

3.2 Test Results

Detailed test results for earth material and concrete aggregate are shown in Table D-1 (1) to D-6.

4. Conclusions and Recommendation

4.1 Fill Material

(a) Earth material

Adequate earth material will be obtainable qualitatively on quantitatively at the earth borrow areas.

Natural moisture content is about 11-25% and the dry side of optimum moisture content, 17-27 %.

(b) Filter material

The sand and gravel materials tested in the laboratory can be used for filter material and concrete aggregate. However, the quantity at the borrow areas is judged to be insufficient. Consequently, it is recommended that all filter material and concrete aggregate be obtained by quarrying and crushing.

(c) Riprap material

As mentioned above, the riprap material be obtained by quarrying.

4.2 Concrete Aggregate

All concrete aggregate will be obtainable from quarried rock.

4.3 Design Value of Fill Materials

Design values of fill materials are assumed based on the construction material investigation. These are shown in Table D-7.

TABLES

TableD-1 (1) Summary of Soil Test for Core Material I

Sample number	No.	TP CB-1		TP CB-2		TP CB-3		TP CB-4		TP CB-5	
		-2.5 m	-5.0 m	-2.5 m	-5.0 m	-2.5 m	-5.0 m	-2.5 m	-5.0 m	-2.5 m	-5.0 m
PROPERTIES											
Borrow pit and depth (m)											
Natural water content	W (%)	42.89	38.46	47.83	48.26	49.59	44.94	50.26	53.97	45.69	31.89
Specific gravity of soil	G _s	2.661	2.599	2.616	2.640	2.614	2.626	2.645	2.640	2.572	2.644
Wet density	γ _t (g/cm ³)										
Void ratio	e										
Degree of saturation	s (%)										
GRAIN-SIZE											
Proportion											
Gravel	(%)										
Sand part	(%)	23	16	4	5	3	15	3	9	9	61
Silt part	(%)	25	20	36	21	38	29	23	20	23	20
Clay part	(%)	32	64	60	74	59	56	74	66	68	19
Max. diameter	(mm)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
60% diameter D ₆₀	(mm)	0.0135	0.0018	0.0052	-	0.0059	0.0080	-	0.0030	0.0029	0.24
10% diameter D ₁₀											
Uniformity coefficient											
Classification		Clay	Clay	Clay	Clay	Clay	Clay	Clay	Clay	Clay	Clay
CONSISTENCY											
Liquid limit	(%)	82.88	68.59	96.59	92.64	102.35	72.23	106.28	93.56	83.92	57.80
Plastic limit	(%)	35.79	36.00	44.09	41.10	47.40	38.44	44.11	40.20	35.15	36.44
Plasticity index		23.11	32.59	52.50	51.34	54.25	33.74	62.17	46.66	48.17	21.36
Flow index		47.09	13.97	49.52	37.85	23.29	17.26	21.15	46.66	21.57	4.58
Shrinkage limit											
Unified soil classification											
Fine course											
Permeability	K (cm/sec)	2.27x10 ⁻⁶	1.78x10 ⁻⁷	3.50x10 ⁻⁷	2.81x10 ⁻⁷	1.54x10 ⁻⁷	5.51x10 ⁻⁷	1.74x10 ⁻⁷	3.19x10 ⁻⁷	2.51x10 ⁻⁷	6.09x10 ⁻⁷
Compaction											
O.M.C.	(%)	37.40	37.40	46.00	48.20	45.80	38.00	46.50	47.00	41.40	32.10
Max. density	γ _d max. (g/cm ³)	1.287	1.294	1.158	1.141	1.162	1.258	1.157	1.139	1.215	1.333

Table D-1 (2) Summary of Soil Test for Core Material I

Sample number	No.	TP CB-1	TP CB-1	TP CB-2	TP CB-2	TP CB-3	TP CB-3	TP CB-4	TP CB-4	TP CB-5	TP CB-5
Borrow pit and depth (m)		-2.5 m	-5.0 m	-2.5 m	-5.0 m	-2.5 m	-5.0 m	-2.5 m	-5.0 m	-2.5 m	-5.0 m
Shearing Strength											
Triaxial compression											
UU											
Cohesion	C (kg/cm ²)	0.41	0.95	0.85	0.63	0.58	0.57	0.35	0.26	0.42	0.45
Internal friction angle		09°19'	10°12'	10°31'	06°23'	08°08'	08°58'	12°46'	10°47'	10°52'	14°49'
CU total of stress											
Cohesion	C (kg/cm ²)	0.23	0.63	0.92	0.52	0.50	0.55	0.26	0.21	0.39	0.40
Internal friction angle		12°55'	12°54'	12°28'	08°59'	12°24'	11°52'	14°17'	14°32'	13°43'	14°56'
Effective stress											
Cohesion	C (kg/cm ²)			0.90	0.48	0.55	0.54	0.23	0.20	0.37	0.39
Internal friction angle				12°28'	10°12'	12°40'	12°58'	15°46'	15°22'	14°34'	15°51'
Unconfined compression											
q _u	(kg/cm ²)										
Sensitivity S ₁											
Direct shear											
Cohesion C	C (kg/cm ²)										
Internal angle											
CONSOLIDATION											
Initial void ratio	e ₀	1.125			1.37		1.137	1.345		1.294	
Preconsolidation load	P ₀ (kg/cm ²)	1.46			1.70		1.70	1.50		2.10	
Compression index	C _c	0.51			0.65		0.48	0.78		0.60	
Coef. of consolidation	C _v (cm ² /sec)	1.65x10 ⁻²			1.53x10 ⁻²		1.44x10 ⁻²	1.80x10 ⁻²		1.98x10 ⁻²	
Coef. of volume comp.	mv (cm ² /g)	1.78x10 ⁻⁵			3.81x10 ⁻⁵		2.17x10 ⁻⁵	2.20x10 ⁻⁵		2.70x10 ⁻⁵	
Coef. of Permeability	K (cm/sec)										

Table D-2 (1) Summary of Soil Test for Core Material II

Sample number	No.	TP CD-1		TP CD-2		TP CD-3		TP CD-4		TP CD-5	
		-1.5 m	-3.0 m	-1.5 m	-3.0 m	-1.5 m	-3.0 m	-1.5 m	-3.0 m	-1.5 m	-3.0 m
PROPERTIES											
Natural water content	W (%)	55.73	55.06	56.63	51.98	53.23	50.60	56.10	56.50	51.89	51.50
Specific gravity of soil	G _s	2.697	2.702	2.698	2.67	2.703	2.691	2.715	2.713	2.728	2.622
Wet density	γ _t (g/cm ³)										
Void ratio	e										
Degree of saturation	s (%)										
GRAIN-SIZE											
Proportion											
Gravel	(%)	3	2	2	2	2	2	2	2	2	2
Sand part	(%)	32	17	29	13	28	29	24	26	33	33
Silt part	(%)	65	31	69	85	70	69	74	72	65	63
Clay part	(%)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Max. diameter	(mm)										
60% diameter D ₆₀	(mm)	-	-	0.0019	-	0.0015	-	0.0012	0.0012	0.0012	0.0019
10% diameter D ₁₀	(mm)										
Uniformity coefficient											
Classification											
		Clay	Clay	Clay	Clay	Clay	Clay	Clay	Clay	Clay	Clay
CONSISTENCY											
Liquid limit	(%)	83.14	87.94	83.20	90.96	95.54	94.80	95.94	92.83	88.01	81.41
Plastic limit	(%)	45.83	48.35	50.50	49.58	47.77	48.92	55.67	57.97	45.48	47.27
Plasticity index		37.31	39.59	32.70	41.38	47.77	45.88	40.27	34.86	42.53	34.14
Flow index		10.28	35.04	12.33	9.95	16/01	21.21	24.41	13.63	13.37	31.87
Shrinkage limit											
Unified soil classification											
Fine											
course											
Permeability	K (cm/sec)	1.83x10 ⁻⁷	8.26x10 ⁻⁷	1.41x10 ⁻⁷	1.45x10 ⁻⁷	2.16x10 ⁻⁷	1.70x10 ⁻⁷	1.58x10 ⁻⁷	1.54x10 ⁻⁷	1.58x10 ⁻⁷	1.82x10 ⁻⁷
Compaction											
O.M.C.	(%)	43.00	43.60	45.80	46.70	45.20	45.90	46.70	46.60	47.20	44.00
Max. density γ _d max.	(g/cm ³)	1.165	1.161	1.160	1.156	1.180	1.164	1.154	1.154	1.161	1.179

Table D-2 (2) Summary of Soil Test for Core Material II

Sample number	No.	TP CD-1	TP CD-1	TP CD-2	TP CD-2	TP CD-3	TP CD-3	TP CD-4	TP CD-4	TP CD-5	TP CD-5
Borrow pit and depth (m)		-1.5 m	-3.0 m	-1.5 m	-3.0 m	-1.5 m	-3.0 m	-1.5 m	-3.0 m	-1.5 m	-3.0 m
SHEARING STRENGTH											
Triaxial compression											
UU											
Cohesion	C (kg/cm ²)	0.62	0.63	0.65	0.62	0.50	0.47	0.58	0.75	0.19	0.86
Internal friction angle		10°29'	08°56'	08°49'	08°45'	09°51'	10°55'	13°09'	11°48'	15°19'	14°54'
CU total of stress											
Cohesion	C (kg/cm ²)	0.57	0.55	0.50	0.47	0.85	0.40	0.49	0.64	0.26	0.64
Internal friction angle		14°21'	10°58'	10°45'	11°24'	10°45'	13°13'	16°23'	13°43'	19°21'	18°33'
Effective stress											
Cohesion	C (kg/cm ²)	0.52		0.47		0.80			0.57	0.26	
Internal friction angle		15°45'		11°52'		11°51'			15°54'	20°03'	
Unconfined compression											
q _u	(kg/cm ²)										
Sensitivity S ₁											
Direct shear											
Cohesion C	C (kg/cm ²)										
Internal angle											
CONSOLIDATION											
Initial void ratio Co			1.355	1.348			1.402	1.392			1.273
Preconsolidation load	Po (kg/cm ²)		2.50	2.10			2.90	2.50			2.50
Compression index Cc			0.64	0.63			0.19	0.67			0.58
Coef. of consolidation	Cv (cm ² /sec)		2.10x10 ⁻²	1.70x10 ⁻²			2.16x10 ⁻²	9.20x10 ⁻³			1.96x10 ⁻²
Coef. of volume comp.	mv (cm ² /g)		2.55x10 ⁻⁵	3.20x10 ⁻⁴			1.53x10 ⁻⁵	2.95x10 ⁻⁵			2.25x10 ⁻⁵
Coef. of Permeability	K (cm/Sdc)		5.30x10 ⁻⁷								

Table D-3 (1) Summary of Soil Test for Core Material III

Sample number	No.	TPK-3-2	TPK-1-2	TPK-1	TPK-2	TPK-2	TPK-3
Borrow pit and depth	(m)	(90:10)%	(95:5)%	(-3.00)	(-1.5)	(-3.00)	(-3.00)
PROPERTIES							
Natural water content	W (%)	14.36	17.00	18.40	10.95	25.01	19.64
Specific gravity of soil	G _s	2.496	2.485	2.478	2.593	2.534	2.470
Wet density	γ _t (g/cm ³)						
Void ratio	e						
Degree of saturation	s (%)						
GRAIN-SIZE							
Proportion							
Gravel part	(%)	9.0	8.0	29.0	8.0	37.0	22.0
Sand part	(%)	51.0	40.0	35.0	39.0	25.0	47.0
Silt part	(%)	19.0	20.0	22.0	21.0	24.0	16.0
Clay part	(%)	21.0	22.0	14.0	32.0	14.0	15.0
Max. diameter	(mm)	5.0	5.0	38.1	19.1	25.4	25.4
60% diameter D ₆₀	(mm)	0.42	0.38	0.85	0.36	1.50	0.55
10% diameter D ₁₀	(mm)	-	-	-	-	-	-
Uniformity coefficient		-	-	-	-	-	-
Classification		Sandy clay loam	Sandy clay loam	Loam	Clay	Clay loam	Sandy loam
CONSISTENCY							
Liquid limit	L.L. (%)	N.P.	N.P.	N.P.	33.78	N.P.	N.P.
Plastic limit	P.L. (%)	N.P.	N.P.	N.P.	16.37	N.P.	N.P.
Plasticity index	P.I.				17.41		
Flow index	F.I.				4.48		
Shrinkage limit					-		
Unified soil classification					CL		
Permeability	K (cm/sec)	5.786x10 ⁻⁸	4.295x10 ⁻⁸	1.286x10 ⁻⁷	3.281x10 ⁻⁸	8.268x10 ⁻⁸	1.441x10 ⁻⁷
Compaction							
Optimum water content	(%)	21.00	24.08	24.50	17.00	27.32	22.60
Max. density γ _d max.	(g/cm ³)	1.520	1.476	1.416	1.717	1.409	1.520

Table D-3 (2) Summary of Soil Test for Core Material III

Sample number	No.	TPK-3-2	TPK-1-2	TPK-1	TPK-2	TPK-2	TPK-3
Borrow pit and depth	(m)	(90:10)%	(95:5)%	(-3.00)	(-1.5)	(-3.00)	(-3.00)
SHEARING STRENGTH							
Triaxial compression							
Unconfirmed compression							
Compression Strength	qu (kg/cm ²)						
Sensitivity	St						
Triaxial compression (UU)							
Cohesion C	(kg/cm ²)	0.40	0.62	0.30	0.48	0.74	0.53
Internal friction angle		35°45'	38°58'	33°25'	25°55'	28°22'	34°24'
Triaxial compression (CU)							
Cohesion C	(kg/cm ²)	0.42	0.12	0.40	0.40	0.65	0.42
Internal friction angle		34°48'	20°33'	28°22'	11°19'	26°34'	35°18'
CONSOLIDATION							
Initial void ratio	Co	0.729	0.779				0.712
Preconsolidation load	Po	2.6	4.8				3.2
Compression index	Cc	0.128	0.119				0.112
Coef. of consolidation	Cv	7.4x10 ⁻³	1.0x10 ⁻²				1.05x10 ⁻²
Coef. of volume comp.	mv	7.4x10 ⁻⁶	2.9x10 ⁻⁶				3.00x10 ⁻⁶
Coef. of Permeability	K	5.6x10 ⁻⁸	3.4x10 ⁻⁸				3.40x10 ⁻⁸

Table D-4 Summary of the Laboratory Test for Filter Material & F.C. Aggregate

Test item Location	Specific Gravity	Water absorption test	Soundness test	Unconfined compression test	Abrasion test	Alkali aggregate reaction	Sieve Analysis (Pass. %)										Classification							
		%	%	kg/cm ²	%	-	100 (mm)	60 (mm)	40 (mm)	30 (mm)	25 (mm)	20 (mm)	15 (mm)	10 (mm)	5 (mm)									
1. Padarincang																								
Padarincang	2.848	10.80	25.8	-	-	-	-	89	68	-	47	42	-	25	18									Sand
Padarincang 1	2.805	12.13	26.7	-	-	-	-	98	80	-	56	45	-	23	11									Sand
Padarincang 2	2.798	27.67	9.9	-	-	-	-	-	-	-	93	91	-	80	72									Sandy clay loam
2. Anyer																								
Anyer	2.778	7.36	16.8	-	-	-	-	94	73	-	59	50	-	34	26									Sand
Anyer 1	2.762	7.31	16.0	-	-	-	-	95	74	-	60	51	-	37	33									Sand
Anyer 2	2.766	7.21	16.70	-	-	-	-	93	72	-	56	46	-	36	33									Sand
3. Labuan																								
Labuan	2.665	10.55	23.7	-	-	-	-	96	74	-	59	49	-	25	13									Sand
Labuan 1	2.664	12.58	23.5	-	-	-	-	98	76	-	60	51	-	29	17									Sandy loam
Labuan 2	2.657	18.16	25.3	-	-	-	-	97	75	-	58	49	-	25	14									Sand
4. Pamarayan																								
Pamarayan	2.834	10.44	12.5	-	-	-	-	-	-	-	100	100	-	99	96									Sand
5. Ciomas																								
Ciomas	2.615	20.08	7.2	-	-	-	-	-	-	-	-	-	-	95	76									Sandy loam

Table D-5 Summary of the Laboratory Test for C.C. Aggregate

Test Item Location	Specific Gravity	Water absorption test (%)	Soundness (%)	Abrasion test			Alkali aggregate reaction	Sieve Analysis (Pass. %)																
				A (%)	B (%)	C (%)		D (%)	100 (mm)	60 (mm)	40 (mm)	30 (mm)	25 (mm)	20 (mm)	15 (mm)	10 (mm)	5 (mm)	F.M.						
1. Cidanau Quarry																								
Peusar	2.695	2.52	22.0	21.6	23.2	36.4	16.2	Not Injurious	-	70	31	21	8	5	4	2	1							8.70
2. Cibanten Quarry																								
Bojong	2.349	6.40	14.1	57.7	49.7	47.9	42.9	Not Injurious	-	68	25	17	10	5	3	1	1							8.80
3. Padarincang																								
Padarincang	2.330	5.24	11.2	28.0	40.0	40.0	24.0	Not Injurious	-	68	25	17	10	5	3	1	1							7.27
Padarincang 1	2.542	4.45	11.4	32.0	33.6	35.9	19.9	"	-	89	70	63	55	45	42	30	25							6.73
4. Anyer																								
Anyer 1	2.580	3.28	5.2	51.7	43.6	50.0	27.5	Not Injurious	-	94	73	67	59	50	44	34	26							7.21
Anyer 2	2.586	3.27	5.7	47.7	41.9	49.5	26.7	"	-	95	74	68	60	51	45	37	32							7.11
Anyer 3	2.599	3.31	5.7	49.7	41.2	49.2	26.5	"	-	93	71	65	56	45	42	33	29							7.26
5. Labuan																								
Labuan 1	2.530	4.67	8.1	41.7	46.6	41.8	29.0	Not Injurious	-	95	73	67	59	49	42	25	13							7.40
Labuan 2	2.532	4.64	9.7	39.7	41.3	39.7	28.0	"	-	97	73	71	63	51	44	28	16							7.28
Labuan 3	2.561	3.96	9.2	43.2	48.8	42.2	29.4	"	-	97	75	70	68	47	41	25	14							7.39

Table D-6 Summary of the Laboratory Test for Rock Material

Test Item	Specific Gravity	Water absorption test %	Soundness test %	Unconfined compression test kg/cm ²	Abrasion test %	Alkali aggregate reaction	Sieve Analysis (Pass. %)																																									
							100 (mm)	60 (mm)	40 (mm)	30 (mm)	25 (mm)	20 (mm)	15 (mm)	10 (mm)	5 (mm)	F.M. (mm)																																
1. Bojong (QB-1)																																																
18.07 - 18.63	2.420	6.41	-	38.28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-									
20.16 - 20.48	2.266	11.23	-	58.43	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-										
24.63 - 25.00	2.380	8.13	-	188.74	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-										
2. Bojong (QB-II)																																																
24.40 - 24.90	2.146	5.38	-	280.52	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								
24.40 - 24.90	2.124	6.67	-	316.11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-									
29.60 - 29.80	2.465	1.46	-	539.47	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-									

Table D-7

Design Value for Heightening of Krenceng Dam Embankment
Materials and Foundation

Item	Unit	Impervious random	Filter	Rock	Existing Krenceng dam	Foundation (welded tuff)
1) Specific gravity	t/m ³	2.492	2.768	2.30	-	-
2) Water content	%	23.9	7.293	6.0	-	-
3) Void ratio		0.72	0.73	0.40	-	-
4) Dry density	t/m ³	1.468	1.60	1.643	-	-
5) Wet density	t/m ³	1.728	1.717	1.742	1.70	
6) Saturated density	t/m ³	1.857	2.021	1.928	1.80	
7) Friction angle	degree	26	33	40	20	32
8) Cohesion	t/m ²	3	0	0	2	5
9) Permeability	cm/sec	1x10 ⁻⁶	1x10 ⁻³	1x10 ⁰⁻¹⁰⁻¹	1x10 ⁻⁵	1x10 ⁻⁴

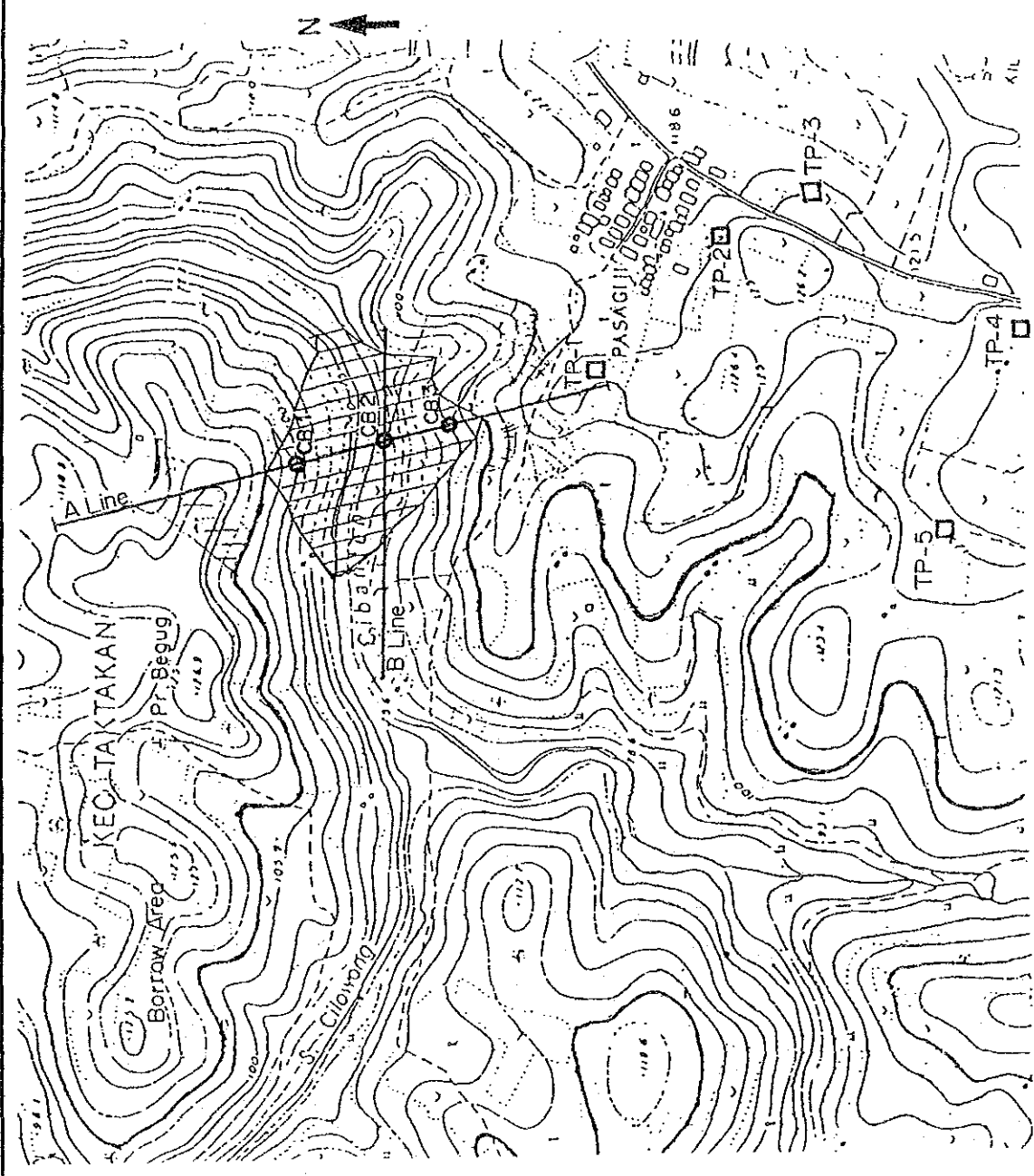
FIGURES

Fig. D-1


LEGEND :

- Tes pit
- Boring hole
- Seismic line

Scale
1:5000

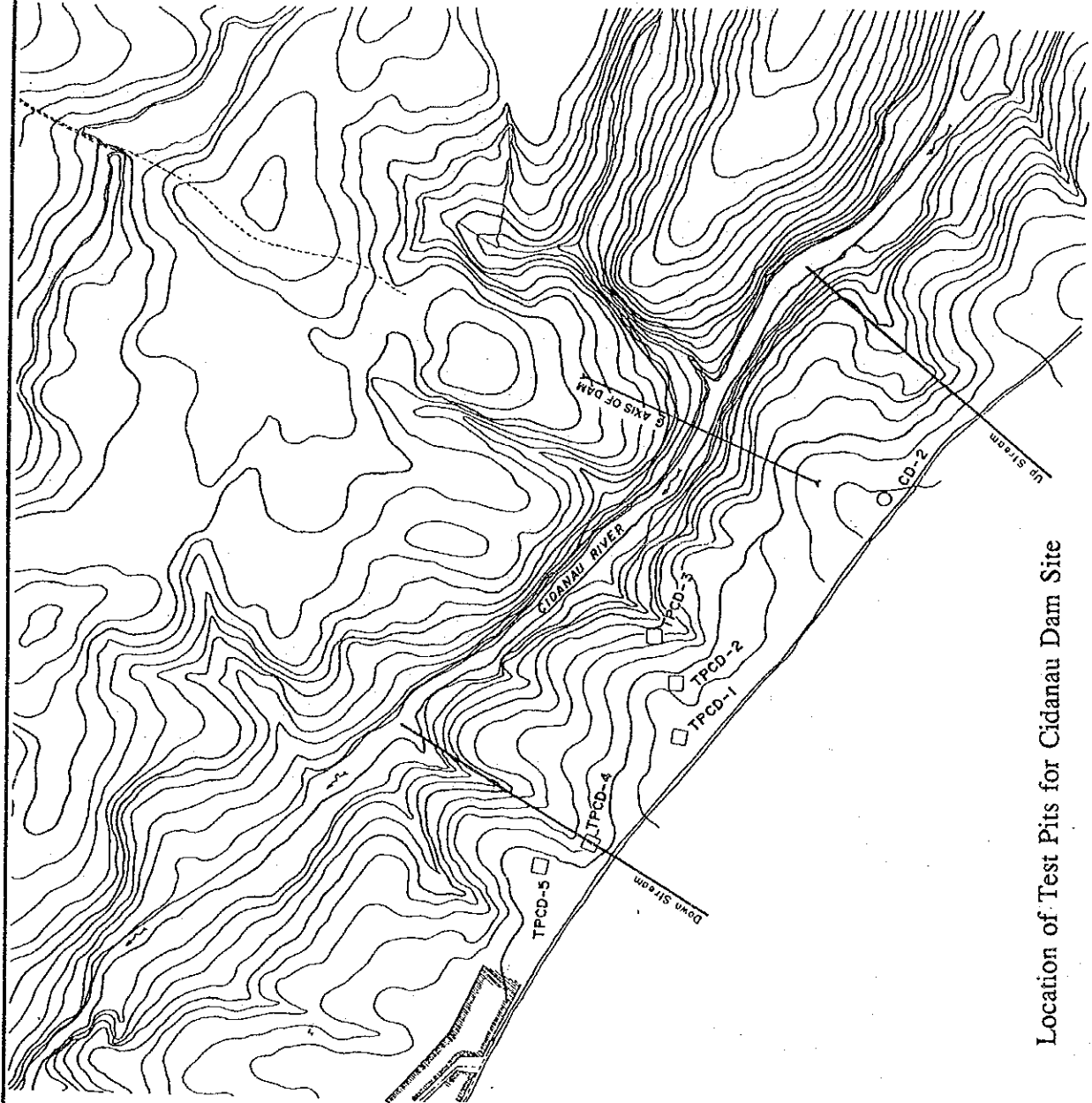


Location of Test Pits for Cibanten Dam Site

 MINISTRY OF PUBLIC WORKS
DIRECTORATE GENERAL OF WATER RESOURCES DEVELOPMENT
FEASIBILITY STUDY ON CIDANAU-CIBANTEN
WATER RESOURCES DEVELOPMENT PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

- LEGEND**
- BORING HOLE
 - TEST PIT
 - CROSS SECTION LINE



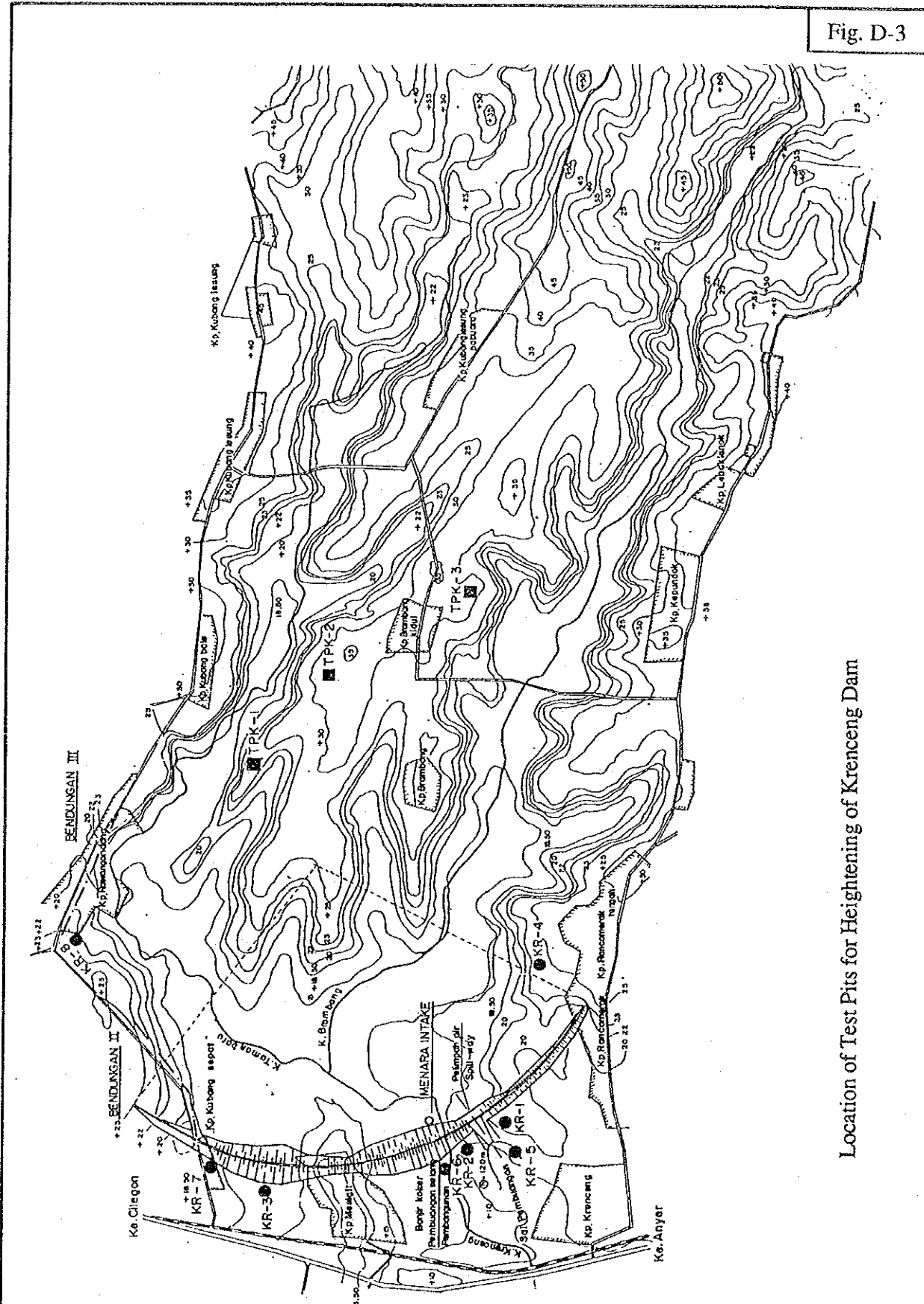
Location of Test Pits for Cidanau Dam Site




MINISTRY OF PUBLIC WORKS
DIRECTORATE GENERAL OF WATER RESOURCES DEVELOPMENT
FEASIBILITY STUDY ON CIDANAU-CIBANTEN
WATER RESOURCES DEVELOPMENT PROJECT

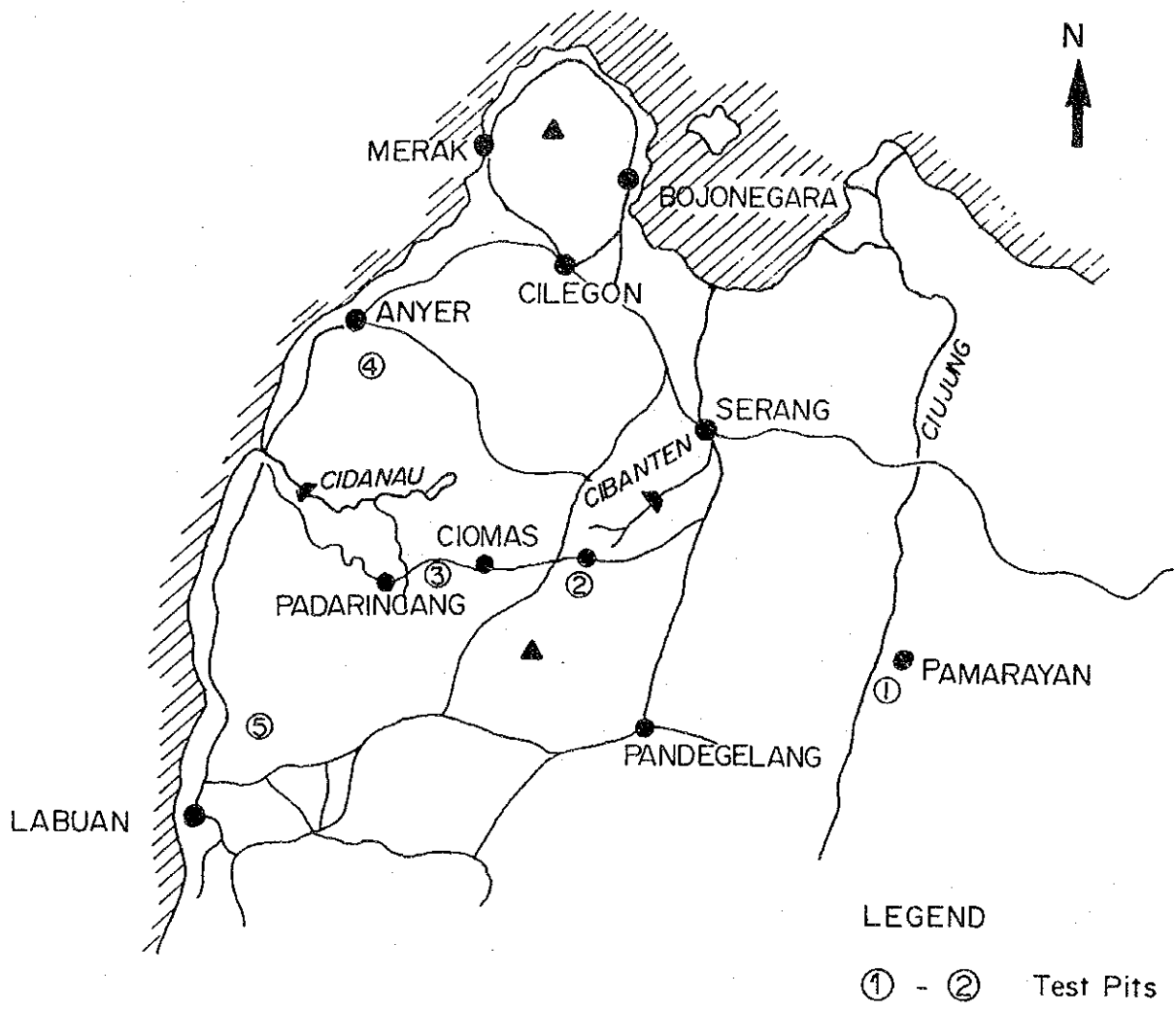
JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. D-3




Location of Test Pits for Heightening of Kreceng Dam

 MINISTRY OF PUBLIC WORKS
DIRECTORATE GENERAL OF WATER RESOURCES DEVELOPMENT
FEASIBILITY STUDY ON CIDANAU-CIBANTEN
WATER RESOURCES DEVELOPMENT PROJECT
JAPAN INTERNATIONAL COOPERATION AGENCY



Location of Test Pits for Filter Material

 MINISTRY OF PUBLIC WORKS
DIRECTORATE GENERAL OF WATER RESOURCES DEVELOPMENT
FEASIBILITY STUDY ON CIDANAU-CIBANTEN
WATER RESOURCES DEVELOPMENT PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

APPENDIX - E
WATER DEMAND SURVEY

APPENDIX - E
WATER DEMAND SURVEY

TABLE OF CONTENTS

	<u>Page</u>
1. PRESENT CONDITIONS OF INDUSTRIAL AND DOMESTIC WATER SUPPLY	E - 1
1.1 Water Supply Organizations and Water Charges	E - 1
1.2 Present Industrial and Domestic Water Use	E - 1
2. INDUSTRIAL WATER DEMAND	E - 2
2.1 Methodology for Industrial Water Demand	E - 2
2.2 Projected Industrial Water Demand	E - 5
3. DOMESTIC WATER DEMAND	E - 5
3.1 Methodology for Domestic Water Demand	E - 5
3.2 Projected Domestic Water Demand	E - 7

LIST OF TABLES

<u>Table No.</u>	<u>List</u>	<u>Page</u>
E-1	PDAM Water Tariff	ET - 1
E-2	Current and Future Average Water Demand (Customer Demand) in the Study Area	ET - 2
E-3	Water Supply of Krakatau Steel in 1990	ET - 3
E-4 (1)	Industrial Water Use in 1990 by Water Source (Customer Demand)	ET - 4
E-4 (2)	Industrial Water Use in 1990 by Water Source (Customer Demand)	ET - 5
E-5	GOI Urban Water Supply Levels of Service Targets for Repelita V	ET - 6
E-6	Current and Future Population in the Study Area	ET - 7
E-7 (1)	Collected Data during Water Demand Survey for Manufacturing Enterprises and Residents (1/7)	ET - 8
E-7 (2)	Collected Data during Water Demand Survey for Manufacturing Enterprises and Residents (2/7)	ET - 9
E-7 (3)	Collected Data during Water Demand Survey for Manufacturing Enterprises and Residents (3/7)	ET - 10
E-7 (4)	Collected Data during Water Demand Survey for Manufacturing Enterprises and Residents (4/7)	ET - 11
E-7 (5)	Collected Data during Water Demand Survey for Manufacturing Enterprises and Residents (5/7)	ET - 12
E-7 (6)	Collected Data during Water Demand Survey for Manufacturing Enterprises and Residents (6/7)	ET - 13
E-7 (7)	Collected Data during Water Demand Survey for Manufacturing Enterprises and Residents (7/7)	ET - 14

LIST OF FIGURES

<u>Figure No.</u>	<u>List</u>	<u>Page</u>
E-1	Location Map for Industrial Area	EF - 1

1. Present Conditions of Industrial and Domestic Water Supply

1.1 Water Supply Organizations and Water Charges

At present, PDAM is providing treated water with only limited portion of Kabupaten Serang. According to PDAM, Serang is estimated service factors in 1990 was as follows:

	Service Factor (%)
Serang city	36
Administrative area of Cilegon city	19
IKK Systems ¹	17

¹: Sub-urban and rural water supply system by PDAM

State owned Krakatau Steel Company has been taking water from Cidanau river and supplying water through its own facilities to public entities as well as private enterprises, volume of which totalled about 975 liter/sec. in 1990 according to the company.

Water charge varies according to the supplier. In case of PDAM, water tariff is as given in Table E-1. In case of Krakatau Steel, water charge is 500 Rp/m³ but water charge due to other private suppliers lies in the range of 2,750 - 9,000 Rp/m³. PDAM tariff is not full-cost-recovery basis, only sufficient to meet operation and maintenance expenses on water supply facilities.

1.2 Present Industrial and Domestic Water Use

According to the data provided by PDAM, Serang and Krakatau Steel Company as well as those provided by the manufacturing enterprises located in the Study Area through the interview survey, about 24.4 million m³ of water was consumed in 1990 for industrial use and domestic use including commercial and public uses. Together with leakage and other unaccounted water as well as treatment use, 30.8 million m³ of raw water was presumed to be obtained either from surface water, spring or groundwater. Water use in Kabupaten Serang in 1990 is shown in Table E-2 by Kecamatan. Estimated supply by Krakatau Steel Company and industrial uses by supply source in 1990 are shown in Table E-3, Table E-4 (1) and E-4 (2), respectively.

It should be noted that PDAM is provided with up to 30 liter/sec. of water by Krakatau Steel Company besides water taken from the springs.

2 Industrial Water Demand

2.1 Methodology for Industrial Water Demand

Industrial water demand in Kabupaten Serang has been sharply increasing since late 1980s. Sizable scale power plant is located in Suralaya and is scheduled to be expanded further within this decade. Accommodation facilities in Anyer and Merak as well as ferry port in Merak require the supply of treated water.

Industrial water demand is projected according to the above-mentioned categories up to the year 2010 based on:

- (1) Present water use in 1990,
- (2) Expansion programs contemplated by factories and industrial estates,
- (3) Expected growth based on the regional and national economic growth contemplated in Repelita V, and
- (4) Expansion plan of the toll road up to Merak by 1995.

Methodology for the industrial water demand projection is given hereunder.

1) Industrial (factory/industrial estate) water demand

Methodologies

- (1) Comprise water uses in the factory land, including both industrial and employees' uses.
- (2) Based on the actual water use data for 1990 obtained from interview survey.
- (3) Factory operation is 300 days/y and 24 hours/day.
- (4) Bojonegara

Based on the planned factory expansion and water use increase up to 1995 and 7.2%/y increase, which is the manufacturing sector growth target of Repelita V for the West Java Province, afterwards.

(5) Pulo Merak

7.2% increase after 1990

(6) Anyer

- Based on the planned expansion of factories and industrial estate up to 2000.
- 7.2%/y increase afterwards
- Water use of the factories located in KIEC (Krakatau Industrial Estate Cilegon) in Anyer is estimated based on the data/information obtained from factory interview survey and not based on the land area of KIEC and unit water use per ha.
- PPI IE (PPI industrial estate) is assumed to be fully developed by 2000.

(7) Cilegon

- Krakatau Steel (KS) production use:
Based on the data provided by KS until 2005
- KIEC (Cilegon portion: 473 ha) is assumed to be fully developed by 2000.
- Cigaden port demand is to be fully met by KS water supply, i.e., 5 lit./s.
- PLTU Suralaya's (Power station) demand is estimated by its expansion plan, part of which is to be supplied by KS, i.e., 50 lit./s. Operation is 365 days/y and 24 hours/day.

2) Port water demand

- (1) 365 days/y and 24 hours/day operation.

(2) Growth rate of ferry traffic/passengers

a. Merak Port (Ferry)

<u>Rate</u>	~ 1995	5%/y
	1995 ~	10%/y

Reason Same as that for "Hotel Water Demand"

b. Cigaden Port

According to Krakatau Steel's data.

c. Banten Port (Freight)

<u>Rate</u>	~ 1995	5%/y
	1995 ~	10%/y

Reason Same as that for Merak Port

3) Hotel water demand

(1) Based on guest data in 1989

(2) Growth rates of visitor • days

	1989 ~1995	5%/y
	1995 ~	10%/y

Based on the national economic growth rate of 5%/y for Repelita V period (1989/90 ~1993/94), considering that major portion of the visitors are and will be coming from Jakarta. The rate will be doubled due to the completion of the toll road by 1995.

(3) No. of visitor • days

	Unit: No. of Visitor • days/y (m ³ /y)						
	1990	1995	2000	2005	2010	2015	2020
Anyer	38,332	48,912	78,797	126,942	204,504	329,456	530,754
Pulo Merak	47,371	60,445	97,377	156,874	252,724	407,138	655,900
Total	85,703	109,357	176,174	283,816	457,228	736,594	1,186,654

(4) 365 days/year and 24 hours/day operation.

2.2 Projected Industrial Water Demand

Projected water demand is given in Table E-2. Industrial water demand would reach 70 million m³/y in 2005 in terms of customer demand. As shown in the table, manufacturing demand is dominant accounting for 95% of the industrial demand and 61% of the total including the domestic.

3 Domestic Water Demand

3.1 Methodology for Domestic Water Demand

Domestic water demand is projected based on:

- (1) Domestic water demand comprises household use, commercial use and public use,
- (2) Present and future population up to 2010 by Kecamatan based on the projection of Biro Pusat (Central Statistical Office), taking into consideration the recent rapid industrialization in Anyer and Bojonegara generating sizable employments,
- (3) Target service factor (SF) contemplated by Cipta Karya for Repelita V, being modified considering the actual SFs in Study Area in 1990,
- (4) Target per Capita water use by Cipta Karya for Repelita V, being modified considering the actual figures in Study Area in 1990.

Methodology for the domestic water demand is given hereunder.

1) Estimated water use & PDAM supply in 1990

(1) PDAM supply

Actual Supply provided by PDAM

(2) Estimated use by factory employees and their families outside factory land.

- Service factor : 100% supply through the company
- Per capita use : 150 lit./cap./day

2) Demand for PDAM supply after 1990

(1) Population projection

- a. For 11 Kecamatan's within the Study Area other than Cilegon, Bojonegara and Anyer, according to Biro Pusat's projection.
- b. Anyer: Until 2000, 1990 population plus PPI industrial Estate related population for urban and no growth for rural and 7.2%/y growth afterwards for both.
- c. Bojonegara & Polomerak:
7.2%/y growth after 1990.
- d. Cilegon: Until 2000, 1990 population plus KIEC (Cilegon portion 473 ha) related population for urban and no growth for rural and 7.2%/y growth afterwards for both.
- e. Serang: 100% of urban population and 52.5% of rural population based on the ratio of the area within the Study Area.
- f. Kasemen: 31.5% of the population

(2) Service factor (SF), per capita consumption, etc.

a.	SF	<u>1995</u>	<u>200 and afterwards</u>
		0.50	0.80

Remarks: Based on Repelita V (1989 - 1993) target by Cipta Karya with Downwards modification, considering the actual figures in 1990.

b. Per capita consumption

<u>Classification</u>	<u>Consumption</u>
<u>Urban</u>	
500,000 > P ≥ 100,000	150
100,000 > P ≥ 20,000	130
20,000 > P	100
<u>Rural</u>	100

c. Multiplying factor

- Multiplying Factor:
(Household + Commercial + Public) ÷ Household
- 1995 and onwards
- 1.29 for Serang and 1.16 for Cilegon and 1.00 for others
- Based on historical data from 1984 to 1990 provided by PDAM, Serang

3.2 Projected Domestic Water Demand

The Projected population for the Study Area up to 2010 is given in Table E-6 and the projected domestic water demand is given in Table E-2. As shown in the table, total demand would be 41.7 million m³ in 2005 in terms of customer demand, accounting for about 36.2% of the total.

TABLES

Table E-1 PDAM Water Tariff (Jan. 1992)

Unit: Rp./m³

Volume of Water Supplied (m ³)	Category III						
	Category I	Category II	Category II		Category IV	Category V	Category VI
	Non- Commercial	Commercial	A	B	Social	Public Hydrant	Niaga Khusus
1 - 10	175	435	700	875	150	150	1400
11 - 20	275	435	700	875	150	150	1400
21 - 30	375	615	1050	1050	275	150	1400
>30	525	875	1400	2100	360	150	2200

Table E-2 Current and Future Average Water Demand (Customer Demand) in the Study Area

Kecamatan	Type of Water Use		1990		1995	2000	2005	2010	
<u>Bojonegara</u>	Manufacturing	PDAM /1	991		1,655	2,344	3,319	4,700	
	Domestic	Fac. /2	11	Urban	265	779	1,103	1,562	
			456	Rural	917	2,077	2,941	4,163	
	Sub-total		1,458		2,837	5,201	7,364	10,426	
<u>Pulo Merak</u>	Manufacturing		351		497	704	997	1,411	
	Power station		1,328		1,826	2,822	2,822	2,822	
	Port		10		12	20	32	51	
	Hotel		47		60	97	157	253	
	Domestic	PDAM /1			Urban	487	1,102	1,560	2,209
		Fac. /2		300	Rural	1,297	2,937	4,158	5,886
Sub-total		2,036		4,179	7,682	9,725	12,632		
<u>Anyer</u>	Manufacturing		1,475		13,074	15,465	16,578	17,772	
	Port		173		177	189	208	238	
	Hotel		38		49	79	127	205	
	Domestic	PDAM /1		11	Urban	1,649	2,967	4,847	6,862
		Fac. /2		618	Rural	390	624	883	1,250
Sub-total		2,315		15,339	19,323	22,643	26,326		
<u>Cilegon</u>	Manufacturing		16,142		30,384	49,207	49,207	69,677	
	Domestic	PDAM /1	320	Urban	1,267	6,363	9,008	12,753	
		Fac. /2			Rural	1,155	1,848	2,616	3,703
Sub-total		16,462		32,806	57,418	60,831	86,134		
<u>Serang</u>	Domestic		1,350	Urban	828	1,350	1,374	1,400	
				Rural	1,159	1,889	1,924	1,959	
Sub-total		1,350		1,988	3,239	3,298	3,359		
<u>Cinangka</u>	Domestic		-	Urban	159	253	251	249	
				Rural	552	877	870	863	
	Hankam		725		725	725	725	725	
Sub-total		725		1,437	1,855	1,846	1,837		
<u>Ciomas</u>	Domestic		-	Urban	124	228	262	301	
				Rural	430	790	908	1,044	
Sub-total		-		554	1,018	1,171	1,345		
<u>Kaserua</u>	Domestic		-	Urban	77	149	178	213	
				Rural	268	515	617	738	
Sub-total		-		345	664	795	952		
<u>Kramatwatu</u>	Domestic		14	Urban	165	311	365	429	
				Rural	573	1,077	1,265	1,487	
Sub-total		14		738	1,388	1,631	1,916		
<u>Mancak</u>	Domestic		-	Urban	130	225	243	263	
				Rural	451	779	842	910	
Sub-total		-		581	1,004	1,085	1,173		
<u>Pabwaran</u>	Domestic		-	Urban	161	256	318	353	
				Rural	557	990	1,101	1,224	
Sub-total		-		718	1,246	1,419	1,577		
<u>Panderingcang</u>	Domestic		5	Urban	178	282	279	276	
				Rural	618	977	966	955	
	Sub-total		5		796	1,259	1,245	1,230	
<u>Taktakan</u>	Domestic		-	Urban	152	260	279	298	
				Rural	527	902	966	1,034	
Sub-total		-		679	1,163	1,244	1,332		
<u>Waringukuring</u>	Domestic		-	Urban	106	179	190	201	
				Rural	366	621	657	696	
Sub-total		-		472	800	847	897		
<u>Study Area</u>	Manufacturing		18,959		45,610	67,720	70,101	93,560	
	Power station		1,328		1,826	2,822	2,822	2,822	
	Port		183		189	209	239	289	
	Hotel		86		109	176	284	457	
	Domestic		3,809		15,733	32,333	41,697	54,008	
	Total (CD)		24,364		63,467	103,260	115,143	151,136	
	Total (SD)		30,820		80,286	130,623	145,656	191,187	

Remarks: 1) Average day demand.

2) Source demand = 1.265 x Customer demand, where 1.265 is the ratio used by P.T. Krakatau Steel.

3) Domestic water demand includes commercial and public water demand.

4) Hankam is a base for the military police.

/1 PDAM supply

/2 Enterprise's supply

Table E-3 Water Supply of Krakatau Steel in 1990

	UNIT: LIT./S
	1990
Krakatau Steel Production Use	568.5
Supply to Other Entities	
KIEC	321.5
Cigaden Port	5
PLTU Suralaya	50
PDAM Cilegon	30
Sub-total	406.5
Total	975
Loss (15% of total)	146.2
Make-up Water (10% of (total + loss))	112.1
Grand Total	1,233.3

Table B-4 (1) Industrial Water Use in 1990 by Water Source (Customer Demand)

Area/Factory	Krakatau Steel		Water Supply		Destination Plant		Deep Well	River	Total (m ³ /y)	Remarks
	Vol(m ³ /y)	Price(Rp/m ³)	Vol(m ³ /y)	Price(Rp/m ³)	Vol(m ³ /y)	Cost(Rp/m ³)	Vol(m ³ /y)	Vol(m ³ /y)		
Bojonegara										
1. P.T. REDECO PETROFIN UTAMA	-	-	*	-	-	-	*	-	-	15,000 m ³ /y in total
2. P.T. SULFINDO ADIUSAHA	-	-	-	-	-	-	-	300,000 (Through P.T. Indprin)	-	
3. P.T. GUNA NUSA UTAMA FABRICATOR (PMDN)	-	-	21,000 P.T. Sumber Alan	5,000	-	-	-	-	-	
4. SPWI	-	-	10,800 P.T. Guna Sugih Jaya	9,000	-	-	-	-	-	
5. P.T. SRIWIJAYA RAKUAN SEJATI	-	-	*	-	-	-	*	-	-	13,500 m ³ /y in total
6. TRANS BAKRIE	-	-	*	855	-	-	*	-	-	270m ³ /y in total
7. CILEGON FABRICATOR	-	-	18,000 P.T. ADES	6,000	-	-	-	-	-	
8. P.T. CONTINENTAL CARBON INDONESIA	-	-	-	-	144,000	-	21,600	-	-	
9. POLICHEM LINDO INC.	-	-	*	7,000	-	-	*	-	-	Also rain water storage 45,600m ³ /y in total
10. P.T. INDOCHLOR PRAKARSA INDUSTRIES (INDPRIN)	-	-	-	-	-	-	-	420,000 Pasauran R.	-	
Bojonegara Total			49,800		144,000		21,600	720,000	935,400	Only the total of the allocated figures
Polomerak										
11. P.T. STATOMER PVC RESIN FACTORY	-	-	12,000	3,500	151,200	5,000	45,000	-	-	
12. P.T. UNGGUL INDAH CORPORATION	-	-	6,000 (P.T. Gunung Sugiojoman)	2,750	-	-	-	-	-	
13. P.T. PETROKIMTA NUSANTARA INTERINDO	-	-	-	-	136,800	-	-	-	-	
Sub-Total			18,000		288,000		45,000		351,000	
Power Station										
14. P.L.T.U. SURALAYA	671,600	500	-	-	656,270	-	-	-	-	
Port										
15. MERAK PORT AUTHORITY	-	-	8,100	5,000	-	-	-	-	-	from P.T. Peteka
Sub-total	671,600		8,100		656,270				1,335,970	
Polomerak Total	671,600		26,100		944,270		45,000	0	1,686,970	

Table E-4 (2) Industrial Water Use in 1990 by Water Source (Customer Demand)

Area/Factory	Krakatau Steel		Water Supply		Desalination Plant		Deep Well	River	Total (m ³ /y)	Remarks
	Vol(m ³ /y)	Price(Rp/m ³)	Vol(m ³ /y)	Price(Rp/m ³)	Vol(m ³ /y)	Cost(Rp/m ³)	Vol(m ³ /y)	Vol(m ³ /y)		
Anyer										
Factory										
16. Polytama Karsa Agung	-	-	-	-	-	-	-	-	-	Operation is scheduled to be started from Dec. 1993. Water source is not yet determined. From Dec. 1991
17. P.T. Tri Polita	-	-	(432,000)	5,000	-	-	-	-	-	
18. Chandre Asli	-	-	(2,160,000)	5,000	-	-	-	-	-	
19. P.T. SANKYU INDONESIA INTERNATIONAL	-	-	(P.T. Peteka)	-	-	-	-	-	-	
20. P.T. SATYA RAYA INDAH WOODBASSED INDUSTRIES	-	-	-	-	-	-	249,600	86,400	-	1,500m ³ /y in total
21. ASAHIMAS SUBENTRA CHEMICAL	1,008,000	500	-	-	-	-	-	-	-	
22. P.T. LAUTAU OTSUKA CHEMICAL	129,600	500	-	-	-	-	-	-	-	
Sub-total	1,137,600		0				249,600	86,400	1473600	
			(2,592,000)						(4,065,600)	
Port										
23. PERUM DEHABUHAN II CABANG (Banten Port)	12,059	500	5,274							
			(P.T. Peteka)							
24. Cigadeng Port	157,680	500	-	-	-	-	-	-	-	
Sub-total	169,739		5,274						175,013	
Anyer Total	1,307,339		5,274				249,600	86,400	1,648,613	
			(2,597,274)						(4,245,887)	
Cilegon										
25. Krakatau Steel	14,736,000									
26. KIEC	1,406,000									
Cilegon Total	16,142,000								16,142,000	
Grand Total	18,120,939		81,174		1,088,270		315,200	806,400	20,412,983	
			(2,673,174)						(23,004,983)	

- Remarks:
- 1) Comprising factory, port and power station uses.
 - 2) All the figures are for 1990 except 4 factories/industrial estates in Anyer.
 - 3) Data for the following factories are not made available and not included in this table:
 - P.T. GPK (existing) --- Anyer
 - P.T. Dong Jing (existing) --- Anyer
 - P.T. Indotermis (under construction) --- Not located
 - P.T. Sterindo Maromer Indonesia (under construction) --- Bojonegara
 - P.T. Jasa Ganerba Pura (under construction) --- Bojonegara
 - P.T. Multisida Agrolindo (existing)
 - 4) () ; not in 1990

Table E-5 GOI Urban Water Supply Levels of Service Targets for Repelita V

Town Category	BNA Program				
	Metro (1)	Large City (2)	Medium Town (3)	Small Town (4)	IKK Program (5)
Population ('000)	>1,000	500<P<1,000	100<P<500	<100	<P<20
Percent of 1993/94 population to be served	80	80	80	80	80
Domestic demand (l/cap/day)					
Direct house of yard connections	190	170	150	130	100
Public standpipe	30	30	30	30	30
Total					
Allowance for Unaccounted Water (% of total production)	20	20	20	20	20

Table E-6 Current and Future Population in the Study Area

		1990	1995	2000	2005	2010
PDAM						
<u>Serang</u>						
	Urban	26,574	27,063	27,561	28,068	28,585
	Rural	48,359	49,249	50,155	51,078	52,017
	Total	74,933	76,312	77,716	79,146	80,602
<u>Cilegon</u>						
	Urban	15,738	46,036	125,236	177,298	251,002
	Rural	54,553	54,553	54,553	77,231	109,337
	Total	70,291	100,589	179,789	254,529	360,339
IKK						
<u>Anyer</u>						
	Urban	6,164	69,524	78,164	110,657	156,658
	Rural	21,364	21,364	21,364	30,245	42,818
	Total	27,528	90,888	99,528	140,902	199,476
<u>Bojonegara</u>						
	Urban	10,246	14,505	20,534	29,070	41,155
	Rural	35,496	50,252	71,142	100,716	142,584
	Total	45,742	64,757	91,676	129,786	183,739
<u>Cinangka</u>						
	Urban	8,805	8,736	8,667	8,600	8,532
	Rural	30,503	30,264	30,027	29,791	29,558
	Total	39,308	39,000	38,694	38,391	38,090
<u>Ciomas</u>						
	Urban	5,914	6,798	7,813	8,979	10,321
	Rural	20,489	23,548	27,065	31,108	35,753
	Total	26,403	30,346	34,878	40,087	46,074
<u>Kasemen</u>						
	Urban	3,553	4,232	5,093	6,097	7,300
	Rural	12,309	14,659	17,643	21,123	25,289
	Total	15,862	18,891	22,736	27,220	32,589
<u>Kramatwatu</u>						
	Urban	7,709	9,059	10,646	12,510	14,701
	Rural	26,708	31,385	36,880	43,338	50,927
	Total	34,417	40,444	47,526	55,848	65,628
<u>Mancah</u>						
	Urban	6,597	7,129	7,703	8,324	8,995
	Rural	22,854	24,695	26,686	28,837	31,161
	Total	29,451	31,824	34,389	37,161	40,156
<u>Pabuaran</u>						
	Urban	7,923	8,807	9,790	10,883	12,097
	Rural	27,447	30,511	33,916	37,701	41,909
	Total	35,370	39,318	43,706	48,584	54,006
<u>Padarincang</u>						
	Urban	9,888	9,773	9,659	9,547	9,436
	Rural	34,255	33,856	33,463	33,073	32,689
	Total	44,143	43,629	43,122	42,620	42,125
<u>Pulomerak</u>						
	Urban	14,486	20,508	29,033	41,102	58,188
	Rural	50,185	71,047	100,582	142,395	201,590
	Total	64,671	91,555	129,615	183,497	259,778
<u>Taktakan</u>						
	Urban	7,784	8,332	8,918	9,545	10,217
	Rural	26,967	28,864	30,894	33,068	35,394
	Total	34,751	37,196	39,812	42,613	45,611
<u>Waringin Kurung</u>						
	Urban	5,467	5,792	6,135	6,499	6,885
	Rural	18,941	20,064	21,255	22,516	23,851
	Total	24,408	25,856	27,390	29,015	30,736
Study Area		567,278	730,605	910,577	1,149,399	1,478,949

Table E-7 (1) Collected Data during Water Demand Survey for Manufacturing Enterprises and Residents (1/7)

No.	Type of Manufacturing (Name of enterprises)	Name of Sub. district	Total employee	Water source	Remarks	Water use in 1991 1 year l/s/ha l/s
CHEMICAL INDUSTRY						
1	PT. Yasa Ganesa Pura	Bojonegara			2	
2	PT. Inti Envestring Indonesia	Bojonegara			5	
3	PT. Pasific Indomas Plastik Income	Pulomerak			5	
4	PT. Ptrokimia Nusantara Interido	Pulomerak	265	Desalination	1	4.34
5	PT. Hamparan Rejeki	Bojonegara			5	
6	PT. Dinamika Ekajaya	Bojonegara			5	
7	PT. Graha Swakarsa Prima	Bojonegara			5	
8	PT. Bakrie Kasei Corporation	Pulomerak			3	
9	PT. Gema Politama Kimia	Ciwandan			1	
10	PT. Petrolindo Citra Indonesia	Bojonegara			5	
11	PT. Indochlor Prakarsa Industries	Bojonegara		Peteka	1	13.32
12	PT. Sriwijaya Pakuan Sejati	Bojonegara		72 Well/Peteka	1	0.43
13	PT. Unggul Indah Corporation	Pulomerak		50 Others	1	0.28
14	PT. Polychem Indo	Bojonegara		70 Others	1	1.45
15	PT. Statomer PVC Resin Factory	Pulomerak		200 Well	1	6.60
16	PT. Sari Sarana Kimia	Pulomerak			5	
17	PT. Dover Chemical	Pulomerak			1	
18	PT. Receco Petrolin Utama	Bojonegara		50 Well	1	0.48
19	PT. Dupont Sari Agri Chemical	Pulomerak			5	
20	PT. Multisida Agro Lindo	Bojonegara		50 Well/KS	1	0.17
21	PT. Indo Terminal	Bojonegara			2	
22	PT. Chandra Asri	Ciwandan		Peteka	2	
23	PT. Polytama Karsa Agung	Ciwandan			3	
24	PT. Panca Puri Perkasa Indah	Ciwandan		2000 Others	2	0.95
25	PT. Sulfindo Adi Usaha	Bojonegara		60 Others	1	9.51
26	PT. Tripolita	Ciwandan		Peteka	1	0.69
27	PT. Sauh Bahtera	Bojonegara			4	
CONCRETE POLE						
1	PT. JSI	Bojonegara			5	
Sub Total						38.15

Remarks :

- 1 Existing
- 2 Under Construction
- 3 Land clearing
- 4 Land acquisition
- 5 Requested

Table E-7 (2) Collected Data during Water Demand Survey for Manufacturing Enterprises and Residents (2/7)

No.	Type of Manufacturing (Name of enterprises)	Name of Sub.district	Total employee	Water source	Remarks	Water use in 1991 l/s/ha l/s
PACKAGING,CONTAINER,DECK PLAT BOILERS,FABRICATOR						1.44
1	PT. Guna Nusa Utama Fabricator	Bojonegara	375	Others	1	0.67
2	PT. Trubalati Purneang	Bojonegara			5	
3	PT. Werudara Jaya Sakti	Pulomerak			5	
4	PT. Lima Kencana Utama	Pulomerak			5	
5	PT. Banten Bay Fabricator	Bojonegara			5	
6	PT. Trans-Bakrie	Bojonegara	302	Well	1	0.01
7	PT. Cilegon Fabricator	Bojonegara	394	Peteka	1	0.76
METAL FOUNDRY,FACTORY						
1	PT. Krakatau Steel - KHI	Pulomerak		Cidanau river	1	800.0
	- Pabrik Baja Profil					4
	- Pabrik Besi Srons					0.33
	- Pabrik Baja Tulangan					328
	- Pabrik Baja Hecket					1.24
	- Pabrik Billet					6
	- Pabrik Slab					71.11
	- Pabrik HSM					92.78
	- Pabrik Batang Kawat					24
	- Pabrik Kawat					3.0
						0.71
Work Shop,Warehouse,Service						0.05
1	PT. Propelat	Ciwandan			5	
2	PT. Prointal	Pulomerak			5	
3	PT. Sankyu Indonesia Internasional	Ciwandan	405	KS	1	0.05
4	PT. Meissei Sarana Indonesia	Bojonegara			2	
5	PT. Indo Sembawang Fabricase	Ciwandan			5	
MUD LUBRICANT						0
1	PT. Baroid Indonesia	Pulomerak			5	
Sub Total						801.44

- 1 Existing
- 2 Under Construction
- 3 Land Clearing
- 4 Land acquisition
- 5 Requested

Table E-7 (3) Collected Data during Water Demand Survey for Manufacturing Enterprises and Residents (3/7)

No.	Type of Manufacturing (Name of enterprises)	Name of Sub. district	Total employee	Water source	Remarks	Water use in 1991 l/s/ha l/s
CARBON FACTORY						
1	PT. Petrocarb Indonesia	Pulomerak			5	
2	PT. Kerta Anugerah Utama	Pulomerak			5	
3	PT. Continental Carbon	Bojonegara	1800	Well & desalination	1	5.25
CRUSHER STONE						
1	PT. Propelat	Ciwandan			5	
2	PT. Anuta Indonesia	Pulomerak			5	
3	PT. Batu Mulia	Pulomerak			5	
4	PT. Widuri Kencana	Cilegon			5	
5	PT. Batu Permata Indah	Cilegon			5	
6	PT. Beton Cilegon Agung	Cilegon			5	
7	PT. Agung Jaya	Pulomerak			5	
Cutting The Ex-Ship						
1	PT. Inter Trias Abadi Ind.	Bojonegara			5	
2	PT. Randahi Agung	Ciwandan			5	
3	PT. Jangkar Mas	Pulomerak			5	
4	PT. Agung Module	Pulomerak			5	
5	PT. Tami Raya	Pulomerak			5	
SHIP YARD						
1	PT. Dias Raya Shipyard	Bojonegara			5	
OFF SHORE DRILLING FACILITY						
1	PT. Brown & Root Indonesia	Ciwandan			5	
2	PT. Santa-fe Deremoy Ind.	Pulomerak			1	0.5 6.49
3	PT. Pribumi Paripurna	Bojonegara			5	
Sub Total						11.74

- Remarks ;
- 1 Existing
 - 2 Under Construction
 - 3 Land clearing
 - 4 Land acquisition
 - 5 Requested

Table E-7 (4) Collected Data during Water Demand Survey for Manufacturing Enterprises and Residents (4/7)

No.	Type of manufacturing (Name of enterprises)	Name of Sub. district	Total employee	Water source	Remarks	Water use in 1991 l/s/ha l/s
KRAKATAU INDUSTRY ESTATE CILEGON (KIEC)						44.58
1	PT. Dongjin Indonesia	Ciwandan		KS	2	
2	PT. Krakatau Prima Dharma Sentana	Pulomerak	63	KS	1	
3	PT. Dava Swahasta Cipta	Pulomerak	153	KS	1	
4	PT. Lautan Otsuka	Ciwandan	144	KS	1	
5	PT. Garuda Mahakam Prahasta	Pulomerak	20	KS	1	4.11
6	PT. Trans-Bakrie Seamless Pipe Ind.	Pulomerak		KS	3	
7	PT. Hoechst Cilegon	Pulomerak	81	KS	1	
8	PT. Latinusa	Pulomerak	482	KS	1	
9	PT. Industri Mesin Perkakas Ind	Pulomerak	61	KS	1	
10	PT. Cpold Rolling Mill Indonesia ut	Pulomerak	2171	KS	1	
11	PT. Distinct Indonesia Cement	Ciwandan	51	KS	1	
12	PT. Cabot	Pulomerak		KS	2	
13	PT. CBI Indonesia	Pulomerak	51	KS	1	
14	PT. Multi Fabrindo Gemilang	Ciwandan	61	KS	1	
15	PT. Cigading Habban Center	Ciwandan	441	KS	1	
16	PT. Samudera Ferro Engineering	Pulomerak	25	KS	1	
17	PT. Aneka Gas Industri	Pulomerak	7	KS	1	
18	PT. Kratama Belindo International	Ciwandan	183	KS	1	
19	PT. Tjokro Putra Persada	Pulomerak	85	KS	1	
20	PT. Kapurindo Sentana Baja	Pulomerak	33	KS	1	
21	PT. Barata Indonesia	Pulomerak	93	KS	1	
22	PT. Indonesia Asri Refractories	Pulomerak	18	KS	1	
23	PT. Asahimas Subentra	Ciwandan	536	KS	1	31.96
24	PT. Santika Pramesti	Pulomerak	425	KS	1	
25	PT. Siemens Indonesia	Ciwandan	82	KS	1	
26	PT. Tikсна Yasa	Pulomerak	16	KS	1	
27	PT. Sumimagne Utama			KS	5	
Not Yet Known						
1	PT. Arpeni Pratama Ocean Line	Bojonegara			5	
2	PT. Indofrist Nusanta Syathetic Ru	Bojonegara			5	
3	PT. Ispat Alyos Indonesia	Bojonegara			5	
4	PT. Hall Beurton	Pulomerak			5	
5	PT. Dowel	Pulomerak			5	
6	PT. Argo	Pulomerak			5	
7	PT. Ayapco	Pulomerak			5	
8	PT. Ipplo	Ciwandan			5	
Sub Total						80.65

Remarks ;

- 1 Existing
- 2 Under Construction
- 3 Land clearing
- 4 Land acquisition
- 5 Requested

Table E-7 (5) Collected Data during Water Demand Survey for Manufacturing Enterprises and Residents (5/7)

No.	Type of Manufacturing (Name of enterprises)	Name of Sub. district	Total employee	Water source	Remarks	Water use in 1991 l/s/ha l/s
9	PT. Bast Man Work Shop	Pulomerak			5	
10	PT. Oil Fool	Pulomerak			5	
11	PT. Inti Jatapura	Pulomerak			5	
12	PT. Nusantara Supraloka Enterprise	Ciwandan			5	
13	PT. Galuh Putra Setia				5	
14	PT. Saneka Indonesia				5	
15	PT. Krawindo Utama Dinamika				5	
16	PT. Dunia Alam Semesta				5	
17	PT. Sarana Trimurti Swadaya	Bojonegara			5	
18	PT. Beton Sarana Indah				5	
19	PT. Summa Raya Sansung Eng	Bojonegara			2	
20	PT. Sterindo Marumer Indonesia	Bojonegara			2	
GENERATE ELECTRICITY						
1	PLTU Suralaya	Bojonegara	8776	KS&Desalination	1	50
2	PLTU 400 MW	Ciwandan		KS	1	38
HARBOUR						
1	Pelabuhan Ferry Merak	Pulomerak	300	Others	1	0.26
2	Pelabuhan Barang Banten	Ciwandan	100	Peteka	1	0.38
3	Pelabuhan Khusus Cigading/KS	Ciwandan		KS	1	5
						l/d/room l/s
HOTEL						
						8
1	Mambruk Beach Resort	Anyer	162	Well	1	0.58
2	Sanghyang Indah Resort	Anyer	71	Well	1	0.92
3	Patra Jasa Anyer Beach Hotel	Anyer	124	Well	1	3
4	Matahari Beach Resort	Cinangka	8		1	
5	Puri Retno	Cinangka	15		1	
6	Villa Karang Bolong	Cinangka	4		1	
7	Lalita Cottages	Cinangka	7		1	
8	JCS Hide Away	Cinangka	6		1	
9	Siyoni Anyer Sea Side Cottages	Anyer	11		1	
10	Tambang Ayam SSC	Anyer	22		1	
11	Anyer Cottages	Anyer	16		1	
12	Marina Village	Anyer	24		1	
13	Pondok Tubagus	Anyer	2		1	
Sub Total						8.64

Remarks :

- 1 Existing
- 2 Under Construction
- 3 Land clearing
- 4 Land acquisition
- 5 Requested

Table E-7 (6) Collected Data during Water Demand for Manufacturing Enterprises and Residents (6/7)

No.	Type of Manufacturing (Name of enterprises)	Name of Sub. district	Total employee	Water source	Remarks	Water use in 1991 l/d/room l/s
14	Kalimaya Putih	Anyer	8		1	
15	Griya Indira	Anyer	9		1	
16	Anyer Beach Hometel	Anyer	41		1	
17	Parikesit	Anyer	17		1	
18	Merak Beach Hotel	Pulomerak	59		1	
19	Pulorida Village	Pulomerak	69		1	
20	Santafe Pomeroy	Pulomerak	16		1	
21	Violeta	Pulomerak	4		1	
22	Robinson	Pulomerak	4		1	
23	Vita Beach	Pulomerak	22		1	
24	Anda	Pulomerak	6		1	
25	Sulawesi I	Pulomerak	4		1	
26	Butet	Pulomerak	6		1	
27	Nirmala	Pulomerak	4		1	
28	Sulawesi II	Pulomerak	4		1	
29	Bahari	Pulomerak	2		1	
30	Kurnia	Pulomerak	4		1	
31	Sony	Pulomerak	6		1	
32	Surabaya Isyana	Pulomerak	10		1	
PDAM						
1	PDAM Cilegon			KS	1	50
2	PDAM Serang			Others	1	
	- Kota Serang				1	
	- Hankam					
	- Kota Cilegon					
	- IKK	Kramatwatu			1	
	- IKK	Ciruas			1	
	- IKK	Bojonegara			1	
	- IKK	Baros			1	
	- IKK	Pontag			1	
	- IKK	Cikeusal			1	
	- IKK	Tirtayasa			1	
	- IKK	Anyer			1	
	- IKK	Mancak			2	
	- IKK	Padarincang			1	
	- IKK	Cikande			1	
	- IKK	Carenang			2	
	- IKK	Pamarayan			2	
	- IKK	Ciomas			2	
	- IKK	Walantaka			2	
Subtotal						50
Remarks ;						
1 Existing						
2 Under construction						
3 Land cleaning						
4 Land acquisition						

Table E-7 (7) Collected Data during Water Demand for Manufacturing Enterprises and Residents (7/7)

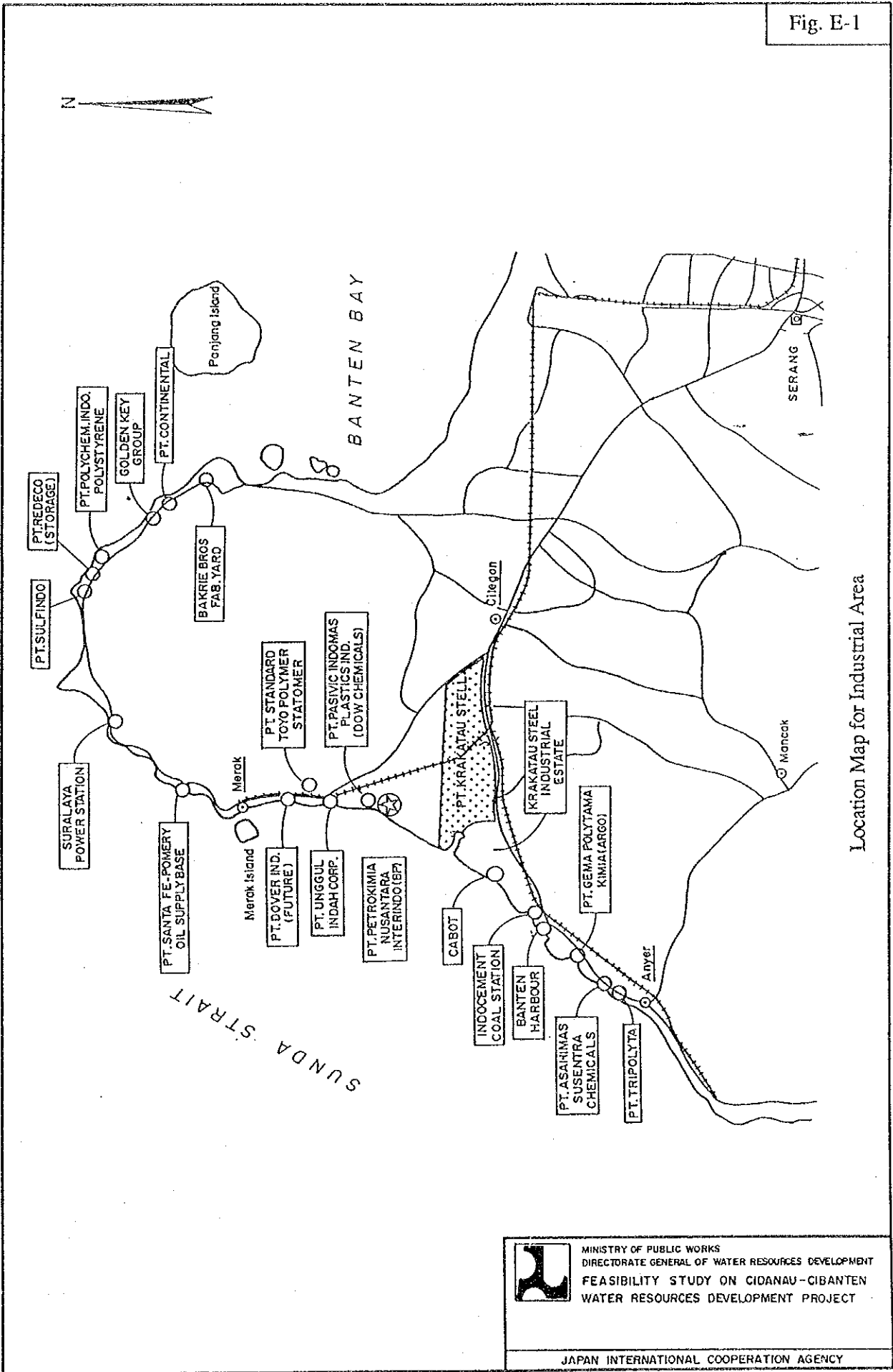
No.	Type of Manufacturing (Name of enterprises)	Name of Sub. district	Total employee	Water source	Remarks	Water use in 1991 Years l/s/ha l/s
-	IK IKK	Pabuaran			2	
-	IK IKK	Kasemen			2	
-	IK IKK	Kragilan			2	
PLYWOOD PROCESSING						
1	PT. Satya Raya Indah W B Co.				1	10.65
2	PT. Suralaya Prakarsa Wood Ind				1	0.44
Sub Total						11.09
Total						951.77

Remarks ;

- 1 Existing
- 2 Under Construction
- 3 Land clearing
- 4 Land acquisition

FIGURES

Fig. E-1



Location Map for Industrial Area

