BORING LOG 2

Depth	Hatch	Samp No	SPT	W %	LL %	IP %	GRADATION #4	#10	#20	#40	#200	Soil Description and Identification
		1	3	57.8	53.4	24.5		100	99.0	98.4	96.2	Very loose grey silt with fine sand (MH).
		2	69	21.3	N.	P	91.6	84.5	77.5	69.2	15.0	Very dense coarse grey sand with shells (SM)
		3	95	21.0	N.	P	99.9	98.3	93.7	79.8	9.7	Very dense medium to fine grey sand (SM-SP)
		4	84	10.8	N.	P	91.5	71.8	62.0	51.8	23.4	Very dense medium to coarse tan silty sand (SM).
5.0		5	83	26.7	N.	P	100	98.7	96.4	90.8	5.7	Very dense medium to fine grey sand (SM-SP).
		6	78	22.6	N.	P.	100	99.9	88.8	53.8	2.0	Very dense coarse to medium brown sand (SP).
		7	65	25.5	N.	P.		100	94.9	92.2	28.3	Very dense medium to fine grey silty sand (SM).
		8	55	49.9	96.4	42.0	96.8	93.0	91.5	90.5	85.3	Very dense tan silt with coarse sand (MH).
		9	98	20.2	N.	P.	64.1	55.5	46.9	41.4	11.1	Very dense coarse to medium grey sand with fine gravel (SM-SP).
10.0												
15.0												

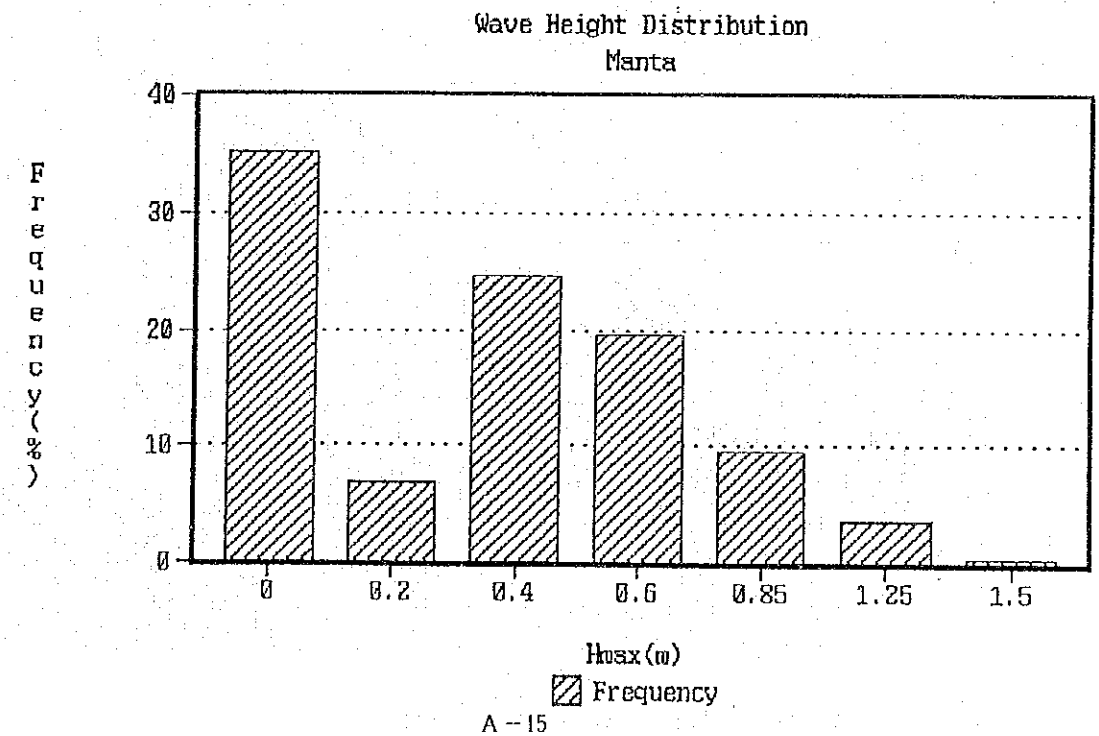
Casing: $\phi 4"$; 7m, driven.

Appendix 4.3(2)

Wave Observation Data at Manta

1990.12.17-1991.1.27

T1/2 (sec)	H1/2(m)						
	<0.3	0.3-<0.5	0.5-<0.7	0.7-<1.0	1.0-<1.5	1.5<=	Total
0-9	132						132
10		2					2
11		1					1
12	1	2					3
13	1	2					3
14		1					1
15		1					1
16	2	1					3
17	2						2
18	2	1					3
19	1	2					3
20	5	2					7
21	3	2					5
22	2	1					3
23			1				1
24	2	4	1				7
25	1						1
26	4	2	1				7
27	1	1					2
28							
29		4					4
30	2	2					4
31<	38	83	34	7	9		171
Total	199	114	37	7	9		366



Appendix 4.3 (2) Wave Measurements at Manta's Bay

H mean (m)	H max (m)	T mean (sec)	Date	Time
0.1372	0.4585	37	122790	1402
0.2771	0.4610	20	122790	1602
0.3635	0.6150	24	122790	1802
0.4339	0.5719	46	122790	2002
0.4097	0.6343	46	122790	2202
0.3806	0.6274	19	122890	2
0.3515	0.7627	13	122890	202
0.3443	0.7471	11	122890	402
0.3656	0.7096	13	122890	602
0.4227	0.6784	16	122890	802
0.3985	0.5909	29	122890	1002
0.4033	0.7433	24	122890	1202
0.3811	0.7469	12	122890	1402
0.3912	0.8280	10	122890	1602
0.4281	1.0651	10	122890	1802
0.4302	0.7037	18	122890	2002
0.4002	0.6177	34	122890	2202
0.3937	0.6607	29	122990	2
0.3315	0.7108	20	122990	202
0.3031	0.5297	12	122990	402
0.2393	0.4746	12	122990	602
0.2726	0.4321	24	122990	802
0.4925	0.6397	300	122990	1002
0.4982	0.6473	133	122990	1202
0.3032	0.4015	71	122990	1402
0.2157	0.4187	21	122990	1602
0.1702	0.2819	17	122990	1802
0.2246	0.3093	63	122990	2002
0.4907	0.5190	400	122990	2202
0.5190	0.5888	400	123090	2
0.3040	0.4057	92	123090	202
0.2112	0.3346	21	123090	402
0.1726	0.4126	13	123090	602
0.1937	0.3474	26	123090	802
0.4340	0.4925	400	123090	1002
0.0000	0.0000	0	123090	1202
0.5020	0.6266	171	123090	1402
0.2738	0.3454	48	123090	1602
0.5020	0.6266	171	123090	1402
0.0278	0.3454	48	123090	1602

Appendix 4.3 (2) Wave Measurements at Manta's Bay

H mean (m)	H max (m)	T mean (sec)	Date	Time
0.1924	0.3719	20	123090	1802
0.1804	0.3110	30	123090	2002
0.3774	0.4321	400	123090	2202
0.6134	0.6172	600	123190	2
0.5568	0.6568	200	123190	202
0.2548	0.3471	55	123190	402
0.1761	0.3443	16	123190	602
0.1636	0.2682	16	123190	802
0.3698	0.4603	109	123190	1002
0.4344	0.4344		123190	1202
0.0000	0.0000	0	123190	1402
0.4527	0.4527		123190	1602
0.1844	0.2911	26	123190	1802
0.1511	0.3187	20	123190	2002
0.2292	0.3309	80	123190	2202
0.0000	0.0000	0	10191	2
0.0000	0.0000	0	10191	202
0.4379	0.4379		10191	402
0.1854	0.2867	41	10191	602
0.1275	0.2237	17	10191	802
0.1678	0.2474	92	10191	1002
0.0000	0.0000	0	10191	1202
0.0000	0.0000	0	10191	1402
0.0000	0.0000	0	10191	1602
0.3340	0.4077	120	10191	1802
0.1377	0.2409	20	10191	2002
0.1655	0.2280	75	10191	2202
0.0000	0.0000	0	10291	2
0.0000	0.0000	0	10291	202
0.0000	0.0000	0	10291	402
0.3642	0.4039	200	10291	602
0.1437	0.2323	18	10291	802
0.1186	0.1885	27	10291	1002
0.0000	0.0000	0	10291	1202
0.0000	0.0000	0	10291	1402
0.0000	0.0000	0	10291	1602
0.0000	0.0000	0	10291	1802
0.1585	0.2507	60	10291	2002
0.1282	0.1935	44	10291	2202
0.0000	0.0000	0	10391	2

Appendix 4.3 (2) Wave Measurements at Manta's Bay

H mean (m)	H max (m)	T mean (sec)	Date	Time
0.0000	0.0000	0	10391	202
0.0000	0.0000	0	10391	402
0.0000	0.0000	0	10391	602
0.1312	0.1876	80	10391	802
0.0852	0.1476	19	10391	1002
0.2679	0.3226	600	10391	1202
0.0000	0.0000	0	10391	1402
0.0000	0.0000	0	10391	1602
0.0000	0.0000	0	10391	1802
0.3302	0.3302		10391	2002
0.0991	0.1585	36	10391	2202
0.0000	0.0000	0	10491	2
0.0000	0.0000	0	10491	202
0.0000	0.0000	0	10491	402
0.0000	0.0000	0	10491	602
0.3543	0.3543		10491	802
0.1251	0.1883	22	10491	1002
0.1584	0.2320	60	10491	1202
0.3961	0.3961		10491	1402
0.0000	0.0000	0	10491	1602
0.0000	0.0000	0	10491	1802
0.0000	0.0000	0	10491	2002
0.1741	0.2470	41	10491	2202
0.1737	0.2908	44	10591	2
0.3491	0.3774	600	10591	202
0.0000	0.0000	0	10591	402
0.0000	0.0000	0	10591	602
0.4950	0.4950		10591	802
0.3603	0.3810	600	10591	1243
0.0000	0.0000	0	10591	1443
0.0000	0.0000	0	10591	1643
0.0000	0.0000	0	10591	1843
0.4285	0.4643	300	10591	2043
0.1971	0.3136	36	10591	2243
0.1692	0.3038	18	10691	43
0.2279	0.3222	86	10691	243
0.4505	0.4505		10691	443
0.0000	0.0000	0	10691	643
0.4379	0.5115	240	10691	843
0.1819	0.2945	40	10691	1043

Appendix 4.3 (2) Wave Measurements at Manta's Bay

H mean (m)	H max (m)	T mean (sec)	Date	Time
0.1813	0.2682	32	10691	1242
0.2324	0.3418	32	10691	1443
0.4699	0.4982	400	10691	1643
0.6625	0.7417	200	10691	1843
0.5512	0.6116	300	10691	2043
0.2685	0.3408	86	10691	2243
0.1887	0.2997	20	10791	43
0.2516	0.3755	26	10791	243
0.3113	0.3689	86	10791	443
0.3707	0.4579	71	10791	643
0.4050	0.6439	55	10791	843
0.4284	0.7586	26	10791	1043
0.2708	0.4438	26	10791	1242
0.2716	0.5231	25	10791	1443
0.3377	0.4726	39	10791	1643
0.4073	0.5298	39	10791	1843
0.4061	0.5525	57	10791	2043
0.3853	0.6214	34	10791	2243
0.2705	0.4962	30	10891	43
0.3305	0.5555	21	10891	243
0.3308	0.4141	31	10891	443
0.5227	0.6095	133	10891	643
0.3565	0.4239	100	10891	843
0.3374	0.4884	75	10891	1043
0.3054	0.4456	27	10891	1242
0.2889	0.4410	21	10891	1443
0.2915	0.3850	52	10891	1643
0.3894	0.6136	48	10891	1843
0.6134	0.6889	171	10891	2043
0.4025	0.5240	75	10891	2243
0.3329	0.6307	29	10991	43
0.2777	0.5275	22	10991	243
0.2968	0.4993	32	10991	443
0.3467	0.4398	92	10991	643
0.5775	0.7228	120	10991	843
0.3628	0.4326	92	10991	1043
0.3508	0.5428	52	10991	1243
0.2654	0.3367	60	10991	1443
0.2877	0.4402	55	10991	1643
0.3494	0.5100	80	10991	1843

Appendix 4.3 (2) Wave Measurements at Manta's Bay

H mean (m)	H max (m)	T mean (sec)	Date	Time
0.6039	0.6228	400	10991	2043
0.6533	0.6628	600	10991	2243
0.5246	0.5605	150	11091	43
0.2981	0.3963	71	11091	243
0.2660	0.3620	48	11091	443
0.4585	0.5340	171	11091	643
0.5924	0.6188	600	11091	843
0.0000	0.0000	0	11091	1042
0.0000	0.0000	0	11091	1242
0.2903	0.3822	100	11091	1443
0.2968	0.4219	75	11091	1643
0.4473	0.5341	300	11091	1843
0.5469	0.5469		11091	2043
0.6627	0.6627		11091	2243
0.6472	0.6943	600	11191	43
0.4982	0.6020	150	11191	243
0.3441	0.4139	100	11191	443
0.2814	0.3453	57	11191	643
0.5360	0.5360		11191	843
0.6246	0.6548	600	11191	1043
0.0000	0.0000	0	11191	1243
0.0000	0.0000	0	11191	1443
0.4793	0.5604	200	11191	1643
0.5114	0.6132	200	11191	1843
0.5718	0.6793	200	11191	2043
0.0000	0.0000	0	11291	2243
0.0000	0.0000	0	11291	43
0.6870	0.7342	600	11291	243
0.2956	0.3667	75	11291	443
0.4755	0.6377	120	11291	643
0.3312	0.3926	71	11291	843
0.0000	0.0000	0	11291	1043
0.0000	0.0000	0	11291	1243
0.0000	0.0000	0	11291	1443
0.5038	0.5454	400	11291	1643
0.4847	0.5092	600	11291	1843
0.5359	0.5849	240	11291	2043
0.0000	0.0000	0	11291	2243
0.0000	0.0000	0	11391	43
0.0000	0.0000	0	11391	243

Appendix 4.3 (2) Wave Measurements at Manta's Bay

H mean (m)	H max (m)	T mean (sec)	Date	Time
0.4753	0.5659	600	11391	443
0.4359	0.5264	133	11391	643
0.4472	0.4774	200	11391	843
0.5560	0.5560		11391	1043
0.0000	0.0000	0	11391	1243
0.0000	0.0000	0	11391	1443
0.0000	0.0000	0	11391	1643
0.3869	0.3869		11391	1843
0.4076	0.4491	600	11391	2043
0.5905	0.6509	600	11391	2243
0.0000	0.0000	0	11491	43
0.0000	0.0000	0	11491	243
0.0000	0.0000	0	11491	443
0.4038	0.4302	300	11491	643
0.4491	0.4567	600	11491	843
0.0000	0.0000	0	11491	1043
0.0000	0.0000	0	11491	1243
0.0000	0.0000	0	11491	1443
0.0000	0.0000	0	11491	1643
0.0000	0.0000	0	11491	1843
0.2585	0.4377	600	11491	2043
0.4449	0.4449		11591	2243
0.0000	0.0000	0	11591	43
0.0000	0.0000	0	11591	243
0.0000	0.0000	0	11591	443
0.4718	0.4926	400	11591	643
0.4113	0.4717	133	11591	843
0.0000	0.0000	0	11591	1043
0.0000	0.0000	0	11591	1243
0.0000	0.0000	0	11591	1443
0.0000	0.0000	0	11591	1643
0.5961	0.6150	600	11591	1843
9.4811	0.5321	600	11591	2043
0.4793	0.6076	171	11591	2243
0.7151	0.7151		11591	43
0.0000	0.0000	0	11691	243
0.0000	0.0000	0	11691	443
0.6397	0.7831	150	11691	643
0.3105	0.4472	46	11691	843
0.2844	0.3666	75	11691	1043

Appendix 4.3 (2) Wave Measurements at Manta's Bay

H mean (m)	H max (m)	T mean (sec)	Date	Time
0.6605	0.7058	400	11691	1243
0.0000	0.0000	0	11691	1443
0.0000	0.0000	0	11691	1643
0.0000	0.0000	0	11691	1843
0.3325	0.4061	71	11691	2043
0.3150	0.4069	80	11691	2243
0.6359	0.7529	300	11791	43
0.0000	0.0000	0	11791	243
0.0000	0.0000	0	11791	443
0.7587	0.9719	171	11791	643
0.3408	0.5230	34	11791	843
0.3097	0.3896	55	11791	1043
0.4429	0.5950	71	11791	1243
0.0000	0.0000	0	11791	1443
0.0000	0.0000	0	11791	1643
0.0000	0.0000	0	11791	1843
0.4134	0.6918	37	11791	2043
0.3506	0.5926	41	11791	2243
0.6812	0.8265	109	11891	43
1.1152	1.1152		11891	243
0.0000	0.0000	0	11891	443
1.2815	1.3834	400	11891	643
0.4157	0.7938	26	11891	843
0.4406	0.6747	24	11891	1043
0.4688	0.7358	50	11891	1243
1.1676	1.3061	400	11891	1443
0.0000	0.0000	0	11891	1643
0.0000	0.0000	0	11891	1843
0.5470	1.0839	26	11891	2043
0.4641	0.7963	30	11891	2243
0.4886	0.8724	36	11991	43
1.2323	1.5097	133	11991	243
0.0000	0.0000	0	11991	443
0.0000	0.0000	0	11991	643
0.4776	1.0113	29	11991	843
0.4761	1.0154	21	11991	1043
0.5498	1.1059	23	11991	1243
1.0472	1.1547	240	11991	1443
0.0000	0.0000	0	11991	1643
0.0000	0.0000	0	11991	1843

Appendix 4.3 (2) Wave Measurements at Manta's Bay

H mean (m)	H max (m)	T mean (sec)	Date	Time
0.5186	0.9109	24	11991	2043
0.4483	0.8175	24	11991	2243
0.5265	0.7483	34	12091	43
0.9209	0.9945	400	12091	243
0.0000	0.0000	0	12091	443
0.0000	0.0000	0	12091	643
0.4813	0.7690	32	12091	1313
0.8812	1.3624	109	12091	1513
0.0000	0.0000	0	12091	1713
0.0000	0.0000	0	12091	1913
1.4419	1.6496	400	12091	2113
0.4853	0.7656	41	12091	2313
0.4053	0.7828	22	12191	113
1.1396	1.1396		12191	313
0.0000	0.0000	0	12191	513
0.0000	0.0000	0	12191	713
0.0000	0.0000	0	12191	913
0.4401	0.6350	80	12191	1113
0.3709	0.6686	19	12191	1313
0.0000	0.0000	0	12191	1513
0.0000	0.0000	0	12191	1713
0.0000	0.0000	0	12191	1913
0.0000	0.0000	0	12191	2113
0.3630	0.5899	75	12191	2313
0.2802	0.4271	40	12291	113
0.7584	0.7584		12291	313
0.0000	0.0000	0	12291	513
0.0000	0.0000	0	12291	713
0.0000	0.0000	0	12291	913
0.8124	0.8124		12291	1113
0.2512	0.3361	48	12291	1313
0.0000	0.0000	0	12291	1513
0.0000	0.0000	0	12291	1713
0.0000	0.0000	0	12291	1913
0.0000	0.0000	0	12291	2113
0.0000	0.0000	0	12291	2313
0.2396	0.3465	57	12391	113
0.3810	0.3810		12391	313
0.0000	0.0000	0	12391	513
0.0000	0.0000	0	12391	713

Appendix 4.3 (2) Wave Measurements at Manta's Bay

H mean (m)	H max (m)	T mean (sec)	Date	Time
0.0000	0.0000	0	12391	913
0.0000	0.0000	0	12391	1113
0.2525	0.3289	48	12391	1313
0.5170	0.5793	300	12391	1513
0.0000	0.0000	0	12391	1713
0.0000	0.0000	0	12391	1913
0.0000	0.0000	0	12391	2113
0.0000	0.0000	0	12391	2313
0.6019	0.7472	171	12491	113
0.2658	0.4482	24	12491	313
0.0000	0.0000	0	12491	513
0.0000	0.0000	0	12491	713
0.0000	0.0000	0	12491	913
0.0000	0.0000	0	12491	1113
1.3434	1.3434		12491	1313
0.4399	0.8224	14	12491	1513
0.5572	0.7323	100	12491	1713
0.0000	0.0000	0	12491	1913
0.0000	0.0000	0	12491	2113
0.0000	0.0000	0	12491	2313
0.0000	0.0000	0	12591	113
0.3548	0.6219	15	12591	313
0.3649	0.6268	33	12591	513
1.1150	1.1150		12591	713
0.0000	0.0000	0	12591	913
0.0000	0.0000	0	12591	1113
0.0000	0.0000	0	12591	1313
0.4625	0.6496	30	12591	1513
0.4354	0.6722	20	12591	1713
0.0000	0.0000	0	12591	1913
0.0000	0.0000	0	12591	2113
0.0000	0.0000	0	12591	2313
0.0000	0.0000	0	12691	113
4.4256	0.6562	43	12691	313
0.4113	0.5331	31	12691	513
0.8265	0.9001	200	12691	713
0.0000	0.0000	0	12691	913
0.0000	0.0000	0	12691	1113
0.0000	0.0000	0	12691	1313
0.0000	0.0000	0	12691	1513

Appendix 4.3 (2) Wave Measurements at Manta's Bay

H mean (m)	H max (m)	T mean (sec)	Date	Time
0.3341	0.4814	36	12691	1713
0.0000	0.0000	0	12691	1913
0.0000	0.0000	0	12691	2113
0.0000	0.0000	0	12691	2313
0.0000	0.0000	0	12691	113
0.0000	0.0000	0	12791	313
0.3807	0.4960	33	12791	513
0.3788	0.5088	75	12791	713

The wave/gage records 2.400 values, according to the waves measurenment period, at intervals of 0.5 seconds each. After data are registered an algorithm is used to determine waves height according to the distance peakvalley in a wave series. H mean and Hmax is later calculated. T mean is calculated as the measuring time duration, 20 minuted (1,200 seconds) divided by the number of waves registered as higher or same as the minimum allowed, 5cm.

Appendix 4.4.1(1)

Depths and Draft of Fishing Boats

Depth (m)	Draft (m)
3.49	3.06
2.64	2.26
1.90	1.55
2.97	2.57
1.95	1.60
1.95	1.60
2.59	2.24
2.50	2.11
2.80	2.45
2.91	2.52
2.80	2.40
3.74	3.26
3.37	2.96
1.58	1.26
1.52	1.20
1.52	1.20
2.30	1.93
1.80	1.46
1.10	0.80
2.20	1.80
47.63	40.23

Draft/Depth = 40.23/47.63 = 0.84

Appendix 4.4.1(2)

Arrival Time of Fishing Boats

Usually, the small boats land their fish catches at Tarqui beach. The numbers of the small boats coming to Tarqui beach was counted from morning to evening on June 29 and July 20, 1991.
The observation periods are;

June 29 (Sat) 1991	5:00-19:00	(every one hour)
July 20 (Sat) 1991	8:00-10:30	(every 30 minutes)

The results are as follows;

Arrival Time

Time	June 29	Jury 20	June 29(cf.La Poza)
5:00- 6:00	10	-	5
6:00- 7:00	19	-	14
7:00- 8:00	16	-	17
8:30- 8:30	17	9	19
8:30- 9:00		14	
9:00- 9:30	20	21	14
9:30-10:00		9	
10:00-10:30	15	6	20
10:30-11:00		-	
11:00-12:00	16	-	16
12:00-13:00	6	-	6
13:00-14:00	5	-	5
14:00-15:00	6	-	5
15:00-16:00	2	-	4
16:00-17:00	0	-	0
17:00-18:00	1	-	1
18:00-19:00	1	-	5
Total	134	59	131

Appendix 4.4.1(3)

Anchoring Condition of Fishing Port

(1) Anchorage area of small fishing boats was investigated on July 11(Thu), 12 (Fri) and 31(Wed), 1991.

The observation periods are;

July	11 (Thu)	13:00-14:00
July	12 (Fri)	12:00-13:00
Jury	12 (Fri)	17:00-18:00
July	31 (Wed)	15:00-16:00

The results are as follows.

Time	Zone"S"	zone"La Poza"	Total
July 11	120	60	180
July 12	130	190	320
July 12	110	160	270
July 31	110	150	260
Average	120	140	260

* Zone"S" and Zone"La Poza" are shown below.

(2) Anchorage Area and Numbers of Ships at Manta Port.

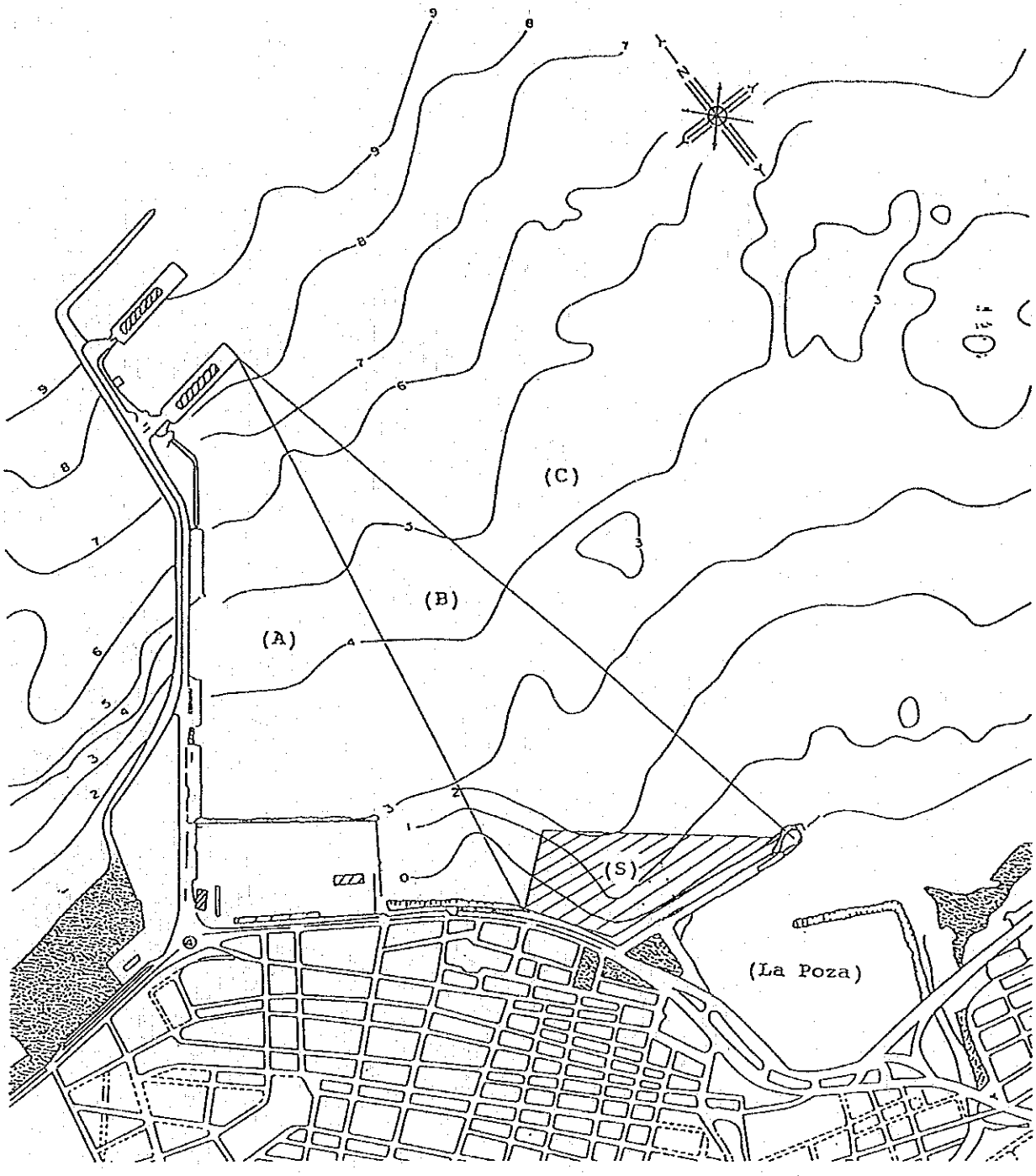
Numbers of ships at anchorage area of Manta Port were investigated.

The observation periods are;

July	4 (Thu)	16:00
July	8 (Mon)	11:00
Jury	10 (Tue)	11:00
July	12 (Fri)	11:00

The results are as follows.

Zone	July 4(Thu)	July 8(Mon)	July10(Tue)	July12(Fri)	Average
A	23	60	60	40	50
B	22	135	115	115	120
C	5	5	4	3	4
					174


(A)
(B)
(C)
(S)
(La Poza)

Appendix 4.4.1(4)

Numbers of Fishing Boat Crews by Boat Scale

(unit: boat)

Crew \ Boat (tons)	0 ~ 19	20 ~ 39	40 ~ 59	60 ~ 79	80 ~ 99	100 ~ 129	130 ~ 149	150 ~ 199	200 ~ 299	300 ~ 399	400 ~ 499	500 ~	Total
1 ~ 4	1	22	4										27
5 ~ 9	4	56	28	9	16	4							117
10 ~ 14		15	11	14	29	14	8						91
15 ~ 19		1	1	1	1	3	4	3	1	1			16
20							1	3			1	1	6
Total	5	94	44	24	46	21	13	6	1	1	1	1	257

Sum
Source: CAPTANIA

Appendix 4.4.1(5)

Present Condition of Wharves of Manta Port used for Fishery Products

Numbers of middle scale fishing boats of Manta are 102 boats (including Jaramijo), of which 90 boats use Manta Port and 12 boats use Tarqui. Above 90 boats use the wharves No.1 and No.2 at Manta Port, and it is estimated that 63 boats are purse seiners and 27 boats are longliners judging from the fishery permission.

The total working days of the fishing boats using No.1 and No.2 are as;

63 boats * 220 days/year = 13,860 days
27 boats * 70 days/year = 1,890 days

15,750 days

Working days per year for facilities are set as 280 days. Therefore, the average numbers of fishing boats per day are as;

15,750/280 = 56 boats

The total berth length needed is calculated as 302m based on the following assumptions;

Berth length: 24 m
Rotation numbers: 10 for landing berth
8 for outfitting berth
56 boats * 24m/10 = 134m
56 boats * 24m/ 8 = 168m

302m

While, the total length of the wharves No.1 and No.2 is 230m, and it is estimated that these wharves are fully used.

Fishery wharf No.1: -3.6m * 150m
No.2: -4.5m * 100m

250m

The busy working condition of these wharves is also recognized by the site observations. Moreover, these wharves are used as the repairing berth additionally, and the middle scale boats are waiting for berthing.

Appendix 4.5.1(1)

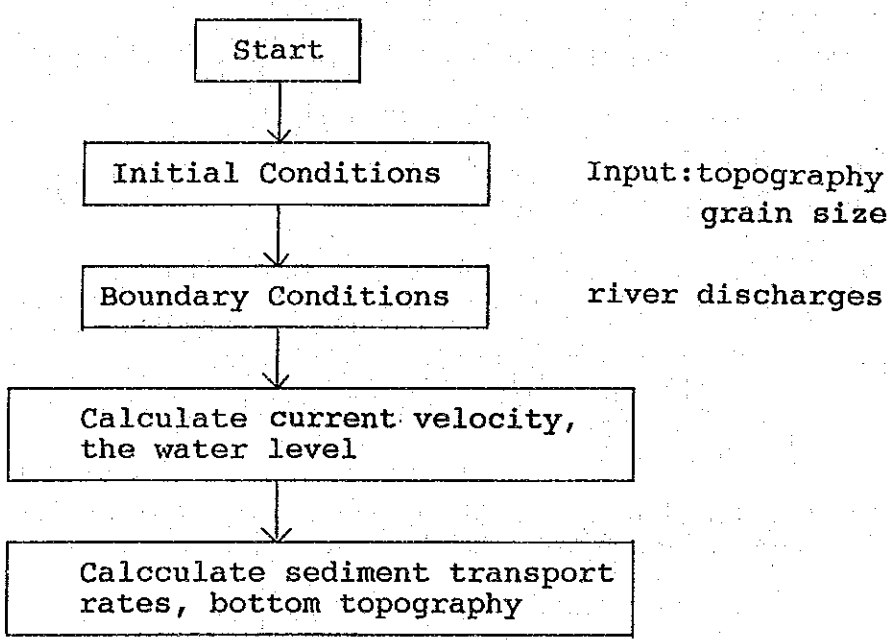
Calculation Method for Sedimentation by River Flood

(1) Objectives

Sand drift and sedimentation discharges from rivers affect the shoaling of the fishing port. Of these factors, the sedimentation discharges are expected to cause the shoaling largely comparing the sedimentation discharges volume, 46,000 m3/year with the sand drift 3,000m3/year. Therefore, the simulation is carried out to examine the effect of the shoaling by the sedimentation discharges.

(2) Method

The flowchart of the calculaton model is shown.



1) Calculation of the current velocity, the water level

Basic equations:

The continuity equation

$$\frac{\partial \zeta}{\partial t} + \frac{\partial}{\partial x}[(\zeta + h)u] \frac{\partial}{\partial y}[(\zeta + h)v] = 0$$

The equation of motion

$$\frac{\partial u}{\partial t} + u \frac{\partial u}{\partial x} + v\frac{\partial u}{\partial y} + g \frac{\partial \zeta}{\partial x} - Ah \left(\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} \right) + \frac{gv\sqrt{u^2+v^2}}{(\zeta + h)c^2} = 0$$

$$\frac{\partial v}{\partial t} + u \frac{\partial v}{\partial x} + v\frac{\partial v}{\partial y} + g \frac{\partial \zeta}{\partial x} - Ah \left(\frac{\partial^2 v}{\partial x^2} + \frac{\partial^2 v}{\partial y^2} \right) + \frac{gv\sqrt{u^2+v^2}}{(\zeta + h)c^2} = 0$$

Where,

x, y	:	the Cartesian coordinates in a horizontal plane
t	:	time
	:	the water surface elevation
h	:	the still water depth
g	:	acceleration of gravity
u, v	:	the corresponding velocity components x- and y-directions
c	:	coefficient of seabottom roughness
Ah	:	coefficient of lateral mixing

2) Calculationof the sediment transport rates
(Einstein-Brown equation)

$$Qb = 40.0\ F(d)\ \tau *$$

Where,

$\tau *$: intensity of bed shear, U*2/(sgd)

$$F(d) = \sqrt{\frac{2}{3} + \frac{36v2}{sgd3}} - \sqrt{\frac{36v2}{sgd3}}$$

Where,

v	:	kinematic velocity, 0.01 cm2/sec
s	:	submerged unit weight of soil particle
d	:	grain size

3) Calculation of the bottom topography change

$$\frac{\partial z}{\partial c} = -\left(\frac{\partial q x}{\partial x} + \frac{\partial q y}{\partial y}\right)$$

Where,

z : bottom topography change
q : sediment transport rates

4) Calculatin conditions

bottom materials d : 0.2mm
river discharges : Q = 278.3 m3/sec
(provability for 50 years)

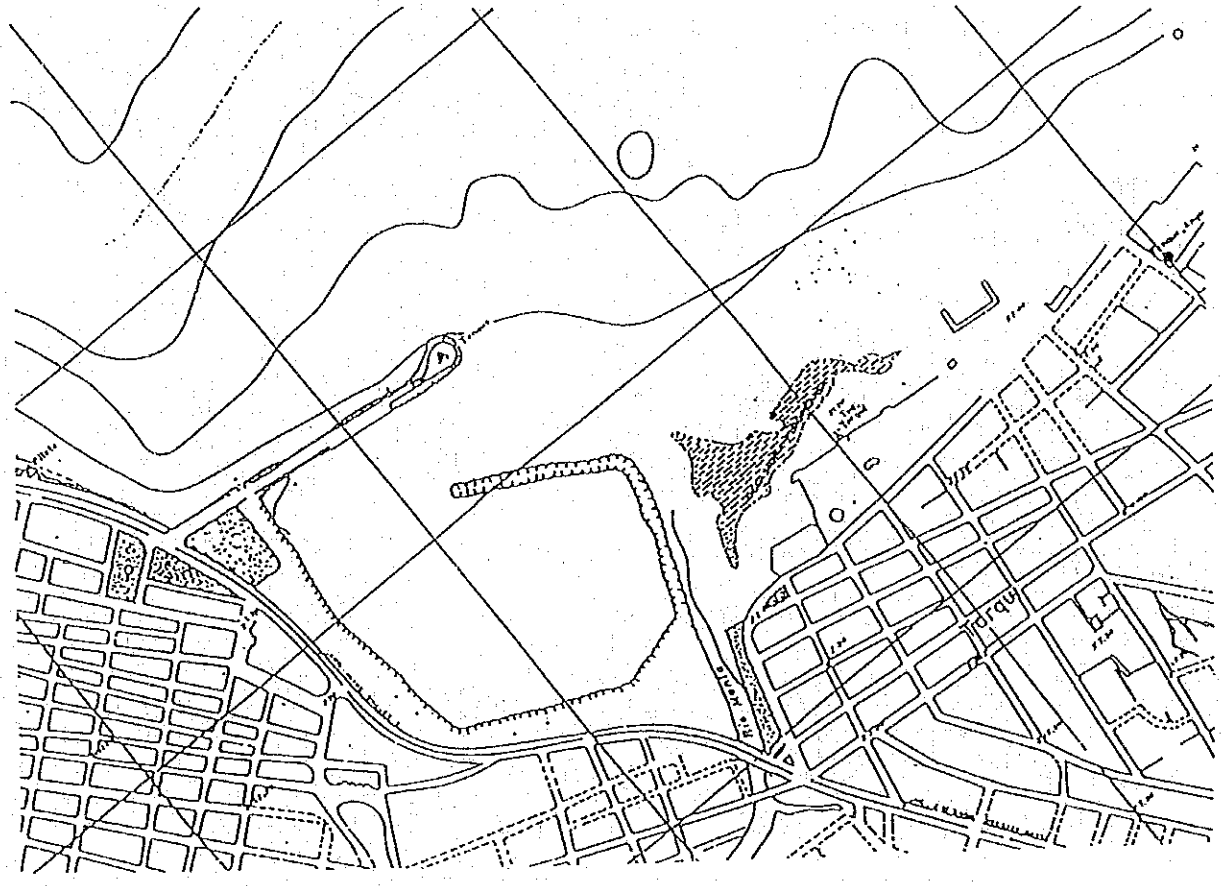
5) Calculation case

Recurrence model of present codition:
Planned model: Case A-1 (extension of the training jetty up to the -2.5m depth from the existing east breakwater)
Case B-1 (extension of the training jetty up to the -2.5m depth from the existing west breakwater)

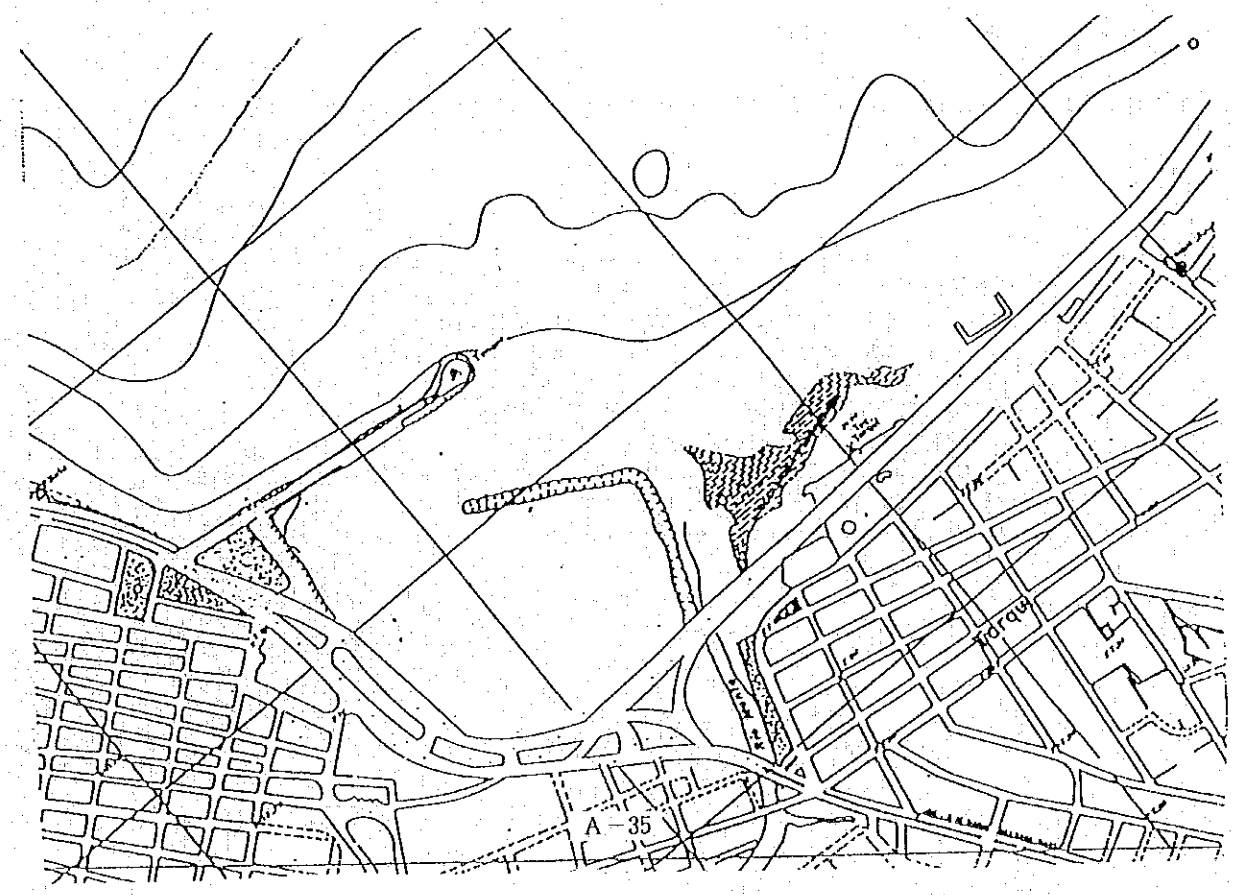
Appendix 4.5.1(2)

Road Improvement Plan at the La Poza

(Present)



(Improvement Plan)



Appendix 4.6.1(1)

Technical Comparison of Alternatives: Training Jetty

Item	Rubble mound	L-type block	Concrete upright	Sheet-pile
1.Experiences at site	+++	++	+	
2.Difficulty of material procurement	+++	++	++	+
3.Difficulty of construction	+++	+	++	+
4.Construction period	+++	++	+	+++
5.Base ground condition	+++	++	++	+
6.Numbers of complicated works	+++	+	++	++
7.Maintenance	+++	+	++	+
8.Temporary facilities required	+++	+	++	++
9.Numbers of construction equipment	+++	+	++	++
10.Necessity of work boats	+++	++	++	+
11.Necessity of land equipment	+++	++	++	++
12.Construction cost($/m)	1,962	1,999	2,695	2,778
Comprehensive evaluation	+++	++	+	+

Note: Ranking of evaluation
+++: Excellent
++: Ordinary
+: Some problems

Appendix 4.6.1(2)

Technical Comparison of Alternatives: Quay Types for Small Boat

Type	Evaluation	Construction cost/berth
Concrete upright	difficult for landing because of large tidal differences(3m),	low
Concrete stair	acceptable for tidal differences, some difficulties for landing,	high
Sloping type	acceptable for tidal differences, easy for landing and handling,	low
Pontoon	acceptable for tidal differences, landing works depend on the design,	high

THE REPUBLIC OF ECUADOR

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MAIN REPORT

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