Table D3-17 Cost for Component 5: City Core North Area Drainage Improvement (1/9)

a. C1: Wat Phnom Basin, Sewer Rehabilitation (89ha)

No.	Items	Unit	Q'ty	Unit Price (US$)		Amount (US$1,000)		
				L.C	F.C	L.C	F.C	Total
I.	**Construction Cost**							
I.1	Dia 375mm							
1.	Trench excavation	m^3	280	0.6	1.5	0.17	0.42	0.59
2.	Sewer installation	m	100	17.6	27.4	1.76	2.74	4.50
3.	Backfilling in trench	m^3	270	4.2	10.4	1.13	2.81	3.94
4.	Disposal of excavated material	m^3	150	1.1	3.2	0.17	0.48	0.65
5.	Asphalt pavement	m^2	100	2.0	4.6	0.20	0.46	0.66
6.	Manhole, connecting pipes, etc.	L.S				0.97	1.93	2.90
	Total of I.1					4.40	8.84	13.24
I.2	Dia 450mm							
1.	Trench excavation	m^3	2,200	0.6	1.5	1.32	3.30	4.62
2.	Sewer installation	m	680	19.3	31.8	13.12	21.62	34.75
3.	Backfilling in trench	m^3	2,000	4.2	10.4	8.40	20.80	29.20
4.	Disposal of excavated material	m^3	1,100	1.1	3.2	1.21	3.52	4.73
5.	Asphalt pavement	m^2	750	2.0	4.6	1.50	3.45	4.95
6.	Manhole, connecting pipes, etc.	L.S				7.22	14.77	21.99
	Total of I.2					32.77	67.47	100.24
I.3	Dia 600mm							
1.	Trench excavation	m^3	6,700	0.6	1.5	4.02	10.05	14.07
2.	Sewer installation	m	1,740	26.7	50.1	46.46	87.17	133.63
3.	Backfilling in trench	m^3	6,000	4.2	10.4	25.20	62.40	87.60
4.	Disposal of excavated material	m^3	3,300	1.1	3.2	3.63	10.56	14.19
5.	Asphalt pavement	m^2	2,270	2.0	4.6	4.54	10.44	14.98
6.	Manhole, connecting pipes, etc.	L.S				23.79	51.06	74.85
	Total of I.3					107.64	231.68	339.32
I.4	Dia 750mm							
1.	Trench excavation	m^3	13,100	0.6	1.5	7.86	19.65	27.51
2.	Sewer installation	m	2,270	32.9	65.5	74.68	148.69	223.37
3.	Backfilling in trench	m^3	11,800	4.2	10.4	49.56	122.72	172.28
4.	Disposal of excavated material	m^3	6,500	1.1	3.2	7.15	20.80	27.95
5.	Asphalt pavement	m^2	4,190	2.0	4.6	8.38	19.27	27.65
6.	Manhole, connecting pipes, etc.	L.S				41.78	93.56	135.33
	Total of I.4					189.41	424.69	614.09
I.5	Dia 900mm							
1.	Trench excavation	m^3	6,100	0.6	1.5	3.66	9.15	12.81
2.	Sewer installation	m	880	47.0	105.8	41.36	93.10	134.46
3.	Backfilling in trench	m^3	5,300	4.2	10.4	22.26	55.12	77.38
4.	Disposal of excavated material	m^3	3,000	1.1	3.2	3.30	9.60	12.90
5.	Asphalt pavement	m^2	1,750	2.0	4.6	3.50	8.05	11.55
6.	Manhole, connecting pipes, etc.	L.S				21.17	50.09	71.27
	Total of I.5					95.25	225.12	320.37
I.6	Dia 1,050mm							
1.	Trench excavation	m^3	9,200	0.6	1.5	5.52	13.80	19.32
2.	Sewer installation	m	1,090	55.4	126.8	60.39	138.21	198.60
3.	Backfilling in trench	m^3	8,000	4.2	10.4	33.60	83.20	116.80
4.	Disposal of excavated material	m^3	4,400	1.1	3.2	4.84	14.08	18.92
5.	Asphalt pavement	m^2	2,400	2.0	4.6	4.80	11.04	15.84
6.	Manhole, connecting pipes, etc.	L.S				31.30	74.79	106.09
	Total of I.6					140.45	335.12	475.57

Table D3-17 Cost for Component 5: City Core North Area Drainage Improvement (2/9)

No.	Items	Unit	Q'ty	Unit Price (US$)		Amount (US$1,000)		
				L.C	F.C	L.C	F.C	Total
I.7	Dia 1,200mm							
1.	Trench excavation	m^3	9,700	0.6	1.5	5.82	14.55	20.37
2.	Sewer installation	m	1,020	73.2	177.9	74.66	181.46	256.12
3.	Backfilling in trench	m^3	8,200	4.2	10.4	34.44	85.28	119.72
4.	Disposal of excavated material	m^3	4,500	1.1	3.2	4.95	14.40	19.35
5.	Asphalt pavement	m^2	2,440	2.0	4.6	4.88	11.22	16.10
6.	Manhole, connecting pipes, etc.	L.S				35.96	88.71	124.67
	Total of I.7					160.72	395.62	556.33
I.8	Dia 1,350mm							
1.	Trench excavation	m^3	8,600	0.6	1.5	5.16	12.90	18.06
2.	Sewer installation	m	730	86.5	214.5	63.15	156.59	219.73
3.	Backfilling in trench	m^3	7,200	4.2	10.4	30.24	74.88	105.12
4.	Disposal of excavated material	m^3	4,000	1.1	3.2	4.40	12.80	17.20
5.	Asphalt pavement	m^2	1,890	2.0	4.6	3.78	8.69	12.47
6.	Manhole, connecting pipes, etc.	L.S				30.88	77.15	108.03
	Total of I.8					137.61	343.01	480.62
I.9	Dia 1,650mm							
1.	Trench excavation	m^3	7,200	0.6	1.5	4.32	10.80	15.12
2.	Sewer installation	m	500	102.5	254.4	51.25	127.20	178.45
3.	Backfilling in trench	m^3	5,800	4.2	10.4	24.36	60.32	84.68
4.	Disposal of excavated material	m^3	3,200	1.1	3.2	3.52	10.24	13.76
5.	Asphalt pavement	m^2	1,490	2.0	4.6	2.98	6.85	9.83
6.	Manhole, connecting pipes, etc.	L.S				25.04	62.57	87.60
	Total of I.9					111.47	277.98	389.45
I.10	Dia 1,800mm							
1.	Trench excavation	m^3	800	0.6	1.5	0.48	1.20	1.68
2.	Sewer installation	m	40	115.6	290.1	4.62	11.60	16.23
3.	Backfilling in trench	m^3	700	4.2	10.4	2.94	7.28	10.22
4.	Disposal of excavated material	m^3	400	1.1	3.2	0.44	1.28	1.72
5.	Asphalt pavement	m^2	130	2.0	4.6	0.26	0.60	0.86
6.	Manhole, connecting pipes, etc.	L.S				2.55	6.41	8.95
	Total of I.10					11.29	28.37	39.66
	Total of I.					991.00	2,337.89	3,328.89
II.	**Land Acquisition**	L.S						0.00
III.	**Administration Cost**	L.S				99.87	0.00	99.87
IV.	**Engineering Service**	L.S				148.65	350.68	499.33
V.	**Physical Contingency**	L.S				99.10	233.79	332.89
	Grand Total					1,338.61	2,922.37	4,260.98

Table D3-17 Cost for Component 5: City Core North Area Drainage Improvement (3/9)

b. C2: Kak Lakeshore Basin, Sewer Rehabilitation (51ha)

No.	Items	Unit	Q'ty	Unit Price (US$)		Amount (US$1,000)		
				L.C	F.C	L.C	F.C	Total
I.	**Construction Cost**							
I.1	Dia 375mm							
1.	Trench excavation	m^3	2,000	0.6	1.5	1.20	3.00	4.20
2.	Sewer installation	m	750	17.6	27.4	13.20	20.55	33.75
3.	Backfilling in trench	m^3	1,900	4.2	10.4	7.98	19.76	27.74
4.	Disposal of excavated material	m^3	1,100	1.1	3.2	1.21	3.52	4.73
5.	Asphalt pavement	m^2	750	2.0	4.6	1.50	3.45	4.95
6.	Manhole, connecting pipes, etc.	L.S				7.08	14.05	21.13
	Total of I.1					32.17	64.33	96.50
I.2	Dia 450mm							
1.	Trench excavation	m^3	2,900	0.6	1.5	1.74	4.35	6.09
2.	Sewer installation	m	830	19.3	31.8	16.02	26.39	42.41
3.	Backfilling in trench	m^3	2,700	4.2	10.4	11.34	28.08	39.42
4.	Disposal of excavated material	m^3	1,500	1.1	3.2	1.65	4.80	6.45
5.	Asphalt pavement	m^2	920	2.0	4.6	1.84	4.23	6.07
6.	Manhole, connecting pipes, etc.	L.S				9.22	19.09	28.31
	Total of I.2					41.81	86.94	128.76
I.3	Dia 600mm							
1.	Trench excavation	m^3	1,100	0.6	1.5	0.66	1.65	2.31
2.	Sewer installation	m	220	26.7	50.1	5.87	11.02	16.90
3.	Backfilling in trench	m^3	1,000	4.2	10.4	4.20	10.40	14.60
4.	Disposal of excavated material	m^3	600	1.1	3.2	0.66	1.92	2.58
5.	Asphalt pavement	m^2	290	2.0	4.6	0.58	1.33	1.91
6.	Manhole, connecting pipes, etc.	L.S				3.42	7.50	10.92
	Total of I.3					15.39	33.82	49.22
	Total of I.					89.37	185.10	274.47
II.	**Land Acquisition**	L.S						0.00
III.	**Administration Cost**	L.S				8.23	0.00	8.23
IV.	**Engineering Service**	L.S				13.41	27.76	41.17
V.	**Physical Contingency**	L.S				8.94	18.51	27.45
	Grand Total					119.95	231.37	351.32

Table D3-17 Cost for Component 5: City Core North Area Drainage Improvement (4/9)

c. C3: Boeng Kak Basin, Kak Drainage Sluiceway

No.	Items	Unit	Q'ty	Unit Price (US$)		Amount (US$1,000)		
				L.C	F.C	L.C	F.C	Total
I.	**Construction Cost**							
1.	Excavation	m^3	3,200	0.7	1.5	2.24	4.80	7.04
2.	Embankment for dike	m^3	1,800	3.1	9.2	5.58	16.56	22.14
3.	Backfilling under road	m^3	50	4.2	10.4	0.21	0.52	0.73
4.	Backfilling with excavated mate	m^3	660	0.8	1.7	0.53	1.12	1.65
5.	Disposal of excavated material	m^3	2,540	1.1	3.2	2.79	8.13	10.92
6.	Asphalt pavement	m^2	30	2.0	4.6	0.06	0.14	0.20
7.	Concrete	m^3	360	71.7	56.7	25.81	20.41	46.22
8.	Reinforcing bars	ton	32	471.8	541.8	15.10	17.34	32.44
9.	Form	m^2	1,000	16.5	3.8	16.50	3.80	20.30
10.	Piling 200x200mm, L=3m	no.	80	113.8	191.8	9.10	15.34	24.45
11.	Steel gate	m^2	5	2,800.0	11,200.0	14.00	56.00	70.00
12.	Miscellaneous	L.S				18.39	28.83	47.22
	Total of I.					110.31	172.99	283.30
II.	**Land Acquisition**	m^2	0	5.0	0.0	0.00	0.00	0.00
III.	**Administration Cost**	L.S				8.50	0.00	8.50
IV.	**Engineering Service**	L.S				16.55	25.95	42.50
V.	**Physical Contingency**	L.S				11.03	17.30	28.33
	Grand Total					146.39	216.24	362.63

Table D3-17 Cost for Component 5: City Core North Area Drainage Improvement (5/9)

d. C4: Tuol Kork Basin, Major Drainage Facilities

No.	Items	Unit	Q'ty	Unit Price (US$) L.C	Unit Price (US$) F.C	Amount (US$1,000) L.C	Amount (US$1,000) F.C	Amount (US$1,000) Total
I.	Construction Cost							
1.	Tuol Kork Drainage Main-I (L= 1.887 km)							
(1)	Excavation	m^3	57,000	0.7	1.5	39.90	85.50	125.40
(2)	Backfilling under road	m^3	21,400	4.2	10.4	89.88	222.56	312.44
(3)	Backfilling with excavated mate	m^3	15,300	0.8	1.7	12.24	26.01	38.25
(4)	Disposal of excavated material	m^3	41,700	1.1	3.2	45.87	133.44	179.31
(5)	Asphalt pavement	m^2	13,200	2.0	4.6	26.40	60.72	87.12
(6)	Concrete	m^3	8,800	71.7	56.7	630.96	498.96	1,129.92
(7)	Reinforcing bars	ton	750	471.8	541.8	353.85	406.35	760.20
(8)	Form	m^2	23,500	16.5	3.8	387.75	89.30	477.05
(9)	Piling 200x200mm, L=3m	no.	1,260	113.8	191.8	143.39	241.67	385.06
(10)	Miscellaneous	L.S				346.05	352.90	698.95
	Total of 1.					2,076.29	2,117.41	4,193.70
2.	Tuol Kork Drainage Main-II (L=0.6 km)							
(1)	Excavation	m^3	16,400	0.7	1.5	11.48	24.60	36.08
(2)	Backfilling under road	m^3	6,600	4.2	10.4	27.72	68.64	96.36
(3)	Backfilling with excavated mate	m^3	4,800	0.8	1.7	3.84	8.16	12.00
(4)	Disposal of excavated material	m^3	11,600	1.1	3.2	12.76	37.12	49.88
(5)	Asphalt pavement	m^2	3,800	2.0	4.6	7.60	17.48	25.08
(6)	Concrete	m^3	2,300	71.7	56.7	164.91	130.41	295.32
(7)	Reinforcing bars	ton	190	471.8	541.8	89.64	102.94	192.58
(8)	Form	m^2	7,000	16.5	3.8	115.50	26.60	142.10
(9)	Piling 200x200mm, L=3m	no.	400	113.8	191.8	45.52	76.72	122.24
(10)	Miscellaneous	L.S				95.79	98.53	194.33
	Total of 2.					574.77	591.21	1,165.97
3.	Tuol Kork Drainage Sluiceway I							
(1)	Excavation	m^3	3,000	0.7	1.5	2.10	4.50	6.60
(2)	Pond dredging	m^3	66,000	2.5	3.5	165.00	231.00	396.00
(3)	Embankment for dike	m^3	1,700	3.1	9.2	5.27	15.64	20.91
(4)	Backfilling under road	m^3	100	4.2	10.4	0.42	1.04	1.46
(5)	Backfilling with excavated mate	m^3	620	0.8	1.7	0.50	1.05	1.55
(6)	Disposal of excavated material	m^3	67,300	1.1	3.2	74.03	215.36	289.39
(7)	Asphalt pavement	m^2	30	2.0	4.6	0.06	0.14	0.20
(8)	Concrete	m^3	340	71.7	56.7	24.38	19.28	43.66
(9)	Reinforcing bars	ton	30	471.8	541.8	14.15	16.25	30.41
(10)	Form	m^2	900	16.5	3.8	14.85	3.42	18.27
(11)	Piling 200x200mm, L=3m	no.	80	113.8	191.8	9.10	15.34	24.45
(12)	Steel gate	m^2	5	2,800.0	11,200.0	14.00	56.00	70.00
(13)	Miscellaneous	L.S				64.77	115.81	180.58
	Total of 3.					388.63	694.83	1,083.47

Table D3-17 Cost for Component 5: City Core North Area Drainage Improvement (6/9)

No.	Items	Unit	Q'ty	Unit Price (US$)		Amount (US$1,000)		
				L.C	F.C	L.C	F.C	Total
4.	Tuol Kork Drainage Sluiceway II							
(1)	Excavation	m^3	1,600	0.7	1.5	1.12	2.40	3.52
(2)	Pond dredging	m^3	132,000	2.5	3.5	330.00	462.00	792.00
(3)	Embankment for dike	m^3	900	3.1	9.2	2.79	8.28	11.07
(4)	Backfilling under road	m^3	30	4.2	10.4	0.13	0.31	0.44
(5)	Backfilling with excavated mate	m^3	330	0.8	1.7	0.26	0.56	0.83
(6)	Disposal of excavated material	m^3	133,270	1.1	3.2	146.60	426.46	573.06
(7)	Asphalt pavement	m^2	20	2.0	4.6	0.04	0.09	0.13
(8)	Concrete	m^3	180	71.7	56.7	12.91	10.21	23.11
(9)	Reinforcing bars	ton	16	471.8	541.8	7.55	8.67	16.22
(10)	Form	m^2	500	16.5	3.8	8.25	1.90	10.15
(11)	Piling 200x200mm, L=3m	no.	40	113.8	191.8	4.55	7.67	12.22
(12)	Steel gate	m^2	5	2,800.0	11,200.0	14.00	56.00	70.00
(13)	Miscellaneous	L.S				105.64	196.91	302.55
	Total of 4.					633.83	1,181.47	1,815.30
5.	Tuol Kork Drainage Sluiceway III							
(1)	Excavation	m^3	2,400	0.7	1.5	1.68	3.60	5.28
(2)	Open excavation for regulation p	m^3	66,000	0.4	1.1	26.40	72.60	99.00
(3)	Embankment for dike	m^3	1,400	3.1	9.2	4.34	12.88	17.22
(4)	Backfilling under road	m^3	40	4.2	10.4	0.17	0.42	0.58
(5)	Backfilling with excavated mate	m^3	500	0.8	1.7	0.40	0.85	1.25
(6)	Disposal of excavated material	m^3	67,900	1.1	3.2	74.69	217.28	291.97
(7)	Asphalt pavement	m^2	20	2.0	4.6	0.04	0.09	0.13
(8)	Concrete	m^3	270	71.7	56.7	19.36	15.31	34.67
(9)	Reinforcing bars	ton	24	471.8	541.8	11.32	13.00	24.33
(10)	Form	m^2	800	16.5	3.8	13.20	3.04	16.24
(11)	Piling 200x200mm, L=3m	no.	60	113.8	191.8	6.83	11.51	18.34
(12)	Steel gate	m^2	5	2,800.0	11,200.0	14.00	56.00	70.00
(13)	Miscellaneous	L.S				34.49	81.32	115.80
	Total of 5.					206.91	487.89	694.81
	Total of I.					3,880.43	5,072.81	8,953.24
II.	**Land Acquisition**	m^2	15,000	5.0	0.0	75.00	0.00	75.00
III.	**Administration Cost**	L.S				268.60	0.00	268.60
IV.	**Engineering Service**	L.S				582.06	760.92	1,342.99
V.	**Physical Contingency**	L.S				388.04	507.28	895.32
	Grand Total					5,194.14	6,341.01	11,535.15

Table D3-17 Cos t for Component 5: City Core North Area Drainage Improvement (7/9)

e. C4: Tuol Kork Basin, Sewer Rehabilitation (332ha)

No.	Items	Unit	Q'ty	Unit Price (US$)		Amount (US$1,000)		
				L.C	F.C	L.C	F.C	Total
I.	Construction Cost							
I.1	Dia 375mm							
1.	Trench excavation	m^3	11,400	0.6	1.5	6.84	17.10	23.94
2.	Sewer installation	m	4,130	17.6	27.4	72.69	113.16	185.85
3.	Backfilling in trench	m^3	10,800	4.2	10.4	45.36	112.32	157.68
4.	Disposal of excavated material	m^3	5,900	1.1	3.2	6.49	18.88	25.37
5.	Asphalt pavement	m^2	4,130	2.0	4.6	8.26	19.00	27.26
6.	Manhole, connecting pipes, etc.	L.S				39.41	78.44	117.85
	Total of I.1					179.05	358.90	537.95
I.2	Dia 450mm							
1.	Trench excavation	m^3	26,400	0.6	1.5	15.84	39.60	55.44
2.	Sewer installation	m	7,900	19.3	31.8	152.47	251.22	403.69
3.	Backfilling in trench	m^3	24,600	4.2	10.4	103.32	255.84	359.16
4.	Disposal of excavated material	m^3	13,600	1.1	3.2	14.96	43.52	58.48
5.	Asphalt pavement	m^2	8,670	2.0	4.6	17.34	39.88	57.22
6.	Manhole, connecting pipes, etc.	L.S				85.98	177.05	263.03
	Total of I.2					389.91	807.12	1,197.02
I.3	Dia 600mm							
1.	Trench excavation	m^3	38,400	0.6	1.5	23.04	57.60	80.64
2.	Sewer installation	m	8,710	26.7	50.1	232.56	436.37	668.93
3.	Backfilling in trench	m^3	35,100	4.2	10.4	147.42	365.04	512.46
4.	Disposal of excavated material	m^3	19,300	1.1	3.2	21.23	61.76	82.99
5.	Asphalt pavement	m^2	11,400	2.0	4.6	22.80	52.44	75.24
6.	Manhole, connecting pipes, etc.	L.S				127.27	276.23	403.51
	Total of I.3					574.32	1,249.44	1,823.76
I.4	Dia 750mm							
1.	Trench excavation	m^3	43,400	0.6	1.5	26.04	65.10	91.14
2.	Sewer installation	m	6,510	32.9	65.5	214.18	426.41	640.58
3.	Backfilling in trench	m^3	39,600	4.2	10.4	166.32	411.84	578.16
4.	Disposal of excavated material	m^3	21,800	1.1	3.2	23.98	69.76	93.74
5.	Asphalt pavement	m^2	12,100	2.0	4.6	24.20	55.66	79.86
6.	Manhole, connecting pipes, etc.	L.S				129.16	291.93	421.09
	Total of I.4					583.87	1,320.70	1,904.57
I.5	Dia 900mm							
1.	Trench excavation	m^3	29,000	0.6	1.5	17.40	43.50	60.90
2.	Sewer installation	m	3,620	47.0	105.8	170.14	383.00	553.14
3.	Backfilling in trench	m^3	26,000	4.2	10.4	109.20	270.40	379.60
4.	Disposal of excavated material	m^3	14,300	1.1	3.2	15.73	45.76	61.49
5.	Asphalt pavement	m^2	7,240	2.0	4.6	14.48	33.30	47.78
6.	Manhole, connecting pipes, etc.	L.S				93.74	222.80	316.54
	Total of I.5					420.69	998.76	1,419.45
I.6	Dia 1,050mm							
1.	Trench excavation	m^3	36,100	0.6	1.5	21.66	54.15	75.81
2.	Sewer installation	m	3,650	55.4	126.8	202.21	462.82	665.03
3.	Backfilling in trench	m^3	31,900	4.2	10.4	133.98	331.76	465.74
4.	Disposal of excavated material	m^3	17,600	1.1	3.2	19.36	56.32	75.68
5.	Asphalt pavement	m^2	8,030	2.0	4.6	16.06	36.94	53.00
6.	Manhole, connecting pipes, etc.	L.S				113.16	271.52	384.68
	Total of I.6					506.43	1,213.50	1,719.94

Table D3-17 Cost for Component 5: City Core North Area Drainage Improvement (8/9)

No.	Items	Unit	Q'ty	Unit Price (US$)		Amount (US$1,000)		
				L.C	F.C	L.C	F.C	Total
I.7	Dia 1,200mm							
1.	Trench excavation	m^3	16,600	0.6	1.5	9.96	24.90	34.86
2.	Sewer installation	m	1,490	73.2	177.9	109.07	265.07	374.14
3.	Backfilling in trench	m^3	14,400	4.2	10.4	60.48	149.76	210.24
4.	Disposal of excavated material	m^3	7,900	1.1	3.2	8.69	25.28	33.97
5.	Asphalt pavement	m^2	3,580	2.0	4.6	7.16	16.47	23.63
6.	Manhole, connecting pipes, etc.	L.S				56.46	139.50	195.96
	Total of I.7					251.82	620.98	872.80
I.8	Dia 1,350mm							
1.	Trench excavation	m^3	9,300	0.6	1.5	5.58	13.95	19.53
2.	Sewer installation	m	670	86.5	214.5	57.96	143.72	201.67
3.	Backfilling in trench	m^3	8,100	4.2	10.4	34.02	84.24	118.26
4.	Disposal of excavated material	m^3	4,500	1.1	3.2	4.95	14.40	19.35
5.	Asphalt pavement	m^2	1,730	2.0	4.6	3.46	7.96	11.42
6.	Manhole, connecting pipes, etc.	L.S				30.75	76.89	107.64
	Total of I.8					136.72	341.15	477.87
I.9	Dia 1,500mm							
1.	Trench excavation	m^3	27,400	0.6	1.5	16.44	41.10	57.54
2.	Sewer installation	m	1,700	88.9	217.6	151.13	369.92	521.05
3.	Backfilling in trench	m^3	23,500	4.2	10.4	98.70	244.40	343.10
4.	Disposal of excavated material	m^3	13,000	1.1	3.2	14.30	41.60	55.90
5.	Asphalt pavement	m^2	4,760	2.0	4.6	9.52	21.90	31.42
6.	Manhole, connecting pipes, etc.	L.S				84.17	209.11	293.28
	Total of I.9					374.26	928.02	1,302.28
I.10	Dia 1,650mm							
1.	Trench excavation	m^3	4,100	0.6	1.5	2.46	6.15	8.61
2.	Sewer installation	m	220	102.5	254.4	22.55	55.97	78.52
3.	Backfilling in trench	m^3	3,500	4.2	10.4	14.70	36.40	51.10
4.	Disposal of excavated material	m^3	1,900	1.1	3.2	2.09	6.08	8.17
5.	Asphalt pavement	m^2	660	2.0	4.6	1.32	3.04	4.36
6.	Manhole, connecting pipes, etc.	L.S				12.54	31.38	43.92
	Total of I.10					55.66	139.01	194.67
I.11	Dia 1,800mm							
1.	Trench excavation	m^3	2,300	0.6	1.5	1.38	3.45	4.83
2.	Sewer installation	m	110	115.6	290.1	12.72	31.91	44.63
3.	Backfilling in trench	m^3	2,000	4.2	10.4	8.40	20.80	29.20
4.	Disposal of excavated material	m^3	1,100	1.1	3.2	1.21	3.52	4.73
5.	Asphalt pavement	m^2	340	2.0	4.6	0.68	1.56	2.24
6.	Manhole, connecting pipes, etc.	L.S				7.11	17.90	25.02
	Total of I.11					31.50	79.15	110.65
	Total of I.					3,504.23	8,056.73	11,560.97
II.	**Land Acquisition**	L.S						0.00
III.	**Administration Cost**	L.S				346.83	0.00	346.83
IV.	**Engineering Service**	L.S				525.63	1,208.51	1,734.14
V.	**Physical Contingency**	L.S				350.42	805.67	1,156.10
	Grand Total					4,727.12	10,070.92	14,798.04

Table D3-17 Cost for Component 5: City Core North Area Drainage Improvement (9/9)

f. C5: University Basin, Drainage Sluiceways (2 locations)

No.	Items	Unit	Q'ty	Unit Price (US$)		Amount (US$1,000)		
				L.C	F.C	L.C	F.C	Total
I.	**Construction Cost**							
1.	Sluiceway under inner dike							
(1)	Excavation	m^3	2,800	0.7	1.5	1.96	4.20	6.16
(2)	Embankment for dike	m^3	1,600	3.1	9.2	4.96	14.72	19.68
(3)	Backfilling under road	m^3	50	4.2	10.4	0.21	0.52	0.73
(4)	Backfilling with excavated mate	m^3	580	0.8	1.7	0.46	0.99	1.45
(5)	Disposal of excavated material	m^3	2,220	1.1	3.2	2.44	7.10	9.55
(6)	Asphalt pavement	m^2	30	2.0	4.6	0.06	0.14	0.20
(7)	Concrete	m^3	320	71.7	56.7	22.94	18.14	41.09
(8)	Reinforcing bars	ton	28	471.8	541.8	13.21	15.17	28.38
(9)	Form	m^2	900	16.5	3.8	14.85	3.42	18.27
(10)	Piling 200x200mm, L=3m	no.	70	113.8	191.8	7.97	13.43	21.39
(11)	Steel gate	m^2	5	2,800.0	11,200.0	14.00	56.00	70.00
(12)	Miscellaneous	L.S				16.61	26.77	43.38
	Total of 1.					99.68	160.59	260.27
2.	Sluiceway under railway							
(1)	Excavation	m^3	2,400	0.7	1.5	1.68	3.60	5.28
(2)	Embankment for dike	m^3	1,400	3.1	9.2	4.34	12.88	17.22
(3)	Backfilling under road	m^3	40	4.2	10.4	0.17	0.42	0.58
(4)	Backfilling with excavated mate	m^3	500	0.8	1.7	0.40	0.85	1.25
(5)	Disposal of excavated material	m^3	1,900	1.1	3.2	2.09	6.08	8.17
(6)	Asphalt pavement	m^2	20	2.0	4.6	0.04	0.09	0.13
(7)	Concrete	m^3	270	71.7	56.7	19.36	15.31	34.67
(8)	Reinforcing bars	ton	24	471.8	541.8	11.32	13.00	24.33
(9)	Form	m^2	800	16.5	3.8	13.20	3.04	16.24
(10)	Piling 200x200mm, L=3m	no.	60	113.8	191.8	6.83	11.51	18.34
(11)	Steel gate	m^2	5	2,800.0	11,200.0	14.00	56.00	70.00
(12)	Miscellaneous	L.S				14.69	24.56	39.24
	Total of 2.					88.11	147.33	235.45
3.	Open channel							
(1)	Open excavation	m^3	2,800	0.4	1.1	1.12	3.08	4.20
(2)	Disposal of excavated material	m^3	2,800	1.1	3.2	3.08	8.96	12.04
(3)	Miscellaneous	L.S				0.84	2.41	3.25
	Total of 3.					5.04	14.45	19.49
	Total of I.					192.83	322.38	515.21
II.	**Land Acquisition**	m^2	1,500	5.0	0.0	7.50	0.00	7.50
III.	**Administration Cost**	L.S				15.46	0.00	15.46
IV.	**Engineering Service**	L.S				28.93	48.36	77.28
V.	**Physical Contingency**	L.S				19.28	32.24	51.52
	Grand Total					264.00	402.97	666.97

Table D3-18 Cost for Component 6: Pochentong East Basin Drainage Improvement (1/2)

No.	Items	Unit	Q'ty	Unit Price (US$)		Amount (US$1,000)		
				L.C	F.C	L.C	F.C	Total
I.	**Construction Cost**							
1.	Pumping Station ($5m^3/s$)							
1.1	Civil Works							
(1)	Open excavation	m^3	16,700	0.4	1.1	6.68	18.37	25.05
(2)	Disposal of excavated material	m^3	11,700	1.1	3.2	12.87	37.44	50.31
(3)	Piling 406x406mm, L=10m	no.	50	268.5	568.8	13.43	28.44	41.87
(4)	Piling 305x305mm, L=10m	no.	110	228.6	449.1	25.15	49.40	74.55
(5)	Piling 200x200mm, L=4m	no.	100	113.8	191.8	11.38	19.18	30.56
(6)	Steel sheet piling	m^2	370	33.6	95.2	12.43	35.22	47.66
(7)	Filling with excavated material	m^3	5,000	0.8	1.7	4.00	8.50	12.50
(8)	Embankment for dike	m^3	8,200	3.1	9.2	25.42	75.44	100.86
(9)	Concrete	m^3	2,200	71.7	56.7	157.74	124.74	282.48
(10)	Form	m^2	4,600	16.5	3.8	75.90	17.48	93.38
(11)	Reinforcing bars	ton	200	471.8	541.8	94.36	108.36	202.72
(12)	Sodding	m^2	3,100	3.6	0.3	11.16	0.93	12.09
(13)	Steel gate	m^2	11	2,800.0	11,200.0	30.80	123.20	154.00
(14)	Miscellaneous	L.S				96.26	129.34	225.60
	Total of 1.1					577.58	776.05	1,353.62
1.2	Mechanical & Electrical Works							
(1)	Intake equipment	L.S				0.00	442.07	442.07
(2)	Pumping equipment	L.S				0.00	743.00	743.00
(3)	Power supply equipment	L.S				0.00	939.79	939.79
(4)	Others	L.S				0.00	255.36	255.36
	Total of 1.2					0.00	2,380.21	2,380.21
	Total of 1.					577.58	3,156.26	3,733.84
2.	Regulation Pond							
(1)	Lake dredging	m^3	51,000	2.5	3.5	127.50	178.50	306.00
(2)	Disposal of excavated material	m^3	51,000	1.1	3.2	56.10	163.20	219.30
(3)	Miscellaneous	L.S				36.72	68.34	105.06
	Total of 2.					220.32	410.04	630.36
3.	Sluiceway							
(1)	Excavation	m^3	500	0.7	1.5	0.35	0.75	1.10
(2)	Embankment for dike	m^3	350	3.1	9.2	1.09	3.22	4.31
(3)	Disposal of excavated material	m^3	500	1.1	3.2	0.55	1.60	2.15
(4)	Concrete	m^3	150	71.7	56.7	10.76	8.51	19.26
(5)	Reinforcing bars	ton	15	471.8	541.8	7.08	8.13	15.20
(6)	Form	m^2	270	16.5	3.8	4.46	1.03	5.48
(7)	Piling 200x200mm, L=3m	no.	25	113.8	191.8	2.85	4.80	7.64
(8)	Steel sheet piling	m^2	50	33.6	95.2	1.68	4.76	6.44
(9)	Steel gate	m^2	8	2,800.0	11,200.0	22.40	89.60	112.00
(10)	Miscellaneous	L.S				10.24	24.48	34.72
	Total of 3.					61.44	146.86	208.30
4.	Drainage Main (L=9km)							
(1)	Excavation	m^3	67,500	0.6	1.5	40.50	101.25	141.75
(2)	Disposal of excavated material	m^3	67,500	1.1	3.2	74.25	216.00	290.25
(3)	Masonry revetment	m^2	50,500	36.4	33.2	1,838.20	1,676.60	3,514.80
(4)	Miscellaneous	L.S				390.59	398.77	789.36
	Total of 4.					2,343.54	2,392.62	4,736.16
	Total of I.					3,202.87	6,105.78	9,308.65

Table D3-18 Cost for Component 6: Pochentong East Basin Drainage Improvement (2/2)

No.	Items	Unit	Q'ty	Unit Price (US$)		Amount (US$1,000)		
				L.C	F.C	L.C	F.C	Total
II.	Land Acquisition	m^2	4,800	5.0	0.0	24.00	0.00	24.00
III.	Administration Cost	L.S				279.26	0.00	279.26
IV.	Engineering Service	L.S				480.43	915.87	1,396.30
V.	Physical Contingency	L.S				320.29	610.58	930.87
	Grand Total					4,306.85	7,632.22	11,939.07

Table D3-19 Cost for Component 7: Northeast and Northwest Areas Drainage Improvement (1/2)

a. Poungpeay Drainage Main (11.92 km long)

No.	Items	Unit	Q'ty	Unit Price (US$)		Amount (US$1,000)		
				L.C	F.C	L.C	F.C	Total
I.	**Construction Cost**							
1.	Open excavation	m^3	325,000	0.4	1.1	130.00	357.50	487.50
2.	Excavation for river improvemet	m^3	21,000	0.6	1.5	12.60	31.50	44.10
3.	Dredging for river improvement	m^3	15,000	1.7	2.9	25.50	43.50	69.00
4.	Disposal of excavated material	m^3	361,000	1.1	3.2	397.10	1,155.20	1,552.30
5.	Embankment for dike	m^3	117,000	3.1	9.2	362.70	1,076.40	1,439.10
6.	Masonry revetment	m^2	17,000	36.4	33.2	618.80	564.40	1,183.20
7.	Tree planting	no.	2,000	51.8	145.6	103.60	291.20	394.80
8.	Asphalt pavement	m^2	1,450	2.0	4.6	2.90	6.67	9.57
9.	Concrete for culverts	m^3	2,200	71.7	56.7	157.74	124.74	282.48
10.	Reinforcing bars	ton	210	471.8	541.8	99.08	113.78	212.86
11.	Form	m^2	4,200	16.5	3.8	69.30	15.96	85.26
12.	Piling 305x305mm, L=10m	no.	150	228.6	449.1	34.29	67.37	101.66
13.	Bridge	m^2	380	390.0	910.0	148.20	345.80	494.00
14.	Miscellaneous	L.S				432.36	838.80	1,271.16
	Total of I.					2,594.17	5,032.82	7,626.99
II.	**Land Acquisition**	L.S	311,000	2.0	0.0	622.00	0.00	622.00
III.	**Administration Cost**	L.S				228.81	0.00	228.81
IV.	**Engineering Service**	L.S				389.13	754.92	1,144.05
V.	**Physical Contingency**	L.S				259.42	503.28	762.70
	Grand Total					4,093.52	6,291.02	10,384.54

Table D3-19 Cost for Component 7: Northeast and Northwest Areas Drainage Improvement (2/2)

b. Syay Pak Drainage Sluiceway (B: 2.0m x H: 2.0m x 2 lanes)

No.	Items	Unit	Q'ty	Unit Price (US$)		Amount (US$1,000)		
				L.C	F.C	L.C	F.C	Total
I.	**Construction Cost**							
1.	Excavation under existing road	m^3	1,700	0.7	1.5	1.19	2.55	3.74
2.	Embankment for dike	m^3	1,200	3.1	9.2	3.72	11.04	14.76
3.	Backfilling under road	m^3	130	4.2	10.4	0.55	1.35	1.90
4.	Disposal of excavated material	m^3	1,700	1.1	3.2	1.87	5.44	7.31
5.	Asphalt pavement	m^2	100	2.0	4.6	0.20	0.46	0.66
6.	Concrete	m^3	500	71.7	56.7	35.85	28.35	64.20
7.	Reinforcing bars	ton	50	471.8	541.8	23.59	27.09	50.68
8.	Form	m^2	900	16.5	3.8	14.85	3.42	18.27
9.	Piling 200x200mm, L=3m	no.	40	113.8	191.8	4.55	7.67	12.22
10.	Steel sheet piling	m^2	50	33.6	95.2	1.68	4.76	6.44
11.	Masonry revetment	m^2	400	36.4	33.2	14.56	13.28	27.84
12.	Steel gate	m^2	16	2,800.0	11,200.0	44.80	179.20	224.00
13.	Miscellaneous	L.S				29.48	56.92	86.40
	Total of I.					176.89	341.54	518.43
II.	**Land Acquisition**	m^2	0	2.0	0.0	0.00	0.00	0.00
III.	**Administration Cost**	L.S				15.55	0.00	15.55
IV.	**Engineering Service**	L.S				26.53	51.23	77.76
V.	**Physical Contingency**	L.S				17.69	34.15	51.84
	Grand Total					236.66	426.92	663.59

c. Drainage Sluiceways in Poungpeay East Basin (12 locations)

No.	Items	Unit	Q'ty	Unit Price (US$)		Amount (US$1,000)		
				L.C	F.C	L.C	F.C	Total
I.	**Construction Cost**							
1.	Excavation under existing road	m^3	1,000	0.7	1.5	0.70	1.50	2.20
2.	Embankment for dike	m^3	400	3.1	9.2	1.24	3.68	4.92
3.	Disposal of excavated material	m^3	1,000	1.1	3.2	1.10	3.20	4.30
4.	Concrete	m^3	350	71.7	56.7	25.10	19.85	44.94
5.	Reinforcing bars	ton	30	471.8	541.8	14.15	16.25	30.41
6.	Form	m^2	900	16.5	3.8	14.85	3.42	18.27
7.	Piling 200x200mm, L=3m	no.	60	113.8	191.8	6.83	11.51	18.34
8.	Steel gate	m^2	40	2,800.0	11,200.0	112.00	448.00	560.00
9.	Miscellaneous	L.S				35.19	101.48	136.67
	Total of I.					211.16	608.89	820.05
II.	**Land Acquisition**	m^2	0	2.0	0.0	0.00	0.00	0.00
III.	**Administration Cost**	L.S				24.60	0.00	24.60
IV.	**Engineering Service**	L.S				31.67	91.33	123.01
V.	**Physical Contingency**	L.S				21.12	60.89	82.00
	Grand Total					288.55	761.11	1,049.66

Table D3-20 Cost for Component 8: Environmental Enhancement

a. Environmental Canal (1.75km long)

No.	Items	Unit	Q'ty	Unit Price (US$)		Amount (US$1,000)		
				L.C	F.C	L.C	F.C	Total
I.	**Construction Cost**							
1.	Trench excavation	m^3	18,000	0.6	1.5	10.80	27.00	37.80
2.	Backfilling under road	m^3	50	4.2	10.4	0.21	0.52	0.73
3.	Backfilling with excavated materi	m^3	13,000	0.8	1.7	10.40	22.10	32.50
4.	Disposal of excavated material	m^3	5,000	1.1	3.2	5.50	16.00	21.50
5.	Asphalt pavement	m^2	30	2.0	4.6	0.06	0.14	0.20
6.	Concrete	m^3	2,800	71.7	56.7	200.76	158.76	359.52
7.	Reinforcing bars	ton	250	471.8	541.8	117.95	135.45	253.40
8.	Form	m^2	11,000	16.5	3.8	181.50	41.80	223.30
9.	Piling 200x200mm, L=3m	no.	600	113.8	191.8	68.28	115.08	183.36
10.	Steel gate	m^2	1	2,800.0	11,200.0	2.80	11.20	14.00
11.	Miscellaneous	L.S				119.65	105.61	225.26
	Total of I.					717.91	633.66	1,351.57
II.	**Land Acquisition**	m^2	0	5.0	0.0	0.00	0.00	0.00
III.	**Administration Cost**	L.S				40.55	0.00	40.55
IV.	**Engineering Service**	L.S				107.69	95.05	202.74
V.	**Physical Contingency**	L.S				71.79	63.37	135.16
	Grand Total					937.94	792.07	1,730.01

b. Kak Interceptor (0.85km long)

No.	Items	Unit	Q'ty	Unit Price (US$)		Amount (US$1,000)		
				L.C	F.C	L.C	F.C	Total
I.	**Construction Cost**							
1.	Trench excavation	m^3	2,400	0.6	1.5	1.44	3.60	5.04
2.	Sewer installation	m	850	17.6	27.4	14.96	23.29	38.25
3.	Backfilling in trench	m^3	2,200	4.2	10.4	9.24	22.88	32.12
4.	Disposal of excavated material	m^3	1,200	1.1	3.2	1.32	3.84	5.16
5.	Manhole, connecting pipes, etc.	L.S				8.09	16.08	24.17
6.	Diversion pits	no.	5	3,170	2,000	15.85	10.00	25.85
	Total of I.					50.90	79.69	130.59
II.	**Land Acquisition**	L.S						0.00
III.	**Administration Cost**	L.S				3.92	0.00	3.92
IV.	**Engineering Service**	L.S				7.63	11.95	19.59
V.	**Physical Contingency**	L.S				5.09	7.97	13.06
	Grand Total					67.54	99.62	167.16

Table D3-21 Implementation Schedule for the Master Plan

Project Component	Cost in US$ mil	Year
		2000 01 02 03 04 2005 06 07 08 09 2010 11 12 13 14 2015 16 17 18 19 2020
Component 1: Riverfront Protection in Sap Downstream Middle Section (1.0km)	2.3	
Component 2: Reinforcement of Kop Sros and Tompun Dikes	17.8	
a. Reinforcement of Kop Srov Dike (9.0km)	16.2	
b. Reinforcement of Tompun Dike (4.4km)	1.6	
Component 3: Tompun Watershed Drainage Improvement	88.6	53.7 — 34.9
a. Tompun Pumping Station (15m³/s) and Regulation Pond	15.7	
b. Meanchey Drainage Main, Downstream Stretch (2.76km long)	5.0	
c. Meanchey Drainage Main, Upstream Stretch (2.135km long)	1.9	
d. Tum Nup Tock Drainage Sluiceway (2mx2mx1 lane)	0.4	
e. Samdachi Monireth Drainage Main (2.36km long)	24.8	
f. Jawaharlal Nehru Drainage Main (1.16km long)	3.6	
g. Salang Drainage Main (1.89km long)	2.3	
h. Sewer Rehabilitation excluding Tum Nup Tock Basin (931ha)	32.8	
i. Sewer Construction, Tum Nup Tock Basin (68ha)	2.1	
Component 4: Trabek Basin Drainage Improvement	94.5	42.0 — 52.5
a. Trabek Pumping Station (8m³/s) and Regulation Pond	18.2	
b. Trabek Drainage Main (1.604km long)	13.7	
c. Toul Sen Drainage Main (2.05km long)	4.0	
d. Norodom Drainage Main (1.768km long)	6.1	
e. Sewer Rehabilitation (1,083ha)	52.5	
Component 5: City Core North Area Drainage Improvement	32.0	12.5 — 19.5
a. C1: Wat Phnom Basin, Sewer Rehabilitation (89ha)	4.3	
b. C2: Kak Lakeshore Basin, Sewer Rehabilitation (51ha)	0.4	
c. C3: Boeng Kak Basin, Kak Drainage Sluiceway	0.4	
d. C4: Tuol Kork Basin, Major Drainage Facilities	11.5	
e. C4: Tuol Kork Basin, Sewer Rehabilitation (332ha)	14.8	
f. C5: University Basin, Drainage Sluiceways (2 locations)	0.7	
Component 6: Pochentong East Basin Drainage Improvement	11.9	
Component 7: Northeast and Northwest Areas Drainage Improvement	12.1	
a. Poungpeay Drainage Main (11.92km)	10.4	
b. Svay Pak Drainage Sluiceway (2mx2mx2 lanes)	0.7	
c. Drainage Sluiceways in Poungpeay East Basin (12 locations)	1.1	
Component 8: Environmental Enhancement	1.9	
a. Environmental Canal (1.75km long)	1.7	
b. Kak Interceptor (0.85km long)	0.2	
Total	261.1	154.2 — 106.9

Table D4-1 Cost of Light Traffic Asphalt Pavement

No.	Work Item	Unit	Quantity	Unit Price (US$)		Amount US$		
				L.C	F.C	L.C	F.C	Total
I.	Lightly Trafficed Asphalt Pavement Road							
1.	Direct Cost							
(1)	Asphalt macadam, t=30mm	m^2	7	1.7	4.8	11.93	33.30	45.24
(2)	Base course, t= 150mm	m^2	7	2.0	6.1	14.33	42.42	56.75
(3)	Sub base course t=200mm	m^2	7	2.5	7.5	17.65	52.35	70.01
(4)	Grading works	m^2	7	0.164	0.162	1.15	1.14	2.29
(5)	Miscallaneous (20% of direct cost)	LS				9.01	25.84	34.86
	Total					54.08	155.06	209.14

(Unit : US$)

Work Items			Local Currency	Foregin Currency	Equivalent
Asphalt Pavement t=30mm		=	11.9	33.3	45.2
Base Course t=150mm		=	14.3	42.4	56.7
Sub base Course t=200mm		=	17.7	52.4	70.0
Grading		=	1.2	1.1	2.3
Miscellaneous (20%)			9.0	25.8	34.9
	per m	US$	54.1	155.1	209.1
	per m^2	US$	7.7	22.2	29.9

Table D4-2 Cost of High Quality Asphalt Pavement

No.	Work Item	Unit	Quantity	Unit Price (US$)		Amount US$		
				L.C	F.C	L.C	F.C	Total
I.	High Quality Asphalt Pavement Road							
1.	Direct Cost							
(1)	Asphalt macadam, t=50mm x 2 layers	m^2	7	4.7	13.5	32.89	94.68	127.56
(2)	Base course, t= 150mm	m^2	7	2.6	7.9	18.53	54.98	73.51
(3)	Sub base course, t=200mm	m^2	7	2.9	8.7	20.45	60.75	81.21
(4)	Grading works	m^2	7	0.164	0.162	1.15	1.14	2.29
(5)	Miscallaneous (20% of direct cost)	LS				14.60	42.31	56.91
	Total					87.62	253.85	341.48

(Unit : US$)

Work Items			Local Currency	Foregin Currency	Equivalent
Concrete Pavement t=250mm		=	32.9	94.7	127.6
Base Course t=150mm		=	18.5	55.0	73.5
Sub base Course t=200mm		=	20.5	60.8	81.2
Grading		=	1.2	1.1	2.3
Miscellaneous (20%)			14.6	42.3	56.9
	per m	US$	87.6	253.9	341.5
	per m^2	US$	12.5	36.3	48.8

Table D4-3 Cost of Concrete Pavement

No.	Work Item	Unit	Quantity	Unit Price (US$)		Amount (US$)		
				L.C	F.C	L.C	F.C	Total
I.	Concrete Pavement Road							
1.	Direct Cost							
(1)	Concrete Pavement, t=250mm	m^2	7	18.3	15.6	128.31	109.43	237.73
(2)	Joint (10% of (1) and (3))	LS				15.05	13.49	28.54
(3)	Reinforcing Bar	ton	0.04704	471.8	541.8	22.19	25.49	47.68
(4)	Base course, t= 300mm	m^2	7	3.3	9.7	23.04	68.21	91.25
(5)	Grading works	m^2	7	0.164	0.162	1.15	1.14	2.29
(6)	Miscallaneous (20% of direct cost)	LS				37.95	43.55	81.50
	Total					227.69	261.30	488.99

(Unit : US$)

Work Items			Local Currency	Foregin Currency	Equivalent
Concrete Pavement t=250mm		=	128.3	109.4	237.7
Base Course t=150mm		=	23.0	68.2	91.3
Reinforcing Bar		=	22.2	25.5	47.7
Joint		=	15.1	13.5	28.5
Grading		=	1.2	1.1	2.3
Miscellaneousn (20%)		=	37.9	43.5	81.5
	per m	US$	227.7	261.3	489.0
	per m^2	US$	32.5	37.3	69.9

Table D4-4 Land Acquisition and House Evacuation Required for the Reinforcement of Kop Srov and Tompun Dikes

Sub-component	Section	Recommended Plan		Alternative Plan	
		Land Acquisition (m^2)	House Evacuation (house)	Land Acquisition (m^2)	House Evacuation (house)
1: Kop Srov Dike *	0+000 to 0+900 (900m)	Road pavement only		Plus slope surface repair on the outer and inner sides	
		0	0	5,400	102
	0+900 to 7+650 (6,750m)	Construction of a dike on the outer side, and Road pavement		Plus slope surface repair on the inner side	
		0 **	54	87,750	307
2: Tompun Dike	0+900 to 5+300 (4,400m)	Road pavement only		Plus slope surface repair on the outer and inner sides	
		0	0	26,400	697
3: Svay Pak Drainage Sluiceway	-	Reconstruction of the existing sluiceway at the same location		(No alternatives)	
		0	0	-	-
4: Relocation Site/ Spoil Area		UNBRO relocation site along a part of Kop Srov Dike		No suitable alternatives suggested .	
		250,000	0	-	-
Borrow Pit		Use a borrow pit commercially operated, e.g. Udon area		(No alternatives)	
		0	0	-	-

* The connecting road portion in the 9,350 m stretch southward from Sta.7+650 requires no land acquisition or house evacuation

** The land on the outer side of Kop Srov Dike belongs to the Government.

Table D4-5 Equipment Necessary for Construction of the Reinforcement of Kop Srov and Tompun Dikes

Equipment	Place where it is Available	Remarks
1. Earthwork Equipment (bulldozers, backhoes, dredgers, compactors)	Phnom Penh / Neighboring countries	
2. Concrete Equipment (truck mixers, vibrations)	Phnom Penh / Neighboring countries	
3. Asphalt Pavement Equipment (finishers, graders)	Phnom Penh / Neighboring countries	Road Construction Center, etc.
4. Transportation Equipment (dump trucks, trailers, cranes)	Phnom Penh / Neighboring countries	
5. Generators, Pumps	Phnom Penh / Neighboring countries	

Table D4-6 Materials Necessary for Construction of the Reinforcement of Kop Srov and Tompun Dikes

Material	Place where it is Available	Remarks
1. Soil, Laterite	Near Phnom Penh	Udon area, etc
2. Stone, Gravel, Sand	Near Phnom Penh	Basset area, etc
3. Cement	Neighboring countries	Thailand, etc
4. Re-bars	Neighboring countries	Thailand, etc
5. Timber, Logs	Cambodia	
6. Steel Sheet Piles, H-beams	Neighboring countries	Thailand, etc
7. RC Piles	Phnom Penh	
8. Steel Gates	Developed countries	Japan, etc
9. Architectural Materials	Phnom Penh	

Table D4-7 Project Cost for the Reinforcement of Kop Srov and Tompun Dikes

Project Sub-component	Project Cost (US$1,000)					
	I.	II.	III.	IV.	V.	Total
1. Reinforcement of Kop Srov Dike (7.65km)	12,355	130	371	1,853	1,236	15,944
2. Reinforcement of Tompun Dike (4.44km)	2,500	0	75	375	250	3,201
3. Reconstruction of Svay Pak Drainage Sluiceway (1.5m wide x 2.0m high x 27.35m long x 3 lanes)	742	0	22	111	74	950
4. Preparation of Relocation Site / Spoil Area (25ha)	189	500	6	28	19	742
Grand Total	**15,787**	**630**	**474**	**2,368**	**1,579**	**20,837**

Remarks:

I. Construction Cost

II. Land Acquisition and House Evacuation

III. Administration Cost

IV. Engineering Service

V. Physical Contingency

Table D4-8 Cost of Sub-component 1: Reinforcement of Kop Srov Dike

(7.65km long)

No.	Items	Unit	Q'ty	Unit Price (US$)		Amount (US$1,000)		
				L.C	F.C	L.C	F.C	Total
I.	**Construction Cost**							
1.	Excavation	m^3	190,200	0.4	1.1	76.08	209.22	285.30
2.	Embankment	m^3	279,900	3.1	9.2	867.69	2,575.08	3,442.77
3.	Disposal of excavated material	m^3	190,200	1.1	3.2	209.22	608.64	817.86
4.	Sodding	m^2	135,900	3.6	0.3	489.24	40.77	530.01
5.	High quality asphalt pavement	m^2	119,000	12.5	36.3	1,487.50	4,319.70	5,807.20
6.	Reconstruction of existing water intakes (2 locations)	L.S				127.94	220.96	348.90
7.	Miscellaneous (10% of 1. To 6.)	L.S				325.77	797.44	1,123.20
	Total of I.					3,583.44	8,771.81	12,355.25
II.	**Land Acquisition and House Evacuation**							
1.	Land Acquisition	m^2	0	2.0	0.0	0.00	0.00	0.00
2.	House Evacuation and Compensation	no.	54	2,400.0	0.0	129.60	0.00	129.60
	Total of II.					129.60	0.00	129.60
III.	**Administration Cost**	L.S				370.66	0.00	370.66
IV.	**Engineering Service**	L.S				537.52	1,315.77	1,853.29
V.	**Physical Contingency**	L.S				358.34	877.18	1,235.52
	Grand Total					4,979.55	10,964.76	15,944.32

Table D4-9 Cost of Sub-component 2: Reinforcement of Tompun Dike

(4.44km long)

No.	Items	Unit	Q'ty	Unit Price (US$)		Amount (US$1,000)		
				L.C	F.C	L.C	F.C	Total
I.	**Construction Cost**							
1.	Excavation	m^3	43,400	0.4	1.1	17.36	47.74	65.10
2.	Embankment	m^3	23,200	3.1	9.2	71.92	213.44	285.36
3.	Disposal of excavated material	m^3	43,400	1.1	3.2	47.74	138.88	186.62
4.	Sodding	m^2	56,000	3.6	0.3	201.60	16.80	218.40
5.	High quality asphalt pavement	m^2	31,100	12.5	36.3	388.75	1,128.93	1,517.68
6.	Miscellaneous (10% of 1. To 5.)	L.S				72.74	154.58	227.32
	Total of I.					800.11	1,700.37	2,500.48
II.	**Land Acquisition and House Evacuation**							
1.	Land Acquisition	m^2	0	2.0	0.0	0.00	0.00	0.00
2.	House Evacuation and Compensation	no.	0	2,400.0	0.0	0.00	0.00	0.00
	Total of II.					0.00	0.00	0.00
III.	**Administration Cost**	L.S				75.01	0.00	75.01
IV.	**Engineering Service**	L.S				120.02	255.06	375.07
V.	**Physical Contingency**	L.S				80.01	170.04	250.05
	Grand Total					1,075.15	2,125.46	3,200.61

Table D4-10 Cost of Sub-component 3: Reconstruction of Svay Pak Drainage Sluiceway

(1.5m wide x 2.0m high x 27.35m long x 3 lanes)

No.	Items	Unit	Q'ty	Unit Price (US$)		Amount (US$1,000)		
				L.C	F.C	L.C	F.C	Total
I.	Construction Cost							
1.	Demolishing of existing structure	m^3	310	25.0	40.0	7.75	12.40	20.15
2.	Coffering	m^3	130	1.0	2.0	0.13	0.26	0.39
3.	Open excavation	m^3	5,400	0.4	1.1	2.16	5.94	8.10
4.	Disposal of excavated material	m^3	660	1.1	3.2	0.73	2.11	2.84
5.	Filling with excavated material	m^3	3,200	0.8	1.7	2.56	5.44	8.00
6.	Backfilling under road	m^3	400	4.2	10.4	1.68	4.16	5.84
7.	Piling 305x305mm square, L=10m	no.	177	228.6	449.1	40.46	79.49	119.95
8.	Steel sheet piling	m^2	300	33.6	95.2	10.08	28.56	38.64
9.	Concrete	m^3	800	71.7	56.7	57.36	45.36	102.72
10.	Form	m^2	2,400	16.5	3.8	39.60	9.12	48.72
11.	Reinforcing bars	ton	79	471.8	541.8	37.27	42.80	80.07
12.	Masonry revetment	m^2	110	36.4	33.2	4.00	3.65	7.66
13.	Sodding	m^2	360	3.6	0.3	1.30	0.11	1.40
14.	Reinstatement of road pavement	m^2	200	2.0	4.6	0.40	0.92	1.32
15.	Steel gate	m^2	18	2,800.0	11,200.0	50.40	201.60	252.00
16.	Miscellaneous (10% of 1. To 14.)	L.S				20.55	24.03	44.58
	Total of I.					276.43	465.96	742.39
II.	Land Acquisition and House Evacuation							
1.	Land Acquisition	m^2	0	2.0	0.0	0.00	0.00	0.00
2.	House Evacuation and Compensation	no.	0	2,400.0	0.0	0.00	0.00	0.00
	Total of II.					0.00	0.00	0.00
III.	Administration Cost	L.S				22.27	0.00	22.27
IV.	Engineering Service	L.S				41.46	69.89	111.36
V.	Physical Contingency	L.S				27.64	46.60	74.24
	Grand Total					367.81	582.45	950.25

Table D4-11 Cost of Sub-component 4: Preparation of Relocation Site/Spoil Area

No.	Items	Unit	Q'ty	Unit Price (US$)		Amount (US$1,000)		
				L.C	F.C	L.C	F.C	Total
I.	Construction Cost							
1.	Construction of infrastructure for UNBRO relocation site	m^2	5,400	10.0	25.0	54.00	135.00	189.00
	Total of I.					54.00	135.00	189.00
II.	Land Acquisition							
1.	UNBRO relocation site/spoil area	m^2	250,000	2.0	0.0	500.00	0.00	500.00
	Total of II.					500.00	0.00	500.00
III.	Administration Cost	L.S				5.67	0.00	5.67
IV.	Engineering Service	L.S				8.10	20.25	28.35
V.	Physical Contingency	L.S				5.40	13.50	18.90
	Grand Total					573.17	168.75	741.92

Table D4-12 Implementation Schedule for the Reinforcement of Kop Srov and Tompun Dikes and for the Tompun Watershed Drainage Improvement

Project Component	Cost (US$ mil.)	Year 2000	2001	2002	2003	2004	2005	2006	2007
Reinforcement of Kop Srov and Tompun Dikes	20.8								
-Sub-component 1: Reinforcement of kop Srov Dike (7.65 km)	15.9								
-Sub-component 2: Reinforcement of Tompun Dike (4.44 km)	3.2								
-Sub-component 3: Reconstruction of Svay Pak Drainage Sluiceway	1.0								
-Sub-component 4: Preparation of Relocation Site /Spoil Area (25 ha)	0.7								
Tompun Watershed Drainage Improvement	50.8								
-Sub-component 1: Construction of Tompun New Pumping Station and Inlet Channel (15 m^3/sec)	11.5								
-Sub-component 2: Construction of Tompun Regulation Pond (47.5 ha)	3.6								
-Sub-component 3: Improvement of Meanchey Drainage Main, Downstream Stretch (2.635 km)	3.8								
-Sub-component 4: Improvement of Meanchey Drainage Main, Middle Stretch (1.285 km)	0.5								
-Sub-component 5: Improvement of Meanchey Drainage Main, Upstream Stretch (0.535 km)	0.5								
-Sub-component 6: Construction of Tum Nup Toek Drainage Sluiceway (10 m^3/sec)	0.7								
-Sub-component 7: Construction of Samdach Monireth Drainage Main, Downstream Stretch (1.676 km)	16.3								
-Sub-component 8: Construction of Samdach Monireth Drainage Main, Upstream Stretch (0.714 km)	3.7								
-Sub-component 9: Construction of Jawaharlal Nehru Drainage Main (1.152 km)	4.1								
-Sub-component 10: Improvement of Salang Drainage Main, Downstream Stretch (0.887 km)	1.3								
-Sub-component 11: Improvement of Salang Drainage Main, Upstream Stretch (0.488 km)	0.6								
-Sub-component 12: Conservation of North Lake of Boeng Salang (5.1 ha)	0.7								
- Sub-component 13: Preparation of Relocation Site / Spoil Area (26 ha)	3.5								
Total	71.6	1.05	13.10	14.00	13.45	7.20	7.20	7.55	8.05

Table D5-1 Comparison on Pump Type

Item	Vertical-shaft Traditional Type	Horizontal-shaft Traditional Type	Submersible Type
1. Civil and Building Works			
1.1 Space Required	Comparatively small in width and length, but relatively higher due to lifting height of crane	Relatively large in width and length, but relatively lower due to lifting height of crane	Comparatively small in width and length
1.2 Substructure and Foundation Work	costly due to heaviness and requirement of accuracy of the machinery	costly due to heaviness and requirement of accuracy of the machinery	comparatively not so costly due to light weight of equipment
1.3 Superstructure/ Building Works	Superstructure is required. In case outdoor type generator is applied, building works is not required except an operating building.	Superstructure is necessary.	No superstructure is required. An operation building only is required. Simple structure with smaller areas are required.
2. Mechanical and Electrical Works			
2.1 Pump Characteristics (Cavitation)	Less cavitation is concerned commonly since impellers are set below water level.	Pump suction performance is limited, and cavitation may occur if water level becomes low.	No cavitation is concerned commonly since impellers are set below water level.
2.2 Ancillary Equipment	Ancillary equipment for prime action is not required.	Ancillary equipment for prime action is inevitable.	Ancillary equipment for prime action is not required.
2.3 Installation	Not so easy	Difficult	Easy
2.4 Operation	Automization is easily done because prime action is unnecessary.	Prime action is required, accordingly automization is complicated.	Automization is easily done due to no concerns about priming and cavitation.
2.5 Maintenance and Repair	Difficult because: - main pump components are installed below water level, and - bearing(s) is placed under water.	Easy because: - main components of pump are installed above water level, - removal of driver is unnecessary upon disassembly, and - less submerged bearings or no submerged bearings.	Rather easy because: - periodic inspection and maintenance can easily be done by lifting of electric motor and pump from water, and - life of electric motor is generally shorter than other types.
2.6 Noise	Less noise emission than the horizontal-shaft type because of submerged impellers installed, while more noisy than submergible type because electric motors are installed on floor.	Noisy because impellers and electric motors are installed on floor	Little noise emission with impellers and electric motors submerged
3. Total Cost	140%	130%	100%
4. Judgement	Not recommended	Not recommended	Recommended

Table D5-2 Land Acquisition and House Evacuation Required for the Tompun Watershed Drainage Improvement

Sub-component	Section	Recommended Plan		Alternative Plan	
		Land Acquisition (m^2)	House Evacuation (house)	Land Acquisition (m^2)	House Evacuation (house)
1: Tompun New Pumping Station and Inlet Channel	1,020 m	Beside the existing Pumping Station		(No alternatives)	
		5,000	30	-	-
2: Tompun Regulation Pond	(47.5 ha)	On the existing Boeng Tompun		(No alternatives)	
		20,000	20	-	-
3: Meanchey Drainage Main, Downstream Stretch	2,635 m	Channel improvement with maintenance roads on both sides		Channel improvement without maintenance roads	
		28,000	90	16,000	50
4: Meanchey Drainage Main, Middle Stretch	1,285 m	Channel improvement with maintenance roads on both sides		Channel improvement without maintenance roads	
		0	120	0	80
5: Meanchey Drainage Main, Upstream Stretch	535 m	Channel improvement without maintenance roads		(No alternatives)	
		0	10	-	-
6: Tum Nup Toek Drainage Sluiceway	61 m	Near the existing Tum Nup Toek Pumping Station		(No alternatives)	
		3,000	10	-	-
7: Samdach Monireth Drainage Main, Downstream Stretch	1,676 m	Construction of a box culvert under Samdach Monireth Street		(No Alternative)	
		2,400	30	-	-
8: Samdach Monireth Drainage Main, Upstream Stretch	714 m	Construction of a box culvert under Samdach Monireth Street		(No alternatives)	
		0	0	-	-
9: Jawaharlal Nehru Drainage Main	1,152 m	Construction of a box culvert under Jawaharlal Nehru Street		(No alternatives)	
		0	0	-	-
10: Salang Drainage Main, Downstream Stretch	887 m	Channel improvement with maintenance roads on both sides		Channel improvement without maintenance roads	
		0	60	0	30
11: Salang Drainage Main, Upstream Stretch	488 m	Channel improvement with a maintenance road on one side		Channel improvement without any maintenance road	
		0	90	0	70
12: Conservation of the North Lake of Boeng Salang	(5.1 ha)	Dredging and provision of a walkway along the lake perimeter		(No alternatives)	
		0	0	-	-
13: Relocation Site/ Spoil Area		Near Tompun New Pumping Station		No suitable alternatives suggested.	
		260,000	20	-	-
Borrow Pit		Use a borrow pit commercially operated		(No alternatives)	
		0	0	-	-

Table D5-3 Equipment Necessary for Construction of the Tompun Watershed Drainage Improvement

Equipment	Place where it is Available	Remarks
1. Earthwork Equipment (bulldozers, backhoes, dredgers, compactors)	Phnom Penh / Neighboring countries	
2. oncrete Equipment (truck mixers, vibrators)	Phnom Penh / Neighboring countries	
3. Asphalt Pavement Equipment (fmishers, graders)	Phnom Penh / Neighboring countries	Road Construction Center, etc.
4. Transportation Equipment (dump trucks, trailers, cranes)	Phnom Penh / Neighboring countries	
5. Generators, Pumps	Phnom Penh / Neighboring countries	

Table D5-4 Materials Necessary for Construction of the Tompun Watershed Drainage Improvement

Material	Place where it is Available	Remarks
1. Soil, Laterite	Near Phnom Penh	Udon area, etc
2. Stone, Gravel, Sand	Near Phnom Penh	Basset area, etc
3. Cement	Neighboring countries	Thailand, etc
4. Re-bars	Neighboring countries	Thailand, etc
5. Timber, Logs	Cambodia	
6. Steel Sheet Piles, H-beams	Neighboring countries	Thailand, etc
7. RC Piles	Phnom Penh	
8. Submergible Pumps and Appurtenants	Developed countries	Japan, etc
9. Generators and Appurtenants	Developed countries	Japan, etc
10. Architectural Materials	Phnom Penh	

Table D5-5 Project Cost for the Tompun Watershed Drainage Improvement

Project Sub-component	Project Cost (US$1,000)					
	I.	II.	III.	IV.	V.	Total
1. Construction of Tompun New Pumping Station and Inlet Channel (Pumping Capacity: 15 m^3/sec, Inlet Channel Length: 1.02km)	8,940	97	268	1,341	894	11,540
2. Construction of Tompun Regulation Pond (47.5ha)	2,658	148	80	399	266	3,550
3. Improvement of Meanchey Drainage Main, Downstream Stretch (2.635km long)	2,714	356	81	407	271	3,830
4. Improvement of Meanchey Drainage Main, Middle Stretch (1.285km long)	202	288	6	30	20	547
5. Improvement of Meanchey Drainage Main, Upstream Stretch (0.535km long)	339	24	10	51	34	458
6. Construction of Tum Nup Toek Drainage Sluiceway (Q=10m^3/sec, 3.0m wide x 3.6m high x 61m long x 1 lane)	507	39	15	76	51	688
7. Construction of Samdach Monireth Drainage Main, Downstream Stretch (1.676km long)	12,693	84	381	1,904	1,269	16,331
8. Construction of Samdach Monireth Drainage Main, Upstream Stretch (0.714km long)	2,863	0	86	429	286	3,665
9. Construction of Jawaharlal Nehru Drainage Main (1.152km long)	3,230	0	97	485	323	4,135
10. Improvement of Salang Drainage Main, Downstream Stretch (0.887km long)	866	144	26	130	87	1,252
11. Improvement of Salang Drainage Main, Upstream Stretch (0.488km long)	333	216	10	50	33	642
12. Conservation of North Lake of Boeng Salang (5.1ha)	531	0	16	80	53	680
13. Preparation of Relocation Site/Spoil Area (26ha)	1,680	1,348	50	252	168	3,498
Grand Total	**37,556**	**2,744**	**1,127**	**5,633**	**3,756**	**50,816**

Remarks:
I. Construction Cost
II. Land Acquisition and House Evacuation
III. Administration Cost
IV. Engineering Service
V. Physical Contingency

Table D5-6 Cost of Sub-component 1: Construction of Tompun New Pumping Station and Inlet Channel

(Pumping Capacity: 15 m^3/s, Inlet Channel Length: 1.02km)

No.	Items	Unit	Q'ty	Unit Price (US$)		Amount (US$1,000)		
				L.C	F.C	L.C	F.C	Total
I.	**Construction Cost**							
1.	Inlet Channel							
(1)	Excavation for river improvement	m^3	13,900	0.6	1.5	8.34	20.85	29.19
(2)	Dredging for river improvement	m^3	28,700	1.7	2.9	48.79	83.23	132.02
(3)	Disposal of excavated material	m^3	42,600	1.1	3.2	46.86	136.32	183.18
(4)	Embankment for dike	m^3	600	3.1	9.2	1.86	5.52	7.38
(5)	Miscellaneous (10% of (1) to (4))	L.S				10.59	24.59	35.18
	Total of 1.					116.44	270.51	386.95
2.	Pumping Station							
2.1	Civil Works							
(1)	Open excavation	m^3	12,800	0.4	1.1	5.12	14.08	19.20
(2)	Disposal of excavated material	m^3	8,750	1.1	3.2	9.63	28.00	37.63
(3)	Piling 406x406mm square, L=10m	no.	108	268.5	568.8	29.00	61.43	90.43
(4)	Piling 305x305mm square, L=10m	no.	115	228.6	449.1	26.29	51.65	77.94
(5)	Filling with excavated material	m^3	12,500	0.8	1.7	10.00	21.25	31.25
(6)	Embankment for dike	m^3	6,500	3.1	9.2	20.15	59.80	79.95
(7)	Concrete	m^3	3,540	71.7	56.7	253.82	200.72	454.54
(8)	Form	m^2	14,200	16.5	3.8	234.30	53.96	288.26
(9)	Reinforcing bars	ton	280	471.8	541.8	132.10	151.70	283.81
(10)	Sodding	m^2	1,720	3.6	0.3	6.19	0.52	6.71
(11)	Masonry	m^2	8,500	36.4	33.2	309.40	282.20	591.60
(12)	Trash boom	L.S				5.67	48.39	54.06
(13)	Miscellaneous (10% of (1) to (12))	L.S				104.17	97.37	201.54
	Total of 2.1					1,145.83	1,071.06	2,216.90
2.2	Mechanical & Electrical Works							
(1)	Intake equipment	L.S				0.00	341.67	341.67
(2)	Pumping equipment	L.S				0.00	2,530.83	2,530.83
(3)	Power supply equipment	L.S				0.00	2,505.00	2,505.00
(4)	Others	L.S				0.00	958.33	958.33
	Total of 2.2					0.00	6,335.83	6,335.83
	Total of 2.					1,145.83	7,406.90	8,552.73
	Total of I.					1,262.27	7,677.41	8,939.68
II.	**Land Acquisition and House Evacuation**							
1.	Land Acquisition	m^2	5,000	5.0	0.0	25.00	0.00	25.00
2.	House Evacuation and Compensation	no.	30	2,400.0	0.0	72.00	0.00	72.00
	Total of II.					97.00	0.00	97.00
III.	**Administration Cost**	L.S				268.19	0.00	268.19
IV.	**Engineering Service**	L.S				189.34	1,151.61	1,340.95
V.	**Physical Contingency**	L.S				126.23	767.74	893.97
	Grand Total					1,943.03	9,596.76	11,539.79

Table D5-7 Cost of Sub-component 2: Construction of Tompun Regulation Pond

(47.5ha)

No.	Items	Unit	Q'ty	Unit Price (US$)		Amount (US$1,000)		
				L.C	F.C	L.C	F.C	Total
I.	**Construction Cost**							
1.	Lake excavation	m^3	78,400	0.7	1.8	54.88	141.12	196.00
2.	Lake dredging	m^3	182,800	2.5	3.5	457.00	639.80	1,096.80
3.	Disposal of excavated material	m^3	261,200	1.1	3.2	287.32	835.84	1,123.16
4.	Miscellaneous (10% of 1. To 3.)	L.S				79.92	161.68	241.60
	Total of I.					879.12	1,778.44	2,657.56
II.	**Land Acquisition and House Evacuation**							
1.	Land Acquisition	m^2	20,000	5.0	0.0	100.00	0.00	100.00
2.	House Evacuation and Compensation	no.	20	2,400.0	0.0	48.00	0.00	48.00
	Total of II.					148.00	0.00	148.00
III.	**Administration Cost**	L.S				79.73	0.00	79.73
IV.	**Engineering Service**	L.S				131.87	266.77	398.63
V.	**Physical Contingency**	L.S				87.91	177.84	265.76
	Grand Total					1,326.63	2,223.05	3,549.67

Table D5-8 Cost of Sub-component 3: Improvement of Meanchey Drainage Main, Downstream Stretch

(2.635km long)

No.	Items	Unit	Q'ty	Unit Price (US$)		Amount (US$1,000)		
				L.C	F.C	L.C	F.C	Total
I.	Construction Cost							
1.	Excavation	m^3	100,400	0.6	1.5	60.24	150.60	210.84
2.	Dredging	m^3	85,100	1.7	2.9	144.67	246.79	391.46
3.	Disposal of excavated material	m^3	183,400	1.1	3.2	201.74	586.88	788.62
4.	Embankment for dike	m^3	1,100	3.1	9.2	3.41	10.12	13.53
5.	Masonry revetment	m^2	1,000	36.4	33.2	36.40	33.20	69.60
6.	Filling with excavated material	m^3	2,100	0.8	1.7	1.68	3.57	5.25
7.	Bridge	m^2	760	390.0	910.0	296.40	691.60	988.00
8.	Miscellaneous (10% of 1. To 7.)	L.S				74.45	172.28	246.73
	Total of I.					818.99	1,895.04	2,714.03
II.	Land Acquisition and House Evacuation							
1.	Land Acquisition	m^2	28,000	5.0	0.0	140.00	0.00	140.00
2.	House Evacuation and Compensation	no.	90	2,400.0	0.0	216.00	0.00	216.00
	Total of II.					356.00	0.00	356.00
III.	Administration Cost	L.S				81.42	0.00	81.42
IV.	Engineering Service	L.S				122.85	284.26	407.10
V.	Physical Contingency	L.S				81.90	189.50	271.40
	Grand Total					1,461.16	2,368.80	3,829.96

Table D5-9 Cost of Sub-component 4: Improvement of Meanchey Drainage Main, Middle Stretch

(1.285km long)

No.	Items	Unit	Q'ty	Unit Price (US$)		Amount (US$1,000)		
				L.C	F.C	L.C	F.C	Total
I.	**Construction Cost**							
1.	Excavation	m^3	13,200	0.6	1.5	7.92	19.80	27.72
2.	Disposal of excavated material	m^3	13,200	1.1	3.2	14.52	42.24	56.76
3.	Masonry revetment	m^2	120	36.4	33.2	4.37	3.98	8.35
4.	Bridge	m^2	70	390.0	910.0	27.30	63.70	91.00
5.	Miscellaneous (10% of 1. To 4.)	L.S				5.41	12.97	18.38
	Total of I.					59.52	142.70	202.22
II.	**Land Acquisition and House Evacuation**							
1.	Land Acquisition	m^2	0	5.0	0.0	0.00	0.00	0.00
2.	House Evacuation and Compensation	no.	120	2,400.0	0.0	288.00	0.00	288.00
	Total of II.					288.00	0.00	288.00
III.	**Administration Cost**	L.S				6.07	0.00	6.07
IV.	**Engineering Service**	L.S				8.93	21.40	30.33
V.	**Physical Contingency**	L.S				5.95	14.27	20.22
	Grand Total					368.46	178.37	546.84

Table D5-10 Cost of Sub-component 5: Improvement of Meanchey Drainage Main, Upstream Stretch

(0.535km long)

No.	Items	Unit	Q'ty	Unit Price (US$)		Amount (US$1,000)		
				L.C	F.C	L.C	F.C	Total
I.	**Construction Cost**							
1.	Excavation	m^3	8,000	0.6	1.5	4.80	12.00	16.80
2.	Disposal of excavated material	m^3	4,300	1.1	3.2	4.73	13.76	18.49
3.	Filling with excavated material	m^3	3,700	0.8	1.7	2.96	6.29	9.25
4.	Masonry revetment	m^2	3,300	36.4	33.2	120.12	109.56	229.68
5.	Concrete for culverts	m^3	130	71.7	56.7	9.32	7.37	16.69
6.	Reinforcing bars for culverts	ton	10	471.8	541.8	4.72	5.42	10.14
7.	Form for culverts	m^2	370	16.5	3.8	6.11	1.41	7.51
8.	Miscellaneous (10% of 1. To 7.)	L.S				15.28	15.58	30.86
	Total of I.					168.03	171.39	339.41
II.	**Land Acquisition and House Evacuation**							
1.	Land Acquisition	m^2	0	5.0	0.0	0.00	0.00	0.00
2.	House Evacuation and Compensation	no.	10	2,400.0	0.0	24.00	0.00	24.00
	Total of II.					24.00	0.00	24.00
III.	**Administration Cost**	L.S				10.18	0.00	10.18
IV.	**Engineering Service**	L.S				25.20	25.71	50.91
V.	**Physical Contingency**	L.S				16.80	17.14	33.94
	Grand Total					244.22	214.23	458.45

Table D5-11 Cost of Sub-component 6: Construction of Tum Nup Toek Drainage Sluiceway

(Q=10m³/sec, 3.0m wide x 3.6m high x 61m long x 1 lane)

No.	Items	Unit	Q'ty	Unit Price (US$)		Amount (US$1,000)		
				L.C	F.C	L.C	F.C	Total
I.	**Construction Cost**							
1.	Open excavation	m^3	10,800	0.4	1.1	4.32	11.88	16.20
2.	Temporary sheet piling for shoring	m^2	270	4.9	13.8	1.32	3.73	5.05
3.	Disposal of excavated material	m^3	6,500	1.1	3.2	7.15	20.80	27.95
4.	Filling with excavated material	m^3	4,300	0.8	1.7	3.44	7.31	10.75
5.	Backfilling under road	m^3	1,000	4.2	10.4	4.20	10.40	14.60
6.	Piling 305x305mm square, L=10m	no.	60	228.6	449.1	13.72	26.95	40.66
7.	Steel sheet piling	m^2	130	33.6	95.2	4.37	12.38	16.74
8.	Concrete	m^3	690	71.7	56.7	49.47	39.12	88.60
9.	Form	m^2	1,500	16.5	3.8	24.75	5.70	30.45
10.	Reinforcing bars	ton	69	471.8	541.8	32.55	37.38	69.94
11.	Masonry revetment	m^2	1,400	36.4	33.2	50.96	46.48	97.44
12.	Sodding	m^2	280	3.6	0.3	1.01	0.08	1.09
13.	Reinstatement of road pavement	m^2	480	2.0	4.6	0.96	2.21	3.17
14.	Stoplogs	m^2	12	700.0	2,800.0	8.40	33.60	42.00
15.	Miscellaneous (10% of 1. To 13.)	L.S				19.82	22.44	42.26
	Total of I.					226.44	280.46	506.90
II.	**Land Acquisition and House Evacuation**							
1.	Land Acquisition	m^2	3,000	5.0	0.0	15.00	0.00	15.00
2.	House Evacuation and Compensation	no.	10	2,400.0	0.0	24.00	0.00	24.00
	Total of II.					39.00	0.00	39.00
III.	**Administration Cost**	L.S				15.21	0.00	15.21
IV.	**Engineering Service**	L.S				33.97	42.07	76.04
V.	**Physical Contingency**	L.S				22.64	28.05	50.69
	Grand Total					337.26	350.57	687.84

Table D5-12 Cost of Sub-component 7: Construction of Samdach Monireth Drainage Main, Downstream Stretch

(1.676km long)

No.	Items	Unit	Q'ty	Unit Price (US$)		Amount (US$1,000)		
				L.C	F.C	L.C	F.C	Total
I.	**Construction Cost**							
1.	Outlet Sluiceway							
(1)	Open excavation	m^3	10,900	0.4	1.1	4.36	11.99	16.35
(2)	Temporary sheet piling for shoring	m^2	240	4.9	13.8	1.18	3.31	4.49
(3)	Disposal of excavated material	m^3	8,500	1.1	3.2	9.35	27.20	36.55
(4)	Filling with excavated material	m^3	2,100	0.8	1.7	1.68	3.57	5.25
(5)	Backfilling under road	m^3	1,000	4.2	10.4	4.20	10.40	14.60
(6)	Piling 305x305mm square, L=10m	no.	120	228.6	449.1	27.43	53.89	81.32
(7)	Steel sheet piling	m^2	90	33.6	95.2	3.02	8.57	11.59
(8)	Concrete	m^3	3,150	71.7	56.7	225.86	178.61	404.46
(9)	Form	m^2	3,200	16.5	3.8	52.80	12.16	64.96
(10)	Reinforcing bars	ton	300	471.8	541.8	141.54	162.54	304.08
(11)	Masonry revetment	m^2	2,100	36.4	33.2	76.44	69.72	146.16
(12)	Sodding	m^2	1,300	3.6	0.3	4.68	0.39	5.07
(13)	Reinstatement of road pavement	m^2	500	2.0	4.6	1.00	2.30	3.30
(14)	Stoplogs	m^2	23	700.0	2,800.0	16.10	64.40	80.50
(15)	Miscellaneous (10% of (1) To (13))	L.S				55.35	54.46	109.82
	Total of 1.					624.99	663.51	1,288.50
2.	Drainage Culvert							
(1)	Excavation under existing road	m^3	135,000	0.7	1.5	94.50	202.50	297.00
(2)	Temporary sheet piling for shoring	m^2	35,700	4.9	13.8	174.93	492.66	667.59
(3)	Backfilling under road	m^3	37,200	4.2	10.4	156.24	386.88	543.12
(4)	Backfilling with excavated material	m^3	30,600	0.8	1.7	24.48	52.02	76.50
(5)	Disposal of excavated material	m^3	104,400	1.1	3.2	114.84	334.08	448.92
(6)	Reinstatement of road pavement	m^2	18,600	2.0	4.6	37.20	85.56	122.76
(7)	Concrete	m^3	30,500	71.7	56.7	2,186.85	1,729.35	3,916.20
(8)	Reinforcing bars	ton	3,050	471.8	541.8	1,438.99	1,652.49	3,091.48
(9)	Form	m^2	36,900	16.5	3.8	608.85	140.22	749.07
(10)	Piling 200x200mm square, L=3m	no.	1,490	113.8	191.8	169.56	285.78	455.34
(11)	Miscellaneous (10% of (1) To (10))	L.S				500.64	536.15	1,036.80
	Total of 2.					5,507.09	5,897.70	11,404.78
	Total of I.					6,132.08	6,561.21	12,693.28
II.	**Land Acquisition and House Evacuation**							
1.	Land Acquisition	m^2	2,400	5.0	0.0	12.00	0.00	12.00
2.	House Evacuation and Compensation	no.	30	2,400.0	0.0	72.00	0.00	72.00
	Total of II.					84.00	0.00	84.00
III.	**Administration Cost**	L.S				380.80	0.00	380.80
IV.	**Engineering Service**	L.S				919.81	984.18	1,903.99
V.	**Physical Contingency**	L.S				613.21	656.12	1,269.33
	Grand Total					8,129.89	8,201.51	16,331.40

Table D5-13 Cost of Sub-component 8: Construction of Samdach Monireth Drainage Main, Upstream Stretch

(0.714km long)

No.	Items	Unit	Q'ty	Unit Price (US$)		Amount (US$1,000)		
				L.C	F.C	L.C	F.C	Total
I.	**Construction Cost**							
1.	Excavation under existing road	m^3	43,600	0.7	1.5	30.52	65.40	95.92
2.	Temporary sheet piling for shoring	m^2	17,200	4.9	13.8	84.28	237.36	321.64
3.	Backfilling under road	m^3	12,200	4.2	10.4	51.24	126.88	178.12
4.	Backfilling with excavated material	m^3	15,300	0.8	1.7	12.24	26.01	38.25
5.	Disposal of excavated material	m^3	28,300	1.1	3.2	31.13	90.56	121.69
6.	Reinstatement of road pavement	m^2	6,100	2.0	4.6	12.20	28.06	40.26
7.	Concrete	m^3	6,200	71.7	56.7	444.54	351.54	796.08
8.	Reinforcing bars	ton	560	471.8	541.8	264.21	303.41	567.62
9.	Form	m^2	14,600	16.5	3.8	240.90	55.48	296.38
10.	Piling 200x200mm square, L=3m	no.	480	113.8	191.8	54.62	92.06	146.69
11.	Miscellaneous (10% of 1. To 10.)	L.S				122.59	137.68	260.26
	Total of I.					1,348.47	1,514.44	2,862.91
II.	**Land Acquisition and House Evacuation**							
1.	Land Acquisition	m^2	0	5.0	0.0	0.00	0.00	0.00
2.	House Evacuation and Compensation	no.	0	2,400.0	0.0	0.00	0.00	0.00
	Total of II.					0.00	0.00	0.00
III.	**Administration Cost**	L.S				85.89	0.00	85.89
IV.	**Engineering Service**	L.S				202.27	227.17	429.44
V.	**Physical Contingency**	L.S				134.85	151.44	286.29
	Grand Total					1,771.48	1,893.05	3,664.52

Table D5-14 Cost of Sub-component 9: Construction of Jawaharlal Nehru Drainage Main

(1.152km long)

No.	Items	Unit	Q'ty	Unit Price (US$)		Amount (US$1,000)		
				L.C	F.C	L.C	F.C	Total
I.	**Construction Cost**							
1.	Excavation under existing road	m^3	41,600	0.7	1.5	29.12	62.40	91.52
2.	Temporary sheet piling for shoring	m^2	20,800	4.9	13.8	101.92	287.04	388.96
3.	Backfilling under road	m^3	13,200	4.2	10.4	55.44	137.28	192.72
4.	Backfilling with excavated material	m^3	13,400	0.8	1.7	10.72	22.78	33.50
5.	Disposal of excavated material	m^3	28,200	1.1	3.2	31.02	90.24	121.26
6.	Reinstatement of road pavement	m^2	7,700	2.0	4.6	15.40	35.42	50.82
7.	Concrete	m^3	6,500	71.7	56.7	466.05	368.55	834.60
8.	Reinforcing bars	ton	590	471.8	541.8	278.36	319.66	598.02
9.	Form	m^2	19,200	16.5	3.8	316.80	72.96	389.76
10.	Piling 200x200mm square, L=3m	no.	770	113.8	191.8	87.63	147.69	235.31
11.	Miscellaneous (10% of 1. To 10.)	L.S				139.25	154.40	293.65
	Total of I.					1,531.70	1,698.42	3,230.12
II.	**Land Acquisition and House Evacuation**							
1.	Land Acquisition	m^2	0	5.0	0.0	0.00	0.00	0.00
2.	House Evacuation and Compensation	no.	0	2,400.0	0.0	0.00	0.00	0.00
	Total of II.					0.00	0.00	0.00
III.	**Administration Cost**	L.S				96.90	0.00	96.90
IV.	**Engineering Service**	L.S				229.76	254.76	484.52
V.	**Physical Contingency**	L.S				153.17	169.84	323.01
	Grand Total					2,011.53	2,123.02	4,134.56

Table D5-15 Cost of Sub-component 10: Improvement of Salang Drainage Main, Downstream Stretch

(0.887km long)

No.	Items	Unit	Q'ty	Unit Price (US$)		Amount (US$1,000)		
				L.C	F.C	L.C	F.C	Total
I.	Construction Cost							
1.	Outlet Sluiceway							
(1)	Demolishing of existing culvert	m^3	250	25.0	40.0	6.25	10.00	16.25
(2)	Open excavation	m^3	9,300	0.4	1.1	3.72	10.23	13.95
(3)	Temporary sheet piling for shoring	m^2	180	4.9	13.8	0.88	2.48	3.37
(4)	Disposal of excavated material	m^3	6,800	1.1	3.2	7.48	21.76	29.24
(5)	Filling with excavated material	m^3	2,500	0.8	1.7	2.00	4.25	6.25
(6)	Backfilling under road	m^3	2,800	4.2	10.4	11.76	29.12	40.88
(7)	Piling 305x305mm square, L=10m	no.	50	228.6	449.1	11.43	22.46	33.89
(8)	Steel sheet piling	m^2	230	33.6	95.2	7.73	21.90	29.62
(9)	Concrete	m^3	620	71.7	56.7	44.45	35.15	79.61
(10)	Form	m^2	1,400	16.5	3.8	23.10	5.32	28.42
(11)	Reinforcing bars	ton	62	471.8	541.8	29.25	33.59	62.84
(12)	Masonry revetment	m^2	2,400	36.4	33.2	87.36	79.68	167.04
(13)	Sodding	m^2	320	3.6	0.3	1.15	0.10	1.25
(14)	Reinstatement of road pavement	m^2	1,400	2.0	4.6	2.80	6.44	9.24
(15)	Stoplogs	m^2	30	700.0	2,800.0	21.00	84.00	105.00
(16)	Miscellaneous (10% of (1) To (14))	L.S				23.94	28.25	52.18
	Total of 1.					284.30	394.72	679.03
2.	Open Channel (L=0.870km)							
(1)	Excavation	m^3	11,300	0.6	1.5	6.78	16.95	23.73
(2)	Disposal of excavated material	m^3	11,300	1.1	3.2	12.43	36.16	48.59
(3)	Bridge	m^2	75	390.0	910.0	29.25	68.25	97.50
(4)	Miscellaneous (10% of (1) To (3))	L.S				4.85	12.14	16.98
	Total of 2.					53.31	133.50	186.80
	Total of I.					337.61	528.22	865.83
II.	Land Acquisition and House Evacuation							
1.	Land Acquisition	m^2	0	5.0	0.0	0.00	0.00	0.00
2.	House Evacuation and Compensation	no.	60	2,400.0	0.0	144.00	0.00	144.00
	Total of II.					144.00	0.00	144.00
III.	Administration Cost	L.S				25.97	0.00	25.97
IV.	Engineering Service	L.S				50.64	79.23	129.87
V.	Physical Contingency	L.S				33.76	52.82	86.58
	Grand Total					591.99	660.28	1,252.26

Table D5-16 Cost of Sub-component 11: Improvement of Salang Drainage Main, Upstream Stretch

(0.488km long)

No.	Items	Unit	Q'ty	Unit Price (US$)		Amount (US$1,000)		
				L.C	F.C	L.C	F.C	Total
I.	**Construction Cost**							
1.	Excavation	m^3	9,200	0.6	1.5	5.52	13.80	19.32
2.	Filling with excavated material	m^3	1,300	0.8	1.7	1.04	2.21	3.25
3.	Disposal of excavated material	m^3	7,900	1.1	3.2	8.69	25.28	33.97
4.	Masonry revetment	m^2	3,300	36.4	33.2	120.12	109.56	229.68
5.	Concrete for culverts	m^3	60	71.7	56.7	4.30	3.40	7.70
6.	Reinforcing bars for culverts	ton	5	471.8	541.8	2.36	2.71	5.07
7.	Form for culverts	m^2	180	16.5	3.8	2.97	0.68	3.65
8.	Miscellaneous (10% of 1. To 7.)	L.S				14.50	15.76	30.26
	Total of I.					159.50	173.41	332.91
II.	**Land Acquisition and House Evacuation**							
1.	Land Acquisition	m^2	0	5.0	0.0	0.00	0.00	0.00
2.	House Evacuation and Compensation	no.	90	2,400.0	0.0	216.00	0.00	216.00
	Total of II.					216.00	0.00	216.00
III.	**Administration Cost**	L.S				9.99	0.00	9.99
IV.	**Engineering Service**	L.S				23.93	26.01	49.94
V.	**Physical Contingency**	L.S				15.95	17.34	33.29
	Grand Total					425.36	216.76	642.13

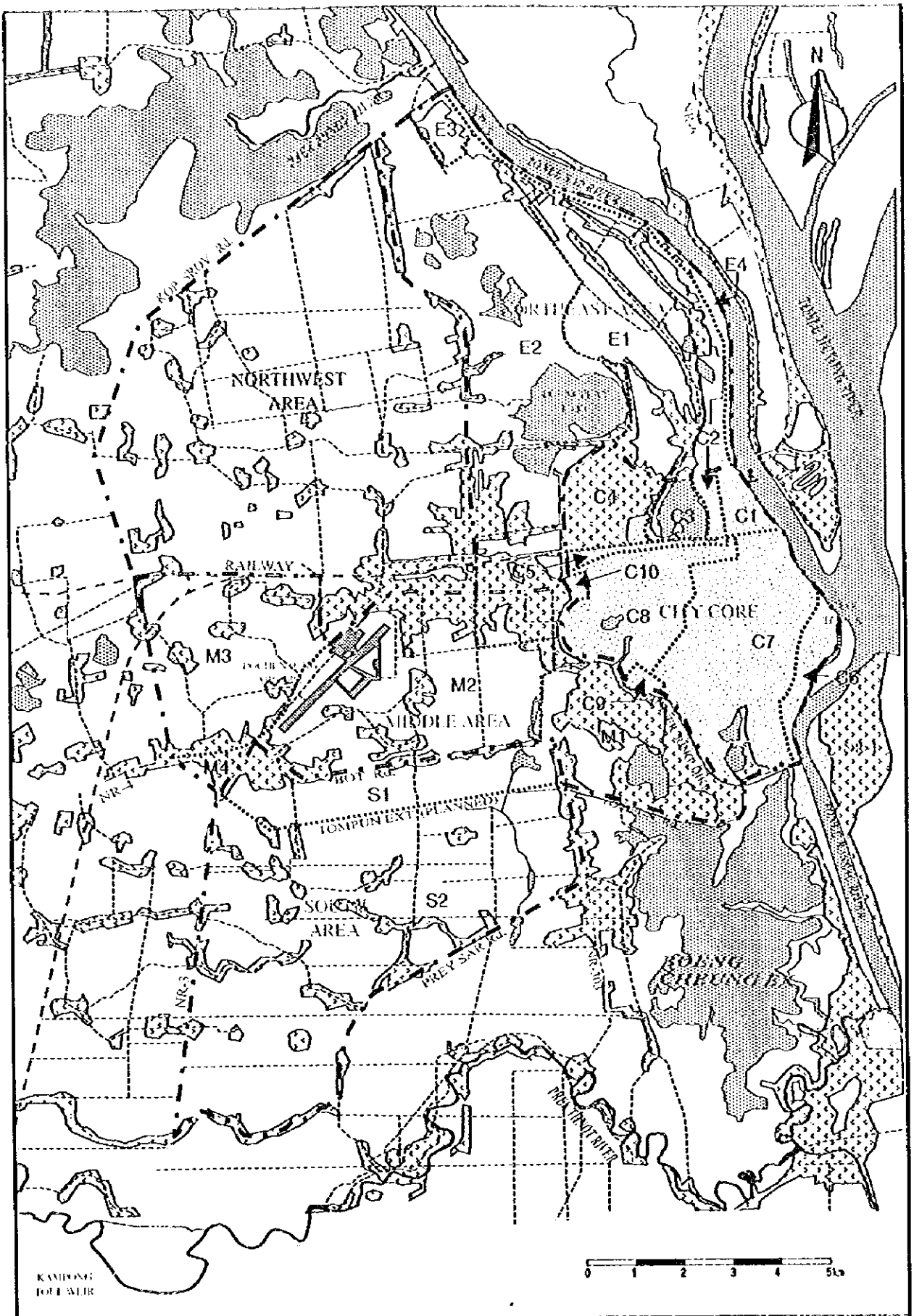
Table D5-17 Cost of Sub-component 12: Conservation of North Lake of Boeng Salang

(5.1ha)

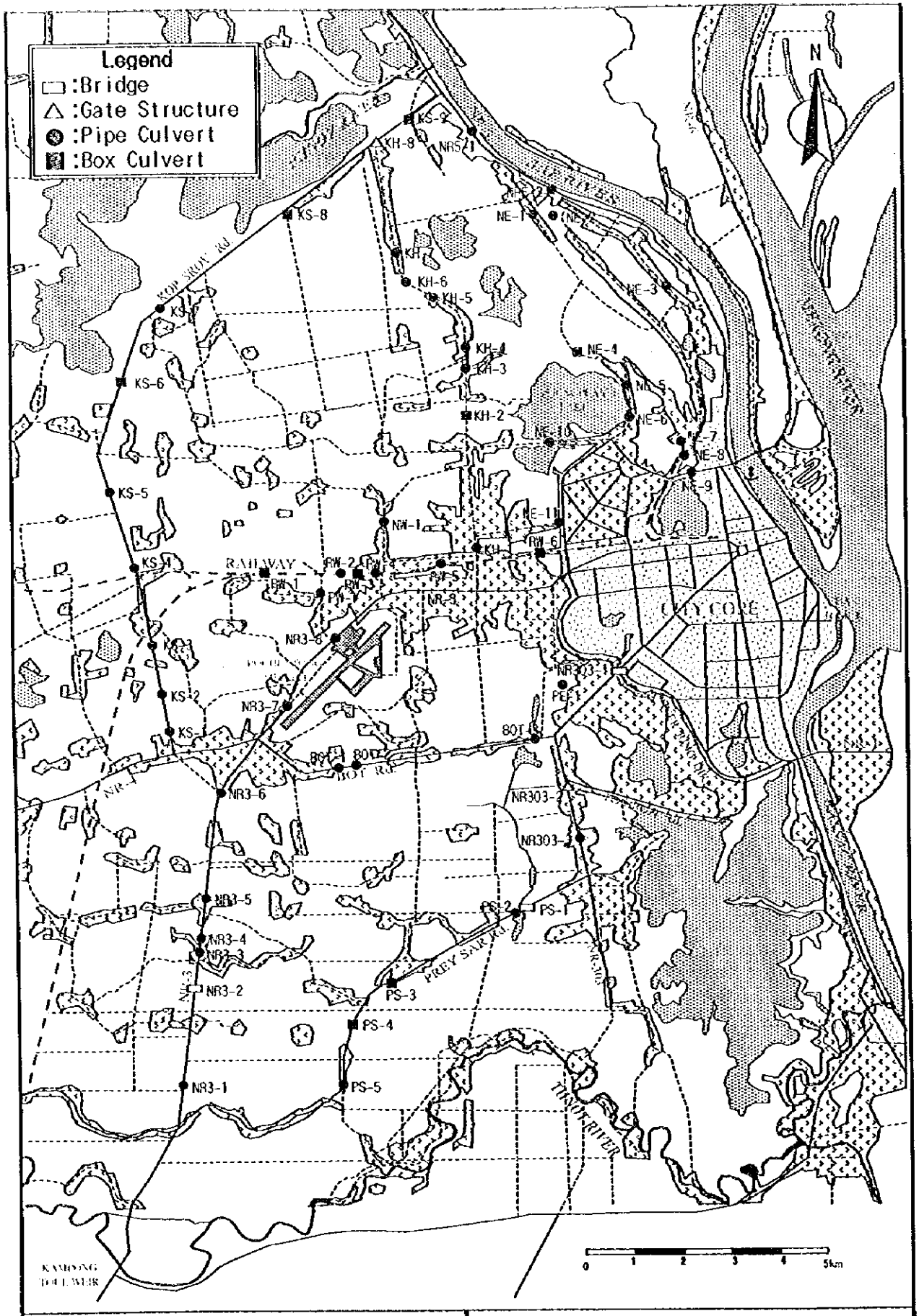
No.	Items	Unit	Q'ty	Unit Price (US$)		Amount (US$1,000)		
				L.C	F.C	L.C	F.C	Total
I.	**Construction Cost**							
1.	Lake excavation	m^3	51,000	0.7	1.8	35.70	91.80	127.50
2.	Disposal of excavated material	m^3	51,000	1.1	3.2	56.10	163.20	219.30
3.	Concrete for weir	m^3	500	71.7	56.7	35.85	28.35	64.20
4.	Form for weir	m^2	510	16.5	3.8	8.42	1.94	10.35
5.	Masonry revetment	m^2	400	36.4	33.2	14.56	13.28	27.84
6.	Piling 305x305mm square, L=10m	no.	50	228.6	449.1	11.43	22.46	33.89
7.	Miscellaneous (10% of 1. To 6.)	L.S				16.21	32.10	48.31
	Total of I.					178.26	353.13	531.39
II.	**Land Acquisition and House Evacuation**							
1.	Land Acquisition	m^2	0	5.0	0.0	0.00	0.00	0.00
2.	House Evacuation and Compensation	no.	0	2,400.0	0.0	0.00	0.00	0.00
	Total of II.					0.00	0.00	0.00
III.	**Administration Cost**	L.S				15.94	0.00	15.94
IV.	**Engineering Service**	L.S				26.74	52.97	79.71
V.	**Physical Contingency**	L.S				17.83	35.31	53.14
	Grand Total					238.77	441.41	680.17

Table D5-18 Cost of Sub-component 13: Preparration of Relocation Site/ Spoil Area

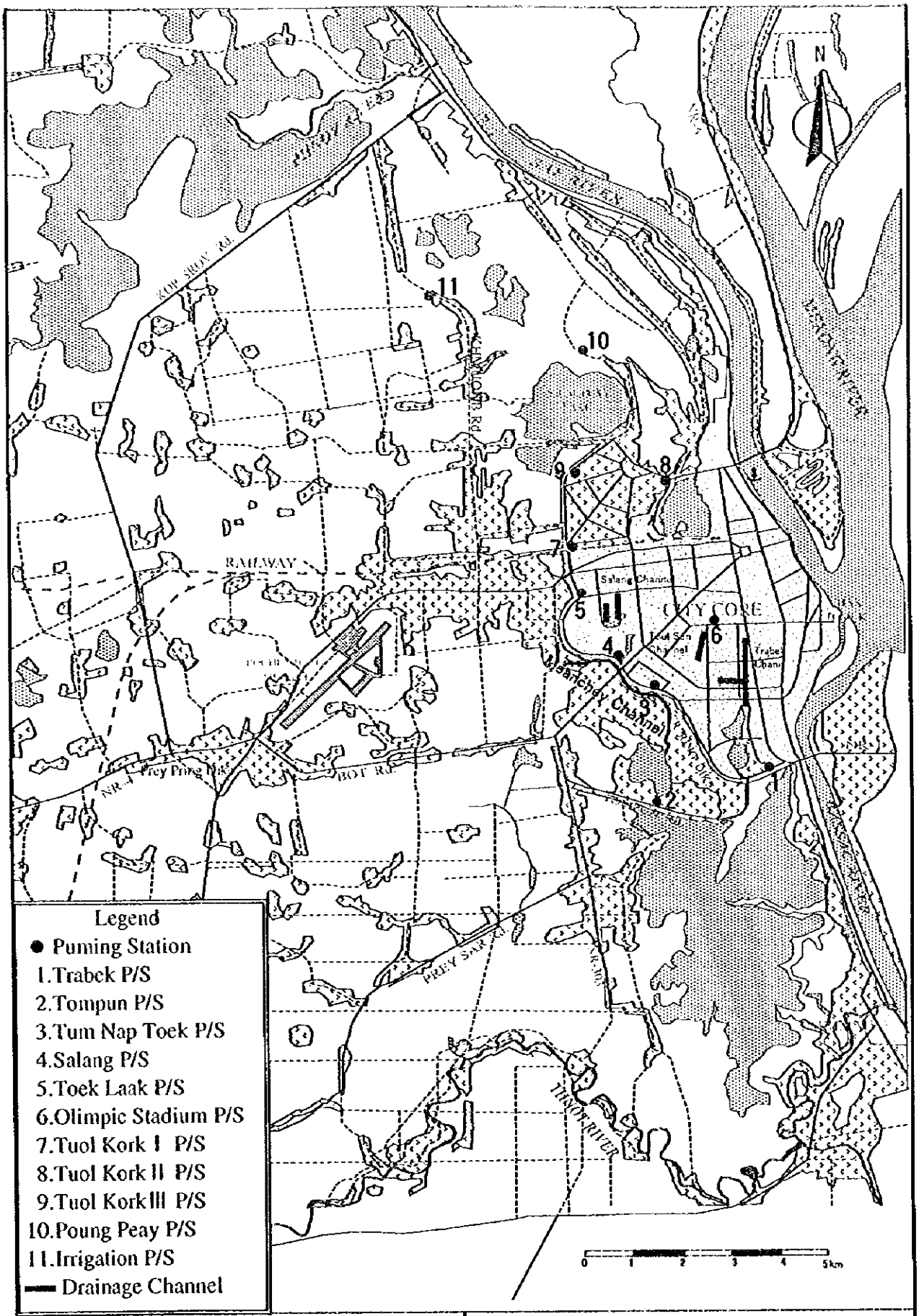
No.	Items	Unit	Q'ty	Unit Price (US$)		Amount (US$1,000)		
				L.C	F.C	L.C	F.C	Total
I.	**Construction Cost**							
1.	Construction of infrastructure for relocation site near Tompun Pumping Station	m^2	48,000	10.0	25.0	480.00	1,200.00	1,680.00
	Total of I.					480.00	1,200.00	1,680.00
II.	**Land Acquisition**							
1.	Land Acquisition for relocation site/spoil area near Tompun Pumping Stataion	m^2	260,000	5.0	0.0	1,300.00	0.00	1,300.00
2.	House Evacuation and Compensation	no.	20	2,400.0	0.0	48.00	0.00	48.00
	Total of II.					1,348.00	0.00	1,348.00
III.	**Administration Cost**	L.S				50.40	0.00	50.40
IV.	**Engineering Service**	L.S				72.00	180.00	252.00
V.	**Physical Contingency**	L.S				48.00	120.00	168.00
	Grand Total					1,998.40	1,500.00	3,498.40



The Study on Drainage Improvement and Flood Control in the Municipality of Phnom Penh JICA - CTIE International Co., Ltd. - Nippon Koei Co., Ltd.	Figure D2-1 Watersheds



The Study on Drainage Improvement and Flood Control in the Municipality of Phnom Penh JICA - CTIE International Co., Ltd. - Nippon Koei Co., Ltd.	Figure D2-2 Ring Dikes, Roads and Crossings



Legend

- ● Puming Station
- 1.Trabek P/S
- 2.Tompun P/S
- 3.Tum Nap Toek P/S
- 4.Salang P/S
- 5.Toek Laak P/S
- 6.Olimpic Stadium P/S
- 7.Tuol Kork I P/S
- 8.Tuol Kork II P/S
- 9.Tuol KorkIII P/S
- 10.Poung Peay P/S
- 11.Irrigation P/S
- ▬ Drainage Channel

The Study on Drainage Improvement and Flood Control in the Municipality of Phnom Penh
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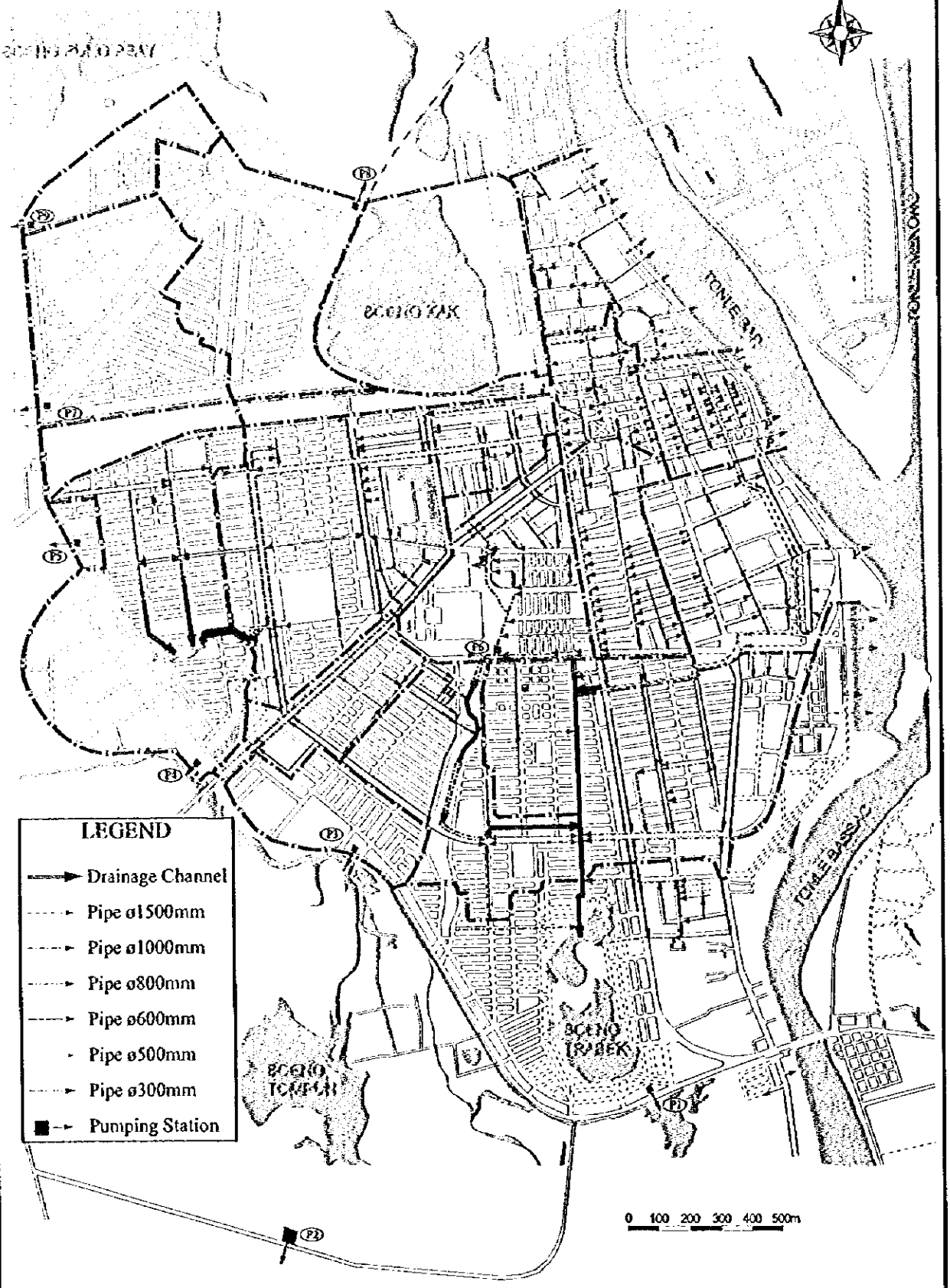
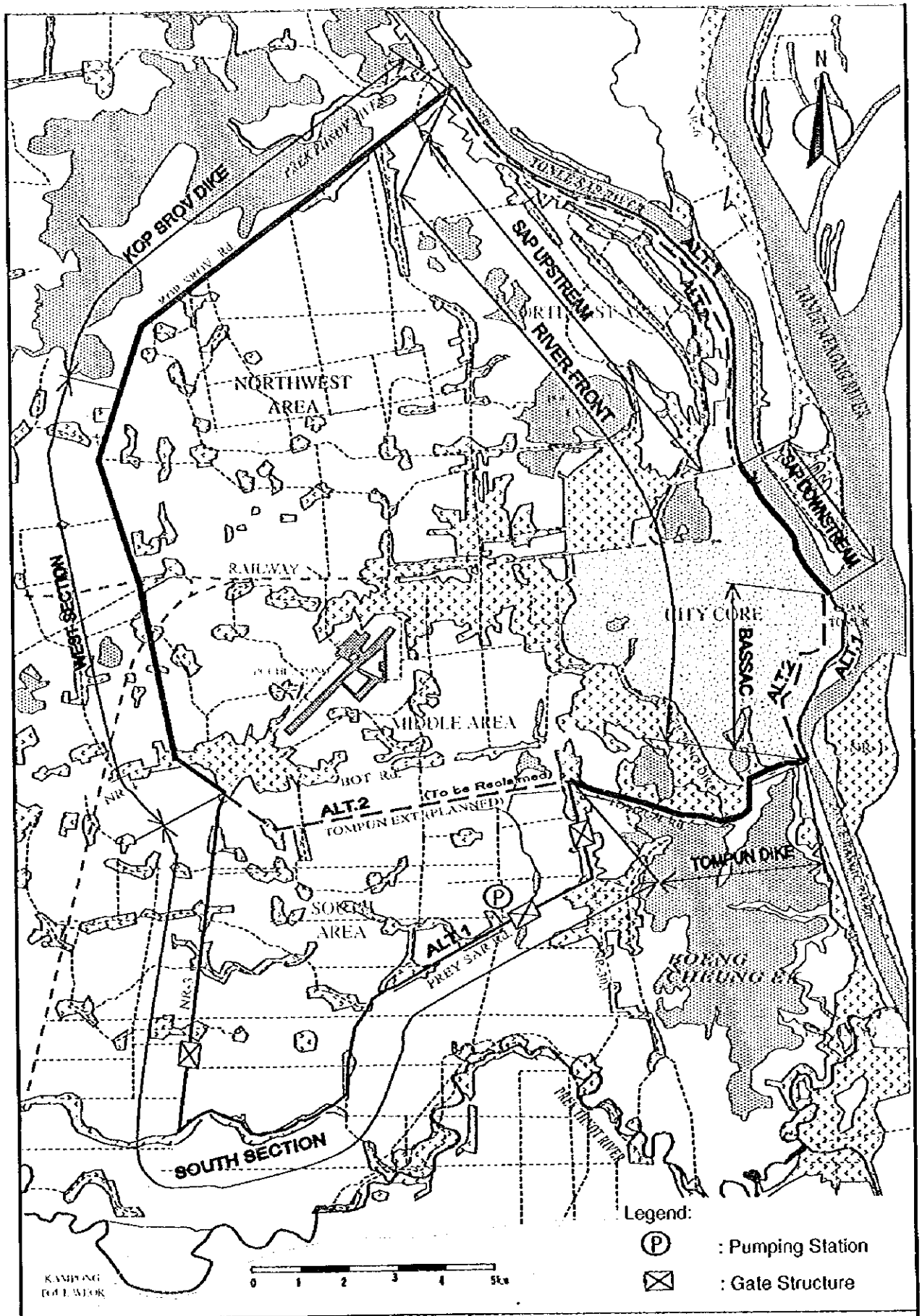
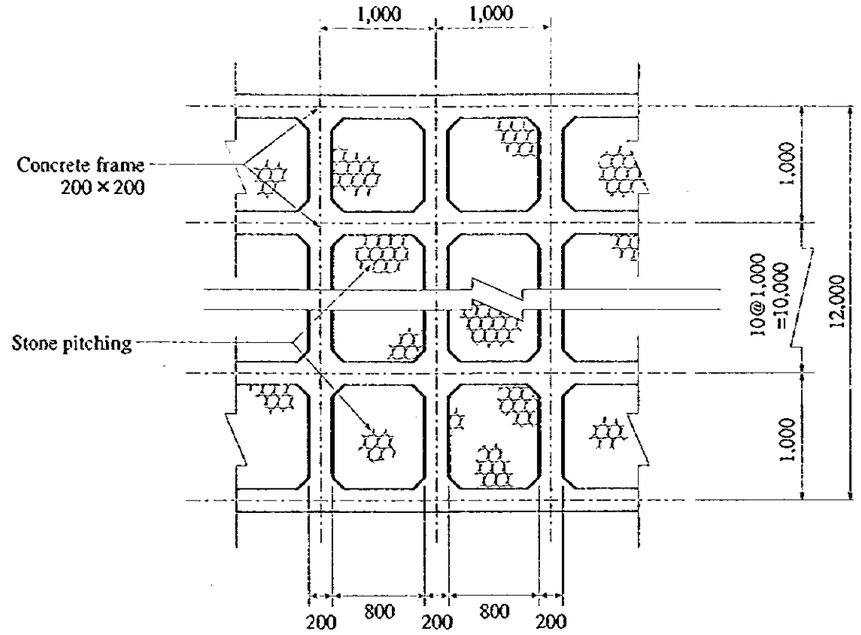
Figure D2-3
Pumping Stations and Drainage Channels



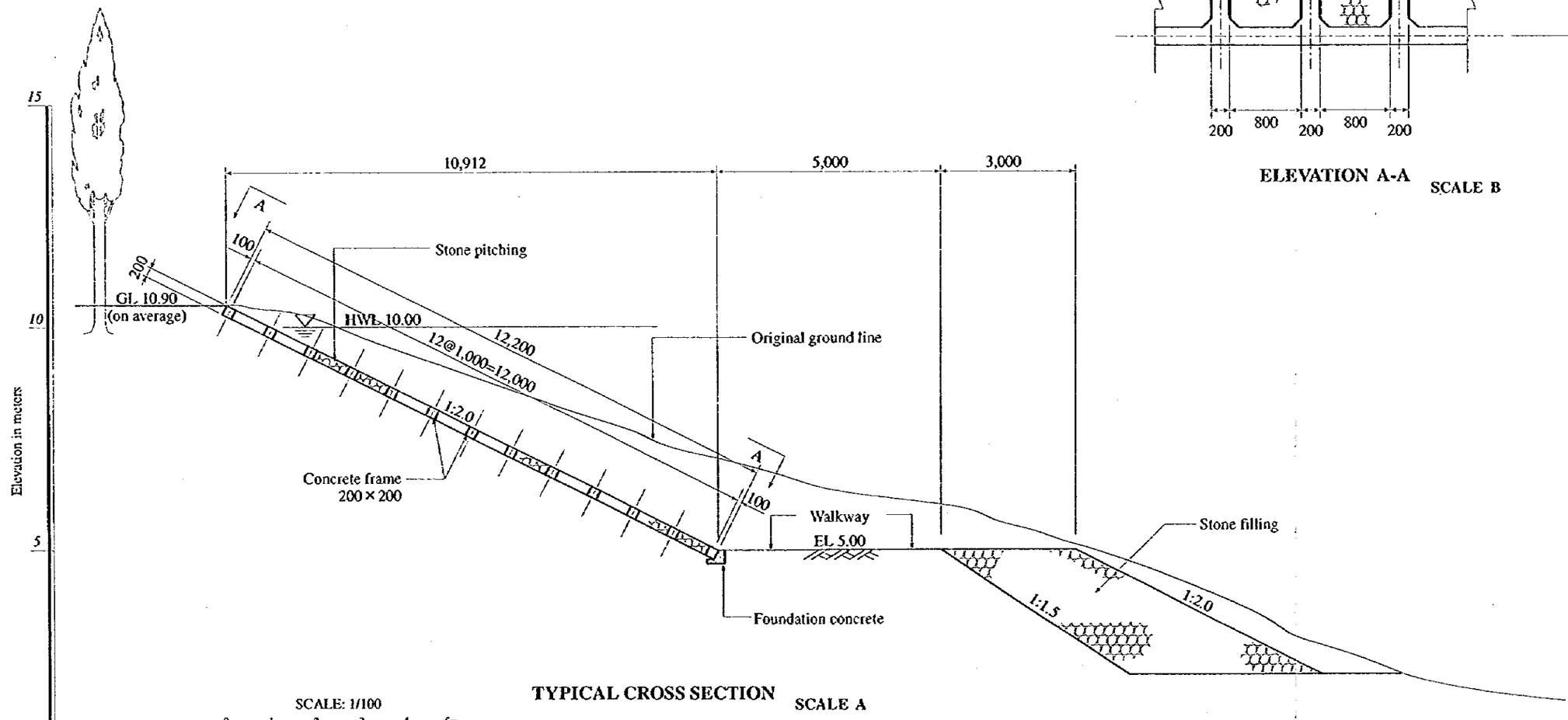
The Study on Drainage Improvement and Flood Control in the Municipality of Phnom Penh JICA - CTIE International Co., Ltd. - Nippon Koei Co., Ltd.	Figure D2-4 Existing Sewer Network



The Study on Drainage Improvement and Flood Control in the Municipality of Phnom Penh JICA - CTIE International Co., Ltd. - Nippon Koei Co., Ltd.	Figure D3-1 Protection Line against Flood



ELEVATION A-A SCALE B



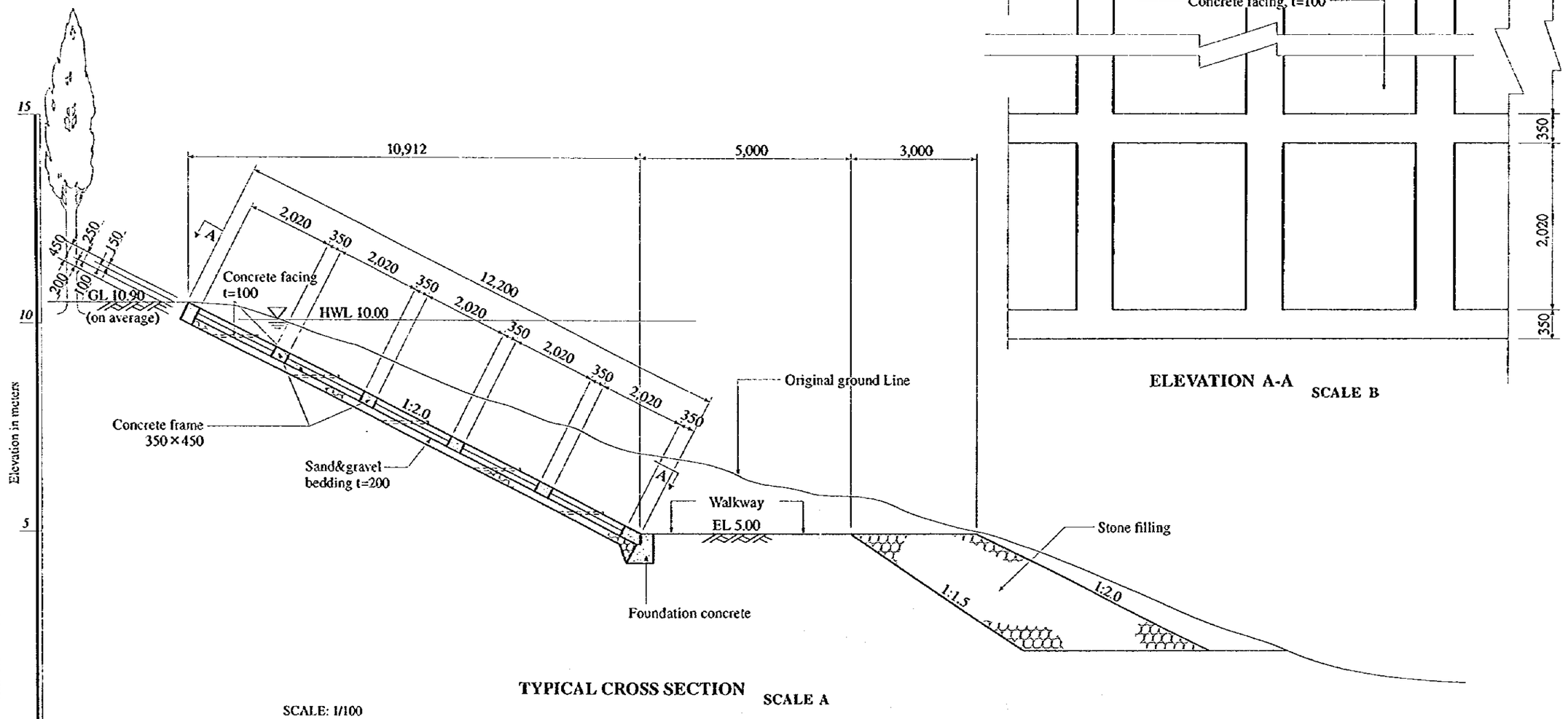
TYPICAL CROSS SECTION SCALE A

SCALE: 1/100
SCALE A 0 1 2 3 4 5m

SCALE: 1/50
SCALE B 0 0.5 1.0 1.5 2.0 2.5m

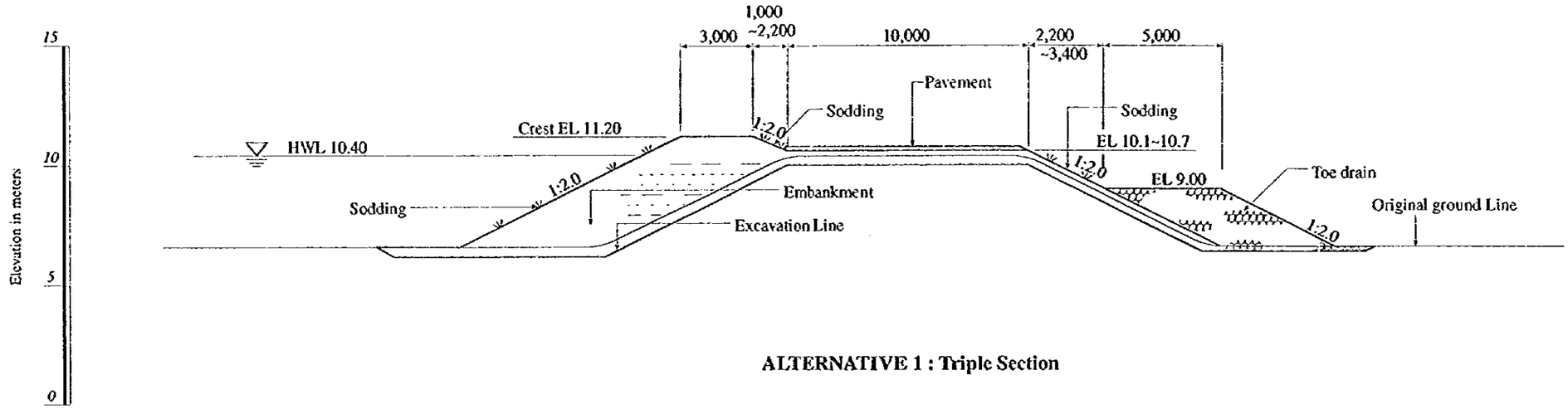
ALTERNATIVE 1 : STONE PITCHING TYPE

The Study on Drainage Improvement and Flood Control in the Municipality of Phnom Penh JICA - CTIE International Co., Ltd. - Nippon Koei Co., Ltd.	Figure. D3-2 Riverfront Protection in Sap Downstream Middle Section (1/2)

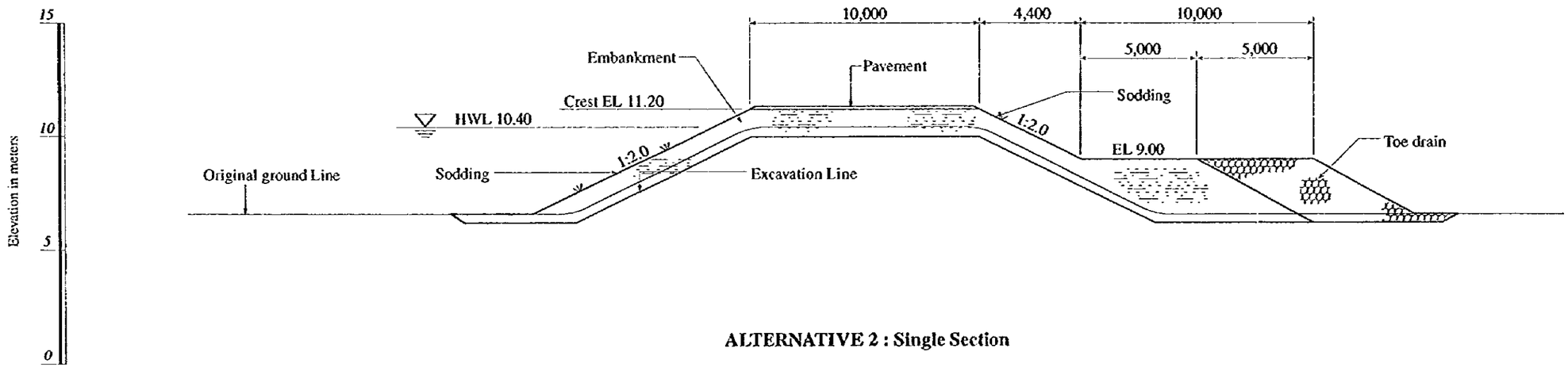


ALTERNATIVE 2 : CONCRETE FACING TYPE

The Study on Drainage Improvement and Flood Control in the Municipality of Phnom Penh JICA - CTIE International Co., Ltd. - Nippon Koei Co., Ltd.	Figure. D3-2 Riverfront Protection in Sap Downstream Middle Section (2/2)



ALTERNATIVE 1 : Triple Section

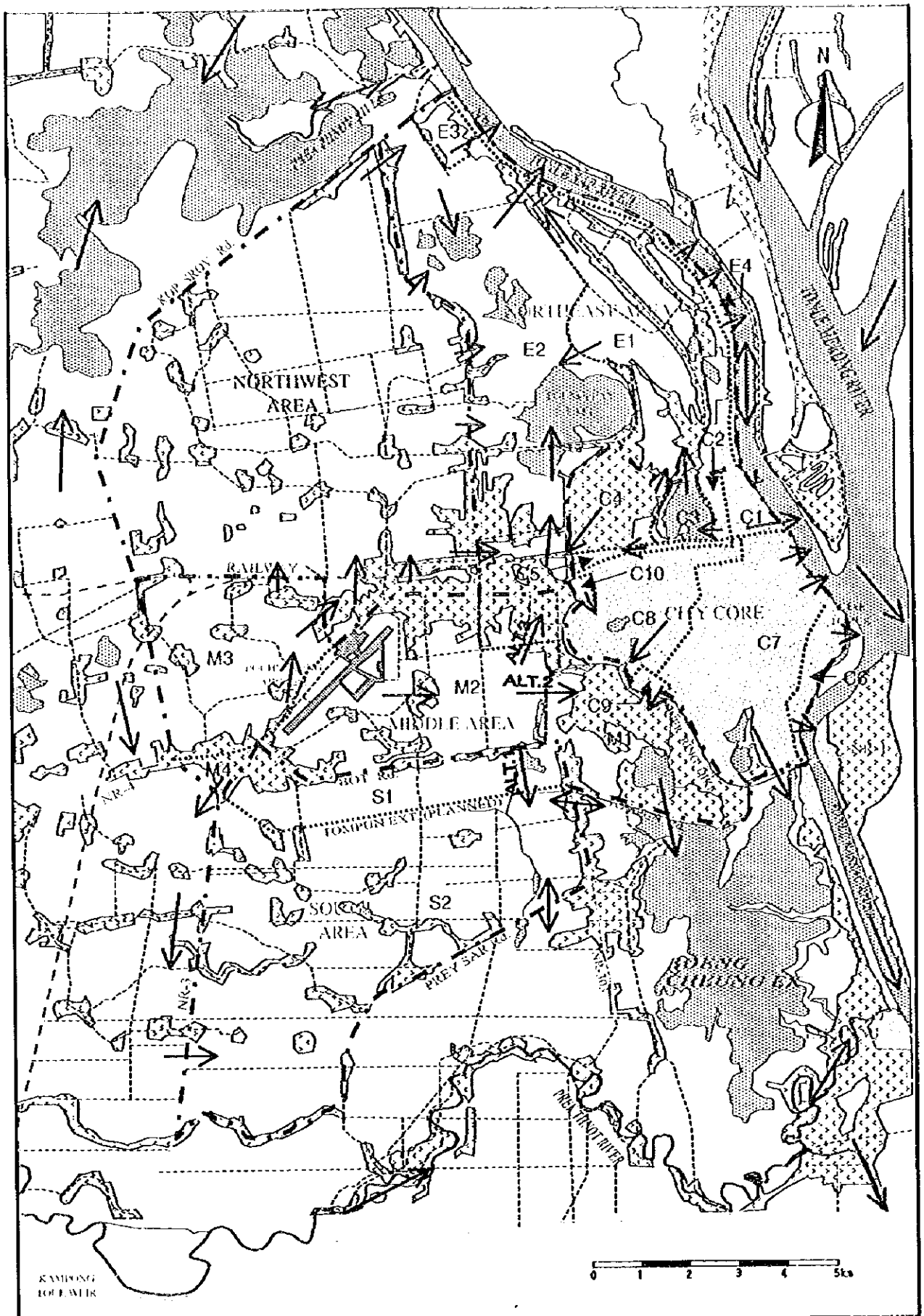


ALTERNATIVE 2 : Single Section

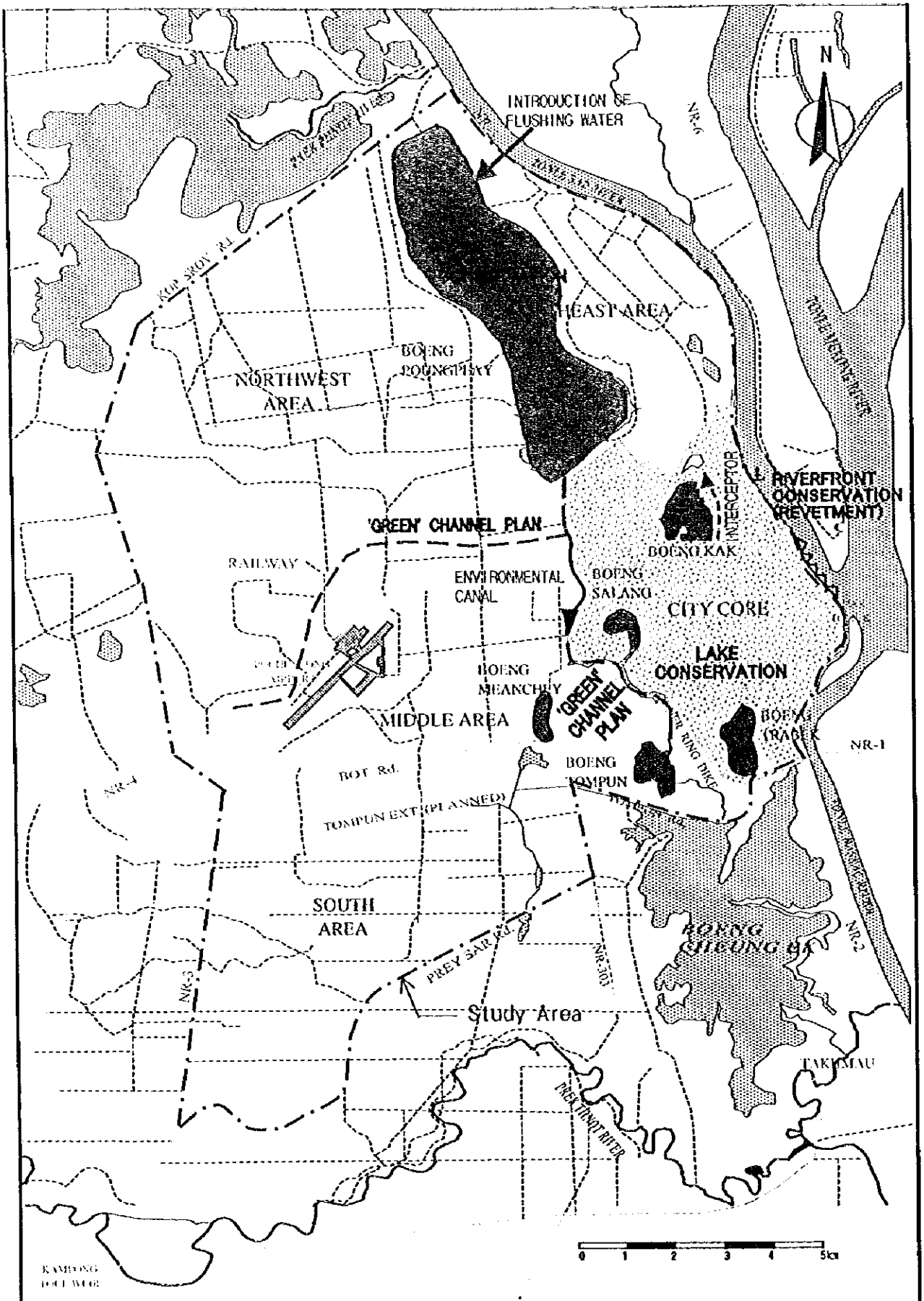
SCALE: 1/200

0 2 4 6 8 10m

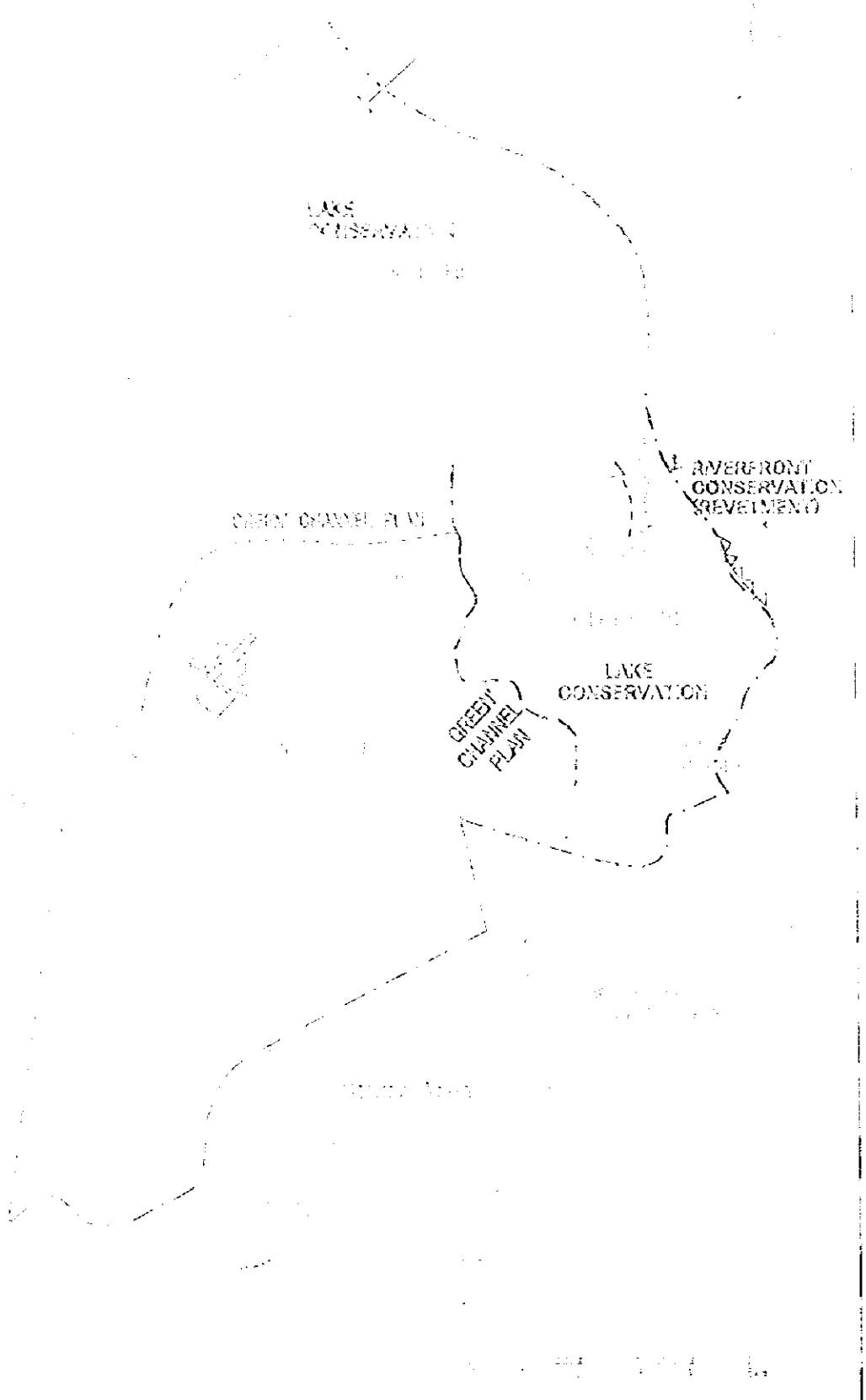
The Study on Drainage Improvement and Flood Control in the Municipality of Phnom Penh JICA - CTIE International Co., Ltd. - Nippon Koei Co., Ltd.	Figure. D3-3 Reinforcement of Kop Srov Dike

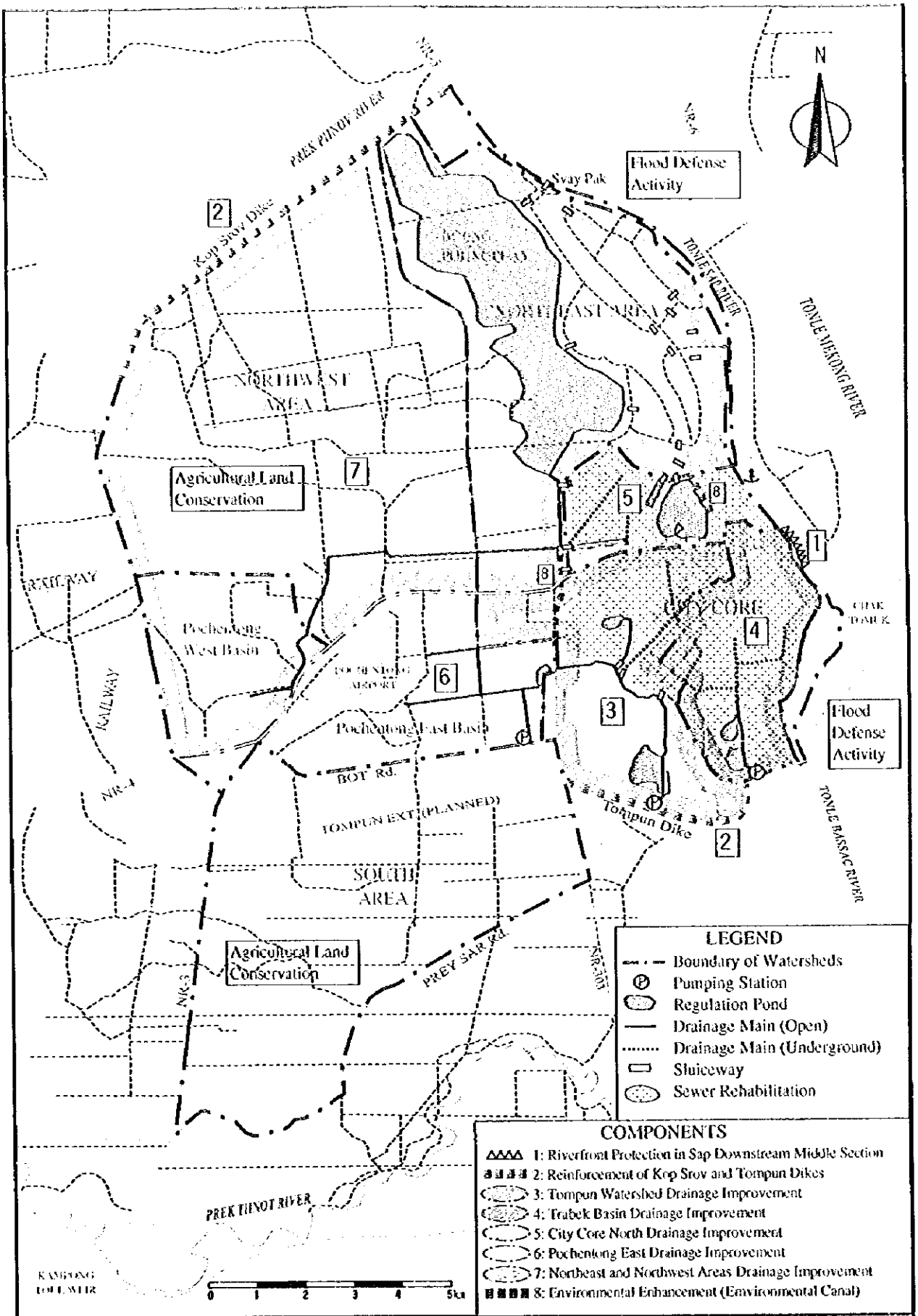


The Study on Drainage Improvement and Flood Control in the Municipality of Phnom Penh JICA - CTIE International Co., Ltd. - Nippon Koei Co., Ltd.	Figure D3-4 Drainage Direction of Each Basin



The Study on Drainage Improvement and Flood Control in the Municipality of Phnom Penh JICA - CTIE International Co., Ltd. - Nippon Koei Co., Ltd.	Figure D3-5 Environmental Enhancement


RIVER FRONT
CONSERVATION
REVETMENT
LAKE
CONSERVATION
GREEN
CHANNEL
PLAN



The Study on Drainage Improvement and Flood Control in the Municipality of Phnom Penh
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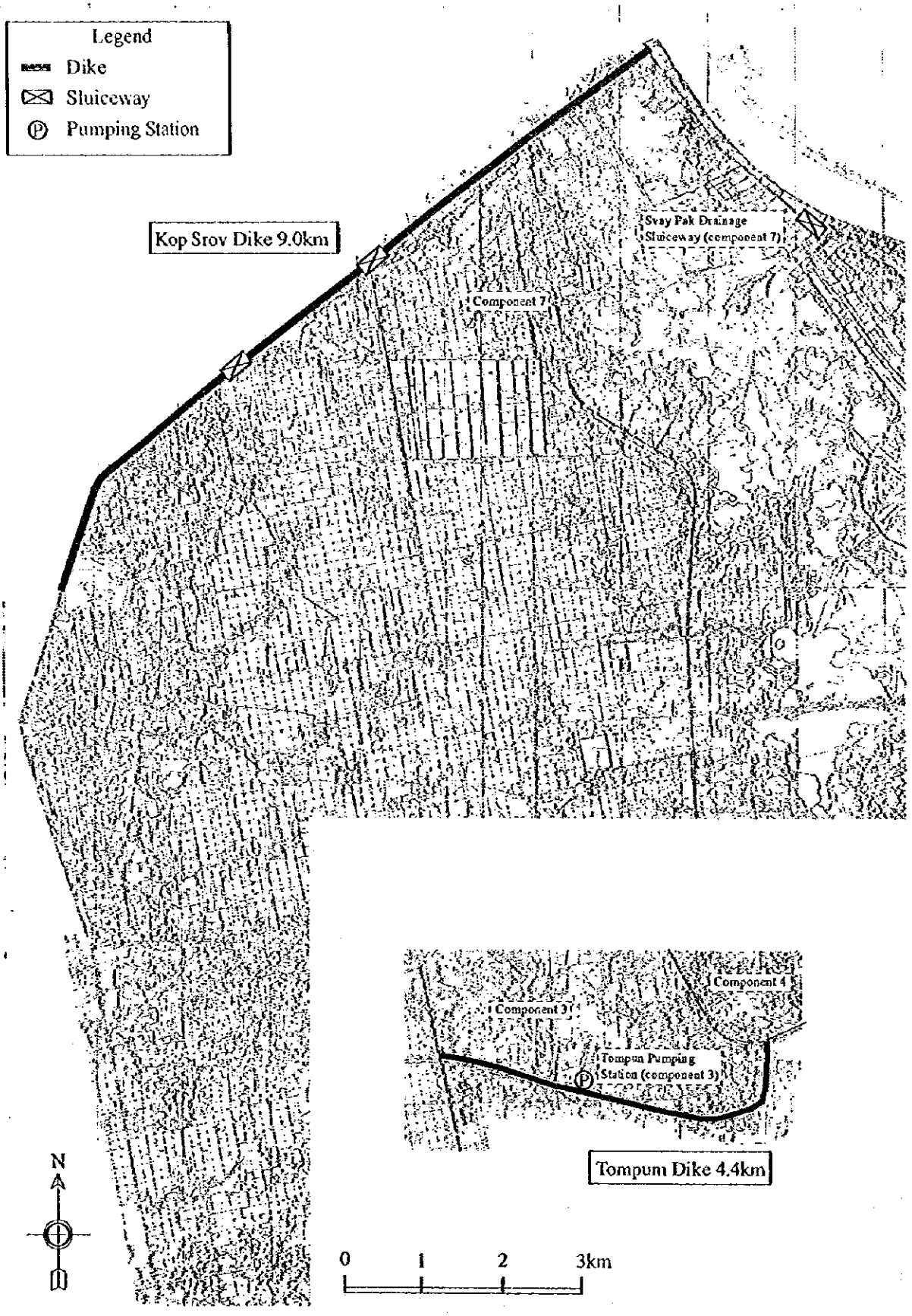
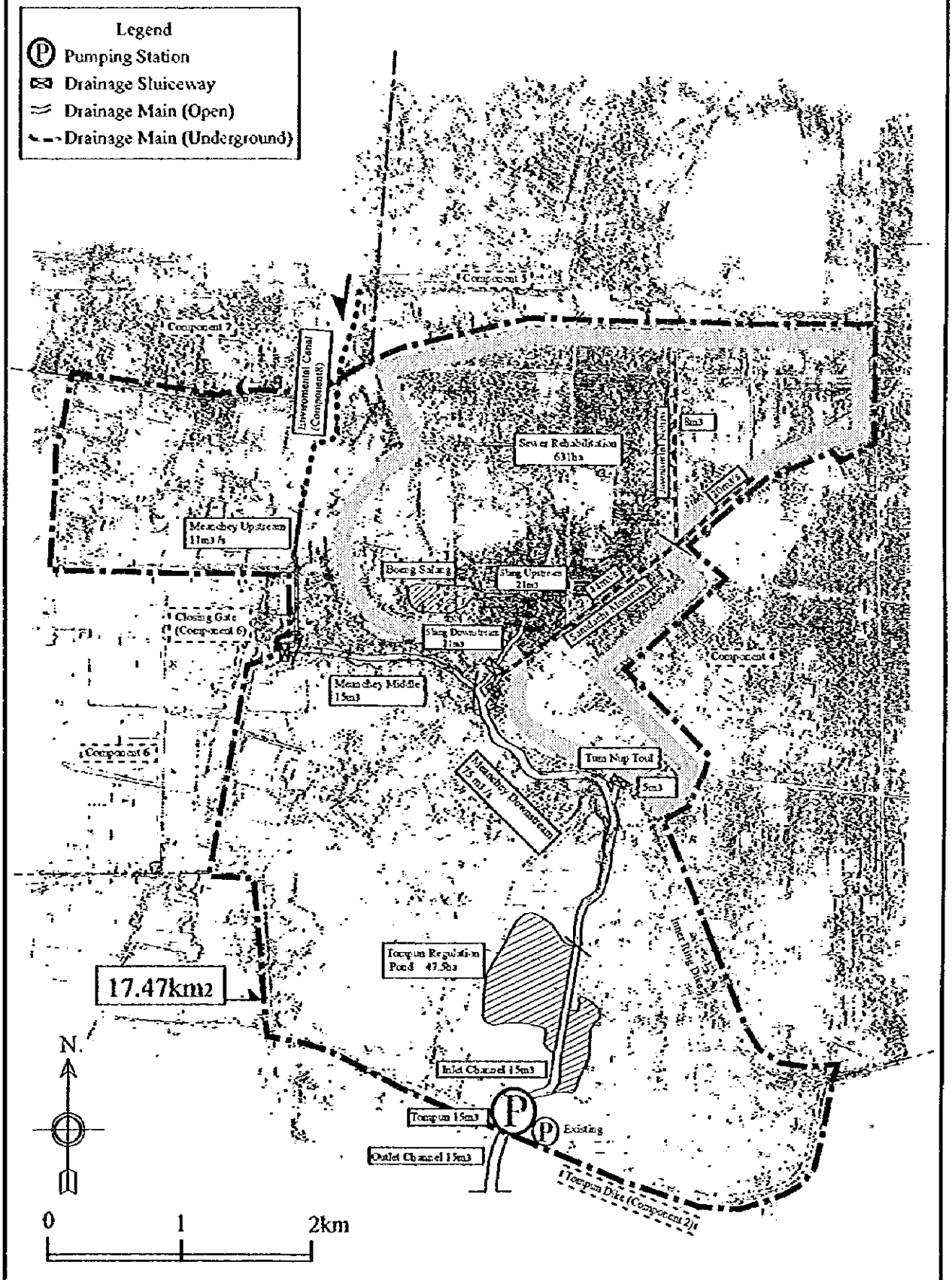
Figure D3-6
The Master Plan

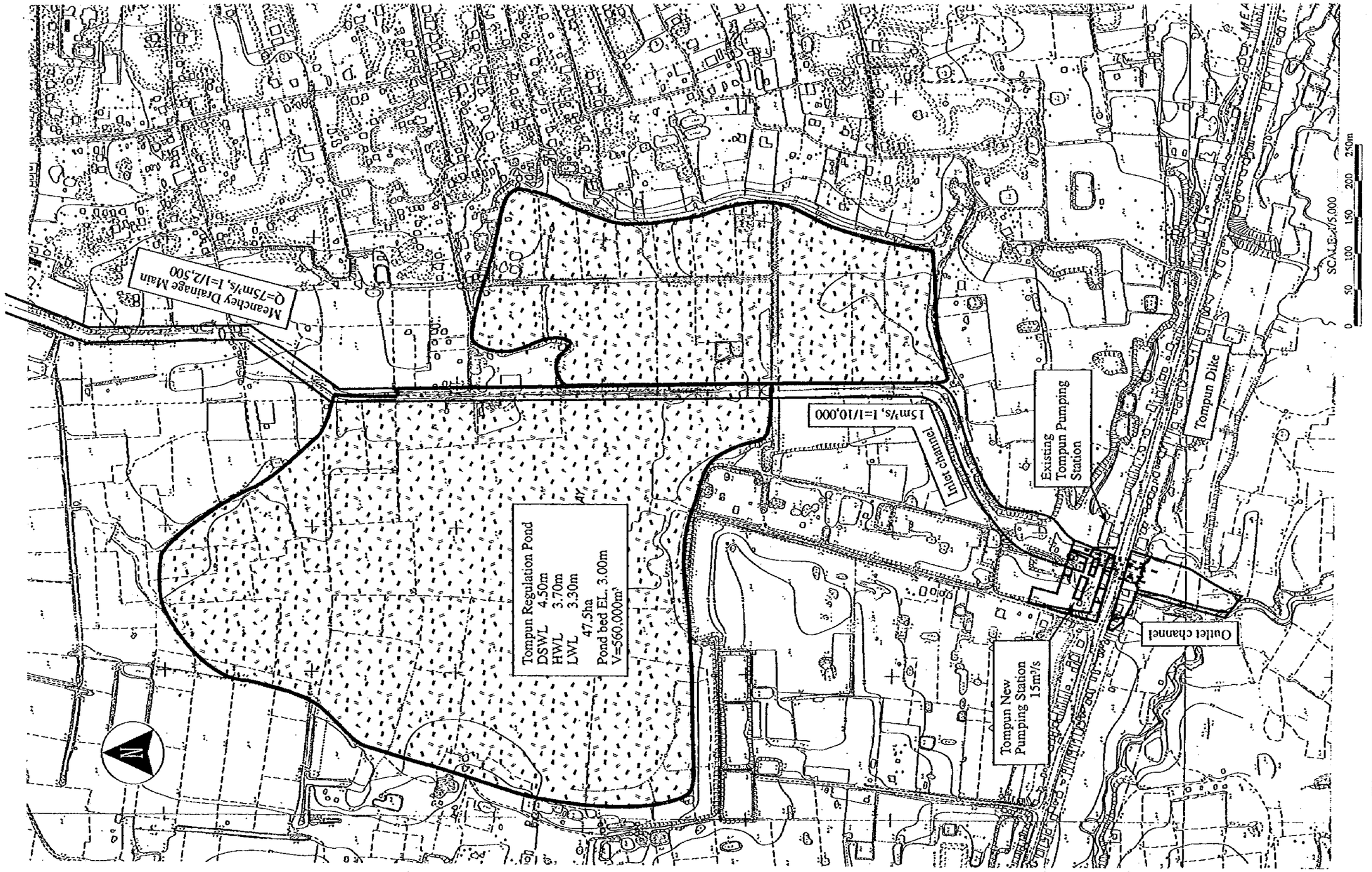


The Study on Drainage Improvement and Flood Control in the Municipality of Phnom Penh JICA - CTIE International Co., Ltd. - Nippon Koei Co., Ltd.	Figure D3-7 Facility Layout for Component 2: Reinforcement of Kop Srov and Tompun Dikes



The Study on Drainage Improvement and Flood Control in the Municipality of Phnom Penh
JICA - CTIE International Co., Ltd. - Nippon Koei Co.,Ltd.

Figure D3-8
Facility Layout for Components 3: Tompun Watershed Drainage Improvement



The Study on Drainage Improvement and Flood Control in the Municipality of Phnom Penh

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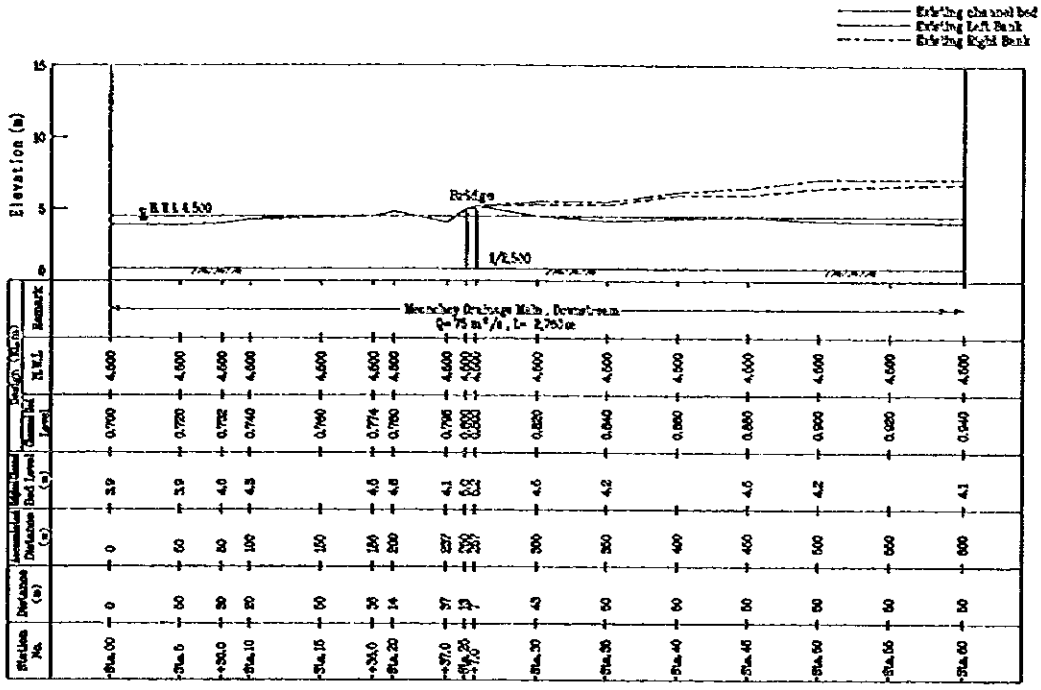
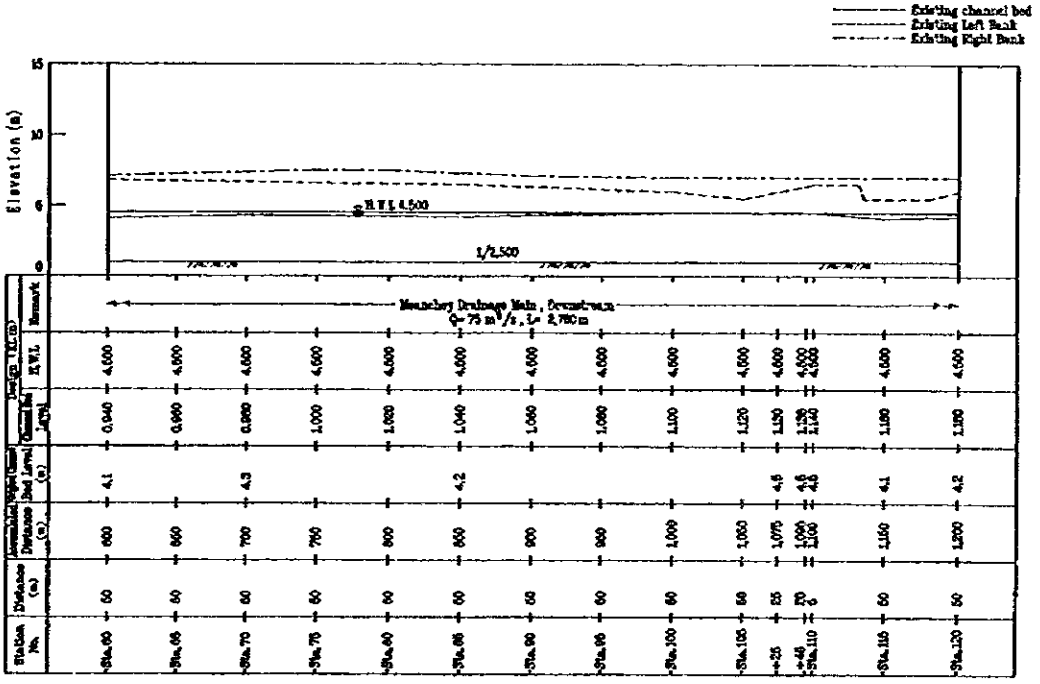
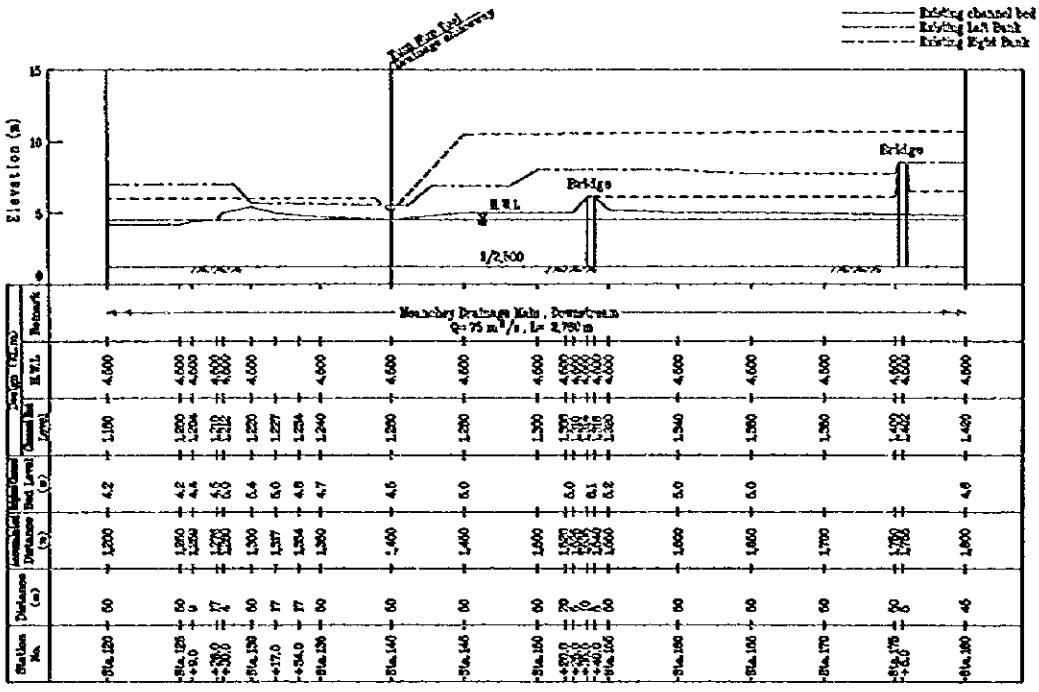
Figure D3-9

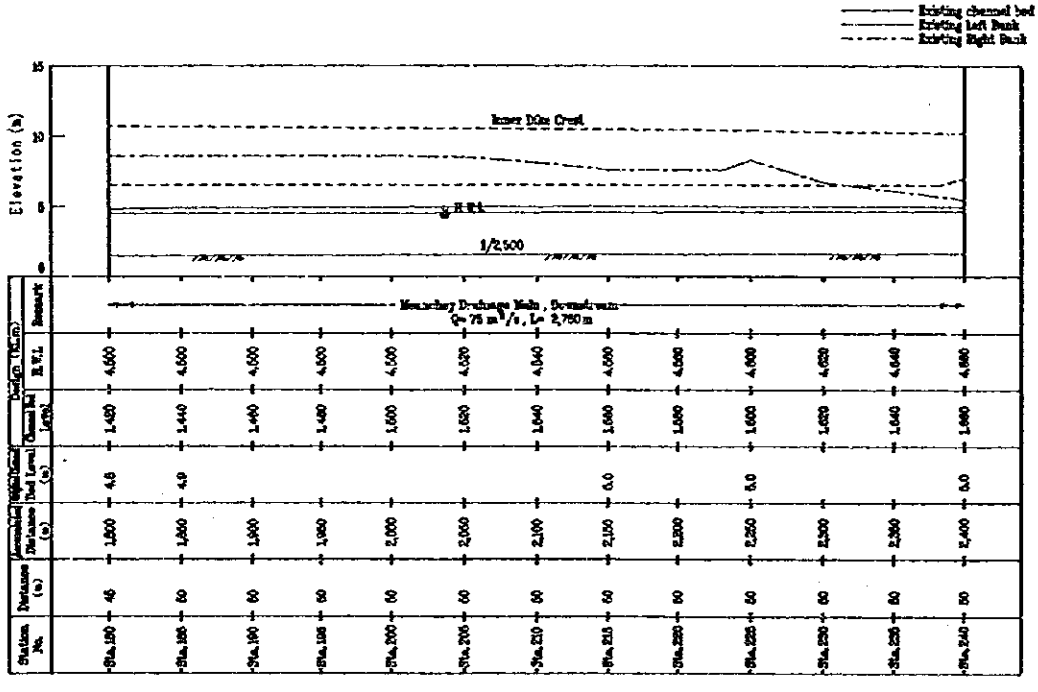
Layout of Tompun Pumping Station and Regulation Pond



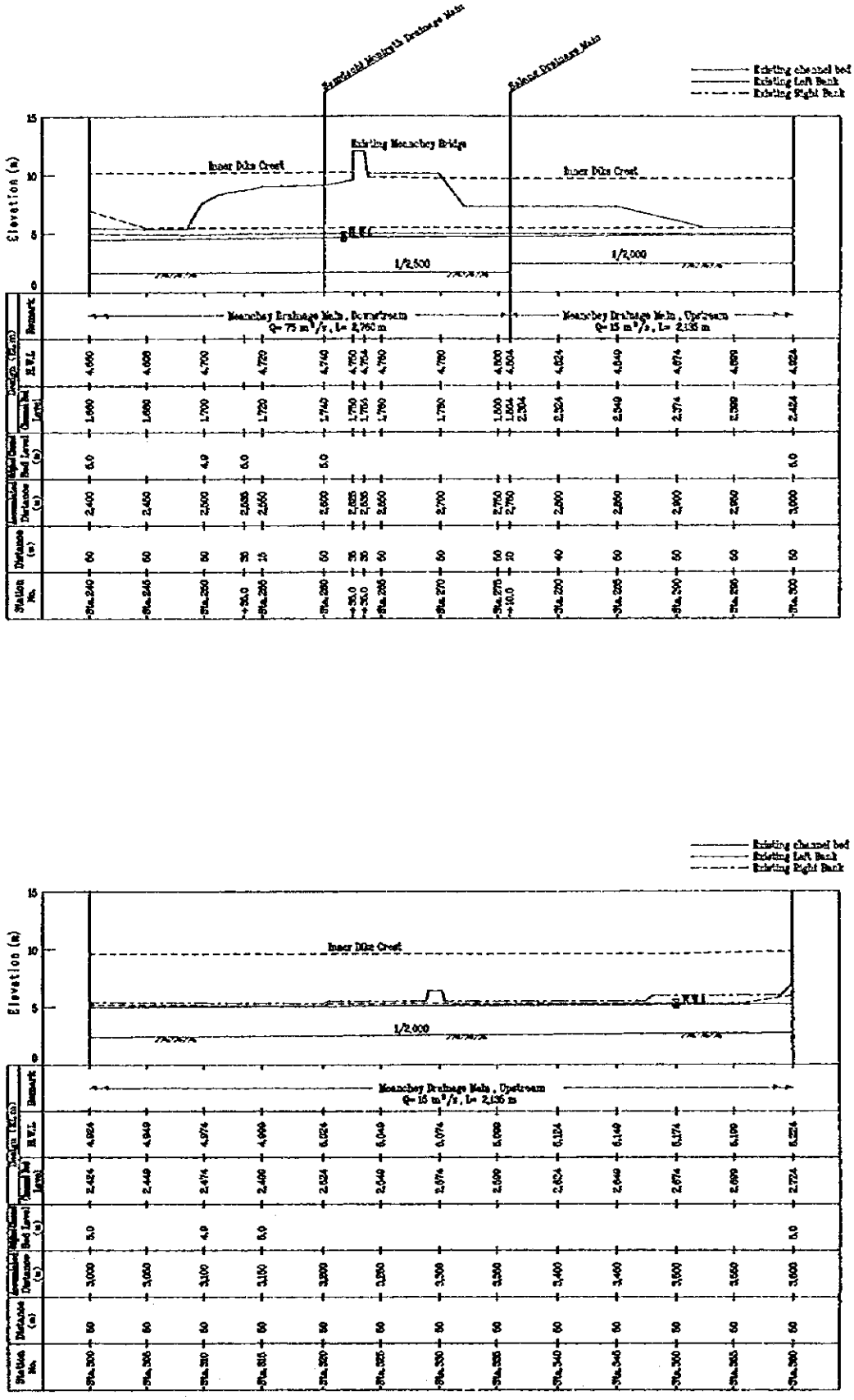


The Study on Drainage Improvement and Flood Control in the Municipality of Phnom Penh JICA - CTIE International Co., Ltd. - Nippon Koei Co., Ltd.	Figure D3-10 Profile of Meanchey Drainage Main (1/5)

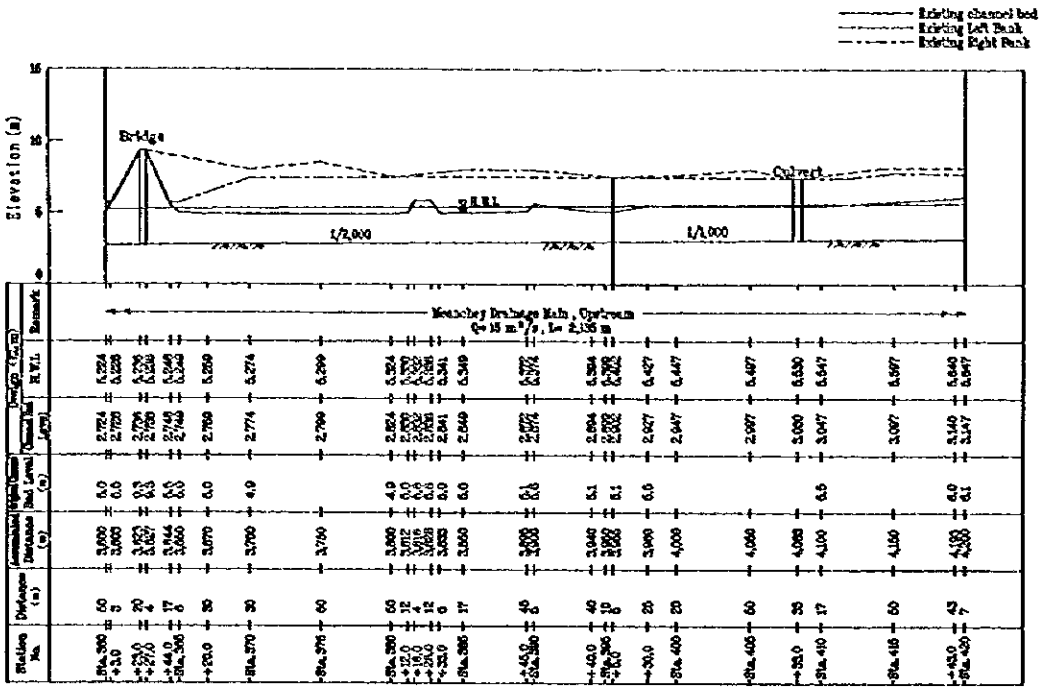


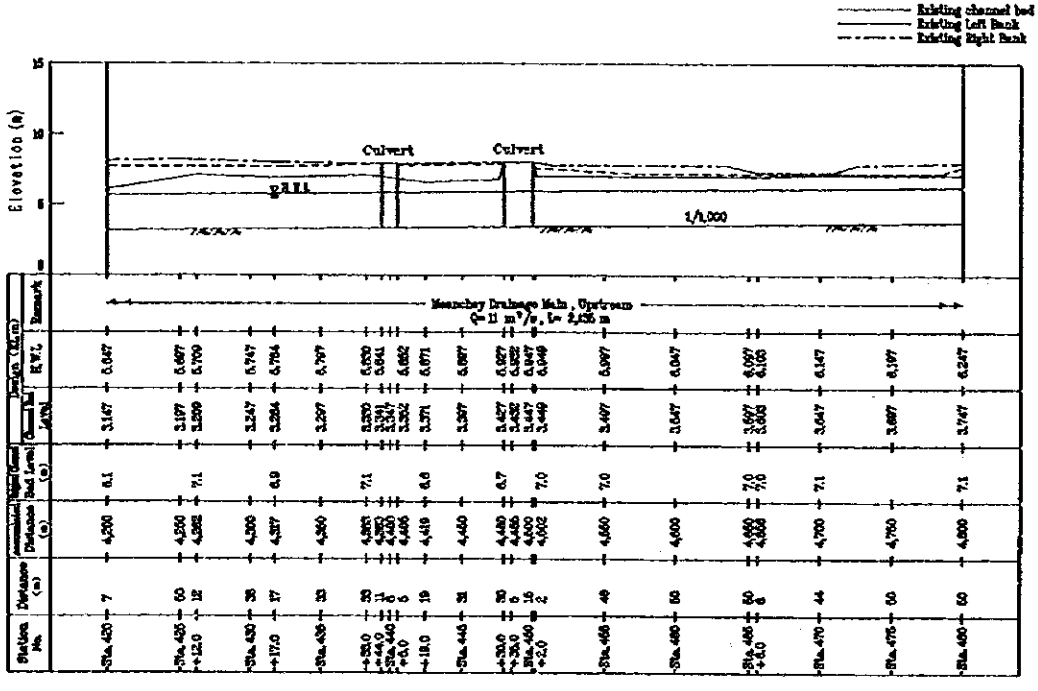


The Study on Drainage Improvement and Flood Control in the Municipality of Phnom Penh JICA - CTIE International Co., Ltd. - Nippon Koei Co., Ltd.	Figure D3-10 Profile of Meanchey Drainage Main (2/5)

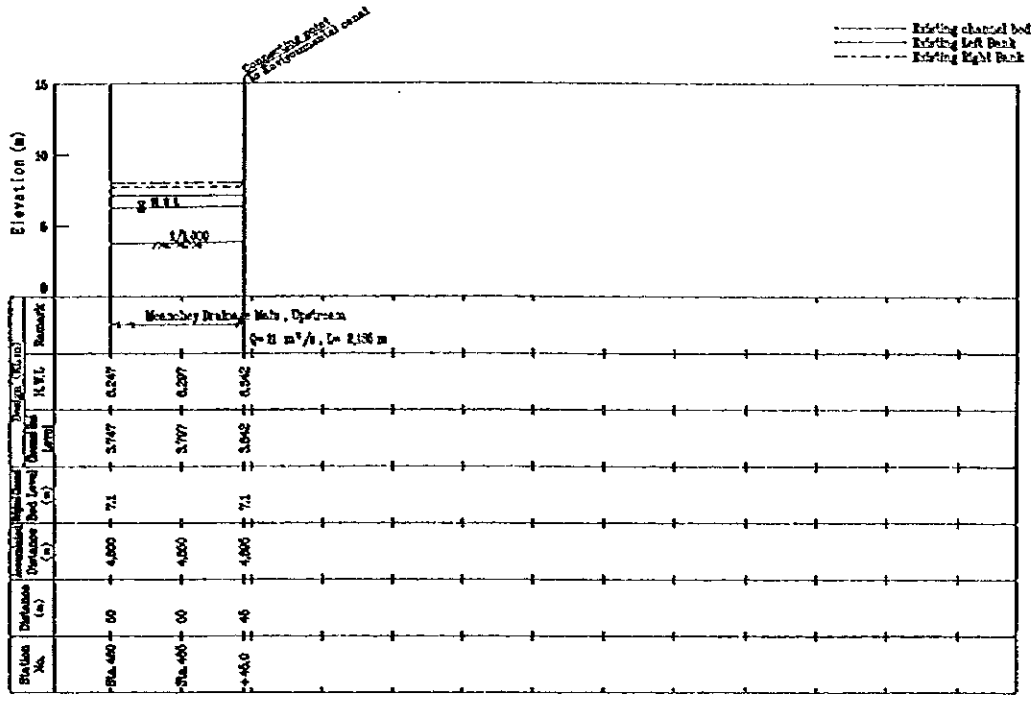


The Study on Drainage Improvement and Flood Control in the Municipality of Phnom Penh JICA - CTIE International Co., Ltd. - Nippon Koei Co., Ltd.	Figure D3-10 Profile of Meanchey Drainage Main (3/5)

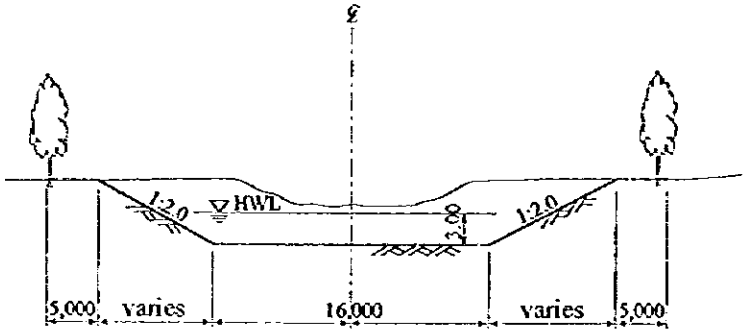




The Study on Drainage Improvement and Flood Control in the Municipality of Phnom Penh JICA - CTIE International Co., Ltd. - Nippon Koei Co., Ltd.	Figure D3-10 Profile of Meanchey Drainage Main (4/5)



The Study on Drainage Improvement and Flood Control in the Municipality of Phnom Penh JICA - CTIE International Co., Ltd. - Nippon Koei Co., Ltd.	Figure D3-10 Profile of Meanchey Drainage Main (5/5)



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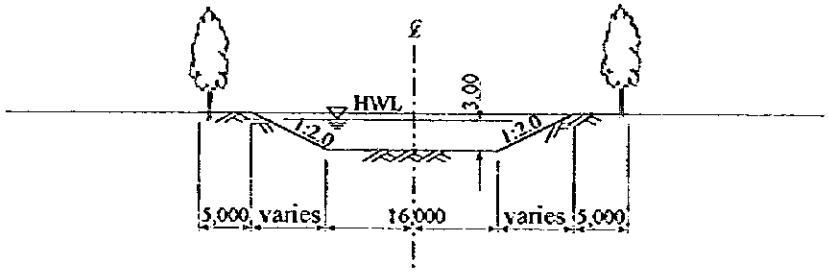

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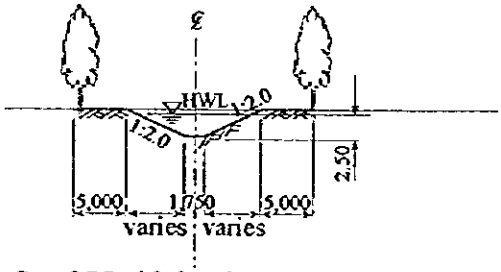
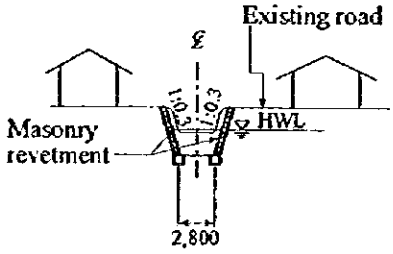


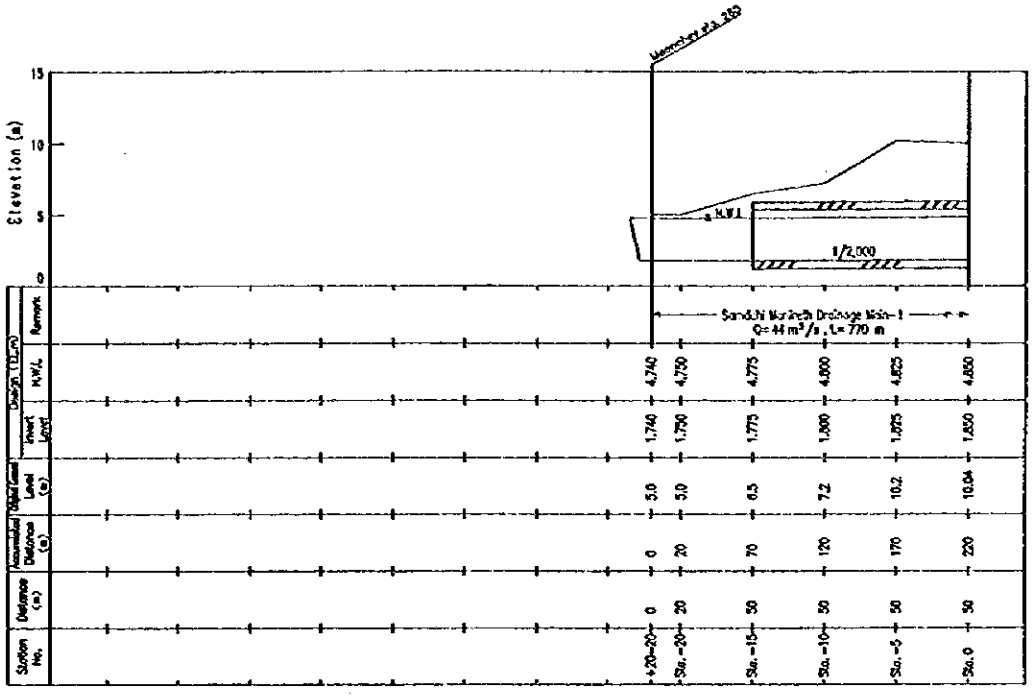
Sta. 275+10.0 ~ Sta. 395+5.0

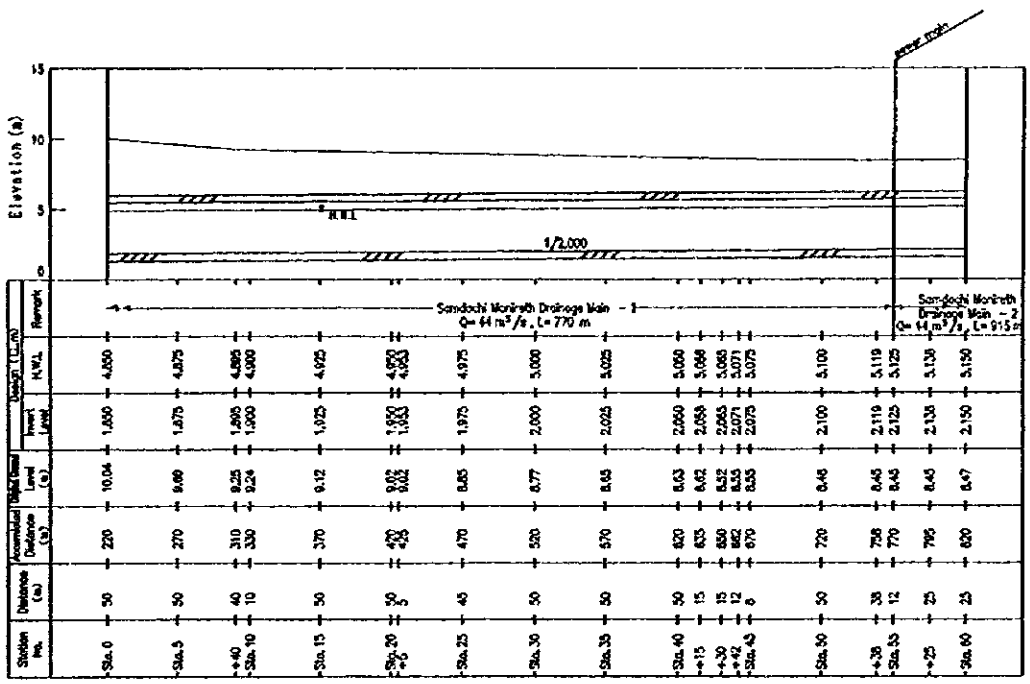


Sta. 395+5.0 ~ Sta. 420

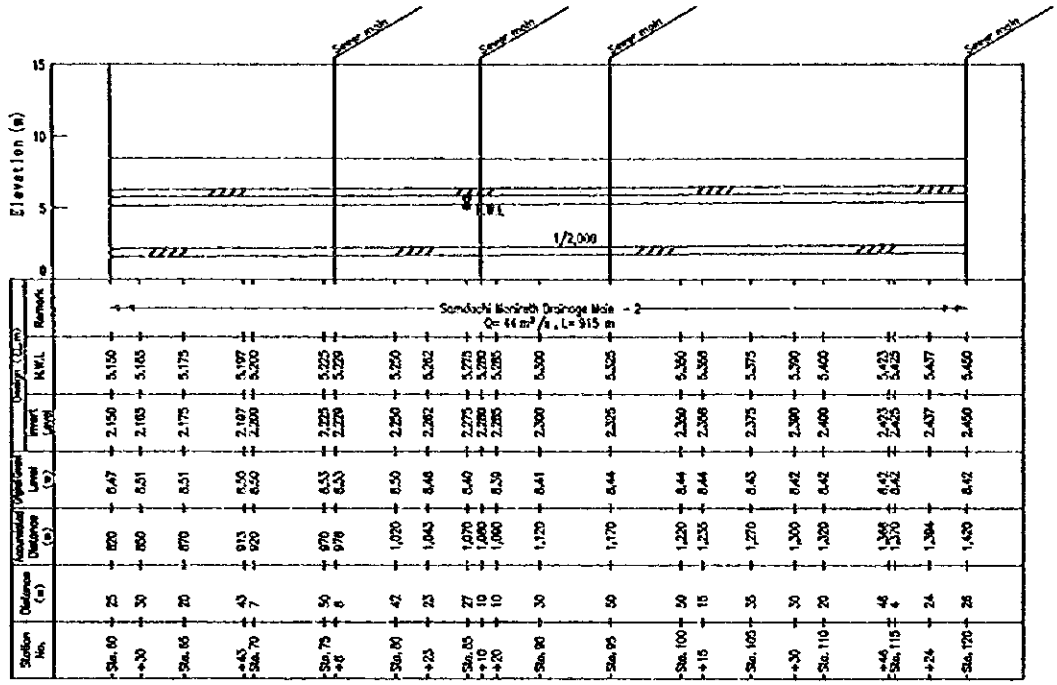
0 5 10 15 20 25m

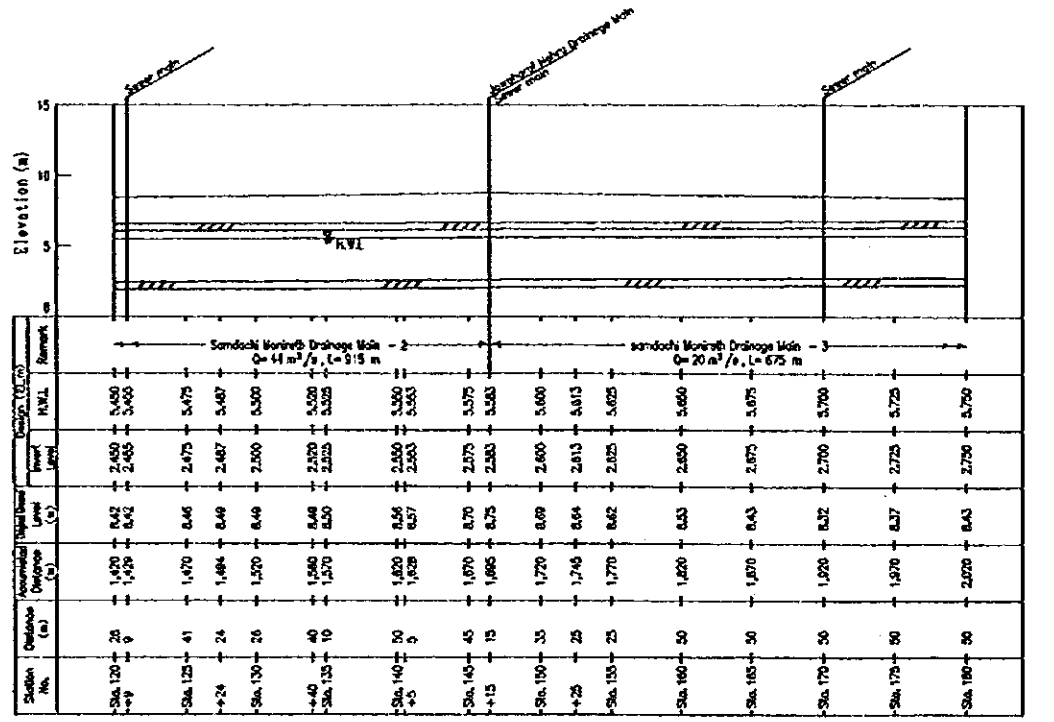
The Study on Drainage Improvement and Flood Control in the Municipality of Phnom Penh JICA - CTIE International Co., Ltd. - Nippon Koei Co., Ltd.	Figure D3-11 Standerd Cross-sections of Meanchey Drainage Main



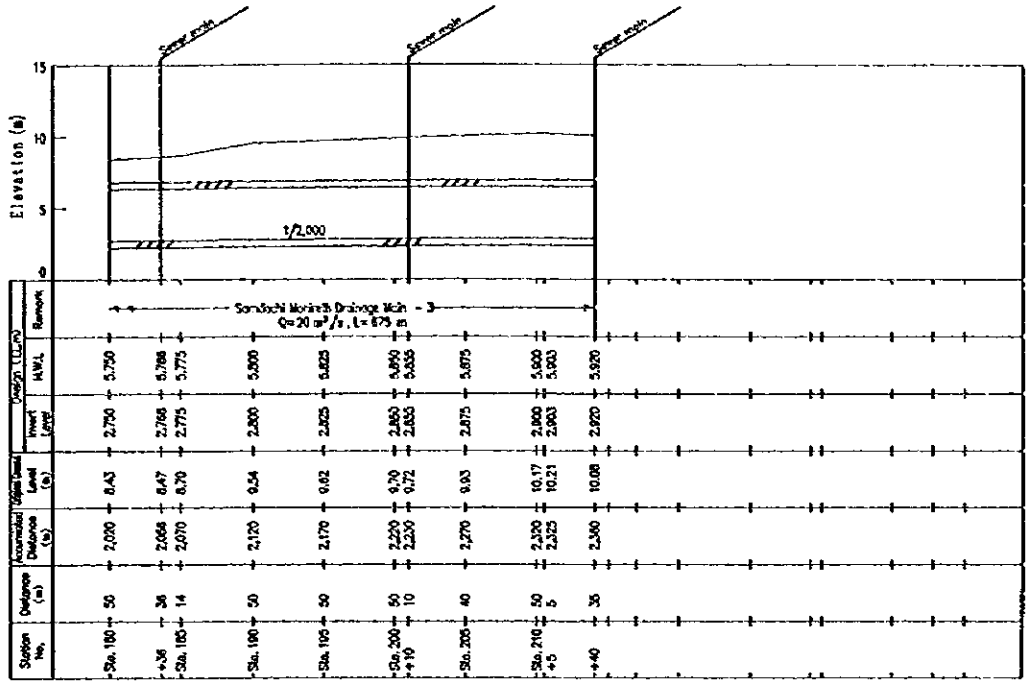


The Study on Drainage Improvement and Flood Control in the Municipality of Phnom Penh JICA - CTIE International Co., Ltd. - Nippon Koei Co., Ltd.	Figure D3-12 Profile of Samdachi Monireth Drainage Main (1/3)

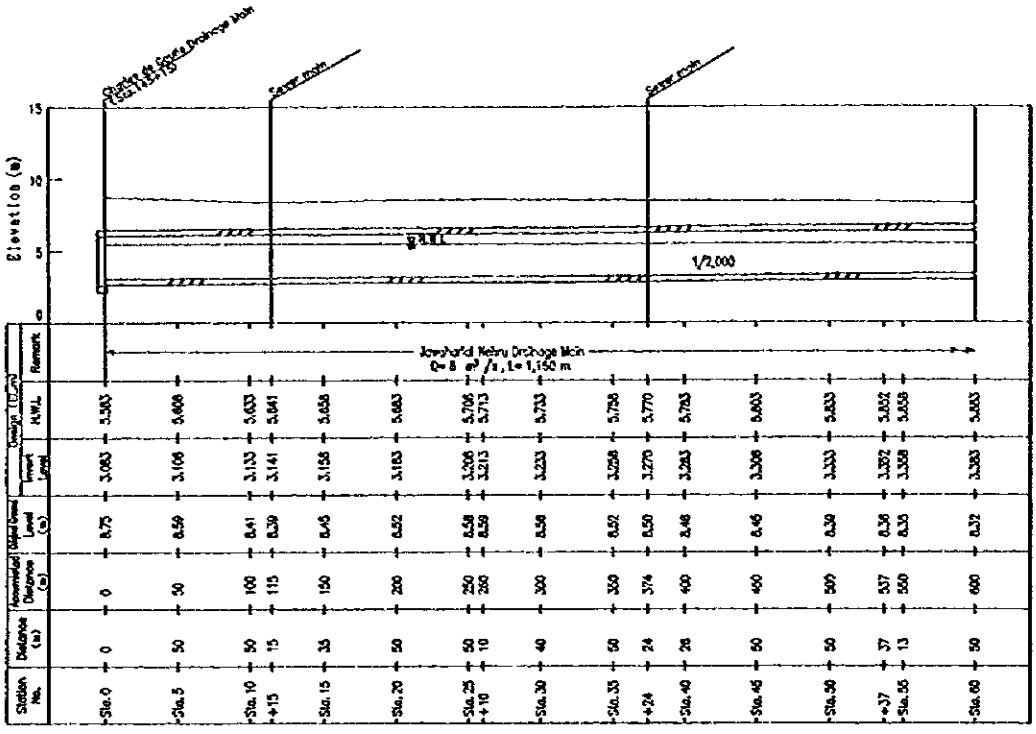


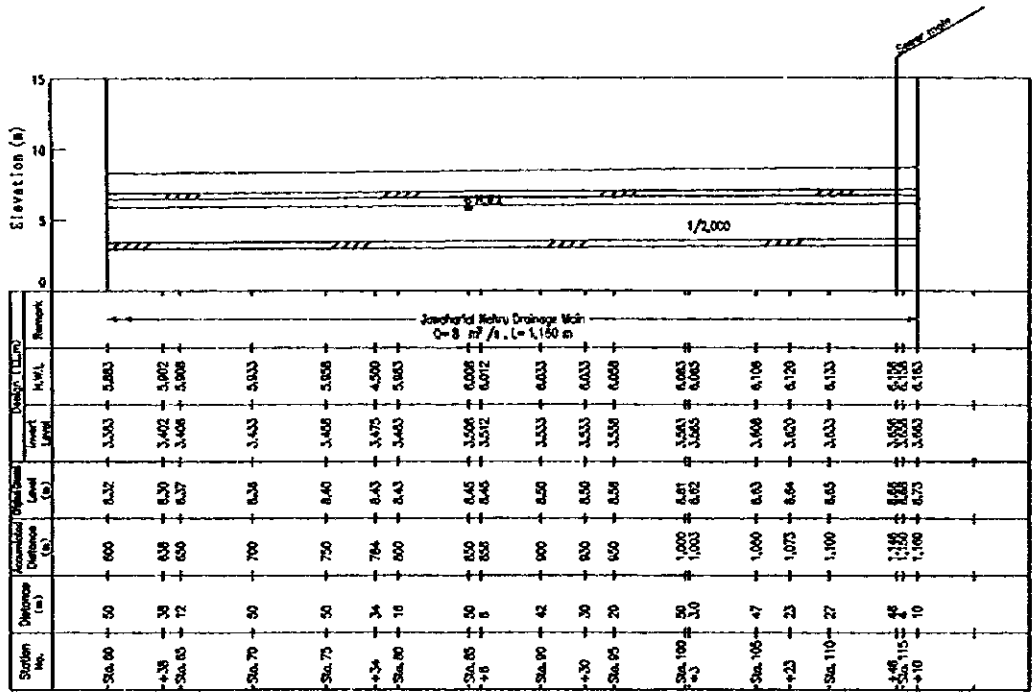


The Study on Drainage Improvement and Flood Control in the Municipality of Phnom Penh JICA - CTIE International Co., Ltd. - Nippon Koei Co., Ltd.	Figure D3-12 Profile of Samdachi Monireth Drainage Main (2/3)

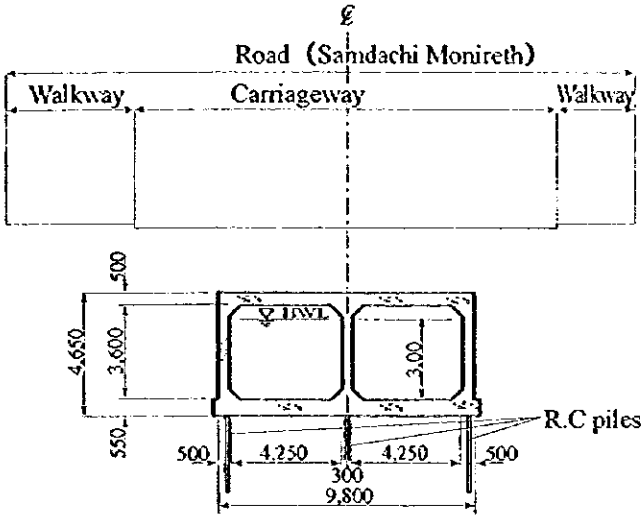


The Study on Drainage Improvement and Flood Control in the Municipality of Phnom Penh JICA - CTIE International Co., Ltd. - Nippon Koei Co., Ltd.	Figure D3-12 Profile of Samdachi Monireth Drainage Main (3/3)

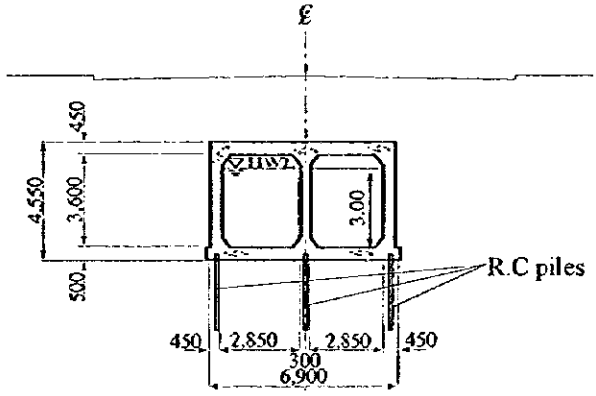




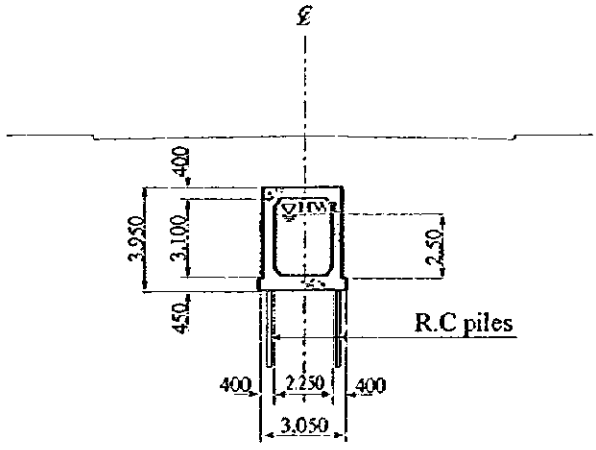
The Study on Drainage Improvement and Flood Control in the Municipality of Phnom Penh JICA - CTIE International Co., Ltd. - Nippon Koei Co., Ltd.	Figure D3-13 Profile of Jawaharlal Nehru Drainage Main



Samdachi Monireth-1&-2(Sta.0 ~ Sta.145+15.0)



Samdachi Monireth-3(Sta.145+15.0 ~ Sta.210+40.0)



Jawaharlal Nehru Drainage Main

0 2 4 6 8 10m

The Study on Drainage Improvement and Flood Control in the Municipality of Phnom Penh JICA - CTIE International Co., Ltd. - Nippon Koei Co., Ltd.	Figure D3-14 Standerd Cross-sections of Samdachi Monireth and Jawaharlal Nehru Drainage Mains