

Table 5.42 (2) Total Construction Cost of Sewerage Development Project

M/P Construction Cost during from 2006 to 2015

Sewerage development Zone		Northern, central and central eastern area	Southern area	South eastern area	Total
Treatment plant site		Pampang	Maccini Sombala	Gunung Sari	
Wastewater Management System		conventional sewerage system	conventional sewerage system	conventional sewerage system	
Served area	(ha)	2,343	409	2,142	4,894
Served Population	(person)	556,800	146,600	412,800	1,116,200
Population density	(person/ha)	238	358	193	228
Design Flow (Day average)	(cu.m/day)	109,100	29,900	77,700	216,700
Direct Construction Costs	House connection sewer (million Rp.)	53,040	11,198	48,489	112,727
	Tertiary/secondary sewer (million Rp.)	96,892	20,676	86,704	204,272
	Main & Conveyance Sewer (million Rp.)	20,894	5,834	7,547	34,275
	Pump Station (million Rp.)	2,576	0	0	2,576
	Treatment Plant (million Rp.)	25,480	9,650	16,306	51,436
	Total (A) (million Rp.)	198,882	47,358	159,046	405,286
Land Acquisition Cost	(million Rp.)	3,140	0	5,000	8,140
Administration Cost	A x 2% (million Rp.)	3,978	947	3,181	8,106
Engineering Cost	A x 12% (million Rp.)	23,866	5,683	19,086	48,634
Total	(million Rp.)	229,866	53,988	186,313	470,166

us\$/people 188 167 205 191

	Ratio of civil works and Equipment					
Pipe cost/civil works		(million Rp.)	170,826	37,708	142,740	351,274
Pump cost		(million Rp.)	2,576	0	0	2,576
Civil works	30%	(million Rp.)	773	0	0	773
Equip.	70%	(million Rp.)	1,803	0	0	1,803
Treatment cost		(million Rp.)	25,480	9,650	16,306	51,436
Civil works	30%	(million Rp.)	7,644	2,895	4,892	15,431
Equip.	70%	(million Rp.)	17,836	6,755	11,414	36,005
Civil works		(million Rp.)	179,243	40,603	147,632	367,478
Equipment		(million Rp.)	19,639	6,755	11,414	37,808
Total		(million Rp.)	198,882	47,358	159,046	405,286

OM	A x 2%	(M. Rp/year)	3,978	947	3,181	8,106
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Table 5.42 (3) Total Construction Cost of Sewerage Development Project

M/P Construction Cost during from 1996 to 2015

Sewerage development Zone		Northern, central and central eastern area	Southern area	South eastern area	Total	
Treatment plant site		Pampang	Maccini Sombala	Gunung Sari		
Wastewater Management System		conventional sewerage system	conventional sewerage system	conventional sewerage system		
Served area	(ha)	2,851	571	2,142	5,564	
Served Population	(person)	710,300	217,400	412,800	1,340,500	
Population density	(person/ha)	249	381	193	241	
Design Flow (Day average)	(cu.m/day)	143,200	41,000	77,700	261,900	
Direct Construction Costs	House connection sewer (million Rp.)	63,907	12,515	48,489	124,911	
	Tertiary/secondary sewer (million Rp.)	119,964	24,436	86,704	231,104	
	Main & Conveyance Sewer (million Rp.)	28,261	7,836	7,547	43,644	
	Pump Station (million Rp.)	4,515	0	0	4,515	
	Treatment Plant (million Rp.)	29,456	11,033	16,306	56,795	
	Total (A) (million Rp.)	246,103	55,820	159,046	460,969	
Land Acquisition Cost	(million Rp.)	8,850	2,440	5,000	16,300	
Administration Cost	A x 2% (million Rp.)	4,922	1,116	3,181	9,219	
Engineering Cost	A x 12% (million Rp.)	29,532	6,698	19,086	55,316	
Total	(million Rp.)	289,417	66,074	186,313	541,804	
		us\$/people	185	138	205	184

	Ratio of civil works and Equipment					
Pipe cost/civil works		(million Rp.)	212,132	44,787	142,740	399,659
Pump cost		(million Rp.)	4,515	0	0	4,515
Civil works	30%	(million Rp.)	1,355	0	0	1,355
Equip.	70%	(million Rp.)	3,161	0	0	3,161
Treatment cost		(million Rp.)	29,456	11,033	16,306	56,795
Civil works	30%	(million Rp.)	8,837	3,310	4,892	17,039
Equip.	70%	(million Rp.)	20,619	7,723	11,414	39,756
Civil works		(million Rp.)	222,324	48,097	147,632	418,053
Equipment		(million Rp.)	23,780	7,723	11,414	42,917
Total		(million Rp.)	246,104	55,820	159,046	460,970

O/M	A x 2%	(M. Rp/year)	4,922	1,116	3,181	9,219
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Table 5.43 Operation and Maintenance Cost of Sewerage System

(1) O/M Cost for F/S per annum

Conditions,

Quantity =

41,100 m³/day

Service Area =

670 ha

Item	Qty		Unit Cost		O/M Cost (M. Rp/year)	Remarks
1 Sewer Line						
House connection	272,521	m	300	Rp/m	82	
Tertiary / Secondary Sewer	237,731	m	300	Rp/m	71	
Main Sewer (D 350-)	20,376	m	300	Rp/m	6	
Sub-total	530,628	m			159	
2 Pump Station						
Electricity	363,540	kwh	180	Rp/kwh	65	
Repairing	11s.				10	Cons.Cost(1,938M Rp) x 0.5%
Sub-total					75	
3 Treatment Plant						
Electricity (Inflow Pump,others)	411,000	kwh	180	Rp/Kwh	74	10kwh/(m ³ /day)
Chemicals	11s.				49	1.2M Rp/(1000m ³ /day)
Repairing	11s.				26	Const.Cost(4,920M Rp) x 0.5%
Sub-total					149	
4 Personnel Expenditure	11s.				355	
Total O/M Cost					738	

(2) O/M Cost for M/P per annum

Conditions,

Quantity =

238,100 m³/day

Service Area =

5,564 ha

Item	Qty		Unit Cost		O/M Cost (M. Rp/year)	Remarks
1 Sewer Line						
House connection	2,629,290	m	300	Rp/m	789	
Tertiary / Secondary Sewer	2,046,875	m	300	Rp/m	614	
Main Sewer (D 350-)	97,176	m	300	Rp/m	29	
Sub-total	4,773,341	m			1,432	
2 Pump Station						
Electricity	762,120	kwh	180	Rp/kwh	137	
Repairing	11s.				23	Cons.Cost(4516M Rp) x 0.5%
Sub-total					160	
3 Treatment Plant						
Electricity (Aerator,Inflow Pump)	23,810,000	kwh	180	Rp/Kwh	4,286	100kwh/(m ³ /day)
Chemicals	11s.				286	1.2M Rp/(1000m ³ /day)
Repairing	11s.				242	Const.Cost(48,497M Rp) x 0.5%
Sub-total					4,814	
4 Personnel Expenditure	11s.				522	
Total O/M Cost					6,928	

Table 5.44 Construction Cost of SMS(B/G)

(1) Construction Cost of SMS(B/G) Based on septic tank

Name of site	Area (ha)	No. of household (pcs)	Population density (p/ha)	Sewer length		Construction cost				
				House connection sewer (m)	Tertiary sewer (m)	House connection sewer (million Rp)	Tertiary sewer (million Rp)	Sub-total of sewer (million Rp)	Wastewater treatment plant (million Rp)	Total of sewer and TP (million Rp)
Sambung Jawa	1.24	77	343	802	658	42	113	155	64	219
Bara-Baraya Selatan	1.28	92	396	732	657	38	116	154	76	230
Totake	1.78	62	192	769	559	40	71	111	52	163
Total	4.30	231	931	2,303	1,874	120	300	420	192	612

(2) Construction Cost of SMS(B/G) Based on Package Wastewater Treatment Plant

Name of site	Area (ha)	No. of household (pcs)	Population density (p/ha)	Sewer length		Construction cost				
				House connection sewer (m)	Tertiary sewer (m)	House connection sewer (million Rp)	Tertiary sewer (million Rp)	Sub-total of sewer (million Rp)	Wastewater treatment plant (million Rp)	Total of sewer and TP (million Rp)
Losari	5.19	170	177	2,333	1,822	121	254	375	364	739

Table 5.45 Total Cost of Feasibility Project

Project Item	Quantity (pcs)	Served population (people)	Investment cost (million Rp.)	O/M cost (million Rp./year)
Rehabilitation of Malfunctioning MCKs	204(59) present total no. (malfun. no.)	15,950	30	408
Provision of new MCKs	66	7,260	330	132
Procurement of vacuum tracks for desludging improvement	20	1,363,000	1,540	766
Improvement of Antang STP access road	(1,800m x 6m) 10,800m ²		540	
Sub-total of Sanitary Improvement Project			2,440	1,306
Provision of SMS(B/G) as pilot project Septic tanks	5	2,068	1,020	11
PWTP	1	935	739	8
Provision of SMS(B/G) (for 250p) as wider project Septic tank	5	1,250	509	7
Sub-total of Pilot Project, SMS(B/G)			4,253	26
Provision of LMS(north)	1	22,900	10,454	138
Provision of CSS(central)	1	130,600	49,098	806
Provision of CSS(south)	1	70,800	12,086	169
Sub-total of Sewerage Development Project			71,638	1,113
Total of F/S Project			76,346	2,445

Table 5.46 Total Project Cost of Master Plan

Investment Cost		unit : million Rp.		
Project Item	1996 - 2005	2006 - 2015	Total	
Public Toilet(MCK), SMS(B)	360	0	360	
Vacuum Trucks	1,540	4,774	6,314	
Improvement of Antang STP Access road	540	0	540	
Sanitary Improvement Project	2,440	4,774	7,214	
SMS(B/G) of Pilot and wider	2,268		2,268	
Sewerage Development	71,638	470,166 (402,569)	541,804 (474,207)	
Total Investment Cost of M/P	76,346	474,940 (407,343)	551,286 (483,689)	

(value) :

Subtracting construction cost of house connection and tertiary/secondary sewer which will be constructed by developer at south-eastern area

Total construction cost of house connection sewer and tertiary/secondary sewer which will be constructed from 2006 to 2015 at south-eastern area is as follows,

	2006 - 2015
House connection sewer	48,489
Tertiary/secondary sewer	86,704
Total	135,193

50 % of the above mentioned cost, 67,597 million Rp, is estimated to be constructed by developer.

O/M Cost		unit : million Rp./Year	
Project Item	1996 - 2005	2006 - 2015	
Public Toilet(MCK), SMS(B)	540	0	
Vacuum Trucks	766	531	
Improvement of Antang STP Access road	0	0	
Sanitary Improvement Project	1,306	531	
SMS(B/G) of Pilot and wider	26	0	
Sewerage Development	1,113	9,219	
Total O/M Cost of M/P	2,445	9,750	

Table 5.47 Results of Water Quality Analysis

Parameters	Units	No. of Survey										Average
		ST-1/1	ST-1/2	ST-1/3	ST-1/4	ST-1/5	ST-1/6	ST-1/7				
Ambient temperature	C.	29.4	29.3	29.4	29.7	29.6	29.8	29.5	30.0			
Water temperature	C.	27.5	27.1	28	25.6	25.3	25.5	25.6	26.0			
Suspended Solids (SS)	mg/l	1100	2700	1300	1600	3400	1520	3600	2174			
pH	-	7.59	7.74	6.41	7.63	7.35	7.86	7.19	7.0			
Biochemical Oxygen Demand (BOD)	mg/l	68.8	97.6	196.4	241.5	257.7	341.5	191.5	199.0			
Chemical Oxygen Demand (COD)	mg/l	124	191.1	374.6	482	568	698	424	409.0			
Fecal Coliform	Colony/100ml	2.70E+05	2.90E+05	1.95E+05	1.80E+05	2.80E+05	2.90E+05	1.73E+05	2.40E+05			

(No.2 - Rumah Susun)

Parameters	Units	No. of Survey										Average
		ST-2/1	ST-2/2	ST-2/3	ST-2/4	ST-2/5	ST-2/6	ST-2/7				
Ambient temperature	C.	29.9	29.6	29.5	29.6	29.3	29.6	29.8	30.0			
Water temperature	C.	26.9	27.1	26.9	27.1	28	25.7	25.9	27.0			
Suspended Solids (SS)	mg/l	500	420	620	510	590	2100	610	764			
pH	-	7.71	7.72	6.43	7.13	7.81	7.86	7.37	7.0			
Biochemical Oxygen Demand (BOD)	mg/l	260.2	241.5	321.8	257.7	274	248.9	274	268.0			
Chemical Oxygen Demand (COD)	mg/l	672	498	692	533	640	596	643	611.0			
Fecal Coliform	Colony/100ml	3.00E+05	2.60E+05	2.70E+05	1.10E+05	2.80E+05	3.20E+05	3.10E+05	2.64E+05			

(No.3 - Communal system)

Parameters	Units	No. of Survey										Average
		ST-3/1	ST-3/2	ST-3/3	ST-3/4	ST-3/5	ST-3/6	ST-3/7				
Ambient temperature	C.	29.9	29.6	29.8	29.9	29.7	29.8	29.8	30.0			
Water temperature	C.	25.8	25.7	25.9	25.8	25.6	25.7	25.6	26.0			
Suspended Solids (SS)	mg/l	1980	2100	1610	1980	1700	2720	1530	1946			
pH	-	7.84	7.86	7.37	7.84	7.38	7.62	7.56	8.0			
Biochemical Oxygen Demand (BOD)	mg/l	243.9	248.9	274	243.9	290.2	355.3	274	276.C			
Chemical Oxygen Demand (COD)	mg/l	501	596	643	501	598	726	582	592.0			
Fecal Coliform	Colony/100ml	3.10E+05	2.90E+05	1.10E+05	7.90E+04	1.64E+05	1.52E+05	1.43E+05	1.79E+05			

Table 5.48 BOD Removal Efficiency of Septic Tank System

(No.1-Individual Toilet)

No. of Survey	Effluent Volume (liter/day)	Effluent Quality (mg-BOD/l)	Discharg Pollution Load (g-BOD/day)	Estimated Inflow Pollution Load (g-BOD/day)	Efficiency (%)
1	77	244	19	84	77%
2	84	249	21		75%
3	76	274	21		75%
4	168	244	41		51%
5	50	290	15		82%
6	75	355	27		68%
7	42	274	12		86%
Average	82	276	22		74%

(No. of user = 8 persons, Effluent volume = 10.3 kcd, retention time = 29.8 days)

(No.2-Rumah Susun)

No. of Survey	Effluent Volume (liter/day)	Effluent Quality (mg-BOD/l)	Discharg Pollution Load (g-BOD/day)	Estimated Inflow Pollution Load (g-BOD/day)	Efficiency (%)
1	994	260	258	598.5	57%
2	672	242	163		73%
3	744	322	240		60%
4	624	258	161		73%
5	768	274	210		65%
6	560	249	139		77%
7	535	274	147		75%
Average	700	268	188		69%

(No. of user = 57 persons, Effluent volume = 12.3 kcd, retention time = 3.1 days)

(No.3-Communal System)

No. of Survey	Effluent Volume (liter/day)	Effluent Quality (mg-BOD/l)	Discharg Pollution Load (g-BOD/day)	Estimated Inflow Pollution Load (g-BOD/day)	Efficiency (%)
1	804	69	55	619.5	91%
2	730	98	72		88%
3	888	196	174		72%
4	840	242	203		67%
5	744	258	192		69%
6	744	342	254		59%
7	696	192	134		76%
Average	778	200	155		75%

(No. of user = 59 persons, Effluent volume = 13.2 kcd, retention time = 5.1 days)

note : Unit pollution load = 10.5 god

Table 5.49 Results of Sanitary Facilities Survey

Items	Toilet with treatment facilities			Toilet without treatment Facilities	Neighboring's Toilet	Public toilet	No Facilities	Total
	with Leaching Pit	with Septic Tank						
Kel. Panambungan RW - V	Population (ratio %)	764 41%	13 1%	440 24%	0 0%	0 0%	632 34%	1849 100%
Kel. Panambungan RW - VIII	Population (ratio %)	217 12%	32 2%	399 22%	0 0%	0 0%	1170 64%	1818 100%
Total	Population (ratio %)	981 27%	45 1%	839 23%	0 0%	0 0%	1802 49%	3667 100%

note: Administrative Population The Field Survey
 RW - V 1,778 1,849
 RW - VIII 1,761 1,818

Table 5.50 (1) Results of Questionnaire Survey for Communal System (Location : RT - A)

Items	Sample No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	User	non-User
Existing Condition	Type of House	2	1	2	1	3	1	1	1	2	1	1	2	1	1	-	-
	Number of Family	Adult	5	2	4	4	3	5	2	4	2	1	0	2	4	31	20
	Child	2	5	0	3	6	6	1	2	2	2	2	1	2	2	28	8
	Total	7	7	4	7	10	9	6	4	6	4	3	10	4	6	59	28
	Drinking /Cooking	1	1	1	1	1	1	1	1	1	1	1	1	2	2	-	-
	Bathing	1	3	3	3	3	3	3	3	3	3	3	3	3	3	-	-
	Washing	1	3	3	3	3	3	3	3	3	3	3	3	3	3	-	-
Gardening	1	3	3	3	3	3	3	3	3	3	3	3	-	-	-	-	
Others	1	3	3	3	3	3	3	3	3	3	3	3	-	-	-	-	
Com.sys.	1	1	1	1	1	1	1	1	1	1	1	1	1	1	9	3	
L.P.																0	0
T. w. T.	1														1	1	
Others																1	0
Impressions for Communal System	(A) Acknowledgment	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1	9	0
	No															0	0
	(B) Condition of Toilet	Good														1	1
	Fair															2	0
	Bad	1	1	1	1	1	1	1	1	1	1	1	1	1	4	2	
	Good															0	0
	Fair															2	0
	Bad															0	0
	(C) Condition of C.S. (odor, etc)	Good														1	1
	Fair	1	1	1	1	1	1	1	1	1	1	1	1	1	6	4	
Bad															0	0	
(D) Condition of C.S. (discharge)	Good														1	1	
Fair	1	1	1	1	1	1	1	1	1	1	1	1	1	6	4		
Bad															0	0	
(E) Condition of C.S. (location)	Good	1	1	1	1	1	1	1	1	1	1	1	1	1	3	2	
Fair															4	0	
Bad															2	1	
(F) Connection with C.S.	Good														1	3	
Fair															3	0	
Bad															1	0	
Questionnaire for User of C.S.	Additional Pipes (No. of pipe)				5	3	1	2	5	1	1	3	3	3	23	0	
	(H) Wishful Connect.	Yes	1	1												0	1
For non-User of C.S. All the Respondents	(I) Willingness pay	Yes	1	1	1	1	1	1	1	1	1	1	1	1	9	0	
	No														1	0	
	(Rp./year)				1500	1000	1000	1500	1500	1500	1000	1000	2500	2500	1625	0	

< Type of House >
 1. Traditional Style
 2. One-storied house
 3. One-storied house with a garden
 4. Two-storied house
 5. Two-storied house with a garden

< Water Source >
 1: PDAM
 2: Public Tap
 3: Well
 4: 1 & 3

< Type of Toilet >
 S. T. : Toilet with Septic Tank
 L. P. : Toilet with Leaching Pit
 T. w. T. : Toilet without Treatment

< User / non-User of Communal System >
 [Shaded Box] : User
 [White Box] : non-User

Table 5.50 (2) Results of Questionnaire Survey for Communal System (Location : RT - D)

Items	Sample No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	non-User	
Existing Condition	Type of House	1	1	2	2	1	1	2	1	1	1	2	1	1	1	1	1	
	Number of Family	6	3	4	-	4	4	2	2	3	4	7	3	2	4	-	48	
	Adult	2	3	3	-	3	2	3	-	-	6	4	6	3	2	-	37	
	Child	4	0	1	-	1	-	-	-	-	3	3	3	1	2	-	11	
	Total	8	6	7	-	7	6	5	2	3	10	11	9	5	6	-	85	
Existing Condition	Drinking /Cooking	2	2	1	2	2	2	2	1	2	2	1	2	2	2	2	-	
	Bathing	2	2	1	2	2	2	2	1	2	2	1	2	2	2	2	-	
	Washing	2	2	1	2	2	2	2	1	2	2	1	2	2	2	2	-	
	Gardening	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Others	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	S. T.	-	-	1	-	-	-	1	-	-	-	1	1	-	-	-	1	5
	L. P.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
	T. w. T.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
	Others	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	7
	A	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	15
B	No	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	
Condition of Toilet	Good	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	
	Fair	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	
	Bad	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	7	
	Good	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	
	Fair	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	
Condition of C.S. (ecor, etc)	Bad	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	5	
	Good	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	
	Fair	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	
	Bad	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	7	
	Good	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	
Condition of C.S. (discharge)	Good	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	
	Fair	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	
	Bad	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	
	Good	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	
	Fair	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	
Condition of C.S. (location)	Good	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	
	Fair	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	
	Bad	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	
	Good	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	
	Fair	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	
Questionnaire for User of C.S.	Connection with C.S.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	
	Fair	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	
	Bad	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	
	Good	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	
	Fair	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	
For non-User of C.S.	Additional Pipes (No. of pipe)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	
	Yes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	
	No	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	
	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	5	
	No	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	
All the Respondents	Willingness pay (RD./Year)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	
	1000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1000	
	1000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1000	
	1000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1000	
	1000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1000	

< Type of House >
 1, Traditional Style
 2, One-storied house
 3, One-storied house with a garden
 4, Two-storied house
 5, Two-storied house with a garden

< Water Source >
 1: PDAM
 2: Public Tap
 3: Well
 4: 1 & 3

< Type of Toilet >
 S. T. : Toilet with Septic Tank
 L. P. : Toilet with Leaching Pit
 T. w. T. : Toilet without Treatment

< User / non-User of Communal Systems >
 : User
 : non-User

Table 5.50 (3) Results of Questionnaire for Communal System (Location : RT - E)

Items	Sample No.	1	2	3	4	5	6	7	8	9	10	11	12	User	non-User	
Existing Condition	Type of House	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
	Number of Family	Adult	4	2	4	3	2	2	3	3	4	7	3	7	30	
	Child	2	2	1	2	1	3	2	2	1	1	3	0	1	15	
	Total	6	4	5	6	4	5	4	5	4	5	10	3	8	45	
	Water source	Drinking /Cooking	1	1	1	1	1	1	1	1	1	2	2	-	-	
	Bathing	1	1	1	1	4	4	4	4	4	4	2	2	-	-	
	Washing	1	4	1	1	4	4	4	4	4	4	2	2	-	-	
	Gardening													-	-	
	Others													-	-	
	Type of Toilet	S. T.	1			1						1		0	2	
	L. P.												0	0		
	T. w. T.		1				1	1	1	1		1	1	6		
	Others				1	1							0	2		
Acknowledgment	A	1	1	1	1	1	1	1	1	1	1	1	2	9		
	B												0	1		
Condition of Toilet	Good	1		1	1	1	1	1	1	1	1	1	2	5		
	Fair				1								0	1		
	Bad	1					1	1	1				0	4		
Impressions for Communal System	C	Good											0	0		
		Fair				1							0	1		
		Bad	1	1	1	1	1	1	1	1	1	1	2	9		
	D	Good											0	0		
		Fair											0	0		
		Bad	1	1	1	1	1	1	1	1	1	1	2	9		
	E	Good	1									1	1	2		
		Fair												0		
		Bad												0		
	Questionnaire for User of C.S.	F	Good											0	0	
		Fair											0	0		
		Bad	1	1	1	1	1	1	1	1	1	1	2	9		
G		Good											0	0		
		Fair											0	0		
		Bad	1	1	1	1	1	1	1	1	1	1	2	9		
H		Good											0	0		
		Fair											0	0		
		Bad	1	1	1	1	1	1	1	1	1	1	2	9		
For non-User of C.S. All the Respondents		Additional Pipes (No. of pipe)														
	Wishful Connect.	Yes				1	1	1	1	1	1	1	1	1	6	
		No												0		
	Willingness pay	Yes				1	1	1	1	1	1	1	1	2	5	
		No												0		
	(Rp./year)				1000	1000	1000	1000	1000	1000	1000	1000	2500	2500	1750	1300

< Type of House >
 1. Traditional Style
 2. One-storied house
 3. One-storied house with a garden
 4. Two-storied house
 5. Two-storied house with a garden

< Water Source >
 1: PDAM
 2: Public Tap
 3: Well
 4: 1 & 3

< Type of Toilet >
 S. T. : Toilet with Septic Tank
 L. P. : Toilet with Leaching Pit
 T. w. T. : Toilet without Treatment

< User / non-User of Communal System >
 [User] : User
 [non-User] : non-User
 [before User] : before User

Table 5.50 (4) Results of Questionnaire for Communal System (Location: RT - F)

Items	Sample No.	11	12	13	14	15	16	17	18	User	non-User
Existing Condition	Number of Family	1	1	1	1	1	1	1	1	1	1
	Type of House	Adult	6	3	4	2	2	7	13	13	20
		Child	9	7	0	1	1	1	3	10	12
	Total	18	13	3	5	3	3	10	23	32	
Water source	Drinking /Cooking	1	1	1	1	1	1	2	-	-	-
	Bathing	1	1	4	4	4	4	2	-	-	-
	Washing	1	1	4	4	4	4	2	-	-	-
	Gardening								-	-	-
	Others								-	-	-
	Type of Toilet	S. T.	1	1			1	1	1	1	2
		L. P.								0	0
		T. w. T.			1	1	1		1	1	3
		Others								0	0
	A	Yes	1	1	1	1	1	1	1	2	5
B	No								0	0	
Condition of Toilet	Good			1	1	1	1	1	1	4	0
	Fair								0	0	0
	Bad	1	1						1	1	1
C	Good								0	0	0
	Fair								0	0	0
	Bad	1						1	1	1	1
D	Good		1	1	1	1	1	1	1	3	0
	Fair								0	0	0
	Bad								1	1	0
E	Good	1	1		1	1	1	1	1	3	0
	Fair								0	0	0
	Bad								1	1	0
F	Good		1						1	1	0
	Fair								0	0	0
	Bad								1	1	1
Additional Pipes (No. of pipe)	Yes	1			1				2	2	4
	No								0	0	2
	Wishful Connect.								0	0	0
Willingness pay	Yes	1	1	1	1	1	1	1	1	2	5
	No								0	0	0
	(Rp./Year)	1000	1000	1000	1000	1000	1000	1000	2500	1750	1000

< User / non-User of Communal System >

☐ : User
 ☐ : non-User

▨ : before User

< Type of Toilet >

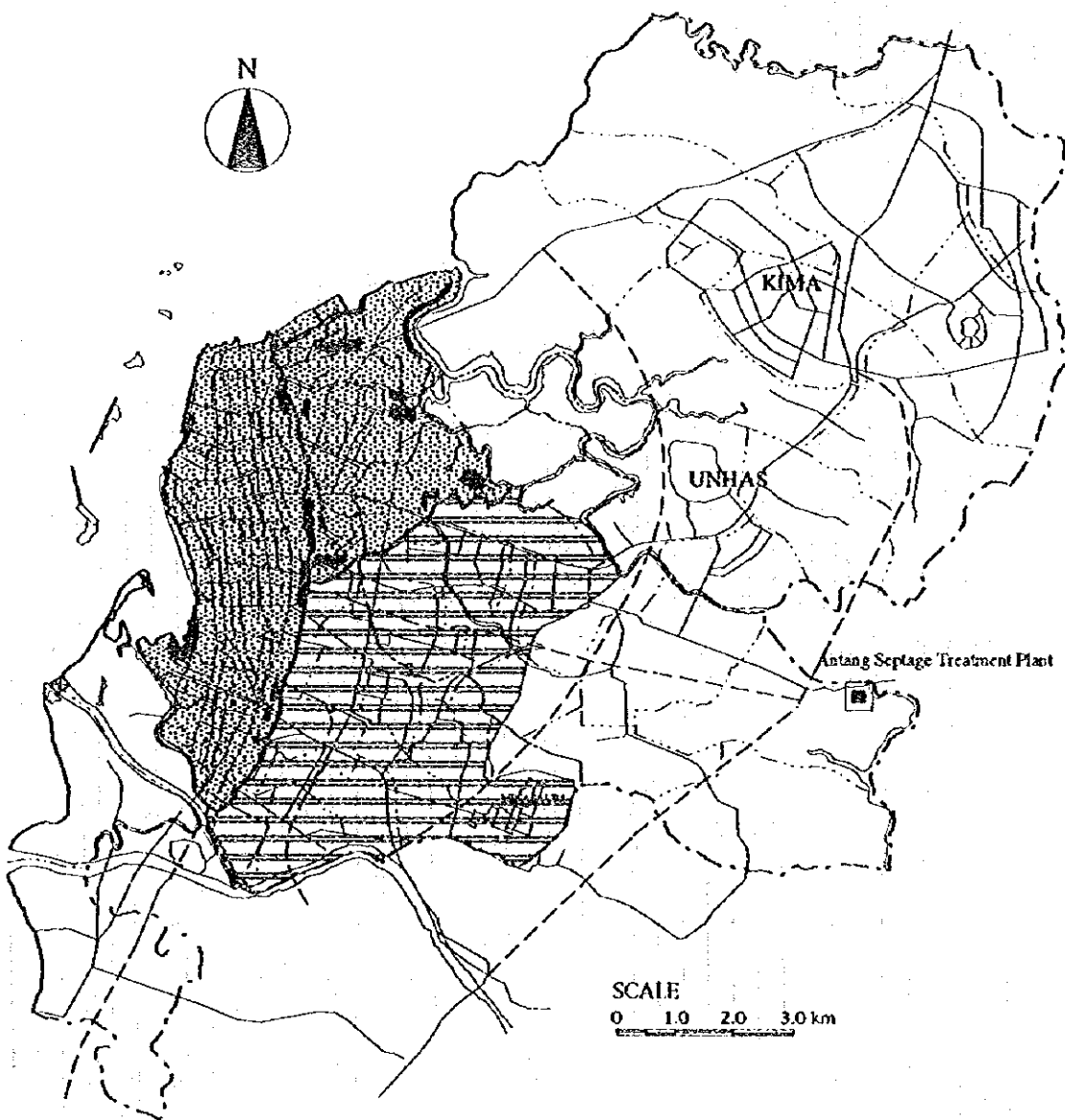
S. T. : Toilet with Septic Tank
 L. P. : Toilet with Leaching Pit
 T. w. T. : Toilet without Treatment

< Water Source >

1: PDAM
 2: Public Tap
 3: Well
 4: 1 & 3

< Type of House >

1. Traditional Style
 2. One-storied house
 3. One-storied house with a garden
 4. Two-storied house
 5. Two-storied house with a garden



LEGEND

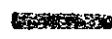

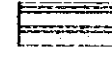

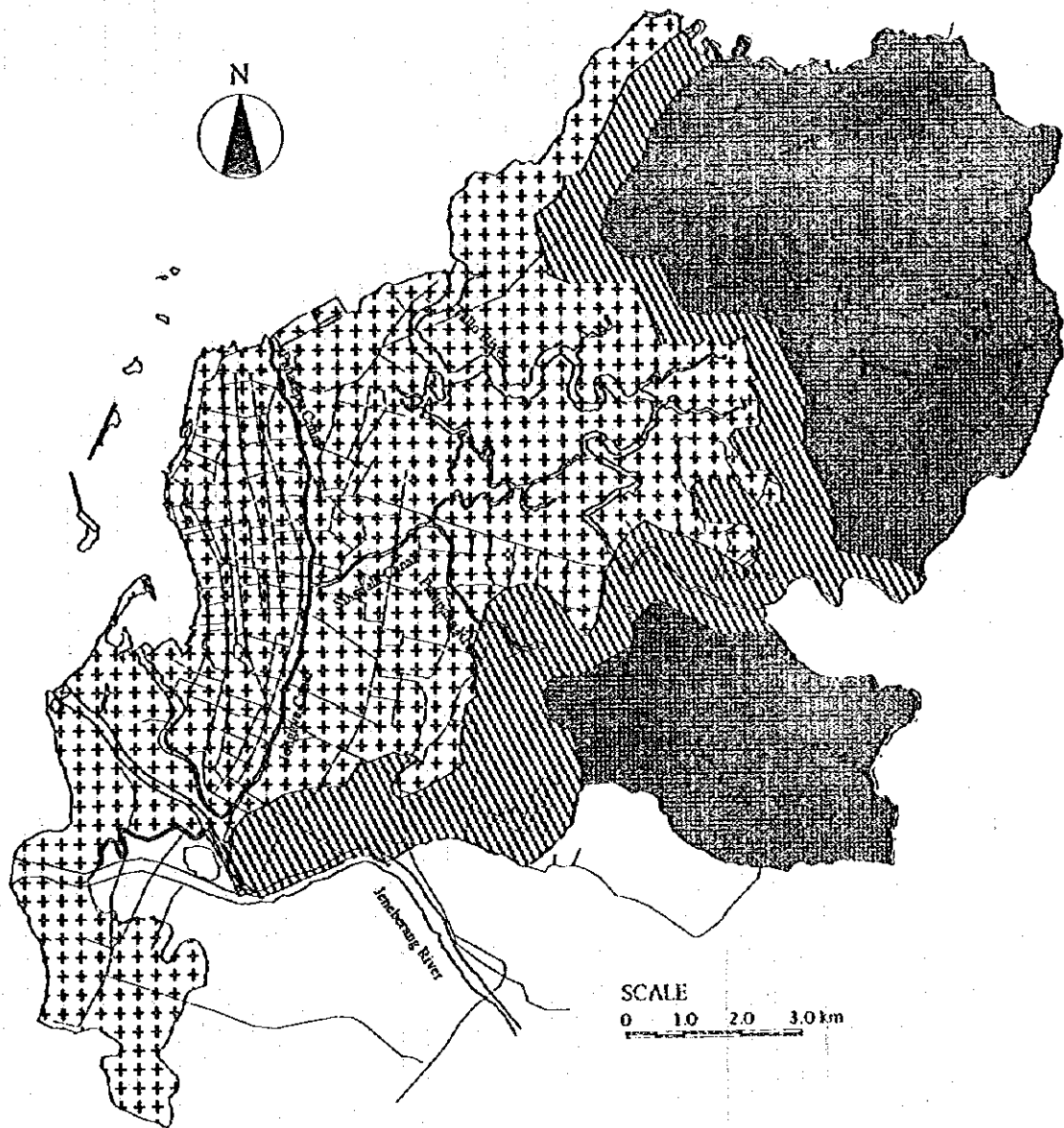
-  Slum Area
-  Urban Area
-  Suburban Development Area
-  Suburban Fringe Area

FIG. 5.1




Present Development Stage of Study Area

MASTER PLAN AND FEASIBILITY STUDY ON WASTEWATER AND SOLID WASTE MANAGEMENT FOR THE CITY OF UJUNG PANDANG IN THE REPUBLIC OF INDONESIA



LEGEND

Depth of Groundwater Table from Ground Surface

-  Shallower than 2 m
-  2 m ~ 4 m
-  Deeper than 4 m

Source : Directorate General of Irrigation

FIG. 5.2

Critical Groundwater Table Level in Rainy Season

MASTER PLAN AND FEASIBILITY STUDY ON WASTEWATER AND SOLID WASTE MANAGEMENT FOR THE CITY OF UJUNG PANDANG IN THE REPUBLIC OF INDONESIA

WASTE WATER TREATMENT PLANT IN KIMA

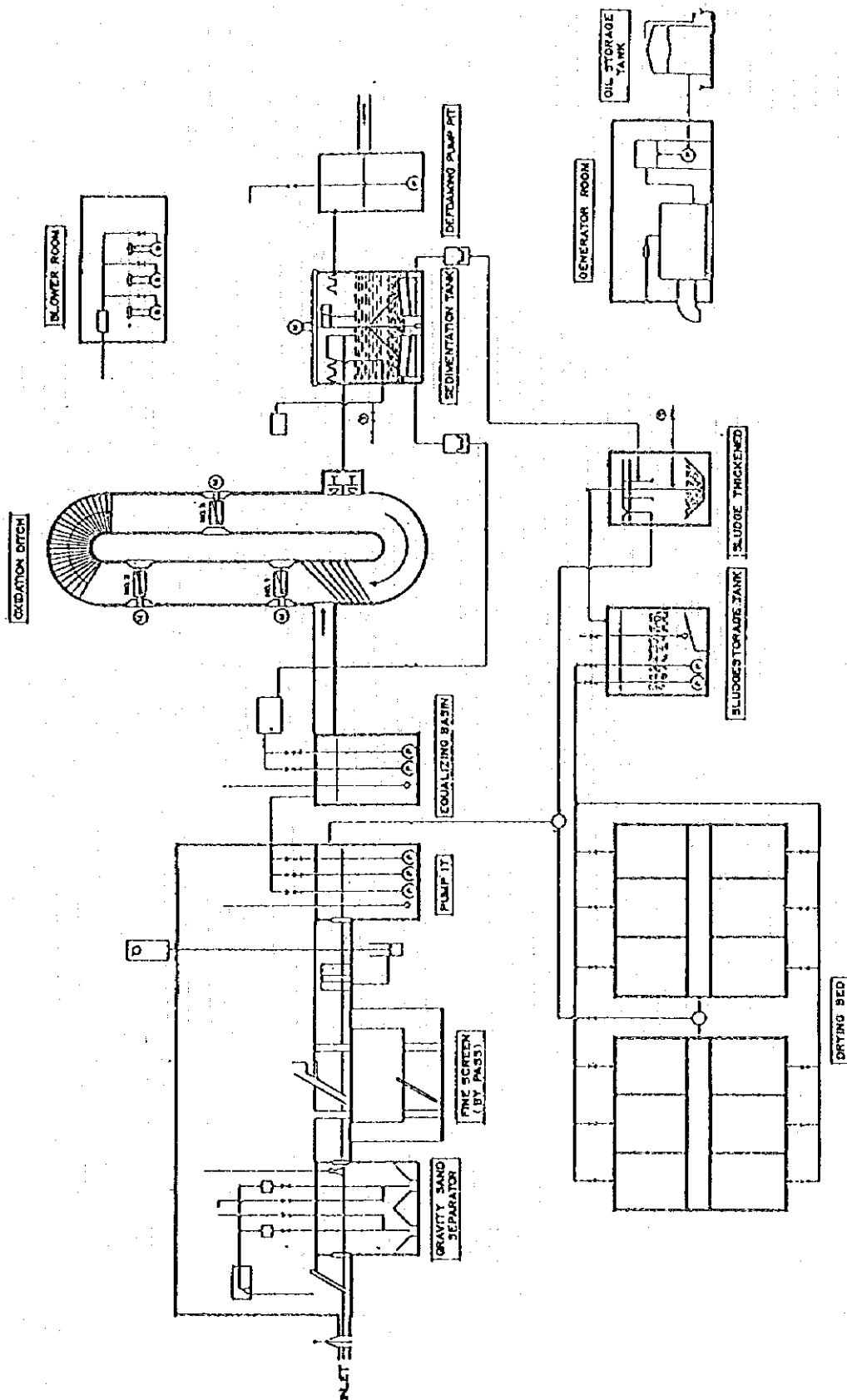


FIG. 5.3

Flow Chart of KIMA Wastewater Treatment Plant

MASTER PLAN AND FEASIBILITY STUDY ON WASTEWATER AND SOLID WASTE MANAGEMENT FOR THE CITY OF UJUNG PANDANG IN THE REPUBLIC OF INDONESIA

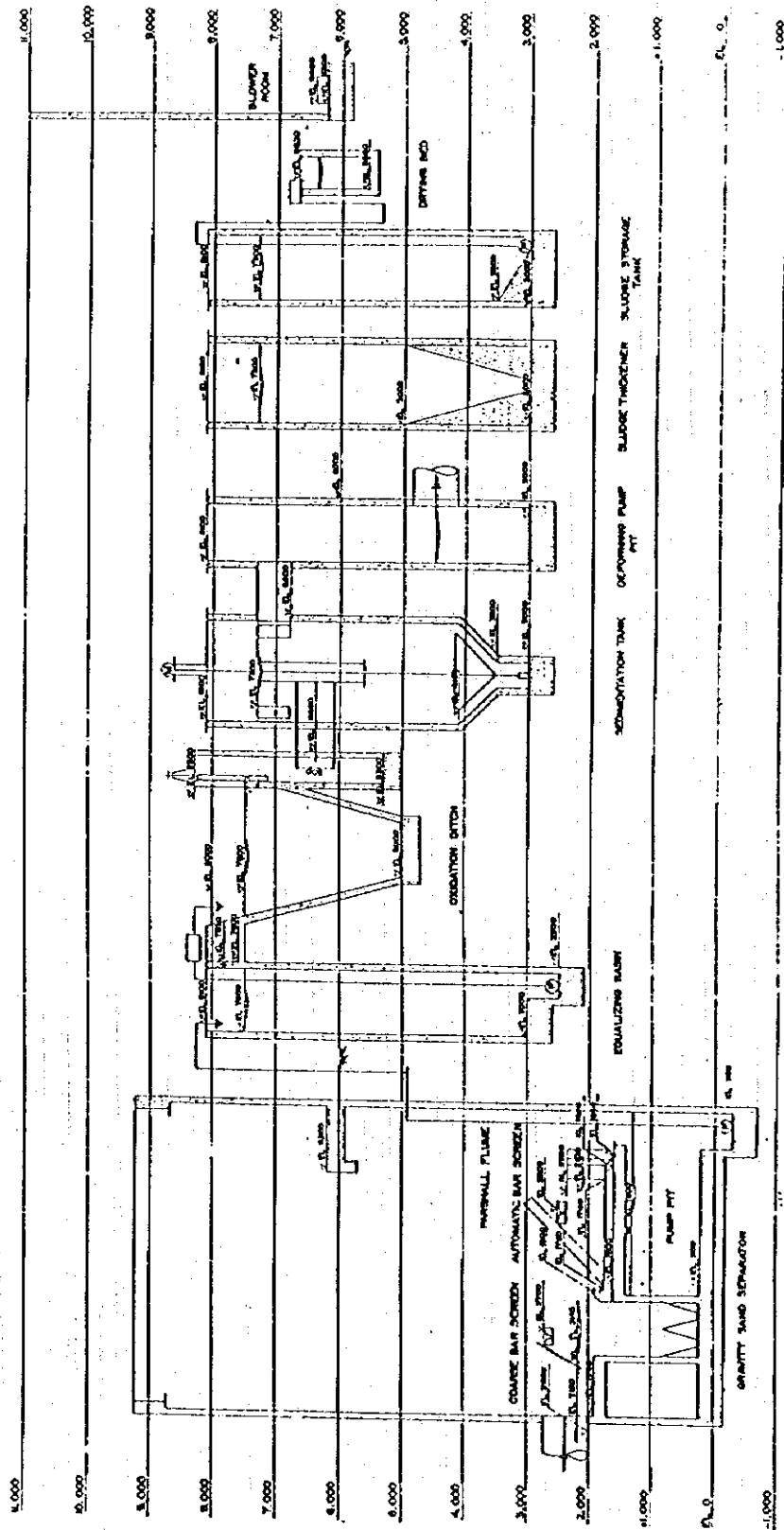


FIG. 5.5

Longitudinal Section of KIMA Wastewater Treatment Plant

MASTER PLAN AND FEASIBILITY STUDY ON WASTEWATER AND SOLID WASTE MANAGEMENT FOR THE CITY OF UJUNG PANDANG IN THE REPUBLIC OF INDONESIA

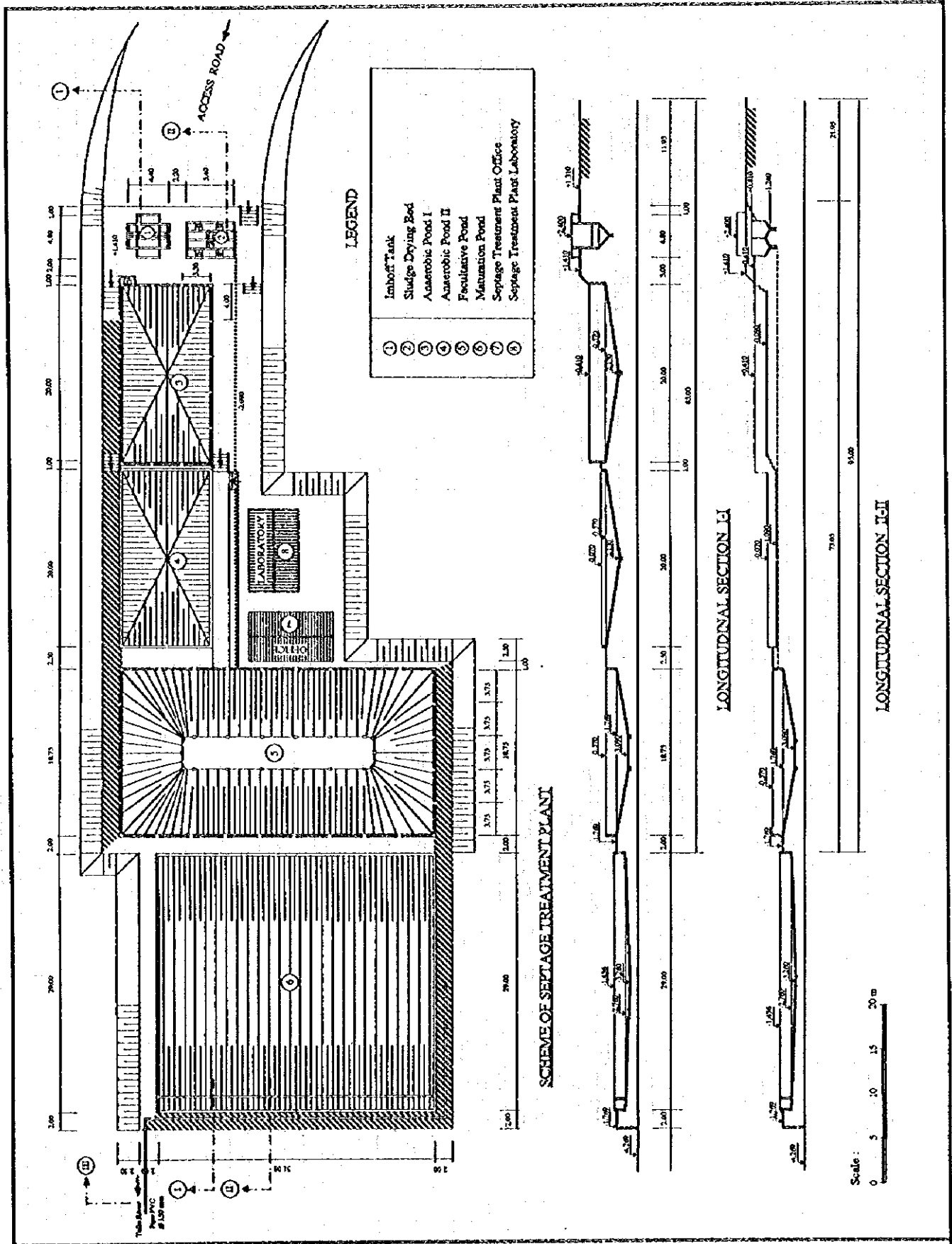
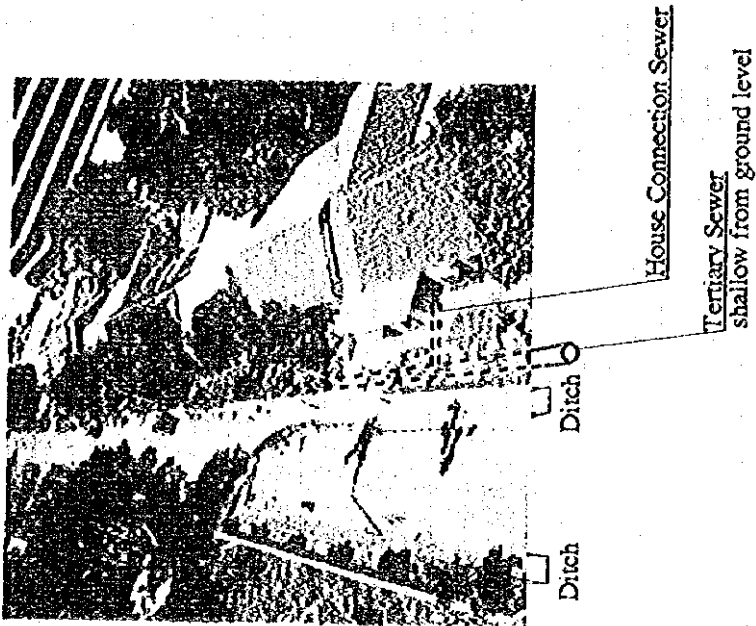
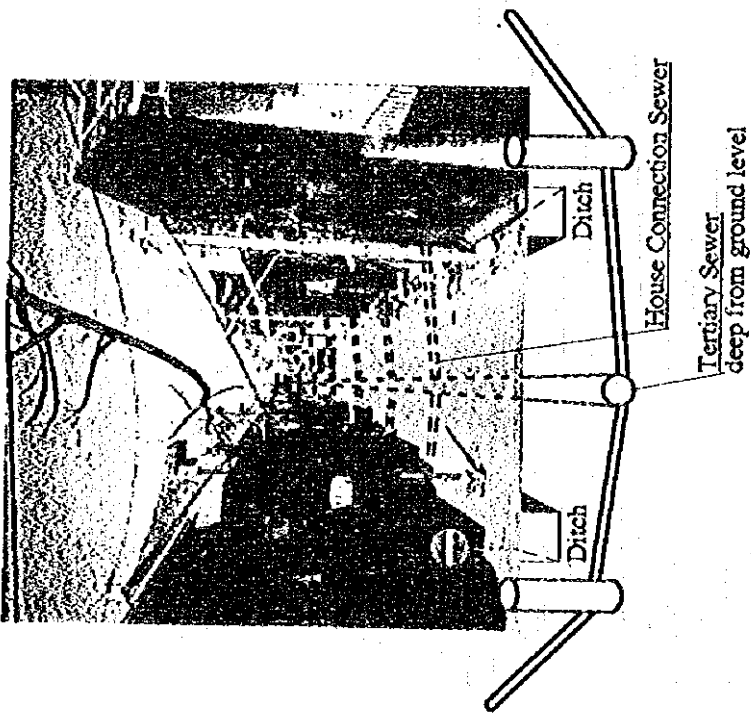


FIG. 5.6 **Layout of Antang Septage Treatment Plant**



Typical Installation of Small Scale Sewer System



Typical Installation of Ordinary Sewer System

FIG. 5.7

Typical Installation Image of Ordinary Sewer and Small Scale Sewer Collection System

MASTER PLAN AND FEASIBILITY STUDY ON WASTEWATER AND SOLID WASTE MANAGEMENT FOR THE CITY OF UJUNG PANDANG IN THE REPUBLIC OF INDONESIA

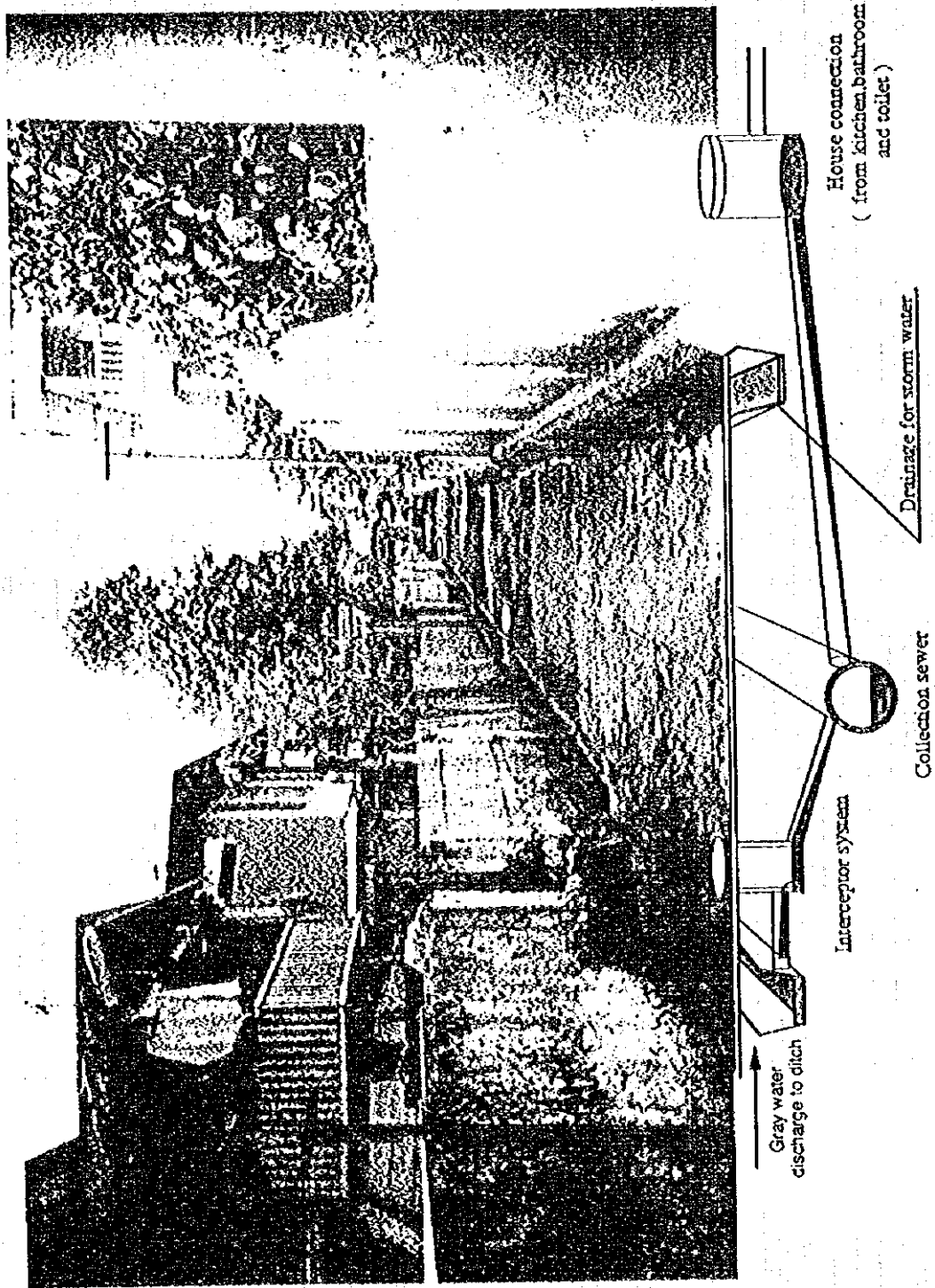


FIG. 5.8

Typical Image of Interceptor Collection System

MASTER PLAN AND FEASIBILITY STUDY ON WASTEWATER AND SOLID WASTE MANAGEMENT FOR THE CITY OF UJUNG PANDANG IN THE REPUBLIC OF INDONESIA

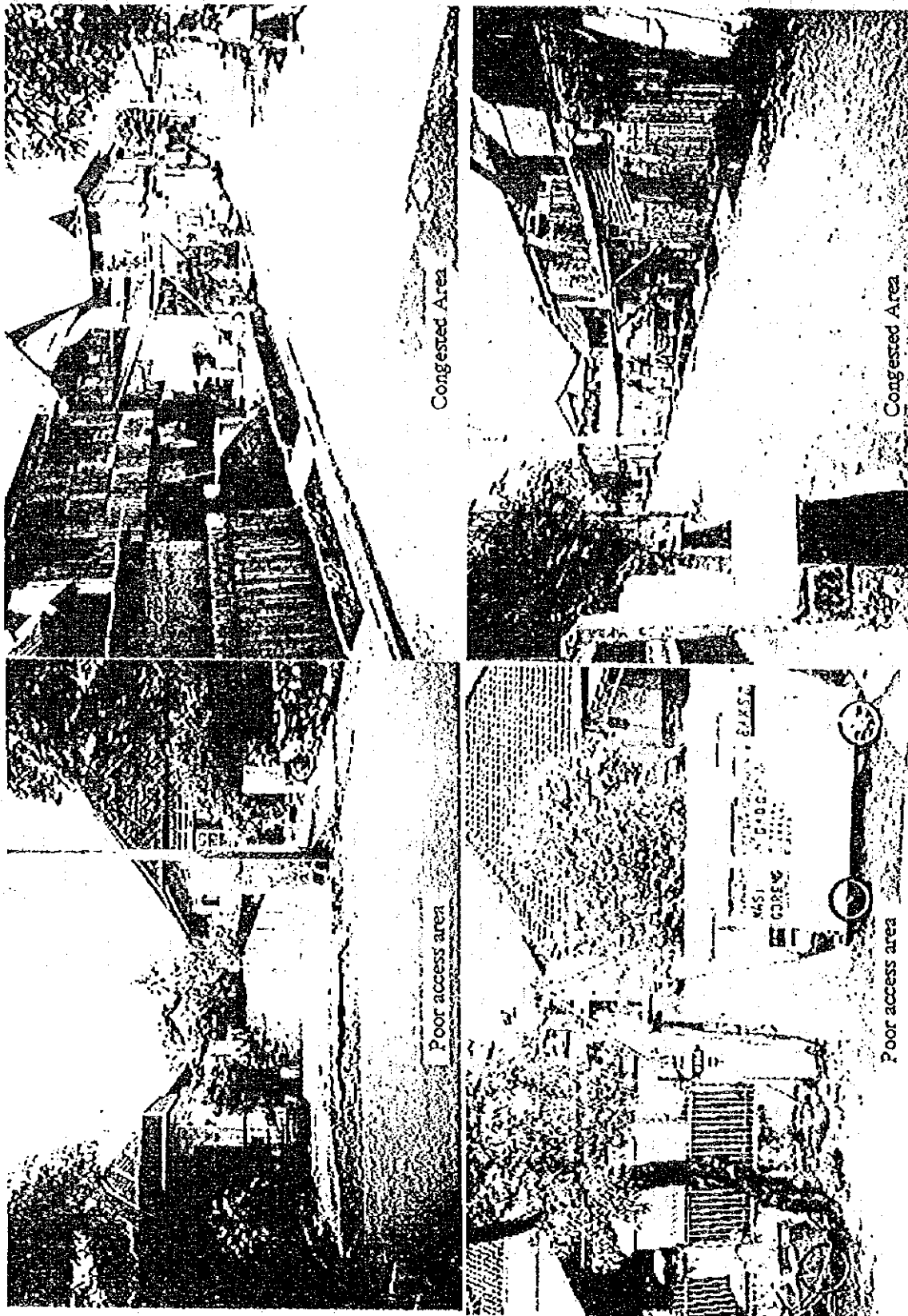
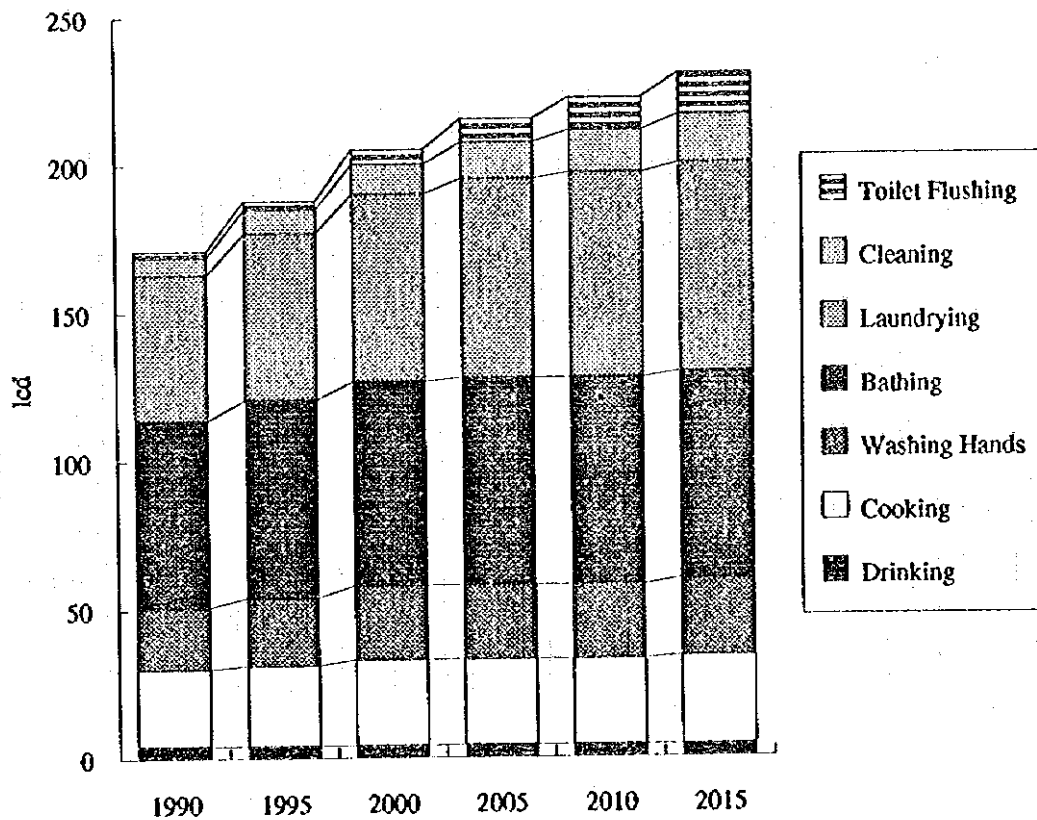


FIG. 5.9

Typical Service Area for Interceptor Collection System

MASTER PLAN AND FEASIBILITY STUDY ON WASTEWATER AND SOLID WASTE MANAGEMENT FOR THE CITY OF UJUNG PANDANG IN THE REPUBLIC OF INDONESIA

						Unit : lcd
Description	1990	1995	2000	2005	2010	2015
Drinking	4	4	4	4	4	4
Cooking	26	27	29	29	29	30
Washing Hands	21	23	25	25	25	26
Bathing	63	67	69	70	70	70
Laundrying	49	56	63	67	69	70
Cleaning	6	8	10	12	14	16
Toilet Flushing	2	3	5	8	11	14
Total	171	188	205	215	222	230



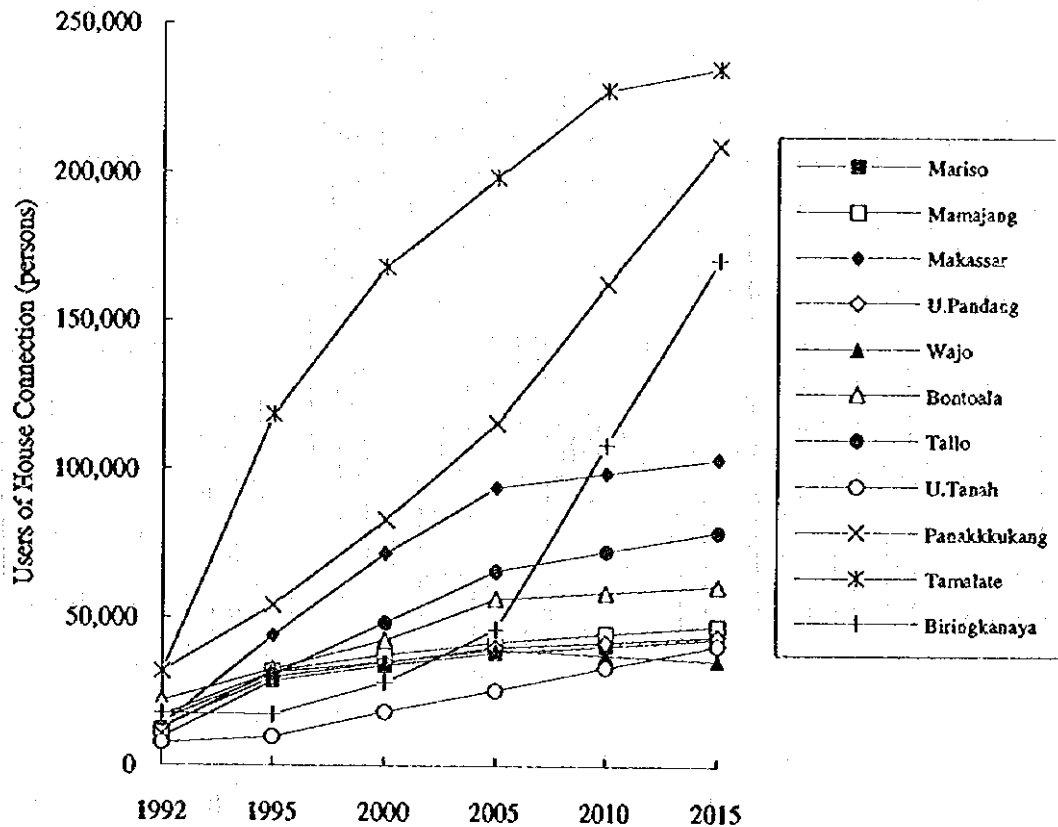
Source : Water Supply Development Plan (PDAM, 1985)

FIG. 5.10

Domestic Water Use by Purpose

MASTER PLAN AND FEASIBILITY STUDY ON WASTEWATER AND SOLID WASTE
MANAGEMENT FOR THE CITY OF UJUNG PANDANG IN THE REPUBLIC OF INDONESIA

	Present (1992)		2005		2015	
	User	Ratio	User	Ratio	User	Ratio
Mariso	35,120	16%	38,053	50%	42,852	57%
Mamajang	38,199	17%	41,758	50%	47,122	57%
Makassar	54,680	14%	93,881	75%	103,380	80%
U.Pandang	35,321	33%	39,884	90%	43,622	90%
Wajo	38,166	36%	39,184	90%	35,448	90%
Bontoala	38,081	32%	56,301	65%	60,757	70%
Tallo	31,913	13%	65,924	40%	79,139	45%
U.Tanah	16,183	16%	25,508	42%	40,715	45%
Panakkukang	91,723	20%	115,565	44%	208,638	48%
Tamalate	147,994	15%	198,148	51%	234,574	55%
Biringkanaya	19,924	23%	46,004	25%	170,395	30%
Total	547,305	19%	760,211	50%	1,066,642	49%



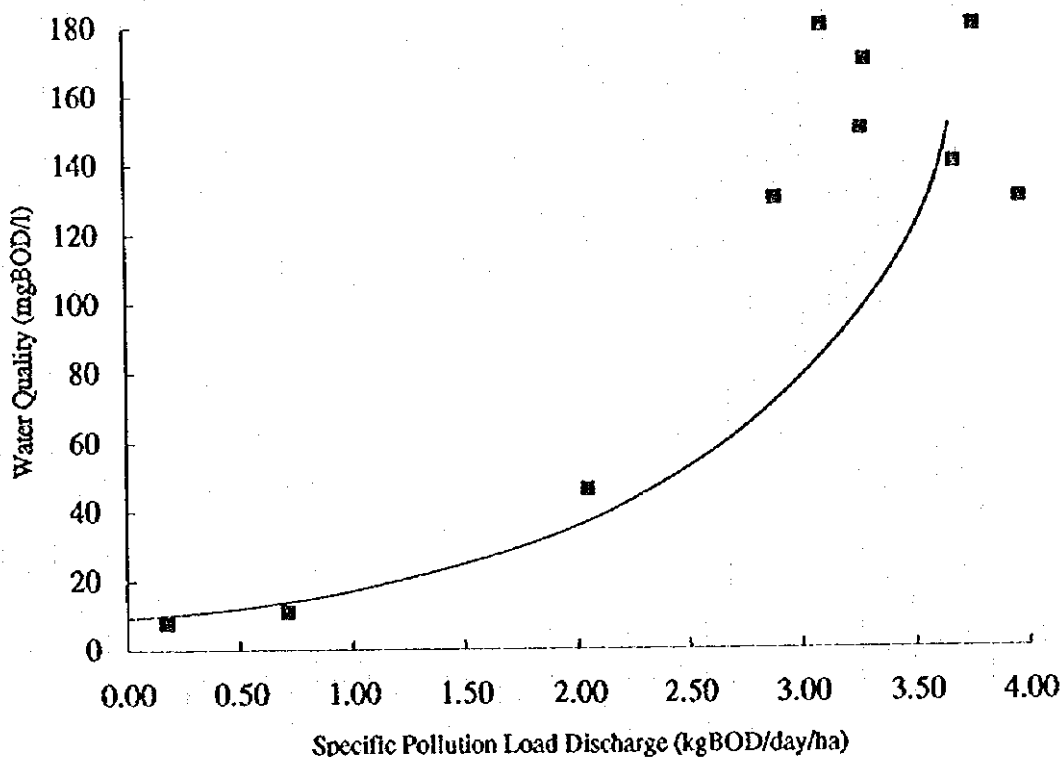
Source : JICA Study Team

FIG. 5.11

User Number and Ratio of House Connection

MASTER PLAN AND FEASIBILITY STUDY ON WASTEWATER AND SOLID WASTE MANAGEMENT FOR THE CITY OF UJUNG PANDANG IN THE REPUBLIC OF INDONESIA

Sample	Catchment Area (ha)	Discharged Pollution Load (kgBOD/day)	Specific Pollution Load Discharge (kgBOD/day/ha)	Water Quality (mgBOD/l)
Jl.Nuri Baru	147	553	3.77	180
Jl.Rajawali	54	216	3.97	130
Jl.Penghibur	93	269	2.89	130
Jl.Ujung Pandang	99	306	3.11	180
Jl.Tarakan	173	568	3.29	170
Jl.Landak Baru	37	122	3.27	150
Sinrijala Canal	77	284	3.68	140
Jongaya Canal	412	843	2.05	46
Pampang	4,551	3,211	0.71	11
Tallo	8,567	1,481	0.17	8



$$y = 7.52 \times 2.15^x$$

y : Water Quality (mgBOD/l)

x : Specific Pollution Load Discharge (kg BOD/day/ha)

r = 0.9603 based on the logarithmic relationship given by :

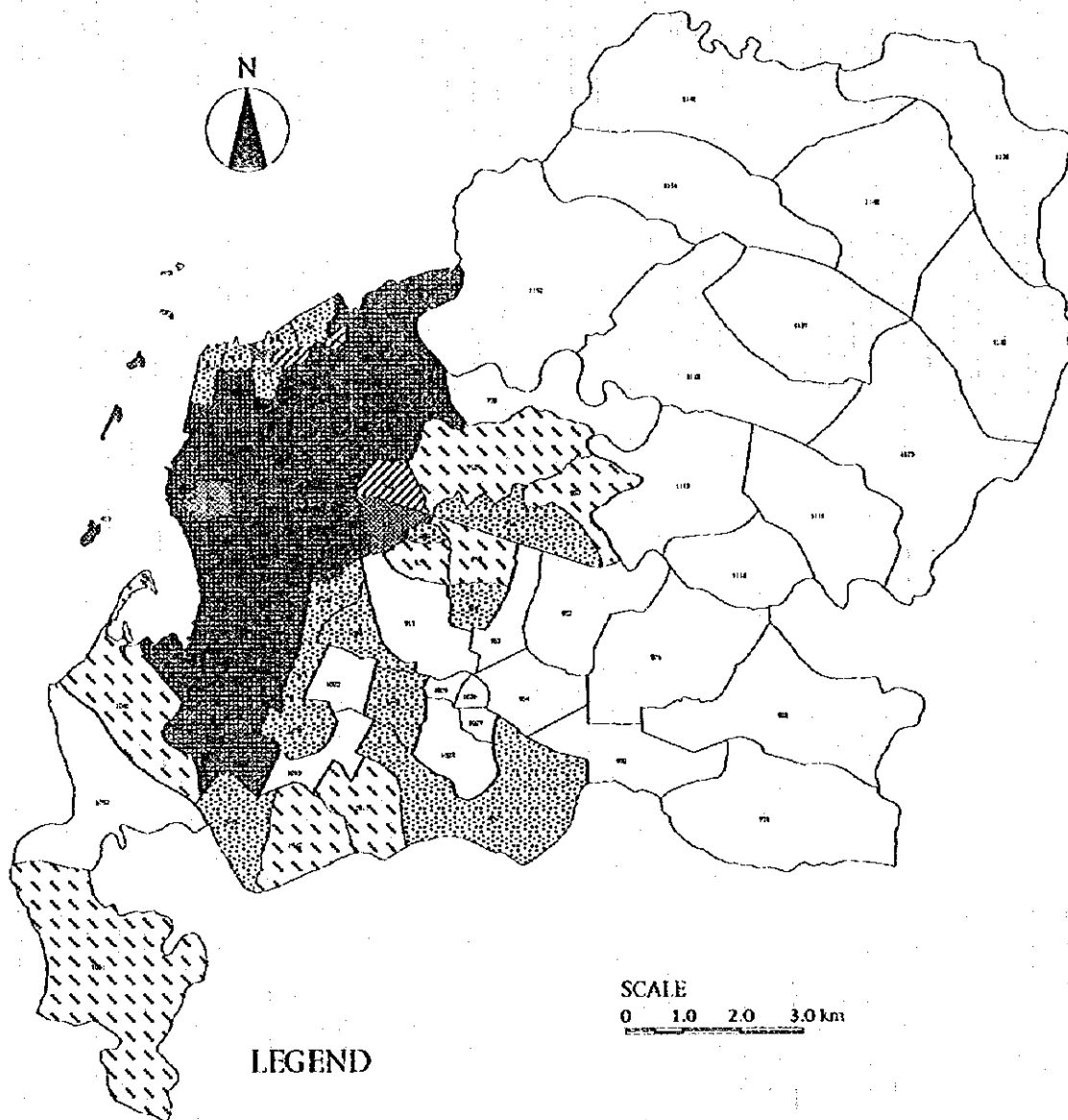
$$\ln y = x \times \ln 2.15 + \ln 7.52$$

Source : JICA Study Team

FIG. 5.12







Correlation between Water Quality and Specific Pollution Load Discharge

MASTER PLAN AND FEASIBILITY STUDY ON WASTEWATER AND SOLID WASTE MANAGEMENT FOR THE CITY OF UJUNG PANDANG IN THE REPUBLIC OF INDONESIA



LEGEND

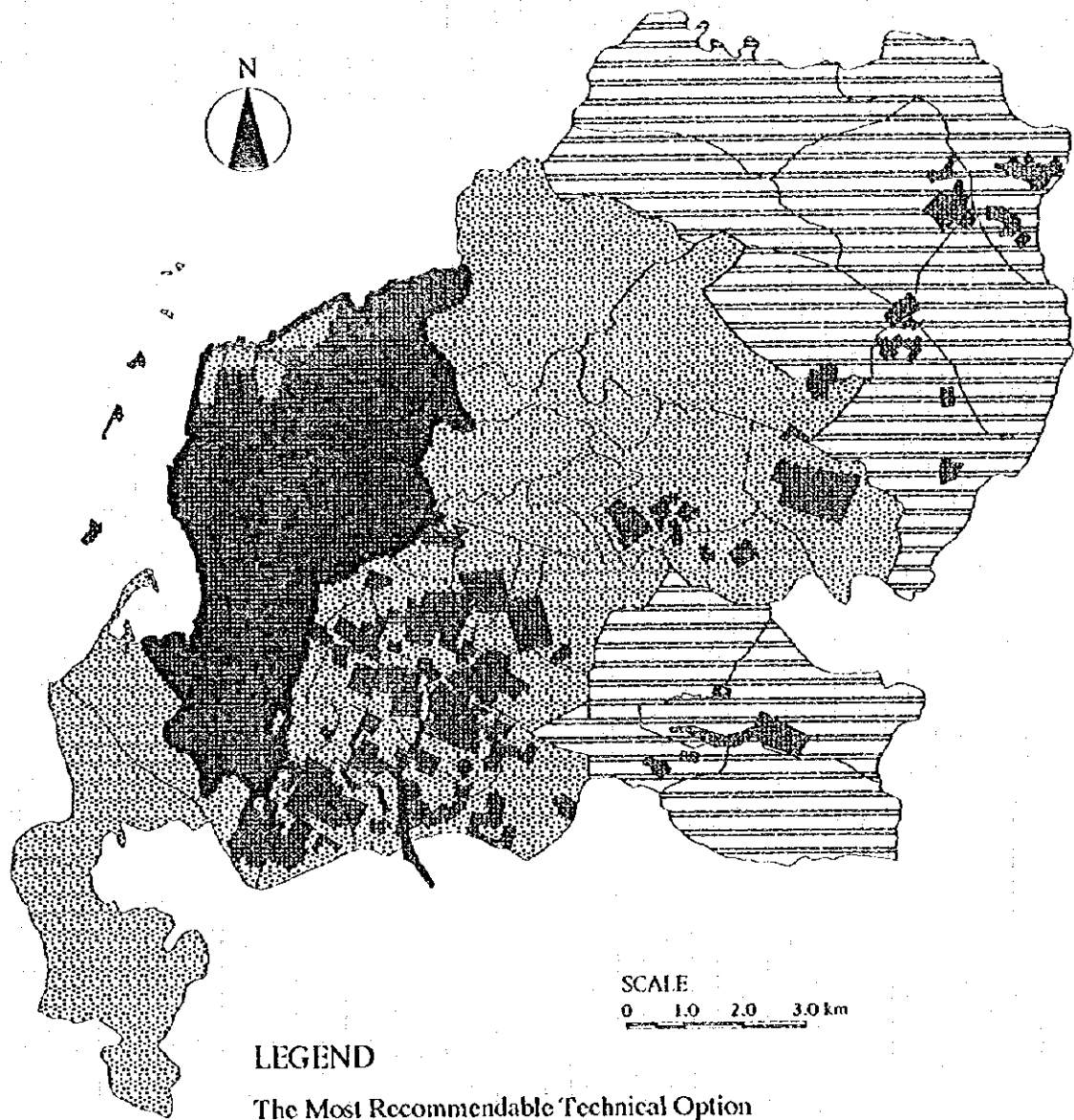
Specific Pollution Load Discharge (kgBOD/day/ha)

-  less than 0.9
-  from 0.9 to 1.8
-  from 1.8 to 2.7
-  from 2.7 to 3.6
-  from 3.6 to 4.5
-  more than 4.5

Source : JICA Study Team

FIG. 5.13 Specific Pollution Load Discharge excluding Housing Estates in 2005

MASTER PLAN AND FEASIBILITY STUDY ON WASTEWATER AND SOLID WASTE MANAGEMENT FOR THE CITY OF UJUNG PANDANG IN THE REPUBLIC OF INDONESIA



LEGEND

The Most Recommendable Technical Option

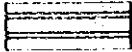



-  Leaching Pit
-  Septic Tank with Leaching Field
-  Off-site System with Secondary Treatment
-  Priority Area

FIG. 5.14

Result of Demarcation for the Short Term Plan

MASTER PLAN AND FRASIBILITY STUDY ON WASTEWATER AND SOLID WASTE MANAGEMENT FOR THE CITY OF UJUNG PANDANG IN THE REPUBLIC OF INDONESIA

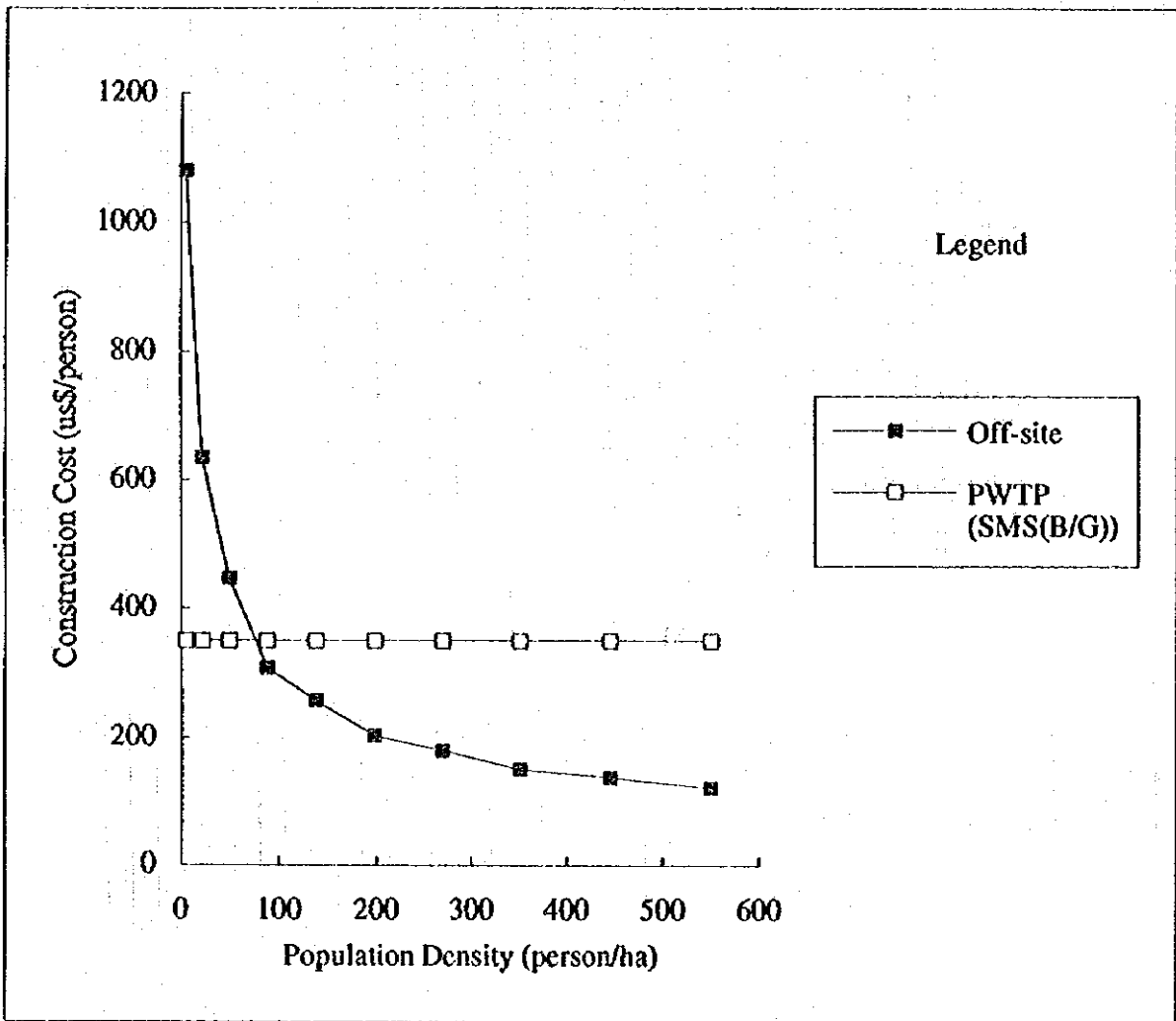


FIG. 5.15

Cost Comparison between CSS and SMS(B/G) using PWTP

MASTER PLAN AND FEASIBILITY STUDY ON WASTEWATER AND SOLID WASTE MANAGEMENT FOR THE CITY OF UJUNG PANDANG IN THE REPUBLIC OF INDONESIA

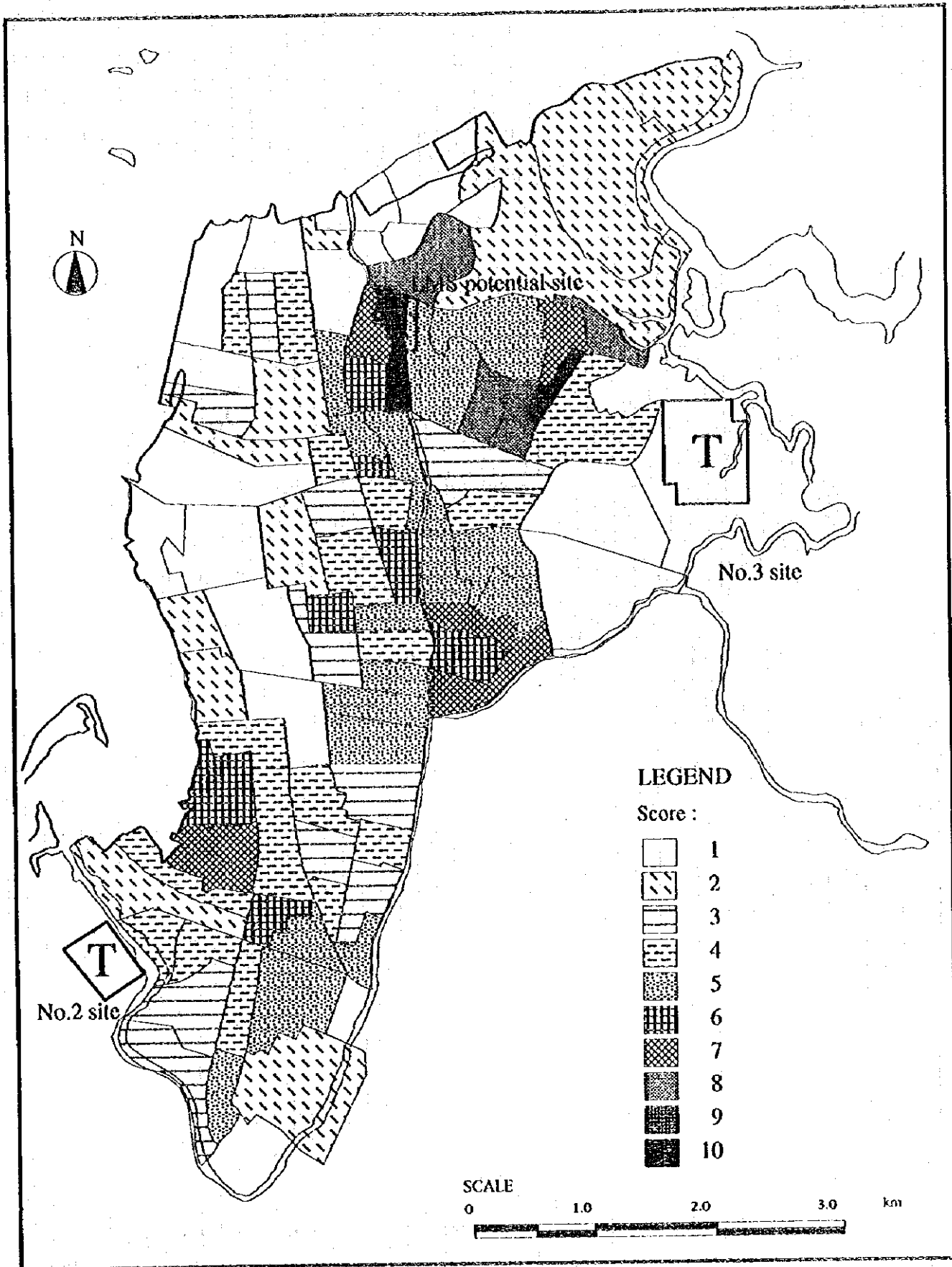


FIG. 5.16 **Score of Population Density by Kelurahan**

MASTER PLAN AND FEASIBILITY STUDY ON WASTEWATER AND SOLID WASTE MANAGEMENT FOR THE CITY OF UJUNG PANDANG IN THE REPUBLIC OF INDONESIA

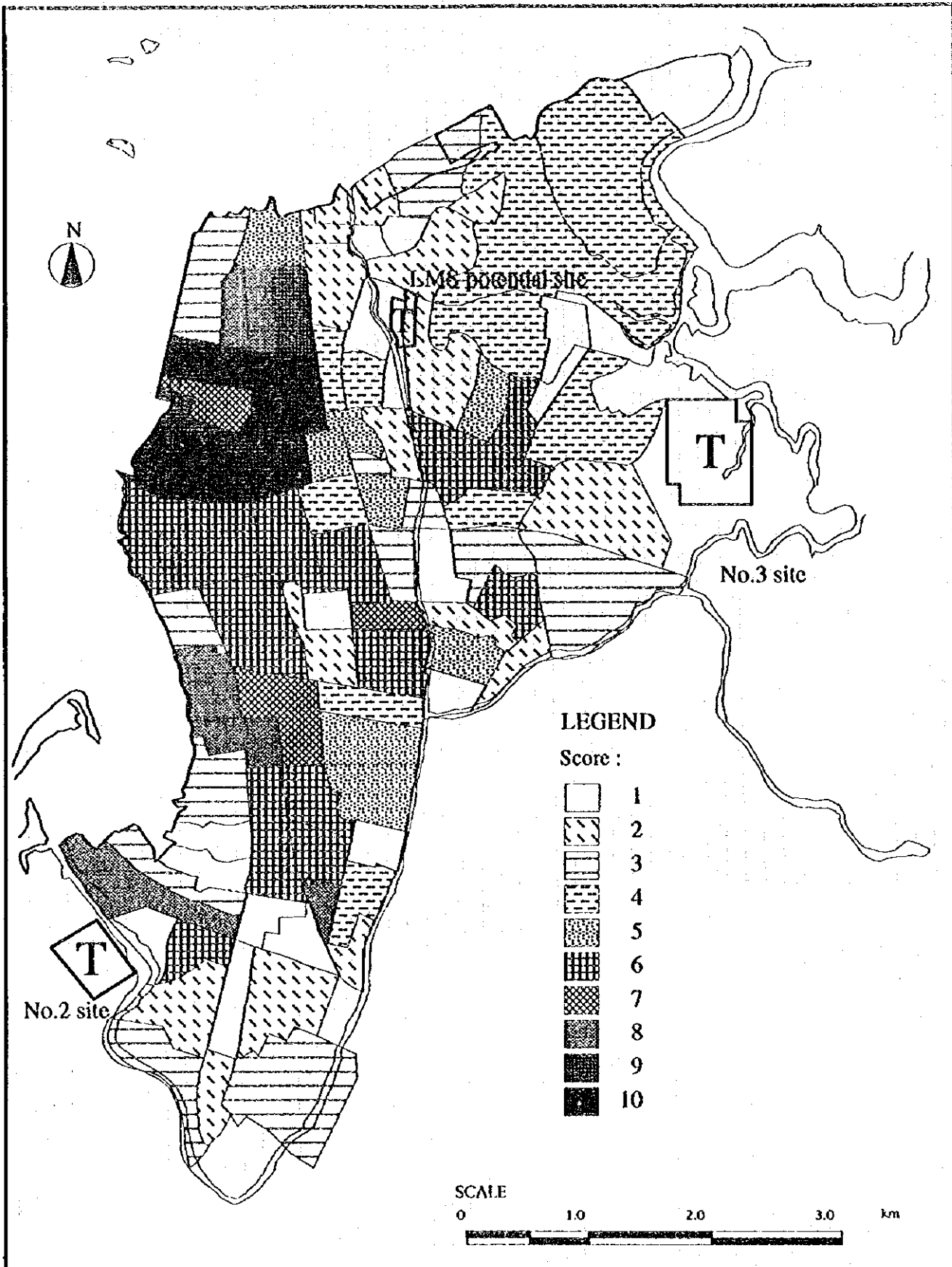


FIG. 5.17

Score of Public Land Use Ratio by Kelurahan

MASTER PLAN AND FEASIBILITY STUDY ON WASTEWATER AND SOLID WASTE MANAGEMENT FOR THE CITY OF UJUNG PANDANG IN THE REPUBLIC OF INDONESIA

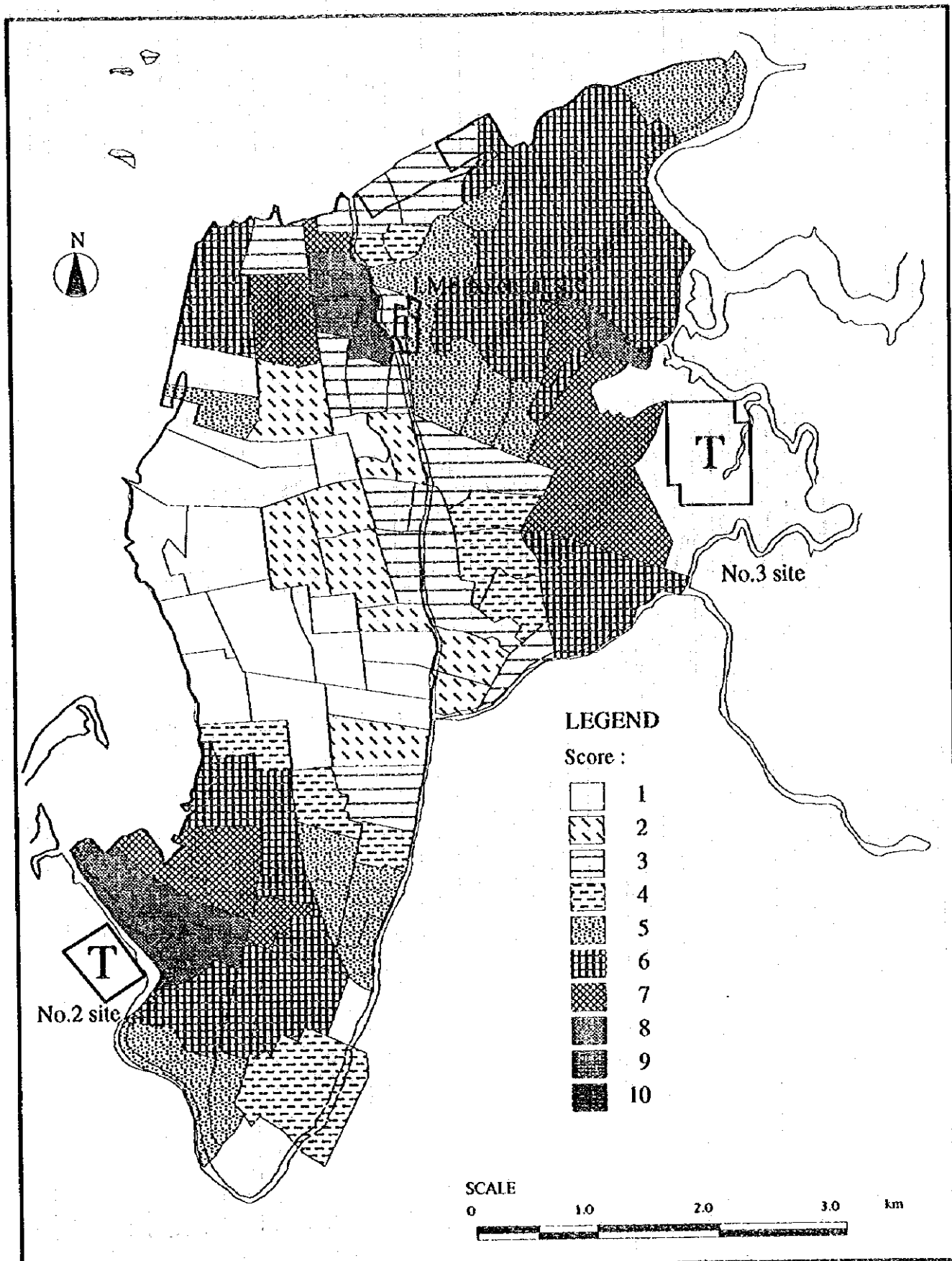


FIG. 5.18

Score of Distance from WTP by Kelurahan

MASTER PLAN AND FEASIBILITY STUDY ON WASTEWATER AND SOLID WASTE MANAGEMENT FOR THE CITY OF UJUNG PANDANG IN THE REPUBLIC OF INDONESIA

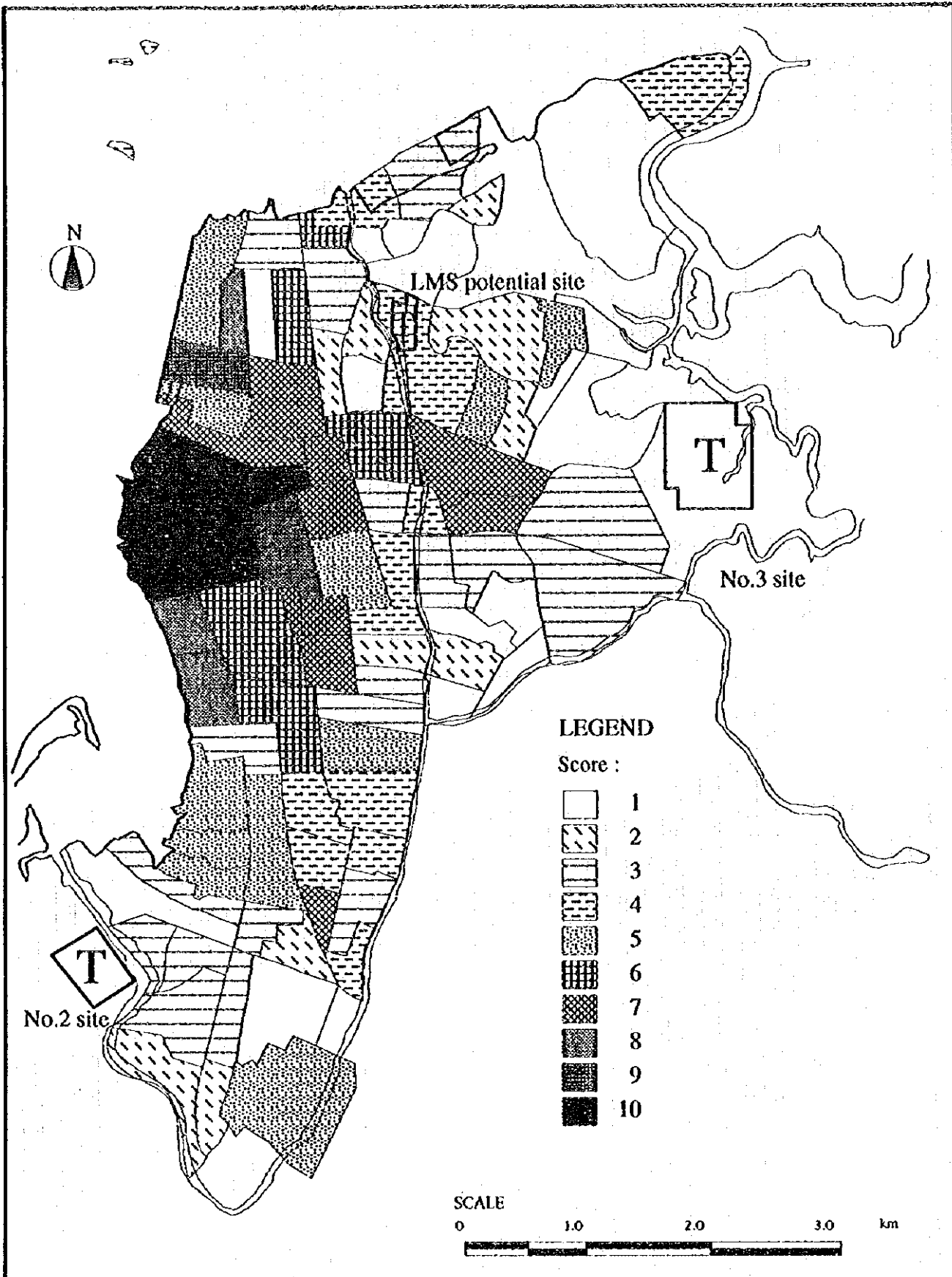


FIG. 5.19

Score of Average Income Level by Kelurahan

MASTER PLAN AND FEASIBILITY STUDY ON WASTEWATER AND SOLID WASTE MANAGEMENT FOR THE CITY OF UJUNG PANDANG IN THE REPUBLIC OF INDONESIA

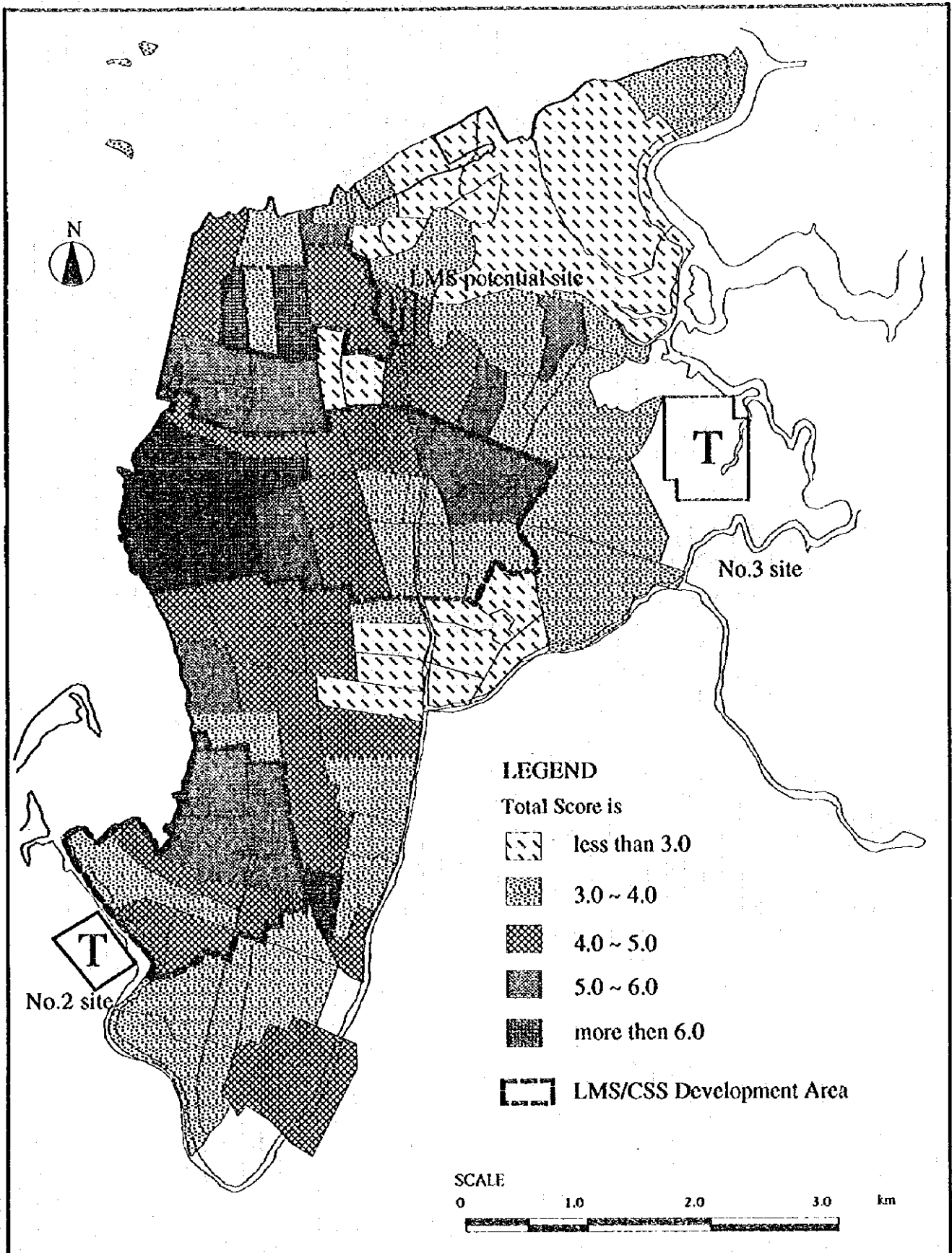


FIG. 5.20

Selection of LMS/CSS Development Area

MASTER PLAN AND FEASIBILITY STUDY ON WASTEWATER AND SOLID WASTE MANAGEMENT FOR THE CITY OF UJUNG PANDANG IN THE REPUBLIC OF INDONESIA

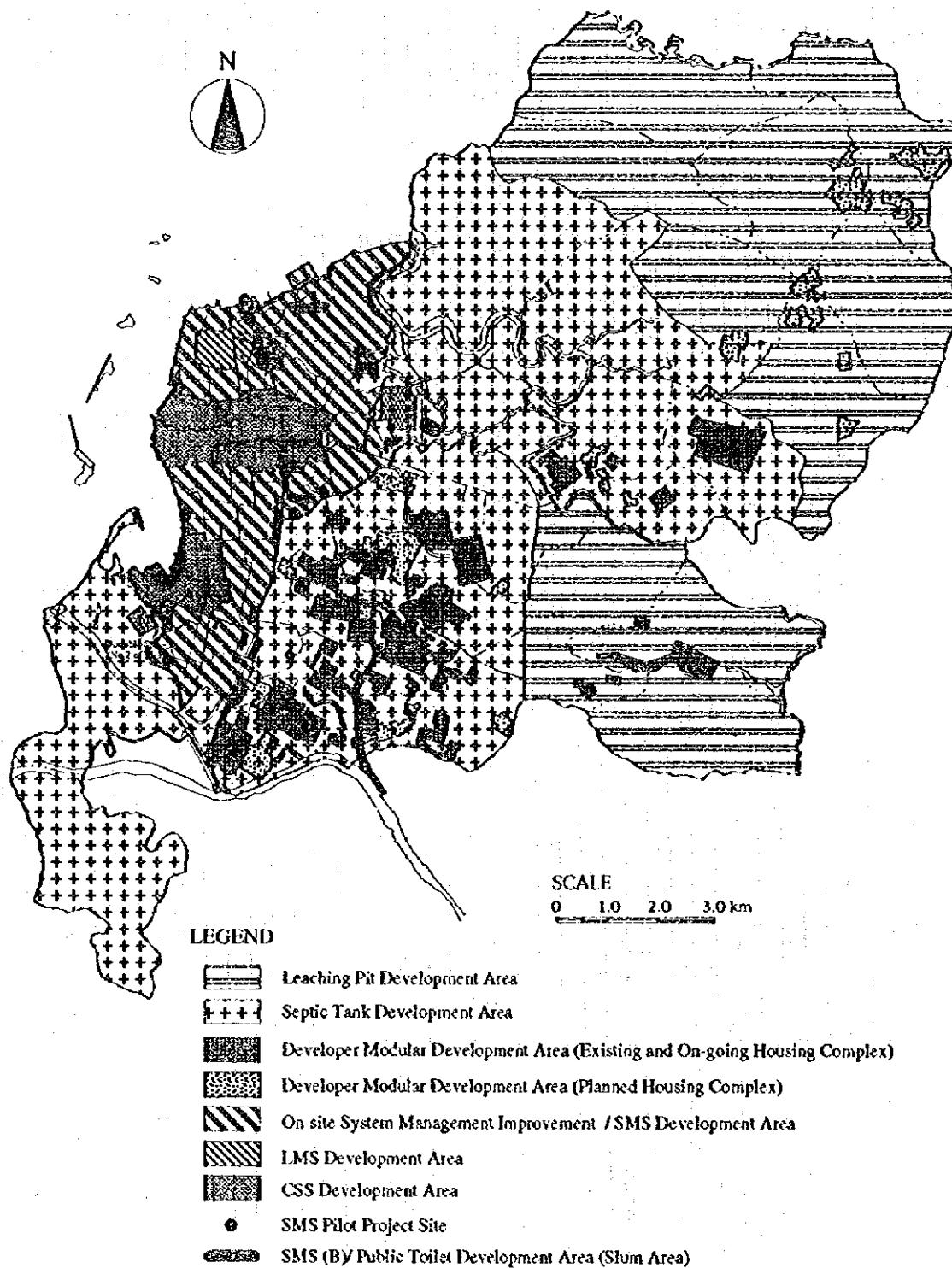


FIG. 5.21

Short Term Wastewater Management Plan in 2005

MASTER PLAN AND FEASIBILITY STUDY ON WASTEWATER AND SOLID WASTE MANAGEMENT FOR THE CITY OF UJUNG PANDANG IN THE REPUBLIC OF INDONESIA

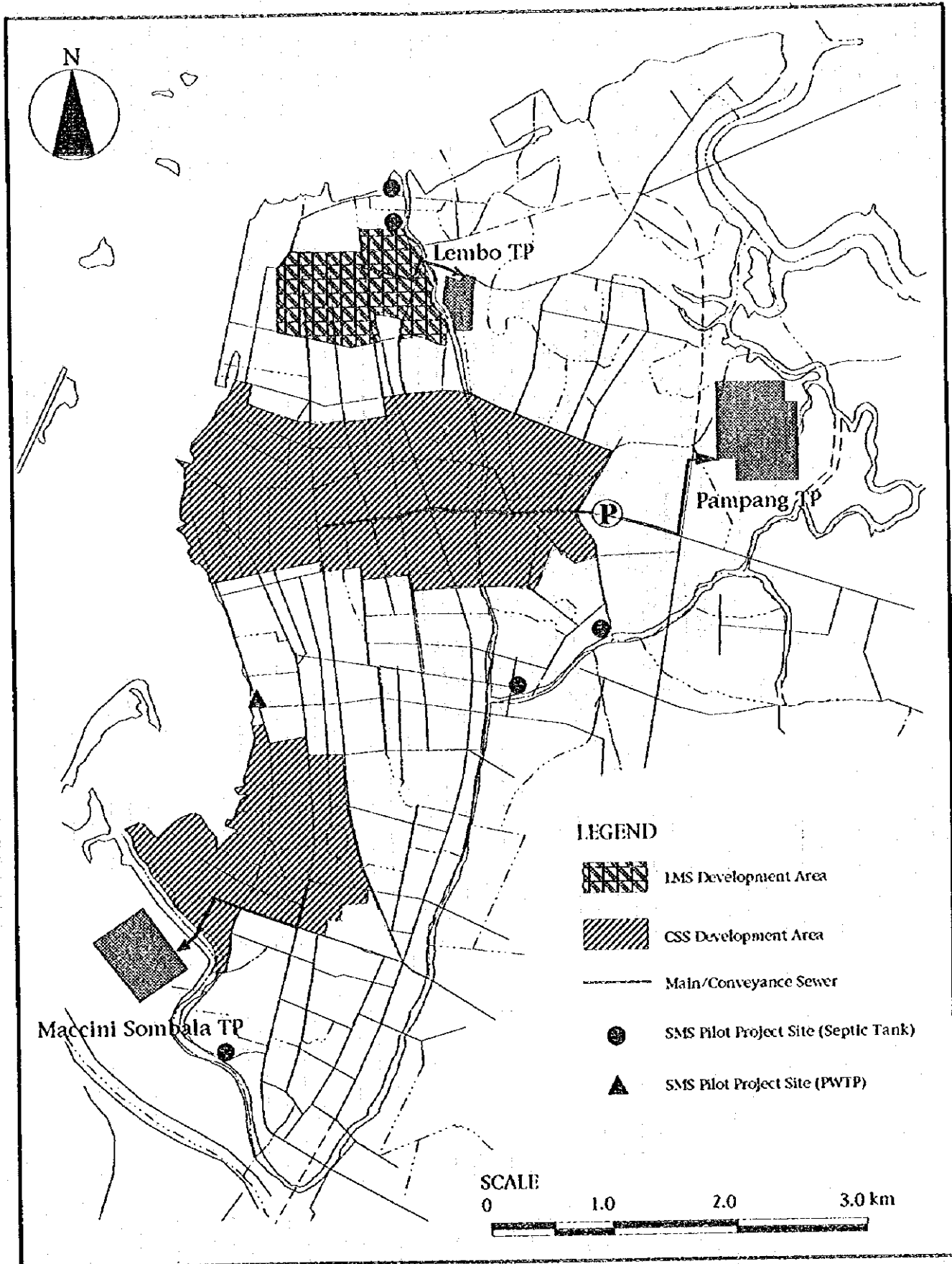
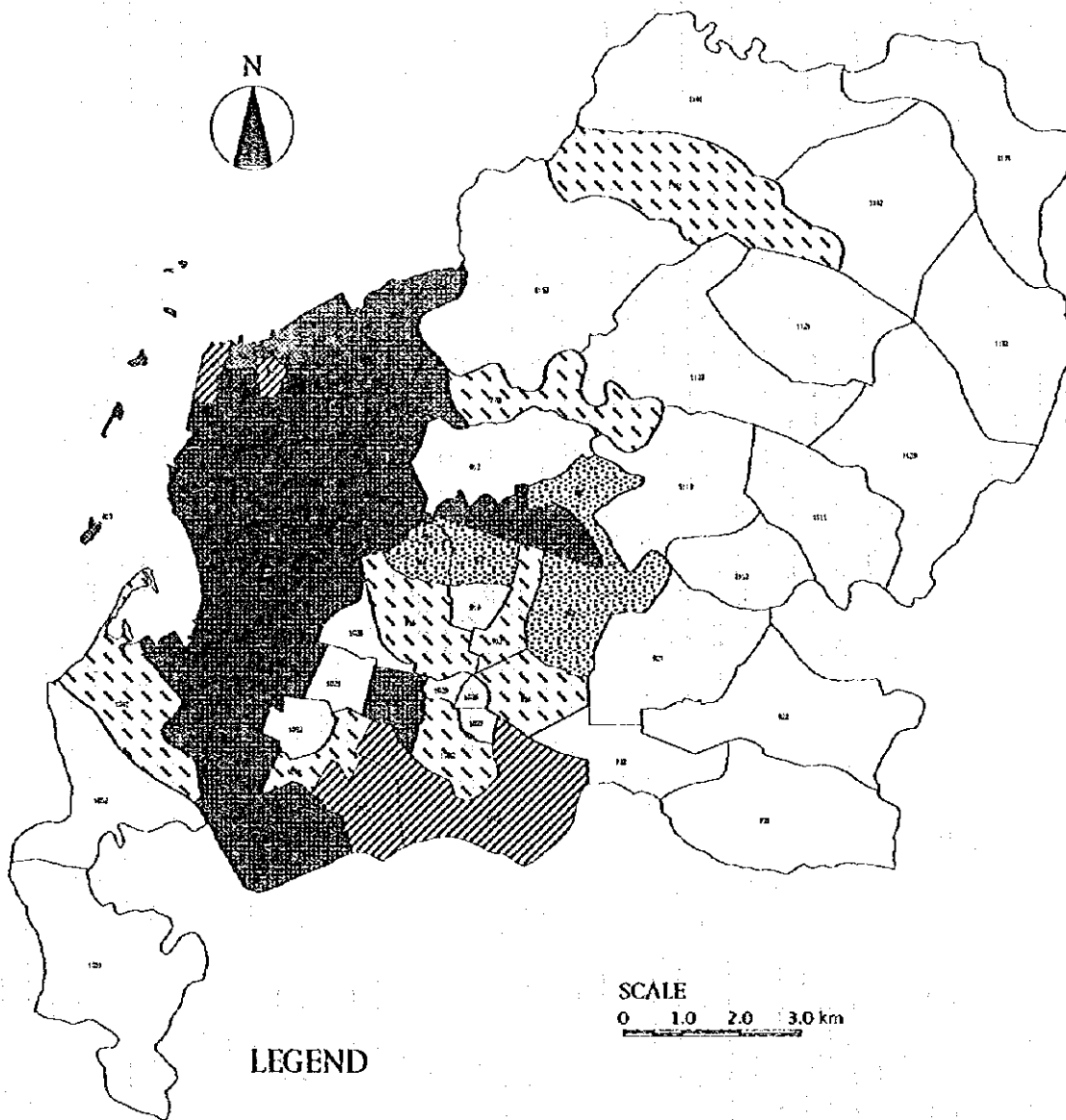


FIG. 5.22







LMS/CSS Development Plant until 2005 and SMS Pilot Project Sites

MASTER PLAN AND FEASIBILITY STUDY ON WASTEWATER AND SOLID WASTE MANAGEMENT FOR THE CITY OF UJUNG PANDANG IN THE REPUBLIC OF INDONESIA



LEGEND

Specific Pollution Load Discharge (kgBOD/day/ha)

-  less than 0.9
-  from 0.9 to 1.8
-  from 1.8 to 2.7
-  from 2.7 to 3.6
-  from 3.6 to 4.5
-  more than 4.5

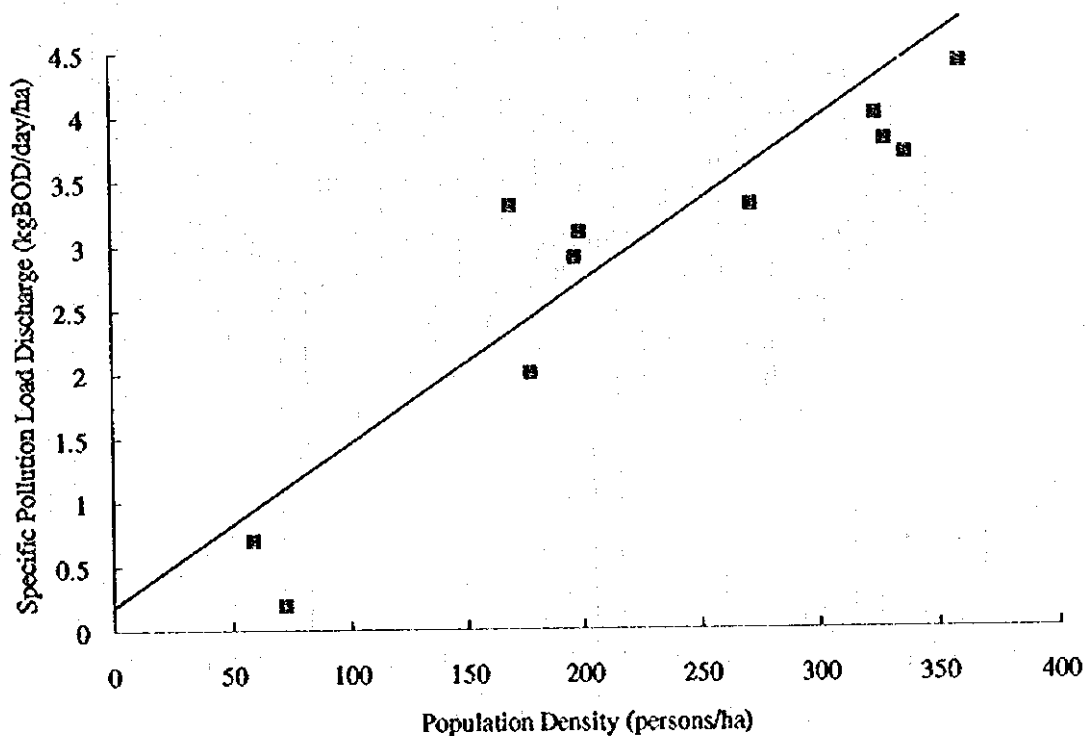
Source : JICA Study Team

FIG. 5.23

Specific Pollution Load Discharge Excluding Housing Estates in 2015

MASTER PLAN AND FEASIBILITY STUDY ON WASTEWATER AND SOLID WASTE MANAGEMENT FOR THE CITY OF UJUNG PANDANG IN THE REPUBLIC OF INDONESIA

Sample	Catchment Area (ha)	Population in 1992	Population Density (persons/ha)	Specific Pollution Load Discharge (kgBOD/day/ha)
Jl.Nuri Baru	147	26,050	177	3.77
Jl.Rajawali	54	73,000	1,341	3.97
Jl.Penghibur	93	48,333	519	2.89
Jl.Ujung Pandang	99	17,727	180	3.11
Jl.Tarakan	173	18,334	106	3.29
Jl.Landak Baru	37	19,659	526	3.27
Sinrijala Canal	77	29,095	377	3.68
Jongaya Canal	412	10,156	25	2.05
Pampang	4,551	266,578	59	0.71
Tallo	8,567	622,146	73	0.17



$$y = 0.01255 x + 0.19411$$

y : Specific Pollution Load Discharge (kg BOD/day/ha)

x : Population Density (persons/ha)

$$r = 0.91811$$

Source : JICA Study Team

FIG. 5.24

Correlation between Population Density and Specific Pollution Load Discharge

MASTER PLAN AND FEASIBILITY STUDY ON WASTEWATER AND SOLID WASTE MANAGEMENT FOR THE CITY OF UJUNG PANDANG IN THE REPUBLIC OF INDONESIA

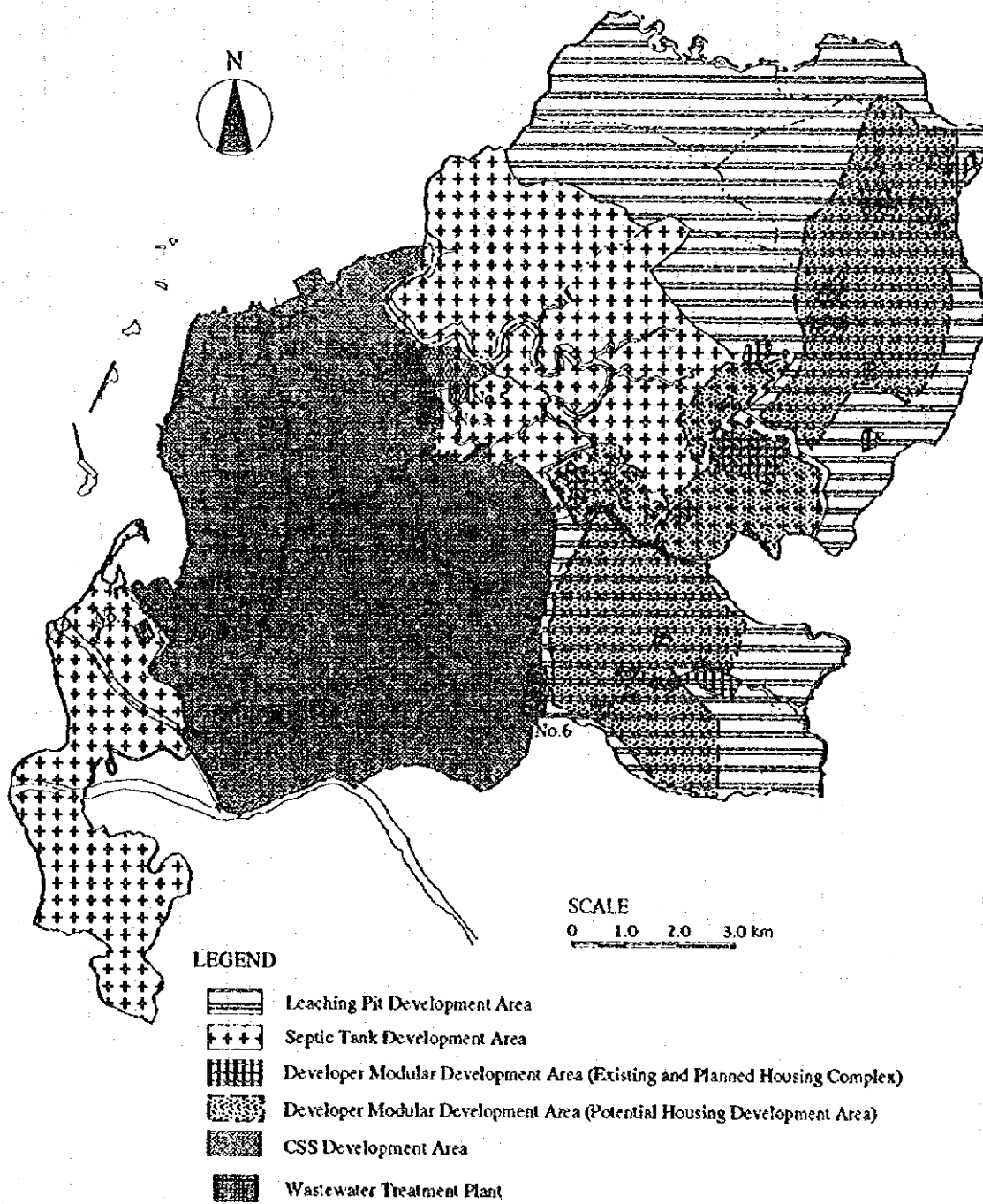


FIG. 5.25

Master Plan of Wastewater Management in 2015

MASTER PLAN AND FEASIBILITY STUDY ON WASTEWATER AND SOLID WASTE MANAGEMENT FOR THE CITY OF UJUNG PANDANG IN THE REPUBLIC OF INDONESIA

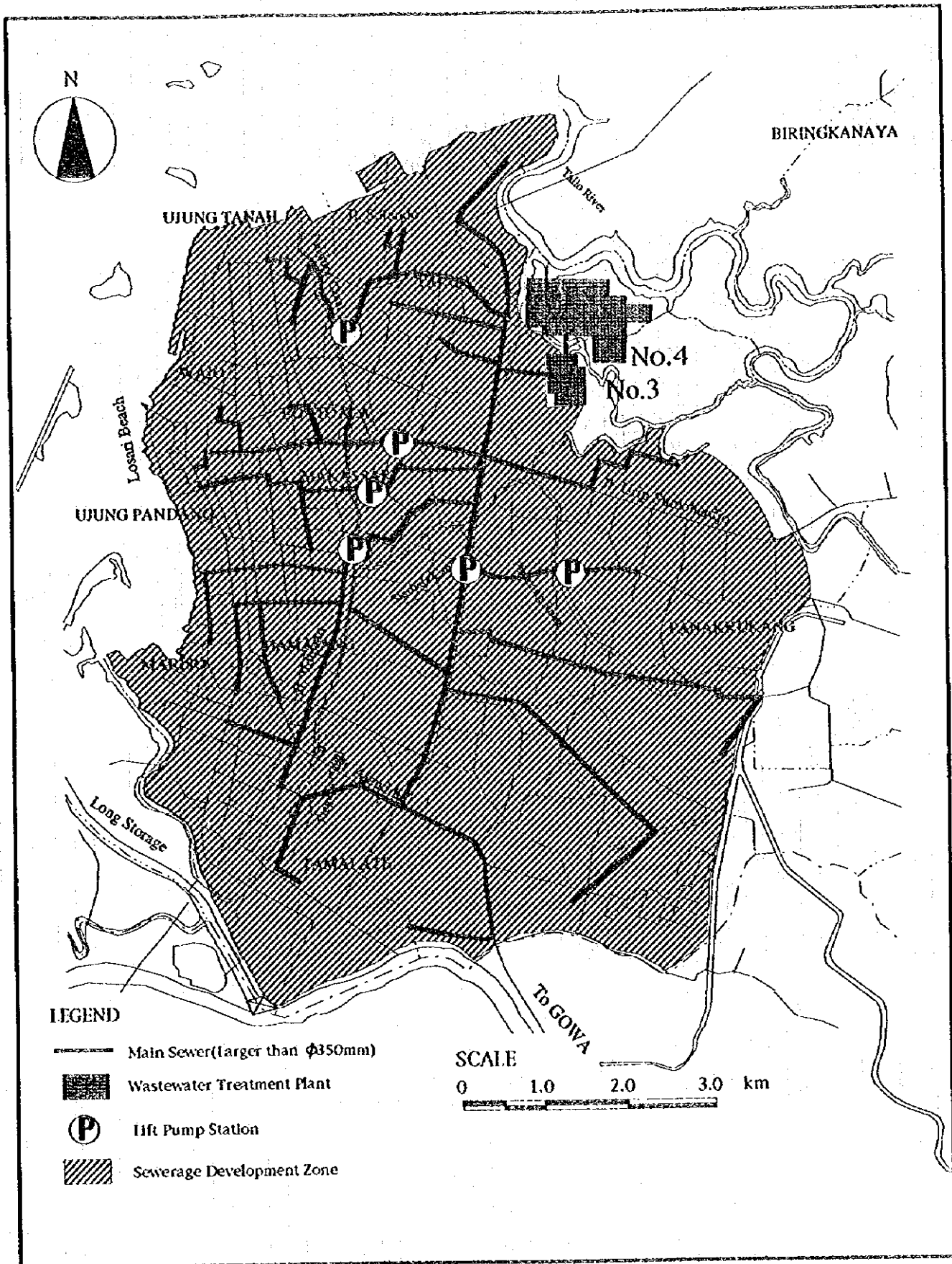


FIG. 5.26

Sewerage Development Plan of Alternative 1

MASTER PLAN AND FEASIBILITY STUDY ON WASTEWATER AND SOLID WASTE MANAGEMENT FOR THE CITY OF UJUNG PANDANG IN THE REPUBLIC OF INDONESIA

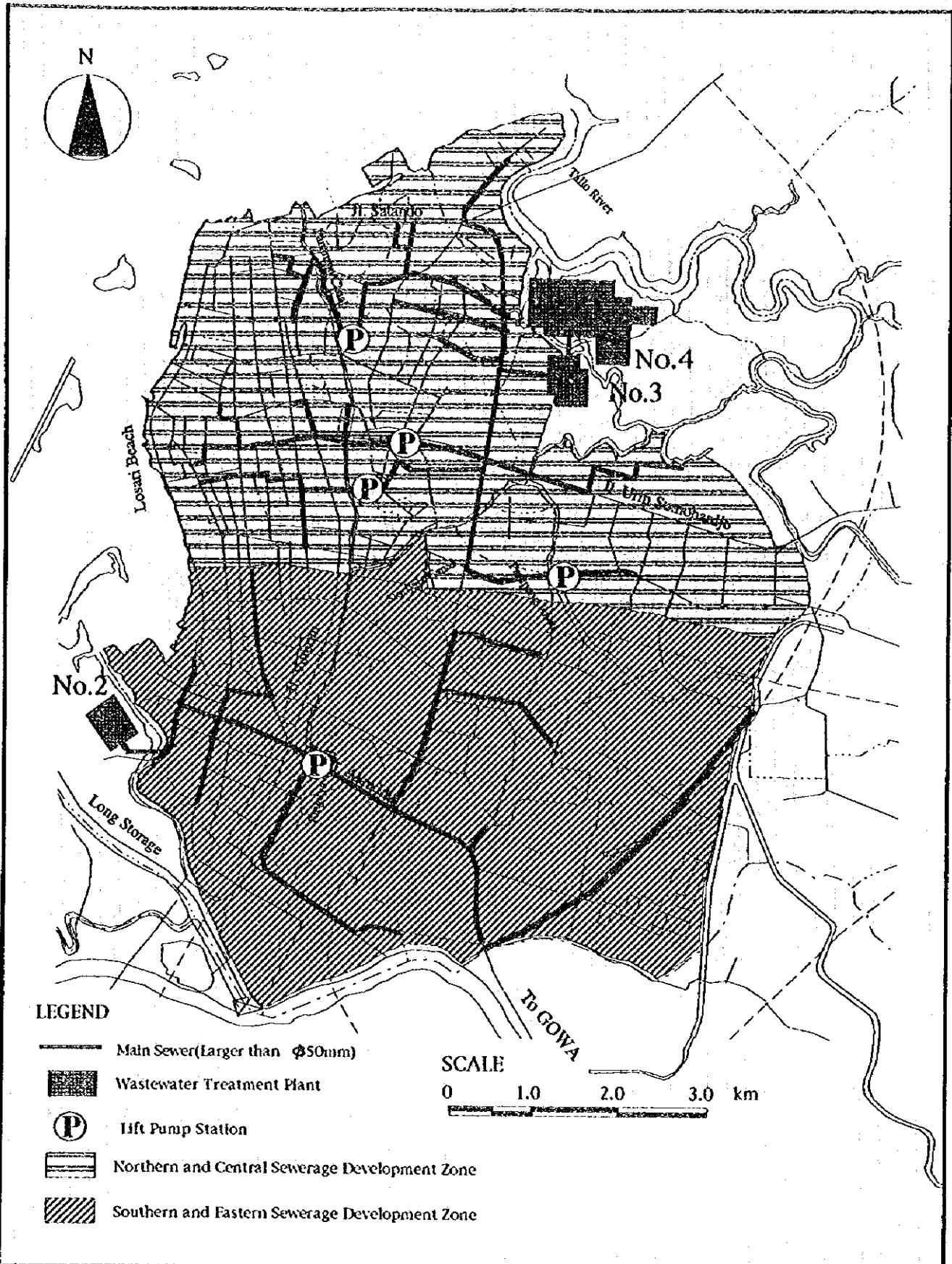


FIG. 5.27 Sewerage Development Plan of Alternative 2

MASTER PLAN AND FEASIBILITY STUDY ON WASTEWATER AND SOLID WASTE MANAGEMENT FOR THE CITY OF UJUNG PANDANG IN THE REPUBLIC OF INDONESIA

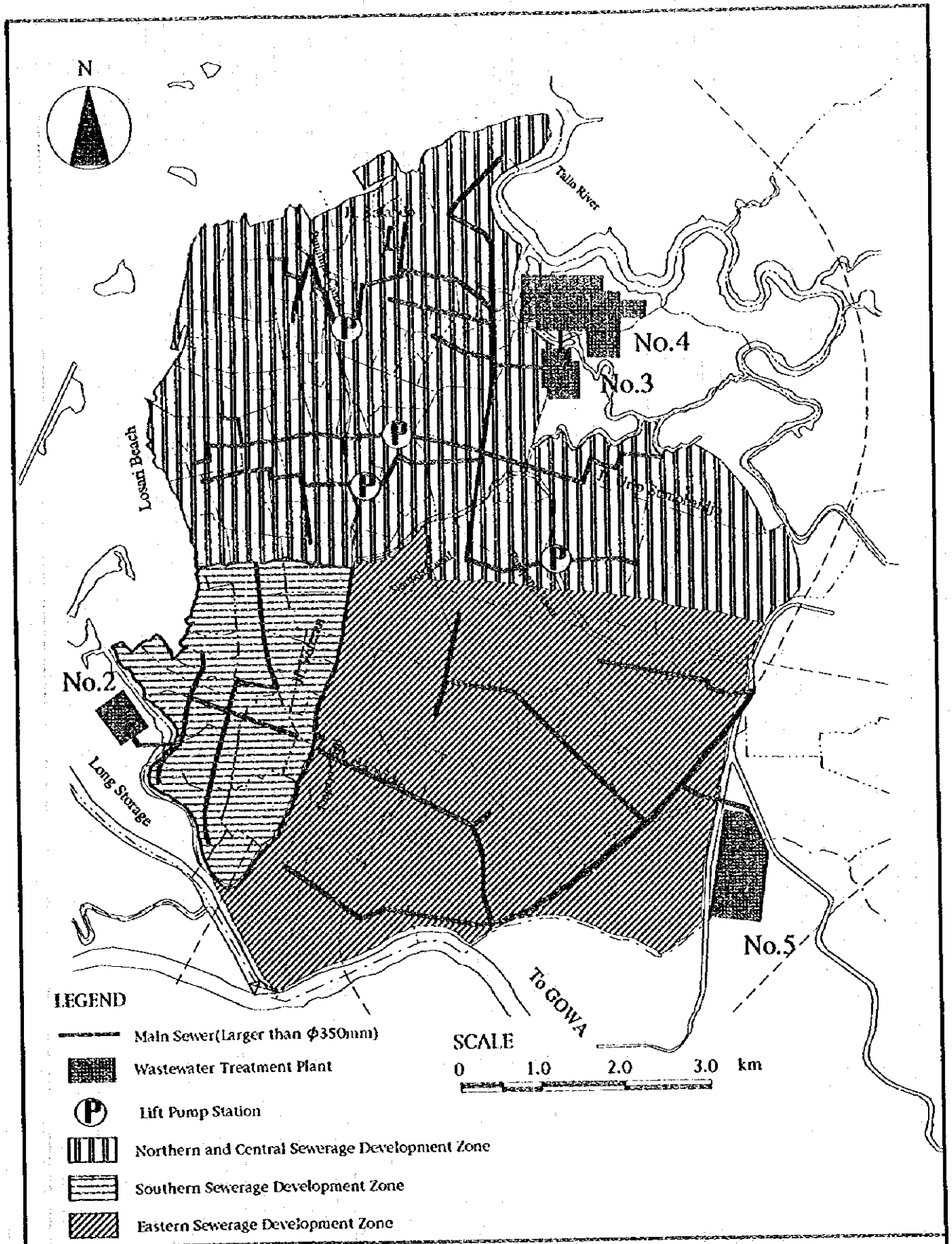


FIG. 5.28 Sewerage Development Plan of Alternative 3

MASTER PLAN AND FEASIBILITY STUDY ON WASTEWATER AND SOLID WASTE MANAGEMENT FOR THE CITY OF UJUNG PANDANG IN THE REPUBLIC OF INDONESIA

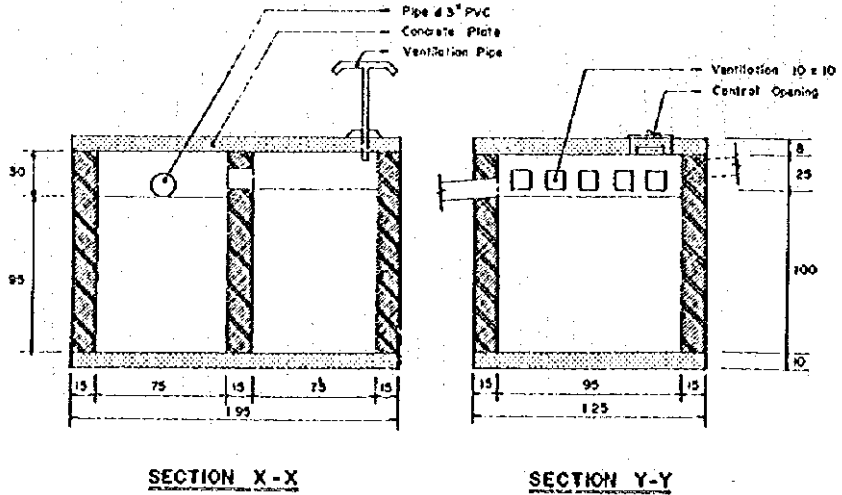
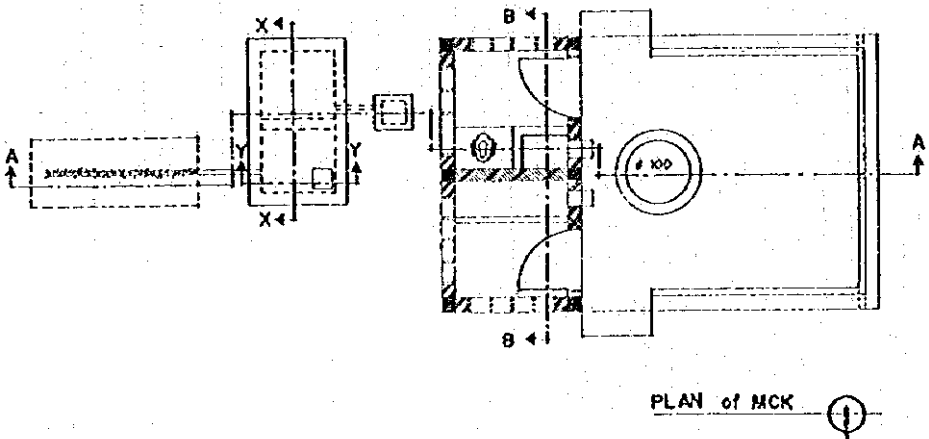
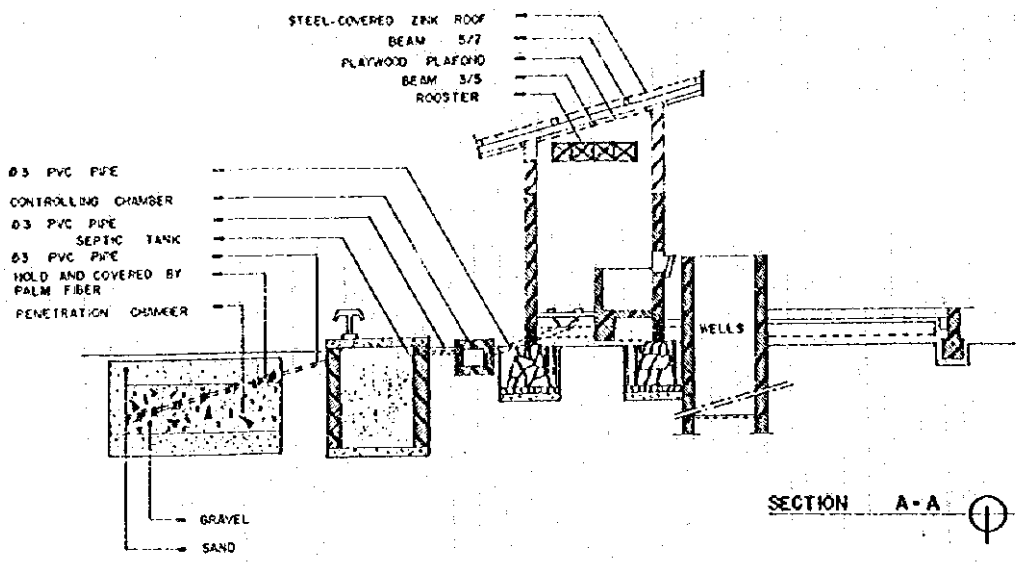


FIG. 5.29 Typical Public Toilet (MCK)

MASTER PLAN AND FEASIBILITY STUDY ON WASTEWATER AND SOLID WASTE MANAGEMENT FOR THE CITY OF UJUNG PANDANG IN THE REPUBLIC OF INDONESIA

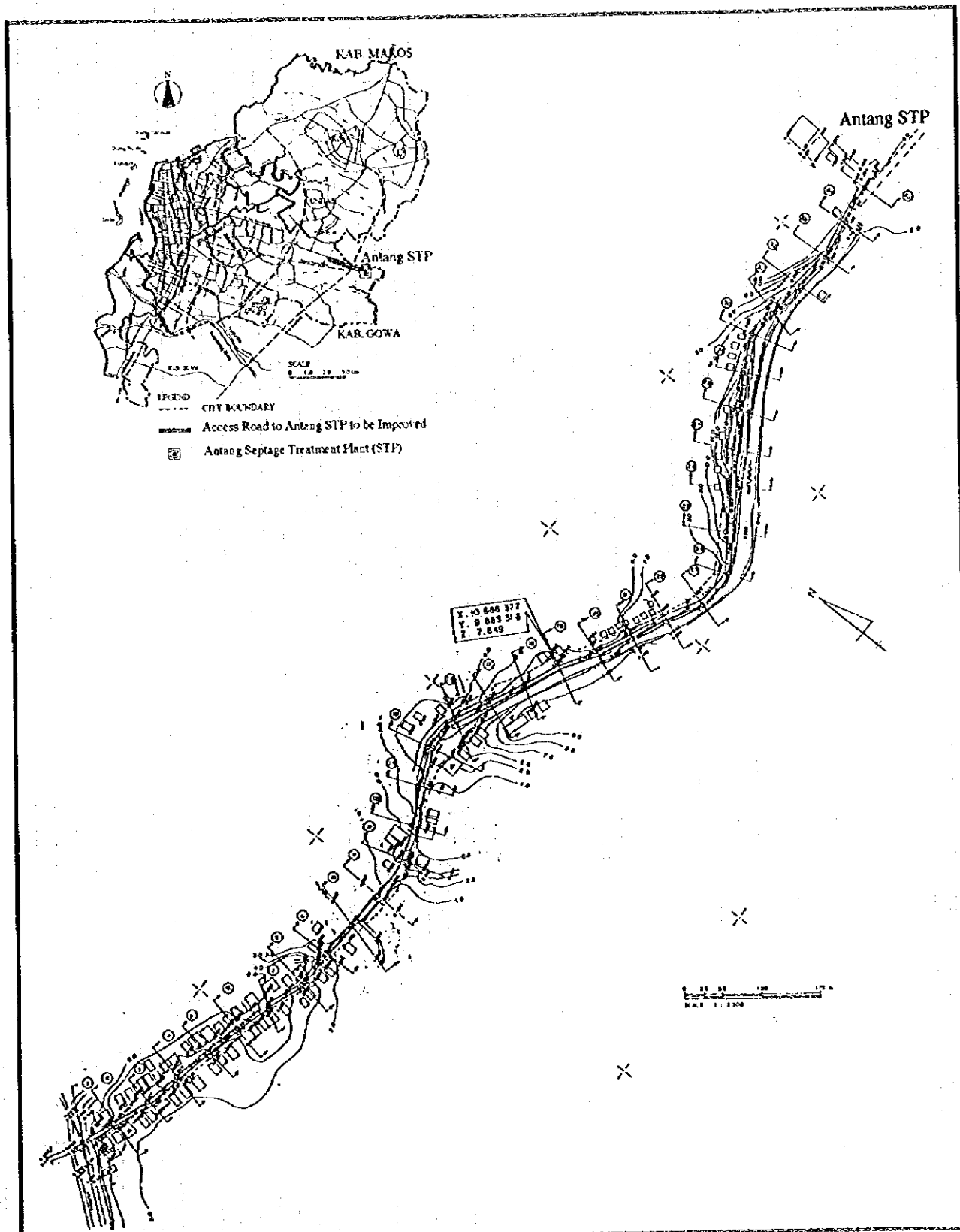


FIG. 5.30 | Access Road to Antang STP for Improvement

MASTER PLAN AND FEASIBILITY STUDY ON WASTEWATER AND SOLID WASTE MANAGEMENT FOR THE CITY OF UJUNG PANDANG IN THE REPUBLIC OF INDONESIA

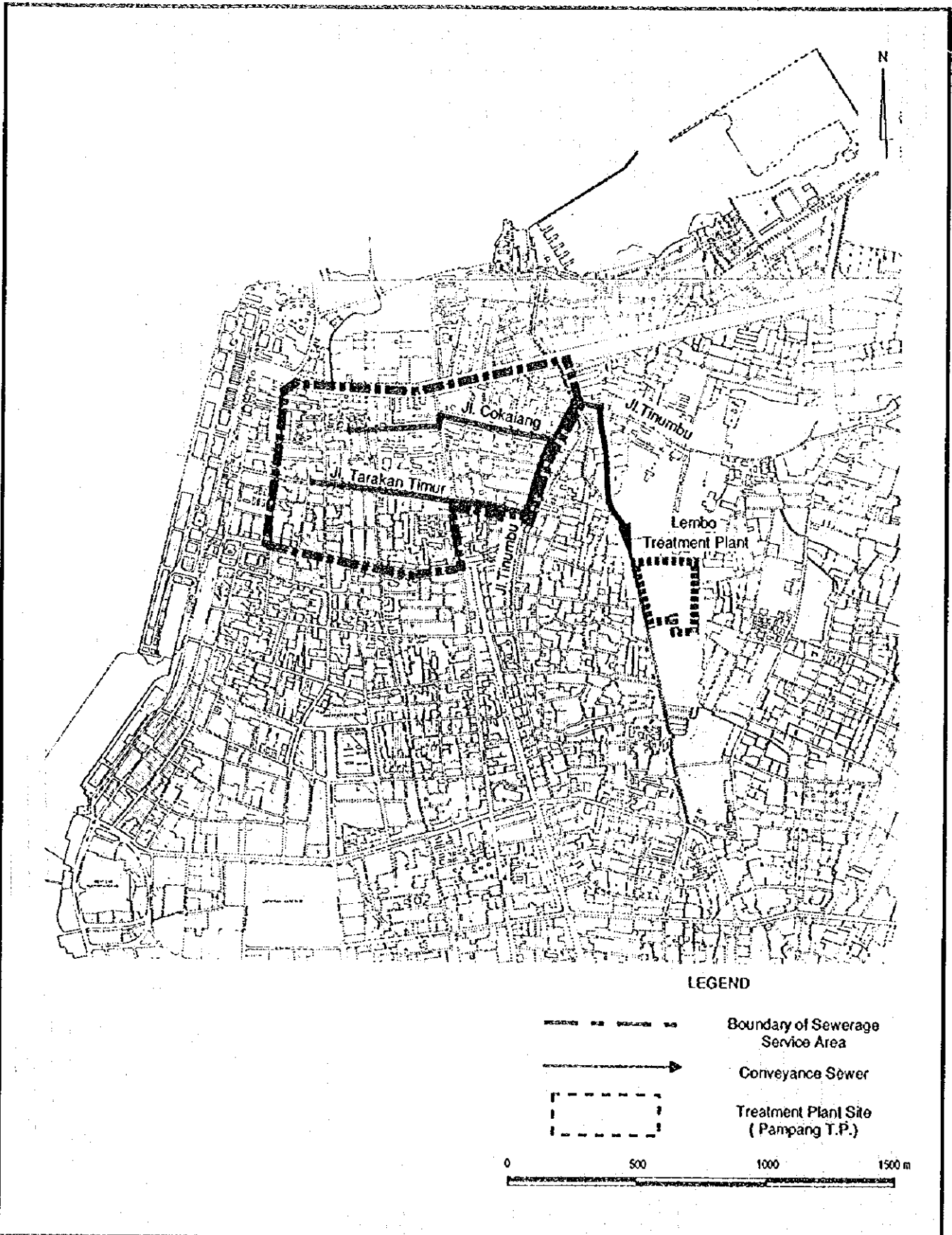


FIG. 5.31 **Northern Sewerage System**

MASTER PLAN AND FEASIBILITY STUDY ON WASTEWATER AND SOLID WASTE MANAGEMENT FOR THE CITY OF UJUNG PANDANG IN THE REPUBLIC OF INDONESIA

DRILL HOLE LOG
BORING NO.: BH-1

PROJECT: WASTE WATER MANAGEMENT
PROJECT NO.:
STANDARD PENETRATION TEST CURVE

ELEVATION/SOIL SYMBOLS, SAMPLERS AND TEST DATA	USCS	DESCRIPTION	DEPTH	N	DEPTH	N
19/10	ML	Blackish grey silt with fragments, low plasticity, hard.	20	30	20	30
18/4		Greyish brown, cemented silt, low plasticity, hard.	21	30	21	30
10/8		Blackish grey, cemented silt, low plasticity, hard.	22	30	22	30
10/5		Light grey, cemented silt, low plasticity, hard.	23	30	23	30
10/7		Dark grey, cemented silt, low plasticity, hard.	24	30	24	30
10/3			25	30	25	30
10/4			26	30	26	30
10/3			27	30	27	30
10/5			28	30	28	30
10/3			29	30	29	30
10/1			30	30	30	30
10/4			31	30	31	30
			32	30	32	30
			34	30	34	30
			36	30	36	30
			38	30	38	30

Profile terminated at the depth of 30.00 meters

DRILL HOLE LOG
BORING NO.: BH-1

PROJECT: WASTE WATER MANAGEMENT
CLIENT: JICA
LOCATION: LEMBO
DRILLER: DIKIN
DRILL RIG: KOKEN
DEPTH TO WATER: INITIAL 0.50 M
AT COMPLETION 0.55 M

ELEVATION/SOIL SYMBOLS, SAMPLERS AND TEST DATA	USCS	DESCRIPTION	DEPTH	N	DEPTH	N
0	SP	Greyish black, fine sand with some silt, poorly graded, very loose.	1	1	1	1
2		Greyish black, fine sand with trace of silt, poorly graded, very loose.	2	2	2	2
4		Greyish black, fine sand with trace of silt, very loose.	3	4	3	4
6		light grey, fine sand with some silt, poorly graded, very loose.	4	2	4	2
8			4.5	2	5	2
10			6	2	6	2
12			7	3	7	3
14			8	2	8	2
14.5	CH	Light grey, clay with trace of silt, high plasticity, very soft.	9	2	9	2
16			10	2	10	2
18			11	4	11	4
		Light grey, clay with some silt, high plasticity, soft.	12	2	12	2
		Light grey, clay with some silt, high plasticity, very soft.	13	4	13	4
		Yellowish grey, clay with trace of silt, high plasticity, soft.	14	4	14	4
			14.5	5	15	5
		Grey, clay with trace of silt, high plasticity, medium soft.	16	6	16	6
		Dark grey, clay with trace of silt, high plasticity, medium stiff.	17	6	17	6
		Blackish grey, clay with some silt, high plasticity, hard.	18	30	18	30
			19	10	19	10

FIG. 5.32(1)

Profile of Bore Log at Lembo

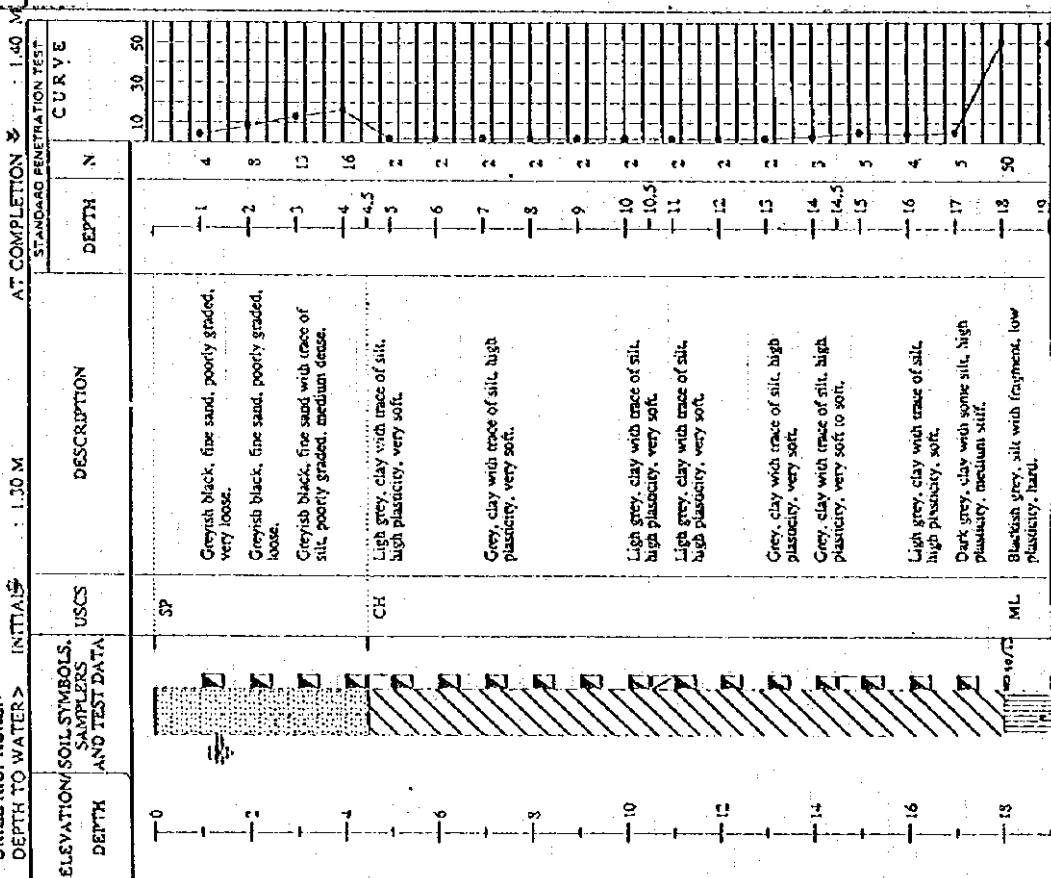
MASTER PLAN AND FEASIBILITY STUDY ON WASTEWATER AND SOLID WASTE MANAGEMENT FOR THE CITY OF UJUNG PANDANG IN THE REPUBLIC OF INDONESIA



DRILL HOLE LOG
BORING NO.: BH-2

PROJECT: WASTE WATER MANAGEMENT
CLIENT: JICA
LOCATION: LEMBO
DRILLER: DIKIN
DRILL RIG: KOKEN
DEPTH TO WATER > INITIAL: 1.30 M

PROJECT NO.:
DATE: 1.6.02
ELEVATION: +1.602
LOGGED BY: NARLAN

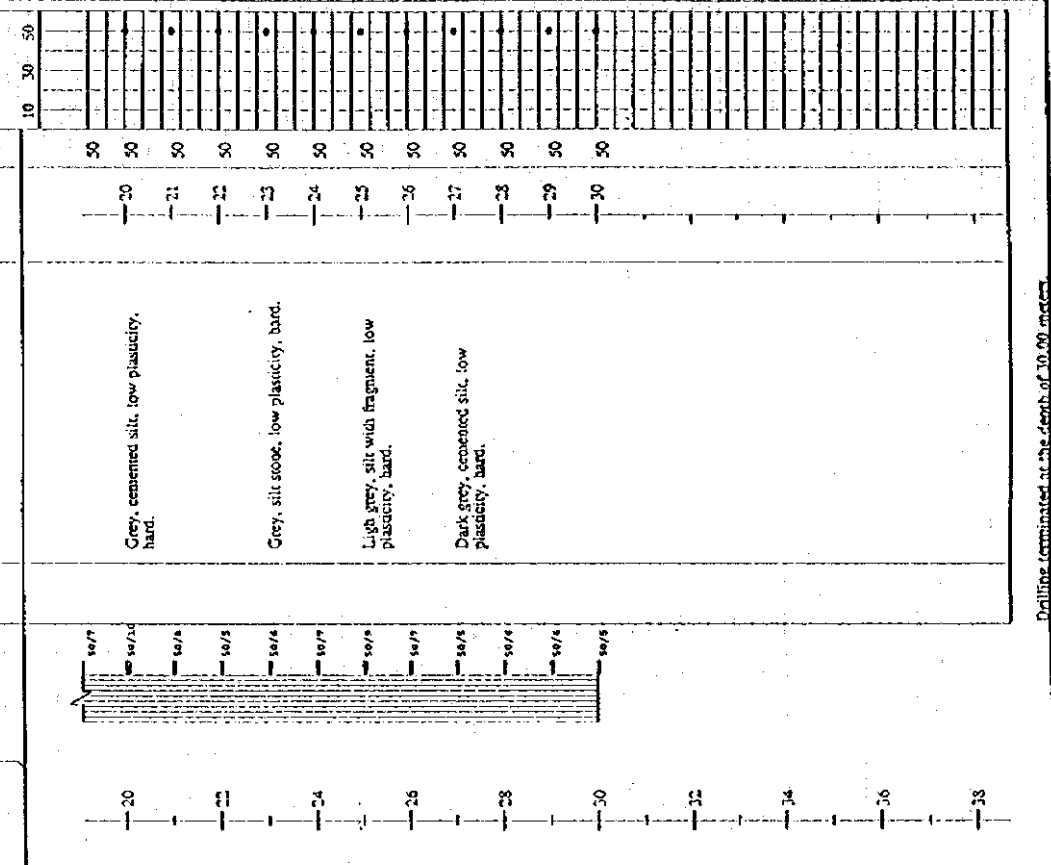


PROJECT NO.:
DATE: 1.6.02
ELEVATION: +1.602
LOGGED BY: NARLAN

DRILL HOLE LOG
BORING NO.: BH-2

PROJECT: WASTE WATER MANAGEMENT
ELEVATION/SOIL SYMBOLS, SAMPLERS AND TEST DATA
DEPTH

PROJECT NO.:
STANDARD PENETRATION TEST CURVE



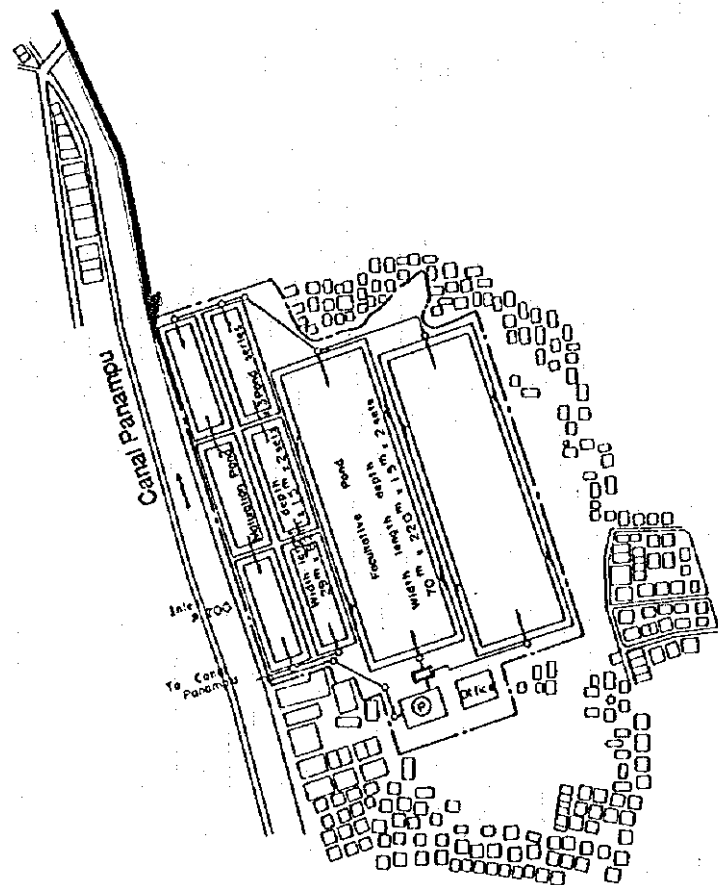
Drilling terminated at the depth of 30.00 meters.

FIG. 5.32(2)

Profile of Bore Log at Lembo

MASTER PLAN AND FEASIBILITY STUDY ON WASTEWATER AND SOLID WASTE MANAGEMENT FOR THE CITY OF UJUNG PANDANG IN THE REPUBLIC OF INDONESIA

Jl. Tinumbu



LEGEND

- Boundary of Treatment Site
- > Conveyance Sewer

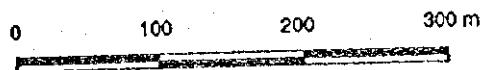


FIG. 5.33

Layout of Lembo Treatment Plant

MASTER PLAN AND FEASIBILITY STUDY ON WASTEWATER AND SOLID WASTE MANAGEMENT FOR THE CITY OF UJUNG PANDANG IN THE REPUBLIC OF INDONESIA

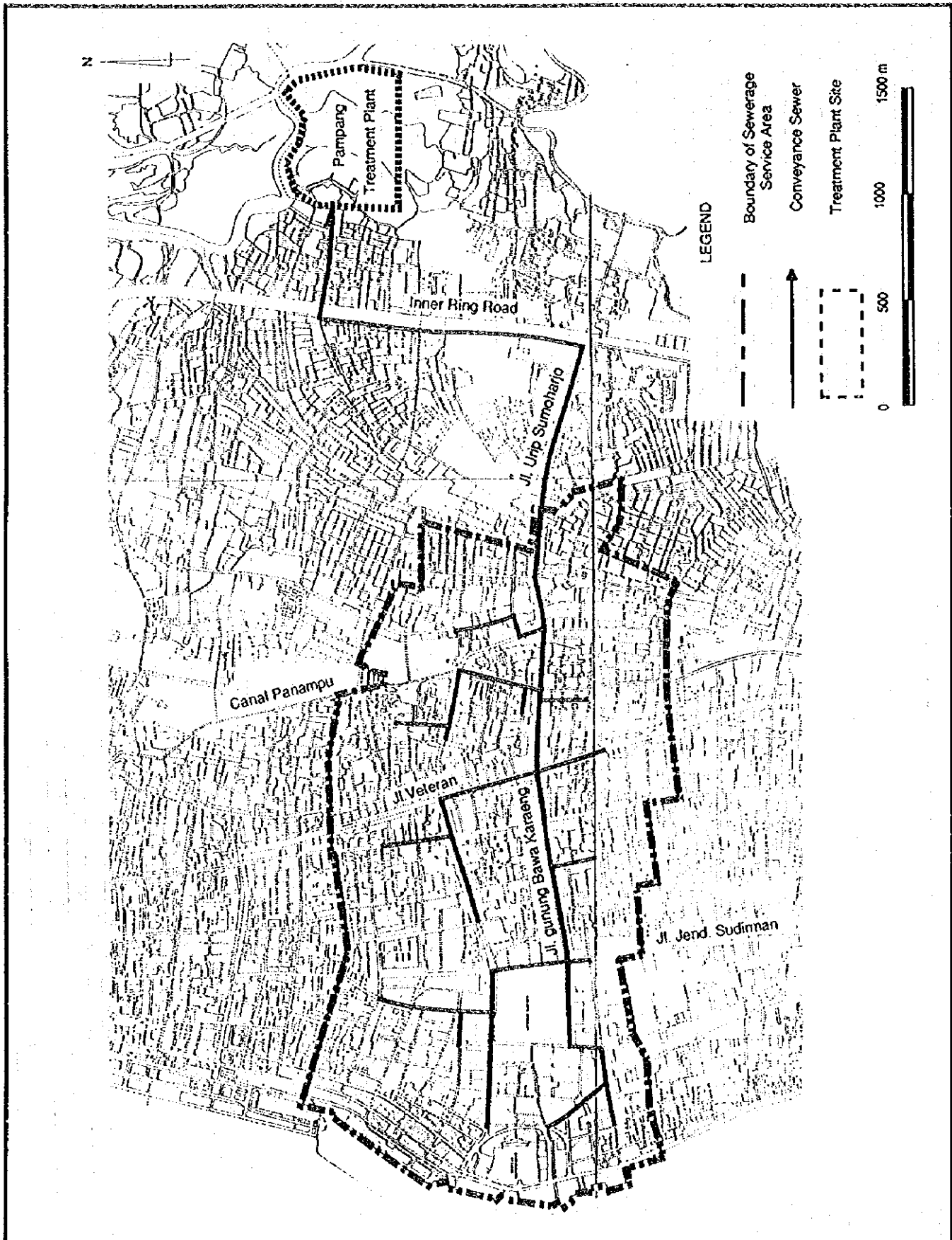
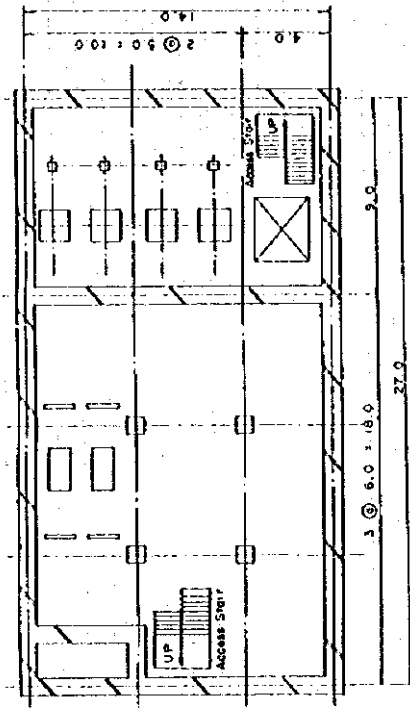


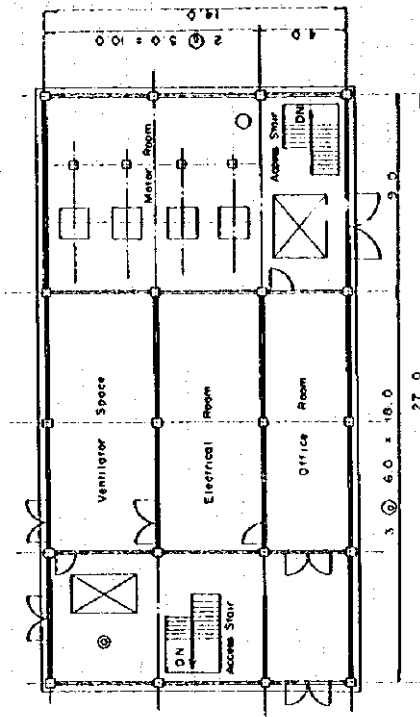
FIG. 5.34

Central Sewerage System

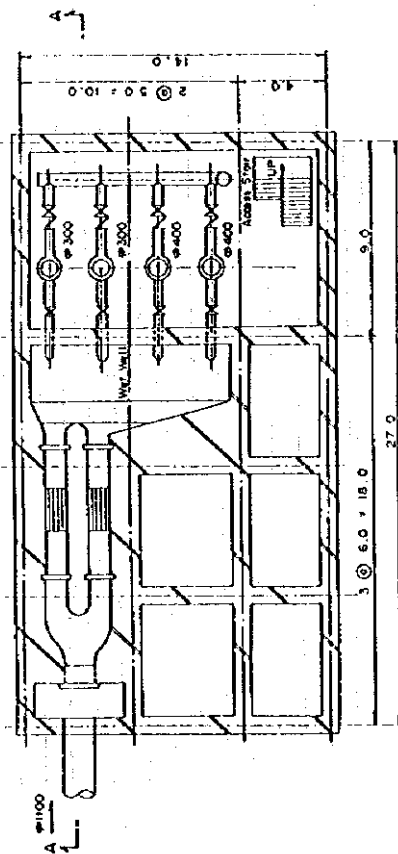
MASTER PLAN AND FEASIBILITY STUDY ON WASTEWATER AND SOLID WASTE MANAGEMENT FOR THE CITY OF UJUNG PANDANG IN THE REPUBLIC OF INDONESIA



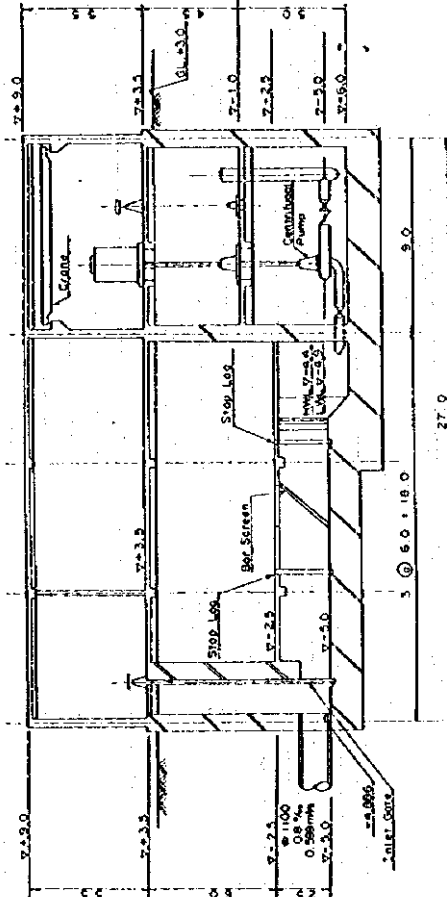
81F FLOOR



GROUND FLOOR



82F FLOOR



SECTION A-A

FIG. 5.35

Lift Pump Station for Central Sewerage System - Kebun Binatang

MASTER PLAN AND FEASIBILITY STUDY ON WASTEWATER AND SOLID WASTE MANAGEMENT FOR THE CITY OF UJUNG PANDANG IN THE REPUBLIC OF INDONESIA

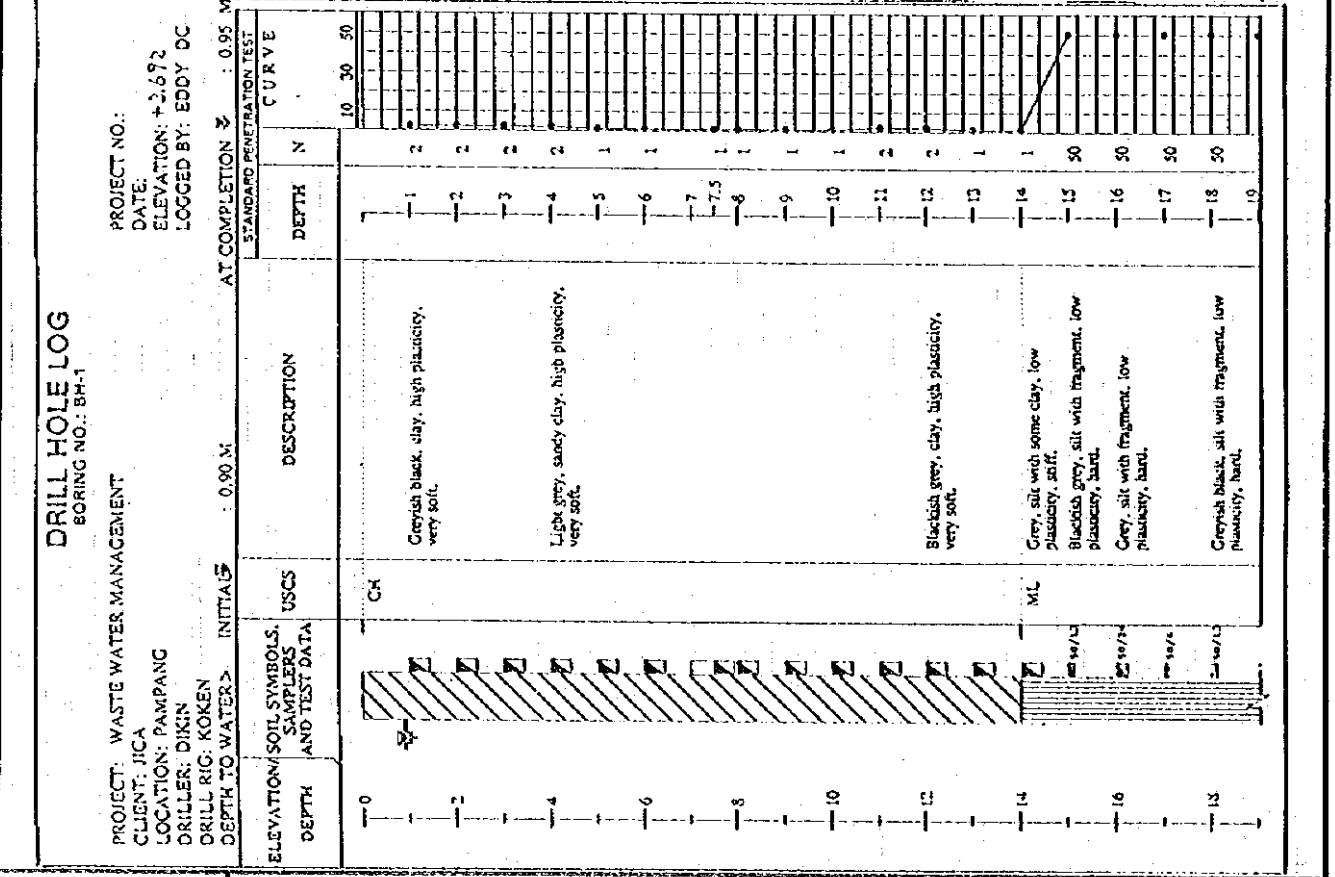
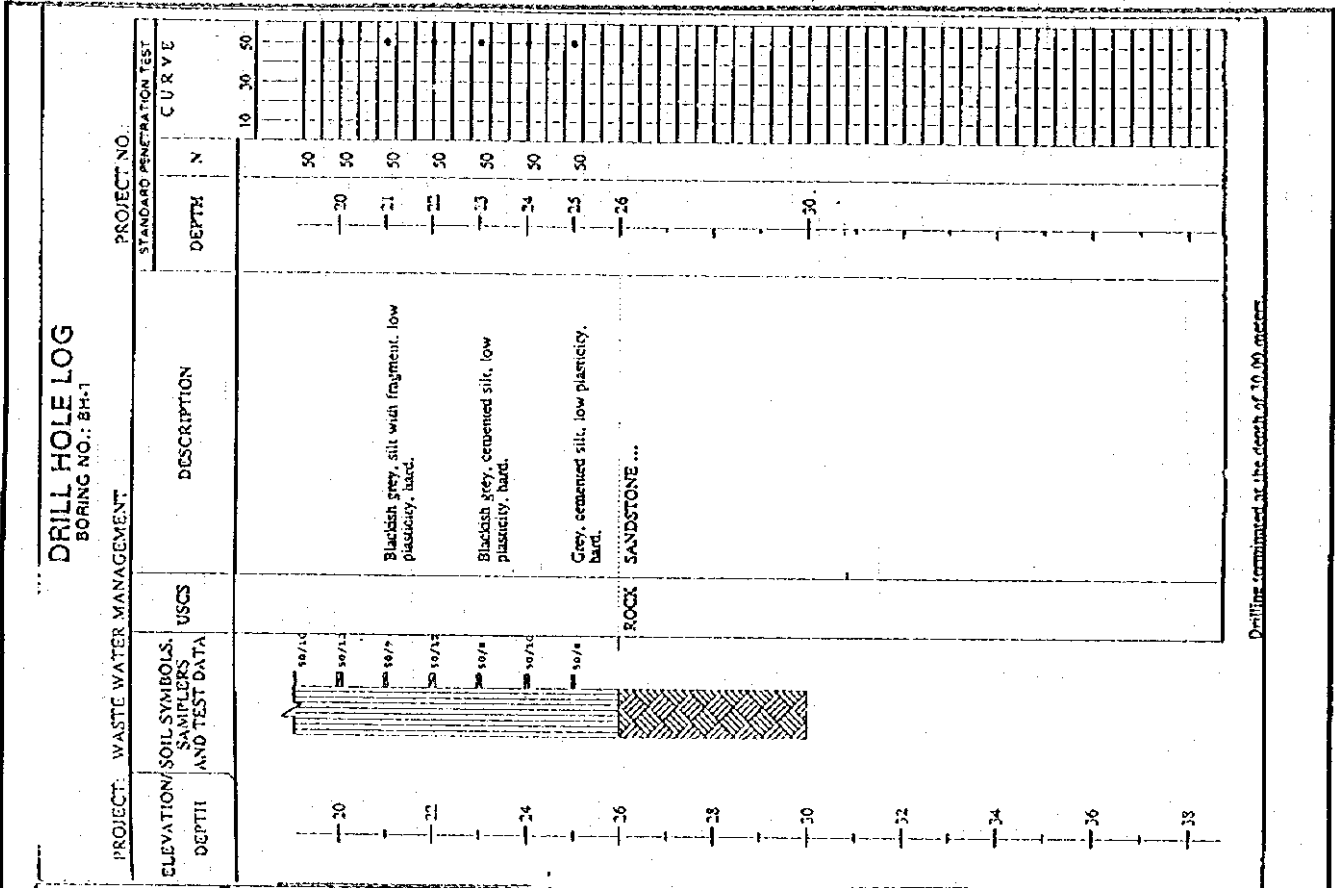


FIG. 5.36(1) Profile Bore Log at Pampang

MASTER PLAN AND FEASIBILITY STUDY ON WASTEWATER AND SOLID WASTE MANAGEMENT FOR THE CITY OF UJUNG PANDANG IN THE REPUBLIC OF INDONESIA

DRILL HOLE LOG
BORING NO.: BH-2

PROJECT: WASTE WATER MANAGEMENT		PROJECT NO.	
ELEVATION/SOIL SYMBOLS, SAMPLERS AND TEST DATA	USCS	DESCRIPTION	DEPTH N
			10 30 50

DRILL HOLE LOG
BORING NO.: BH-2

PROJECT: WASTE WATER MANAGEMENT		PROJECT NO.	
ELEVATION/SOIL SYMBOLS, SAMPLERS AND TEST DATA	USCS	DESCRIPTION	DEPTH N
	CH, MH, ML, ROCK	Brownish grey, clay with some sand, high plasticity, very soft. Brownish grey, clay, high plasticity, very soft. Light grey, clay, high plasticity, very soft. Brown mottled grey, clay, high plasticity, very soft. Brown mottled grey, silt with some sand, high plasticity, medium stiff. Greyish brown, silt with some clay, high plasticity, stiff. Greyish brown, silt with fragment, low plasticity, hard. Blackish grey, silt with fragment, low plasticity, hard. SANDSTONE	1, 2, 3, 4, 4.5, 5, 6, 7, 7.5, 8, 9, 10, 11, 12, 13, 14
			10 30 50

Drilling terminated at the depth of 19.20 meters.

FIG. 5.36(2)

Profile Bore Log at Pampang

MASTER PLAN AND FEASIBILITY STUDY ON WASTEWATER AND SOLID WASTE MANAGEMENT FOR THE CITY OF UJUNG PANDANG IN THE REPUBLIC OF INDONESIA

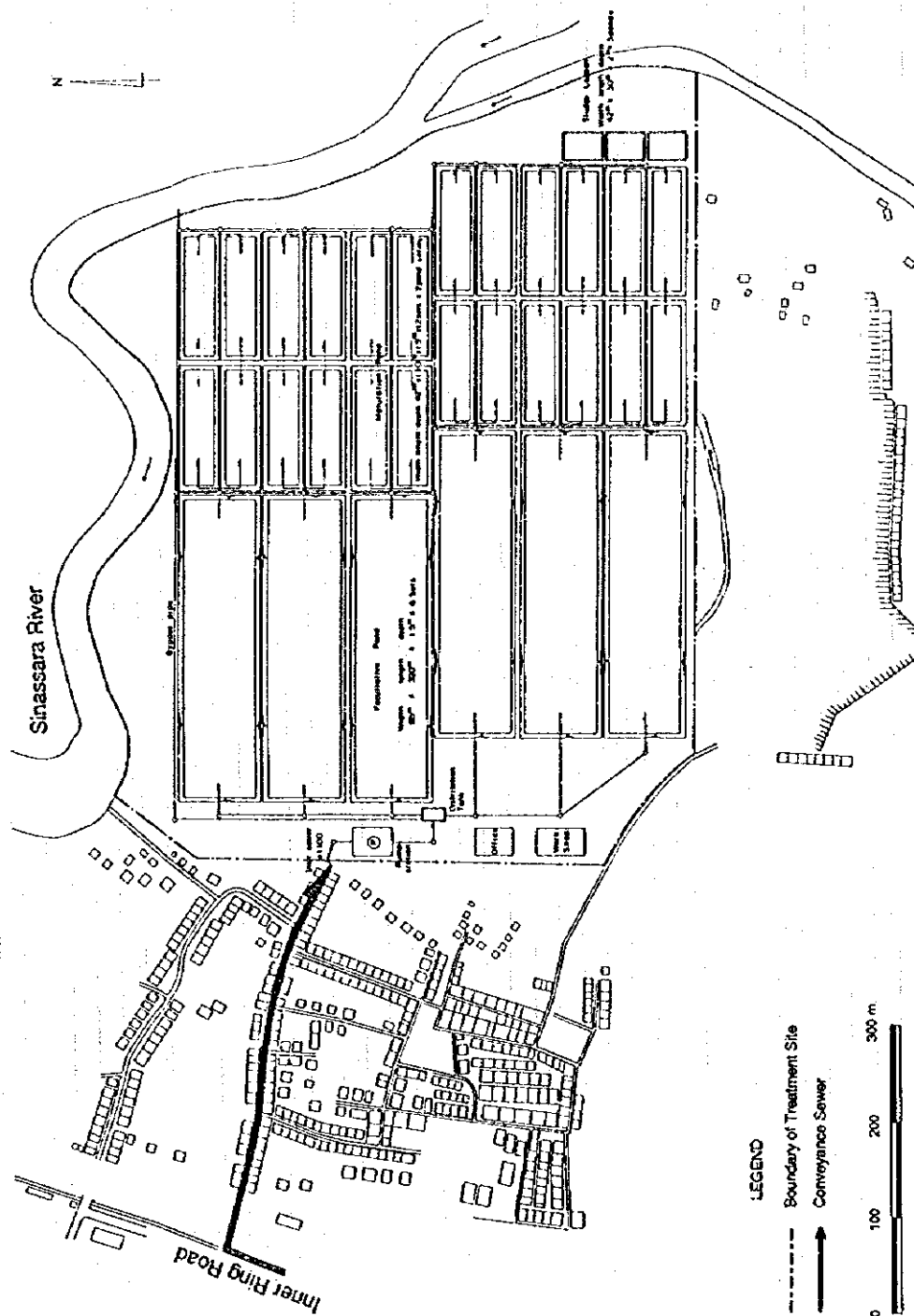


FIG. 5.37 | Layout of Pampang Treatment Plant

MASTER PLAN AND FEASIBILITY STUDY ON WASTEWATER AND SOLID WASTE MANAGEMENT FOR THE CITY OF UJUNG PANDANG IN THE REPUBLIC OF INDONESIA



LEGEND

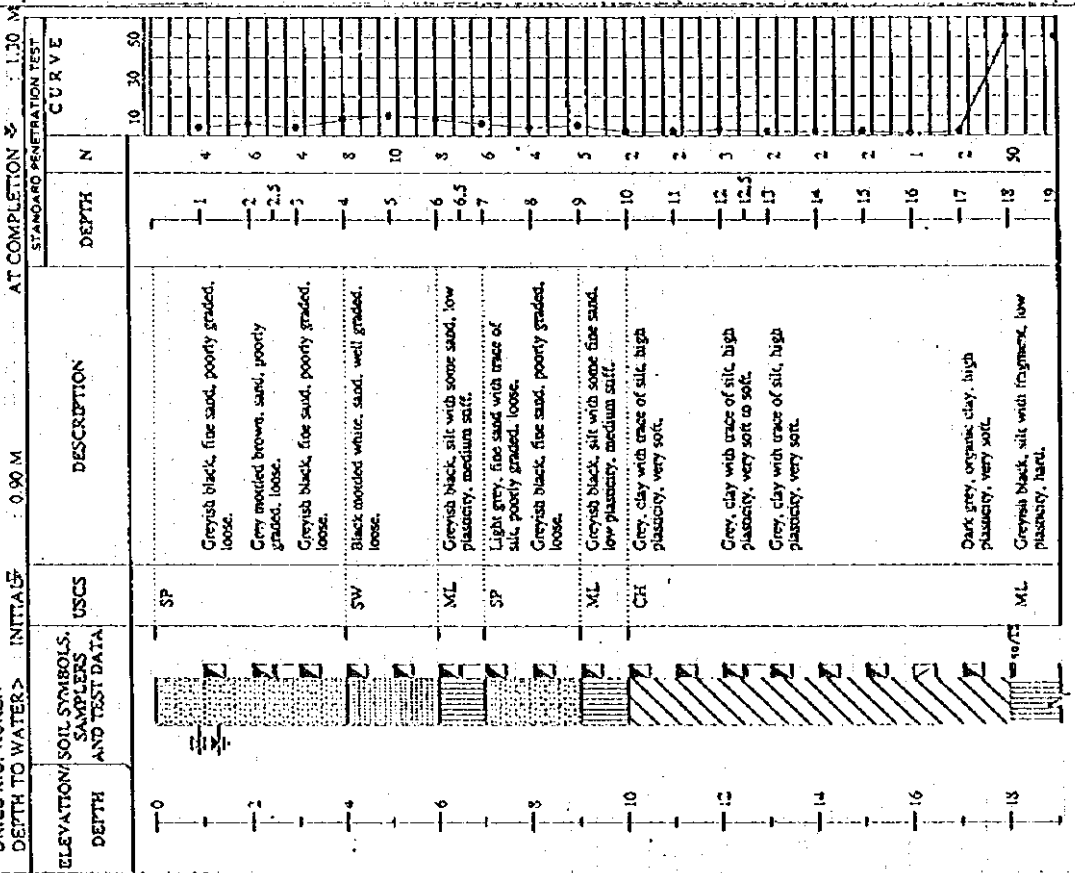
- Boundary of Sewerage Service Area
 - > Conveyance Sewer
 - Treatment Plant Site
- 0 500 1000 1500 m

FIG. 5.38 Southern Sewerage System
MASTER PLAN AND FEASIBILITY STUDY ON WASTEWATER AND SOLID WASTE MANAGEMENT FOR THE CITY OF UJUNG PANDANG IN THE REPUBLIC OF INDONESIA

DRILL HOLE LOG
BORING NO.: BH-1

PROJECT: WASTE WATER MANAGEMENT
CLIENT: JICA
LOCATION: MACCINI SOMBALA
DRILLER: DIKIN
DRILL RIG: KOKEN
DEPTH TO WATER: INITIAL 0.90 M

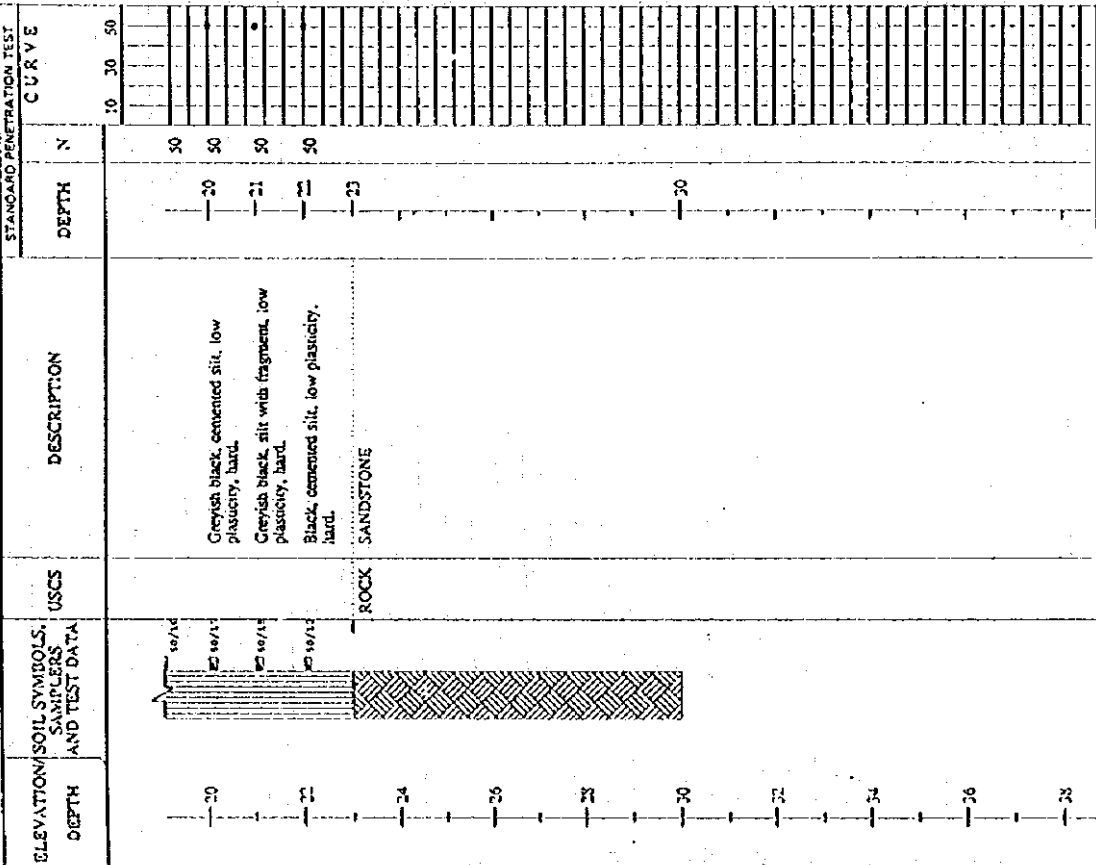
PROJECT NO.:
DATE: 1.08
ELEVATION: +1.08
LOGGED BY: EDDY DC



DRILL HOLE LOG
BORING NO.: BH-1

PROJECT: WASTE WATER MANAGEMENT

PROJECT NO.:



Drillings terminated at the depth of 38.00 meters.

FIG. 5.39(1)

Profile of Bore Log at Maccini Sombala

MASTER PLAN AND FEASIBILITY STUDY ON WASTEWATER AND SOLID WASTE MANAGEMENT FOR THE CITY OF UJUNG PANDANG IN THE REPUBLIC OF INDONESIA

DRILL HOLE LOG
BORING NO.: BH-2

PROJECT: WASTE WATER MANAGEMENT

PROJECT NO.:

ELEVATION/ SOIL SYMBOLS, SAMPLERS AND TEST DATA	USCS	DESCRIPTION	STANDARD PENETRATION TEST CURVE	
			DEPTH	N
20			10	50
21			30	50
22			30	50
23		Black, cemented silt, low plasticity, hard.	30	50
24			30	50
25		Brownish grey, cemented silt, low plasticity, hard.	30	50
26			30	50
27		Dark grey, cemented silt, low plasticity, hard.	30	50
28			30	50
29			30	50
30		Dark grey, cemented silt, low plasticity, hard.	30	50

Drillline terminated at the depth of 30.00 meters.

DRILL HOLE LOG
BORING NO.: BH-2

PROJECT: WASTE WATER MANAGEMENT

PROJECT NO.:

DATE: 1.2.21
ELEVATION: +1.21
LOGGED BY: NARLAN

CLIENT: JICA
LOCATION: MANCINI SOMBALA
DRILLER: DIKIN
DRILL RIG: KOIKEN
DEPTH TO WATER: 0.50 M
INITIALS:
AT COMPLETION: 0.53 M

ELEVATION/ SOIL SYMBOLS, SAMPLERS AND TEST DATA	USCS	DESCRIPTION	STANDARD PENETRATION TEST CURVE	
			DEPTH	N
0			10	50
1	SP	Greyish black, fine sand, poorly graded, loose.	10	50
2		Greyish black, fine sand, poorly graded, medium dense.	12	50
3		Greyish black, sand, poorly graded, loose.	10	50
4			10	50
5		Black, sand, poorly graded, medium dense.	11	50
6		Grey mottled white, sand, poorly graded, medium dense.	11	50
7			12	50
8			11	50
9		Greyish black, sand, poorly graded, loose.	9	50
10	SW	Yellowish grey, coarse sand, well graded, medium dense.	18	50
11	SP	Greyish black, sand, poorly graded, medium dense.	11	50
12		Grey mottled white, fine sand, poorly graded, medium dense.	11	50
13			50	50
14			6	50
15	ML	Greyish black, cemented silt, low plasticity, hard.	50	50
16			50	50
17			50	50
18		Greyish black, cemented silt, low plasticity, hard.	50	50
19			50	50

FIG. 5.39(2)

Profile of Bore Log at Maccini Sombala

MASTER PLAN AND FEASIBILITY STUDY ON WASTEWATER AND SOLID WASTE MANAGEMENT FOR THE CITY OF UJUNG PANDANG IN THE REPUBLIC OF INDONESIA

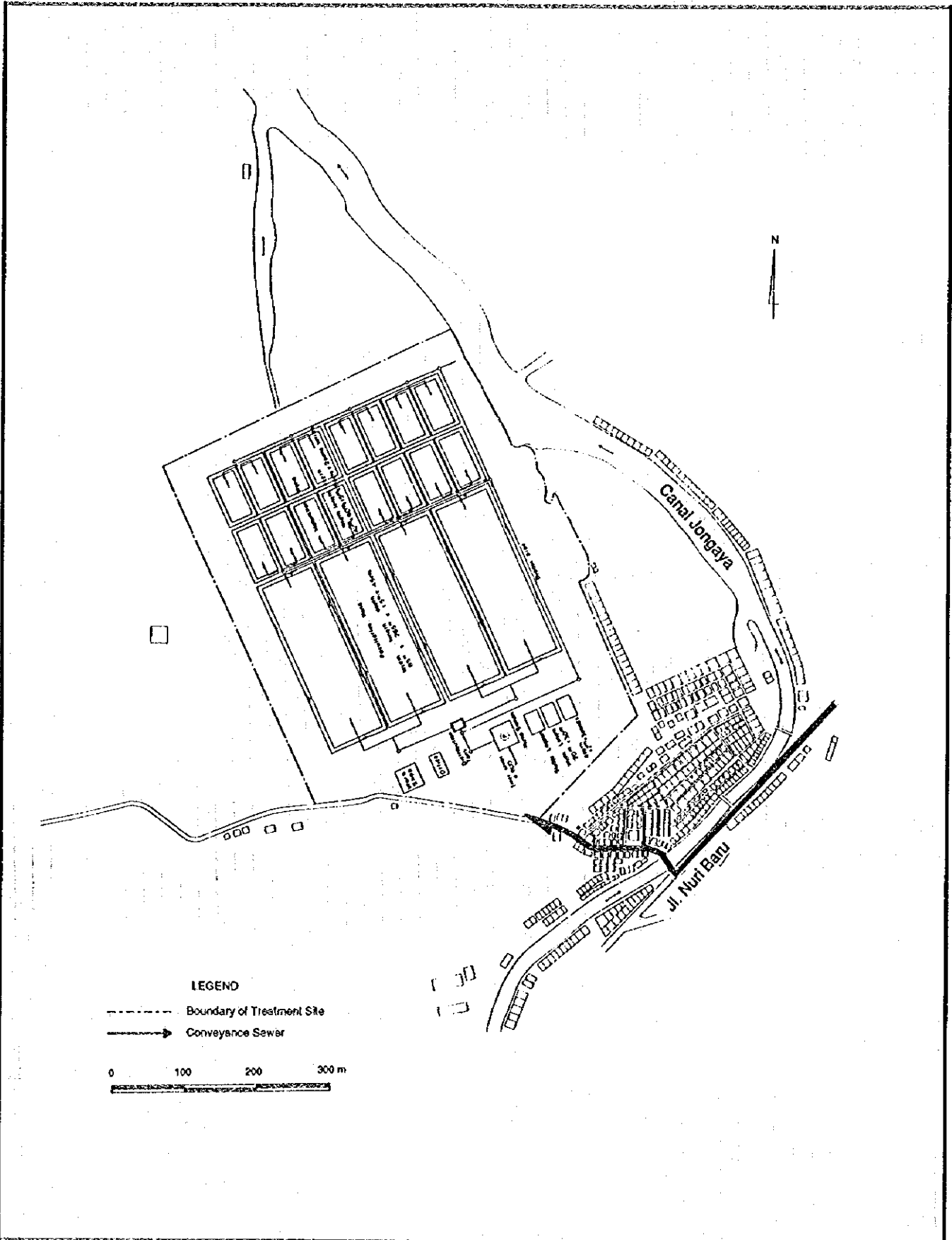
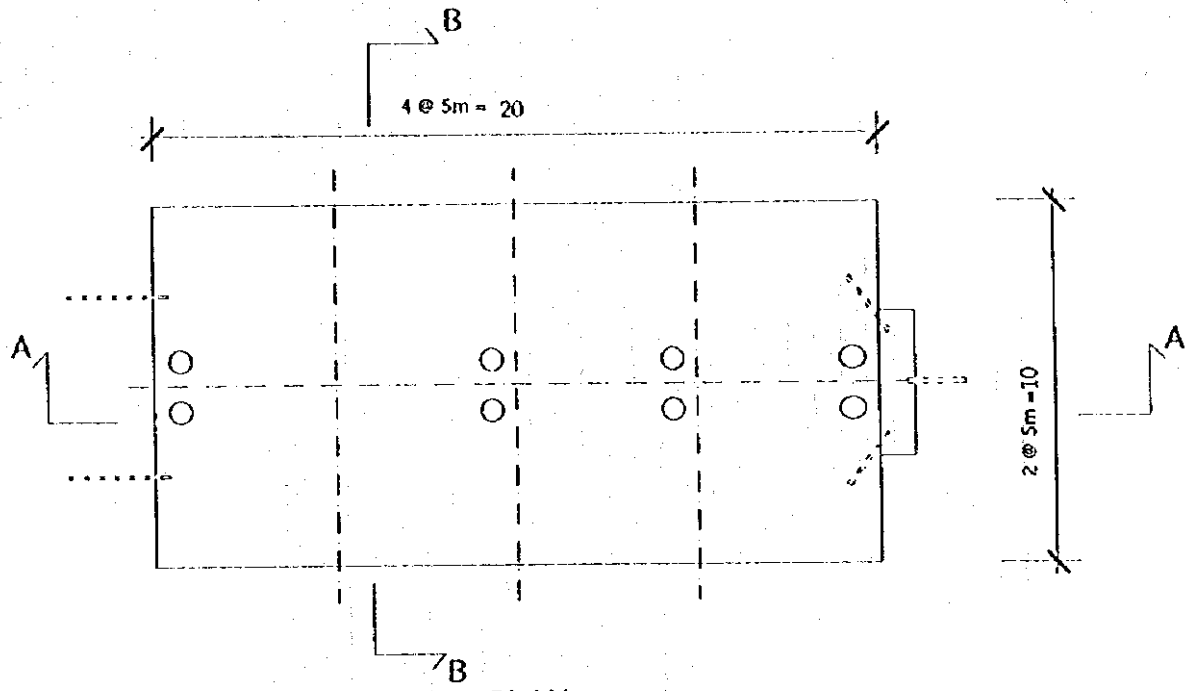


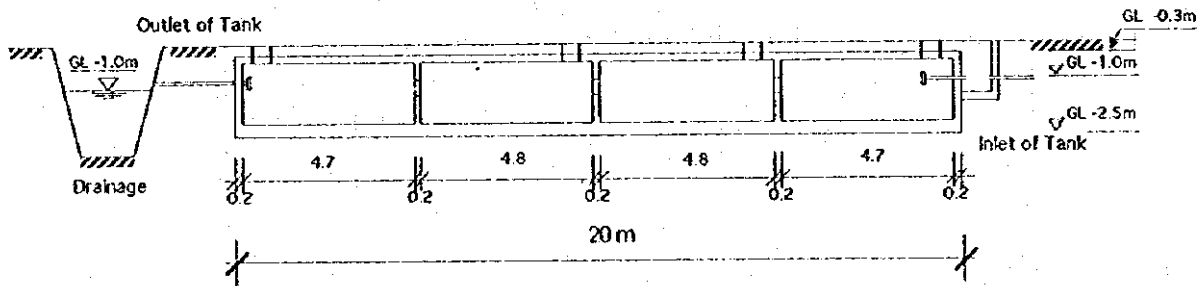
FIG. 5.40

Layout of Maccini Sombala Treatment Plant

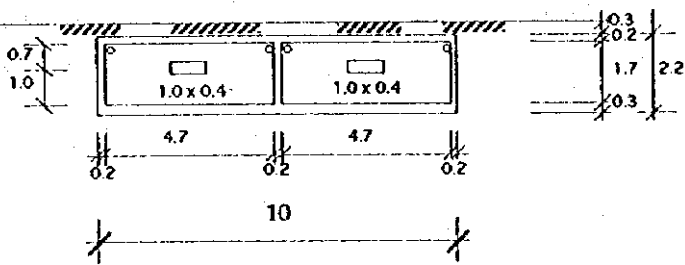
MASTER PLAN AND FEASIBILITY STUDY ON WASTEWATER AND SOLID WASTE MANAGEMENT FOR THE CITY OF UJUNG PANDANG IN THE REPUBLIC OF INDONESIA



PLAN
SCALE 1:200



SECTION A-A
SCALE 1:200



SECTION B-B
SCALE 1:200

FIG. 5.41

Typical Septic Tank

MASTER PLAN AND FEASIBILITY STUDY ON WASTEWATER AND SOLID WASTE MANAGEMENT FOR THE CITY OF UJUNG PANDANG IN THE REPUBLIC OF INDONESIA