Table - 14 MONTHLY RAINFALL DATA

River Basin : SEKAMPUNG.- Station No. R.006.

Month / Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Total	Maximum Rainfall mm/day	date
1980	418	426	117	238	99	120	151	86	149	107	183	420	2,514	99	Jan 17
79	243	286	124	265	145	83	107	58	69	64	65	252	1,761	95	Dec 13
78	164	324	404	206	340	136	87	124	62	146	238	282	2,513	132	May 13
77	254	274	294	151	68	91	34	21	45	62	117	251	1,662	106	Mar 22
76	189	156	191	81	54	21	86	48	1	97	125	269	1,318	60	Jan 8
75	272	405	123	156	169	73	56	158	164	127	121	209	2,036	119	Feb 5
74	101	210	81	228	89	105	128	157	226	94	147	140	1,706	62	Aug 24
73	264	349	540	118	293	95	24	236	255	128	152	205	2,659	130	Aug 17
72	327	309	161	33	114	39	15	41	20	84	155	278	1,576	105	Dec 12
71	233	192	179	162	183	61	54	39	84	240	329	320	2,076	82	Apr 18
70	220	180	267	165	220	35	62	5	72	115	68	204	1,613	107	Apr 12
69	—	—	—	—	—	—	30	20	245	79	209	95	—		
68															
67															
66															
65															
64															
63															
62															
61															
60															
59															
58															
57															
56															
55															
54															
53															
52															
51															
Total	2,685	3,111	2,481	1,803	1,774	859	804	973	1,147	1,264	1,703	2,830	21,434		
Mean	244	283	226	164	161	78	73	88	104	115	155	257	1,948		
%	12.5	14.5	11.6	8.4	8.3	4.0	3.7	4.5	5.3	5.9	8.0	13.2	99.9		

The Total Rainfall

In Rainy Paddy Season : Normal Year 1,174 mm = 257 + 244 + 283 + 226 + 164

Droughty Year 927 mm = 95 + 220 + 180 + 267 + 165

In Dry Paddy Season : Normal Year 504 mm = 161 + 78 + 73 + 88 + 104

Droughty Year 394 mm = 220 + 35 + 62 + 5 + 72

Note : The droughty year is 1970.

Table - 15 Data on Unit Duty of Water

Project Name : WAY TEBU III.   Division Name : K.N.IV.   Gate Number : K.r.2.

Year	Item	Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Note
1981	1	Discharge Qmax (1/s)	40	45	45	50	45	0	50						1/17 - 5/31
	2	Discharge Qmean (1/s)	36	41	43	42	27	0	34						135 (135) days
	3	Irrigation Period (day)	13	28	31	30	31	0	28						1,246 mm
	4	Puddling Area (ha)	20	12	0	0	0	7	18						
	5	Nursery Bed Area (ha)	2.5	1.5	0	0	0	3	3						
	6	Paddy Field Area (ha)	0	20	35	35	35	0	10						
	7	2 / (4 + 5 + 6)			1.23	1.20	0.77								
1980	1	Discharge Qmax (1/s)	50	50	50	45	40	20	40	45	45	45	45	49	1/6 - 6/28
	2	Discharge Qmean (1/s)	32	32	45	38	31	20	33	40	43	43	36	22	165 (159) days
	3	Irrigation Period (day)	26	23	31	30	31	18	14	31	30	31	27	9	1.339 mm
	4	Puddling Area (ha)	17.5	0	0	0	0	0	10	16	0	0	0	0	
	5	Nursery Bed Area (ha)	3	0	0	0	0	0	1.5	2	0	0	0	0	7/18 - 12/15
	6	Paddy Field Area (ha)	5	35	35	35	33	0	0	10	30	30	29	10	150 (142) days
	7	2 / (4 + 5 + 6) (1/s/ha)		0.91	1.29	1.09									1.582 mm
1979	1	Discharge Qmax (1/s)	50	50	50	50	75	50	40	45	45	45	45	0	1/3 - 5/31
	2	Discharge Qmean (1/s)	40	48	50	42	27	35	37	37	37	39	34	0	149 (149) days
	3	Irrigation Period (day)	29	28	31	30	31	10	31	31	30	31	28	0	1.518 mm
	4	Puddling Area (ha)	3	0	0	0	0	7	8.5	0	0	0	0	2	
	5	Nursery Bed Area (ha)	0.5	0	0	0	0	3	1.5	0	0	0	0	1	6/21 - 11/28
	6	Paddy Field Area (ha)	30	35	35	35	20	0	15	35	35	35	30	0	161 (161) days
	7	2 / (4 + 5 + 6) (1/s/ha)		1.37	1.43	1.20									1.460 mm
1978	1	Discharge Qmax (1/s)	50	50	50	50	45	20	50	50	40	45	30	0	1/2 - 6/4
	2	Discharge Qmean (1/s)	42	48	47	45	35	19	34	40	40	40	24	0	154 (154) days
	3	Irrigation Period (day)	30	28	31	30	31	12	31	31	30	30	28	0	1.622 mm
	4	Pudling Area (ha)	7	0	0	0	0	4	10	0	0	0	0	10	
	5	Nursery Bed Area (ha)	1.5	0	0	0	0	2	2	0	0	0	0	2	6/23-11/28
	6	Paddy Field Area (ha)	20	35	35	35	20	0	10	30	30	30	10	0	159 (158) days
	7	2 / (4 + 5 + 6) (1/s/ha)		1.37	1.34	1.29									1,589 mm
1977	1	Discharge Qmax (1/s)	50	77	45	50	45	35	45	45	45	35	45	50	
	2	Discharge Qmean (1/s)	48	44	36	45	43	18	26	18	27	17	33	39	
	3	Irrigation Period (day)	31	28	28	30	20	21	31	28	28	18	14	19	
	4	Pudling Area (ha)	11	0	0	0	0	6	4.5	0	0	0	0	19	
	5	Nursery Bed Area (ha)	1.5	0	0	0	0	3	0.5	0	0	0	0	3	6/10 - 12/19
	6	Paddy Field Area (ha)	20	35	35	35	15	0	25	30	30	30	15	0	193 (159) days
	7	2 / (4 + 5 + 6) (1/s/ha)		1.26	1.03	1.29									1,138 mm

In the Way Tebu I & II and IV projects, the planted area in the dry season has been one third of that in the rainy season. But it appears that we are able to irrigate a half of the benefited area (2,350 ha ÷ 4,209 ha = 0.56).

So we should persuade farmers at the Way Tebu I & II and IV projects to plant a half of the benefited area.

9. Examination of the Way Sekampung Curve

Indonesia has a long history of irrigation and has many unique technologies. One of them is the Tegal or the Way Sekampung curve, that has been used for deciding a cross-section area of canal. So we will examine the Way Sekampung curve.

We have drawn Fig - 18 by the following method.

(i) To calculate the average unit duty of water (a) at each division works.

$$a = \frac{Q}{A} \quad (/s/ha)$$

where,

Q: average irrigated water (ℓ/s)

A: planted paddy field area (ha)

It is 1.21 ℓ/s/ha in the case of Table - 15.

(ii) To culculate the variable (t) of the Way Sekampung curve.

The Way Sekampung curve is expressed as follows.

$$Q = A.t.a$$

We adopt Qmax as Q, because the variable (t) is the factor to decide the muximum cross-section area of canal.

$$\text{So } t = \frac{Qmax}{A.t\ a}$$

$$= \frac{77}{35x1.21}$$

$$= 1.82$$

(iii) To plot the variable (t) on Fig - 18 as a function of the paddy field area.

By Fig - 18, we find the following facts.

(i) There is a slight tendency that the smaller the paddy field area is, the bigger the variable (t) becomes.

(ii) The Way Sekampung curve gives the bigger variable (t) in the case that the paddy field area is smaller than 70 ha.

(iii) But, even if we perform the normal water management, the running water in the tertiary canal is sometimes 1.8 times as much as the design discharge.

By the way, recently the design of the tertiary or quarternary canal has been performed by using only the design discharge of canal (e.g. "Guidelines Manual For Planning of Tertiary Network", Directorate of Irrigation, 1979). But as mentioned above, if we design by such a way, the running water will flow over the earth canal, and the canal will be broken.

We should construct the tertiary or quarternary canal or other canal structures by using the discharge that is 1.8 times as big as the design discharge.

And Fig - 19 indicates the relation between the variable (t) and the paddy field area in the case that an intermittent irrigation was performed in the dry season of 1977 at the Way Tebu III project.

The variable (t) is sometimes bigger than the Way Sekampung curve. Therefore, when we plan the intermittent irrigation, after deciding the intervals of irrigation, we should calculate the maximum discharge of the canal. Later, we should design the cross-section of the canal that has a freeboard.

And further, the relation between the design discharge and the happened maximum discharge in the main canal is shown in Fig - 20.

The latter is 1.3 times as big as the former. Therefore, we should construct the freeboard to cover the maximum discharge and design other canal structures that permit discharge flow that is 1.3 times as big as the design discharge.

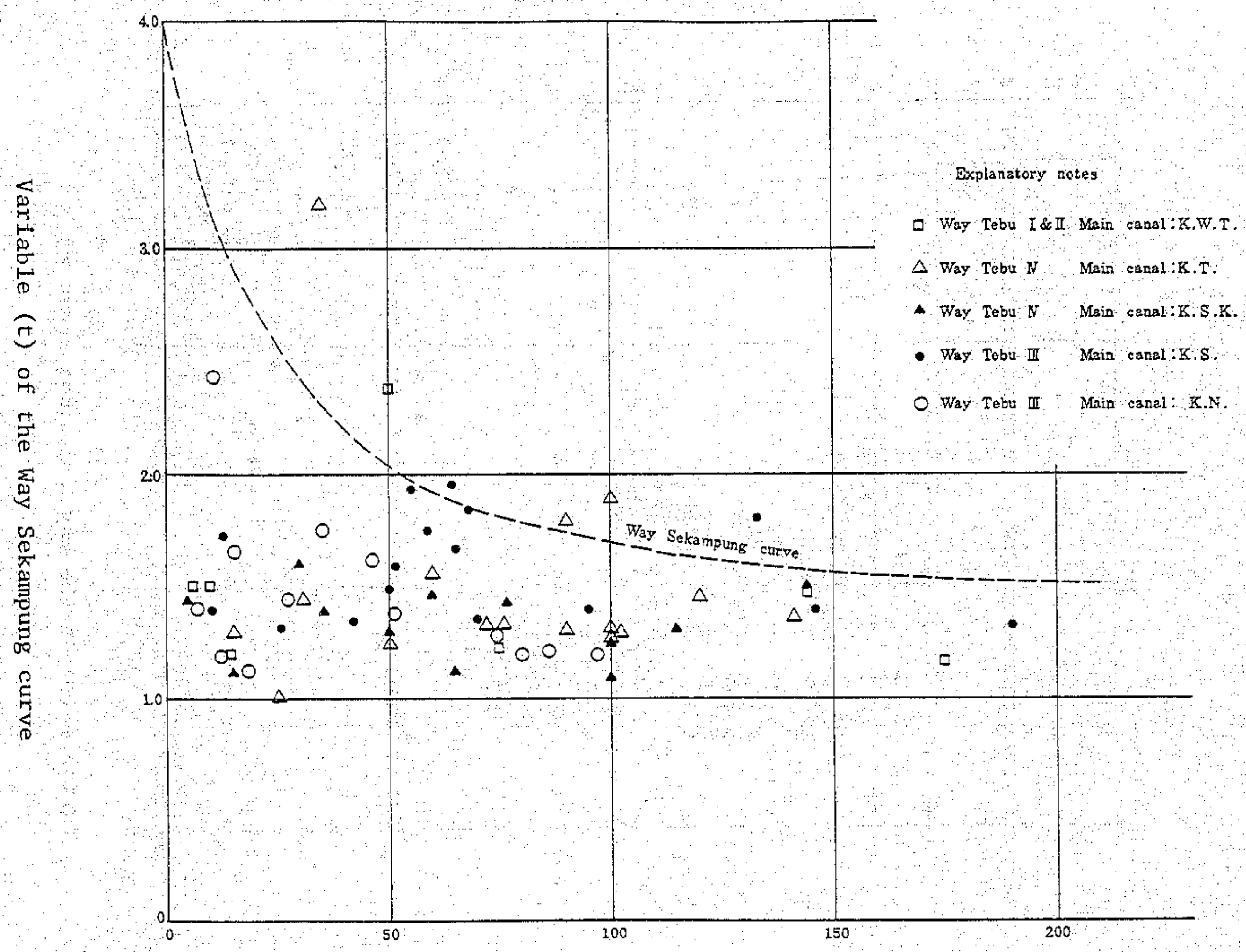


Fig. - 18 Examination of the Way Sekampung curve (Plot-to-plot irrigation).

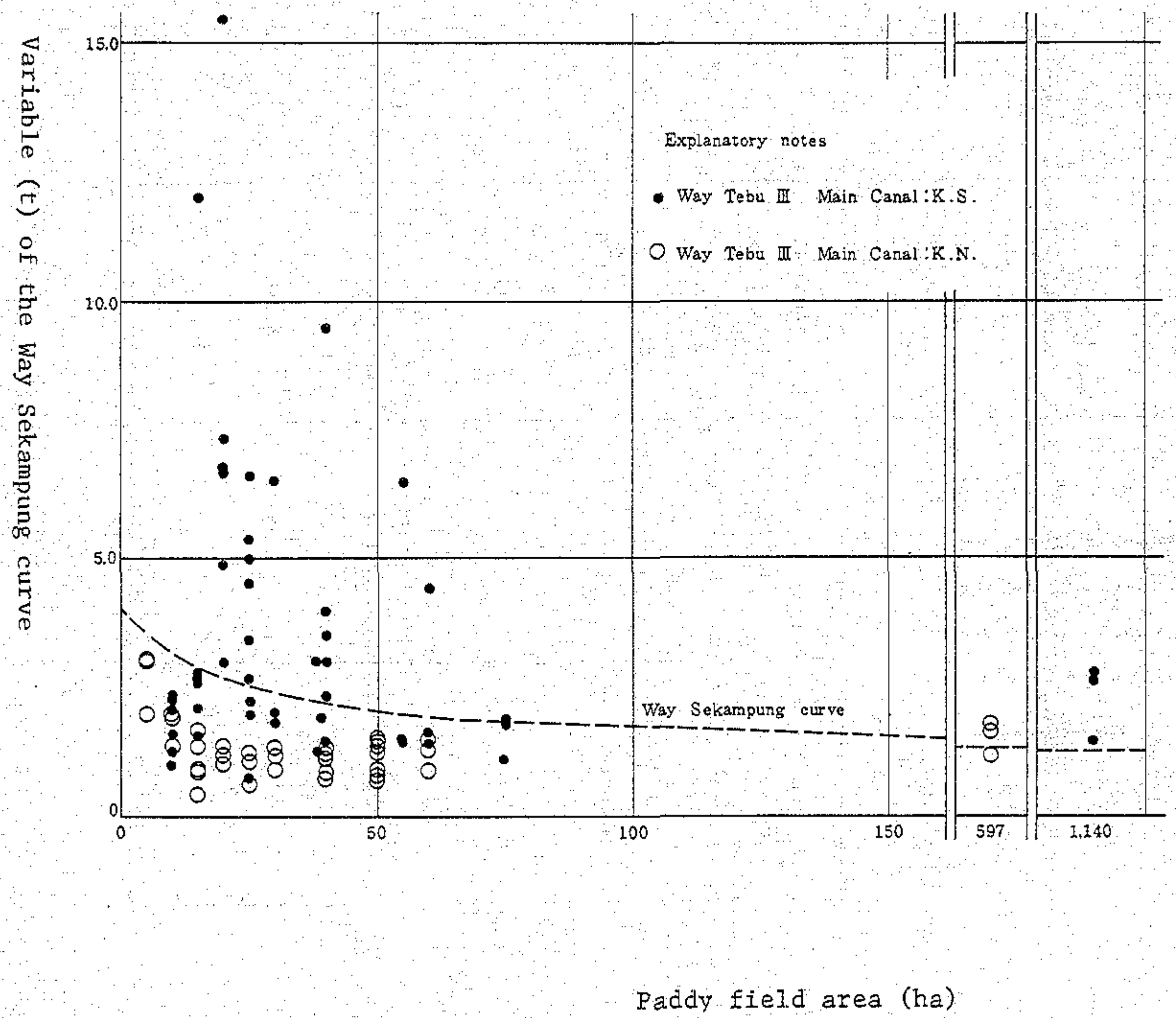


Fig. - 19 Examination of the Way Sekampung curve (Intermittent irrigation).

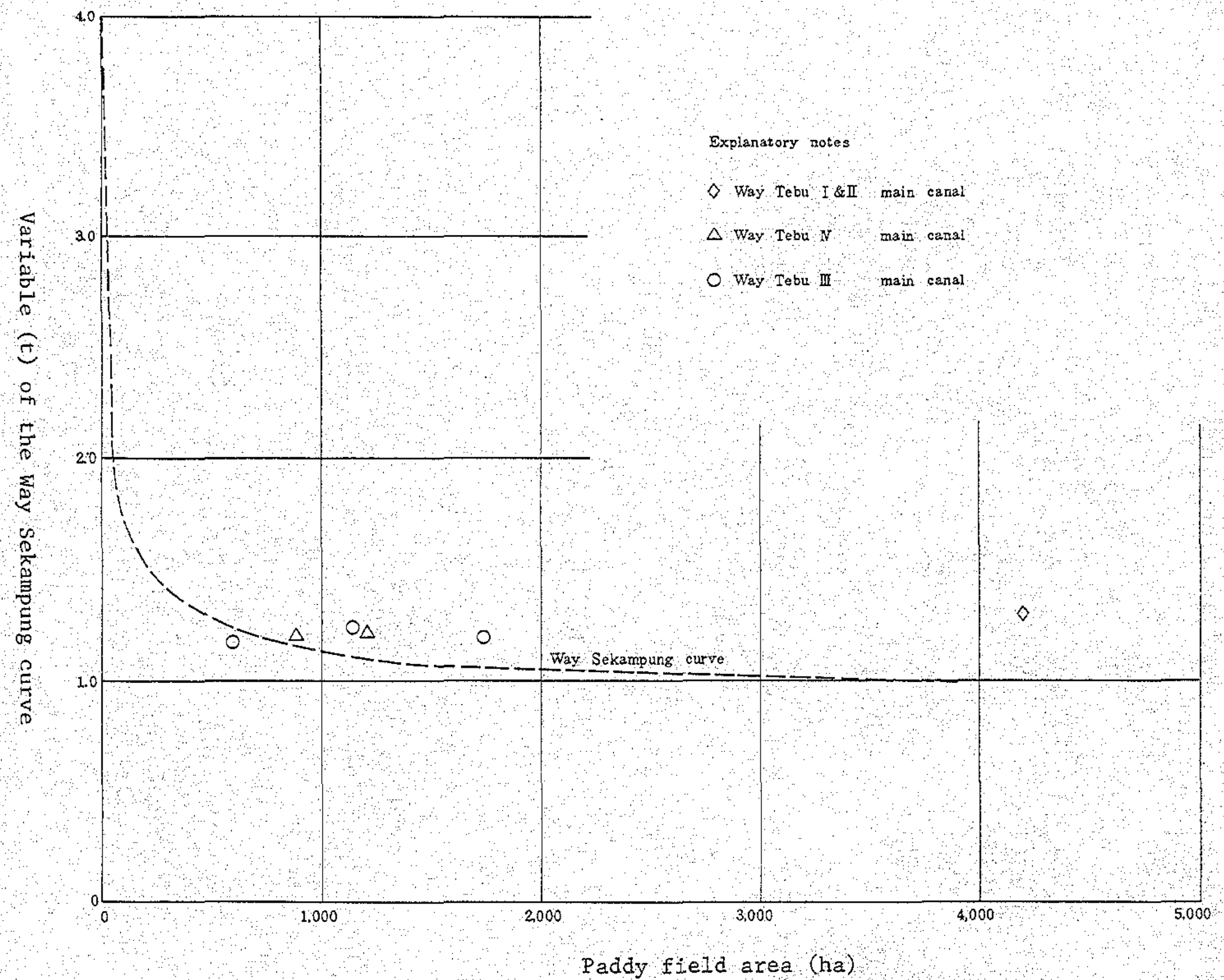
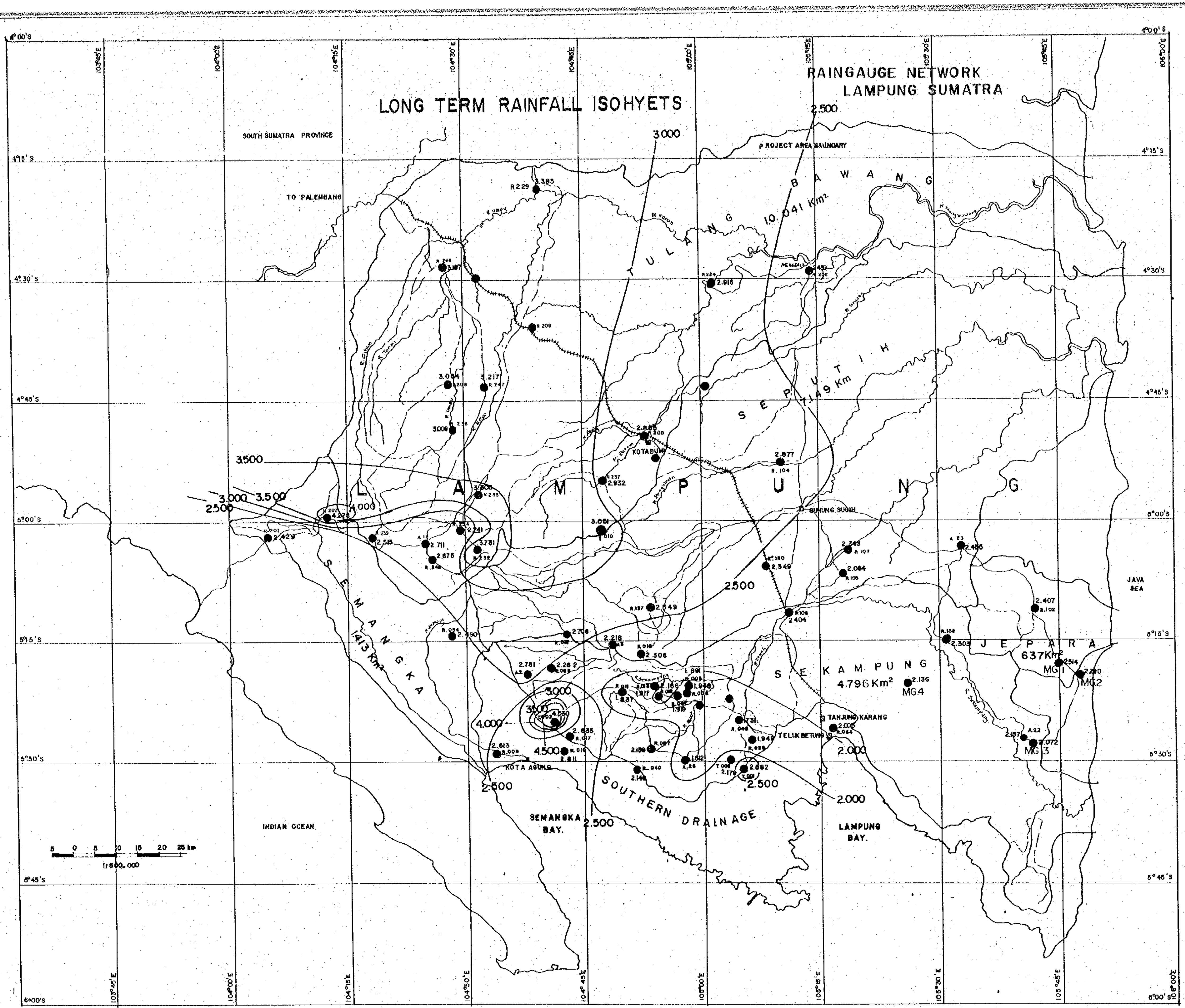


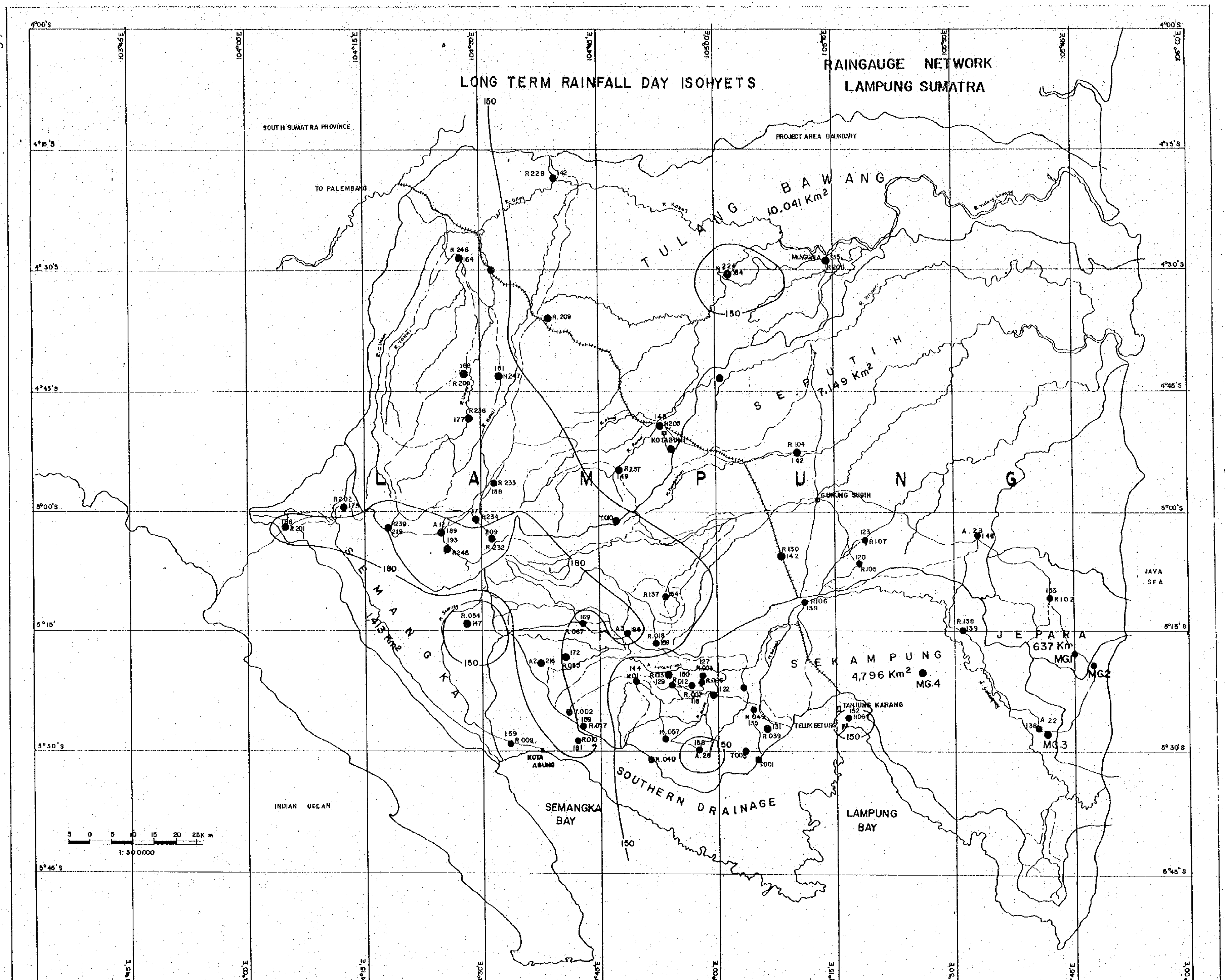
Fig - 20 Esamination of the Way Sekampung curve (Plot-to-plot irrigation).

A

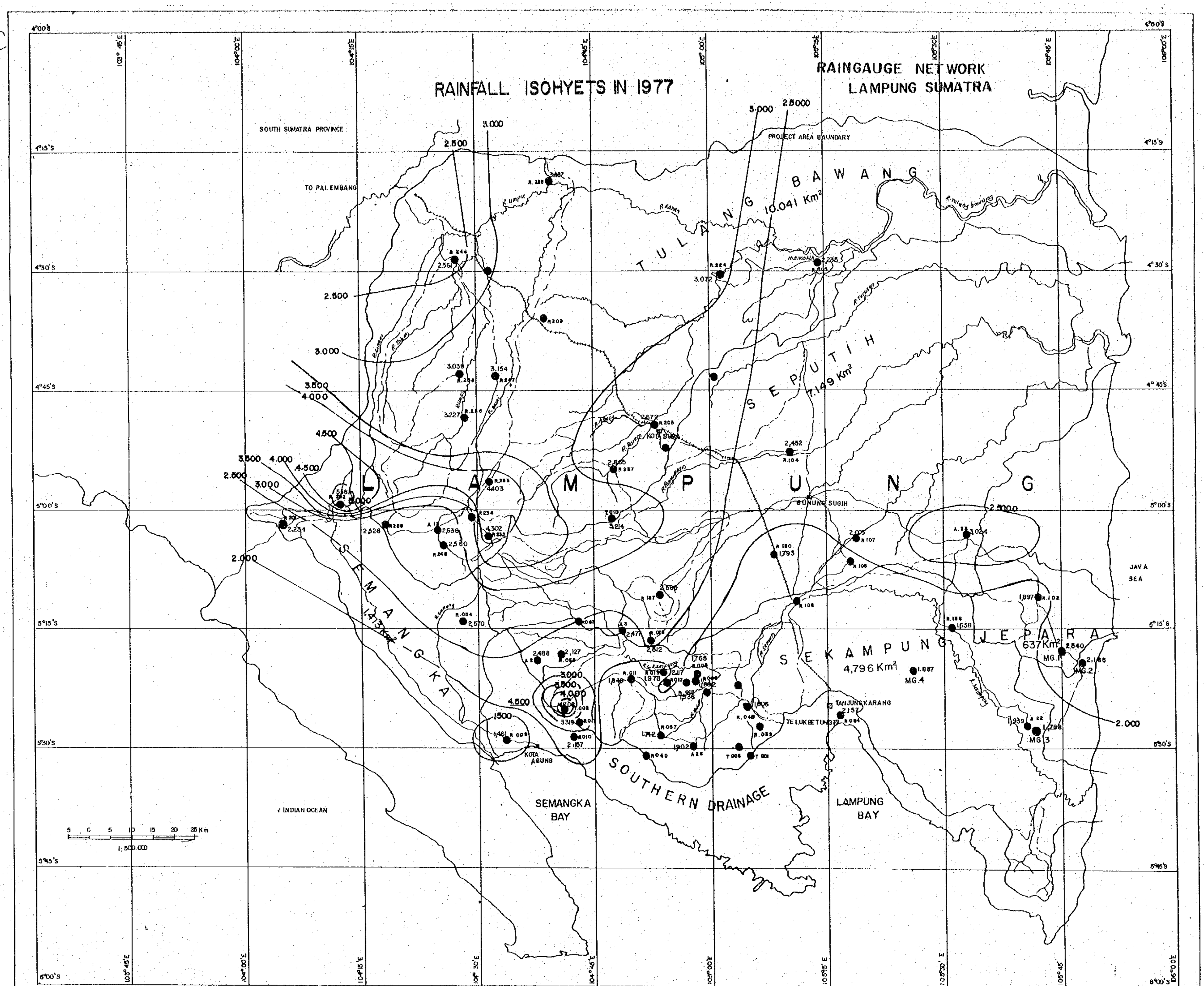


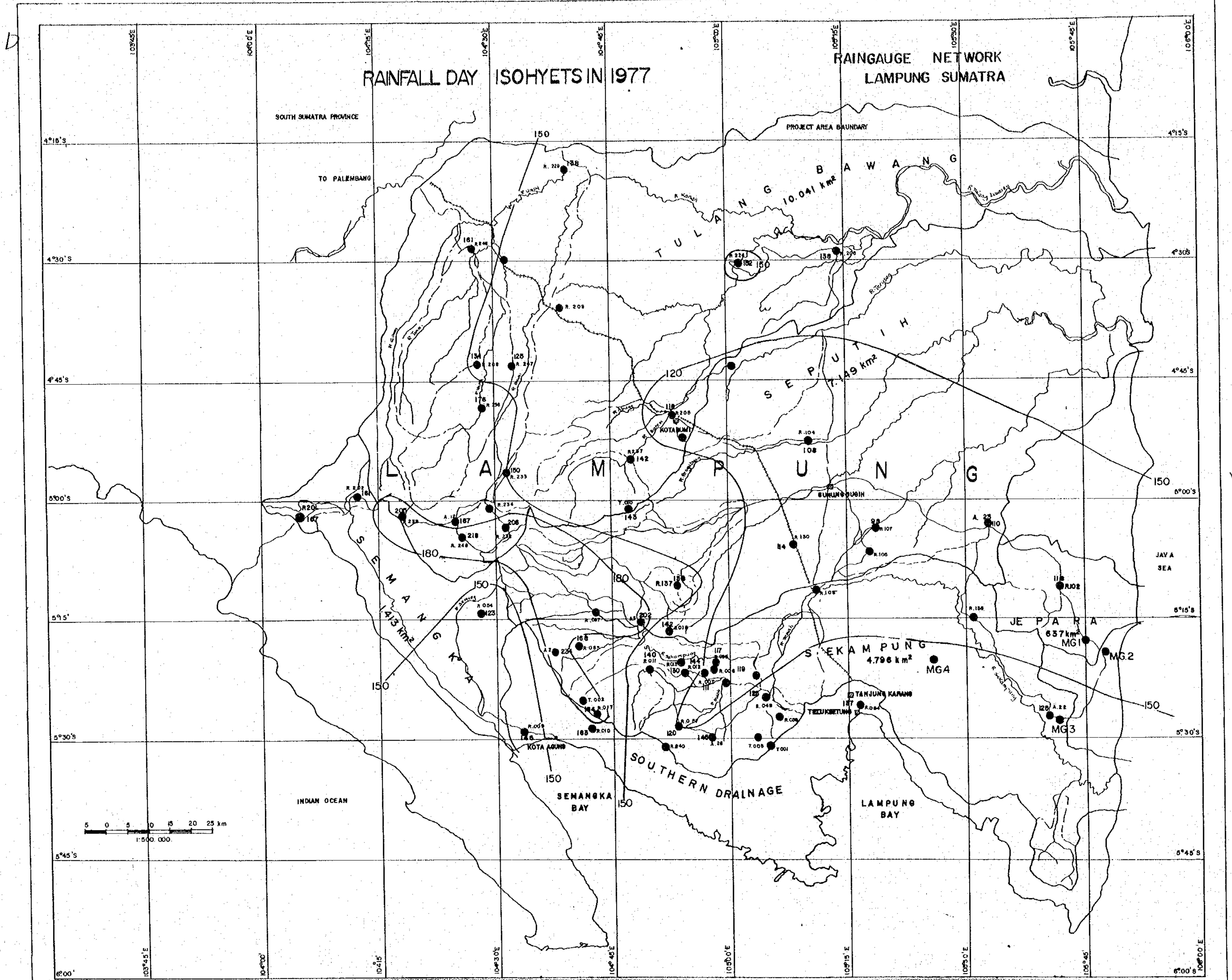
LONG TERM RAINFALL ISOHYETS
RAINGAUGE NETWORK
LAMPUNG SUMATRA
SOUTH SUMATRA PROVINCE
PROJECT AREA BOUNDARY
TO PALEMBANG
TULANG BAWANG
10.041 Km²
SEPUTIH
7.149 Km
LAMPUNG
KOTABUMI
BUKUNG SUGIH
SEMANGKA
1413 Km²
SEKAMPUNG
4.796 Km²
JEPARA
637 Km²
MG1
MG2
MG3
MG4
TANJUNG KARANG
TELUK BETUNG
KOTA AGUNG
SOUTHERN DRAINAGE
SEMANGKA BAY.
LAMPUNG BAY.
INDIAN OCEAN
JAVA SEA
1:500.000
4°00'S
4°15'S
4°30'S
4°45'S
5°00'S
5°15'S
5°30'S
5°45'S
6°00'S
103°45'E
104°00'E
104°15'E
104°30'E
104°45'E
105°00'E
105°15'E
105°30'E
105°45'E
106°00'E

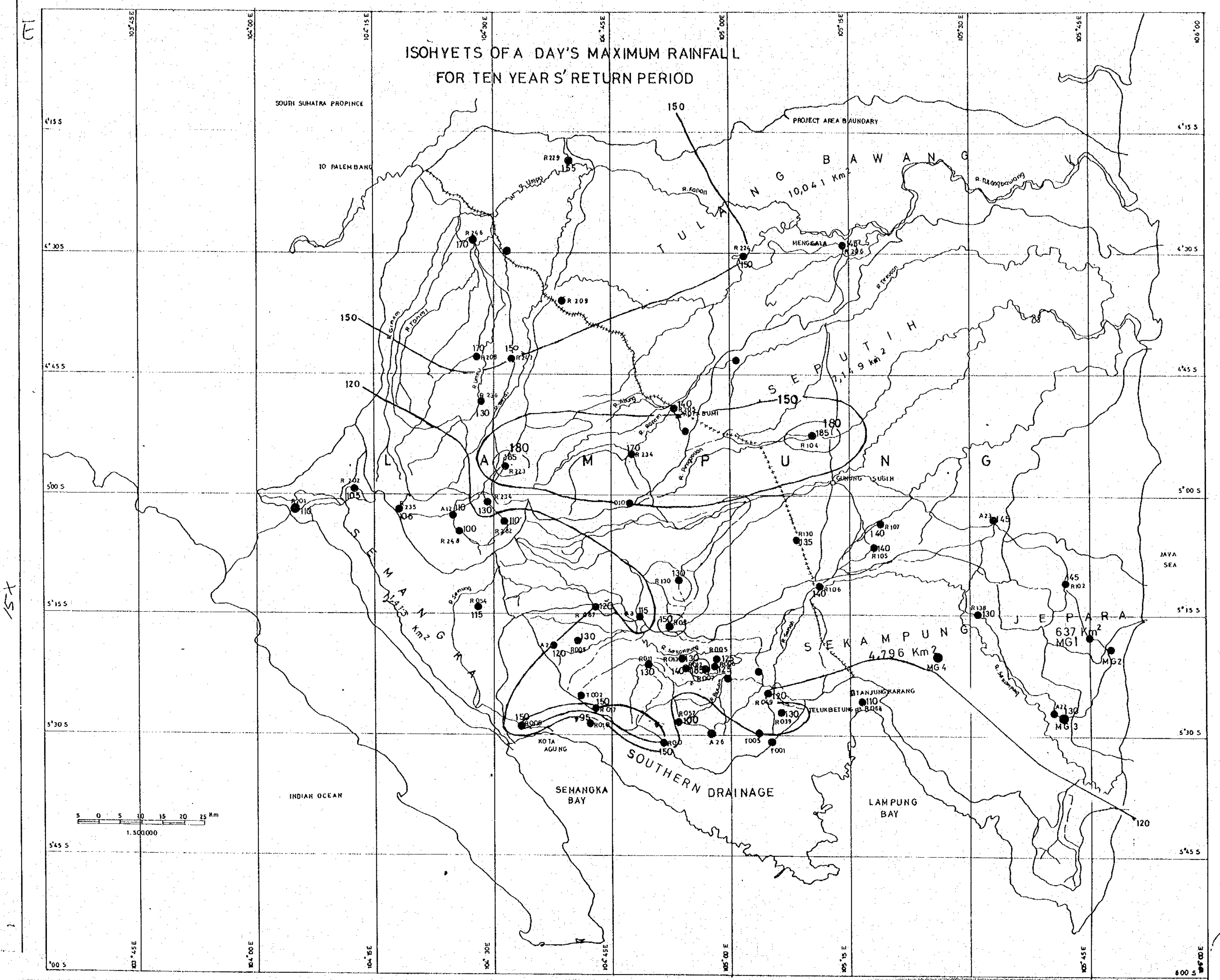
15



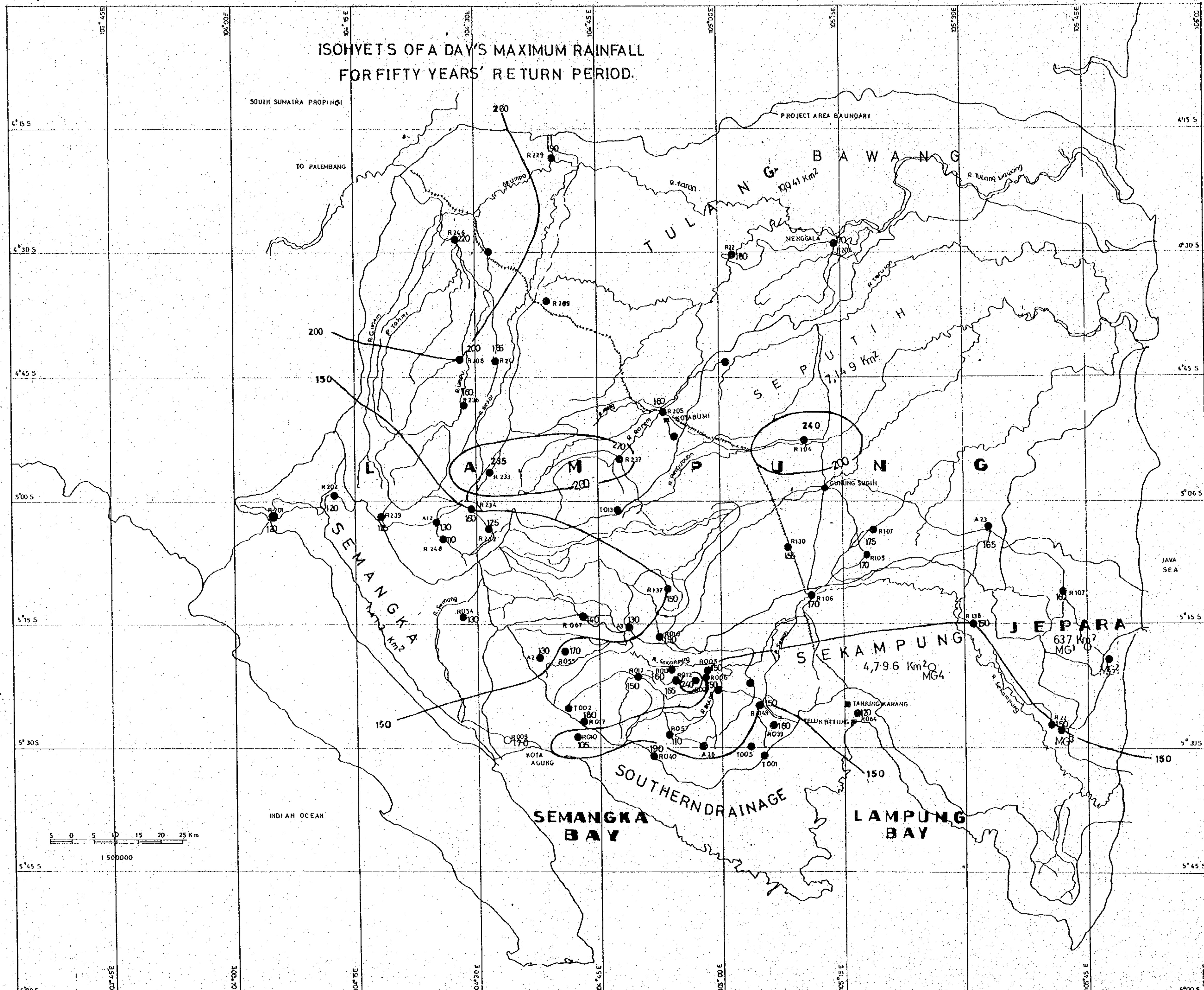
LONG TERM RAINFALL DAY ISOHYETS
RAINGAUGE NETWORK
LAMPUNG SUMATRA
SOUTH SUMATRA PROVINCE
PROJECT AREA BOUNDARY
TO PALEMBANG
TULANG BAWANG
10.041 Km²
SEPUTIH
7.149 Km²
LAMPUNG
SEMANGKA
1413 Km²
SEKAMPUNG
4,796 Km²
JEPARA
637 Km
SOUTHERN DRAINAGE
MENGGALA
KOTABUMI
GUNUNG SUGIH
TANJUNG KARANG
TELUK BETUNG
KOTA AGUNG
INDIAN OCEAN
SEMANGKA BAY
LAMPUNG BAY
JAVA SEA
MG.1
MG.2
MG.3
MG.4
1: 500,000


RAINFALL ISOHYETS IN 1977
RAINGAUGE NETWORK
LAMPUNG SUMATRA
SOUTH SUMATRA PROVINCE
PROJECT AREA BAUNDARY
TO PALEMBANG
TULANG BAWANG
10.041 Km²
SEPUTIH
7.149 Km²
LAMPUNG
SEMANGKA
1.413 Km²
SEKAMPUNG
4,796 Km²
JEPARA
637 Km²
SOUTHERN DRAINAGE
GUNUNG SUGIH
KOTA BUMI
KOTA AGUNG
TANJUNGKARANG
TELUKBETUNG
SEMANGKA BAY
LAMPUNG BAY
INDIAN OCEAN
JAVA SEA
1:500.000


RAINFALL DAY ISOHYETS IN 1977
RAINGAUGE NETWORK
LAMPUNG SUMATRA
SOUTH SUMATRA PROVINCE
PROJECT AREA BAUNDARY
TO PALEMBANG
TULANG BAWANG
10.041 km²
SEPUTIH
7.149 km²
LAMPUNG
SEMANGKA
1.413 km²
SEKAMPUNG
4.796 km²
JEPARA
637 km²
SOUTHERN DRAINAGE
INDIAN OCEAN
SEMANGKA BAY
LAMPUNG BAY
JAVA SEA
KOTA AGUNG
KOTABUMI
TANJUNG KARANG
TELUKBETUNG
GUNUNG SUGIH
MG1
MG2
MG3
MG4
150
120
180
1:500.000
5 0 5 10 15 20 25 km


ISOHYETS OF A DAY'S MAXIMUM RAINFALL
FOR TEN YEAR S' RETURN PERIOD
SOUTH SUMATRA PROPINCE
TO PALEMBANG
PROJECT AREA BAUNDARY
TULANG BAWANG
10,041 Km²
MENGGALA
SEPUTIH
1,149 Km²
LAMPUNG
GUNUNG SUGIH
SEMANGKA
1,413 Km²
SEKAMPUNG
4,796 Km²
JEPARA
637 Km²
JAVA SEA
TANJUNG KARANG
TELUKBETUNG
KOTA AGUNG
SOUTHERN DRAINAGE
SEMANGKA BAY
LAMPUNG BAY
INDIAN OCEAN
1:500,000
Km

F


ISOHYETS OF A DAY'S MAXIMUM RAINFALL
FOR FIFTY YEARS' RETURN PERIOD.
SOUTH SUMATRA PROPINSI
PROJECT AREA BAUNDARY
TO PALEMBANG
TULANG BAWANG
10,041 Km2
SEPUTIH
7,149 Km2
LAMPUNG
SEMANGKA
SEKAMPUNG
4,796 Km2
JEPARA
637 Km2
MENGGALA
KOTABUMI
GUNUNG SUGIH
TANJUNG KARANG
TELUK BETUNG
KOTA AGUNG
SOUTHERN DRAINAGE
SEMANGKA BAY
LAMPUNG BAY
INDIAN OCEAN
JAVA SEA
1 500000
5 0 5 10 15 20 25 Km
260
200
150
240
235
270
4°15 S
4°30 S
4°45 S
5°00 S
5°15 S
5°30 S
5°45 S
6°00 S
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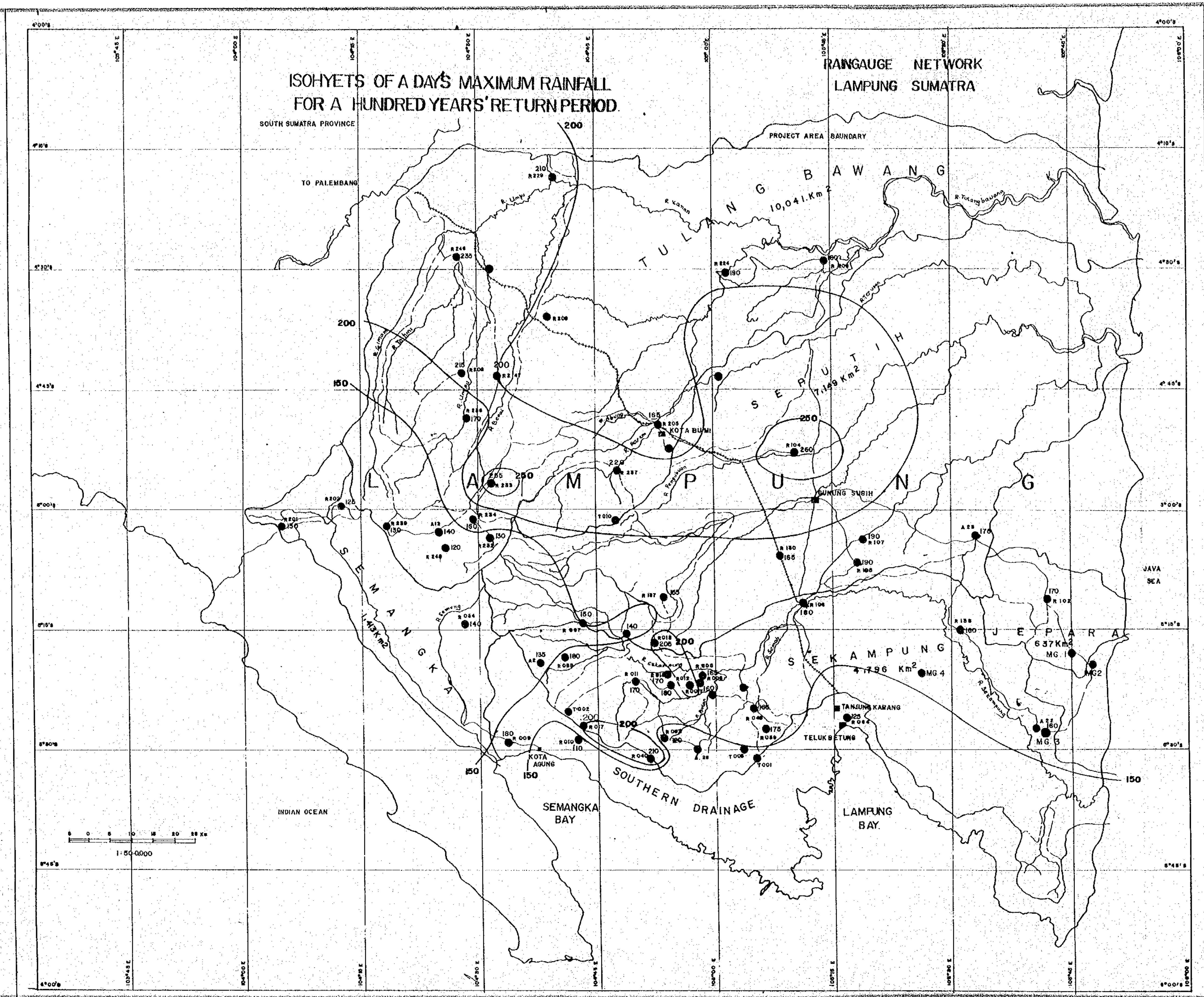
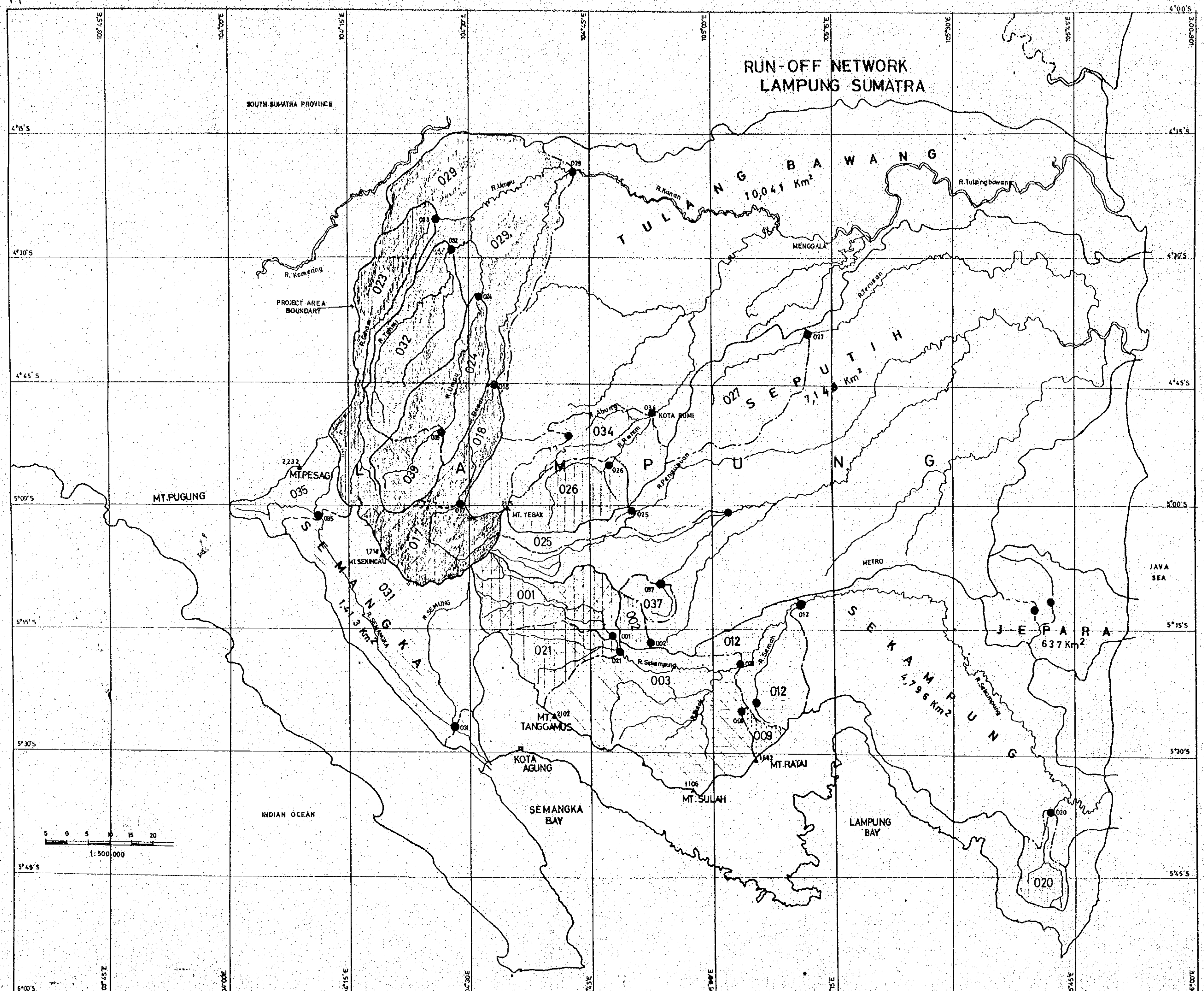
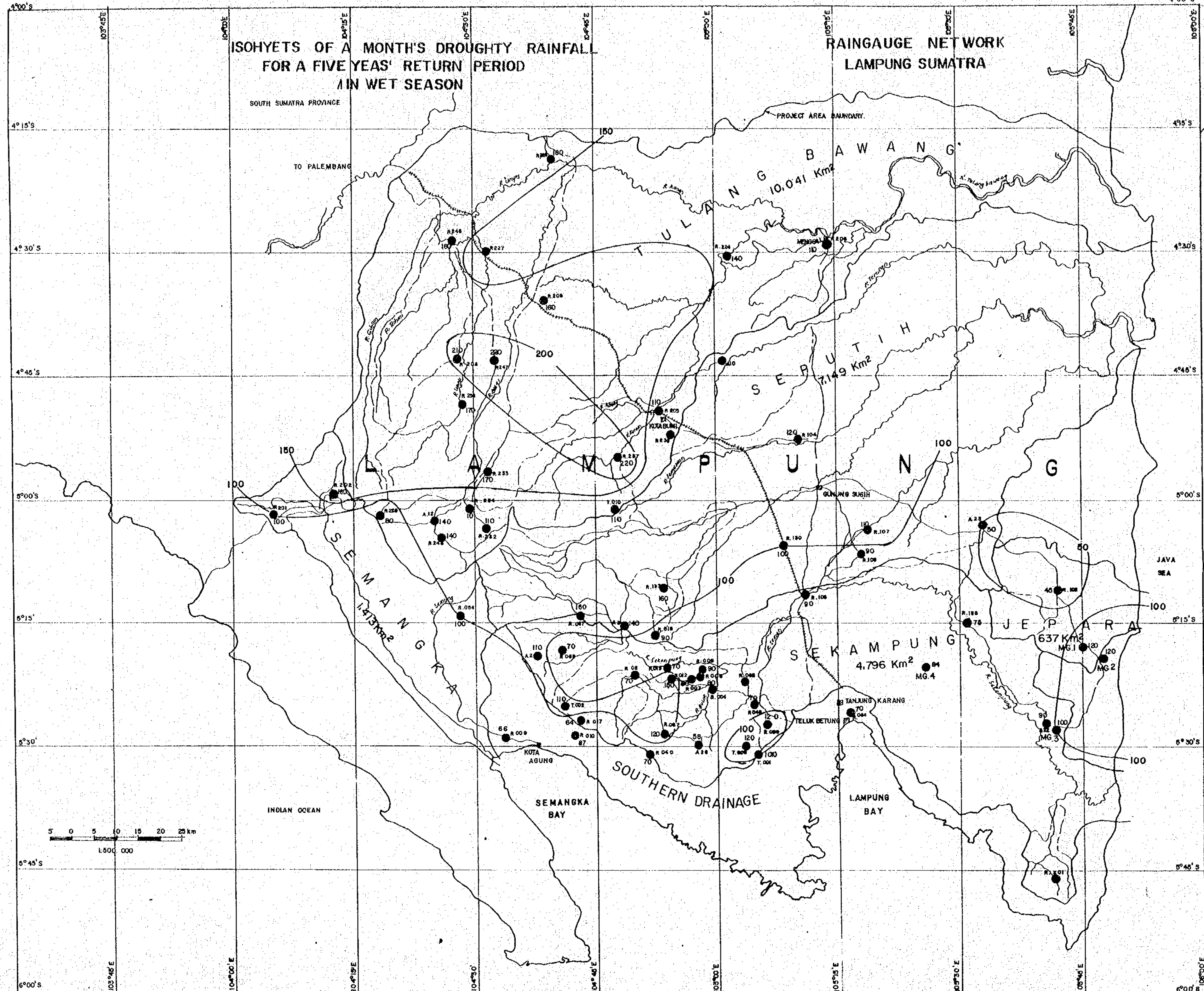
105°45E
106°00E


ISOHYETS OF A DAYS MAXIMUM RAINFALL
FOR A HUNDRED YEARS' RETURN PERIOD.
RAINGAUGE NETWORK
LAMPUNG SUMATRA
SOUTH SUMATRA PROVINCE
PROJECT AREA BOUNDARY
TO PALEMBANG
TULANG BAWANG
10,041.Km2
SEPUTIH
7,149 Km2
LAMPUNG
KOTA BUMI
GUNUNG SUGIH
SEMANGKA
1,413Km2
SEKAMPUNG
4,1796 Km2
JEPARA
637Km2
JAVA
SEA
TANJUNG KARANG
TELUK BETUNG
KOTA AGUNG
SOUTHERN DRAINAGE
SEMANGKA
BAY
LAMPUNG
BAY.
INDIAN OCEAN
1:50.0000
200
150
250



RUN-OFF NETWORK
LAMPUNG SUMATRA
SOUTH SUMATRA PROVINCE
TULANG BAWANG
10,041 Km²
SEPUTIH
7,148 Km²
LAMPUNG
SEKAMPUNG
4,796 Km²
JEPARA
637 Km²
SEMANGKA
1,413 Km²
R. Kemering
PROJECT AREA BOUNDARY
R. Umpu
R. Kanan
R. Tulangbawang
MENGGALA
KOTA BUMI
MT.PESAG
MT.PUGUNG
MT. TEBAK
MT.SEKINCAU
R.SEMUNG
R. Sekampung
METRO
JAVA SEA
MT. TANGGAMUS
KOTA AGUNG
MT.RATAI
MT. SULAH
INDIAN OCEAN
SEMANGKA BAY
LAMPUNG BAY
1: 500 000

I


ISOHYETS OF A MONTH'S DROUGHTY RAINFALL
FOR A FIVE YEAS' RETURN PERIOD
IN WET SEASON
RAINGAUGE NETWORK
LAMPUNG SUMATRA
SOUTH SUMATRA PROVINCE
PROJECT AREA BOUNDARY
TO PALEMBANG
TULANG BAWANG
10,041 Km2
SEPUTIH
7,149 Km2
LAMPUNG
SEMANGKA
1,413 Km2
SEKAMPUNG
4,796 Km2
JEPARA
637 Km2
SOUTHERN DRAINAGE
JAVA SEA
INDIAN OCEAN
SEMANGKA BAY
LAMPUNG BAY
KOTA AGUNG
TANJUNG KARANG
TELUK BETUNG
GUNUNG SUGIH
KOTABUMI
1:500 000
4°00'S
4°15'S
4°30'S
4°45'S
5°00'S
5°15'
5°30'
5°45'S
6°00'S
103°45'E
104°00'E
104°15'E
104°30'E
104°45'E
105°00'E
105°15'E
105°30'E
105°45'E
106°00'E

157

J

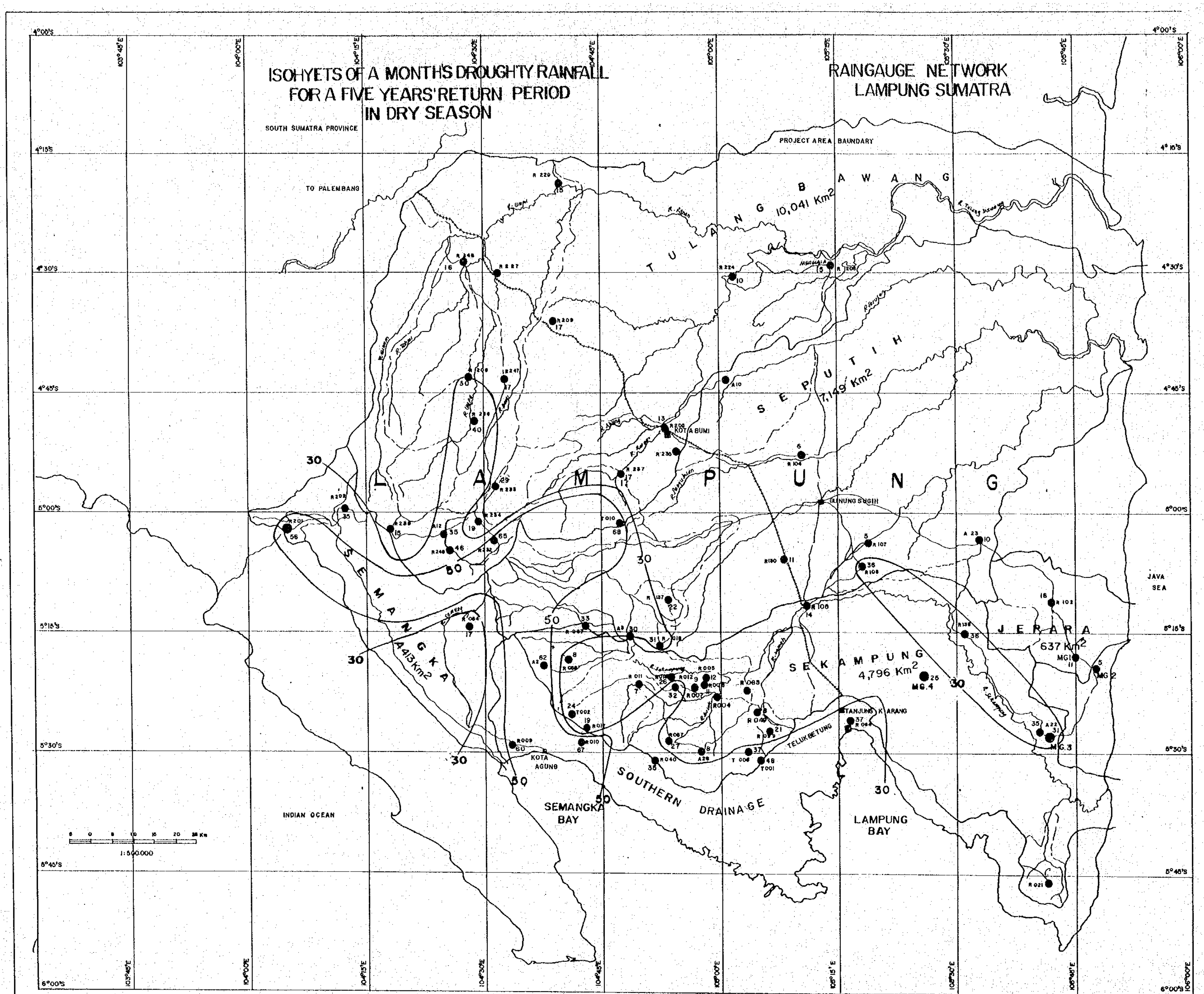
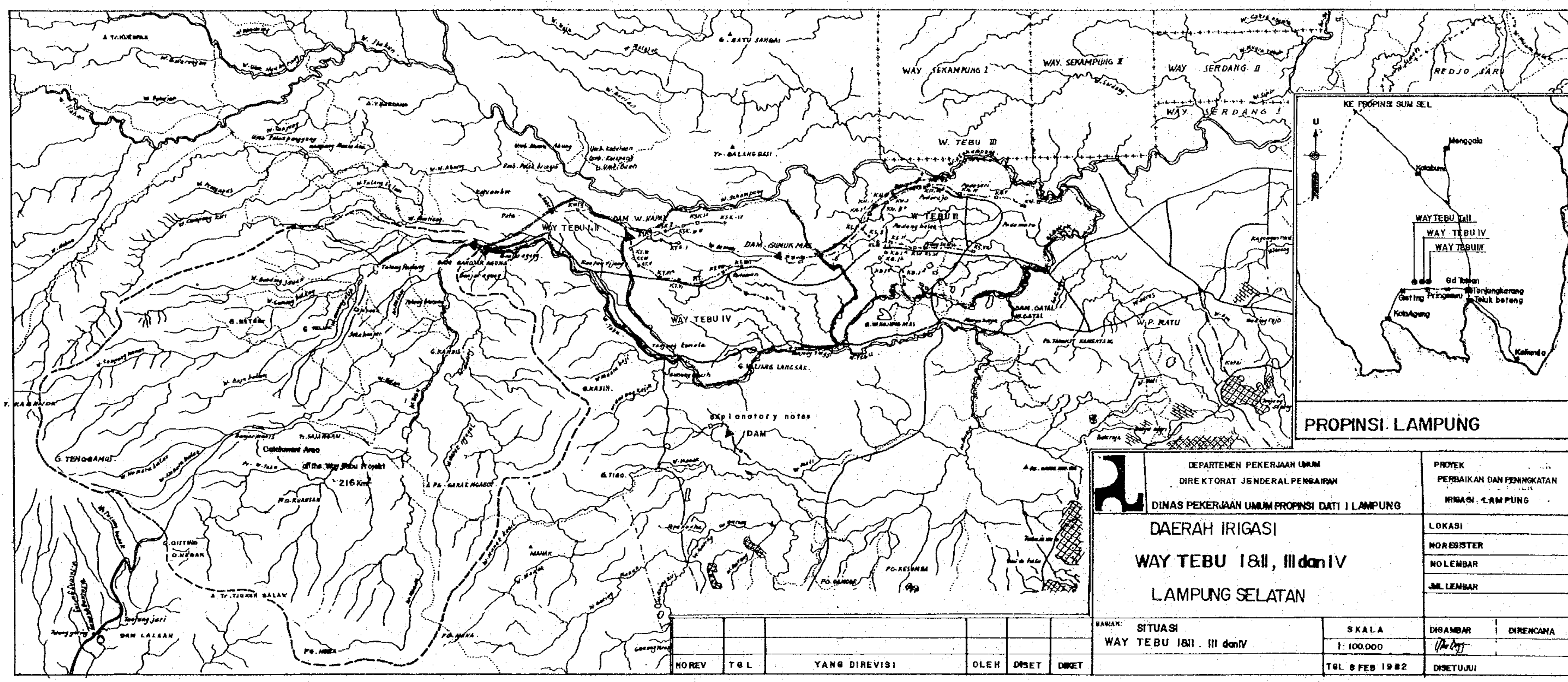

ISOHYETS OF A MONTH'S DROUGHTY RAINFALL
FOR A FIVE YEARS' RETURN PERIOD
IN DRY SEASON
RAINGAUGE NETWORK
LAMPUNG SUMATRA
SOUTH SUMATRA PROVINCE
PROJECT AREA BAUNDARY
TO PALEMBANG
TULANG BAWANG
10,041 Km2
SEPUTIH
7,149 Km2
LAMPUNG
SEMANGKA
4,413 Km2
SEKAMPUNG
4,796 Km2
JERARA
637 Km2
SOUTHERN DRAINAGE
KOTA BUMI
GUNUNG SUGIH
TANJUNG KARANG
TELUKBETUNG
KOTA AGUNG
SEMANGKA BAY
LAMPUNG BAY
INDIAN OCEAN
JAVA SEA
1:500.000
4°00'S
4°15'S
4°30'S
4°45'S
5°00'S
5°15'S
5°30'S
5°45'S
6°00'S
103°45'E
104°00'E
104°15'E
104°30'E
104°45'E
105°00'E
105°15'E
105°30'E
105°45'E
106°00'E

Fig 1.



WAY SEKAMPUNG I
WAY SEKAMPUNG II
WAY SERDANG II
WAY SERDANG I
W. TEBU III
WAY TEBU I-II
W. TEBU II
WAY TEBU IV
DAM W. HAPIT
DAM SUMUR MAS
W. P. RATU
explanatory notes
DAM
Catchment Area of the Way Tebu Project 216 Km²
DAN LALAAN
KE PROPINSI SUM SEL
Menggala
Kotabumi
WAY TEBU I-II
WAY TEBU IV
WAY TEBU III
Gisting
Pringsewu
Tanjungkarang
Teluk betong
KotaAgung
Kalianda
PROPINSI LAMPUNG
DEPARTEMEN PEKERJAAN UMUM
DIREKTORAT JENDERAL PENGAIRAN
DINAS PEKERJAAN UMUM PROPINSI DATI I LAMPUNG
PROYEK
PERBAIKAN DAN PENINGKATAN
IRIGASI LAMPUNG
DAERAH IRIGASI
WAY TEBU I&II, III dan IV
LAMPUNG SELATAN
LOKASI
NO REGISTER
NO LEMBAR
JML LEMBAR
NO REV
TGL
YANG DIREVISI
OLEH
DISET
DIKET
GAMBAR
SITUASI
WAY TEBU I&II . III dan IV
SKALA
1: 100.000
TGL 8 FEB 1982
DIGAMBAR
DIRENCANA
DISETUJUI

15X.

JICA