32	-1.32	-1.43	-1.27	-0.83
	43	2	-0.61	-0.90	-1.09	-1.24	-1.34	-0.83
	44	3	0.06	-0.28	-0.40	-0.50	-0.47	-0.48
	45	4	0,69	0.31	0.36	0.23	0.25	0.25
	46	5	1.17	0.82	1.02	0.93	0.91	0.89
	47	6	1.29	1.23	1.39	1.28	1.33	1.32
	48	7	0.94	1.27	1.31	1.33	1.49	1.48
	49	8	0.39	0.78	0.87	0.94	1.23	1.25
	50	9	-0.22	0.23	0.31	0.29	0.64	0.66
	51	10	-0.93	-	-	-	-	-

TABLE # 7.2 Tidal mezsurement in Chone river estuary, referred to IGM levels, during (1/2) june 03, 04 and 05, 1994

Date	Hour	Time	Bahía de Carauez	ST-1 Salinas	ST-2 Quiroga	ST-3 Ariaga	ST-4 Barquero	ST-5 Simbocal	ST-5A Simbocal
June-03-1994	1	8	0.06						
	2	9	0.35	0.22	0.20	0.28	0.15	0.94	0.09
	3	10	0.70	0.63	0.58	0.63	0.53	0.94	0.40
	4	11	0.96	0.86	0.83	0.94	0.92	1.01	0.88
	5	12	0.89	0.98	1.00	1.11	0.97	1.03	0.96
	6	13	0.75	0.77	0.81	0.94	0.96	1.02	0.91
	7	14	0.44	0.47	0.53	0.62	0.60	0.94	0.57
	8	15	0.09	0.11	0.15	0.25	0.26	0.93	0.23
	9	16	-0.25	-0.23	-0.20	-0.08	-0.08	0.93	-0.12
	10	17	-0.53	-0.57	-0.52	-0.42	-0.42	0.93	-0.44
	11	18	-0.64	-0.72	-0.76	-0.67	0.69	0.93	-0.73
	12	19	-0.52	-0.71	-0.76	-0.62	-0.67	0.92	-0.71
	13	20	-0.32	-0.46	-0.48	-0.45	-0.62	0.90	-0.64
	14	21	-0.07	-0.12	-0.16	-0.08	-0.18	0.90	-0.20
	15	22	0.29	0.27	0.21	0.36	0.17	0.92	0.13
	16	23	0.55	0.63	0.57	0.69	0.57	0.92	0.54
	17	24	0.72	0.80	0.79	0.89	0.83	0.94	0.80
June-04-1994	18	1	0.63	0.80	0.82	0.93	0.87	0.97	0.84
	19	2	0.46	0.55	0.59	0.68	0.70	0.94	0.66
	20	3	0.16	0.26	0.27	0.38	0.33	0.91	0.29
	21	4	-0.17	-0.08	-0.05	0.03	0.05	0.91	0.01
	22	5	-0.44	-0.40	-0.37	-0.27	-0.23	0.92	-0.27
	23	6	-0.56	-0.68	-0.66	-0.62	-0.55	0.92	-0.59
	24	7	-0.51	-0.62	-0.68	-0.65	-0.63	0.91	-0.74
	25	8	-0.33	-0.40	-0.49	-0.46	-0.52	0.91	-0.55
	26	9	0.04	-0.12	-0.12	-0.05	-0.09	0.91	-0.13
	27	10	0.45	0.30	0.26	-0.32	0.20	0.91	0.17
	28	11	0.75	0.69	0.65	0.72	0.60	0.91	0.56
	29	12	0.97	0.93	0.94	1.04	0.96	1.00	0.94
	30	13	0.96	1.08	1.06	1.16	1.00	1.04	1.00
	31	14	0.79	0.75	0.90	1.03	1.04	1.08	1.02
	32	15	0.44	0.50	0.55	0.70	0.66	0.93	0.64
	33	16	0.04	0.17	0.20	0.31	0.34	0.90	0.30
	34	17	-0.32	-0.21	-0.17	-0.07	-0.01	0.90	-0.03
	35	18	-0.56	-0.55	0.55	-0.46	-0.43	0.88	-0.44
	36	19	-0.65	-0.85	-0.83	-0.72	-0.72	0.88	-0.73
	37	20	-0.55	-0.63	-0.75	-0.72	-0.87	0.88	-0.93
	38	21	-0.31	-0.39	-0.50	-0.37	-0.49	0.89	-0.52
	39	22	0.06	-0.12	-0.16	-0.02	-0.17	0.89	-0.18
	40	23	0.39	0.28	0.24	0.28	0.25	0.90	0.23
	41	24	0.74	0.60	0.58	0.67	0.60	0.90	0.58
June-05-1994	42	1	0.84	0.91	0.88	0.98	0.89	0.95	0.88
	43	2	0.82	0.88	0.97	0.97	0.97	1.01	0.96
	44	3	0.59	0.65	0.63	0.74	0.73	0.93	0.70
	45	4	0.25	0.30	0.26	0.43	0.44	0.90	0.42
	46	5	-0.08	-0.05	-0.02	0.05	0.05	0.90	0.03
	47	6	-0.34	-0.42	-0.37	-0.27	-0.27	0.89	-0.29
	48	7	-0.51	-0.63	-0.64	-0.61	-0.55	0.89	-0.59
	49	8	-0.50	-0.62	-0.74	-0.68	-0.78	0.88	-0.81
	50	9	-0.21	-0.50	-0.51	-0.45	-0.40	0.89	-0.41
	51	10	0.14	-0.04	-0.10	-0.05	-0.10	0.89	-0.19

TABLE # 7.2 Tidal mezsurement in Chone river estuary, referred to IGM levels, during(2/2)
August 12, 13 and 14, 1994

Date	Hour	Time	Bahìa de Carauez	ST-1 Salinas	ST-2 Quiroga	ST-3 Ariaga	ST-4 Barquero	ST-5 Simbocal	ST-5A Simbocal
Augus-12-1994	1	8	1.34	1.40	1.57	1.53	1.47	1.46	-
	2	9	0.94	1.02	1.08	1.35	1.45	1.45	1.44
	3	10	0.34	0.51	0.57	0.85	0.93	0.98	0.96
	4	11	-0.21	-0.01	0.04	0.29	0.35	0.38	0.31
	5	12	-0.76	-0.55	-0.41	-0.26	-0.25	0.27	-0.29
	6	13	-1.18	-1.02	-0.91	1.36	-0.81	0.27	-0.86
	7	14	-1.33	-1.30	-1.26	-1.17	-1.23	0.27	-1.34
	8	15	-0.91	-1.30	-1.39	-1.33	-1.40	0.27	-1.34
	9	16	0.41	-0.74	-0.90	-0.87	-0.97	0.27	-1.04
	10	17	0.22	-0.12	-0.22	-0.21	-0.30	0.27	-0.35
	11	18	0.82	0.52	0.41	0.43	0.32	0.31	0.27
	12	19	1.16	1.13	1.00	1.03	0.90	0.87	0.86
	13	20	1.22	1.30	1.29	1.33	1.27	1.26	1.23
	14	21	0.86	1.07	1.16	1.33	1.35	1.36	1.26
	15	22	0.42	0.60	0.64	0.86	0.93	0.99	0.81
	16	23	-0.11	0.10	0.16	0.19	0.34	0.41	0.29
	17	24	-0.61	-0.45	-0.32	-0.18	-0.17	0.27	-0.23
Augus-13-1994	18	1	-1.01	-0.90	-0.79	-0.67	-0.73	0.27	-0.75
	19	2	-1.18	-1.24	-1.17	-1.10	-1.14	0.27	-1.19
	20	3	-0.91	-1.35	-1.37	-1.32	-1.34	0.27	-1.34
	21	4	-0.48	-0.78	-0.96	-0.94	-1.05	0.27	-0.98
	22	5	0.14	-0.25	-0.34	-0.30	-0.39	0.27	-0.45
	23	6	0.76	0.40	0.31	0.31	0.19	0.28	0.15
	24	7	-1.16	1.05	0.90	0.92	0.78	0.74	0.74
	25	8	-1.46	1.31	1.28	1.33	1.25	1.23	1.16
	26	9	1.19	1.30	1.38	1.46	1.41	1.41	1.36
	27	10	0.74	0.85	0.95	1.14	1.35	1.38	1.30
	28	11	0.24	0.37	0.49	0.69	0.73	0.76	0.69
	29	12	-0.24	-0.12	0.00	0.14	0.15	0.29	0.09
	30	13	-0.81	-0.65	-0.51	-0.37	-0.36	0.28	-0.40
	31	14	-1.08	-1.09	-0.99	-0.86	-0.89	0.28	-0.97
	32	15	-1.08	-1.31	-1.25	-1.21	-1.24	0.28	-1.31
	33	16	-0.71	-1.11	-1.21	-1.26	-1.39	0.28	-1.34
	34	17	-0.24	-0.62	-0.71	-0.67	-0.70	0.28	-0.78
	35	18	0.29	-0.02	-0.08	-0.07	-0.15	0.28	-0.22
	36	19	0.74	0.61	0.48	0.49	0.39	0.34	0.34
	37	20	1.07	1.01	0.97	1.00	0.92	0.91	0.86
	38	21	1.04.	1.18	1.21	1.24	1.23	1.21	1.17
	39	22	0.82	0.87	0.98	1.15	1.22	1.24	1.24
	40	23	0.34	0.44	0.52	0.64	0.67	0.71	0.63
	41	24	-0.14	-0.02	0.08	0.19	0.21	0.32	0.16
Augus-14-1994	42	1	-0.56	-0.49	-0.36	-0.31	-0.26	0.27	-0.33
	43	2	-0.91	-0.92	-0.81	-0.73	-0.73	0.27	-0.80
	44	3	-0.95	-1.18	-1.13	-1.07	-1.13	0.27	-1.18
	45	4	-0.74	-1.02	-1.10	-1.08	-1.26	0.27	-1.34
	46	5	-0.31	-0.60	-0.68	-0.64	-0.68	0.27	-0.76
	47	6	0.24	-0.10	-0.15	-0.11	0.17	0.27	-0.26
	48	7	0.74	0.50	0.39	0.39	0.32	0.30	0.24
	49	8	1.04	0.97	0.91	0.94	0.84	0.79	0.77
	50	9	1.22	1.21	1.21	1.24	1.20	1.19	1.15
	51	10							