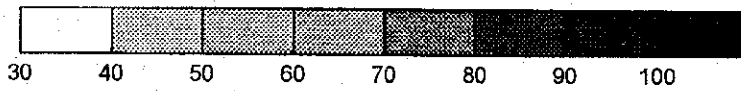


LEGEND

Isopach of TB Aquifer (m)



65 Well location used to compile the map with thickness of TB aquifer (m)

Figure 7.2.39

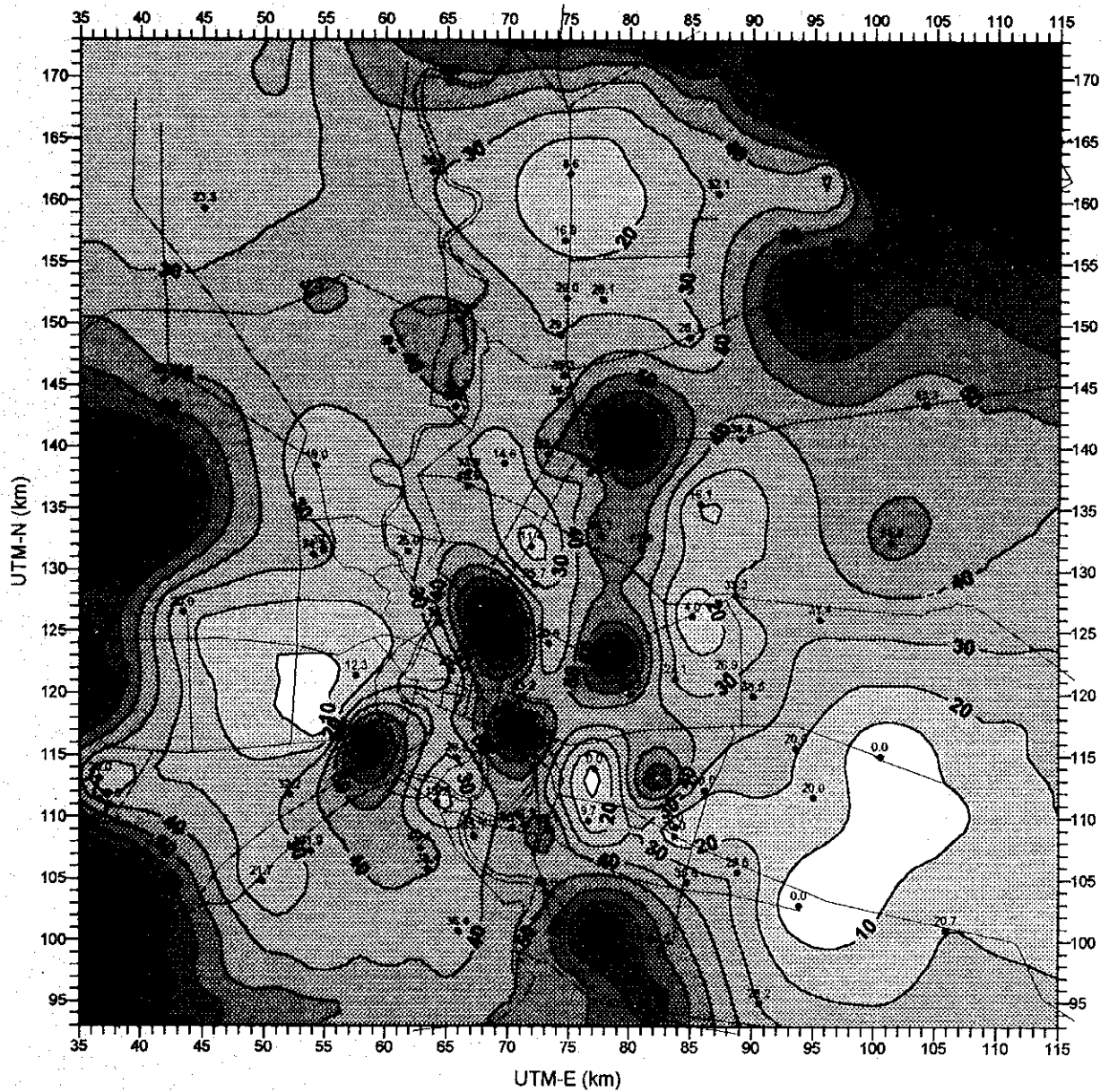
ISOPACH MAP OF TB AQUIFER

**THE STUDY ON MANAGEMENT OF GROUNDWATER AND LAND SUBSIDENCE
IN THE BANGKOK METROPOLITAN AREA AND ITS VICINITY**

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

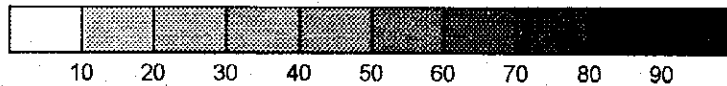
KOKUSAI KOGYO CO., LTD.





LEGEND

Clay Content of BK Aquifer (%)



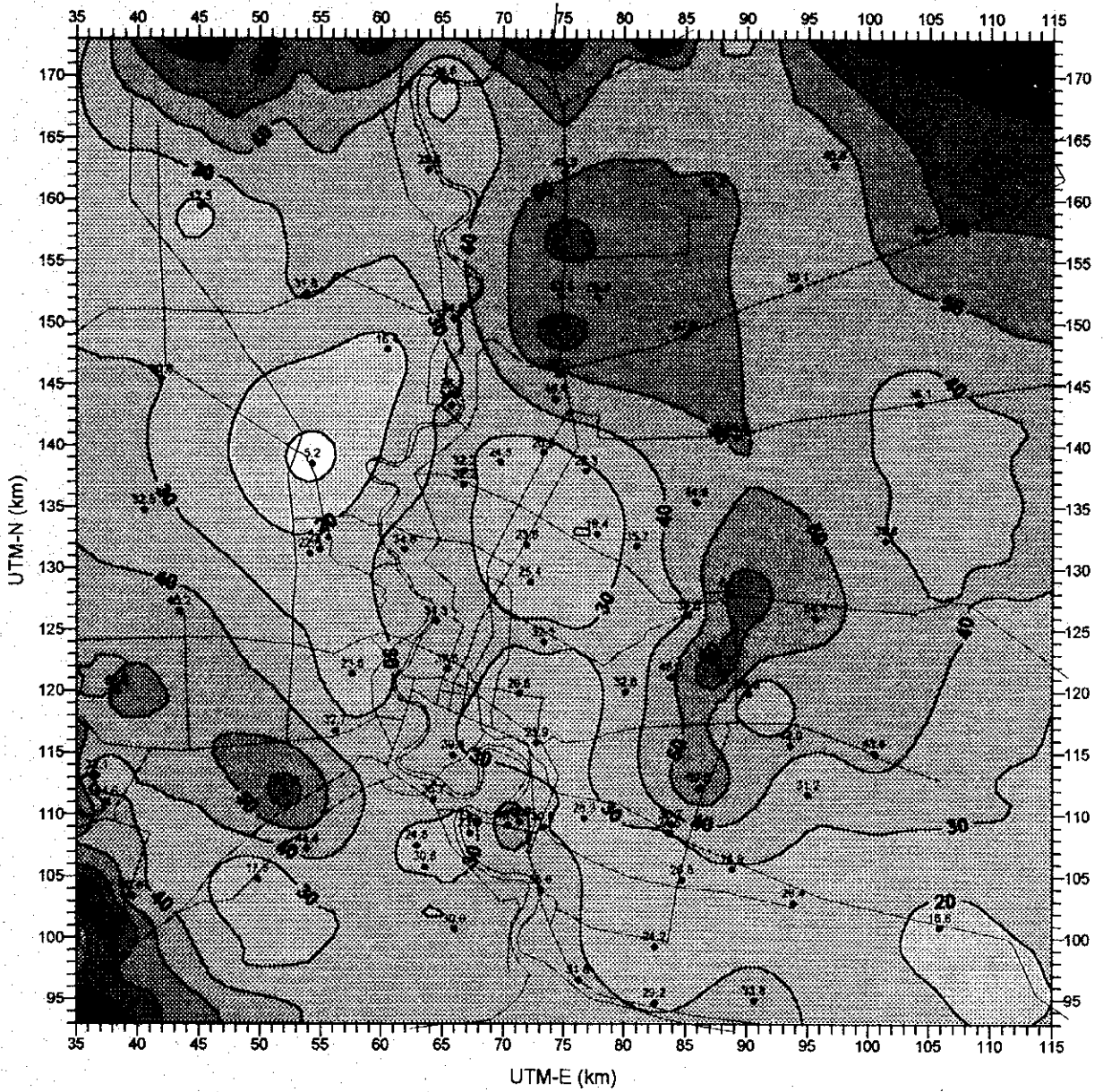
• Well location used to compile the map with clay content of BK aquifer (%)

$$(\text{Clay content}) = (\text{total thickness of clay beds}) / (\text{aquifer thickness}) \times 100 (\%)$$

Figure 7.2.40	CLAY CONTENT OF BK AQUIFER
THE STUDY ON MANAGEMENT OF GROUNDWATER AND LAND SUBSIDENCE IN THE BANGKOK METROPOLITAN AREA AND ITS VICINITY	
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)	KOKUSAI KOGYO CO., LTD.

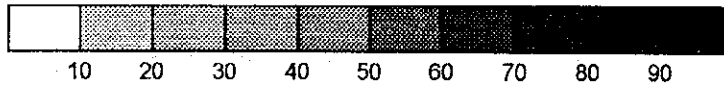
	£	£
Revenue	1,200,000	
Cost of sales	(400,000)	
Operating expenses	(200,000)	
Operating profit	600,000	
Finance income	50,000	
Finance expense	(20,000)	
Profit before tax	630,000	
Income tax expense	(157,500)	
Profit for the year	472,500	
Dividends paid		(100,000)
Retained profit		372,500

The company has no other income or expenses. The company's tax rate is 25%.



LEGEND

Clay Content of PD Aquifer (%)

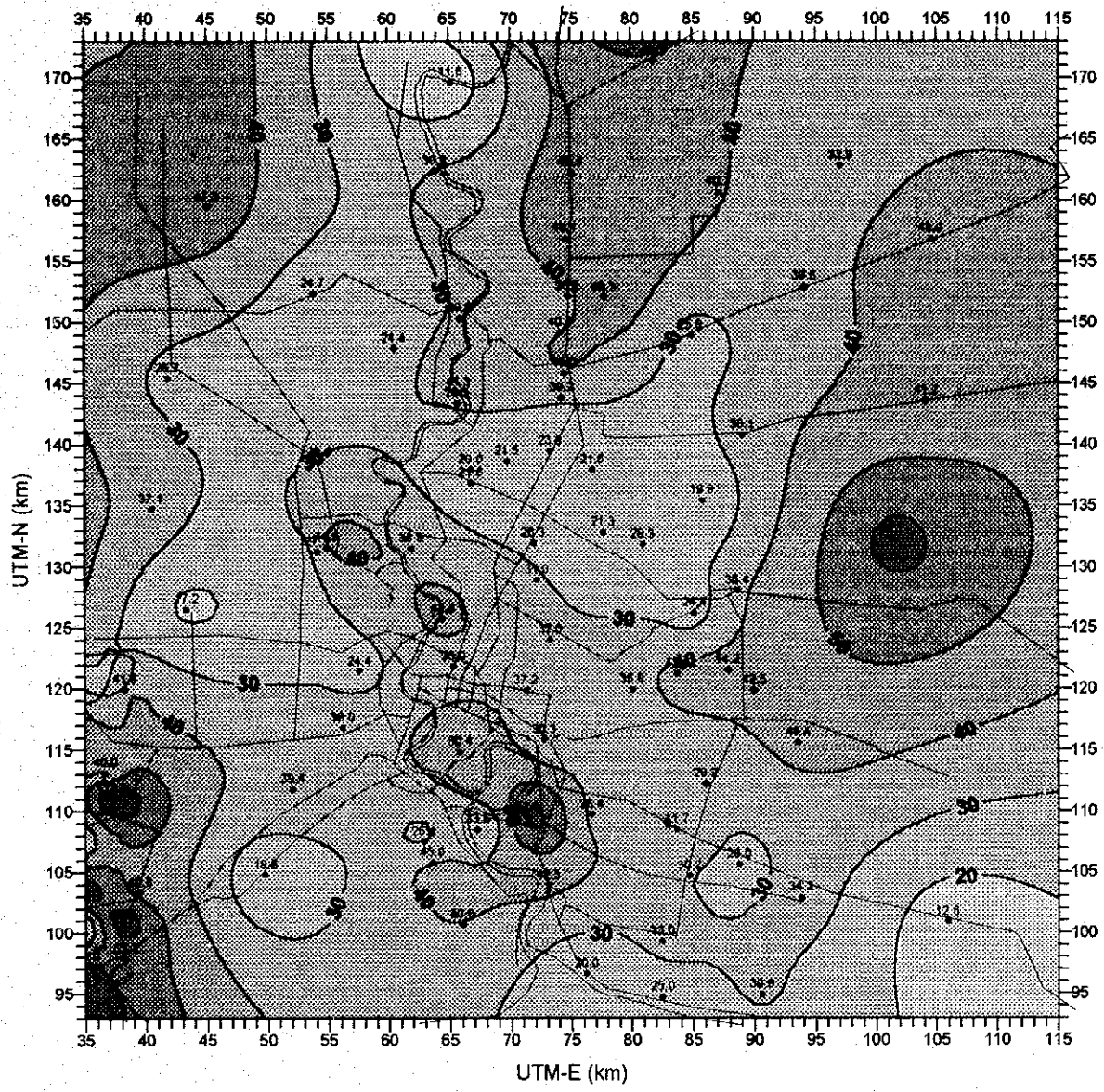


• Well location used to compile the map with clay content of PD aquifer (%)

$$(\text{Clay content}) = (\text{total thickness of clay beds}) / (\text{aquifer thickness}) \times 100 (\%)$$

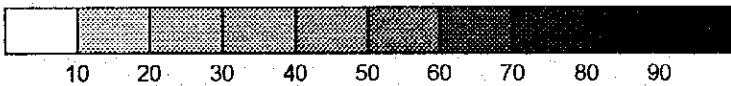
Figure 7.2.41	CLAY CONTENT OF PD AQUIFER
THE STUDY ON MANAGEMENT OF GROUNDWATER AND LAND SUBSIDENCE IN THE BANGKOK METROPOLITAN AREA AND ITS VICINITY	
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)	KOKUSAI KOGYO CO., LTD.

1. *Journal of the American Medical Association*. 2004;292:3111-3112.



LEGEND

Clay Content of NL Aquifer (%)

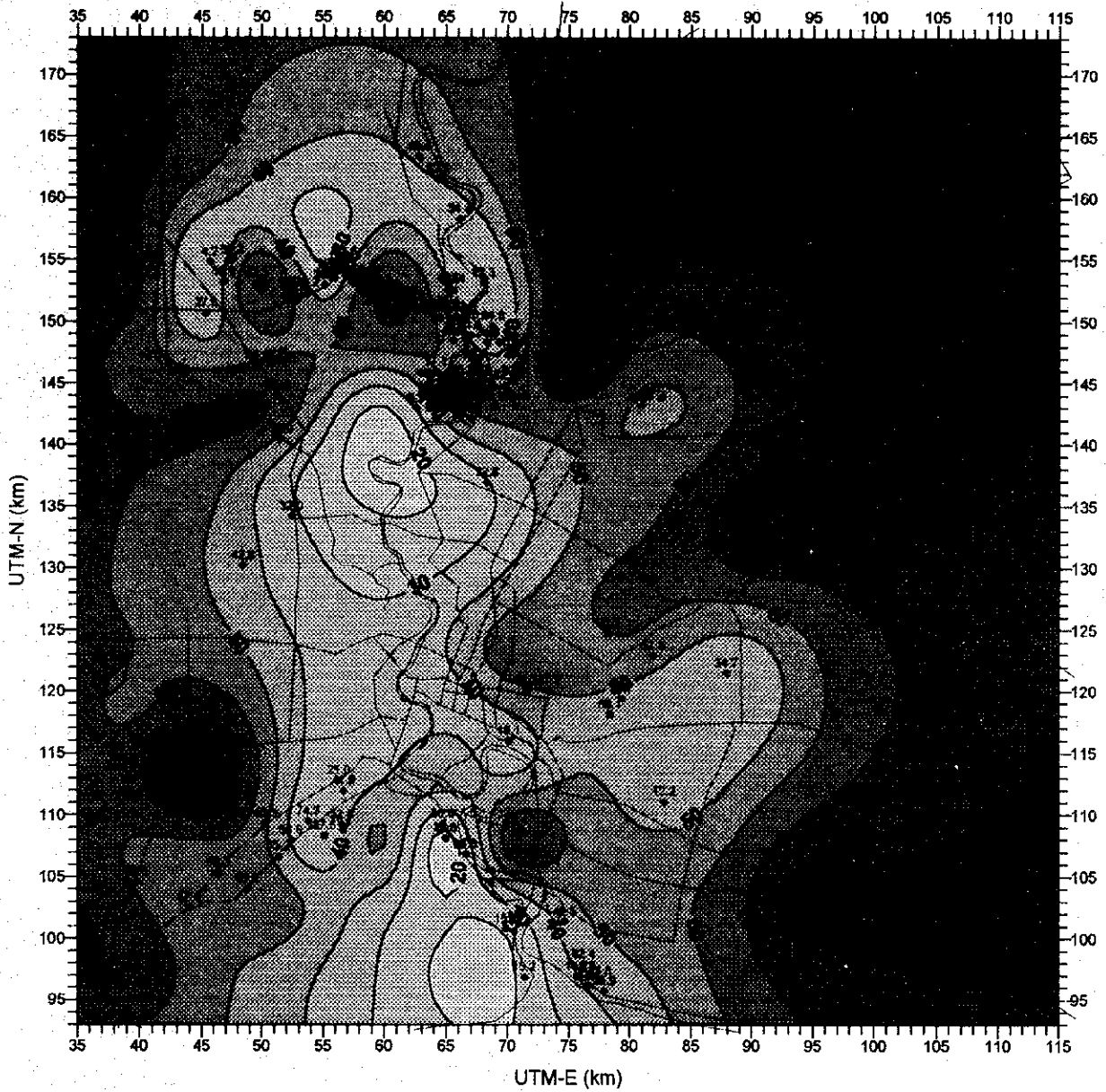


10 20 30 40 50 60 70 80 90

51.5 Well location used to compile the map with clay content of NL aquifer (%)

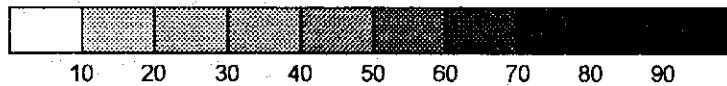
$(\text{Clay content}) = (\text{total thickness of clay beds} / \text{aquifer thickness}) \times 100 (\%)$

Figure 7.2.42	CLAY CONTENT OF NL AQUIFER
THE STUDY ON MANAGEMENT OF GROUNDWATER AND LAND SUBSIDENCE IN THE BANGKOK METROPOLITAN AREA AND ITS VICINITY	
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)	KOKUSAI KOGYO CO., LTD.



LEGEND

Clay Content of NB Aquifer (%)



10 20 30 40 50 60 70 80 90

55.5 Well location used to compile the map with clay content of NB aquifer

$$(\text{Clay content}) = (\text{total thickness of clay beds}) / (\text{aquifer thickness}) \times 100 (\%)$$

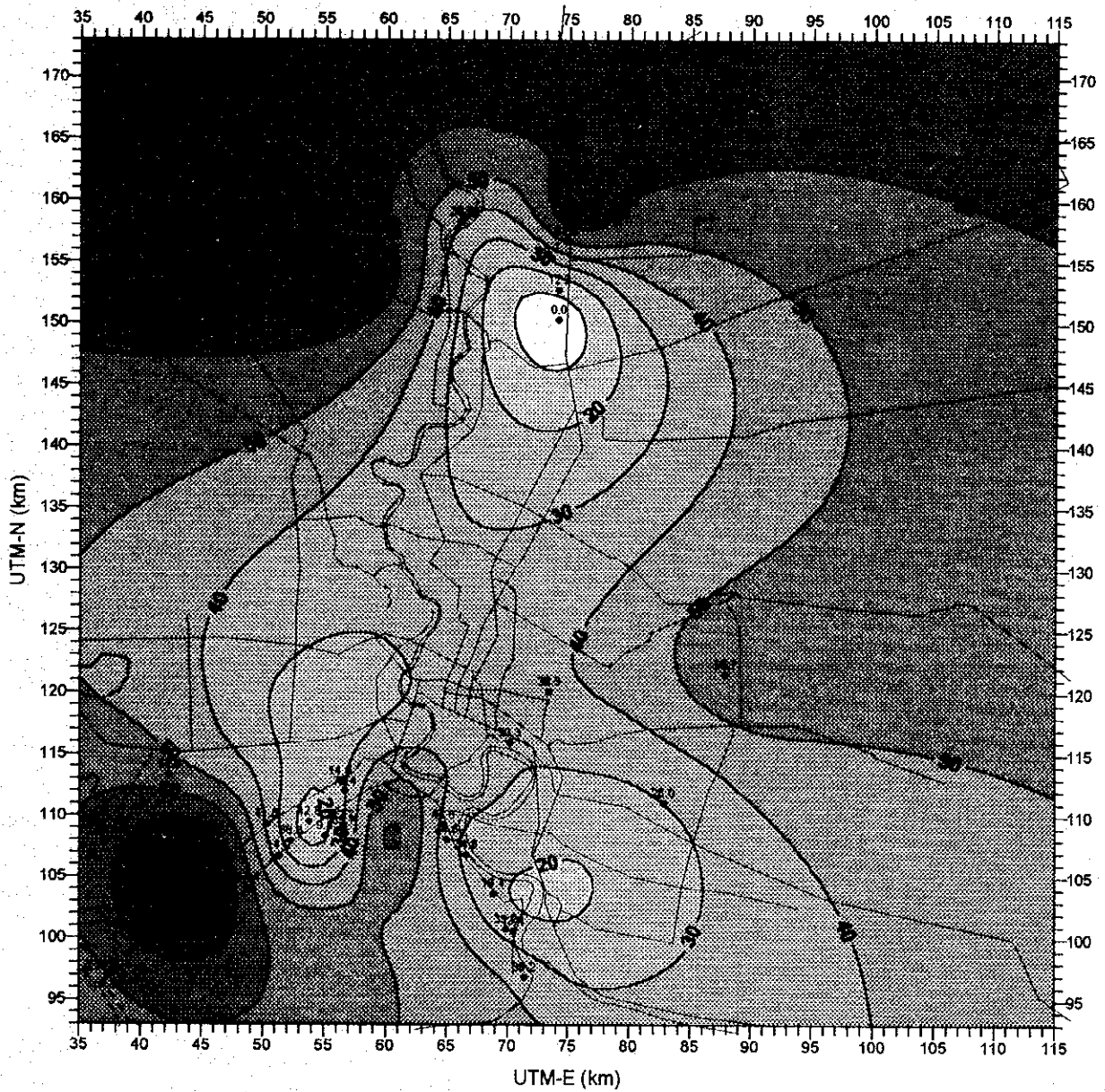
Figure 7.2.43

CLAY CONTENT OF NB AQUIEFR

THE STUDY ON MANAGEMENT OF GROUNDWATER AND LAND SUBSIDENCE IN THE BANGKOK METROPOLITAN AREA AND ITS VICINITY

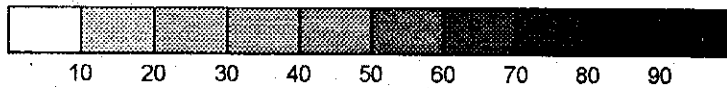
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

KOKUSAI KOGYO CO., LTD.



LEGEND

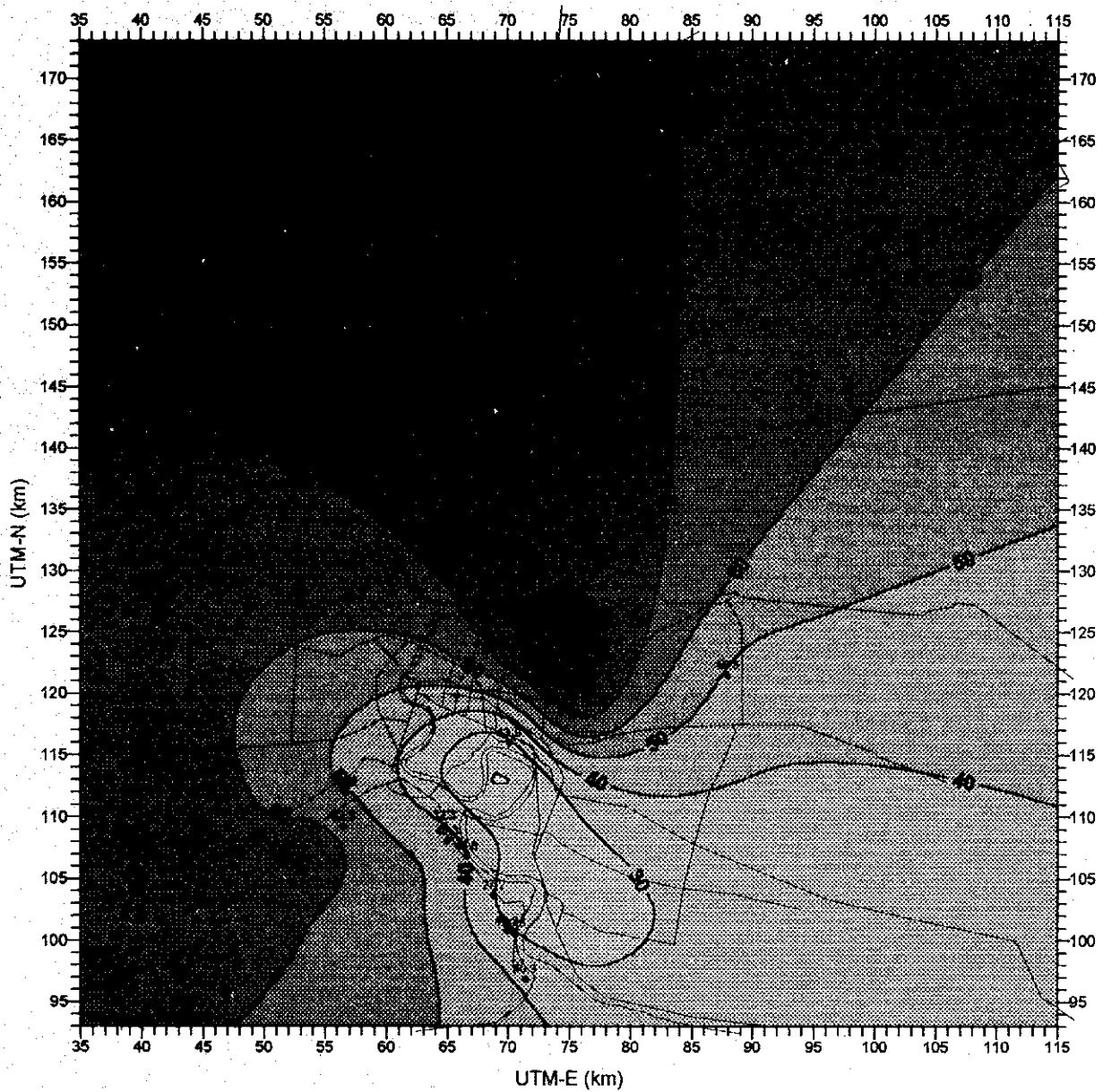
Clay Content of PT Aquifer (%)



55.5 Well location used to compile the map with clay content of PT aquifer (%)

$(\text{Clay content}) = (\text{total thickness of clay beds}) / (\text{aquifer thickness}) \times 100 (\%)$

Figure 7.2.45	CLAY CONTENT OF PT AQUIFER
THE STUDY ON MANAGEMENT OF GROUNDWATER AND LAND SUBSIDENCE IN THE BANGKOK METROPOLITAN AREA AND ITS VICINITY	
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)	KOKUSAI KOGYO CO., LTD.



LEGEND

Clay Content of TB Aquifer (%)

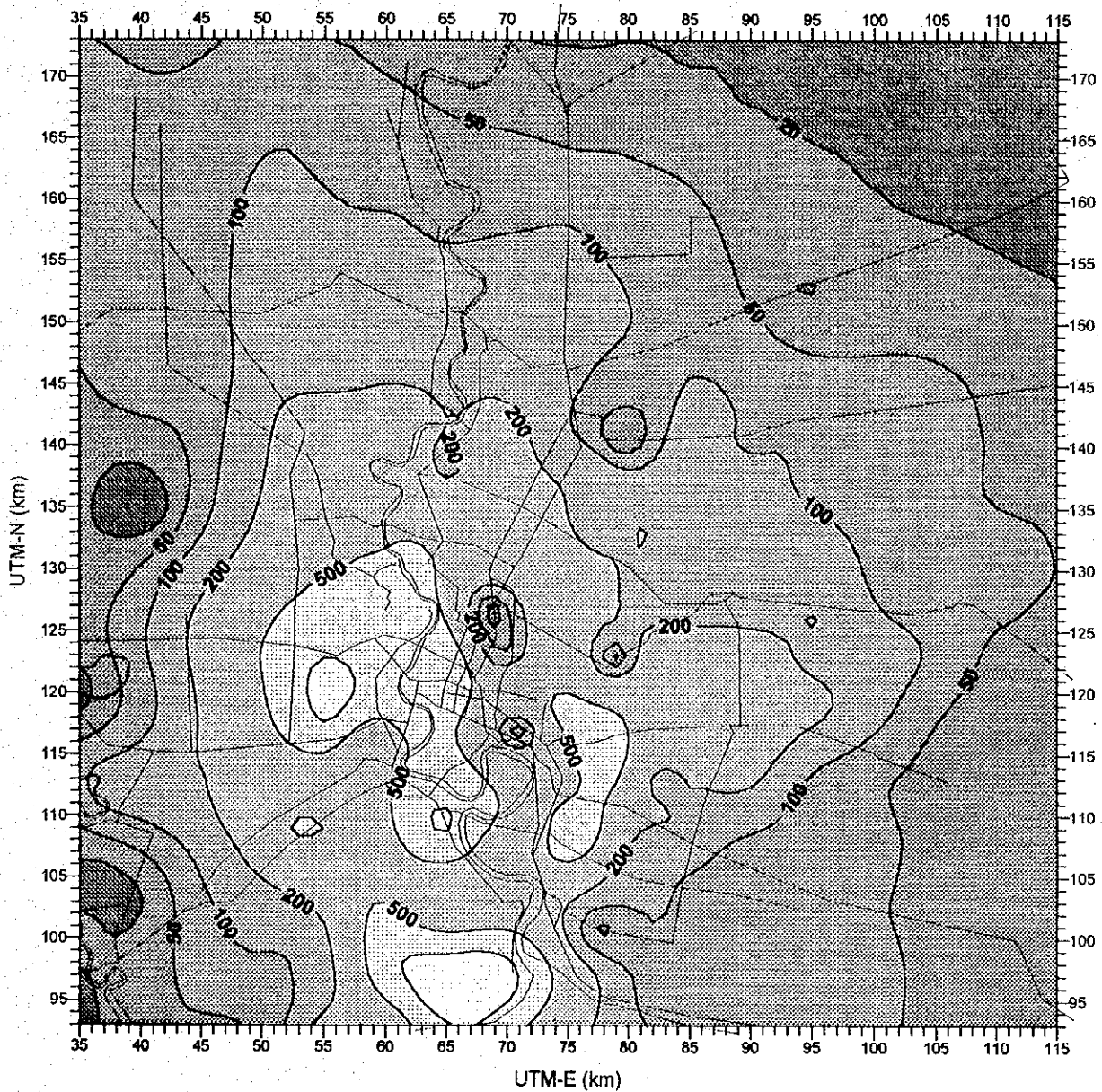


55.5 Well location used to compile the map with clay content of TB aquifer (%)

$$(\text{Clay content}) = (\text{total thickness of clay beds}) / (\text{aquifer thickness}) \times 100 (\%)$$

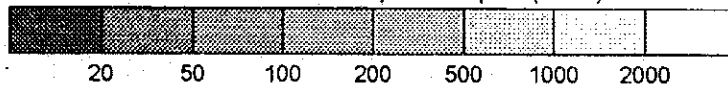
Figure 7.2.46	CLAY CONTENT OF TB AQUIFER
THE STUDY ON MANAGEMENT OF GROUNDWATER AND LAND SUBSIDENCE IN THE BANGKOK METROPOLITAN AREA AND ITS VICINITY	
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)	KOKUSAI KOGYO CO., LTD.





LEGEND

Estimated Transmissivity of BK Aquifer (m²/d)



$$(\text{Estimated transmissivity}) = (\text{estimated permeability}) \times (\text{isopach}) \times [100 - (\text{clay content})] / 100$$

Figure 7.2.47

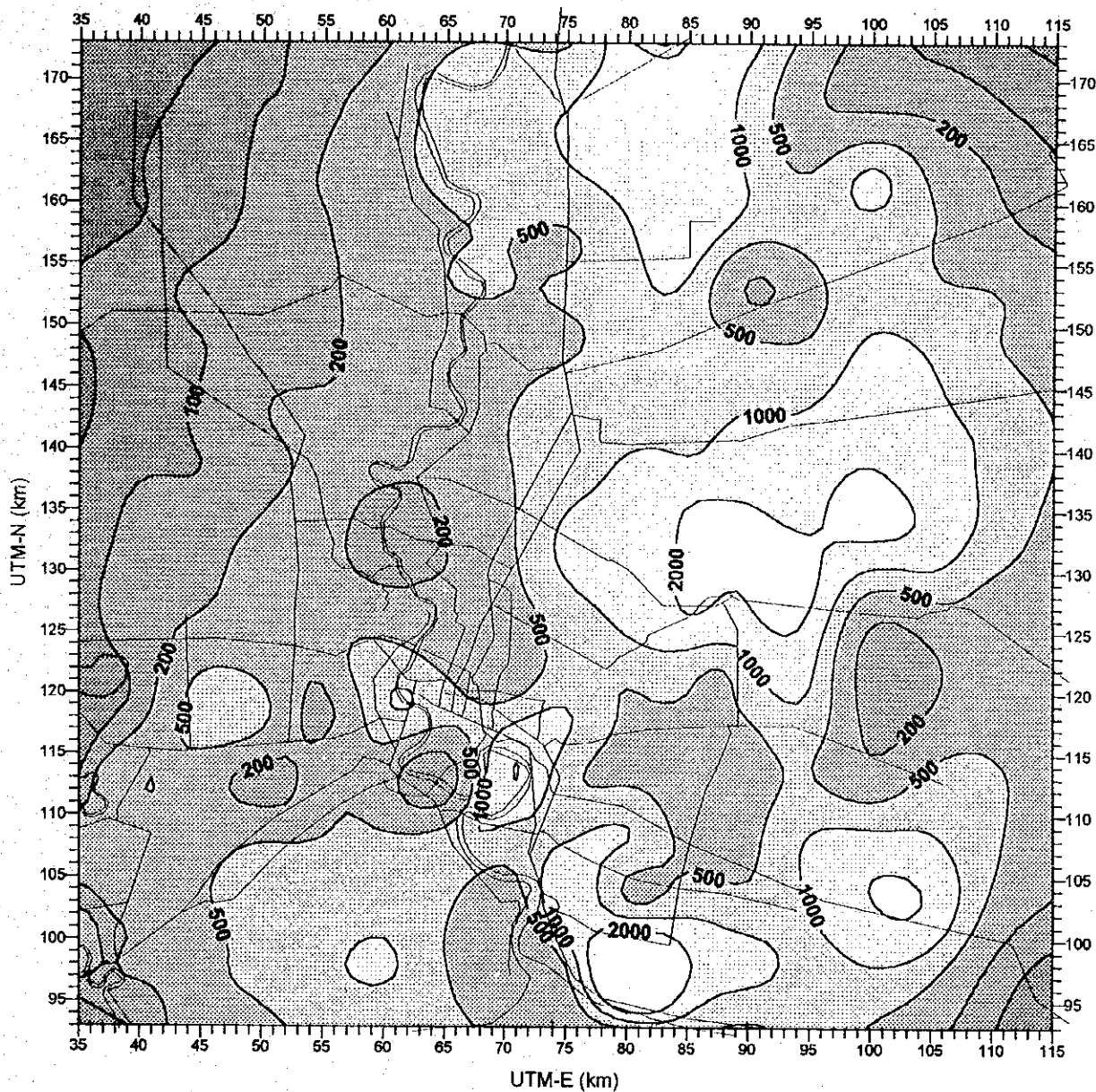
ESTIMATED TRANSMISSIVITY OF BK AQUIFER

THE STUDY ON MANAGEMENT OF GROUNDWATER AND LAND SUBSIDENCE
IN THE BANGKOK METROPOLITAN AREA AND ITS VICINITY

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

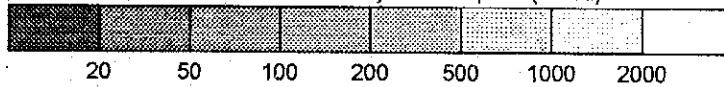
KOKUSAI KOGYO CO., LTD.





LEGEND

Estimated Transmissivity of PD Aquifer (m²/d)



$$(\text{Estimated transmissivity}) = (\text{estimated permeability}) \times (\text{isopach}) \times [100 - (\text{clay content})] / 100$$

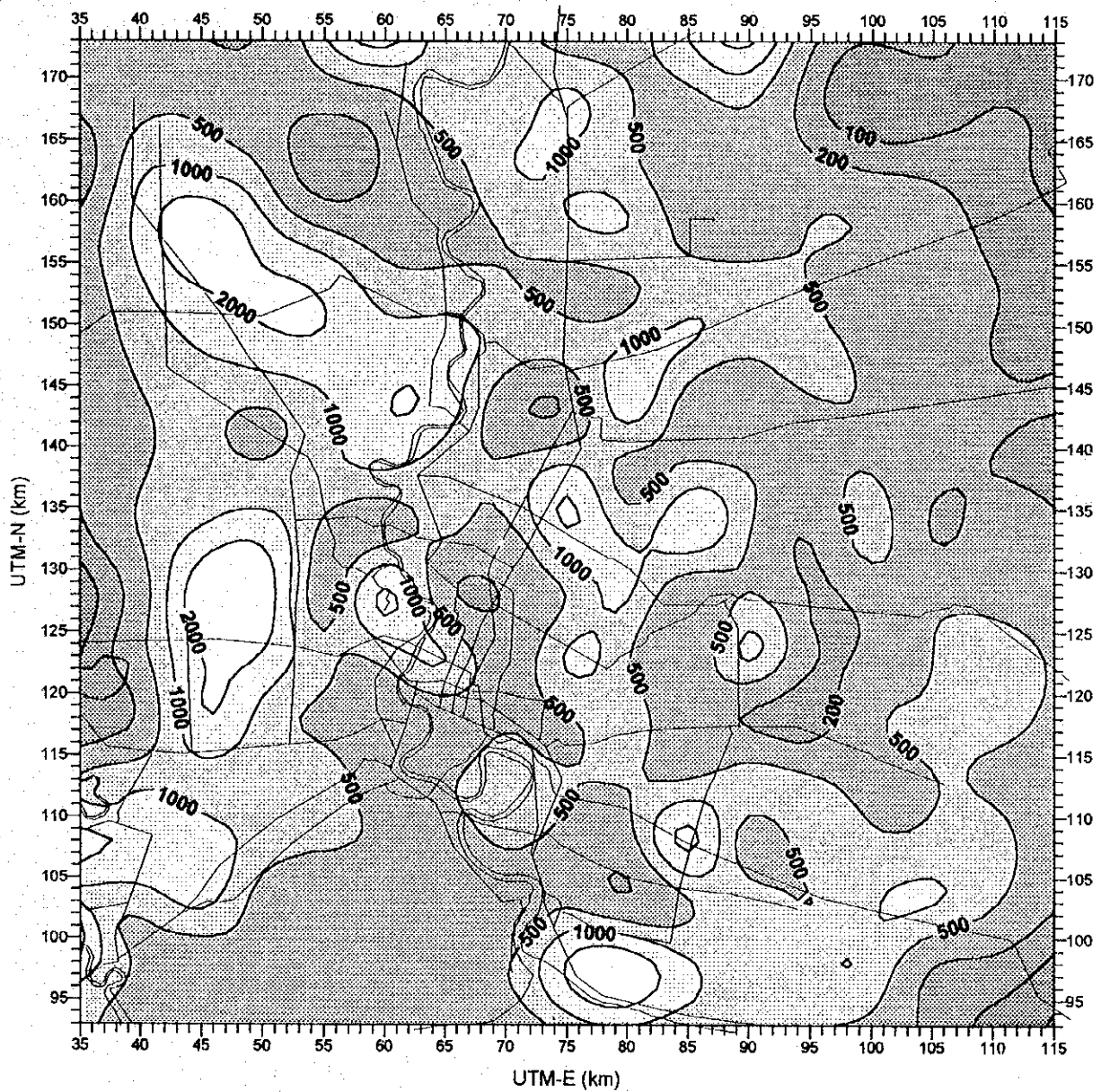
Figure 7.2.48

ESTIMATED TRANSMISSIVITY OF PD AQUIFER

THE STUDY ON MANAGEMENT OF GROUNDWATER AND LAND SUBSIDENCE
IN THE BANGKOK METROPOLITAN AREA AND ITS VICINITY

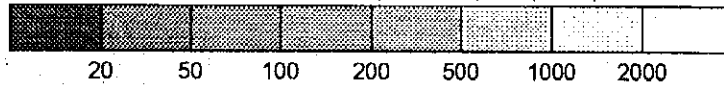
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

KOKUSAI KOGYO CO., LTD.



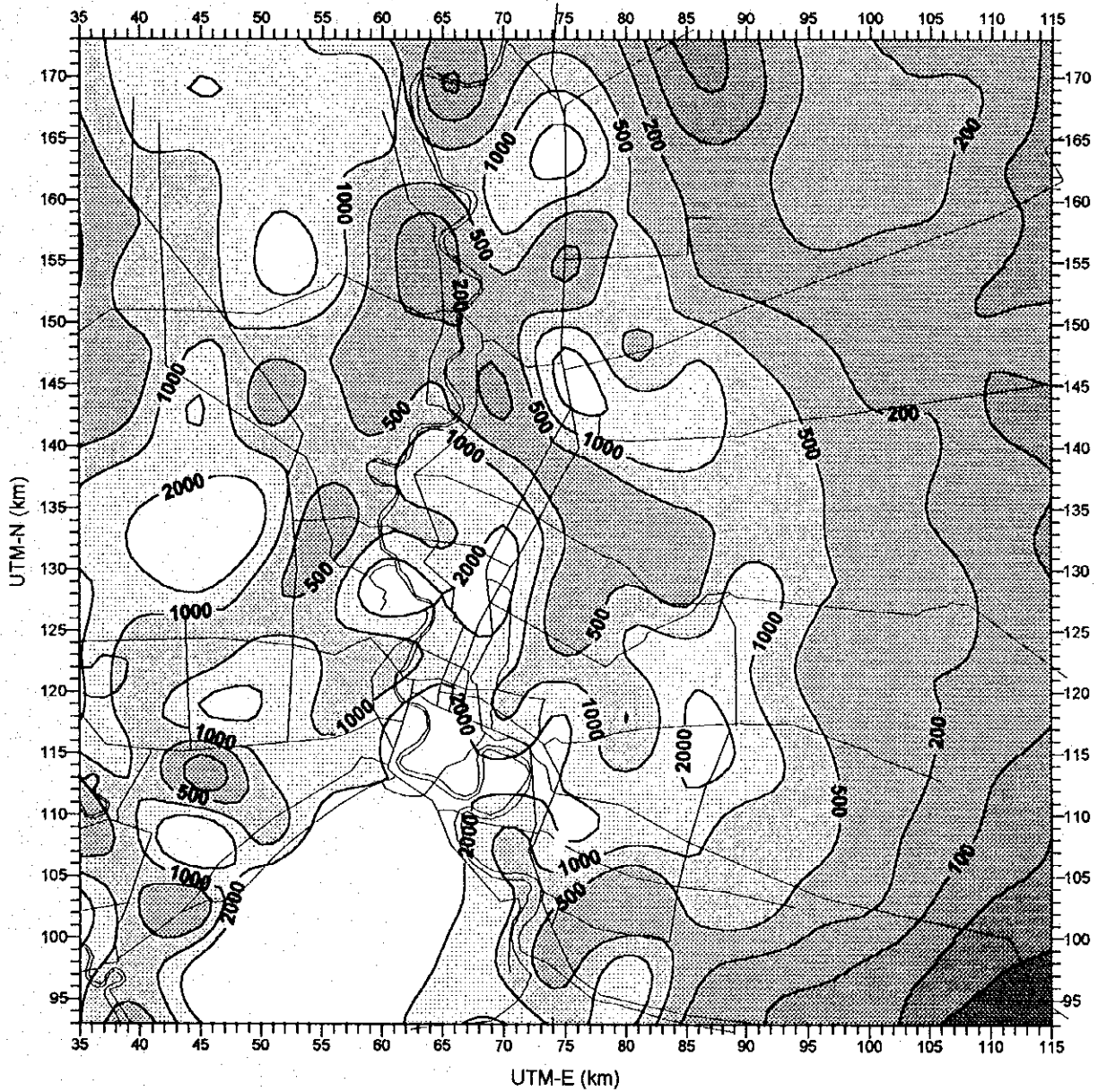
LEGEND

Estimated Transmissivity of NL Aquifer (m^2/d)



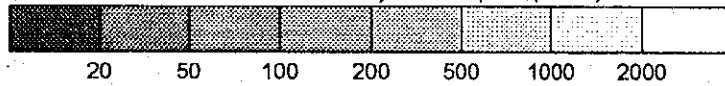
$$(\text{Estimated transmissivity}) = (\text{estimated permeability}) \times (\text{isopach}) \times [100 - (\text{clay content})] / 100$$

Figure 7.2.49	ESTIMATED TRANSMISSIVITY OF NL AQUIFER
THE STUDY ON MANAGEMENT OF GROUNDWATER AND LAND SUBSIDENCE IN THE BANGKOK METROPOLITAN AREA AND ITS VICINITY	
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)	KOKUSAI KOGYO CO., LTD.



LEGEND

Estimated Transmissivity of NB Aquifer (m^2/d)



$$(\text{Estimated transmissivity}) = (\text{estimated permeability}) \times (\text{isopach}) \times [100 - (\text{clay content})] / 100$$

Figure 7.2.50

ESTIMATED TRANSMISSIVITY OF NB AQUIFER

THE STUDY ON MANAGEMENT OF GROUNDWATER AND LAND SUBSIDENCE
IN THE BANGKOK METROPOLITAN AREA AND ITS VICINITY

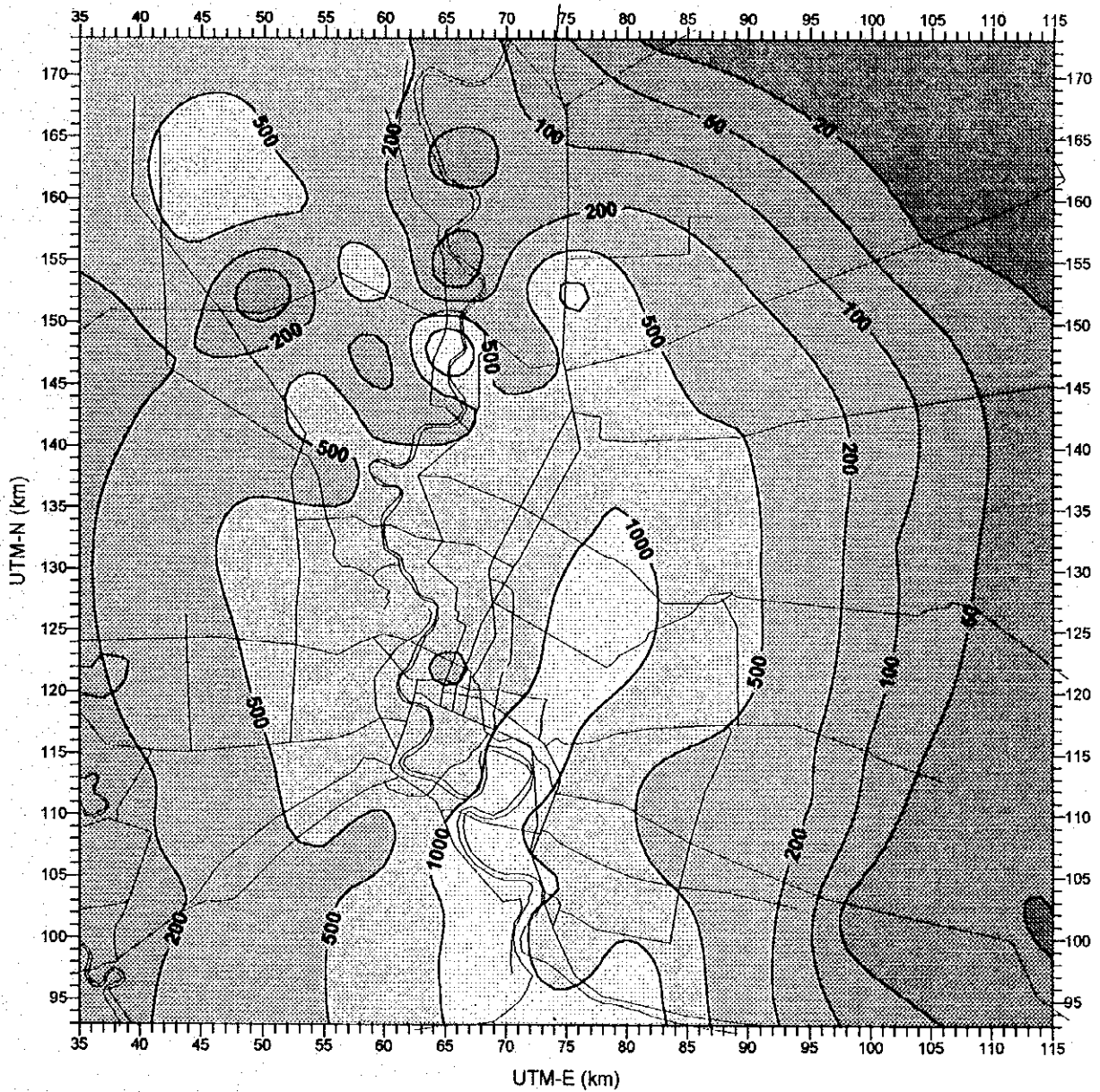
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

KOKUSAI KOGYO CO., LTD.

Faint, illegible text on the left margin, possibly bleed-through from the reverse side of the page.

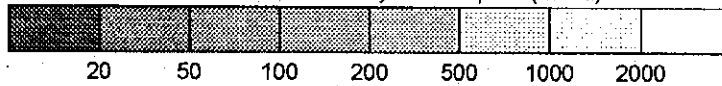
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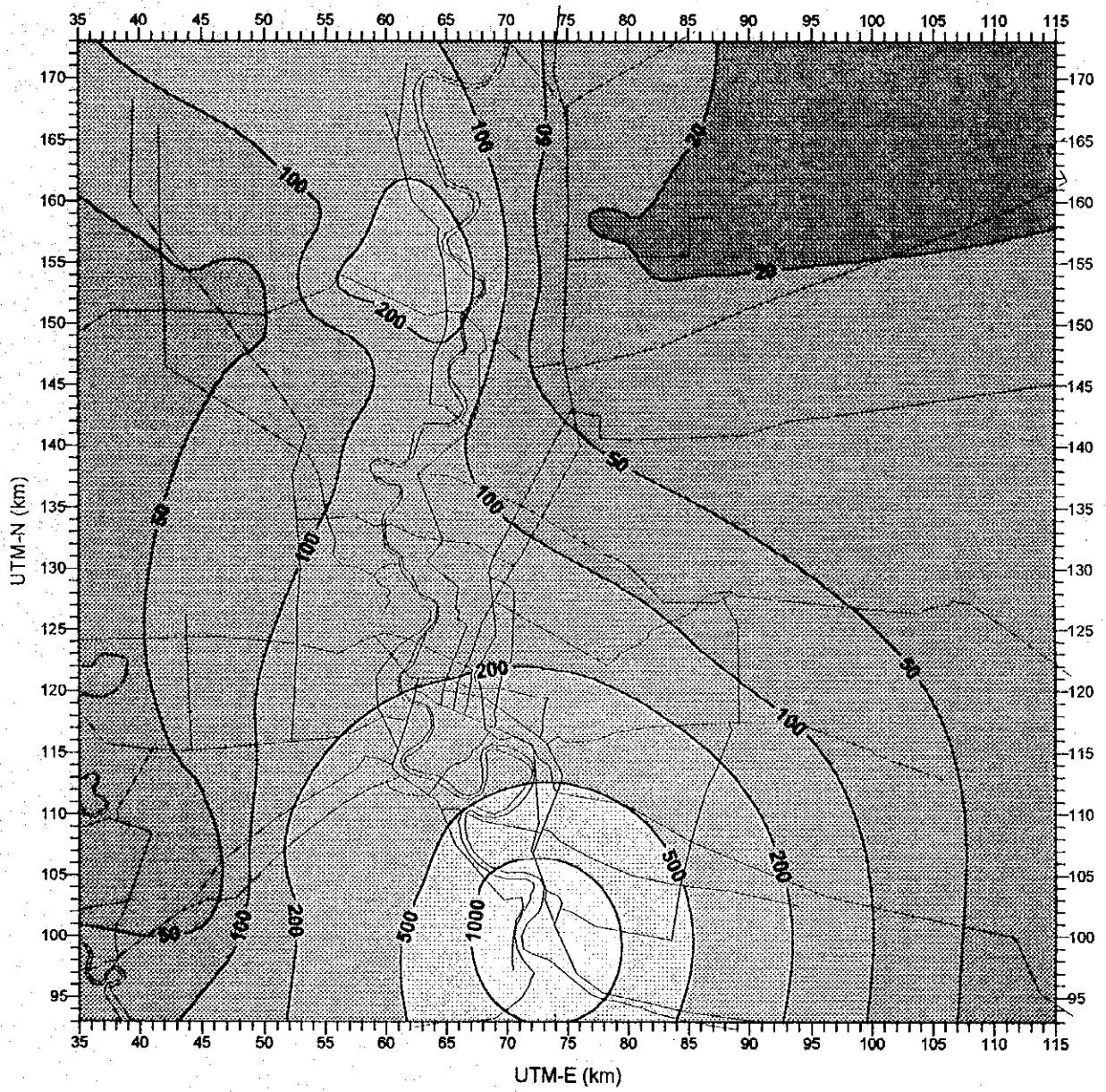
Estimated Transmissivity of SK Aquifer (m^2/d)



$$(\text{Estimated transmissivity}) = (\text{estimated permeability}) \times (\text{isopach}) \times [100 - (\text{clay content})] / 100$$

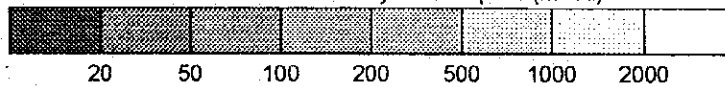
Figure 7.2.51	ESTIMATED TRANSMISSIVITY OF SK AQUIFER
THE STUDY ON MANAGEMENT OF GROUNDWATER AND LAND SUBSIDENCE IN THE BANGKOK METROPOLITAN AREA AND ITS VICINITY	
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)	KOKUSAI KOGYO CO., LTD.





LEGEND

Estimated Transmissivity of PT Aquifer (m²/d)



$$(\text{Estimated transmissivity}) = (\text{estimated permeability}) \times (\text{isopach}) \times [100 - (\text{clay content})] / 100$$

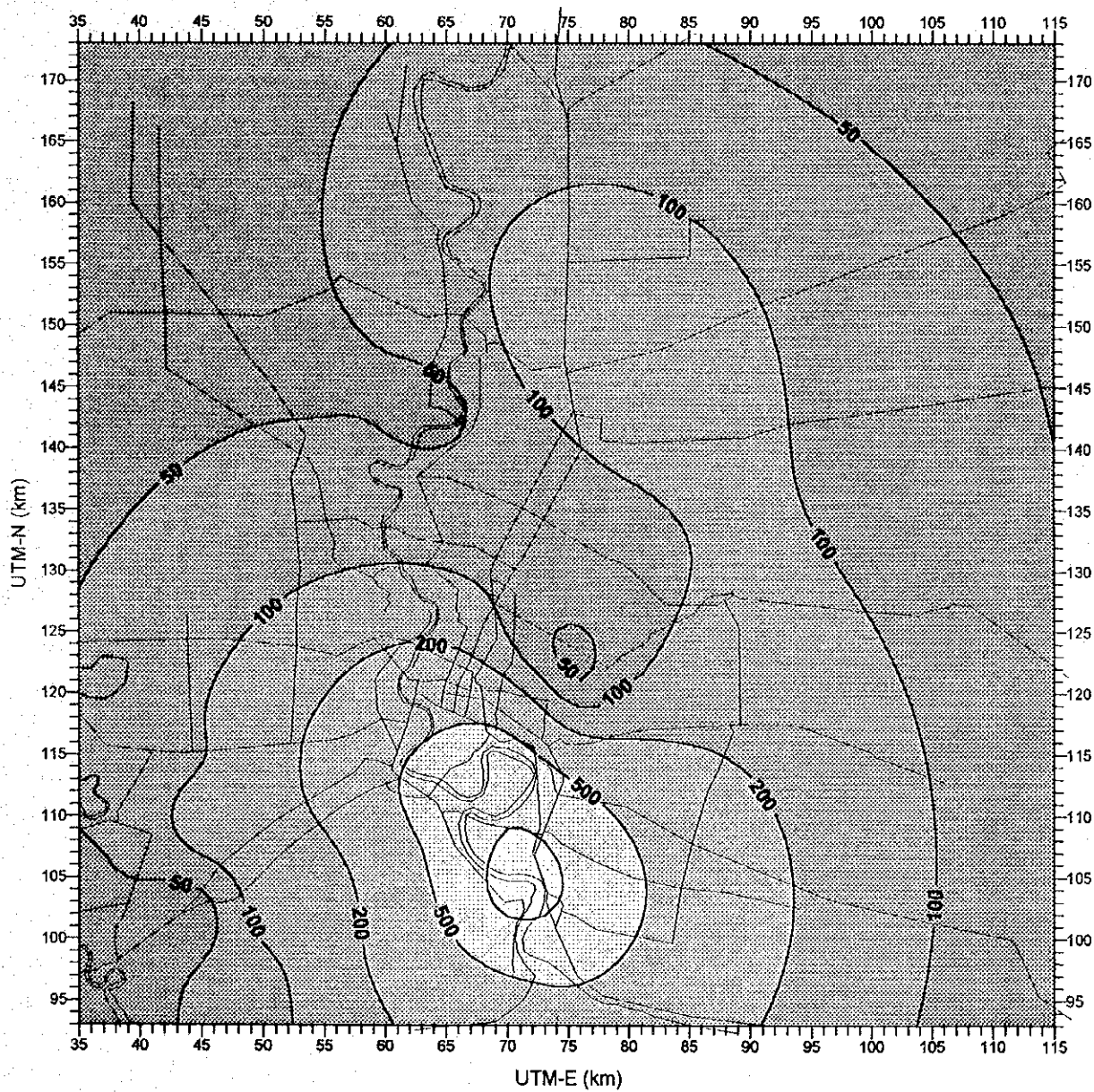
Figure 7.2.52

ESTIMATED TRANSMISSIVITY OF PT AQUIFER

THE STUDY ON MANAGEMENT OF GROUNDWATER AND LAND SUBSIDENCE IN THE BANGKOK METROPOLITAN AREA AND ITS VICINITY

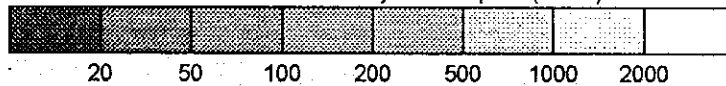
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

KOKUSAI KOGYO CO., LTD.



LEGEND

Estimated Transmissivity of TB Aquifer (m²/d)



$$(\text{Estimated transmissivity}) = (\text{estimated permeability}) \times (\text{isopach}) \times [100 - (\text{clay content})] / 100$$

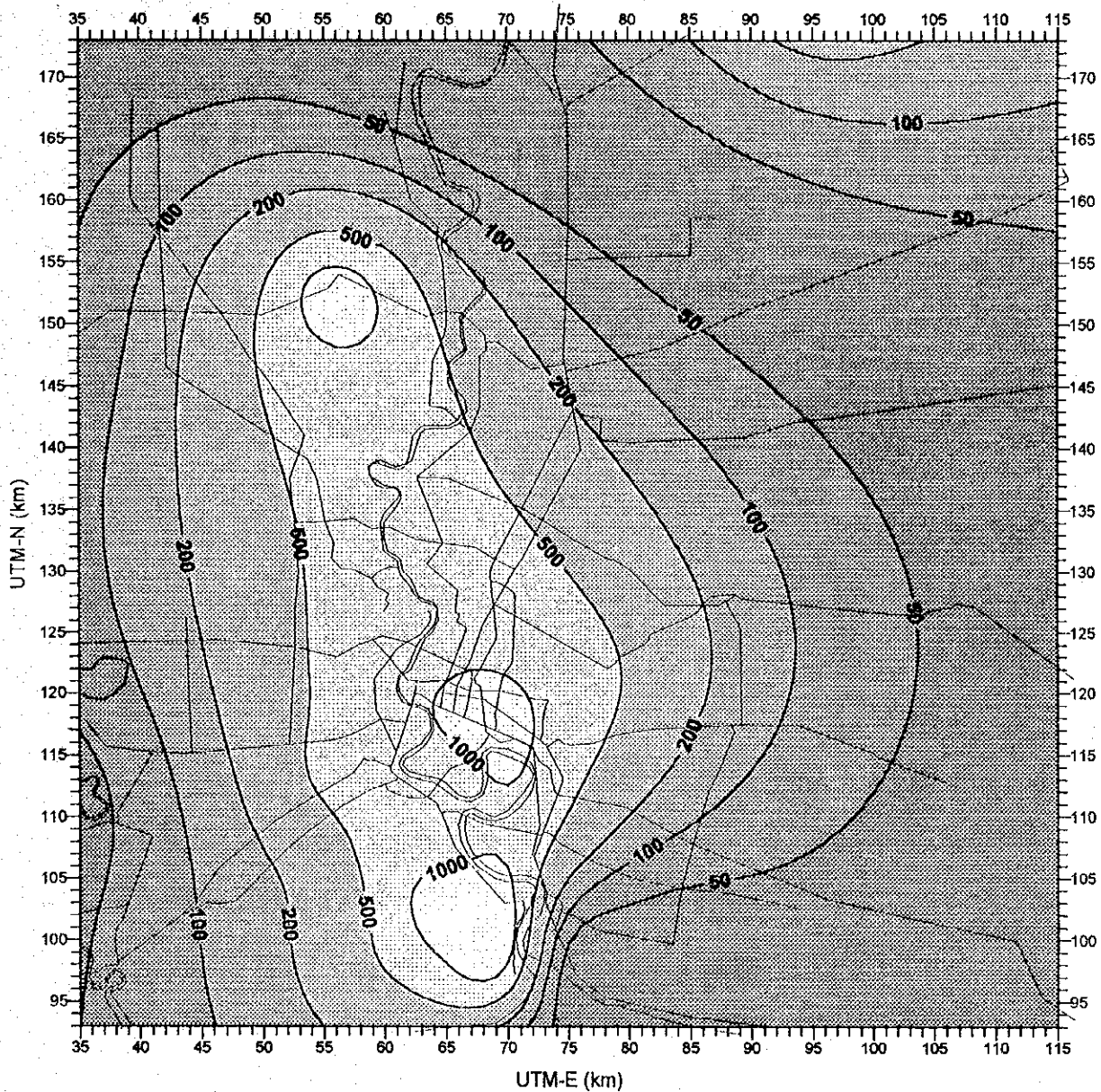
Figure 7.2.53

ESTIMATED TRANSMISSIVITY OF TB AQUIFER

THE STUDY ON MANAGEMENT OF GROUNDWATER AND LAND SUBSIDENCE
IN THE BANGKOK METROPOLITAN AREA AND ITS VICINITY

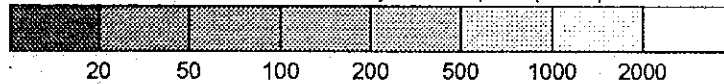
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

KOKUSAI KOGYO CO., LTD.



LEGEND

Estimated Transmissivity of PN Aquifer (m²/d)



$$(\text{Estimated transmissivity}) = (\text{estimated permeability}) \times (\text{isopach}) \times [100 - (\text{clay content})] / 100$$

Figure 7.2.54

ESTIMATED TRANSMISSIVITY OF PN AQUIFER

THE STUDY ON MANAGEMENT OF GROUNDWATER AND LAND SUBSIDENCE
IN THE BANGKOK METROPOLITAN AREA AND ITS VICINITY

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

KOKUSAI KOGYO CO., LTD.

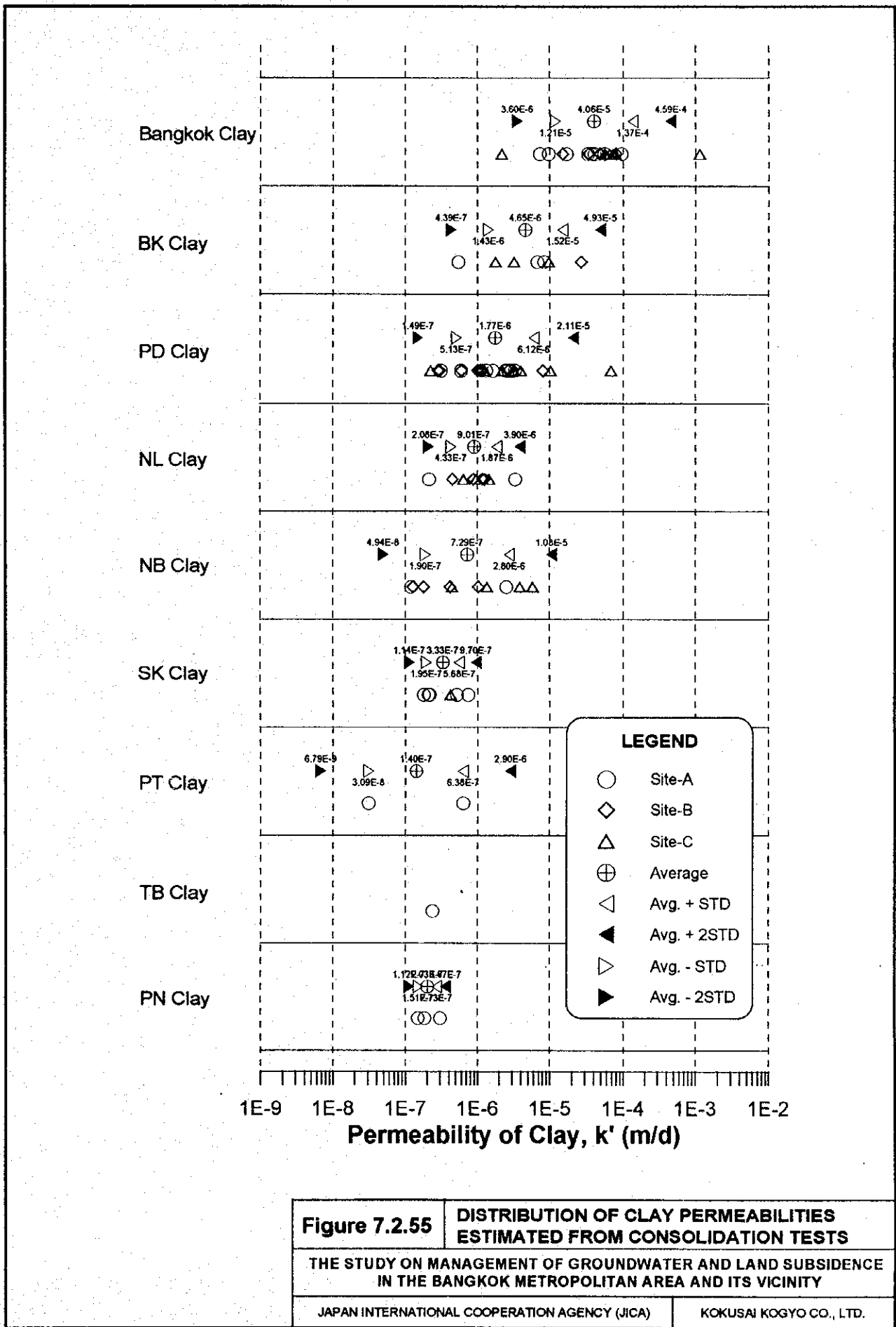
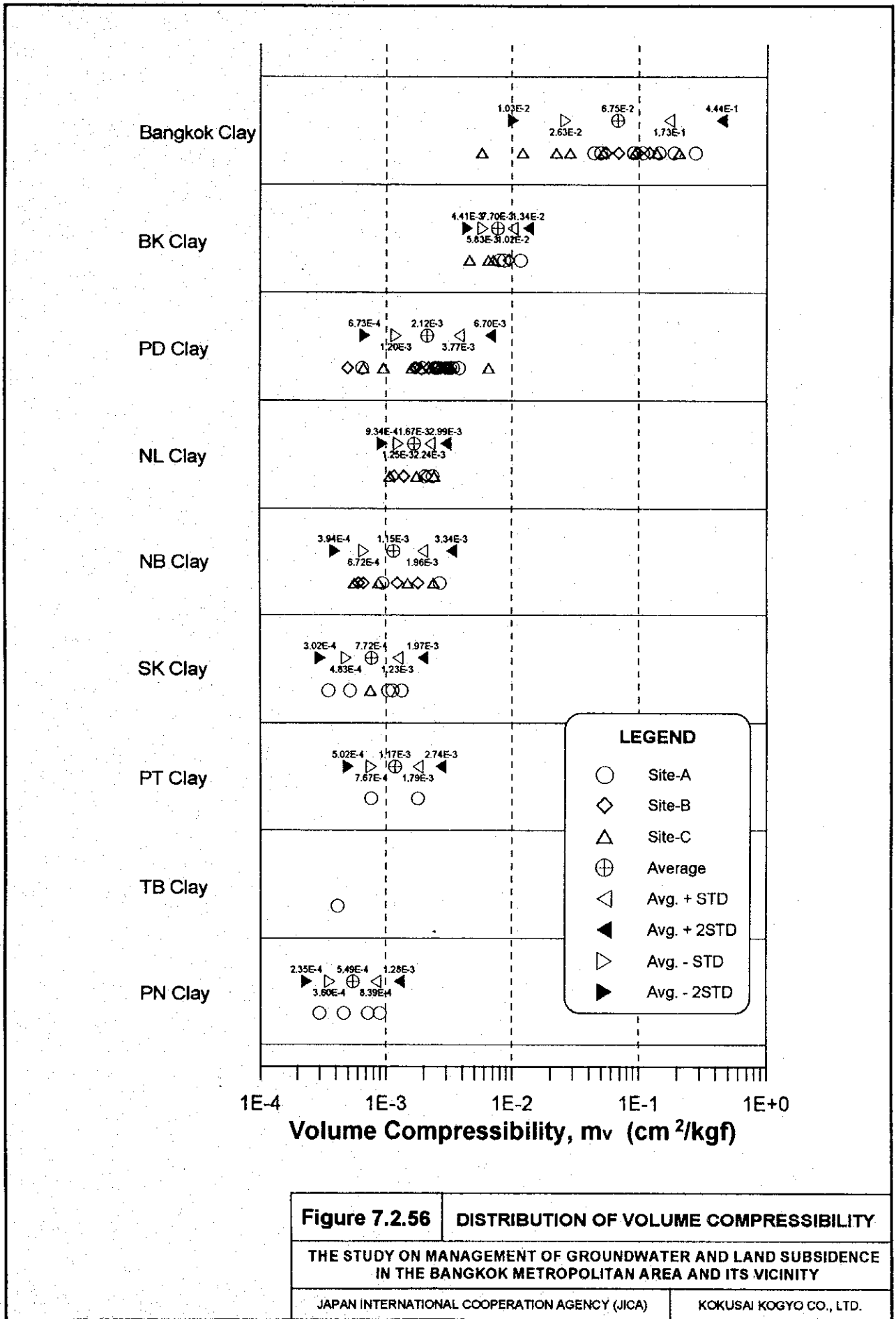


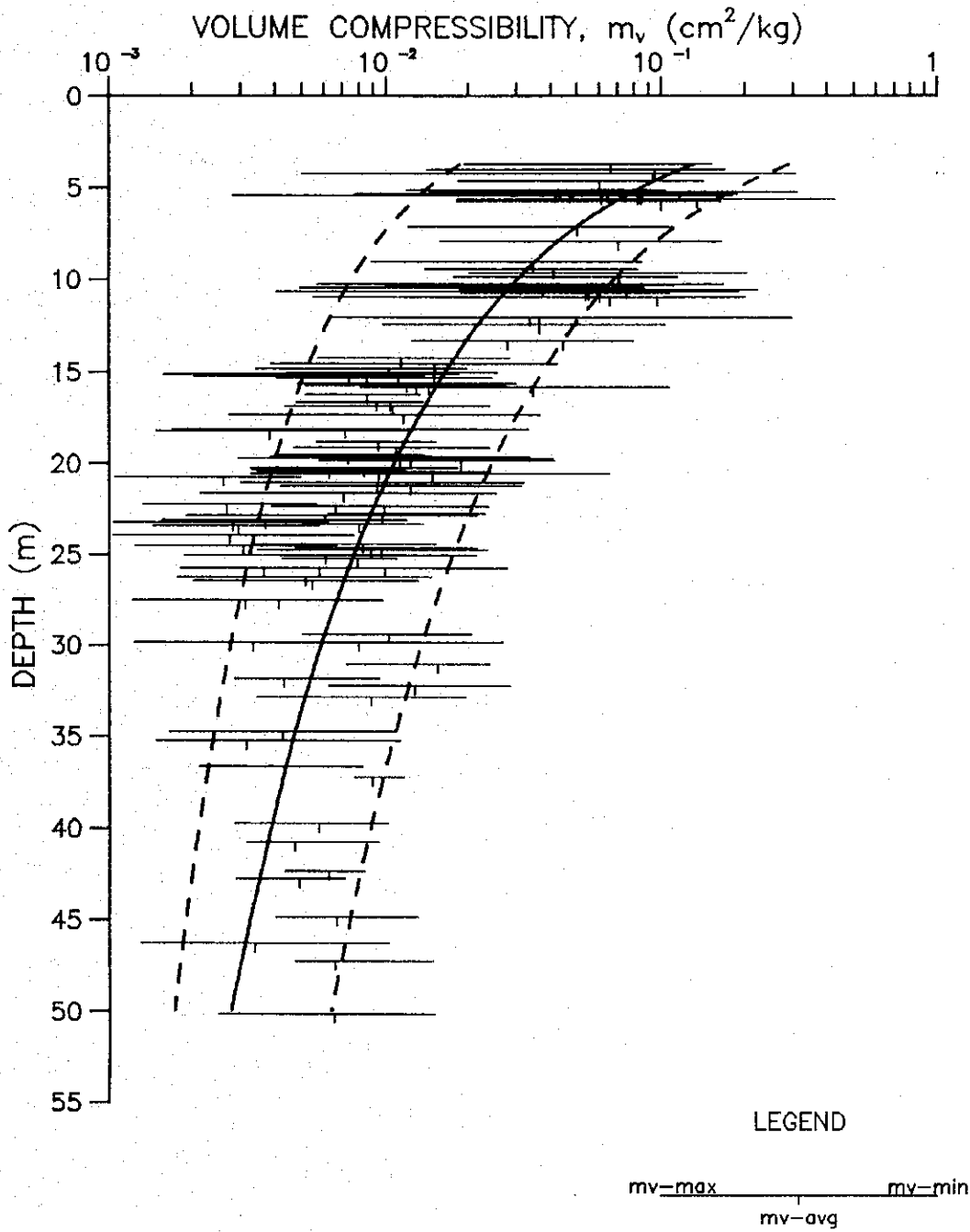
Figure 7.2.55 DISTRIBUTION OF CLAY PERMEABILITIES ESTIMATED FROM CONSOLIDATION TESTS

THE STUDY ON MANAGEMENT OF GROUNDWATER AND LAND SUBSIDENCE IN THE BANGKOK METROPOLITAN AREA AND ITS VICINITY

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

KOKUSAI KOGYO CO., LTD.





(Data source: AIT(1978), Results of Laboratory Tests on Subsoils of Bangkok and Adjacent Areas, Appendix III, Volume 1)

Figure 7.2.57	RELATION BETWEEN DEPTH AND VOLUME COMPRESSIBILITY (m_v) AT CI-STATIONS
	THE STUDY ON MANAGEMENT OF GROUNDWATER AND LAND SUBSIDENCE IN THE BANGKOK METROPOLITAN AREA AND ITS VICINITY
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)	KOKUSAI KOGYO CO., LTD.

Age Group	Number of People
0-10	120
11-20	150
21-30	180
31-40	200
41-50	220
51-60	240
61-70	260
71-80	280
81-90	300
91-100	320

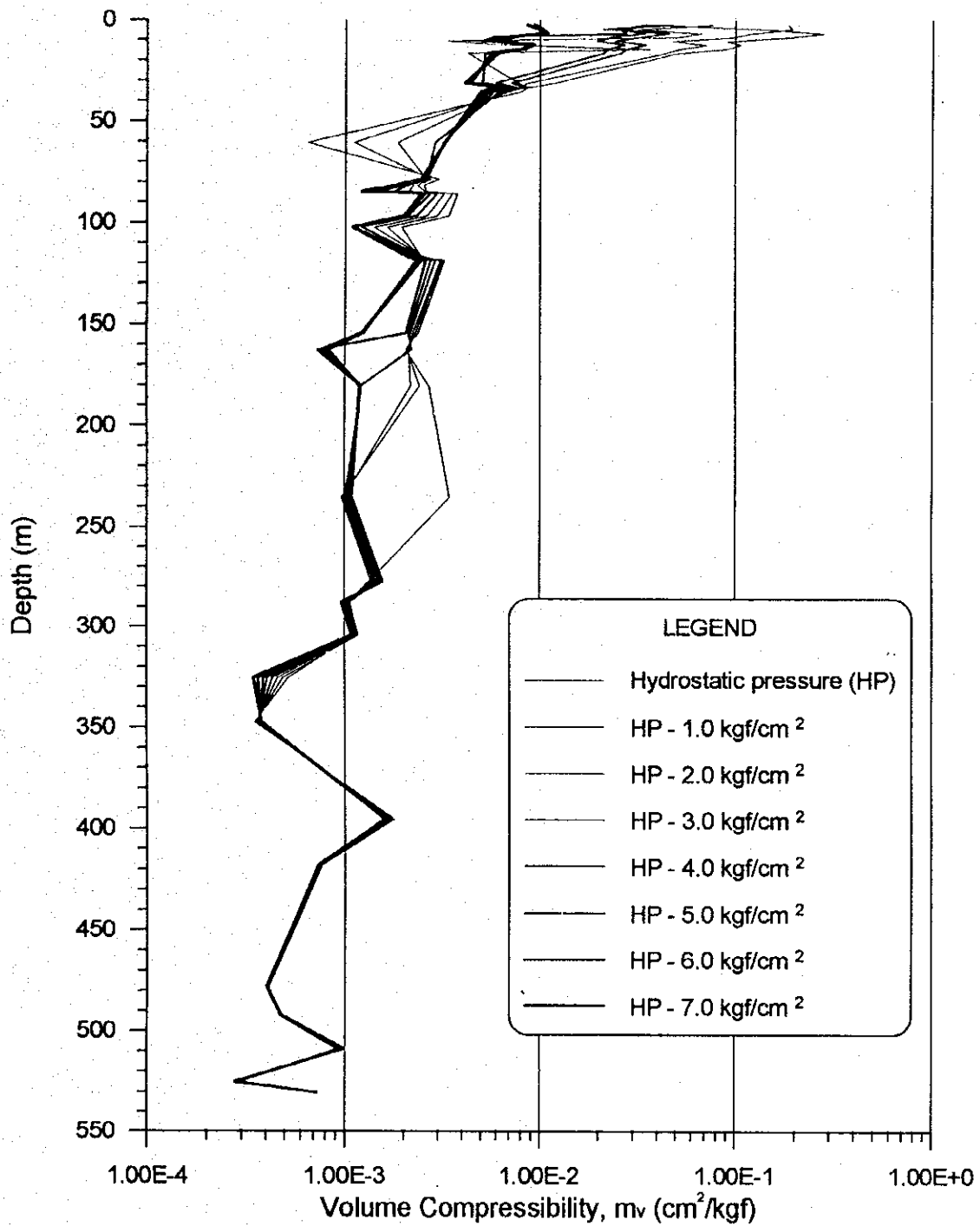


Figure 7.2.58

CHANGES IN VOLUME COMPRESSIBILITY WITH GROUNDWATER PRESSURE AT SITE-A

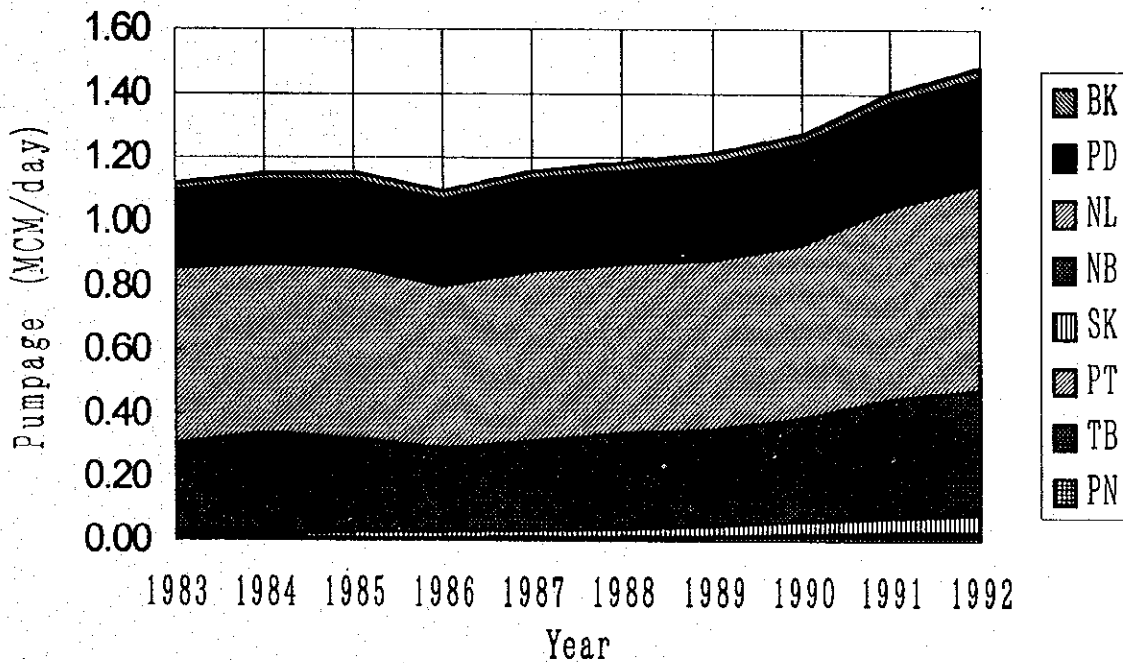
THE STUDY ON MANAGEMENT OF GROUNDWATER AND LAND SUBSIDENCE IN THE BANGKOK METROPOLITAN AREA AND ITS VICINITY

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

KOKUSAI KOGYO CO., LTD.



Groundwater Pumpage in the Study Area by Aquifer Unit (MCM/day)



GROUNDWATER PUMPAGE IN THE STUDY AREA BY AQUIFER UNIT

Year	Pumpage (m ³ /day)								Total
	BK	PD	NL	NB	SK	PT	TB	PN	
1983	24092	236114	553009	289930	11559	169	811	1344	1117028
1984	25490	257075	530359	318831	13916	478	1203	3684	1151037
1985	26830	265076	541452	293482	17750	475	1742	5784	1152591
1986	27734	268639	511464	260767	20266	677	1749	6037	1097332
1987	28023	281856	533159	281416	23599	1297	1841	6676	1157867
1988	28535	286765	533790	298745	26860	1409	1853	7798	1185756
1989	30138	298823	532979	303360	33610	1863	1920	10125	1212818
1990	30394	309841	546690	324886	41642	3484	3256	12445	1272639
1991	32520	325379	598820	372068	50574	4610	4799	13538	1402309
1992	33714	328218	640850	396054	55257	6719	6924	13327	1481062

Figure 7.2.59

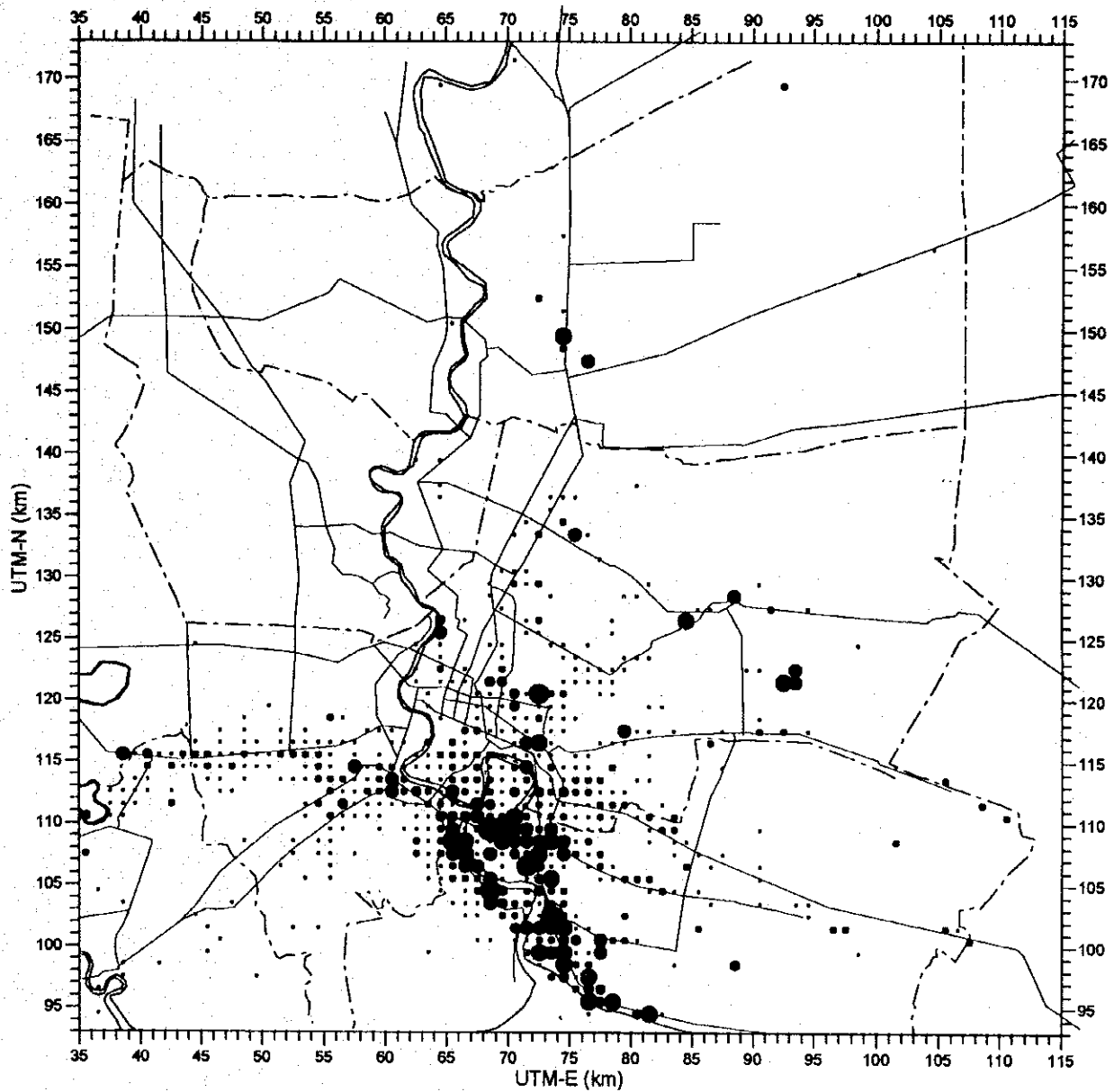
HISTORICAL GROUNDWATER PUMPAGE IN THE STUDY AREA BY AQUIFER UNIT

THE STUDY ON MANAGEMENT OF GROUNDWATER AND LAND SUBSIDENCE
IN THE BANGKOK METROPOLITAN AREA AND ITS VICINITY

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

KOKUSAI KOGYO CO., LTD.





PUMPAGE DISTRIBUTION FROM PD AQUIFER IN 1983

LEGEND

Groundwater Pumpage (m^3/day)
per 1km x 1km grid

- 1 to 99
- 100 to 499
- 500 to 999
- 1,000 to 1,999
- 2,000 to 4,999
- 5,000 to 9,999
- More than 10,000

Total Pumpage from PD Aquifer in 1983 = 236,114 m^3/day
= 86.18161 MCM/year

Figure 7.2.60

**DISTRIBUTION OF GROUNDWATER PUMPAGE
FROM PD AQUIFER IN 1983**

**THE STUDY ON MANAGEMENT OF GROUNDWATER AND LAND SUBSIDIENCE
IN THE BANGKOK METROPOLITAN AREA AND ITS VICINITY**

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

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