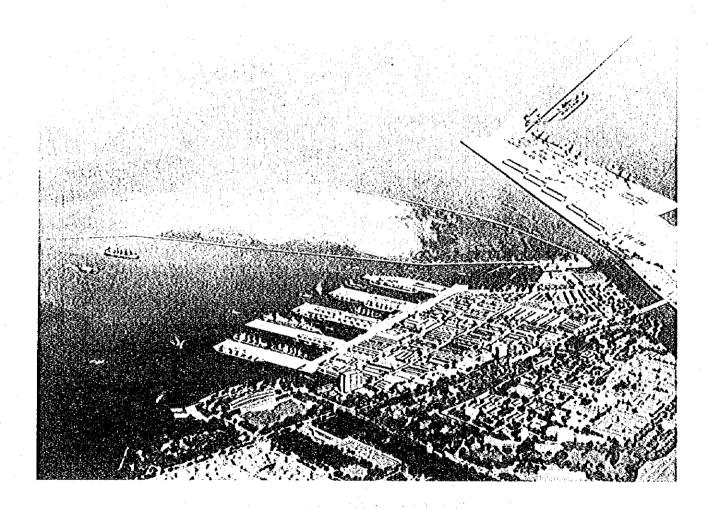
VOLUME 3 APPENDICES

MANILA SOUTH PORT REHABILITATION PROJECT

REPUBLIC OF THE PHILIPPINES



FEASIBILITY STUDY

FINAL REPORT

JUNE 1987

JAPAN INTERNATIONAL COOPERATION AGENCY



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Appendix 2.2.1 Future Population Projections

Philippine population projections for the period 1980 to 2030 have been prepared by the Population/Development Planning and Research Project of NEDA. Population estimates are based on the revised projections prepared by NCSO.

Three alternatives, that is high, medium and low projections, are based upon different assumptions about fertility, mortality and migration. The assumptions used for the three alternative forecasts are as follows:

Low Assumption: Rapid fertility decline and moderate

mortality decline.

Medium Assumption: Moderate fertility decline and moderate

mortality decline.

High Assumption: Slow fertility decline and moderate mortality

decline.

Rapid fertility decline means that fertility will decline from its 1980 level so that an NRR (Net Reproduction Rate) of one (1) will be achieved by the year 2000. Moderate fertility decline means that fertility will decline from its 1980 level so that an NRR of one (1) will be achieved by the year 2010. Slow fertility decline means that fertility will decline from its 1980 level so that an NRR of one (1) will be achieved by the year 2020.

As for migration, the foregoing study adopted only one set of migration assumptions on account of the difficulty of projecting future migration patterns. The projections assume that international migration will have little effect on the national population due to strict immigration laws, but that the inter-regional net migration rate will continue the present pattern of population redistribution though at a progressively diminishing rate. The inter-regional net migration rates used for the projections are as follows:

Net Migration

	Region	Rate, 1975-1980
Metrop	olitan Manila Area	3.70
Region	1	-1.79
	11	-0.17
	111	0.25
	11/	1.43
	V	-2.25
٠	Ι V Ι	-1.97
	IIV	-2.08
	VIII	-3.13
	IX	-0.47
	X	1.69
	XI (1.07
	XII	0.99

Appendix 2.4.1 Existing Road Network by System Classification and Surface Type: 1979-1984

TOTAL

YEAR	ALL TYPES	EARTH	MACADAM	BITUMINOUS	CONCRETE	MISC.
1979	147,608.83	52,354.67	67,809.55	17,483.47	9,961.14	- '
1980	151,918.76	53,914.64	70,284.71	17,634.41	10,085.00	
1981	153,528.08	55,210.82	70,581.52	17,475.51	10,260.23	-
1982	154,473.30	10,417.04	124,595.72	11,106.41	8,354.13	-
1983	155,671.06	9,953.13	125,901.97	11,273.6	8,542.40	-
1984	157.139.10	9,580.17	127,531.31	11,298.51	8,729.11	_

NATIONAL

YEAR	ALL TYPES	EARTH	MACADAM	BITUMINOUS	CONCRETE	MISC.
1979	23,552.21	767.40	12,784.91	4,821.95	5,177.95	
1980	23,641.10	856.47	12,668.54	4,906.35	5,209.74	_
1981	23,488.72	928.12	12,324.98	4,912.88	5,322.74	-
1982	23,783,45	886.40	12,431.35	4,918.44	5,547.26	-
1983	24,140.47	594.94	12,755.73	5,078.66	5,711.14	-
1984	25,116.75	651.19	13,419.89	5,316.35	5,729.32	-

LOCAL

YEAR	ALL TYPES	EARTH	MACADAM	BITUMINOUS	CONCRETE	MISC.
1979	124,056.62	51,587.27	55,024.64	12,661.52	4,783.19	-
1980	128,277.66	53,058.17	57,616.17	12,728.06	4,875.26	-
1981	130,039.36	54,282.70	58,256.54	12,562.63	4,937.49	
1982	130,689.85	9,530.64	112,164.24	6,187.97	2,806.87	
1983	131,530.59	9,358.19	113,146.24	6,194.90	2,831.26	-
1984	132,022.35	8,928.98	114,111.42	5,982.16	2,999.79	-

Source: Philippine Statistical Yearbook 1985

Appendix 2.4.2 PNR Railways and Motor Service Rolling Stock Inventory 1978-1983

		-71	3 1,0,		•	
nga kacamatan ng pagamatan ng Kabapatan ng Kabapatan ng Kabapatan ng Kabapatan ng Kabapatan ng Kabapatan ng Ka Kabapatan ng Kabapatan ng Kabapa						
INVENTORY	1978	1979	1980	1981	1982	1983
Train Service	1,767	1,727	1,659	1,600	1,547	1,334
Passenger cars and baggage cars	218	259	218	217	206	218
Diesel rail cars	125	125	147	1 46	127	108
Diesel engine locomotives	101	109	109	109	111	84
Freight Cars	1,323	1,234	1,185	1,128	1,103	924
Motor Service	233	161	174	160	101	101
Revenue vehicles	211	145	160	1 48	83	86
Buses	202	1 42	157	147	83	85
First Class	31	17	12	16	13	13
Air-conditioned	16	12	12	16	12	12
Mini-bus	3	3	-	-	1	1
Tourist	12	2	-	-		1
Third class	171	125	1 45	131	70	72
Freight trucks & tankers	9	3	3	1		1
Non-revenue vehicles	22	16	14	12	18	15
Automobiles	3	3	3	2	÷	-
Jeeps	14	9	6	6	17	12
Ambulances	2	1	2	2	-	1
Wreckers	3	3	3	2	1	2

Source: Philippine Yearbook 1985

Appendix 2.4.3 Traffic Volume and Revenue for Railways (PNR): 1950-1985

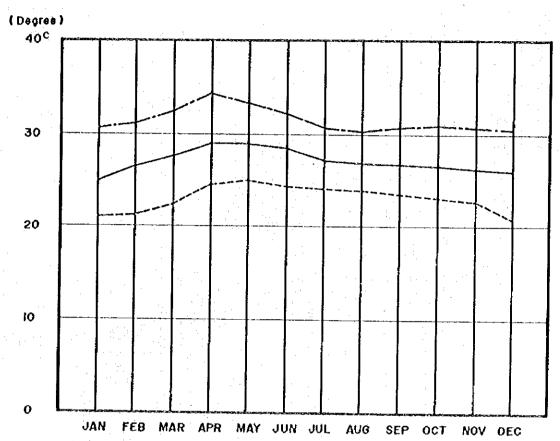
:	PASSENCERS CARRIED	PASSENGER REVENUE	REVENUE PER	FREIGHT TONS	FREIGHT	REVENUE PER	EXPRESS TONS	EXPRESS	REVENUE PER
YEAR	<u> </u>	(Thousand Pesos)	PASSENGER	(Thousand)	(Thousand Pesos)	S	(Thousand)	(Thousand Pesos)	•
1950	6,430.0	7.025.6	1.09	787.2	6,812.0	8.65	44.3	1,674.6	37.79
1955.	7.104.1	8,229.4	1.16	1,130.8	7,357.4	6.51	6.84	1,975.7	07.07
1960	9,546.5	13,684.3	1.43	1.337.1	8,441.0	6.31	59.6	2,344.6	39.39
1965	8.088.0	15,945.8	1.97	837.3	5,263.8	6.29	61.6	2,421.6	39.30
1970	5,628.4	24,785.1	9 +	277.7	4,512.1	16.25	100.3	4,415.9	40.44
1971	4,794.0	28,816.9	6.01	378.8	5,146.7	13.59	68.5	3,587.5	52.37
1972	3.955.0	26,301.3	6.65	204.8	2,981.4	14.56	6.69	3,582.8	51.26
1973	6,162.6	33,822.8	5.49	257.0	4,304.2	16.75	83.3	4.649.4	55.82
1974	8,116.9	48,305.2	5.95	331.8	8.215.5	24.76	104.5	8,224.8	78.86
1975	8,723.3	52,012.8	5.96	280.6	9,383.7	33.44	7.69	8,036.5	115.80
1976	9,683.4	47,179.6	4.87	208.6	6.073.7	29.12	56.4	5,736.6	101.71
1977	12,796.4	48,264.9	3.77	194-3	4.047,9	34.75	51.3	5,267.6	102.68
1978	9,581.8	43,103.1	4.50	158.7	5,152.2	32.46	37.2	3,802.9	102.22
1979	8,531.6	38,546.1	4.52	145.5	5.783.4	39.88	34.2	4,381.5	128.11
1980	7,423.4	48.833.4	6.58	141.9	6,440.5	45.39	24.8	4,288.5	172.94
1981	7.808.8	41,502/6	5.31	115.8	6,729.9	58.12	18.2	3,411.0	187.42
1982	5,652.0	34.967.6	6.19	79.2	5,440.3	69.89	15.8	3,642.0	230.51
1983	6.517.7	45,698.0	7.01	65.3	5.377.6	82.35	17.1	3.989.0	233.27
1984	6,018.2	61,471.7	10.21	72.1	8,851.4	122.72	21.6	6,878.3	318.44
1985	1,315.8	17,639.8	13.41	13.0	2,086.6	160.51	5.36	1,974.3	368.34
					A				

Source: Philippine Statistical Yearbook 1985

Appendix 3.1.1 Data Sheet - Termperature in Degrees (1977-1982)

K					 -			 	
YEAR	1 4.5					المنا			6 YEAR
	ITEM	1977	1978	1979	1980	1981	1982	TOTAL	
MONTH				·					AVERAGE
1 1	Mean	26.6	25.9	26.1	27.1	24.7	24.2	154.6	25.8
JAN.	Max.	30.7	30.5	30.7	31.8	29.7	29.7	183.1	30.5
	Min.	22.5	21.4	21.4	22.3	19.7	18.7	126.0	21.0
	Mean	26.6	26.2	27.6	27.4	25.5	25.3	158.6	26,4
FEB.	Max.	31,0	30.7	32.6	32.5	30.5	31.5	188.8	31.5
1	Min.	22.1	21.6	22.6	22,2	20.5	19.1	128.1	21.4
	Mean	27.3	28.9	28.5	28.2	26.1	27.5	166.5	27.8
MAR.	Max.	32.7	34.0	33.8	33.3	31.7	33.8	199.3	33.2
	Min.	21.9	23.9	23.3	23.0	20.4	21.3	133.8	22.3
	Mean	29.3	29.9	29.8	29.8	28.1	29.0	175.9	29.3
APR.	Max.	34.4	35.3	34.2	35.0	33.2	34.7	206.8	34.5
]	Min.	24.3	24.5	25.5	24.6	22.9	23.3	145.1	24.2
	Mean	29.4	30.2	29.0	29.7	28.1	29.6	176.0	29.3
MAY	Max.	33.8	35.0	33.0	34.2	32.5	35.1	203.6	33.9
į į	Min.	25.0	25.5	24.9	25.3	23.7	24.0	148.4	24.7
	Mean	29.5	28.5	28.7	-	25.4	29.1	141.2	28,2
JUN.	Max.	33.6	31.4	32.5		29.1	33.9	160.5	32.1
1 1	Min.	25.3	25.6	25.0	_	21.7	24.3	121.9	24.4
	Mean	27.9	27.6	27.7	27.3	26.6	27.1	164.2	27.4
JUL	Max.	31.6	31.0	31.1	30.2	30.1	30.7	184.7	30.8
1	Min.	24.3	24.3	24.3	24.3	23.1	23.6	143.9	24.0
	Mean	27.9	26.8	27.2	27.4	26.3	27.3	162.9	27.2
AUG.	Max.	31.5	29.0	30.4	30.3	29.5	31.1	181.8	30.3
1	Min.	24.3	24.5	24.1	24,5	23.1	23.5	144.0	24.0
	Mean	27.4	27.0	27.9	26.4	27.1	27.2	163.0	27.2
SEP.	Max.	30.6	29.5	32.0	29.2	30.7	31.0	183.0	30.5
\	Min.	24.3	24.5	23.8	23.6	23.4	23.3	142.9	23.8
	Mean	28.1	26.9	27.4	27.0	25.5	1.15	162.0	27.0
ост.	Max.	32.1	29.7	31.1	30.6	29.7	32.1	185.3	30.9
[]	Min.	24.1	24.2	23.6	23.4	21.2	22.2	138.7	23.1
	· Mean	26.9	26.4	27.8	27.0	25.9	26.6	160.6	26.8
NOV.	Max.	30.5	30.1	31.9	30.8	30.1	31.9	185.3	30.9
j	Min.	23.3	22.6	23.8	23.1	21.6	21.4	135.8	22.6
	Mean	26.1	26.9	26.1	26.0	24.8	26.2	156.1	26.0
DEC.	Max	30.8	31.0	31.0	30.1	29.3	30.9	183.1	30.5
[Min.	21.3	22,8	21.2	21.8	20.3	21.4	128.8	21.5
L		ı <u>~</u> _			<u> </u>		·		

Appendix 3.1.2 Monthly Temperature in Degrees (1977-1982)



Legend:
Mean
Maximum
Minimum

Appendix 3.1.3 Data Sheet - Rainfall (1) (1977-1982)

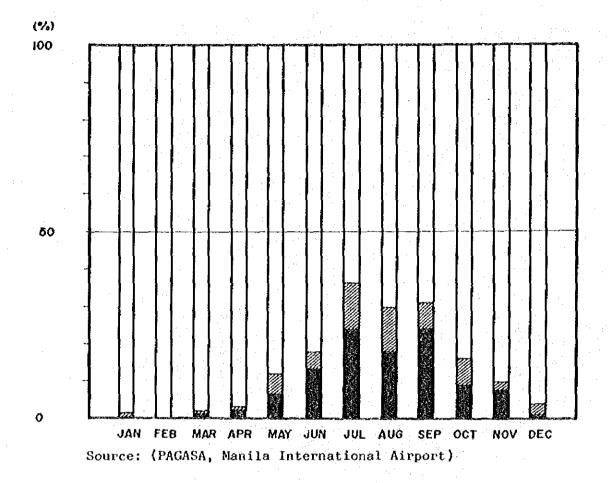
									(mm)
YEAR			l		l	1	1	6 YEAR	CREATEST 24 HR
	ITEM.	1977	1978	1979	1980	1981	1982		RAINFÁLL
МОИТН			-/ -	-,,,				AVERAGE	in 6 yrs.
	TOTAL	34.9	0	0	0	1.0	1.5	6.10	
JAN.	GRTST 24 h	10.9	0	0	0	1.0	1.4	1. 1,4, 4	10.9
	NO.OF DAYS	11.0	0	0	0	1.0	2.0	2.33	
	TOTAL	10.4	0	0.8	0	3.0	0.7	2.48	
FEB.	GRTST 24 h	7.1	0	0.8	0	3.0	0.4		7.1
	NO. OF DAYS	3.0	0	1.0	0	1.0	2.0	1.17	
<u> </u>	TOTAL	8.9	0	0	43.9	0	28.6	13.57	
MAR.	GRTST 24 h	6.1	0	0	24.1	0	28 4		28.4
	NO.OF DAYS	3.0	0	0	5.0	0	2.0	1.67	
	TOTAL	0.0	5.8	60.3	0	3.3	0.84	19.57	
APR.	GRTDT 24 h	0.0	5.3	34.3	0	3.3	32.2	14. 2. 4.	34.3
	NO.OF DAYS	0	2.0	3.0	0	1.0	3.0	1.50	
	TOTAL	105.9	155.9	161.3	41.9	26.3	75.9	94.53	
MAY	GRTST 24 h	38.9	41.7	86.0	32.5	20.0	29.4		86.0
	NO.OF.DAYS	10.0	7.0	15.0	4.0	5.0	10.0	8.50	
	TOTAL	78.9	149.0	169.9		419.3	191.2	201.66	
JUN.	GRTST 24 h	44.0	35.7	24.9		69.8	38.4		69.8
	NO.OF. DAYS	8.0	14.0	16.0	_	23.0	15.0	15.2	
	TOTAL	419.4	320.5	299.1	364.6	399.0	611.9	392.42	
JUL.	GRTST 24 h	101.3	83.3	41.1	75.6	69.7	121.6		121.6
	NO.OF DAYS		16.0	19.0	18.0	17.0	24.0	19.17	
:	TOTAL	347.2	734	363.5	213.0	247.6	423.0	388.05	1, 44 1144 <u>-</u>
AUG.	CRTST 24 h	199.0	115.9	104.0	31.8	76.4	72.8		199.0
	NO. OF DAYS	15.0	24.0	19.0	20.0	16.0	28.0	20.33	
	TOTAL	591.3	774.0	291.0	312.4	231.2	321.3	420.20	
SEP.	CRTST 24 h	197.2	135.2	94.8	87.0	68.2	53.6		197.2
•	NO.OF DAYS	20.0	22.0	14.0	19.0	12.0	25.0	18.67	
	TOTAL	66.4	558.5	89.0	162.5	196.4	106.9		
OCT:	GRTST 24 h	30.5	274.5	22.2	78.5	46.0	31.0		274.5
	NO.OF DAYS	8.0	18.0	12.0	10.0	15.0	11.0		
:	TOTAL	240.1	86.4	32.3	261.4	175.0	109.1		
NOV.	GRTST 24 h	121.7	37.1	16.1	78.4	65.2	38.4		121.7
	NO.OF DAYS	12.0	10.0	7.0	11.0	12.0	15.0		
	TOTAL	18.1	23.3	12.8	21.6	48.0	49.9		
DEC.	GRTST 24 h	17.6	9.8	12.8	7.0	33.4	16.4		33.4
	NO.OF DAYS	2.0	5.0	1.0	5.0	4.0	10.0	4.50	
ANNUAL TOTAL	RAINFALL (mm)	1921.5	2807.4	1 480.0		1690.1	1968.0		
	NO.OF DAYS	113.0	118.0	107.0		107.0	147.0		
	<u> </u>	· · · · · · · · · · · · · · · · · · ·		ــــــا				F	

Appendix 3.1.4 Data Sheet - Rainfall (2) (1977-1982)

YEAR Cam PANGE 1977 1978 1979 1980 1981 1982 AVERAGE X AVERAGE										
YEAR RANGE 1977 1978 1979 1980 1981 1982 6 YEAR X AVERAGE NONTH NONTH				-					(Days)	
NONTH NONT	YRAR	(mm)	Γ	I						
MONTH			1977	1978.	1979	1980	1981	1982		16
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	MONTH		1 1	-/-					AVERAGE	
See B 10-20 0 0 0 0 0 0 0 0 0		0-10	30	31	31	31	31	31	30.83	99.5
F E B . 0-10	JAN.	10-20	1	0	0	0	0	0	0.16	0.5
FEB. 10-20 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	‡ *	20-	0	0	0	0	0	0	0	0
FEB. 10-20 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	ij	0-10	28	28	28	29	28	28	28.17	100.0
MARR. 0-10 31 31 31 29 31 30 30.50 98.4 MARR. 10-20 0 0 0 1 0 0 0 0.16 0.5 20- 0 0 0 1 0 1 0.3 1.1 APR. 10-20 0 0 0 1 0 0 1 0.30 1.1 20- 0 0 0 2 0 0 1 0.50 1.7 APR. 10-20 2 0 3 0 1 3 1.5 4.9 20- 0 0 2 0 3 0 1 3 1.5 4.9 20- 2 0 3 0 1 3 1.5 4.9 20- 2 4 2 1 0 1 1.67 5.3 3 0-10 28 26 24 - 20 25 24 6 82.0 3 U N 10-20 1 1 1 1 - 4 1 1.6 5.3 20- 1 3 5 - 6 4 3.8 12.7 3 U L 10-20 6 3 2 2 2 17 20.0 64.5 3 U L 10-20 6 3 2 2 2 4 6 3.83 12.4 20- 7 7 7 9 5 8 7.17 23.1 A U G 10-20 2 6 3 8 4 4 4 4.5 14.5 3 4 4 4 4.5 14.5 4 5 10-20 5 1 1 1 0 2 5 2.33 7.8 5 E P 10-20 5 1 1 1 0 2 5 2.33 7.8 20- 1 6 1 3 3 2 2.0 6.5 20- 1 6 1 3 3 2 2.0 6.5 0 C T 10-20 2 2 2 3 0 3 2 2.0 6.5 N O V 10-20 1 1 1 1 2 0 1 1.0 3.3 D E C 10-20 1 1 1 1 1 2 0 1 1.0 3.3 D E C 10-20 1 0 1 1 1 2 0 8 3.8 96.3	FEB.	10-20	7	0	0	0	0	0		0
MAR. 10-20 0 0 0 0 1 0 0 0.16 0.5			0		0	0			0	l
Noverteen name		0-10	31	31	31	29.	31	30	30.50	98.4
A P R .	MAR.	10-20	0	0	0		0		0.16	
A P R . 10-20 0 0 0 1 0 0 0 1 0.30 1.1 1.7 20- 0 0 0 2 0 0 0 1 0.50 1.7 14 25 24 20 20 20 20 1.7 27 28 28 29 24 27 26 30 30 27 27.83 89.8 89.8 10-20 2 0 3 0 1 3 1.5 4.9 1.5 1.5 4.9 1.5		20-	0	0	0	1	0	1	0.3	1.1
NAY		0-10	30	30	27	30	30	28	29.17	97.2
MAY 10-20 2 27 26 30 30 27 27.83 89.8 10-20 2 0 3 0 1 3 1.5 4.9 20- 2 4 2 1 0 1 1.67 5.3 3 3 3 3 3 3 3 3 3	APR.	10-20	0	0	1	0	0	1	0.30	1.1
MAY 10-20 2 0 3 0 1 3 1.5 4.9		20-	0	0	. 2	0	0	1	0.50	1.7
The state of the		0-10	27	27	26	30	30	27	27.83	89.8
JUN. 0-10 28 26 24 - 20 25 24.6 82.0 JUN. 10-20 1 1 1 - 4 1 1.6 5.3 20- 1 3 5 - 6 4 3.8 12.7 JUL. 10-20 6 3 2 2 20 22 17 20.0 64.5 JUL. 10-20 6 3 2 2 2 4 6 3.83 12.4 20- 7 7 7 9 5 8 7.17 23.1 AUG. 10-20 2 6 3 8 4 4 4.5 14.5 AUG. 10-20 2 6 3 8 4 4 4.5 14.5 20- 4 10 6 2 5 6 5.5 17.7 SEP. 10-20 5	MAY	10-20	2	0	3	0	1	3	1.5	4.9
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$.	20-	2	4	2	1	0	1	1.67	5.3
20- 1 3 5 - 6 4 3.8 12.7		0-10	28	26	24	-	20	25	24.6	82.0
20- 1 3 5 - 6 4 3.8 12.7	JUN.	10-20		1	1	-	4	1	1.6	5.3
J U L . 10-20 6 3 2 2 4 6 3.83 12.4 20- 7 7 7 9 5 8 7.17 23.1 A U G . 10-10 25 15 22 21 22 21 21.0 67.8 A U G . 10-20 2 6 3 8 4 4 4.5 14.5 20- 4 10 6 2 5 6 5.5 17.7 S E P . 10-20 5 1 1 0 2 5 2.33 7.8 20- 8 15 4 6 4 5 7.0 23.3 0 C T . 10-20 2 2 3 0 3 2 2.6 3.8 N O V . 10-20 2 2 3 0 3 2 2.6 8.6 N O V . 10-20 1 1 1 2 0 1 1.0 3.3 D E C . 10-20 1 0 1 1 1 1 2 29 29 29.83 96.3 D E C . 10-20 1 0		20-	1	3	5	1 1 1	: 6	<u>. 4</u>	3.8	12.7
A U G .	7	0-10	18	21	22	20	22	17	20.0	64.5
A U C . 10-20 2 6 3 8 4 4 4 5 14.5	JUL.	10-20	6	3	2	2	- 4		3.83	12.4
A U G .		20-	7	7	7	9	5	8	7.17	23.1
20- 4 10 6 2 5 6 5.5 17.7 SEP. 0-10 17 14 25 24 24 20 20.67 68.9 SEP. 10-20 5 1 1 0 2 5 2.33 7.8 20- 8 15 4 6 4 5 7.0 23.3 0-10 28 23 27 28 25 27 26.33 84.9 0-10 28 23 27 28 25 27 26.33 84.9 0-10-20 2 2 3 0 3 2 2.0 6.5 20- 1 6 1 3 3 2 2.67 8.6 NOV. 10-20 1 1 1 2 0 1 1.0 3.3 20- 3 1 0 4 3 2 2.17	•	0-10	25	15	52	21	22	21	21.0	67.8
SEP. 0-10 17 14 25 24 24 20 20.67 68.9	AUG.	10-20	2	6	3	8	4	4	4.5	14.5
SEP. 10-20 5 1 1 0 2 5 2.33 7.8 20- 8 15 4 6 4 5 7.0 23.3 0-10 28 23 27 28 25 27 26.33 84.9 0 CT. 10-20 2 2 3 0 3 2 2.0 6.5 20- 1 6 1 3 3 2 2.67 8.6 NOV. 10-20 1 1 1 1 2 0 1 1.0 3.3 DEC. 10-20 1 0 1 1 1 1 2 0.83 96.3 DEC. 10-20 1 0 1 1 1 1 2 0.83 96.3		20-	l _i	10	6	2	. 5	6	5.5	17.7
20- 8 15 4 6 4 5 7.0 23.3 0 - 10 28 23 27 28 25 27 26.33 84.9 0 C T . 10-20 2 2 3 0 3 2 2.0 6.5 20- 1 6 1 3 3 2 2.67 8.6 N O V . 10-20 1 1 1 2 0 1 1.0 3.3 20- 3 1 0 4 3 2 2.17 7.2 20- 3 1 0 4 3 2 2.17 7.2 0-10 30 31 30 30 29 29 29.83 96.3 D E C . 10-20 1 0 1 1 1 2 0.83 3.2		0-10	17	14	25	24	24	20	20.67	68.9
OCT. 0-10 28 23 27 28 25 27 26.33 84.9 OCT. 10-20 2 2 3 0 3 2 2.0 6.5	SEP.	10-20	5	- 1	1	0	2	5	2.33	7.8
O C T . 10-20 2 2 3 0 3 2 2.0 6.5 20- 1 6 1 3 3 2 2.67 8.6 N O V . 0-10 26 28 29 24 27 27 26.83 89.5 N O V . 10-20 1 1 1 2 0 1 1.0 3.3 20- 3 1 0 4 3 2 2.17 7.2 0-10 30 31 30 30 29 29 29.83 96.3 D E C . 10-20 1 0 1 1 1 2 0.83 3.2		20-	8	15	14	6	4	5	7.0	23.3
NOV. 1 6 1 3 3 2 2.67 8.6 NOV. 10-20 1 1 1 2 0 1 1.0 3.3 20- 3 1 0 4 3 2 2.17 7.2 0-10 30 31 30 30 29 29 29.83 96.3 D E C. 10-20 1 0 1 1 1 2 0.83 3.2		0-10	28	23	27	28	25	27	26.33	84.9
NOV. 10-20 1 1 1 2 0 1 1.0 3.3 20- 3 1 0 4 3 2 21.17 7.2 0-10 30 31 30 30 29 29 29.83 96.3 DEC. 10-20 1 0 1 1 1 2 0.83 3.2	OCT.	10-20			- 3		3		2.0	
N O V . 10-20 1 1 1 2 0 1 1.0 3.3 20- 3 1 0 4 3 2 2.17 7.2 0-10 30 31 30 30 29 29 29.83 96.3 D E C . 10-20 1 0 1 1 1 2 0.83 3.2		20-	1	6	1	3	3	2	2.67	8.6
20- 3 1 0 4 3 2 2.17 7.2 0-10 30 31 30 30 29 29 29.83 96.3 D E C 10-20 1 0 1 1 1 2 0.83 3.2				28	29		27	27	26.83	89.5
0-10 30 31 30 30 29 29 29.83 96.3 D F C . 10-20 1 0 1 1 1 2 0.83 3.2	иоч.	10-20		1					1.0	3.3
D E C . 10-20 1 0 1 1 1 2 0.83 3.2			3	1		4	3			
			30	31	30	30		29		
20- 0 0 0 0 1 0 0.16 0.5	DEC.		1	0	1	1	i	2		
		20-	0	0	0	0	1	0	0.16	0.5

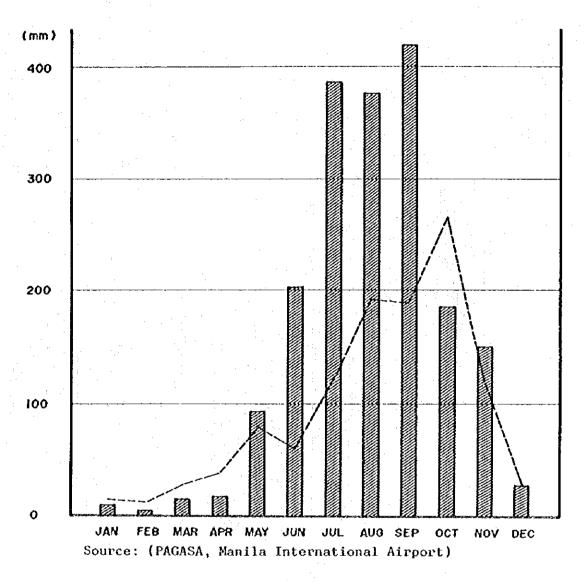
Source: (PAGASA, Manila International Airport)

Appendix 3.1.5 Monthly Mean Range of Rainfall in Percentages (1977-1982)



: 0 - 10 mm : 10 - 20 mm : 20 mm. OVER

Appendix 3.1.6 Monthly Mean Rainfall in mm (1977-1982)



Legend

: Month

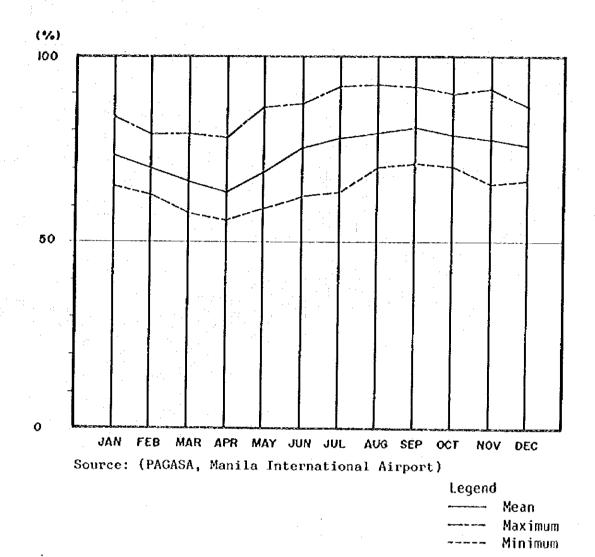
: Monthly Mean Rainfall (nm)

---- : Greatest 24 hour Rainfall (mm)

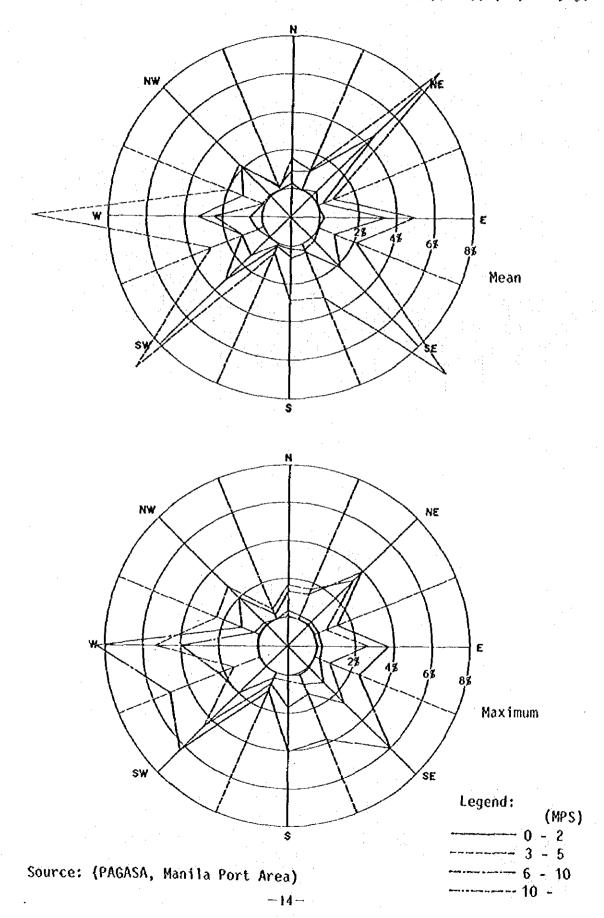
Appendix 3.1.7 Data Sheet - Humidity in Percentages (1977-1982)

MONTH TEM 1977 1978 1979 1980 1981 1982 TOTAL AVERAGE
Month Mean 76.0 71.0 71.0 72.0 73.0 76.0 439.0 73.17 JAN Max 84.0 81.0 80.0 87.0 82.0 93.0 507.0 84.50 Min. 69.0 65.0 60.0 63.0 67.0 69.0 393.0 65.50 Mean 68.0 67.0 68.0 71.0 76.0 70.0 420.0 70.00 FBB Max 80.0 75.0 77.0 80.0 82.0 83.0 477.0 79.50 Min. 60.0 60.0 61.0 68.0 72.0 61.0 382.0 63.67 Max 80.0 72.0 69.0 91.0 93.0 84.0 478.0 79.67 Min. 54.0 59.0 57.0 62.0 68.0 53.0 353.0 58.83 Mean 58.0 62.0 65.0 64.0 71.0 67.0 387.0 64.50 A P R Max 63.0 73.0 92.0 78.0 85.0 79.0 470.0 78.33 Min. 54.0 54.0 58.0 56.0 61.0 58.0 341.0 56.83 M A Y Max 78.0 94.0 88.0 91.0 81.0 86.0 518.0 86.33 Min. 54.0 58.0 57.0 54.0 66.0 59.0 348.0 58.0 J U N Max 79.0 89.0 86.0 - 90.0 91.0 435.0 87.00 Min. 60.0 66.0 60.0 - 69.0 63.0 318.0 63.60 Mean 74.0 80.0 82.0 78.0 75.0 84.0 473.0 78.83 J U L Max 87.0 92.0 97.0 93.0 90.0 94.0 553.0 92.17
Month Mean 76.0 71.0 71.0 72.0 73.0 76.0 439.0 73.17 JAN Max 84.0 81.0 80.0 87.0 82.0 93.0 507.0 84.50 Min. 69.0 65.0 60.0 63.0 67.0 69.0 393.0 65.50 Mean 68.0 67.0 68.0 71.0 76.0 70.0 420.0 70.00 FEB Max 80.0 75.0 77.0 80.0 82.0 83.0 477.0 79.50 Min. 60.0 60.0 61.0 68.0 72.0 61.0 382.0 63.67 MAR Max 69.0 72.0 69.0 91.0 93.0 84.0 478.0 79.67 Min. 54.0 59.0 57.0 62.0 68.0 53.0 353.0 58.83 MAY Max 78.0 94.0 88.0 91.0 81.0 86.0 518.0 86.33 Max 79.0 89.0 86.0 - 90.0 91.0 435.0 87.00 Min. 54.0 58.0 57.0 54.0 66.0 59.0 348.0 58.00 JUN Max 79.0 89.0 86.0 - 90.0 91.0 473.0 78.83 JUL Max 87.0 92.0 97.0 93.0 94.0 553.0 92.17
JAN. Max. 84.0 81.0 80.0 87.0 82.0 93.0 507.0 84.50 Min. 69.0 65.0 60.0 63.0 67.0 69.0 393.0 65.50 Mean 68.0 67.0 68.0 71.0 76.0 70.0 420.0 70.00 FEB. Max. 80.0 75.0 77.0 80.0 82.0 83.0 477.0 79.50 Min. 60.0 60.0 61.0 68.0 72.0 61.0 382.0 63.67 Mean 61.0 64.0 63.0 69.0 74.0 64.0 395.0 65.83 MAR. Max. 69.0 72.0 69.0 91.0 93.0 84.0 478.0 79.67 Min. 54.0 59.0 57.0 62.0 68.0 53.0 353.0 58.83 APR. Max. 63.0 73.0 92.0 78.0 85.0 79.0 470.0 78.33<
Min. 69.0 65.0 60.0 63.0 67.0 69.0 393.0 65.50 Rear 68.0 67.0 68.0 71.0 76.0 70.0 420.0 70.00 Feb. Max. 80.0 75.0 77.0 80.0 82.0 83.0 477.0 79.50 Min. 60.0 60.0 61.0 68.0 72.0 61.0 382.0 63.67 Mean 61.0 64.0 63.0 69.0 74.0 64.0 395.0 65.83 MAR. Max. 69.0 72.0 69.0 91.0 93.0 84.0 478.0 79.67 Min. 54.0 59.0 57.0 62.0 68.0 53.0 353.0 58.83 APR. Max. 63.0 73.0 92.0 78.0 85.0 79.0 470.0 78.33 Min. 54.0 54.0 58.0 56.0 61.0 58.0 341.0 56.83 <tr< td=""></tr<>
Mean 68.0 67.0 68.0 71.0 76.0 70.0 420.0 70.00
F B B . Max. 80.0 75.0 77.0 80.0 82.0 83.0 477.0 79.50 Min. 60.0 60.0 61.0 68.0 72.0 61.0 382.0 63.67 Mean 61.0 64.0 63.0 69.0 74.0 64.0 395.0 65.83 M A R . Max, 69.0 72.0 69.0 91.0 93.0 84.0 478.0 79.67 Min. 54.0 59.0 57.0 62.0 68.0 53.0 353.0 58.83 Mean 58.0 62.0 65.0 64.0 71.0 67.0 387.0 64.50 Min. 54.0 54.0 58.0 56.0 61.0 58.0 341.0 56.83 Min. 54.0 54.0 58.0 56.0 61.0 58.0 341.0 56.83 Max. 78.0 94.0 88.0 91.0 81.0 86.0 518.0 86.33 Min. 54.0 58.0 57.0 54.0 66.0 59.0 348.0 58.00 Mean 69.0 78.0 77.0 - 80.0 77.0 381.0 76.20 J U N . Max. 79.0 89.0 86.0 - 90.0 91.0 435.0 87.00 Mean 74.0 80.0 82.0 78.0 75.0 84.0 473.0 78.83 J U L . Max. 87.0 92.0 97.0 93.0 90.0 94.0 553.0 92.17
Min. 60.0 60.0 61.0 68.0 72.0 61.0 382.0 63.67 Max. 69.0 64.0 63.0 69.0 74.0 64.0 395.0 65.83 MAX. 69.0 72.0 69.0 91.0 93.0 84.0 478.0 79.67 Min. 54.0 59.0 57.0 62.0 68.0 53.0 353.0 58.83 Mean 58.0 62.0 65.0 64.0 71.0 67.0 387.0 64.50 APR. Max. 63.0 73.0 92.0 78.0 85.0 79.0 470.0 78.33 Min. 54.0 54.0 58.0 56.0 61.0 58.0 341.0 56.83 MAY Max. 78.0 94.0 88.0 91.0 81.0 86.0 518.0 86.33 Min. 54.0 58.0 57.0 54.0 66.0 59.0 348.0 58.00 JUN.
Min. 60.0 60.0 61.0 68.0 72.0 61.0 382.0 63.67 M A R . Mean 61.0 64.0 63.0 69.0 74.0 64.0 395.0 65.83 M A R . Max. 69.0 72.0 69.0 91.0 93.0 84.0 478.0 79.67 Min. 54.0 59.0 57.0 62.0 68.0 53.0 353.0 58.83 Mean 58.0 62.0 65.0 64.0 71.0 67.0 387.0 64.50 A P R . Max. 63.0 73.0 92.0 78.0 85.0 79.0 470.0 78.33 Min. 54.0 54.0 58.0 56.0 61.0 58.0 341.0 56.83 M A Y Max. 78.0 94.0 88.0 91.0 81.0 86.0 518.0 86.33 M A Y Mean 69.0 78.0 77.0 - 80.0 77.0 381.0 76.20 <t< td=""></t<>
M A R . Max, 69.0 72.0 69.0 91.0 93.0 84.0 478.0 79.67 Min, 54.0 59.0 57.0 62.0 68.0 53.0 353.0 58.83 Mean 58.0 62.0 65.0 64.0 71.0 67.0 387.0 64.50 A P R . Max. 63.0 73.0 92.0 78.0 85.0 79.0 470.0 78.33 Min. 54.0 54.0 58.0 56.0 61.0 58.0 341.0 56.83 M A Y Max. 78.0 94.0 88.0 91.0 81.0 86.0 518.0 86.33 Min. 54.0 58.0 57.0 54.0 66.0 59.0 348.0 58.00 J U N . Max. 79.0 89.0 86.0 - 80.0 77.0 381.0 76.20 J U L . Max. 87.0 92.0 97.0 93.0 90.0 94.0 553.0 92.17
Min. 54.0 59.0 57.0 62.0 68.0 53.0 353.0 58.83 Mean 58.0 62.0 65.0 64.0 71.0 67.0 387.0 64.50 A P R . Max. 63.0 73.0 92.0 78.0 85.0 79.0 470.0 78.33 Min. 54.0 54.0 58.0 56.0 61.0 58.0 341.0 56.83 Max. 78.0 94.0 88.0 91.0 81.0 86.0 518.0 86.33 Min. 54.0 58.0 57.0 54.0 66.0 59.0 348.0 58.00 Min. 54.0 58.0 77.0 - 80.0 77.0 381.0 76.20 J U N . Max. 79.0 89.0 86.0 - 90.0 91.0 435.0 87.00 Min. 60.0 66.0 60.0 - 69.0 63.0 318.0 63.60 Mean 74.0 80.0 82.0 78.0 75.0 84.0 473.0 78.83 J U L . Max. 87.0 92.0 97.0 93.0 90.0 94.0 553.0 92.17
Mean 58.0 62.0 65.0 64.0 71.0 67.0 387.0 64.50 Max. 63.0 73.0 92.0 78.0 85.0 79.0 470.0 78.33 Min. 54.0 54.0 58.0 56.0 61.0 58.0 341.0 56.83 MAY Max. 78.0 94.0 88.0 91.0 81.0 86.0 518.0 86.33 Min. 54.0 58.0 57.0 54.0 66.0 59.0 348.0 58.00 JUN. Max. 79.0 89.0 86.0 - 90.0 91.0 435.0 87.00 Max. 79.0 89.0 86.0 - 90.0 91.0 435.0 87.00 Min. 60.0 66.0 60.0 - 69.0 63.0 318.0 63.60 JUL. Max. 87.0 92.0 97.0 93.0 90.0 94.0 553.0 92.17
A P R . Max. 63.0 73.0 92.0 78.0 85.0 79.0 470.0 78.33 Min. 54.0 54.0 58.0 56.0 61.0 58.0 341.0 56.83 M A Y Max. 78.0 94.0 88.0 91.0 81.0 86.0 518.0 86.33 Min. 54.0 58.0 57.0 54.0 66.0 59.0 348.0 58.00 J U N . Max. 79.0 89.0 86.0 - 80.0 77.0 381.0 76.20 J U L . Max. 79.0 89.0 86.0 - 90.0 91.0 435.0 87.00 Max. 74.0 80.0 82.0 78.0 75.0 84.0 473.0 78.83 J U L . Max. 87.0 92.0 97.0 93.0 90.0 94.0 553.0 92.17
Min. 54.0 54.0 58.0 56.0 61.0 58.0 341.0 56.83 Mean 65.0 68.0 74.0 65.0 72.0 72.0 416.0 69.33 MAY Max. 78.0 94.0 88.0 91.0 81.0 86.0 518.0 86.33 Min. 54.0 58.0 57.0 54.0 66.0 59.0 348.0 58.00 JUN. Mean 69.0 78.0 77.0 - 80.0 77.0 381.0 76.20 JUN. Max. 79.0 89.0 86.0 - 90.0 91.0 435.0 87.00 Min. 60.0 66.0 60.0 - 69.0 63.0 318.0 63.60 Mean 74.0 80.0 82.0 78.0 75.0 84.0 473.0 78.83 JUL. Max. 87.0 92.0 97.0 93.0 90.0 94.0 553.0 92.17 <
M A Y Mean 65.0 68.0 74.0 65.0 72.0 72.0 416.0 69.33 M A Y Max. 78.0 94.0 88.0 91.0 81.0 86.0 518.0 86.33 Min. 54.0 58.0 57.0 54.0 66.0 59.0 348.0 58.00 J U N Mean 69.0 78.0 77.0 - 80.0 77.0 381.0 76.20 J U N Max. 79.0 89.0 86.0 - 90.0 91.0 435.0 87.00 Min. 60.0 66.0 60.0 - 69.0 63.0 318.0 63.60 Mean 74.0 80.0 82.0 78.0 75.0 84.0 473.0 78.83 J U L Max. 87.0 92.0 97.0 93.0 90.0 94.0 553.0 92.17
M A Y Max. 78.0 94.0 88.0 91.0 81.0 86.0 518.0 86.33 Min. 54.0 58.0 57.0 54.0 66.0 59.0 348.0 58.00 J U N . Mean 69.0 78.0 77.0 - 80.0 77.0 381.0 76.20 J U N . Max. 79.0 89.0 86.0 - 90.0 91.0 435.0 87.00 Min. 60.0 66.0 60.0 - 69.0 63.0 318.0 63.60 Mean 74.0 80.0 82.0 78.0 75.0 84.0 473.0 78.83 J U L . Max. 87.0 92.0 97.0 93.0 90.0 94.0 553.0 92.17
Min. 54.0 58.0 57.0 54.0 66.0 59.0 348.0 58.00 JUN. Mean 69.0 78.0 77.0 - 80.0 77.0 381.0 76.20 JUN. Max. 79.0 89.0 86.0 - 90.0 91.0 435.0 87.00 Min. 60.0 66.0 60.0 - 69.0 63.0 318.0 63.60 Mean 74.0 80.0 82.0 78.0 75.0 84.0 473.0 78.83 JUL. Max. 87.0 92.0 97.0 93.0 90.0 94.0 553.0 92.17
JUN. Mean 69.0 78.0 77.0 - 80.0 77.0 381.0 76.20 JUN. Max. 79.0 89.0 86.0 - 90.0 91.0 435.0 87.00 Min. 60.0 66.0 60.0 - 69.0 63.0 318.0 63.60 Mean 74.0 80.0 82.0 78.0 75.0 84.0 473.0 78.83 JUL. Max. 87.0 92.0 97.0 93.0 90.0 94.0 553.0 92.17
JUN. Max. 79.0 89.0 86.0 - 90.0 91.0 435.0 87.00 Min. 60.0 66.0 60.0 - 69.0 63.0 318.0 63.60 Mean 74.0 80.0 82.0 78.0 75.0 84.0 473.0 78.83 JUL. Max. 87.0 92.0 97.0 93.0 90.0 94.0 553.0 92.17
Min. 60.0 66.0 60.0 - 69.0 63.0 318.0 63.60 Mean 74.0 80.0 82.0 78.0 75.0 84.0 473.0 78.83 JUL. Max. 87.0 92.0 97.0 93.0 90.0 94.0 553.0 92.17
Mean 74.0 80.0 82.0 78.0 75.0 84.0 473.0 78.83 JUL. Max. 87.0 92.0 97.0 93.0 90.0 94.0 553.0 92.17
JUL. Max. 87.0 92.0 97.0 93.0 90.0 94.0 553.0 92.17
Min. 61.0 53.0 66.0 66.0 65.0 73.0 384.0 64.00
Mean 75.0 86.0 81.0 76.0 77.0 84.0 479.0 79.83
A U G . Max. 91.0 98.0 94.0 92.0 87.0 92.0 554.0 92.33
Min. 68.0 75.0 68.0 66.0 70.0 77.0 424.0 70.67
Mean 83.0 87.0 79.0 80.0 77.0 84.0 490.0 81.67
SEP. Max. 95.0 94.0 94.0 89.0 86.0 95.0 553.0 92.17
Min. 76.0 76.0 66.0 68.0 67.0 74.0 427.0 71.17
Mean 76.0 85.0 79.0 80.0 81.0 78.0 479.0 79.83
OCT. Max. 91.0 97.0 91.0 90.0 88.0 87.0 544.0 90.67
Min. 68.0 76.0 68.0 66.0 74.0 69.0 421.0 70.17
Mean 78.0 82.0 75.0 77.0 80.0 80.0 472.0 78.67
NOV. Max. 93.0 93.0 91.0 93.0 92.0 87.0 5/19.0 91.50
Min. 69.0 71.0 67.0 66.0 62.0 66.0 401.0 66.83
Mean 75.0 76.0 75.0 76.0 81.0 80.0 463.0 77.17
DEC. Max. 81.0 87.0 91.0 88.0 87.0 89.0 523.0 87.17
Min. 66.0 67.0 66.0 66.0 70.0 67.0 402.0 67.00

Appendix 3.1.8 Monthly Humidity in Percentages (1977-1982)



Appendix 3.1.9 Annual Occurrence Frequency of Wind Speed and Wind Direction (1971-1978, 1982-1983)



Appendix 3.1.10 Data Sheet - Occurrence Fequency of Mean Wind Speed and Wind Direction
(1 of 2) (1971-1978, 1982-1983)

	MON	THLY O	CCURRE	NCR FR	FOUENC	Y OF M	EAN WIL	ID SPE	ED IN	PERCEN'	TAGES		
DIRECTION	RANK	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
	ī	.7	.8	0	0	.0	, 4	1.0	1.0	2.6	1.2	1.1	1.9
	11	3.0	1.6	.7	0	4	.7	2.1	.7	1.8	1.9	1.5	4.2
N	111	. 4	0	.3	0	. 4	0 .	. 4	0	0	8	.8	0
	IV	0	0	0	0	0	0	0	00	0	0	_0	0
		4.1	2.4	1.0	0	.8	1.1	3.5	1.7	4.4	3.9	3.4	6.1
	1	3.0	. 4	-3	0	0	0	.7	.7	1.1	1.2	1.5	3.1
	11	3.0	b	1.0	0	4	. 4	0	.3	0	1.2	3.4	3.5
NNE	111	0	0	0	0	0	0	0	0	0	0	0 ,	0
	IV	0	0	0	0	0	0.3	0.3	$\frac{0}{1.0}$	$\frac{0}{1.1}$	2.4	7 5.6	6.6
		6.0 4.8	.8 3.6	$\frac{1.3}{1.0}$.7	.7	1.4	1.0 2.4	1.3	4.4	6.0	$\frac{-3.0}{17.7}$	18.5
	I	20.7	15.1	7.0	5.1	4.3	1.4	2.5	2.3	5.1	5.8	21.5	24.3
Mile	111	20.7	0	1.0	4	4	0	0	4	0	. 4	0	1.2
NE	IV	0 1	ŏ	0	0	0	ŏ	0	0	ő	O	٠, 4	0
		25.9	18.7	9.0	6.2	5.4	2.8	4.9	4.0	9.5	12.2	39.6	44.0
	<u> </u>	0	0	0	0	0	0	3	0	. 4	2.3	. 4	0
	ÎI	3.0	, u	0	4	0	0	0	. 4	0	.8	1.1	1.1
ENE	111	Ó	0	0	0	0	0	0	0	0	0	0	0
	IV	0	0	0	0	0	0	4	0	0	- 0	o	0
		3.0	71	0	. 4	0	0	.7	, 4	. 4	3.1	1.5	1.1
	1	5.5	4.0	2.1	. 4	.7	1.8	1.4	3,4	1.1	12.0	4.9	3.1
	11	7.4	7.5	8.7	8.1	3.2	1.4	1.7	2.0	.7	7.7	5.3	5.8
E	111	0	D	1.0	, i	0	0	0	0	. 4	4	0	4
Į l	IV	0	0		0	4	0	0	_0	0	0	0	0
<u></u>		12.9	11.5	11.8	8.9	4.3	3.2	3.1	5.4	2,2	20.1	10.2	9.3
1	I	1.5	1.2	1.0	1.8	.7	.3	1.0	1.7	.7	.8	.7	.4
	II	3.0	3.6	5.2	5.9	2.9	.7	.7	.3	.7	1.5	.4	1.5
ESE	III	0	0	0	0	0	0	. 4	0	0	0	0	0
	IV	4.5	0 4.8	6.2	0 -	3.6	0	2,1	2.0	1.4	2.3	1.1	1.9
	<u> </u>	1.8	2.8	3.1	7.7	1.8	$\begin{array}{c} 1.0 \\ 2.1 \end{array}$	1.4	.7	4.3	3.5	1.5	2.0
[. i	1 11	5.5	20.6	30.1	30.9	15.5	6.1	2.8	1.7	4.3	4.7	4.5	1.5
SE	111	0	0	7	1.0	7	0.1	.3	0	0	i i	0	0
"	ΙV	ŏ	0	o'	0	0	ō	0	ŏ	0	0	o	ŏ
		7.3	23.4	33.9	32.6	18.0	8.2	4.5	2.4	8.6	8.6	6.0	3.5
		2.2	.8	0	. 4	. 4	.4	.7	.7	. 4	.8	0	.4
	11	3.0	6.7	5.9	7.7	5.4	2.9	1.7	.7	1.4	1.2	. 1.1	0
SSE	111	0	0	1.0	1.1	1.4	0	. 4	0	0	, ų	0	0
]	17	0	0	0	0	0	0	0	0	0	0	0	0
		5.2	7.5	6.9	9.2	7.2	3.3	2.8	1.4	1.8	2.4	1.1	. 4
	I	. 4	,4	1.4	.7	.7	0	1.0	.3	1.4	.8	.4	.8
	II	1.1	1.2	3.1	4.8	7.2	5.4	2.5	1.7	2.9	4.3	.7	.8
S	III	0	0	0	. 4	0	. 4	0	.3	0	4	0	0
1	<u>IV</u>	0	0	0	0	0	0	0	0	0	0	0	0
L	l	1.5	1.6	4.5	5.9	7.9	5.8	3.5	2.3	4.3	5.5	1.1	1.6

Note RANK 1; 0-2m/s

RANK II; 3-5m/s

RANK III; 6-10m/s

RANK IV; Over 11m/s

Source: (PAGASA, Manile Port Area)

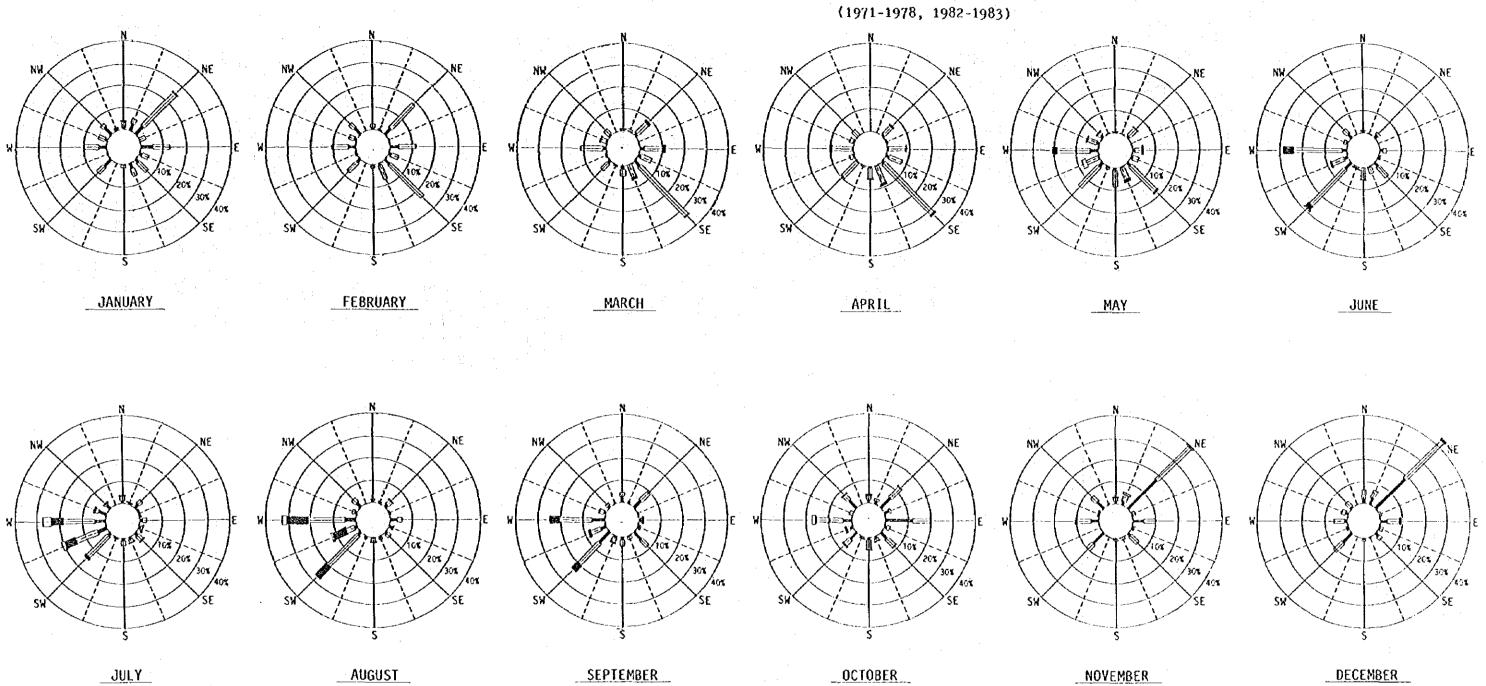
Data Sheet - Occurrence Fequency of Mean Wind Speed and Wind Direction (2 of 2) (1971-1978, 1982-1983)

	MON	THLY O	CCURRE	NCE FRI	EQUENC.	Y OF M	EAN WII	ND SPE	BD IN	PERCENT	FACES	***************************************	
DIRECTION	RANK	JAN	F68	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
	I	0	0	.3	0	. 4	0	.3	0	.7	4	0	0
	11	0	0	. 4	7	.7	7	. 4	1.0	2.5	. 4	0	0
SSW	ш	0	0	. 0	0	0	0	0	0	h	.3	0	0
	IV.	0:	0	0	0	O	. 4	.0	0	0	0	. 4	0
		0	0	.7	.7	1.1	1.1	.7	1.0	3.6	1.1	. 4	0
	I	4.1	1.6	1.4	4	2.0	4.0	1.1	1.7	6.5	4.0	6.8	5.8
	П	4.1	6.0	4.2	9.2	12.3	22.2	12.8	18.8	13.0	3.1	3.4	5.0
SW	111	0	0	0	0	0	2.5	1.4	7.0	4.0	8.	0	0
* * * * * * * * * * * * * * * * * * * *	IA	0	0	0	0	0	. 4	0	0		0	0	0
		8.2	7.6	5.6	9.6	14.3	29.1	15.3	27.5	23.5	7.9	10.2	10.8
	1	.4	4	.3	.7	. 4	1.8	4.2	1.3	2.9	1.5	0	. 4
	11	0	4	. 4	1.5	5.1	5.7	10.4	4.0	4.7	1.2	0	. 4
WSW	111	0	0	0	0	0	.7	5.2	6.4	1.1	.8	0	0
	IV	0	0	0	0	1.8	0	1.4	7	0	0	0	0_0
1.		. 4	.8	.7	2.2	7.3	8.2	21.2	12.4	8.6	3.5	0	.8
	1	3.0	3.2	1.4	4	3.2	2.5	4.5	5.0	6.1	3.8	3.8	1.5
	11	6.6	7.5	10.4	9.2	15.2	21.5	13.9	16.1	14.4	11.6	6.4	4.6
W	III	0	0	0	1.1	2.2	4.6	5.6	9.7	4.3	. 4	b b	0
	IV	0	0	0	0	0	0	3.8	2.0	0	1.5	0	0
		9.6	10.7	11.8	10.7	20.6	28.6	27.8	32.8	24.8	17.3	10.6	6.1
-	I	1.1	1.0	.3	7	1,1	1.1	3.8 1.4	1.0	1.1 2.1	1.5	4	1.5 2.0
1211	II	3.0	2.4	2.4	1.5	4.3	1.1 0	7	1.0	0	1.5	h	0
WNW	111	0	0	0.4	0	0	0	0	0	0	0	0	Ö
	<u> 1V</u>	4.1	3.4	3.1	2.2	5.8	2.2	5.9	2.0	3.2	$\frac{0}{1.5}$	1.2	3.5
	I	4.1	3.6	.7	0	1.1	2.1	2,1	2.3	1.1	4.3	4.2	.8
*	II	1.8	2.8	2.8	3.7	1.4	2.9	7	1.4	11	3.5	3.0	3.1
WW	111	0	0	0:	0.1	4	0	3	0	0	.4	0	0.1
หก	IA	0	Ö	0	o	0	Ö	0	0	o	ا ما	ő	o l
	, A 4	5.9	6.4	3.5	3.7	2.9	5.0	3.1	3.7	2.2	8.2	7.2	3.9
·	I	.7	0.7	0	0	0	0.	0	0	. 4	0	.8	4
	II	.7	ŏ	ő	ŏ	4	Ö	Ŏ	Ö	0	lŏ.	0	0
NNW	111	0.1	ŏ	ő	Ö	ا ن	ő	o	ŏ	ŏ.	l ŏ	ŏ	ŏ
	IV	o ·	ő	0	Ŏ	ŏ	ŏ	o	ŏ	0	Ŏ	0	o l
		1.4	o o	0	ŏ	- 4	Ŏ	0	0	- 4	0	.8	, 1
					<u> </u>	1							
OBSERVATIO	N	271	252	289	272	277	279	288	298	278	258	265	259
NUMBER	ا ــــــــــــــــــــــــــــــــــــ		.	l]	<u> </u>	L	1	l	L	l	<u> </u>	<u> </u>

Note RANK 1; 0-2m/s RANK II; 3-5m/s RANK III; 6-10m/s RANK IV; Over 11m/s

Source: (PAGASA, Manila Port Area)

Appendix 3.1.11 Occurrence Frequency of Mean Wind Speed and Wind Direction



Source: (PASAGA, Manila Port Area)

Appendix 3.1.12 Deta Sheet - Occurence Frequency of Maximum Wind Speed and Wind Direction (1 of 2) (1971-1978, 1982-1983)

	MONTE	UA OCC	HERVNO	E FREC	HIENCY	OF MAX	H MUNT	IND SE	PEED IN	PERCE	NTAGES	<u> </u>	
DIRECTION	RANK	JAN	FEB	MAR	APR	MAY	JUNB	JULY	AUG	SEPT	OCT	NOV	DEC
DINICIPON	I	0	0	0	0	0	<u> </u>	0	0	-3	ō	.3	0
	11	1.3	2.1	.6	,3	ŏ	.7	2.0	1,6	1.7	.7	5.0	3.9
ี ห	111	2.9	2.5	0	ő	1.0	.3	1 3	1,3	1.3	1.3	1.0	3.2
,	ĨΫ	0	o l	0	o.	.3	0	.č	0	0	.3	1.0	1.6
		4.2	4.6	.6	.3	1.3	1.0	3.9	2.9	3.3	2.3	7.3	8.7
	Ī	0	0	0	0	0	0	0	0	0	0	0	0
:	11	1.6	7	1.0	Ó	• 3	.3	. 6	1.0	.7	3.0	5.0	4.8
NNE	III	2.3	. 4	2.3	0	.6	0	0	.3	7	2.0	3.7	4.8
: [IV	0.7	0	0	0	3	0	.6	0	0	3	.3	.3
		4.6	1.1	3.3	0	1.2	.3	1.2	1.3	1.4	5.3	9.0	9.9
į	I	0	0	0	0	0	0	0	0	0	0	.3	0
	11	5.9	2.1	1.0	.7	2.0	1.0	1.0	1.6	3.7	2.9	9.0	9.0
NE	111	7.8	6.8	3.2	2.3	2.0	.7	1.0	7	2.0	2.0 0	7.3	11.6
· · · · 	IV	0.3	- 2	.3	- 4	4.0	2.0	0	2.3	0 5.7	4.9	17.0	21.2
	1	14.0	9.3	4.5	3.4	0	0	2.0	0	0	0	0	.3
· • • • • • • • • • • • • • • • • • • •	ΙΙ	1.0	1.1	.3	0 4	7	Ö	0	ő	.7	.6	3.0	1.3
ENB	III	4.2	.7	1.6	.7	3	Ö	.6	.6	.3	2.9	2.3	2.0
ERIB	17	0.7	.7	0	.3	0	, h	0	ان	.3	0	í4	0
,		5.9	2.5	1.9	1,4	1.0	, i	.6	.6	1.3	3.5	5.7	3.6
	Ī	0	0	0	0	.6	0	0	0	0	0	0	.3
	H	4.2	2.8	1.0	2,4	1.0	1.4	1.0	1.0	.7	6.8	5.3	3.9
Е	111	4.9	8.2	8.1	5.0	2.6	1.0	1.0	6.	1.0	3.2	3.3	5.2
	ĮV	0.3	1.4	. 3	3	0	0	6	.3	0	0_	0	0
		9,4	12.4	9.4	7.7	4.2	2.4	2.6	1.9	1.7	10.0	8.6	9.4
	I	0	8	0	0	0	0	0	0	0	0	0	0
	11	0.3	2.1	.6	0	.6	.3	0	1,3	٠3	2.0	2.0	.6
ESE	111	3.6	5.0	6.1	4.7	5.0	1.0	-3	1.3	.3	2.9	2.0	2.0
	IV	0		2.3	7	6	.4	0	0_	0	- 3	0	2.6
		3.9	7.1	9.0	5.4	3.2	1.7	.3	2.6	.6	5.2	4.0 0	0
	l	0	. 4	0	0	0	0	0	0	2.7	3.5	.7	3.5
SE	II III	5.6 3.6	4.3	2.6 15.5	3.3 19.7	2.2 5.8	2.0 4.0	1.6	1.6	2.0	2.6	3.7	2.6
OE,	IV	0.7	1.8	4.5	3.3	2.0	0	1.3	0	.3	0	0	0
,		9.9	17.5	22.6	26.3	10.0	6.0	3.2	2.6	5.3	6.1	4.4	6.1
	Ī	0.3	0	0	0	0	0.0	0	1 0	0	0	0	0
, , <u>,</u>	Î	2.3	.7	. 3	1,0	1.0	1.3	1.6	.3	.3	1.3	.7	3.5
SSE	111	1.6	5.7	9.7	13.7	5.5	2.3	1.0	2.0	1.7	1.6	1.3	7
)	IV	1.0	1.1	1.3	3.0	.6	.4	Ò	0	0	1.0	0	0
		5.2	7.5	11.3	17.7	7.1	4.0	2.6	2,3	2.0	3.9	2.0	4.2
	Ī	0	0	0	0	0	Õ	Ō	0	0	0	0	0
	II	2.3	1.8	2.3	2.4	1.3	1.3	.6	1.0	2.3	3.2	1.3	1.0
S	III	2.0	4.0	12.0	7.7	9.7	4.4	2.6	1.3	2.0	1.3	.7	1.3
i	IV	0	0	0	1.3	6	1.0	0 =	6	0	.3	0	0
<u> </u>	<u> </u>	4.3	5.8	14.3	11.4	11.6	$\frac{6.7}{}$	3.2	2.9	4.3	4.8	2.0	2.3

Note RANK I; RANK II; 0-2m/s

RANK I; 0-2m/s RANK II; 3-5m/s RANK III; 6-10m/s

RANK IV; Over 11m/s

Source: (PAGASA, Manila Port Area)

Deta Sheet - Occurence Frequency of Maximum Wind Speed and Wind Direction (2 of 2) (1971-1978, 1982-1983)

	MONTE	ILY OC	CURREN	CE FRE	QUENCY	OF MA	XIMUM 1	NIND SI	PEED I	PERCI	ENTAGE:	S	
DIRECTION	RANK	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	ИОЛ	DEC
	ī	0	0	Ō	0	0	0	0	0	0	0	0	0
	11	0	.7	1.0	.7	.3	.7	.6	1.0	1.0	.6	.3	6
SSW	111	0.7	.4	6	.7	1.6	1.3	1.6	1.0	3.3	1.0	3]	0
	ΙΛ	0	0	0	.3	.6	0_	.6	.3	1.7	1.3	0	0
		0.7	1.1	1.6	1.7	2.5	2.0	2.8	2.3	6.0	2.9	.6	.6
1 .	I	0	0	0	0	. 3	0	0	0	0	.6	0	0
	11	4.9	5.0	3.0	2.0	3.5	3.0	3.5	2.6	4.7	3.5	9.3	7.4
SW	111	2.0	3.0	4.5	5.3	9.4	12.0	6.8	14.3	9.3	3.9	1.4	3.9
	IV	0	0	0_	.7	3.9	4.7	4.2	5.2	5.0	1.0	0	0
, .		6.9	8.0	7.5	8.0	17.1	19.7	14.5	22,1	19.0	9.0	10.7	11.3
	I	0	0	0	0	0	0	0	0	0	.3	0	. 0
	II	2.3	1.1	.3	.7	.6	1.0	2.2	1.3	1.0	1.6	3.0	2.3
พรพ	111	1.0	1.4	3.5	3.3	6.1	14.7	10.6	8.1	7.7	4.2	0	0
	17	0	00	_ 0	.3	2.6	2.7	9.4	8.5	2.0	1.6	0	0
		3.3.	2.5	3.8	4.3	9.3	18.4	22.2	17.9	10.7	7.7	3.0	2.3
	I	0	0	0	0	0	0	0	0	0	- 3	0	.3
	11	10.1	3.6	3.5	2.7	3.2	2.0	6.8	2.9	7.0	8.7	6.0	4.8
พ	III	3.6	3.6	2.3	5.7	15.5	16.0	13.2	16.0	15.3	5.5	4.0	1.0
	VI	0	0	3	1.3	2.0	9.0	13.8	12.6	3.4	3.2	1.3	0
		13.7	7.2	6.1	9.7	20.7	27.0	33.8	31.5	25.7	17.7	11.3	6.1
-	I	0.3	0	0	0	.3	0	0	0	0:	0	0	.3
	II	3.9	4.6	1.3	0	2.0	2.3	2.0	.3	4.7	4.5	1.0	2.9
www	III	0.7	.4	.6	0	2.0	1.0	.6	2.3	2.0	1.3	3	1.3
	V	0	0	0	1.0	.3	7	1.0	.6	.3	0 6	. 4	-0-
		4.9	5.0	1.9	1.0	4.6	4.0	3.6	3.2	7.0	5.8 0	$\frac{1.7}{0}$	4.5
	I	0	0	0	0		.3	0	i				4.5
	11	5.2	4.0	.3	.7	.3	2.4	2.0	1.0	2.7	5.5	5.7	
NW	III	1.6	4.0	1.0	1.0	1.6	1.3	,6	2.0	1.7	3.5	5.0	2.0
	11	6.8	0	.6	$\frac{0}{1.7}$	1.9	4,4	2.6	3		9.3	11.0	6.5
		0.0	$\frac{8.0}{0}$	1.9		0	0	0	3.3	5.0	3.3	0	0.2
	I II	2.0	. 4	-	0	.3	0	.6	3	.7	1.3	.7	o
พทห	111	0.3	0 4	0.3	0	0 3	o	.3	0	.3	3	1.0	0
TATAKA	IA	0.5	0	Ö	Ó	0	0	0.3	0	0.3	,	0	.7
	- - 1 V	2.3	.4	.3	-0	- 3	0	.9	-3	1.0	1.6	$\left \frac{1.7}{1.7} \right $	-:7
					- 0		<u> </u>	 	<u></u>		├ ─ैं ~	 '-	
OBSERVATIO NUMBER	ห	306	281	310	300	310	299	310	308	300	310	300	310

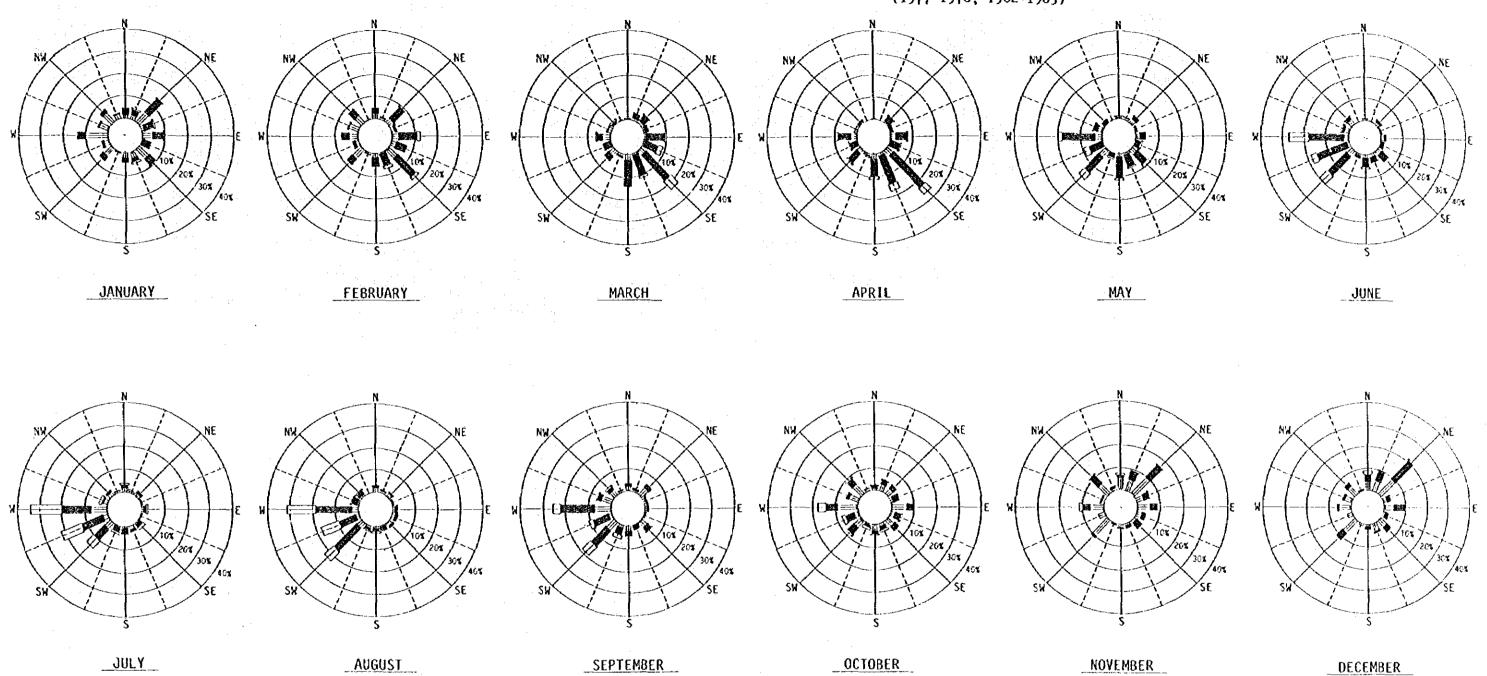
Note RANK 0-2m/sI;

RANK II;

3-5m/s 6-10m/s RANK III; RANK IV; Over 11m/s

Source: (PACASA, Manila Port Area)

Appendix 3.1.13 Occurrence Frequency of Maximum Wind Speed and Wind Direction (1977-1978, 1982-1983)



Source: (PAGASA, Manila Port Area)

Appendix 3.1.14 Typhoon List (1 of 2)

Typhoon List (2 of 2)

		1						
-	. !		Atmospheric	Pressure (mb)		Man-Pre.	Directly	Selected
	င့် နှ	arnw .	်ဂိုရို	Min-Pre. of typ.	Pre. at LUZON I.	(A.8.C)	Over, Manila Bay or not	Typhoo:.
·	E	? 2	ი -	686	388	<	Yes	
	S	-		980	388	υ	2	
	82		Ŧ .	960	980	<	Ŷ	
	v	0		305	388	U	ş	
	27		٠.	920	960	v	No.	0
	24	Ï		975	380	<	Š	l
	S		_	340	186	~	2	
	=======================================			970	985	<	Ş	
	'n			940	888	U	Ş	
_	ţ		n	335	970	<	ž	C
	ن.	0		970	366	<	, CO)
	61		П	920	955.	8	7.63	0
	7			965	388	4	No.)
	=	Q		985	1000	ສ	Yes	
	23			994	394	U	2	
	О.		$\overline{\mathbb{D}}$	916	950	53	2	O
	75		<u> </u>	925	976	2	2	C
	49			975	366	<	Yes)
	-	ρ		985	905	<	Ş	
•	92			905	970	82	2	0
-	<i>∞</i>			985	086	υ	Š	
	77			096	096	υ	ş	0
	<u></u>			950	990	<	₹)
	62	D		365	980	20	Yes	
	<u>*</u>			975	.866	<	o N	
_	,			•	•	•	•	

Minimum pressure was occurred.

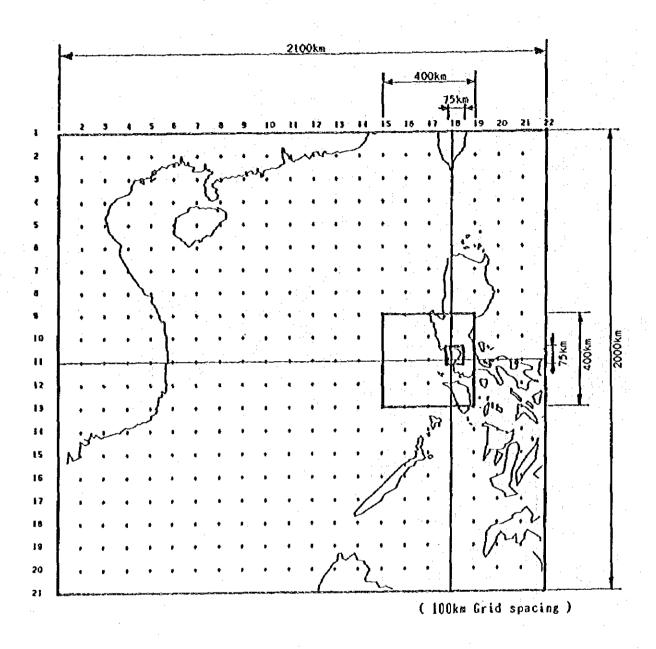
A: after the typhoon passed LUZON Is.

B: before the typhoon passed LUZON Is.

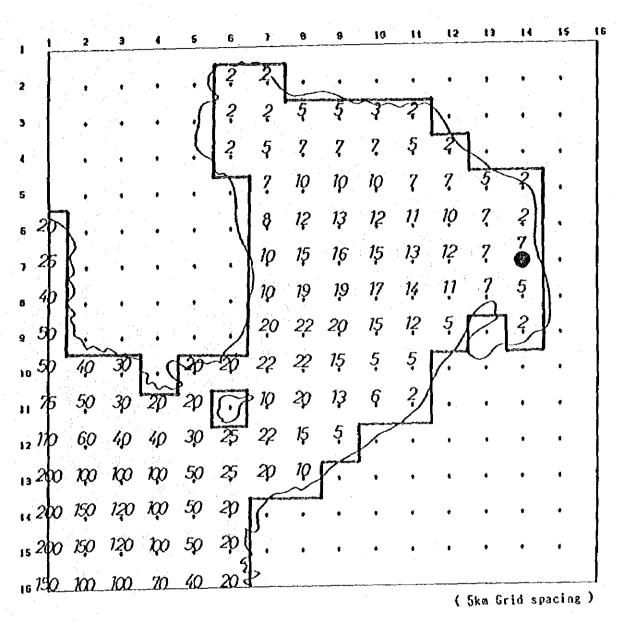
C: while the typhoon passed over LUZON Is.

_	·																																			
	Selected																												0			O	O			
	Directly	Over Manila Bay	or not	:	•	%¢	200	70¢	No	Š.	No.	ž	γo	Yes	Ş.	8	No.	N _O	No	NO.	Yes	No	₩ 0	No	•	Yes	20	No	Yes			Yes	Yes	Year	No No	No
	Point of Min-Pre.	(A.B.C)			,	2 0	æ	E;	ស	<	<	<	<	ಐ	υ	E	<	<	B	<	<	2	<	33		22	O	2 3	න	•	,	Ų		ပ	<	<
	(чт)	Pre. at			•	8	1000	986	1000	2001	1004	1004	1000	980	980	990	1000	1001	086	998	036	1004	385	066		066	990	900	965	,	,	970	925	975	985	982
	c Pressure	Min-Pre.	3	_		255 255	ន្ត	975	980	1000	1000	1000	066	950	970	940	266	585	930	766	896	997	026	006	•	972	57.4	976	806	•	•	905	016	975	186	365
	Atmospheric	Muleiply by 100		₹ ** **		<u> </u>		<u></u>						U	D			_					ъ			n	 								-	
		No.] :	3 	•	1 -	N V	.: 1	23	9	X	M !:		J.	23	23	77	200	=======================================	1		∞	ន	25	•	~	e .	8	8	•	. •	01	25	==	06 06	8
		Year		١	35	1956	*	٠.		1957	3561	1950	1961			-	1961	1962	:36:	-	1964				1965	1966			1967	1968	1960	1970		1371		

Appendix 3.1.15 Calculation Area for Wave Mindcasting (Large Area)



Apendix 3.1.16 Calculation Grid and Boundary Conditions for Wave Hindcasting (Manila Bay)



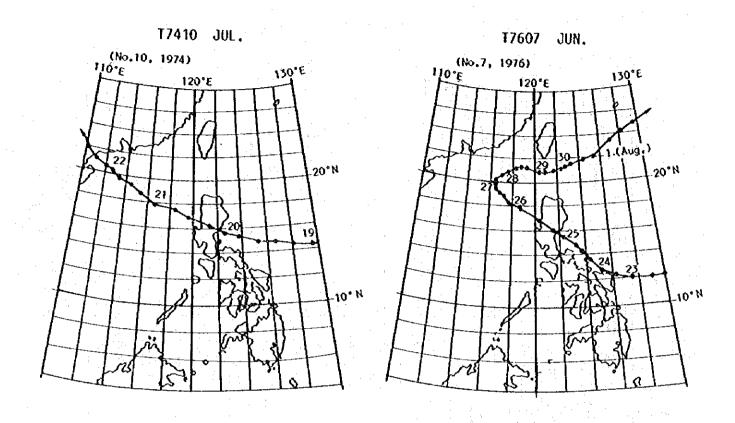
Legend

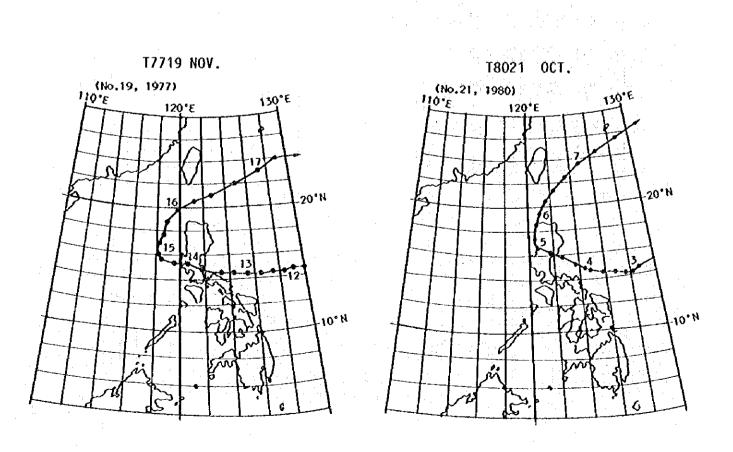
Boundary Line

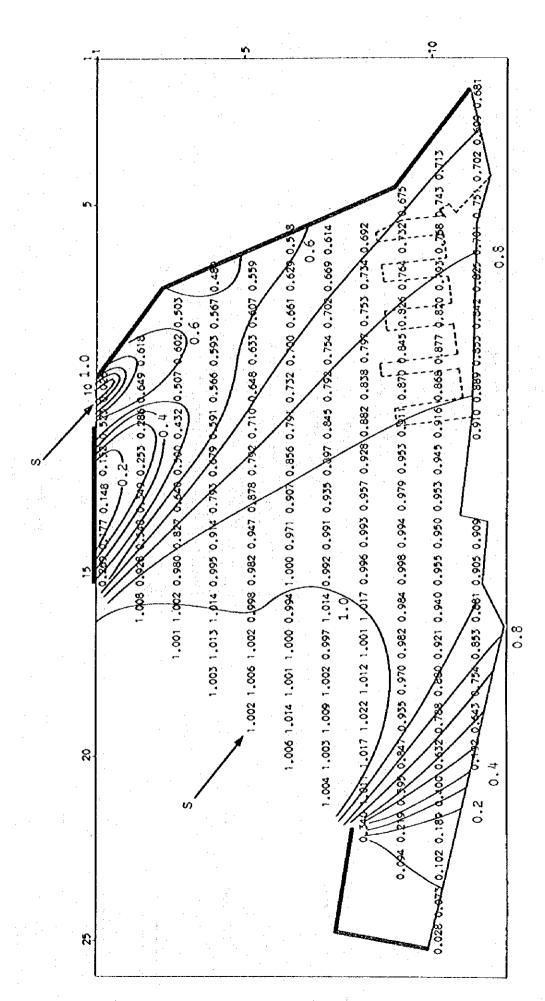
(20) Sea Depth in Meters
Calculated Point

Manila Port

Appendix 3.1.17 Typhoon Course

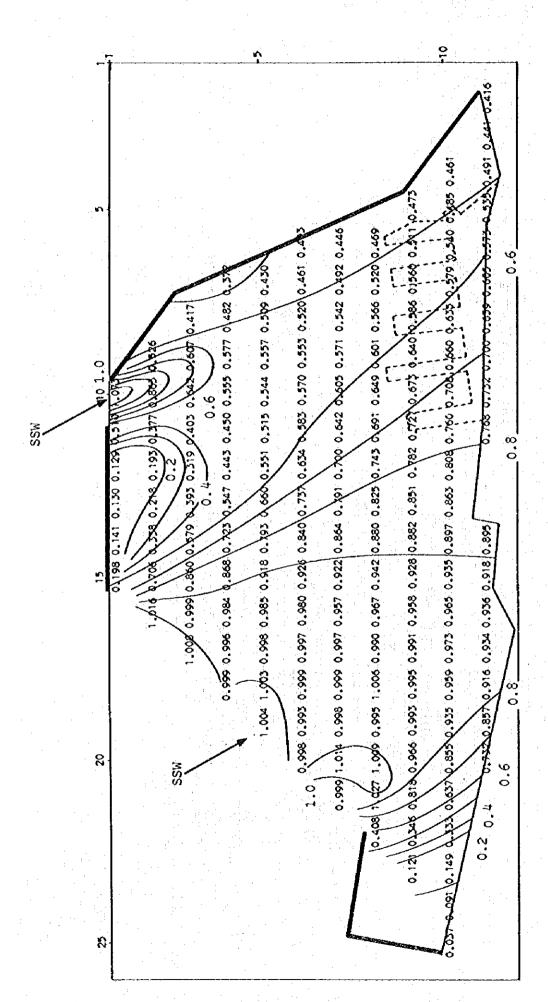






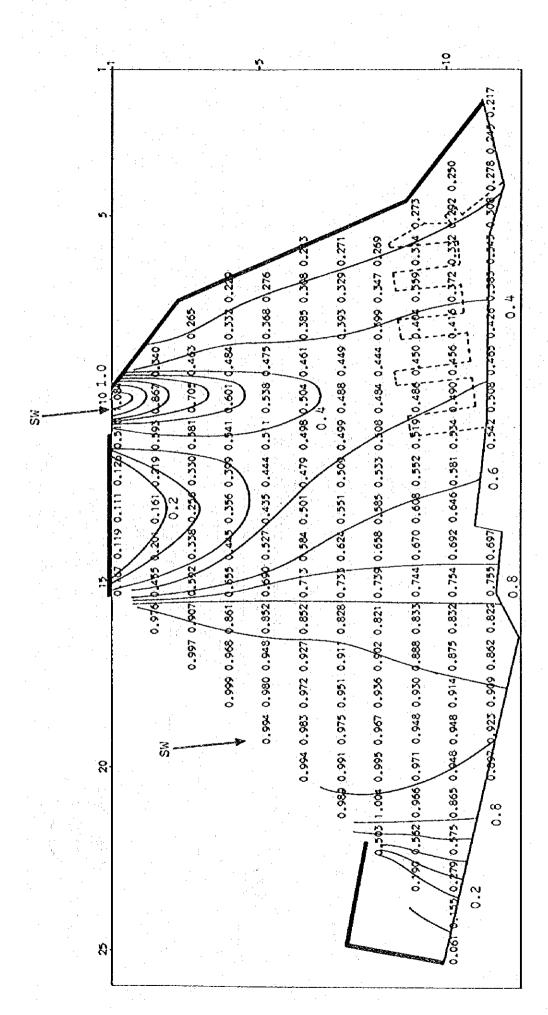


Appendix 3.1.18 Diffraction Coefficient (S direction wind) (1 of 5)



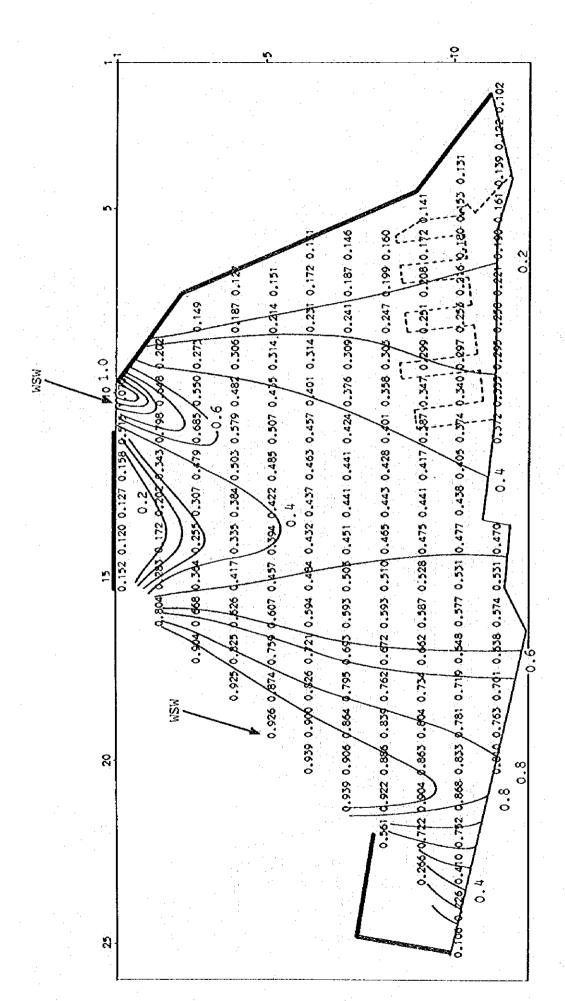
Diffraction Coefficient (SSW direction wind) (2 of 5)





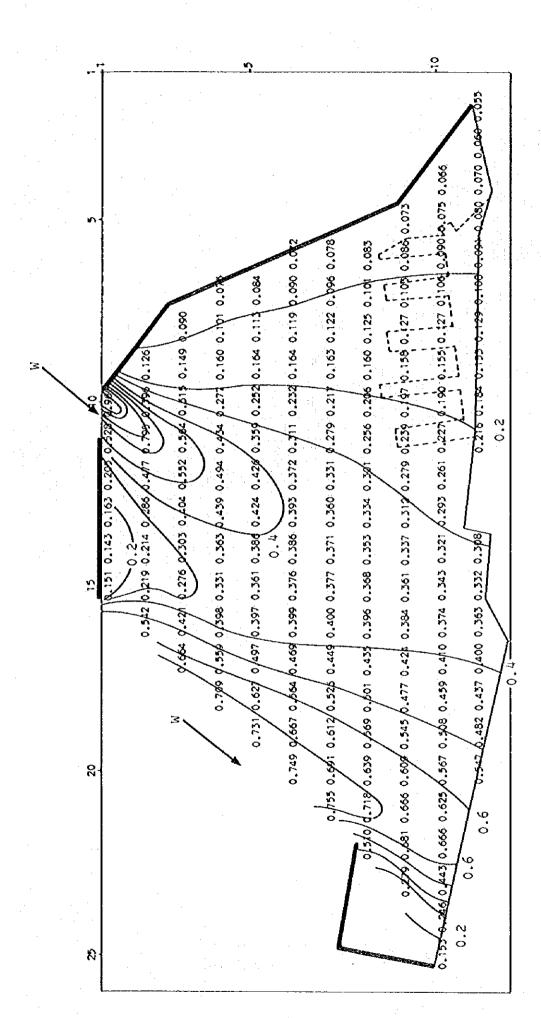
Diffraction Coefficient (SW direction wind) (3 of 5)





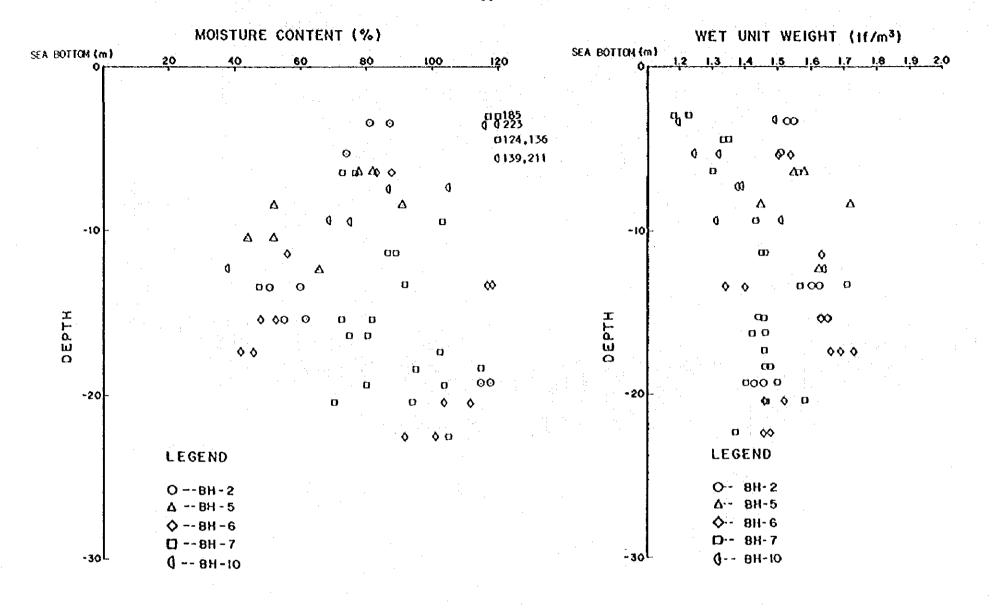


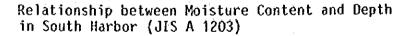
Diffraction Coefficient (WSW direction wind) (4 of 5)

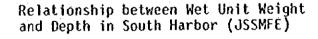


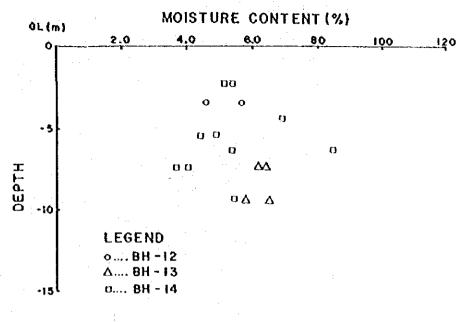


Diffraction Coefficient (W direction wind) (5 of 5)

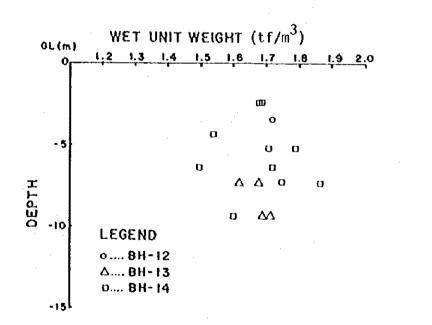






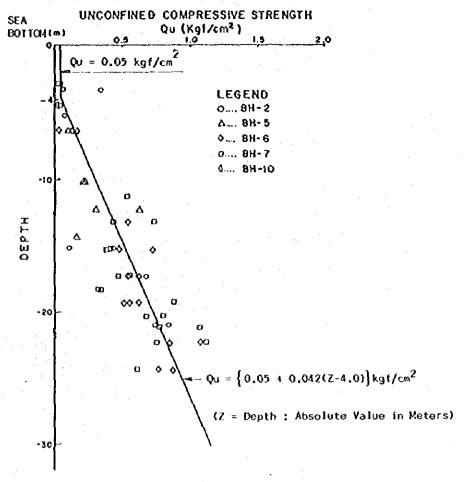


Relationship between Moisture Content and Depth in North Harbor (JIS A 1203)

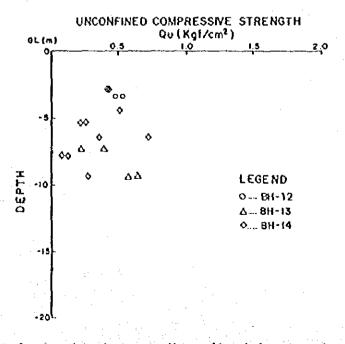


Relationship between Wet Unit Weight and Depth in North Harbor (JSSMFE)

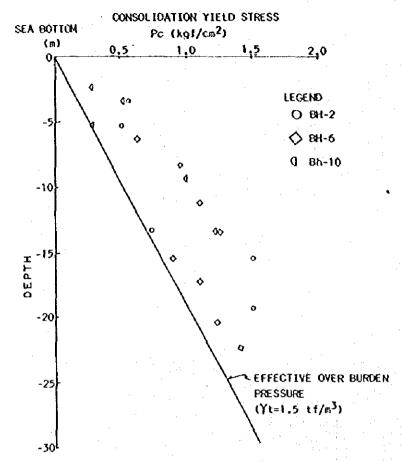
Appendix 3.1.20 Shear Characteristics of Soil in Investigation Area



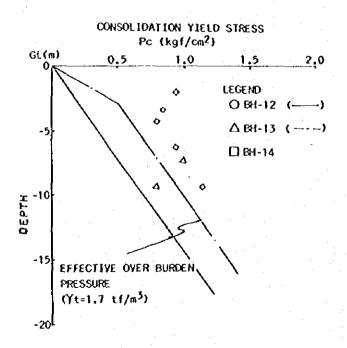
Relationship between Unconfined Compressive Strength and Depth in South Harbor (JIS A 1216)



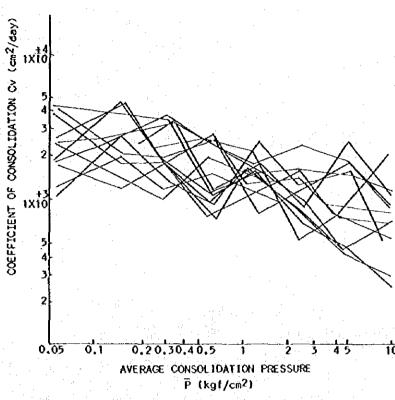
Relationship between Unconfined Compressive Strength and Depth in North Harbor (JIS A 1216)



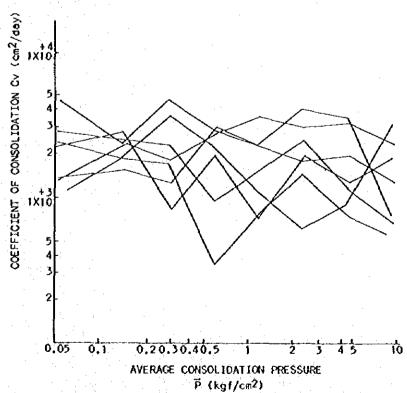
Relationship between Consolidation Yield Stress and Depth in South Harbor (JIS A 1217)



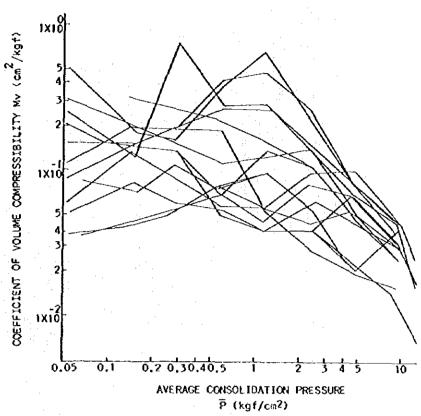
Relationship between Consolidation Yield Stress and Depth in North Harbor (JIS A 1217)



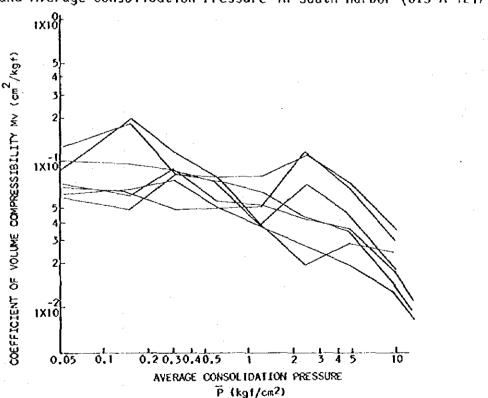
Relationship between Coefficient of Consolidation and Average Consolidation Pressure in South Harbor (JIS A 1217)



Relationship between Coefficient of Consolidation and Average Consolidation Pressure in North Harbor (JIS A 1217)



Relationship between Coefficient of Volume Compressibility and Average Consolidation Pressure in South Harbor (JIS A 1217)



Relationship between Coefficient of Volume Compressibility and Average Consolidation Pressure in North Harbor (JIS A 1217)

Appendix 3.1.22 Plate Bearing Test

Plate bearing tests were conducted in North and South Harbors in conformity with JIS A 1215. The settlement at 0.125 cm for the coefficient of bearing capacity (K-value) was used on concrete paved roads. The results of the plate bearing tests are shown in Table A.

Table A Results of Plate Bearing Tests

Test Pit	Depth	к ,	Settle- ment	Density	(tſ/cm ³)	Moisture Content	Remarks
No. PBT	(m)	(kgf/cm ³)	(em)	het	Dry	(%)	nem or no
1	0.63	10.4	0.125	1.44	1.04	32.4	South Harbor Road
2	0.80	4.9	- do -	1.55	1.05	32.3	South Harbor Container Yard (CY-2)
3	0.45	8.6	- do -	1.79	1.40	28.1	- do -
4	0.55	12.8	- do -	1.73	1.30	33.0	- do -
5	1.15	6.4	- do -	1.83	1.39	31.4	South Harbor Road
6	0.45	6.2	- do -	1.71	1.29	30.9	South Harbor Container Yard (CY-1)
7	0.95	6.3	- do -	1.81	1.42	42.9	- do -
8	0.70	5.6	- do -	1.75	1.31	33.2	- do -
9	0.65	5.6	- do -	1.84	1.39	32.6	South Harbor Road
10	0.85	27.6	- do -	1.81	1.58	14.4	North Harbor Road
11	0.75	37.6	- do -	1.81	1.30	37.6	- do -
12	0.85	26.3	- do -	2.09	1.65	26.3	- do -

On the other hand, the design coefficient of bearing capacity is calculated as follows.

The d-values are shown below.

Table B d-values

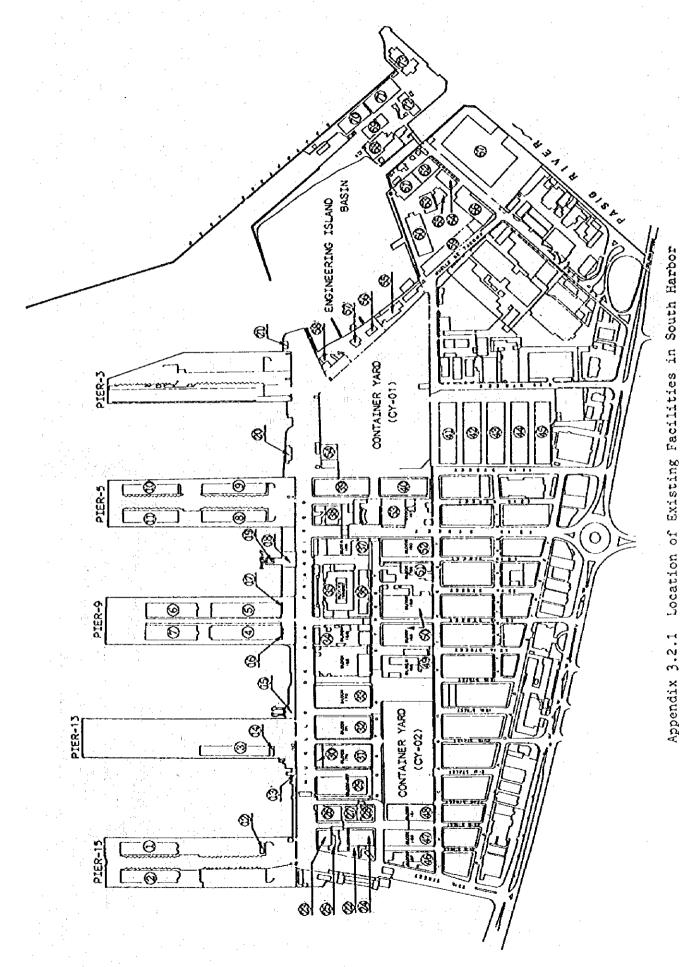
Test Number	3	4	5	6	7	8	9	10 above
d	1.91	2.24	2.48	2.67	2.84	2.96	3.08	3.18

CBR tests were performed to obtain Modified K-values for the cohesive subgrade soils. Two CBR tests were carried out in South Harbor. The results of the CBR tests are shown in Table C. The modified K-values are obtained using the following formula.

The design coefficient of bearing capacity is presented in Section 3.1.5.4, Table 3.1.9.

Table C Results of CBR Tests

Test Pit	ĆBP	(%)	Coefficient of	
No. PBT	Natural	Soaked	Modification	Area
			(soaked/natural)	
8	2.28	2.25	0.99	Container Yard (CY-1)
11	1.48	1.35	0.91	North Harbor Road



-41-

Appendix 3.2.2 List of Sheds and Buildings on Piers and Slips

										
Remarks									·	
						· 				
Condition of Facility	Ω1		Ø	Ø	m	m	w	æ	n	w
Cond of F				. 19			٠			
Type of Structure	One story concrete framed building with hollow-block walls, corrugated	aluminum sheet, roofing on steel frame, plain cement finish concrete floor, and sliding steel plate doors.	· op ·	, ob ,	1. 00 1.	op .	· op ·	9	, og ,	000
Area (m ²)	2,875 One with	34 C	2,875	3,102.60	4,056	- တို့	3,350.88	9	3,400	3,400
Application	Transit Shed N		Transit Shed M	Transit Shed E	Transit Shed A	Transit Shed B	Transit Shed C	Transit Shed D	Transit Shed I	Transit shed J
Location	Pier 15		1 0 0	Pier 13	Pier 9	9 9	, 0	- QD -	Pier 5	ر 00 ا
No.			Ŋ	<u>ω</u>	-1	<u>ιν</u>	φ	~	ω	σ,

Condition of Facility Remarks	O	ni.	an a	. St	U	ith A Old Building	* of			4	77	· · ·		¥		
Type of Structure	One story concrete framed building	with hollow-block walls, corrugated	frame, plain cement finish concrete		op ,	One story timber framed building with	concrete hollow-block wall, corruga-	ted iron sheet roofing on timber	frame.	One story timber framed building.	with hollow-block walls, corrugated	galvanized iron sheet roofing on	timber frame.		columns, sidings and flooring,	corrugated G.I. sheet roofing on
Area (m ²)	2,932.50		an a		2,932.50	192				 42.3				 12.0		
Application	Transit Shed K				Transit Shed L	Office Building								Terminal Operation	Office	
Location	Pier 5			and an instrument of	- op -	 Pier 15		-		 Slip 14		•		Pier 13		
No.	95		:		H	 12				13				₹		

	. **															
Remarks				Only use the	first floor.			op •								
Condition of Facility	A			Ω				ល	∢							
Type of Structure	8 m wide and 12 m long constructed	of reinforced concrete tubular piles, steel and concrete frame and steel		Three story concrete framed building	with hollow-block walls, corrugated aluminum sheet roofing on timber	frame.		9	Two story concrete framed structure	with hollow-block walls, corrugated	iron sheet roofing on timber frame,	plywood ceiling. Two one story	concrete framed structures on its	left and right wings with hollow-	block walls and iron sheet roofing	
Area (m ²)	* *		4 , -	790.50				1,255.50	3,770							
Application	Ro-Ro Ramp Landing			Office Building				ا وي ـ	Passenger Terminal	Warehouse and Office						
Location	S11p 10-12			Pier 9				၊ တို	Slip 8,	Pier 7.	Slip 6	14. 14.				
No.	15			9			-	11	∞							

No.	Location	ion	Application	Area (m ²)	Type of Structure	Condition of Facility	Remarks
6,1	Pier	7	Bureau of Customs,	368	Two story concrete framed building	W	
			Fire Boat Station		with hollow-block walls, RC slab		
					roofing, vinyl tile finish, concrete		
		~~~			second floor and unglazed tile		
·					finish concrete ground floor.		
-							•
20	Slip	==	Security and	363	1 GO 1	4	
			Dental Office				
21	Slip	0	Open Shed	110.7	One story steel framed structure	Þ	
					with corrugated iron sheet roofing		
	·				on steel frame.		

Appendix 3.2.3 List of Warehouses and Buildings Behind Pier

ſ			·····		**					
Remarks										
Condition of Facility	A			∢.			∢,		ω	
Type of Structure	Two story timber framed building	with concrete hollow blocks, ground floor walling and wooden second	floor siding on wooden frame.	One story concrete bungalow with	concrete hollow-block walls, corrugated galvanized iron sheet on timber	frame, plain cement finish concrete floor.	One story timber frame with concrete hollow-block walls, corrugated	galvanized iron sheet roofing on timber frame.	158.80 One story timber frame with concrete hollow-block walls, corrugated galvanized iron roofing on timber	frame.
Area (m ² ) (Land)	1,932			360.0			346.80		158.80	
Application	PPA, Engineering	Building		National Customs	Police		Customs Motorpool		Police Quarters	
Location	Block 183			- op -			၊ တိ		1 00 1	
Š.	52			23	, v i		4		25	

ty Remarks	Burned in 1975												-						:	
Condition of Facility	¥						<del></del>	4			A					· .	A			
Type of Structure	Five story concrete framed building	with reinforced concrete walls,	corrugated galvanized fron sheet	roofing on timber frame, reinforced	concrete slab on second, third and	fourth floors.		One story steel frame building with	concrete hollow blocks and corrugated	iron sheet roofing on steel frame.	Two story concrete framed building	with concrete walls, corrugated	iron sheet roofing on timber frame,	reinforced concrete slab second	floor.		One story steel framed building	with cyclone wire and concrete	hollow-block walls, aluminum sheet	
Area (m ² ) (Land)	11,875	(3,901)						1,120			1,920	-					2,804	(5,479)		_
Application	Travel Agency	(Marshman)	(Building)					Warehouse			Rental Office						Motor Pool		-	
Location	Block 182							t op			 - ဝမ္မ						Block 177			
No.	26							27	:		28		•				20			

	Application	Area (m ² ) (Land)	Type of Structure	Condition of Facility	Remarks
	PMU Office		Four story reinforced concrete building	∢	
	Gourt and Office	6,412 (5,479)	Reinforced concrete walls, corrugated iron shhet roofing on steel frame.	٧	Previously Warehouse
Block 171	Warehouse 11	5,600	One story steel frame building with corrugated aluminum sheet and hollow-	₹	
Block 170	Warehouse 1	5,600 (5,479)		٧	
Block 164	Quarantine Service	1,279	Two story concrete framed building with concrete walls and partitions cormusated inco sheet moding on	<b>∢</b>	
			timber frame, plain cement finish concrete ground floor, T & G finish concrete second floor.		

83	e tra	6)			ture	ture	·		<u></u>								
Remarks	Old, massive	ernaonra s			New Structure	New Structure			Not usable								
Condition of Facility	¥		∢		⋖	4		1	ນ 				 4	Æ		:	
Type of Structure	Four story concrete frame building		Two story concrete frame building		Two story concrete frame building	One story reinforced concrete	building		One story concrete steel framed	building, with concrete hollow-	block walls, corrugated iron sheet	roofing on steel frame.	٠ ١	One story steel framed building	with corrugated aluminum sheets and	hollow-block walls, corrugated alu-	minum sheet on steel frame.
Area (m ² ) (Land)	28,476	10.77						1	3,528			÷	3,528	4, 420	(40,050)		
Application	Bureau of Customs		Federation of	Customs Brokers	Computer Center	Metroport Service	Office		Warehouse 2				Warehouse 3	Warehouse 6			
Location	Block 156,	757	- ဝဉ် -		Block 149				Block 141				 Block 142				
Š.	35	<del></del>	36	· · · · · · · · · · · · · · · · · · ·	37	 8	·		33				 3	47	·		

ss							e Te	e, con-	verted from ware-	factory	<del></del>					 <del></del>	
Remarks					٠	٠	Large scale	structure, con-	verted f	house to factory				Very old		notused	-
Condition of Facility		O _g					മ്പ				-			O	,	_m	
Type of Structure		One story concrete steel framed	building with hollow-block walls,	corrugated iron sheet roofing on	timber frame.		Three story concrete framed building	with reinforced concrete walls and	partitions, corrugated iron sheet on	steel frame, plain cement finish	concrete ground floor, reinforced	concrete second and third floors.				Three story R.C. framed building with	hollow-block walls, roofing on timber
Area (m ² ) (Land)		200	(5,002)				29,232	(10,005)						(5,002)		9.560	(3,904)
Application		Red Cross, Warehouse					Bureau of Frinting		-			-		MPWH, Equipment	Service	Office	
Location		Block 166	-				Block 163,	158						Block 155		Block 150	<del>-</del>
No.		\$					S		<del></del>	<del>_</del>			-	겂		 었	

the property of the property o	4,012 (4,410)		ADTITUDE TO	Remarks
Training Center (				
t.		INO Story concrete iramed building	∢	
Motor Pool and		with hollow blocks, corrugated iron		
Motor Pool and		sheet roofing on timber frame, plain		
Motor Pool and		cement finish on ground floor, vinyl		
Motor Pool and		tile finish concrete second floor.		
	:	One story steel framed building with	O	
Machine shop		cyclone wire and concrete bollow-		
		block walls, corrugated iron sheet		
		roofing on timber frame.		

Appendix 3.2.4 List of Warehouses and Buildings around Engineering Basin

Application	Area (m ² )	Type of Structure	of Facility	Remarks
Office and Motor		Two story reinforced concrete office	v	Not used
		and one story motor pool, corrugated		
		galvanized iron sheet roofing sup- ported by steel frame.		
Customs Police	1	One story wooden structure	മ	
Storage	1	Semi-arc, corrugated inon shect roofing on wooden frame.	O	Not used
Bureau of Custom, Office		Two story reinforced concrete office building.	Ф	
NMC Office	. 1	One story, partially two story, R.C. walls, galvanized iron sheet on timber frame.	∢	
Warehouse 28	2.550	One story steel frame structure with galvanized iron sheet wall and roof.	O	Severely worn

Remarks	Newly rebuilt	e.r.e	Severely worn				E				, To	severely worn	ಭ
Rem	Newly	stracture	Severe			Usable	but worn				Not used,	severe	Not used
Condition of Facility	₩		O	ω	ω	മ		M	Ą		υ		٥
ure		watt and root.				illy three		teel frame structure with iron sheet wall and roof.	ınized iron		with galva-	and roof.	
of Structure		ron saege	် မှ ၂	រ ល ស រ	် တွ (	C., partially	78.	story steel frame anized iron sheet	frame with galvanized	and roof.	oden frame	sheet wall	000
Type	One story steel	Sarvanized iron sueec wair				43	story building	One story stegslvanized in	Steel frame v	sheet wall ar	One story wooden frame with galva-	nized iron sh	
Area (m ² )		3,300		066	066	!		2,800	11,040		1		1
Application	3A.	-	1	<b>=1</b>	w			E E			Suilding		ě
App 11	Warebouse		<del>ပို့</del> ၂	Warehouse	Warehouse	NFA Office		Warehouse	Warehouse		Materials Building		E.I.S. Office
Location	Along Mulle Warehouse	de lacoma	- db	- op	, op ,	- 00 -		- op -	Along Pasig	River	BASECO		, 8
No.	16		8	8	<b>₹</b>	<b>ξ</b>		99	67		89		69

Application A	Area (m ² )	Type of Structure	of Facility	Remarks	
Plant and Angle Shop	One si	One story steel frame, with galva- nized iron sheet wall and roof.	m	Not used	· · · · · · · · · · · · · · · · · · ·
Machine Shop	one st	One story wooden frame, with galva- nized iron sheet wall and roof.	υ	   0   7	
	one s	One story steel frame, with galva- nized iron sheet wall and roof.	O	। १	
·	Two	Two story reinforced concrete building.	<b>A</b>		

### Appendix 3.2.5 Navigation Aids

# A. Existing Navigational Situation at South Harbor Basin

- 1. South Harbor and its navigation environs encompass the main study area of the South Port District (Piers 3,5,9,13 and 15), the adjacent areas of the North Port District (piers 2,4,6,8,10,12,14, and 16) and the Manila International Container Terminal, the latter at a location nearly equidistant from the two port districts.
- 2. The South Harbor basin is normally protected from inclement weather and rough sea conditions by two breakwaters, West and South, with lengths of 2,300 and 880 meters respectively.

### B. Navigational Problems Identified

Per a discussion with Mr. Gregorio Gayac, commandant of CG-10, Philippine Coast Guard, the following navigational problems at South Harbor and adjacent areas have been noted:

- 1. Absence of light and weak intensity lights at the mooring buoys and lighthouses positioned at the quarantine and anchorage areas, mainly due to the stealing of expensive lighthouse batteries by fishermen.
- Inadequate lighthouses and mooring buoys especially in shallow and risky areas such as the entrance to the Pasig River and the barge pool basin alongside West Breakwater, where mancuvering is very difficult.
- 3. No permanent berthing place for many small craft plying the South Harbor area. Thus, berthing is variable and poses some obstruction to navigation.
- 4. A major problem, however, is the presence of numerous fishing pens off the anchorage areas which pose dangers and hazards to navigation.

 The entrance or channel to the South Harbor basin is quite narrow, thus affecting the maneuverability of vessels. However, the water depth is sufficient.

### C. PCG Recommendations

The following recommendations from PCG have been spelled out by Mr. Gayac:

- 1. Installation of stronger intensity lights for the mooring buoys and lighthouses to assure visibility from far distances.
- 2. Possible use of wave activated buoys to prevent stealing.
- 3. Sufficient quantities of filling materials are needed at the breakwater to prevent the collapse of the lighthouse structure.
- 4. Installation of additional lighthouses in shallow, dangerous and risky areas.
- 5. Extension of South Breakwater by 100 meters.
- 6. Provision of a water basin for small craft either between Pier 3 and 5 or between Pier 3 and the area adjacent to the Engineering Island.
- Restricting Pasig River navigation to smaller vessels with lower drafts.
- 8. Installation of additional mooring buoys from West and South Breakwaters towards Rizal Park.
- 9. Removal of the barge pool area since it is hardly utilized and navigation there is very dangerous.
- 10. Removal of fishing pens off the anchorage areas. Presently, the PCG is starting some demolition of the fishpen structures.

11. Possible moving of South Breakwater from its existing location for increased maneuverability.

Appendix 3.2.6 List of Navigation Aids

Headquarters Philippine Coast Guard 25th Street, Port Area Manila

FIRST COAST GUARD DISTRICT

	REMARKS	Broken Fuel Line		Defective	Generator	Manila Bay Area		Manila Bay Area		Manila Bay Area			Defective Battery		Manila Bay Area		Manila Bay Area		Manila Bay Area		Manila Bay Area		Manila Bay Area		-			
STATUS	NOT	×		×					:				×	-														
S	OPTC					·																					· ·	
	POWER SOURCE	3 DEG PHI 220 VAC		1 DEC PHI		3 DEG PHI		Local Elec	10A lead Batt	10 Solar Panel	24 SMIL Batt		10 ALCAD 4 Solar		10 ALCAD 6 Solar			6 Solar	6 Solar 10 A lead		10 ALCAD Batt		6 SMIL Batt	1 HAMC M/C	2 SMC BAIT		2 Willard 6V	
	MANNING	₹.		3		7		2		none	2		none		none		none		none		none		none		7		7	
	CHARACTERISTICS	Grp Fl 2W ev	10 secs	Grp Fl 4W ev	15 secs	Grp Fl 4W ev	25 secs	F1 R ev 5 secs		FI Wev 5 secs	Crp Fl 3 Wev	5 secs	Fl R ev 5 secs		FI C ev 5 secs		Fl 2R ev 5 secs		Fl. G ev 5 secs		Gry Fl R ev 5 secs		Fl 3 C ev 10 secs		FI R ev 5 secs		Fl R ev 5 secs	
	No. LIGHT STATION/LOCATION	1. LS CABRA,	Lubang, Occ Mindoro	2. LS CAPONES,	San Antonio, Zamoales	3. LS CORRECIDOR,	Cavite	4. LS CUSTOM TOWER,	Manila	5. LS EL ERAJIE,	6. LS HERMAN MAYOR,	Sta. Cruz, Zambales	7. LS LA MONJA,	Mariveles, Battan	8. LS Mla Jetty Nr 1,	Manila	9. LS Mla. Jetty Nr 2,	Manila	10. LS Mla. Jetty Nr. 3	Manila	11. LS Mla. Jetty Nr 4,	Manila	12. LS Mla. Jetty Nr 5,	Manila	13. LS MARIVELES,	Bataan	14. LS NAPINDAN,	Taguig Rizal

		·	- -				<b>t</b> -				Ι		T		Γ		ı				r		r		·	
	REMARKS		Manila Bay Area		Manila Bay Area		Manila Bay Area		Manila Bay Area		Manila Bay Area						Manila Bay Area				Manila Bay Area		Manila Bay Area		No Tower Ma.,	bay Area
IUS	NOT OPTG			-:					×		×														×	
STATUS	OPTG																									
	MANNING POWER SOURCE	3 1 DEC ABI 24 SMIL Batt	maintained 6 Willard Batt	V & Solar	9	by Military	maintained Local Elec	by HANC	none 6 Solar 10 A lead		none 1 HANC M/C SMC	Batt	4 3 DEC ABI		municipal Local Elec	maintained	none 2 Batt		1 2 SMG Batt		none 10A lead	4 Solar Panel		4 Solar Panel	none 4 Solar	
LIGHT	CHARACTERISTICS	GRP F1 2 W ev			Fl R ev 5 secs		Alt Fl W&R ev		FIR ev 5 secs		Fl Wev 5 secs		Fl Wev 5 secs		F1 Wev 5 secs		Fl R ev 5 secs		FL R ev 5 secs		FIR ev 5 secs		FIG		다. 단	
	No. LIGHT STATION/LOCATION	15. LS PALUIG,	16. IS PASIG RIVER.		17. LS PTO. AZUL.	Tarnate, Cavite	18. LS SANCLEY PT,	Cavite	19. LS SAN NICOLAS	Rosario, Cavite	20. LS SISIMAN COVE.	Mariveles	21. LS SESTE PT.	Subic, Zambales	22. LS TANAY,	Tanay, Rizal	23. LS TARNATE	Tarnate, Cavite	24. LS TILIK,	Lubang, Occ. Mindoro	25. LS IP CMNL LICHT,	Manila	26. US IP CMNL LIGHT,	Manila	27. LS IP CMU LICHT,	Manila
<b>L</b> .			١.		<b></b>		J		<b>!</b>		<u>.                                    </u>		L		<b></b> .	50-			L		L					

### Appendix 3.2.7 Water and Oil Supply

# Results of the interview with Harbor Systems and Supply Inc. (Pier 8, North Harbor)

Number of barges used in water supply - 2 (300MT and 260 MT)

Water supply demand depends on the frequency of vessel calls and the kind of vessels that call at the port. Usually, water and oil demand concentrates during the peak tourist season. Passenger vessels require more water than cargo vessels.

The company charges for a minimum delivery of 90 tons of water which they bill at thirty-five pesos (P.35.00) to forty pesos (P.40.00) per ton if it is delivered at South Harbor or Anchorage, and at twenty-eight pesos (P.28.00) to thirty pesos (P.30.00) per ton at North Harbor.

The water sources of this company are located at Pier 8 and 2 in North Harbor, and at the foot of Quezon bridge in Quiapo. At North Harbor, the company uses a pump to obtain the volume of water needed to fill the barge, while at Quiapo where the water pressure is high, they rely on gravity to fill up the barge.

The only big problem with the barge transport on the Pasig River is the low clearance which during high tide makes it impossible for barges to pass under the bridge.

## Oil Supply for Vessels

The results of the interview with C.B. NAZAL Trading, Inc. (Navotas, Metro Manila) are as follows:

#### Business:

Oil and petroleum delivery to vessels at South Harbor, Anchorage and North Harbor.

### Number of Barges:

Two (2) compartment barges with total carrying capacity of 220,000 liters and 290,000 liters.

### System:

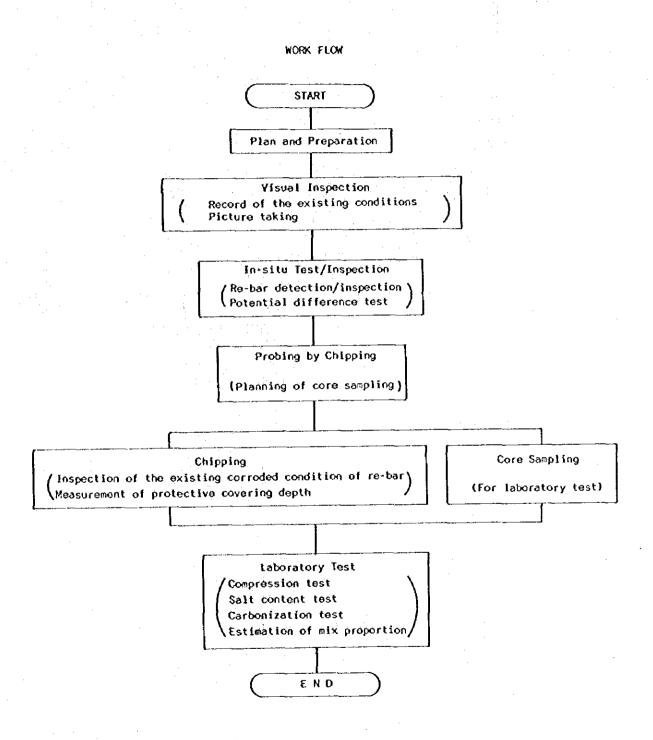
Oil and petroleum products orders are placed in advance to the oil depot (Caltex Philippines). The time of arrival and departure of vessels is also given. The oil company then advises the hauling company (NAZAL). During the stay of the vessel, the hauling company supplies the products using their barges at North Harbor which can be reached by radio. Oil is pumped up by the vessel. NAZAL charges P.O. 55/L for hauling oil and petroleum products.

The problem with this system is also the low clearance of the bridge during high tide.

Factors that can affect demand include varying prices and the quality of the products.

## Appendix 3.3.1 Investigation/Survey Flow

The following is the flow of the Investigation.



## Appendix 3.3.2 Visual Inspection Results

- 1) Figs. A through B (damage degree maps) show the results of inspection for all beams, slabs and piles using the symbols given in Table A.
- 2) Fig. 3.3.1 is based on the damage degree map (Figs. A through E) where symbols are replaced by panels patterned differently based on the degree of damage as specified in Table B.
- 3) Table C and Figs. F through H show the overall results of the visual inspection.
  - Tables D and E and Figs. I and J show further results for slabs and beams to be inspected item by item.
- 4) Table F shows the results of the underwater survey for piles.

Table A Damage Symbols

	SLAB	A
SERIOUSLY DAMAGED	BEAM	
	PILB	•
	SLAB	Δ
SLIGHTLY DAMAGED	BEAM	
	PILE	0

Table B Damage Color Symbols

Item	Symbol	Colored Mapping in Terms of Panels
Pile	0	All the four adjacent panels are deemed to be unreliable or "seriously damaged," though the slabs are structurally sound Red color
:	0,	The degree of damage of the four adjacent panels is decided individually based on the structural conditions of the relevant beams/slabs connected with the pile.
Beam		Panels on both sides of the beam are deemed to be unreliable or "seriously damaged," though the slabs are structurally sound —Red color
		The degree of damage of the two adjacent panels depends on the soundness of the relevant slabs. — Yellow or Red color
Slab	<b>A</b>	The said panel is regarded as "seriously damaged" Red color
÷	Δ	The said panel is regarded as "slightly damaged"Yellow color

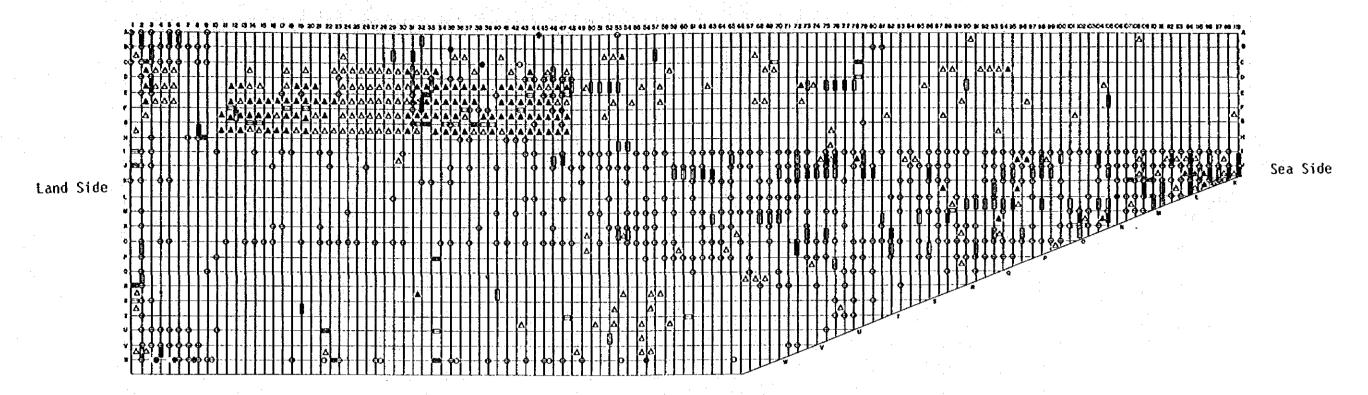


Fig. A Damage Degree Map of Pier 3

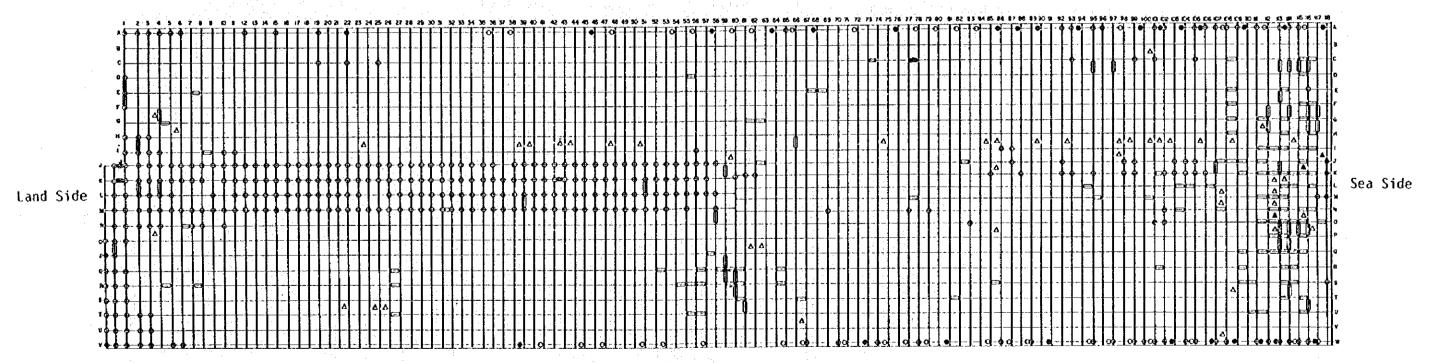


Fig. B Damage Degree Map of Pier 5

LEGEND

	ŞŁAB	<b>A</b>
SERIOUSLY DAMAGED	BEAM	<b>61</b> 0
	PILE	•
	SLAB	Δ
SLIGHTLY DAMAGED	BEAM	
·	PILE	0

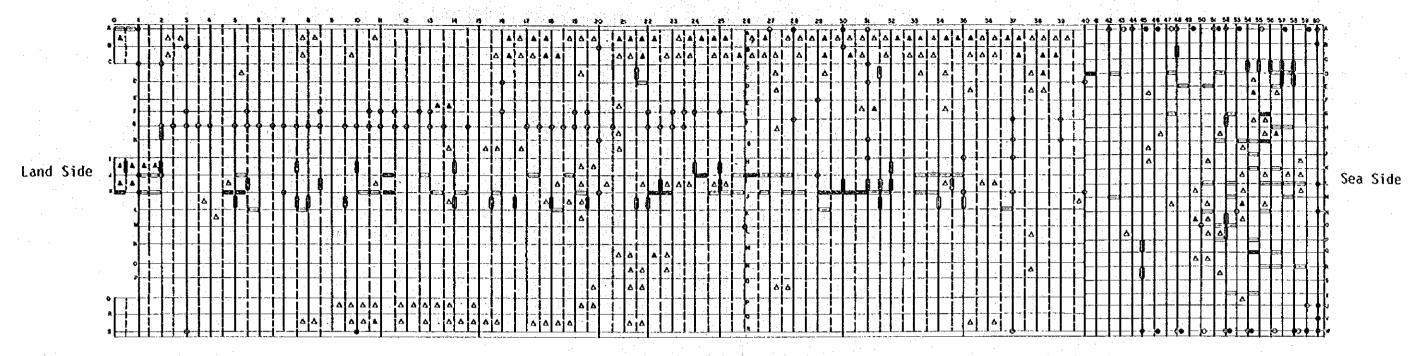


Fig. C Damage Degree Map of Pier 9

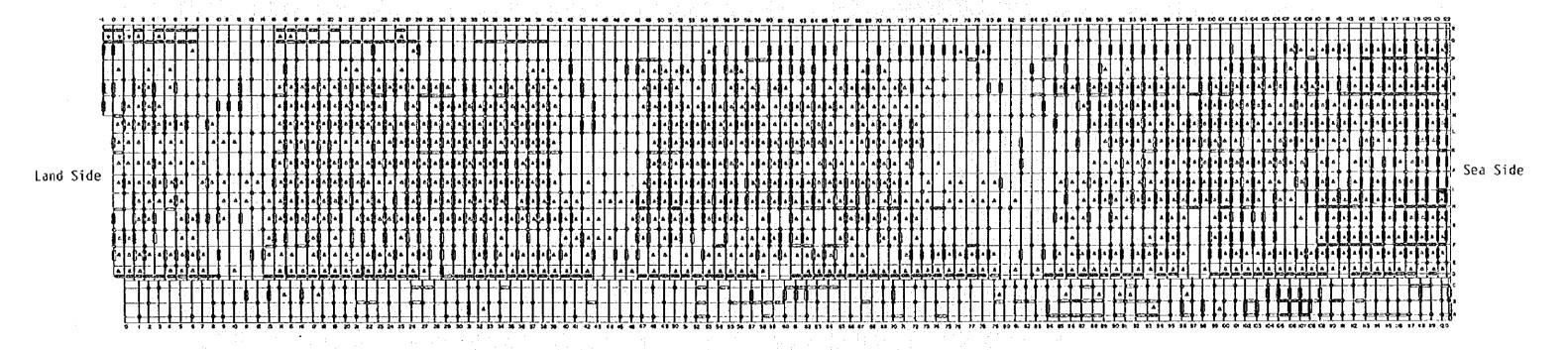


Fig. D Damage Degree Map of Pier 13

## **LEGEND**

	SLAB	A
SERIOUSLY DAMAGED	BEAM	<b>(19</b> )
	PILE	•
	SLAB	Δ
SLISHTLY DAMAGED	BEAM	<b>.</b>
	PILE	0

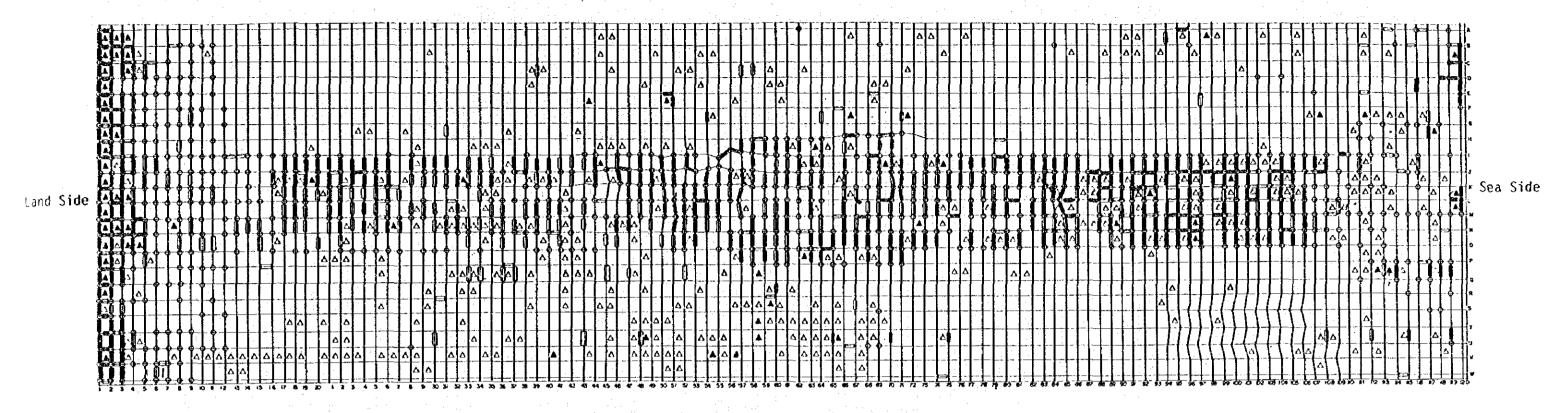


Fig. E Damage Degree Map of Pier 15

## **LEGEND**

	SLAB	<b>A</b>
SERIOUSLY DAMAGED	BEAM	22
	PRE	•
	SLAB	Δ
SLIGHTLY DAMAGED	BEAM	
	PILE	0

Table C Overall Damage Evaluation

	·			,				·		
	Rate	82.0	15.5	2.5	84.2	7.8	8.0	71.7	28.1	0.2
15	al		2,618			5,374			2,827	
	Total	2,147	907	65	4,526	027	428	2,026	794	7
	Rate	0.64	23.7	27.3	63.1	18.9	18.0	0.14	59.0	0
LT.	al		1,964			3,262			2,532	
	Total	962	465	537	2,059	617	586	1,039	1,493	O
	Rate	87.7	6.6	2.4	7.56	3.6	2.0	91.0	6.7	2.3
6	8.1	1.8911		3,548			1,234			
	Total	1,587	180	717	3,394	128	26	1,123	83	28
	Rate	6.79	1.9	0.2	6.96	3.0	0.1	84.3	14.3	1.4
2	al		2,534			5,211			2,756	
	Total	2,481	87	. <b>.</b>	5,047	15 85	9	2,322	39.4	Ω.
	Rate	84.7	7.5	7.8	95.9	2.9	1.2	82.5	16.9	9.0
m	3.1	2,500		5,141			2,657			
	Total	2,117	187	196	4,929	6ħ T	63	2,191	644	17
Pier No.	Symbol	0	$\triangleleft$	×	0	۵	×	0	$\triangleleft$	×
		ν L	⊲¢ α	· v	óa t	ù ∢ ;	E 0	<u>о</u> . н	பங	S

○ : Sound
△ : Slightly Damaged
× : Seriously Damaged

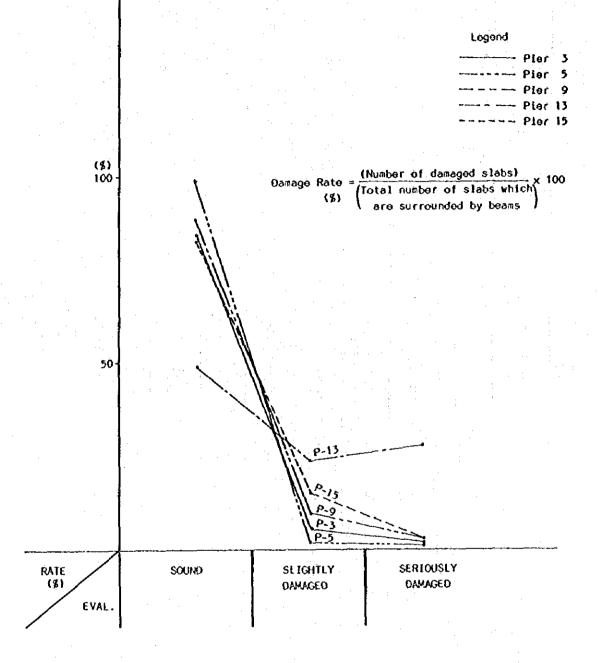


Fig. F Damage Rate of Slabs

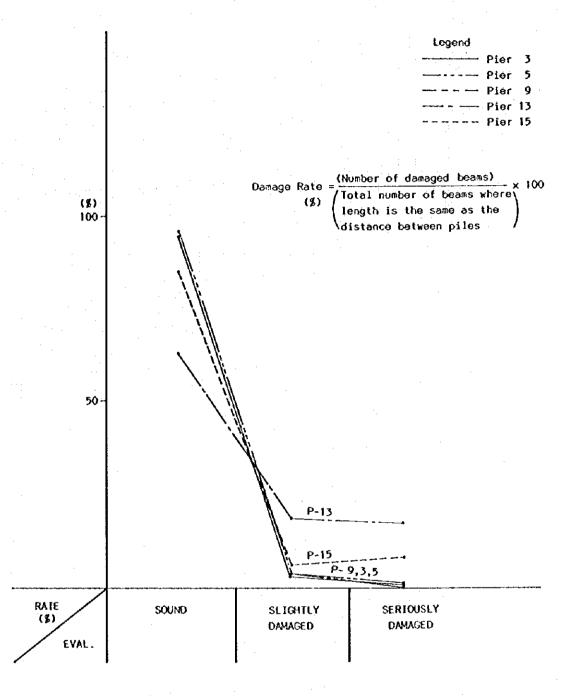


Fig. G Damage Rate of Beams

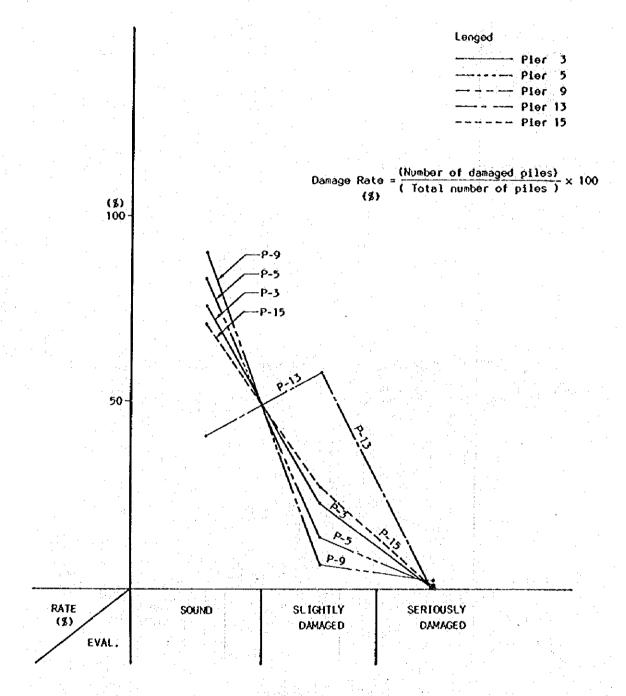


Fig. H Damage Rate of Piles

Table D Rate of Damage (Slabs) (Item by Item Inspection)

	Pier No.		m		Ŋ		6	Ţ	13		15	
Description		Total	Rate	Total	Rate	Total	Rate	Total	Rate	Total	Rate	
Loss of Concrete	ncrete	2	0.5	12	22.6	m	ं <del>।</del> ल	91	9.9	9	#	
Exposure of Reinforcement	of lent	270	71.6	δ.	17.0	9	18.5	8 17 8	36.7	170	39.0	
Free Lime		63	16.7	ю В	34.0	86	45.4	£11	16.1	126	28.9	
Honeycombing	<b>8</b> น	6	2.4	0	0	6	4.2	0	0	38	8.7	···
Rust		r-l	0	0	0	O	O	0	0	0	o	
Cracks		32	ω ω	कर	26.4	99	30.5	285	9.	96	22.0	
Total		377	100	53	100	216	100	702	100	987	100	
Α	Damaged	9		0	<b>.</b>	8	ı	300		37	1	
No Symbol S	Sound	2,117	. 4	2,481	. 1	1,587	E.	962	1	2,147		
Grand Total	_E	2,500	100	2,534	100	1,811	100	1,964	100	2,620	100	

Table E Rate of Damage (Beams) (Item by Item Inspection)

	a	5	9		<u> </u>		· ·	)	ı		C
15	Rate	3.5	52.6	0.7	6	0	F. 74	00 1		•	100
Ι.	Total	25	379	5	17	0	298	721	127	4,526	5,374
13	Rate	9.1	27.9	0.3	8.0	0	61.9	100			100
	Total	86	263	m	7	0	582	176	262	2,059	3,262
6	Rate	3.4	28.1	0.7	0	o	67.8	100	. •	1	100
	Total	ın	147	<b>.</b>	0	0	66	1 46	80	3,394	3,548
5	Rate	2.5	1.8	0	0	0	95.7	100	ľ	•	100
	Total	<b>4</b>	m	0	Ö	0	155	162	H	5,047	5,210
3	Rate	න න	30.9	2.0	0.5	0	57.8	100			000
1	Total	18	63	#	. ←	0	118	204	80	4,929	5,141
Pier No.	Description	Loss of Concrete	Exposure of Reinforcement	Free Lime	Honeycombing	Rust	Crack	Total	Damaged	Sound	Grand Total

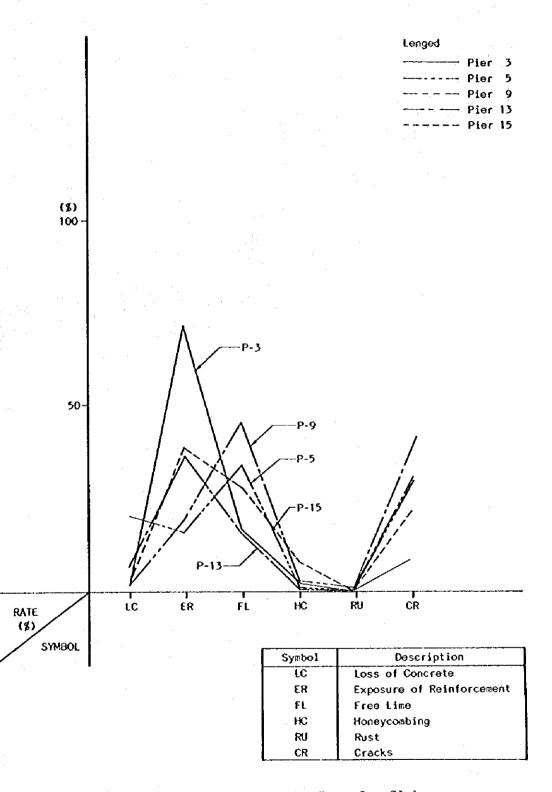


Fig. I Rate of Damage by Item for Slabs

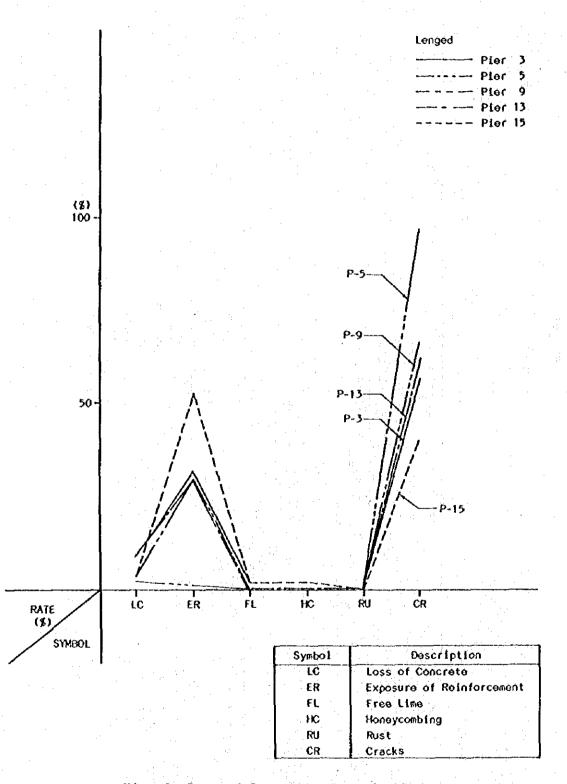


Fig. J Rate of Damage by Item for Beams

Table F Results of Underwater Survey of Piles

Pier No. Classification	3	5	9	13	15
Number of Damaged Piles (A)	8	16	36	46	<b>1</b>
Number of Sumples (B)	593	672	290	546	690
Rate of Damage (A/B x 100) %	1.4	2.4	12.4	8.4	0.1