12. WATER DEMAND FOR WATER FRONT CITY

Water demand in the existing north coastal area is already included in the calculation of future water demand for DKI Jakarta. Future water demand for new reclamation area is discussed in this section.

Since detail information about new reclamation area is not sufficient, average water demand, average per capita consumption, of DKI Jakarta was employed for future water demand forecast in the new reclamation area.

Average per capita consumption is calculated as shown on **Table-W.1**.

Table-W.1 AVERAGE PER CAPITA CONSUMPTION IN JAKARTA

	UNIT	1995	2000	2005	2010	2015	2019
Total Served Population	(x 1,000)	2,200	3,600	5,200	7,000	9,100	9,400
Total Water Demand	(1,000 m3/day)	459	749	1,078	1,473	1,949	2,089
Average per capita consumption	(lpcd)	209	208	207	210	214	222

Total water demand for new reclamation area was calculated from the average per capita consumption mentioned above and future population. Calculated water demand is shown on **Table-W.2.**

Table-W.2 WATER DEMAND FOR NEW RECLAMATION AREA

	UNIT	1995	2000	2005	2010	2015	2019
Average per capita consumption	(lpcd)	209	208	207	210	214	222
Future Population	(x 1,000)	0	0	197	395	592	750
Total Water Demand	(1,000m3/day)	0	0	41	83	127	167
Total Water Demand	(l/sec)	0	0	473	959	1,467	1,927

13. ESTIMATED POPULATION

Kotamadya / Kecamatan		YEAR 1995	2000	2005	2010	2015	2019
[71] JAKARTA SELATAN		2,030	2,150	2,260	2,360	2,470	2,560
[010]	KEBAYORAN LAMA	310	320	325	330	335	340
[011]	PESANGGRAHAN	175	195	215	230	245	255
[020]	CILANDAK	190	210	230	250	280	305
[030]	PASAR MINGGU	270	300	325	345	360	375
[031]	JAGAKARSA	190	235	275	320	375	415
[040]	MAMPANG PRAPATAN	155	155	155	155	150	145
[041]	PANCORAN	155	160	165	165	160	155
[050]	KEBAYORAN BARU	185	185	185	185	190	195
[060]	SETIA BUDI	150	140	140	140	140	145
[070]	TEBET	250	250	245	240	235	230
[72] JAKARTA TIMUR		2,360	2,690	2,940	3,190	3,430	3,550
[010]	PASAR REBO	145	175	200	220	240	260
[011]	CIRACAS	190	230	260	290	310	320
[012]	CIPAYUNG	140	190	240	300	380	430
[020]	KRAMAT JATI	230	250	250	250	255	260
[021]	MAKASAR	170	200	225	250	275	290
[030]	JATINEGARA	290	300	295	290	285	280
[031]	DUREN SAWIT	340	390	420	440	455	460
[040]	MATRAMAN	160	155	145	140	135	130
[050]	PULO GADUNG	295	300	305	310	315	320
[060]	CAKUNG	400	500	600	700	780	800
[73] JAKARTA PUSAT		1,020	1,000	980	970	960	950
[010]	TANAH ABANG	170	170	170	170	170	170
[020]	MENTENG	90	90	90	90	90	90
[030]	SENEN	105	100	95	95	95	95
[040]	CEMPAKA PUTIH	95	90	90	90	90	90
[041]	JOHAR BARU	105	100	90	85	80	75
[050]	KEMAYORAN	230	225	220	215	210	205
[060]	SAWAH BESAR	120	120	120	120	120	120
[070]	GAMBIR	105	105	105	105	105	105
[74] JAKARTA BARAT		1,950	2,050	2,140	2,230	2,320	2,380
[010]	KEBON JERUK	285	300	315	330	340	350
[011]	KEMBANGAN	155	215	250	285	320	350
[020]	CENGKARENG	420	465	495	515	535	540
[021]	KALI DERES	210	240	270	305	345	380
[030]	GROGOL PETAMBURAN	240	240	240	240	240	235
[031]	PALMERAH	220	215	210	205	200	195
[040]	TAMBORA	260	250	240	235	230	225
[050]	TAMAN SARI	130	125	120	115	110	105
[75] JAKARTA UTARA		1,440	1,510	1,580	1,650	1,720	1,760
[010]	PENJARINGAN	280	300	320	340	360	370
[011]	PADEMANGAN	155	165	175	185	195	200
[020]	TANJUNG PRIOK	340	350	360	370	380	380
[030]	KOJA	260	270	260	250	240	235
[031]	KELAPA GADING	130	150	170	190	210	225
[040]	CILINCING	240	260	280	300	320	335
[050]	KEPULAUAN SERIBU	15	15	15	15	15	15
Jakarta Total		8,800	9,400	9,900	10,400	10,900	11,260
[32] JAWA BARAT		1,360	1,720	2,055	2,370	2,695	2,865
[03] BOGOR		70	80	85	90	95	105
[150]	CIMANGGIS						
[200]	SAWANGAN						
[201]	LIMO	70	80	85	90	95	105
[720]	BEJI						
[18] BEKASI		280	280	290	290	330	380
[010]	PONDOK GEDE	210	210	220	220	250	280
[011]	JATIASIH	70	70	70	70	80	100
[100]	TARUMAJAYA						
[730]	BEKASI BARAT						
[19] TANGERANG		540	630	830	960	1,170	1,280
[060]	CIPUTAT	250	320	380	440	540	580
[061]	PAMULANG	150	190	230	270	330	360
[070]	PONDOK AREN	140	180	210	250	300	340
[150]	TELUKNAGA						
[151]	KOSAMBI						
[75] Kotamadya TANGERANG		470	670	860	1,030	1,300	1,300
[010]	CILEDUG	280	410	460	500	500	500
[020]	CIPONDOH	190	260	400	530	600	600
[050]	BATU CEPER						
[060]	BENDA						
Study Area Total		10,160	11,120	11,955	12,770	13,595	14,065

14. NUMBER OF DOMESTIC CONNECTION

Kotamadya / Kecamatan		YEAR 1995	2000	2005	2010	2015	2019
[71] JAKARTA SELATAN		25,710	81,200	141,710	217,580	314,840	332,920
[010]	KEBAYORAN LAMA	1,900	11,550	21,360	31,720	43,240	43,100
[011]	PESANGGRAHAN	0	6,030	13,450	21,550	30,520	32,240
[020]	CILANDAK	1,900	7,930	15,340	23,620	34,310	38,620
[030]	PASAR MINGGU	1,900	10,690	21,030	33,240	44,140	46,720
[031]	JAGAKARSA	0	0	0	13,280	44,830	51,720
[040]	MAMPANG PRAPATAN	1,900	7,410	13,100	18,620	23,450	23,450
[041]	PANCORAN	1,900	6,900	12,240	17,410	21,720	21,720
[050]	KEBAYORAN BARU	6,720	10,690	14,660	18,620	23,280	24,140
[060]	SETIA BUDI	1,900	5,860	10,170	14,310	18,450	19,310
[070]	TEBET	7,590	14,140	20,340	26,210	31,900	31,900
[72] JAKARTA TIMUR		55,660	133,970	222,530	334,830	474,470	497,060
[010]	PASAR REBO	860	7,070	15,000	23,970	34,310	37,760
[011]	CIRACAS	690	8,450	17,930	29,450	41,550	43,450
[012]	CIPAYUNG	0	0	0	12,240	43,790	52,410
[020]	KRAMAT JATI	4,310	11,720	18,620	25,520	33,100	33,970
[021]	MAKASAR	1,380	6,550	12,930	20,520	29,310	31,900
[030]	JATINEGARA	10,690	18,970	26,380	33,450	40,340	40,340
[031]	DUREN SAWIT	11,380	22,500	34,480	46,720	59,310	60,170
[040]	MATRAMAN	7,410	11,380	14,660	17,930	21,030	21,030
[050]	PULO GADUNG	11,550	20,170	29,140	38,280	47,760	48,620
[060]	CAKUNG	7,590	27,070	53,430	86,720	123,970	127,410
[73] JAKARTA PUSAT		61,130	81,560	101,740	121,560	141,380	141,380
[010]	TANAH ABANG	10,340	14,140	17,930	21,720	25,520	25,520
[020]	MENTENG	4,313	6,900	9,660	12,240	15,000	15,000
[030]	SENEN	2,930	6,210	9,310	12,590	15,860	15,860
[040]	CEMPAKA PUTIH	12,760	11,900	11,900	11,900	11,900	11,900
[041]	JOHAR BARU	2,930	6,030	8,280	10,520	12,410	12,410
[050]	KEMAYORAN	13,100	17,070	20,690	24,140	27,590	27,590
[060]	SAWAH BESAR	6,030	8,970	11,900	14,830	17,760	17,760
[070]	GAMBIR	8,790	10,340	12,070	13,620	15,340	15,340
[74] JAKARTA BARAT		55,000	117,600	185,870	260,530	340,360	354,140
[010]	KEBON JERUK	4,140	14,830	26,720	39,660	52,760	54,480
[011]	KEMBANGAN	4,140	11,210	20,520	32,070	45,520	50,690
[020]	CENGKARENG	5,860	22,930	41,900	61,550	82,760	83,620
[021]	KALI DERES	5,860	13,450	22,410	33,790	47,760	53,790
[030]	GROGOL PETAMBURAN	7,760	14,830	21,900	28,970	36,210	36,210
[031]	PALMERAH	5,520	12,760	19,660	26,380	32,590	32,530
[040]	TAMBORA	13,100	17,070	20,520	24,310	27,760	27,760
[050]	TAMAN SARI	8,620	10,520	12,240	13,790	15,000	15,000
[75] JAKARTA UTARA		99,830	124,300	150,520	177,920	207,070	214,660
[010]	PENJARINGAN	11,720	19,480	28,280	37,930	48,620	50,340
[011]	PADEMANGAN	12,590	14,480	16,550	18,790	21,210	22,070
[020]	TANJUNG PRIOK	29,830	33,790	38,100	42,410	46,900	46,900
[030]	KOJA	13,970	17,930	21,550	24,830	27,930	27,760
[031]	KELAPA GADING	18,790	21,720	24,830	27,930	31,030	33,620
[040]	CILINCING	12,930	16,900	21,210	26,030	31,380	33,970
[050]	KEPULAUAN SERIBU	0	0	0	0	0	0
Jakarta Total		297,590	538,630	802,430	1,112,410	1,478,120	1,510,160
Persons Per Connection		5.8					
[32] JAWA BARAT		0	0	0	51,210	180,870	312,410
[03] BOGOR		0	0	0	0	0	0
[150]	CIMANGGIS	0	0	0	0	0	0
[200]	SAWANGAN	0	0	0	0	0	0
[201]	LIMO	0	0	0	0	0	0
[720]	BEJI	0	0	0	0	0	0
[18] BEKASI		0	0	0	0	4,310	7,930
[010]	PONDOK GEDE	0	0	0	0	4,310	7,930
[011]	JATIASIH	0	0	0	0	0	0
[100]	TARUMAJAYA	0	0	0	0	0	0
[730]	BEKASI BARAT	0	0	0	0	0	0
[19] TANGERANG		0	0	0	0	67,250	139,830
[060]	CIPUTAT	0	0	0	0	33,280	68,280
[061]	PAMULANG	0	0	0	0	18,450	38,100
[070]	PONDOK AREN	0	0	0	0	15,520	33,450
[160]	TELUKNAGA	0	0	0	0	0	0
[161]	KOSAMBI	0	0	0	0	0	0
[75] Kotamadya TANGERANG		0	0	0	51,210	109,310	164,650
[010]	CILEDUG	0	0	0	25,520	51,030	78,630
[020]	CIPONDOH	0	0	0	25,690	58,280	86,020
[050]	BATU CEPER	0	0	0	0	0	0
[060]	BENDA	0	0	0	0	0	0
Study Area Total		297,590	538,630	802,430	1,163,620	1,658,990	1,822,570

15. SERVED POPULATION BY DOMESTIC CONNECTION

(x 1,000)

Kotamadya / Kecamatan		YEAR 1995	2000	2005	2010	2015	2019
[71]	JAKARTA SELATAN	149	471	822	1,262	1,836	1,931
[010]	KEBAYORAN LAMA	11	67	124	184	245	256
[011]	PESANGGRAHAN	0	35	78	125	177	187
[020]	CILANDAK	11	46	89	137	199	224
[030]	PASAR MINGGU	11	62	122	187	256	271
[031]	JAGAKARSA	0	0	0	77	260	300
[040]	MAMPANG PRAPATAN	11	43	76	108	136	136
[041]	PANCORAN	11	40	71	101	126	126
[050]	KEBAYORAN BARU	39	62	85	108	135	140
[060]	SETIA BUDI	11	34	59	83	107	112
[070]	TEBET	44	82	118	152	185	185
[72]	JAKARTA TIMUR	324	777	1,291	1,942	2,752	2,883
[010]	PASAR REBO	5	41	87	139	199	219
[011]	CIRACAS	4	49	104	171	241	252
[012]	CIPAYUNG	0	0	0	71	254	304
[030]	KRAMAT JATI	25	68	108	148	192	197
[021]	MAKASAR	8	38	75	119	170	185
[090]	JATINEGARA	62	110	153	194	234	234
[031]	DUREN SAWIT	66	131	200	271	344	349
[040]	MATRAMAN	43	66	85	104	122	122
[050]	PULO GADUNG	67	117	169	222	277	282
[060]	CAKUNG	44	157	310	503	719	739
[73]	JAKARTA PUSAT	355	473	590	705	820	820
[010]	TANAH ABANG	60	82	104	126	148	148
[020]	MENTENG	25	40	56	71	87	87
[030]	SENEN	17	36	54	73	92	92
[040]	CEMPAKA PUTIH	74	69	69	69	69	69
[041]	JOHAR BARU	17	35	48	61	72	72
[050]	KEMAYORAN	76	99	120	140	160	160
[060]	SAWAH BESAR	35	52	69	86	103	103
[070]	GAMBIR	51	60	70	79	89	89
[74]	JAKARTA BARAT	319	682	1,078	1,511	1,974	2,054
[010]	KEBON JERUK	24	86	155	230	306	316
[011]	KEMBANGAN	24	65	119	186	264	294
[020]	CENGKARENG	34	133	243	357	480	485
[021]	KALI DERES	34	78	130	196	277	312
[030]	GROGOL PETAMBURAN	45	86	127	168	210	210
[031]	PALMERAH	32	74	114	153	189	189
[040]	TAMBORA	76	99	119	141	161	161
[050]	TAMAN SARI	50	61	71	80	87	87
[75]	JAKARTA UTARA	579	721	873	1,032	1,201	1,245
[010]	PENJARINGAN	68	113	164	220	282	292
[011]	PADEMANGAN	73	84	96	109	123	128
[020]	TANJUNG PRIOK	173	196	221	246	272	272
[030]	KOJA	81	104	125	144	162	161
[031]	KELAPA GADING	109	126	144	162	180	195
[040]	CILINCING	75	98	123	151	182	197
[050]	KEPULAUAN SERIBU	0	0	0	0	0	0
Jakarta Total		1,726	3,124	4,654	6,452	8,573	8,933
[32]	JAWA BARAT	0	0	0	297	1,049	1,812
[03]	BOGOR	0	0	0	0	0	0
[150]	CIMANGGIS	0	0	0	0	0	0
[200]	SAWANGAN	0	0	0	0	0	0
[201]	LIMO	0	0	0	0	0	0
[720]	BEJI	0	0	0	0	0	0
[18]	BEKASI	0	0	0	0	25	46
[010]	PONDOK GEDE	0	0	0	0	25	46
[011]	JATIASIH	0	0	0	0	0	0
[100]	TARUMAJAYA	0	0	0	0	0	0
[730]	BEKASI BARAT	0	0	0	0	0	0
[19]	TANGERANG	0	0	0	0	300	513
[060]	CIPUTAT	0	0	0	0	193	396
[061]	PAMULANG	0	0	0	0	107	221
[070]	PONDOK AREN	0	0	0	0	90	194
[160]	TELUKNAGA	0	0	0	0	0	0
[161]	KOSAMBI	0	0	0	0	0	0
[75]	Kotamadya TANGERANG	0	0	0	297	654	955
[010]	CILEDUG	0	0	0	148	296	456
[030]	CIPONDOH	0	0	0	149	338	499
[050]	BATU CEPER	0	0	0	0	0	0
[060]	BENDA	0	0	0	0	0	0
Study Area Total		1,726	3,124	4,654	6,749	9,622	10,745

16. NUMBER OF PUBLIC HYDRANT

Kotamadya / Kecamatan			YEAR 1995	2000	2005	2010	2015	2019
[71]	JAKARTA SELATAN		42	42	42	42	42	42
	[010]	KEBAYORAN LAMA	2	2	2	2	2	2
	[011]	PESANGGRAHAN	0	0	0	0	0	0
	[020]	CILANDAK	2	2	2	2	2	2
	[030]	PASAR MINGGU	4	4	4	4	4	4
	[031]	JAGAKARSA	0	0	0	0	0	0
	[040]	MAMPANG PRAPATAN	4	4	4	4	4	4
	[041]	PANCORAN	4	4	4	4	4	4
	[050]	KEBAYORAN BARU	5	5	5	5	5	5
	[060]	SETIA BUDI	4	4	4	4	4	4
	[070]	TEBET	17	17	17	17	17	17
[74]	JAKARTA TIMUR		122	122	122	122	122	122
	[010]	PASAR REBO	2	2	2	2	2	2
	[011]	CERACAS	2	2	2	2	2	2
	[012]	CIPAYUNG	0	0	0	0	0	0
	[020]	KRAMAT JATI	10	10	10	10	10	10
	[021]	MAKASAR	3	3	3	3	3	3
	[030]	JATINEGARA	15	15	15	15	15	15
	[031]	DUREN SAWIT	3	3	3	3	3	3
	[040]	MATRAMAN	17	17	17	17	17	17
	[050]	PULO GADUNG	42	42	42	42	42	42
	[060]	CAKUNG	28	28	28	28	28	28
[73]	JAKARTA PUSAT		359	359	359	359	359	359
	[010]	TANAH ABANG	36	36	36	36	36	36
	[020]	MENTENG	8	8	8	8	8	8
	[030]	SENEN	11	11	11	11	11	11
	[040]	CEMPAKA PUTIH	84	84	84	84	84	84
	[041]	JOHAR BARU	11	11	11	11	11	11
	[050]	KEMAYORAN	140	140	140	140	140	140
	[060]	SAWAH BESAR	37	37	37	37	37	37
	[070]	GAMBIR	32	32	32	32	32	32
[74]	JAKARTA BARAT		449	449	449	449	449	449
	[010]	KEBON JERUK	7	7	7	7	7	7
	[011]	KEMBANGAN	7	7	7	7	7	7
	[020]	CENGKARENG	41	41	41	41	41	41
	[021]	KALI DERES	41	41	41	41	41	41
	[030]	GROGOL PETAMBURAN	55	55	55	55	55	55
	[031]	PALMERAH	9	9	9	9	9	9
	[040]	TAMBORA	226	226	226	226	226	226
	[050]	TAMAN SARI	63	63	63	63	63	63
[75]	JAKARTA UTARA		912	912	912	912	912	912
	[010]	PENJARINGAN	42	42	42	42	42	42
	[011]	PADEMANGAN	186	186	186	186	186	186
	[020]	TANJUNG PRIOK	246	246	246	246	246	246
	[030]	KOJA	218	218	218	218	218	218
	[031]	KELAPA GADING	12	12	12	12	12	12
	[040]	CILINCING	208	208	208	208	208	208
	[050]	KEPULAUAN SERIBU	0	0	0	0	0	0
Jakarta Total			1,884	1,884	1,884	1,884	1,884	1,884
[32]	JAWA BARAT		0	0	0	132	434	564
[03]	BOGOR		0	0	0	0	0	22
	[150]	CIMANGGIS						
	[200]	SAWANGAN						
	[201]	LIMO						22
	[720]	BEJI						
[18]	BEKASI		0	0	0	0	57	71
	[010]	PONDOK GEDE					43	54
	[011]	JATIASIH					14	17
	[100]	TARUMAJAYA						
	[730]	BEKASI BARAT						
[19]	TANGERANG		0	0	0	0	201	251
	[060]	CIPUTAT					93	116
	[061]	PAMULANG					57	71
	[070]	PONDOK AREN					51	64
	[160]	TELUKNAGA						
	[161]	KOSAMBI						
[75]	Kotamadya TANGERANG		0	0	0	132	176	220
	[010]	CILEDUG				64	86	107
	[020]	CIPONDOH				68	90	113
	[050]	BATU CEPER						
	[060]	BENDA						
Study Area Total			1,884	1,884	1,884	2,016	2,318	2,488

17. SERVED POPULATION BY PUBLIC HYDRANT

Kotamadya / Kecamatan	YEAR 1995	2000	2005	2010	2015	2019
[71] JAKARTA SELATAN	10,500	10,500	10,500	10,500	10,500	10,500
[010] KEBAYORAN LAMA	500	500	500	500	500	500
[011] PESANGGRAHAN	0	0	0	0	0	0
[020] CILANDAK	500	500	500	500	500	500
[030] PASAR MINGGU	1,000	1,000	1,000	1,000	1,000	1,000
[031] JAGAKARSA	0	0	0	0	0	0
[040] MAMPANG PRAPATAN	1,000	1,000	1,000	1,000	1,000	1,000
[041] PANCORAN	1,000	1,000	1,000	1,000	1,000	1,000
[050] KEBAYORAN BARU	1,250	1,250	1,250	1,250	1,250	1,250
[060] SETIA BUDI	1,000	1,000	1,000	1,000	1,000	1,000
[070] TEBET	4,250	4,250	4,250	4,250	4,250	4,250
[72] JAKARTA TIMUR	30,500	30,500	30,500	30,500	30,500	30,500
[010] PASAR REBO	500	500	500	500	500	500
[011] CIRACAS	500	500	500	500	500	500
[012] CIPAYUNG	0	0	0	0	0	0
[020] KRAMAT JATI	2,500	2,500	2,500	2,500	2,500	2,500
[021] MAKASAR	750	750	750	750	750	750
[030] JATINEGARA	3,750	3,750	3,750	3,750	3,750	3,750
[031] DUREN SAWIT	750	750	750	750	750	750
[040] MATRAMAN	4,250	4,250	4,250	4,250	4,250	4,250
[050] PULO GADUNG	10,500	10,500	10,500	10,500	10,500	10,500
[060] CAKUNG	7,000	7,000	7,000	7,000	7,000	7,000
[73] JAKARTA PUSAT	89,750	89,750	89,750	89,750	89,750	89,750
[010] TANAH ABANG	9,000	9,000	9,000	9,000	9,000	9,000
[020] MENTENG	2,000	2,000	2,000	2,000	2,000	2,000
[030] SENEN	2,750	2,750	2,750	2,750	2,750	2,750
[040] CEMPAKA PUTIH	21,000	21,000	21,000	21,000	21,000	21,000
[041] JOHAR BARU	2,750	2,750	2,750	2,750	2,750	2,750
[050] KEMAYORAN	35,000	35,000	35,000	35,000	35,000	35,000
[060] SAWAH BESAR	9,250	9,250	9,250	9,250	9,250	9,250
[070] GAMBIR	8,000	8,000	8,000	8,000	8,000	8,000
[74] JAKARTA BARAT	112,250	112,250	112,250	112,250	112,250	112,250
[010] KEBON JERUK	1,750	1,750	1,750	1,750	1,750	1,750
[011] KEMBANGAN	1,750	1,750	1,750	1,750	1,750	1,750
[020] CENGKARENG	10,250	10,250	10,250	10,250	10,250	10,250
[021] KALI DERES	10,250	10,250	10,250	10,250	10,250	10,250
[030] GROGOL PETAMBURAN	13,750	13,750	13,750	13,750	13,750	13,750
[031] PALMERAH	2,250	2,250	2,250	2,250	2,250	2,250
[040] TAMBORA	56,500	56,500	56,500	56,500	56,500	56,500
[050] TAMAN SARI	15,750	15,750	15,750	15,750	15,750	15,750
[75] JAKARTA UTARA	228,000	228,000	228,000	228,000	228,000	228,000
[010] PENJARINGAN	10,500	10,500	10,500	10,500	10,500	10,500
[011] PADEMANGAN	46,500	46,500	46,500	46,500	46,500	46,500
[020] TANJUNG PRIOK	61,500	61,500	61,500	61,500	61,500	61,500
[030] KOJA	54,500	54,500	54,500	54,500	54,500	54,500
[031] KELAPA GADING	3,000	3,000	3,000	3,000	3,000	3,000
[040] CILINCING	52,000	52,000	52,000	52,000	52,000	52,000
[050] KEPULAUAN SERIBU	0	0	0	0	0	0
Jakarta Total	471,000	471,000	471,000	471,000	471,000	471,000

*Persons Per Connection: 250

[32] JAWA BARAT	0	0	0	33,000	108,400	141,000
[03] BOGOR	0	0	0	0	0	5,500
[150] CIMANGGIS	0	0	0	0	0	0
[200] SAWANGAN	0	0	0	0	0	0
[201] LIMO	0	0	0	0	0	5,500
[720] BEJI	0	0	0	0	0	0
[18] BEKASI	0	0	0	0	14,200	17,750
[010] PONDOK GEDE	0	0	0	0	10,800	13,500
[011] JATIASIH	0	0	0	0	3,400	4,250
[100] TARUMAJAYA	0	0	0	0	0	0
[730] BEKASI BARAT	0	0	0	0	0	0
[19] TANGERANG	0	0	0	0	50,200	62,750
[060] CIPUTAT	0	0	0	0	23,200	29,000
[061] PAMULANG	0	0	0	0	14,200	17,750
[070] PONDOK AREN	0	0	0	0	12,800	16,000
[160] TELUKNAGA	0	0	0	0	0	0
[161] KOSAMBI	0	0	0	0	0	0
[75] Kotamadya TANGERANG	0	0	0	33,000	44,000	55,000
[010] CILEDUG	0	0	0	16,050	21,400	26,750
[020] CIPONDOH	0	0	0	16,950	22,600	28,250
[050] BATU CEPER	0	0	0	0	0	0
[060] BENDA	0	0	0	0	0	0
Study Area Total	471,000	471,000	471,000	504,000	579,400	612,000

18. TOTAL SERVED POPULATION

(x 1,000, Connection + P. Hydrant)

Kotamadya / Kecamatan		YEAR 1995	2000	2005	2010	2015	2019
[71] JAKARTA SELATAN		160	482	833	1,273	1,837	1,942
	[010] KEBAYORAN LAMA	12	68	125	185	246	251
	[011] PESANGGRAHAN	0	35	78	125	177	157
	[020] CILANDAK	12	47	90	135	200	225
	[030] PASAR MINGGU	12	63	123	158	257	272
	[031] JAGAKARSA	0	0	0	77	260	300
	[040] MAMPANG PRAPATAN	12	44	77	109	137	137
	[041] PANCORAN	12	41	72	102	127	127
	[050] KEBAYORAN BARU	40	63	86	109	136	141
	[060] SETIA BUDI	12	35	60	84	108	113
	[070] TEBET	48	66	122	156	189	189
[72] JAKARTA TIMUR		357	810	1,934	1,975	2,785	2,916
	[010] PASAR REBO	6	42	88	140	200	220
	[011] CIRACAS	5	50	105	172	242	253
	[012] CIPAYUNG	0	0	0	71	254	304
	[020] KRAMAT JATI	28	71	111	151	195	200
	[021] MAKASAR	9	39	76	120	171	186
	[030] JATINEGARA	66	119	157	198	238	238
	[031] DUREN SAWIT	67	132	201	272	345	350
	[040] MATRAMAN	47	70	89	108	126	126
	[050] PULO GADUNG	78	128	180	233	268	293
	[060] CAKUNG	51	164	317	510	726	746
[73] JAKARTA PUSAT		445	563	680	795	910	910
	[010] TANAH ABANG	69	91	113	135	157	157
	[020] MENTENG	27	42	58	73	89	89
	[030] SENEN	20	39	57	76	95	95
	[040] CEMPAKA PUTIH	95	90	90	90	90	90
	[041] JOHAR BARU	20	38	51	64	75	75
	[050] KEMAYORAN	111	134	155	175	195	195
	[060] SAWAH BESAR	44	61	78	95	112	112
	[070] GAMBIR	59	68	78	87	97	97
[74] JAKARTA BARAT		432	795	1,191	1,634	2,087	2,167
	[010] KEBON JERUK	26	88	157	232	308	318
	[011] KEMBANGAN	26	67	121	188	266	296
	[020] CENGKARENG	44	143	253	367	490	495
	[021] KALI DERES	44	88	140	206	267	322
	[030] GROGOL PETAMBURAN	59	100	141	182	224	224
	[031] PALMERAH	34	76	116	155	191	192
	[040] TAMBORA	133	156	176	198	218	218
	[050] TAMAN SARI	66	77	87	96	103	103
[75] JAKARTA UTARA		809	951	1,108	1,262	1,431	1,475
	[010] PENJARINGAN	79	124	175	231	293	303
	[011] PADEMANGAN	120	131	143	156	170	175
	[020] TANJUNG PRIOK	235	258	283	308	334	334
	[030] KOJA	136	159	150	199	217	216
	[031] KELAPA GADING	112	129	147	165	183	198
	[040] CILINCING	127	150	175	203	234	249
	[050] KEPULAUAN SERIBU	0	0	0	0	0	0
Jakarta Total		2,203	3,601	5,131	6,939	9,050	9,410

[32] JAWA BARAT		0	0	0	330	1,157	1,954
[03] BOGOR		0	0	0	0	0	6
	[150] CIMANGGIS	0	0	0	0	0	0
	[200] SAWANGAN	0	0	0	0	0	0
	[201] LIMO	0	0	0	0	0	6
	[720] BEJI	0	0	0	0	0	0
[18] BEKASI		0	0	0	0	39	64
	[010] PONDOK GEDE	0	0	0	0	36	60
	[011] JATIASIH	0	0	0	0	3	4
	[100] TARUMAJAYA	0	0	0	0	0	0
	[730] BEKASI BARAT	0	0	0	0	0	0
[19] TANGERANG		0	0	0	0	440	874
	[060] CIPUTAT	0	0	0	0	216	425
	[061] PAMULANG	0	0	0	0	121	239
	[970] PONDOK AREN	0	0	0	0	103	210
	[160] TELUKNAGA	0	0	0	0	0	0
	[161] KOSAMBI	0	0	0	0	0	0
[75] Kotamadya TANGERANG		0	0	0	330	678	1,010
	[010] CILEDUG	0	0	0	164	317	483
	[020] CIPONDOH	0	0	0	166	361	527
	[050] BATU CEPER	0	0	0	0	0	0
	[060] BENDA	0	0	0	0	0	0
Study Area Total		2,203	3,601	5,131	7,259	10,207	11,364

19. SERVICE RATIO

(Total, including Connectin + P. Hydrant)

Kotamadya / Kecamatan		YEAR 1995	2000	2005	2010	2015	2019
[71] JAKARTA SELATAN		8%	22%	37%	54%	74%	76%
	[010] KEBAYORAN LAMA	4%	21%	38%	56%	73%	74%
	[011] PESANGGRAHAN	0%	18%	36%	54%	72%	73%
	[020] CILANDAK	6%	22%	39%	55%	71%	74%
	[030] PASAR MINGGU	4%	21%	38%	54%	71%	73%
	[031] JAGAKARSA	0%	0%	0%	24%	69%	72%
	[040] MAMPANG PRAPATAN	8%	26%	50%	70%	91%	94%
	[041] PANCORAN	8%	26%	44%	62%	79%	82%
	[050] KEBAYORAN BARU	22%	34%	46%	59%	72%	72%
	[060] SETIA BUDI	8%	25%	43%	60%	77%	78%
	[070] TEBET	19%	34%	50%	65%	80%	82%
[72] JAKARTA TIMUR		15%	30%	45%	62%	81%	82%
	[010] PASAR REBO	4%	24%	44%	64%	83%	85%
	[011] CIRACAS	3%	22%	40%	59%	78%	79%
	[012] CIPAYUNG	0%	0%	0%	24%	67%	71%
	[020] KRAMAT JATI	12%	28%	44%	60%	76%	77%
	[021] MAKASAR	5%	20%	34%	45%	62%	64%
	[030] JATINEGARA	23%	38%	53%	68%	84%	85%
	[031] DUREN SAWIT	20%	34%	45%	62%	76%	76%
	[040] MATRAMAN	29%	45%	61%	77%	93%	95%
	[050] PULO GADUNG	26%	43%	59%	75%	91%	92%
	[060] CAKUNG	13%	33%	53%	73%	93%	93%
[73] JAKARTA PUSAT		44%	56%	69%	82%	95%	96%
	[010] TANAH ABANG	41%	54%	66%	79%	92%	92%
	[020] MENTENG	39%	47%	64%	81%	99%	99%
	[030] SENEN	19%	39%	60%	80%	100%	100%
	[040] CEMPAKA PUTIH	100%	100%	100%	100%	100%	100%
	[041] JOHAR BARU	19%	38%	57%	75%	94%	100%
	[050] KEMAYORAN	45%	60%	70%	81%	95%	95%
	[060] SAWAH BESAR	37%	51%	65%	79%	93%	93%
	[070] GAMBIR	56%	65%	74%	83%	92%	92%
[74] JAKARTA BARAT		22%	39%	56%	73%	90%	91%
	[010] KEBON JERUK	9%	29%	50%	70%	91%	91%
	[011] KEMBANGAN	14%	31%	48%	66%	83%	85%
	[020] CENGKARENG	10%	31%	51%	71%	92%	92%
	[021] KALI DERES	21%	37%	52%	68%	83%	85%
	[030] GROGOL PETAMBURAN	25%	42%	59%	76%	93%	95%
	[031] PALMERAH	15%	35%	55%	76%	96%	96%
	[040] TAMBORA	51%	62%	73%	84%	95%	97%
	[050] TAMAN SARI	51%	62%	73%	83%	94%	95%
[75] JAKARTA UTARA		56%	63%	70%	76%	83%	84%
	[010] PENJARINGAN	26%	41%	55%	68%	81%	82%
	[011] PADEMANGAN	77%	79%	82%	84%	87%	86%
	[020] TANJUNG PRIOK	69%	74%	79%	83%	86%	86%
	[030] KOJA	49%	59%	69%	80%	90%	92%
	[031] KELAPA GADING	86%	86%	86%	87%	87%	86%
	[040] CILINCING	53%	58%	63%	68%	73%	74%
	[050] KEPULAUAN SERIBU	0%	0%	0%	0%	0%	0%
Jakarta Total		25%	36%	52%	67%	83%	84%
[32] JAWA BARAT		0%	0%	0%	14%	43%	68%
[03] BOGOR		0%	0%	0%	0%	0%	6%
	[150] CIMANGGIS						
	[300] SAWANGAN						
	[301] LIMO	0%	0%	0%	0%	0%	6%
	[720] BEJI						
[18] BEKASI		0%	0%	0%	0%	12%	17%
	[010] PONDOK GEDE	0%	0%	0%	0%	14%	21%
	[011] JATIASIH	0%	0%	0%	0%	4%	4%
	[100] TARUMAJAYA						
	[730] BEKASI BARAT						
[19] TANGERANG		0%	0%	0%	0%	38%	68%
	[060] CIPUTAT	0%	0%	0%	0%	40%	73%
	[061] PAMULANG	0%	0%	0%	0%	32%	66%
	[070] PONDOK AREN	0%	0%	0%	0%	34%	62%
	[160] TELUKNAGA						
	[161] KOSAMBI						
[75] Kotamadya TANGERANG		0%	0%	0%	32%	62%	92%
	[010] CILEDUG	0%	0%	0%	33%	63%	97%
	[020] CIPONDOH	0%	0%	0%	31%	60%	88%
	[050] BATU CEPER						
	[060] BENDA						
Study Area Total		22%	32%	43%	57%	75%	81%

20. PERMISSIBLE YIELD OF GROUNDWATER

Kotamadya / Kecamatan		YEAR 1995 l/sec	2000 l/sec	2005 l/sec	2010 l/sec	2015 l/sec	2019 l/sec
[71] JAKARTA SELATAN		1,341	2,365	3,590	2,299	1,007	1,007
[010]	KEBAYORAN LAMA	186	328	499	317	136	136
[011]	PESANGGRAHAN	130	229	348	221	95	95
[020]	CILANDAK	176	310	470	299	128	128
[030]	PASAR MINGGU	211	373	566	360	154	154
[031]	JAGAKARSA	160	318	481	321	160	160
[040]	MAMPANG PRAPATAN	75	132	200	127	54	54
[041]	PANCORAN	79	140	213	135	58	58
[050]	KEBAYORAN BARU	125	220	334	212	91	91
[060]	SETIA BUDI	87	154	234	149	64	64
[070]	TEBET	92	162	246	157	67	67
[72] JAKARTA TIMUR		2,231	3,046	3,048	2,043	1,039	1,039
[010]	PASAR REBO	93	164	249	166	83	83
[011]	CIRACAS	115	204	309	206	103	103
[012]	CIPAYUNG	196	347	526	351	175	175
[020]	KRAMAT JATI	129	227	345	219	94	94
[021]	MAKASAR	209	368	559	356	152	152
[030]	JATINEGARA	103	181	275	175	75	75
[031]	DUREN SAWIT	220	388	589	375	161	161
[040]	MATRAMAN	90	90	15	15	15	15
[050]	PULO GADUNG	289	289	49	49	49	49
[060]	CAKUNG	787	787	132	132	132	132
[73] JAKARTA PUSAT		888	888	149	149	149	149
[010]	TANAH ABANG	172	172	29	29	29	29
[020]	MENTENG	121	121	20	20	20	20
[030]	SENEN	78	78	13	13	13	13
[040]	CEMPAKA PUTIH	87	87	15	15	15	15
[041]	JOHAR BARU	44	44	7	7	7	7
[050]	KEMAYORAN	134	134	23	23	23	23
[060]	SAWAH BESAR	110	110	18	18	18	18
[070]	GAMBIR	141	141	24	24	24	24
[74] JAKARTA BARAT		2,338	2,338	392	392	392	392
[010]	KEBON JERUK	325	325	54	54	54	54
[011]	KEMBANGAN	457	457	77	77	77	77
[020]	CENGKARENG	518	518	87	87	87	87
[021]	KALI DERES	508	508	85	85	85	85
[030]	GROGOL PETAMBURAN	209	209	35	35	35	35
[031]	PALMERAH	140	140	23	23	23	23
[040]	TAMBORA	102	102	17	17	17	17
[050]	TAMAN SARI	81	81	14	14	14	14
[75] JAKARTA UTARA		2,656	2,656	479	479	479	479
[010]	PENJARINGAN	658	658	110	110	110	110
[011]	PADEMANGAN	221	221	37	37	37	37
[020]	TANJUNG PRIOK	461	461	77	77	77	77
[030]	KOJA	210	210	35	35	35	35
[031]	KELAPA GADING	299	299	50	50	50	50
[040]	CILINCING	789	789	132	132	132	132
[050]	KEPULAUAN SERIBU	219	219	37	37	37	37
Jakarta Total		9,654	11,492	7,659	5,363	3,067	3,067

[32] JAWA BARAT		1,928	2,977	3,864	2,644	1,423	1,423
[03] BOGOR		166	293	444	296	148	148
[150]	CIMANGGIS						
[200]	SAWANGAN						
[201]	LIMO	166	293	444	296	148	148
[720]	BEJI						
[18] BEKASI		535	946	1,433	956	478	478
[010]	PONDOK GEDE	349	618	936	624	312	312
[011]	JATIASIH	186	328	497	331	166	166
[100]	TARUMAJAYA						
[730]	BEKASI BARAT						
[19] TANGERANG		666	1,178	1,784	1,189	595	595
[060]	CIPUTAT	257	454	688	459	229	229
[061]	PAMULANG	198	351	531	354	177	177
[070]	PONDOK AREN	211	373	565	376	188	188
[160]	TELUKNAGA						
[161]	KOSAMBI						
[75] Kotamadya TANGERANG		561	561	203	203	203	203
[010]	CILEDUG	219	219	79	79	79	79
[020]	CIPONDOH	341	341	124	124	124	124
[050]	BATU CEPER						
[060]	BENDA						
Study Area Total		11,581	14,469	11,523	8,007	4,490	4,490

21. GROUNDWATER USE FOR COMMERCIAL AND INDUSTRIAL DEMAND

Kotamadya / Kecamatan		YEAR 1995 l/sec	2000 l/sec	2005 l/sec	2010 l/sec	2015 l/sec	2019 l/sec
[71]	JAKARTA SELATAN	251	230	190	159	127	127
[010]	KEBAYORAN LAMA	23	20	17	14	12	12
[011]	PESANGGRAHAN	2	2	2	2	1	1
[020]	CILANDAK	32	28	24	20	17	17
[030]	PASAR MINGGU	20	18	16	14	11	11
[031]	JAGAKARSA	2	2	2	2	1	1
[040]	MAMPANG PRAPATAN	71	62	54	45	36	36
[041]	PANCORAN	25	21	18	15	12	12
[050]	KEBAYORAN BARU	32	28	24	20	16	16
[060]	SETIA BUDI	38	33	29	25	19	19
[070]	TEBET	6	5	4	3	3	3
[72]	JAKARTA TIMUR	275	240	206	172	140	140
[010]	PASAR REBO	53	47	41	35	27	27
[011]	CIRACAS	16	14	12	10	8	8
[012]	CIPAYUNG	0	0	0	0	0	0
[020]	KRAMAT JATI	19	16	14	12	9	9
[021]	MAKASAR	16	14	12	10	8	8
[030]	JATINEGARA	17	14	12	10	9	9
[031]	DUREN SAWIT	15	13	11	9	8	8
[040]	MATRAMAN	6	5	4	3	3	3
[050]	PULO GADUNG	20	17	15	12	11	11
[060]	CAKUNG	133	99	86	72	57	57
[73]	JAKARTA PUSAT	140	124	108	93	71	71
[010]	TANAH ABANG	20	18	16	14	10	10
[020]	MENTENG	37	32	28	24	18	18
[030]	SENEN	35	31	28	24	18	18
[040]	CEMPAKA PUTIH	6	5	4	3	3	3
[041]	JOHAR BARU	0	0	0	0	0	0
[050]	KEMAYORAN	2	2	2	2	1	1
[060]	SAWAH BESAR	16	14	12	10	8	8
[070]	GAMBIR	24	21	18	15	12	12
[74]	JAKARTA BARAT	133	117	101	84	69	69
[010]	KEBON JERUK	19	17	15	13	10	10
[011]	KEMBANGAN	1	1	1	1	1	1
[020]	CENGKARENG	49	44	38	32	25	25
[021]	KALI DERES	10	9	8	6	6	6
[030]	GROGOL PETAMBURAN	24	21	18	15	12	12
[031]	PALMERAH	22	19	16	13	11	11
[040]	TAMBORA	0	0	0	0	0	0
[050]	TAMAN SARI	7	6	5	4	4	4
[75]	JAKARTA UTARA	115	102	90	78	58	58
[010]	PENJARINGAN	33	29	25	22	16	16
[011]	PADEMANGAN	2	2	2	2	1	1
[020]	TANJUNG PRIOK	26	23	20	17	14	14
[030]	KOJA	4	4	3	3	2	2
[031]	KELAPA GADING	25	22	20	17	13	13
[040]	CILINCING	24	22	19	17	13	13
[050]	KEPULAUAN SERIBU	0	0	0	0	0	0
Jakarta Total		914	804	695	586	465	465
[32]	JAWA BARAT	237	207	177	147	119	119
[03]	BOGOR	8	7	6	5	4	4
[150]	CIMANGGIS	0	0	0	0	0	0
[200]	SAWANGAN	0	0	0	0	0	0
[201]	LIMO	8	7	6	5	4	4
[720]	BEJI	0	0	0	0	0	0
[16]	BEKASI	16	15	12	9	8	8
[010]	PONDOK GEDE	12	11	9	7	6	6
[011]	JATIASIH	4	4	3	2	2	2
[100]	TARUMAJAYA	0	0	0	0	0	0
[730]	BEKASI BARAT	0	0	0	0	0	0
[19]	TANGERANG	59	52	45	35	30	30
[060]	CIPUTAT	27	24	21	18	14	14
[061]	PAMULANG	16	14	12	10	8	8
[070]	PONDOK AREN	15	14	12	10	8	8
[160]	TELUKNAGA	0	0	0	0	0	0
[161]	KOSAMBI	0	0	0	0	0	0
[75]	Kotamadya TANGERANG	153	133	114	95	77	77
[010]	CILEDUG	110	96	82	68	55	55
[020]	CIPONDOH	43	37	32	27	22	22
[050]	BATU CEPER	0	0	0	0	0	0
[060]	BENDA	0	0	0	0	0	0
Study Area Total		1,150	1,011	872	733	584	584

22. WELL USER

(x 1,000) (*1000)

Kotamadya / Kecamatan		1995	2000	2005	2010	2015	2019
		YEAR					
[71] JAKARTA SELATAN		1,870	1,668	1,427	1,087	633	618
[010]	KEBAYORAN LAMA	298	253	200	145	89	89
[011]	PESANGGRAHAN	175	160	137	105	68	68
[020]	CILANDAK	178	163	140	112	80	80
[030]	PASAR MINGGU	258	237	202	157	103	103
[031]	JAGAKARSA	190	235	275	243	115	115
[040]	MAMPANG PRAPATAN	143	111	78	46	13	8
[041]	PANCORAN	143	119	93	63	33	26
[050]	KEBAYORAN BARU	145	122	99	76	54	54
[060]	SETIA BUDI	138	105	80	56	32	32
[070]	TEBET	202	164	123	84	45	41
[72] JAKARTA TIMUR		2,003	1,680	1,616	1,215	645	634
[010]	PASAR REBO	139	133	112	80	40	40
[011]	CIRACAS	185	150	155	118	68	67
[012]	CIPAYUNG	140	190	240	229	126	126
[020]	KRAMAT JATI	202	179	159	99	60	60
[021]	MAKASAR	161	161	149	130	104	104
[030]	JATINEGARA	224	186	138	92	47	42
[031]	DUREN SAWIT	273	258	219	168	110	110
[040]	MATRAMAN	113	85	56	32	9	4
[050]	PULO GADUNG	217	172	125	77	27	27
[060]	CAKUNG	549	336	263	190	54	54
[73] JAKARTA PUSAT		575	437	300	175	50	40
[010]	TANAH ABANG	101	79	57	35	13	13
[020]	MENTENG	63	48	32	17	1	1
[030]	SENEN	85	61	38	19	0	0
[040]	CEMPAKA PUTIH	0	0	0	0	0	0
[041]	JOHAR BARU	85	62	39	21	5	0
[050]	KEMAYORAN	119	91	65	40	15	10
[060]	SAWAH BESAR	76	59	42	25	8	8
[070]	GAMBIR	46	37	27	18	8	8
[74] JAKARTA BARAT		1,518	1,255	949	606	233	213
[010]	KEBON JERUK	259	212	158	98	32	32
[011]	KEMBANGAN	159	148	129	97	54	54
[020]	CENGKARENG	376	322	242	148	45	45
[021]	KALI DERES	166	152	130	99	58	58
[030]	GROGOL PETAMBURAN	181	149	99	58	16	11
[031]	PALMERAH	186	139	94	50	9	4
[040]	TAMBORA	127	94	64	37	12	7
[050]	TAMAN SARI	64	48	33	19	7	2
[75] JAKARTA UTARA		631	559	477	388	289	285
[010]	PENJARINGAN	201	176	145	109	67	67
[011]	PADEMANGAN	35	34	32	29	25	25
[020]	TANJUNG PRIOK	105	92	77	62	46	46
[030]	KOJA	144	111	80	51	23	19
[031]	KELAPA GADING	18	21	23	25	27	27
[040]	CILINCING	113	110	105	97	86	86
[050]	KEPULAUAN SERIBU	15	15	15	15	15	15
Jakarta Total		6,597	5,799	4,769	3,471	1,850	1,790

[32] JAWA BARAT		1,360	1,720	2,055	2,040	1,538	911
[03] BOGOR		70	80	85	90	95	99
[150]	CIMANGGIS	0	0	0	0	0	0
[200]	SAWANGAN	0	0	0	0	0	0
[201]	LIMO	70	80	85	90	95	99
[720]	BEJI	0	0	0	0	0	0
[16] BEKASI		280	280	290	290	291	316
[010]	PONDOK GEDE	210	210	220	220	214	220
[011]	JATIASIH	70	70	70	70	77	96
[100]	TARUMAJAYA	0	0	0	0	0	0
[730]	BEKASI BARAT	0	0	0	0	0	0
[19] TANGERANG		540	690	830	960	730	406
[060]	CIPUTAT	250	320	380	440	324	155
[061]	PAMULANG	150	190	230	270	209	121
[070]	PONDOK AREN	140	180	210	250	197	130
[160]	TELUKNAGA	0	0	0	0	0	0
[161]	KOSAMBI	0	0	0	0	0	0
[75] Kotamadya TANGERANG		470	670	860	700	422	90
[010]	CIUDUG	280	410	460	336	183	17
[020]	CIPONDOH	190	260	400	364	239	73
[050]	BATU CEPER	0	0	0	0	0	0
[060]	BENDA	0	0	0	0	0	0
Study Area Total		7,957	7,519	6,824	5,511	3,388	2,701

23. ESTIMATION OF POTENTIAL DEMAND (m^3/day)

Kotamadya / Kecamatan		1995 m^3/day	2000 m^3/day	2005 m^3/day	2010 m^3/day	2015 m^3/day	2019 m^3/day
[71] JAKARTA SELATAN		283,114	319,132	359,194	407,067	459,176	500,955
[010]	KEBAYORAN LAMA	40,236	44,367	48,712	53,819	59,811	62,320
[011]	PESANGGRAHAN	21,200	25,071	29,651	34,666	40,450	43,155
[020]	CILANDAK	26,616	31,264	36,709	42,955	51,813	58,000
[030]	PASAR MINGGU	35,226	41,547	48,305	55,471	63,053	67,475
[031]	JAGAKARSA	23,000	28,400	33,300	42,858	61,043	69,700
[040]	MAMPANG PRAPATAN	25,836	28,658	31,934	35,446	38,593	39,660
[041]	PANCORAN	21,856	24,372	27,214	29,877	32,011	32,430
[050]	KEBAYORAN BARU	34,334	37,837	41,517	45,586	50,663	53,940
[060]	SETIA BUDI	22,376	23,019	25,237	27,702	30,558	32,600
[070]	TEBET	32,424	34,587	36,414	38,677	41,181	41,675
[72] JAKARTA TIMUR		334,734	401,418	466,756	545,821	640,897	681,615
[010]	PASAR REBO	22,270	28,004	34,023	40,313	47,723	52,785
[011]	CIRACAS	24,434	31,300	38,091	45,085	53,570	57,180
[012]	CIPAYUNG	16,800	22,800	28,800	39,843	60,882	71,350
[020]	KRAMAT JATI	31,360	36,239	38,993	42,331	46,882	49,145
[021]	MAKASAR	22,508	27,818	33,126	39,371	46,458	50,355
[030]	JATINEGARA	40,822	45,225	48,267	51,620	55,409	56,640
[031]	DUREN SAWIT	44,785	54,227	62,337	70,098	78,227	81,315
[040]	MATRAMAN	23,638	24,675	25,197	26,649	28,170	28,460
[050]	PULO GADUNG	45,102	49,249	53,955	59,445	65,695	68,690
[060]	CAKUNG	63,014	81,881	103,966	130,065	157,480	165,885
[73] JAKARTA PUSAT		188,080	204,966	223,481	244,270	266,428	278,440
[010]	TANAH ABANG	29,650	32,537	35,701	39,120	42,705	44,620
[020]	MENTENG	21,690	24,582	27,693	30,953	34,445	36,455
[030]	SENEN	17,262	18,244	19,497	21,521	23,875	24,850
[040]	CEMPAKA PUTIH	14,384	14,531	15,448	16,275	17,192	17,925
[041]	JOHAR BARU	14,352	14,911	14,648	15,542	16,272	16,220
[050]	KEMAYORAN	31,926	33,652	35,560	37,768	40,117	41,000
[060]	SAWAH BESAR	25,290	28,226	31,478	34,825	38,477	40,475
[070]	GAMBIR	33,526	38,313	43,256	48,266	53,345	56,895
[74] JAKARTA BARAT		282,204	320,174	363,225	412,654	469,600	498,270
[010]	KEBON JERUK	38,084	43,236	49,573	56,969	64,831	68,660
[011]	KEMBANGAN	24,584	30,353	37,942	46,787	57,104	64,230
[020]	CENGKARENG	57,284	68,292	79,224	90,493	103,680	107,845
[021]	KALI DERES	28,744	34,919	42,121	51,199	62,676	70,900
[030]	GROGOL PETAMBURAN	34,380	37,386	40,877	44,873	49,415	50,630
[031]	PALMERAH	31,352	33,511	35,082	39,091	42,382	43,295
[040]	TAMBORA	39,856	41,992	44,272	47,492	50,857	52,435
[050]	TAMAN SARI	27,920	30,485	33,134	35,950	38,655	40,275
[75] JAKARTA UTARA		241,864	269,282	298,986	330,508	364,760	385,115
[010]	PENJARINGAN	47,518	54,421	62,236	70,838	80,587	85,450
[011]	PADEMANGAN	38,338	42,672	46,986	51,600	56,331	59,270
[020]	TANJUNG PRIOK	59,758	65,460	71,576	77,895	84,575	87,690
[030]	KOJA	36,036	37,022	38,190	39,504	40,987	41,615
[031]	KELAPA GADING	26,394	31,377	36,694	42,128	47,780	52,385
[040]	CILINCING	32,020	36,530	41,504	45,843	52,700	56,905
[050]	KEPULAUAN SERIBU	1,800	1,800	1,800	1,800	1,800	1,800
Total		1,329,996	1,515,002	1,711,642	1,940,620	2,210,861	2,344,395

[32] JAWA BARAT		183,852	232,430	278,180	335,686	423,204	500,480
[03] BOGOR		9,065	10,400	11,100	11,900	12,600	13,440
[150]	CIMANGGIS	0	0	0	0	0	0
[200]	SAWANGAN	0	0	0	0	0	0
[201]	LIMO	9,065	10,400	11,100	11,900	12,600	13,440
[730]	BEJI	0	0	0	0	0	0
[18] BEKASI		35,000	35,300	36,800	37,100	43,944	51,760
[010]	PONDOK GEDE	26,250	26,500	27,900	28,100	33,624	38,930
[011]	JATIASIH	8,750	8,800	8,900	9,000	10,320	12,830
[100]	TARUMAJAYA	0	0	0	0	0	0
[730]	BEKASI BARAT	0	0	0	0	0	0
[19] TANGERANG		69,930	89,000	105,700	123,600	169,665	211,865
[060]	CIPUTAT	32,375	41,300	49,000	55,700	79,162	97,950
[061]	PAMULANG	19,425	24,500	29,600	34,700	47,638	59,055
[070]	PONDOK AREN	18,130	23,200	27,100	32,200	42,865	54,860
[150]	TELUKNAGA	0	0	0	0	0	0
[161]	KOSAMBI	0	0	0	0	0	0
[75] Kotamadya TANGERANG		69657	97,730	124,580	163,086	196,995	223,415
[010]	CI EDUG	43,120	61,580	70,500	85,011	97,359	113,010
[020]	CIPONDOH	26,537	36,150	54,080	78,075	99,636	112,405
[050]	BATU CEPER	0	0	0	0	0	0
[060]	BENDA	0	0	0	0	0	0
Study Area Total		1,513,648	1,747,432	1,989,822	2,276,306	2,634,055	2,844,875

24. ESTIMATION OF POTENTIAL DEMAND (l/s)

Kotamadya / Kecamatan		1995 l/s	2000 l/s	2005 l/s	2010 l/s	2015 l/s	2019 l/s
[71] JAKARTA SELATAN		3,277	3,694	4,157	4,711	5,430	5,798
[010]	KEBAYORAN LAMA	456	514	564	623	692	721
[011]	PESANGGRAHAN	245	290	345	401	458	499
[020]	CILANDAK	308	362	425	497	600	671
[030]	PASAR MINGGU	408	481	559	642	730	781
[031]	JAGAKARSA	266	329	385	495	707	807
[040]	MAMPANG PRAPATAN	299	332	370	410	447	459
[041]	PANCORAN	253	282	315	345	370	375
[050]	KEBAYORAN BARU	397	438	481	528	585	624
[060]	SETIA BUDI	259	266	292	321	354	377
[070]	TEBET	375	400	421	448	477	492
[72] JAKARTA TIMUR		3,874	4,645	5,402	6,317	7,418	7,889
[010]	PASAR REBO	258	324	394	457	552	611
[011]	CIRACAS	283	362	441	533	625	662
[012]	CIPAYUNG	194	264	333	451	705	826
[020]	KRAMAT JATI	363	419	451	490	543	569
[021]	MAKASAR	261	322	383	455	538	583
[030]	JATINEGARA	472	523	559	597	641	656
[031]	DUREN SAWIT	518	628	721	811	905	939
[040]	MATRAMAN	274	286	292	308	326	329
[050]	PULO GADUNG	522	570	624	688	760	795
[060]	CAKUNG	729	948	1,203	1,505	1,823	1,920
[73] JAKARTA PUSAT		2,177	2,373	2,587	2,827	3,084	3,223
[010]	TANAH ABANG	343	377	413	453	494	516
[020]	MENTENG	251	285	321	358	399	422
[030]	SENEN	200	211	226	249	276	288
[040]	CEMPAKA PUTIH	165	168	179	188	199	207
[041]	JOHAR BARU	166	173	172	180	188	188
[050]	KEMAYORAN	370	389	412	437	464	475
[060]	SAWAH BESAR	293	327	364	403	445	468
[070]	GAMBIR	388	443	501	559	617	658
[74] JAKARTA BARAT		3,266	3,706	4,204	4,778	5,435	5,767
[010]	KEBON JERUK	441	500	574	659	750	795
[011]	KEMBANGAN	285	351	439	542	661	743
[020]	CENGKARENG	663	790	917	1,047	1,200	1,248
[021]	KALI DERES	333	404	488	593	725	821
[030]	GROGOL PETAMBURAN	398	433	473	519	572	585
[031]	PALMERAH	363	388	418	452	491	501
[040]	TAMBORA	451	486	512	550	589	607
[050]	TAMAN SARI	323	353	383	416	447	466
[75] JAKARTA UTARA		2,759	3,117	3,450	3,826	4,222	4,457
[010]	PENJARINGAN	550	630	720	820	933	989
[011]	PADEMANGAN	414	494	544	597	652	686
[020]	TANJUNG PRIOK	692	758	828	902	979	1,015
[030]	KOJA	417	428	442	457	474	492
[031]	KELAPA GADING	305	363	425	488	553	606
[040]	CILINCING	371	423	480	542	610	659
[050]	KEPULAUAN SERIBU	21	21	21	21	21	21
Total		15,393	17,535	19,811	22,451	25,589	27,134

[32] JAWA BARAT		2,126	2,690	3,220	3,885	4,898	5,793
[03] BOGOR		105	120	128	138	146	156
[150]	CIMANGGIS	0	0	0	0	0	0
[200]	SAWANGAN	0	0	0	0	0	0
[201]	LIMO	105	120	128	138	146	156
[720]	BEJI	0	0	0	0	0	0
[18] BEKASI		405	409	426	429	509	599
[010]	PONDOK GEDE	304	307	323	325	389	451
[011]	JATIASIH	101	102	103	104	119	148
[100]	TARUMAJAYA	0	0	0	0	0	0
[730]	BEKASI BARAT	0	0	0	0	0	0
[19] TANGERANG		809	1,030	1,223	1,431	1,954	2,452
[060]	CIPUTAT	375	478	567	656	916	1,134
[061]	PAMULANG	225	284	343	402	551	684
[070]	PONDOK AREN	210	269	314	373	496	635
[160]	TELUKNAGA	0	0	0	0	0	0
[161]	KOSAMBI	0	0	0	0	0	0
[75] Kotamadya TANGERANG		806	1,131	1,442	1,858	2,280	2,586
[010]	CILEDUG	499	713	816	984	1,127	1,285
[020]	CIPONDOH	307	418	626	904	1,153	1,301
[050]	BATU CEPER	0	0	0	0	0	0
[060]	BENDA	0	0	0	0	0	0
Study Area Total		17,519	20,225	23,030	26,346	30,487	32,927

25. ESTIMATION OF DEMAND (m^3/day)

Kotamadya / Kecamatan		1995 m³/day	2000 m³/day	2005 m³/day	2010 m³/day	2015 m³/day	2019 m³/day
[71] JAKARTA SELATAN		37,040	99,923	171,542	262,650	382,249	415,828
[010]	KEBAYORAN LAMA	2,455	12,388	23,247	35,227	48,126	50,635
[011]	PESANGGRAHAN	27	5,698	13,238	21,893	32,204	34,909
[020]	CILANDAK	2,491	9,295	17,857	27,819	40,788	45,975
[030]	PASAR MINGGU	2,524	11,548	22,693	35,444	49,777	54,199
[031]	JAGAKARSA	27	27	127	13,535	47,157	55,814
[040]	MAMPANG PRAPATAN	2,577	9,977	17,934	26,016	33,939	35,606
[041]	PANCORAN	2,565	8,237	14,490	21,042	26,979	27,998
[050]	KEBAYORAN BARU	14,167	20,775	27,561	34,736	42,800	45,077
[060]	SETIA BUDI	2,558	7,525	13,107	18,816	25,090	27,132
[070]	TEBET	7,639	14,452	21,288	28,322	35,389	36,483
[72] JAKARTA TIMUR		70,672	155,047	255,020	385,158	551,420	593,458
[010]	PASAR REBO	1,006	7,959	17,020	27,672	40,577	45,639
[011]	CIRACAS	859	8,508	18,481	31,097	45,079	48,409
[012]	CIPAYUNG	0	0	0	12,363	45,762	56,240
[020]	KRAMAT JATI	5,514	13,353	21,108	29,446	38,879	41,162
[021]	MAKASAR	1,806	7,288	14,209	22,907	33,287	37,184
[030]	JATINEGARA	12,509	21,662	30,654	39,716	49,010	50,841
[031]	DUREN SAWIT	10,726	22,151	35,126	49,191	64,377	67,265
[040]	MATRAMAN	9,560	14,043	18,131	22,550	26,831	27,721
[050]	PULO GADUNG	17,332	27,106	37,680	49,157	61,548	64,542
[060]	CAKUNG	11,360	32,977	62,611	101,059	146,070	154,475
[73] JAKARTA PUSAT		106,959	141,808	178,108	215,271	254,324	267,536
[010]	TANAH ABANG	15,770	21,473	27,455	33,690	40,265	42,180
[020]	MENTENG	10,972	16,015	21,398	26,809	32,745	34,766
[030]	SENEN	4,028	8,215	12,553	17,182	22,315	23,300
[040]	CEMPAKA PUTIH	13,856	14,099	15,102	16,016	16,933	17,666
[041]	JOHAR BARU	4,152	7,471	10,168	13,022	15,672	16,220
[050]	KEMAYORAN	17,470	22,556	27,584	32,792	38,229	39,712
[060]	SAWAH BESAR	14,769	19,920	25,387	30,950	36,615	38,814
[070]	GAMBIR	25,932	32,059	38,451	44,810	51,348	54,878
[74] JAKARTA BARAT		88,540	159,477	240,654	332,847	435,671	456,741
[010]	KEBON JERUK	5,362	16,327	29,317	44,086	60,127	63,956
[011]	KEMBANGAN	5,418	12,507	22,376	35,061	50,538	57,664
[020]	CENGKARENG	7,905	25,893	45,925	69,974	95,107	100,272
[021]	KALI DERES	7,917	15,897	25,863	38,785	55,219	63,443
[030]	GROGOL PETAMBURAN	10,586	18,772	27,442	36,617	45,458	48,273
[031]	PALMERAH	7,101	15,162	23,397	31,948	40,336	41,849
[040]	TAMBORA	24,616	30,712	36,592	43,052	49,417	51,555
[050]	TAMAN SARI	19,635	24,207	28,742	33,324	37,469	39,589
[75] JAKARTA UTARA		156,242	193,365	233,974	277,342	325,043	345,878
[010]	PENJARINGAN	20,586	30,797	42,641	55,871	71,141	76,004
[011]	PADEMANGAN	33,927	38,385	42,944	47,924	53,226	56,165
[020]	TANJUNG PRIOK	44,883	52,419	60,609	69,002	77,874	80,989
[030]	KOJA	18,392	23,383	28,317	33,157	38,045	39,353
[031]	KELAPA GADING	22,067	26,919	32,222	37,643	43,457	45,062
[040]	CILINCING	16,387	21,462	27,241	33,745	41,300	45,505
[050]	KEPULAUAN SERIBU	0	0	0	0	0	0
Total		459,453	749,620	1,079,298	1,473,468	1,948,707	2,089,441

[32] JAWA BARAT		0	0	0	71,545	228,362	380,878
[03] BOGOR		0	0	0	668	854	1,214
[150]	CIMANGGIS	0	0	0	0	0	0
[200]	SAWANGAN	0	0	0	0	0	0
[201]	LIMO	0	0	0	668	854	1,214
[720]	BEJI	0	0	0	0	0	0
[18] BEKASI		0	0	0	0	8,333	13,149
[010]	PONDOK GEDE	0	0	0	0	7,426	12,012
[011]	JATIASIH	0	0	0	0	907	1,137
[100]	TARUMAJAYA	0	0	0	0	0	0
[730]	BEKASI BARAT	0	0	0	0	0	0
[19] TANGERANG		0	0	0	0	79,473	160,553
[060]	CIPUTAT	0	0	0	0	39,072	78,140
[061]	PAMULANG	0	0	0	0	21,867	43,844
[070]	PONDOK AREN	0	0	0	0	18,534	38,569
[160]	TELUKNAGA	0	0	0	0	0	0
[161]	KOSAMBI	0	0	0	0	0	0
[75] Kotamadya TANGERANG		0	0	0	70,878	139,702	205,562
[010]	CILEDUG	0	0	0	38,815	70,647	104,218
[020]	CIPONDOH	0	0	0	32,063	69,055	101,744
[050]	BATU CEPER	0	0	0	0	0	0
[060]	BENDA	0	0	0	0	0	0
Study Area Total		459,453	749,620	1,079,298	1,545,014	2,177,069	2,470,319

<Total>

26. ESTIMATION OF DEMAND (l/s)

Kotamadya / Kecamatan		1995 l/s	2000 l/s	2005 l/s	2010 l/s	2015 l/s	2019 l/s
[71] JAKARTA SELATAN		429	1,157	1,985	3,042	4,424	4,813
[010]	KEBAYORAN LAMA	29	143	269	408	557	585
[011]	PESANGGRAHAN	0	66	153	253	373	404
[020]	CILANDAK	29	108	207	322	472	544
[030]	PASAR MINGGU	29	134	263	410	576	627
[031]	JAGAKARSA	0	0	1	157	545	646
[040]	MAMPANG PRAPATAN	30	115	208	301	393	412
[041]	PANCORAN	30	95	158	244	312	324
[050]	KEBAYORAN BARU	164	240	319	402	495	533
[060]	SETIA BUDI	30	87	152	218	290	314
[070]	TEBET	88	167	245	328	410	422
[72] JAKARTA TIMUR		818	1,795	2,952	4,458	6,382	6,869
[010]	PASAR REBO	12	92	197	320	470	528
[011]	CIRACAS	10	98	214	360	522	560
[012]	CIPAYUNG	0	0	0	143	530	651
[030]	KRAMAT JATI	64	155	244	341	450	476
[021]	MAKASAR	21	84	164	255	385	430
[030]	JATINEGARA	145	251	355	460	567	588
[031]	DUREN SAWIT	124	256	407	559	745	779
[040]	MATRAMAN	111	163	210	261	311	321
[050]	PULO GADUNG	201	314	435	569	712	747
[060]	CAKUNG	131	382	725	1,170	1,691	1,788
[73] JAKARTA PUSAT		1,238	1,641	2,061	2,492	2,944	3,095
[010]	TANAH ABANG	183	249	318	390	456	488
[020]	MENTENG	127	185	248	310	379	402
[030]	SENEN	47	95	145	199	258	270
[040]	CEMPAKA PUTIH	160	163	175	185	195	204
[041]	JOHAR BARU	48	86	118	151	181	188
[050]	KEMAYORAN	202	261	319	380	442	460
[060]	SAWAH BESAR	171	231	294	358	426	449
[070]	GAMBIR	300	371	445	519	594	635
[74] JAKARTA BARAT		1,025	1,846	2,785	3,852	5,042	5,402
[010]	KEBON JERUK	62	189	339	510	696	740
[011]	KEMBANGAN	63	145	259	406	585	667
[020]	CENGKARENG	91	300	543	810	1,112	1,161
[021]	KALI DERES	92	184	299	449	639	734
[030]	GROGOL PETAMBURAN	123	217	318	424	538	559
[031]	PALMERAH	82	175	271	370	457	484
[040]	TAMBORA	285	355	424	498	572	597
[050]	TAMAN SARI	227	280	333	386	434	459
[75] JAKARTA UTARA		1,808	2,238	2,708	3,210	3,762	4,003
[010]	PENJARINGAN	238	356	494	647	823	880
[011]	PADEMANGAN	393	444	497	555	616	650
[020]	TANJUNG PRIOK	519	607	701	799	901	937
[030]	KOJA	213	271	328	384	440	453
[031]	KELAPA GADING	255	312	373	436	503	555
[040]	CILINCING	190	248	315	391	478	527
[050]	KEPULAUAN SERIBU	0	0	0	0	0	0
Total		5,318	8,675	12,492	17,054	22,554	24,183

[32] JAWA BARAT		0	0	0	828	2,643	4,408
[03] BOGOR		0	0	0	8	10	14
[150]	CIMANGGIS	0	0	0	0	0	0
[200]	SAWANGAN	0	0	0	0	0	0
[201]	LIMO	0	0	0	8	10	14
[720]	BEJI	0	0	0	0	0	0
[16] BEKASI		0	0	0	0	95	152
[010]	PONDOK GEDE	0	0	0	0	86	139
[011]	JATIASIH	0	0	0	0	10	13
[100]	TARUMAJAYA	0	0	0	0	0	0
[730]	BEKASI BARAT	0	0	0	0	0	0
[19] TANGERANG		0	0	0	0	920	1,858
[050]	CIPUTAT	0	0	0	0	452	904
[061]	PAMULANG	0	0	0	0	253	507
[070]	PONDOK AREN	0	0	0	0	215	445
[150]	TELUKNAGA	0	0	0	0	0	0
[161]	KOSAMBI	0	0	0	0	0	0
[75] Kotamadya TANGERANG		0	0	0	820	1,617	2,384
[010]	CILEDUG	0	0	0	449	818	1,206
[020]	CIPONDOH	0	0	0	371	799	1,178
[050]	BATU CEPER	0	0	0	0	0	0
[060]	BENDA	0	0	0	0	0	0
Study Area Total		5,318	8,676	12,492	17,882	25,198	28,592

27. BALANCE BETWEEN POTENTIAL DEMAND AND ESTIMATED DEMAND (l/s)

Kotamadya	Kecamatan	1995 l/s	2000 l/s	2005 l/s	2010 l/s	2015 l/s	2019 l/s
[71] JAKARTA SELATAN		2,848	2,537	2,172	1,669	1,006	985
	[010] KEBAYORAN LAMA	437	370	295	215	135	135
	[011] PESANGGRAHAN	245	224	192	148	95	95
	[020] CILANDAK	279	254	218	175	128	128
	[030] PASAR MINGGU	378	347	295	232	154	154
	[031] JAGAKARSA	255	328	384	340	161	161
	[040] MAMPANG PRAPATAN	269	216	162	109	54	47
	[041] PANCORAN	223	187	147	102	58	51
	[050] KEBAYORAN BARU	233	197	162	126	91	91
	[060] SETIA BUDI	229	179	140	103	63	63
	[070] TEBET	287	233	175	120	67	60
[72] JAKARTA TIMUR		3,056	2,852	2,451	1,860	1,036	1,020
	[010] PASAR REBO	246	232	197	145	83	83
	[011] CIRACAS	273	264	227	173	103	102
	[012] CIPAYUNG	194	264	333	318	175	175
	[020] KRAMAT JATI	299	265	207	149	93	93
	[021] MAKASAR	240	238	219	191	152	152
	[030] JATINEGARA	328	273	204	138	74	67
	[031] DUREN SAWIT	394	371	315	242	160	150
	[040] MATRAMAN	163	123	82	47	15	9
	[050] PULO GADUNG	321	256	188	119	48	43
	[060] CAKUNG	598	566	479	336	132	132
[73] JAKARTA PUSAT		939	731	525	336	140	126
	[010] TANAH ABANG	161	128	95	63	28	28
	[020] MENTENG	124	99	73	48	20	20
	[030] SENEN	153	115	80	50	18	18
	[040] CEMPAKA PUTIH	6	5	4	3	3	3
	[041] JOHAR BARU	118	86	54	29	7	0
	[050] KEMAYORAN	167	128	92	58	22	15
	[060] SAWAH BESAR	122	95	70	45	19	19
	[070] GAMBIR	88	72	55	40	23	23
[74] JAKARTA BARAT		2,241	1,850	1,419	926	393	365
	[010] KEBON JERUK	379	311	234	149	54	54
	[011] KEMBANGAN	222	207	180	135	76	76
	[020] CENGKARENG	572	491	374	237	88	88
	[021] KALI DERES	241	220	188	144	86	86
	[030] GROGOL PETAMBURAN	275	215	155	96	34	27
	[031] PALMERAH	281	212	147	83	24	17
	[040] TAMBORA	176	131	89	51	17	10
	[050] TAMAN SARI	95	73	51	30	14	7
[75] JAKARTA UTARA		991	879	752	617	460	454
	[010] PENJARINGAN	312	273	227	173	109	109
	[011] PADEMANGAN	51	50	47	43	36	36
	[020] TANJUNG PRIOK	172	151	127	103	78	78
	[030] KOJA	204	158	114	73	34	28
	[031] KELAPA GADING	50	52	52	52	50	50
	[040] CILINCING	181	174	165	152	132	132
	[050] KEPULAUAN SERIBU	21	21	21	21	21	21
Total		10,076	8,659	7,319	5,407	3,034	2,951

[32] JAWA BARAT		2,126	2,690	3,220	3,057	2,255	1,384
[03] BOGOR		105	120	128	130	136	142
	[150] CIMANGGIS	0	0	0	0	0	0
	[200] SAWANGAN	0	0	0	0	0	0
	[201] LIMO	105	120	128	130	136	142
	[720] BEJI	0	0	0	0	0	0
[18] BEKASI		405	409	426	429	412	447
	[010] PONDOK GEDE	304	307	323	325	303	312
	[011] JATIASIH	101	102	103	104	109	135
	[100] TARUMAJAYA	0	0	0	0	0	0
	[730] BEKASI BARAT	0	0	0	0	0	0
[19] TANGERANG		809	1,030	1,223	1,431	1,044	594
	[060] CIPUTAT	375	478	567	655	454	229
	[061] PAMULANG	225	284	343	402	298	176
	[070] PONDOK AREN	210	269	314	373	282	189
	[160] TELUKNAGA	0	0	0	0	0	0
	[161] KOSAMBI	0	0	0	0	0	0
[75] Kotamadya TANGERANG		806	1,131	1,442	1,067	663	202
	[010] CILEDUG	499	713	816	535	309	79
	[020] CIPONDOH	307	418	626	533	354	123
	[050] BATU CEPER	0	0	0	0	0	0
	[060] BENDA	0	0	0	0	0	0
Study Area Total		12,201	11,549	10,538	8,464	5,289	4,335

<Domestic>

28. ESTIMATION OF POTENTIAL DOMESTIC DEMAND

Kotamadya / Kecamatan	1995 m³/day	2000 m³/day	2005 m³/day	2010 m³/day	2015 m³/day	2019 m³/day
[71] JAKARTA SELATAN	247,644	276,482	309,404	350,187	404,946	431,395
[010] KEBAYORAN LAMA	37,476	41,097	44,842	49,439	54,821	56,930
[011] PESANGGRAHAN	21,000	24,871	29,551	34,366	40,050	42,755
[020] CILANDAK	23,076	27,014	31,759	37,295	45,453	51,040
[030] PASAR MINGGU	32,676	38,487	44,745	51,401	58,483	62,495
[031] JAGAKARSA	22,800	28,200	33,000	42,568	60,643	69,300
[040] MAMPANG PRAPATAN	18,876	20,288	22,134	24,326	26,063	26,120
[041] PANCORAN	18,876	20,762	23,094	25,147	26,661	26,670
[050] KEBAYORAN BARU	23,484	24,687	26,167	27,926	30,803	32,380
[060] SETIA BUDI	18,276	18,109	19,517	21,172	23,118	24,560
[070] TEBET	31,104	32,967	34,594	36,547	38,851	39,145
[72] JAKARTA TIMUR	290,904	351,508	410,916	483,951	573,217	609,435
[010] PASAR REBO	17,460	22,604	28,063	33,803	40,653	45,315
[011] CIRACAS	22,824	29,540	35,081	43,935	51,580	54,660
[012] CIPAYUNG	16,800	22,800	28,800	39,843	60,882	71,360
[020] KRAMAT JATI	28,140	32,499	34,833	37,651	41,792	43,645
[021] MAKASAR	20,568	25,478	30,486	36,321	43,108	46,705
[030] JATINEGARA	36,552	40,145	42,277	44,820	47,799	48,330
[031] DUREN SAWIT	43,056	52,187	59,897	67,348	75,177	77,765
[040] MATRAMAN	20,268	20,895	21,007	21,949	23,060	23,050
[050] PULO GADUNG	35,492	39,599	43,406	47,896	53,146	55,410
[060] CAKUNG	48,744	65,761	85,066	110,385	136,020	143,195
[73] JAKARTA PUSAT	124,380	129,086	135,171	143,760	153,738	156,500
[010] TANAH ABANG	21,480	22,767	24,321	26,140	28,225	28,930
[020] MENTENG	11,460	12,242	13,253	14,403	15,795	16,215
[030] SENEN	12,852	13,154	13,637	14,991	16,575	17,020
[040] CEMPAKA PUTIH	11,544	11,181	11,598	12,015	12,432	12,765
[041] JOHAR BARU	12,852	13,111	12,748	13,142	13,572	13,320
[050] KEMAYORAN	26,136	26,962	27,970	29,178	30,627	30,800
[060] SAWAH BESAR	14,580	15,506	16,638	17,975	19,517	20,015
[070] GAMBIR	13,476	14,163	15,006	15,916	16,995	17,425
[74] JAKARTA BARAT	231,924	261,114	295,075	335,824	383,610	405,550
[010] KEBON JERUK	34,824	39,376	45,013	51,809	58,971	62,300
[011] KEMBANGAN	22,824	28,293	35,482	44,027	54,044	60,870
[020] CENGKARENG	50,424	60,192	69,884	79,923	91,880	95,125
[021] KALI DERES	25,224	30,879	37,451	46,009	56,856	64,680
[030] GROGOL PETAMBURAN	28,740	30,736	33,227	36,213	39,755	40,170
[031] PALMERAH	27,312	28,671	30,442	32,641	35,132	35,445
[040] TAMBORA	27,096	27,322	27,682	28,992	30,447	30,625
[050] TAMAN SARI	15,480	15,645	15,894	16,210	16,515	16,335
[75] JAKARTA UTARA	166,044	183,912	203,976	226,258	251,060	264,525
[010] PENJARINGAN	34,728	39,431	44,966	51,388	58,847	62,060
[011] PADEMANGAN	15,588	17,692	19,976	22,460	25,161	26,680
[020] TANJUNG PRIOK	39,588	42,800	46,386	50,275	54,525	55,840
[030] KOJA	29,916	30,172	30,610	31,194	31,947	32,065
[031] KELAPA GADING	19,164	22,937	26,954	31,208	35,670	39,315
[040] CILINCING	25,260	29,080	33,274	37,933	43,110	46,765
[050] KEPULAUAN SERIBU	1,800	1,800	1,800	1,800	1,800	1,800
Total	1,060,896	1,202,102	1,354,542	1,539,980	1,766,571	1,867,405
Per Capita Consumption	156	162	168	174	180	185
Groundwater per capita	120					

[32] JAWA BARAT	163,200	206,400	246,600	296,516	373,554	444,540
[03] BOGOR	8,400	9,600	10,200	10,800	11,400	11,880
[150] CIMANGGIS	0	0	0	0	0	0
[200] SAWANGAN	0	0	0	0	0	0
[201] LIMO	8,400	9,600	10,200	10,800	11,400	11,880
[720] BEJI	0	0	0	0	0	0
[18] BEKASI	33,600	33,600	34,800	34,800	39,424	45,430
[010] PONDOK GEDE	25,200	25,200	26,400	26,400	30,184	34,910
[011] JATIASIH	8,400	8,400	8,400	8,400	9,240	11,520
[100] TARUMAJAYA	0	0	0	0	0	0
[730] BEKASI BARAT	0	0	0	0	0	0
[19] TANGERANG	64,800	82,800	98,400	115,200	157,855	198,755
[050] CIPUTAT	30,000	38,400	45,600	52,800	73,652	91,850
[051] PAMULANG	18,000	22,800	27,600	32,400	44,358	55,405
[070] PONDOK AREN	16,800	21,600	25,200	30,000	39,855	51,490
[160] TELUKNAGA	0	0	0	0	0	0
[161] KOSAMBI	0	0	0	0	0	0
[75] Kotamadya TANGERANG	56400	80,400	103,200	135,716	164,855	187,475
[010] CILEDUG	33,600	49,200	55,200	66,091	75,289	85,400
[020] CIPONDOH	22,800	31,200	48,000	69,625	89,576	101,075
[050] BATU CEPER	0	0	0	0	0	0
[060] BENDA	0	0	0	0	0	0
Study Area Total	1,224,096	1,408,502	1,601,142	1,836,496	2,140,125	2,311,945

<Domestic>

29. ESTIMATION OF DOMESTIC DEMAND

Kotamadya / Kecamatan	1995 m³/day	2000 m³/day	2005 m³/day	2010 m³/day	2015 m³/day	2019 m³/day
[71] JAKARTA SELATAN	23,241	76,322	138,164	219,747	328,986	357,235
[010] KEBAYORAN LAMA	1,716	10,857	20,842	32,039	44,141	46,250
[011] PESANGGRAHAN	0	5,671	13,311	21,766	31,890	34,595
[020] CILANDAK	1,716	7,454	14,959	23,855	35,853	41,440
[030] PASAR MINGGU	1,716	10,047	20,506	32,561	46,123	50,135
[031] JAGAKARSA	0	0	0	13,408	46,843	55,500
[040] MAMPANG PRAPATAN	1,716	6,968	12,774	18,806	24,503	25,160
[041] PANCORAN	1,716	6,482	11,934	17,587	22,701	23,310
[050] KEBAYORAN BARU	6,084	10,047	14,287	18,806	24,323	25,900
[060] SETIA BUDI	1,716	5,509	9,917	14,452	19,278	20,720
[070] TEBET	6,864	13,287	19,834	26,457	33,331	34,225
[72] JAKARTA TIMUR	50,544	125,908	216,995	338,151	495,817	533,355
[010] PASAR REBO	780	6,644	14,623	24,203	35,853	40,515
[011] CIRACAS	624	7,940	17,481	29,775	43,420	46,620
[012] CIPAYUNG	0	0	0	12,363	45,762	56,240
[020] KRAMAT JATI	3,900	11,019	18,153	25,771	34,592	36,445
[021] MAKASAR	1,248	6,158	12,606	20,721	30,628	34,225
[030] JATINEGARA	9,672	17,825	25,717	33,780	42,159	43,290
[031] DUREN SAWIT	10,296	21,227	33,617	47,188	61,977	64,565
[040] MATRAMAN	6,708	10,595	14,287	18,109	21,980	22,570
[050] PULO GADUNG	10,452	18,959	28,406	38,656	49,906	52,170
[060] CAKUNG	6,864	25,441	52,106	87,585	129,540	136,715
[73] JAKARTA PUSAT	55,380	76,646	99,171	122,760	147,738	151,700
[010] TANAH ABANG	9,360	13,287	17,481	21,940	26,665	27,380
[020] MENTENG	3,900	6,482	9,413	12,363	15,675	16,095
[030] SENEN	2,652	5,834	9,077	12,711	16,575	17,020
[040] CEMPAKA PUTIH	11,544	11,181	11,593	12,015	12,432	12,765
[041] JOHAR BARU	2,652	5,671	8,068	10,622	12,972	13,320
[050] KEMAYORAN	11,856	16,042	20,170	24,378	28,827	29,600
[060] SAWAH BESAR	5,460	8,426	11,593	14,975	18,557	19,055
[070] GAMBIR	7,956	9,723	11,766	13,756	16,035	16,465
[74] JAKARTA BARAT	49,764	110,514	181,195	263,104	355,650	379,990
[010] KEBON JERUK	3,744	13,936	26,053	40,049	55,131	58,460
[011] KEMBANGAN	3,744	10,533	20,002	32,387	47,564	54,390
[020] CENGKARENG	5,304	21,552	40,844	62,163	85,490	89,725
[021] KALI DERES	5,304	12,639	21,851	34,129	49,906	57,720
[030] GROGOL PETAMBURAN	7,020	13,936	21,347	29,253	37,835	38,850
[031] PALMERAH	4,992	11,991	19,162	26,641	34,052	34,965
[040] TAMBORA	11,856	16,042	20,002	24,552	29,007	29,785
[050] TAMAN SARI	7,800	9,885	11,934	13,930	15,675	16,095
[75] JAKARTA UTARA	90,324	116,832	146,736	179,698	216,380	230,325
[010] PENJARINGAN	10,608	18,311	27,566	38,308	50,807	54,020
[011] PADEMANGAN	11,388	13,612	16,136	18,980	22,161	23,680
[020] TANJUNG PRIOK	26,988	31,760	37,146	42,835	49,005	50,320
[030] KOJA	12,636	16,852	21,010	25,074	29,187	29,785
[031] KELAPA GADING	17,004	20,417	24,204	28,208	32,430	36,075
[040] CILINCING	11,700	15,880	20,674	26,293	32,790	36,445
[050] KEPULAUAN SERIBU	0	0	0	0	0	0
Total	269,256	506,222	782,261	1,123,460	1,544,571	1,652,605

[32] JAWA BARAT	0	0	0	51,716	188,994	335,220
[03] BOGOR	0	0	0	0	0	0
[150] CIMANGGIS	0	0	0	0	0	0
[200] SAWANGAN	0	0	0	0	0	0
[201] LIMO	0	0	0	0	0	0
[720] BEJI	0	0	0	0	0	0
[18] BEKASI	0	0	0	0	4,504	8,510
[010] PONDOK GEDE	0	0	0	0	4,504	8,510
[011] JATIASIH	0	0	0	0	0	0
[100] TARUMAJAYA	0	0	0	0	0	0
[730] BEKASI BARAT	0	0	0	0	0	0
[19] TANGERANG	0	0	0	0	70,265	150,035
[050] CIPUTAT	0	0	0	0	34,772	73,260
[061] PAMULANG	0	0	0	0	19,278	40,885
[070] PONDOK AREN	0	0	0	0	16,215	35,890
[160] TELUKNAGA	0	0	0	0	0	0
[161] KOSAMBI	0	0	0	0	0	0
[75] Kotamadya TANGERANG	0	0	0	51,716	114,225	176,675
[010] CILEDUG	0	0	0	25,771	53,329	84,360
[020] CIPONDOH	0	0	0	25,945	60,896	92,315
[050] BATU CEPER	0	0	0	0	0	0
[060] BENDA	0	0	0	0	0	0
Study Area Total	269,256	506,222	782,261	1,175,176	1,733,565	1,987,815

30. ESTIMATION OF HYDRANT & PUBLIC TAPS DEMAND

Kotamadya / Kecamatan		1995 m³/day	2000 m³/day	2005 m³/day	2010 m³/day	2015 m³/day	2019 m³/day
[71] JAKARTA SELATAN		410	410	410	410	410	410
[010]	KEBAYORAN LAMA	50	50	50	50	50	50
[011]	PESANGGRAHAN	0	0	0	0	0	0
[020]	CILANDAK	50	50	50	50	50	50
[030]	PASAR MINGGU	50	50	50	50	50	50
[031]	JAGAKARSA	0	0	0	0	0	0
[040]	MAMPANG PRAPATAN	50	50	50	50	50	50
[041]	PANCORAN	50	50	50	50	50	50
[050]	KEBAYORAN BARU	20	20	20	20	20	20
[060]	SETIA BUDI	50	50	50	50	50	50
[070]	TEBET	90	90	90	90	90	90
[72] JAKARTA TIMUR		4,840	4,840	4,840	4,840	4,840	4,840
[010]	PASAR REBO	140	140	140	140	140	140
[011]	CIRACAS	140	140	140	140	140	140
[012]	CIPAYUNG	0	0	0	0	0	0
[020]	KRAMAT JATI	710	710	710	710	710	710
[021]	MAKASAR	210	210	210	210	210	210
[030]	JATINEGARA	110	110	110	110	110	110
[031]	DUREN SAWIT	40	40	40	40	40	40
[040]	MATRAMAN	1,210	1,210	1,210	1,210	1,210	1,210
[050]	PULO GADUNG	1,370	1,370	1,370	1,370	1,370	1,370
[060]	CAKUNG	910	910	910	910	910	910
[73] JAKARTA PUSAT		3,710	3,710	3,710	3,710	3,710	3,710
[010]	TANAH ABANG	520	520	520	520	520	520
[020]	MENTENG	40	40	40	40	40	40
[030]	SENEN	90	90	90	90	90	90
[040]	CEMPAKA PUTIH	450	450	450	450	450	450
[041]	JOHAR BARU	90	90	90	90	90	90
[050]	KEMAYORAN	1,370	1,370	1,370	1,370	1,370	1,370
[060]	SAWAH BESAR	710	710	710	710	710	710
[070]	GAMBIR	440	440	440	440	440	440
[74] JAKARTA BARAT		6,690	6,690	6,690	6,690	6,690	6,690
[010]	KEBON JERUK	160	160	160	160	160	160
[011]	KEMBANGAN	160	160	160	160	160	160
[020]	CENGKARENG	560	560	560	560	560	560
[021]	KALI DERES	560	560	560	560	560	560
[030]	GROGOL PETAMBURAN	750	750	750	750	750	750
[031]	PALMERAH	210	210	210	210	210	210
[040]	TAMBORA	3,460	3,460	3,460	3,460	3,460	3,460
[050]	TAMAN SARI	830	830	830	830	830	830
[75] JAKARTA UTARA		12,690	12,690	12,690	12,690	12,690	12,690
[010]	PENJARINGAN	1,040	1,040	1,040	1,040	1,040	1,040
[011]	PADEMANGAN	4,050	4,050	4,050	4,050	4,050	4,050
[020]	TANJUNG PRIOK	2,680	2,680	2,680	2,680	2,680	2,680
[030]	KOJA	2,330	2,330	2,330	2,330	2,330	2,330
[031]	KELAPA GADING	220	220	220	220	220	220
[040]	CILINCING	2,370	2,370	2,370	2,370	2,370	2,370
[050]	KEPULAUAN SERIBU	0	0	0	0	0	0
Jakarta Total		28,340	28,340	28,340	28,340	28,340	28,340
[32] JAWA BARAT		0	0	0	1,830	6,860	8,860
[03] BOGOR		0	0	0	0	0	260
[150]	CIMANGGIS	0	0	0	0	0	0
[200]	SAWANGAN	0	0	0	0	0	0
[201]	LEMO	0	0	0	0	0	260
[720]	BEJI	0	0	0	0	0	0
[18] BEKASI		0	0	0	0	2,020	2,530
[010]	PONDOK GEDE	0	0	0	0	1,540	1,920
[011]	JATIASIH	0	0	0	0	480	610
[100]	TARUMAJAYA	0	0	0	0	0	0
[730]	BEKASI BARAT	0	0	0	0	0	0
[19] TANGERANG		0	0	0	0	2,400	3,010
[060]	CIPUTAT	0	0	0	0	1,110	1,390
[061]	PAMULANG	0	0	0	0	680	850
[070]	PONDOK AREN	0	0	0	0	610	770
[160]	TELUKNAGA	0	0	0	0	0	0
[161]	KOSAMBI	0	0	0	0	0	0
[75] Kotamadya TANGERANG		0	0	0	1,830	2,440	3,060
[010]	CILEDUG	0	0	0	700	930	1,170
[020]	CIPONDOH				1,130	1,510	1,890
[050]	BATU CEPER	0	0	0	0	0	0
[060]	BENDA	0	0	0	0	0	0
Study Area Total		28,340	28,340	28,340	30,170	35,200	37,200

31. ESTIMATION OF POTENTIAL COMMERCIAL & SERVICE DEMAND

Kotamadya / Kecamatan	1995 m³/day	2000 m³/day	2005 m³/day	2010 m³/day	2015 m³/day	2019 m³/day
[71] JAKARTA SELATAN	34,000	41,100	48,200	55,200	62,500	67,800
[010] KEBAYORAN LAMA	2,600	3,100	3,700	4,200	4,800	5,200
[011] PESANGGRAHAN	200	200	300	300	400	400
[020] CILANDAK	3,400	4,100	4,800	5,500	6,200	6,800
[030] PASAR MINGGU	2,400	2,900	3,400	3,900	4,400	4,800
[031] JAGAKARSA	200	200	300	300	400	400
[040] MAMPANG PRAPATAN	6,600	8,000	9,400	10,700	12,100	13,100
[041] PANCORAN	2,700	3,300	3,800	4,400	5,000	5,400
[050] KEBAYORAN BARU	10,800	13,100	15,300	17,600	19,800	21,500
[060] SETIA BUDI	3,900	4,700	5,500	6,300	7,200	7,800
[070] TEBET	1,200	1,500	1,700	2,000	2,200	2,400
[72] JAKARTA TIMUR	24,500	29,600	34,700	39,900	44,900	48,900
[010] PASAR REBO	1,900	2,300	2,700	3,100	3,500	3,800
[011] CIRACAS	700	800	1,000	1,100	1,300	1,400
[012] CIPAYUNG	0	0	0	0	0	0
[020] KRAMAT JATI	2,200	2,700	3,100	3,600	4,000	4,400
[021] MAKASAR	1,700	2,100	2,400	2,800	3,100	3,400
[030] JATINEGARA	4,000	4,800	5,700	6,500	7,200	8,000
[031] DUREN SAWIT	1,600	1,900	2,300	2,600	2,900	3,200
[040] MATRAMAN	2,000	2,400	2,800	3,300	3,700	4,000
[050] PULO GADUNG	3,700	4,500	5,200	6,000	6,800	7,400
[060] CAKUNG	6,700	8,100	9,500	10,900	12,300	13,300
[73] JAKARTA PUSAT	58,300	70,400	82,700	94,800	106,900	116,100
[010] TANAH ABANG	7,600	9,200	10,800	12,400	13,900	15,100
[020] MENTENG	10,100	12,200	14,300	16,400	18,500	20,100
[030] SENEN	3,100	3,700	4,400	5,000	5,700	6,200
[040] CEMPAKA PUTIH	2,300	2,800	3,300	3,700	4,200	4,600
[041] JOHAR BARU	1,400	1,700	2,000	2,300	2,600	2,800
[050] KEMAYORAN	4,400	5,300	6,200	7,200	8,100	8,800
[060] SAWAH BESAR	9,800	11,800	13,900	15,900	18,000	19,500
[070] GAMBIR	19,600	23,700	27,800	31,900	35,900	39,000
[74] JAKARTA BARAT	42,300	51,000	60,000	68,800	77,700	84,400
[010] KEBON JERUK	3,100	3,700	4,400	5,000	5,700	6,200
[011] KEMBANGAN	1,600	1,900	2,300	2,600	2,900	3,200
[020] CENGKARENG	5,700	6,900	8,100	9,300	10,500	11,400
[021] KALI DERES	2,600	3,100	3,700	4,200	4,800	5,200
[030] GROGOL PETAMBURAN	4,800	5,800	6,800	7,800	8,800	9,600
[031] PALMERAH	3,800	4,600	5,400	6,200	7,000	7,600
[040] TAMBORA	9,100	11,000	12,900	14,800	16,700	18,100
[050] TAMAN SARI	11,600	14,000	16,400	18,900	21,300	23,100
[75] JAKARTA UTARA	38,300	46,200	54,400	62,300	70,300	76,300
[010] PENJARINGAN	10,300	12,400	14,600	16,700	18,900	20,500
[011] PADEMANGAN	6,700	8,100	9,500	10,900	12,300	13,300
[020] TANJUNG PRIOK	9,600	11,600	13,600	15,600	17,600	19,100
[030] KOJA	3,300	4,000	4,700	5,400	6,100	6,600
[031] KELAPA GADING	5,400	6,500	7,700	8,800	9,900	10,800
[040] CILINCING	3,000	3,600	4,300	4,900	5,500	6,000
[050] KEPULAUAN SERIBU	0	0	0	0	0	0
Total	197,400	238,300	280,000	321,000	362,900	393,500
Population of DKI Jakarta	8800	9400	9900	10400	10900	11200
Exponential	24	29	34	39	44	48

PAM / July'94-June'94	49,440 *1000m³
Total Potential Demand	72,191 *1000m³
	197,782 m³/day

[32] JAWA BARAT	15,572	18,800	22,000	25,400	28,500	30,900
[03] BOGOR	665	800	900	1,100	1,200	1,300
[150] CIMANGGIS	0	0	0	0	0	0
[200] SAWANGAN	0	0	0	0	0	0
[201] LIMO	665	800	900	1,100	1,200	1,300
[720] BEJI	0	0	0	0	0	0
[18] BEKASI	1,400	1,700	2,000	2,300	2,500	2,800
[010] PONDOK GEDE	1,050	1,300	1,500	1,700	1,900	2,100
[011] JATIASIH	350	400	500	600	600	700
[100] TARUMAJAYA	0	0	0	0	0	0
[730] BEKASI BARAT	0	0	0	0	0	0
[19] TANGERANG	5,130	6,200	7,200	8,400	9,400	10,100
[060] CIPUTAT	2,375	2,900	3,400	3,900	4,400	4,700
[061] PAMULANG	1,425	1,700	2,000	2,300	2,600	2,800
[070] PONDOK AREN	1,330	1,600	1,900	2,200	2,400	2,600
[160] TELUKNAGA	0	0	0	0	0	0
[161] KOSAMBI	0	0	0	0	0	0
[75] Kotamadya TANGERANG	8,377	10,100	11,800	13,600	15,400	16,700
[010] CILEDUG	6,160	7,400	8,700	10,000	11,300	12,300
[020] CIPONDOH	2,217	2,700	3,100	3,600	4,100	4,400
[050] BATU CEPER	0	0	0	0	0	0
[060] BENDA	0	0	0	0	0	0
Study Area Total	213,000	257,100	302,000	346,400	390,800	424,400

32. ESTIMATION OF COMMERCIAL & SERVICE DEMAND

Kotamadya / Kecamatan	1995 m³/day	2000 m³/day	2005 m³/day	2010 m³/day	2015 m³/day	2019 m³/day
[71] JAKARTA SELATAN	13,350	22,954	32,562	42,067	52,048	57,348
[010] KEBAYORAN LAMA	699	1,458	2,318	3,077	3,850	4,250
[011] PESANGGRAHAN	27	27	127	127	314	314
[020] CILANDAK	722	1,767	2,813	3,858	4,818	5,418
[030] PASAR MINGGU	758	1,431	2,104	2,777	3,536	3,936
[031] JAGAKARSA	27	27	127	127	314	314
[040] MAMPANG PRAPATAN	811	2,902	4,994	6,985	9,162	10,162
[041] PANCORAN	799	1,658	2,418	3,277	4,050	4,450
[050] KEBAYORAN BARU	8,035	10,681	13,226	15,872	18,418	20,118
[060] SETIA BUDI	790	1,935	3,081	4,226	5,645	6,245
[070] TEBET	682	1,068	1,354	1,741	1,941	2,141
[72] JAKARTA TIMUR	9,899	16,812	23,727	30,741	37,384	41,384
[010] PASAR REBO	86	658	1,231	1,804	2,550	2,850
[011] CIRACAS	95	282	568	754	954	1,054
[012] CIPAYUNG	0	0	0	0	0	0
[020] KRAMAT JATI	818	1,490	2,063	2,736	3,309	3,709
[021] MAKASAR	318	890	1,363	1,936	2,409	2,709
[030] JATINEGARA	2,704	3,677	4,750	5,722	6,609	7,309
[031] DUREN SAWIT	390	863	1,436	1,909	2,295	2,595
[040] MATRAMAN	1,482	1,968	2,454	3,041	3,441	3,741
[050] PULO GADUNG	2,404	3,377	4,250	5,222	6,109	6,709
[060] CAKUNG	1,602	3,607	5,612	7,617	9,708	10,708
[73] JAKARTA PUSAT	47,501	60,809	74,319	87,628	101,456	110,658
[010] TANAH ABANG	5,872	7,645	9,418	11,190	13,036	14,236
[020] MENTENG	6,990	9,435	11,881	14,326	16,945	18,545
[030] SENEN	1,286	2,058	2,931	3,704	4,750	5,250
[040] CEMPAKA PUTIH	1,782	2,368	2,954	3,441	3,941	4,341
[041] JOHAR BARU	1,400	1,700	2,000	2,300	2,600	2,800
[050] KEMAYORAN	4,227	5,127	6,027	7,027	8,014	8,714
[060] SAWAH BESAR	8,418	10,590	12,863	15,036	17,309	18,809
[070] GAMBIR	17,526	21,886	26,245	30,604	34,863	37,963
[74] JAKARTA BARAT	31,672	41,670	51,966	62,063	73,170	78,870
[010] KEBON JERUK	1,458	2,231	3,104	3,877	4,836	5,336
[011] KEMBANGAN	1,514	1,814	2,214	2,514	2,814	3,114
[020] CENGKARENG	1,955	5,617	5,249	6,881	8,599	9,499
[021] KALI DERES	1,995	2,582	3,268	3,854	4,454	4,854
[030] GROGOL PETAMBURAN	2,726	3,956	5,245	6,504	7,763	8,563
[031] PALMERAH	1,899	2,958	4,018	5,077	6,050	6,650
[040] TAMBORA	9,100	11,000	12,900	14,800	16,700	18,100
[050] TAMAN SARI	10,995	13,482	15,968	18,554	20,954	22,754
[75] JAKARTA UTARA	32,770	41,189	49,908	58,325	67,449	73,449
[010] PENJARINGAN	8,572	10,845	13,218	15,490	18,036	19,636
[011] PADEMANGAN	6,527	7,927	9,327	10,727	12,214	13,214
[020] TANJUNG PRIOK	8,131	10,304	12,477	14,650	16,822	18,322
[030] KOJA	3,300	4,000	4,700	5,400	6,100	6,600
[031] KELAPA GADING	4,363	5,550	6,836	8,022	9,382	10,282
[040] CILINCING	1,877	2,563	3,350	4,036	4,895	5,395
[050] KEPULAUAN SERIBU	0	0	0	0	0	0
Total	135,192	183,434	232,482	280,822	330,509	361,709

[32] JAWA BARAT	0	0	0	9,084	20,638	23,038
[03] BOGOR	0	0	0	668	854	954
[150] CIMANGGIS	0	0	0	0	0	0
[200] SAWANGAN	0	0	0	0	0	0
[201] LEMO				668	854	954
[720] BEJI	0	0	0	0	0	0
[18] BEKASI	0	0	0	0	1,809	2,109
[010] PONDOK GEDE					1,382	1,582
[011] JATIASIH					427	527
[100] TARUMAJAYA	0	0	0	0	0	0
[730] BEKASI BARAT	0	0	0	0	0	0
[19] TANGERANG	0	0	0	0	6,808	7,508
[060] CIPUTAT					3,190	3,490
[061] PAMULANG					1,909	2,109
[070] PONDOK AREN					1,709	1,909
[160] TELUKNAGA	0	0	0	0	0	0
[161] KOSAMBI	0	0	0	0	0	0
[75] Kotamadya TANGERANG	0	0	0	8,416	11,167	12,467
[010] CILEDUG				6,198	8,190	9,190
[020] CIPONDOH				2,218	2,977	3,277
[050] BATU CEPER	0	0	0	0	0	0
[060] BENDA	0	0	0	0	0	0
Study Area Total	135,200	183,400	232,500	289,900	351,300	384,700

33. BALANCE BETWEEN POTENTIAL AND DEMAND = DEPEND ON GROUNDWATER

Kotamadya / Kecamatan		1995 l/sec	2000 l/sec	2005 l/sec	2010 l/sec	2015 l/sec	2019 l/sec
[71] JAKARTA SELATAN		239	210	181	152	121	121
[010]	KEBAYORAN LAMA	22	19	16	13	11	11
[011]	PESANGGRAHAN	2	2	2	2	1	1
[020]	CILANDAK	31	27	23	19	16	16
[030]	PASAR MINGGU	19	17	15	13	10	10
[031]	JAGAKARSA	2	2	2	2	1	1
[040]	MAMPANG PRAPATAN	67	59	51	43	34	34
[041]	PANCORAN	22	19	16	13	11	11
[050]	KEBAYORAN BARU	32	28	24	20	16	16
[060]	SETIA BUDI	36	32	28	24	18	18
[070]	TEBET	6	5	4	3	3	3
[72] JAKARTA TIMUR		169	148	127	106	87	87
[010]	PASAR REBO	21	19	17	15	11	11
[011]	CIRACAS	7	6	5	4	4	4
[012]	CIPAYUNG	0	0	0	0	0	0
[020]	KRAMAT JATI	16	14	12	10	8	8
[021]	MAKASAR	16	14	12	10	8	8
[030]	JATINEGARA	15	13	11	9	8	8
[031]	DUREN SAWIT	14	12	10	8	7	7
[040]	MATRAMAN	6	5	4	3	3	3
[050]	PULO GADUNG	15	13	11	9	8	8
[060]	CAKUNG	59	52	45	38	30	30
[73] JAKARTA PUSAT		125	111	97	83	63	63
[010]	TANAH ABANG	20	18	16	14	10	10
[020]	MENTENG	36	32	28	24	18	18
[030]	SENEN	21	19	17	15	11	11
[040]	CEMPAKA PUTIH	6	5	4	3	3	3
[041]	JOHAR BARU	0	0	0	0	0	0
[050]	KEMAYORAN	2	2	2	2	1	1
[060]	SAWAH BESAR	16	14	12	10	8	8
[070]	GAMBIR	24	21	18	15	12	12
[74] JAKARTA BARAT		123	108	93	78	64	64
[010]	KEBON JERUK	19	17	15	13	10	10
[011]	KEMBANGAN	1	1	1	1	1	1
[020]	CENGKARENG	43	38	33	28	22	22
[021]	KALI DERES	7	6	5	4	4	4
[030]	GROGOL PETAMBURAN	24	21	18	15	12	12
[031]	PALMERAH	22	19	16	13	11	11
[040]	TAMBORA	0	0	0	0	0	0
[050]	TAMAN SARI	7	6	5	4	4	4
[75] JAKARTA UTARA		64	58	52	46	33	33
[010]	PENJARINGAN	20	18	16	14	10	10
[011]	PADEMANGAN	2	2	2	2	1	1
[020]	TANJUNG PRIOK	17	15	13	11	9	9
[030]	KOJA	0	0	0	0	0	0
[031]	KELAPA GADING	12	11	10	9	6	6
[040]	CILINCING	13	12	11	10	7	7
[050]	KEPULAUAN SERIBU	0	0	0	0	0	0
Total		720	635	550	465	368	368
		62,208	54,864	47,520	40,176	31,795	31,795

[32] JAWA BARAT		181	158	135	112	91	91
[03] BOGOR		8	7	6	5	4	4
[150]	CIMANGGIS	0	0	0	0	0	0
[200]	SAWANGAN	0	0	0	0	0	0
[201]	LIMO	8	7	6	5	4	4
[720]	BEJI	0	0	0	0	0	0
[18] BEKASI		16	15	22	9	8	8
[010]	PONDOK GEDE	12	11	9	7	6	6
[011]	JATIASIH	4	4	3	2	2	2
[100]	TARUMAJAYA	0	0	0	0	0	0
[730]	BEKASI BARAT	0	0	0	0	0	0
[19] TANGERANG		59	52	45	38	30	30
[060]	CIPUTAT	27	24	21	18	14	14
[061]	PAMULANG	16	14	12	10	8	8
[070]	PONDOK AREN	15	14	12	10	8	8
[160]	TELUKNAGA	0	0	0	0	0	0
[161]	KOSAMBI	0	0	0	0	0	0
[75] Kotamadya TANGERANG		97	84	72	60	49	49
[010]	CILEDUG	73	62	53	44	36	36
[020]	CIPONDOH	26	22	19	16	13	13
[050]	BATU CEPER	0	0	0	0	0	0
[060]	BENDA	0	0	0	0	0	0
Study Area Total		901	793	685	577	459	459

34. ESTIMATION OF POTENTIAL INDUSTRIAL DEMAND

Kotamadya / Kecamatan	1995 m³/day	2000 m³/day	2005 m³/day	2010 m³/day	2015 m³/day	2019 m³/day
[71] JAKARTA SELATAN	1,060	1,140	1,180	1,270	1,330	1,350
[010] KEBAYORAN LAMA	110	120	120	130	140	140
[011] PESANGGRAHAN	0	0	0	0	0	0
[020] CILANDAK	90	100	100	110	110	110
[030] PASAR MINGGU	100	110	110	120	120	130
[031] JAGAKARSA	0	0	0	0	0	0
[040] MAMPANG PRAPATAN	310	330	350	370	380	390
[041] PANCORAN	240	260	270	280	300	310
[050] KEBAYORAN BARU	30	30	30	40	40	40
[060] SETIA BUDI	150	160	170	180	190	190
[070] TEBET	30	30	30	40	40	40
[72] JAKARTA TIMUR	14,490	15,470	16,300	17,130	17,940	18,440
[010] PASAR REBO	2,770	2,960	3,120	3,270	3,430	3,530
[011] CIRACAS	770	820	870	910	950	980
[012] CIPAYUNG	0	0	0	0	0	0
[020] KRAMAT JATI	310	330	350	370	380	390
[021] MAKASAR	30	30	30	40	40	40
[030] JATINEGARA	160	170	180	190	200	200
[031] DUREN SAWIT	90	100	100	110	110	110
[040] MATRAMAN	160	170	180	190	200	200
[050] PULO GADUNG	3,540	3,780	3,980	4,180	4,380	4,510
[060] CAKUNG	6,660	7,110	7,490	7,870	8,250	8,480
[73] JAKARTA PUSAT	1,690	1,800	1,900	2,000	2,080	2,130
[010] TANAH ABANG	50	50	60	60	60	60
[020] MENTENG	90	100	100	110	110	110
[030] SENEN	1,220	1,300	1,370	1,440	1,510	1,550
[040] CEMPAKA PUTIH	90	100	100	110	110	110
[041] JOHAR BARU	10	10	10	10	10	10
[050] KEMAYORAN	20	20	20	20	20	30
[060] SAWAH BESAR	200	210	230	240	250	250
[070] GAMBIR	10	10	10	10	10	10
[74] JAKARTA BARAT	1,290	1,370	1,460	1,540	1,600	1,630
[010] KEBON JERUK	0	0	0	0	0	0
[011] KEMBANGAN	0	0	0	0	0	0
[020] CENGKARENG	600	640	680	710	740	760
[021] KALI DERES	360	380	410	430	450	460
[030] GROGOL PETAMBURAN	90	100	100	110	110	110
[031] PALMERAH	30	30	30	40	40	40
[040] TAMBORA	200	210	230	240	250	250
[050] TAMAN SARI	10	10	10	10	10	10
[75] JAKARTA UTARA	11,230	11,980	12,620	13,260	13,910	14,300
[010] PENJARINGAN	1,450	1,550	1,630	1,710	1,800	1,850
[011] PADEMANGAN	500	530	560	590	620	640
[020] TANJUNG PRIOK	5,790	6,150	6,510	6,840	7,170	7,370
[030] KOJA	490	520	550	580	610	620
[031] KELAPA GADING	1,610	1,720	1,810	1,900	1,990	2,050
[040] CILINCING	1,390	1,480	1,560	1,640	1,720	1,770
[050] KEPULAUAN SERIBU	0	0	0	0	0	0
Total	29,760	33,760	33,460	35,200	36,850	37,850
Population of DKI Jakarta	8800	9400	9900	10400	10900	11200
Arithmetic	442	655	868	1,081	1294	1,465

PAM / July'94-June'94	4,850 *1000m³
Total Industrial Demand	10,863 *1000m³
	29,761 m³/day

[32] JAWA BARAT	4,880	7,230	9,580	11,940	14,290	16,180
[03] BOGOR	0	0	0	0	0	0
[350] CIMANGGIS						
[200] SAWANGAN						
[201] LIMO	0	0	0	0	0	0
[220] BEJI						
[18] BEKASI	0	0	0	0	0	0
[010] PONDOK GEDE	0	0	0	0	0	0
[011] JATIASIH	0	0	0	0	0	0
[100] TARUMAJAYA						
[730] BEKASI BARAT						
[19] TANGERANG	0	0	0	0	0	0
[060] CIPUTAT	0	0	0	0	0	0
[061] PAMULANG	0	0	0	0	0	0
[070] PONDOK AREN	0	0	0	0	0	0
[160] TELUKNAGA						
[161] KOSAMBI						
[75] Kotamadya TANGERANG	4,880	7,230	9,580	11,940	14,290	16,180
[010] CILEDUG	3,360	4,980	6,600	8,220	9,840	11,140
[020] CIPONDOH	1,520	2,250	2,980	3,720	4,450	5,040
[050] BATU CEPER						
[060] BENDA						
Study Area Total	34,600	39,000	43,000	47,100	53,100	54,000

35. ESTIMATION OF INDUSTRIAL DEMAND

Kotamadya / Kecamatan	1995 m³/day	2000 m³/day	2005 m³/day	2010 m³/day	2015 m³/day	2019 m³/day
[71] JAKARTA SELATAN	36	237	406	626	805	835
[010] KEBAYORAN LAMA	0	23	37	61	85	85
[011] PESANGGRAHAN	0	0	0	0	0	0
[020] CILANDAK	3	24	35	56	67	67
[030] PASAR MINGGU	0	20	33	56	68	78
[031] JAGAKARSA	0	0	0	0	0	0
[040] MAMPANG PRAPATAN	0	57	116	175	224	234
[041] PANCORAN	0	47	88	128	178	188
[050] KEBAYORAN BARU	28	28	28	38	39	39
[060] SETIA BUDI	2	31	59	88	117	117
[070] TEBET	3	7	10	24	27	27
[72] JAKARTA TIMUR	5,389	7,487	9,457	11,426	13,379	13,879
[010] PASAR REBO	0	517	1,026	1,525	2,034	2,134
[011] CIRACAS	0	146	292	428	565	595
[012] CIPAYUNG	0	0	0	0	0	0
[020] KRAMAT JATI	86	134	182	229	268	278
[021] MAKASAR	30	30	30	40	40	40
[030] JATINEGARA	23	50	77	104	132	132
[031] DUREN SAWIT	0	21	33	54	65	65
[040] MATRAMAN	160	170	180	190	200	200
[050] PULO GADUNG	3,106	3,400	3,654	3,909	4,163	4,293
[060] CAKUNG	1,984	3,019	3,983	4,947	5,912	6,142
[73] JAKARTA PUSAT	368	643	908	1,173	1,418	1,468
[010] TANAH ABANG	18	21	36	40	44	44
[020] MENTENG	42	58	64	80	86	86
[030] SENEN	0	233	455	677	900	940
[040] CEMPAKA PUTIH	90	100	100	110	110	110
[041] JOHAR BARU	10	10	10	10	10	10
[050] KEMAYORAN	17	17	17	17	18	28
[060] SAWAH BESAR	181	194	216	229	240	240
[070] GAMBIR	10	10	10	10	10	10
[74] JAKARTA BARAT	414	603	803	992	1,161	1,191
[010] KEBON JERUK	0	0	0	0	0	0
[011] KEMBANGAN	0	0	0	0	0	0
[020] CENGKARENG	56	164	272	370	468	488
[021] KALI DERES	58	116	184	242	299	309
[030] GROGOL PETAMBURAN	90	100	100	110	110	110
[031] PALMERAH	0	3	7	20	24	24
[040] TAMBORA	200	210	230	240	250	250
[050] TAMAN SARI	10	10	10	10	10	10
[75] JAKARTA UTARA	6,858	8,154	9,340	10,529	11,724	12,114
[010] PENJARINGAN	366	601	817	1,033	1,258	1,308
[011] PADEMANGAN	462	496	531	567	601	621
[020] TANJUNG PRIOK	4,984	5,475	5,906	6,337	6,767	6,967
[030] KOJA	126	201	277	353	428	438
[031] KELAPA GADING	480	732	962	1,193	1,425	1,455
[040] CILINCING	440	649	847	1,046	1,245	1,295
[050] KEPULAUAN SERIBU	0	0	0	0	0	0
Total	13,065	17,124	20,914	24,746	28,487	29,487

[32] JAWA BARAT	0	0	0	8,916	11,870	13,760
[03] BOGOR	0	0	0	0	0	0
[150] CIMANGGIS						
[200] SAWANGAN						
[201] LIMO						
[720] BEJI						
[18] BEKASI	0	0	0	0	0	0
[010] PONDOK GEDE						
[011] JATIASIH						
[100] TARUMAJAYA						
[730] BEKASI BARAT						
[19] TANGERANG	0	0	0	0	0	0
[060] CIPUTAT						
[061] PAMULANG						
[070] PONDOK AREN						
[160] TELUKNAGA						
[161] KOSAMBI						
[75] Kotamadya TANGERANG	0	0	0	8,916	11,870	13,760
[010] CILEDUG				6,146	8,198	9,498
[020] CIPONDOH				2,770	3,672	4,262
[050] BATU CEPER						
[060] BENDA						
Study Area Total	13,100	17,100	20,900	33,700	40,400	43,200

36. BALANCE BETWEEN POTENTIAL AND DEMAND = DEMAND ON GROUNDWATER

Kotamadya / Kecamatan		1995 l/sec	2000 l/sec	2005 l/sec	2010 l/sec	2015 l/sec	2019 l/sec
[71] JAKARTA SELATAN		11.97	10.47	8.98	7.49	5.98	5.98
[010]	KEBAYORAN LAMA	1.27	1.12	0.96	0.80	0.64	0.64
[011]	PESANGGRAHAN	0.03	0.03	0.03	0.03	0.02	0.02
[020]	CILANDAK	1.00	0.88	0.75	0.62	0.50	0.50
[030]	PASAR MINGGU	1.19	1.04	0.89	0.74	0.60	0.60
[031]	JAGAKARSA	0.00	0.00	0.00	0.00	0.00	0.00
[040]	MAMPANG PRAPATAN	3.61	3.16	2.71	2.26	1.80	1.80
[041]	PANCORAN	2.82	2.46	2.11	1.76	1.41	1.41
[050]	KEBAYORAN BARU	0.02	0.02	0.02	0.02	0.01	0.01
[060]	SETIA BUDI	1.71	1.49	1.28	1.07	0.85	0.85
[070]	TEBET	0.31	0.27	0.23	0.19	0.15	0.15
[72] JAKARTA TIMUR		105.60	92.40	79.21	66.02	52.80	52.80
[010]	PASAR REBO	52.33	28.28	24.24	20.20	16.16	16.16
[011]	CIRACAS	8.91	7.80	6.69	5.58	4.46	4.46
[012]	CIPAYUNG	0.00	0.00	0.00	0.00	0.00	0.00
[020]	KRAMAT JATI	2.59	2.27	1.95	1.63	1.30	1.30
[021]	MAKASAR	0.00	0.00	0.00	0.00	0.00	0.00
[030]	JATINEGARA	1.59	1.39	1.19	0.99	0.79	0.79
[031]	DUREN SAWIT	1.05	0.91	0.78	0.65	0.52	0.52
[040]	MATRAMAN	0.00	0.00	0.00	0.00	0.00	0.00
[050]	PULO GADUNG	5.03	4.40	3.77	3.14	2.51	2.51
[060]	CAKUNG	54.12	47.35	40.59	33.83	27.06	27.06
[73] JAKARTA PUSAT		15.29	13.39	11.48	9.57	7.66	7.66
[010]	TANAH ABANG	0.37	0.33	0.28	0.23	0.19	0.19
[020]	MENTENG	0.56	0.49	0.42	0.35	0.28	0.28
[030]	SENEN	14.11	12.35	10.59	8.83	7.06	7.06
[040]	CEMPAKA PUTIH	0.00	0.00	0.00	0.00	0.00	0.00
[041]	JOHAR BARU	0.00	0.00	0.00	0.00	0.00	0.00
[050]	KEMAYORAN	0.03	0.03	0.03	0.03	0.02	0.02
[060]	SAWAH BESAR	0.22	0.19	0.16	0.13	0.11	0.11
[070]	GAMBIR	0.00	0.00	0.00	0.00	0.00	0.00
[74] JAKARTA BARAT		10.15	8.88	7.61	6.34	5.08	5.08
[010]	KEBON JERUK	0.00	0.00	0.00	0.00	0.00	0.00
[011]	KEMBANGAN	0.00	0.00	0.00	0.00	0.00	0.00
[020]	CENGKARENG	6.29	5.51	4.72	3.93	3.15	3.15
[021]	KALI DERES	3.50	3.06	2.62	2.18	1.75	1.75
[030]	GROGOL PETAMBURAN	0.00	0.00	0.00	0.00	0.00	0.00
[031]	PALMERAH	0.36	0.31	0.27	0.23	0.18	0.18
[040]	TAMBORA	0.00	0.00	0.00	0.00	0.00	0.00
[050]	TAMAN SARI	0.00	0.00	0.00	0.00	0.00	0.00
[75] JAKARTA UTARA		50.60	44.28	37.95	31.62	25.30	25.30
[010]	PENJARINGAN	12.54	10.98	9.41	7.84	6.27	6.27
[011]	PADEMANGAN	0.44	0.39	0.33	0.27	0.22	0.22
[020]	TANJUNG PRIOK	9.33	8.16	6.99	5.82	4.66	4.66
[030]	KOJA	4.21	3.69	3.16	2.63	2.11	2.11
[031]	KELAPA GADING	13.08	11.44	9.81	8.18	6.54	6.54
[040]	CILINCING	11.00	9.62	8.25	6.88	5.50	5.50
[050]	KEPULAUAN SERIBU	0.00	0.00	0.00	0.00	0.00	0.00
Total		193.62	169.42	145.23	121.04	96.82	96.82

[32] JAWA BARAT		56.48	49.00	42.00	35.00	28.00	28.00
[33] BOGOR		0.00	0.00	0.00	0.00	0.00	0.00
[150]	CIMANGGIS						
[200]	SAWANGAN						
[201]	LIMO	0.00	0.00	0.00	0.00	0.00	0.00
[720]	BEJI						
[18] BEKASI		0.00	0.00	0.00	0.00	0.00	0.00
[010]	PONDOK GEDE	0.00	0.00	0.00	0.00	0.00	0.00
[011]	JATIASIH	0.00	0.00	0.00	0.00	0.00	0.00
[100]	TARUMAJAYA						
[730]	BEKASI BARAT						
[19] TANGERANG		0.00	0.00	0.00	0.00	0.00	0.00
[060]	CIPUTAT	0.00	0.00	0.00	0.00	0.00	0.00
[061]	PAMULANG	0.00	0.00	0.00	0.00	0.00	0.00
[070]	PONDOK AREN	0.00	0.00	0.00	0.00	0.00	0.00
[160]	TELUKNAGA						
[161]	KOSAMBI						
[75] Kotamadya TANGERANG		56.48	49.00	42.00	35.00	28.00	28.00
[010]	CILEDUG	38.89	34.00	29.00	24.00	19.00	19.00
[020]	CIPONDOH	17.59	15.00	13.00	11.00	9.00	9.00
[050]	BATU CEPER						
[060]	BENDA						
Study Area Total		250.00	218.00	187.00	156.00	125.00	125.00

37. ESTIMATION OF SPECIAL DEMAND

Kotamadya / Kecamatan	PAM(July'94-June'95) m³	m³/day	1995 m³/day	2000 m³/day	2005 m³/day	2010 m³/day	2015 m³/day	2019 m³/day
Population of DKI Jakarta		8,800	8,800	9,400	9,900	10,400	10,900	11,200
[75] JAKARTA UTARA	4,967,506	13,610	13,600	14,500	15,300	16,100	16,800	17,300
[011] PADEMANGAN	4,201,857	11,512	11,500	12,300	12,900	13,600	14,200	14,600
[020] TANJUNG PRIOK	765,649	2,098	2,100	2,200	2,400	2,500	2,600	2,700
Total	4,967,506	13,610	13,600	14,500	15,300	16,100	16,800	17,300

5C	Tongkang Air	42,300
5D	BPP Tanjung Priok	744,499
5E	BPP Ancol	4,180,707

ANNEX-36

WATER RESOURCE

THE STUDY ON WATER RESOURCES DEVELOPMENT

THE STUDY ON WATER RESOURCES DEVELOPMENT

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CHAPTER IV

MASTER PLAN STUDY ON WATER RESOURCES DEVELOPMENT

4.1 Procedure for Master Plan Study

The Jabotabek Water Resources Management Study (JWRMS) has recommended to supply raw water for municipal and irrigation water uses to the DKI Jakarta from the Citarum river through the West Tarum Canal and Conveyance 2 in the eastern area of the Jabotabek and to supply water uses to the Kabupatens of Tangerang and Serang and DKI Jakarta from the envisaged four (4) dams schemes, that is, the Karian, Pasir Kopo, Tanjung and Cilawang dam/reservoir schemes and Karian-Serpong conveyance system in the Ciujung and Cidurian river basins in the western area, as mentioned in Chapter III. The said dam schemes were reviewed and updated by the Study on Ciujung-Cidurian Integrated Water Resources (SCCIWR) in Indonesia.

The master plan study on surface water resources development to supply municipal and industrial (M&I) water uses to the DKI Jakarta was made to preliminarily formulate the most attractive and favorable development plan from the scenarios and their alternatives, which were obtained by combining the dam schemes and conveyance system schemes recommended by the JWRMS and the SCCIWR, in consideration with the future water supply conditions to the Tangerang- Serang area.

The following is the procedure for the master plan study and its flowchart is shown in Fig. 4.1 :

1) Inventory of the existing water sources and development plans of water sources and conveyance systems
2) Study on necessity of immediate measure for water sources
3) Selection of scenarios
4) Establishment of future water demand
5) Study on Scenario I
   a) Selection of alternative water resources development plans
   b) Water demand - supply balance analysis
   c) Establishment of implementation schedule of water sources and conveyance systems
   d) Financial analysis
   e) Comprehensive evaluation
   f) Final selection of proposed water resources development plan for Scenario I
   g) Proposed water resources development plan for Scenario I
   h) Unit raw water cost
6) Study on Scenario II
   a) Formulation of water resources development plan
   b) Water demand - supply balance analysis
   c) Proposed water resources development for Scenario II

d) Unit raw water cost

7) Final selection of proposed water resources development plan

4.2 Inventory of the Existing Water Sources and Development Plans of Water Sources and Conveyance Systems

As mentioned in the preceding Section 3.6.1, the Jabotabek Water Resources Management Study (JWRMS) and The Study on Ciujung-Cidurian Integrated Water Resources in Indonesia (SCCIWR) have proposed to implement several water sources and conveyance systems to meet future water demand. Taking into due consideration of the output of the said Study Reports, the following inventory of the existing water sources and development plans of water sources and conveyance systems was prepared for the purpose to formulate the most optimum and practical development plan in this master plan study :

Existing Water Sources

a) West Tarum Canal (Citarum River) : 16.1 m^3/sec
b) Serpong Treatment Plant (Cisadane River) : 2.8 m^3/sec

Development Plans

a) Conveyance 2 Scheme (Jatiluhur Dam/Reservoir, Citarum river) :
Phases I to III : 10 m^3/sec each
(Canal 2 to be renamed as Conveyance 2)
(Pre-feasibility Study completed in 1984)

b) Karian Dam/Reservoir Scheme (Ciujung river) :
Phases I : 14.6 m^3/sec Phase II : 3.3 m^3/sec
(Feasibility Study completed by JICA in 1995)

c) Pasir Kopo Dam/Reservoir Scheme (Ciujung river) : 8.2 m^3/sec
(Feasibility Study completed by JICA in 1995)

d) Tanjung Dam/Reservoir-Canal Scheme (Cidurian river) : 9.7 m^3/sec
(Feasibility Study completed by JICA in 1995)

e) Cilawang Dam/Reservoir-Canal Scheme (Cidurian river) : 4.1 m^3/sec
(Feasibility Study completed by JICA in 1995)

f) Karian-Serpong Conveyance System (KSCS)
(Feasibility Study completed by JICA in 1995)

4.3 Study on Necessity of Immediate Measure for Water Sources

1) Required Period for Completion of First Implementation

The following two (2) alternative water sources and conveyance systems were considered as the first implementation under the recommendation by the JWRMS and the SCCIWR :

a) Karian Dam/Reservoir and Karian-Serpong Conveyance System Scheme (Karian Scheme)

b) Conveyance 2 Scheme

The required period till completion of the scheme/project was assumed, counting the periods for the required procedures and actions as follows :

(Unit : Year)

	Karian Scheme	Conveyance 2 Scheme
Feasibility study	-	2
Procedures for environmental assessment & Financial arrangement for compensation :	2	2
Settlement of resettlement with inhabitants including establishment of resettlement areas:	3	2
Construction works	4	3
Total :	9	9

It is noted that the period for the procedures for environmental assessment and financial arrangement for compensation, and settlement of resettlement with inhabitants would cover financial arrangement for construction for two (2) years and preparation of tender documents including detailed design for two (2) years. The said results indicates that the completion time for both Karian Scheme and Conveyance 2 Scheme will be at end of 2005 after 9 years from 1997.

2) Necessity of Immediate Measure for Water Source

It is projected as mentioned in latter Section (5) that the capacity of the existing facilities can cover the water demand up to 2001, while completion of the Karian Scheme and Conveyance 2 Scheme will be completed at the end of 2005. Under such conditions, it is emphasized that an immediate measure of water sources is essentially needed to cover deficit of water demand after 2002. In this future situation, the Study Team proposed to implement the upgrading, in quantity aspect, of the West Tarum Canal to provide 5 m^3/sec in addition to 16.1 m^3/sec of the existing capacity. The preliminary study showed that the said upgrading work can be completed at the end of 2001 after five (5) years from 1997, assuming financial arrangement for two (2) years, preparation of tender documents and tender procedures for two (2) years and construction works for two (2) years.

In this connection, it is noted that the present upgrading plan of the West Tarum Canal recommended by the JWRMS has only water quality aspect.

The said proposal has been frequently discussed between the Study Team and Jatiluhur Authority as the implementing agency and finally approved by the Steering Committee Meeting held on November 23, 1995.

3) Further Immediate Measure due to Delay of First Implementation

In case that delay of the first implementation, especially the Karian Scheme, may occur due to difficulty of procedures for environmental assessment and land acquisition and resettlement in reservoir area which may caused extension of entire implementing period before construction period, further immediate measure shall be taken as soon as possible.

In such situation, the Steering Committee suggested in the Meeting held on May 24, 1996 several potential water resources for study on their possibility as water sources for such further immediate measure. Among these potential resources, the Steering Committee confirmed to provide further 5 m^3/sec, totally 10 m^3/sec, of raw water from the West Tarum Canal to the Jakarta Water Supply System.

Further, the Study carried out the study on possibility as water sources for other potentials suggested by the Steering Committee as mentioned below :

i) Increasing efficiency of irrigation water use
ii) Katulampa Irrigation System
iii) River course storing
iv) Storage by estuary weir

i) Increasing efficiency of irrigation water

Increased efficiency of irrigation water use has been considered in providing additional 10 m^3/sec from the West Tarum Canal as above-mentioned. Other irrigation conveyance systems such as Cisadane Main Canal, Solokan Barat Main Canal, Cidurian Main Canal, Ciujung Main Canal are providing mainly irrigation water to the owned areas with gradually increasing their efficiency and some irrigation conveyance systems are allocating water to the rural water supply system. In such situation and conditions, it is considered that there is no possibility to provide water to the Jakarta Water Supply System from other irrigation conveyance systems. It is noted that the JWRMS has never recommended to use water to the Jakarta Water Supply System from other irrigation conveyance system than the West Tarum Canal, considering the said situation and conditions. In addition, it is mentioned that many reports concerned to the irrigation conveyance systems have studied, aiming to obtain efficient and effective use of water for the owned area, but no for outside the owned area.

ii) Katulampa Irrigation System

The Katulampa Irrigation System is located, extending from south-east of Bogor toward west of DKI Jakarta. The existing irrigation area, having about 4,600 ha, is served directly from the Katulampa intake. The entire canal network also serves a domestic water supply in the Empang area.

The Feasibility Study on Cisadane River Basin Development, Directorate General of Water Resources Development (DGWRD), 1987, has concluded according to the proposal made in the Pre-feasibility Study stage that the development of the Ciliwung water resources will

not economically attractive to meet the municipal, industrial and other demands up to 2025. It is noted that this conclusion has been still maintained by the DGWRD up to date. This conclusion has stated that the current use of its water resource primarily by the Katulampa intake cannot be made more efficient. Further, the said conclusion interprets that as the efficiency of the current use of water resources would be already maximized for this irrigation system and its associated communities, the Ciliwung water resources cannot provide water supply for outside the Katulampa Irrigation System.

iii) River Course Storing

Generally, the seasonal regulation of river runoff, which is to provide firm water for irrigation and M & I water uses in dry season, requires much capacity in more than 50 million m^3 order depending on amount of annual runoff and topography. For this purpose, reservoir is created by dam. It is noted for reference that firming-up discharge in dry season is resulted from reservoir operation simulation study, using river runoff and reservoir effective storage capacity. In case of river course, it is very clear that the said capacity is physically not possible to be obtained under the conditions of its wide, depth, gradient and length. While, in flood control aspect, retardation for reducing magnitude of peak flood can be sometimes expected in river course, but the said retardation does not substantially control flood. In addition, reservoir provides flood control space adding to other purposes and its provision is made under requirement of its purpose to downstream reach.

Under such considerations, it is concluded that river course storing does not meet purpose for providing an additional or supplemental water for water supply in dry season. It is further noted that the previous report including the JWRMS have never recommended supplementing water by river course storing, since it is supposed that this is not practical water source as above-mentioned.

iv) Storage by Estuary Weir

Firstly, it is reported that no previous reports including the JWRMS have proposed to implement construction of estuary weir for intake purpose for M & I water supply.

There are several existing estuary weirs in Japan and several estuary weirs are still awaiting to proceed construction works. The existing estuary weirs were constructed and completed for the purposes of 1) flood control and drainage in surrounding area, 2) prevention of seawater intrusion for downstream irrigation area, 3) firm water supply for irrigation area, and 4) M & I water supply. It is in situation that the proposed estuary weirs in Japan have encountered a difficulty to proceed their immediate construction works due to the difficulty of settlement on environmental impact assessment with local government and inhabitants. The said difficulty may result to take a long time to commence construction works and/or to abandon their implementations.

Under such references, it is agreed that estuary weir construction would be one of water resources development measure to supplement implementation of the existing water resources development plans as listed as above inventory. However, water resources

development on estuary weir construction will not play role to supplement deficit water supply, which will be caused due to delay of the said two (2) First Implementation, due to the reasons that it will take required time (about 13 to 14 years or more) for its implementation and completion taking the following steps and procedures, if these steps and procedures are possibly taken, and also that this water development is still unforeseenable to be taken up as a further measure at present, since it is not sure whether or not the following steps and procedures can be continuously proceeded up to completion of project :

a) As no reports on water resources development to construct estuary weir have been proposed up to date, integrated estuary water resources study (like master plan study) is initially needed. (3 to 4 years including financial arrangement for the study and feasibility study)
b) In compliance with the recommendation made by master plan study, feasibility study for the priority project/projects is needed to make financial arrangement. Following the said study, environmental impact assessment (analysis) and resettlement study are carried out. (2 years)
c) Settlement of environmental impact assessment and resettlement study including financial arrangement for compensation for land and construction of resettlement area including facilities is completed by the governmental agencies concerned. (2 years)
d) Land acquisition for priority area for construction is settled with inhabitants and priority resettlement area shall be completed. (2 years)
e) Construction works are commenced and completed. (4 years)

v) Conclusion

In the light as above-mentioned, it is concluded that other potentials than the further 5 m^3/sec suggested by the Steering Committee are not applicable as the further immediate measure due to delay of the First Implementation.

4.4 Selection of Scenarios

The following two (2) scenarios were considered for formulation of an attractive and practical water resources development plan :

Scenario I :

Water Resources Development Plan in case that the First Implementation is proceeded and completed on schedule. In this Scenario, introduction of the water source of 5 m^3/sec supplied through the West Tarum Canal as the initial immediate measure is preceded before the First Implementation. Under such conditions, optimization study for selecting the most attractive development plan is made for several alternative development plans.

Scenario II :

Water Resources Development Plan in case that the First Implementation is delayed to be proceeded. For this plan, the water source of additional 5 m^3/sec supplied through the West Tarum Canal as the further immediate measure to be substituted before completion of the First Implementation. The water resources development plan for Scenario II after the First Implementation is formulated, based on the most attractive development plan optimized in Scenario I, in consideration of the integrated sufficiency of water supply to the eastern and western areas and future treatment facilities plan.

4.5 Future Water Demand

The municipal and industrial (M&I) water demand and agricultural water requirement in the north Banten and Jabotabek areas were projected by the JWRMS. The Study on Ciujung-Cidurian Integrated Water Resources made the review of the said forecast and judged that the estimation procedures on the basis of the economic data including the latest 1990 census, which have been accumulated and updated since BTA-155 Study, was reasonable.

While, the demand projection for the DKI Jakarta was made based on the accumulated and updated data and information in accordance with the Terms of Reference as mentioned in the Main Report, Paragraph 3.5, separately from those projected by the JWRMS.

In such background, the newly projected demand for the DKI Jakarta area by the Study and the projected demand for the Tangerang and Serang areas under Strategy G-5 by the JWRMS were applied to the water demand-supply balance analysis.

The yearly water demand in the Jabotabek area is given in Table 4.22 and the water demand for each target year is as follows is as follows :

Demand Area	1995	2000	2005	2010	2015	2019
DKI Jakarta	13.89	17.47	22.42	31.68	43.58	49.26
Bekasi	2.32	3.26	4.42	7.79	10.58	13.33
Bogor N	0.74	1.26	2.00	2.83	3.87	4.50
Bogor SE	1.26	2.11	3.37	5.79	7.89	9.58
Bogor WS/S-W	0.53	0.63	0.84	1.47	2.11	2.53
Tangerang	3.58	5.05	7.68	10.31	11.75	12.42
Serang	3.47	4.63	7.26	9.58	12.84	14.53
Total without Bogor	24.00	31.68	43.79	62.19	82.62	94.04

4.6 Study on Scenario I

4.6.1 Selection of Alternative Water Resources Development Plans

The following basic assumption and conditions were applied to select alternative water resources development plans :

I) To satisfy continuos sufficiency of water supply capacity to meet water demand for DKI Jakarta for whole period
ii) To satisfy sufficiency of water supply capacity to meet water demand for DKI Jakarta in Target Year (2019)
iii) Inventory of the existing water sources and development plans of water sources and conveyance systems as referred to in Section (2).
iv) The upgrading of West Tarum Canal, in quantity aspect, to provide 5 m^3/sec is put into operation at the beginning of 2002.
v) The Karian Dam/Reservoir Scheme and Conveyance 2 Scheme was assumed to be commissioned in 2006 as mentioned in Section (3).
vi) No alternative having full water supply from the water sources in the Ciujung and Cidurian river basins to the DKI Jakarta without Conveyance 2 was considered, since there is no availability of other sources than said the water sources to meet water demand for the Tangerang and Serang area and accordingly, the said alternative is not practical to be selected for plan formulation of the water resources development plan.

Based on the said assumption and conditions, the following five (5) alternative water resources development plans was selected for Scenario I and their supply flowcharts are shown in Fig. 4.2 :

Alternative A : Independent Supply System - I

For DKI Jakarta Area	:	*Conveyance 2*
For Serang-Tangerang	:	Karian Dam & Tanjung Dam

Alternative B & C : Independent Supply Systems - II & III

For DKI Jakarta	:	*Conveyance 2 & Karian Dam*
- First Implementation -		*B : Conveyance 2*
		C : Karian Dam
For Serang-Tangerang	:	Pasir Kopo Dam, Tanjung Dam & Cilawang Dam

Alternatives D & E : Integrated Supply Systems - I & II

For DKI Jakarta	:	*Conveyance 2* *Karian Dam* *(Integrated with Tangerang/Serang)* *Tanjung Dam* *(Integrated with Tangerang)*

- First Implementation -

D : Conveyance 2
E : Karian Dam

For Serang : Karian Dam & Pasir Kopo Dam

4.6.2 Water Demand-Supply Balance Analysis

The water demand and supply balance analysis was made for five alternative plans as listed in Sub-paragraph 4.6.1, based on the projected water demand as summarized in Paragraph 4.5. The details of the analysis are shown in Tables 4.7 to 4.21 and illustrated in Figs. 4.11 to 4.15. The following are the summary of the water demand-supply balance analysis for the DKI Jakarta :

- Alternative A -

Item	1995	2000	2005	2010	2015	2019
(1) Supply Capacity	16.10	18.90	23.90	40.40	49.40	49.40
(2) Demand	13.89	17.47	22.42	31.68	43.58	49.26
(5) Balance (Reservation)	2.21	1.43	1.48	8.72	5.82	0.14

- Alternative B -

Item	1995	2000	2005	2010	2015	2019
(1) Supply Capacity	16.10	18.90	23.90	44.50	47.80	57.30
(2) Demand	13.89	17.47	22.42	31.68	43.58	49.26
(5) Balance (Reservation)	2.21	1.43	1.48	12.82	4.22	8.04

- Alternative C

Item	1995	2000	2005	2010	2015	2019
(1) Supply Capacity	16.10	18.90	23.90	41.80	47.60	57.30
(2) Demand	13.89	17.47	22.42	31.68	43.58	49.26
(5) Balance (Reservation)	2.21	1.43	1.48	10.12	4.02	8.04

- Alternative D -

Item	1995	2000	2005	2010	2015	2019
(1) Supply Capacity	16.10	18.90	23.90	34.00	44.20	51.50
(2) Demand	13.89	17.47	22.42	31.68	43.58	49.26
(5) Balance (Reservation)	2.21	1.43	1.48	2.32	0.62	2.24

- Alternative E -

Item	1995	2000	2005	2010	2015	2019
(1) Supply Capacity	16.10	18.90	23.90	36.00	44.80	51.50
(2) Demand	13.89	17.47	22.42	31.68	43.58	49.26
(5) Balance (Reservation)	2.21	1.43	1.48	4.32	1.22	2.24

4.6.3 Implementation Schedule of Water Source and Conveyance System Schemes

The water demand-supply balance analysis resulted the implementation schedule of water sources and conveyance system schemes for the respective alternatives in Tables 4.1 to 4.6 and Figs. 4.3 to 4.7. The following are the commissioning schedule of the water sources and conveyance system schemes for the respective alternative development plans :

Alternative A :

For DKI Jakarta	:	Conveyance 2, Phase I	:	2006
		Conveyance 2, Phase II	:	2010
		Conveyance 2, Phase III	:	2014
For Tangerang-Serang	:	Karian Dam	:	2006
		Tanjung Dam	:	2010

Alternative B :

For DKI Jakarta	:	Conveyance 2, Phase I	:	2006
		Karian Dam	:	2010
		Conveyance 2, Phase II	:	2018
For Tangerang-Serang	:	Tanjung dam	:	2006
		Pasir Kopo	:	2010
		Cilawang Dam	:	2015

Alternative C :

For DKI Jakarta	:	Karian Dam	:	2006
		Conveyance 2, Phase I	:	2015
		Conveyance 2, Phase II	:	2018
For Tangerang-Serang	:	Tanjung Dam	:	2010
		Pasir Kopo Dam	:	2014
		Cilawang dam	:	2018

Alternative D :

For DKI Jakarta	:	Conveyance 2, Phase I	:	2006
		Karian Dam	:	2010
		(Integrated with Tangerang-Serang)		
		Conveyance 2, Phase II	:	2011
		Tanjung Dam	:	2016
		(Integrated with Tangerang)		
For Tangerang-Serang	:	Pasir Kopo Dam	:	2011

Alternative E :

For DKI Jakarta	:	Karian Dam (Integrated with Tangeran-Serang)	:	2006
		Conveyance 2, Phase I	:	2009
		Conveyance 2, Phase II	:	2012
		Tanjung Dam (Integrated with Tangerang)	:	2016
For Serang		Pasir Kopo Dam	:	2010

4.6.4 Financial Analysis

The financial analysis in the evaluation of the respective alternative development plans was made by demonstrating the estimate of total investment, total present worth of annual disbursement of project/scheme costs in 1996 and capitalized annual project/scheme cost in 2001, when the Upgraded West Tarum Canal as the first implementation scheme is completed and commissioned. The following are the assumption, conditions and criteria for the financial analysis and evaluation :

(1) The project/scheme (construction) costs and their annual disbursements were obtained by the following sources :

1) Upgraded West Tarum Canal : Newly and roughly estimated
2) Conveyance 2 : Obtained from Draft Pre-F/S Report (Thames Water International) & Report on Cibeet Irrigation, Flood Control and Water Supply Study (NEDECO, 1982)
3) Dams and Conveyance Schemes in Ciujung-Cidurian River Basin : Obtained from Study Report on Ciujung -Cidurian Integrated Water Resources in Indonesia (JICA, 1995)

The details of the projects/scheme costs are shown in Tables 4.27 and 4.28.

(2) The total investment cost was simply calculated as the sum of project/scheme costs and the total present worth of annual disbursement of project/scheme costs in 1995 (TPW) was obtained by the following equation :

$$(TPW) = SUM\ (AD \times PWF)$$

where,

TPW = Total present worth of annual disbursement in 1995
AD = Annual disbursement
PWF = Present worth factor

The calculation of the total investment and total present worth of annual disbursement are given in Tables 4.24 to 4.26.

(3) The capitalized annual project/scheme cost in 2001 (CAC) was obtained by the following equation :

$$(CAC) = (CRF) \times SUM(AD/PWF) / (PWF \text{ for } 6 \text{ years})$$

where,

CAC = Capitalized annual project/scheme cost in 2001
CRF = Capitalized recovery factor for disbursement years

The calculation of the capitalized annual project/scheme costs under the respective alternatives are shown in Tables Table 4.24 to 4.26.

(4) It is evaluated that less amount of the total present worth of annual disbursement and capitalized cost indicates more attractive and favorable to implement development.

The results of the financial analysis are summarized as follows :

ALTERNATIVE	A	B	C	D	E
Total Investment (US$ 10^6)	2,301.00	2,279.60	2,279.60	2,117.80	2,117.80
Total Present Worth (US$ 10^6)	*791.12*	*861.39*	*675.49*	*643.56*	*654.80*
- Ranking -	- 4 -	- 5 -	- 3 -	- 1 -	- 2 -
Arithmetic Average Disbursement (US$ 10^6)	143.81	119.98	119.98	124.58	124.58
Capitalized Annual Cost (US$ 10^6)	*148.05*	*150.77*	*118.23*	*117.46*	*119.51*
- Ranking -	- 4 -	- 5 -	- 2 -	- 1 -	- 3 -

4.6.5 Comprehensive Evaluation

The comprehensive evaluation of alternative water resources development plans in consideration with the future water supply conditions to the Tangerang-Serang area aims to formulate the most attractive and favorable development plan. The evaluation applied scoring criteria for the following evaluation items (Full score : 100) :

i) Continuos sufficiency of water supply capacity to meet water demand for Tangerang-Serang area for whole period (Full score : 15)
ii) Sufficiency of water supply capacity to meet water demand for Tangerang-Serang area (Full score : 15)
iii) Integrated water supply system for DKI Jakarta area and Tangerang-Serang area or independent water supply systems (10)
iv) Total present worth of annual disbursement of project/scheme costs in 1995 (Full score : 40)
v) Capitalized annual cost (Full score : 20)

The evaluation results are summarized as follows :

ALTERNATIVE	A	B	C	D	*E*
(1) 15	15 Sufficient	0 Insufficient	0 Insufficient	0 Partially insufficient	15 Sufficient
(2) 15	15 Sufficient	8 Insufficient	8 Insufficient	15 Sufficient	15 Sufficient
(3) 10	0 Independent System	0 Independent System	0 Independent System	10 Integrated System	10 Integrated System
(4) 40 - Ranking -	20 - 4 -	15 - 5 -	30 - 3 -	40 - 1 -	35 - 2 -
(5) 20 - Ranking -	5 - 4 -	5 - 5 -	15 - 2 -	20 - 1 -	15 - 3 -
Comprehensive Evaluation *Score* *Ranking*	 *55* *3*	 *28* *5*	 *53* *4*	 *85* *2*	 *90* *1*

The comprehensive evaluation resulted that the Alternative E obtained the highest score out of the five (5) selected alternatives.

4.6.6 Final Selection of Proposed Water Resources Development Plan for Scenario I

As stated in the preceding Sub-section 4), the results of the comprehensive evaluation under the scoring criteria indicated that the Alternative E was formulated to be the most attractive development plan. It is further noted that the total score for the Alternative E is slightly higher than that of the Alternative D, while the financial aspect for the Alternative D is slightly more favorable than that for the Alternative E. Such evaluation results might give the selection of the proposed development plan to either the Alternative D or Alternative E. However, the Alternative E was finally selected as the proposed development plan due to the following considerations and aspects in addition to the comprehensive evaluation under the scoring criteria. :

a) Present Status of Study Level for Implementation of Karian Dam/Karian-Serpong Water Conveyance System (hereinafter called as "Karian Scheme") and Conveyance 2 Scheme

It is firstly noted that the Karian Scheme has been proposed as the first implementation in the Alternative E, while the Conveyance 2 Scheme has been taken up the first implementation in the Alternative D.

The present status of the study level for the Karian Scheme, on which the study in Feasibility level was completed under the JICA's financing in February 1995, is more advanced than that for the Conveyance 2 Scheme, on which only the preliminary study had been completed in 1984. The Study Report on Ciujung-Cidurian Integrated Water Resources Development recommended the stagewise development of the dam/reservoir schemes, in which the Karian Scheme has been given the first priority to implement. While, no further report for promoting implementation of the Conveyance 2 Scheme has been completed up to date since

the preparation of the said preliminary report, though it has been informally informed that a private enterprise is preparing a report on this scheme for financing arrangement. Such status indicates that the Karian Scheme might be given higher priority for the first implementation than the Conveyance 2 Scheme.

b) Financial Aspect

As the construction cost of the Conveyance 2 Scheme was roughly estimated based on the rough design and work quantities in the Study, the said cost estimate level is lower than that ofd the Karian Scheme, for which the cost estimate was made based on more detailed design and work quantities in the Said Study report (JICA). The financial aspects based on such cost conditions might not substantially control the selection of the proposed development plan, but it could be used as a indicator in the comprehensive evaluation. It is noted that the financial indicators for the Alternative E with the Karian Scheme consisting of the total present worth and capitalized annual cost is only 2 percent higher than that of the Alternative D with the Conveyance 2 Scheme. The said consideration might give almost same condition to select the first implementation.

c) Integrated Consideration with Sufficiency of Water Supply Capacity for Tangerang/Serang Area

The selection of the Alternative D will result insufficiency of the water supply capacity for the Tangerang area till 2009, when the Karian Scheme as the second implementation is to be completed, unless other source is developed separately from the Conveyance 2 Scheme as the first implementation in the Alternative D. It is noted that development of only groundwater abstraction is conceivable as other source. While, insufficient water supply capacity for the Tangerang area in the Alternative E will continue till 2005, when the Karian Scheme as the first implementation in the Alternative E is to be completed as the shortest implementation time span, which means to be the advanced development with four (4) years compared with the Alternative D. This condition might have more advantageous consideration to select the Alternative E as the proposed development plan than that of the Alternative D. The said advantage was considered as the item (1) in the comprehensive evaluation as shown in the above summary table.

d) Conclusion

Under the results of the comprehensive evaluation with the scoring criteria and the considerations as above-mentioned, it is concluded that the Alternative E has been proposed as the prospective water resources development plan to meet the future water demand not for the DKI Jakarta area but also for the Tangerang/Serang area.

The Alternative Development Plan E consists of the implementation of the following construction series :

For DKI Jakarta :

Karian Dam
(Integrated with Tangerang/Serang)
Conveyance 2, Phase I
Conveyance 2, Phase II
Tanjung Dam
(Integrated with Tangerang)

For Serang *Pasir Kopo*

7) Proposed Water Resources Development Plan for Scenario I

The following are the proposed phasing development plan of the water resources to meet increasing water demand for the DKI Jakarta :

Phase I	:	Upgraded West Tarum Canal (Citarum river) *to be completed in 2001*
Phase II	:	Karian Dam & Karian-Serpong Conveyance System (Ciujung river) *to be completed in 2005*
Phase III	:	Conveyance 2, Phase I (Jatiluhur Dam, Citarum river) *to be completed in 2008*
Phase IV	:	Conveyance 2, Phase II (Jatiluhur Dam, Citarum river) *to be completed in 2011*
Phase V	:	Tanjung Dam & Karian-Serpong Conveyance System (Cidurian river) *to be completed in 2015*

Phase I Development (Immediate Measure)

The phase I development as an immediate measure is to upgrade the existing West Tarum Canal for increasing the supply capacity from 21.1 m^3/sec to 26.1 m^3/sec, out of which 21.1 m^3/sec is allocated to supply for M&I water demand for the DKI Jakarta. The upgrading consists of dredging and excavation inside the canal, of which both right and left side faces are reinforced by sheet piles, to expand flow capacity.

Phase II Development

The components of the phase II development are :

1) Karian multipurpose dam scheme in Ciujung river,
2) KSCS I between Karian Dam and treatment plants for Tangerang area with maximum capacity of 14.6 m^3/sec including intake structure and Ciuyah

tunnel with length of 1.2 km and concrete type waterway with length of 36.5 km,

3) KSCS III between treatment plants for Tangerang area and treatment plants for DKI Jakarta with maximum capacity of 14.9 m^3/sec including pumping station and PC pipe and steel type waterway with length of 11.9 km, and

4) River improvement work for middle reach of Ciujung river between Pamayaran weir and Rangkasbitung.

Phase III Development

The phase III development is to construct the Conveyance 2 - Phase I consisting of intake structure at the Jutiluhur Reservoir for Phases I and II having maximum capacity of 20 m^3/sec, concrete lined open canal for phases I and II, concrete piped non-pressure waterway for Phase I with maximum capacity of 10 m^3/sec and appurtenant structures such as intake and outlet basins including pumping equipment and steel pipes for crossing the rivers, drop structures, emergency spillway, bridges, etc. The total waterway length was assumed to be 75 km.

Phase IV Development

The phase V development is to construct the Conveyance 2 - Phase II composing an additional concrete piped non-pressure waterway having length of 30 km to provide the maximum supply capacity of 10 m^3/sec and appurtenant structures.

Phase V Development

The phase VI development consists of the Tanjung Dam in the Cidurian river, Tanjung Canal between the Tanjung Dam and KSCS II with length of 4.3 km and KSCS II between destination of Tanjung Canal and treatment plants for the Tangerang area along the KSCS I, having maximum capacity of 9.7 m^3/sec.

8) Unit Raw Water Cost

The unit raw water cost was estimated for the proposed development plan under the following assumption and conditions, for reference :

i) Annual financial cost : a) repayment of loan and b) operation and maintenance (O&M) cost

ii) Payment term :
   a) Annual interest rate : 3 %
   b) Repayment period : 30 years including 10-year grace period, immediately after commissioning of projects/schemes

iii) Operation and maintenance cost : 0.5 % of total investment cost

iv) Covered area for water demand
   a) DKI Jakarta before Karian Dam commissioned in 2006
   b) DKI Jakarta and Tangerang from 2006 to 2008 when the conveyance 2 completed

c) DKI Jakarta, Tangerang and North Bogor from 2009 to 2013 when Karian dam commissioned for Serang
d) DKI Jakarta, Tangerang, Serang and North Bogor after 2014

v) Unit raw water cost = (Total annual cost)/(Water demand)

The summary of the estimation of unit raw water cost is as follows :

	1995	2000	2005	2010	2015	2019
Annual Cost (US$ 10^3)	6,042	7,003	8,053	41,317	53,634	104,086
Water Demand (m^3/sec)	13.89	17.47	22.42	44.82	73.08	82.81
Unit Raw Water cost (Rp/m^3)	30	28	25	64	51	87

4.7 Study on Scenario II

4.7.1 Formulation of Water Resources Development

The following is the phasing development for Scenario II, which was preliminarily obtained by substituting the further immediate measure having 5 m^3/sec of additional capacity to be supplied by the West Tarum Canal before commissioning of the Karian Dam/Reservoir-KACS in the phasing development for Scenario I proposed in the preceding Section (6) :

Phase I : Upgraded West Tarum Canal (Phase I)
(Citarum river)

Phase II : Upgraded West Tarum Canal (Phase II)
(Citarum River)

Phase III : Karian Dam & Karian-Serpong Conveyance System (KSCS)
(Ciujung river)

Phase IV : Conveyance 2, Phase I
(Jatiluhur Dam, Citarum river)

Phase V : Conveyance 2, Phase II
(Jatiluhur Dam, Citarum river)

Tanjung Dam & Karian-Serpong Conveyance System (KSCS)
(Cidurian river)
- No commissioning needed before 2019 -

The preliminary water demand-supply balance indicates that the Tanjung Dam-KSCS Scheme is not required to be commissioned before the target year 2019. Under such condition, it was formulated as follows that the Conveyance 2 is implemented in one (1) phase in order to be able to put into operation the Tanjung Dam-KSCS before the target

year 2019, in consideration of the integrated sufficiency of water supply to the eastern and western areas and future treatment plan facilities plan as referred to in Scenario I.

Phase I	:	Upgraded West Tarum Canal Phase I (Citarum river)
Phase II	:	Upgraded West Tarum Canal, Phase II (Citarum River)
Phase III	:	Karian Dam & Karian-Serpong Conveyance System (Ciujung river)
Phase IV	:	Conveyance 2 (Jatiluhur Dam, Citarum river)
Phase V	:	Tanjung Dam & Karian-Serpong Conveyance System (Cidurian river)

4.7.2 Water Demand - Supply Balance Analysis

The water and supply balance analysis was made, based on the projected water demand as given in Section (6) and the phasing development plan as mentioned in the preceding Sub-section (7) 1).

The following are the summary of the water demand-supply analysis for proposed development plan as shown in Table 4.31 and as illustrated in Fig. 4.19 :

Item	1995	2000	2005	2010	2015	2019
(1) Supply Capacity	16.10	18.90	23.90	34.30	45.00	51.70
(2) Demand	13.89	17.47	22.42	31.68	43.58	49.26
(5) Balance (Reservation)	2.21	1.43	1.48	2.62	1.42	2.44

4.7.3 Proposed Water Resources Development Plan for Scenario II

The following are the proposed phasing development plan of the water resources to meet increasing water demand for the DKI Jakarta :

Phase I	:	Upgraded West Tarum Canal, Phase I (Citarum river) *to be completed in 2001*
Phase I	:	Upgraded West Tarum Canal, Phase II (Citarum river) *to be completed in 2005*
Phase II	:	Karian Dam & Karian-Serpong Conveyance System (Ciujung river) *to be completed in 2008*
Phase III	:	Conveyance 2 (Jatiluhur Dam, Citarum river) *to be completed in 2011*

Phase V : Tanjung Dam & Karian-Serpong Conveyance System
(Cidurian river)
to be completed in 2015

Phase I -I Development (Initial Immediate Measure)

The phase I-I development as the initial immediate measure is to upgrade the existing West Tarum Canal for increasing the supply capacity from 21.1 m^3/sec to 26.1 m^3/sec, out of which 21.1 m^3/sec is allocated to supply for M&I water demand for the DKI Jakarta. The upgrading consists of dredging and excavation inside the canal, of which both right and left side faces are reinforced by sheet piles, to expand flow capacity.

Phase I-II Development (Further Immediate Measure)

The Phase I-II development as the further immediate measure is to further upgrade the existing West Tarum Canal for increasing the supply capacity from 26.1 m^3/sec to 31.1 m^3/sec, out of which 26.1 m^3/sec is provided for M&I water demand for the DKI Jakarta.

Phase II Development

The components of the phase II development are :

1) Karian multipurpose dam scheme in Ciujung river,
2) KSCS I between Karian Dam and treatment plants for Tangerang area with maximum capacity of 14.6 m^3/sec including intake structure and Ciuyah tunnel with length of 1.2 km and concrete type waterway with length of 36.5 km,
3) KSCS III between treatment plants for Tangerang area and treatment plants for DKI Jakarta with maximum capacity of 14.9 m^3/sec including pumping station and PC pipe and steel type waterway with length of 11.9 km, and
4) River improvement work for middle reach of Ciujung river between Pamayaran weir and Rangkasbitung.

Phase III Development

The phase III development is to construct the Conveyance 2 consisting of intake structure at the Jutiluhur Reservoir having maximum capacity of 15 m^3/sec, concrete lined open canal, concrete piped non-pressure waterway and appurtenant structures such as intake and outlet basins including pumping equipment and steel pipes for crossing the rivers, drop structures, emergency spillway, bridges, etc. The total waterway length was assumed to be 75 km.

Phase IV Development

The phase VI development consists of the Tanjung Dam in the Cidurian river, Tanjung Canal between the Tanjung Dam and KSCS II with length of 4.3 km and KSCS II between

destination of Tanjung Canal and treatment plants for the Tangerang area along the KSCS I, having maximum capacity of 9.7 m^3/sec.

4.7.4 Unit Raw Water Cost

The unit raw water cost was estimated for the proposed development plan under the following assumption and conditions, for reference :

i) The project/scheme (construction) cost is referred to in Sub-section (8) 3).
ii) Annual financial cost : a) repayment of loan and b) operation and maintenance (O&M) cost
iii) Payment term :
  a) Annual interest rate : 3 %
  b) Repayment period : 30 years including 10-year grace period, immediately after commissioning of projects/scheme
vi) Operation and maintenance cost : 0.5 % of total investment cost
v) Covered area for water demand
  a) DKI Jakarta before Karian Dam commissioned in 2009
  b) DKI Jakarta and Tangerang from 2009 to 20011 when the conveyance 2 completed
  c) DKI Jakarta, Tangerang and North Bogor from 2012 to 2015 when Karian dam commissioned for Serang
  d) DKI Jakarta, Tangerang, Serang and North Bogor after 2016
vi) Unit raw water cost = (Total annual cost)/(Water demand)

The summary of the estimation of unit raw water cost is as follows :

	1995	2000	2005	2010	2015	2019
Annual Cost (US$ 10^3)	6,042	7,003	8,053	41,317	53,634	104,086
Water Demand (m^3/sec)	13.89	17.47	22.42	44.82	73.08	82.81
Unit Raw Water cost (Rp/m^3)	30	28	25	64	51	87

4.8 Final Selection of Proposed Water Resources Development Plan

4.8.1 Necessary Procedures and Action prior to Commencement of Construction Works for Karian Dam-KSCS Scheme

The important point to finally select the proposed development plan in this master plan is whether or not the Karian Dam-KSCS Scheme as the First Implementation is delayed to proceed necessary procedures to be taken and completed prior to commencement of the construction works. For this discussion, immediately necessary action is listed up as follows, referring to the "Chapter 9 Proposed Action Plan" in the Study on Ciujung-Cidurian Integrated Water Resources in Indonesia (February 1995, JICA), Main Report :

i) Establishment of environmental monitoring and management unit (EMMU), consisting of environmental unit (EU) and environmental monitoring and management committee (EMMCC), to successfully execute the resettlement of local residents in the affected area by the proposed scheme.
ii) Necessary procedures for commencement of environmental impact assessment

According to the latest information from the concerned agencies including the Steering Committee, the Director General of Water Resources Development, Ministry of Public Works in close corporation of Director General of Human Settlement and Environmental Impact Management Agency has not yet taken necessary action on the said items up to date and it is not sure when these action be taken. The following are the further procedures and actions :

iii) Financial arrangement for consultancy services and construction cost
vi) Consultancy (engineering) services on definite study and detailed design including preparation of tender documents
v) Tender procedures and contracting
vi) Environmental impact study and resettlement study
vii) Financial arrangement for land acquisition and resettlement cost
viii) Construction and completion of resettlement area including facilities as the minimum requirement before commencement of the construction works

In such situation, the Steering Committee clarified in compliance with the questionnaire made by JICA with his letter to the Director General of Human Resettlement dated July 15, 1996 that the Karian Project is expected to be completed at the end of Year 2008, assuming the required periods for the concerned procedures and actions as shown in Fig. 4.22.

4.8.2 Future View and Consideration on Implementation of Further Upgrading

The further upgrading of the West Tarum Canal would easier proceed action on Items vi) to viii) compared with the Karian Dam-KSCS Scheme, since it may have much less difficulty on land acquisition and resettlement by utilizing the existing facilities and land in maximum. It might be said that the further upgrading of the West Tarum Canal has more advantage than that of Karian Scheme only in this light. While, in technical aspect, it has many items to be studied for practical implementation, which may result longer period. because only availability of water of 5 m^3/sec is committed and actual study is not made in this study. In this connection, it is emphasized to avoid misunderstanding that the reason of adopting the Karian Scheme as the First Implementation instead of the further upgrading of the West Tarum Canal is mentioned as follows :

i) The feasibility study on the Karian Scheme with formalization of its report makes sure to proceed easier procedure for implementation and it will save time for its procedures. While, implementation of the further upgrading of the West Tarum Canal has never been recommended by any previous report and its study level is quite low.

ii) Earlier implementation of the Karian Scheme has been repeatedly emphasized by the formal reports since 1980's in integrated development consideration with sufficiency of water supply to the DKI Jakarta and Tangerang-Serang area in the western region.

4.8.3 Selection of Scenario

Although a critical point to finally select proposed water resources development plan between Scenarios I and II is not clearly found as far as the said two considerations 1) and 2), it is provisionally concluded to proceed a feasibility study for the immediate project that the water resources development plan in Scenario II be recommended in this master plan due to the following consideration :

i) As the starting date of procedures for environmental impact assessment for the Karian Dam-KSCS Scheme is not sure, the required period up to commencement of the construction works is unforseenable. In addition, required period for procedures and actions for environmental impact assessment and resettlement is not clear, since no formal schedule on these procedures and actions is not yet established by the concerned agency due to non-establishment of the environmental monitoring and management unit (EMMU).

ii) It is confirmed that the further upgrading of the West Tarum Canal having an additional 5 m^3/sec supply capacity has been committed by the Steering Committee held on May 24, 1996. In such fact, it is understood that necessary procedures and actions to proceed the above immediate measure prior to the implementation of the Karian Scheme has been committed to be timely taken by the concerned governmental agencies.

4.8.4 Proposed Water Resources Development Plan

The following are the proposed development plan for the water resources finally selected in this master plan study :

Phase I	:	Upgraded West Tarum Canal, Phase I (Citarum river) *to be completed in 2001*
Phase I	:	Upgraded West Tarum Canal, Phase II (Citarum river) *to be completed in 2005*
Phase II	:	Karian Dam & Karian-Serpong Conveyance System (Ciujung river) *to be completed in 2008*
Phase III	:	Conveyance 2 (Jatiluhur Dam, Citarum river) *to be completed in 2011*

Phase V : Tanjung Dam & Karian-Serpong Conveyance System (Cidurian river)

to be completed in 2015

CHAPTER V

FUTURE GROUNDWATER ABSTRACTION AND MANAGEMENT

5.1 Permissive Yield for Future Water Demand

The groundwater study has been made in several reports since 1970's. The following are the previous reports reviewed for this study purpose on the establishment of criteria on possible amount of groundwater for future water requirement in and around the DKI Jakarta :

(1) "Jakarta Water Supply Development Project, Master Plan Report - Groundwater Resources in Jakarta, July 1984"
Japan International Cooperation Agency (JICA)
Ministry of Public Works, Cipta Karya

(2) "Jakarta Water Supply Development Project, Master Plan Report - Groundwater Condition in Jakarta City, March 1985"
JICA, Ministry of Public Works, Cipta Karya

(3) "Jakarta Groundwater Study (1983-1985), Final Report, July 1986"
Ministry of Mining and Energy, Directorate of Environmental Geology

(4) "Cisadane River Basin Development, Final Feasibility Study Report - Groundwater, September 1987"
Ministry of Public Works, Directorate General of Water Resources Development

(5) "Jabotabek Water Resources Management Study (JWRMS), Final Report - Groundwater Resources, Groundwater Models, Groundwater Salinity, Groundwater Salinity, Groundwater Pollution, Land subsidence, Groundwater Management Analysis, Groundwater Management Measures and Groundwater Tariff, February 1994"

It is noted according to the review results that the said reports have studied and mentioned the potentiality of groundwater in the Jabotabek area, but only the Final Feasibility Study Report on the Cisadane River Basin Development has studied and presented the provisionally recommendable amount of groundwater abstraction for future water requirement in Jabotabek area in accordance with the appropriate criteria in consideration of the physical, economic and environmental aspects. The Master Plan Report - Groundwater Resources in Jakarta as referred to in the above list recommended the sustainable yield of groundwater, but no other factors than the recharge were considered for its evaluation. It is noted that the JWRMS has also studied the sustainable yield of groundwater, but the evaluation results have not presented any recommendation on the sustainable yield of groundwater. Therefore, the said evaluation results were used only for reference in this study.

In addition to the above-mentioned information, it is noted that it is very difficult to estimate possible amount of groundwater abstraction for future water requirement in and around the DKI Jakarta area, because of the limited information and data on hydrogeology.

Under such situation, it was proposed that information, data and analysis in the Final Feasibility Study Report on the Cisadane River Basin Development (herein after called as the F/S Report on CRBDP) were applied to the establishment of assumption, conditions and criteria to estimate provisionally recommendable amount of groundwater for future water demand in and around the DKI Jakarta area.

(1) Concept of Permissive Yield (Safe Yield)

The provisionally recommendable amount of groundwater for future water demand in the DKI Jakarta served area in the Study was defined as "Permissive Yield (Safe Yield)", which can be abstracted without producing an undesired result, based on the "Sustainable Development Concept".

Some authorities had suggested in 1970's that safe yield be defined as the annual abstraction of water which does not exceed the average annual groundwater recharge. However, it was pointed out to the said concept by the international authorities that the safe yield should be determined based on the interrelationship between groundwater flow and surface in harmony with physical, economic and environmental aspects to continue the future maintainable use of groundwater under "Sustainable Development Concept". Therefore, the safe yield would be an amount of water deducting certain amount from recharge, which would be obtained under the conceivable factors in physical, economic and environmental aspects, or it would be the limited amount of groundwater abstraction to be controlled by priority aspect/aspects, but not by recharge.

(2) Factors covering Safe Yield

The F/S Report on CRBDP described that determination of safe yield of groundwater basin requires identification of undesired results which may occur if actual amount of groundwater abstraction exceeds safe yield. The following five (5) factors was generally considered for the evaluation of safe yield :

a) Economics consideration of abstraction from the basin
b) Quality of groundwater
c) Water rights in and around the basin
d) Land subsidence

Economic Consideration

Economic considerations may govern safe yield in basin where the cost of groundwater becomes excessive. If the investment in developing a supply is lost by abandonment in favor of other more economical supplies, damage will result. Excessive pumping costs are usually associated with lowered groundwater levels, which may necessitate deepening of wells, lowering of pump bowls, installing larger pumping equipment and higher pumping costs.

Quality

Actual amount of groundwater abstraction will exceed safe yield, if draft on a produce a groundwater with inferior quality. In Jakarta case, pumping in the coastal aquifer induces sea water into the basin and lowered levels could lead to pumping of underlying saline water.

Water Rights

Water rights for groundwater use are not yet established in Indonesia, although a provincial regulation was enacted in 1977 in West Java. This regulation does not restrict groundwater abstraction in the basin.

Land Subsidence

In addition to the said three (3) factors, land subsidence has been considered recently for safe yield study. Land subsidence is one of the most important undesired results arising from overdraft.

(3) Zoning of Groundwater Basin

The Jakarta groundwater basin having an area of 2,730 km^2 was divided into three (3) zones considering both hydrology and present abstraction conditions of groundwater, as shown in Fig. 5.1.

Zone A

Zone A consists of alluvial deposit and covers the dense groundwater abstraction area, particular in Jakarta and Tangerang. The phreat aquifer and two artesian aquifers constitute the major groundwater reservoirs in this zone. A substantial decline of head in both phreatic and confined aquifers has already happened and sea water has intruded Since these undesirable results have already appeared, quality and subsidence factors for safe yield have to be seriously evaluated.

Zone B

Zone B is located in southern terrace of DKI Jakarta. Hydrogeologic conditions are basically the same as in Zone A, but the uppermost phreatic aquifer is composed of delluvial volcanic deposits. Drop of head of the aquifer is slightly less compared to Zone A. The said drop was caused by the increase of groundwater abstraction in Zones A and B themselves. Water in Zone B is considered not to be polluted in the phreatic aquifer. The area in Zone B is drained by many north-flowing rivers which form the terrace and U-shaped valleys. It is presumed that very soft alluvial sediment is presented along these valleys. Land subsidence may take place, if groundwater levels decline near these areas.

Zone C

Zone C is a large terrace which occupies about 60 percent of Jakarta groundwater basin. The present knowledge of hydrogeology of Zone C is still rudimentary. Zone C is in virtually virgin condition from a groundwater development view. The aquifer system in Zone C includes sand layers correlative with the Quaternary deposit and a groundwater sub-basin in Depok-Bogor area. Although hydrogeology and aquifer characteristics are not known yet in detail, it is undeniable that there is a great potential for groundwater development.

(4) Evaluation Result of Safe Yield

The evaluation of safe yield was made in the F/S Report on CRBD (Vol. 3 Groundwater, Chapter 8), based on the results of the simulation models of confined aquifer system (Chapter 7) and the considerations. It is noted that although the assumptions and conditions used for the said simulation models should be updated under the present situation and conditions in principle, the said assumptions and conditions were assumed to be maintained up to date, since no comprehensive investigation and study on this purpose have been conducted by any study team up to date since the F/S Report stage of CRBD. The results of the evaluation for the DKI Jakarta area and its surrounding area are summarized below :

Zone	Area (m^3)	Present	Recharge (m^3/sec)	Safe Yield
A (Alluvial Plain)	225	-	2.0	0.7
B (Terrace)	341	-	6.9	2.4
C (Terrace)	78	-	1.6	0.5
Total	644	6.8	10.5 (47.4)	3.6 (14.3)

( ) : Value for Jabotabek

It is informed for reference that the Jakarta Water Supply Development Project, Master Plan Report - Groundwater Resources in Jakarta, July 1984 (JICA), has defined the sustainable yield (safe yield) of groundwater which does not exceed the annual recharge in the area, should not allow intrusion of saline water and/or should not make to drop piezometric level to cause land subsidence. However, the said Report concluded that the sustainable yield (safe yield) was assumed to be equal to the recharge amount (potential yield) to be 7.3 m^3/sec without any consideration of the said latter two (2) factors. The Final Master Plan Report adopted the said sustainable yield for water demand-supply balance analysis.

In addition, it is mentioned for reference that the JWRMS has studied the sustainable yield of groundwater applying the criteria which was based on the objectives consisting of 1) use of groundwater to maximum extent for satisfying M&I water demand, 2) acceptable environmental impacts of groundwater abstraction, 3) sustainability of groundwater resources, 4) acceptable public health risk related to groundwater pollution, 5) lowest possible production cost of groundwater and 6) lowest possible groundwater rescues management effort. Further, the JWRMS applied the groundwater management variants as listed below under the Scenarios A, B and C to the said criteria:

Code 0	:	Continuation of present groundwater management
Code 1	:	Improved groundwater management
Code 2	:	Strongly improved groundwater management

As above-mentioned, it is commented that the evaluation results has not presented any recommendation on amount of the sustainable yield of groundwater. The following are *the sustainable yield under groundwater use to maximum extent for satisfying M&I water demand out of the said six (6) factors*, and groundwater demand in 2025, which might be the restrained amount of groundwater abstraction against the potential amount, for reference :

Scenario	Total Sustainable Yield, 1995-2025 ($10^6 m^3$)	Sustainable Yield (m^3)	Water Demand in 2025 (m^3/sec)
A	17.0	25.7	17.7
B	17.8	26.9	19.1
C	11.9	18.0	10.1
Rechage (m^3/sec)		*20.4* (10.94)	*20.4*

(10.94) : Estimated Amount of Groundwater Abstraction in 1990

In the above table, the detailed estimation of the total recharge and amount of groundwater abstraction in 1990 was made, using the values which ware obtained from the JWRMS. It is noted that the said values estimated in the JWRMS show higher values than those under F/S Report of CRBD. Further, it is commented that the sustainable yield, especially for Scenarios A and B, would not be reliable because of higher values than the estimated recharge.

In the above-mentioned light, it was provisionally recommended that the values of the recharge amount in the basin and sustainable (permissive or safe) yield of groundwater in and around the DKI Jakarta area recommended by the F/S Report on the CRBD were adopted for the water resources study. It is noted that the recommended permissive yield (3.6 m3/sec) would be conservative in the future reservation of surface water resources, compared to those in the previous Master Plan Study (7.7 m^3/sec) and the JWRMS (17.7 to 10.1 m^3/sec).

The recharge and permissive yield for the DKI Jakarta area and its surrounding area were estimated for the respective Kecamatans which were divided in the Demand Projection. The said two (2) values were calculated by multiplying the service area by the following unit values :

Zone	Area (km^2)	Recharge (m^3/sec)	Unit Recharge (lit./sec/km^2)	Permissive Yield (m^3/sec)	Unit Permissive Yield (lit./sec/km^2)
A	225	2.0	8.8888	0.7	3.1111
			(0.08888)		(0.03111)
B	341	6.9	20.2346	2.4	7.0381
			(0.20235)		(0.07038)
C	78	1.6	20.5128	0.5	6.4103
			(0.20513)		(0.06410)
Total	644	10.5		3.6	

( ) : lit./sec/ha

5.2 Target Year to be reduced to Permissive Yield

The timing of deduction of groundwater abstraction largely depends on the completion of new and extended piped water supply networks in the unserved piped water areas. While, in environmental aspect, especially for Zone A, a target year to reduced to the permissive yield should be urgently established in order to avoid accumulation of further unfavorable condition as mentioned in Chapter II. The establishment of the target year would present a guideline for timing to complete the said new piped water supply networks. In such light, the following target years were provisionally established for the demand forecast :

Zone A

(1) *Further development of groundwater is stopped immediately and the present conditions of groundwater abstraction is maintained up to 2004, which means to transfer remaining potential requirement exceeding the present supply capacity :* It is noted that the said maintenance will restrain further subsidence in the area as the most important and priority factor in this zone according to the study results in the JWRMS, Paragraph 8.6. In addition, it will take some time till completion of new and/or extended water supply networks in the unserved piped water areas where the groundwater abstractions are being made, since no immediate implementation plan is established at present. The time span till the completion of the said new and/or networks was assumed to 10 years from 1995.

(2) *In 2005, the present amount of groundwater abstraction is reduced to the permissive yield and thereafter abstraction is maintained under the conditions of the permissive yield :* It was assumed that new and/or extended piped water supply networks in the unserved piped water area would be expected to be completed up to 2005 to shift the water demand from groundwater supply to piped water supply.

Zones B and C

(1) *Groundwater potential requirement is met by the groundwater to be supplied by the existing and further developed facilities up to 2005 :* It is considered that the groundwater abstraction will not cause serious problem in physical, economic and environmental aspects in this Zone for the time being according to the information obtained by the F/S Report on CRBD and JWRMS. Further, it is emphasized that groundwater is a precious sources in terms of the water supply in and around the DKI Jakarta.

(2) *After 2005, the supply capacity of groundwater is gradually and linearly decreased from groundwater potential requirement to the permissive yield up to 2015 :* It was assumed that new and/or extended water supply networks yearly would satisfy an additional water requirement to be shifted from groundwater abstraction to piped water supply.

The following are the groundwater requirement under the previous study reports for reference :

Master Plan Report, March 1985 (JICA)

1980	1985	1990	1995	2000	2005
6.4	7.9	8.6	8.4	8.3	7.3

JWRMS

Scenario	1990	1995	2000	2005	2010	2015	2020	2025
A	15.1	16.0	16.8	17.3	17.6	17.8	17.8	17.8
B	15.1	16.2	17.2	18.0	18.5	18.8	19.0	19.1
C	***15.1***	***15.2***	***14.8***	***13.4***	***11.1***	***10.8***	***10.4***	***10.1***

(Under limited groundwater use and high reliance on piped water)

As seen in above tables, groundwater potential requirement grows under non-control condition of abstraction for initial five (5) to ten (10) years from the beginning of the study year and thereafter, requirement is decreased up to the permissive (sustainable) yield. It is noted that the initial transition period in this study has adopted five (5) years as above-mentioned, which is almost same assumptions as those in the above two (2) previous studies. However, the initial transition period depends on the target

completion time of new and extended piped water supply networks in the unserved area as mentioned in the first paragraph of Section 5.2.

The following are the permissible yield in the target years :

Zone	1995	2000	2004	2005	2015	2019
A	PR	PR	PR	0.7	0.7	0.7
B	GPR	GPR	GPR	GPR	2.4	2.4
C	GPR	GPR	GPR	GPR	0.5	0.5
Total	-	-		-	3.6	3.6

PR : Present Requirement
GPR : Groundwater Potential Requirement

5.3 Present Groundwater Abstraction

The total amount of present groundwater abstraction was estimated in Paragraph 2.4 to be 8.02 m^3/sec consisting of 0.96 m^3/sec for registered wells and 7.06 m^3/sec for non-registered wells. The allocation of the said amount to three (3) Zones based on the assumption that the proportion estimated in the F/S Report on Cisadane River Basin Development has maintained up to date. The following are the calculation of the unit demand of groundwater in 1995 :

Zone	Demand in 1987 under F/F on CRBD (m^3/sec)	Proportion	Allocation of Demand in 1995 (m^3/sec)	Area (km^2)	Unit Demand (lit./sec/ km^2)	Unit Demand (lit./sec/ ha)
A	3.5	0.52	4.17	225	18.5333	0.185333
B	2.8	0.41	3.29	341	9.6481	0.096481
C	0.5	0.07	0.56	78	7.1795	0.071795
Total	6.8	1.00	8.02	644		

5.4 Future Groundwater Demand Growth up to Permissive Yield

As for Zone A, the present groundwater demand is controlled up to 2004, while the future demand growth in Zones B and C is continued till 2005 and thereafter it decreases to the permissive yield in 2015, as described in Paragraph 5.2. The yearly demand in Zones B and C is calculated by multiplying demand in 1995 by the annual growth rate of the total demand from 1995 to 2005.

Zone	1995 Demand (m^3/sec)	Unit Demand (lit./sec/ha)	2000 Demand (m^3/sec)	Unit Demand (lit./sec/ha)	2005 Demand (m^3/sec)	Unit Demand (lit./sec/ha)
A	4.17	0.185333				
B	3.29	0.096481	5.80	0.170088	8.81	0.258358
C	0.56	0.071795	0.99	0.126923	1.50	0.192308

5.5 Calculation of Yearly Amount of Groundwater Abstraction for Each Zone

The calculation of yearly amount of groundwater abstraction for each zone in the DKI Jakarta based on the unit permissive yield, target year and future groundwater demand growth is made in Table 5.1 and its summary is as follows :

Zone	1995	2000	2004	2005	2010	2015	2019
A	7.25	7.25	7.25	1.22	1.22	1.22	1.22
B	1.82	3.21		4.88	3.10	1.33	1.33
C	0.58	1.03		1.57	1.04	0.52	0.52
Total	9.65	11.49		7.67	5.36	3.07	3.07

5.6 Groundwater Management

Groundwater is a major source of water supply in the Jabotabek and its surrounding area, particular for domestic use in the DKI Jakarta area as mentioned in the preceding sections. Since it is a precise source, proper management of the groundwater basin is essential for development and conservation. However, in recent years, excessive groundwater abstraction has caused the environmental problems such as land subsidence saltwater intrusion. Significant subsidence had been observed in the northern DKI Jakarta area. Such subsidence might be resulted by excessive abstraction of groundwater. In addition, an highly contaminated by saline water widely along the coastal plain. The said phenomena might be caused by seawater intrusion accompanied a decline of water level due to excessive abstraction of groundwater.

The first groundwater management measure to be discussed is monitoring. Monitoring as such does not improve the groundwater situation, but it provides basic data about the state of the groundwater system. Furthermore, it enables checking whether the implementation of the measure is actually taking place and whether they have the expected effect.

Measures with an actual impact on the groundwater system can be divided into :

1) Measure to reduce deep groundwater abstraction
2) Measure to reduce shallow groundwater abstraction
3) Measure to enhance groundwater recharge
4) Measure to control pollution and related health risks

Many groundwater management measures do not apply to groundwater abstraction as such, but are related to other sectors like piped water, housing, roads, industrial development, health, etc. Implementation of these measures can not be carried out by a groundwater management agency itself, but should be carried out by other government agencies or the private sector. The implementation method can be classified into the following three (3) types. :

1) Measures to be wholly implemented by the groundwater management agency
2) Measures to be implemented by the private sector ; the groundwater management agency sets regulations and checks enhancement
3) Measures to be wholly implemented by other government agencies and/or private sector ; the groundwater management agency only gives recommendations.

Overview of the said groundwater management measures are referred to in Table 1.1 in Annex 15 in the JWRMS.

Out of the said four (4) measures, the former measures 1) and 2) are discussed in this for the following items in this paragraph :

(1) Reducing abstraction by providing attractive alternative sources

(2) Reducing unregistered abstraction

(3) Licensing

(4) Groundwater tariff

(5) Strong Government's Control

(1) Reducing Abstraction by Proving Attractive Alternative Sources

There are the following alternative sources of water that are already applied to a smaller or larger extent :

1) Surface water
2) Tank trucks
2) Piped water from the water supply agencies

The most attractive alternative is an own intake and treatment of surface water, However, raw water source for this use will be limited and further, investment cost for this provision is extremely high. Therefore, this source is not practically recommendable. Water supplied from tank trucks will be attractive only for small consumption. Finally, it is concluded to be piped water from water supply agencies as the most attractive source.

Apart from the physical availability of alternative sources like primary and secondary piped water distribution main, the attractiveness of the alternative water sources is very important and this attractiveness is determined by the following three (3) factors :

1) Reliability of supply (available flow and pressure)
2) Quality of water
3) Cost of water

Especially the first factors are often overlooked in discussions about making groundwater users switch to piped supply. It has been experienced that for industries which need water as vital input for these production process as well as luxurious hotels, the first two factors are more important than the last one.

(2) Reducing Unregistered Abstraction

Although all deep wells should be registered by law and a groundwater tariff is applied for non-domestic use of groundwater, field surveys and reports have cleanly confirm the suspicion that only a small part of the deep well abstraction points is registered. In the context of the assessment of present deep groundwater abstraction, first priority therefore is put on the identification of unregistered deep wells. Since the industry is the major non-domestic consumer of deep groundwater, the attention should be primarily focused on this group. In a later phase, the inventory should be completed to a complete coverage of existing abstraction points.

(3) Licensing

The licensing procedures provide a good basis for effective deep groundwater licensing. There are the following two sorts of license required when using groundwater ; a) Licensing to make well and b) License to use groundwater, which is pumped from one well or more wells.

The PERDA about making wells and using groundwater is presently being reviewed for further improvement of the legal basis for groundwater licensing. Hence, the government regulations do not hinder an effective licensing, but actual implementation of the licensing can still be improved considerably.

(4) Groundwater Tariff

The groundwater tariff is a way of controlling groundwater abstraction through the economic price mechanism. The JWRMS has presented groundwater tariff using an appropriate economic model, for reference.

(5) Strong Government Control

The situation and conditions on the groundwater abstraction have arisen strong government control establishing appropriate state and local regulations and laws to

avoid further development of the unfavorable environmental conditions and to make conservation groundwater.

CHAPTER VI

RECOMMENDATION

6.1 Proposed Action Program

The proposed action program for the Citarum river and Ciujung-Cidurian integrated water resources development projects to meet increasing water demand for the DKI Jakarta is illustrated in Fig. 411.1, which was prepared based on the phasing implementation plan obtained in the results of the master plan study as mentioned in Sub-paragraph 3.6.2. The action program will take the following four (4) development steps for taking the measures :

Phase I : *Immediate Measure*
- *Phase I-I* : *Upgraded West Tarum Canal*
  - commissioning in 2002 -
- *Phase I-II* : *Upgraded West Tarum Canal*
  - 2006 -

Phase II : *Short-term Measure*
Karian Dam & KSCS I & III
- 2009 -

Phase III : *Middle-term Measure*
Conveyance 2 - Phase I
- 2012 -

Phase IV : *Long-term Measure*
Conveyance 2
- 2016 -

Figure-411.2 shows the implementation schedule in case that the Karian Dam/Karian-Serpong Conveyance System Scheme is efficiently and smoothly implemented and will be completed at the end of 2005.

6.2 Recommendation

(1) As the results of the Study, it is strongly recommended that necessary action for implementation of the development of the Upgrading of the existing West Tarum Canal to increase supply capacity is immediately taken in order to meet the required supply capacity in 2002 for Phase I-I and 2006 for 2006.

(2) Through the Study, it was identified that the Karian Scheme as the short-term measure consisting of the dam, Karian-Serpong Conveyance System (KSCS I & III) with a length of 48.4 km from the Ciuyah tunnel to water treatment plant for the DKI Jakarta and river improvement works along the Ciujung river has urgently in terms of water demand-supply balance and flooding situation in order to support the current economic development in the study area. Therefore, it is strongly recommended to proceed with necessary procedures for executing the

said works as already recommended in the Study Report on Ciujung-Cidurian Integrated Water Resources in Indonesia (JICA, 1995).

(3) The Karian Dam Scheme and KSCS I & III were planned by the said Study Report to provide raw water for M&I water supply in the DKI Jakarta, Tangerang and Serang areas. In order to promote implementation of these schemes, it is recommended to establish necessary coordination committee and system with the related agencies to the M&I water supply in DKI Jakarta, Tangerang and Serang as already emphasized in the said Study Report.

(4) In order to successfully execute the resettlement of local residents in the affected areas by proposed schemes, it is suggested that the environmental monitoring and management unit (EMMU) composing the environmental unit (EU) and environmental monitoring and management committee (EMMC) be established under the initiation of Directorate General of Water Resources Development (DGWRD), Ministry of Public Works in close cooperation and coordination with the Directorate General of Human Settlement and Environmental Impact Management Agency.

(5) At present, there are the concerned agencies for coordinating and management for water sources and supply in Indonesia with local coordination committees and panels. It is proposed to establish comprehensive coordination and management committee for promotion of water sources and supply systems development, and coordination, allocation and management of water sources and supply in nationwide in order not induce conflict on water allocation between water users. It is noted for information that the Study Report on Ciujung-Cidurian Integrated Water Resources in Indonesia has proposed the organization and activities of the agencies for implementation of the project and general procedures of low flow management.

(6) Groundwater is a major source of water to satisfy demands in JABOTABEK, particularly for municipal and industrial use in the DKI Jakarta. Excessive groundwater abstraction in the northern part of the DKI Jakarta and its surrounding area has caused the environmental impacts such as land subsidence, while groundwater is still exploitable in the southern part of the DKI Jakarta and its surrounding area, where groundwater abstraction has not yet given remarkably physical and environmental problems, but groundwater abstraction in the southern area, which will be arisen by the steadily and strongly increasing water demand, will encounter same problems as those in the northern part in near future. Under such situation and conditions, proper management of groundwater is essential for development and conservation. The Study recommends that further development of groundwater in the northern part of the DKI Jakarta is stopped immediately. The present abstraction conditions are maintained and amount of groundwater abstraction should immediately decreases by the permissive yield in 2005, when new water sources and supply systems is expected to be completed. Further development is allowed in the

southern part till 2004 and thereafter amount of abstraction should gradually decrease by the permissive yield till 2015.

6.3 Immediate Action

The following actions are immediately necessary to proceed with the immediate and short- term measures :

(1) Engineering works of upgrading of West Tarum Canal for financing arrangement

As shown in Fig. 4.1.1, requirement of the upgrading of the West Tarum Canal, Phase I-I, for the DKI Jakarta water supply system will be in 2002 after five (5) years from the beginning of 1997 and that for Phase I-II will be in 2006 after further four (4) years. Under such time schedule, necessary procedure for preparation of feasibility report for financing arrangement should immediately commence to avoid delay of the completion of the scheme.

(2) Detailed environmental impact investigation and study

The SRCCIWR has made the preliminary environmental analysis and recommended to take the following immediate action :

1) Establishment of environmental monitoring and management unit (EMMU) consisting of environmental unit (EU) and environmental monitoring and management committee (EMMCC) to successfully execute the resettlement of local residents in the affected area by the proposed scheme.

2) Necessary procedures for commencement of environmental impact assessment.

(3) Establishment of comprehensive coordination and management committee of water sources and supply

As stated in Paragraph 4.2, it is suggested to take necessary action on establishing a comprehensive coordination and management committee on water sources and supply as soon as possible.

(4) Establishment of law and regulation on groundwater conservation and management

The Study preliminarily proposed the management and control plan on abstraction of groundwater in the DKI Jakarta as mentioned in Sub-paragraph 3.6.4. However, as implementation of the management and control plan needs national and local law and regulation, action on its procedures is recommended to be taken as soon as possible.