FEATURE OF WATER DEMAND AND SUPPLY BALANCE IN MUDA & KEDAH RIVER SYSTEM (1/6)
(UNDER THE COMPREHENSIVE DAM OPERATION WITH WATER SAVING)

(unit : million cum)

YEAR / MONTH	MUDA RIVER SYSTEM								KEDAH RIVER SYSTE						DRAW OFF FROM RESERVOIR				CONVEYANCE	
	DOMESTIC/INDUSTRIAL				IRRIGATION				D / I		IRRIGATION									
	P.PINANG		MUDA		P.PINANG		MUDA		KEDAH		MADA NORTH FRINGE		MADA SOUTH FRINGE		MUDA & PEDU	AHNINO	BERIS	NAOK & REMAN	MUDA TO PEDU	JENIANG TRANSFER
	ABSTRACTION	DEFICIT	ABSTRACTION	DEFICIT	ABSTRACTION	DEFICIT	ABSTRACTION	DEFICIT	ABSTRACTION	DEFICIT	ABSTRACTION	DEFICIT	ABSTRACTION	DEFICIT						
1962																				
1	29.8	.0	12.8	.0	9.8	.0	4.3	.0	12.3	.0	157.5	.0	145.5	.0	262.5	2.7	5.1	29.7	40.5	27.7
2	26.9	.0	11.5	.0	1.9	.0	.0	.0	11.1	.0	60.3	.0	54.3	.0	108.9	.6	5.7	2.1	17.9	1.4
3	29.8	.0	12.8	.0	11.3	.0	12.0	.0	12.3	.0	71.8	.0	61.1	.0	113.2	6.3	4.8	8.4	28.6	7.1
4	28.8	.0	12.4	.0	20.6	.0	19.6	.0	11.9	.0	96.9	.0	117.9	.0	208.3	2.0	8.4	1.5	24.7	.2
5	29.8	.0	12.8	.0	11.8	.0	7.6	.0	12.3	.0	89.7	.0	19.6	.0	64.1	13.6	3.1	12.5	69.8	8.8
6	28.8	.0	12.4	.0	14.2	.0	8.3	.0	11.9	.0	38.2	.0	5.9	.0	36.0	2.4	3.1	5.6	61.4	4.2
7	29.8	.0	12.8	.0	3.1	.0	.8	.0	12.3	.0	6.6	.0	.0	.0	4.9	9.4	7.1	2.5	71.0	.1
8	29.8	.0	12.8	.0	.9	.0	3.1	.0	12.3	.0	14.1	.0	10.2	.0	4.5	2.8	9.4	7.9	79.8	6.3
9	28.8	.0	12.4	.0	12.7	.0	16.8	.0	11.9	.0	70.8	.0	61.0	.0	45.2	10.9	9.1	23.1	77.6	24.6
10	29.8	.0	12.8	.0	3.5	.0	3.2	.0	12.3	.0	59.0	.0	42.8	.0	47.8	9.8	12.1	25.4	102.7	18.6
11	28.8	.0	12.4	.0	.0	.0	.0	.0	11.9	.0	8.3	.0	4.2	.0	.0	5.6	9.5	4.2	80.4	.0
12	29.8	.0	12.8	.0	.0	.0	2.1	.0	12.3	.0	81.7	.0	17.0	.0	84.1	.8	6.3	11.4	53.1	9.8
ANNUAL	350.6	.0	150.5	.0	89.8	.0	77.8	.0	145.2	.0	755.0	.0	539.5	.0	979.4	66.8	83.7	134.3	707.7	108.7
1963																				
1	29.8	.0	12.8	.0	.0	.0	1.4	.0	12.3	.0	163.8	.0	107.2	.0	252.6	.7	4.4	13.4	33.7	12.1
2	26.9	.0	11.5	.0	.0	.0	.0	.0	11.1	.0	58.4	.0	49.1	.0	103.5	.5	7.1	.7	15.6	.0
3	29.8	.0	12.8	.0	11.5	.0	16.6	.0	12.3	.0	74.8	.0	71.9	.0	110.7	8.9	10.1	3.2	25.0	2.3
4	28.8	.0	12.4	.0	30.2	.0	24.7	.0	11.9	.0	180.0	.0	161.9	.0	299.5	1.8	26.6	39.1	16.2	.0
5	29.8	.0	12.8	.0	2.9	.0	4.4	.0	12.3	.0	90.9	.0	19.1	.0	81.0	4.2	4.0	18.5	47.8	52.2
6	28.8	.0	12.4	.0	11.3	.0	1.3	.0	11.9	.0	32.5	.0	2.9	.0	21.2	1.9	3.0	3.5	58.0	2.6
7	29.8	.0	12.8	.0	12.5	.0	3.0	.0	12.3	.0	71.7	.0	7.9	.0	69.3	.6	3.3	9.5	52.6	7.5
8	29.8	.0	12.8	.0	2.0	.0	5.0	.0	12.3	.0	39.1	.0	12.2	.0	41.6	.6	3.3	8.5	44.7	6.2
9	28.8	.0	12.4	.0	13.0	.0	13.7	.0	11.9	.0	60.8	.0	45.3	.0	44.4	3.1	3.0	34.3	65.2	30.5
10	29.8	.0	12.8	.0	1.2	.0	3.6	.0	12.3	.0	36.9	.0	25.4	.0	3.3	7.3	3.1	11.7	100.9	6.5
11	28.8	.0	12.4	.0	2.6	.0	.0	.0	11.9	.0	.7	.0	2.5	.0	.0	18.3	3.0	6.8	106.6	.0
12	29.8	.0	12.8	.0	.0	.0	.2	.0	12.3	.0	6.8	.0	.8	.0	5.8	3.1	6.3	4.0	88.3	.9
ANNUAL	350.6	.0	150.5	.0	87.2	.0	74.0	.0	145.2	.0	816.5	.0	506.3	.0	1032.9	50.9	77.2	153.3	654.7	120.9
1964																				
1	29.8	.0	12.8	.0	.0	.0	1.4	.0	12.3	.0	111.9	.0	80.2	.0	176.9	.5	4.5	11.5	32.7	10.7
2	27.9	.0	12.0	.0	1.2	.0	.0	.0	11.5	.0	57.1	.0	40.8	.0	94.5	.5	6.3	.9	13.9	.3
3	29.8	.0	12.8	.0	16.5	.0	18.6	.0	12.3	.0	86.1	.0	79.6	.0	128.8	.6	29.8	35.3	17.7	.0
4	28.8	.0	12.4	.0	20.6	.0	15.1	.0	11.9	.0	106.7	.0	88.1	.0	111.8	.4	11.7	81.3	28.0	3.4
5	29.8	.0	12.8	.0	3.2	.0	6.4	.0	12.3	.0	13.5	.0	21.3	.0	14.2	3.0	7.0	5.5	74.1	48.6
6	28.8	.0	12.4	.0	.0	.0	8.7	.0	11.9	.0	65.4	.0	21.0	.0	70.0	.7	3.0	9.3	55.9	32.9
7	29.8	.0	12.8	.0	2.5	.0	.6	.0	12.3	.0	74.4	.0	.0	.0	73.4	.6	3.1	.3	51.5	33.0
8	29.8	.0	12.8	.0	2.2	.0	5.7	.0	12.3	.0	44.3	.0	17.5	.0	42.0	.5	3.4	14.5	48.4	8.3
9	28.8	.0	12.4	.0	4.2	.0	4.1	.0	11.9	.0	68.5	.0	33.1	.0	16.1	8.0	3.0	18.0	109.3	27.1
10	29.8	.0	12.8	.0	5.8	.0	3.7	.0	12.3	.0	71.5	.0	48.5	.0	28.4	6.6	3.1	22.9	71.5	16.9
11	28.8	.0	12.4	.0	.0	.0	.0	.0	11.9	.0	6.0	.0	1.5	.0	.0	8.1	3.0	7.9	100.4	.0
12	29.8	.0	12.8	.0	.0	.0	.2	.0	12.3	.0	54.8	.0	2.3	.0	51.1	.9	3.1	4.1	65.0	2.2
ANNUAL	351.6	.0	150.9	.0	56.3	.0	64.5	.0	145.6	.0	760.3	.0	434.0	.0	807.3	30.4	81.0	211.6	668.4	183.5
1965																				
1	29.8	.0	12.8	.0	3.3	.0	6.3	.0	12.3	.0	168.0	.0	67.8	.0	226.1	.5	4.3	6.9	21.9	6.3
2	26.9	.0	11.5	.0	1.4	.0	.0	.0	11.1	.0	59.2	.0	25.5	.0	83.0	.3	9.7	.4	14.6	.0
3	29.8	.0	12.8	.0	12.2	.0	14.4	.0	12.3	.0	76.9	.0	66.2	.0	77.7	.3	17.2	64.9	13.5	.2
4	28.8	.0	12.4	.0	12.3	.0	12.6	.0	11.9	.0	85.5	.0	114.4	.0	112.4	2.6	4.7	53.6	70.6	45.2
5	29.8	.0	12.8	.0	12.2	.0	4.4	.0	12.3	.0	21.6	.0	32.9	.0	28.7	7.6	3.1	.0	39.5	33.9
6	28.8	.0	12.4	.0	26.3	.0	16.5	.0	11.9	.0	6.7	.0	38.6	.0	29.0	1.2	3.1	12.2	45.4	27.6
7	29.8	.0	12.8	.0	4.4	.0	3.5	.0	12.3	.0	12.2	.0	24.6	.0	11.9	.5	3.5	24.7	47.8	29.4
8	29.8	.0	12.8	.0	1.0	.0	3.1	.0	12.3	.0	11.2	.0	16.8	.0	5.4	8.7	3.1	5.9	44.9	12.8
9	28.8	.0	12.4	.0	8.7	.0	10.1	.0	11.9	.0	58.3	.0	42.2	.0	7.4	6.7	3.0	22.0	66.6	27.5
10	29.8	.0	12.8	.0	7.4	.0	2.7	.0	12.3	.0	44.3	.0	42.9	.0	23.6	13.9	3.1	22.6	107.5	15.5
11	28.8	.0	12.4	.0	3.3	.0	.0	.0	11.9	.0	11.7	.0	2.1	.0	.0	16.1	10.3	6.8	99.0	.0
12	29.8	.0	12.8	.0	.0	.0	1.5	.0	12.3	.0	12.8	.0	.0	.0	.0	18.5	14.5	5.9	123.1	.0
ANNUAL	350.6	.0	150.5	.0	92.5	.0	75.1	.0	145.2	.0	568.3	.0	474.0	.0	605.3	77.0	79.6	226.0	694.6	198.6
1966																				
1	29.8	.0	12.8	.0	.0	.0	.4	.0	12.3	.0	78.5	.0	28.0	.0	80.6	1.6	7.2	16.0	61.3	15.5
2	26.9	.0	11.5	.0	.0	.0	.0	.0	11.1	.0	45.5	.0	37.0	.0	72.9	.7	3.4	8.8	26.8	7.6
3	29.8	.0	12.8	.0	10.1	.0	13.4	.0	12.3	.0	60.5	.0	57.5	.0	109.6	.5	5.3	6.3	20.6	5.4
4	28.8	.0	12.4	.0	7.4	.0	17.9	.0	11.9	.0	86.2	.0	84.2	.0	157.0	1.4	5.0	8.4	25.7	6.4
5	29.8	.0	12.8	.0	3.1	.0	2.1	.0	12.3	.0	8.5	.0	7.5	.0	7.3	3.6	3.1	8.2	55.1	4.0
6	28.8	.0	12.4	.0	3.5	.0	8.7	.0	11.9	.0	1.1	.0	.0	.0	.4	4.0	4.9	3.1	56.2	.0
7	29.8	.0	12.8	.0	.0	.0	2.5	.0	12.3	.0	8.9	.0	6.3	.0	8.6	.8	4.6	7.3	39.3	4.6
8	29.8	.0	12.8	.0	.7	.0	3.1	.0	12.3	.0	26.9	.0	18.2	.0	29.0	1.3	4.2	15.0	35.7	13.5
9	28.8	.0	12.4	.0	12.3	.0	14.1	.0	11.9	.0	66.5	.0	52.4	.0	70.3	6.4	5.8	17.8	48.9	16.5
10	29.8	.0	12.8	.0	5.1	.0	5.5	.0	12.3	.0	57.7	.0	37.3	.0	8.2	23.3	8.7	21.2	73.8	16.0
11	28.8	.0	12.4	.0	2.4	.0	1.6	.0	11.9	.0	7.7	.0	10.6	.0	.0	3.4	9.4	5.9	79.7	.4
12	29.8	.0	12.8	.0	.4	.0	8.1	.0	12.3	.0	.0	.0	5.7	.0	.0	5.5	8.8	10.2	75.0	4.2
ANNUAL	350.6	.0	150.5	.0	45.0	.0	77.4	.0	145.2	.0	448.1	.0	344.8	.0	543.7	52.3	70.5	128.1	598.0	94.3

FEATURE OF WATER DEMAND AND SUPPLY BALANCE IN MUDA & KEDAH RIVER SYSTEM (2/6)
(UNDER THE COMPREHENSIVE DAM OPERATION WITH WATER SAVING)

(unit : million cum)

YEAR / MONTH	MUDA RIVER SYSTEM								KEDAH RIVER SYSTEM						DRAW OFF FROM RESERVOIR				CONVEYANCE	
	DOMESTIC/INDUSTRIAL				IRRIGATION				D / I		IRRIGATION									
	P.PINANG		MUDA		P.PINANG		MUDA		KEDAH		MADA NORTH FRINGE		MADA SOUTH FRINGE		MUDA & PEDU	AHNING	BERIS	NAOK & REMAN	MUDA TO PEDU	JENIANG TRANSFER
	ABSTRACTION	DEFICIT	ABSTRACTION	DEFICIT	ABSTRACTION	DEFICIT	ABSTRACTION	DEFICIT	ABSTRACTION	DEFICIT	ABSTRACTION	DEFICIT	ABSTRACTION	DEFICIT						
1967																				
1	29.8	.0	12.8	.0	1.6	.0	2.7	.0	12.3	.0	.0	.0	39.2	.0	19.7	4.2	8.7	19.3	73.5	15.7
2	26.9	.0	11.5	.0	1.8	.0	.0	.0	11.1	.0	30.6	.0	50.1	.0	68.8	.5	3.1	7.3	17.8	6.9
3	29.8	.0	12.8	.0	14.7	.0	17.5	.0	12.3	.0	82.4	.0	78.8	.0	156.8	.6	8.4	1.2	19.6	.3
4	28.8	.0	12.4	.0	19.9	.0	19.2	.0	11.9	.0	66.3	.0	85.3	.0	138.8	1.0	8.0	5.0	32.9	3.4
5	29.8	.0	12.8	.0	9.7	.0	18.1	.0	12.3	.0	7.6	.0	24.6	.0	.0	12.9	3.6	15.0	125.6	8.0
6	28.8	.0	12.4	.0	17.5	.0	6.3	.0	11.9	.0	2.1	.0	14.7	.0	8.1	9.2	8.8	8.1	74.4	4.7
7	29.8	.0	12.8	.0	5.7	.0	1.8	.0	12.3	.0	.8	.0	.0	.0	.0	2.8	9.0	2.7	76.7	.0
8	29.8	.0	12.8	.0	2.0	.0	2.1	.0	12.3	.0	25.0	.0	17.6	.0	19.1	2.3	6.4	8.9	54.0	10.1
9	28.8	.0	12.4	.0	16.6	.0	14.3	.0	11.9	.0	54.7	.0	50.9	.0	32.0	2.8	5.2	29.9	44.1	27.7
10	29.8	.0	12.8	.0	6.6	.0	4.4	.0	12.3	.0	39.0	.0	45.1	.0	77.5	15.6	10.1	20.1	18.2	15.7
11	28.8	.0	12.4	.0	3.7	.0	1.1	.0	11.9	.0	10.1	.0	5.7	.0	115.1	10.5	11.8	7.0	.0	.0
12	29.8	.0	12.8	.0	.0	.0	2.6	.0	12.3	.0	53.1	.0	55.9	.0	134.8	2.9	9.1	21.8	28.4	18.8
ANNUAL	350.6	.0	150.5	.0	99.7	.0	90.1	.0	145.2	.0	371.6	.0	467.8	.0	770.7	65.4	92.1	146.4	565.2	111.5
1968																				
1	29.8	.0	12.8	.0	4.0	.0	8.5	.0	12.3	.0	158.5	.0	147.2	.0	292.5	.8	3.7	7.7	22.6	6.8
2	27.9	.0	12.0	.0	1.3	.0	.0	.0	11.5	.0	59.7	.0	50.3	.0	101.4	.6	5.3	4.0	21.1	3.2
3	29.8	.0	12.8	.0	12.3	.0	15.7	.0	12.3	.0	69.8	.0	67.5	.0	114.2	5.3	11.3	.6	15.7	.0
4	28.8	.0	12.4	.0	19.1	.0	15.1	.0	11.9	.0	91.8	.0	122.7	.0	138.6	16.0	13.9	3.7	25.6	2.2
5	29.8	.0	12.8	.0	12.3	.0	2.1	.0	12.3	.0	22.5	.0	40.8	.0	18.5	4.9	4.0	11.8	37.7	9.7
6	28.8	.0	12.4	.0	14.7	.0	10.8	.0	11.9	.0	8.7	.0	6.1	.0	8.4	.9	3.0	5.1	34.1	3.9
7	29.8	.0	12.8	.0	2.7	.0	.3	.0	12.3	.0	20.0	.0	5.3	.0	4.0	2.4	3.1	4.7	73.0	.9
8	29.8	.0	12.8	.0	2.4	.0	5.6	.0	12.3	.0	20.2	.0	19.4	.0	.8	3.1	3.1	13.4	47.8	8.8
9	28.8	.0	12.4	.0	13.9	.0	15.4	.0	11.9	.0	61.6	.0	53.8	.0	14.5	3.7	3.0	21.4	56.7	22.5
10	29.8	.0	12.8	.0	13.3	.0	6.3	.0	12.3	.0	68.1	.0	29.3	.0	2.1	14.4	3.1	8.3	82.0	.5
11	28.8	.0	12.4	.0	.0	.0	1.7	.0	11.9	.0	9.2	.0	14.3	.0	2.0	4.5	3.1	6.3	63.2	4.9
12	29.8	.0	12.8	.0	1.4	.0	1.0	.0	12.3	.0	12.5	.0	53.8	.0	41.0	5.5	4.3	13.2	36.3	12.5
ANNUAL	351.6	.0	150.9	.0	97.3	.0	82.5	.0	145.6	.0	602.5	.0	610.5	.0	738.1	62.3	60.8	100.3	515.8	76.0
1969																				
1	29.8	.0	12.8	.0	.9	.0	4.5	.0	12.3	.0	111.1	.0	39.7	.0	128.3	1.3	4.3	11.7	32.2	9.7
2	26.9	.0	11.5	.0	1.9	.0	.0	.0	11.1	.0	58.5	.0	39.7	.0	86.4	.7	5.2	6.1	20.6	5.4
3	29.8	.0	12.8	.0	12.2	.0	14.2	.0	12.3	.0	63.0	.0	70.7	.0	116.8	.9	11.7	5.9	23.1	3.5
4	28.8	.0	12.4	.0	30.7	.0	21.0	.0	11.9	.0	132.3	.0	143.3	.0	223.3	1.1	4.7	26.6	36.1	24.8
5	29.8	.0	12.8	.0	6.4	.0	5.2	.0	12.3	.0	80.1	.0	22.6	.0	51.3	4.6	3.1	10.7	56.7	6.2
6	28.8	.0	12.4	.0	9.1	.0	7.3	.0	11.9	.0	37.5	.0	.9	.0	30.6	3.2	3.0	3.8	46.9	.5
7	29.8	.0	12.8	.0	2.3	.0	.7	.0	12.3	.0	8.4	.0	.0	.0	4.5	4.9	3.1	3.6	51.1	.1
8	29.8	.0	12.8	.0	3.6	.0	3.6	.0	12.3	.0	36.6	.0	13.7	.0	18.7	11.2	5.0	7.7	72.9	1.9
9	28.8	.0	12.4	.0	16.9	.0	18.4	.0	11.9	.0	84.7	.0	57.8	.0	44.8	6.9	8.5	30.5	71.8	32.5
10	29.8	.0	12.8	.0	3.2	.0	2.2	.0	12.3	.0	74.1	.0	57.9	.0	8.0	7.8	10.5	23.4	89.1	17.0
11	28.8	.0	12.4	.0	.9	.0	.0	.0	11.9	.0	3.1	.0	6.5	.0	.0	16.4	10.1	8.3	85.4	.0
12	29.8	.0	12.8	.0	.0	.0	1.0	.0	12.3	.0	39.6	.0	1.1	.0	29.7	3.7	7.6	4.9	64.5	1.4
ANNUAL	350.6	.0	150.5	.0	88.2	.0	78.1	.0	145.2	.0	729.0	.0	454.1	.0	742.4	62.8	76.7	143.1	650.5	103.0
1970																				
1	29.8	.0	12.8	.0	.0	.0	1.2	.0	12.3	.0	136.0	.0	87.0	.0	198.9	.8	3.5	16.0	24.3	14.5
2	26.9	.0	11.5	.0	.5	.0	.0	.0	11.1	.0	60.8	.0	55.5	.0	109.1	.7	5.1	.9	11.7	.1
3	29.8	.0	12.8	.0	13.7	.0	16.3	.0	12.3	.0	59.6	.0	67.1	.0	118.5	.8	11.3	2.8	19.8	2.0
4	28.8	.0	12.4	.0	23.2	.0	12.5	.0	11.9	.0	136.9	.0	100.0	.0	218.6	1.1	6.7	5.8	18.4	3.5
5	29.8	.0	12.8	.0	8.7	.0	10.1	.0	12.3	.0	29.8	.0	20.3	.0	9.7	7.3	3.1	12.7	66.5	10.1
6	28.8	.0	12.4	.0	16.2	.0	11.0	.0	11.9	.0	7.4	.0	1.8	.0	2.5	4.5	3.2	4.1	48.0	.5
7	29.8	.0	12.8	.0	.0	.0	.0	.0	12.3	.0	4.6	.0	3.7	.0	.0	5.4	3.1	5.3	52.6	1.8
8	29.8	.0	12.8	.0	2.6	.0	5.4	.0	12.3	.0	18.3	.0	18.6	.0	.0	4.8	3.1	12.4	51.7	7.3
9	28.8	.0	12.4	.0	10.1	.0	7.5	.0	11.9	.0	37.8	.0	18.0	.0	.8	11.6	4.8	9.3	79.5	4.9
10	29.8	.0	12.8	.0	2.3	.0	1.0	.0	12.3	.0	61.0	.0	21.0	.0	.0	13.9	9.0	16.0	76.5	8.9
11	28.8	.0	12.4	.0	.0	.0	.0	.0	11.9	.0	7.5	.0	.0	.0	.0	9.6	9.4	8.3	80.1	.0
12	29.8	.0	12.8	.0	.0	.0	.6	.0	12.3	.0	44.4	.0	.0	.0	25.3	15.4	9.1	4.2	77.3	.2
ANNUAL	350.6	.0	150.5	.0	77.1	.0	65.8	.0	145.2	.0	604.0	.0	392.9	.0	683.4	76.0	71.5	97.7	606.4	53.7
1971																				
1	29.8	.0	12.8	.0	.2	.0	1.1	.0	12.3	.0	132.3	.0	32.0	.0	128.0	2.6	5.5	16.6	46.3	13.9
2	26.9	.0	11.5	.0	1.9	.0	.0	.0	11.1	.0	47.1	.0	39.4	.0	79.4	4.0	11.1	2.9	33.0	.7
3	29.8	.0	12.8	.0	12.3	.0	17.5	.0	12.3	.0	65.5	.0	67.1	.0	82.0	7.6	3.5	18.4	89.7	15.9
4	28.8	.0	12.4	.0	31.6	.0	19.3	.0	11.9	.0	178.3	.0	150.4	.0	318.8	.8	8.5	2.4	28.5	1.2
5	29.8	.0	12.8	.0	20.9	.0	9.0	.0	12.3	.0	21.8	.0	17.2	.0	25.3	2.6	3.6	9.0	42.3	7.0
6	28.8	.0	12.4	.0	16.5	.0	9.7	.0	11.9	.0	6.6	.0	.0	.0	2.3	3.1	3.5	3.0	60.7	.1
7	29.8	.0	12.8	.0	8.9	.0	1.6	.0	12.3	.0	15.2	.0	7.7	.0	11.9	1.7	6.0	7.9	52.7	5.1
8	29.8	.0	12.8	.0	.7	.0	1.2	.0	12.3	.0	42.0	.0	19.0	.0	16.2	16.0	6.8	11.9	57.9	7.0
9	28.8	.0	12.4	.0	6.1	.0	6.9	.0	11.9	.0	46.1	.0	42.5	.0	14.3	6.3	8.1	27.6	69.0	28.3
10	29.8	.0	12.8	.0	6.7	.0	2.9	.0	12.3	.0	57.0	.0	33.3	.0	27.6	10.7	8.3	18.1	70.0	11.5
11	28.8	.0	12.4	.0	2.6	.0	.7	.0	11.9	.0	15.2	.0	.8	.0	1.6	7.9	6.8	4.4	57.6	.0
12	29.8	.0	12.8	.0	.0	.0	.6	.0	12.3	.0	7.9	.0	8.9	.0	5.9	3.4	5.4	7.5	45.8	5.6
ANNUAL	350.6	.0	150.5	.0	108.4	.0	70.5	.0	145.2	.0	634.9	.0	418.4	.0	713.3	66.7	77.0	129.8	653.5	96.3

FEATURE OF WATER DEMAND AND SUPPLY BALANCE IN MUDA & KEDAH RIVER SYSTEM (3/6)
(UNDER THE COMPREHENSIVE DAM OPERATION WITH WATER SAVING)

(unit : million cum)

YEAR / MONTH	MUDA RIVER SYSTEM								KEDAH RIVER SYSTE						DRAW OFF FROM RESERVOIR				CONVEYANCE	
	DOMESTIC/INDUSTRIAL				IRRIGATION				D / I		IRRIGATION									
	P.PINANG		MUDA		P.PINANG		MUDA		KEDAH		MADA NORTH FRINGE		MADA SOUTH FRINGE		MUDA & PEDU	AHNING	BERIS	NAOK & REMAN	MUDA TO PEDU	JENIANG TRANSFER
	ABSTRACTION	DEFICIT	ABSTRACTION	DEFICIT	ABSTRACTION	DEFICIT	ABSTRACTION	DEFICIT	ABSTRACTION	DEFICIT	ABSTRACTION	DEFICIT	ABSTRACTION	DEFICIT						
1972																				
1	29.8	.0	12.8	.0	3.0	.0	1.9	.0	12.3	.0	145.8	.0	82.1	.0	209.7	1.1	3.8	8.5	16.9	6.9
2	27.9	.0	12.0	.0	1.2	.0	.0	.0	11.5	.0	52.6	.0	29.0	.0	73.9	.8	9.2	2.1	29.8	.8
3	29.8	.0	12.8	.0	11.1	.0	17.8	.0	12.3	.0	73.9	.0	67.0	.0	129.4	.8	9.4	3.4	18.2	2.4
4	28.8	.0	12.4	.0	14.6	.0	12.7	.0	11.9	.0	77.5	.0	109.0	.0	137.0	3.6	5.3	14.6	42.2	11.6
5	29.8	.0	12.8	.0	18.1	.0	16.8	.0	12.3	.0	66.2	.0	37.3	.0	48.9	1.1	3.1	21.3	54.5	19.2
6	28.8	.0	12.4	.0	.4	.0	4.6	.0	11.9	.0	12.8	.0	21.8	.0	19.9	.8	3.0	10.9	60.7	10.1
7	29.8	.0	12.8	.0	7.5	.0	7.3	.0	12.3	.0	11.8	.0	60.3	.0	46.6	.8	3.8	17.8	42.6	18.4
8	29.8	.0	12.8	.0	2.8	.0	6.9	.0	12.3	.0	17.3	.0	25.1	.0	28.9	1.5	3.6	10.5	41.5	9.4
9	28.8	.0	12.4	.0	4.9	.0	5.4	.0	11.9	.0	37.4	.0	32.6	.0	11.2	19.3	6.1	10.9	94.4	2.3
10	29.8	.0	12.8	.0	10.3	.0	5.6	.0	12.3	.0	68.6	.0	46.9	.0	7.8	7.2	12.3	32.6	104.2	26.4
11	28.8	.0	12.4	.0	.0	.0	.0	.0	11.9	.0	3.1	.0	3.0	.0	26.0	29.1	13.4	14.1	91.4	.0
12	29.8	.0	12.8	.0	.0	.0	2.7	.0	12.3	.0	.0	.0	6.2	.0	117.1	2.8	11.9	6.3	.0	.8
ANNUAL	351.6	.0	150.9	.0	73.9	.0	81.8	.0	145.6	.0	566.9	.0	520.2	.0	856.4	68.9	84.9	153.0	596.5	108.3
1973																				
1	29.8	.0	12.8	.0	.0	.0	7.7	.0	12.3	.0	27.6	.0	33.6	.0	80.5	4.0	5.9	13.5	12.5	12.2
2	26.9	.0	11.5	.0	.0	.0	.0	.0	11.1	.0	49.9	.0	47.2	.0	84.7	.7	5.3	4.2	16.8	3.3
3	29.8	.0	12.8	.0	9.0	.0	14.6	.0	12.3	.0	70.7	.0	71.0	.0	132.5	.8	8.2	1.4	23.7	.3
4	28.8	.0	12.4	.0	9.8	.0	14.1	.0	11.9	.0	93.7	.0	47.9	.0	98.5	3.9	3.0	26.9	73.8	19.5
5	29.8	.0	12.8	.0	9.0	.0	9.0	.0	12.3	.0	31.0	.0	23.4	.0	2.0	12.0	9.1	14.2	101.3	5.1
6	28.8	.0	12.4	.0	2.7	.0	8.8	.0	11.9	.0	62.3	.0	8.2	.0	37.3	12.9	9.7	9.4	82.7	7.6
7	29.8	.0	12.8	.0	4.9	.0	1.3	.0	12.3	.0	44.5	.0	.0	.0	78.1	1.0	9.2	5.4	48.0	.5
8	29.8	.0	12.8	.0	.6	.0	1.9	.0	12.3	.0	23.1	.0	5.3	.0	161.4	3.2	15.1	10.2	.0	2.1
9	28.8	.0	12.4	.0	17.5	.0	17.7	.0	11.9	.0	84.8	.0	53.5	.0	95.8	1.7	9.9	30.1	7.5	41.1
10	29.8	.0	12.8	.0	12.7	.0	3.8	.0	12.3	.0	44.2	.0	28.4	.0	123.9	5.2	11.8	20.0	3.1	12.4
11	28.8	.0	12.4	.0	.0	.0	.0	.0	11.9	.0	7.5	.0	13.3	.0	118.0	7.7	11.7	9.2	.0	2.3
12	29.8	.0	12.8	.0	.0	.0	2.6	.0	12.3	.0	3.4	.0	10.3	.0	122.6	8.7	12.3	13.8	.0	5.1
ANNUAL	350.6	.0	150.5	.0	66.3	.0	81.2	.0	145.2	.0	542.9	.0	342.0	.0	1135.4	61.9	111.2	158.4	371.3	111.6
1974																				
1	29.8	.0	12.8	.0	.0	.0	7.6	.0	12.3	.0	87.8	.0	94.9	.0	151.6	1.1	5.2	21.0	42.1	19.1
2	26.9	.0	11.5	.0	1.3	.0	.0	.0	11.1	.0	44.2	.0	38.0	.0	68.3	1.0	3.0	6.5	20.6	5.0
3	29.8	.0	12.8	.0	12.8	.0	16.4	.0	12.3	.0	60.2	.0	64.3	.0	113.9	.8	6.1	1.4	21.4	.4
4	28.8	.0	12.4	.0	13.2	.0	10.7	.0	11.9	.0	139.4	.0	96.1	.0	213.3	.8	11.9	13.9	46.3	12.5
5	29.8	.0	12.8	.0	2.8	.0	7.5	.0	12.3	.0	47.0	.0	14.7	.0	42.2	.9	3.1	9.0	50.5	3.2
6	28.8	.0	12.4	.0	17.6	.0	14.8	.0	11.9	.0	15.1	.0	19.2	.0	16.4	3.8	3.6	7.0	34.4	4.5
7	29.8	.0	12.8	.0	9.8	.0	8.5	.0	12.3	.0	.0	.0	5.9	.0	.6	1.4	3.5	4.6	36.9	3.0
8	29.8	.0	12.8	.0	2.9	.0	7.5	.0	12.3	.0	16.3	.0	13.1	.0	17.0	.8	3.1	9.2	37.5	8.3
9	28.8	.0	12.4	.0	10.3	.0	9.1	.0	11.9	.0	59.6	.0	38.2	.0	30.2	10.5	3.7	18.0	74.1	12.2
10	29.8	.0	12.8	.0	9.7	.0	4.0	.0	12.3	.0	57.5	.0	34.0	.0	10.8	7.2	8.4	17.5	71.2	16.8
11	28.8	.0	12.4	.0	2.1	.0	3.0	.0	11.9	.0	19.1	.0	1.4	.0	3.8	7.0	3.4	7.0	26.9	1.6
12	29.8	.0	12.8	.0	9.8	.0	22.4	.0	12.3	.0	138.0	.0	47.1	.0	163.6	1.9	4.5	5.1	18.5	3.6
ANNUAL	350.6	.0	150.5	.0	92.4	.0	109.8	.0	145.2	.0	684.1	.0	466.8	.0	831.5	37.1	59.5	120.2	480.5	90.2
1975																				
1	29.8	.0	12.8	.0	5.9	.0	3.3	.0	12.3	.0	50.8	.0	52.2	.0	89.3	3.9	4.6	6.7	20.7	3.8
2	26.9	.0	11.5	.0	.8	.0	.0	.0	11.1	.0	30.8	.0	45.6	.0	67.1	.7	5.7	1.8	15.6	.1
3	29.8	.0	12.8	.0	8.2	.0	14.9	.0	12.3	.0	61.0	.0	68.3	.0	110.7	.8	5.6	8.7	28.5	6.7
4	28.8	.0	12.4	.0	18.8	.0	19.4	.0	11.9	.0	96.2	.0	55.5	.0	114.9	2.2	3.0	22.1	37.5	21.2
5	29.8	.0	12.8	.0	18.4	.0	10.3	.0	12.3	.0	47.7	.0	7.4	.0	41.0	2.0	7.0	10.0	63.2	4.5
6	28.8	.0	12.4	.0	17.4	.0	13.6	.0	11.9	.0	31.1	.0	42.5	.0	29.0	2.8	3.0	13.1	42.3	10.6
7	29.8	.0	12.8	.0	6.0	.0	5.8	.0	12.3	.0	24.6	.0	47.8	.0	47.1	10.5	3.8	12.2	52.4	6.7
8	29.8	.0	12.8	.0	2.1	.0	5.5	.0	12.3	.0	28.5	.0	25.4	.0	33.5	2.3	3.1	10.4	44.7	8.3
9	28.8	.0	12.4	.0	5.9	.0	9.5	.0	11.9	.0	47.5	.0	19.6	.0	5.8	13.5	4.8	12.6	61.6	8.3
10	29.8	.0	12.8	.0	11.1	.0	5.4	.0	12.3	.0	60.7	.0	38.5	.0	35.8	6.6	7.7	23.7	65.2	19.9
11	28.8	.0	12.4	.0	1.1	.0	.0	.0	11.9	.0	9.9	.0	16.1	.0	.0	23.9	10.3	7.2	87.2	.1
12	29.8	.0	12.8	.0	.9	.0	.0	.0	12.3	.0	1.2	.0	6.3	.0	.0	11.0	12.4	9.6	104.8	.3
ANNUAL	350.6	.0	150.5	.0	96.5	.0	87.8	.0	145.2	.0	490.0	.0	425.3	.0	574.3	80.3	70.9	138.1	623.6	90.6
1976																				
1	29.8	.0	12.8	.0	5.5	.0	5.3	.0	12.3	.0	63.6	.0	94.2	.0	114.7	1.4	5.3	23.2	44.4	24.8
2	27.9	.0	12.0	.0	.6	.0	.0	.0	11.5	.0	60.1	.0	51.4	.0	99.3	.8	4.9	1.8	13.1	.9
3	29.8	.0	12.8	.0	13.0	.0	14.8	.0	12.3	.0	77.4	.0	57.0	.0	121.7	2.1	9.5	2.4	16.7	.8
4	28.8	.0	12.4	.0	15.8	.0	16.5	.0	11.9	.0	113.1	.0	58.6	.0	142.6	6.0	8.8	4.2	35.6	1.3
5	29.8	.0	12.8	.0	.2	.0	2.6	.0	12.3	.0	18.8	.0	20.0	.0	.0	20.8	3.1	11.8	81.1	5.2
6	28.8	.0	12.4	.0	1.7	.0	10.8	.0	11.9	.0	54.4	.0	29.4	.0	41.9	1.7	3.0	26.1	67.0	23.9
7	29.8	.0	12.8	.0	6.0	.0	2.6	.0	12.3	.0	26.4	.0	.0	.0	13.0	11.5	4.8	3.1	76.3	.1
8	29.8	.0	12.8	.0	3.7	.0	3.9	.0	12.3	.0	13.0	.0	11.6	.0	6.8	1.6	6.0	9.1	51.0	10.5
9	28.8	.0	12.4	.0	7.4	.0	15.8	.0	11.9	.0	38.3	.0	36.3	.0	37.5	6.0	6.6	17.1	55.9	14.0
10	29.8	.0	12.8	.0	3.1	.0	6.4	.0	12.3	.0	46.7	.0	19.3	.0	.0	15.1	8.7	9.6	74.0	.8
11	28.8	.0	12.4	.0	.5	.0	3.0	.0	11.9	.0	9.9	.0	10.2	.0	91.1	12.9	9.3	7.2	12.9	.0
12	29.8	.0	12.8	.0	.0	.0	16.0	.0	12.3	.0	57.7	.0	51.7	.0	101.5	2.7	6.6	22.1	25.1	23.8
ANNUAL	351.6	.0	150.9	.0	57.4	.0	97.8	.0	145.6	.0	579.6	.0	439.8	.0	770.2	82.5	76.6	137.9	553.0	106.0

FEATURE OF WATER DEMAND AND SUPPLY BALANCE IN MUDA & KEDAH RIVER SYSTEM (4/6)
(UNDER THE COMPREHENSIVE DAM OPERATION WITH WATER SAVING)

(unit : million cum)

YEAR / MONTH	MUDA RIVER SYSTEM								KEDAH RIVER SYSTEM						DRAW OFF FROM RESERVOIR				CONVEYANCE	
	DOMESTIC/INDUSTRIAL				IRRIGATION				D / I		IRRIGATION									
	P.PINANG		MUDA		P.PINANG		MUDA		KEDAH		MADA NORTH FRINGE		MADA SOUTH FRINGE		MUDA & PEDU	AHNING	BERIS	NAOK & REMAN	MUDA TO PEDU	JENIANG TRANSFER
	ABSTRACTION	DEFICIT	ABSTRACTION	DEFICIT	ABSTRACTION	DEFICIT	ABSTRACTION	DEFICIT	ABSTRACTION	DEFICIT	ABSTRACTION	DEFICIT	ABSTRACTION	DEFICIT						
1977																				
1	29.8	.0	12.8	.0	2.4	.0	6.0	.0	12.3	.0	99.2	.0	104.4	.0	163.7	1.0	4.7	26.5	37.1	27.2
2	26.9	.0	11.5	.0	.7	.0	.0	.0	11.1	.0	61.2	.0	38.9	.0	88.9	.7	4.5	1.4	11.6	.6
3	29.8	.0	12.8	.0	16.6	.0	19.7	.0	12.3	.0	82.4	.0	76.4	.0	148.9	.8	18.1	.7	10.7	.0
4	28.8	.0	12.4	.0	24.0	.0	26.2	.0	11.9	.0	168.7	.0	115.4	.0	276.1	.6	40.7	.7	18.5	.0
5	29.8	.0	12.8	.0	3.2	.0	11.3	.0	12.3	.0	18.2	.0	9.3	.0	8.6	5.5	4.0	5.5	31.0	1.9
6	28.8	.0	12.4	.0	6.4	.0	10.3	.0	11.9	.0	49.9	.0	14.0	.0	25.8	13.0	3.0	7.4	69.2	3.3
7	29.8	.0	12.8	.0	9.6	.0	5.8	.0	12.3	.0	69.8	.0	11.8	.0	73.2	.7	3.1	2.6	34.3	1.2
8	29.8	.0	12.8	.0	1.8	.0	3.8	.0	12.3	.0	14.2	.0	18.3	.0	8.4	2.8	4.0	11.8	52.6	9.5
9	28.8	.0	12.4	.0	6.6	.0	10.3	.0	11.9	.0	46.4	.0	24.4	.0	12.2	3.8	3.0	17.5	72.7	20.5
10	29.8	.0	12.8	.0	.3	.0	1.9	.0	12.3	.0	37.4	.0	23.2	.0	.0	29.2	3.1	13.0	138.6	.0
11	28.8	.0	12.4	.0	.4	.0	1.3	.0	11.9	.0	7.4	.0	5.6	.0	.9	8.9	3.0	4.2	112.5	.0
12	29.8	.0	12.8	.0	.0	.0	9.0	.0	12.3	.0	59.5	.0	59.0	.0	97.0	.8	3.1	13.5	53.8	12.2
ANNUAL	350.6	.0	150.5	.0	71.9	.0	105.6	.0	145.2	.0	714.4	.0	500.6	.0	903.7	67.9	94.3	104.7	642.6	76.4
1978																				
1	29.8	.0	12.8	.0	4.7	.0	7.0	.0	12.3	.0	112.6	.0	110.8	.0	210.6	.6	4.6	5.5	18.8	4.7
2	26.9	.0	11.5	.0	1.0	.0	.0	.0	11.1	.0	60.9	.0	46.3	.0	100.4	.5	8.9	.6	9.8	.0
3	29.8	.0	12.8	.0	9.8	.0	14.2	.0	12.3	.0	68.9	.0	63.7	.0	124.4	2.0	14.2	.7	9.4	.0
4	28.8	.0	12.4	.0	25.6	.0	22.7	.0	11.9	.0	137.1	.0	114.9	.0	242.4	2.3	14.0	3.1	13.7	2.1
5	29.8	.0	12.8	.0	.3	.0	.2	.0	12.3	.0	58.8	.0	43.4	.0	46.7	4.4	5.0	32.1	34.1	28.1
6	28.8	.0	12.4	.0	.0	.0	.6	.0	11.9	.0	40.6	.0	.0	.0	30.1	1.7	3.2	2.0	16.2	.2
7	29.8	.0	12.8	.0	.0	.0	.1	.0	12.3	.0	17.8	.0	.0	.0	2.5	2.5	3.1	2.2	52.0	.0
8	29.8	.0	12.8	.0	1.4	.0	3.7	.0	12.3	.0	35.8	.0	18.2	.0	34.7	1.3	3.1	8.4	34.3	7.1
9	28.8	.0	12.4	.0	13.8	.0	15.9	.0	11.9	.0	54.0	.0	45.3	.0	20.9	8.6	3.0	19.6	44.1	19.4
10	29.8	.0	12.8	.0	7.7	.0	6.9	.0	12.3	.0	65.3	.0	32.4	.0	25.1	12.7	3.1	12.1	48.9	8.4
11	28.8	.0	12.4	.0	.9	.0	3.5	.0	11.9	.0	12.5	.0	18.2	.0	2.1	11.2	3.0	8.6	31.3	4.0
12	29.8	.0	12.8	.0	20.9	.0	23.9	.0	12.3	.0	125.5	.0	57.7	.0	163.8	1.2	10.9	9.4	18.3	8.8
ANNUAL	350.6	.0	150.5	.0	86.1	.0	98.7	.0	145.2	.0	789.7	.0	550.8	.0	1003.7	49.0	76.0	104.2	330.9	82.7
1979																				
1	29.8	.0	12.8	.0	13.7	.0	7.1	.0	12.3	.0	162.8	.0	135.0	.0	164.6	3.7	18.6	122.3	7.4	.0
2	26.9	.0	11.5	.0	1.8	.0	.0	.0	11.1	.0	61.3	.0	52.7	.0	56.2	30.6	17.1	22.1	5.0	.0
3	29.8	.0	12.8	.0	11.8	.0	18.8	.0	12.3	.0	69.4	.0	67.8	.0	67.7	39.6	24.5	60.9	3.6	.0
4	28.8	.0	12.4	.0	11.9	.0	14.3	.0	11.9	.0	80.2	.0	64.0	.0	61.9	21.3	3.1	13.8	38.9	19.5
5	29.8	.0	12.8	.0	13.5	.0	8.2	.0	12.3	.0	85.9	.0	41.4	.0	25.4	7.2	3.1	1.0	39.7	44.6
6	28.8	.0	12.4	.0	2.1	.0	7.6	.0	11.9	.0	57.1	.0	1.5	.0	32.7	1.0	3.3	.2	40.8	23.2
7	29.8	.0	12.8	.0	4.9	.0	4.5	.0	12.3	.0	9.1	.0	.7	.0	5.2	.2	4.3	.0	10.2	4.3
8	29.8	.0	12.8	.0	1.6	.0	4.7	.0	12.3	.0	25.3	.0	26.0	.0	16.4	1.8	2.9	2.9	12.0	8.2
9	28.8	.0	12.4	.0	10.4	.0	14.2	.0	11.9	.0	63.2	.0	55.9	.0	28.0	2.0	3.0	.0	73.2	70.5
10	29.8	.0	12.8	.0	16.0	.0	7.6	.0	12.3	.0	76.5	.0	61.1	.0	64.3	3.7	3.3	39.1	51.1	39.7
11	28.8	.0	12.4	.0	.0	.0	.0	.0	11.9	.0	5.0	.0	1.8	.0	.0	.1	3.0	4.1	99.2	29.9
12	29.8	.0	12.8	.0	.0	.0	5.8	.0	12.3	.0	56.5	.0	45.4	.0	58.6	.4	3.1	36.0	46.1	6.4
ANNUAL	350.6	.0	150.5	.0	87.6	.0	92.9	.0	145.2	.0	752.4	.0	553.4	.0	581.0	111.6	89.4	302.4	427.2	246.2
1980																				
1	29.8	.0	12.8	.0	1.7	.0	8.3	.0	12.3	.0	169.0	.0	154.8	.0	161.0	35.5	17.9	120.3	7.2	.2
2	27.9	.0	12.0	.0	1.8	.0	.0	.0	11.5	.0	49.5	.0	46.1	.0	45.7	25.5	3.0	44.5	5.9	.0
3	29.8	.0	12.8	.0	13.4	.0	15.0	.0	12.3	.0	75.5	.0	55.5	4.0	75.0	31.0	2.7	34.8	22.8	6.4
4	28.8	.0	12.4	.0	22.2	.0	17.4	.0	11.9	.0	93.2	2.4	64.6	23.9	62.7	31.2	1.3	37.1	10.9	.3
5	29.8	.0	12.8	.0	15.4	.0	12.4	.0	12.3	.0	66.5	.0	51.6	9.2	38.8	9.8	3.3	1.7	46.4	27.0
6	28.8	.0	12.4	.0	14.2	.0	14.8	.0	11.9	.0	20.0	.0	38.4	3.6	29.5	3.9	3.0	1.4	39.6	31.8
7	29.8	.0	12.8	.0	6.6	.0	5.1	.0	12.3	.0	.1	.0	2.5	.0	1.6	.1	3.6	.0	32.6	13.9
8	29.8	.0	12.8	.0	1.3	.0	3.8	.0	12.3	.0	15.6	.0	17.4	.0	15.8	.2	3.1	.0	63.8	57.2
9	28.8	.0	12.4	.0	3.4	.0	4.6	.0	11.9	.0	82.0	.0	49.1	.0	58.8	.8	3.0	20.6	58.6	50.3
10	29.8	.0	12.8	.0	3.5	.0	1.0	.0	12.3	.0	61.6	.0	35.0	.0	1.9	.1	3.1	1.3	111.4	77.3
11	28.8	.0	12.4	.0	.7	.0	.0	.0	11.9	.0	8.1	.0	.1	.0	.0	.1	3.0	6.2	80.9	.0
12	29.8	.0	12.8	.0	.0	.0	3.1	.0	12.3	.0	.3	.0	14.0	.0	.0	.1	3.1	11.6	55.7	11.4
ANNUAL	351.6	.0	150.9	.0	84.3	.0	85.5	.0	145.6	.0	641.3	2.4	529.1	40.7	490.9	138.3	50.1	279.4	535.8	275.8
1981																				
1	29.8	.0	12.8	.0	1.7	.0	5.1	.0	12.3	.0	90.0	.0	62.2	.0	110.9	.4	3.8	30.8	12.1	16.0
2	26.9	.0	11.5	.0	.0	.0	.0	.0	11.1	.0	36.1	.0	49.9	.0	44.1	.4	9.7	36.2	5.3	.0
3	29.8	.0	12.8	.0	12.9	.0	17.7	.0	12.3	.0	79.9	.0	67.7	.0	74.6	.5	21.9	70.5	8.1	.0
4	28.8	.0	12.4	.0	10.7	.0	15.9	.0	11.9	.0	38.1	.0	87.7	.0	54.7	29.2	1.1	37.3	9.7	10.8
5	29.8	.0	12.8	.0	7.3	.0	7.2	.0	12.3	.0	87.0	.0	52.4	.0	64.5	6.3	3.4	9.8	71.7	48.6
6	28.8	.0	12.4	.0	20.0	.0	12.6	.0	11.9	.0	96.0	.0	43.3	.0	73.6	1.1	3.0	31.4	62.8	63.0
7	29.8	.0	12.8	.0	13.8	.0	5.7	.0	12.3	.0	44.5	.0	3.8	.0	42.1	.2	3.4	3.8	43.9	26.3
8	29.8	.0	12.8	.0	3.0	.0	6.1	.0	12.3	.0	28.4	.0	49.1	.0	52.2	.3	3.4	20.4	25.2	13.2
9	28.8	.0	12.4	.0	4.3	.0	5.0	.0	11.9	.0	70.9	.0	88.0	.0	87.5	.4	3.0	30.4	65.0	65.4
10	29.8	.0	12.8	.0	15.9	.0	7.5	.0	12.3	.0	83.8	.0	72.7	.0	77.7	.4	3.1	62.3	42.0	34.3
11	28.8	.0	12.4	.0	.0	.0	2.5	.0	11.9	.0	4.3	.0	10.6	.0	.0	.1	3.0	.3	58.4	33.8
12	29.8	.0	12.8	.0	14.9	.0	24.3	.0	12.3	.0	90.6	.0	120.7	.0	106.2	.5	5.6	77.7	49.8	18.8
ANNUAL	350.6	.0	150.5	.0	104.5	.0	109.6	.0	145.2	.0	749.5	.0	708.0	.0	788.1	39.9	64.5	411.0	454.3	330.3

FEATURE OF WATER DEMAND AND SUPPLY BALANCE IN MUDA & KEDAH RIVER SYSTEM (5/6)
(UNDER THE COMPREHENSIVE DAM OPERATION WITH WATER SAVING)

(unit : million cum)

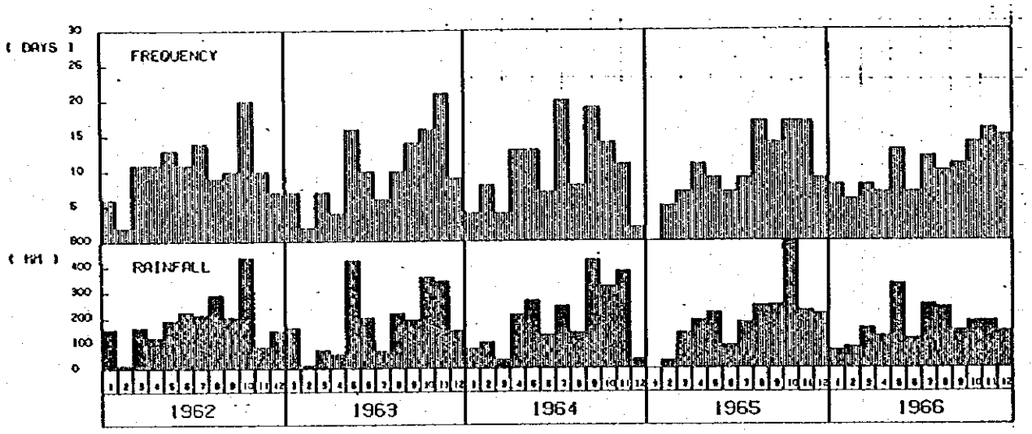
YEAR / MONTH	MUDA RIVER SYSTEM								KEDAH RIVER SYSTEM						DRAW OFF FROM RESERVOIR				CONVEYANCE	
	DOMESTIC/INDUSTRIAL				IRRIGATION				D / I		IRRIGATION									
	P.PINANG		MUDA		P.PINANG		MUDA		KEDAH		MADA NORTH FRINGE		MADA SOUTH FRINGE		MUDA & PEDU	AMNING	BERIS	NAOK & REMAN	MUDA TO PEDU	JENIANG TRANSFER
	ABSTRACTION	DEFICIT	ABSTRACTION	DEFICIT	ABSTRACTION	DEFICIT	ABSTRACTION	DEFICIT	ABSTRACTION	DEFICIT	ABSTRACTION	DEFICIT	ABSTRACTION	DEFICIT						
1982																				
1	29.8	.0	12.8	.0	17.7	.2	9.3	.1	12.3	.0	165.7	.0	146.8	7.1	149.6	37.8	17.1	116.9	7.2	.0
2	26.8	.1	11.5	.0	1.7	.2	.0	.0	11.1	.0	47.9	4.4	37.6	14.8	26.6	22.2	5.5	26.2	2.8	.0
3	29.8	.0	12.8	.0	11.6	.0	14.3	.0	12.3	.0	65.2	13.0	52.4	23.6	43.2	22.8	2.6	49.8	21.8	.3
4	28.8	.0	12.4	.0	14.6	.0	8.5	.0	11.9	.0	60.7	3.8	55.3	11.1	23.2	9.1	2.1	18.2	19.1	16.2
5	29.8	.0	12.8	.0	1.7	.0	6.9	.0	12.3	.0	14.1	.0	11.8	.0	2.3	.1	2.8	.1	47.9	69.8
6	28.8	.0	12.4	.0	.0	.0	10.4	.0	11.9	.0	4.9	.0	.5	.0	2.7	.1	3.0	.0	27.5	44.0
7	29.8	.0	12.8	.0	.0	.0	4.4	.0	12.3	.0	.7	.0	.0	.0	.1	.1	3.1	.0	33.3	28.9
8	29.8	.0	12.8	.0	3.5	.0	5.4	.0	12.3	.0	17.0	.0	15.0	.0	16.2	.3	3.9	10.8	20.8	11.4
9	28.8	.0	12.4	.0	6.7	.0	15.0	.0	11.9	.0	84.0	.0	66.9	.0	85.8	.8	3.0	24.3	65.4	64.5
10	29.8	.0	12.8	.0	9.8	.0	5.0	.0	12.3	.0	51.8	.0	39.5	.0	8.4	.3	3.1	7.3	75.1	49.4
11	28.8	.0	12.4	.0	.0	.0	.0	.0	11.9	.0	10.5	.0	9.1	.0	1.6	.1	3.0	6.5	91.6	1.2
12	29.8	.0	12.8	.0	.0	.0	3.0	.0	12.3	.0	39.7	.0	50.7	.0	29.7	.6	3.1	29.5	64.7	26.0
ANNUAL	350.6	.1	150.5	.0	67.2	.4	82.2	.1	145.2	.0	562.3	21.2	485.6	56.7	389.4	94.3	52.4	289.7	477.2	311.8
1983																				
1	29.8	.0	12.8	.0	1.5	.0	7.7	.0	12.3	.0	152.7	.0	123.5	.0	154.6	.4	3.6	114.8	17.0	12.7
2	26.9	.0	11.5	.0	1.9	.0	.0	.0	11.1	.0	60.0	.0	53.8	.0	55.1	10.8	8.2	43.8	3.4	.0
3	29.8	.0	12.8	.0	11.3	.0	16.4	.0	12.3	.0	81.0	.0	64.4	.9	75.7	19.9	17.2	51.5	11.4	.9
4	28.8	.0	12.4	.0	33.2	.0	27.5	.0	10.9	1.0	145.4	31.2	35.3	110.0	121.1	33.9	1.1	74.2	8.4	.0
5	29.8	.0	12.8	.0	.3	.0	2.4	.0	12.3	.0	22.3	9.0	10.3	4.7	16.5	1.0	2.3	1.9	23.1	28.5
6	28.8	.0	12.4	.0	.0	.0	.0	.0	11.9	.0	17.7	.2	.4	.0	1.9	.2	3.0	.0	36.9	34.7
7	29.8	.0	12.8	.0	.0	.0	1.5	.0	12.3	.0	19.6	1.1	7.3	.3	22.2	.3	3.9	2.2	30.6	13.0
8	29.8	.0	12.8	.0	2.8	.0	5.6	.0	12.3	.0	20.6	.0	18.4	.0	19.0	.2	3.1	.0	63.7	47.6
9	28.8	.0	12.4	.0	3.2	.0	3.3	.0	11.9	.0	36.1	.0	30.1	.0	8.8	.1	3.0	.0	113.4	91.2
10	29.8	.0	12.8	.0	12.2	.0	5.3	.0	12.3	.0	52.8	.0	43.8	.0	23.7	.5	3.1	10.9	75.9	37.8
11	28.8	.0	12.4	.0	1.7	.0	9.6	.0	11.9	.0	7.1	.0	10.4	.0	.0	.1	3.0	6.0	82.3	.0
12	29.8	.0	12.8	.0	1.0	.0	16.5	.0	12.3	.0	43.4	.0	36.1	.0	60.3	.2	3.1	17.2	79.0	12.7
ANNUAL	350.6	.0	150.5	.0	69.1	.0	95.7	.0	144.2	1.0	658.9	41.5	433.8	115.8	558.8	67.7	54.6	322.7	545.1	279.0
1984																				
1	29.8	.0	12.8	.0	10.1	.0	7.2	.0	12.3	.0	113.5	.0	120.8	.0	210.2	.3	5.2	19.1	18.9	9.7
2	27.9	.0	12.0	.0	.0	.0	.0	.0	11.5	.0	57.8	.0	41.7	.0	53.5	.2	6.9	42.3	4.5	.3
3	29.8	.0	12.8	.0	12.7	.0	14.9	.0	12.3	.0	67.0	.0	57.6	.0	68.2	3.3	15.2	52.4	12.2	1.1
4	28.8	.0	12.4	.0	8.5	.0	10.5	.0	11.9	.0	93.0	.0	53.9	.0	97.8	.5	3.1	43.6	35.8	35.5
5	29.8	.0	12.8	.0	8.5	.0	1.4	.0	12.3	.0	86.0	.0	24.7	.0	87.2	.1	3.1	20.8	25.9	32.7
6	28.8	.0	12.4	.0	18.8	.0	7.2	.0	11.9	.0	20.4	.0	.9	.0	21.1	.1	3.0	.6	22.2	19.0
7	29.8	.0	12.8	.0	8.0	.0	3.1	.0	12.3	.0	.4	.0	.2	.0	.1	.1	4.3	.0	76.7	68.4
8	29.8	.0	12.8	.0	1.0	.0	6.2	.0	12.3	.0	18.9	.0	39.6	.0	23.8	.2	3.1	27.7	38.9	12.9
9	28.8	.0	12.4	.0	13.5	.0	14.9	.0	11.9	.0	61.3	.0	67.7	.0	71.3	.1	3.0	54.4	31.2	13.5
10	29.8	.0	12.8	.0	14.9	.0	8.8	.0	12.3	.0	58.6	.0	70.5	.0	62.4	.1	3.1	8.9	85.1	55.4
11	28.8	.0	12.4	.0	1.6	.0	9.7	.0	11.9	.0	19.1	.0	14.4	.0	2.2	.1	3.0	8.8	63.0	6.6
12	29.8	.0	12.8	.0	2.6	.0	11.3	.0	12.3	.0	5.6	.0	74.8	.0	49.9	.8	3.1	16.7	42.0	13.9
ANNUAL	351.6	.0	150.9	.0	100.2	.0	95.3	.0	145.6	.0	601.5	.0	566.8	.0	747.6	6.1	56.2	295.3	456.3	268.9
1985																				
1	29.8	.0	12.8	.0	10.4	.0	7.8	.0	12.3	.0	132.1	.0	140.3	.0	134.7	.4	4.0	130.0	14.1	11.8
2	26.9	.0	11.5	.0	1.2	.0	.0	.0	11.1	.0	34.1	.0	37.2	.0	51.3	5.4	8.4	13.4	19.3	.3
3	29.8	.0	12.8	.0	11.1	.0	15.5	.0	12.3	.0	66.0	.0	59.8	.0	82.9	9.8	3.2	36.5	42.8	25.3
4	28.8	.0	12.4	.0	15.7	.0	15.1	.0	11.9	.0	99.1	.1	84.0	6.0	96.3	26.0	3.4	52.9	13.1	8.8
5	29.8	.0	12.8	.0	20.6	.0	6.5	.0	12.3	.0	87.3	.0	40.7	3.8	63.9	7.7	3.2	16.0	60.4	40.6
6	28.8	.0	12.4	.0	18.0	.0	16.2	.0	11.9	.0	77.5	.0	42.6	.0	59.5	1.6	3.0	21.3	71.7	63.2
7	29.8	.0	12.8	.0	8.0	.0	5.8	.0	12.3	.0	84.8	1.5	42.6	.0	90.1	3.4	3.8	30.6	61.9	31.7
8	29.8	.0	12.8	.0	1.6	.0	4.7	.0	12.3	.0	35.8	.0	26.3	.0	44.2	.3	3.1	6.4	70.5	52.9
9	28.8	.0	12.4	.0	9.9	.0	9.1	.0	11.9	.0	51.7	.0	52.7	.0	59.1	.3	3.0	18.3	59.5	44.9
10	29.8	.0	12.8	.0	1.9	.0	2.8	.0	12.3	.0	56.0	.0	36.2	.0	4.3	.1	3.1	18.5	86.5	32.3
11	28.8	.0	12.4	.0	.5	.0	.0	.0	11.9	.0	7.5	.0	7.1	.0	.0	.1	3.0	13.2	115.3	.4
12	29.8	.0	12.8	.0	.0	.0	3.6	.0	12.3	.0	50.8	.0	3.7	.0	47.1	.2	3.1	6.4	78.2	3.2
ANNUAL	350.6	.0	150.5	.0	98.9	.0	87.1	.0	145.2	.0	782.6	1.6	573.0	9.8	733.5	55.3	44.4	363.5	693.2	315.4
1986																				
1	29.8	.0	12.8	.0	5.8	.0	5.4	.0	12.3	.0	155.3	.0	68.1	.0	162.5	.1	3.2	55.1	22.0	13.3
2	26.9	.0	11.5	.0	1.9	.0	.0	.0	11.1	.0	59.9	.0	45.8	.0	56.2	.1	4.5	46.3	7.2	.0
3	29.8	.0	12.8	.0	12.4	.0	16.2	.0	12.3	.0	76.8	.0	59.4	.0	80.0	8.2	10.6	50.4	19.5	7.1
4	28.8	.0	12.4	.0	24.5	.0	19.0	.0	11.9	.0	96.2	.0	74.1	.0	74.9	13.0	15.4	28.5	30.2	21.7
5	29.8	.0	12.8	.0	5.7	.0	5.2	.0	12.3	.0	66.1	.0	35.7	.0	55.5	4.0	3.1	15.7	29.5	35.9
6	28.8	.0	12.4	.0	.0	.0	15.8	.0	11.9	.0	28.5	.0	31.5	.0	44.9	.2	3.0	10.7	24.8	29.1
7	29.8	.0	12.8	.0	5.8	.0	5.5	.0	12.3	.0	94.4	.0	5.8	.0	91.7	.1	3.2	6.2	16.0	18.0
8	29.8	.0	12.8	.0	1.8	.0	4.7	.0	12.3	.0	26.3	.0	11.8	.0	23.8	.5	4.3	8.7	14.8	9.3
9	28.8	.0	12.4	.0	2.3	.0	4.2	.0	11.9	.0	57.4	.0	33.9	.0	47.1	.4	3.0	14.0	51.5	48.8
10	29.8	.0	12.8	.0	2.9	.0	2.3	.0	12.3	.0	47.1	.0	19.4	.0	.0	.1	3.1	6.6	141.2	29.9
11	28.8	.0	12.4	.0	.0	.0	.0	.0	11.9	.0	6.3	.0	2.9	.0	.0	.1	3.0	6.0	124.8	.0
12	29.8	.0	12.8	.0	8.4	.0	.2	.0	12.3	.0	52.1	.0	12.5	.0	41.1	.2	3.1	12.2	84.3	8.6
ANNUAL	350.6	.0	150.5	.0	71.4	.0	78.4	.0	145.2	.0	766.3	.0	401.0	.0	677.6	27.0	59.5	260.3	565.8	221.8

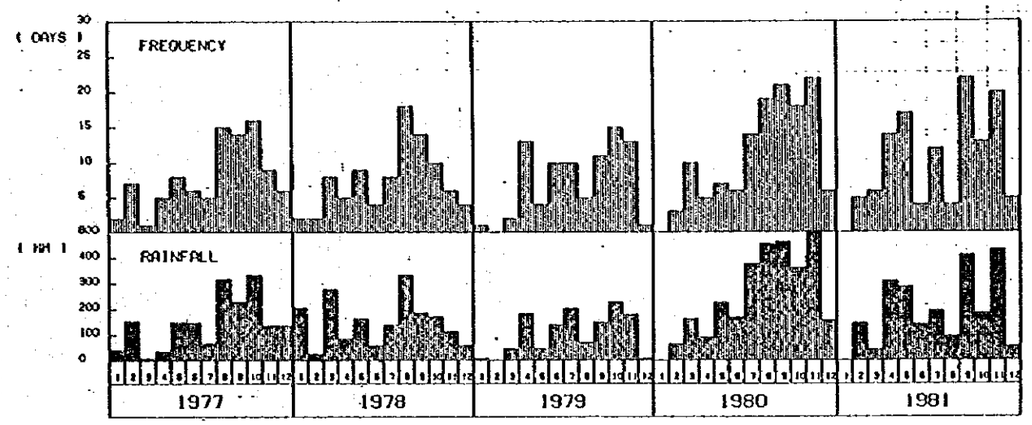
FEATURE OF WATER DEMAND AND SUPPLY BALANCE IN MUDA & KEDAH RIVER SYSTEM (6/6)
(UNDER THE COMPREHENSIVE DAM OPERATION WITH WATER SAVING)

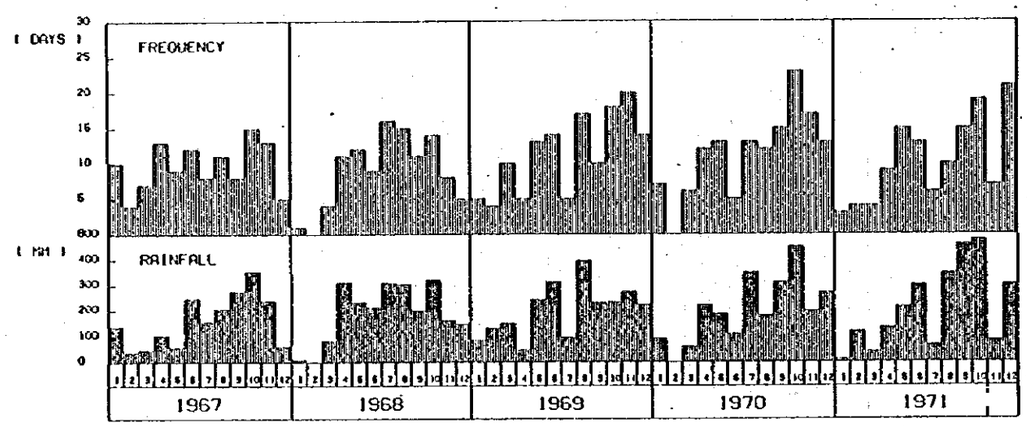
(unit : million cum)

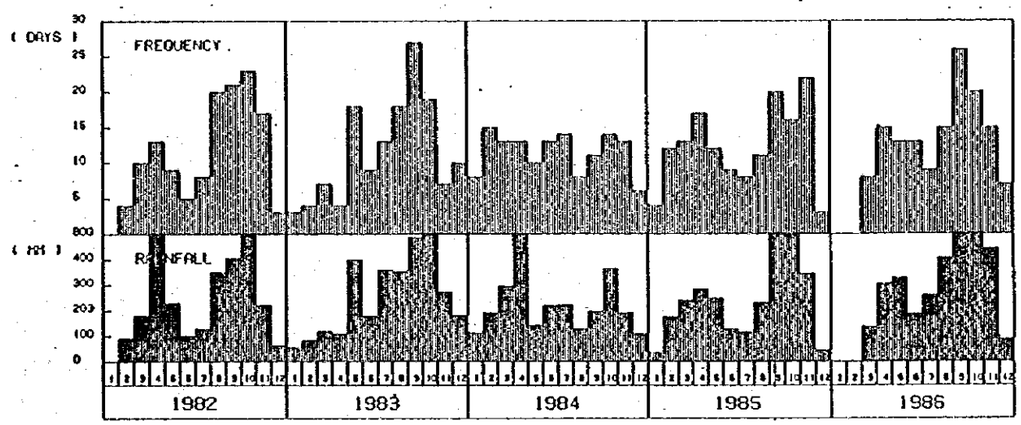
YEAR / MONTH	MUDA RIVER SYSTEM								KEDAH RIVER SYSTE						DRAW OFF FROM RESERVOIR				CONVEYANCE	
	DOMESTIC/INDUSTRIAL				IRRIGATION				D / I		IRRIGATION									
	P.PINANG		MUDA		P.PINANG		MUDA		KEDAH		MADA NORTH FRINGE		MADA SOUTH FRINGE		MUDA & PEDU	AHNING	BERIS	NAOK & REMAN	MUDA TO PEDU	JENIANG TRANSFER
	ABSTRACTION	DEFICIT	ABSTRACTION	DEFICIT	ABSTRACTION	DEFICIT	ABSTRACTION	DEFICIT	ABSTRACTION	DEFICIT	ABSTRACTION	DEFICIT	ABSTRACTION	DEFICIT						
1987																				
1	29.8	.0	12.8	.0	12.0	.0	6.3	.0	12.3	.0	160.9	.0	81.9	.0	173.9	.3	3.2	64.8	23.3	14.7
2	26.9	.0	11.5	.0	1.9	.0	.0	.0	11.1	.0	61.0	.0	52.9	.0	58.1	.1	5.0	53.4	6.7	.0
3	29.8	.0	12.8	.0	13.8	.0	16.7	.0	12.3	.0	69.5	.0	64.8	.0	68.1	11.8	9.8	46.2	18.0	9.2
4	28.8	.0	12.4	.0	19.8	.0	18.5	.0	11.9	.0	127.5	.5	110.4	6.3	127.5	40.7	22.9	67.9	18.3	7.0
5	29.8	.0	12.8	.0	2.8	.0	12.1	.0	12.3	.0	67.5	1.5	10.8	2.1	52.8	2.6	3.3	4.6	35.3	23.2
6	28.8	.0	12.4	.0	11.3	.0	15.2	.0	11.9	.0	122.6	4.9	.5	.2	82.9	.4	3.0	.5	59.0	59.1
7	29.8	.0	12.8	.0	5.6	.0	6.6	.0	12.3	.0	89.7	7.3	22.4	.5	83.9	9.8	3.1	14.8	26.1	16.2
8	29.8	.0	12.8	.0	2.5	.0	5.9	.0	12.3	.0	31.0	.0	22.4	.0	13.6	.2	3.1	.0	102.2	89.6
9	28.8	.0	12.4	.0	7.7	.0	5.6	.0	11.9	.0	37.0	.0	26.8	.0	11.2	.4	3.0	11.0	115.6	13.2
10	29.8	.0	12.8	.0	16.2	.0	5.9	.0	12.3	.0	48.9	.0	28.4	.0	.0	.1	3.1	12.4	149.7	.1
11	28.8	.0	12.4	.0	.0	.0	.0	.0	11.9	.0	4.6	.0	5.8	.0	.0	.1	3.0	11.6	131.3	.9
12	29.8	.0	12.8	.0	.0	.0	.0	.0	12.3	.0	31.2	.0	35.9	.0	23.1	.3	3.1	22.4	104.1	20.3
ANNUAL	350.6	.0	150.5	.0	93.6	.0	92.8	.0	145.2	.0	851.4	14.1	463.1	9.0	695.1	66.8	65.6	309.5	789.8	253.5
1988																				
1	29.8	.0	12.8	.0	.8	.0	.2	.0	12.3	.0	141.8	.0	94.0	.0	204.9	.3	3.1	26.6	33.5	25.6
2	27.9	.0	12.0	.0	1.0	.0	.0	.0	11.5	.0	37.3	.0	2.2	.0	36.9	.2	3.0	1.8	10.0	.8
3	29.8	.0	12.8	.0	10.8	.0	14.5	.0	12.3	.0	50.2	.0	53.8	.0	100.9	.1	5.6	1.1	8.9	.3
4	28.8	.0	12.4	.0	9.2	.0	12.1	.0	11.9	.0	64.1	.0	36.0	.0	39.9	.1	4.8	14.9	49.2	17.3
5	29.8	.0	12.8	.0	18.6	.0	17.7	.0	12.3	.0	23.5	.0	39.1	.0	5.1	.1	3.1	17.9	69.8	17.4
6	28.8	.0	12.4	.0	18.0	.0	10.2	.0	11.9	.0	44.6	.0	20.8	.0	47.3	.2	3.0	13.8	48.8	11.4
7	29.8	.0	12.8	.0	7.4	.0	6.5	.0	12.3	.0	13.4	.0	15.9	.0	7.4	.1	3.1	10.1	73.2	5.1
8	29.8	.0	12.8	.0	.8	.0	1.1	.0	12.3	.0	21.3	.0	10.4	.0	11.0	.1	12.0	9.0	107.0	2.6
9	28.8	.0	12.4	.0	10.8	.0	8.6	.0	11.9	.0	49.8	.0	36.5	.0	1.4	.1	16.5	15.9	140.2	7.3
10	29.8	.0	12.8	.0	6.5	.0	3.5	.0	12.3	.0	53.4	.0	38.0	.0	7.3	.1	13.8	22.1	117.3	21.4
11	28.8	.0	12.4	.0	3.1	.0	2.6	.0	11.9	.0	15.8	.0	16.9	.0	20.6	.6	16.2	26.8	125.2	16.7
12	29.8	.0	12.8	.0	7.2	.0	20.1	.0	12.3	.0	1.0	.0	37.8	.0	107.8	5.6	10.6	12.3	19.0	10.1
ANNUAL	351.6	.0	150.9	.0	94.3	.0	97.0	.0	145.6	.0	516.0	.0	401.3	.0	590.6	7.8	94.9	172.2	802.0	135.9
1989																				
1	29.8	.0	12.8	.0	13.8	.0	6.6	.0	12.3	.0	82.6	.0	115.2	.0	181.4	.3	3.9	11.0	28.9	10.4
2	26.9	.0	11.5	.0	1.9	.0	.0	.0	11.1	.0	61.6	.0	52.1	.0	108.2	.2	2.9	2.5	11.0	1.8
3	29.8	.0	12.8	.0	12.4	.0	11.5	.0	12.3	.0	62.2	.0	61.0	.0	120.0	.2	6.4	3.1	15.7	1.3
4	28.8	.0	12.4	.0	13.1	.0	6.1	.0	11.9	.0	89.7	.0	40.0	.0	97.4	.5	3.0	22.2	45.1	20.8
5	29.8	.0	12.8	.0	23.0	.0	14.5	.0	12.3	.0	76.8	.0	33.6	.0	52.8	4.2	3.1	16.0	53.4	12.0
6	28.8	.0	12.4	.0	3.5	.0	7.5	.0	11.9	.0	73.9	.0	3.5	.0	57.1	2.4	5.1	6.7	52.6	3.9
7	29.8	.0	12.8	.0	3.6	.0	2.2	.0	12.3	.0	73.0	.0	26.0	.0	41.6	3.9	6.8	18.6	57.9	13.9
8	29.8	.0	12.8	.0	1.0	.0	3.5	.0	12.3	.0	37.5	.0	18.1	.0	35.0	.4	4.9	13.6	41.6	12.3
9	28.8	.0	12.4	.0	6.6	.0	8.4	.0	11.9	.0	44.6	.0	42.6	.0	37.6	9.4	9.9	27.5	84.3	28.1
10	29.8	.0	12.8	.0	11.8	.0	3.9	.0	12.3	.0	49.7	.0	25.5	.0	.0	16.4	14.0	16.3	118.7	6.6
11	28.8	.0	12.4	.0	2.7	.0	3.6	.0	11.9	.0	6.4	.0	14.5	.0	.0	1.6	12.4	10.5	105.1	6.3
12	29.8	.0	12.8	.0	15.5	.0	15.8	.0	12.3	.0	37.9	.0	46.3	.0	69.5	.3	5.0	18.3	28.7	20.3
ANNUAL	350.6	.0	150.5	.0	109.0	.0	83.5	.0	145.2	.0	696.1	.0	478.6	.0	800.8	39.7	77.4	166.4	643.1	137.8
1990																				
1	29.8	.0	12.8	.0	12.4	.0	6.3	.0	12.3	.0	144.5	.0	96.7	.0	231.5	.1	3.2	6.0	14.0	5.1
2	26.9	.0	11.5	.0	1.6	.0	.0	.0	11.1	.0	57.2	.0	49.3	.0	102.0	.1	4.4	.9	10.9	.2
3	29.8	.0	12.8	.0	12.1	.0	16.3	.0	12.3	.0	71.6	.0	69.1	.0	135.7	.4	11.6	1.8	26.0	1.5
4	28.8	.0	12.4	.0	12.2	.0	20.7	.0	11.9	.0	93.9	.0	120.7	.0	198.6	.3	3.1	15.8	41.6	13.1
5	29.8	.0	12.8	.0	4.2	.0	6.1	.0	12.3	.0	36.9	.0	48.7	.0	30.9	.5	3.1	13.7	76.7	7.4
6	28.8	.0	12.4	.0	21.3	.0	12.4	.0	11.9	.0	.5	.0	39.4	.0	20.4	.1	3.0	11.5	40.0	13.7
7	29.8	.0	12.8	.0	13.8	.0	6.1	.0	12.3	.0	36.4	.0	14.9	.0	45.6	.1	3.1	5.2	22.8	3.9
8	29.8	.0	12.8	.0	2.4	.0	5.1	.0	12.3	.0	66.9	.0	21.2	.0	82.8	.1	3.3	3.7	18.0	2.7
9	28.8	.0	12.4	.0	12.6	.0	12.3	.0	11.9	.0	83.2	.0	44.4	.0	85.5	.2	3.0	40.1	45.2	38.6
10	29.8	.0	12.8	.0	3.1	.0	6.5	.0	12.3	.0	31.7	.0	48.8	.0	9.4	5.4	8.2	34.6	95.3	30.6
11	28.8	.0	12.4	.0	.0	.0	.0	.0	11.9	.0	13.1	.0	2.0	.0	1.9	9.2	14.1	7.3	119.3	.1
12	29.8	.0	12.8	.0	.0	.0	7.9	.0	12.3	.0	40.1	.0	9.4	.0	31.4	2.1	7.5	9.8	63.5	8.0
ANNUAL	350.6	.0	150.5	.0	95.8	.0	99.6	.0	145.2	.0	676.0	.0	564.7	.0	975.6	18.8	67.5	150.3	573.4	124.9
1991																				
1	29.8	.0	12.8	.0	3.1	.0	7.0	.0	12.3	.0	112.6	.0	82.8	.0	184.7	.1	4.0	7.6	20.3	6.8
2	26.9	.0	11.5	.0	1.9	.0	.0	.0	11.1	.0	59.9	.0	49.9	.0	107.6	.1	6.8	.7	10.5	.2
3	29.8	.0	12.8	.0	6.7	.0	14.4	.0	12.3	.0	59.8	.0	57.7	.0	95.2	.3	12.3	3.4	19.2	2.2
4	28.8	.0	12.4	.0	23.0	.0	16.9	.0	11.9	.0	109.8	.0	119.9	.0	186.3	1.5	8.6	21.2	27.6	5.5
5	29.8	.0	12.8	.0	2.2	.0	7.8	.0	12.3	.0	20.6	.0	19.1	.0	.0	15.5	3.1	7.4	95.9	9.3
6	28.8	.0	12.4	.0	.0	.0	.0	.0	11.9	.0	.0	.0	1.6	.0	.0	18.9	3.0	4.4	129.5	.0
7	29.8	.0	12.8	.0	.0	.0	.0	.0	12.3	.0	.3	.0	24.4	.0	.0	18.8	9.4	9.2	97.3	4.4
8	29.8	.0	12.8	.0	.7	.0	2.3	.0	12.3	.0	14.2	.0	18.5	.0	10.7	3.5	9.5	7.7	80.5	5.7
9	28.8	.0	12.4	.0	9.4	.0	13.3	.0	11.9	.0	68.6	.0	51.3	.0	24.1	4.1	8.2	29.5	69.5	38.7
10	29.8	.0	12.8	.0	9.1	.0	6.7	.0	12.3	.0	54.9	.0	16.1	.0	15.3	9.3	9.8	10.5	83.3	8.3
11	28.8	.0	12.4	.0	1.9	.0	8.7	.0	11.9	.0	13.4	.0	6.8	.0	.0	4.1	11.6	5.7	98.4	.2
12	29.8	.0	12.8	.0	14.9	.0	21.2	.0	12.3	.0	128.3	.0	26.9	.0	137.3	.3	5.7	11.5	48.2	10.3
ANNUAL	350.6	.0	150.5	.0	72.8	.0	98.4	.0	145.2	.0	642.5	.0	475.0	.0	761.3	76.6	92.0	119.0	780.2	91.7

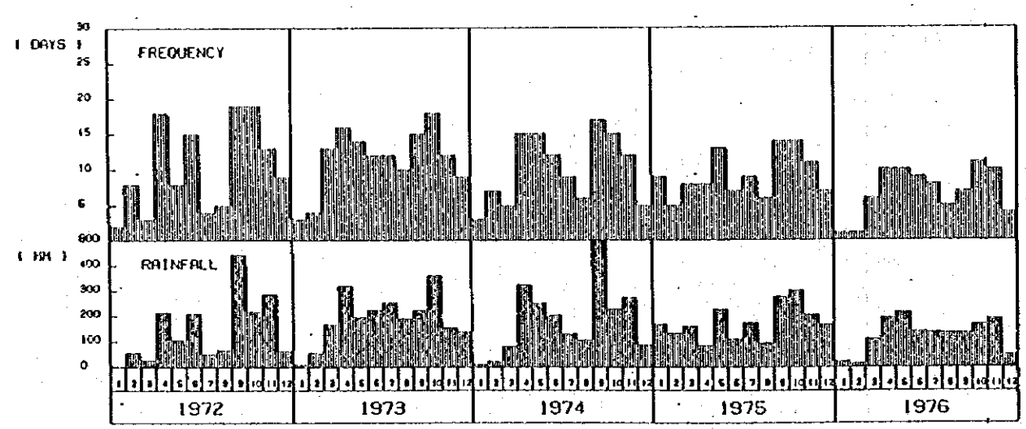
MONTHLY RAINFALL DEPTH AND RAINY DAYS OF KEY STATION

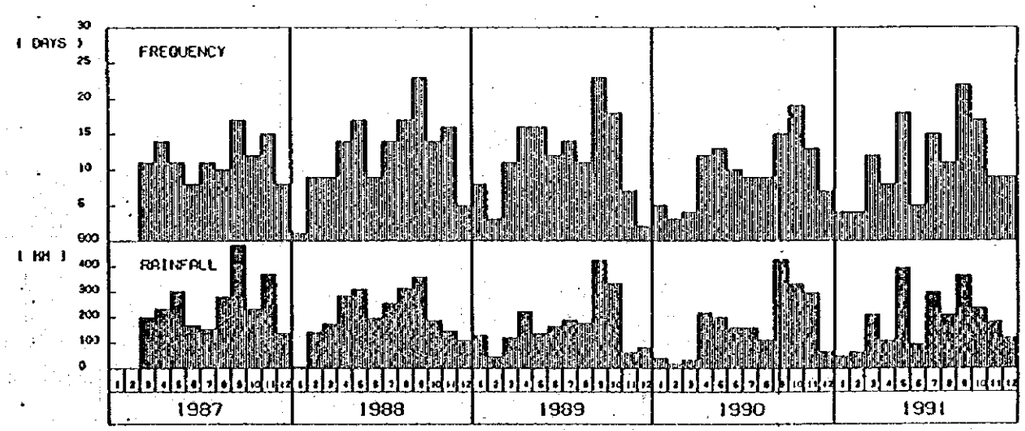




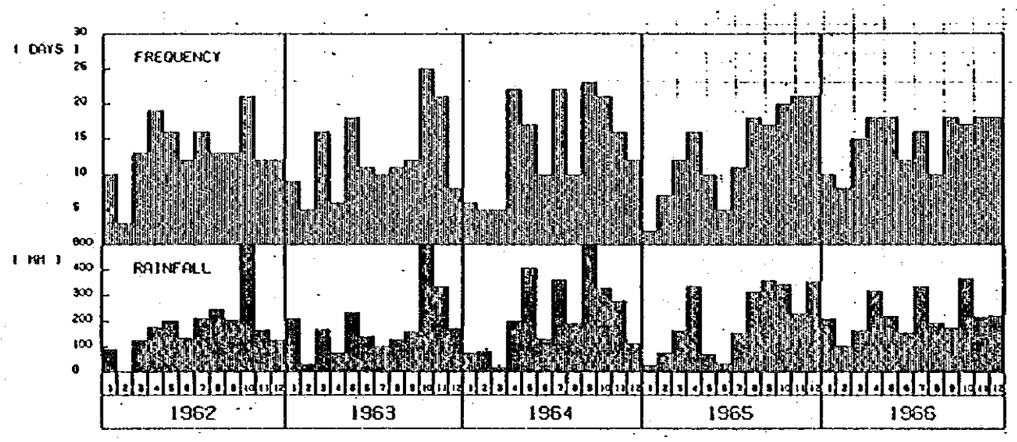


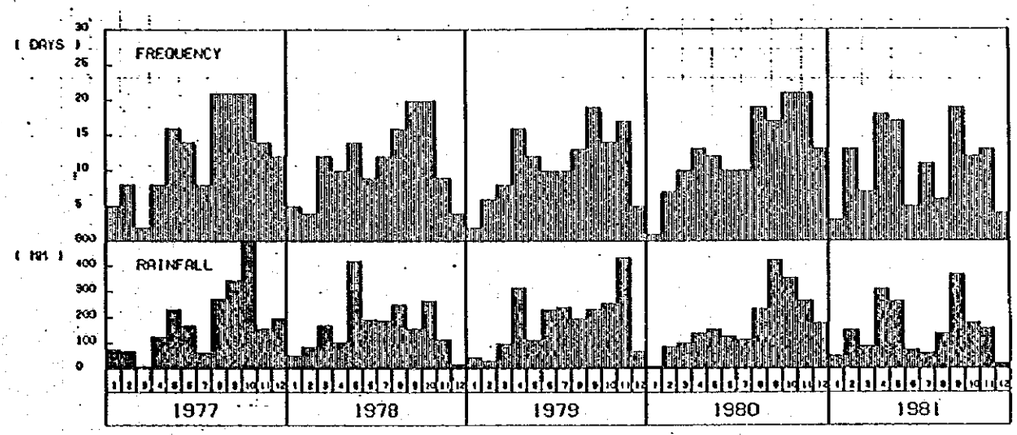


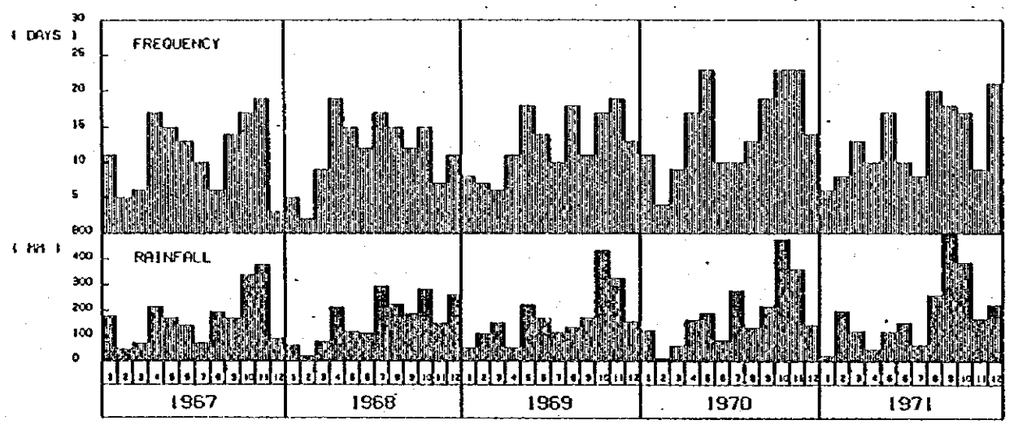


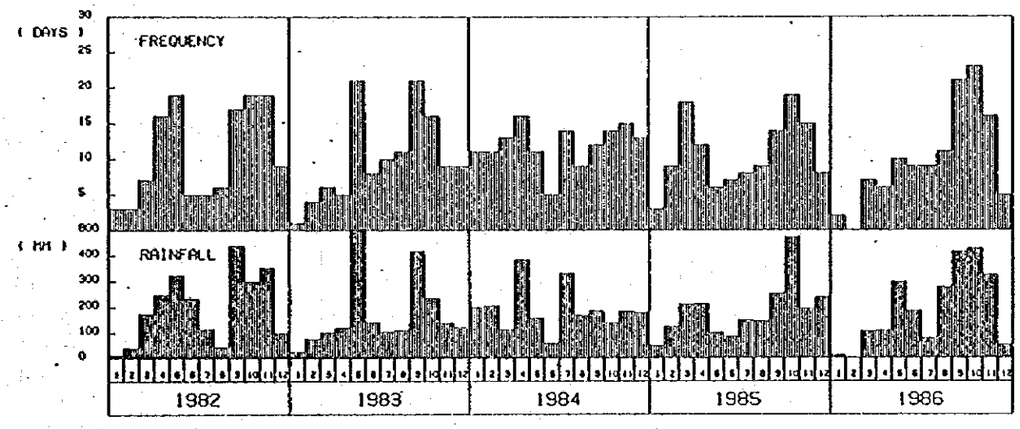


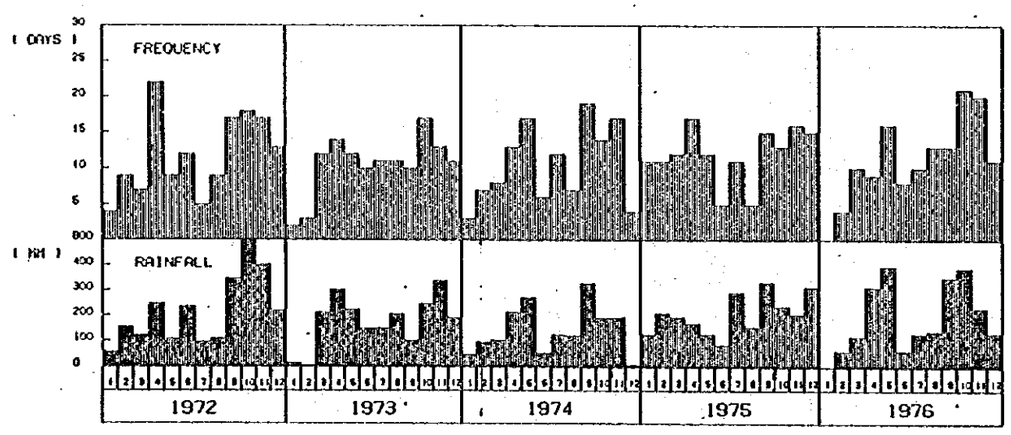
COMPREHENSIVE MANAGEMENT PLAN OF MUDA RIVER BASIN JAPAN INTERNATIONAL COOPERATION AGENCY	MANTHLY RAINFALL DEPTH AND RAINY DAYS OF KEY STATION (STATION ----- SEMELING)

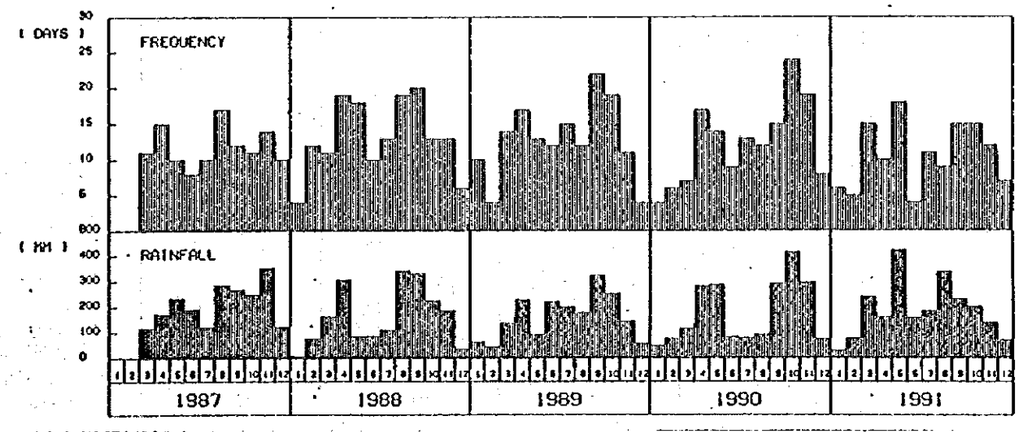




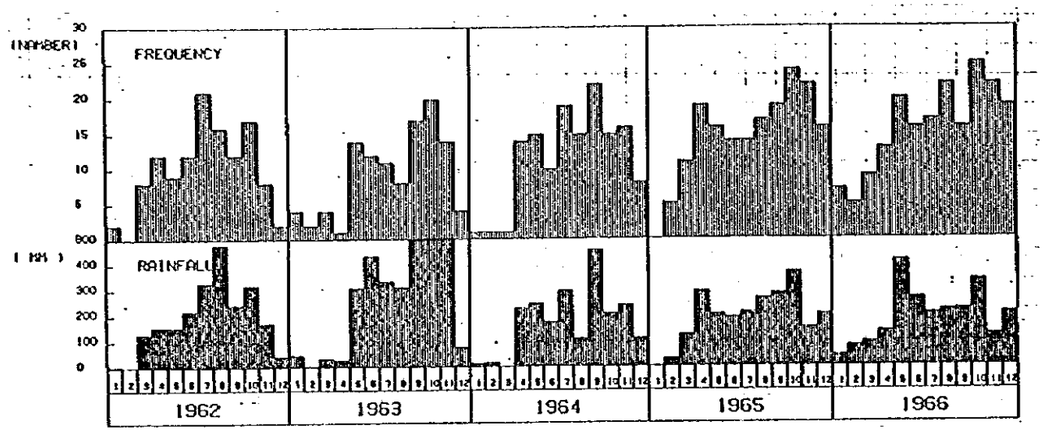


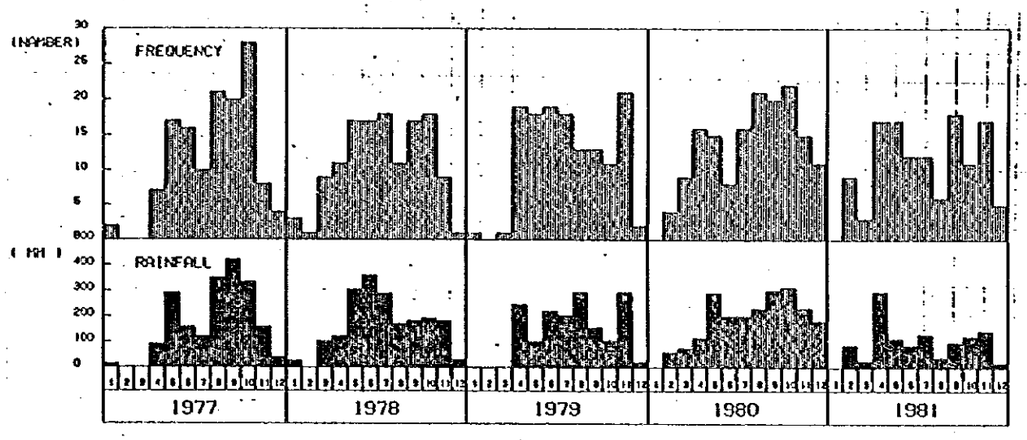


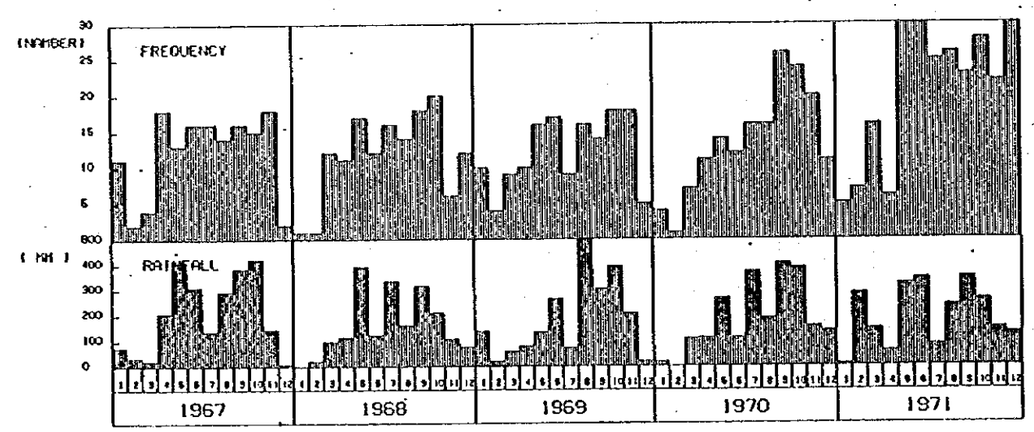


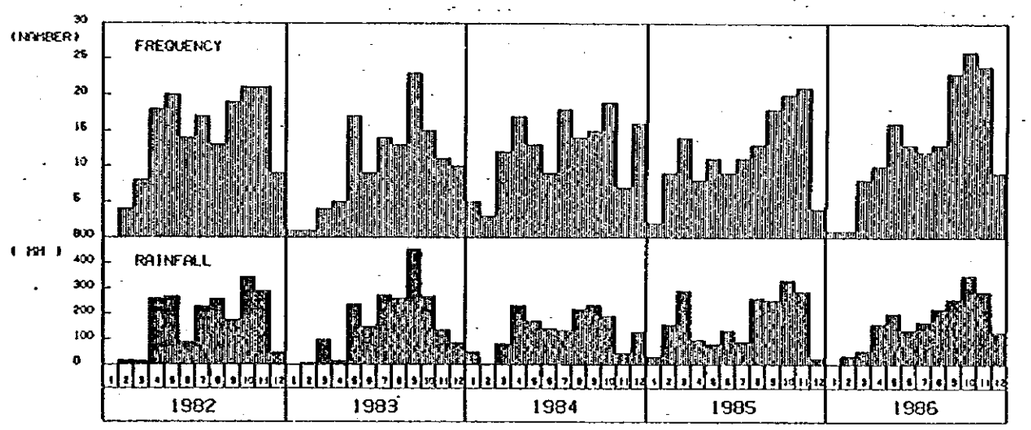


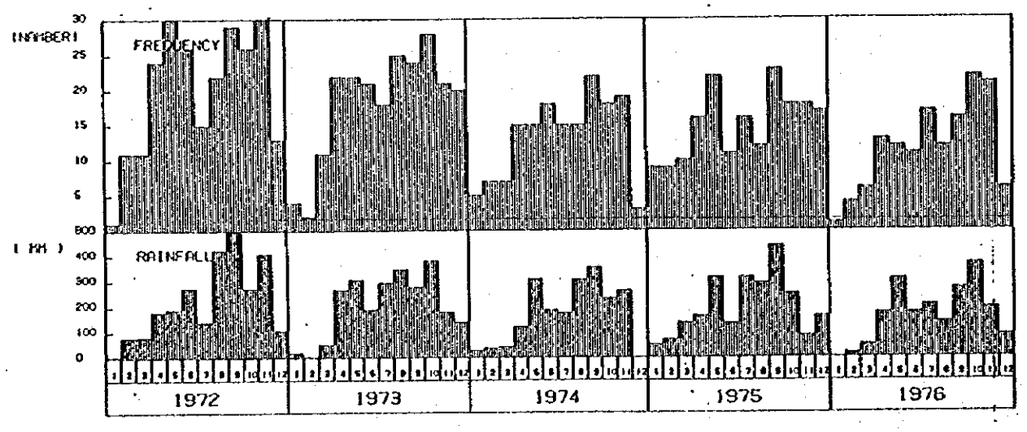
COMPREHENSIVE MANAGEMENT PLAN OF MUDA RIVER BASIN	MANTHLY RAINFALL DEPTH AND RAINY DAYS OF KEY STATION
JAPAN INTERNATIONAL COOPERATION AGENCY	(STATION ----- LADANG HEIRIETTA)

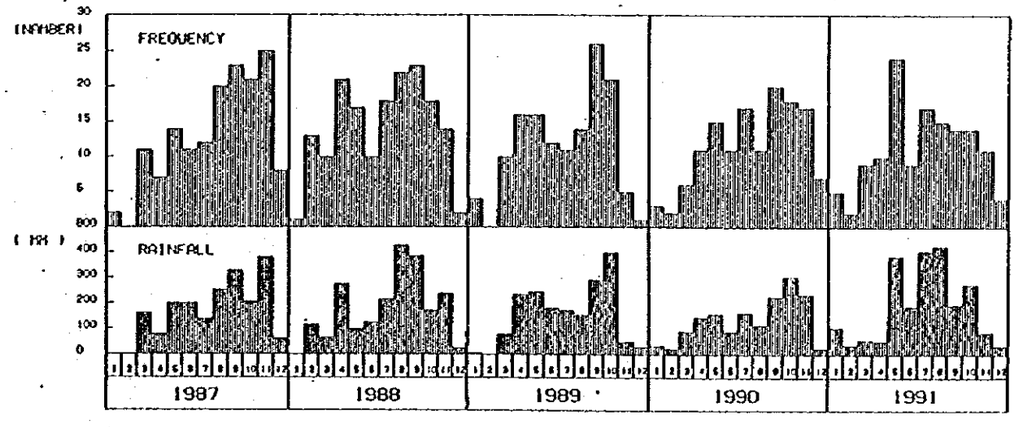












COMPREHENSIVE MANAGEMENT PLAN OF MUDA RIVER BASIN JAPAN INTERNATIONAL COOPERATION AGENCY	MANTHLY RAINFALL DEPTH AND RAINY DAYS OF KEY STATION (STATION ----- ALOR SETAR)

DATA BOOK IV
RIVER ENVIRONMENTAL MANAGEMENT PLAN

DATA BOOK IV
RIVER ENVIRONMENTAL MANAGEMENT PLAN

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TABLE 1.1 List of Bird in Gunung Inas Forest Reserve (Kedoh) and Bintang Hijan Forest Reserve (Perak)

Scientific Name	English Name	Sighted No.	Indirect Estimate No.
Blanus caeruleus	Black-shouldered Kite	1	0
Spilornis cheela	Grested Serpent-Eagle	14	0
Caloperdix oculea	Ferrunginous Wood Partridge	2	0
Argusianus argus	Great Argus	4	4
Macropygia nochali	Barred Cuckoo-Dove	6	6
Chalcophaps indica	Green-vinged Pigeon/Emerald Dove	2	0
Centropus bengalensis	Lesser Coucal	1	0
Caprimulgus macrurus	Large-tailed Nightjar	1	0
Merops leschenaulti	Chestnut-headed Bee-eater	2	0
Rhyticeros undulatus	Wreathed Hornbill	13	0
Anthracoceros convexus	Southern Pied Hornbill	8	3
Buceros rhinoceros	Rhinoceros Hornbill	16	0
Rhinoplax vigil	Helmeted Hornbill	1	0
Megalaima lineata	Lineated Barbet	2	0
Megalaima chrysopogon	Gold-whiskered Barbet	1	0
Megalaima mystacophanos	Red-throated Barbet	2	0
Megalaima franklinii	Golden-throated Barbet	3	0
Calorhamphus fuliginosus	Brown Barbet	2	0
Hemipus picauts	Bar-vinged Flycatcher-Shrike	2	0
Pericrocotus divaricatus	Ashy Minivet	2	0
Pericrocotus flammeus	Scarlet Minivet	5	0
Chloropsis cyanopogon	Lesser Green Leafbird	2	0
Cloropsis aurifrons	Golden-fronted Leafbird	2	0
*Chloropsis cochinchinensis	Blue-winged Leafbird	1	0
Pcynonotus atriceps	Black-headed Bulbul	14	0
Pcynonotus melanicterus	Black-crested Bulbul	6	0
Pcynonotus squamatus	Scaly-breasted Bulbul	12	0
Pcynonotus jocosus	Red-wiskered Bulbul	6	0
Pcynonotus finlaysoni	Red-whiskered Bulbul	4	0
Criniger ochraceus	Ochraceus Bulbul	10	0
Hypsipetes criniger	Hairy-backed Bulbul	4	0
Hypsipetes melaccensis	Streaked Bulbul	2	0
Dicrurus aeneus	Bronzed Drongo	1	0
Oriolus chinensis	Black-naped Oriole	5	0
Irena puella	Asian Fairy-Bluebird	2	0
Minla Strigula	Chestnut-tailed Minla	2	0
Alcippe peracensis	Mountain Fulvetta	8	0
Heterophasia picaoides	Long-tailed Sibia	2	0
Copsychus malabaricus	White-rumped Shama	1	0
Enicurus leschenaulti	White-crowned Forktail	1	0
Phyllopscopus ricketti	Sulfur-breasted Warbler	2	0
Ficedula vestermanni	Little Pied Flycatcher	1	0
Cyornis rubeculoides	Blue-throated Flycatcher	3	0
Rhipidura albicollis	White-throated Fantail	7	0
Hypothmis azurea	Black-naped Monarch	1	0
Terpsiphone paradisi	Asian Paradise Flycatcher	2	0
Motacilla cinerea	Grey Wagtail	1	0
Aethopyga saturata	Black-throated Sunbird	5	0
Aethopyga siparaja	Crimson Sunbird	2	0
Arachnothera longirostra	Little Spiderhunter	1	0
Arachnothera flavigaster	Spectacled Spiderhunter	1	0
Prionochilus maculatus	Yellow-breasted Flowerpecker	2	0
Prionochilus percussus	Crimson-breasted Flower pecer	3	0
Total		206	13

(Data Source : Department of Wild life)

TABLE 1.2 List of Mammal, Primate and Reptile in Gunng Inas Frest Reserve (Kedah) and Bintang Hijan Forest Reserve (Perak)

Scientific Name	English Name	Sighted No.	Indirect Estimate No.
Python reticulatics	Python	1	0
Presbytis cristata	Silvered Leaf-monkey	2	0
Presbytis melalophus	Banded Leaf-monkey	9	1
Macaca fascicularis	Long-tailed Macaque	11	0
Ratufa bicolor	Black Giant Squirrel	2	0
Hystrix brachyra	Malayan Porcupine	2	1
Trichys lipura	Long-tailed Porcupine	1	0
Aonyx cinerea	Oriental Small-claved Otter	6	0
Panthera tigris corbetti	Malayan Tiger	3	7
Elephans maximus maximus	Malayan Elephant	7	15
Tapirus Indicus	Tapir	5	14
Dicerorhinus sumatrensis	Lesser Two-horned Rhinoceros	0	7
Sus scrofa	Wild Pig	1	16
Muntiacus muntjak	Barking Deer/Indian Muntjac	7	4
Capricornis sumatraensis	Serv	0	3
Total		57	68

(Data Source : Department of Wild life)

TABLE 1.3 INVENTORY of WILDLIFE in STATE of KEDAH (1993) (1/7)

(Data Source : DWNP)

No.	Scientific Name	Malaysian Name	Total Number	District
1	Python reticulatis	Ular Sawa	1	Bandar Baharu
2	Varanus salvator	Biawak Air	2	Baling
			1	Bandar Baharu
			4	Kulim
			6	Langkawi
			1	Padang Terap
			1	Sik
			1	Yan
3	Varanus nebulosus	Biawak Tikus	1	Kulim
4	Butorides striatus	Pucong Keladi	1	Bandar Baharu
			6	Langkawi
5	Ardeola bacchus	Pucong Cina	10	Bandar Baharu
			57	Kubang Pasu
6	Egretta eulophotes	Bangau Cina	7	Kubang Pasu
7	Egretta garzetta	Bangau Kecil	26	Baling
			5	Kubang Pasu
			12	Kulim
8	Ixobrychus eurhythmus	Pucong Gelam	2	Kubang Pasu
			1	Yan
9	Ixobrychus cinnamomeus	Pucong Bendang	2	Baling
			2	Kuala Muda
			2	Kubang Pasu
10	Aviceda jerdoni	Lang Baza	2	Kubang pasu
11	Machaer hamphus alcinus	Lang Malam	1	Langkawi
12	Elanus caeruleus	Lang Bahu Hitam	1	Baling
			2	Bandar Baharu
			1	Kuala Muda
			5	Kubang Pasu
			1	Langkawi
			3	Pendang
13	Haliastur indus	Lang Merah	1	Kuala Muda
			2	Kulim
			9	Langkawi

TABLE 1.3 INVENTORY of WILDLIFE in STATE of KEDAH (1993) (2/7)

No.	Scientific Name	Malaysian Name	Total Number	District
14	Haliaeetus leucogaster	Lang Siput	1	Kuala Muda
			8	Langkawi
			2	Padang Terap
15	Spilornis cheela	Lang Berjambul	1	Baling
			1	Bandar Baharu
			1	Kubang Pasu
			2	Sik
16	Accipiter gularis	Lang Sewah	1	Kota Kuala Muda
			1	Kuala Muda
			2	Padang Terap
17	Ictinaetus malayensis	Lang Hitam	1	Padang Terap
18	Spizaetus cirrhatus	Lang Hindek	7	Sik
19	Coturnix chinensis	Pikau	1	Baling
20	Gallus gallus	Ayam Hutan	2	Kuala Muda
			3	Padang Terap
			4	Sik
21	Turnix suscitator	Puyuh Tanah	2	Sik
22	Rallus striatus	Sintar	4	Yan
23	Amaurornis phoenicurus	Ruak-Ruak	6	Bandar Baharu
			1	Gurun
			7	Kuala Muda
			1	Kubang Pasu
			1	Langkawi
			2	Yan
24	Gallicrex cinerea	Ayam-Ayam	3	Kuala Muda
			2	Kubang Pasu
25	Tringa totanus	Kedidi Kaki Merah	1	Kuala Muda
26	Tringa glareola	Kedidi Kyu	30	Kubang Pasu
27	Actitis hypoleucos	Kedidi Pasir	2	Kota Star
			11	Yan

No.	Scientific Name	Malaysian Name	Total Number	District
28	Gallinago gallinago	Berkek Ekor Kapas	2	Kuala Muda
29	Sterna hirundo	Camar Siput	20	Kuala Muda
30	Sterna sumatrana	Camar Topi Hitam	22	Kuala Muda
31	Sterna albifrons	Camar Kecil	20	Kubang Pasu
32	Treron olax	Punai Daun	5	Langkawi
			5	Sik
33	Ducula aenea	Pergam besar	2	Baling
34	Chalcophaps indica	Punai Tanah	7	Baling
			5	Bandar Baharu
			3	Kulim
			2	Langkawi
			6	Sik
			1	Yan
35	Loriculus galgulus	Bayan Kecil/Serindit	7	Baling
			3	Kuala Muda
			4	Sik
36	Cacomantis merulinus	Sewah Mati Anak	2	Baling
			1	Kubang Pasu
37	Phaenicophaeus chlorophaeus	Cenok Kerak	4	Baling
38	Phaenicophaeus curvirostris	Cenok Birah	1	Kulim
39	Centropus rectunguis	But-But Besar	1	Baling
			8	Kubang Pasu
40	Centropus sinensis	But-But Carik Anak	4	Baling
			1	Kuala Muda
41	Centropus bangalensis	But-But Kecil	1	Baling
			1	Kota Star
			1	Kubang Pasu
			5	Kulim
			2	Padang Terap
			3	Yan

No.	Scientific Name	Malaysian Name	Total Number	District
42	Otus bakkamonea	Hantu Reban	1	Kulim
			1	Sik
43	Caprimulgus macrurus	Tukang Kubur	1	Kuala Muda
			1	Langkawi
44	Alcedo atthis	Pekaka Cit-Cit Kecil	1	Kubang Pasu
45	Pelargopsis capensis	Pekaka Paruh Pendek	1	Kubang Pasu
46	Halcyon smyrnensis	Pekaka Belukar	27	Baling
			4	Bandar Baharu
			4	Kuala Muda
			15	Kubang Pasu
			8	Kulim
			5	Padang Terap
			6	Pendang
			4	Sik
			5	Yan
47	Halcyon chloris	Pekaka sungai	2	Baling
			1	Kota Star
			3	Kuala Muda
48	Merops phlippinus	Berek-Berek Carit Dada	2	Kubang Pasu
49	Eurystomus orientalis	Tiong Batu	2	Padang Terap
50	Rhyticeros undulatus	Enggang Gunung	14	Langkawi
			5	Padang Terap
			2	Sik
51	Antharacoceros convexus	Enggang Kelingking	3	Baling
			20	Langkawi
			8	Padang Terap
			4	Sik
52	Buceros rhinoceros	Enggang Lilin/Badak	2	Baling
			15	Sik
53	Rhinoplax vigil	Enggang Tebang Mentua	5	Sik
54	Psilopogon pyrolophus	Takor Api	1	Sik
55	Megalaima lineata	Takor Kukup	1	Baling
56	Megalaima chrysopogon	Takor Jambang Emas	4	Baling
			3	Kulim

TABLE 1.3 INVENTORY of WILDLIFE in STATE of KEDAH (1993) (5/7)

No.	Scientific Name	Malaysian Name	Total Number	District
57	Dinopium javanense	Belatok Pinang Muda	1	Baling
58	Dinopium rafflesii	Belatok Rimba	2	Sik
59	Picoides canicapillus	Belatok Belacan	1	Baling
60	Hirundo rustica	Suafo Api	2	Kuala Muda
			1	Merbok
61	Pericrocotus	Mas Belukar	18	Langkawi
62	Aegithina lafresnayei	Kunyit Bukit	2	Kulim
			1	Langkawi
			2	Yan
63	Pcynonotus zeylanicus	Barau-Barau	2	Kulim
64	Pcynonotus atriceps	Merbah Siam	20	Kulim
65	Pcynonotus jocosus	Merbah Telinga Merah	2	Baling
			4	Kuala Muda
			4	Kulim
66	Pcynonotus finlaysoni	Merbah Luris Leher	11	Baling
			2	Kuala Muda
			3	Kubang Pasu
			2	Kulim
67	Dicrururs remifer	Cecawi Hamba Kera	2	Langkawi
68	Dicrurus paradiseus	Cecawi Anting-Anting	2	Baling
			6	Kuala Muda
			8	Kulim
			1	Yan
69	Oriolus chinensis	Dendang Selayang	4	Baling
70	Oriolus cruentus	Dendang Mas	2	Kulim

TABLE 1.3 INVENTORY of WILDLIFE in STATE of KEDAH (1993) (6/7)

No.	Scientific Name	Malaysian Name	Total Number	District
71	Copsychus malabaricus	Murai Rimba	1	Kubang Pasu
			1	Kulim
			5	Langkawi
72	Enicurus leschenaulti	Murai Cegar Belukar	2	Yan
73	Gracula religiosa	Tiong Mas	3	Baling
			15	Langkawi
			2	Padang Terap
			3	Sik
74	Echinosorex gymnurus	Tikus Ambang Bulan	1	Baling
75	Pteropus vampyrus	Keluang	20	Sik
76	Presbytis cristata	Lotong Kelabu	10	Baling
			40	Kuala Muda
			9	Kulim
			19	Langkawi
			5	Padang Terap
			6	Sik
77	Presbytis melalophus	Ceneka/Seneka/Kekah	7	Kuala Muda
			5	Kubang Pasu
78	Macaca fascicularis	Kera	6	Bandar Baharu
			109	Kuala Muda
			20	Kulim
			13	Langkawi
79	Macaca nemestrina	Beruk	1	Kuala Muda
			20	Kulim
			2	Sik
80	Hylobates lar	Ungka Tangan Putih/ Wak-Wak	4	Baling
			2	Kubang Pasu
			1	Kulim
			1	Sik

TABLE 1.3 INVENTORY of WILDLIFE in STATE of KEDAH (1993) (7/7)

No.	Scientific Name	Malaysian Name	Total Number	District
81	Hylobates agilis	Ungka Tangan Hitam/ Wak-Wak	1	Baling
82	Manis javanica	Tenggiling/ Pengguling	3	Kulim
83	Ratufa bicolor	Kerawak Hitam	1 1 2 1	Langkawi Pendang Sik Yan
84	Callosciurus prevostii	Tupai Gading	1	Kulim
85	Petaurista petaurista	Tupai Terbang	4	Padang Terap
86		Memerang	4 18 15	Kulim Padang Terap Sik
87	Lutra sumatrana	Memerang Hidung Berbulu	5	Kuala Muda
88	Lutra perspicillata	Memerang Bulu Licin	3	Langkawi
89	Paradoxurus hermaphroditus	Musang Pulut	1 3 1	Kota Kuala Muda Kulim Langkawi
90	Herpectes auropunctatus	Bambun Kecil/ Cerpelai	1	Pendang
91	Elephas maximus maximus	Gajah	4	Kulim
92	Sus scrofa	Babi Hutan	3 3 6	Kulim Langkawi Padang Terap

(Data Source : Department of Wildlife)

TABLE 1.4 DATA OF WILDLIFE IN HULU MUDA FOREST (1)

(Wildlife estimated for the type of habitat under 100 metres)

Type of Habitat	Bird	Small Mammals	Big Mammals	Herpetofauna	Fish	TOTAL
DA	0	2	0	1	124	127
HKS	3	0	18	0	0	21
HPP	576	0	2	0	0	578
HPS	0	9	37	0	0	46
HR	0	0	9	0	0	9
J	0	0	31	0	0	31
PL	0	6	0	4	0	10
TAS	0	0	21	0	0	21
TAT	26	10	43	7	0	86
TL	1	2	6	0	0	9
	606	29	167	12	124	938

LEGEND

DA	: Aquatic	J	: Saltlick
HKS	: Hill Secondary Forest	PL	: Muddy Aquatic
HPP	: Lowland Primary Forest	TAS	: River Bank
HPS	: Lowland Secondary Forest	TAT	: Lake Bank
HR	: 'Riparian' Forest	TL	: Muddy Lake

TABLE 1.4 DATA ON WILDLIFE IN ULU MUDA FOREST RESERVE (2)

Wildlife estimated for the type of habitat between 100 to 300m

Type of Habitat	Bird	Small Mammals	Big Mammals	Herpetofauna	Fish	TOTAL
DA	0	0	0	0	9456	9456
HKP	42	6	12	0	0	60
HKS	14	2	55	0	0	71
HPP	39	0	2	0	0	41
HPS	427	46	84	104	0	661
J	0	0	15	0	0	15
LG	1	0	0	0	0	1
PD	188	4	120	1	0	313
TAP	0	5	0	0	0	5
TAS	34	23	68	4	0	129
TAT	16	13	25	0	0	54
	761	99	381	109	9456	10806

LEGEND

DA	: Aquatic	J	: Saltlick
HKP	: Hill Primary Forest	LG	: Rubber Plantation
HKS	: Hill Secondary Forest	PD	: Lowland Aquatic
HPP	: Lowland Primary Forest	TAP	: Swamp bank
HPS	: Lowland Secondary Forest	TAS	: River Bank
		TAT	: Lake Bank

TABLE 1.4 DATA ON WILDLIFE IN ULU MUDA FOREST RESERVE (3)

Wildlife estimated for the type of habitat over 300 metres

Type of Habitat	Bird	Small Mammals	Big Mammals	Herpetofauna	Fish	TOTAL
BD	26	1	24	1	0	52
HKP	84	5	53	1	0	143
HKS	12	1	21	0	0	34
HPP	4	0	15	0	0	19
HPS	17	0	0	0	0	17
TAS	0	0	2	0	0	2
	143	7	115	2	0	267

LEGEND

BD : Aquatic
HKP : Hill Primary Forest
HKS : Hill Secondary Forest
HPP : Lowland Primary Forest
HPS : Lowland Secondary Forest
TAS : River Bank

TABLE 1.4 DATA ON WILDLIFE IN ULU MUDA FOREST RESERVE (4)

(List of big mammal species that can find and recognize at Ulu Muda Reserve Forest, Kedah)

No.	Scientific Name	Common Name	Malay Name	Number	
				Actual	Estimate
1	Presbytis obscura	Banded leaf monkey	Lotong chengkong	29	2
2	Presbytis melalophus	Dusky leaf monkey	Lotong cheneka	23	6
3	Macaca fascicularis	Long tailed macaque	Kera	24	19
4	Macaca nemestrina	Pig tailed macaque	Berok	41	0
5	Hylobates lar	Siamang	Siamang	7	69
6	Hylobates agiles	Agile gibbon	Wak-wak	4	8
7	Helarctos malayanus	White handed gibbon	Ungka	1	3
8	Panthera tigris corbetti	Tiger	Harimau belang	0	1
9	Panthera pardus	Leopard	Harimau kumbang	1	1
10	Neofelis nebulosa	Clouded Leopard	Harimau dahan	0	13
11	Elephas maximus maimus	Elephant	Gajah	20	76
12	Tapirus indicus	Tapir	Badak chipan	4	2
13	Sus scrofa	Wild pig	Babi hutan	107	152
14	Muntiacus muntjak	Barking deer	Kijang	20	28
15	Cervus unicolor	Sambur deer	Rusa	8	43
16	Bos gaurus hubbacki	Gaur	Seladang	1	19
17	Capricornis sumatrensis	Serow	Kambing gurun	0	4
				290	446

TABLE 1.4 DATA ON WILDLIFE IN ULU MUDA FOREST RESERVE (5)

Distribution and frequency of big mammal species according to height at Ulu Muda Reserve Forest

No.	Scientific Name	Common Name	Malay Name	Height		
				< 100m	100m-300	> 300m
1	Presbytis obscura	Banded leaf monkey	Lotong chengkong	6	7	
2	Presbytis melalophus	Dusky leaf monkey	Lotong cheneka	2	6	2
3	Macaca fascicularis	Long tailed macaque	Kera	5	4	
4	Macaca nemestrina	Pig tailed macaque	Berok	3	3	1
5	Hylobates lar	Siamang	Siamang	4	24	5
6	Hylobates agiles	Agile gibbon	Wak-wak		6	
7	Helarctos malayanus	White handed gibbon	Ungka	1	1	1
8	Panthera tigris corbetti	Tiger	Harimau belang		1	
9	Panthera pardus	Leopard	Harimau kumbang	1	1	
10	Neofelis nebulosa	Clouded leopard	Harimau dahan	1	12	
11	Elephas maximus maimus	Elephant	Gajah	16	30	22
12	Tapirus indicus	Tapir	Badak chipan	1	5	
13	Sus scrofa	Wild pig	Babi hutan	19	60	29
14	Muntiacus muntjak	Barking deer	Kijang	8	28	10
15	Cervus unicolor	Sambur deer	Rusa	14	6	2
16	Bos gaurus hubbacki	Gaur	Seladang	14	6	
17	Capricornis sumatrensis	Serow	Kambing gurun			4

TABLE 1.4 DATA ON WILDLIFE IN ULU MUDA FOREST RESERVE (6)

Distribution and frequency of big mammal according to habitat at Ulu Muda Reserve Forest, Kedah

No.	Scientific Name	Common Name	Malay Name	Habitat										
				HPS	TAT	HR	HKS	HKP	TL	TAS	J	HPP	BD	PD
1	Presbytis obscura	Banded leaf monkey	Lotong chengkong	9	3	1								
2	Presbytis melalophus	Dusky leaf monkey	Lotong cheneka	4	1			1						3
3	Macaca fascicularis	Long tailed macaque	Kera	5	1	1	1							1
4	Macaca nemestrina	Pig tailed macaque	Berok	4				1						2
5	Hylobates lar	Siamang	Siamang	8	1		6	4						12
6	Hylobates agiles	Agile gibbon	Wak-wak	2	1	3								
7	Helarctos malayanus	White handed gibbon	Ungka	1	1							1		
8	Panthera tigris corbetti	Tiger	Harimau belang				1							
9	Panthera pardus	Leopard	Harimau kumbang						1	1				
10	Neofelis nebulosa	Clouded leopard	Harimau dahan							13				
11	Elephas maximus maimus	Elephant	Gajah	10	4		12	12	1	13	6	5	4	1
12	Tapirus indicus	Tapir	Badak chipan	4						1	1			
13	Sus scrofa	Wild pig	Babi hutan	17	8	2	7	15	1	11	2	1	11	32
14	Muntiacus muntjak	Barking deer	Kijang	7	2		4	7		14	5	2	3	2
15	Cervus unicolor	Sambur deer	Rusa	5	10		9			9	6			3
16	Bos gaurus hubbacki	Gaur	Seladang	4			1			15				
17	Capricornis sumatrensis	Serow	Kambing gurun											4
				80	32	7	41	40	3	77	20	9	18	60

Legand :

HPS = Lowland Secondary Forest
TAT = Lake Bank
HR = 'Riparian' Forest
HKS = Hill Secondary Forest
HKP = Hill Primary Forest
TL = Muddy Lake
TAS = River Bank
J = Saltlick
HPP = Lowland Primary Forest
BD = Aquatic
PD = Lowland Aquatic

TABLE 1.4 DATA ON WILDLIFE IN ULU MUDA FOREST RESERVE (7)

Small mammal at research area in Ulu Muda Reserve Forest, Kedah

No.	Scientific Name	Common Name	Malay Name	Number	Frequency
1	Nycteris ja vanica	Hallow faced bat	Kelawar muka lekok	1	1
2	Rhinolopus affinis	Intermediate horseshoe bat	Kelawar ladam hutan	2	1
3	Rhinolopus refulgens	Glossy horseshoe bat	Kelawar ladam bulu kilat	2	1
4	Rhinolopus acuminatus	Acuminate horseshoe bat	Kelawar ladam kenorong	7	4
5	Rhinolopus trifoliatus	Trefoil horseshoe bat	Kelawar ladam muka kuning	5	2
6	Hipponderos sabanus	Lawas roundleaf horseshoe bat	Kelawar ladam bulat lawas	1	1
7	Tupaia glis	Common treeshrew	Tupai muncong besar	4	2
8	Ratufa bicolor	Black giant squirrel	Tupai kerawak hitam	6	3
9	Callosciurus notatus	Plaintain squirrel	Tupai pinang	16	4
10	Callosciurus caniceps	Grey bellied squirrel	Tupai teratak	1	1
11	Sundasciurus tenuis	Slender squirrel	Tupai cerleh	2	1
12	Rattus tiomanicus	Malaysian wood rat	Tikus belukar	1	1
13	Rattus surifer	Red spiny rat	Tikus duri merah	1	1
14	Rattus rajah	Brown spiny rat	Tikus duri hitam pudar	2	1
15	Bandikota indika	Large bandicoot rat	Wirok hitam	1	1
16	Hystrix brachyura	Large porcupine	Landak raya	5	3
17	Martes flavigula	Yellow throated marten	Mengkira	1	1
18	Amblonyx cinerea	Small clawed otter	Memerang/ Berang-berang kecil	33	4
19	Lutra perspicillatta	Smooth otter	Memerang bulu licin	39	4
20	Viverra tangalunga	Malay civet	Tanggalong	1	1
21	Lutra lutra	Common otter	Memerang darat	9	4
22	Felis bengalensis	Leopard cat	Kucing batu	11	4
23	Tragulus javanicus	Lesser mouse deer	Pelanduk	10	4
24	Tragulus napu	Large mouse deer	Napuh	1	1
	TOTAL			162	

Frequency mod

1= Hard (1-2)
2= Sometimes (3-4)
3= Always (5-6)
4= Everydays (> 6)

TABLE 1.4 DATA ON WILDLIFE IN ULU MUDA FOREST RESERVE (8)

Fish species distribution at catchment Muda Dam

No.	Scientific Name	Malay Name	J/KIRA	J/ANG	J/A/BERA (kg)
1	Acrosocheilus hexagonolepis	Tengas	1		0.5
2	Chana striatus	Haruan	39	23	45
3	Clarias macrocephalus	Keli	6	8	2.4
4	Cyclocheilichthys heteronema	Chemperas	16		1.6
5	Hampala macrolepidota	Seberau	1	590	112.3
6	Labiobarbus leptocheilus	Kawan		15250	770
7	Mystacoleucus marginatus	Sia	17	285	8.4
8	Mystus vittatus	Baung	20	8	6.3
9	Notopterus notopterus	Belida / Selat	7	50	22.2
10	Osphronemus goramy	Kalui		8	2
11	Osteuchilus hasselti	Terboi	3	4800	235
12	Osteuchilus vittatus	Rong		1000	85
13	Pristolepis fasciatus	Kepor	13	10	2.7
14	Puntius daruphani	Kerai		180	30
15	Puntius gonionotus	Lampam jawa	1	304	79.3
16	Rasbora einthoveni	Susur batang		140	14
17	Tilapia mossambica	Tilapia	20	650	175
18	Tor tambroides	Kelah	1		1
19	Trichogaster pectoralis	Sepat siam	1		0.1
20	Wallogo attu	Tapah	3		1
			149	23306	1593.8

TABLE 1.5 STATUS OF WILDLIFE

(by JICA PKP Study in 1982)

Item No.	Species	Status
1.	Common Wild Pig	E
2.	Leaf Monkey	E
3.	White-Handed Gibbon	V
4.	Long-Tailed Porcupine	R
5.	Common Palm Civet	E
6.	Malay Civet	E
7.	Sambar Deer	E
8.	Barking Deer	V
9.	Lesser Mouse Deer	V
10.	Tiger	E
11.	Leopard	R

Note :
E : Endangered
V : Vulnerable
R : Rare

TABLE 1.6 LIST OF WILDLIFE IN SIK DISTRICT (1/10)

(Data source : Report of Beris Dam)

	Local Name	English Name
A.	Wildlife Mammal	
1.	Babi Hutan	Wild Pig
2.	Beruang	Malayan Sum Bear
3.	Beruk	Pig-tailed Macaque
4.	Ceneka	Banded Leaf-monkey
5.	Cipan	Tapir
6.	Gajah	Malayan Elephant
7.	Harimau Dahan	Clouded Leopard
8.	Kelawar Ladam Bulu Kilat	Glossy Horseshoe Bat
9.	Kelawar Ladam Hutan	Intermediate Horseshoe Bat
10.	Kelawar Ladam Kenarong	Acuminate Horseshoe Bat
11.	Kelawar Ladam Muka Kuning	Trefoil Horseshoe Bat
12.	Kelawar Ladam Bulat Lawas	Lawas Roundleaf Horseshoe Bat
13.	Kelawar Muka Lekok	Hollow-faced Bat
14.	Kera	Long-tailed Macaque
15.	Kerawak Hitam	Black Giant Squirrel
16.	Kijang	Barking Deer
17.	Kuching Batu	Leopard Cat
18.	Landak Raya	Malayan Porcupine
19.	Lotong Bercelak/ Cengkong	Dusky Leaf-monkey
20.	Memerang Bulu Licin	Smooth Otter
21.	Memerang Darat	Otter Civet
22.	Memerang Kecil	Oriental Small-clawed Otter
23.	Mengkira	Yellow-throated Otter

TABLE 1.6 LIST OF WILDLIFE IN SIK DISTRICT (2/10)

A.	**Wildlife Mammal (Continued)**	
24.	Napuh	Large Mouse-deer
25.	Pelanduk	Lesser Mose-deer
26.	Rusa Sambar	Sambar Deer
27.	Seladang	Seladang
28.	Tenggalung	Malay Civet
29.	Tikus Belukar	Malaysian Wood-rat
30.	Tikus Duri Hitam-pudar	Brown Spiny Rat
31.	Tikus Duri Merah	Red Spiny Rat
32.	Tikus Kendeng	Pencil-tailed Tree-mouse
33.	Tupai Cerleh	Slender Squirrel
34.	Tupai Pinang	Plaintain Squirrel
35.	Tupai Teratak	Grey-bellied Squirrel
36.	Tupai-moncong Besar	Common Treeshrew
37.	Ungka Tangan Hitam	Agile Gibbon
38.	Ungka Tangan Putih	White-handed Gibbon

TABLE 1.6 LIST OF WILDLIFE IN SIK DISTRICT (3/10)

	Local Name	English Name
B.	**Wildlife Bird**	
1.	Ayam Hutan	Red Junglefowl
2.	Ayam Pegar	Crested Fireback
3.	Bangau Kendi	Cattle Egret
4.	Barau-Barau	Straw-headed Bulbul
5.	Bayan Kecil	Blue-crowned Hanging Parrot
6.	Belatok Belacan	Grey-capped Woodpecker
7.	Belatok Berjalor	Great Salty Woodpecker
8.	Belatok Gajah	White-bellied Woodpecker
9.	Belatok Mas	Crimson-winged Woodpecker
10.	Belatok Pinang Muda	Common Goldenback
11.	Belatok Punggoh	Grey-and-Buff Woodpecker
12.	Belatok Ranum	Orange-backed Woodpecker
13.	Berek-Berek Carik Dada	Blue-tailed Bee-eater
14.	Berek-Berek Janggut Merah	Red-bearded Bee-eater
15.	Berek-Berek Senja	Chesnut-headed Bee-eater
16.	Berek-Berek Tadah Hujan	Blue-throated Bee-eater
17.	But-But Carik Anak	Greater Coucal
18.	Cecawi Anting-Anting	Greater Racket-tailed Drongo
19.	Cecawi Keladi	Bronzed Drongo
20.	Cecawi Rajawali	Black Drongo
21.	Cekup Artik	Arctic Warbler
22.	Cekup Rimba	Inornate Warbler
23.	Cekup Sampah	Great Reed Warbler

TABLE 1.6 LIST OF WILDLIFE IN SIK DISTRICT (4/10)

B.	Wildlife Bird (Continued)	
24.	Cenuk Birah	Chesnut-breast Malkoha
25.	Cenok Kecil	Chesnut-bellied Malkoha
26.	Cenok Kerak	Raffle's Malkoha
27.	Cenok Perut Hitam	Black-bellied Malkoha
28.	Ciak Arnab	Plain-backed Sparrow
29.	Daun Besar	Greater Green Leafbird
30.	Daun Kecil	Lesser Green Leafbird
31.	Dendang Gajah	Asian Fairy-Bluebird
32.	Dendang Selayang	Black-naped Oriole
33.	Dendang Senja	Dark-throated Oriole
34.	Enggang Belukar	Bushy-crested Hornbill
35.	Enggang Gatal Birah	Black Hornbill
36.	Enggang Gunung	Wreathed Hornbill
37.	Enggang Jambul Putih	White-crowned Hornbill
38.	Enggang Kelingking	Oriental Pied Hornbill
39.	Enggang Lilin/ Badak	Rhinoceros Hornbill
40.	Enggang Papan	Great Hornbill
41.	Enggang Tebang Mentua	Helmeted Hornbill
42.	Falko Rajawali	Black-thighed Falconet
43.	Gagak Anting-Anting	Racket-tailed treepie
44.	Gagak Kambing	Black Magpie
45.	Gagak Paruh Besar	Large-billed Crow
46.	Hantu Kuang Kuik	Common Scoops-Owl
47.	Kedidi Pasir	Common Sandpiper

TABLE 1.6 LIST OF WILDLIFE IN SIK DISTRICT (5/10)

B.	Wildlife Bird (Continued)	
48.	Kelicap Gunung	Black-throated Sunbird
49.	Kelicap Jantung	Little Spiderhunter
50.	Kelicap Mayang Kelapa	Brown-throated Sunbird
51.	Kelicap Rimba	Purple-naped Sunbird
52.	Kelicap Sepah Raja	Crimson Sunbird
53.	Kuang raya	Great Argus
54.	Kunyit Bukit	Common Iora
55.	Lang Berjambul	Crested Serpent-Eagle
56.	Lang Hindek	Changeable Hawk-Eagle
57.	Lang Hitam	Black Kite
58.	Lang Kangok	Lesser Fish Eagle
59.	Lang Kepala Kelabu	Grey-headed Fish-Eagle
60.	Lang Malam	Bat Hawk
61.	Lang Merah	Brahminy Kite
62.	Lang Sewah	Japanese Sparrowhawk
63.	Lang Sikap	Crested Goshawk
64.	Lang Siput	White-bellied Sea Eagle
65.	Lang Tiram	Osprey
66.	Layang-LAyang Asia	Asian Palm-Swift
67.	Layang-Layang Jambul Kecil	Whiskered Treeswift
68.	Layang-Layang Kecil	Silver-rumped Swift
69.	Layang-Layang Perut Putih	White-bellied Swiftlet
70.	Mas Belukar	Scarlet Minivet
71.	Mas Padang	Ashy Minivet

TABLE 1.6 LIST OF WILDLIFE IN SIK DISTRICT (6/10)

B.	Wildlife Bird (Continued)	
72.	Merbah Abu	Ashy Bulbul
73.	Merbah Bulu Panjang Tengkok	Hairy-backed Bulbul
74.	Merbah Jambul Hitam	Black-crested Bulbul
75.	Merbah Kapur	Yellow-vented Bulbul
76.	Merbah Lorek Bukit	Streaked Bulbul
77.	Merbah Luris Leher	Striped-throated Bulbul
78.	Merbah Mata Merah	Red-eyed Bulbul
79.	Merbah Mata Putih	Cream-vented Bulbul
80.	Merbah Perut Kuning	Yellow-bellied Bulbul
81.	Merbah Rengkong Kembang	Puft-throated Bulbul
82.	Merbah Rengkong Putih	White-throated Bulbul
83.	Merbah Sampah	Grey-cheeked Bulbul
84.	Merbah Siam	Black-headed Bulbul
85.	Merbok Balam	Black-headed Bulbul
86.	Murai Belanda	Orange-headed Thrush
87.	Murai Cegar	Chestnut-naped Forktail
88.	Murai Kampung	Magpie Robin
89.	Murai Rimba	White-rumped Shama
90.	Murai Siberia	Siberian Blue Robin
91.	Murai Siberia Kelabu	Siberian Thrush
92.	Pacat Bukit	Banded Pitta
93.	Patuk Baldu	Velvet-fronted Nuthatch
94.	Pekaka Belukar	White-throated Kingfisher
95.	Pekaka Bintik-Bintik	Blue-eared Kingfisher

TABLE 1.6 LIST OF WILDLIFE IN SIK DISTRICT (7/10)

B.	Wildlife Bird (Continued)	
96.	Pekaka Bukit	Blue-banded Kingfisher
97.	Pekaka Cit-Cit Kecil	Common Kingfisher
98.	Pekaka Kopiah Hitam	Black-capped Kingfisher
99.	Pakaka Paruh Pendek	Stork-billed Kingfisher
100.	Pekaka Rimba	Black-blacked Kingfisher
101.	Pekaka Sungai	Collared Kingfisher
102.	Perenjak Belukar	Dark-necked Tailorbird
103.	Perenjak Bukit	Ashy Tailorbird
104.	Perenjak Padi	Yellow-bellied Prinia
105.	Perenjak Pisang	Common Tailorbird
106.	Perenjak Rimba	Rufous-tailed Tailorbird
107.	Perenjak Sampah	Rufescent Prinia
108.	Pergam Besar	Green Imperial Pigeon
109.	Pikau	Blue-breasted Quail
110.	Pipit Batu	Grey Wagtail
111.	Pipit Kuning	Yellow Wagtail
112.	Pipit Padi	White-bellied Munia
113.	Pipit Tanah	Richard's Pipit
114.	Puchong Jawa	Javan Pond-Heron
115.	Puchong Keladi	Little Heron
116.	Puchong Merah	Yellow Bittern
117.	Punai Bakok	Large Green Pigeon
118.	Punai Daun	Little Green Pigeon
119.	Punai Lengguak	Thick-billed Pigeon

TABLE I.6 LIST OF WILDLIFE IN SIK DISTRICT (8/10)

B.	Wildlife Bird (Continued)	
120.	Punai Tanah	Emerald Dove
121.	Rembah Batu	Black-winged Flycatcher-Shrike
122.	Rembah Kayu Besar	Large Wood Shrike
123.	Rimba Berjalor	Striped Tit-Babbler
124.	Rimba Bermisai	Moustached Babbler
125.	Rimba Merbah Sampah	Chestnut-winged Babbler
126.	Rimba Pong-Pong	Fluffy-backed Tit-Babbler
127.	Rimba Sampah	Ferruginous Babbler
128.	Rimba Tua Besar	Rufous crowned Babbler
129.	Rimba Tua Kecil	Scaly-crowned Babbler.
130.	Ruak-Ruak	White-breasted Waterhen
131.	Sambar Asia	Asian Brown Flycatcher
132.	Sambar Belantara	Brown-streaked Flycatcher
133.	Sambar Bukit	Hill Blue Flycatcher
134.	Sambar Ekor Panjang	Asian Paradise Flycatcher
135.	Sambar Pacat	Grey-headed Flycatcher
136.	Sambar Paya	Rufous-winged Flycatcher
137.	Sambar Rengkong Biru	Blue-throated Flycatcher
138.	Sambar Uban Hitam	Black-naped Monarch
139.	Sepah Puteri Bukit	Orange-bellied Flowerpecker
140.	Sepah Puteri Merah	Scarlet-backed Flowerpecker
141.	Sepah Puteri Raja	Yellow-breasted Flowerpecker
142.	Sewah Gila	Brush Cuckoo
143.	Sewah India	Indian Cuckoo

TABLE I.6 LIST OF WILDLIFE IN SIK DISTRICT (9/10)

B.	Wildlife Bird (Continued)	
144.	Sewah Kapas	Pied Triller
145.	Sewah kecil	Lesser Cuckoo-Shrike
146.	Sewah Mati Anak	Plaintive Cuckoo
147.	Sewah Rimba	Bar-bellied Cuckoo-Shrike
148.	Sewah Sawai	Drongo Cuckoo
149.	Sewah Tanah	Asian Emerald Cuckoo
150.	Siul Berjambul	Crested Wood Partridge
151.	Sualo Api	Barn Swallow
152.	Sualo Batu	Pacific Swallow
153.	Takau Hitam Kuning	Black-and -Yellow Broadbill
154.	Takau Rakit	Black-and-Red Broadbill
155.	Takau Selawit	Green Broadbill
156.	Takor Bukit	Black-browed Barbet
157.	Takor Dahan	Brown Barbet
158.	Takor Gunung	Red-crowned Barbet
159.	Takor Jambang Emas	Gold-whiskered Barbet
160.	Takor Mahkota Kuning	Yellow-crowned Barbet
161.	Takor Raya	Red-throated Barbet
162.	Tiong Batu	Dollarbird
163.	Tiong Gembala Kerbau	Common Myna
164.	Tiong Hutan	Jungle Myna
165.	Tiong Mas	Hill Myna
166.	Tirjup Rimau	Tiger Shrike
167.	Tirjup Tanah	Brown Shrike

TABLE 1.6 LIST OF WILDLIFE IN SIK DISTRICT (10/10)

B.	Wildlife Bird (Continued)	
168.	Tukang Kubur	Large-tailed Nightjar
169.	Yuhina Perut Putih	White-bellied Yuhina

TABLE 1.7 Standard Statistical Classification of Common Malaysian Freshwater Fishes

Division group of species	Local Name	English Name	Scientific Name
FRESHWATER FISHES			
Carps, Barbels and others	Tengas	Carp	*Acrossocheilus Hexagonoicpis*
	Kap Kepala Besar	Big HeadCarp	*Aristichths nobilis*
	Ikan Mas	Edible Gols Fish	*Carassius auratus*
	Kap Lumpur	Mud Carp	*Cirhina molitorella*
	Kap Rumput	Grass Carp	*Ctenopharyngodon indellus cyprinids*
	Temperas	Carp	*Cyclocheilchthys apogon*
	Lee Koh	Common Carp	*Cyprinus Carpio*
	Selimang Batu	Carp	*Epbalzeorthynchus kalopterus*
	Sebaral	Carp	*Hampala macrolepidota*
	Kap Perak	Silver Carp	*Hypophthalmichthys molitris*
	Pucuk Pisang	Carp/Barb	*Labiobarbus fasciatus*
	Lomah	Carp/Barb	*Labiobarbus ocellatus*
	Jelawat	River Carp	*Leptobarbus hoevenii*
	Jenkua	Carp	*Morulius chrysophekadion*
	Kap Hitam	Black Carp	*Mylopharyngodon piceus*
	Sia	Carp	*Mystacoleucus marginatus*
	Terbol	Carp	*Osteochilus hasseltii*
	Lallang	Carp	*Oxygaster anomalura*
	Bulu Ayam	Carp	*Oxygaster spp.*
	Temoleh, Temelian	Giant River Carp	*Probarbus Jullieni*
	Putih, Tebal Sisek	Common Barb	*Puntius binotatus*
	Tengalan	Carp/Barb	*Puntius bulu*
	Keral Kunyit	Carp/Barb	*Puntius daruphani*
	Lampam Java	Javanese Carp	*Puntius gonionotus*
	Bagoh	Spanner Barb	*Puntiuslateristriga*
	Lampam Sungai*	River Carp	*Puntius schwanefeldii*
	Susur Batang	Raasbora	*Rasbora einthovenii*
	Sefuang	Two-spot Rasbora	*Rasabora elegans*
	Kelah	River Carp	*Tor tamboroides*
Tilapias and Cichlids	Tilapia	Tilapia	*Tilapia mossambica*
Miscellaneous freshwater fishes	Puyu*	Climbing Perch	*Anabas tertudineus*
	Tuna	River Eel	*Anquilla bicolor/A. nebulosa*
	Kepala Timah	White Spot	*Aplocheilus panchax*
	Lali-lali	Loach	*Botia spp.*
	Keli*	Freshwater Catfish	*Clarias batrachus/C. macrocephalus*
	Limbal	Freshwater Catfish	*Clarias nieuhofi*
	Belut*	Swamp Eel	*Fluta alba*
	Temakang	Kissing Gouraml	*Helostoma temminckii*
	Susoh Bats	Loach	*Homaloptera spp.*
	Baung*	River Catfish	*Mystus nemurus*
	Tengku Lolah	River Catfish	*Mustus wyckii*
	Belida*	Feather back	*Notopterus notopterus*
	Kalui*	Giant Gouraml	*Osphronemus goramy*
	Bujuk	Snake Head	*Ophicephalus lucius*
	Toman	Snake Head	*Ophicephalus micropeltes*
	Haruan*	Snake Head	*Ophicephalus striatus*
	Ketutu*	Goby	*Oxyeleotris marmoratus*
	Lawang	River Catfish	*Pangasius micronemus*
	Patin*	River Catfish	*Pangasius pangasius*
	Kepar, Patong	Perch	*Pristipepisfasciatus*
	Kelesa	Sclerapages	*Scleropages formosus*
	Sepat Siam	Snakeskin Gouramy	*Trichogasterpectoralis*
	Sepat Padi*	Two-spot Gouramy	*Trichogastertrichopterus*
	Tapah	Giant River Catfish	*Wallago spp.*
CRUSTACEANS			
Freshwater Crustaceans	Udang Galah *	Giant Freshwater prawn	*Macrobrachiumrosenbergii*

* Common in Sg. Muda

TABLE 1.8 LIST OF FOREST RESERVE IN STATE OF KEDAH (1985)

District and Name of Forest	Reserved Forest Area (ha)	Proposed Reserved Forest Area (ha)	Total Area (ha)
Daerah Kedah Utara			
Ayer Hangat	605.00		605.00
Bukit Kayu Hitam	2,522.50		2,522.50
Bukit Malut	1,391.30		1,391.30
Bukit Perangin	13,096.90		13,096.90
Bukit Sawak	3,353.34		3,353.34
Bukit Tangga	3,359.01		3,359.01
Bukit Tampoi	1,768.54		1,768.54
Chebar Bestar	8,826.91		8,826.91
Dayang Bunting	3,849.51		3,849.51
Gua Cerita	1,308.80		1,308.80
Kisap	2,558.52		2,558.52
Koh Moi	9,447.72		9,447.72
Kuah	35.21		35.21
Kubang Badak	419.27		419.27
Machinchang	5,130.64		5,130.64
Padang Terap	13,541.26		13,541.26
Pedu	15,540.48		15,540.48
Pulau Langgun	655.61		655.61
Pulau Singa Besar	635.78		635.78
Pulau Timun	856.75		856.75
Pulau Tuba	503.85		503.85
Gunong Raya	5,184.61		5,184.61
Selat PPanchor	1,359.79		1,359.79
Sungai Badak	2,901.70		2,901.70
Tanjung Dagu	764.07		764.07
Bukit Payung		1,187.79	1,187.79
Bkt. Tiang Layar		322.55	322.55
Bukit Kachi		744.65	744.65
Bkt. Genting Iboi		6,369.98	6,369.98
Bukit Keramat		11,060.45	11,060.45
Bukit Kemunting		8,025.20	8,025.20
Bukit Kerogn		390.94	390.94
Sub-total	99,617.07	28,101.56	127,718.63
Daerah Kedah Tengah			
Bukit Enggang	7,844.71	-	7,844.71
Bukit Perak	12,342.62	-	12,342.62
Chebar Kecil	1,183.75	-	1,183.75
Gunong Jerai	8,676.36	-	8,676.36
Merbok	5,378.87	-	5,378.87
Rimba Teloi	22,928.91	-	22,928.91
Sungkop	2,318.03	-	1,092.69
Terenas	6,591.75	1,092.69	7,684.44
Ulu Muda	55,706.95	1,359.39	57,066.34
Bukit Siong	-	8,191.13	8,191.13
Sub-total	122,971.95	10,643.21	132,389.82
Daerah Kedah Selatan	10,524.50	-	10,524.50
Gunong bongsu	38,594.22	-	38,594.22
Gunong Inas	1,368.29	-	1,368.29
Bukit Relau	13,728.30	-	13,728.30
Rimba Teloi	49,507.76	-	49,507.76
Ulu Muda	72.04	-	72.04
Kulim Catchment	80.94	-	80.94
Parit Buntar			
Sub-total	113,876.05	-	113,876.05
Total	336,465.07	38,744.77	373,984.50

(Data Source : Department of Forest)

TABLE 1.9 FOREST DATA OF STATE OF KEDAH

Description	Kedah (ha)	Penisular Malysia (ha)
1. Forested and Non-forested land		
(1) Land Area	942,530	13,161,270
(2) Permanent Forest Estate		
. Existing	307,173	4,499,741
. Proposed	35,567	198,718
. Total	342,740	4,698,459
(3) Other Forested Area		
. Stateland	868	667,146
. Wildlife Reserve	0	658,403
. Total	868	1,325,549
(4) Total		
. Forested	343,608	6,024,008
. Non-Forested	598,922	7,138,262
2. Permanent Forest Estate by Forest Type		
(1) Forest		
. Inland	334,706	4,393,930
. Peat Swamp	0	169,591
. Mangrove	8,034	88,938
. Total	342,740	4,698,459
3. Progress in Gazettement of Permanent Forest Estate		
(1) As At 1.1.1993	307,173	4,499,741
(2) Under Consideration of Exco	31,270	44,847
(3) Preliminary Notification	4,297	153,871
(4) Gazetted During the Year	0	0
(5) Excluded During the Year	0	0
(6) As at 31.12 1993	342,740	4,698,459
4. Forest Area opened for Logging		
(1) Permanent Forest Estate	5,198	47,970
(2) Stateland	274	107,368
(3) Others	0	13,750
(4) Total	5,492	169,088

(To be continued)

Table 1.9 (Continued)

Description	Kedah (ha)	Penisular Malaysia (ha)
5. Number of Mills in selected Wood based in Industries		
(1) Sawmills		
. Licensed	35	704
. Operation	29	592
(2) Plywood/Veneer Mills		
. Licensed	2	45
. Operation	2	38
(3) Moulding Mills		
. Licensed	0	105
. Operation	0	60
6. Number of Workers Employed in the Logging Industries and selected Wood Based Industries		
(1) Logging		
. BP	900	9,392
. BBP	300	7,484
. Total	1,200	16,876
(2) Sawmills		
. BP	267	-20,151
. BBP	223	13,196
. Total	490	33,347
(3) Plywood/Veneer Mills		
. BP	151	12,509
. BBP	142	5,324
. Total	293	17,833
(4) Moulding Mills		
. BP	0	2,480
. BBP	0	1,602
. Total	0	4,082
7. Consumption by Mills in the Wood based Industry		
(1) Consumption of Logs		
. Sawmills	244,325	7,420,397
. Plywood/Veneer Mills	42,647	2,032,094
. Total	286,972	9,452,491
(2) Consumption of Sawntimber by Moulding Mills	0	264,182

(To be continued)

Table 1.9 (Continued)

Description	Kedah (ha)	Penisular Malaysia (ha)
8. Production by Mills in the Wood Based Industry		
(1) Sawmills		
. Sawntimber	131,487	4,927,518
(2) Plywood/Veneer Mills		
. Plywood	14,326	1,004,001
. Veneer	5,664	340,996
. Blockboard	0	4,502
(3) Moulding Mills		
. Mouldings	0	204,606
9. Log Production		
(1) Species	(m3)	(m3)
. Balau	9,541	-
. Keranji	6,790	-
. Merbau	10,366	-
. Others	7,928	-
10		
(1) Species		
. Meranti Merah	76,037	-
. Meranti Putih	23,053	-
. Nyatoh	12,350	-
11. Forest Revenue and Expenditure	(ha)	(ha)
(1) Premium	30,138,197	180,611,102
(2) Royalty		
. Sawlogs	5,860,281	98,526,847
. Other Forest Products	461,574	5,720,205
(3) Cess	1,107,413	26,290,193
(4) Other Sources	0	40,703,158
(5) Total	37,567,465	351,851,505
12. Expenditure		
(1) Operating Expenditure		(RM)
. Emolument	3,524,213	50,956,275
. Survices and Supplies	190,642	13,332,414
. Assets	477,691	8,877,023
. Transfer Allowance	0	591
. Others	0	1,325,583
. Total	4,192,746	74,561,886
(2) Development Expenditure	4,369,491	53,514,796
(3) Total Expenditure	8,562,237	128,076,682

Data Source : 1993 Annual Report of Department of Forest

TABLE 2.1 Water Quality Classfication and Proposed Interim

National Water Quality Standards for Malaysia (DOE) (1)

Parameters	Classes					
	I	IIA	IIB	III#	IV	V
Ammoniacal Nitrogen	0.1	0.3	0.3	0.9	2.7	2.7
BOD (mg/l)	1	3	3	6	12	12
COD (mg/l)	10	25	25	50	100	100
DO(mg/l)	7	5—7	5—8	3—5	3	1
pH	6.50 - 8.5	6.5 - 9.0	6.5 - 9.0	5—9	5—9	-
Colour (TUC)	15.00	150.00	150	-	-	-
Elect. Conductivity (umhos/cm)**	1000	1000	-	-	6000	-
Floatables	NV	NV	NV	-	-	-
Odour	NOO	NOO	NOO	-	-	-
Salinity (%) **	0.5	1	-	-	2	-
Taste	NOT	NOT	NOT	-	-	-
Total Dissolved Solids (mg/l)	500	1000	-	-	4000	-
Total Suspended Solids (mg/l)	25	50	50	150	300	300
Temperature (°C)	-	Normal 2	-	Normal 2	-	-
Tourbidity (NTU)	5	50	50	-	-	-
Faecal Coliform (counts/100 ml)	10	100	400	5000 (20000)@	5000 (20000)@	
Total Coliform (counts/100 ml)	100	5000	5000	5000	5000	5000
Al (mg/l)	-	-	-	0.056	0.5	-
As (mg/l)		0.05		0.045 (0.44)	0.1	
Ba (mg/l)		1		-	-	
Cd (mg/l)		0.005		0.001 (0.011**)	0.01	
Cr (IV) (mg/l)		0.05		0.054 (1.45)	0.1	
Cr (III) (mg/l)		-		- (2.53)	-	
Cu (mg/l)		1.00		0.01 (0.012*)	0.2	
Hardness (mg/l)		100		-	-	
Ca (mg/l)		-		-	-	
Mg (mg/l)		0.05		-	-	
Na (mg/l)		-	NR	-	3 SAR	
K (mg/l)		-		-	-	
Fe (mg/l)		0.3		1.00	1 (Leaf) 5 (Others)	
Pb (mg/l)		0.05		0.01 (0.014*)	5.00 -	
Mn (mg/l)		0.1		0.1	0.2	
Hg (mg/l)		0.001		0.0001 (0.004)	0.002	
Ni (mg/l)		0.05		- (0.9*)	0.2	
Se (mg/l)		0.01		0.037 (0.25)	0.02	
Ag (mg/l)		0.05		- (0.0002)	-	
Sn (mg/l)		NR		0.05		
U (mg/l)		NR		-		
Zn (mg/l)		5		- (0.35)	2	

NATURAL LEVELS

LEVELS ABOVE

(Continued ...)

Table 2.1 Water Quality Classfication and Proposed Interim

National Water Quality Standards for Malaysia (DOE) (2)

Parameters	Classes					
	I	IIA	IIB	III#	IV	V
B (mg/l)		1		3.4	0.75	
Cl (mg/l)		200		-	79	
Cl2 mg/l)		-		0.022	-	
CN (mg/l)		0.02		0.0023	-	
				(0.058)		
F (mg/l)		1		-	1	
				(11)		
NO3/NO2 (mg/l)		7/3		0.028	5	
				(0.37)		
P (mg/l)		0.1		0.10	-	
Silica (mg/l)		50	NR	-	-	
SO4 (mg/l)		200		-	-	
S (mg/l)		0.05		0.001	-	
CO2 (mg/l)		-		-	-	
Gross (Bql)		0.1		-	-	
Gross (Bql)		1		-	-	
Ra-226 (Bql)		+0.1		-	-	
Sr-90 (Bql)		+0.1		-	-	
CCE (ug/l)		500		-	-	
MBAS/BAS (ug/l)		500		200		
O&G (Mineral) (mg/l)		40; NF		NL		
O&G (Emulsified edible) (ug/l)		7000; NF		NL		
PCB (mg/l)		0.1		0.044		
				(6.1)		
Phenol (ug/l)		10	NR	-	NR	NR
				(9900)		
Aldrin/		0.02		0.008		
Dieldrin (ug/l)				(0.2)		
				0.13		
BHC (ug/l)		2.00		(9.9)		
Chlordane (ug/l)		0.08		(2.2)		
Cu (mg/l)				0.004		
t-DDT (ug/l)		0.1		(1)		
Endosulfan (ug/l)		10		-		
				(0.01)		
Heptachlor/		0.05		0.06		
Epoxide (ug/l)				(0.91)		
Lindane (ug/l)		2		0.38	NR	NR
			NR	(2.9)		
2,4-D (ug/l)		70		(450)		
2, 4, 5-T (ug/l)		10		(160)		
2, 4, 5-TP (ug/l)		4		(850)		
Paraquat (ug/l)		10		(1800)		

ABSENT

(Continued ...)

Table 2.1 Water Quality Classifications and Proposed Interim National Water Quality Standards for Malaysia (DOE) (3)

NOTES		
CLASS I	:	Conservation of natural environment Water Supply I - practically no treatment necessary Fishery I - very sensitive equartic species
CLASS IIA	:	Water Supply II - conventional treatment required Fishery II - sensitive aquatic species
CLASS IIB	:	Recreational use with body contact
CLASS III	:	Water Supply III - extensive treatment required Fishery III - common, of economic value, and tolerant species Livestock drinking
CLASS IV	:	Irrigation
CLASS V	:	None of the above
NV	-	No Visible floatable materials or debris
NOO	-	No. Objectionable odour
NOT	-	No Objectionable taste
**	-	Related Parameters, only one recommended for use
@	-	Maximum not to be exceeded
NR	-	No Recommendation
*	-	At hardness 50 mg/l CaCo3
#	-	24-hr average and maximum (bracketed) concentrations are shown
NF	-	Free from visible film, sheen, discoloration and deposits
NL	-	Free from visible layer, discoloration and deposits
#	-	24-hr average and maximum (bracketed) concentration are shown

TABLE 2.2 Recommended Raw Water Quality Criteria and Frequency of Monitoring (JBA/DOH) (1)

Parameter	Column I	Column II			Column III
	Acceptable	Frequency to be monitored			Surface of
	Value	Surface	Ground	Direct Impoing	Reference
Total Coliform	5000	W	M	M	WHO1
Turbidity	1000	W	M	M	WHO2
Colour	300	W	M	M	WHO1
pH	5.5 - 9.0	W	M	M	MAL
Total Dissolved Solids	1500	M	Y/4	Y/4	WHO1
CCE	0.5	M	Y/4	Y/4	WHO1
Biological Oxygen Demand	6	M	Y/4	Y/4	WHO1
Chemical Oxygen Demand	10	M	Y/4	Y/4	WHO1
Chloride	250	M	Y/4	Y/4	MAL
Anionic Detergent MBAS	1.0	M	Y/4	Y/4	WHO1
Ammonia (as N)	0.5	M	Y/4	Y/4	WHO1
Nitrate (as N)	10	M	Y/4	Y/4	MAL
Total Nitrogen N (-NO3)	1.0	M	Y/4	Y/4	WHO1
Iron (as Fe)	1.0	M	Y/4	Y/4	WHO1
Fluoride	1.5	M	Y/4	Y/4	WHO1
Hardness	500	M	Y/4	Y/4	MAL
Mercury	0.001	Y/4	Y/4	Y/4	MAL
Cadmium	0.005	Y/4	Y/4	Y/4	MAL
Selenium	0.01	Y/4	Y/4	Y/4	WHO1
Arsenic	0.05	Y/4	Y/4	Y/4	WHO1
Cyanide	0.1	Y/4	Y/4	Y/4	MAL
Lead	0.1	Y/4	Y/4	Y/4	MAL
Chromium	0.05	Y/4	Y/4	Y/4	WHO1
Silver	0.05	Y/4	Y/4	Y/4	MAL
Copper	1.0	Y/4	Y/4	Y/4	MAL
Manganese	0.2	Y/4	Y/4	Y/4	MAL
Magnesium	150	Y/4	Y/4	Y/4	MAL
Sodium	200	Y/4	Y/4	Y/4	MAL
Zinc	1.5	Y/4	Y/4	Y/4	WHO1
Sulphate	400	Y/4	Y/4	Y/4	WHO1
Mineral Oil	0.3	Y/4	Y/4	Y/4	MAL
Phenol	0.002	Y/4	Y/4	Y/4	WHO1

(Continued)

Table 2.2 Recommended Raw Water Quality Criteria and Frequency of Monitoring (JBA/DOH) (2)

Parameter	Column I	Column II			Column III
	Acceptable Value	Frequency to be monitored			Surface of
		Surface	Ground	Direct Imping	Reference
Biocides : Total	0.1	Y/4	Y/4	Y/4	MAL
Organochlorine Pesticides :					
Aldrin/Dieldrin	0.00003	Y/4	Y/4	Y/4	MAL
Chlordane	0.0003	Y/4	Y/4	Y/4	MAL
DDT	0.001	Y/4	Y/4	Y/4	MAL
Heptachlor & Heptachlor Epoxide	0.0001	Y/4	Y/4	Y/4	MAL
Hexachlorobenzene	0.00001	Y/4	Y/4	Y/4	MAL
Lindane	0.003	Y/4	Y/4	Y/4	MAL
Methoxychlor	0.03	Y/4	Y/4	Y/4	MAL
Herbicides :					
2, 4-D	0.1	Y/4	Y/4	Y/4	MAL
Radioactivity :					
Gross α	0.1	Y	Y	Y	MAL
Gross β	1.0	Y	Y	Y	MAL

W Indicates Parameters to be monitored at least once a week
M Indicates parameters to be monitored at least once a month
Y/4 Indicates parameters to be monitored at least once in 3 months
Y Indicates parameters to be monitored at least once a year
WHO1 Refers to who International standards for drinking water 1963
WHO2 Refers to who guidelines for drinking water quality vol. 1 & 2 1984
MAL Refers to values adapted for Malaysian conditions

NOTE: Collection of samples of both raw and treated water for examination for toxic substances should be carried out more frequency if values above the acceptable values are known to be present in the source of supply, or where such potential pollution exists.

TABLE 2.3 Standard for Sewage and Industrial Effluents (JBA/DOH)

Parameter	Unit	Standard *	
		A	B
(1)	(2)	(3)	(4)
1 Temperature	°C	40	40
2 PH Value	—	6.0 - 9.0	5.5 - 9.0
3 BDSs at 20°C	mg/l	20	50.00
4 COD	mg/l	50	100
5 Suspended Solids	mg/l	50	100
6 Mercury	mg/l	0.005	0.05
7 Cadmium	mg/l	0.01	0.02
8 Chromium Hexavalent	mg/l	0.05	0.05
9 Arsenic	mg/l	0.05	0.10
10 Cyanide	mg/l	0.05	0.10
11 Lead	mg/l	0.10	0.50
12 Chromium, Trivalent	mg/l	0.20	1.0
13 Copper	mg/l	0.20	1.0
14 Manganese	mg/l	0.20	1.0
15 Nickel	mg/l	0.20	1.0
16 Tin	mg/l	0.20	1.0
17 Zinc	mg/l	1.0	1.0
18 Boron	mg/l	1.0	4.0
19 Iron (Fe)	mg/l	1.0	5.0
20 Phenol	mg/l	0.001	1.0
21 Free Chlorine	mg/l	1.00	2.0
22 Sulphide	mg/l	0.50	0.50
23 Oil and Grease	mg/l	Not detectable	10.00

A : Discharge upstream of water supply sources
B : Discharge downstream of water supply sources

TABLE 2.4 E1 Standard of Water Quality for Padi Cultivation (MADA)

Item		Standard Values
Cl	Chloride	Under 80ppm
pH	Concentration of hydrogen ion	6.0 7.5
COD	Chemical Oxygen demand	Under 6ppm
SS	Inorganic suspended solid	Under 100ppm
DO	Dissolved oxygen	Over 5ppm
TN	Total nitrogen	Under 1ppm
EC	Electric conductivity	Under 0.3 m/cm (milimho/cm) (300 μmho / cm)
As	Arsenic	Under 0.05ppm
Zn	Zinc	Under 0.5ppm
Cu	Copper	Under 0.02ppm
Fe	Iron	Under 1ppm
Salinity		Under 2%
F	Flouride	Under 1%

TABLE 2.5 DOE Water Quality Criteria for Malaysia (Classification of Malaysian Rivers 1994) (1/5)

Parameter	Domestic Water Supply	Aquatic Life Avg. (max.)	Livestock	Recreation
INORGANIC (mg/L)				
Alkalinity	-	>20	-	-
Ammonia total (as N)	0.1	0.2	-	-
free (as NH)	-	0.02	-	-
Aluminum	-	0.056	-	-
Arsenic	0.04	0.045 (0.44)	0.5	-
Barium	1	-	-	-
Bicarbonate	-	-	-	-
Boron	0.4	3.4	-	-
Cadmium	0.005	0.0007 (0.011*)	0.02	-
Calcium	-	-	-	-
Carbon Dioxide	-	-	-	-
Chloride	200	-	-	-
Chlorine (PRH 1	-	0.0022	-	-
Chromium (VI)	0.05	0.054 (1.45)	-	-
Chromium ((()	-	(2.53)	-	-
Cyanide	0.2	0.0023 (0.058)	-	-
Copper	1	0.008 (0.012*)	2	-
Fluoride	1	(11)	-	-
Hardness	100	-	-	-
Iron	0.1	1	-	-
Lead	0.05	0.0013 (0.004*)	0.5	-
Manganese	0.05	0.1	-	-
Magnesium	-	-	-	-
Mercury	0.001	0.0001(0.004)	0.003	-
Nitrate/	7	-	-	-
Nitrites	3	0.028 (0.37)	-	-
Nitrogen Kjeldahl (as N)	-	-	-	-
Nickel	0.011	(0.9*)	-	-
Phosphate (as P)	0.1	0.1	-	-
Potassium	-	-	-	-
Selenium	0.01	0.037 (0.25)	0.05	-
Silver	0.05	(0.0002)	-	-
Silica, Reactive	50	-	-	-
Sulphate	200	-	-	-
Sulphide	0.05	0.0001	-	-
Uranyl Ion	-	-	-	-
Zinc	5	(0.35*)	20	-
Tin	-	-	0.05	-

* At hardness 50mg/L CaCO3

Table 2.5 DOE Water Quality Criteria for Malaysia (Classification of Malaysian Rivers 1994) (2/5)

Parameter	Domestic Water Supply	Aquatic Life Avg. (max.)	Livestock	Recreation
Aluminium	0.5	0.5 to 5	-	20
Arsenic	0.1	2	-	2
Beryllium	0.1	-	-	0.5
Bicarbonate	142	142 to 355	>355	-
Boron	0.75	0.75 to 2	>2	-
Cadmium	0.01	-	-	0.05
Chloride	7.9	79 to 477	>477	-
Chromium	0.1	-	-	1
Cobalt (sandy)	0.05	-	-	q
Cobalt (normal)	1	-	-	5
Conductivity (in mmhos/cm)	0.75	0.75 to 3	>3	-
Coper	0.2	-	-	5
Faecal coliform # (in counts/100mL)	1000 (4000)@	-	-	-
Fluoride	1	-	-	15
Iron (leaf)	1	-	-	q
Iron (others)	5	-	-	-
Lead	5	-	-	10
Lithium (citrus)	0.1	-	-	q
Lighium (others)	2.5	-	-	q
Manganese	0.2	-	-	10
Mercury	0.002	-	-	q
Molybdenum	0.01	-	-	0.05
Nitrate + Nitrite (as N)	5	5 to 30	>30	-
Nickel	0.2	-	-	q
pH	4.5 or 9	4.5 to 9	4.5 to 9	-
Selenium	0.02	-	-	q
Sodium	3 SAR	3 to 9	>9	-
Total Dissolved Solids	480	480 to 1920	>1920	-
Vanadium	0.1	-	-	q
Zinc	2	-	-	10

= 200 (geometric mean) for crops eaten raw

q = qv normal

@= Maximum not to be exceeded

Table 2.5 DOE Water Quality Criteria for Malaysia (Classification of Malaysian Rivers 1994) (3/5)

Parameter	Domestic Water Supply	Aquatic Life Avg. (max.)	Livestock	Recreation
RADIOACTIVITY				
Gross-Alpha	0.1 Bq/L	-	-	-
Gross-Beta	1Bq/L	-	-	-
Radium-226	<0.1 Bq/L	-	-	-
Strontium-90	<1 Bq/L	-	-	-
ORGANIC(μG/L)				
General				
CCE	-	-	-	-
MBAS/BAS	500	200	-	500
O&G (mineral)	nb	nc	-	nd
O&G (emulsifiededible)	nb	nc	-	nd
PCB	0.03	0.044 (6.1)	-	-
Phenol	1	(9900)	-	ne
OrganochlorinePesticides				
Aldrin/Dieldrin	0.02	0.008 (0.2)	0.09	-
BHC	2	0.13 (9.9)	0.6	-
Chlordane	0.08	0.02 (2.2)	0.3	-
t-DDT	0.1	0.004 (1)	0.3	-
Endosulfan	10	(0.01)	12	-
Endrin	0.06	0.014 (0.25)	0.09	-
Heptachlor/Epoxide	0.05	0.06 (0.91)	0.06	-
Lindane	2	0.38 (2.9)	0.6	-
Methoxychlor	100	0.05 (0.45)	18	-
Toxaphene	0.3	(1.4)	1.5	-
OrganophosphorusPesticides				
Malathion	100	(0.32)	-	-
Parathion	20	(0.44)	-	-
Parathion-methy 1	6	(3.7)	-	-
CarbamatePesticides				
Carbary l	60	(2.9)	-	-
Carbofuran	10	(0.01)	-	-
Propoxur	800	(8.9)	-	-

nb Free from visible film, sheen, discoloration and deposits; free from conc. affecting taste and odor

nc Free from visible layer, discoloration and deposits

nd No visible film, discoloration or deposit; no objectionable odor

ne no objectionable odor

Table 2.5 DOE Water Quality Criteria for Malaysia (Classification of Malaysian Rivers 1994) (4/5)

Parameter	Domestic Water Supply	Aquatic Life Avg. (max.)	Livestock	Recreation
Chlorophenols				
Chlorophenols	0.1	(2200)	-	n2
2,4-Dichlorophenon	0.3	(3400)	-	n2
Dichlorophenols	0.04 - 0.5	23 - 84	-	n2
Trichlorophenols	1 - 2	(2500)	-	n2
Tetrachlorophenols	1	(18)	-	n2
PCP	30	(60)	-	-
PHYSICAL				
Coloud (TCU)	-	-	-	-
Dissolved Oxygen	-	7 (daily mean)	-	-
(mg/L)		2 (daily min.)	-	-
Electrical Conductivity	-	-	-	-
pH	-	6.5 - 9.0	-	-
Total Dissolved Solids	-	-	-	-
Suspended Solids	-	-	-	-
Floatables	Absent	-	-	Absent
Taste & Odor	n2	-	-	n2
Temperature	-	-	-	-
Turbidity (NTU)	1	-	-	-
Salinity	-	-	-	-
OTHERS				
BOD (mg/L)	1	-	-	-
COD (mg/L)	10	-	-	-
MICROBIOLOGICAL (counts/100mL)				
Feacal coliform	0	-	-	200
Total coliform	0	-	-	-

n2 Free from objectionable taste and odor

** Geometric mean

Table 2.5 DOE Water Quality Criteria for Malaysia (Classification of Malaysian Rivers 1994) (5/5)

Parameter	Domestic Water Supply	Aquatic Life Avg. (max.)	Livestock	Recreation
Herbicides				
2, 4-D	70	(450)	-	-
2,4, 5-T	10	(160)	-	-
2,4, 5-TP	4	(850)	-	-
Paraquat	6	(1800)	-	-
OtherInsecticides				
Acephate	120	-	-	-
Aldicarb	7	-	-	-
Azinphos-methyl	10	-	-	-
Carbophenothion	1	-	-	-
Chlorfenvinphos	10	-	-	-
Chlorpyrifos	6	-	-	-
Diazinon	10	-	-	-
Dichlorvos	20	-	-	-
Dimethoate	100	-	-	-
Disulfoton	10	-	-	-
Ethion	30	-	-	-
Fenchlorphon	60	-	-	-
Fenitrothion	30	-	-	-
fensulfothion	10	-	-	-
Fenthion	3	-	-	-
Methamidophos	10	-	-	-
Methidathion	30	-	-	-
Methomyl	60	-	-	-
Mevinphos	9	-	-	-
Monochrotophos	3	-	-	-
Omethoate	3	-	-	-
Phorate	0.6	-	-	-
Primiphos-methyl	60	-	-	-
Temephos	300	-	-	-
Trichlorfon	30	-	-	-
OtherHerbicides				
Alachlor	10	-	-	-
Asulam	300	-	-	-
Atrazine	100	-	-	-
Bromacil	70	-	-	-
MCPA	7	-	-	-
Picloram	1000	-	-	-
Thiobencarb	50	-	-	-
Trifluratin	500	-	-	-
2,3,7,8-TCDD	0.00002	-	-	-

TABLE 2.6 DOE Interim National Water Quality Standards for Malaysia(1/3)

Parameters		Classes I	IIA	IIB	III#	IV	V
NH3-N	(mg/L)	0.1	0.3	0.3	0.9	2.7	>2.7
BOD	(mg/L)	1	3	3	6	12	>12
COD	(mg/L)	10	25	25	50	100	>100
DO	(mg/L)	7	5-7	5-7	3-5	<3	<1
pH		6.5-8.5	6-9	6-9	5-9	5-9	-
Colour	(TCU)	15	150	150.00	-	-	-
Elect. Cond.*	(μohms/cm)	250	500	-	-	-	-
Floatables		N	N	N	-	-	-
Odour		N	N	N	-	-	-
Salinity*		0.5	1	-	-	-	-
Taste		N	N	N	-	-	-
TotalDiss.Solid*	(mg/L)	500	1000	-	-	-	-
Total Susp. Solids	(mg/L)	25	50	50	150	300	>300
Temperature	(°C)	-Normal 2°C		-Normal 2°C		-	-
Turbidity	(NTU)	5	50	50		-	-
F. Colif.**	(counts/100mL)	10	100	400 500 (2000)#		(2000)#	-
Tot. Colif.	(counts/100mL)	100	1000	1000	50000	50000	>50000

N = No visible floatable materials/debris, or objectionable odour, or objectionable taste.

* = Related parameters, only one recommended for use

** = Geometric mean

= Maximum not to be exceeded

Class	Uses
I	Conservation of natural environment
	Water supply I - practically no treatment necessary (except by disinfection or boiling only)
	Fishery I - very sensitive aquatic species
IIA	Water supply II - conventional treatment required
	Fishery II - sensitive aquatic species
	Recreational use with body contact
IIB	Water supply III - extensive treatment required
	Fishery III- common, of economic value, and tolerant species
	Livestock Drinking
IV	Irrigation
V	None of the above

(Continued ...)

Table 2.6 DOE Interim National Water Quality Standards for Malaysia(2/3)

Parameters		Classes I	IIA/IIB	III#	IV	V
Al	(mg/L)	N.L.	-	-(0.06)	0.5	Level above IV
As	(mg/L)	N.L.	0.05	0.4 (0.05)	0.1	Level above IV
Ba	(mg/L)	N.L.	1	-	-	Level above IV
Cd	(mg/L)	N.L.	0.01	0.01*(0.001)	0.01	Level above IV
Cr (IV)	(mg/L)	N.L.	0.05	1.4(0.05)	0.1	Level above IV
Cr (III)	(mg/L)	N.L.	-	2.5	-	Level above IV
Cu	(mg/L)	N.L.	0.02	-	0.2	Level above IV
Hardness	(mg/L)	N.L.	250	-	-	Level above IV
Ca	(mg/L)	N.L.	-	-	-	Level above IV
Mg	(mg/L)	N.L.	-	-	-	Level above IV
Na	(mg/L)	N.L.	-	-	3 SAR	Level above IV
K	(mg/L)	N.L.	-	-	-	Level above IV
Fe	(mg/L)	N.L.	1	1	1 (leaf)	Level above IV
Pb	(mg/L)	N.L.	0.05	0.02*(0.01)	5(hous)	Level above IV
Mn	(mg/L)	N.L.	0.1	0.1	5	Level above IV
Hg	(mg/L)	N.L.	0.001	0.004(0.0001)	0.002	Level above IV
Ni	(mg/L)	N.L.	0.05	0.9*	0.2	Level above IV
Se	(mg/L)	N.L.	0.01	0.25(0.04)	0.02	Level above IV
Ag	(mg/L)	N.L.	0.05	0.0002	-	Level above IV
Sn	(mg/L)	N.L.	-	0.004	-	Level above IV
U	(mg/L)	N.L.	-	-	-	Level above IV
Zn	(mg/L)	N.L.	5	0.4*	2	Level above IV
B	(mg/L)	N.L.	1	-(3.4)	0.8	Level above IV
Cl	(mg/L)	N.L.	200	-	80	Level above IV
Cl2	(mg/L)	N.L.	-	-(0.02)	-	Level above IV
CN	(mg/L)	N.L.	0.02	0.06 (0.02)	-	Level above IV
F	(mg/L)	N.L.	1.5	10	1	Level above IV
NO2	(mg/L)	N.L.	0.4	0.4(0.03)	-	Level above IV
No3	(mg/L)	N.L.	7	-	5	Level above IV
P	(mg/L)	N.L.	0.2	0.1	-	Level above IV
Silica	(mg/L)	N.L.	50	-	-	Level above IV
SO4	(mg/L)	N.L.	250	-	-	Level above IV
S	(mg/L)	N.L.	0.05	-(0.001)	-	Level above IV
CO2	(mg/L)	N.L.	-	-	-	Level above IV
Gross-α	(Bq/L)	N.L.	0.1	-	-	Level above IV
Gross-β	(Bq/L)	N.L.	1	-	-	Level above IV
Ra-226	(Bq/L)	N.L.	<0.1	-	-	Level above IV
Sr-90	(Bq/L)	N.L.	<1	-	-	Level above IV

N.L. = Natural Levels

* = At hardness 50 mg/L CaCO3

" = Maximum (unbracketed) and 24-hr. average (bracketed) concentrations

Table 2.6 DOE Interim National Water Quality Standards for Malaysia(3/3)

Parameters		Classes I	IIA/IIB	III#	IV	V
CCE	(μg/L)	N.L.O.A	500	-	-	-
MBAS/BAS	(μg/L)	N.L.O.A	500	5000 (200)	-	-
O&G(mineral)	(μg/L)	N.L.O.A	40; N	N	-	-
O&G(emulsifiededible)	(μg/L)	N.L.O.A	7000; N	-	-	-
PCB	(μg/L)	N.L.O.A	0.1	6 (0.05)	-	-
Phenol	(μg/L)	N.L.O.A	10	-	-	-
Aldrin/Dieldrin	(μg/L)	N.L.O.A	0.02	0.2 (0.01)	-	-
BHC	(μg/L)	N.L.O.A	2	9 (0.1)	-	-
Chlordane	(μg/L)	N.L.O.A	0.08	2 (0.02)	-	-
t-DDT	(μg/L)	N.L.O.A	0.1	1 (0.01)	-	-
Endosulfan	(μg/L)	N.L.O.A	10	-	-	-
Heptachlor/Epoxide	(μg/L)	N.L.O.A	0.05	0.9 (0.6)	-	-
Lindane	(μg/L)	N.L.O.A	2	3 (0.4)	-	-
2,4-D	(μg/L)	N.L.O.A	70	450	-	-
2,4,5-T	(μg/L)	N.L.O.A	10	160	-	-
2,4,5-TP	(μg/L)	N.L.O.A	4	850	-	-
Paraquat	(μg/L)	N.L.O.A	10	1800	-	-

N.L.O.A = Nat Levels or Absent
N. = Free from visible film, sheen, discoloration and deposits
" = Maximum (unbracketed) and 24-hr. average (bracketed) concentrations

TABLE 2.7

WATER QUALITY STANDARDS AND RIVER CLASSIFICATION

The six classes of river use classification are defined as follows :

CLASS	USES
I	Conservation of natural environment
	Water supply I - practically no treatment necessary
	Fishery I - very sensitive aquatic species
IIA	Water supply II - conventional treatment required
	Fishery II - sensitive aquatic species
IIB	Recreational use with body contact
	Fishery II - sensitive aquatic species
III	Water supply III - extensive treatment required
	Fishery III - common and tolerant species
	Livestock drinking
IV	Irrigation
V	None of the above

Class I represents water bodies of excellent quality. Standards are set for the conservation of natural environment in its undisturbed states. Water bodies such as those in the national park area, fountain-heads, and in the highlands and uninhabited areas come under this category meet the most stringent requirements for human health and aquatic protection.

Class IIA represents water bodies of good water quality. Most existing raw water supply sources come under this category. Class IIA standards are set on the basis of the criteria developed for the protection of human health and sensitive aquatic species known to exist in these waters. In practice, no body-contact activity is allowed in these waters for the prevention of transmission of probable human pathogens. There is a need to introduce another class for water bodies not used for water supply but of similar quality level which may be referred to as Class IIB. The determination of Class IIB standards is based on criteria for recreational use and protection of sensitive aquatic species.

Class III is defined with the primary objective of protecting common and moderately tolerant aquatic species of economic value. Water under this classification may be used for water supply with extensive/ advanced treatment. This class of water is also defined to suit livestock drinking needs.

Class IV defines water quality required for major agriculture irrigation activities which may not cover minor applications to sensitive crops.

Class V represents other waters which do not meet any of the above uses.

In determining the water quality requirements of each of these classes, the list of parameters which has been considered for criteria development are divided into two major groups according to the concepts introduced above. The primary group are the general parameters which include temp, pH, DO, BOD, SS, AN, microbiological, and aesthetic parameters which determine the general water quality and this is used as the basic for classification according to the saprobic system.

The second group are the many chemical parameters which have been identified in the aquatic environment. The list is expanding, especially for organic chemicals.

The different classes of standards may have different trends in quantifying these parameters according the effects on the various beneficial uses. INWQS are to be recommended for selected chemicals which are relevant to the local environment and essential to protect the designated uses under the proposed classification system. Standards values recommended should be compatible with the criteria developed.

The six classes of INWQS were derived from the recommended water quality criteria as follows :

General primary parameters

Standards for the six classes defined are determined basically according to the saprobic system of classification, taking into account the general ambient conditions. Criteria developed for the various uses form the basis of arriving at the various ranges of standard value recommended as shown in the Table DOE Interim National Water Quality Standards for Malaysia (Table A1.2, Appendix 1.2)

Chemical parameters

Important inorganic and organic chemicals are identified for standards setting in each of the six classes from the list of parameters of which criteria have been developed. For parameters considered toxic, the criteria derived should be adopted as standards unless site specific effects can be proven. Aesthetic parameters may be adjusted based on an economic impact analysis. Standards values are derived according to the procedures described below :

Class I Standards

1. Criteria derived based on human health protection are adopted.

2. The adopted values are reviewed with respect to the general natural concentrations of water stringent than the adopted values may be set for purpose of conservation of the existing high level of natural purity attainable This provision ensures that derived standards would adequately protect naturally present aquatic habitats of the most sensitive type.

3. The derived standards are then compared with the analytical detection limits. A narrative standard 'not detectable' shall be adopted if the derived value is lower than the analytical detection limits.

Class IIA Standards

1. Criteria derived based on human health and aquatic life protection are adopted.

2. The adopted value are reviewed with respect to the general water quality of present and potential water sources for water supply throughout Malaysia. If existing levels are generally well below the adopted value, the latter will be chosen as the standards without consideration of treatment capability.

3. If not, removal efficiency of the contaminants by conventional water treatment processes will be assessed to determine the maximum concentrations acceptable. These concentrations are then adopted as standards.

4. These standards are then reviewed with respect to the requirements of sensitive aquatic species known to be present in these waters.

Class IIB Standards

1. Criteria for aquatic life protection are to be adopted as standards
2. These standards may be unnecessarily stringent if :

- ◊ the species at the site are more or less sensitive than those included in the national criteria data set;
- ◊ physical and/ or chemical characteristics of the site alter the biological availability and/ or toxicity of the chemical, and quality criteria derived are based on laboratory water experimental data.
- ◊ under these conditions, site-specific criteria may be developed and adopted as standards. Guidelines developed by USEPA (1983) for deriving site-specific water criteria may be adopted for this purpose.

3. Most chemicals in water pose relatively low health effects through dermal contact and accidental ingestion. The general primary parameters already determine and the criteria of chemicals for protective for recreational use.

Class III Standards

Criteria for aquatic life protection and livestock drinking are to be adopted and revised according to the local environment conditions as for Class IIB.

Class IV Standards

Criteria developed for irrigation use are to be adopted and modified according to crop sensitivity and soil types.

Class V Standards

T 2.7 (6)

These are actually limits of chemical contaminants beyond which n criteria developed for any of the beneficial uses will be met.

TABLE 2.8 INDEX VALUES OF WATER QUALITY BY DOE (1986 Report)

$$WQI = (0.21 \times SI1) + (0.24 \times SI2) + (0.19 \times SI3) + (0.21 \times SI4) + (0.15 \times SI5) + (0.15 \times SI5)$$

For COD

$SI1 = 99.6 \times e^{(-0.0157x)}$ for $x > 20$,

$SI1 = -1.333x + 99.08$ for $x \leq 5$,

For BOD

$SI2 = 100.8 \times e^{(-0.0485x)}$ for $x > 5$

$SI2 = -4.32x + 100.4$ for $x \leq 5$,

For AN

$SI3 = 101.3 \times e^{(-1.251x)}$ for $x > 0.3$,

$SI3 = -105x + 100.5$ for $x \leq 0.3$,

For SS

$SI4 = 97.5 \times e^{(-0.00676x)}$ for $x > 50$,

$SI4 = -0.568x + 97.1$ for $x \leq 50$,

For pH

$SI5 = 10^{0.2335x + 0.44}$ for $x < 6.7$,

$SI5 = 100$ for $6.7 \leq x \leq 7.58$,

$SI5 = 10^{4.22 - 0.293x}$ for $x > 7.58$,

Note : x : Measured concentration of the parameter concerned

Data source : Water Quality Criteria and Standard for Malaysia (DE, 1986)

TABLE 2.9 INDEX VALUES OF WATER QUALITY BY DOE (1990 Report)

$$WQI = 0.22 * SIDO + 0.19 * SIBOD + 0.16 + SICOD + 0.15 * SIAN + 0.16 * SISS + 0.12 * SIpH$$

Subindex for DO (in % saturation) :

$SIDO = 0$	for $x \leq 8$
$SIDO = 100$	for $x \geq 92$
$SIDO = -0.395 + 0.030x^2 - 0.00020x^3$	for $8 < x < 92$.

Subindex for BOD :

$SIBOD = 100.4 - 4.23x$	for $x \leq 5$
$SIBOD = 108 * e^{-0.055x} x - 0.1x$	for $x > 5$

Subindex for COD :

$SICOD = 1.33x + 99.1$	for $x \leq 20$
$SICOD = 103 * e^{-0.0157x} - 0.04x$	for $x > 20$

Subindex for AN :

$SIAN = 100.5 - 105x$	for $x \leq 0.3$
$SIAN = 94 * e^{-0.573x} - 5 * : x - 2 :$	for $0.3 < x < 4$
$SIAN = 0$	for $x \geq 4$

Subindex for SS :

$SISS = 97.5 * e^{-0.00676x} + 0.05x$	for $x \leq 100$
$SISS = 71 * e^{-0.0016x} -0.015x$	for $100 < x < 1000$
$SISS = 0$	for $x \geq 1000$

Subindex for pH :

$SIPH = 17.2 - 17.2x + 5.02x^2$	for $x < 5.5$
$SIPH = -242 + 95.5x - 6.67x^2$	for $5.5 \leq x < 7$
$SIPH = -181 + 95.5x - 6.67x^2$	for $7 \leq x < 8.75$
$SIPH = 536 + 77.0x + 2.76x^2$	for $x \geq 8.75$

Note :

x : Concentration in mg / l for all parameters except for pH

* : multiply by

Data source : Development of Criteria & Standards for water Quality(Phases II)

TABLE 2.10

Review of the Interim National Water Quality Standards[a] (1 of 4)
(Revised version shown in italics)

PARAMETERS	units	CLASSES								COMMENTS
		I	*I*	IIA IIB	*II*	III	*III*	IV	*IV*	
NH_3 - N[b]	mg/L	0.1	*0.1*	0.3	*0.3*	0.9	*0.9*	2.7	2.7	
BOD	mg/L	1	*1*	3	*3*	6	*6*	12	*12*	Review method using ATU
COD	mg/L	10	*10*	25	*30*	50	*60*	100	*120*	Suggested modification
DO	mg/L	7	*7*	5-7	*5-7*	3-5	*3-5*	<3	<3	Acceptable
pH		6.5 - 8.5	*6.5 - 8.5*	6-9	*6.9*	5-9	*5-9*	5-9	*5-9*	Acceptable
Colour (True Colour)	TCU	15	*15*	150	*150*	-	-		-	Review
Elec. Cond.*	ohms/cm	250	*250*	500	*500*	-	-			-
Floatables		N	*N*	N	*N*	-	-		-	-
Odour		N	*N*	N	*N*	-	-		-	Acceptable
Salinity*	$^{o}/_{oo}$	0.5	*0.5*	;	*I*	-	-			-
Taste		N	*N*	N	*N*	-	-			-
Total Diss. Solids	mg/L	500	*500*	1000	*1000*	-	-			-
Total Susp. Solids*	mg/L		*25*	50	*100*	150	*300*	300	*300*	Suggested modification
Temperature	°C	-	-	Normal±2°C	*Normal±2°C*	Normal±2°C	*Normal±2°C*	-	-	-
Turbidity	NTU	5	*20*	50	*100*	-	-	-	-	Suggested modification
F.Colif.**	counts/100mL	10	*10*	100/400	*200*	500(2000)"	*500*	(2000)"	*2000*	Needs further review
Tot.Colif.**	counts/100mL	100	*100*	1000	*1000*	5000	*5,000*	50000	*50000*	Needs further review

N = No visible floatable materials/debris, or objectionable odour, or objectionable taste
* = Related parameters, only one recommended for use
** = Geometric mean (Monitoring data for compliance evaluation should be based on the geometric means instead of the 90 persentile values)
" = Maximum not to be exceed
[a] = Suggested modification in bold italics
[b] = NH_3 -N represents actual free NH_3 level which is dependent on pH, temperature itonic strength

Table 2.10

Review of the Interim National Water Quality Standards[a] (2 of 4)
(Revised version shown in italics)

PARAMETERS	units		CLASSES[a]							COMMENTS
			I	*I*	IIA/IIB	*II*	III	*III*	IV	*IV*	
Al	mg/L			*0.06*	-	*0.06*	-(0.06)	*0.5*	0.5	*0.5*	Suggested changes
As	mg/L			*0.05*	0.05	*0.05*	0.4(0.05)	*0.1*	0.1	*0.1*	Restrictive
Ba	mg/L			*1*	1	*1*	-	-	-	-	Acceptable
Cd	mg/L	N		*0.01*	0.01	*0.01*	0.01"(0.001)	*0.01*	0.01	*0.01*	Acceptable
Cr(VI)	mg/L	A		*0.05*	0.05	*0.05*	1.4(0.05)	*0.05*	0.1	*0.1*	Acceptable
Cr(III)	mg/L	T		*NL*	-	-	2.5	-	-	-	Acceptable
Cu	mg/L	U		*0.02*	1	*0.02*		*0.2*	0.2	*0.2*	Review Class II
Hardness	mg/L	R		*NL*	250	*250*	-	-	-	-	Acceptable
Ca	mg/L	A		*NL*	-	-	-	-	-	-	-
Mg	mg/L	L		*NL*	-	-	-	-	-	-	-
Na	mg/L			*NL*	-	-	-	-	3 SAR	-	-
K	mg/L			*NL*	-	-	-	-	-	-	-
Fe	mg/L	L		*1*	0.3	*1*	1	*1*	1(leaf)5(others)	*1(leaf)*	Sensitive for aquatic life
Pb	mg/L	E		*0.02*	0.05	*0.02*	0.02(0.001)	*0.05*	5	*5*	Restrictive
Mn	mg/L	V		*0.1*	0.1	*0.1*	0.1	*0.1*	0.2	*0.2*	Acceptable
Hg	mg/L	E		*0.001*	0.001	*0.001*	0.004(0.0001)	*0.001*	0.002	*0.002*	Acceptable Class III needs review
Ni	mg/L	L		*0.05*	0.05	*0.05*	0.9	*0.2*	0.2	*0.2*	Acceptable except Class IV
Se	mg/L	S		*0.01*	0.01	*0.01*	0.25(0.04)	*0*	0.02	*0.04*	Acceptable
Ag	mg/L			-	0.05	-	0.0002	-	-	-	Review Class III
Sn	mg/L			0.004	-	0.004	*0.004*	-	-	-	Acceptable
U	mg/L			-	-	-	-	-	-	-	-
Zn	mg/L			0.4	*5*	0.4	*0.4*	5	*2*	5	Suggested modification

[a] = Suggested modification in bold italics

Table 2.10

Review of the Interim National Water Quality Standards[a] (3 of 4)
(Revised version shown in italics)

PARAMETERS	units	CLASSES[a]								COMMENTS
		I	*I*	IIA/IIB	*II*	III	*III*	IV	*IV*	
B	mg/L		*1*	1	*1*	-(3.4)	*1*	0.8	*1*	Acceptable
Cl	mg/L	N	*200*	200	*200*	-	-	80	*80*	Acceptable
Cl_2	mg/L	A	*0*	-	*0.002*	-(0.002)	-	-	-	Suggested modification
CN	mg/L	T	*0.02*	0.02	*0.02*	0.06(0.02)	*0.02*	-	-	Acceptable
F	mg/L	U	*1.5*	1.5	*1.5*	11	*1.5*	1	*1.5*	Acceptable
NO_2	mg/L	R A	*0.4*	0.4	*0.4*	0.4(0.03)	-	-	-	Restrictive, exception to aquatic life in low DO water
NO_3	mg/L	L	*7*	7	*7*	-	*7*	5	*7*	Limited relaxation possible
P	mg/L		*0.2*	0.2	*0.2*	0.1	*0.2*	-	-	
Si	mg/L		*NL*	50	*50*	-	-	-	-	
SO_4	mg/L	L	*NL*	250	*250*	-	-	-	-	
S	mg/L	E	*0.005*	0.05	*0.005*	0.005	*0.005*	-	-	Suggested modification
CO_2	mg/L	V	*NL*	-	-	-	-	-	-	
Gross- α	Bq/L	E	*0.1*	-	*0.1*	-	-	-	-	
Gross- β	Bq/L	L	*1*	1	*1*	-	-	-	-	
Rad-226	Bq/L	S	*<0.1*	<0.1	*<0.1*	-	-	-	-	
Sr-90	Bq/L		*<1*	<I	*<1*	-	-	-	-	

[a] = Suggested modification in bold italics

Table 2.10

Review of the Interim National Water Quality Standards[a] (4of 4)
(Revised version shown in italics)

PARAMETER	units	CLASSES[a]								COMMENTS
		I	*I*	IIA/IIB	*II*	III[#]	*III*	IV	*IV*	
CCE	ug/L	N.A	*NL*	500	*500*	-	-	-	-	Acceptable
MBAS/BAS	ug/L	N.A	*NL*	500	*500*	5000(200)	*500*	-	-	Suggested modification
O&G(mineral)	ug/L	N.A	*NL*	400;N	*200;N*	N	*N*	-	-	Acceptable
O&G(emulsified)(edible)	ug/L	N.A	*NL*	7000;N	*7000;N*	-	*N*	-	-	Acceptable
PCB	ug/L	N.A	*0.0*	0.1	*0.1*	6(0.05)	*0.1*	-	-	-
Phenol	ug/L	N.A	*NL*	10	*10*		*0.1*	-	-	Acceptable
Aldrin/Dieldrin	ug/L	N.A	*0.00*	0.02	*0.02*	0.2(0.01)	*0.02*	-	-	-
BHC	ug/L	N.A	*0.0*	2	*0.1*	9(0.1)	*2*	-	-	-
Chlordane	ug/L	N.A	*0.00*	0.08	*0.02*	2(0.02)	*0.08*	-	-	Suggested modification
t-DDT	ug/L	N.A	*0.00*	0.1	*0.1*	1(0.004)	*0.1*	-	-	Suggested modification
Endosulfan	ug/L	N.A	*0*	10	*10*	-	*10*	-	-	-
Heptachlor/Epoxide	ug/L	N.A	*0.00*	0.05	*0.05*	0.9(0.06)	*0.05*	-	-	Suggested modification
Lindane	ug/L	N.A	*0.0*	2	*0.4*	3(0.4)	*2*	-	-	Suggested modification
2,4-D	ug/L	N.A	*0*	70	*70*	450	*70*	-	-	" "
2,4,5-T	ug/L	N.A	*0*	10	*10*	160	*10*	-	-	" "
2,4,5-TP	ug/L	N.A	*0*	4	*4*	850	*4*	-	-	" "
Paraquat	ug/L	N.A	*0*	10	*10*	1800	*10*	-	-	" "

N = Free from visible film, sheen, discoloration and deposits
NL = Natural background levels
[#] = Maximum(unbracketed) and 24-hr average(bracketed) concentrations
[a] = Suggested modification in bold italics

TABLE 3.1 Water Sampling Months by DOE for Muda River (1992 - 1994)

Sta. No.	5504602	5505603	5506604	5607606	5608601	5608602	5608603	5608605	5609609	5706607	5706610	5806614	6007608
River	Muda	Muda	Muda	Tawar	Tawar	Tawar	Naksah	Ketil	Ketil	Jerung	Jerung	Muda	Muda
Location	Bumbing S	P.Tungga	K.Ketil	Tawar				K.Pegang	Bating			Jenlang	Merbau
1992.1													
2													
3													
4	*	*	*	*				*	*			*	*
5	*	*	*	*				*	*			*	*
6	*	*	*	*				*	*			*	*
7	*	*	*	*				*	*			*	*
8	*	*	*	*				*	*			*	*
9	*	*	*	*				*	*			*	*
10													
11			*	*					*			*	*
12													
1993.1													
2													
3			*	*				*	*	*	*	*	*
4													
5			*	*				*	*	*	*	*	*
6													
7			*	*				*	*	*	*	*	*
8			*	*				*	*	*	*	*	*
9			*	*				*	*	*	*	*	*
10													
11			*	*				*	*	*	*	*	*
12													
1994.1													
2													
3			*		*	*	*		*	*	*		*
4													
5													
6			*		*	*	*		*	*	*		*
7													
8													
9													
10													
11													
12													
	Note: This table is prepared by compiling the recording sheets from DOE.												

TABLE 3.2 . Water Quality Records of DOE for Muda River (at Station No. 5504602 (1992-1994) , (1))

Sta. No.		5504602	5504602	5504602	5504602	5504602	5504602	5504602	5504602	5504602	5504602
River		Muda	Muda	Muda	Muda	Muda	Muda	Muda	Muda	Muda	Muda
Date		1992.4.21	1992.5.26	1992.6.15	1992.7.26	1992.8.28	1992.9.14				
FIELD TEST											
Tempe.	D.Centigrad	33	32	30	28	26	29				
Conductivity	umhos/cm	50	50	40	50	30	40				
?	ppt										
DO	ppm										
PH	-	7.3	7.4	7.1	7.2	6.6	7.2				
LABORATORY TEST											
GENERAL/PHYSICAL											
PH	-										
BOD	mg/l	1	<1	1	1	1	1				
COD	mg/l		20	20	25	20	15				
NH4-N	mg/l		0.02	0.06	0.07	0.13	0.15				
Nitrat N	mg/l		0.3	0.3	0.5	0.55	0.5				
Klorida	mg/l										
Sulfat	mg/l		16	20	7	18	23				
Fosfat	mg/l		0.19	0.13	0.25	0.1	0.14				
Pepejal Te.	mg/l		40	40	40	225	25				
Jemlah Pepeja	mg/l										
Pepejal Terlar	mg/l										
HEAVY METALS											
As	mg/l										
Raksa	mg/l										
Pb	mg/l										
Cd	mg/l										
Cr	mg/l										
Zn	mg/l										
Ni	mg/l										
Fe	mg/l										
BACTERIA											
Total Coliform	MPN/100ml										
E. Coriform	MPN/100ml										
OTHERS											
Oil & Grls	mg/l										
Pheno;	mg/l										
MBAS	mg/l										
		Note: This table is prepared by compiling the recording sheets from DOE.									

Table 3.2 Water Quality Records of DOE for Muda River (at Station No. 5505603) (1992 - 1994), (2)

Sta. No.		5505603	5505603	5505603	5505603	5505603	5505603	5505603	5505603	5505603	5505603
River		Muda	Muda	Muda	Muda	Muda	Muda	Muda	Muda	Muda	Muda
Date		1992.4.21	1992.5.26	1992.6.15	1992.7.28	1992.8.28	1992.9.14				
FIELD TEST											
Tempe.	D.Centigrad	32	30	29	28	27	28				
Conductivity	umhos/cm	50	60	40	50	30	40				
?	ppt										
DO	ppm										
PH	-	7.7	7.6	7.1	7.1	6.5	7.2				
LABORATORY TEST											
GENERAL/PHYSICAL											
PH	-										
BOD	mg/l		<1	<1	1	1	1				
COD	mg/l		15	20	25	20	20				
NH4-N	mg/l		0.08	0.14	0.07	0.09	0.09				
Nitrat N	mg/l		0.5	0.5	0.4	0.95	0.95				
Klorida	mg/l										
Sulfat	mg/l		16	21	10	13	24				
Fosfat	mg/l		0.42	0.1	0.01	0.17	0.13				
Pepejal Te.	mg/l		50	95	35	255	35				
Jemlah Pepeja	mg/l										
Pepejal Terlar	mg/l										
HEAVY METALS											
As	mg/l	ND	ND	ND	ND	ND	ND				
Raksa	mg/l	0.05	ND	<0.01	ND	ND	ND				
Pb	mg/l										
Cd	mg/l	<0.01	ND	<0.01	ND	ND	ND				
Cr	mg/l	0.01	ND	<0.01	ND	<0.01	<0.01				
Zn	mg/l										
Ni	mg/l										
Fe	mg/l		0.4	1	0.6	0.3	0.6				
BACTERIA											
Total Coliform	MPN/100ml										
E. Coriform	MPN/100ml	130	170	3500	2500	3000	2500				
OTHERS											
Oil & Gris	mg/l										
Pheno;	mg/l										
MBAS	mg/l										
		Note: This table is prepared by compiling the recording sheets from DOE.									

Table 3.2 . Water Quality Records of DOE for Muda River at Station No. 5506604 (1992 - 1994). (3)

Sta. No.		5506604	5506604	5506604	5506604	5506604	5506604	5506604	5506604	5506604	5506604	5506604	5506604	5506604	5506604	5506604	5506604	5506604
River		Muda	Muda	Muda	Muda	Muda	Muda	Muda	Muda	Muda	Muda	Muda	Muda	Muda	Muda	Muda	Muda	Muda
Date		92.4.21	92.5.26	92.6.15	92.7.26	92.8.28	92.9.13	92.11.7	93.3.9	93.5.24	93.7.19	93.8.15	93.9.29	93.11.10		94.3.7	94.6.25	
FIELD TEST																		
Tempe.	D.Centigrad	32	29	28	27	26	30	31	28	29	26	29	27	26		25	25	
Conductivity	umhos/cm	70	60	30	60	30	50	90	65	90	50	60	40	50		60	55	
?	ppt															0	0	
DO	ppm								4.5	6.1	6.4	7.5	6.9	5.5		7.9	7.2	
PH	-	7.5	7.3	7.1	7.4	6.6	7	6	6.8	6.3	5.8	6.3	6.3	6.5		7.6	6.5	
LABORATORY TEST																		
GENERAL/PHYSICAL																		
PH	-								7	7	6.5	7						
BOD	mg/l		<1	1	1	1	1	1	1	1	2	2	1			1	1	
COD	mg/l		20	20	20	20	15	15	20	10	10	15	10			25	15	
NH4-N	mg/l		0.03	0.06	0.05	0.14	0.15	0.03	0.07	0.12	0.05	0.05	0.1			0.45	0.36	
Nitrat N	mg/l		0.35	0.6	0.45	0.16	0.2	0.2	0.35	0.25	0.25	0.25	0.15					
Klorida	mg/l								4	8	12							
Sulfat	mg/l		15	21	13	17	24	8	4	14	5							
Fosfat	mg/l		0.31	0.1	0.26	0.17	0.19	0.06	0.17	0.73	<0.05							
Pepejal Te.	mg/l		36	160	30	140	30	25	50	35	40	70	60			30	56	
Jemlah Pepeja	mg/l								100	145	165	170						
Pepejal Terlar	mg/l								50	110	145	100						
HEAVY METALS																		
As	mg/l																	
Raksa	mg/l																	
Pb	mg/l																	
Cd	mg/l																	
Cr	mg/l																	
Zn	mg/l																	
Ni	mg/l																	
Fe	mg/l																	
BACTERIA																		
Total Coliform	MPN/100ml																	
E. Coriform	MPN/100ml																	
OTHERS																		
Oil & Gris	mg/l																	
Pheno;	mg/l																	
MBAS	mg/l					Note: This table is prepared by compiling the recording sheets from DOE.												

Table 3.2 . Water Quality Records of DOE for Muda River at Station No. 5607606 (1992 - 1994). (4)

Sta. No.		5607606	5607606	5607606	5607606	5607606	5607606	5607606	5607606	5607606	5607606	5607606	5607606	5607606	5607606	5607606	5607606	5607606
River		Tawar	Tawar	Tawar	Tawar	Tawar	Tawar	Tawar	Tawar	Tawar	Tawar	Tawar	Tawar	Tawar	Tawar	Tawar	Tawar	Tawar
Date		92.4.21	92.5.26	92.6.14	92.7.26	92.8.28	92.9.13	92.11.7	93.3.8	93.5.24	93.7.19	93.8.15	93.9.28	93.11.10				
FIELD TEST																		
Tempe.	D.Centigrad	29	27	27	24	26	28	31	28	29	26	28	25	25				
Conductivity	umhos/cm	51	60	50	60	30	50	90	100	60	60	60	50	40				
?	ppt																	
DO	ppm								5.2	6.4	3.6	7.2	6.4	6.8				
PH	-	7.1	7.3	7	7	6.5	7.1	5.4	6.5	6.4	5.4	6.4	6.1	6.5				
LABORATORY TEST																		
GENERAL/PHYSICAL																		
PH	-								7		6.5	7						
BOD	mg/l		2	1	2	2	3	1	1	1	2		1					
COD	mg/l		30	25	40	20	30	15	55	5	10		1					
NH4-N	mg/l		0.03	0.05	1.1	0.19	0.2	0.16	1.9	0.43	0.46		2.8					
Nitrat N	mg/l		1.8	2.2	1.6	0.35	0.35	0.2	1.7	0.5	0.5		0.65					
Klorida	mg/l								4		14	2						
Sulfat	mg/l		17	19	12	19	21	6	12		14	2						
Fosfat	mg/l		0.51	0.1	0.26	0.19	0.05	0.22	0.89		0.52	0.94						
Pepejal Te.	mg/l		13	30	25	255	10	25	65	10	35	10	70					
Jemlah Pepeja	mg/l								135	105	125	65						
Pepejal Terlar	mg/l								70	95	90	55						
HEAVY METALS																		
As	mg/l																	
Raksa	mg/l																	
Pb	mg/l																	
Cd	mg/l																	
Cr	mg/l																	
Zn	mg/l																	
Ni	mg/l																	
Fe	mg/l																	
BACTERIA																		
Total Coliform	MPN/100ml																	
E. Coriform	MPN/100ml																	
OTHERS																		
Oil & Gris	mg/l																	
Pheno;	mg/l																	
MBAS	mg/l					Note: This table is prepared by compiling the recording sheets from DOE.												

Table 3.2 Water Quality Records of DOE for Muda River (at Station No. 5608601) (1992 - 1994), (5)

Sta. No.		5608601	5608601	5608601	5608601	5608601	5608601	5608601	5608601	5608601	5608601
River		Tawar	Tawar	Tawar	Tawar	Tawar	Tawar	Tawar	Tawar	Tawar	Tawar
Date									94.3.8	94.6.26	
FIELD TEST											
Tempe.	D.Centigrade								23	21	
Conductivity	umhos/cm								40	35	
?	ppt								0	0	
DO	ppm								6.2	7.5	
PH	-								7.6	6.6	
LABORATORY TEST											
GENERAL/PHYSICAL											
PH	-										
BOD	mg/l								<1	1	
COD	mg/l								15	10	
NH4-N	mg/l								0.05	0.18	
Nitrat N	mg/l										
Klorida	mg/l										
Sulfat	mg/l										
Fosfat	mg/l										
Pepejal Te.	mg/l								20	50	
Jemlah Pepeja	mg/l										
Pepejal Terlar	mg/l										
HEAVY METALS											
As	mg/l										
Raksa	mg/l										
Pb	mg/l										
Cd	mg/l										
Cr	mg/l										
Zn	mg/l										
Ni	mg/l										
Fe	mg/l										
BACTERIA											
Total Coliform	MPN/100ml										
E. Coriform	MPN/100ml										
OTHERS											
Oil & Gris	mg/l										
Pheno;	mg/l										
MBAS	mg/l										
		Note: This table is prepared by compiling the recording sheets from DOE.									

Table 3.2 Water Quality Records of DOE for Muda River (at Station No. 5608602) (1992 - 1994), (6)

Sta. No.		5608602	5608602	5608602	5608602	5608602	5608602	5608602	5608602	5608602	5608602
River		Tawar	Tawar	Tawar	Tawar	Tawar	Tawar	Tawar	Tawar	Tawar	Tawar
Date									94.3.8	94.6.26	
FIELD TEST											
Tempe.	D.Centigrade								24	21	
Conductivity	umhos/cm								60	50	
?	ppt								0	0	
DO	ppm								6.6	7	
PH	-								7.3	6.8	
LABORATORY TEST											
GENERAL/PHYSICAL											
PH	-										
BOD	mg/l								1	1	
COD	mg/l								3	15	
NH4-N	mg/l								6.9	1.1	
Nitrat N	mg/l										
Klorida	mg/l										
Sulfat	mg/l										
Fosfat	mg/l										
Pepejal Te.	mg/l								25	55	
Jemlah Pepeja	mg/l										
Pepejal Terlar	mg/l										
HEAVY METALS											
As	mg/l										
Raksa	mg/l										
Pb	mg/l										
Cd	mg/l										
Cr	mg/l										
Zn	mg/l										
Ni	mg/l										
Fe	mg/l										
BACTERIA											
Total Coliform	MPN/100ml										
E. Coriform	MPN/100ml										
OTHERS											
Oil & Gris	mg/l										
Pheno;	mg/l										
MBAS	mg/l										
		Note: This table is prepared by compiling the recording sheets from DOE.									

Table 3.2 Water Quality Records of DOE for Muda River
(at Station No. 5608603) (1992 - 1994) (n)

Sta. No.		5608603	5608603	5608603	5608603	5608603	5608603	5608603	5608603	5608603	5608603
River		Naksah	Naksah	Naksah	Naksah	Naksah	Naksah	Naksah	Naksah	Naksah	Naksah
Date									94.3.8	94.6.26	
FIELD TEST											
Tempe.	0.Centigrade								24	25	
Conductivity	umhos/cm								110	85	
?	ppt								0	0	
DO	ppm								4	6.2	
PH	-								7.1	6.6	
LABORATORY TEST											
GENERAL/PHYSICAL											
PH	-										
BOD	mg/l								2	1	
COD	mg/l								5	20	
NH4-N	mg/l								5	0.27	
Nitrat N	mg/l										
Klorida	mg/l										
Sulfat	mg/l										
Fosfat	mg/l										
Pepejal Te.	mg/l								?	?	
Jemlah Pepeja	mg/l										
Pepejal Terlan	mg/l										
HEAVY METALS											
As	mg/l										
Raksa	mg/l										
Pb	mg/l										
Cd	mg/l										
Cr	mg/l										
Zn	mg/l										
Ni	mg/l										
Fe	mg/l										
BACTERIA											
Total Coliform	MPN/100ml										
E. Coriform	MPN/100ml										
OTHERS											
Oil & Gris	mg/l										
Pheno;	mg/l										
MBAS	mg/l										
		Note: This table is prepared by compiling the recording sheets from DOE.									

Table 3.2 Water Quality Records of DOE for Muda River at Station No. 5608605 (1992 - 1994), (8)

Sta. No.		5608605	5608605	5608605	5608605	5608605	5608605	5608605	5608605	5608605	5608605	5608605	5608605	5608605	5608605	5608605	5608605
River		Ketil	Ketil	Ketil	Ketil	Ketil	Ketil	ketil	ketil	ketil	ketil	ketil	ketil	ketil	ketil	ketil	ketil
Date		92.4.20	92.5.25	92.6.14	92.7.25	92.8.28	92.9.13	93.3.6	93.5.24	93.7.19	93.8.15	93.9.28	93.11.10				
FIELD TEST																	
Tempe.	D.Centigrad	30	29	29	26	26	30										
Conductivity	umhos/cm	125	100	90	90	50	60										
?	ppt																
DO	ppm							6.1	6.4	6.3	6.6	7.2	7				
PH	-	7.6	7.6	7.5	7.6	7.2	7.5	7.1	6.7	6.6	6.6	8	7.1				
LABORATORY TEST																	
GENERAL/PHYSICAL																	
PH	-							7	7	7	7						
BOD	mg/l		<1	1	1	1	1	1	2	2	2	1					
COD	mg/l		20	20	25	20	20	30	15	10	20	5					
NH4-N	mg/l		0.02	0.03	0.07	0.06	0.07	0.14	0.26	0.14	0.19	0.5					
Nitrat N	mg/l		0.1	0.35	0.2	0.4	0.4	0.2	0.2	0.25	1	0.1					
Klorida	mg/l							4		9	13						
Sulfat	mg/l		17	19	10	19	20	3		14	4						
Fosfat	mg/l		0.5	0.06	0.34	0.25	0.05	0.16		0.42	0.16						
Pepejal Te.	mg/l		30	30	30	195	45	40	15	135	30	95					
Jemlah Pepeja	mg/l							110	210	220	100						
Pepejal Terlar	mg/l							70	195	85	70						
HEAVY METALS																	
As	mg/l																
Raksa	mg/l																
Pb	mg/l																
Cd	mg/l																
Cr	mg/l																
Zn	mg/l																
Ni	mg/l																
Fe	mg/l																
BACTERIA																	
Total Coliform	MPN/100ml																
E. Coriform	MPN/100ml	950	2750	9000	16000	11000	6000										
OTHERS																	
Oil & Gris	mg/l																
Pheno;	mg/l																
MBAS	mg/l			Note: This table is prepared by compiling the recording sheets from DOE.													

Table 3.2 Water Quality Records of DOE for Muda River at Station No. 5609609 (1992 - 1994), (9)

Sta. No.		5609609	5609609	5609609	5609609	5609609	5609609	5609609	5609609	5609609	5609609	5609609	5609609	5609609	5609609	5609609	5609609
River		Ketil	Ketil	Ketil	Ketil	Ketil	Ketil	Ketil	ketil	ketil	ketil	ketil	ketil	ketil	ketil	ketil	ketil
Date		92.4.20	92.5.25	92.6.14	92.7.25	92.8.28	92.9.13	92.11.7	93.3.6	93.5.24	93.7.19	93.8.15	93.9.28	93.11.10		94.3.7	94.6.25	
FIELD TEST																		
Tempe.	D.Centigrad	30	29	31	25	25	28	31	29	29	26	28	26	27		25	22	
Conductivity	umhos/cm	140	100	60	90	50	80	100	95	100	100	130	115	90		120	100	
?	ppt															0	0	
DO	ppm								6.9	6.6	7.5	7	7.3	6.4		6.4	7.4	
PH	-	7.6	7.7	7.7	7.9	7.3	7.6	6.9	7	6.5	6.6	6.6	8	7.4		7.5	6.5	
LABORATORY TEST																		
GENERAL/PHYSICAL																		
PH	-								7	7	7	7						
BOD	mg/l		<1	<1	1	1	1	1	1	1	3	4	3			1	1	
COD	mg/l		25	15	30	20	15	15	30	15	40	20	2			2	25	
NH4-N	mg/l		0.02	0.05	0.11	0.04	0.05	0.09	0.3	0.1	0.38	0.8	0.2			0.12	0.22	
Nitrat N	mg/l		0.6	0.6	0.1	0.35	0.3	0.1	0.1	0.25	0.3	0.45	0.1					
Klorida	mg/l								4		10	16						
Sulfat	mg/l		17	19	10	18	21	4	3		12	2						
Fosfat	mg/l		0.19	0.11	0.19	0.18	0.06	0.19	0.17		0.71	0.43						
Pepejal Te.	mg/l		20	10	25	230	25	30	35	60	80	35	15			10	115	
Jemlah Pepeja	mg/l								120	190	270	115						
Pepejal Terlar	mg/l								85	130	190	80						
HEAVY METALS																		
As	mg/l	ND	ND		ND	ND	ND	ND	<0.01	<0.01	<0.01	<0.01	<0.01					
Raksa	mg/l	<0.01	ND		ND	0.02	ND	<0.01	<0.01	<0.01	<0.01		<0.01					
Pb	mg/l	<0.01	ND		<0.01	0.02	<0.01	0.01	<0.01	0.05	0.02	<0.01	0.01					
Cd	mg/l	ND	ND		ND	<0.01	ND	ND	<0.01	0.01	<0.01		<0.01					
Cr	mg/l	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	0.03	0.01	<0.01	<0.01					
Zn	mg/l									0.03	0.04							
Ni	mg/l																	
Fe	mg/l		0.4	0.4	0.5	0.1	0.4	0.4	0.4			0.8						
BACTERIA																		
Total Coliform	MPN/100ml								160000+	90000	160000+	35000	160000	35000				
E. Coriform	MPN/100ml	16000	16000	16000	16000	14000	16000		2000	3500	160000+	5000	160000	35000				
OTHERS																		
Oil & Gris	mg/l																	
Pheno;	mg/l																	
MBAS	mg/l															<1		

Note: This table is prepared by compiling the recording sheets from DOE.

Table 3.2 Water Quality Records of DOE for Muda River at Station No. 5706607 (1992 - 1994), (10)

FIELD TEST											
Tempe.	D.Centigrad	26	28	27	29	27	26		24	23	
Conductivity	umhos/cm	153	45	70	5	140	50		40	45	
?	ppt								0	0	
DO	ppm	0.8	5	6.2	1.6	3.6	5.5		7.9	7.4	
PH	-	5.6	5.6	5.4	4.9	5.7	5.2		7.4	6.4	
LABORATORY TEST											
GENERAL/PHYSICAL											
PH	-	7	7	7	7	7	7				
BOD	mg/l	24	1	2	136	21	3		1	1	
COD	mg/l	130	85	10	150	30	10		5	5	
NH4-N	mg/l	4.9	0.68	0.57	9	14	1.8		0.06	0.18	
Nitrat N	mg/l	0.25	0.35	0.15	0.6	0.85	1.3				
Klorida	mg/l	6		18	28						
Sulfat	mg/l	9		3	50						
Fosfat	mg/l	0.28		0.66	11.8						
Pepejal Te.	mg/l	65	65	25	25	80	50		20	45	
Jemlah Pepeja	mg/l	130	115	80	250						
Pepejal Terlar	mg/l	65	50	55	225						
HEAVY METALS											
As	mg/l										
Raksa	mg/l										
Pb	mg/l										
Cd	mg/l										
Cr	mg/l										
Zn	mg/l										
Ni	mg/l										
Fe	mg/l										
BACTERIA											
Total Coliform	MPN/100ml										
E. Coriform	MPN/100ml										
OTHERS											
Oil & Gris	mg/l										
Pheno;	mg/l										
MBAS	mg/l										
			Note: This table is prepared by compiling the recording sheets from DOE.								

Table 3.2 Water Quality Records of DOE for Muda River at Station No. 5706610 (1992 - 1994), (11)

FIELD TEST											
Tempe.	D.Centigrad	26	27	26	28	25	26		24	25	
Conductivity	umhos/cm	50	55	50	45	40	50		150	120	
?	ppt								0	0	
DO	ppm	5.2	6.2	7.3	6.7	5.8	5.5		3.9	1.1	
PH	-	5.7	6.4	6.2	5.7	5.5	5.2		6.3	5.6	
LABORATORY TEST											
GENERAL/PHYSICAL											
PH	-	7	7	7	7	7	7				
BOD	mg/l	2	2	1	1	2	1		38	41	
COD	mg/l	30	5	1	1	5	5		125	425	
NH4-N	mg/l	0.06	0.12	0.04	0.03	0.26	0.12		11.1	15.6	
Nitrat N	mg/l	0.25	0.4	0.15	0.1	0.6	0.2				
Klorida	mg/l	5									
Sulfat	mg/l	3		7	3						
Fosfat	mg/l	0.17		0.08	<0.05						
Pepejal Te.	mg/l	45	35	35	75	45			35	150	
Jemlah Pepeja	mg/l										
Pepejal Terlar	mg/l										
HEAVY METALS											
As	mg/l										
Raksa	mg/l										
Pb	mg/l										
Cd	mg/l										
Cr	mg/l										
Zn	mg/l										
Ni	mg/l										
Fe	mg/l										
BACTERIA											
Total Coliform	MPN/100ml										
E. Coriform	MPN/100ml										
OTHERS											
Oil & Gris	mg/l										
Pheno;	mg/l										
MBAS	mg/l										
			Note: This table is prepared by compiling the recording sheets from DOE.								

Table 3-2 Water Quality Records of DOE for Muda River at Station No. 5806614 (1992 - 1994) (12)

Sta. No.		5806614	5806614	5806614	5806614	5806614	5806614	5806614	5806614	5806614	5806614	5806614	5806614	5806614	5806614	5806614	5806614	5806614
River		Muda	Muda	Muda	Muda	Muda	Muda	Muda	Muda	Muda	Muda	Muda	Muda	Muda	Muda	Muda	Muda	Muda
Date		92.4.20	92.5.25	92.6.14	92.7.25	92.8.28	92.9.13	92.11.7	93.3.8	93.5.24	93.7.19	93.8.15	93.9.28	93.11.9				
FIELD TEST																		
Tempe.	D.Centigrad	32	30	31	30	25	30	33	30	29	29	29	27	27				
Conductivity	umhos/cm	60	50	40	40	30	40	30	73	50	60	75	40	40				
?	ppt																	
DO	ppm								5.6	6.5	7.2	7.3	7.3	5.9				
PH	-	7.1	76.9	76.9	7.1	6.9	6.9	6.6	6.6	6.6	6.3	6.5	6.5	7.1				
LABORATORY TEST																		
GENERAL/PHYSICAL																		
PH	-								7	7	7	7	7					
BOD	mg/l		<1	<1	1	2	1	1	1	1	2	2	2					
COD	mg/l		20	20	30	30	20	15	30	25	10	10	15					
NH4-N	mg/l		0.04	0.12	0.03	0.09	0.12	0.18	0.1	0.06	0.07	0.05	0.13					
Nitrat N	mg/l		0.2	0.25	0.1	0.21	0.05	0.2	0.05	0.25	0.2	0.35	0.35					
Klorida	mg/l								4		10	17						
Sulfat	mg/l		17	23	9	19	23	3	4		16	1						
Fosfat	mg/l		0.25	0.19	0.1	0.21	0.05	0.2	0.53	0.33	<0.05							
Pepejal Te.	mg/l		35	35	20	130	10	35	40	50	25	10	80					
Jemlah Pepeja	mg/l								90	155	155	75						
Pepejal Terlar	mg/l								50	105	130	65						
HEAVY METALS																		
As	mg/l																	
Raksa	mg/l																	
Pb	mg/l																	
Cd	mg/l																	
Cr	mg/l																	
Zn	mg/l																	
Ni	mg/l																	
Fe	mg/l																	
BACTERIA																		
Total Coliform	MPN/100ml																	
E. Coriform	MPN/100ml																	
OTHERS																		
Oil & Gris	mg/l																	
Pheno:	mg/l																	
MBAS	mg/l			Note: This table is prepared by compiling the recording sheets from DOE.														

Table 3-2 .. Water Quality Records of DOE for Muda River at Station No. 6007608 (1992 - 1994) (13)

Sta. No.		6007608	6007608	6007608	6007608	6007608	6007608	6007608	6007608	6007608	6007608	6007608	6007608	6007608	6007608	6007608	6007608	6007608
River		Muda	Muda	Muda	Muda	Muda	Muda	Muda	Muda	Muda	Muda	Muda	Muda	Muda	Muda	Muda	Muda	Muda
Date		92.4.20	92.5.25	92.6.14	92.7.25	92.8.28	92.9.13	92.11.7	93.3.8	93.5.24	93.7.19	93.8.15	93.9.28	93.11.9		94.3.8	94.6.26	
FIELD TEST																		
Tempe.	D.Centigrad	30	30	28	29	25	29	27	27	29	26	26	26	26		28	22	
Conductivity	umhos/cm	70	70	50	60	40	50	90	120	60	70	170	55	50		60	60	
?	ppt															0	0	
DO	ppm								5	6.6	6.8	6.8	7.7	7.3		7.4	7.7	
PH	-	7.1	7.6	7.2	7.9	7.3	7.4	7	7.1	6.7	6.8	6.8	7.7	7.3		6.8	6.6	
LABORATORY TEST																		
GENERAL/PHYSICAL																		
PH	-								7	7	7	7						
BOD	mg/l		<0.1	<0.1	1	2	1	1	<1.0	1	2	2	<1.0			1	1	
COD	mg/l		20	15	20	30	15	15	20	10	50	5	2			5	15	
NH4-N	mg/l		0.03	0.13	1.02	0.04	0.05	0.03	0.04	0.08	0.15	0.03	0.04			0.1	0.31	
Nitrat N	mg/l		0.05	0.2	0.15	0.35	0.3	0.15	0.05	0.35	0.25	0.2	0.2					
Klorida	mg/l								10		13	18						
Sulfat	mg/l		18	28	13	16	30	15	1		17	42						
Fosfat	mg/l		0.59	0.25	0.13	0.2	0.06	15	0.9	0.9	<0.05							
Pepejal Te.	mg/l								35	5	435	70	20			15	65	
Jemlah Pepeja	mg/l								100	85	600	170						
Pepejal Terlar	mg/l								65	80	165	100						
HEAVY METALS																		
As	mg/l	ND	ND	ND	ND	ND	ND	ND	<0.01	<0.01	<0.01	<0.01	<0.01					
Raksa	mg/l	ND	<0.01	<0.01	ND	0.01	ND	0.01	<0.01	<0.01	<0.01		<0.01					
Pb	mg/l	ND	0.01	<0.01	<0.01	ND	<0.01	0.03	0.01	<0.01	0.09	<0.01	<0.01					
Cd	mg/l	ND	<0.01	<0.01	ND	ND	ND	<0.01	<0.01	<0.01	0.01	<0.01	<0.01					
Cr	mg/l	ND	<0.01	0.08	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.04	<0.01	<0.01					
Zn	mg/l									<0.01	0.05							
Ni	mg/l																	
Fe	mg/l		0.6	0.6	0.2	0.1	0.6	0.6										
BACTERIA																		
Total Coliform	MPN/100ml								500	7000	160000+	2000	13000					
E. Coriform	MPN/100ml	130	170	3300	500	4500	7000	1100	200	1400	160000+	1700	13000					
OTHERS																		
Oil & Gris	mg/l																	
Pheno:	mg/l																	
MBAS	mg/l			Note: This table is prepared by compiling the recording sheets from DOE.														

TABLE 3.3 Water Quality of Muda River
In January 1983 by PKP Study Team

Chemical Analyasis (mg/l)	Sg. Muda Station No.						
	5504602	5505603	5505604	5508605	5906607	5906614	5907606
Sampling Time	1730	1550	1450	1220	1110	1030	1420
Sampling Date	Jan. 16	Jan. 16	Jan. 16	Jan. 16	Jan. 16	Jan. 16	Jan. 16
1 pH at 26℃	7.4	7.2	7.2	7.8	7.3	7.3	7.2
2 B.O.D. 5 Days @20℃	1	1	1	1	1	1	1
3 Chemical Oxygen Demand	20	20	20	5	20	5	5
4 Ammoniacal Nitrogen as N	0.30	0.06	0.04	0.10	0.20	0.07	0.08
5 Albuminoid Nitrogen	-	-	-	-	-	-	-
6 Nitrate Nitorogen as N	0.25	0.20	0.25	0.20	0.15	0.74	0.40
7 Chloride (as Cl)	2	2	2	3	2	2	2
8 Flouride (as F)	-	-	-	-	-	-	-
9 Sulphate (as S04)	-	-	-	-	-	-	-
10 Phosphate (as PO4)	-	-	-	-	-	-	-
11 Total Solids Dried at 105℃	55	55	70	95	55	50	55
12 Suspended Solids Dried at 105℃	30	30	10	10	10	20	20
13 Dissolved Solids	25	25	60	85	45	30	35
14 Oil and Grease	-	-	-	-	-	-	-
15 Salinity % (Parts per thousand)	0	0	0	0	0	0	0
16 Conductivity (umhos/cm)	40	40	50	90	30	30	30
17 Arsenic (as As)	-	-	-	-	-	-	-
18 Iron (as Fe)	0.4	0.2	0.4	0.4	0.4	0.4	0.4
19 Color (Hazen units)	5	10	5	5	5	5	5
20 Turbidity (FTU)	5	10	5	5	5	5	5
21 Manganese (as Mn)	-	-	-	-	-	-	-
22 Cadmium (as Cd)	-	-	-	-	-	-	-
23 Sodium (as Na)	-	-	-	-	-	-	-
24 Total Hardness (as CaCO3)	15	15	20	40	10	10	15
25 Calcium (as Ca)	4.8	4.8	5.6	12.8	3.2	2.8	3.6
26 Magnesium (as Mg)	0.7	0.7	1.0	1.9	1.0	1.0	1.0
27 Dissolved Oxygen	7.3	7.2	7.5	7.5	8.1	6.5	8.2