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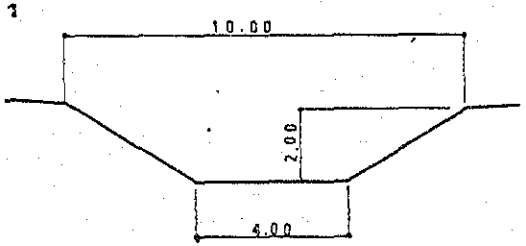

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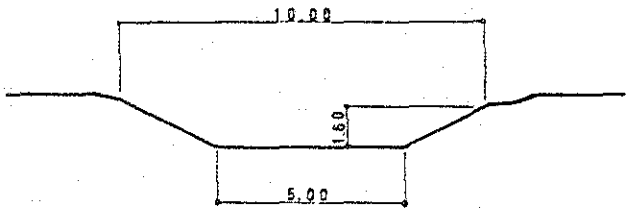

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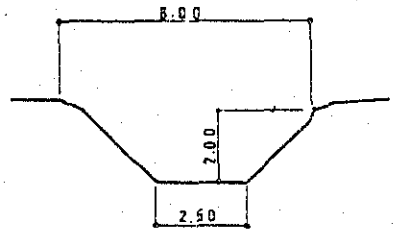

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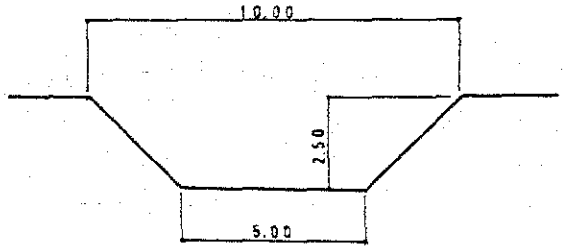

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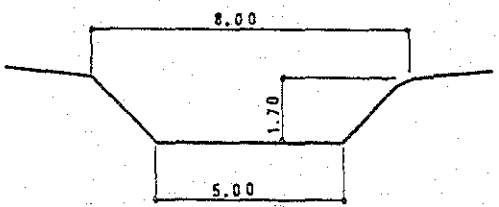

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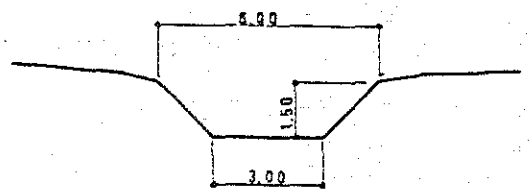
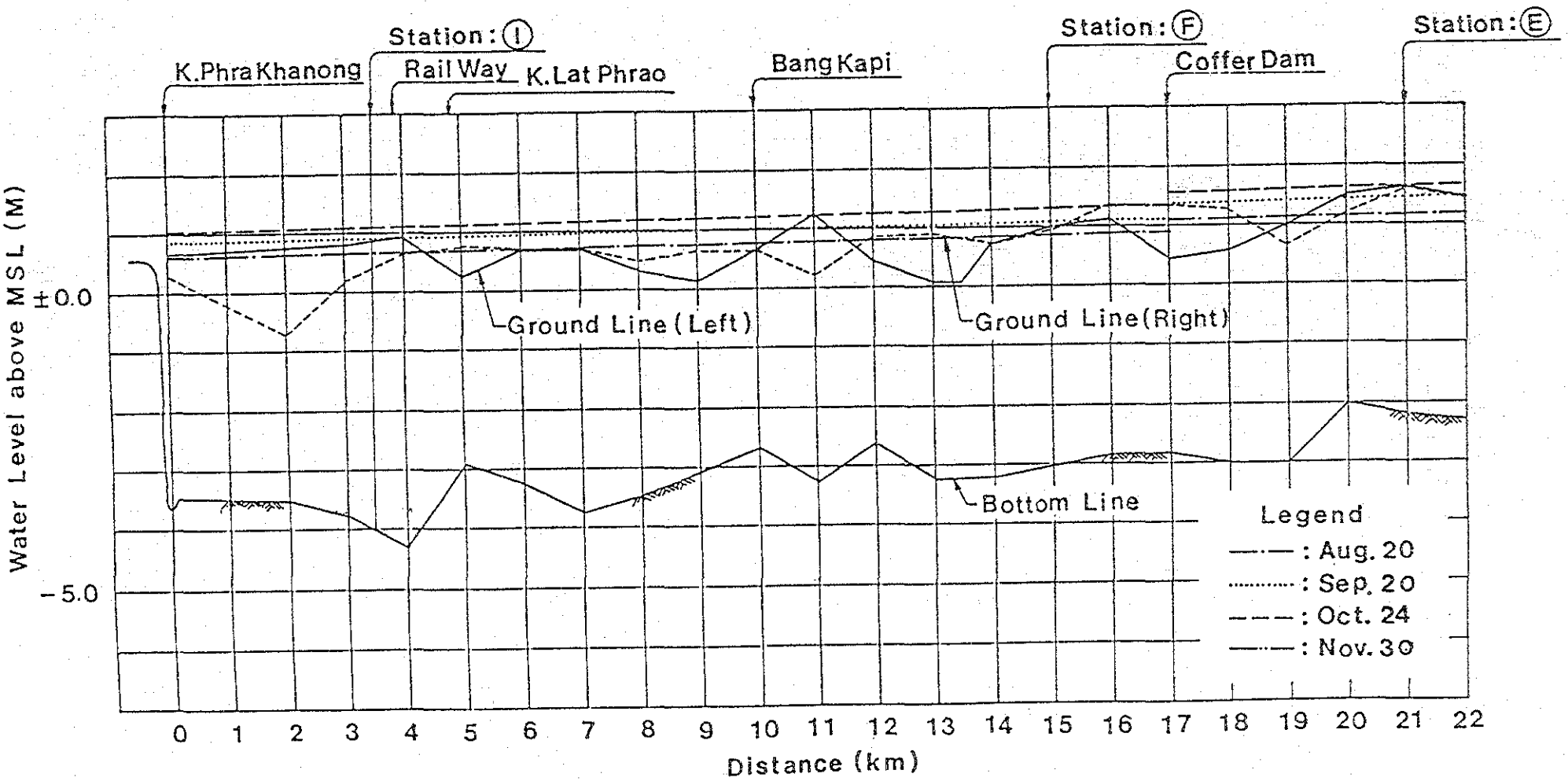


Note: Locations are shown in Fig 5.3

Scale
Not to Scale

Fig. C.16 CROSS SECTIONS OF MAIN KLONGS (2)

MASTER PLAN ON FLOOD PROTECTION/DRAINAGE PROJECT IN EASTERN SUBURBAN-BANGKOK



Note : Location of the Station is shown in Fig. A.1.

Fig. C.17 PROFILE OF OBSERVED WATER LEVEL IN KLONG SAEN SAEP BETWEEN AUG. AND NOV. IN 1983

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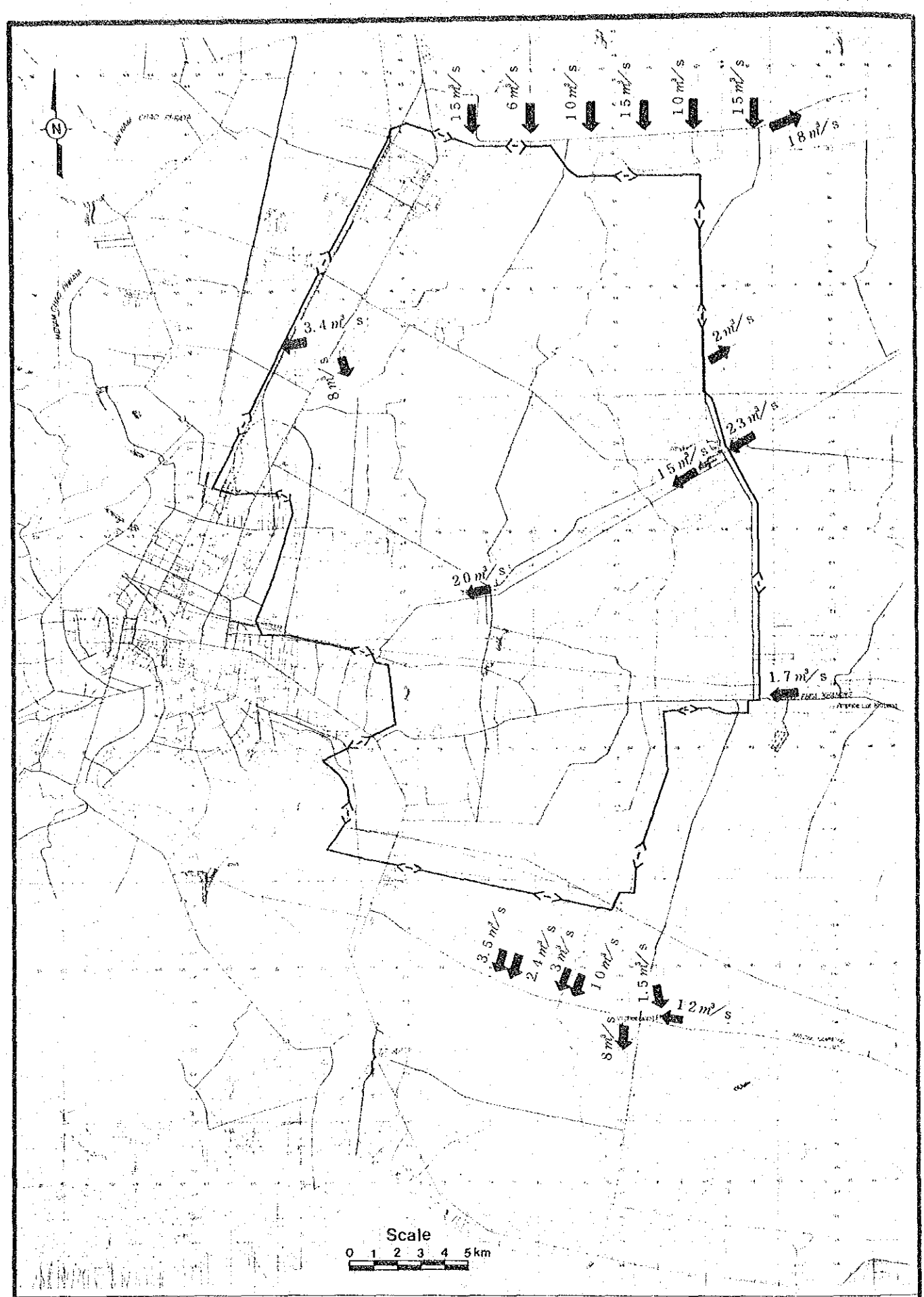

Fig. C.18	AMOUNT OF THE WATER FLOW DURING OCT.-NOV. 1983

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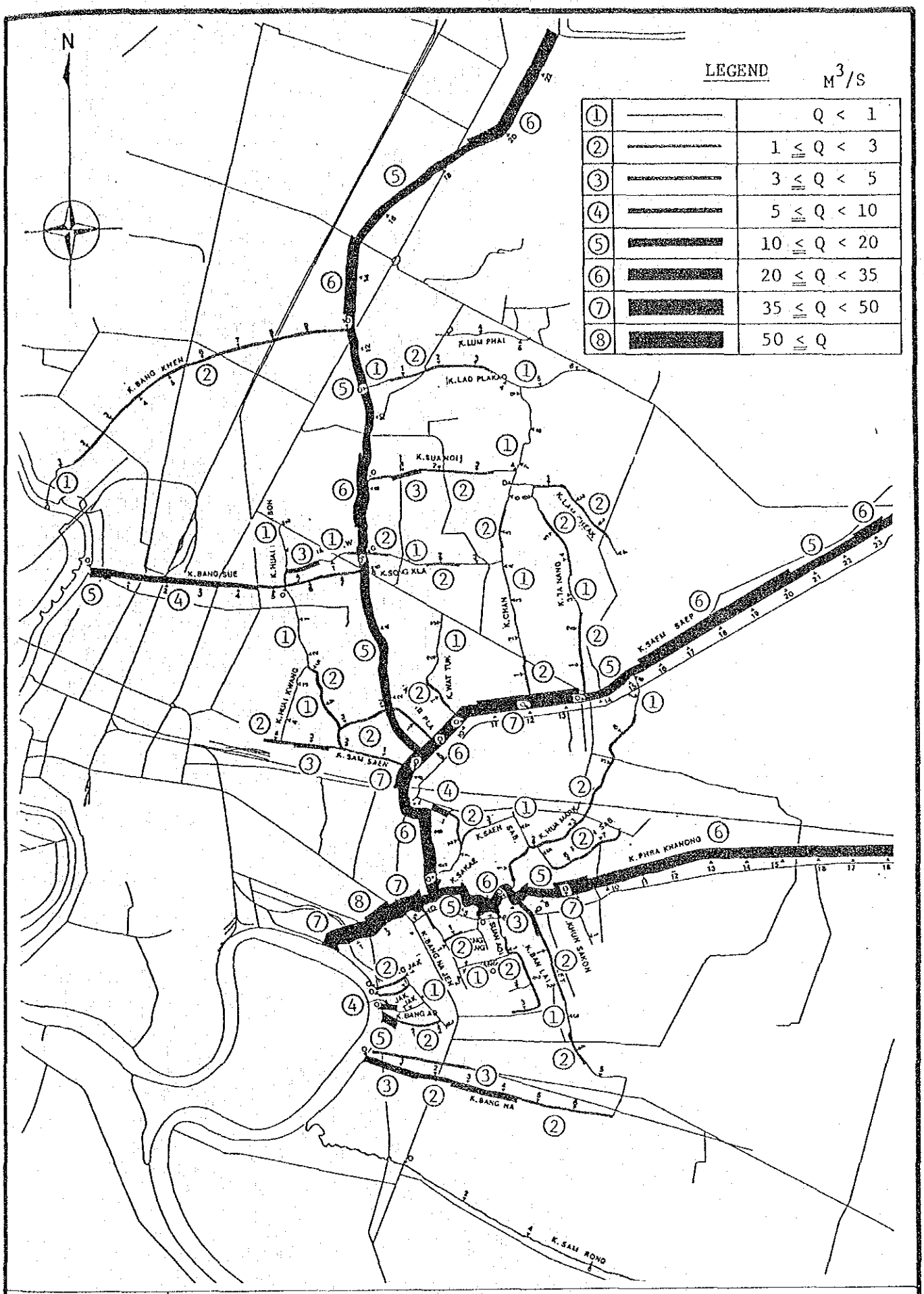

Fig. C.19 DISCHARGE CAPACITY OF KLONGS IN THE MASTER PLAN AREA

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APPENDIX D

LAND SUBSIDENCE

APPENDIX D LAND SUBSIDENCE

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Appendix D Land Subsidence

The national Environmental Board (NEB) made a comprehensive investigation programme to assess the land subsidence problem quantitively in 1975. According to the programme, the investigation entitled "Investigation of Land Subsidence Caused by Deep Well Pumping in the Bangkok Are" was carried out from February 1978 to April 1981 by the Asian Institute of Technology (AIT) in the Division of Geotechnical and Transportation Engineering.

The investigation is a joint effort with the Royal Thai Survey Department (RTSD) and the Department of Mineral Resources. The land subsidence described in this report is based mainly on the result of this AIT study.

1. Historical Land Subsidence

During the year from 1978 to 1981, at six-month intervals, the RTSD carried out precise levelling from a stable bench mark at Khao Lao Mountain, Ratchaburi, for the 24 observation stations as well as the existing old bench marks in Bangkok.

Based on these levelling results as shown on Tables D.1 and D.2 and Figs. D.1 and D.2, it was found that the existing bench marks are 30 to 80 cm lower than the original elevations which were established in the 1930s.

The subsidence rate varies from location to location, with the maximum being more than 10 cm per year, as shown in Fig. D.3 and Table D.2. The zone of particularly high subsidence rate can be distinguished, and this corresponds to the area of heavy groundwater pumping which is shown in Fig. D.4.

The much troubled areas are Lat Phrao, Hua Mark, Phra Khanong and Bang Na. The survey also revealed that the ground elevations in these areas are less than 1.0 m above MSL with the lowest area being less than 0.5 m above MSL as shown in Fig. D.5.

Table D.1 Change of Elevation of Benchmarks, Total Subsidence from 1930 to 1981

and Average Subsidence Rates During 1978 - 1980

station No.	Bench Mark	Location	Elevation m + MSL							Total Subsidence upto 1981 (cm)	Average Subsidence Rate 1978-1981 (cm/year)
			old Elev. (1930's)	1st mid 1978	2nd end 1978	3rd early 1979	4th end 1979	5th early 1980	1981		
B1	P.RTSD	Royal Thai Survey Department	2.79	2.45	2.45	2.43	2.42	2.41	2.40	39	2.0
B2	P.RTSD School	RTSD School Rajdamnern Ave.	2.35	1.99	1.98	1.97	1.95	1.94	1.92	43	2.8
B3	P.BM.	Royal Palace Railway Station	3.35	2.81	2.79	2.77	2.75	2.73	2.70	65	4.4
B4	P.IA	Klong Sam Sen Railway Bridge	4.67	4.35	4.33	4.32	4.30	4.28	4.25	42	4.0
B5	P.IIIA.	Bang Son Railway Bridge	2.38	1.94	1.91	1.90	1.87	1.85	1.80	58	5.6
B6	P.236	King Tak Sin Monument Wong Wian Yai	2.52	2.23	2.22	2.21	2.20	2.19	2.19	33	1.6
B7	P.386	Meteorological Dept. Bank Kapi	2.31	1.83	1.81	1.79	1.77	1.74	1.68	63	3.6
B8	S.2269	Front of Bhumiphol Hospital, Don Muang	2.47	2.17	2.19	2.15	2.14	2.11	-	36*1	3.0*3
B9	S.2271	Nakseni Bridge (Sapanmai) Don Muang	4.41	4.22	4.24	4.20	4.19	4.18	-	23*1	2.0*3
B10	S.135	Khlong Lao	2.43	1.59	-	-	-	-	-	84*2	-
B11	S.136	Khlong Hua Mark	2.37	1.70	-	-	-	-	-	67*2	-

Note: All data from new survey runs were adjusted by the RTSD to the fixed reference BMRI located in Nong Khaen District, elev. + 1.3689 m, and rounded off to 1 cm. The location is shown in Fig. D.1.

*1. Total Subsidence up to 1980

*2. Total Subsidence up to 1978

*3. Average Subsidence Rate between 1978 and 1980

Table D.2 Ground Surface Elevations at the Observation Stations Based on the Levelling Runs on Surface Reference Points by RTSD

Station Number	Ground Surface Elevation + m MSL					Average Subsidence Rate (78-79) cm/year
	1st mid 1978	2nd late 1978	3rd early 1979	4th late 1979	5th early 1980	
1	2.23	2.22	2.19	2.16	2.27	4.6
2	-	1.67	1.63	1.57	1.52	10.0
3	1.14	1.12	1.10	1.08	1.07	3.5
4		1.44	1.40	1.35	1.29	10.0
5	1.71	1.67	1.62	1.57	1.52	9.5
6	1.47	1.53	1.52	1.52	1.51	1.3
7	1.43	1.42	1.40	1.39	1.37	3.0
8	1.54	1.51	1.51	1.48	1.46	4.0
9	1.27	1.24	1.22	1.18	1.15	6.0
10	0.70	0.63	0.59	0.53	0.46	12.0
11	1.50	1.49	1.48	1.48	1.47	1.5
12	1.40	-	1.38	1.37	1.35	2.5
13	1.56	1.52	1.50	1.47	1.43	6.5
14	0.71	0.66	0.63	0.59	0.54	8.5
15	2.26	2.28	2.25	2.24	2.24	1.0
16	2.07	2.07	2.00	1.97	1.92	7.5
17	1.42	1.44	1.42	1.40	1.39	1.5
18	1.15	1.10	1.06	1.01	0.95	10.0
19	-	0.81	0.78	0.77	0.75	4.0
20	1.41	1.37	1.35	1.36	1.33	4.0
21	1.01	0.97	0.94	0.90	0.86	7.5
22	1.20	1.19	1.16	1.14	1.13	3.5
23	1.35	1.32	1.30	1.27	1.25	5.0
24	0.91	0.89	0.86	0.84	0.83	4.0

Note: All data were adjusted by RTSD to the reference BMR1, elev. + 1.3689 m, and rounded off to 1 cm.
The location is shown in Fig. D.2

2. Floodig and Land Subsidence

It is evident from the study of patterns of floods in Bangkok that land subsidence greatly aggravates the problems in the area. It is recognized that the east and southeast parts of the city are flood-prone and usually suffer more severely than any other area in Bangkok.

A spectacular example is the Hua Mark area. The measured ground elevation at the subsidence observation station at No. 10. in Figure D.2, Remkhamhaeng University was 0.70m above MSL in mid 1978 and rapid subsidence brought down the elevation to only 0.46 m above MSL in early 1980.

In 1980 and 1983, the University was submerged under 1 m of flood water for more than two months.

It was worth mentioning that there are numerous private housing estates in the area and there is no proper public water supply in the area. These estates rely on a large quantity of groundwater being pumped from a large number of deep wells.

3. Groundwater Extraction and Land Subsidence

During the past few decades, rapid development has taken place in the industrial and agricultural sectors with a consequent increase in population. The need for water for municipal and industrial purposes has, therefore, steadily grown. To cope with this need, more than one million cubic metres of groundwater is extracted from aquifers underneath the city every day.

The exploitation of groundwater has lowered the groundwater level from the free conditions to a level lower than 45 m below ground at some places. The groundwater level has been dropping at the persistent rate of 2-3 m per year during the past decade.

When water is removed from a confined water bearing stratum the pressure of the water in the pore space of the soil is lowered. This lowering of the pore water pressure in an aquifer creates a hydraulic gradient between the aquifer and the adjacent clay layer. As the pore water flows out of the clay layer, consolidation takes place and the layer is compressed. The compression of these layers manifests itself as ground subsidence.

In the deep layers, the drop in groundwater level is large, and the level continues to decline at the rapid rate, the measured compression of the strata in this deep zone was found to form the major part of the subsidence of the ground, accounting for 6 cm out of 10 cm surface subsidence in one year.

In the upper 10 m of the subsurface, however, there is no persistent decline in the groundwater level and it fluctuates in the region of 1-2 m below ground. The measured compression of this top zone was found to be very small.

This is due to the fact that most of the wells pump groundwater from deep aquifers at depths of 100-200 m.

4. Past Groundwater Development

The first large scale utilization of groundwater began in the early 1950s by the drilling of several large wells into deep aquifers by the Department of Public and Municipal Works. Subsequently, more than 150 large wells were installed in the period from 1955 to 1960 for public water supply.

The growth in groundwater development in the private sector was also being increased in the same period. The MWWA was formally established in 1967 and the use of groundwater for public water supply has been increasing ever since. In 1980, MWWA extracted about 450,000 CMD of groundwater from deep aquifers to cope with the public water demand. (Ref. to Table D.3)

At the same time, the growing number of groundwater wells in the private sector reached 8,000 with the estimated pumping rate of about 800,000 CMD. (Ref. to Table D.4 and Fig. D.4)

The total rate of groundwater pumping in the Bangkok area at present, including both the private and public sectors, is about 1.2 MCMD, while surface water is consumed at 1.52 MCMD, it was realised that the land subsidence problem would become more serious if the use of groundwater is continued. Fig. D.6 shows the groundwater pumping rate in the Bangkok area from 1955 to 1978.

Table D.3 Pumpage for Public Water Supply (MWWA, 1980)

AREA	Pumpage in m^3/day 1980
Bangkok (112 Wells)	365,000
Nonthaburi (15 Wells)	61,000
Samut Prakan (7 Wells)	24,000
Total	450,000

Table D.4 Areal Distribution of Private Wells as of January 1982

(Source: Department of Mineral Resources)

Area \ Usage	Domestic	Industry/Factory	Agriculture	Total	Total
	Number of Wells (Pumpage in m^3/day)	Number of Wells (Pumpage in m^3/day)	Number of Wells (Pumpage in m^3/day)	Number of Wells	Pumpage in m^3/day
Bangkok	3,353 (245,492)	1,838 (212,744)	100 (9,194)	5,291	467,430
Samut Prakan	1,478 (49,582)	1,392 (266,472)	103 (2,905)	2,973	318,959
Samut Sakhon	325 (4.779)	207 (30,594)	98 (2,741)	630	38,114
Nonthaburi	139 (27,738)	59 (14,000)	1 (10)	199	41,748
TOTAL	5,295 (327.591)	3,496 (523,810)	302 (14,850)	9,093	866,251

5. Future Groundwater Use

The Department of Mineral Resources is the authority that controls groundwater utilization. The Department is regulating the installation of new groundwater wells and only allowing those who have real need and have no public water supply in the area.

The Department also has a policy not to allow any more pumping after the year 1985. The MWWA, however, is not under this regulation. The MWWA is the largest single consumer of groundwater, using about one third of all groundwater extraction in Bangkok.

The MWWA needs groundwater to be replaced by the surface water supply which is severely below the level of demand of the ever-rising population of Bangkok. The MWWA, in foreseeing this problem, has devised a "Master Plan" which calls for rapid expansion of the surface water supply from 1.5 MCMD as of 1980 to 5.0 MCMD in the year 2000.

According to the MWWA Master Plan, the MWWA will phase out groundwater use entirely by 2000. It seems that, with a full production of 5.0 million cubic metre per day of surface water, there would be no need for private sector pumping in the year 2000.

6. Future Land Subsidence

6.1 Future Land Subsidence Estimated by AIT

There might be various causes which would delay the planned schedules of MWWA "Master Plan". Therefore, the land subsidence rate was estimated according to a different forecast of groundwater use by AIT. (See Table D.5)

Land subsidence rate will decline and ground elevation will stabilize as shown in Fig. D.7 if surface water is substituted for the whole or part of the groundwater extraction. This would be the case with schemes C,D,E and F of Table D.5.

However, land subsidence will continue if groundwater of 1.65 MCMD or more after 1985 is extracted. This would be the case with schemes A and B.

The correlation between the future groundwater utilization and land subsidence are displayed in Fig. D.7.

6.2 Future Land Subsidence Estimation

The MWWA Master Plan is now being revised to cope with the future estimated population in 2000.

According to the draft revised Development Plan, the water demand in the Bangkok area in the year 2000 will decrease about 0.5 MCMD from that of Master Plan due to the decrease of the future estimated population. Even in case of the draft revised Development plan, MWWA will not be able to supply surface water all over the Bangkok Metropolis. Some groundwater utilization in the private sectors (about 0.4 MCMD) will still remain after 1986 until 2000.

The draft revised Development Plan is shown in Fig. D.8 and proposed future service area of public water supply by MWWA is shown in Fig. D.9.

At the meeting between MWWA and the Study Team in August 1983, it was reported that the latest MWWA surface water supply plan had been delayed by about 2 years. Under such situation to establish a basic condition for the estimate of land subsidence in this project, the Study Team assumed that the executioin of the latest MWWA plan will be delayed for 5 years as a conservative figure.

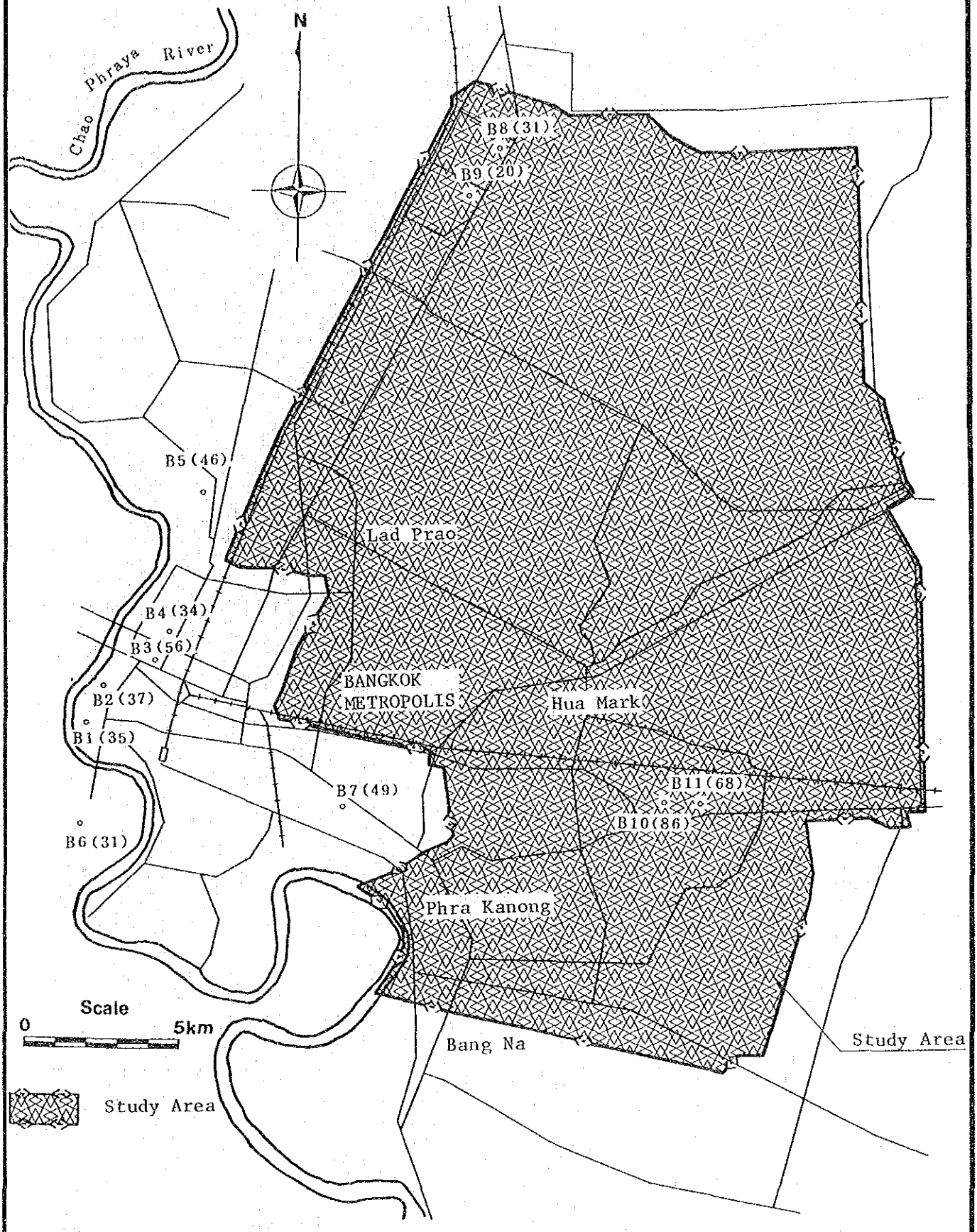
Base on this condition, the estimated land subsidence between 1983 and 2000 will be 1.0 metre in the critical area and 0.7 metre in other areas, and the expected ground elevation in the year 1990 and 2000 are shown in Figs. D.10 and D.11 respectively.

Table D.5 Supply of Water in million m^3/day (after AIT)

Year	Scheme A		B		C		D		E		F	
	GW	SW	GW	SW	GW	SW	GW	SW	GW	SW	GW	SW
1980	1.2	1.6	1.2	1.6	1.2	1.6	1.2	1.6	1.2	1.6	1.2	1.6
1985	1.65	1.62	1.65	1.62	1.65	1.62	1.5	1.77	0.6	2.67	1.07	2.20
1990	2.15	1.56	1.65	2.06	1.30	2.41	0.6	3.11	0.6	3.11	0.81	2.80
1995	2.55	1.68	1.65	2.58	0.6	3.63	0.6	3.63	0.6	3.63	0.43	3.80
2000	3.00	1.74	1.65	3.09	0.6	4.14	0.6	4.14	0.6	4.14	0.0	4.74

These figures exclude about 0.4 MCMD groundwater usage for private sector.

GW - Supply from groundwater.
SW - Supply from surface water.



Note: B1 - B11 mean the Benchmark observation station.

Figures in parentheses show the total subsidence in the Bangkok Area between 1930s and Mid. 1978 in centimeter.

Fig. D.1	TOTAL SUBSIDENCE IN THE BANGKOK AREA BETWEEN 1930S AND MID. 1978

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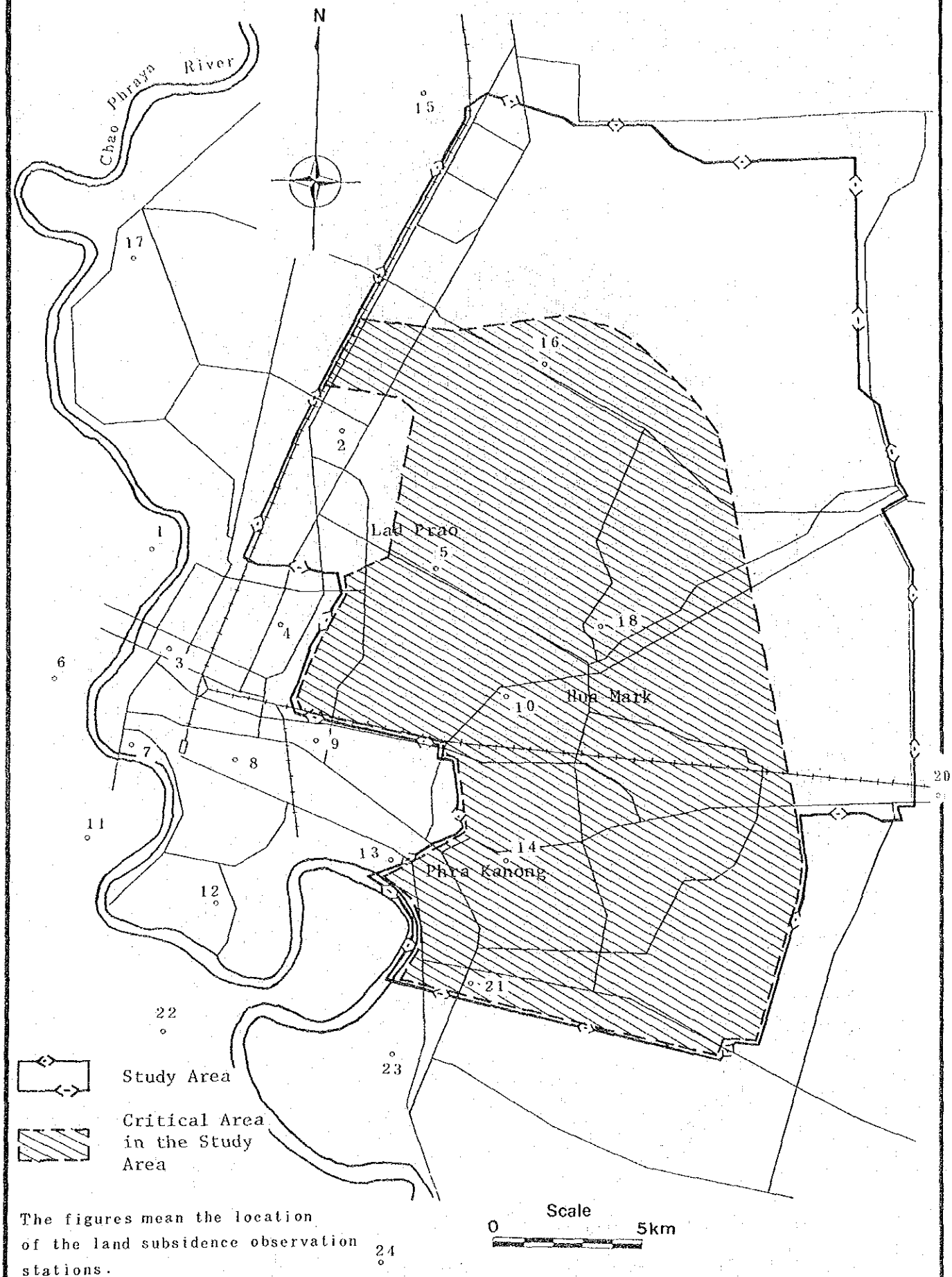

Fig. D.2 LOCATIONS OF SUBSIDENCE OBSERVATION STATION

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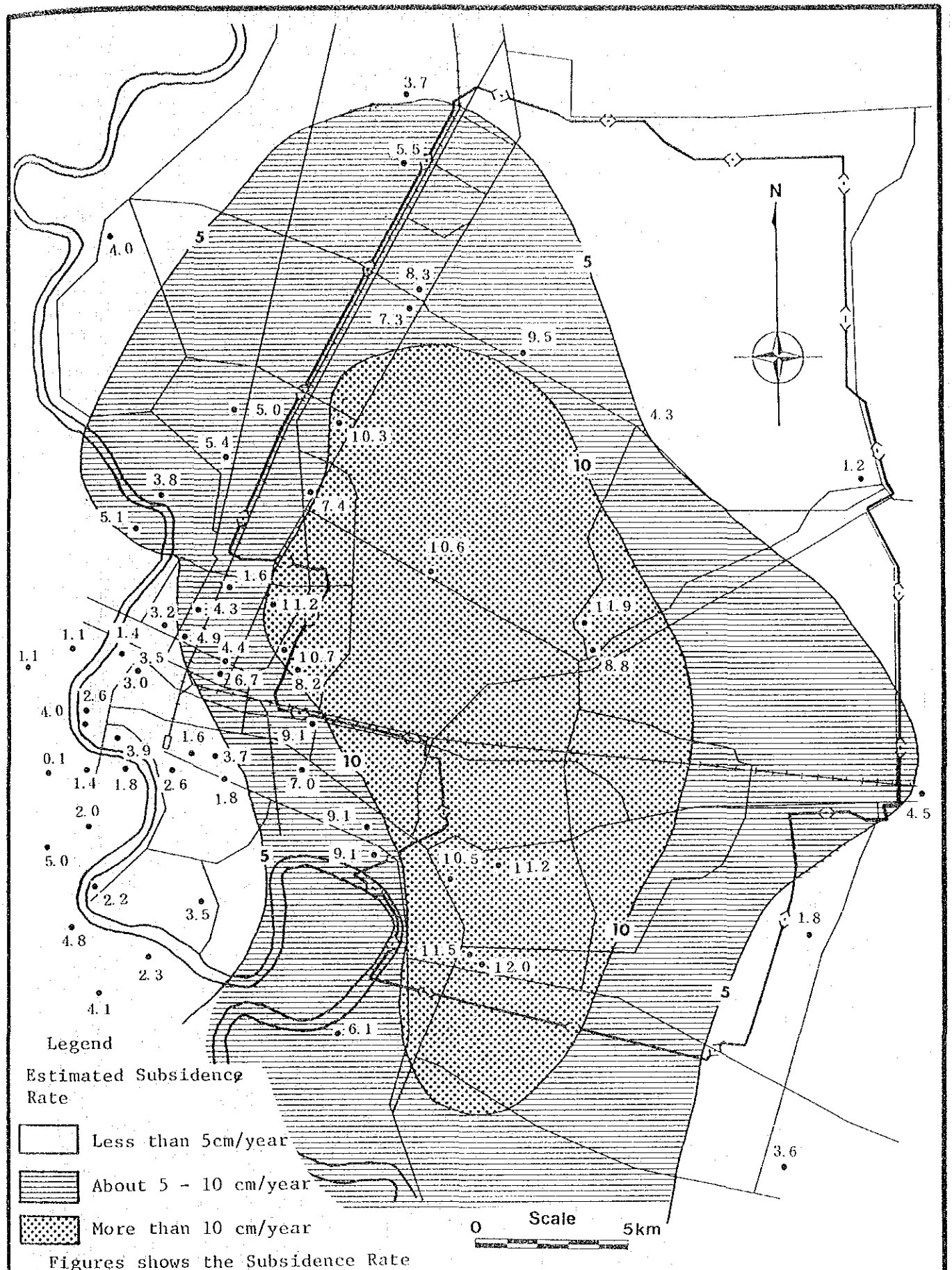

Fig. D.3 SUBSIDENCE RATE IN THE BANGKOK AREA IN 1981 (CM/YEAR)

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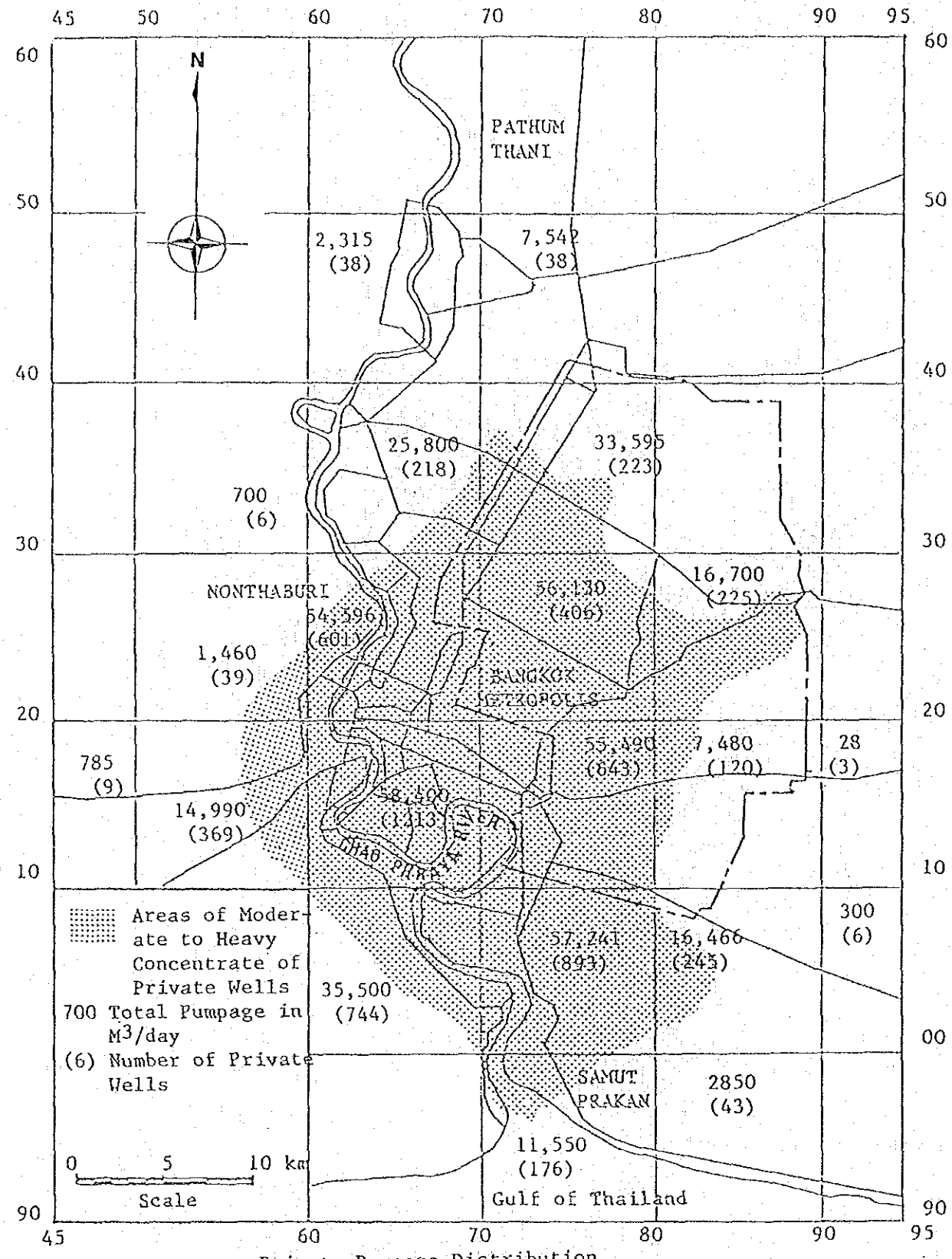

Private Pumpage Distribution.

: 431 private wells are not included in above figures. The pumpage of those wells is 18,024 M^3/day.

Source : Groundwater Resources in Bangkok Area : Development and Managment Study.

Fig. D.4	PRIVATE PUMPAGE DISTRIBUTION

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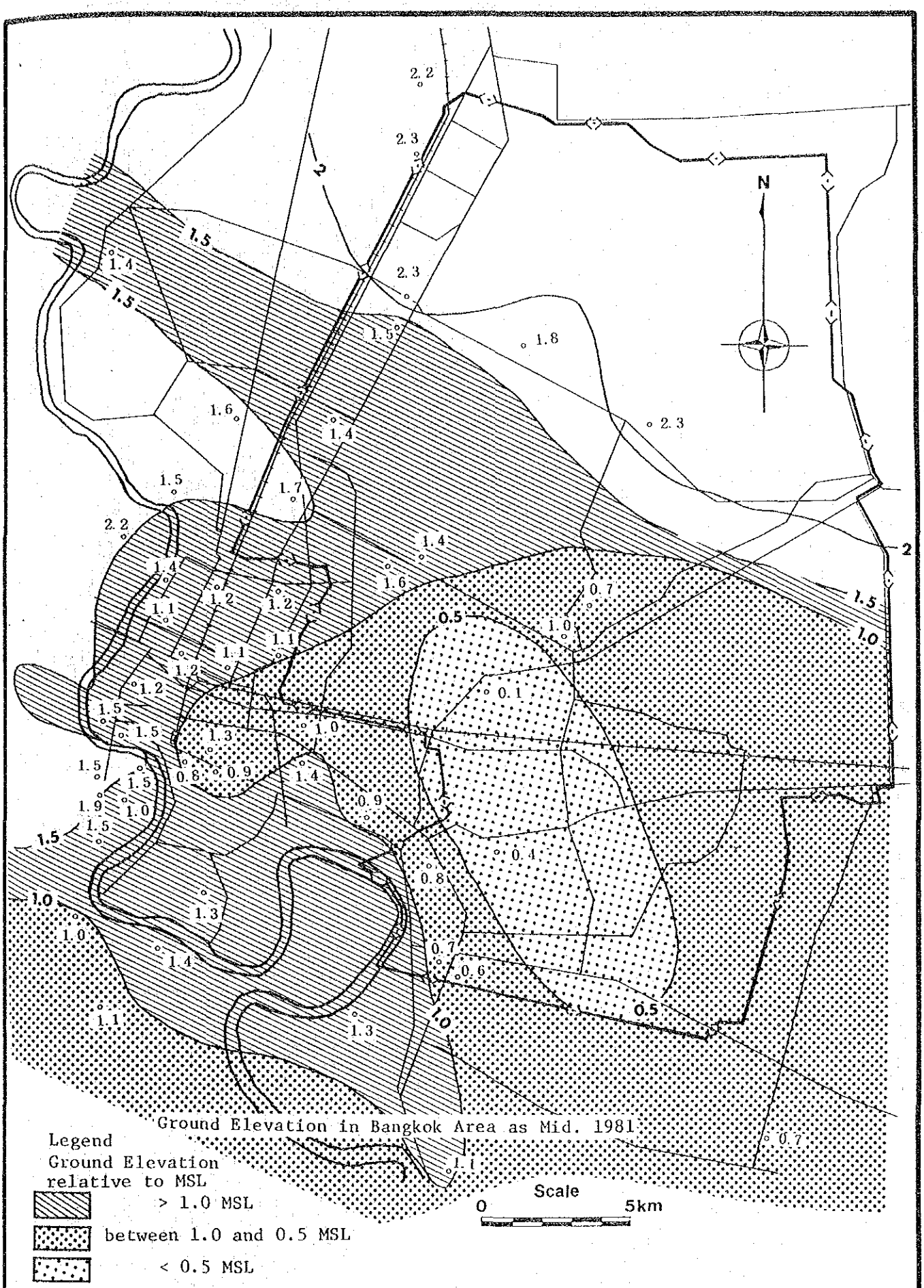

Fig. D.5 GROUND ELEVATION IN BANGKOK AREA AS MID. 1981

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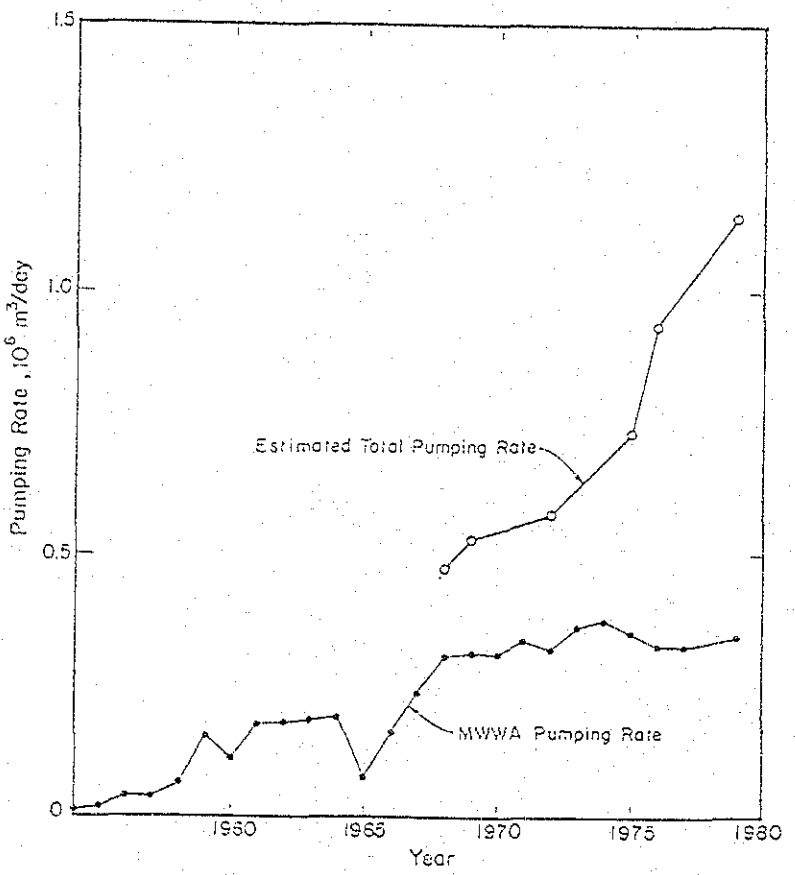
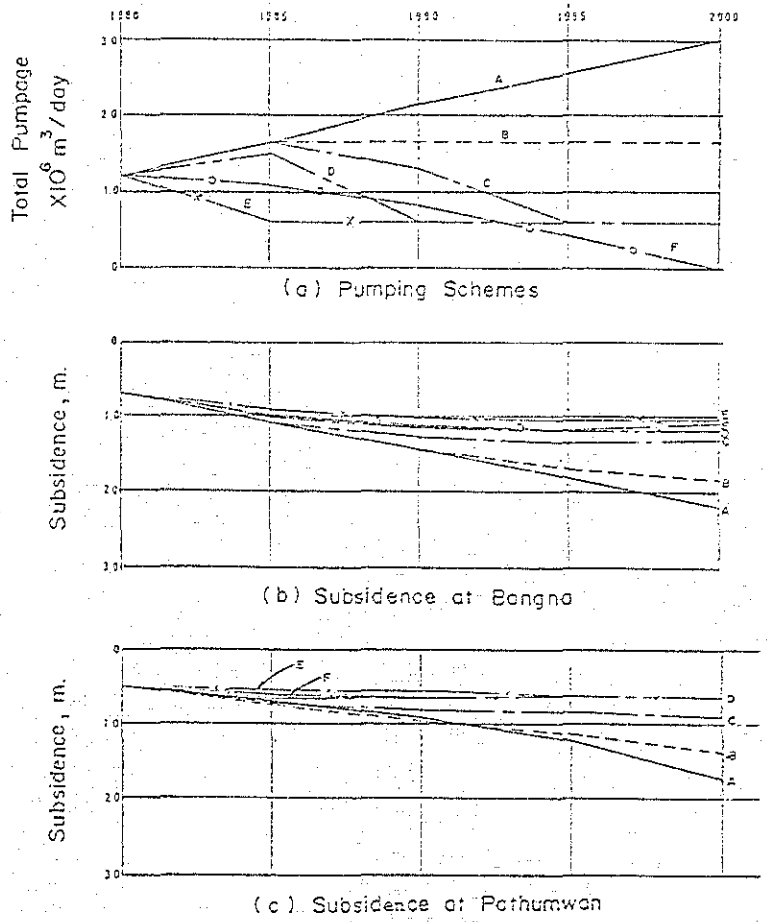


Rate of Groundwater Withdrawal in the Bangkok Area from 1955 to 1979



Summary of Model Predictions of Subsidence for Six Pumping Shemes (after AIT)

Fig. D.6	RATE OF GROUNDWATER WITHDRAWAL IN THE BANGKOK AREA FROM 1955 TO 1979

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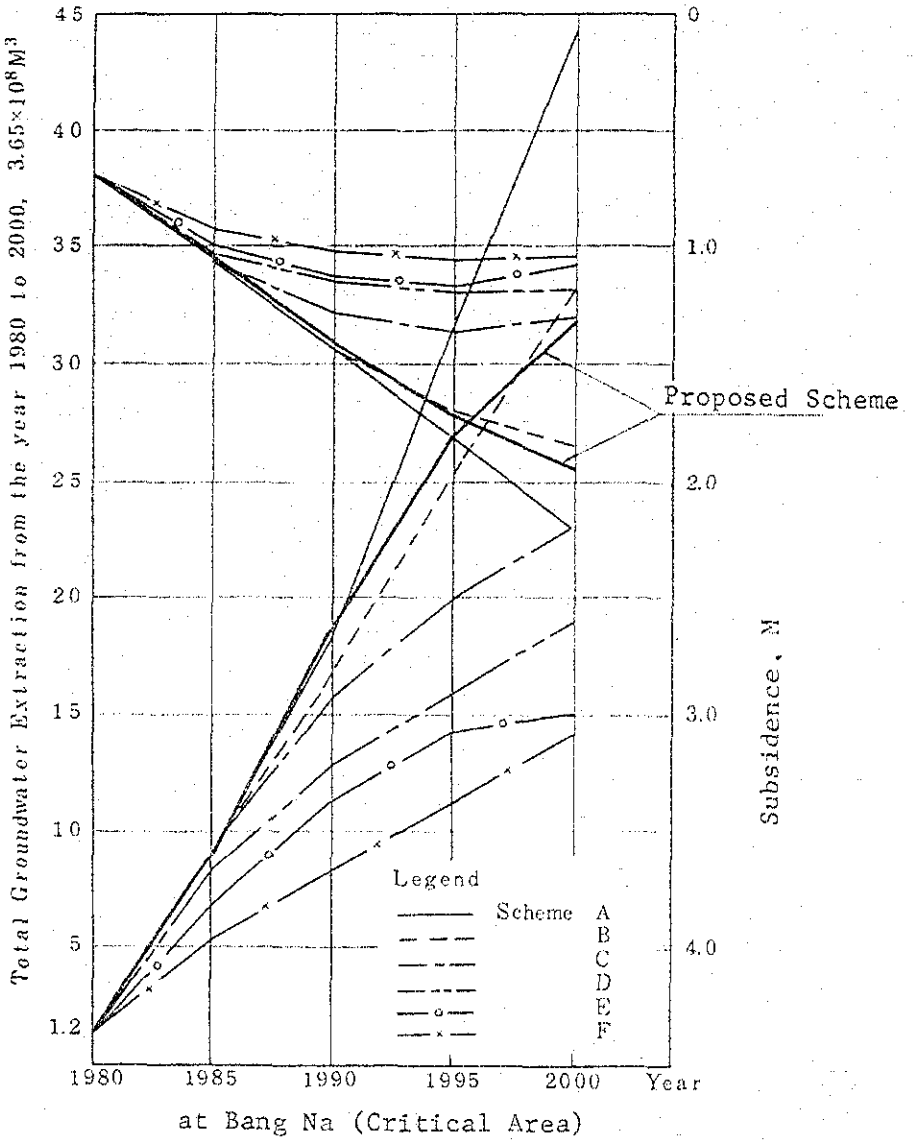


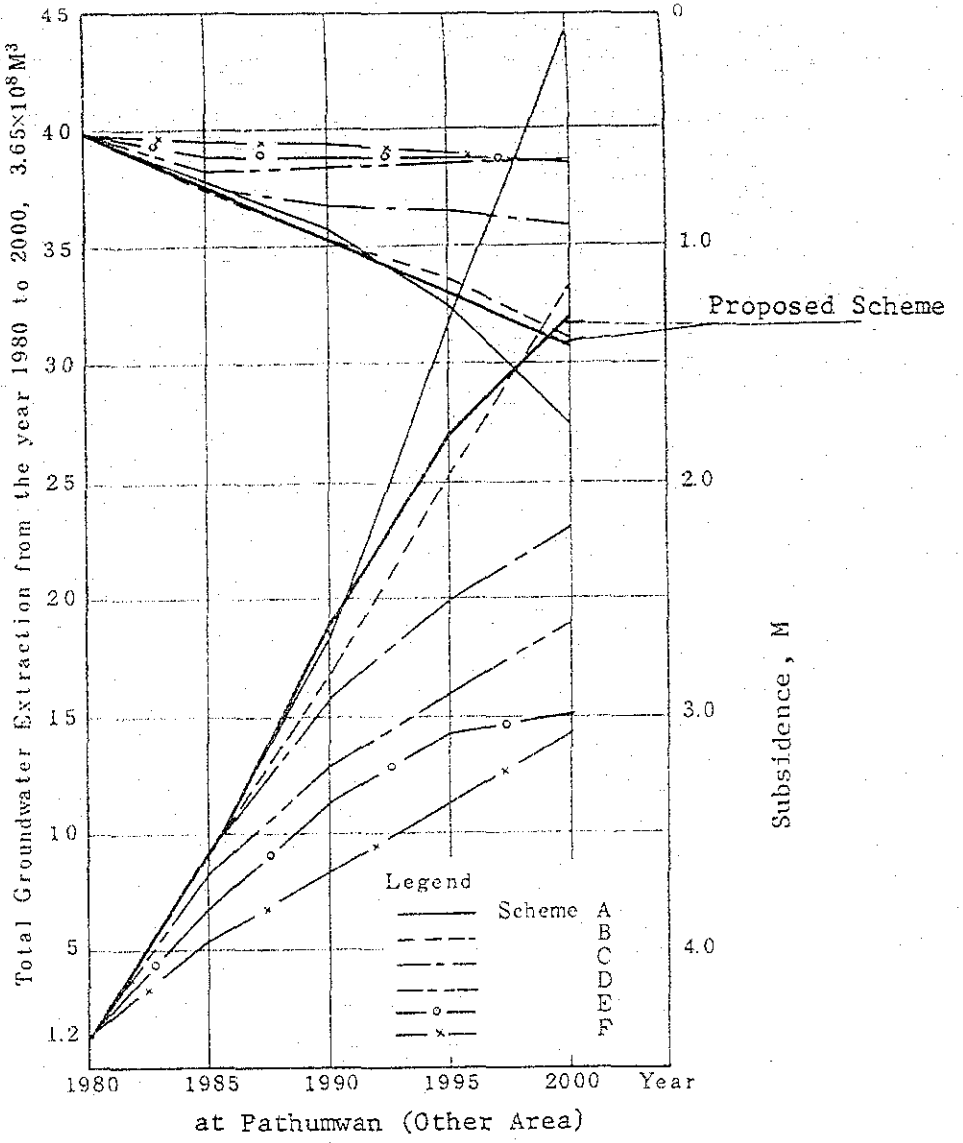
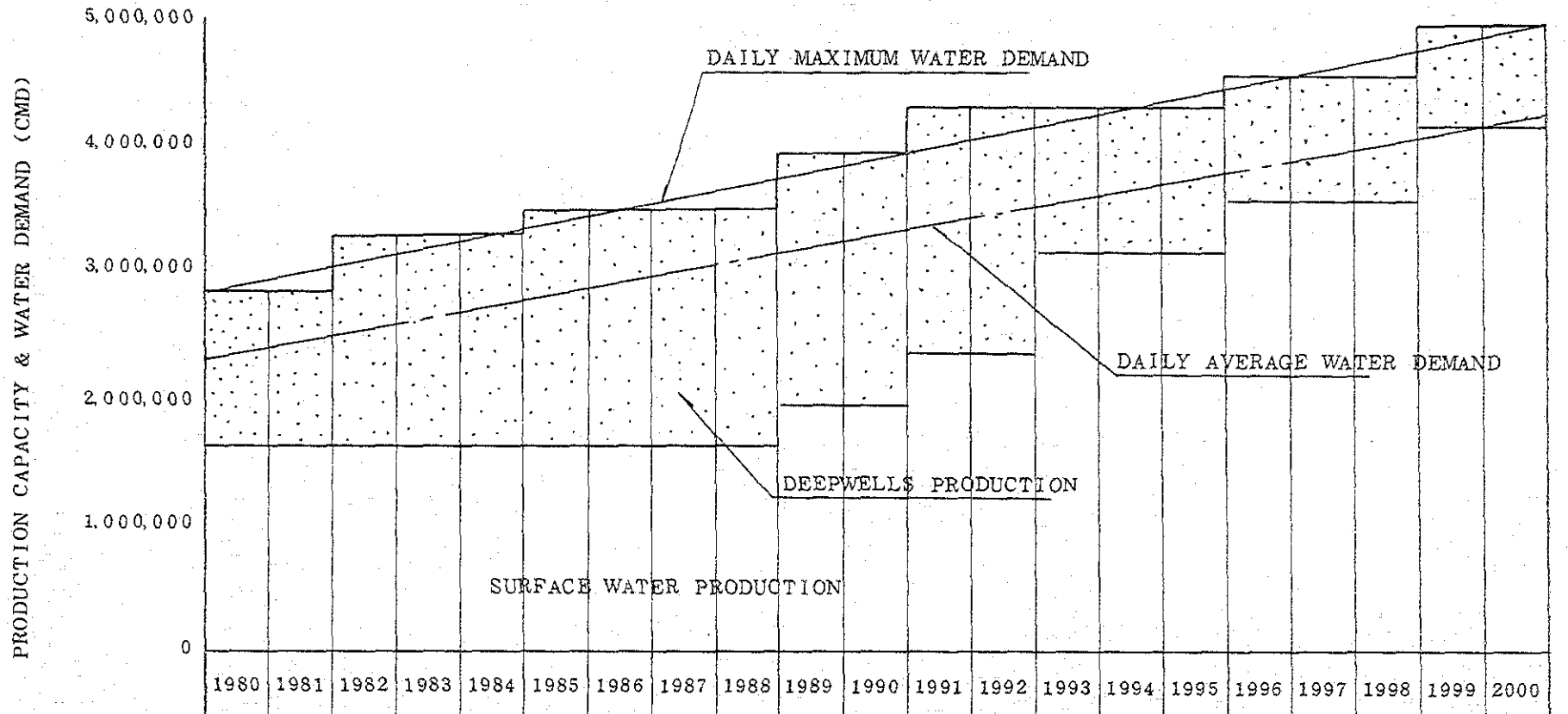


Fig. D.7 TOTAL GROUNDWATER PUMPAGE FROM 1980 TO 2000 AND LAND SUBSIDENCE FOR SIX SCHEMES AFTER ATT AND PROPOSED SCHEME BY THE STUDY AREA

MASTER PLAN ON FLOOD PROTECTION/DRAINAGE PROJECT IN EASTERN SUBURBAN-BANGKOK



	1980 1981	1982 1983 1984	1985 1986 1987 1988	1989 1990	1991 1992	1993 1994 1995	1996 1997 1998	1999 2000
SURFACE WATER SUPPLY	1,600	1,600	1,600	1,920	2,320	3,100	3,500	4,100
DEEPWELL	1,200	1,650	1,850	1,980	1,930	1,150	1,000	800
TOTAL	2,800	3,250	3,450	3,900	4,250		4,500	4,900

(×1,000 CMD)

NOTE: GROWNDWATER WITHDRAWAL IN PRIVATE SECTORS 0.8 MCMD IN 1980 AND 0.4 MCMD IN 2,000 INCLUDED IN THESE FIGURES.

Fig. D.8 WATER DEMAND AND ASSUMED WATER SUPPLY PLAN BY THE STUDY TEAM

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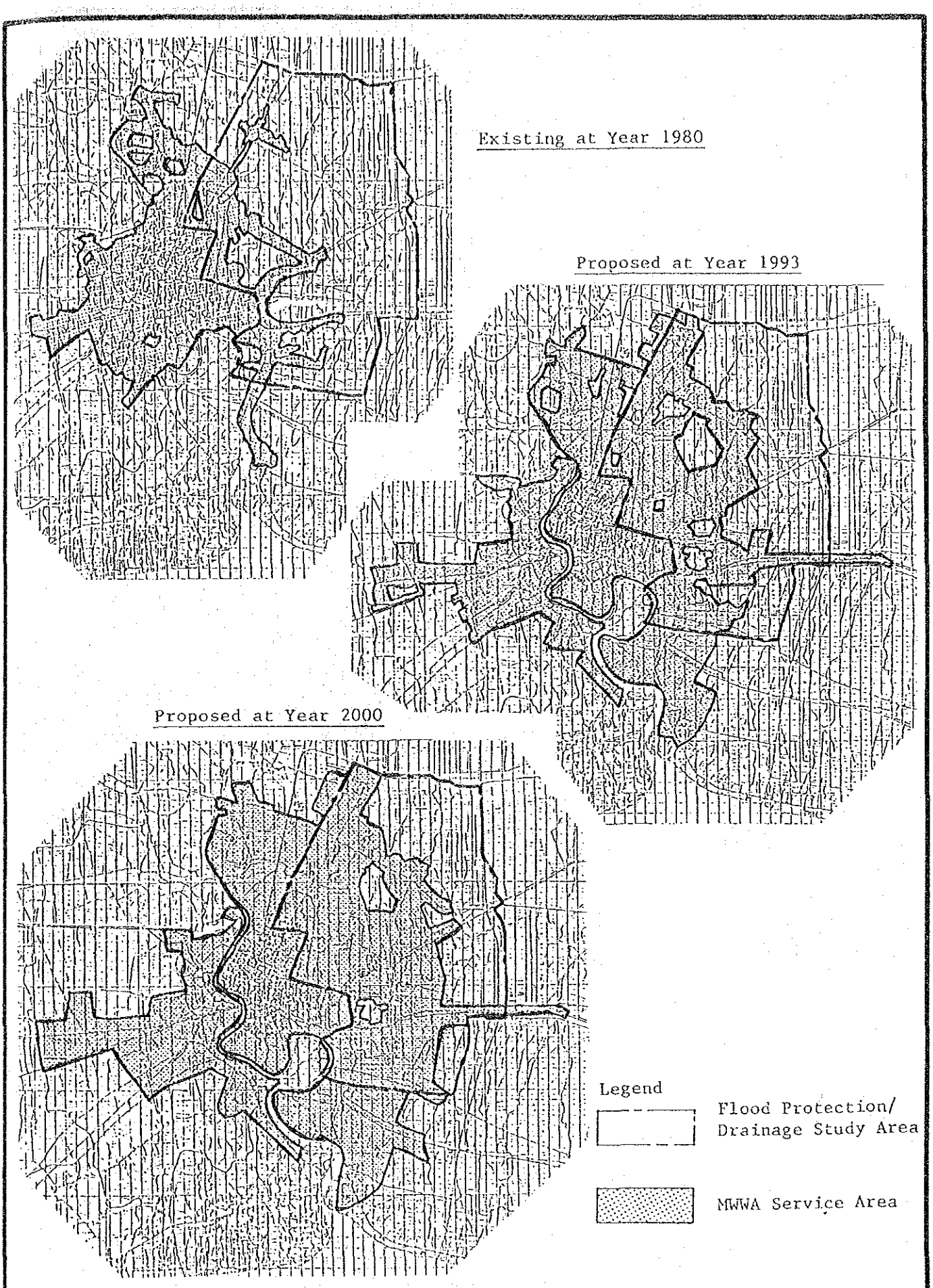

Fig. D.9 MWWA SERVICE AREA MAP, EXISTING AND FUTURE

MASTER PLAN ON FLOOD PROTECTION/DRAINAGE PROJECT IN EASTERN SUBURBAN-BANGKOK

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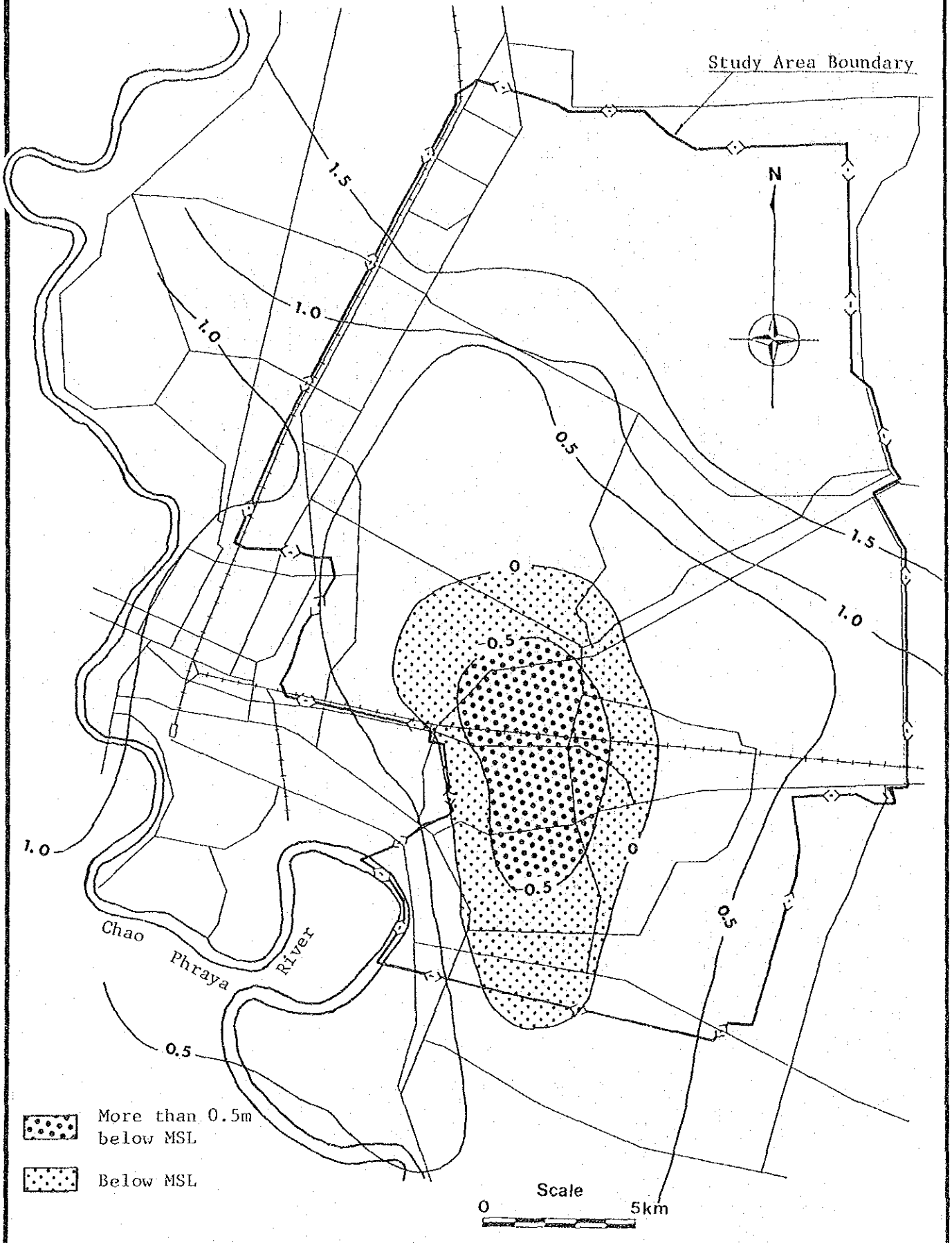

Fig. D.10 EXPECTED GROUND ELEVATION IN 1990 BASED ON THE PROPOSED SCHEME

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Fig. D.11 EXPECTED GROUND ELEVATION IN 2000 BASED ON THE PROPOSED SCHEME

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APPENDIX E

POPULATION AND LAND USE

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Appendix E POPULATION AND LAND USE

1. Existing Condition

1.1 Urbanization

From 1900 onwards, the urbanized area of Bangkok Metropolis grew as shown:

1900	13 km^2
1936	43 km^2
1953	66 km^2
1958	96 km^2
1971	183 km^2
1980	345 km^2

Table E.1 Urbanized Areas of the Bangkok Metropolis, the Preliminary Study Area and the Master Plan Area

	Bangkok Metropolis	Preliminary Study Area	Master Plan Area
Urbanized area in 1980	345 km^2	148 km^2	134 km^2

Urbanization in the Master Plan Area which is expanding along the main roads is shown in Fig. E.1.

1.2 Populations

The present population of the Bangkok Metropolis is estimated as 5,070,000 persons based on the 1980 Population Census and the 1980 Register Record. The population of the Preliminary Study Area and the Master Plan Area in 1980 were estimated as 1,160,000 and 1,060,000 respectively based on the District Populations under the Population Census and the Register Record.

Table E.2 Population of the Bangkok Metropolis, the Preliminary Study Area and the Master Plan Area

	Bangkok Metropolis	Preliminary Study Area	Master Plan Area
Population in 1980	5,070,000 persons	1,160,000 persons	1,060,000 persons

1.3 Existing Land Use

The Master Plan Area is devoted mainly to residential use surrounding the central business district of the Bangkok Metropolis. The commercial areas are allocated in Bangkapi, Lad Phrao and Phrakhanong along the main streets.

The existing land use situation of the Master Plan Area is shown in Fig. E.2 while details of the areas earmarked for various categories of land use are given in Table E.3.

Table E.3 Existing Land Use

Land-Use Classification	Preliminary Study Area	Master Plan Area	
	Area (km^2)	Area (km^2)	Percentage (%)
Residential	111	97	37.3
Commercial	6	6	2.3
Industrial	3	3	1.1
Institutional	22	22	8.5
Park, Sport Ground, etc.	6	6	2.3
Agricultural and Open Space	353	126	48.5
Total	501	260	100.0

1.4 Available Development Plan and Project

1.4.1 Development Plan

There are several urban development plans.

1) The Fifth Five-year national development Plan

The Fifth five year national development plan, covering the period from October 1981 to September 1986, emphasizes a strategy to stimulate economic activities in other regions outside the Bangkok area, pointing out the problem of excessive concentration of economic activities and population on the metropolitan area.

2) The Structural Plan for Bangkok Metropolis and its Vicinity, 2000

The TCPD made the structural plan and had public hearings several times from 1976, aiming at the authorization of the Structural Plan under the City Planning Act, 1975 but without success. In June 1984, intergovernmental committee was newly established aiming at finalization by 1985.

Thus, at present, there is no authorized city plan in Bangkok to control the land use and guide an orderly city development.

Nevertheless, the concept of the Structural Plan is presently utilized more or less in conformity with the policy of the Fifth National Development Plan.

The Plan covers not only the city area of the Bangkok Metropolis but also the whole region of the six provinces or the so called "Bangkok Metropolis and its Vicinity". This whole region is divided into 3 parts, viz:

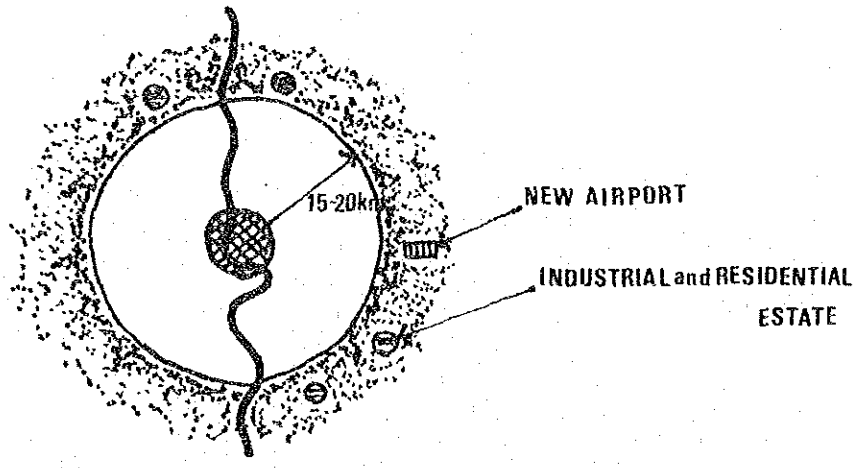
Inner Area: The inner area will be the city area of the Bangkok Metropolis and its vicinity. In the future it will have a radius of 20 to 25 kilometers from the center. It is planned to be surrounded by the outer ring road (Fig. E.3).

Green Belt Area: The Green Belt area is the area between the inner area and the outer area. This area is proposed to stop uncontrolled urban growth. The Green Belt area is planned for agriculture, recreation and conservation of the natural landscape. It is an area with many canals, lying within a radius of 30 kilometers from the center of the Bangkok metropolis.

Outer Area: The outer area stretches from the outside of the Green Belt area to the surrounding provincial boundaries. This area will be promoted for agricultural use and for location of residential and industrial complexes. Industrial parks should be located within this area.

1.4.2 Development Project

The schematic plan for industrial, housing and new airport projects is shown in the following Figure. According to this figure, these projects are allocated in the Outer Area.



1.4.3 Road Plan

Road Plan as shown in Fig. E.3 is being implemented.

2. Development Policy

2.1 Existing Problem

From following viewpoints, the new urban structures for Bangkok Metropolis, Preliminary Study Area and Master Plan Area is developed by the Study Team taking into account the absence of an authorized master plan.

2.2 Development Policy

2.2.1 Bangkok Metropolis

To resolve these contradictory problems, the following three areas should be prepared:

1) Outer Development Area

The characteristics of the Outer Development Area including the Green Belt Project Area and the Outer Suburban Area of Bangkok Metropolis, are as follows:

- Only self-contained projects such as large industrial and residential estates which are able to arrange their own infrastructure should be permitted.
- In this Area, those who execute self-contained projects should be responsible for the infrastructure without the assistance of Administration.

2) Urban Control Area

The characteristics of the Urban Control Area which are allocated between the Urban Development Area and the Outer Development Area are as follows:

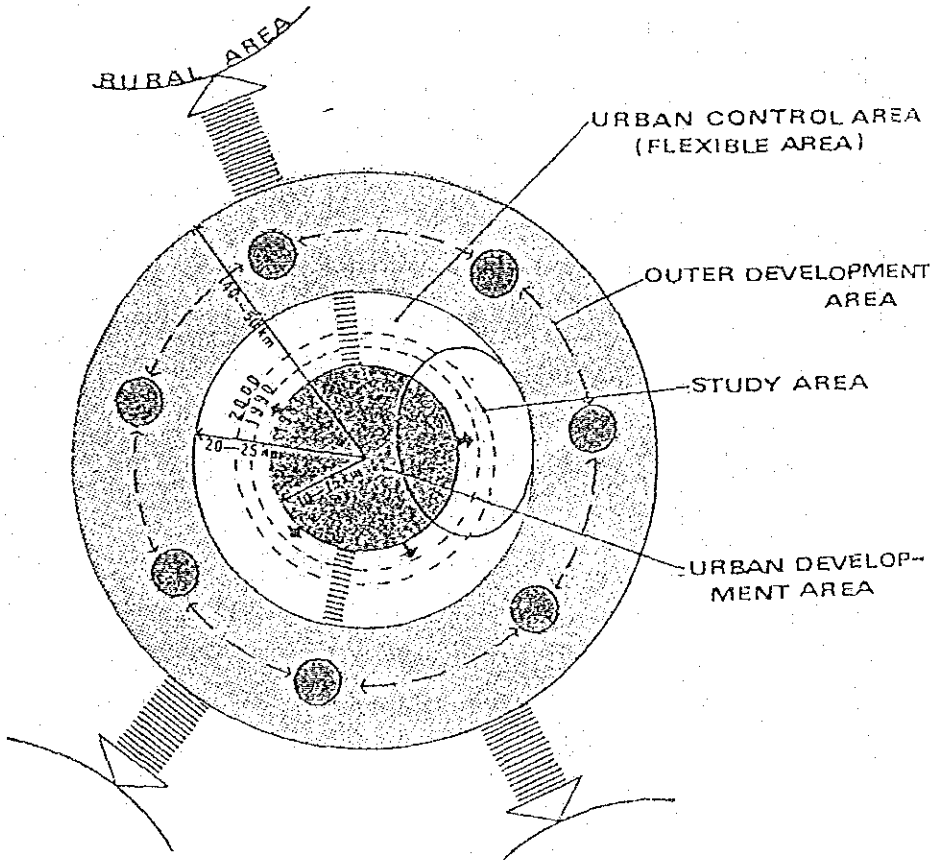
- This Area is earmarked to facilitate the provision of infrastructure in the Urban Development Area.
- The inner boundary adjoining the Urban Development Area will be expanded each 5 or 10 years in relation with the arrangement of infrastructure in the Urban Development Area.

- All Land in this Area should be frozen temporarily against any development within a certain period of years.
- This Area will be phased out eventually.

3) Urban Development Area

The characteristics of the Urban Development Area which is the central part of Bangkok Metropolis are as follows:

- Taking into account the economical standard of infrastructure which is immediately desirable, this area should be developed as a populated area of high density.
- To arrange the infrastructure immediately, some kinds of urban development projects such as land re-adjustment projects and re-development projects should be enacted and enforced.
- The Administration should have the responsibility for arranging the infrastructure in this area.



2.2.2 Preliminary Study Area and Master Plan Area

Under the development policy of Bangkok Metropolis, the Preliminary Study Area should be divided into the Urban Development Area and the Urban Control Area targeting on the year of 2000 and the Master Plan Area should be the Urban Development Area.

3. Future Land Use

3.1 Population Projection

(1) Bangkok Metropolis

In order to project the future population in the Master Plan Area up to the year 2000, population in the Bangkok Metropolis is first estimated.

The following four methods are adopted to estimate future population:

(a) *Projection based on regression curve*

(b) Projection based on "Population Projections for Thailand Whole Kinglom and Regions, NSO"

(c) Estimated figures of "The General Plan of Bangkok Metropolis and its Vicinity 2000, TCP"

(d) Estimated figures of "The Research Centre of Chulalongkorn University"

Results of these projections are summarized in Table 5.4, showing variations from 7,260,000 to 7,800,000 in the year 2000. It is considered reasonable to adopt 7,700,000 as the medium projected population for the Bangkok Metropolis.

Table E.4 Population Projection of the Bangkok Metropolis

Year	Method			
	a	b	c	d
1980	5,070,000	5,070,000	5,070,000	5,070,000
1990	6,390,000	6,890,000	6,360,000	6,380,000
2000	7,780,000	7,800,000	7,260,000	7,640,000

(2) Preliminary Study Area

The future population for the Study Area is estimated from the Development Policy as mentioned in the preceding section and the population trend from 1960.

Following the allocation of projected industrial population from 1980 to 2000 to the Outer Development Area under the Development Policy, the remaining future population of Bangkok Metropolis is distributed to the categorized Areas (Urban Core Area, Core Fringe Area and Suburban Area) according to population trends from 1960 to 1980.
The result of this projection is summarized in Figure E.4.

Figure E.4 Projected Population for categorized Area