Table N-2-3-1.10(1) Laboratory Test on Seawater Sample
(Iloilo)

A. DAMIAN
LABORATORIES

A. DAMIAN LABORATORIES
66 Calamba Street, Quezon City, Philippines
P.O. Box 3730, Manila
Telephone No. 731-7771
FAX # 741-0988 (632)

TO: PHILSOIL CONSULTANTS INC.

Date Analyzed: August 29, 1991
Analyzed by: Mariesa N. Mojica
Nina D. Botelho

Sample Date: August 23, 1991

LABORATORY ANALYSIS REPORT NO. 6161

Items Determined		Sample A #5 1.50	Sample B #1 1.50	Sample C #1 0.30	Sample D #5 0.30	Sample E #2 1.30	
pH							
P Alkalinity	ppm $CaCO_3$						
Total Alkalinity	" $CaCO_3$						
Total Hardness	" $CaCO_3$						
Calcium Hardness	" $CaCO_3$						
Magnesium Hardness	" $CaCO_3$						
Chlorides	" NaCl						
Fluorides	" F						
Sulfates	" Na_2SO_4						
Phosphates	" PO_4						
Nitrates	" NO_3						
Nitrites	" NO_2						
Silica	" SiO_2						
Total Iron	" Fe						
Manganese	" Mn						
B. O. D. (5-day) 20°C	" B.O.D.						
C.O.D.	" C.O.D.						
Turbidity	JTU						
Color	APHA						
Conductance	Micromho/cm						
Total Dissolved Solids	ppm $CaCO_3$						
Suspended Solids	ppm SS	460	460	456	472	452	
Free Carbon Dioxide	ppm $CaCO_3$						
Sodium	ppm Na						

REMARKS:

CHEMICAL / BACTERIOLOGICAL ANALYSIS OF WATER
WASTE WATER BOD COD TOC

Source: JICA Study Team

Table N-2-3-1.10(2) Laboratory Test on Seawater Sample
(Bacolod)

A. DAMIAN
LABORATORIES

A. DAMIAN LABORATORIES
66 Calamba Street, Quezon City, Philippines
P.O. Box 3730, Manila
Telephone No. 731-7771
FAX # 741-0988 (632)

TO: GEOTECNIC PHIL. INC.

Date Analyzed: Sept. 4, 1991
Analyzed by: Mina D. Bote, Marissa N. Mojica

Sample Date: Sept. 3, 1991

LABORATORY ANALYSIS REPORT NO. 6179

Items Determined			SEA WATER Sample#1	Sample#2	Sample#3	Sample#4	Sample#5	
P Alkalinity	ppm	$CaCO_3$						
tal Alkalinity	"	$CaCO_3$						
Total Hardness	"	$CaCO_3$						
Calcium Hardness	"	$CaCO_3$						
gnesium Hardness	"	$CaCO_3$						
Chlorides	"	NaCl						
orides	"	F						
Sulfates	"	Na_2SO_4						
Phosphates	"	PO_4						
rates	"	NO_3						
Nitrites	"	NO_2						
ca	"	SiO_2						
Total Iron	"	Fe						
nganese	"	Mn						
B.O.D. (5-day) 20°C	"	B.O.D.						
C.O.D.	"	C.O.D.						
bidity	JTU							
Color	APHA							
nductance	Micromho/cm							
Total Dissolved Solids	ppm	$CaCO_3$						
Suspended Solids	ppm	SS	270	278	260	286	252	
e Carbon Dioxide	ppm	$CaCO_3$						
Sodium	ppm	Na						

MARKS: Sample#1 - Locx-1;depth =0.30 from sea bed;rough condition
Sample#2 -Loc x-1;depth = 1.50m from sea bed ;rough condition
Sample#3 -Loc x-4;depth = 0.30m above sea bed ;rough condition
Sample#4 -Loc x-4;depth = 1.50m above sea bed ;rough condition
Sample#5 -Loc x-6;depth =1.30m above sea bed ; calm condition

CHEMICAL / BACTERIOLOGICAL ANALYSIS OF WATER
WASTE WATER BOD COD TOC

Source: JICA Study Team

9. These testing result show the following matters;

1) Heavy siltation is expected in Iloilo and Bacolod from the result of suspendid load in sea water testing.

2) Movement of sea bed material in Iloilo is considered small since the sea bed material is composed of medium sand copose with wave height and current velosity at site.

3) In the case of Bacolod, siltation is active at -2.5m depth in all direction. Movement of siltation material at -0.4m depth shows the prevailling direction from north and south. The direction of siltation will be almost the same direction with current, this was comfirmed by the results of sand catchment observation.

10. Further discussion on this matter is presented in Note A-2-3-4 Siltation Study.

F. Subsoil Investigation

11. Subsoil investigation had conducted for structural design in Iloilo and Bacolod.

12. Scope of work are as follows:

i) Soil investigation

- Boring number Iloilo 2 - boreholes
  (Rotary boring) Bacolod 4 - boreholes
- Standard Penetration Test (SPT)
  1.5m interval for each boreholes
  N value and undisturbed sampling
- Undisturbed sampling (thinwall sampling) of soft cohesive material
- Laboratory test
  Specific Gravity, consistency test (L.L., P.L.) Grain size analysis
  Sieve test (Disturbed sample)
  Sieve and hydro test (Undisturbed sample)
  Unconfined compression test (undisturbed sample)
  Consolidation test (undisturbed sample)

ii) Sea bed sampling and testing

- Sampling number Iloilo 5 - samples
  Bacolod 5 - samples
- Laboratory test
  Specific Gravity
  Sieve and hydro test (all samples)

iii) Sea water sampling and testing

- Sampling number
  Iloilo - 5 samples Bacolod - 5 Samples
- Laboratory test
  Contents of suspended solid (ss; ppm)

13. The results of test are shown hereunder.

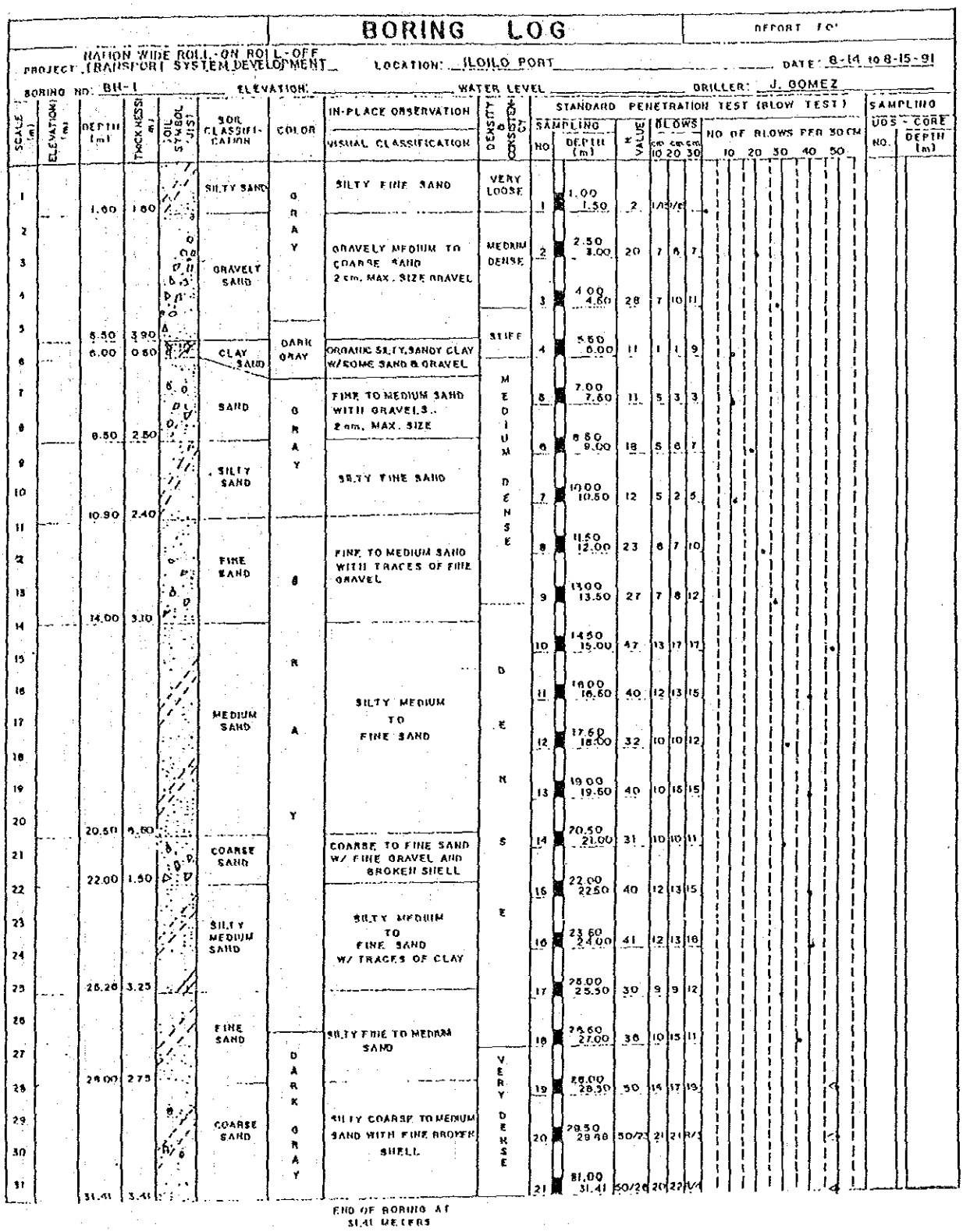


Figure N-2-3-1.9(1) Bore Hole Log (BH-1 Iloilo)

Source: JICA Study Team

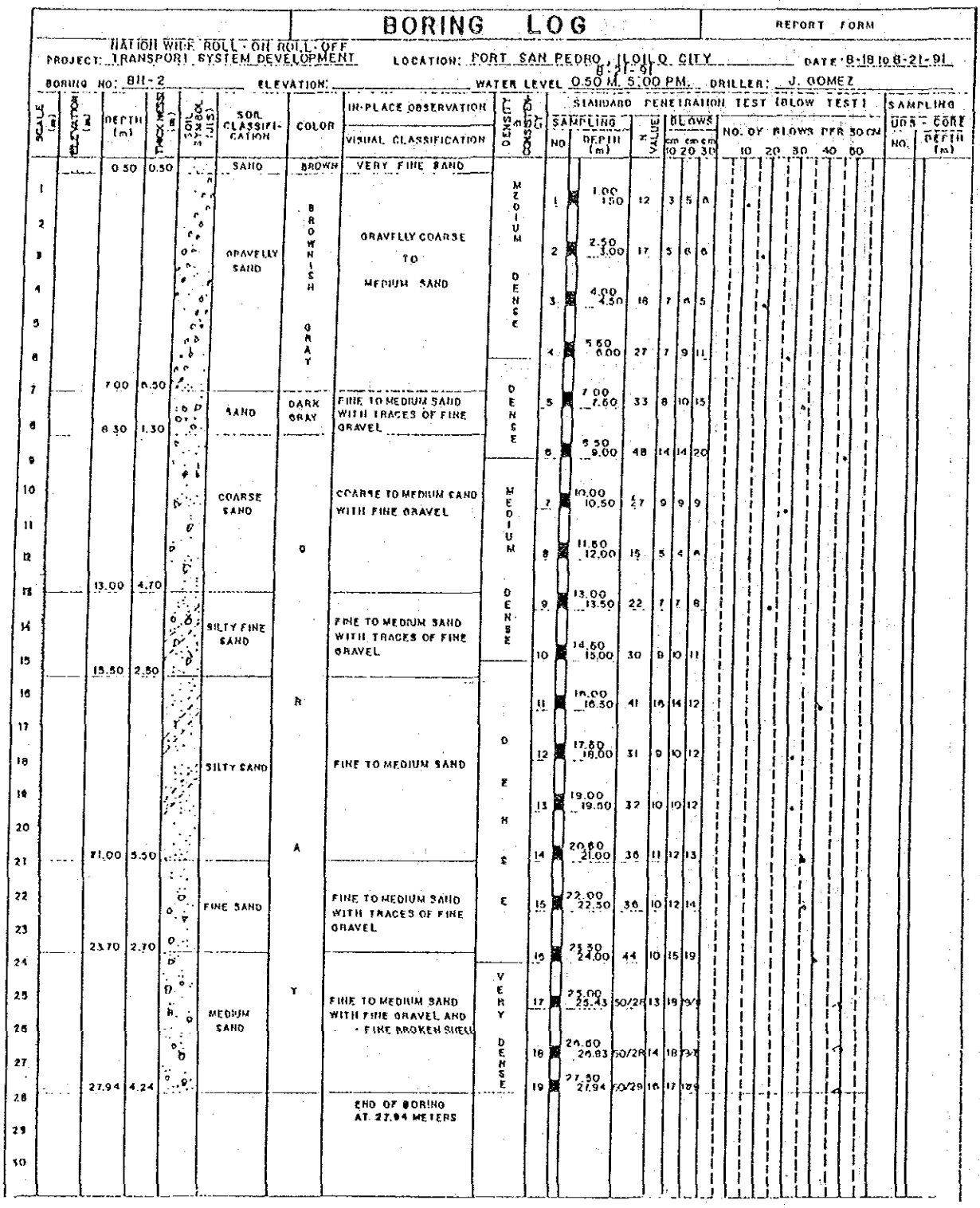


Figure N-2-3-1.9(2) Bore Hole Log (BH-2 Iloilo)

Source: JICA Study Team

BORING LOG

REPORT FORM

PROJECT: NATIONWIDE ROLL-ON ROLL-OFF TRANSPORT SYSTEM DEVELOPMENT
LOCATION: Bacolod City
DATE: 8-20-25-91
BORING NO: BH-1
ELEVATION:
WATER LEVEL 8-22-91 (7:00 a.m.) 0.00 m.
DRILLER: L. GATCHALIAN / J. OLIQUINO

SCALE (m)	ELEVATION (m)	DEPTH (m)	THICKNESS (m)	SOIL SYMBOL (JIS)	SOIL CLASSIFICATION	COLOR	IN-PLACE OBSERVATION: VISUAL CLASSIFICATION	DENSITY & CONSISTENCY
1		1.50	1.50	CH	Silty CLAY	DARK GRAY	with traces of shell fragments	SOFT
2–10		10.50	9.00	SM	Silty SAND		fine to coarse grained	FIRM, DENSE, VERY DENSE
11		12.00	1.50	SP	Poorly graded SAND		with traces of SILT	
12–13		13.50	1.50	SM	Silty SAND		fine to coarse grained	
14		15.00	1.50	SC	Clayey SAND	LIGHT GRAY	with traces of GRAVEL	
15–16		16.50	1.50	MH	Clayey SILT		Clayey SILT	HARD
17–18		18.00	1.50	SM	Silty SAND	BROWNISH GRAY	fine to coarse grained	VERY DENSE
19		19.50	1.50					
20–21		21.00	1.50				with GRAVEL	

END OF BORING AT 21.00 M

STANDARD PENETRATION TEST (BLOW TEST)

SAMPLING NO.	DEPTH (m)	N VALUE	BLOWS 10 cm	20 cm	30 cm
1	0.0–0.45	3	1	1	1
2	1.00–1.50	3	1	1	1
3	2.55–3.00	25	9	13	15
4	4.05–4.50	38	9	12	17
5	5.55–6.00	43	11	15	19
6	7.05–7.50	54	16	18	20
7	8.55–9.00	79	19	22	38
8	10.05–10.50	79	21	27	31
9	11.55–12.00	84	25	29	30
10	13.05–13.50	111	33	38	40
11	14.55–15.00	101	31	33	37
12	16.05–16.50	114	34	38	42
13	17.55–18.00	125	34	41	50
14	19.05–19.50	134	36	48	50
15	20.55–21.00	45,50/50	45	50	50

NO. OF BLOWS PER 30 CM: 10 20 30 40 50

SAMPLING: UDS - CORE NO. DEPTH (m)

Figure N-2-3-1.10(1) Bore Hole Log (BH-1 Bacolod)

Source: JICA Study Team

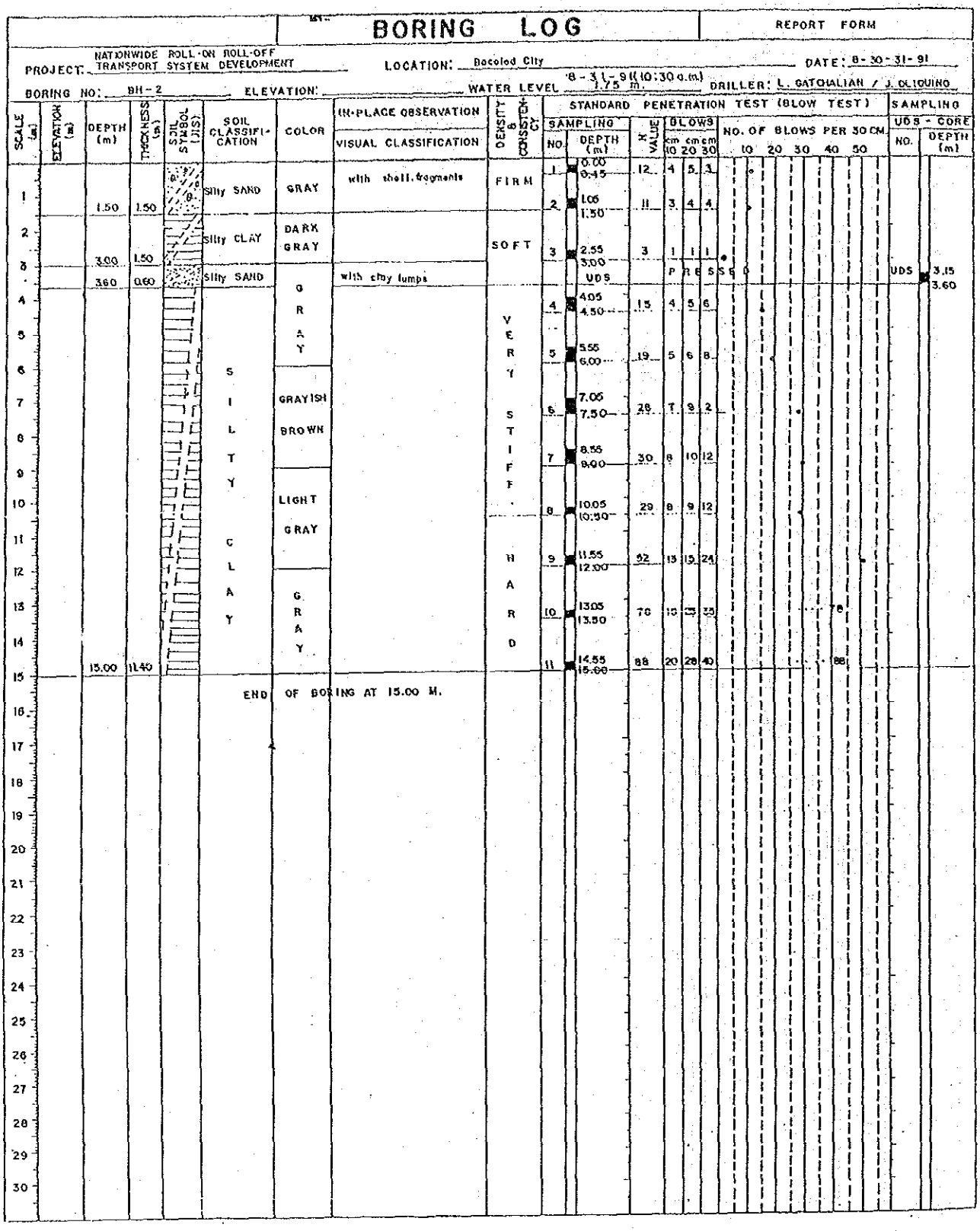


Figure N-2-3-1.10(2) Bore Hole Log (BH-2 Bacolod)

Source: JICA Study Team

BORING LOG

REPORT FORM

PROJECT: NATIONWIDE ROLL-ON ROLL-OFF TRANSPORT SYSTEM DEVELOPMENT — LOCATION: Bacolod City — DATE: 8-23 - 26-91

BORING NO: BH - 3 — ELEVATION: — WATER LEVEL 8-24-91 (10:31am) 1.60 m. — DRILLER: L. GATCHALIAN / J. OLIQUINO

SCALE (m)	ELEVATION (m)	DEPTH (m)	THICKNESS (m)	SOIL SYMBOL (JIS)	SOIL CLASSIFICATION	COLOR	IN-PLACE OBSERVATION / VISUAL CLASSIFICATION	DENSITY & CONSISTENCY	STANDARD PENETRATION TEST (BLOW TEST) SAMPLING NO.	DEPTH (m)	N VALUE	BLOWS cm 10	cm 20	cm 30	NO. OF BLOWS PER 30 CM (10 20 30 40 50)	SAMPLING UDS - CORE NO.	DEPTH (m)
1		1.50	1.50		Silty SAND	GRAY		MEDIUM DENSE	1	0.0 / 0.45	11	4	4	3			
									2	1.05 / 1.50	11	3	4	4			
2		3.00	1.50		Silty CLAY	DARK GRAY	with little shell particles	SOFT	3	2.55 / 3.00	3	1	1	1	PRESSED	UDS1	3.00 / 3.45
4		4.50	1.50		Clayey SAND				4	4.05 / 4.50	4	1	1	2			
5		4.95	0.45		Silty CLAY										PRESSED	UDS2	4.50 / 4.95
		6.00	1.00		Clayey SAND			MEDIUM DENSE	5	5.55 / 6.00	11	2	4	5			
7					Clayey SILT	BROWNISH GRAY	with sand and traces of shell fragments.	VERY STIFF	6	7.05 / 7.50	20	4	7	9			
		9.00	3.00				with small sand	HARD	7	8.55 / 9.00	37	7	13	17			
9		10.50	1.50		Silty SAND		fine - grained	VERY DENSE	8	10.05 / 10.50	51	11	15	25			
11					Clayey SILT		with sand	VERY STIFF	9	11.55 / 12.00	22	5	7	10			
13		13.50	3.00					HARD	10	13.05 / 13.50	33	7	12	14			
15					Sandy SILT		fine - grained		11	14.55 / 15.00	48	12	15	21			
		16.50	3.00						12	16.05 / 16.50	65	17	23	25	66		
17								VERY DENSE	13	17.55 / 18.00	98	28	32	38	98		
19						GRAY			14	19.05 / 19.50	108	30	35	41	108		
21					Silty SAND		Sand is fine to medium grained		15	20.55 / 21.00	113	33	37	43	113		
23									16	22.05 / 22.50	127	38	42	47	127		
		24.00	7.50						17	23.55 / 24.00	138	40	48	50	138		
25		25.50	1.50		Clayey SAND				18	25.05 / 25.00	47,50/5	47,50/5			47,50/5		

END OF BOREHOLE AT 25.50 M.

Figure N-2-3-1.10(3) Bore Hole Log (BH-3 Bacolod)

Source: JICA Study Team

BORING LOG

REPORT FORM

PROJECT: NATIONWIDE ROLL-ON ROLL-OFF TRANSPORT SYSTEM DEVELOPMENT
LOCATION: PIER BANAGO, BACOLOD
DATE: 8-24-25-1991
BORING NO: BH-4
ELEVATION:
WATER LEVEL: 8-25-91 (10:25 AM) 6.40 MTS.
DRILLER: J. GOMEZ

SCALE (m)	ELEVATION (m)	DEPTH (m)	THICKNESS (m)	SOIL SYMBOL (JIS)	SOIL CLASSIFICATION	COLOR	IN-PLACE OBSERVATION / VISUAL CLASSIFICATION	DENSITY & CONSISTENCY	SAMPLING NO.	SAMPLING DEPTH (m)	N VALUE	BLOWS cm 10	BLOWS cm 20	BLOWS cm 30	NO. OF BLOWS PER 30 CM (10 20 30 40 50)	SAMPLING UDS - CORE NO.	SAMPLING UDS - CORE DEPTH (m)
1					MEDIUM SAND	GRAY	FINE TO MEDIUM SAND W/ DISINTEGRATED MARINE SHELLS.	LOOSE	1	1.00 1.50	2	1/15	1/15				
2		2.00	2.00														
3					SILTY CLAY		SILTY CLAY W/ SOME AMOUNT OF SHELLS & FINE SAND.	SOFT		UDS	PRESSED					UDS 1	2.00 2.80
4		3.95	1.95														
		4.35	0.40		SANDY CLAY	DARK GRAY	SANDY CLAY W/LITTLE ORGANIC MATTERS		2	4.00 4.50	18	3	6	9			
5					CLAYEY SAND	GRAY	CLAYEY FINE SAND W/ TRACE OF MARINE SHELL FRAGMENT	MEDIUM DENSE	3	5.50 6.00	11	4	3	4			
6		6.90	2.55														
7					SILT		SANDY SILT	VERY STIFF	4	7.00 7.50	21	6	7	8			
8		8.30	1.40														
		8.80	0.50		CLAY		SANDY, SILTY CLAY		5	8.50 9.00	18	5	5	6			
9		9.10	0.30			DARK GRAY	LOAM CLAY										
10					SAND	GRAY	CLAYEY SILTS FINE SAND	DENSE	6	10.50 11.00	31	9	9	13			
11		11.20	2.1						7	11.50 11.74	50/9	50/9					
12					SILTSTONE	LIGHT GRAY	FINE SANDY SILT CEMENTED SILTSTONE	HARD									
13		13.40	2.20						8	13.00 13.40	50/25	11	23	50/3			
							BORING END AT 13.40 METERS										

Figure N-2-3-1.10(4) Bore Hole Log (BH-4 Bacolod)

Source: JICA Study Team

Table N-2-3-1.11(1) Summary of Soil Test Result
(BH - 1 Iloilo)

JIS - A - 1	SUMMARY OF SOIL TEST RESULTS	REPORT FORM

PROJECT, Nationwide Roll-On Roll-Off Transport System LOCATION Iloilo City

HOLE NO. BH-1 SAMPLE NO.

DATE: Sept. 18, 1991 DEPTH, M

RECORDER: N.P. ARAFILES

	SAMPLE NO.	7	8	9	10	11	12
	DEPTH, M	10.00 10.50	11.50 12.00	13.00 13.50	14.50 15.00	16.00 16.50	17.50 18.00
GRAIN SIZE ANALYSIS	GRAVEL (>2000μ) %	1.0	6.7	2.5	0.1	0.3	0.3
	SAND (74-2000μ) %	82.9	80.9	85.2	82.5	87.0	86.5
	SILT (5-74μ) %	16.1	12.4	12.3	17.4	12.7	13.2
	CLAY (<5 μ) %						
	MAX. DIAMETER mm	2.00	4.76	4.76	2.00	2.00	2.00
	COEFFICIENT OF UNIFORMITY Uc						
	COEFFICIENT OF CURVATURE U'c						
CONSISTENCY	LIQUID LIMIT WL %	21.4					
	PLASTIC LIMIT Wp %	20.7			N.P.		N.P.
	PLASTICITY INDEX Ip	0.7					
CLASSIFICATION	TRIANGULAR CLASSIFICATION CHART						
	PLASTICITY CHART						
SPECIFIC GRAVITY OF SOIL PARTICLES Gs		2.67	2.61	2.67	2.63	2.64	2.67
NATURAL STATE	WATER CONTENT W %	29.1	18.8	22.5	21.9	22.2	22.8
	WET UNIT WEIGHT γt g/cm³						
	VOID RATIO e						
	DEGREE OF SATURATION Sr %						
MECHANICAL CHARACTERISTICS	UNCONFINED COMPRESSION TEST: UNCONFINED COMPRESSIVE STRENGTH qu kg/cm²						
	UNCONFINED COMPRESSION TEST: SECANT MOD. E50 kg/cm²						
	UNCONFINED COMPRESSION TEST: SENSITIVITY RATIO ST.						
	SINGLE SHEAR TEST: TESTING CONDITION						
	SINGLE SHEAR TEST: COHESION C kg/cm²						
	SINGLE SHEAR TEST: ANGLE OF SHEARING RESISTANCE Ø °						
	TRIAXIAL COMPRESSION TEST: TESTING CONDITION						
	TRIAXIAL COMPRESSION TEST: COHESION C kg/cm²						
	TRIAXIAL COMPRESSION TEST: ANGLE OF SHEARING RESISTANCE Ø °						
	CONSOLIDATION TEST: CONSOLIDATION PC PRESSURE kg/cm²						
	CONSOLIDATION TEST: COMPRESSION INDEX Cc						

REMARKS :

Source: JICA Study Team

Table N-2-3-1.11(2) Summary of Soil Test Result
(BH - 1 Iloilo)

JIS - A - 1	SUMMARY OF SOIL TEST RESULTS	REPORT FORM

PROJECT, Nationwide Roll-On Roll-Off Transport System LOCATION Iloilo City

HOLE NO. BH-1	SAMPLE NO.	13	14	15	16	17	18
DATE: RECORDER: N.P. Arafiles	DEPTH, M	19.00 19.50	20.50 21.00	22.00 22.50	23.50 24.00	25.00 25.50	26.50 27.00
GRAIN SIZE ANALYSIS	GRAVEL (>2000μ) %	1.5	16.6	0.1	0	0.2	0.9
	SAND (74~2000μ) %	86.6	71.8	80.3	86.3	86.2	81.0
	SILT (5~74μ) %	11.9	11.6	19.6	13.7	13.6	18.1
	CLAY (<5μ) %						
	MAX. DIAMETER mm	4.76	9.52	2.00	0.84	2.00	4.76
	COEFFICIENT OF UNIFORMITY Uc						
	COEFFICIENT OF CURVATURE U'c						
CONSISTENCY	LIQUID LIMIT WL %				17.7	18.4	
	PLASTIC LIMIT Wp %				12.6	14.5	
	PLASTICITY INDEX Ip				5.1	3.9	
CLASSIFICATION	TRIANGULAR CLASSIFICATION CHART						
	PLASTICITY CHART						
SPECIFIC GRAVITY OF SOIL PARTICLES Gs		2.69	2.70	2.64	2.71	2.56	2.61
NATURAL STATE	WATER CONTENT W %	20.9	18.0	20.5	25.0	20.6	22.7
	WET UNIT WEIGHT γt g/cm³						
	VOID RATIO e						
	DEGREE OF SATURATION Sr %						
MECHANICAL CHARACTERISTICS	UNCONFINED COMPRESSION TEST: UNCONFINED COMPRESSIVE STRENGTH qu kg/cm²						
	UNCONFINED COMPRESSION TEST: SECANT MOD. E50 kg/cm²						
	UNCONFINED COMPRESSION TEST: SENSITIVITY RATIO ST.						
	SINGLE SHEAR TEST: TESTING CONDITION						
	SINGLE SHEAR TEST: COHESION C kg/cm²						
	SINGLE SHEAR TEST: ANGLE OF SHEARING RESISTANCE Ø °						
	TRIAXIAL COMPRESSION TEST: TESTING CONDITION						
	TRIAXIAL COMPRESSION TEST: COHESION C kg/cm²						
	TRIAXIAL COMPRESSION TEST: ANGLE OF SHEARING RESISTANCE Ø °						
	CONSOLIDATION TEST: CONSOLIDATION PRESSURE PC kg/cm²						
	CONSOLIDATION TEST: COMPRESSION INDEX Cc						

REMARKS :

Source: JICA Study Team

Table N-2-3-1.11(3) Summary of Soil Test Result

(BH - 1 Iloilo)

JIS - A - 1	SUMMARY OF SOIL TEST RESULTS	REPORT FORM

PROJECT, Nationwide Roll-On Roll-Off Transport System LOCATION Iloilo City

HOLE NO. BH-1	SAMPLE NO.	19	20	21			
DATE: Sept. 18, 1991 RECORDER: N.P. Arafiles	DEPTH, M	28.00 28.50	29.50 29.88	31.00 31.4			
GRAIN SIZE ANALYSIS	GRAVEL (>2000μ) %	3.2	4.1	2.0			
	SAND (74-2000μ) %	93.3	85.2	84.1			
	SILT (5-74μ) %	3.5	10.7	13.9			
	CLAY (<5μ) %						
	MAX. DIAMETER mm	4.76	4.76	2.00			
	COEFFICIENT OF UNIFORMITY Uc	3.07	5.71				
	COEFFICIENT OF CURVATURE U'c	1.50	2.06				
CONSISTENCY	LIQUID LIMIT WL %						
	PLASTIC LIMIT Wp %	N.P.					
	PLASTICITY INDEX Ip						
CLASSIFICATION	TRIANGULAR CLASSIFICATION CHART						
	PLASTICITY CHART						
SPECIFIC GRAVITY OF SOIL PARTICLES Gs		2.56	2.64	2.65			
NATURAL STATE	WATER CONTENT W %	32.5	20.6	20.9			
	WET UNIT WEIGHT γt g/cm³						
	VOID RATIO e						
	DEGREE OF SATURATION Sr %						
MECHANICAL CHARACTERISTICS	UNCONFINED COMPRESSION TEST: UNCONFINED COMPRESSIVE STRENGTH qu kg/cm²						
	UNCONFINED COMPRESSION TEST: SECANT MOD. E50 kg/cm²						
	UNCONFINED COMPRESSION TEST: SENSITIVITY RATIO ST.						
	SINGLE SHEAR TEST: TESTING CONDITION						
	SINGLE SHEAR TEST: COHESION C kg/cm²						
	SINGLE SHEAR TEST: ANGLE OF SHEARING RESISTANCE Ø °						
	TRIAXIAL COMPRESSION TEST: TESTING CONDITION						
	TRIAXIAL COMPRESSION TEST: COHESION C kg/cm²						
	TRIAXIAL COMPRESSION TEST: ANGLE OF SHEARING RESISTANCE Ø °						
	CONSOLIDATION TEST: CONSOLIDATION PRESSURE PC kg/cm²						
	CONSOLIDATION TEST: COMPRESSION INDEX Cc						

REMARKS :

Source: JICA Study Team

Table N-2-3-1.11(4) Summary of Soil Test Result

(BH - 2 Iloilo)

JIS - A - 1	SUMMARY OF SOIL TEST RESULTS	REPORT FORM

PROJECT, Nationwide Roll-On Roll-Off Transport System LOCATION Iloilo City

HOLE NO. BH-2		SAMPLE NO.	1	2	3	4	5	6
DATE: Sept. 18, 1991 RECORDER: N.P. Arafiles		DEPTH, M	1.00 1.50	2.50 3.00	4.00 4.50	5.50 6.00	7.00 7.50	8.50 9.00
GRAIN SIZE ANALYSIS	GRAVEL (>2000μ) %		23.7	12.7	20.8	23.8	0.6	21.7
	SAND (74-2000μ) %		68.7	80.8	71.8	69.8	83.5	68.8
	SILT (5-74μ) %		7.6	6.5	7.4	6.4	15.9	9.5
	CLAY (<5μ) %							
	MAX. DIAMETER mm		9.52	4.76	9.52	9.52	4.76	9.52
	COEFFICIENT OF UNIFORMITY Uc		6.36	6.70	7.72	4.50		5.80
	COEFFICIENT OF CURVATURE U'c		1.09	1.25	1.13	0.96		0.99
CONSISTENCY	LIQUID LIMIT WL %							
	PLASTIC LIMIT Wp %							
	PLASTICITY INDEX Ip							
CLASSIFICATION	TRIANGULAR CLASSIFICATION CHART							
	PLASTICITY CHART							
SPECIFIC GRAVITY OF SOIL PARTICLES Gs			2.67	2.68	2.64	2.68	2.68	2.64
NATURAL STATE	WATER CONTENT W %		14.0	15.1	15.0	15.6	22.0	14.3
	WET UNIT WEIGHT γt g/cm³							
	VOID RATIO e							
	DEGREE OF SATURATION Sr %							
MECHANICAL CHARACTERISTICS	UNCONFINED COMPRESSION TEST	UNCONFINED COMPRESSIVE STRENGTH kg/cm² qu						
		SECANT MOD. E50 kg/cm²						
		SENSITIVITY RATIO ST.						
	SINGLE SHEAR TEST	TESTING CONDITION						
		COHESION C kg/cm²						
		ANGLE OF SHEARING RESISTANCE Ø °						
	TRIAXIAL COMPRESSION TEST	TESTING CONDITION						
		COHESION C kg/cm²						
		ANGLE OF SHEARING RESISTANCE Ø °						
	CONSOLIDATION TEST	CONSOLIDATION PC PRESSURE kg/cm²						
		COMPRESSION INDEX Cc						

REMARKS :

Source: JICA Study Team

Table N-2-3-1.11(5) Summary of Soil Test Result

(BH - 2 Iloilo)

JIS - A - 1	SUMMARY OF SOIL TEST RESULTS	REPORT FORM

PROJECT: Nationwide Roll-On Roll-Off Transport System LOCATION: Iloilo City

HOLE NO. BH-2	SAMPLE NO.	7	8	9	10	11	12
DATE: Sept. 18, 1991 RECORDER: N.P. Arafiles	DEPTH, M	10.00 10.50	11.50 12.00	13.00 13.50	14.50 15.00	16.00 16.50	17.50 18.00
GRAIN SIZE ANALYSIS	GRAVEL (>2000μ) %	23.3	14.6	4.4	1.9	0.7	0.2
	SAND (74-2000μ) %	66.4	68.1	85.6	79.3	85.2	85.7
	SILT (5-74μ) %	10.3	17.3	10.0	18.8	14.1	14.1
	CLAY (<5μ) %						
	MAX. DIAMETER mm	9.52	9.52	4.76	2.00	2.00	2.00
	COEFFICIENT OF UNIFORMITY Uc	7.12		4.05		6.04	
	COEFFICIENT OF CURVATURE U'c	1.48		1.98		3.48	
CONSISTENCY	LIQUID LIMIT WL %						
	PLASTIC LIMIT Wp %						
	PLASTICITY INDEX Ip						
CLASSIFICATION	TRIANGULAR CLASSIFICATION CHART						
	PLASTICITY CHART						
SPECIFIC GRAVITY OF SOIL PARTICLES Gs		2.67	2.64	2.62	2.62	2.61	2.64
NATURAL STATE	WATER CONTENT W %	15.7	16.6	19.8	19.8	19.9	24.4
	WET UNIT WEIGHT γt g/cm³						
	VOID RATIO e						
	DEGREE OF SATURATION Sr %						
MECHANICAL CHARACTERISTICS: UNCONFINED COMPRESSION TEST	UNCONFINED COMPRESSIVE STRENGTH qu kg/cm²						
	SECANT MOD. E50 kg/cm²						
	SENSITIVITY RATIO ST.						
SINGLE SHEAR TEST	TESTING CONDITION						
	COHESION C kg/cm²						
	ANGLE OF SHEARING RESISTANCE φ °						
TRIAXIAL COMPRESSION TEST	TESTING CONDITION						
	COHESION C kg/cm²						
	ANGLE OF SHEARING RESISTANCE φ °						
CONSOLIDATION TEST	CONSOLIDATION PRESSURE Pc kg/cm²						
	COMPRESSION INDEX Cc						

REMARKS :

Source: JICA Study Team

Table N-2-3-1.11(6) Summary of Soil Test Result
(BH - 2 Iloilo)

JIS - A - 1	SUMMARY OF SOIL TEST RESULTS	REPORT FORM

PROJECT, Nationwide Roll-On Roll-Off Transport System LOCATION Iloilo City

HOLE NO. BH - 2		SAMPLE NO.	13	14	15	16	17	18
DATE: Sept. 18, 1991 RECORDER: N.P. ARAFILES		DEPTH, M	19.00 19.50	20.50 21.00	22.00 22.50	23.50 24.00	25.00 25.43	26.50 26.93
GRAIN SIZE ANALYSIS	GRAVEL (>2000μ)	%	0.1	1.1	4.6	6.3	4.8	8.2
	SAND (74-2000μ)	%	83.9	85.4	83.4	81.7	79.8	79.2
	SILT (5-74μ)	%	16.0	13.5	12.0	12.0	15.4	12.6
	CLAY (<5μ)	%						
	MAX. DIAMETER	mm	2.00	2.00	4.76	4.76	4.76	4.76
	COEFFICIENT OF UNIFORMITY	Uc		7.5		6.00		
	COEFFICIENT OF CURVATURE	U'c		2.31		2.91		
CONSISTENCY	LIQUID LIMIT	WL %						
	PLASTIC LIMIT	Wp %						
	PLASTICITY INDEX	Ip						
CLASSIFICATION	TRIANGULAR CLASSIFICATION CHART							
	PLASTICITY CHART							
SPECIFIC GRAVITY OF SOIL PARTICLES		Gs	2.56	2.63	2.62	2.66	2.66	2.62
NATURAL STATE	WATER CONTENT	W %	20.7	21.6	22.0	17.7	19.0	16.0
	WET UNIT WEIGHT	γt g/cm³						
	VOID RATIO	e						
	DEGREE OF SATURATION	Sr %						
MECHANICAL CHARACTERISTICS	UNCONFINED COMPRESSION TEST	UNCONFINED COMPRESSIVE STRENGTH qu kg/cm²						
		SECANT MOD. E50 kg/cm²						
		SENSITIVITY RATIO, ST.						
	SINGLE SHEAR TEST	TESTING CONDITION						
		COHESION C kg/cm²						
		ANGLE OF SHEARING RESISTANCE Ø °						
	TRIAXIAL COMPRESSION TEST	TESTING CONDITION						
		COHESION C kg/cm²						
		ANGLE OF SHEARING RESISTANCE Ø °						
	CONSOLIDATION TEST	CONSOLIDATION PRESSURE PC kg/cm²						
		COMPRESSION INDEX Cc						

REMARKS :

Source: JICA Study Team

Table N-2-3-1.11(7) Summary of Soil Test Result

(BH - 2 Iloilo)

JIS - A - 1	SUMMARY OF SOIL TEST RESULTS	REPORT FORM

PROJECT, Nationwide Roll-On Roll-Off Transport System LOCATION Iloilo City

HOLE NO.	BH-2	SAMPLE NO.	19						
DATE: Sept. 18, 1991 RECORDER: N.P. ARAFILES		DEPTH, M	27.50 27.94						
GRAIN SIZE ANALYSIS	GRAVEL	(>2000μ) %	10.3						
	SAND	(74~2000μ) %	73.3						
	SILT	(5~74μ) %	16.4						
	CLAY	(<5μ) %							
	MAX. DIAMETER	mm	4.76						
	COEFFICIENT OF UNIFORMITY	Uc							
	COEFFICIENT OF CURVATURE	U'c							
CONSISTENCY	LIQUID LIMIT	WL %							
	PLASTIC LIMIT	Wp %							
	PLASTICITY INDEX	Ip							
CLASSIFICATION	TRIANGULAR CLASSIFICATION CHART								
	PLASTICITY CHART								
SPECIFIC GRAVITY OF SOIL PARTICLES		Gs	2.64						
NATURAL STATE	WATER CONTENT	W %	15.5						
	WET UNIT WEIGHT	γt g/cm³							
	VOID RATIO	e							
	DEGREE OF SATURATION	Sr %							
MECHANICAL CHARACTERISTICS	UNCONFINED COMPRESSION TEST	UNCONFINED COMPRESSIVE STRENGTH qu kg/cm²							
		SECANT MOD. E50 kg/cm²							
		SENSITIVITY RATIO ST.							
	SINGLE SHEAR TEST	TESTING CONDITION							
		COHESION C kg/cm²							
		ANGLE OF SHEARING RESISTANCE φ °							
	TRIAXIAL COMPRESSION TEST	TESTING CONDITION							
		COHESION C kg/cm²							
		ANGLE OF SHEARING RESISTANCE φ °							
	CONSOLIDATION TEST	CONSOLIDATION PRESSURE PC kg/cm²							
		COMPRESSION INDEX Cc							

REMARKS :

Source: JICA Study Team

Table N-2-3-1.12(1) Summary of Soil Test Result

(BH - 1 Bacolod)

JIS - A - 1	SUMMARY OF SOIL TEST RESULTS	REPORT FORM

PROJECT: NATIONWIDE ROLL-ON ROLL-OFF TRANSPORT SYSTEM DEVELOPMENT LOCATION Bacolod City

HOLE NO. BH-1		SAMPLE NO.	1	2	3	4	5	6
DATE: 8 - 29 - 91 RECORDER:		DEPTH, M	0.00 0.45	1.05 1.50	2.55 3.00	4.05 4.50	5.55 6.00	7.05 7.50
GRAIN SIZE ANALYSIS	GRAVEL (>2000μ) %		2.0	5.0	3.0	–	1.0	8.0
	SAND (74-2000μ) %		17.0	15.0	80.0	83.0	86.0	76.0
	SILT (5-74μ) %		81.0	80	17.0	17.0	13.0	16.0
	CLAY (<5μ) %							
	MAX. DIAMETER mm		0.84	2.00	0.84	0.84	2.00	4.76
	COEFFICIENT OF UNIFORMITY Uc		–	–	–	10.0	4.0	–
	COEFFICIENT OF CURVATURE U'c		–	–	–	2.0	1.0	–
CONSISTENCY	LIQUID LIMIT WL %		69.0	66.0	–	–	–	–
	PLASTIC LIMIT Wp %		31.0	31.0	NP	NP	NP	NP
	PLASTICITY INDEX Ip		38.0	35.0	–	–	–	–
CLASSIFICATION	TRIANGULAR CLASSIFICATION CHART		CH	CH	SM	SM	SM	SM
	PLASTICITY CHART							
SPECIFIC GRAVITY OF SOIL PARTICLES Gs			2.72	2.69	2.69	2.70	2.61	2.80
NATURAL STATE	WATER CONTENT W %		131.0	111.0	30.0	16.0	31.0	25.0
	WET UNIT WEIGHT γt g/cm³							
	VOID RATIO e							
	DEGREE OF SATURATION Sr %							
MECHANICAL CHARACTERISTICS	UNCONFINED COMPRESSION TEST	UNCONFINED COMPRESSIVE STRENGTH qu kg/cm²						
		SECANT MOD. E50 kg/cm²						
		SENSITIVITY RATIO ST.						
	SINGLE SHEAR TEST	TESTING CONDITION						
		COHESION C kg/cm²						
		ANGLE OF SHEARING RESISTANCE Ø °						
	TRIAXIAL COMPRESSION TEST	TESTING CONDITION						
		COHESION C kg/cm²						
		ANGLE OF SHEARING RESISTANCE Ø °						
	CONSOLIDATION TEST	CONSOLIDATION PRESSURE PC kg/cm²						
		COMPRESSION INDEX Cc						

REMARKS :

Source: JICA Study Team

Table N-2-3-1.12(2) Summary of Soil Test Result

(BH - 1 Bacolod)

JIS - A - 1	SUMMARY OF SOIL TEST RESULTS	REPORT FORM

PROJECT, NATIONWIDE ROLL-ON ROLL-OFF TRANSPORT SYSTEM DEVELOPMENT LOCATION Bacolod City

HOLE NO. BH - 1		SAMPLE NO.	7	8	9	10	11	12
DATE: 8 - 29 - 91		DEPTH, M	8.55 9.00	10.05 10.50	11.55 12.00	13.05 13.50	14.55 15.00	16.05 16.50
RECORDER:								
GRAIN SIZE ANALYSIS	GRAVEL	(>2000μ) %	2.0	—	1.0	2.0	15.0	2.0
	SAND	(74-2000μ) %	85.0	84.0	88.0	76.0	59.0	46.0
	SILT	(5-74μ) %	13.0	16.0	11.0	22.0	26.0	52.0
	CLAY	(<5μ) %						
	MAX. DIAMETER	mm	2.00	0.84	2.00	2.00	4.76	2.00
	COEFFICIENT OF UNIFORMITY	Uc	4.0	—	6.00	5.0	—	—
	COEFFICIENT OF CURVATURE	U'c	1.0	—	2.00	1.0	—	—
CONSISTENCY	LIQUID LIMIT	WL %	—	—	—	32.0	42.0	61.0
	PLASTIC LIMIT	Wp %	NP	NP	NP	29.0	25.0	32.0
	PLASTICITY INDEX	Ip	-	—	—	3.0	17.0	29.0
CLASSIFICATION	TRIANGULAR CLASSIFICATION CHART		SM	SM	SP-SM	SM	SC	MH
	PLASTICITY CHART							
SPECIFIC GRAVITY OF SOIL PARTICLES		Gs	2.60	2.74	2.64	2.71	2.67	2.70
NATURAL STATE	WATER CONTENT	W %	27.0	23.0	22.0	23.0	25.0	39.0
	WET UNIT WEIGHT	γt g/cm³						
	VOID RATIO	e						
	DEGREE OF SATURATION	Sr %						
MECHANICAL CHARACTERISTICS	UNCONFINED COMPRESSION TEST	UNCONFINED COMPRESSIVE STRENGTH qu kg/cm²						
		SECANT MOD. E50 kg/cm²						
		SENSITIVITY RATIO ST.						
	SINGLE SHEAR TEST	TESTING CONDITION						
		COHESION C kg/cm²						
		ANGLE OF SHEARING RESISTANCE Ø °						
	TRIAXIAL COMPRESSION TEST	TESTING CONDITION						
		COHESION C kg/cm²						
		ANGLE OF SHEARING RESISTANCE Ø °						
	CONSOLIDATION TEST	CONSOLIDATION PRESSURE PC kg/cm²						
		COMPRESSION INDEX Cc						

REMARKS :

Source: JICA Study Team

Table N-2-3-1.12(3) Summary of Soil Test Result

(BH - 1 Bacolod)

JIS - A - 1	SUMMARY OF SOIL TEST RESULTS	REPORT FORM

PROJECT, NATIONWIDE ROLL-ON ROLL-OFF TRANSPORT SYSTEM DEVELOPMENT LOCATION Bacolod City

HOLE NO. BH - 1		SAMPLE NO.	13	14	15				
DATE: 8 - 29 - 91		DEPTH, M	17.55 18.00	19.05 19.50	20.55 21.00				
RECORDER:									
GRAIN SIZE ANALYSIS	GRAVEL	(>2000μ) %	12.0	—	29.0				
	SAND	(74-2000μ) %	65.0	83.0	54.0				
	SILT	(5-74μ) %	23.0	17.0	17.0				
	CLAY	(<5μ) %							
	MAX. DIAMETER	mm	4.76	4.76	4.76				
	COEFFICIENT OF UNIFORMITY	Uc	10.0	—	—				
	COEFFICIENT OF CURVATURE	U'c	2.0	—	—				
CONSISTENCY	LIQUID LIMIT	WL %	31.0	—	—				
	PLASTIC LIMIT	Wp %	28.0	NP	NP				
	PLASTICITY INDEX	Ip	3.0	—	—				
CLASSIFICATION	TRIANGULAR CLASSIFICATION CHART		SM	SM	SM				
	PLASTICITY CHART								
SPECIFIC GRAVITY OF SOIL PARTICLES		Gs	2.67	2.69	2.65				
NATURAL STATE	WATER CONTENT	W %	27.0	27.0	43.0				
	WET UNIT WEIGHT	γt g/cm³							
	VOID RATIO	e							
	DEGREE OF SATURATION	Sr %							
MECHANICAL CHARACTERISTICS	UNCONFINED COMPRESSION TEST	UNCONFINED COMPRESSIVE STRENGTH qu kg/cm²							
		SECANT MOD. E50 kg/cm²							
		SENSITIVITY RATIO ST.							
	SINGLE SHEAR TEST	TESTING CONDITION							
		COHESION C kg/cm²							
		ANGLE OF SHEARING RESISTANCE φ °							
	TRIAXIAL COMPRESSION TEST	TESTING CONDITION							
		COHESION C kg/cm²							
		ANGLE OF SHEARING RESISTANCE φ °							
	CONSOLIDATION TEST	CONSOLIDATION PC PRESSURE kg/cm²							
		COMPRESSION INDEX Cc							

REMARKS :

Source: JICA Study Team

Table N-2-3-1.12(4) Summary of Soil Test Result

(BH - 2 Bocolod)

JIS - A - 1	SUMMARY OF SOIL TEST RESULTS	REPORT FORM

PROJECT, NATIONWIDE ROLL-ON ROLL-OFF TRANSPORT SYSTEM DEVELOPMENT LOCATION Bacolod City

HOLE NO. BH-2 SAMPLE NO.

DATE: 8-3-91

RECORDER:

			1	2	3	UDS-1	4	5
	DEPTH, M		0.00 0.45	1.05 1.50	2.55 3.00	3.15 3.16	4.05 4.50	5.55 6.00
GRAIN SIZE ANALYSIS	GRAVEL	(>2000μ) %	1.0	–	–	–	–	–
	SAND	(74-2000μ) %	70.0	84.0	24.0	67.0	64.0	29.0
	SILT	(5-74μ) %	29.0	16.0	76.0	33.0	36.0	71.0
	CLAY	(<5μ) %						
	MAX. DIAMETER	mm	2.00	0.84	0.42	0.18	0.84	0.84
	COEFFICIENT OF UNIFORMITY	Uc	–			–		
	COEFFICIENT OF CURVATURE	U'c	–			–		
CONSISTENCY	LIQUID LIMIT	WL %	33.0		68.0	42.0	39.0	65.0
	PLASTIC LIMIT	Wp %	26.0	NP	29.0	30.0	29.0	31.0
	PLASTICITY INDEX	Ip	7.0	–	39.0	12.0	10.0	34.0
CLASSIFICATION	TRIANGULAR CLASSIFICATION CHART		SM	SM	CH	SC	SM	CH
	PLASTICITY CHART							
SPECIFIC GRAVITY OF SOIL PARTICLES		Gs	2.66	2.65	2.71	2.63	2.70	2.74
NATURAL STATE	WATER CONTENT	W %	17.0	41.0	57.0	38.0	36.0	31.0
	WET UNIT WEIGHT	γt g/cm³						
	VOID RATIO	e						
	DEGREE OF SATURATION	Sr %						
MECHANICAL CHARACTERISTICS	UNCONFINED COMPRESSION TEST	UNCONFINED COMPRESSIVE STRENGTH kg/cm² qu				0.2686 0.3425		
		SECANT MOD. E50 kg/cm²				0.0500 0.0247		
		SENSITIVITY RATIO ST.						
	SINGLE SHEAR TEST	TESTING CONDITION				at 3.50-3.65 m. depth	at 3.65-3.80 m. depth	at 3.80-3.95 m. depth
		COHESION C kg/cm²						
		SHEAR STRESS (t/sq.m.)				1.50	1.80	2.10
	TRIAXIAL COMPRESSION TEST	TESTING CONDITION						
		COHESION C kg/cm²						
		ANGLE OF SHEARING RESISTANCE Ø °						
	CONSOLIDATION TEST	CONSOLIDATION PRESSURE PC kg/cm²				3.90		
		COMPRESSION INDEX Cc				0.33		

REMARKS :

Source: JICA Study Team

Table N-2-3-1.12(5) Summary of Soil Test Result

(BH - 2 Bocolod)

JIS - A - 1	SUMMARY OF SOIL TEST RESULTS	REPORT FORM

PROJECT, NATIONWIDE ROLL-ON ROLL-OFF TRANSPORT SYSTEM DEVELOPMENT LOCATION Bocolod City

HOLE NO. BH - 2		SAMPLE NO.	6	7	8	9	10	11
DATE: 8 - 3 - 91		DEPTH, M	7.05 7.50	8.55 9.00	10.05 10.50	11.55 12.00	13.05 13.50	14.55 15.00
RECORDER:								
GRAIN SIZE ANALYSIS	GRAVEL (>2000μ) %		5.0	4.0	7.0	1.0	3.0	6.0
	SAND (74-2000μ) %		15.0	21.0	25.0	31.0	19.0	27.0
	SILT (5-74μ) %		76.0	75.0	68.0	68.0	78.0	67.0
	CLAY (<5 μ) %							
	MAX. DIAMETER mm		4.76	4.76	2.00	2.00	2.00	2.00
	COEFFICIENT OF UNIFORMITY Uc							
	COEFFICIENT OF CURVATURE U'c							
CONSISTENCY	LIQUID LIMIT WL %		71.0	70.0	61.0	62.0	75.0	64.0
	PLASTIC LIMIT Wp %		30.0	30.0	30.0	31.0	32.0	30.0
	PLASTICITY INDEX Ip		41.0	40.0	31.0	31.0	43.0	34.0
CLASSIFICATION	TRIANGULAR CLASSIFICATION CHART		CH	CH	CH	CH	CH	CH
	PLASTICITY CHART							
SPECIFIC GRAVITY OF SOIL PARTICLES Gs			2.73	2.70	2.69	2.70	2.69	2.72
NATURAL STATE	WATER CONTENT W %		37.0	31.0	37.0	55.0	57.0	73.0
	WET UNIT WEIGHT γt g/cm³							
	VOID RATIO e							
	DEGREE OF SATURATION Sr %							
MECHANICAL CHARACTERISTICS	UNCONFINED COMPRESSION TEST	UNCONFINED COMPRESSIVE STRENGTH qu kg/cm²						
		SECANT MOD. E50 kg/cm²						
		SENSITIVITY RATIO ST.						
	SINGLE SHEAR TEST	TESTING CONDITION	at 4.80-4.95 m. depth	at 4.95-5.10 m. depth	at 5.10-5.95 m. depth			
		COHESION C kg/cm²						
		SHEAR STRESS (t/sq.m) °	3.10	2.70	3.75			
	TRIAXIAL COMPRESSION TEST	TESTING CONDITION						
		COHESION C kg/cm²						
		ANGLE OF SHEARING RESISTANCE Ø °						
	CONSOLIDATION TEST	CONSOLIDATION PC PRESSURE kg/cm²						
		COMPRESSION INDEX Cc						

REMARKS :

Source: JICA Study Team

Table N-2-3-1.12(6) Summary of Soil Test Result

(BH - 3 Bacolod)

JIS - A - 1	SUMMARY OF SOIL TEST RESULTS	REPORT FORM

PROJECT, NATIONWIDE ROLL-ON ROLL-OFF TRANSPORT SYSTEM DEVELOPMENT LOCATION BACOLOD CITY

HOLE NO. BH-3

DATE: 8-1-91

RECORDER: E. N. MANAOG

		SAMPLE NO.	1	2	3	UDS-1	4	UDS-2
		DEPTH, M	0.00-0.45	1.05-1.50	2.55-3.00	3.00-3.45	4.05-4.50	4.55-5.00
GRAIN SIZE ANALYSIS	GRAVEL (>2000μ) %		22.0	20.0	4.00	3.00	6.00	-
	SAND (74-2000μ) %		73.0	73.0	27.0	52.0	45.0	12.0
	SILT (5-74μ) %		5.0	7.0	69.0	45.0	49.0	88.0
	CLAY (<5μ) %							
	MAX. DIAMETER mm		4.76	4.76	2.00	9.52	2.00	2.00
	COEFFICIENT OF UNIFORMITY Uc		6.0	6.0	6.0	-	5.0	-
	COEFFICIENT OF CURVATURE U'c		1.0	1.0	1.0	-	1.0	-
CONSISTENCY	LIQUID LIMIT WL %		-	-	61.	50	72	75
	PLASTIC LIMIT Wp %		NP	NP	30	30	32	29
	PLASTICITY INDEX Ip		-	-	31	20	40	46
CLASSIFICATION	TRIANGULAR CLASSIFICATION CHART		SM	SM	CH	SC	SC	CH
	PLASTICITY CHART							
SPECIFIC GRAVITY OF SOIL PARTICLES Gs			2.66	2.64	2.69	2.67	2.76	2.65
NATURAL STATE	WATER CONTENT W %		23.0	24.0	43.0	74.0	64.0	82.0
	WET UNIT WEIGHT γt g/cm³					1.53		1.46
	VOID RATIO e					2.0244		2.3119
	DEGREE OF SATURATION Sr %					97.01		93.88
MECHANICAL CHARACTERISTICS	UNCONFINED COMPRESSION TEST	UNCONFINED COMPRESSIVE STRENGTH qu kg/cm²				slumpy		slumpy
		SECANT MOD. E50 kg/cm²						
		SENSITIVITY RATIO ST.						
	SINGLE SHEAR TEST	TESTING CONDITION			at 3.50-3.60 m. depth	at 3.65-3.80 m depth	at 3.85-4.00 m depth	at 5.00-5.15 m. depth
		COHESION C kg/cm²						
		SHEAR STRESS (t/sq. m.)			Undisturbed: 1.70 Remoulded: 0.40	Undisturbed: 1.50 Remoulded: 0.30	Undisturbed 1.60 Remoulded: 0.60	Undisturbed 1.80 Remoulded: 0.60
	TRIAXIAL COMPRESSION TEST	TESTING CONDITION						
		COHESION C kg/cm²						
		ANGLE OF SHEARING RESISTANCE Ø °						
	CONSOLIDATION TEST	CONSOLIDATION PRESSURE PC kg/cm²				3.10		2.70
		COMPRESSION INDEX Cc				0.33		1.06

REMARKS :

Source: JICA Study Team

Table N-2-3-1.12(7) Summary of Soil Test Result

(BH - 3 Bacolod)

JIS - A - 1	SUMMARY OF SOIL TEST RESULTS	REPORT FORM

PROJECT, NATIONWIDE ROLL-ON ROLL-OFF TRANSPORT SYSTEM DEVELOPMENT LOCATION BACOLOD CITY

HOLE NO. BH-3		SAMPLE NO.	5	6	7	8	9	10
DATE: 8-1-91 RECORDER: E.N. MANAOG		DEPTH, M	5.55 - 6.00	7.05 - 7.50	8.55 - 9.00	10.05 - 10.50	11.55 - 12.00	13.05 - 13.50
GRAIN SIZE ANALYSIS	GRAVEL (>2000μ) %		4.00	1.00	3.00	7.00	-	2.00
	SAND (74-2000μ) %		56.0	14.00	16.0	67.0	40.0	38.0
	SILT (5-74μ) %		40.0	85.0	81.0	26.0	60.0	60.0
	CLAY (<5μ) %							
	MAX. DIAMETER mm		2.00	2.00	2.00	4.76	0.84	4.76
	COEFFICIENT OF UNIFORMITY Uc		5.0	-	-	3.0	-	7.0
	COEFFICIENT OF CURVATURE U'c		1.0	-	-	2.0	-	1.0
CONSISTENCY	LIQUID LIMIT WL %		45	61	60	33	58	56
	PLASTIC LIMIT Wp %		26	32	32	29	32	31
	PLASTICITY INDEX Ip		19	29	28	4	26	25
CLASSIFICATION	TRIANGULAR CLASSIFICATION CHART		SC	MH	MH	SM	MH	MH
	PLASTICITY CHART							
SPECIFIC GRAVITY OF SOIL PARTICLES Gs			2.68	2.67	2.69	2.66	2.66	2.68
NATURAL STATE	WATER CONTENT W %		69.0	61.0	54.0	29.0	63.0	58.0
	WET UNIT WEIGHT γt g/cm³							
	VOID RATIO e							
	DEGREE OF SATURATION Sr %							
MECHANICAL CHARACTERISTICS	UNCONFINED COMPRESSION TEST	UNCONFINED COMPRESSIVE STRENGTH qu kg/cm²						
		SECANT MOD. E50 kg/cm²						
		SENSITIVITY RATIO ST.						
	SINGLE SHEAR TEST	TESTING CONDITION	at 5.15-5.30 m. depth	at 5.30-5.45 m. depth				
		COHESION C kg/cm²						
		SHEAR STRESS (t/sq. m.)	Undisturbed 2.00 Remoulded 0.65	Undisturbed 2.10 Remoulded 0.67				
	TRIAXIAL COMPRESSION TEST	TESTING CONDITION						
		COHESION C kg/cm²						
		ANGLE OF SHEARING RESISTANCE Ø °						
	CONSOLIDATION TEST	CONSOLIDATION PRESSURE PC kg/cm²						
		COMPRESSION INDEX Cc						

REMARKS :

Source: JICA Study Team

Table N-2-3-1.12(8) Summary of Soil Test Result

(BH - 3 Bacolod)

JIS - A - 1	SUMMARY OF SOIL TEST RESULTS	REPORT FORM

PROJECT, NATIONWIDE ROLL-ON ROLL - OFF TRANSPORT SYSTEM DEVELOPMENT LOCATION BACOLOD CITY

HOLE NO. BH-3	SAMPLE NO.	11	12	13	14	15	16
DATE: 8-1-91	DEPTH, M	14.55 15.00	16.05 16.50	17.55 18.00	19.05 19.50	20.55 21.00	22.05 22.50
RECORDER: E.N.MANAOG							
GRAIN SIZE ANALYSIS	GRAVEL (>2000μ) %	-	1.00	7.00	-	1.00	2.00
	SAND (74-2000μ) %	14.0	6.0	69.0	80.0	78.0	66.0
	SILT (5-74μ) %	86.0	93.0	24.0	20.0	21.0	32.0
	CLAY (<5μ) %						
	MAX. DIAMETER mm	0.84	2.00	4.76	0.84	2.0	2.0
	COEFFICIENT OF UNIFORMITY Uc	2.0	-	10.0	2.0	10.0	-
	COEFFICIENT OF CURVATURE U'c	1.0	-	1.0	1.0	5.0	-
CONSISTENCY	LIQUID LIMIT WL %	49	48	—	—	—	—
	PLASTIC LIMIT Wp %	29	29	NP	NP	NP	NP
	PLASTICITY INDEX Ip	20	19	-	—	—	—
CLASSIFICATION	TRIANGULAR CLASSIFICATION CHART	ML	ML	SM	SM	SM	SM
	PLASTICITY CHART						
SPECIFIC GRAVITY OF SOIL PARTICLES Gs		2.66	2.65	2.69	2.65	2.67	2.65
NATURAL STATE	WATER CONTENT W %	37.0	32.0	31.0	30.0	33.0	16.0
	WET UNIT WEIGHT γt g/cm³						
	VOID RATIO e						
	DEGREE OF SATURATION Sr %						
MECHANICAL CHARACTERISTICS	UNCONFINED COMPRESSION TEST: UNCONFINED COMPRESSIVE STRENGTH qu kg/cm²						
	SECANT MOD. E50 kg/cm²						
	SENSITIVITY RATIO ST.						
	SINGLE SHEAR TEST: TESTING CONDITION						
	COHESION C kg/cm²						
	SHEAR STRESS (t / sq. m.)						
	TRIAXIAL COMPRESSION TEST: TESTING CONDITION						
	COHESION C kg/cm²						
	ANGLE OF SHEARING RESISTANCE Ø °						
	CONSOLIDATION TEST: CONSOLIDATION PRESSURE PC kg/cm²						
	COMPRESSION INDEX Cc						

REMARKS :

Source: JICA Study Team

Table N-2-3-1.12(9) Summary of Soil Test Result

(BH - 3 Bacolod)

JIS - A - 1	SUMMARY OF SOIL TEST RESULTS	REPORT FORM

PROJECT, NATIONWIDE ROLL-ON ROLL-OFF TRANSPORT SYSTEM DEVELOPMENT LOCATION BACOLOD CITY

HOLE NO. BH-3		SAMPLE NO.	17	18					
DATE: 8-1-91 RECORDER: E. N. MANAOG		DEPTH, M	23.55 24.00	25.05 25.50					
GRAIN SIZE ANALYSIS	GRAVEL	(>2000μ) %	-	7.00					
	SAND	(74-2000μ) %	57.00	49.00					
	SILT	(5-74μ) %	43.00	44.00					
	CLAY	(<5μ) %							
	MAX. DIAMETER	mm	0.42	4.76					
	COEFFICIENT OF UNIFORMITY	Uc	1.0	-					
	COEFFICIENT OF CURVATURE	U'c	-	-					
CONSISTENCY	LIQUID LIMIT	WL %	-	43					
	PLASTIC LIMIT	Wp %	NP	26					
	PLASTICITY INDEX	Ip	-	17					
CLASSIFICATION	TRIANGULAR CLASSIFICATION CHART		SM	SC					
	PLASTICITY CHART								
SPECIFIC GRAVITY OF SOIL PARTICLES		Gs	2.67	2.70					
NATURAL STATE	WATER CONTENT	W %	35.0	41.0					
	WET UNIT WEIGHT	γt g/cm³							
	VOID RATIO	e							
	DEGREE OF SATURATION	Sr %							
MECHANICAL CHARACTERISTICS	UNCONFINED COMPRESSION TEST	UNCONFINED COMPRESSIVE STRENGTH qu kg/cm²							
		SECANT MOD. E50 kg/cm²							
		SENSITIVITY RATIO ST.							
	SINGLE SHEAR TEST	TESTING CONDITION							
		COHESION C kg/cm²							
		SHEAR STRESS (t/sq.m.)							
	TRIAXIAL COMPRESSION TEST	TESTING CONDITION							
		COHESION C kg/cm²							
		ANGLE OF SHEARING RESISTANCE Ø °							
	CONSOLIDATION TEST	CONSOLIDATION PRESSURE PC kg/cm²							
		COMPRESSION INDEX Cc							

REMARKS :

Source: JICA Study Team

Table N-2-3-1.12(10) Summary of Soil Test Result
(BH - 4 Bacolod)

JIS - A - 1	SUMMARY OF SOIL TEST RESULTS	REPORT FORM

PROJECT, Nationwide Roll-On Roll-Off Tranport System Development Study LOCATION Bacolod City

HOLE NO. BH-4 SAMPLE NO.

DATE: Sept. 2, 1991
RECORDER: N.P. ARAFILES

			1	2	3	4	5	6
	DEPTH, M		1.00 1.50	2.00 2.80	4.00 4.50	8.50 8.80	8.80 9.10	10.00 10.50
GRAIN SIZE ANALYSIS	GRAVEL	(>2000μ) %	7.2	3.9	0	3.4	0	2.6
	SAND	(74-2000μ) %	87.5	27.5	29.5	15.4	17.8	24.9
	SILT	(5-74μ) %	5.3	66.8	70.5	81.2	82.2	72.5
	CLAY	(<5μ) %		1.8				
	MAX. DIAMETER	mm	9.52	4.76	0.84	4.76	0.84	4.76
	COEFFICIENT OF UNIFORMITY	Uc	2.64	3.76				
	COEFFICIENT OF CURVATURE	U'c	1.33	0.11				
CONSISTENCY	LIQUID LIMIT	WL %	13.7	49.2	41.8	37.8	40.3	43.5
	PLASTIC LIMIT	Wp %	N.P.	24.6	24.8	23.6	29.2	26.7
	PLASTICITY INDEX	Ip	—	24.6	17.0	14.2	11.1	16.8
CLASSIFICATION	TRIANGULAR CLASSIFICATION CHART		SM	CL	CH	ML	ML	SC
	PLASTICITY CHART							
SPECIFIC GRAVITY OF SOIL PARTICLES		Gs	2.65	2.48	2.58	2.56	2.59	2.59
NATURAL STATE	WATER CONTENT	W %	20.4	81.7	47.1	46.1	45.3	40.6
	WET UNIT WEIGHT	γt g/cm³		1.48 1.50				
	VOID RATIO	e		2.04 2.10				
	DEGREE OF SATURATION	Sr %		98.9 103.1				
MECHANICAL CHARACTERISTICS	UNCONFINED COMPRESSION TEST: UNCONFINED COMPRESSIVE STRENGTH	kg/cm² qu		0.330 0.202				
	UNCONFINED COMPRESSION TEST: SECANT MOD. E50	kg/cm²		0.0825 0.0404				
	UNCONFINED COMPRESSION TEST: SENSITIVITY RATIO	ST.						
	SINGLE SHEAR TEST: TESTING CONDITION			at 2.00m.	at 5.00 m.			
	SINGLE SHEAR TEST: COHESION C	kg/cm²						
	SINGLE SHEAR TEST: SHEAR STRESS (t/sq. m)			Undisturbed 1.80 Remoulded 0.60	Undisturbed 2.25 Remoulded 0.70			
	TRIAXIAL COMPRESSION TEST: TESTING CONDITION							
	TRIAXIAL COMPRESSION TEST: COHESION C	kg/cm²						
	TRIAXIAL COMPRESSION TEST: ANGLE OF SHEARING RESISTANCE	Ø °						
	CONSOLIDATION TEST: CONSOLIDATION PRESSURE	PC kg/cm²						
	CONSOLIDATION TEST: COMPRESSION INDEX	Cc						

REMARKS :

Source: JICA Study Team

Table N-2-3-1.12(11) Summary of Soil Test Result
(BH - 4 Bacolod)

JIS - A - 1	SUMMARY OF SOIL TEST RESULTS	REPORT FORM

PROJECT, Nationwide Roll-On Roll-Off ~~Tranport~~ System Development Study LOCATION Bacolod City

HOLE NO. BH-4		SAMPLE NO.	7						
DATE: Sept. 2, 1991 RECORDER: N.P. ARAFILES		DEPTH, M	13.00 13.40						
GRAIN SIZE ANALYSIS	GRAVEL	(>2000μ) %	9.2						
	SAND	(74~2000μ) %	43.7						
	SILT	(5~74μ) %	47.1						
	CLAY	(<5 μ) %							
	MAX. DIAMETER	mm	4.76						
	COEFFICIENT OF UNIFORMITY	Uc							
	COEFFICIENT OF CURVATURE	U'c							
CONSISTENCY	LIQUID LIMIT	WL %	39.4						
	PLASTIC LIMIT	Wp %	29.4						
	PLASTICITY INDEX	Ip	10.0						
CLASSIFICATION	TRIANGULAR CLASSIFICATION CHART		ML						
	PLASTICITY CHART								
SPECIFIC GRAVITY OF SOIL PARTICLES		Gs	2.54						
NATURAL STATE	WATER CONTENT	W %	20.2						
	WET UNIT WEIGHT	γt g/cm³							
	VOID RATIO	e							
	DEGREE OF SATURATION	Sr %							
MECHANICAL CHARACTERISTICS	UNCONFINED COMPRESSION TEST	UNCONFINED COMPRESSIVE STRENGTH qu kg/cm²							
		SECANT MOD. E50 kg/cm²							
		SENSITIVITY RATIO ST.							
	SINGLE SHEAR TEST	TESTING CONDITION							
		COHESION C kg/cm²							
		ANGLE OF SHEARING RESISTANCE φ °							
	TRIAXIAL COMPRESSION TEST	TESTING CONDITION							
		COHESION C kg/cm²							
		ANGLE OF SHEARING RESISTANCE Ø °							
	CONSOLIDATION TEST	CONSOLIDATION PRESSURE PC kg/cm²							
		COMPRESSION INDEX Cc							

REMARKS :

Source: JICA Study Team

Table N-2-3-1.13 Results of VANE Shearing Test (Bacolod)

PROJECT : Nationwide RO-RO Transport System Dev. Project INSTRUMENT TYPE : GEONOR

LOCATION : Bacolod City SIZE OF VANE : 3"

FIELD VANE SHEAR TEST

BOREHOLE NO.	SAMPLE NO.	DEPTH (M)	DATE TESTED	READING UNDISTURBED	READING REMOLDED	SHEAR STRESS (T/sq.m.) UNDISTURBED	SHEAR STRESS (T/sq.m.) REMOLDED	TYPE OF SOIL
BH-2	1	3.50-3.65	8-30-91			1.50		
	2	3.65-3.80	8-30-91			1.80		
	3	3.80-3.95	8-30-91			2.10		
	1	4.80-4.95	8-31-91			3.10		
	2	4.95-5.10	8-31-91			2.70		
	3	5.10-5.25	8-31-91			3.75		
BH-3	1	3.50-3.60	8-23-91			1.70	0.40	
	2	3.65-3.80	8-23-91			1.50	0.30	
	3	3.85-4.00	8-23-91			1.80	0.60	
	1	5.00-5.15	8-23-91			1.80	0.60	
	2	5.15-5.30	8-23-91			2.00	0.65	
	3	5.30-5.45	8-23-91			2.10	0.67	
BH-4	1	2.00	8-24-91			1.80	0.60	
	2	5.00	8-24-91			2.25	0.70	

Source: JICA Study Team

Note A-2-3-2 Wave Climate in Iloilo and Bacolod

1. Wave statistics for Iloilo and Bacolod were prepared by S-M-B method which is used to be applied to estimation of wave generated by offshore wind. Wind data and offshore fetch are needed for wave estimation by S-M-B method and those data were prepared by following procedure;

2. Wind data in Iloilo were taken as hourly record by PAGASA station which is located at about ten(10) km from the nearest shoreline. Wind data in Iloilo were classified by its direction and wind speed for one (1) year 1990. Wind data in Bacolod were taken by A.T.O in Bacolod Airport which is located by two (2) km from the sea shore and also classified by its direction and wind speed for one (1) year 1990.

3. In order to apply the S-M-B method, it is needed offshore wind speed. Wind data mentioned above were converted its speed from on-land speed to off-shore speed.

4. Generally, offshore wind shall decrease its speed when it arrives at land area because of the difference of surface friction between land area and water area which will act as resistanse forse against wind motion. Conversion was carried out only for Iloilo data by multiplying the certain factor to wind speed because the location of A.T.O Bacolod is very close to sea shore and will provide the smallest affection to wind speed. Conversion factor for Iloilo wind data was chosen as 1.5 considering the location of PAGASA office through experiences.

5. Effective fetch will be calculated by geological condition. In this study, Guimaras Island is located at the front of both of Iloilo and Bacolod and provide shorter distance for wave to grow up. According to the theory of S-M-B method, the longer fetch will produce the bigger wave under the constant wind speed. Fetches for Iloilo and Bacolod are shown in Figure N-2-3-2.1 coresponding to the offshore wave direction.

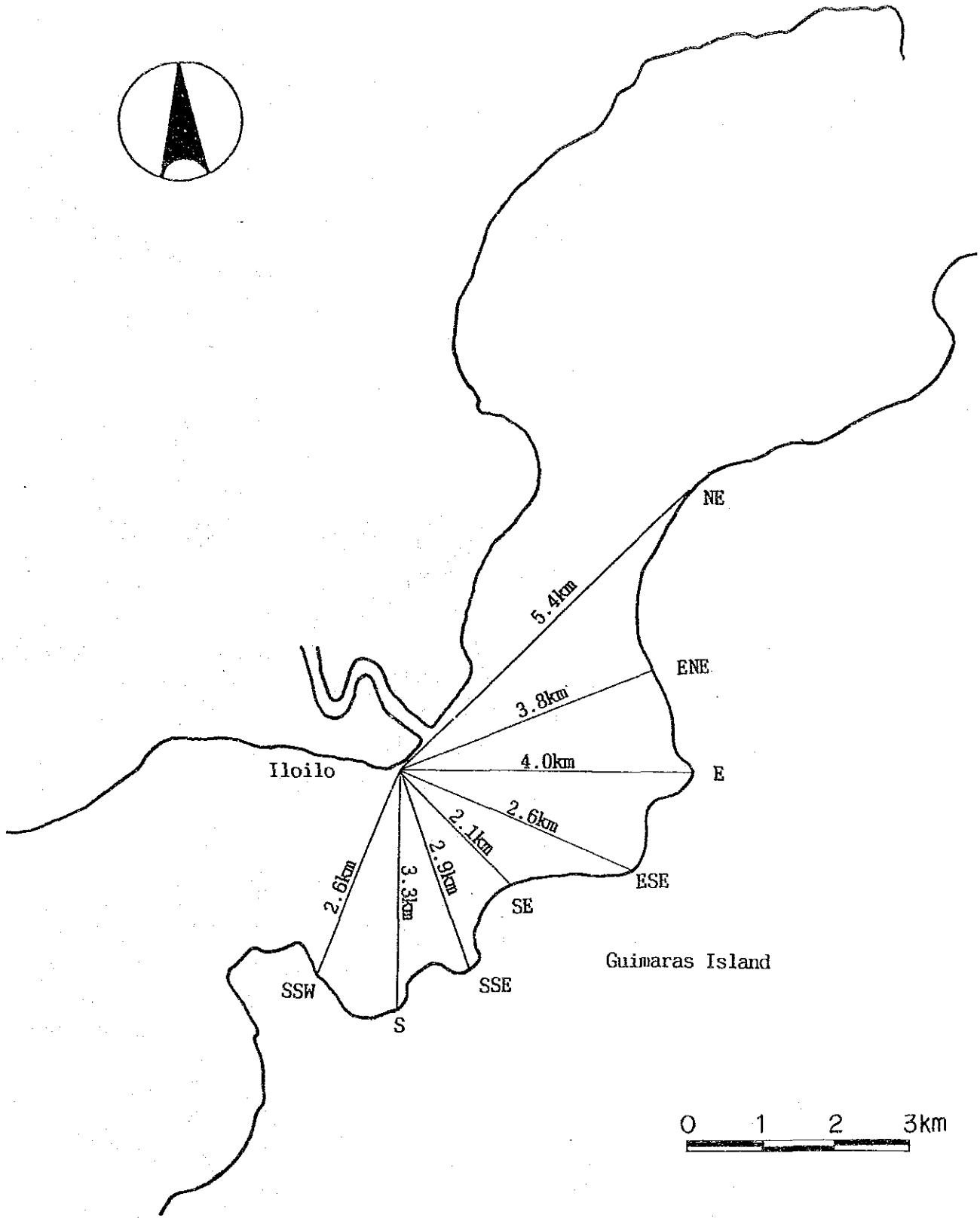


Figure N-2-3-2.1(1) Component Fetch against each Wind Direction (Iloilo)
Source: JICA Study Team

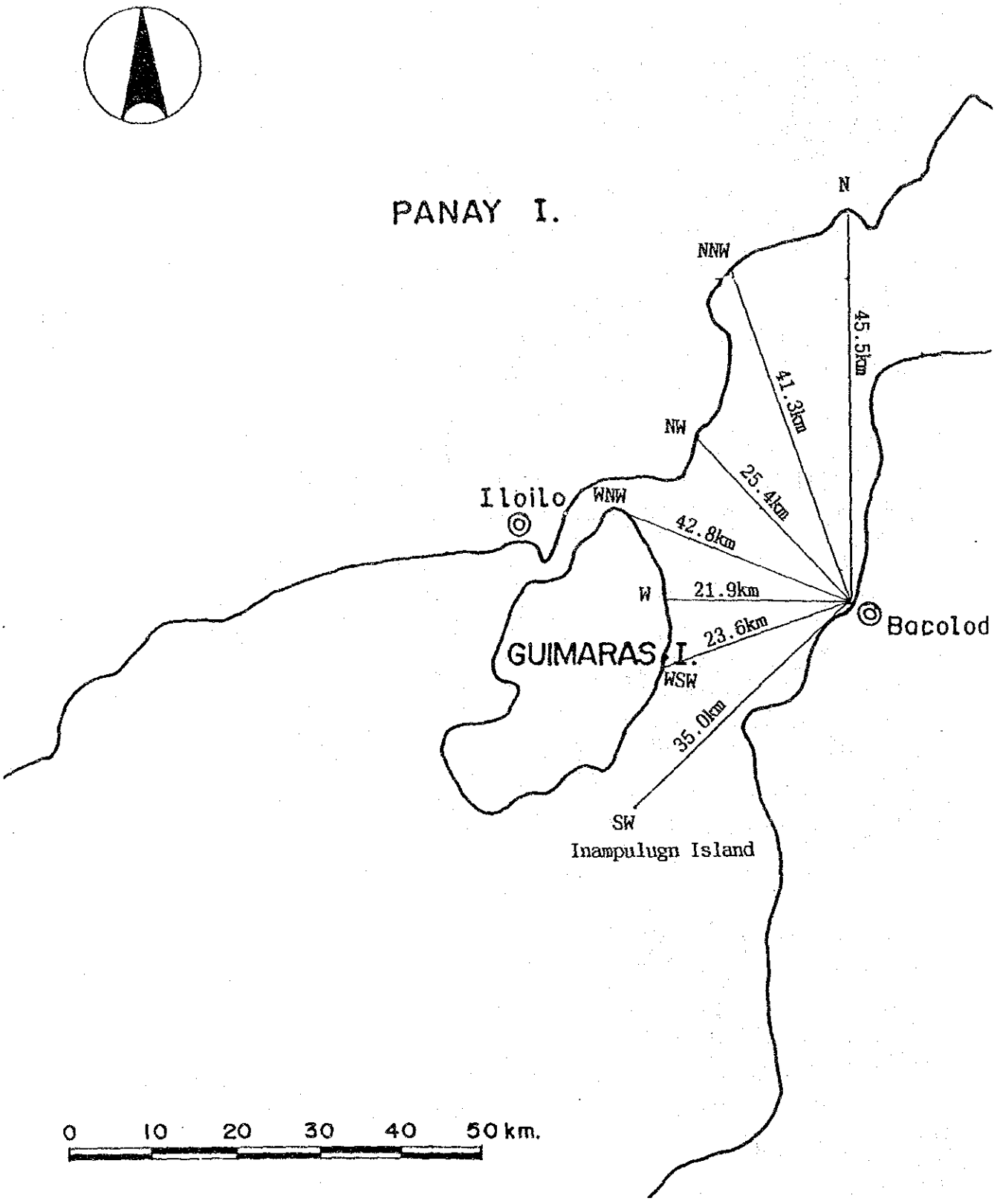


Figure N-2-3-2.1(2) Component Fetch against each Wind Direction (Bacolod)
Source: JICA Study Team

6. Computation of effective fetch was carried out by the following equation;

$$Feff = (\Sigma Fi\cos^2\theta i)/(\Sigma\cos\theta i)$$

where ; Fi distance of fetch along the wind direction
θi angle between the objected wind and each wind components

Offshore wave was estimated by following formula;

$$\frac{gH_{1/3}}{U^2} = 0.30\left[1-\frac{1}{\{1+0.004(\frac{gF}{U^2})^{1/2}\}^2}\right]$$

$$\frac{gT_{1/3}}{2\pi U} = 1.37\left[1-\frac{1}{\{1+0.008(\frac{gF}{U^2})^{1/3}\}^5}\right]$$

where

H1/3: significant wave height (m)
T1/3: significant wave period (sec)
U : wind velosity 10m above sea water surface
F : effective fetch (m)
g : acceleration of gravity (= 9.8 m/sec2)

7. Wind wave will change its height during the travell from deep water to shallow water by the effect such as deflection, shallowness, wave breaking, sea bed friction and etc. Wave deformation by abovementioned factor was computed by numerical analysis for each wave direction shown in Figure N-2-3-2.2 to N-2-3-2.3.

8. Table N-2-3-2.2 shows the wave statistics reflecting the wave deformation in its height and direction.

9. As a result of this study, it is found that more than 95% of wave which arrive at studied area has wave height less than 50 cm and it means operatable days of berthing facility per year is more than 95% and that is satisfactory against the Japanese standard on this matter.

Table N-2-3-2.1(1) Wave estimation by S-M-B method

Iloilo

Prevailling Wind Direction	Effective Fetch (m)	Wind speed (m/sec)	H1/3 (m)	T1/3 (sec)
NE	4050	1	0.04	0.81
	4050	2	0.10	1.21
	4050	3	0.17	1.50
	4050	4	0.24	1.73
	4050	5	0.31	1.92
	4050	6	0.39	2.08
	4050	7	0.46	2.23
ENE	3690	1	0.04	0.79
	3690	2	0.10	1.19
	3690	3	0.17	1.47
	3690	4	0.23	1.69
	3690	5	0.30	1.87
	3690	6	0.37	2.03
	3690	7	0.44	2.17
E	3100	1	0.04	0.77
	3100	2	0.09	1.14
	3100	3	0.16	1.40
	3100	4	0.22	1.61
	3100	5	0.28	1.78
	3100	6	0.34	1.93
	3100	7	0.41	2.07
ESE	2620	1	0.04	0.74
	2620	2	0.09	1.10
	2620	3	0.14	1.34
	2620	4	0.20	1.54
	2620	5	0.26	1.70
	2620	6	0.32	1.84
	2620	7	0.38	1.97
SE	2450	1	0.03	0.73
	2450	2	0.09	1.08
	2450	3	0.14	1.32
	2450	4	0.20	1.51
	2450	5	0.25	1.67
	2450	6	0.31	1.81
	2450	7	0.37	1.93
SSE	2370	1	0.03	0.73
	2370	2	0.09	1.07
	2370	3	0.14	1.31
	2370	4	0.19	1.50
	2370	5	0.25	1.66
	2370	6	0.30	1.79
	2370	7	0.36	1.91
S	2540	1	0.03	0.74
	2540	2	0.09	1.09
	2540	3	0.14	1.33
	2540	4	0.20	1.53
	2540	5	0.26	1.69
	2540	6	0.31	1.83
	2540	7	0.37	1.95
SSW	2610	1	0.04	0.74
	2610	2	0.09	1.09
	2610	3	0.14	1.34
	2610	4	0.20	1.54
	2610	5	0.26	1.70
	2610	6	0.32	1.84
	2610	7	0.38	1.97

Source: JICA Study Team

Table N-2-3-2.1(2) Wave estimation by S-M-B method

Bacolod

Prevailling Wind Direction	Effective Fetch (m)	Wind speed (m/sec)	H1/3 (m)	T1/3 (sec)
N	35500	1	0.03	0.78
	35500	2	0.10	1.37
	35500	3	0.19	1.84
	35500	4	0.30	2.23
	35500	5	0.41	2.57
	35500	6	0.53	2.87
	35500	7	0.66	3.14
NNW	34660	1	0.03	0.78
	34660	2	0.10	1.37
	34660	3	0.19	1.83
	34660	4	0.29	2.22
	34660	5	0.41	2.56
	34660	6	0.53	2.86
	34660	7	0.66	3.13
NW	30730	1	0.03	0.78
	30730	2	0.09	1.35
	30730	3	0.18	1.80
	30730	4	0.29	2.17
	30730	5	0.40	2.50
	30730	6	0.51	2.79
	30730	7	0.63	3.05
WNW	27140	1	0.03	0.77
	27140	2	0.09	1.33
	27140	3	0.18	1.76
	27140	4	0.28	2.13
	27140	5	0.38	2.44
	27140	6	0.49	2.72
	27140	7	0.61	2.96
W	25540	1	0.03	0.76
	25540	2	0.09	1.31
	25540	3	0.18	1.74
	25540	4	0.27	2.10
	25540	5	0.37	2.41
	25540	6	0.48	2.68
	25540	7	0.59	2.92
WSW	26290	1	0.03	0.77
	26290	2	0.09	1.32
	26290	3	0.18	1.75
	26290	4	0.27	2.11
	26290	5	0.38	2.42
	26290	6	0.49	2.70
	26290	7	0.60	2.94
SW	25130	1	0.03	0.76
	25130	2	0.09	1.31
	25130	3	0.18	1.74
	25130	4	0.27	2.10
	25130	5	0.37	2.40
	25130	6	0.48	2.67
	25130	7	0.59	2.91

Source: JICA Study Team

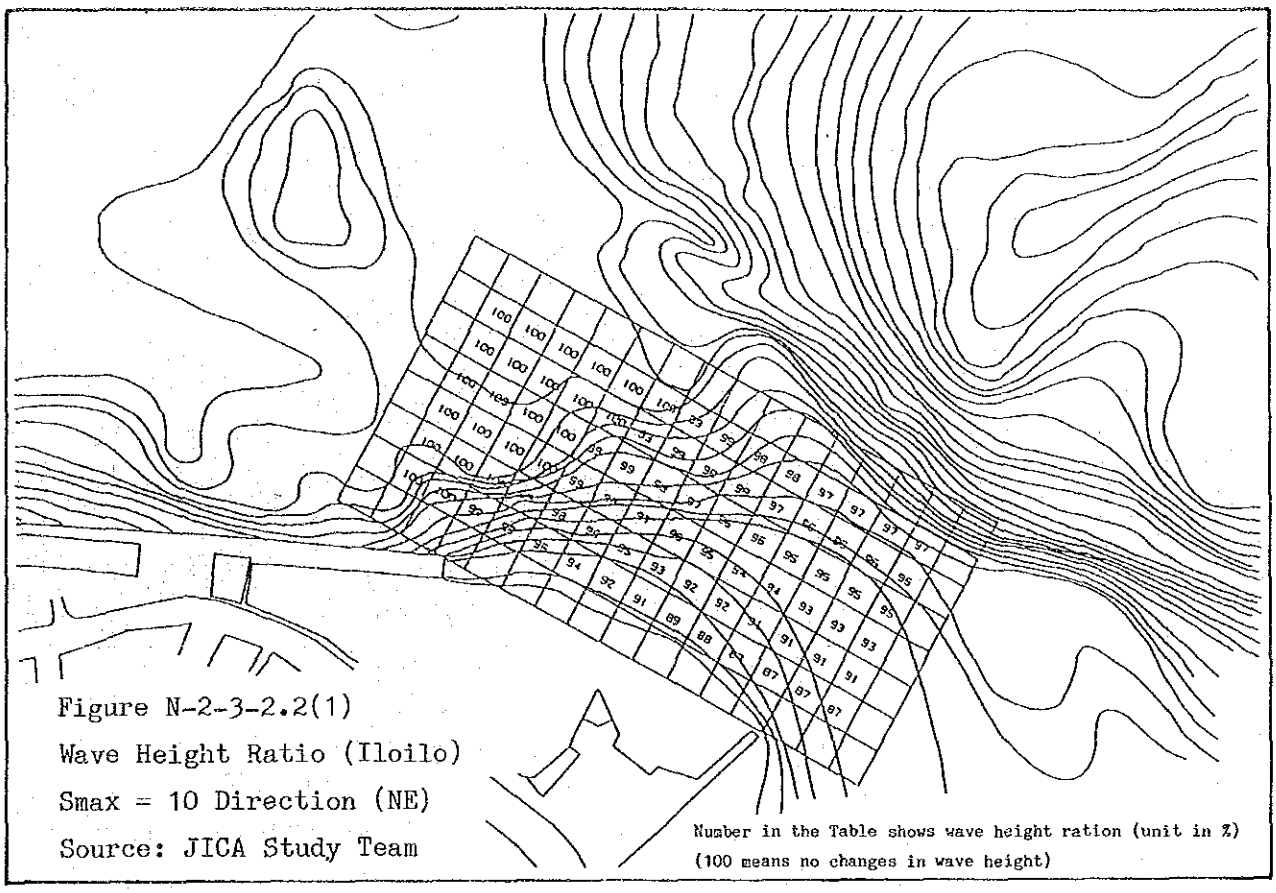


Figure N-2-3-2.2(1)
Wave Height Ratio (Iloilo)
Smax = 10 Direction (NE)
Source: JICA Study Team

Number in the Table shows wave height ration (unit in %)
(100 means no changes in wave height)

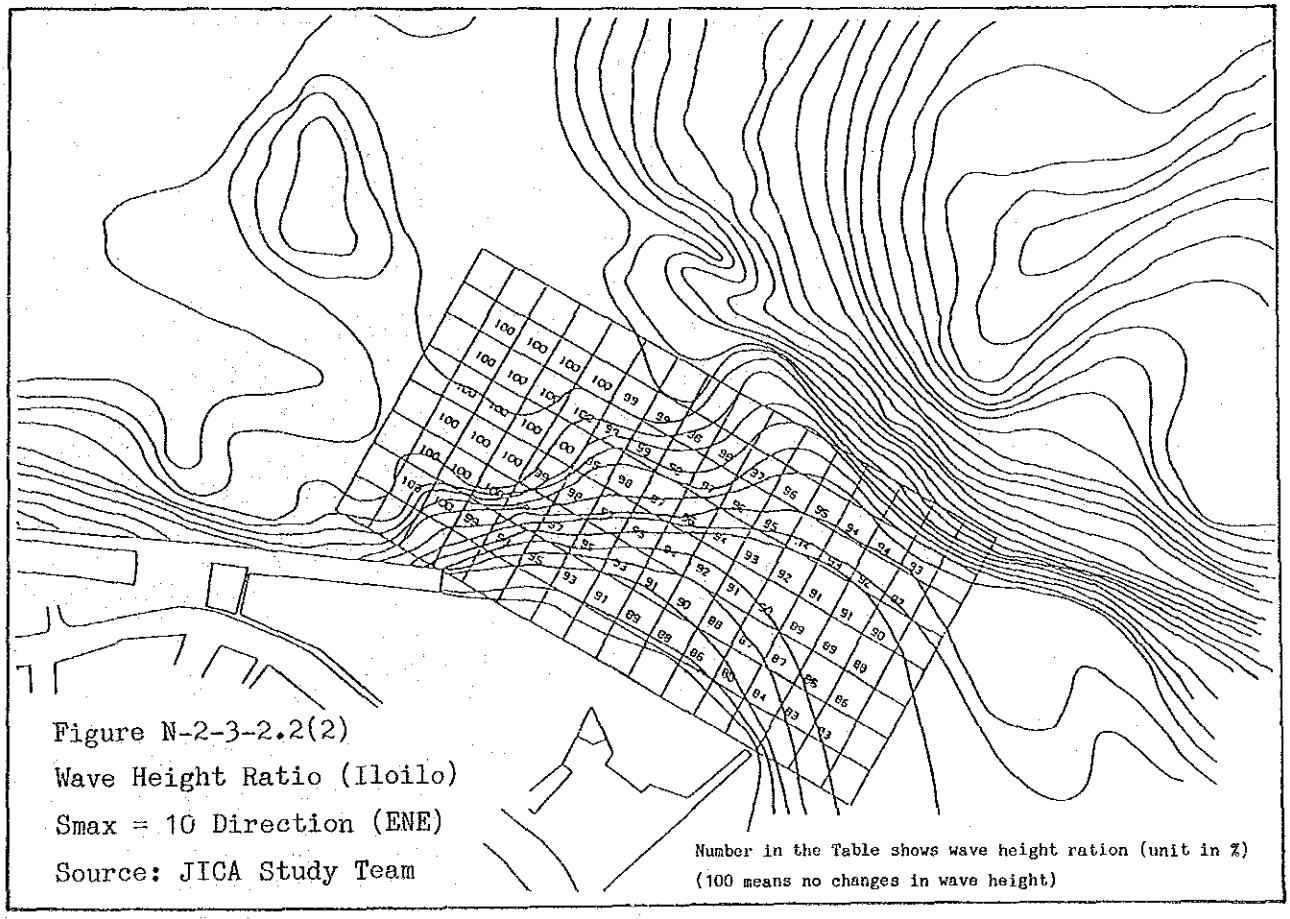


Figure N-2-3-2.2(2)
Wave Height Ratio (Iloilo)
Smax = 10 Direction (ENE)
Source: JICA Study Team

Number in the Table shows wave height ration (unit in %)
(100 means no changes in wave height)

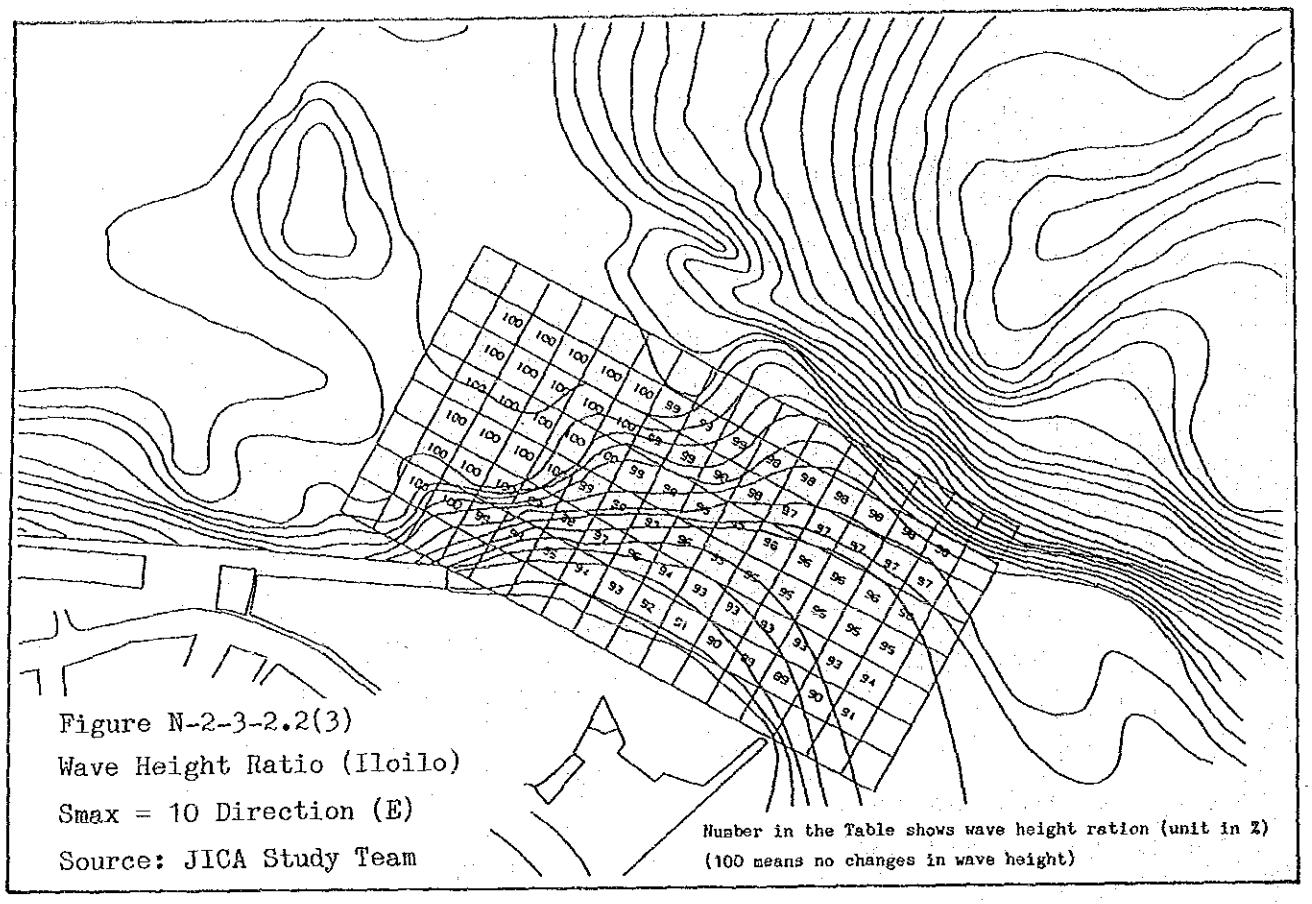


Figure N-2-3-2.2(3)
Wave Height Ratio (Iloilo)
Smax = 10 Direction (E)
Source: JICA Study Team

Number in the Table shows wave height ration (unit in %)
(100 means no changes in wave height)

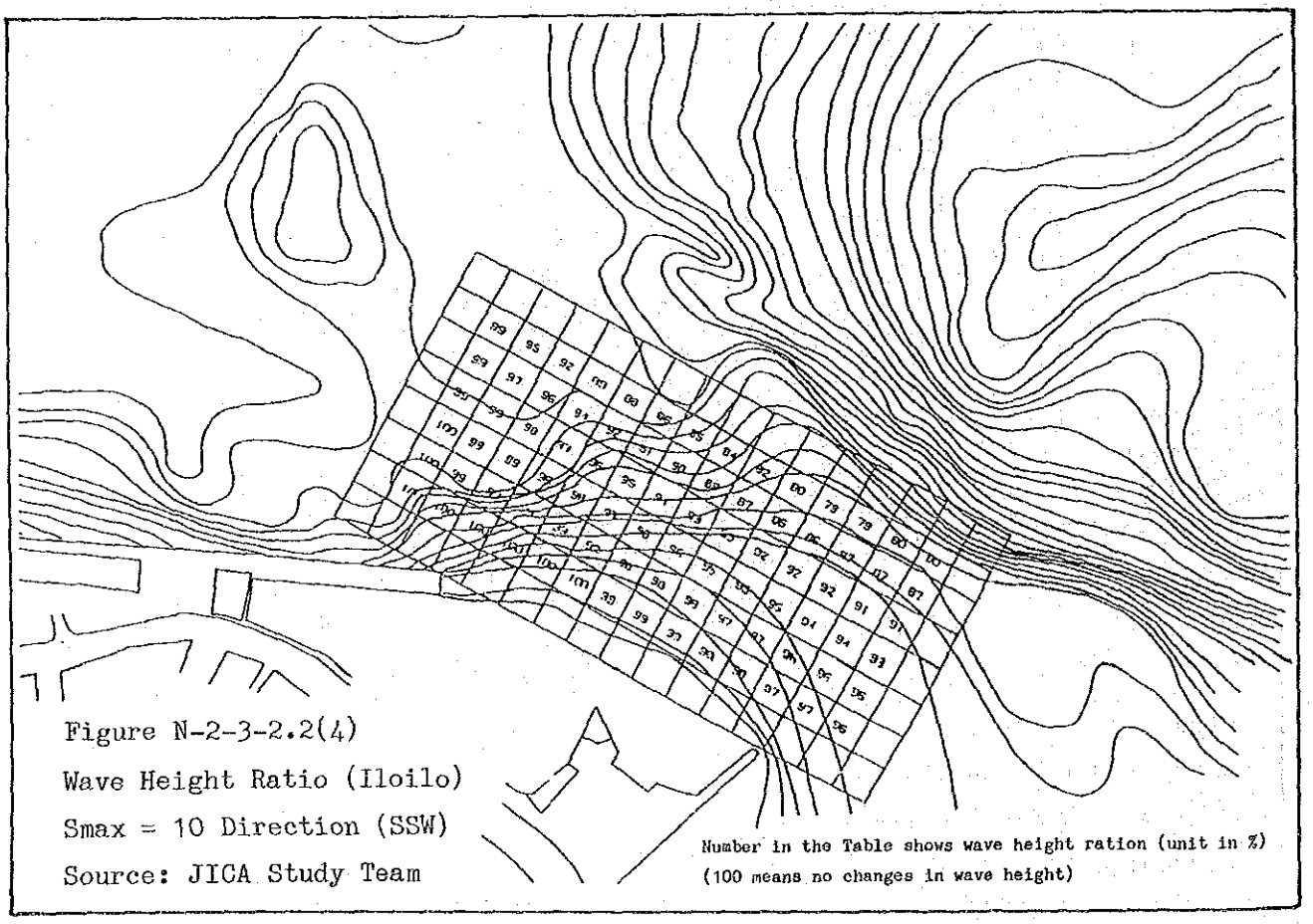


Figure N-2-3-2.2(4)
Wave Height Ratio (Iloilo)
Smax = 10 Direction (SSW)
Source: JICA Study Team

Number in the Table shows wave height ration (unit in %)
(100 means no changes in wave height)

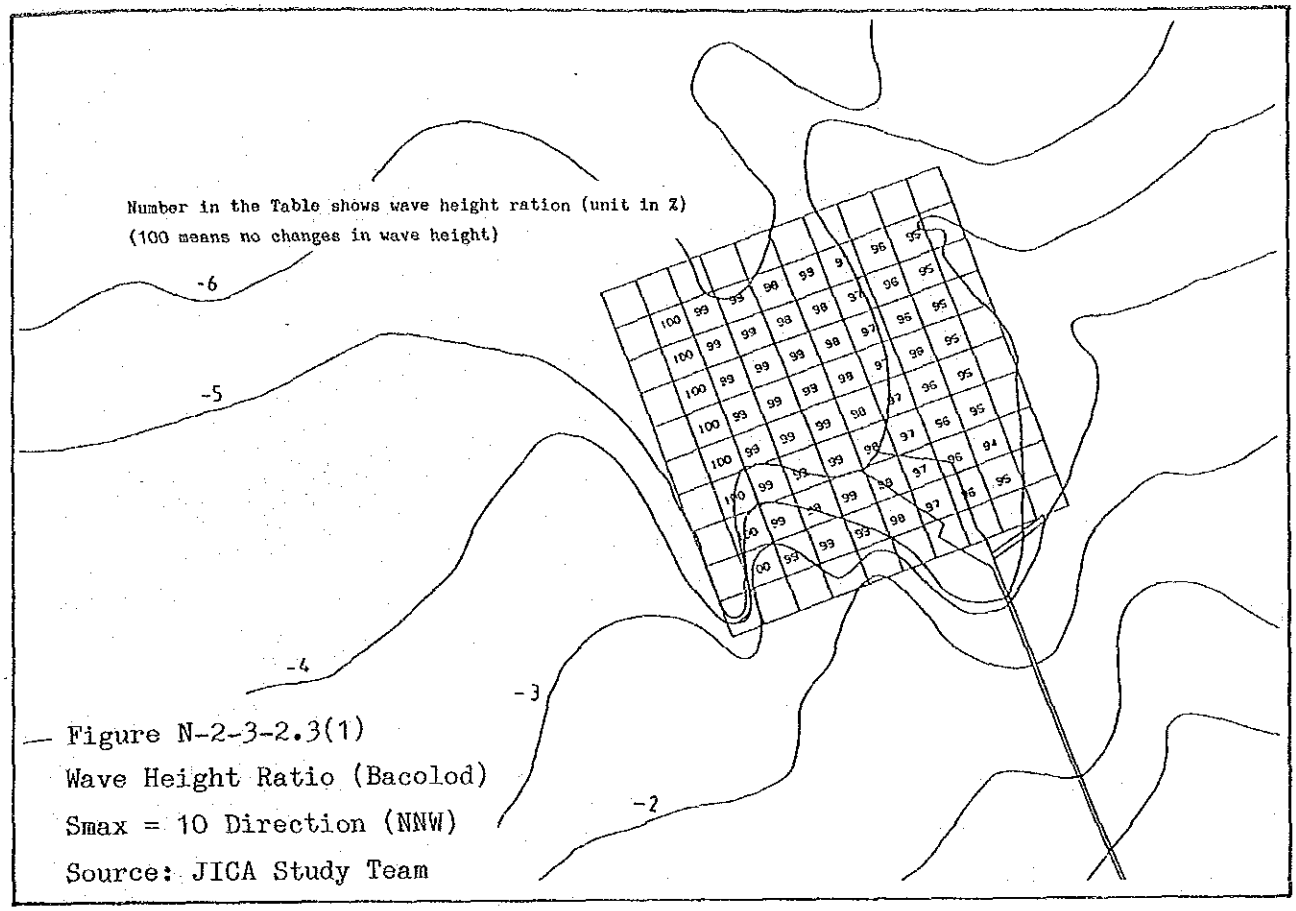


Figure N-2-3-2.3(1)
Wave Height Ratio (Bacolod)
Smax = 10 Direction (NNW)
Source: JICA Study Team

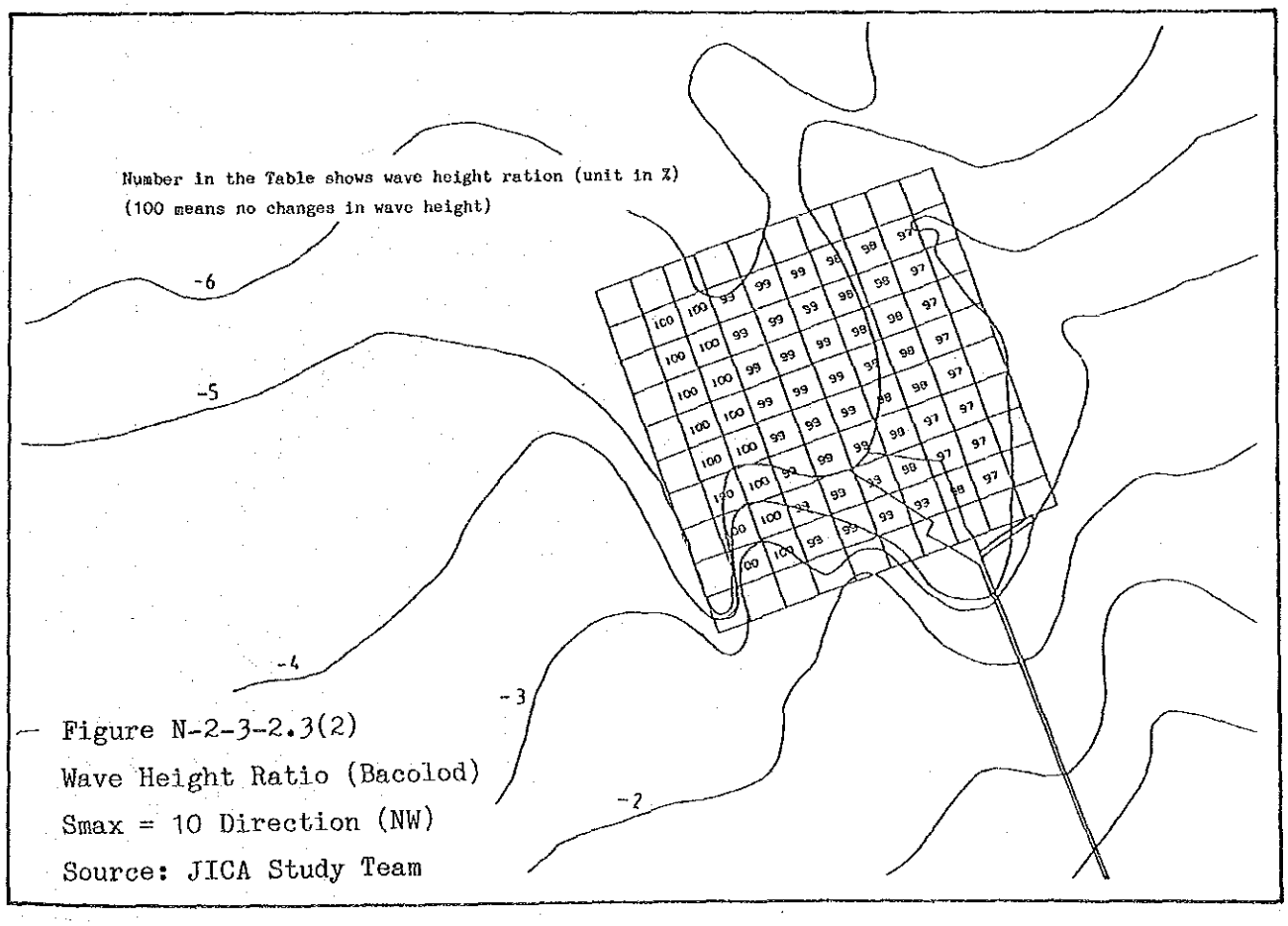


Figure N-2-3-2.3(2)
Wave Height Ratio (Bacolod)
Smax = 10 Direction (NW)
Source: JICA Study Team

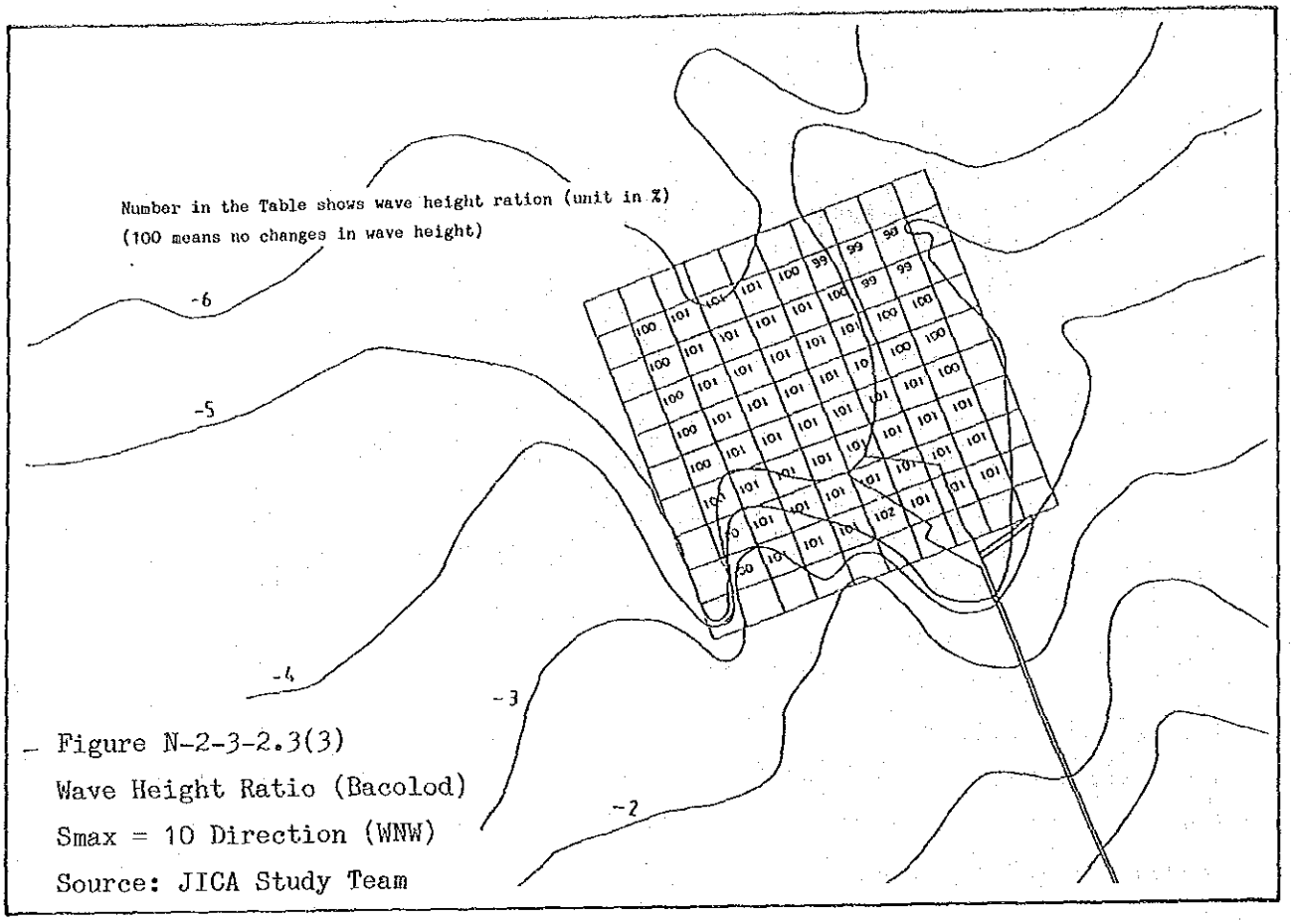


Figure N-2-3-2.3(3)
Wave Height Ratio (Bacolod)
Smax = 10 Direction (WNW)
Source: JICA Study Team

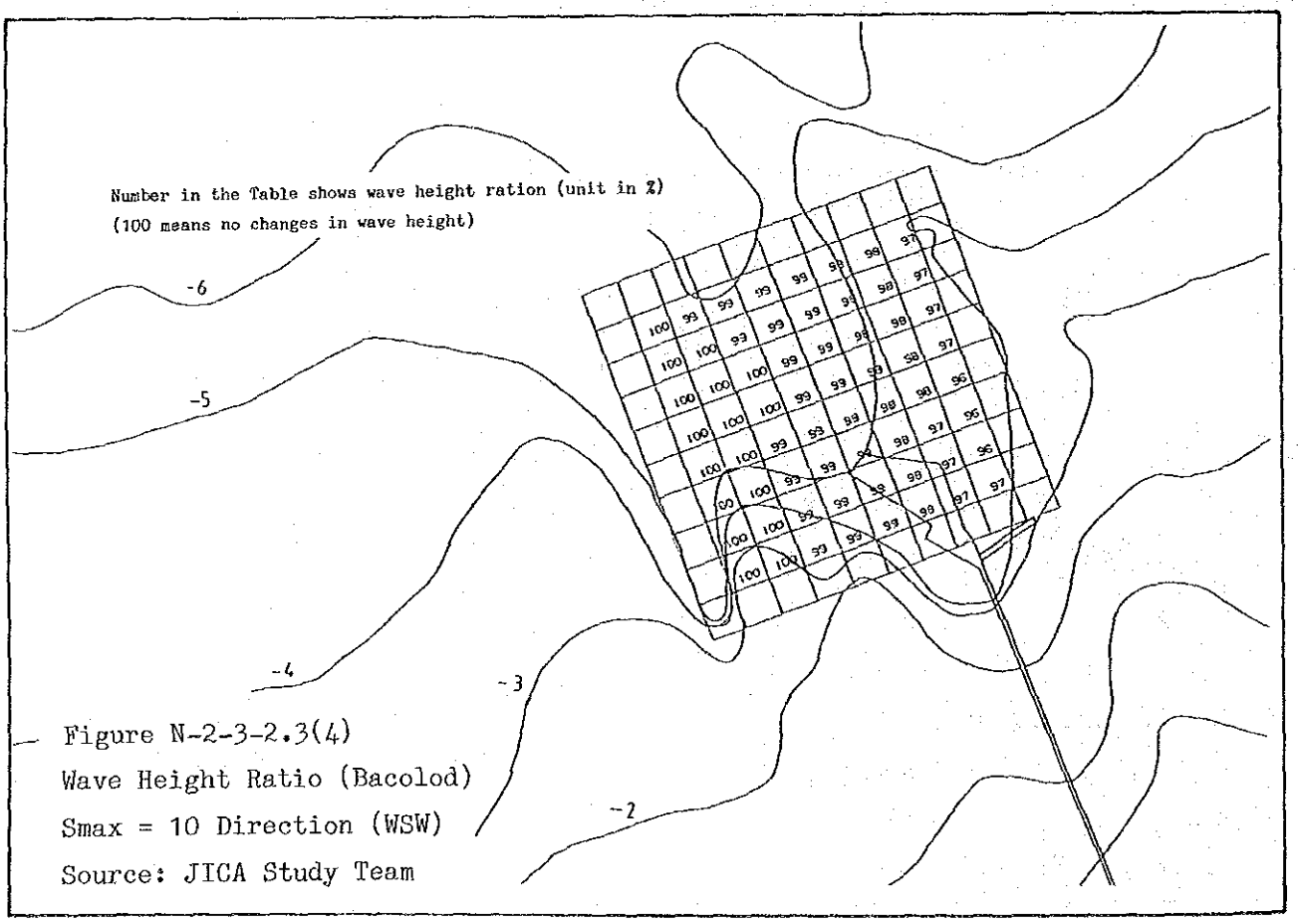


Figure N-2-3-2.3(4)
Wave Height Ratio (Bacolod)
Smax = 10 Direction (WSW)
Source: JICA Study Team

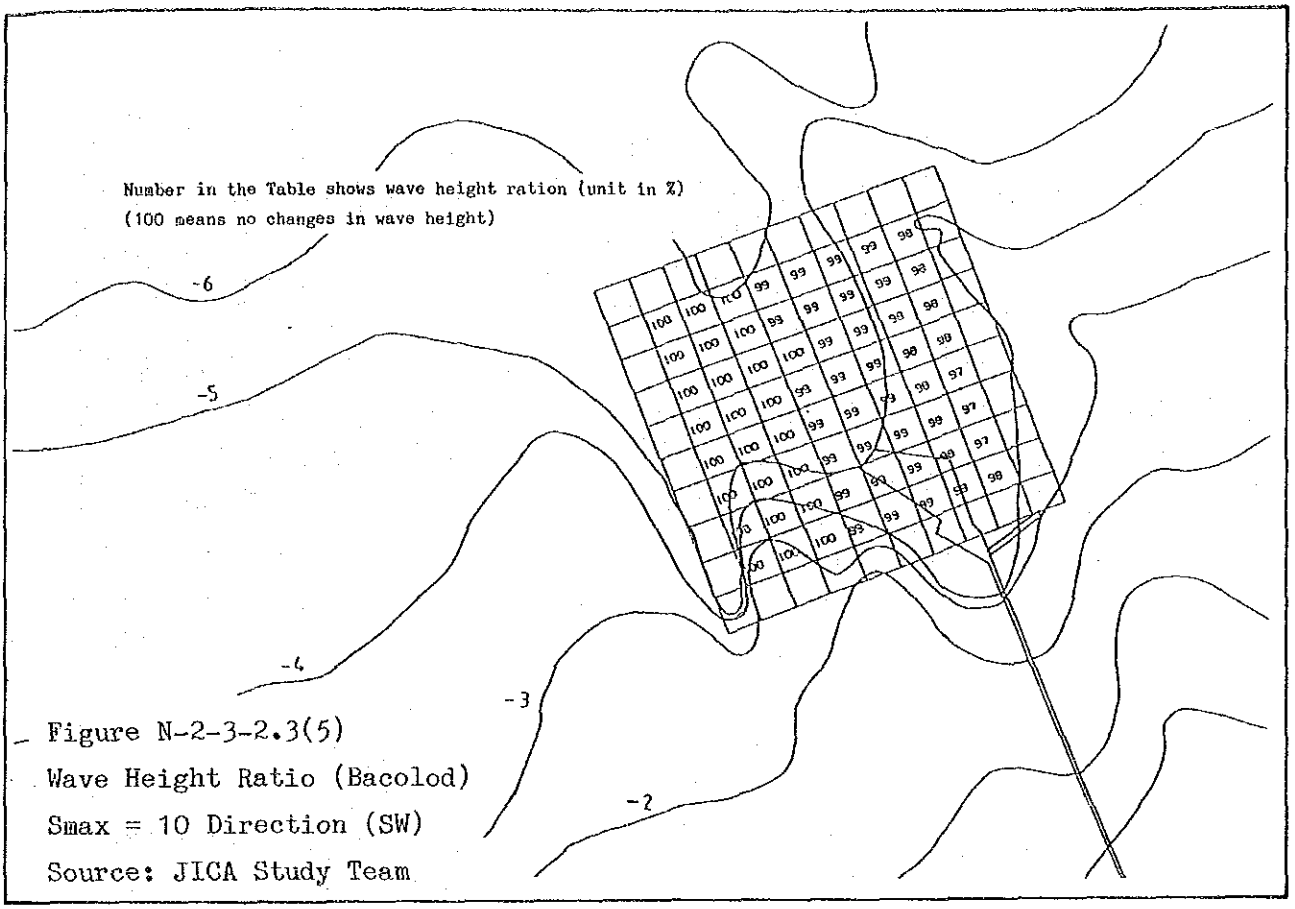


Figure N-2-3-2.3(5)
Wave Height Ratio (Bacolod)
Smax = 10 Direction (SW)
Source: JICA Study Team

Table N-2-3-2.2(1) Wave Classification in Iloilo

Wave Height	WAVE DIRECTION																
(m)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Total
- 0.3																	96.1
0.3 - 0.5			0.9	1.8	0.3					0.7							3.7
0.5 - 0.6			0.1	0.1													0.2
0.6 - 0.8																	
0.8 -																	
Total			1.0	1.9	0.3					0.7							100.0

Source: JICA Study Team

UNIT IN (%)

Table N-2-3-2.2(2) Wave Classification in Bacolod

Wave Height	WAVE DIRECTION																
(m)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Total
- 0.3																	84.3
0.3 - 0.5	5.2										0.3	0.1		0.3	2.6	6.1	14.6
0.5 - 0.6														0.1	0.7	0.3	1.1
0.6 - 0.8																	
0.8 -																	
Total	5.2										0.3	0.1		0.4	3.3	6.4	100.0

Source: JICA Study Team

UNIT IN (%)

Note A-2-3-3 Design Wave Estimation

1. The design wave height in the Visayas area was based on typhoon records covering the period from 1951 to 1990. This was analyzed against the occurrence of strong typhoons with less than 960 mb Pc (atmospheric pressure). Figure N-2-3-3.1 shows the indivisual track of 12 strong typhoons. The strongest typhoons that passed by the northern part of Visayas were 8707 and 8715 in 1987 and 6341 in 1963 while the strongestene that tranversed the southern region was 9025 in 1990. (Note: The Japanese standard was used in the coding of typhoons)

2. Based on the foregoing, typhoon Ruping (9025) which was considered the strongest that hit the project areas was chosen for the wave estimation for Iloilo and Bacolod.

3. Typhoon 9025 (Local Code: Ruping) passed through 15 to 20 km north of Iloilo city moving westward at a speed of 36 km/hr and atmospheric pressure of 955 - 960 mb on November 12-13, 1990. The weather chart published in Japan and the report from PAGASA (Philippines) were used as reference (see Figure N-2-3-3.2). The Wilson's method and S-M-B method were applied in the analysis of the following:

Wave estimation in Iloilo

(i) Estimation of Design Wave height by S-M-B method.

4. Most typhoons in the Philippines have small radius with strong center winds. In the case of typhoon Ruping, it has an average maximum speed of 35m/sec.

5. Estimated wave height and wave period by S-M-B method under the following conditions are shown below.

- Condition
  Wind speed 35m/sec fetch 3.2 km
- Wave height H1/3 = 1.5 m

Wave period T1/3 = 3.4 sec

Figure N-2-3-3.3 and Figure N-2-3-3.4 show the direction of wave and S-M-B graph respectively.

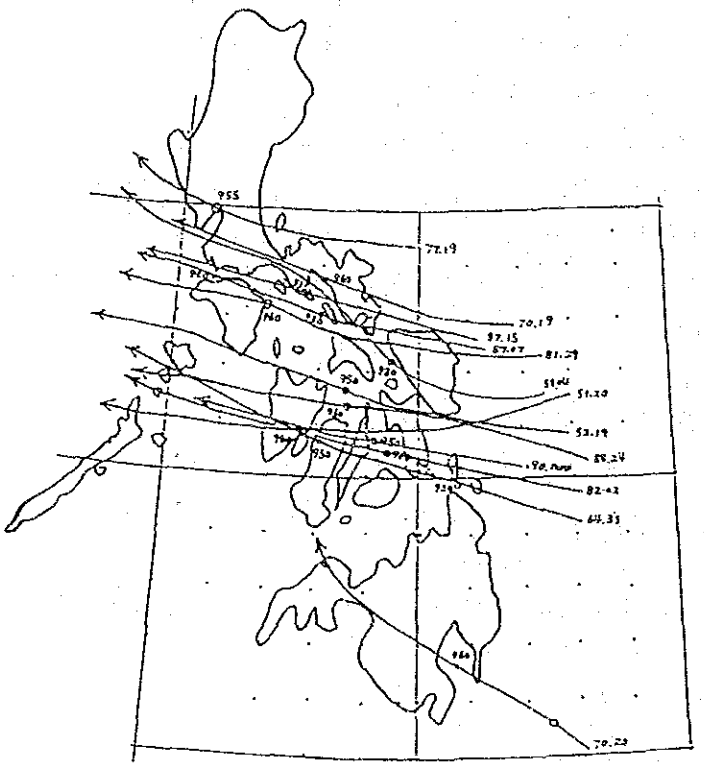


Figure N-2-3-3.1 Tropical Typhoon Track in Area M
(1951 - 1990 Pc < 960mb)
Source: JICA Study Team

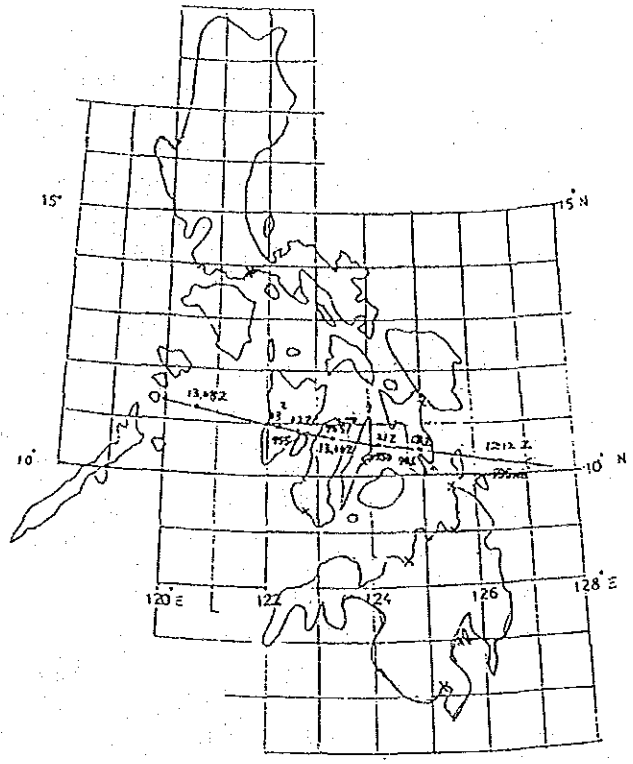


Figure N-2-3-3.2 Track of Typhoon 9025 (Ruping)
Source: JICA Study Team

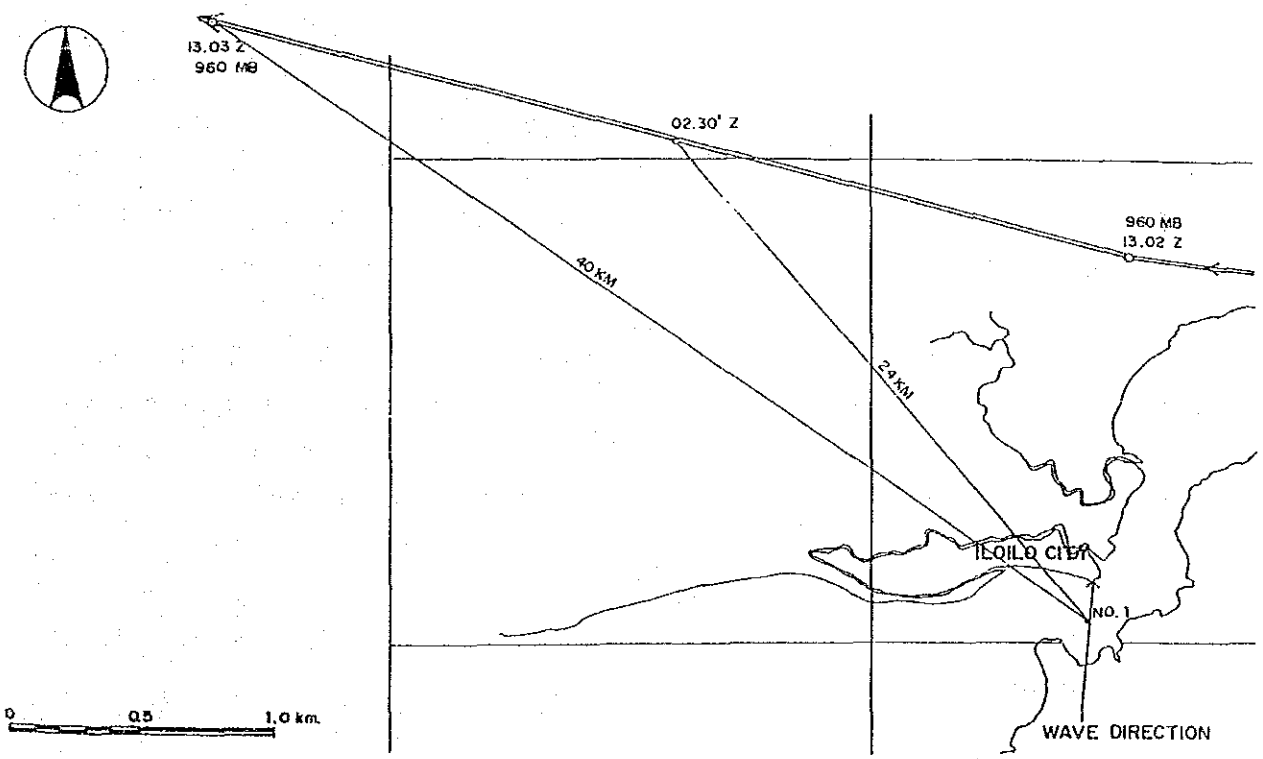


Figure N-2-3-3.3 Location of Typhoon of 9025 and Linear Fetch S5°W (Iloilo)
Source: JICA Study Team

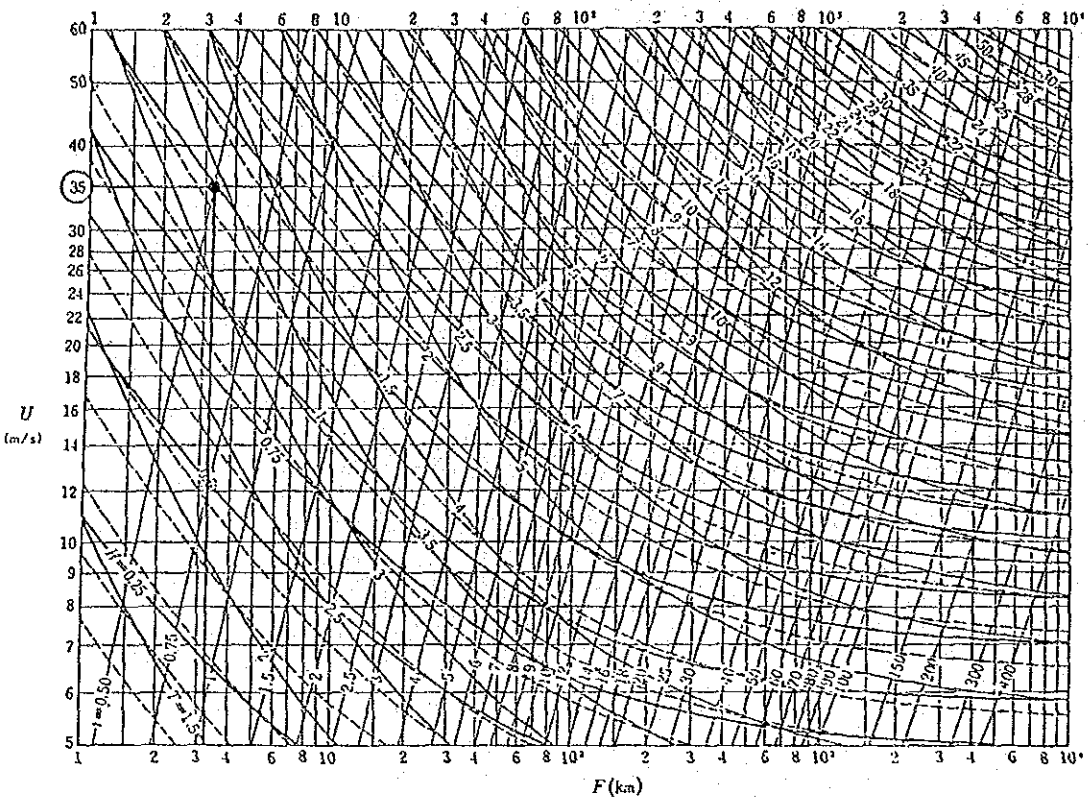


Figure N-2-3-3.4 S-M-B Graph

(ii) Estimation of design wave height by Wilson's method.

6. Figure N-2-3-3.5 shows the location and atmospheric pressure (Pc) of typhoon Ruping against time. Table N-2-3-3.1 shows the distribution of wind speed. Using the Wilson's diagram, (refer to Figure N-2-3-3.6), the estimated offshore wave height is 1.8 m (H1/3) with period of 4.3 sec (T1/3) and S 55 W direction.

7. Iloilo port is sheltered by the Bandulen Pt. from the S 55 W wave so that only part of the wave action could reach Iloilo port. Wave refraction due to the effect of Bandulen Pt. is estimated at 80% of total energy. Hence, the wave height in front of the structure will be reduced to 1.44 m (1.8 m x 0.8).

8. Considering the foregoing, the design wave used in the structural design analysis are as follows:

Wave height = 1.5 m
Wave period = 3.4 sec
Wave direction = N 5 S

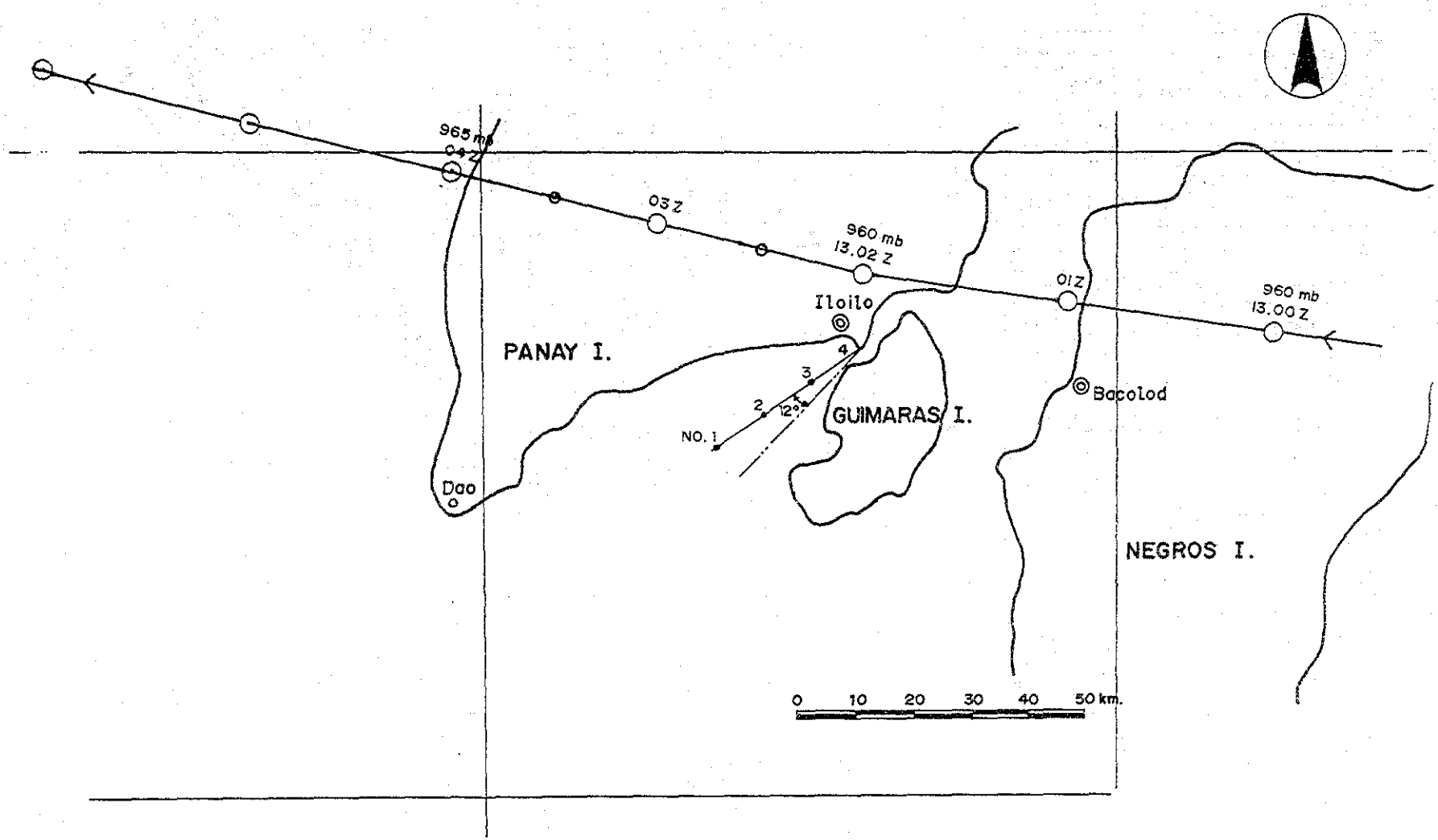


Figure N-2-3-3.5 Location of Typhoon 9025 and Linear Fetch S55°W (Iloilo)

Source: JICA Study Team

Table N-2-3-3.1 Wind speed on the linear Fetch (Iloilo)

DATE	Pt No	r (Km)	r_o (Km)	ΔP (mb)	F(r) (m/s)	M	θ	$\sqrt{\ }$	V(m/s) $0.5F(r)\sqrt{\ }$	β	γ	Vc(m/s) Vcosr
13 02 00Z	1	39	37	58	43.2	0.24	153	0.76	26.3	59	44	18.9
	2	29	37	58	42.7	0.24	158	0.76	26.3	57	38	20.7
	3	19	37	58	37.8	0.24	167	0.77	23.3	55	27	20.8
13 02 30Z	1	35	37	58	43.3	0.24	182	0.81	28.1	51	9	27.8
	2	28	37	58	42.5	0.24	193	0.84	28.6	49	5	28.5
	3	24	37	58	41.1	0.24	214	0.92	30.2	46	27	26.9
13 03 00Z	2	37	37	58	43.3	0.24	224	0.96	33.3	46	38	23.1
	3	37	37	58	43.3	0.24	239	1.02	35.3	46	52	21.7
	4	40	37	58	43.2	0.24	253	1.08	37.3	47	66	15.2
13 03 30Z	3	54	37	58	41.7	0.24	250	1.07	35.7	47	62	16.8
	4	58	37	58	41.1	0.24	258	1.10	36.2	48	65	15.3
13 04 00Z	3	71	37	58	38.5	0.25	254	1.09	33.6	47	67	13.1
	4	77	37	58	37.8	0.25	261	1.11	33.6	48	71	10.9

Source: JICA Study Team

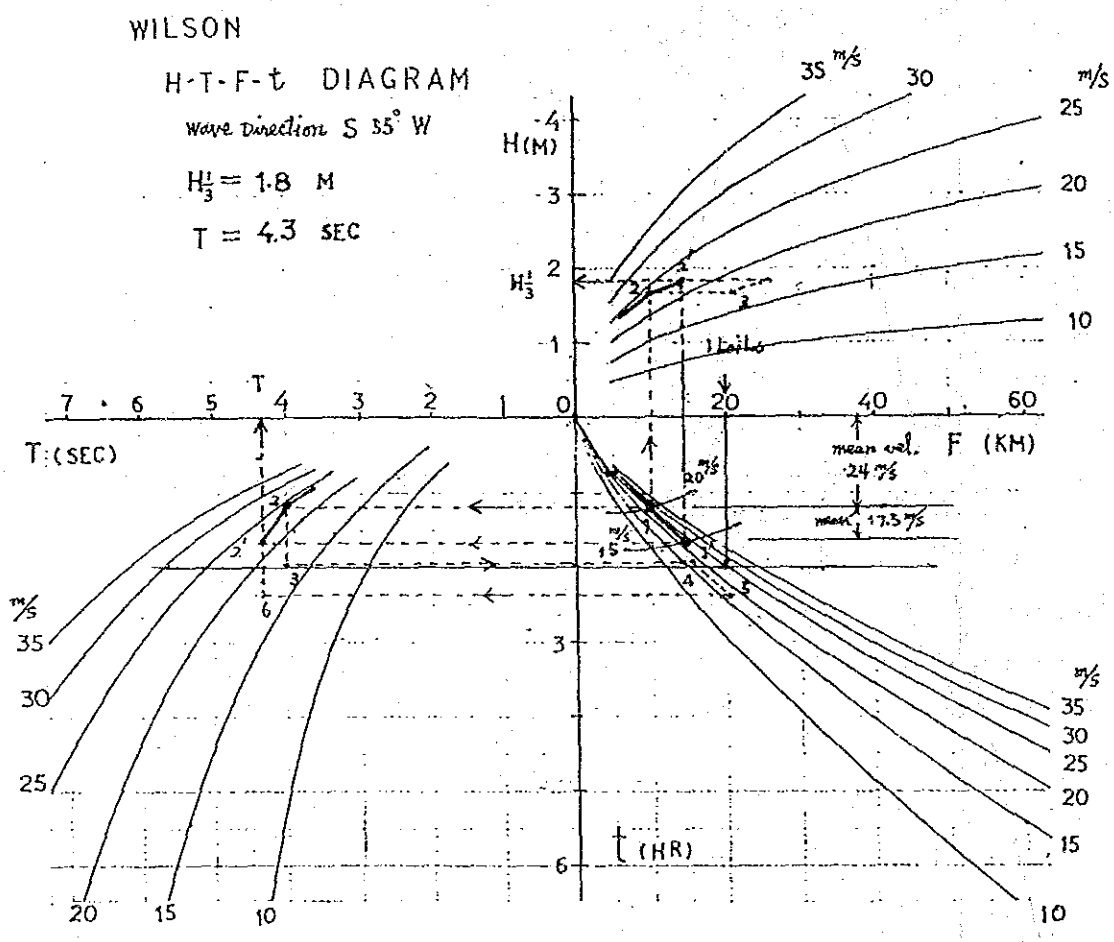


Figure N-2-3-3.6 Wilson's H-T-F-t Diagram

Source: JICA Study Team

Wave Estimation in Bacolod

9. The Wilson's method was adopted to estimate the design wave for both the NW and NNW directions.

10. Figure N-2-3-3.7 shows the location and atmospheric pressure of typhoon Ruping. Table N-2-3-3.2 shows the distribution of wind speed for both the NW and NNW directions. As a result of the analysis, the resultant offshore wave for the direction of NW and NNW are as follows:

NW	Wave height	H1/3 = 2.5 m
	Wave period	T1/3 = 5.1 sec
NNW	Wave height	H1/3 = 3.5 m
	Wave period	T1/3 = 6.2 sec

Wilson's diagram are shown in Figure N-2-3-3.8 and Figure N-2-3-3.9.

11. In the case of Bacolod, the shallow water extend about 6 km offshore with a depth ranging from -5.0 m to -15.0 m below MLLW. The estimated decrease in wave height is due to deflection and sea bed friction while traveling in shallow waters. Figure N-2-3-3.10 shows the deflection diagram. Figure N-2-3-3.11 shows the effect of sea bed friction by Bredschneider's diagram. The shoaling coefficient is also taken into account in shallow water. In view of the foregoing conditions affecting movements in shallow water, the hereunder parameters were only considered.

12. The estimated offshore wave height at a depth of -5.0 m MLLW is as follows:

NW	Wave height	= 2.1 m
NNW	Wave height	= 2.3 m

13. Consequently, the design wave used in the design of the marine structures are as follows:

Wave height	= 2.3 m
Wave period	= 6.2 sec
Direction	= N 38 W

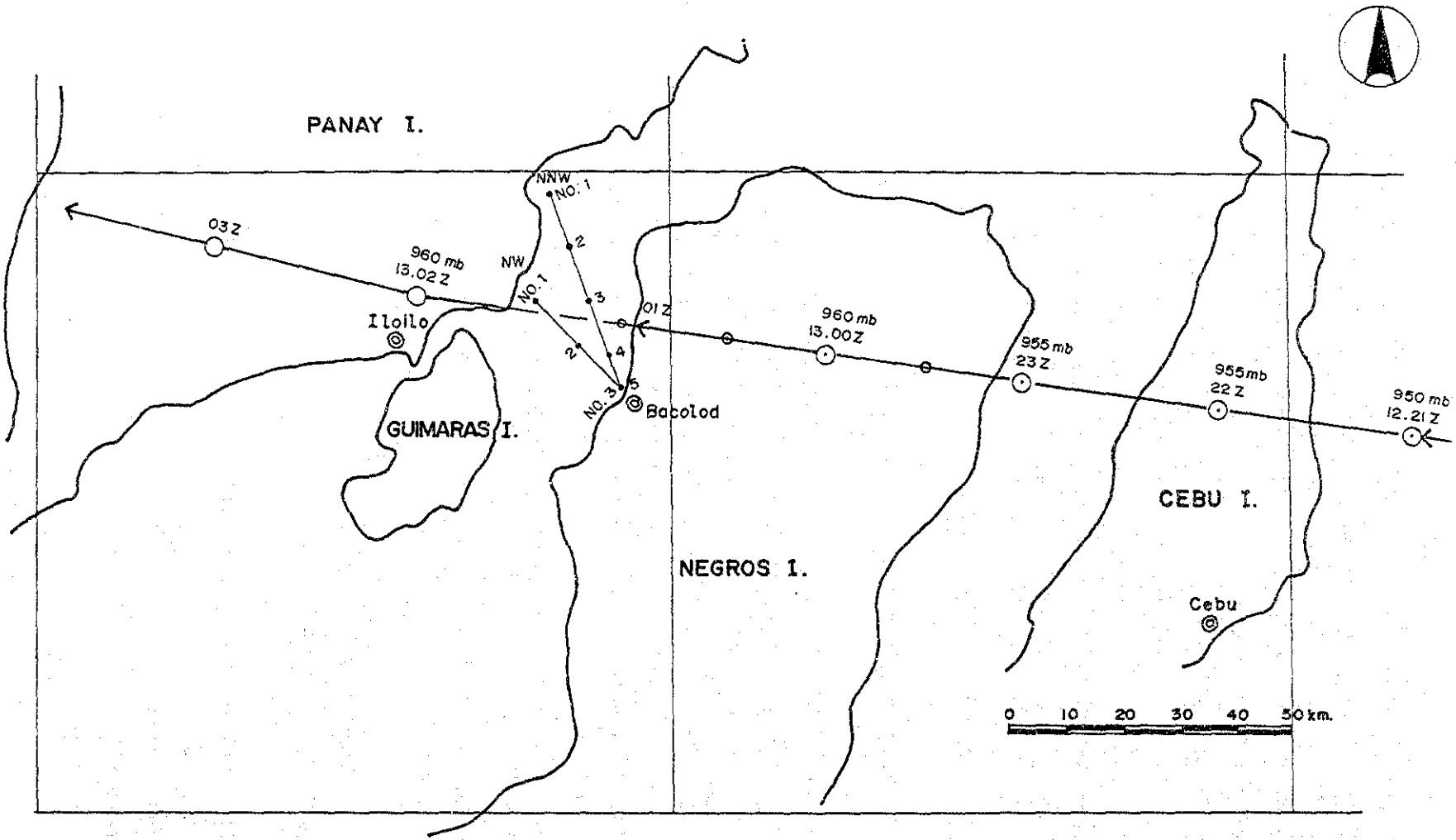


Figure N-2-3-3.7 Location of Typhoon 9025 and Linear Fetch (Bacolod)

Source: JICA Study Team

Table N-2-3-3.2 Wind speed on the linear Fetch (Bacolod)

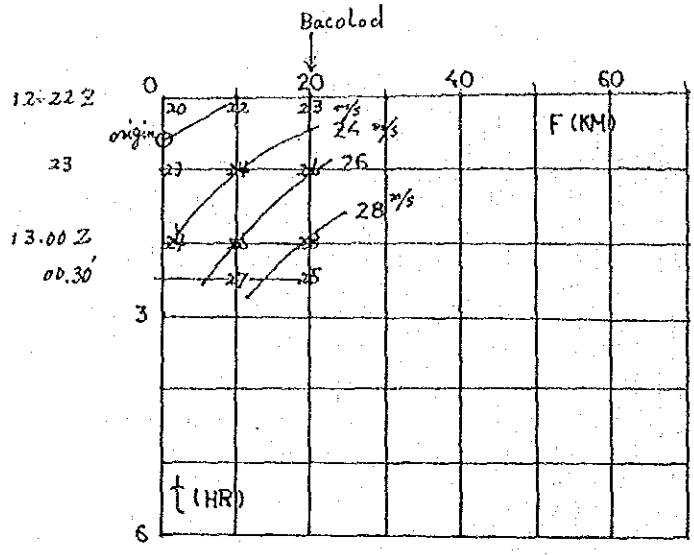
NNW

DATE	Pt No	r (Km)	r_o (Km)	ΔP (mb)	F(r) (m/s)	M	θ	$\sqrt{\ }$	V(m/s) $0.8F(r)\sqrt{\ }$	β	γ	Vc(m/s) Vcosr
12 21 00Z	1	158	36	66	30.7	0.21	82	0.94	23.1	72	18	22.0
	2	152	36	66	31.3	0.21	85	0.93	23.3	72	14	22.6
	3	148	36	66	31.7	0.21	89	0.92	23.3	71	10	22.9
	4	143	36	66	32.2	0.21	92	0.91	23.4	71	7	23.2
12 22 30Z	1	123	36	63	33.5	0.22	80	0.95	25.5	73	21	23.8
	2	118	36	63	34.1	0.22	84	0.93	25.4	73	17	24.3
	3	113	36	63	34.7	0.22	88	0.92	25.5	72	12	24.9
	4	109	36	63	35.2	0.22	93	0.91	25.6	72	6	25.5
12 23 00Z	2	83	36	63	38.8	0.22	82	0.94	29.2	73	20	27.4
	3	78	36	63	39.5	0.22	88	0.92	29.1	72	12	28.5
	4	74	36	63	40.1	0.22	94	0.90	28.9	71	5	28.8
12 23 30Z	3	60	36	63	42.3	0.22	87	0.92	31.1	72	13	30.3
	4	56	36	63	43.0	0.22	95	0.90	31.0	71	3	31.0
13 00 00Z	3	43	37	58	43.0	0.24	85	0.92	31.6	74	17	30.2
	4	39	37	58	43.2	0.24	99	0.87	30.1	72	2	30.1
	5	37	37	58	43.3	0.24	107	0.84	29.1	71	8	28.8
13 00 30Z	2	32	37	58	43.1	0.24	69	0.99	34.1	74	34	28.3
	3	25	37	58	41.5	0.24	82	0.94	31.2	74	16	30.0
	4	21	37	58	39.4	0.24	105	0.84	26.5	71	1	26.5
	5	21	37	58	39.4	0.24	123	0.79	24.9	68	11	24.4

NW

DATE	Pt No	r (Km)	r_o (Km)	ΔP (mb)	F(r) (m/s)	M	θ	$\sqrt{\ }$	V(m/s) $0.8F(r)\sqrt{\ }$	β	γ	Vc(m/s) Vcosr
12 22 00Z	1	122	36	63	33.6	0.22	89	0.91	24.5	72	35	20.1
	2	113	36	63	34.7	0.22	93	0.90	25.0	72	30	21.7
	3	105	36	63	35.7	0.22	96	0.89	25.4	72	27	22.6
12 23 00Z	1	88	36	63	38.0	0.22	88	0.91	27.7	72	35	22.7
	2	79	36	63	39.6	0.22	95	0.89	28.1	72	30	24.3
	3	71	36	63	40.6	0.22	100	0.87	28.3	71	24	25.9
13 00 00Z	1	53	37	58	41.8	0.24	86	0.92	30.8	74	38	24.3
	2	44	37	58	42.9	0.24	98	0.87	29.9	73	29	26.2
	3	37	37	58	43.3	0.24	108	0.84	29.1	71	15	28.1
13 00 30Z	2	28	37	58	41.9	0.24	100	0.87	29.2	73	23	26.9
	3	22	37	58	40.1	0.24	123	0.79	25.3	68	4	25.2

Source: JICA Study Team



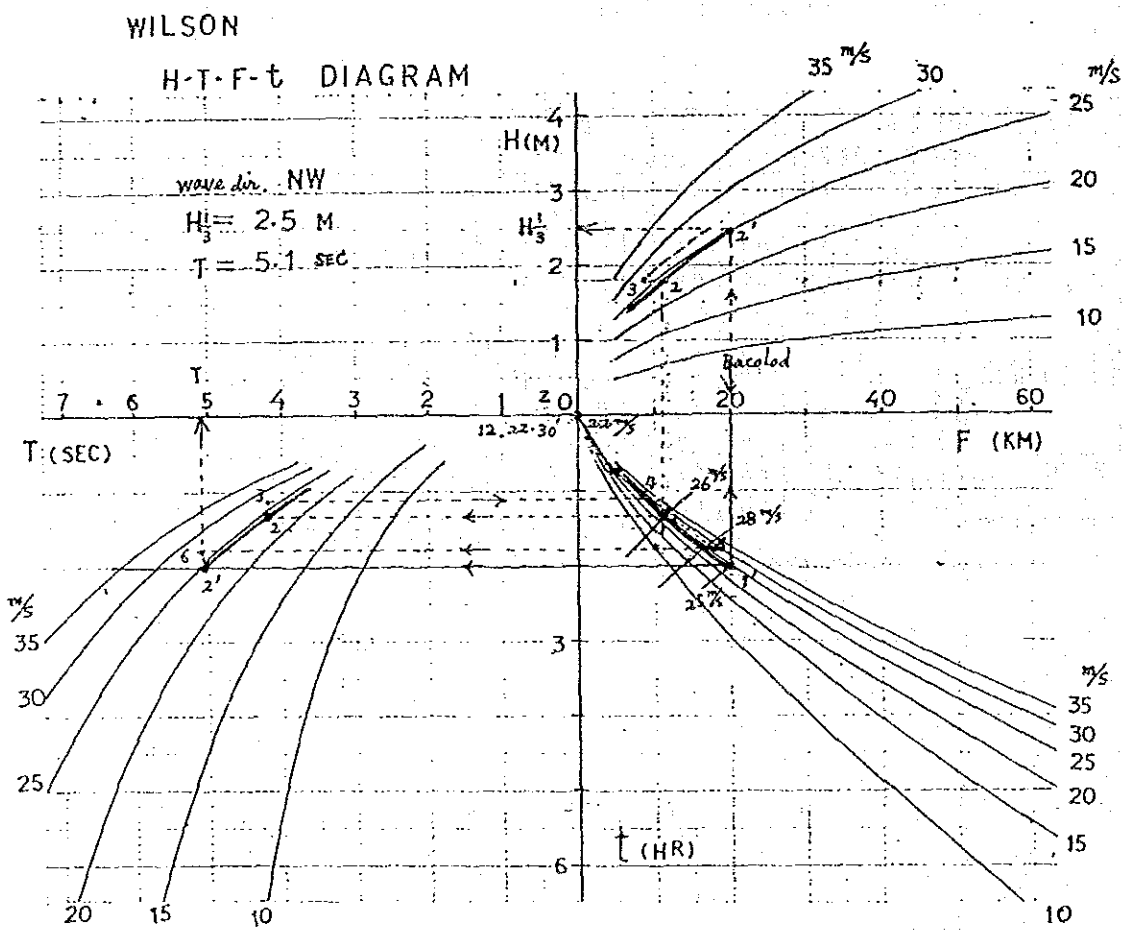
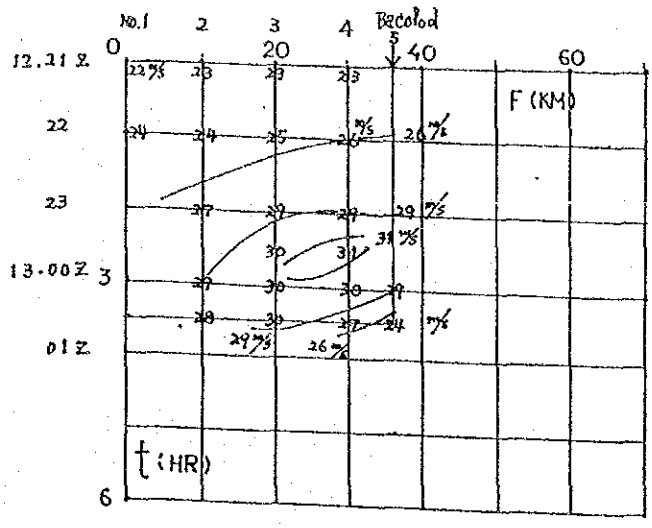


Figure N-2-3-3.8 Wilson's H-T-F-t Diagram

Source: JICA Study Team



TY. 9025 . RUPING

WILSON

H-T-F-t DIAGRAM

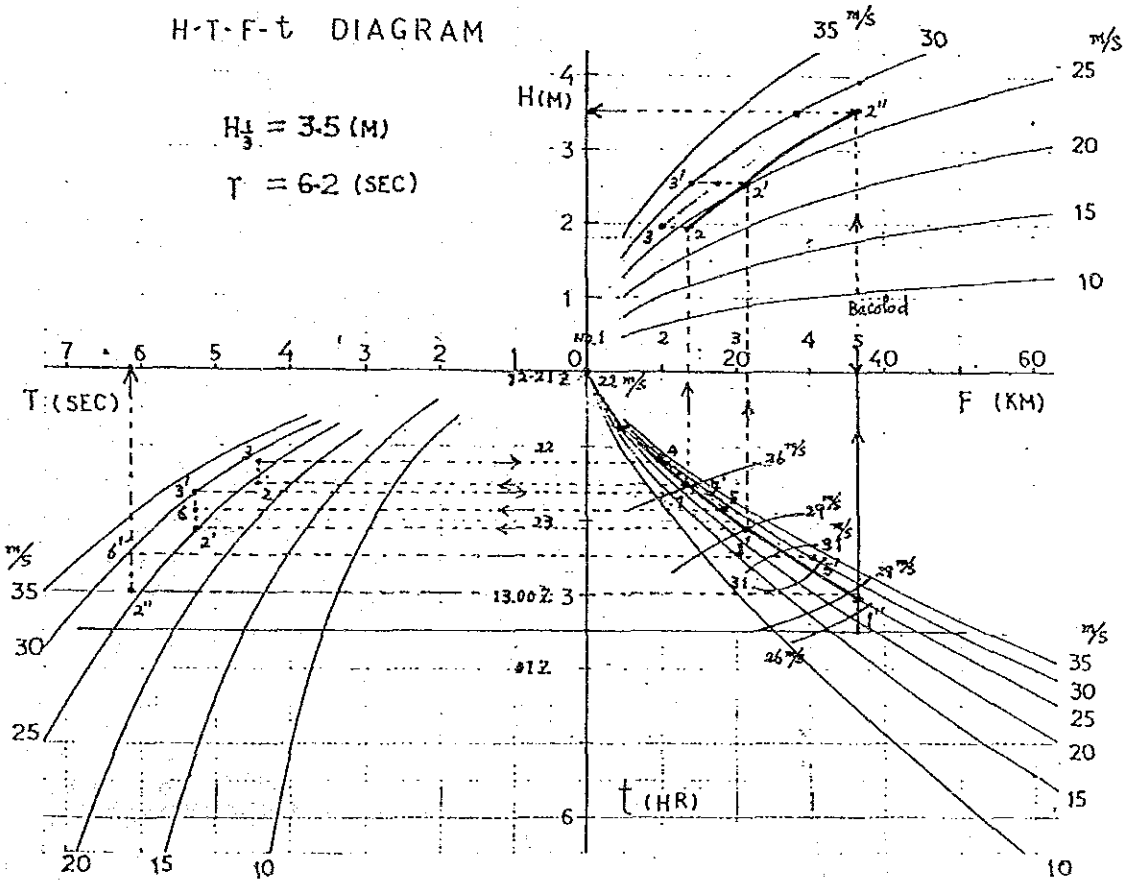
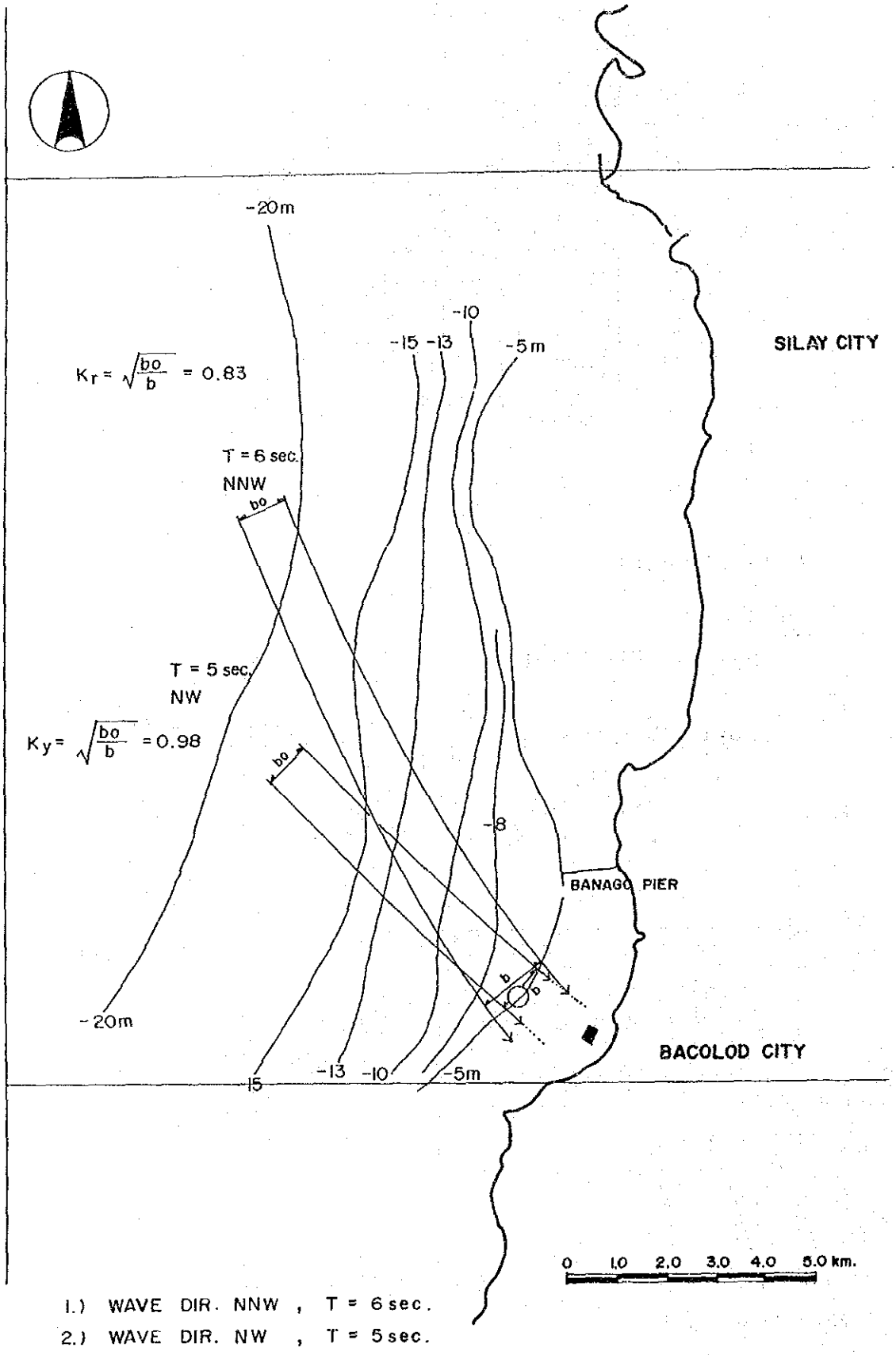


Figure N-2-3-3.9 Wilson's H-T-F-t Diagram

Source: JICA Study Team



1.) WAVE DIR. NNW , T = 6 sec.
2.) WAVE DIR. NW , T = 5 sec.

Figure N-2-3-3.10 Refrection Diagram
Source: JICA Study Team

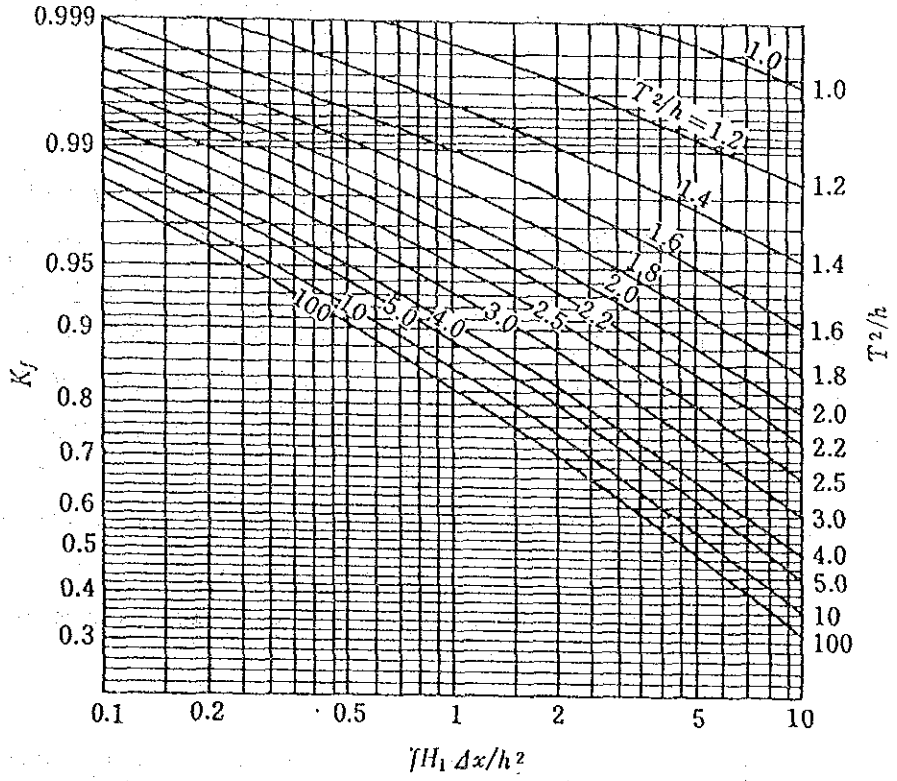


Figure N-2-3-3.11 Breadschneider's Diagram for Seabed Friction

[Reference]

1. Tropical Cyclone 1984 to 1978, PAGASA, Climatological Division

Note A-2-3-4 Siltation Study

General

1. According to the result of existing siltation study, siltation in Iloilo mainly arise in Iloilo river while siltation in old foreign pier is minimal. Iloilo river which is located north adjacent to old foreign pier deposit siltation material about 195,000 m3 per year. Most of the deposit is piled up at the mouth of river and its neighbor area and about 5% (11,000 m3) of deposit from Iloilo river transfer out of river.

2. Sea bed profile in front of old foreign pier is quite steep, so that, sedimentation fell down to the deeper portion will not be pushed up by wave and current any more. Based on the above, siltation in old foreign pier is expected small.

3. In the case of Bacolod, heavy siltation will appear based on the field survey as mentioned in Chapter 3, Volume II.

Field Survey

4. The following field survey was conducted to investigate the siltation phenomena in Iloilo and Bacolod.

i) Sea bed material test
To investigate the character of bed load, sea bed material was sampled and test for sieve testing. Location of sampling in Iloilo and Bacolod are shown in Figures N-2-3-4.1 and N-2-3-4.2. As a result of sieve test, composition of sea bed material are as follows;

Figure N-2-3-4.1
Location Map of
Sea Water/Sea Bed Metarlial Sampling
(Iloilo)

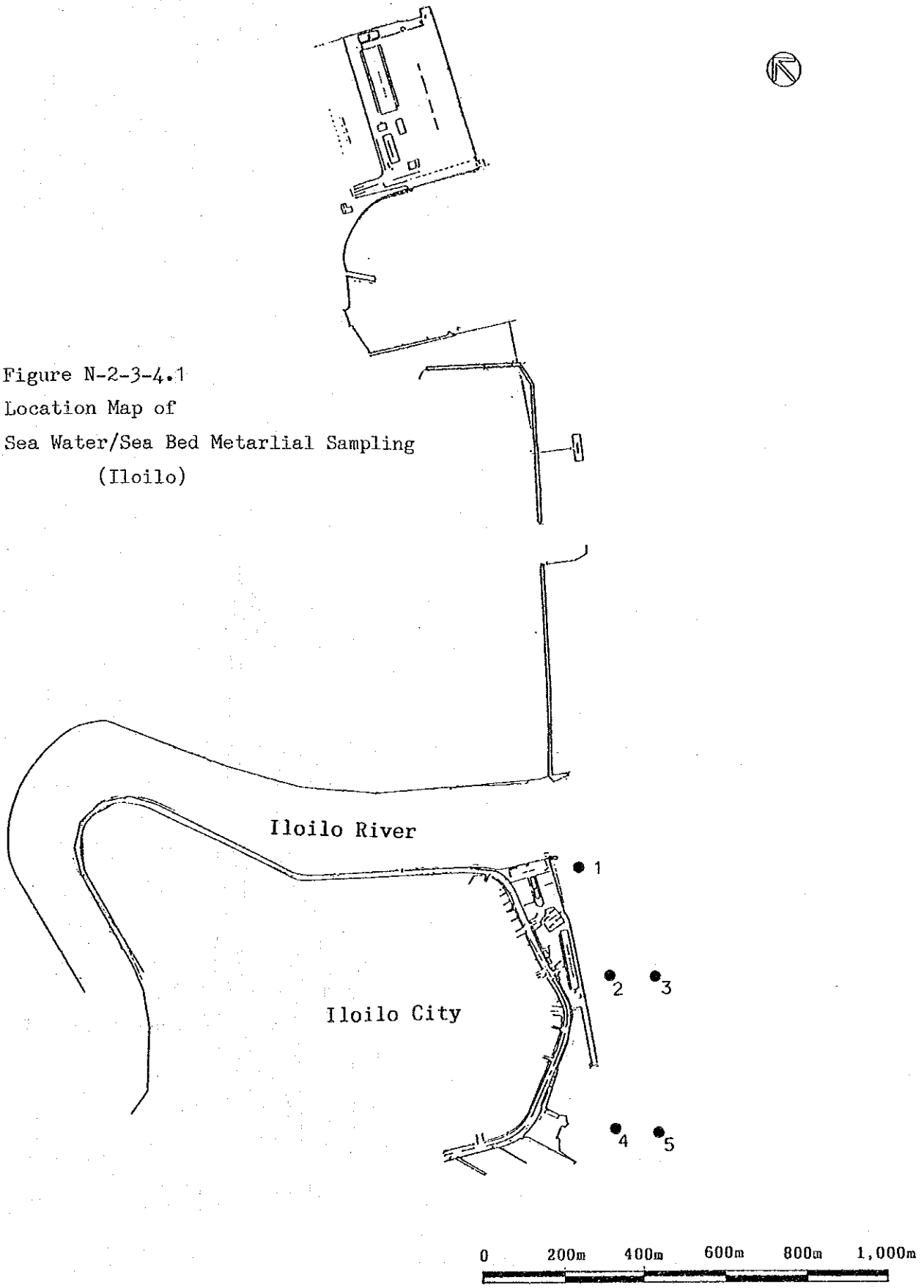


Figure N-2-3-4.2
Location Map of
Sea Water/Sea Bed Metarlial Sampling
(Bacolod)

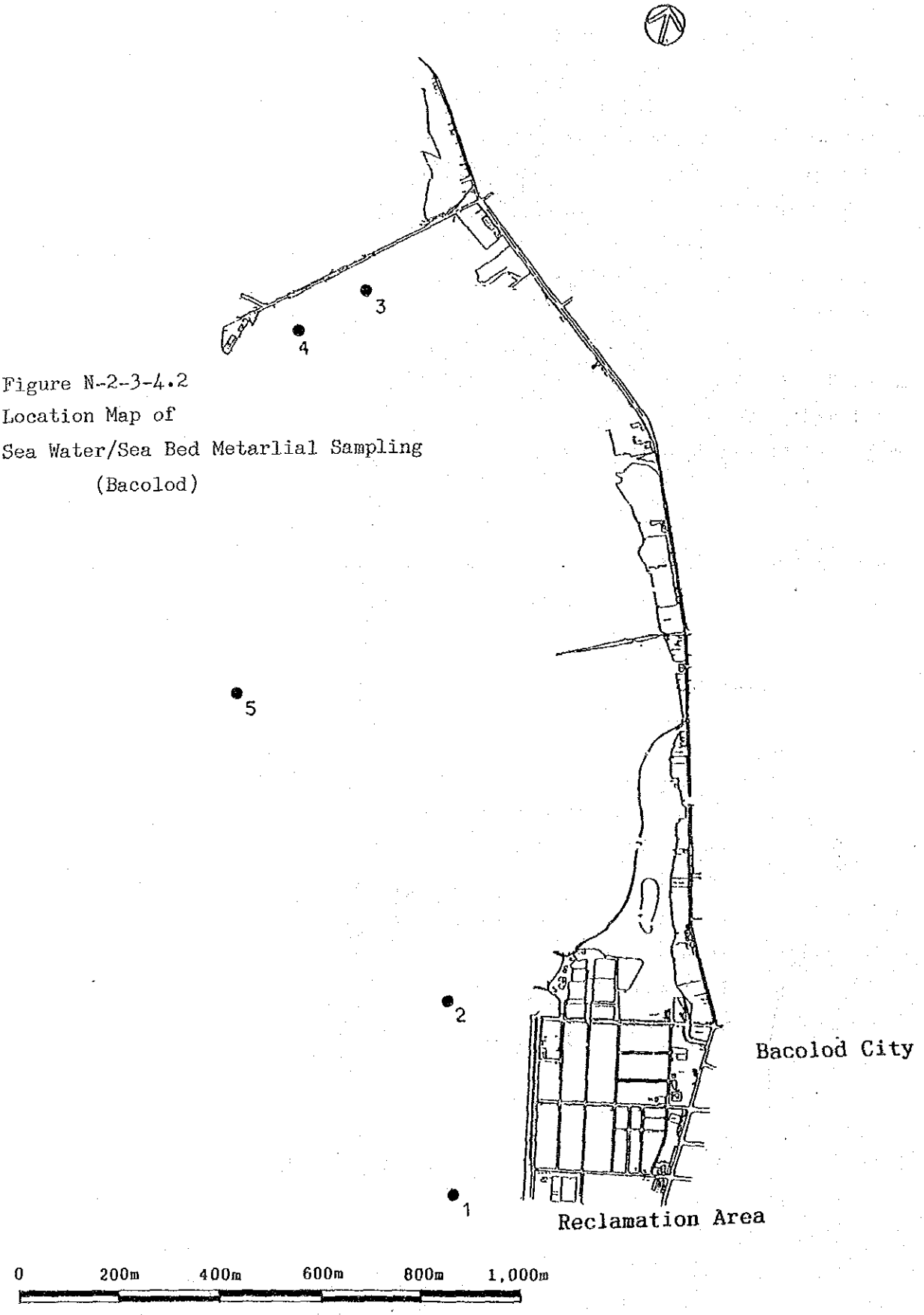


Table N-2-3-4.1 Composition of Sea Bed Material (Iloilo)

	1	2	3	4	5
Gravel	-	8.5	17.8	0.1	0.0
Sand	34.3	78.0	69.8	96.3	90.7
Silt	56.7	13.5	12.4	3.6	9.3
Clay	9.0	-	-	-	-

(Unit in %)

Source : JICA Study Team

Table N-2-3-4.2 Composition of Sea Bed Material (Bacolod)

	1	2	3	4	5
Gravel	4.0	1.0	9.0	2.0	-
Sand	76.0	84.0	78.0	81.0	20.0
Silt	14.3	12.8	9.0	12.0	42.0
Clay	5.7	2.2	4.0	5.0	38.0

(Unit in %)

Source : JICA Study Team

As a reference of siltation study in Iloilo and Bacolod, Nos. 4 and 5 in Iloilo and No.5 in Bacolod can be utilized.

ii) Sea water test

To investigate the character of suspended load, sea water was sampled and tested. Location of sampling in Iloilo and Bacolod are also shown in Figures N-2-3-4.1 to N-2-3-4.2. Result of testing are shown in Table N-2-3-4.3 for both Iloilo and Bacolod.

Table N-2-3-4.3 Results of Sea Water Test

	1	2	3	4	5
Iloilo	460	460	456	472	452
Bacolod	270	278	260	286	252

(Unit in ppm.)

Source : JICA Study Team

Density of S.S. (Suspended Solid) in Iloilo is as about twice as that of Bacolod but can be evaluated to quite large against the ordinary value for both Iloilo and Bacolod.

iii) Sand catchment test

In addition to above mentioned testing, sand catchment was installed in Bacolod in order to measure the actual volume of suspended load. Figure N-2-3-4.3 shows sketch of sand catchment. Instrument was produced in the field and placed at the location shown in Figure N-2-3-4.4. Testing result is shown in Table 3-4 Chapter 3, Volume II.

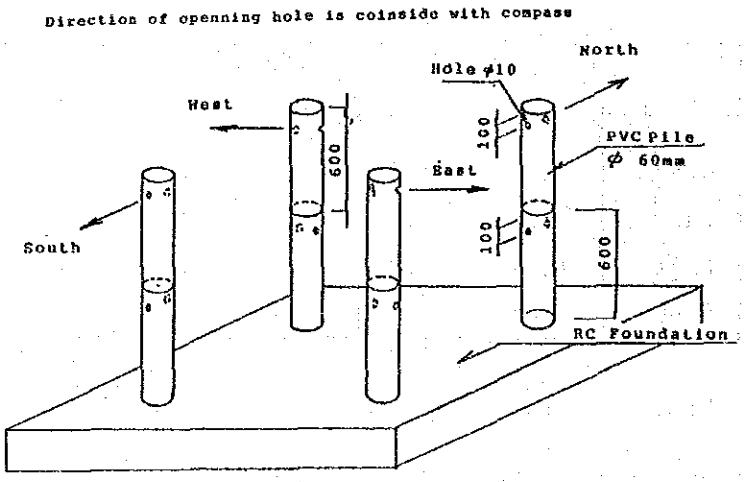


Figure N-2-3-4.3 Sketch of the Sand Catchment

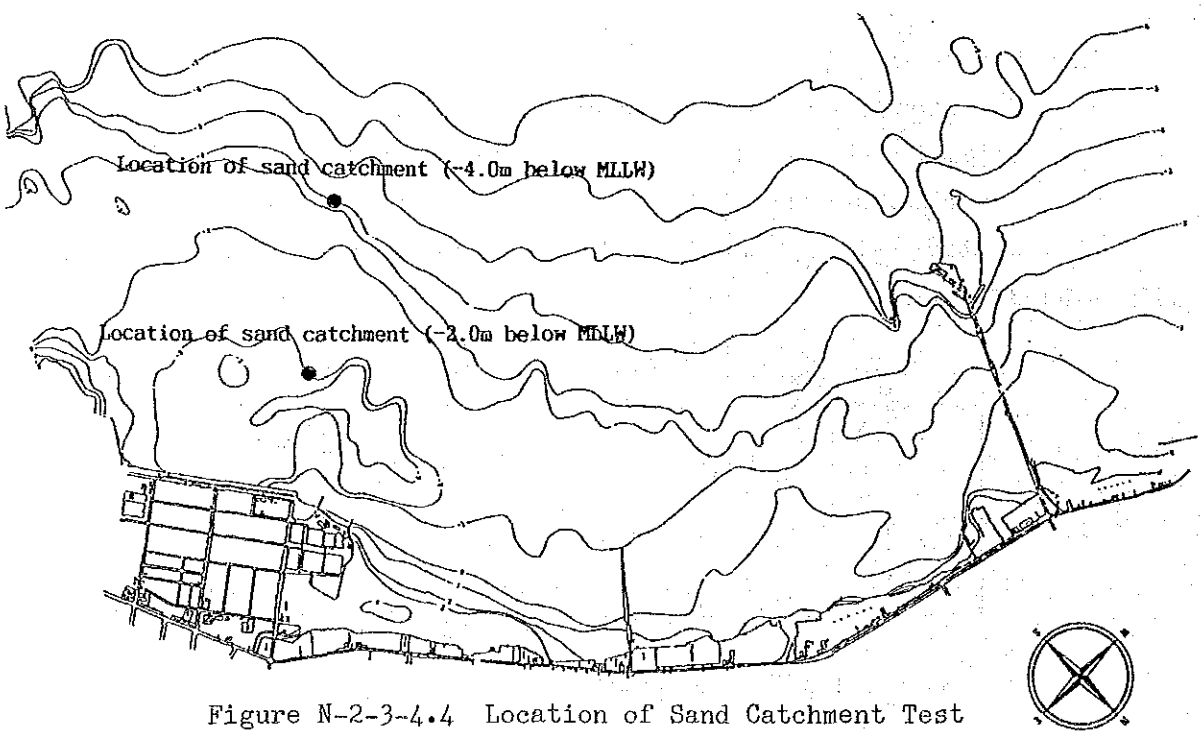


Figure N-2-3-4.4 Location of Sand Catchment Test

Oceanographic Condition

5. As an outer force for movement of siltation material, characteristic of wave and current are needed to study the siltation phenomena.

6. Wave data were estimated based on the S-M-B method and shown in Figure 3-3, Chapter 3, Volume II.

7. Current data observed was analyzed by harmonic analysis and shown in Note A-2-3-1.

Numerical Simulation

8. Numerical analysis was carried out by the use of computer. The basic theory of E.W.Bijker issued in 1980 was used for this computer analysis. In his theory, siltation will be caused by the force of current and wave. He presented the force by means of velocity, so that, wave was converted to mass transportation velocity.

9. Very fine particles such as wash load travelling with the sea water are moved by force due to velocity. The volume of siltation will be increased proportionally to velocity of the stream. When the flow encounters the sudden change of sea bed configuration, for example in dredging area, the velocity of flow becomes slow and some of the suspended load fall down to sea bed. This phenomena leads to the sedimentation of dredged channel, and his proposed calculation method is applicable in solving such problem.

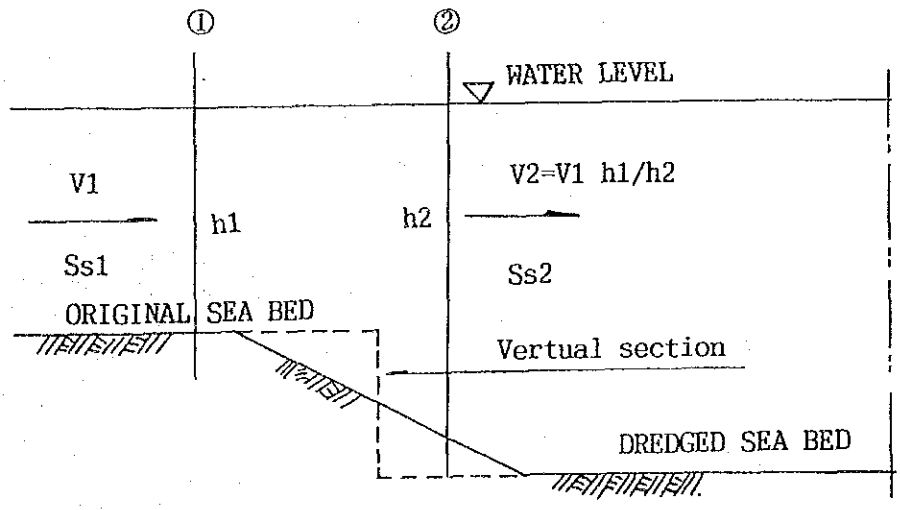


Figure N-2-3-4.5 Definition Sketch

10. Computation was carried out by the following formulas;

$$\Delta h/\Delta t + 1/(1-\lambda) \times (Ss1 - Ss2)/2 = 0$$

where

λ : Void ratio (= 0.35)

Ss1 : Volume of suspended solid which enter to channel

Ss2 : Volume of suspended solid which go out from channel

1 : Width of channel

$$Ss = Cb \times \bar{V}/W \times \{ 1-\exp(-Wh/\varepsilon) \}$$

$$Cb = Bd/6.34r \times \exp[-0.27\,\Delta dc/\mu \bar{V}^2 \{1 + 1/2 \times (\zeta \mu_0 /\bar{V}^2 \}]$$

$$= C / \sqrt{fw/2g}$$

$$fw = \exp[-5.997+5.213(a0/r)-0.194]$$

where

V : Mean velocity (m/sec)

C : Average silt concentration

Cb : concentration at the bed

W : the fall velocity of the suspended material (m/sec)

h : Water depth (m)

: Mean diffusion coefficient for the suspended material

= 0.16 V x h

C : Chezy coefficient (= $h^{1/6}$ /n)

n : Manning coefficient (= 0.024)

g : Acceleration of gravity (m/sec^2)

d : Grain size of sea bed material

V : Bed shear velocity (m/sec)

$$ai = H/2 \times 1/\sinh(2\pi h/L)$$

$$= 2\pi/T \times a0$$

H : Wave height (m)

T : Wave period (sec)

L : Wave length (m)

11. In the case of Bacolod, frequency of big wave is quite small. Thus, wave can be eliminated from the force of siltation mechanism and therefore the tidal current becomes the major force to be taken in the computation.

12. The maximum current velocity of periodical movement caused by the component of M2 and S2 will be mainly obtained from harmonic analysis.

13. Computation was carried out by 1 hour interval and changes of water depth was traced intermittently. Results of computer simulation is shown in Table N-2-3-4.4 and Figure N-2-3-4.6.

14. From the Figure N-2-3-31, the existing sea bed elevation of -2.5m is dredged up to -5.5m, and takes 5 months to become shallower by 1 meter. Consequently after 1 year, the dredging area becomes shallower by 2.1m.

15. Total volume of sediments is estimated to be about 500,000 m3 per year.

16. In the case of Iloilo, it is not needed to be provided access channel becomes deep water area is close to port. Computation on the siltation was carried out against the sedimentation of dredged maneuvering area. Result of computation is shown in Table N-2-3-4.5 and Figure N-2-3-4.7. From the Figure N-2-3-4.7, changes in the sea bed elevation is quite small.

Table N-2-3-4.4(1) Computation Results on Sedimentation of Channel

Bacolod (Original sea bed EL. = -2.0m from MLLW)

Year	Month	Computation time (hour)	dh (m)	Elevation from MWL	h2-h1 (m)	hi-hi+1 (m)
0	1	720	0.32	6.48	3.18	0.32
	2	1,440	0.54	6.26	2.96	0.22
	3	2,160	0.75	6.05	2.75	0.21
	4	2,880	0.96	5.84	2.54	0.21
	5	3,600	1.15	5.65	2.35	0.19
	6	4,320	1.34	5.46	2.16	0.19
	7	5,040	1.52	5.28	1.98	0.18
	8	5,760	1.68	5.12	1.82	0.16
	9	6,480	1.84	4.96	1.66	0.16
	10	7,200	2.00	4.80	1.50	0.16
	11	7,920	2.14	4.66	1.36	0.14
	12	8,640	2.27	4.53	1.23	0.13
1	13	9,360	2.40	4.40	1.10	0.13
	14	10,080	2.51	4.29	0.99	0.11
	15	10,800	2.62	4.18	0.88	0.11
	16	11,520	2.72	4.08	0.78	0.10
	17	12,240	2.81	3.99	0.69	0.09
	18	12,960	2.89	3.91	0.61	0.08
	19	13,680	2.97	3.83	0.53	0.08
	20	14,400	3.03	3.77	0.47	0.06
	21	15,120	3.09	3.71	0.41	0.06
	22	15,840	3.15	3.65	0.35	0.06
	23	16,560	3.20	3.60	0.30	0.05
	24	17,280	3.25	3.55	0.25	0.05
2	25	18,000	3.29	3.51	0.21	0.04
	26	18,720	3.33	3.47	0.17	0.04
	27	19,440	3.36	3.44	0.14	0.03
	28	20,160	3.39	3.41	0.11	0.03
	29	20,880	3.41	3.39	0.09	0.02
	30	21,600	3.43	3.37	0.07	0.02
	31	22,320	3.45	3.35	0.05	0.02
	32	23,040	3.47	3.33	0.03	0.02
	33	23,760	3.48	3.32	0.02	0.01

Source: JICA Study Team

Table N-2-3-4.4(2) Computation Results on Sedimentation of Channel

Bacolod (Original sea bed EL. = -3.0m from MLLW)

Year	Month	Computation time (hour)	dh (m)	Elevation from MWL	h2-h1 (m)	hi-hi+1 (m)
0	1	720	0.32	6.48	3.18	0.32
	2	1,440	0.51	6.29	2.99	0.19
	3	2,160	0.70	6.10	2.80	0.19
	4	2,880	0.88	5.92	2.62	0.18
	5	3,600	1.04	5.76	2.46	0.16
	6	4,320	1.19	5.61	2.31	0.15
	7	5,040	1.34	5.46	2.16	0.15
	8	5,760	1.47	5.33	2.03	0.13
	9	6,480	1.59	5.21	1.91	0.12
	10	7,200	1.70	5.10	1.80	0.11
	11	7,920	1.80	5.00	1.70	0.10
	12	8,640	1.89	4.91	1.61	0.09
1	13	9,360	1.97	4.83	1.53	0.08
	14	10,080	2.04	4.76	1.46	0.07
	15	10,800	2.11	4.69	1.39	0.07
	16	11,520	2.16	4.64	1.34	0.05
	17	12,240	2.21	4.59	1.29	0.05
	18	12,960	2.26	4.54	1.24	0.05
	19	13,680	2.30	4.50	1.20	0.04
	20	14,400	2.34	4.46	1.16	0.04
	21	15,120	2.37	4.43	1.13	0.03
	22	15,840	2.40	4.40	1.10	0.03
	23	16,560	2.43	4.37	1.07	0.03
	24	17,280	2.45	4.35	1.05	0.02
2	25	18,000	2.47	4.33	1.03	0.02
	26	18,720	2.49	4.31	1.01	0.02
	27	19,440	2.50	4.30	1.00	0.01

Source: JICA Study Team

Table N-2-3-4.4(3) Computation Results on Sedimentation of Channel

Bacolod (Original sea bed EL. = -4.0m from MLLW)

Year	Month	Computation time (hour)	dh (m)	Elevation from MWL	h2-h1 (m)	hi-hi+1 (m)
0	1	720	0.25	6.55	3.25	0.25
	2	1,440	0.39	6.41	3.11	0.14
	3	2,160	0.52	6.28	2.98	0.13
	4	2,880	0.64	6.16	2.86	0.12
	5	3,600	0.75	6.05	2.75	0.11
	6	4,320	0.85	5.95	2.65	0.10
	7	5,040	0.94	5.86	2.56	0.09
	8	5,760	1.01	5.79	2.49	0.07
	9	6,480	1.08	5.72	2.42	0.07
	10	7,200	1.15	5.65	2.35	0.07
	11	7,920	1.20	5.60	2.30	0.05
	12	8,640	1.25	5.55	2.25	0.05
1	13	9,360	1.29	5.51	2.21	0.04
	14	10,080	1.33	5.47	2.17	0.04
	15	10,800	1.37	5.43	2.13	0.04
	16	11,520	1.40	5.40	2.10	0.03
	17	12,240	1.43	5.37	2.07	0.03
	18	12,960	1.45	5.35	2.05	0.02
	19	13,680	1.47	5.33	2.03	0.02
	20	14,400	1.49	5.31	2.01	0.02
	21	15,120	1.50	5.30	2.00	0.01

Source: JICA Study Team

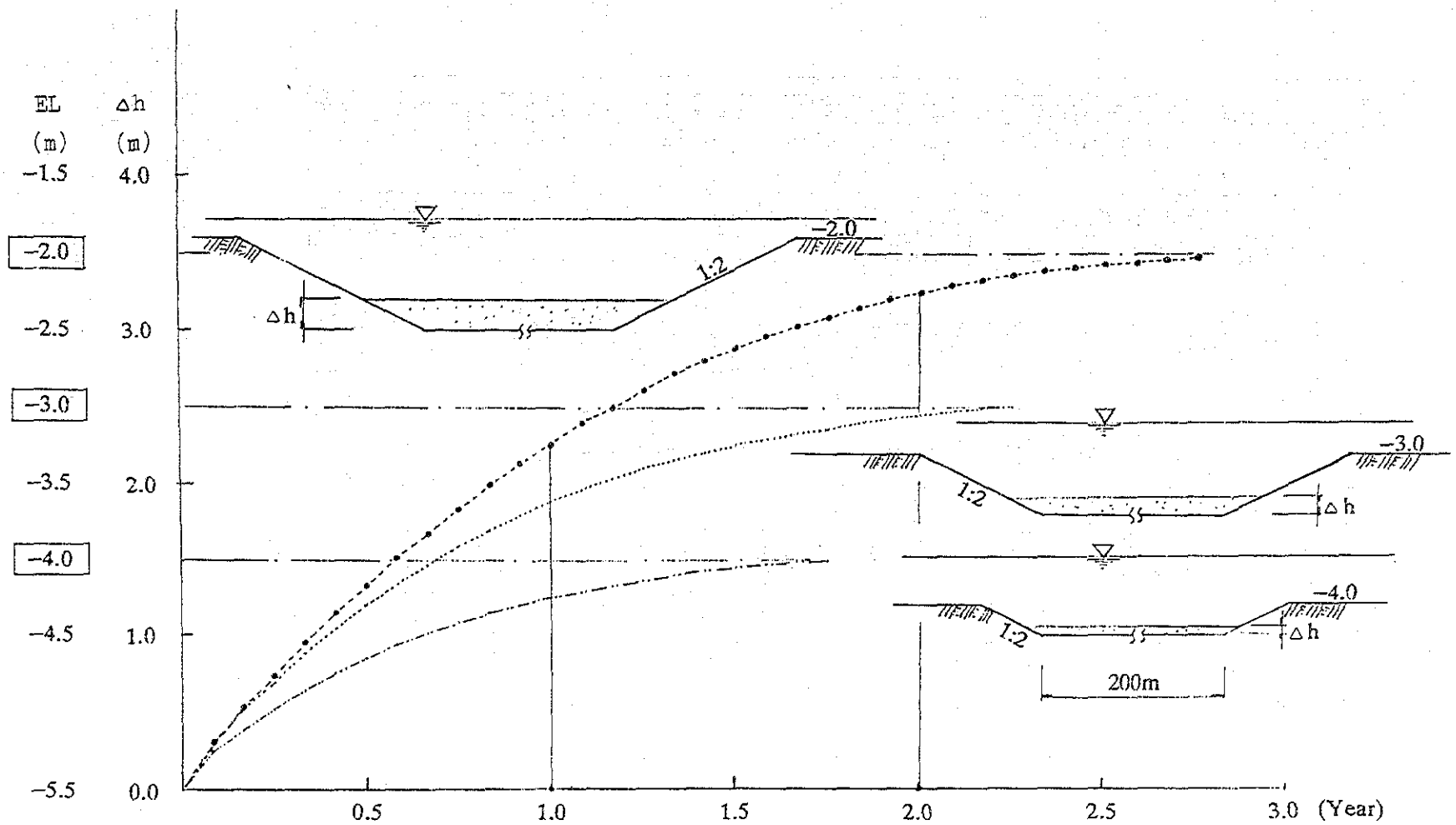


Figure N-2-3-4.6 Result of Siltation Study (Bacolod)

Table N-2-3-4.5 Computation Results on Sedimentation of Waterbasin

Iloilo

Year	Month	Computatio time (hour	dh (m)	Elevation from MWL	h2-h1 (m)	hi-hi+1 (m)
0	1	720	0.054	6.196	6.196	0.320
	2	1,440	0.059	6.191	6.191	0.005
	3	2,160	0.063	6.187	6.187	0.004
	4	2,880	0.068	6.182	6.182	0.005
	5	3,600	0.071	6.179	6.179	0.003
	6	4,320	0.076	6.174	6.174	0.005
	7	5,040	0.080	6.170	6.170	0.004
	8	5,760	0.084	6.166	6.166	0.004
	9	6,480	0.089	6.161	6.161	0.005
	10	7,200	0.093	6.157	6.157	0.004
	11	7,920	0.097	6.153	6.153	0.004
	12	8,640	0.101	6.149	6.149	0.004
1	13	9,360	0.106	6.144	6.144	0.005
	14	10,080	0.110	6.140	6.140	0.004
	15	10,800	0.114	6.136	6.136	0.004
	16	11,520	0.119	6.131	6.131	0.005
	17	12,240	0.122	6.128	6.128	0.003
	18	12,960	0.127	6.123	6.123	0.005
	19	13,680	0.131	6.119	6.119	0.004
	20	14,400	0.135	6.115	6.115	0.004
	21	15,120	0.139	6.111	6.111	0.004
	22	15,840	0.143	6.107	6.107	0.004
	23	16,560	0.147	6.103	6.103	0.004
	24	17,280	0.151	6.099	6.099	0.004
2	25	18,000	0.155	6.095	6.095	0.004
	26	18,720	0.159	6.091	6.091	0.004
	27	19,440	0.163	6.087	6.087	0.004
	28	20,160	0.168	6.082	6.082	0.005
	29	20,880	0.172	6.078	6.078	0.004
	30	21,600	0.176	6.074	6.074	0.004
	31	22,320	0.180	6.070	6.070	0.004
	32	23,040	0.184	6.066	6.066	0.004
	33	23,760	0.188	6.062	6.062	0.004
	34	24,480	0.192	6.058	6.058	0.004
	35	25,200	0.197	6.053	6.053	0.005
	36	25,920	0.201	6.049	6.049	0.004
3	48	34,560	0.250	6.000	6.000	0.049
4	60	43,200	0.300	5.950	5.950	0.050

Source: JICA Study Team

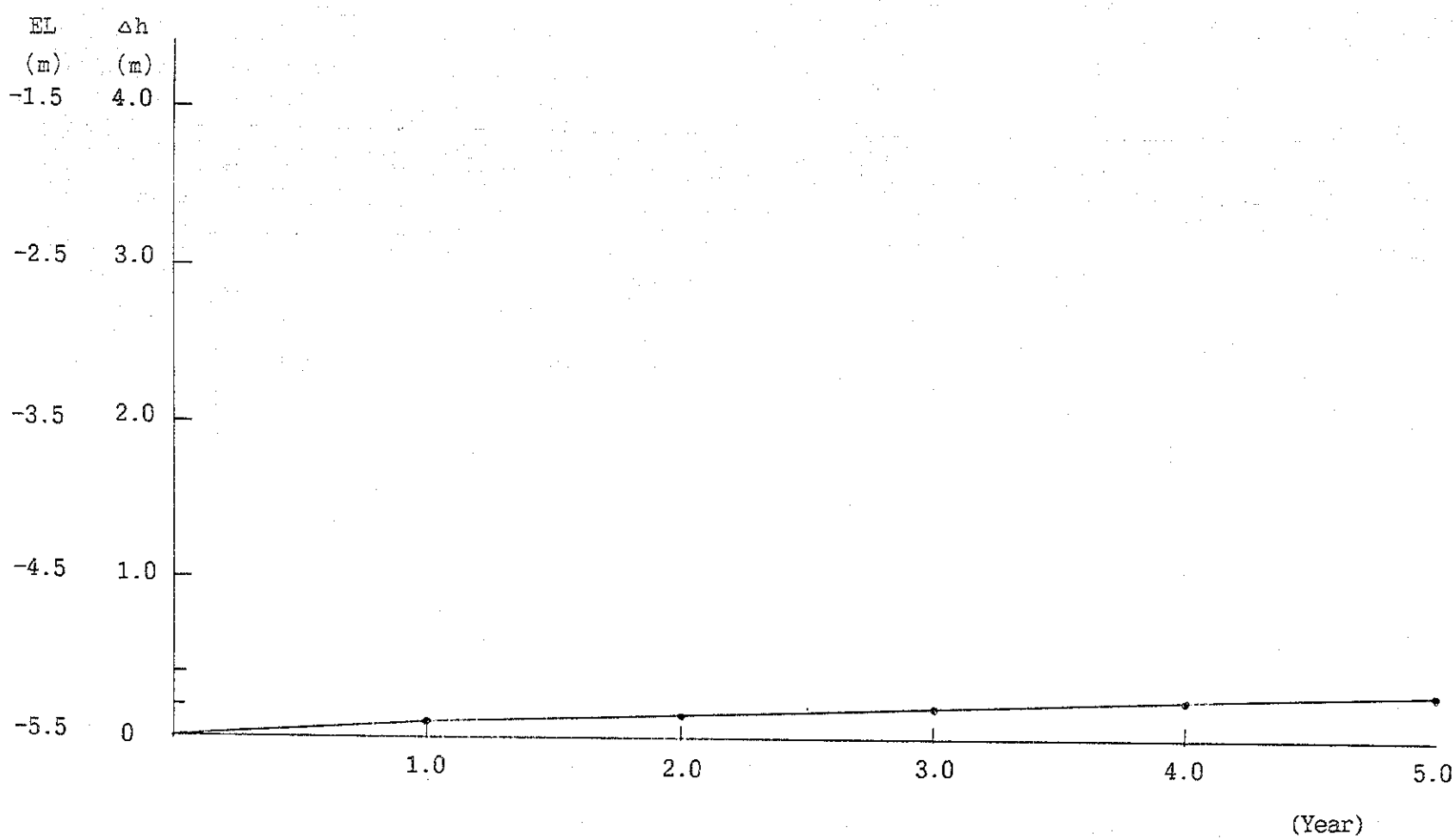


Figure N-2-3-4.7 Result of Siltation Study (Iloilo)

[Reference]

1. Final Report on the Siltation Study, January 1984, PPA

2. Sedimentation in Channel and Trenches, E.W.Bijker, Coastal Enginnering, 1980, pp. 1708 - 1718

Table A-2-4-1 Passenger/Cargo Volumes of Existing Ferry Vessel

Commodity Flow of F/S Route

Port : Iloilo

Year 1990

Vessel Type = (Ferry)

Cargo Unit : Metric Ton

No.	Commodity		Total	1	2	3	4	5	6	7	8	9	10	11	12	Remark
8	Passenger	Dis	771,964	69,298	56,890	66,434	75,344	75,502	78,869	59,728	55,441	53,032	63,122	66,188	58,116	
		Emb	783,843	66,425	55,458	61,258	77,813	76,673	80,391	58,952	55,563	54,927	65,974	68,167	62,244	
	Total		1,555,807	135,723	112,348	121,692	153,157	152,175	159,260	118,680	111,004	107,959	129,096	134,355	120,360	141,437 = Average
	Seasonable Value			93	79	86	108	108	113	84	78	76	91	95	85	

Breakbulk Cargo			Total	1	2	3	4	5	6	7	8	9	10	11	12	Remark
1	Live Animals	In	0													
		Out	0													
2	Dairy Product	In	1			1										
		Out	0													
3	Fish & Fish Preparation	In	7,877	980	1,220	957	420	325	344	511	417	496	984	670	553	
		Out	651	183	82	74	60	33	11	41	59	13	65	117	13	
4	Palay & Rice	In	92	5		20	22	18	7	1	8	5	6			
		Out	4,289	258	690	954	362	144	292	189	38	10	56	204	1,232	
5	Corn	In	10					10								
		Out	299			13	281	77	8							
6	Wheat	In	18		7	5					6					
		Out	72	12	14			5	8		4	7	17	2	3	
7	Fruits & Vegitables	In	600	12	69	43	15	26	53	90	52	8	126	84	23	
		Out	4,954	253	1,381	1,117	415	165	129	204	137	95	287	115	856	
8	Sugar	In	121	70	15						35		1			
		Out	80	19	3	1	3		29	5	6		10	3	1	
9	Molasses	In	0													
		Out	0													
10	Animal Feeds	In	690	37	46	55	24	47	42	35	59	59	130	73	83	
		Out	815	34	128	155	78	46	16	16	16	9	49	16	68	
11	Bottled Cargo	In	4						3					1		
		Out	22			4	9	2						7		
23	Lumber	In	11								11					
		Out	2							2						
27	Fertilizer	In	47	15					30		2					
		Out	3	2		1										
33	Mineral Fuels	In	577	23	23	8	19	78	100	43	131	40	57	44	11	
		Out	111	9	3	2	4	2	9	6	48	11	3	5	9	
41	Coconut Oil	In	0													
		Out	0													
51	Chemicals	In	125		1	4		2	2	7	12	4	28	38	29	
		Out	38		1			5	4	3	7	1	15	1	1	
61	Plywood & Veneer	In	10		4							6				
		Out	22					22								
63	Cement	In	0													
		Out	0													
64	Iron & Steel	In	82		2	15	4	2	2	8		4	5	7	33	
		Out	19	1						1	3	1		1	3	
65	Manufactured Metal	In	128	6	9	4		4	5	15	26	16	20	6	17	
		Out	452	8	3	3	14	76	86	48	112	18	42	25	19	
71	Machinery & Electrical Equipment	In	114		23		19	2	5	18		6	9	26	15	
		Out	219			40	1	8	4	28	3	7	54	27	55	
72	Transport Equipment	In	1,021	247	122	238	51	53	42	57	38	52	26	48	55	
		Out	1,124	179	313	165	85	68	64	55	43	27	44	40	79	
81	Furniture	In	14			8									8	
		Out	0													
91	Other General Cargo	In	5,678	586	457	529	490	351	260	523	309	515	566	512	582	
		Out	8,163	732	793	1,002	695	394	433	528	462	620	693	724	1,887	
	Salt	In	4				4									
		Out	329				46		3	28	18	21	43	68	103	
Total			38,670	3,589	5,339	5,418	3,094	1,956	1,989	2,366	2,060	2,051	3,336	2,854	4,708	3,515 = Average
Seasonable Value				102	152	154	85	56	57	67	59	58	95	81	134	

Source: PPA Monthly Report, Philippine Ports Authority

Table A-2-4-2 Cargo Volumes of Existing Conventional Vessel

Port : Iloilo to Bacaggo | Year 1990 | Vessel Type = (GC) | Jan - Jun

Cargo Unit : Metric Ton

Breakbulk Cargo			Total	1	2	3	4	5	6	7	8	9	10	11	12	Remark
3	Fish & Fish Preparation	In	124						124							
		Out	2			2										
6	Wheat	In	0													
		Out	3,075	550	550	725	1,250									
7	Fruits & Vegitables	In	60						60							
		Out	54			16			38							
8	Sugar	In	2,093		1,245	100		748								
		Out	0													
62	Texile & Garment Product	In	0													
		Out	48			38			10							
63	Cement	In	0													
		Out	0													
64	Iron & Steel	In	0													
		Out	37		19	14			4							
71	Machinery & Electrical Equipment	In	0													
		Out	2						2							
72	Transport Equipment	In	6						6							
		Out	126			79			47							
91	Other General Cargo	In	267					31	236							
		Out	546	231	2	63	225	20	5							
Total			6,440	781	1,816	1,037	1,475	799	532	0	0	0	0	0	0	1,073 = Average
Seasonable Value				73	169	97	137	74	50	0	0	0	0	0	0	

Port : Iloilo to Bacaggo | Year 1990 | Vessel Type = (GC) | Jan - Jun

Cargo Unit : Metric Ton

Containerized Cargo			Total	1	2	3	4	5	6	7	8	9	10	11	12	Remark
3	Fish & Fish Preparation	In	21		3		18									
		Out	0													
4	Palay & Rice	In	12			6			6							
		Out	0													
5	Corn	In	0													
		Out	206					206								
6	Wheat	In	26			15	11									
		Out	0													
8	Sugar	In	7,434	1,893	1,850	1,661	924	1,381	1,325							
		Out	0													
10	Animal Feeds	In	0													
		Out	63			6		57								
27	Fertilizer	In	109			96		13								
		Out	0													
41	Coconut Oil	In	0													
		Out	11	11												
71	Machinery & Electrical Equipment	In	33	22				11								
		Out	0													
91	Other General Cargo	In	1,288	181	358	488	186	222	29							
		Out	62	34		3		22	3							
Total			9,185	1,281	1,483	2,187	1,059	1,912	1,383	0	0	0	0	0	0	1,531 = Average
Seasonable Value				92	92	143	69	125	89	0	0	0	0	0	0	

Source: PPA Monthly Report, Philippine Ports Authority

Table A-2-4-2 Cargo Volumes of Existing Conventional Vessel (continued)

Commodity Flow of F/S Route

Port : Iloilo to Reclam | Year 1990 | Vessel Type = (GC) | Jan - Jun

Cargo Unit : Metric Ton

Breakbulk Cargo			Total	1	2	3	4	5	6	7	8	9	10	11	12	Remark
4	Palay & Rice	In	0													
		Out	7,047	35	78	390	779	4,616	1,157							
6	Wheat	In	0													
		Out	2,716	375		363		511	1,467							
7	Fruits & Vegitables	In	0													
		Out	8		2	5	1									
8	Sugar	In	7,839	60	2,898	3,289	1,110		498							
		Out	0													
10	Animal Feeds	In	0													
		Out	96			10		25	61							
11	Bottled Cargo	In	0													
		Out	780	683	97											
22	Logs	In	0													
		Out	23				23									
27	Fertilizer	In	35		35											
		Out	35,397	6,697	9,876	4,537	6,432	4,333	4,322							
28	Crude Minerals	In	0													
		Out	6					6								
29	Metal/Ores Metal Scrap	In	50						50							
		Out	0													
51	Chemicals	In	0													
		Out	3						3							
61	Plywood & Veneer	In	0													
		Out	35		35											
63	Cement	In	120				20	100								
		Out	1,177			677	500									
64	Iron & Steel	In	0													
		Out	414		94				328							
71	Machinery & Electrical Equipment	In	20			20										
		Out	0													
91	Other General Cargo	In	1,827	114	45	1,545	38	38	47							
		Out	545			407		3	135							
Total			58,138	7,964	12,344	11,243	8,903	9,832	8,052	0	0	0	0	0	0	9,690 = Average
Seasonable Value				82	127	116	92	99	83	0	0	0	0	0	0	

Commodity Flow of F/S Route

Port : Iloilo to Reclam | Year 1990 | Vessel Type = (Bulk) | Jan -Jun

Cargo Unit : Metric Ton

Bulk			Total	1	2	3	4	5	6	7	8	9	10	11	12	Remark
9	Molasses	In	12,130	1,485	2,553	1,665	2,845	1,248	2,334							
		Out	0													
Total			12,130	1,485	2,553	1,866	2,845	1,248	2,334	0	0	0	0	0	0	2,022 = Average
Seasonable Value				73	126	92	141	62	115	0	0	0	0	0	0	
Grand Total			124583	15089	23455	21550	17286	15547	14270	2366	2060	2051	3336	2854	4708	20,760

Source: PPA Monthly Report, Philippine Ports Authority

Table A-2-4-3 Production Statistics of Fruits & Vegetable in Region VI

Unit : 1,000 Metric Ton

Province	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Panay										
Aklan	47,710	42,112	54,323	47,458	32,649	36,179	44,011	51,972	67,628	61,055
Antique	14,488	12,286	14,053	14,605	15,032	15,811	15,492	15,438	14,306	14,050
Capiz	36,971	36,403	29,325	29,016	18,340	24,615	25,014	23,557	21,664	21,042
Iloilo	297,781	284,728	254,322	264,000	278,953	316,757	310,952	280,558	279,046	273,138
Sub Total	396,950	375,529	352,023	355,079	344,974	393,362	395,469	371,525	382,644	369,285
Negros										
Negros.O	178,786	168,797	135,336	114,754	127,169	127,406	128,324	129,071	130,220	120,445
Total	575,736	544,326	487,359	469,833	472,143	520,768	523,793	500,596	512,864	489,730

Source : Estimated production,area harvested and yield per hectore,by croptype,WESTERN VISAYA

Table A-2-4-4 Origin and Destination of Iloilo-Baclod Ferry

(Iloilo -> Bacolod)

Code	Name	From	To
60101	Altavas	32	-
60107	Kalibo	6	-
	Aklan	38	-
60201	Anini-y	20	-
60211	Patnongon	12	-
60212	San Jose	51	-
60213	San Remigi	6	-
60215	Sibalom	12	-
60216	Tibiao	6	-
60218	Valderrama	44	-
	Antique	151	-
60301	Cuartero	12	-
60302	Dao	16	8
60306	Jamindan	6	-
60314	Roxas City	52	-
60315	Sapi-an	23	-
	Capiz	109	8
60402	Alimodian	12	-
60404	Badiangan	6	-
60405	Balasan	8	-
60406	Banate	43	-
60407	Barotac Nu	65	-
60411	Cabatuan	26	-
60412	Calinog	52	-
60415	Dingle	20	-
60417	Dumangas	55	-
60418	Estancia	12	-
60419	Guimbal	50	-
60420	Igbaras	16	-
60421	Iloilo Cit	2590	8
60422	Janiuay	12	-
60424	Leganes	57	-
60426	Leon	26	-
60427	Maasin	15	-
60428	Miagao	64	-
60431	Oton	112	-
60432	Passi	42	-
60433	Pavia	22	-
60434	Pototan	20	-
60436	San Enriqu	7	-
60437	San Joaqui	26	-
60438	San Miguel	45	-
60440	Santa Barb	49	-
60441	Sara	6	-
60442	Tigbauan	45	-
60443	Tubungan	6	-
60444	Zarraga	34	-
	Iloilo	3543	8
60501	Buenavista	6	-
60502	Jordan	8	-
60503	Nueva Vale	6	-
	Guimaras	20	-
60601	Bacolod Ci	30	2606
60602	Bago City	-	68
60603	Binalbagan	-	39
60604	Cadiz City	-	73
60607	Cauayan	-	32
60608	Enrique B.	-	38
60610	Himamaylan	-	52
60611	Hinigaran	-	68
60612	Hinoba-an	-	8
60613	Ilog	-	8
60614	Isabela	-	13
60615	Kabankalan	7	63
60616	La Carlota	-	72
60618	Manapla	-	16
60620	Murcia	-	15
60621	Pontevedra	-	8
60622	Pulupandan	-	26
60623	Sagay	-	73
60625	San Carlos	-	22
60626	San Enriqu	-	15
60627	Silay City	-	243
60629	Taboso	-	6
60630	Talisay	-	112
60631	Valladolid	-	67
60632	Victorias	-	87
	Negros Occ	37	3830
70217	Cebu City	-	20
	Cebu	-	20
70310	Dumaguete	-	12
	Negros Ori	-	12
80407	Gamay	-	8
	Northern S	-	8
1401	Manila	-	12
	Total	3898	3898

(Bacolod -> Iloilo)

Code	Name	From	To
60107	Kalibo	-	8
	Aklan	-	8
60201	Anini-y	-	8
60202	Barbaza	-	13
60206	Culasi	-	12
60212	San Jose	-	31
60217	Tobias For	8	-
	Antique	8	64
60304	Dumarao	-	13
60308	Mambusao	-	8
60312	Pontevedra	-	7
60314	Roxas City	-	69
	Capiz	-	97
60401	Ajuy	-	6
60402	Alimodian	-	6
60403	Anilao	-	6
60407	Barotac Nu	-	24
60411	Cabatuan	-	25
60412	Calinog	-	8
60415	Dingle	-	8
60416	Duenas	-	6
60417	Dumangas	-	25
60419	Guimbal	-	35
60421	Iloilo Cit	30	1874
60422	Janiuay	-	31
60423	Lambunao	-	20
60424	Leganes	-	38
60426	Leon	-	6
60427	Maasin	8	16
60428	Miagao	-	25
60430	New Lucena	-	7
60431	Oton	6	128
60432	Passi	-	24
60433	Pavia	-	89
60434	Pototan	-	39
60438	San Miguel	8	46
60440	Santa Barb	-	52
60442	Tigbauan	-	91
60444	Zarraga	-	38
	Iloilo	52	2673
60501	Buenavista	-	38
60502	Jordan	-	39
	Guimaras	-	77
60601	Bacolod Ci	2015	47
60602	Bago City	34	-
60603	Binalbagan	55	-
60604	Cadiz City	67	-
60607	Cauayan	7	8
60608	Enrique B.	25	-
60610	Himamaylan	30	-
60611	Hinigaran	50	-
60612	Hinoba-an	12	-
60613	Ilog	16	-
60615	Kabankalan	50	-
60616	La Carlota	59	-
60618	Manapla	9	-
60620	Murcia	8	-
60622	Pulupandan	12	-
60623	Sagay	12	-
60625	San Carlos	72	-
60627	Silay City	108	-
60628	Sipalay	24	-
60630	Talisay	95	-
60631	Valladolid	49	-
60632	Victorias	111	-
	Negros Occ	2926	55
70308	Canlaon Ci	8	-
70310	Dumaguete	8	-
	Negros Ori	16	-
1401	Manila	-	6
	Total	3002	2980

Note : Total of "From" and "To" are not equal because of unknown data like ? -> Iloilo or Bacolod -> ?.

Source: NSO Statistics,

NSO

LAND USE OPPORTUNITY MAP of WESTERN VISAYAS
SCALE 1,200,000

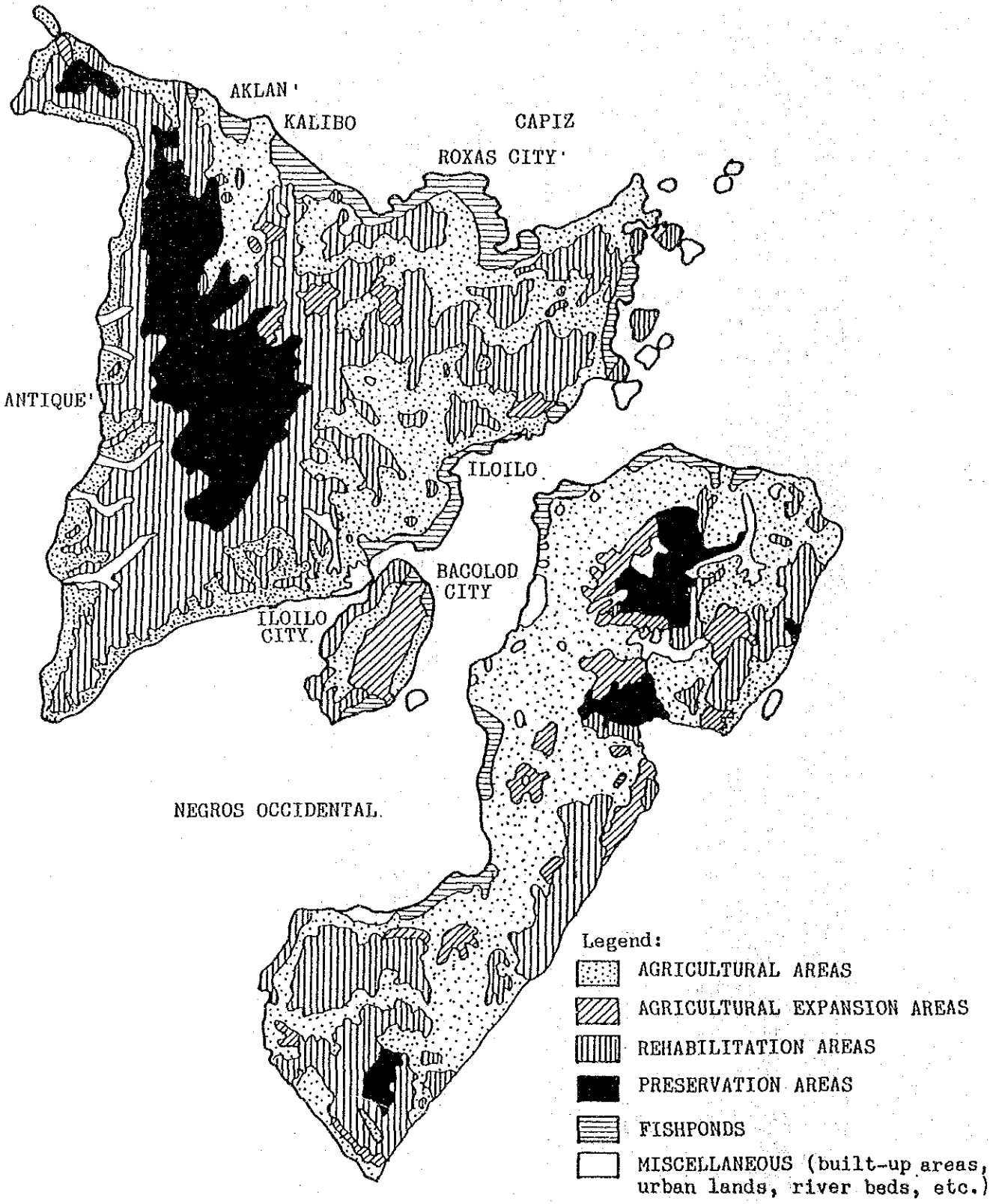


Figure A-2-4-1 Present Land Use Map
(Western Visayas)
Source: NEDA Region VI

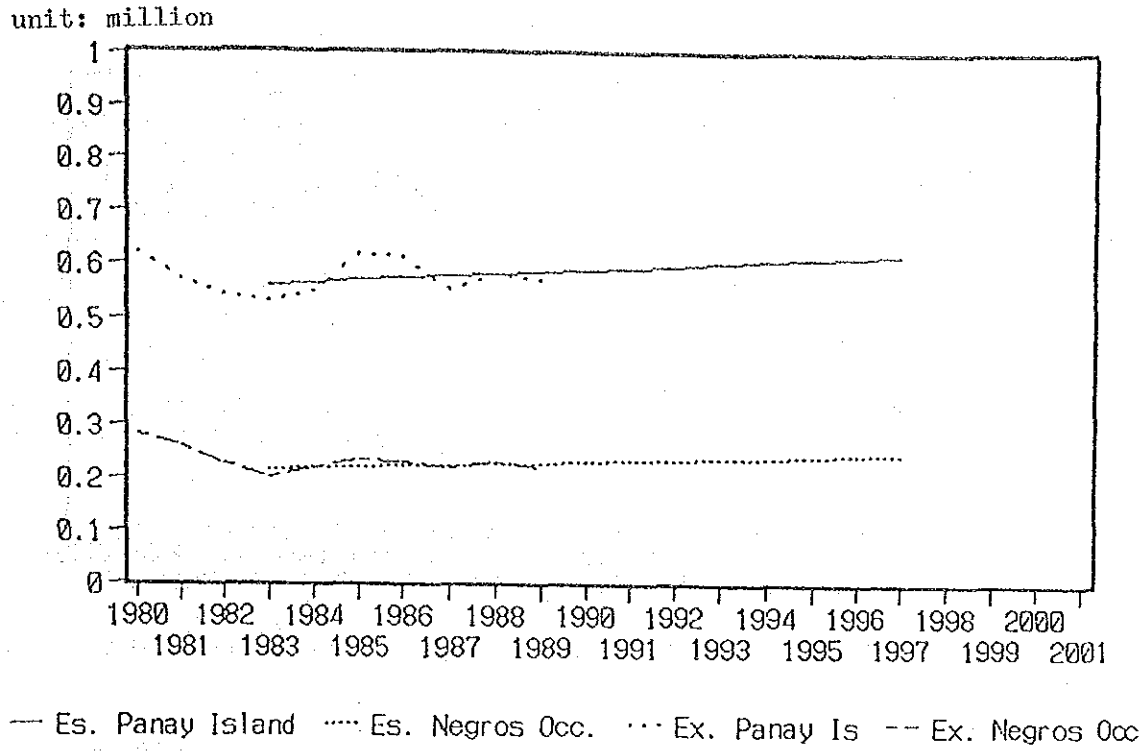
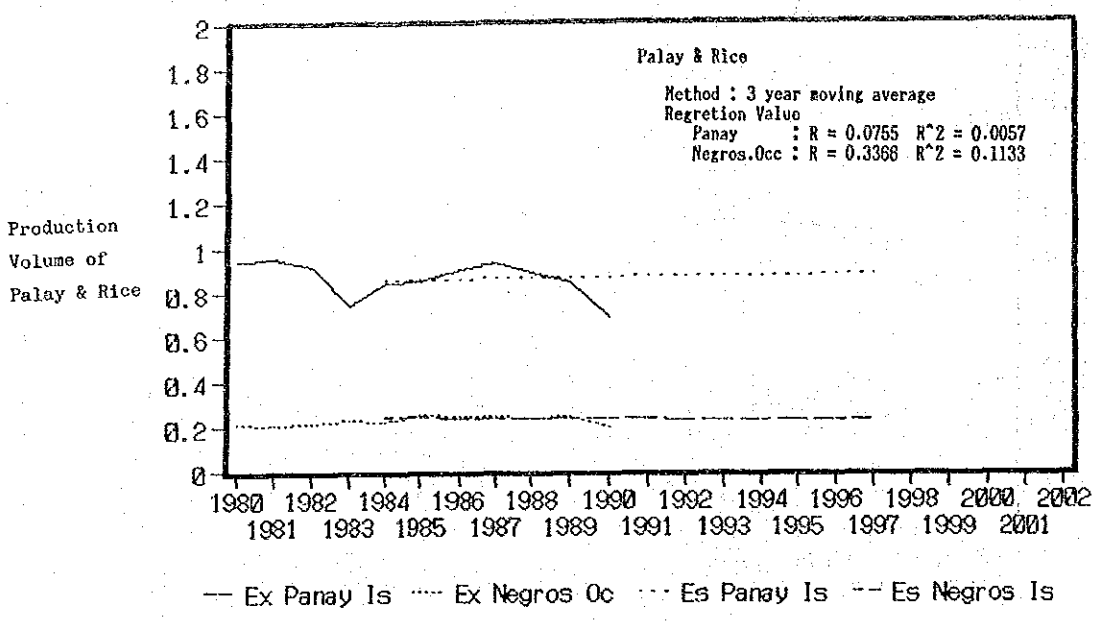


Figure A-2-4-2 Estimated production of Fruits & Vegetable in Western Visaya
Source: JICA Study Team



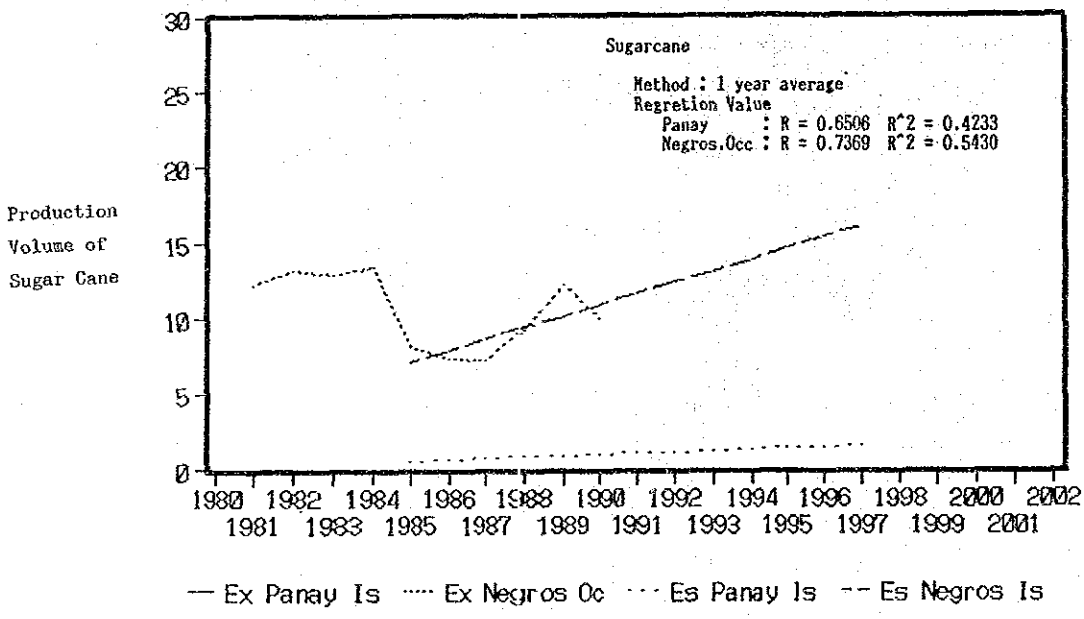


Figure A-2-4-3 Historical Production of Palay & Rice and Sugar Cane in Western Visaya

Source: JICA Study Team

Table A-2-5-1 Ro/Ro Facility Plan of Each Alternatives

Item	Unit	Alternative A	Alternative B	Alternative C
Pier Causeway	m	732	1440	1310
Rock Causeway	m	0	0	530
Terminal	m	85	94	94
Ro/Ro Berth	m	115	115	115

Source: JICA Study Team

Table A-2-5-2 Construction Cost of Each Alternatives

Unit : 1,000 peso

Item	Unit	Alternative A		Alternative B		Alternative C	
		Dimension	Cost	Dimension	Cost	Dimension	Cost
Berth	m	115	19,435	115	19,435	115	19,435
Ro/Ro Ramp	Unit	1	3,162	1	3,162	1	3,162
Pier Causeway	m	732	49,044	1,440	96,480	1,310	87,770
Terminal	Unit	1	19,547	1	22,059	1	22,059
Building	Unit	1	6,600	1	6,600	1	6,600
Utility	Unit	1	450	1	2,880	1	2,620
Reclamation	m2	1,590	636	1,590	636	1,590	636
Revetment	m	127	7,046	203	11,279	127	7,046
On shore Terminal	m2	150	1,650	150	1,650	150	1,650
Rock Causeway	m	-	-	-	-	530	53,000
Sub Total			107,570		164,181		203,978
Indirect Cost	Unit	1	77,906	1	118,906	1	147,729
Sub Total			185,476		283,087		351,707
R.V.Exstructure	Unit	1	4,561	-	-	-	-
P.W.Berth	Unit	1	-700	-	-	-	-
Total			189,337		283,087		351,707

Source: JICA Study Team

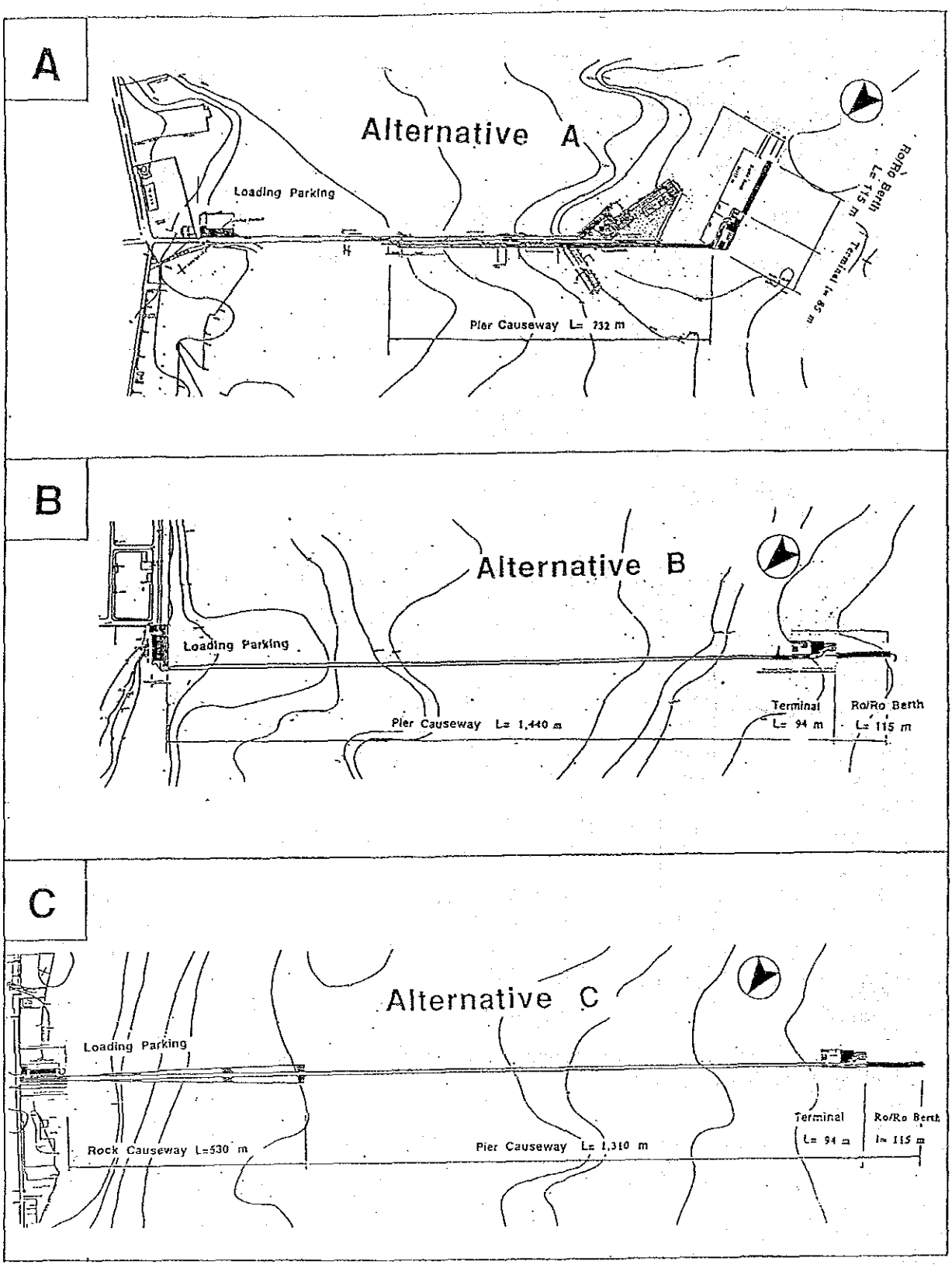


Figure A-2-5-1 Layout Plan at Each Alternative Site

Source: JICA Study Team

Note A-2-5-1 The Benefit for Land Transportation

1. Project Description

Without : Iloilo Port (RC #3) ⇄ Banago Port

With : Iloilo Port (RC #3) ⇄ Reclamation Area

The difference is only Bacolod side.

2. Traffic Characteristics

2.1 Passenger

1) Traffic Volume and Distribution

According to the Origin/Destination Survey carried out on Aug. 1 and 2, there are 6,400 persons using the Iloilo-Bacolod link accounted in two days.
The distribution of users is as follows(Interim Report (1) P275).

Table N-2-5-1.1(1) Distribution of Users

Iloilo			→	Bacolod		
Total	3,898			Total	3,898	
Panay Island	3,841	98.5%		Negros Island	3,842	98.5%
Iloilo	3,543	90.9%		Negros Occ.	3,830	98.3%
Antique	151	3.9%		Negros Ori.	12	0.3%
Capiz	109	2.8%				
Aklan	38	1.0%				
Gumaras	20	0.5%				

Source: JICA Study Team based on
JICA Origin/Destination Survey undertaken on Aug. 1991.

Table N-2-5-1.1(2) Distribution of Users

Bacolod ⟶ Iloilo

Total	3,002		Total	2,980	
Negros Island	2,942	98.0%	Panay Island	2,842	95.4%
Negros Occ.	2,926	97.5%	Iloilo	2,673	89.7%
Negros Ori.	16	0.5%	Capiz	97	3.3%
			Antique	64	2.1%
			Aklan	8	0.3%
			Guimaras	77	2.6%

Source: JICA Study Team based on
JICA Origin/Destination Survey undertaken on Aug. 1991.

The number of users from/to Bacolod side departing/arriving at Negros Occidential by direction is as follows.

Table N-2-5-1.2 Number of Users

	to Bacolod		from Bacolod		Total	
Bacolod City	2,015	68.9%	2,606	68.0%	4,621	68.4%
South	476	16.3	561	14.6	1,037	15.3
North	427	14.6	648	16.9	1,075	15.9
East	8	0.3	15	0.4	23	0.3
Total	2,926	100.0	3,830	100.0	6,756	100.0

Note: East : Murcia, Salvodor
North: Talisay, Silay City, Enrique B. Magalona, Victorias, Manapla, Cadiz City, Sagay, Escalante, Taboso and Calatrava
South: other Negros Occidental

Source: JICA Study Team based on
JICA Origin/Destination Survey undertaken on Aug. 1991.

The users from/to Bacolod side will be assumed in future as follows.

from/to Bacolod City	70 %
South	15 %
North	15 %

2) Access Mode

Access/Egress mode at Bacolod side is as follows.

Table N-2-5-1.3 Access/Egress Mode

Vehicle Type	Access		Egress		Total	
Car/Van	695	25.1%	917	26.9%	1,612	26.1%
Jeepney	1,816	65.4	2,223	65.3	4,039	65.4
Bus	209	7.5	153	4.5	362	5.9
Truck	16	0.6	26	0.8	42	0.7
Motorcycle	14	0.5	14	0.4	28	0.5
Tricycle	13	0.5	60	1.8	73	1.2
Others	12	0.4	12	0.4	24	0.4
Total	2,775	100.0	3,405	100.0	6,180	100.0

Source: JICA Study Team based on
Origin/Destination Survey undertaken on Aug. 1991

The mode of transportation from/to Bacolod side will be assumed in future as follows.

Car/Van	30 %
Jeepney	65 %
Bus	5 %

3) Average Load Factor

According to the Vehicular Traffic Count Survey, average load factor at Bacolod side is as follows.

Table N-2-5-1.4 Load Factor

Vehicle Type	Count	Passenger	Ave. L.F.
Car/Van	434	1,237	2.6
Jeepney	323	3,726	11.5
Bus	1	35	35.0
Truck	1	4	4.0
Motorcycle	5	6	1.2
Tricycle	12	1	1.3

Source: JICA Study Team based on
Vehicular Traffic Count Survey undertaken on Aug. 1991

The average load factor in Bacolod side will be assumed same as the present in future.

2.2 Cargo

1) Traffic Volume and transport mode

Table N-2-5-1.5
Vehicular Traffic Count
(Banago Port)

Mode	Count	Rate(%)
Car	-	-
Taxi	2	1.7
Jeep	21	18.1
Pick-up/Van	37	31.9
*Car/Van	60	51.7
Jeepney	15	12.9
Bus	-	-
Truck	35	30.2
Motorcycle	-	-
Tricycle	4	3.4
Others	2	1.7
Total	116	100.0

Note : * is sub-total.
Source: JICA Study Team based on Vehicular Traffic Count Survey undertaken on Aug. 1991

Car/Van is the dominant mode for delivering/picking up goods followed by Truck and Jeepney. After the introduction of Ro/Ro, the future mode of transport is assumed as follows.

Truck	30 %	→ 50 %
Jeepney(incl. Jeep)	31 %	→ 30 %
Pick-up/Van	32 %	→ 20 %

3. Preliminary Estimate of Benefits

3.1 Assumptions

1) Vehicle Operating Costs

Table N-2-5-1.6 Vehicle Operating Costs

Vehicle Type	a)Running Costs (₱/km)	b)Fixed Costs (₱/min)	c)Time Cost (₱/min)
Car/Van	2.808	0.119	0.501
Jeepney	1.800	0.591	0.735
Bus	4.381	0.972	3.174
Truck	5.590	1.044	0.000
Motorcycle	0.624	0.019	0.289
Tricycle	0.720	0.416	0.236

Source: Planning and Project Development Office, DPWH
with Aug.1991 fuel adjustment
Surface is paved and condition is fair.

Note : Highway Planning Manual Volume 4, MPWH, Oct.1982

1) Running costs are defined as the part of vehicle operating costs which vary directly with the number of kilometers operated.
2) Fixed costs are defined as the part of vehicle operating costs which vary directly with operating time (running + waiting time).
3) Time costs are defined as the value of passengers' time, including the time value for drivers of private cars.

2) Production/Attraction of Trips

Trips from/to Bacolod City are assumed to generate/attract cargo and passenger to/from City Hall. Especially for cargo all trips

are assumed to generate/attract from/to City Hall.

Banago - City Hall	4.0 km
Reclamation Area - City Hall	1.0 km
Banago - Reclamation Area	3.0 km

3) Vehicle Speed

Tabel N-2-5-1.7 Vehicle Speed

Service Type	Vehicle Type	Speed (km/h)	Travel Time (min) 1km	3km	4km
Passe-nger	Car/Van	40	1.5	4.5	6.0
	Jeepney	20	3.0	9.0	12.0
	Bus	25	2.4	7.2	9.6
Cargo	Truck	40	1.5	4.5	6.0
	Jeepney	40	1.5	4.5	6.0
	Pick-up/Van	40	1.5	4.5	6.0

Source: JICA Study Team

4) Average Load Factor for Ro/Ro

Truck	5,000 kg
Jeepney	2,000 kg
Pick-up/Van	2,000 kg

5) Passenger in 1997

1,213 thousand / year / direction

The number of passengers and vehicles by direction and by mode are as follows.

Tabel N-2-5-1.8 Passenger Number

Item	Direction	Car	Jeepney	Bus
Passen-ger	Bacolod City	254,730	551,915	42,455
	South	54,585	118,268	9,098
	North	54,585	118,268	9,098
Vehicle	Bacolod City	97,973	47,993	1,213
	South	20,994	10,284	260
	North	20,994	10,284	260

Source: JICA Study Team

6) Cargo in 1997

115,000 M Tons / year / both directions

Table N-2-5-1.9 Cargo Volume
(Unit:M Ton/year)

Commodity	Total	Ro/Ro
Palay/Rice	22,000	11,000
Fruits/Vegetables	9,000	9,000
Sugar	39,000	4,000
Fertilizer	84,000	27,000
Bottled Cargo	15,000	3,000
Other General Cargo	87,000	61,000
Total	256,000	115,000

Source: JICA Study Team

3.2 Benefits for Passenger

The estimates of benefit and cost are determined using the following formula.

(Benefit) = (Cost)Banago - (Cost)Reclamation

(Cost) = VOC
by vehicle type

(Cost) at Banago is

```
  (2.808x4 +0.119x 6.0+0.501x 6.0)x97,973  Car/Van Bacolod
+ (1.800x4 +0.591x12.0+0.735x12.0)x47,993  Jeepney Bacolod
+ (4.381x4 +0.972x 9.6+3.174x 9.6)x 1,213  Bus     Bacolod
+ (2.808xd1+0.119x t11+0.501x t11)x20,994  Car/Van North
+ (1.800xd1+0.591x t12+0.735x t12)x10,284  Jeepney North
+ (4.381xd1+0.972x t13+3.174x t13)x   260  Bus     North
+ (2.808xd2+0.119x t21+0.501x t21)x20,994  Car/Van South
+ (1.800xd2+0.591x t22+0.735x t22)x10,284  Jeepney South
+ (4.381xd2+0.972x t23+3.174x t23)x   260  Bus     South
```

(Cost) at Reclamation Area is

```
  (2.808x1 +0.119x 1.5+0.501x 1.5)x97,973  Car/Van Bacolod
+ (1.800x1 +0.591x 3.0+0.735x 3.0)x47,993  Jeepney Bacolod
+ (4.381x1 +0.972x 2.4+3.174x 2.4)x 1,213  Bus     Bacolod
+ (2.808xD1+0.119x T11+0.501x T11)x20,994  Car/Van North
+ (1.800xD1+0.591x T12+0.735x T12)x10,284  Jeepney North
+ (4.381xD1+0.972x T13+3.174x T13)x   260  Bus     North
+ (2.808xD2+0.119x T21+0.501x T21)x20,994  Car/Van South
+ (1.800xD2+0.591x T22+0.735x T22)x10,284  Jeepney South
+ (4.381xD2+0.972x T23+3.174x T23)x   260  Bus     South
```

(Benefit) is

```
  (2.808x3 +0.119x 4.5+0.501x 4.5)x97,973  Car/Van Bacolod
```

+ (1.800x3 +0.591x 9.0+0.735x 9.0)x47,993 Jeepney Bacolod

+ (4.381x3 +0.972x 7.2+3.174x 7.2)x 1,213 Bus Bacolod

= 1098699 + 831911 + 52152

= ₱ 1,982,762 / direction

= ₱ 3,965,524 / both directions

where :

t11 : Travel time between Banago and North by Car/Van

t12 : Travel time between Banago and North by Jeepney

t13 : Travel time between Banago and North by Bus

t21 : Travel time between Banago and South by Car/Van

t22 : Travel time between Banago and South by Jeepney

t23 : Travel time between Banago and South by Bus

d1 : Distance between Banago and North

d2 : Distance between Banago and South

T11 : Travel time between Recla. and North by Car/Van (= t11 + 4.5 min)

T12 : Travel time between Recla. and North by Jeepney (= t12 + 9.0 min)

T13 : Travel time between Recla. and North by Bus (= t13 + 7.2 min)

T21 : Travel time between Recla. and South by Car/Van (= t21 - 4.5 min)

T22 : Travel time between Recla. and South by Jeepney (= t22 - 9.0 min)

T23 : Travel time between Recla. and South by Bus (= t23 - 7.2 min)

D1 : Distance between Recla. and North (= d1 + 3km)

D2 : Distance between Recla. and South (= d2 - 3km)

3.2 Benefits for Cargo

The estimates of benefit and cost are determined using the following formula.

(Benefit) = (Cost)Banago - (Cost)Reclamation

(Cost) = VOC (excl. time cost)
by vehicle type

The calculation of total number of vehicles

N x (0.50x5 + 0.30x2 + 0.20x2) = 115,000
Truck Jeepney Pick-up/Van Total

N = 32,857 vehicles / year

Truck	16,429
Jeepney	9,857
Pick-up/Van	6,571

(Cost) at Banago is

(5.590x4 +1.044x 6.0)x16,429 Truck
+ (1.800x4 +0.591x 6.0)x 9,857 Jeepney
+ (2.808x4 +0.119x 6.0)x 6,571 Pick-up/Van

(Cost) at Reclamation Area is

(5.590x1 +1.044x 1.5)x16,429 Truck
+ (1.800x1 +0.591x 1.5)x 9,857 Jeepney
+ (2.808x1 +0.119x 1.5)x 6,571 Pick-up/Van

(Benefit) is

(5.590x3 +1.044x 4.5)x16,429 Truck
+ (1.800x3 +0.591x 4.5)x 9,857 Jeepney
+ (2.808x3 +0.119x 4.5)x 6,571 Pick-up/Van
= 352,698 + 79,442 + 58,873
= ₱ 491,013 / both directions

3.3 Total Benefits

Total benefits amount to ₱ 4,456,537 / both directions / year.

Table A-2-6-1 Arrival Vessel Name at ICPC (1990, May)

Vessel Name	Company	S.T	Type	G.R.T	L (m)	B (m)	D (m)	P.Capacity	Frequency
(Foreign)									
Al Reza	Foreign	T	G.C	9,895	144	20			
Bei He	Foreign	T	G.C	8,716	156	20			
(Domestic)									
Super Ferry 1		L	P/Fe	4,511	132	14			
Cotabato Princese	Sulpicio	L	P/Fe	7,977	149		4.7		2/week
Abocon 6	Aboitiz								
Abocon 8	Aboitiz	L	Con	2,833	92	14	7.1	-	
Wilcon 5	William	L	Con	1,858	72	-	-	-	
Wilcon 6	William								
Amigo 3	Amigo.S								
Sulcon 11	Sulpicio								

Source: JICA Study Team based on
PPA Monthly Report, Philippine Ports Authority

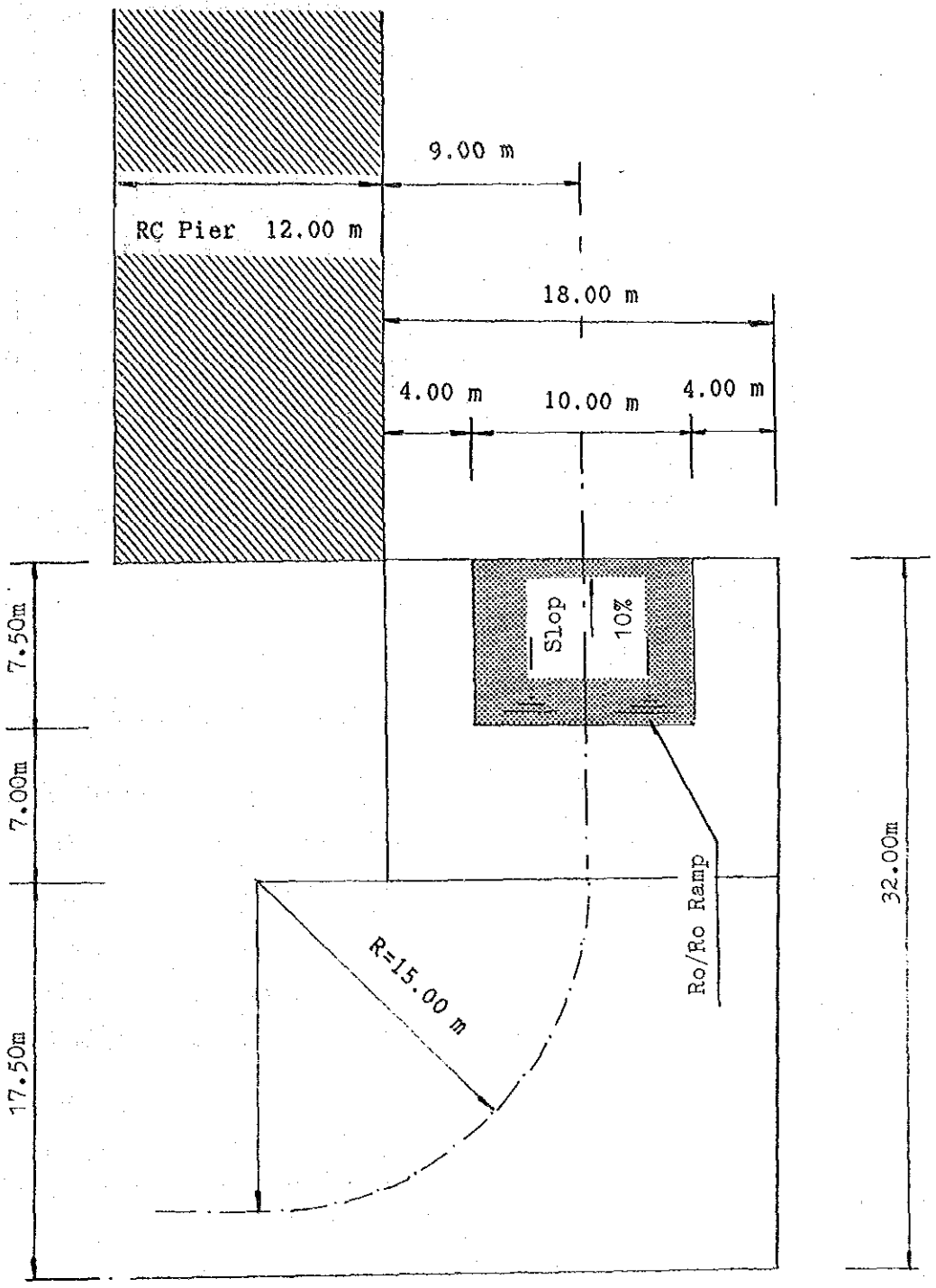
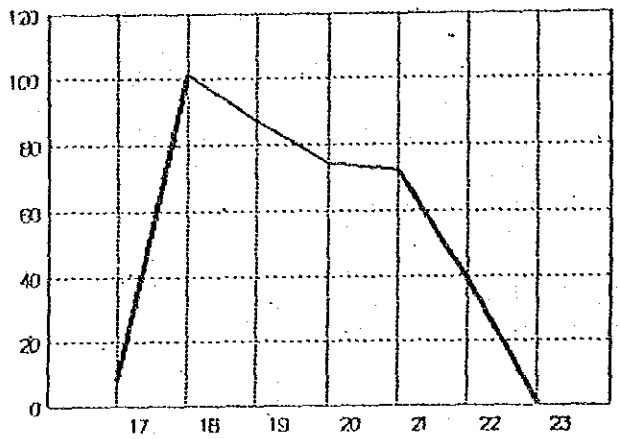


Figure A-2-6-1 Design of Ro/Ro Ramp
Source: JICA Study Team

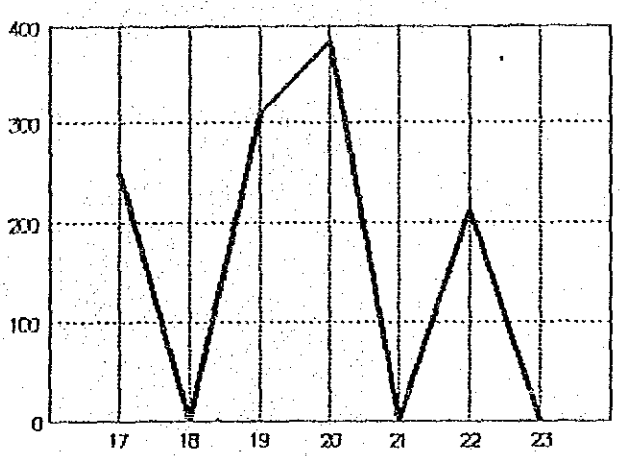
CONTAINER INVENTORY (Marshalling Yard)

February 17–23, 1992



BREAKBULK CARRIED IN TONS

February 17–23, 1992



Container Inventory at Banago Marshalling Yard

Date	Vessel	Number of Container
Feb.17	St.Maria	8
18	St.Florentina	101
19	San.Sevastian Don Jurio	383
20	St.Maria	74
21	St.Florentina	72
22	St.Maria Don Jurio	39
23		1

Source : NENACO

Breakbulk Volume in Tons at Banago Port Outgoing

unit : M ton

Date	Vessel	Breakbulk Carried
Feb.17	Don Claudio	250
18	St.Florentina	Drydock
19	Don Jurio	309
20	San.Sevastian	74
21	St.Florentina	Drydock
22	St.Maria	211
23	Conny 2	0

Source : NENACO

Figure A-2-6-2 Container Inventory & Breakbulk Volume Treated at Banago Pier

Source: JICA Study Team based on NENACO

Note A-2-7-1 Required Ro/Ro Terminal Facilities

The required Ro/Ro terminal facilities are estimated as follows;

1. Transported Cargo Volume and Passenger Number by each one trip

Passenger; 1,236,000 pas./(4 trip x 340 day) = 908 person
(capacity ; 1,000 person)

Cargo ; 81,000 M ton /(4 trip x 340 day) = 62 M ton
(capacity ; 79.5 M ton)

2. Loading Parking Area

Using the composition of loading vehicle type and unit parking area by each vehicle type, the required loading parking area is calculated as follows;

Bus	; 3 car x 60 m^2	=	180 m^2
Private Car	; 8 car x 25 m^2	=	200 m^2
Truck	; 6 car x 50 m^2	=	300 m^2
Jeepney	; 49 car x 25 m^2	=	1,225 m^2
	Total	=	1,905 m^2

Assuming the facility utilized ratio at 80%, the required area is

$$1,905\ m^2 \times 80\ \% = 1,524\ m^2 = 1,500\ m^2$$

3. Utility Area

A utility area is required for vehicle drivers to wait the vessel arrive at the loading panby ocean. The utility area is calculated as follows;

Basic assumption ; Utilized ratio = 80 %
Concentrate ratio = 60 %