

7.6 Environmental Impact assessment (EIA)

7.6.1 General

The IEE results show that the environmental impacts of the channel improvement project is considered as minor. In order to establish the integrated environmental protection program in the Feasibility Study for the project, however, it is required to carry out the detailed environmental study of the present situation and examination of mitigation and/or elimination of the negative impacts. Based on the IEE results, investigation items of the environmental factors, which are identified for further detailed environmental study, are given below.

(1) Water Quality Including Analysis of Sediment and Benthic Animals

Changes in water quality by proposed dredging activities, which is also executed presently, will not occur. However, in case of closing the existent distributary channels, it will lead the deterioration of water quality of the closed channel. Therefore, it is necessary to measure the present water quality including analysis of Sediment and Benthic animals for the establishment of an environmental protection plan.

(2) Aquatic Life and Fishery

The aquatic life will be affected by closing channels. There is very little data on existing aquatic life in the Orinoco Delta. Therefore, it is necessary to supplement current knowledge and the situation of the aquatic life, and especially the fishery activities being conducted at the influenced area.

(3) Social Environment

There are some villages around the project area. Except the case of closing channels, the impact to them is considered as minor. The social environmental survey will be carried out to study households socio-economic condition and that of the business enterprise for the evaluation of their ability to cope with the expected impacts from the project both positively and negatively.

7.6.2 Existing Environmental Study

(1) Quality of Water, Sediment and Analysis of Benthic Animals and Planktons

1) Objectives

The objective in this case is to know the current conditions of water and sediment quality, in terms of their physical-chemical and biological characteristics, before performing the

Project. The results will contribute for establishing the most convenient measures to avoid or mitigate the negative effects.

2) Methodology

The characterization was made based on:

- i) Review of existing related information
- ii) Sampling and analysis at the points in the project area

20 Sampling were carried out for waters and sediments, according to the scheme shown in Fig. 7-6-1. The parameters for water sampling consists of temperature, pH, turbidity, electric conductivity(EC), suspended solid(SS), COD, BOD, dissolved oxygen(DO), total nitrogen, total phosphorus and heavy metals(mercury, cadmium, copper, lead, chromium). The sampling of Benthic animals and planktons were carried out at the same time. As for the sediment, the parameters consists of ignition loss (IL), total carbon, total nitrogen, total phosphorus and heavy metals(mercury, cadmium, copper, lead, chromium)

3) Results of the Study

Table 7.6.1 shows the results of the on site and laboratory analysis of the nineteen (19) water samples and the twenty (20) sediment samples taken at the area of study with the purpose of characterizing them in their physical, chemical and biological conditions.

From the results obtained from the processing of water and sediment samples at the area of study, it can be outlined as below:

- The physical and chemical characteristics of the waters in this area of the river are the same as that of its tributaries. The measured values are considered as normal comparing to the standards on water qualities in Venezuela (Decree N° 883 - Waters type 2, 4 and 6; agriculture, recreation and navigation). Only at certain points some atypical parameters were detected attributable to local discharges of human activities.
- The composition of the bottom material is essentially sand with insignificant organic components.
- Biological activity is very poor.
- The development of plankton communities is strongly limited by turbidity, availability of nutrients and current velocity.
- No macroinvertebrate organisms were found associated to the bottom.

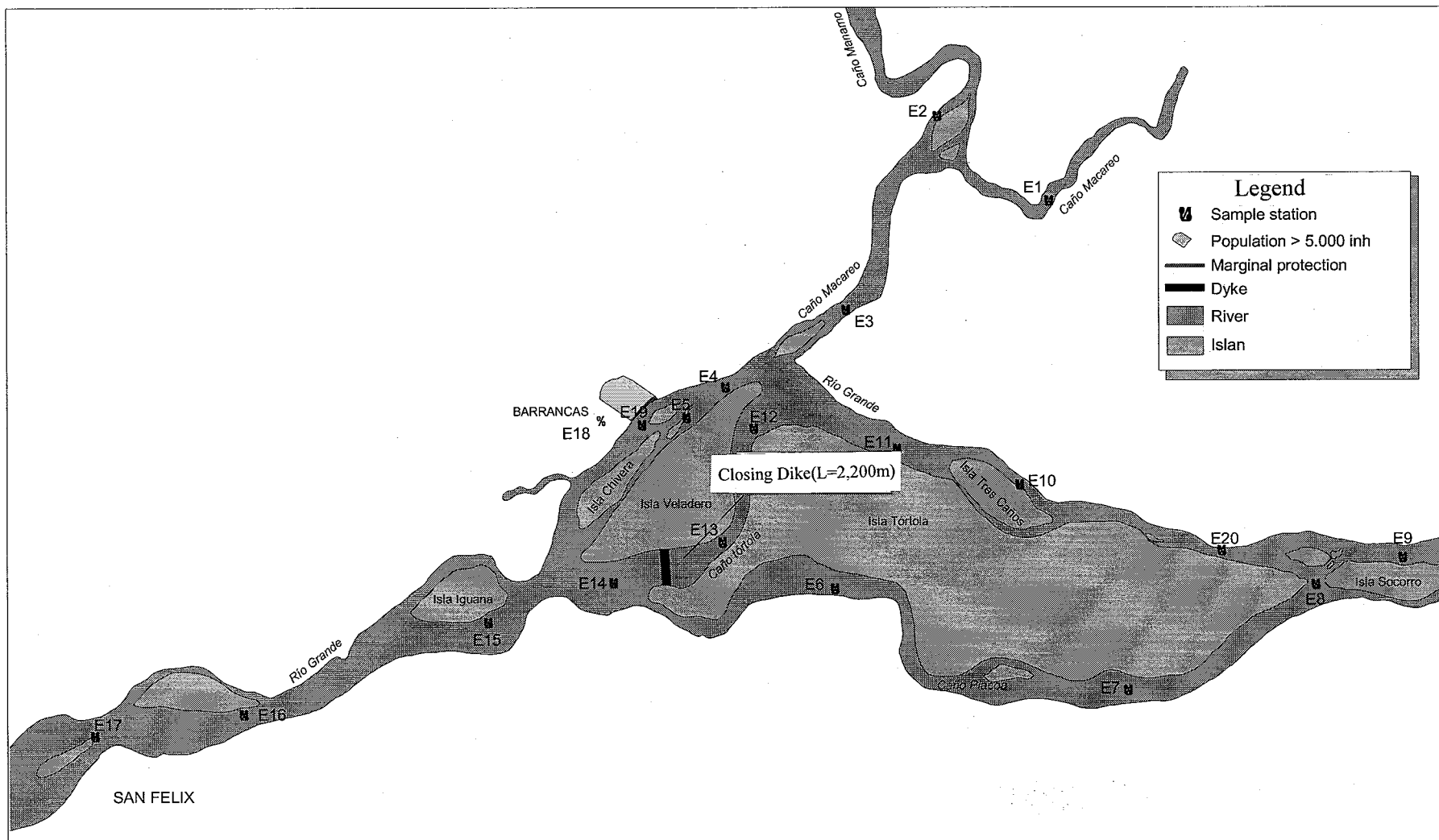


Fig. 7-6-1 Water Quality Study Area and Locations of Sampling Sites

Table 7.6.1 Results of Analysis of Water Quality (1/5)

Resultados de Análisis de Muestras de Agua y Sedimentos
Anexo A

Cuadro N° A-1
Datos del muestreo de aguas y determinaciones *in situ*

Estación	Localidad	Latitud	Longitud	Período de muestreo (fecha)	Hora de muestreo	Temperatura (superf.) °C	Transparencia (m)	Conductividad específica $\mu\text{S/cm}$
E1	Caño Macareo	615863	974872	18-09-99	11:20	29,3	0,3	22,7
E2	Caño Manamo	608355	980617	18-09-99	13:30	31,6	1,05	23,5
E3	Caño Macareo	602677	968000	18-09-99	15:05	29,4	0,3	24
E4	Río Grande	595010	962643	18-09-99	16:15	29,4	0,3	22,9
E5	Río Grande	592491	961251	18-09-99	16:39	29,4	0,35	23,1
E6	Caño Piacoa	601856	949887	19-09-99	10:10	29,0	0,45	19,3
E7	Caño Piacoa	620884	943401	19-09-99	11:14	29,0	0,45	18,5
E8	Confluencia Río Grande con caño Piacoa	632573	950438	19-09-99	0,5	29,1	0,4	29,1
E9	Río Grande	637796	951807	19-09-99	12:45	29,3	0,4	22,4
E10	Río Grande	613383	956716	19-09-99	14:25	29,4	0,3	23,3
E20	Río Grande	626851	953029					
E11	Río Grande	605738	959257	19-09-99	15:00	29,5	0,35	23,5
E12	Caño Tórtola	597020	960228	19-09-99	15:45	29,4	0,4	21
E13	Caño Tórtola	594821	953302	19-09-99	16:13	29,4	0,3	22,7

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Resultados de Análisis de Muestras de Agua y Sedimentos
Anexo A

Cuadro N° A-1 (Cont.)
Datos del muestreo de aguas y determinaciones *in situ*

Estación	Localidad	Latitud	Longitud	Período de muestreo (fecha)	Hora de muestreo	Temperatura (superf.) °C	Transparencia (m)	Conductividad d. específica $\mu\text{S/cm}$
E14	Caño Tórtola	587966	950851	19-09-99	16:43	29,4	0,4	21,2
E15	Río Orinoco	579813	948600	19-09-99	17:30	29,4	0,25	23,5
E16	Río Orinoco	565044	942721	19-09-99	18:20	29,4	0,3	23,9
E17	Río Orinoco	556220	940104	19-09-99	18:54	28,8	-	16,2
E18	Río Grande en Barrancas	589283	961255	20-09-99	0,6111111	30	-	23,4
E19	Río Grande en Barrancas	589283	961255	20-09-99	0,6215278	30	-	23,4

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Table 7.6.1 Results of Analysis of Water Quality (2/5)

Resultados de Análisis de Muestras de Agua y Sedimentos
Anexo A

Cuadro N° A-2
Resultados de análisis practicados a las muestras de aguas

Estación	Localidad	Turbidez	pH	Salinidad (ppt)	Alcalinidad a pH 4,5 (mgCaCO ₃ /l)	Color (mgPt-Co)	Dureza total (mg CaCO ₃ /l)	Oxígeno disuelto (mg/l)	D.B.O5 (mg O ₂ /l)	DQO (mg O ₂ /l)
E1	Caño Macareo	10,26	5,1	0	8,0	45	0,0	4,7	< 2,0	8
E2	Caño Manamo	1,66	6,3	0	13,0	30	0,0	4,7	< 2,0	24
E3	Caño Macareo	11,5	6,6	0	12,5	55	0,0	4,5	< 2,0	24
E4	Río Grande	13,33	6,6	0	12,5	70	0,0	5,2	< 2,0	8
E5	Río Grande	7,35	6,6	0	12,5	45	0,0	5,6	< 2,0	24
E6	Caño Piacoa	10,31	6,2	0	11,0	50	0,0	6,2	< 2,0	8
E7	Caño Piacoa	9,6	6,6	0	10,5	50	0,0	6,0	< 2,0	8
E8	Confluencia Río Grande con caño Piacoa	95	66	0	120	50	0	62	< 2,0	8
E9	Río Grande	98	6,7	0	12,0	50	0,0	6,0	< 2,0	32
E10	Río Grande	14,22	6,7	0	12,5	75	0,0	4,9	< 2,0	8
E11	Río Grande	12,6	6,7	0	12,5	55	0,0	4,8	< 2,0	16
E12	Caño Tórtola	83	66	0	115	40	0	63	< 2,0	32
E13	Caño Tórtola	101	65	0	130	55	0	62	< 2,0	32

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Resultados de Análisis de Muestras de Agua y Sedimentos
Anexo A

Cuadro N° A-2 (Cont.)
Resultados de análisis practicados a las muestras de aguas

Estación	Localidad	Turbidez	pH	Salinidad (ppt)	Alcalinidad a pH 4,5 (mgCaCO ₃ /l)	Color (mgPt-Co)	Dureza total (mg CaCO ₃ /l)	Oxígeno disuelto (mg/l)	D.B.O5 (mg O ₂ /l)	DQO (mg O ₂ /l)
E14	Caño Tórtola	911	68	0	125	55	0	61	< 2,0	24
E15	Río Orinoco	1423	70	0	135	75	0	58	< 2,0	32
E16	Río Orinoco	1122	68	0	135	65	0	58	< 2,0	24
E17	Río Orinoco	67	65	0	105	35	0	60	< 2,0	32
E18	Río Grande en Barrancas	772	67	0	130	40	0	-	< 2,0	32
E19	Río Grande en Barrancas	511	67	0	140	45	0	-	< 2,0	24
E20	Río Grande	-	-	-	-	-	-	-	-	-

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Table 7.6.1 Results of Analysis of Water Quality (3/5)

Resultados de Análisis de Muestras de Agua y Sedimentos
Anexo ACuadro A-3
Resultados de análisis practicados a las muestras de aguas (sólidos, nutrientes y aniones)

Estación	Localidad	S.T.* (mg/l)	S.D.T.** (mg/l)	S.S.*** (mg/l)	NO ₃ (µg/l)	NO ₂ (µg/l)	NH ₄ ⁺ (µg/l)	Nitrógeno orgánico (µg/l)	Fósforo Total (µg/l)	C.D.D.♦ (µg/l)	Sulfatos (mg/l)	Cloruros (mg/l)
E1	Caño Macareo	1217	308	909	5070	<4,0	<5,0	63476	944	28271	<1,0	100
E2	Caño Manamo	413	196	217	50	<4,0	<5,0	109860	163	21468	<1,0	100
E3	Caño Macareo	933	33	900	7559	<4,0	<5,0	55887	10047	21145	<1,0	50
E4	Río Grande	1200	567	633	7892	<4,0	<5,0	299870	8287	20563	<1,0	<0,15
E5	Río Grande	792	167	625	471	<4,0	<5,0	123790	9107	29326	<1,0	<0,15
E6	Caño Piacoa	1283	750	533	258	<4,0	<5,0	155670	4647	25968	<1,0	<0,15
E7	Caño Piacoa	1033	700	333	8110	<4,0	<5,0	135350	6467	23190	<1,0	<0,15
E8	Confluencia Río Grande con caño Piacoa	775	225	550	420	<4,0	<5,0	86363	523	23255	<1,0	<0,15
E9	Río Grande	992	383	609	6773	<4,0	<5,0	49820	5284	26850	<1,0	<0,15
E10	Río Grande	1375	650	725	9015	<4,0	<5,0	100920	6467	26850	<1,0	<0,15
E11	Río Grande	1225	442	783	7935	<4,0	<5,0	68045	13051	27453	<1,0	<0,15
E12	Caño Tórtola	933	267	666	463	<4,0	<5,0	74032	4586	22673	<1,0	<0,15

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Resultados de Análisis de Muestras de Agua y Sedimentos
Anexo ACuadro A-3 (Cont.)
Resultados de análisis practicados a las muestras de aguas (sólidos, nutrientes y aniones)

Estación	Localidad	S.T.* (mg/l)	S.D.T.** (mg/l)	S.S.*** (mg/l)	NO ₃ (µg/l)	NO ₂ (µg/l)	NH ₄ ⁺ (µg/l)	Nitrógeno orgánico (µg/l)	Fósforo Total (µg/l)	C.D.D.♦ (µg/l)	Sulfatos (mg/l)	Cloruros (mg/l)
E13	Caño Tórtola	1075	117	958	391	<4,0	<5,0	106170	6497	28121	<1,0	<0,15
E14	Caño Tórtola	808	141	667	458	<4,0	<5,0	85560	10077	20693	<1,0	<0,15
E15	Río Orinoco	1142	67	1075	391	<4,0	<5,0	77656	12535	25882	<1,0	<0,15
E16	Río Orinoco	600	200	400	391	<4,0	<5,0	81122	5344	23082	<1,0	<0,15
E17	Río Orinoco	1375	450	925	9610	<4,0	<5,0	73435	4616	25688	<1,0	<0,15
E18	Río Grande en Barracas	1392	758	634	3840	<4,0	385	53812	6528	42870	<1,0	<0,15
E19	Río Grande en Barracas	1358	600	758	3895	<4,0	7845	89788	7074	38391	<1,0	<0,15
E20	Río Grande	-	-	-	-	-	-	-	-	-	-	-

* Sólidos Totales (ST) ** Sólidos Disueltos Totales (SDT) *** Sólidos Suspendidos (SS) ♦Carbono Orgánico Disuelto (COD)

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Table 7.6.1 Results of Analysis of Water Quality (4/5)

Resultados de Análisis de Muestras de Agua y Sedimentos
Anexo ACuadro A-4
Resultados de análisis practicados a las muestras de aguas (metales pesados y grasas y aceites)

Estación	Localidad	Ba (mg/l)	Cu (mg/l)	Al (mg/l)	Cr (mg/l)	Hg (mg/l)	Se (mg/l)	As (mg/l)	V (mg/l)	Pb (mg/l)	G y A (mg/l)
E1	Caño Macareo	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	0,8
E2	Caño Manamo	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	2
E3	Caño Macareo	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	1,1
E4	Río Grande	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	1,4
E5	Río Grande	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	0,4
E6	Caño Piacoa	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	0,4
E7	Caño Piacoa	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	3,3
E8	Confluencia Río Grande con caño Piacoa	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	2,1
E9	Río Grande	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	1,7
E10	Río Grande	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	2,7
E11	Río Grande	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	3,4
E12	Caño Tórtola	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	4,7
E13	Caño Tórtola	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	3,2
E14	Caño Tórtola	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	1,9
E15	Río Orinoco	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	4,8
E16	Río Orinoco	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	2,2
E17	Río Orinoco	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	12,9
E18	Río Grande en Barracas	< 0,05	< 0,05	< 0,78	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	3,5
E19	Río Grande en Barrancas	< 0,05	< 0,05	< 0,59	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05	1,7
E20	Río Grande	-	-	-	-	-	-	-	-	-	-

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Resultados de Análisis de Muestras de Agua y Sedimentos
Anexo ACuadro A-5
Resultados de análisis practicados a las muestras de sedimentos

Estación	Localidad	Tipo de grano	% Materia orgánica (peso seco)	Fósforo total (µg/g)	Nitrógeno orgánico (µg/g)
E1	Caño Macareo	Arcilla-limo	3,17	25,5	518,3
E2	Caño Manamo	Arcilla-limo (Foto 2)	2,61	25,8	671,8
E3	Caño Macareo	Arena fina-media	2,45	10	-
E4	Río Grande	Arena fina (Foto 3)	0,03	18,1	161
E5	Río Grande	Arena fina	0,04	14,2	244,8
E6	Caño Piacoa	Arena gruesa (Foto 4)	0,41	7,2	-
E7	Caño Piacoa	Arena media-gruesa (Foto 5)	0,04	8,2	94,2
E8	Confluencia Río Grande con caño Piacoa	Arena fina (Foto 6)	0,03	10,2	121,7
E9	Río Grande	Arena media-gruesa	0,72	8	88,8
E10	Río Grande	Arena fina	0,48	9,8	187,6
E11	Río Grande	Arena fina	0,53	9,2	-
E12	Caño Tórtola	Arena gruesa	0,94	6,2	10,9
E13	Caño Tórtola	Arena gruesa	0,53	6,2	141,5
E14	Caño Tórtola	Arena media-gruesa	0,58	8,8	-
E15	Río Orinoco	Arena gruesa	0,65	10,5	90,7
E16	Río Orinoco	Arena gruesa	0,72	8,7	-
E17	Río Orinoco	Arena gruesa	0,09	6,4	-
E18	Río Grande en Barracas	Arcilla-limo	4,7	23,2	740,8
E19	Río Grande en Barrancas	Arena fina	3,61	10,8	549,2
E20	Río Grande	Arena gruesa	0,72	14,1	-

(*) Determinación cualitativa, (-) No hay presencia

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Table 7.6.1 Results of Analysis of Water Quality (5/5)

Resultados de Análisis de Muestras de Agua y Sedimentos
Anexo A

Cuadro A-6
Resultados de determinaciones de metales pesados en muestras de sedimentos

Estación	Localidad	Cu (mg/Kg)	As (mg/Kg)	Ni (mg/Kg)	Cd (mg/Kg)	Hg (mg/Kg)	Cr (mg/Kg)	Ba (mg/Kg)
E1	Caño Macareo	<5	<10	<10	<5	0,1	<5	90
E2	Caño Manamo	<5	<10	<10	<5	0,1	<5	38
E3	Caño Macareo	<5	<10	<10	<5	0,1	<5	62
E4	Río Grande	<5	<10	<10	<5	<0,1	<5	83
E5	Río Grande	<5	<10	<10	<5	<0,1	<5	48
E6	Caño Piacoa	<5		<10	<5	<0,1	<5	14
E7	Caño Piacoa	<5	<10	<10	<5	<0,1	<5	85
E8	Confluencia Río Grande con caño Piacoa	<5	<10	<10	<5	<0,1	<5	5
E9	Río Grande	<5	<10	<10	<5	<0,1	<5	143
E10	Río Grande	<5	<10	<10	<5	<0,1	<5	32
E11	Río Grande	<5	<10	<10	<5	<0,1	<5	<5
E12	Caño Tórtola	<5	<10	<10	<5	<0,1	13	52
E13	Caño Tórtola	<5	<10	<10	<5	<0,1	<5	40
E14	Caño Tórtola	<5	<10	<10	<5	<0,1	<5	32
E15	Río Orinoco	<5	<10	<10	<5	<0,1	<5	14
E16	Río Orinoco	<5	<10	<10	<5	<0,1	<5	50
E17	Río Orinoco	<5	<10	<10	<5	<0,1	<5	1021
E18	Río Grande en Barracas	<5	<10	10	<5	0,1	24	412
E19	Río Grande en Barracas	<5	<10	<10	<5	<0,1	<5	60
E20	Río Grande	<5	<10	<10	<5	<0,1	<5	171

The detail observations on quality of water and sediment are given below.

- In general the transparency levels are low due to the load of suspended solids of the river. The highest value was obtained at the station Manamo channel, and it is attributed to the sedimentation effect generated by the closure of the channel.
- The results of conductivity measures show a similar behavior to those of transparency with lower values in Piacoa channel. Measurements of turbidity in the laboratory corroborate the trends observed in the transparency values.
- The pH with values between 6 and 7, in most stations, showed a significantly lower value in Macareo channel, followed by Manamo and Piacoa. The highest values correspond to the stations on the Orinoco. The values of the stations on Rio Grande did not show significant variations.
- In general terms alkalinity is low, reflecting the effect of dilution that the rivers of the right bank of the Orinoco have. These rivers drain soils poor in carbonates (Macizo Guayanes).
- Dissolved oxygen, yielded values above 60% saturation, supplemented with low BOD5 and COD .
- Concerning suspended solids, the values obtained are found within the range reported in other studies (21,7-107,5 mg/l).
- In relation to nutrients, the predominant inorganic form of nitrogen is that of nitrates. The nitrate distribution is quite irregular, and no defined patterns can be observed.
- Total phosphorus, as in the case of nitrogen, showed similar values to those reported by Lewis and Saunders (1990), but lower than those of Monente and Colonnello (1997).
- Dissolved organic carbon, showed variations with the exception of the stations associated to Barrancas.
- The concentration of metals in water is very low, being below the detection limits of the methods used for their determination. Likewise, the grease and oil values were low, with the exception of station 17, on the Orinoco bed, where a certain increase was observed. This could be attributed to a specific pollution problem due to the industrial activities at the zone (Punta de Piedras).

<Sediment analysis>

- Concerning the river bed sediments, the results obtained show a predominance of sandy bottoms with the exception of samples taken from Manamo and Macareo channel. Nevertheless, it should be noted that due to the type of sampler used in these cases, sampling was made at the banks, not at the center of the river bed, as in the other stations, because of sampler operating problems due to the current. This has an influence on the sample composition. The phosphorous and nitrogen content of sediments is quite low, as well as that of heavy metals, with the exception of barium that showed very high concentrations at stations 17 and 20. It would be interesting to determine the origin of that barium, since it could be related to chemical products used by the oil industry.

<Benthic animals>

- The biological communities are very poorly represented. No benthonic organisms were found, which can be explained by the conditions of the substratum. The large mobility of sediments (sand), due to the effect of strong currents, generates a great instability at the river bed, making its colonization difficult. Additionally, the substratum is very poor in organic matter offering little food to potential colonizers.

<Plankton>

- Concerning planktonic microorganisms, the densities found are extremely low (less than 20.000org./l in average). The more representative phytoplankton groups are the Bacillariophyceae (diatoms), with predominance of *Melosira granulata*, *Navicula* spp., and *Achnanthes* spp.; the Chlorophyta (chlorophytes), with representation of Zygothryx of the genders: *Desmidium*, *Hyalotheca*, *Closterium* and *Cosmarium*, *Spirogyra* and *Mougeotia*.
- The zooplankton analysis was qualitative. The number of observed organisms was also extremely low (no organisms were found in most samples), being the predominant group that of copepods cyclops sp., with the sporadic appearance of some cladocerans (also known as water fleas) of the Chydoroidea sub-family. It can be concluded from the analysis that the biological activity in the main course, during the sampling period (high waters), is very low.

(2) Aquatic Life and Fisheries

The aquatic ecosystem of the Orinoco Delta constitutes one of the most important aspects that will be strongly influenced by the closure of the Tórtola channel.

1) Objective

The essential objectives of this characterization are aimed at improving and supplementing the current knowledge and the situation of the aquatic life, and especially the fishery activities being conducted at the most immediate area of influence of the Project.

2) Methodology

- i) Review and analysis of the studies and research made on the aquatic life, the delta ecosystem and the fisheries of the Orinoco River.
- ii) Supplement of the basic and referential information with field survey and interviews to the related persons in the Project area.
- iii) The analysis, processing and discussion of the obtained data or information

The interviews survey was conducted to a total of twenty (20) fishermen selected from several communities existing in the neighboring areas of the site. (refer to Fig. 7-6-2)

3) Results of the study

The results of the study can be outlined as below:

- Typical aquatic ecosystems of large fluvial courses are found at the surrounding area of the site.
- There are many communities of fishermen and local producers that alternate commercial fishing with short cycle agriculture and extensive livestock activities.
- There is certain area which is partially intervened by dredging operations in the navigation channel during six months of the year.
- The great proportion of the fishing in the Delta concentrates at Barrancas; approximately 2,000 - 3,300 t/year, or 10% -15% of annual catch of the entire Delta of Orinoco .
- Commercial fisheries are performed seasonally in the dry season (November to April).