

APPENDIX-C
GEOLOGY AND SOIL MECHANICS

APPENDIX - C

GEOLOGY AND SOIL MECHANICS

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APPENDIX-C

GEOLOGY AND SOIL MECHANICS

CHAPTER C-1 GEOLOGICAL SURVEY

Nine (9) geotechnical borings were conducted with depths ranging from 10 to 20 m on Phase II Third Field Works in 2001. The core drilling of 120 m in total and Standard Penetration Test (SPT) at every one meter in every hole were carried out, and laboratory test was done on selected soil samples.

The locations of the geotechnical boring sites are as follows, and shown in Table C-1 and Fig. C-2.

Boring No.	Location	Depth (m)
BH1	Left side bank at Tumnap Lok Reservoir	20
BH2	Left side bank at Tumnap Lok Reservoir	20
BH3	Dike at O Saray Reservoir	15
BH4	Dike at O Saray Reservoir	15
BH5	Dike at Kpob Trobek Reservoir	15
BH6-1	Dike at Kpob Trobek Reservoir	15
BH6-2	Dike at Kpob Tribek Reservoir	15
BH7	Main canal No.1 (Canal 33)	10
BH8	Main canal No.2 (Koh Kaek canal)	10

The summary of geotechnical boring is shown in Table C-2, and the boring logs are shown in Fig. C-3, C-4, C-5 and C-6.

CHAPTER C-2 SOIL MECHANICAL INVESTIGATION

C-2.1 Phase I : First Field Work

The soil mechanical test was conducted on six (6) samples, which were sampled from the following sites at Phase I First Field Work in 2001.

- Dike at Tumnup Lok Reservoir
- Dike at O Saray Reservoir
- Dike at Kpob Trobek Reservoir
- Main canal No.1 (Canal 33)
- Main canal No.2 (Koh Kaek canal)
- Secondary canal No.60

The location of sampling sites and results of the soil mechanical test are shown in Fig. C-1 and Table C-3, respectively. The reconnaissance survey of the borrow pits and the quarry sites for the construction material was carried out in parallel, and it was found that the following borrow pits and quarry sites are available for the projects:

Borrow pits for Embankment material

- B-1; Located adjacent to Mt. Kraol (Laterite for road pavement)
- B-2; Located adjacent to Pre Kduoch village (Laterite and Clayey gravel for embankment)

Quarry sites for Riprap and Gravel

- Q-1; Mt. Chi Sou located about 22 km north of Takeo town
- Q-2; Mt. Salang located about 21 km south of Takeo town
- Q-3; Mt. Chruoh Kaev located about 25 km west of Takeo town

The locations of the above sites are shown in Fig. C-1.

C-2.2 Phase II: Third Field Work

Fifteen test pits in total to depths ranging from 2.0 m to 2.5 m and six field density tests were conducted at sites shown in Fig. C-2, Table C-1 and Table C-2. Out of them, five test pit-sites were conducted along Main canal No.2 (Koh Kaek canal). The soil mechanical test was also performed on selected materials and combined materials at the laboratory. The designated sample number and sampling depth are shown in Table C-4.

Soil mechanical test items are as follows:

Physical Test

- Specific gravity test
- Moisture content test
- Grain size analysis
- Atteberg limit test

Mechanical test

- Compaction test (Moisture-density relation test)
- Permeability test (Constant head method)
- Unconfirmed compression test

The summary of the soil mechanical test results are shown in Table C-4 and Table C-5. The gradation curve and the moisture-density relation curve are shown in Fig. C-7 and Fig. C-8. The soil properties of existing embankment of dike and canal, obtained from the geotechnical borings and soil mechanical tests, are shown in Table C-6.

Tables

Table C-1 (1) Location of Geotechnical Boring

Boring No.	GPS		Location	Commune	Depth (m)	Elevation (m)
	48P	UTM				
BH1	48P 0440707	1229943	Tumnop Lok Reservoir	Dombouk Khpos	20	38.69
BH2	48P 0440727	1230046	Tumnop Lok Reservoir	Dombouk Khpos	20	42.87
BH3	48P 0443408	1224906	O Saray Reservoir	O Saray	15	39.99
BH4	48P 0443459	1224897	O Saray Reservoir	O Saray	15	39.73
BH5	48P 0446920	1223527	Kpob Trobek Reservoir	Kpob Trobek	15	38.56
BH6-1	48P 0447096	1223486	Kpob Trobek Reservoir	Kpob Trobek	15	38.69
BH6-2	48P 0447124	1223477	Kpob Trobek Reservoir	Kpob Trobek	15	38.64
BH7	48P 0448396	1223193	At Intake of Main Canal No.1 (Canal 33)	Kpob Trobek	10	38.04
BH8	48P 0448381	1223026	At Intake of Main Canal No.2 (Koh Kaek Canal)	Kpob Trobek	10	38.99

Table C-1 (2) Location of Test Pits for Soil Mechanical Investigation

Test Pit No.	GPS		Location	Commune	Depth (m)
	48P	UTM			
P1	48P 0440702	1229799	Tumnop Lok Reservoir	Trapeang Kranhung	2.0
P2	48P 0443435	1224900	O Saray Reservoir	O Saray	2.0
P3	48P 0447082	1223437	Kpob Trobek Reservoir	Kpob Trobek	2.0
P4	48P 0448393	1223194	Main Canal No.1 (Canal 33)	Kpob Trobek	2.0
P5	48P 0448389	1223021	Main Canal No.2 (Koh Kaek Canal)	Kpob Trobek	2.0
P6	48P 0448002	1223417	Main Canal No.3	Kpob Trobek	2.0
P7	48P 0447151	1222015	Agricul. Field	Kpob Trobek	2.0
P8	48P 0452125	1221783	Borrow Pit B-1	Phnom Kraol	2.0
P9	48P 0436847	1226313	Borrow Pit B-2	Prey Kdouch	2.0
P10	48P 0436763	1226321	Borrow Pit B-2	Prey Kdouch	2.0
C1	48P 0453571	1216475	Main Canal No.2 (Koh Kaek Canal)	Trapeang Thum	2.5
C2	48P 0452547	1217956	Main Canal No.2 (Koh Kaek Canal)	Trapeang Thum	2.5
C3	48P 0451765	1219312	Main Canal No.2 (Koh Kaek Canal)	Trapeang Thum	2.5
C4	48P 0450595	1220768	Main Canal No.2 (Koh Kaek Canal)	Trapeang Thum	2.0
C5	48P 0449510	1222026	Main Canal No.2 (Koh Kaek Canal)	Trapeang Thum	2.5

Table C-2 (1) Summary of Geotechnical Boring(1)

Boring No.	Location	Elevation at neck of hole (m)	Depth (m)	Soil Classification	N Value	Boring No.	Location	Elevation at neck of hole (m)	Depth (m)	Soil Classification	N Value
BH1	Tumnop Lok Reservoir	38.69	1	Sand with clay	12	BH4	O Saray Reservoir	39.73	1	Silty sand	15
			2	Fat clay	10				2	Silty sand	10
			3	Fat clay	11				3	Sand with clay	16
			4	Fat clay	32				4	Sand with clay	22
			5	High weathered rock	50/8cm				5	Sand with clay	9
BH2	Tumnop Lok Reservoir	42.87	1	Silty sand	2				6	Sand with clay	21
			2	Silty sand	10				7	Fat clay	10
			3	Silty sand	24				8	Fat clay	30
			4	Sand with clay	10				9	Fat clay	17
			5	Sand with clay	23				10	Fat clay	34
			6	Sand with clay	36				11	Fat clay	37
			7	Sand with clay	37				12	Fat clay	50/20cm
			8	Fat clay	50/25cm				13	Lean clay	50/26.5cm
			9	Fat clay	50/16.5cm				14	Lean clay	50/9.5cm
			10	Fat clay	50/11.5cm				15	Lean clay	50/4cm
			11	Fat clay	50/19cm	1	Sandy lean clay	50/23cm			
			12	High weathered rock	50/5cm	2	Sandy lean clay	49			
			13	High weathered rock	50/6cm	3	Sandy lean clay	1			
BH3	O Saray Reservoir	39.99	1	Silty sand	6	4	Silty sand	8			
			2	Silty sand	3	5	Silty sand	9			
			3	Silty sand	15	6	Silty sand	22			
			4	Silty sand	7	7	Sandy lean clay	20			
			5	Silty sand	18	8	Sandy lean clay	11			
			6	Silty sand	25	9	Sandy lean clay	29.00			
			7	Sand with clay	24	10	Sandy lean clay	50/28.5cm			
			8	Fat clay	9	11	Sandy lean clay	50/17cm			
			9	Fat clay	33	12	Sandy lean clay	50/16cm			
			10	Fat clay	33	13	Sandy lean clay	50/5cm			
			11	Fat clay	23	14	Sandy lean clay	50/3cm			
			12	Fat clay	50/20cm	15	Sandy lean clay	100/3cm			
			13	Lean clay	50/16.5cm						
			14	Lean clay	50/11cm						
			15	Lean clay	50/8cm						

Table C-2 (2) Summary of Geotechnical Boring(2)

Boring No.	Location	Elevation at neck of hole (m)	Depth (m)	Soil Classification	N Value
BH6-1	Kpob Trobek Reservoir	38.69	1	Sandy lean clay	50/26cm
			2	Silty sand	31
			3	Silty sand	11
			4	Silty sand	11
			5	Silty sand	12
			6	Sandy lean clay	4
			7	Sandy lean clay	2
			8	Sandy lean clay	1
			9	Silty sand	6
			10	Silty sand	6
			11	Silty sand	1
			12	Silty sand	17
			13	Sandy lean clay	48
			14	Sandy lean clay	50/13cm
			15	Sandy lean clay	50/11cm
BH6-2	Kpob Trobek Reservoir	38.64	1	Silty sand	50/22cm
			2	Silty sand	20
			3	Silty sand	8
			4	Sandy lean clay	6
			5	Sandy lean clay	6
			6	Silty sand	7
			7	Silty sand	13
			8	Silty sand	6
			9	Fat clay	15
			10	Fat clay	29
			11	Fat clay	50/27.5cm
			12	Fat clay	50/28cm
			13	Fat clay	50/23cm
			14	Sandy lean clay	50/10.5cm
			15	Sandy lean clay	50/21.5cm

Boring No.	Location	Elevation at neck of hole (m)	Depth (m)	Soil Classification	N Value
BH7	Main Canal No.1 (Canal 33) Downstream of Intake gate	38.04	1	Silty sand	25.00
			2	Silty sand	50/19.5cm
			3	Silty sand	50/28cm
			4	Silty sand	47
			5	Silty sand	26
			6	Sandy lean clay	22
			7	Sandy lean clay	20
			8	Sandy lean clay	29
			9	Sandy lean clay	50
			10	Sandy lean clay	34
BH8	Main Canal No.2 (Koh Kaek Canal) Downstream of Intake gate	38.99	1	Silty sand	22
			2	Silty sand	26
			3	Silty sand	18
			4	Silty sand	45
			5	Clayey sand	31
			6	Clayey sand	20
			7	Fat clay	24
			8	Fat clay	30
			9	Lean clay	40
			10	Lean clay	50/29cm

Field density test

Sample No.	Location	Depth (m)	Dry density (g/cm3)	Moisture content (%)	
F1	BH-1	0.5	1.854	11.41	
F2	BH-2	0.5	1.587	7.50	
F3	BH-3	0.5	1.722	9.39	
F4	BH-4	0.5	1.672	2.38	
F5	BH-5	0.5	1.912	4.41	
F6	BH-6	0.5	1.601	6.32	

Table C-3 Summary of Soil Mechanical Test Results (1)
(Phase-I First Field Works)

Test No.	Location	Soil Classification	Specific Gravity	Particle Size					Atterberg Limit			Compaction Test ($E_c=25.3\text{cm.kgf/cm}^3$)		
				dmax (mm)	Clay (%)	Silt (%)	Sand (%)	Gravel (%)	LL (%)	PL (%)	IP (%)	Max. dry density (g/cm^3)	Opt. water content (%)	Degree of saturation (%)
T1	Kpob Trobek Reservoir site	CL	2.65	16	29	22	42	7	24.20	10.71	13.49	2.099	8.10	81.6
T2	Main Canal No.1 (No.33 Canal)	SM	2.65	8	14	38	47	1	No Plastisity			2.090	7.00	69.2
T3	Main Canal No.2 (Koh Kaek Canal)	SM	2.66	8	10	33	57	0	No Plastisity			1.956	8.00	59.1
T4	O Saray Reservoir site	SC	2.68	16	15	15	68	2	No Plastisity			2.223	5.22	67.9
T5	Tumnup Lok reservoir site	SM	2.64	16	11	26	61	2	No Plastisity			2.095	7.00	71.1
T6	Canal No.60	SP	2.66	2	0	32	68	0	No Plastisity			1.726	10.10	49.7

Opt. water content : Optimum water content

Table C-4 Summary of Soil Mechanical Test Result(2) - Physical Test -
(Phase-II Third Field Works)

Pit No.	Location	Sample No.	Depth (m)	Soil classification	Specific Gravity Gs	Natural moisture content (%)	Particle Size				Atterverg Limit		
							Gravel (%)	Sand (%)	Silt (%)	Clay (%)	LL (%)	PL (%)	IP (%)
P1	Tumnop Lok	S 1	0.2 ~ 0.5	SC	2.63	12.91	0.00	65.57	13.65	20.78	No Plasticity		
		S 2	1.8 ~ 2.0	CL	2.59	21.96	0.00	24.40	18.50	57.01	28.63	16.37	12.26
P2	O Saray	S 3	0.2 ~ 0.5	SC	2.68	7.50	0.00	60.32	12.25	27.43	No Plasticity		
		S 4	1.8 ~ 2.0	SC	2.67	7.87	0.44	70.28	12.58	16.68	No Plasticity		
P3	Kpob Trobek	S 5	0.2 ~ 0.5	SM	2.65	14.51	0.00	78.95	12.10	8.95	No Plasticity		
		S 6	1.8 ~ 2.0	S-M	2.65	15.91	0.00	85.36	8.26	6.39	No Plasticity		
P4	Main Canal No.1 (Canal 33)	S 7	0.2 ~ 0.5	SM	2.66	17.95	0.88	67.63	16.81	14.68	No Plasticity		
		S 8	1.8 ~ 2.0	CL	2.72	14.48	9.68	37.45	12.68	40.19	31.30	9.33	21.97
P5	Main Canal No.2 (Koh Kaek)	S 9	0.2 ~ 0.5	CL	2.68	10.69	2.02	45.06	12.85	40.07	21.34	8.24	13.1
		S 10	1.8 ~ 2.0	CL	2.69	12.14	0.00	42.35	14.00	43.65	21.95	8.44	13.51
P6	Main Canal No.3	S 11	0.2 ~ 0.5	SM	2.67	17.39	0.00	72.41	15.12	12.47	No Plasticity		
		S 12	1.8 ~ 2.0	SC	2.66	8.19	0.00	52.90	10.73	36.37	16.58	8.49	8.09
P7	Agricul. Field	S 13U	0.2 ~ 0.5	G-M	3.05	13.17	72.20	18.06	4.90	4.84	19.57	11.8	7.77
		S 14M	1.0 ~ 1.2	CL	2.74	17.81	7.18	22.09	13.39	57.37	47.50	20.42	27.08
P8	Borrow Pit B-1	S 15M	1.0 ~ 1.2	G-M	3.15	11.92	51.03	36.95	7.16	4.86	16.43	13.22	3.21
		S 16L	1.8 ~ 2.0	GM	3.07	11.88	27.28	54.27	10.97	7.48	14.12	13.45	0.67
P9	Borrow Pit B-2	S 17M	1.0 ~ 1.2	GC	3.02	7.92	48.78	31.16	7.01	13.05	37.40	18.74	18.66
		S 18L	1.8 ~ 2.0	GC	3.02	11.67	40.54	20.18	16.21	23.07	38.55	22.03	16.52
P10	Borrow Pit B-2	S 19M	1.0 ~ 1.2	GC	2.87	10.85	37.89	36.09	10.75	15.27	39.70	20.34	19.36
		S 20L	1.8 ~ 2.0	GC	3.00	14.21	42.85	19.64	15.05	22.46	40.65	20.96	19.69
	Combined	S 21C		GC	3.06		47.12	28.34	10.95	13.53	15.47	13.55	1.92
		S 22C		GC	3.02		40.68	26.13	9.80	23.39	41.85	22.19	19.66
		S 23C		GC	2.96		32.30	34.18	11.09	22.43	17.67	11.74	5.93
		S 24C		SC	2.82		16.65	42.59	10.87	29.89	28.60	13.93	14.67
		S 21C ; S 15(70%) + S 16(30%) S 22C ; S 17(70%) + S 18(30%)				S 23C ; S 15(70%) + S 8(30%) S 24C ; S 19(70%) + S 12(30%)							
C1		C 1-1	0.0 ~ 1.5	SM	2.68	10.67	0.00	76.64	15.91	7.45	No Plasticity		
		C 1-2	1.5 ~ 2.0	SM	2.68	11.95	0.00	65.93	17.69	16.38	No Plasticity		
		C 1-3	2.0 ~ 2.5	ML	2.65	18.55	0.00	48.06	18.47	33.47	17.00	11.78	5.22
C2	Main Canal No.2 (Koh Kaek)	C 2-1	0.0 ~ 0.64	SM-ML	2.68	14.97	0.00	57.00	21.29	21.59	No Plasticity		
		C 2-2	0.63 ~ 1.65	ML	2.67	11.35	0.00	13.51	40.89	45.6	19.35	13.05	6.30
		C 2-3	1.65 ~ 1.97	ML	2.68	6.50	6.00	45.48	16.09	32.02	15.05	10.09	4.96
		C 2-4	1.97 ~ 2.50	ML	2.63	9.20	4.68	40.02	15.95	39.35	17.30	10.53	6.77
C3		C 3-1	0.0 ~ 1.4	ML-CL	2.63	16.81	0.12	56.22	21.84	21.82	17.32	13.07	4.25
		C 3-2	1.4 ~ 2.0	ML	2.66	18.43	0.00	56.42	19.81	23.77	15.04	12.03	3.01
		C 3-3	2.0 ~ 2.5	CL	2.55	17.42	0.62	41.73	17.42	39.13	25.55	10.44	15.11
C4		C 4-1	0.0 ~ 1.5	SM-ML	2.66	11.24	2.29	59.26	13.04	25.41	No Plasticity		
		C 4-2	1.5 ~ 2.0	SC	2.67	11.76	0.13	62.04	10.38	27.45	17.50	11.46	6.04
C5		C 5-1	0.0 ~ 1.16	SM	2.66	12.43	0.00	67.40	14.99	17.61	No Plasticity		
		C 5-2	1.16 ~ 2.0	CL	2.68	14.23	0.00	43.50	18.64	37.86	27.52	10.96	16.56
		C 5-3	2.0 ~ 2.5	SM	2.69	14.85	0.00	65.82	16.39	17.79	No Plasticity		

Table C-5 Summary of Soil Mechanical Test Result(3) - Mechanical Test -
(Phase-II Third Field Works)

Pit No.	Location	Sample No.	Depth (m)	Soil classification	Specific Gravity Gs	Compaction Test				Permeability test					Unconfined compression test			
						Max. dry density (g/cm ³)	Wopt (%)	Void ratio e	Sr (%)	Permeability (cm/sec)	Initial Specimen Condition				qu (KPa)	Initial Specimen Condition		
											Dry density (g/cm ³)	Water content (%)	Void ratio e	Sr (%)		Dry density (g/cm ³)	Water content (%)	Void ratio e
P1	Tumnop Lok	S 1	0.2 ~ 0.5	SC	2.63	1.936	9.8	0.36	71.6	2.9E-06	1.84	13.3	0.43	81.3	60.2	1.87	12.19	0.41
		S 2	1.8 ~ 2.0	CL	2.59	1.762	14.5	0.47	79.9	9.5E-05	1.67	18.0	0.55	84.8	130.0	1.71	16.78	0.51
P2	O Saray	S 3	0.2 ~ 0.5	SC	2.68	1.910	8.6	0.40	57.6	2.4E-06	1.81	13.8	0.48	77.1	23.3	1.87	10.62	0.43
		S 4	1.8 ~ 2.0	SC	2.67	1.965	9.5	0.36	70.5	6.9E-06	1.86	13.2	0.44	80.1	34.8	1.92	8.99	0.39
P3	Kpob Trobek	S 5	0.2 ~ 0.5	SM	2.65	1.776	12.1	0.49	65.4	2.1E-05	1.69	16.8	0.57	78.1	27.1	1.70	11.78	0.56
		S 6	1.8 ~ 2.0	S-M	2.65	1.698	14	0.56	66.3	3.6E-05	1.61	19.9	0.65	81.1	19.2	1.63	13.47	0.63
P4	Main Canal No.1	S 7	0.2 ~ 0.5	SM	2.66	1.834	11.3	0.45	66.8	9.9E-08	1.78	14.3	0.49	77.6	30.7	1.83	10.85	0.45
		S 8	1.8 ~ 2.0	CL	2.72	1.988	10.5	0.37	77.2	4.2E-10	1.89	13.5	0.44	83.5	96.0	1.91	13.36	0.42
P5	Main Canal No.2	S 9	0.2 ~ 0.5	CL	2.68	1.974	10.4	0.36	77.4	2.1E-09	1.87	13.4	0.43	83.5	29.6	1.89	13.10	0.42
		S 10	1.8 ~ 2.0	CL	2.69	1.948	11.7	0.38	82.8	1.5E-09	1.81	14.7	0.49	80.7	25.6	1.82	13.70	0.48
P6	Main Canal No.3	S 11	0.2 ~ 0.5	SM	2.67	1.876	10.35	0.42	65.8	2.6E-05	1.81	13.4	0.48	74.3	40.0	1.94	10.04	0.38
		S 12	1.8 ~ 2.0	SC	2.66	1.832	10.7	0.45	63.2	2.6E-06	1.78	13.7	0.49	74.4	76.6	1.96	10.55	0.36
P7	Agricul. Field	S 13U	0.2 ~ 0.5	G-M	3.05	2.125	7.7	0.44	53.4	3.0E-03	1.92	7.7	0.59	39.8	51.4	2.14	6.97	0.43
		S 14M	1.0 ~ 1.2	CL	2.74	1.693	16.7	0.62	73.8	5.7E-10	1.63	19.7	0.68	79.4	155.2	1.76	16.80	0.56
P8	Borrow Pit B-1	S 15M	1.0 ~ 1.2	G-M	3.15	2.210	10.5	0.43	76.9	4.6E-04	2.06	10.5	0.53	62.4	56.5	2.22	9.57	0.42
		S 16L	1.8 ~ 2.0	GM	3.07	2.284	8.50	0.34	76.8	3.7E-03	2.19	8.5	0.40	65.2	53.5	2.23	9.28	0.38
P9	Borrow Pit B-2	S 17M	1.0 ~ 1.2	GC	3.02	2.050	11.80	0.47	75.8	4.4E-04	1.96	11.8	0.54	66.0	58.1	2.05	11.14	0.47
		S 18L	1.8 ~ 2.0	GC	3.02	1.928	14.60	0.57	77.4	9.9E-06	1.86	14.6	0.62	71.1	78.0	1.96	13.91	0.54
P10	Borrow Pit B-2	S 19M	1.0 ~ 1.2	GC	2.87	1.992	13.50	0.44	88.1	3.5E-07	1.89	13.5	0.52	74.5	37.0	1.95	13.20	0.47
		S 20L	1.8 ~ 2.0	GC	3.00	2.035	13.00	0.47	83.0	9.8E-07	1.93	13.0	0.55	70.9	133.6	1.99	12.29	0.51
	Combined	S 21C		GC	3.06	2.170	8.10	0.41	60.5	2.0E-03	2.04	8.1	0.50	49.6	69.4	2.22	7.16	0.38
	Combined	S 22C		GC	3.02	2.060	12.50	0.47	80.3	1.1E-03	1.92	12.5	0.57	66.2	71.3	2.00	11.85	0.51
	Combined	S 23C		GC	2.96	2.190	9.60	0.35	81.2	2.5E-04	2.05	9.6	0.44	64.6	151.2	1.98	8.89	0.49
	Combined	S 24C		SC	2.82	2.040	11.10	0.38	82.4	1.6E-06	1.94	11.1	0.45	69.6	197.1	1.99	10.98	0.42

S 21C ; S 15(70%) + S 16(30%)

S 22C ; S 17(70%) + S 18(30%)

S 23C ; S 15(70%) + S 8(30%)

S 24C ; S 19(70%) + S 12(30%)

Wopt : Optimum water content

Sr : Degree of saturation

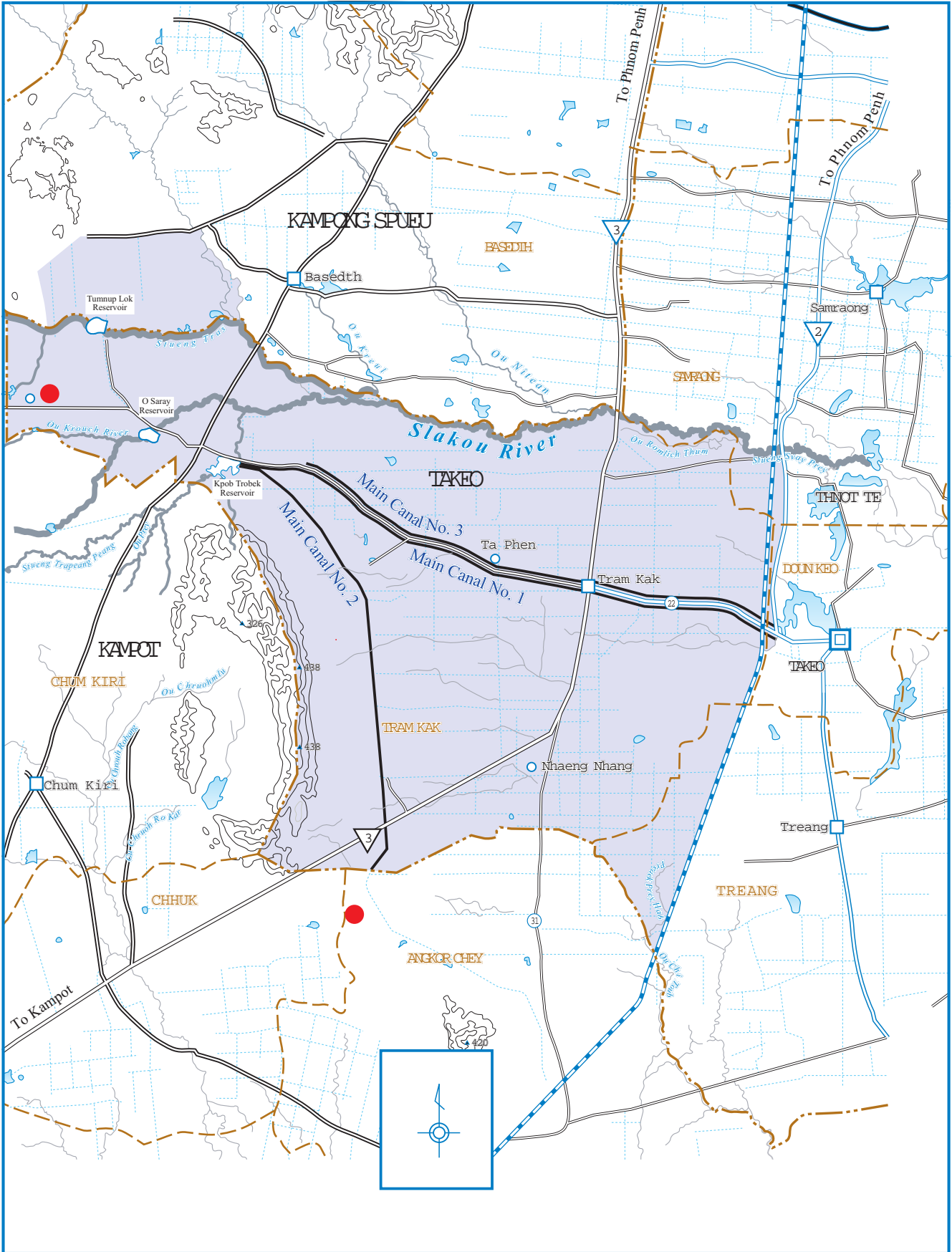
Table C-6 Soil Properties of Existing Dike and Canal

Location	Sample No.	Depth (m)	Specific Gravity Gs	Soil classification	Unified soil classification	Field dry density (g/cm ³)	Moisture content (%)	Void ratio e	Max.dry density (g/cm ³)	D-value	N Value	Converted Internal friction angle ϕ	
												$\sqrt{12N + 15}$	$\sqrt{15 N + 15}$
Tumnop Lok Reservoir	F1	0.5	2.68	Clayey sand	SC	1.854	11.41	0.45	1.936	95.8	-	-	-
	BH-1	1.0		Clayey sand	SC	1.903	14.23	0.41	1.936	98.3	12	27.0	28.4
Tumnop Lok Reservoir	BH-2	0.5	2.65	Silty sand	SC (NP)	1.587	7.50	0.67	1.936	82.0	-	-	-
		1.0		Silty sand	SC (NP)	1.802	6.18	0.47	1.936	93.1	2	19.9	20.5
		2.0		Silty sand	SC (NP)	1.821	3.42	0.46	1.936	94.1	10	26.0	27.2
		3.0		Silty sand	SC (NP)	1.974	4.75	0.34	1.936	102.0	24	32.0	34.0
O Saray Reservoir	BH-3	0.5	2.67	Silty sand	SC (NP)	1.722	9.39	0.55	1.910	90.2	-	-	-
		1.0		Silty sand	SC (NP)	1.727	11.21	0.55	1.910	90.4	6	23.5	24.5
		2.0		Silty sand	SC (NP)	2.005	10.14	0.33	1.965	102.0	3	21.0	21.7
		3.0	Silty sand	SC (NP)	1.968	9.71	0.36	1.965	100.2	15	28.4	30.0	
		4.0	Silty sand	SC (NP)	1.832	13.54	0.46	1.965	93.2	7	24.2	25.2	
		5.0	2.68	Sand with clay	S-C (NP)	2.087	7.14	0.28	1.965	106.2	8	24.8	26.0
		6.0	Sand with clay	S-C (NP)	1.805	14.78	0.48	1.965	91.9	25	32.3	34.4	
O Saray Reservoir	BH-4	0.5	2.67	Silty sand	SC (NP)	1.672	2.38	0.60	1.910	87.5	-	-	-
		1.0		Silty sand	SC (NP)	1.767	3.79	0.51	1.910	92.5	15	28.4	30.0
		2.0		Silty sand	SC (NP)	1.814	5.68	0.47	1.910	95.0	10	26.0	27.2
		3.0		Silty sand	SC (NP)	1.988	9.56	0.34	1.965	101.2	16	28.9	30.5
Kpob Trobek Reservoir	BH-5	0.5	2.66	Clayey sand	SC	1.912	4.41	0.39	1.936	98.8	-	-	-
		1.0		Clayey sand	SC	2.032	7.20	0.31	1.936	105.0	50/23cm	39.5	42.4
		2.0		Clayey sand	SC	1.893	2.43	0.41	1.936	97.8	49	39.2	42.1
		3.0	2.71	Sandy clay	CL	1.733	17.84	0.56	1.762	98.4	1	-	-
		4.0	Sandy clay	CL	1.768	9.87	0.53	1.762	100.3	8	-	-	
		5.0	2.69	Clayey sand	SC	1.991	2.87	0.35	1.936	102.8	9	25.4	26.6
Kpob Trobek Reservoir	BH-6-1	0.5	2.79	Sandy clay	CL	1.601	6.32	0.74	1.762	90.9	-	-	-
		1.0		Clayey sand	SC	2.055	5.36	0.30	1.965	104.6	50/26cm	39.5	42.4
		2.0	2.68	Clayey sand	SC	1.936	7.85	0.38	1.965	98.5	31	34.3	36.6
		3.0	Clayey sand	SC	1.940	9.00	0.38	1.965	98.7	11	26.5	27.8	
		4.0	-	Sandy clay	CL	1.662	9.55	-	-	-	11	-	-
5.0	-	Sandy clay	CL	1.711	16.49	-	-	-	12	-	-		
Kpob Trobek Reservoir	BH-6-2	1.0	2.68	Silty sand	SM (NP)	1.932	2.88	0.39	1.776	108.8	50/22cm	39.5	42.4
		2.0		Silty sand	SM (NP)	2.104	4.03	0.27	1.776	118.5	20	30.5	32.3
		3.0		Silty sand	SM (NP)	1.667	5.82	0.61	1.776	93.9	8	24.8	26.0
Main canal No.1 (Canal 33)	BH-7	1.0	2.70	Silty sand	SM (NP)	1.941	5.96	0.39	1.855	104.6	25	32.3	34.4
		2.0		Silty sand	SM (NP)	1.882	2.80	0.43	1.855	101.5	50/19.5cm	39.5	42.4
		3.0		Silty sand	SM (NP)	1.977	4.51	0.37	1.855	106.6	50/28cm	39.5	42.4
Maincnal No.2 (Koh Kaek canal)	BH-8	1.0	2.69	Silty sand	SM (NP)	1.987	6.61	0.35	1.855	107.1	22	31.2	33.2
		2.0		Silty sand	SM (NP)	1.869	3.33	0.44	1.855	100.8	26	32.7	34.7
		3.0		Silty sand	SM (NP)	1.865	4.15	0.44	1.855	100.5	18	29.7	31.4

BH ; Boring F ; Field density test

Source: Geotechnical boring and Soil mechanical test on Phase II Third field works.

Figures

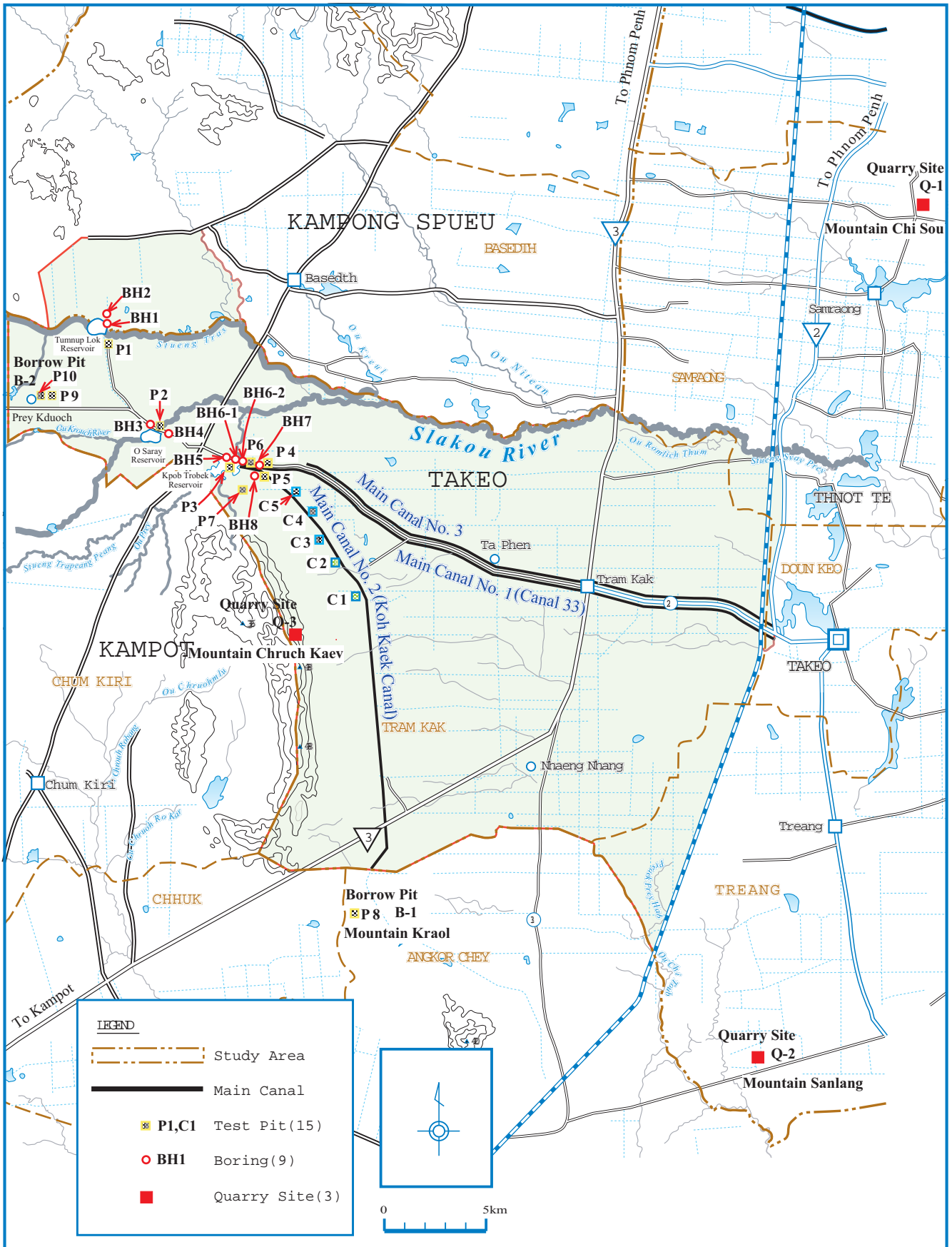


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Figure C-1

Location Map of Sampling Sites,
Quarry Sites and Borrow Pits



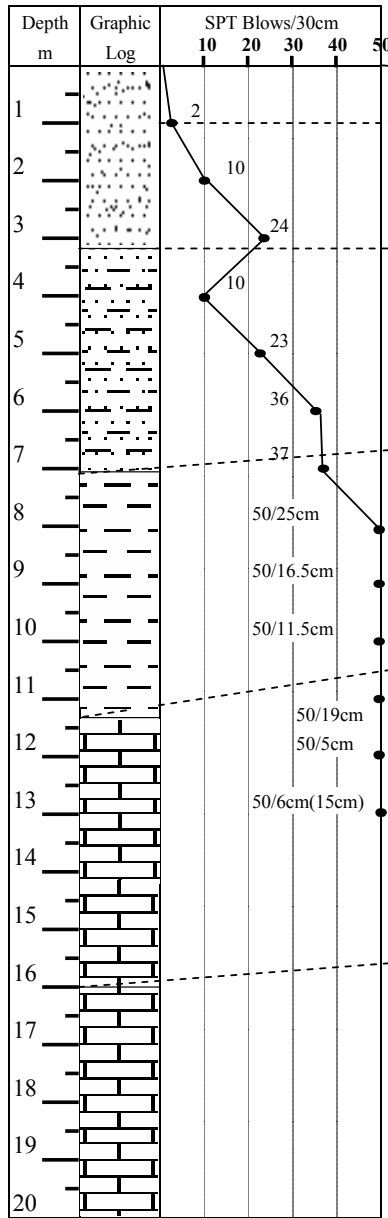
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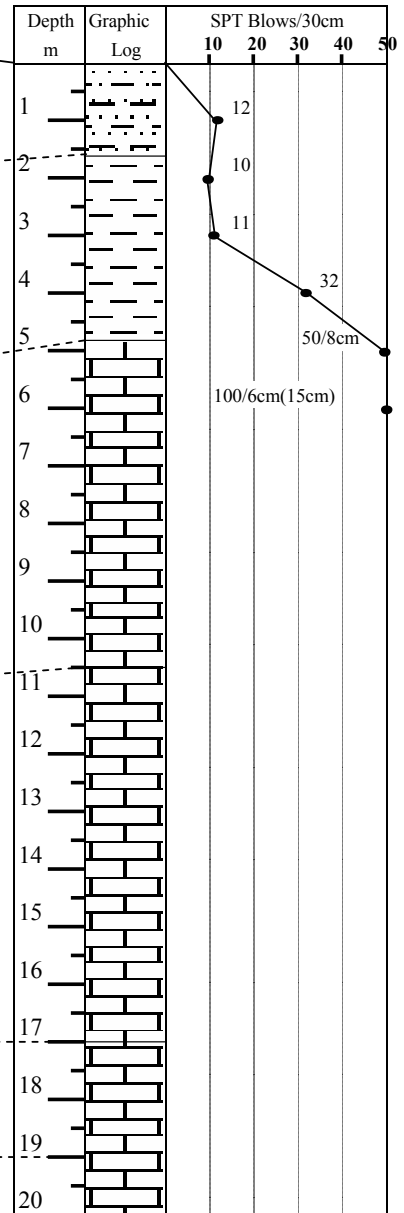
Figure C-2

Location Map of Test Pits and Borings (Phase II, Third field work)

Hole No : BH 2
 Location : Tumnap Lok
 Depth : 20 m
 Elevation : +42.869 m
 Water Level : 4.20 m



Hole No : BH 1
 Location : Tumnap Lok
 Depth : 20 m
 Elevation : +38.694 m
 Water Level : 5.68 m



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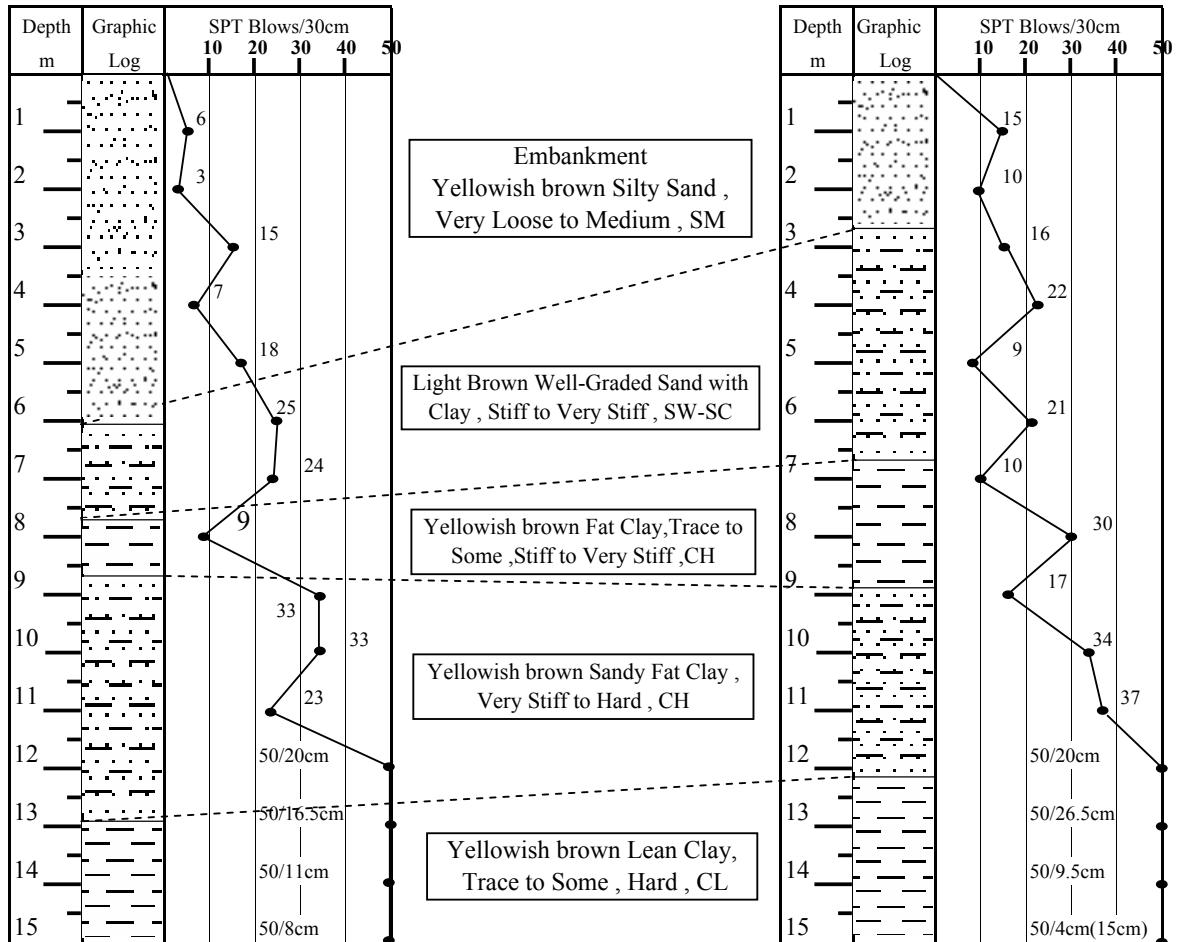
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Figure C - 3

Boring Logs (1 / 4)

Hole No : BH 3
 Location : O Saray
 Depth : 15 m
 Elevation : + 39.986 m
 Water Level : 3.61 m

Hole No : BH 4
 Location : O Saray
 Depth : 15 m
 Elevation : + 39.726 m
 Water Level : 3.34 m



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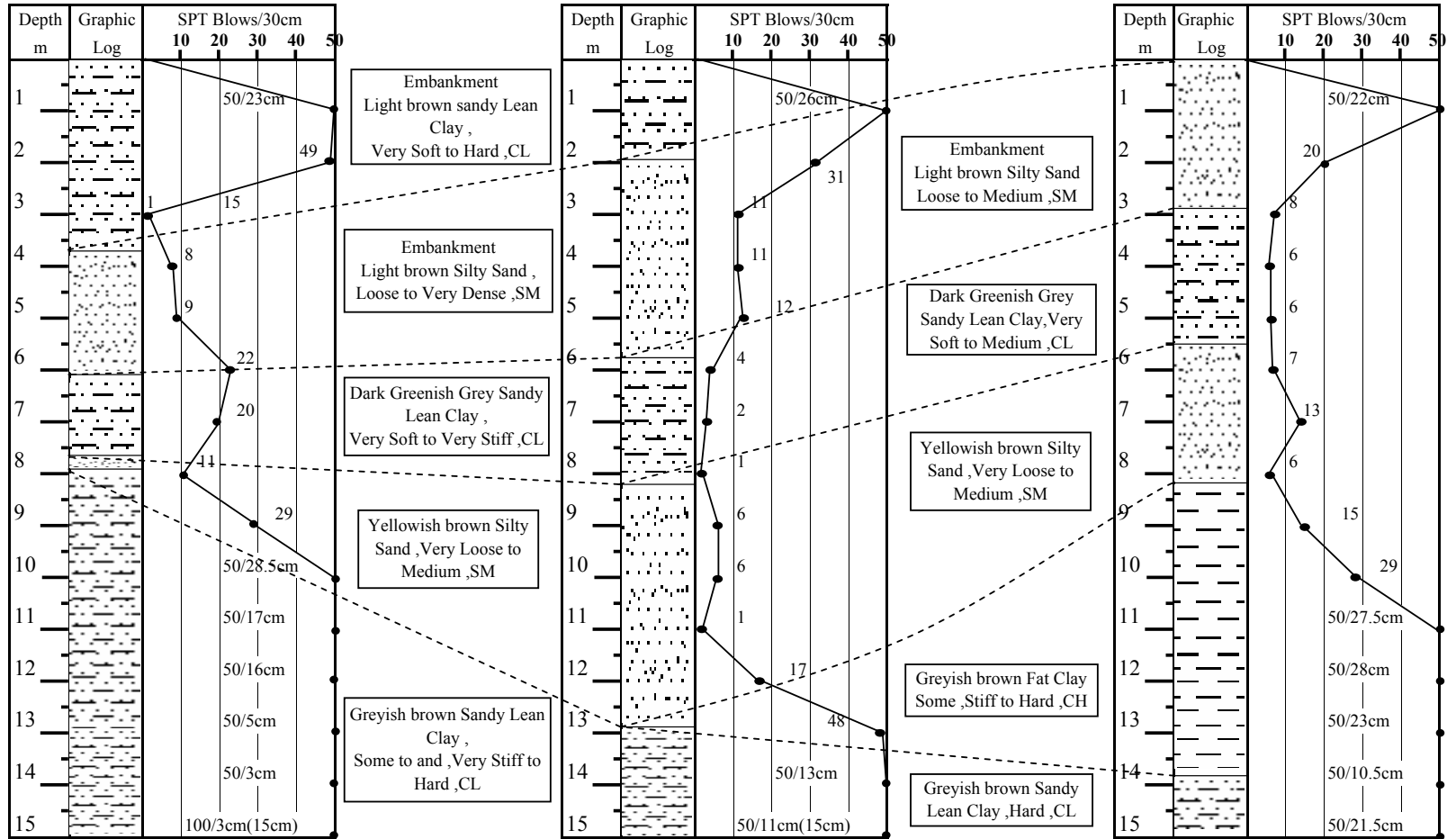
Figure C - 4

Boring Logs (2 / 4)

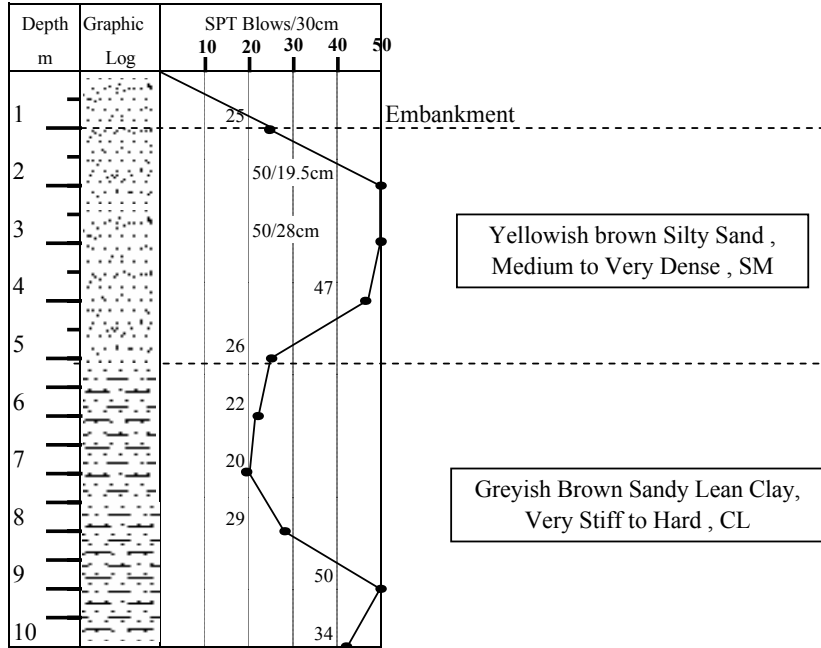
Hole No : BH 5
Location : Kpob Trobek
Depth : 15 m
Elevation : + 38.562 m
Water Level : 5.71 m

Hole No : BH 6-1
Location : Kpob Trobek
Depth : 15 m
Elevation : + 38.694 m
Water Level : 5.68 m

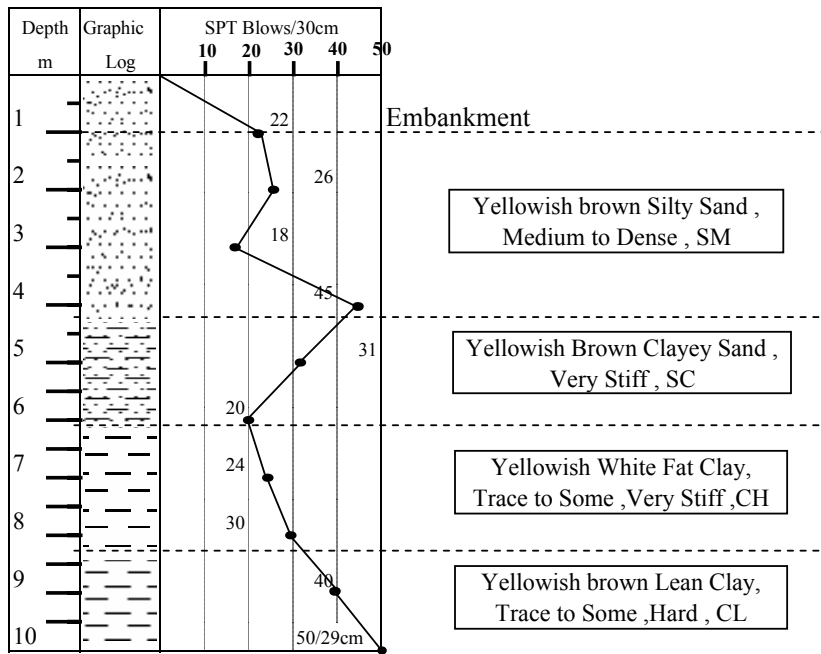
Hole No : BH 6-2
Location : Kpob Trobek
Depth : 15 m
Elevation : + 38.644 m
Water Level : 5.74 m



Hole No : BH 7
 Location : Canal No.1 (Kpob Trobek)
 Depth : 10 m
 Elevation : + 38.042 m
 Water Level : 3.61 m



Hole No : BH 8
 Location : Canal No.2 (Kpob Trobek)
 Depth : 10 m
 Elevation : + 38.991 m
 Water Level : 3.85 m

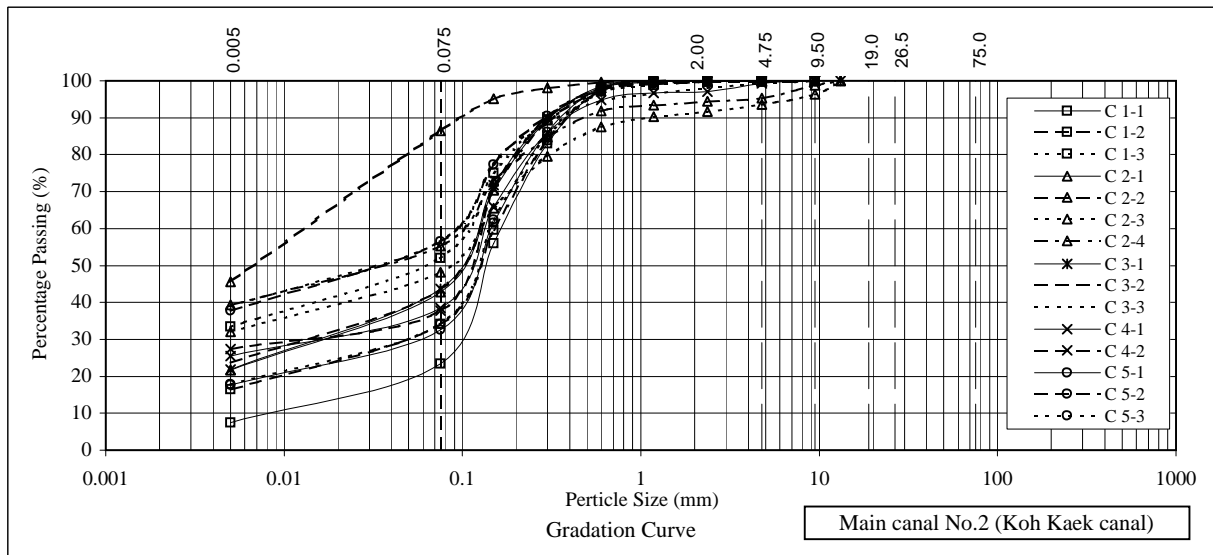
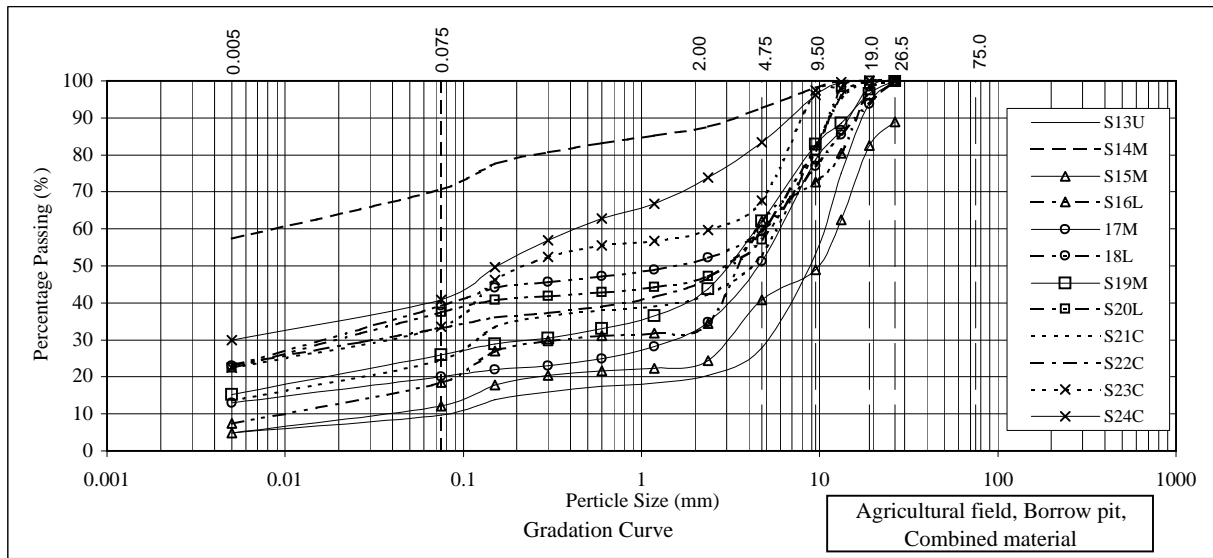
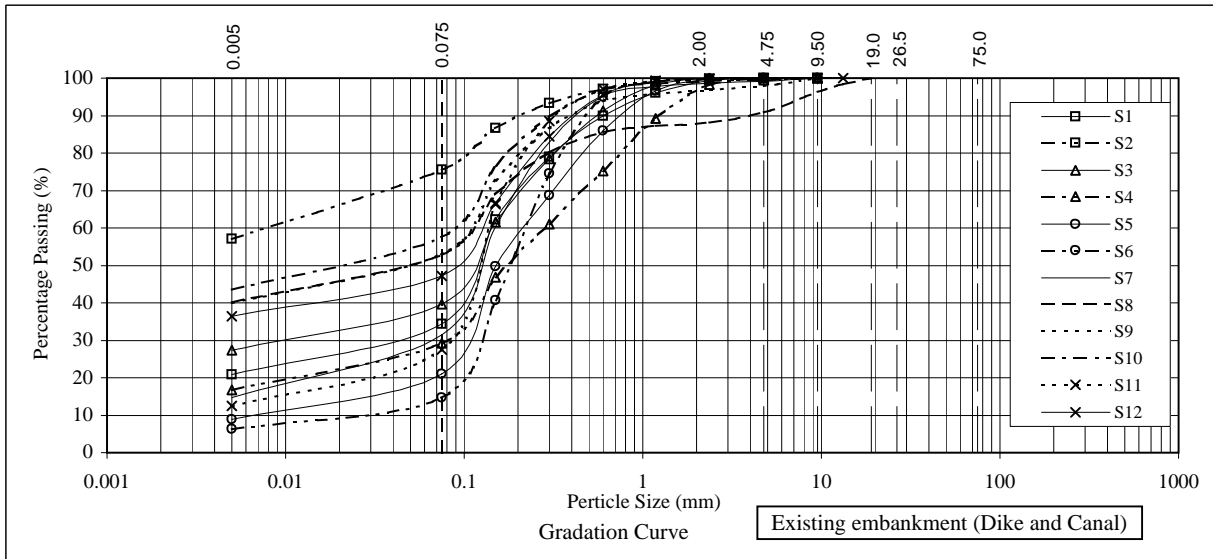


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Figure C - 6

Boring Logs (4 / 4)

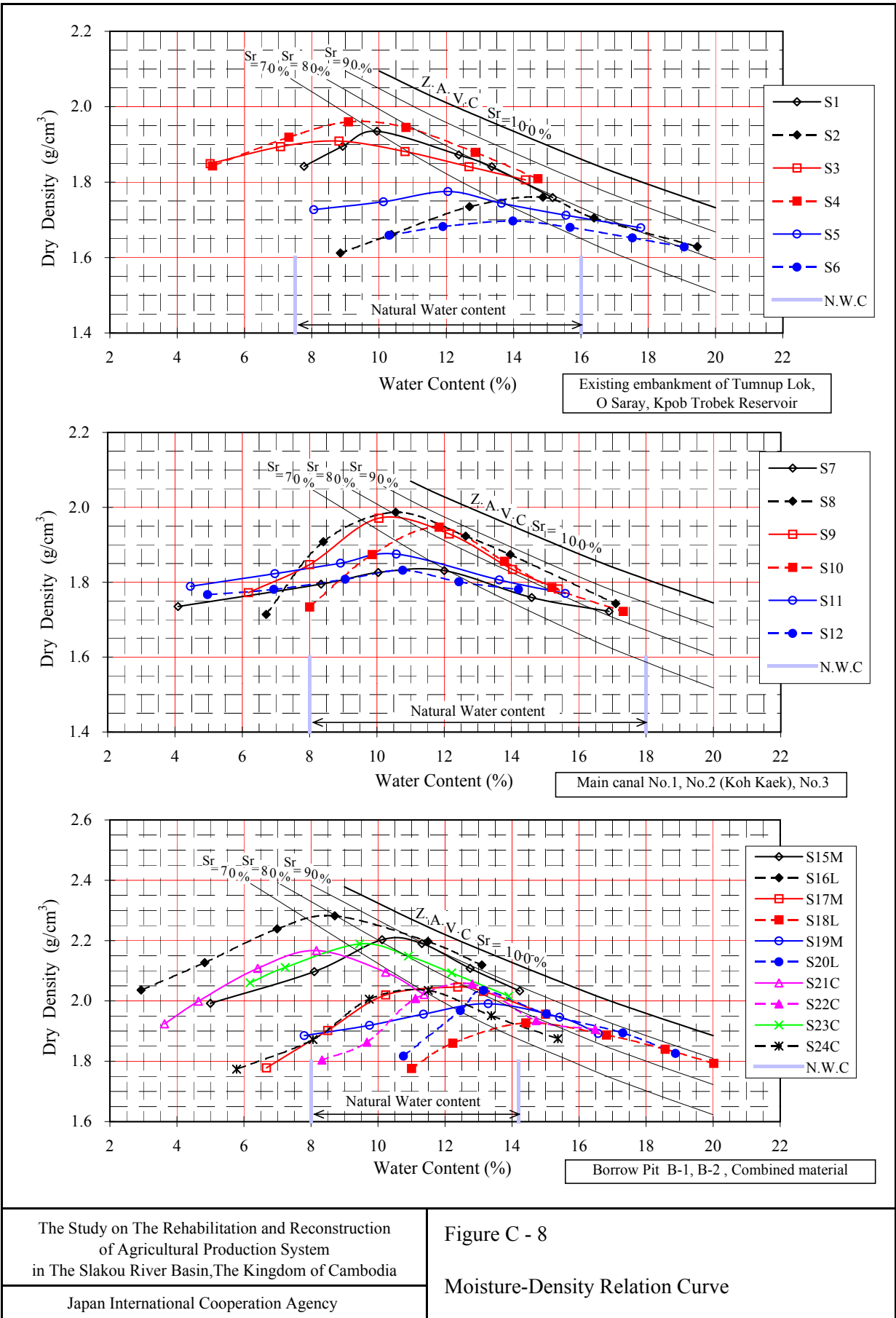


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Figure C - 7

Gradation Curve of Soil Materials



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Figure C - 8

Moisture-Density Relation Curve