Appendix 5. Cost Estimation borrne by the Recipient Cuntry

The Philippine's share in the expenses to implement the project are as follows.

	Items	Cost (pesos)
1.	Acquisition of land	1,800,000
	1) New irrigation canal and new road	
	2) Resettlement area and Nursery etc.	
	3) Dam and reservoir	
2.	Compensation for Resettler	1,000,000
	1) Farmers in submerged area (15 households)	
	2) Farmers in the resettlement area (25 to 35 households)	
3.	Construction of Secondary and Tertiary irrigation canal	1,000,000
4.	Seedling cost of the nursery	1,000,000
5.	Construction cost of the house in the resettlement area	5,000,000
6.	Construction cost of electric power distribution lines for the resettlement area	3,000,000
7.	Cost of supervision during implementation period (Philippines side)	1,000,000
8.	Payment of charges for the Japanese foreign exchange bank based on the bank agreement	1,000,000
	Total	14,800,000 Pesos

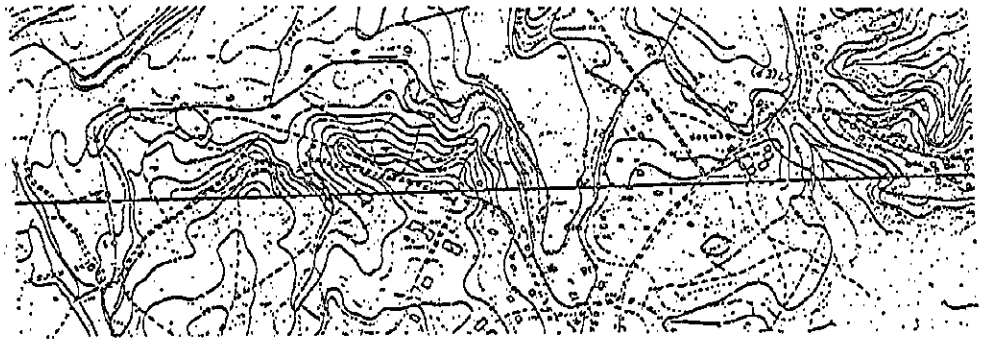
Appendix 6 Other Relevant Data

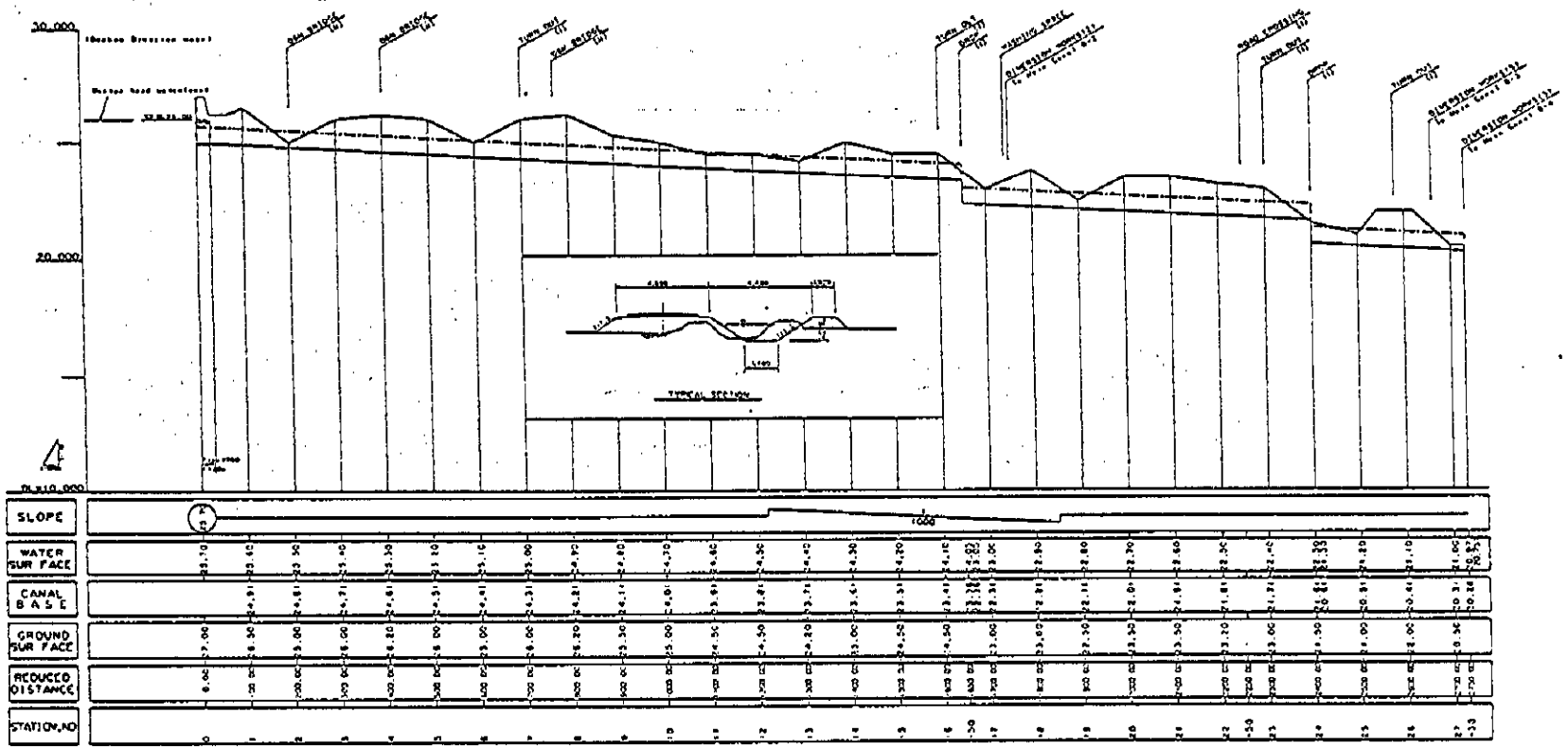
The relevant data are listed below and attached from the following page. The number of each data is arranged for a respective section/chapter for the easy reference.

Data 2.3.2.1- 1	Profiles of Irrigation Canals (Drawings)
Data 2.3.2.1- 2	Water Balance Calculation
Data 2.3.2.2- 1	Selection of Dam Axis
Data 2.3.2.2- 2	Geology of the Project Area (The Results of Geological Survey)
Data 2.3.2.3- 1	Stability Analyses of Dam
Data 2.3.2.3- 2	Seepage Analyses of Dam
Data 2.3.2.3- 3	Study on Spillway
Data 2.3.2.6- 1	Data for the Study for Resettlement Plan
Data 3.1- 1	Study on River Diversion

Data 2.3.2.1- 1 Profiles of Irrigation Canals (Drawings)

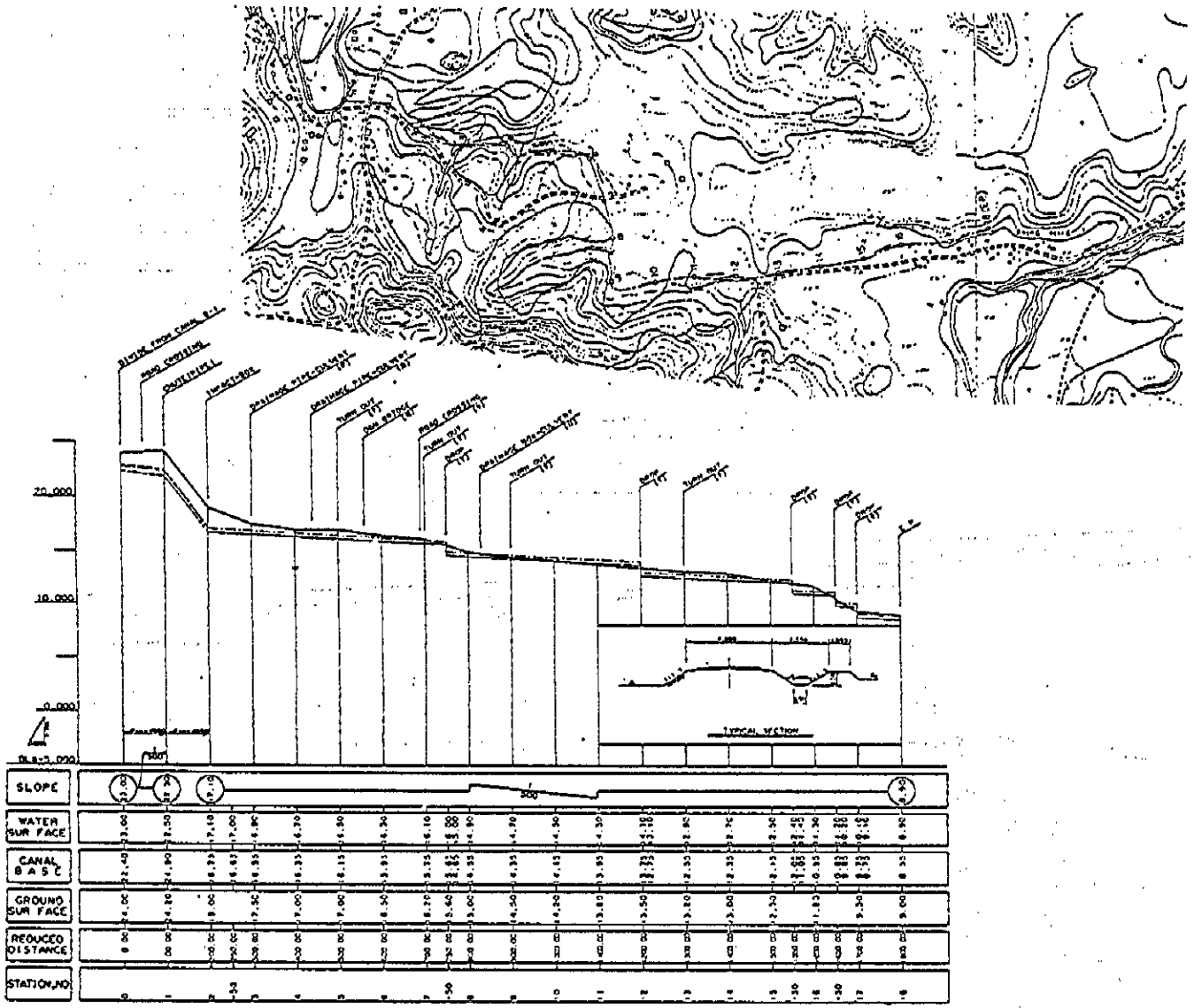
PLAN AND PROFILE OF MAIN CANAL B-1





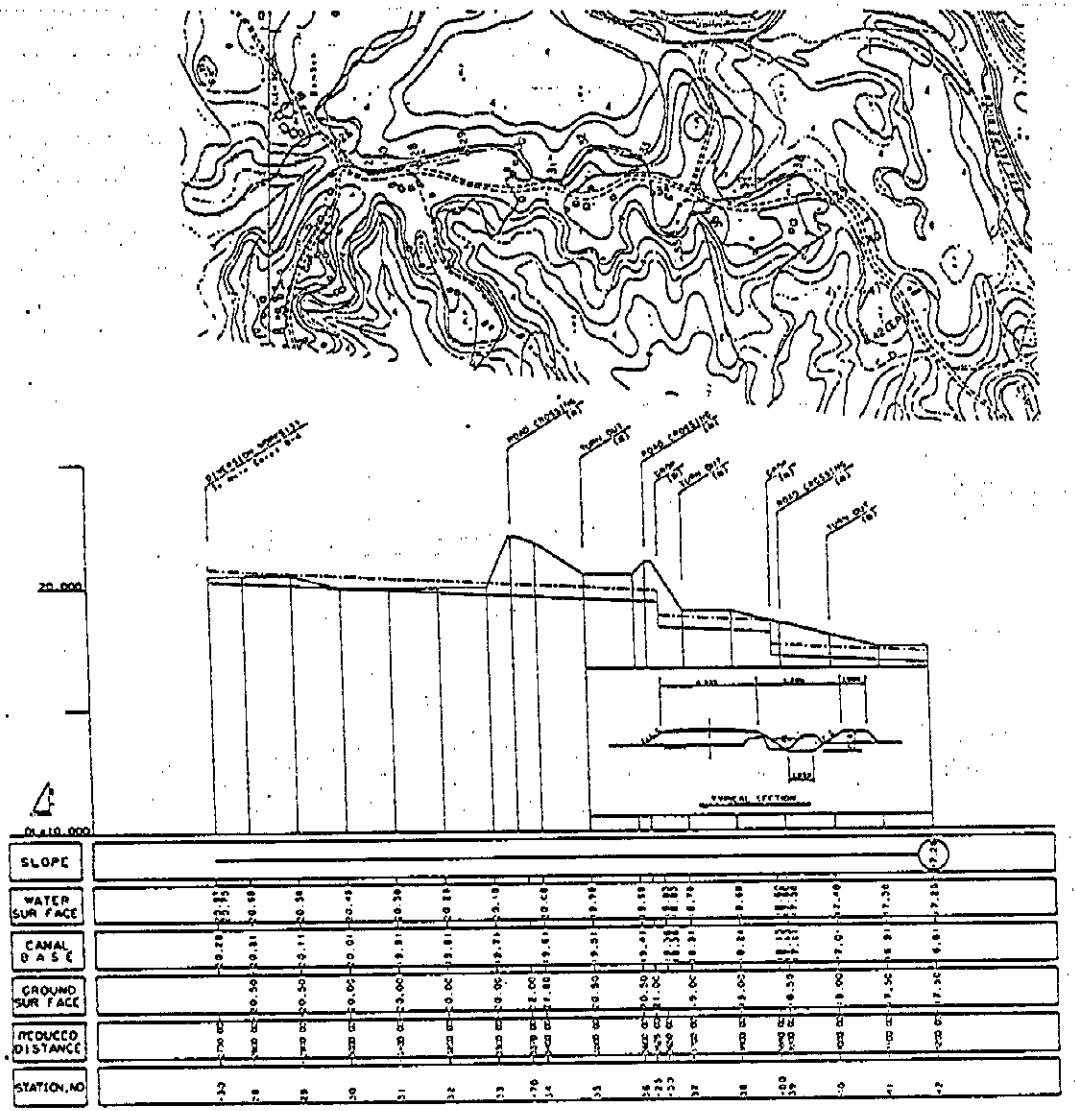
インファンタ地区灌漑 環境整備計画基本設計調査 国際協力事業団	PLAN AND PROFIL OF MAIN CANAL B-1

PLAN AND PROFILE OF MAIN CANAL B-2



インファンタ地区灌漑 環境整備計画基本設計調査	PLAN AND PROFIL OF MAIN CANAL B-2

PLAN AND PROFILE OF MAIN CANAL B-5(1)

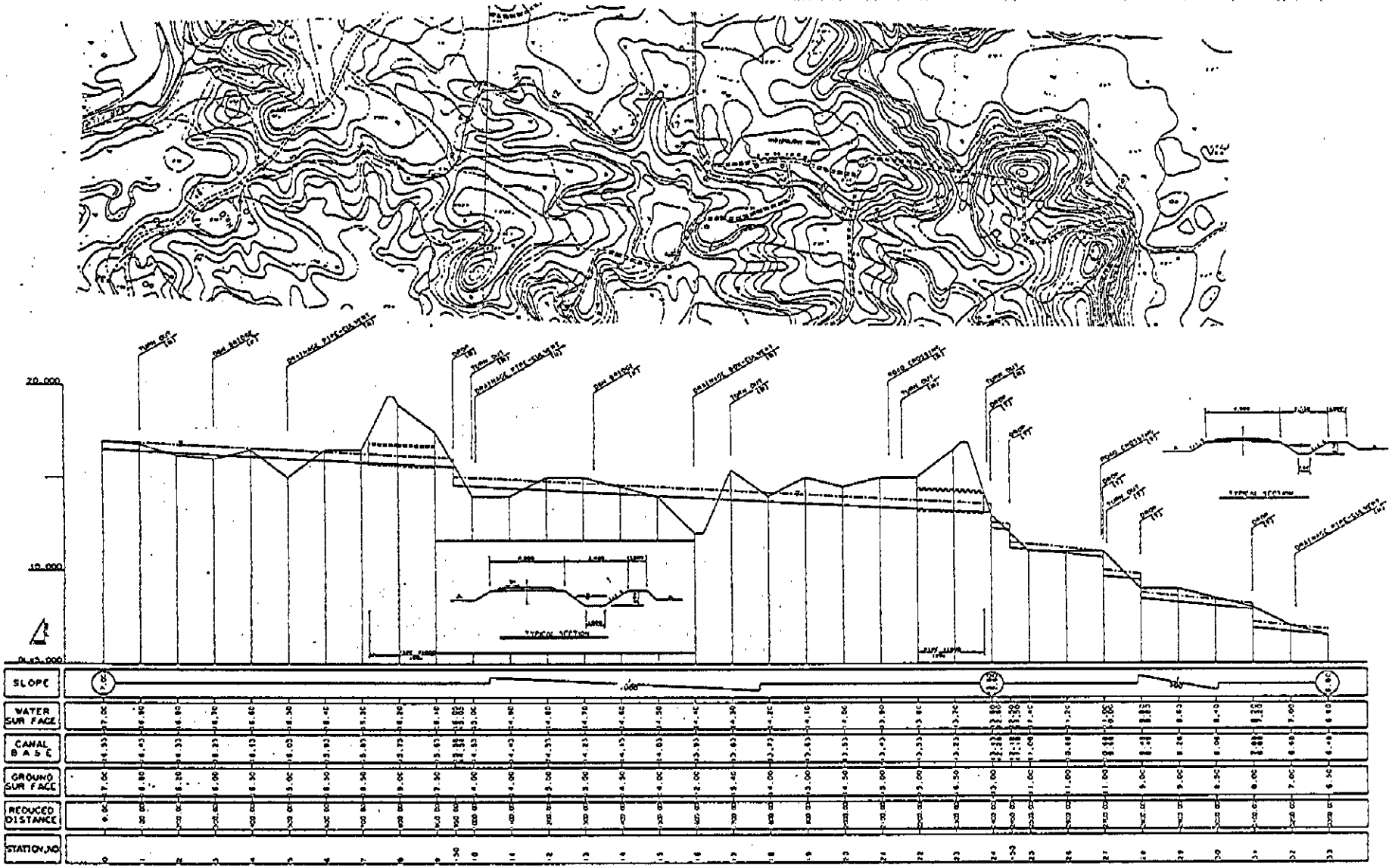


インファンタ地区灌漑施設 環境整備計画基本設計調査 国際協力事業団	PLAN AND PROFIL OF MAIN CANAL B-5(1)

Data 2.3.2.1-1-4

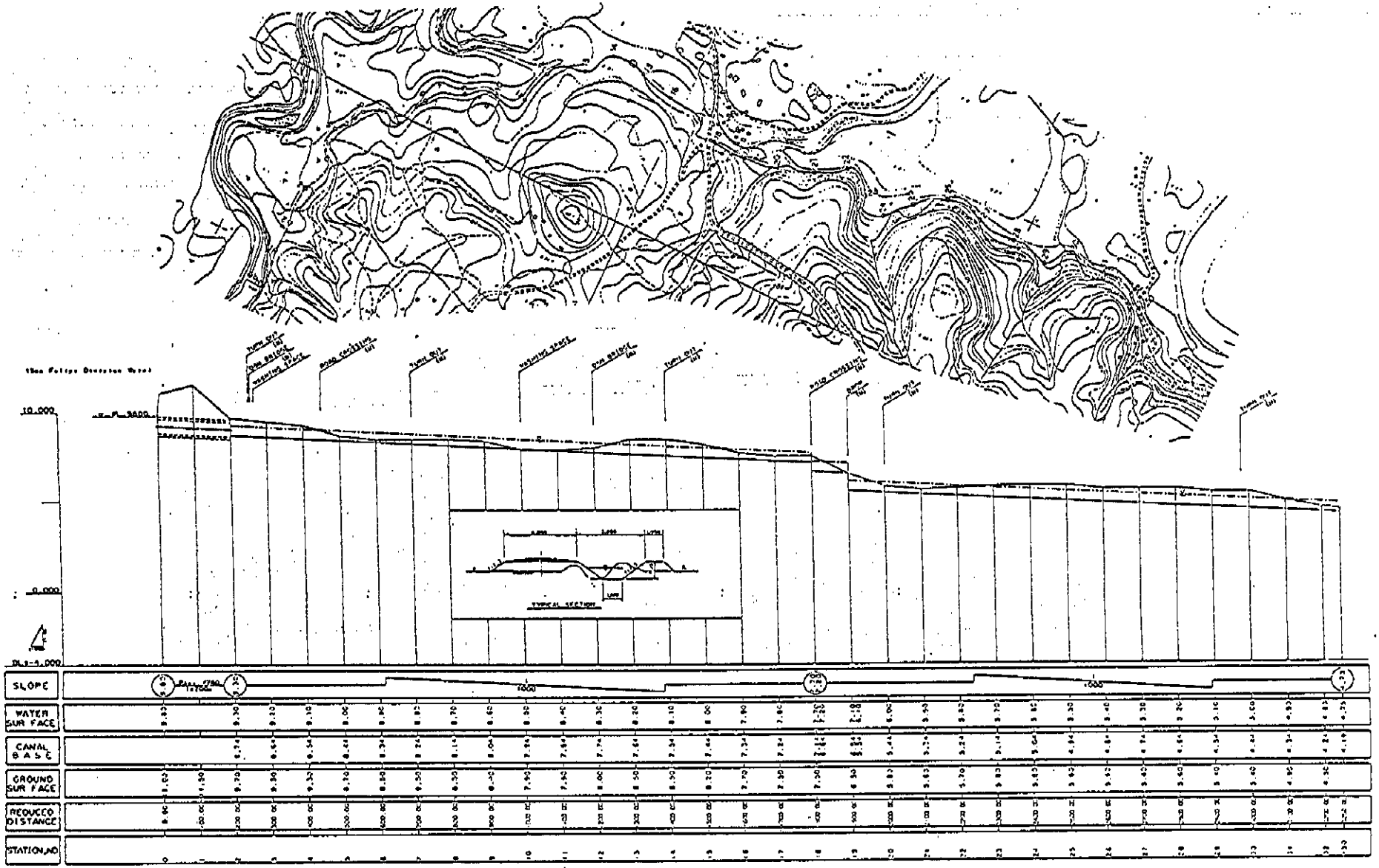
Appendix 6

PLAN AND PROFILE OF MAIN CANAL B-5(2)



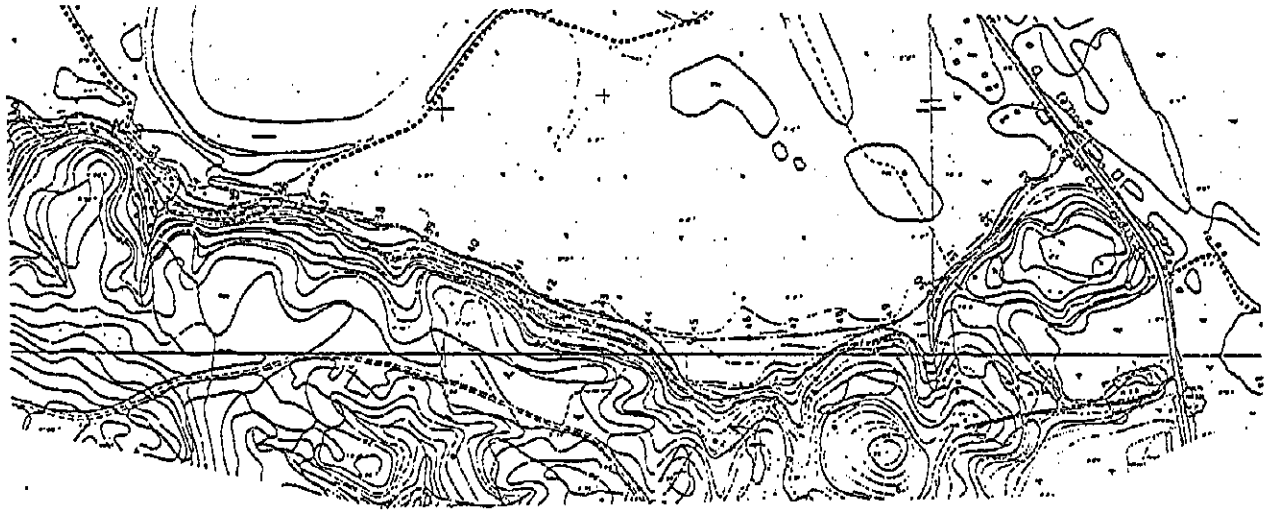
インファンタ地区天水農業 環境整備計画基本設計調査 国際協力事業団	PLAN AND PROFIL OF MAIN CANAL B-5(2)

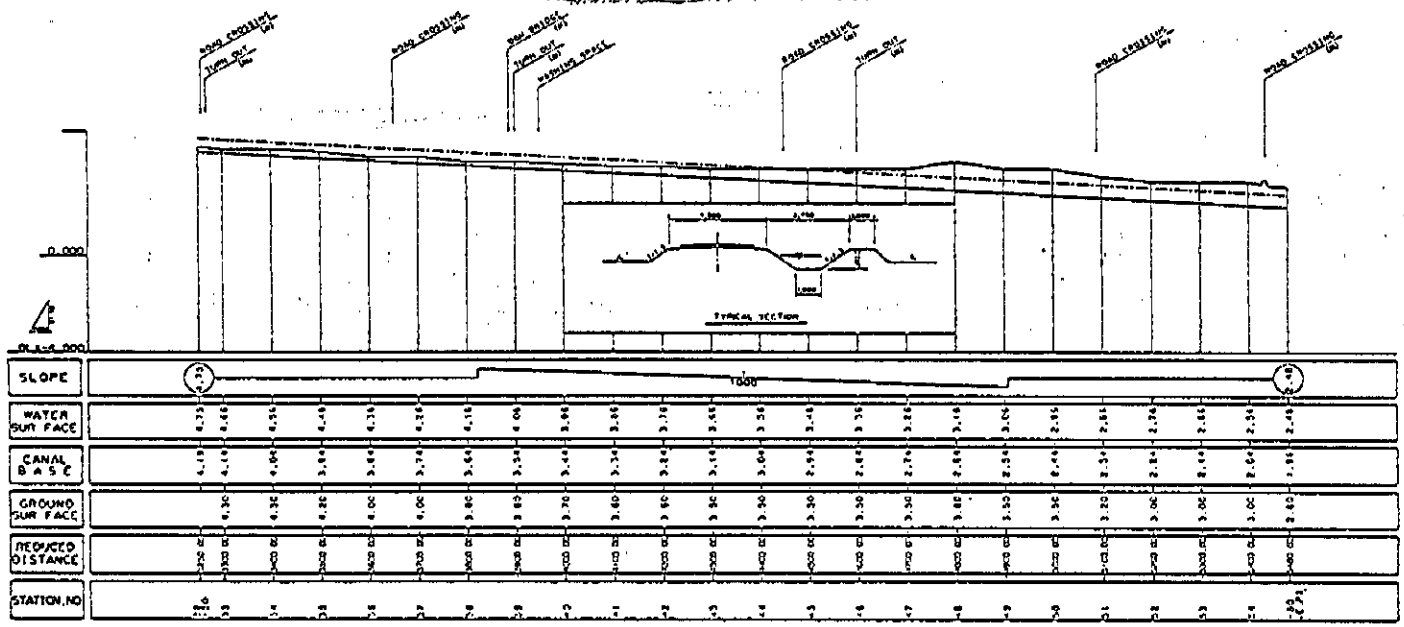
PLAN AND PROFILE OF MAIN CANAL S-1



インファンタ地区灌漑農業 環境整備計画基本設計調査 国際協力事業団	PLAN AND PROFIL OF MAIN CANAL S-1

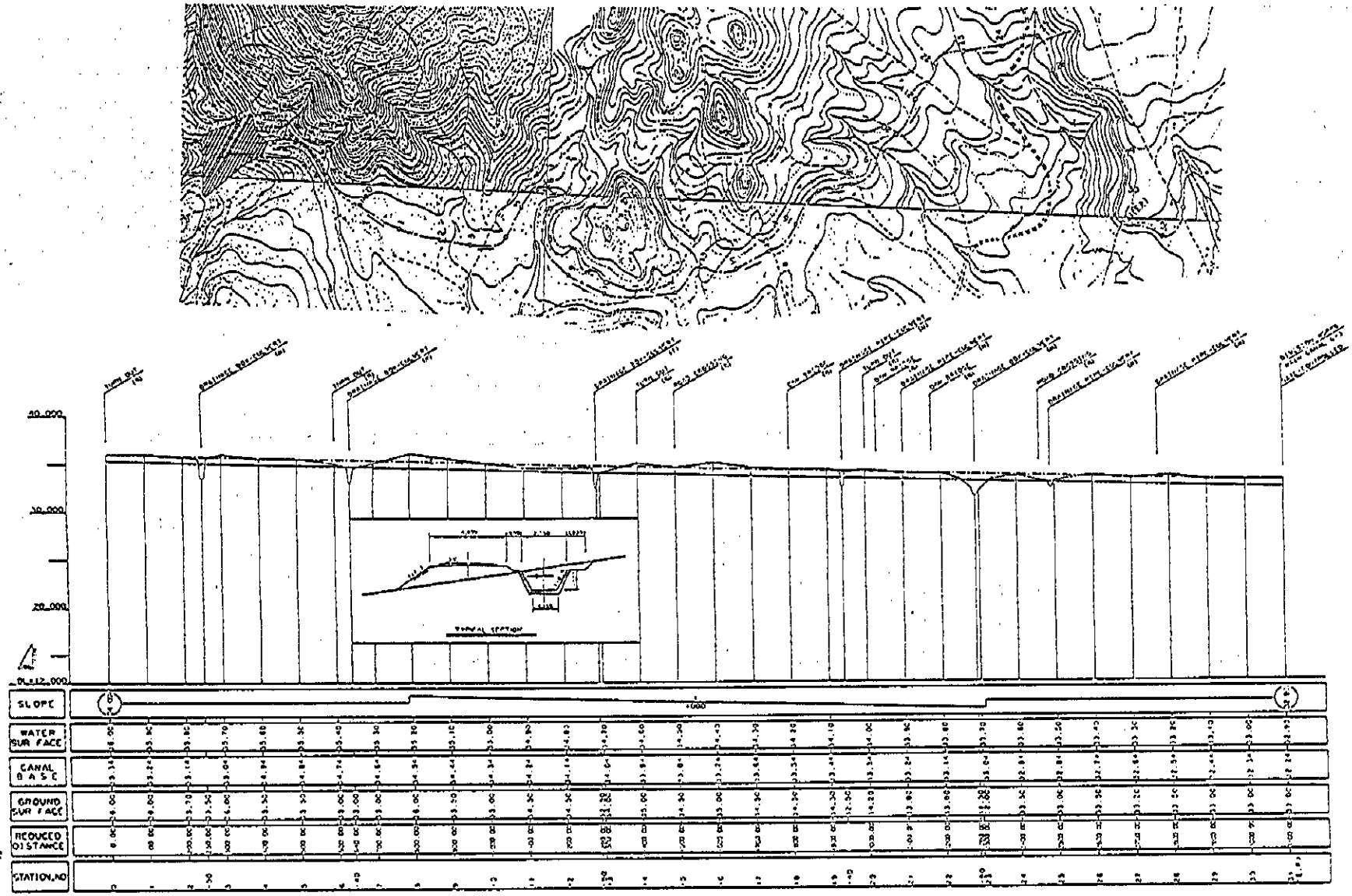
PLAN AND PROFILE OF MAIN CANAL S-2





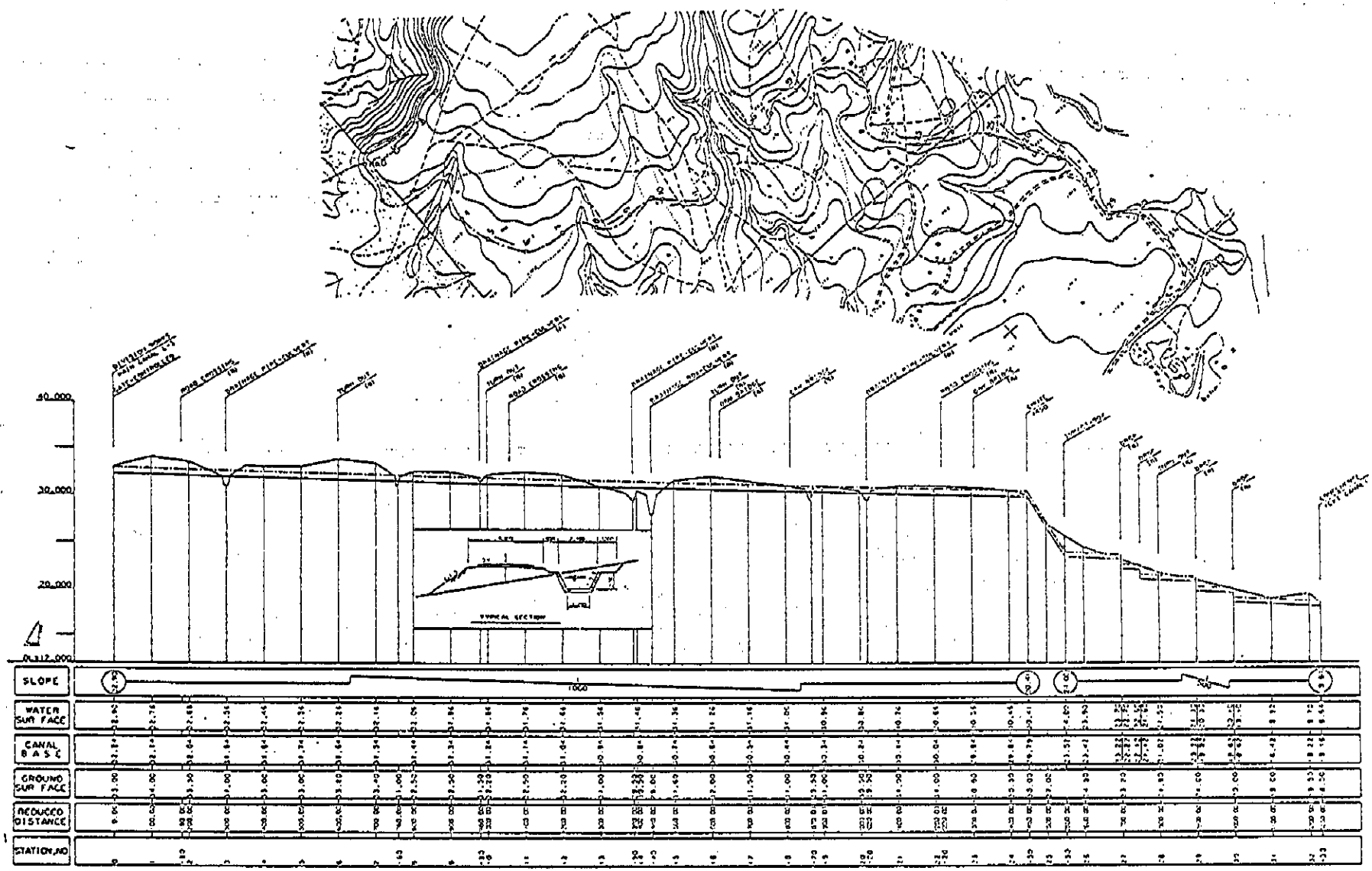
インファンタ地区灌漑農業 環境整備計画基本設計調査 国際協力事業団	PLAN AND PROFIL OF MAIN CANAL S-2

PLAN AND PROFILE OF MAIN CANAL L-1



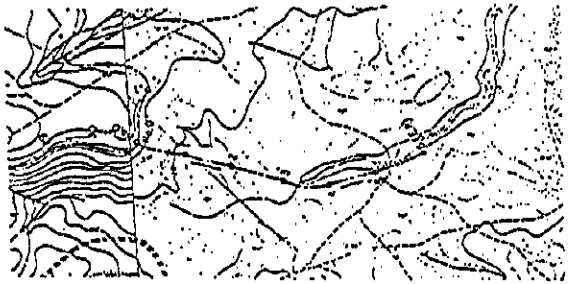
インファンタ地区天水農業 環境整備計画基本設計調査 国際協力事業団	PLAN AND PROFIL OF MAIN CANAL L-1

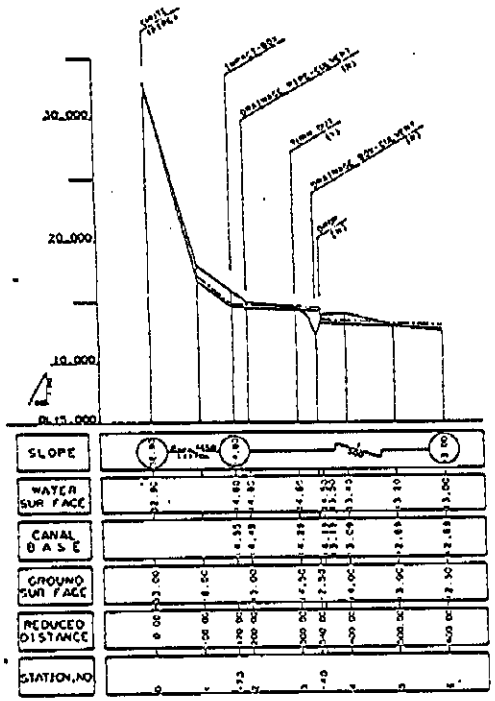
PLAN AND PROFILE OF MAIN CANAL L-2



インファンタ地区天水農業 環境整備計画基本設計調査 国際協力事業団	PLAN AND PROFIL OF MAIN CANAL L-2

PLAN AND PROFILE OF MAIN CANAL L-3





インファンタ地区灌漑 環境整備計画基本設計調査	PLAN AND PROFIL OF MAIN CANAL L-3
国際協力事業団	

Data 2.3.2.1- 2 Water Balance Calculation

(1) Irrigation Area :Rainy Season 1,280ha --- Dry Season 770ha

- Table -1~ 5 Water Balance
- Fig. -1~ 2 Water Balance (Water Level)
- Fig. -3~4 Water Balance (Storage Capacity)

(2) Irrigation Area :Rainy Season 1,280ha ---Dry Season 900ha

- Table -6~10 Water Balance
- Fig. -5~6 Water Balance (Water Level)
- Fig. -7~8 Water Balance (Storage Capacity)

(3) Inflow Capacity of Average Year

Irrigation Area :Rainy Season 1,280ha ---Dry Season 960ha

- Table -11 Water Balance
- Fig. -9 Water Balance (Water Level)
- Fig. -10 Water Balance (Storage Capacity)

Reference 2.3.2.1-2

Analysis of Water Balance

(1) Irrigation Area: Rainy Season 1,280ha --- Dry Season 770 ha

- Table -1~5 Water Balance
- Fig. -1~2 Water Balance (Water Level)
- Fig. -3~4 Water Balance (Storage Capacity)

(2) Irrigation Area :Rainy Season 1,280ha --- Dry Season 900 ha

- Table -6~10 Water Balance
- Fig. -5~6 Water Balance (Water Level)
- Fig. -7~8 Water Balance (Storage Capacity)

(3) Inflow Capacity of Average Year

Irrigation Area: Rainy Season 1,280ha --- Dry Season 960ha

- Table -11 Water Balance
- Fig. -9 Water Balance (Water Level)
- Fig. -10 Water Balance (Storage Capacity)

5.9.2 Design data of Irrigation

(1) Plan and Longitudinal of Canal

(2) Facility of Structure

TABLE-1 WATER BALANCE（水收支計算表）
(Irrigation Area: Rainy Season 1280ha. Dry Season 770ha.)

Year 年	Month 月	Inflow 流入量(1) (m³/sec)	Inflow 流入量(2) (m³/month)	Irr. Requirment 灌溉用水量 (m³/month)	Storage Cap. 貯水量 m³	Water level 貯水位 EL	Water Surface 貯水面積 Km²	Evap. 蒸発量 m³	Over Flow 越流流量 m³	Over Flow 越流水量 m³/sec	Evaporation 蒸発量 mm/month	Effec. Evap. 0.7 m/month
1956	Jan.	0.21	562,464	3,204,305	5,358,159	52.80	0.59	83,422	0	0.00	203	0.142
	Feb.	0.19	459,648	3,661,964	2,072,421	44.48	0.32	56,038	0	0.00	250	0.175
	Mar.	0.15	401,760	945,338	1,472,804	42.32	0.25	45,455	0	0.00	259	0.181
	Apr.	0.16	414,720	0	1,842,069	43.65	0.29	47,256	0	0.00	230	0.161
	May	0.41	1,098,144	0	2,892,957	47.45	0.42	42,737	0	0.00	147	0.103
	Jun.	0.32	829,440	0	3,679,660	50.13	0.50	47,378	0	0.00	135	0.095
	Jul.	0.80	2,142,720	0	5,775,002	53.45	0.62	51,577	0	0.00	119	0.083
	Aug.	2.35	6,294,240	0	8,000,000	57.00	0.88	87,472	4,017,665	1.50	142	0.099
	Sep.	10.79	27,967,680	0	8,000,000	57.00	0.88	85,624	27,880,208	10.76	139	0.097
	Oct.	1.07	2,865,888	0	8,000,000	57.00	0.88	97,944	2,780,264	1.04	159	0.111
	Nov.	1.36	3,525,120	1,642,822	8,000,000	57.00	0.88	84,392	1,784,354	0.69	137	0.096
	Dec.	0.73	1,955,232	2,445,080	7,424,760	56.08	0.81	90,439	0	0.00	159	0.111
1957	Jan.	0.46	1,232,064	3,204,305	5,362,080	52.80	0.59	83,451	0	0.00	203	0.142
	Feb.	0.31	749,952	3,661,964	2,366,618	45.55	0.35	62,006	0	0.00	250	0.175
	Mar.	0.29	776,736	945,338	2,136,009	44.71	0.33	59,392	0	0.00	259	0.181
	Apr.	0.28	725,760	0	2,802,377	47.12	0.40	65,178	0	0.00	230	0.161
	May	0.25	669,600	0	3,406,800	49.30	0.47	48,866	0	0.00	147	0.103
	Jun.	0.42	1,088,640	0	4,445,574	51.35	0.54	51,079	0	0.00	135	0.095
	Jul.	10.30	27,587,520	0	8,000,000	57.00	0.88	73,304	23,983,015	8.95	119	0.083
	Aug.	3.25	8,704,800	0	8,000,000	57.00	0.88	87,472	8,631,495	3.22	142	0.099
	Sept.	1.95	5,054,400	0	8,000,000	57.00	0.88	85,624	4,966,928	1.92	139	0.097
	Oct.	0.95	2,571,264	0	8,000,000	57.00	0.88	97,944	2,485,640	0.93	159	0.111
	Nov.	0.33	855,360	1,642,822	7,114,594	55.59	0.78	74,438	0	0.00	137	0.096
	Dec.	0.23	616,032	2,446,080	5,210,108	52.56	0.58	64,499	0	0.00	159	0.111
1958	Jan.	0.17	455,328	3,204,305	2,396,631	45.65	0.36	50,843	0	0.00	203	0.142
	Feb.	0.17	411,264	3,661,964	0	37.00	0.08	14,000	0	0.00	250	0.175
	Mar.	0.15	401,760	945,338	0	37.00	0.08	14,504	0	0.00	259	0.181
	Apr.	0.11	285,120	0	270,616	37.98	0.11	17,930	0	0.00	230	0.161
	May	0.14	374,976	0	627,662	39.27	0.15	15,718	0	0.00	147	0.103
	Jun.	1.73	4,454,160	0	5,096,103	52.38	0.57	54,213	0	0.00	135	0.095
	Jul.	4.90	13,124,160	0	8,000,000	57.00	0.88	73,304	10,166,050	3.80	119	0.083
	Aug.	2.53	6,776,352	0	8,000,000	57.00	0.88	87,472	6,703,048	2.50	142	0.099
	Sept.	3.32	8,605,440	0	8,000,000	57.00	0.88	85,624	8,517,968	3.29	139	0.097
	Oct.	1.95	5,222,880	0	8,000,000	57.00	0.88	97,944	5,137,256	1.92	159	0.111
	Nov.	0.62	1,607,040	1,642,822	7,866,274	56.79	0.86	82,889	0	0.00	137	0.096
	Dec.	0.37	991,008	2,446,080	6,328,314	54.34	0.68	76,133	0	0.00	159	0.111
1959	Jan.	0.28	749,952	3,204,305	3,797,827	50.31	0.51	72,100	0	0.00	203	0.142
	Feb.	0.22	532,224	3,661,964	595,988	39.15	0.15	26,089	0	0.00	250	0.175
	Mar.	0.22	589,248	945,338	213,808	37.77	0.10	18,997	0	0.00	259	0.181
	Apr.	0.17	440,640	0	635,451	39.29	0.15	24,739	0	0.00	230	0.161
	May	0.45	1,205,280	0	1,815,992	43.56	0.29	29,892	0	0.00	147	0.103
	Jun.	0.46	1,192,320	0	2,978,420	47.76	0.43	40,185	0	0.00	135	0.095
	Jul.	0.53	1,419,552	0	4,357,787	51.21	0.54	44,647	0	0.00	119	0.083
	Aug.	1.17	3,133,728	0	7,446,868	56.12	0.82	81,027	0	0.00	142	0.099
	Sept.	2.02	5,235,840	0	8,000,000	57.00	0.88	85,624	4,601,681	1.78	139	0.097
	Oct.	0.53	1,419,552	0	8,000,000	57.00	0.88	97,944	1,333,928	0.50	159	0.111
	Nov.	0.37	959,040	1,642,822	7,218,274	55.76	0.79	75,604	0	0.00	137	0.096
	Dec.	0.31	830,304	2,446,080	5,526,894	53.07	0.60	66,300	0	0.00	159	0.111
1960	Jan.	0.25	669,600	3,204,305	2,925,889	47.57	0.42	59,561	0	0.00	203	0.142
	Feb.	0.14	338,688	3,661,964	0	37.00	0.08	14,000	0	0.00	250	0.175
	Mar.	0.06	160,704	945,338	0	37.00	0.08	14,504	0	0.00	259	0.181
	Apr.	0.02	51,840	0	37,336	37.13	0.08	13,577	0	0.00	230	0.161
	May	0.06	160,704	0	184,463	37.67	0.10	10,432	0	0.00	147	0.103
	Jun.	0.38	984,960	0	1,158,991	41.19	0.21	20,255	0	0.00	135	0.095
	Jul.	0.36	964,224	0	2,102,960	44.59	0.32	26,969	0	0.00	119	0.083
	Aug.	5.79	15,507,936	0	8,000,000	57.00	0.88	87,472	9,583,927	3.58	142	0.099
	Sept.	3.27	8,475,840	0	8,000,000	57.00	0.88	85,624	8,388,368	3.24	139	0.097
	Oct.	2.33	6,240,672	0	8,000,000	57.00	0.88	97,944	6,155,048	2.30	159	0.111
	Nov.	0.75	1,944,000	1,642,822	8,000,000	57.00	0.88	84,392	203,234	0.08	137	0.096
	Dec.	0.49	1,312,416	2,446,080	6,781,944	55.06	0.74	82,052	0	0.00	159	0.111

Appendix 6

Data
2.3.2.1-2③

TABLE-2 WATER BALANCE（水収支計算表）

(Irrigation Area: Rainy Season 1280ha, Dry Season 770ha.)

Year 年	Month 月	Inflow 流入量(1) (m³/sec)	Inflow 流入量(2) (m³/month)	Irr. Requirment 灌漑用水量 (m³/month)	Storage Cap. 貯水量 m³	Water level 貯水位 EL	Water Surface 貯水面積 Km²	Evap. 蒸発量 m³	Over Flow 越流流量 m³	Over Flow 越流水量 m³/sec	Evaporation 蒸発量 mm/month	Effec. Evap. 0.7 m/month
1961	Jan.	0.35	937,440	3,204,305	4,433,027	51.33	0.54	76,709	0	0.00	203	0.142
	Feb.	0.31	749,952	3,651,964	1,444,306	42.22	0.25	43,297	0	0.00	250	0.175
	Mar.	0.27	723,168	945,338	1,178,839	41.26	0.22	39,277	0	0.00	259	0.181
	Apr.	0.22	570,240	0	1,709,802	43.17	0.28	44,788	0	0.00	230	0.161
	May	0.21	562,464	0	2,227,477	45.04	0.34	34,800	0	0.00	147	0.103
	Jun.	1.36	3,525,120	0	5,717,798	53.37	0.61	57,878	0	0.00	135	0.095
	Jul.	2.90	7,767,360	0	8,000,000	57.00	0.88	73,304	5,427,279	2.03	119	0.083
	Aug.	2.26	6,053,184	0	8,000,000	57.00	0.88	87,472	5,979,880	2.23	142	0.099
	Sept.	3.75	9,720,000	0	8,000,000	57.00	0.88	85,624	9,632,528	3.72	139	0.097
	Oct.	2.66	7,124,544	0	8,000,000	57.00	0.88	97,944	7,038,920	2.63	159	0.111
	Nov.	0.98	2,540,160	1,642,822	8,000,000	57.00	0.88	84,392	799,394	0.31	137	0.096
	Dec.	0.55	1,473,120	2,446,080	6,942,648	55.32	0.76	84,149	0	0.00	159	0.111
1962	Jan.	0.35	937,440	3,204,305	4,591,634	51.58	0.55	77,860	0	0.00	203	0.142
	Feb.	0.24	580,608	3,661,964	1,432,418	42.17	0.25	43,056	0	0.00	250	0.175
	Mar.	0.18	482,112	945,338	926,136	40.34	0.19	33,967	0	0.00	259	0.181
	Apr.	0.22	570,240	0	1,462,410	42.28	0.25	40,171	0	0.00	230	0.161
	May	0.21	562,464	0	1,984,702	44.17	0.31	31,904	0	0.00	147	0.103
	Jun.	0.36	933,120	0	2,885,918	47.42	0.41	39,171	0	0.00	135	0.095
	Jul.	5.12	13,713,408	0	8,000,000	57.00	0.88	73,304	8,560,155	3.20	119	0.083
	Aug.	2.34	6,267,456	0	8,000,000	57.00	0.88	87,472	6,194,152	2.31	142	0.099
	Sept.	3.15	8,164,800	0	8,000,000	57.00	0.88	85,624	8,077,328	3.12	139	0.097
	Oct.	1.25	3,348,000	0	8,000,000	57.00	0.88	97,944	3,252,376	1.22	159	0.111
	Nov.	0.60	1,555,200	1,642,822	7,814,434	56.70	0.86	82,306	0	0.00	137	0.096
	Dec.	0.28	749,952	2,446,080	6,036,000	53.88	0.65	72,319	0	0.00	159	0.111
1963	Jan.	0.18	482,112	3,204,305	3,241,487	48.71	0.46	64,759	0	0.00	203	0.142
	Feb.	0.18	435,456	3,651,964	0	37.00	0.08	14,000	0	0.00	250	0.175
	Mar.	0.12	321,408	945,338	0	37.00	0.08	14,504	0	0.00	259	0.181
	Apr.	0.08	207,360	0	192,856	37.70	0.10	16,479	0	0.00	230	0.161
	May	0.07	187,488	0	363,865	38.31	0.12	12,572	0	0.00	147	0.103
	Jun.	1.65	4,276,800	0	4,628,093	51.64	0.55	51,955	0	0.00	135	0.095
	Jul.	1.91	5,115,744	0	8,000,000	57.00	0.88	73,304	1,691,882	0.63	119	0.083
	Aug.	1.85	4,955,040	0	8,000,000	57.00	0.88	87,472	4,881,736	1.82	142	0.099
	Sept.	3.42	8,864,640	0	8,000,000	57.00	0.88	85,624	8,777,168	3.39	139	0.097
	Oct.	1.49	3,990,816	0	8,000,000	57.00	0.88	97,944	3,905,192	1.46	159	0.111
	Nov.	0.55	1,425,600	1,642,822	7,684,834	56.50	0.84	80,849	0	0.00	137	0.095
	Dec.	0.42	1,124,928	2,446,080	6,282,833	54.27	0.68	75,540	0	0.00	159	0.111
1964	Jan.	0.26	696,384	3,204,305	3,699,372	50.16	0.50	71,385	0	0.00	203	0.142
	Feb.	0.25	604,800	3,661,964	570,823	39.06	0.15	25,579	0	0.00	250	0.175
	Mar.	0.18	482,112	945,338	82,018	37.30	0.09	16,228	0	0.00	259	0.181
	Apr.	0.06	155,520	0	221,310	37.60	0.11	17,010	0	0.00	230	0.161
	May	0.08	214,272	0	418,572	38.51	0.13	13,224	0	0.00	147	0.103
	Jun.	1.03	2,669,760	0	3,075,108	48.10	0.44	41,244	0	0.00	135	0.095
	Jul.	1.27	3,401,568	0	6,435,432	54.51	0.70	58,026	0	0.00	119	0.083
	Aug.	5.03	13,472,352	0	8,000,000	57.00	0.88	87,472	11,849,758	4.42	142	0.099
	Sep.	2.87	7,439,040	0	8,000,000	57.00	0.88	85,624	7,351,568	2.84	139	0.097
	Oct.	3.54	9,481,536	0	8,000,000	57.00	0.88	97,944	9,395,912	3.51	159	0.111
	Nov.	1.06	2,747,520	1,642,822	8,000,000	57.00	0.88	84,392	1,006,754	0.39	137	0.096
	Dec.	1.00	2,678,400	2,446,080	8,000,000	57.00	0.88	97,944	147,928	0.06	159	0.111
1965	Jan.	0.52	1,392,768	3,204,305	6,090,519	53.96	0.66	93,241	0	0.00	203	0.142
	Feb.	0.37	895,104	3,661,964	3,230,418	48.67	0.45	79,528	0	0.00	250	0.175
	Mar.	0.30	803,520	945,338	3,009,072	47.87	0.43	77,739	0	0.00	259	0.181
	Apr.	0.39	1,010,880	0	3,942,213	50.54	0.51	82,876	0	0.00	230	0.161
	May	0.76	2,035,584	0	5,894,921	53.65	0.63	65,160	0	0.00	147	0.103
	Jun.	2.21	5,728,320	0	8,000,000	57.00	0.88	83,160	3,558,081	1.37	135	0.095
	Jul.	3.38	9,052,992	0	8,000,000	57.00	0.88	73,304	8,969,832	3.35	119	0.083
	Aug.	2.51	6,722,784	0	8,000,000	57.00	0.88	87,472	6,649,480	2.48	142	0.099
	Sep.	2.25	5,832,000	0	8,000,000	57.00	0.88	85,624	5,744,528	2.22	139	0.097
	Oct.	1.08	2,892,672	0	8,000,000	57.00	0.88	97,944	2,807,048	1.05	159	0.111
	Nov.	0.63	1,632,960	1,642,822	7,892,194	56.83	0.87	83,180	0	0.00	137	0.095
	Dec.	0.30	803,520	2,446,080	6,166,454	54.08	0.67	74,021	0	0.00	159	0.111

Appendix 6

Data
2.3.2.1-2 ⑧

TABLE-3 WATER BALANCE (水収支計算表)

(Irrigation Area: Rainy Season 1280ha. Dry Season 770ha.)

Year 年	Month 月	Inflow 流入量(1) (m³/sec)	Inflow 流入量(2) (m³/month)	Irr. Requirment 灌漑用水量 (m3/month)	Storage Cap. 貯水量 (m³)	Water level 貯水位 EL	Water Surface 貯水面積 Km²	Evap. 蒸発量 m³	Over Flow 越流流量 m³	Over Flow 越流水量 m³/sec	Evaporation 蒸発量 mm/month	Effec. Evap. 0.7 m/month
1966	Jan.	0.21	562,464	3,204,305	3,450,591	49.46	0.48	68,203	0	0.00	203	0.142
	Feb.	0.20	501,120	3,661,964	221,544	37.80	0.11	18,494	0	0.00	250	0.175
	Mar.	0.28	749,952	945,338	7,664	37.03	0.08	14,655	0	0.00	259	0.181
	Apr.	0.18	466,560	0	459,559	38.66	0.13	21,456	0	0.00	230	0.161
	May	0.78	2,059,152	0	2,527,255	46.13	0.37	38,375	0	0.00	147	0.103
	Jun.	0.93	2,410,560	0	4,899,439	52.07	0.55	53,264	0	0.00	135	0.095
	Jul.	1.71	4,580,064	0	8,000,000	57.00	0.88	73,304	1,426,239	0.53	119	0.083
	Aug.	1.59	4,258,655	0	8,000,000	57.00	0.88	87,472	4,185,352	1.56	142	0.099
	Sep.	6.49	16,822,080	0	8,000,000	57.00	0.88	85,624	16,734,608	6.46	139	0.097
	Oct.	1.32	3,535,488	0	8,000,000	57.00	0.88	97,944	3,449,864	1.29	159	0.111
	Nov.	1.09	2,825,280	1,642,822	8,000,000	57.00	0.88	84,392	1,084,514	0.42	137	0.096
	Dec.	0.88	2,356,992	2,446,080	7,826,520	56.72	0.86	95,681	0	0.00	159	0.111
1967	Jan.	0.44	1,178,496	3,204,305	5,705,030	53.35	0.61	86,819	0	0.00	203	0.142
	Feb.	0.21	508,032	3,661,964	2,464,279	45.90	0.37	63,987	0	0.00	250	0.175
	Mar.	0.18	482,112	945,338	1,937,066	43.99	0.30	55,211	0	0.00	259	0.181
	Apr.	0.18	466,560	0	2,348,415	45.48	0.35	56,706	0	0.00	230	0.161
	May	0.16	428,544	0	2,720,253	46.82	0.40	40,677	0	0.00	147	0.103
	Jun.	1.90	4,924,800	0	7,604,375	56.37	0.83	78,777	0	0.00	135	0.095
	Jul.	2.40	6,428,160	0	8,000,000	57.00	0.88	73,304	5,953,758	2.22	119	0.083
	Aug.	3.90	10,445,760	0	8,000,000	57.00	0.88	87,472	10,372,456	3.87	142	0.099
	Sep.	1.78	4,613,760	0	8,000,000	57.00	0.88	85,624	4,526,288	1.75	139	0.097
	Oct.	3.02	8,088,768	0	8,000,000	57.00	0.88	97,944	8,003,144	2.99	159	0.111
	Nov.	1.18	3,058,560	1,642,822	8,000,000	57.00	0.88	84,392	1,317,794	0.51	137	0.096
	Dec.	0.62	1,660,608	2,446,080	7,130,135	55.62	0.78	85,595	0	0.00	159	0.111
1968	Jan.	0.78	2,089,152	3,204,305	5,928,388	53.70	0.64	90,540	0	0.00	203	0.142
	Feb.	1.34	3,241,728	3,661,964	5,417,612	52.89	0.59	103,268	0	0.00	250	0.175
	Mar.	0.36	964,224	945,338	5,333,230	52.76	0.59	106,204	0	0.00	259	0.181
	Apr.	0.34	881,280	0	6,108,306	53.99	0.66	105,978	0	0.00	230	0.161
	May	0.44	1,178,496	0	7,180,824	55.70	0.78	80,671	0	0.00	147	0.103
	Jun.	0.63	1,632,960	0	8,000,000	57.00	0.88	83,160	733,113	0.28	135	0.095
	Jul.	0.94	2,517,696	0	8,000,000	57.00	0.88	73,304	2,434,536	0.91	119	0.083
	Aug.	9.41	25,203,744	0	8,000,000	57.00	0.88	87,472	25,130,440	9.38	142	0.099
	Sep.	3.76	9,745,920	0	8,000,000	57.00	0.88	85,624	9,658,448	3.73	139	0.097
	Oct.	1.87	5,008,608	0	8,000,000	57.00	0.88	97,944	4,922,984	1.84	159	0.111
	Nov.	0.67	1,736,640	1,642,822	7,995,874	56.99	0.88	84,346	0	0.00	137	0.096
	Dec.	0.46	1,232,064	2,446,080	6,697,513	54.93	0.73	80,950	0	0.00	159	0.111
1969	Jan.	0.39	1,044,576	3,204,305	4,456,833	51.36	0.54	76,882	0	0.00	203	0.142
	Feb.	0.23	556,416	3,661,964	1,274,404	41.60	0.23	39,851	0	0.00	250	0.175
	Mar.	0.19	508,896	945,338	798,111	39.88	0.17	31,276	0	0.00	259	0.181
	Apr.	0.21	544,320	0	1,311,154	41.73	0.23	37,349	0	0.00	230	0.161
	May	0.37	991,008	0	2,264,814	45.18	0.34	35,245	0	0.00	147	0.103
	Jun.	1.65	4,276,800	0	6,506,368	54.62	0.70	66,614	0	0.00	135	0.095
	Jul.	7.42	19,873,728	0	8,000,000	57.00	0.88	73,304	18,313,483	6.84	119	0.083
	Aug.	3.61	9,659,024	0	8,000,000	57.00	0.88	87,472	9,595,720	3.58	142	0.099
	Sep.	2.60	6,739,200	0	8,000,000	57.00	0.88	85,624	6,651,728	2.57	139	0.097
	Oct.	1.42	3,803,328	0	8,000,000	57.00	0.88	97,944	3,717,704	1.39	159	0.111
	Nov.	0.72	1,866,240	1,642,822	8,000,000	57.00	0.88	84,392	125,474	0.05	137	0.096
	Dec.	0.40	1,071,360	2,446,080	6,540,888	54.68	0.71	78,907	0	0.00	159	0.111
1970	Jan.	0.36	964,224	3,204,305	4,221,900	50.99	0.53	75,177	0	0.00	203	0.142
	Feb.	0.42	1,016,064	3,661,964	1,500,823	42.42	0.25	44,444	0	0.00	250	0.175
	Mar.	0.31	830,304	945,338	1,341,345	41.84	0.24	42,692	0	0.00	259	0.181
	Apr.	0.16	414,720	0	1,713,373	43.19	0.28	41,855	0	0.00	230	0.161
	May	0.46	1,232,064	0	2,900,582	47.47	0.42	42,828	0	0.00	147	0.103
	Jun.	1.11	2,877,120	0	5,734,874	53.40	0.61	58,067	0	0.00	135	0.095
	Jul.	2.10	5,624,640	0	8,000,000	57.00	0.88	73,304	3,301,447	1.23	119	0.083
	Aug.	3.86	10,338,624	0	8,000,000	57.00	0.88	87,472	10,265,320	3.83	142	0.099
	Sep.	5.87	15,215,040	0	8,000,000	57.00	0.88	85,624	15,127,568	5.84	139	0.097
	Oct.	2.16	5,785,344	0	8,000,000	57.00	0.88	97,944	5,699,720	2.13	159	0.111
	Nov.	1.20	3,110,400	1,642,822	8,000,000	57.00	0.88	84,392	1,369,634	0.53	137	0.096
	Dec.	0.98	2,624,832	2,446,080	8,000,000	57.00	0.88	97,944	94,360	0.04	159	0.111

Appendix 6

Data
2.3.2.1-2 (5)

TABLE-4 WATER BALANCE（水収支計算表）

(Irrigation Area: Rainy Season 1280ha. Dry Season 770ha.)

Year 年	Month 月	Inflow 流入量(1) (m³/sec)	Inflow 流入量(2) (m³/month)	Irr. Requirment 灌漑用水量 (m³/month)	Storage Cap. 貯水量 m³	Water level 貯水位 EL	Water Surface 貯水面積 Km²	Evap. 蒸発量 m³	Over Flow 越流流量 m³	Over Flow 越流水量 m³/sec	Evaporation 蒸発量 mm/month	Effec. Evap. 0.7 m/month
1971	Jan.	0.08	214,272	3,204,305	4,912,023	52.09	0.56	80,185	0	0.00	203	0.142
	Feb.	0.07	169,344	3,661,954	1,339,218	41.84	0.24	41,166	0	0.00	250	0.175
	Mar.	0.11	294,624	945,338	647,338	39.34	0.16	28,108	0	0.00	259	0.181
	Apr.	0.21	544,320	0	1,163,551	41.20	0.21	34,594	0	0.00	230	0.161
	May	0.23	615,032	0	1,744,959	43.30	0.28	29,045	0	0.00	147	0.103
	Jun.	0.30	777,600	0	2,493,544	46.00	0.37	34,874	0	0.00	135	0.095
	Jul.	0.59	1,580,256	0	4,038,926	50.70	0.52	43,291	0	0.00	119	0.083
	Aug.	2.69	7,204,896	0	8,000,000	57.00	0.88	87,472	3,200,531	1.19	142	0.099
	Sep.	0.62	1,607,040	0	8,000,000	57.00	0.88	85,624	1,519,558	0.59	139	0.097
	Oct.	2.13	5,704,992	0	8,000,000	57.00	0.88	97,944	5,619,368	2.10	159	0.111
	Nov.	3.46	8,968,320	1,642,822	8,000,000	57.00	0.88	84,392	7,227,554	2.79	137	0.095
	Dec.	0.95	2,571,264	2,446,080	8,000,000	57.00	0.88	97,944	40,792	0.02	159	0.111
1972	Jan.	0.21	562,464	3,204,305	5,260,215	52.64	0.58	82,711	0	0.00	203	0.142
	Feb.	0.18	435,456	3,661,964	1,950,995	44.05	0.31	53,575	0	0.00	250	0.175
	Mar.	0.19	508,896	945,338	1,460,978	42.28	0.25	45,206	0	0.00	259	0.181
	Apr.	0.20	518,400	0	1,934,172	43.98	0.30	48,975	0	0.00	230	0.161
	May	0.09	241,056	0	2,126,253	44.68	0.33	33,593	0	0.00	147	0.103
	Jun.	0.40	1,036,800	0	3,129,460	48.30	0.44	41,839	0	0.00	135	0.095
	Jul.	10.55	28,283,904	0	8,000,000	57.00	0.88	73,304	23,371,525	8.73	119	0.083
	Aug.	2.92	7,820,928	0	8,000,000	57.00	0.88	87,472	7,747,624	2.89	142	0.099
	Sep.	0.17	440,640	0	8,000,000	57.00	0.88	85,624	353,168	0.14	139	0.097
	Oct.	0.25	669,600	0	8,000,000	57.00	0.88	97,944	583,976	0.22	159	0.111
	Nov.	0.21	544,320	1,642,822	6,803,554	55.10	0.74	70,942	0	0.00	137	0.095
	Dec.	0.17	455,328	2,446,080	4,741,850	51.82	0.56	61,838	0	0.00	159	0.111
1973	Jan.	0.17	455,328	3,204,305	1,931,045	43.97	0.30	43,174	0	0.00	203	0.142
	Feb.	0.42	1,016,064	3,661,954	0	37.00	0.08	14,000	0	0.00	250	0.175
	Mar.	0.31	830,304	945,338	0	37.00	0.08	14,504	0	0.00	259	0.181
	Apr.	0.28	725,760	0	711,256	39.57	0.16	26,153	0	0.00	230	0.161
	May	0.56	1,499,904	0	2,185,007	44.89	0.33	34,293	0	0.00	147	0.103
	Jun.	1.08	2,799,360	0	4,950,073	52.15	0.57	53,508	0	0.00	135	0.095
	Jul.	2.93	7,847,712	0	8,000,000	57.00	0.88	73,304	4,744,277	1.77	119	0.083
	Aug.	3.61	9,669,024	0	8,000,000	57.00	0.88	87,472	9,595,720	3.58	142	0.099
	Sep.	3.41	8,838,720	0	8,000,000	57.00	0.88	85,624	8,751,248	3.38	139	0.097
	Oct.	1.87	5,008,608	0	8,000,000	57.00	0.88	97,944	4,922,984	1.84	159	0.111
	Nov.	0.93	2,540,160	1,642,822	8,000,000	57.00	0.88	84,392	799,394	0.31	137	0.096
	Dec.	0.58	1,553,472	2,446,080	7,023,000	55.45	0.77	85,197	0	0.00	159	0.111
1974	Jan.	0.15	401,760	3,204,305	4,135,258	50.85	0.52	74,548	0	0.00	203	0.142
	Feb.	0.13	314,496	3,661,964	713,242	39.58	0.16	28,468	0	0.00	250	0.175
	Mar.	0.10	267,840	945,338	7,276	37.03	0.08	14,657	0	0.00	259	0.181
	Apr.	0.06	155,520	0	148,139	37.53	0.10	15,645	0	0.00	230	0.161
	May	0.12	321,408	0	453,902	38.64	0.13	13,646	0	0.00	147	0.103
	Jun.	0.08	207,360	0	647,616	39.34	0.16	14,654	0	0.00	135	0.095
	Jul.	0.57	1,576,688	0	2,159,651	44.80	0.33	27,516	0	0.00	119	0.083
	Aug.	5.62	15,052,608	0	8,000,000	57.00	0.88	87,472	9,184,742	3.43	142	0.099
	Sep.	0.42	1,088,640	0	8,000,000	57.00	0.88	85,624	1,001,168	0.39	139	0.097
	Oct.	5.82	15,588,288	0	8,000,000	57.00	0.88	97,944	15,502,654	5.79	159	0.111
	Nov.	0.58	1,503,360	1,642,822	7,762,594	56.62	0.85	81,723	0	0.00	137	0.096
	Dec.	0.13	348,192	2,446,080	5,582,983	53.15	0.60	66,618	0	0.00	159	0.111
1975	Jan.	0.99	2,651,616	3,204,305	4,953,675	52.17	0.57	80,560	0	0.00	203	0.142
	Feb.	1.99	4,814,208	3,661,964	6,035,360	53.87	0.65	113,697	0	0.00	250	0.175
	Mar.	1.36	3,642,624	945,338	8,000,000	57.00	0.88	159,544	618,949	0.23	259	0.181
	Apr.	1.43	3,706,560	0	8,000,000	57.00	0.88	141,680	3,547,016	1.37	230	0.161
	May	1.69	4,526,496	0	8,000,000	57.00	0.88	90,552	4,384,816	1.64	147	0.103
	Jun.	1.50	3,888,000	0	8,000,000	57.00	0.88	83,160	3,797,448	1.47	135	0.095
	Jul.	1.73	4,633,632	0	8,000,000	57.00	0.88	73,304	4,550,472	1.70	119	0.083
	Aug.	3.38	9,052,992	0	8,000,000	57.00	0.88	87,472	8,979,688	3.35	142	0.099
	Sep.	2.39	6,194,880	0	8,000,000	57.00	0.88	85,624	6,107,408	2.36	139	0.097
	Oct.	1.83	4,901,472	0	8,000,000	57.00	0.88	97,944	4,815,848	1.80	159	0.111
	Nov.	0.92	2,384,640	1,642,822	8,000,000	57.00	0.88	84,392	643,874	0.25	137	0.096
	Dec.	0.56	1,499,904	2,446,080	6,959,432	55.36	0.76	84,498	0	0.00	159	0.111

Data
2.3.2.1-2 ①

Appendix 6

TABLE-5 WATER BALANCE（水収支計算表）

(Irrigation Area: Rainy Season 1280ha, Dry Season 770ha.)

Year 年	Month 月	Inflow 流入量(1) (m³/sec)	Inflow 流入量(2) (m³/month)	Irr. Requirment 灌漑用水量 (m³/month)	Storage Cap. 貯水量 m³	Water level 貯水位 EL	Water Surface 貯水面積 Km²	Evap. 蒸発量 m³	Over Flow 越流流量 m³	Over Flow 越流水量 m³/sec	Evaporation 蒸発量 mm/month	Effec. Evap. 0.7 m/month
1976	Jan.	0.38	1,017,792	3,204,305	4,698,420	51.75	0.55	78,635	0	0.00	203	0.142
	Feb.	0.27	653,184	3,661,964	1,611,006	42.82	0.27	46,679	0	0.00	250	0.175
	Mar.	0.11	294,624	945,338	913,613	40.30	0.19	33,703	0	0.00	259	0.181
	Apr.	0.13	336,960	0	1,216,870	41.39	0.22	35,589	0	0.00	230	0.161
	May	3.82	10,231,488	0	8,000,000	57.00	0.88	90,552	3,412,769	1.27	147	0.103
	Jun.	2.50	6,480,000	0	8,000,000	57.00	0.88	83,160	6,389,448	2.47	135	0.095
	Jul.	3.76	10,070,784	0	8,000,000	57.00	0.88	73,304	9,987,624	3.73	119	0.083
	Aug.	3.61	9,669,024	0	8,000,000	57.00	0.88	87,472	9,595,720	3.58	142	0.099
	Sep.	5.07	13,141,440	0	8,000,000	57.00	0.88	85,624	13,053,968	5.04	139	0.097
	Oct.	2.10	5,624,640	0	8,000,000	57.00	0.88	97,944	5,539,016	2.07	159	0.111
	Nov.	1.69	4,380,480	1,642,822	8,000,000	57.00	0.88	84,392	2,639,714	1.02	137	0.096
	Dec.	1.32	3,535,488	2,446,080	8,000,000	57.00	0.88	97,944	1,005,016	0.38	159	0.111
1977	Jan.	1.00	2,678,400	3,204,305	7,376,151	56.01	0.81	114,656	0	0.00	203	0.142
	Feb.	0.94	2,274,048	3,661,964	5,873,579	53.62	0.63	110,378	0	0.00	250	0.175
	Mar.	0.79	2,115,936	945,338	6,933,799	55.30	0.76	136,884	0	0.00	259	0.181
	Apr.	0.79	2,047,680	0	8,000,000	57.00	0.88	141,680	844,595	0.33	230	0.161
	May	0.97	2,598,048	0	8,000,000	57.00	0.88	90,552	2,456,368	0.92	147	0.103
	Jun.	2.01	5,209,920	0	8,000,000	57.00	0.88	83,160	5,119,368	1.98	135	0.095
	Jul.	2.29	6,133,536	0	8,000,000	57.00	0.88	73,304	6,050,376	2.26	119	0.083
	Aug.	2.33	6,240,672	0	8,000,000	57.00	0.88	87,472	6,167,368	2.30	142	0.099
	Sep.	10.11	26,205,120	0	8,000,000	57.00	0.88	85,624	26,117,648	10.08	139	0.097
	Oct.	2.13	5,704,992	0	8,000,000	57.00	0.88	97,944	5,619,368	2.10	159	0.111
	Nov.	2.27	5,883,840	1,642,822	8,000,000	57.00	0.88	84,392	4,143,074	1.60	137	0.096
	Dec.	1.44	3,856,896	2,446,080	8,000,000	57.00	0.88	97,944	1,326,424	0.50	159	0.111
1978	Jan.	0.85	2,276,640	3,204,305	6,974,391	55.37	0.76	107,964	0	0.00	203	0.142
	Feb.	0.77	1,862,784	3,661,964	5,067,247	52.33	0.57	100,137	0	0.00	250	0.175
	Mar.	0.73	1,955,232	945,338	5,977,004	53.78	0.64	116,550	0	0.00	259	0.181
	Apr.	0.67	1,736,640	0	7,597,095	56.36	0.83	134,076	0	0.00	230	0.161
	May	0.73	1,955,232	0	8,000,000	57.00	0.88	90,552	1,418,251	0.53	147	0.103
	Jun.	1.49	3,852,080	0	8,000,000	57.00	0.88	83,160	3,771,528	1.45	135	0.095
	Jul.	2.58	6,910,272	0	8,000,000	57.00	0.88	73,304	6,827,112	2.55	119	0.083
	Aug.	7.73	20,704,032	0	8,000,000	57.00	0.88	87,472	20,630,728	7.70	142	0.099
	Sep.	3.41	8,838,720	0	8,000,000	57.00	0.88	85,624	8,751,248	3.38	139	0.097
	Oct.	1.87	5,008,608	0	8,000,000	57.00	0.88	97,944	4,922,984	1.84	159	0.111
	Nov.	0.98	2,540,160	1,642,822	8,000,000	57.00	0.88	84,392	799,394	0.31	137	0.096
	Dec.	0.58	1,553,472	2,446,080	7,023,000	55.45	0.77	85,197	0	0.00	159	0.111
1979	Jan.	0.69	1,848,096	3,204,305	5,581,594	53.15	0.60	85,044	0	0.00	203	0.142
	Feb.	0.66	1,596,672	3,661,964	3,431,258	49.39	0.48	83,602	0	0.00	250	0.175
	Mar.	0.61	1,633,824	945,338	4,036,142	50.69	0.52	94,196	0	0.00	259	0.181
	Apr.	0.63	1,632,960	0	5,574,907	53.14	0.60	96,300	0	0.00	230	0.161
	May	1.35	3,615,840	0	8,000,000	57.00	0.88	90,552	1,094,447	0.41	147	0.103
	Jun.	1.26	3,265,920	0	8,000,000	57.00	0.88	83,160	3,175,368	1.23	135	0.095
	Jul.	1.74	4,660,416	0	8,000,000	57.00	0.88	73,304	4,577,256	1.71	119	0.083
	Aug.	6.01	16,097,184	0	8,000,000	57.00	0.88	87,472	16,023,880	5.98	142	0.099
	Sep.	1.62	4,199,040	0	8,000,000	57.00	0.88	85,624	4,111,568	1.59	139	0.097
	Oct.	1.68	4,499,712	0	8,000,000	57.00	0.88	97,944	4,414,088	1.65	159	0.111
	Nov.	0.98	2,540,160	1,642,822	8,000,000	57.00	0.88	84,392	799,394	0.31	137	0.096
	Dec.	0.58	1,553,472	2,446,080	7,023,000	55.45	0.77	85,197	0	0.00	159	0.111

Data
2.3.2.1-2 ⑤

Appendix 6

Fig.1 Water Balance (Water Level)

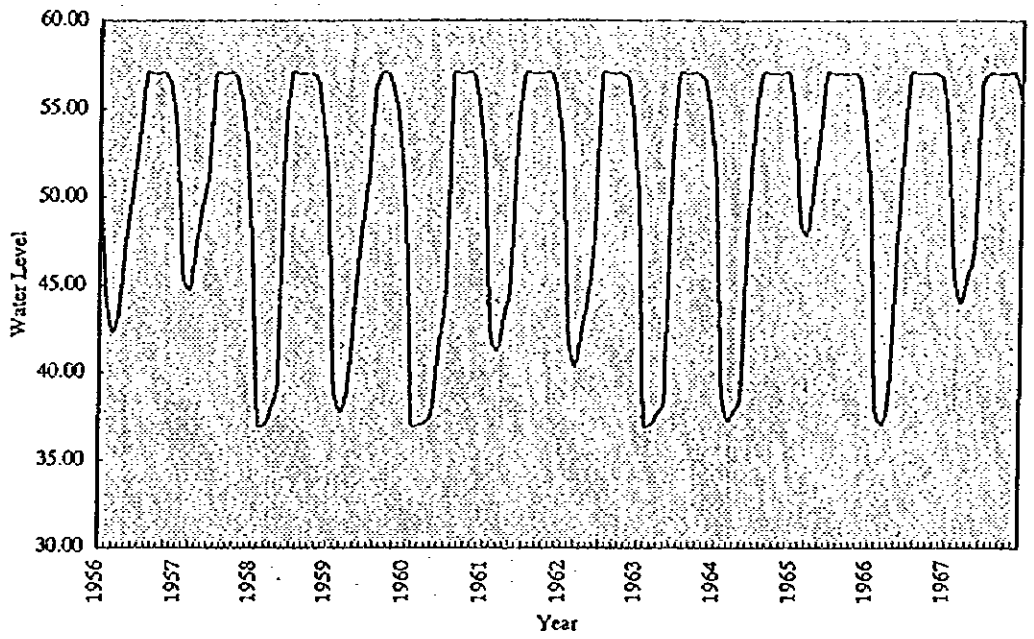
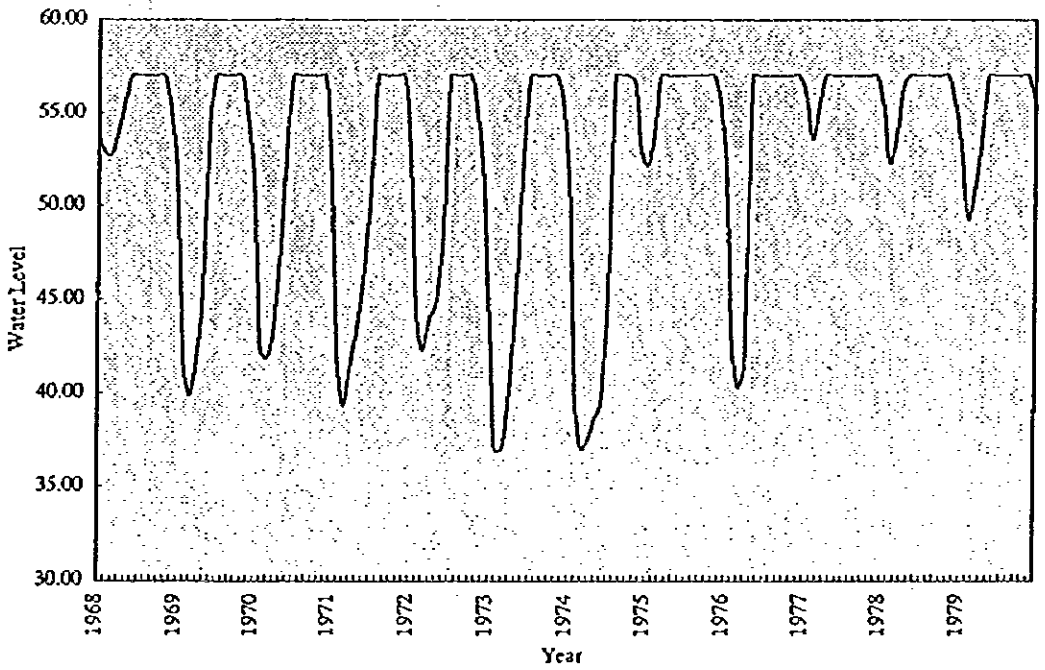
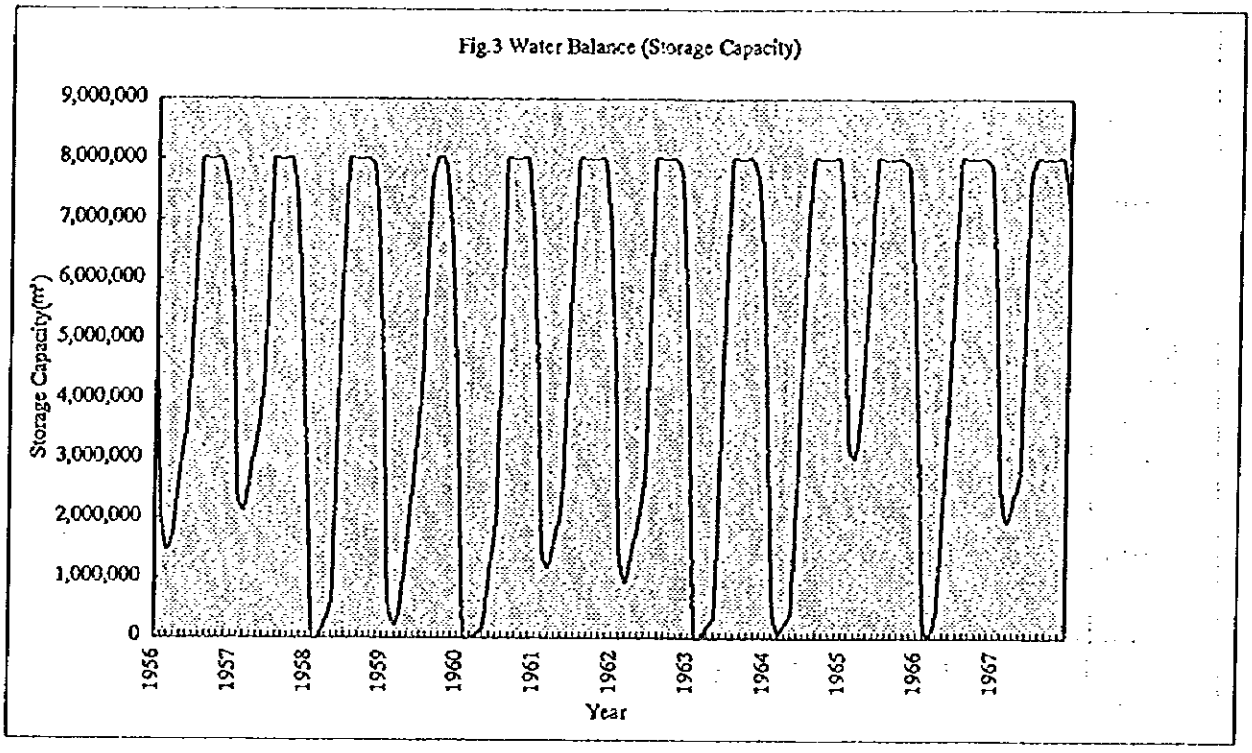


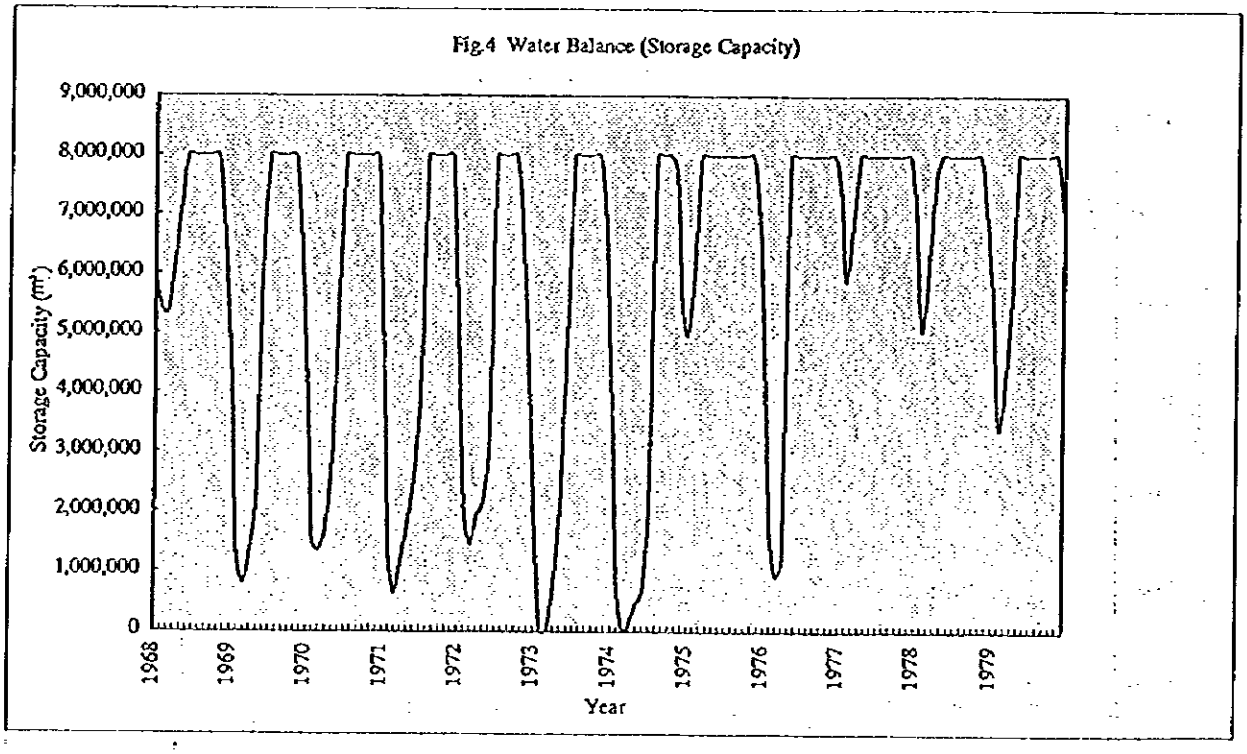
Fig.2 Water Balance (Water Level)



Data
2.3.2.1-2 ⑥

Appendix 6





Data
2.3.2.1-2⑦

Appendix 6

TABLE-6 WATER BALANCE（水収支計算表）
(Irrigation Area: Rainy Season 1280ha. Dry Season 900ha.)

Year 年	Month 月	Inflow 流入量(1) (m³/sec)	Inflow 流入量(2) (m³/month)	Irr. Requirment 灌漑用水量 (m³/month)	Storage Cap. 貯水量 m³	Water level 貯水位 EL	Water Surface 貯水面積 Km²	Evap. 蒸発量 m³	Over Flow 越流流量 m³	Over Flow 越流水量 m³/sec	Evaporation 蒸発量 mm/month	Effec. Evap. 0.7 m/month
1956	Jan.	0.21	562,464	3,738,356	4,824,105	51.95	0.56	79,547	0	0.00	203	0.142
	Feb.	0.19	459,648	4,272,291	931,918	40.37	0.19	32,904	0	0.00	250	0.175
	Mar.	0.15	401,760	1,102,895	197,880	37.71	0.10	18,662	0	0.00	259	0.181
	Apr.	0.16	414,720	0	593,937	39.14	0.15	23,964	0	0.00	230	0.161
	May	0.41	1,098,144	0	1,668,117	43.02	0.27	28,128	0	0.00	147	0.103
	Jun.	0.32	829,440	0	2,469,429	45.92	0.37	34,609	0	0.00	135	0.095
	Jul.	0.80	2,142,720	0	4,577,540	51.55	0.55	45,582	0	0.00	119	0.083
	Aug.	2.35	6,294,240	0	8,000,000	57.00	0.88	87,472	2,825,198	1.06	142	0.099
	Sep.	10.79	27,967,680	0	8,000,000	57.00	0.88	85,624	27,880,208	10.76	139	0.097
	Oct.	1.07	2,865,888	0	8,000,000	57.00	0.88	97,944	2,780,264	1.04	159	0.111
	Nov.	1.35	3,525,120	1,916,625	8,000,000	57.00	0.88	84,392	1,510,551	0.58	137	0.095
	Dec.	0.73	1,955,232	2,853,760	7,017,080	55.44	0.76	85,120	0	0.00	159	0.111
1957	Jan.	0.46	1,232,064	3,738,355	4,425,668	51.31	0.54	76,656	0	0.00	203	0.142
	Feb.	0.31	749,952	4,272,291	826,673	39.99	0.18	30,769	0	0.00	250	0.175
	Mar.	0.29	776,736	1,102,895	459,745	38.70	0.13	24,376	0	0.00	259	0.181
	Apr.	0.28	725,760	0	1,171,131	41.23	0.22	34,735	0	0.00	230	0.161
	May	0.25	669,600	0	1,805,995	43.52	0.29	29,773	0	0.00	147	0.103
	Jun.	0.42	1,088,640	0	2,864,862	47.35	0.41	38,941	0	0.00	135	0.095
	Jul.	10.30	27,587,520	0	8,000,000	57.00	0.88	73,304	22,413,441	8.37	119	0.083
	Aug.	3.25	8,704,800	0	8,000,000	57.00	0.88	87,472	8,631,495	3.22	142	0.099
	Sept.	1.95	5,054,400	0	8,000,000	57.00	0.88	85,624	4,966,928	1.92	139	0.097
	Oct.	0.96	2,571,264	0	8,000,000	57.00	0.88	97,944	2,485,640	0.93	159	0.111
	Nov.	0.33	855,360	1,916,625	6,840,791	55.16	0.74	71,360	0	0.00	137	0.095
	Dec.	0.23	616,032	2,853,760	4,531,702	51.48	0.54	60,643	0	0.00	159	0.111
1958	Jan.	0.17	455,328	3,738,355	1,188,031	41.29	0.22	30,936	0	0.00	203	0.142
	Feb.	0.17	411,264	4,272,291	0	37.00	0.08	14,000	0	0.00	250	0.175
	Mar.	0.15	401,760	1,102,895	0	37.00	0.08	14,504	0	0.00	259	0.181
	Apr.	0.11	285,120	0	270,616	37.98	0.11	17,930	0	0.00	230	0.161
	May	0.14	374,976	0	627,662	39.27	0.15	15,718	0	0.00	147	0.103
	Jun.	1.73	4,484,160	0	5,096,103	52.38	0.57	54,213	0	0.00	135	0.095
	Jul.	4.90	13,124,160	0	8,000,000	57.00	0.88	73,304	10,165,050	3.80	119	0.083
	Aug.	2.53	6,776,352	0	8,000,000	57.00	0.88	87,472	6,703,048	2.50	142	0.099
	Sept.	3.32	8,605,440	0	8,000,000	57.00	0.88	85,624	8,517,968	3.29	139	0.097
	Oct.	1.95	5,222,880	0	8,000,000	57.00	0.88	97,944	5,137,256	1.92	159	0.111
	Nov.	0.62	1,607,040	1,916,625	7,592,471	56.35	0.83	79,811	0	0.00	137	0.095
	Dec.	0.37	991,008	2,853,760	5,649,908	53.26	0.60	67,282	0	0.00	159	0.111
1959	Jan.	0.28	749,952	3,738,356	2,594,222	46.37	0.38	54,098	0	0.00	203	0.142
	Feb.	0.22	532,224	4,272,291	0	37.00	0.08	14,000	0	0.00	250	0.175
	Mar.	0.22	589,248	1,102,895	0	37.00	0.08	14,504	0	0.00	259	0.181
	Apr.	0.17	440,640	0	426,136	38.54	0.13	20,832	0	0.00	230	0.161
	May	0.45	1,205,280	0	1,610,584	42.82	0.27	27,442	0	0.00	147	0.103
	Jun.	0.46	1,192,320	0	2,775,461	47.02	0.40	37,952	0	0.00	135	0.095
	Jul.	0.53	1,419,552	0	4,157,052	50.89	0.53	43,793	0	0.00	119	0.083
	Aug.	1.17	3,133,728	0	7,246,987	55.80	0.79	78,698	0	0.00	142	0.099
	Sept.	2.02	5,235,840	0	8,000,000	57.00	0.88	85,624	4,404,129	1.70	139	0.097
	Oct.	0.53	1,419,552	0	8,000,000	57.00	0.88	97,944	1,333,928	0.50	159	0.111
	Nov.	0.37	959,040	1,916,625	6,944,471	55.32	0.76	72,526	0	0.00	137	0.095
	Dec.	0.31	830,304	2,853,760	4,848,489	51.99	0.56	62,444	0	0.00	159	0.111
1960	Jan.	0.25	669,600	3,738,356	1,717,289	43.20	0.28	39,654	0	0.00	203	0.142
	Feb.	0.14	338,688	4,272,291	0	37.00	0.08	14,000	0	0.00	250	0.175
	Mar.	0.06	160,704	1,102,895	0	37.00	0.08	14,504	0	0.00	259	0.181
	Apr.	0.02	51,840	0	37,336	37.13	0.08	13,577	0	0.00	230	0.161
	May	0.06	160,704	0	184,453	37.67	0.10	10,432	0	0.00	147	0.103
	Jun.	0.38	984,960	0	1,158,991	41.19	0.21	20,255	0	0.00	135	0.095
	Jul.	0.36	954,224	0	2,102,960	44.59	0.32	26,959	0	0.00	119	0.083
	Aug.	5.79	15,507,935	0	8,000,000	57.00	0.88	87,472	9,583,927	3.58	142	0.099
	Sept.	3.27	8,475,840	0	8,000,000	57.00	0.88	85,624	8,388,368	3.24	139	0.097
	Oct.	2.33	6,240,672	0	8,000,000	57.00	0.88	97,944	6,155,048	2.30	159	0.111
	Nov.	0.75	1,944,000	1,916,625	7,929,431	56.89	0.87	83,599	0	0.00	137	0.095
	Dec.	0.49	1,312,416	2,853,760	6,304,488	54.30	0.68	75,822	0	0.00	159	0.111

Data
2.3.2.1-2 (8)

Appendix 6

TABLE-7 WATER BALANCE（水収支計算表）

(Irrigation Area: Rainy Season 1280ha. Dry Season 900ha.)

Year 年	Month 月	Inflow 流入量(1) (m³/sec)	Inflow 流入量(2) (m³/month)	Irr. Requirment 灌漑用水量 (m³/month)	Storage Cap. 貯水量 m³	Water level 貯水位 EL	Water Surface 貯水面積 Km²	Evap. 蒸発量 m³	Over Flow 越流流量 m³	Over Flow 越流水量 m³/sec	Evaporation 蒸発量 mm/month	Effec. Evap. 0.7 m/month
1961	Jan.	0.35	937,440	3,738,355	3,427,749	49.38	0.48	67,827	0	0.00	203	0.142
	Feb.	0.31	749,952	4,272,291	0	37.00	0.08	14,000	0	0.00	250	0.175
	Mar.	0.27	723,168	1,102,895	0	37.00	0.08	14,504	0	0.00	259	0.181
	Apr.	0.22	570,240	0	555,736	39.01	0.14	23,251	0	0.00	230	0.161
	May	0.21	562,464	0	1,094,949	40.95	0.21	21,292	0	0.00	147	0.103
	Jun.	1.35	3,525,120	0	4,598,777	51.59	0.55	51,813	0	0.00	135	0.095
	Jul.	2.90	7,767,360	0	8,000,000	57.00	0.88	73,304	4,314,324	1.61	119	0.083
	Aug.	2.26	6,053,184	0	8,000,000	57.00	0.88	87,472	5,979,880	2.23	142	0.099
	Sept.	3.75	9,720,000	0	8,000,000	57.00	0.88	85,624	9,632,528	3.72	139	0.097
	Oct.	2.66	7,124,544	0	8,000,000	57.00	0.88	97,944	7,038,920	2.63	159	0.111
	Nov.	0.98	2,540,160	1,916,625	8,000,000	57.00	0.88	84,392	525,591	0.20	137	0.096
	Dec.	0.55	1,473,120	2,853,760	6,534,958	54.67	0.71	78,830	0	0.00	159	0.111
1962	Jan.	0.35	937,440	3,738,356	3,655,222	50.09	0.50	71,055	0	0.00	203	0.142
	Feb.	0.24	580,608	4,272,291	0	37.00	0.08	14,000	0	0.00	250	0.175
	Mar.	0.18	482,112	1,102,895	0	37.00	0.08	14,504	0	0.00	259	0.181
	Apr.	0.22	570,240	0	555,736	39.01	0.14	23,251	0	0.00	230	0.161
	May	0.21	562,464	0	1,094,949	40.95	0.21	21,292	0	0.00	147	0.103
	Jun.	0.36	933,120	0	2,006,777	44.25	0.31	29,542	0	0.00	135	0.095
	Jul.	5.12	13,713,408	0	8,000,000	57.00	0.88	73,304	7,690,643	2.87	119	0.083
	Aug.	2.34	6,267,456	0	8,000,000	57.00	0.88	87,472	6,194,152	2.31	142	0.099
	Sept.	3.15	8,164,800	0	8,000,000	57.00	0.88	85,624	8,077,328	3.12	139	0.097
	Oct.	1.25	3,348,000	0	8,000,000	57.00	0.88	97,944	3,262,376	1.22	159	0.111
	Nov.	0.60	1,555,200	1,916,625	7,540,631	56.27	0.83	79,228	0	0.00	137	0.096
	Dec.	0.28	749,952	2,853,760	5,357,595	52.80	0.59	65,337	0	0.00	159	0.111
1963	Jan.	0.18	482,112	3,738,355	2,035,013	44.35	0.32	44,903	0	0.00	203	0.142
	Feb.	0.18	435,456	4,272,291	0	37.00	0.08	14,000	0	0.00	250	0.175
	Mar.	0.12	321,408	1,102,895	0	37.00	0.08	14,504	0	0.00	259	0.181
	Apr.	0.08	207,360	0	192,656	37.70	0.10	16,479	0	0.00	230	0.161
	May	0.07	187,488	0	363,865	38.31	0.12	12,572	0	0.00	147	0.103
	Jun.	1.65	4,276,800	0	4,628,093	51.64	0.55	51,955	0	0.00	135	0.095
	Jul.	1.91	5,115,744	0	8,000,000	57.00	0.88	73,304	1,691,882	0.63	119	0.083
	Aug.	1.85	4,955,040	0	8,000,000	57.00	0.88	87,472	4,881,736	1.82	142	0.099
	Sept.	3.42	8,864,640	0	8,000,000	57.00	0.88	85,624	8,777,168	3.39	139	0.097
	Oct.	1.49	3,990,816	0	8,000,000	57.00	0.88	97,944	3,905,192	1.46	159	0.111
	Nov.	0.55	1,425,600	1,916,625	7,411,031	56.06	0.81	77,771	0	0.00	137	0.096
	Dec.	0.42	1,124,928	2,853,760	5,604,428	53.19	0.60	66,740	0	0.00	159	0.111
1964	Jan.	0.26	695,384	3,738,355	2,495,715	46.01	0.37	52,475	0	0.00	203	0.142
	Feb.	0.25	604,800	4,272,291	0	37.00	0.08	14,000	0	0.00	250	0.175
	Mar.	0.18	482,112	1,102,895	0	37.00	0.08	14,504	0	0.00	259	0.181
	Apr.	0.06	155,520	0	141,016	37.51	0.10	15,512	0	0.00	230	0.161
	May	0.08	214,272	0	339,776	38.23	0.12	12,285	0	0.00	147	0.103
	Jun.	1.03	2,669,760	0	2,997,252	47.82	0.43	40,391	0	0.00	135	0.095
	Jul.	1.27	3,401,568	0	6,358,429	54.39	0.69	57,274	0	0.00	119	0.083
	Aug.	5.03	13,472,352	0	8,000,000	57.00	0.88	87,472	11,773,506	4.40	142	0.099
	Sep.	2.87	7,439,040	0	8,000,000	57.00	0.88	85,624	7,351,568	2.84	139	0.097
	Oct.	3.54	9,481,536	0	8,000,000	57.00	0.88	97,944	9,395,912	3.51	159	0.111
	Nov.	1.06	2,747,520	1,916,625	8,000,000	57.00	0.88	84,392	732,951	0.28	137	0.095
	Dec.	1.00	2,678,400	2,853,760	7,740,248	56.59	0.85	94,555	0	0.00	159	0.111
1965	Jan.	0.52	1,392,768	3,738,356	5,300,105	52.70	0.58	83,001	0	0.00	203	0.142
	Feb.	0.37	895,104	4,272,291	1,839,917	43.64	0.29	51,322	0	0.00	250	0.175
	Mar.	0.30	803,520	1,102,895	1,489,220	42.38	0.25	45,800	0	0.00	259	0.181
	Apr.	0.39	1,010,880	0	2,454,300	45.86	0.36	58,682	0	0.00	230	0.161
	May	0.76	2,035,584	0	4,431,203	51.32	0.54	55,538	0	0.00	147	0.103
	Jun.	2.21	5,728,320	0	8,000,000	57.00	0.88	83,160	2,103,984	0.81	135	0.095
	Jul.	3.38	9,052,992	0	8,000,000	57.00	0.88	73,304	8,959,832	3.35	119	0.083
	Aug.	2.51	6,722,784	0	8,000,000	57.00	0.88	87,472	6,649,480	2.48	142	0.099
	Sep.	2.25	5,832,000	0	8,000,000	57.00	0.88	85,624	5,744,528	2.22	139	0.097
	Oct.	1.08	2,892,672	0	8,000,000	57.00	0.88	97,944	2,807,048	1.05	159	0.111
	Nov.	0.63	1,632,960	1,916,625	7,618,391	56.39	0.84	80,102	0	0.00	137	0.095
	Dec.	0.30	803,520	2,853,760	5,488,049	53.00	0.59	65,079	0	0.00	159	0.111

Data
2.3.2.1-2 ⑨

TABLE-8 WATER BALANCE (水収支計算表)

(Irrigation Area: Rainy Season 1280ha. Dry Season 900ha.)

Year 年	Month 月	Inflow 流入量(1) (m³/sec)	Inflow 流入量(2) (m³/month)	Irr. Requirment 灌漑用水量 (m3/month)	Storage Cap. 貯水量 m³	Water level 貯水位 EL	Water Surface 貯水面積 Km²	Evap. 蒸発量 m³	Over Flow 越流流量 m³	Over Flow 越流水量 m³/sec	Evaporation 蒸発量 mm/month	Effec. Evap. 0.7 m/month
1966	Jan.	0.21	562,464	3,738,356	2,246,077	45.11	0.34	48,363	0	0.00	203	0.142
	Feb.	0.20	501,120	4,272,291	0	37.00	0.08	14,000	0	0.00	250	0.175
	Mar.	0.28	749,952	1,102,895	0	37.00	0.08	14,504	0	0.00	259	0.181
	Apr.	0.18	466,560	0	452,056	38.63	0.13	21,316	0	0.00	230	0.161
	May	0.78	2,089,152	0	2,519,892	46.10	0.37	38,288	0	0.00	147	0.103
	Jun.	0.93	2,410,560	0	4,892,164	52.06	0.56	53,229	0	0.00	135	0.095
	Jul.	1.71	4,580,064	0	8,000,000	57.00	0.88	73,304	1,418,999	0.53	119	0.083
	Aug.	1.59	4,258,655	0	8,000,000	57.00	0.88	87,472	4,185,352	1.55	142	0.099
	Sep.	6.49	16,822,080	0	8,000,000	57.00	0.88	85,624	16,734,608	6.46	139	0.097
	Oct.	1.32	3,535,488	0	8,000,000	57.00	0.88	97,944	3,449,864	1.29	159	0.111
	Nov.	1.09	2,825,280	1,916,625	8,000,000	57.00	0.88	84,392	810,711	0.31	137	0.095
	Dec.	0.88	2,356,992	2,853,760	7,418,840	56.08	0.81	90,362	0	0.00	159	0.111
1967	Jan.	0.44	1,178,496	3,738,356	4,768,618	51.86	0.56	79,144	0	0.00	203	0.142
	Feb.	0.21	508,032	4,272,291	925,215	40.34	0.19	32,768	0	0.00	250	0.175
	Mar.	0.18	482,112	1,102,895	271,655	37.98	0.11	20,213	0	0.00	259	0.181
	Apr.	0.18	466,560	0	718,012	39.59	0.16	26,279	0	0.00	230	0.161
	May	0.16	428,544	0	1,120,276	41.05	0.21	21,594	0	0.00	147	0.103
	Jun.	1.90	4,924,800	0	6,023,482	53.86	0.65	61,265	0	0.00	135	0.095
	Jul.	2.40	6,428,160	0	8,000,000	57.00	0.88	73,304	4,390,378	1.64	119	0.083
	Aug.	3.90	10,445,760	0	8,000,000	57.00	0.88	87,472	10,372,455	3.87	142	0.099
	Sep.	1.78	4,613,760	0	8,000,000	57.00	0.88	85,624	4,526,288	1.75	139	0.097
	Oct.	3.02	8,088,768	0	8,000,000	57.00	0.88	97,944	8,003,144	2.99	159	0.111
	Nov.	1.18	3,058,560	1,916,625	8,000,000	57.00	0.88	84,392	1,043,991	0.40	137	0.095
	Dec.	0.62	1,660,608	2,853,760	6,722,456	54.97	0.73	81,276	0	0.00	159	0.111
1968	Jan.	0.78	2,089,152	3,738,356	4,991,976	52.21	0.57	80,765	0	0.00	203	0.142
	Feb.	1.34	3,241,728	4,272,291	3,680,648	50.45	0.51	89,533	0	0.00	250	0.175
	Mar.	0.36	964,224	1,102,895	3,652,445	50.08	0.50	90,643	0	0.00	259	0.181
	Apr.	0.34	881,280	0	4,443,082	51.34	0.54	86,994	0	0.00	230	0.161
	May	0.44	1,178,496	0	5,534,583	53.03	0.60	61,336	0	0.00	147	0.103
	Jun.	0.63	1,632,950	0	7,106,207	55.58	0.78	73,259	0	0.00	135	0.095
	Jul.	0.94	2,517,695	0	8,000,000	57.00	0.88	73,304	1,550,644	0.58	119	0.083
	Aug.	9.41	25,203,744	0	8,000,000	57.00	0.88	87,472	25,130,440	9.38	142	0.099
	Sep.	3.76	9,745,920	0	8,000,000	57.00	0.88	85,624	9,658,448	3.73	139	0.097
	Oct.	1.87	5,008,608	0	8,000,000	57.00	0.88	97,944	4,922,984	1.84	159	0.111
	Nov.	0.67	1,736,640	1,916,625	7,722,071	56.56	0.85	81,268	0	0.00	137	0.095
	Dec.	0.45	1,232,064	2,853,760	6,019,107	53.85	0.65	72,059	0	0.00	159	0.111
1969	Jan.	0.39	1,044,576	3,738,356	3,253,228	48.75	0.46	64,952	0	0.00	203	0.142
	Feb.	0.23	556,416	4,272,291	0	37.00	0.08	14,000	0	0.00	250	0.175
	Mar.	0.19	508,896	1,102,895	0	37.00	0.08	14,504	0	0.00	259	0.181
	Apr.	0.21	544,320	0	529,816	38.91	0.14	22,767	0	0.00	230	0.161
	May	0.37	991,008	0	1,498,057	42.41	0.25	26,100	0	0.00	147	0.103
	Jun.	1.65	4,276,800	0	5,748,757	53.42	0.62	58,221	0	0.00	135	0.095
	Jul.	7.42	19,873,728	0	8,000,000	57.00	0.88	73,304	17,564,263	6.55	119	0.083
	Aug.	3.61	9,669,024	0	8,000,000	57.00	0.88	87,472	9,595,720	3.58	142	0.099
	Sep.	2.60	6,739,200	0	8,000,000	57.00	0.88	85,624	6,651,728	2.57	139	0.097
	Oct.	1.42	3,803,328	0	8,000,000	57.00	0.88	97,944	3,717,704	1.39	159	0.111
	Nov.	0.72	1,866,240	1,916,625	7,851,671	56.76	0.86	82,725	0	0.00	137	0.096
	Dec.	0.40	1,071,360	2,853,760	5,986,546	53.80	0.64	71,674	0	0.00	159	0.111
1970	Jan.	0.36	964,224	3,738,356	3,140,739	48.34	0.44	63,100	0	0.00	203	0.142
	Feb.	0.42	1,016,064	4,272,291	0	37.00	0.08	14,000	0	0.00	250	0.175
	Mar.	0.31	830,304	1,102,895	0	37.00	0.08	14,504	0	0.00	259	0.181
	Apr.	0.16	414,720	0	400,216	38.45	0.13	20,349	0	0.00	230	0.161
	May	0.46	1,232,064	0	1,611,931	42.82	0.27	27,458	0	0.00	147	0.103
	Jun.	1.11	2,877,120	0	4,461,593	51.37	0.54	51,151	0	0.00	135	0.095
	Jul.	2.10	5,624,640	0	8,000,000	57.00	0.88	73,304	2,035,082	0.76	119	0.083
	Aug.	3.85	10,338,624	0	8,000,000	57.00	0.88	87,472	10,265,320	3.83	142	0.099
	Sep.	5.87	15,215,040	0	8,000,000	57.00	0.88	85,624	15,127,568	5.64	139	0.097
	Oct.	2.15	5,785,344	0	8,000,000	57.00	0.88	97,944	5,699,720	2.13	159	0.111
	Nov.	1.20	3,110,400	1,916,625	8,000,000	57.00	0.88	84,392	1,095,831	0.42	137	0.095
	Dec.	0.98	2,624,832	2,853,760	7,685,680	56.50	0.84	93,856	0	0.00	159	0.111

Data
2.3.2.1-2 (10)

Appendix 6

TABLE-9 WATER BALANCE (水収支計算表)

(Irrigation Area: Rainy Season 1280ha. Dry Season 900ha.)

Year 年	Month 月	Inflow 流入量(1) (m³/sec)	Inflow 流入量(2) (m³/month)	Irr. Requirment 灌漑用水量 (m³/month)	Storage Cap. 貯水量 m³	Water level 貯水位 EL	Water Surface 貯水面積 Km²	Evap. 蒸発量 m³	Over Flow 越流流量 m³	Over Flow 越流水量 m³/sec	Evaporation 蒸発量 mm/month	Effec. Evap. 0.7 m/month
1971	Jan.	0.08	214,272	3,738,356	4,068,740	50.75	0.52	74,065	0	0.00	203	0.142
	Feb.	0.07	169,344	4,272,291	0	37.00	0.08	14,000	0	0.00	250	0.175
	Mar.	0.11	294,624	1,102,895	0	37.00	0.08	14,504	0	0.00	259	0.181
	Apr.	0.21	544,320	0	529,816	38.91	0.14	22,767	0	0.00	230	0.161
	May	0.23	615,032	0	1,123,081	41.05	0.21	21,627	0	0.00	147	0.103
	Jun.	0.30	777,600	0	1,879,053	43.79	0.30	28,143	0	0.00	135	0.095
	Jul.	0.59	1,580,255	0	3,431,167	49.39	0.48	39,794	0	0.00	119	0.083
	Aug.	2.69	7,204,895	0	8,000,000	57.00	0.88	87,472	2,596,269	0.97	142	0.099
	Sep.	0.62	1,607,040	0	8,000,000	57.00	0.88	85,624	1,519,568	0.59	139	0.097
	Oct.	2.13	5,704,992	0	8,000,000	57.00	0.88	97,944	5,619,358	2.10	159	0.111
	Nov.	3.45	8,968,320	1,916,625	8,000,000	57.00	0.88	84,392	6,953,751	2.68	137	0.096
	Dec.	0.95	2,571,264	2,853,760	7,633,112	56.42	0.84	93,157	0	0.00	159	0.111
1972	Jan.	0.21	562,464	3,738,356	4,364,062	51.22	0.54	76,208	0	0.00	203	0.142
	Feb.	0.18	435,456	4,272,291	451,019	38.63	0.13	23,149	0	0.00	250	0.175
	Mar.	0.19	508,896	1,102,895	0	37.00	0.08	14,504	0	0.00	259	0.181
	Apr.	0.20	518,400	0	503,896	38.82	0.14	22,284	0	0.00	230	0.161
	May	0.09	241,055	0	722,668	39.61	0.16	16,852	0	0.00	147	0.103
	Jun.	0.40	1,036,800	0	1,742,617	43.29	0.28	26,648	0	0.00	135	0.095
	Jul.	10.56	28,283,904	0	8,000,000	57.00	0.88	73,304	21,999,873	8.21	119	0.083
	Aug.	2.92	7,820,928	0	8,000,000	57.00	0.88	87,472	7,747,624	2.89	142	0.099
	Sep.	0.17	440,640	0	8,000,000	57.00	0.88	85,624	353,168	0.14	139	0.097
	Oct.	0.25	669,600	0	8,000,000	57.00	0.88	97,944	583,976	0.22	159	0.111
	Nov.	0.21	544,320	1,916,625	6,529,751	54.66	0.71	67,854	0	0.00	137	0.095
	Dec.	0.17	455,328	2,853,760	4,063,455	50.74	0.52	57,952	0	0.00	159	0.111
1973	Jan.	0.17	455,328	3,738,356	722,445	39.61	0.15	23,267	0	0.00	203	0.142
	Feb.	0.42	1,016,064	4,272,291	0	37.00	0.08	14,000	0	0.00	250	0.175
	Mar.	0.31	830,304	1,102,895	0	37.00	0.08	14,504	0	0.00	259	0.181
	Apr.	0.28	725,760	0	711,256	39.57	0.16	26,153	0	0.00	230	0.161
	May	0.55	1,499,904	0	2,185,007	44.89	0.33	34,293	0	0.00	147	0.103
	Jun.	1.08	2,799,360	0	4,950,073	52.15	0.57	53,508	0	0.00	135	0.095
	Jul.	2.93	7,847,712	0	8,000,000	57.00	0.88	73,304	4,744,277	1.77	119	0.083
	Aug.	3.61	9,669,024	0	8,000,000	57.00	0.88	87,472	9,595,720	3.58	142	0.099
	Sep.	3.41	8,838,720	0	8,000,000	57.00	0.88	85,624	8,751,248	3.38	139	0.097
	Oct.	1.87	5,008,608	0	8,000,000	57.00	0.88	97,944	4,922,984	1.84	159	0.111
	Nov.	0.93	2,540,160	1,916,625	8,000,000	57.00	0.88	84,392	525,591	0.20	137	0.096
	Dec.	0.58	1,553,472	2,853,760	6,615,320	54.80	0.72	79,878	0	0.00	159	0.111
1974	Jan.	0.15	401,760	3,738,356	3,198,846	48.55	0.45	64,057	0	0.00	203	0.142
	Feb.	0.13	314,496	4,272,291	0	37.00	0.08	14,000	0	0.00	250	0.175
	Mar.	0.10	267,840	1,102,895	0	37.00	0.08	14,504	0	0.00	259	0.181
	Apr.	0.06	155,520	0	141,016	37.51	0.10	15,512	0	0.00	230	0.161
	May	0.12	321,408	0	446,912	38.61	0.13	13,562	0	0.00	147	0.103
	Jun.	0.08	207,360	0	640,710	39.31	0.15	14,578	0	0.00	135	0.095
	Jul.	0.57	1,526,688	0	2,152,820	44.77	0.33	27,451	0	0.00	119	0.083
	Aug.	5.62	15,052,608	0	8,000,000	57.00	0.88	87,472	9,177,977	3.43	142	0.099
	Sep.	0.42	1,088,640	0	8,000,000	57.00	0.88	85,624	1,001,168	0.39	139	0.097
	Oct.	5.82	15,588,288	0	8,000,000	57.00	0.88	97,944	15,502,654	5.79	159	0.111
	Nov.	0.58	1,503,360	1,916,625	7,488,791	56.19	0.82	78,645	0	0.00	137	0.096
	Dec.	0.13	348,192	2,853,760	4,904,577	52.08	0.56	62,762	0	0.00	159	0.111
1975	Jan.	0.99	2,651,616	3,738,356	3,755,075	50.25	0.51	71,789	0	0.00	203	0.142
	Feb.	1.99	4,814,208	4,272,291	4,225,202	50.99	0.53	92,612	0	0.00	250	0.175
	Mar.	1.35	3,642,624	1,102,895	6,672,320	54.89	0.72	131,327	0	0.00	259	0.181
	Apr.	1.43	3,706,560	0	8,000,000	57.00	0.88	141,680	2,247,553	0.87	230	0.161
	May	1.69	4,526,496	0	8,000,000	57.00	0.88	90,552	4,384,816	1.64	147	0.103
	Jun.	1.50	3,888,000	0	8,000,000	57.00	0.88	83,160	3,797,448	1.47	135	0.095
	Jul.	1.73	4,633,632	0	8,000,000	57.00	0.88	73,304	4,550,472	1.70	119	0.083
	Aug.	3.38	9,052,992	0	8,000,000	57.00	0.88	87,472	8,979,688	3.35	142	0.099
	Sep.	2.39	6,193,880	0	8,000,000	57.00	0.88	85,624	6,107,408	2.36	139	0.097
	Oct.	1.83	4,901,472	0	8,000,000	57.00	0.88	97,944	4,815,848	1.80	159	0.111
	Nov.	0.92	2,384,640	1,916,625	8,000,000	57.00	0.88	84,392	370,071	0.14	137	0.096
	Dec.	0.56	1,499,904	2,853,760	6,561,752	54.71	0.71	79,179	0	0.00	159	0.111

Data
2.3.2.1-2 (11)

Appendix 6

TABLE-10 WATER BALANCE (水収支計算表)

(Irrigation Area: Rainy Season 1280ha, Dry Season 900ha.)

Year 年	Month 月	Inflow 流入量(1) (m³/sec)	Inflow 流入量(2) (m³/month)	Irr. Requirment 灌漑用水量 (m³/month)	Storage Cap. 貯水量 m³	Water level 貯水位 EL	Water Surface 貯水面積 Km²	Evap. 蒸発量 m³	Over Flow 越流流量 m³	Over Flow 越流水量 m³/sec	Evaporation 蒸発量 mm/month	Effec. Evap. 0.7 m/month
1976	Jan.	0.38	1,017,792	3,738,356	3,762,009	50.26	0.51	71,840	0	0.00	203	0.142
	Feb.	0.27	653,184	4,272,291	71,062	37.26	0.09	15,441	0	0.00	250	0.175
	Mar.	0.11	294,624	1,102,895	0	37.00	0.08	14,504	0	0.00	259	0.181
	Apr.	0.13	335,960	0	322,456	38.16	0.12	18,898	0	0.00	230	0.151
	May	3.82	10,231,488	0	8,000,000	57.00	0.88	90,552	2,535,046	0.95	147	0.103
	Jun.	2.50	6,480,000	0	8,000,000	57.00	0.88	83,160	6,389,448	2.47	135	0.095
	Jul.	3.76	10,070,784	0	8,000,000	57.00	0.88	73,304	9,987,624	3.73	119	0.083
	Aug.	3.61	9,669,024	0	8,000,000	57.00	0.88	87,472	9,595,720	3.58	142	0.099
	Sep.	5.07	13,141,440	0	8,000,000	57.00	0.88	85,624	13,053,968	5.04	139	0.097
	Oct.	2.10	5,624,640	0	8,000,000	57.00	0.88	97,944	5,539,016	2.07	159	0.111
	Nov.	1.69	4,380,480	1,916,625	8,000,000	57.00	0.88	84,392	2,365,911	0.91	137	0.095
	Dec.	1.32	3,535,488	2,853,760	8,000,000	57.00	0.88	97,944	597,336	0.22	159	0.111
1977	Jan.	1.00	2,678,400	3,738,356	6,842,100	55.16	0.74	105,760	0	0.00	203	0.142
	Feb.	0.94	2,274,048	4,272,291	4,738,097	51.81	0.56	97,195	0	0.00	250	0.175
	Mar.	0.79	2,115,936	1,102,895	5,653,943	53.27	0.60	109,684	0	0.00	259	0.181
	Apr.	0.79	2,047,680	0	7,591,939	56.35	0.83	133,979	0	0.00	230	0.151
	May	0.97	2,598,048	0	8,000,000	57.00	0.88	90,552	2,056,009	0.77	147	0.103
	Jun.	2.01	5,209,920	0	8,000,000	57.00	0.88	83,160	5,119,368	1.98	135	0.095
	Jul.	2.29	6,133,536	0	8,000,000	57.00	0.88	73,304	6,050,376	2.26	119	0.083
	Aug.	2.33	6,240,672	0	8,000,000	57.00	0.88	87,472	6,167,368	2.30	142	0.099
	Sep.	10.11	26,205,120	0	8,000,000	57.00	0.88	85,624	26,117,648	10.08	139	0.097
	Oct.	2.13	5,704,992	0	8,000,000	57.00	0.88	97,944	5,619,368	2.10	159	0.111
	Nov.	2.27	5,883,840	1,916,625	8,000,000	57.00	0.88	84,392	3,869,271	1.49	137	0.095
	Dec.	1.44	3,856,896	2,853,760	8,000,000	57.00	0.88	97,944	918,744	0.34	159	0.111
1978	Jan.	0.85	2,276,640	3,738,356	6,440,340	54.52	0.70	99,068	0	0.00	203	0.142
	Feb.	0.77	1,862,784	4,272,291	3,931,765	50.53	0.51	89,990	0	0.00	250	0.175
	Mar.	0.73	1,955,232	1,102,895	4,694,113	51.74	0.55	100,287	0	0.00	259	0.181
	Apr.	0.67	1,736,640	0	6,330,466	54.34	0.68	110,171	0	0.00	230	0.151
	May	0.73	1,955,232	0	8,000,000	57.00	0.88	90,552	175,527	0.07	147	0.103
	Jun.	1.49	3,862,080	0	8,000,000	57.00	0.88	83,160	3,771,528	1.46	135	0.095
	Jul.	2.58	6,910,272	0	8,000,000	57.00	0.88	73,304	6,827,112	2.55	119	0.083
	Aug.	7.73	20,704,032	0	8,000,000	57.00	0.88	87,472	20,630,728	7.70	142	0.099
	Sep.	3.41	8,838,720	0	8,000,000	57.00	0.88	85,624	8,751,248	3.38	139	0.097
	Oct.	1.87	5,008,608	0	8,000,000	57.00	0.88	97,944	4,922,984	1.84	159	0.111
	Nov.	0.98	2,540,160	1,916,625	8,000,000	57.00	0.88	84,392	525,591	0.20	137	0.095
	Dec.	0.58	1,553,472	2,853,760	6,615,320	54.80	0.72	79,878	0	0.00	159	0.111
1979	Jan.	0.69	1,848,096	3,738,356	4,645,182	51.66	0.55	78,248	0	0.00	203	0.142
	Feb.	0.66	1,596,672	4,272,291	1,891,314	43.83	0.30	52,365	0	0.00	250	0.175
	Mar.	0.61	1,633,824	1,102,895	2,369,879	45.56	0.35	64,307	0	0.00	259	0.181
	Apr.	0.63	1,632,960	0	3,938,532	50.54	0.51	82,846	0	0.00	230	0.151
	May	1.35	3,615,840	0	7,471,526	55.16	0.82	84,177	0	0.00	147	0.103
	Jun.	1.26	3,265,920	0	8,000,000	57.00	0.88	83,160	2,653,259	1.02	135	0.095
	Jul.	1.74	4,660,416	0	8,000,000	57.00	0.88	73,304	4,577,256	1.71	119	0.083
	Aug.	6.01	16,097,184	0	8,000,000	57.00	0.88	87,472	16,023,880	5.98	142	0.099
	Sep.	1.62	4,199,040	0	8,000,000	57.00	0.88	85,624	4,111,568	1.59	139	0.097
	Oct.	1.68	4,499,712	0	8,000,000	57.00	0.88	97,944	4,414,088	1.65	159	0.111
	Nov.	0.98	2,540,160	1,916,625	8,000,000	57.00	0.88	84,392	525,591	0.20	137	0.095
	Dec.	0.58	1,553,472	2,853,760	6,615,320	54.80	0.72	79,878	0	0.00	159	0.111

Appendix 6

Data.

2.3.2.1~2 (12)

Fig. 5 Water Balance (Water Level)

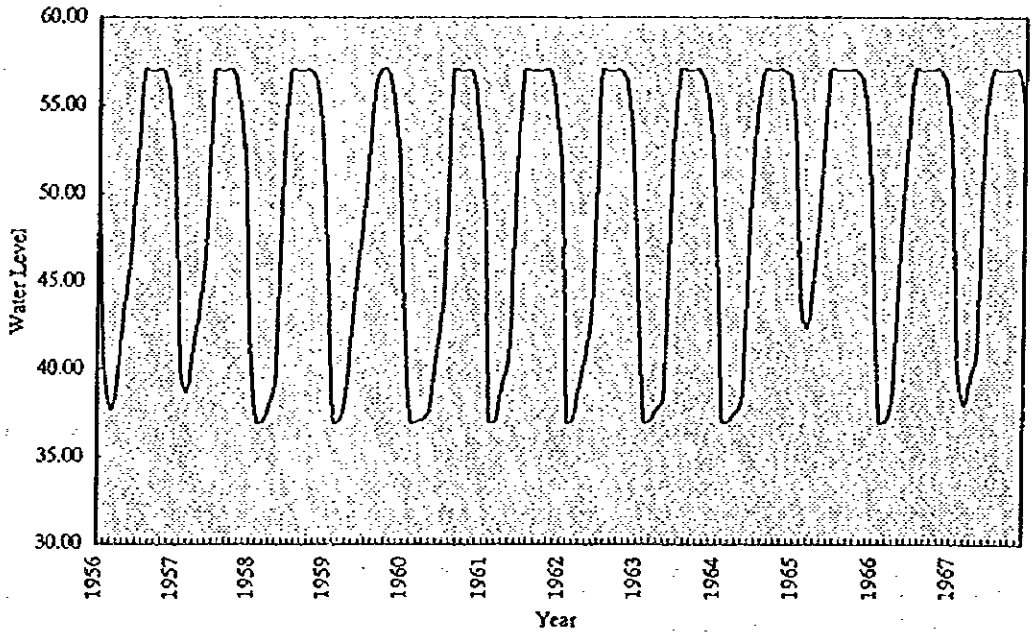
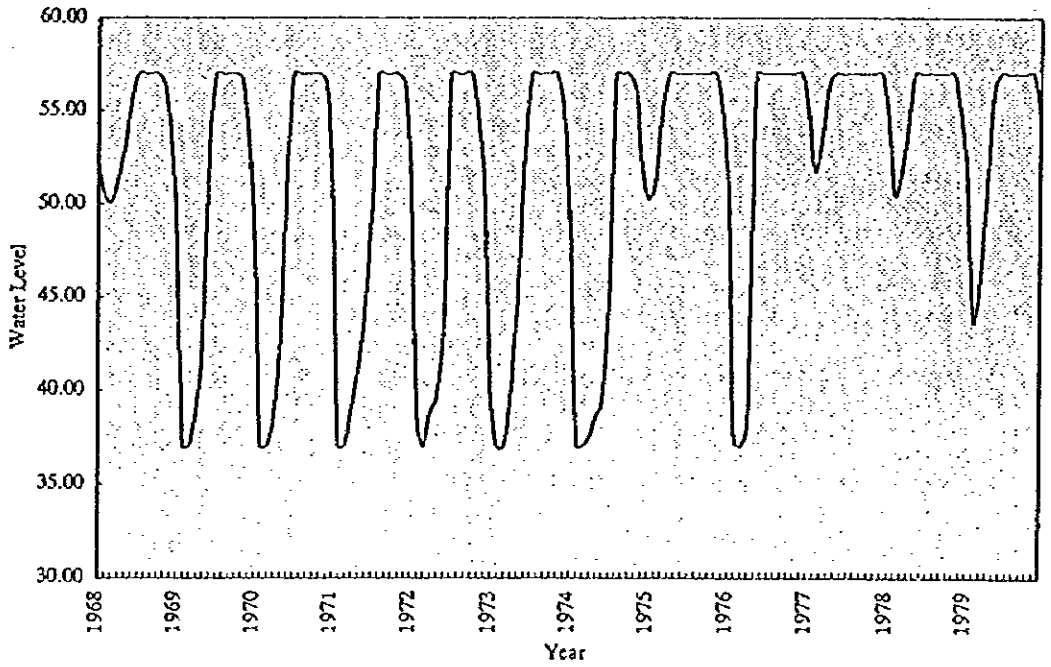


Fig. 6 Water Balance (Water Level)



Data
2.3.2.1-2(13)

Appendix 6

Fig. 7 Water Balance (Storage Capacity)

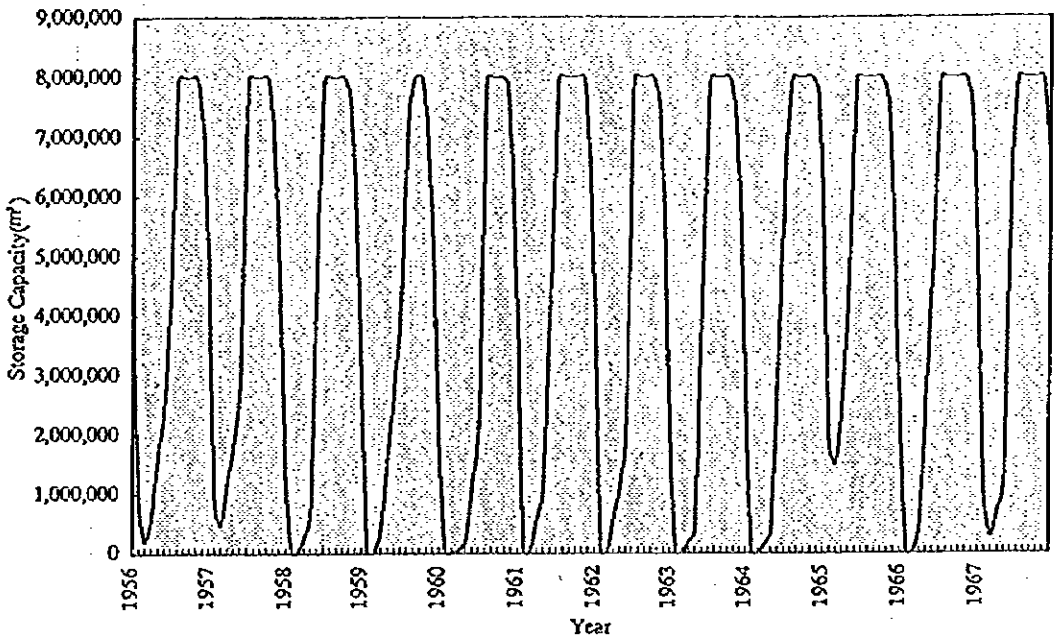
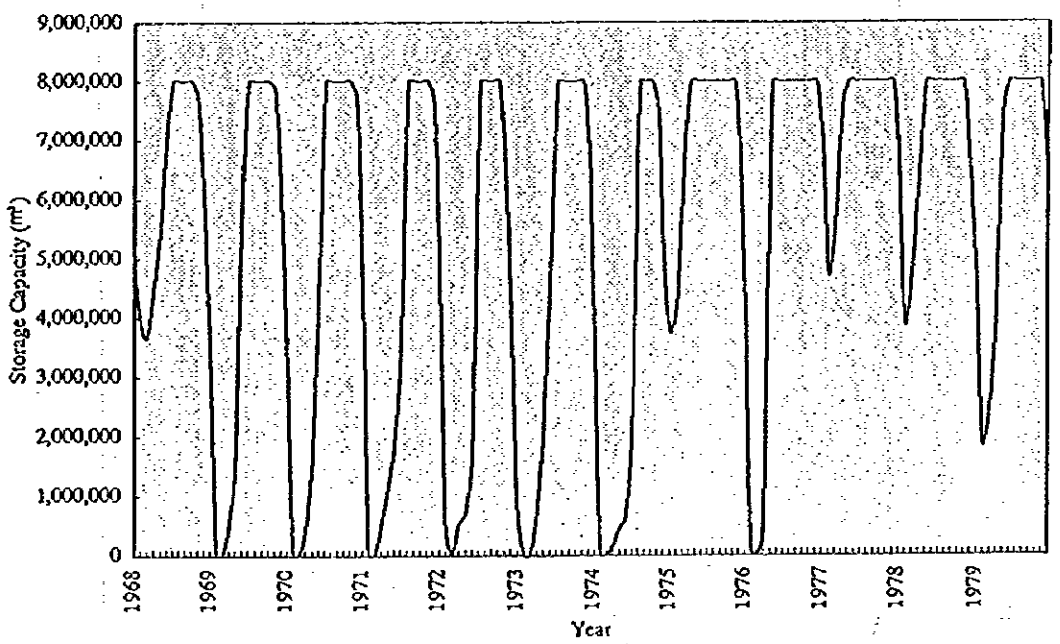


Fig. 8 Water Balance (Storage Capacity)



Data
2, 3, 2, 1 - 2 (14)

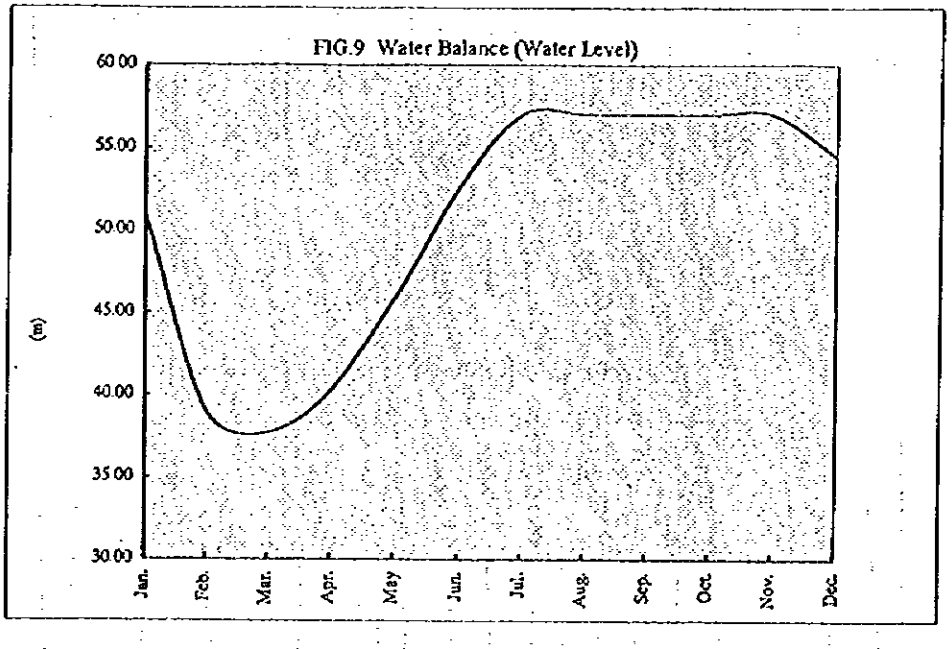
Appendix 6

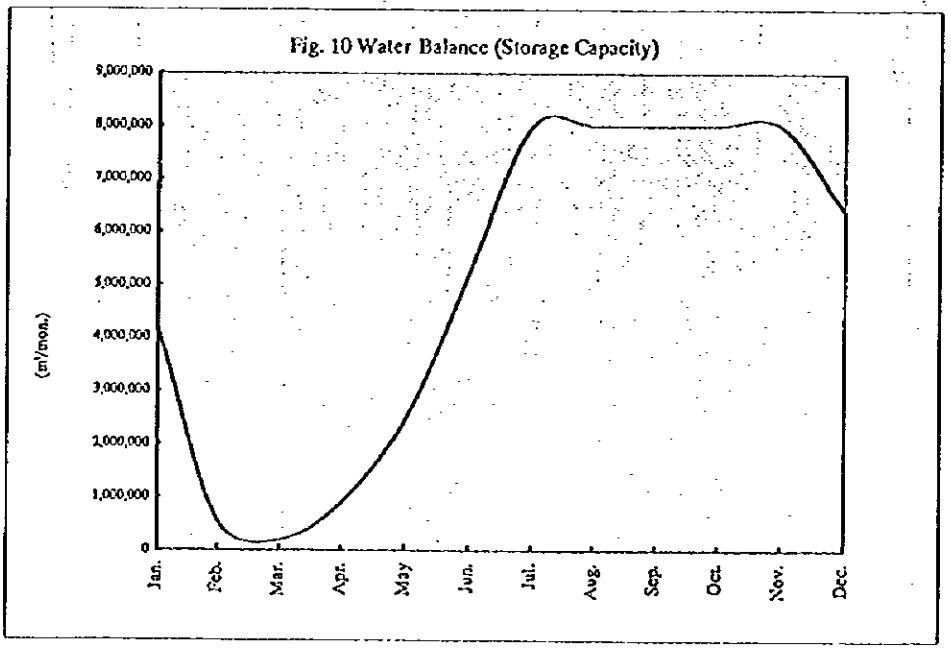
TABLE-11 WATER BALANCE OF AVERAGE YEAR (平均年の水収支計算表)

(Irrigation Area; Rainy Season 1280ha. Dry Season 960ha.)

Month	Runc off Ave.	Volume of Mon.	Water Use of Mon.	Vol. of Reserver	Water Level	Water Surface	Vol. of Evapo.	Vol. of Spill	Vol. of Spill
	(m^3/sec)	(m^3/mon.)	(m^3/mon.)	(m^3/mon.)	(m)	(km^2)	(m^3/mon.)	(m^3/mon.)	(m^3/sec.)
Jan.	0.45	1,205,280	4,005,382	4,159,898	50.95	0.53	75,017	0	0.00
Feb.	0.42	1,016,064	4,577,455	563,490	39.03	0.15	25,430	0	0.00
Mar.	0.31	830,304	1,181,673	186,691	37.67	0.10	18,427	0	0.00
Apr.	0.28	725,760	0	894,024	40.23	0.18	29,564	0	0.00
May	0.59	1,580,256	0	2,444,716	45.83	0.36	37,391	0	0.00
Jun.	1.08	2,799,360	0	5,206,685	52.55	0.58	54,747	0	0.00
Jul.	2.93	7,847,712	0	8,000,000	57.00	0.88	73,304	4,999,650	1.87
Aug.	3.61	9,669,024	0	8,000,000	57.00	0.88	87,472	9,595,720	3.58
Sep.	3.41	8,838,720	0	8,000,000	57.00	0.88	85,624	8,751,248	3.38
Oct.	1.81	4,847,904	0	8,000,000	57.00	0.88	97,944	4,762,280	1.78
Nov.	0.98	2,540,160	2,053,527	8,000,000	57.00	0.88	84,392	388,659	0.15
Dec.	0.58	1,553,472	3,057,600	6,411,480	54.47	0.69	77,218	0	0.00

(1956-1979)





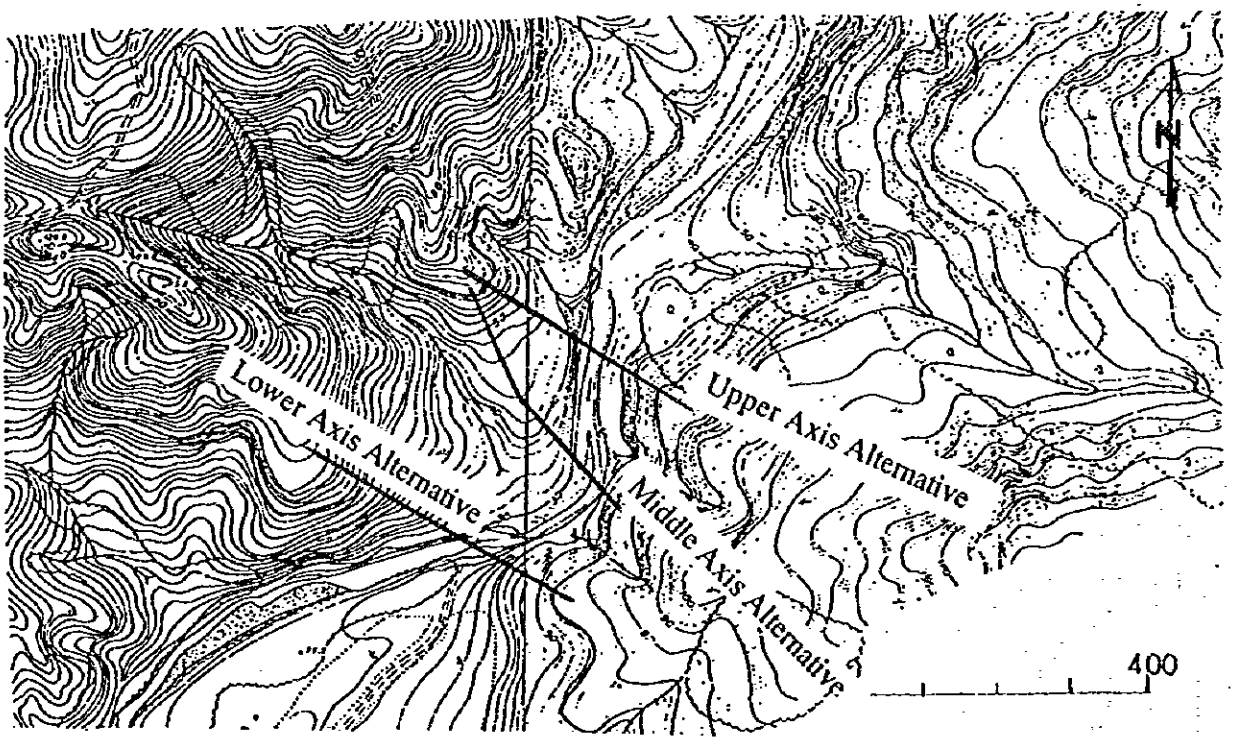
Data

2.3.2.1-2 (15)

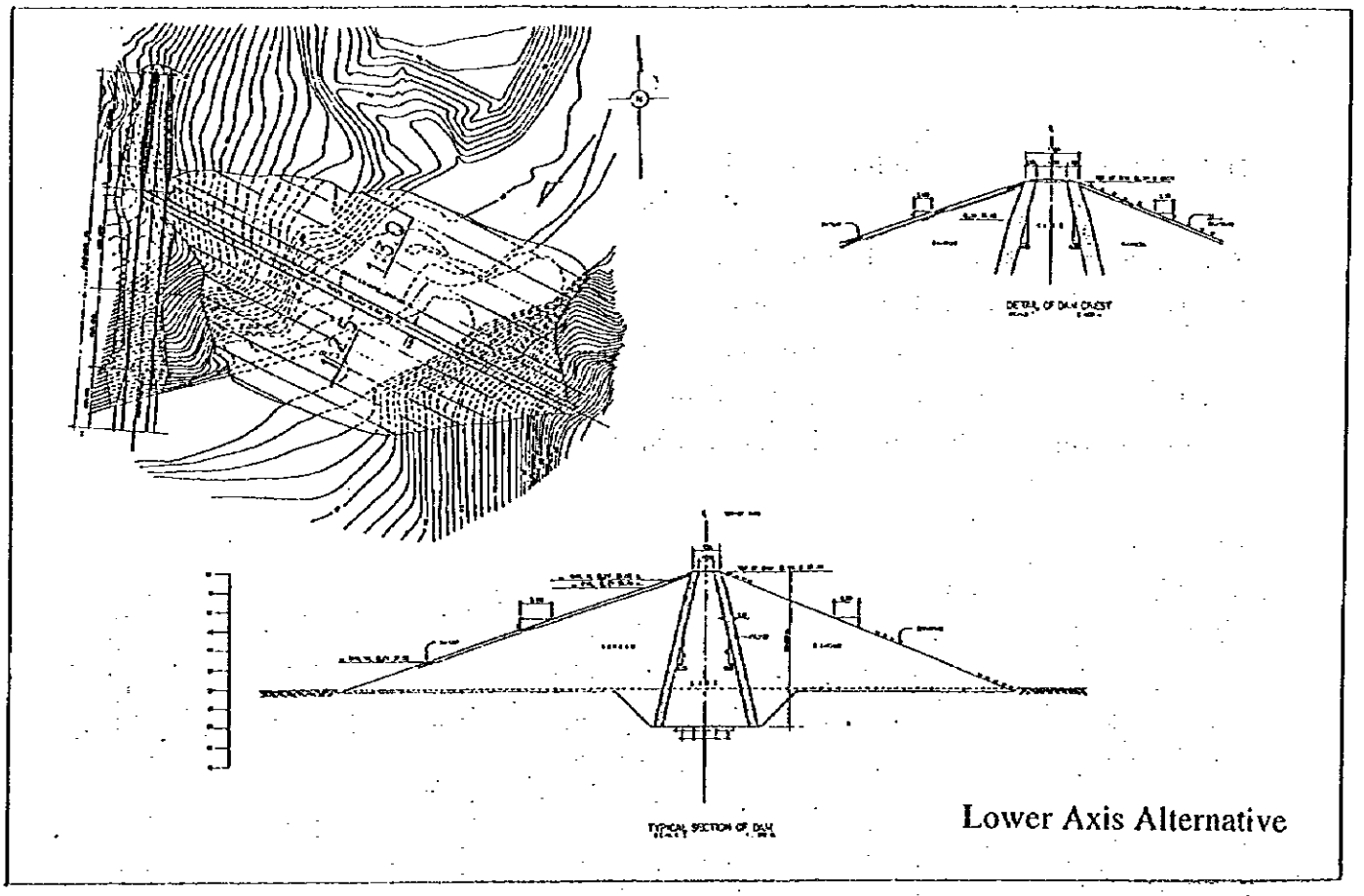
Appendix 6

Data 2.3.2.2-1 Selection of Dam Axis

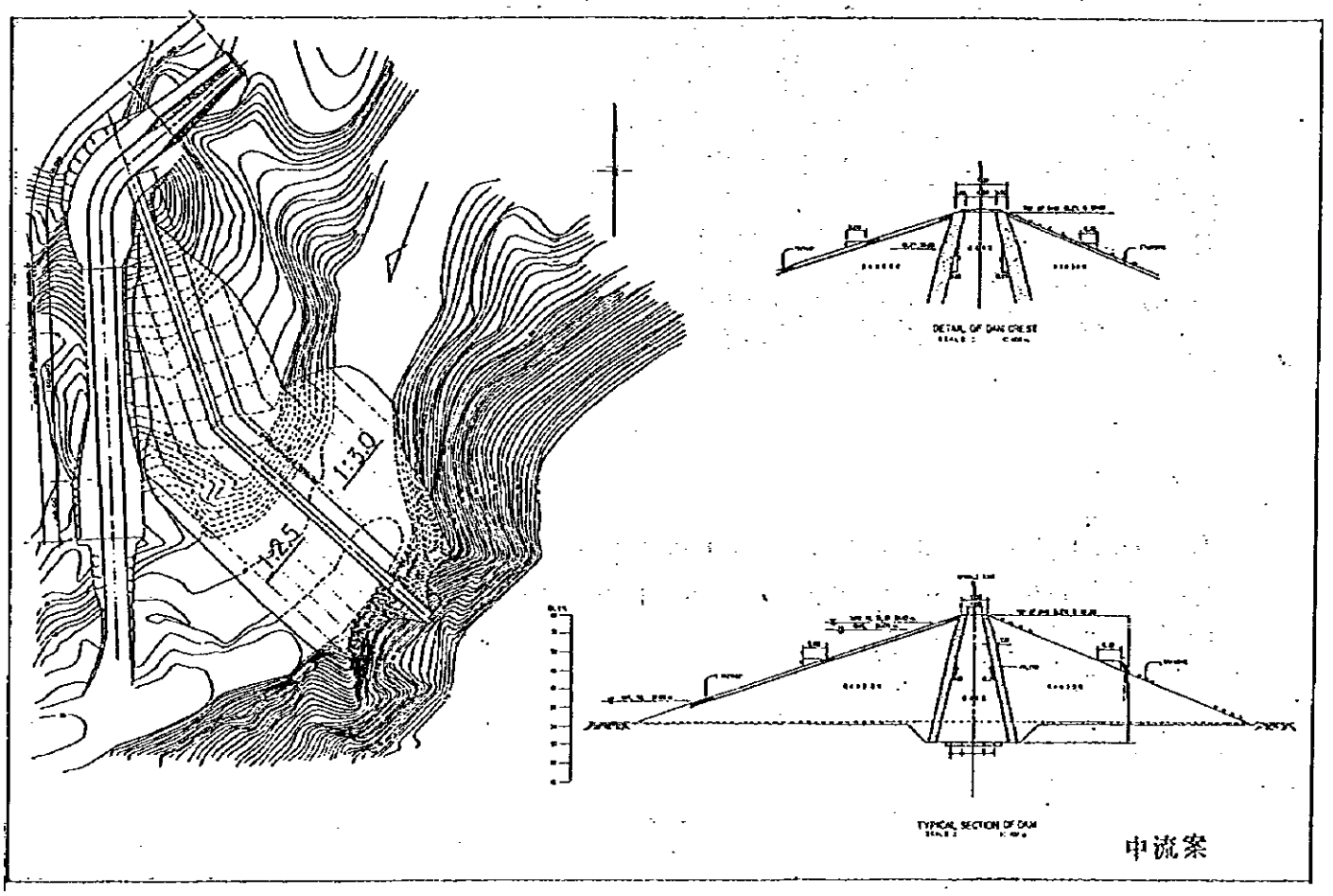
The study of dam axis is to be carried out among 3 alternatives (upper, middle, and lower) in the river stretch of 300 - 400 m located at the outlet of the San felipe river valley. The alternative study is to be based on the topography, geology, impounding effect per dam volume, economic advantage, layout of structures, construction methods and so on. The locations of three alternative axises are shown in the figures below.



The general plan and standard section(s) of dam at alternative axis site are shown respectively in the following two pages. The upstream side alternative was selected as a result of the alternative study.



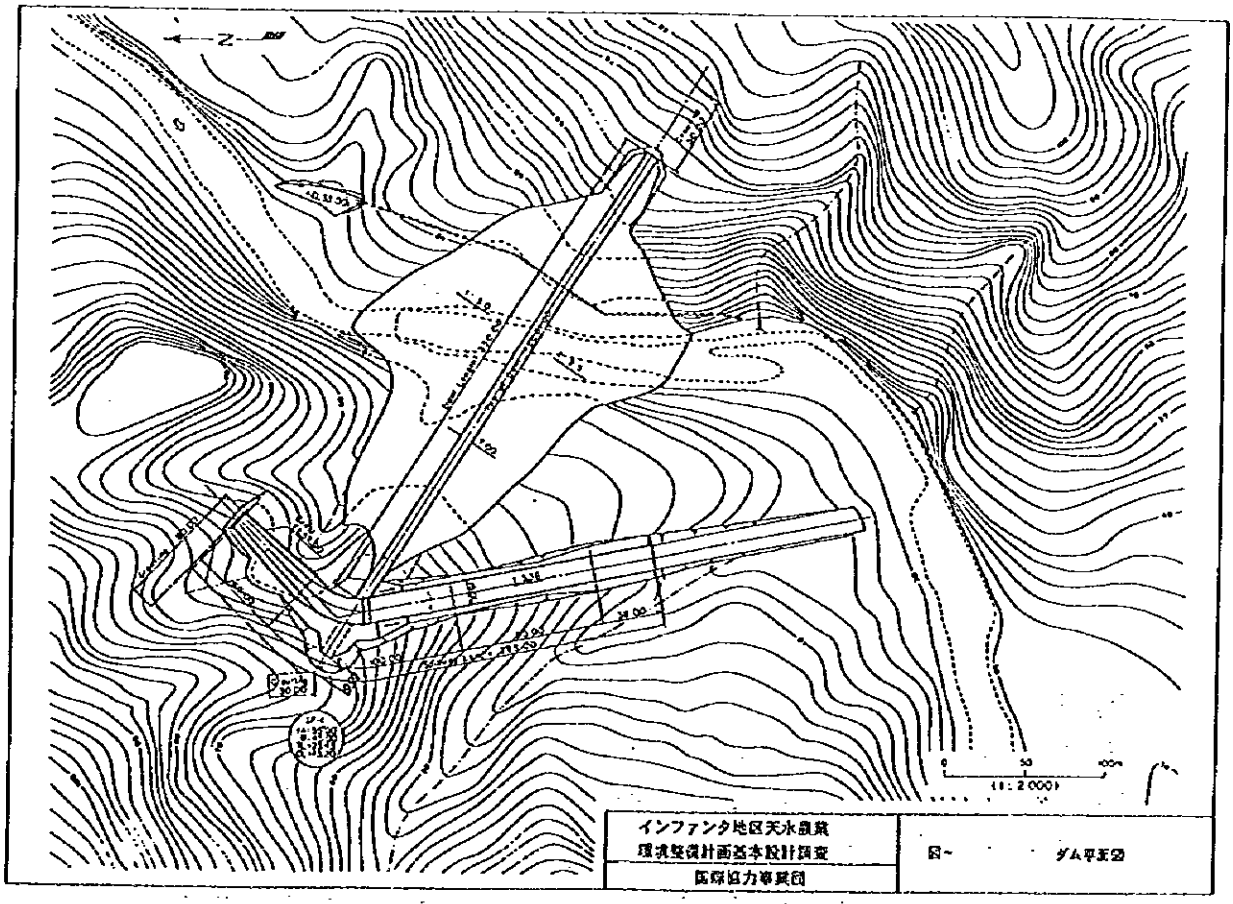
Lower Axis Alternative

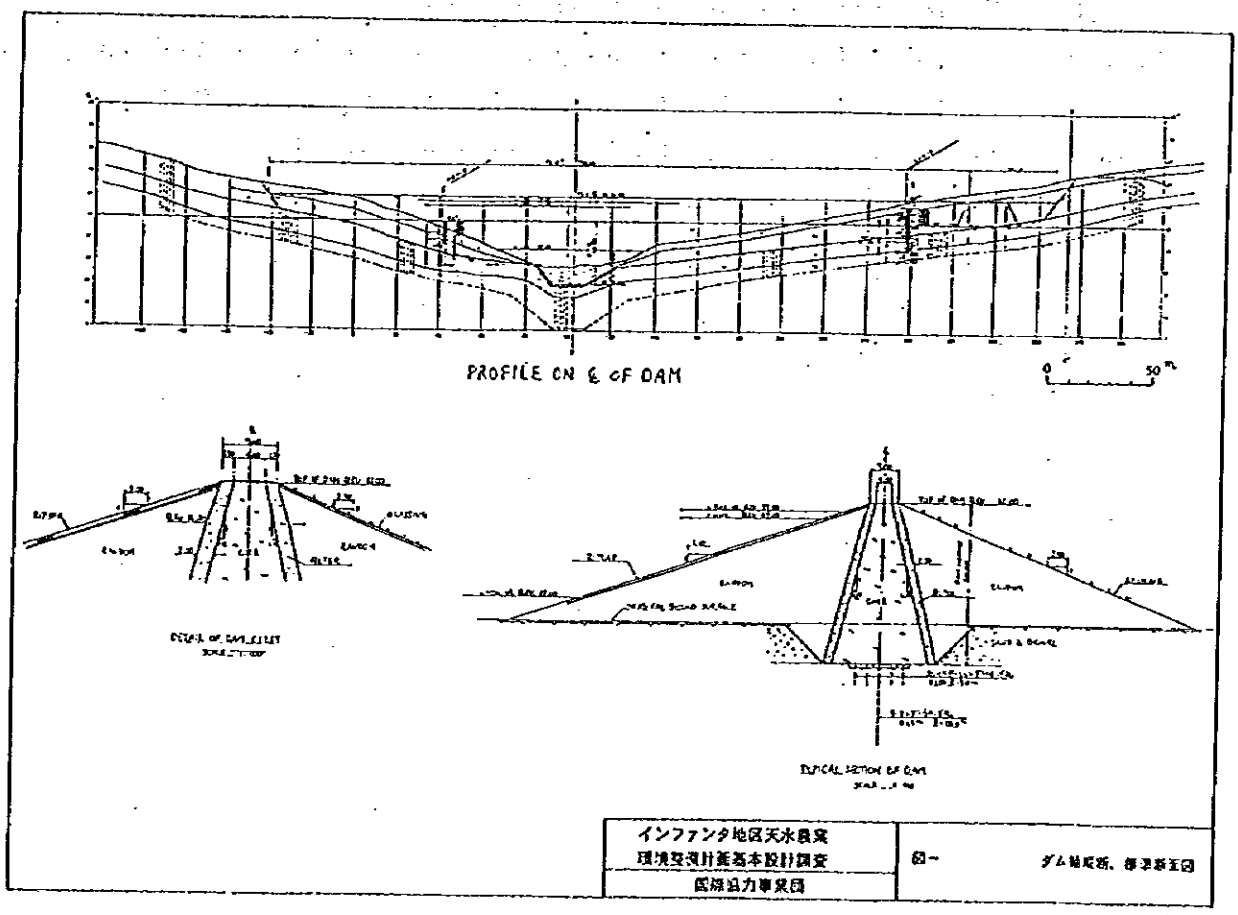


中流案

図－

Middle Axis Alternative





Upper Axis Alternative

Data 2.3.2.2-1-3 Appendix 6

Data 2.3.2.2- 2 Geology of the Project Area
(The Results of Geological Survey)

The geological features of the project area , especially for the dam site , are shown in the descriptions, figures and tables to be attached in the following pages. The results are obtained from the geological survey and the analyses which are carried out in October and November 1996.

Fig. 1 Geological reference map of Luzon.
Fig. 2 Generalized geological map of Zambales Range.
Fig. 3 Stratigraphic column of the Zambales ophiolite.
Fig. 4 Geological Map of the Project Area
Fig. 5 Geological Map of the Surrounding Area of the Reservoir
Fig. 6 Geological Plan of The Damsite Area
Fig. 7 Geological Profile of the Damsite Area (Section A-A' and B-B')
Fig. 8 Geological Profile of the Damsite Area (Section C-C' and D-D')
Fig. 9 Explanation Map of the Material Investigation

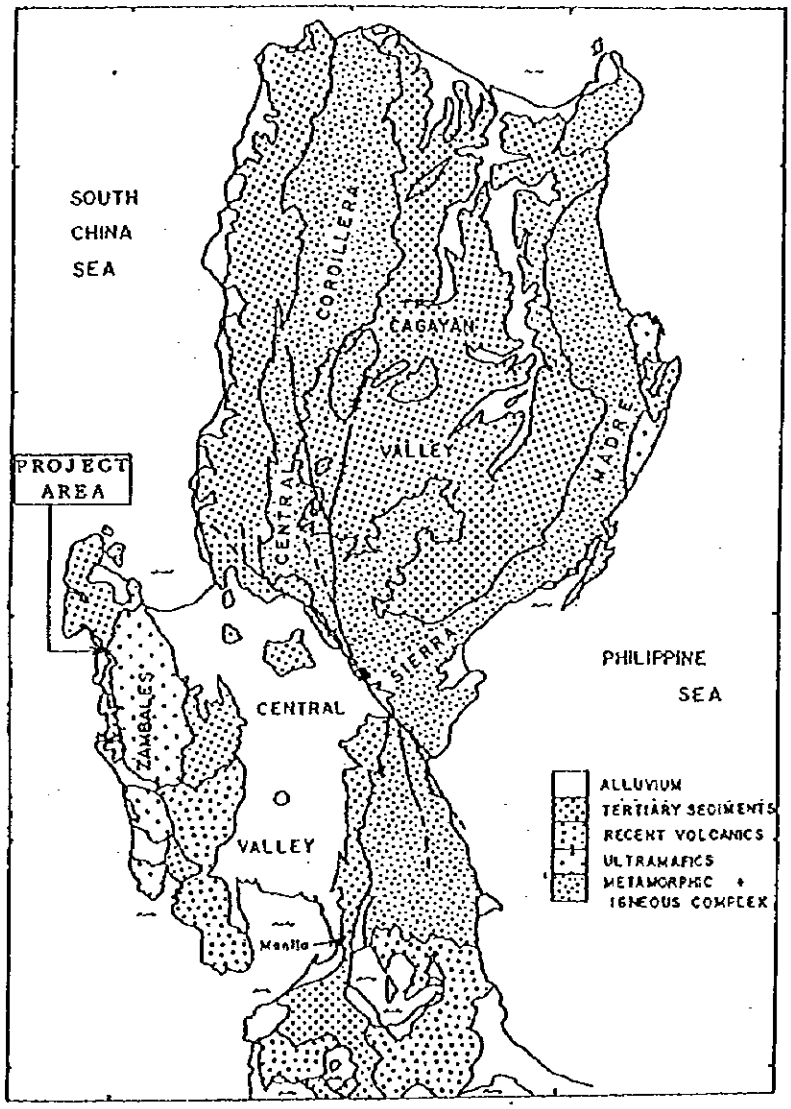


Fig. 1 Geological reference map of Luzon (quoted from E.E, Geary et al., 1983).

Data 2.3.22-2-2

Appendix 6

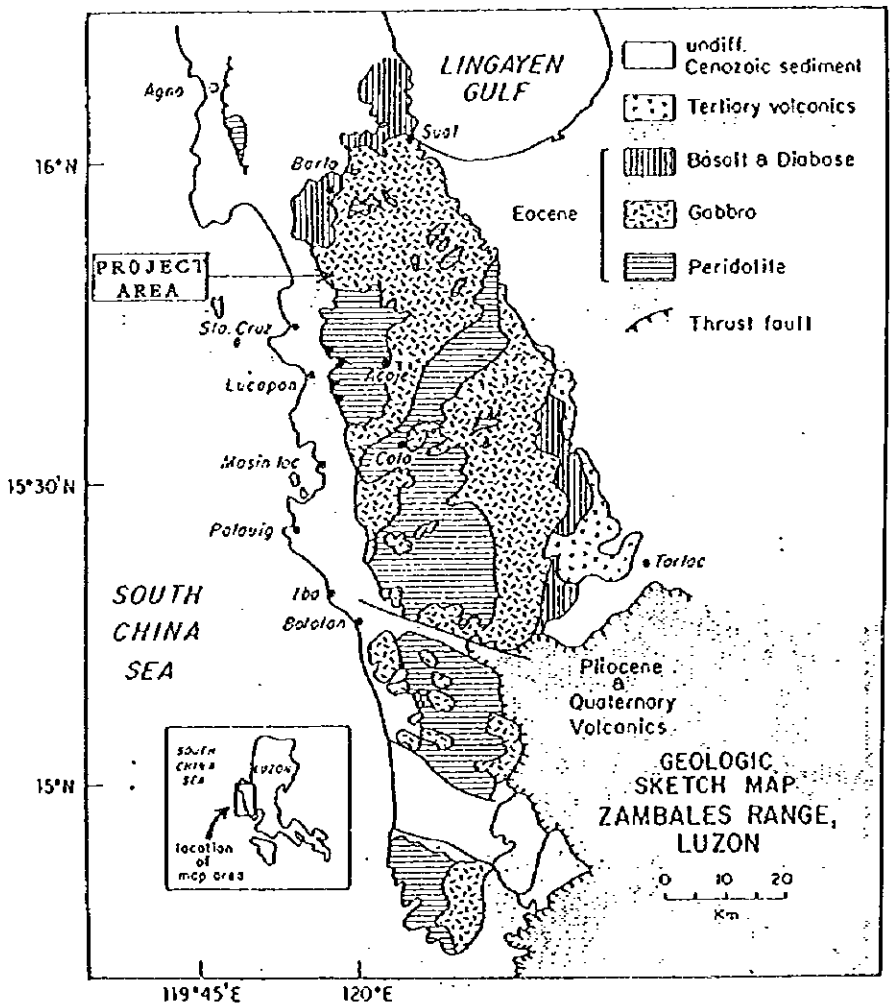


Fig. 2 Generalized geological map of Zambales Range based on the Geological map of the Philippines, mapping by the Philippines Bureau of Mines (quoted from James W. Hawkins et. al., 1983).

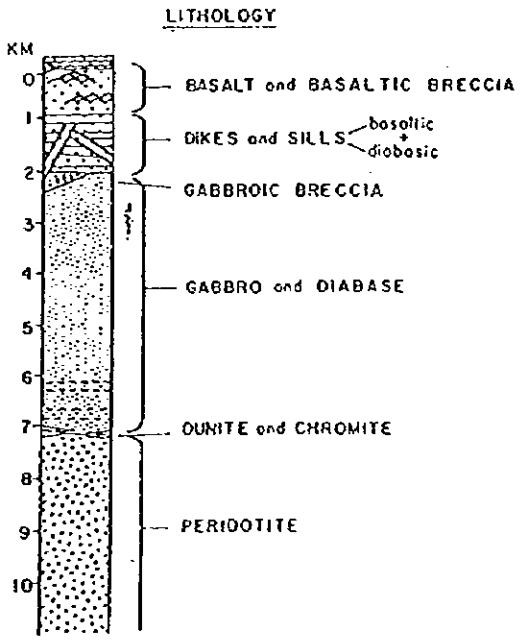
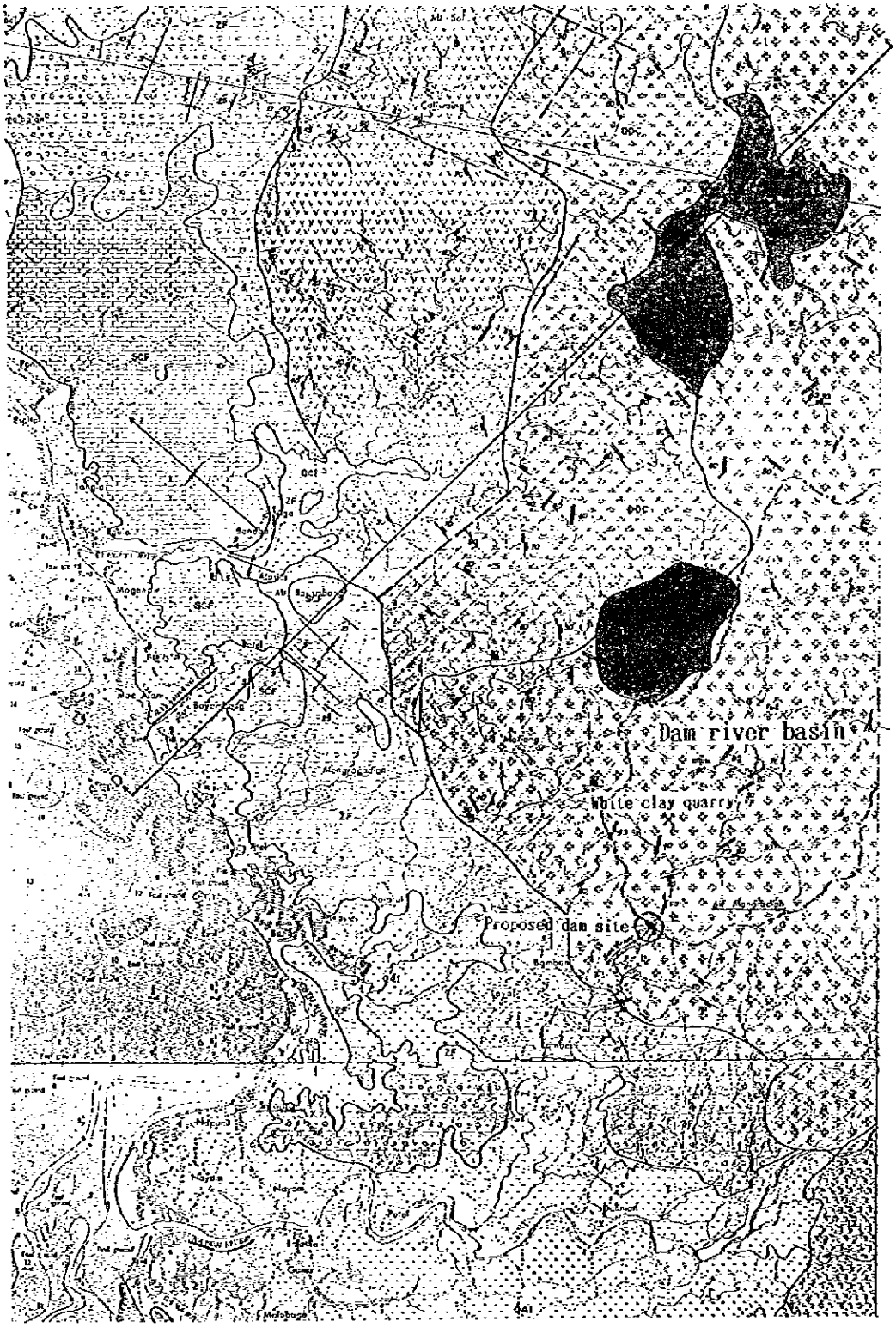
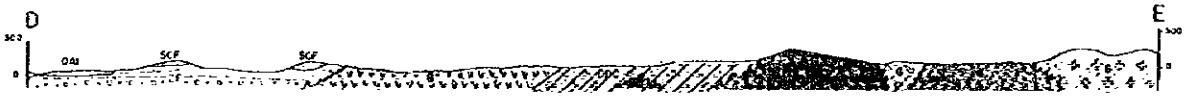


Fig. 3 Stratigraphic column of the Zambales ophiolite(igneous units). Thickness of the different unit are only approximate. (Quoted from E. E. Geary et al., 1983)

Data 2.3.2.2-2-3

Appendix 6





GEOLOGIC CROSS-SECTION ALONG D–E

SCALE 1:100,000

BASIC DESIGN FOR INFANTA IMPOUNDING IRRIGATION AND ENVIRONMENTAL IMPROVEMENT PROJECT	Fig. 4
JAPAN INTERNATIONAL CORPORATION AGENCY	Geological Map of the Project Area

Data 2.3.2.2-2-4 Appendix 6

EXPLANATION

STRATIGRAPHY

CENOZOIC

QUATERNARY — Holocene, Pleistocene

TERTIARY — Pliocene (Late, Early); Miocene (Late, Middle, Early); Oligocene (Late, Early); Eocene (Late, Early); Paleocene

MESOZOIC

CRETACEOUS

PRE-CRETACEOUS

STRATIFIED ROCKS

QAl — Quaternary Alluvium
Detrital deposits, mostly sand and gravel

SCF — Sta. Cruz Formation
Bedded to massive coralline limestone.

ZF — Zambales Formation
Interbedded sandstone, shale, conglomerate and limestone; the sandstone and shale are tuffaceous

B — Basalt
Basaltic flows; spilitic, massive to pillowed and commonly altered

INTRUSIVE AND PSEUDO-STRATIFIED ROCKS

Ultrabasic to Basic

DDC — Diabase Dike Complex
Dike swarms mainly of diabase; partly micro gabbro and andesite

G — Gabbro
Extensive massive to layered norite; partly troctolite, normal gabbro and pegmatitic anorthosite

P — Peridotite
Massive to layered peridotite; pyroxenite and dunite layers are common, generally serpentinized

Intermediate to Acidic

Q — Quartz Diorite
Stocks and dikes of quartz diorite and diorite

LITHOLOGY

- Limestone
- Shale
- Sandstone
- Conglomerate
- Diorite
- Basalt
- Diabase
- Gabbro
- Peridotite

GEOLOGIC STRUCTURES

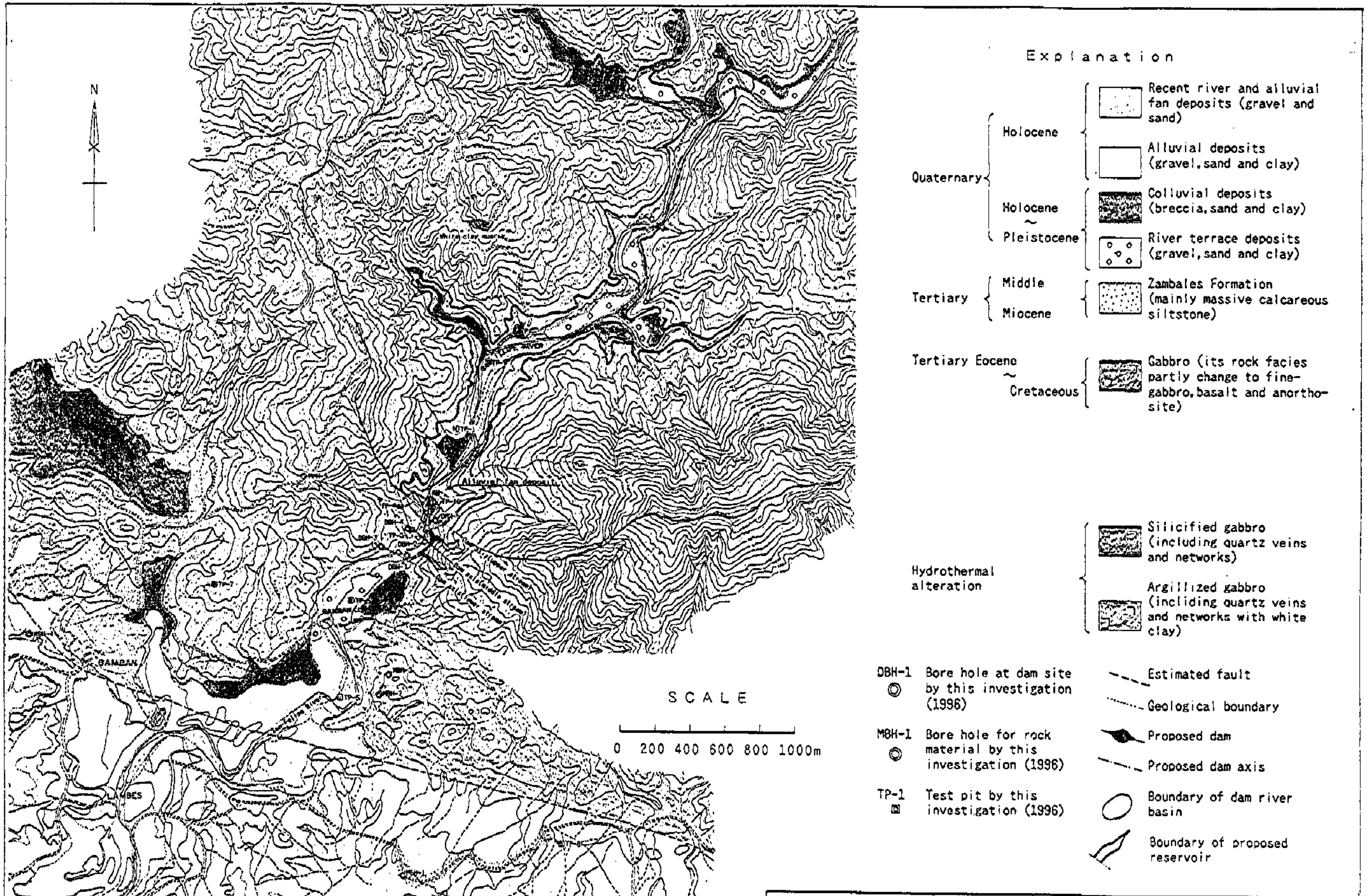
- Formational Boundary
- 70 Inclined Fracture
- Syncline (Arrow along strike indicates direction of plunge)
- Anticline (Arrow along strike indicates direction of plunge)
- 75 Inclined Bedding
- 50 Inclined Shear
- 70 Inclined Layering
- 60 Inclined Dike
- Dam and dam river basin

Note: This geological map is prepared on the basis of the geological maps of Dasol and Natabago quadrangles (scale 1:50,000) by Philippine bureau of Mines and Geo-Sciences.

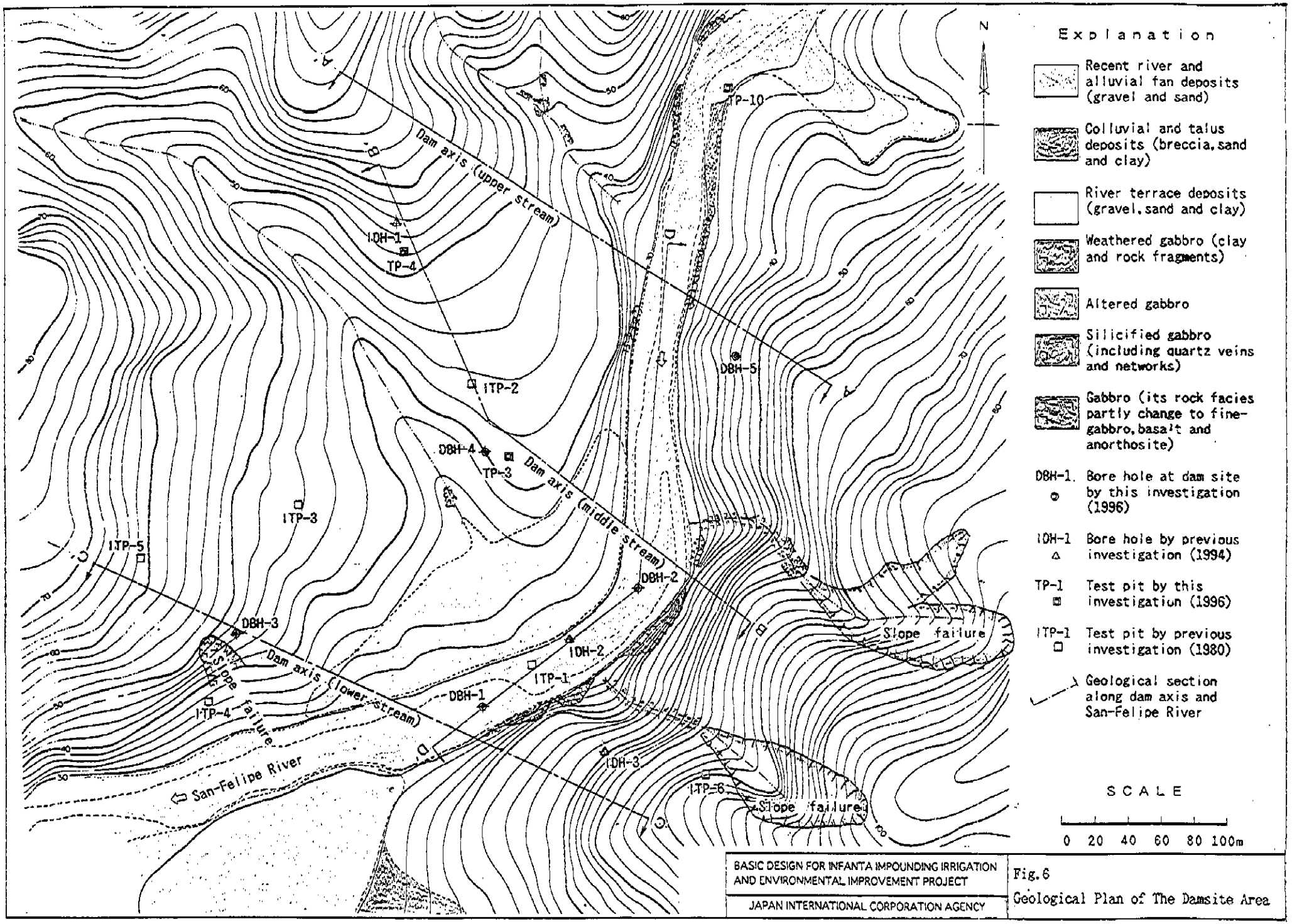
BASIC DESIGN FOR INFANTA IMPOUNDING IRRIGATION AND ENVIRONMENTAL IMPROVEMENT PROJECT	Fig. 4
JAPAN INTERNATIONAL CORPORATION AGENCY	Geological Map of the Project Area

Data 2.3.2.2-2-4

Appendix 6



BASIC DESIGN FOR INFANTA IMPOUNDING IRRIGATION AND ENVIRONMENTAL IMPROVEMENT PROJECT JAPAN INTERNATIONAL CORPORATION AGENCY	Fig.5 Geological Map of the Surrounding Area of the Reservoir

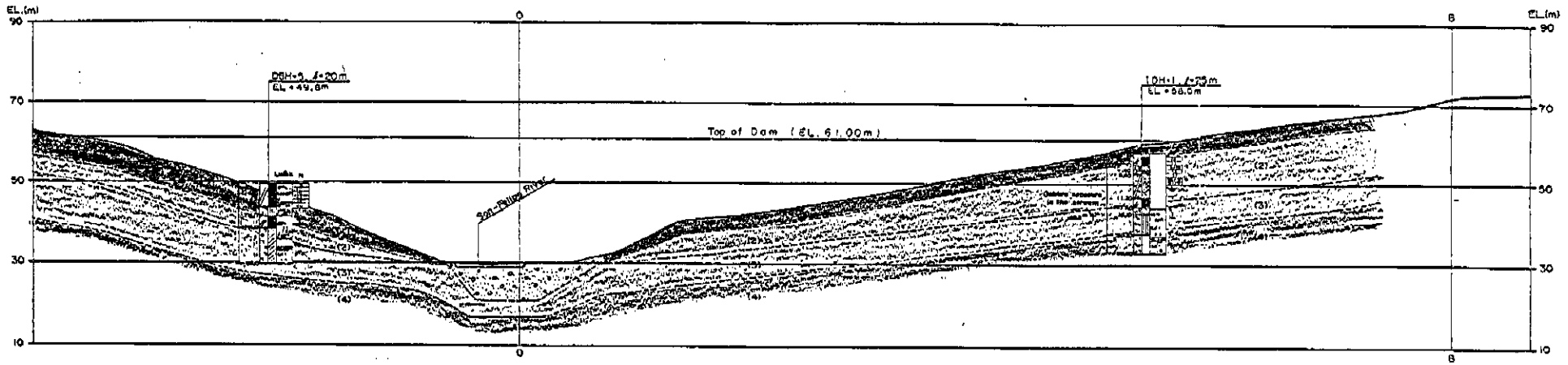


BASIC DESIGN FOR INFANTA IMPOUNDING IRRIGATION AND ENVIRONMENTAL IMPROVEMENT PROJECT

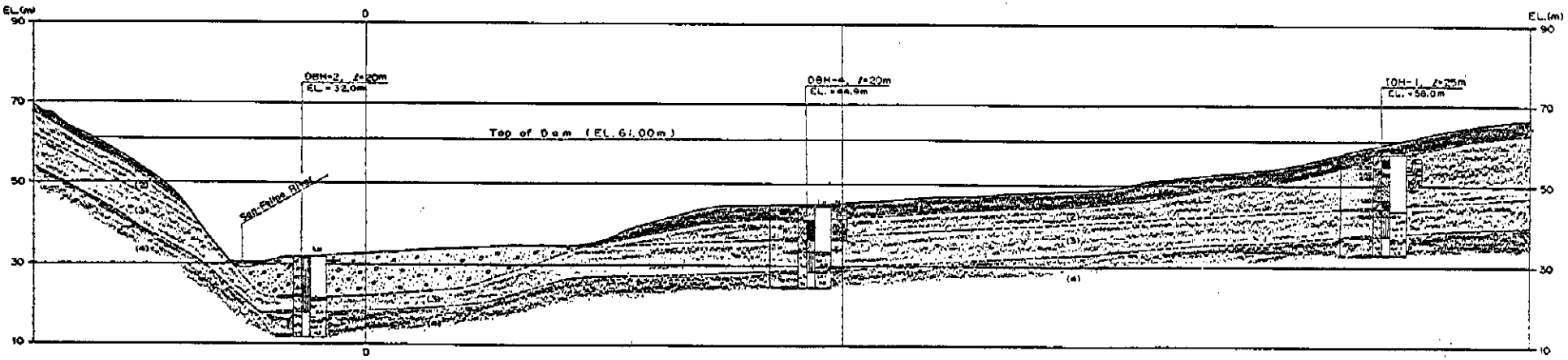
JAPAN INTERNATIONAL CORPORATION AGENCY

Fig. 6
Geological Plan of The Damsite Area

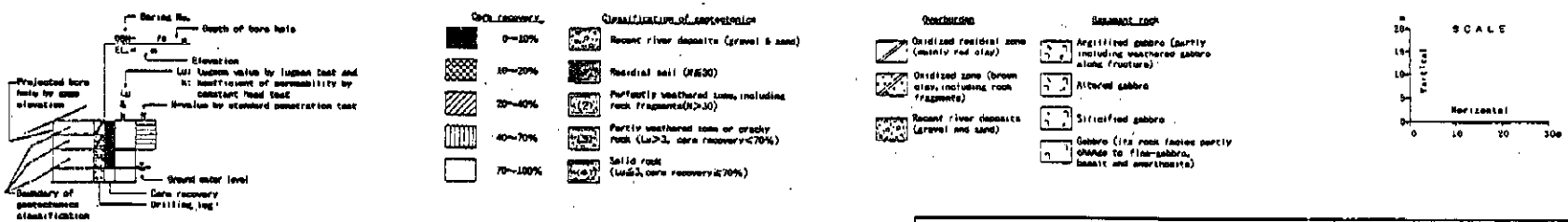
Data 2.3.2.2-2-6



SECTION A – A' (Along dam axis at upper stream side)

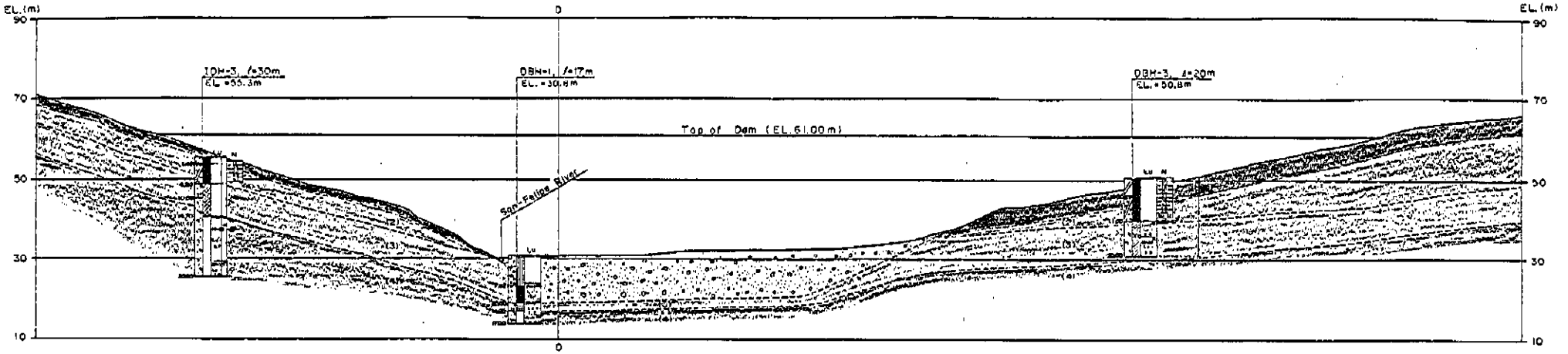


SECTION B – B' (Along dam axis at middle stream)

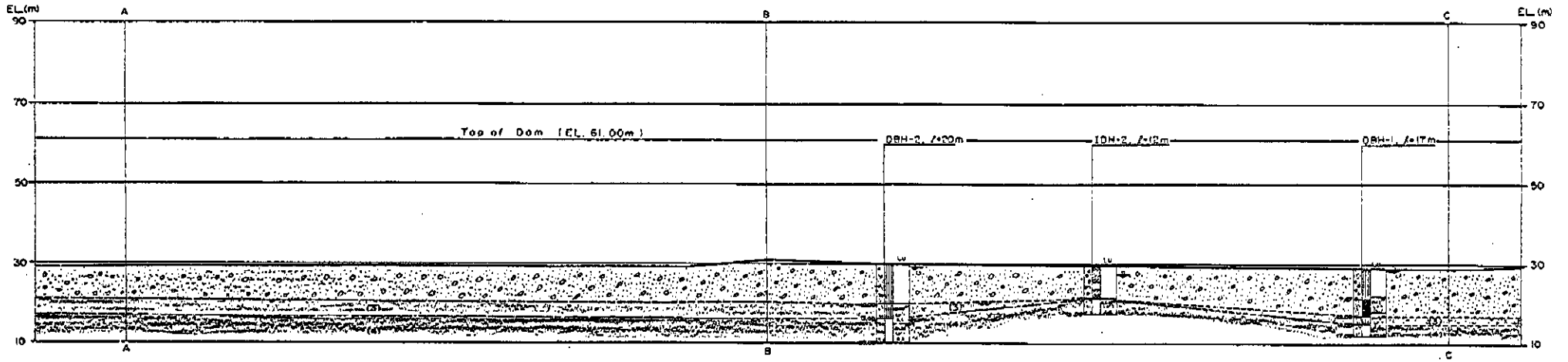


BASIC DESIGN FOR INFANTA IMPOUNDING IRRIGATION AND ENVIRONMENTAL IMPROVEMENT PROJECT	Fig.7 Geological Profile of the Damsite Area (Section A-A' and B-B')
JAPAN INTERNATIONAL CORPORATION AGENCY	

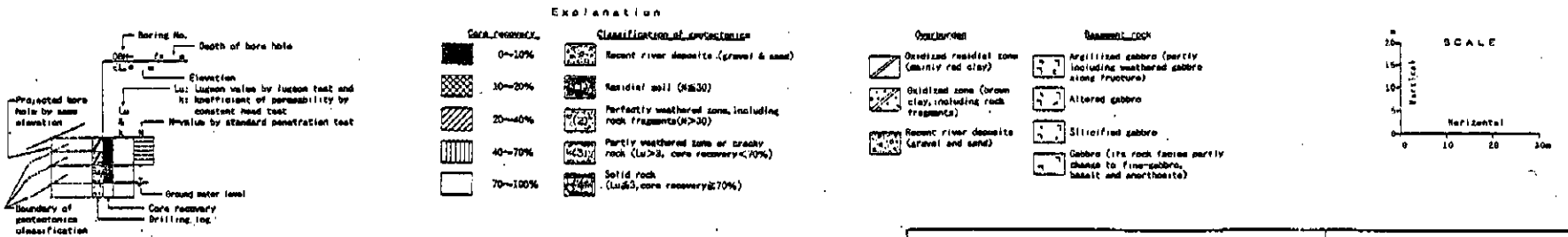
Date 2.3.2.2-2-7



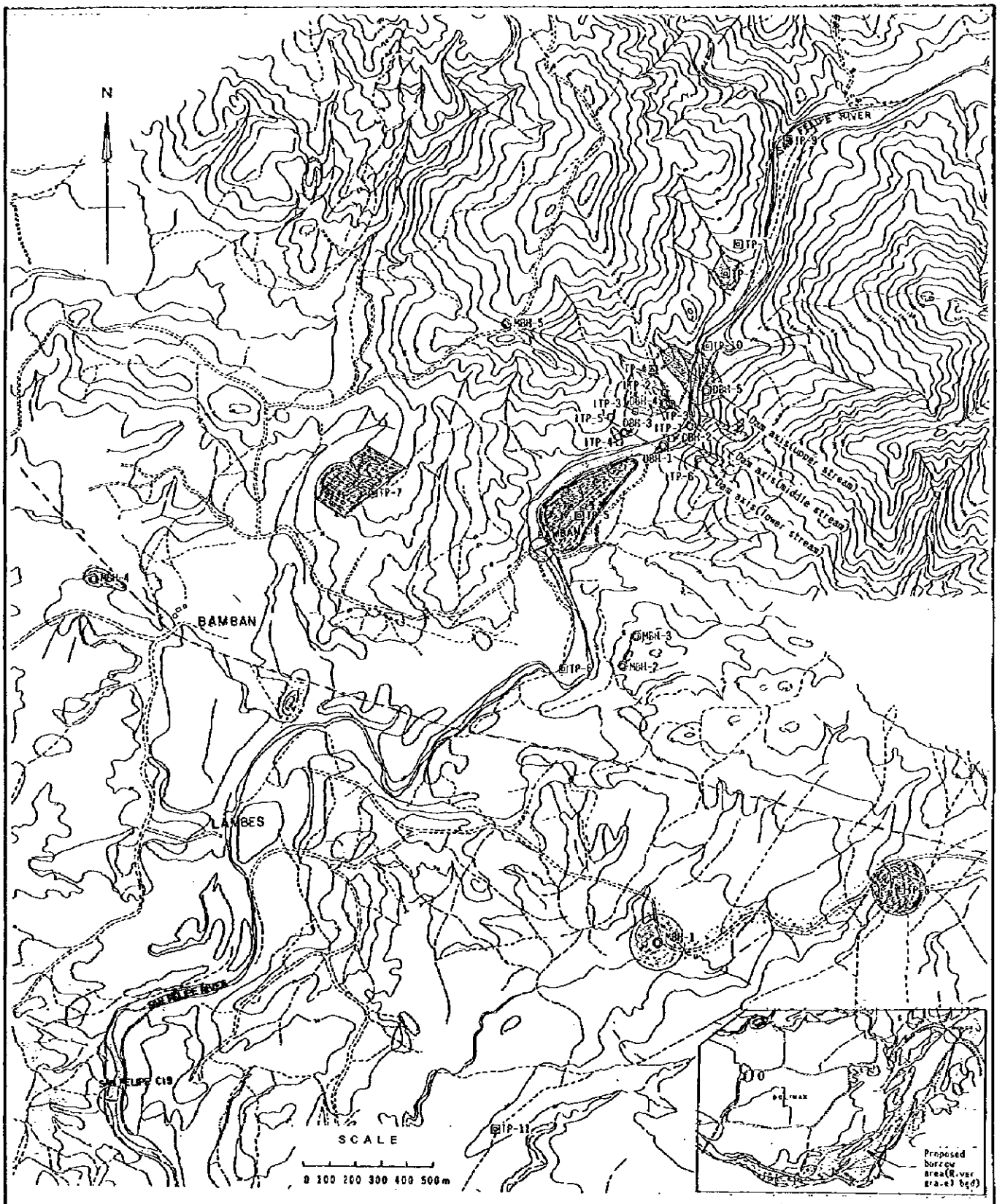
SECTION C – C' (Along dam axis at lower stream side)



SECTION D – D' (Along San – Felipe River)



BASIC DESIGN FOR INFANTA IMPOUNDING IRRIGATION AND ENVIRONMENTAL IMPROVEMENT PROJECT	Fig. 8 Geological Profile of the Damsite Area (Section C-C' and D-D')
JAPAN INTERNATIONAL CORPORATION AGENCY	



Explanation

- Miocene, Zambales Formation (mainly massive calcareous siltstone)
- Proposed borrow area (Core material)
- Proposed borrow area (Calcareous siltstone)
- Proposed borrow area (River gravel bed)
- Estimated fault
- DBH-1 Bore hole at dam site by this investigation (1996)
- MBH-1 Bore hole for rock material by this investigation (1996)
- TP-1 Test pit by this investigation (1996)
- ITP-1 Test pit by previous investigation (1980)
- Proposed dam
- Proposed dam axis

BASIC DESIGN FOR INFANTA IMPOUNDING IRRIGATION AND ENVIRONMENTAL IMPROVEMENT PROJECT JAPAN INTERNATIONAL COORPORATION AGENCY	Fig. 9 Explanation Map of the Material Investigation

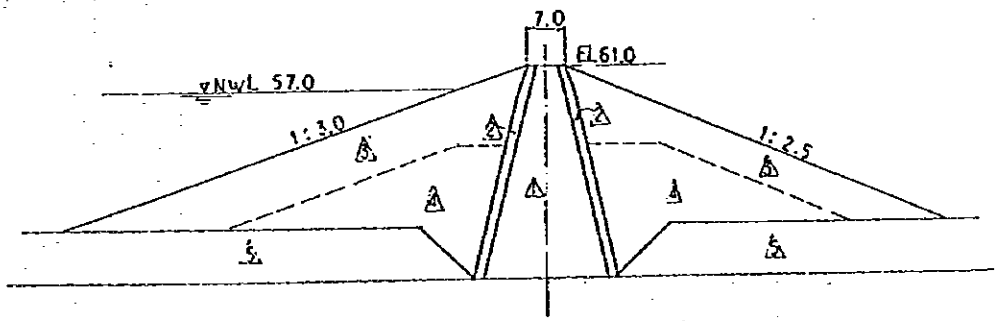
Data 2.3.2.3-1 Stability Analysis of Dam

The stability analysis are carried out for the dam embankment as well as the dam foundation based on the circular arc method.

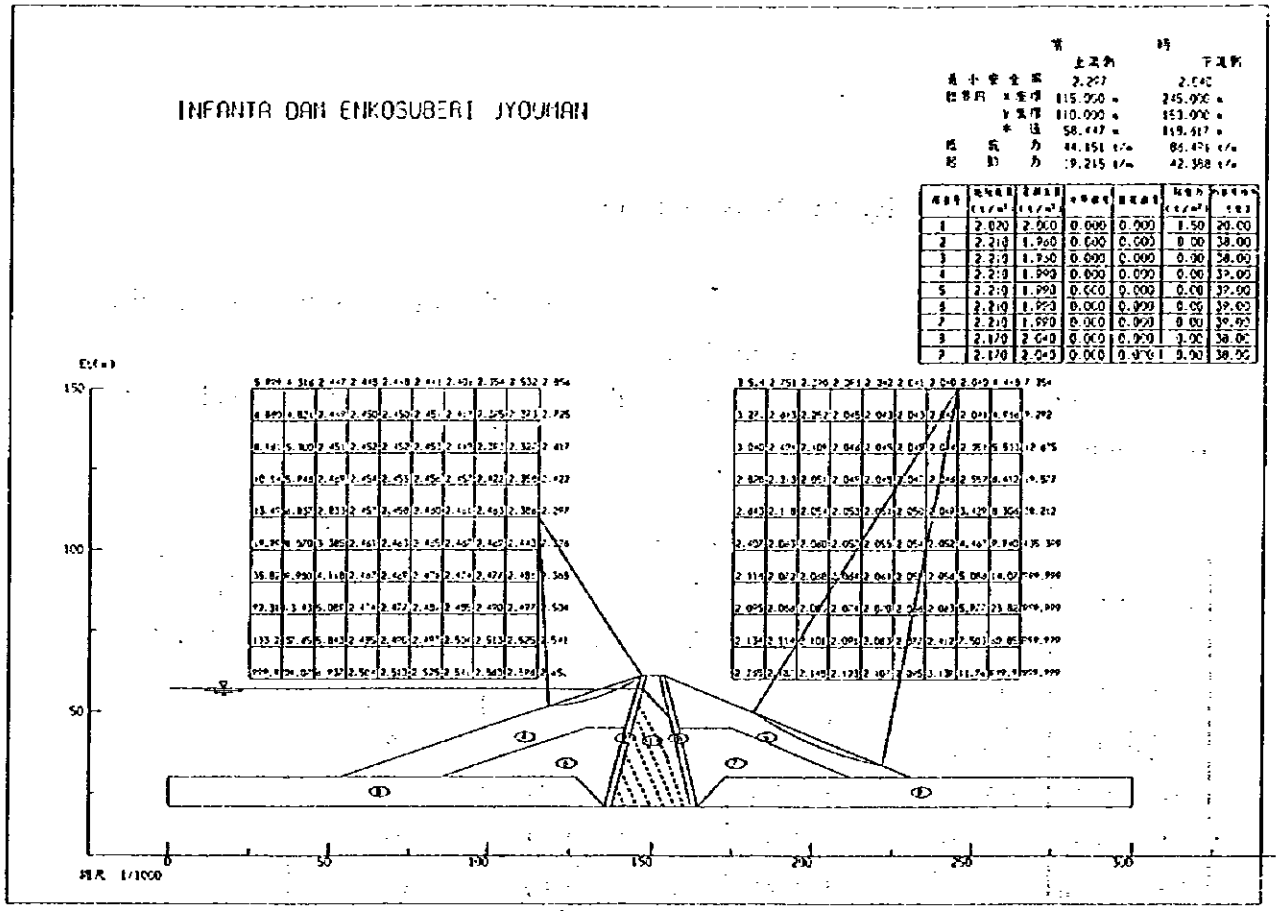
The design values for the stability analysis are decided in reference to the examples of the other similar dam as follows:

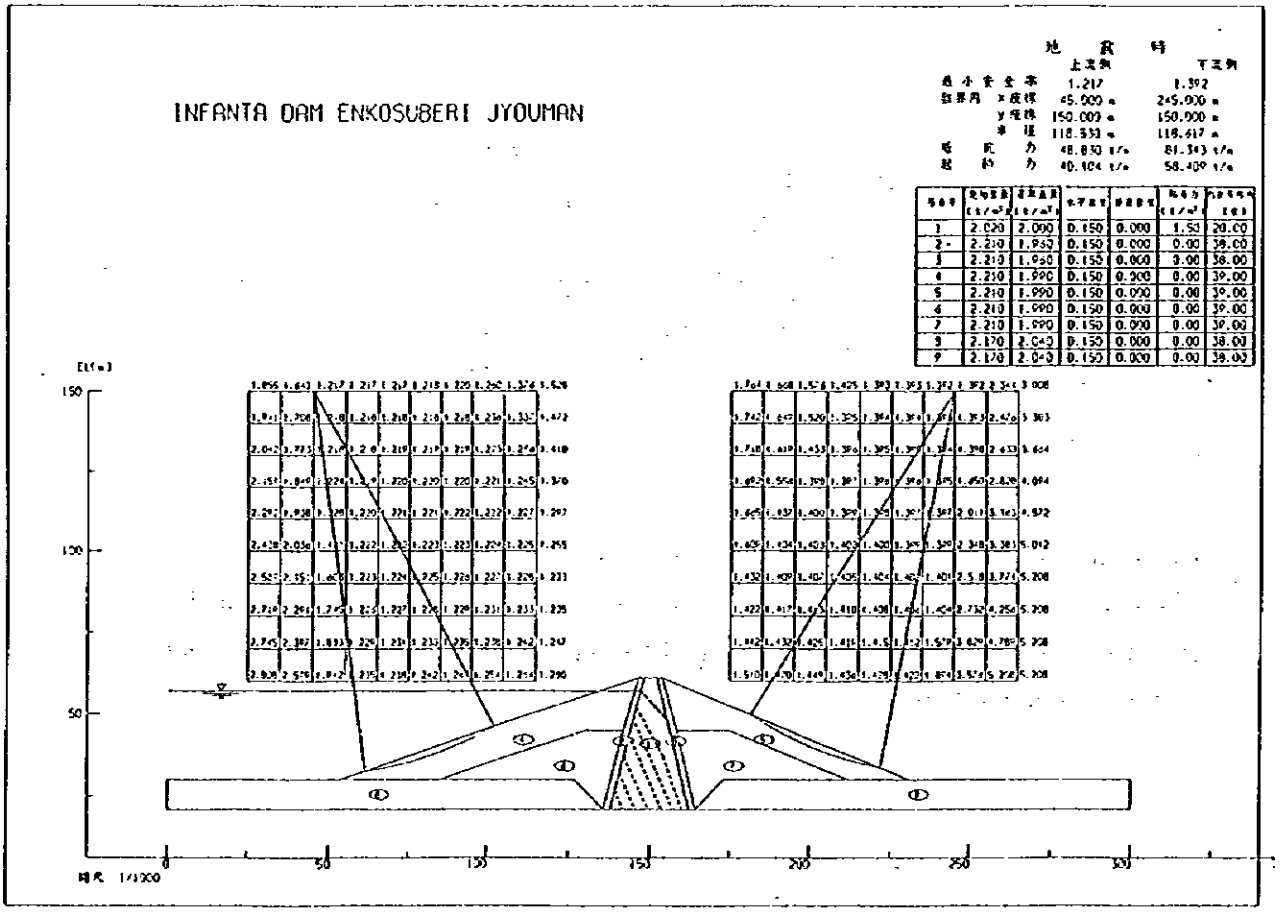
Design values of dam materials

Zone	Mark	Specific gravity	Unit Weight (t/m^3)			Internal Fric Angle (ϕ)	Cohesion $C(t/m^2)$
			Dry	Wet	Saturated		
Core	1	2.7	1.62	2.00	2.02	20°	1.5
Filter	2	2.7	1.93	1.96	2.21	38°	
Rundom	3	2.7	1.93	1.99	2.21	39°	
Rundom	4	2.7	1.93	1.99	2.21	39°	
Foundation	5	2.7	1.85	2.04	2.17	38°	



The results of stability analyses show that the dam is stable in all the cases. The minimum safety factor occurs in case of the normal high water level (k=0.15) and in case of just after the completion (k=0.075) and the safety factor of 1.22 in both cases is higher than the design factor of 1.20.

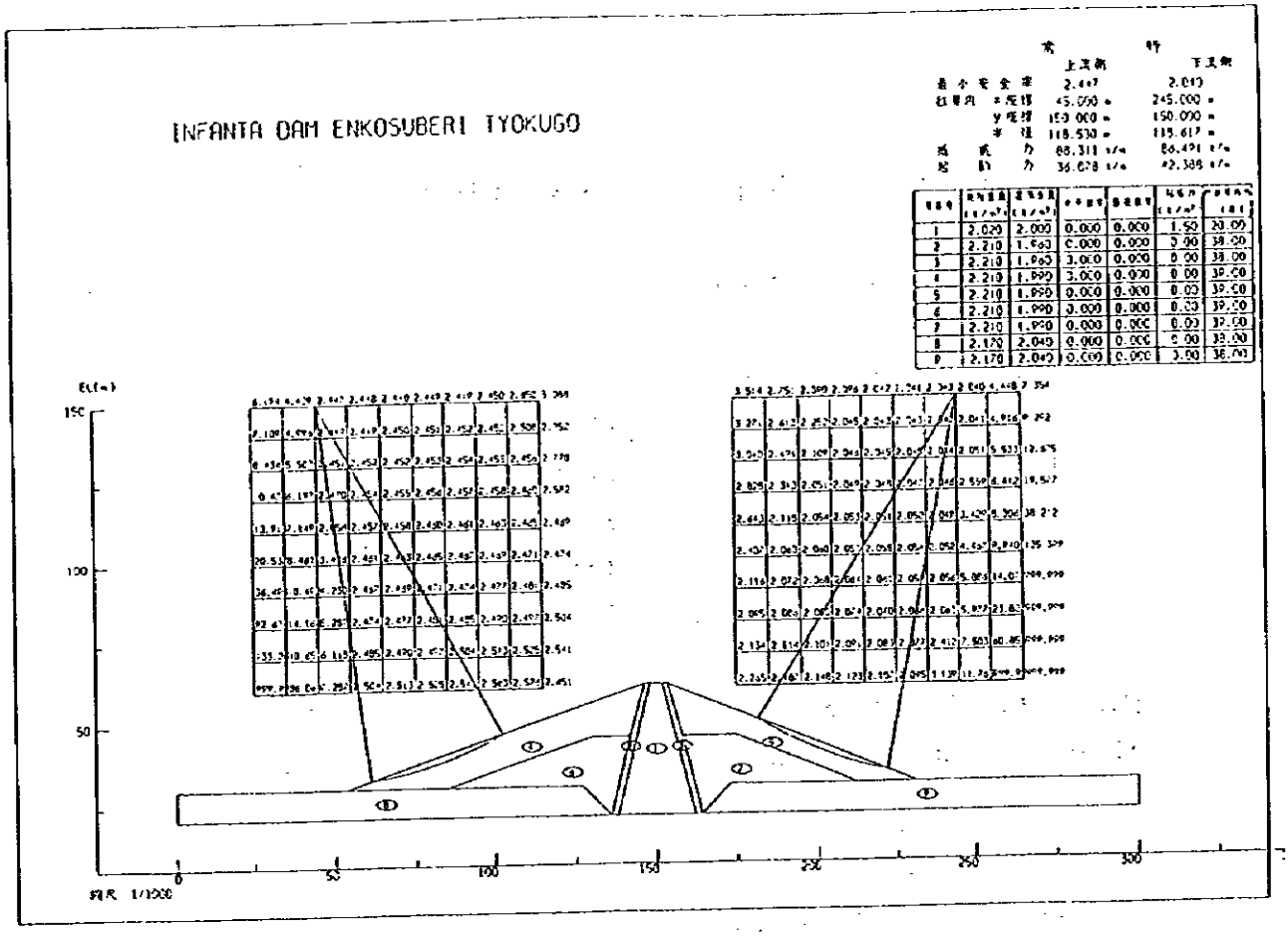




図－ .. : Factor of safety by slip circle method
(Normal water level)

Data 2.3.2.3-1-2

Appendix 6



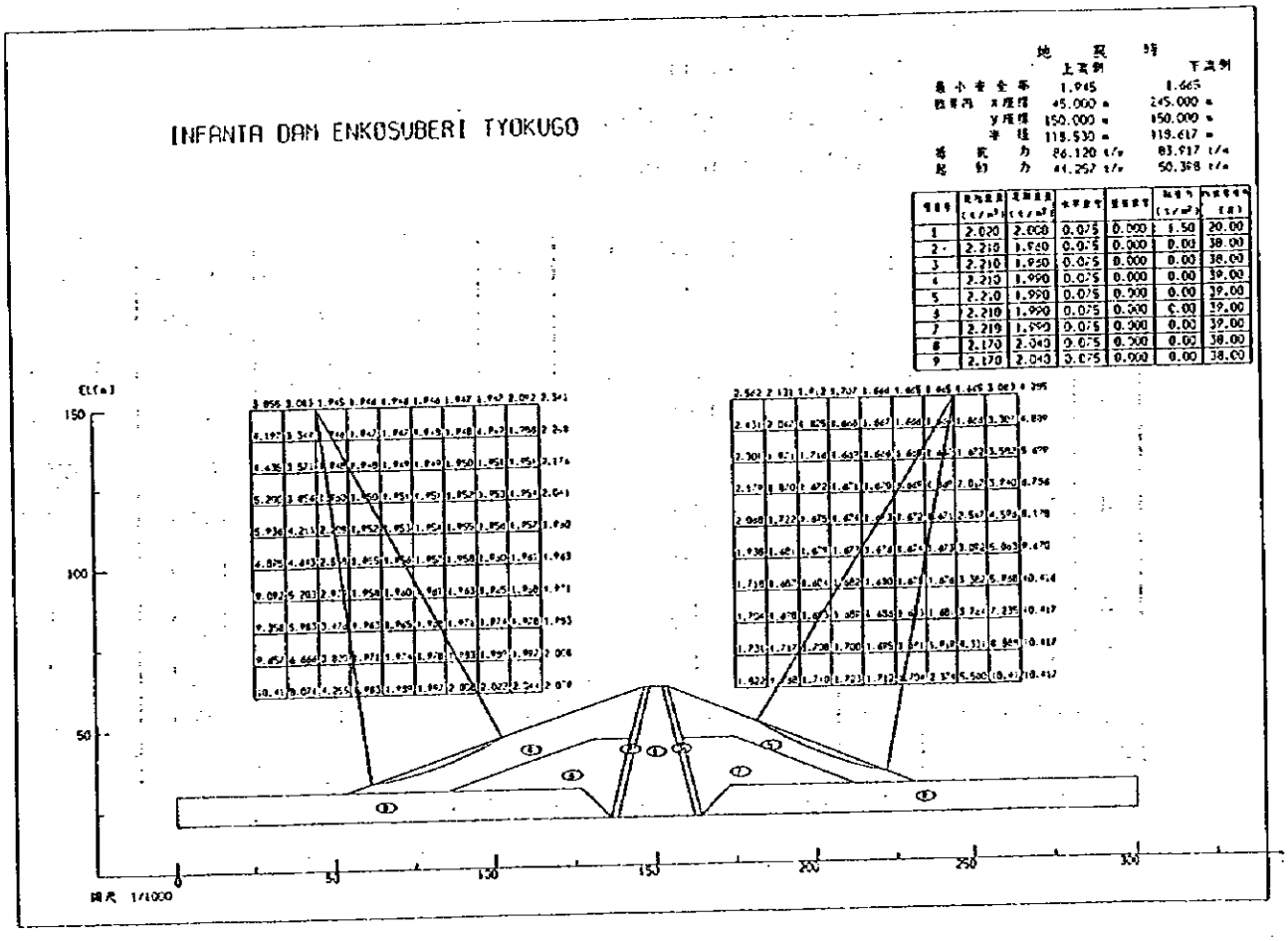


図- 1:. Factor of safety by slip circle method

Data 2.3.1.3-1-3 (after construction)

Appendix 6

Data 2.3.2.3-2 Seapage Analyses of Dam

(1) Seapage from Dam Body

(A) Conditions for Calculation

N.H.W.L.	El 57.00 m
Dam Foundation El	El 21.00 m
Core Seapage Coefficient	$K = 10^{-5}$cm/s = 10^{-7}m/s
Core Upstream Side Slope	1 : 0.25
Core Downstream Side Slope	1 : 0.25

(B) Calculation for Seapage Flow

The seapage volume is obtained from the following equation.

$$Q = \Sigma\Delta q = \Sigma K \cdot \frac{H}{L} \cdot \Delta x$$

Q : Total seapage flow

Δ q : Seapage per unit width

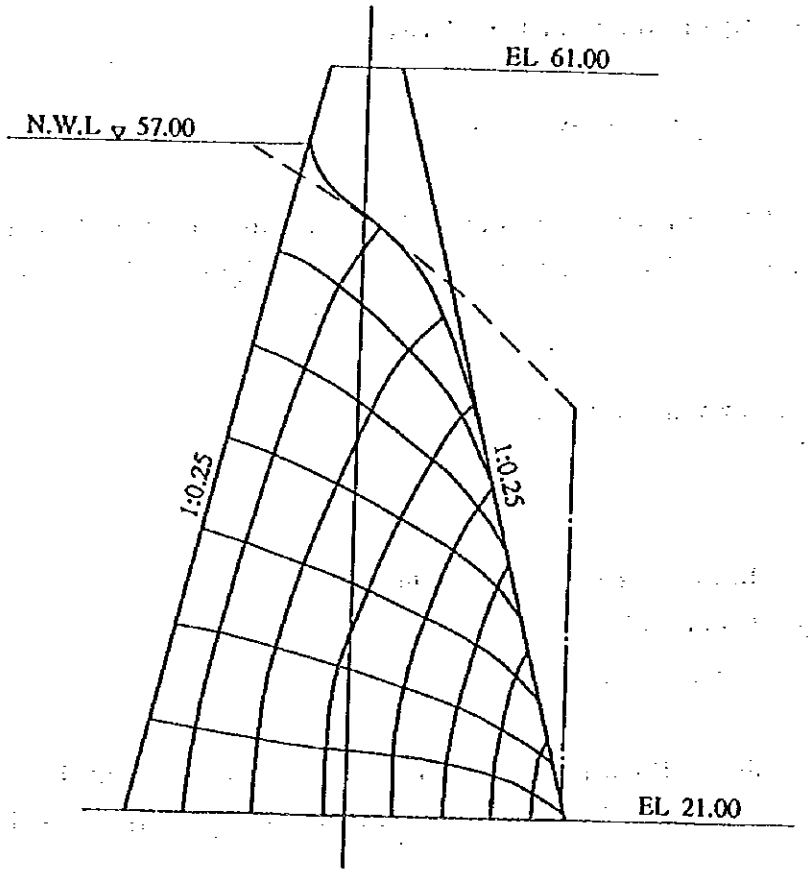
K : Seapage coefficient

H : Head between up & downstream sides of core zone

L : Flow length in the core zone

Flow No.	H	L	H/L	$\frac{(H/L)_n + (H/L)_{n-1}}{2}$	Δ x	Flow length of dam axis direction (m)	Average length (m)	Δ q
1	15.6	19.0	0.821			323.0		1,520 k
2	19.5	19.2	1.016	0.919	5.3	300.0	312.0	1,618 k
3	22.8	19.6	1.163	1.090	5.3	260.0	280.0	1,498 k
4	26.0	20.1	1.294	1.229	5.3	200.0	230.0	1,239 k
5	29.6	20.8	1.423	1.359	5.3	144.0	172.0	823 k
6	32.5	22.0	1.478	1.451	5.3	70.0	107.0	393 k
7	35.0	23.5	1.489	1.484	5.3	30.0	50.0	182 k
8	36.0	24.0	1.500	1.495	5.3	16.0	23.0	7,273 k
Total								

7273 k = 7273 × 10^{-7} m/s ×86400 s/day = 63 m^3/day



(2) Seapage Flow from the Foundation/Ground

The calculation is made by the similar way as that of dam body.

Q = KiA

$$Q = 5 \times 10^{-7} \times \frac{(57-30)/2}{100} \times (330 \times 15) = 3.34 \times 10^{-4} \times 86400 = 29 m^3/day$$

Data 2.3.2.3-3 Study on Dam Floodway

(1) Design Flood by Floodway

The design flood of floodway is decided to be the maximum discharge released from the floodway when a flood of 1.2 times of 200 year probability flood is regulated by the storage function.

The equation is given as follows:

$$I - O = \frac{ds}{dt}$$

where I : Inflow to the reservoir at a time (t)
Q : Outflow discharge
S : Storage Volume

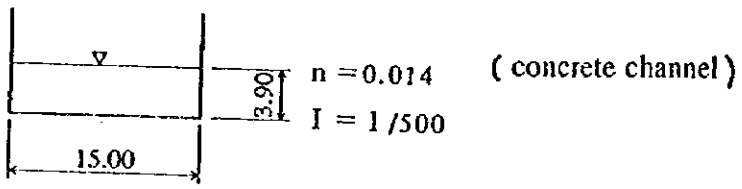
The calculation results of flood routing is obtained as shown in Table 1. The table shows that the max. outflow is 347m^3/s and the design discharge of floodway is decided at 350 m^3/s.

The floodway has the capacity obtained by the following formula.

$$Q = C \cdot B \cdot H^{3/2}$$

where Q : Discharge
C : Discharge coefficient (maxi 2.0)
B : Outflow section width
H : Overflow depth

(2) Flow Capacity of Chuteway



$A = 15.00 \times 3.90 = 58.50m^2$

$P = 3.90 \times 2 + 15.00 = 22.80m$

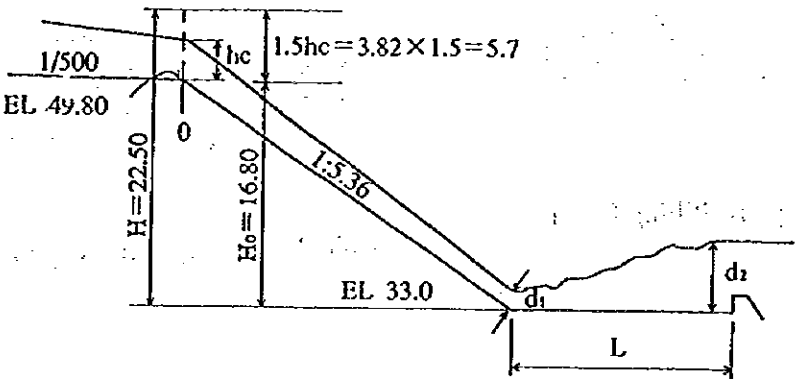
$$R = \frac{A}{P} = \frac{58.50}{22.80} = 2.57m$$

$$v = \frac{1}{n} \cdot R^{2/3} \cdot I^{1/2} = \frac{1}{0.014} \times 2.57^{2/3} \times \left(\frac{1}{500}\right)^{1/2} = 5.99m/s$$

$Q = A \cdot v$

$Q = 58.50 \times 5.99 = 350.4m^3/s > 350m^3/s$

(3) Design of Stilling Basin



$$hc = \sqrt[3]{\frac{Q^2}{gB^2}} = \sqrt[3]{\frac{350^2}{9.8 \times 15.0^2}} = 3.82m$$

$$d_1 = \frac{Q}{0.95B\sqrt{2gH}} = \frac{350}{0.95 \times 15.0\sqrt{2 \times 9.8 \times 22.5}} = 1.17m$$

$$v = \frac{Q}{Bd_1} = \frac{350}{15.0 \times 1.17} = 19.9m/s$$

$$Fr = \frac{Q}{B\sqrt{gd_1^3}} = \frac{350}{15.0\sqrt{9.8 \times 1.17^3}} = 5.89$$

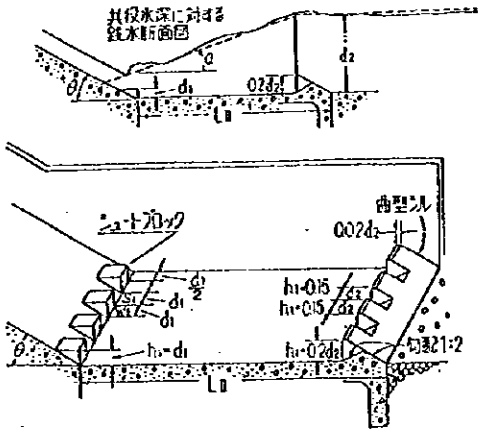
$$d_2 = \tfrac{1}{2} \times d_1\left(\sqrt{1 + 8F_1^2} - 1\right)$$

$$d_2 = \tfrac{1}{2} \times 1.17 \times \left(\sqrt{1 + 8 \times 5.89^2} - 1\right) = 9.2m$$

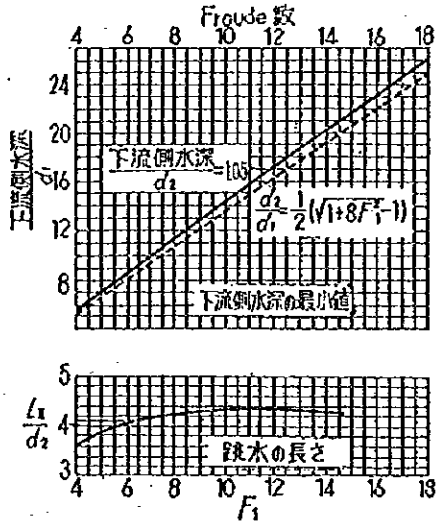
The wall height is decided to be 10.0 m by adding the free board of 0.8 m.

The type II of USBR, with chute blocks in the flat basin, is adopted as shown in the figures below.

From the figures, L II = 4.1, $d_2 = 4.1 \times 9.2 = 38m$



Features of Type II Stilling Basin



Calculation graphs for Type II Stilling Basin

Table Flood Routing Calculation

表－5.11.1 洪水調節計算

ダム ヨウリョウ ケイサン ——*** Infanta dam ***　B:60.0 * 1 ***　EL= 57.0

DATE	(QI)	(H)	(QO)	(V)	
1 0	0.00	57.00	0.00	0.	0
	0.75	57.00	0.00	225.	1
	1.50	57.00	0.00	899.	1
	2.24	57.00	0.04	2012.	2
	2.99	57.00	0.12	3538.	3
	3.74	57.01	0.20	5467.	3
1 1	4.49	57.01	0.29	7795.	3
	5.67	57.01	0.40	10642.	3
	6.86	57.01	0.56	14120.	4
	8.05	57.02	0.73	18213.	4
	9.23	57.02	0.92	22911.	4
	10.42	57.03	1.14	28199.	4
1 2	11.60	57.03	1.38	34063.	4
	15.19	57.04	1.67	41202.	4
	18.78	57.05	2.06	50291.	5
	22.36	57.06	2.51	61283.	5
	25.95	57.07	3.04	74135.	5
	29.53	57.09	3.65	88802.	5
1 3	33.12	57.10	4.35	105233.	6
	36.10	57.12	5.09	123204.	6
	39.08	57.14	5.89	142503.	6
	42.07	57.16	6.75	163098.	6
	45.05	57.18	7.65	184956.	6
	48.03	57.21	8.76	208001.	6
1 4	51.01	57.23	10.62	231947.	6
	52.38	57.25	12.48	256084.	6
	53.75	57.28	14.33	279928.	6
	55.12	57.30	16.15	303493.	6
	56.49	57.32	17.96	326792.	6
	57.86	57.34	19.74	349835.	6
1 5	59.23	57.37	21.50	372636.	6
	60.19	57.39	23.24	395082.	6
	61.14	57.41	25.27	416970.	6
	62.09	57.43	27.58	438125.	6
	63.05	57.45	29.81	458490.	6
	64.00	57.47	31.96	478114.	6
1 6	64.96	57.49	34.03	497044.	6
	65.72	57.51	36.02	515269.	6
	66.48	57.53	37.93	532777.	6
	67.24	57.54	39.72	549631.	5
	68.00	57.56	41.50	565872.	5
	68.77	57.57	43.21	581523.	5
1 7	69.53	57.59	44.86	596621.	5
	70.63	57.60	46.51	611284.	5
	71.72	57.62	48.43	625519.	5
	72.82	57.63	50.38	639252.	5
	73.92	57.64	52.21	652523.	5
	75.02	57.66	53.99	665370.	5

ダム ヨウリョウ ケイサン ——*** Infanta dam ***　B:60.0 * 1 ***　EL= 57.0

DATE	(QI)	(H)	(QO)	(V)	
1 8	76.12	57.67	55.71	677826.	5
	77.24	57.68	57.38	689930.	5
	78.37	57.69	59.01	701720.	5
	79.49	57.70	60.60	713219.	5
	80.62	57.71	62.15	724452.	5
	81.75	57.72	63.67	735439.	5
1 9	82.87	57.74	65.15	746201.	5
	83.56	57.75	66.59	756629.	5
	84.25	57.76	67.97	766624.	5
	84.94	57.77	69.30	776219.	5
	85.63	57.77	70.58	785447.	5
	86.32	57.78	71.80	794337.	5
1 10	87.01	57.79	72.99	802916.	5
	88.04	57.80	74.15	811308.	5
	89.07	57.81	75.42	819588.	4
	90.10	57.82	76.85	827678.	5
	91.13	57.82	78.08	835585.	4
	92.16	57.83	79.37	843352.	4
1 11	93.19	57.84	80.64	850971.	4
	94.44	57.85	81.89	858517.	4
	95.70	57.85	83.15	866061.	4
	96.95	57.86	84.40	873604.	4
	98.20	57.87	85.66	881146.	4
	99.45	57.88	86.91	888686.	4
1 12	100.70	57.88	88.16	896226.	4
	102.05	57.89	89.42	903794.	4
	103.40	57.90	90.69	911414.	4
	104.75	57.91	91.96	919082.	4
	106.10	57.91	93.24	926795.	4
	107.45	57.92	94.53	934546.	4
1 13	108.80	57.93	95.82	942333.	4
	110.96	57.94	97.16	950384.	4
	113.12	57.95	98.65	958881.	5
	115.27	57.95	100.13	967779.	5
	117.43	57.96	101.67	977066.	5
	119.58	57.97	103.27	986705.	5
1 14	121.74	57.98	104.92	996663.	5
	124.39	57.99	106.65	1007052.	5
	127.05	58.00	108.53	1017952.	5
	129.70	58.01	110.73	1029221.	5
	132.36	58.03	112.97	1040753.	5
	135.01	58.04	115.25	1052520.	5
1 15	137.66	58.05	117.58	1064494.	5
	141.04	58.06	119.99	1076859.	5
	144.41	58.07	122.49	1089776.	5
	147.79	58.09	125.10	1103184.	5
	151.16	58.10	127.79	1117030.	5
	154.53	58.12	130.55	1131264.	5

ﾀﾞﾑ ﾖｳﾘｮｳ ｹｲｻﾝ ——*** Infanta dam *** B:60.0 * 1 *** EL= 57.0

DATE	(QI)	(ID)	(QO)	(V)	
1 16	157.91	58.13	133.39	1145843.	5
	165.03	58.15	136.48	1161796.	5
	172.15	58.16	140.01	1180042.	5
	179.27	58.18	144.04	1200296.	6
	186.40	58.20	148.44	1222296.	6
	193.52	58.23	153.66	1245687.	6
1 17	200.64	58.25	159.12	1270149.	6
	256.45	58.29	167.79	1309282.	6
	312.26	58.36	182.50	1374940.	7
	368.07	58.44	203.22	1463501.	7
	423.88	58.55	229.92	1571361.	8
	479.69	58.67	259.94	1695722.	8
1 18	535.50	58.81	292.99	1834677.	8
	479.62	58.93	321.65	1955063.	8
	423.75	59.00	338.97	2028034.	7
	367.87	59.03	347.11	2059761.	6
	312.00	59.03	346.43	2055652.	3
	256.12	58.99	337.63	2020798.	6
1 19	200.24	58.93	322.99	1959401.	7
	193.51	58.86	306.17	1888640.	7
	186.78	58.80	290.67	1823546.	7
	180.05	58.74	276.34	1763373.	7
	173.32	58.68	263.03	1707463.	7
	166.59	58.63	250.60	1655246.	7
1 20	159.86	58.58	238.79	1606270.	7
	158.05	58.54	227.76	1561591.	7
	156.24	58.50	218.11	1522041.	6
	154.43	58.47	209.43	1486913.	6
	152.62	58.43	201.69	1455633.	6
	150.81	58.41	194.77	1427670.	6
1 21	149.00	58.38	188.94	1402450.	6
	143.70	58.36	183.58	1378457.	6
	138.40	58.34	178.23	1354500.	6
	133.10	58.31	172.88	1330573.	6
	127.80	58.29	167.54	1306671.	6
	122.50	58.26	162.20	1282793.	6
1 22	117.20	58.24	156.87	1258934.	6
	113.51	58.22	151.65	1235544.	6
	109.81	58.20	146.72	1212983.	6
	106.11	58.17	142.43	1190969.	6
	102.41	58.15	138.21	1169288.	6
	98.71	58.13	134.05	1147905.	6
1 23	95.02	58.11	129.94	1126786.	6
	92.48	58.09	125.93	1106232.	6
	89.94	58.07	122.09	1086508.	6
	87.40	58.05	118.49	1067495.	5
	84.86	58.03	114.91	1049113.	5
	82.32	58.02	111.44	1031322.	5

ﾀﾞﾑ ﾖｳﾘｮｳ ｹｲｻﾝ ——*** Infanta dam *** B:60.0 * 1 *** EL= 57.0

DATE	(QI)	(ID)	(QO)	(V)	
2 0	79.78	58.00	108.08	1014058.	5
	77.08	57.98	105.25	997085.	5
	74.39	57.97	102.44	980188.	5
	71.70	57.95	99.64	963360.	5
	69.01	57.93	96.85	946591.	5
	66.32	57.92	94.07	929878.	5
2 1	63.62	57.90	91.30	913215.	5
	59.28	57.88	88.46	896123.	5
	54.94	57.87	85.49	878170.	5
	50.60	57.85	82.29	859463.	6
	46.26	57.83	79.07	840075.	6
	41.92	57.81	75.74	820047.	6
2 2	37.58	57.79	72.64	799342.	6
	33.96	57.77	69.71	778057.	6
	30.34	57.75	66.72	756373.	6
	26.71	57.72	63.68	734323.	6
	23.09	57.70	60.60	711935.	6
	19.46	57.68	57.47	689237.	6
2 3	15.84	57.66	54.30	666252.	6
	14.61	57.63	51.19	643696.	6
	13.37	57.61	48.22	622224.	6
	12.14	57.59	45.58	601697.	6
	10.90	57.57	43.41	581874.	6
	9.67	57.55	41.30	562594.	6
2 4	8.44	57.54	39.25	543822.	6
	7.84	57.52	37.27	525713.	6
	7.25	57.50	35.43	508394.	5
	6.65	57.48	33.62	491815.	5
	6.06	57.47	31.88	475946.	5
	5.47	57.45	30.22	460742.	5
2 5	4.87	57.44	28.62	446162.	5
	4.55	57.43	27.10	432244.	5
	4.22	57.41	25.65	419025.	5
	3.90	57.40	24.27	406460.	5
	3.58	57.39	23.30	394408.	5
	3.25	57.38	22.39	382726.	5
2 6	2.93	57.37	21.51	371385.	5
	2.77	57.36	20.66	360421.	5
	2.62	57.34	19.84	349866.	5
	2.47	57.33	19.06	339701.	5
	2.31	57.33	18.30	329909.	5
	2.16	57.32	17.56	320473.	5
2 7	2.00	57.31	16.86	311376.	5
	1.92	57.30	16.18	302625.	5
	1.84	57.29	15.53	294226.	5
	1.76	57.28	14.90	286163.	5
	1.68	57.27	14.34	278408.	4
	1.60	57.27	13.77	270943.	4

Data 2.3.2.3-3-5

Appendix 6

ﾀﾞﾑ ﾖｳﾘｮｳ ｹｲｻﾝ ———*** Infanta dam *** B:60.0 * 1 *** EL= 57.0

DATE	(QI)	(H)	(QO)	(V)	
2 8	1.52	57.26	13.21	263780.	4
	1.48	57.25	12.67	256904.	4
	1.44	57.25	12.16	250317.	4
	1.40	57.24	11.67	244007.	4
	1.36	57.23	11.20	237961.	4
	1.31	57.23	10.75	232167.	4
2 9	1.27	57.22	10.32	226613.	4
	1.26	57.22	9.90	221296.	4
	1.24	57.21	9.51	216214.	4
	1.23	57.21	9.13	211357.	4
	1.22	57.20	8.77	206713.	4
	1.20	57.20	8.42	202273.	4
2 10	0.00	57.19	8.23	197627.	4
	0.00	57.19	8.03	192738.	4
	0.00	57.19	7.83	187969.	4
	0.00	57.18	7.64	183318.	4
	0.00	57.18	7.45	178782.	4
	0.00	57.17	7.27	174358.	4

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535.50	59.03	347.11	2059761.

ｼｮｷ ﾖｳﾘｮｳ	ﾁｮｳｾﾂ ﾖｳﾘｮｳ	ｱﾘﾏｼ ﾖｳﾘｮｳ (0.2)
0.	2059761.	2471714.

ｻｰﾁｬｰｼﾞ ｽｲｲ	ｻｰﾁｬｰｼﾞ ﾖｳﾘｮｳ
59.436	2471714.

Data 2.3.2.3-3-6

Appendix 6

Data 2.3.2.6-1 Reference Data for Resettlement Plan and Design

(1) Soil

Soil surveys were performed at seven places to check the suitability for the farming in the resettlement area. Soil texture of various soil sections are shown in as follows.

(A) Description of Soil Profile in Resettlement

Soil survey point No.	1
Date	15/10/96
Land use	Grassland
Topography	Flat, Elevation 56m
Parent material	Consolidated igneous rock

Horizon	Depth (cm)	Description
1	0~18	Dark reddish brown (5YR3/4), Loam, Low (2~5%) humus, Few (<5%) fine (1~0.2cm) and small (5~1cm) semi-angular gravels, Fine granular structure, Few fine (0.1~0.5mm) pore space, Medium compactness Weak plasticity, Medium stickiness, Medium or large permeability, Moist moisture condition, Clear and irregular horizon boundary
2	18~40	Reddishi brown (5YR4/6), Clay loam, Few (<2%) humus, Very much (20~50%) fine (1~0.2cm) and small (5~1cm) semi-angular gravels, No structure, Few fine (0.1~0.5mm) pore space, Strong compactness, Medium plasticity, Medium stickiness, Medium permeability, Moist moisture condition, Clear and irregular horizon boundary
3	40~60	Reddish brown (5YR4/8), Clay loam, No humus, Much (10~20%) fine (1~0.2cm) and small (5~1cm) semi-angular gravels, No structure, Few fine (0.1~0.5mm) pore space, Strong compactness, Strong plasticity, Strong stickiness, Weak permeability, Moist moisture condition, Clear and rolling horizon boundary
4	60~	Light reddish brown (5YR5/6), Light clay, No humus, Few (<5%) fine (1~0.2cm) and small (5~1cm) semi-angular gravels, Few (<5%) dark red (7.5R3/6) semi-weathering gravels, No structure, Few fine (0.1~0.5mm) pore space, Strong compactness, Strong plasticity, Strong stickiness, Weak permeability, Moist moisture condition

Distribution of roots 0~30cm medium, 30~40cm little, 40~55cm few

Thickness of effective soil depth 40cm

Soil survey point No. 2
Date 20/10/96
Land use Grassland
Topography Flat, Elevation 38m
Parent material Consolidated igneous rock

Horizon	Depth (cm)	Description
1	0~18	Brown (7.5YR4/4), Silty loam, Low (2~5%) humus, Few (<5%) fine (1~0.2cm) and small (5~1cm) semi-angular gravels, Fine granular structure, Few fine (0.1~0.5mm) pore space, Medium compactness Medium plasticity, Medium stickiness, Medium or large permeability, Moist moisture condition, Clear and irregular horizon boundary
2	18~44	Brown (7.5YR4/6), Clay loam, Few (<2%) humus, Very much (20~50%) fine (1~0.2cm) and small (5~1cm) semi-angular gravels, Few semi-weathering gravels, No structure, Few fine (0.1~0.5mm) pore space, Strong compactness, Medium plasticity, Medium stickiness, Medium permeability, Moist moisture condition, Clear and irregular horizon boundary
3	44~	Brown (10YR4/6), Light clay, No humus, Very much (20~50%) fine (1~0.2cm) and small (5~1cm) semi-angular gravels, No structure, No pore space, Strong compactness, Strong plasticity, Strong stickiness, Weak permeability, Moist moisture condition

Distribution of roots 0~30cm medium, 30~40cm little, 40~60cm few
Thickness of effective soil depth 40cm

Soil survey point No. 3
Date 23/10/96
Land use Grassland
Topography Flat, Elevation 42m
Parent material Consolidated igneous rock

Horizon	Depth (cm)	Description
1	0~25	Brown (7.5YR4/4), Fine sandy loam, Low (2~5%) humus, Few (<5%) fine (1~0.2cm) and small (5~1cm) semi-angular gravels, Few reddish brown (5YR4/8) fine and small semi-weathering semi-angular gravels, Fine granular structure, Few fine (0.1~0.5mm) pore space, Medium compactness, Weak plasticity, Weak stickiness, Large permeability,

		Moist moisture condition, Clear and irregular horizon boundary
2	25~40	Brown (10YR4/6), Loam, Low (2~5%) humus, Few (<5%) fine (1~0.2cm) and small (5~1cm) semi-angular gravels, Few dark reddish brown (2.5YR3/6) fine and small semi-weathering semi-angular gravels, No structure, Few fine (0.1~0.5mm) pore space, Medium compactness, Medium plasticity, Medium or large permeability, Moist moisture condition, Clear and irregular horizon boundary
3	40~45	Brown (10YR4/6), Clay loam, No humus, Very much (20~50%) fine (1~0.2cm) and small (5~1cm) semi-angular gravels, No structure, No pore space, Strong compactness, Strong plasticity, Medium stickiness, Medium permeability, Moist moisture condition, Clear and rolling horizon boundary
4	45~	Brown (10YR4/6), Bed rock

Distribution of roots	0~15cm medium,	15~23cm little,	23~40cm few
Thickness of effective soil depth	40cm		

Soil survey point No.	4
Date	22/10/96
Land use	Grassland
Topography	Flat, Elevation 30m
Parent material	Consolidated igneous rock

Horizon	Depth (cm)	Description
1	0~20	Dark brown (7.5YR3/4), Loam, Low (2~5%) humus, Few (<5%) or low (5~10%) fine (1~0.2cm) and small (5~1cm) semi-angular gravels Few light reddish brown (2.5YR5/8) fine and small semi-weathering semi-angular gravels, Fine granular structure, Few fine (0.1~0.5mm) pore space, Medium compactness, Medium plasticity, Medium stickiness, Medium permeability, Moist moisture condition, Clear and irregular horizon boundary, Medium (10~5cm) and big (20~10cm) gravels appear betweenn 1 and 2 horizon
2	20~50	Reddish brown (5YR4/6), Clay loam, Few (<2%) humus, Much (10~20%) fine (1~0.2cm) and small (5~1cm) semi-angular gravels, Low (5~10%) medium (10~5cm) semi-angular gravels, Few (<5%) light reddish brown (2.5YR5/8) fine and small semi-weathering semi-angular gravels, No structure, Few fine (0.1~0.5mm) pore space, Medium compactness, Medium plasticity, Medium stickiness,

		Medium permeability, Moist moisture condition, Clear and irregular horizon boundary
3	50~	Light reddish brown (5YR5/6), Clay loam, No humus, Much (10~20%) fine (1~0.2cm) and small (5~1cm) semi-angular gravels, Few (<5%) medium (10~5cm) semi-angular gravels, Few (<5%) light reddish brown (2.5YR5/8) fine and small semi-weathering semi-angular gravels, No structure, No pore space, Strong compactness, Medium plasticity, Medium stickiness, Medium permeability, Moist moisture condition

Distribution of roots	0~20cm medium,	20~30cm little,	30~50cm few
Thickness of effective soil depth	50cm		

Soil survey point No.	5
Date	22/10/96
Land use	Grassland
Topography	Flat, Elevation 20m
Parent material	Consolidated igneous rock

Horizon	Depth (cm)	Description
1	0~21	Brown (7.5YR4/6), Silty loam, Low (2~5%) humus, Few (<5%) or low (5~10%) fine (1~0.2cm) and small (5~1cm) semi-angular gravels Few red (10R4/6) fine and small semi-weathering semi- angular gravels, Fine granular structure, Few fine (0.1~0.5mm) pore space, Medium compactness Medium plasticity, Medium stickiness, Medium permeability, Moist moisture condition, Clear and irregular horizon boundary
2	21~36	Reddish brown (5YR4/8), Clay loam, Few (<2%) humus, Few (<5%) or low (5~10%) fine (1~0.2cm) and small (5~1cm) semi-angular gravels, Few red (10R4/6) fine and small semi-weathering semi- angular gravels, No structure, Few fine (0.1~0.5mm) pore space, Medium or strong compactness, Medium or strong plasticity, Medium or strong stickiness, Medium permeability, Moist moisture condition, Clear and irregular horizon boundary
3	36~48	Light reddish brown (5YR5/8), Light clay , No humus, Few (<5%) fine (1~0.2cm), small (5~1cm) and medium (10~5cm) semi-angular gravels, Few red (10R4/6) fine and small semi-weathering semi-angular gravels, No structure, Few fine (0.1~0.5mm) pore space, Strong compactness, Strong plasticity, Strong stickiness, Weak permeability, Moist moisture condition, Clear and rolling horizon boundary

4	48~	Orange (5YR6/8), Light clay, No humus, Low (5~10%) fine (1~0.2cm), small (5~1cm) and medium (10~5cm) semi-angular gravels Few (<5%) dark red (7.5R3/6) semi-weathering semi-angular gravels, No structure, Few fine (0.1~0.5mm) pore space, Strong compactness, Strong plasticity, Strong stickiness, Weak permeability, Moist moisture condition,

Distribution of roots	0~18cm medium,	18~36cm little,	36~45cm few
Thickness of effective soil depth	36cm		

Soil survey point No.	6
Date	23/10/96
Land use	Grassland
Topography	Flat, Elevation 31m
Parent material	Consolidated igneous rock

Horizon	Depth (cm)	Description
1	0~20	Dark brown (7.5YR3/4), Clay loam, Low (2~5%) humus, Few (<5%) fine (1~0.2cm) and small (5~1cm) semi-angular gravels, Fine granular structure, Few fine (0.1~0.5mm) pore space, Medium compactness, Medium plasticity, Medium stickiness, Medium permeability, Moist moisture condition, Clear and irregular horizon boundary,
2	20~42	Brown (7.5YR4/6), Clay loam, Few (<2%) humus, Very much (0~50%) fine (1~0.2cm), small (5~1cm) and medium (10~5cm) semi-angular gravels, Few (<5%) light reddish brown (5YR5/8) fine, small and medium semi-weathering semi-angular gravels, No structure, Few fine (0.1~0.5mm) pore space, Strong compactness, Medium plasticity, Medium stickiness, Weak permeability, Moist moisture condition, Clear and irregular horizon boundary
3	42~	Brown (10YR4/6), Light clay, No humus, Very much (20~50%) fine (1~0.2cm), small (5~1cm) and medium (10~5cm) semi-angular gravels, Few (<5%) light reddish brown (5YR5/8) fine, small and medium semi-weathering semi-angular gravels, No structure, No pore space, Strong compactness, Strong plasticity, Strong stickiness, Weak permeability, Moist moisture condition

Distribution of roots	0~20cm medium,	20~35cm little,	35~60cm few
Thickness of effective soil depth	30cm		

Soil survey point No. 7

Date 19/10/96

Land use Grassland

Topography Flat, Elevation 26m

Parent material Consolidated igneous rock

Horizon	Depth (cm)	Description
1	0~25	Dark reddish brown (5YR3/6), Clay loam, Low (2~5%) humus, Few (<5%) fine (1~0.2cm) and small (5~1cm) semi-angular gravels, Small (5~1cm) and medium (10~5cm) semi- angular gravels intersperse on a surface, Fine granular structure, Few fine (0.1~0.5mm) pore space, Medium compactness, Medium plasticity, Medium stickiness, Medium permeability, Moist moisture condition, Clear and irregular horizon boundary,
2	25~48	Reddish brown (5YR4/8), Clay loam, Few (<2%) humus, Low (5~10%) fine (1~0.2cm) and small (5~1cm) semi-angular gravels, Few (<5%) or low (5~10%) dark red (7.5R3/6) semi-weathering semi-angular gravels, No structure, Few fine (0.1~0.5mm) pore space, Medium or strong compactness, Medium plasticity, Medium stickiness, Medium permeability, Moist moisture condition, Clear and irregular horizon boundary
3	48~	Yellowish brown (10YR5/6), Light clay, No humus, Few (<5%) fine (1~0.2cm) and small (5~1cm) semi- angular gravels, Few (<5%) dark red (7.5YR3/6) and dark reddish brown (2.5YR3/6) semi-weathering semi-angular gravels, No structure, No pore space, Strong compactness, Strong plasticity, Strong stickiness, Weak permeability, Moist moisture condition

Distribution of roots	0~12cm medium,	12~20cm little,	20~50cm few
Thickness of effective soil depth	45cm		

(B) RESULTS OF ANALYSIS

Survey point No.	Hori-zon	Depth cm	pH H_2O	pH KCl	Available P* ppm	Organic C %	Organic Matter %	Exchangeable cation me/100g Ca	Mg	Na	K	Sum	Cation exchange capacity me	Base Satulation % Base	Ca
1	1	0~18	5.5	4.4	0.6	0.82	1.41	0.9	0.7	tr	tr	1.6	6.5	24.6	13.8
	2	18~40	6.1	4.5	0.6	0.48	0.83	1.8	1.4	tr	tr	3.2	8.3	38.6	12.0
2	1	0~18	5.8	4.5	0.5	0.53	0.91	1.4	1.4	tr	tr	2.8	4.7	59.6	29.8
	2	18~44	6.0	4.9	0.6	0.31	0.53	1.8	2.2	0.2	tr	4.2	9.9	42.4	18.2
3	1	0~25	5.5	4.3	0.8	0.33	0.57	0.4	0.6	tr	tr	1.0	4.8	20/8	8.3
	2	25~40	5.6	4.1	0.6	0.26	0.45	1.0	1.3	tr	tr	2.3	5.0	46.0	20.0
4	1	0~20	5.4	4.4	0.6	0.37	0.64	0.7	0.7	tr	tr	1.4	6.0	23.3	11.7
	2	20~50	5.7	4.9	0.6	0.27	0.46	2.1	2.0	tr	tr	4.1	10.4	39.4	20.2
5	1	0~21	5.7	4.4	0.6	0.55	0.95	2.6	2.9	0.1	tr	5.6	11.3	49.6	23.0
	2	21~36	5.6	4.9	0.7	0.45	0.77	3.8	4.1	0.2	tr	8.1	12.2	66.4	31.1
6	1	0~20	5.3	4.2	0.6	0.85	1.46	2.6	2.7	tr	tr	5.3	12.6	42.1	20.6
	2	20~42	5.5	4.4	0.6	0.36	0.62	3.4	3.6	0.1	tr	7.1	7.8	91.0	43.6
7	1	0~25	5.5	4.9	0.6	0.34	0.58	1.8	2.2	tr	tr	4.0	8.8	45.5	20.5
	2	25~48	5.6	5.0	0.6	0.28	0.48	2.9	3.2	0.1	tr	6.2	5.6	111	51.8
8	2	40	5.9	5.0	1.0	0.18	0.31	16.3	22.1	0.2	0.1	38.7	43.7	88.6	37.3
9	2	40	6.0	5.0	0.7	0.41	0.70	8.1	10.2	0.1	0.1	18.5	24.5	76.1	33.3
10	2	40	6.3	5.5	0.7	0.51	0.88	10.5	11.7	0.2	tr	22.4	24.4	91.8	43.0

Note
1 Organization of analysis: BSWM
2 Survey point: No.1~No.7: Schedule area of resettllement (Bamban)
Survey point: No.8 (Patima), No.9 (Maya), No.10 (Doliman)
3 Available P*: Brays 2 method
4 tr: trace

(2) Resettlement plan

(A) Pinatubo victim resettlement plan

Approximately 40,000 households are estimated to directly suffer from damages of sediment runoff due to the volcanic eruption of Mount Pinatubo in June 1991. According to the result of surveys in April 1994, 22,550 households were registered, and 17,450 were not registered. Out of the households were not registered, 15,085 households had removed to victim camps, however, 11,535 were still standing by at provisional victim camps. After the survey in April 1994, the Pinatubo victims rescue plan and its execution have been promoted under the Integrated Plan for the Mount Pinatubo Affected Areas that have been prepared by the MPC (Mount Pinatubo Commission). As the result of these activities, 30,000 households have been removed to the facilities that were constructed in Tarac, Bampanga, and Zambales. The MPC is promoting the construction of the resettlement area in Region III for the remaining 10,000 victims households in consideration of desires on the resettlement region of victims. There are 27 households of Pinatubo victims living in Infanta already, and the early resettlement of these families is planned.

The Pangasinan Provincial Government, was motivated also by the request of President Ramos, has decided to receive approximately 100 households of Pinatubo victims. However, since the size of the resettlement area to be constructed under the project are limited, number of new resettlers will be 20 to 30 households. Candidates for resettlement are invited publicly, and those who want to engage in farming will be selected. Discussions were held for the implementation of the resettlement between Mr. Engr Alvin Bigay, Chief of Provincial Housing and Coordinating Center, and Mr. Antonio Fernando, Executive Director of Office of the Malacanan. The survey team participated in the discussion as an observer. It was determined that the MPC pays for the house construction in the resettlement area.

(B) Farming and distribution area

The land holding area of paddy field in the Infanta region is 1.3 ha. In addition to paddy fields, approximately 70% of the farmers own land including mountain areas. Some farmers use adjacent mountain area (national land) for mango afforestation. Fowls, goats, pigs, and a small number of beef cattle are bred in farmyards for farmer's self consumption, and such breeding plays also an important role of earning additional income. According to the survey of the Infanta Municipal Government, the average income of farmers from agricultural activities is roughly estimated as Ps. 60,000 to 250,000 per household.

The Pangasinan Provincial Government is planning to distribute 1.5 ha of paddies and 1.5 ha of rainfed water cultivation and per household in consideration of the productivity of the newly developed paddy fields and expected income of resettlers. The size of distribution area and achievement plan of farmer's economic goal are shown below.

(a) Irrigable area

Paddy rice double-cropping is planned for the irrigable area where water can be supplied from the irrigation canals to be constructed under the project. The cropping intensity is made 160% based on water use rate the dam. Paddy field reclamation after resettlement is planned as 0.3 ha/year, reclamation of 1.5 ha will be finished during five years. Production is estimated as 2.0 ton/ha for the first five years after paddy preparation, and 2.8 ton/ha afterwards.

(b) Rainfed water agriculture

The rainfed water agriculture zone may use 0.5 ha for rainfed water rice cropping, and 1.0 ha for beef cattle breeding and pasture. Mango trees will be afforested in the pasture for the future.

(c) Farming of resettlers

The farming of the farmers that were provided with 1.5 ha of paddies and 1.5 of ha rainfed water cultivation area under the above-mentioned plan are expected to develop as shown in the following table. It is planned that the Food Frame Work of the Pangasinan Provincial Government will provide farmers with startup fund for help.

Goal Income of Paddy (1)

Farmers	Land Holding Paddy (ha)	Cropping density (%)	Unit Production (ton)	Production (ton)	Unite Price (1kg/Ps)	Income (Ps)
Rice	1.5	160	2.8	6.7	8.0	53,760

Goal Income of Upland (2)

Farmers	Land Holding Up land (ha)	Cultivated Area (ha)	Unit Production (ton)	Production (ton)	Unite Price (1kg/Ps)	Income (Ps)
Rice	1.5	0.5	1.5	0.8	7.0	5,250
Mango		12 Trees	500	6,000	10	60,000
Total						65,250

Goal Income of Livestock (3)

Farmers	Land Holding Up land (ha)	Pasture Area (ha)	Cow (No. of head)	Production (No. of head)	Unite Price (head/Ps)	Income (Ps/Year)
Livestock (Cow)	1.5	1.0	1.0	0.3	150,000	45,000

Farmer's Income after Settlement

			Years									
			1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Paddy	Area	ha	-	0.3	0.6	0.9	1.2	1.5	1.5	1.5	1.5	1.5
	Dencty	%	-	160	160	160	160	160	160	160	160	160
	Prodc.	ton	-	2.0	2.0	2.0	2.0	2.8	2.8	2.8	2.8	2.8
	Cost	Ps/kg		8	8	8	8	8	8	8	8	8
	Income	Ps	-	7,680	15,360	23,040	30,720	53,760	53,760	53,760	53,760	53,760
Upland	Paddy	ha	-	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
	Prodc.	ton	-	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
	Cost	Ps/kg	-	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
	Income	Ps	-	5,250	5,250	5,250	5,250	5,250	5,250	5,250	5,250	5,250
	Mango	ton	-	-	-	-	-	-	-	2.4	3.0	6.0
	Cost	Ps/kg	-	-	-	-	-	-	-	10	20	25
	Income	Ps	-	-	-	-	-	-	-	24,000	60,000	150,000
Livestock	Cow		-	-	3,000	3,000	3,000	6,000	6,000	6,000	6,000	6,000
Total			0	12,930	20,610	31,290	38,970	65,010	65,010	89,010	125,010	215,010

(3) Residential area and its size of resettler

The residential area for the resettlers should be planned so that sustainable their life and farming can be maintained. Acquisition conditions of domestic water, convenience of social life, and use of farmland have been compared between the rainfed water cultivation zone and the irrigation zone for the residential area of resettlers. The merits and demerits have been examined, and position has been determined after deliberation with the Pangasinan Provincial Government.

Table 5.13-1 Comparative study on Resettlement Zone

Item of Comparison	1st alternative (Rainfed zone)		2nd alternative (Irregation zone)	
	Merit	Demerit	Merit	Demerit
Water supply		Water supply by pump Maintenance is necessary No experimence Water supply always need expenses. Famers are heavily boundened in the initial stage for the stepped development procedure.	Gravitation supply from dam Maintenance free No heavy burden even for stepped development	
Social life		Far from existing village, and inconvenient for life. The residential zone is located above 50 m elevation, and is inconvenient for livimg.	Close to barangay Slete Meso, and convenient for school children to go go school.	
Land use	10ha or more irrigation area is obtainable		Good and Convenient access to Paddies.	10ha or less irrigation area is obtainable

As a result of above comparison, considering the following matters with priority, and taking up the request of the Pangasinan provincial Government as well, the residential zone is located in the irrigation area.

- Domestic water supplied from the dam should be distributed with gravity after filtration, and no significant maintenance cost should be required.

- In consideration of the convenience of good access to school for children and to existing villages for people at large, it is desirable to locate the residential area along the newly constructed road in the southern side of the immigration (resettlement) land.

Data 3.1- 1 Study for River Diversion

The construction of dam is scheduled to be carried out during the two dry seasons. During the first dry season, the river bed excavation, foundation treatment and embankment (75,000m^3) of core & filter zones upto the river bed level will be carried out at the river bed section. And during the second dry season, the main embankment works (354,000m^3) will be carried out.

The river diversion plan is to be made to a 10 years probable flood during the dry season.

The design flood discharge is estimated on the basis of recent 15 years daily rainfall data at Iba station which is located in the same climate zone and has comparatively long-term reliable records. The annual maximum daily rainfall records at Iba during the dry season (November to May) are listed as shown in the table below.

Year	Daily rainfall (mm)
1995	43.8
1994	22.1
1993	49.6
1992	39.6
1991	34.0
1990	12.7
1989	35.0
1988	44.8
1987	16.8
1986	38.0
1985	45.0
1984	33.5
1983	37.0
1982	44.2
1981	65.6

The 10 years probable daily rainfall is obtained at 60 mm according to the Iwai method.

The daily maximum rainfall is distributed to hourly rainfall and the 10 years probable

flood is estimated by the unit-hydrograph method of which coefficients and conditions are obtained from BSWM. The peak discharge becomes 67 m^3/s and the total inflow volume 1,450,000 m^3.

However the rainfall happens more or less sporadically and the ground surface is dried up during the dry season and the actual runoff coefficient would be comparatively less than that of rainy season. The runoff coefficient, thus estimated to be 70% of that of rainy season. Namely, the peak discharge becomes 47 m^3/s and the total inflow 1,000,000 m^3.

(1) River diversion plan during the first dry season

An upstream side coffer dam with the crest El. 38.50 m and a downstream coffer dam with the crest El. 33.0 m are to be constructed on the both sides of proposed dam site. And a diversion open channel with a capacity of 15 m^3/s is to be constructed on the right bank along the river.
A 10 years flood flow will be safely released by the channel capacity and the storage capacity of approx. 400,000 m^3 at WL 37.00 m. It is considered that a flood exceeding 15 m^3/s will occur very scarcely during the construction period.

The diversion channel has 3 m in bottom width, 1:1 slopes on both sides, and approx. 2 m in depth. The channel is approx. 285 m in total length. Two lines of pipe (1.3 m in diameter) are to be placed in the 40 m section crossing the upstream side coffer dam and a cover to make a culvert open channel is to be placed in the 15 section crossing the downstream side coffer dam.

The upstream side coffer dam is designed to have 3 m of the crest width, 1:2.5 on the upstream slope, 1:2.0 on the downstream slope, and approx. 6.5 m in the max. height. The downstream coffer dam is 3 m of the crest width, 1:2.0 on the up & downstream slopes, and approx. 3.0 m in the max. height.

(2) River diversion plan during the second dry season

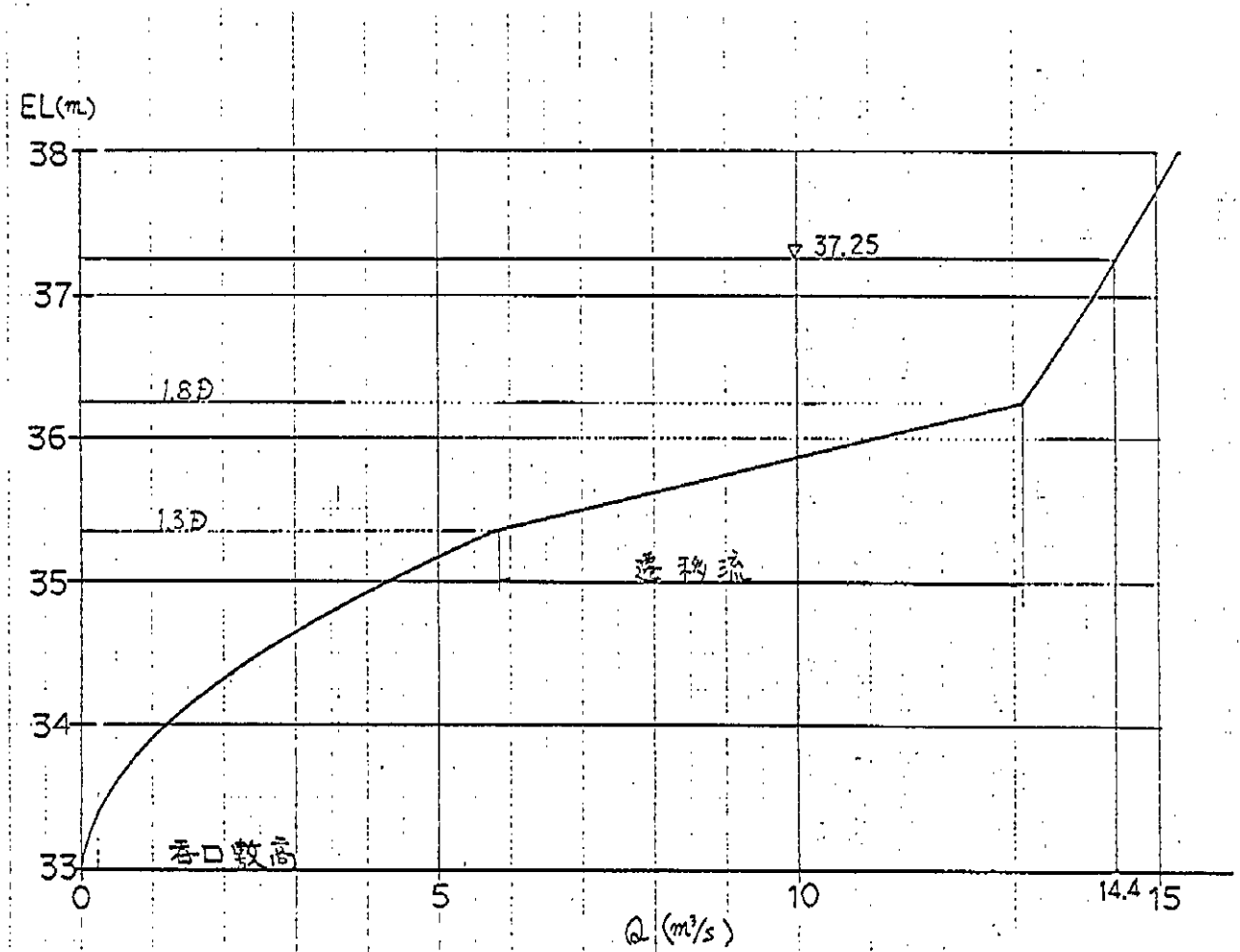
For the second dry season, a concrete lined steel pipe of 1.8 m in diameter is to be placed on the left bank side after the excavation of approx. 2.5 m deep. This pipe is utilized as a permanent irrigation conduit after the construction works. The pipe

capacity has approx. 15 m^3/s at WL. 37.0 m. The open channel on the right bank will be removed in the middle of dry season, therefore the capacity of river diversion becomes almost double during the early part of dry season when a flood occurrence is expected to be higher in the dry season.

The dam embankment will be carried out mostly during 3 months from January to March and the maximum probable daily rainfall is only 31 mm which is nearly a half of that in 6 months. That is, actual safety factor is increased.

In addition to the above, it is informed for a reference that the max. discharge in the San felipe river was 38 m^3/s (Aug. 13) in the rainy season, less than 1 m^3/s in May and June, and less than 10 m^3/s in October and November according to the new observation started in May 1996.

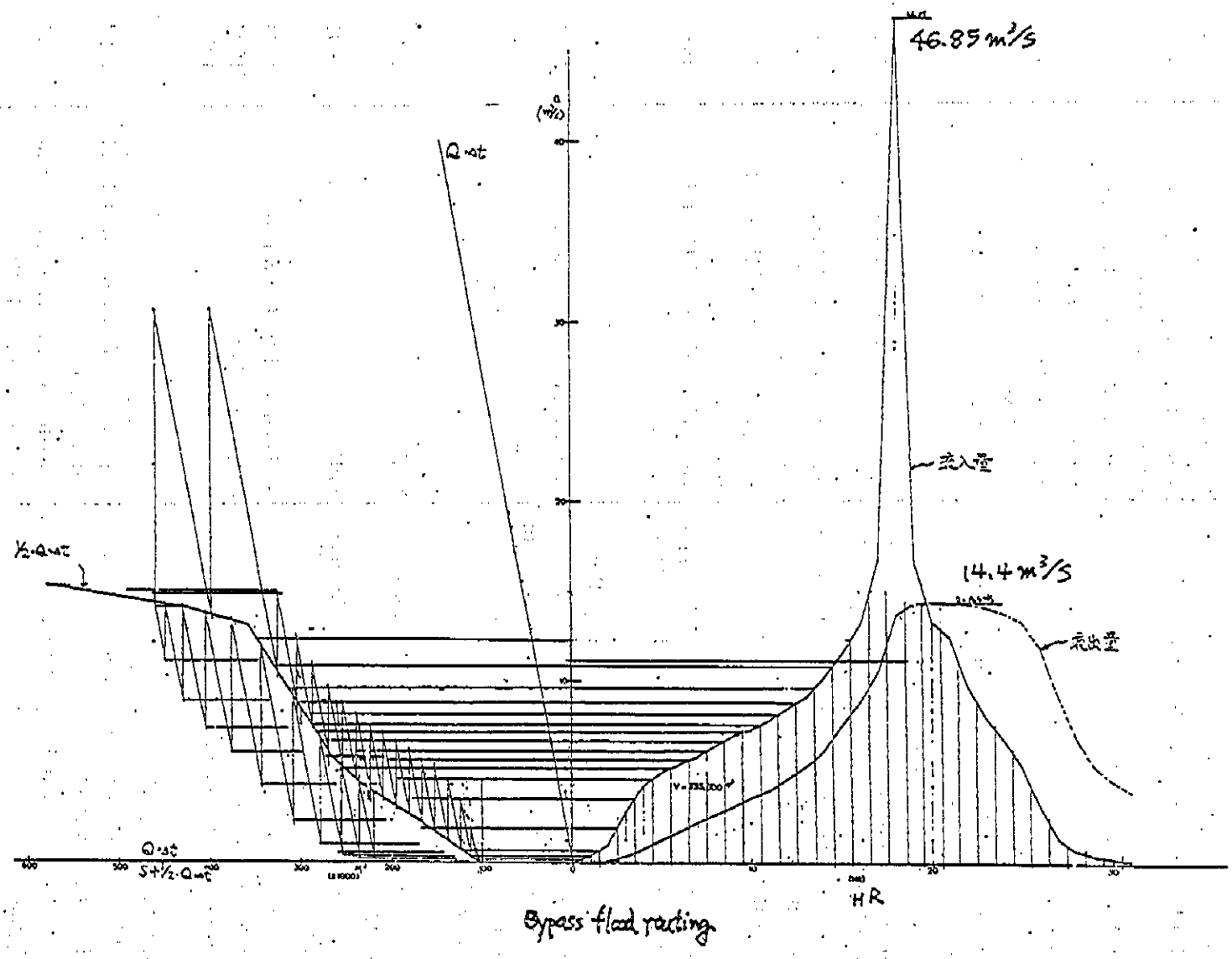
Data 3.1-1-3



転流工 水位～流量曲線 (D=1.8m)

BASIC DESIGN FOR INFANTA IMPOUNDING IRRIGATION AND ENVIRONMENTAL IMPROVEMENT PROJECT JAPAN INTERNATIONAL COOPORATION AGENCY	Capacity Curve of Steel Pipe (ϕ 1.8 m)

Data 3.1-1-4



Case: ϕ 1.8 m

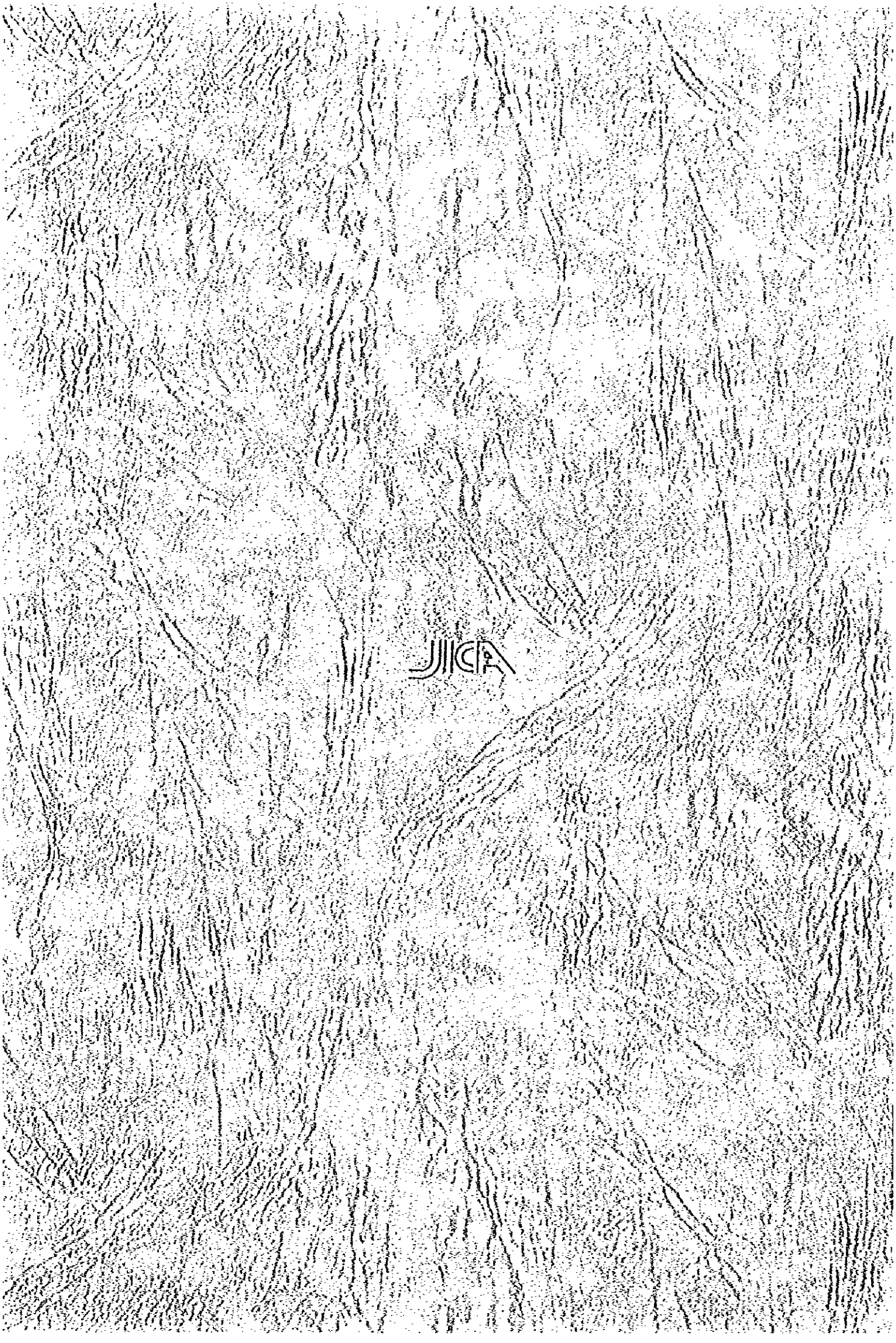
BASIC DESIGN FOR INFANTA IMPOUNDING IRRIGATION AND ENVIRONMENTAL IMPROVEMENT PROJECT JAPAN INTERNATIONAL COOPORATION AGENCY	Flood Routing Calculation for River Diversion (ϕ 1.8 m pipe)

Data 3.1-1-5

Appendix 7. References

	Title	Publisher	Year
Topography / Geology			
1	Roadmap of the Philippines	National Book Store Inc.	1985
2	Map of 1/50,000 (Santa Cruz, Bugallon)	National Mapping and Resource Information Authority	1989
3	Map of 1/250,000 (Tarlac)	National Mapping and Resource Information Authority	
4	The Nipas Law	Department of Environmental and Natural Resource	1992
5	Report on the semi-detailed geological investigation of the proposed San Felipe Mini-Reservoir Project in Infanta, Pangasinan	NIA Investigaiton Team	1980
6	The Geology and Mineral Resources of Pangasinan Province. Report of Investigation No. 75.	Philippine Bureau of Mines	1974
7	Sheet 2967 I, Geological map of Dasol Quadrangle, Scale 1 : 50,000.	Philippine Bureau of Mines and Geo-Sciences	1983
8	Sheet 2967 II, Geological map of Malabago Quadrangle, Scale 1:50,000.	Philippine Bureau of Mines and Geo-Sciences	1983
9	Geology of the Zambales Range, Luzon, Philippine Islands, Ophiolite Derived from Island Arc-Back Arc Basin Pair. 95-123. Geophysical Monograph 27, Am, Geophy. Union	James W. Haukins and Cunthia A. Evance	1983
10	Petrological and Geochemical Documentation of Ocean Floor Metamorphism in Zambales Ophiolite, Philippines. 139-155. Geophysical Monograph 27, Am. Geophy. Union.	E. E. Geary and R. W. Kay	1983
Socio - Economy / Development Plan			
1	Medium-Term Philippine Development Plan 1993 - 1998	NEDA	1994
2	National Handbook on Land and Other Physical Resources	NEDA	1991
3	Philippine Statical Year Book 1994	National Statistic Courdi. B.	1994
4	Statistics & Province of Pangasinan	Pangasinan Province	1994
5	Provincial Physical Framework Plan 1996 - 2026	Pangasinan Province	1996
Environment / Afforestation			
1	Nipas Act R.A 7586 and Implementing and Regurations Dao 25 1992	Department of Environmental and Natural Resource	1992
2	A Primer on Environmental Impact Assessment in the Philippines	Department of Environmental and Natural Resource (EMB)	1992
3	Amending the Revised Rules and Regulations Implementing P.D. 1586	Department of Environmental and Natural Resource (EMB)	1992
4	Policies, Memoranda and other issuances on the National Forestation Program Volume-II	DENR	1991
5	Policies, Memoranda and other issuances on the National Forestation Program Volume-IV	DENR	1991

	Title (表題)	Publisher (発行者)	Year
Environment / Afforestation			
6	Policies, Memoranda and other issuances on the National Forestation Program Volume-VII	DENR	1991
7	Our Future Forests	DENR	
8	Timters of the Philippines (Volume 1)	GOVERNMENT PRINTING OFFICE	1974
9	Manual of Reforestation and Erosion Control for the Philippines	ESCHBORN	1975
10	Land Use Map Province of Pangasinan		
Agriculture / Soil / Land Use			
1	Statistics on Selected Major Crops 1981 - 1990	Bureau of Agricultural Statistics	1994
2	インファンタ地区の土壌調査結果抜粋	BSWM	1993
3	パンガシナン州土壌分類図	URDYA	
4	パンガシナン州土地利用図	URDYA	1994
5	パンガシナン、ラ、ウニオン土壌図	DENR	
Meteo - Hydrology			
1	Daily Rainfal Values, Sta Cruz, 1975 - 1995	PAGASA	1996
2	Daily Rainfal Values, Dagupan City, 1961 - 1995	PAGASA	1996
3	Daily Rainfal Values, Mabini, 1968 - 1995	PAGASA	1996
4	Daily Rainfal Values, Iba, 1961 - 1995	PAGASA	1996
Design Standards / Design Drawings			
1	Design guides and Criteria for irrigation Canals, O&M Roads Drainage Channels & Appurtenant structures	NIA	1979
2	Bamban Weir Design Drawing (1枚) San Felipe Weir Design Drawing (4枚)	NIA	-
3	Barangay Road Standard Design Drawing	PEO	-
4	Box-Culverts Design Drawing (2枚)	PEO	-
Construction Plan and Cost Estimate			
1	Cost Estimate of Gravel Pavement	Pangasinan Province	1996
2	League of Pangasinan Contractors		1996
3	Guidelines on the Procurement of Consulting Services for Government Projects	NEDA	1992
4	Equipment Guidebook	ACEL	1992
5	Construction Materials	RID	1996
Others			
1	Settlement Plan Infanta Impounding Irrigation and Environmental Improvement Project	Pangasinan Housing & Urban Development Cooordinating Office	1996
2	Integrated Plan for the Mount Pinatubo Affected Areas	Mt. Pinatubo Commission	1994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