23. FINANCIAL ANALYSIS

23.1 Purpose

1. The purpose of the financial analysis is to examine the viability of the project itself and the financial soundness of the project during the project life.

23.2 Methodology of the Financial Analysis

1. Figure 23-2-1 shows a flowchart of the financial analysis.

23.2.1 Viability of the Project

2. The viability of the project is analyzed using the Financial Internal Rate of Return (FIRR) by means of the Discounted Cash Flow Method. The FIRR is a discount rate in which net present values of costs and the revenue during the project life are considered equal. It is obtained from the following formula:

$$\sum_{i=1}^{n} \frac{Bi - Ci}{(1+r)^{i-1}} = 0$$

where, n : Period of financial calculation (project life)
Bi : Revenue in i-th year
Ci : Costs in i-th year
r : Discount rate

3. Revenue and the cost in this analysis cover the following items

Revenue : Operating revenues by the project
Costs : Investments for the project
Maintenance, repair, personnel and administration costs

23.2.2 Financial Soundness of the Project

4. The financial soundness of the project is appraised using the following indices calculated based on the projected financial statements in order to examine the project's profitability, creditworthiness and efficiency.

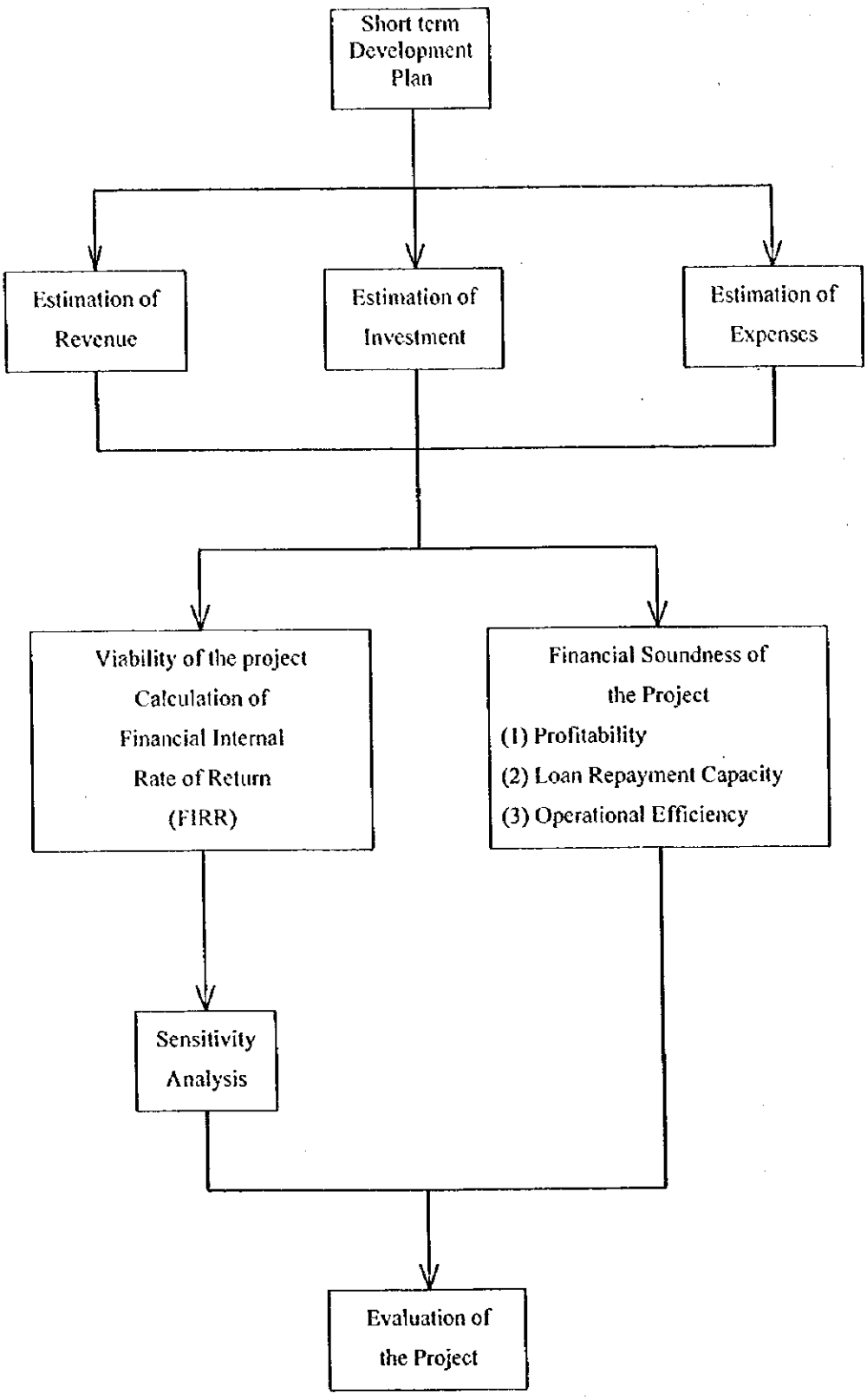


Figure 23-2-1 Flowchart of the Financial Analysis

(1) Profitability

5. Rate of Return on Net Fixed Assets

$$= \frac{\text{Net Operating Income}}{\text{Net Fixed Assets}} \times 100$$

6. This indicator shows the profitability of the investments, which are presented as net total fixed assets. It is necessary to keep the rate above the average interest rate of the funds for investments.

(2) Loan Repayment Capacity

7. Debt Service Coverage Ratio (times)

$$= \frac{\text{Net Operating Income + Depreciation Cost}}{\text{Repayment Amount of Principal and Interest for Long-term loans}}$$

8. This indicator shows whether the operating income can cover the repayment and the interest on the long-term loans. The ratio must be higher than 1.0.

(3) Operation Efficiency

Operating Ratio (%)

$$= \frac{\text{Operating Expenses}}{\text{Operating Revenues}} \times 100$$

Working Ratio (%)

$$= \frac{\text{Operating Expenses - Depreciation Costs}}{\text{Operating Revenues}} \times 100$$

9. The operation ratio shows the percentage of port revenue that is consumed by operating expenses. It must be less than 70~75%. Working ratio shows the efficiency of the routine operations of the port. It must be less than 50~60% .

23.3 Prerequisites of Analysis

23.3.1 Scope of the Analysis

1. The financial analysis is implemented from the viewpoint of the port management body, according to the short-term development plan. Based on the examination of the cargo handling forecast.

23.3.2 Fund Raising

2. For the port facilities developed by the public sector, all the initial investment costs are assumed to be raised by foreign funds. However, it is important to invest the internal resource of CEPA as much as possible which is made from international airport sector and port of Acajutla sector, to reduce the debt of foreign loan. Reinvestment costs and any cash shortage will be covered by the internal resources of the CEPA. Cash excess will be deposited in a domestic bank with an annual interest rate of 10%.

(1) Foreign funds

Covered range : 75% of the initial investment costs of the project
Loan Period : 25 years including a grace period of 7 years
Interest rate : 2.2% per annum
Repayment : Fixed amount repayment of principal
(Note) These conditions are quoted from those of the OECF (Japan)

(2) Other foreign funds

Covered range : 25% of the initial investment costs of the project
Loan period : 12 years including a grace period of 3 years
Interest rate : 7.5% per annum
Repayment : Fixed amount repayment of principal
(Note) These conditions are quoted from those of the BCIE
3 year grace period is assumed by study team

(3) Weighted average interest rate

3.525% (2.2% *0.75 +7.5% * 0.25)

23.3.3 Project Life and Base Year

(1) Project life

3. Taking account the conditions of the long-term loans and service lives of the port facilities, the project life for the financial analysis is determined as 35 years: 5 years of construction and 30 years of management and operation.

(2) Base year

4. In principal, all costs and revenues are indicated in prices as of December 1997 (US$1.00 = 130Y = 8.75colon). Neither price inflation nor increases in nominal wage are considered during the project life.

23.3.4 Revenue

5. Revenues from port activities are calculated mainly based on the present tariff of Acajutla port. However, some revisions to the present tariff of container cargo will be incorporated to ensure competitiveness with some surrounding ports. La Union new port container cargo tariff is shown in Table 23-3-1. The revenues/year during the project life are shown in Financial Statement Table 23-4-6 and 23-4-7 .

23.3.5 Expenditure

(1) Investment

6. Initial investment costs for the infrastructure development for B-3 and C-3 are shown in Table 23-3-2 and 23-3-3. The depreciable facilities will be renewed by public sector based on their service lives, the reinvestment cost is included in the investment.

(2) Personnel cost

7. Annual personnel costs are estimated based on the required

Table 23-3-1 La Union New Port Container Cargo Service Tariff

Service			unit rate (US$)	unit
Handling	Loading / unloading	FCL	21.55 *	/ container
		LCL	21.55 *	/ container
		Empty	21.55 *	/ container
	Assignable to consignee or shippe	FCL	4.31 *	/ MT
		LCL	4.31 *	/ MT
	Assignable to shipping company	FCL	12.79	/ container
		LCL	12.79	/ container
	Empty box handling		19.40	/ container
Terminal	Filling		3.60	/ MT
	Emptying		3.60	/ MT
	Loading / Unloading		16.43	/ container
Storage	Dry Container		1.20	/ TEU / day
	Reefer Container		20.10	/ TEU / day

*Note : * Tariff of Quetzal Port*

Table 23-3-2 Project Cost of the La Union New Port B-3

Unit:'000US$

Initial Investment	Initial Investment Costs by Facilities				Mainte.	Depr.	Depr.
	Direct Cost	P.Cont.	Eng.	Total	Cost	Period	/Year
Short Term Development	87,147	7,081	6,437	100,664	1,257		3,398
Mobilization	5,845	643	585	7,072	0		
Container Berth							
Dredging	383	42	38	463			
Container Wharf	11,533	1,269	1,153	13,955	81	30	465
West Revetment	1,324	146	132	1,602	16.0204	30	53
Reclamation	6,488	714	649	7,850		30	262
Pavement	3,226	355	323	3,903	39.0346	30	130
Building	600	66	60	726	7.26	30	24
Utilities	1,178	130	118	1,425	14.2538	30	48
total	24,732	2,721	2,473	29,926	157.569		982
Bulk Berth							
Dredging	700	77	70	847			
East Revetment	316	35	32	382	3.8236	30	13
Main Wharf	10,088	1,110	1,009	12,206	63	30	407
Reclamation	2,655	292	266	3,213			
Pavement	2,796	308	280	3,383	33.8316	30	113
Building Works	677	74	68	819	8.1917	30	27
Utilities	882	97	88	1,067	10.6722	30	36
total	18,114	1,993	1,811	21,918	119.519		595
Channel							
Channel Dredging	5,802	638	580	7,020			
Turning basin, Berth Pocket	4,231	465	423	5,120			
Navigation Aids	923	102	92	1,117	11.1683	10	112
total	10,956	1,205	1,096	13,257	11.1683		112
Road							
Access Road	4,722	519	472	5,714	57.1362	30	190
Loading Equipment	18,932			18,932	757.28	15	1,262
Tug Boat	3,846			3,846	153.84	15	256
Grand Total (Initial Investment)	87,147	7,081	6,437	100,664			

Table 23-3-3 Project Cost of the La Union New Port C-3

Unit:'000US$

Initial Investment	Initial Investment Costs by Facilities				Mainte.	Depr.	Depr.
	Direct Cost	P.Cont.	Eng.	Total	Cost	Period	/Year
Short Term Development	78,062	6,504	5,913	90,479	1,267		3,238
Mobilization	5,375	591	538	6,504	0		
Container Berth							
Dredging	368	40	37	445			
Container Wharf	12,264	1,349	1,226	14,839	110	30	495
Reclamation	5,821	640	582	7,043		30	235
Pavement	3,226	355	323	3,903	39.0346	30	130
Building	600	66	60	726	7.26	30	24
Utilities	1,114	123	111	1,348	13.4794	30	45
total	23,393	2,573	2,339	28,306	169.774		929
Bulk Berth							
Dredging	659	72	66	797			
Main Wharf	8,718	959	872	10,549	77	30	352
Reclamation	5,206	573	521	6,299			
Pavement	2,796	308	280	3,383	33.8316	30	113
Building Works	677	74	68	819	8.1917	30	27
Utilities	903	99	90	1,093	10.9263	30	36
total	18,959	2,085	1,896	22,940	129.95		528
Channel							
Channel Dredging	5,923	652	592	7,167			
Turning basin, Berth Pocket	822	90	82	995			
Navigation Aids	923	102	92	1,117	11.1683	10	112
total	7,668	843	767	9,278	11.1683		112
Road							
Access Road	3,735	411	374	4,519	45.1935	30	151
Loading Equipment	18,932			18,932	757.28	15	1,262
Tug Boat	3,846			3,846	153.84	15	256
Grand Total (Initial Investment)	81,908	6,504	5,913	94,325			

number of employees in Chapter 21 to manage and operate the future cargo handling volume and port facilities. Unit personnel costs are assumed based on the actual unit cost of Acajutla port in recent years.

(3) Administration cost

8. Annual administration costs are assumed as 30% of the total annual personnel costs based on the actual data of Acajutla port between 1991 and 1995.

(4) Maintenance and repair cost

9. Annual maintenance and repair costs for the infrastructure facilities are calculated as 1% of construction costs. On the other hand, machinery maintenance and repair costs are calculated as 4% of initial installation costs. The costs/year during the project life are shown in Table 23-4-6 and 23-4-7.

(5) Depreciation cost

10. Annual depreciation costs for the infrastructure facilities and cargo handling equipment are calculated by the straight line method, based on their services lives. Residual value after all depreciation is estimated as zero. The costs/year during the project life are shown in Table 23-4-6 and 23-4-7.

(6) Tax

11. A 25% income tax is levied on the profit, and then a further 25% government contribution tax is levied on the balance.

23.4 Appraisal of the Project

23.4.1 Viability of the project

1. The result of the FIRR calculation are summarized in Table 23-4-1 and its details are shown in Table 23-4-2, 23-4-3, 23-4-4 and 23-4-5.

2. Sensitivity analysis is conducted to measure the impact of

changing conditions on the financial status of the project. The following cases are envisioned.

Sensitivity A : The cost increased by 10%
Sensitivity B : The revenue decreased by 10%
Sensitivity C : The cost increased by 10% and the revenue decreased by 10%

3. Weighted average interest rate of the funds is 3.525% in this study. Since all the cases, FIRR exceeds the weighted average interest rate in all cases, this projects can be judged to be financially viable.

Table 23-4-1 Summary of FIRR Calculation

	B-3		C-3	
	Case1	Case 2	Case1	Case 2
Base Case	8.7%	8.2%	9.3%	8.7%
Sensitivity A	7.6%	7.1%	8.1%	7.6%
Sensitivity B	7.5%	6.9%	8.0%	7.5%
Sensitivity C	6.3%	5.9%	6.9%	6.3%

Note Cargo Projection Socio-economic Frame
GDP Growth (Case 1) 5.0%/year till 2015
(Case 2) 5.0%/year till 2005,
3.5%/year till 2015 (the average growth in the past)

23.4.2 Financial Soundness of the Project

4. To be on the safe side, Case 2, in which the cargo volume was forecast based on a conservative rate of GDP growth is adopted for the financial soundness analysis. Projected financial statements and financial indicators for the project is shown in Table 23-4-6 and 23-4-7.

1) Profitability

5. The rate of return on net fixed assets exceeds the average interest rate of the funds from 2007.

2) Loan Repayment Capacity

6. The debt service coverage ratio exceeds 1.0 except for the term of construction period and 2004. This temporary cash shortage can be covered by the internal resources of the management body.

3) Operational Efficiency

7. The working ratio keeps below 50% after 2005 and the operation ratio keeps below 70% after 2006. This means that the operation will be efficient.

4) Appraisal

8. Based on the above indicators, it can be judged that financial soundness of the project can be secured.

23.5 Conclusion

1. Judging from the above analysis, the project is regarded as financially feasible. However, attention should be paid to the following issues.

1) Public sector has to make efforts to heighten the quality of the service, improve cargo handling efficiency to secure forecast cargo volume and to constantly minimize operating expenses. And, public sector should select the most appropriate funding scheme for investment as far as possible.
2) The Government has to set the Contribution tax at a level which allows public sector saving internal resource to cover the cash shortage in the beginning phase of project and reinvestment costs.

Table 23-4-2 FIRR Calculation Short Term B-3 Case 1

Base Case	8.7%	
Sensitivity Analysis A	7.6%	Cost 10% increase
Sensitivity Analysis B	7.5%	Revenue 10% decrease
Sensitivity Analysis C	6.3%	Cost 10% increase, Benefit 10% decrease

	year	Initial cost	Renewal cost	Mainte cost	Operation cost	Cost Total	Revenue Total	Revenue - Cost	Net Present Value (NPV) Revenue	Cost	Revenue - Cost
1	1999	1,210,000			114,000	1,324,000	0	-1,324,000	0	1,324,000	-1,324,000
2	2000	2,090,000			114,000	2,204,000	0	-2,204,000	0	2,027,413	-2,027,413
3	2001	8,913,904			114,000	9,027,904	0	-9,027,904	0	7,639,204	-7,639,204
4	2002	24,413,011			114,000	24,527,011	0	-24,527,011	0	19,091,340	-19,091,340
5	2003	52,528,754			178,000	52,706,754	0	-52,706,754	0	37,738,850	-37,738,850
6	2004	11,507,796	0	1,126,565	2,245,750	14,880,111	4,661,287	-10,218,824	3,070,145	9,800,747	-6,730,602
7	2005		0	1,255,734	2,245,750	3,501,484	8,578,165	5,076,680	5,197,302	2,121,465	3,075,838
8	2006		0	1,255,734	2,245,750	3,501,484	9,741,676	6,240,192	5,429,350	1,951,490	3,477,860
9	2007		0	1,255,734	2,245,750	3,501,484	10,905,202	7,403,717	5,590,858	1,795,134	3,795,724
10	2008		0	1,255,734	2,245,750	3,501,484	12,068,701	8,567,216	5,691,620	1,651,306	4,040,314
11	2009		0	1,255,734	2,245,750	3,501,484	13,232,212	9,730,728	5,740,351	1,519,001	4,221,349
12	2010		0	1,255,734	2,245,750	3,501,484	14,395,724	10,894,239	5,744,736	1,397,297	4,347,439
13	2011		1,112,000	1,255,734	2,245,750	4,613,484	15,559,235	10,945,751	5,711,569	1,693,543	4,018,026
14	2012		0	1,255,734	2,245,750	3,501,484	16,722,747	13,221,263	5,646,839	1,182,361	4,464,478
15	2013		3,846,000	1,255,734	2,245,750	7,347,484	17,886,260	10,538,775	5,555,816	2,282,270	3,273,546
16	2014		0	1,255,734	2,245,750	3,501,484	19,049,771	15,548,287	5,443,130	1,000,486	4,442,644
17	2015		5,148,000	1,255,734	2,245,750	8,649,484	19,049,900	10,400,416	5,007,054	2,273,420	2,733,633
18	2016		0	1,255,734	2,245,750	3,501,484	19,050,030	15,548,545	4,605,914	846,588	3,759,325
19	2017		0	1,255,734	2,245,750	3,501,484	19,050,159	15,548,675	4,236,911	778,759	3,458,152
20	2018		13,784,000	1,255,734	2,245,750	17,285,484	19,050,288	1,764,804	3,897,471	3,536,412	361,059
21	2019		0	1,255,734	2,245,750	3,501,484	19,050,418	15,548,933	3,585,225	658,968	2,926,257
22	2020		0	1,255,734	2,245,750	3,501,484	19,050,547	15,549,063	3,297,995	606,170	2,691,825
23	2021		0	1,255,734	2,245,750	3,501,484	19,050,676	15,549,192	3,033,776	557,603	2,476,173
24	2022		0	1,255,734	2,245,750	3,501,484	19,050,806	15,549,321	2,790,725	512,927	2,277,798
25	2023		3,846,000	1,255,734	2,245,750	7,347,484	19,050,935	11,703,451	2,567,146	990,086	1,577,060
26	2024		0	1,255,734	2,245,750	3,501,484	19,051,064	15,549,580	2,361,479	434,027	1,927,452
27	2025		1,112,000	1,255,734	2,245,750	4,613,484	19,051,193	14,437,709	2,172,290	526,047	1,646,242
28	2026		0	1,255,734	2,245,750	3,501,484	19,051,323	15,549,838	1,998,257	367,264	1,630,993
29	2027		5,148,000	1,255,734	2,245,750	8,649,484	19,051,452	10,401,968	1,838,166	834,540	1,003,627
30	2028		0	1,255,734	2,245,750	3,501,484	19,051,581	15,550,097	1,690,902	310,770	1,380,131
31	2029		0	1,255,734	2,245,750	3,501,484	19,051,711	15,550,226	1,555,435	285,871	1,269,564
32	2030		0	1,255,734	2,245,750	3,501,484	19,051,840	15,550,356	1,430,821	262,967	1,167,855
33	2031		0	1,255,734	2,245,750	3,501,484	19,051,840	15,550,356	1,316,182	241,897	1,074,285
34	2032		1,112,000	1,255,734	2,245,750	4,613,484	19,051,840	14,438,356	1,210,728	293,183	917,545
35	2033		-3,527,009	1,255,734	2,245,750	-25,516	19,051,840	19,077,356	1,113,723	-1,492	1,115,215
	Total	100,663,465	31,581,000	37,542,861	68,006,500	237,793,826	504,770,423	266,976,597	108,531,916	108,531,916	-0

FIRR= 8.7%

Table 23-4-3 FIRR Calculation Short Term B-3 Case 2

Base Case	8.1%	
Sensitivity Analysis A	7.0%	Cost 10% increase
Sensitivity Analysis B	6.9%	Revenue 10% decrease
Sensitivity Analysis C	5.9%	Cost 10% increase, Benefit 10% decrease

	year	Initial cost	Renewal cost	Mainte cost	Operation cost	Cost Total	Revenue Total	Revenue - Cost	Net Present Value (NPV) Revenue	Cost	Revenue - Cost
1	1999	1,210,000			114,000	1,324,000	0	-1,324,000	0	1,324,000	-1,324,000
2	2000	2,090,000			114,000	2,204,000	0	-2,204,000	0	2,038,007	-2,038,007
3	2001	8,913,901			114,000	9,027,901	0	-9,027,901	0	7,719,253	-7,719,253
4	2002	24,413,011			114,000	24,527,011	0	-24,527,011	0	19,392,204	-19,392,204
5	2003	52,528,754			178,000	52,706,754	0	-52,706,754	0	38,533,903	-38,533,903
6	2004	11,507,796	0	1,126,565	2,245,750	14,880,111	4,661,287	-10,218,824	3,151,206	10,059,516	-6,908,310
7	2005		0	1,255,734	2,245,750	3,501,484	8,578,165	5,076,680	5,362,403	2,188,856	3,173,547
8	2006		0	1,255,734	2,245,750	3,501,484	9,457,825	5,956,341	5,467,019	2,024,004	3,443,014
9	2007		0	1,255,734	2,245,750	3,501,484	10,337,442	6,835,957	5,525,436	1,871,568	3,653,868
10	2008		0	1,255,734	2,245,750	3,501,484	11,217,080	7,715,596	5,544,054	1,730,612	3,813,442
11	2009		0	1,255,734	2,245,750	3,501,484	12,096,718	8,595,234	5,528,526	1,600,273	3,928,254
12	2010		0	1,255,734	2,245,750	3,501,484	12,976,357	9,474,873	5,483,891	1,479,749	4,004,141
13	2011		1,112,000	1,255,734	2,245,750	4,613,484	13,855,995	9,242,511	5,414,619	1,802,849	3,611,771
14	2012		0	1,255,734	2,245,750	3,501,484	14,735,634	11,234,150	5,324,676	1,265,251	4,059,426
15	2013		3,846,000	1,255,734	2,245,750	7,347,484	15,615,271	8,267,787	5,217,568	2,455,032	2,762,535
16	2014		0	1,255,734	2,245,750	3,501,484	16,494,911	12,993,426	5,096,391	1,081,845	4,014,546
17	2015		5,148,000	1,255,734	2,245,750	8,649,484	17,375,343	8,725,858	4,964,097	2,471,139	2,492,959
18	2016		0	1,255,734	2,245,750	3,501,484	17,073,800	13,572,316	4,510,569	925,025	3,585,544
19	2017		0	1,255,734	2,245,750	3,501,484	19,268,860	15,767,376	4,703,077	855,357	3,851,720
20	2018		13,784,000	1,255,734	2,245,750	17,285,484	19,268,860	1,983,376	4,352,567	3,904,550	448,017
21	2019		0	1,255,734	2,245,750	3,501,484	19,268,860	15,767,376	4,024,757	731,368	3,293,389
22	2020		0	1,255,734	2,245,750	3,501,484	19,268,860	15,767,376	3,721,636	676,285	3,045,350
23	2021		0	1,255,734	2,245,750	3,501,484	19,268,860	15,767,376	3,441,341	625,352	2,815,992
24	2022		0	1,255,734	2,245,750	3,501,484	19,268,860	15,767,376	3,182,162	578,254	2,603,908
25	2023		3,846,000	1,255,734	2,245,750	7,347,484	19,268,860	11,921,376	2,942,500	1,122,016	1,820,484
26	2024		0	1,255,734	2,245,750	3,501,484	19,268,860	15,767,376	2,720,888	494,432	2,226,455
27	2025		1,112,000	1,255,734	2,245,750	4,613,484	19,268,860	14,655,376	2,515,966	602,390	1,913,576
28	2026		0	1,255,734	2,245,750	3,501,484	19,268,860	15,767,376	2,326,478	422,761	1,903,717
29	2027		5,148,000	1,255,734	2,245,750	8,649,484	19,268,860	10,619,376	2,151,261	965,667	1,185,594
30	2028		0	1,255,734	2,245,750	3,501,484	19,268,860	15,767,376	1,989,241	361,479	1,627,761
31	2029		0	1,255,734	2,245,750	3,501,484	19,268,860	15,767,376	1,839,423	334,255	1,505,168
32	2030		0	1,255,734	2,245,750	3,501,484	19,268,860	15,767,376	1,700,858	309,081	1,391,807
33	2031		0	1,255,734	2,245,750	3,501,484	19,268,860	15,767,376	1,572,787	285,803	1,286,984
34	2032		1,112,000	1,255,734	2,245,750	4,613,484	19,268,860	14,655,376	1,454,334	348,207	1,106,127
35	2033		-3,527,000	1,255,734	2,245,750	-25,516	19,268,860	19,294,376	1,344,802	-1,781	1,346,582
	Total	100,663,465	31,581,000	37,542,861	68,006,500	237,793,826	492,046,455	254,252,628	112,578,563	112,578,563	-0

FIRR= 8.1%

Table 23-4-4 FIRR Calculation Short Term C-3 Case 1

Base Case	9.3%	
Sensitivity Analysis A	8.1%	Cost 10% increase
Sensitivity Analysis B	8.0%	Revenue 10% decrease
Sensitivity Analysis C	6.9%	Cost 10% increase, Benefit 10% decrease

	year	Initial cost	Renewal cost	Mainte cost	Operation cost	Cost Total	Revenue Total	Revenue - Cost	Net Present Value (NPV) Revenue	Cost	Revenue - Cost
1	1999	1,210,000			114,000	1,324,000	0	-1,324,000	0	1,324,000	-1,324,000
2	2000	2,090,000			114,000	2,204,000	0	-2,204,000	0	2,016,108	-2,016,108
3	2001	7,860,581			114,000	7,974,581	0	-7,974,581	0	6,672,863	-6,672,863
4	2002	16,736,196			114,000	16,850,196	0	-16,850,196	0	12,897,676	-12,897,676
5	2003	53,369,609			178,000	53,547,609	0	-53,547,609	0	37,492,874	-37,492,874
6	2004	13,053,967	0	1,136,875	2,245,750	16,436,593	4,661,287	-11,775,306	2,985,497	10,527,436	-7,541,939
7	2005		0	1,266,717	2,245,750	3,512,467	8,578,165	5,065,698	5,025,825	2,057,905	2,967,920
8	2006		0	1,266,717	2,245,750	3,512,467	9,741,676	6,229,209	5,220,941	1,882,467	3,338,474
9	2007		0	1,266,717	2,245,750	3,512,467	10,905,202	7,392,735	5,346,271	1,721,986	3,624,285
10	2008		0	1,266,717	2,245,750	3,512,467	12,068,701	8,556,233	5,412,276	1,575,186	3,837,091
11	2009		0	1,266,717	2,245,750	3,512,467	13,232,212	9,719,745	5,428,178	1,440,900	3,987,278
12	2010		0	1,266,717	2,245,750	3,512,467	14,395,724	10,883,257	5,402,034	1,318,063	4,083,971
13	2011		1,112,000	1,266,717	2,245,750	4,624,467	15,559,235	10,934,768	5,340,897	1,587,405	3,753,492
14	2012		0	1,266,717	2,245,750	3,512,467	16,722,747	13,210,280	5,250,924	1,102,911	4,148,013
15	2013		3,846,000	1,266,717	2,245,750	7,358,467	17,886,260	10,527,792	5,137,476	2,113,575	3,023,901
16	2014		0	1,266,717	2,245,750	3,512,467	19,049,771	15,537,304	5,005,209	922,879	4,082,330
17	2015		5,148,000	1,266,717	2,245,750	8,660,467	19,049,900	10,389,433	4,578,543	2,081,498	2,497,045
18	2016		0	1,266,717	2,245,750	3,512,467	19,050,030	15,537,563	4,188,248	772,234	3,416,014
19	2017		0	1,266,717	2,245,750	3,512,467	19,050,159	15,537,692	3,831,224	706,401	3,124,823
20	2018		13,784,000	1,266,717	2,245,750	17,296,467	19,050,288	1,753,821	3,504,634	3,181,987	322,646
21	2019		0	1,266,717	2,245,750	3,512,467	19,050,418	15,537,950	3,205,883	591,093	2,614,791
22	2020		0	1,266,717	2,245,750	3,512,467	19,050,547	15,538,080	2,932,600	540,702	2,391,898
23	2021		0	1,266,717	2,245,750	3,512,467	19,050,676	15,538,209	2,682,612	494,606	2,188,006
24	2022		0	1,266,717	2,245,750	3,512,467	19,050,806	15,538,338	2,453,935	452,441	2,001,494
25	2023		3,846,000	1,266,717	2,245,750	7,358,467	19,050,935	11,692,468	2,244,751	867,040	1,377,711
26	2024		0	1,266,717	2,245,750	3,512,467	19,051,064	15,538,597	2,053,399	378,588	1,674,811
27	2025		1,112,000	1,266,717	2,245,750	4,624,467	19,051,193	14,426,726	1,878,358	455,951	1,422,407
28	2026		0	1,266,717	2,245,750	3,512,467	19,051,323	15,538,856	1,718,239	316,789	1,401,449
29	2027		5,148,000	1,266,717	2,245,750	8,660,467	19,051,452	10,390,985	1,571,769	714,499	857,269
30	2028		0	1,266,717	2,245,750	3,512,467	19,051,581	15,539,114	1,437,784	265,079	1,172,705
31	2029		0	1,266,717	2,245,750	3,512,467	19,051,711	15,539,243	1,315,221	242,481	1,072,741
32	2030		0	1,266,717	2,245,750	3,512,467	19,051,840	15,539,373	1,203,106	221,809	981,297
33	2031		0	1,266,717	2,245,750	3,512,467	19,051,840	15,539,373	1,100,541	202,900	897,641
34	2032		1,112,000	1,266,717	2,245,750	4,624,467	19,051,840	14,427,373	1,006,719	244,362	762,357
35	2033		-3,527,000	1,266,717	2,245,750	-14,533	19,051,840	19,066,373	920,896	-702	921,598
	Total	94,320,351	31,581,000	37,871,675	68,006,500	231,779,529	504,770,423	272,990,894	99,383,987	99,383,987	-0

FIRR= 9.3%

Table 23-4-5 FIRR Calculation Short Term C-3 Case 2

Base Case	8.7%	
Sensitivity Analysis A	7.6%	Cost 10% increase
Sensitivity Analysis B	7.5%	Revenue 10% decrease
Sensitivity Analysis C	6.3%	Cost 10% increase, Benefit 10% decrease

	year	Initial cost	Renewal cost	Mainte cost	Operation cost	Cost Total	Revenue Total	Revenue - Cost	Net Present Value (NPV) Revenue	Cost	Revenue - Cost
1	1999	1,210,000			114,000	1,324,000	0	-1,324,000	0	1,324,000	-1,324,000
2	2000	2,090,000			114,000	2,204,000	0	-2,204,000	0	2,027,275	-2,027,275
3	2001	7,860,581			114,000	7,974,581	0	-7,974,581	0	6,746,989	-6,746,989
4	2002	16,736,196			114,000	16,850,196	0	-16,850,196	0	13,113,182	-13,113,182
5	2003	53,369,609			178,000	53,547,609	0	-53,547,609	0	38,330,479	-38,330,479
6	2004	13,053,967	0	1,136,875	2,245,750	16,436,593	4,661,287	-11,775,306	3,069,100	10,822,236	-7,753,136
7	2005		0	1,266,717	2,245,750	3,512,467	8,578,165	5,065,698	5,195,180	2,127,250	3,067,930
8	2006		0	1,266,717	2,245,750	3,512,467	9,457,825	5,945,358	5,268,641	1,956,679	3,311,962
9	2007		0	1,266,717	2,245,750	3,512,467	10,337,442	6,824,975	5,296,895	1,799,785	3,497,111
10	2008		0	1,266,717	2,245,750	3,512,467	11,217,080	7,704,613	5,286,755	1,655,471	3,631,284
11	2009		0	1,266,717	2,245,750	3,512,467	12,096,718	8,584,251	5,244,184	1,522,729	3,721,455
12	2010		0	1,266,717	2,245,750	3,512,467	12,976,357	9,463,890	5,174,450	1,400,631	3,773,819
13	2011		1,112,000	1,266,717	2,245,750	4,624,467	13,855,995	9,231,528	5,082,182	1,696,189	3,385,993
14	2012		0	1,266,717	2,245,750	3,512,467	14,735,634	11,223,167	4,971,442	1,185,020	3,786,421
15	2013		3,846,000	1,266,717	2,245,750	7,358,467	15,615,271	8,256,804	4,845,785	2,283,505	2,562,280
16	2014		0	1,266,717	2,245,750	3,512,467	16,494,911	12,982,443	4,708,316	1,002,660	3,705,715
17	2015		5,148,000	1,266,717	2,245,750	8,660,467	17,375,343	8,714,876	4,561,945	2,273,830	2,288,115
18	2016		0	1,266,717	2,245,750	3,512,467	17,073,800	13,561,333	4,123,328	848,262	3,275,066
19	2017		0	1,266,717	2,245,750	3,512,467	19,268,860	15,756,393	4,280,305	780,245	3,500,060
20	2018		13,784,000	1,266,717	2,245,750	17,296,467	19,268,860	1,972,393	3,937,094	3,534,086	403,008
21	2019		0	1,266,717	2,245,750	3,512,467	19,268,860	15,756,393	3,621,403	660,135	2,961,267
22	2020		0	1,266,717	2,245,750	3,512,467	19,268,860	15,756,393	3,331,025	607,203	2,723,822
23	2021		0	1,266,717	2,245,750	3,512,467	19,268,860	15,756,393	3,063,931	558,515	2,505,415
24	2022		0	1,266,717	2,245,750	3,512,467	19,268,860	15,756,393	2,818,253	513,732	2,304,521
25	2023		3,846,000	1,266,717	2,245,750	7,358,467	19,268,860	11,910,393	2,592,275	989,918	1,602,327
26	2024		0	1,266,717	2,245,750	3,512,467	19,268,860	15,756,393	2,384,416	434,649	1,949,767
27	2025		1,112,000	1,266,717	2,245,750	4,624,467	19,268,860	14,644,393	2,193,224	526,367	1,666,857
28	2026		0	1,266,717	2,245,750	3,512,467	19,268,860	15,756,393	2,017,363	367,740	1,649,624
29	2027		5,148,000	1,266,717	2,245,750	8,660,467	19,268,860	10,608,393	1,855,603	834,008	1,021,595
30	2028		0	1,266,717	2,245,750	3,512,467	19,268,860	15,756,393	1,706,814	311,130	1,395,684
31	2029		0	1,266,717	2,245,750	3,512,467	19,268,860	15,756,393	1,569,955	286,183	1,283,772
32	2030		0	1,266,717	2,245,750	3,512,467	19,268,860	15,756,393	1,444,070	263,236	1,180,835
33	2031		0	1,266,717	2,245,750	3,512,467	19,268,860	15,756,393	1,328,279	242,128	1,086,151
34	2032		1,112,000	1,266,717	2,245,750	4,624,467	19,268,860	14,644,393	1,221,773	293,222	928,551
35	2033		-3,527,000	1,266,717	2,245,750	-14,533	19,268,860	19,283,393	1,123,806	-848	1,124,654
	Total	91,320,354	31,581,000	37,871,675	68,006,500	231,779,529	492,046,455	260,266,925	103,317,791	103,317,791	0

FIRR= 8.7%

Table 23-4-6 Financial Statement

B-3 Case2

PROFIT AND LOSS STATEMENT (UNIT: '000 US$)

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Operating Revenues						4,661	8,578	9,458	10,337	11,217	12,097	12,976	13,856	14,736	15,615	16,495	17,375	18,310	19,269	19,269	19,269	19,269	19,269	19,269	19,269	19,269	19,269	19,269	19,269	19,269	19,269
Operating Expenses	114	114	114	114	178	6,900	6,900	6,900	6,900	6,900	6,900	6,900	6,900	6,900	6,900	6,900	6,900	6,900	6,900	6,900	6,900	6,900	6,900	6,900	6,900	6,900	6,900	6,900	6,900	6,900	6,900
Personnel	88	88	88	88	137	1,728	1,728	1,728	1,728	1,728	1,728	1,728	1,728	1,728	1,728	1,728	1,728	1,728	1,728	1,728	1,728	1,728	1,728	1,728	1,728	1,728	1,728	1,728	1,728	1,728	1,728
Administrations	26	26	26	26	41	518	518	518	518	518	518	518	518	518	518	518	518	518	518	518	518	518	518	518	518	518	518	518	518	518	518
Maintenance & repairs	0	0	0	0	0	1,257	1,257	1,257	1,257	1,257	1,257	1,257	1,257	1,257	1,257	1,257	1,257	1,257	1,257	1,257	1,257	1,257	1,257	1,257	1,257	1,257	1,257	1,257	1,257	1,257	1,257
Depreciation costs	0	0	0	0	0	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398
Net Operating Income	-114	-114	-114	-114	-178	-2,239	1,678	2,558	3,437	4,317	5,196	6,076	6,956	7,835	8,715	9,595	10,475	11,409	12,369	12,369	12,369	12,369	12,369	12,369	12,369	12,369	12,369	12,369	12,369	12,369	12,369
Non-operating Revenues	0	0	0	0	0	0	0	0	0	0	45	227	400	366	455	355	647	728	1,433	2,309	2,221	3,169	4,195	5,305	6,506	7,562	8,945	10,361	11,982	13,382	15,381
Interest on deposit	0	0	0	0	0	0	0	0	0	0	45	227	400	366	455	355	647	728	1,433	2,309	2,221	3,169	4,195	5,305	6,506	7,562	8,945	10,361	11,982	13,382	15,381
Non-operating Expenses	0	43	116	431	1,289	3,134	3,517	3,448	3,281	3,113	2,943	2,764	2,542	2,272	1,993	1,718	1,460	1,248	1,069	977	884	792	700	608	515	423	331	240	150	69	11
Interest on long-term loans	0	43	116	431	1,289	3,134	3,517	3,448	3,281	3,113	2,943	2,764	2,542	2,272	1,993	1,718	1,460	1,248	1,069	977	884	792	700	608	515	423	331	240	150	69	11
Interest on short-term loans	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Income before Tax	-114	-156	-230	-544	-1,467	-5,373	-1,839	-891	156	1,204	2,299	3,539	4,814	5,930	7,177	8,232	9,662	10,890	12,733	13,700	13,705	14,745	15,864	17,066	18,359	19,507	20,983	22,490	24,200	25,681	27,739
Corporate Income Tax	0	0	0	0	0	0	0	0	39	301	575	885	925	1,483	833	2,058	1,129	2,722	3,183	0	3,426	3,686	3,966	4,267	3,786	4,877	4,968	5,623	4,763	6,420	6,935
Net Income after Tax	-114	-156	-230	-544	-1,467	-5,373	-1,839	-891	117	903	1,724	2,654	3,888	4,448	6,345	6,174	8,534	8,167	9,550	13,700	10,279	11,059	11,898	12,800	14,572	14,631	16,015	16,868	19,437	19,261	20,804
Retained Earnings	-114	-270	-500	-1,044	-2,511	-7,885	-9,724	-10,615	-10,498	-9,595	-7,870	-5,216	-1,328	3,119	9,464	15,638	24,171	32,339	41,888	55,589	65,867	76,926	88,824	101,624	116,196	130,827	146,842	163,710	183,147	202,408	223,212

CASH FLOW STATEMENT (Unit '000US$)

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Cash Beginning		-114	-270	-500	-1,044	-2,545	-4,612	-3,392	-1,902	-914	453	2,270	4,000	3,663	4,552	3,550	6,470	7,281	14,332	23,086	22,206	31,688	41,951	53,052	65,056	75,619	89,453	103,611	119,819	133,821	153,812
Cash Inflow (excluding G. Funds)	1,096	1,976	8,799	24,299	52,351	12,667	5,076	5,956	6,835	7,715	8,640	9,701	10,754	11,600	12,568	13,348	14,520	15,535	17,200	18,075	17,987	18,935	19,962	21,072	22,272	23,328	24,712	26,128	27,749	29,149	31,148
Net operating income	-114	-114	-114	-114	-178	-2,239	1,678	2,558	3,437	4,317	5,196	6,076	6,956	7,835	8,715	9,595	10,475	11,409	12,369	12,369	12,369	12,369	12,369	12,369	12,369	12,369	12,369	12,369	12,369	12,369	12,369
Depreciation costs	0	0	0	0	0	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398
Long-term loans	1,210	2,090	8,913	24,413	52,529	11,508	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Interest on deposits		0	0	0	0	0	0	0	0	0	45	227	400	366	455	355	647	728	1,433	2,309	2,221	3,169	4,195	5,305	6,506	7,562	8,945	10,361	11,982	13,382	15,381
Cash Outflow (excluding G. Funds)	1,210	2,133	9,029	24,844	53,851	14,734	3,856	4,466	5,847	6,348	6,823	7,971	11,090	10,711	13,570	10,427	13,710	8,481	8,416	18,955	8,505	8,673	8,860	9,068	11,709	9,491	10,554	9,919	13,747	9,158	7,435
Investment	1,210	2,090	8,913	24,413	52,529	11,508	0	0	0	0	0	0	1,112	0	3,846	0	5,148	0	0	13,784	0	0	0	0	3,213	0	1,112	0	5,148	0	0
Repayment for long-term loans	0	0	0	0	34	92	339	1,017	2,527	2,934	3,305	4,322	6,511	6,957	6,899	6,651	5,973	4,514	4,194	4,194	4,194	4,194	4,194	4,194	4,194	4,194	4,144	4,057	3,685	2,668	480
Interest on long-term loans	0	43	116	431	1,289	3,134	3,517	3,448	3,281	3,113	2,943	2,764	2,542	2,272	1,993	1,718	1,460	1,248	1,069	977	884	792	700	608	515	423	331	240	150	69	11
Corporate Income Tax	0	0	0	0	0	0	0	0	39	301	575	885	925	1,483	833	2,058	1,129	2,722	3,183	0	3,426	3,686	3,966	4,267	3,786	4,877	4,968	5,623	4,763	6,420	6,935
Interest on short-term loans		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cash Inflow - Cash Outflow	-114	-156	-230	-544	-1,501	-2,067	1,220	1,490	988	1,367	1,817	1,730	-337	889	-1,002	2,920	811	7,051	8,753	-880	9,482	10,263	11,102	12,003	10,563	13,834	14,158	16,209	14,002	19,991	23,723
Cash Ending	-114	-270	-500	-1,044	-2,545	-4,612	-3,392	-1,902	-914	453	2,270	4,000	3,663	4,552	3,550	6,470	7,281	14,332	23,086	22,206	31,688	41,951	53,052	65,056	75,619	89,453	103,611	119,819	133,821	153,812	177,535
Cash excess	0	0	0	0	0	0	0	0	0	453	2,270	4,000	3,663	4,552	3,550	6,470	7,281	14,332	23,086	22,206	31,688	41,951	53,052	65,056	75,619	89,453	103,611	119,819	133,821	153,812	177,535
Cash shortage	-114	-270	-500	-1,044	-2,545	-4,612	-3,392	-1,902	-914	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

BALANCE SHEET (UNIT: '000US$)

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
(Assets)																															
Current Assets	0	0	0	0	0	0	0	0	0	453	2,270	4,000	3,663	4,552	3,550	6,470	7,281	14,332	23,086	22,206	31,688	41,951	53,052	65,056	75,619	89,453	103,611	119,819	133,821	153,812	177,535
Cash & Deposit	0	0	0	0	0	0	0	0	0	453	2,270	4,000	3,663	4,552	3,550	6,470	7,281	14,332	23,086	22,206	31,688	41,951	53,052	65,056	75,619	89,453	103,611	119,819	133,821	153,812	177,535
Net Fixed Assets	1,210	3,300	12,213	36,626	89,155	97,265	93,867	90,469	87,071	83,673	80,275	76,877	74,591	71,193	71,641	68,243	69,093	66,595	63,197	73,583	70,185	66,787	63,389	59,990	59,805	56,407	54,121	50,723	52,473	49,075	45,677
Construction costs	1,210	3,300	12,213	36,626	89,155	100,663	100,663	100,663	100,663	100,663	100,663	100,663	101,775	101,775	105,621	105,621	110,769	110,769	110,769	124,553	124,553	124,553	124,553	124,553	127,766	127,766	128,878	128,878	131,026	131,026	134,026
Accumulated depreciation	0	0	0	0	0	3,398	6,796	10,194	13,592	16,990	20,388	23,786	27,184	30,582	33,980	37,378	40,776	44,174	47,572	50,970	54,368	57,766	61,164	64,563	67,961	71,359	74,757	78,155	81,553	84,951	88,349
Total Assets	1,210	3,300	12,213	36,626	89,155	97,265	93,867	90,469	87,071	84,126	82,545	80,877	78,254	75,745	75,190	74,713	77,273	80,927	86,282	95,788	101,873	108,737	116,441	125,046	135,424	145,861	157,732	170,543	186,295	202,887	223,212
(Liabilities and capital)																															
Liabilities	1,324	3,570	12,713	37,670	91,666	105,150	103,591	101,084	97,568	93,720	90,415	86,093	79,582	72,625	65,726	59,075	53,102	48,588	44,394	40,200	36,005	31,811	27,617	23,422	19,228	15,034	10,890	6,833	3,148	480	0
Current liabilities	114	270	500	1,044	2,545	4,612	3,392	1,902	914	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fixed liabilities (Long-term loan)	1,210	3,300	12,213	36,626	89,121	100,538	100,198	99,181	96,654	93,720	90,415	86,093	79,582	72,625	65,726	59,075	53,102	48,588	44,394	40,200	36,005	31,811	27,617	23,422	19,228	15,034	10,890	6,833	3,148	480	0
Capital	-114	-270	-500	-1,044	-2,511	-7,885	-9,724	-10,615	-10,498	-9,595	-7,870	-5,216	-1,328	3,119	9,464	15,638	24,171	32,339	41,888	55,589	65,867	76,926	88,824	101,624	116,196	130,827	146,842	163,710	183,147	202,408	223,212
Investment in kind by gov. funds																															
Retained Earnings	-114	-270	-500	-1,044	-2,511	-7,885	-9,724	-10,615	-10,498	-9,595	-7,870	-5,216	-1,328	3,119	9,464	15,638	24,171	32,339	41,888	55,589	65,867	76,926	88,824	101,624	116,196	130,827	146,842	163,710	183,147	202,408	223,212
Total Liabilities and capital	1,210	3,300	12,213	36,626	89,155	97,265	93,867	90,469	87,071	84,126	82,545	80,877	78,254	75,745	75,190	74,713	77,273	80,927	86,282	95,788	101,873	108,737	116,441	125,046	135,424	145,861	157,732	170,543	186,295	202,887	223,212

FINANCIAL INDICATORS

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Working Ratio	0.0%	0.0%	0.0%	0.0%	0.0%	75.1%	49.8%	37.0%	33.9%	31.2%	29.0%	27.0%	25.3%	23.8%	22.4%	21.2%	20.2%	19.1%	18.2%	18.2%	18.2%	18.2%	18.2%	18.2%	18.2%	18.2%	18.2%	18.2%	18.2%	18.2%	18.2%
Operating Ratio	0.0%	0.0%	0.0%	0.0%	0.0%	148.0%	80.4%	73.0%	66.8%	61.5%	57.0%	53.2%	49.8%	46.8%	44.2%	41.8%	39.7%	37.7%	35.8%	35.8%	35.8%	35.8%	35.8%	35.8%	35.8%	35.8%	35.8%	35.8%	35.8%	35.8%	35.8%
Rate of Return on Net Fixed Assets	-9.4%	-3.4%	-0.9%	-0.3%	-0.2%	-2.3%	1.8%	2.8%	3.9%	5.2%	6.5%	7.9%	9.3%	11.0%	12.2%	14.1%	15.0%	17.1%	19.6%	16.8%	17.6%	18.5%	19.5%	20.6%	20.7%	21.9%	22.9%	24.4%	23.6%	25.2%	27.1%
Debt Service Coverage Ratio	0.0%	-266.7%	-97.8%	-26.4%	-13.5%	35.9%	131.6%	133.4%	117.3%	127.6%	137.6%	133.7%	114.4%	121.7%	136.2%	155.2%	186.6%	257.0%	299.6%	301.9%	310.4%	316.2%	322.2%	328.3%	331.8%	341.5%	352.4%	367.0%	411.0%	576.0%	3217.4%

Interest Rate on Short Term Loan	**0.0%**
Interest Rate on Short Term Deposit	10.0%
Rate of Institutional Tax	25.0%

Table 23-4-7 Financial Statements

C-3 Case 2

PROFIT AND LOSS STATEMENT (UNIT: '000 US$)

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Operating Revenues						4,661	8,578	9,458	10,337	11,217	12,097	12,976	13,856	14,736	15,615	16,495	17,375	18,310	19,269	19,269	19,269	19,269	19,269	19,269	19,269	19,269	19,269	19,269	19,269	19,269	19,269
Operating Expenses	114	114	114	114	178	6,751	6,751	6,751	6,751	6,751	6,751	6,751	6,751	6,751	6,751	6,751	6,751	6,751	6,751	6,751	6,751	6,751	6,751	6,751	6,751	6,751	6,751	6,751	6,751	6,751	6,751
Personnel	88	88	88	88	137	1,728	1,728	1,728	1,728	1,728	1,728	1,728	1,728	1,728	1,728	1,728	1,728	1,728	1,728	1,728	1,728	1,728	1,728	1,728	1,728	1,728	1,728	1,728	1,728	1,728	1,728
Administrations	26	26	26	26	41	518	518	518	518	518	518	518	518	518	518	518	518	518	518	518	518	518	518	518	518	518	518	518	518	518	518
Maintenance & repairs	0	0	0	0	0	1,267	1,267	1,267	1,267	1,267	1,267	1,267	1,267	1,267	1,267	1,267	1,267	1,267	1,267	1,267	1,267	1,267	1,267	1,267	1,267	1,267	1,267	1,267	1,267	1,267	1,267
Depreciation costs	0	0	0	0	0	3,238	3,238	3,238	3,238	3,238	3,238	3,238	3,238	3,238	3,238	3,238	3,238	3,238	3,238	3,238	3,238	3,238	3,238	3,238	3,238	3,238	3,238	3,238	3,238	3,238	3,238
Net Operating Income	-114	-114	-114	-114	-178	-2,089	1,828	2,707	3,587	4,466	5,346	6,226	7,105	7,985	8,865	9,744	10,625	11,559	12,518	12,518	12,518	12,518	12,518	12,518	12,518	12,518	12,518	12,518	12,518	12,518	12,518
Non-operating Revenues	0	0	0	0	0	0	0	0	0	69	237	462	713	758	923	904	1,279	1,426	2,205	3,164	3,168	4,213	5,342	6,562	7,881	9,016	10,532	12,089	13,862	15,420	17,557
Interest on deposit	0	0	0	0	0	0	0	0	0	69	237	462	713	758	923	904	1,279	1,426	2,205	3,164	3,168	4,213	5,342	6,562	7,881	9,016	10,532	12,089	13,862	15,420	17,557
Non-operating Expenses	0	43	116	393	981	2,856	3,295	3,243	3,091	2,937	2,782	2,619	2,417	2,165	1,904	1,647	1,405	1,194	1,010	923	837	750	664	577	491	404	318	233	149	73	12
Interest on long-term loans	0	43	116	393	981	2,856	3,295	3,243	3,091	2,937	2,782	2,619	2,417	2,165	1,904	1,647	1,405	1,194	1,010	923	837	750	664	577	491	404	318	233	149	73	12
Interest on short-term loans	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Income before Tax	-114	-156	-230	-507	-1,159	-4,946	-1,468	-536	496	1,598	2,801	4,069	5,401	6,577	7,883	9,001	10,498	11,791	13,714	14,759	14,850	15,981	17,196	18,503	19,908	21,130	22,732	24,375	26,231	27,866	30,063
Corporate Income Tax	0	0	0	0	0	0	0	0	124	400	700	1,017	1,072	1,644	1,009	2,250	1,338	2,948	3,428	244	3,712	3,995	4,299	4,626	4,016	5,283	5,405	6,094	5,271	6,966	7,516
Net Income after Tax	-114	-156	-230	-507	-1,159	-4,946	-1,468	-536	372	1,199	2,101	3,051	4,329	4,933	6,874	6,751	9,161	8,843	10,285	14,515	11,137	11,985	12,897	13,878	15,893	15,848	17,327	18,281	20,960	20,899	22,548
Retained Earnings	-114	-270	-500	-1,007	-2,167	-7,112	-8,580	-9,116	-8,744	-7,545	-5,445	-2,393	1,936	6,869	13,743	20,493	29,654	38,497	48,782	63,298	74,435	86,420	99,318	113,195	129,088	144,936	162,263	180,544	201,504	222,403	244,951

CASH FLOW STATEMENT (Unit '000US$)

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Cash Beginning		-114	-270	-500	-1,007	-2,200	-4,000	-2,540	-613	689	2,367	4,621	7,127	7,576	9,230	9,037	12,785	14,260	22,049	31,642	31,681	42,126	53,419	65,624	78,809	90,163	105,318	120,892	138,618	154,203	175,572
Cash Inflow	1,096	1,976	7,747	16,622	53,192	14,202	5,065	5,945	6,824	7,773	8,821	9,925	11,056	11,980	13,025	13,886	15,141	16,223	17,961	18,920	18,924	19,968	21,098	22,318	23,637	24,772	26,288	27,845	29,618	31,176	33,313
Net operating income	-114	-114	-114	-114	-178	-2,089	1,828	2,707	3,587	4,466	5,346	6,226	7,105	7,985	8,865	9,744	10,625	11,559	12,518	12,518	12,518	12,518	12,518	12,518	12,518	12,518	12,518	12,518	12,518	12,518	12,518
Depreciation costs	0	0	0	0	0	3,238	3,238	3,238	3,238	3,238	3,238	3,238	3,238	3,238	3,238	3,238	3,238	3,238	3,238	3,238	3,238	3,238	3,238	3,238	3,238	3,238	3,238	3,238	3,238	3,238	3,238
Long-term loans	1,210	2,090	7,861	16,736	53,370	13,054	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Interest on deposits		0	0	0	0	0	0	0	0	69	237	462	713	758	923	904	1,279	1,426	2,205	3,164	3,168	4,213	5,342	6,562	7,881	9,016	10,532	12,089	13,862	15,420	17,557
Cash Outflow	1,210	2,133	7,977	17,129	54,385	16,002	3,605	4,018	5,523	6,094	6,567	7,419	10,607	10,326	13,218	10,138	13,666	8,434	8,368	18,881	8,479	8,675	8,893	9,133	12,282	9,617	10,715	10,119	14,033	9,807	8,072
Investment	1,210	2,090	7,861	16,736	53,370	13,054	0	0	0	0	0	0	1,112	0	3,846	0	5,148	0	0	13,784	0	0	0	0	3,846	0	1,112	0	5,148	0	0
Repayment for long-term loans	0	0	0	0	34	92	310	775	2,308	2,758	3,085	3,782	6,006	6,516	6,458	6,240	5,775	4,293	3,930	3,930	3,930	3,930	3,930	3,930	3,930	3,930	3,880	3,793	3,465	2,768	544
Interest on long-term loans	0	43	116	393	981	2,856	3,295	3,243	3,091	2,937	2,782	2,619	2,417	2,165	1,904	1,647	1,405	1,194	1,010	923	837	750	664	577	491	404	318	233	149	73	12
Corporate Income Tax	0	0	0	0	0	0	0	0	124	400	700	1,017	1,072	1,644	1,009	2,250	1,338	2,948	3,428	244	3,712	3,995	4,299	4,626	4,016	5,283	5,405	6,094	5,271	6,966	7,516
Interest on short-term loans		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cash Inflow - Cash Outflow	-114	-156	-230	-507	-1,193	-1,800	1,460	1,927	1,302	1,679	2,253	2,507	448	1,654	-193	3,748	1,475	7,788	9,593	39	10,445	11,293	12,205	13,185	11,354	15,155	15,573	17,726	15,585	21,369	23,241
Cash Ending	-114	-270	-500	-1,007	-2,200	-4,000	-2,540	-613	689	2,367	4,621	7,127	7,576	9,230	9,037	12,785	14,260	22,049	31,642	31,681	42,126	53,419	65,624	78,809	90,163	105,318	120,892	138,618	154,203	175,572	200,813
Cash excess	0	0	0	0	0	0	0	0	689	2,367	4,621	7,127	7,576	9,230	9,037	12,785	14,260	22,049	31,642	31,681	42,126	53,419	65,624	78,809	90,163	105,318	120,892	138,618	154,203	175,572	200,813
Cash shortage	-114	-270	-500	-1,007	-2,200	-4,000	-2,540	-613	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

BALANCE SHEET (UNIT: '000US$)

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
(Assets)																															
Current Assets	0	0	0	0	0	0	0	0	689	2,367	4,621	7,127	7,576	9,230	9,037	12,785	14,260	22,049	31,642	31,681	42,126	53,419	65,624	78,809	90,163	105,318	120,892	138,618	154,203	175,572	200,813
Cash & Deposit	0	0	0	0	0	0	0	0	689	2,367	4,621	7,127	7,576	9,230	9,037	12,785	14,260	22,049	31,642	31,681	42,126	53,419	65,624	78,809	90,163	105,318	120,892	138,618	154,203	175,572	200,813
Net Fixed Assets	1,210	3,300	11,161	27,897	81,267	91,083	87,846	84,608	81,370	78,133	74,895	71,657	69,532	66,294	66,902	63,665	65,575	62,337	59,100	69,646	66,408	63,171	59,933	56,695	57,304	54,066	51,940	48,703	50,613	47,375	44,138
Construction costs	1,210	3,300	11,161	27,897	81,267	94,321	94,321	94,321	94,321	94,321	94,321	94,321	95,433	95,433	99,279	99,279	104,427	104,427	104,427	118,211	118,211	118,211	118,211	118,211	122,057	122,057	123,169	123,169	128,317	128,317	128,317
Accumulated depreciation	0	0	0	0	0	3,238	6,475	9,713	12,951	16,188	19,426	22,664	25,901	29,139	32,377	35,614	38,852	42,090	45,327	48,565	51,803	55,040	58,278	61,516	64,753	67,991	71,229	74,466	77,704	80,942	84,179
Total Assets	1,210	3,300	11,161	27,897	81,267	91,083	87,846	84,608	82,059	80,500	79,516	78,785	77,108	75,524	75,939	76,450	79,836	84,386	90,741	101,327	108,534	116,589	125,557	135,504	147,467	159,384	172,832	187,321	204,816	222,947	244,951
(Liabilities and capital)																															
Liabilities	1,324	3,570	11,661	28,904	83,434	98,195	96,426	93,724	90,803	88,045	84,960	81,178	75,172	68,655	62,197	55,957	50,182	45,889	41,959	38,029	34,099	30,169	26,239	22,309	18,379	14,449	10,569	6,777	3,312	544	-0
Current liabilities	114	270	500	1,007	2,200	4,000	2,540	613	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fixed liabilities (Long-term loan)	1,210	3,300	11,161	27,897	81,233	94,196	93,886	93,111	90,803	88,045	84,960	81,178	75,172	68,655	62,197	55,957	50,182	45,889	41,959	38,029	34,099	30,169	26,239	22,309	18,379	14,449	10,569	6,777	3,312	544	-0
Capital	-114	-270	-500	-1,007	-2,167	-7,112	-8,580	-9,116	-8,744	-7,545	-5,445	-2,393	1,936	6,869	13,743	20,493	29,654	38,497	48,782	63,298	74,435	86,420	99,318	113,195	129,088	144,936	162,263	180,544	201,504	222,403	244,951
Investment in kind by gov. funds																															
Retained Earnings	-114	-270	-500	-1,007	-2,167	-7,112	-8,580	-9,116	-8,744	-7,545	-5,445	-2,393	1,936	6,869	13,743	20,493	29,654	38,497	48,782	63,298	74,435	86,420	99,318	113,195	129,088	144,936	162,263	180,544	201,504	222,403	244,951
Total Liabilities and capital	1,210	3,300	11,161	27,897	81,267	91,083	87,846	84,608	82,059	80,500	79,516	78,785	77,108	75,524	75,939	76,450	79,836	84,386	90,741	101,327	108,534	116,589	125,557	135,504	147,467	159,384	172,832	187,321	204,816	222,947	244,951

FINANCIAL INDICATORS

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Working Ratio	0.0%	0.0%	0.0%	0.0%	0.0%	75.4%	41.0%	37.1%	34.0%	31.3%	29.0%	27.1%	25.4%	23.8%	22.5%	21.3%	20.2%	19.2%	18.2%	18.2%	18.2%	18.2%	18.2%	18.2%	18.2%	18.2%	18.2%	18.2%	18.2%	18.2%	18.2%
Operating Ratio	0.0%	0.0%	0.0%	0.0%	0.0%	144.8%	78.7%	71.4%	65.3%	60.2%	55.8%	52.0%	48.7%	45.8%	43.2%	40.9%	38.9%	36.9%	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%
Rate of Return on Net Fixed Assets	-9.4%	-3.4%	-1.0%	-0.4%	-0.2%	-2.3%	2.1%	3.2%	4.4%	5.7%	7.1%	8.7%	10.2%	12.0%	13.3%	15.3%	16.2%	18.5%	21.2%	18.0%	18.9%	19.8%	20.9%	22.1%	21.9%	23.2%	24.1%	25.7%	24.7%	26.4%	28.4%
Debt Service Coverage Ratio	0.0%	-266.7%	-97.8%	-28.9%	-17.6%	39.0%	140.5%	148.0%	126.4%	135.3%	146.3%	147.8%	122.8%	129.3%	144.7%	164.6%	193.1%	269.7%	319.0%	324.7%	330.5%	336.6%	343.0%	349.6%	356.4%	363.5%	375.4%	391.4%	436.0%	554.7%	2834.4%

Interest Rate on Short Term Loan	0.0%
Interest Rate on Short Term Deposit	10.0%
Rate of Income Tax	25.0%

24. ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

24.1 Introduction

24.1.1 Purpose and Methodology

1. The main purpose of this Environmental Impact Assessment (EIA) is to evaluate environmental impact of items related to the port development plan which were evaluated as having "Significant Effects" in the check list of the Initial Environmental Evaluation (IEE) shown in Chapter 14. Impact on water quality and terrestrial ecology and others are also further examined using the latest data collected by the Study Team during the field survey.

24.1.2 Policy and Regulations on Environment in El Salvador

2. In El Salvador, focus on environmental problems and their possible solutions has been increasing in recent years. In the 1970's, Salvadoran biologists started to voice their alarm with respect to increased rate of pollution of the rivers and estuaries, primarily caused by the unregulated use of pesticides in agriculture. The increased incidents of sea and coastal specie kills also alarmed the Salvadoran population, who began to demand environmental policy and related laws. The following gives a brief review of the current state of environmental policy and law in El Salvador, including the comprehensive environmental law just approved in March, 1998.

(1) Environmental Policy in El Salvador

3. In the 1980's, a number of institutions and private citizens groups began to show concern for the environmental problems mentioned above. Ecological institutions were created with support of the media and government agencies. These institutions started various campaigns designed to create ecological awareness at different levels of government and public sectors.

4. As a result, in 1990 the government of El Salvador organized the Executive Secretary of Environment of the Ministry of Agriculture (SEMA) which was later reorganized under the Ministry of Planning. SEMA was in charge of all matters related to the environment and for establishing

environmental policy in El Salvador. In 1997, the government of El Salvador also established the MENR. At present the Ministry has a small number of technical personnel, the majority being professionals with considerable experience, including the minister who previously served as the first Executive Director of SEMA. At present the country does not have an environmental policy. The new Ministry is in process of designing and implementing a national environmental policy.

(2) Environmental Management

5. Environmental management in El Salvador is currently shared by the following institutions:

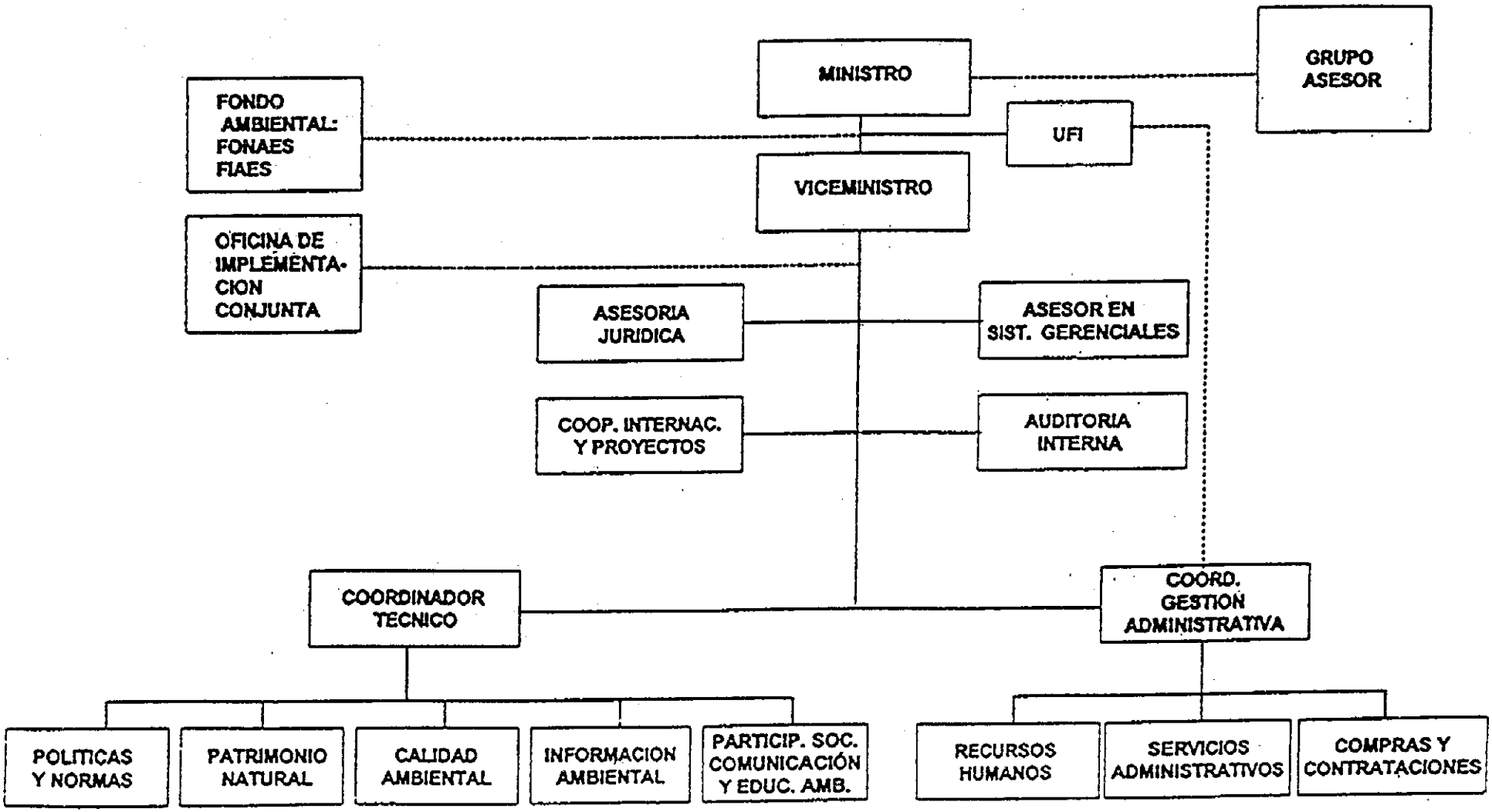
- Ministry of Health
- Ministry of Agriculture
- Ministry of Education
- Attorney General's Office
- National Assembly Committee on Health and Environment
- National Civil Police (PNC)
- Vice Ministry of Housing
- Ministry of Public Works
- Ministry of the Environment and Natural Resources (MENR)

6. It should be noted that in El Salvador there are over one hundred non-governmental organizations (NGOs) that also promote environmental protection.

7. The Ministry of the Environment and Natural Resources is ultimately is in charge of implementation for regulations and corresponding laws implicating the environment and natural resources. An organizational chart of this ministry is shown in Figure 24-1-1.

Figure 24-1-1

Organizational Chart
Ministry of Environment and Natural Resources (in Spanish)



(3) Description of Environmental Laws in El Salvador

8. A significant environmental law for El Salvador was approved on March 2, 1998 and issued to the Official Diary May 4, 1998 (Tome No.339-79, Decree No. 233). It includes 14 titles with 116 articles, establishing the principles and basic norms for conservation and remediation of the environment to ensure sustainable use of national resources and proper environmental procedures in public and private conduct. Its basic premise is to protect the environment as a basic obligation of the government, municipalities, and citizens.

9. Also pertaining to the Political Constitution of El Salvador, Articles 69 and 117 establish that it is of social interest to develop environmental protection and rehabilitation, in order to utilize the national resources in a sustainable manner. These articles call for the State to establish economic incentives and provide the necessary technical assistance for development and implementation of adequate environmental conservation and rehabilitation programs.

10. The law, approved by the Legislative Assembly, establishes:

1) In conformity with the Constitution of the Republic of El Salvador, the protection, conservation and improvement of Environment and Natural Resources must be objective of special legislation.

2) That the deterioration of the environment is generating serious economic and social problems, threatening irreversible damages affecting the well being of the present and future generations. In that sense it is necessary to establish a balance between economic and social development with the sustainable utilization of the natural resources and to protect the environment.

3) In order to confront the environmental problems with success and in an integral way, it should be considered that the environment is composed of many elements interrelated and in constant change, caused by either natural causes or originated by humans. Therefore it is necessary to give to the country a new environmental legislation coherent with the principles of sustainable economic and social development.

4) That El Salvador has signed and ratified international agreements with

the obligations to fulfill the acquired commitments, and according to the situation, to adopt appropriate measures or another type of inclusive legislation to apply the international norms in the country.

11. The new environmental law dedicates Articles 21-29 (Chapters III and IV) to the system of Environmental Impact Assessments (EIA). These articles outline the requirements for an EIA for all activities, works or projects. Article 21(c) addresses the necessity to obtain an environmental permit through a governmental authority for port projects. An EIA must be submitted to the MENR for compliance as one requirement for approval.

(4) Environmental Standards

12. At present there are no environmental standards in El Salvador. The Ministry of Health to a certain degree has established Health Codes and procedures applied to the industrial control of pollution generated by various processes. For execution of new projects it recommends the use of international standards as established by the World Bank. It is also expected that the MENR will define Environmental Standards in the future.

24.1.3 Procedure for approval by the Government

13. Although the environmental law has been passed (March 2, 1998), the MENR is only currently preparing the associated regulations of the newly enacted law. At this point, the regulations for environmental permitting and compliance are not yet established.

14. The current accepted approach for obtaining a permit and governmental approval for a project begins with coordination with the associated municipality. The EIA of this project for the port reactivation in La Union Province should be presented to La Union Municipality. The La Union Municipality should subsequently send copies of this EIA to the relevant agencies including the Ministry of Health and MENR. Depending on the ruling of these institutions, the project may be approved for the first phase of construction.

24.2 EIA

24.2.1 Overview of Existing Conditions

1. According to the field observations, environmental conditions in the bay and surrounding areas are complicated. The critical points are mainly: water pollution, lack of solid waste management, and deforestation and related sediment deposits in the river deltas and the bay. These problems are discussed in the Strategic Plan for Suitable Development of the Salvadoran area of Fonseca Gulf (July 1996), prepared by the Government of El Salvador with the support of the Organization of American States (OAS).

2. This document mentions the general environmental conditions of La Union Province and establishes that more than 80% of that province is deforested which is an indicator of poor agriculture practices developed over a long time by the peasants. Similarly, the mangroves have been over exploited to obtain timber and fire wood. In the same way, overexploitation has had a significant impact on local fishery production (mainly shrimp catch) as mentioned in the Final Draft Formulation Rules of the Advantage of Mangrove Ecosystems (SEMA, 1993).

3. This section begins with a general review of the present conditions of seawater quality, marine sediment, and terrestrial and marine ecology in and around the selected port site, which are surveyed by the Study Team in 1997, such that the future impacts of the proposed development may be adequately evaluated. For this reason, relevant physical, chemical and biological data are compiled through site exploration and field measurements. The following sections detail the field survey method, analysis results and impact assessment. The entire field survey area is shown in Figure 24-2-1.

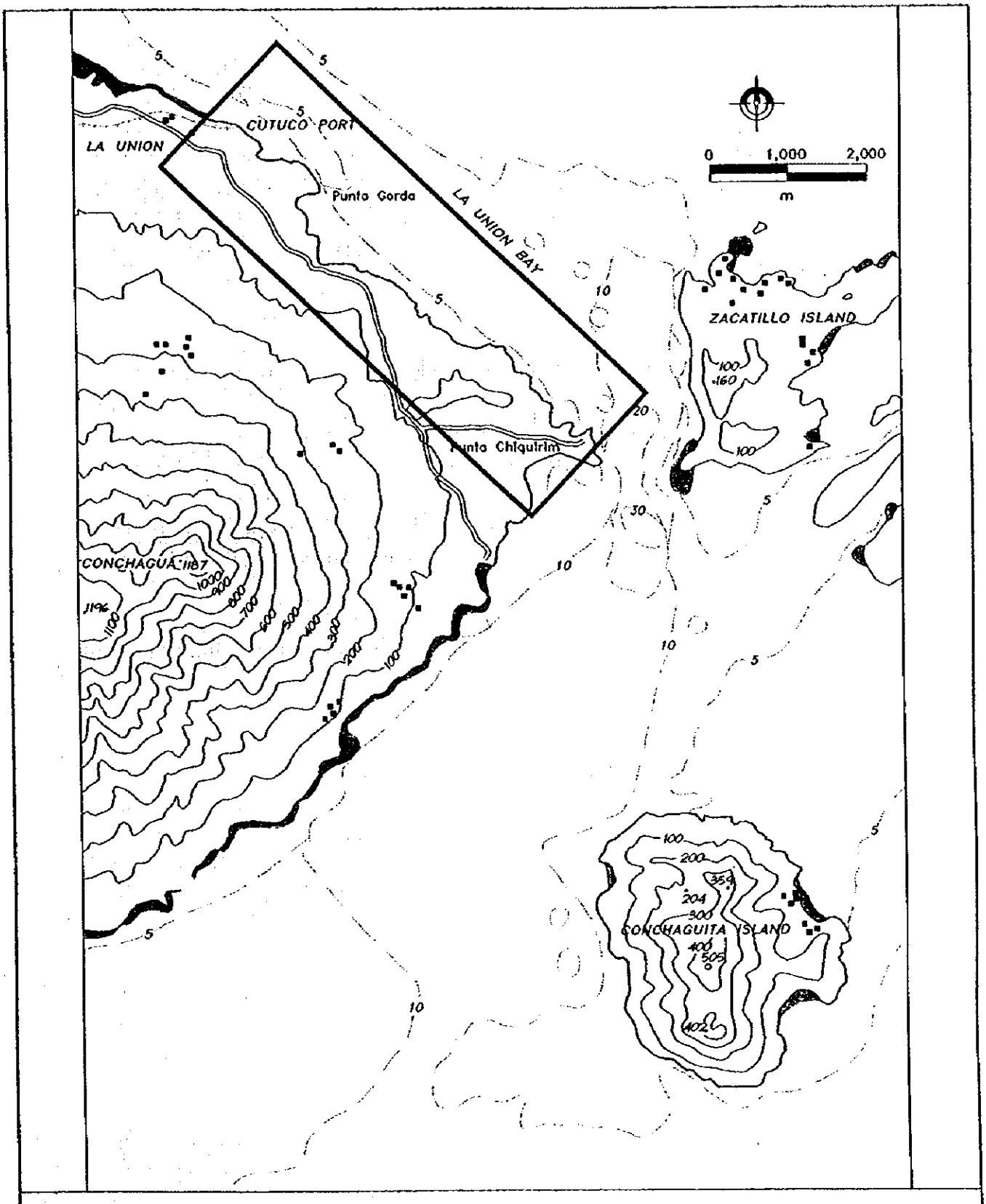


Figure 24-2-1 Study Area

24.2.2 Impact on Seawater Quality

(1) Field Survey Method

4. Sampling and analysis of sea water were performed by the study team according to methods specified by the United States Environmental Protection Agency (USEPA) and "Standard Methods for the Examination of Water and Wastewater" published Jointly by American Public Health Association, American Water Works Association, and Water Pollution Control Federation.

5. The location of the five (5) seawater sampling points selected by the Study Team is shown in Figure 24-2-2. The five sampling locations where sea water and marine sediments sampling was performed were selected by considering their relative location or proximity regarding key points in the impact area of the proposed port redevelopment project. These five sampling points may serve as future monitoring points to compare with baseline data determined in this environmental survey. Sampling point locations are described as follows:

Station 1: Northeast of Cutuco Port, the most interior test location in the gulf
Station 2: Punta Gorda.
Station 3: Lagartos Beach - Manglitos.
Station 4: Punta Remolinos
Station 5: Chiquirin, location is in the outskirts of the gulf

6. In each monitoring location, two seawater samples were obtained in low and high tides respectively. Observations and conditions noted during sampling at sampling locations are listed in Table 24-2-1.

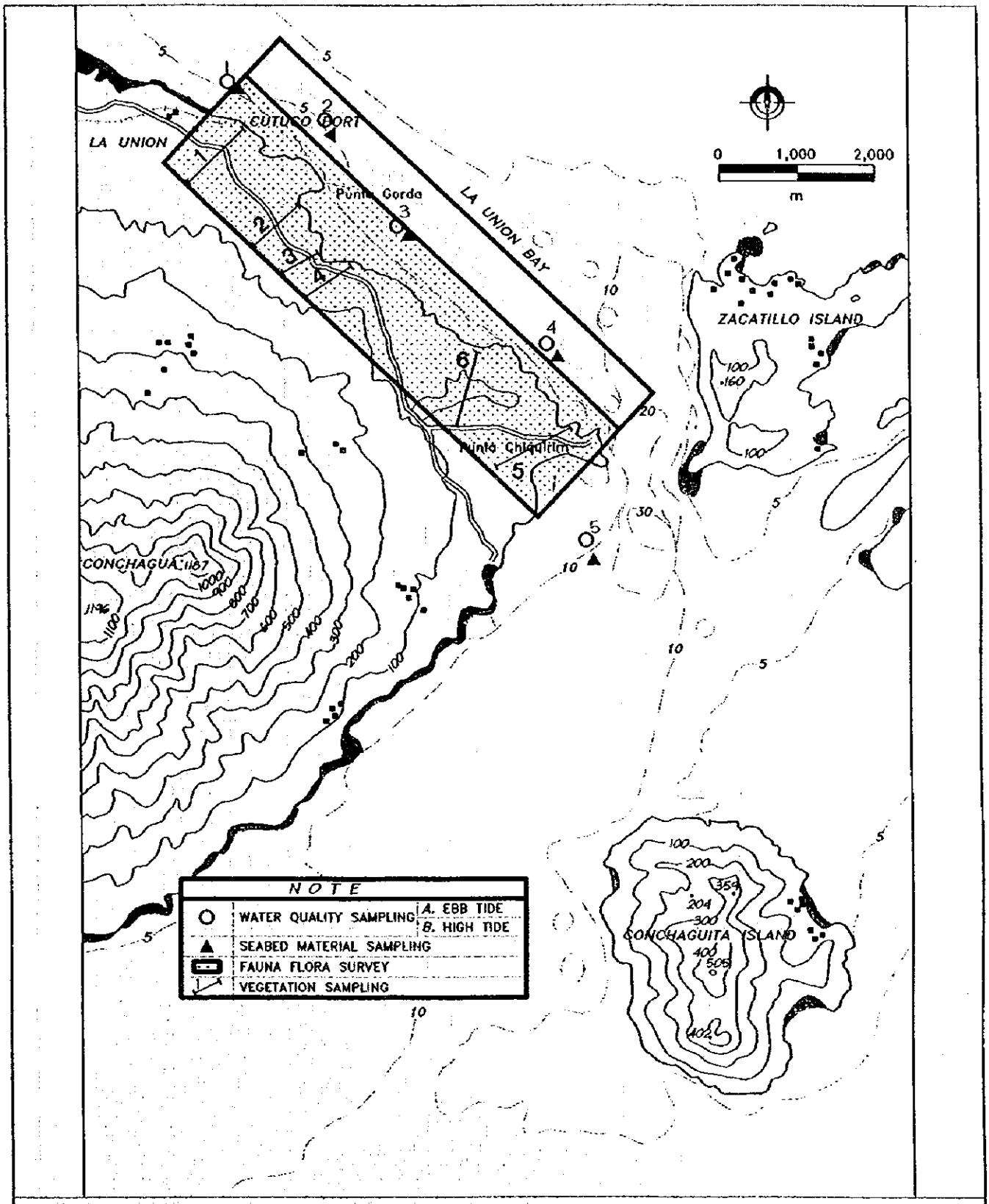


Figure 24-2-2 Sampling Locations

394-F002

Table 24-2-1 (1)

FIELD DATA FORM FOR SAMPLING LOCATIONS

ENVIRONMENTAL SURVEY FOR PORT REACTIVATION STUDY, LA UNION, EL SALVADOR

SAMPLE / PARAMETER	1A	2A	3A
DATE	5-Dec-97	5-Dec-97	5-Dec-97
HOUR	9:00	9:35	10:05
SAMPLE	EBB TIDE	EBB TIDE	EBB TIDE
DEPTH (m)	6.1	5.7	5
SAMPLING SITES	NORTHEAST CUTUCO PORT	PUNTA GORDA	LAGARTOS BEACH-MANGLITOS
SAMPLING SITE DESCRIPTION			
CLOUDINESS	0/8	0/8	0/8
ASPECT	NORMAL	NORMAL	NORMAL
COLOR	TRANSPARENT	TRANSPARENT	TRANSPARENT
ODOR	NORMAL	NORMAL	NORMAL
OIL FILM	NO	NO	NO
ZOOPLANKTON AND ALGAE PRESENCE	NOT LIKELY	NOT LIKELY	NOT LIKELY
COMPOSITION	-	-	-
WIND DIRECTION	SOUTH EAST	SOUTH EAST	SOUTH EAST
WND VELOCITY (m/s)	1.6 to 3.3	0.3 to 1.5	0.0 to 0.2
ANALYSIS IN SITU			
AMBIENT TEMPERATURE (°C)	29	30	32
SAMPLE TEMPERATURE (°C)	29.5	29.2	29
pH (Unit)	7.8	7.82	7.88
SALINITY (%)	35.2	31	34
DISSOLVED OXYGEN (mg/L)	WINKLER	WINKLER	WINKLER
TRANSPARENCY (Secchi depth) (m)	1.3	1.0	1.0
SURROUNDING OBSERVATIONS			
CLIMATE	WARM	WARM	WARM
WATER USE	FISHING	FISHING	FISHING
LAND USE ALONG THE SHORE	TOURISM AND PORTS	FISHING FACTORY	ABANDONED INFRAESTRUCTURE
RIVER OUTLET	NO	NO	NO
DID IT RAIN WITHIN 24 hr PRIOR TO SAMPLING	NO	NO	NO
ROWBOAT TRAFFIC	NOT DURING SAMPLING	NOT DURING SAMPLING	NOT DURING SAMPLING
CULTIVATION ALONG THE SHORE	NO	NO	NO
HOUSING ALONG THE SHORE	NO	NO	NO
SUSPENDED ORGANIC MATTER	NO	NO	NO
FISHING ACTIVITY	NOT DURING SAMPLING	NOT DURING SAMPLING	NOT DURING SAMPLING
OBSERVATIONS	MODERATE CURRENT	MODERATE CURRENT	MODERATE CURRENT

Table 24-2-1 (2)

FIELD DATA FORM FOR SAMPLING LOCATIONS

ENVIRONMENTAL SURVEY FOR PORT REACTIVATION STUDY, LA UNION, EL SALVADOR

SAMPLE / PARAMETER	4A	5A	1B
DATE	6-Dec-97	6-Dec-97	6-Dec-97
HOUR	9:50	8:30	15:20
SAMPLE	EBB TIDE	EBB TIDE	HIGH TIDE
DEPTH (m)	6.5	5	5.5
SAMPLING SITES	PUNTA REMOLINOS	CHIQUILIN	NORTHEAST CUTUCO PORT
SAMPLING SITE DESCRIPTION			
CLOUDINESS	0/8	0/8	0/8
ASPECT	NORMAL	NORMAL	NORMAL
COLOR	TRANSPARENT - GREENISH	TRANSPARENT - GREENISH	TRANSPARENT - GREENISH
ODOR	NORMAL	NORMAL	NORMAL
OIL FILM	NO	NO	NO
ZOOPLANKTON AND ALGAE PRESENCE	NOT LIKELY	NOT LIKELY	NOT LIKELY
COMPOSITION	-	-	-
WIND DIRECTION	NORTH	SOUTH EAST	SOUTH EAST
WND VELOCITY (m/s)	1.6 to 3.3	1.6 to 3.3	1.6 to 3.3
ANALYSIS IN SITU			
AMBIENT TEMPERATURE (°C)	30	30	32
SAMPLE TEMPERATURE (°C)	27	27	28
pH (Unit)	7.94	7.87	7.8
SALINITY (%)	33	35	34
DISSOLVED OXYGEN (mg/L)	WINKLER	WINKLER	WINKLER
TRANSPARENCY (Secchi depth) (m)	1.64	1.23	1.5
SURROUNDING OBSERVATIONS			
CLIMATE	WARM	WARM	WARM
WATER USE	FISHING	FISHING	FISHING
LAND USE ALONG THE SHORE	HOUSING - CROPS	CROPS	PORT
RIVER OUTLET	NO	NO	NO
DID IT RAIN WITHIN 24 hr PRIOR TO SAMPLING	NO	NO	NO
ROWBOAT TRAFFIC	NO	NO	NO
CULTIVATION ALONG THE SHORE	YES	YES	NO
HOUSING ALONG THE SHORE	YES	NO	NO
SUSPENDED ORGANIC MATTER	NO	NO	NO
FISHING ACTIVITY	NOT DURING SAMPLING	NOT DURING SAMPLING	NOT DURING SAMPLING
OBSERVATIONS	MODERATE CURRENT NEAR PUEBLO VIEJO	MODERATE CURRENT	MODERATE CURRENT

Table 24-2-1 (3)

FIELD DATA FORM FOR SAMPLING LOCATIONS

ENVIRONMENTAL SURVEY FOR PORT REACTIVATION STUDY, LA UNION, EL SALVADOR

SAMPLE / PARAMETER	2B	3B	4B
DATE	5-Dec-97	5-Dec-97	5-Dec-97
HOUR	14:50	13:50	14:35
SAMPLE	HIGH TIDE	HIGH TIDE	HIGH TIDE
DEPTH (m)	6	4.5	5
SAMPLING SITES	PUNTA GORDA	LAGARTO'S BEACH - MANGLITO	PUNTA REMOLINOS
SAMPLING SITE DESCRIPTION			
CLOUDINESS	0/8	0/8	0/8
ASPECT	NORMAL	NORMAL	NORMAL
COLOR	TRANSPARENT - GREENISH	TRANSPARENT - GREENISH	TRANSPARENT - GREENISH
ODOR	NORMAL	NORMAL	NORMAL
OIL FILM	NO	NO	NO
ZOOPLANKTON AND ALGAE PRESENCE	NOT LIKELY	NOT LIKELY	NOT LIKELY
COMPOSITION	-	-	-
WIND DIRECTION	SOUTH EAST	SOUTH EAST	SOUTH EAST
WND VELOCITY (m/s)	1.6 to 3.3	1.6 to 3.3	1.6 to 3.3
ANALYSIS IN SITU			
AMBIENT TEMPERATURE (°C)	33.5	31.5	30
SAMPLE TEMPERATURE (°C)	27	29	27
pH (Unit)	7.75	7.76	7.77
SALINITY (%)	32.5	31.5	35
DISSOLVED OXYGEN (mg/L)	WINKLER	WINKLER	WINKLER
TRANSPARENCY (Secchi depth) (m)	1.4	1.58	1.2
SURROUNDING OBSERVATIONS			
CLIMATE	WARM	WARM	WARM
WATER USE	FISHING	FISHING	FISHING
LAND USE ALONG THE SHORE	FISHING FACTORY	ABANDON INFRAESTRUCTURE	HOUSING - CROPS
RIVER OUTLET	NO	NO	NO
DID IT RAIN WITHIN 24 hr PRIOR TO SAMPLING	NO	NO	NO
ROWBOAT TRAFFIC	NO	NO	NO
CULTIVATION ALONG THE SHORE	NO	NO	YES
HOUSING ALONG THE SHORE	NO	YES	YES
SUSPENDED ORGANIC MATTER	NO	NO	NO
FISHING ACTIVITY	NOT DURING SAMPLING	NOT DURING SAMPLING	NOT DURING SAMPLING
OBSERVATIONS	WEAK CURRENT	WEAK CURRENT	WEAK CURRENT

Table 24-2-1 (4)

FIELD DATA FORM FOR SAMPLING LOCATIONS

ENVIRONMENTAL SURVEY FOR PORT REACTIVATION STUDY
LA UNION, EL SALVADOR

PARAMETER \ SAMPLE	5B
DATE	6-Dec-97
HOUR	14:00
SAMPLE	HIGH TIDE
DEPTH (m)	4
SAMPLING SITES	CHIQUILIN
SAMPLING SITE DESCRIPTION	
CLOUDINESS	0/8
ASPECT	NORMAL
COLOR	TRANSPARENT - GREENISH
ODOR	NORMAL
OIL FILM	NO
ZOOPLANKTON AND ALGAE PRESENCE	NO
COMPOSITION	-
WIND DIRECTION	SOUTHEAST
WND VELOCITY (m/s)	1.6 to 3.3
ANALYSIS IN SITU	
AMBIENT TEMPERATURE (°C)	31.5
SAMPLE TEMPERATURE (°C)	29.5
pH (Unit)	7.86
SALINITY (%)	35
DISSOLVED OXYGEN (mg/L)	WINKLER
TRANSPARENCY (Secchi depth) (m)	1.18
SURROUNDING OBSERVATIONS	
CLIMATE	WARM
WATER USE	FISHING
LAND USE ALONG THE SHORE	CROPS
RIVER OUTLET	NO
DID IT RAIN WITHIN 24 hr PRIOR TO SAMPLING	NO
ROWBOAT TRAFFIC	NO
CULTIVATION ALONG THE SHORE	YES
HOUSING ALONG THE SHORE	NO
SUSPENDED ORGANIC MATTER	NO
FISHING ACTIVITY	NOT DURING SAMPLING
OBSERVATIONS	WEAK CURRENT

(2) Results of Existing Seawater Conditions

7. The results of water quality laboratory tests are shown in Table 24-2-2 and summarized in the following:

a) pH

8. The pH values vary from 7.7 to 7.9. This is a normal range for seawater and indicates the large buffering capacity of the ocean.

b) Normal Hexane Extracts (NHE)

9. Generally, NHE corresponds to content of fats and oils. Results show value range of 21.4 to 71.4 mg/l. NHE ambient standards are not common but when they do exist they are low (such as the Malaysian requirement of 0.5 mg/l). All results were at least one order of magnitude higher than 0.5 mg/l, indicating pollution levels that are likely caused by ship and boat activities. The highest NHE concentration was 71.4 mg/l detected at station point No.1, northeast of Cutuco Port where sampling was performed in the morning hours.

10. Similarly, a high NHE concentration of 45.8 mg/l was detected in a sample obtained at station No.5 also in the morning hours. It is likely that the morning activities of fishing vessels contribute to this pollution due to oil residuals from their motors.

c) Dissolved Oxygen

11. Measured results varied between 5.65 and 6.5 mg/l. Generally speaking, this range of values is not so bad taking into consideration the minimum standards in other countries. However, these values are enough to guarantee the development of diverse marine fauna. The excessive values of the COD subsequently discussed are likely to be the cause of the decrease in dissolved oxygen.

Table 24-2-2

WATER QUALITY ANALYSIS RESULTS

SAMPLING DATE		DAY-MONTH-YEAR		5-Dec-97	5-Dec-97	5-Dec-97	6-Dec-97	6-Dec-97	5-Dec-97	5-Dec-97	5-Dec-97	6-Dec-97	6-Dec-97
		ANALYSIS NUMBER		A-736/97	A-737/97	A-738/97	A-739/97	A-740/97	A-741/97	A-742/97	A-743/97	A-744/97	A-745/97
PARAMETER				SAMPLING LOCATIONS									
		UNIT	SITE	1A	2A	3A	4A	5A	1B	2B	3B	4B	5B
PHYSICAL	TRANSPARENCY (SECCHI DEPTH)	m	F	1.30	1.00	1.00	1.64	1.23	1.50	1.50	1.58	1.22	1.18
	SAMPLE TEMPERATURE	°C	F	29.50	29.20	29.00	27.00	27.00	28.00	28.00	21.00	29.00	39.50
	AMBIENT TEMPERATURE	°C	F	29.00	30.00	32.00	30.00	30.00	32.00	32.00	31.50	30.00	31.50
CHEMICAL	pH	UNIT	F	7.80	7.82	7.88	7.94	7.87	7.80	7.80	7.76	7.77	7.86
	SALINITY	‰	F	35.20	31.00	34.00	33.00	35.00	34.00	34.00	31.50	35.00	35.00
	CHEMICAL OXYGEN DEMAND (COD)	mg/L	L	1313.92	1101.27	1435.44	1648.10	1443.04	1336.71	1336.71	1298.73	1329.11	1691.14
	TOTAL NITROGEN	mg/L	L	5.81	6.12	3.93	5.81	5.02	3.45	3.45	3.45	3.45	3.77
	TOTAL PHOSPHOROUS	mg/L	L	0.17	0.09	0.04	0.22	0.19	0.09	0.09	0.13	0.18	0.14
	NORMAL HEXANE EXTRACTS (OIL)	mg/L	L	71.40	28.00	46.20	26.30	45.60	37.00	37.00	33.20	22.90	21.40
	CHLORINE (CL)	mg/L	L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	DISSOLVED OXYGEN	mg/L	F	6.30	5.70	5.65	6.00	6.15	6.50	6.10	5.80	6.00	5.80

SAMPLING SITES

1A	NORTHEAST CUTUCO PORT	1B	NORTHEAST CUTUCO PORT
2A	PUNTA GORDA	2B	PUNTA GORDA
3A	LAGARTOS BEACH - MANGLITOS	3B	LAGARTOS BEACH - MANGLITOS
4A	PUNTA REMOLINOS	4B	PUNTA REMOLINOS
5A	CHIQUIRIN	5B	CHIQUIRIN

F	FIELD
L	LABORATORY
ND	NOT DETECTED

Chemical Oxygen Demand (COD)

12. Very high COD results in the range between 1,101 and 1,891 mg/l were obtained. These results are consistent in all monitoring stations and exceed the maximum allowed standard value of 8 mg/l by more than two orders of magnitude. The results indicate a high degree of contamination. It is most likely that this contamination is caused by excess of both organic loading and inorganic substances that are being oxidized. This high degree of pollution is likely due to the combined effects of uncontrolled discharge of untreated sewage and other domestic residuals, and the present industrial activities in the gulf. These industrial activities that may be confirmed by the high levels of NHE, are likely contribute to the excessive COD values. It is highly recommended that COD loading be evaluated in the following rivers: Goascorán, Pasaquina, Siramá, El Nacimiento, El Municipeo, El Camarón, and El Zapote.

13. It is likely that these rivers serve as contamination conduits since they act as receptors to diverse polluting loads from domestic sewage, and industrial sources along their drainage path.

e) Total Nitrogen (T-N)

14. T-N results show values between 3.45 and 6.12 mg/l. These results are high and indicate high concentrations of nitrogen nutrients. The minimum total N standard for eutrophication avoidance is 0.06 mg/l. This analysis shows significant differences among the value at each sampling point with regard to the high and low tide, with the higher values always apparent during low tide. The results were consistent with slight differences among sampling stations.

f) Total Phosphorum (T-P)

15. T-P results range between 0.04 and 0.22 mg/l. These results are consistently above the standard of 0.01 mg/l. Significant differences are not observed among the stations These high values are likely to indicate pollution from municipal, agricultural, and industrial sources including sewage, fertilizers and detergents.

g) Chlorine (Cl)

16. There was no detection of residual free chlorine in any of the samples.

h) Air temperature

17. Ambient air temperature varied between 29°C and 32°C during the two sampling days on December 5th and 6th, 1997. As it was observed, the maximum variation of temperature was of 3°C, with an average temperature of 30.8°C.

i) Sea water Temperature

18. During these two sampling days there was a slight variation in sea water temperature, 29.5°C and 27.0°C for maximum and minimum, respectively. There was also no appreciable difference observed among the sampling stations.

j) Transparency (Secchi Depth)

19. Transparency observations were similar for all the sampling stations. Results varied between 1.0 and 1.64 m. These values are low and indicate turbidity. A universally accepted, minimum reference value is 2.50 meters.

(3) Impact Evaluation

20. As mentioned in IEE, the present seawater is polluted mainly by raw municipal solid waste and untreated industrial discharges from inland, including the activities of local fishing boats, since both the Port of Cutuco and Punta Gorda have not been used so much by cargo ships recently. If necessary, detailed survey concerning the inflow of the relevant rivers should be conducted.

21. Regarding the port activities in the Short Term Plan, their impact on water quality of the surrounding area is limited and insignificant. Modern, well-equipped container terminals essentially have no significant pollution source.

22. As to dry bulk, a sheet should always be covered between the quay and the ship so that cargo cannot fall into the sea during cargo handling. Whatever remains on the apron after cargo handling should be cleaned or collected without water, which sometimes results in contaminants flowing into the sea. On the other hand, liquid bulk is handled by pipeline system.

23. Generally, major oil spills do not necessarily increase along with increased port activities and vessel traffic. Major oil spills and leaks are accidental. Such events are difficult to predict. However, they can be prevented or significantly decreased through efforts to increase safe and efficient operations.

24. It is recommended that a sound contingency plan for oil spill be established with authorities concerned on the bay as soon as possible, following the Port of Acajutla. In addition, the government is expected to take appropriate measures for MARPOL, including inspections of calling vessels to prevent illegal disposal of bilge.

25. Currently, CEPA is preparing a National Contingency Plan to address large oil spills and accidental marine discharges of other harmful substances. The plan includes: 1) measures to contain, control, and skim oil spills and dispersion of other harmful substances in the sea; 2) measures to protect ecosystem and natural resources; and, 3) measures to establish the necessary mechanisms of coordination and cooperation to utilize human, material, and legal resources.

26. During construction, proper countermeasures will be taken for turbidity by soil dredging and dumping by the method described in the section of 20.1.7. using a silt protector sheet.

24.2.3 Impact on Marine Sediment

(1) Field Survey

27. Sampling and analysis of marine sediments were performed by the Study Team according to methods specified by the United States Environmental Protection Agency (USEPA) and American Society of Testing and Materials (ASTM). Figure 24-2-2 also shows the location of the five (5) seabed sampling points, the same as those for the seawater quality. Marine sediment samples were obtained at the five sampling points using an

Eckman dredger and a PVC sampler. For each sediment sample, field observations were carried out and tabulated including color, scent, and general composition.

(2) Results of Seabed Material Laboratory Test

28. Laboratory results of seabed material tests are shown in Table 24-2-3 and summarized in the following:

a) Color and scent

29. Sediment color and scent may be indicators of contamination. The slight hydrosulfuric scent and greenish-gray color of all five sediment samples indicated possible contamination of the sediments.

b) Loss of Ignition

30. Sediment samples S-1 -through S-4 results show high ignition loss values in the range of 12 to 15% which indicate high content of organic matter that could be associated with pollution. Sample S-5 in the open waters, having ignition loss value of 2.17%, is very low compared with the other four sampling locations.

c) Particle Size Distribution

31. Ignition loss results correlate well with particle size distribution of samples S-1 to S-4. These samples have high silt and clay contents, whereas sample S-5 consists mostly of sand.

d) Chemical Oxygen Demand (COD)

32. As was the case with the sea water analysis, COD in the marine sediments samples was very high with values ranging between 25,929 and 33,809 mg/kg. These values confirm that marine sediments in the study area have accumulated high contamination levels due to pollutant transport by gulf currents. Although they remain very high, COD levels decrease significantly in sampling stations S-2 through S-5 with respect to S-1 that is located in the interior of the gulf. This decrease in COD levels towards the open waters appears to demonstrate that contamination is reduced with increased distance from the gulf, likely by the buffering effect of the ocean.

e) Lead (Pb)

33. Lead was detected in all five marine sediment samples with concentration values between 0.41 and 0.8 parts-per-million (ppm). The current values obtained could be compared to the standard values or criteria concerning specifications of the bottom specifications of the bottom sediments. Permissible limits for offshore dumping of dredged material set up in Canada and U.S.A are 45 and 33 ppm, respectively.

34. This lead contamination could be related to three pollution mechanisms: 1- Runoff from agricultural pesticides; 2- Contamination from spills of ship and boat fuel (lead is used as a common preservative in there fuels to increase octane); and, 3- The breakup of metallic parts and welds of the several sunken ships. Lead concentration values decrease in sampling stations that are further from the gulf towards the open water, respectively, which appears to demonstrate again the buffering affect of the ocean.

f) Zinc (Zn)

35. Zinc was detected in all five samples at a concentration value range of 33.67 to 46.42 ppm. These values are lower than the allowable USEPA standard of 105 ppm.

36. Zinc contamination could be related to two pollution mechanisms: 1- Contamination from ship maintenance activities such as stripping, protective coating, and painting since many of the thinners, coatings and paints used for ships and boats contain Zinc; and, 2- The breakup of metallic parts and welds of the several sunken ships. The zinc concentration value significantly decreases in sampling station No.5 that is further from the gulf and nearest to the open water, which appears to demonstrate again the buffering effect of the ocean.

g) Total Chromium (Total - Cr)

37. Chromium contamination could also be attributed to ship maintenance activities since it is in ship protective coatings that are applied before painting. Total-Cr concentration values were consistent in all five sediment samples, ranging from 32.50 to 38.26 ppm.

Table 24-2-3

MARINE SEDIMENT ANALYSIS RESULTS

SAMPLING DATE	DAY-MONTH-YEAR		9-Dec-97	9-Dec-97	9-Dec-97	9-Dec-97	9-Dec-97
PARAMETER	ANALYSIS NUMBER		S-2107/97	S-2108/97	S-2109/97	S-2110/97	S-2111/97
			SAMPLING LOCATIONS				
	UNIT	SITE	S-1	S-2	S-3	S-4	S-5
COLOR	-	F	GREENISH-GRAY	GREENISH-GRAY	GREENISH-GRAY	GREENISH-GRAY	GREENISH-GRAY
ODOR	-	F	HYDROSULFURIC	HYDROSULFURIC	HYDROSULFURIC	HYDROSULFURIC	HYDROSULFURIC
IGNITION LOSS	%	L	13.34	13.34	12.55	14.98	2.17
SAND	%	L	16.92	16.92	16.92	16.92	94.92
SILT	%	L	54.00	30.00	60.00	48.00	2.00
CLAY	%	L	29.08	53.08	23.08	35.08	3.08
CHEMICAL OXYGEN DEMAND (COD)	mg/kg	L	33809.59	29072.62	29358.62	26466.31	25929.77
LEAD (Pb)	ppm	L	0.80	0.76	0.76	0.71	0.41
ZINC (Zn)	ppm	L	43.45	41.62	44.81	46.42	33.67
CADMIUM (Cd)	ppb	L	<0.08	<0.08	<0.08	<0.08	<0.08
ARSENIC (As)	ppb	L	<0.23	<0.23	<0.23	<0.23	<0.23
TOTAL CHROMIUM (Cr)	ppm	L	38.26	32.43	35.56	36.32	33.50
TOTAL MERCURY (Hg)	µg/kg	L	<0.1	<0.1	<0.1	<0.1	<0.1
SULFIDE (S^{2-})	mg/kg	L	14	34	64	66	10

SAMPLING SITES

S-1 NORTHEAST CUTUCO PORT
S-2 PUNTA GORDA
S-3 LAGARTOS BEACH - MANGLITOS
S-4 PUNTA REMOLINOS
S-5 CHIQUIRIN

F FIELD
L LABORATORY

h) Sulfide

38. The sulfide concentrations range is from 10 to 64 ppm. This range also indicates a certain degree of metal contamination in these marine sediments.

i) Arsenic (As), Cadmium (Cd), and Total Mercury (Total-Hg)

39. These parameters were reported as traces smaller that their respective method detection limits (MDLs) of the laboratory analysis, 0.23, 0.08, and 0.1 parts-per-billion (ppb), respectively. Therefore, for all practical purposes it may be considered that there were no As, Cd and Total-Hg contamination in these five samples.

(3) Impact Evaluation

40. The aforementioned inflow of pollutants from land areas is mainly assumed to be adversely affecting the marine sediment around the port, taking into consideration the high value of the organic indices such as Loss of Ignition and COD, while the inorganic substance is detected but estimated at the allowable level.

41. To cope with the situation, a municipal solid waste program is being implemented by the La Union Municipality. In addition, appropriate countermeasures such as a sewage treatment system are under examination by the Municipality of La Union to minimize or eliminate the further contamination of the bay, under the coordination of the Ministries of Health, and Environment and Natural Resources.

42. During construction of the new port, dredging and dumping of such materials require special attention as mentioned in the previous section related to seawater quality. The dumping site is also an important factor as well as the method of dredging and dumping. The place in the bay of the territory of El Salvador, where the current velocity is weak and impact on the marine ecology is limited, is desirable. In this standpoint, dredging and dumping methods are examined as explained in the section of 20.1.7.

24.2.4 Impact on Terrestrial and Marine Ecology

43. The impacts on terrestrial and marine ecology are addressed in this section. Field survey methods and results are discussed for terrestrial flora, terrestrial fauna, and marine fauna, followed by an analysis of overall impacts.

(1) Field Survey

1) Terrestrial Flora Survey Method, Analysis, and Results

a) Survey Method

44. The study team conducted a terrestrial ecology survey by the following method. Based on the survey results, the Study Team developed Figure 24-2-3. The figure is a vegetation distribution map that was developed to delineate the present distribution of the different types of vegetation in the study area.

45. Aerial photographic maps were obtained from the National Geographical Institute of El Salvador (NGIES). The aerial photographs obtained from the NGIES and Cartographic bases used are listed as follows:

PHOTOGRAPHIC AERA NUMBER	FLIGHT	SCALE
087	1S-I-1980-C1	1:20,000
088	1S-I-1980-C1	1:20,000
089	1S-I-1980-C1	1:20,000
129	NN-1962	1:20,000
130	NN-1962	1:20,000
131	NN-1962	1:20,000
132	NN-1962	1:20,000
133	NN-1962	1:20,000
134	NN-1962	1:20,000
SAL CH-5	1972	1:20,000
SAL CH-6	1974-1979	1:40,000
No. 65406	1985	1:5,000
No. 65405	1985	1:5,000

46. Initially the aerial photographs were interpreted stereoscopically to create a preliminary map that was later adjusted according to field observations:

47. The sampling methodology presented by Matteucci & Coleman (1982) was used for this survey. Flora characterization was carried out using a methodical perpendicular and parallel cross-sections of the study area, with respect to the coastline. Sampling of present species in a given quadrant was then performed. In areas where the trees were taller than three (3) meters, study quadrants were each a hundred square meters (100 m^2). In study areas where bushes and small trees prevailed (less than three meters), study quadrants were each twenty-five square meters (25 m^2). In study areas where grass prevailed, study quadrants were each four square meters (4 m^2). The locations of the parallel and perpendicular cross-sections are shown in Figure 24-2-2 (a total of 6 parallel and perpendicular cross-section and 63 quadrants).

48. In each parcel the flora species were identified and quantified. Their height and importance to the region were also noted. In cultivated areas, the species present and their use were recorded.

49. The identified species were counted and their density computed. The diversity of each species was also computed using the Shannon Weaver method (Matteucci and Coleman 1982). Based on Figure 24-2-3, the percentage of the study area covered by various vegetation types was identified.

b) Analysis and Results of Existing Conditions

50. In the study area there are the following categories of vegetation, as shown in Figure 24-2-3.

Shrubs (s)
Shrub Trees (ST)
Scrub (SR)
Trees taller than 3 m (T)
Grass (G)
Grasses with dispersed trees (GT)
Grass and cultivated land (GC)
Grass and cultivated land with trees (GC + T)

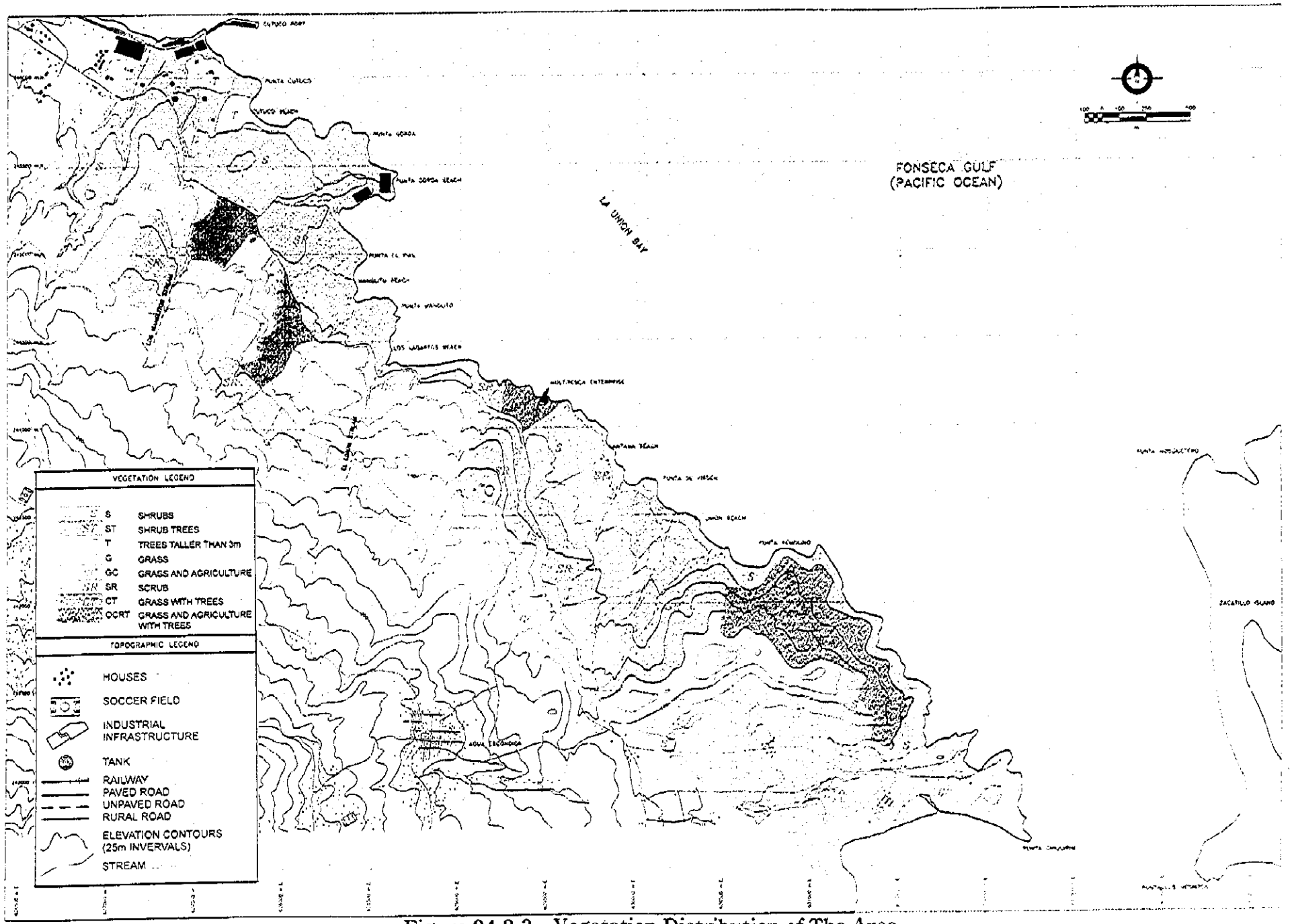


Figure 24-2-3 Vegetation Distribution of The Area

51. The category for Shrub Trees also includes trees shorter than 3 m since it is difficult to differentiate the two categories on a map. It should also be noted that the term "agriculture" used in Figure 24-2-3 legend refers to areas of human intervention and cultivation.

52. In total, the studied area is covered by about 61% of all grass types (including cultivated areas), 22% shrubs and smaller trees, and about 17% canopy covered by taller trees (taller than three meters).

53. The species found in each one of the working quadrants are presented in Table 24-2-4(1) through 24-2-4(6) (6 table sheets). Average height, species number, species density, and total number of species encountered are listed for each quadrant.

54. In total, there were 32 families with 55 flora species in the categories of bushes, shrubs and trees. There were 964 samples, obtaining a diversity index of 1.48 (Table 24-2-5). This diversity index value is not considered very high.

55. In the cultivated and grass areas, there were 22 species belonging to 10 families (Table 24-2-6). In total, 73 vegetation species were identified in the study area among herbaceous, shrubs, bushes and trees.

Table 24-2-4 (1)

VEGETATION SPECIES OF THE STUDY AREA

TRANSECT : 1
SITE: CUTUCO PORT
PLOTS: 18

LOCAL NAME	FAMILY	SCIENTIFIC NAME	AVERAGE HEIGHT (m)	NUMBER OF INDIVIDUALS	INDIVIDUALS PER m^2
Aceituno	Simarubaceae	*Simarouba glauca*	4.3	5	0.0077
Barrenillo	Gramineae	*Cynodon dactylon*	5	2	0.0031
Carbon negro	-	sp2	2.1	8	0.0123
Cinco negritos	Verbenaceae	*Lantana camara*	2.2	6	0.0092
Cojon	Apocynaceae	*Stemmadenia glabra*	2.3	15	0.0231
Conacaste blanco	Mimosaceae	*Albizzia caribaea*	5.8	2	0.0031
Conacaste negro	Mimosaceae	*Enterolobium cyclocarpum*	7.3	7	0.0108
Chaperno	Fabaceae	*Lonchocarpus miniflorus*	3	3	0.0046
Escobilla	Malvacea	*Sida acuta*	1.68	6	0.0092
Espino blanco	Mimosaceae	*Acacia farnesiana*	3	5	0.0077
Frijolillo	Fabaceae	*Phaseolus carazalla*	3.5	3	0.0046
Granadilla	Capparidaceae	*Crateeva tapia*	3.6	1	0.0015
Guacimo o tapaculo	Sterculiaceae	*Guazuma ulmifolia*	3.8	13	0.0200
Guineo	Musaceae	*Musa sapientum*	3.5	1	0.0015
Huilihuiste	Rhamnaceae	*Karwinskia calderoni*	4	1	0.0015
Iscanal	Momasaceae	*Acacia hendsii*	2.8	5	0.0077
Jazmin	Rutaceae	*Murraya paniculata*	3.5	3	0.0046
Jiote	Burseraceae	*Bursera simaruba*	2.7	1	0.0015
Jocote	Anacardiaceae	*Spondias purpurea*	3.7	3	0.0046
Laurel	Borraginaceae	*Cordia alliodora*	3	11	0.0169
Madrecacao	Papilionaceae	*Glricidia sepium*	4	1	0.0015
Mango	Anacardiaceae	*Mangifera indica*	8.5	2	0.0031
Maquiligua	Bignoniaceae	*Tabebuia rosea*	0.7	1	0.0015
Maranon	Anacardiaceae	*Anacardium occidentale*	3.6	2	0.0031
Naranja grey	Rutaceae	*Citrus aurantium*	5.5	1	0.0015
Palmera	Palmae	*Erythea salvadorensis*	7.3	2	0.0031
Pie de venado	Ceasalpinaceae	*Bahuinia eculeata*	3.5	13	0.0200
Pintadillo	-	sp3	4	4	0.0062
Quebracho	Mimosaceae	*Albizzia sp*	2.5	4	0.0062
Tihuilote	Borraginaceae	*Cordia dentata*	4	10	0.0154
Varilla negra	-	sp5	2.4	3	0.0046
Zarza	Smilacaceae	*Smilax mexicana*	2.6	1	0.0015
TOTAL SPECIES					32
TOTAL INDIVIDUALS					145
DIVERSITY					1.36

Table 24-2-4 (2)

VEGETATION SPECIES OF THE STUDY AREA

TRANSECT: 2
SITE: CORSAIN
PLOTS: 13

LOCAL NAME	FAMILY	SCIENTIFIC NAME	AVERAGE HEIGHT (m)	NUMBER OF INDIVIDUALS	INDIVIDUALS PER m^2
Carbon negro	-	sp2	4.5	12	0.0143
Cinco negritos	Verbenaceae	*Lantana camara*	2	3	0.0036
Cojon	Apocynaceae	*Stemmadenia glabra*	3.9	11	0.0131
Chupa chupa	Bignoniaceae	*Arrabidaea millisima*	-	3	0.0036
Guacimo o tapaculo	Sterculiaceae	*Guazuma ulmifolia*	3.5	5	0.0060
Guarumo	Moraceae	*Cecropia sp.*	5.5	8	0.0095
Huesito	Flacourtiaceae	*Casearia sylvestris*	6	1	0.0012
Huilihuiste	Rhamnaceae	*Karwinskia calderoni*	6	4	0.0048
Iscanal	Momasaceae	*Acacia hendsii*	5.5	5	0.0060
Jiote	Burseraceae	*Bursera simaruba*	5	1	0.0012
Jocote	Anacardiaceae	*Spondies purpurea*	6	2	0.0024
Laurel	Borraginaceae	*Cordia alliodora*	4.5	12	0.0143
Madrecacao	Papilionaceae	*Glinicidie sepium*	5	1	0.0012
Mangle	Rhizophoraceae	*Rhizophora mangle*	6	15	0.0179
Mangle	Martyniaceae	*Avicenia germinans*	4.5	7	0.0083
Mangle	Combretaceae	*Leguncularia racemosa*	6	4	0.0048
Mongollano	Momosaceae	*Pithecollobium dulce*	5	1	0.0012
Pie de venado	Ceasalpinaceae	*Bahuinia aculeata*	3	1	0.0012
Pintadillo	-	sp3	5	4	0.0048
Sombrerito	-	sp4	-	2	0.0024
Tihuilote	Borraginaceae	*Cordia dentata*	4	5	0.0060
Varilla negra	-	sp5	1.5	1	0.0012
TOTAL SPECIES					**22**
TOTAL INDIVIDUALS					**108**
DIVERSITY					**1.2**

Table 24-2-4 (3)

VEGETATION SPECIES OF THE STUDY AREA

TRANSECT: 3
SITE: LAGARTOS
PLOTS: 13 13

LOCAL NAME	FAMILY	SCIENTIFIC NAME	AVERAGE HEIGHT (m)	NUMBER OF INDIVIDUALS	INDIVIDUALS PER m^2
Barrenillo	Gammineae	*Cynodon dactylon*	2	1	0.0017
Cactus	Cactaceae	*Lamaireocereus cichlamii*	1.2	2	0.0033
Carambolillo	-	sp1	3	20	0.0333
Ceiba	Bombacaceae	*Ceiba pentandra*	7.5	4	0.0067
Cinco negritos	Verbenaceae	*Lantana camara*	1	2	0.0033
Cojon	Apocynaceae	*Stemmedenia glabra*	3	10	0.0167
Conacaste negro	Mimosaceae	*Enterolobium cyclocarpum*	12	4	0.0067
Chaperno	Fabaceae	*Lonchocarpus miniflorus*	3.5	12	0.0200
Chichipince	Rubieaceae	*Hamelia patents*	2.5	17	0.0283
Chupa chupa	Bignoniaceae	*Arrabidaea*	-	31	0.0517
DIVERSITY				1	0.0017
Espino blanco	Mimosaceae	*Acacia farnesiana*	5	2	0.0033
Frijolillo	Fabaceae	*Phaseolus carazalle*	1.5	38	0.0633
Guacimo o tapaculo	Sterculiaceae	*Guazuma ulmifolia*	4	15	0.0250
Guarumo	Moraceae	*Cecropia sp.*	8	7	0.0117
Huilihuiste	Rhamnaceae	*Karwinskia calderoni*	4	15	0.0250
Jiote	Burseraceae	*Bursera simaruba*	4	18	0.0300
Mora	Bignoniaceae	*Crescentia alata*	2.5	2	0.0033
Pintadillo	-	sp3	5	3	0.0050
Quebracho	Mimosaceae	*Albizzia sp*	4	14	0.0233
Ronron	Euphorbiaceae	*Astrotonium graveeleus*	18	1	0.0017
Tihuilote	Borraginaceae	*Cordia dentata*	5	2	0.0033
Varilla negra	-	sp5	1.8	1	0.0017
Verdenance	-	sp6	3.5	2	0.0033
Zarza	Smilacaceae	*Smilax mexicana*	4	44	0.0733
TOTAL ESPECIES					24
TOTAL INDIVIDUALS					267
DIVERSITY					1.17

Table 24-2-4 (4)

VEGETATION SPECIES OF THE STUDY AREA

TRANSECT: 4
SITE: MULTIPESCA
PLOTS: 14

LOCAL NAME	FAMILY	SCIENTIFIC NAME	AVERAGE HEIGHT (m)	NUMBER OF INDIVIDUALS	INDIVIDUALS PER m^2
Aceituno	Simarubaceae	*Simarouba glauca*	6	1	0.0013
Barrenillo	Gramineae	*Cynodon dactylon*	6	3	0.0040
Cactus	Cactaceae	*Lemaireocereus cichlamii*	1.5	1	0.0013
Campanilla lila	Convolvulaceae	*Ipomoea sp.*	1	2	0.0027
Carbon negro	-	sp2	7	1	0.0013
Ceiba	Bombacaceae	*Ceiba pentendra*	4.5	3	0.0040
Cinco negritos	Verbenaceae	*Lantana camara*	1.5	12	0.0160
Cojon	Apocynaceae	*Stemmadenia glabra*	3.8	33	0.0440
Conacaste negro	Mimosaceae	*Enterolobium cyclocarpum*	11	2	0.0027
Chapemo	Fabaceae	*Lonchocarpus miniflorus*	3.5	3	0.0040
Chiltepe (chile)	Solanacea	*Capsicum annuum*	1.8	2	0.0027
Chupa chupa	Bignoniaceae	*Arrabidaea millisima*	1.8	2	0.0027
DIVERSITY			1.3	1	0.0013
Escobilla	Malvacea	*Sida acuta*	1	4	0.0053
Espino blanco	Mimosaceae	*Acacia farnesiana*	3.5	1	0.0013
Flor fuego/guacamayo	Caesalpinaceae	*Delonix sp.*	7	23	0.0307
Frijolillo	Fabaceae	*Phaseolus carazella*	8	1	0.0013
Guacimo o tapaculo	Sterculiaceae	*Guazuma ulmifolia*	4.8	23	0.0307
Huilihuiste	Rhamnaceae	*Karwinskia calderoni*	3.5	10	0.0133
Iscanal	Momasaceae	*Acacia hendsii*	5	62	0.0827
Jalacate flor amarilla	Compositae	*Baltimora recta*	2.5	4	0.0053
Jicaro o Morro	Bignoniaceae	*Crescentia cujete*	4	12	0.0160
Jiote	Burseraceae	*Bursera simaruba*	3.8	5	0.0067
Madrecacao	Papilionaceae	*Gliricidia sepium*	7	4	0.0053
Mangollano	Mimosaceae	*Pithecollobium dulce*	5	2	0.0027
Pie de venado	Ceasalpinaceae	*Bahuinia aculeata*	5	1	0.0013
Pintadillo	-	sp3	5.5	16	0.0213
Quebracho	Mimosaceae	*Albizzia sp*	6	1	0.0013
Salamo	Rubiaceae	*Calycophyllum candidissimum*	4	3	0.0040
Sombrerito	-	sp4	3	1	0.0013
Tallo cuadrado	Compositae	*Melantera nivea*	2	70	0.0933
Tihuilote	Borraginaceae	*Cordia dentata*	5	1	0.0013
Varilla negra	-	sp5	1.5	6	0.0080
TOTAL ESPECIES					**32**
TOTAL INDIVIDUALS					**315**
DIVERSITY					**1.13**

Table 24-2-4 (5)

VEGETATION SPECIES OF THE STUDY AREA

TRANSECT: 5
SITE: Chiquirin
PLOTS: 2

LOCAL NAME	FAMILY	SCIENTIFIC NAME	AVERAGE HEIGHT (m)	NUMBER OF INDIVIDUALS	INDIVIDUALS PER m^2
Carambolillo	-	sp1	3	2	0.0100
Carbon negro	-	sp2	5	2	0.0100
Chaperno	Fabaceae	*Lonchocarpus miniflorus*	1.5	2	0.0031
Frijolillo	Fabaceae	*Phaseolus carazalia*	5	2	0.0031
Huilihuiste	Rhamnaceae	*Karwinskia calderoni*	3.5	18	0.0277
Iscanal	Momasaceae	*Acacia hondsii*	5	2	0.0031
Jicaro o Morro	Bignoniaceae	*Crescentia cujete*	5	1	0.0015
Jiote	Burseraceae	*Bursera simaruba*	4.5	2	0.0031
Pie de venado	Ceasalpinaceae	*Bahuinia aculeata*	2.8	6	0.0092
Pintadillo	-	sp3	5	14	0.0215
Zarza	Smilacaceae	*Smilax mexicana*	4	2	0.0031
TOTAL SPECIES					11
TOTAL INDIVIDUALS					53
DIVERSITY					0.006

Table 24-2-4 (6)

VEGETATION SPECIES OF THE STUDY AREA

TRANSECT: 6
SITE: PUEBLO VIEJO
PLOTS: 3

LOCAL NAME	FAMILY	SCIENTIFIC NAME	AVERAGE HEIGHT (m)	NUMBER OF INDIVIDUALS	INDIVIDUALS PER m^2
Carambolillo	-	sp1	3.5	2	0.0047
Cojon	Apocynaceae	*Stemmadenia glabra*	3.5	12	0.0282
Conacaste blanco	Mimosaceae	*Albizzia caribaea*	12	1	0.0024
Chapemo	Fabaceae	*Lonchocarpus miniflorus*	5	17	0.0400
Chupa chupa	Bignoniaceae	*Arrabideae millisima*	3.5	1	0.0024
DIVERSITY				1	0.0024
Guacimo o tapaculo	Sterculiaceae	*Guazuma ulmifolia*	5.5	4	0.0094
Huesito	Flacourtiaceae	*Casearia sylvestris*	3.5	4	0.0094
Huitihuiste	Rhamnaceae	*Karwinskia calderoni*	4.5	11	0.0259
Iscanal	Momasaceae	*Acacia hendsii*	6	1	0.0024
Jiote	Burseraceae	*Bursera simaruba*	5	1	0.0024
Morro	-	sp7	1.8	1	0.0024
Pie de venado	Ceasalpinaceae	*Behuinia aculeata*	4	3	0.0071
Pintadillo	-	sp3	5.5	17	0.0400
TOTAL SPECIES					**13**
TOTAL INDIVIDUALS					**75**
DIVERSITY					**0.92**

Table 24-2-5

VEGETATION SPECIES OF THE STUDY AREA

PLOTS: 63

LOCAL NAME	FAMILY	SCIENTIFIC NAME	NUMBER OF INDIVIDUALS	INDIVIDUALS PER m^2
Aceituno	Simarubaceae	Simarouba glauca	6	0.0017
Barrenillo	Gramineae	Cynodon dactylon	6	0.0017
Cactus	Cartaceae	Lamirecocereus cichlamii	3	0.0009
Campanilla lila	Convolvulaceae	Ipomoea sp.	2	0.0006
Carambotillo	-	sp1	24	0.0069
Carbon negro	-	sp2	23	0.0066
Ceiba	Bombacaceae	Ceiba pentendra	7	0.0020
Cinco negritos	Verbenaceae	Lantana camara	23	0.0066
Cojon	Apocynaceae	Stemmadenia glabra	81	0.0234
Conacaste blanco	Mimosaceae	Albizzia caribaea	3	0.0009
Conacaste negro	Mimosaceae	Enterolobium cyclocarpum	13	0.0038
Chaperno	Fabaceae	Lonchocarpus miniflorus	37	0.0107
Chichipince	Rubiaceae	Hamelia patents	17	0.0049
Chiltepe (chile)	Solanacea	Capsicum annuum	2	0.0006
Chupa chupa	Bignoniaceae	Arrabidaea millisima	37	0.0107
Escobilla	Malvacea	Sida acuta	10	0.0029
Espino blanco	Mimosaceae	Acacia farnesiana	8	0.0023
Flor fuego/guacamayo	Caesalpinaceae	Delonix sp	23	0.0066
Guayabo	Mirtaceae	Phisidium guayaba	3	0.0009
Frijolillo	Fabaceae	Phaseolus carazalla	41	0.0118
Granadilla	Capparidaceae	Crataeva tapia	1	0.0003
Guacimo o tapacuto	Sterculiaceae	Guazuma ulmifolia	60	0.0173
Guarumo	Moraceae	Cecropia sp	15	0.0043
Guineo	Musaceae	Musa sapientum	1	0.0003
Huesito	Flacourtiaceae	Casearia sylvestris	5	0.0014
Huilihuiste	Rhamnaceae	Karwinskia calderoni	59	0.0171
Iscanal	Momasaceae	Acacia hendsii	75	0.0217
Jalacate flor amarilla	Compositae	Baltimora recta	4	0.0012
Jazmin	Rutaceae	Murraya paniculata	3	0.0009
Jicaro o Morro	Bignoniaceae	Crescentia cujete	14	0.0040
Jiote	Burseraceae	Bursera simaruba	28	0.0081
Jocote	Anacardiaceae	Spondias purpurea	5	0.0014
Laurel	Borraginaceae	Cordia alliodora	23	0.0066
Madrecacao	Papilionaceae	Gliricidia sepium	6	0.0017
Mangle	Rhizophoraceae	Rhizophora mangle	15	0.0043
Mangle	Martyniaceae	Avicenia germinans	7	0.0020
Mangle	Combretaceae	Laguncularia racemosa	4	0.0012
Mango	Anacardiaceae	Mangifera indica	2	0.0006
Mangolfano	Mimosaceae	Pithecollobium dulce	4	0.0012
Maquiligua	Bignoniaceae	Tabebuia rosea	1	0.0003
Maranon	Anacardiaceae	Anacardium occidentale	2	0.0006
Moro	Bignoniaceae	Crescentia alata	2	0.0006
Naranja grey	Rutaceae	Citrus aurantium	1	0.0003
Palmera	Palmae	Erythea salvadorensis	2	0.0006
Pie de venado	Ceasalpinaceae	Bahuinia aculeata	24	0.0069
Pintadillo	-	sp3	58	0.0168
Quebracho	Mimosaceae	Albizzia sp	19	0.0055
Ronron	Euphorbiaceae	Astrotonium gravealeus	1	0.0003
Salamo	Rubiaceae	Calycophyllum candidissimum	3	0.0009
Sombrerito	-	sp4	3	0.0009
Talto cuadrado	Compositae	Melantera nivea	70	0.0202
Tihuilote	Borraginaceae	Cordia dentata	18	0.0052
Vanilla negra	-	sp5	11	0.0032
Verdenance	-	sp6	2	0.0006
Zarza	Smilacaceae	Smilax mexicana	47	0.0136
TOTAL SPECIES				**55**
TOTAL INDIVIDUALS				**964**
DIVERSITY				**1.48**

Table 24-2-6

GRASSES AND CULTURAL SPECIES OF THE STUDY AREA

FAMILY	SCIENTIFIC NAME	LOCAL NAME
APOCYNACEAE	*Allamanda cathartica*	San Jose
	Catharanthus roseus	Chula
GRAMINEAE	*Cynodon dactylon*	Barenillo
	Zea mays	Maíz
	Sorghum vulgare	Maicillo
	Cenchrus brownii	Mozote
	Eleusine indica	Cola de Caballo
	Ixophorus unisetus	Mesmeto
COMBRETACEAE	*Combretum fruticosum*	Chupachupa
LOASACEAE	*Gronovia scandens*	Pan caliente
COMPOSITAE	*Melanthera nivea*	Botoncillo blanco
	Melampodium divaricatum	Hierba del sapo
	Baltimora recta	Flor amarilla
	Tridax procumbens	Hierba del toro
BROMELIACEAE	*Bromelia Karatas*	Piñuela
COMMELINACEAE	*Commelina erecta*	Coyuntura
	Tinantia erecta	Chuspa
CYPERACEAE	*Cyperus rotundus*	Coyolito
	Cyperus difussus	Coyolito
	Cyperus mutissi	Coyolito
MALVACEAE	*Sida Acuta*	Escobilla
CACTACEAE	*Acanthocereus pentagonus*	Pitahaya

c) Main Species

56. The predominant flora species present in areas of shrubs, trees and bushes are listed in descending dominance order, as follows: cojon (*Stemmadenia glabra*; with 81, Iscanal (*Acacia hendsii*) with 75. Tallo cuadrado (*Mewlanthera nivea*) with 70, Guacimo (*Guazuma ulmifolia*) with 60, Huilihuiste (*Karwinskia calderonii*) with 59, Pintadillo with 58, Bramble (*Smilax mexicana*) with 47, and Frijolillo (*Phasea cazaralla*) with 41. The majority of these species are bushes (cojon, tallo cuadrado, bramble, frijolillo), or pioneer species, characteristic of intervention areas, such as the Guacimo and/or Iscanal that are typical to warm-dry areas (Figure 24-2-4).

57. Of the species present in areas of grass and cultivation, 59.1% belong to the families Gramineae, Compositae and Cyperaceae, and the majority are herbaceous species typical of warm and dry areas.

58. Although not very abundant, the presence of a small swamp area stands out near the south side of Punta Gorda (out of the project site of this Study), where three tree species are present. Although this area may potentially be the habitat for breeding fish, mollusks and/or crustaceans, the swamp area is very small which suggests that its contribution to the ecosystem of the bay is limited.

59. Table 24-2-7 shows the various uses of flora species found in the study area. Most species are principally used for firewood (25.45%), construction (21.8%), food (16.4%), ornaments, and medicines. Figure 24-2-5 shows the relative usage rates of flora species found in the study area. It means almost all the kinds of species there are already utilized for human daily life in some way.

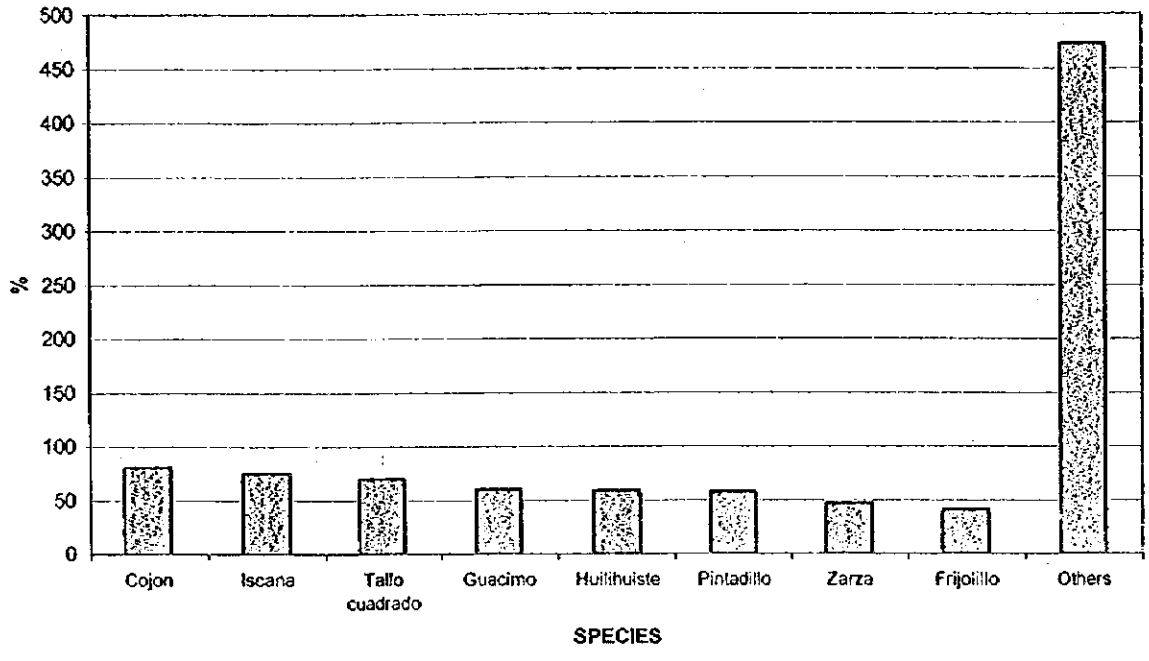


Figure 24-2-4 Relative Abundance of Principal Species

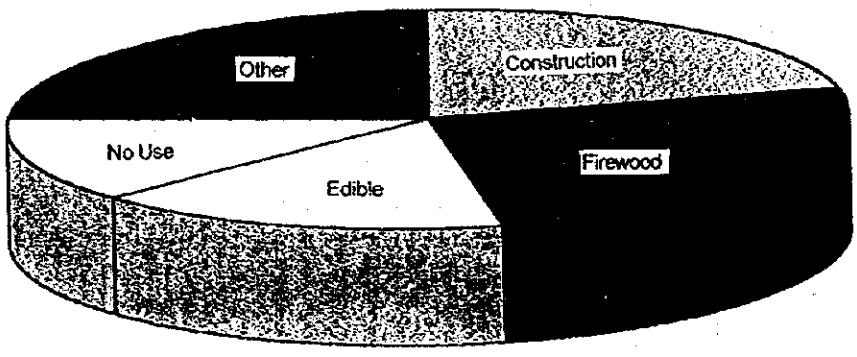


Figure 24-2-5 Relative Usage Rates of The Species

Table 24-2-7

VEGETATION SPECIES USE OF THE STUDY AREA

PLOTS: 63

LOCAL NAME	FAMILY	SCIENTIFIC NAME	USE
Aceituno	Simarubaceae	*Simarouba glauca*	BOARD, MORTUARY BOXES, OIL
Barrenillo	Gramineae	*Cynodon dactylon*	-
Cactus	Cartaceae	*Lamlreocereus cichlamii*	-
Campanilla lila	Convolvulaceae	*Ipomoea sp.*	-
Carambolillo	-	*sp1*	-
Carbon negro	-	sp2	FIREWOOD
Ceiba	Bombacaceae	*Ceiba pentandra*	CONSTRUCTION
Cinco negritos	Verbenaceae	*Lantana camara*	MEDICINAL
Cojon	Apocynaceae	*Stemmadenia glabra*	-
Conacaste blanco	Mimosaceae	*Albizzia caribaea*	CONSTRUCTION
Conacaste negro	Mimosaceae	*Enterolobium cyclocarpum*	CONSTRUCTION
Chaperno	Fabaceae	*Lonchocarpus miniflorus*	FIREWOOD
Chichipince	Rubiaceae	*Hamelia patents*	MEDICINAL
Chiltepe (chile)	Solanacea	*Capsicum annuum*	EDIBLE, ORNAMENTAL
Chupa chupa	Bignoniaceae	*Arrabidaea millisima*	FIREWOOD
Escobilla	Malvacea	*Sida acuta*	BROOMS
Espino blanco	Mimosaceae	*Acacia farnesiana*	FIREWOOD
Flor fuego/guacamayo	Caesalpinaceae	*Delonix sp*	ORNAMENTAL
Guayabo	Mirtaceae	*Phisidium guayaba*	EDIBLE
Frijolillo	Fabaceae	*Phaseolus carazalla*	-
Granadilla	Capparidaceae	*Crataeva tapia*	EDIBLE
Guacimo o tapaculo	Sterculiaceae	*Guazuma ulmifolia*	MEDICINAL
Guarumo	Moraceae	*Cecropia sp*	POST
Guineo	Musaceae	*Musa saplentum*	EDIBLE
Huesito	Flacourtiaceae	*Casearia sylvestris*	FIREWOOD
Huilihuiste	Rhamnaceae	*Karwinskia calderoni*	FIREWOOD
Iscanal	Momasaceae	*Acacia hendsli*	FIREWOOD
Jalacate flor amarilla	Compositae	*Baltimora recta*	CONSTRUCTION
Jazmin	Rutaceae	*Murraya paniculata*	ORNAMENTAL
Jicaro o Morro	Bignoniaceae	*Crescentia cujete*	FIREWOOD
Jiote	Burseraceae	*Bursera simaruba*	POST, MEDICINAL
Jocote	Anacardiaceae	*Spondias purpurea*	EDIBLE
Laurel	Borraginaceae	*Cordia alliodora*	CONSTRUCTION
Madrecacao	Papilionaceae	*Gliricidia sepium*	CONSTRUCTION
Mangle	Rhizophoraceae	*Rhizophora mangle*	CONSTRUCTION, FIREWOOD, COLORANT
Mangle	Martyniaceae	*Avicenia germinans*	CONSTRUCTION, FIREWOOD
Mangle	Combretaceae	*Laguncularia racemosa*	CONSTRUCTION, FIREWOOD
Mango	Anacardiaceae	*Mangifera indica*	EDIBLE
Mangollano	Mimosaceae	*Pithecolloblum dulce*	FIREWOOD
Maquiligua	Bignoniaceae	*Tabebula rosea*	CONSTRUCTION
Maranon	Anacardiaceae	*Anacardium occidentale*	EDIBLE
Moro	Bignoniaceae	*Crescentia alata*	CONSTRUCTION
Naranja grey	Rutaceae	*Citrus aurantium*	EDIBLE
Palmera	Palmae	*Erythea salvadorensis*	BROOMS, ROOF
Pie de venado	Ceasalpinaceae	*Bahuinia aculeata*	FIREWOOD, POST
Pintadillo	-	sp3	FIREWOOD, POST
Quebracho	Mimosaceae	*Albizzia sp*	FIREWOOD, POST
Ronron	Euphorbiaceae	*Astrotonium gravealeus*	CONSTRUCTION
Salamo	Rubiaceae	*Calycophyllum candidissimum*	FIREWOOD
Sombrerito	-	sp4	RATTAN CANE
Tallo cuadrado	Compositae	*Melantera nivea*	-
Tihuilote	Borraginaceae	*Cordia dentata*	FIREWOOD
Varilla negra	-	sp5	BROOMS
Verdenance	-	sp6	EDIBLE
Zarza	Smilacaceae	*Smilax mexicana*	FIREWOOD

d) Rare Species

60. According to inhabitants of the region, some rare species exist which include: lagarto (*Sciadendron excelsum*), cortez amarillo (*Tabebuia chrysantra*), papaya montes (*Carrica caliliflora*), and huesito (*Casearia sylvestris*). Of these, only one huesito specimen was encountered in the 63 quadrants studied. (One individual was found on the No.2 cross-section just on the south of Punta Gorda, and four were on the No.6 around Punta Chiquirin cross-section.) The remaining species were not found in the study area and are thought to be more prevalent at higher elevations out of the study area.

61. According to local residents, some other species have diminished considerably in number from the area including: madrecacao (*Gliricidia sepium*), conacaste blanco (*Albizzia caribeae cambaca*), and ceiba (*Ceiba pentandra*). The reduction in these species is attributed to their over-exploitation, since they are considered valuable for construction.

e) Analysis of Existing Conditions

62. The study area is characterized by flora species common to hot and dry climate, with diameters smaller than 10 cm to the chest height, typically found in intervention areas, showing evidence that vegetation has been negatively impacted by serious degree of human interference. The vegetation has suffered greatly as a majority of species have been used for construction or firewood.

63. Due to their demand, there are less than 80 mature trees (greater than 25 years old) in the area. The mature tree species include Conacaste (*Enterolobium cyclorarpum*), ceiba (*Ceiba pentandra*) and Jiote (*Bursera simaruba*), and are primarily used for shade by residents.

2) Terrestrial Fauna Survey Method and Analysis

a) Field Survey Method

64. Mammal observations were carried out at dawn, dusk and specified hours during the day. The Study Team also conducted continuous night observations at several locations between the hours of 7 p.m. to 5 a.m.

b) Results

b-1) Mammals of the Study Area

65. Table 24-2-8 shows the observed mammals and mammals reported by town inhabitants in the study area. There is a total of 19 species belonging to seven (7) orders. It is also possible that the area contains other species that are difficult to observe. The following describes the most important ecological characteristics of each species encountered:

- *Didelphis marsupialis* (Tacuazin)

66. Nocturnal; arboreal and terrestrial; solitary. Feeds chiefly on small animals: insects, worms or small vertebrates, including snakes, with about one quarter of the diet consisting of fruit, and in the dry season sometimes nectar. Found in humid forests and outlying gallery forests; thrives in secondary forests and around dwellings, where it feeds on garbage and other wastes.

- *Philander opossum* (Weasel, ferret)

67. Nocturnal; arboreal and terrestrial; solitary. Feeds chiefly on invertebrates and small vertebrates, supplemented by fruit. Found in mature and secondary rainforests, gardens, plantations, and gallery forests.

- *Marmosa mexicana* (Fox)

68. Nocturnal; arboreal and terrestrial; solitary. Feeds on insects and probably fruit found on or near the ground. Uses a leaf nest borrowed in the ground. Most common in moist evergreen forests, but also found in plantations and arid grasslands.

- *Dasypus novemcinctus* (Cusuco)

69. Chiefly nocturnal, sometimes diurnal; terrestrial; solitary. Feeds mostly on ants, termites, and other insects, but will eat many kinds of small animals. Found in a wide range of mature and secondary habitats from deep rain forests to grasslands and dry scrubs.

- *Saccopteryx bilineata* (Bat)

70. Feeds on tiny insects (2-4 mm). Found in mature lowlands and secondary rainforests, dry forests, gallery forests, plantations, gardens, and pastures.

- *Trachops cirrhosus* (Bat)

71. Feeds on frogs and lizards, with some insects and occasional small mammals. Found in rainforests, gallery forests, deciduous forests, plantations and areas of secondary vegetation.

- *Glossophaga sp.* (Bat).

72. Feeds on nectar, fruits, insects and pollen. Found throughout the rain forests and secondary forest, plantations, deciduous forests and savannas.

- *Carollia perspicillata* (Bat),

73. Feeds on fruit and insects, supplemented by nectar in the dry season. Found in mature and disturbed rainforests, gardens and plantations, deciduous forests and gallery forests.

- *Uroderma bilobatum* (Bat)

74. Feeds on fruit, nectar, and insects. Found in mature and disturbed rainforests, gardens and plantations, and deciduous forests.

- *Artibeus jamaicensis* (Bat)

75. Feeds mainly on fruit, especially figs, nectar, and insects. Found in mature and secondary rainforests and deciduous forests, gardens, and plantations.

- *Procyon lotor* (Mapache).

76. Nocturnal; terrestrial and arboreal; solitary except females with young or congregations at food sources. Feeds on fruits and small animals, especially aquatic ones such as crayfish, crabs, and fish; also raids garbage

bins and dumps. Also known to eat young ears of corn and cause damage to crops. Found on the beaches of both coasts of Central America and are also found inland in mangrove swamps and near rivers. Adapts well to humans and thrive in towns and cities.

- *Conepatus semistriatus* (Skunk, beaver)

77. Nocturnal; terrestrial; solitary. Feeds mainly on insects and other invertebrates, probably small vertebrates and occasional fruit. Found in pastures, clearings, roadsides, and other cultivated areas, in rainforests, and dry forests.

- *Mazama americana* (cachon, deer)

78. Diurnal and nocturnal; terrestrial; solitary. Feeds on fruits, fungi, leaves, and fallen lowers; leaves are mainly eaten when fruits are scarce in the dry season. Found in mature and secondary rainforests, gallery forests, forest edges, gardens and plantations, and savannas near the forest.

- *Odocoileus virginianus* (White-tailed Deer)

79. Diurnal and nocturnal; terrestrial; small groups or solitary. Feeds on leaves and grass, some fruit and fallen flowers. Found in open and secondary habitats bordering the rainforests and old secondary forest.

- *Sciurus variegatiodes* (Squirrel)

80. Diurnal; arboreal; solitary. Feeds mainly on soft, juicy fruits, other types of fruits, and flowers. Found in deciduous forest, open woodland, scrub, and plantations of fruit trees; uncommon in evergreen rainforests.

- *Rattus rattus* ('casero' mouse)

81. Nocturnal; mostly terrestrial. Feeds on grains, garbage, fruits, carrion, and almost anything remotely edible, such as soap,. candles, or leather. Found in buildings and farms.

- *Mus musculus* ('casero' mouse)

82. Nocturnal; terrestrial but climbs well. Feeds mainly on grains and cereals stored by humans, such as ruffles and corn, supplemented by other stored foods and insects. Found in agricultural areas, grain fields and hedgerows as well as buildings.

- *Dasyprocta punctata* (Tepescuintle)

83. Diurnal; terrestrial; solitary and rarely lives in pairs. Feeds chiefly on seeds, fruits, and cotyledons of seedlings, supplemented by fungi, flowers, leaves, and insects. Founds in mature and secondary lowlands and mountain rainforests and deciduous forests and in gardens and plantations.

Table 24-2-8

MAMMALS OF THE STUDY AREA (RESEARCH AND OBSERVATIONS)

ORDER	FAMILY OR SUBFAMILY	SPECIE SCIENTIFIC NAME	LOCAL NAME	DISTRIBUTION
MARSUPIALIA	Didelphidae	* Didelphis marsupialis	Tacuazin	Mexico to Bolivia
		Philander opossum	Comadreja Huron	S. Mexico to Panama
		Marmosa mexicana	Zorro	Central America
EDENTATA	Dasypodidae	* Dasypus novemcinctus	Cusuco	S. United States through Central America
CHIROPTERA	Phyllostominae	Trachops cirrhosus	Murciélago	S. Mexico South to Bogotá and SE Brazil
	Glossophaginae	Glossophaga sp.	Murciélago	Central and South America
	Carolliinae	Carollia perspicillata	Murciélago	S. Mexico to Bolivia
		Uroderma bilobatum	Murciélago	S. Mexico South to Bogotá N. Bolivia and SE Brazil
	Stenodermatinae	Artibeus jamaicensis	Murciélago	Central Mexico South to Paraguay and N. Argentina
	Emballonuridae	Saccopteryx bilineata	Murciélago	S. Mexico to SE Brazil
CARNIVORA	Procyonidae	Procyon lotor	Mapache	S. Canada South to Chiriqui Panampa
	Mustelidae	Conepatus semistriatus	Zorrillo Castor	Veracruz South through Central America
ARTIODACTYLA	Cervidae	Mazama americana	Venado Cachón	S. Mexico South to N. Argentina
		Odocoileus virginianus	Venado cola blanca	S. Canada to South America
RODENTIA	Sciuridae	Sciurus variegatoides	Ardilla	Central America
	Murinae	Mus musculus	Raton casero	Worldwide
		Rattus rattus	Rata	Worldwide
	Dasyproctidae	Dasyprocta punctata	Tepescuintle	Central and South America
LAGOMORPHA	Leporidae	* Sylvilagus floridanus	Chilinco - conejo	Central America, Colombia, Venezuela

* OBSERVED IN THE FIELD

b-2) Reptiles of the Study Area

84. Reptile Species observed by the Study Team are listed in Table 24-2-9 and their ecological importance is described in the following:

- *Iguana iguana* (Iguana)

85. Diurnal and arboreal, primarily herbivores, but will eat eggs, insects and small vertebrates; prefers fruits, found in canopies of tropical forests.

- *Ctenosaura similis* (Garrobo)

86. Solitary and terrestrial. Feeds on small vertebrates. Found in hot areas exposed to direct sun which are its preferred habitats.

- *Crotalus durissus* (Cascabel)

87. Terrestrial. Feeds on small vertebrates. Founds in dry areas, savannas and bushes.

Table 24-2-9

REPTILES OF THE STUDY AREA
(Observation and/or Research)

FAMILY	SCIENTIFIC NAME	LOCAL NAME	OCCURRENCE
IGUANIDAE	*Iguana igruna*	Iguana	Scarce
	Ctenosaura similis	Garrobo	Common
	Phyllodactylus tuberculosus	Geco casero	Common
VIPERIDAE	*Crotalus durissus*	Cascabel	Scarce
	Masticophis mentovarius	Zumbadora	Common

b-3) Birds of the Study Area

88. A total of thirty-one (31) bird species were in encountered in the study area as shown in Tables 24-2-10. Table 24-2-11 shows bird species of the area listed in the literature. Ecological importance of each bird species observed and/or reported is summarized in the following:

- *Actitis macularia* (Agachadiza)

89. Common, solitary. Feeds on small crustaceans and fish. Their habitat is the coastal areas and internal lakes.

- *Amazilia rutilia* (Canelo hummingbird)

90. Feeds of nectar. They develop their activities in intervened areas and forest and shrub ecosystems.

- *Aratinga holochora* (Green parakeet)

91. Found in groups. Feeds mainly on fruits and inhabits small and shrub areas in dry regions.

- *Ardea herodias* (Blue heron)

92. Found in groups and nests in small colonies. Feeds on fish, frogs and aquatic insects and inhabits estuaries, swamps, rivers and lakes.

- *Calidris mauri* (Playerito).

93. Found in groups. Inhabits coastal zones and humid areas and feeds on small crustaceans, mollusks and aquatic insects located near the beaches.

- *Calocitta formosa* (Magpie)

94. Solitary or in pairs. Feeds on seeds and fruits. Inhabits forest areas, bushes and tall shrubs.

- *Cathartes aura* (Red head zopilote)

95. Solitary or in groups. Feeds on decayed matter and occasionally fruits. Inhabits open areas, shrub and forest areas are mainly found in proximity to urban areas.

- *Charadrius alexandrinus* (Playerito)

96. Solitary or in groups. Feeds on small crustaceans and insects. Inhabits beaches and river basin areas.

- *Colinus leucopogon* (quail)

97. Solitary on in groups. Feeds on seeds and occasionally fruits and insects. Inhabits savannas and open areas.

- *Columba livia* (white dove)

98. Found in groups. Feeds on seeds and fruits. Inhabits open areas, gardens and parks and nests in abandoned houses.

- *Columbine inca* (Turtle dove)

99. Generally observed in groups and feeds mainly on seeds. Inhabits open areas, savannas and gardens.

- *Coragyps atratus* (Zopilote)

100. It is usually found in groups. Feeds on insects and occasionally fruits and seeds. Inhabits primarily open and brush areas, and also cultivated areas.

- *Crotophaga sulcirostris* (Pijullo)

101. Sociable, found in groups. Feeds on insects and occasionally fruits and seeds. Inhabits primarily open and brush areas and also cultivated areas.

- *Dendrocygna autumnalis* (Pichiche)

102. Found in groups. Feeds on crustaceaus, fish and amphibians. Inhabits humid coastal areas.

- *Egretta thula* (Heron)

103. Found in small groups and feeds on small crustaceans, insects, fish and amphibians that it locates in the bottom of water bodies. Inhabits humid coastal areas.

- *Fregata magnificens* (Fragata, Tijereta)

104. Found in colonies and feeds on fish and crustaceans. Inhabits coastal areas swamps and marshes.

- *Icterus sp.* (Chiltota)

105. Usually found in groups in isolated trees. Feeds on fruits and occasionally seeds and insects. Inhabits open areas in savanna and dry areas.

- *Pelecanus occidentalis* (Pelican)

106. Usually found in groups and feeds mainly on fish. Inhabits coastal areas, swamps and marshes.

- *Pitangus sulphuratus* (Guis)

107. Territorial and solitary. Feeds on insects and occasionally fruits. Inhabits open areas, gardens and brush.

- *Progne chalybea* (Swallow)

108. Found in large groups and feeds on insects. Inhabits open areas.

- *Quiscalus mexicanus* (Clarinero and Zanate)

109. Solitary or in small groups. Feeds on insects, seeds, fruits, and occasionally small crustaceans. Inhabits open areas with dispersed trees,

gardens and urban areas.

- *Stema maxim* (Gull)

110. Found in large groups and feeds mainly on fish. Inhabits beaches and coastal areas.

- *Asian zenaida* (white wings)

111. Observed in groups. Feeds on seed, fruits and grains. Found in open areas and in general cultivated areas.

Tables 24-2-10
BIRDS OF THE STUDY AREA (OBSERVATIONS)

FAMILY	SCIENCTIFIC NAME	LOCAL NAME	OBSERVATIONS / 60 HOURS	RANGE
SCOLOPACIDAE	Actitis macularia	Agachadiza	1	SCARCE
TROCHILIDAE	Amazilia rutila	Colibri canelo	2	SCARCE
PSITTACIDAE	Aratinga holocchlora	Perico verde	14	COMMON
ARDEIDAE	Ardea herodias	Garza azul	1	SCARCE
SCOLOPACIDAE	Calidris mauri	Playerito	11	COMMON
CORVIDAE	Calocitta formosa	Urraca	35	COMMON
CATHARTIDAE	Cathates aura	Zopilote cabeza roja	7	SCARCE
CHARADRIIDAE	Charadrius alexandrinus	Playerito	3	SCARCE
PHASIANIDAE	Colinus leucopogon	Codorniz	15	COMMON
COLUMBIDAE	Columba livia	Paloma	3	SCARCE
CATHARTIDAE	Coragyps atratus	Zopilote cabeza roja	12	COMMON
CUCULIDAE	Crotophaga sulcirostris	Pijullo	30	COMMON
COLUMBIDAE	Columbina inca	Tortolita	19	COMMON
ANATIDAE	Dendrocygna autumnalis	Piche	1	SCARCE
ARDEIDAE	Egretta thula	Garza	1	SCARCE
FALCONIDAE	Falco sparverius	Lisfique	3	SCARCE
FREGATIDAE	Fragata magnificens	Fragata Tijereta	6	SCARCE
ICTERIDAE	Icterus sp.	Chiltota o Chorcha	9	SCARCE
LARIDAE	Larus philadelpia	Gaviota	1	SCARCE
STRIGIDAE	Micrathene whitneyi	Lechuza	2	SCARCE
ARDEIDAE	Nyctanassa violacea	Paloma mareña	10	SCARCE
PICIDAE	Picufus sp.	Carpintero	6	SCARCE
PELECANIDAE	Pelecanus occidentalis	Pelicano	53	ABUNDANT
TYRANIDAE	Pitangus sulphuratus	Guis	42	ABUNDANT
HIRUNDINIDAE	Progne chalybea	Golondrina	65	ABUNDANT
ICTERIDAE	Quiscalus mexicanus	Clarinero	39	ABUNDANT
PARULIDAE	Seiurus novaboracensis	Alzacolita	3	SCARCE
LARIDAE	Sterna hilotica	Paloma de mar	43	ABUNDANT
LARIDAE	Sterna maxima	Gaviota	30	COMMON
TORTIDAE	Turdus gravi	Zenzontle	5	SCARCE
COLUMBIDAE	Zenaida asiatica	Alas blancas	70	ABUNDANT

Table 24-2-11

BIRDS OF THE STUDY AREA (RESEARCH)

SCIENTIFIC NAME	LOCAL NAME
Accipiter striatus	Gavilán pajarero
Actitis macularia	Agachadiza
Amazilia rutila	Colibrí canelo
Aratinga canicularis	Chocoyo
Aratinga holocchlora	Perido verde
Brotegeris jugularis	Catalnica
Bubo virginianus	Tecolote
Busarellus nigricollis	Gavilan pescador
Buteo brachyurus	Gavilan
Calidris mauri	Playerito
Calocitta formosa	Urnaca
Campylorinchus rufinucha	Guacalchia
Catharles aura	Zopilote cabeza roja
Charadrius alexandrinus	-
Charadrius semipalmatus	-
Charadrius vociferus	-
Colinus leucopogon	Codornis
Columba livia	Paloma
Columbina inca	-
Columbina paserina	-
Columbina taparoti	-
Coragyps atratus	Zopilote
Crotophaga sulcirostris	Pijalfo
Dendrocygma autumnalis	Piche
Dendroica pelechia	Carpintero
Dendroica virens	Chipe
Egretta rufescens	Garza
Egretta thula	Garza
Eumamota superciliosa	Talapo
Falco sparverius	Lilisque
Fragata magnificens	Fragata - Tijereta
Geothlypis trichas	-
Glaucidium brasilianum	Aurora
Haematopos palliatus	-
Icteria virens	-
Icterus sp	Chiltota - Churcha
Larus argentatus	Gaviota
Larus philadelphia	Gaviota
Melanerper carolinus	Chengo
Micrathene whitneyi	Lechuza
Mimus poliglottus	Tijerilla veranera
Momotus momota	Togoroz
Nyctanassa violacea	Paloma mareña (inmatusre)
Ortalis leugocastra	Chacha
Parabuteo unialctus	-
Passerina ciris	-
Passerina cyanea	-
Pelecanus occidentalis	Pelicano
Picoides scalaris	Carpintero
Pitangus sulphuranus	Guis
Progne chalybex	Golondrina
Puculus sp.	Carpintero
Quiscalus major	-
Quiscalus mexicanus	Clarinero (sanete)
Rhynchops niger	Rauyador negro
Rosthiramus sociabilis	Gavilan
Ruteo brachyurus	Gavilan
Seiurus noveboracensis	Alza colita
Speotyto cunicularia	Lechuza
Sterna maxima	Gaviota
Sterna nilotica	Paloma de mar
Trogon elegans	Coa elegante
Turdus gravi	Zenzotle
Turdus sp.	Chonta
Tyto alba	Jolote
Vireo bellii	Piñalero
Wilsonia pusilla	-
Zenaida asiática	Alas blancas

b-4) Insects of the Study Area

112. The more common insects observed in the survey area are the following:

- *Periplaneta americana* (Orthoptera)
- *Mantis reliogiosa* (Orthoptera)
- *Termes sp.* (Isoptera)
- *Libellula sp.* (Odonata)
- *Pediculus humanus capitis* (Anoplura)
- *Notonecta sp.* (Hemiptera)
- *Magicicade septen* (Homoptera)
- *Papilio machaon* (Lepidoptera)
- *Marpho peleides* (Lepidoptera)
- *Deilephilar sp.* (Lepidoptera)
- *Hellula undalis* (Lepidoptera)
- *Musca domestica* (Diptera)
- *Anopheles sp.* (Diptera)
- *Pulex irritans* (Diptera)
- *Tunga penetrans* (Diptera)
- *Hydrophilus picens* (Coleoptera)
- *Dynastes sp.* (Coleoptera)
- *Apis sp.* (Himenoptera)

3) Marine Fauna Survey Method, Analysis, and Results

a) Survey Method

113. The marine species recorded in this study were found by means of research, visits and surveys in the fish markets, interviews with local fishermen, and direct observations. References used for species identification include Orellana (1989), Von Prahl et al. (1990), and others.

b) Analysis and Results

114. Seventy-three (73) marine species belonging to 32 families were recorded in the study area and surrounding waters as listed in Tables 24-2-12 and 24-2-13. Twenty-one (21) of these were captured within the confines of the study area.

115. The dolphin (*Stenella longirostris*) and marine turtles (*Lepidochelys olivacea and Erectochelys imbricata*) occasionally visit the study area.

116. It is important to note that the *golfina* turtle is considered endangered.

117. Activities to protect the turtles include implementation of nets that avoid their capture and the care of their eggs. At present these activities are carried out by CENDEPESCA in La Union.

118. Most of the commercial fishing is conducted in sectors outside of the study area. Locally, fisherman mainly capture crustaceans and mollusks species, especially shrimps of the red " chacalin" (*Xiphopenaeus riveti*) and the shrimp zebra or carabali (*Trachypenaeus sp.*) species. Most of the Penaeus species captured locally are sold directly to industrial fishing processing plants.

119. Several species are generally sold locally. These include the green *lobster (Panulirus gracilis)*, captured mainly from Punta Chiquirins rocky sectors; the Punche (*Gecarcinus lateralis*) also, captured from rocky sectors; and the Jaiba *(Callinectes arcuatus)* which is not as common as the other species.

120. A favorite species of area inhabitants is known as the donkeys helmet, or "Casco de Burro" (*Anadara grandis*), which is captured during low tide but is becoming scarce due to its over exploitation. Unfortunately, there are no statistical data on the fishing industry in the region. However, fishermen affirmed that the fishing has substantially diminished over the last decade.

(2) Impact Evaluation

121. The survey area had already been disturbed mainly by agricultural activities of local inhabitants in some way to a significant degree. It could also be suggested by the vegetation diversity index of 1.48, which is not considered very high (see Table 24-2-5).

122. As well, the population density of the important terrestrial fauna species is supposed to be relatively low especially in the short-term project area due to human activities related to the existing facilities such as the Ports of Cutuco and Punta Gorda for Alternative C-3 and the private piers for Alternative B-3.

123. There remains the very small swamp near the south side of Punta Gorda, but it is located out of the project site of this Study. Although it may potentially be the habitat for breeding fish, mollusks and/or crustaceans, it is generally supposed to be too small to contribute to the ecosystem of the bay.

124. In this sense, the north area of La Union City is still covered with massive mangrove growth. Considering the total ecological capacity of the area, the authorities concerned should make it a top environmental priority to carefully conserve this mangrove area.

125. Additionally, the population density of the important marine fauna species is also relatively low in the short-term project area, and most of the commercial fishing is conducted outside of the port development area (however, the fishing has substantially diminished over the last decade). As to the important *golfina* turtle, appropriate measures would be able to be taken for its protection with related groups such as CENDEPESCA, if necessary.

Table 24-2-12

MARINE SPECIES IN AND AROUND THE STUDY AREA

FAMILY	SCIENTIFIC NAME	LOCAL NAME
	FISH	
CARCHARHINIDAE	* *Carcharinus sp.*	Tiburon
SPHYRNIDAE	*Sphyrna lewini*	Tiburon martillo
ARIIDAE	*Bagre panamensis*	Bagre
	Bagre pinimaculatus	Bagre tacazonte
	Arius troschelli	Guicho
	Arius Seemanni	Bagre
	Galeichthys jordani	Guicho
	* *Galeichthys peruvianus*	Bagre
	Galeichthys sp.	Guicho
	* *Sciades troschely*	Bagre galiciano
DASYATIDAE	*Dasyatis sabina*	Raya
	Pristis zephyreus	Raya
SCIANIDAE	*Stellifer ercymba*	Corvinilla
	Cynoscion procephalus	Pinchada
	* *Cynoscion squamipinnis*	Babosa
	* *Cynoscion reticulatus*	Pancha rayada
	* *Cynoscion sp1*	Curvina
	Cynoscion albus	Corvina blanca
	Nebris occidentalis	Guabina pinchada
	Larimus sp.	Pinchada
	* *Micropoginias altipinis*	Pancha
	Cynoscion sp2	Peladura
	* *Larimus effulgeus*	Guabina
ARIIDAE	* *Sciades troschely*	Bagre galiciano
TETRADONTIDAE	*Sphoeroides tricocephalus*	Sapa
POLYNEMIDAE	*Polydactylus approximaus*	Pez gato
SCOMBRIDAE	* *Scomberomorus sierra*	Macarela
	Scorpaena sp1	Pejetoro
CORYPHAENIDAE	*Coryphaena hippurus*	Dorado
LUTTANIDAE	*Lutjanus peru*	Pargo colorado
	Lutjanus novemfasciatus	Pargo dienton
	Lutjanus guttatus	Pargo lunarejo
SPHYRAENIDAE	* *Sphyraena ensis*	Picuda
MUGILIDAE	*Mugil Curema*	Lisa
CENTROPOMIDAE	*Centropomus medius*	Robalo
	Centropomus robalitos	Robalito
HAEMULIDAE	* *Haemulon sp.*	Ruco
	* *Anysortemus pacific*	Ruco
	* *Pomadasys panamenses*	Ruco
	* *Macrodon sp.*	Dientona
NN	*sp1*	Chopa
SERRANIDAE	*Ephinephelus sp.*	Mero
CARANGIDAE	*Carranx canicus*	Jurel
	Hemicaranx sp.	Palometa
	Selene peruvianus	Palometa
MULLIDAE	*Pseudopeneus grandisquamis*	
STROMATEIDAE	*Peprilus synideri*	Tilosa
	Peprilus medius	Tilosa
GERRIDAE	*Diapterus peruvianus*	Huesudas
	Scorpaena sp.	Pez toro
SYNGNATHIDAE	*Hippocampus ingens*	Pez caballo
GOBIESOCIDAE	*Gobiesox daedaleus*	Pez sapo
		Pez gavilan

* MARINE SPECIES IN THE STUDY AREA
** MARINE SPECIES OCCASIONALLY IN THE STUDY AREA
NN NO NAME IDENTIFIED

Table 24-2-13

MARINE SPECIES IN AND AROUND THE STUDY AREA

FAMILY	SCIENTIFIC NAME	LOCAL NAME
	MOLLUSKS	
ARCIDAE	Anadara grandis	Casco de burro
	Anadara tuberculosa	Curil concha negra
	Anadara similis	Curil concha negra
OSTICIDAE	Ostrea iridescens	Ostra
MYTILIDAE	Mytela estrigata	Churria Almeja
	CRUSTACEANS	
PENAEIDAE	* Xiphopenaeus riveti	Chacalin rojo
	Penaeus stylirostris	Camaron azul
	Trachypenaeus sp.	Camaron cebra o carabali
	* Penaeus vannamel	Camaron patas blancas
	Penaeus californiensis	
	* Penaeus occidentalis	Camaron café
PORTUNIDAE	Callineetes arcuatus	Jaiba
	Portunus sp.	Jaiba
GECARCINIDAE	* Gecarcinus lateralis	Puche
	Cardisoma sp.	Concho apred
	* Menippes sp.	Apretador
	* Caleppa sp.	Apretador negro
PALINURIDAE	* Panulirus gracilis	Langosta verde
		Langosta cuca
	MAMMALS	
DELPHINIIDAE	** Stenella longirostris	Bufeo
	REPTILES	
CHELONIIDAE	** Lepidochelys olivacea	Golfina
	** Eretmochelys imbricate	Carey

* MARINE SPECIES IN THE STUDY AREA
** MARINE SPECIES OCCASIONALLY IN THE STUDY AREA
NN NO NAME IDENTIFIED

24.2.5 Impact on Displacement of Inhabitants and Facilities

(1) Impact Around Alternative B-3

126. The construction of Alternative B-3 could affect three private shrimp piers operated by MULTIPESCA, VERALMAR, and INDUMAR. At least, the Short Term plan requires the demolition of the pier of MULTIPESCA which is located to the west side. However, the said pier is in very poor structural condition and presently abandoned, surrounded by sunken ships. Therefore, it seems not to be difficult to resolve the issues.

127. Regarding the remaining piers, the central pier (VERALMAR) and the east pier (INDUMAR) are in use and under construction, respectively. In order to obtain the rights for these properties, CEPA will need to negotiate acceptable agreements with these users and owners before the second bulk terminal on the east side is constructed.

128. As one of the best alternatives, these three piers should be relocated to the fishing Port of Punta Gorda, even if this involved some form of compensation. Such functional separation is desirable from the standpoint of proper port development on the La Union bay.

129. Land owners around the site are shown in Figure 24-2-6 based on the information of CNR(Centro Nacional de Registros). The divisions of CORSAIN (1/1), Sociedad Salvador Alaskan Lumber(3) and MULTIPESCA S.A. DE C.V.(4) on the sea side could be mainly affected at the Short Term plan. The neighboring divisions of SERVIMAR S.A.(1), where the VERALMAR operates, and FINATA (52/1 to 52/24) related with INDUMAR might be affected at the Master Plan stage.

130. The land of CORSAIN could be utilized considering the purpose of the institute without any problems. Sociedad Salvador Alaskan Lumber has many lots around the site, and its activities seem not always to be related to coastal activities. Further, FINATA is a public organization.

131. Other private lots, neither mentioned here nor related to coastal activities, could be involved for the project, if necessary, with some proper treatments according to the authorities concerned, since such a matter has never become a big issue in the country side in El Salvador.

(2) Impact Around Alternative C-3

132. Alternative C-3 is basically located between the areas of the Port of Cutuco and Punta Gorda. Therefore, a serious problem would not arise, compared to Alternative B-3. As shown in Figure 24-2-7, the former belongs to FENADESAL(27/12), and the latter to CORSAIN (1/1). The parcel of 3/1 is also owned by CORSAIN. The area (26) surrounded by the said FENADESAL is of the Ministry of Finance for a customs office.

133. At present, approximately 25 rural houses are settled along the existing road to the small bay of Punta Cutuco, in the property belonging to the said CORSAIN. The alternative requires a landfill of the bay, but doesn't force settlers to relocate to another place. However, it is desirable that such an area be incorporated for total port development. According to authorities concerned, it would not be so difficult because of the original right for the corresponding land in addition to the same reason referred to concerning B-3.

134. Furthermore, as mentioned in Chapter 5, this area lacks basic infrastructure such as electricity, telephone, school and toilet, so inhabitants are forced to go to the town area every time such services are needed. In addition, the economic activities are limited to self-sufficient cultivation and animal husbandry, which cause exploitation of the area in disorder, deteriorating natural resources and discharging the waste water into the sea. In this sense, such activities should be planned to be incorporated into around the town area of La Union in a proper way. If necessary, the new port could generate new jobs for people for this area.

135. In this regard, the similar measures are desirable to be taken for the parcels from 27/1 to 27/11 and 30 in the long run. The former parcels of from 27/1 to 27/11 are used only for private, and 30 is owned by Instituto Regulador de Abastecimiento (IRA).

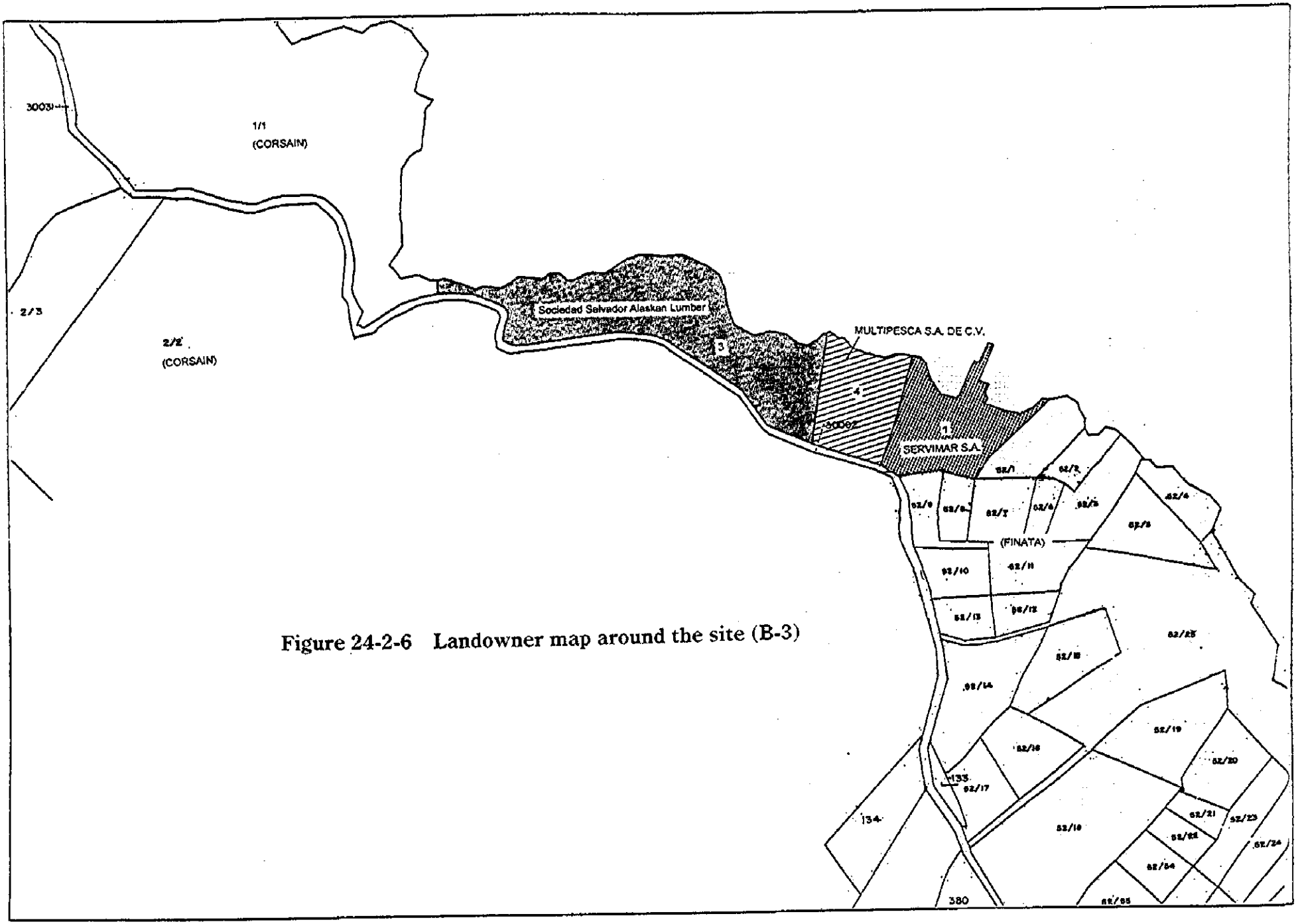


Figure 24-2-6 Landowner map around the site (B-3)

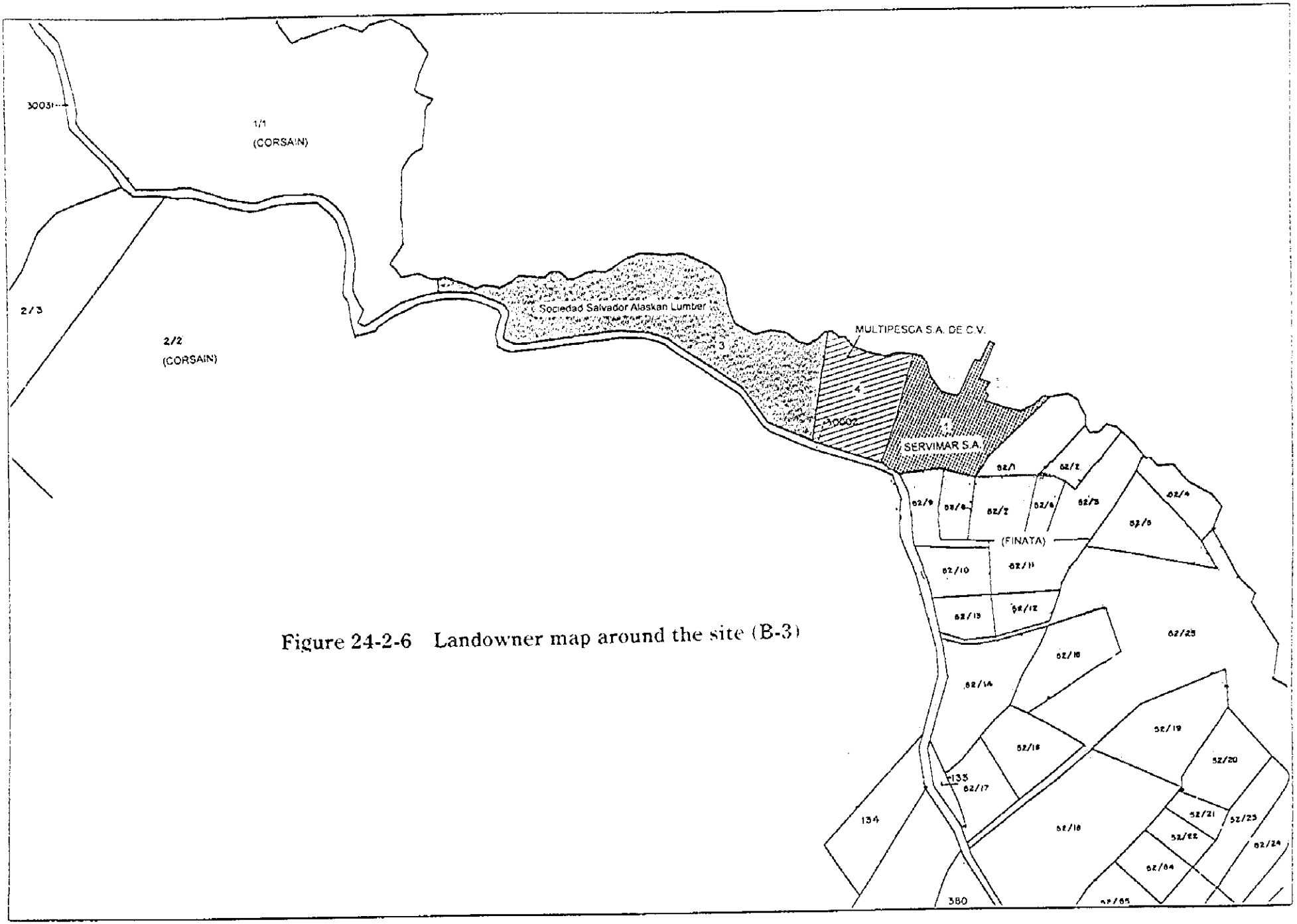


Figure 24-2-6 Landowner map around the site (B-3)

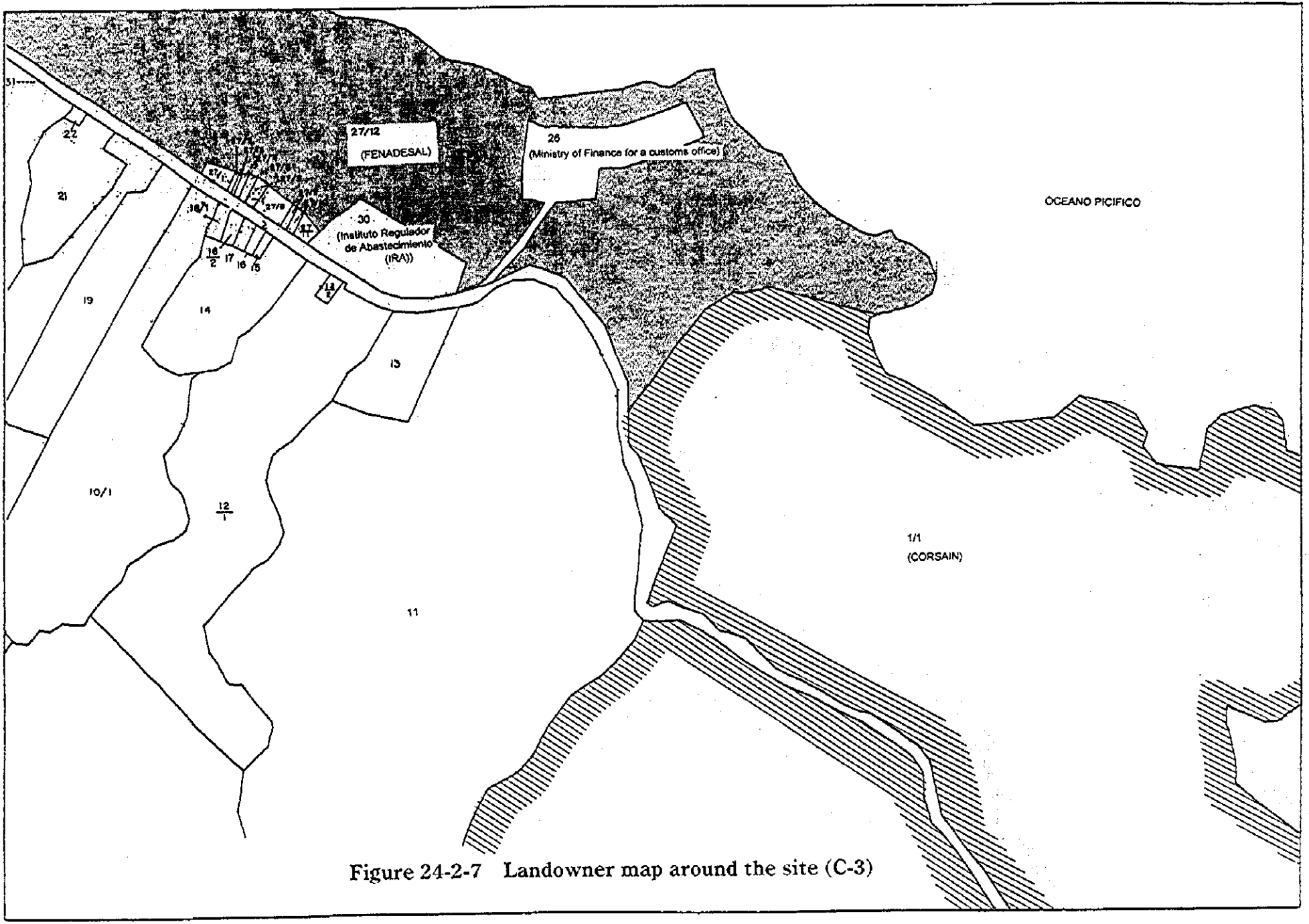


Figure 24-2-7 Landowner map around the site (C-3)

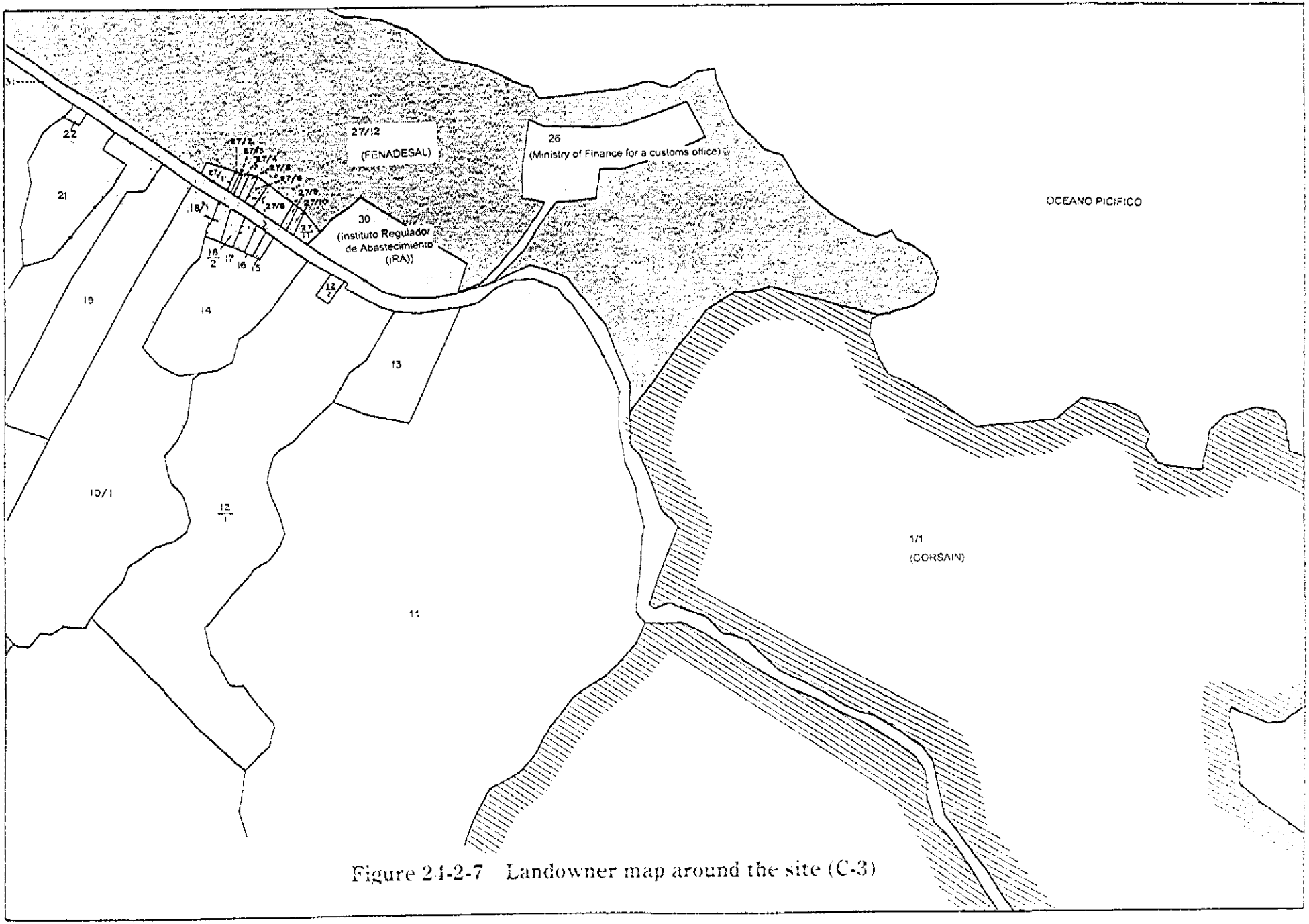


Figure 24-2-7 Landowner map around the site (C-3)

24.2.6 Impact on Water Area Use

136. During the port construction stage channel navigation might be affected for a limited period of time. However, small fishing boats which are able to move flexibly in a shallower area of the bay would not be greatly affected. Out of the bay, and outside the channel fishing is permitted. Good planning and stringent navigation control during construction could greatly minimize any inconvenience associated with channel navigation.

137. Dredging and port construction activities could also adversely affect international traffic of vessels from other countries entering to discharge products such as oil, fertilizer, grains and gas. At present, however, these kinds of activities are limited. In this sense, good planning to smoothly execute the project is required in order to cope with these large ships as soon as possible.

138. After the completion of the project, the number of large ship calls is only one or two per day which won't greatly affect use of the water area.

24.2.7 New Road to By-Pass the Town Area

139. As shown in Figure 18-3-6, the Study Team proposed the construction of a by-pass road around the south part of La Union City to the new port. This by-pass will greatly reduce the negative impacts of commercial port traffic on the city including noise, air pollution, and traffic jams as aforementioned.

140. The by-pass route is roughly described in the figure based on the brief site survey, which runs around the area where city activities are of low-density. However, it might affect the settlements of Barrio Las Flores and Hacienda La Paz in some way. In such a case, proper treatment such as land acquisition and resettlement of the affected inhabitants would be required.

141. Of course, the by-pass road will require topographic and geotechnical investigations, engineering design and environmental considerations. In addition, proper land use along the said road, including the establishment of EPZs, should be considered. It also appears that in the near future it may be necessary to improve access roads to the said by-pass.

(Note)

142. It appears that the by-pass road will affect approximately 850 houses in the settlement of Barrio Las Flores. The Municipality of La Union estimated that the fair market value of these houses may be about US$6.00/m^2.

143. Hacienda La Paz is registered as one private property. At the present time the property is occupied by many dwellers, who are the beneficiaries of the government program "ISTA". It is difficult to estimate at this time what will be the land acquisition cost of this affected property. However, it is said that it could be reasonably negotiated at an approximate price of about US$3.70/m^2.

24.2.8 Other Significant Environmental Impact Considerations

(1) Environmental Impact of Dredging in the Bay Area

144. Based on the IEE for the Master Plan, disposal of dredging spoil is one of the important factors to be examined from the environmental aspect. The method and the disposal place is already explained in the section of 20.1.7. In this section, supplementary explanation will be given.

(Note)

145. To begin with, it should be remembered that the initial dredging volume was drastically reduced from the environmental viewpoint.

146. At the Master Plan stage, the total volume is estimated at around 6-7 million m^3 for Alternative B-3 and C-3, which is generated by dredging up to -13m in general (See Appendix 3., PART II). If the initial dredging is left up to - 12 m, the volume would be 4-5 million m^3 .

147. As examined in 18.3.3(3), turning basin and access channel are planned to be dredged only up to -11m at the Short Term stage, taking into consideration the real calling draft of ships and the tidal benefit of around 3 m at La Union. By this means, the dredging volume decreased to approximately 2 million m^3 , less than half than that up to - 12 m and around one-third than that up to -13m, for the smooth implementation of the project.

(2) Disposal of Dredged Materials

a) The Municipal Crematory Site

148. According to preliminary negotiations conducted by the Study Team with the La Union Municipality it was agreed that dredged materials could be disposed and placed, if necessary, at the site that is presently used as the municipal crematory. Figure 24-2-8 shows the location of that site which has an approximate area of 13.3 hectares, based on a traditionally estimated area of 19 "Manzanas" where a Manzana is 7,000 m^2 (or 1 Manzana = 0.7 hectare).

149. However, there are two potential problems that will require proper

evaluation and engineering before disposal of dredged materials at that site and could unreasonably increase the disposal cost, as follows:

- The site is on a relatively steep slope. Therefore, there could be problems of stability of the dredged materials such as landslides. To resolve this problem a containment embankment will have to be properly designed and constructed from compacted, locally available fill soils.

- The stormwater runoff and leachate from the dredged materials, if allowed to flow uncontrolled, could significantly increase the salinity of downgradient soil surface and adversely affect vegetation. To resolve this problem, it may be necessary to properly drain the site in a lined channel to properly convey the stromwater runoff and leachate.

150. Therefore, this site is not preferred.

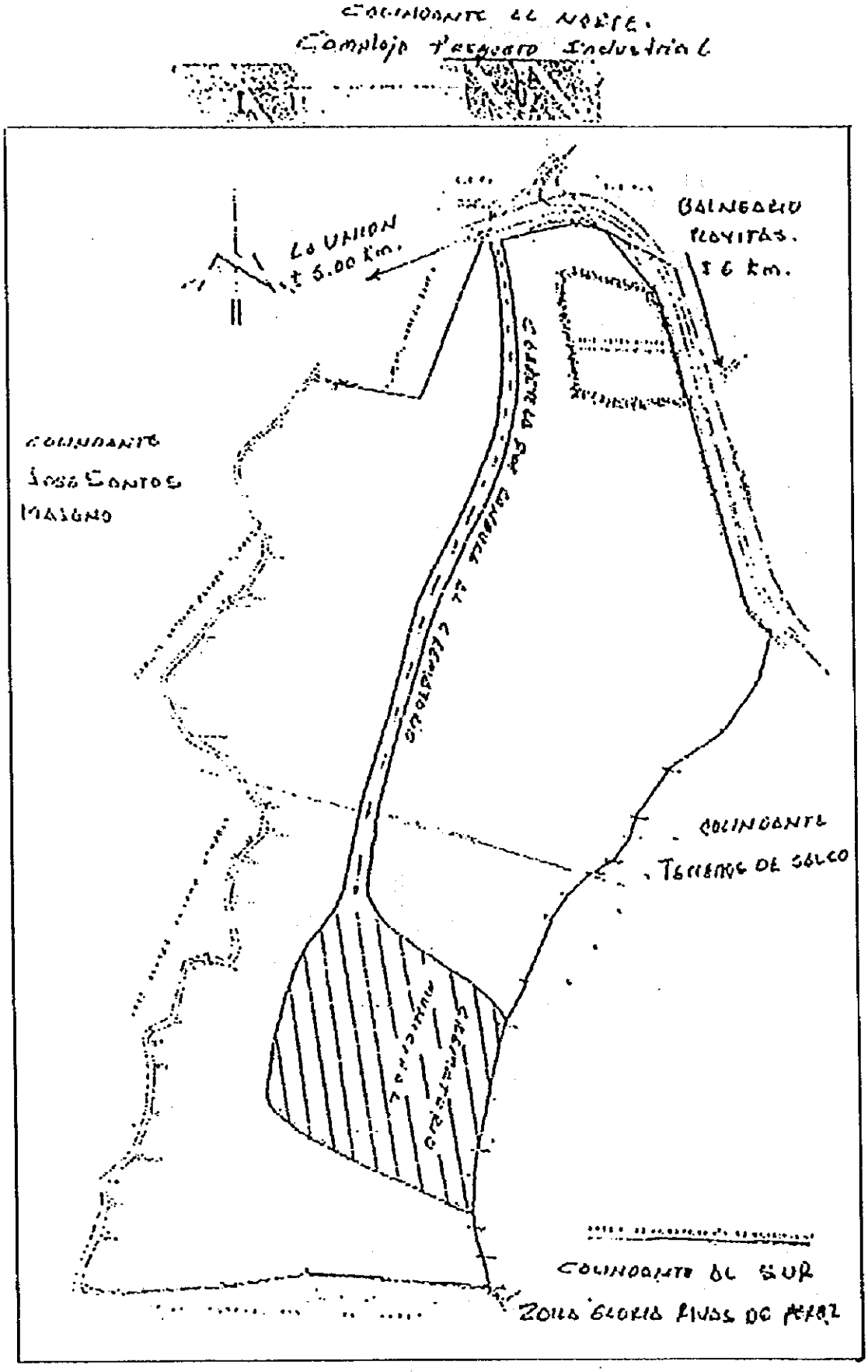


Figure 24-2-8 Municipal Crematory

b) Marine Area Disposal

151. Due to the potential environmental impacts of land disposal discussed in the previous section, the study team identified finally two possible sites for marine placement of dredged materials, as follows:

- Site A: located between Cutuco Port and Conejo Island
  as shown in Figure 20-1-3

- Site B: located between the Conchaguita Island and Meanguera Islandas
  as shown in Figure 20-1-4

152. Both sites A and B have an approximate area of 1,000,000 m^2 (a 1,000 x 1,000 m square shape), and are located at a distance of about 2,000 m from the navigation channel.

- Site A: This site is located inside the bay, where the seabed is already relatively shallow and covered with a very soft silty deposit. Although this site might be relatively close to the existing mangrove area, the dredged materials which are well controlled under the proposed method could not spread so easily due to the calmness and the low current velocity at the site. This site was selected as the most appropriate site for marine disposal of the dredged materials.

- Site B: This site is located in the open seas. However, the Fishing Development Center has determined that this site will not affect fishing activities since fishing activities at this area include lobster fishing performed in rocky seabed areas which are sufficiently far from the disposal site. Therefore, this site is selected as the alternative site for Site A.

153. It should be noted that sufficient data concerning natural conditions and environmental conditions at these sites are not found at the stage of this Study. It is desirable to investigate such data before the project execution. In addition, environmental monitoring should be implemented through the whole period of dredging work.

(Note)

154. Two additional sites, A-1 also located between Cutuco Port and Conejo Island, and A-2 located between the Martin Perez Island and Zacatillo Island, were also evaluated.

155. As a result, however, these sites were ruled out since they could potentially impose significant adverse impacts as follows:

- Site A-1: This location was ruled out because the seabed at this site is already relatively shallow and covered with a very soft silty deposit. This site is also relatively close to the existing mangrove area and could adversely affect the mangrove ecosystem. Additionally, the Fishing Development Center has determined that dredging disposal at this site could adversely affect fishing activities.

- Site A-2: Was ruled out due to strong currents and the possibility that dredged materials disposed at this site could be displaced into the nearby territorial water of the neighboring countries (Honduras or Nicaragua).

c) Dredging and Marine Disposal Method

156. The Study Team has proposed a dredging and marine disposal method that will significantly reduce any negative impacts, as in the section of 20.1.7. As illustrated in the related figures, by using a boat mounted sheet fence to protect the dredge bucket area from silt dispersion, and a floating sheet fence containment shield system at the disposal location, the dispersion of the dredged materials during both dredging and disposal is greatly reduced.

157. Dredging operations could impact some part of fishing activities made by about 7,000 local fishermen according to data provided by the Fishing Development Center. However, this impact is short-term and should last only through the duration of dredging operations. In addition, it is limited at the actual dredging locations with proposed countermeasures as explained.

158. By the way, it will be necessary to consider the presence of submarine electrical cables that provide energy to various settlements. These cables are laid on the seabed and should be carefully handled to

prevent any damages. One is connected from the Playitas area to houses on the south side of Conchaguita Island and further onto another group of houses on the north of the Meanguera Island. Another cable is connected from the Pueblo Viejo area to a group of houses on the north of the Zacatillo Island.

(3) Impact on Employment

159. The project will increase employment around La Union Province as described in the Chapter 22. This impact could be evaluated from three different aspects, as follows:

a) Short-Term Employment during Port Construction

160. Port construction work of the project will result in a significant number of jobs and indirect employment in related industries during the construction period.

b) Direct, Long-Term Employment Related to Terminal Operation

161. During the implementation of the short-term development plan, facilities and activities at the port of La Union will increase. The resulting employment will increase, respectively and continue for the long-term as the port continues to operate and develop.

c) New Indirect Employment Supported by Port Activity

162. The Port development project will support the expansion of La Union Province, with significant economic activity related to indirect employment of services and industry associated with increased long term port activities. The long-term effects of this port development will positively impact the entire economy of El Salvador.