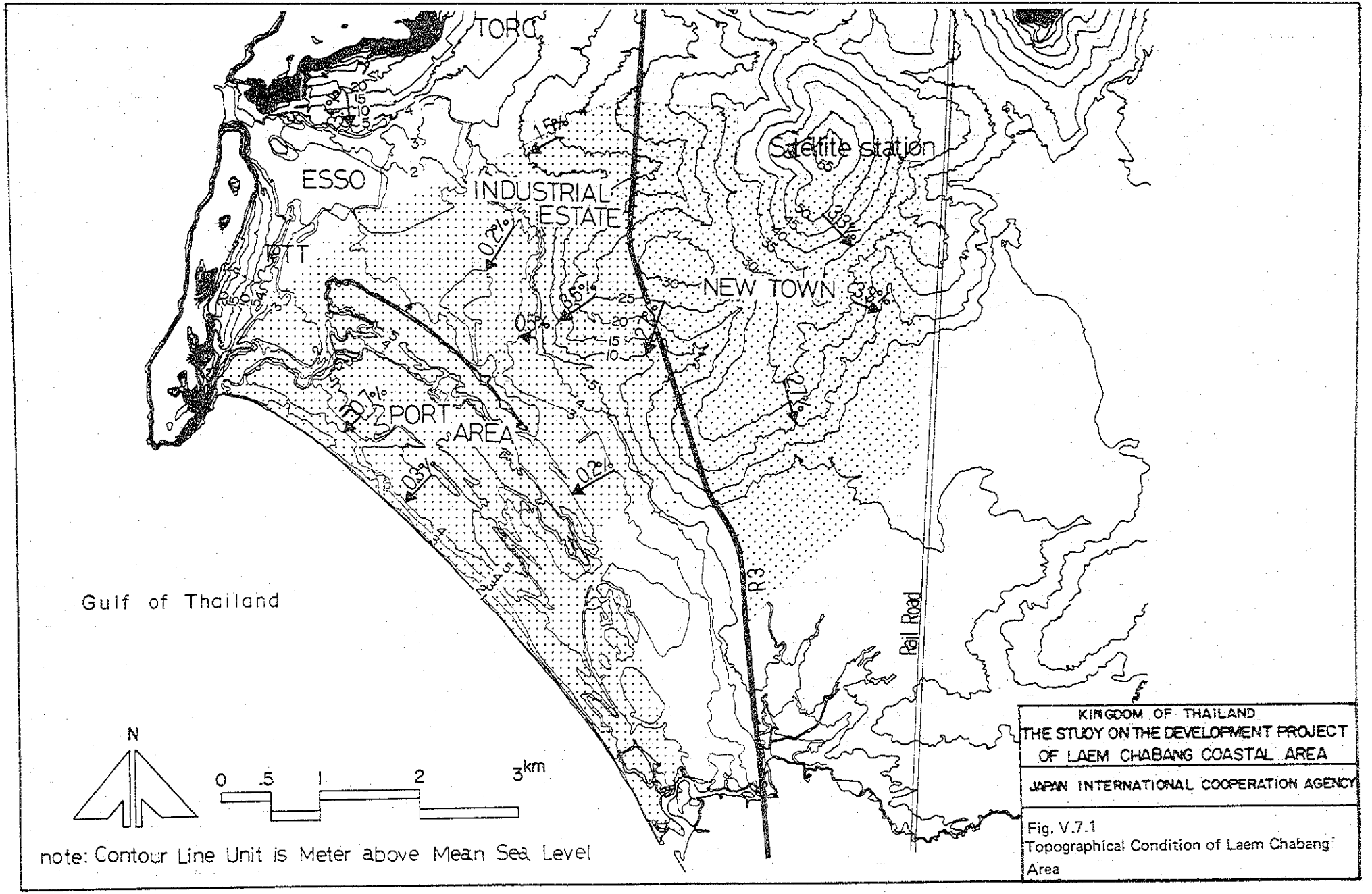
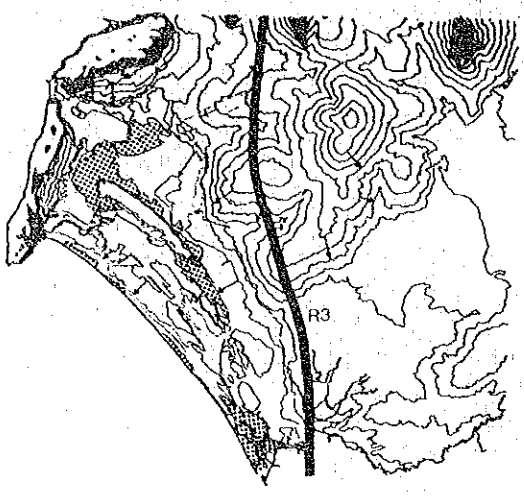
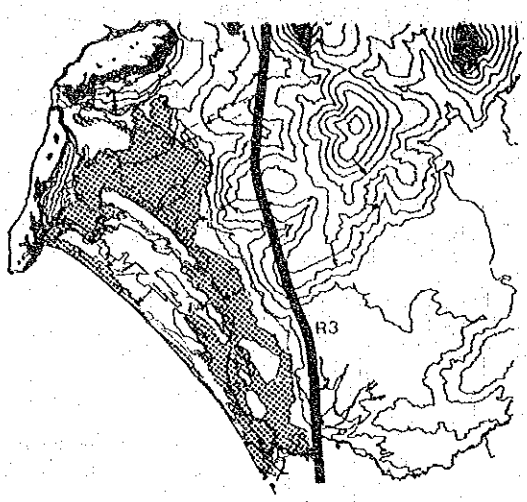
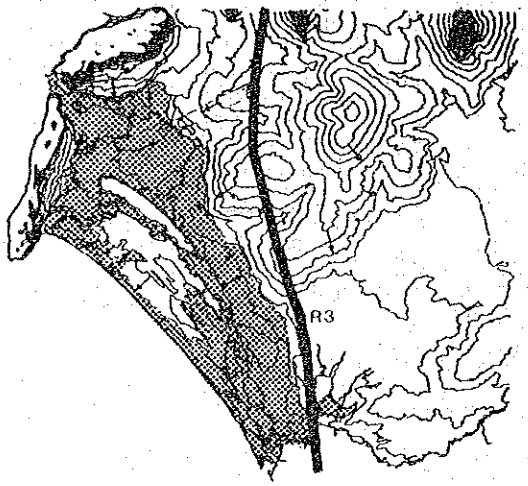

TORC
ESSO
PTT
INDUSTRIAL ESTATE
Satellite station
NEW TOWN
PORT AREA
Gulf of Thailand
R3
Rail Road
N
0 .5 1 2 3km
note: Contour Line Unit is Meter above Mean Sea Level
KINGDOM OF THAILAND
THE STUDY ON THE DEVELOPMENT PROJECT OF LAEM CHABANG COASTAL AREA
JAPAN INTERNATIONAL COOPERATION AGENCY
Fig. V.7.1
Topographical Condition of Laem Chabang Area



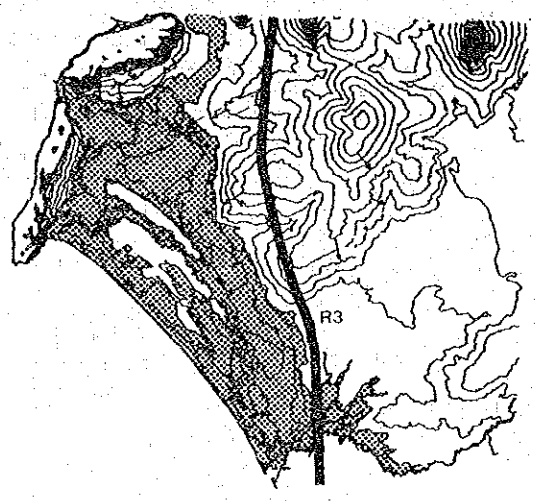
EL 0~2m



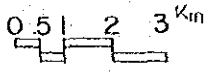
EL 0~3m



EL 0~4m



EL 0~5m



LEGEND

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THE STUDY ON THE DEVELOPMENT PROJECT OF LAEM CHABANG COASTAL AREA

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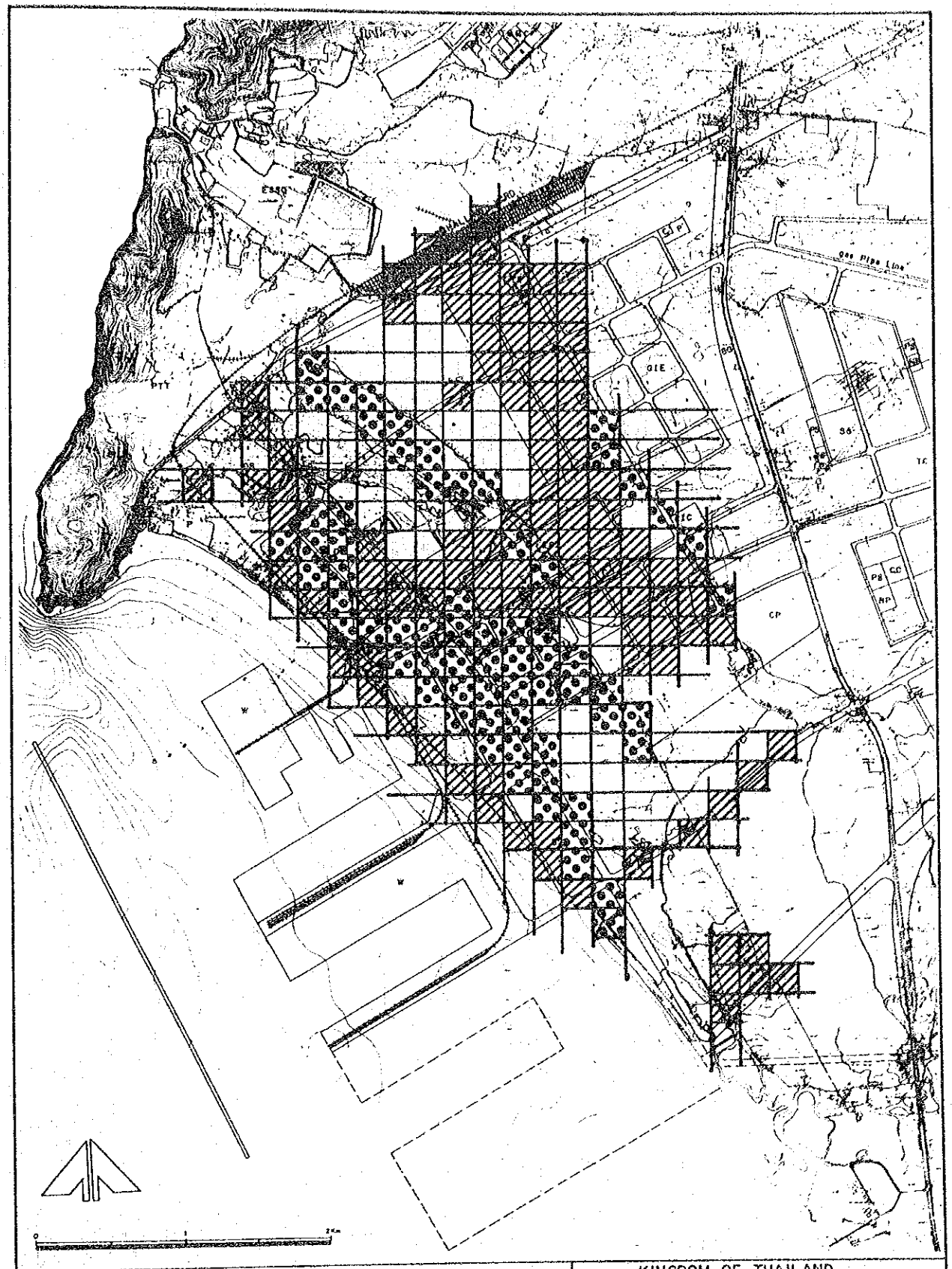
Fig. V.7.2
Lower Land Distribution



LEGEND

Banking Area
(5,600,000m³)

Cutting Area
(3,900,000m³)

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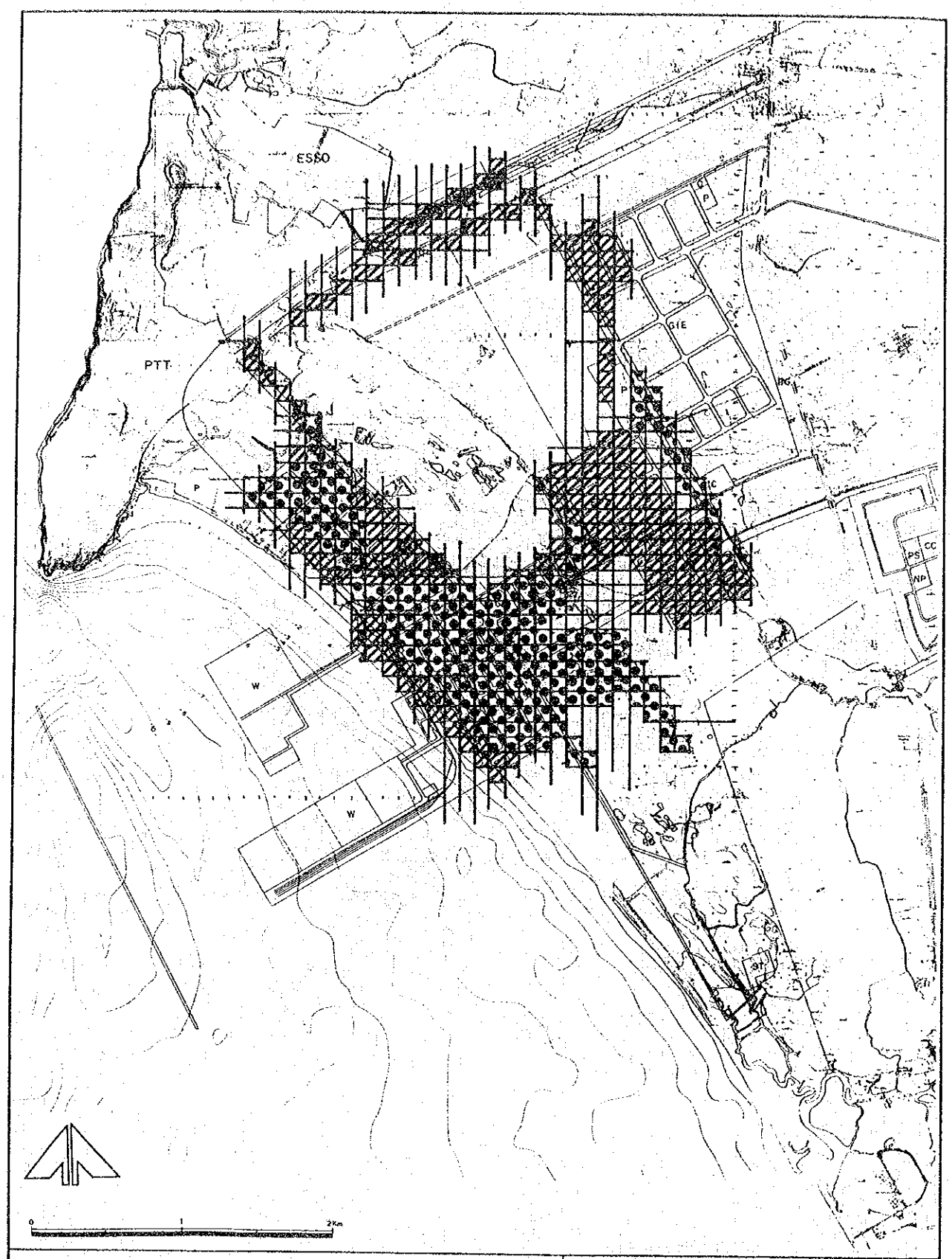
Fig. V.7.3-1)
Earth Work (Master Plan)



LEGEND

Banking Area
(2,600,000 m³)

Cutting Area
(2,600,000 m³)

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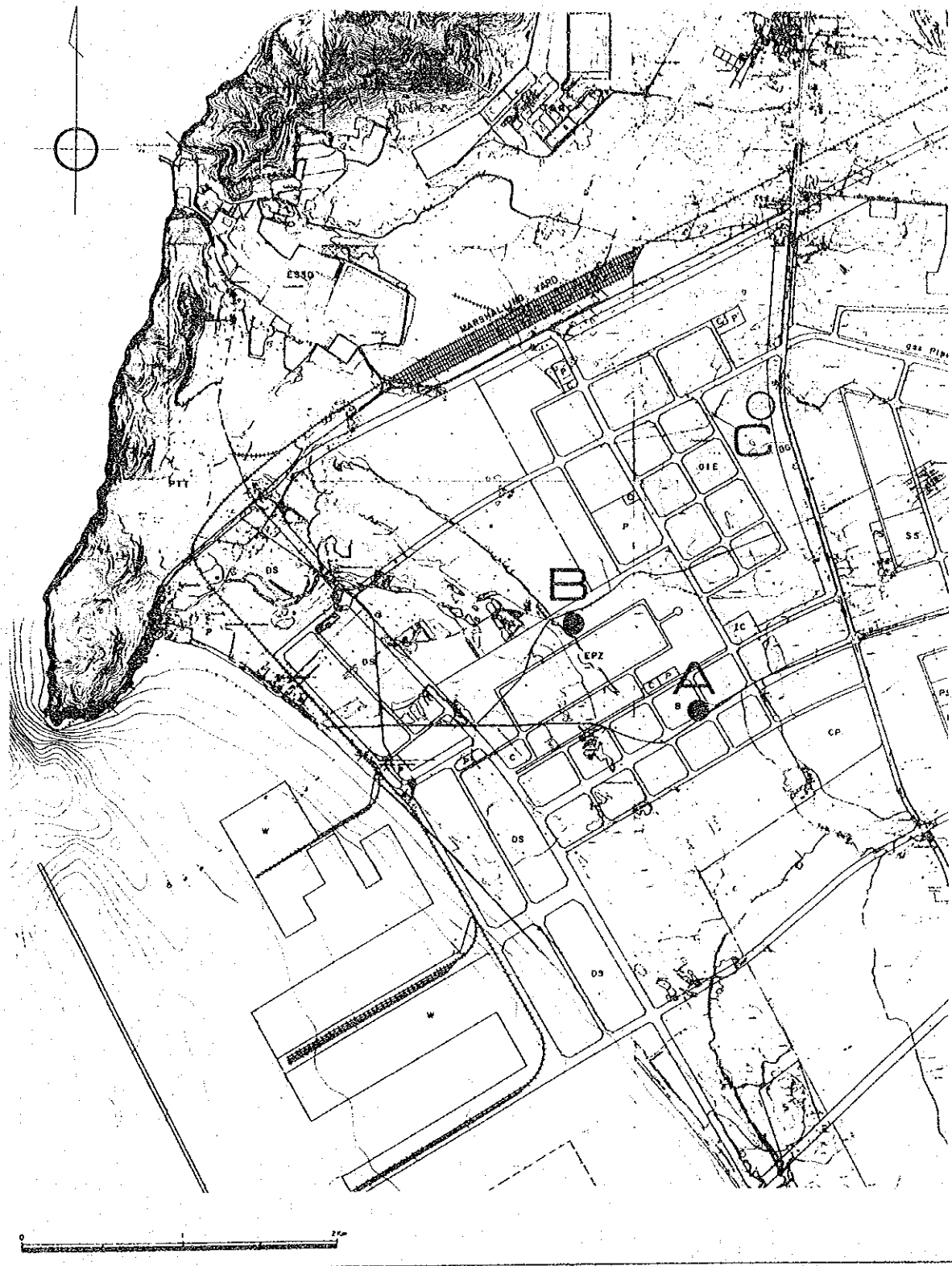
Fig. V.7.3-2)
Earth Work (Short Term Development)



LEGEND

● Soil Boring Surveyed by JICA Team

○ Soil Boring Surveyed by Nong Kho Pipeline Survey Team(JICA)

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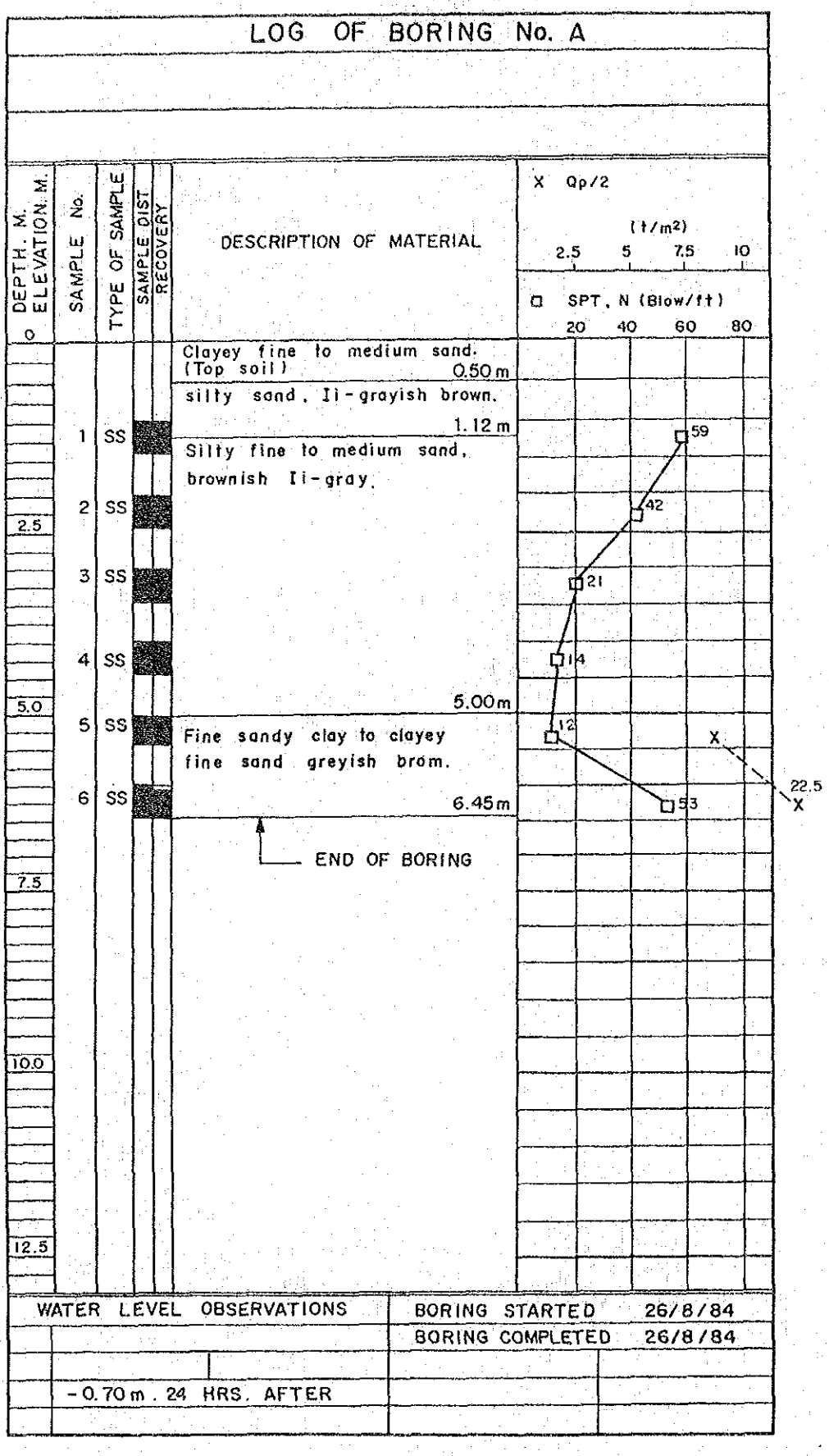
Fig. V.7.4
Location of Soil Boring

LOG OF BORING No. A



WATER LEVEL OBSERVATIONS	BORING STARTED 26/8/84
	BORING COMPLETED 26/8/84
-0.70 m . 24 HRS. AFTER	

LOG OF BORING No. B

DEPTH, M. ELEVATION, M.	SAMPLE No.	TYPE OF SAMPLE	SAMPLE DIST	RECOVERY	DESCRIPTION OF MATERIAL
0					Clayey silty sand. (Top Soil) 0.30 m
					Silty sand, brown. 1.00 m
	1	SS			Silty fine to med. sand with black clay lense, trace of
	2	SS			shell, brown to gray, very loose.
2.5					3.00 m
	3	SS			Clayey fine sand with trace
	4	SS			of shell, gray, very loose. 4.35 m
5.0					Fine sandy Clay, some sand
	5	SS			seam li-gray, soft to medium.
					6.00 m
	6	SS			Clayey fine sand, li-grayish
					brown, medium to dense.
7.5	7	SS			7.45 m
					END OF BORING
10.0					
12.5					

Q Natural Water Content (%) 20 40 60 80 100

X Qp/2 (t/m²) 2.5 5 7.5 10

□ SPT. N (Blow/ft) 20 40 60 80

□2 □1 □2 □2 □26 □11 □46

X 225

WATER LEVEL OBSERVATIONS	
-0.70 m. 24 HRS. AFTER	

BORING STARTED	26/8/84
BORING COMPLETED	26/8/84

BOREHOLE LOG C

LOCATION Receiving well ELEVATION 26m (by map) DATE 15 Nov., 1983

BORE HOLE No. B-9 METHOD OF BORING TESTED BY SIRIWAT

SCALE m	ELEVATION m	DEPTH m	STRATUM	SOIL PROFILE: DIAGRAM	CLASSIFICATION	COLOR	DESCRIPTION OF MATERIALS & REMARKS	GROUND WATER LEVEL m	STANDARD PENETRATION TEST (CONE PENETRATION TEST): DEPTH m	BLOW / cm	N - VALUE (PENETRATION RESISTANCE, qc, kg/cm²)
1					Clayey sand	Light brown to reddish brown	1 Completely weathered granite. Loose to medium.		1.15	5/30	
2									1.45		
									2.15	15/30	
3	23.0	3.00	3.00					3.20	2.45		
									3.15	17/30	
4					Clayey sand	Brownish yellow to reddish brown and light gray	2 Highly weathered granite. Dense. Clayey, fine to coase sand.		3.45		
									4.65		
5									4.95	41/30	
6									6.15		
									6.45	46/30	
7	18.5	7.50	4.50						7.65		
8					Clayey sand	Light brown to reddish brown	2 Highly weathered granite. Very dense. Clayey, fine to coase sand.		7.95	82/30	
9									9.15		
									9.45	60/30	
10	16.0	10.00	2.50						10.65		
	15.2	10.80	0.80		Clayey sand	Reddish brown	3 Slightly weathered granite.		10.80	50/15	
11											

A P P E N D I X

APPENDIX V-1 WATER RESOURCES MANAGEMENT FOR LAEM CHABANG DEVELOPMENT

1. Water Balance in 1991

Based on the development framework of the Laem Chabang Complex, water requirement was calculated in order to evaluate the water supply and demand balance situation.

Projected water demand for 1991 is summarized as below.

(Unit : 10^6/yr)

Water Use	Demand
Industry	7.0
(GIE)	(5.9)
(EPZ)	(1.1)
Domestic	3.0
Port	0.7
Domestic (outside of the Complex)/5	3.0
Total	12.5

Note: (1) Figures are consumer water demand.

(2) Please refer to Chapter 1 of "Water Supply" for detail of water demand projection.

Consumer water demand above is converted to source water demand by taking into consideration an unaccounted for water to compare it with the water supply capacity of the Nong Kho reservoir as below.

		(Unit : $10^6 m^3/yr$)
(1) Source Water Demand/1	:	16.2
(2) Water Supply Capacity of the Nong Kho Reservoir/2	:	10.2
(3) Balance	:	-6.0

/1 : 12.5/0.85 x 1.1 (Unaccounted for water : 15% & 10% of water produced at Water works in distribution process and raw water conveyance process respectively.)

/2 : 13.9 - 1.7 - 2.0; Water Supply Capacity - (River Maintenance Flow + Reserve for non-development area) - Ao Udom Waterworks.

It is revealed from the above that some other water resources is required to be developed in order to promote the development program of Laem Chabang as envisaged. Supposing that the Laem Chabang development be implemented within the extent of the water resources availability of the Nong Kho Reservoir, the industrial development in GIE and EPZ will inevitably be confined to around 1,300 Rai in gross instead of 1,800 rai.

Requirement for new water resources development arises also from Pattaya. Though Map Prachan reservoir was created in 1979 to supply water to Pattaya, it is forecast that Pattaya becomes short of water supply in near future; around 0.5 x $10^6 m^3/yr$ and 9.0 x $10^6 m^3/yr$ in 1991 and 2001 respectively.

In view of this tight water supply and demand balance situation both in Laem Chabang and Pattaya, it is required to analyze the situation from the long-term as well as overall regional point of view.

2. Proposed Water Resources Development Programs by Previous Studies

In 1982, JICA conducted a study called "The East Coast Water Resources Development Project (Phase II)" (hereinafter "Phase II Study") to establish an overall water supply plan for the Eastern Seaboard Area until the year 2001. It covered vast area of fields required for the planning of water resources and conveyance facilities as well as irrigation facilities and proposed to construct three

dams and associated facilities; namely Khlong Luang, Khlong Thap Ma and Khlong Yai and their associated facilities.

For the Laem Chabang-Pattaya corridor where future water defecit is prospected to be most been, basically two alternatives of water resources and conveyance plan were set up; one is with the inter-basin water diversion from the Rayong river basin (hereafter "Case A") and the other without the diversion (hereafter "Case B"). They are presented in Fig. V-1 and V-2 respectively.

In Case A, raw water amounting to around 31 x 10^6/yr will be transfered from the Nong Pla Lai reservoir to the Nong Kho reservoir and further conveyed to Laem Chabang and Pattaya in 2001. In case B, four reservoirs are planned to be newly developed along the coastal area, out of which three (Huai Bung, Huai Takian Tia and Klong Na Klua) are for Laem Chabang and one (Huai Yai) for Pattaya. In both cases, projected water demand for industrial and domestic use until 2001 will be met by the planned water resources development.

In 1983 to 1984, a study called "Nong Kho-Laem Chabang Water Pipeline Project" (hereafter "Pipeline Study") was conducted by JICA to formulated an optimum development plan of the raw water pipeline between the Nong Kho reservoir and Laem Chabang. The Pipeline Study was carried out within the framework of Case A. Regional water supply and demand balance in Laem Chabang and Pattaya areas were reviewed and modified to some extent as shown in Fig. V-3 based on the most updated data.

As a conclusion of the Phase II Study, Case A was judged to be more economical in terms of construction cost. In addition, it was revealed that water resources development along the coastal area might involve serious resettlement and compensation problems as was the case of Map Prachan Reservoir.

In the present study, it was tentatively endevored to compare the water resources development cost of Case A and Case B by modifying the amount of water to be transfered in accordance with the water demand projected for 2001 in the present study which is about 51.8 x 10^6 m^3/yr for Laem Chabang and Pattaya. Results are shown below.

Item	Development Cost A	Development Cost B
Development Cost (฿10^6)		
Laem Chabang	1,706.6/1	1,428.0/3
Pattaya	244.4/2	1,281.8/4
Total	1,951.1	2,709.8
Water Cost (฿/m^3)		
Laem Chabang	5.5	4.6
Pattaya	2.1	7.9
Total	4.0	5.7

/1 : From Nong Kho & NOng Pla Lai

/2 : From NOng Kho & Huai Khon Dai

/3 : From Nong Kho, Huai Bung, Huai Takian Tia & Huai Khon Dai

/4 : From Haui Yai

Note : Development cost originally estimated in the Phase II Study and Pipeline Study was adjusted in proportion to the change in the water requirement.

It is revealed from the above that cost is lower in Case B, if focused only on Laem Chabang, but Case A is cheaper with Pattaya included. Water supply and demand relationship is illustrated in Fig. V-4.

3. Recommendation

In order to promote the development of Laem Chabang in a smooth and effective manner, actions are needed to be promptly taken particularly to ensure a sufficient water supply to Laem Chabang.

Firstly, considering that the detailed design work of the Nong Kho-Laem Chabang Water Pipeline is scheduled to start in near future, it is essential to make necessary coordinations of the results of the present study and the detail design work, especially in relation to the water demand and development scale of the pipeline. This coordination is recommended to be done at the initial stage of the design work.

Secondly it is essential to take an action to materialize the water resources development project in addition to the Nong Kho reservoir, for which the Study Team considers the Nong Pla Lai Water Pipeline Project, which is to divert raw water from the Rayong river basin to Nong Kho, as most suitable and recommendable for the reasons mentioned in the previous section. Considering that Laem Chabang and Pattaya is prospected to run out of water supply in near future, this measure is urgently required to be taken.

Finally, it is essential to make sufficient coordination between the development scale of Laem Chabang and water resources developemnt in the Rayong river basin. At moment the detail design work of the Nong Pla Lai dam is scheduled to start quite soon by the Royal Irrigation Department (RID). Though the scale of the Nong Pla Lai Dam was determined at a feasibility study level by previous JICA studies, it will become necessary to review it, particularly in relation with the requirement of inter-basin water diversion to the Nong Kho reservoir. Needless to say, this requirement for quick action on this matter is on the ground that the Nong Pla Lai Water Pipeline Project be implemented. Sufficient communication and coordination between IEAT and RID on this issue is also inevitable.

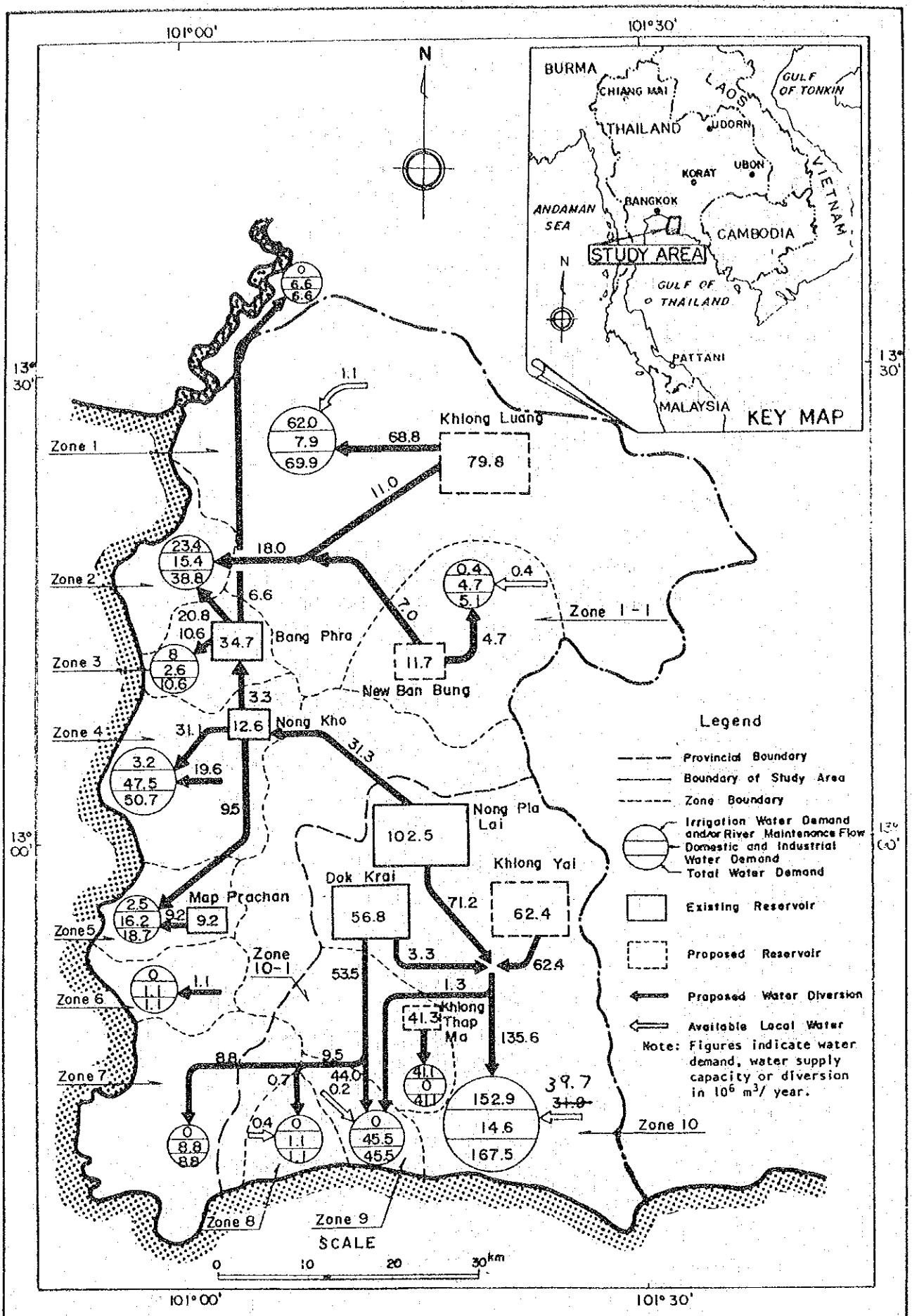


Fig. V-1 Water Supply Plan in 2001, (Case A)

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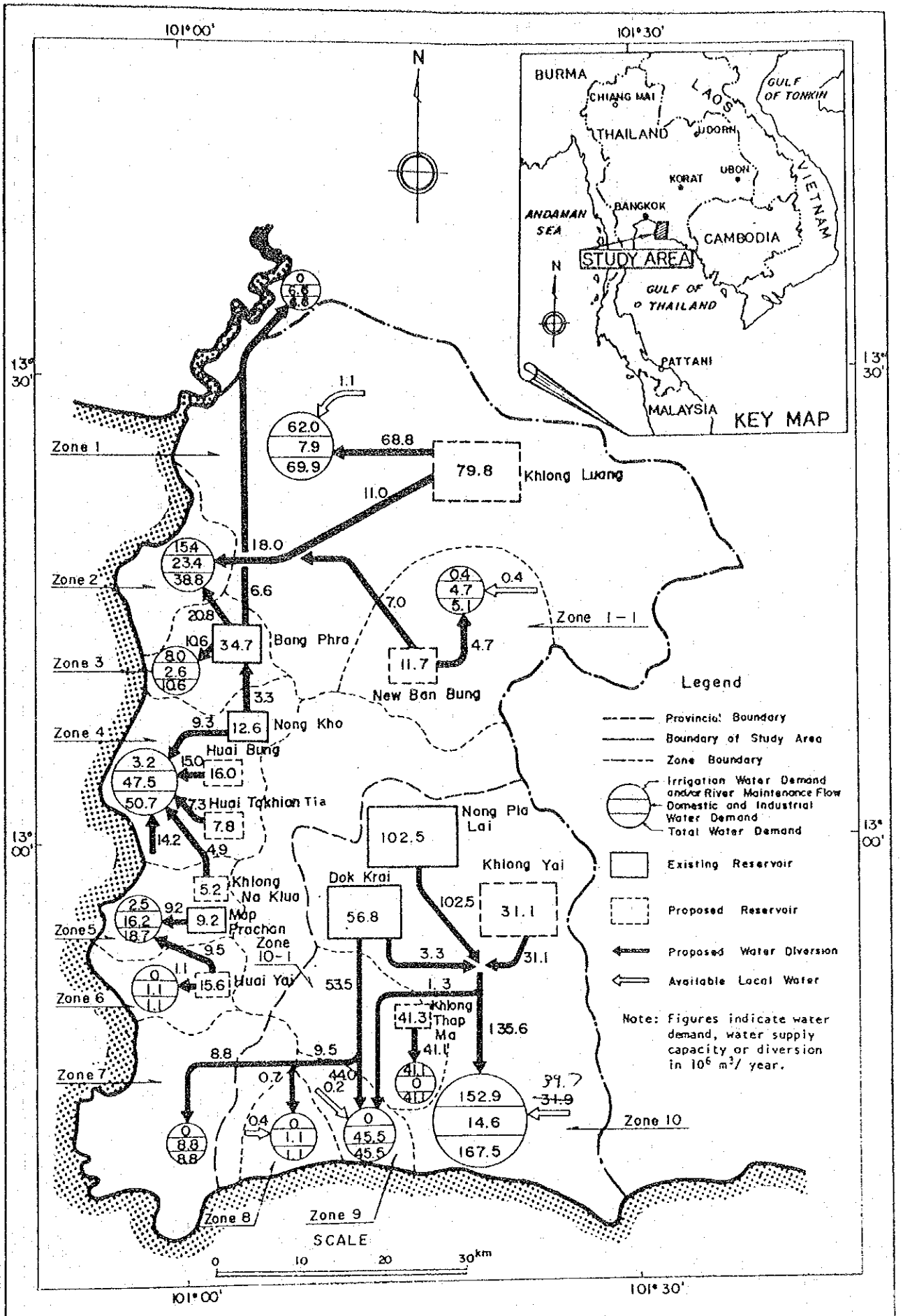

Fig.V-2 Water Suppiy Plan in 2001(Case B)

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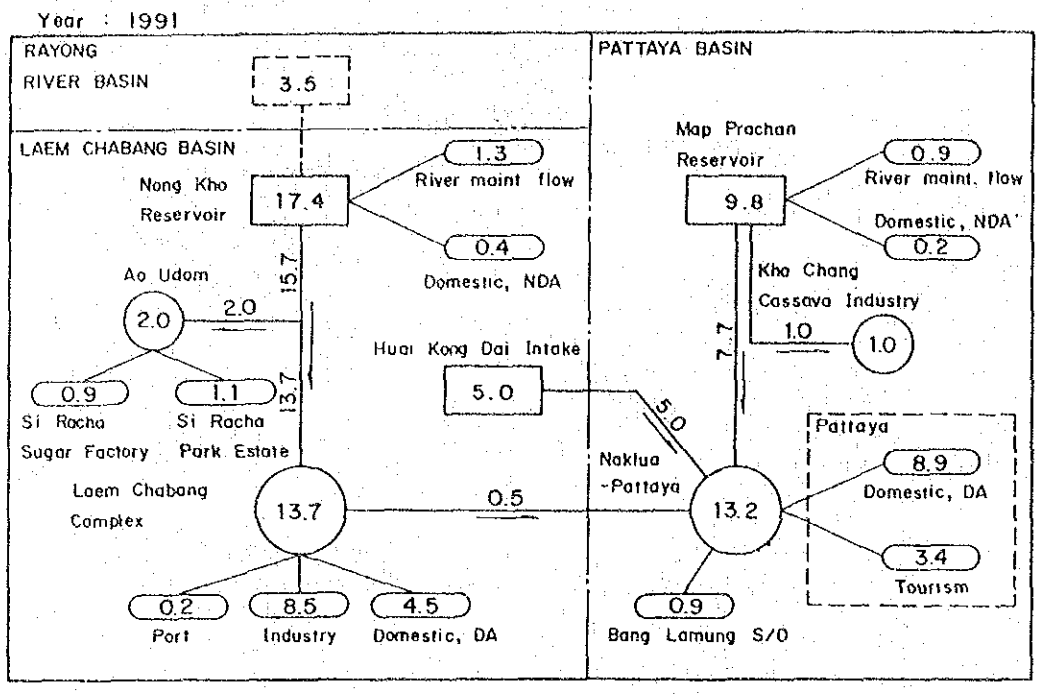

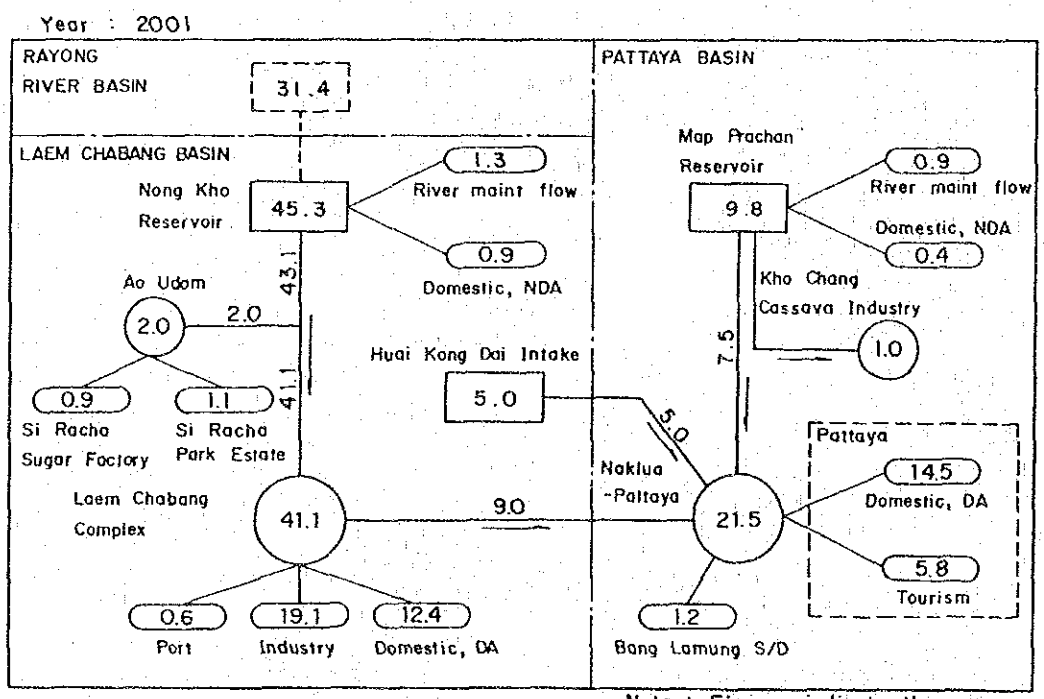

LEGEND

- Water source facilities
- Water use
- Demand center

Note : Figures indicate the annual water withdrawal or water supply amount in $10^6 m^3$

LEGEND

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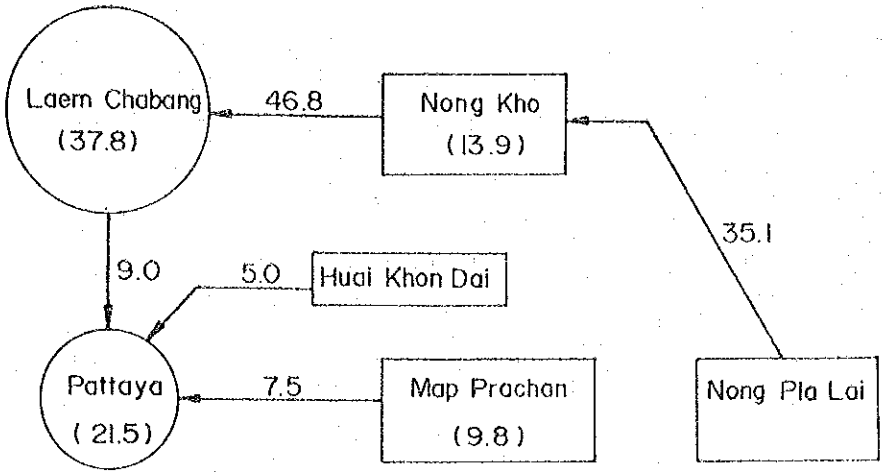
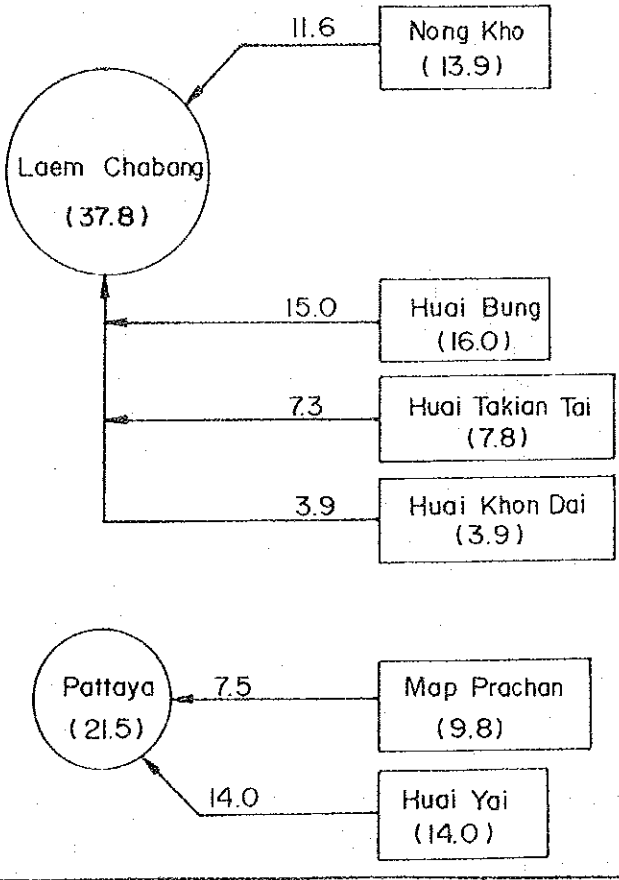
Fig. V.3
Raw Water Supply Plan

CASE A



CASE B



LEGEND

○ Demand Center

▭ Reservoir or Intake

Note. 1) Difference between capacity of reservior and actual supply is river maintenance flow etc.

2) Figure is in $10^6 m^3/yr$

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Fig. V.4
Water Supply & Demand Balance

APPENDIX V-2 PRELIMINARY COMPARISON OF SEWERAGE SYSTEMS

To prepare the most suitable sewerage system plan, comparison was made for the comprehensive and separate sewerage systems at a preliminary level. The layout plan for the separate system is prepared as shown in Fig. V-5. This is worked out to be the most realistic alternative to the proposed comprehensive system.

Construction costs for both systems are roughly compared as below for the year 2001.

Item	Comprehensive System	Separate System
Treatment Plant		
- Sewage Volume (m^3/day)	97,800	97,800
- Construction Cost (₱10^6)	568.0	613.0
	-	(NT : 215.0)
	-	(IE : 300.0)
	-	(Port: 98.0)
Tounk Sewer		
- Length (m)	32,035	33,700
	-	(NT : 16,160)
	-	(IE : 8,400)
	-	(Port: 9,210)
- Construction Cost (₱10^6)	122.3	102.8
	-	(NT : 35.5)
	-	(IE : 38.0)
	-	(Port: 29.3)
Total Cost (₱10^6)	690.3	715.8

Note: Oxidation ditch is assumed as treatment method for either system.

This reveals that the construction cost of the comprehensive system is lower mainly due to the difference in the construction cost of the sewage treatment plant.

THE STUDY ON THE DEVELOPMENT PROJECT OF
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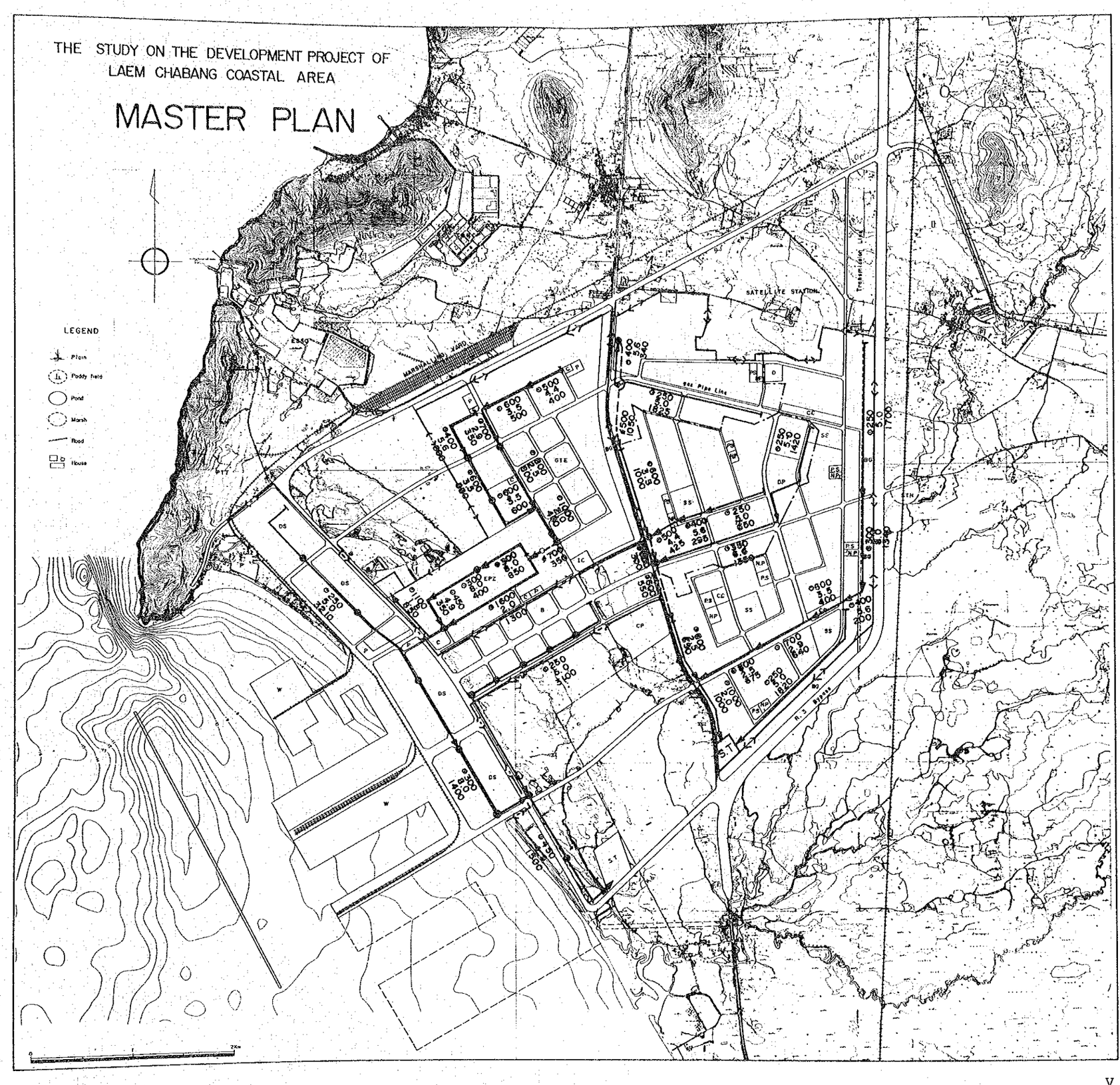
MASTER PLAN



LEGEND

—(-)—	Boundary of Project Area
⊛	Pumping Station
ST	Treatment Plant
——→	Trunk Sewer
- - - →	Force Main
⊙ 600	Diameter (mm)
3.5	Slope (‰)
400	Length (m)

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Fig. V.5
Layout Plan for Separate Sewerage System

APPENDIX V-3 COMPUTATION OF EFFLUENT QUALITY ON TH SEA AREA

Diffusion on the sea area is effected by the numerically unpredictable factors, such as surge, wind and topography. As satisfactory data necessary for the computation of diffusion has not been obtained, rough computation of the diffusion is carried out applying Joseph-Sendner formula as follows:

Joseph - Sendner formula

$$S = (So - S_1)\ 1 - \exp\ -\ \frac{Q}{dp}\left(\frac{1}{r} - \frac{1}{r_1}\right) + {}_1S$$

where,

S : Concentration on arbitrary point (mg/l)

S_1: Concentration of sea water (mg/l)

COD = 1.0

N = 0.15 anticipated value

P = 0.01

S_o: Effluent density

COD = 30.0

N = 30.0

P = 3.0

r : Distance from pollution origin to arbitrary point (m)

r_1: Distance from pollution origin to the point where the influence of pollution is neglected.

here,

$$\log\left(\frac{r_1^2}{2}\right) = 1.23 \log Q + 0.086$$

Q: Effluence (m^3/day)

Diffusion angle is assumed to be 180°, then = /2 is substituted.

d : mixing depth (m)

d = 1.0 m

p : diffusion velocity (const) (m/h)

p = 360 m/h = 0.1 m/sec

Computed diffusion concentration at the location of 5.0 km and 10.0 km from the Khlong Bang Lamung mouth is shown as follows:

(Unit: mg/l)

Distance	COD	N	P
5 km	1.2	0.4	0.03
10 km	1.1	0.3	0.02

SECTORAL REPORT VI

COST ESTIMATION

TABLE OF CONTENTS

LIST OF TABLES

1. INVESTMENT COST FOR LONG TERM DEVELOPMENT

1.1 General

1) Cost Categories

Investment cost is estimated for the following categories:

a. Construction costs
b. Land acquisition cost in the new town area. Industrial and port areas has been already acquired.
c. Engineering service fee
d. Physical contingency

2) Construction cost

Construction cost to be considered are as follows:

a. The labour cost
b. The cost of the construction equipments and materials for construction
c. Overhead and profit of contractor

3) Condition of cost estimate

Conditions of the cost estimate are as follows:

a. Price
   The price is expressed in baht based on 1984 prices.
b. Exchange rate
   Exchange rate is calculated as US 1$ = 22.90 Baht,
   US 1$ = 236¥, 1 Baht = 10.3¥
c. Duty and Tax
   Duty for imported construction materials, equipments and plants are excluded from the cost estimate.
   Business tax and municipal tax are also eliminated from the cost estimate.

d. Engineering service fee

The engineering service fee includes cost for detailed engineering, natural condition survey, construction supervision and government administration cost.

e. Contingency

The contingency is considered to be 20 percent of the construction cost plus engineering service fee.

4) Foreign and Local Currency

(1) Foreign Currency

The components of the foreign currency are as follows:

a) Costs of imported equipment and materials such as steel products and others (CIF price)
b) A portion of the material cost for cement, asphalt and fuel
c) A portion of labour cost
d) A portion of the detailed engineering and supervision service fees
e) A portion of the overhead, profit and contingency

(2) Local Currency

The components of the local currency are as follows:

a) Purchase cost of domestic products such as crushed stone, sand, paint etc.
b) Transport cost in Thailand
c) A portion of the material cost for cement, asphalt and fuel
d) A portion of labour cost
e) A portion of the detailed engineering and supervision service fees
f) A portion of the overhead, profit and contingency
g) Cost of land acquisition
h) Tax

1.2 Basic Data for Cost Estimate

1) Construction Materials and Equipments

The cost of major construction materials and equipments are collected through hearing survey with related offices and with reference to the price lists of private companies.

The market price of the major construction materials and equipments are listed in Table VI-1 and Table VI-2.

2) Labor Costs

Labor costs are estimated through hearing survey with related offices and with reference to pricelists of private companies. Labor cost list is shown in Table VI-3.

1.3 Unit Cost

Unit cost of main construction work items are estimated on the basis of discussions with IEAT, CIPO, PAT and other related agencies and refering to related reports.

The basic guidelines for the unit cost analysis are as follows:

a. Construction materials available in Thailand
b. Market prices of the construction materials and equipments
c. Labour cost, power and capability in Thailand
d. Construction efficiency and capacity in Thailand
e. Construction experience in Thailand

1.4 Investment Cost

Investment costs for the long term plan are estimated as shown in Table VI-4. Breakdown of investigation cost are shown for each area from Table VI-5 to VI-9.

Table VI-1 MARKET PRICE OF CONSTRUCTION MATERIAL (1/2)

(Unit : 1984 price)

Items	Description	Unit	Cost (฿)
Crusherrun	1:1/2	m^3	90
	1"	m^3	100
	3/4"	m^3	100
	3/8"	m^3	110
Sand	-	m^3	130
Gravel	-	m^3	250
Rock Wast	-	m^3	90
Stone	50 200 Kg/Block	m^3	155
	1∿2 t/Bloci	m^3	150
Wood	log	m^3	3,000
	Timber	m^3	5,000
	Plate	m^3	5,500
	Plywood	m^3	6,000
Concrete Brik	230 x 115 x 32		10.8
	230 x 115 x 50		19.0
	230 x 115 x 70		19.8
P.C Bridge Girder	ℓ = 10	unit	13,000
	ℓ = 20	unit	47,500
P.C Concrete Pile	0.18x0.18x6.00	unit	600
	0.18x0.18x8.00	unit	1,000
	0.22x0.22x12.00	unit	17,000
Ready Mixed Concrete	$\sigma'28$ = 140 kg	m^3	880
	$\sigma'28$ = 180 kg	m^3	930
	$\sigma'28$ = 210 kg	m^3	975
	σ 28 = 240 kg	m^3	1,020
	σ 28 = 280 kg	m^3	1,065
R.C. Pipe	ϕ 400	4.0m	4,540
	ϕ 600	4.5m	7,160
	ϕ 800	5.0m	12,370
	ϕ 1,000	5.0m	16,210
P.C. Pipe	ϕ 400	5.0m	2,060
	ϕ 600	4.0m	2,790
	ϕ 800	5.0m	4,000
	ϕ 1,000	5.0m	8,170

Table VI-1 MARKET PRICE OF CONSTRUCTION MATERIAL (2/2)

(Unit : 1984 price)

Items	Description	Unit	Cost (฿)
Reinforced Bar	ϕ 10	t	10,460
SD 30	ϕ 16	t	9,820
	ϕ 28	t	9,820
Steel	Pipe Pile	t	18,000
	sheet pile	t	13,000
	H shaped pile	t	13,000
	Steel Plate	t	12,000
Cement	type I	t	1,650
	type V	t	1,730
Asphalt	-	t	9,000
Gasoline	-	ℓ	11.9
Light oil	-	ℓ	8.0
Diesel oil	-	ℓ	7.4

Table VI-2 COST OF CONSTRUCTION EQUIPMENTS

(Unit : 1,000 ฿)

Type of Equipment	Description	Price
Backhoe	0.4 m^3	1,100
	0.7 m^3	1,800
Clamshell	0.3 m^3	100
	0.6 m^3	150
	1.2 m^3	200
Bulldozer	11 to 0.5	2,400
	21 to 0.7	3,700
Dump Truck	6 t	420
	11 t	650
Truck Crane	10∿11 t	1,850
	15∿18 t	3,000
Generator	7.5 KVA	30
	45.0 KVA	40
	100.0 KVA	60
Submergible Pump	100 mm 5.5 KW	49
Concrete Mixer	200 liters	12.5
Diesel Hammer	2.2 t	-
	3.6 t	-
Tire Roller	8∿15 t	950
Trailer	25 t	2,500
Scraper	11 m^3	4,300
Crawler Crane	15 t	5,500
	30 t	7,000
	50 t	10,000
Truck Mixer	4 m^3	1,500
Wheel Type Loader	0.8 m^3	2,500
	1.8 m^3	3,500

Table VI-3 LABOR COSTS

(Baht per day)

Type of Labor	Labor Cost
Common labor	65 - 70
Skilled labor	80 - 85
Welder	120 - 150
Mason	120 - 140
Carpenter	100 - 180
Mechanic	150 - 200
Brick layer	100 - 140
Concrete worker	100 - 140
Steel bender and fixer	85 - 120
Painter	120 - 150
Lorry driver	120 - 150
Equipment operater	150 - 180
Foreman	180 - 200

Table VI-4 SUMMARY OF PROJECT COST

(Unit: ₱ X 10^6 in 1984 constant price)

	Area	Cost
1)	Industrial Estate	2,101
2)	Port Area	14,380
	(1) Port Facility Area (Off shore)	(13,050)
	(2) Port Hinter Land (On shore)	(1,330)
3)	New Town	6,618
	(1) Land Preparation	(2,754)
	(2) Housing and Common Facility	(3,864)
4)	Others (Connected Roads)	1,069
	TOTAL:	24,168

1) Excluding acquisition costs of land which have already been acquired by IEAT and PAT.

2) Construction costs of the utility plants such as water filtration plant, sewage treatment plant, electricity substation, telephone exchange, solid waste tip were distributed to each area in proportion to demand.

3) Cost of railroad spur in port area is included in 2)-(1) Port Facility Area.

Note: Physical contigency of 20% and engineering service fee and administration cost of 10% are included in each item.

Table VI-5 PROJECT COST OF INDUSTRIAL ESTATE FOR MASTER PLAN

Item	Unit	Q'ty	Unit Cost	Amount (1000 Baht)
1. Site Preparation				
Preparation Work	ha	450	20,000	9,000
Earth Work	m^3	2,800,000	20	56,000
2. Road & Bridge				
V_2	km	2.32	19,790,000	45,913
V_3	km	10.45	13,060,000	136,447
V_4	km	5.18	5,766,000	29,868
Bridge	m^2	4,540	12,000	54,480
3. Water Supply				
Filtration Plant	unit	0.50	420,000,000	210,000
Distribution Basin	unit	0.50	76,670,000	38,335
Supply Pipe	m	14,680	2,057	30,201
4. Sewerage				
Treatment Plant	unit	0.5	567,900,000	283,950
Sewer	m	18,630	1,195	22,271
Pumping Station & Man Hole	unit	353	60,991	21,530
5. Drainage				
Drain	m	41,650	4,508	187,775
6. Power Supply	Ls	1	-	154,000
7. Telecommunication	Ls	1	-	32,000
8. Park				
Park	m^2	105,000	1,095	114,975
Buffer Zone	m^2	493,000	5	2,465
9. Administrative				
Main Center Area	m^2	15,500	110	1,705
Sub Center Area	m^2	60,058	110	6,606
Factory Building	m^2	24,450	4,800	117,360
10. Solid Waste Tip	unit	0.50	74,200,000	37,100
11. Sub-Total				1,591,981
12. Engineering Service (10%)	Ls			159,198
13. Contingency (20%)	Ls			350,236
14. Total				2,101,415

Table VI-6 PROJECT COST OF NEW TOWN FOR MASTER PLAN

	Item	Unit	Q'ty	Unit Cost	Amount (1000 Baht)
1.	Site Preparation				
	Preparation Work	ha	930	20,000	18,600
	Earth Work	m^3	0	20	0
2.	Road & Bridge				
	V_3	km	6.60	13,060,000	86,196
	V_4	km	21.10	5,766,000	121,663
	V_{5-7}	km	221.70	2,194,000	486,410
	Bridge	m^2	3,355	12,000	40,260
3.	Water Supply				
	Filtration Plant	unit	0.40	420,000,000	168,000
	Distribution Basin	unit	0.40	76,670,000	30,668
	Supply Pipe	m	34,740	7,868	273,326
4.	Sewerage				
	Treatment Plant	unit	0.25	567,900,000	141,975
	Sewer	m	233,875	665	155,410
	Pumping Station & Man Hole	unit	4,678	11,283	52,780
5.	Drainage				
	Drain	m	73,230	2,941	215,406
6.	Power Supply	Ls	1	-	67,000
7.	Telecommunication	Ls	1	-	158,000
8.	Park				
	Park	m^2	560,000	50	28,000
	Buffer Zone	m^2	470,000	5	2,350
9.	Administrative				
	Main Center Area	m^2	0	-	-
	Sub Center Area	m^2	0	-	-
10.	Solid Waste Tip	unit	0.40	74,200,000	29,680
11.	Bus Terminal	unit	1	10,278,000	10,278
12.	Sub-Total				2,086,002
13.	Engineering Service (10%)	Ls			208,600
14.	Contingency (20%)	Ls			458,920
15.	Total				2,753,522

Table VI-7 PROJECT COST OF HINTERLAND FOR MASTER PLAN

	Item	Unit	Q'ty	Unit Cost	Amount (1000 Baht)
1.	Site Preparation				
	Preparation Work	ha	720	20,000	14,400
	Earth Work	m^3	2,800,000	20	56,000
2.	Road & Bridge				
	V_2	km	3.55	19,790,000	70,254
	V_3	km	4.73	13,060,000	61,774
	V_4	km	9.90	5,766,000	51,083
	Bridge	m^2	5,610	12,000	67,320
3.	Water Supply				
	Filtration Plant	unit	0.1	420,000,000	42,000
	Distribution Basin	unit	0.1	76,670,000	7,667
	Supply Pipe	m	29,650	643	19,079
4.	Sewerage				
	Treatment Plant	unit	0.25	567,900,000	141,975
	Sewer	m	30,335	1,160	35,180
	Pumping Station & Man Hole	unit	607	59,423	36,070
5.	Drainage				
	Drain	m	36,565	5,495	200,912
6.	Power Supply	Ls	1	-	81,000
7.	Telecommunication	Ls	1	-	68,000
8.	Park				
	Park	m^2	740,000	50	37,000
	Buffer Zone	m^2	0	5	0
9.	Administrative				
	Main Center Area	m^2	-	-	-
	Sub Center Area	m^2	-	-	-
10.	Solid Waste Tip	unit	0.1	74,200,000	7,420
11.	Bus Terminal	unit	1	10,278,000	10,278
12.	Sub-Total				1,007,412
13.	Engineering Service (10%)	Ls			100,741
14.	Contingency (20%)	Ls			221,631
15.	Total				1,329,784

Table VI-8 PROJECT COST OF HOUSING & PUBLIC FACILITIES FOR MASTER PLAN

Items	Unit	Q'ty	Unit Cost	Amount (1000 Baht)
1. Housing				
Row House	unit	20,140	60,000	1,208,400
Shop House	unit	940	330,000	310,200
Semidetached	unit	4,490	110,000	493,900
Detached	unit	530	250,000	132,500
Sub-Total		26,100	-	2,145,000
2. Education Facilities				
Secondary	unit	4	30,000,000	120,000
Primary	unit	8	18,900,000	151,200
Kindergraden	unit	32	4,400,000	140,800
Sub-Total				412,000
3. Community Facilities				
Town Center	m^2	60,000	5,000	300,000
Community Center	m^2	12,000	5,000	60,000
Shopping Center	m^2	2,000	5,000	10,000
Sub-Total				370,000
4. 1, 2, 3 Total	-	-	-	2,927,000
5. Engineering Service (10%)	-	-	-	293,000
6. Contingency (20%)	-	-	-	644,000
7. Grand Total	-	-	-	3,864,000

Table VI-9 PROJECT COST OF RELATED ROAD FOR MASTER PLAN

Items	Unit	Q'ty	Unit Cost	Amount (1000 Baht)
1. By-pass (V_1)				
Road	km	15	29,026,000	435,390
Bridge 1	M^2	2,400	28,000	67,200
Bridge 2	M^2	2,400	28,000	67,200
Bridge 3	M^2	480	28,000	13,400
Land Acquisition	ha	150	500,000	75,000
Sub-Total				658,230
2. V_2				
Road	km	2.2	19,790,000	43,538
Land Acquisition	ha	6.6	500,000	3,300
Sub-Total				46,838
3. V_3				
Road	km	7.5	13,060	97,950
Land Acquisition	ha	15	500,000	7,500
Sub-Total				105,450
4. 1, 2, 3 Total	–	–	–	810,518
5. Engineering Service (10%)	–	–	–	81,052
6. Contingency (20%)	–	–	–	178,314
7. Total	–	–	–	1,069,884

2. INVESTIMENT COST OF SHORT TERM DEVELOPMENT

2.1 Construction Material

Construction material survey is performed on the basis of the hearing to some construction companies in Bangkok and some quarry sites comparatively near the study area. Since quality and capacity of the quarry site has not been analysed in depth in this survey, more detaled soil investigation or material investigation should be carried out in the detail design stage.

1) Aggregate

Three quarry factories of the aggregate are operating at five kilometer from the nouthern part of Bang Phra reservation area. Production capacity of aggregate of these factories are as follows:

- THAI PIPAT : 700 m^3/day
- SILA SANSUK : 300 - 400 m^3/day
- CHINDA FACTORY : 300 - 400 m^3/day

The distance between these quarry sites and the study area is about 20 kilometers. It is required to find out the new quarry site near the Study Area at the detail design or the construction stage. It will be necessary to minimize the traffic flow, especially heavy trucks, to transport aggregates through Route 3 between these three factories and the study area, from the emvironmental point of view.

2) Fine Aggregate

Fine aggregate material for the concrete or reinforced concrete are not found near the Study Area. It is generally difficult to find out fine aggregate with good quality in Thailand. Coastal sand cannot be used for chemical reason.

However, as a result of hearing survey with various contractors in Bangkok, it was found out that several areas producing fine aggregate are as follows:

a. Amphoe Ban Bung
b. Changwat Rayong
c. Phanom Sarakham

Distance between above mentioned areas and the Study Area are about 30 km, 60 km, and 90 km respectively.

3) Soil and embankment fill material

Soil and embankment fill material should basically be managed in the Study Area. For this purpose, soil investigation should be carried out prior to the construction start.

2.2 Construction Schedule

2.2.1 Construction Schedule of the Industrial Estate

The present feasibility study is scheduled to be completed in early 1985. The detailed design of the project is recommended to be commenced as soon as possible after completion of the study. It is assumed that detailed design work be undertaken for about a year until early 1986.

Such facilities as main roads, trunk main, trunk sewer and main canal are planned to be constructed at once at the early stage for economic and administrative efficiency. On the other hand, such facilities as water filtration and sewage treatment plants which can be constructed in a stagewise manner will be constructed broadly in accordance with demand.

The short term construction will be completed by the end of 1989.

A part of GIE andEPZ area will start to be sold in the middle of 1986. Factories will start operation in the middle of 1987 and 1988 for GIE and EPZ respectively. The construction schedule is illustrated in Table VI-10.

2.2.2 Construction Schedule of the New Town

The land of new town area should be acquired as soon as possible to ensure prompt accommodation of New Town facilities. The land acquisition is assemed to take for about one year. The GIE and EPZ will start operation in the middle of 1987 and 1988 respectively. It is assumed in the present study that workers in this period will be those communiting from outside the new town.

Housing units are planned to be constructed in four years from 1988 to 1991 in same number in each year. Various facilities in the new town will be, on the contrary, constructed ahead of demand and in a shorter periods from the viewpoint of efficiency. These facilities will be constructed by 1989.

2.3 Investment Cost

The total investment cost for the short-term development is estimated to be 9.1×10^9 as shown in Table VI-12. Detailed breakdown of the investment cost of the industrial estate, new town, port hinter-land, and power supply and telecommunication facilities are shown in Tables VI-13 to VI-16. Detailed cost of the port are presented in the Sectoral Report II "Port Development Plan".

According to the construction schedule, the total investment cost are split over the years and disbursement schedules are prepared as presented in Table VI-17 and VI-19 for the industrial estate and new town respectively. Detailed annual construction costs are given in Table VI-18 and VI-20 for the industrial estate and new town respectively.

Table VI-10

CONSTRUCTION SCHEDULE OF INDUSTRIAL ESTATE FOR SHORT TEPM DEVELOPMENT

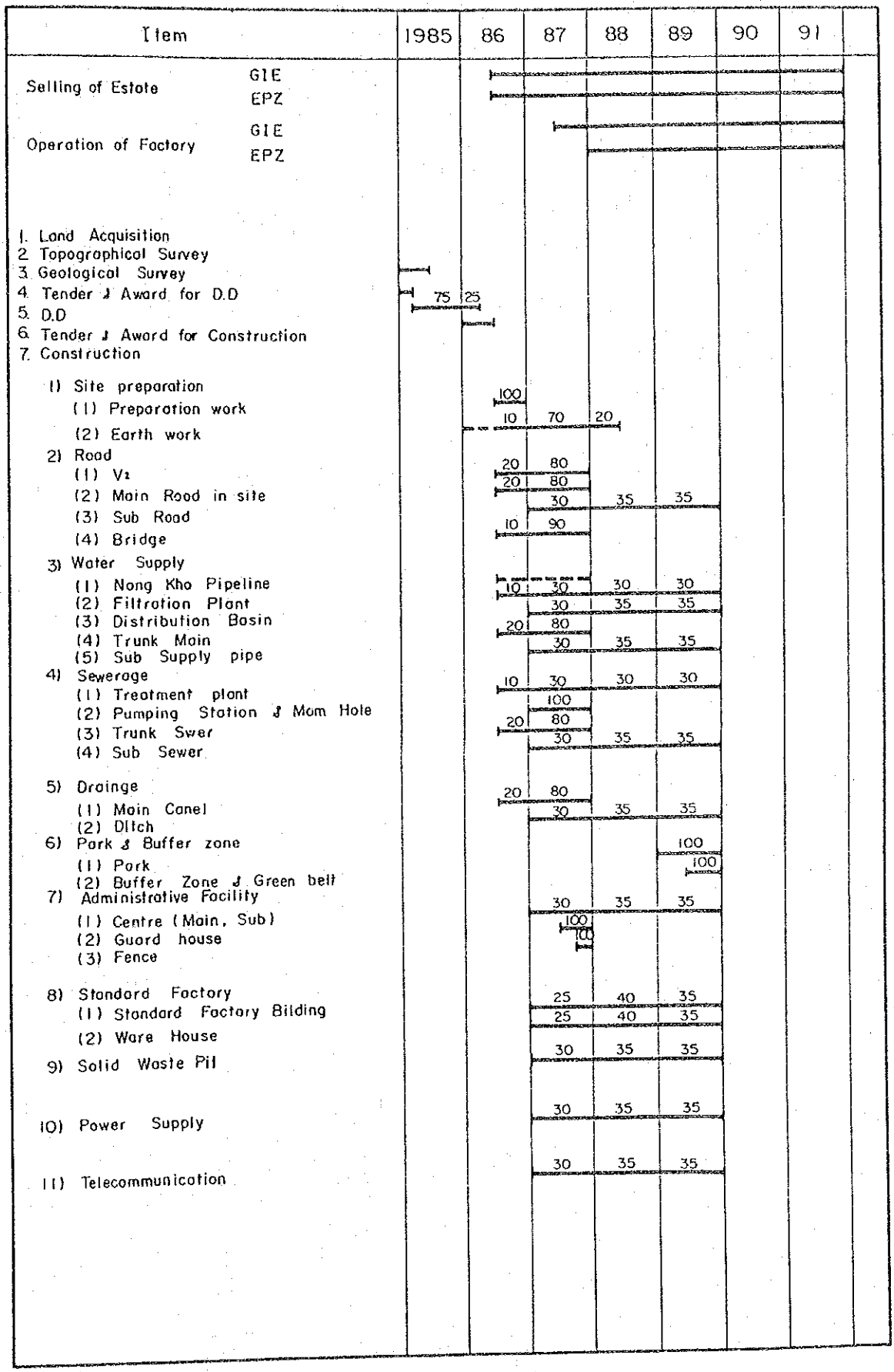

Table VI-11

CONSTRUCTION SCHEDULE OF NEW TOWN FOR SHORT-TERM DEVELOPMENT

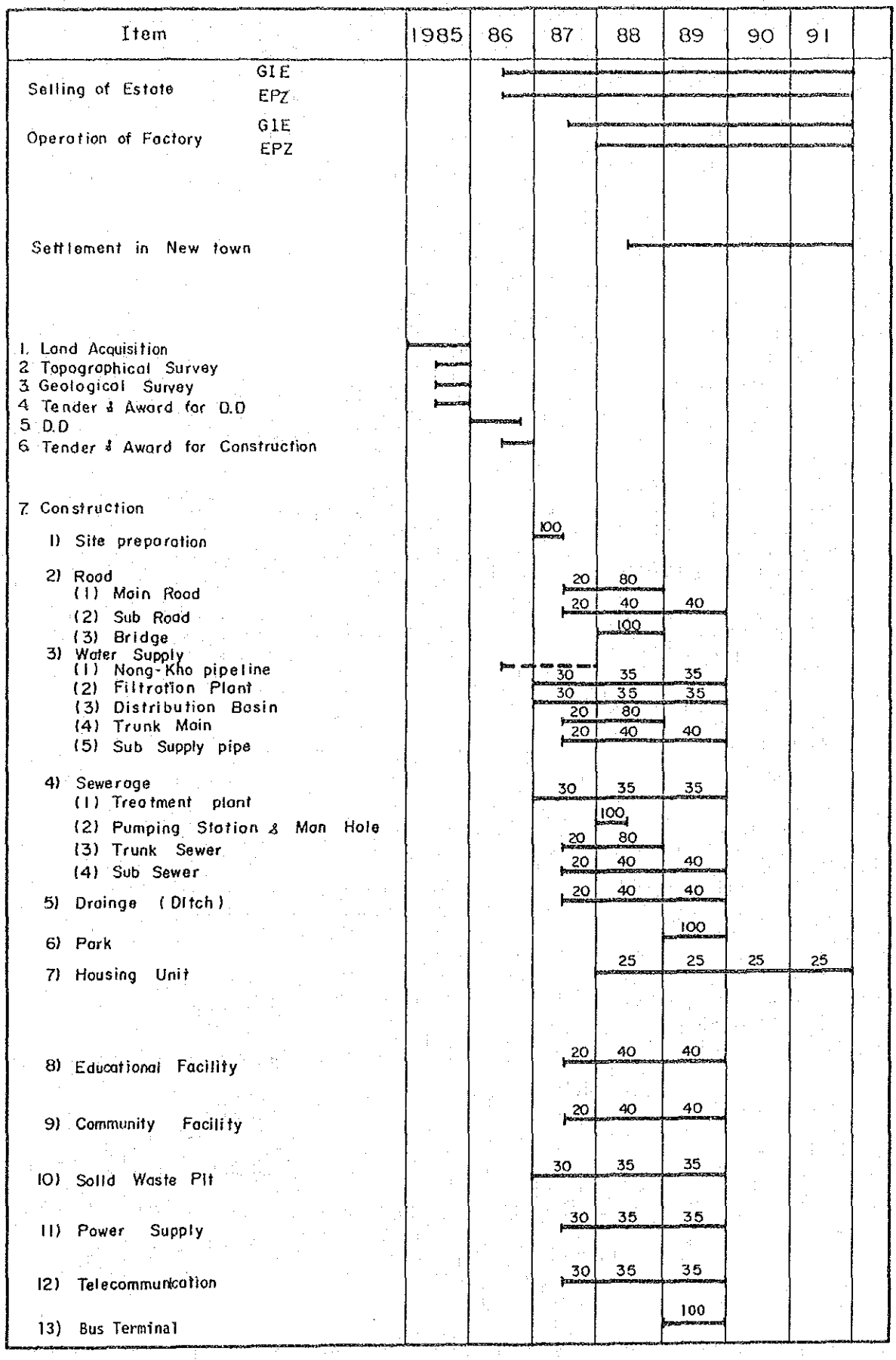

Table VI-12

SUMMARY OF INVESTMENT COST FOR SHORT TERM DEVELOPMENT

Items	Amount (₱ x 10^6)			Remarks
	Total	F/C	L/C	
1. Industrial Estate	1,114	478	636	
2. Port Area (Wharf)	5,948	2,985	2,963	
3. Port Area (Hinterland)	680	265	415	
4. New Town	1,010	297	713	
Sub-total	8,752	4,025	4,727	
5. Power Supply	206	82	124	
6. Telecommunication	163	97	66	
Sub-total	369	179	190	
Total	9,121	4,204	4,917	

Note: Cost of railroad spur in port area is included in 2. Port Area (Wharf)

F/C: Foreign Currency

L/C: Local Currency

TABLE VI-13 COST FOR INDUSTRIAL ESTATE IN SHORT-TERM DEVELOPMENT (1/2)

Items	Discription	Unit	Unit Cost			Quantity	Amount Cost (1000 Baht)			Remarks
			Total	F/C	L/C		Total	F/C	L/C	
1. Land Acquisition		ha	-	-	-	0	0	0	0	
2. Site Preparation							(20,600)	(8,980)	(11,620)	
	Preparation Work	ha	20,000	8,000	12,000	290	5,800	2,320	3,480	
	Earth Work	m^3	20	9	11	740,000	14,800	6,660	8,140	
3. Road & Bridge							(146,743)	(59,098)	(87,645)	
	V2-1	m	10,043	4,426	5,617	0	0	0	0	
	V2-2	m	9,559	3,846	5,713	0	0	0	0	
	V3-1	m	9,021	3,587	5,434	3,520	31,754	12,626	19,128	
	V4-2	m	4,002	1,332	2,670	7,720	30,895	10,283	20,612	
	V5-2	m	2,675	932	1,743	6,040	16,157	5,629	10,528	
	V6-2	m	1,525	569	956	100	153	57	96	
	Bridge	m^2	14,800	6,660	8,140	4,580	67,784	30,503	37,281	
4. Water Supply							(209,993)	(114,446)	(95,547)	
	Filtration Plant	unit	210,000,000	120,700,000	89,300,000	0.75	157,500	90,525	66,975	
	Trunk Pipe	m	3,532	2,246	1,236	7,170	25,327	16,463	8,864	
	Branch Pipe	m	340	221	119	4,900	1,666	1,083	583	
	Distribution Basin	unit	34,000,000	8,500,000	25,500,000	0.75	25,500	6,375	19,125	
5. Sewerage							(205,836)	(113,170)	(92,666)	
	Treatment Plant	unit	238,040,000	141,633,300	96,406,700	0.75	178,530	106,225	72,305	
	Trunk Sewer	m	1,574	268	1,306	9,040	14,229	2,423	11,806	
	Sub-Trunk Sewer	m	630	107	523	4,900	3,087	524	2,563	
	Pumping Station	unit	3,000,000	1,500,000	1,500,000	2	6,000	3,000	3,000	
	Man Hole	unit	10,000	2,500	75,000	399	3,990	998	2,992	
6. Drainage							(76,566)	(19,152)	(57,414)	
	Drain Main	m	7,278	1,820	5,458	5,700	41,484	10,371	31,113	
	Sub Drain	m	2,370	593	1,778	14,805	35,082	8,781	26,301	
7. Park							(11,118)	(2,890)	(8,228)	
	Play Ground	m^2	1,000	280	720	5,540	5,540	1,551	3,989	
	Parking Area	m^2	105	21	84	2,000	210	42	168	
	Office	m^2	4,800	700	4,100	600	2,880	420	2,460	
	Sub-Ground	m^2	1,000	280	720	2,000	2,000	560	1,440	
	Lighting	unit	22,200	14,430	7,770	22	488	317	171	
8. Pavement (for center)							(5,527)	(2,513)	(3,014)	
	GIE Center	m^2	110	50	60	8,700	957	435	522	
	GIE Sub-Center	m^2	110	50	60	6,000	660	300	360	
	EPZ Center	m^2	110	50	60	6,300	693	315	378	
	EPZ Sub-Center	m^2	110	50	60	3,700	407	185	222	
	Ware House	m^2	110	50	60	1,000	110	50	60	
	S.F.B	m^2	110	50	60	19,696	2,166	985	1,181	
	Other Place	m^2	110	50	60	4,860	534	243	291	Bus Stop, Guard House
9. Green Belt	Turf	ha	50,000	14,000	36,000	14.90	745	209	536	
10. Buffer Zone	Turf & Tree	ha	50,000	14,000	36,000	20.1	1,005	281	724	
11. Perimeter Road	EPZ W=3.0m	m	657	269	388	3,100	2,037	834	1,203	

F/C: Foreign Currency
L/C: Local Currency

TABLE VI-13 COST FOR INDUSTRIAL ESTATE IN SHORT-TERM DEVELOPMENT (2/2)

Items	Discription	Unit	Unit Cost			Quantity	Amount Cost (1000 Baht)			Remarks
			Total	F/C	L/C		Total	F/C	L/C	
12. Fence										
	Fence	m	120	54	66	6,000	720	324	396	
13. Center Building							(9,060)	(1,322)	(7,738)	
	IEAT Office	m^2	4,800	700	4,100	700	3,360	490	2,870	
	Exhibition Room	m^2	4,800	700	4,100	200	960	140	820	
	Library	m^2	4,800	700	4,100	150	720	105	615	
	Shopping House	m^2	4,800	700	4,100	400	1,920	280	1,640	
	Custom House	m^2	4,800	700	4,100	300	1,440	210	1,230	
	Guard House	m^2	3,000	450	2,550	60	180	27	153	
	Meeting Room	m^2	4,800	700	4,100	100	480	70	410	
14. Sub-Center Building							(2,190)	(323)	(1,867)	
	Meeting Room	m^2	4,800	700	4,100	100	480	70	410	
	Small Hall	m^2	4,800	700	4,100	200	960	140	820	
	Shopping House	m^2	3,000	450	2,550	200	600	90	510	
	Ground House	m^2	3,000	450	2,550	50	150	23	127	
15. Gaurd House										
	Gaurd House	m^2	3,000	450	2,550	50	150	23	127	
16. Ware House										
	Ware House	m^2	3,000	450	2,550	3,000	9,000	1,350	7,650	
17. Factory Building							(129,480)	(19,422)	(110,058)	
	Single Storey	m^2	3,500	525	2,975	6,480	22,680	3,402	19,278	
	Three Storey	m^2	10,000	1,500	8,500	10,680	106,800	16,020	90,780	
18. Solid Waste Trip										
	Waste Trip	unit	22,400,000	6,370,000	16,030,000	0.60	13,440	3,822	9,618	
19. Sub-Total		-	-	-	-		844,210	348,159	496,051	
20. Engineering Service		-	-	-	-		84,421	50,653	33,768	19) Sub-Total x 10%
21. Sub-Total		-	-	-	-		928,631	398,812	529,819	19) + 20)
22. Physical Contingency		-	-	-	-		185,726	79,762	105,964	21) Sub-Total x 20%
23. Total		-	-	-	-		1,114,357 (100%)	478,574 (42.9%)	635,783 (57.1%)	

F/C: Foreign Currency
L/C: Local Currency

TABLE VI-14 COST FOR NEW TOWN AREA IN SHORT-TERM DEVELOPMENT

Items	Discription	Unit	Unit Cost			Quantity	Amount Cost (1000 Baht)			Remarks
			Total	F/C	L/C		Total	F/C	L/C	
1. Land Acquisition		ha	500,000	0	500,000	145.7	72,850	0	72,850	
2. Site Preparation										
	Preparation Work	ha	20,000	8,000	12,000	1,130	2,600	1,040	1,560	
	Earth Work	m^3	20	9	11	0	-	-	-	
3. Read & Bridge										
	V_3	m	9,021	3,587	5,434	3,675	33,152	13,182	19,970	
	V_4	m	4,453	1,614	2,839	1,300	5,789	2,098	3,691	
	V_5	m	3,442	1,106	2,336	2,800	9,638	3,097	6,541	
	V6-1	m	2,137	725	1,412	4,700	10,044	3,408	6,636	
	V6-2	m	1,525	569	956	4,600	7,015	2,617	4,398	
	V6-2	m	1,525	569	956	3,190	4,865	1,815	3,050	
	V_7	m	1,657	269	388	12,720	8,357	3,422	4,935	
	Bridge	m^2	12,000	5,400	6,600	1,280	15,360	6,912	8,448	
4. Water Supply										
	Filtration Plant	unit	210,000,000	120,700,000	89,300,000	0.17	35,700	20,519	15,181	
	Trunk Pipe	m	2,795	1,817	978	13,230	36,980	24,037	12,943	
	Branch Pipe	m	340	221	119	11,700	3,978	2,586	1,392	
	Distribution Basin	unit	34,000,000	8,500,000	25,500,000	0.17	5,780	1,445	4,335	
5. Sewerage										
	Treatment Plant	unit	238,040,000	141,633,300	96,406,700	0.17	40,467	24,078	16,389	
	Trunk Sewer	m	964	164	800	12,835	12,373	2,105	10,268	
	Sub-Trunk Sewer	m	630	107	523	23,400	14,742	2,504	12,238	
	Pumping Station	unit	3,000,000	1,500,000	1,500,000	1	3,000	1,500	1,500	
	Man Hole	unit	10,000	2,500	7,500	725	7,250	1,813	5,437	
6. Drainage										
	Drain	m	1,531	383	1,148	16,815	25,744	6,440	19,304	
7. Housing Unit						5,133	(241,099)	(36,165)	(204,934)	
	Row House	unit	36,000	5,400	30,600	4,048	145,728	21,859	123,869	
	Semidetached	unit	59,000	8,850	50,150	806	47,554	7,133	40,421	
	Detached	unit	143,000	21,450	121,550	99	14,157	2,124	12,033	
	Shop House	unit	187,000	28,050	158,950	180	33,660	5,049	28,611	
8. Park		ha	500,000	140,000	360,000	8.8	4,400	1,232	3,168	
9. Community Center		m^2	5,000	2,000	3,000	12,000	60,000	24,000	36,000	
10. Bus Terminal		unit	5,139,000	2,826,000	2,313,000	1	5,139	2,826	2,313	
11. School										
	Secondary	unit	30,000,000	4,500,000	25,500,000	1	30,000	4,500	25,500	
	Primary	unit	18,000,000	2,700,000	15,300,000	2	36,000	5,400	30,600	
	Kinder garden	unit	4,400,000	660,000	3,740,000	8	35,200	5,280	29,920	
12. Solid Waste Trip		unit	22,400,000	6,370,000	16,030,000	0.20	4,480	1,274	3,206	
13. Sub-Total		-	-	-	-	-	772,002	205,295	566,707	
14. Engineering Service		-	-	-	-	-	69,915	41,949	27,966	(2 ~ 12) x 10%
15. Sub-Total		-	-	-	-	-	841,917	247,244	594,673	
16. Physical Contingency		-	-	-	-	-	168,383	49,449	118,934	
17. Total		-	-	-	-	-	1,010,300 (100%)	296,693 (29.4%)	713,607 (70.6%)	

F/C: Foreign Currency
L/C: Local Currency

TABLE VI-15 COST FOR PORT (HINTERLAND) IN SHORT-TERM DEVELOPMENT

Items	Discription	Unit	Unit Cost			Quantity	Amount Cost (1000 Baht)			Remarks
			Total	F/C	L/C		Total	F/C	L/C	
1. Land Acquisition			-	-	-	0	-	-	-	
2. Site Preparation										
	Preparation Work	ha	20,000	8,000	12,000	390	7,800	3,120	4,680	
	Earth Work	m^3	20	9	11	1,530,000	30,600	13,770	16,830	
3. Road & Bridge	V_{2-1}	m	10,043	4,426	5,617	3,300	33,142	14,606	18,536	
	V_{2-2}	m	9,559	3,846	5,713	3,900	37,280	15,000	22,280	
	V_{3-1}	m	9,928	3,853	6,075	2,300	22,834	8,862	13,972	
	V_{3-2}	m	9,021	3,587	5,434	4,180	37,708	14,994	22,714	
	V_4	m	5,686	2,078	3,608	7,400	42,076	15,377	26,699	
	V_5	m	3,896	1,237	2,659	3,800	14,805	4,701	10,104	
	V_6	m	1,525	569	956	2,400	3,660	1,366	2,294	
	Bridge	m^2	12,000	5,400	6,600	3,160	37,920	17,064	20,856	
4. Water Supply										
	Filtration Plant	unit	210,000,000	120,700,000	89,300,000	0.08	16,800	9,656	7,144	
	Trunk Pipe	m	617	531	286	13,310	10,874	7,068	3,806	
	Branch Pipe	m	340	221	119	4,490	1,527	992	535	
	Distribution Basin	unit	34,000,000	8,500,000	25,500,000	0.08	2,720	680	2,040	
5. Sewerage										
	Treatment Plant	unit	238,040,000	141,633,300	96,406,700	0.08	19,043	11,331	7,712	
	Trunk Sewer	m	2,683	456	2,227	11,530	30,935	5,258	25,677	
	Sub-Truck Sewer	m	630	107	523	5,090	3,207	545	2,662	
	Pumping Station	unit	3,000,000	1,500,000	1,500,000	3	9,000	4,500	4,500	
	Man-Hole	unit	10,000	2,500	7,500	333	3,330	832	2,498	
6. Drainage										
	Drain	m	5,474	1,369	4,105	21,125	115,638	28,920	86,718	
7. Park		ha	500,000	140,000	360,000	48.7	24,350	6,818	17,532	
8. Buffer Zone		ha	50,000	14,000	36,000	0	0	0	0	
9. Solid Waste Trip		unit	22,400,000	6,370,000	16,030,000	0.20	4,480	1,274	3,206	
10. Bus Terminal		unit	5,139,000	2,826,000	2,313,000	1	5,139	2,826	2,313	
11. Sub-Total							514,868	189,560	325,308	
12. Engineering & Service		-	-	-	-	-	51,487	30,892	20,595	
13. Sub-Total		-	-	-	-	-	566,355	220,452	345,903	
14. Physical Contingency		-	-	-	-	-	113,271	44,090	69,181	
15. Total		-	-	-	-	-	679,626	264,542	415,084	
							(100%)	(38.9%)	(61.1%)	

F/C: Foreign Currency
L/C: Local Currency

TABLE VI-16 COST OF POWER SUPPLY AND TELECOMMUNICATION

Item	Description	Unit	Quantity	Amount Cost (1000 Baht) Total	F/C	L/C	Remarks
I. Industrial Estate							
1. Power Supply				(103,880)	(44,160)	(59,720)	
	115 Transmission	LS	1	10,260	0	10,260	
	80HVA Sub-station	LS	1	85,120	42,560	42,560	
	22KV Distribution	LS	1	8,000	1,600	6,400	
	Low Tension	LS	1	500	0	500	
2. Telecommunication				(58,250)	(36,560)	(21,690)	
	Switching System	LS	1	38,855	33,415	5,440	
	Telex Exchange System	LS	1	7,500	0	7,500	
	Local Cable	LS	1	15,500	0	15,500	
	PCM Cable	LS	1	3,145	3,145	0	
Sub-Total				162,130	80,720	81,410	
3. Engineering Service	(10%)			16,213	9,728	6,485	
Sub-Total				178,343	90,448	87,895	
4. Contingency	(20%)			35,669	18,090	17,579	
5. Total				214,012	108,538	105,474	
II. New Town							
1. Power Supply				(27,570)	(8,640)	(18,930)	
	115 Transmission	LS	1	1,890	0	1,890	
	80HVA Sub-station	LS	1	15,680	7,840	7,840	
	22KV Distribution	LS	1	4,000	800	3,200	
	Low Tension	LS	1	6,000	0	6,000	
2. Telecommunication				(32,501)	(18,281)	(14,220)	
	Switching System	LS	1	19,428	16,708	2,720	
	Telex Exchange	LS	1	3,750	0	3,750	
	Local Cable	LS	1	7,750	0	7,750	
	PCM Cable	LS	1	1,573	1,573	0	
Sub-Total				60,071	26,921	33,150	
3. Engineering Service	(10%)			6,007	3,604	2,403	
Sub-Total				66,078	30,525	35,553	
4. Contingency	(20%)			13,216	6,105	7,111	
5. Total				79,294	36,630	42,664	
III. Port Area							
1. Power Supply				(24,570)	(9,040)	(15,530)	
	115 Transmission	LS	1	1,890	0	1,890	
	80 HVA Sub-station	LS	1	15,680	7,840	7,840	
	22 KV Distribution	LS	1	6,000	1,200	4,800	
	Low Tension	LS	1	1,000	0	1,000	
2. Telecommunication				(32,501)	(18,281)	(14,220)	
	Switching System	LS	1	19,428	16,708	2,720	
	Telex Exchange	LS	1	3,750	0	3,750	
	Local Cable	LS	1	7,750	0	7,750	
	PCM Cable	LS	1	1,573	1,573	0	
Sub-Total				57,071	27,321	29,750	
3. Engineering Service	(10%)			5,707	3,424	2,283	
Sub-Total				62,778	30,745	32,033	
4. Contingency	(20%)			12,555	6,148	6,407	
5. Total				75,333	36,893	38,440	

F/C: Foreign Currency
L/C: Local Currency

TABLE VI-17 DISBURSEMENT SCHEDULE OF INVESTMENT COST FOR THE INDUSTRIAL ESTATE

(Unit: 1,000 Baht)

	1985			1986			1987			1988		
	Total	F/C	L/C	Total	F/C	L/C	Total	F/C	L/C	Total	F/C	L/C
1. Investigation and Engineering Cost	31,658	18,995	12,663	14,064	8,439	5,625	17,536	10,522	7,014	10,456	6,274	4,182
2. Construction Cost for Road, water works & administrative facility	-	-	-	70,220	34,087	36,133	350,719	146,403	204,316	209,125	82,915	126,210
3. Construction Cost for power & telecommunication	-	-	-	-	-	-	53,503	27,134	26,369	62,420	31,657	30,763
4. Sub-Total	31,658	18,995	12,663	84,284	42,526	41,758	421,758	184,059	237,699	282,001	120,846	161,155
5. Total Cost with Contingency(20%)	37,990	22,794	15,196	101,141	51,031	50,110	506,110	220,871	285,239	338,401	145,015	193,386

	1989			Total			Remarks
	Total	F/C	L/C	Total	F/C	L/C	
1. Investigation and Engineering Cost	10,707	6,424	4,283	84,421	50,653	33,768	2 x 10%
2. Construction Cost for Road, water works & administrative facility	214,146	84,756	129,390	844,210	348,159	496,051	
3. Construction Cost for power & telecommunication	62,420	31,657	30,763	178,343	90,448	87,895	including engineering cost
4. Sub-Total	287,273	122,837	164,436	1,106,974	489,260	617,714	
5. Total Cost with Contingency(20%)	344,727	147,401	197,326	1,328,369	587,112	741,257	

Note: Discrepancies are due to rounding.

TABLE VI-18 ANNUAL CONSTRUCTION COST OF INDUSTRIAL ESTATE (GIE, EPZ) (1/2)

(Unit : 1,000 Baht)

	1985			1986			1987			1988		
	Total	F/C	L/C	Total	F/C	L/C	Total	F/C	L/C	Total	F/C	L/C
1. Land Acquisition	-	-	-	-	-	-	-	-	-	-	-	-
2. Investigation & DD	31,658	18,995	12,663	10,553	6,332	4,221	-	-	-	-	-	-
3. Supervision	-	-	-	3,511	2,107	1,404	17,536	10,522	7,014	10,456	6,274	4,182
4. Construction	-	-	-	-	-	-	-	-	-	-	-	-
1) Site Preparation	-	-	-	-	-	-	-	-	-	-	-	-
(1) Preparation Work	-	-	-	5,800	2,320	3,480	-	-	-	-	-	-
(2) Earth Work	-	-	-	1,480	666	814	10,360	4,662	5,698	2,960	1,332	1,628
2) Road	-	-	-	-	-	-	-	-	-	-	-	-
(1) Main Road	-	-	-	6,351	2,525	3,826	25,403	10,101	15,302	-	-	-
(2) Sub Road	-	-	-	-	-	-	14,161	4,791	9,370	16,522	5,589	10,933
(3) Bridge	-	-	-	6,778	3,050	3,728	61,006	27,453	33,553	-	-	-
3) Water Supply	-	-	-	-	-	-	-	-	-	-	-	-
(1) Filtration Plant	-	-	-	15,750	9,051	6,699	47,250	27,158	20,092	47,250	27,158	20,092
(2) Distribution Basin	-	-	-	-	-	-	7,650	1,913	5,737	8,925	2,231	6,694
(3) Trunk Main	-	-	-	5,065	3,293	1,772	20,262	13,171	7,091	-	-	-
(4) Sub Supply Pipe	-	-	-	-	-	-	500	325	175	583	379	204
4) Sewerage	-	-	-	-	-	-	-	-	-	-	-	-
(1) Treatment Plant	-	-	-	17,853	10,623	7,230	53,559	31,868	21,691	53,559	31,868	21,691
(2) Pumping Station & Man Hole	-	-	-	-	-	-	9,990	3,998	5,992	-	-	-
(3) Trunk Sewer	-	-	-	2,846	485	2,361	11,383	1,938	9,445	-	-	-
(4) Sub Sewer	-	-	-	-	-	-	927	158	769	1,080	183	897
5) Drainage	-	-	-	-	-	-	-	-	-	-	-	-
(1) Main Canal	-	-	-	8,297	2,074	6,223	33,187	8,297	24,890	-	-	-
(2) Ditch	-	-	-	-	-	-	10,526	2,635	7,891	12,278	3,073	9,205
6) Park & Buffer Zone	-	-	-	-	-	-	-	-	-	-	-	-
(1) Park	-	-	-	-	-	-	-	-	-	-	-	-
(2) Buffer Zone & Green Belt	-	-	-	-	-	-	-	-	-	-	-	-
7) Administrative Facility	-	-	-	-	-	-	-	-	-	-	-	-
(1) Centre (Main, Sub)	-	-	-	-	-	-	5,033	1,248	3,785	5,872	1,455	4,417
(2) Guard House	-	-	-	-	-	-	150	23	127	-	-	-
(3) Fence	-	-	-	-	-	-	720	324	396			
8) Standard Factory	-	-	-	-	-	-	-	-	-	-	-	-
(1) Standard Factory Building	-	-	-	-	-	-	32,370	4,856	27,514	51,792	7,769	44,023
(2) Ware House	-	-	-	-	-	-	2,250	338	1,912	3,600	540	3,060
9) Solid Waste Tip	-	-	-	-	-	-	4,032	1,146	2,886	4,704	1,338	3,366
10) Perimeter Road	-	-	-	-	-	-	-	-	-	-	-	-
5. Total	31,658	18,995	12,663	84,284	42,526	41,758	368,255	156,925	211,330	219,581	89,189	130,392
6. Investment Cost with Contingency(20%)	37,990	22,794	15,196	101,141	51,031	50,110	441,906	188,310	253,596	263,497	107,027	156,470

Note: (1) Discrepancies are due to rouding.

TABLE VI-18 ANNUAL CONSTRUCTION COST OF INDUSTRIAL ESTATE (GIE, EPZ) (2/2)

(Unit : 1,000 Baht)

	1989			Total			Remarks
	Total	F/C	L/C	Total	F/C	L/C	
1. Land Acquisition	-	-	-	-	-	-	Already purchased by IEAT as of ฿113,100,000 in
2. Investigation & DD	-	-	-	42,211	25,327	16,884	4 x 5% 1980.
3. Supervision	10,707	6,424	4,283	42,210	25,326	16,884	- do -
4. Construction							
1) Site Preparation	-	-	-	(20,600)	(8,980)	(11,620)	
(1) Preparation Work	-	-	-	5,800	2,320	3,480	
(2) Earth Work	-	-	-	14,800	6,660	8,140	
2) Road	-	-	-	(146,743)	(59,098)	(87,645)	
(1) Main Road	-	-	-	31,754	12,626	19,128	
(2) Sub Road	16,522	5,589	10,933	47,205	15,969	31,236	
(3) Bridge	-	-	-	67,784	30,503	37,281	
3) Water Supply	-	-	-	(209,993)	(114,446)	(95,547)	
(1) Filtration Plant	47,250	27,158	20,092	157,500	90,525	66,975	
(2) Distribution Basin	8,925	2,231	6,694	25,500	6,375	19,125	
(3) Trunk Main	-	-	-	25,327	16,463	8,864	
(4) Sub Supply Pipe	583	379	204	1,666	1,083	583	
4) Sewerage	-	-	-	(205,836)	(113,170)	(92,666)	
(1) Treatment Plant	53,559	31,867	21,692	178,530	106,225	72,305	
(2) Pumping Station & Man Hole	-	-	-	9,990	3,998	5,992	
(3) Trunk Sewer	-	-	-	14,229	2,423	11,806	
(4) Sub Sewer	1,080	183	897	3,087	524	2,563	
5) Drainage	-	-	-	(76,566)	(19,152)	(57,414)	
(1) Main Canal	-	-	-	41,484	10,371	31,113	
(2) Ditch	12,278	3,073	9,205	35,082	8,781	26,301	
6) Park & Buffer Zone	-	-	-	(12,868)	(3,380)	(9,488)	
(1) Park	11,118	2,890	8,228	11,118	2,890	8,228	
(2) Buffer Zone & Green Belt	1,750	490	1,260	1,750	490	1,260	
7) Administrative Facility	-	-	-	(17,647)	(4,505)	(13,142)	
(1) Centre (Main, Sub)	5,872	1,455	4,417	16,777	4,158	12,619	
(2) Guard House	-	-	-	150	23	127	
(3) Fence	-	-	-	720	324	396	
8) Standard Factory	-	-	-	(138,480)	(20,772)	(117,708)	
(1) Standard Factory Building	45,318	6,797	38,521	129,480	19,422	110,058	
(2) Ware House	3,150	472	2,678	9,000	1,350	7,650	
9) Solid Waste Tip	4,704	1,338	3,366	(13,440)	(3,822)	(9,618)	
10) Perimeter Road	2,037	834	1,203	(2,037)	(834)	(1,203)	
5. Total	224,853	91,180	133,673	928,631	398,812	529,819	
6. Investment Cost with Contingency(20%)	269,824	109,416	160,408	1,114,357	478,574	635,783	

TABLE VI-19 DISBURSEMENT SCHEDULE OF INVESTMENT COST FOR THE NEW TOWN

(Unit: 1,000 Baht)

	1985			1986			1987			1988		
	Total	F/C	L/C	Total	F/C	L/C	Total	F/C	L/C	Total	F/C	L/C
1. Investigation & Engineering Cost	1,748	1,049	699	33,209	19,925	13,284	4,765	2,859	1,906	14,134	8,480	5,654
2. Construction Cost for Road, water works, educational facilities & others	72,850	-	72,850	-	-	-	95,304	36,531	58,773	282,686	94,154	188,532
3. Construction Cost for powers telecommunication	-	-	-	-	-	-	-	-	-	19,822	9,157	10,665
4. Sub-Total	74,598	1,049	73,549	33,209	19,925	13,284	100,069	39,390	60,679	316,642	111,791	204,851
5. Total Cost with Contingency (20%)	89,516	1,259	88,257	39,851	23,910	15,941	120,083	47,268	72,815	379,970	134,149	245,821

	1989			1990			1991			Total		
	Total	F/C	L/C	Total	F/C	L/C	Total	F/C	L/C	Total	F/C	L/C
1. Investigation & Engineering Cost	9,774	5,864	3,910	3,013	1,808	1,205	3,271	1,963	1,308	69,915	41,949	27,966
2. Construction Cost for Road, water works, educational facilities & others	195,473	53,701	141,772	60,275	9,041	51,234	65,414	11,868	53,546	772,002	205,295	566,707
3. Construction Cost for powers telecommunication	23,128	10,684	12,444	23,128	10,684	12,444	-	-	-	66,078	30,525	35,553
4. Sub-Total	228,375	70,249	158,126	86,416	21,533	64,883	68,685	13,831	54,854	907,995	277,769	630,226
5. Total Cost with Contingency (20%)	274,050	84,299	189,751	103,699	25,840	77,859	82,424	16,598	65,826	1,089,594	333,323	756,271

TABLE VI-20 ANNUAL CONSTRUCTION COST OF NEW TOWN

(Unit : 1,000 Baht)

	1985			1986			1987			1988		
	Total	F/C	L/C	Total	F/C	L/C	Total	F/C	L/C	Total	F/C	L/C
1. Land Acquisition	72,850	-	72,850	-	-	-	-	-	-	-	-	-
2. Investigation & DD	1,748	1,049	699	33,209	19,925	13,284	-	-	-	-	-	-
3. Supervision	-	-	-	-	-	-	4,765	2,859	1,906	14,134	8,480	5,654
4. Construction	-	-	-	-	-	-	(95,304)	(36,531)	(58,773)	(282,686)	(94,154)	(188,532)
1) Site Preparation	-	-	-	-	-	-	2,600	1,040	1,560	-	-	-
2) Road	-	-	-	-	-	-	-	-	-	-	-	-
(1) Main Road	-	-	-	-	-	-	6,630	2,636	3,994	26,522	10,546	15,976
(2) Sub Road	-	-	-	-	-	-	9,142	3,291	5,851	18,283	6,583	11,700
(3) Bridge	-	-	-	-	-	-	-	-	-	15,360	6,912	8,448
3) Water Supply	-	-	-	-	-	-	-	-	-	-	-	-
(1) Filtration Plant	-	-	-	-	-	-	10,710	6,155	4,555	12,495	7,182	5,313
(2) Distribution Basin	-	-	-	-	-	-	1,734	433	1,301	2,023	506	1,517
(3) Trunk Main	-	-	-	-	-	-	7,396	4,807	2,589	29,584	19,230	10,354
(4) Sub Supply Pipe	-	-	-	-	-	-	796	518	278	1,591	1,034	557
4) Sewerage	-	-	-	-	-	-	-	-	-	-	-	-
(1) Treatment Plant	-	-	-	-	-	-	12,141	7,224	4,917	14,163	8,427	5,736
(2) Pumping Station	-	-	-	-	-	-	-	-	-	10,250	3,313	6,937
(3) Trunk Sewer	-	-	-	-	-	-	2,475	421	2,054	9,898	1,684	8,214
(4) Sub Sewer	-	-	-	-	-	-	2,948	500	2,448	5,897	1,002	4,895
5) Drainage (Ditch)	-	-	-	-	-	-	5,148	1,288	3,860	10,298	2,576	7,722
6) Park	-	-	-	-	-	-	-	-	-	-	-	-
7) Housing Unit	-	-	-	-	-	-	-	-	-	60,274	9,041	51,233
8) Educational Facility	-	-	-	-	-	-	20,240	3,036	17,204	40,480	6,072	34,408
9) Community Facility	-	-	-	-	-	-	12,000	4,800	7,200	24,000	9,600	14,400
10) Solid Waste Tip	-	-	-	-	-	-	1,344	382	962	1,568	446	1,122
11) Bus Terminal	-	-	-	-	-	-	-	-	-	-	-	-
5. Total (1 - 4)	74,598	1,049	73,549	33,209	19,925	13,284	100,069	39,390	60,679	296,820	102,634	194,186
6. Investment Cost with Contingency(20%)	89,516	1,259	88,257	39,851	23,910	15,941	120,083	47,268	72,815	356,184	123,161	233,023

(Unit : 1,000 Baht)

	1989			1990			1991			Total			
	Total	F/C	L/C	Total	F/C	L/C	Total	F/C	L/C	Total	F/C	L/C	
1. Land Acquisition	-	-	-	-	-	-	-	-	-	72,850	-	72,850	
2. Investigation & DD	-	-	-	-	-	-	-	-	-	34,957	20,974	13,983	4x5%
3. Supervision	9,774	5,864	3,910	3,013	1,808	1,205	3,271	1,963	1,308	34,958	20,975	13,983	-do-
4. Construction	(195,473)	(53,701)	(141,772)	(60,275)	(9,041)	(51,234)	(65,414)	(11,868)	(53,546)	(699,152)	(205,295)	(493,857)	
1) Site Preparation	-	-	-	-	-	-	-	-	-	2,600	1,040	1,560	
2) Road	-	-	-	-	-	-	-	-	-	-	-	-	
(1) Main Road	-	-	-	-	-	-	-	-	-	33,152	13,182	19,970	
(2) Sub Road	18,283	6,583	11,700	-	-	-	-	-	-	45,708	16,457	29,251	
(3) Bridge	-	-	-	-	-	-	-	-	-	15,360	6,912	8,448	
3) Water Supply	-	-	-	-	-	-	-	-	-	-	-	-	
(1) Filtration Plant	12,495	7,182	5,313	-	-	-	-	-	-	35,700	20,519	15,181	
(2) Distribution Basin	2,023	506	1,517	-	-	-	-	-	-	5,780	1,445	4,335	
(3) Trunk Main	-	-	-	-	-	-	-	-	-	36,980	24,037	12,943	
(4) Sub Supply Pipe	1,591	1,034	557	-	-	-	-	-	-	3,978	2,586	1,392	
4) Sewerage	-	-	-	-	-	-	-	-	-	-	-	-	
(1) Treatment Plant	14,163	8,427	5,736	-	-	-	-	-	-	40,467	24,078	16,389	
(2) Pumping Station	-	-	-	-	-	-	-	-	-	10,250	3,313	6,937	
(3) Trunk Sewer	-	-	-	-	-	-	-	-	-	12,373	2,105	10,268	
(4) Sub Sewer	5,897	1,002	4,895	-	-	-	-	-	-	14,742	2,504	12,238	
5) Drainage (Ditch)	10,298	2,576	7,722	-	-	-	-	-	-	25,744	6,440	19,304	
6) Park	4,400	1,232	3,168	-	-	-	-	-	-	4,400	1,232	3,168	
7) Housing Unit	60,275	9,041	51,234	60,275	9,041	51,234	60,275	9,042	51,233	241,099	30,165	204,934	
8) Educational Facility	40,480	6,072	34,408	-	-	-	-	-	-	101,200	15,180	86,020	
9) Community Facility	24,000	9,600	14,400	-	-	-	-	-	-	60,000	24,000	36,000	
10) Solid Waste Tip	1,568	446	1,122	-	-	-	-	-	-	4,480	1,274	3,206	
11) Bus Terminal	-	-	-	-	-	-	5,139	2,826	2,313	5,139	2,826	2,313	
5. Total (1 - 4)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	841,917	247,244	594,673	
6. Investment Cost with Contingency(20%)	246,296	71,476	174,818	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1,010,300	296,693	713,607