Table J.5.11(1) Construction Cost Breakdown: Pumping Station, Pump Drainage Improvement

(Unit : Million VND)

Item	Unit	Quantity	Unit Cost (1000VND)	Construction Cost	Remarks
1. Thanh Da					Phase I
1) Civil Work					
(1) Excavation	m3	1,964	55.8	109.6	
(2) Backfill	m3	1,431	34.9	49.9	
(3) Surplus Soil	m3	533	48.8	26.0	
(4) Filling	m3	80	270	21.6	
(5) RC Pile: 300 x 300 x 24 m	pile	16	7,776	124.4	
250 x 250 x 12 m	pile	70	3,468	242.8	
(6) Reinforced Concrete	m3	350	2,093	732.6	
(7) Leveling Concrete	m3	29	1,186	34.4	
(8) Red Soil t = 20 cm	m3	58	70	4.1	
(9) Rip Rap t = 50 cm	m3	36	133	4.8	
(10) Dewatering	set	1		66.2	5%
(11) Building	m2	40	1,000	40.0	10 x 4 x 3.5 mH
(12) Landscaping	m	50	209	10.5	Net Fence
(13) Miscellaneous	set			158.5	10%
Sub-Total				1,613.6	
Site Expenses		15%		242.0	
Overhead		10%		185.6	
Total of 1.1)				2,041.2	
2) Mechanical &Electrical Work (include Site Expenses and Overhead)					include Motor and
(1) Pump Equipment	set			8,699.4	Electrical Facilities
(2) Sluice Gate	m2	6.36	72,000	457.9	4 Units
(3) Miscellaneous	set			915.7	10%
Total of 1.2)				10,073.0	
Total of 1.				12,114.2	
2. Ben Me Coc (1) : Phase I					
1) Civil Work					
(1) Excavation	m3	1,850	55.8	103.2	
(2) Backfill	m3	1,220	34.9	42.6	
(3) Surplus Soil	m3	630	48.8	30.7	
(4) Filling	m3	410	270	110.7	
(5) RC Pile: 300 x 300 x 24 m	pile	16	7,776	124.4	
250 x 250 x 12 m	pile	54	3,468	187.3	
(6) Reinforced Concrete	m3	272	2,093	569.3	
(7) Leveling Concrete	m3	30	1,186	35.6	
(8) Red Soil t = 20 cm	m3	60	70	4.2	
(9) Rip Rap t = 50 cm	m3	73	133	9.7	
(10) Dewatering	set	1		59.4	5%
(11) Building	m2	90	1,000	90.0	16 x 5 x 3.5 mH
(12) Landscaping	m	90	209	18.8	Net Fence
(13) Miscellaneous	set			138.6	10%
Sub-Total				1,524.5	
Site Expenses		15%		228.7	
Overhead		10%		175.3	
Total of 2.1)				1,928.5	
2) Mechanical &Electrical Work : (include Site Expenses and Overhead)					include Motor and
(1) Pump Equipment	set			10,711.3	Electrical Facilities
(2) Sluice Gate	m2	10.25	72,000	738.0	3 Units
(3) Miscellaneous	set			1,144.9	
Total of 2)				12,594.2	
Total of 2.				14,522.7	

Table J.5.11(2) Construction Cost Breakdown: Pumping Station, Pump Drainage Improvement

Item	Unit	Quantity	Unit Cost (1000VND)	Construction Cost	Remarks
3. Ben Me Coc (1) : Phase II					
1) Civil Work					
(1) Excavation	m3	230	55.8	12.8	
(2) Backfill	m3	120	34.9	4.2	
(3) Surplus Soil	m3	110	48.8	5.4	
(4) Filling	m3	0	270	0.0	
(5) RC Pile: 300 x 300 x 24 m	pile	18	7,776	140.0	
250 x 250 x 12 m	pile	0	3,468	0.0	
(6) Reinforced Concrete	m3	130	2,093	272.1	
(7) Leveling Concrete	m3	11	1,186	13.0	
(8) Red Soil t = 20 cm	m3	22	70	1.5	
(9) Rip Rap t = 50 cm	m3	24	133	3.2	
(10) Dewatering	set	1		22.3	5%
(11) Miscellaneous	set			47.5	10%
Sub-Total				522.0	
Site Expenses		15%		78.3	
Overhead		10%		60.0	
Total of 3.1)				660.3	
2) Mechanical &Electrical Work : (include Site Expenses and Overhead)					include Motor and
(1) Pump Equipment	set			11,066.6	Electrical Facilities
(2) Sluice Gate	m2	8.16	72,000	587.5	3 Gate
(3) Miscellaneous	set			1,165.4	
Total of 3.2)				12,819.5	
Total of 3.				13,479.8	
4. Ben Me Coc (1) : Control Gate					Phase I
1) Civil Work					
(1) Excavation	m3	605	55.8	33.8	
(2) Backfill	m3	475	34.9	16.6	
(3) Surplus Soil	m3	130	48.8	6.3	
(4) Slope Protection	m	24	4,021	96.5	Revetment: Type A
	m	24	6,432	154.4	Revetment: Type B
(5) RC Pile: 300 x 300 x 24 m	pile	0	7,776	0.0	
250 x 250 x 12 m	pile	9	3,468	31.2	
(6) Reinforced Concrete	m3	94	2,093	196.7	
(7) Leveling Concrete	m3	8.2	1,186	9.7	
(8) Red Soil t = 20 cm	m3	16.3	70	1.1	
(9) Rip Rap t = 50 cm	m3	110	133	14.6	
(10) Dewatering	set	1		27.7	5%
(11) Landscaping	m	0	209	0.0	Net Fence
(12) Miscellaneous	set			58.9	10%
Sub-Total				647.5	
Site Expenses		15%		97.1	
Overhead		10%		74.5	
Total of 4.1)				819.1	
2) Mechanical &Electrical Work : (include Site Expenses and Overhead)					
(1) Sluice Gate	m2	7.63	72,000	549.4	4 Units
(2) Miscellaneous	set			54.9	
Total of 4.2)				604.3	
Total of 4.				1,423.4	

Table J.5.11(3) Construction Cost Breakdown: Pumping Station, Pump Drainage Improvement

Item	Unit	Quantity	Unit Cost (1000VND)	Construction Cost	Remarks
5. Ben Me Coc (2)					Phase II
1) Civil Work					
(1) Excavation	m3	5,020	55.8	280.1	
(2) Backfill	m3	3,260	34.9	113.8	
(3) Surplus Soil	m3	1,760	48.8	85.9	
(4) Filling	m3	870	270	234.9	
(5) RC Pile: 300 x 300 x 24 m	pile	25	7,776	194.4	
250 x 250 x 12 m	pile	152	3,468	527.1	
(6) Reinforced Concrete	m3	442	2,093	925.1	
(7) Leveling Concrete	m3	68	1,186	80.6	
(8) Red Soil t = 20 cm	m3	136	70	9.5	
(9) Rip Rap t = 50 cm	m3	0	133	0.0	
(10) Dewatering	set	1		118.3	5%
(11) Building Works	m2	40	1,000	40.0	10x4x3.5mH
(12) Landscaping	m	120	209	25.1	Net Fence
(13) Miscellaneous	set			263.5	10%
Sub-Total				2,898.3	
Site Expenses		15%		434.7	
Overhead		10%		333.3	
Total of 5.1)				3,666.3	
2) Mechanical &Electrical Work : (include Site Expenses and Overhead)					include Motor and
(1) Pump Equipment	set			11,232.5	Electrical Facilities
(2) Sluice Gate	m2	10.42	72,000	750.2	4 Units
(3) Miscellaneous	set			1,198.3	
Total of 5.2)				13,181.0	
Total of 5.				16,847.3	
Grand Total of Pumping Station Construction				**58,387.4**	

Table J.5.12 Construction Cost Breakdown: Dike Pump Drainage Improvement

(Unit : Million VND)

Item	Description	Unit	Quantity	Unit Cost (1000VND)	Construction Cost	Remarks
1.Thanh Da : 74m						Phase I
1) Concrete Work		m3	98.9	4,800	475	
2) Leveling concrete		m3	39.1	1,186	46	
3) Red Soil		m2	64.8	70	5	
4) Piling Work	300x300x12mH	pile	50	3,888	194	
5) Rip Rap	Cobble: t = 50cm	m3	185	133	25	
6) Dewatering	5%	set			37	
7) Miscellaneous	5%	set			39	
Sub-Total					821	
Site Expenses	15%				123	
Overhead	10%				94	
Total of 1.					1,038	
2. Ben Me Coc (1) : 1,360m						Phase I
1) Filling		m3	1,360	270	367	
2) Concrete Work		m3	680	4800	3,264	
3) Revetment Work		m2	4,896	412	2,017	
4) O/M Road	Concrete Block	m2	7,900	220	1,738	
5) Dewatering	5%	set			369	
6) Miscellaneous	5%	set			388	
Sub-Total					8,144	
Site Expenses	15%				1,222	
Overhead	10%				937	
Total of 2.					10,302	
3. Ben Me Coc (2) : 1,530m						Phase II
1) Filling		m3	1,530	270	413	
2) Concrete Work		m3	765	4800	3,672	
3) Revetment Work		m2	5,508	412	2,269	
4) O/M Road	Concrete Block	m2	6,580	220	1,448	
5) Dewatering	5%	set			390	
6) Miscellaneous	5%	set			410	
Sub-Total					8,602	
Site Expenses	15%				1,290	
Overhead	10%				989	
Total of 3.					10,881	
Grand Total of Dike Construction					22,221	

Table J.5.13 Construction Cost Breakdown: Retarding Pond Pump Drainage Improvement

(Unit : Million VND)

Item	Description	Unit	Quantity	Unit Cost (1000VND)	Construction Cost	Remarks
1.Thanh Da						Phase I
1) Excavation		m3	8,000	56	446	
2) Surplus Soil		m3	8,000	49	390	
3) Filling		m3	270	270	73	
4) Slope Protection	Revetment : Type B	m	328	6,432	2,110	
5) O/M Road	Concrete Block	m2	900	220	198	
6) Landscaping Work	Bar Fence	m	380	181	283	
7) Miscellaneous	10%	set			350	
Sub-Total					3,850	
Site Expenses	15%				578	
Overhead	10%				443	
Total of 1.					4,870	
2. Ben Me Coc (1) : Phase I						
1) Excavation		m3	5,590	56	312	
2) Surplus Soil		m3	5,590	49	273	
3) Filling		m3	1,700	270	459	
4) Slope Protection	Soding	m2	4,060	72	292	
	Revetment : Type B	m	37	6,432	238	
5) O/M Road	Low Cost Pavement	m2	900	212	191	
6) Landscaping Work	Bar Fence	m	1,000	181	125	
7) Miscellaneous	10%	set			165	
Sub-Total					2,055	
Site Expenses	15%				308	
Overhead	10%				236	
Total of 2.					2,600	
3. Ben Me Coc (1) : Phase II						
1) Excavation		m3	18,510	56	1,033	
2) Surplus Soil		m3	18,510	49	903	
3) Filling		m3	0	270	0	
4) Slope Protection	Revetment Type;B	m	430	6,432	2,766	
5) O/M Road	Concrete Block	m2	900	220	198	
6) Landscaping Work	Bar Fence	m	0	181	400	
7) Miscellaneous	10%	set			530	
Sub-Total					5,830	
Site Expenses	15%				875	
Overhead	10%				670	
Total of 3.					7,375	
4. Ben Me Coc (2)						Phase II
1) Excavation		m3	53,000	56	2,957	
2) Surplus Soil		m3	53,000	49	2,586	
3) Side Dich		m	90	625	56	
4) Slope Protection	Revetment Type;B	m	454	6,432	2,920	
5) O/M Road	Concrete Block	m2	910	220	200	
	Road Grade	m2	4,760	500	2,380	
6) Landscaping Work	Bar Fence	m	470	181	613	
7) Miscellaneous	10%	set			933	
Sub-Total					12,647	
Site Expenses	15%				1,897	
Overhead	10%				1,454	
Total of 4.					15,999	
Grand Total					23,469	

Table J.5.14 Construction Cost of Breakdown: Flap Gate Pump Drainage Improvement

(Unit : Million VND)

Construction Area	Type	Number	Unit Cost (1000 VND)	Construction Cost	Remarks
1. Thanh Da	A-2	5	51,809	259.0	Table J.5.8
	B-2	1	70,458	51.8	Table J.5.8
	C-2	0	84,860	0.0	Table J.5.8
Sub-Total				310.8	
2. Ben Me Coc (1)	A-1	3	57,559	172.7	Table J.5.8
	B-1	8	74,273	594.2	Table J.5.8
	C-1	1	92,420	92.4	Table J.5.8
Sub-Total				859.3	
2. Ben Me Coc (2)	A-1	1	57,559	57.6	Table J.5.8
	B-1	6	74,273	445.6	Table J.5.8
	C-1	1	92,420	92.4	Table J.5.8
Sub-Total				595.6	
Total				1,765.7	

Table J.5.15(1) Construction Cost of Breakdown: Storm Sewer Pump Drainage Improvement

(Unit : Million VND)

Item	Description	Unit	Quantity	Unit Cost (1000VND)	Construction Cost	Remarks
1.Thanh Da						Phase I
1) Storm Sewer		set	1		1,252	Table J.24
2) Manhole		set	1		183	Table J.25
3) Miscellaneous	3%	set			43	
Sub-Total					1,478	
Site Expenses	15%				222	
Overhead	10%				170	
Total of 1.					1,870	
2. Ben Me Coc (1)						Phase I
1) Storm Sewer		set	1		10,209	Table J.24
2) Manhole		set	1		1,767	Table J.25
3) Miscellaneous	3%	set			359	
Sub-Total					12,335	
Site Expenses	15%				1,850	
Overhead	10%				1,419	
Total of 2.					15,604	
3. Ben Me Coc (2)						Phase II
1) Storm Sewer		set	1		8,634	Table J.24
2) Manhole		set	1		1,377	Table J.25
3) Miscellaneous	3%	set			300	
Sub-Total					10,311	
Site Expenses	15%				1,547	
Overhead	10%				1,186	
Total of 3.					13,044	
Total of 1,2,3					30,518	

Table J.5.15(2) Construction Cost of Breakdown: New and Rehabilitation Sewer

(Unit : Million VND)

Item	Description	Unit	Quantity	Unit Cost (1000VND)	Construction Cost	Remarks
1. New Storm Sewer						
1) New Sewer construction		set	1		86,319	Table J.26
2) Manhole		set	1		10,017	Table J.26
Sub-Total					96,336	
Site Expenses	15%				14,450	
Overhead	10%				11,079	
Total					121,865	
2. Rehabilitation of Combined Sewer						
1) Rehabilitation Sewer		set	1		94,280	Table J.27
2) Manhole		set	1		11,998	Table J.27
Sub-Total					106,278	
Site Expenses	15%				15,942	
Overhead	10%				12,222	
Total					134,442	
Grand Total					256,307	

Table J.5.16(1) Construction Cost of Tau Hu - Ben Nghe Canal Improvement

(Unit : Million VND)

Item	Description	Unit	Quantity	Unit Cost (1000VND)	Construction Cost	Remarks
1.Ben Nghe						
1) Revetment Work	Type - A	m	6,020	4,021	24,206	
2) Dredging		m3	266,390	45	11,988	
3) Transport&Dumpimg		m3	266,390	90	23,975	Distance;40km
4) Filling		m3	86,760	270	23,425	
5) Rip Rap	t = 50cm	m3	15,700	133	2,088	
6) Maintenance Road	(a)	m2	30,100	212	6,381	
7) Miscellaneous	10%				9,206	
Sub-Total					101,270	
Site Expenses	15%				15,191	
Overhead	10%				11,646	
Total of 1.					128,107	
2.Tau Hu (Down-stream)						
1) Revetment Work	Type - A	m	4,120	4,021	16,567	
	Type - B	m	1,950	6,432	12,542	
	Type - C	m	1,050	14,774	15,513	
2) Dredging		m3	335,830	45	15,112	
3) Transport&Dumpimg		m3	335,830	90	30,225	Distance;40km
3) Filling		m3	77,170	270	20,836	
4) Rip Rap	t = 50cm	m3	21,100	133	2,806	
4) Maintenance Road	(a)	m2	38,160	212	8,090	
5) Miscellaneous	10%				12,169	
Sub-Total					133,860	
Site Expenses	15%				20,079	
Overhead	10%				15,394	
Total of 2.					169,333	
3.Tau Hu (Up-stream)						
1) Revetment Work	Type - A	m	6,746	4,021	27,126	
	Type - B	m	600	6,432	3,859	
	Type - C	m	0	14,774	0	
2) Dredging		m3	410,820	45	18,487	
3) Transport&Dumpimg		m3	410,820	90	36,974	Distance;40km
3) Filling		m3	55,210	270	14,907	
4) Rip Rap	t = 50cm	m3	24,050	133	3,199	
4) Maintenance Road	(a)	m2	39,585	212	8,392	
5) Miscellaneous	10%				11,294	
Sub-Total					124,237	
Site Expenses	15%				18,636	
Overhead	10%				14,287	
Total of 3.					157,160	

Table J.5.16(2) Construction Cost of Tau Hu - Ben Nghe Canal Improvement

(Unit : Million VND)

Item	Description	Unit	Quantity	Unit Cost (1000VND)	Construction Cost	Remarks
4. Ngang No.1						
1) Revetment Work	Type - A	m	790	4,021	3,177	
2) Dredging		m3	35,100	45	1,580	
3) Transport&Dumpimg		m3	35,100	90	3,159	Distance;40km
3) Filling		m3	1,660	270	448	
4) Rip Rap	t = 50cm	m3	1,975	133	263	
5) Maintenance Road	(a)	m2	3,950	212	837	
6) Miscellaneous	10%				946	
Sub-Total					10,410	
Site Expenses	15%				1,562	
Overhead	10%				1,197	
Total of 4.					13,168	
5. Ngang No.2						
1) Revetment Work	Type - A	m	0	4,021	0	
2) Dredging		m3	20,340	45	915	
3) Transport&Dumpimg		m3	20,340	90	1,831	Distance;40km
3) Filling		m3	2,940	270	794	
4) Rip Rap	t = 50cm	m3	2,075	133	276	
5) Maintenance Road	(a)	m2	4,050	212	859	
6) Miscellaneous	10%				467	
Sub-Total					5,142	
Site Expenses	15%				771	
Overhead	10%				591	
Total of 5.					6,504	
6. Ngang No.3						
1) Revetment Work	Type - A	m	810	4,021	3,257	
2) Dredging		m3	57,040	45	2,567	
3) Transport&Dumpimg		m3	57,040	90	5,134	Distance;40km
3) Filling		m3	11,270	270	3,043	
4) Rip Rap	t = 50cm	m3	2,025	133	269	
5) Maintenance Road	(a)	m2	4,050	212	859	
6) Miscellaneous	10%				1,513	
Sub-Total					16,641	
Site Expenses	15%				2,496	
Overhead	10%				1,914	
Total of 6.					21,051	
Grand Total					495,323	

Table J.5.17(1) Bill of Quantities for Sewerage Development (Treatment Capacity;512,000m^3/day with Effluent Quality:20mg/l of BOD_5)

Item	Calculation	Unit	Quantity
1. Westewater Treatment Plant			
1.1 Site Preperation			
1) Gross Area	680 x 690 + 1/2(200 + 690) x 120 = 522,600	m^2	522,600
2) Filling Sand	522,600 x 5.0 = 2,613,000	m^3	2,613,000
3) Vertical-Drain	(522,600 x 0.7) / 2.25 = 162,587	drain	162,587
1.2 Temporary Access			
1) Temporary Pier	10 x 50 = 500	m^2	500
2) Temporary Road	L = 1000m (Total L = 3250 m, 2250 m; Other Project)		
(1) Filling Sand	8 x 5 x 1000 = 40,000	m^3	40,000
(2) Low Cost Pavement	7 x 1000 = 7,000	m^2	7,000
1.3 Receiving Tank (Pumping Pit)			
1) Foundation Pile	400 x400 L = 25 m	pile	133
2) Earth Work			
(1) Excavation	[12.1 x 27 + 1/2(27 + 20) x 13] x 10.0 = 6,322 (11 + 1) x (20 + 2) x 5.3 = 1,399.2 1/2[(12.1 x 27 + 1/2(27 + 20) x 13 + 12 x 22) +(18.6 x 40 + 36.5 x 13 + 18.5 x 35)] x 6.5 =12,	m^3	19,850
(2) Steel Sheet Pile	(13.1 + 12.5 + 12) x 2 + 29 + 22 = 126.2	m	126
(3) Surplus Soil	26 x 12.6 x 16.5 + 1/2(26 + 20) x 12.5 x 16.5 + 9 x 20 x 11.	m^3	12,016
(4) Back Filling	19,850 - 12,016 = 7,834	m^3	7,834
3) Whole Concrete Work (Cubic Content of Tank)	26 x 12.1 x 15.8 + 1/2(26 + 20) x 12.5 x 15.8 + 8.5 x 20 x 1	m^3	11,400
1.4 Primary Sedimentation Tank			
1) Foundation Pile	400 x 400 L = 25 m	pile	4,361
2) Earth Work			
(1) Excavation	1/2 (64.0 x 426.0 + 67.45 x 432.9) x 3.45 = 97,399	m^3	97,399
(2) Surplus Soil	62.0 x 422.0 x 3.45 = 90,266	m^3	90,266
(3) Back Filling	97,399 - 90,266 = 7,133	m^3	7,133
3) Whole Concrete Work (Cubic Content of Tank)	62.0 x 422.0 x 4.75 = 124,279	m^3	124,279
1.5 Aeration Tank			
1) Foundation Pile	400 x 400 L = 25 m	pile	5,627
2) Earth Work			
(1) Excavation	1/2(426 + 435.6) x 80.0 x 4.8 = 165,427	m^3	165,427
(2) Surplus Soil	422 x 80.0 x 4.8 =162,948	m^3	162,948
(3) Back Filling	165,427 - 162,948 = 2,479	m^3	2,479
3) Whole Concrete Work (Cubic content of Tank)	422 x 80.0 x 6.0 = 202,560	m^3	202,560
1.6 Secondary Sedimentation Tank			
1) Foundation Pile	400 x 400 L = 25 m	pile	5,767
2) Earth Work			
(1) Excavation	1/2(426 x 82 + 434.95 x 88.475) x 4.475 = 164,264	m^3	164,264
(2) Surplus Soil	422 x 82 x 4.475 = 154,853	m^3	154,853
(3) Back Filling	164,264 - 154,853 = 9,411	m^3	9,411
3) Whole Concrete Work (Cubic Content of Tank)	422 x 82 x 5.625 = 194,648	m^3	194,648
1.7 Disinfection Tank			
1) Foundation Pile	350 x 350 L = 25 m	pile	229
2) Earth Work			
(1) Excavation	1/2(30 x 61 + 39.8 x 70.8) x 4.9 = 11,388	m^3	11,388
(2) Surplus Soil	30 x 61 x 4.9 = 8,967	m^3	8,967

Table J.5.17(2) Bill of Quantities for Sewerage Development (Treatment Capacity;512,000m^3/day with Effluent Quality:20mg/l of BOD_5)

Item	Calculation	Unit	Quantity
(3) Back Filling	11,388 - 8,967 = 2,421	m^3	2,421
3) Whole Concrete Work	26 x 56 x 4.5 = 6,552		
(Cubic Content of Tank)	6 x 26 x 6 = 936	m^3	7,488
1.8 Sludge Thickner	2 Thickner		
1) Foundation Pile	400 x 400 L = 25 m 57piles/thickner x 2 = 114	pile	114
2) Earth Work			
(1) Excavation	1/2[(13.0)2 + (15.2)2] x π x 2.2 = 1,382 x 2 = 2,764	m^3	2,764
(2) Surplus Soil	(12.0)2 x π x 2.2 = 995 x 2 = 1,990	m^3	1,990
(3) Back Filling	1,382 - 995 = 387 x 2 = 774	m^3	774
3) Whole Concrete Work (Cubic Content of Tank)	(12.0)2 x π x 5.715 = 2,581 x 2 = 5,168	m^3	5,168
1.9 Building			
1) Pumping Station	11.6 x 26.0 x 1F = 301.6	m^2	301.6
2) Air Blower Room	22.0 x 40.0 x 2F = 1760.0	m^2	1760
	Foundation Pile 400 x 400 x 25 m	pile	110
3) Administrative & Control Room	20.0 x 40.0 x 3F = 2,400.0	m^2	2,400
	Foundation Pile 400 x 400 x 25 m	pile	100
4) Disinfection Facility Building	15.0 x 35.0 x 1F = 525.0	m^2	525
	Foundation Pile 400 x 400 x 25 m	pile	53
5) Dewatering Room	26.0 x 136.0 x 2F = 7,072.0	m^2	7,072
	Foundation Pile 400 x 400 x 25 m	pile	442
6) Compost Plant	110 x 281 = 30,910	m^2	30,910
	Foundation Pile 300 x 300 x 25 m	pile	1,546
1.10 Road in Plant Site	10.0 x (100 + 630 + 500 x 2) = 17,300		
	7.0 x (270 + 520 + 120 x 4 + 230 + 260) = 12,320	m^2	29,620
2. Pumpimg Station			
1.1 Site Preperation			
1) Gross Area	108 x 54 = 5,832	m^2	5,832
2) Filling Sand	5,832 x 2 = 11,664	m^3	11,664
1.2 Receiving Tank (Pumping Pit)			
1) Foundation Pile	Cast-in-place Concrete Pile ϕ 800	pile	110
2) Earth Work			
(1) Excavation	23.2 x 29.2 x 12.3 = 11,924.1		
	1/2[(34.2 + 9.5) x (27.2 + 19) + (34.2 + 2) x (27.2 + 4)] x 5.0 = 7,871.0		
	1/2[(25.5 + 14) x (39.2 + 7) + (25.5 + 2) x (39.2 + 1)] x 4.5	m^3	26,389
(2) Surplus Soil	12.8 x 34.2 x 27.2 + 38.8 x 25.5 x 4.5 = 16,359.4	m^3	16,359
(3) Back Filling	26,389 - 16,359 = 10,030	m^3	10,030
(4) Steel Sheet Pile	[(31.2 + 2) + (27.2 + 2)] x 2 = 124.8	m	125
3) Whole Concrete Work	34.2 x 27.2 x 18.1 = 17,488.5		
(Cubic Content of Tank)	1/2(25.0 x 27.2) x 39.3 x 6.145 = 6,303.1	m3	23,792
1.3 Pumping Station Building			
(Control Room)	31.2 x 27.2 + 32.85 x 34.8 = 1991.8	m^2	1,992
1.4 Road of Site	7.0 x (95 x 2 + 42 x 2) =1,918	m^2	1,918
3. Sewer Pipe Laying Work			
3.1 O/M Road			
1) Undeveloped Area	300 + 400 + 200 = 900	m	900
2) Narrow Farm Road	700	m	700
3.2 Diversion Chamber	Type 1	set	100
	Type 2	set	3

Table J.5.18(1) Bill of Quantities for Sewerage Facilities in Phase I

Item	Calculation	Unit	Quantity
1. Westewater Treatment Plant			
1.1 Site Preperation			
1) Gross Area	690 x 250 = 172,500	m^2	172,500
2) Filling Sand	172,500 x 5.0 = 862,500	m^3	862,500
3) Vertical-Drain	172,500 / 2.25 = 76,667	drain	76,667
1.2 Temporary Access			
1) Temporary Pier	10 x 20 = 200	m^2	200
2) Temporary Road	L = 1000m (Total L=3250m, 2250m; Other Project)		
(1) Filling Sand	8 x 5 x 1000 = 40,000	m^3	40,000
(2) Low Cost Pavement	7 x 1000 = 7,000	m^2	7,000
1.3 Receiving Tank (Pumping Pit)			
1) Foundation Pile	400 x 400 L = 25 m	pile	133
2) Earth Work			
(1) Excavation	[12.1 x 27 + 1/2(27 + 20) x 13] x 10.0 = 6,322 (11 + 1) x (20 + 2) x 5.3 = 1,399.2 1/2[(12.1 x 27 + 1/2(27 + 20) x 13 + 12 x 22) + (18.6 x 40 + 36.5 x 13 + 18.5 x 35)] x 6.5 = 12,129	m^3	19,850
(2)Steel Sheet Pile	(13.1 + 12.5 + 12) x 2 + 29 + 22 = 126.2	m	126
(3) Surplus Soil	26 x 12.6 x 16.5 + 1/2(26 + 20) x 12.5 x 16.5 + 9 x 20 x 11.8 = 12,016	m^3	12,016
(4) Back Filling	19,850 - 12,016 = 7,834	m^3	7,834
3) Whole Concrete Work (Cubic Content of Tank)	26 x 12.1 x 15.8 + 1/2(26 + 20) x 12.5 x 15.8 + 8.5 x 20 x 11.1 = 11,400	m^3	11,400
1.4 Primary Sedimentation Tank			
1) Foundation Pile	400 x 400 L = 25m	pile	727
2) Earth Work			
(1) Excavation	97,399 x 1/6 = 16,233	m^3	16,233
(2) Surplus Soil	90,266 x 1/6 = 15,044	m^3	15,044
(3) Back Filling	7,133 x 1/6 = 1,189	m^3	1,189
3) Whole Concrete Work (Cubic Content of Tank)	124,279 x 1/6 = 20,713	m^3	20,713
1.5 Aeration Tank			
1) Foundation Pile	400 x 400 L = 25m	pile	938
2) Earth Work			
(1) Excavation	165,427 x 1/6 = 27,571	m^3	27,571
(2) Surplus Soil	162,948 x 1/6 = 27,158	m^3	27,158
(3) Back Filling	2,479 x 1/6 = 413	m^3	413
3) Whole Concrete Work (Cubic Content of Tank)	202,560 x 1/6 = 33,760	m^3	33,760
1.6 Secondary Sedimentation Tank			
1) Foundation Pile	400 x 400 L = 25 m	pile	1,073
2) Earth Work			
(1) Excavation	164,264 x 1/6 = 27,377	m^3	27,377
(2) Surplus Soil	154,853 x 1/6 = 25,809	m^3	25,809
(3) Back Filling	9,411 x 1/6 = 1,569	m^3	1,569
3) Whole Concrete Work (Cubic Content of Tank)	194,648 x 1/6 = 32,441	m^3	32,441
1.7 Disinfection Tank			
1) Foundation Pile	350 x 350 L = 25m 229 x 1/3 = 76	pile	76
2) Earth Work			
(1) Excavation	11,388 x 1/3 = 3,796	m^3	3,796
(2) Surplus Soil	8,967 x 1/3 = 2,989	m^3	2,989
(3) Back Filling	2,421 x 1/3 = 807	m^3	807
3) Whole Concrete Work	6,552 x 1/3 = 2184		
(Cubic Content of Tank)	936 x 1/3 = 312	m^3	2,496

Table J.5.18(2) Bill of Quantities for Sewerage Facilities in Phase I

Item	Calculation	Unit	Quantity
1.8 Sludge Thickner	1 Thickner		
1) Foundation Pile	400 x 400 L = 25 m	pile	57
2) Earth Work			
(1) Excavation	1/2[(13.0)2 +(15.2)2] x x 2.2 = 1,382	m^3	1,382
(2) Surplus Soil	(12.0)2 x x 2.2 = 995	m^3	995
(3) Back Ffilling	1,382 - 995 = 387	m^3	387
3) Whole Concrete Work (Cubic Content of Tank)	(12.0)2 x π x 5.715 = 2,584	m^3	2,584
1.9 Building			
1) Pumping Station	11.6 x 26.0 x 1F = 301.6	m^2	301.6
2) Air Blower Room	22.0 x 15.0 x 2F = 660	m^2	660
	Foundation Pile 400 x 400 x 25 m	pile	41
3) Administrative & Control Roo	20.0 x 30.0 x 2F = 1,200	m^2	1,200
	Foundation Pile 400 x 400 x 25 m	pile	75
4) Disinfection Facility Building	525.0 x 1/3 = 175	m^2	175
	Foundation Pile 350 x 350 x 25 m	pile	22
5) Dewatering Room	26.0 x 48.0 x 2F = 2,496.0	m^2	2,496
	Foundation Pile 400 x 400 x 25 m	pile	156
6) Compost Plant	110 x 281 = 30,910 x 1/4 = 7,728	m^2	7,728
	Foundation Pile 300 x 300 x 25 m	pile	386
1.10 Road in Plant Site	10.0 x (270 + 500 x 2) = 12,700		
	7.0 x (140 + 120 x 5) = 5,180	m^2	17,880
2. Pumpimg Station			
1.1. Site Preperation			
1) Gross Area	108 x 54 = 5,832	m^2	5,832
2) Filling Sand	5,832 x 2 = 11,664	m^3	11,664
1.2.Receiving Tank (Pumping Pit)			
1) Foundation Pile	Cast-in-place Concrete Pile 800	pile	110
2) Earth Work			
(1) Excavation	23.2 x 29.2 x 12.3 = 11,924.1		
	1/2[(34.2 + 9.5) x (27.2 + 19) + (34.2 + 2) x (27.2 + 4)] x 5.0 = 7,871.0		
	1/2[(25.5 + 14) x (39.2 + 7) + (25.5 + 2) x (39.2+ 1)] x 4.5 = 6,593.4	m^3	26,389
(2) Surplus Soil	12.8 x 34.2 x 27.2 + 38.8 x 25.5 x 4.5 = 16,359.4	m^3	16,359
(3) Back Filling	26,389 - 16,359 = 10,030	m^3	10,030
(4) Steel Sheet Pile	[(31.2 + 2)+ (27.2 + 2)] x 2 = 124.8	m	125
3) Whole Concrete Work	34.2 x 27.2 x 18.1 = 17,488.5		
(Cubic Content of Tank)	1/2 (25.0 x 27.2) x 39.3 x 6.145 = 6,303.1	m^3	23,792
1.3. Pumping Station Building (Control Room)			
	31.2 x 27.2 + 32.85 x 34.8 = 1991.8	m^2	1,992
1.4. Road of Site	7.0 x (95 x 2 + 42 x 2) = 1,918	m^2	1,918
3. Sewer Pipe Laying Work			
3.1. O/M Road			
1) Undeveloped Area	300 + 400 + 200 = 900	m	900
2) Narrow Farm Road	700	m	700
3.2.Diversion Chamber	Type 1	set	32
	Type 2	set	0

Table J.5.19(1) Bill of Quantity for Sewerage System in Phase II

Item	Equation	Unit	Quantity
1. Westewater Treatment Plant			
1.1 Site Preperation			
1) The gross area	522,600 - 172,500 = 347,100	m^2	347,100
2) Filling Sand	2,613,000 - 862,500 = 1,750,500	m^3	1,750,500
3) Vertical-Drain	162,587 - 76,667 = 85,920	drain	85,920
1.2 Temporary Access			
1) Temporary Pier	500 - 200 = 300	m^2	300
2) Temporary Road	L = 1000m (Total L=3250m, 2250m;Other Projict)		
(1) Filling Sand		m^3	0
(2) Low Cost Pavement		m^2	0
1.3 Receiving Tank (Pumping Pit)			0
1.4 Primary Sedimentation Tank			
1) Foundation Pile	400x400 L = 25m 727 x 3 = 2,181	pile	2,181
2) Earth Work			
(1) Excavation	16,233 x 3 = 48,699	m^3	48,699
(2) Surplus Soil	15,044 x 3 = 45,132	m^3	45,132
(3) Back Ffilling	1,189 x 3 = 3,567	m^3	3,567
3) Whole Concrete Work (Cubic Content of Tank)	20,713 x 3 = 62,139	m^3	62,139
1.5 Aeration Tank			
1) Foundation Pile	400x400 L = 25m 938 x 3 = 2,814	pile	2,814
2) Earth Work			
(1) Excavation	27,571 x 3 = 82,713	m^3	82,713
(2) Surplus Soil	27,158 x 3 = 81,474	m^3	81,474
(3) Back Ffilling	413 x 3 = 1,239	m^3	1,239
3) Whole Concrete Work (Cubic Content of Tank)	33,760 x 3 = 101,280	m^3	101,280
1.6 Secondary Sedimentation Tank			
1) Foundation Pile	400x400 L = 25m 1,073 x 3 = 3,219	pile	3,219
2) Earth Work			
(1) Excavation	27,377 x 3 = 82,131	m^3	82,131
(2) Surplus Soil	25,809 x 3 = 77,427	m^3	77,427
(3) Back Filling	1,569 x 3 = 4,707	m^3	4,707
3) Whole Concrete Work (Cubic content of Tank)	32,441 x 3 = 97,323	m^3	97,323
1.7 Disinfection Tank			
1) Foundation Pile	350x350 L = 25m 229 - 76 = 153	pile	153
2) Earth Work			
(1) Excavation	11,388 -3,796 =7,592	m^3	7,592
(2) Surplus Soil	8,967 - 2,989 = 5,978	m^3	5,987
(3) Back Filling	7,592 - 5,978 = 1,614	m^3	1,614
3) Whole Concrete Work (Cubic content of Tank)	7,488 - 2,496 = 4,992	m^3	4,992

Table J.5.19(2) Bill of Quantity for Sewerage System in Phase II

Item	Equation	Unit	Quantity
1.8 Sludge Thickner	Another 1 Thickner is Third Stage		0
1.9 Building			
1) Pumping Station		m^2	0
2) Air Blower Room	1,760 - 660 = 1,100	m^2	1,100
	Foundation Pile 400x400x25m	pile	69
3) Administrative &	2,400 - 1,200 = 1,200	m^2	1,200
Control Room	Foundation Pile 400x400x25m	pile	25
4) Disinfection Facility Building	525 - 175 = 350	m^2	350
	Foundation Pile 350x350x25m	pile	31
5) Dewatering Room	2,496 x 1 = 2,496	m^2	2,496
	Foundation Pile 400x400x25m	pile	156
6) Compost Plant	7,728 x 1 = 7,728	m^2	7,728
	Foundation Pile 300x300x25m	pile	386
1.10 Road in Plant Site	29,620 - 17,880 = 11,740	m^2	11,740
2. Pumpimg Station	Civil & Building Works are required.		0
3. Sewer Pipe Laying Work			
3.1 O/M Road			0
3.2 Diversion Chamber	Type 1	set	68
	Type 2	set	3

Table J.5.20(1) Total Construction Cost of Sewerage Development

(Unit : Million VND)

Item	Quantity	Unit	Unit Cost (1000VND)	Construction Cost	Remark
1. Wastewater Treatment Plant					
1.1 Civil & Building Works					
1.1.1 Site Preperation					
1) Geotexitle Sheet	522,600	m^2	35	18,292	
2) Filling Sand	2,613,000	m^3	102	266,526	
3) Vertical-Drain	162,587	drain	1,382	224,695	
1.1.2 Temporary Access					
1) Temporary Pier	500	m^2	8,676	4,338	
2) Temporary Road					
(1) Filling Sand	40,000	m^3	145	4,080	
(2) Low Cost Pavement	7,000	m^2	328	2,296	
1.1.3 Receiving Tank (Pumping Pit)					
1) Foundation Pile	133	pile	15,000	1,995	
2) Earth Work					
(1) Excavation	19,850	m^3	55.8	1,108	
(2) Surplus Soil	12,016	m^3	48.8	586	
(3) Back Filling	7,834	m^3	34.9	273	
(4) Steel Sheet Pile	126	m	305	38	
3) Whole Concrete Work (Cubic Content of Tank)	11,400	m^3	1,186	13,520	
1.1.4 Primary Sedimentation Tank					
1) Foundation Pile	2,908	pile	15,000	43,620	
2) Earth Work					
(1) Excavation	64,932	m^3	55.8	3,623	
(2) Surplus Soil	60,176	m^3	48.8	2,936	
(3) Back Filling	4,756	m^3	34.9	165	
3) Whole Concrete Work (Cubic Content of Tank)	82,852	m^3	1,186	98,263	
1.1.5 Aeration Tank					
1) Foundation Pile	3,752	pile	15,000	56,280	
2) Earth Work					
(1) Excavation	110,284	m^3	55.8	6,153	
(2) Surplus Soil	108,632	m^3	48.8	5,301	
(3) Back Filling	1,652	m^3	34.9	57	
3) Whole Concrete Work (Cubic Content of Tank)	135,040	m^3	1,186	160,157	
1.1.6 Secondary Sedimentation Tank					
1) Foundation Pile	4,292	pile	15,000	64,380	
2) Earth Work					
(1) Excavation	109,508	m^3	55.8	6,111	
(2) Surplus Soil	103,236	m^3	48.8	5,037	
(3) Back Filling	6,276	m^3	34.9	219	
3) Whole Concrete Work (Cubic Content of Tank)	129,764	m^3	1,186	153,900	
1.1.7 Disinfection Tank	153			1,790	
1) Foundation Pile	76	pile	11,700	889	
2) Earth Work	7,592			289	
(1) Excavation	9,774	m^3	55.8	504	
(2) Surplus Soil	4,603	m^3	48.8	202	
(3) Back Filling	5,799	m^3	34.9	5,949	
3) Whole Concrete Work (Cubic Content of Tank)	2,496	m^3	1,186	2,960	

Table J.5.20(2) Construction Cost of Sewerage Development

(Unit : Million VND)

Item	Quantity	Unit	Unit Cost (1000VND)	Construction Cost	Remark
1.1.8 Sludge Thickner					
1) Foundation Pile	57	pile	15,000	855	
2) Earth Work	0			0	
(1) Excavation	1,382	m^3	55.8	77	
(2) Surplus Soil	995	m^3	48.8	49	
(3) Back Filling	387	m^3	34.9	14	
3) Whole Concrete Work	2,584	m^3	1,186	3,065	
(Cubic Content of Tank)	0			0	
1.1.9 Building	0			0	
1) Pumping Station	302	m^2	3,698	1,115	
2) Air Blower Room	1,760	m^2	4,815	8,472	
Foundation Pile	110	pile	15,000	1,650	
3) Administrative & Control Building	2,400	m^2	4,745	11,388	
Foundation Pile	100	pile	15,000	1,500	
4) Disinfection Facility Building	525	m^2	4,815	2,527	
Foundation Pile	53	pile	15,000	795	
5) Dewatering Room	4,992	m^2	4,815	24,032	
Foundation Pile	312	pile	15,000	4,680	
6) Compost Plant	15,456	m^2	2,589	40,016	
Foundation Pile	772	pile	8,100	6,254	
1.1.10 Road in Plant Site	29,620	m^2	500	14,810	
Total				1,277,831	
Cost for indirect works (12%)				153,339	
Head office expenses (5%)				71,558	
Total of 1.1				1,502,728	
1.2 Mechanical and Electricity Works					
1.2.1 Lifting Pump	1	unit		50,094	
1.2.2 Primary Sedimentation	1	unit		74,832	
1.2.3 Aeration Tank	1	unit		105,028	
1.2.4 Secondary Sedimentation	1	unit		95,060	
1.2.5 Disinfection	1	unit		15,262	
1.2.6 Primary Sludge Thickener	1	unit		11,016	
1.2.7 Excess Sludge Thickener	1	unit		29,478	
1.2.8 Dewatering	1	unit		71,886	
1.2.9 Compost Plant	1	unit		42,560	
1.2.10 Water Reuse	1	unit		11,364	
1.2.11 Deodorization	1	unit		5,539	
1.2.12 Piping Material	1	unit		44,300	
1.2.13 Electricity	1	unit		226,304	
1.2.14 Spare Parts	1	unit		8,204	
1.2.15 Packing and Delivery	1	unit		32,412	
1.2.16 Marine Transportation	1	unit		27,900	
1.2.17 Installation and Piping	1	unit		81,284	
Above costs include indirect cost and overhead charge.					
Total of 1.2				932,523	
Total of WastewaterTreatment Plant				2,435,251	
2. Pumpimg Station					
2.1 Civil & Building Works					
2.1.1 Site Preperation					
1) Geotexitle Sheet	5,832	m^2	35	204	
2) Filling Sand	11,664	m^3	145	1,691	

Table J.5.20(3) Construction Cost of Sewerage Development

(Unit : Million VND)

Item	Quantity	Unit	Unit Cost (1000VND)	Construction Cost	Remark
2.1.2 Receiving Tank (Pumpig Pit)					
1) Foundation Pile	110	pile	53,320	5,865	
2) Earth Work					
(1) Excavation	26,389	m^3	55.8	1,473	
(2) Surplus Soil	16,359	m^3	48.8	798	
(3) Back Filling	10,030	m^3	34.9	350	
(4) Steel Sheet Pile	125	m	305	38	
3) Whole Concrete Work (Cubic Content of Tank)	23,792	m^3	1,186	28,217	
2.1.3 Pumping Station Building (Control Room)	1,992	m^2	3,698	7,366	
2.1.4 Road of Site	1,918	m^2	500	959	
Total				46,961	
Cost for indirect works (12%)				5,635	
Head office expenses (5%)				2,630	
Total of 2.1				55,226	
2.2 Mechanical and Electricity Works					
2.2.1 Screen	1	unit		32,062	
2.2.2 Grid Chamber	1	unit		13,477	
2.2.3 Lifting Pump	1	unit		50,094	
2.2.4 Piping Material	1	unit		7,400	
2.2.5 Electricity	1	unit		34,000	
2.2.6 Installation and Piping	1	unit		14,000	
Above costs include indirect cost and overhead charge.					
Total of 2.2				151,033	
Total of Pumping Station				206,259	
3. Interceptor Sewer					
3.1 Interceptor Sewer	2	set		441,204	Table J.21
3.2 Diversion Chamber Type. 1	100	set	128,895	12,890	Table J.28
Type. 2	3	set	126,782	380	Table J.28
Sub-Total				454,474	
Cost for indirect works (12%)				54,536	
Head office expenses (5%)				25,451	
Total of 3				534,461	
4. Conveyance Sewer					
4.1 Conveyance Sewer	1	set		337,859	Table J.22
4.2 O/M Road					
1) Undeveloped Area	900	m	7,296	6,566	Table J.16
2) Narrow Farm Road	700	m	5,326	3,728	Table J.16
Sub-Total				348,153	
Cost for indirect works (12%)				41,778	
Head office expenses (5%)				19,497	
Total of 4				409,428	
5. Sewerage Construction for unsewered area					
5.1 New Sewer Construction	1	set		43,781	Table J.23
5.2 Manhole	1	set		5,190	Table J.23
5.3 House Connection	1	set		31,112	Table J.23
Sub-Total				80,083	
Cost for indirect works (12%)				9,610	
Head office expenses (5%)				4,485	
Total of 5				94,178	
Total Construction Cost				3,679,577	

Table J.5.21(1) Construction Cost of Sewerage Development in Phase I

(Unit : Million VND)

Item	Quantity	Unit	Unit Cost (1000VND)	Construction Cost	Remark
I. Wastewater Treatment Plant					
1.1 Civil & Building Works					
1.1.1 Site Preperation					
1) Gross Area	175,500	m^2	35	6,143	
2) Filling Sand	862,500	m^3	102	87,975	
3) Vertical-Drain	76,667	drain	1,382	105,954	
1.1.2 Temporary Access				0	
1) Temporary Pier	200	m^2	8,676	1,735	
2) Temporary Road				0	
(1) Filling Sand	40,000	m^3	102	4,080	
(2) Low Cost Pavement	7,000	m^2	328	2,296	
1.1.3 Receiving Tank (Pumping Pit)				0	
1) Foundation Pile	133	pile	15,000	1,995	
2) Earth Work				0	
(1) Excavation	19,850	m^3	55.8	1,108	
(2) Surplus Soil	12,016	m^3	48.8	586	
(3) Back Filling	7,834	m^3	34.9	273	
(4) Steel Sheet Pile	126	m	305	38	
3) Whole Concrete Work	11,400	m^3	1,186	13,520	
(Cubic Content of Tank)				0	
1.1.4 Primary Sedimentation Tank				0	
1) Foundation Pile	727	pile	15,000	10,905	
2) Earth Work				0	
(1) Excavation	16,233	m^3	55.8	906	
(2) Surplus Soil	15,044	m^3	48.8	734	
(3) Back Filling	1,189	m^3	34.9	41	
3) Whole Concrete Work	20,713	m^3	1,186	24,566	
(Cubic Content of Tank)				0	
1.1.5 Aeration Tank				0	
1) Foundation Pile	938	pile	15,000	14,070	
2) Earth Work				0	
(1) Excavation	27,571	m^3	55.8	1,538	
(2) Surplus Soil	27,158	m^3	48.8	1,325	
(3) Back Filling	413	m^3	34.9	14	
3) Whole Concrete Work	33,760	m^3	1,186	40,039	
(Cubic Content of Tank)				0	
1.1.6 Secondary Sedimentation Tank				0	
1) Foundation Pile	1,073	pile	15,000	16,095	
2) Earth Work				0	
(1) Excavation	27,377	m^3	55.8	1,528	
(2) Surplus Soil	25,809	m^3	48.8	1,259	
(3) Back Filling	1,569	m^3	34.9	55	
3) Whole Concrete Work	32,441	m^3	1,186	38,475	
(Cubic Content of Tank)				0	
1.1.7 Disinfection Tank				0	
1) Foundation Pile	76	pile	11,700	889	
2) Earth Work				0	
(1) Excavation	3,796	m^3	55.8	212	
(2) Surplus Soil	2,989	m^3	48.8	146	
(3) Back Filling	807	m^3	34.9	28	
3) Whole Concrete Work	2,496	m^3	1,186	2,960	
(Cubic Content of Tank)				0	

Table J.5.21(2) Construction Cost of Sewerage Development in Phase I

(Unit : Million VND)

Item	Quantity	Unit	Unit Cost (1000VND)	Construction Cost	Remark
1.1.8 Sludge Thickner				0	
1) Foundation Pile	57	pile	15,000	855	
2) Earth Work				0	
(1) Excavation	1,382	m^3	55.8	77	
(2) Surplus Soil	995	m^3	48.8	49	
(3) Back Filling	387	m^3	34.9	14	
3) Whole Concrete Work	2,584	m^3	1,186	3,065	
(Cubic Content of Tank)				0	
1.1.9 Building				0	
1) Pumping Station	301.6	m^2	3,698	1,115	
2) Air Blower Room	660	m^2	4,814	3,177	
Foundation Pile	41	pile	15,000	615	
3) Administrative & Control Building	1,200	m^2	4,745	5,694	
Foundation Pile	75	pile	15,000	1,125	
4) Disinfection Facility Building	175	m^2	4,814	842	
Foundation Pile	22	pile	15,000	330	
5) Dewatering Room	2,496	m^2	4,814	12,016	
Foundation Pile	156	pile	15,000	2,340	
6) Compost Plant	7,728	m^2	2,589	20,008	
Foundation Pile	386	pile	8,100	3,127	
1.1.10 Road in Plant Site	17,880	m^2	500	8,940	
Total				444,877	
Cost for indirect works (12%)				53,385	
Head office expenses (5%)				24,913	
Total of 1.1				523,175	
1.2 Mechanical and Electricity Works					
1.2.1 Lifting Pump	1	unit		20,038	40%(2/5)
1.2.2 Primary Sedimentation	1	unit		18,708	16.7%(1/6)
1.2.3 Aeration Tank	1	unit		26,257	16.7%(1/6)
1.2.4 Secondary Sedimentation	1	unit		23,765	16.7%(1/6)
1.2.5 Disinfection	1	unit		3,815	25%
1.2.6 Primary Sludge Thickener	1	unit		11,016	50%
1.2.7 Excess Sludge Thickener	1	unit		0	0%
1.2.8 Dewatering	1	unit		35,943	31.6%(6/19)
1.2.9 Compost Plant	1	unit		10,640	16.7%(1/6)
1.2.10 Water Reuse	1	unit		2,841	16.7%(1/6)
1.2.11 Deodorization	1	unit		1,385	25%
1.2.12 Piping Material	1	unit		11,075	16.7%(1/6)
1.2.13 Electricity	1	unit		56,576	16.7%(1/6)
1.2.14 Spare Parts	1	unit		2,051	16.7%(1/6)
1.2.15 Packing and Delivery	1	unit		8,103	16.7%(1/6)
1.2.16 Marine Transportation	1	unit		6,975	16.7%(1/6)
1.2.17 Installation and Piping	1	unit		20,321	16.7%(1/6)
Above costs include indirect cost and overhead charge.					
Total of 1.2				259,509	
Total of 1.				782,684	
2. Pumpimg Station				0	
2.1 Civil & Building Works					
2.1.1 Site Preperation					
1) Geotexitle Sheet	5,832	m^2	35	204	
2) Filling Sand	11,664	m^3	145	1,691	

Table J.5.21(3) Construction Cost of Sewerage Development in Phase I

(Unit : Million VND)

Item	Quantity	Unit	Unit Cost (1000VND)	Construction Cost	Remark
2.1.2 Receiving Tank (Pumpig Pit)					
1) Foundation Pile	110	pile	53,320	5,865	
2) Earth Work					
(1) Excavation	26,389	m^3	55.8	1,473	
(2) Surplus Soil	16,359	m^3	48.8	798	
(3) Back Filling	10,030	m^3	34.9	350	
(4) Steel Sheey Pile	125	m	305	38	
3) Whole Concrete Work (Cubic Content of Tank)	23,792	m^3	1,186	28,217 0	
2.1.3 Pumping Station Building (Control Room)	1,992	m^2	3,698	7,366	
2.1.4 Road of Site	1,918	m^2	500	959	
Total				46,961	
Cost for indirect works (12%)				5,635	
Head office expenses (5%)				2,630	
Total of 2.1				55,226	
2.2 Mechanical and Electricity Works					
2.2.1 Screen	1	unit		8,016	25%
2.2.2 Grid Chamber	1	unit		0	0%
2.2.3 Lifting Pump	1	unit		20,038	40%(2/5)
2.2.4 Piping Material	1	unit		1,850	25%
2.2.5 Electricity	1	unit		17,000	50%
2.2.6 Installation and Piping	1	unit		3,500	25%
Above costs include indirect cost and overhead charge.					
Total of 2.2				50,404	
Total of 2.				105,630	
3. Interceptor Sewer					
3.1 Interceptor Sewer	1	set		136,462	Table J.21
3.2.Diversion Chamber Ttpe. 1	32	set	128,895	4,125	Table J.28
Type. 2	0	set	126,782	0	
Sub-Total				140,587	
Cost for indirect works (12%)				16,870	
Head office expenses (5%)				7,873	
Total of 3				165,330	
4. Conveyance Sewer					
4.1. Conveyance Sewer	1	set		337,859	Table J.22
4.2. O/M Road					
1) Undeveloped Area	900	m	7,296	6,566	Table J.17
2) Narrow Farm Road	700	m	5,326	3,728	Table J.17
Sub-Total				348,153	
Cost for indirect works (12%)				41,778	
Head office expenses (5%)				19,497	
Total of 4				409,428	
5. Sewer Construction Future Development Area					
5.1. New Sewer Construction	1	set		0	
5.2. Manhole	1	set		0	
5.3. House Connection	1	set		0	
Sub-Total				0	
Cost for indirect works (12%)				0	
Head office expenses (5%)				0	
Total of 5				0	
Total Construction Cost of Phase I				1,463,072	

Table J.5.22(1) Construction Cost of Sewerage Development in Phase II

(Unit : Million VND)

Item	Quantity	Unit	Unit Cost (1000VND)	Construction Cost	Remark
1. Wastewater Treatment					
1.1 Civil & Building Works					
1.1.1 Site Preperation					
1) The gross area	347,100	m^2	35	12,149	
2) Filling Sand	1,750,500	m^3	102	178,551	
3) Vertical-Drain	85,920	drain	1,382	118,741	
1.1.2 Temporary Access					
1) Temporary Pier	300	m^2	8,676	2,603	
2) Temporary Road				0	
(1) Filling Sand	0	m^3	102	0	
(2) Low cost pavement	0	m^2	328	0	
1.1.3 Receiving Tank (Pumping Pit)				0	
1) Foundation Pile	0	pile	15,000	0	
2) Earth Work				0	
(1) Excavation	0	m^3	55.8	0	
(2) Surplus Soil	0	m^3	48.8	0	
(3) Back Filling	0	m^3	34.9	0	
(4) Steel Sheet Pile	0	m	305	0	
3) Whole Concrete Work (Cubic content of Tank)	0	m^3	1,186	0	
1.1.4 Primary Sedimentation Tank					
1) Foundation Pile	2,181	pile	15,000	32,715	
2) Earth Work				0	
(1) Excavation	48,699	m^3	55.8	2,717	
(2) Surplus Soil	45,132	m^3	48.8	2,202	
(3) Back Ffilling	3,567	m^3	34.9	124	
3) Whole Concrete Work (Cubic content of Tank)	62,139	m^3	1,186	73,697	
1.1.5 Aeration Tank					
1) Foundation Pile	2,814	pile	15,000	42,210	
2) Earth Work				0	
(1) Excavation	82,713	m^3	55.8	4,615	
(2) Surplus Soil	81,474	m^3	48.8	3,976	
(3) Back Ffilling	1,239	m^3	34.9	43	
3) Whole Concrete Work (Cubic content of Tank)	101,280	m^3	1,186	120,118	
1.1.6 Secondary Sedimentation Tank					
1) Foundation Pile	3,219	pile	15,000	48,285	
2) Earth Work				0	
(1) Excavation	82,131	m^3	55.8	4,583	
(2) Surplus Soil	77,427	m^3	48.8	3,778	
(3) Back Ffilling	4,707	m^3	34.9	164	
3) Whole Concrete Work	97,323	m^3	1,186	115,425	
1.1.7 Disinfection Tank					
1) Foundation Pile	153	pile	11,700	1,790	
2) Earth Work				0	
(1) Excavation	7,592	m^3	55.8	289	
(2) Surplus Soil	5,978	m^3	48.8	292	
(3) Back Ffilling	1,614	m^3	34.9	56	
3) Whole Concrete Work (Cubic content of Tank)	4,992	m^3	1,186	5,921	

Table J.5.22(2) Construction Cost of Sewerage Development in Phase II

(Unit : Million VND)

Item	Quantity	Unit	Unit Cost (1000VND)	Construction Cost	Remark
1.1.8 Sludge Thickner					
1) Foundation Pile	0	pile	15,000	0	
2) Earth Work				0	
(1) Excavation	0	m^3	55.8	0	
(2) Surplus Soil	0	m^3	48.8	0	
(3) Back Ffilling	0	m^3	34.9	0	
3) Whole Concrete Work	0	m^3	1,186	0	
(Cubic content of Tank)				0	
1.1.9 Building				0	
1) Pumping Station	0	m^2	3,698	0	
2) Air Blower Room	1100	m^2	4,814	5,295	
Foundation Pile	69	pile	15,000	1,035	
3) Administrative & Control Building	1,200	m^2	4,745	5,694	
Foundation Pile	25	pile	15,000	375	
4) Disinfection Facility Building	350	m^2	4,814	1,685	
Foundation Pile	31	pile	15,000	465	
5) Dewatering Room	2,496	m^2	4,814	12,016	
Foundation Pile	156	pile	15,000	2,340	
6) Compost Plant	7,728	m^2	2,589	20,008	
Foundation Pile	386	pile	8,100	3,127	
1.1.10 Road in Plant Site	11,740	m^2	500	5,870	
Total				832,954	
Cost for indirect works (12%)				99,954	
Head office expenses (5%)				46,645	
Total of 1.1				979,553	
1.2 Mechanical and Electricity Works					
1.2.1 Lifting Pump	1	unit		30,056	100%
1.2.2 Primary Sedimentation	1	unit		56,124	50%(3/6)
1.2.3 Aeration Tank	1	unit		78,771	50%(3/6)
1.2.4 Secondary Sedimentation	1	unit		71,295	50%(3/6)
1.2.5 Disinfection	1	unit		11,447	100%
1.2.6 Primary Sludge Thickener	1	unit		0	0%
1.2.7 Excess Sludge Thickener	1	unit		29,478	50%
1.2.8 Dewatering	1	unit		35,943	31.6%(6/19)
1.2.9 Compost Plant	1	unit		31,920	50%(3/6)
1.2.10 Water reuse	1	unit		8,523	50%(3/6)
1.2.11 Deodorization	1	unit		4,154	100%
1.2.12 Piping Material	1	unit		33,225	50%(3/6)
1.2.13 Electricity	1	unit		169,728	50%(3/6)
1.2.14 Spare parts	1	unit		6,153	50%(3/6)
1.2.15 Packing and delivery	1	unit		24,309	50%(3/6)
1.2.16 Marine transportation	1	unit		20,925	50%(3/6)
1.2.17 Installation and piping	1	unit		60,963	50%(3/6)
Above costs include indirect cost and overhead charge.					
Total of 1.2				673,014	
Total of 1.				1,652,567	
2. Pumpimg Station				0	
2.1 Civil & Building Works				0	
2.1.1 Site Preperation					
1) Geotexitle Sheet	0	m^2	35	0	
2) Filling Sand	0	m^3	145	0	

Table J.5.22(3) Construction Cost of Sewerage Development

(Unit : Million VND)

Item	Quantity	Unit	Unit Cost (1000VND)	Construction Cost	Remark
2.1.2 Receiving Tank (Pumpig Pit)					
1) Foundation Pile	0	pile	53,320	0	
2) Earth Work					
(1) Excavation	0	m^3	55.8	0	
(2) Surplus Soil	0	m^3	48.8	0	
(3) Back Filling	0	m^3	34.9	0	
(4) Steel Sheet Pile	0	m	305	0	
3) Whole Concrete Work	0	m^3	1,186	0	
(Cubic Content of Tank)				0	
2.1.3 Pumping Station Building	0	m^2	3,698	0	
(Control Room)				0	
2.1.4 Road of Site	0	m^2	500	0	
Total				0	
Cost for indirect works (12%)				0	
Head office expenses (5%)				0	
Total of 2.1				0	
2.2 Mechanical and Electricity Works					
2.2.1 Screen	1	unit		24,046	100%
2.2.2 Grid Chamber	1	unit		13,477	100%
2.2.3 Lifting Pump	1	unit		30,056	100%
2.2.4 Piping material	1	unit		5,550	100%
2.2.5 Electricity	1	unit		17,000	100%
2.2.6 Installation and piping	1	unit		10,500	100%
Above costs include indirect cost and overhead charge.					
Total of 2.2				100,629	
Total of 2.				100,629	
3. Interceptor Sewer					
3.1 Interceptor Sewer	1	set		304,742	Table J.21
3.2 Diversion Chamber Ttpe. 1	68	set	128,895	8,765	Table J.28
Type. 2	3	set	126,782	380	Table J.28
Sub-Total				313,887	
Cost for indirect works (12%)				37,666	
Head office expenses (5%)				17,578	
Total of 3.				369,131	
4. Conveyance Sewer					
4.1 Conveyance Sewer	0	set		0	
4.2 O/M Road					
1) Undeveloped area	0	m	7,296	0	
2) Narrow farm road	0	m	5,326	0	
Sub-Total				0	
Cost for indirect works (12%)				0	
Head office expenses (5%)				0	
Total of 4.				0	
5. Sewerage Construction for unsewered area					
5.1 New Sewer construction	1	set		43,781	Table.J 23
5.2 Manhole	1	set		5,190	Table.J 23
5.3 House Connection	1	set		31,112	Table.J 23
Sub-Total				80,083	
Cost for indirect works (12%)				9,610	
Head office expenses (5%)				4,485	
Total of 5.				94,178	
Total Construction Cost of Phase II				2,216,505	

Table J.5.23 Construction Cost of Interceptor Sewer

Sub-Zone	Pipe No	Diameter (mm)	Length (m)	Average Depth (m)	Unit Price (1000VND)	Construction Method	Construction Cost (MVND)	Remarks
Tau Ha Ben Nghe Canal Left Bank (East Side)		700	870	5	3,336	OC	2,902	- Main
		1,000	1,130	7	5,324	OC	6,016	
		1,100	840	8	6,640	OC	5,578	
		1,200	1,070	9	41,647	PJ	41,562	
		1,500	1,070	11	44,131	PJ	47,223	
		1,500	500	12	44,131	PJ	22,067	
	Sub-Total		5,480				128,348	
		300	2,016	3	1,220	OC	2,460	- Secondary
		400	633	3	1,270	OC	804	
		450	678	3	1,330	OC	902	
		500	1,588	3	1,390	OC	2,207	
		700	1,138	3	1,530	OC	1,741	
	Sub-Total		6,053				8,114	
Total of Left Bank			10,090				136,462	
Tau Ha Ben Nghe Canal Left Bank (West Side)		700	1,950	4	1,860	OC	3,627	
		1,000	400	6	4,294	OC	1,718	
		1,200	550	6	5,767	OC	3,172	
		1,500	1,340	8	7,597	OC	10,180	
		1,500	750	9	55,167	PJ	41,375	
Sub-Total			4,990				60,072	
Khanh Hoi	K1	500	207	2	870	OC	180	
	K2	800	1,652	3	1,590	OC	2,627	
	K3	400	514	2	760	OC	391	
	K4	800	600	4	1,920	OC	1,152	
	K8	400	960	3	1,270	OC	1,219	
	K7	600	582	4	1,400	OC	815	
	K6	800	1,259	6	4,153	OC	5,229	
	K5	1,100	560	7	5,545	OC	3,105	
	KC	2,500	179	Te Canal	142,968	ST	25,593	Siphone 2 line
Sub-Total			6,513				40,309	
Hung Phu	H1	400	845	3	1,270	OC	1,073	
	H2	400	797	4	1,600	OC	1,275	
	H3	400	733	2	760	OC	557	
	H4	400	823	3	1,270	OC	1,045	
	H5	400	387	4	1,600	OC	619	
	H6	400	798	2	760	OC	606	
	HC	1,500	160	Doi Canal	44,134	PJ	7,061	Siphone 2 line
Sub-Total			4,543				12,236	
Binh Dong	BDO1	400	1,077	3	1,270	OC	1,368	
	BDO2	400	1,424	3	1,270	OC	1,808	
	BDOC	350	42	Ngang 1 Canal	3,735	OC	157	Siphone 2 line
Sub-Total			2,543				3,333	
Tung Thien Vuong	T1	450	173	5	3,858	OC	667	
	T2	400	809	2	760	OC	615	
	T3	600	380	5	3,288	OC	1,249	
	T4	400	363	2	760	OC	276	
	T5	600	143	6	4,108	OC	587	
	T6	400	1,046	3	1,270	OC	1,328	
	T7	400	825	2	760	OC	627	
	T8	450	984	5	3,188	OC	3,127	
	TC	1,500	150	Doi Canal	44,134	PJ	6,620	Siphone 2 line
Sub-Total			4,870				15,096	
Rach Ong	R1	1,100	654	9	38,539	PJ	25,205	
	R2	1,200	519	10	41,647	PJ	21,615	
	RC	1,200	21	11	41,647	PJ	875	
Sub-Total			1,194				47,695	
Binh Dang	BDA1	700	1,921	4	1,860	OC	3,573	
	BDA2	1,000	587	9	35,431	PJ	20,798	
	BDAC	1,000	41	Xom Cui River	35,431	PJ	1,453	
Sub-Total			2,549				25,824	
Pham The Hien	P1	1,100	809	9	38,539	PJ	31,178	
	P2	1,300	1,074	11	43,305	PJ	46,510	
	P3	1,200	540	10	41,647	PJ	22,489	
Sub-Total			2,423				100,177	
Grand Total			35,165				411,201	

Table J.5.24 Construction Cost of Conveyance Sewer

Sub-Zone	Pipe No.	Diameter (mm)	Length (m)	Average Depth (m)	Unit Price (1000VND)	Construction Method	Construction Cost (MVND)	Remarks
Conveynace	C2	1,500	500	13	44,134	PJ	22,067	
	C3	2,000	300	13	118,104	ST	35,431	
	C4	2,000	200	13	118,104	ST	23,621	
	C5	2,500	1,000	4	3,850	OC	3,850	
	C6	2,500	300	5	4,593	OC	1,378	
	C7	2,500	700	5	4,593	OC	3,215	
	C8	2,500	50	6	142,968	ST	7,148	River crossing
	C9	2,500	350	6	11,688	OC	4,091	
	C10	2,500	200	6	11,688	OC	2,338	
	C11	2,500	200	6	11,688	OC	2,338	
	C12	2,500	1,100	7	16,300	OC	17,930	
	C13	2,500	100	8	142,968	ST	14,297	River crossing
	TP	2,500	1,400	9	142,968	ST	200,155	
Total			6,400				337,859	

Table J.5.25 Construction Cost of Sewer for Separate System Areas (Wastewater)

1) **Binh Dang Area (208ha)**

Item	Population in 2010	Average Resident of Household	No of House Connection	Unit Cost (1000VND)	Construction Cost (MVND)
House Connection	41,562	5.71	7,279	1,170	8,516
Sub Total			7,279		8,516
Item	Diameter (mm)	Average Depth (m)	Length (m)	Unit Cost (1000VND)	Construction Cost (MVND)
Secondary/Tertiary sewer	ϕ 300	2	9,981	710	7,089
Main sewer	ϕ 300	2	4,803	710	3,410
	ϕ 300	3	1,244	1,220	1,518
	ϕ 300	4	1,114	1,550	1,359
	ϕ 400	2	601	760	932
	ϕ 400	5	181	3,136	138
	ϕ 500	5	488	3,239	1,530
	ϕ 500	6	507	3,992	2,024
Sub Total			18,922		18,000
Item	Type		No of Manhole		Construction Cost (MVND)
Manhole	1 - Type		368		1,708
	2 - Type		23		529
Sub Total			391		2,237
Total					28,753

2) **Pham The Hien Area (195.8 ha)**

Item	Population in 2010	Average Resident of Household	No of House Connection	Unit Cost (1000VND)	Construction Cost (MVND)
House Connection	42,796	5.71	7,495	1,170	8,769
Sub Total			7,495		8,769
Item	Diameter (mm)	Average Depth (m)	Length (m)	Unit Cost (1000VND)	Construction Cost (MVND)
Secondary/Tertiary sewer	ϕ 300	2	9,398	710	6,673
Main sewer	ϕ 300	2	7,214	710	5,122
	ϕ 300	3	1,356	1,220	1,654
	ϕ 300	4	779	1,550	1,207
	ϕ 400	4	287	1,600	459
Sub Total			19,034		15,115
Item	Type		No of Manhole		Construction Cost (MVND)
Manhole	1 - Type		388		1,721
Sub Total			388		1,721
Total					25,605

3) **Rach Ong Area (133 ha)**

Item	Population in 2010	Average Resident of Household	No of House Connection	Unit Cost (1000VND)	Construction Cost (MVND)
House Connection	67,480	5.71	11,818	1,170	13,827
Sub Total			11,818		13,827
Item	Diameter (mm)	Average Depth (m)	Length (m)	Unit Cost (1000VND)	Construction Cost (MVND)
Secondary/Tertiary sewer	ϕ 300	2	6,384	710	4,533
Main sewer	ϕ 300	2	5,090	710	3,614
	ϕ 300	3	199	1,220	243
	ϕ 400	2	314	760	239
	ϕ 400	3	606	1,270	770
	ϕ 500	3	647	1,390	899
	ϕ 600	3	250	1,470	368
Sub Total			13,490		10,666
Item	Type		No of Manhole		Construction Cost (MVND)
Manhole	1 - Type		259		1,098
	2 - Type		20		134
Sub Total			279		1,232
Total					16,431

Table J.5.26 Construction Cost of Sewer Pipe for Priority Drainage Area

Area name	Pipe No.	Diameter (mm)	Length (m)	Average Depth (m)	Unit Price (1000VND)	Construction Method	Construction Cost (MVND)	Remarks
Thanh Da		800	47	3	1,590	OC	75	
		1,000	353	3	1,720	OC	607	
		1,200	291	3	1,960	OC	570	
Total			691				1,252	

Area name	Pipe No.	Diameter (mm)	Length (m)	Average Depth (m)	Unit Price (1000VND)	Construction Method	Construction Cost (MVND)	Remarks
Ben Me Coc 1		900	700	3	1,660	OC	1,162	
		1,000	841	3	1,720	OC	1,447	
		1,100	88	4	2,185	OC	192	
		1,200	1,582	4	2,310	OC	3,654	
		1,500	927	4	2,590	OC	2,401	
		1,800	469	4	2,884	OC	1,353	
Total			4,607				10,209	

Area name	Pipe No.	Diameter (mm)	Length (m)	Average Depth (m)	Unit Price (1000VND)	Construction Method	Construction Cost (MVND)	Remarks
Ben Me Coc 2		800	377	3	1,590	OC	599	
		900	587	3	1,660	OC	974	
		1,000	1,567	3	1,720	OC	2,695	
		1,200	345	4	2,310	OC	797	
		1,500	1,018	4	2,590	OC	2,637	
		1,800	148	4	2,884	OC	427	
		2,000	164	4	3,080	OC	505	
Total			4,206				8,634	

Table J.5.27 Construction Cost of Manhole for Priority Drainage Area

Area Name	Manhole Type	Diameter (mm)	Length (m)	Average Depth (m)	No of Manhole	Unit Price (1000VND)	Construction Cost (MVND)	Remarks
Thanh Da	3	800	47	3	2	9,000	18	
	4	1,000	353	3	8	11,100	89	
	4	1,200	291	3	7	11,100	76	
	Sub-total				15			
Total			691		17		183	

Area Name	Manhole Type	Diameter (mm)	Length (m)	Average Depth (m)	No of Manhole	Unit Price (1000VND)	Construction Cost (MVND)	Remarks
Ben Me Coc 1	3	900	700	3	14	9,000	126	
	4	1,000	841	3	18	11,100	198	
	4	1,100	88	4	3	21,715	60	
	4	1,200	1,582	4	33	21,715	709	
	Sub-total				35			
	5	1,500	927	4	20	21,950	429	
	6	1,800	469	4	10	23,595	245	
Total			4,607		97		1,767	

Area Name	Manhole Type	Diameter (mm)	Length (m)	Average Depth (m)	No of Manhole	Unit Price (1000VND)	Construction Cost (MVND)	Remarks
Ben Me Coc 2	3	800	377	3	8	9,000	68	
	3	900	587	3	13	9,000	115	
	Sub-total				20			
	4	1,000	1,567	3	32	11,100	359	
	4	1,200	345	4	8	21,715	172	
	5	1,500	1,018	4	21	21,950	469	
	6	1,800	148	4	4	23,595	93	
	6	2,000	164	4	4	23,595	101	
	Sub-total				8			
Total			4,206		89		1,377	

Table J.5.28 Construction Cost of Sewer for Separate System Areas (Stormwater)

1) **Binh Dang Area (208ha)**

Item	Diameter (mm)	Avarage Depth (m)	Length (m)	Unit Cost (1000VND)	Construction Cost (MVND)
Secondary/Tertiary sewer	ϕ 600	2	9,984	940	9,385
Main sewer	ϕ 800	2	181	1,050	190
	ϕ 1000	2	107	1,170	125
	ϕ 1200	3	740	1,960	1,450
	ϕ 1300	3	257	2,053	528
	ϕ 1500	3	3,370	2,240	7,549
	ϕ 1800	4	2,302	2,884	6,639
	ϕ 2500	4	1,839	3,850	7,080
	ϕ 2500	5	309	4,593	1,419
	ϕ 3000	5	168	6,511	1,094
Sub Total			19,257		35,459

Item	Type	No of Manhole	Construction Cost (MVND)
Manhole	3 - Type	5	34
	4 - Type	20	211
	5 - Type	76	860
	6 - Type	48	1,144
	7 - Type	46	1,557
	8 - Type	5	212
Sub Total		200	4,018
Total			39,477

2) **Pham The Hien Area (195.8 ha)**

Item	Diameter (mm)	Average Depth (m)	Length (m)	Unit Cost (1000VND)	Construction Cost (MVND)
Secondary/Tertiary sewer	ϕ 600	2	9,398	940	8,834
Main sewer	ϕ 600	2	90	940	85
	ϕ 700	2	99	995	99
	ϕ 1000	3	476	1,720	819
	ϕ 1100	3	298	1,840	548
	ϕ 1200	3	1,898	1,960	3,720
	ϕ 1300	3	1,069	2,053	2,195
	ϕ 1500	3	3,034	2,240	6,796
	ϕ 1600	3	443	2,330	1,032
	ϕ 1800	4	778	2,884	2,244
	ϕ 2000	4	367	3,080	1,130
	ϕ 2500	4	1,459	3,850	5,617
Sub Total			19,409		33,119

Item	Type	No of Manhole	Construction Cost (MVND)
Manhole	2 - Type	3	15
	3 - Type	3	20
	4 - Type	57	633
	5 - Type	85	962
	6 - Type	36	739
	7 - Type	31	1,011
Sub Total		215	3,380
Total			36,499

3) **Rach Ong Area (133 ha)**

Item	Diameter (mm)	Average Depth (m)	Length (m)	Unit Cost (1000VND)	Construction Cost (MVND)
Secondary/Tertiary sewer	ϕ 600	2	6,384	940	6,001
Main sewer	ϕ 1000	3	484	1,720	832
	ϕ 1100	3	554	1,840	1,019
	ϕ 1200	3	1,520	1,960	2,979
	ϕ 1300	3	977	2,053	2,006
	ϕ 1500	3	872	2,240	1,953
	ϕ 1600	3	331	2,330	771
	ϕ 1800	3	801	2,528	2,025
	ϕ 1800	4	824	2,884	2,376
	ϕ 2000	4	211	3,080	650
	ϕ 2500	4	813	3,850	3,130
Sub Total			13,771		17,741

Item	Type	No of Manhole	Construction Cost (MVND)
Manhole	4 - Type	56	621
	5 - Type	42	476
	6 - Type	44	739
	7 - Type	24	783
Sub Total		166	2,619
Total			20,360

Table J.5.29 Proposed Section of Existing Main Combined Sewer Improvement

Sewer

Sewer Line No.	Section Upstream	Section Downstream	Road Name	Existing Pipe Diameter (mm) / Conduit Type	Improvement	Length (m)	Diameter (mm)	Average Excavation Depth (m)	Unit Cost (1000VND/m)	Construction Cost (MVND)
1	51_1	134B_1	Nguyen Bieu	800	Additional	147	1,200	3	1,960	288
2	134B_1	134B_2	ditto	-	New	362	2,500	6	3,400	1,231
3	49_1	253_1	Le Hong Phong	800	Additional	391	1,000	3	1,170	457
4	253_1	50B_1	Hung Vuong	800	Additional	298	2,000	4	2,728	813
5	50B_1	50EA_1	Tran Binh Trong	1,000	Replace	932	2,000	6	3,674	3,424
6	50EA_1	50EB_1	ditto	J-1	Replace	25	2,000	7	9,350	234
7	50EB_1	50EC_2	ditto	J-1	Replace	363	2,500	7	11,200	4,066
8	140A_1	47C_1	Dien Bien Phu	800	Additional	714	2,500	4	3,850	2,749
9	-	-	Nguyen Tri Phuong	-	New	4,740	ox : 2400 x 2000 - 2400 x 3000	6	9,350	44,319
10	-	-	Le Dai Hanh - Mac Cuu	-	New	3,620	ox : 2400 x 2400 - 2400 x 3000	6	9,350	33,847
Total						11,592				91,428

Manhole

Type	Construction Cost (MVND) 3	4	5	6	7	Sub Total
Type-1						0
Type-2						0
Type-3						0
Type-4	144					144
Type-5						0
Type-6						0
Type-7		605		9,826	573	11,004
Sub Total	144	605	0	9,826	573	11,148

Table J.5.30 Construction Cost of DIVERSION CHAMBER

TYPE. 1 (Unit: 1,000VND)

Item	Description	Unit	Quantity	Unit Cost	Construction Cost	Remarks
1. Eeath Work						
1)Excavation		m3	93.1	66.3	6,173	
2)Surplus Soil		m3	28.7	48.8	1,401	
3)Back Filling		m3	64.4	34.9	2,248	
4)Steel Sheet Pile	>12m, grade II	m	18	308	5,548	
2. Foundation Work						
1)Cobble Stone		m3	2.2	893	1,965	
2)Lean Concrete		m3	1.5	1,186	1,779	
3)Form of Lean Concrete		m2	2.2	140	308	
4)Foundation Pile	200 x 200 x 12 m	pile	4	2,220	8,880	185/m
3. Concrete Work		m3	13.1	2,093	27,418	
4. Form of Concrete Work		m2	89.3	205	18,307	
5. Reinforced Bar		ton	1.3	9,979	12,973	
6. Flap Gate	1000 x 1000	set	1	24,600	24,600	
Sub-Total					111,597	
7.Dewatering		set	1		5,580	5%
8.Miscellaneous		set	1		11,718	10%
Total					128,895	

TYPE. 2 (Unit: 1,000VND)

Item	Description	Unit	Quantity	Unit Cost	Construction Cost	Remarks
1.Eeath Work						
1)Excavation		m3	88.9	66.3	5,894	
2)Surplus Soil		m3	28.4	48.8	1,386	
3)Back Filling		m3	60.5	34.9	2,112	
4)Steel Sheet Pile	> 12 m, grade II	m	18.4	308	5,671	
2.Foundation Work					0	
1)Cobble Stone		m3	2.4	893	2,143	
2)Lean Concrete		m3	1.6	1,186	1,898	
3)Form of Lean Concrete		m2	2.2	140	308	
4)Foundation Pile	200 x 200 x 12 m	pile	4	2,220	8,880	185/m
3.Concrete Work		m3	12.7	2,093	26,581	
4.Form of Concrete Work		m2	84.5	205	17,323	
5.Reinforced Bar		ton	1.3	9,979	12,973	
6. Flap Gate	1000 x 1000	set	1	24,600	24,600	
Sub-Total					109,768	
6.Dewatering		set			5,488	5%
7.Miscellaneous		set			11,526	10%
Total					126,782	

Table J.5.31 Annual Disbursement of Construction Cost
Urban Drainage Development

1. Phase I

Cost Component	Project Cost (Mil. VND)	2000			2001			2002			2003			2004			2005		
	Total	FC	LC	Sb-total	FC	LC	Sb-total	FC	LC	Sb-total	FC	LC	Sb-total	FC	LC	Sb-total	FC	LC	Sb-total
Urban Drainage																			
(1) Direct construction cost	558,836				25,148	58,678	83,825	41,913	97,796	139,709	41,913	97,796	139,709	41,913	97,796	139,709	16,765	39,119	55,884
(2) Land acquisition & Comp.	361,110	0	144,444	144,444	0	54,167	54,167	0	54,167	54,167	0	54,167	54,167	0	54,167	54,167			
(3) Enginnering cost	39,119	13,692	5,868	19,560	2,738	1,174	3,912	2,738	1,174	3,912	2,738	1,174	3,912	2,738	1,174	3,912	2,738	1,174	3,912
(4) Administration cost	27,598	0	5,520	5,520	0	4,416	4,416	0	4,416	4,416	0	4,416	4,416	0	4,416	4,416	0	4,416	4,416
(5) Physical contingency	55,884				2,515	5,868	8,383	4,191	9,780	13,971	4,191	9,780	13,971	4,191	9,780	13,971	1,676	3,912	5,588
Sub total	1,042,547	13,692	155,832	169,524	30,401	124,303	154,703	48,842	167,333	216,175	48,842	167,333	216,175	48,842	167,333	216,175	21,179	48,621	69,800
Price Contingency	101,123	274	4,675	4,949	1,228	7,570	8,798	2,990	15,516	18,506	4,026	21,002	25,028	5,084	26,652	31,735	2,672	9,435	12,107
Total	1,143,670	13,966	160,507	174,473	31,629	131,873	163,501	51,832	182,849	234,681	52,868	188,335	241,203	53,926	193,985	247,910	23,851	58,056	81,907

2. Phase II

Cost Component	Project Cost (Mil. VND)	2005			2006			2007			2008			2009			2010		
	Total	FC	LC	Sb-total	FC	LC	Sb-total	FC	LC	Sb-total	FC	LC	Sb-total	FC	LC	Sb-total	FC	LC	Sb-total
Urban Drainage																			
(1) Direct construction cost	428,729				51,448	120,044	171,492	51,448	120,044	171,492	25,724	60,022	85,746						
(2) Land acquisition & Comp.	49,696	0	24,848	24,848	0	9,939	9,939	0	7,454	7,454	0	7,454	7,454						
(3) Enginnering cost	30,011	10,504	4,502	15,006	4,201	1,801	6,002	3,151	1,351	4,502	3,151	1,351	4,502						
(4) Administration cost	14,353	0	3,588	3,588	0	3,588	3,588	0	3,588	3,588	0	3,588	3,588						
(5) Physical contingency	42,873				5,145	12,004	17,149	5,145	12,004	17,149	2,573	6,003	8,575						
Sub total	565,662	10,504	32,938	43,442	60,794	147,376	208,170	59,744	144,441	204,185	31,448	78,418	109,865						
Price contingency	130,021	1,325	6,392	7,717	9,039	33,878	42,917	10,256	38,533	48,788	6,135	23,900	30,035						
Total	695,683	11,829	39,330	51,159	69,833	181,254	251,087	70,000	182,974	252,973	37,583	102,318	139,900						

(Note) Price Escalation : LC : 3% annum.
FC : 2% annum.

Table J.5.32 Annual Disbursement of Construction Cost
Sewerage Development

1. Phase I

Cost Component	Project Cost (Mil. VND)	2000			2001			2002			2003			2004			2005		
	Total	FC	LC	Sb-total	FC	LC	Sb-total	FC	LC	Sb-total	FC	LC	Sb-total	FC	LC	Sb-total	FC	LC	Sb-total
Sewerage system																			
(1) Direct construction cost	1,463,072				80,469	65,839	146,308	144,844	118,509	263,353	217,266	177,763	395,029	217,266	177,763	395,029	144,844	118,509	263,353
(2) Land acquisition & Comp.	72,797	0	72,797	72,797															
(3) Enginnering cost	102,415	35,846	15,362	51,208	7,169	3,073	10,242	7,169	3,073	10,242	7,169	3,073	10,242	7,169	3,073	10,242	7,169	3,073	10,242
(4) Administration cost	46,076	0	9,215	9,215	0	7,372	7,372	0	7,372	7,372	0	7,372	7,372	0	7,372	7,372	0	7,372	7,372
(5) Physical contingency	146,307				14,631	14,631	29,261	14,631	14,631	29,261	14,631	14,631	29,261	14,631	14,631	29,261	14,631	14,631	29,261
Sub total	1,830,667	35,846	97,374	133,220	102,269	90,915	193,183	166,644	143,585	310,228	239,066	202,839	441,904	239,066	202,839	441,904	166,644	143,585	310,228
Price contingency	188,062	717	2,921	3,638	4,132	5,537	9,668	10,200	13,314	23,514	19,707	25,458	45,165	24,882	32,307	57,189	21,024	27,863	48,887
Total	2,018,729	36,563	100,295	136,858	106,401	96,452	202,851	176,844	156,899	333,742	258,773	228,297	487,069	263,948	235,146	499,093	187,668	171,448	359,115

2. Phase II

Cost Component	Project Cost (Mil. VND)	2005			2006			2007			2008			2009			2010		
	Total	FC	LC	Sb-total	FC	LC	Sb-total	FC	LC	Sb-total	FC	LC	Sb-total	FC	LC	Sb-total	FC	LC	Sb-total
Sewerage system																			
(1) Direct construction cost	2,216,505				182,862	149,614	332,476	304,769	249,357	554,126	304,769	249,357	554,126	304,769	249,357	554,126	121,908	99,743	221,651
(2) Land acquisition & Comp.	0																		
(3) Enginnering cost	155,155	54,305	23,273	77,578	10,861	4,655	15,516	10,861	4,655	15,516	10,861	4,655	15,516	10,861	4,655	15,516	10,861	4,655	15,516
(4) Administration cost	66,495	0	13,299	13,299	0	10,639	10,639	0	10,639	10,639	0	10,639	10,639	0	10,639	10,639	0	10,639	10,639
(5) Physical contingency	221,651				22,165	22,165	44,330	22,165	22,165	44,330	22,165	22,165	44,330	22,165	22,165	44,330	22,165	22,165	44,330
Sub total	2,659,806	54,305	36,572	90,877	215,888	187,073	402,961	337,795	286,816	624,611	337,795	286,816	624,611	337,795	286,816	624,611	154,934	137,202	292,136
Price contingency	639,906	6,851	7,097	13,948	32,099	43,003	75,103	57,986	76,514	134,500	65,901	87,414	153,315	73,975	98,641	172,616	37,707	52,718	90,425
Total	3,299,712	61,156	43,669	104,825	247,987	230,076	478,064	395,781	363,330	759,111	403,696	374,230	777,926	411,770	385,457	797,227	192,641	189,920	382,561

(Note) Price Escalation : LC : 3% annum.
FC : 2% annum.

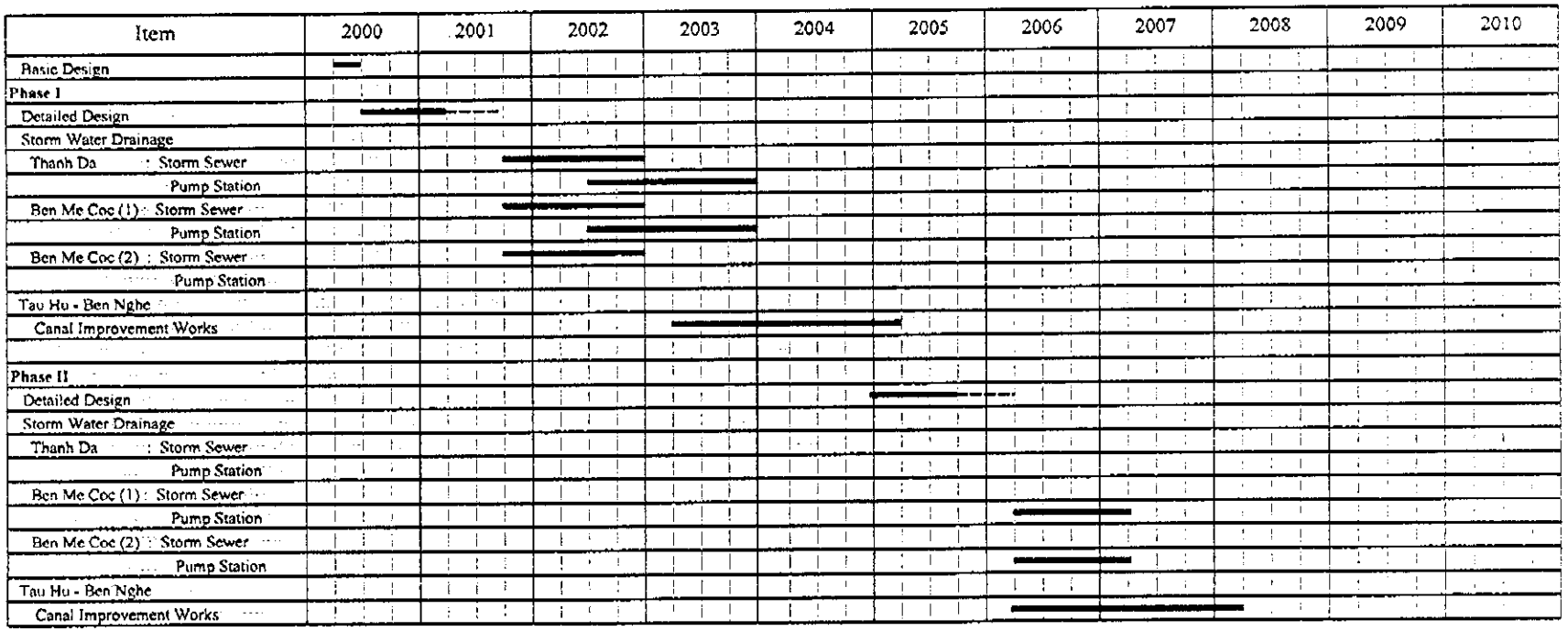


Fig. J.3.1 Construction Schedule of Urban Drainage Improvement

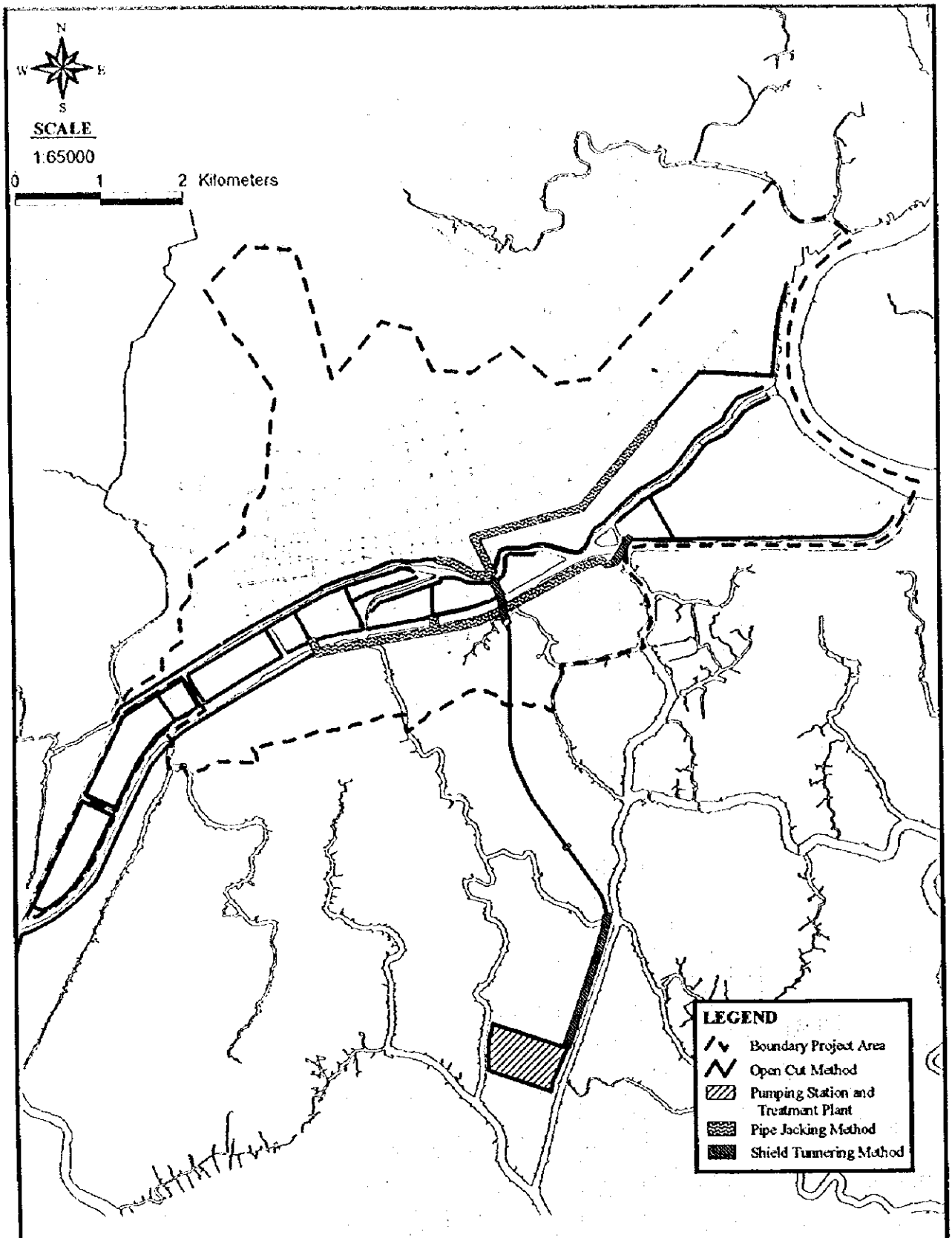
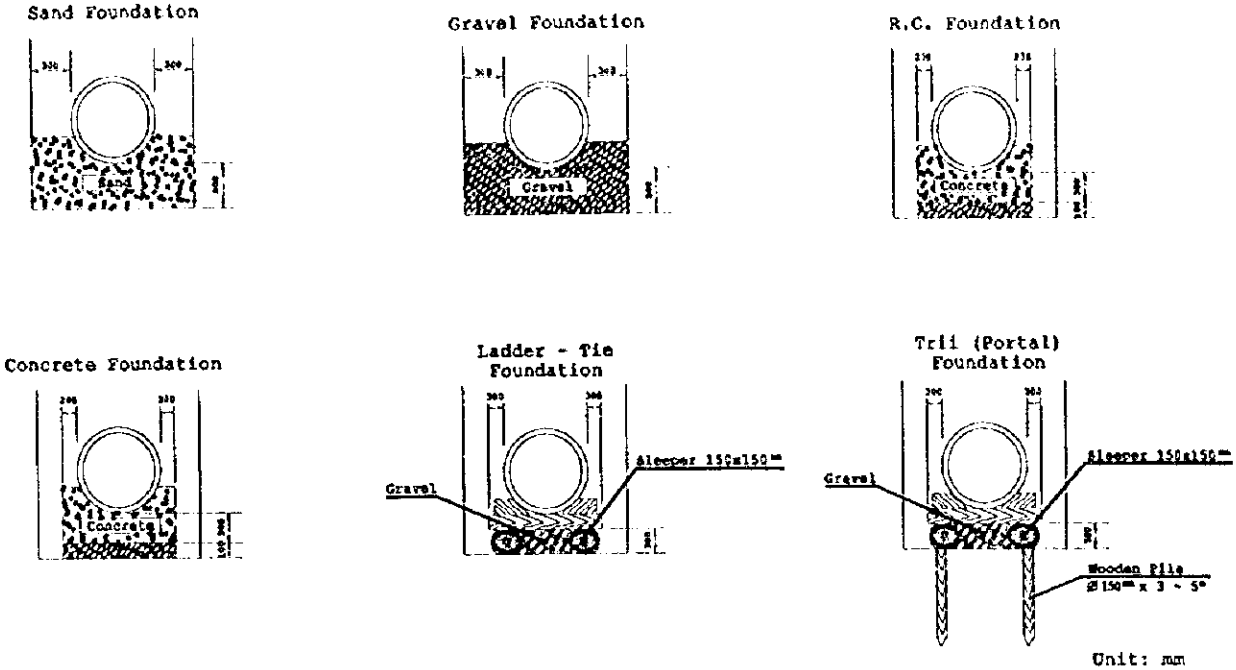
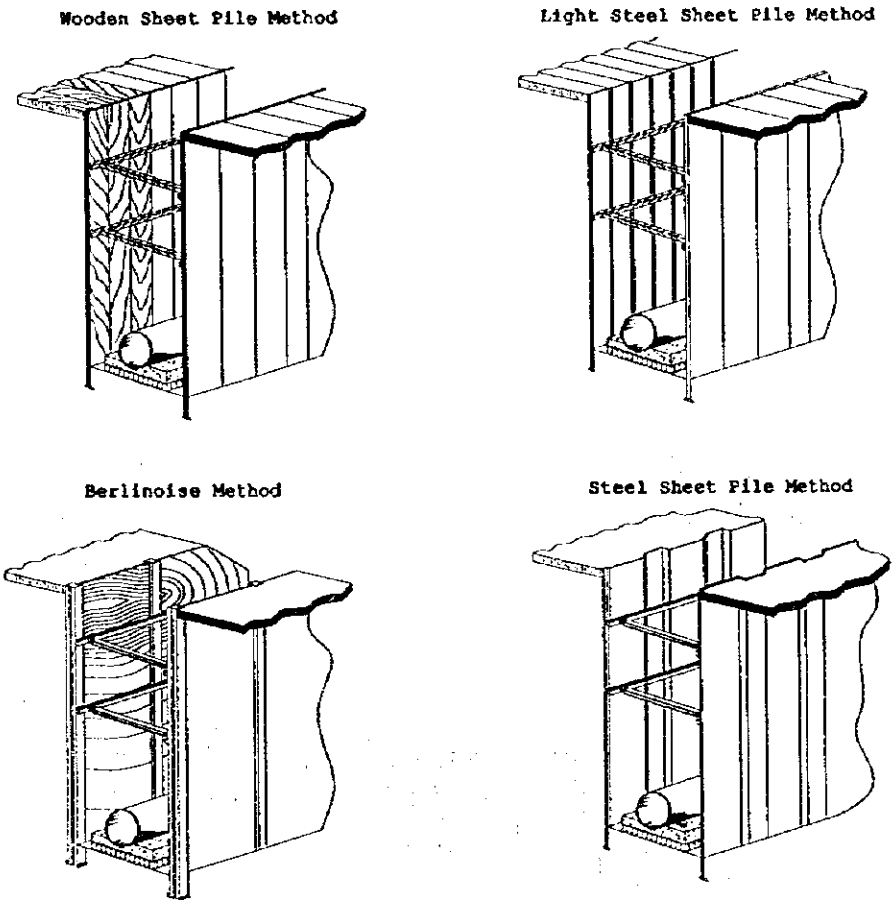


FIG. J.3.2 CONSTRUCTION METHOD OF INTERCEPTOR AND CONVEYANCE SEWERS

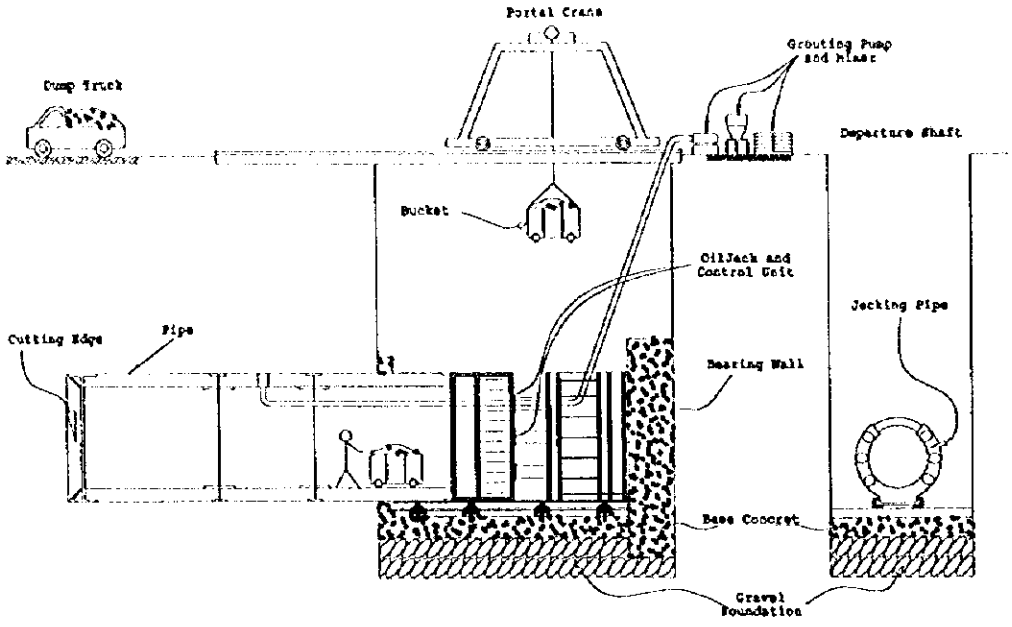


(TYPICAL SECTION OF PIPE FOUNDATION)

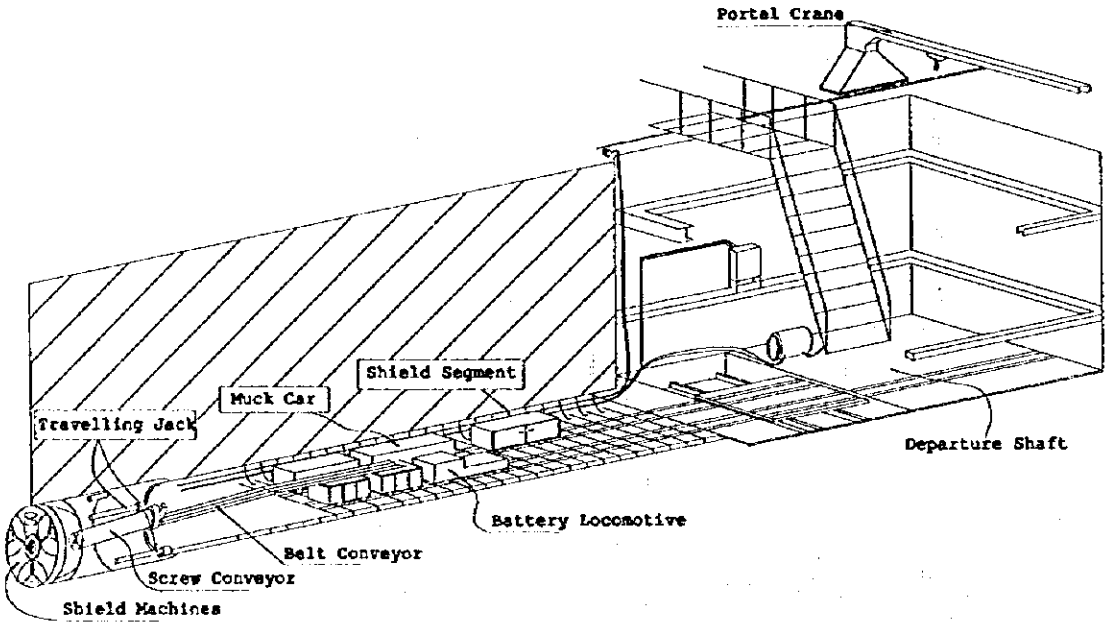


(EARTH - RETAINING)

FIG. J.3.3 TYPICAL CONSTRUCTION METHODS OF SEWER PIPE



(PIPE JACKING METHOD)



(SHIELD TUNNELING METHOD)

FIG. J.3.4 OVERVIEW OF MECHANICAL METHOD

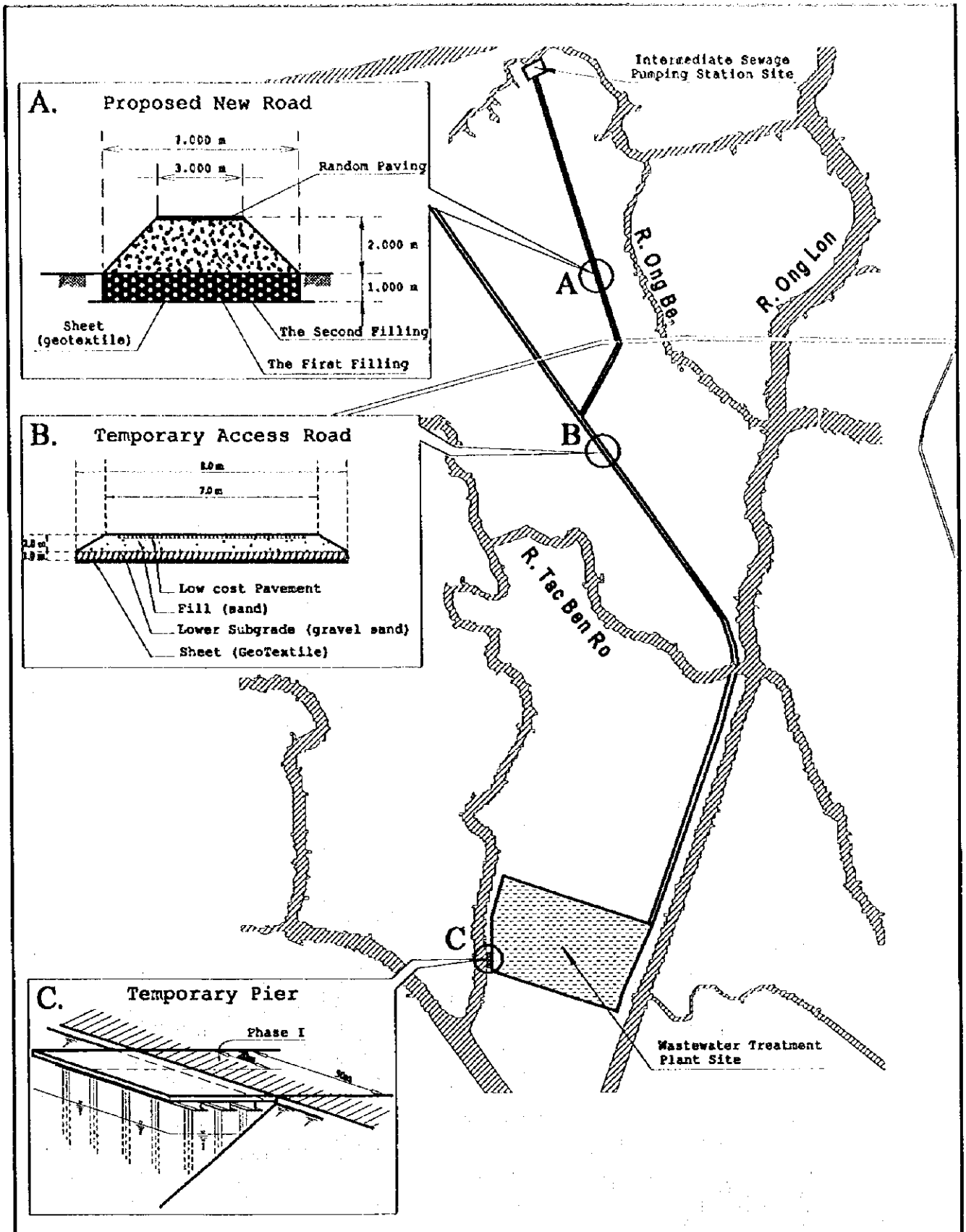


FIG. J.3.5 TEMPORARY ACCESS PLAN AND PROPOSED NEW ROAD

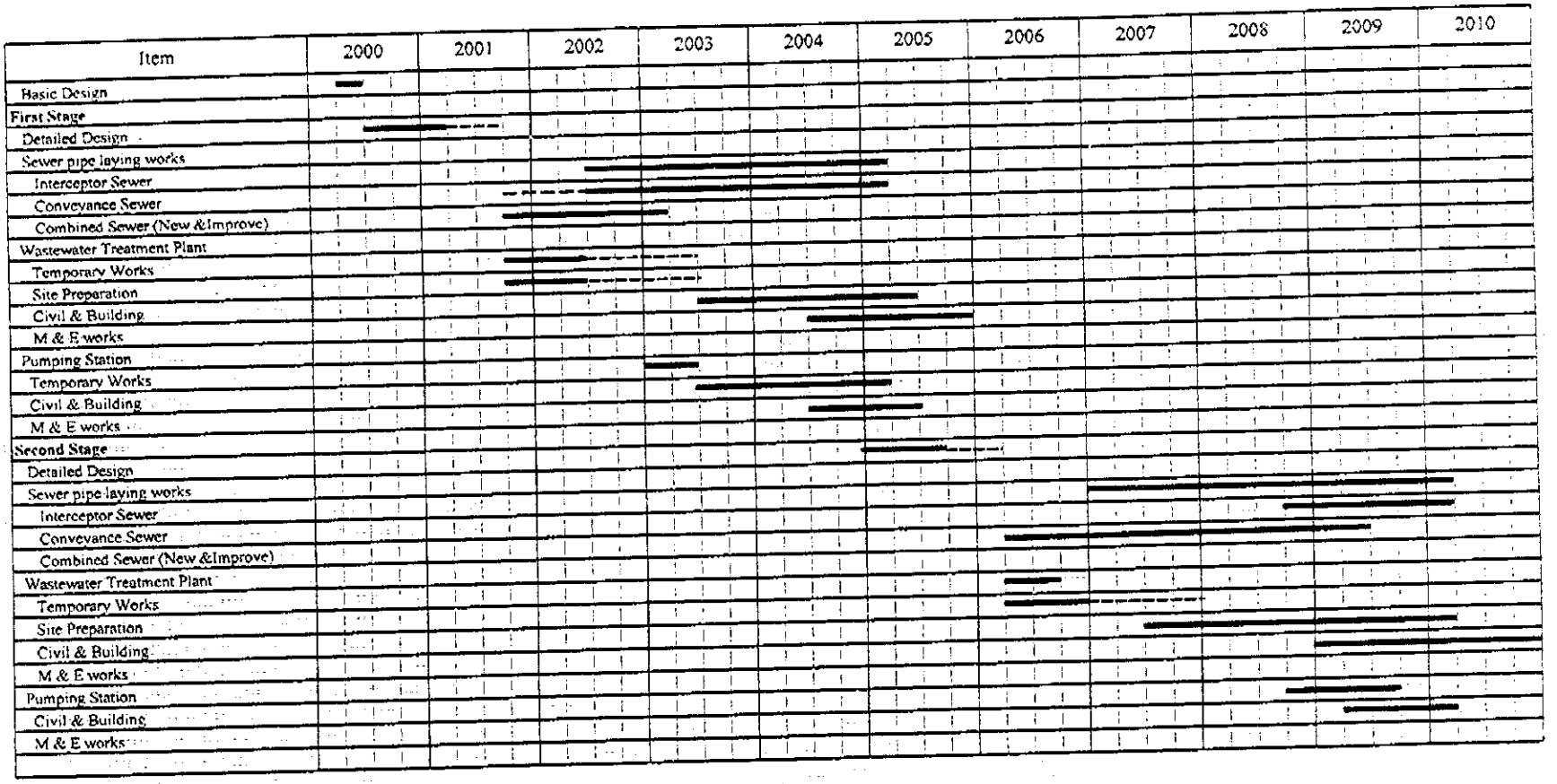


Fig. J.3.6 Construction Schedule of Sewerage Development

APPENDIX K
ORGANIZATION AND LEAGAL FRAMEWORK

TABLE OF CONTENTS

Page

LIST OF FIGURES

Page

Table of Attachments

APPENDIX K ORGANIZATION AND LEAGAL FRAMEWORK

1. FRAMEWORK OF THE INSTITUTIONAL DEVELOPMENT PROGRAM

1.1 Institutional Development Program

The present study is expected to formulate an urban drainage and sewerage master plan and undertake a feasibility study on the priority project identified to be implemented urgently. To ensure successful and effective implementation, operation and maintenance of the project, capacity of the related organizations and suitability of legal framework will be reviewed and any improvement thereof, if necessary, will be sought for.

Institutional setup, in its *broad sense*, includes cultural, socioeconomic and legal frameworks, organizations and their operational, financial and human resources. An institutional development program will cover these issues of the study and will be intended to present a comprehensive guidance to pursue a sustainable undertaking of the project.

1.2 Concepts of Institution and Organization

In the course of the master plan study, construction plans for the drainage and sewerage facilities will be conceived and proposed. Once the proposed facilities are defined, a technical operation and maintenance program will be defined, and scale and qualifications of personnel to keep facilities running will be assessed. Costs for capital construction and ongoing operation will also be estimated.

The facilities envisaged in the master plan frame are expected to generate the defined benefits or impacts that are desirable. In order to keep this scheme running, suitable institution and organization should be envisaged. Here, distinction between "institution" and "organization" has to be given in the *narrow sense*. Taking a simple sports analogy, institution will be well understood as "rule of game" against organization which may be seen as "team of players." Thus, institutions are a set of formal and informal rules and distinct from organizations, which act and behave under them.[1]

[1] In a general usage such as "institutional setup" or "institution strengthening program," however, institution includes both of thus distinguished "institution" and "organization."

Institutional arrangements, therefore, have to include the public consensus on the necessity of the project and to what extent its costs shall be recovered from the beneficiaries, a legislative means to institute an organization for drainage and sewerage services, an enforceable tariff system, obligation of connection to sewers, prohibition from discharging certain substance or chemicals into sewers, etc. *Organizational* arrangements will comprise at least design of the organization's structure, placement of required personnel, i.e., engineers, technicians, workers, accountants, business handlers, etc., to the suitable seats or roles, clear descriptions of key roles and measures to keep staff in a desirable work ethics, which may include training programs to upgrade technology and skills and a well defined promotion scheme.

1.3 Contents of the Program

The institutional development program will be prepared in the following sequence and contents. *At first*, the field findings on the existing legal arrangement and organizations are described and evaluated in the light of suitability criteria.

Secondly, institutional requirements will be enumerated. The requirements shall be derived mostly from the technical operation and maintenance program and the financial projection. They will be, e.g., need for a new sewerage law, need to establish an implementing agency, need to fund operating expenses, etc. These requirements will be identified and articulated to define the objectives to be achieved through institutional and organizational arrangements.

Thirdly, to achieve these objectives, measures are sought for, resources are mobilized and methods to develop them will be presented. Most importantly, an organization to administer the sewerage and drainage services will be designed to be readily acceptable to the existing social environment. Legislative arrangements to support the organization will also be defined. A sequential program will be discussed to implement a series of actions, which shall consist of formation of consensus, establishment of legal installments and setting-up and growing of the organization.

1. Framework of the institutional development program
2. Existing institutional setup
3. Necessary Functions and Concept of the Sewerage and Drainage Services
4. Resources needed and their development

2. EXISTING INSTITUTIONAL SETUP

2.1 The National Government

To establish Doi Moi or renovation and open door policy, the new Constitution was adopted in 1992. Now the Party is to operate within framework of the Constitution and the law. The National Assembly has enhanced powers of legislation. The Prime Minister is empowered to appoint deputy ministers and members of provincial people's committees. The President has specific powers, including the power to recommend to the National Assembly the dismissal of the Prime Minister. Skeleton of the National Government structure is shown in Fig. K-2.1. List of 17 ministries are given below.

Ministry of Defense
Ministry of Interior
Ministry of Foreign Affairs
Ministry of Justice
Ministry of Planning and Investment
Ministry of Finance
Ministry of Trade
Ministry of Science, Technology and Environment
Ministry of Construction
Ministry of Transport and Communications
Ministry of Labor, Disabled Veteran and Social Affairs
Ministry of Industry
Ministry of Agriculture and Rural Development
Ministry of Culture and Information
Ministry of Marine Products
Ministry of Education and Training
Ministry of Public Health

2.1.1 Key Ministries

Some features of key ministries relevant to the development of the drainage and sewerage sector are briefed to give a picture of institutional background.

a. Ministry of Planning and Investment (MPI)

MPI was funded on the basis of the former State Committee for Planning. The most important task of MPI is to propose to the Council of Ministers the overall national allocation of state finance. This makes MPI the most influential policy maker at the ministry level, particularly in formulating the investment projects. All major infrastructure projects must pass the approval of MPI.

b. Ministry of Finance (MOF)

MOF works closely with MPI and distributes the state budget finance to the sectors and projects (including drainage and sewerage projects), according to the actual liquidity of the state treasury. MOF also sets annual sectoral goals, and regulates management accounting; any exceptions from the uniform system must be reported to MOF.

c. Ministry of Construction (MOC)

MOC has wide responsibilities in physical planning, housing etc. MOC is also the line ministry in urban water supply, drainage and sanitation; it sets regulations, plans, designs and constructs water supply and sanitation facilities, and supervises project implementation through its design and construction companies.

2.2 Local Government in Ho Chi Minh City

Local government system in Ho Chi Minh City is three-tiered. The City is administratively divided into 22 districts, of which 17 districts are urban, namely Inner City, and 5 are suburban. The districts are subdivided into wards in the Inner City and into communes in suburban districts. There are 281 wards and communes in the City. At each level of City, district and ward/commune, people's council that is legislature of elected members and people's committee that is executive organ are established. Members of people's councils are elected by vote for 5-year term. They in turn elect members of people's committee. According to the Constituti
on 1992, people's committees are the local government organs with responsibility to implement the Constitution, laws, regulations and other instructions by the higher government levels. At the same time, the people's committee has to execute the resolutions of the people's council of each level.

In accordance with the devolution proclaimed mainly by the 1992 Constitution, the people's committee at each level plays an important role in approving and granting permits/license on the investment plans and other activities within the delegated capacity.

2.2.1 People's Committee of Ho Chi Minh City

Members of People's Council are elected by the people for 5-year term at the election day same as the National Assembly. People's Council of Ho Chi Minh City consists of 83 members, who are grouped into three: namely Culture-Society, Economics-Budget and Legislation groups. Likewise, district people's council consists of 35 members, while ward/commune people's council has 25 members. Members of people's committee are elected by the council. Results of election of provincial and special cities' people's committees should be approved by the Prime Minister. In Ho Chi Minh City People's Committee (HCMC PC or PC), there are a chairman, 5 deputy chairmen and 5 members that consist of 2 official members and 3 authorized members. The Chairman is elected by and among members of the People's Council. Five deputy chairmen and other 5 members are nominated by the elected chairman and approved by vote by the People's Council. The Chairman, 5 deputy chairmen and 2 official members are entitled to sign and seal on behalf of the People's Committee, while other 3 authorized members are to sign and seal only when so authorized.

In Ho Chi Minh City People's Committee, there are numerous establishments which exercise various functions. They may be grouped into five categories according to the institutional status and linkage to the City and the central government (see Fig. K-2.2).

a. The state administration and management are made through 20 departments/offices. Each of departments is dictated by the equivalent line ministry/ies of the central government, while discharging duties assigned by the HCMC PC.
b. The hierarchical bodies derived from the central government are directly managed by the central government, and are exercising its functions in the City.
c. There are supporting establishments of the HCMC PC. They are mostly committees consulting to the relevant departments. Some are permanent organizations, while others are temporary.
d. There are City's radio and TV broadcasting stations and institutions not directly belonging to any department.
e. City level state business enterprises are supervised by the relevant departments of HCMC PC. They include Water Supply Company, Urban Drainage Company, City Environmental Company, Waste Treatment Company, etc.

These departments and offices are led by directors and supervised by deputy chairmen of HCMC PC. Roles of the Chairman and deputies are shown as follows:

Chairman (Mr. Vo Viet Thanh)	Represent the City and all departments Secretariat of People's Council Cadres Organization Agency
Deputy Chairman, Permanent (Mr. Le Thanh Hai)	Dept. of Planning & Investment Dept. of Agriculture & Rural Development
Deputy Chairman, Economics (Mr. Nguyen Van Chi)	Dept. of Commerce Dept. of Tourism Dept. of Finance-Pricing Institute of Economics City Bank
Deputy Chairman, Industry (Mr. Tran Thanh Long)	Dept. of Industry Dept. of Science, Technology & Environment Post Office of City Division of Statistics Industrial Zones
Deputy Chairman, Culture-Society (Ms. Pham Phuong Thao)	Dept. of Labor, Disabled and Social Affairs Dept. of Sports and Gymnastics Dept. of Culture and Information Dept. of Health Dept. of Training and Education Legislature Service City Police Investigation Agency Custom Agency of City
Deputy Chairman, Urban Management and Construction (Mr. Vu Hung Viet)	Dept. of Construction Dept. of Housing and Land Dept. of Transportation and Public Works Office of Chief Architect

2.2.2 People's Committees at District and Ward/Commune

Each of 22 District People's Committees unanimously has 11 administrative offices, some other administrative establishments and the district level state enterprises, which are supervised by the relevant administrative office. Some district enterprises are engaged in the solid waste management by subcontracting with the City Environmental Company. Number of administrative personnel in a district PC are around or more than 100.

At the ward/commune level, the PC has around or more than 10 administrative officers.

2.2.3 Key Departments in the HCMC PC

Among the 20 departments of the HCMC PC, some key departments, which, in the initial view, assume significant roles in the present Urban Drainage and Sewerage Development Project (the Project), are selected and their functions and duties are depicted with what has been learned in the first field review.

(1) Department of Planning and Investment

Department of Planning and Investment (DPI) is the most important policy formulation arm of the PC. It is dictated by the Ministry of Planning and Investment (formerly State Committee for Planning) of the central government. Under instructions by the PC, it formulates strategy and planning for socioeconomic development.

Under the planned economy in the old regime, it was a sole source of all the plans to manage and operate the City's economic activities. In the current transition to the market economy, it is still a major source of economic and investment planning, or a sole source of approval to the various investment plans within the City. Investment plans are approved by the PC, only when the DPI forward them to the PC.

Capital investment plans proposed by the departments of the People's Committee are submitted to the DPI for its evaluation and forwarding to the PC for approval. Ho Chi Minh City is devolved to approve the investment projects within the following capital thresholds:

Foreign direct investment	US$ 10 million
Official development aid	US$ 1.5 million
Grant aid or NGO donation	US$ 500,000 or VND 100 billion
Domestic investment	VND 200 billion

If the capital cost is more, the investment plan will have to be forwarded for final approval by the central government.

Functions of DPI, as were officially informed, are to compile strategies and plans on socioeconomic development and mechanism of economic management, and to assist the City People's Committee in pursuit of goals and balances of the City's economy. Its duties, as were officially informed, are:

a. Formulation of strategies and grand plans including separate sector plans,
b. Mobilization of all domestic and foreign resources to incorporate into short-, medium- and long-term plans, and balancing the economy: saving and spending, budget, goods and material, import and export, and spending on the infrastructure construction,
c. Collaboration with Department of Finance-Pricing in allocation of budget,
d. Directing and inspecting the other departments, organizations and the district people's committees in implementing the approved plans,
e. Research, forecast, collection and obtaining of domestic and foreign socioeconomic information to serve for the development planning,
f. Training of staff as required,
g. Devolved agent of the City for evaluation of investment projects and for

coordination, management and use of the official development aid, and

h. Evaluating the establishment of state and private enterprises.

Organization chart with qualification of staff is shown in Fig. K-2.3.

(2) Department of Finance-Pricing

Department of Finance-Pricing (DFP) is an organ to prepare and manage the state budget at the City level and to control price of the essential commodities. It works closely with the DPI in preparing capital and budget to the approved investment projects. The Department's duties, as were officially informed, are as follows:

a. Assist the City People's Committee in implementation and guidance on the execution of policy, law and regulation of the State in the regime of financing and pricing in the City.
b. Assist the People's Committee and the city authorities in preparation and approval of the state budget of the City and the annual expenditure plans.
c. Report the City's finance and budget to Ministry of Finance.
d. Work out plan to allocate capital expense and recurrent budget for submission to the relevant authorities for approval, and execute their allocation in accordance with the approved plans.
e. Manage the public properties of administrative establishments belonging to the City. Guide and inspect the management of public properties by the city authorities. Manage the Finance Reserve Fund and the Aid Fund of the City.
f. Exercise the devolved authorization to supervise the state businesses such as lottery company, finance printing enterprise, auditing company, etc.
g. Consult with the City People's Committee and suggest the Central Government on necessary measures to stabilize the market price and prevent from acute fluctuation of price of the essential goods and services. Propose the price policies and tariff of goods and services to be decided by the People's Committee.
h. Exercise the professional skills in forecasting and analyzing the market price, and cooperate with the Statistics Division in calculating price index.
i. Implement the justice inspection duty in the finance and accounting field.

Organization and cadres of the Department of Finance-Pricing are shown in Fig. K-2.4.

(3) Department of Science, Technology and Environment

This Department is responsible for policy and regulation of science, technology and environment in the Ho Chi Minh City. It has established specialists and selected utilities/equipment for the advanced scientific and analytical work.

Organization of Department of Science, Technology and Environment is shown in Fig. K-2.5.

(4) Department of Transportation and Public Works

This Department is assumed to be responsible for road and river transportation, water supply and sanitation of the City. No official information so far on its function and duties was provided but only organization chart (Fig. K-2.6). It is known through the organization chart that the Department supervises 18 business enterprises and 18 public utility enterprises. The business enterprises include companies for road/bridge construction, river transportation, shipbuilding and ports. The public utility enterprises are mostly on maintenance of roads, bus service, water supply, drainage and solid waste management services. It is noted that the Department is supervising the state enterprises relevant to or neighboring to the urban drainage and sewerage sector such as the City Environmental Company, Waste Treatment Company, Water Supply Company and Urban Drainage Company. It also has the Waterway Management Unit that is responsible for maintenance of the drainage canals.

(5) Department of Agriculture and Rural Development

Department of Agriculture and Rural Development (DARD) was instituted in 1990 by integration of 4 departments: agriculture, marine products, irrigation and forestry. It is a professional organ of the HCMC PC in carrying out the state management function in the sectors of agriculture, forestry, irrigation, marine products and rural development. The DARD also dictate instructions by Ministry of Agriculture and Rural Development and Ministry of Marine Products.

The Department's duties, as were officially informed, are to:

a. Carry out the state management function to the units engaged in production and trading in the sectors of agriculture, forestry, irrigation, marine products including salt production;
b. Carry out the duty as standing office of water management and flood prevention and fighting for the City by executing flood prevention and fighting options, protecting river and sea embankment, reducing natural disasters and overcoming consequences of floods;
c. Manage and control use and development of water resources in respect to irrigation and rural water supply;
d. Manage the marketing of seeds produced or imported for production of crop and husbandry;
e. Coordinate and help cooperation of authorities at districts and communes by organizing and encouraging the rural development activities; and
f. Organize and instruct the districts, communes and other economic units engaged in agriculture, forestry and fishing operation.

This Department has a unit for water management and flood prevention and fighting. It is a new division instituted in 1996 and expected to develop inundation database and flood warning system. Organization of DARD with cadres is shown in Fig. K-2.7.

2.3 Operation and Maintenance of the Existing System

2.3.1 Sewerage / Drainage System

The existing drainage/sewer system in Ho Chi Minh City is maintained by the Urban Drainage Company (UDC), which serves for grade 1 to 3 sewers, and state owned enterprises at the district level serving for grade 4 sewers (see Fig. K-2.8),. As a state owned enterprise under the direct supervision of the Department of Transportation and Public Works (DTPW), UDC is a service contractor to the city, and therefore, does not own any of the drainage/sewerage assets. UDC possesses only equipment and vehicles for the construction and maintenance work contracted by the city. At this point, UDC is completely different from other public utility service providers in HCM city, such as Water Supply Company (WSC) and Electricity Company, who hold direct title to all fixed assets, other than land, used to provide the services. More importantly, UDC's total revenue earning is derived from the budget allocation from the city, while those of WSC and Electricity Company are basically derived from service fees collected from consumers. Thus, UDC lacks system of the service charge collection from consumers.

As shown in Fig. G-2, Appendix G, UDC has four management units and six enterprises that are production units, of which 4 are engaged exclusively in the maintenance of the drainage/sewer system. The remaining 2 units are to be engaged in the construction consulting services and construction services. The total workforce of them is nearly 680 among some 760 personnel of the entire company. Approximately 70 professionals have degrees in civil engineering, hydraulics, environmental engineering, economics, finance and accounting, architecture, and administration. Staff distribution in each unit is shown with educational levels in the following table.

Units of UDC	Number of Staff with Educational Level			
	University	College	Other	Total
Director	1			1
Deputy director	2			2
Planning - Technical division	10	2	11	23
Accounting, financial and statistical division	5	2	3	10
Administration & human resources division	8	4	30	42
PMU of UDC	5			5
Construction consulting services Inc.	14	6	2	22
Construction services Inc.	3	3	72	78
Drainage enterprise No. 1 (Sai Gon area)	3	4	155	162
Drainage enterprise No. 2 (Cho Lon area)	3	2	160	165
Drainage enterprise No. 3 (Gia Dinh area)	2	3	148	153
Drainage enterprise No. 4 (Thu Duc area)	3	4	94	101
Total	59	30	675	764

In 1998, UDC spent approximately VND 31 billion for the operation and maintenance of the system. Source of UDC, however, estimates that necessary budget required for the sufficient maintenance work for all sewers, manholes and canals, and minor new construction would be 115 billion or 3.7 times of the actually disbursed. As shown in the following income statement, UDC keeps net profit at the level of 6 to 8 percent of gross revenue. The generation of the net profit is the most important priority matter following that of profit tax in all the state owned enterprises in Vietnam, because employee's bonus and welfare funds are capitalized from this source. Less priority, therefore, is given in maintaining adequate levels of operating expenses, or more specifically, costs of services including depreciation needed for capital replacement.

Income Statements of Urban Drainage Company: 1996 – 1998 (million VND)

	1996	1997	1998
Operating Revenues			
Gross revenues	28,769.6	26,154.2	31,033.0
Less deductions	157.9	56.6	290.8
Net revenue	28,611.7	26,097.6	30,742.2
Cost of Goods Sold	24,008.1	20,644.3	24,216.8
Gross margin	4,603.6	5,453.3	6,525.4
Management and adminiatration expenses	2,278.8	2,784.1	3,142.6
Operating Income	2,324.8	2,669.2	3,382.8
Non-Operating Income and Expenses			
Income from financial activities	82.6	86.4	110.0
Expenses from financial activities			
Extraordinary income	45.0		
Extraordinary expenses	21.3		
Net Profit Before Tax	2,431.1	2,755.6	3,492.8
Profit Tax	614.8	713.9	873.2
Net Profit After Tax	1,816.3	2,041.7	2,619.6

Source: Data provided by UDC

2.3.2 Water Supply System

Water Supply Company (WSC) is the largest public utility company under the Department of Transportation and Public Works (See Fig. K-2.9). Official information regarding status of water supply service in the City has not been provided. However, the information was obtained from "Second Water Utilities Data Book," Asian Development Bank, 1997. The following data are as of 1995 unless otherwise specified.

General Data About Ho Chi Minh City Water Supply Company

Connections	248,454	
Staff	1,590	
Annual O&M Costs	VND 242,929 million	US$ 21,857,955
Annual Collections	VND 269,491 million	US$ 24,247,911
Annual Billings	VND 248,197 million	US$ 22,331,960
Annual Capital Expenditure (Average over last 5years)	VND 56,824 million Expenditure per Connection	US$ 5,112,812 US$ 20.58/connection
Source of Investment Funds	90% national government grant; 10% internally generated reserves	

$1=VND11,114

Tariff Structure

(Effective August 1, 1996 and amended by 1999 data)

Category	Water Rates per Cubic Meter (VND)		
Water Tariff	Base Tariff	Capital Work Surcharge	Total Tariff
Domestic			
0-4 m^3/capita/month	1,000	300	1,300
Over 4 m^3/capita/month	1,500	600	2,100
Industrial (Production)	2,500	600	3,100
Business and Service			
0-8 m^3/month	4,700	500	5,200
Over 8 m^3/month	4,700	4,000	8,700

Notes: 1 All consumers pay on metered use. They are billed monthly and pay at designated banks, at the utility office or to bill collectors.

2 Tariff setting aims at full cost recovery with profit including sufficient counterpart funds for project loans and contingencies for cost escalation and reserves for long term development.

3 There were 6,016 new connections in 1995. Cost of new connections range from VND 500,000 (US$ 44.99) to VND 700,000 (US$ 62.98) payable in advance.

4 Water bill has no sewerage surcharge.

5 Special tariff for foreign residents was terminated as of July 1999.

Average monthly water consumption per family: 39.5 m^3
Average water bills per month: VND 64,110 (US$ 5.77)
Average power bills per month: VND 197,640 (US$ 17.87)

Production/Distribution		
Average Daily Production[2]	:	730,000 m^3/d
Groundwater	:	11 %
Surface Water	:	89 %
Treatment Type	:	Conventional
Treatment Capacity	:	700,000 m^3/d
Storage	:	260,000 m^3
Service Area[3]	:	153 sq km
Service Connections		
House (10 persons/HC)	:	236,433
Public Tap (1,270 persons/PT)	:	3
Industrial	:	3,537
Commercial	:	1,770
Institutional	:	4,160
Other[4]	:	2,551
Total	:	248,454
Service Indicators		
Service Coverage[5]	:	52 %
Water Availability[6]	:	24 hours/day
Per Capita Consumption	:	136 l/c/d
Average Tariff	:	US$ 0.131/m^3
Drinking Water[7]	:	Boiled
Efficiency Indicators		
Unaccounted-for Water[8]	:	34 %
Non-Revenue Water	:	34 %
Unit Production Cost	:	US$ 0.083/ m^3
Operating Ratio	:	0.96
Accounts Receivable	:	3.4 months
Staff/1,000 Connections	:	6.4
Annual Water Use	:	257,736,355 m^3
Domestic	:	48 %
Industrial/Commercial	:	11 %

[2] Actual daily production in 1995 was about 706,130 m^3/d
[3] Total area of responsibility is 2,069 sq km.
[4] Mostly bulk supply connections to residential areas.
[5] Residents not served by the utility rely mostly on tubewells.
[6] About 96 % of residents have 24-hour water supply. Only 18 consumer complaints were registered in 1995.
[7] All 480 water samples tested passed the bacteriological tests.
[8] In 1995, about 9,932 leaks were repaired and 56,215 meters were replaced or repaired.

Other	:	7 %
Unaccounted-for Water	:	34 %
Annual Water Billings	:	US$ 22,257,735
Domestic	:	59 %
Industrial/Commercial	:	33 %
Other[9]	:	8 %
Annual O&M Costs	:	US$ 21,318,096
Personnel	:	12 %
Power	:	28 %
Parts/Materials	:	9 %
Bulk Supply	:	3 %
Other[10]	:	48 %

Served Population by Area of HCMC

(Source: National Water Tariff Study - 1996)

Location	Population (a)	% to Total Population	Population Served by WSC (b)	% to Total Served Population	% of Population Served by WSC (b/a)
Old Area	2,032,275	45.9	1,617,588	66.0	79.6
New Area	1,268,608	28.7	636,961	26.0	50.2
Inner City Total	3,300,883	74.6	2,254,549	92.0	68.3
Suburban Area	1,125,715	25.4	195,570	8.0	17.4
HCMC Total	4,426,598	100.0	2,450,119	100.0	55.3

Technical Staff per Field

(Source: WSC brochure, WSC & SIC 1997)

	University Degree	College
Construction	39	7
Electrical and Mechanical	22	9
Economy, Finance	36	26
Architecture	3	
Chemistry, Biology, Physics	9	
Business administration	15	
Wage control		6
Sanitarium	4	
Other fields	19	16
Total	147	64

[9] Other use and billing refer to institutional connections.
[10] Other costs include depreciation, overhead, major repairs, production cost and taxes.

2.3.3 Solid Waste Management

The Ho Chi Minh City Environmental Company (CITENCO), a state owned enterprise under the authority of the HCMC PC, is rendering the removal and disposal of solid waste. Besides the waste transportation services with its own equipment, CITENCO also subcontracts the services to district enterprises, some cooperatives, a private waste transport companies and individual collectors (see Fig. K-2.10 and 2. 11). CITENCO's annual budget for this service is in the range of VND 3 to 4 billion. In addition, CITENCO is collecting annual fee of some 850 million under waste removal contracts with commercial establishments. Expenses of district enterprises are not known, as they are allocated through budgets of the district PCs. However, largest amount of waste collection fee is paid by households and majority of commercial/industrial waste generators to numerous private collectors. An assumption on the scale of these expenses reports that the total amount would be in the range of 40 billion to 65 billion.

3. NECESSARY FUNCTIONS AND CONCEPT OF THE SEWERAGE AND DRAINAGE SERVICES

3.1 Requirements to the Sewerage and Drainage Service Provider

HCMC is entering a new era of its sewerage and drainage service in the near future. With assistance by the multilateral and bilateral donors, global betterment of the service will be launched soon. Due to the scale of investment and magnitude of the operation and maintenance cost, maintenance of the service may not be financed from the HCMC budget allocation alone as has been done for the existing service. Some measures for cost recovery from the service users should be instituted. Should the public service be provided for the fee from the beneficiary, a consensus that may be articulated in the following four principles should be sought for:

Single management - One integrated and responsible entity shall operate and maintain all the sewerage and drainage facilities, and provide the sewerage and drainage services in Ho Chi Minh City. There shall be a single central organization to manage and operate the sewerage and drainage services for the whole city.

Efficient operation / least cost - The service of acceptable quality should be provided with expense of the least operation cost. The provider needs to render the service very efficiently.

Transparent cost - To ensure the least cost operation, detailed cost components that are verified by the audited financial reports shall be made available to the public and the beneficiaries.

Cost recovery as practicable - It is desired to recover costs of the sewerage and drainage service from the beneficiaries as much as practicable or to the level of their affordability or willingness to pay. Share of the recoverable cost would be increased as the affordability-to-pay improves.

These principles are bases and targets in instituting any public utility service, which is natural monopoly in the service area, in general. Layout of organization for the service provider and implementing legal framework should follow the line to conform these principles.

3.1.1 Universal Tariff Setting

Under the present Project, recovery of the service costs from the beneficiaries, i.e., customers of the service should be considered. It is expected to set tariff, and bill and collect it from customers. It is expected then to run its operation with expenses from the revenue thus collected.

Many sewerage and drainage projects by plural donors are expected to launch soon in different areas in HCMC. It may be likely that operation and maintenance costs differ from a project to another. This might lead differentiated tariff settings in different project areas. Differentiated tariff rates, however, are hardly to manage and not advisable. Tariff should be universal to varied project areas and should be used to run the single sewerage and drainage service for the entire city.

3.1.2 Accountability to the Taxpayers and the Customers

The sewerage and drainage service may be operated partly on budget and partly on fees comprising the connection charge and the service charge. The budget is originated from taxpayers and granted by sanctions of representatives at the national and city levels. The fees are originated from customers who pay for the service. Both taxpayers and customers expect that their money is utilized very efficiently and no unnecessary expense is allowed in the service operation. The service provider is therefore accountable to both of them. It should make all of its activities publicly monitorable and its financial status properly audited and reported.

Costs of the service should be grasped in sufficient details and controlled by a single management so that they can be enumerated in one financial statement. This practice would be possible in an independent entity that operates the services in a way similar to those of commercial or business operations. Under the present institutional framework of Vietnam, such quasi business operation may be possible by a state owned enterprise. The service provider would be organized under the jurisdiction of the Department of Transportation and Public Works (DTPW) of the HCMC PC.

3.1.3 Control of Tariff

The sewerage and drainage service is a natural monopoly and, therefore, does not face any market competition. Where price is not determined in the market, it should be determined by the public interest. Rate of tariff or amendment thereof shall be approved by the suitable authority of the HCMC PC that shall assume the public representation.

3.1.4 Required Functions of the Service Provider

The present Study proposes a Master Plan for the sewerage and drainage development for the entire HCMC. It also includes a Feasibility Study on the Priority Project to be developed by the target year 2020. The present institutional development program is intended to help institute the sustainable sector service in HCMC. The program would need to depict guidelines for establishing a provider of the sector service. Divisional and unit functions given below are those of the management center of the service provider, which should manage and control operation and maintenance offices attached to each of plants and pumping stations.

a. Technical operation (Technical operation, maintenance and repair, procurement and storehouse, laboratory, design and construction management)

Sewerage engineers and technicians are required to operate the facilities with the minimum expense. Shift work routine shall be organized where the facilities are to be operated 24-hour a day. There should be an Operation Unit. Daily, weekly, monthly and yearly routines to check specific equipment and facilities have to be established. Periodical replacements are necessary as to the consumable parts. For the unexpected malfunction of the system, urgent repair has to be made by the in-house personnel. Both corrective and preventive maintenance should be carried out by a Maintenance and Repair Unit. Consumable chemicals and spare parts are to be procured and stored in the specified quantities. There should be a Procurement and Storehouse Unit.

To ensure the water quality standards and function of each facility within the sewage treatment plant, water quality at each unit process should be kept monitored at the in-house laboratory. Daily, weekly, monthly and yearly checklists shall be developed and organized as a routine program of a Laboratory Unit.

Function of design and construction management should be established to supply plans and designs for construction work necessary to develop or maintain the sector services. There will be a Design and Construction Management Unit.

b. Planning Function (planning)

Planning function should be assumed, at first, to be a monitoring center of progress of projects under the master plan. If difficulty to the progress is encountered, a

planning unit shall analyze the problem and prepare measures to solve it. This unit function begins with analysis of the problem and its solution by comparing the present service with the targets set according to social, economic, environmental and regulatory policies within which the sector service must function.

Using this frame of reference, the unit should aim at effective accomplishment of the objectives of the service in the long, medium and short term. The planning function must make sure all parts of the service provider work efficiently to meet targets so that it may deliver the services required by the community.

c. Administration Support (public and customer relations, human resources administration and development, payroll, supply and asset administration, legal office)

The drainage and sewerage service shall be recognized by the public and customers as essential for their health and environment. The customers need to know that the tariff they pay is utilized in the most appropriate way. Decision-makers and politicians also need to be aware of the importance of the financial support to the sewerage and drainage service. The provider shall supply thus required information through a Public and Customer Relations Unit. In areas where on-site sanitation system is adopted, the provider should organize propaganda for the sanitation improvement through this Unit.

The provider needs to recruit the required personnel and train them for the demanded expertise, as its service area and capacity develop in line with the master plan. To ensure stable supply of required expertise, a plan of human resources demand and supply should be drawn up, and external and in-house training programs should be developed by a Unit of Human Resources Administration and Development.

A Supply and Asset Administration Unit should be organized to control the provider's procurement of supplies and holding of asset. Within this unit, a sub-unit for transport administration may be attached as responsible for the management, operation and maintenance of vehicles used by the provider.

A General Administration Unit will be assigned for tasks that are not assigned to other units. Legal function can be combined with this unit.

d. Financial Control (accounting, financial administration and cost control)

A Financial Administration and Cost Control Unit should be responsible for managerial accounting as well as cost control and compilation of annual budget, while an Accounting Unit should be responsible for financial accounting and cash handling. These two units in collaboration should compile financial reports for audit

by the professional authority designated by the HCMC People's Committee. They should then publish thus audited financial reports annually for the general circulation. The most important function of the Financial Administration and Cost Control Unit is to grasp and control actual cost of the sewerage service.

e. Commercial System (billing and collection, customer registration, marketing)

The provider's major source of revenue will be the sewerage service and drainage charge and the new connection charge. A Customer Registration Unit should register a new connection and arrange the work thereof. A Billing and Collection Unit shall establish a database for all the connected customers by the time the sewerage service will be started. This will be made by combining the WSC's consumer database and the UDC's connection ledger in the case that the bill collection is contracted to WSC. Otherwise, the provider's management needs to mobilize a taskforce to create a connection/customer database by canvassing all the buildings and houses within the service area.

3.2 Requirements to the Project Implementing Agency

After the planning stage, the Project will be implemented in accordance with the construction schedule. An implementing agency shall be instituted and suitably staffed to undertake implementation activities. The implementing activities comprise stage of selection and employment of consultants, detailed design stage, bidding stage and procurement and construction stage. Another important activity, however, will be acquisition and preparation of lands, which may involve relocation of inhabitants.

The first job of the agency is to employ a consultant in accordance with the guidelines of the lender. The consultant's main duties are the professional advice to the executing and implementing agencies, detailed design, preparation of tender documents and supervision of construction. The implementing agency shall prepare the terms of reference to define these duties of the consultant for consent of the lender. In consultation with the lender, the implementing agency shall also proceed with the employment of the consultant that includes:

- Listing of the potential consultants (preparation of the long list)
- Preparation of Letter of Invitation for Proposal
- Preliminary selection of the most relevant consultants (short list)
- Evaluation of the submitted proposals
- Obtaining the consent of the lender on results of the evaluation
- Negotiation with the selected consultant on terms of the service agreement
- Signing of the agreement and approval by the lender

In the detailed design stage, the consultant shall prepare detailed design and tender documents in close collaboration with the implementing agency, to which the consultant is actually an advising organ. Here, the agency shall sign to approve design drawings on behalf of the executing agency. In most of countries, the tender and contracting procedures shall be taken in accordance with the laws and regulations relevant to the public procurement and construction works. In the case of projects funded by the bi- or multi-lateral loan agency, however, these procedures are required also to follow guidelines of such agency, which will be stipulated in the Loan Agreement. While the consultant is preparing the tender documents, the agency is expected to supply information on legal restrictions, if any, of procurements and contracts of the public works. Such information will be incorporated into terms of tender and contract of the tender documents, while the terms of the Loan Agreement between the executing agency and the lender are more influential. The tender documents thus prepared shall be submitted to the lender for its approval prior to the bidding stage.

At the bidding stage, the consultant shall assist the implementing agency in evaluating the tenders submitted, negotiating contracts with the successful bidders and finalizing the contracts. The executing agency and the lender before the contracts take effect shall approve all of these procedures.

In the procurement and construction stage, the consultant shall supervise the construction work, check quality and quantity of material procured, and measure progress of the work. More importantly, the consultant shall advise the contractor in organizing technology transfer and training on operation and maintenance of the constructed facilities and the installed equipment. By that time, the implementing agency shall have the personnel to be trained. That personnel shall be transferred to the sewerage and drainage service provider after the handing-over the completed project facilities.

Acquisition and preparation of lands for the wastewater treatment plants, pump stations, interceptor sewers of large diameters will have to be completed by the time construction work shall begin. It is also anticipated that some illegal housing over and along canals will have to be cleared to ensure environmental improvement and canal's draining capacity.