

表2.2.17 半島マレーシアの小規模貯水池で開発される果樹園面積

Year	(1) Target Production (ton)	(2) National Area (ha)	(3) Area in P. Malaysia (ha)	(4) Increase in Area (ha)	(5) Area to be Developed by Small Reservoir (ha)
1990	716,336	191,895	162,085	-	
1995	992,019	291,237	246,019	83,934	41,967
2000	1,286,230	331,786	262,780	16,761	8,381
2010	2,446,151	*630,451	*499,317	236,537	118,269

Note : (1) Production of fruits targeted by NPA 1992-2010.

(2) data of MOA

(3) ditto

(4) increase in area from the preceding target year.

(5) 50% of the increased area is deemed to be developed by small reservoirs.

* estimated by Study Team

表2.2.18 水稻の作付面積と生産量 1975-1992

year	Area ('000 ha)		Production ('000 tons)	
	Planted	Harvested	Padi	Rice
1975	766.0	750.4	1,996	1,288
1980	716.9	697.5	2,045	1,318
1985	656.4	649.3	1,953	1,258
1986	711.0	703.0	1,745	1,149
1987	704.0	684.2	1,697	1,096
1988	665.8	647.1	1,783	1,152
1989	646.2	628.0	1,714	1,104
1990	650.4	632.1	1,725	1,114
1991p	661.2	642.6	1,847	1,201
1992e	666.9	648.2	1,867	1,214

Source : Ministry of Agriculture

p = provisional, e = estimate

表2.2.19 水稻の反収

Year	(kg/ha)		表2.2.20 米の輸入 (tons)	
	Main season	Off season	year	imports
1980	3,038	3,260	1980	167,592
1985	3,392	3,291	1985	428,412
1986	3,425	3,293	1986	199,593
1987	3,472	2,734	1987	193,784
1988	3,330	2,933	1988	283,880
1989	3,286	3,264	1989	367,471
1990	3,293	3,204	1990	329,711
1991p	3,500	2,830	1991p	430,448
1992e	3,230	n.a.	1992e	462,000

表2.3.1 河川流域别平均月雨量

unit : mm

Basin	Period	Month												Total
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
1	1983-1992	19	47	111	138	177	129	180	182	257	247	169	76	1733
2	1983-1992	12	51	102	212	288	225	359	316	459	409	218	35	2686
3a	1983-1992	18	35	102	172	221	138	270	294	327	258	168	64	2066
3b	1983-1992	13	39	105	162	207	135	243	260	306	255	169	67	1966
3c	1983-1992	18	53	121	187	237	141	263	289	332	289	202	73	2203
3d	1983-1992	18	52	121	186	236	141	263	289	331	287	201	72	2198
4	1983-1992	51	116	175	253	273	156	214	232	324	351	283	121	2549
5a	1983-1992	18	89	161	217	270	147	248	278	340	350	269	91	2478
5b	1983-1992	18	99	172	226	279	149	244	275	342	368	288	97	2557
5c	1983-1992	18	99	172	226	279	149	244	275	342	368	288	97	2557
5d	1983-1992	95	138	180	289	266	166	174	176	299	329	276	153	2540
6	1983-1992	95	138	180	289	266	166	174	176	300	329	276	153	2540
7	1983-1992	58	63	138	221	262	189	256	240	385	365	236	96	2508
8	1983-1992	97	128	167	255	235	148	156	157	272	294	252	144	2305
9	1983-1992	130	102	143	148	123	81	81	85	155	152	181	149	1530
10a	1983-1992	79	123	153	186	242	132	184	190	278	273	280	227	2348
10b	1983-1992	84	143	150	153	207	104	129	138	206	190	188	127	1820
10c	1983-1992	169	210	240	280	244	151	175	160	243	260	296	235	2663
10d	1983-1992	180	211	249	298	253	162	175	160	247	276	329	256	2794
11	1983-1992	147	144	198	239	219	130	115	145	207	232	290	226	2292
12	1983-1992	169	115	141	158	149	74	116	139	180	187	184	221	1833
13	1983-1992	143	123	155	183	179	88	119	141	200	206	206	207	1950
14	1983-1992	169	115	141	158	149	74	116	139	180	187	184	221	1833
15	1983-1992	113	132	205	201	210	86	173	157	263	265	298	214	2317
16	1983-1992	89	97	162	166	216	106	167	142	256	244	263	168	2075
17	1983-1992	83	86	142	153	198	99	150	121	218	205	229	138	1822
18	1983-1992	72	102	164	186	191	90	142	114	183	178	230	128	1779
19	1983-1992	72	102	164	186	191	90	142	114	183	178	230	128	1779
20	1983-1992	78	104	176	236	193	146	153	152	205	186	233	142	2003
21a	1983-1992	122	108	184	141	197	84	129	128	187	163	218	197	1856
21b	1983-1992	152	78	221	173	170	96	125	120	160	172	249	244	1962
22	1983-1992	174	108	240	192	176	102	131	122	168	186	263	231	2094
23	1983-1992	186	115	195	194	207	124	138	123	182	149	186	252	2051
24	1983-1992	233	107	197	205	233	146	153	154	221	178	225	340	2392
25	1983-1992	300	100	196	206	250	167	169	189	259	210	295	474	2815
26	1983-1992	349	110	135	119	146	119	151	159	187	157	409	656	2698
27	1983-1992	244	72	192	152	149	117	133	130	168	161	303	431	2254
28	1983-1992	222	99	172	133	150	86	115	120	148	154	273	386	2058
29	1983-1992	307	112	198	154	121	122	123	114	174	199	472	577	2675
30a	1983-1992	152	115	162	187	224	165	174	155	261	283	306	284	2467
30b	1977-1986	92	90	131	213	228	153	178	140	201	256	238	337	2258
30c	1983-1992	119	119	173	188	205	95	123	138	225	227	240	196	2048
30d	1983-1992	102	99	162	139	196	116	149	118	200	192	221	196	1888
30e	1983-1992	129	102	172	149	192	87	115	124	184	171	214	212	1852
30f	1977-1986	104	91	144	197	203	118	138	99	171	225	209	171	1868
30g	1983-1992	262	106	197	143	119	113	105	108	172	220	499	566	2610
31	1983-1992	180	76	151	106	130	105	100	115	168	151	298	420	1999
32	1983-1992	153	73	125	98	128	105	101	123	190	167	421	487	2172
33	1983-1992	120	69	93	89	124	105	102	134	218	188	573	569	2385
34	1983-1992	120	69	93	89	124	105	102	134	218	188	573	569	2385
35	1983-1992	114	57	108	89	109	109	93	131	206	202	655	534	2408
36a	1977-1986	64	78	96	112	142	115	133	148	193	237	463	471	2252
36b	1983-1992	110	50	117	89	99	111	88	130	199	211	706	512	2421
37	1983-1992	110	50	117	89	99	111	88	130	199	211	706	512	2421
38	1983-1992	155	71	102	135	169	141	212	178	300	271	425	599	2757
39	1983-1992	97	51	98	82	169	177	200	213	271	235	486	608	2687
40a	1977-1986	78	85	108	165	233	158	184	180	256	295	294	333	2368
40b	1983-1992	119	100	139	158	243	156	164	171	287	274	308	309	2429
40c	1983-1992	155	71	102	135	169	141	212	178	300	271	425	599	2757
40d	1983-1992	97	51	98	82	169	177	200	213	271	235	486	608	2687
41	1983-1992	97	51	98	82	169	177	200	213	271	235	486	608	2687

Note : River basin 41 basins with 27 sub-basins which originate from "National Water Resources Study, Malaysia (JICA 1982)"

表2.3.3 主要気象観測所の平均日蒸発量

Station	Period	Jan.	Feb.	Mar.	Apr.	May	Jun	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
Senao	1974-1989	3.5	3.9	3.6	3.5	3.3	3.3	3.1	3.2	3.1	3.2	2.9	3.0	3.3
Kluang	1974-1989	3.4	3.9	3.7	3.3	3.0	2.9	2.8	2.9	2.9	3.0	2.8	2.9	3.1
Mersing	1974-1989	4.2	4.7	4.6	4.1	3.8	3.6	3.5	3.7	3.8	3.6	3.2	3.5	3.9
Alor Setar	1974-1989	5.3	5.8	5.5	4.9	3.9	3.5	3.6	3.6	3.5	3.5	3.3	4.3	4.2
Kota Bharu	1968-1989	4.4	4.9	5.3	5.5	5.0	4.5	4.7	4.5	4.5	4.2	3.6	3.6	4.5
Kuala Krai	Dec.1984-1989	2.8	4.0	4.1	4.5	4.0	4.0	4.1	3.8	3.8	3.4	2.7	2.4	3.6
Malacca	1968-1989	5.1	5.5	5.1	4.5	4.2	4.1	3.9	4.0	4.2	4.2	3.9	4.3	4.4
Batu Embun	Jun.1982-1989	2.5	3.4	3.7	3.9	3.5	3.2	3.3	3.3	3.4	3.1	2.9	2.1	3.2
Kajiklim Tanah Rata	1973-1987	2.3	2.5	2.6	2.3	2.2	2.4	2.4	2.4	2.1	2.0	1.8	1.9	2.2
Cameron Highlands	Apr.1983-1989	1.9	2.3	2.3	2.1	1.9	2.2	2.1	1.9	1.7	1.7	1.6	1.7	1.9
Kuantan	1974-1989	3.2	3.7	4.2	4.0	4.1	3.9	4.0	4.1	4.1	3.8	2.9	2.9	3.7
Muadzam Shah	Aug.1983-1989	3.5	4.1	3.5	3.7	3.5	3.5	3.5	3.7	3.4	3.6	2.9	2.9	3.5
Temerloh	1979-1989	3.1	3.8	3.9	3.7	3.5	3.4	3.4	3.5	3.4	3.3	2.9	2.7	3.4
Bayan Lepas	1974-1989	5.0	5.0	4.7	4.3	3.8	3.8	3.8	3.7	3.5	3.5	3.6	4.4	4.1
Ipoh	1974-1989	4.1	4.4	4.5	4.5	4.0	4.1	4.0	4.0	3.7	3.9	3.5	3.8	4.0
Sitawan	1974-1989	3.4	3.9	4.0	4.0	3.8	3.6	3.8	3.5	3.7	3.5	3.2	3.3	3.6
Chuping	1979-1989	4.8	5.4	5.0	4.3	3.6	3.1	3.2	3.2	3.1	2.8	2.7	3.5	3.7
Subang	1968-1989	4.3	5.0	5.1	4.8	4.6	4.4	4.4	4.5	4.4	4.4	4.0	3.8	4.5
Petaling Jaya	1971-1989	3.4	3.9	3.9	3.8	3.6	3.4	3.4	3.5	3.3	3.3	3.1	3.0	3.5
Kuala Terengganu Airport	1985-1989	4.4	5.2	5.2	5.3	4.8	4.6	4.6	4.4	4.5	3.9	3.7	4.1	4.5
Kajiklim Kuala Terengganu	1974-1989	3.7	4.1	4.6	4.6	4.3	4.0	4.0	4.0	3.8	3.5	3.0	3.2	3.9
Kota Kinabalu	1971-1989	4.5	4.7	5.2	5.5	5.3	5.1	5.1	5.0	4.9	4.8	4.6	4.6	4.9
KUDat	Oct.1981+1989	3.7	4.2	5.0	5.3	5.0	4.6	4.4	4.6	4.3	4.0	3.5	3.5	4.3
Sandakan	1972-1989	4.2	4.8	5.4	5.5	5.1	4.8	4.6	4.8	4.4	4.3	4.0	3.8	4.6
Tawau	Jul.1979-1989	3.6	3.9	4.3	4.3	4.3	3.7	3.9	4.3	4.2	4.1	3.9	3.6	4.0
Labuan	1972-1989	4.4	4.8	5.4	5.3	4.8	4.4	4.3	4.8	4.7	4.4	4.4	4.4	4.7
Bintulu	1968-1989	3.5	4.0	4.3	4.4	4.3	4.4	4.2	4.3	4.2	4.0	3.8	3.7	4.1
Kuching	1968-1989	3.1	3.4	3.7	3.9	4.1	4.1	4.1	4.1	3.9	3.9	3.5	3.3	3.7
Miri	1968-1989	3.6	4.2	4.5	4.7	4.5	4.5	4.5	4.7	4.7	4.4	4.1	3.8	4.3
Sibu	1968-1989	3.1	3.4	3.7	3.7	3.8	3.9	3.8	3.8	3.9	3.8	3.5	3.3	3.6
Sri Aman	1983-1989	2.8	3.1	3.4	3.3	3.2	3.5	3.2	3.4	3.4	3.5	3.3	3.0	3.3

表2.3.4 蒸發散作物係數 (Kc)
(DOORENBOS AND KASSAM, 1979)

CROP	Crop Development Stage					Total Growing Period
	Initial	Crop Development	Mid-Season	Late Season	At Harvest	
Banana						
tropical	0.40-0.50	0.70-0.85	1.00-1.10	0.90-1.00	0.75-0.85	0.70-0.80
Bean						
green	0.30-0.40	0.65-0.75	0.95-1.05	0.90-0.95	0.85-0.95	0.85-0.90
dry	0.30-0.40	0.70-0.80	1.05-1.20	0.65-0.75	0.25-0.30	0.70-0.80
Cabbage	0.40-0.50	0.70-0.80	0.95-1.10	0.90-1.00	0.80-0.95	0.70-0.80
Grape	0.35-0.55	0.60-0.80	0.70-0.90	0.60-0.80	0.55-0.70	0.55-0.75
Groundnut	0.40-0.50	0.70-0.80	0.95-1.10	0.75-0.85	0.55-0.60	0.75-0.80
Maize						
sweet	0.30-0.50	0.70-0.90	1.05-1.20	1.05-1.20	0.95-1.10	0.80-0.95
grain	0.30-0.50*	0.70-0.85*	1.05-1.20*	1.05-1.20*	0.55-0.60*	0.75-0.90*
Onion						
green	0.40-0.60	0.60-0.75	0.95-1.05	0.95-1.05	0.95-1.05	0.65-0.80
Pea, fresh	0.40-0.50	0.70-0.85	1.05-1.20	1.00-1.15	0.95-1.10	0.80-0.95
Pepper, fresh	0.30-0.40	0.60-0.75	0.95-1.10	0.85-1.00	0.80-0.90	0.70-0.80
Potato	0.40-0.50	0.70-0.80	1.05-1.20	0.85-0.95	0.70-0.75	0.75-0.90
Rice	1.10-1.15	1.10-1.50	1.10-1.30	0.95-1.05	0.95-1.05	1.05-1.20
Sorghum	0.30-0.40	0.70-0.75	1.00-1.15	0.75-0.80	0.50-0.55	0.75-0.85
Soybean	0.30-0.40	0.70-0.80	1.00-1.15	0.70-0.80	0.40-0.50	0.75-0.90
Sugarcane	0.40-0.50	0.70-1.00	1.00-1.30	0.75-0.80	0.50-0.60	0.85-1.05
Tobacco	0.30-0.40	0.70-0.80	1.00-1.20	0.90-1.00	0.75-0.85	0.85-0.95
Tomato	0.40-0.50	0.70-0.80	1.05-1.25	0.80-0.95	0.60-0.65	0.75-0.90
Watermelon	0.40-0.50	0.70-0.80	0.95-1.05	0.80-0.90	0.65-0.75	0.75-0.85
Citrus						
clean weeding						0.65-0.75
no weed control						0.85-0.90

First Figure :Under high humidity (RHmin>70%) and low wind (U<5m/sec).

Second Figure :Under low humidity (RHmin<20%) and strong wind (U>5m/sec).

表2.5.1 灌溉施設の概略費用

Crop	Capital cost (RM/ha)
Sprinkler System	
Oil palm (nursery)	8,750
Durian	8,750
Star fruit	8,750
Banana	8,750
Papaya	8,750
Chilli	8,750
Watermelon	8,750
Leaf vegetables	8,750
Micro-irrigation	
Oil palm (nursery)	12,500
Durian	3,250
Star fruit	5,000
Banana	6,250
Papaya	5,000
Chilli	5,250
Watermelon	5,250
Flower (chrysanthemum)	6,250

Source : Industry

Note : Based on a system for 10 ha.

表5.2.1 地質および土質調査の数量

No.	Name of Project	Site	Hole	Place	Elevation	Depth	DIA	SPT	BPT	SMT	Remarks
1	KH 4 Kawasan PadUpstream Lembu and Lembu		KH-1	Left	B. 11.681 m	5.0 m	100 mm	3 nos	1 nos	1 sp	
			KH-2	Left	B. 4.686 m	10.0 m	do	8 nos	1 nos		
						(5.0 m)		(3 nos)			
	KH 5 Kedawang Ketapang		KH-3	Left	B. 17.639 m	10.0 m	do	4 nos	2 nos		
			KH-4	Right	B. 15.586 m	7.0 m	do	3 nos	1 nos		
						(10.0 m)		(7 nos)			
2	TR 44 Pasir Nerin		TR-1	Right	B.	10.0 m	do	8 nos	2 nos	1 sp	
			TR-2	Left	B.	9.0 m	do	5 nos	1 nos		
						(10.0 m)		(7 nos)			
3	MA 16 Felcra BK. Sedanan		MA-1	Right	B.	10.0 m	do	7 nos	2 nos	1 sp	
			(MA-2)	Left	B.)	(5.0 m)		(3 nos)	(1 nos)		
			NS-1	Right	B.	(5.0 m)		(3 nos)	(1 nos)		
4	NS 1 Stesen Mard Jelebu		NS-1	Right	B.	10.0 m	do	7 nos	1 nos	1 sp	one additional hole for sampling & k-test (NS-1A, d=10 m)
			NS-2	Left	B.	10.0 m	do	7 nos	2 nos		
5	KN 16 Bendang Pmt Sungkai		KN-1	Right	B.	12.0 m	do	8 nos	2 nos	1 sp	
			(KN-2)	Left	B.)	(6.0 m)		(4 nos)	(2 nos)		
			PP-1			(6.0 m)		(4 nos)	(2 nos)		
6	PP 3 Tok Bedu Irrigation		PP-1			16.0 m	do	13 nos	2 nos		
			PP-2			(5.0 m)		(3 nos)	(1 nos)		
						(5.0 m)		(3 nos)	(1 nos)		
	Total		11 hols			109.0 m		73 nos	17 nos	5 sp	
			(14 hols)				(102.0 m)		(68 nos)	22 nos	

NOTE:

- 1) Columns of Hole & Depth, parentheses means original plan
- 2) DIA: Borehole Diameter, SPT: Standard Penetration Test, BPT: Borehole Permeability Test, SMT: Soil Mechanical Test Sample
- 3) No. 1 to No. 3 Project for JICA, No. 4 to No. 6 for DID

表5.2.2 ダム盛土材料の土質試験結果

No.	Project	Sample	B.Densi		S.Gravity		N.Water		G.size			Att.Limits		Compaction		Perm.Test x10 ⁻⁷ (m/s)	Tri.UU		Tri.CU		Soil Type
			(Mg/m ³)	(%)	(%)	(%)	cl	si	ss	gr	PL	LL	PI	Max.D.D	Opt.M.C		(kPa)	pi	(kPa)	pi	
1	KH 4/KH 5		2.62	11	13	15	49	23	36	56	20	1.77	17	0.115	55	24	15	38	SM		
2	TR 44		2.60	17	46	11	32	11	37	63	26	1.68	20	0.467	50	31	0	33	MH		
3	MA 16		2.64	24	47	8	44	1	36	73	37	1.70	20	0.152	140	43	10	33	MH		
4	NS 1		2.61	12	20	45	35	0	18	31	13	1.93	12.5	1.600	75	22	0	41	CL		
5	KN 16		2.61	9	-	4	50	46	-	NP	-	2.01	7.5	3.540	-	-	0	50	SP		
6	KN 16		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

表5.2.3 マレーシアの暫定国家水質基準

No. Parameters	暫定国家水質基準				
	Class I	Class IIA	Class IIB	Class III	Class IV
1 pH	6.5-8.5	6.5-9.0	6.5-9.0	5-9	5-9
2 Temperature (°C)	-	-	-	-	-
3 EC (mS/cm)	1	1	-	-	6
4 Salinity (%)	-	-	-	-	-
5 Turbidity (NTU)	5	50	50	-	-
6 Dissolved Oxygen (mg/l)	7	5-7	5-7	3-5	3
7 COD (mg/l)	10	25	25	50	100
8 Color (TUC)	15	150	150	-	-
9 BOD (mg/l)	1	3	3	6	12
10 Ammoniacal Nitrogen (mg/l)	0.1	0.3	0.3	0.9	2.7
11 Nitrate Nitrogen (mg/l)	-	7	-	0.028	5
12 Total Solids (mg/l)	525	1050	50	150	4300
13 Dissolved Solids (mg/l)	500	1000	-	-	4000
14 Suspended Solids (mg/l)	25	50	50	150	300
15 Alkalinity (mg/l)	-	-	-	-	-
16 Hardness	-	100	-	-	-
17 Calcium (mg/l)	-	-	-	-	-
18 Magnesium (mg/l)	-	-	-	-	-
19 Potassium (mg/l)	-	-	-	-	-
20 Sodium (mg/l)	-	-	-	-	-
21 Chloride (mg/l)	200	-	-	-	79
22 Fluoride (mg/l)	-	1	-	-	1
23 Phosphate (mg/l)	-	0.1	-	0.1	-
24 Sulphate (mg/l)	-	200	-	-	-
25 Iron (mg/l)	-	0.3	-	1	1/5**
26 Silica (mg/l)	-	50	-	-	-

- Class I: Conservation of natural environment water supply I-Practically no treatment necessary
Fishery I-Very sensitive species
- Class IIA: Water supply II-conventional treatment required,
Fishery II-Sensitive aquatic species
- Class IIB: Water supply III-Extensive treatment required,
Fishery III-Common and tolerant species
- Class IV: Irrigation**
- ** Iron: 1-For leaves, and 5-for others

表5.3.1 シンパン・ゲッテイおよびタシク・ムラテイ地区タバコ灌漑用水量

Simpang Geti : 40 ha ; Tasik Murati : 100 ha

Item	Unit	Jan	Feb	Mar	Apr	May	Total
Evaporation at Chuping	mm/day	4.8	5.4	5.0	4.0	3.6	
Crop Factor (Kc)		0.4	0.8	1.1	1.0	0.8	
Evapotranspiration	mm/month	60	121	171	120	89	501
Effective Rainfall	mm/month		7	23	34	88	152
Net Irrig. Requirements	mm/month	0 **	114	148	86	1	349
Irrigation Efficiency			0.5	0.5	0.5	0.5	
Gross Irrig Requirements	mm/month		228	296	172	2	698
Gross Irrig. Requirements for 140 ha ***	'000 m3		319	414	241	3	977

Note ** : January is the nursery period requiring no irrigation because of residual moisture.
 Note *** : 10 ha in Simpang Geti Scheme is excluded because it is irrigated by existing 8 ponds.

表5.3.2 シンパン・ゲッティ地区の経済評価

PR1&4		BENEFIT		COST		B-C:RM
		Tobacco	Canal	O&M	in 1994	
Simpang Gethi ha		40	Drainage		price	
1995	1	0	261,003	0	-261,003	
1996	2	81,280		1,305	79,975	
1997	3	81,280		1,305	79,975	
1998	4	81,280		1,305	79,975	
1999	5	81,280		1,305	79,975	
2000	6	81,280		1,305	79,975	
2001	7	81,280		1,305	79,975	
2002	8	81,280		1,305	79,975	
2003	9	81,280		1,305	79,975	
2004	10	81,280		1,305	79,975	
2005	11	81,280		1,305	79,975	
2006	12	81,280		1,305	79,975	
2007	13	81,280		1,305	79,975	
2008	14	81,280		1,305	79,975	
2009	15	81,280		1,305	79,975	
2010	16	81,280		1,305	79,975	
2011	17	81,280		1,305	79,975	
2012	18	81,280		1,305	79,975	
2013	19	81,280		1,305	79,975	
2014	20	81,280		1,305	79,975	
2015	21	81,280		1,305	79,975	
2016	22	81,280		1,305	79,975	
2017	23	81,280		1,305	79,975	
2018	24	81,280		1,305	79,975	
2019	25	81,280		1,305	79,975	
2020	26	81,280		1,305	79,975	
2021	27	81,280		1,305	79,975	
2022	28	81,280		1,305	79,975	
2023	29	81,280		1,305	79,975	
2024	30	81,280		1,305	79,975	
				EIRR=	30.63%	

表5.3.3 タシック・ムラティ地区の経済評価

PR1&4		BENEFIT		COST		B-C:RM
		Tobacco	Canal	O&M	in 1994	
Tasek Melati	ha	40	Drainage		price	
1995	1	0	400,864	0	-400,864	
1996	2	203,200		2,004	201,196	
1997	3	203,200		2,004	201,196	
1998	4	203,200		2,004	201,196	
1999	5	203,200		2,004	201,196	
2000	6	203,200		2,004	201,196	
2001	7	203,200		2,004	201,196	
2002	8	203,200		2,004	201,196	
2003	9	203,200		2,004	201,196	
2004	10	203,200		2,004	201,196	
2005	11	203,200		2,004	201,196	
2006	12	203,200		2,004	201,196	
2007	13	203,200		2,004	201,196	
2008	14	203,200		2,004	201,196	
2009	15	203,200		2,004	201,196	
2010	16	203,200		2,004	201,196	
2011	17	203,200		2,004	201,196	
2012	18	203,200		2,004	201,196	
2013	19	203,200		2,004	201,196	
2014	20	203,200		2,004	201,196	
2015	21	203,200		2,004	201,196	
2016	22	203,200		2,004	201,196	
2017	23	203,200		2,004	201,196	
2018	24	203,200		2,004	201,196	
2019	25	203,200		2,004	201,196	
2020	26	203,200		2,004	201,196	
2021	27	203,200		2,004	201,196	
2022	28	203,200		2,004	201,196	
2023	29	203,200		2,004	201,196	
2024	30	203,200		2,004	201,196	
EIRR=					50.19%	

表5.3.4 シンパン・ゲッティ及びタシク・ムラティ (プルリス) 州の水質

No.	Parameters	Simpang Geti				Tasik Melati				INWQS for Irrigation
		PR-L1		PR-L2		PR-L3		PR-L4		
		S1	S2	S1	S2	S1	S2	S1	S2	
<u>On Site Parameters</u>										
1	pH	8.45	8.30	8.13	7.37	7.38	7.77	7.65	7.84	5-9
2	Temperature (°C)	30.4	30.9	29.8	29.8	29.3	29.4	29.7	29.7	-
3	EC (mS/cm)	0.250	0.274	0.195	0.194	0.400	0.461	0.290	0.485	6
4	Salinity (%)	0.01	0.01	0	0	0.01	0.02	0.01	0.02	-
5	Turbidity (NTU)	4	5	45	49	56	36	8	7	-
6	Dissolved Oxygen (mg/l)	5.9	5.2	6.2	4.5	3.2	3.8	3.5	4.4	3
7	COD (mg/l)	15	15	10	20	45	20	20	20	100
<u>Laboratory Parameters</u>										
8	Color (Hazen Units)	10	10	40	>70	50	20	60	15	-
9	BOD (mg/l)	<1	1	4	6	2	1	1	1	12
10	Ammoniacal Nitrogen (mg/l)	0.06	0.47	0.17	0.10	0.06	0.73	0.17	0.78	2.7
11	Nitrate Nitrogen (mg/l)	0.20	0.10	0.20	0.30	0.05	0.15	0.05	0.10	5
12	Total Solids (mg/l)	180	200	170	170	290	335	245	315	4300
13	Dissolved Solids (mg/l)	155	190	95	135	240	315	190	310	4000
14	Suspended Solids (mg/l)	25	10	75	35	50	20	55	5	300
15	Alkalinity (mg/l)	-	91	68	68	220	225	100	225	-
16	Hardness	101	107	71	70	224	250	200	240	-
17	Calcium (mg/l)	23.0	20.0	16.0	16.0	11.0	3.0	7.0	5.0	-
18	Magnesium (mg/l)	11.0	14.0	8.0	7.0	48.0	59.0	44.0	55.0	-
19	Potassium (mg/l)	6.0	5.6	5.0	4.2	2.8	1.8	3.3	2.1	-
20	Sodium (mg/l)	12.0	11.2	5.0	10.4	8.0	7.2	9.0	7.2	-
21	Chloride (mg/l)	24.0	26.0	22.0	21.0	13.0	13.0	12.0	15.0	79
22	Fluoride (mg/l)	0.4	0.3	0.2	0.5	0.3	0.2	0.3	0.2	1
23	Phosphate (mg/l)	<0.1	<0.05	<0.1	0.1	<0.1	0.1	<0.1	<0.05	-
24	Sulphate (mg/l)	3.0	6.0	<1.0	2.0	<1.0	1.0	4.0	2.0	-
25	Iron (mg/l)	<0.1	<0.1	0.1	0.3	<0.1	<0.1	<0.1	<0.1	1/5**
26	Silica (mg/l)	10.0	6.0	8.0	8.0	10.0	6.0	14.0	6.0	-

Sampling Locations

- PR-L1: Simpang Geti (Pond 1)
- PR-L2: Simpang Geti (Pond 2)
- PR-L3: Tasek Melati (upstream)
- PR-L4: Tasik Melati (Downstream)
- S1: Sample 1 (July 6, 1994)
- S2: Sample 2 (July 28, 1994)

表5.3.5 ヌンロン川、ルポ川、ジュレネ川、ティマタソーダムの水質

No.	Parameters	PR-L5		PR-L6		PR-L7	PR-L8	PR-L9	INWQS for Irrigation
		S1	S2	S1	S2				
<u>On Site Parameters</u>									
1	pH	7.43	7.58	7.44	7.47	8.25	7.51	7.36	5-9
2	Temperature (°C)	28.7	28.6	29.5	29.1	29.6	28.0	29.4	-
3	EC (mS/cm)	0.400	0.462	0.280	0.376	0.218	0.582	0.339	6
4	Salinity (%)	0.01	0.01	0.01	0.01	0.00	0.02	0.01	-
5	Turbidity (NTU)	12	8	13	19	11	3	9	-
6	Dissolved Oxygen (mg/l)	3.4	5.4	4.6	3.2	5.7	4.2	3.4	3
7	COD (mg/l)	20	15	20	15	10	10	10	100
<u>Laboratory Parameters</u>									
8	Color (HAZEN UNITS)	50	20	50	20	30	10	15	-
9	BOD (mg/l)	2	1	2	1	1	<1	1	12
10	Ammoniacal Nitrogen (mg/l)	0.14	0.13	0.04	0.13	0.17	0.08	0.13	2.7
11	Nitrate Nitrogen (mg/l)	0.04	0.35	0.05	0.15	0.15	0.45	0.15	5
12	Total Solids (mg/l)	270	325	205	255	170	310	250	4300
13	Dissolved Solids (mg/l)	225	300	120	240	155	295	240	4000
14	Suspended Solids (mg/l)	45	25	85	15	15	15	10	300
15	Alkalinity (mg/l)	207	209	66	164	92	273	149	-
16	Hardness	214	237	133	175	97	190	156	-
17	Calcium (mg/l)	14.0	11.0	30.0	22.0	23.0	2.0	20.0	-
18	Magnesium (mg/l)	44.0	51.0	14.0	29.0	10.0	45.0	26.0	-
19	Potassium (mg/l)	4.0	4.2	4.0	4.3	3.2	0.8	5.1	-
20	Sodium (mg/l)	6.0	8.4	8.0	10.0	6.0	5.0	10.0	-
21	Chloride (mg/l)	13.0	16.0	16.0	25.0	12.0	10.0	19.0	79
22	Fluoride (mg/l)	0.4	0.2	0.4	0.3	0.3	<0.1	0.3	1
23	Phosphate (mg/l)	<0.1	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	-
24	Sulphate (mg/l)	1.0	2.0	<1.0	2.0	2.0	1.0	3.0	-
25	Iron (mg/l)	<0.1	<0.1	<0.1	0.1	<0.1	0.1	<0.1	1/5**
26	Silica (mg/l)	18.0	8.0	7.0	8.0	6.0	8.0	8.0	-

Sampling Locations

PR-L5: Nglong Headworks

PR-L6: Sg. Rupoh

PR-L7: Timah Tasoh Dam

PR-L8: Sg. JJerneh

PR-L9: Paya Headworks

S1: Sample 1 (July 6, 1994)

S2: Sample 2 (July 28, 1994)

表5.4.1 レンブ地区の経済評価

Lembu	ha	BENEFIT		COST			B-C KH-IRR	
		Paddy	Hortus	Fish	Construciton	O&M	unit:RM	
		100	10	2			in 1994 price	
1995	1	0	0		5,903,770	0	-5,903,770	
1996	2	168,600	460,000	460,000		29,519	645,081	
1997	3	168,600	460,000	460,000		29,519	645,081	
1998	4	168,600	460,000	460,000		29,519	645,081	
1999	5	168,600	460,000	460,000		29,519	645,081	
2000	6	168,600	460,000	460,000		29,519	645,081	
2001	7	168,600	460,000	460,000		29,519	645,081	
2002	8	168,600	460,000	460,000		29,519	645,081	
2003	9	168,600	460,000	460,000		29,519	645,081	
2004	10	168,600	460,000	460,000		29,519	645,081	
2005	11	168,600	460,000	460,000		29,519	645,081	
2006	12	168,600	460,000	460,000		29,519	645,081	
2007	13	168,600	460,000	460,000		29,519	645,081	
2008	14	168,600	460,000	460,000		29,519	645,081	
2009	15	168,600	460,000	460,000		29,519	645,081	
2010	16	168,600	460,000	460,000	166,750	29,519	645,081	
2011	17	168,600	460,000	460,000		29,519	645,081	
2012	18	168,600	460,000	460,000		29,519	645,081	
2013	19	168,600	460,000	460,000		29,519	645,081	
2014	20	168,600	460,000	460,000		29,519	645,081	
2015	21	168,600	460,000	460,000		29,519	645,081	
2016	22	168,600	460,000	460,000		29,519	645,081	
2017	23	168,600	460,000	460,000		29,519	645,081	
2018	24	168,600	460,000	460,000		29,519	645,081	
2019	25	168,600	460,000	460,000		29,519	645,081	
2020	26	168,600	460,000	460,000		29,519	645,081	
2021	27	168,600	460,000	460,000		29,519	645,081	
2022	28	168,600	460,000	460,000		29,519	645,081	
2023	29	168,600	460,000	460,000		29,519	645,081	
2024	30	168,600	460,000	460,000		29,519	645,081	
							EIRR=	10.21%

表5.4.2 クタパン地区の経済評価

Ketapang	ha	BENEFIT		COST			B-C KH-IRR unit:RM in 1994 price
		Paddy 60	Hortus 10	Reservoir, canal, drain	Equipment	O&M	
1995	1	0	0	4,319,482	212,691	0	-4,532,173
1996	2	101,160	460,000			22,661	538,499
1997	3	101,160	460,000			22,661	538,499
1998	4	101,160	460,000			22,661	538,499
1999	5	101,160	460,000			22,661	538,499
2000	6	101,160	460,000			22,661	538,499
2001	7	101,160	460,000			22,661	538,499
2002	8	101,160	460,000			22,661	538,499
2003	9	101,160	460,000			22,661	538,499
2004	10	101,160	460,000			22,661	538,499
2005	11	101,160	460,000			22,661	538,499
2006	12	101,160	460,000			22,661	538,499
2007	13	101,160	460,000			22,661	538,499
2008	14	101,160	460,000			22,661	538,499
2009	15	101,160	460,000			22,661	538,499
2010	16	101,160	460,000		320,620	22,661	217,879
2011	17	101,160	460,000			22,661	538,499
2012	18	101,160	460,000			22,661	538,499
2013	19	101,160	460,000			22,661	538,499
2014	20	101,160	460,000			22,661	538,499
2015	21	101,160	460,000			22,661	538,499
2016	22	101,160	460,000			22,661	538,499
2017	23	101,160	460,000			22,661	538,499
2018	24	101,160	460,000			22,661	538,499
2019	25	101,160	460,000			22,661	538,499
2020	26	101,160	460,000			22,661	538,499
2021	27	101,160	460,000			22,661	538,499
2022	28	101,160	460,000			22,661	538,499
2023	29	101,160	460,000			22,661	538,499
2024	30	101,160	460,000			22,661	538,499
EIRR=							11.17%

表5.4.3 カワサンペディ・ランカウイ (ケダ州) の水質

No. Parameters	Langkawi, Kedah						INWQS for Irrigation
	KH-L1		KH-L2		KH-L3		
	S1	S2	S1	S2	S1	S2	
<u>On Site Parameters</u>							
1 pH	5.65	5.50	7.27	6.65	6.49	6.67	5-9
2 Temperature (°C)	26.8	26.4	33.7	28.8	27.7	27.0	-
3 EC (mS/cm)	0.055	0.070	0.065	0.109	0.070	0.077	6
4 Salinity (%)	0	0	0	0	0	0	-
5 Turbidity (NTU)	5	7	17	37	4	2	-
6 Dissolved Oxygen (mg/l)	5.7	4.5	6.2	4.6	6	5.3	3
7 COD (mg/l)	4	5	5	15	2	5	100
<u>Laboratory Parameters</u>							
8 Color (TUC)	20	10	70	70	15	5	-
9 BOD (mg/l)	<1	<1	<1	<1	<1	<1	12
10 Ammoniacal Nitrogen (mg/l)	0.12	0.02	0.04	0.10	0.02	0.02	2.7
11 Nitrate Nitrogen (mg/l)	0.10	0.05	0.10	0.05	0.10	0.05	5
12 Total Solids (mg/l)	55	65	75	160	70	90	4300
13 Dissolved Solids (mg/l)	40	50	55	75	45	55	4000
14 Suspended Solids (mg/l)	15	15	20	85	25	35	300
15 Alkalinity (mg/l)	19	18	23	32	11	25	-
16 Hardness	10	11	16	29	16	15	-
17 Calcium (mg/l)	1.0	3.0	3.0	6.0	2.0	2.0	-
18 Magnesium (mg/l)	2.0	1.0	2.0	3.0	3.0	2.0	-
19 Potassium (mg/l)	2.5	7.7	3.0	10.0	3.0	9.0	-
20 Sodium (mg/l)	6.0	7.2	6.0	9.6	8.0	9.6	-
21 Chloride (mg/l)	6.0	9.0	8.0	24.0	8.0	10.0	79
22 Fluoride (mg/l)	<0.1	<0.1	<0.1	0.4	<0.1	<0.1	1
23 Phosphate (mg/l)	<0.1	0.2	<0.1	0.2	0.1	0.1	-
24 Sulphate (mg/l)	1.0	1.0	<1	3.0	2.0	1.0	-
25 Iron (mg/l)	0.1	0.1	0.2	2.4	0.1	0.1	1/5**
26 Silica (mg/l)	14.0	10.0	11.0	8.0	4.0	10.0	-

Sampling Locations

KH-L1: Sg. Jenali

KH-L2: Sg. Bukit Lembu

KH-L3: Sg. Ketapang

S1: Sample 1 (July 3, 1994)

S2: Sample 2 (July 30, 1994)

表5.4.4 ランカウイ構造計画下の観光と環境に関する主な政策

No.	Policy
1	Tourism activities shall be the basis for the overall economic growth.
2	An attractive and conducive environment for tourism shall be created in line with Langkawi's function as an international tourist destination.
3	Agriculture areas, especially paddy fields, shall be preserved as a tourist attraction.
4	Development of accommodation facilities for tourism such as hotels, chalets and other types are encouraged in areas which have been identified for tourism development, and in the major settlement areas.
5	Development of chalets shall be undertaken in a planned and systematic manner.
6	More tourist attractions shall be identified, developed and provided with related facilities.
7	Paddy areas shall be preserved as an attractive landscape and tourist attraction.
8	Existing tourism recreational activities shall be improved and new recreational facilities shall be identified and developed.
9	Promotional activities shall be carried out in a concerted manner based on the theme of Langkawi's uniqueness and outstanding natural beauty.
10	Modern technology and assistance shall be provided to increase productivity in the agriculture sector
11	Crop yields shall be increased through diversification and the identification of more hardy and suitable crops.
12	Protective and recreation forests reserve shall be preserved and only development related to tourism recreation will be permitted.
13	Sufficient and suitable recreational facilities, to meet the demand of both the local population as well as the tourists shall be provided.
14	Stringent and effective control of sources of water pollution shall be imposed.
15	Only non-polluting types of industry shall be permitted for development.
16	Appropriate methods of natural resource utilization shall be adopted in order to avoid environment from being polluted.
17	The quality of the environment at major attraction areas shall be conserved and upgraded.
18	Landscape planning is to be an integral part of landuse planning.
19	Selection of suitable trees and plants shall be undertaken to characterize the environment of Langkawi.

表5.5.1 ブキット・セダナン地区 (FELCRA+MIADP)の経済評価

MA.16

FELCRA		BENEFIT			COST		B-C
+		Durian	Orchid	Hortus	Dam+Equipment	O&M	unit:RM
MIADP	ha	37	2	25			in 1994 price
1995	1	-313,723	-250,000	0	4,795,397	0	-5,359,120
1996	2	-57,128	290,000	750,000		8,667	974,005
1997	3	-68,561	290,000	750,000		8,667	962,572
1998	4	-78,773	290,000	750,000		8,667	952,360
1999	5	-107,596	290,000	750,000		8,667	923,537
2000	6	-98,346	290,000	750,000		8,667	932,787
2001	7	-14,504	290,000	750,000		8,667	1,016,629
2002	8	106,042	290,000	750,000		8,667	1,137,175
2003	9	244,496	290,000	750,000		8,667	1,275,629
2004	10	360,676	290,000	750,000		8,667	1,391,809
2005	11	508,380	290,000	750,000	148,000	8,667	1,391,513
2006	12	595,293	290,000	750,000		8,667	1,626,426
2007	13	682,243	290,000	750,000		8,667	1,713,376
2008	14	769,156	290,000	750,000		8,667	1,800,289
2009	15	754,911	290,000	750,000		8,667	1,786,044
2010	16	769,156	40,000	750,000	719,293	8,667	830,997
2011	17	769,159	290,000	750,000		8,667	1,800,289
2012	18	769,156	290,000	750,000		8,667	1,800,289
2013	19	769,156	290,000	750,000		8,667	1,800,289
2014	20	754,911	290,000	750,000		8,667	1,786,044
2015	21	769,156	290,000	750,000	148,000	8,667	1,652,289
2016	22	769,156	290,000	750,000		8,667	1,800,289
2017	23	769,156	290,000	750,000		8,667	1,800,289
2018	24	769,156	290,000	750,000		8,667	1,800,289
2019	25	769,156	290,000	750,000		8,667	1,800,289
2020	26	769,156	290,000	750,000		8,667	1,800,289
2021	27	769,156	290,000	750,000		8,667	1,800,289
2022	28	769,156	290,000	750,000		8,667	1,800,289
2023	29	769,156	290,000	750,000		8,667	1,800,289
2024	30	769,156	290,000	750,000		8,667	1,800,289
EIRR=							20.80%

表5.5.2 ブキット・セダナン (マラッカ州) の水質

No. Parameters	Bukit Sedanan, Melaka								INWQS for Irrigation
	MA-L1		MA-L2		MA-L3		MA-04		
	S1	S2	S1	S2	S1	S2			
<u>On Site Parameters</u>									
1 pH	6.35	6.59	5.85	5.90	5.95	6.01	5.82		5-9
2 Temperature (°C)	30.5	31.5	27.0	30.4	26.3	25.5	26.1		-
3 EC (mS/cm)	0.029	0.030	0.033	0.035	0.037	0.025	0.023		6
4 Salinity (%)	0	0	0	0	0	0	0		-
5 Turbidity (NTU)	7	12	8	11	12	9	14		-
6 Dissolved Oxygen (mg/l)	6.4	6.8	6.5	5.2	6.6	5.9	4.1		3
7 COD (mg/l)	8	10	10	8	10	10	20		100
<u>Laboratory Parameters</u>									
8 Color (HAZEN UNITS)	20	-	80	-	10	-	-		-
9 BOD (mg/l)	1.0	1.0	0.7	0.7	0.8	0.6	0.9		12
10 Ammoniacal Nitrogen (mg/l)	<0.02	0.09	<0.02	0.12	<0.02	0.08	0.15		2.7
11 Nitrate Nitrogen (mg/l)	<0.02	<0.02	<0.02	<0.02	0.05	0.10	<0.02		5
12 Total Solids (mg/l)	35	33	47	45	48	46	58		4300
13 Dissolved Solids (mg/l)	25	25	34	34	33	35	52		4000
14 Suspended Solids (mg/l)	10	8	13	11	15	11	6		300
15 Alkalinity (mg/l)	9.1	5.0	14.8	10.1	12.5	13.1	6.1		-
16 Hardness (mg/l)	9.0	10.0	10.0	11.0	13.0	12.0	10.0		-
17 Calcium (mg/l)	2.8	2.4	3.2	3.6	3.6	3.2	2.8		-
18 Magnesium (mg/l)	0.5	1.0	0.5	0.5	1.0	1.0	0.7		-
19 Potassium (mg/l)	1.8	1.7	1.5	1.9	2.1	2.1	2.5		-
20 Sodium (mg/l)	2.6	1.9	3.1	2.4	4.1	3.1	3.0		-
21 Chloride (mg/l)	5.0	5.0	5.0	4.0	5.0	5.0	6.0		79
22 Fluoride (mg/l)	0.07	0.08	0.07	0.08	0.07	0.08	0.08		1
23 Phosphate (mg/l)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		-
24 Sulphate (mg/l)	0.5	0.6	0.4	0.3	0.2	0.3	1.0		-
25 Iron (mg/l)	1.0	0.7	4.9	2.8	4.2	4.0	0.7		1/5**
26 Silica (mg/l)	8.0	8.0	12.0	12.0	12.0	12.0	16.0		-

Sampling Locations

MA-L1 Existing pond

MA-L2 Pond near durian farm

MA-L3 Sg. Mentangor tributary

MA-L4 Sg. Mentangor Tributary (At the forestry area)

S1: Sample 1 (June 14, 1994)

S2: Sample 2 (July 18, 1994)

表5.6.1 クロンボック・カンガール・ムルリマウ地区の経済評価

JR-10

	ha	BENEFIT		COST			B-C
		Durian 1	Durian 2	Pond, Canal	Equipment	O&M	unit:RM
		24	13	& Road			in 1994 price
1995	1	100,298	-105,988	751,048	598,922	0	-1,355,660
1996	2	146,593	-19,300			6,750	120,543
1997	3	212,910	-23,163			6,750	182,998
1998	4	240,617	-26,613			6,750	207,254
1999	5	268,347	-36,350			6,750	225,247
2000	6	310,694	-33,225			6,750	270,719
2001	7	301,646	-4,900			6,750	289,996
2002	8	310,694	35,825			6,750	339,769
2003	9	310,694	82,600			6,750	386,544
2004	10	310,694	121,850			6,750	425,794
2005	11	310,694	171,750			6,750	475,694
2006	12	310,694	201,113			6,750	496,009
2007	13	310,694	230,488			6,750	534,431
2008	14	310,694	259,850			6,750	563,794
2009	15	310,694	255,038			6,750	558,981
2010	16	310,694	259,850		531,555	6,750	32,239
2011	17	310,694	259,850			6,750	563,794
2012	18	310,694	259,850			6,750	563,794
2013	19	310,694	259,850			6,750	563,794
2014	20	310,694	255,038			6,750	558,981
2015	21	310,694	259,850			6,750	563,794
2016	22	310,694	259,850			6,750	563,794
2017	23	310,694	259,850			6,750	563,794
2018	24	310,694	259,850			6,750	563,794
2019	25	310,694	259,850			6,750	563,794
2020	26	310,694	259,850			6,750	563,794
2021	27	310,694	259,850			6,750	563,794
2022	28	310,694	259,850			6,750	563,794
2023	29	310,694	259,850			6,750	563,794
2024	30	310,694	259,850			6,750	563,794
EIRR=							20.48%

*1: Durian 1= betterment:with-without
 Durian 2= new planting

*2: Replacement costs include pumps, gates and screens
 on top of the equipment costs.

*3: O&M costs=Construction costs*0.005

表5.6.2 クロンボック・カンガール・ムルリマウ
(ジョホール州) の水質

No.	Parameters	Kangkar, Johor				INWQS for Irrigation
		JR-L1		JR-L2		
		S1	S2	S1	S2	
<u>On Site Parameters</u>						
1	pH	5.96	5.35	5.62	5.23	5-9
2	Temperature (°C)	25.4	25.7	27.6	28.7	-
3	EC (mS/cm)	0.024	0.017	0.034	0.029	6
4	Salinity (%)	0	0	0	0	-
5	Turbidity (NTU)	20	6	70	4	-
6	Dissolved Oxygen (mg/l)	6.8	6.0	5.5	5.3	3
7	COD (mg/l)	6	5	7	3	100
<u>Laboratory Parameters</u>						
8	Color (TUC)	40	-	100	-	-
9	BOD (mg/l)	0.8	0.6	0.6	0.7	12
10	Ammoniacal Nitrogen (mg/l)	<0.02	<0.02	0.11	0.18	2.7
11	Nitrate Nitrogen (mg/l)	0.22	0.24	0.25	0.36	5
12	Total Solids (mg/l)	58	28	102	32	4300
13	Dissolved Solids (mg/l)	29	26	35	28	4000
14	Suspended Solids (mg/l)	29	2	67	4	300
15	Alkalinity (mg/l)	2.3	<0.1	2.3	<0.1	-
16	Hardness	6.0	12.0	13.0	9.0	-
17	Calcium (mg/l)	1.6	3.2	4.0	2.0	-
18	Magnesium (mg/l)	0.5	1.0	0.7	1.0	-
19	Potassium (mg/l)	1.8	0.6	1.9	0.8	-
20	Sodium (mg/l)	1.2	1.0	2.1	1.6	-
21	Chloride (mg/l)	5.0	5.0	7.0	6.0	79
22	Fluoride (mg/l)	0.05	0.08	0.07	0.07	1
23	Phosphate (mg/l)	<0.1	<0.1	0.1	<0.1	-
24	Sulphate (mg/l)	0.6	1.9	3.8	1.0	-
25	Iron (mg/l)	1.3	0.3	3.4	0.2	1/5**
26	Silica (mg/l)	8.0	12.0	12.0	16.0	-

Sampling Locations

JR-L1 Existing pond used for irrigation

JR-L1 Pt.Kangkar Limau

S1: Sample 1 (July 23,1994)

S2: Sample 2 (July 20,1994)

表5.7.1 パシール・ネリン地区の経済評価

TR-44

	BENEFIT		COST		B-C:RM in 1994 price	
	Rossele	Canal,Road	Equipment	O&M		
	ha	42 Pump House				
1995	1	149,940	454,523	410,132	0	-714,715
1996	2	149,940			4,323	145,617
1997	3	149,940			4,323	145,617
1998	4	149,940			4,323	145,617
1999	5	149,940			4,323	145,617
2000	6	149,940			4,323	145,617
2001	7	149,940			4,323	145,617
2002	8	149,940			4,323	145,617
2003	9	149,940			4,323	145,617
2004	10	149,940			4,323	145,617
2005	11	149,940			4,323	145,617
2006	12	149,940			4,323	145,617
2007	13	149,940			4,323	145,617
2008	14	149,940			4,323	145,617
2009	15	149,940			4,323	145,617
2010	16	149,940		145,900	4,323	-283
2011	17	149,940			4,323	145,617
2012	18	149,940			4,323	145,617
2013	19	149,940			4,323	145,617
2014	20	149,940			4,323	145,617
2015	21	149,940			4,323	145,617
2016	22	149,940			4,323	145,617
2017	23	149,940			4,323	145,617
2018	24	149,940			4,323	145,617
2019	25	149,940			4,323	145,617
2020	26	149,940			4,323	145,617
2021	27	149,940			4,323	145,617
2022	28	149,940			4,323	145,617
2023	29	149,940			4,323	145,617
2024	30	149,940			4,323	145,617
					EIRR=	20.01%

*1:presumption is given in the adjacent table on roselle cultivation

*2:Replacement costs include gates and screens on top of the equipment costs

*3:O&M costs = Construction costs*0.005

表5.7.2 パシール・ネリン (トレンガヌ州) の水質

No. Parameters	Pasir Nering, Trengganu						INWQS for Irrigation
	TR-L1		TR-L2		TR-L3		
	S1	S2	S1	S2	S1	S2	
<u>On Site Parameters</u>							
1 pH	5.63	5.75	5.49	5.53	6.01	6.30	5-9
2 Temperature (°C)	25.4	25.4	27.6	25.3	24.8	25.9	-
3 EC (mS/cm)	0.098	0.019	0.013	0.013	0.023	0.020	6
4 Salinity (%)	0	0	0	0	0	0	-
5 Turbidity (NTU)	14	41	12	8	7	14	-
6 Dissolved Oxygen (mg/l)	5.6	4.8	4.1	3.7	6.1	5.2	3
7 COD (mg/l)	4	15	15	15	10	15	100
<u>Laboratory Parameters</u>							
8 Color (HAZEN UNITS)	85	125	100	70	40	40	-
9 BOD (mg/l)	<0.5	0.5	1.4	0.6	1.0	<0.5	12
10 Ammoniacal Nitrogen (mg/l)	0.19	0.19	0.49	0.49	0.36	0.36	2.7
11 Nitrate Nitrogen (mg/l)	0.31	0.11	<0.02	<0.02	0.06	0.21	5
12 Total Solids (mg/l)	54	115	68	70	84	75	4300
13 Dissolved Solids (mg/l)	34	71	44	57	70	44	4000
14 Suspended Solids (mg/l)	20	44	24	13	14	31	300
15 Alkalinity (mg/l)	5.0	4.0	4.0	4.0	8.0	9.0	-
16 Hardness	7.0	10.0	8.0	7.0	7.0	8.0	-
17 Calcium (mg/l)	1.2	1.2	0.8	2.0	2.0	2.0	-
18 Magnesium (mg/l)	1.0	1.7	1.5	0.5	0.5	0.7	-
19 Potassium (mg/l)	3.5	1.0	0.7	0.3	1.0	0.9	-
20 Sodium (mg/l)	16.0	4.9	2.7	4.5	3.5	5.0	-
21 Chloride (mg/l)	9.0	9.0	8.0	10.0	7.0	9.0	79
22 Fluoride (mg/l)	-	-	-	-	-	-	1
23 Phosphate (mg/l)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-
24 Sulphate (mg/l)	<0.1	<0.1	<0.1	3.0	2.9	<0.1	-
25 Iron (mg/l)	0.9	0.9	0.7	0.7	0.4	0.4	1/5**
26 Silica (mg/l)	4.0	8.0	5.0	7.0	5.0	7.0	-

Sampling Locations

TR-L1 Sg.Perching

TR-L2 Sg.Udang

TR-L3 Sg.Por

S1: Sample 1 (June 27,1994)

S2: Sample 2 (August 3,1994)

表6.1 地区別調査集計表

州名	地区名	コード番号	作物 (現況)	(計画)	貯水池	灌漑施設等	事業費 (RM)	単位費用 (RM/ha)	E.I.R.R (%)
ブルリス	シンバン・ゲッテイ	PR1	乾季 10 ha (タバコ)	乾季 50 ha (タバコ)	既設 (タイプB)	排水路 1.6 km 農道 1.6 km	261,000	5,200	31
	タシク・ムラテイ	PR4	乾季 休閒	乾季 100 ha (タバコ)	既設 (タイプB)	排水路 1.6 km 農道 1.6 km	401,000	4,000	50
ケダ	ケダワン (レンプ貯水池)	KH4/KH5	雨季 100 ha (水稲)	雨季 100 ha (水稲) 通年 10 ha (野菜等)	ポンド (タイプB) 容量: 13 万トン	用水路 9.5 km 排水路 5.5 km	10,617,000	96,500	10
	ケダワン (クタバンダム)	KH4/KH5	雨季 60 ha (水稲)	雨季 60 ha (水稲) 通年 10 ha (野菜等)	ダム (タイプA) 容量: 16 万トン	用水路 1.6 km 排水路 2.8 km	5,222,000	74,600	11
マラッカ	アキット・セダナン	MR16	FELCRA 地区栽培休止 MIADP 地区 未墾地	37 ha (ドリアン) 2 ha (蘭) 25 ha (園芸作物)	ダム (タイプA) 容量: 25 万トン	ポンプ場 3ヶ所 パイプライン 3.8 km ドリッピングシステム 62 ha	4,795,000	74,900	21
ジョホール	クロンボック・カンカール・ムリラウ	JR10	37 ha (ドリアン)	37 ha (ドリアン)	ポンド (タイプB) 容量: 100トン	ポンプ場 3ヶ所 パイプライン 1.8 km	1,242,000	34,500	20
トレンガヌ	バシール・ネリン	TR44	2 ha (ロゼル)	42 ha (ロゼル)	ポンド (タイプB) 容量: 100トン	ポンプ場 1ヶ所 パイプライン 3.3 km	865,000	20,600	20

付図

Organization Chart

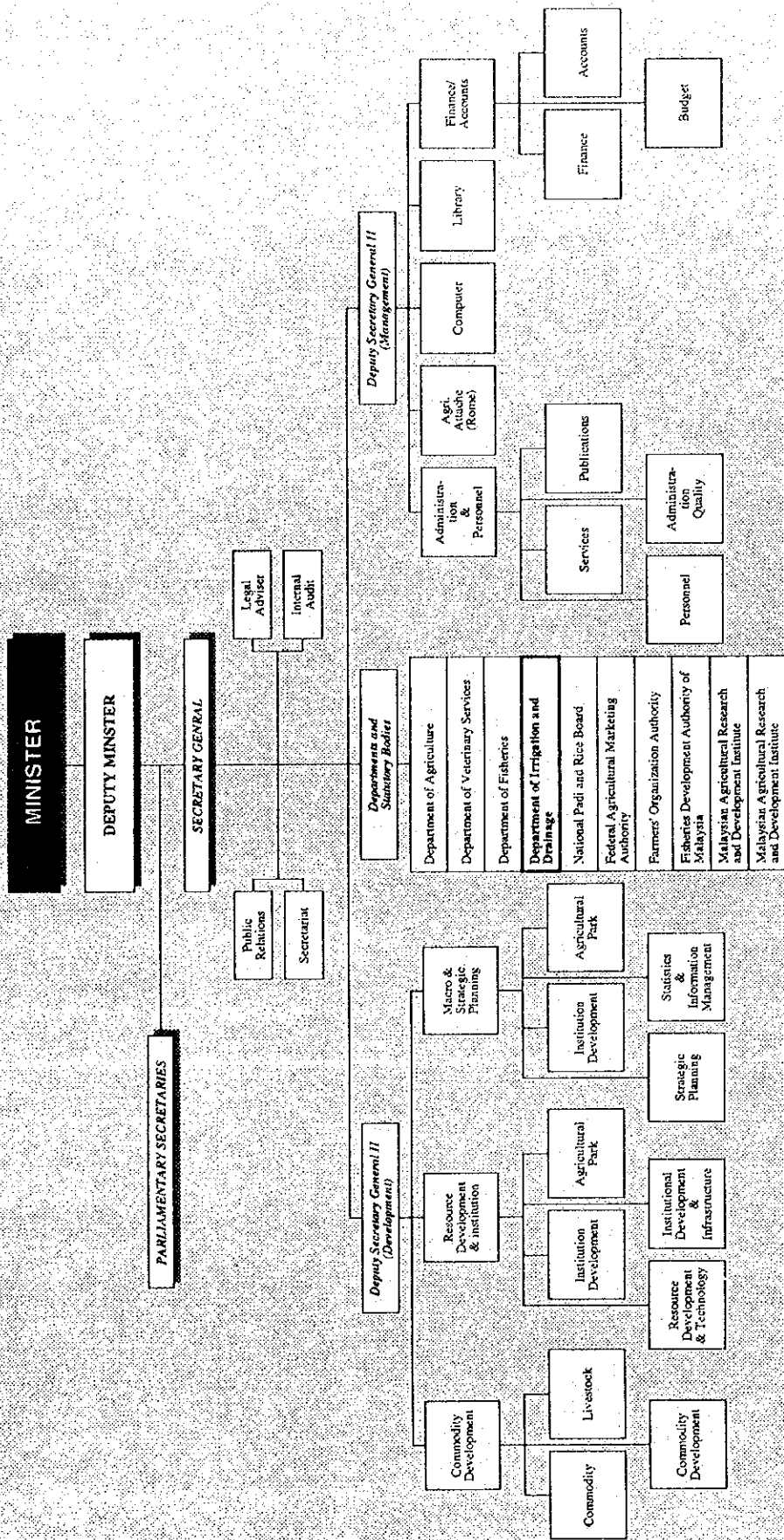


图1.4.1 農業省組織圖

Organization Chart

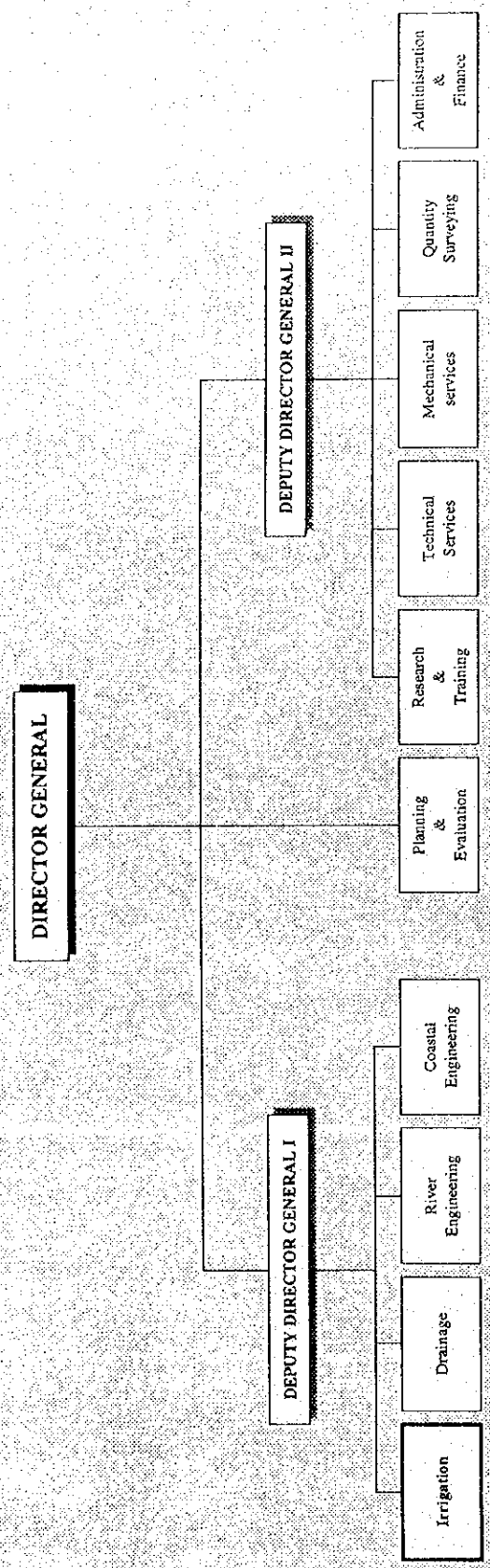


圖1.4.2 灌溉排水局組織圖

Organization Chart

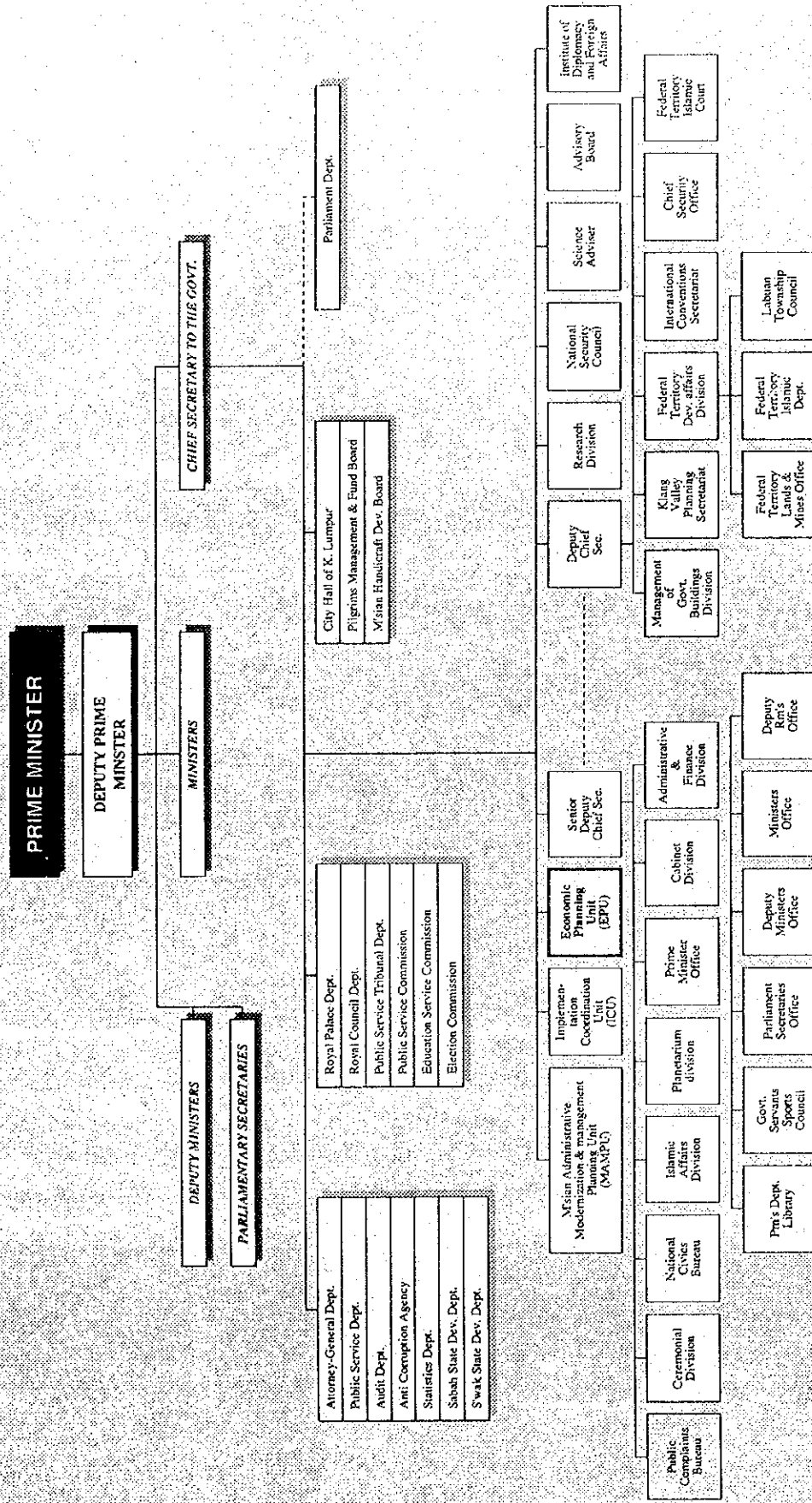
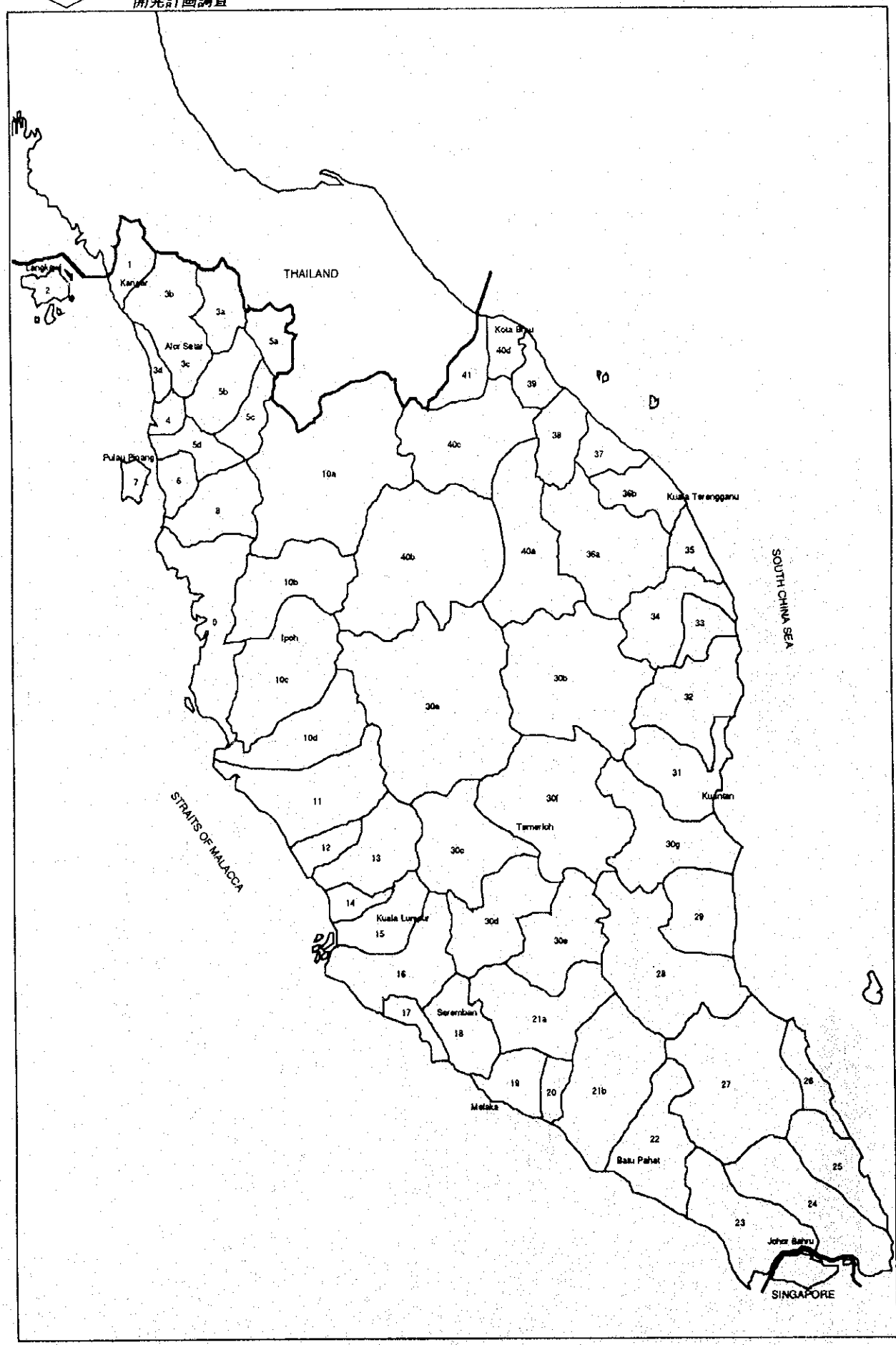


图 1.4.3 总理府组织图



マレーシア国
半島マレーシア小規模貯水池
開発計画調査

図2.3.1 河川域流図



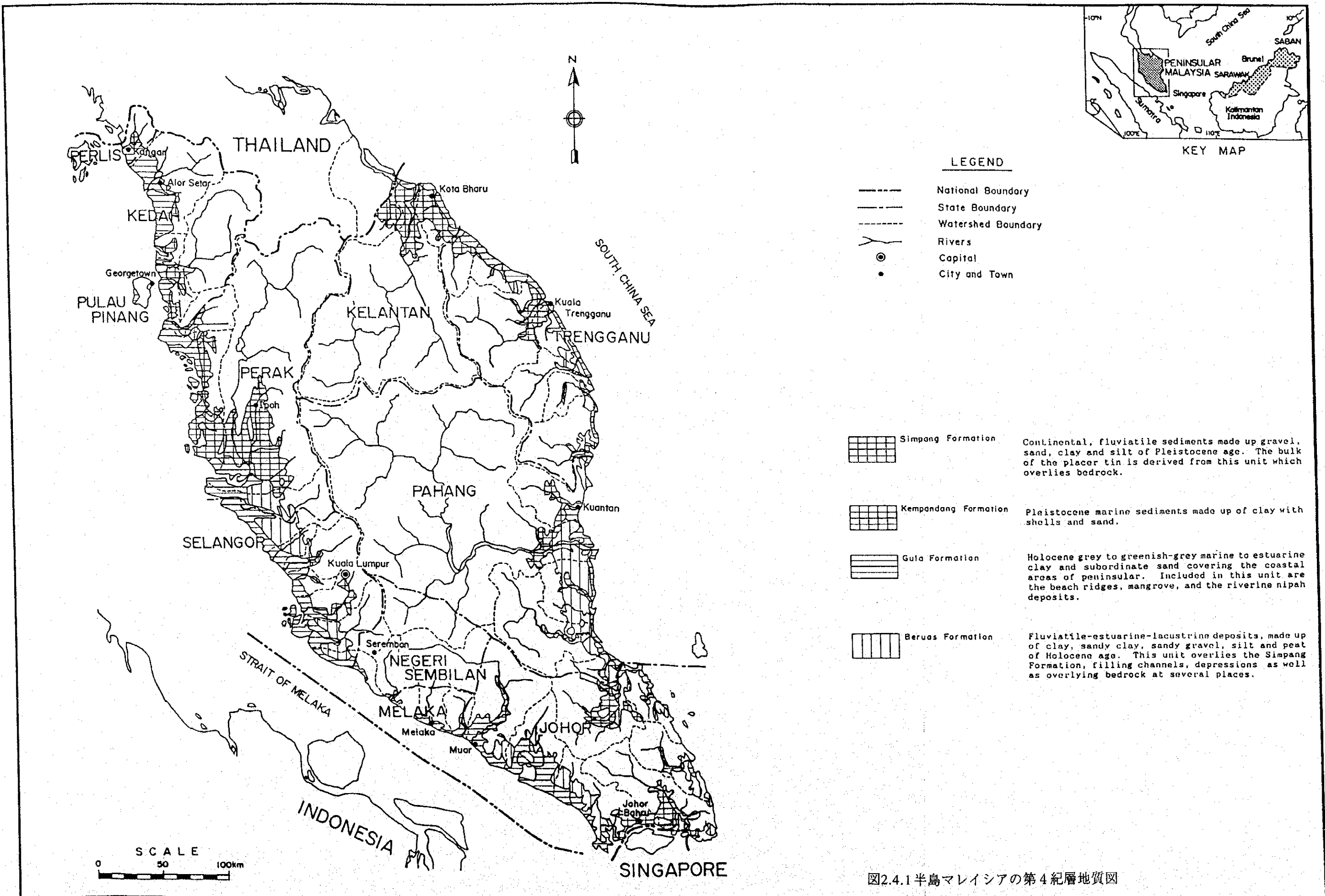


図2.4.1 半島マレーシアの第4紀層地質図

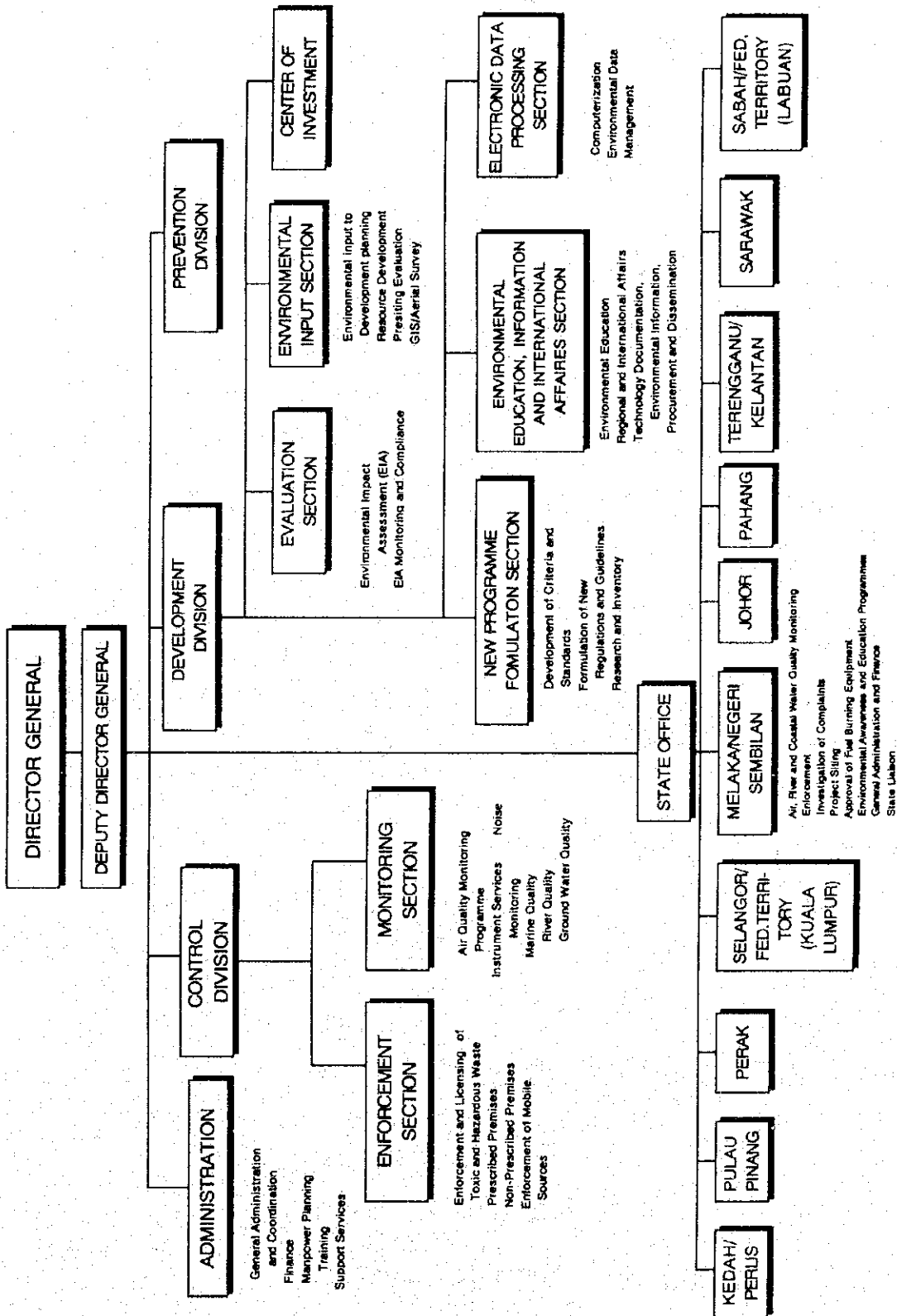


図2.6.1 環境事業部門の体制図

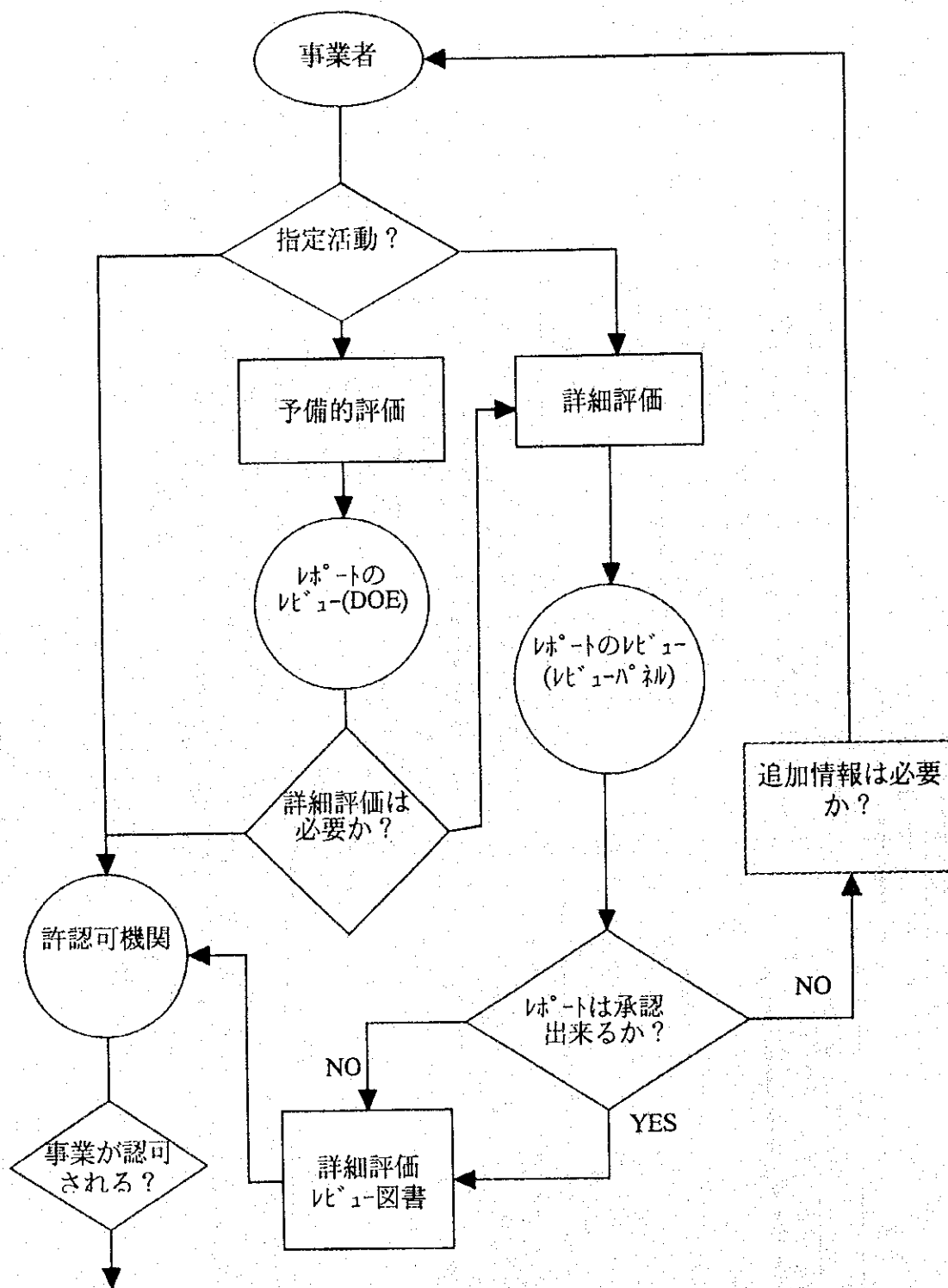


図2.6.2 マレーシアの環境評価の手続き

図3.2.1 小規模貯水池タイプ概念図

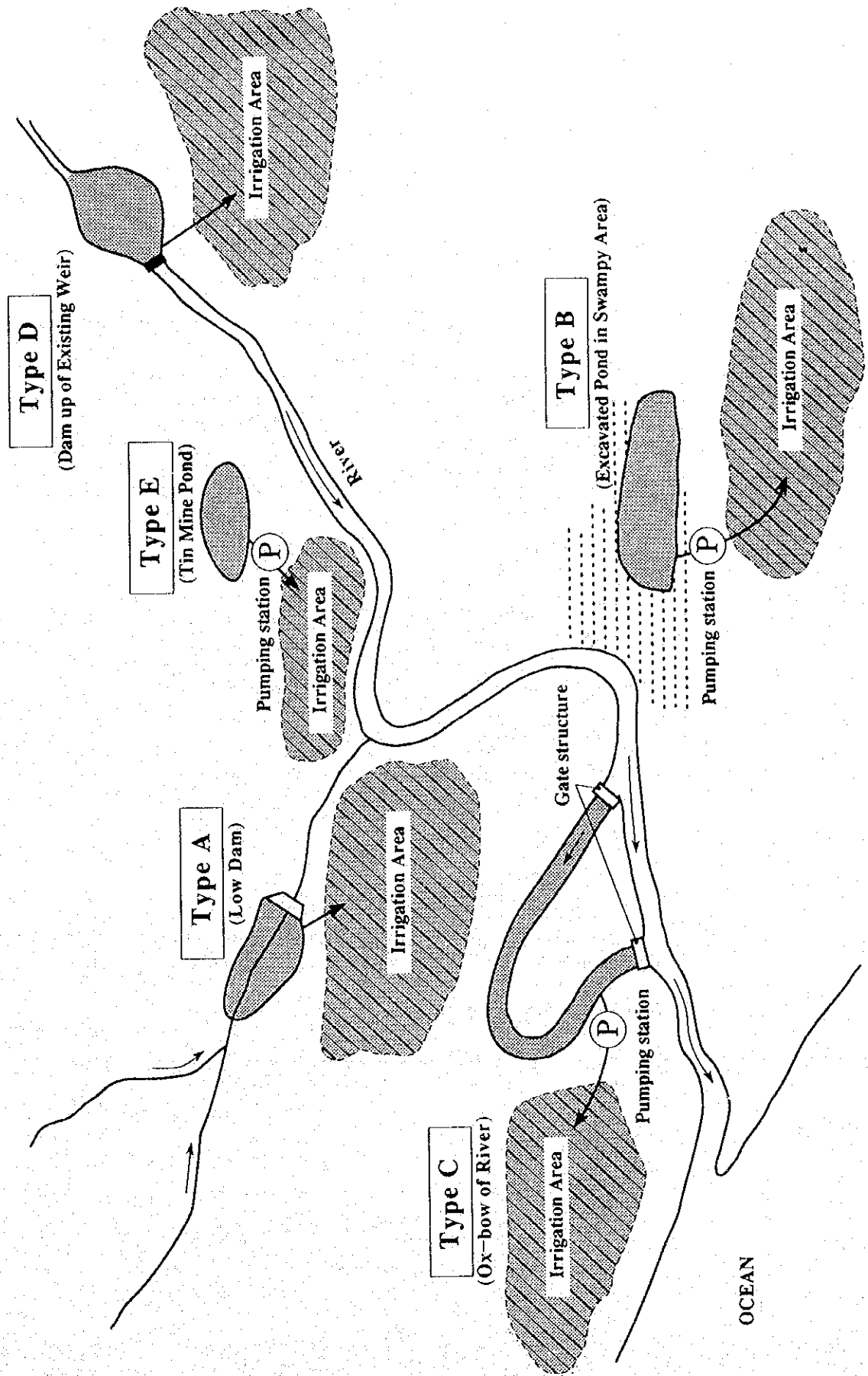


図3.4.1 小規模貯水池開発の事業実施フロー

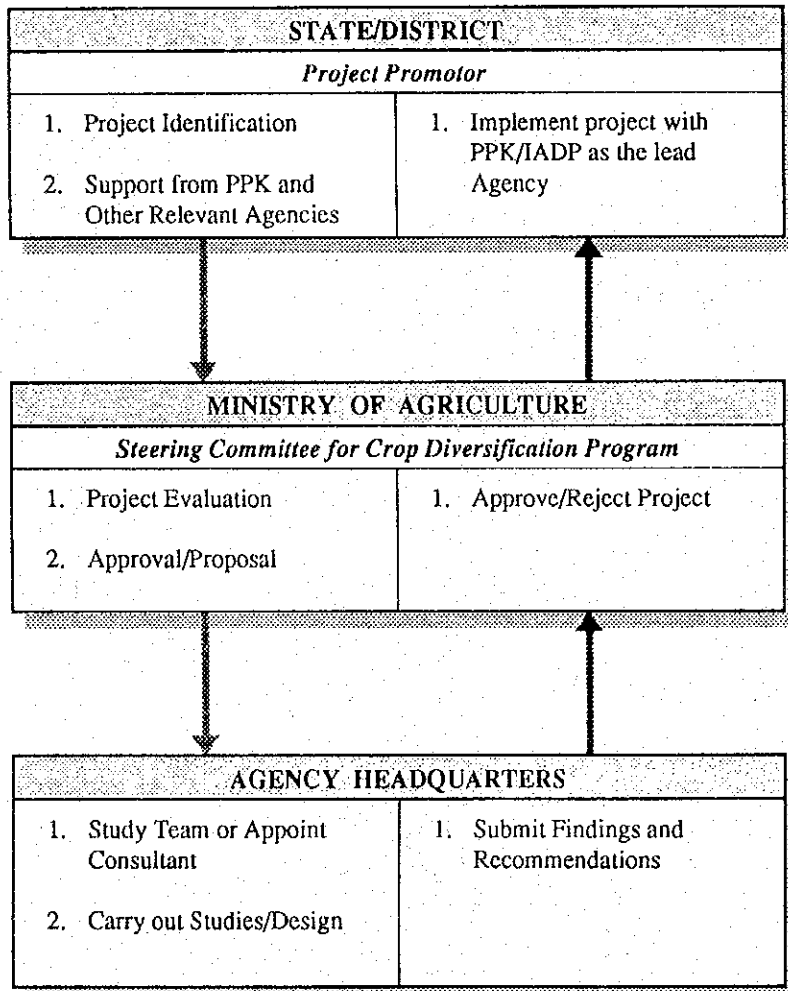


図3.5.1 小規模貯水池登録フォーム

Code No.	
Basin No.	
Name of River	

1	Owner	
2	Office Address	
3	Contact Person	
4	Telephone No.	
5	Fax. No.	
6	Location of Reservoir	
	- Mukim	
	- District	
	- State	
	- Description of direction to site	
7	Type of Reservoir	
	- Low Dam	
	- Pond	
	- Oxbow of River	
	- Upstream Weir	
	- Tin Mine Pond or Lake	
8	Height of Dam (m)	
9	Length of Dam (m)	
10	Surface Area (ha)	
11	Storage Volume (cu. m)	
12	Normal Water Level (El. m)	
13	Year Constructed	
14	Sketch of layout and cross section	

図5.2.1 調査対象地区近傍の降雨パターン

単位：mm

		1月	2月	3月	4月	5月	6月	7月	8月	9月	10月	11月	12月	合計
ベリリス	*1	41.9	38.7	109.0	151.7	180.5	141.7	167.0	175.5	266.5	237.9	206.4	100.4	1817.2
ケダ	*2	26.4	35.3	90.5	202.0	293.7	260.9	298.2	316.6	404.0	394.5	218.2	48.9	2589.2
マラッカ	*3	97.1	90.3	163.3	189.2	156.7	104.0	119.3	121.2	153.9	182.3	212.2	139.8	1729.3
バリスロン	*4	155.9	137.9	219.8	259.4	177.3	151.2	174.8	171.3	202.4	234.7	270.4	191.6	2346.8
パヤクマツ	*5	287.8	152.9	140.3	144.2	199.1	166.9	186.6	195.4	263.8	293.9	429.6	597.6	3058.1

- 注
- *1 雨量観測所ブキット・デミアン (DID 6502010), 1967～1990の平均
 - *2 雨量観測所ウル・マラッカ (DID 6397112), 1953～1990の平均
 - *3 雨量観測所ブキット・センゲ (DID 2324032), 1953～1990の平均
 - *4 雨量観測所バリ・スロン (DID 1929064), 1951～1990の平均
 - *5 雨量観測所パヤ・クマツ (DID 5029036), 1956～1990の平均

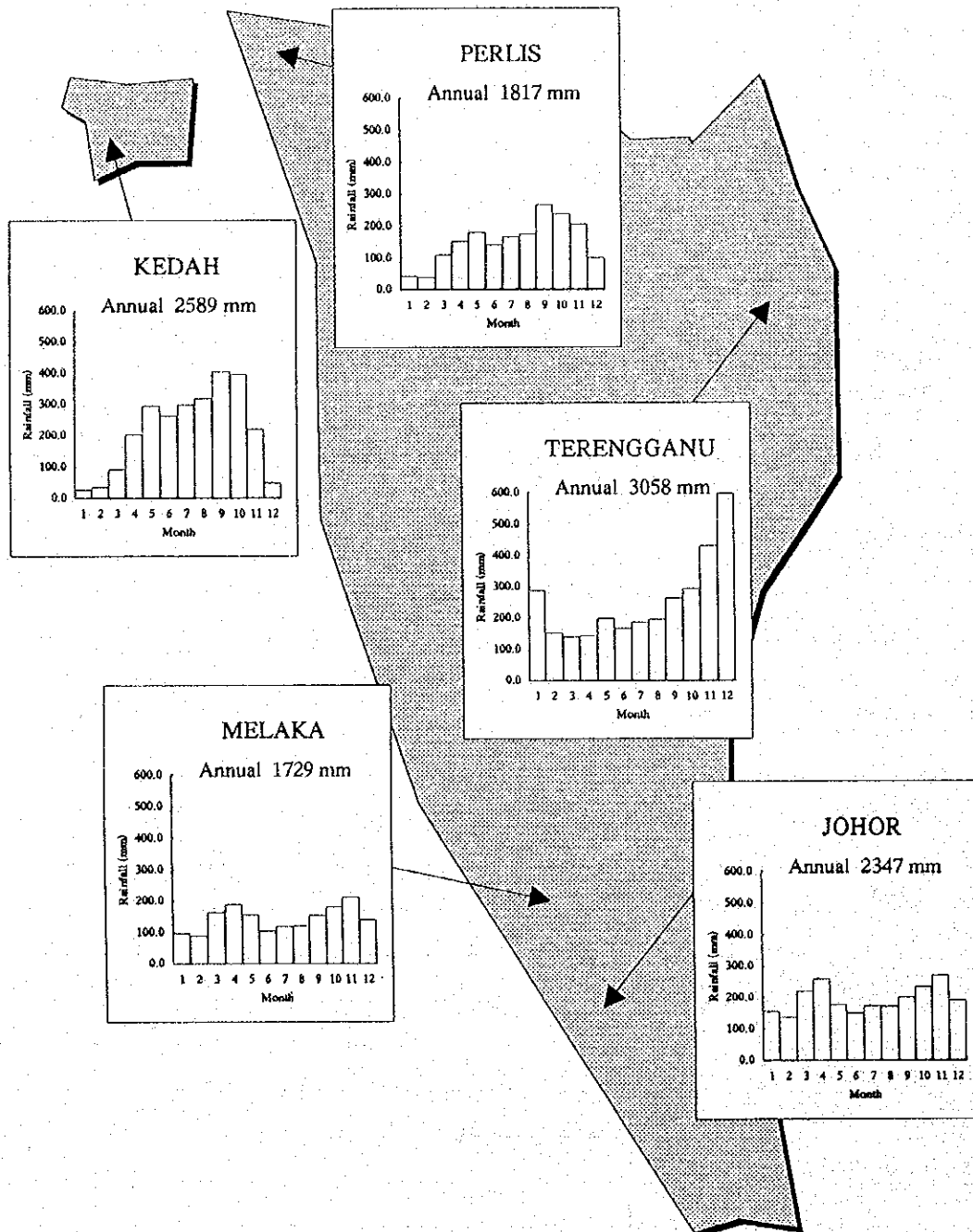
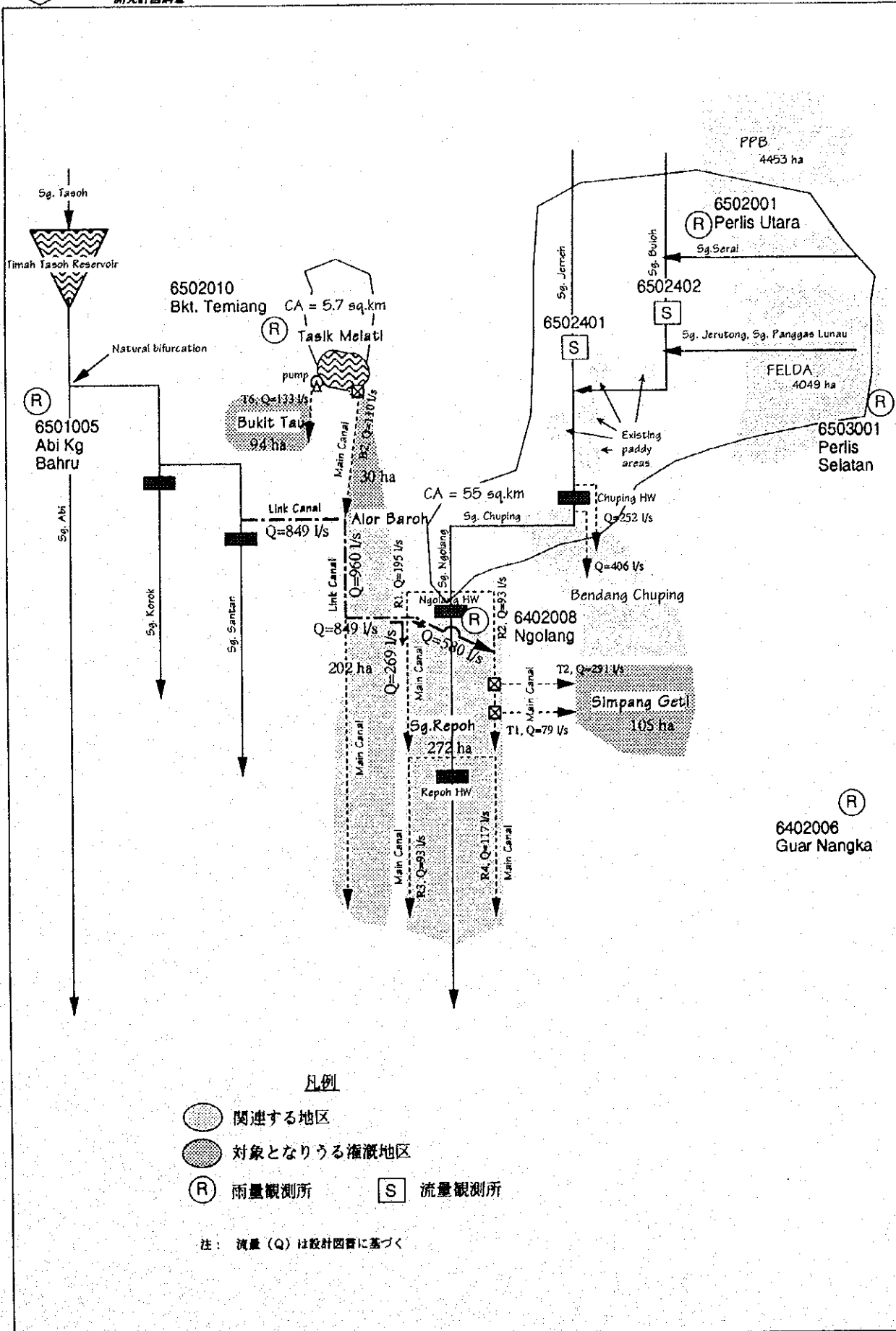


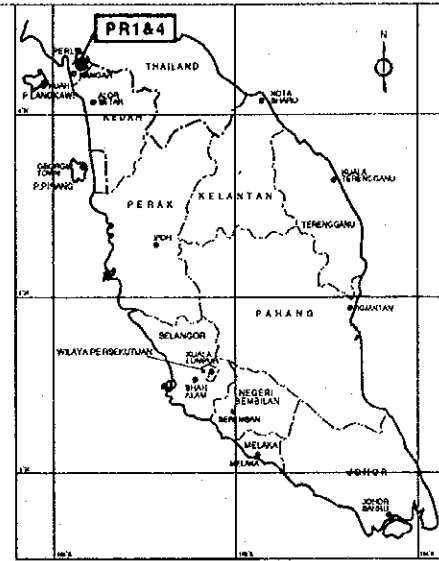
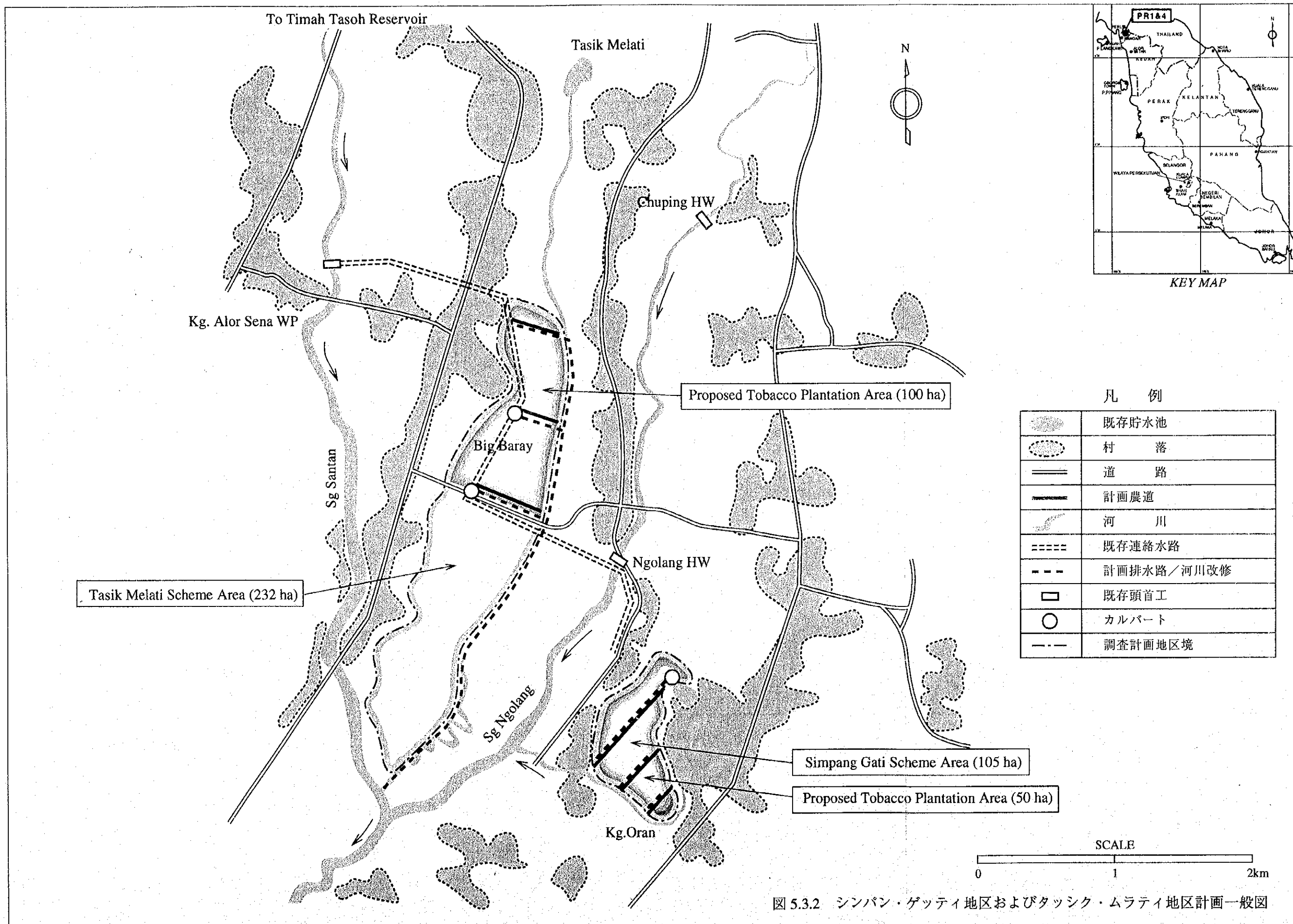
図5.3.1 ペルリス州の水利利用



凡例

- 関連する地区
- 対象となりうる灌漑地区
- R 雨量観測所
- 流量観測所

注：流量 (Q) は設計図書に基づく



KEY MAP

凡 例

	既存貯水池
	村 落
	道 路
	計画農道
	河 川
	既存連絡水路
	計画排水路／河川改修
	既存頭首工
	カルバート
	調査計画地区境

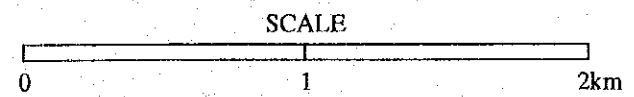
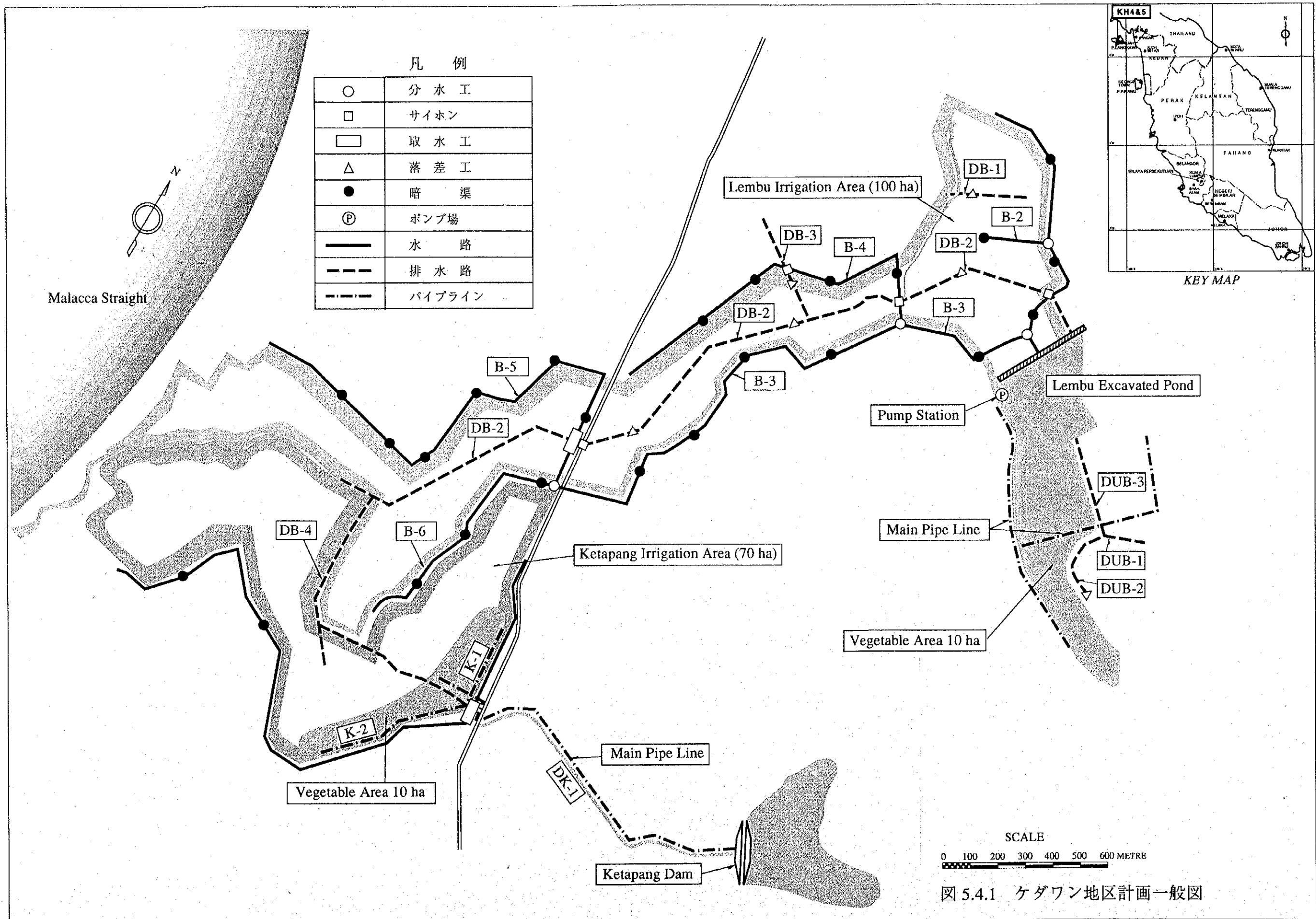


図 5.3.2 シンパン・ゲッティ地区およびタシク・ムラティ地区計画一般図



凡 例

○	分水工
□	サイホン
◻	取水工
△	落差工
●	暗 渠
Ⓟ	ポンプ場
—	水 路
- - -	排 水 路
- · - ·	パイプライン

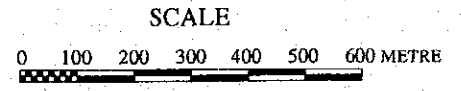
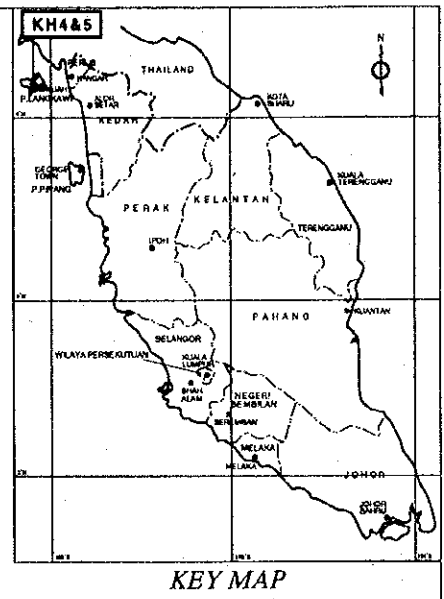
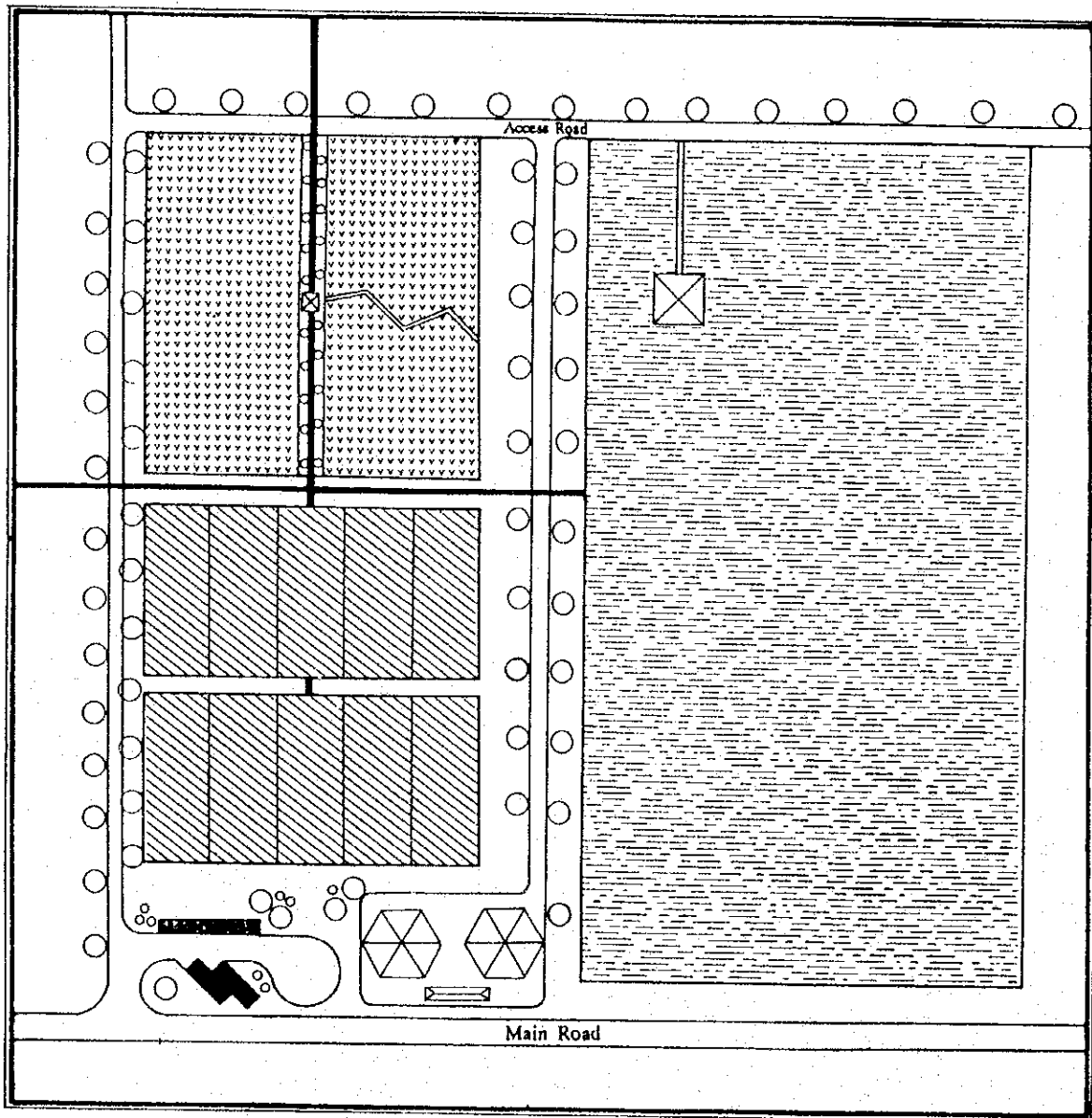


図 5.4.1 ケダワン地区計画一般図



凡例











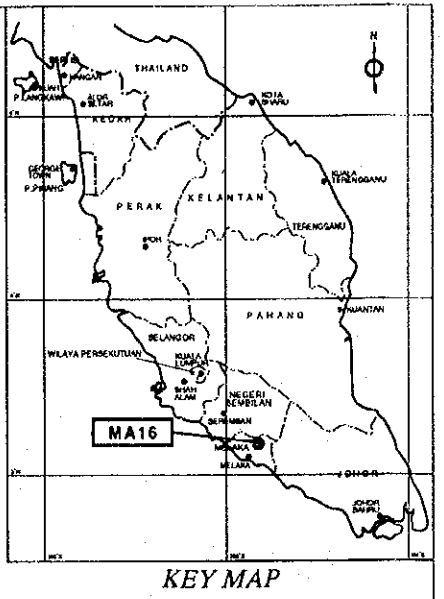
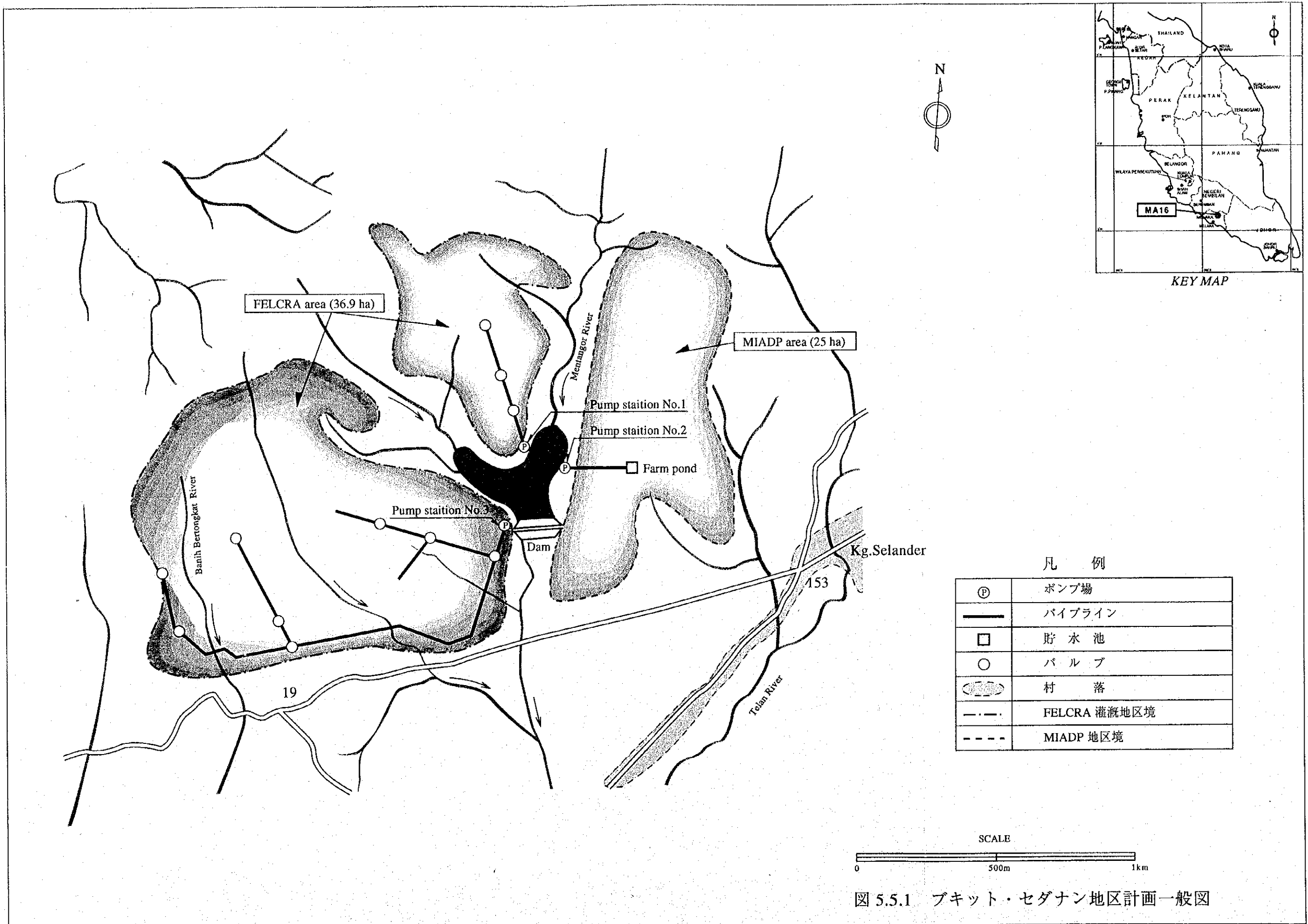
- | | | | |
|---|----------|---|-------|
|  | 水田 |  | 小規模溜池 |
|  | 日除けシェルター |  | 散歩路 |
|  | 休憩所 |  | 水路 |
|  | 駐車場 |  | 木 |
|  | レストラン |  | トイレ |

図5.4.2 観光農業施設の概要図



凡 例

Ⓟ	ポンプ場
—	パイプライン
□	貯水池
○	バルブ
⦶	村落
- · - ·	FELCRA 灌漑地区境
- - - -	MIADP 地区境

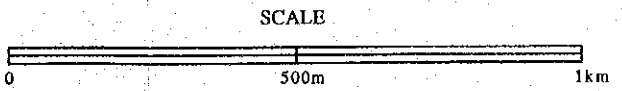
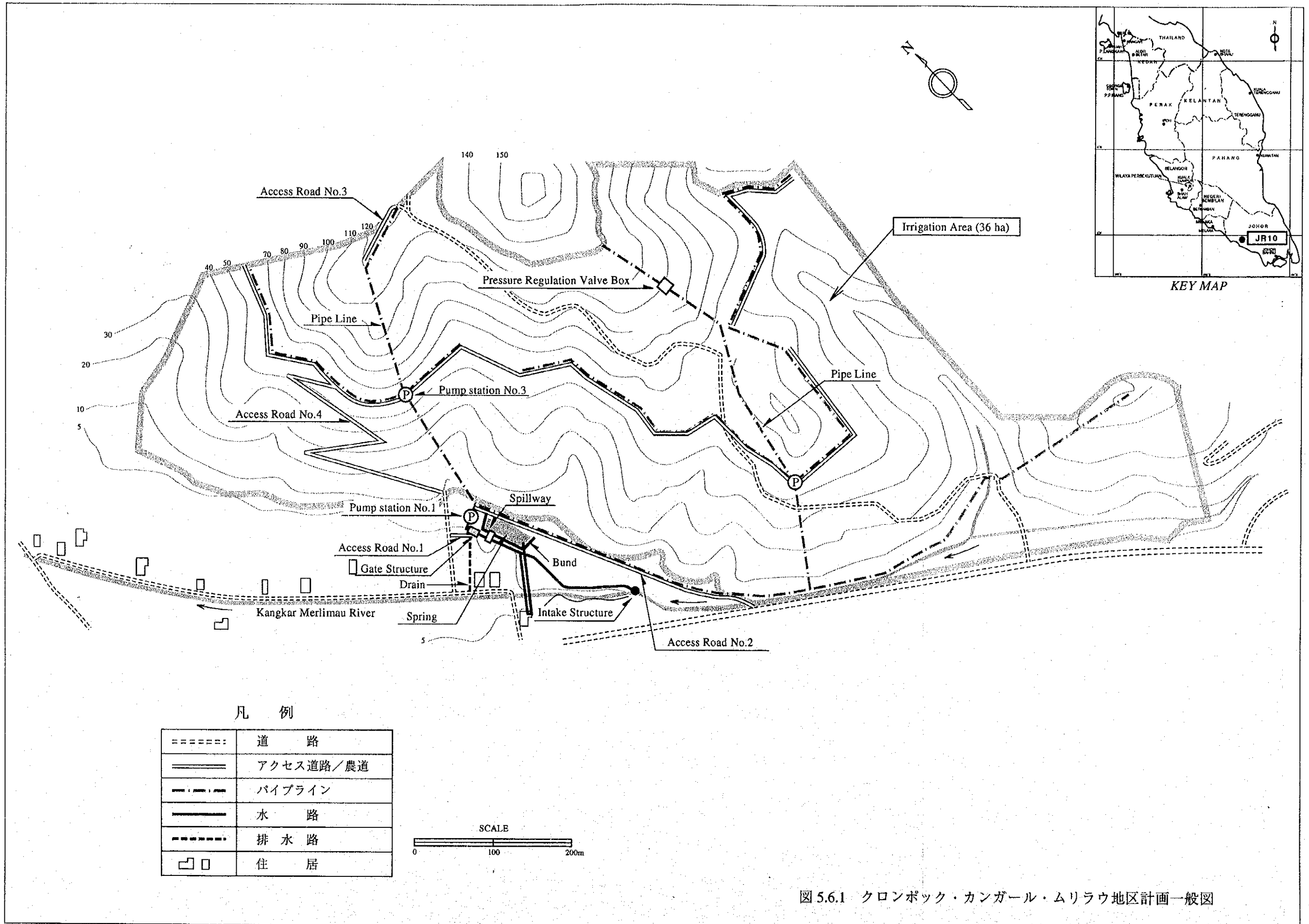


図 5.5.1 ブキット・セダナン地区計画一般図



凡 例

=====	道 路
====	アクセス道路/農道
- - - - -	パイプライン
————	水 路
- - - - -	排 水 路
□ □	住 居

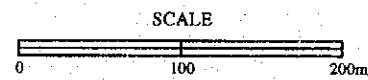
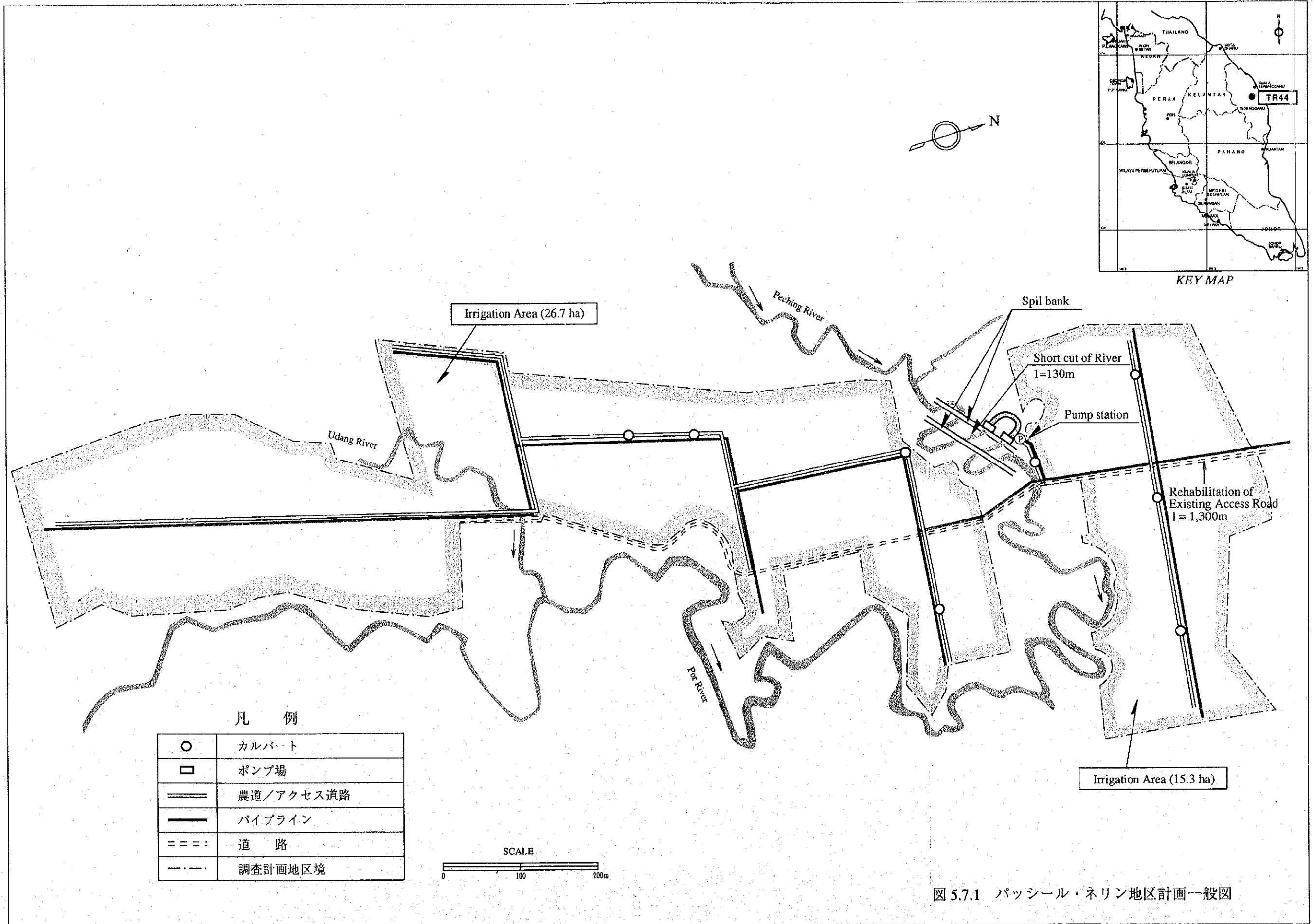


図 5.6.1 クロンポック・カンガール・ムリラウ地区計画一般図



凡 例

○	カルバート
□	ポンプ場
══	農道/アクセス道路
══	パイプライン
===	道 路
----	調査計画地区境

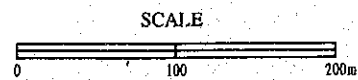
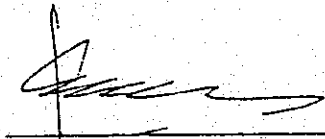


図 5.7.1 パシール・ネリン地区計画一般図

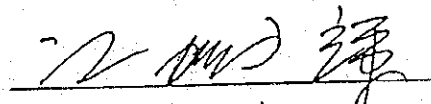
添付資料

SCOPE OF WORK
FOR
THE FEASIBILITY STUDY
ON
SMALL RESERVOIR DEVELOPMENT
IN
PENINSULAR MALAYSIA
AGREED UPON BETWEEN
THE ECONOMIC PLANNING UNIT
OF
THE PRIME MINISTER'S DEPARTMENT
ON BEHALF OF THE GOVERNMENT OF MALAYSIA
AND
THE JAPAN INTERNATIONAL COOPERATION AGENCY

KUALA LUMPUR, 16 FEBRUARY 1993



Kassim bin Sarbani
Director, Agriculture Section
The Economic Planning Unit
The Prime Minister's Department
on behalf of the Government of Malaysia



Terushi Egashira
Leader
Preparatory Study Team
The Japan International
Cooperation Agency

I. INTRODUCTION

In response to the request by the Government of Malaysia, the Government of Japan has decided to conduct the Feasibility Study on Small Reservoir Development in Peninsular Malaysia (hereinafter referred to as the Study) in accordance with the relevant laws and regulations in force in Japan. Accordingly, the Japan International Cooperation Agency (hereinafter referred to as JICA), the official agency responsible for the implementation of technical cooperation programmes of the Government of Japan, will undertake the Study in close cooperation with the authorities concerned of the Government of Malaysia.

The present document sets forth the Scope of Work with regard to the Study.

II. OBJECTIVES OF THE STUDY

The objectives of the Study are as follows:

- A. To identify and evaluate existing and potential small reservoir development in Peninsular Malaysia.
- B. To select pilot small reservoir irrigation projects and undertake feasibility studies.
- C. To establish guidelines for the planning, design, operation and maintenance of small reservoirs for irrigation.

III. OUTLINE OF THE STUDY

A. Study Area

The Study shall cover agricultural areas in Peninsular Malaysia.

B. Scope of the Study

The Study shall comprise the following two phases:

Phase I

1. Review existing development policies, strategies and projects relevant to the Study.
2. Collect and review the existing data and information on small reservoir development practices.

3. Prepare criteria (taking into account factors such as erosion, siltation, hydrology, topography, geology, engineering, socio-economy and environment) for identifying potential sites for small reservoir development.
4. Identify potential sites for small reservoir development in accordance with the above criteria for various purposes in the Study area.
5. Collect and compile data and information on potential service areas of the small reservoirs.
6. Compile and evaluate the results of the above identification and classify the potential small reservoir schemes into several categories.
7. Establish an information system on small reservoirs.
8. Select sites where the pilot small reservoir irrigation projects can be formulated.

Phase II

1. Collect additional data and information relevant to the formulation of the pilot small reservoir irrigation projects.
2. Formulate the pilot small reservoir irrigation projects, including agricultural development, water resources development, irrigation and drainage, and supporting services plans.
3. Design the pilot projects facilities and prepare the operation and maintenance manuals.
4. Analyze the expected results of the pilot projects (financial profitability, economic impact, social changes and environmental effects).
5. Prepare guidelines for the small reservoir irrigation development including planning, design, operation and maintenance.

IV. Study Schedule

The tentative schedule of the Study is as attached (see Annex).

V. REPORTS

JICA shall submit the following reports in English to the Government of Malaysia.

A. Inception Report

Thirty (30) copies at the commencement of the Study.

B. Progress Report I

Thirty (30) copies in the middle of Phase I.

C. Interim Report

Thirty (30) copies at the end of Phase I.

D. Draft Final Report

Thirty (30) copies at the end of Phase II.

The Government of Malaysia shall submit the comments on the Draft Final Report to JICA within one (1) month.

E. Final Report

Hundred (100) copies within two months after the receipt of the comments from the Government of Malaysia on the Draft Final Report.

F. Guidelines for Small Reservoir Irrigation Development

Hundred (100) copies to be submitted at the same time as the Final Report.

VI. UNDERTAKING OF JICA

For the implementation of the Study, JICA shall take the following measures :

1. To dispatch, at its own expense, a Study Team(s) to Malaysia; and
2. To provide technical training of the Malaysian counterpart personnel in the course of the Study.

VII. UNDERTAKING OF THE GOVERNMENT OF MALAYSIA

A. To facilitate smooth conduct of the Study, the Government shall take necessary measures :

1. To inform the members of the Study, Team any existing risk in the Study area and to take any measures deemed necessary to secure the safety of the Study Team;

2. To ensure the necessary entry permits for the Study Team to conduct field surveys in Malaysia and exempt them from consular fees;
 3. To exempt the members of the Study Team from taxes and duties, as normally accorded under the provision of Malaysian General Circular No. 1 of 1979, on equipment, machinery and other materials brought into and out of Malaysia for the conduct of the Study;
 4. To exempt the non-Malaysian members of the Study Team from Malaysian income tax on their official emoluments in respects of their period of assignment in Malaysia in connection with the conduct of the Study while retaining the right to take such emoluments into account for the purpose of assessing the amount to be applied to income from other sources;
 5. To provide necessary facilities to the Study Team for the remittance as well as the utilization of funds introduced into Malaysia from Japan in connection with the implementation of the Study;
 6. To secure permission for entry into private properties or restricted areas for the implementation of the Study;
 7. To make arrangements for the Study Team to take back to Japan the data, maps and other materials connected with the Study, subject to the approval of the Government of Malaysia, in order to prepare the reports;
 8. To provide the Study Team with medical services when needed, the expenses of which shall be chargeable to the members of the Study Team; and
 9. To secure clearance for the use of communication facilities including transceivers.
- B. The Government of Malaysia shall indemnify any member of the Study Team in respect of damages arising from any legal action against him in relation of any act performed or omissions made in undertaking the Study except when the both Government agree that such a member is guilty of gross negligence of wilful misconduct.




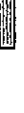



- C. The Department of Irrigation and Drainage (hereinafter referred to as DID) shall act as a counterpart agency of the Study Team and also as a coordinating body in relation with other relevant organizations for the smooth implementation of the Study.
- D. DID shall, at its own expense, provide the Study Team with the following in cooperation with other organizations concerned :
1. available data, information and materials including aerial photographs and topographic maps related to the Study,
 2. counterpart personnel,
 3. suitable office space with clerical services and necessary equipment in DID headquarters and the Study area,
 4. vehicles with drivers and other supporting services necessary for the implementation of the Study, and
 5. credential or identification cards.
- E. DID shall assist in conducting surveys assigned/requested by the Study Team in the course of the Study.

VIII. CONSULTATION

JICA, DID, Ministry of Agriculture and the Economic Planning Unit shall consult with each other in respect of any matter that may arise from or in connection with the Study.



(Annex 1)

TENTATIVE WORK SCHEDULE

Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Work in Malaysia																					
Work in Japan																					
Submission of Reports							Δ P/R(I)		Δ IT/R							Δ DF/R		Δ F/R		Δ F/R	Δ G
	Phase I Study										Phase II Study										

(Note)

IC/R : Inception Report P/R (I) : Progress Report (I)
 IT/R : Interim Report F/R : Final Report
 DF/R : Draft Final Report G : Technical Guidelines

 work carried out by the Japanese Study team
 work carried out by Malaysian side




JICA