Appendix I-60 UNIT PRICE ANALYSIS

CONSTRUCTION COST ESTIMATE | DATE PREPARED | SHEET 1 OF 3

PROJECT: FEASIBILITY STUDY FOR MANILA-BATAAN COASTAL ROAD AND ITS RELATED ROADS

LOCATION: METRO MANILA AND BULACAN, PHILIPPINES

PACIFIC CONSULTANTS INTERNATIONAL

BASIS FOR ESTIMATE: ☐ CODE A (No design completed) ☒ CODE B (Preliminary design) ☐ CODE C (Final design) ☐ OTHER (Specify)

DRAWING NO. | ESTIMATOR | CHECKED BY

DESCRIPTION	QUANTITY NO. UNITS	QUANTITY UNIT MEAS	EQUIPMENT/LABOR PER UNIT	EQUIPMENT/LABOR TOTAL	MATERIAL PER UNIT	MATERIAL TOTAL	TOTAL COST
UNIT COST BACK-UP SHEET							
ITEM NO. 5							
Common Excavation, Borrow							
Medium Hauling Distance (2.0 km Single Trip) - 1,000 m³							
Equipment							
Convertible Excavator, 0.6 m³	18	HR	251	4,518.00		-	
Dump Truck, 3.0 m³	100	HR	55	5,500.00		-	
Bulldozer, 17 t	10	HR	277	2,770.00		-	
Tyre Roller, 10 t	17	HR	138	2,346.00		-	
Sub-Total				₱15,134.00		₱ 0	
Labor							
Foreman	18	MH	4.98	89.64		-	
Asst. Foreman	18	MH	3.35	60.30		-	
Optr., Excavator	18	MH	4.27	76.86		-	
Optr., Dump Truck	100	MH	4.27	427.00		-	
Optr., Bulldozer	10	MH	4.27	42.70		-	
Optr., Roller	17	MH	4.27	72.59		-	
Unskilled Labor	184	MH	2.58	474.72		-	
Unskilled Labor Signalman	38	MH	2.58	98.04		-	
Sub-Total				₱ 1,341.85		₱ 0	
TOTAL DIRECT COST FOR 1,000 m³				₱16,475.85		₱ 0	₱ 16,475.85
UNIT DIRECT COST PER m³				₱ 16.48		₱ 0	₱ 16.48

CONSTRUCTION COST ESTIMATE WORKSHEET	DATE PREPARED	SHEET 2 OF 3

PROJECT
FEASIBILITY STUDY FOR MANILA-BATAAN COASTAL ROAD AND ITS RELATED ROADS

LOCATION
METRO MANILA AND BULACAN, PHILIPPINES

PACIFIC CONSULTANTS INTERNATIONAL

DRAWING NO.	ESTIMATOR	CHECKED BY

UNIT COST BACK-UP SHEET						
ITEM NO. 5						
Common Excavation, Borrow Medium						
Hauling Distance (2.0 km Single Trip)	-	1,000 m^3				
Equipment						
Convertible Excavator, 0.6 m^3	1,000 m^3	÷ 57 m^3/HR	= 18			18 HR
Dump Truck, 3.0 m^3	Hauling Distance	2.0 km				
	Loading	3.0 m^3	÷ 54 m^3	=	0.06 HR	
	Hauling	2.0 km	÷ 30 km/HR	=	0.07	
	Dump			=	0.05	
	Return	2.0	÷ 35 km/HR	=	0.06	
	Total				0.24	
	Total time required					
	1,000 / 3.0 x 0.8	x 0.24	= 100 HR			100 HR
Bulldozer, 17 t	For compaction and spreading					
	1,000 m^3	÷ 100 m^3/HR	= 10 HR			10 HR
Tyre Roller, 10 t	1,000 m^3	÷ 60 m^3/HR	= 16.7 HR say			17 HR
Labor						
Foreman	180 MH	÷ 10 = 18				18 MH
Asst. Foreman						18 MH
Optr., Excavator						18 MH
Optr., Dump Truck						100 MH
Optr., Bulldozer						10 MH
Optr., Tyre Roller						17 MH

CONSTRUCTION COST ESTIMATE WORKSHEET	DATE PREPARED	SHEET 3 OF 3

PROJECT
FEASIBILITY STUDY FOR MANILA-BATAAN COASTAL ROAD AND ITS RELATED ROADS

LOCATION
METRO MANILA AND BULACAN, PHILIPPINES

PACIFIC CONSULTANTS INTERNATIONAL

DRAWING NO.	ESTIMATOR	CHECKED BY

UNIT COST BACK-UP SHEET						
ITEM NO. 5	-	Cont'd.				
Common Excavation, Borrow, Medium Hauling Distance	(2.0 km Single Trip) - Cont'd.					
Labor						
Unskilled Labor	(18 + 10 + 17) x 4 Men = 180					180 MH
Unskilled Labor, Signalman	100 HR ÷ 8 x 3 Men = 37.5					38 MH

CONSTRUCTION COST ESTIMATE

DATE PREPARED:

SHEET 1 OF 4

PROJECT: FEASIBILITY STUDY FOR MANILA-BATAAN COASTAL ROAD AND ITS RELATED ROADS

LOCATION: METRO MANILA AND BULACAN, PHILIPPINES

PACIFIC CONSULTANTS INTERNATIONAL

BASIS FOR ESTIMATE
- [ ] CODE A (No design completed)
- [X] CODE B (Preliminary design)
- [ ] CODE C (Final design)
- [ ] OTHER (Specify) _____

DRAWING NO.

ESTIMATOR

CHECKED BY

DESCRIPTION	QUANTITY NO. UNITS	QUANTITY UNIT MEAS.	EQUIPMENT / LABOR PER UNIT	EQUIPMENT / LABOR TOTAL	MATERIAL PER UNIT	MATERIAL TOTAL	TOTAL COST
UNIT COST BACK-UP SHEET							
ITEM NO. 6							
Common Excavation, Borrow, Long Hauling Distance (10 km Single Trip)					-	10,000 m^3	
Equipment							
Convertible Excavator 0.6 m^3	193	HR	251	48,443.00		-	
Dump Truck, 3.0 m^3	2,792	HR	55	153,560.00		-	
Bulldozer, 17 ton	100	HR	277	27,700.00		-	
Sheep's-foot Roller	67	HR	99	6,633.00		-	
Tyre Roller, 10 ton	21	HR	138	2,898.00		-	
Motor Grader	21	HR	220	4,620.00		-	
Sub-Total				₱ 243,854.00		₱ 0	
Labor							
Foreman	134	MH	4.98	667.32		-	
Asst. Foreman	134	MH	3.35	448.90		-	
Operator, Excavator	193	MH	4.27	824.11		-	
Operator, Dump Truck	2,792	MH	4.27	11,921.84		-	
Operator, Bulldozer	100	MH	4.27	427.00		-	
Operator, Tyre Roller	21	MH	4.27	89.67		-	
Operator, Motor Grader	21	MH	4.27	89.67		-	
Unskilled Labor	1,340	MH	2.58	3,457.20		-	
Unskilled Labor, Signalman	419	MH	2.58	1,081.02		-	
Sub-Total				₱ 19,006.73		₱ 0	
TOTAL DIRECT COST FOR 10,000 m^3				₱ 262,860.73		₱ 0	₱ 262,860.73
UNIT DIRECT COST PER m^3				₱ 26.29		₱ 0	₱ 26.29

CONSTRUCTION COST ESTIMATE WORKSHEET	DATE PREPARED	SHEET 2 OF 4

PROJECT
FEASIBILITY STUDY FOR MANILA-BATAAN COASTAL ROAD AND ITS RELATED ROADS

LOCATION
METRO MANILA AND BULACAN, PHILIPPINES

PACIFIC CONSULTANTS INTERNATIONAL

DRAWING NO.	ESTIMATOR	CHECKED BY

UNIT COST BACK-UP SHEET

ITEM NO. 6

Common Excavation, Borrow, Long Hauling Distance (10 km Single Trip) - 10,000 m^3

Equipment

Convertible Excavator, 0.6 m^3

Assume close-lying material which fills dipper or bucket and often provides heaped loads

Shovel-Dipper Factor (k)
= 1.00

Efficiency Factor (E)
= 0.75

Soil Conversion Factor (f)
= 0.80

Output per HR

Assume 135° Swing

Output = 71 m^3/HR (K = 1.0 & E = 0.75)
x f = 71 m^3/HR x 0.8
= 57 m^3/HR

Total Time Required
= 10,000 m^3 ÷ 57 m^3/HR = 175 HR

Consider downtime to wait dump truck
175 HR x 1.1 HR = 193 HR

CONSTRUCTION COST ESTIMATE WORKSHEET	DATE PREPARED	SHEET 3 OF 4

PROJECT
FEASIBILITY STUDY FOR MANILA BATAAN COASTAL ROAD AND ITS RELATED ROADS

LOCATION
METRO MANILA AND BULACAN, PHILIPPINES

PACIFIC CONSULTANTS INTERNATIONAL

DRAWING NO.	ESTIMATOR	CHECKED BY

UNIT COST BACK-UP SHEET

ITEM NO. 6

Comon Excavation, Borrow, Long Hualing Distance (10 Km Single Trip) - Cont'd.

Equipment - Cont'd.

Dump Truck, 3.0 m^3 — Hauling Distance = 10 Km (Single Trip)

Time required for 1 round trip

Loading =	Assume cutting & loading	-	
Hauling =	10 : 30 Km/HR	0.33 HR	
Dump		0.05 HR	
Return =	10 : 35 Km/HR	0.29 HR	
	Total	0.67 HR/RT	

Total time required =

$\frac{10{,}000\ m^3}{3\ m^3 \times 0.8}$ x 0.67 HR/RT = 2,792 HR

Bulldozer, 17 ton	For Compaction & Spreading 10,000 m^3 : 100 m^3/HR	=	100 HR
Sheep's Foot Roller	10,000 m^3 : 150 m^3/HR	=	67 HR
Tyre Roller, 10 ton	10,000 m^3 x 1/8 : 60 m^3/HR	=	21 HR

Labor

Foreman	1,340 HR : 10	134 MH
Assistance Foreman		134 MH
Operator, Excavator		193 MH
Operator, Dump Truck		2,792 MH
Operator, Bulldozer		100 MH
Operator, Tyre Roller		21 MH
Operator, Motor Grader		21 MH

CONSTRUCTION COST ESTIMATE WORKSHEET	DATE PREPARED	SHEET 4 OF 4

PROJECT
FEASIBILITY STUDY FOR MANILA BATAAN COASTAL ROAD AND ITS RELATED ROADS

LOCATION
METRO MANILA AND BULACAN, PHILIPPINES

PACIFIC CONSULTANTS INTERNATIONAL

DRAWING NO.	ESTIMATOR	CHECKED BY

UNIT COST BACK-UP SHEET

ITEM NO. 6

Common Excavation, Borrow, Long Hauling Distance (10 Km Single Trip) - Cont'd.

Labor - Cont'd.

Unskilled Labor	(193 + 100 + 21 + 21) x 4 men	1,340 MH
Unskilled Labor, Signalman	2,792 HR ÷ 20 x 3 men	419 MH

CONSTRUCTION COST ESTIMATE

DATE PREPARED

SHEET 1 OF 2

PROJECT: FEASIBILITY STUDY FOR MANILA-BATAAN COASTAL ROAD AND ITS RELATED ROADS

LOCATION: METRO MANILA AND BULACAN, PHILIPPINES

PACIFIC CONSULTANTS INTERNATIONAL

BASIS FOR ESTIMATE
- ☐ CODE A (No design completed)
- ☒ CODE B (Preliminary design)
- ☐ CODE C (Final design)
- ☐ OTHER (Specify)

CEILING NO.

ESTIMATOR

CHECKED BY

DESCRIPTION	QUANTITY NO. UNITS	QUANTITY UNIT MEAS	EQUIPMENT/LABOR PER UNIT	EQUIPMENT/LABOR TOTAL	MATERIAL PER UNIT	MATERIAL TOTAL	TOTAL COST
UNIT COST BACK-UP SHEET							
ITEM NO. 9							
Granular Borrow -	1,000	m^3					
Material							
Sand for Back fill Material	1,200	m^3		-	55	66,000.00	
Equipment							
Bulldozer, 17 ton	17	HR	277	4,709.00		-	
Tyre Roller, 10 ton	2	HR	138	276.00		-	
Sub-Total				₱4,985.00		₱ 0	
Labor							
Optr., Bulldozer	17	MH	4.27	72.59		-	
Optr., Tyre Roller	2	MH	4.27	8.54		-	
Foreman	8	MH	4.98	39.84		-	
Asst. Foreman	8	MH	3.35	26.80		-	
Unskilled Labor	76	MH	2.58	196.08		-	
Sub-Total				₱ 343.85		₱ 0	
TOTAL DIRECT COST FOR	1,000	m^3		₱5,328.85		₱66,000.00	₱71,328.85
UNIT DIRECT COST PER m^3				₱ 5.33		₱ 66.00	₱ 71.33

CONSTRUCTION COST ESTIMATE WORKSHEET	DATE PREPARED	SHEET 2 OF 2

PROJECT
FEASIBILITY STUDY FOR MANILA-BATAAN COASTAL ROAD AND ITS RELATED ROADS

LOCATION
METRO MANILA AND BULACAN, PHILIPPINES

PACIFIC CONSULTANTS INTERNATIONAL

DRAWING NO.	ESTIMATOR	CHECKED BY

UNIT COST BACK-UP SHEET						
ITEM NO. 9						
Granular Borrow	- 1,000 m^3					
Material						
Sand	1,000 m^3 x 1.20 =					1,200 m^3
Equipment						
Bulldozer, 17 ton	Spreading and Compaction					
	1,000 m^3 ÷ 100 m^3/HR + 1,000 m^3					
	÷ 150 m^3/HR = 10 HR + 7 HR					
	= 17 HR					17 HR
Tyre Roller, 10 ton	1,000 m^3 x 1/4 ÷ 150 m^3/HR					
	= 1.7 HR				Say	2 HR
Labor						
Operator, Bulldozer						17 MH
Optr., Tyre Roller						2 MH
Foremen	76 MH ÷ 10					8 MH
Asst. Foremen						8 MH
Unskilled Labor	(17 + 2) HR x 4 men =					76 MH

CONSTRUCTION COST ESTIMATE

DATE PREPARED:

SHEET 1 OF 3

PROJECT: FEASIBILITY STUDY FOR MANILA-BATAAN COASTAL ROAD AND ITS RELATED ROADS

LOCATION: METRO MANILA AND BULACAN, PHILIPPINES

PACIFIC CONSULTANTS INTERNATIONAL

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- ☐ CODE C (Final design)
- ☐ OTHER (Specify) _____

DRAWING NO.:

ESTIMATOR:

CHECKED BY:

DESCRIPTION	QUANTITY NO. UNITS	QUANTITY UNIT MEAS	EQUIPMENT + LABOR PER UNIT	EQUIPMENT + LABOR TOTAL	MATERIAL PER UNIT	MATERIAL TOTAL	TOTAL COST
UNIT COST BACK-UP SHEET							
ITEM NO. 12							
Sub-Base Coarse, Class B - 1,000 m^3							
Material							
Coarse Aggregate							
1-1/2" - 3/4"	306	m^3		-	90	27,540.00	
3/4" - 4"	383	m^3		-	90	34,470.00	
Fine Aggregate							
#4 - #200	842	m^3		-	55	46,310.00	
Sub-Total				₱ 0		₱ 108,320.00	
Equipment							
Motor Grader	40	HR	220	8,800.00		-	
Tyre Roller, 10 ton	40	HR	138	5,520.00		-	
Macadam Roller,							
10 ton	40	HR	106	4,240.00		-	
Vib. Roller	40	HR	28	1,120.00		-	
Tank Truck	20	HR	76	1,520.00		-	
Sub-Total				₱ 21,200.00		₱ 0	
Labor							
Optr. Motor Grader	40	MH	4.27	170.80		-	
Optr., Tyre Roller	40	MH	4.27	170.80		-	
Optr., Mac. Roller	40	MH	4.27	170.80		-	
Optr., Vib. Roller	40	MH	4.27	170.80		-	
Optr., Tank Truck	20	MH	4.27	85.40		-	
Foreman	40	MH	4.98	199.20		-	
Asst. Foreman	40	MH	3.35	134.00		-	
Skilled Labor	80	MH	3.21	256.80		-	
Unskilled Labor	320	MH	2.58	825.60		-	
Sub-Total				₱ 2,184.20		₱ 0	

CONSTRUCTION COST ESTIMATE

DATE PREPARED:

SHEET 2 OF 3

PROJECT: FEASIBILITY STUDY FOR MANILA-BATAAN COASTAL ROAD AND ITS RELATED ROADS

LOCATION: METRO MANILA AND BULACAN, PHILIPPINES

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- ☐ CODE C (Final design)
- ☐ OTHER (Specify) ____

DRAWING NO:

ESTIMATOR:

CHECKED BY:

DESCRIPTION	QUANTITY		EQUIPMENT/LABOR		MATERIAL		TOTAL COST
	NO. UNITS	UNIT MEAS	PER UNIT	TOTAL	PER UNIT	TOTAL	
UNIT COST BACK-UP SHEET							
ITEM NO. 12							
Sub-base Course, Class B - Cont'd.							
TOTAL DIRECT COST FOR 1,000 m^3				₱23,384.20		₱108,320.00	₱131,704.20
UNIT DIRECT COST PER m^3				₱ 23.38		₱ 108.32	₱ 131.70

CONSTRUCTION COST ESTIMATE WORKSHEET	DATE PREPARED	SHEET 3 OF 3

PROJECT
FEASIBILITY STUDY FOR MANILA BATAAN COASTAL ROAD AND ITS RELATED ROADS

LOCATION
METRO MANILA AND BULACAN, PHILIPPINES

PACIFIC CONSULTANTS INTERNATIONAL

DRAWING NO.	ESTIMATOR	CHECKED BY

UNIT COST BACK-UP SHEET						
ITEM NO. 12						
Sub-Base Course, Class B	- 1,000 m^3					
Material						
Coarse Aggregate						
1-1/2" - 3/4"	1,000 m^3	x .20 x	1.5 x 1.02			306 m^3
3/4 - #4	1,000 m^3	x .25 x	1.5 x 1.02			383 m^3
Fine Aggregate						
#4 - #200	1,000 m^3	x .55 x	1.5 x 1.02			842 m^3
Equipment						
Motor Grader	1,000 m^3	÷ 25 m^3/HR				40 HR
Tyre Roller, 10 ton						40 HR
Macadam Roller, 10 ton						40 HR
Vibratory Roller						40 HR
Sprinkling Equipment,						
Tank Truck						20 HR
Labor						
Operator, Motor Grader						40 MH
Operator, Tyre Roller						40 MH
Operator, Macadam Roller						40 MH
Operator, Vib. Roller						40 MH
Operator, Tank Truck						20 MH
Foreman						40 MH
Asst. Foreman						40 MH
Skilled Labor	40 HR x	2 Men				80 MH
Unskilled Labor	40 HR x	8 Men				320 MH

CONSTRUCTION COST ESTIMATE

DATE PREPARED:

SHEET 1 OF 5

PROJECT: FEASIBILITY STUDY FOR MANILA-BATAAN COASTAL ROAD AND ITS RELATED ROADS

LOCATION: METRO MANILA AND BULACAN, PHILIPPINES

PACIFIC CONSULTANTS INTERNATIONAL

BASIS FOR ESTIMATE
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- ☒ CODE B (Preliminary design)
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- ☐ OTHER (Specify)

DRAWING NO.:

ESTIMATOR:

CHECKED BY:

DESCRIPTION	QUANTITY		EQUIPMENT/LABOR		MATERIAL		TOTAL COST
	NO. UNITS	UNIT MEAS	PER UNIT	TOTAL	PER UNIT	TOTAL	
UNIT COST BACK-UP SHEET							
ITEM NO. 17							
Hot Bituminous							
Concrete Pavement		-	1,000 ton				
Material							
Asphalt Cement,							
80-100 Penetration	61.8	MT		-	1,860	114,948	
Coarse Aggregate							
1/2" - #8	264.6	M^3		-	90	23,814	
3/8" - #16	75.6	M^3		-	85	6,426	
Fine Aggregate							
#4 - (-) #200,							
Crushed	302.4	M^3		-	90	27,216	
#4 - (-) #200,							
Natural	75.6	M^3		-	85	6,426	
Mineral Filler	52.5	ton		-	1,540	80,850	
Fuel	5,000	lit		-	1.56	7,800	
Sub-Total				P 0		P 267,480	
Equipment							
Continuous Mix							
Asphalt Plant,							
100 ton/HR	12	HR	2,147	25,764		-	
Tractor Shovel, 1.4 m^3	36	HR	213	7,668		-	
Bulldozer, 17 ton	24	HR	277	6,648		-	
Dump Truck, 3 m^3	344	HR	55	18,920		-	
Bituminous Spreader	28	HR	391	10,948		-	
Macadam Roller, 10 ton	28	HR	106	2,968		-	
Tyre Roller 8 - 10 ton	56	HR	138	7,728		-	

CONSTRUCTION COST ESTIMATE	DATE PREPARED	SHEET 2 OF 5
PROJECT: FEASIBILITY STUDY FOR MANILA-BATAAN COASTAL ROAD AND ITS RELATED ROADS		BASIS FOR ESTIMATE: ☐ CODE A (No design completed) ☒ CODE B (Preliminary design) ☐ CODE C (Final design) ☐ OTHER (Specify)
LOCATION: METRO MANILA AND BULACAN, PHILIPPINES		
PACIFIC CONSULTANTS INTERNATIONAL		
DRAWING NO.	ESTIMATOR	CHECKED BY

DESCRIPTION	QUANTITY		EQUIPMENT/LABOR		MATERIAL		TOTAL COST
	NO. UNITS	UNIT MEAS	PER UNIT	TOTAL	PER UNIT	TOTAL	
UNIT COST BACK-UP SHEET							
ITEM NO. 17							
Hot Bituminous							
Concrete Pavement	-	Cont'd.					
Equipment - Cont'd.							
Misc. Tools 5% of							
Spreading and Com-							
paction Cost	1	All		4,032		-	
Sub-Total				₱ 84,676		₱ 0	
Labor							
Superintendent	30	MH	10.00	300		-	
Operator, Mixing Plant	48	MH	4.27	205		-	
Greaser	12	MH	4.27	51		-	
Skilled Labor @ Plt.	60	MH	3.21	193		-	
Unskilled Labor @plt.	132	MH	2.58	341		-	
Operator, Shovel	36	MH	4.27	154		-	
" , Bulldozer	24	MH	4.27	103		-	
" , Dump Truck	344	MH	4.27	1,469		-	
" , Spreader	56	MH	4.27	239		-	
" , Rollers	84	MH	4.27	359		-	
Raker	112	MH	3.21	360		-	
Unskilled Labor	168	MH	2.58	433		-	
Foreman	30	MH	4.98	149		-	
Asst. Foreman	30	MH	3.35	101		-	
Sub-Total				₱ 4,457		₱ 0	
TOTAL DIRECT COST FOR 1	000 ton			₱ 89,133		₱ 267,480	₱ 356,613
UNIT DIRECT COST PER ton				₱ 89.13		₱ 267.48	₱ 356.61

CONSTRUCTION COST ESTIMATE WORKSHEET	DATE PREPARED	SHEET 3 OF 5

PROJECT
FEASIBILITY STUDY FOR MANILA-BATAAN COASTAL ROAD AND ITS RELATED ROADS

LOCATION
METRO MANILA AND BULACAN, PHILIPPINES

PACIFIC CONSULTANTS INTERNATIONAL

DRAWING NO.	ESTIMATOR	CHECKED BY

UNIT COST BACK-UP SHEET						
PAY ITEM NO. 17						
Hot Bituminous Concrete						
Pavement	~ 1,000 ton					
Material						
Asphalt Cement,						
80-100 Penetration	1,000 ton x 0.60 x 1.03 = 61.8					61.8 ton
Coarse Aggregate						
1/2" - #8	1,000 ton x 35% x .72 m^3/ton x 1.05=264.6					264.6 m^3
3/8" - #16	1,000 ton x 10% x .72 m^3/ton x 1.05= 75.6					75.6 m^3
Fine Aggregate						
#4 - (-)#200,						
Crushed	1,000 ton x 40% x .72 m^3/ton x 1.05=302.4					302.4 m^3
#4 - (-) #200,						
Natural	1,000 ton x 10% x .72 m^3/ton x 1.05 = 75.6					75.6 m^3
Mineral Filler	1,000 ton x 5 % x 1.05 = 52.5					52.5 to
Equipment						
Continuous mix asphalt plant, 100 ton/HR	1,000 ton x 1.03 ÷ 90 ton/HR = 11.5 HR					12 HR
Tractor Shovel 1.4 m^3	12 HR x 3 unit = 36 HR					36 HR
Bulldozer, 17 ton	12 HR x 2 unit = 24 HR					24 HR
Dump Truck, 3 m^3	1,000 ton x 1.03 ÷ 5 ton x 1.67 HR=344 HR					344 HR
	Time required for one round trip is					
	as follows:					

CONSTRUCTION COST ESTIMATE WORKSHEET	DATE PREPARED	SHEET 4 OF 5

PROJECT
FEASIBILITY STUDY FOR MANILA-BATAAN COASTAL ROAD AND ITS RELATED ROADS

LOCATION
METRO MANILA AND BULACAN, PHILIPPINES

PACIFIC CONSULTANTS INTERNATIONAL

DRAWING NO.	ESTIMATOR	CHECKED BY

UNIT COST BACK-UP SHEET						
ITEM NO. 17						
Hot Bituminous Concrete						
Pavement	- Cont'd.					
	Loading =			= 0.08		
	Waiting =			= 0.05		
	Hauling = 15 km ÷ 20 km/HR			= 0.75		
	Dump = 5 ton ÷ 36 ton/HR			= 0.14		
	Waiting =			= 0.05		
	Return = 15 km ÷ 25 km/HR			= 0.60		
	Total			1.67	HR	
Bituminous Spreader,						
Self-Propelled	1,000 ton ÷ 36 ton/HR = 28					28 HR
Macadam Roller, 10 ton						28 HR
Tyre Roller, 10 ton						28 HR
Tyre Roller, 8 ton						28 HR
Miscellaneous Tools,						
5% of Spreading &						
Compaction Cost						1 All
Labor						
Superintendent	12 HR x 2 Men x 1.25 = 30					30 MH
Operator, Mixer						12 MH
" , Dryer						12 MH
" , Hot Oil Heater						12 MH
" , Asphalt Pump						12 MH
Greaser						12 MH
Skilled Labor, 0 Plt.	12 HR x 5 Men = 60					60 HR
Unskilled Labor,						
Cold Elevator	12 HR x 6 Men = 72					72 HR

CONSTRUCTION COST ESTIMATE WORKSHEET	DATE PREPARED	SHEET 5 OF 5

PROJECT
FEASIBILITY STUDY FOR MANILA-BATAAN COASTAL ROAD AND ITS RELATED ROADS

LOCATION
METRO MANILA AND BULACAN, PHILIPPINES

PACIFIC CONSULTANTS INTERNATIONAL

DRAWING NO.	ESTIMATOR	CHECKED BY

UNIT COST BACK-UP SHEET						
ITEM NO. 17						
Hot Bituminous		Cont'd.				
Concrete Pavement						
Labor - Cont'd						
Unskilled Labor, Mineral						
Filler Handling	12 HR	x 2 Men =	24 MH			24 MH
Unskilled Labor, Handling						
Asphalt and Fuel	12 HR	x 3 Men =	36 MH			36 MH
Operator, Shovel						36 MH
" , Buildozer						24 MH
" , Dump Truck						344 MH
" , Spreader	28 HR	x 2 Men =	56 MH			56 MH
" , Roller						84 MH
Unskilled Labor	28 HR	x 4 Men =	112 MH			112 MH
Raker	28 HR	x 2 Men =	56 MH			56 MH
Signalman						56 MH
Foreman						30 MH
Asst. Foreman						30 MH

CONSTRUCTION COST ESTIMATE

DATE PREPARED

SHEET 1 OF 2

PROJECT: FEASIBILITY STUDY FOR MANILA-BATAAN COASTAL ROAD AND ITS RELATED ROADS

LOCATION: METRO MANILA AND BULACAN, PHILIPPINES

PACIFIC CONSULTANTS INTERNATIONAL

BASIS FOR ESTIMATE

- [ ] CODE A (No design completed)
- [x] CODE B (Preliminary design)
- [ ] CODE C (Final design)
- [ ] OTHER (Specify)

DRAWING NO.

ESTIMATOR

CHECKED BY

DESCRIPTION	QUANTITY		EQUIPMENT / LABOR		MATERIAL		TOTAL COST
	NO. UNITS	UNIT MEAS	PER UNIT	TOTAL	PER UNIT	TOTAL	
UNIT COST BACK-UP SHEET							
ITEM NO. 19							
Concrete, Class A	100 m^3		(Plain Concrete @ Plant)				
Material							
Cement Portland	859	Bag		-	23	19,757	
Aggregate, Coarse	85.1	m^3		-	90	7,659	
Aggregate, Fine	45.2	m^3		-	85	3,842	
Sub-Total						₱ 31,258	
Equipment							
Concrete Batching							
Plant, Portable	8	HR	274	2,192		-	
Generator, diesel,							
50 KVA	8	HR	379/day	379		-	
Belt Conveyor,							
Portable	48	HR	109/day	654		-	
Sub-Total				₱ 3,225		₱ 0	
Labor							
Optr., Batching Plant	16	MH	4.27	68		-	
Optr., Generator	8	MH	4.27	34		-	
Foreman	8	MH	4.98	40		-	
Asst. Foreman	8	MH	3.35	27		-	
Skilled Labor	128	MH	3.21	411		-	
Unskilled Labor	32	MH	2.58	83		-	
Sub-Total				₱ 663		₱ 0	
TOTAL DIRECT COST FOR	100 m^3			₱ 3,888		₱ 31,258	₱ 35,146
UNIT DIRECT COST PER m^3				₱ 38.88		₱ 312.58	₱ 351.46

CONSTRUCTION COST ESTIMATE WORKSHEET	DATE PREPARED	SHEET 2 OF 2

PROJECT
FEASIBILITY STUDY FOR MANILA-BATAAN COASTAL ROAD AND ITS RELATED ROADS

LOCATION
METRO MANILA AND BULACAN, PHILIPPINES

PACIFIC CONSULTANTS INTERNATIONAL

DRAWING NO.	ESTIMATOR	CHECKED BY

UNIT COST BACK-UP SHEET						
ITEM NO. 19						
Concrete, Class A -	100 m^3	(Plain Concrete Plant)				
Material						
Cement, Portland	100 m^3 / 1.28 x 6.5 x 1.03					859 Bag
Aggregate, Coarse	100 m^3 x	1.215 ton/m^3 x 1.05 ÷ 1.5 ton/m^3				85.1 m^3
Aggregate, Fine	100 m^3 x	0.645 ton/m^3 x 1.05 ÷ 1.5 ton/m^3				45.2 m^3
Equipment						
Concrete Batching Plant,						
Portable	100 m^3 ÷	(22.5 m^3/HR x 0.75) = 5.9 HR				
		Add 2 HR for down time				8 HR
Generator, Diesel,						
50, KVA						8 HR
Belt Conveyor, Portable	8 HR x	6 Units				48 HR
Labor						
Optr., Batching Plant	8 HR x	2 Men				16 MH
Optr., Generator						8 MH
Foreman						8 MH
Asst. Foreman						8 MH
Skilled Labor	8 HR x	16 Men				128 MH
Unskilled Labor	8 HR x	4 Men				32 MH

CONSTRUCTION COST ESTIMATE

DATE PREPARED:

SHEET 1 OF 2

PROJECT: FEASIBILITY STUDY FOR MANILA-BATAAN COASTAL ROAD AND ITS RELATED ROADS

LOCATION: METRO MANILA AND BULACAN, PHILIPPINES

PACIFIC CONSULTANTS INTERNATIONAL

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DRAWING NO.:

ESTIMATOR:

CHECKED BY:

DESCRIPTION	QUANTITY NO. UNITS	QUANTITY UNIT MEAS	EQUIPMENT/LABOR PER UNIT	EQUIPMENT/LABOR TOTAL	MATERIAL PER UNIT	MATERIAL TOTAL	TOTAL COST
UNIT COST BACK-UP SHEET							
ITEM NO. 20							
Concrete - Class B -	100	m^3	(Plain Concrete @Plant)				
Material							
Portland Cement	793	Bag		-	23	18,239	
Coarse Aggregate	76	m^3		-	90	6,840	
Fine Aggregate	55	m^3		-	85	4,675	
Sub-Total				₱ 0		₱ 29,754	
Equipment							
Concrete Batching Plant, Portable	8	HR	274	2,192		-	
Generator, Diesel, 50 KVA	8	HR	379/day	379		-	
Belt Conveyor, Portable	48	HR	109/day	654		-	
Sub-Total				₱ 3,225		₱ 0	
Labor							
Optr., Batching Plant	16	MH	4.27	68		-	
Optr., Generator	8	MH	4.27	34		-	
Foreman	8	MH	4.98	40		-	
Asst. Foreman	8	MH	3.35	27		-	
Skilled Labor	48	MH	3.21	154		-	
Unskilled Labor	112	MH	2.58	289		-	
Sub-Total				₱ 612		₱ 0	
TOTAL DIRECT COST FOR	100 m^3			₱ 3,837		₱ 29,754	₱ 33,591
UNIT DIRECT COST PER m^3				₱ 38.37		₱ 297.54	₱ 335.91

CONSTRUCTION COST ESTIMATE WORKSHEET	DATE PREPARED	SHEET 2 OF 2

PROJECT
FEASIBILITY STUDY FOR MANILA-BATAAN COASTAL ROAD AND ITS RELATED ROADS

LOCATION
METRO MANILA AND BULACAN, PHILIPPINES

PACIFIC CONSULTANTS INTERNATIONAL

DRAWING NO.	ESTIMATOR	CHECKED BY

UNIT COST BACK-UP SHEET						
ITEM NO. 20						
Concrete, Class B - 100 m^3 (Plain concrete @Plant)						
Material						
Cement, Portland	100 m^3/.78 x 6.0 x 1.03 = 792.31					793 Bag
Aggregate, Coarse	100 m^3 x 1.081 ton/m^3 x 1.05 ÷ 1.5 ton/m^3					76.0 m^3
Aggregate, Fine	100 m^3 x 0.786 ton/m^3 x 1.05 ÷ 1.5 ton/m^3					55.0 m^3
Equipment						
Concrete Batching						
Plant, Portable	100 m^3 ÷ (22.5 m^3/HR x 0.75) = 5.9 HR					
	add 2 HR for down time					8 HR
Generator, Diesel,						
50 KVA						8 HR
Belt Conveyor, Portable	8 HR x 6 unit					48 HR
Labor						
Operator, Batching						
Plant	8 HR x 2 Men					16 MH
Operator, Generator	8 HR					8 MH
Foreman						8 MH
Asst. Foreman						8 MH
Skilled Labor	8 HR x 6 Men					48 MH
Unskilled Labor	8 HR x 14 Men					112 MH

CONSTRUCTION COST ESTIMATE

DATE PREPARED:

SHEET 1 OF 2

PROJECT: FEASIBILITY STUDY FOR MANILA-BATAAN COASTAL ROAD AND ITS RELATED ROADS

LOCATION: METRO MANILA AND BULACAN, PHILIPPINES

PACIFIC CONSULTANTS INTERNATIONAL

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- ☐ OTHER (Specify) ____

DRAWING NO.:

ESTIMATOR:

CHECKED BY:

DESCRIPTION	QUANTITY		EQUIPMENT / LABOR		MATERIAL		TOTAL COST
	NO. UNITS	UNIT MEAS	PER UNIT	TOTAL	PER UNIT	TOTAL	
UNIT COST BACK-UP SHEET							
ITEM NO. 24							
Reinforcing Steel -	1,000	Kg					
Material							
Reinforcing Steel,							
Deformed Bars	1,060	Kg		-	5.5	5,830	
Binding Wire	5	Kg		-	8.5	43	
Sub-Total				₱ 0		₱ 5,873	
Equipment							
Flat Bed Truck	5	HR	76	380		-	
Tools	1	ALL	15	15		-	
Sub-Total				₱ 395		₱ 0	
Labor							
Foreman	8	MH	4.98	40		-	
Asst. Foreman	8	MH	3.35	27		-	
Skilled Labor	52	MH	3.21	167		-	
Heavy Labor	50	MH	3.21	161		-	
Unskilled Labor	46	MH	2.58	119		-	
Operator, Truck	5	MH	3.73	19		-	
Sub-Total				₱ 533		₱ 0	
TOTAL DIRECT COST FOR 1,000 Kg				₱ 928		₱ 5,873	₱ 6,801
UNIT DIRECT COST PER Kg				₱ 0.93		₱ 5.87	₱ 6.80

CONSTRUCTION COST ESTIMATE WORKSHEET	DATE PREPARED	SHEET 2 OF 2

PROJECT
FEASIBILITY STUDY FOR MANILA-BATAAN COASTAL ROAD AND ITS RELATED ROADS

LOCATION
METRO MANILA AND BULACAN, PHILIPPINES

PACIFIC CONSULTANTS INTERNATIONAL

DRAWING NO.	ESTIMATOR	CHECKED BY

UNIT COST BACK-UP SHEET						
ITEM NO. 24						
Reinforcing Steel, Deformed Bars	1,000 Kg	x 1.06	cutting loss			1,060 Kg
Binding wire	1,000 kg	x 1/200				5 Kg
Equipment						
Flat Bed Truck	1.0 ton ÷ 2.75 ton/truck x ¼ HR/R.T. = 1.45 HR add to 1.0 HR for loading & unloading					
	Hauling materials to the yard = 2.5 HR					
	Hauling bent bars to the job site = 2.5 HR					
	Total			5 HR		5 HR
Tools						1 ALL
Labor						
Foreman						8 MH
Asst. Foreman						8 MH
Skilled Labor	6.5 man-day x 8 HR/man-day					52 MH
Heavy Labor	46 MH + 4.0 MH (Loading & Unloading)					50 MH
Unskilled Labor						46 MH
Operator, Truck						5 MH

CONSTRUCTION COST ESTIMATE

DATE PREPARED

SHEET 1 OF 4

PROJECT: FEASIBILITY STUDY FOR MANILA-BATAAN COASTAL ROAD AND ITS RELATED ROADS

LOCATION: METRO MANILA AND BULACAN, PHILIPPINES

PACIFIC CONSULTANTS INTERNATIONAL

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DRAWING NO.

ESTIMATOR

CHECKED BY

DESCRIPTION	QUANTITY NO. UNITS	QUANTITY UNIT MEAS	EQUIPMENT/LABOR PER UNIT	EQUIPMENT/LABOR TOTAL	MATERIAL PER UNIT	MATERIAL TOTAL	TOTAL COST
UNIT COST BACK-UP SHEET							
ITEM NO. 60							
Asphalt Treated Base		-	1,000 ton				
Material							
Asphalt Cement,							
80-100 Penetration	41.2	ton		-	1,860	76,632	
Coarse Aggregate							
3/8"	226.8	M^3		-	85	19,278	
Fine Aggregate	475	M^3		-	85	40,375	
Mineral Filler	52	ton		-	1,540	80,080	
Fuel	5,000	lit		-	1.56	7,800	
Sub-Total				₱ 0		₱ 224,165	
Equipment							
Asphalt Plant	12	HR	2,147	25,764		-	
Tractor Shovel	12	HR	213	2,556		-	
Bulldozer, 17 ton	12	HR	277	3,324		-	
Dump Truck, 5 ton	344	HR	55	18,920		-	
Bituminous Spreader	28	HR	391	10,948		-	
Macadam Roller, 10 ton	28	HR	106	2,968		-	
Tyre Roller, 8 - 10 ton	28	HR	138	3,864		-	
Misce. Tools	1	All		2,950		-	
Sub-Total				₱ 71,294		₱ 0	
Labor							
Superintendent	30	MH	10.00	300		-	
Optr., Mix Plant	48	MH	4.27	205		-	
Optr., Greaser	12	MH	4.27	51		-	
Skilled Labor	60	MH	3.21	193		-	
Unskilled Labor	108	MH	2.58	279		-	
Optr., Shovel	12	MH	4.27	51		-	
Optr., Bulldozer	12	MH	4.27	51		-	

CONSTRUCTION COST ESTIMATE

DATE PREPARED:

SHEET 2 OF 4

PROJECT: FEASIBILITY STUDY FOR MANILA-BATAAN COASTAL ROAD AND ITS RELATED ROADS

LOCATION: METRO MANILA AND BULACAN, PHILIPPINES

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DRAWING NO.:

ESTIMATOR:

CHECKED BY:

DESCRIPTION	QUANTITY		EQUIPMENT / LABOR		MATERIAL		TOTAL COST
	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL	PER UNIT	TOTAL	
UNIT COST BACK-UP SHEET							
ITEM NO. 60	- Cont'd.						
Asphalt Treated Base							
Labor - Cont'd.							
Optr., Dump Truck	344	MH	4.27	1,469		-	
Optr., Spreader	56	MH	4.27	239		-	
Optr., Roller	56	MH	4.27	239		-	
Raker	56	MH	3.21	180		-	
Unskilled Labor	168	MH	2.58	433		-	
Foreman	30	MH	4.98	149		-	
Asst. Foreman	30	MH	3.35	101		-	
Sub-Total:				₱ 3,940		₱ 0	
TOTAL DIRECT COST FOR 1,000 ton				₱ 75,234		₱ 224,165	₱ 299,399
UNIT DIRECT COST PER ton				₱ 75.23		₱ 224.17	₱ 299.40

CONSTRUCTION COST ESTIMATE WORKSHEET	DATE PREPARED	SHEET 3 OF 4

PROJECT
FEASIBILITY STUDY FOR MANILA-BATAAN COASTAL ROAD AND ITS RELATED ROADS

LOCATION
METRO MANILA AND BULACAN, PHILIPPINES

PACIFIC CONSULTANTS INTERNATIONAL

DRAWING NO.	ESTIMATOR	CHECKED BY

UNIT COST BACK-UP SHEET						
ITEM NO. 60	- 1,000 ton					
Material						
Asphalt Cement,						
80-100 Penetration	1,000 ton x 0.04 x 1.03 = 41.2 ton					41.2 ton
Coarse Aggregate 3/8"	1,000 ton x 30% x 0.72 m^3/ton x 1.05					
	= 226.8 m^3					226.8 m^3
Excavated Material	1,000 ton x 66% x 0.72 m^3/ton = 475 m^3					475 m^3
Equipment						
Asphalt Plant	1,000 ton x 1.03 ÷ 90 ton/HR = 12 HR					12 HR
Tractor Shovel 1.4 m^3						12 HR
Bulldozer, 17 t						12 HR
Dump Truck 3 m^3	1,000 ton x 1.03 ÷ 5 ton x 1.67 HR = 344 HR					344 HR
	(See Hot Bituminous Concrete Pavement for					
	required hour for one R.T.)					
Bituminous Spreader	1,000 ton ÷ 36 ton/HR = 28 HR					28 HR
Macadam Roller, 10 ton						28 HR
Tyre Roller, 8 - 10 ton						28 HR
Misc. Tools 5% of						
Spreading Cost						1 All
Labor						
Optr., Plant						12 MH
" , Dryer						12 MH
" , Hot Oil Heater						12 MH
" , Asphalt Pump						12 MH
" , Greaser						12 MH
Skilled Labor, @ Plant	12 HR x 5 Men = 60 MH					60 MH
Unskilled Labor,	12 HR x 9 Men = 108 MH					108 MH
Optr., Shovel						12 MH
" , Bulldozer						12 MH

CONSTRUCTION COST ESTIMATE WORKSHEET	DATE PREPARED	SHEET 4 OF 4

PROJECT
FEASIBILITY STUDY FOR MANILA-BATAAN COASTAL ROAD AND ITS RELATED ROADS

LOCATION
METRO MANILA AND BULACAN, PHILIPPINES

PACIFIC CONSULTANTS INTERNATIONAL

DRAWING NO.	ESTIMATOR	CHECKED BY

UNIT COST BACK-UP SHEET						
Asphalt Treated Base -	Cont'd.					
Labor - Cont'd.						
Optr., Dump Truck						344 MH
" , Spreader	28 HR x 2 = 56 MH					56 MH
" , Rollers	28 HR x 2 = 56 MH					56 MH
Unskilled Labor	28 HR x 4 =112 MH					112 MH
Raker	28 HR x 2 = 56 MH					56 MH
Signalman	28 HR x 2 = 56 MH					56 MH
Foreman						30 MH
Asst. Foreman						30 MH

CONSTRUCTION COST ESTIMATE

DATE PREPARED

SHEET 1 OF 2

PROJECT: FEASIBILITY STUDY FOR MANILA-BATAAN COASTAL ROAD AND ITS RELATED ROADS

LOCATION: METRO MANILA AND BULACAN, PHILIPPINES

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DRAWING NO.

ESTIMATOR

CHECKED BY

DESCRIPTION	QUANTITY NO. UNITS	QUANTITY UNIT MEAS.	EQUIPMENT & LABOR PER UNIT	EQUIPMENT & LABOR TOTAL	MATERIAL PER UNIT	MATERIAL TOTAL	TOTAL COST
UNIT COST BACK-UP SHEET							
ITEM NO. 61							
Portland Cement Concrete Pavement	-			10,000 m²			
Material							
Concrete, Class A	2,500	m³	351.46	878,650		-	
Formwork	460	m²	87.68	40,333		-	
Steel Bars & Mesh	10.34	t	6,800	70,312		-	
Primer	20	ℓ	3.21	64		-	
Misc. Work	1	All		55,440		-	
Sub-Total				₱1,044,799		₱ 0	
Equipment							
Concrete Spreader	33	HR	260	8,580		-	
Concrete Finisher	33	HR	270	8,910		-	
Transit Mixer	1,185	HR	83	98,355		-	
Sub-Total				₱ 115,845		₱ 0	
Labor							
Foreman	33	MH	4.98	164		-	
Asst. Foreman	33	MH	3.35	111		-	
Optr., Spreader	33	MH	4.27	141		-	
" ., Finisher	33	MH	4.27	141		-	
" ., Transit Mixer	1,185	MH	4.27	5,060		-	
Skilled Labor	165	MH	3.21	530		-	
Unskilled Labor	264	MH	2.58	681		-	
Sub-Total				₱ 6,969		₱ 0	
TOTAL DIRECT COST FOR	10,000	m²		₱1,167,613		₱ 0	₱1,167,613
UNIT DIRECT COST PER	m²			₱ 116.76		₱ 0	₱ 116.76

CONSTRUCTION COST ESTIMATE WORKSHEET	DATE PREPARED	SHEET 2 OF 2

PROJECT
FEASIBILITY STUDY FOR MANILA-BATAAN COASTAL ROAD AND ITS RELATED ROADS

LOCATION
METRO MANILA AND BULACAN, PHILIPPINES

PACIFIC CONSULTANTS INTERNATIONAL

DRAWING NO.	ESTIMATOR	CHECKED BY

UNIT COST BACK-UP SHEET						
ITEM NO. 61						
Portland Cement Concrete	Pavement	- 10,000 m^2				
Material						
Concrete, Class A	10,000 m^2 x 0.25 m = 2,500 m^3					2,500 m^3
Formwork	1,000 m x 0.23 m x 2 = 460 m^2					460 m^2
Steel Bar Ø28 mm	5.04 kg/m x (0.70 m x 11) x 100 = 3,880 kg					3,880 kg
" " Ø25 mm	3.98 kg/m x (0.70 m x 11) x 100 = 3,070 kg					3,070 kg
" " Ø22 mm	3.04 kg/m x (1.0 x 8) x 100 = 2,430 kg					2,430 kg
Mesh Ø 6 mm	0.249 kg/m x (2.10 + 3.40) x 7 x 100 = 960 kg					960 kg
Primer	0.2 ℓ x 100 = 20 ℓ					20 ℓ
Misc. Work						1 All
Equipment						
Concrete Spreader	2,370 m^3 ÷(100 x 0.80) = 30 HR add 10%					33 HR
Concrete Finisher	"			"		33 HR
Transit Mixer	2,370 m^3 ÷2 m^3/Mixer Truck x 1.0 HR					
				= 1,185 HR		1,185 HR
Labor						
Foreman						33 MH
Asst. Foreman						33 MH
Optr., Spreader						33 MH
" , Finisher						33 MH
" , Mixing Truck						1,778 MH
Skilled Labor						165 MH
Unskilled Labor						330 MH

CONSTRUCTION COST ESTIMATE

DATE PREPARED:

SHEET 1 OF 2

PROJECT: FEASIBILITY STUDY FOR MANILA-BATAAN COASTAL ROAD AND ITS RELATED ROADS

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DRAWING NO:

ESTIMATOR:

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DESCRIPTION	QUANTITY		EQUIPMENT/LABOR		MATERIAL		TOTAL COST
	NO. UNITS	UNIT MEAS	PER UNIT	TOTAL	PER UNIT	TOTAL	
UNIT COST BACK-UP SHEET							
ITEM NO. 101							
Dredging, Shallow Layer		-		1,000,000			
Equipment							
Dredger, 4,000 PS	1,280	HR	5,590	7,155,200		-	
Tugboat, 2,000 PS	256	HR	417	106,752		-	
Others	1	ALL		363,098		-	
Sub-Total				₱ 7,625,050		₱ 0	
Material							
Heavy Oil	1,162	kl	1,490	1,731,380		-	
Others	1	ALL		432,840		-	
Sub-Total				₱ 2,164,220		₱ 0	
Labor							
Officer	5,120	MH	130	655,600		-	
Crew	20,480	MH	4.27	87,450		-	
Unskilled Labor	4,096	MH	2.58	10,570		-	
Sub-Total				₱ 753,620		₱ 0	
TOTAL DIRECT COST FOR 1,000,000 m^3				₱10,542,890		₱ 0	₱10,542,890
UNIT DIRECT COST PER m^3				₱ 10.54		₱ 0	₱ 10.54

CONSTRUCTION COST ESTIMATE WORKSHEET	DATE PREPARED	SHEET 2 OF 2

PROJECT
FEASIBILITY STUDY FOR MANILA-BATAAN COASTAL ROAD AND ITS RELATED ROADS

LOCATION
METRO MANILA AND BULACAN, PHILIPPINES

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DRAWING NO.	ESTIMATOR	CHECKED BY

UNIT COST BACK-UP SHEET						
ITEM NO. 101						
Dredging, Shallow Layer	-	1,000,000 m^3				
Equipment						
Dredger, 4,000 PS						
	1,000,000 m^3 ÷ 250,000 m^3/30 day x 8					
	+ 0.75 = 1,280 HR					1,280 HR
Tugboat, 2,000 PS						
	1,280 HR x 20% = 256 HR					256 HR
Material						
Heavy Oil	Dredger					
	1,280 x 850 l/HR = 1,088 kl					
	Tugboat					
	256 x 290 l/HR = 74 kl					
						1,162 kl
Labor						
Officer	1,280 HR x 4 Men = 5,120 MH					5,120 MH
Crew	1,280 HR x 16 Men = 20,480 MH					20,480 MH
Unskilled Labor	20,480 MH x 20 %					4,096 MH

CONSTRUCTION COST ESTIMATE

DATE PREPARED:

SHEET 1 OF 2

PROJECT: FEASIBILITY STUDY FOR MANILA-BATAAN COASTAL ROAD AND ITS RELATED ROADS

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- [ ] CODE C (Final design)
- [ ] OTHER (Specify)

DRAWING NO.:

ESTIMATOR:

CHECKED BY:

DESCRIPTION	QUANTITY		EQUIPMENT/LABOR		MATERIAL		TOTAL COST
	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL	PER UNIT	TOTAL	
UNIT COST BACK-UP SHEET							
ITEM NO. 102							
Dredging, Deep Layer	-			1,000,000 m^3			
Equipment							
Dredger 4,000 PS	2,130	HR	5,590	11,906,700		-	
Tugboat 2,000 PS	320	HR	417	133,440		-	
Others				363,060		-	
Sub-Total				₱12,403,200		₱ 0	
Material							
Heavy Oil	1,903	Kl	1,490	2,835,470		-	
Others				425,330		-	
Sub-Total				₱ 3,260,800		₱ 0	
Labor							
Officer	6,400	MH	130	832,000		-	
Crew	25,600	MH	4.27	109,312		-	
Unskilled Labor	3,840	MH	2.58	9,908		-	
Sub-Total				₱ 951,220		₱ 0	
TOTAL DIRECT COST FOR	1,000,000 m^3			₱16,615,220		₱ 0	₱16,615,220
UNIT DIRECT COST PER m^3				₱ 16.62		₱ 0	₱ 16.62

CONSTRUCTION COST ESTIMATE WORKSHEET	DATE PREPARED	SHEET 2 OF 2

PROJECT
FEASIBILITY STUDY FOR MANILA-BATAAN COASTAL ROAD AND ITS RELATED ROADS

LOCATION
METRO MANILA AND BULACAN, PHILIPPINES

PACIFIC CONSULTANTS INTERNATIONAL

DRAWING NO.	ESTIMATOR	CHECKED BY

UNIT COST BACK-UP SHEET						
ITEM NO. 102						
Dredging, Deep Layer	-	1,000,000 m^3				
Equipment						
Dredger 4,000 PS	1,000,000 ÷ 150,000 m^3/30 day x 8					
	÷ 0.75 = 2,130 HR					2,130 HR
Tugboat 2,000 PS	2,130 HR x 15 % = 320 HR					320 HR
Material						
Heavy Oil	Dredger					
	2,130 x 850 kl/HR = 1,810 Kl					
	Tugboat					
	320 x 290 kl/HR = 93 Kl					
						1,903 Kl
Labor						
Officer	2,130 HR x 3 Men = 6,390 MH Say					6,400 MH
Crew	2,130 HR x 12 Men = 25,560 MH Say					25,600 MH
Unskilled Labor	25,600 MH x 15%					3,840 MH

CONSTRUCTION COST ESTIMATE

DATE PREPARED

SHEET 1 OF 4

PROJECT: FEASIBILITY STUDY FOR MANILA-BATAAN COASTAL ROAD AND ITS RELATED ROADS

LOCATION: METRO MANILA AND BULACAN, PHILIPPINES

PACIFIC CONSULTANTS INTERNATIONAL

BASIS FOR ESTIMATE

- ☐ CODE A (No design completed)
- ☒ CODE B (Preliminary design)
- ☐ CODE C (Final design)
- ☐ OTHER (Specify) _____

DRAWING NO.

ESTIMATOR

CHECKED BY

DESCRIPTION	QUANTITY		EQUIPMENT/LABOR		MATERIAL		TOTAL COST
	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL	PER UNIT	TOTAL	
UNIT COST BACK-UP SHEET							
ITEM NO. 104							
Rockfill	-		1,000 m^3				
1. Rock Excavation							
Equipment							
Air Compressor	100	HR	570/d	7,128		-	
Rockdrill	300	HR	108/d	4,050		-	
Bulldozer 21 t	38	HR	406	15,428		-	
Convertible Excavator							
0.6 m^3	62	HR	251	15,562		-	
Dump Truck, 6 m^3	334	HR	120	40,080		-	
Sub-Total				₱ 82,248		₱ 0	
Labor							
Optr., Compressor	110	MH	4.27	470		-	
Optr., Drill	300	MH	4.27	1,281		-	
Optr., Bulldozer	38	MH	4.27	162		-	
Optr., Excavator	62	MH	4.27	265		-	
Optr., Dump Truck	334	MH	4.27	1,426		-	
Foreman	110	MH	4.98	548		-	
Asst. Foreman	110	MH	3.35	369		-	
Unskilled Labor	1,712	MH	2.58	4,417		-	
Sub-Total				₱ 8,938		₱ 0	
Material							
Dynamite	200	kg		-	45.00	9,000	
Cap. Electric	600	Ea		-	5.00	3,000	
Detonating Cord	400	m		-	5.00	2,000	
Wire, Lead	400	m		-	1.60	640	
Sub-Total				₱ 0		₱ 14,640	

CONSTRUCTION COST ESTIMATE	DATE PREPARED	SHEET 2 OF 4
PROJECT: FEASIBILITY STUDY FOR MANILA-BATAAN COASTAL ROAD AND ITS RELATED ROADS		BASIS FOR ESTIMATE: ☐ CODE A (No design completed) ☒ CODE B (Preliminary design) ☐ CODE C (Final design) ☐ OTHER (Specify)
LOCATION: METRO MANILA AND BULACAN, PHILIPPINES		
PACIFIC CONSULTANTS INTERNATIONAL.		
DRAWING NO.	ESTIMATOR	CHECKED BY

DESCRIPTION	QUANTITY		EQUIPMENT/LABOR		MATERIAL		TOTAL COST
	NO. UNITS	UNIT MEAS	PER UNIT	TOTAL	PER UNIT	TOTAL	
UNIT COST BACK-UP SHEET							
ITEM NO. 104	-		Cont'd.				
Rockfill	-		1,000 m³				
2. Hauling and Inplacing							
Equipment							
Barge, 60 m³	167	HR	90	15,030		-	
Tugboat	167	HR	162	27,054		-	
Gib Crane, 4 t	167	HR	58	9,686		-	
Sub-Total				₱ 51,770		₱ 0	
Labor							
Optr., Barge	334	MH	4.27	1,426		-	
Optr., Tugboat	334	MH	4.27	1,426		-	
Optr., Crane	334	MH	4.27	1,426		-	
Diver	240	MH	10.00	2,400		-	
Foreman	167	MH	4.98	832		-	
Unskilled Labor	1,503	MH	2.58	3,878		-	
Sub-Total				₱ 11,388		₱ 0	
TOTAL DIRECT COST FOR ,000 m³				₱ 154,344		₱ 14,640	₱ 168,984
UNIT DIRECT COST PER m³				₱ 154.34		₱ 14.64	₱ 168.98

CONSTRUCTION COST ESTIMATE WORKSHEET	DATE PREPARED	SHEET 3 OF 4

PROJECT
FEASIBILITY STUDY FOR MANILA-BATAAN COASTAL ROAD AND ITS RELATED ROADS

LOCATION
METRO MANILA AND BULACAN, PHILIPPINES

PACIFIC CONSULTANTS INTERNATIONAL

CALKING NO.	ESTIMATOR	CHECKED BY

UNIT COST BACK-UP SHEET						
PAY ITEM NO. 104						
Rockfill	-	1,000 m^3				
1. Rock Excavation						
Equipment						
Air Compressor,						
10 - 15 m^3/min.	1,000 m^3	x 10 HR/100 m^3 = 100 HR				100 HR
Rock Drill	100 HR x	3 units = 300 HR				300 HR
Bulldozer, 21 t	1,000 m^3	x 2/3 ÷ (79 x 0.67 x 0.40) m^3/HR				
	= 32 HR	add 20% for ripping work				38 HR
Convertible						
Excavator	1,000 m^3	+ (60 x 0.67 x 0.40)m^3/HR =	62 HR			62 HR
Dump Truck 6 m^3	1,000 m^3	+ (6.0 m^3 x 0.8) x	1.6 HR/RT	= 334 HR		334 HR
	Time Required for 1 Round Trip					
	Loading	6.0 x 0.8 + 16 m^3/HR	= 0.30			
	Hauling	10 km ÷ 15 km/HR	= 0.70			
	Dump		= 0.10			
	Return	10 km ÷ 20 km/HR	= 0.50			
	Total:		= 1.60	HR		
Labor						
Optr., Compressor	100 HR x	1.1 = 110 MH				110 MH
Optr., Rock Drill						300 MH
Optr., Bulldozer						57 MH
Optr., Excavator						62 MH
Optr., Dump Truck						334 MH
Foreman	100 HR x	1 Man x 1.1 = 110				110 MH
Asst. Foreman						110 MH
Unskilled Labor	100 HR x	8 Men = 800 MH				800 MH
Unskilled Labor,	300 HR x	2 Men + 100 HR x 2 Men				
Signalman	+ 334 HR	+ 6 unit x 2 Men (Signalman)				
	= 600 +	200 + 112 = 912 MH				912 MH

CONSTRUCTION COST ESTIMATE WORKSHEET	DATE PREPARED	SHEET 4 OF 4

PROJECT
FEASIBILITY STUDY FOR MANILA-BATAAN COASTAL ROAD AND ITS RELATED ROADS

LOCATION
METRO MANILA AND BULACAN, PHILIPPINES

PACIFIC CONSULTANTS INTERNATIONAL

DRAWING NO.	ESTIMATOR	CHECKED BY

UNIT COST BACK-UP SHEET						
ITEM NO. 104						
Rockfill - (Cont'd)						
Material						
Dynamite	1,000 m^3	x 20 kg/100 m^3 =		200 kg		200 kg
Cap. Electric	1,000 m^3	x 60 Ea./100 m^3 =		600 Ea.		600 Ea.
Detonating Cord	1,000 m^3	x 40 m /100 m^3 =		400 m		400 m
Wire, Lead	1,000 m^3	x 40 m/100 m^3 =		400 m		400 m
2. Hauling and Emplacing						
Equipment						
Barge, 60 m^3		1,000 m^3 + (60 x 0.8) x 8.0 HR				
		= 167 HR				167 HR
Tugboat						167 HR
Gib Crane						167 HR
Labor						
Optr., Barge		167 HR x 2 Men =		334 MH		334 MH
Optr., Tugboat						334 MH
Optr., Crane						334 MH
Foreman						167 MH
Unskilled Labor		167 HR x 9 Men =		1,503 MH		1,503 MH
Diver						240 MH

CONSTRUCTION COST ESTIMATE

DATE PREPARED:

SHEET 1 OF 2

PROJECT: FEASIBILITY STUDY FOR MANILA BATAAN COASTAL ROAD AND ITS RELATED ROADS

LOCATION: METRO MANILA AND BULACAN, PHILIPPINES

PACIFIC CONSULTANTS INTERNATIONAL

BASIS FOR ESTIMATE

- ☐ CODE A (No design completed)
- ☒ CODE B (Preliminary design)
- ☐ CODE C (Final design)
- ☐ OTHER (Specify)

DRAWING NO.:

ESTIMATOR:

CHECKED BY:

DESCRIPTION	QUANTITY		EQUIPMENT LABOR		MATERIAL		TOTAL COST
	NO. UNITS	UNIT MEAS	PER UNIT	TOTAL	PER UNIT	TOTAL	
UNIT COST BACK-UP SHEET							
ITEM NO. 109							
Furnishing and Driving Steel Sheet Pile, 400 mm x 160 mm							
x 16 mm x 18 m		-	4,500 m				
Material							
Steel Sheet Pile, 400 x 160 x 16	342.5	ton		-	5,000	1,712,500	
Equipment							
Pile Driver Boat	263	HR	1,207	317,441		-	
Tugboat	263	HR	417	109,671		-	
Flat Bed Truck	357	HR	76	27,132		-	
Sub-Total				₱ 454,244		₱ 0	
Labor							
Foreman	263	MH	4.98	1,310		-	
Asst. Foreman	263	MH	3.35	881		-	
Optr., Pile Driver	263	MH	4.27	1,123		-	
" Tugboat	263	MH	4.27	1,123		-	
" Truck	357	MH	3.73	1,332		-	
Crew	1,052	MH	4.27	4,492		-	
Unskilled Labor	2,183	MH	2.58	5,632		-	
Sub-Total				₱ 15,893		₱ 0	
TOTAL DIRECT COST FOR 4,500 m				₱ 470,137		₱ 1,712,500	₱ 2,182,637
UNIT DIRECT COST PER m				₱ 104.47		₱ 380.56	₱ 485.03

CONSTRUCTION COST ESTIMATE WORKSHEET	DATE PREPARED	SHEET 2 OF 2

PROJECT
FEASIBILITY STUDY FOR MANILA-BATAAN COASTAL ROAD AND ITS RELATED ROADS

LOCATION
METRO MANILA AND BULACAN, PHILIPPINES

PACIFIC CONSULTANTS INTERNATIONAL

DRAWING NO.	ESTIMATOR	CHECKED BY

UNIT COST BACK-UP SHEET						
ITEM NO. 109						
Furnishing and Driving Steel						
Sheet Pile, 400 mm x 160 mm						
x 16 mm x 18 m	-	100 m				
Material						
Steel Sheet Pile	76.1 kg/m x 18 m x 250 m = 342.5 ton					342.5 t
Equipment						
Pile Driver Boat	18 m x 250 = 4,500 m					
	4,500 m x 3.5 min/m = 15,750 min.					263 HR
Tugboat						263 HR
Labor						
Foreman						263 MH
Asst. Foreman						263 MH
Optr. Pile Driver						263 MH
" Crane						263 MH
Crew	4-Man x 263 HR = 1,052 MH					1,052 MH
Unskilled Labor						2,183 MH
Transportation of Sheet Pile						
Flatbed Truck	342.5 ÷ 3 ton/trk x 2.5 HR = 285 HR					
	add 25% (Loading & Unloading)					357 HR
Optr., Truck						357 MH

Appendix I-61

1. VEHICLE OPERATING COST

Studies on the vehicle operating cost and the future traffic forecast were conducted on five vehicle types, each indicating a different pattern of traffic movement, namely:

Cars
Jeepneys
Buses
Pick-ups
Trucks, medium and large

Representative vehicle types of the above categories were determined after interviewing a number of dealers, manufacturers, and organizations, shown in Table 61-2. These vehicles shared the largest portion of recent sales as well as strong popularity. Their design and performance statistics are also presented in the same table. The price per unit and of their components is shown in Table 61-3. Average running distance in km per annum, determined after the interview, is indicated in Table 61-1.

Table 61-1 LIFE OF VEHICLE AND TIRES, AND OPERATION HOURS OF VEHICLES

Vehicle	Vehicle Life		Annual Use	Tire Use	Operation Hours	
	(Years)	('000 km)	(km)	(km)	(per day in hrs.)	(per annum)
Car						
Bantam	8	160,000	20,000	40,000	5.0	1,500
Light	8	160,000	20,000	40,000	5.0	1,500
PU Jeepney	7	420,000	60,000	50,000	10.0	3,000
PU Bus	8	480,000	60,000	60,000	10.0	3,000
Pick-up	7	210,000	30,000	45,000	8.0	2,400
Medium truck	10	400,000	40,000	60,000	10.0	3,000
Large truck	10	500,000	50,000	75,000	10.0	3,000

The vehicle operating cost is composed of running-mileage-related and time-related cost (fixed hourly cost). The method of estimation in this study is similar to those used in recent studies such as the National Transportation System Study (Interim, 1978) and Feasibility Study on C-3 and R-4 and Related Roads Project (1978).

The Team has referred to the research on basic vehicle operating cost conducted by MPH since 1975. The MPH policy on basic traffic

Table 61-2 REPRESENTATIVE VEHICLES

		Announced Retail Price (₱) 1/	Engine (HP)	Engine (CC)	Gross Veh. Wt.	Curb Weight & Seats	Tires
Toyota	Bantam Car	42,200	55	1,200	-	0.9t 5s	6.15-13-4
Ford	PU Jeepney McArthur type	46,570	70	Diesel 2,400	2.0t	1.1t 17s	6.40-13-6
Mitsu-bishi	PU Bus	205,787	140	Diesel 6,500	10.0t	6.0t 55s	9.00-20-12
Ford	Truck Pick-up	30,650	55	1,200	2.0"	1.0t	6.40-13-6
Isuzu	Medium-truck	93,151	100	Diesel 4,500	7.0t	3.5t	8.25-20-12
Isuzu	Large-truck	233,750	180	Diesel 7,500	16.0t	7.0t	10.00-20-14

Source: Car Masters Inc., City Wide Motors Inc., Northern Auto Mart Inc., Ambassador Trading Corp., Tolentino Auto Supply Co., Blumentrit Tire Supplier Inc., etc. July 1979

Note : 1/ Body cost is included.

Table 61-3 PRICES OF REPRESENTATIVE VEHICLES

Unit: in pesos

Description		Import 1/ CKD (1)	Duties 1/ (2)	Local Mat 4/ (3)	Sales Tax 2/ (4)	Total (5)	Percent of (1)+(3)/(5)	Percent of For. Ex. Comp. (1)/(5)
Bantam Car	Complete	14,648	4,394	19,041	4,117	42,200	77.5%	
	Tires	239	48	584	87	958	85.9	
	Net	14,409	4,346	18,457	4,030	41,242	79.7	
	W/o Taxes	14,409	-	18,457	-	32,866	-	43.8%
Light Car	Complete	19,094	5,728	24,821	7,857	57,500	76.4	
	Tires	269	55	659	98	1,081	85.6	
	Net	18,825	5,673	24,498	7,759	56,419	76.8	
	W/o Taxes	18,825	-	24,498	-	43,323	-	43.5%
Jeepney 3/	Complete	14,621	2,924	26,318	3,707	46,570	87.9	
	Tires	317	63	772	115	1,267	86.0	
	Net	14,304	2,861	25,546	3,592	46,303	86.1	
	W/o Taxes	14,304	-	25,546	-	39,850	-	35.9
PU Bus 3/	Complete	97,610	19,523	74,283	14,371	205,787	83.5	
	Tires	1,846	369	4,496	671	7,382	85.9	
	Net	95,764	19,154	69,787	13,700	198,405	83.4	
	W/o Taxes	95,764	-	69,787	-	165,551	-	57.8
Pick-up 3/	Complete	9,405	1,881	16,930	2,434	30,650	85.9	
	Tires	317	63	772	115	1,267	86.0	
	Net	9,088	1,818	16,158	2,319	29,383	85.6	
	W/o Taxes	9,088	-	16,158	-	25,246	-	38.0
Medium Truck 3/	Complete	44,422	8,884	32,845	7,000	93,151	82.9	
	Tires	1,519	304	3,701	553	6,077	85.9	
	Net	42,903	8,580	29,144	6,447	87,074	82.7	
	W/o Taxes	42,903	-	29,144	-	72,047	-	59.5
Large Truck 3/	Complete	134,263	26,852	55,279	17,356	233,750	81.1	
	Tires	2,382	477	5,806	867	9,532	85.9	
	Net	131,881	26,375	49,473	16,489	224,218	80.9	
	W/o Taxes	131,881	-	49,473	-	181,354	-	72.7

Source: Those dealers listed in Table 61-2 as well as the Philippine Automotive Ass., Philippine Motor Association and Automotive Manufacturing Institute Inc. Bureau of customs and Bureau of Internal Revenue also provided the customs and tax rates in July 1979.

Notes :

1) Majority of the vehicles are CKD imported and manufactured by those firms affiliated in Progressive Car (Truck) Manufacturing programs. The customs rate on CKD import is 20%, according to 87.04, Tariff Code of 1978.

2) Sales tax rates are shown in Sec. 195, B, Sales Tax on Automobiles, Tax on Business, which indicates a number of sales tax rate on list prices, ranging from 10% for less than P35,000 to P13,500 + 70% on the excess over 60,000 for more than P60,000. Sales tax on trucks and public utility vehicles are shown in Sec. 199, F, Sales Tax on Ordinary Articles. The rates are also shown by dealers.

3) The cost of body is added for bus, med-truck, large truck, and jeepney as well.

4) Local cost component including dealer's margins and the cost of CKD are estimated by the team after interviews with those organizations listed in Table 61-2 and this table.

cost[1] which has been used in previous and on-going feasibility studies, in order to maintain consistency has also been adopted for this study. There are, however, some minor modifications to be consistent with the findings of the Team.

1.1 Running Mileage Related Cost

Mileage related cost is the cost incurred by the movement of vehicles on roads. It is composed of the following items:

A. Fuel Cost

Fuel prices with their breakdowns are shown in Table 61-4. The prices in the market are authorized by the Bureau of Energy Utilization. The consumption rates of fuel by representative vehicles are shown in Table 61-5. This Table also presents the index of changes in fuel consumption due to the changes in operating speed. It is understood that when traffic congestion occurs, the vehicles encounter frequent changes of speed and slow movement, resulting in higher consumption of fuel together with higher traffic cost. Fuel consumption indices will be incorporated in the dl method in the economic analysis of transportation costs for the proposed road project.

Table 61-4 FUEL PRICES

Unit: in pesos per liter

Fuel & Oil	Market Price	Duties & Taxes	Net Cost	Ratio of (3) ÷ (1)
Gasoline				
- Special	2.230	1.010	1.220	0.54
- Regular	2.070	0.930	1.140	0.55
Diesel Fuel	1.420	0.370	1.050	0.74
Engine Oil				
- Special	7.660	1.000	6.660	0.87
- Regular	7.480	1.000	6,480	0.87

Source: PPDO in MPH, Manual on Basic Traffic Cost Calculation Procedures, Price Level July 1, 1979, which is quoted from Oil Industry Commission.

1/ PPDO of MPH, Manual on Basic Traffic Cost Calculation Procedures, Price Level, July 1, 1979.

Table 61-5 FUEL CONSUMPTION INDEX

Mean Speed 1/ Km/Hr	Fuel Consumption Index by Jeep 2/	Average Index 1)	Section 2)	Fuel consumption (running km per liter for free flow of traffic) 3)
80	-	110	A	Car 12 km/liter
70	-	100	B	Feepney 8 km/liter
60	100			
50	100	110	B	Bus 5 km/liter
44	108	115	C	Pick-up 10 km/liter
41	121			
34	127	130		
32	132		D	Medium truck 6 km/liter
30	135			
28	145			
25	145	160	B	Large truck 3 km/liter
22	165			
21	178			
19	194	200	F	
10	-			

Source : 1 and 2 MPH, Norconsult, A.S and Hoffs Overgard, Road Feasibility Study II (June 1975), Table II-6-3. The data were developed from the studies on Ho-Ho city streets.

Notes : 1) Indices are classified according to ranges of speed. They are applied to all types of vehicles.

2) The sections classified here apply when the traffic assignment on road network and vehicle operation cost are estimated.

3) Fuel consumption rate is assumed under free flow of traffic on good paved road with negligible side friction. Running speed is around 60 - 75 km per hour.

Engine oil consumption is assumed to be 1/100 of fuel consumption per liter for small vehicles and 2/100 for large vehicles. The oil cost is also estimated based on this assumption: equivalent to 4% of fuel cost per km for small vehicles and 6% for large vehicles.

B. Capital Cost (depreciation cost)

The depreciation cost per km is estimated by finding the retail price, residual value, years in use, operating distance per year and the discount rate (opportunity cost) of capital. There are different methods of allocating the factor cost between the running miles related cost and time related cost. One method was established in the Road Feasibility Study II, (MPH, and Norconsult A.S. and Hoffe Overgard, 1975), which has also been applied to other studies in the Philippines. The study team adopted this procedure in general and allocated a portion of the depreciation cost to the running cost. The interest cost and remaining portion of the depreciation are allocated against time-related cost.

The allocations in percent are as follows. 2/

Vehicle	Distance related (%)	Time related (%)
Car	50	50
Jeepney	85	15
Bus	85	15
Pick-up	65	35
Truck	65	35

Depreciation cost is calculated from a straight line relationship and then it is divided into the distant related cost and time related cost by applying the percentages indicated above after making allowance for the residual value. The interest charge per year is the product of half of the initial price and the interest rate, where 15% p.a. is applied. Prices for representative vehicle are shown in Table 61-3 and the calculation work is shown in Table 61-6.

C. Tire Cost

Tire cost per km is calculated from the data on the price of tires (See Table 61-3) and the assumed usage in km (See Table 61-1). Recapped tires are also used in Philippines particularly by commercial vehicles.

By means of the field interview, it was found that the difference in cost per km of using recapped and brand new tires is hard to define. The recapping practice is considered

2/ PPDO of MPH, op. cit.

Table 61-6 VEHICLE DEPRECIATION AND COSTS

Description	Car, Bantan		FC Jeepney		FC Bus		Pick-up		Medium-truck		Large-truck	
	Financial	Economic	Financial	Economic	Financial	Economic	Financial	Economic	Financial	Economic	Financial	Economic
1. Initial Price (P)	41,262	32,866	66,303	39,850	198,695	165,551	29,383	25,246	92,075	72,057	224,218	181,354
2. Residual value (P Present Worth)	1,349	1,024	1,741	1,498	6,496	5,412	1,105	949	2,152	1,781	5,563	4,583
3. Depreciation (A-B)	39,696	31,792	64,562	38,352	191,919	160,139	28,278	24,297	89,922	70,266	218,635	176,821
4. Veh. use (yr)	8	8	7	7	8	8	7	7	10	10	10	10
5. Operating Life (km)	160,000	160,000	420,000	420,000	460,000	460,000	210,000	210,000	500,000	500,000	500,000	500,000
6. Annual use (km)	20,000	20,000	60,000	60,000	60,000	60,000	30,000	30,000	50,000	50,000	50,000	50,000
7. Straight line dep. (3./5. in P/km)	0.249	0.199	0.106	0.091	0.4	0.334	0.135	0.116	0.212	0.176	0.437	0.354
8. Distance realated cost, (%)	50	50	85	85	85	85	65	65	65	65	65	65
9. Distance realated cost (7.x8. in P/km)	0.124	0.099	0.063	0.045	0.198	0.165	0.067	0.057	0.105	0.087	0.217	0.176
10. Tire relatec cost, (%)	50	50	15	15	15	15	35	35	35	35	35	35
11. Annual operation (hr)	2,500	2,500	3,000	3,000	3,000	3,000	2,500	2,500	3,500	3,000	3,000	3,000
12. Tire related cost (7.x10.xll. in P(hr))	1.660	1.327	0.318	0.273	1.200	1.002	0.591	0.508	0.990	0.821	2.549	2.065
13. Interest cost (1%05%15%11) in P/hr	2.062	1.643	1.158	0.956	4.969	4.139	0.918	0.759	2.177	1.801	5.456	4.534

Table 61-7 REGISTRATION, INSURANCE AND TIRE COSTS

Description	Bantan w/taxes	w/o taxes	FC Jeepney w.	w/o	FC Bus w.	w/o	Pick-up w.	w/o	Medium-truck w.	w/o	Large-truck w.	w/o
Registration												
(1) Annual fee (P)	269	-	240	-	1,200	-	160	-	840	-	1,920	-
(2) Annual use (hr)	1,500	-	3,000	-	3,000	-	2,400	-	3,000	-	3,000	-
(3) *(1) ÷(2) (P/hr)	0.171	-	0.080	-	0.100	-	0.067	-	0.280	-	0.633	-
Insurance												
(1) Annual fee (P)	1,350	-	480	-	600	-	200	-	300	-	500	-
(2) Annual opr. (hr)	1,500	-	3,000	-	2,500	-	3,000	-	3,000	-	3,000	-
(3) *(1) ÷(2) (P/hr)	0.900	-	0.160	-	0.333	-	0.067	-	0.100	-	0.167	-
Tire												
(1) Price of a set (P)	958	823	1,767	1,053	7,352	6,352	1,767	1,059	6,972	5,220	9,532	8,155
(2) Tire life (km)	40,000	40,000	50,000	50,000	60,000	60,000	45,000	45,000	60,000	60,000	75,000	75,000
(3) *(1) ÷(2), (P/km)	0.024	0.021	0.035	0.022	0.123	0.106	0.039	0.024	0.131	0.087	0.127	0.109

Table 61-8 MAINTENANCE CREW AND OVERHEAD COSTS

Description	Car, Bantan		FC Jeepney		FC Bus		Pick-up		Medium-truck		Large-truck	
	Financial	Economic	Financial	Economic	Financial	Economic	Financial	Economic	Financial	Economic	Financial	Economic
Maintenance												
1. Parts (%) 1/	2.5	2.5	10.0	10.0	8.0	8.0	5.0	5.0	7.0	7.0	7.0	7.0
2. Parts cost p.a. (P)	1,031	822	4,633	3,985	15,872	13,214	1,469	1,262	6,095	5,043	15,695	12,695
3. Parts cost (P/km)	0.052	0.041	0.116	0.099	0.265	0.221	0.049	0.042	0.152	0.126	0.314	0.254
4. Labor (hr) 1/	60	60	200	200	300	300	100	100	250	250	300	300
5. Labor cost 1/ ₱11.85 ₱11.50	711	690	2,370	2,300	3,555	3,450	1,185	1,150	2,963	2,875	3,555	3,450
6. Labor cost (P/hr)	0.036	0.035	0.040	0.038	0.059	0.058	0.040	0.038	0.074	0.072	0.071	0.069
7. Total of 3. and 6.	0.088	0.076	0.156	0.137	0.324	0.279	0.089	0.080	0.226	0.198	0.385	0.323
Crew cost	1]	1]										
1. Driver's rate (P/hr)	1.05	1.05	3.50	3.50	5.00	5.00	3.50	3.50	5.00	5.00	5.00	5.00
2. Asst's rate (P/hr)	-	-	-	-	3.00	3.00	-	-	2.0x2	2.0x2	2.0x2	2.0x2
3. Total of 1. and 2. (P/hr)	1.05	1.05	3.50	3.50	8.00	8.00	3.50	3.50	8.00	8.00	8.00	8.00
Overhead cost												
1. (P/hr) 1/	1.23	1.15	1.80	1.75	5.37	5.10	2.34	2.30	6.05	5.75	6.13	5.75

Sources: 1/ FIDA of PPA, op.cit.
Notes : 1) Assuming the percent of employed driver at 30%

in this study by assuming a longer tire life, approximately by 20%. The cost per km is shown in Table 61-7.

D. Maintenance

The study team tried to obtain data from garage owners and vehicle owners concerning expenses for normal vehicle maintenance. The replies, however, were unsatisfactory and no definite conclusion was reached. Parts and labor costs related to vehicle maintenance and repair work are shown in Table 61-8. They are quoted from the same research of the MPH.

The maintenance cost is divided into that of spare parts and of labor. Their indices are shown below 3/ and the cost per km is illustrated also in Table 61-8.

Vehicle type	Spare parts cost p.a. in % of the initial price	Labor hours p.a.
Bantam car	2.5%	70
Jeepney	10.0%	200
Bus	8.0%	300
Pick-up	5.0%	100
Medium truck	7.0%	250
Large truck	7.0%	300

E. Accident Cost

Due to the limited statistical data regarding accidents, the accident costs are not included in the estimates.

1.2 Time Related Cost

Time related cost is part of vehicle operating cost, and it is considered suitable to associate it with the operating hours regardless of actual running time. It is composed of the following items:

A. Capital Cost (Depreciation Cost)

The time related depreciation cost is calculated simultaneously with the mileage-related cost of depreciation. A portion of the depreciation cost is assumed to be the time related cost. Interest charge is also a factor to be included. Calculated costs per hour are shown in Table 61-6.

B. Crew Cost

The current average wage rate for drivers and assistants including fringe benefits has been determined by means of

3/ PPDO of MPH, op. cit.

interviews with operators and drivers. Some private cars are driven by employed drivers, however, it is difficult to determine the percentage of employed drivers compared with owner drivers. Under the circumstances, the percentage is assumed to be 30%. One third of the wage cost has been included for passenger cars. Crew cost per hour is shown in Table 61-8.

C. Registration Fees

It is required by law that all vehicles must be registered for use on the roads every year. Sometimes, commercial vehicles are subject to mechanical checks by the Land Transportation Commission. The registration fee is calculated from the provisions in Republic Act No. 4136, and the estimated fees are shown together with the emergency tax in Table 61-9. the cost per hour is calculated in Table 61-7.

D. Insurance Fee

All vehicles are required to buy at least the compulsory insurance coverage as determined by the Office of the Insurance Commissioner. Comprehensive (all risk) insurance coverage is bought by some owners of expensive cars and new cars. The majority, however, are covered by third party insurance or the third party and passenger liability insurance. These are shown in Table 61-9.

E. Overhead Cost

Overhead cost per hour is quoted from the study of MPH.[4] They are shown in Table 61-8.

F. Reduction Factors

It is expected that the road improvement project will result in a savings in travelling time, hence a savings in time related cost. However, the savings in time related cost is not always utilized effectively in other economic activities including transport operation. Some of the savings result only in non-utilized idle time.

Similarly, the increased productivity of vehicles resulting from the improved road facilities will reduce the number of vehicle fleets required. This factor, together with the probability of idling, must also be considered in estimating the time related (fixed) cost of vehicles in the economic study. MPH has already established the reduction coefficients to be adopted in the feasibility studies of a similar nature. They are shown in Table 61-11. The factors are to be multiplied by the total time related cost.

4/ PPDO of MPH, op. cit.

Table 61-9 REGISTRATION FEE[1/] AND INSURANCE FEE[2/]

Unit: in pesos per year

Vehicle Type	Registration Fee	Emergency Tax[1)]	Total	Insurance Fees		
				Compulsory	Comprehensive[2)]	Total
Car						
Bantam	110	150	260	150	1,200	1,350
Light	200	375	575	160	1,500	1,650
PNJ						
Jeepney SVW 2.0t	250	-	240	480	-	480
P Bus						
gvw 1ot	1,200	-	1,200	899	-	800
Pick-up						
Private Gvw. 2.0t	160	-	160	160	-	160
for hire	100	-	100	200	-	200
Truck						
Medium gvw 7t	840	-	840	300	-	300
Large gvw 16t	1,920	-	1,920	500	-	500

Source : 1/ Land Transport Commission

2/ Office of the Insurance Commissioner and PHILAM GEN Insurance Co., Ltd.

Notes : 1) Emergency tax (ad valorem tax) for a new vehicle (zero year old) is shown in the table.

2) Comprehensive coverage insurance fee is shown only for private cars. Vehicles for hire and public use do not generally buy the comprehensive insurance coverage.

1.3 The Summary

The summary of the distance related cost and the time related cost for the representative vehicles are shown in the following Table 61-12 and Table 61-13. If they are compared to an example of the basic traffic cost of MPH, the differences are quite modest (See Table 61-10). It is understood, however, that the differences result from different findings of the Study Team.

Table 61-10 TRAFFIC COST, July 1979

Vehicle Type	Luzon Unit Prices [1]		Manila Unit Prices [2]	
	Distance Related Cost (₱/km)	Time Related Cost (₱/hr)	Distance Related Cost (₱/hr)	Time Related Cost (₱/hr)
Bentam Car	0.367	1.02	0.303	1.236
Pick-up & vans	0.348	2.47	0.306	2.830
Jeepney	0.343	5.25	0.385	5.867
Large Bus	0.783	14.64	0.892	14.869
Medium truck	0.829	10.46	0.585	9.823
Large truck	0.955	14.39	1.033	15.262

Sources: 1 Ministry of Public Highways cost estimates based on data from Olongapo Road Study.
2 The Study Team cost estimates based on data from the PROJECT.

Table 61-11 SUMMARY OF VEHICLE OPERATION COSTS: TIME RELATED COSTS

Unit: in pesos per hour

Description	Car		Jeepney		Bus		Pick-up		Medium-truck		Large-truck	
	w/Tax	w/o Tax	w/Tax	w/o Tax	w/Tax	w/o Tax	w/Tax	w/o Tax	w/Tax	w/o Tax	w/Tax	w/o Tax
Capital	1.660	1.327	0.318	0.273	1.200	1.002	0.591	0.508	0.990	0.821	2.549	2.065
Interest	2.062	1.643	1.158	0.996	4.960	4.139	0.918	0.789	2.177	1.801	5.605	4.534
Crew	-	-	3.500	3.500	8.000	8.000	3.500	3.500	8.000	8.000	8.000	8.000
Registration	0.173	-	0.080	-	0.400	-	0.667	-	0.280	-	0.633	-
Insurance	0.900	-	1.160	-	0.333	-	0.067	-	0.100	-	0.167	-
Overheads	1.230	1.150	1.800	1.750	8.370	8.100	2.340	2.300	6.050	5.750	6.130	5.750
Total	6.025	4.120	7.016	6.519	23.263	21.241	8.083	7.097	17.597	16.372	23.084	20.349
(%)	(100.0)	(68.4)	(100.0)	(92.9)	(100.0)	(91.3)	(100.0)	(87.8)	(100.0)	(93.0)	(100.0)	(88.2)
Reduction Factor 1/												
By Commercial use	0.3	0.3	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
By fleet reduction	1.0	1.0	0.9	0.9	0.7	0.7	0.4	0.4	0.6	0.6	0.75	0.75
Net time related cost	1.811	1.236	6.314	5.867	16.284	14.869	3.233	2.830	10.558	9.823	17.31	15.262

Source: 1/ PPDO of MPH, op. cit.

Table 61-12 SUMMARY OF VEHICLE OPERATING COSTS: RUNNING MILEAGE RELATED COSTS 1/

Unit: in pesos per km

Description	Car		Jeepney		Bus		Pick up		Medium-truck		Large-truck	
	w/Tax	w/o Tax	w/Tax	w/o Tax	w/Tax	w/o Tax	w/Tax	w/o Tax	w/Tax	w/o Tax	w/Tax	w/o Tax
Fuel	0.186	0.102	0.176	0.143	0.284	0.210	0.223	0.122	0.237	0.175	0.473	0.350
Oil	0.007	0.004	0.007	0.006	0.017	0.013	0.009	0.005	0.014	0.011	0.028	0.021
Capital	0.125	0.100	0.090	0.077	0.340	0.284	0.088	0.075	0.138	0.114	0.284	0.230
Tire	0.024	0.021	0.025	0.022	0.123	0.106	0.028	0.024	0.101	0.087	0.127	0.109
Maintenance	0.088	0.076	0.156	0.137	0.324	0.279	0.089	0.080	0.226	0.198	0.385	0.323
Total	0.430	0.303	0.454	0.385	1.088	0.892	0.437	0.306	0.716	0.585	1.297	1.033
(%)	(100.0)	(70.5)	(100.0)	(84.8)	(100.0)	(82.0)	(100.0)	(70.0)	(100.0)	(81.7)	(100.0)	(79.6)

Note: 1/ On good paved flat road with free flow of traffic, the speed is 60-75 km per hour.

Table 61-13 TIME VALUE OF PASSENGERS

Vehicle Type	Average Nos. of Passengers per Vehicle 1/	Percent of Trip Purposes	Assessing Time Value of Purposes (%)	Value per Vehicle (₱) 3/	Assessing by Purpose and Component	Weighted Value per veh.
Car	2.8	21% To and from work	50%	11.50x0.7=8.05	1.825	
		25% Work and business	100%	3.50x0.3=1.05	4.345	
		54% Others 1/	0%	4.60x1.8=8.28	0.0	₱ 6.170/hr
				17.38		
Jeepney	14.8	31% To & from Work	50%	2.30x14.8=34.04	5.276	
		13% Work and Business	100%		4.425	
		56% Others 2/	0%		0.0	₱ 9.692/hr
Bus	44.7	31% To & from Work	50%	2.90x44.7=129.63	20.093	
		13% Work and Business	100%		16.852	
		56% Others 3/	0%		0.0	₱36.945/hr

Source:
1/ From OD survey in July 1979.
2/ From MPH and JICA Urban Transport Study in Manila Metropolitan Area (September 1973)
3/ Car owner driver ₱11.50/hr
Driver otherwise and passenger P4.60/hr
Jeepney passenger ₱2.30/hr
Large bus passenger P2.90/hr
As quoted from PPDO of MPH, op. cit.

Appendix I-62

TIME VALUE OF PASSENGERS

Savings in time in passenger movement can be measured in terms of money and quantified in the economic evaluation, although the method of quantification is still a subject for discussion. In this study, the time is associated with the wage rate and assessed in terms of economic cost.

The daily wage rate of a skilled laborer in the Manila area effective in June 1978 was in the range of 12.72-27.35 a day.[1] The rate of ₱14.55 a day for common laborers can be taken as the basis since this would be the average if house maids and other unskilled service sector workers are included. If we consider the wage rate in June 1979, the rate would be increased by 10% to ₱16.00. Accordingly, the wage rate per hour would be at ₱2.00.

MPH, on the other hand, has found the hourly rate value of time as shown below to be applicable to the feasibility studies.

Descriptions	Wage Rate per Hr.
Car driver owner	₱11.50
Car driver otherwise and passenger	₱ 4.60
Jeepney passenger	₱ 2.30
Bus passenger	₱ 2.90

The above figures are applied to the Study. The calculation of the values in vehicle-hour is shown in Table 61-13.

Further, it is necessary to note that the time saved is not always used in other productive activities. Considering the Philippine economy, in which full employment of resources and labor has not yet been attained (although the economy has developed steadily), the time value of passengers is determined to be half (1/2) of the preliminary time value in Table 61-13. is shown below:

Vehicles	Time Value of Passengers
Car	6.170 x 1/2 = ₱3.085/per vehicle-hour
Jeepney	₱.692 x 1/2 = ₱4.846/per vehicle-hour
Bus	36.945 x 1/2 = ₱18.473/per vehicle-hour

Appendix I-63

dl AND dt METHODS (APPLICATION OF BASIC TRAFFIC COSTS ON THE PROJECT ROADS)

Individual running costs are determined by applying dl and dt system to the basic running cost which is the cost of a vehicle running on a level, straight road with a good paved surface condition, free flow of traffic and insignificant side friction.

1/ NEDA. Philippine Economic Indicators Vol. VI. No. 12.

Individual running cost on a road without ideal conditions are assumed to be equal to the cost of running at an ideal conditions on the same length plus an extra distance, dl, which varies in accordance with the actual conditions for that length.

MPH has developed a set of dl values applicable to various road conditions since 1975.[1] The Study Team decided to adopt this system with an adjustment suitable to the actual road conditions for the road system in the Project Area. The following items are the elements of dl applicable to the PROJECT which could be additive independently to obtain the actual traffic costs on a road section.

When dl values are allocated for each section of the road, the dt value is calculated by dividing the sum of l and dls by the running speed. The normal speed of light vehicles is determined at 70 km and heavy vehicles 60 km.

A. Roadside friction and level of service

The roadside friction is categorized into four classes with the following definitions.

i) None: Few or no houses along the carriageway.

ii) Light: Houses and/or intersections along and close to the carriageway, 100-200 meters apart. Pedestrian and other slow moving traffic seen occasionally.

iii) Medium: Scattered roadside development, 50-100 m between buildings and/or intersections.

Pedestrian and other slow moving traffic observed frequently.

iv) Heavy: Continuous roadside development. Pedestrian and other slow moving traffic tend to disrupt the motor vehicle traffic frequently and reduce travel speed to under 40 k/hr even at low traffic densities.

B. Service Level

The service level is categorized into the seven classes A-G (See Table 63-1) by finding the volume capacity ratio. The ratio is measured at PCU (passenger car unit equivalence) for the peak hour traffic which was found to be 8% of ADT based on the traffic survey conducted in July 1979.

1/ MPH and Norconsult A.S. & Hoff Overgard. Road Feasibility Study II. June 1975.

Table 63-1 ROAD SIDE FRICTION, ETC.

(1) Road Friction and Level of Service

Level of Service

Degree of Friction	Level of Service	dls in km	
		Light Vehicle	Heavy Vehicle
None	A, B	0.00	0.00
	C, D	0.10	0.20
	E	0.40	0.50
	F, G	0.60	0.70
Light	A, B	0.00	0.00
	C	0.10	0.20
	D	0.20	0.30
	E	0.40	0.50
	F, G	0.60	0.70
Medium	A	0.00	0.00
	B	0.10	0.20
	C	0.20	0.30
	D	0.30	0.40
	E	0.50	0.60
	F, G	0.70	0.80
Heavy	A	0.10	0.20
	B	0.20	0.30
	C	0.30	0.40
	D	0.40	0.50
	E	0.60	0.70
	F, G	0.90	1.00

Level of Service	Volume Capacity Ratio
A	0.0 - 0.20
B	0.21 - 0.50
C	0.51 - 0.70
D	0.71 - 0.85
E	0.86 - 1.00
F	1.01 - 1.30
G	1.31 -

(2) Road Elements

a. Surface type: Paved

Unit: in km

Gradient Class	1	2	3	4	5	6	7
Length	≤ 400				>400		
Gradient % / Condition	<3%	3-5%	6-7%	7%	3-5%	6-7%	>7%
Good	0.00	0.15	0.30	0.65	0.15	0.40	0.75
	0.00	0.20	0.45	0.80	0.75	1.60	2.00
Fair	0.20	0.35	0.50	0.80	0.35	0.55	0.90
	0.30	0.50	0.70	1.05	1.00	1.80	2.20
Bad	0.40	0.55	0.70	1.00	0.55	0.75	1.10
	0.60	0.75	1.00	1.35	1.80	2.10	2.50
Very bad	0.60	0.75	0.90	1.20	0.75	0.95	1.30
	0.90	1.00	1.30	1.65	1.60	2.40	2.80

Note: Upper lines for light vehicles and lower lines for heavy vehicles.

b. Surface type: Gravel

Unit: in km

Gradient Class	1	2	3	4	5	6	7
Length	≤400 m				>400 m		
Gradient % / Condition	<3%	3-5%	6-7%	>7%	3-5%	6-7%	>7%
Good	0.15	0.30	0.45	0.75	0.30	0.50	0.85
	0.20	0.45	0.65	1.00	1.00	1.80	2.20
Fair	0.30	0.45	0.65	0.90	0.45	0.65	1.00
	0.40	0.70	0.90	1.25	1.20	2.00	2.40
Bad	0.60	0.75	0.90	1.20	0.75	0.95	1.30
	0.90	1.05	1.30	1.60	1.60	2.40	2.80
Very Bad	0.90	1.05	1.20	1.50	1.05	1.25	1.60
	1.30	1.45	1.65	2.00	2.00	2.80	3.20

Note: Upper lines for light vehicles and lower lines for heavy vehicles.

c. Others (in km)

	Light vehicle	Heavy vehicle
- Major intersections	0.25	0.35
- Sharp curves, R<25 m	0.10	0.20
- Higher speed 60-69 K/H	0.00	0.00
70-79	0.00	0.10
80	0.10	0.20

Source: PPDO of MPH, *Approach to computer Program for Economic Evaluation of Highway Investment*, November 1977

A heavy vehicle is assumed to be equivalent to two (2) PCUs. Table 63-1 indicates the dl values under the above classifications.

C. Surface Conditions and Others

In the Project Area, the road network considered in the traffic study is mostly paved, with different surface type and running conditions. Roads surfaced with concrete and asphaltic concrete are identified as paved roads. The conditions are rated as follows:

i) Good: Few or no potholes

ii) Fair: Less than 5 potholes per 100 meters and/or slightly corrugated.

iii) Bad: More than 5 potholes per 100 meters and/or heavy corrugation and/or rutted. The pavement, if any, starts to break up. Maximum travel speed about 40 km/hr.

iv) Very bad: Just passable for all vehicles with 2 wheel drive. The travel speed varies between 10 and 30 km/hr.

The gradient of road sections in the project area is less than 6 percent. Classified figures of dl due to road elements and other factors are shown in Table 63-1. Existing road conditions were surveyed and classified so that the above dl values are applicable for each section.

Appendix I-64
Table III-10-1 EXTERNAL TRANSACTION ACCOUNTS

(in million pesos, current prices)

Description	1976	1977 1)	1978 2)
Receipts			
Exports	23,248	29,200	32,272
a. Merchandise, FOB	18,593	22,889	24,784
b. Other exports	4,655	6,311	7,485
Others			
Current Receipts	26,987	33,393	38,071
Disbursements			
Imports	31,841	34,675	41,463
a. Merchandise, FOB	26,520	28,550	24,258
b. Other imports	5,321	6,125	7,205
Others	3,149	3,798	4,605
Current Disbursements	34,907	38,371	46,008
Surplus (borrowing)	(7,920)	(4,978)	(7,937)
Capital transfers from the world	100	62	138
Net lending (borrowing) to the world	(7,820)	(4,916)	(7,801)

Appendix I-65
Table III-10-2 GENERAL GOVERNMENT INCOME

(in million pesos, current prices)

Description	1976	1977 1)	1978 2)
Income from property and enterprises	626	887	1,280
Indirect taxes	12,821	14,400	18,140
Direct taxes	3,858	4,769	5,583
Social security contributions	1,647	1,655	1,721
Current transfers from the world	205	155	139
Current Receipts	19,157	21,866	27,063

Notes: 1) Revised
2) Provisional

Source: NEDA, Philippine Economic Indicators June, 1979

Appendix I-66
Table III-10-3 REVENUE OF BUREAU OF CUSTOMS

(in million pesos, current prices)

Description	1976	1977	1978
Import duty and tax	-	5,601	7,860
Export premium duty	-	599	427
Others & fees	-	15	43
Total	-	6,215	8,330

Source: Bureau of Customs, ADENDA, Annual Report, 1978.

Notes: SER 1977 $\fallingdotseq \frac{(34675+5601) + (29200-599)}{(34675 + 29200)} = 1.08$

SER 1978 $\fallingdotseq \frac{(41463+7860) + (32272-427)}{(41463 + 32272)} = 1.10$

Appendix I-67 COST BENEFIT ANALYSIS TABLE (PHASE I)

TABLE III-10-4 A PLAN 2

YEAR	DISC = 0 % INVEST.	MAINT.	TRAFFIC.	DISC = 15 % INVEST.	MAINT.	TRAFFIC.	DISC = 30 % INVEST.	MAINT.	TRAFFIC.
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1982	6.8	0.0	0.0	5.9	0.0	0.0	5.2	0.0	0.0
1983	25.7	0.0	0.0	19.4	0.0	0.0	15.2	0.0	0.0
1984	55.3	0.0	0.0	36.7	0.0	0.0	25.9	0.0	0.0
1985	260.5	0.0	0.0	160.4	0.0	0.0	96.3	0.0	0.0
1986	179.8	0.0	0.0	49.4	0.0	0.0	43.4	0.0	0.0
1987	135.5	0.0	0.0	56.6	0.0	0.0	29.1	0.0	0.0
1988	0.0	0.4	-127.3	0.0	0.2	-67.4	0.0	0.0	-20.3
1989	0.0	0.4	-141.0	0.0	0.1	-66.1	0.0	0.0	-17.3
1990	0.0	0.4	-156.2	0.0	0.1	-64.4	0.0	0.0	-14.7
1991	0.0	0.4	-173.0	0.0	0.1	-62.8	0.0	0.0	-12.5
1992	0.0	0.4	-191.6	0.0	0.1	-61.2	0.0	0.0	-10.7
1993	0.0	0.4	-212.2	0.0	0.1	-59.7	0.0	0.0	-9.1
1994	0.0	0.4	-235.0	0.0	0.1	-58.2	0.0	0.0	-7.8
1995	0.0	0.4	-260.3	0.0	0.1	-56.8	0.0	0.0	-6.6
1996	0.0	0.4	-288.3	0.0	0.0	-55.4	0.0	0.0	-5.6
1997	0.0	0.5	-319.3	0.0	0.0	-54.1	0.0	0.0	-4.8
1998	0.0	0.6	-353.7	0.0	0.0	-52.9	0.0	0.0	-4.1
1999	0.0	0.6	-391.6	0.0	0.0	-51.7	0.0	0.0	-3.5
2000	0.0	0.6	-434.0	0.0	0.0	-50.5	0.0	0.0	-3.0
2001	0.0	0.6	-480.7	0.0	0.0	-49.4	0.0	0.0	-2.5
2002	0.0	0.6	-532.9	0.0	0.0	-48.3	0.0	0.0	-2.2
2003	0.0	0.6	-590.7	0.0	0.0	-47.2	0.0	0.0	-1.8
2004	0.0	0.6	-655.2	0.0	0.0	-46.2	0.0	0.0	-1.6
2005	0.0	0.6	-726.5	0.0	0.0	-45.3	0.0	0.0	-1.3
2006	0.0	0.6	-805.3	0.0	0.0	-44.3	0.0	0.0	-1.1
2007	0.0	0.6	-892.5	0.0	0.0	-43.4	0.0	0.0	-1.0
2008	-225.5	0.6	-942.7	-5.2	0.0	-92.4	-0.2	0.0	-0.3
TOTAL	459.3	10.5	-6934.9	365.2	1.7	-709.3	240.4	0.4	-132.3
		P.W. TOTAL	-6950.2		P.W. TOTAL	-341.3		P.W. TOTAL	48.4
	B/C =	-19.469		B/C =	-1.993		B/C =	-1.599	

--* I = *-*-* 22.4 %

TABLE III-10-4 B PLAN 3 & 4

YEAR	DISC = 0 % INVEST.	MAINT.	TRAFFIC.	DISC = 15 % INVEST.	MAINT.	TRAFFIC.	DISC = 30 % INVEST.	MAINT.	TRAFFIC.
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1982	6.6	0.0	0.0	5.7	0.0	0.0	5.1	0.0	0.0
1983	24.8	0.0	0.0	18.8	0.0	0.0	14.7	0.0	0.0
1984	54.0	0.0	0.0	35.5	0.0	0.0	24.6	0.0	0.0
1985	271.6	0.0	0.0	155.3	0.0	0.0	95.1	0.0	0.0
1986	174.2	0.0	0.0	48.6	0.0	0.0	42.4	0.0	0.0
1987	131.3	0.0	0.0	54.5	0.0	0.0	27.8	0.0	0.0
1988	0.0	0.4	-133.1	0.0	0.2	-70.0	0.0	0.0	-21.2
1989	0.0	0.4	-147.4	0.0	0.1	-68.2	0.0	0.0	-18.1
1990	0.0	0.4	-163.3	0.0	0.1	-66.6	0.0	0.0	-15.4
1991	0.0	0.4	-180.9	0.0	0.1	-64.7	0.0	0.0	-13.1
1992	0.0	0.4	-200.4	0.0	0.1	-63.1	0.0	0.0	-11.2
1993	0.0	0.4	-222.0	0.0	0.1	-61.5	0.0	0.0	-9.5
1994	1.2	0.4	-245.9	0.2	0.1	-59.9	0.0	0.0	-8.1
1995	3.7	0.5	-272.2	0.5	0.1	-58.3	0.1	0.0	-6.9
1996	51.2	0.5	-301.0	6.3	0.1	-57.1	1.0	0.0	-5.9
1997	66.6	0.6	-333.9	7.3	0.0	-55.7	1.0	0.0	-5.0
1998	0.0	0.6	-369.3	0.0	0.1	-56.1	0.0	0.0	-4.5
1999	0.0	0.6	-408.1	0.0	0.0	-54.5	0.0	0.0	-3.8
2000	0.0	0.6	-450.4	0.0	0.0	-53.5	0.0	0.0	-3.3
2001	0.0	0.6	-497.6	0.0	0.0	-52.2	0.0	0.0	-2.8
2002	0.0	0.6	-549.4	0.0	0.0	-51.1	0.0	0.0	-2.4
2003	0.0	0.6	-606.3	0.0	0.0	-49.9	0.0	0.0	-2.0
2004	0.3	0.6	-668.9	0.0	0.0	-48.8	0.0	0.0	-1.7
2005	0.0	0.6	-737.0	0.0	0.0	-47.7	0.0	0.0	-1.5
2006	0.0	0.6	-811.4	0.0	0.0	-46.7	0.0	0.0	-1.2
2007	0.0	0.6	-892.0	0.0	0.0	-45.7	0.0	0.0	-1.1
2008	-259.8	0.6	-1065.0	-6.0	0.0	-54.5	-0.2	0.0	-0.9
TOTAL	527.4	10.5	-7663.4	367.3	1.2	-756.0	215.5	0.3	-139.6
		P.W. TOTAL	-7695.6		P.W. TOTAL	-357.5		P.W. TOTAL	76.2
	B/C =	-18.341		B/C =	-2.056		B/C =	-2.845	

--* I = *-*-* 23.4 %

TABLE III-10-4 C PLAN 5

YEAR	INVEST.	DISC = [illegible] % PAINT.	TRAFFIC.	INVEST.	DISC = 15 % PAINT.	TRAFFIC.	INVEST.	DISC = 30 % PAINT.	TRAFFIC.
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1982	7.0	0.0	0.0	6.1	0.0	0.0	5.4	0.0	0.0
1983	26.5	0.0	0.0	20.3	0.0	0.0	15.7	0.0	0.0
1984	57.5	0.0	0.0	37.3	0.0	0.0	20.2	0.0	0.0
1985	269.2	0.0	0.0	165.4	0.0	0.0	101.3	0.0	0.0
1986	165.4	0.0	0.0	92.2	0.0	0.0	49.9	0.0	0.0
1987	139.7	0.0	0.0	68.4	0.0	0.0	28.9	0.0	0.0
1988	0.0	0.6	-105.5	0.0	0.2	-40.2	0.0	0.1	-17.0
1989	0.0	0.6	-116.1	0.0	0.2	-38.7	0.0	0.1	-14.5
1990	0.0	0.6	-134.0	0.0	0.2	-37.2	0.0	0.1	-12.4
1991	0.0	0.6	-145.3	0.0	0.1	-35.9	0.0	0.0	-10.5
1992	0.0	0.6	-160.7	0.0	0.1	-34.5	0.0	0.0	-9.0
1993	0.0	0.6	-176.0	0.0	0.1	-33.3	0.0	0.0	-7.6
1994	0.0	0.6	-177.1	0.0	0.1	-32.0	0.0	0.0	-6.5
1995	0.0	0.6	-216.3	0.0	0.1	-30.9	0.0	0.0	-5.5
1996	0.0	0.6	-241.3	0.0	0.1	-29.7	0.0	0.0	-4.7
1997	0.0	4.6	-267.8	0.0	0.5	-28.6	0.0	0.1	-4.0
1998	0.0	0.9	-296.6	0.0	0.1	-27.6	0.0	0.0	-3.4
1999	0.0	0.9	-328.5	0.0	0.1	-26.5	0.0	0.0	-2.9
2000	0.0	0.9	-363.4	0.0	0.1	-25.6	0.0	0.0	-2.5
2001	0.0	0.9	-402.9	0.0	0.1	-24.6	0.0	0.0	-2.1
2002	0.0	0.9	-446.3	0.0	0.0	-23.7	0.0	0.0	-1.8
2003	0.0	0.9	-494.3	0.0	0.0	-22.5	0.0	0.0	-1.5
2004	0.0	0.9	-547.5	0.0	0.0	-22.0	0.0	0.0	-1.3
2005	0.0	0.9	-606.4	0.0	0.0	-21.2	0.0	0.0	-1.1
2006	0.0	0.9	-671.6	0.0	0.0	-20.4	0.0	0.0	-1.0
2007	0.0	0.9	-743.7	0.0	0.0	-19.6	0.0	0.0	-0.8
2008	-232.7	0.9	-823.8	-5.3	0.0	-18.9	-0.2	0.0	-0.7
TOTAL	472.6	13.9	-7990.4	376.5	2.2	-594.0	227.2	0.5	-111.0
		P.V. TOTAL	-6997.1		P.V. TOTAL	-215.2		P.V. TOTAL	116.7
	B/C =	-15.807		B/C =	-0.572		B/C =	-0.484	

[illegible] 1 P [illegible] 49.0 %

Appendix I-68
Table IV-2-1 ACTUAL DOMESTIC CONSUMPTION OF ENERGY

Unit: in millions of tons of oil equivalent

	1973	1974	1975	1976	1977	1978
Oil	9.15	8.58	9.31	9.55	10.39	10.77
Coal	0.03	0.23	0.07	0.08	0.18	0.19
Hydro Geothermal	0.46	0.58	0.55	0.68	0.50	0.70
Total	9.64	9.19	9.93	10.31	11.07	11.66
Annual Growth Rate (%)	-	(-4.6)	8.1	3.8	7.4	5.3

Source: BEU

Appendix I-69
Table IV-2-2 PETROLEUM PRODUCT CONSUMPTION BY PRODUCT TYPE

Unit: in thousand barrels

Descriptions	1973	1974	1975	1976	1977	1978
Energy Products	64,826	60,822	66,601	68,597	74,574	77,455
Avgas	158	172	185	176	151	140
Avturbo	2,035	2,992	2,165	2,145	2,320	2,597
Petroleum Gasoline	4,171	4,177	5,124	5,530	6,102	6,832
Regular Gasoline	12,290	10,436	10,132	9,268	8,791	8,395
Diesel	12,753	12,216	13,227	14,027	14,886	15,582
Fuel oil	29,257	27,112	30,528	32,038	36,574	37,633
Kerosene	3,320	2,878	2,154	3,236	3,393	3,683
LPG	1,842	1,839	2,086	2,177	2,407	2,593
Non-Energy Products	2,163	2,031	2,690	2,609	2,701	2,713
Asphalt	435	295	425	458	877	397
Ref. Process Gas	212	240	262	204	188	211
Solvents	221	221	244	237	144	230
Naphtha	145	282	748	676	866	709
Lubricants	1,102	907	912	900	905	999
Greases	33	31	30	29	28	30
Waxes & Petroleums	16	55	69	105	128	137
Total Product Sales	66,990	62,854	69,291	71,206	77,275	80,168
Adjustment	4,036	3,634	2,834	2,694	2,849	2,813
Total Petroleum Consumption	71,026	66,488	72,125	73,900	80,124	82,981

Source: BEU

Appendix I-70
Table IV-2-3 CONSUMPTION OF PETROLEUM PRODUCTS, 1973

Unit: in million barrels

Sector	Motor Gasoline	Diesel Oil	Heavy Oil	Other	Total
Transport					
Road	16.3	5.4	-	-	21.7
Other		1.5	1.9	2.0	5.4
Electric Power		0.4	11.4	-	11.8
Industry		4.6	13.7	1.4	19.1
Other		1.4	0.9	5.4	7.3
Total	16.3	12.7	27.9	8.4	65.3

Source: The Philippines: Priority and Prospects for Development.

Appendix I-71
Table IV-2-4 REFINED OIL STORAGE FACILITY IN METRO MANILA, 1978

	PETROPHIL				CALTEX	SHELL	MOBIL	
	Pandacan Terminal	Sta. Mesa	Pasig	Navotas	Pandacan	Pandacan	Pandacan	Pasig
Area (ha)	12.6	4.5	5	0.92	4.65	7	5	4
Storage Capacity (x1,000 barrels)	750	170	LPG 750 MT Asphalt 1.5	25	457	735	388	15
Number of tanks	52	12	5	2	39	46	47	10

Source: Philippine National Oil Company

Appendix I-72
Table IV-2-5 ESTIMATED GROWTH RATES OF STEEL CONSUMPTION

Sector	Growth Rate (1978-1987)	Growth Rate of Steel Consumption	Remarks
Construction	12.4%	8.7%	
Containers	8.7%	8.7%	
Shipbuilding	12.3%	12.3%	
Automobile	12.3%	12.3%	
Others	8.0%	8.0%	

Appendix I-73
Table IV-2-6 ESTIMATE OF STEEL CONSUMPTION INCREASE BASED ON SECTOR SHARES (IN MANILA AND THE REST OF LUZON)

Unit: in tons

Year / Sector	1977	1981	1986	1991
Construction	547,800	738,000	977,000	1,215,000
Containers	136,000	185,000	244,000	304,000
Shipbuilding	173,040	109,000	154,000	199,000
Automobile	45,650	68,000	96,000	124,000
Others	109,610	145,000	189,000	232,000
Total	913,000	1,245,000	1,660,000	2,074,000

Appendix I-74
Table IV-2-7 EXISTING SHIPYARD BY NATURE OF OPERATION, PHILIPPINES, 1974

Nature of Operation	Number of Shipyards	Percent of Total
Drydocking and Repair	15	45.5
Shipbuilding, Drydocking and repair	14	42.4
Shipbuilding	4	12.1
Total	33	100.0

Source: The First Philippine Shipbuilding Industry Development Program

Appendix I-75
Table IV-2-8 CAPACITY OF SHIPYARDS PHILIPPINES, 1974

Number of Facilities	Total G.T.	Nature of Work Done (G.T.)		
		Ship Building	Dry docking & Repair	Shipbuilding Dry docking Repair
64	61,570	9,550	48,270	3,750

Appendix I-76
Table IV-2-9 AN ANNUAL GROWTH RATE OF FLEET

Designations	An Annual Growth Rate (%)	Period
Ocean-Going Vessels	5.6	1967-1972
Inter-Island Vessels	10.6	1967-1971
Barges, Lighters and Tugboats	11.2	1967-1971
Commercial Fishing Vessels	7.7	1967-1974

Appendix I-77
Table IV-2-10 THE PHILIPPINE FLEET, 1967-1974

Year	Ocean – Going		Inter-Island		Barges, Lighters and Tugboats		Commercial Fishing vessels	
	Number	Gross Tonnage	Number	Gross Tonnage	Number	Gross Tonnage	Number	Gross Tonnage
1974	131	727,935	457	366,284	2448	617,032	3540	136,709
1974	–	–	–	–	–	–	2513	113,004
1972	131	827,483	–	–	–	–	2222	99,554
1971	130	819,948	434	390,499	1124	312,312	2180	90,550
1970	128	816,047	405	361,542	1103	298,086	2284	89,658
1969	127	813,948	375	348,055	1039	284,406	2273	84,117
1968	113	718,539	317	300,243	950	258,402	2225	81,950
1967	92	628,858	273	261,205	776	204,115	2361	81,268

Source : Philippine Coast Guard and Philippine Fisheries Commission

Appendix I-78
Table IV-2-11 BREAKDOWN OF EXISTING FACILITIES ACCORDING TO GEOGRAPHICAL LOCATION AND NATURE OF OPERATION

Island	Shipbuilding		Dry docking and Repair		Shipbuilding/ Dry docking and Repair		Total	
	No.	Capacity	No.	Capacity	No.	Capacity	No.	Capacity
Luzon	6	4,850	29	26,100	3	950	38	31,900
Visayas	3	4,700	17	21,170	1	1,800	21	27,670
Mindanao	–	–	4	1,000	1	1,000	5	2,000
Total	9	9,550	50	48,270	5	3,750	64	61,570

Source : PCG and PFC

Appendix I-79
Table IV-2-12 NUMBER OF REGISTERED MOTOR VEHICLES, METRO MANILA, 1971-1975

Vehicle Type	1971		1975		Annual Growth Rate 1971-1975 (%)
	Number	Percent	Number	Percent	
Cars	167,300	69.3	224,100	68.5	6.0
Trucks	58,000	24.0	85,000	26.0	7.9
Jeepneys	13,400	5.6	15,000	4.6	2.3
Buses	2,700	1.1	2,900	0.9	1.4
Total	241,400	100.0	327,000	100.0	6.3

Source: Land Transport Commission

Appendix I-80
Table IV-2-13 TRANSPORT, STORAGE AND COMMUNICATION ESTABLISHMENTS BY MUNICIPALITY, 1972 AND 1975

Area	1972		1975		Annual Growth 1975/1972 %
	Number	Percent	Number	Percent	
Metro Manila	1,915	100.0	2,256	100.0	5.6%
Manila	1,092	57.0	909	40.3	-5.9%
Caloocan City	194	10.1	315	14.0	17.5%
Pasay City	134	7.0	181	8.0	10.5%
Quezon City	148	7.7	282	12.4	24.0%
Las Piñas	5	0.3	-	0	-
Makati	120	6.3	116	5.1	1.1%
Malabon	99	2.0	105	4.7	39.1%
Mandaluyong	29	1.5	58	2.6	26.9%
Marikina	16	0.8	58	2.6	53.6%
Muntinlupa	4	0.2	5	0.2	7.7%
Navotas	64	3.4	74	3.3	5.0%
Parañaque	15	0.8	21	0.9	11.9%
Pasig	19	1.0	61	2.7	47.5%
Pateros	6	0.3	4	0.2	-12.6%
San Juan Del Monte	16	0.8	45	2.0	41.2%
Taguig	1	0.1	1	0.1	-
Valenzuela	13	0.7	21	0.9	17.3%

Appendix I-81
Table IV-2-14 ESTIMATED SOLID WASTE GENERATION IN METRO MANILA (1978)

Area	Population	Waste Generated (tons)	
		Low 1/	High 2/
Manila	2,704,000	865.3	1,352.-
Quezon City	1,594,000	510.1	797.0
Caloocan City	549,000	175.7	274.5
Malabon	202,000	64.6	101.0
Navotas	112,000	35.8	56.0
Valenzuela	216,000	69.1	108.0
San Juan	174,000	55.7	87.0
Makati	492,000	157.4	246.0
Pasay City	348,000	11.4	174.0
Mandaluyong	239,000	76.4	119.5
Parañaque	241,000	77.1	120.5
Las Piñas	110,000	35.2	55.0
Muntinlupa	121,000	38.2	60.5
Pasig	301,000	96.3	150.5
Marikina	227,000	72.6	113.5
Taguig	85,000	27.2	42.5
Pateros	27,000	8.6	13.5
Total	7,742,000	2,477.4	3,871.0

Notes : 1/ Low estimate : 0.32 kg/capita-day
2/ High estimate : 0.5 kg/capita-day

Appendix I-82
Table IV-2-15 COMPOSITION OF SOLID WASTES FROM VARIOUS CITIES

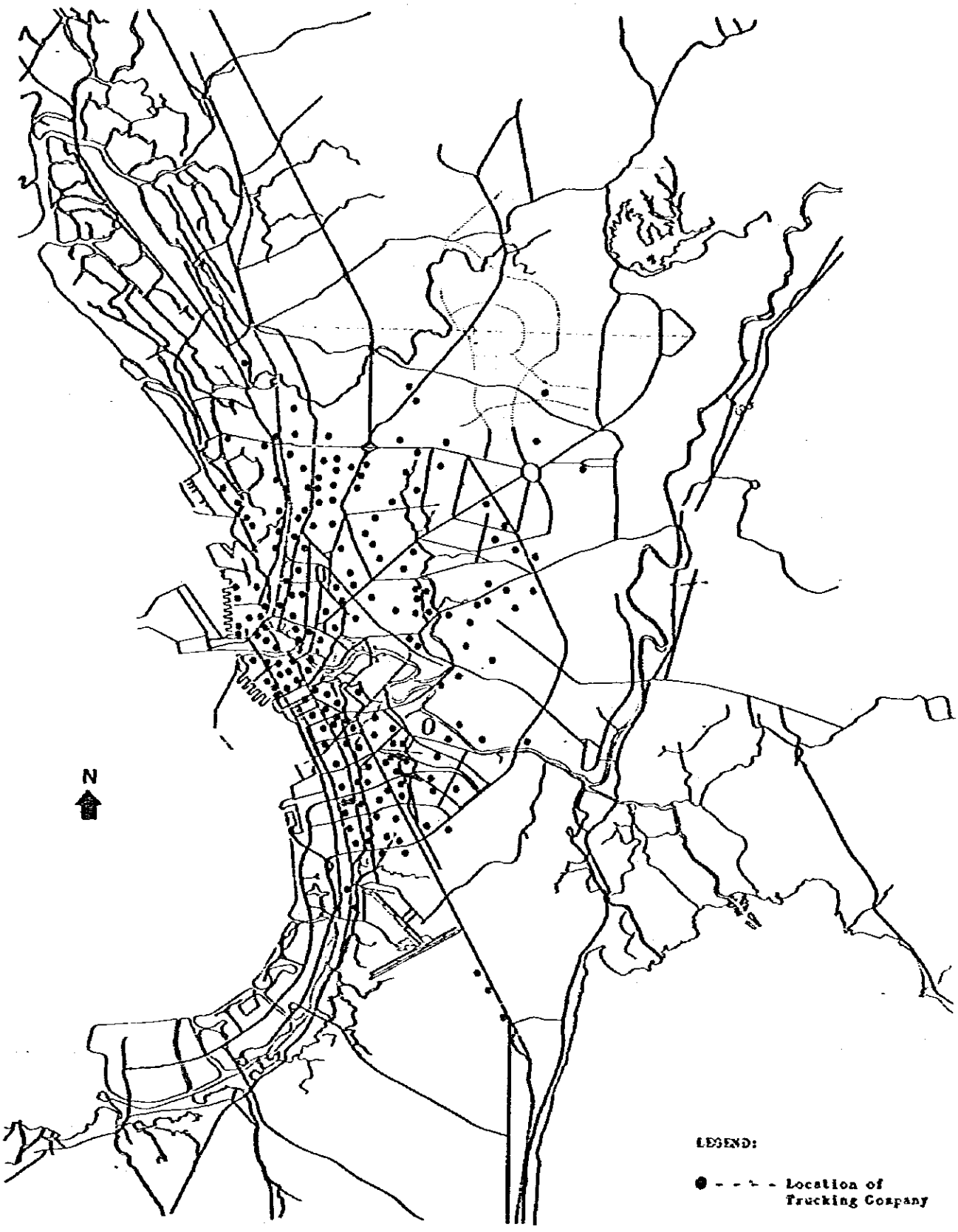
Descriptions	Typical Indian City	Manila	Typical European City	Sydney, Australia	Richmond, USA
Paper	2.0	17.0	27.0	39.0	43.2
Metals	0.1	1.5	7.0	8.0	8.0
Glass	0.2	5.3	11.0	14.0	10.8
Putrescible matter	75.0	58.8	30.0	28.0	23.5
Plastic, Textiles	4.0	8.2	6.0	7.0	4.5
Misc., ashes, dust, stones	19.0	19.2	19.0	4.0	10.8

Appendix I-83
Table IV-2-16 COLLECTION AND DISPOSAL OF SOLID WASTE IN METRO MANILA

Area/Sector	Operational No. of Trucks		Other Heavy Equipment Used (Specifics)	Collected Solid Waste Average/day		Number of Field Personnel			Dumpsite Location
	Gov't.	Private		Tons	cu.m.	Aide	Collector	Dumpsite Laborer	
West Sector			(Bulldozer Excavator)						
Manila	81	28	Dumpsite	998	2,495	1,953	1,241	60	Balut Island
North Sector			(Bulldozer Excavator)						
Quezon City	11	47	Dumpsite	600	1,950	550	550	3	Tianco Property
Caloocan City	5	16		135	450	159	159		J. Felipe Street
Malabon	0	12		85.7	2,832	95	13		Gov. Pascual Ave.
Navotas	2	0		79.16	261.4	63	20	7	Shoreline
Valenzuela	7	0		80.20	264.5	45	40	4	Karuhatan
San Juan	3	8		69.6	228.6	35	56	1	c/o Quezon City
Sub-total	28	83		1,059.66	3,497.7	1,282	833	15	5
South Sector									
Makati	3	42		193.6	638.6	781	155	6	c/o Quezon City
Pasay City	5	11		125	412.5	96	13		c/o Quezon City
Mandaluyong	1	15		100	200	112	33	2	c/o Quezon City
Parañaque	1	7		80	264	27	18	1	San Dionisio
Las Pinas	1	4		37	122	50		1	Pulang Lupa
Muntinlupa	3	5		86.8	286.44	174	35		Tuna San
Sub-total	14	84		622.4	2,053.54	1,240	264	10	3
East Sector									
Pasig	10	0		105	345.5	15	39	3	Pinagbuhatan
Marikina	2	8		90	297	62	36	2	Bo. Mayamot
Taguig	0	2		18	59.4	62	6	2	
Pateros	0	2		3	9.9	38	8	0	
Sub-total	12	12		216	712.8	177	89	7	2
Total	135	207		2,596.06	8,759.06	4,651	2,432	92	11

Appendix I-84

Fig. IV-2-1 LOCATION OF TRUCKING COMPANIES IN METRO MANILA



Appendix I-85
Table IV-3-1 WEATHER INFORMATION IN MANILA

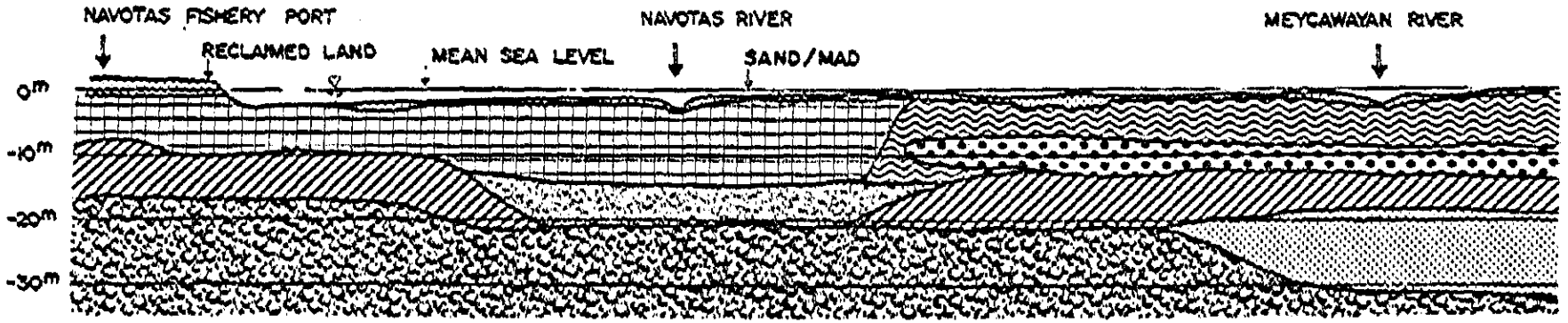
Climatic Table compiled from 16 to 46 Years' Observations, 1921 to 1966

Month	Pressure at M.S.L. Mean	Air temperature: Mean daily max.	Mean daily min.	Mean highest in each month	Mean lowest in each month	Relative humidity: 0600	1300	Mean cloud: Amount φ	Amount —	Rain: Average fall	No. of days with 0.3 mm or more	Wind direction 0600: Percentage of observations from N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calm	Wind direction 1300: Percentage of observations from N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calm	Mean wind speed 0600	1300	No. of days with gale	No. of days with thunder
	mb.	°C.	°C.	°C.	°C.	%	%	Oktas		mm.																					Knots			
January	1014	30	21	33	19	88	64	5		23	6	26	34	13	3	0	1	1	3	19	6	14	10	18	4	22	28	6	1	3	6	0	(6)
February	1013	31	22	33	19	88	60	4		11	4	18	33	27	4	2	1	1	3	17	4	13	8	18	3	23	42	5	1	3	7	0	(6)
March	1013	33	22	35	20	86	55	4		17	4	8	30	21	5	2	1	1	1	21	2	13	10	18	5	21	35	3	1	3	7	0	(6)
April	1011	34	24	36	22	85	55	4		32	4	8	25	26	10	1	1	1	2	26	4	4	11	22	5	22	25	5	1	3	6	0	2
May	1010	34	24	36	22	89	61	5		128	12	9	23	28	12	3	3	1	1	20	2	4	8	20	4	23	29	6	1	3	7	0	7
June	1009	32	24	35	23	90	67	6		252	17	6	19	27	17	4	8	3	1	15	1	3	4	11	5	25	36	4	1	3	7	1	7
July	1009	31	24	34	23	91	73	6		413	24	6	16	23	15	8	13	6	3	10	1	3	3	7	6	46	26	6	2	3	8	1	7
August	1009	31	23	33	23	91	73	6		437	23	7	17	22	14	6	12	8	3	10	2	3	3	5	5	50	29	4	1	3	8	1	7
September	1009	31	23	33	23	92	72	6		333	22	10	25	21	12	5	10	5	2	10	3	3	4	5	7	37	36	5	0	3	7	1	6
October	1010	31	23	33	22	91	71	6		195	19	13	32	20	9	4	5	3	2	11	5	8	6	7	5	29	31	8	1	2	6	1	5
November	1011	31	23	33	21	90	68	6		138	14	22	35	18	6	1	2	1	4	11	8	15	8	8	4	31	28	7	1	3	5	0	3
December	1013	30	22	32	19	90	66	5		68	11	24	35	14	4	2	1	2	5	13	8	7	9	8	5	20	27	6	1	3	6	0	(6)
Means	1011	32	23	36*	18**	89	65	5	—	—	—	13	27	21	9	3	5	3	3	16	4	6	8	11	5	29	31	5	1	3	7	1	5
Totals	—	—	—	—	—	—	—	—	—	2067	159	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	5	46
Extreme values	—	—	—	38†	16††	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
No. of years' observations		46										16									16									30	30	20	20

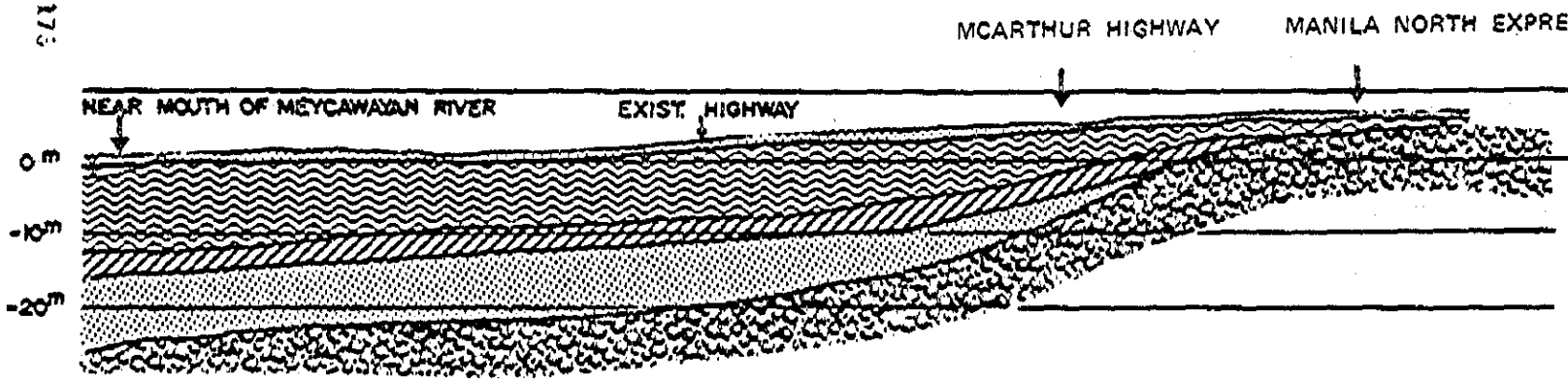
* Mean of highest each year.
** Mean of lowest each year.
† Highest recorded temperature.
†† Lowest recorded temperature.
(6) Rare.

Source:—M.O. data Bracknell.

Appendix I-86
Fig. IV-3-1 PROBABLE SOIL PROFILE (I)
SCALE: V= 1:1,000 H= 1:50,000



SECTION ① - ① MANILA-BATAAN COASTAL ROAD

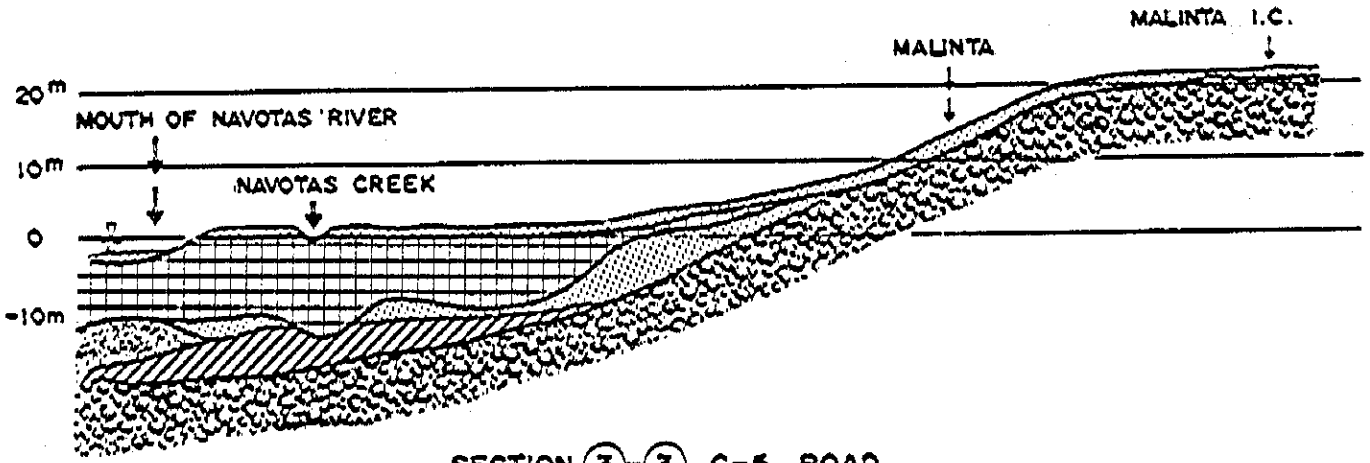


SECTION ② - ② C-5 ROAD

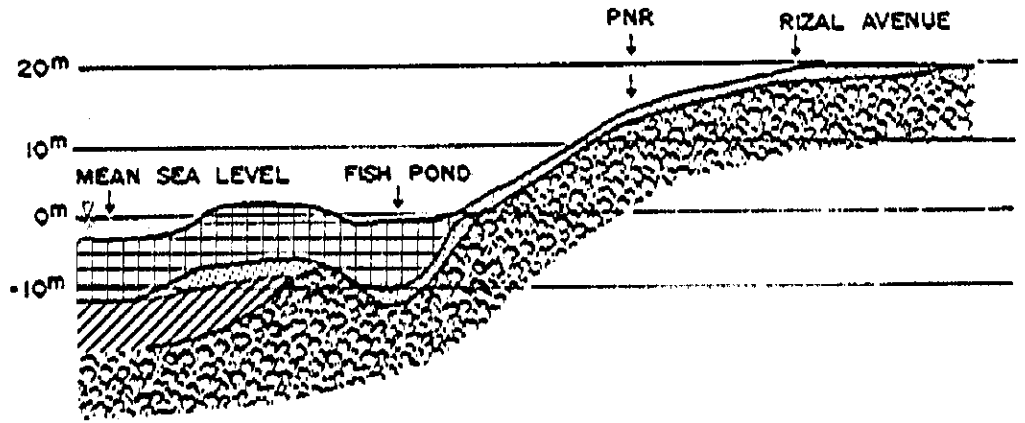
LEGEND:

SYMBOL	CLASSIFICATION	N-VALUE
	TOP SOIL	
	SILTY CLAY	N=0~3
	SANDY SILT	N=0~3
	SILTY SAND	N=20~30
	SEA SHELLS	N=3~5
	CLAY	N=5~20
	SAND	N=10~30
	TUFF	N≥ 50

Appendix I-87
Fig. IV-3-2 PROBABLE SOIL PROFILE (II)
SCALE : V = 1:1,000 H = 1:50,000



SECTION ③-③ C-5 ROAD



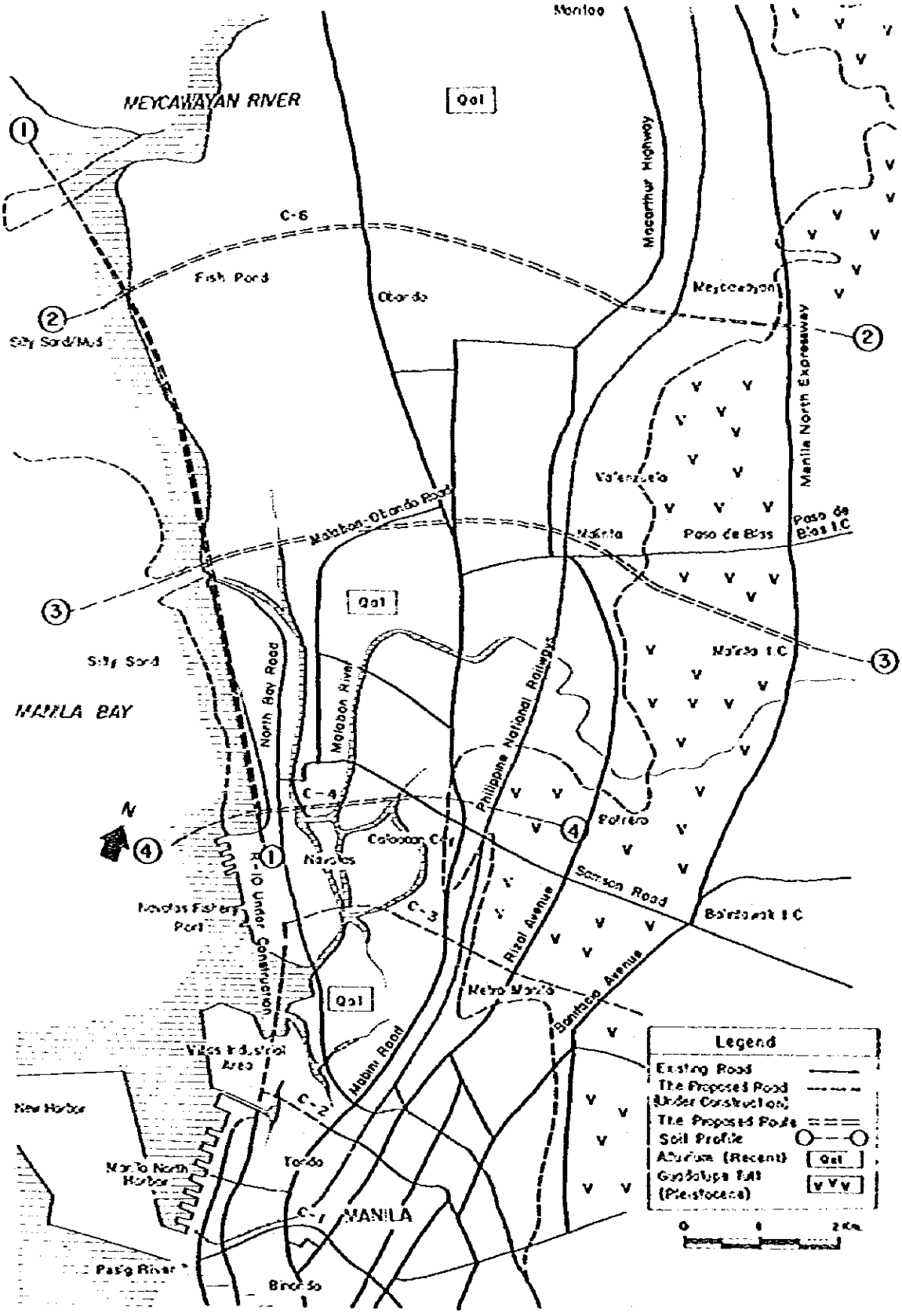
SECTION ④-④ C-4 ROAD

LEGEND:

SYMBOL	CLASSIFICATION	N-VALUE
	TOP SOIL	
	SILTY CLAY	N=0~3
	CLAY	N=5~20
	SILTY SAND	N=20~30
	TUFF	N ≧ 50
	SAND	N=10~30

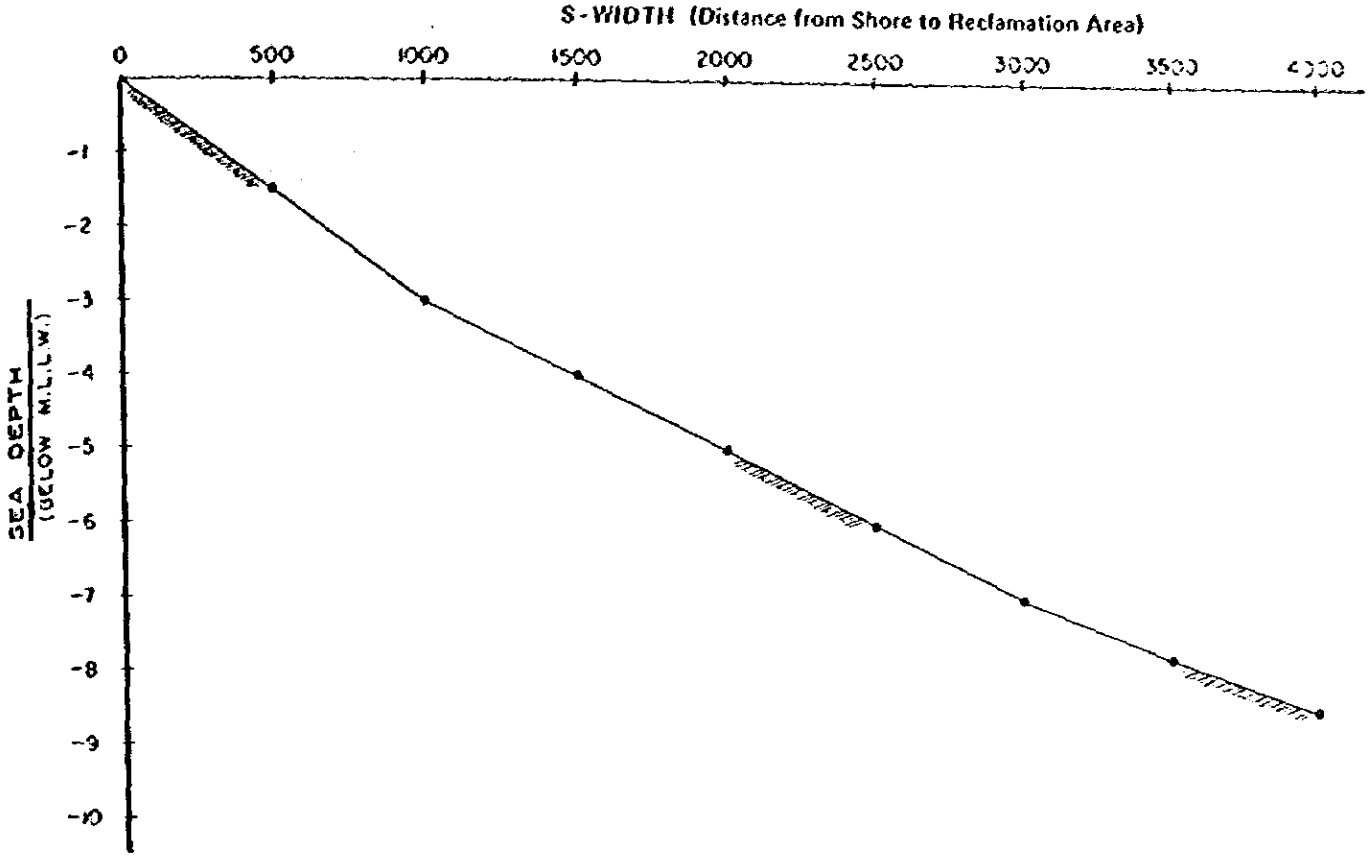
AP-177

Appendix 1-88
Fig. IV-3-3 GEOLOGICAL MAP SHOWING MANILA-BATAAN COASTAL ROAD AND C5 & C6 ROADS



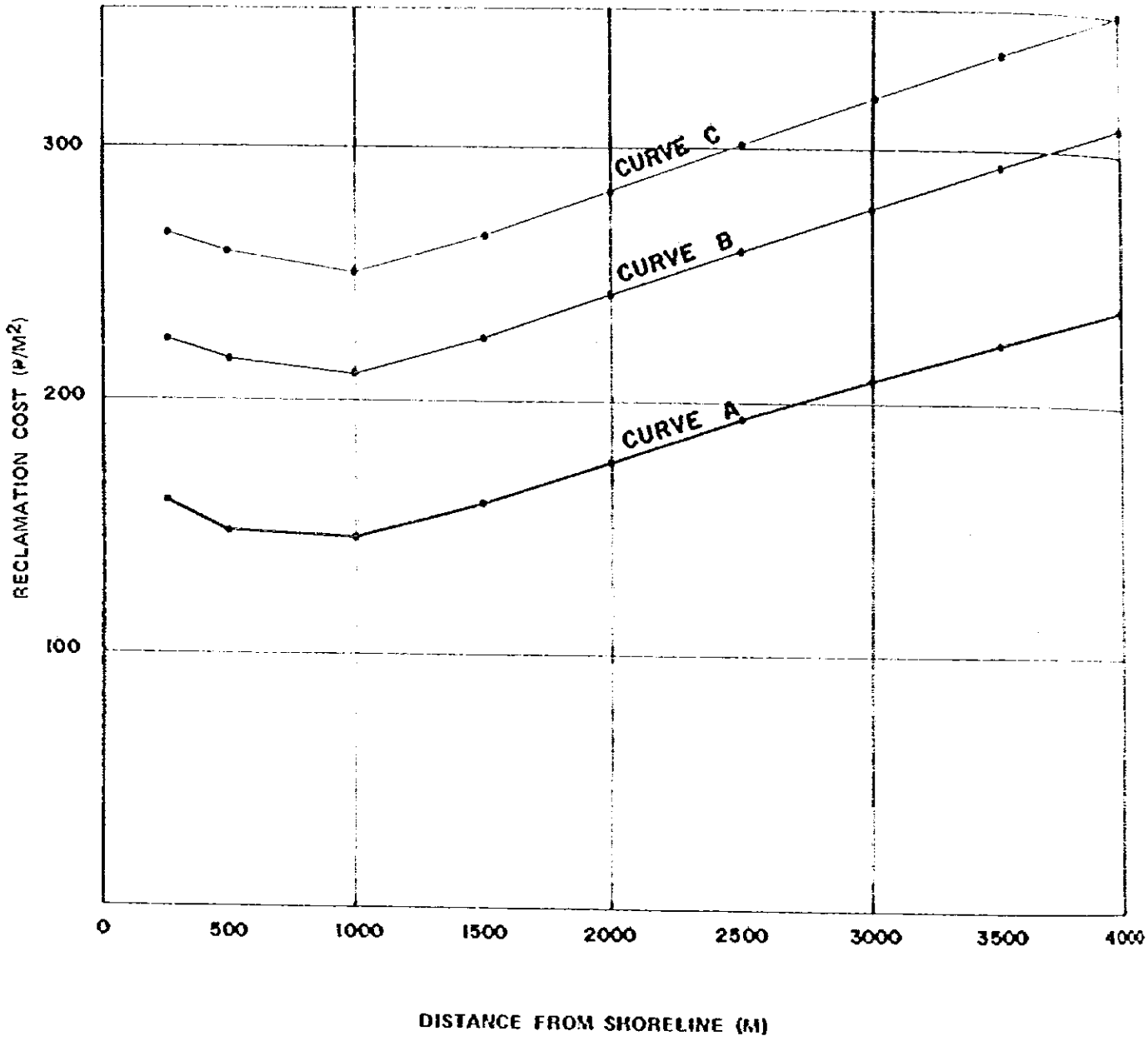
Appendix I-89

Fig. IV-3-4 RELATION OF S-WIDTH TO SEA DEPTH



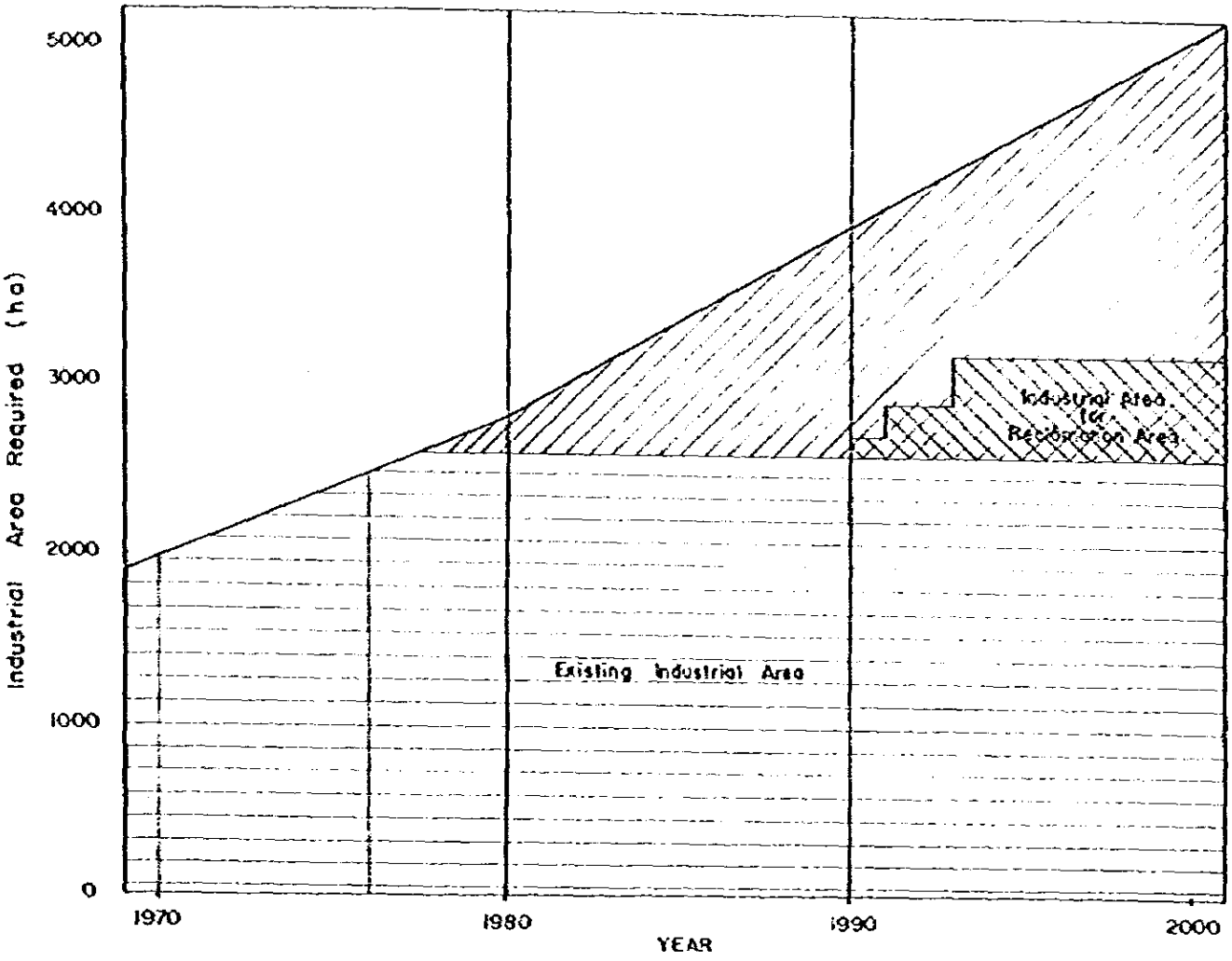
Appendix I-90

Fig. IV-3-5 RELATION OF S-WIDTH TO RECLAMATION COST



Note: Curve A = Zero soil improvement
" B = 30% soil improvement ratio
" C = 50% soil improvement ratio

Appendix I-91
Fig. IV-4-1 INDUSTRIAL LAND REQUIREMENT IN METRO MANILA



LEGEND:

- Existing Industrial Area
- Addition Area Requirement
- Reclamation Area Prepared
- 2000 Projected Year in this study

Appendix I-92
Table IV-5-1 ALLOCATED LAND IN THE RECLAMATION AREA BY SECTOR

Sector	Annual Requirement/Production	Capacity/ha	Levels of Allocation of Land Use		
			High (ha)	Low (na)	Medium[1/] (ha)
Industries					
Petroleum Storage	1,200,000 bbl	60,000 bbl	20[2/]	10[3/]	15
Steel Processing Industry, Construction	1,200,000 ton	2,500 ton	96[5/]	48[6/]	72
Steel Processing Industry, Machinery	230,000 ton	500 ton	115[4/]	46[6/]	81
Shipbuilding and Repairing Industries	120,000 gross ton	1,000 gross ton	60[3/]	30[4/]	45
Wood Industry	450,000 ton	5,900 ton	76[2/]	38[3/]	57
Commodities Distribution Center	(6,000 - 4,000 ton/day)	400 ton/day	15	10	13
Solid Waste Disposal	1,100,000 ton	-	-	-	150[7/]

1/ Average of high and low projection.
2/ 100% of total requirement/Production has been allocated in the reclamation area.
3/ 50% -- ditto --
4/ 25% -- ditto --
5/ 20% -- ditto --
6/ 10% -- ditto --
7/ See Table IV-2-28 for required area for each disposal block.

Appendix I-93
Table IV-5-2 PROJECTED ANNUAL REQUIREMENT/ PRODUCTION BY SECTOR, 1990

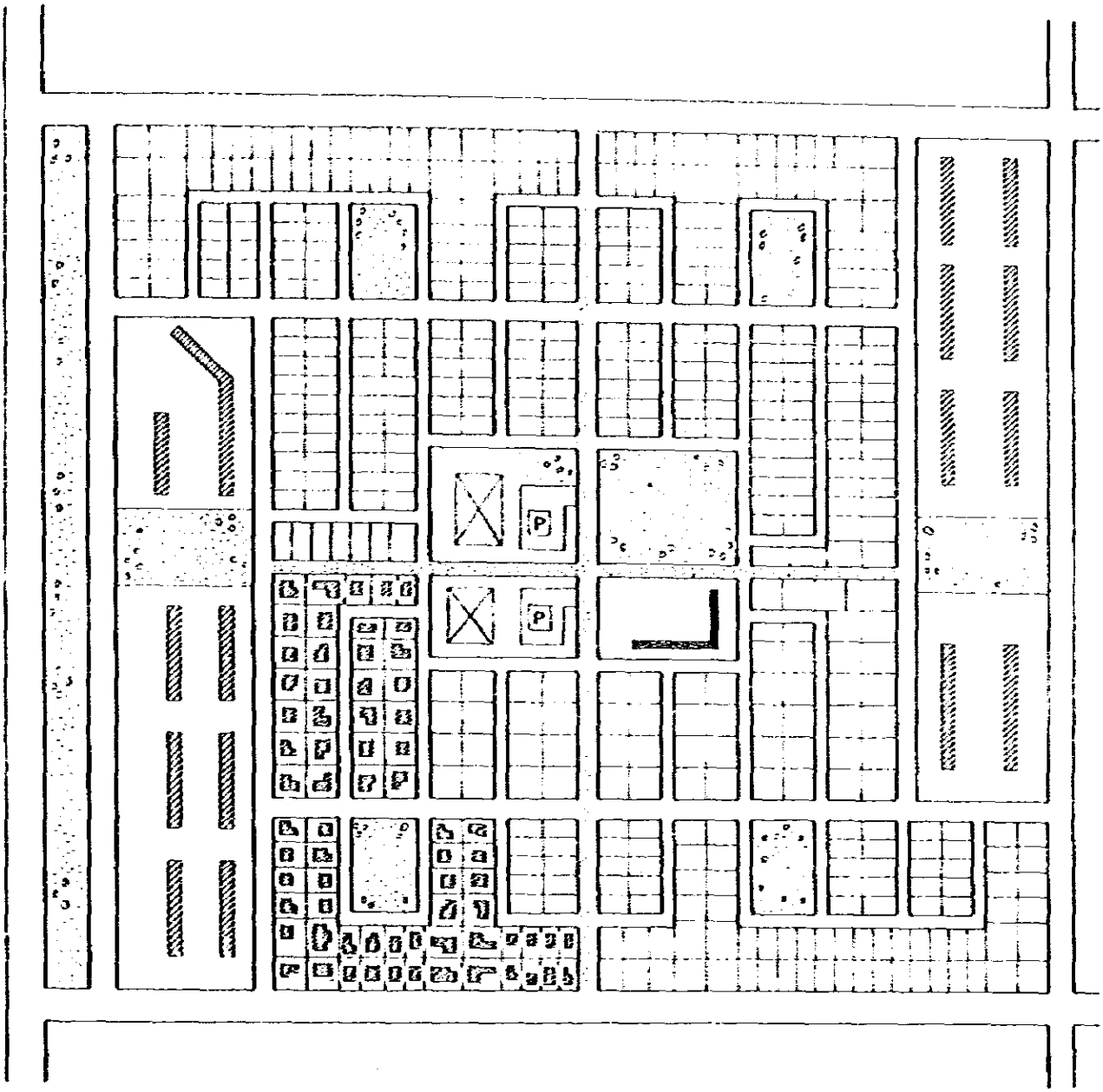
Sector	Unit	Projected Value	Remarks
Industries			
Petroleum Storage	barrel	1,200,000	Total of additional POL storage capacity required in Metro Manila
Steel Processing Industry, Construction	ton	1,200,000	Total consumption in Metro Manila and the rest of Luzon
Steel Processing Industry, Machinery	ton	230,000	Same as above
Shipbuilding and Repairing Industries	gross ton	68,000	Total fleet build-up in the Philippines except for ocean-going fleet
Wood Industry	ton	450,000	Total export tonnage through Manila International Port
Commodities Distribution Center	ton	6,000-4,000/day	Total volume of commodities to be handled by one distribution center
Solid Waste Disposal	ton	1,100,000	Total solid waste disposal in Metro Manila

Appendix I-94
Table IV-5-3 LAND USE ALLOCATION

Land Use	Alternative I High		Alternative II Low		Alternative III Medium	
	Area	%	Area	%	Area	%
Industrial Area						
Petroleum Storage	20	2.3	10	1.1	15	1.7
Steel Processing Industry, Construction	96	10.8	48	5.4	72	8.1
Steel Processing Industry, Machinery	115	12.9	46	5.2	81	9.1
Shipbuilding and Repairing Industry	60	6.8	30	3.4	45	5.1
Wood Industry	101	11.3	51	5.8	76	8.5
Other Light Industry	140	15.7	108	12.1	120	13.5
Commodities Distribution Center	15	1.7	10	1.1	13	1.5
Park[1]	141	15.9	250	28.1	185	20.8
(Recreational Field)	(15)	(1.7)	(40)	(4.5)	(30)	(3.4)
Residential Area	52	5.8	150	16.8	104	11.7
Town Center and Institutional Area	10	1.1	30	3.4	22	2.4
Utility Area	20	2.2	27	3.0	27	3.0
Road	120	13.5	130	14.6	130	14.6
Total	890	100.0	890	100.0	890	100.0

Note : 1) Park includes also recreational field.

Appendix I-95
Fig. IV-5-1 TYPICAL RESIDENTIAL AREA



LEGEND:

- Park
- High Rise Apartment
- House
- Neighborhood Center
- School
- Parking
- Foot Path

Appendix I-96
Fig. IV-5-2 GENERAL LAYOUT OF PROCESSING FACTORY

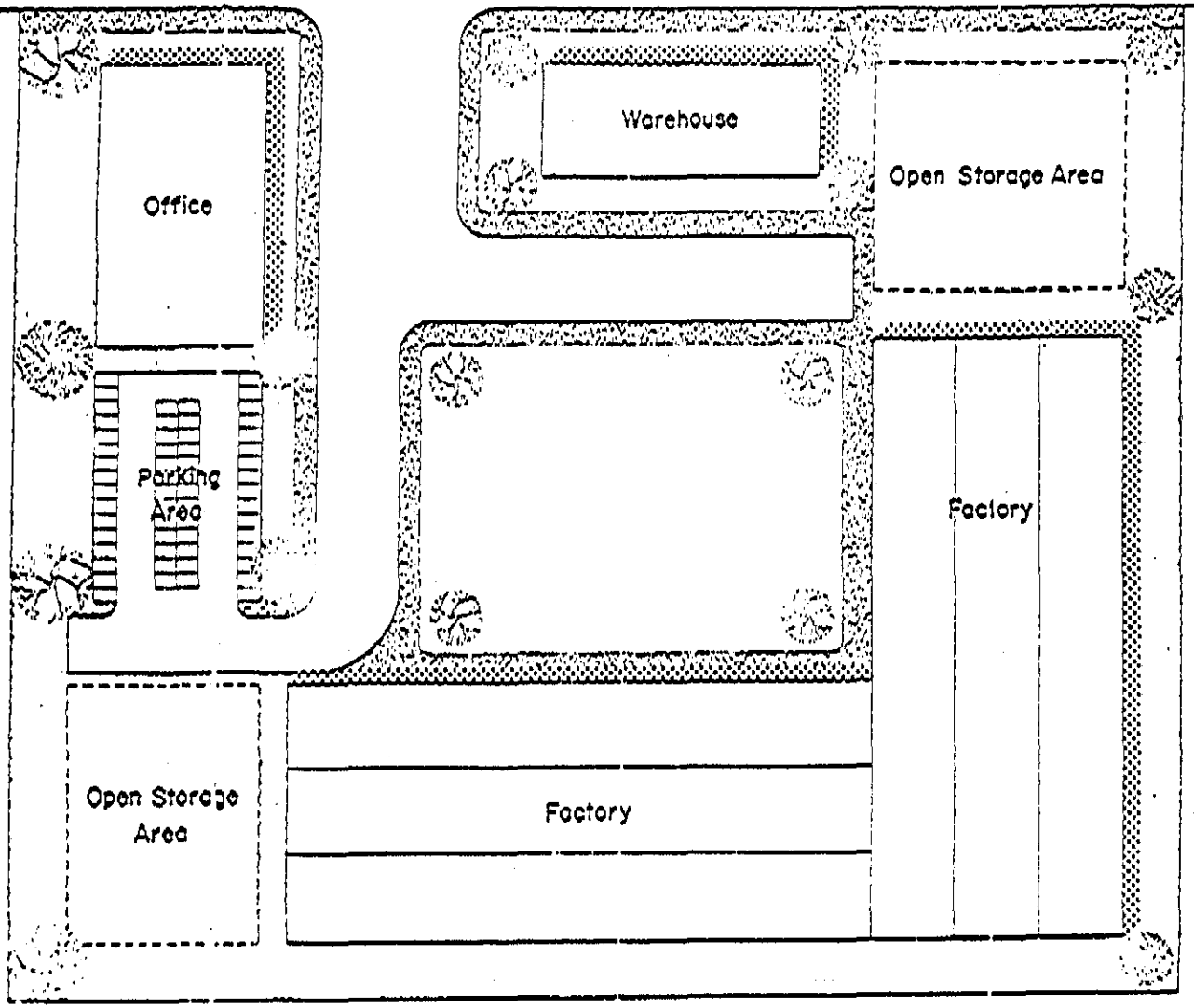
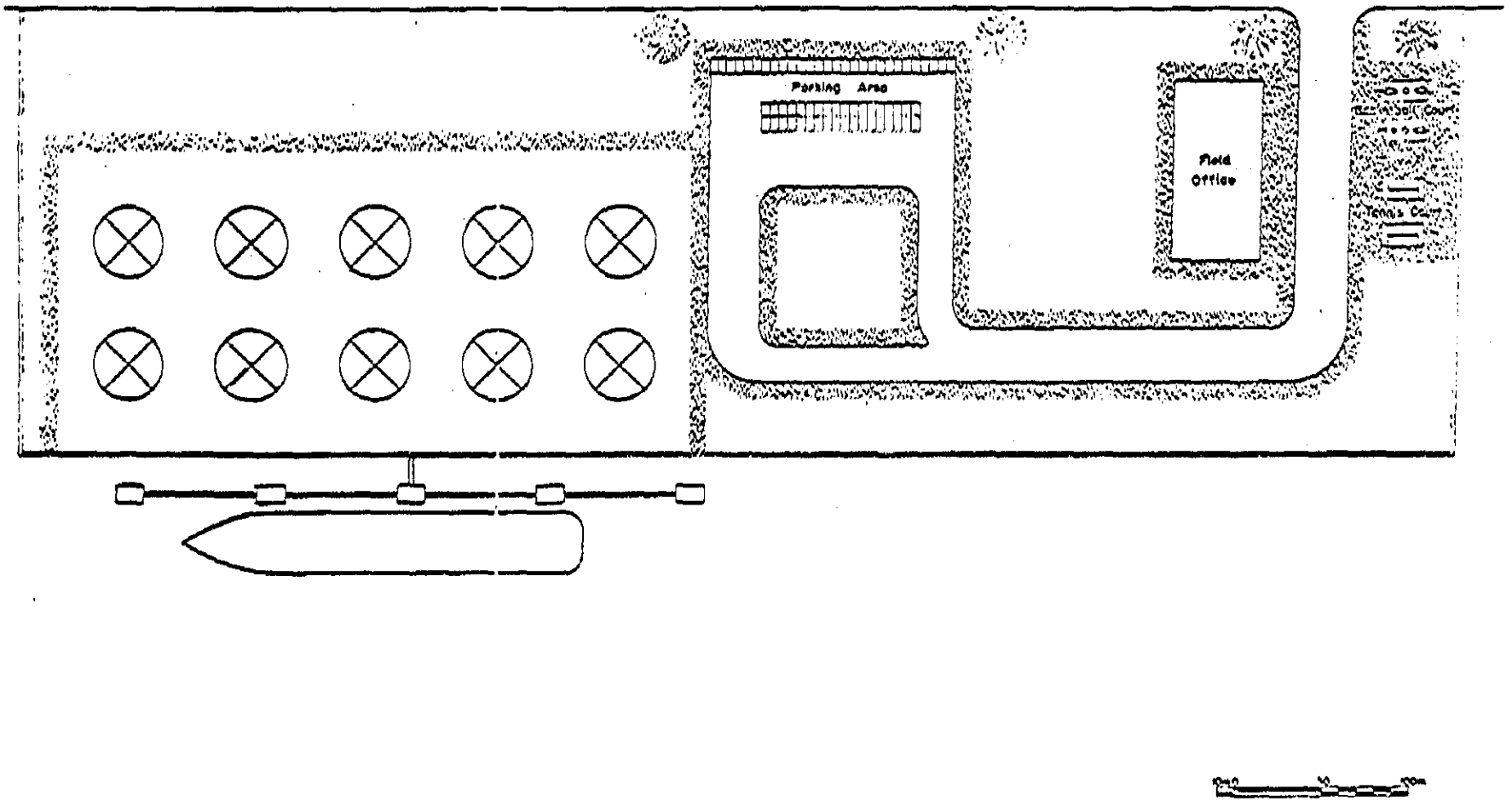
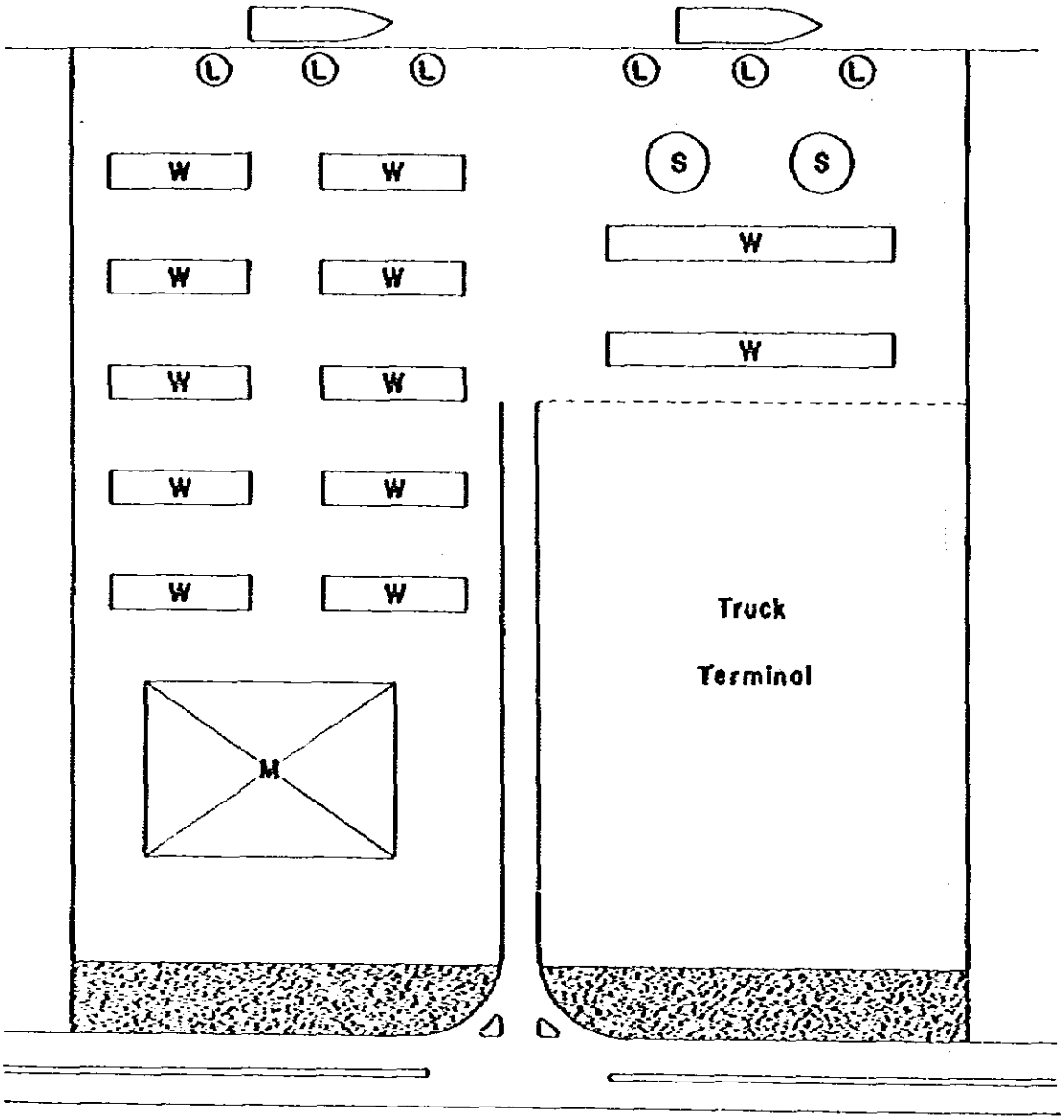


Fig. IV-5-3 GENERAL LAYOUT OF OIL TANK FARM AREA



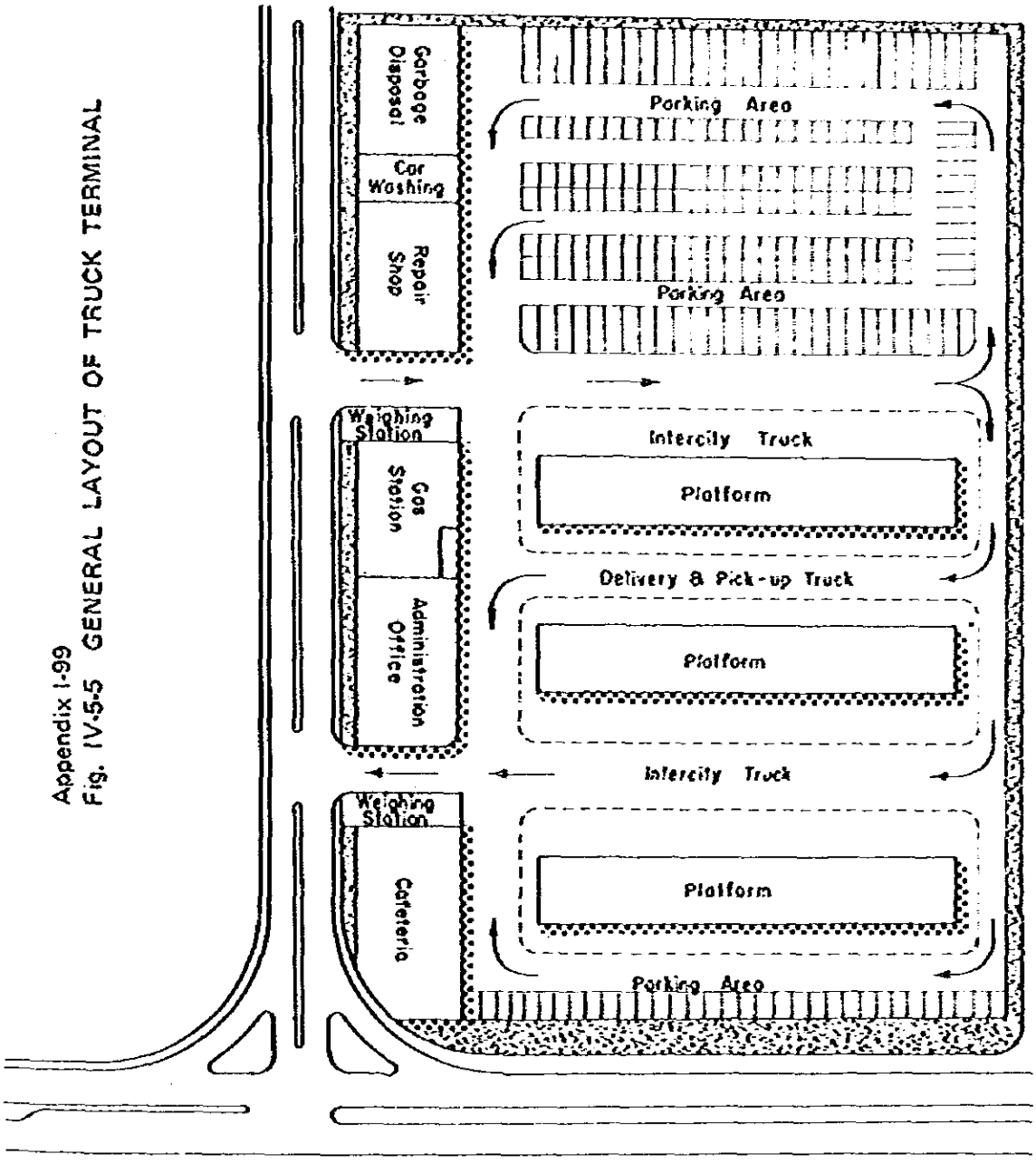
Appendix I-98
Fig. IV-5-4 COMMODITIES DISTRIBUTION CENTER



LEGEND:

M Market
S Silos
W Warehouse
L Water Transport Landing

Appendix I-99
Fig. IV-5-5 GENERAL LAYOUT OF TRUCK TERMINAL



Appendix I-100
Fig. IV-5-6 GENERAL DESIGN OF COMMUNITY PARK

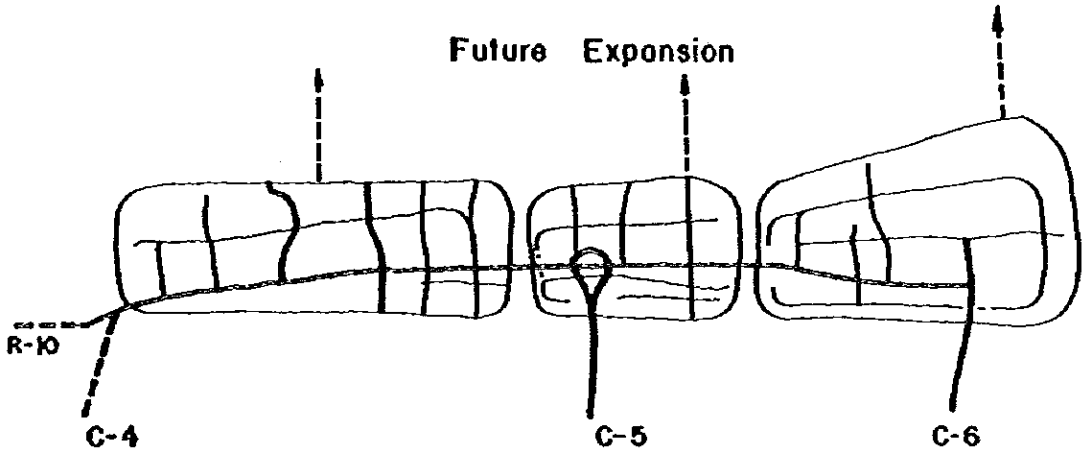
Appendix I-101
Fig. IV-5-7 ROAD NETWORK ALTERNATIVES

LEGEND:

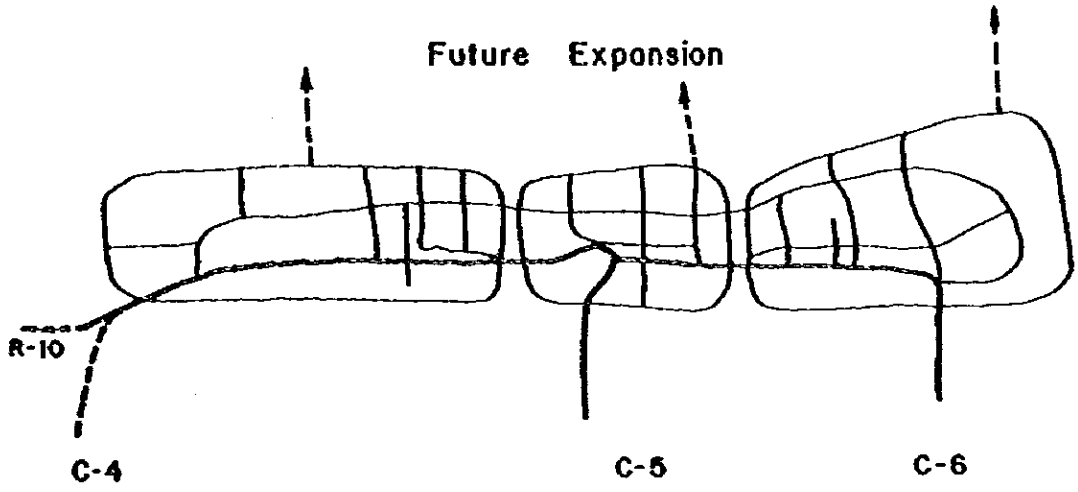
Major Thoroughfare ——

Secondary Road ——

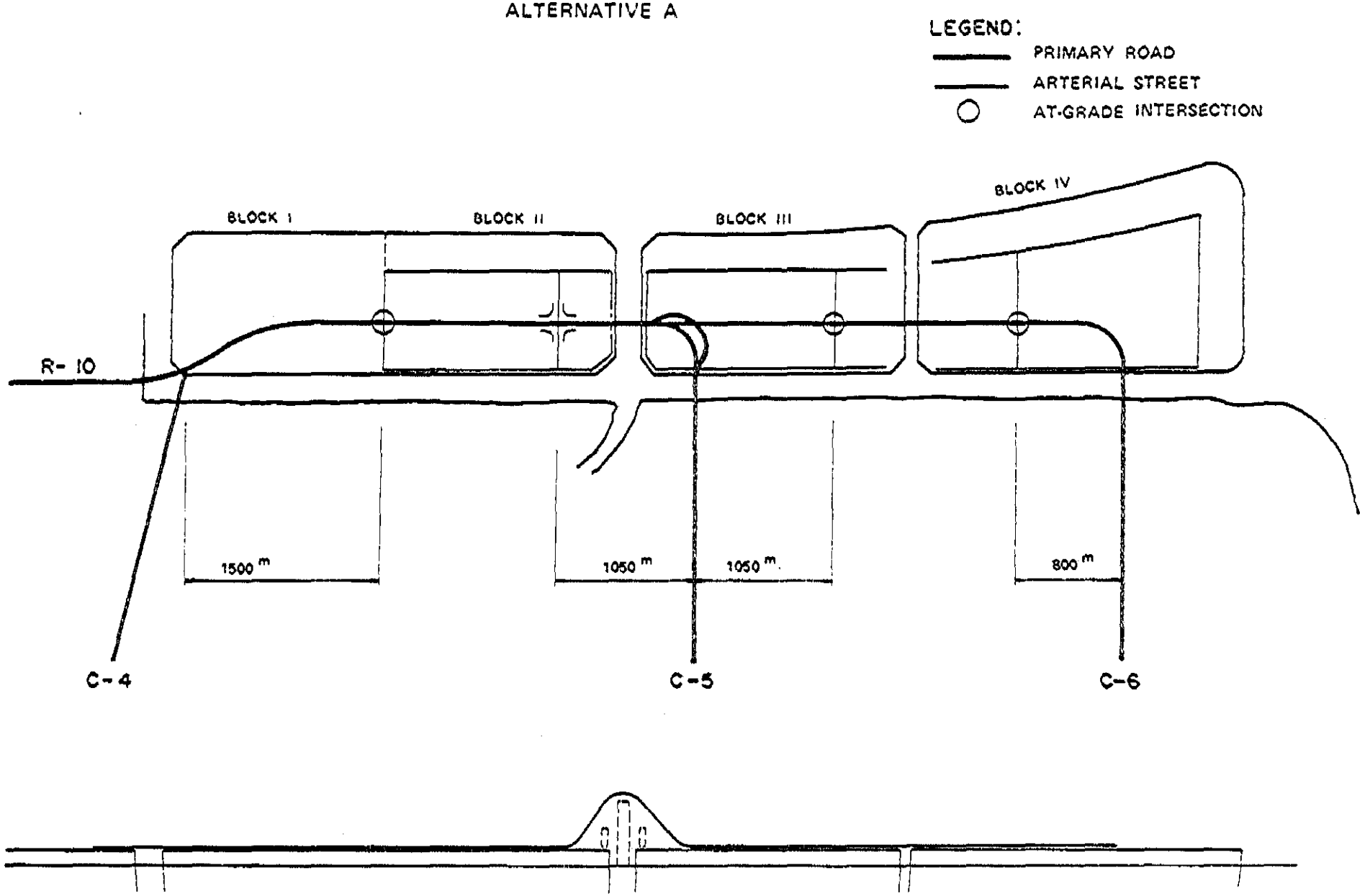
Alternative I



Alternative II

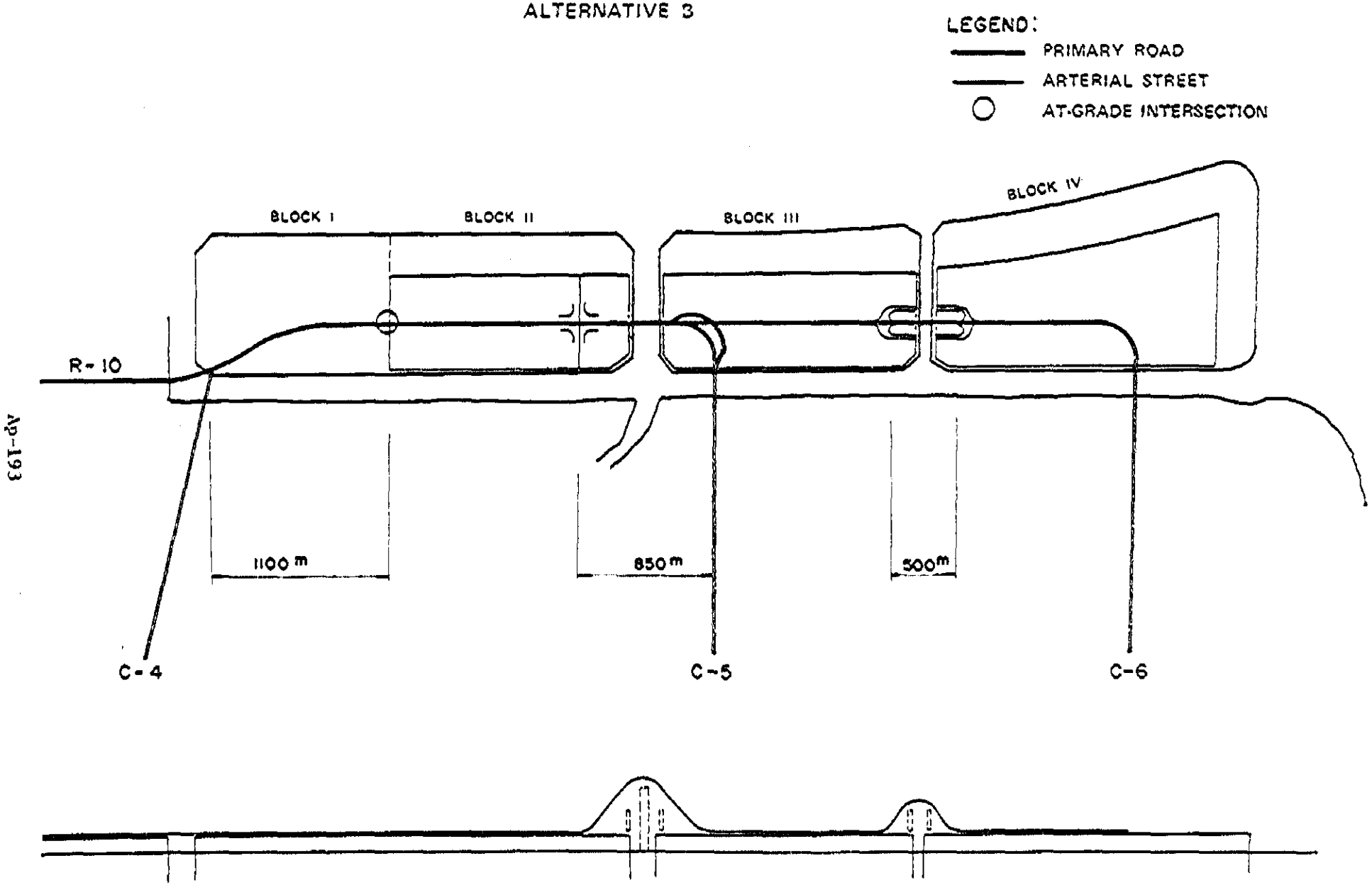


Appendix I-102
Fig. IV-5-8 LOCATION OF MAJOR ROAD JUNCTIONS
ALTERNATIVE A

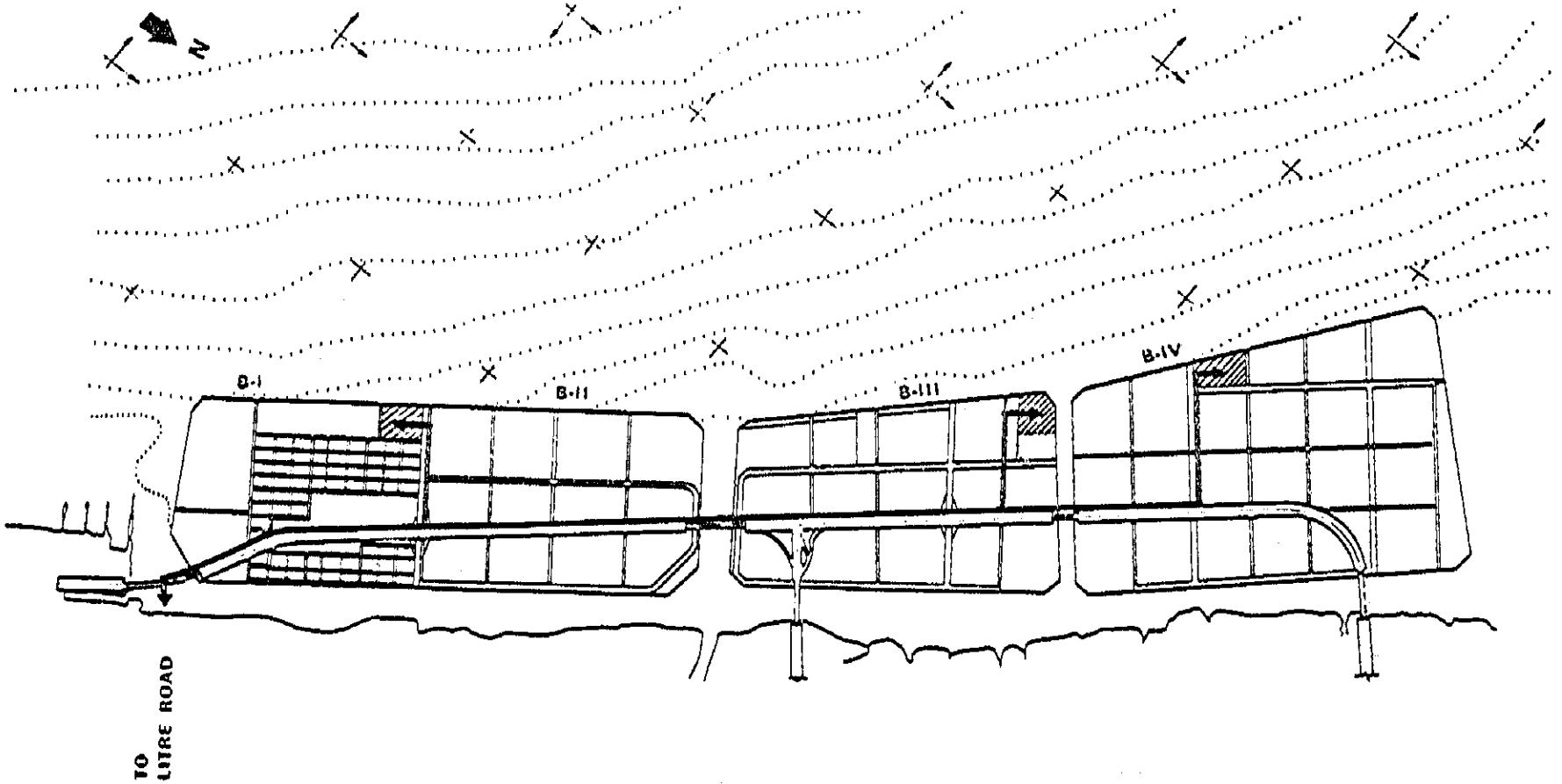


Appendix I-103

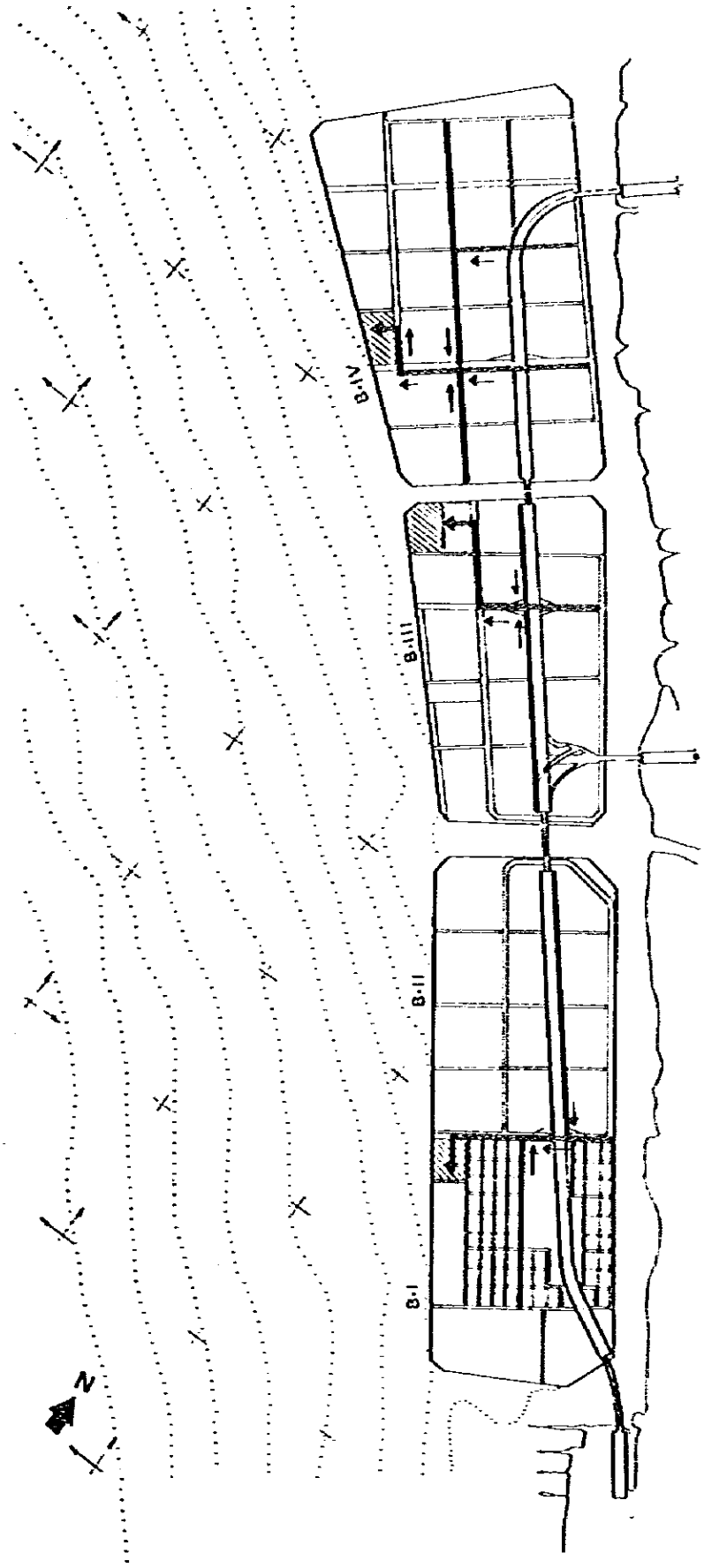
Fig. IV-5-9 LOCATION OF MAJOR ROAD JUNCTIONS
ALTERNATIVE 3



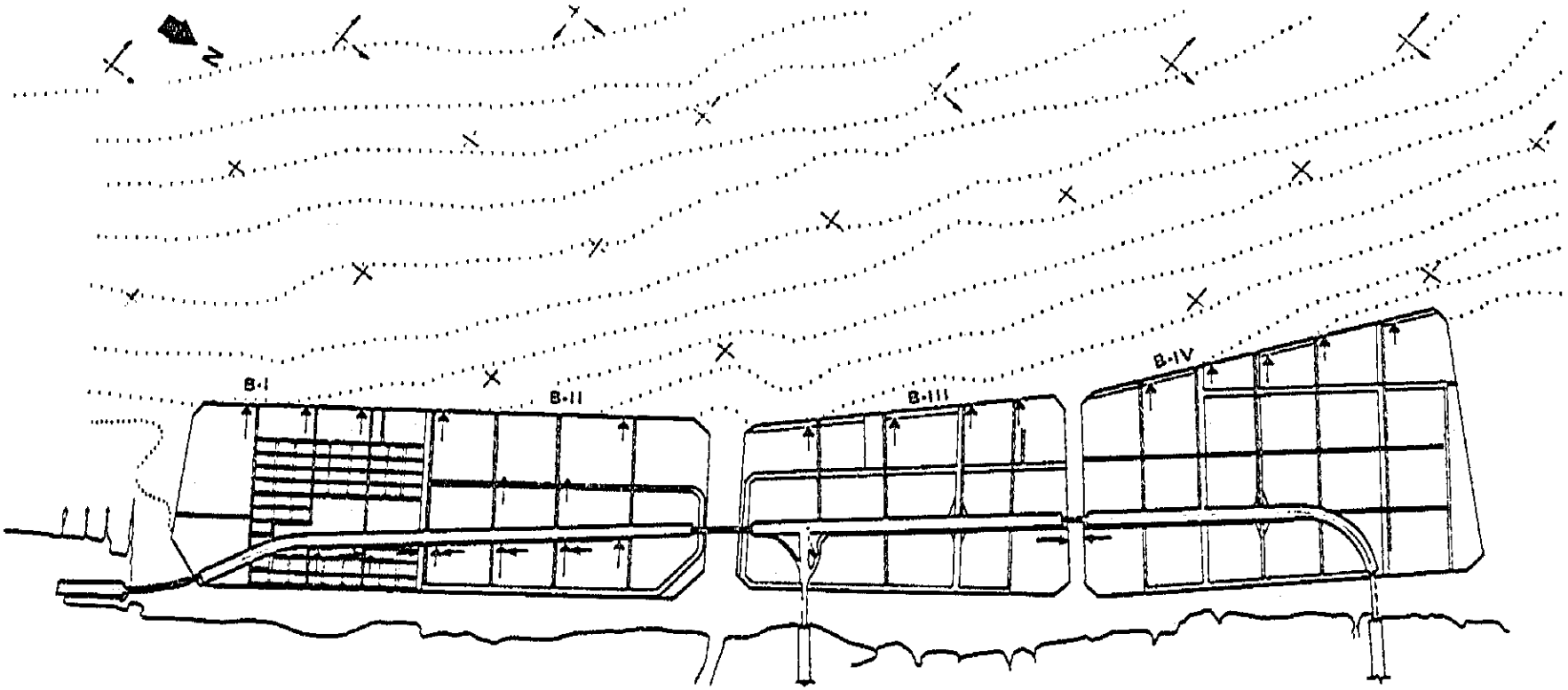
Appendix I-104
Fig. IV-5-10 WATER SUPPLY SYSTEM



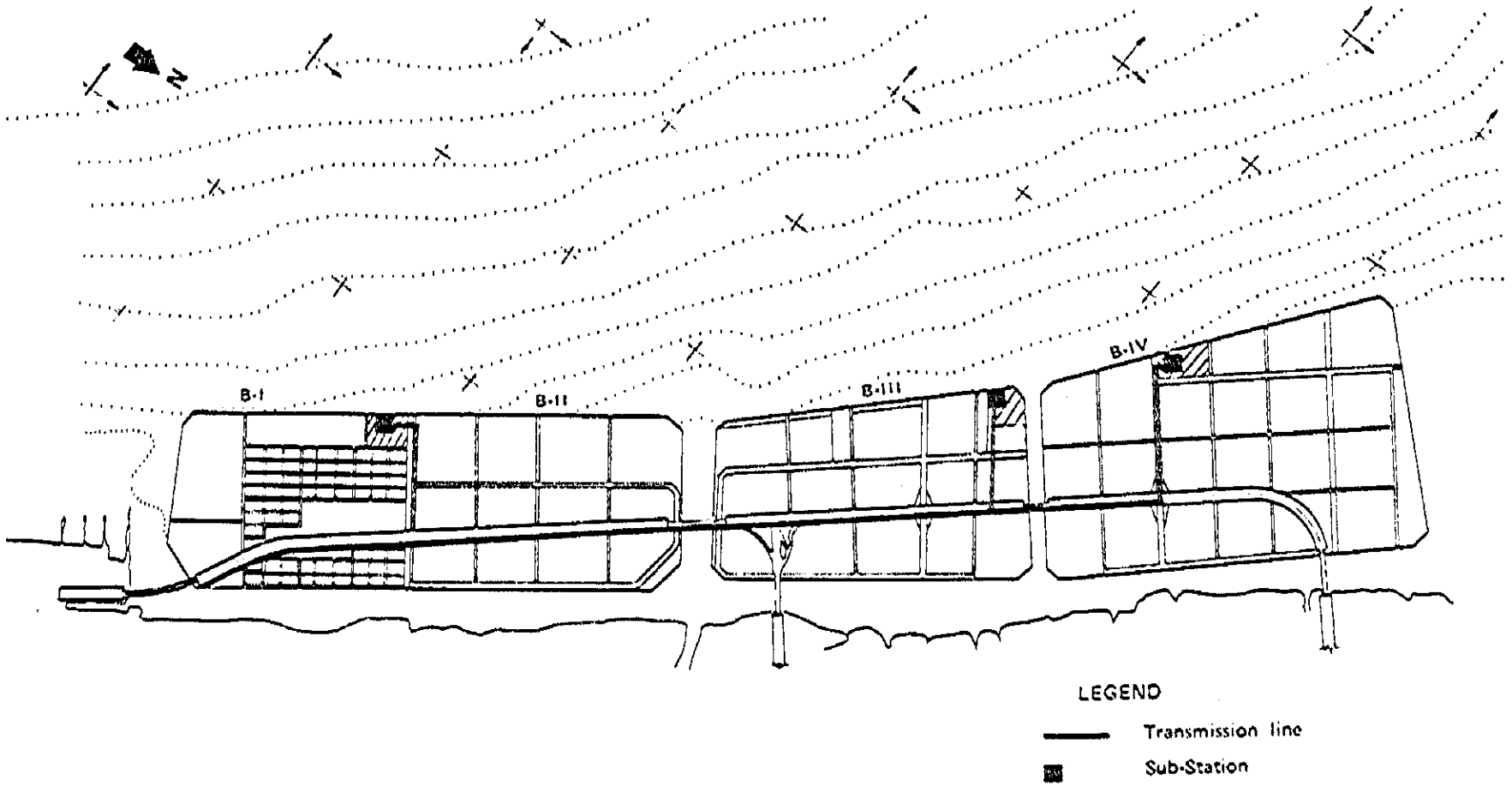
Appendix I-105
Fig. IV-5-11 SEWAGE SYSTEM



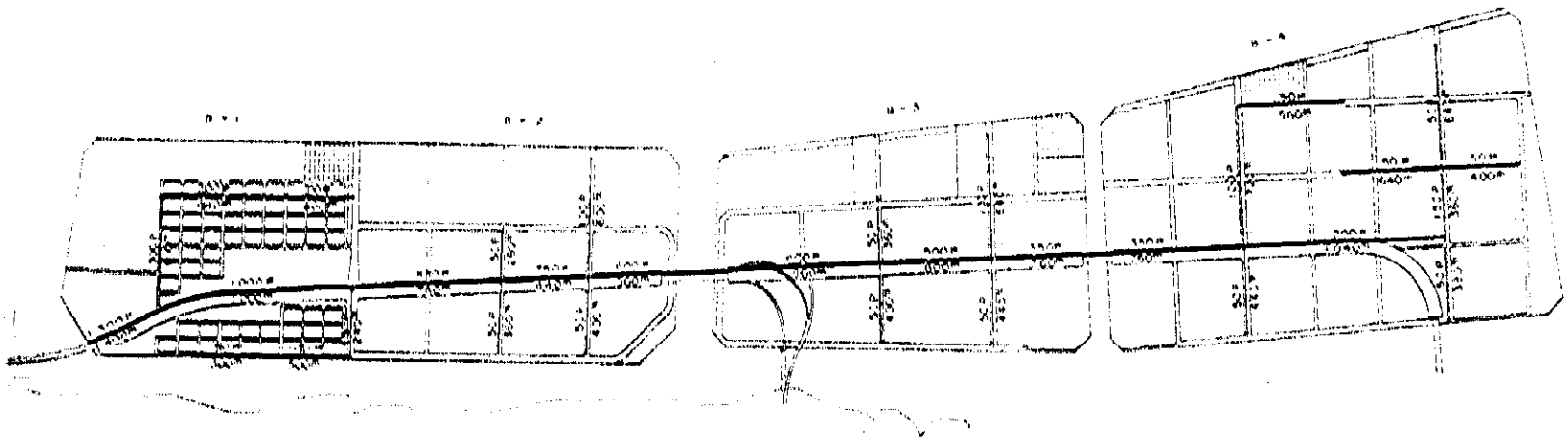
Appendix I-106
Fig. IV-5-12 STORM DRAINAGE SYSTEM



Appendix I-107
Fig. IV-5-13 ELECTRIC POWER DISTRIBUTION SYSTEM



Appendix I-108
Fig. IV-5-14 TELECOMMUNICATION SYSTEM



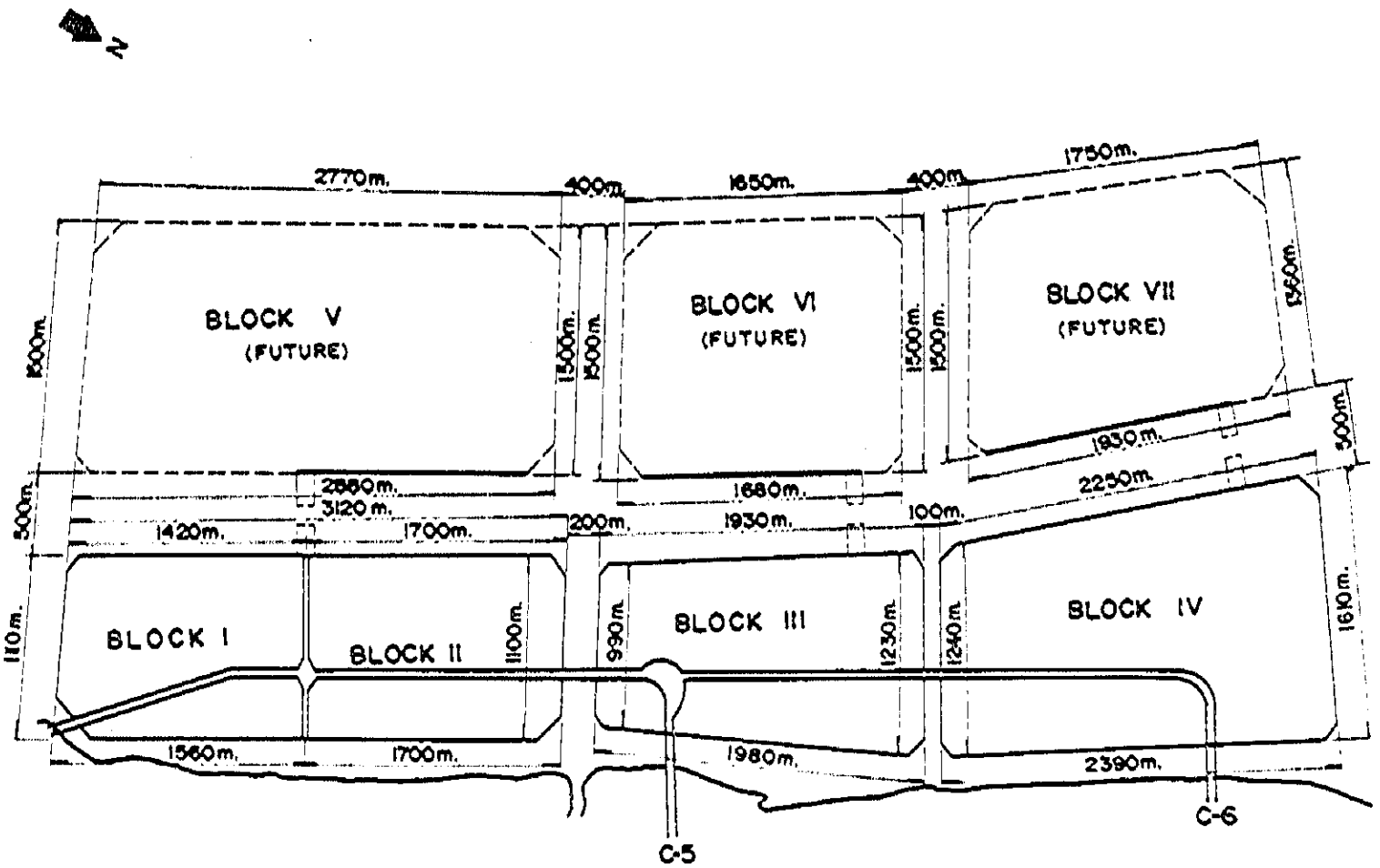
LEGEND

MAIN CABLE IN UNDERGROUND DUCT

SHIFTING POINT

OVERHEAD LINE

Appendix I-109
Fig. IV-6-1 LAND FORM OF RECLAIMED AREA



Appendix I-110
Fig. IV-6-2 LOCATION OF BOREHOLES

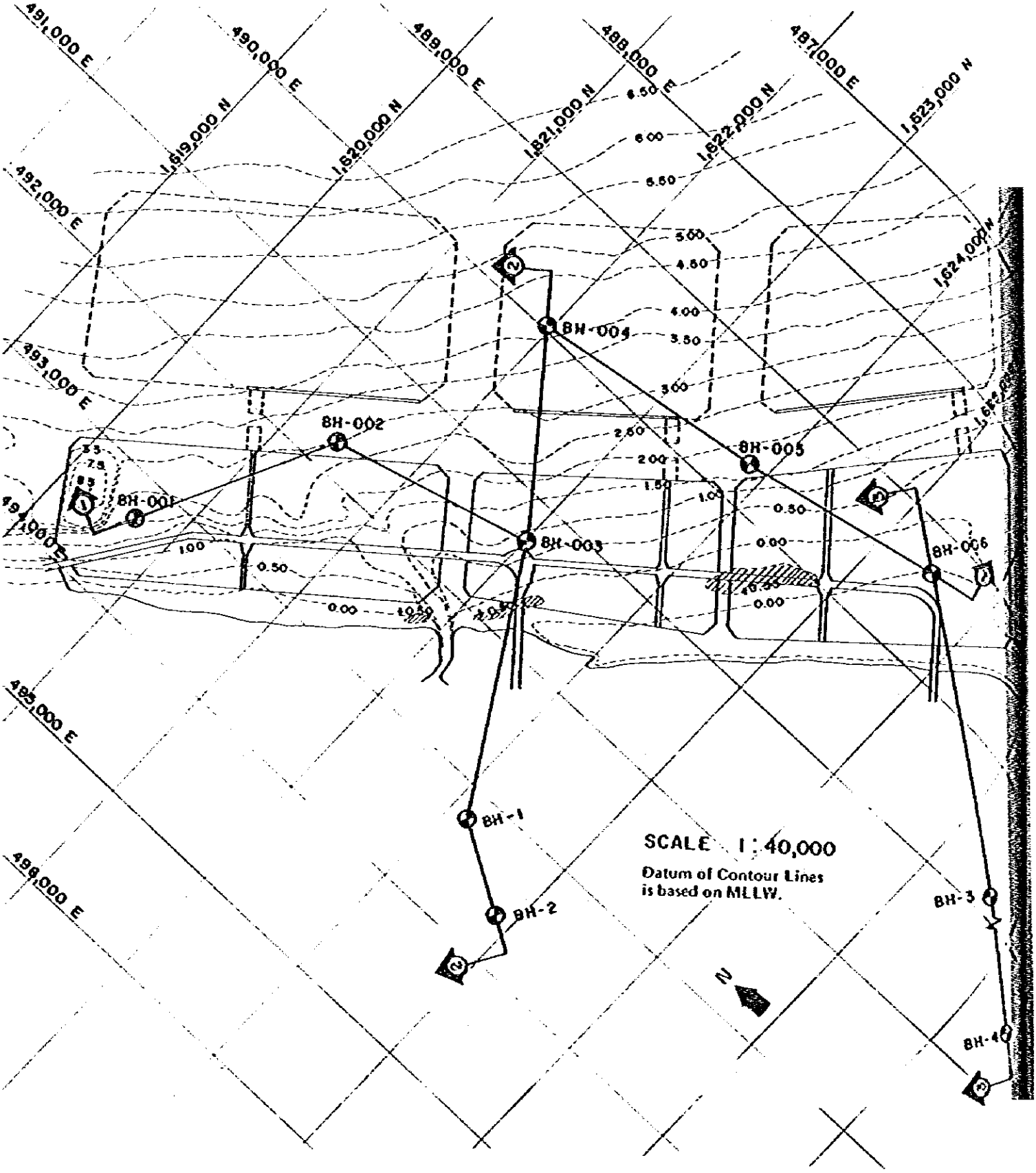
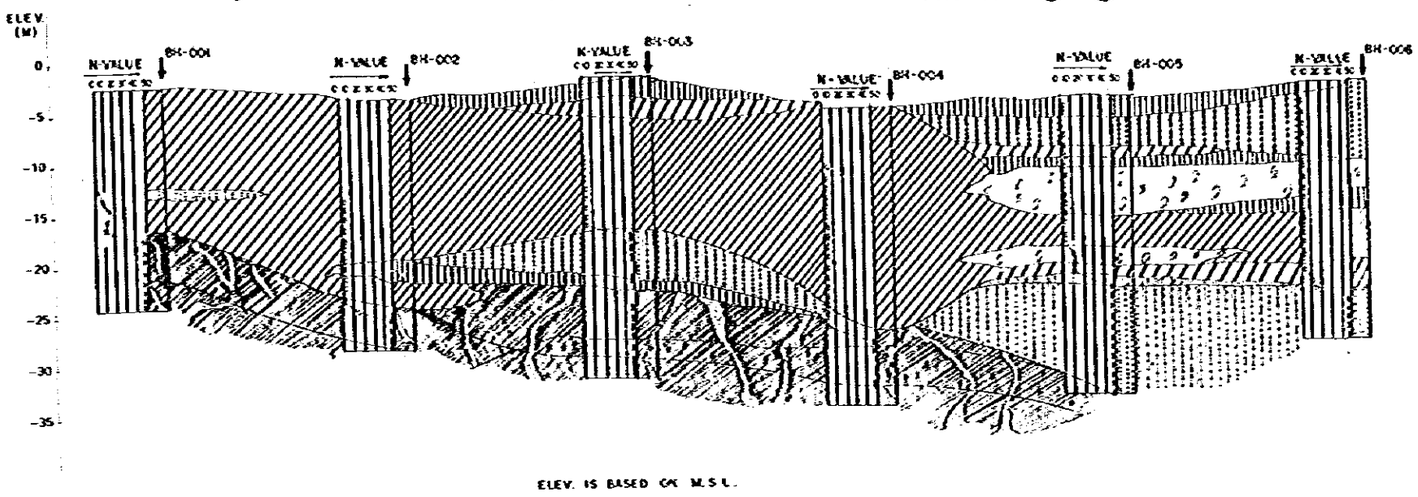
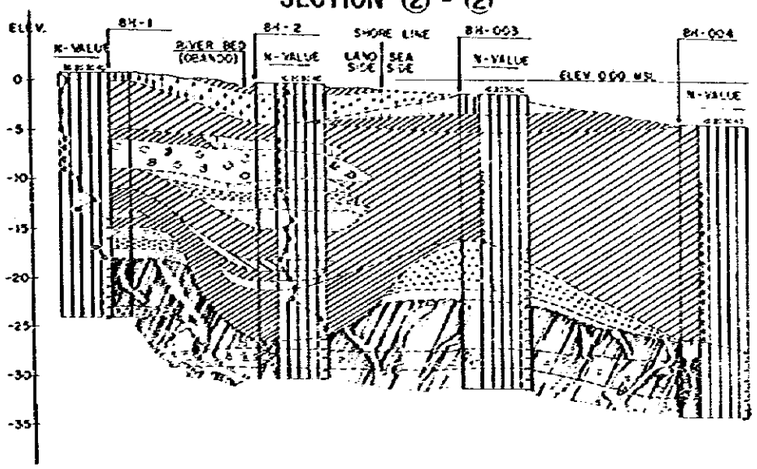


Fig. IV-6-4 SOIL PROFILES

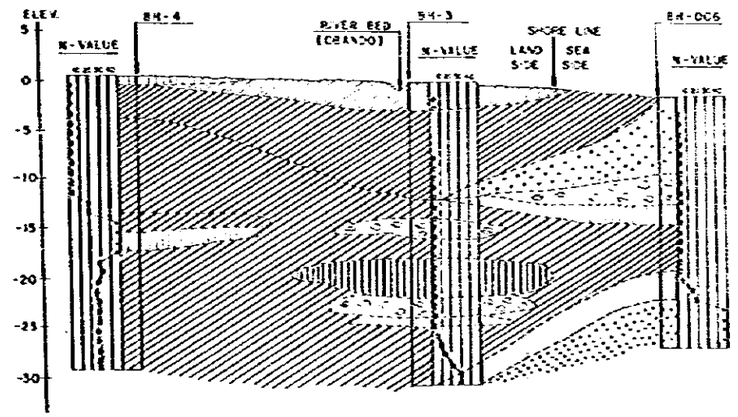
SECTION ① - ①



SECTION ② - ②



SECTION ③ - ③



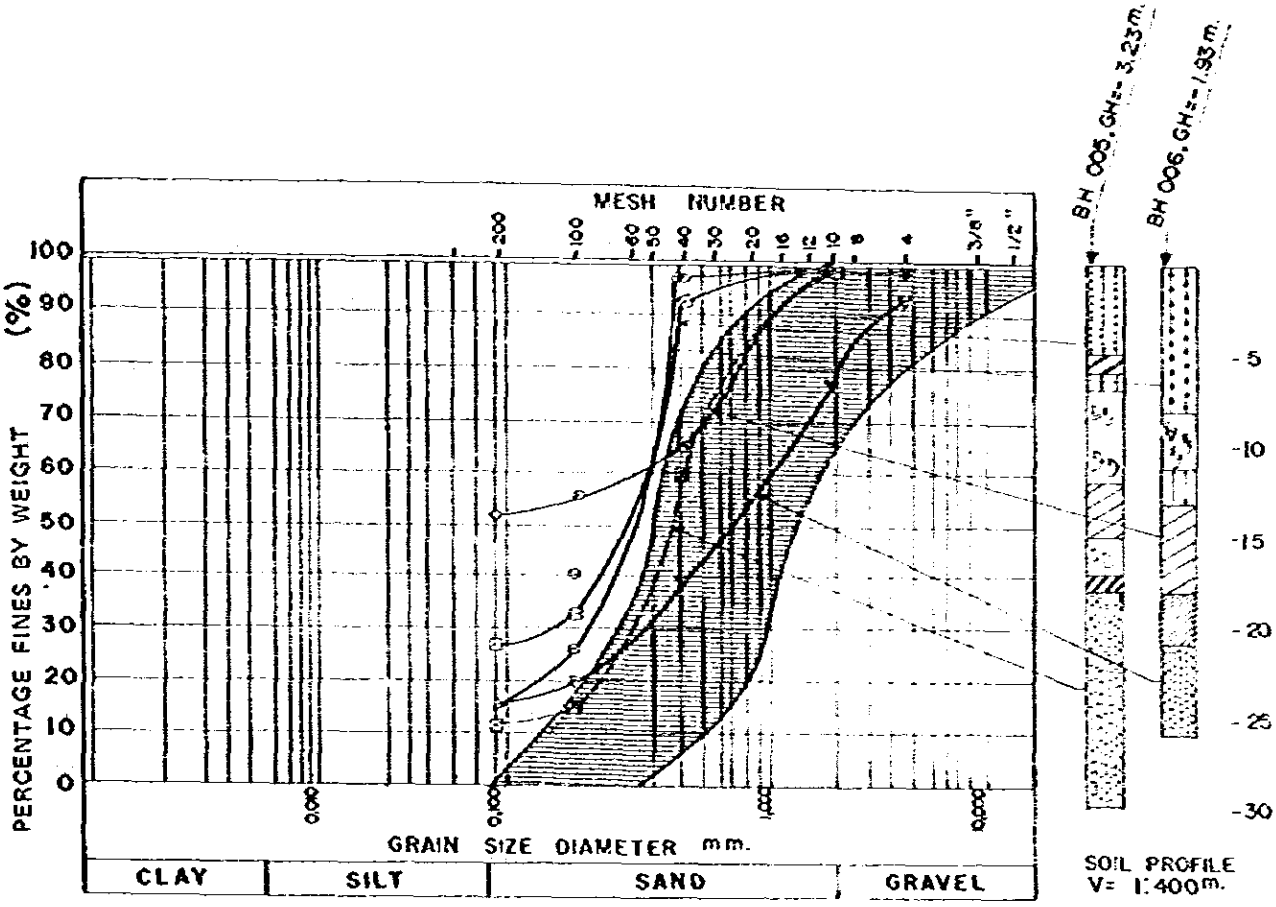
LEGEND:

- CLAY
- SILT (SANDY, CLAYEY)
- SILTY FINE SAND
- COMPACTED SANDY SILT
- COMPACTED SILTY FINE SAND
- CLAY (SANDY & SILTY)
- SEASHELLS
- SHALY TUFF
- TUFFACEOUS SANDY SHALE
- TUFFACEOUS SHALY

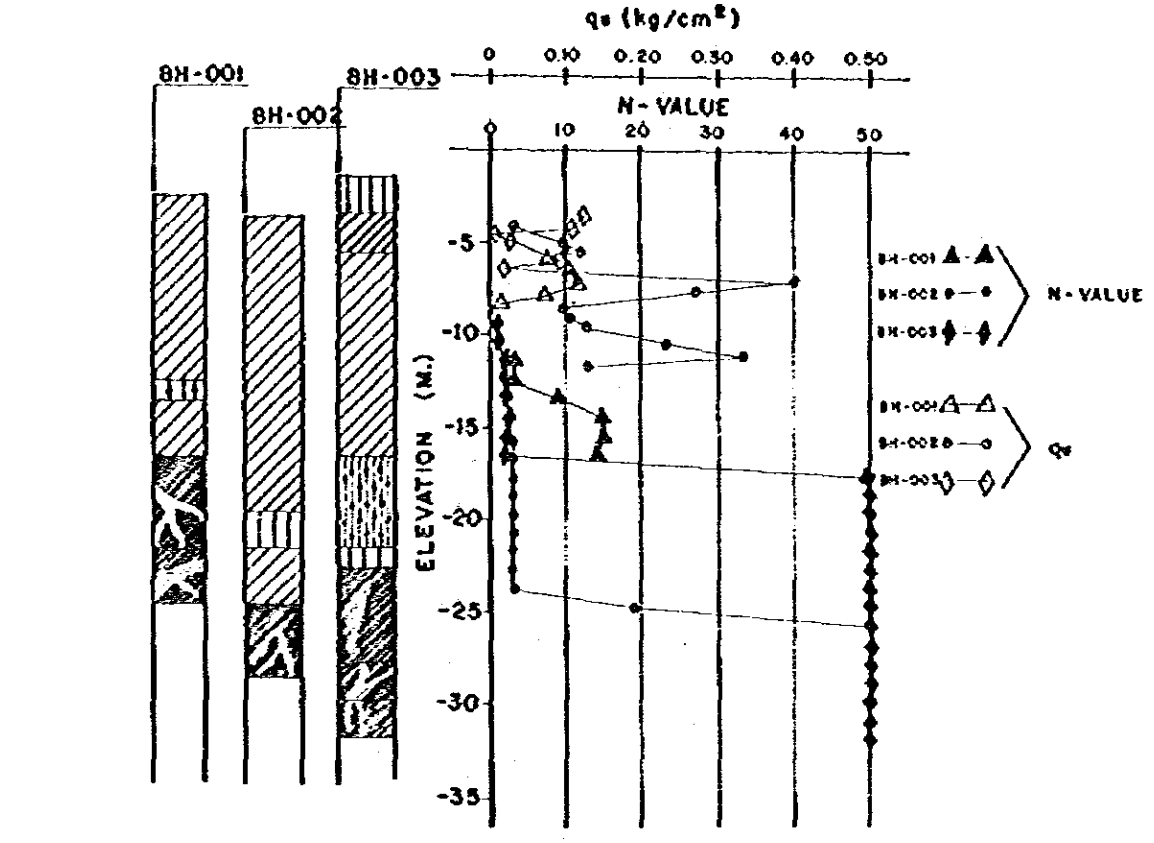
N-VALUE - Value obtained from standard penetration test (SPT)

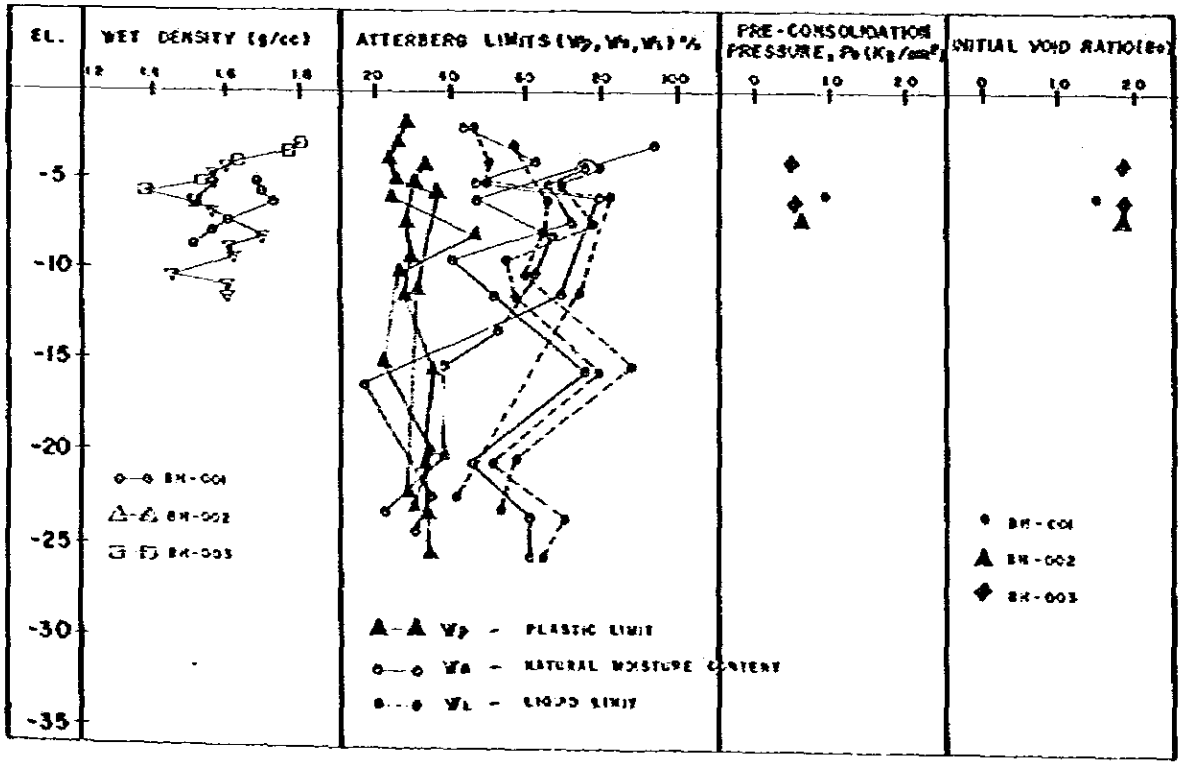
SCALE: V 1:400
H 1:40,000

Appendix 1-112
Fig. IV-6-4 SIEVE ANALYSIS OF BORROW PIT SOIL

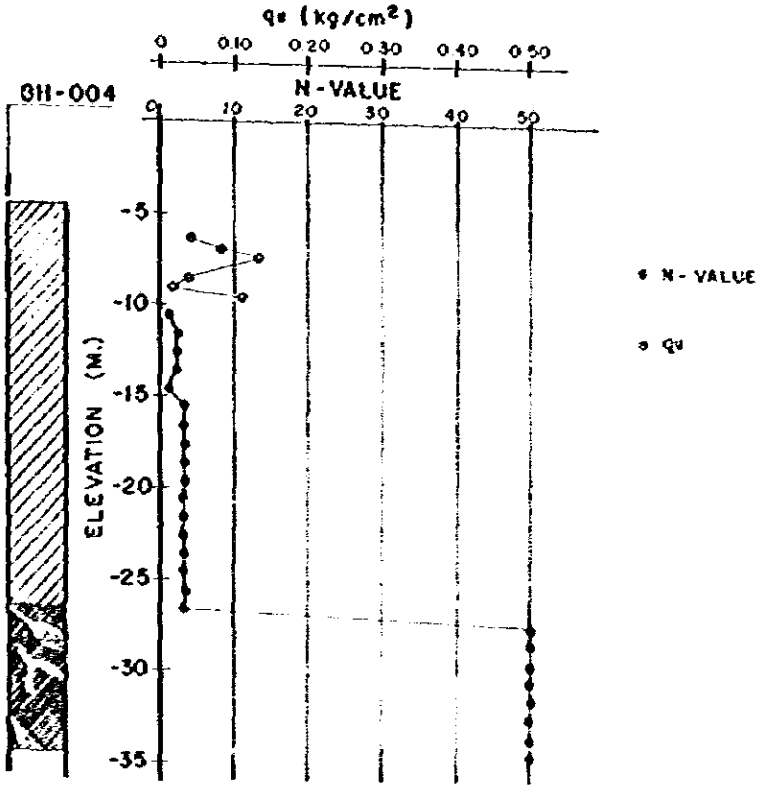


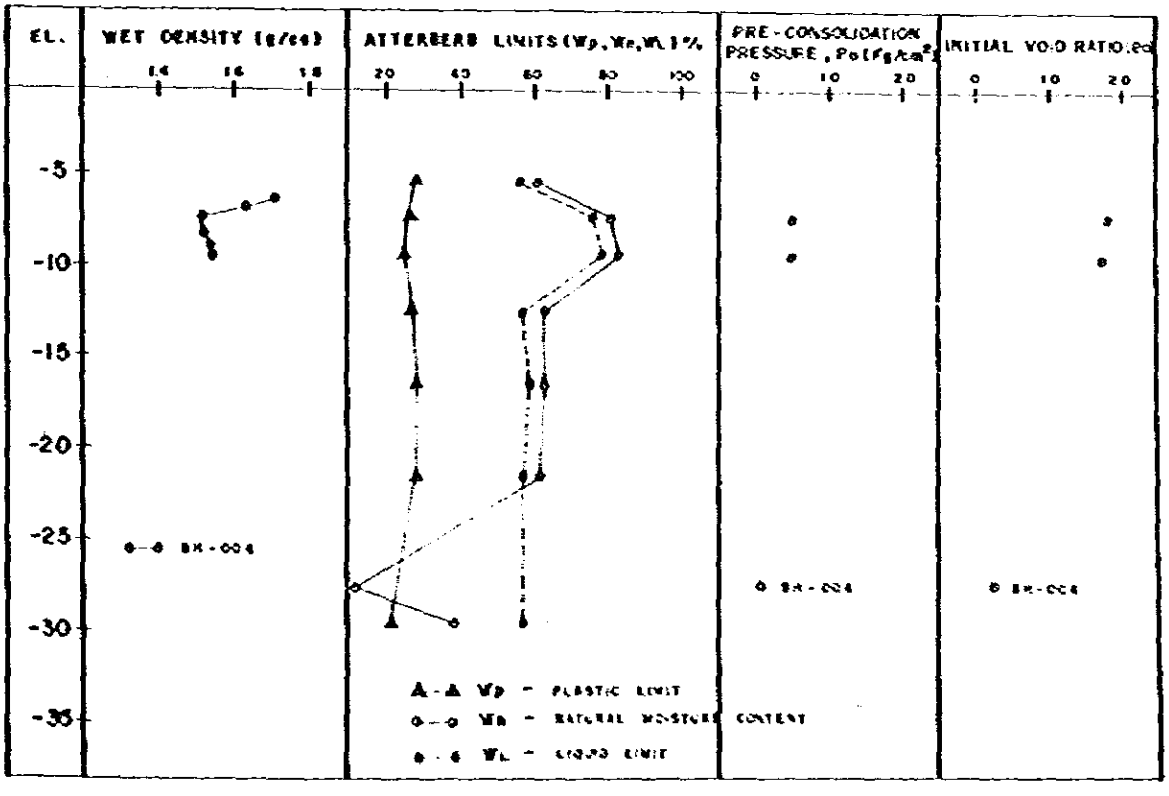
Appendix I-113
Fig. IV-6-5 SOIL PROPERTIES



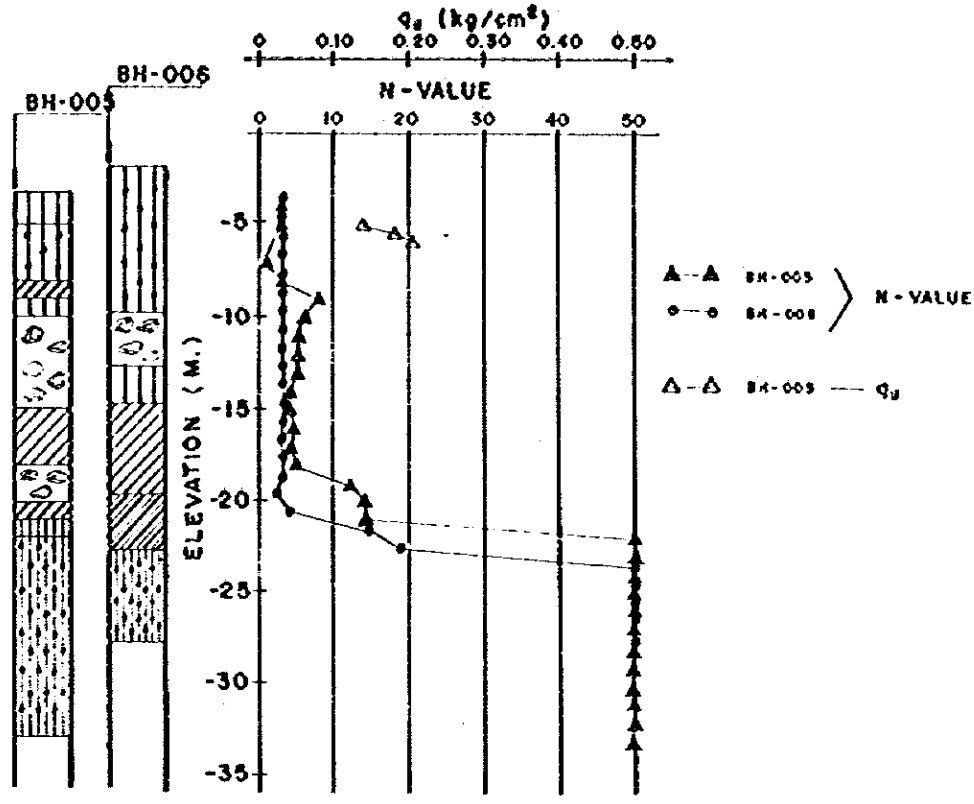


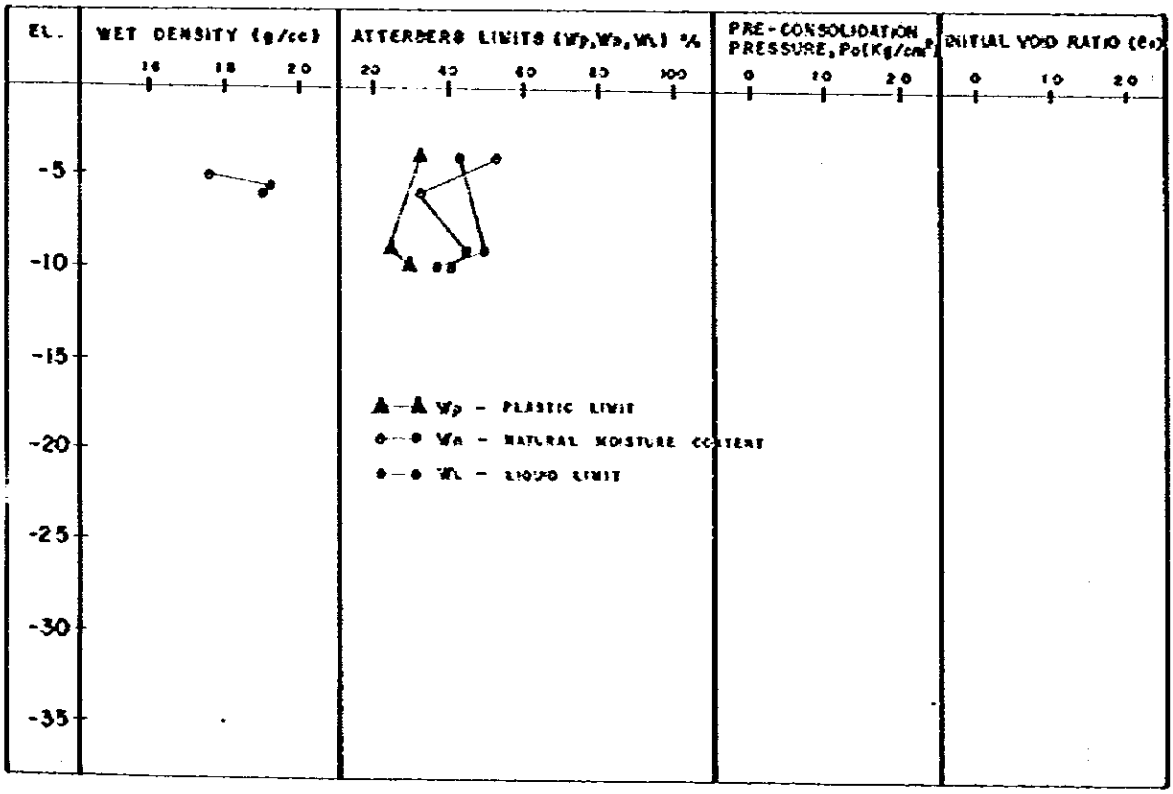
Appendix I-114
Fig. IV-6-6 SOIL PROPERTIES



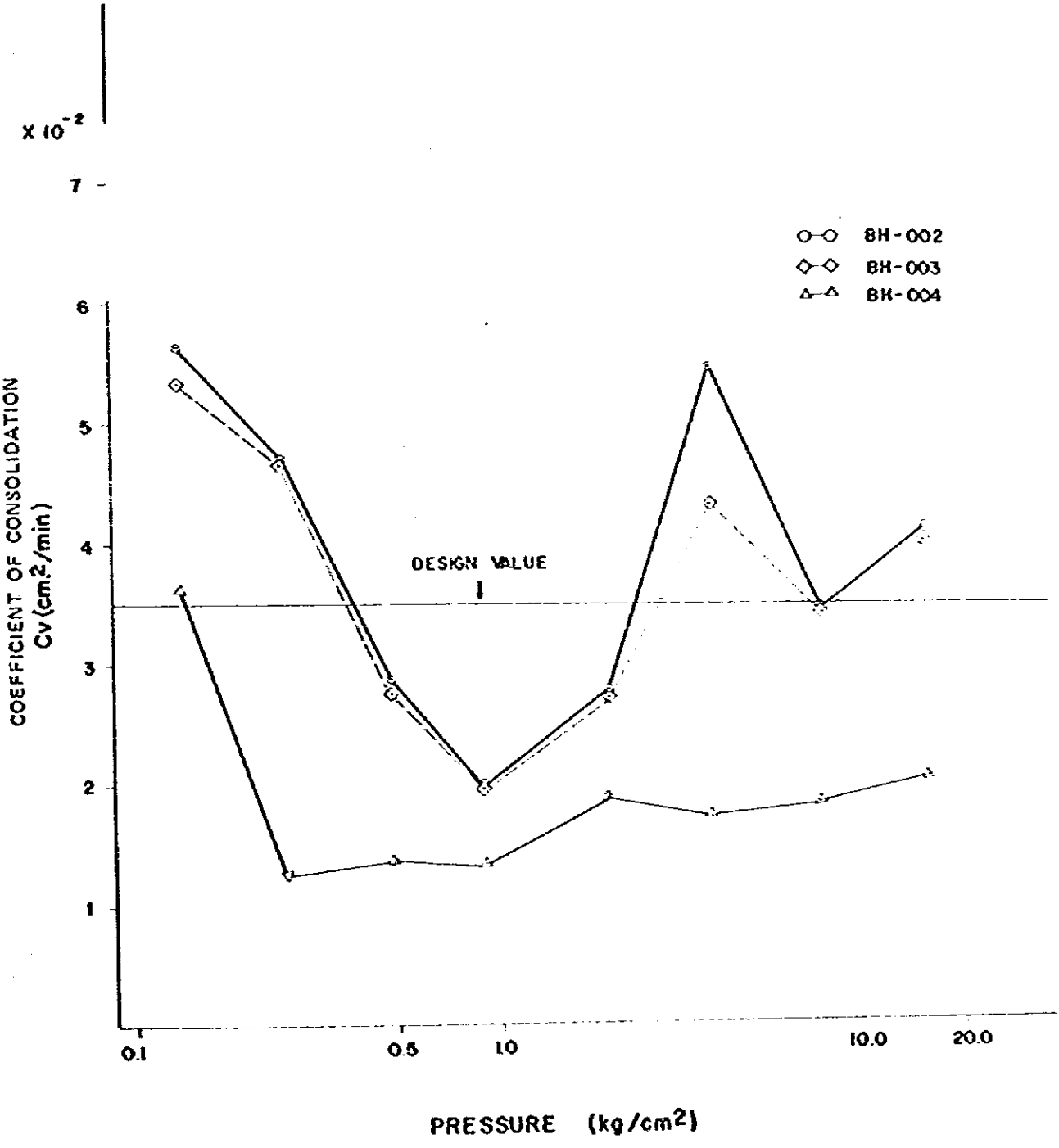


Appendix I-115
Fig. IV-6-7 SOIL PROPERTIES

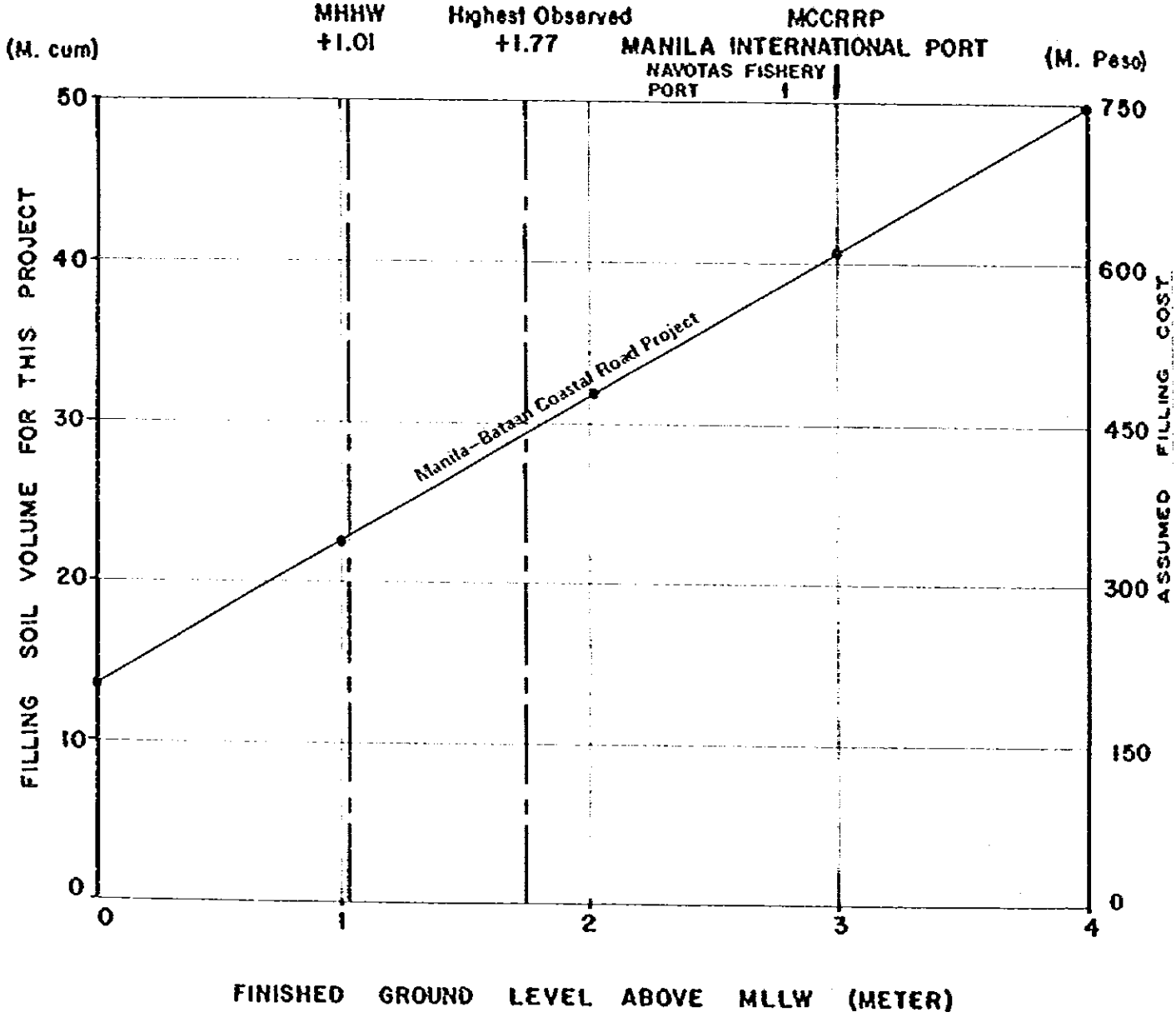




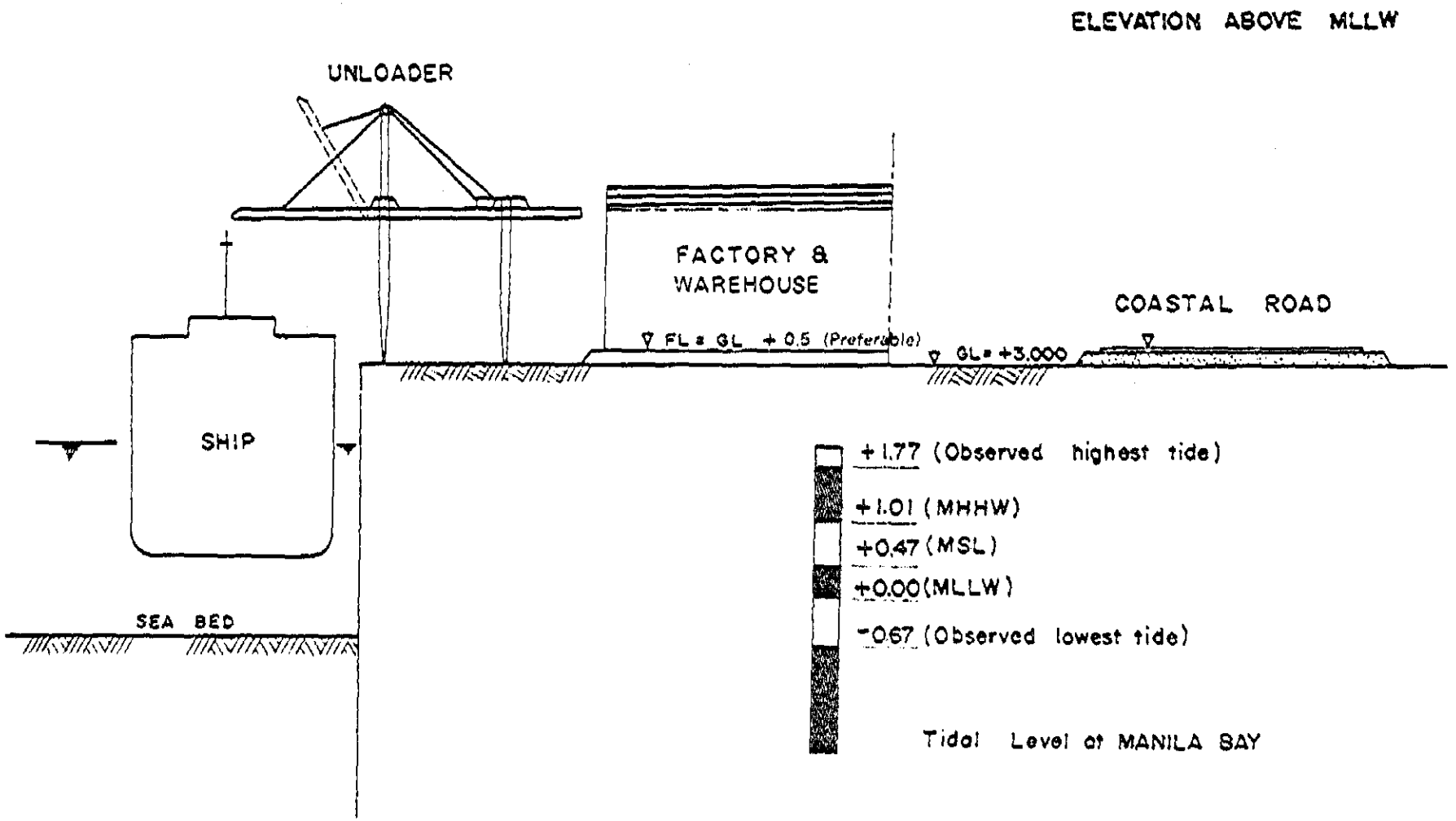
Appendix I-116
Fig. IV-6-8 AVERAGE CONSOLIDATION LOAD vs. Cv.



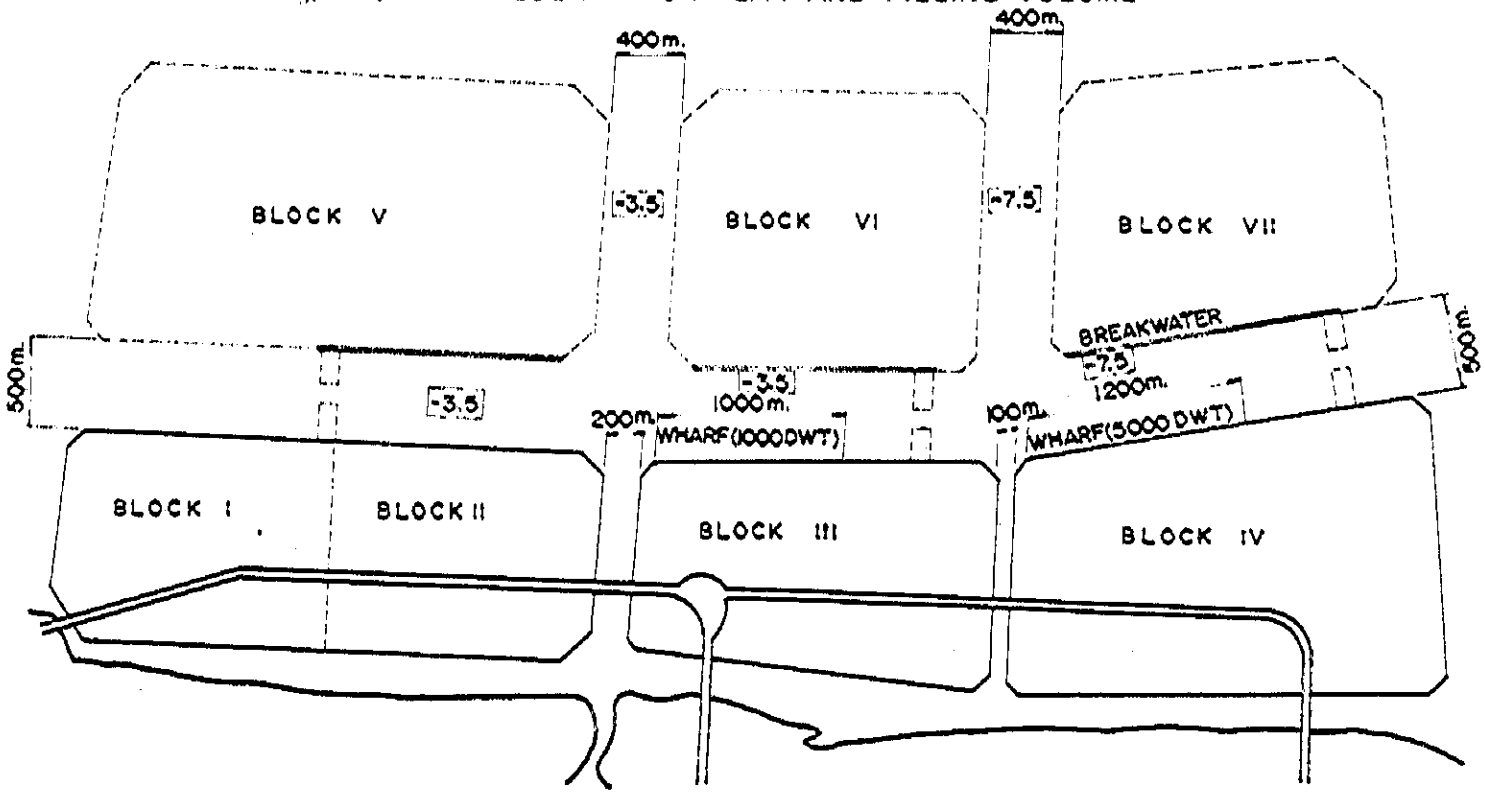
Appendix I-117
Fig. IV-6-9 FINISHED GROUND LEVEL VS. FILLING SOIL VOLUME



Appendix I-118
Fig. IV-6-10 TYPICAL GROUND LEVEL OF THE RECLAIMED LAND



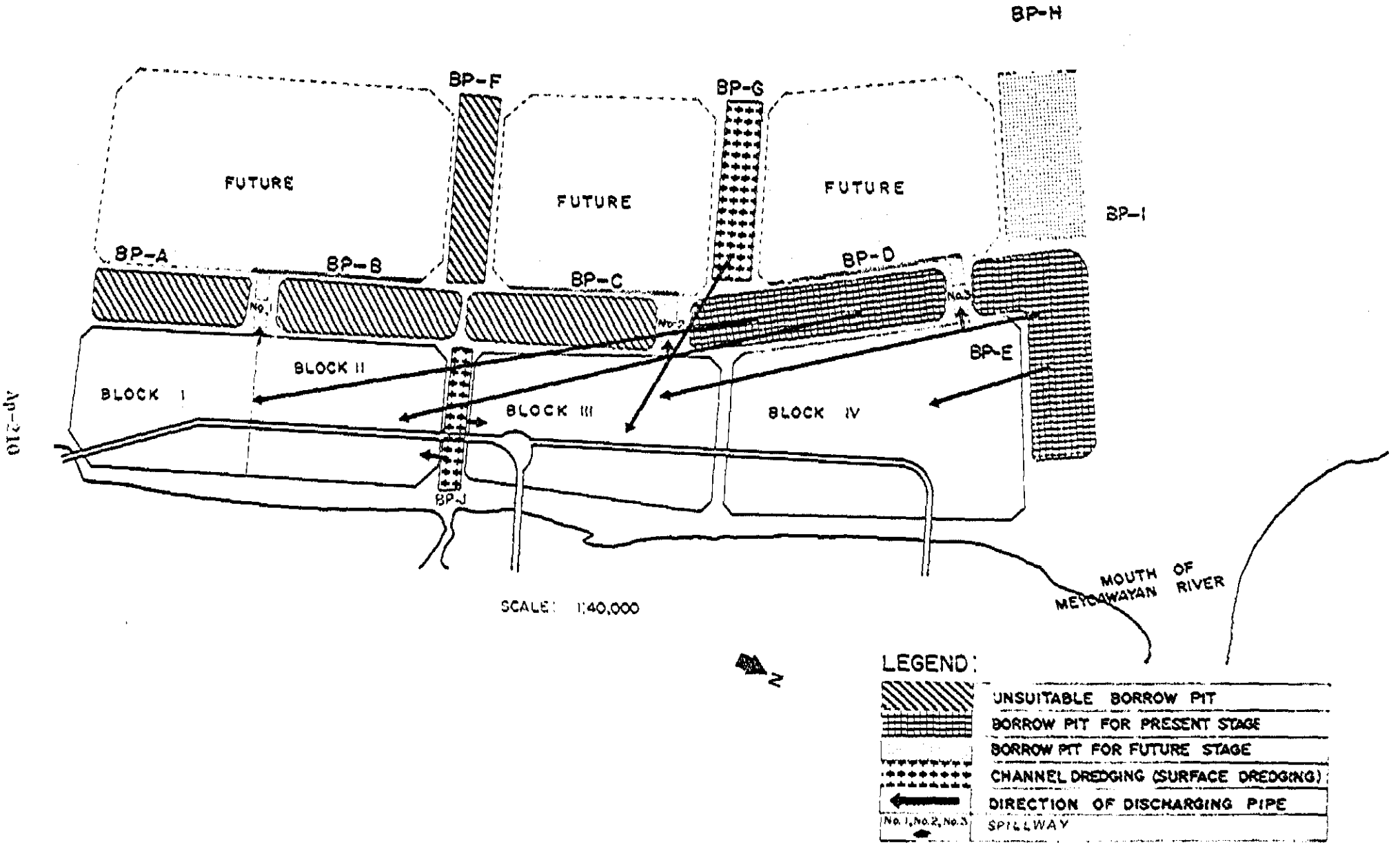
Appendix I-119
Fig. IV-6-11 RECLAMATION PLAN AND FILLING VOLUME



BLOCK	AREA (ha)	NET VOLUME (M. Cum.)	FILLING 2) VOLUME (M. Cum.)	FUTURE BLOCK	AREA (ha)	NET VOLUME (M. Cum.)	FILLING VOLUME (M. Cum.)
I	165	10.530	2.960 1)	V	426	34.915	37.045
II	185	7.710	8.635	VI	261	19.029	20.330
III	215	8.080	9.155	VII	261	17.353	18.653
IV	325	10.920	12.545				
TOTAL	890	37.240	33.295	TOTAL	948	71.297	76.028

NOTE: 1) FILLING VOLUME DENOTES DREDGE FILL NEEDED TO FILL UP ROADWAY & BULKHEAD AREA FOR BLOCK No. 1
2) FILLING VOLUME = NET VOLUME + EXTRA - BANKING

Appendix I-120
Fig. IV-6-12 RECLAMATION AND BORROW PIT PLAN



AP-210

Appendix I-121
Fig. IV-6-13 CLASSIFICATION OF BORROW PIT SOIL

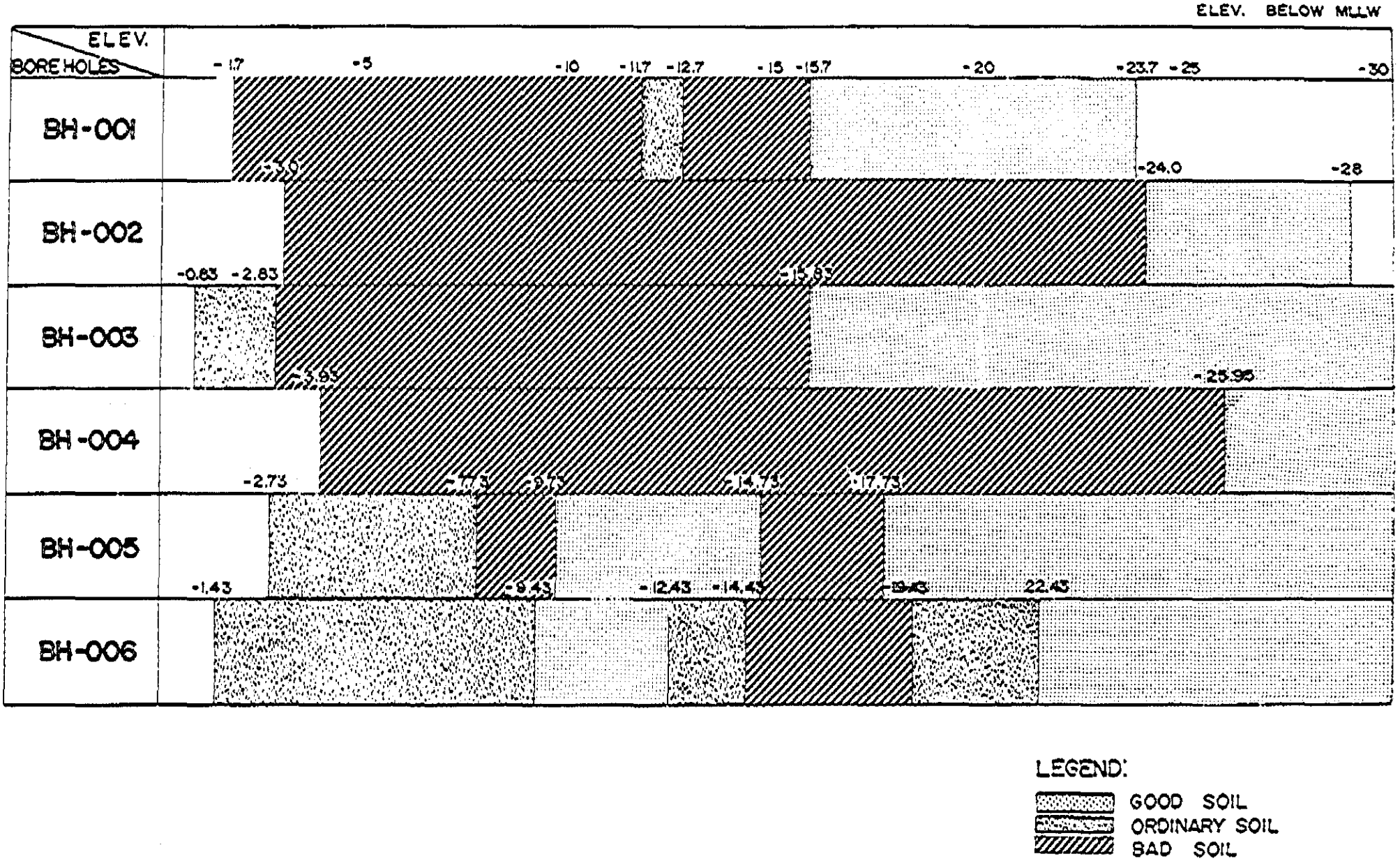
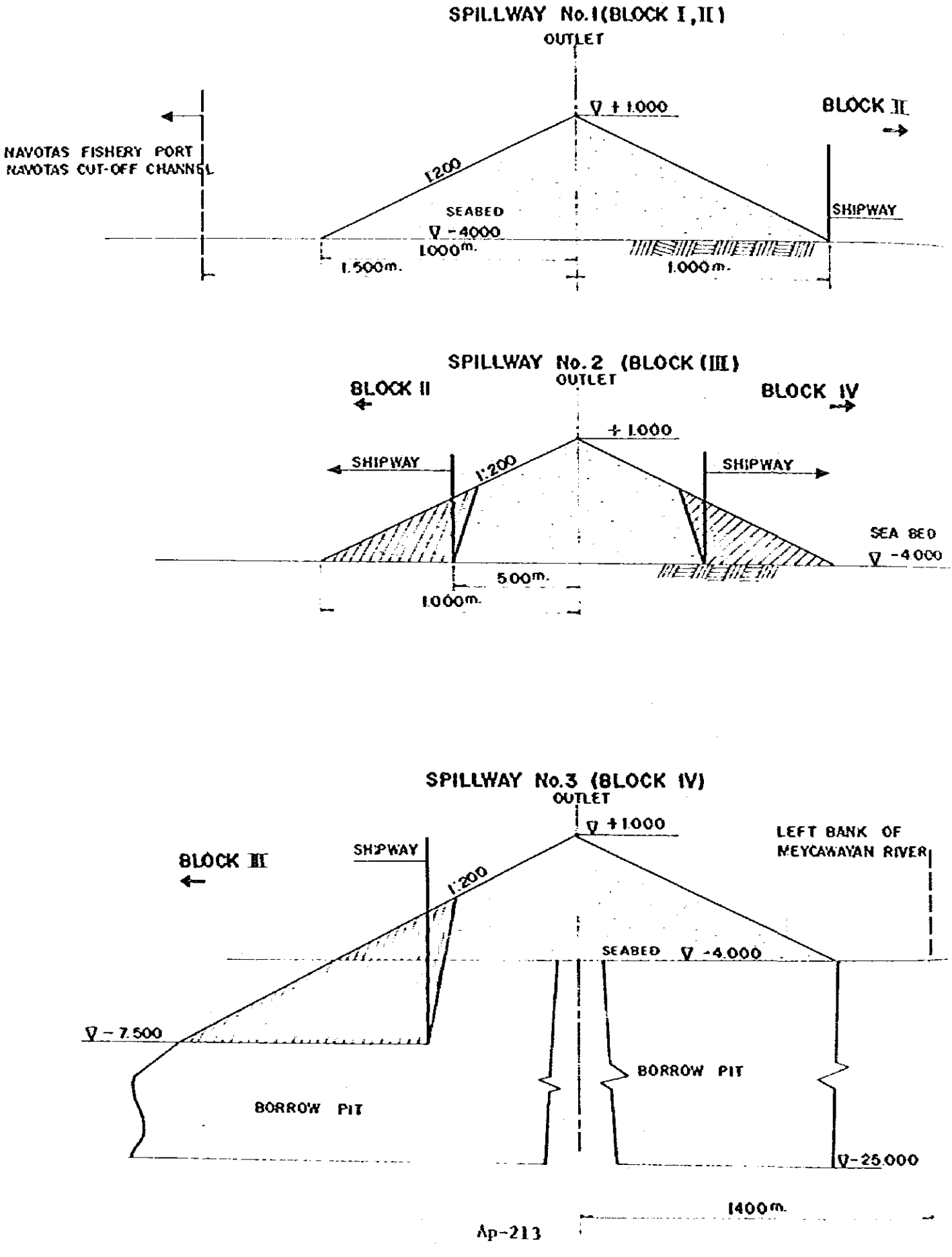


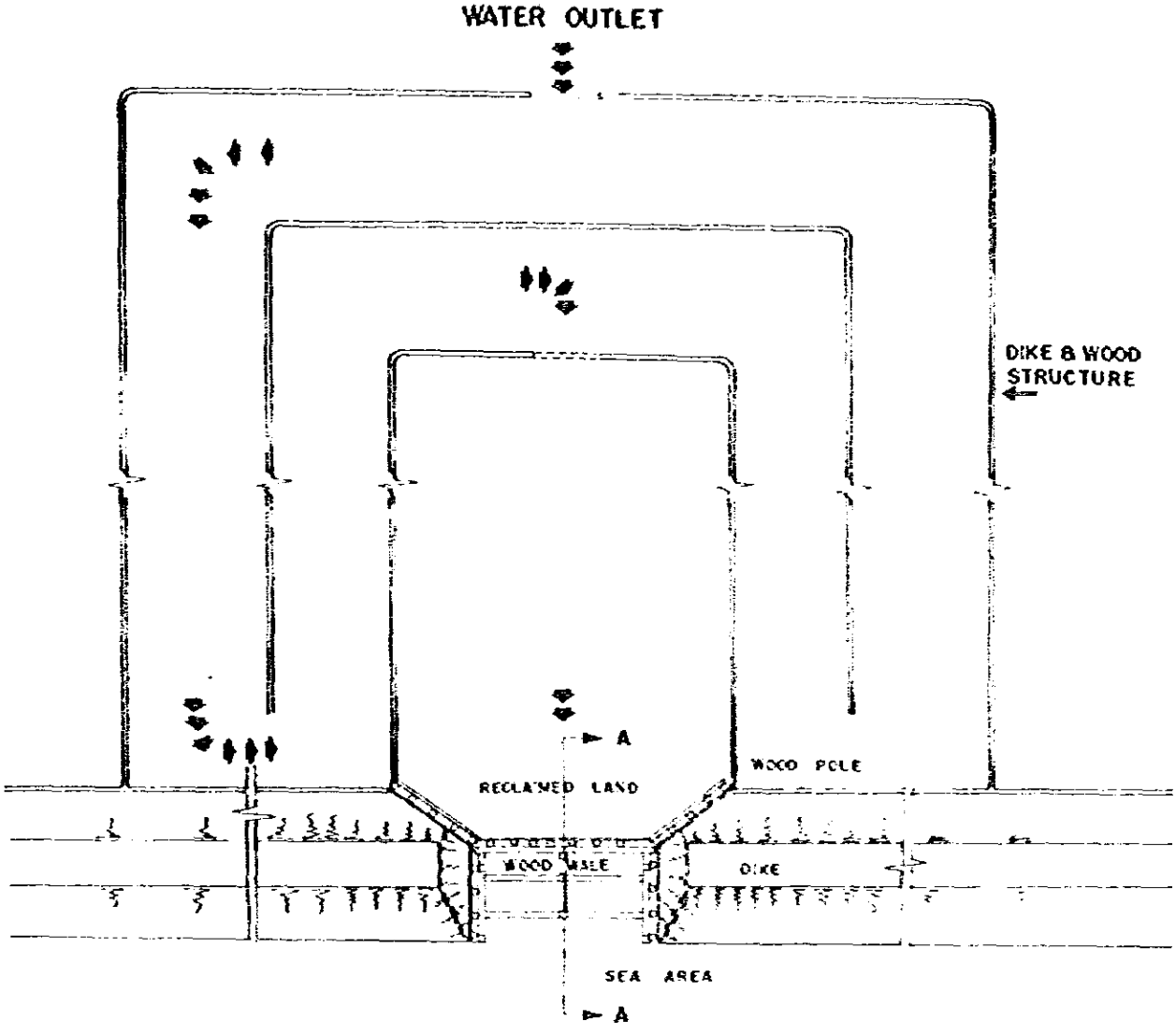
Table IV-6-1 SOIL VOLUME OF BORROW PITS

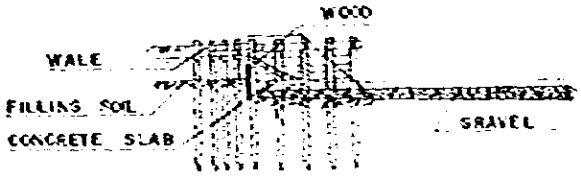
Name of Borrow Pit	Related Bore Holes	Borrow Pit Area (ha.)	Volume per ha. (M.CU.M.) Seabed EL. – 16.0 m			Volume per ha. (M.CU.M.) –16.0 m EL. – 25.0 m			Total Volume per ha. (M.CU.M.) Seabed EL. – 25.0 m			Total Volume per Block (M.CU.M.)			
			Good Soil	Ordinary Soil	Bad Soil	Good Soil	Ordinary Soil	Bad Soil	Good Soil	Ordinary Soil	Bad Soil	Good Soil	Ordinary Soil	Bad Soil	Total
BP-A	BH-001	47	0.003 (3%)	0.01 (10%)	0.080 (87%)	0.09	–	–	0.093 (50%)	0.01 (5%)	0.084 (45%)	4.37	0.47	3.95	8.79
BP-B	BH-002	47	–	–	0.12 (100%)	0.01 (10%)	–	0.08 (90%)	0.01 (5%)	–	0.2 (95%)	0.47	–	9.40	9.87
BP-C	BH-003	53	–	–	0.115 (100%)	–	–	0.09 (100%)	–	–	0.205 (100%)		–	10.86	10.87
BP-D	BH-005	80	0.05 (37%)	0.05 (37%)	0.033 (26%)	0.073 (81%)	–	0.017 (19%)	0.123 (56%)	0.05 (22%)	0.05 (22%)	9.84	4.00	4.00	19.84
BP-E	BH-006	100	0.04 (30%)	0.075 (55%)	0.02 (15%)	0.05 (55%)	0.015 (16%)	0.026 (29%)	0.09 (40%)	0.09 (40%)	0.046 (20%)	9.00	9.00	4.60	22.60
											Sub-total	23.68	13.47	32.81	71.97
BP-F	BH-004														8.00
BP-G	(Channel Dredging)														1.50
BP-H	(Borrow Pit for Future Stage)														13.89
BP-I	(– ditto –)														59.10
BP-J	(Channel Dredging)														0.8
													Sub-total		91.29
													Total		163.26

Fig. IV-6-14 SILTING INFLUENCE ZONE

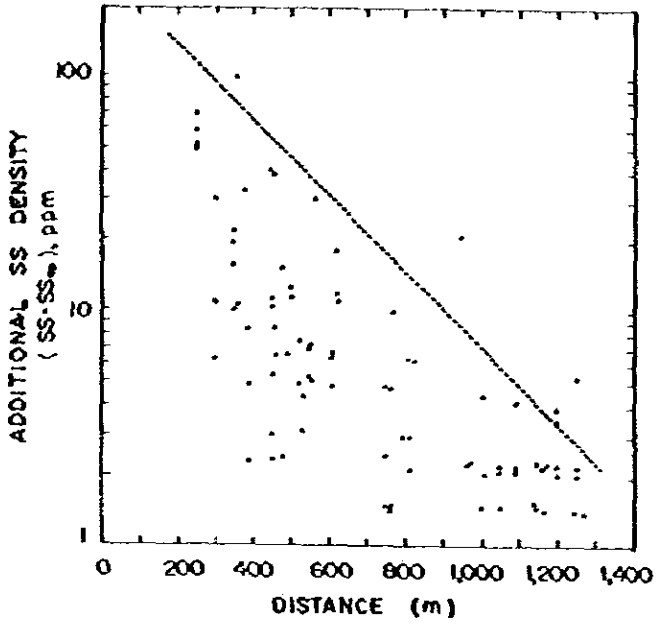


Appendix I-124
Fig. IV-6-15 PLAN OF SPILLWAY

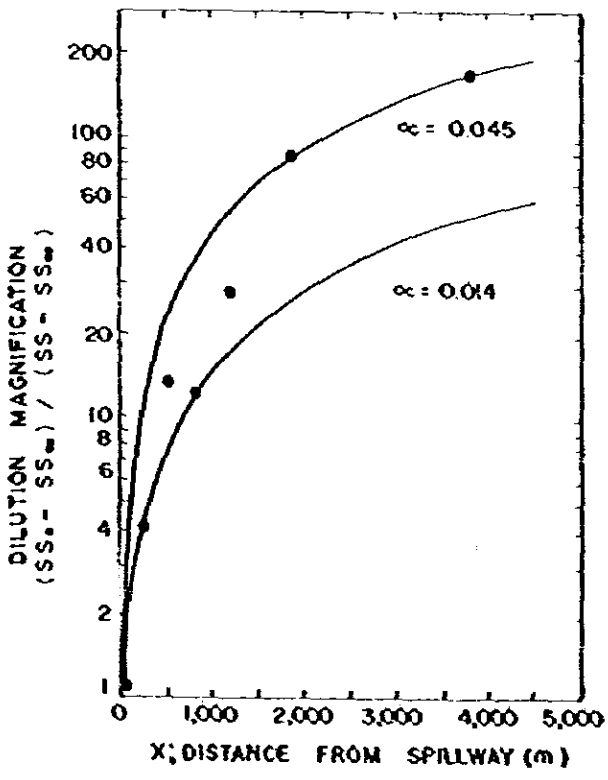




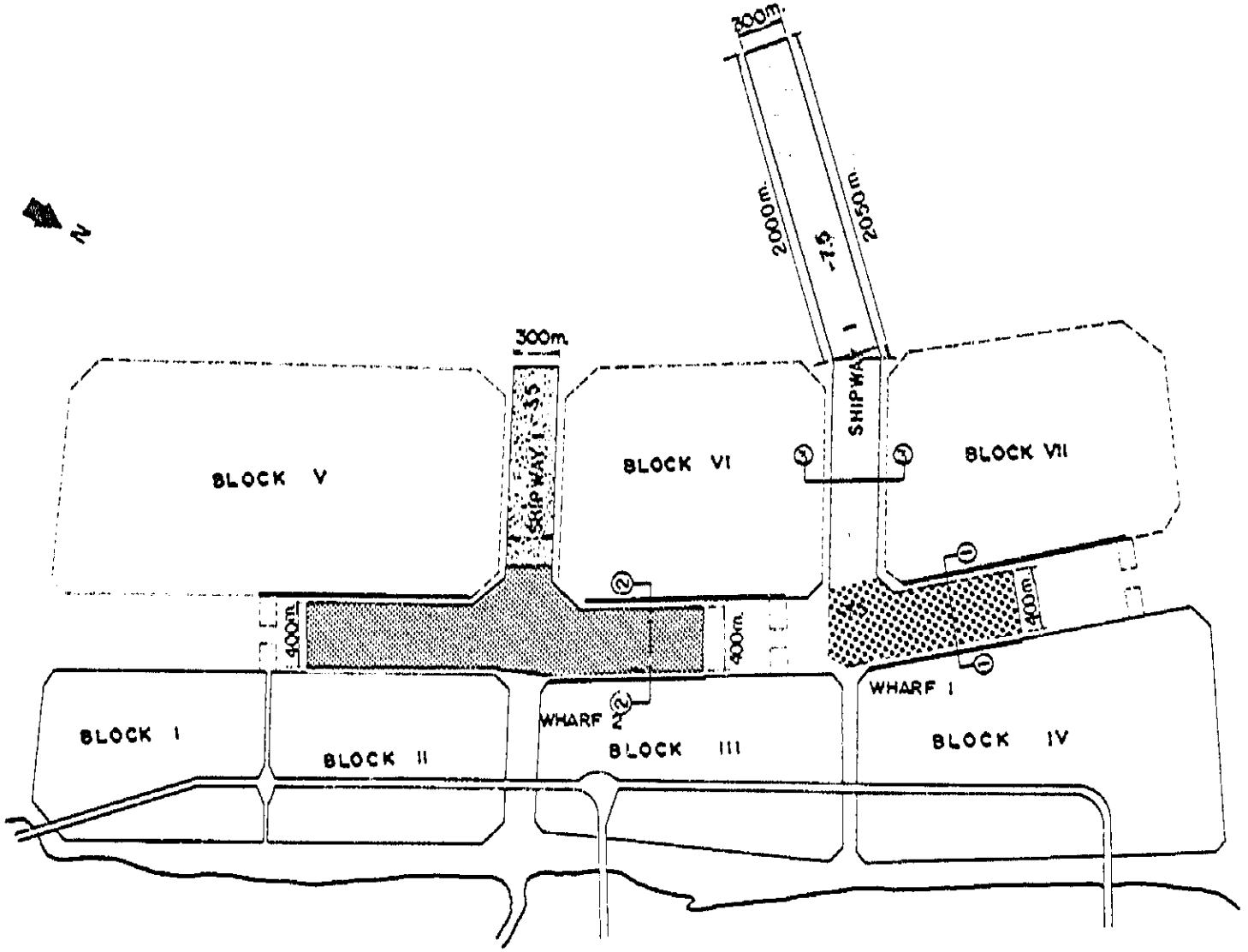
Appendix I-125
Fig. IV-6-16 THE DISTANCE FROM SPILLWAY VS. SS DENSITY



Appendix I-126
Fig. IV-6-17 THE DISTANCE FROM SPILLWAY VS. SS DILUTION MAGNIFICATION

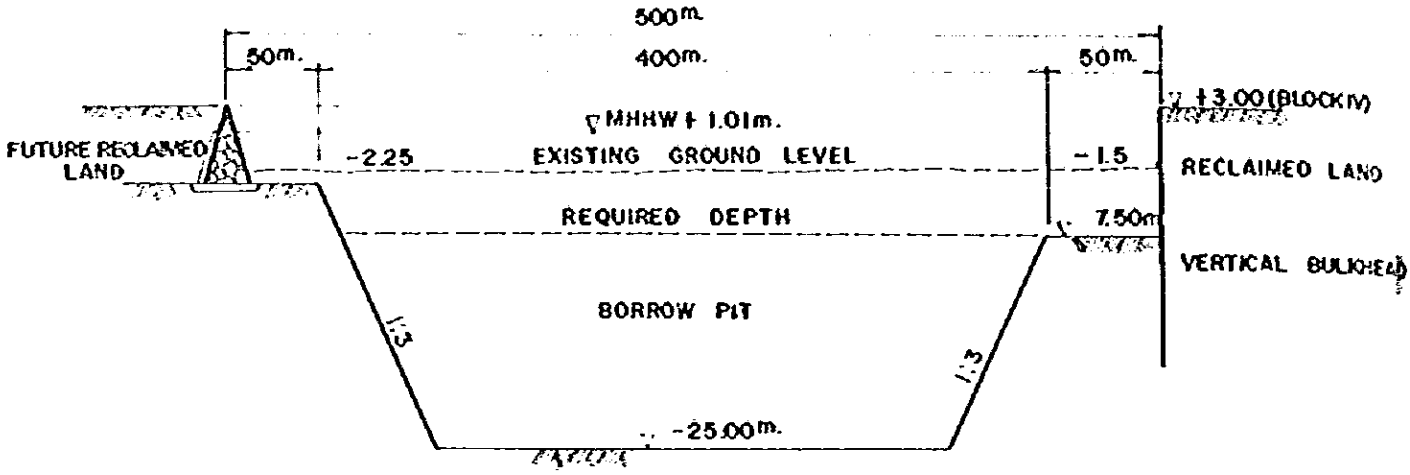


Appendix I-127
Fig. IV-6-18 LOCATION OF SHIPWAY
SCALE : 1:40,000

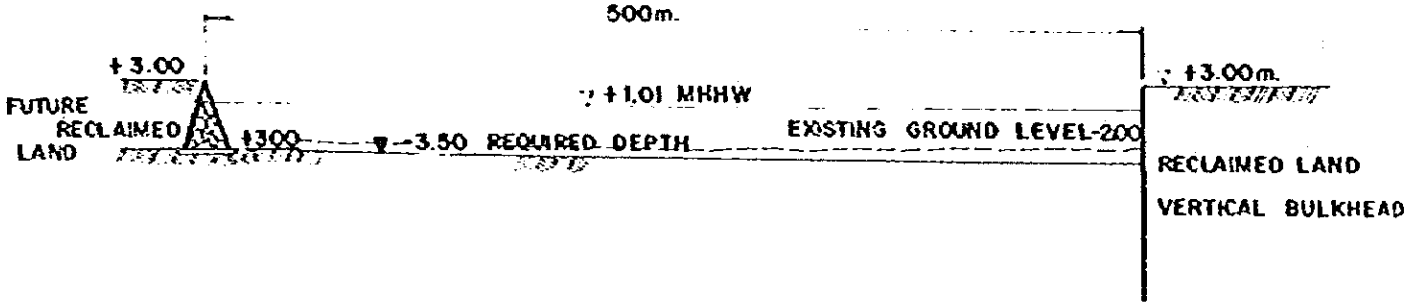


Appendix I-128
Fig. IV-6-19 TYPICAL SECTION OF SHIPWAY

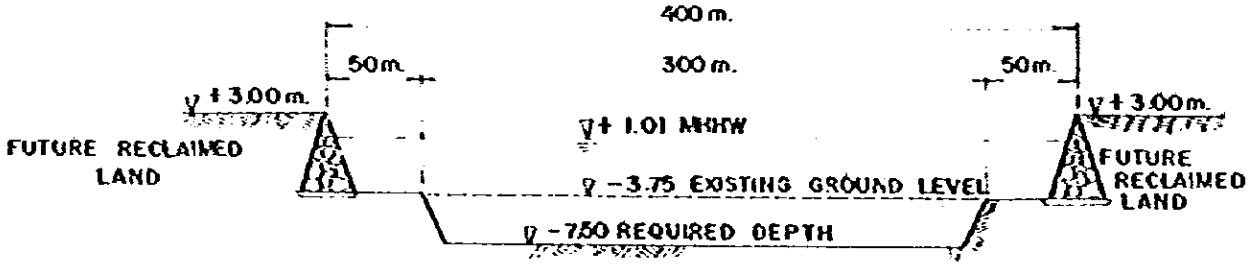
SECTION ①-①(WHARF I)
SCALE: H 1:4,000 V 1:600



SECTION ②-②(WHARF II)
SCALE H 1:4,000 V 1:600

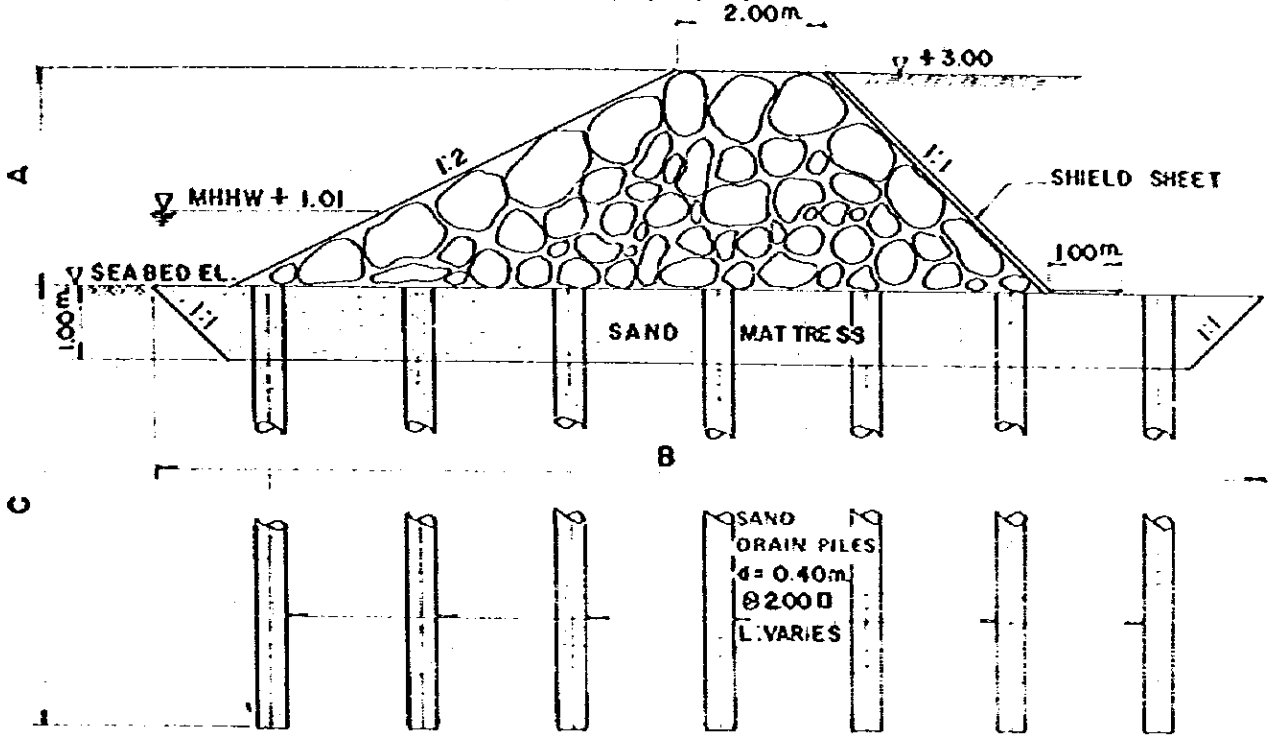


SECTION ③-③(SHIPWAY)
SCALE: H 1:4,000 V 1:600



Appendix I-129

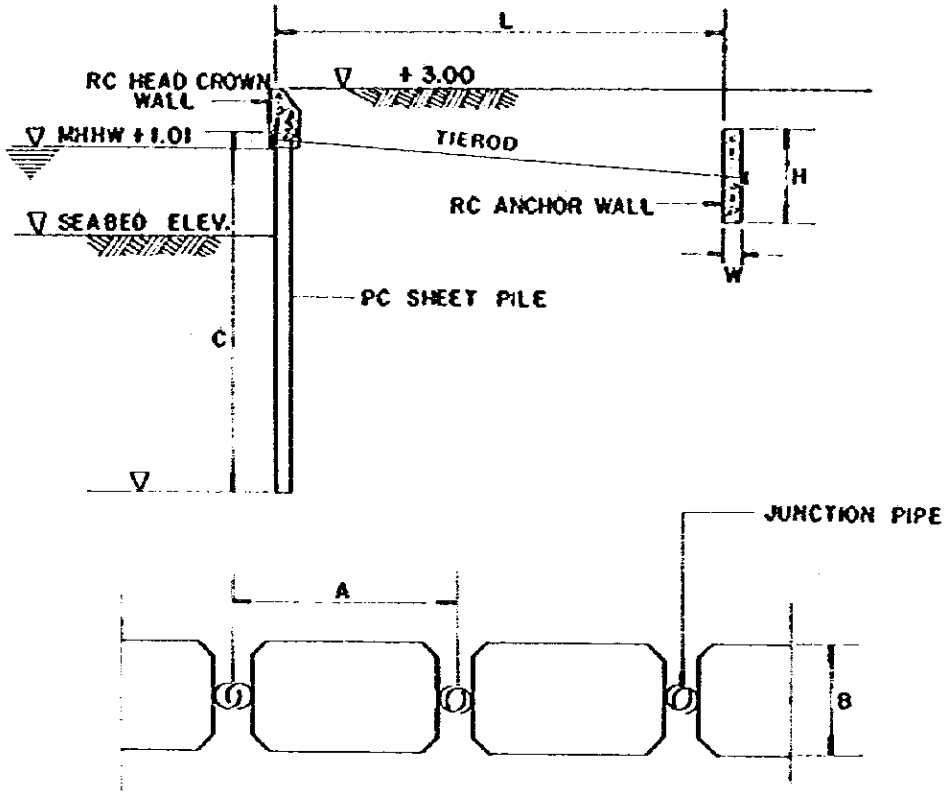
Fig. IV-6-20 TYPICAL SECTION OF ROCK BULKHEAD (TYPE I, II, III, IV, V)



SIZE AND QUANTITY OF BULKHEAD

TYPE	SEABED ELEV. (DATUM MLLW)	SIZE OF BULKHEAD (M)			QUANTITY Per L.M (Wall Length)				
		A	B	C	ROCK (cu.m)	SAND MAT (cu.m.)	SAND PILE		SHIELD SHEET (SQ. M.)
							SAND (cu.m)	(Pcs.)	
I	± 0.00	3	15	7	19.50	14.0	3.10	3.5	- 5.24
II	– 1.00	4	18	7	32.00	17.0	- -	- -	- 6.66
III	– 1.50	4.5	19	7	39.375	18.5	4.00	4.5	- 7.36
IV	– 2.50	5.5	22.5	8	56.375	21.5	5.54	5.5	- 8.78
V	– 3.50	6.5	25.5	9	76.375	24.5	6.80	6.0	-10.19

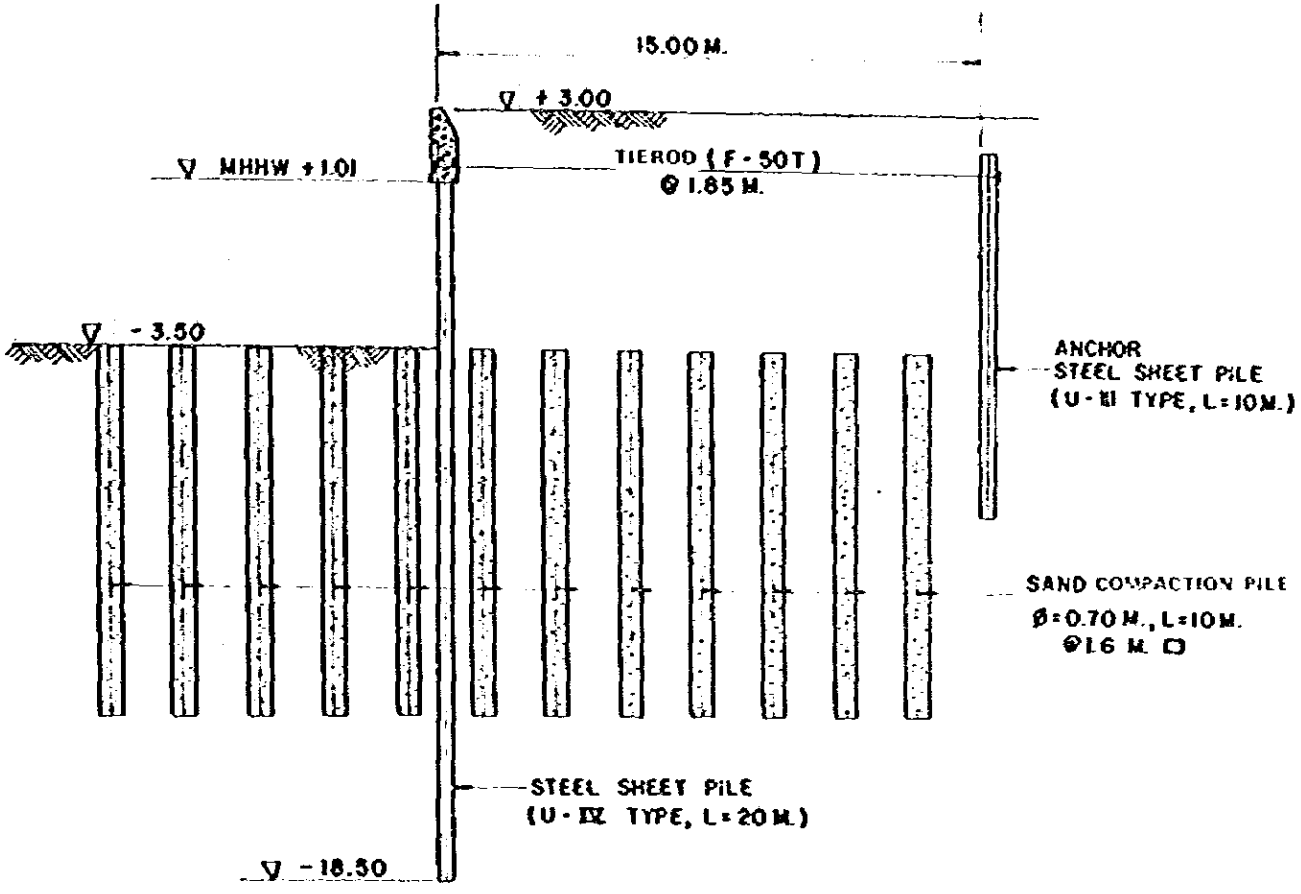
Appendix I-130
Fig. IV-6-21 TYPICAL SECTION OF PC SHEET PILING (TYPE VI, VII)



TYPE	SEABED ELEV. (M.)	SIZE & DIMENSIONS											
		PC SHEET PILES(M)			JUNCTION PIPES (M.)			TIEROD			RC ANCHOR WALL (M)		RC HEAD CROWN WALL
		A	B	C	DIAMETER (d)	THICKNESS (t)	LENGTH (L)	TENSIONING FORCE (F)	LENGHT (L)	SPACING @ a M.	W	H	
VI	± 0.00	0.60	0.30	10	0.080	0.006	4	30 T	12 M.	1.80	0.40	2.50	—
VII	- 1.00	0.60	0.35	12	0.080	0.006	5	50 T	14 M.	1.80	0.40	2.50	—

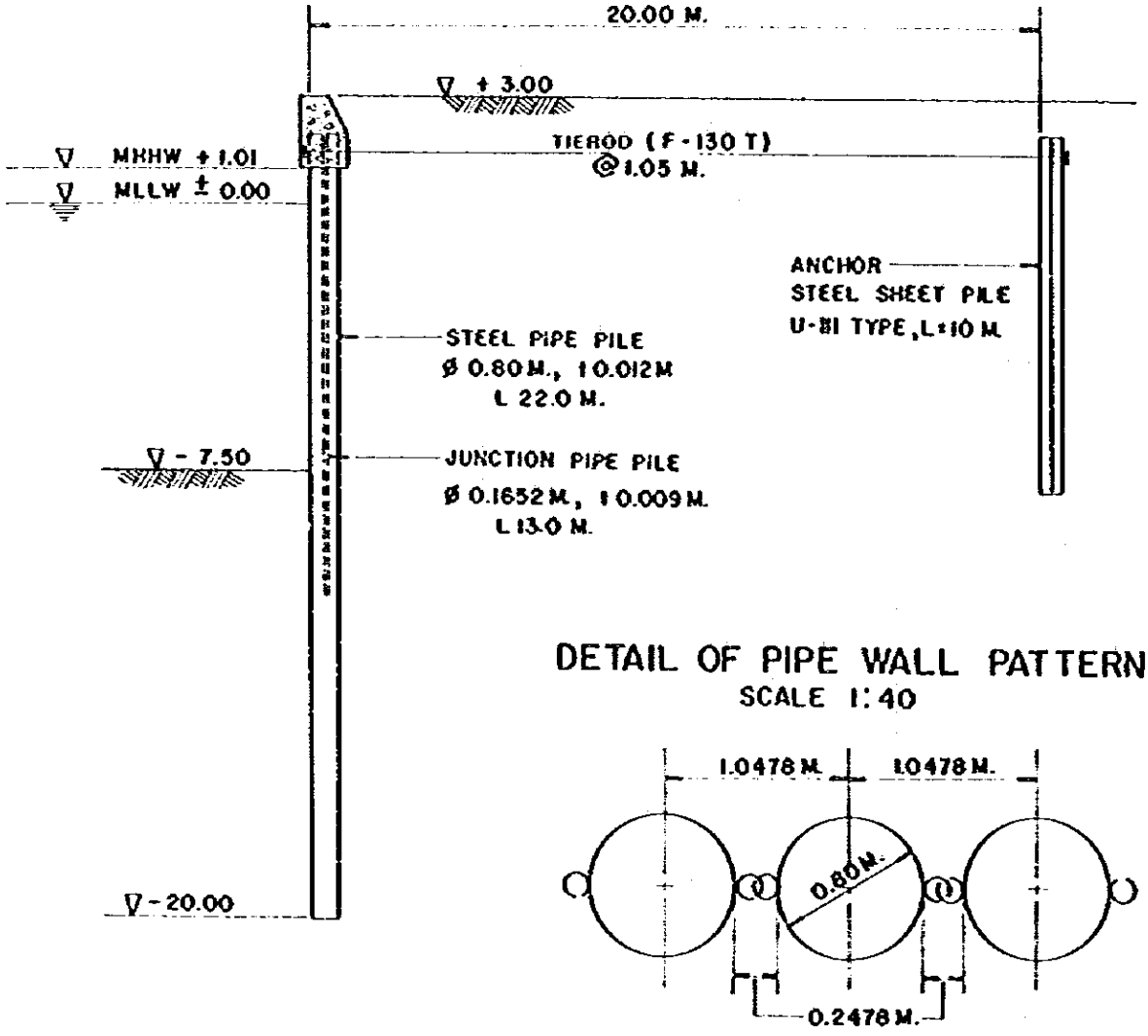
TYPE	SEABED ELEV. (M.)	LENGTH (M.)	QUANTITIES per L.M. (Wall Length)				
			P. C. (pcs.)	JUNCTION PIPE (T)	TIEROD (pcs.)	RC ANCHOR WALL (cu.m.)	RC HEAD CROWN WALL (cu. m.)
VI	± 0.00	4245	1.66	0.076	0.555	1.0	1.70
VII	- 1.00	1090	1.66	0.095	0.555	1.0	1.70

Appendix I-131
Fig. IV-6-22 TYPICAL SECTION OF STEEL SHEET PILE (TYPE VIII)



TYPE	SEABED ELEV. (M.)	QUANTITIES PER LM (WALL LENGHT)					
		STEEL SHEET PILE (U-IX TYPE)(T)	ANCHOR STEEL SHEET PILE (U-III TYPE) (T)	TIEROD (F-130T) (pcs.)	SAND PILE		HEAD CROWN WALL (cu. m)
					SAND (cu. m)	(pcs.)	
VIII	- 3.5	3.805	1.5	0.54	38.5	10	1.7

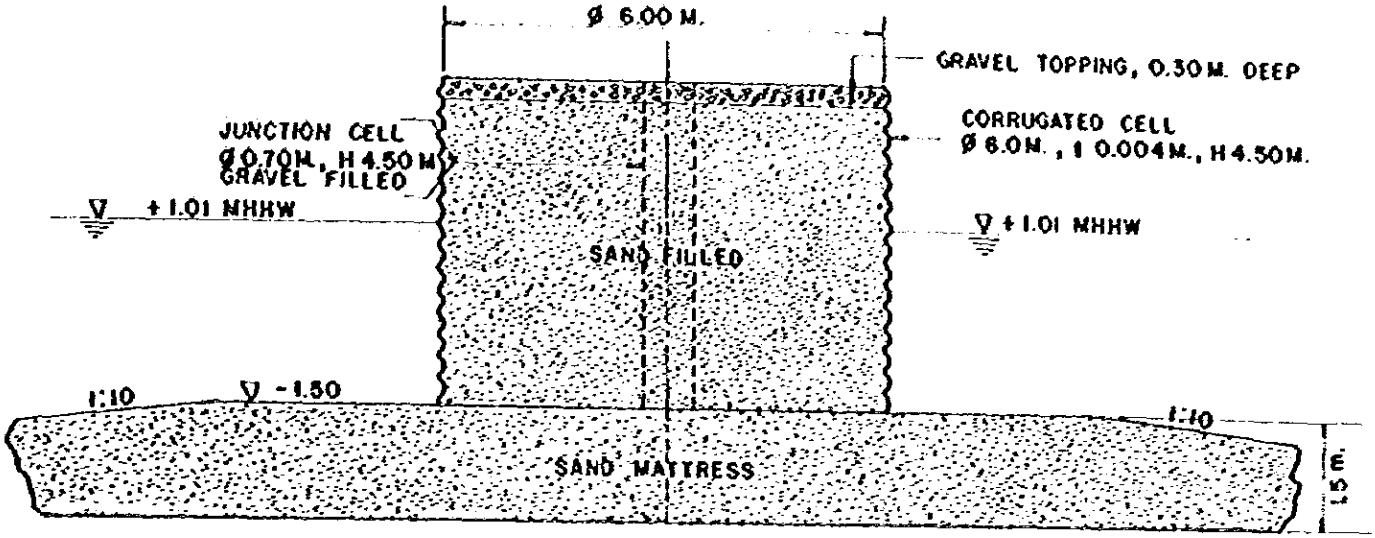
Appendix I-132
Fig. IV-6-23 TYPICAL SECTION OF INTERLOCKED STEEL PILE (TYPE IX)

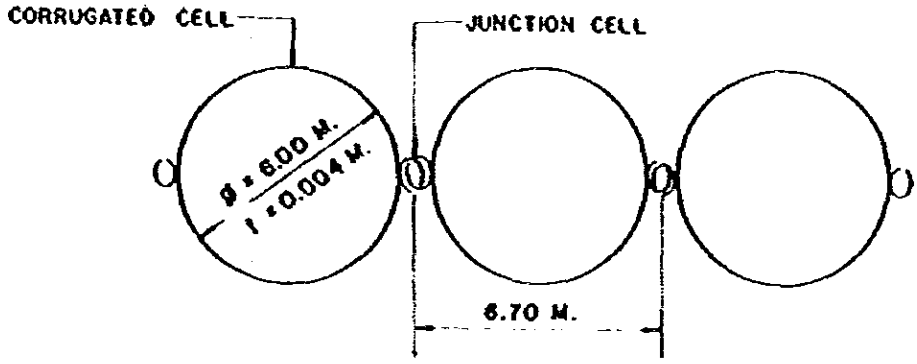


DETAIL OF PIPE WALL PATTERN
SCALE 1:40

TYPE	SEABED ELEV. (M.)	QUANTITIES PER LM (Wall Length)				
		STEEL PIPE PILE (T)	JUNCTION PIPE PILE (T)	TIEROD (F-130T) (pcs.)	ANCHOR STEEL SHEET PILE (T)	HEAD CROWN WALL (cu. m)
IX	- 7.5	4.90	0.86	0.95	0.5	2.50

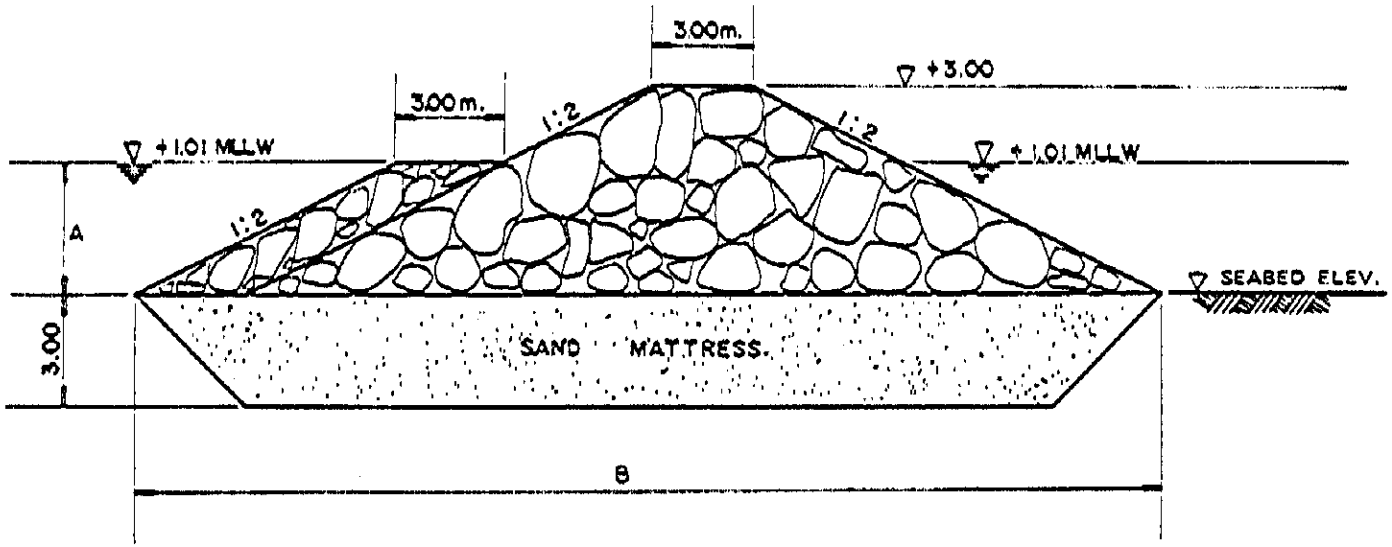
Appendix I-133
Fig. IV-6-24 TYPICAL SECTION OF CORRUGATED CELL (TYPE X)





DESCRIPTION & SIZE (M)	QUANTITY/pc.	QUANTITY/L.M.(wall long)
CORRUGATED CELL Ø = 6.00 M. t = 0.004 M. H = 4.50 M.	3.81 ton	0.568 ton
JUNCTION CELL Ø = 0.70 M. t = 0.004 M. H = 4.50 M.	1.189 ton	0.177 ton
FILLING SAND	127 cu.m.	19 cu.m.
SANDMATTRESS	—	40.5 cu.m.
FILLING GRAVEL for JUNCTION PIPE	—	0.132 cu.m.

Appendix I-134
Fig. IV-6-25 TYPICAL SECTION OF BREAKWATER STRUCTURE (TYPE XI, XII, XIII)



TYPE	SEA BED ELEV. (DATUM MLLW)	SIZE OF BREAKWATER		QUANTITY PER LM	
		A	B	ROCK (cu.m.)	SANDMAT(cu.m)
XI	- 2.5	3.5	28	95.75	75
XII	- 3.00	4.0	30	111 .00	81
XIII	- 3.50	4.5	32	127.25	87