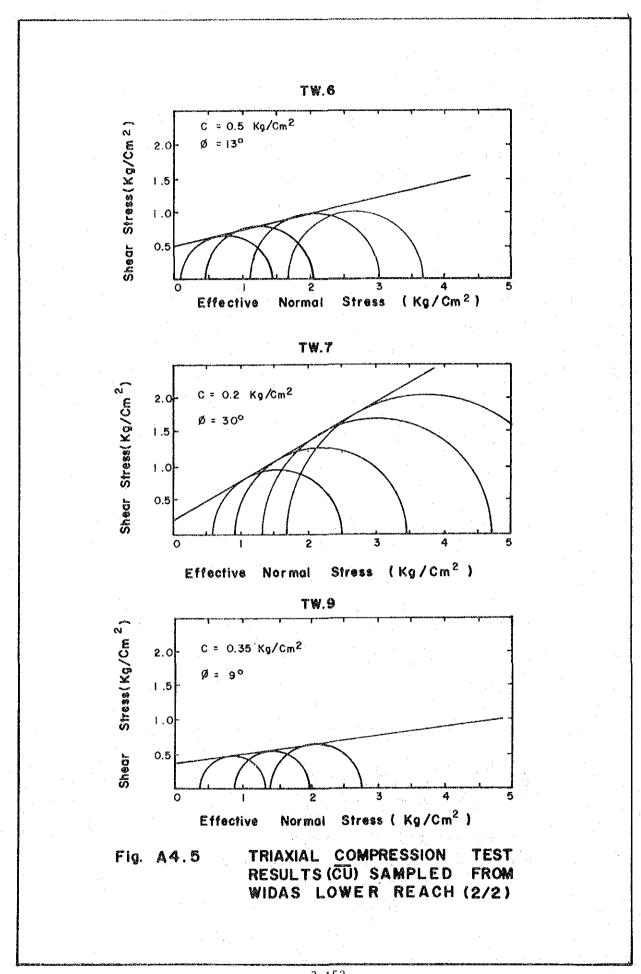
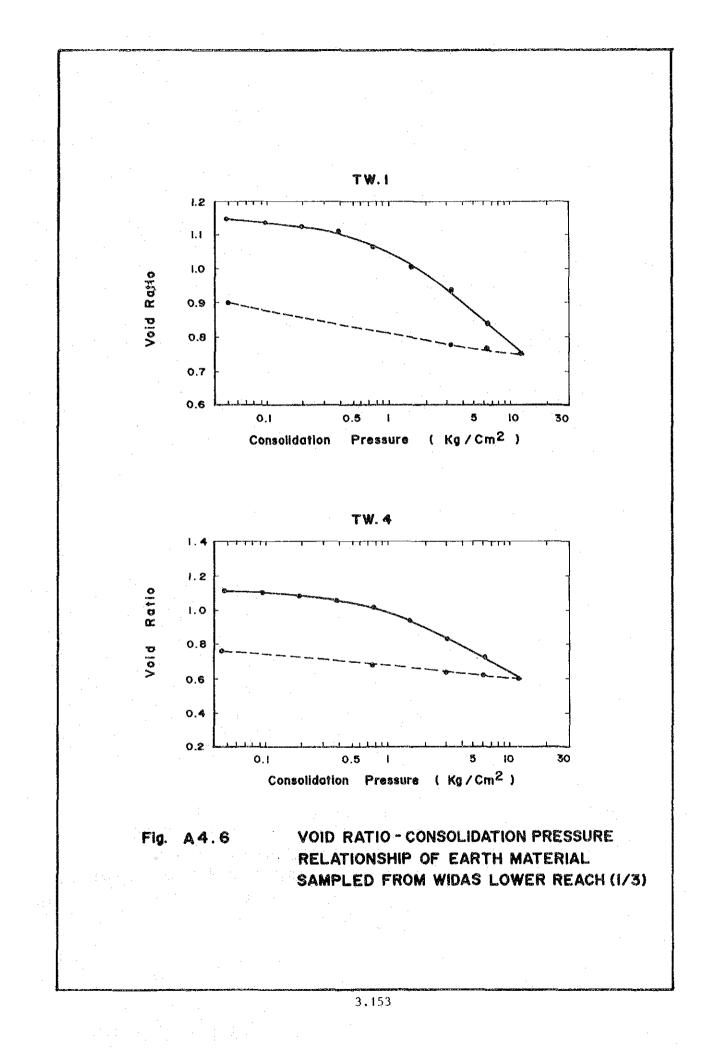
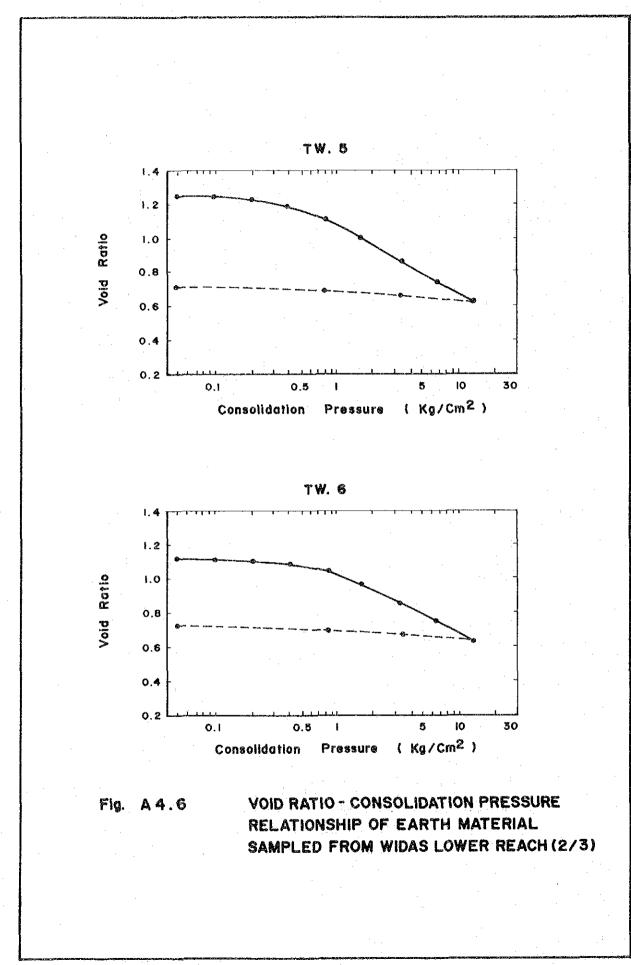
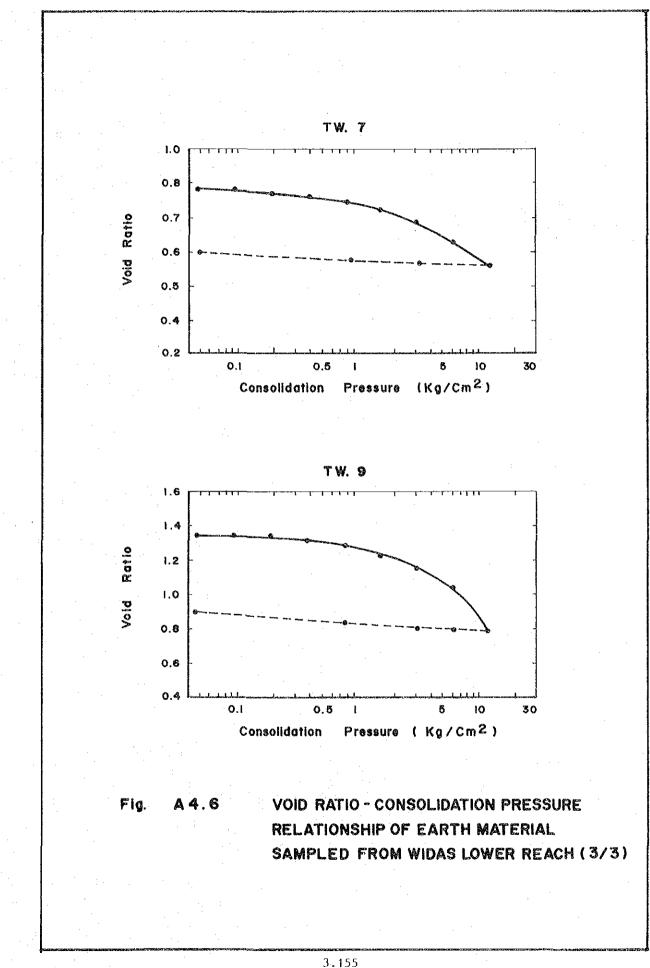


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# FLOOD CONTROL

### ANNEX - 4

#### FLOOD CONTROL

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Supplement data and calculation results on flood control plan are presented in this ANNEX-4.

This ANNEX-4 contains the following items;

- Present Conditions of Rivers and Related River Structures

- Comparative Study on Alternative Flood Control Plan

- Hydraulic Study on Retarding Basin

- Proposed River Channel Improvement

- Proposed Related River Structures

4.1 Present Conditions of Rivers and Related River Structures

1. Characteristics of existing river channel

Based on the river cross-sections surveyed by BRBDEO, major features of the existing channels are listed in Table 4.1.1 and shown on Fig. 4.1.1 for major 4 rivers. The cross-sections surveyed are given in the Topographic Survey Report on the Widas Flood Control and Drainage Project (Part II), Feb. 1985.

2. Retarding basin

Topographic maps of the Widas, Ulo and Kedungsoko retarding basins are shown in Fig. 4.1.2 with the elevation contours of 1 m interval.

Cropping patterns in the three retarding basins are presented on Fig. 4.1.3. Hamlet (village) and house in the above basins are listed up in Table 4.1.2.

3. Observation records of groundwater level, water level in retarding basin and observed annual peak discharge at Lengkong.

Groundwater level and water level in the Widas basin have been observed since Dec. 1984. The locations of the observation are shown on Fig. 4.1.4. The observation records of groundwater level of the wells are shown on Fig. 4.1.5. The water level records are shown on Fig. 4.1.6. Annual peak discharge observed at Lengkong in Widas are shown on Fig. 4.1.7.

For reference, ten-days rainfall observed at Bulakmojo (near Nganjuk) and at Mrican is given on Table 4.1.3 for the last 10 years.

4. Related river structures

The locations and those major dimensions of the related river structures are listed in Table 4.1.4 for river structures except bridge and Table 4.1.5 for bridge. Fig. 4.1.8 shows sketch of irrigation head works. Widas river

Sect, Distance (m) Elevation device clevation (smr, m) Dike clevation (smr, m) River with (m) Depth Arga Capacit	Wi	das r	iver							· · · · · · · · · · · · ·			
in.         Single         Accum.         (silv).         etcl         Right         Left         Right         Low         Distance         Distance         (m <sup>2</sup> )         (m <sup>2</sup> )	Sect.	Distar	ice ( m)	Riverbed	Ground Ele	vation (SHVP,m)	Dike Ele	vation (9M <sup>1</sup> .81)	River k				Bankful Capacity
0.1       303       303       32.0       36.8       36.9       37       5.3       127       191         1.1       415       1,123       32.6       36.0       35.9       38       3.6       36       127       191         1.5       407       1,530       22.3       36.6       36.8       38       36       36       36       36       36       36       16       38       3.7       179       15.3       40       1.53       36.6       37.1       36       36.7       37.2       37.4       36       36       4.8       199       161       165       5.5       412       5.60       33.3       37.6       37.6       31.1       5.0       13.5       5.268       34.1       37.6       31.8       30.0       38.0 <th></th> <th>Single</th> <th>Accum,</th> <th>(SHVP, m)</th> <th>Left</th> <th>Right</th> <th>Left</th> <th>Right</th> <th>Low wc</th> <th></th> <th></th> <th>(m<sup>2</sup>)</th> <th>(m³/sec)</th>		Single	Accum,	(SHVP, m)	Left	Right	Left	Right	Low wc			(m <sup>2</sup> )	(m³/sec)
0.1       303       303       32.0       36.8       36.9       37       5.3       127       191         1.1       415       1,123       32.6       36.0       35.9       38       3.6       36       127       191         1.5       407       1,530       22.3       36.6       36.8       38       36       36       36       36       36       36       16       38       3.7       179       15.3       40       1.53       36.6       37.1       36       36.7       37.2       37.4       36       36       4.8       199       161       165       5.5       412       5.60       33.3       37.6       37.6       31.1       5.0       13.5       5.268       34.1       37.6       31.8       30.0       38.0 <td>W 0.0</td> <td>0</td> <td>0</td> <td>32.9</td> <td>36.8</td> <td>37.2</td> <td></td> <td></td> <td>57</td> <td></td> <td>4.1</td> <td>184</td> <td>192</td>	W 0.0	0	0	32.9	36.8	37.2			57		4.1	184	192
1.14151,12332.636.035.9383.6791791.54071,53032.336.836.035.9384.71421651.94111,94132.737.137.3404.51631813.533.63.6.2530.737.237.1564.71631633.8446532.237.537.738.1525.4131655.54125,68033.337.637.6315.0315.01121785.94196,09934.238.038.238.9303.8901346.74817,00133.438.539.039.439403.51311616.74827,00233.438.539.039.439.2285995.41071627.482,768,2333.438.539.039.439.2285995.41071625.943.443.639.039.3426.61.11591598.18.7839.039.3426.64.21271558.39.6634.138.438.840.03728741.64.11591699.14669,63235.039.039.342 </td <td>0.3</td> <td>303</td> <td>303</td> <td>32.0</td> <td></td> <td></td> <td></td> <td></td> <td>46</td> <td></td> <td>5.1</td> <td>170</td> <td>180</td>	0.3	303	303	32.0					46		5.1	170	180
1.54071,53032.336.636.836.836364.71421651.94111,94132.737.137.3404.51881743.56352,78933.037.037.137.6326.81991634.18004.46532.237.537.738.1525.41531665.54175,66033.337.637.6315.01121785.94196,09934.238.038.039394.71281616.74817,00134.538.137.438.738.837403.51031307.13907,40034.638.238.039.0455.21331787.54827,08233.438.535.039.439.2285995.41071627.631383.639.439.2285995.41071621598.34158,72832.838.238.438.840.0372876.11598.74389,16634.139.439.2285996.11591598.74389,16634.139.439.440.038664.21271548.34156.59.039.741.040.0<	0.7	405	708	31.9	36.6	36.9			37		5.3	127	191
1.94111.94132.737.137.3404.51581742.76482.70933.037.037.1564.71631813.56363.62530.737.237.4326.81531665.18035.26834.137.637.637.6343.91041655.54126.6934.238.036.238.93034.8391345.46.70934.238.038.238.93037.837.837.837.85.54126.700134.538.137.438.738.837403.51031307.13997.40033.438.535.039.439.2285995.4121787.54827.68233.438.535.039.439.7414164.41231558.341543.438.238.438.840.0372876.11591597.43831633.239.039.741.04164.41231558.341543.038.440.039.7414164.41231558.39.16333.739.039.741.04164.41231558.49.16333.739.538.640.240.744 <td>1.1</td> <td>415</td> <td>1;123</td> <td>32.6</td> <td>36.0</td> <td>35.9</td> <td></td> <td></td> <td>38</td> <td></td> <td>3.6</td> <td>79</td> <td>179</td>	1.1	415	1;123	32.6	36.0	35.9			38		3.6	79	179
2.76482.78933.037.037.1564.71631813.58363.62530.737.237.4326.81491635.38353.62530.737.237.738.1525.41531665.18035.26834.137.837.6343.91041655.94196.69934.238.038.238.9303.8901346.34216.69933.438.038.238.9304.71281616.74817.00134.538.137.438.738.837403.51301307.54827.08233.438.536.039.439.228595.41071627.54827.08233.438.839.039.8444.41231553.34158.72838.238.438.840.0372876.11597.54827.08233.339.039.3426.01491589.16634.138.438.240.039.74141.64.41521599.550610.13833.739.039.3426.014915810.381110.94935.739.739.240.740.74	1.5	407	1,530	32.3	36.8	36.8			38		4.7	142	165
3.53.63.62530.737.237.4326.81491634.38404,64532.237.537.738.1525.41531665.18036,52633.337.637.631525.41531665.54125,68033.337.637.6315.01121785.94196,69934.238.038.038.738.837403.51031307.13997,00034.538.137.438.738.837403.51031307.13997,00034.438.539.039.439.2285995.41071627.58427,88233.438.530.039.8444.41231558.33158,72832.838.238.440.0372876.11591599.14669,63235.039.038.740.040.0386564.21271559.14669,63235.739.538.640.240.7464.41521699.14669,63235.739.539.741.341.636.64.21271559.550610,13833.739.739.240.740.7554186.6223188 <tr< td=""><td>1.9</td><td>417</td><td>1,941</td><td>32.7</td><td>37.1</td><td>37.3</td><td></td><td></td><td>40</td><td></td><td>4.5</td><td>158</td><td>174 .</td></tr<>	1.9	417	1,941	32.7	37.1	37.3			40		4.5	158	174 .
4.38404,46532.237.537.738.1525.41531665.18035,66834.137.637.6343.91041655.54126,60934.238.038.238.9303.8901346.34216,52033.838.038.238.9394.71281616.74417,00133.438.539.0394.7103151337.13997,40033.438.539.039.2285995.41071627.94318,31334.638.839.039.2285995.41071627.94389,16634.138.438.840.0372876.11591598.74389,16634.138.438.840.0372876.11591599.1669,63233.739.039.7414164.41231559.550610,13833.739.738.640.240.7444624.216517510.384111,48333.739.539.741.341.5403104.316517010.411,43833.739.539.741.341.5403104.316517010.512,43333.7<	2.7	848	2,789	33.0	37.0	37.1			56		4.7	163	181
5.18035,26834.137.637.6343.91041655.54125,60033.337.637.637.6315.01121786.34216,52033.838.038.038.738.837403.51037.1997,40033.438.539.039.0455.21331787.54827,88233.438.539.039.0455.21331787.54827,88233.438.539.039.0444.41231558.34158,72832.838.238.438.640.03728761.1598.74389,16634.138.438.240.039.7414164.41521699.14669,63235.039.039.740.040.03862.61.1199.146833.739.739.240.740.7444624.216517510.381110,94935.739.539.741.341.641.5364324.712117011.54221,33336.539.739.741.441.5364324.712117011.445417.89233.839.539.741.441.5364324.7121 <td< td=""><td>3.5</td><td>836</td><td>3,625</td><td>30.7</td><td>37.2</td><td>37.4</td><td></td><td></td><td>32</td><td></td><td>6.8</td><td>149</td><td>163</td></td<>	3.5	836	3,625	30.7	37.2	37.4			32		6.8	149	163
5.54125,68033.337.637.637.631.5.01121785.94196,09934.238.038.238.9303.8901346.34216,52033.838.038.039.0394.71281616.74817,00133.438.539.039.0455.21331787.54827,08233.438.539.039.439.2285995.41071627.94318,31334.638.639.039.439.2285995.41071627.94318,31334.638.639.039.74141.64.41521699.14669,65235.038.038.740.039.7414164.41521699.14669,65235.038.740.240.7444624.21651759.550610,13833.739.538.640.240.7444624.21651759.550611,43833.739.539.741.341.5403104.346521311701.614.116.914.4355.213117014.3386.21731661.1.445411.89233.839.539.741	4.3	840	4,465	32.2	37.5	37.7	38.1		52		5.4	153	166
5.94196.09934.238.038.238.9.303.8901346.34216.52033.833.038.039.0.394.71281616.74817.00133.438.539.039.0455.21331307.13997.40033.438.539.039.0455.21331787.54827.80233.438.536.039.439.2285995.41071627.94318.31334.638.839.039.844441231558.74389.16634.138.438.240.039.74114164.41521599.550610.13833.539.039.3426.014915810.381110.94935.739.538.640.240.740.7444624.216517510.748911.43833.739.739.741.341.5404.39916311.544212.33434.840.240.241.4365.213117012.343335.539.741.441.5404.39916313.533.639.539.741.441.5404.39916313.443215.7 <td>5,1</td> <td>803</td> <td>5,268</td> <td>34.1</td> <td>37.8</td> <td>37.6</td> <td></td> <td></td> <td>34</td> <td></td> <td>3.9</td> <td>104</td> <td>165</td>	5,1	803	5,268	34.1	37.8	37.6			34		3.9	104	165
6.34216,52033.838.038.038.038.738.837403.51031307.13997,40033.438.539.039.439.2285995.41031767.54218,31334.638.839.039.439.2285995.41031667.94318,31334.638.839.039.439.2285995.41071667.94318,31334.638.238.438.840.0372876.11591598.34158,72832.838.238.438.840.0386564.21271559.550610,13833.539.039.3426.01491580.381110,94935.739.538.640.240.740.7554186.622318811.144214.38233.839.440.141.3386.217116611.544212,33434.840.240.241.4365.213117012.343313,07635.539.539.741.341.5364324.712117013.433.636.239.539.741.441.7304.34912115813.539.5 <td< td=""><td>5.5</td><td>412</td><td>5,680</td><td>33.3</td><td>37.6</td><td>37.6</td><td></td><td></td><td>31</td><td></td><td>5.0</td><td>112</td><td>178</td></td<>	5.5	412	5,680	33.3	37.6	37.6			31		5.0	112	178
6.74817,00134,538,137,438,738,837403.51031307,13997,40033,438,539,039,0455.21331787,54827,68233,438,536,039,439,2285995.41071627,94318,31334,638,838,039,439,2285995.41071627,94389,16634,138,438,740,0372876.11591598,74389,16634,138,438,740,040,0386564.21271559,550610,13833,539,039,3426.014915810,381110,94935,739,538,640,240,7444624.216517510,748911,43833,739,239,741,341,54186.622318811,154212,33434,840,240,241,4365.213117011,93912,64335,739,539,741,341,5403104,314612,747313,5035,839,539,741,441,730-4,3916112,747313,6036,540,039,5 <td< td=""><td>5.9</td><td>419</td><td>6,099</td><td>34.2</td><td>38.0</td><td>38.2</td><td>38.9</td><td></td><td>. 30</td><td></td><td>3.8</td><td>90</td><td>134</td></td<>	5.9	419	6,099	34.2	38.0	38.2	38.9		. 30		3.8	90	134
1, 100 $1, 100$ $31.4$ $38.5$ $39.0$ $30.0$ $45$ $5.2$ $133$ $178$ $7, 5$ $482$ $7, 682$ $33.4$ $38.5$ $39.0$ $39.4$ $39.2$ $28$ $599$ $5.4$ $107$ $162$ $7, 9$ $431$ $8, 133$ $34.6$ $38.8$ $39.0$ $39.8$ $44$ $4.4$ $123$ $155$ $8.3$ $415$ $8, 728$ $82.8$ $38.2$ $38.4$ $38.8$ $40.0$ $37$ $287$ $6.1$ $159$ $8.7$ $438$ $9, 166$ $34.1$ $38.4$ $38.2$ $40.0$ $39.7$ $41$ $416$ $4.4$ $152$ $169$ $9, 1466$ $9, 632$ $35.0$ $39.0$ $38.7$ $40.0$ $40.0$ $38$ $656$ $4.22$ $127$ $158$ $10.3$ $811$ $10, 949$ $35.7$ $39.5$ $38.6$ $40.2$ $40.7$ $44$ $462$ $4.2$ $165$ $175$ $10.7$ $489$ $11, 438$ $33.7$ $39.7$ $39.2$ $40.7$ $40.7$ $55$ $418$ $6.6$ $223$ $188$ $11.5$ $42$ $11.892$ $33.8$ $39.5$ $39.7$ $41.3$ $41.5$ $40$ $310$ $4.3$ $146$ $175$ $12.3$ $433$ $13.076$ $35.5$ $39.5$ $39.7$ $41.3$ $41.5$ $40$ $310$ $4.3$ $49$ $121$ $170$ $11.9$ $309$ $12, 643$ $35.7$ $39.5$ $39.7$ $41.4$ $41.5$ <td< td=""><td>6.3</td><td>421</td><td>6,520</td><td>33.8</td><td>38.0</td><td>38.0</td><td></td><td></td><td>39</td><td></td><td>4.7</td><td>128</td><td></td></td<>	6.3	421	6,520	33.8	38.0	38.0			39		4.7	128	
7.54827,88233.438.536.039.439.2285995.41021627.94318,13334.638.838.238.438.840.0372876.11591598.34158,72832.838.238.438.840.0372876.11591599.14669,63235.039.038.740.040.0386564.21271559.550610,13833.539.039.3426.014915810.381110,94935.739.538.640.240.740.7554186.622318811.745417,89233.839.440.141.3386.217316611.544212,33434.840.240.241.4365.213117012.343313,07635.539.741.441.5364324.712117012.443,30335.839.539.741.441.730-4.39916313.583714,34036.240.039.5384.215015113.93714,34036.240.039.5-41.6434.912115814.332215,14936.540.6	6.7	481	7,001	34.5	38.1	37.4	38.7	38.8	37	40	3.5	103	130
1.51.63.6.63.8.83.9.03.9.84.44.41.231.558.34158.72832.838.238.438.840.0372876.11.591.598.74389.1663.138.438.240.039.7414164.41521.599.14669.63235.039.038.740.040.0386564.21.271.559.550610.13833.539.039.3426.01491.5810.381110.94935.739.538.640.240.7444624.21651.7510.748911,43833.739.739.240.740.7554186.622318811.544212,63335.739.539.741.341.5403104.314615712.343313.07635.539.539.741.441.73038-4.215015113.937714,71735.840.039.538-4.215015113.937714,21436.540.039.538-4.215015113.937714,21436.540.039.538-4.21501511	7.1	399	7,400	33.4	38.5	39.0	39.0		45		5.2	133	
$B_{.3}$ $A_{15}$ $B_{.728}$ $B_{.72}$	7.5	482	7,882	33.4	38.5	36.0	39.4	39.2		599	5.4	107	
a. 5a. 7a. 7a	7.9	431	8,313	34.6	38.8	39.0	.39.8		44		4.4	123	
a) <td>8.3</td> <td>415</td> <td>8,728</td> <td>32.8</td> <td>38.2</td> <td>38.4</td> <td>38.8</td> <td>40.0</td> <td></td> <td></td> <td></td> <td></td> <td></td>	8.3	415	8,728	32.8	38.2	38.4	38.8	40.0					
1.11.001.011.	8.7	438	9,166	34.1	38.4	38.2							
10.381110.94935.739.739.240.7444624.216517510.748911,43833.739.739.240.740.7554186.622318811.745411,89233.839.440.141.3386.277316611.544212,33434.840.240.241.4365.213117011.930912,64335.739.539.741.341.5403104.314615712.343313,07635.539.539.741.441.730-4.39916313.583714,34036.240.039.538-4.215015113.937714,71735.840.040.041.6434.912115814.343215,14936.540.039.5-41.7554.016712915.188216,03136.940.840.641.9504.116016115.539.184.0540.841.8366.217017416.386717,67937.040.740.5384.512216017.593018,60933.441.540.042.0403.915413516.738917,679 </td <td>9.1</td> <td>466</td> <td>9,632</td> <td>35.0</td> <td>39.0</td> <td></td> <td>40.0</td> <td>40.0</td> <td></td> <td>656</td> <td></td> <td></td> <td></td>	9.1	466	9,632	35.0	39.0		40.0	40.0		656			
10.748911,43833.739.739.240.740.7554186.622318811,145411,89233.839.440.141.3386.217316611.544212,33434.840.240.241.4365.213117011.930912,64335.739.539.741.341.5403104.314615712.343313,07635.539.539.441.641.5364324.712117012.742713,50335.839.539.741.441.730-4.39916313.583714,34036.240.039.538-4.215015113.937714,71735.840.040.041.641.34.912115814.343215,14936.540.039.5-41.7554.016712915.188616,03136.940.840.841.8366.217017116.386717,29037.240.540.942.0403.912413916.778917,67937.040.740.5384.512216017.539018,60933.441.540.542.3324.8111164	9.5	506	10,138	33.5									
11, 145411, 89233, 839, 440, 141, 338 $6.2$ 17116611, 544212, 33434. 840, 240, 241. 4365.213117011, 930912, 64335. 739, 539, 741. 341. 5403104, 314615712, 343313, 07635. 539, 539, 741. 441. 730-4. 39916313, 583714, 34036. 240. 039, 538-4. 215015113, 937714, 71735. 840. 040, 041. 6434.912115814, 34036. 540. 039, 538-4.215015113, 937714, 71735. 840. 039, 5-41. 7554.016712915, 188216, 03136. 940. 840. 641. 9504. 116016115515, 539216, 42334. 840. 540. 841. 8366. 217017116. 386717, 29037, 240. 540. 942.0403.912413916. 739317, 67937, 040, 740. 5384.512216017, 530018, 60933. 441. 540. 642. 3324.8	10.3	811	10,949	35.7	39.5								
11.5 $422$ $12,334$ $34.8$ $40.2$ $40.2$ $41.4$ $36$ $5.2$ $131$ $170$ 11.9 $309$ $12,643$ $35.7$ $39.5$ $39.7$ $41.3$ $41.5$ $40$ $310$ $4.3$ $146$ $157$ $12.3$ $433$ $13,076$ $35.5$ $39.5$ $39.4$ $41.6$ $41.5$ $36$ $432$ $4.7$ $121$ $170$ $12.7$ $427$ $13,503$ $35.8$ $39.5$ $39.7$ $41.4$ $41.7$ $30$ $ 4.3$ $99$ $163$ $13.5$ $837$ $14,340$ $36.2$ $40.0$ $39.5$ $  38$ $ 4.2$ $150$ $151$ $13.9$ $37.7$ $14,717$ $35.8$ $40.0$ $40.0$ $41.6$ $41.7$ $30$ $ 4.3$ $99$ $163$ $14.3$ $422$ $15,149$ $36.5$ $40.0$ $39.5$ $  38$ $ 4.2$ $150$ $151$ $13.3$ $422$ $15,149$ $36.5$ $40.0$ $39.5$ $ 41.7$ $55$ $4.0$ $167$ $129$ $51.1$ $882$ $16,031$ $36.9$ $40.8$ $40.6$ $41.9$ $50$ $4.1$ $160$ $161$ $15.5$ $392$ $16,423$ $34.8$ $40.5$ $40.8$ $41.8$ $36$ $6.2$ $170$ $171$ $16.3$ $867$ $17,290$ $37.2$ $40.5$ $40.9$ $3.9$ $124$ $139$ $16.7$ $399$ <	10.7	489	11,438	33.7	39.7	39.2	40.7	40.7		418	1.1		
11.930912,64335.739.539.741.341.5403104.314615712.343313,07635.539.539.441.641.5364324.712117012.742713,50335.839.539.741.441.730-4.39916313.583714,34036.240.039.538-4.215015113.937714,71735.840.040.041.6434.912115814.343215,14936.540.039.5-41.7554.016712915.188216,03136.940.840.641.9504.116016115.539216,42334.840.540.942.0403.912413916.738917,67937.040.740.5384.512216017.593018,60933.441.540.042.0408.316215518.7102319,63237.141.241.4404.913516319.139320,02537.241.441.042.3324.811116419.543820,46336.941.540.542.6305.311016019.937320,836	11.1	454	11,892	33.8	39.4	40.1	41.3	·					
12.343313.07635.539.539.441.641.5364324.712117012.742713,50335.839.539.741.441.730-4.39916313.583714,34036.240.039.538-4.215015113.937714,71735.840.040.041.6434.912115814.343215,14936.540.039.5-41.7554.016712915.188216,03136.940.840.641.9504.116016115.539216,42334.840.540.841.8366.217017116.386717,29037.240.540.942.0403.912413916.738917,67937.040.740.5384.512216017.593018,60933.441.540.0408.316215518.7102319,63237.141.241.4404.913516319.139320,02537.241.441.642.7364.411915120.319,63237.141.540.542.6305.311016019.543820,46336.941.540.542	11.5	442	12,334	34.8	40.2	40.2							+
12.7 $427$ $13,503$ $35.8$ $39.5$ $39.7$ $41.4$ $41.7$ $30$ - $4.3$ $99$ $163$ $13.5$ $837$ $14,340$ $36.2$ $40.0$ $39.5$ $38$ - $4.2$ $150$ $151$ $13.9$ $377$ $14,717$ $35.8$ $40.0$ $40.0$ $41.6$ $43$ $4.9$ $121$ $158$ $14.3$ $432$ $15,149$ $36.5$ $40.0$ $39.5$ - $41.7$ $55$ $4.0$ $167$ $129$ $15.1$ $882$ $16,031$ $36.9$ $40.8$ $40.6$ $41.9$ $50$ $4.1$ $160$ $161$ $15.5$ $392$ $16,423$ $34.8$ $40.5$ $40.8$ $41.8$ $36$ $6.2$ $170$ $171$ $16.3$ $867$ $17,290$ $37.2$ $40.5$ $40.9$ $42.0$ $40$ $3.9$ $124$ $139$ $16.7$ $389$ $17,679$ $37.0$ $40.7$ $40.5$ $38$ $4.5$ $122$ $160$ $17.5$ $930$ $18,609$ $33.4$ $41.5$ $40.0$ $40$ $8.3$ $162$ $155$ $18.7$ $1023$ $19,632$ $37.1$ $41.2$ $41.4$ $40$ $4.9$ $135$ $163$ $19.1$ $393$ $20,025$ $37.2$ $41.4$ $41.0$ $42.3$ $32$ $4.8$ $111$ $164$ $19.5$ $438$ $20,463$ $36.9$ $41.5$ $40.5$ $42.6$ $30$ $5.3$ $110$ $160$ </td <td>11.9</td> <td>309</td> <td>12,643</td> <td>35.7</td> <td>39.5</td> <td>39.7</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	11.9	309	12,643	35.7	39.5	39.7							
13.583714,340 $36.2$ 40.0 $39.5$ 384.215015113.937714,71735.840.040.041.6434.912115814.343215,14936.540.039.5-41.7554.016712915.188216,03136.940.840.641.9504.116016115.539216,42334.840.540.942.0403.912413916.738917,67937.040.740.5384.512216017.593018,60933.441.540.0408.316215518.7102319,63237.141.241.4404.913516319.139320,02537.241.441.042.3324.811116419.543820,46336.941.540.542.6305.311016019.937320,83637.741.041.642.7364.411915120.31921,02737.742.041.543.0404.713816321.14222,05038.042.041.543.0404.713816321.14222,05038.042.041.443.0264.586 <td< td=""><td>12.3</td><td>433</td><td>13,076</td><td>35.5</td><td>39.5</td><td>39.4</td><td>41.6</td><td></td><td></td><td>432</td><td>4.7</td><td></td><td></td></td<>	12.3	433	13,076	35.5	39.5	39.4	41.6			432	4.7		
13.937714,71735.840.040.041.6434.912115814.343215,14936.540.039.5-41.7554.016712915.188216,03136.940.840.641.9504.116016115.539216,42334.840.540.841.8366.217017116.386717,29037.240.540.942.0403.912413916.738917,67937.040.740.5384.512216017.593018,60933.441.540.0408.316215518.7102319,63237.141.241.4404.913516319.139320,02537.241.441.042.3324.811116419.543820,46336.941.540.542.6305.311016019.937320,83637.741.041.642.7364.411915120.319121,02737.742.041.543.0404.713816321.142422,05038.042.042.042.9364.312214321.540022,45038.442.041.443.0264.586164 <td>12.7</td> <td>427</td> <td>13,503</td> <td>35.8</td> <td>39.5</td> <td>39.7</td> <td>41.4</td> <td>41.7</td> <td>30</td> <td>-</td> <td>4.3</td> <td>99</td> <td>163</td>	12.7	427	13,503	35.8	39.5	39.7	41.4	41.7	30	-	4.3	99	163
14.343215,14936.540.039.5-41.7554.016712915.188216,03136.940.840.641.9504.116016115.539216,42334.840.540.841.8366.217017116.386717,29037.240.540.942.0403.912413916.738917,67937.040.740.5384.512216017.593018,60933.441.540.0408.316215518.7102319,63237.141.241.4404.913516319.139320,02537.241.441.042.3324.811116419.543820,46336.941.540.542.6305.311016019.937320,83637.741.041.642.7364.411915120.319121,02737.742.041.543.0404.713816321.142422,05038.042.042.042.9364.312214321.540022,45038.442.041.443.0264.58616421.942222,87238.642.041.842.9474.0159127 <td>13.5</td> <td>837</td> <td>14,340</td> <td>36.2</td> <td>40.0</td> <td>39.5</td> <td>-</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	13.5	837	14,340	36.2	40.0	39.5	-						
15.188216,03136.940.840.641.9504.116016115.539216,42334.840.540.841.836 $6.2$ $170$ 17116.386717,29037.240.540.942.040 $3.9$ 12413916.738917,67937.040.740.5384.512216017.593018,60933.441.540.0408.316215518.7102319,63237.141.241.4404.913516319.139320,02537.241.441.042.3324.811116419.543820,46336.941.540.542.6305.311016019.937320,83637.741.041.642.7364.411915120.319121,02737.742.041.543.0404.713816321.142422,05038.042.041.543.0404.713816321.142422,05038.042.042.042.9364.312214321.540022,45038.442.041.443.0264.58616421.942222,87238.642.041.842.9474.0159127 <td>13.9</td> <td>377</td> <td>14,717</td> <td>35.8</td> <td>40.0</td> <td>40.0</td> <td></td> <td></td> <td>43</td> <td></td> <td>4.9</td> <td>121</td> <td>158</td>	13.9	377	14,717	35.8	40.0	40.0			43		4.9	121	158
15.5 $392$ 16,423 $34.8$ $40.5$ $40.8$ $41.8$ $36$ $6.2$ $170$ $171$ 16.3 $867$ $17,290$ $37.2$ $40.5$ $40.9$ $42.0$ $40$ $3.9$ $124$ $139$ 16.7 $389$ $17,679$ $37.0$ $40.7$ $40.5$ $38$ $4.5$ $122$ $160$ $17.5$ $930$ $18,609$ $33.4$ $41.5$ $40.0$ $40$ $8.3$ $162$ $155$ $18.7$ $1023$ $19,632$ $37.1$ $41.2$ $41.4$ $40$ $4.9$ $135$ $163$ $19.1$ $393$ $20,025$ $37.2$ $41.4$ $41.0$ $42.3$ $32$ $4.8$ $111$ $164$ $19.5$ $438$ $20,463$ $36.9$ $41.5$ $40.5$ $42.6$ $30$ $5.3$ $110$ $160$ $19.9$ $37.3$ $20,836$ $37.7$ $41.0$ $41.6$ $42.7$ $36$ $4.4$ $119$ $151$ $20.3$ $191$ $21,027$ $37.7$ $42.0$ $41.5$ $42.8$ $36$ $5.3$ $146$ $201$ $20.7$ $599$ $21,626$ $37.8$ $41.5$ $41.5$ $43.0$ $40$ $4.7$ $138$ $163$ $21.1$ $424$ $22,050$ $38.0$ $42.0$ $42.0$ $42.9$ $36$ $4.3$ $122$ $143$ $21.5$ $400$ $22,450$ $38.4$ $42.0$ $41.4$ $43.0$ $26$ $4.5$ $86$ $164$ $21.9$ $422$ $22,872$ <td>14.3</td> <td>432</td> <td>15,149</td> <td>36.5</td> <td>40.0</td> <td>39.5</td> <td>*</td> <td>41.7</td> <td>55</td> <td></td> <td>4.0</td> <td>167</td> <td>129</td>	14.3	432	15,149	36.5	40.0	39.5	*	41.7	55		4.0	167	129
16.386717,29037.240.540.942.040 $3.9$ 12413916.738917,67937.040.740.5384.512216017.593018,60933.441.540.0408.316215518.7102319,63237.141.241.4404.913516319.139320,02537.241.441.042.3324.811116419.543820,46336.941.540.542.6305.311016019.937.320,83637.741.041.642.7364.411915120.319121,02737.742.041.543.0404.713816321.142422,05038.042.042.042.9364.312214321.540022,45038.442.041.443.0264.58616421.942222,87238.642.041.842.9474.015912722.340023,27238.642.542.043.3524.213815022.735023,62238.442.542.342.8444.5138139	15.1	882	16,031	36.9	40.8	40.6		41.9	50		4.1	160	
16.7 $389$ $17,679$ $37.0$ $40.7$ $40.5$ $38$ $4.5$ $122$ $160$ $17.5$ $930$ $18,609$ $33.4$ $41.5$ $40.0$ $40$ $8.3$ $162$ $155$ $18.7$ $1023$ $19,632$ $37.1$ $41.2$ $41.4$ $40$ $4.9$ $135$ $163$ $19.1$ $393$ $20,025$ $37.2$ $41.4$ $41.0$ $42.3$ $32$ $4.8$ $111$ $164$ $19.5$ $438$ $20,463$ $36.9$ $41.5$ $40.5$ $42.6$ $30$ $5.3$ $110$ $160$ $19.9$ $373$ $20,836$ $37.7$ $41.0$ $41.6$ $42.7$ $36$ $4.4$ $119$ $151$ $20.3$ $191$ $21,027$ $37.7$ $42.0$ $41.5$ $42.8$ $36$ $5.3$ $146$ $201$ $20.7$ $599$ $21,626$ $37.8$ $41.5$ $41.5$ $43.0$ $40$ $4.7$ $138$ $163$ $21.1$ $424$ $22,050$ $38.0$ $42.0$ $42.0$ $42.9$ $36$ $4.3$ $122$ $143$ $21.5$ $400$ $22,450$ $38.4$ $42.0$ $41.4$ $43.0$ $26$ $4.5$ $86$ $164$ $21.9$ $422$ $22,872$ $38.6$ $42.0$ $41.8$ $42.9$ $47$ $4.0$ $159$ $127$ $22.3$ $400$ $23,272$ $38.6$ $42.5$ $42.0$ $43.3$ $52$ $4.2$ $138$ $150$ $22.7$ $350$ $23,6$	15.5	392	16,423	34.8	40.5	40.8		41,8	36		6.2	120	171
17.5 $930$ $18,609$ $33.4$ $41.5$ $40.0$ $40$ $8.3$ $162$ $155$ $18.7$ $1023$ $19,632$ $37.1$ $41.2$ $41.4$ $40$ $4.9$ $135$ $163$ $19.1$ $393$ $20,025$ $37.2$ $41.4$ $41.0$ $42.3$ $32$ $4.8$ $111$ $164$ $19.5$ $438$ $20,463$ $36.9$ $41.5$ $40.5$ $42.6$ $30$ $5.3$ $110$ $160$ $19.9$ $373$ $20,836$ $37.7$ $41.0$ $41.6$ $42.7$ $36$ $4.4$ $119$ $151$ $20.3$ $191$ $21,027$ $37.7$ $42.0$ $41.5$ $42.8$ $36$ $5.3$ $146$ $201$ $20.7$ $599$ $21,626$ $37.8$ $41.5$ $41.5$ $43.0$ $40$ $4.7$ $138$ $163$ $21.1$ $424$ $22,050$ $38.0$ $42.0$ $42.0$ $42.9$ $36$ $4.3$ $122$ $143$ $21.5$ $400$ $22,450$ $38.4$ $42.0$ $41.4$ $43.0$ $26$ $4.5$ $86$ $164$ $21.9$ $422$ $22,872$ $38.6$ $42.0$ $41.8$ $42.9$ $47$ $4.0$ $159$ $127$ $22.3$ $400$ $23,272$ $38.6$ $42.5$ $42.0$ $43.3$ $52$ $4.2$ $138$ $150$ $22.7$ $350$ $23,622$ $38.4$ $42.5$ $42.3$ $42.8$ $44$ $4.5$ $138$ $139$	16.3	867	17,290	37.2	40.5	40.9		42.0	40		3.9	124	139
18.7 $1023$ $19,632$ $37.1$ $41.2$ $41.4$ $40$ $4.9$ $135$ $163$ $19.1$ $393$ $20,025$ $37.2$ $41.4$ $41.0$ $42.3$ $32$ $4.8$ $111$ $164$ $19.1$ $393$ $20,025$ $37.2$ $41.4$ $41.0$ $42.3$ $32$ $4.8$ $111$ $164$ $19.5$ $438$ $20,463$ $36.9$ $41.5$ $40.5$ $42.6$ $30$ $5.3$ $110$ $160$ $19.9$ $373$ $20,836$ $37.7$ $41.0$ $41.6$ $42.7$ $36$ $4.4$ $119$ $151$ $20.3$ $191$ $21,027$ $37.7$ $42.0$ $41.5$ $42.8$ $36$ $5.3$ $146$ $201$ $20.7$ $599$ $21,626$ $37.8$ $41.5$ $41.5$ $43.0$ $40$ $4.7$ $138$ $163$ $21.1$ $424$ $22,050$ $38.0$ $42.0$ $42.0$ $42.9$ $36$ $4.3$ $122$ $143$ $21.5$ $400$ $22,450$ $38.4$ $42.0$ $41.4$ $43.0$ $26$ $4.5$ $86$ $164$ $21.9$ $422$ $22,872$ $38.6$ $42.0$ $41.8$ $42.9$ $47$ $4.0$ $159$ $127$ $22.3$ $400$ $23,272$ $38.6$ $42.5$ $42.0$ $43.3$ $52$ $4.2$ $138$ $150$ $22.7$ $350$ $23,622$ $38.4$ $42.5$ $42.3$ $42.8$ $44$ $4.5$ $138$ $139$ <td>16.7</td> <td>389</td> <td>17,679</td> <td>37.0</td> <td>40.7</td> <td>40.5</td> <td></td> <td></td> <td>38</td> <td></td> <td>4.5</td> <td>122</td> <td>160</td>	16.7	389	17,679	37.0	40.7	40.5			38		4.5	122	160
10.19.00.10000.10000.10000.10000.100019.139320,02537.241.441.042.3324.811116419.543820,46336.941.540.542.6305.311016019.937320,83637.741.041.642.7364.411915120.319121,02737.742.041.542.8365.314620120.759921,62637.841.541.543.0404.713816321.142422,05038.042.042.042.9364.312214321.540022,45038.442.041.443.0264.58616421.942222,87238.642.041.842.9474.015912722.340023,27238.642.542.043.3524.213815022.735023,62238.442.542.342.8444.5138139	17.5	930	18,609	33.4	41.5	40.0			40		8.3	162	155
19.543820,46336.941.540.542.6305.311016019.937320,83637.741.041.642.7364.411915120.319121,02737.742.041.542.8365.314620120.759921,62637.841.541.543.0404.713816321.142422,05038.042.042.042.9364.312214321.540022,45038.442.041.443.0264.58616421.942222,87238.642.041.842.9474.015912722.340023,27238.642.542.343.3524.213815022.735023,62238.442.542.342.8444.5138139	18.7	1,023	19,632	37.1	41.2	41.4			40		4.9	135	163
19.9 $373$ $20,836$ $37.7$ $41.0$ $41.6$ $42.7$ $36$ $4.4$ $119$ $151$ $20.3$ $191$ $21,027$ $37.7$ $42.0$ $41.5$ $42.8$ $36$ $5.3$ $146$ $201$ $20.7$ $599$ $21,626$ $37.8$ $41.5$ $41.5$ $43.0$ $40$ $4.7$ $138$ $163$ $21.1$ $424$ $22,050$ $38.0$ $42.0$ $42.0$ $42.9$ $36$ $4.3$ $122$ $143$ $21.5$ $400$ $22,450$ $38.4$ $42.0$ $41.4$ $43.0$ $26$ $4.5$ $86$ $164$ $21.9$ $422$ $22,872$ $38.6$ $42.0$ $41.8$ $42.9$ $47$ $4.0$ $159$ $127$ $22.3$ $400$ $23,272$ $38.6$ $42.5$ $42.0$ $43.3$ $52$ $4.2$ $138$ $150$ $22.7$ $350$ $23,622$ $38.4$ $42.5$ $42.3$ $42.8$ $44$ $4.5$ $138$ $139$	19.1	393	20,025	37.2	41.4	41.0		42.3	32		4.8	111	164
20.319121,02737.742.041.542.8365.314620120.759921,62637.841.541.543.0404.713816321.142422,05038.042.042.042.9364.312214321.540022,45038.442.041.443.0264.58616421.942222,87238.642.041.842.9474.015912722.340023,27238.642.542.043.3524.213815022.735023,62238.442.542.342.8444.5138139	19.5	438	20,463	36.9	41.5	40.5		42.6	30		5.3	110	
20.759921,62637.841.541.543.0404.713816321.142422,05038.042.042.042.9364.312214321.540022,45038.442.041.443.0264.58616421.942222,87238.642.041.842.9474.015912722.340023,27238.642.542.043.3524.213815022.735023,62238.442.542.342.8444.5138139	19.9	373	20,836	37.7	41.0	41.6			36		·	119	
21.142422,05038.042.042.042.042.9364.312214321.540022,45038.442.041.443.0264.58616421.942222,87238.642.041.842.9474.015912722.340023,27238.642.542.043.3524.213815022.735023,62238.442.542.342.8444.5138139	20.3	191	21,027	37.7	42.0	41.5					5.3	146	201
21.540022,45038.442.041.443.0264.58616421.942222,87238.642.041.842.9474.015912722.340023,27238.642.542.043.3524.213815022.735023,62238.442.542.342.8444.5138139	20.7	599	21,626	37.8	41.5			and the second		-			
21.9       422       22,872       38.6       42.0       41.8       42.9       47       4.0       159       127         22.3       400       23,272       38.6       42.5       42.0       43.3       52       4.2       138       150         22.7       350       23,622       38.4       42.5       42.3       42.8       44       4.5       138       139	21.1	424	22,050	38.0	42.0								
22.3       400       23,272       38.6       42.5       42.0       43.3       52       4.2       138       150         22.7       350       23,622       38.4       42.5       42.3       42.8       44       4.5       138       139													
22.7 350 23,622 38.4 42.5 42.3 42.8 44 4.5 138 139													
23.1 375 23,997 38.1 43.0 42.8 44.0 47 4.9 144 146													
	23.1	375 2	23,997	38.1	43.0	42.8		44.0	47		4.9	144	146

Table 4.1.1 CHARACTERISTICS OF EXISTING RIVER CHANNEL (2/5)

	Wi	das	river	<b>B</b> .	· .								
	Sect.		ance ( m)	Riverbed Elevation	Ground Ele	vation (SHVP,m)	Dike Elev	ation (SMP,m)	River W	 Hidth (m)		LOW WC	BankYul
	No.	Singl	e Accum.	(SHVP, m2)	Left	Right	Left	Right	LOW WC	Dike to Dike	Depth (m)	Area (m²)	Capacity (m <sup>3</sup> /sec)
N	23.5	350	24.347	38.2	43.0	42.2		43.8	38		4.8	137	155
	23.9	450	24,797	36.9	42.6	42.5	43.1	44.2	35	232	5.7	144	123
	24.3	550	25,347	38.2	43.0	42.6	43.7	44.2	42	254	5.2	150	152
	25.1	500	25,847	39.7	43.3	43.2	44.3	44.5	30	130	4.8	87	165
	25.5	550	26,397	38.8	43.5	43.3	44.7	45.2	34	142	5.2	139	166
	25.9	300	26,697	39.2	.43.9	43.0	44.5	44.6	38	130	4.9	135	161
÷.	26.1	250	26,947	38.9	44.5	43.2	44.9	44.7	46	152	4.9	187	149
	26.6	500	27,447	39.2	44.0	44.0			32		4.8	96	85
	27.1	500	27,947	39.8	44.0	44.4			33		4.7	107	93
	27.6	500	28,447	40.4	44.5	44.6			30		4.3	85	100
	28.1	500	28,947	40.6	44.6	44.8	45.2		27		4.4	99	104
	28.6	500	29,447	39.8	44.7	45.1	45.2		32		5.2	113	107
	29.1	500	29,947	40.7	45.0	45.1	45.3		32		4.3	103	113
	29.6	500	30,447	41.2	45.0	45.5	45.7		37		4.2	108	111
	30.1	500	30,947	41.1	45.8	45.8			43		4.7	104	125
	30.6	500	31,447	41.5	46.0	46.4			40		4.1	131	129
	31.1	500	31,947	42.1	46.2	46.1			44		4.2	109	134
	31.6	500	32,447	42.2	47.0	46.3			60		4.2	118	141
	32.1	500	32,947	42.2	46.8	46.9			41		4.3	115	148
	32.8	500	33,447	42.3	47.0	47.0			44		4.3	137	347
	33.1	500	33,947	42.9	47.0	47.4			51		3.8	123	138
	33.6	500	34,447	43.2	47.5	47.2			49		3.7	110	128
	34.1	500	34,947	43.2	47.2	47.5			48		4.1	.111	135
	34.6	500	35,447	43.7	48.0	48.1			71		4.0	144	172
	35.1	500	35,947	43,3	48.5	48.0			50		4.7	108	166
	35.6	500	36,447	43.3	48.7	48.5			54		5.0	110	195
	36,1	500	36,947	43.8	48.8	48.9			40		5.0	100	180
	36.6	500	37,447	43.9	49.5	49.5			45		5.3	118	218
	37.1	500	37,947	43.5	50.3	50.1			64		6.5	139	225
	37.6	500	38,447	43.6	50.6	50.4			60		6.7	111	250
	38.1	500	38,947	44.7	51.0	51.0			70		6.2	178	277
	38.6	500	39,447	44.7	51.3	51.1		51.9	50		6.2	124	298
	39.1	500	39,947	45.3	51.8	51.8			50		6.2	146	298
	39.6	500	40,447	46.0	52.6	52.8			65		6.5	162	350
	40.1	500	40,947	46.2	53.0	53.0			72		6.8	156	350
	40.6	500	41,447	46.7	53.8	53.8	•	•	50		7.3	178	410
	41.1	500	41,947	47.1	54.3	54.8			75		7.0	209	300
	41.6		42,447	47.5	55.8	55.4			100		7.3	244	500
	42.1	500	42,947	48.3	56.7	56.6			100		7.2	231	530
	42.6	500	43,447	49.0	57.8	57.6			100		8.5	248	600
	43.1	500	43,947	49,6	57.9	57.6			110		6.8	246	500
	43.6	500	44,447	48,6	58.3	58.3		5. 5	130		8,4	290	550
	44,1	500	44,947	51.1	57.0	58.5		59,1	100		5.2	154	358
	44.6		45,447	52.0	59,3	58.6		2211	100		6.6	252	550
	45.1	500	45,947	52.7	59.1	59.1			106		6.1	243	510 510
	45.6	500	45,947	52.9	59,1 60,5	60.0			100		7.2	216	600
					60.5	59.9			61		5.6	162	440
	45.1	500	46,947	54.4	00.0	37.7	•		01		2+0	•02	·••

Table 4.1.1 CHARACTERISTICS OF EXISTING RIVER CHANNEL (3/5)

Sect.	Dista	nce (m)	Riverbed Elevation	Ground Elevation (SHVP,m)		Dike Elevation (SMP,m)		River Width (m)		l Low wc Area	Bankful Capacit
No.	Single	Accum.	(SHVP, m)	Left	Right	Left	Right	Low wc Dike Lo Dike	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /sec)
46.6	500	47,447	54.5	61.4	61.2			129	6.6	157	480
47.1	500	47,947	54.8	61.5	61.9			60	6.7	210	356
47.6	500	48,447	57.5	62.5	62.5			65	4.9	160	510
48.1	500	48,947	58.8	64.0	64.0			75	5.2	197	600
48.6	500	49,447	58.5	64.7	63.8			88	5.6	157	341
49.1	500	49,947	59.1	65.7	64.8	-1		46	5.6	139	450
49.6	500	50,447	59.4	65.1	66.7			80	5.6	145	350
50.1	500	50,947	59.8	66.4	66.8		- 4 -	70	6.8	225	460
50.6		51,447	59.9	63.6	69.0			55	7.0	311	700

Kedungsoko river

Sect.		OKO II nce (m)	Riverbed Elevation	Ground El	evation (SMP,m)	Dike Ele	vation (SIMP.m)	River W	idth (m)	Channe I Depth	el Low wc Arga	BankYul Capatity
No.	Single	Accum.	(SHVP, ₪)	Left	Right	Left	Right	LOW WC	Dike to Dike	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /sec
K 0.0 (₩ 26.1	) 0	0	38.9			· · ·	44.7					
0.5	500	500	39.2	43.2	43.0		45.3	32		3.8	99	201
1.0	500	1,000	40.0	43.7	42.2		45.2	42		3.5	74	157
1.5	500	1,500	39.9	43.8	43.8			34		4.0	102	165
2.0	500	2,000	39.9	43.9	43.7		45.1	30		4.0	- 88	127
2.5	500	2,500	40.4	43.8	43.7		45.0	30		3.7	64	117
3.0	500	3,000	40.1	43.6	43.7	44 6	45.1	30	50	3.7	78	79
3.5	500	3,500	40.6	44.2	44.1	45.1	45.2	30	60	3.5	70	77
4.0	500	4,000	40.5	44.3	44.3	45.7	44.9	28	100	4.0	76	114
4.5	500	4,500	41.1	44.7	44.9			30	97	3.8	88	108
5.0	500	5,000	41.8	44.5	44.5	45.6	45.9	34	98	3.3	81	120
5.25	250	5,250	42.0		- ·	45.5	45.9	31	97	3.2	70	107
5.5	250	5,500	42.1	44.6	44.5	45.4	45.9	27	95	3.1	60	94
6.0	500	6,000	42.4	44.3	44.2	45.6	45.9	23	98	.3.1	56	87
6.5	500	6,500	42.8	44.8	44.8	45.8	46.0	28	100	2.9	60	84
7.0	500	7,000	43.0	44.9	45.0	46.3	46.8	26	98	2.8	50	76
7.5	500	7,500	43.3	44.9	45.2	46.0	46.8	27	93	2.4	41	50
8.0	500	8,000	43.4	45.4	45.6	47.1	47.2	32	96	2.9	. 65	79
8.5	500	8,500	43.7	45.8	45.5	47.4	47.8	28	97	2.8	40	68
9.0	500	9,000	44.2	46.3	46.8	48.1	47.7	31	96	2.6	56	55
9.5	500	9,500	44.3	46.0	46.0	48.1	48.1	28	98	2.4	50	50
10.0	500	10.000	44.2	46.6	46.8	49.1	48.9	65	98	2.8	96	71

Table 4.1.1 CHARACTERISTICS OF EXISTING RIVER CHANNEL (4/5)

Ulo river

Sect.	Distan	······	Riverbed Elevation	Ground Ele	vation (SMP,m)	Dike Elevat	ion (SIMP,n)	River 1	lidth (m)	- Channel Depth	Low wc Arga	Bankfu Capacil
lo.	Single	Accum.	(SHVP, B)	Left	Right	Left	Right	Low wc	Dike to Dike	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /sec
0.0	0	0	39.6	43.6	43.7			23		4.0	49	53
(1.5)		500	10.0	12.0.	12.0							
0.5	500	500	40.2	43.8	43.9			16		3,7	45	57
1.0	500	1,000	40.8	43.9	43.9			22		3.2	38	49
1.5	500	1,500	40.9	44.0	44.1	44.4	44.4	17	17	3.2	32	40
2.0	500	2,00	41.4	44.5	44.5		÷ .	26		3.5	45	43
2.5	500	2,500	41.1	44.5	44.5	44.9		17		2.4	32	43
3.0	500	3,000	42.1	44.9	44.7	45.6	45.2	27	27	2.8	32	49
3.5	500	3,500	42.3	45.2	45.0	45.5	45.9	17	17	2.7	31	38
4.0		4,000	42.6	45.1	45.6	45.9	46.0	12	12	2.7	34	31
4.5	500	4,500	42.6	45.9	45.3	46.2	46.2	15	15	3.2	30	35
5.0	500	5,000	41.8	45.9	45.6	46.6	46.6	12	12	3.7	26	30
5.5	500	5,500	42.6	46.0	45.9	46.9	46.8	12	12	3.5	26	32
6.0	500	6,000	44.0	46.0	45.9	47.2	47.0	10	10	2.2	12	24
6.5	500	6,500	44.1	46.4	46.7	47.7	47.7	13	13	2.4	14	17
7.0	500	7,000	44.3	46.7	46.9	47.9	47.9	. 13	13	2.3	24	. 16
7.5	500	7,500	44.9	47.8	46.8	48.2	48.7	27	27	3.0	29	35
8.0	500	8,000	44.8	47.5	47.3	48.2	48.6	12	12	2.7	25	22
8,5	500	8,500	44.8	48.1	48.0	48.4	48.6	24	24	3,1	28	36
9.0	500	9,000	45.5	48.3	48,2	-	48.8	19		3.8	30	31
9.5	500	9,500	45.2	48.8	48.9	-	-	29		3.5	50	36
10.0		0,000	45.9	49.0	49.3			49		3.0	52	41
10,5	500 1	0,500	46.5	49.8	49.4		50.4	22		3.3	33	56
11.0	500	1,000	48.6	49.9	49,9		50.6	18		1.5	23	41
11.5	500 - J	1,500	47.2	51,0	50.5		50.9	16		3.5	32	42
12.0	500 I	2,000	47.6	51.7	51.0		51.5	15		3.8	35	63
12.5	500	2,500	48.7	52.0	51.5		52.5	20		3.2	40	70
13.0	500 Û	3,000	48.9	52.3	52.2		52.8	13		3.5	27	60
13.5	500	3,500	49.2	52,8	52.5		54.2	. 22		3.6	56	60
14,0	500 J	4,000	49.3	53,9	53.2		54,3	30		4.5	52	114
14.5	500	4,500	50,1	53.7	52.9		54.7	18		3.2	45	73
15.0	500	5,000	50,5	53.7	52.8		55.0	20		3.3	46	70
15.5	500	5,500	50.7	54.3	53.5		\$5.5	19		3.3	40	36
16.0	500 1	6,000	51.2	54.4	54.1		55.3	16		3.1	45	63
16.5	500	6,500	51,3	54.0	53,9	54.6	55.9	16	30	2.7	37	59
17.0		7,000	51.8	55.1	55.5	55,6	56.7	20	. 29	3.3	54	69
17,5	500	17,500	52.3	56.3	56.0	57.2	57.0	20	29	3.8	57	131
18.0	500	18,000	52,4	56.8	57.0	58.1	58.1	19	31	4.5	61	138
18.5	500	18,500	53,5	58.2	57.8		58,9	20		4.5	57	159
	500 :		54.85	58.50	59.0							
	<b>500</b>		56.25	61.0	61,0							
20.0		20,000	57.0	62.40	62.80							
20,5			58.75	64.0	64.0							
21.0		21,000	62.10	65.0	65.0							
21.5	1 A A	21,500	62,50	66.0	66.0							
	- 1		63.0	67.0	67.0			5. J.				
22.0	200 3	22,000	03.0	07.0	V/.V							

Note : Channel dimension upstream from sect 19.0 is based on the topo maps with 1/2,500 in scale.

 Table 4.1.1
 CHARACTERISTICS OF EXISTING RIVER CHANNEL (5/5)

Ulo river

	10 I.L.				· · · · · · · · · · · · · · · · · · ·					
Sect.	Distan	ice (km)	Riverbed Elevation	Ground Ele	evation (SHMP,m)	Dike Elev	ation (SMP.m)	River Width (m)	Channel Low wc	
No.	Single	Accum.	(SHVP, m)	Left	Right	Left	Right	Low wc Dike Lo Dike	Depth Area (m) (m <sup>2</sup> )	Capacity (m <sup>3</sup> /sec)
23.0	500	23,000	65.40	69.0	69.00			•		
23.5	500	23,500	66.90	70.0	70.0			94	246	
24.0	500	24,000	70.70	74.60	72.60					
24.5	500	24,500	76.0	80.0	80.0					
25.0	500	25,000	83.500	88.0	88.0					
25,5	500	25,500	89.0	92.0	92.0		•	66	271	
26.0	500	26,000	96.50	103.0	104.0					
26.5	500	26,500	107.70	110.0	111.0					
27.0	500	27,000	116,50	120.0	121.0		:			
27.5	500	27,500	128.0	130.0	135.0					
28.0	500	28,000	136.80	144.0	144.0					
28.0+ 100	100		140	144	144.7					

Note : Channel dimension upstream from sect 19.0 is based on the topo maps with 1/2,500 in scale

Kuncir river

Sect.	Distar	ice ( m)	Riverbed Elevation	Ground Elé	wation (SMP,m)	Dike Eleva	tion (SHP.m)	River Width (m)		Reath	LOW WC	Bankful
No.	Single	Accum.	(SHVP, B)	Left	Right	Left	Right	Low wc	Dike to Dike	(m)	Arga (m²)	Capacity (m <sup>3</sup> /sec
Kc 0. (K 5.		Ó	41.9	45.0	45.0			19		3.1	47	50
0,5	500	500	42.6	45.3	45.4			10		3.0	21	49
1.0	500	1,000	43.2	45,1	45.7			13		2.4	18	17
1.5	500	1,500	43.9	45.0	45.5	46.2	46.1	12	12	1.4	11	13
2.0	500	2,000	44.6	45.5	45.5	46.7	46.6	15	15	1.5	7	8
2.5	500	2,500	44.1	45.8	46.2	47.1	47.3	12	12	1.9	6	8
3,0	500	3,000	44.8	46.0	46.5	47.5	47.6	12	12	1.6	14	8
3.5	500	3, 500	44.9	46,7	46.5	47.9	48,0	13	13	2.0	11	11
4,0	500	4,000	45.4	47.0	47.0	48.4	48,4	12	12	1.6	11	9
4,5	500	4,500	45.1	47.7	47.7	48.8	48.4	10	10	2.8	15	-13
5.0	500	5,000	46.5	48,1	48.0	49.2	48.8	10	10	1.7	13	15
5.5	500	5,500	45.9	48.3	48.2	49.3	49.3	13	13	2.3	21	15
6.0	500	6,000	46.2	49.3	48.9	50.1	49.7	12	12	3.0	20	25
6.5	500	6,500	45.5	50.0	49.5	50.7	50,2	30	. 30	4.6		
7.0	500	7,000	47.4	50.2	50.0			13		2.5	66	43
7.5	500	7,500	47.9	50.7	50.5	51.5	50.9	16	16	2.7	25	50
A.0	500	8,000	47.9	51.0	51.4	51,6		20		3.2	22	34
8.5	500	8,500	48.8	52.2	51.5		52.4	20		3.3	42	49
9.0	500	9,000	48.8	52.4	51.9		52.7	45		3.3	46	41
¢.5	\$00	9,300	49,5	52.8	52.3	53 1	53.4	16	16	3.2	. 37	64
0,0	500 1	10,000	50.7	53.8	54.0	54.5		19		3,3	40	101
10.5	500 1	10,500	51.8	56.0	56.0			-25		4.7	100	216
1,0	500	11,000	52.1	56.0	55.8			32		3.9	48	126
1.5	500 1	11,500	52.0	56.8	57.0	57 2		20		4.7	55	137
12.0	500 1	2,000	53.4	58.0	58.0			27		4.5	68	148
2.5	500 I	2,500	55.0	59.8	59.7			20		4.6	63	270
3,0	500 i	3,000	56.4	62.2	62.0			27		5.8	114	320
3.5	500 1	3,500	57.7	63.3	63.0			40		5.9	128	360
4.0	500 1	4,000	58,6	65.2	64.7			23		6.4	80	310
14.5		14.500	60.2	66,6	66.1	66.8	66.3	- 36	62	5.9	129	260
16.5	2,000 1		68.1	76.5	78,9			65	_		157	
8.5	2,000 1		101,4	108.0	108.5			28			127	
		0.500	****	10010				42			160	

## Table 4.1.2 HAMLET AND HOUSE IN THE NATURAL RETARDING BASIN

#### HAMLET AND HOUSE IN THE WIDAS RETARDING DASIN (1/3) (below 38.6 m SHVP)

Name of hamlet	No. of houses
Dk. Tambak	· · · · · · · · · · · · · · · · · · ·
Ds. Jatikalen	219
Kec. Jatikalen	
Dk. Kedung tunggak	
Ds. Jatikalen	107
Kec. Jatikalen	
Dk. Balowono	· ·
Ds. Jatikalen	93
Kec. Jatikalen	
Dk. Ngrengket	
Ds. Ngrengket	213
Kec. Jatikalen	
Total	632 nos

#### HAMLET AND HOUSE IN THE ULO RETARDING BASIN (2/3)

	(below 44.9 m SHVP)
Name of hamlet	No. of houses
Dk. Kedungsoko Ds. Kedungsoko Kec. Sukomoro	122
Dk. Gempol Cable Ds. Kedungsoko Kec. Sukomoro	ek 108
Dk. Turi Ds. Nglundo Kec. Sukomoro	55
Dk. Nglundo Ds. Nglundo Kec. Sukomoro	230
Dk. Jopatran Ds. Nglundo Kec. Sukomoro	106
Dk. Bale Turi Ds. Nglundo Kec. Sukomoro	34
Dk. Gebang Ds. Kedunggulun Kec. Gondang	48
Dk. Jasuman Ds. Kedunggulun Kec. Gondang	248
Dk. Paldaplang Ds. Kedunggulun Kec. Gondang	133
Dk. Bringin Ds. Kedunggulun Kec. Gondang	144
Total	1228 nos

#### HAMLET AND HOUSE IN THE KEDUNGSOKO RETARDING BASIN (3/3)

·	(below 45.0 m SHVP)
Name of hamlet	No. of houses
Dk. Miren Ds. Sidoarjo Kec. Tanjung Anom	283
Dk. Tanjungrejo Ds. Ngadirejo Kec. Tanjung Anom	4
Dk. Jaruman Ds. Ngadirejo Kec. Tanjung Anom	152
Dk, Nglegok Ds. Sumengko Kec. Sukomoro	42
Dk. Sekar Putih Ds. Sonobekel Kec.Tanjung Anom	17
Dk. Mukuh Ds. Sidoarjo Kec. Tanjung Anom	53
Dk. Ngadirejo Ds. Ngadirejo Kec. Tanjung Anom	. 193
Dk. Wonoasri Ds. Ngadirejo Kec. Tanjung Anom	203
Dk. Gempolan Ds. Semengko Kec. Sukomoro	15
Dk. Blimbing Ds. Banjar Anyar Kec. Tanjung Anom	245
Dk. Sumber Ungu Ds. Banjar Anyar Kec. Tanjung Anom	205
Dk. Sumber Agung Ds. Banjar Anyar Kec. Tanjung Anom	386
Dx. Sumberejo Ds. Banjar Anyar Kec. Tanjung Anom	107
Dk. Sumberwaru Ds. Banjar Anyar Kec. Tanjung Anom	180
Dk. Kedung Bengkah Ds. Kedungsoko Kec. Sukomoro	63
Dk. Bulak Sogo Ds. Nglundo Kec. Sukomoro	26
Dk. Bulak Jeruk Ds. Blitaran Kec. Sukomoro	160
Dk. Sembung Ds. Blitaran Kec. Sukomoro	108
Dk. Bungur Ds. Bungur Kec. Sukomoro	73
Total	2515 nos

Table 4.1.3

TEN - DAYS RAINFALL AT BULAKMOJO ( 1973 to 1983 ) (1/2)

	Each				)	fear	<u></u>					
Month	Ten Days	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	198
Jan.	F	72.5	92.1	118.7	113	114.9	110.5	114.5	86	66	96	140.
	м	60.3	55.8	157.5	61.3	73.2 153.2	92.3 123.3	104.5	156	48	40.9	52.0
	L	108.4	86.1	59,3	10.7	153.2	123.3	46.7	75.6	151	67	143.
Peb.	F	188.2	109.2	131.1	20,9	106.9	85.7	31.4	25.7	35.6	(~ )	10.4
	м	213.6	27.2	51.3	32.7	56.6	192.7	9	72.4	320.9	( <del>-</del> `	103.
	L	108.1	95.1	92	130.0	20.3	47,6	112.1	179.5	13.8	(~)	123.
Mar.	F	79.8	105.6	76	191.3	53.8	131.5	22	34	(-)	169.0	42
	м	68.3	47.9	59.9	36.0	57.7	71,5	95	94.5	1-2	123.5	137
	L	70.8	57.8	133.1	121.0	128.9	40	105	60	(- )	60.0	112.
Apr.	F	40.9	77.8	136.0	56.0	90.1	25.5	119.5	67.4	(~)	35,5	83.
	M .	72.9	145.6	137.2	22.5	4.9	11.0	147	106.7	(-)	28.0	64
	Ľ	92.6	14.5	94.5	15.0	17.8	0	29.5	49.1	(-)	161.0	7
May	F	22.9	63.2	<u>.</u>	4.0	0	6.0	120	0	115.5	-	69.
	м	15.5	75.8	- <b>-</b> -	0	0	83.0	9	0	1.6	-	93.
	Ĺ	10.4	-	*	0	7.0	26.0	39	0		-	105.
June	F	-	2.2	-	0	57.5	49.0	108.5	-	-	0	· -
	м	·	-	~	0	9.9	19.0	0	-	43.4	0	
	L	-	22.3	. –	0	48.1	32.2	0	-	33.5	0 · ·	-
July	F	0		-	0	<del>.</del> .	66,7	0	o	4.5	0	-
	м	61.9	-	13.9	0	-	4.5	0	0	31	0	<b>-</b> .
	L	10,4	31.6	-	0		0	0	18.5	-	0	+
Aug.	F	0	61.1	· _	0		0	0	11 -	-	0	
	м	0		-	0	-	0	0	0	. <del>∽</del> `.	0	-
	Ľ	0	7.3	. •	0		0	0	0	24.1	0	-
Sep.	F	0	5.7	29.5	0	-	11.5	0	. 0.	0	<u> </u>	-
	м	47.0	77.6	17.8	0	-	0	0		3.0	-	-
	L	55,4	-		0		O	0		55.5	· -	-
Oct.	F	<b>_</b> '	76.3	99	0	_	11.3	0	. 0	82.0	.0	-
	м		4.9	47	2.9	-	0	0	1.0	6.0	0	55
	L	20.4	62.8	131.0	11.4	-	0	0	11.0	-	0	27
Nov:	F	0	No data	33.4	77.8		55.5	0	48	62.0	0	74
	м	ວ່	No data	71,1	0	-	42.0	34.5	40.5	84.5	15.1	145.
	L	0	No data	87.5	149.9	99,5	39.0	3.5	233	77.5	0	103.
Dec.	F	-	256.2	124.8	37.1	153.9	133.5	75.5	162.5	80.5	91.5	46.
	м	-	91.4	46.6	32.1	30.4	85.0	105.5	74	40.9	87.3	-
4	L	-	38.8	79.5	53.8	342,7	445.4	133	<b>173.2</b>	76.6	68	204.

Note : (-); No available data

Table 4.1.3

#### TEN - DAY RAINFALL AT MRICAN ( 1973 to 1983 ) (2/2)

	Each			· ··			ar					
Month	Ten Days	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	198
Jan.	F No	o data	184.3	118.4	183.3	107.3	131	245	134.7	6	(-)	243
	м	÷1	61.1	72.3	119.3	142.0	112	239	188	87	(-)	76
	Г	11	93.6	53.5	42.5	63.2	88 .	103	174	48	( ~ )	39
Feb.	F	41	53.2	89.0	26.5	16.7	50.5	136.5	157.2	102	124	90.0
	м	u	84.9	79.0	110.5	34.5	80.5	27	252.1	51	114	188
	Г	a	148.3	74.0	169.0	69.1	41.5	78	58.1	88	164	98
Mar.	F	w	150.5	71.9	201.0	123.8	48.1	98.1	0	93.3	(-)	101
	м		50.3	113.4	106.2	49.2	20.2	159.3	54.9	18.7	(-)	144
	г	т <b>н</b>	103.1	158.9	97.9	105.7	155.1	51.1	105	62.4	(-)	111
Apr.	F		59.8	23.5	9.8	34.9	64.8	147	103	39.0	-	: 49
-	м	n	34.9	103.7	2.1	4.0	37.3	192	177	76	55	102
	L	н.	4	49.3	21.6	109.3	. 68.2	31	121	132	12	168
Мау	F		154.9	85.6	17.7	0	79.5	112	2.0	16		65
- ·	м	**	37.2	69.6	0	0	155	38	0	12	- ·	109
	L		-	15.9	0	49	.13	97	16.0	-	·	101
June	F	н		-	0	10.5	38	49		· _	-	-
	M	n	3	-	0	3	9	0		2Ż	-	. 2
	L,	"	23	31.2	0	9	103	0		27	-	. –
July	F	-	-	_	0	0	104	0	0	-15	•	· _
	м	6	<b>-</b> .	0.4	0	- · ·	12	0	ò	28	-	-
	L		47	-	. 0	-	14	0	60	1	-	
Aug.	F	24	-	_	0		10	0	34	·	-	-
	M	-	0.8	0.3	0	-	59	0	2	1	· -	-
	L	4	4.3	-	0	-	0	0	0	17	-	-
Sep.	F	2	37	18.1	· 0	<u> </u>	38	o	. 0	. 4	1	1
1	м	35.3	45	55.7	0	· - ·	15	0	-	~	~	~
•	L	49	-	1.4	24	~	0	0	1	38	-	-
Dct.	F	-	59	83.1	0	· <u> </u>	64	0	0	. 4	-	••-
	м	. 17	-	11.3	59	-	4	0	5	18	-	25
	·L	2	22	342.7	97.4	3	49	8.8	2	11	·· - `	39
Nov.	P	·	1	19.0	0	-	45	3.4	0	15	_	4
	м		230	32.3	3.7	11.3	34	68,9	27	19	26	31
	L	•	64	108.5	192.1	10.0	10	47.3	50	133	3	90
Dec.	F	-	96	80	36.4	106.9	103	.68	11	189	69	27
	м	-	31	205	1.8	37,7	88	63,5	18	94	. 98	15
	L	-	38	69.5	0.5	121.2	204	128.3	24.5	48	44	264

Note : ( - ) ; No available data

# Table: 4.1.4 EXISTING RIVER STRUCTURE IN WIDAS BASIN (1/2) River nome: K. WIDAS

	Kind of	Structure.	1.	colec			Totol	Width of m	ovoble por l	Width of	Bed sill	He	ighl	
Locotion	Structure	nome	ŝ	ere Cere	Rota	Purpose	Width	Total width	Spon	fixed	of Structure	Movable port	Fixed port	Remarks
51.45 <sup>km</sup>	Dam (Ngu	dikan)		0		Irrigation	45.1 <sup>m</sup>	5.1 m (2.1 m)	ł	40 <sup>m</sup>	-	2.5	2.5	
	Syphon	+	0			Irrigation	1.25	1.25	1	-	-	- 1	-	
	Sluice	-			0	Irrigation	3.5	1.75	2	. ~	-	· -	-	

# River nome : K. KEDUNGSOKO

	Kind of	Structure	1	dle			Total	Width of m	t roq eldovo	Width of	Bed sill	He	ight	- ·
Location	Structure	name	Laft	Come	Richt	Purpose	Width	Total width	Span	fixed part	of Structur <del>a</del>	Movoble part	Fixed part	Remarks
1.00 <sup>km</sup>	Sluice	-			0	Drainage	-	· -	-	-		-	- i	Ø 0.4 <sup>™</sup> x1
1.25		-			0	. <u>.</u>	1,5	1.5	1	-	-	2.3		
3.30	U	-			0	' u	0.3	0.3	. <b>1</b> .	-	-	0.5	- :	· .
5.25	(1	-			0	11	1.2	1.2	1	- <u>-</u>	-	1.5	-	
6, 50	14 <sup>i</sup>	. –	0		·	. 11	-	-	-	· -	-	-		.ø 0.8 <sup>m</sup> x1
10.15	Dam (Ma	langsari)		0	Γ	Irrigation	36.6	36.6		3,2+35+7,5 +7,6 +7,7)		4		•
	Sluice		0			и <sub>.</sub>	1.8	1.8	1	-	-			

River name : K. uto

	Kind of	Structure	1.00	ote	din		Total	Width of m	ovable part	Width of	Bed sill	He	lght	
Location	Structure	'nome	19 1	Centre	Right	Purpose	Width	Total width	Span	flxød port	of Structure	Movable part	Fixed por I	Remarks
8.8 <sup>km</sup>	Syphon ( Dor	ogeneng )		0	E .	Irrigation	-		-	-	-		-	Canal B <sup>3</sup> 50 x H1.54
10.8	Weir (Bul	akmojo )		0			23.2 <sup>m</sup>	3.2 m (1,9m)	1	20 <sup>m</sup>	-	3 .	3	
10.0	Sluice	-			0	u	1.0	1.0	1	· –	-	-		
14.0	Sluice ( Dan	gdet dam)	0			-	1.5	1.5	1	-	<u> </u>	1.0	-	
16.75	Sluice	-	0				0,5	0.5	1	-	~	0.8	· -	
	Dam (Tir	ipan)		0		"	10.05	10,05	5.025x2 4.0m;4.1m	, ~	-	2.2	-	
•	Sluice	-	0			tî .	0.6	0.6	1	. –	-		-	
20.7	Sluice				0		1.2	. 1, 2	(0.6x2)		-	-	-	
	Sluice	-			0	11	6,9	6.9	2.3 x 3 (1.6mx3)	-	-		-	İ
28.1	Kuncir d	liversion				. ( Sau	e K, Kunc	(r)						

#### Table : 4.1.4

#### EXISTING RIVER STRUCTURE IN WIDAS BASIN ( 2/2 )

River name : K. KUNCIR

	Kind of	Structure	1.00	cota		Dura e	Total	Width of m	ovable port	Width of	Bed sill	Не	ight	Remarks
Location	Structure	ngme	Left	Conte	Right	Purpose	Width	Totol width	Span	fixed part	of Structure	Movable part	Fixed por I	Nemarks
1.9 <sup>km</sup>	Sluice		0			Drainage	0.5 <sup>m</sup>	0.5 <sup>m</sup>	1	-	-	1.0		
2.2	· tr	-	0				0.5	0.5	1	**	-	0.8		
н	11	-			0	53	0.5	0.5	1	-	-	0.8		
3.65	53	-	0			n	0.3	0,3	1	_		0.3		
4.55	н	· _			0	н	-	-	<b>~</b>	-	-	-	-	ø 0.3 <sup>m</sup> x
	Dam (	Kapas )		0		` 11	18	18	6m x 3 (5m x 3)	-	-	4		
6.5	Sluice	-	0			11	1.0	1.0	1	-	-	2		
	Sluice	-			0	11	1.0	1.0	1	-	-	2		
.8.65	Syphon	-		0		19	-	-	·-	-	-	-	-	∲ 2.0 <sup>m</sup> x
9.65	Dam (Ta (Ki	injung) (amat)		0		Irrigation	9.5	9.5	4.75mx2 (4.0mx2)	-	-	2.6	-	
	Sluice				0	11	0.7	0.7	1		-			 
10,95	n				0	• H	2.5	2.5	1		-	2	-	
	Dam (Kedu	mggerit)		0		. 11	18.3	3.5 (2.0m)	1	. 15	-	6	6	
17.58	Sluice (S	Syphone)	0	-		**	1.3	1.3	1	-	-	_	-	
	Sluice				0	ŧt	1.3	1.3	1	-	~	-		
20.5	Diversion	a veir		0		Flood Diversion	33.0	33.0	8,25x4 (7.5x4)	-	-	-	-	
20.55	Diversion	n weir	.0	[		. Н	14.4	14.4	4,8x3 (4.0mx3)	-	-		-	

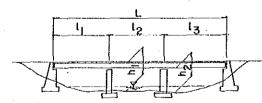
# Table 4.1.5 PRESENT CONDITION OF EXISTING BRIDGE IN THE WIDAS BASIN (1/4)

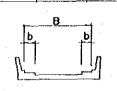
River name : K. widas

No of Inventory Survey	Location	Administra- tive office		Super	Type of Sub Structure	Bridge length L ( m )	Nos. of Span	Span length L ( m )	<u>В</u> b (m)	h <sub>l</sub> (m)	<sup>h</sup> 2 (m)
1	3.90 + 100		Footpath	Ватьоо	Woodén	20.0	-	-		<b>-</b> ·	_
(Lengkong) 2	11.50 + 130		Road	RC-slab PC-Pretec	Inverted -T Type Pile ben	65.0	7	7.5 14.0	$\frac{4.6}{9.5} \frac{1.0}{0.56}$	6.7	5.8
(Karangsem	1) 24.7 + 150		do	Steel Truss	bent Inverted T-Type	63.0	4	24.0	4.5	7.6	6.1
4	32.1 + 200		do	SRC -T Beam	Inverted T-Type	47.00	4	12.0	4.0 0.6	9.0	8.5
5	34.6 + 350		đo	Shape Steel	Steel Frame	40.30	5 .	8.0	2.0	5.25	5.0
6	37.1 + 120		Footpath	Steel suspensio	n <sup>do</sup>	31.8	4	11.50	2.25	8,1	7.6
7	38.6 + 250		Road	RC-T Beam	Inverted -T-Type	38.8	4	9,00	3.9 0.9	8.6	8.4
8	43.1 + 300		Road	RC-slab	Rigiđ	50.25	6	10.00	4.3	10.0	9,2
9	48.1 + 200		Light Railway	Steel truss	Gravity	46.7	3	28.70	2.75	7.5	7.0
10	48.6 + 200		Road	do	Gravity Pile bent	47.0	2	23.75	2.70	6.3	5.5
							<u> </u>	·			

River name : K Kedungsoko

No of Inventory Survey	Location	Administra- tive office		Type of Super Structure	Type of Sub Structure	Bridge length L (m)	Nos. of Span	Span length L ( m )	8 b (m)	h <sub>i</sub> (m)	<sup>h</sup> 2 (m)
1	3.5 + 200	Binamarga	Roađ	Shape Steel	Inverted T-type Steel_fr:	50.8	5	11.6	8.5		
2	3.5 + 220		Railway	Steel girder	Inverted T-Type	82.0	8	12.2	1.067		
3	7.0 + 250		Footpath (Road)	Wooden	Wooden	41.0	8	10.0	1.3	1	
4	8.0 + 100		Footpath	Banboo	-	40.0	-	_: .	-		
5	10.0 + 150					40.8					





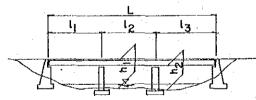
L : Bridge length

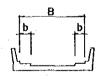
- L : Span length ( most longest )
- B : Effective width include in sidewalk
- b : Width of sidewalk
- $\mathbf{h_l}$  : Height to surface from river bed
- h<sub>2</sub>: Height to girder bottom from river bed

#### Table 4.1.5 PRESENT CONDITION OF EXISTING BRIDGE IN THE WIDAS BASIN (2/4)

River name : K Ulo (No. 1)

No of Inventory Survey	Location	Administra- tive office	Classifi - cation	Type of Super Structure	Type of Sub Structure	Bridge length L ( m )	Nos. of Span	Span length l ( m )	<u>B</u> b (m)	հլ (m)	<sup>h</sup> 2 (m)
·~1	1.5 + 200		Road	Wooden	Wooden	15.5	3	5.3	2.35	4.75	4.60
2	5.5 + 350		Road	do	đo ,	16.6	4	4.7	2.0	3.85	3.6
3	6.5 + 330		Road	RC-slab	Gravity	21.8	2	10.9	4.0	4.10	3.4
4	10.0 + 70		Road	Shape Steel	Inverted T-Type	15.3	2	7.65	3.9	4.55	4.35
5	11.5 + 00		Road	RC~T Beam	Inverted T-Type	24.6	2	11.5	6.2	5.0	4.6
6	13.0 + 200		Road	do	Inverted T-type	25,2	2	11.8	8.35	4.55	3.45
. 7	13.5 + 300		Road	Wooden	do	22.0	2	11.0	2.5	5.0	4.5
8	14.0 + 250	Binamarga	Road	RC-slab	do	46.0	4	11.0	1.3	4.9	4.2
9	14.5 + 250	рјка	Railway	Steel Beam	đo	51.60	3	17.40	1.067	5.9	4.3
10	16.0 + 300		Road	RC-T Beam	đo	25.0	2	12.50	8.8 0.81	5,35	4.7
11	18.0 + 300		Road	đo	Pile bent	27.8	. 2	13,90	6.9	6.8	6.1
12	18.5 + 50		Road	Shape Steel	Inverted T-Type	12.2	1	12.2	3.3	6.0	5.6
13	19.5 + 250		Footpath (Road)	Bamboo	Wooden	20.4	3	7.0	1.5	-	5.55
14	20.5 + 200	-	Road	Árch	Gravity	36.0	3	5(7)	2.5		
15	21.0 + 200		Road	RC-T Bear	Inverted T-Type	15.2	2	7.6	3.1	4.8	4.4
16	22.5 + 110		Footpath	Wooden	Gravity Wooden	9.4	. 2	4.7	1,8	7.25	7.0
. 17	24.0 + 440		Roađ	Shape Steel	Inverted T-Type	15.4	2	7,7	3.0	6,25	6.0
18	24.0 + 280		Aqueduct	Arch	Gravity	21.2	2.	10.6	1.5	-	-





- L : Bridge length
- 1 : Span length (most longest)
- B : Effective width include in sidewolk
- b : Width of sidewalk
- h<sub>1</sub> : Height to surface from river bed
- h<sub>2</sub>: Height to girder bottom from river bed

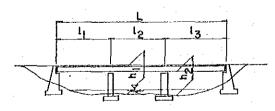
#### Table 4.1.5 PRESENT CONDITION OF EXISTING BRIDGE IN THE WIDAS BASIN (3/4)

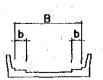
River name : K Uio (no. 2)

No of Inventory Survey	Location	Administra- tive office		Super	Type of Sub Structure	Bridge length L (m)	Nos. of Span	Span length l (m)	B b (m)	<sup>h</sup> l (m)	<sup>h</sup> 2 (m)
19	24.5 + 300		Footpath	Shape Steel	Gravity	11.1	1	11.1	2.0	-	7.7
20	25.0 + 300		Road	wooden	Inverted T-Type	22.6	3	7.5	2.5	6.5	·
21	25.5 + 430		Footpath (Road)	Wooden	do	14.3	2	7.0	2.0	-	7.4
22	26.0 + 400		Road	Shape Steel	Inverted T-Type	28.1	3	9.5	2.0	-	6,0
23	27.0 + 300		Footpath	Bamboo	Wooden	31.4	4	7.85	1.0		-

River name : K KUNCIR ( No. 1 )

No of Inventory Survey	Location	Administra- tive office	Classifi - cation -	Type of Super Structure	Type of Sub Structure	Bridge length L ( m )	Nos. of Span	Span length l ( m )	8 b (m)	.h (៣)	<sup>h</sup> 2 (m)
1	0 + 50		Footpath	Bamboo	-	10.0	1	20.0	-	~	-
2	0.5 + 70		do	do	-	10.0	1	10.0	-	-	-
3	1.0 - 50		Road	Wooden	Gravity	5,5	1	5.5 -	3.2	2.7	-
4	1,5 + 0		do	do	do	6.8	1	6.8	2.5	2.8	-
5	1 5 + 350	[	Footpath	Bamboo	Bamboo	10.0	1	10.0	-		-
6	2.0 + 200		Footpath (Road)	do	Wooden	10,0	1	10.0	1.5	1	-
7	2.5 + 120		đo	do	Gravity	14.2	2	7.1	1.5	-	1.
8	4.0 + 250		Roađ	RC-T Bear	do	14.4	1	14.0	4.8	4.3	3.0
9	5.5 + 0		do.	Wooden	do	11.2	3	3.8	3.1	3.65	
10	7,5 + 220		Footpath	Bamboo	Wooden	10.0	I	10.0	-	-	-
11	8.0 + 150		Road	Steel Truss	Gravity	20.25	1	20.25	2.6	.' -	3.7
12	8.0 + 450		do	Shape Steel	Gravity 5 Rigid frame	13,85	2	6.90	3.65	4.25	3.7
13	9.5 + 150		Road	RC-T Bean	Gravity Pile bent	19.00	2	9.5	8.2	4.8	4.4
14	10.0 + 400		Aqueduct	Steel Box	do	10.00	1	10.00	0.6	-	-
15	10.5 + 0		Road	H-beam	đo	20.5	2	12.3	10.5	5.3	4.6
16	10.5 + 350		do	Wooden	Steel frame	25.5	3	13.7	2.6	_	4.7
17	12.0 + 120		Footpath	Bamboo	Steel fra me Gravi-	26.0	3	8.5	1.5	-	
18	12,5 + 50		Road	Steel	ty Cravity	22.0	4	7.6	2.0	5.9	5.4

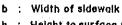




L : Bridge length

i : Span length ( most longest )

B : Effective width include in sidewalk



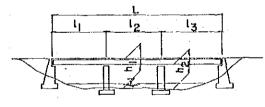
h<sub>1</sub>: Height to surface from river bed

h<sub>2</sub> : Height to girder bottom from river bed

#### Table 4.4.5 PRESENT CONDITION OF EXISTING BRIDGE IN THE WIDAS BASIN (4/4)

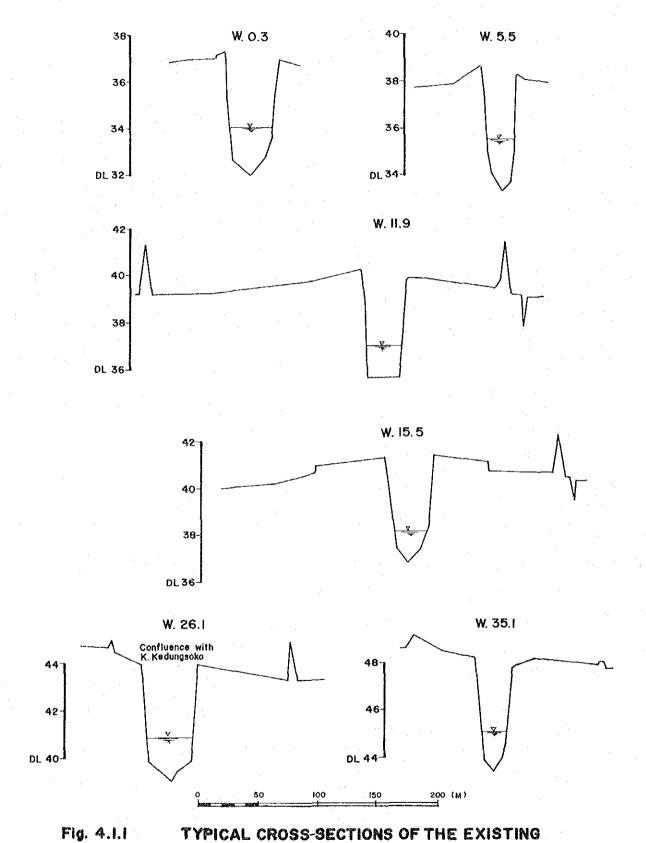
River name : K Kuncir (No. 2)

No of Inventory Survey	Location	Administra- tive office	Classifi - cation	Type of Super Structure	Type of Sub Structure	Bridge length L. ( m )	Nos. of Span	Span length L ( m )	<u>B</u> b (m)	h <sub>l</sub> (m)	<sup>h</sup> 2 (m)
19	13.0 + 80		Road	RC-slab	Inverted T-Type Pile bent	22.0	2	10.5	6.2	7.4	6.9
20	14.5 + 0		Road	Shape	Inverted T-Type	17.8	2	8.9	3.5	7.25	6.7
-21	16.5 + 180	· · ·	Road	đo	Gravity	10.0	1	10.0	2.5	7.90	7,60
22	17.0 + 250		Road		Inverted T-Type	14.5	2	7,25	2.5_	6.2	5.9
23	17.0 + 400		Road		Inverted T-Type	21.0	2	10.25	6.2	5.50	4.70
24	18.5 + 150		Road	Shape Steel	Gravity	28.0	3	9.5	2.0	7.00	6.80
25	20.5 + 0		Road	Shape Steel	Gravity	40.0	4	8.0	3.6		



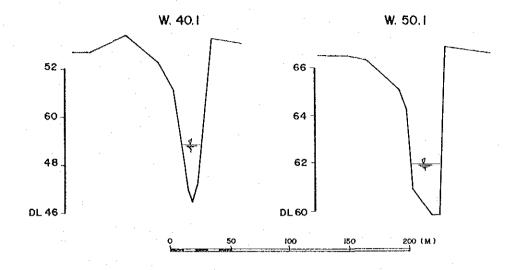


- L : Bridge length
- i : Span length ( most longest )
- B : Effective width include in sidewalk
- b : Width of sidewalk
- h; : Height to surface from river bed
- $h_2$ : Height to girder bottom from river bed



TYPICAL CROSS-SECTIONS OF THE EXISTING K. WIDAS ( 1/5 )

4.16





TYPICAL CROSS SECTIONS OF THE EXISTING K. WIDAS (2/5)

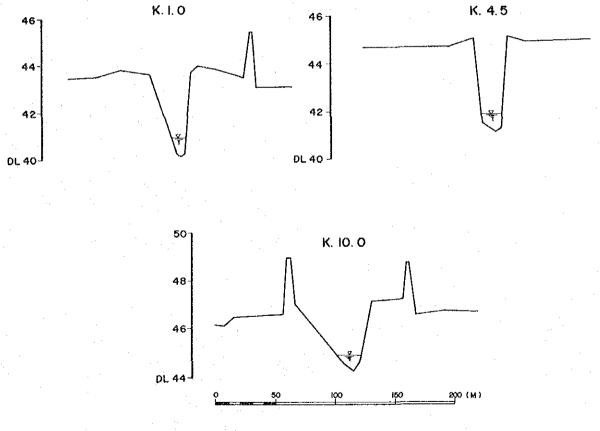


Fig. 4.1.1

TYPICAL CROSS-SECTIONS OF THE EXISTING K. KEDUNGSOKO (3/5)

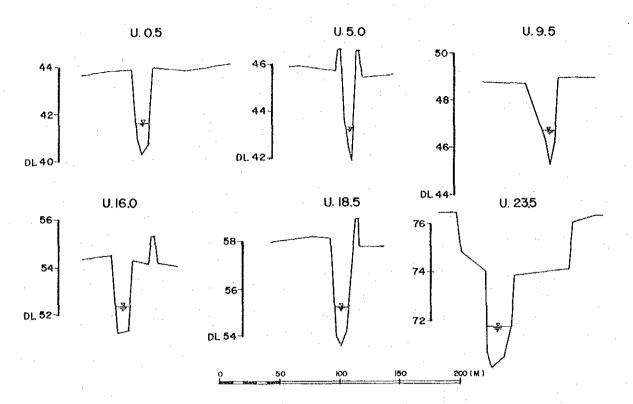


Fig. 4.1.1

TYPICAL CROSS-SECTIONS OF THE EXISTING K. ULO (4/5)

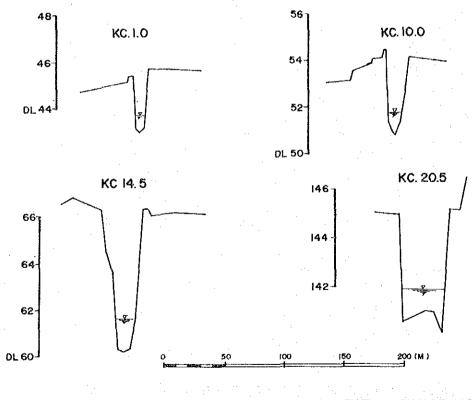
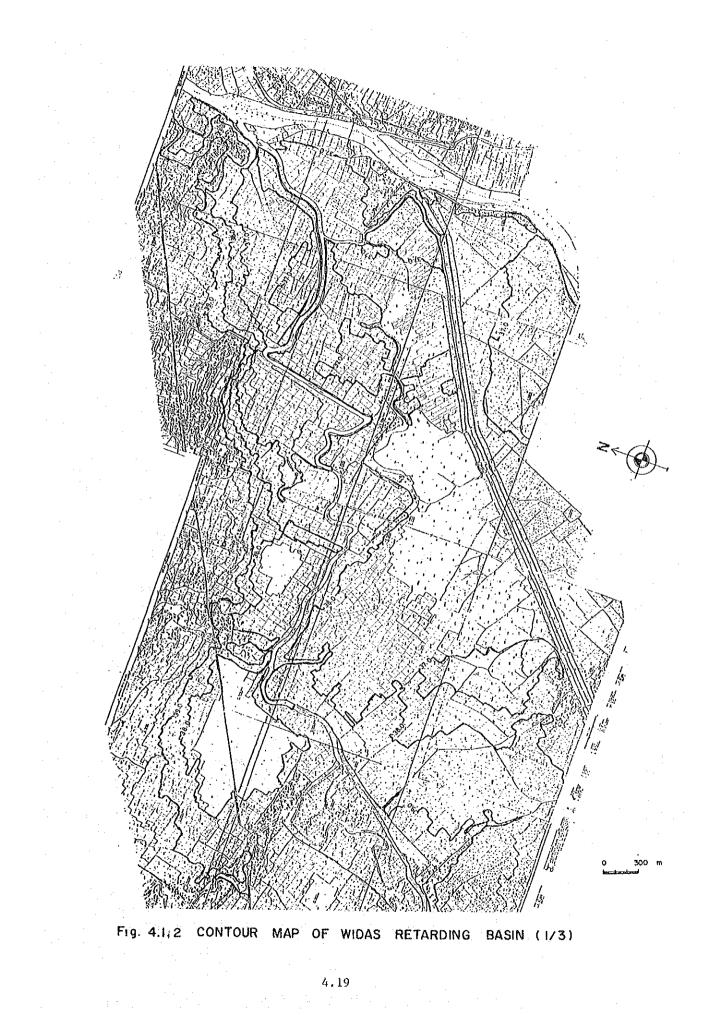


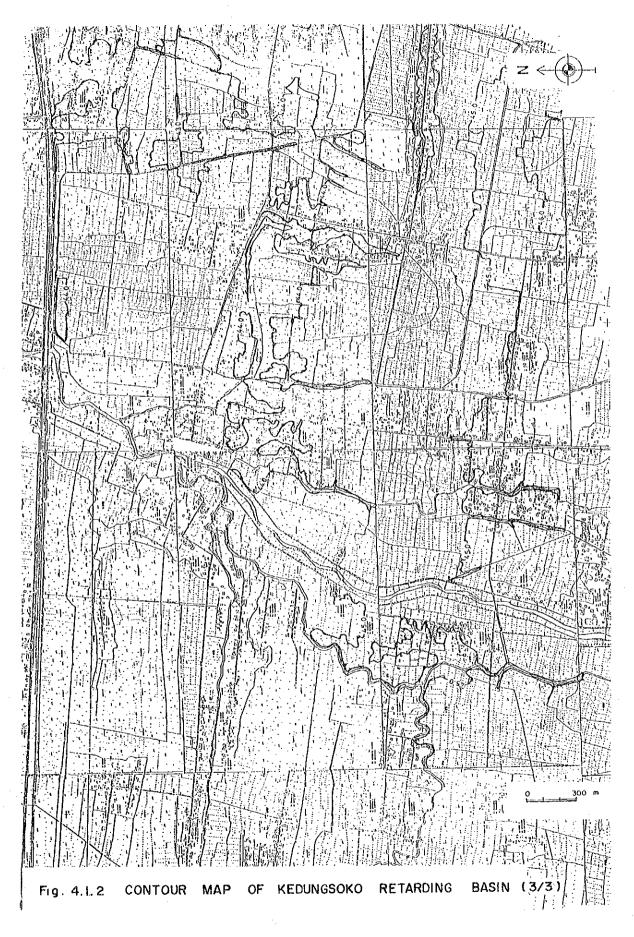
Fig. 4.1.1

TYPICAL CROSS-SECTIONS OF THE EXISTING K. KUNCIR (5/5)

4.18







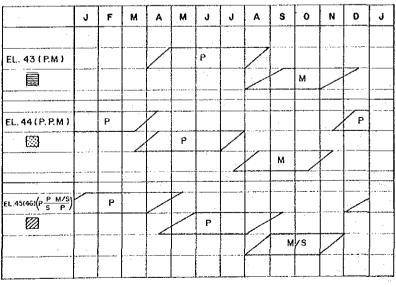
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EL. 36/37								· .					
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P-M-K 🖾					· · ·								
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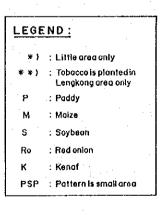
### WIDAS RETARDING BASIN

#### ULO RETARDING BASIN

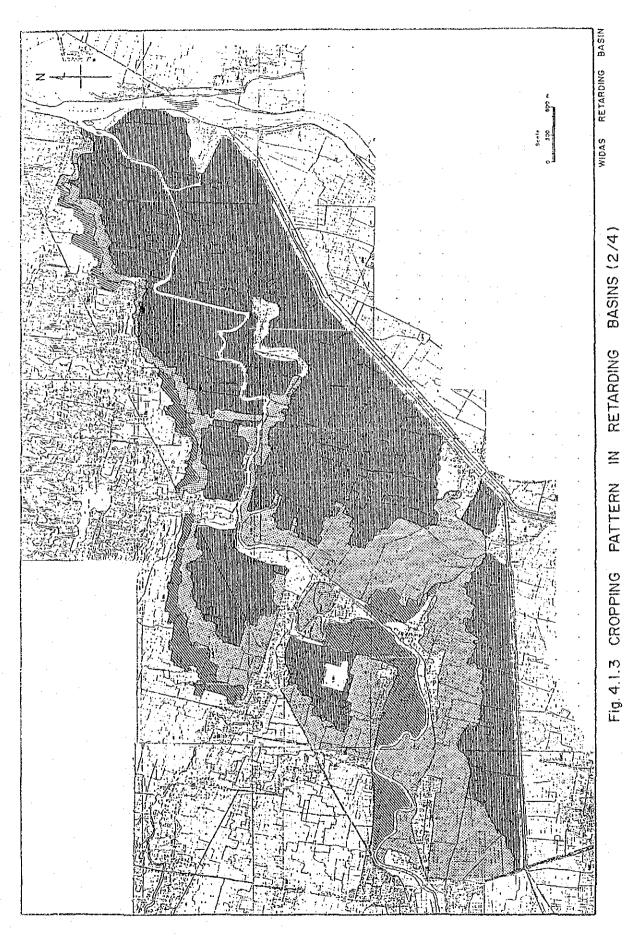
	1	J	F	M	A	м	J	J	A	S	0	N	D	J
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P-M/S-К							ę							
	F									M/S		<b>/</b> c	ĸ	
											-			
EL. 44	7		Р			7								
P-P-M (	2							Р						
									2		м			
EL. 45 = 46	_													
		$\square$		P						<b></b>			$\square$	
P-P-Ro/M	$\mathbb{Z}$						Р							
											Ro/M			

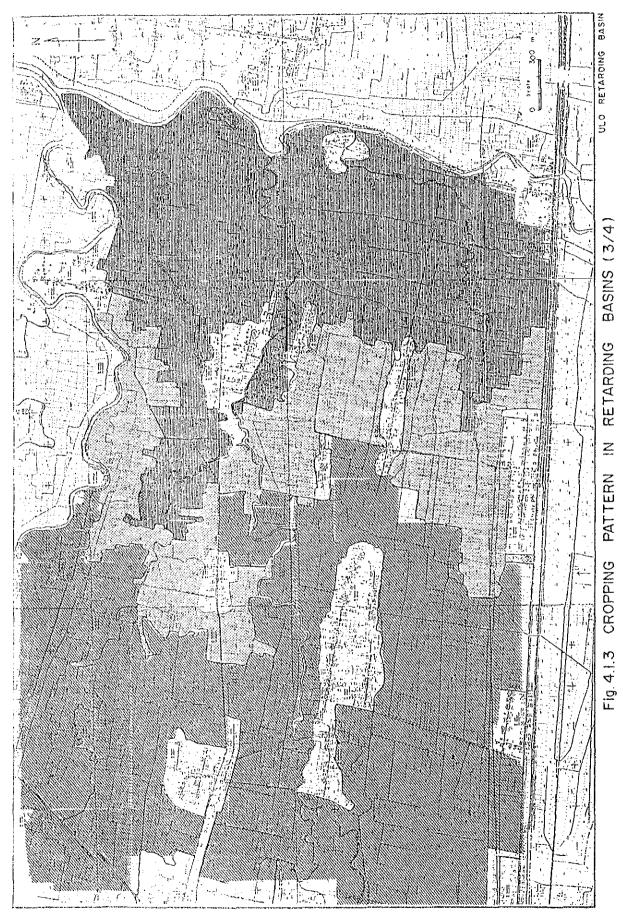
### KEDUNGSOKO RETARDING BASIN

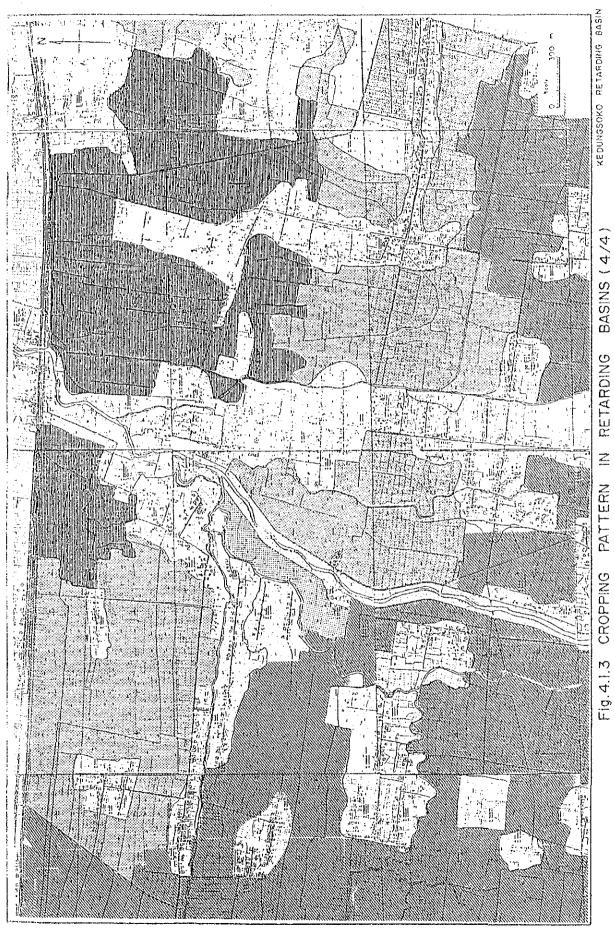


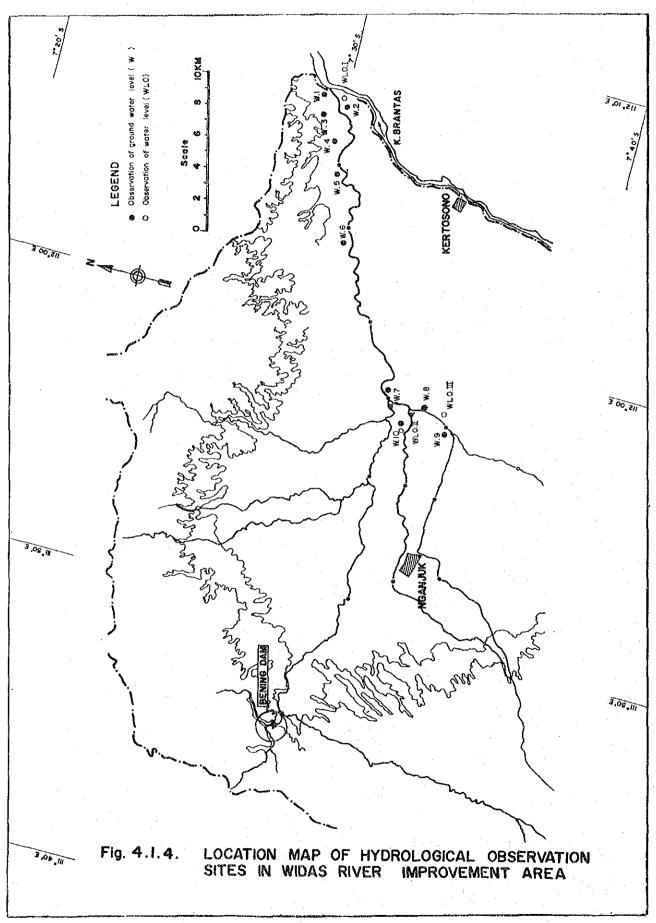


# Fig. 4.1.3 CROPPING PATTERN IN RETARDING BASINS (1/4)









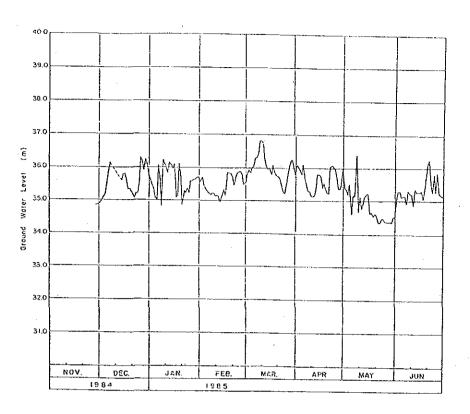
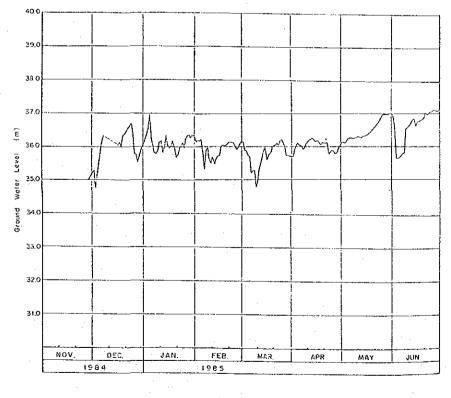
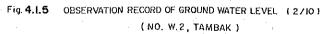
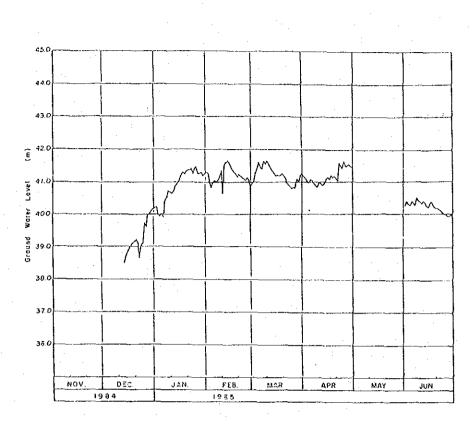
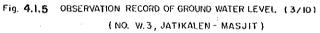


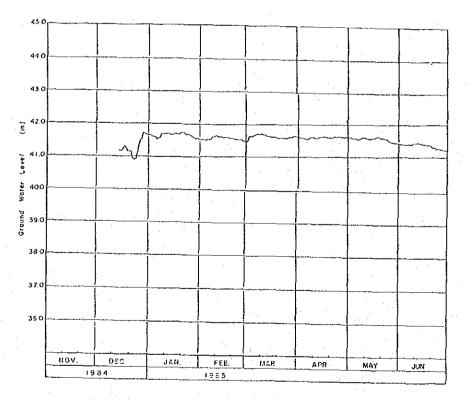
Fig. 4.1.5 OBSERVATION RECORD OF GROUND WATER LEVEL (1/10) (NO. W.1, BEGENDENG)

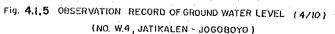












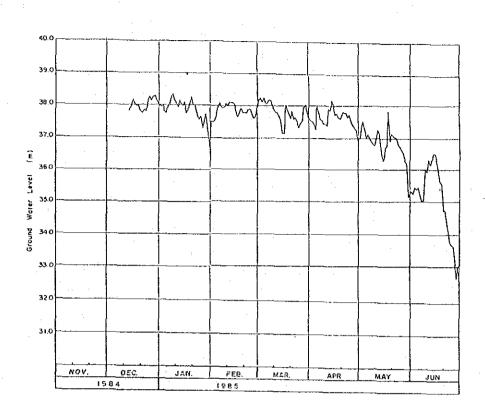


Fig. 4.1.5 OBSERVATION RECORD OF GROUND WATER LEVEL (5/10) (NO. W.5, KEDUNGMLATEN)

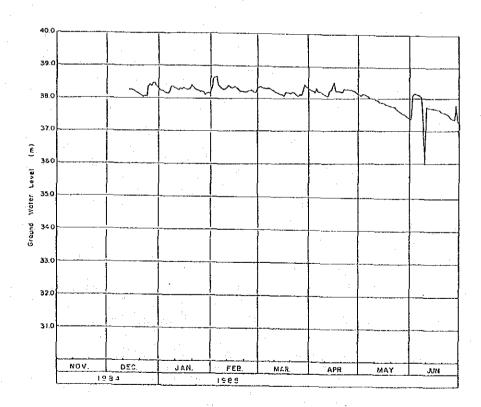


Fig. 4.1.5 OBSERVATION RECORD OF GROUND WATER LEVEL (6/10) ( NO. W.G., BANJARDOWO )

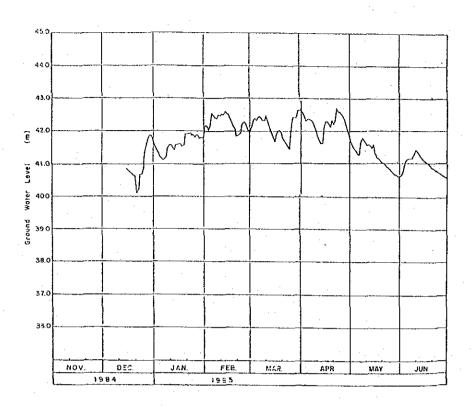


Fig. 4.1.5 OBSERVATION RECORD OF GROUND WATER LEVEL (7/10) (NO. W.7, PANCAR)

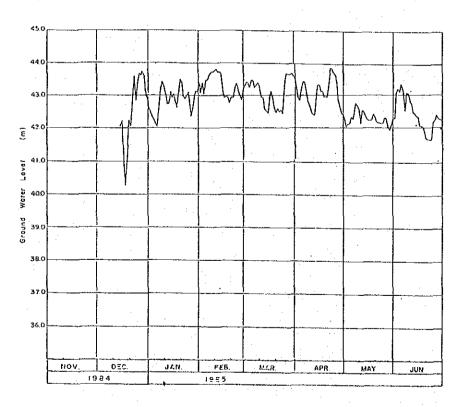


Fig. 4.1.5 OBSERVATION RECORD OF GROUND WATER LEVEL (8/10) (NO. WB, KEDUNGREGUL)

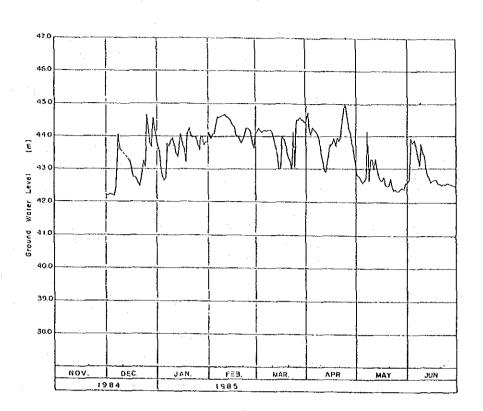
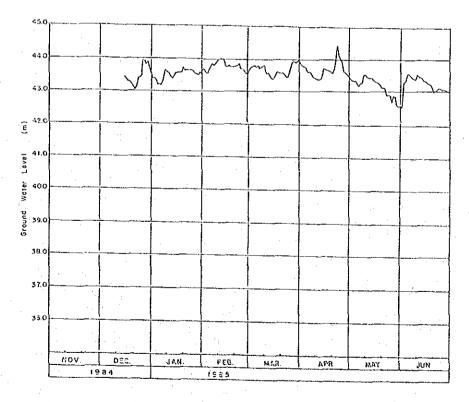
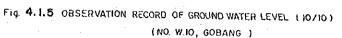
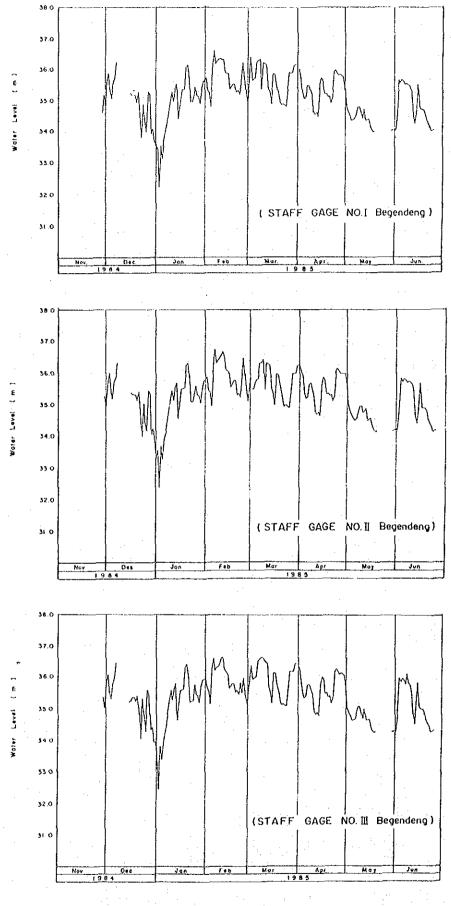
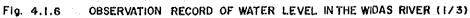


Fig. 4.1.5 OBSERVATION RECORD OF GROUND WATER LEVEL (9/10) ( NO. W.9., SUMBERWARU )









4.32

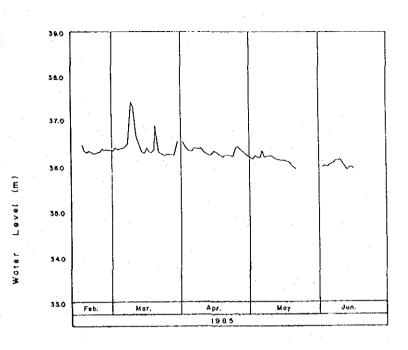


Fig. 4.1.6. OBSERVATION RECORD OF WATER LEVEL IN WIDAS RETARDING BASIN (2/3)

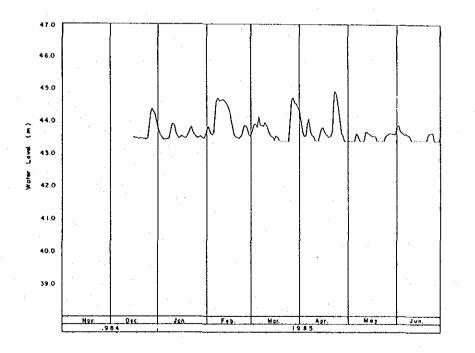
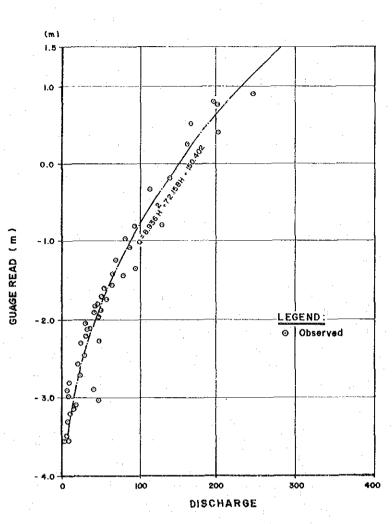
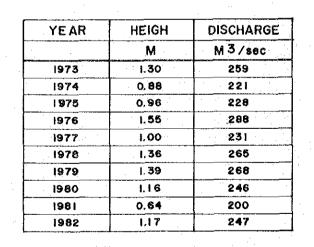


FIG. 4.1.6. OBSERVATION RECORD OF WATER LEVEL IN KEDUNGSOKO RETARDING BASIN (3/3)

4.33



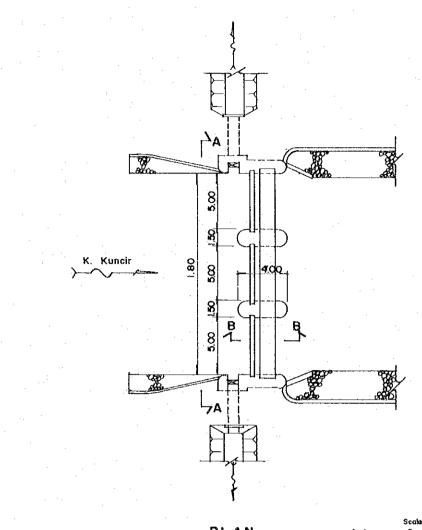




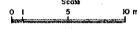
### ESTIMATED ANNUAL MAX. DISCHARGES

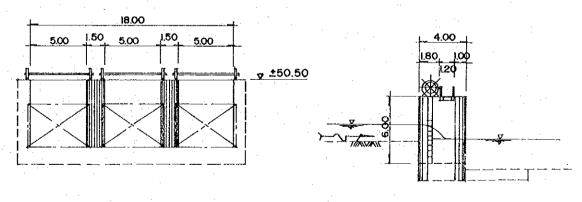
Fig. 4.1.7.

## ANNUAL MAXIMUM DISCHARGE AT LENGKONG BRIDGE









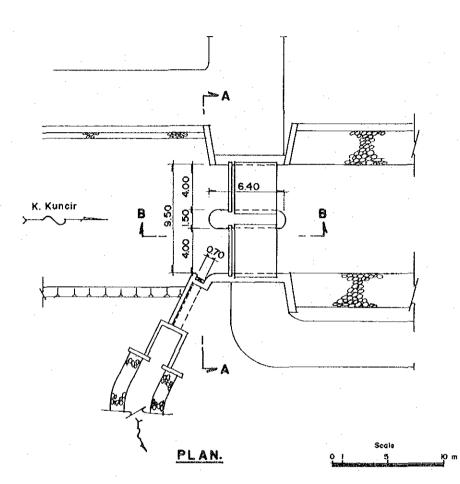


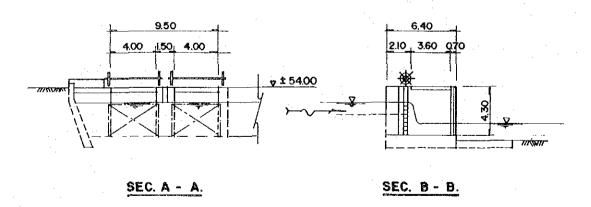
SEC. B - B

Note : Base structure is based on data collected at Pengairan SeksiNganjuk offices

Fig. 4.1.8.

SKETCH OF KAPAS DAM (1/4)

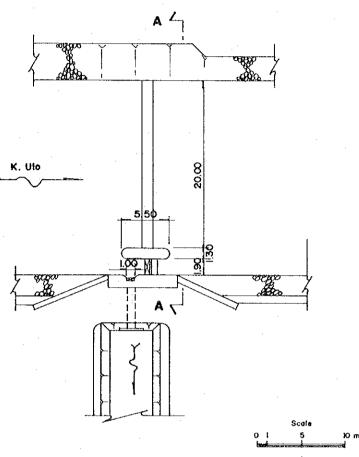




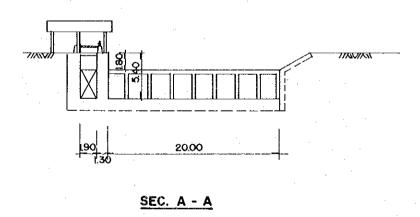
Note : Base structure is based on data collected at Pengairan Seksi Nganjuk offices

Fig. 4.1.8.

- 8. SKETCH OF KRAMAT (TANJUNG) DAM (2/4)
  - 4.36

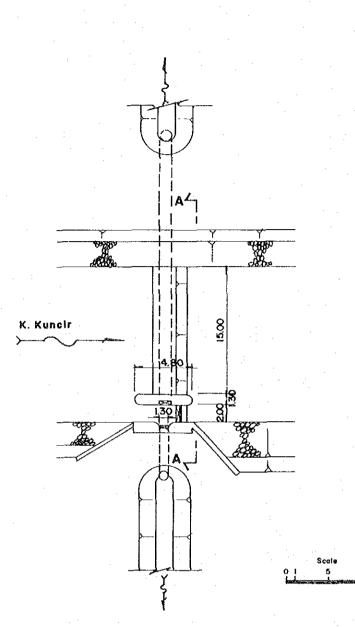




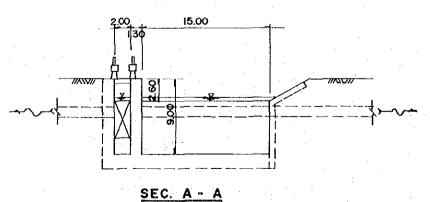


Note : Base structure is based on data collected at Pengairan SeksiNganluk offices

Fig. 4.1.8. SKETCH OF BULAKMOJO WEIR (3/4)







Note : Base structure is based on data collected at Pengairan Seksi Nganjuk offices

SKETCH OF KEDUNGGERIT DAM (4/4) Fig. 4.1.8.