SEWAGE FLOW CALCULATION TABLE (TONGI)

P :

No. of Sewrs	No. of Sewrs Downstream	Drainage Area		Length		Concentration Time	Storm Run-off					Sewage Flow				Other Sewage		Total Sewage Flow	Design Sewer							Remarks
		Area	Total	Length	Total		Rainfall per ha	Rain off Coeffi	Converted Area		Rainfall	Pop. Density	Population		Sewage Flow	Per Sewer	Total		Diameter	Slope	Velocity	Flow	Elevation	Invert Level	Earth Cover	
									Area	Total			Per Sewer	Total												
		ha	ha	m	m	min	m³/s·ha		ha	ha	m³/s	P/ha	Per	Person	m³/s	m³/s	m³/s	m³/s	m/m	‰	m/s	m³/s	M	M	m	
101		7590	7590	500	500							291.4	722	123 221	230.04			00410	300	190	0772	00538	661 647	5302 4352	100 181	
102		10120	17710	500	1000							291.4	729	497 516	200.09			00955	400	140	0799	00980	647 683	4255 3555	181 287	
103		9730	27440	500	1500							291.4	728	360 799	300.14			01481	500	200	0860	01689	683 683	3450 2449	283 383	
104		6420	33860	500	2000							291.4	718	712 986	920.18			01828	600	160	0869	02456	683 683	2349 1550	382 462	
105		5640	39500	500	2500							291.4	716	439 1151	319.21			02132	600	160	0869	02456	683 843	1550 0751	462 702	
106		4670	44170	500	3000							291.4	713	612 1287	430.23			02384	600	160	0869	02455	843 772	6770 5911	100 115	
107	118	2920	47090	500	3500							291.4	785	1197 254	. 254			02542	700	140	0900	03465	772 747	5811 5111	124 159	
121		4280	4280	300	300							291.4	712	475 124	750.02			00231	250	220	0739	00363	1159 948	10090 8222	124 100	
120		2920	7200	300	600							291.4	785	11 20986	. 038			00389	300	190	0772	00538	948 737	7915 6062	126 100	
119		3890	11090	500	1100							291.4	711	339 323	250.05			00599	350	160	0785	00747	737 747	6011 5212	100 190	
118		3890	62070	400	3900							291.4	711	339 1809	160.33			03350	700	140	0900	03465	747 737	4860 4300	184 230	
117	115	1170	63240	400	4300							291.4	734	1018 4329	. 341			03413	700	140	0900	03465	737 793	4300 3740	230 342	
108		4280	4280	400	400							291.4	712	475 124	750.02			00231	250	220	0739	00363	829 829	5032 4152	100 188	
109		2720	7000	500	900							291.4	779	28 20403	. 037			00378	300	190	0772	00538	829 829	4104 3154	188 283	

SEWAGE FLOW CALCULATION TABLE (TONGI)

No. of Sewrs	No. of Sewrs Downstream	Drainage Area		Length		Concentration Time	Storm Run-off					Sewage Flow				Other Sewage		Total Sewage Flow	Design Sewer							Remarks
		Area	Total	Length	Total		Rainfall Per ha	Run-off Coeffi.	Converted Area		Rainfall	Pop. Density	Population		Sewage Flow	per Sewer	Total		Diameter	Slope	Velocity	Flow	Elevation	Invert Level	Earth Cover	
									Area	Total			Per Sewer	Total												
		ha	ha	m	m	min	m³/s·ha		ha	ha	m³/s	P/ha	Per	Person	m³/s	m³/s	m³/s	m³/s	mm	‰	m/s	m³/s	M	M	m	
110		5060	12060	500	1400							291.47	147	49	351	520.06			00651	350	160	0785	00747	629 629	3104 2305	282 363	
111		3500	15560	500	1900							291.47	102	01	453	530.03			00840	400	140	0799	00980	629 629	2258 1558	353 433	
112		3890	19450	500	2400							291.47	113	88	566	910.10			01050	450	130	0830	01274	629 793	1511 0860	432 661	
116		7780	90470	500	4800							291.47	226	76	2636	930.48			04883	900	110	0944	06004	793 619	0402 -0148	654 535	
115		2920	93390	500	5300							291.47	851	127	2204	504			05041	900	110	0944	06004	619 619	-0148 -0698	535 590	
114		6030	99420	500	5800							291.47	175	76	2897	800.53			05366	900	110	0944	06004	619 726	4200 3610	100 266	
113	T	4860	104280	500	6300							291.47	141	65	3039	450.56			05629	900	110	0944	06004	726 567	3510 3060	266 162	

SEWAGE FLOW CALCULATION TABLE (NORTH DHAKA EAST)

P 1

No. of Sewrs	No. of Sewrs Downstream	Drainage Area		Length		Concentration Time	Storm Run-off					Sewage Flow				Other Sewage		Total Sewage Flow	Design Sewer							Remarks
		Area	Total	Length	Total		Rainfall per ha	Run-off Coeffi.	Converted Area		Rainfall	Pop. Density	Population		Sewage Flow	Per Sewer	Total		Diameter	Slope	Velocity	Flow	Elevation	Invert Level	Earth Cover	
									Area	Total			per Sewer	Total												
		ha	ha	m	m	mun	m³/s·ha		ha	ha	m³/s	P/ha	Per	Person	m³/s	m³/s	m³/s	m³/s	mm	‰	m/s	m³/s	M	M	m	
202		6790	6790	500	500							158.4	6107	60107	600.01			00199	200	250	0683	00219	772 772	6511 5261	100 225	
203		8430	15220	500	1000							158.4	6133	58241	180.04			00447	300	190	0772	00538	772 772	5185 4215	225 320	
204		8190	23410	500	1500							158.4	6129	78370	960.06			00687	350	160	0785	00747	772 772	4155 3366	320 400	
205	206	4210	27620	500	2000							158.4	6667	1.43767	.081			00811	400	140	0799	00980	772 772	3319 2619	399 469	
201		2110	2110	700	700							158.4	6334	4 3344	.006			00062	200	200	0467	00147	1159 772	10136 6500	118 100	
206		4680	34410	500	2500							158.4	6741	6 54527	.101			01010	450	130	0830	01274	772 872	2572 1921	459 634	
207		5850	40260	500	3000							158.4	6926	9 63796	.118			01181	450	130	0830	01274	872 767	1921 1270	634 594	
208		6320	46580	500	3500							158.4	6100	15 738	110.13			01367	500	200	0860	01689	767 725	1212 0211	591 649	
209		3980	50560	500	4000							158.4	6630	7 80118	.148			01484	500	200	0860	01689	725 691	0211 -0790	649 715	
210		25050	75610	500	4500							158.4	6396	941198	120.22			02219	600	160	0869	02456	691 699	5250 4391	100 194	
211		2340	77950	500	5000							158.4	6370	8123520	.228			02287	600	160	0869	02456	699 709	4391 3592	194 284	
212		4210	82160	500	5500							158.4	6667	1130191	.241			02411	600	160	0869	02456	709 709	3592 2793	284 364	
213		6550	88710	500	6000							158.4	6103	791405	700.26			02603	700	140	0900	03465	709 756	2633 1993	363 480	
214		12880	101590	500	6500							158.4	6204	1016093	800.29			02981	700	140	0900	03465	756 756	1993 1293	480 550	
301		11170	112760	500	7000							357.7	5399	612009	410.37			03721	800	120	0911	04581	756 720	1293 0593	549 573	

SEWAGE FLOW CALCULATION TABLE (NORTH DHAKA EAST)

No. of Sewrs	No. of Sewrs Downstream	Drainage Area		Length		Concentration Time	Storm Run-off					Sewage Flow				Other Sewage		Total Sewage Flow	Design Sewer							Remarks
		Area	Total	Length	Total		Rainfall Per ha	Rain-off Coeffi	Converted Area		Rainfall	Pop. Density	Population		Sewage Flow	per Sewer	Total		Diameter	Slope	Velocity	Flow	Elevation	Invert Level	Earth Cover	
									Area	Total			per Sewer	Total												
		ha	ha	m	m	min	m³/s·ha		ha	ha	m³/s	P/ha	Per	Person	m³/s	m³/s	m³/s	m³/s	mm	‰	m/s	m³/s	M	M	m	
302		10200	122960	500	7500							357.7	5364	902374	310.43			04397	800	120	0911	04582	720 674	0593 -0007	573 587	
303		9710	132670	500	8000							357.7	5347	1382721	690.50			05040	900	110	0944	06004	674 693	-0107 -0657	586 660	
304		11650	144330	500	8500							357.7	5417	1331388	820.58			05813	900	110	0944	06004	693 705	4240 4350	100 171	
305		8010	152340	400	8900							357.7	5286	563425	380.63	00296	00296	06039	1000	100	0965	07582	705 648	4250 3350	170 153	
306		8740	161080	500	9400							357.7	5312	673738	450.69		00296	07218	1000	100	0965	07582	648 648	3850 3250	153 203	
307		10690	171770	500	9900							357.7	5382	1441204	490.76		00296	07927	1100	090	0976	09274	648 653	3250 2802	202 252	
308		7530	179300	500	10400							357.7	5269	394389	880.81		00296	08425	1100	090	0976	09274	653 653	2802 2354	252 297	
309		9710	189010	500	10900							357.7	5347	1474737	250.87		00296	09069	1100	090	0976	09274	653 632	2354 1906	297 320	
310		12140	201150	500	11400							357.7	5434	3151715	60.95		00296	09873	1200	090	1034	11696	632 632	1806 1358	319 364	
311		7040	208190	500	11900							357.7	5251	865423	421.00		00296	10339	1200	090	1034	11696	632 646	1358 0910	364 423	
312		8010	216200	500	12400							357.7	5286	555709	971.05		00296	10870	1200	090	1034	11696	646 646	0910 0462	423 468	
313	331	7530	223730	500	12900							357.7	5269	395979	361.10		00296	11369	1200	090	1034	11696	646 613	0462 0014	468 480	
314		4860	4860	500	500							357.7	5173	87 173	870.03	01093	01093	01415	500	200	0860	01589	703 704	5480 4479	100 201	
315		7040	11900	500	1000							357.7	5251	86 425	730.07		01093	01881	600	160	0869	02456	704 722	4379 3580	200 298	
316		6310	18210	500	1500							357.7	5225	74 651	470.12		01093	02299	600	160	0869	02456	722 722	3580 2781	298 378	

SEWAGE FLOW CALCULATION TABLE (NORTH DHAKA EAST)

No. of Sewrs	No. of Sewrs Downstream	Drainage Area		Length		Concentration Time	Storm Run-off					Sewage Flow				Other Sewage		Total Sewage Flow	Design Sewer							Remarks
		Area	Total	Length	Total		Rainfall per ha	Rain-off Coeffi.	Converted Area		Raunfall	Pop. Density	Population		Sewage Flow	Per Sewer	Total		Diameter	Slope	Velocity	Flow	Elevation	Invert Level	Earth Cover	
									Area	Total			per Sewer	Total												
		ha	ha	m	m	min	m³/s-ha		ha	ha	m³/s	P/ha	Per	Person	m³/s	m³/s	m³/s	m³/s	mm	‰	m/s	m³/s	M	M	m	
317		1460	19670	350	1850							357.7	55223	70370	.130		01093	02396	600	160	0869	02456	722 697	2381 2221	378 409	
318		7290	26960	500	2350							357.7	52608	0 964	500.17		01093	02879	700	140	0900	03465	697 688	2121 1421	408 469	
319		6800	33760	500	2850							357.7	52432	71207	770.22		01093	03330	700	140	0900	03465	688 688	1421 0721	469 539	
320		4860	38620	300	3150							357.7	51738	71381	640.25		01093	03652	800	120	0911	04581	688 688	0621 0261	538 574	
321	329	1940	40560	500	3650							357.7	56940	145104	.268		01093	03780	800	120	0911	04581	688 679	5000 4360	100 155	
322		5830	5830	250	250							357.7	52085	7 208	570.03			00386	300	190	0772	00538	701 708	5702 5227	100 155	
323		4860	10690	500	750							357.7	51738	7 382	440.07			00708	350	160	0785	00747	708 708	5177 4378	154 234	
324		5590	16280	500	1250							357.7	51999	8 582	420.10			01079	450	130	0830	01274	708 694	4286 3633	234 285	
325		4860	21140	500	1750							357.7	51738	7 756	290.14			01401	500	200	0860	01689	694 694	3575 2574	282 332	
326	329	2430	23570	450	2200							357.7	58693	84322	.156			01562	500	200	0860	01689	694 679	2574 1674	382 457	
327		2430	2430	400	400							357.7	58694	8694	.016			00161	200	250	0683	00219	623 651	5021 4021	100 228	
328		1940	4370	350	750							357.7	56940	15634	.029			00290	250	220	0739	00363	651 679	3973 3203	228 333	
329		730	69230	400	4050							357.7	52612	247671	.458		01093	05680	900	110	0944	06004	679 679	1274 0834	453 497	
330		3160	72390	500	4550							357.7	51130	52589	760.47		01093	05889	900	110	0944	06004	679 613	4778 4140	102 100	

SEWAGE FLOW CALCULATION TABLE (NORTH DHAKA EAST)

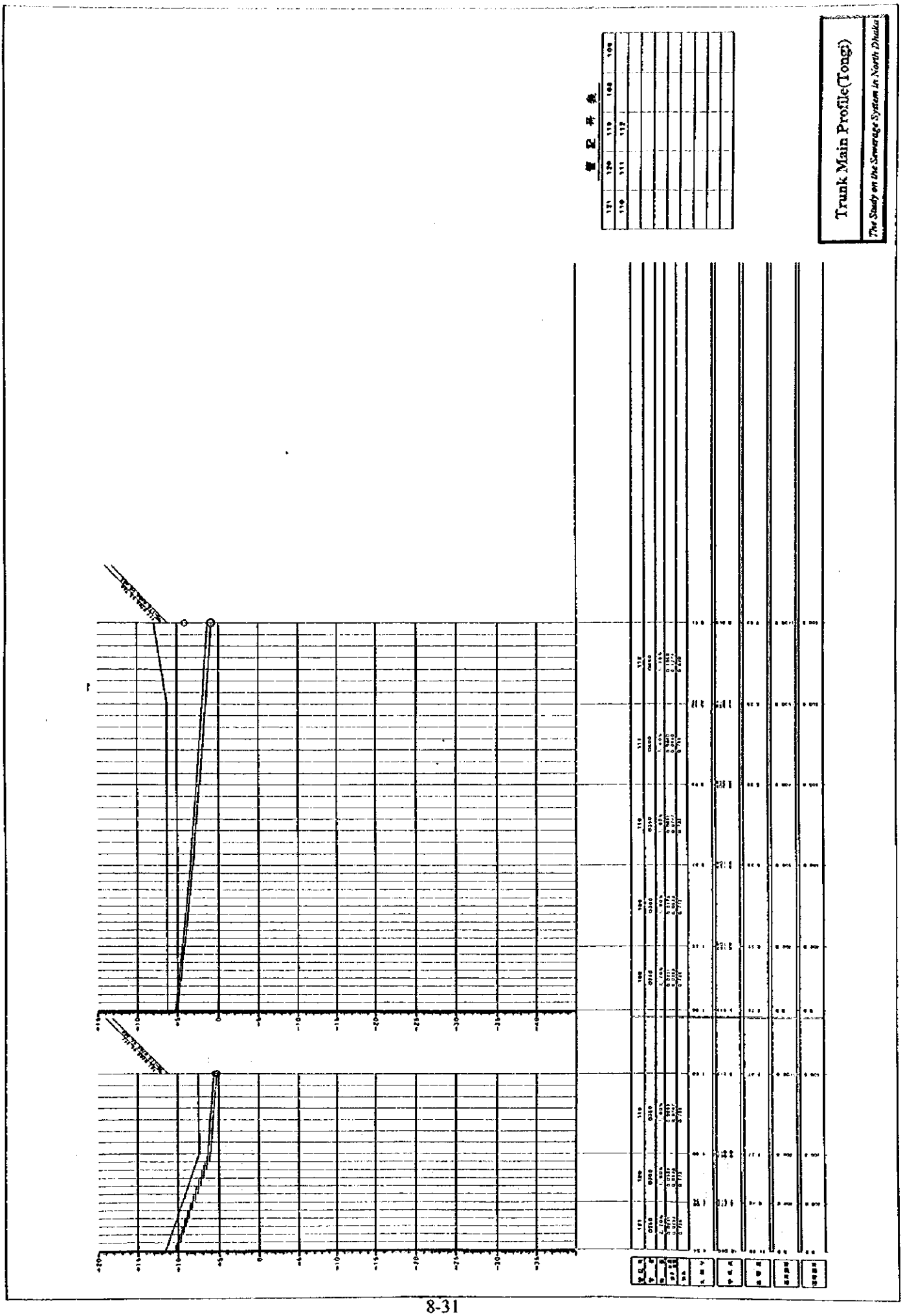
No. of Sewrs	No. of Sewrs Downstream	Drainage Area		Length		Concentration Time	Storm Run-off					Sewage Flow				Other Sewage		Total Sewage Flow	Design Sewer							Remarks
		Area	Total	Length	Total		Rainfall per ha	Rain-off Coeffi	Converted Area		Rainfall	Pop. Density	Population		Sewage Flow	per Sewer	Total		Diameter	Slope	Velocity	Flow	Elevation	Invert Level	Earth Cover	
									Area	Total			per Sewer	Total												
		ha	ha	m	m	min	m³/s·ha		ha	ha	m³/s	P/ha	Per	Person	m³/s	m³/s	m³/s	m³/s	mm	‰	m/s	m³/s	M	M	m	
331		7770	303890	500	13400							357.7	5277	978847	081.63		01389	17772	1500	090	1200	21207	613 603	-0286 -0738	477 512	
332		8990	312880	500	13900							357.7	5321	629168	701.69		01389	18368	1500	090	1200	21207	603 593	-0738 -1190	512 547	
333	Pump	12630	325510	450	14350							357.7	5451	849620	541.78		01389	19205	1500	090	1200	21207	593 593	-1190 -1595	547 588	

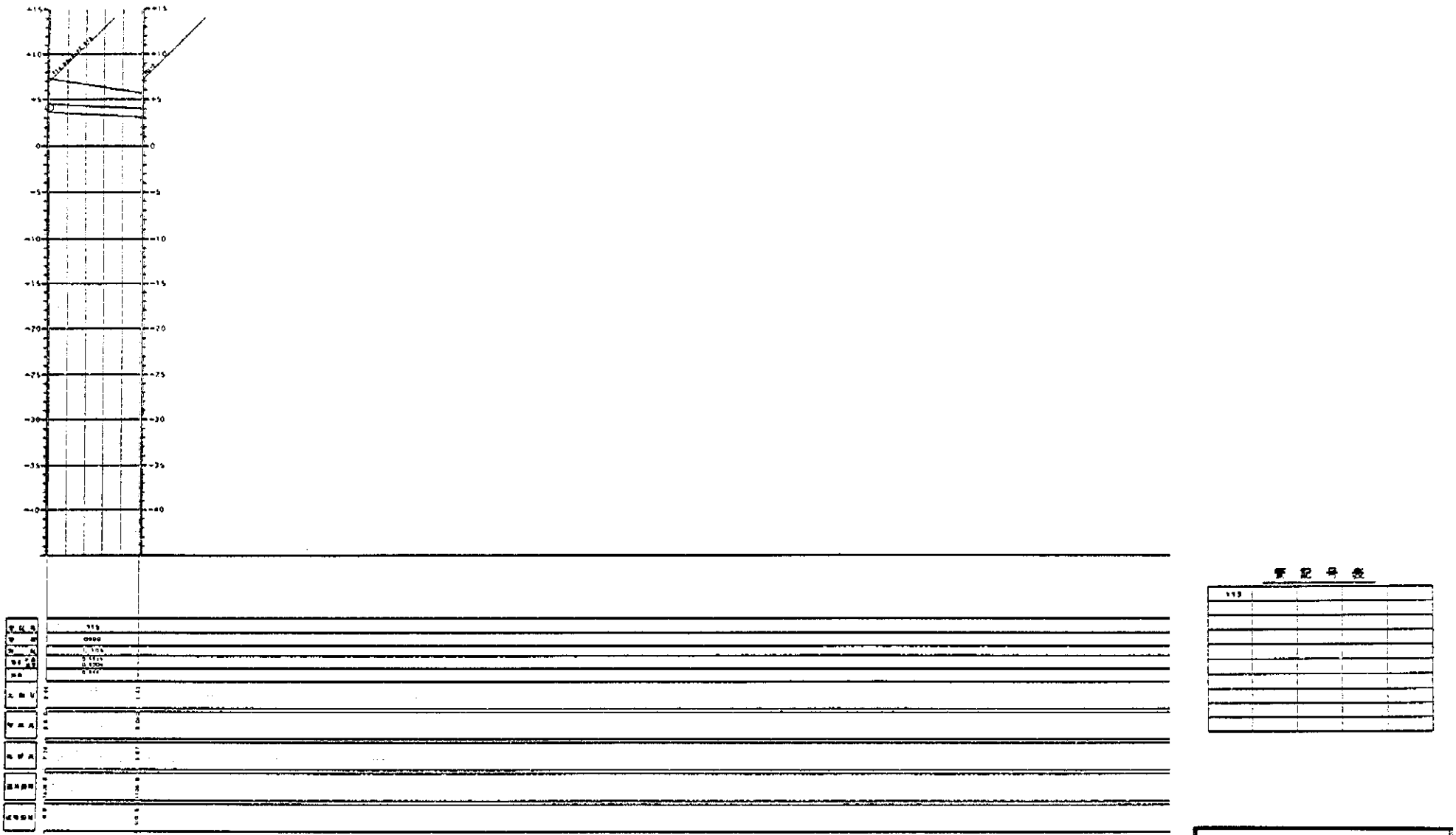
SEWAGE FLOW CALCULATION TABLE (NORTH DHAKA WEST)

No. of Sewers	No. of Sewers Downstream	Drainage Area		Length		Concentration Time	Storm Run-off					Sewage Flow				Other Sewage		Total Sewage Flow	Design Sewers							Remarks
		Area	Total	Length	Total		Rainfall per ha	Run-off Coeffi.	Converted Area Area	Converted Area Total	Rainfall	Pop. Density	Population per Sewer	Population Total	Sewage Flow	per Sewer	Total		Diameter	Slope	Velocity	Flow	Elevation	Invert Level	Earth Cover	
		ha	ha	m	m	min	/ ·ha		ha	ha	/	P/ha	Per	Person	/	/	/	/	mm		m/	/	M	M	m	
401		7900	7900	500	500							657.7	55	1963	519	630.09			00962	400	140	0799	00980	711 611	5660 4703	104 100	
402		7390	15290	500	1000							657.7	54	3607	1005	700.18			01862	600	160	0869	02456	611 611	4450 3651	100 180	
403		3820	19110	500	1500							657.7	52	5127	1256	970.23			02328	600	160	0869	02456	611 611	3651 2852	180 260	
404		2290	21400	500	2000							657.7	51	5062	1407	590.26			02607	700	140	0900	03465	611 611	2752 2052	259 329	
405		3060	24460	500	2500							657.7	52	0127	1608	860.29			02979	700	140	0900	03465	611 597	2052 1352	329 385	
406		4840	29300	500	3000							657.7	53	1835	1927	210.35			03569	800	120	0911	04581	597 711	1252 0652	334 558	
407		5100	34400	500	3500							657.7	53	3545	2262	660.41			04190	800	120	0911	04581	711 965	5230 4590	100 418	
408		5600	40000	400	3900							657.7	53	6834	2631	000.48			04372	900	110	0944	06004	965 1174	4490 4050	417 670	
409		19110	59110	500	4400							657.7	51	2569	7388	79 0.7			07200	1000	100	0965	07582	1174 1112	3950 3450	669 657	
410		9940	69050	500	4900							657.7	56	5380	4541	770.84			08411	1100	090	0976	09274	1112 1257	8910 8432	100 293	
411		7390	76440	500	5400							657.7	54	8608	5027	850.93			09311	1200	090	1034	11696	1257 1050	8332 7884	292 130	
412	417	1780	78220	500	5900							657.7	51	1708	5144	930.95			09528	1200	090	1034	11696	1050 842	7772 6100	141 100	
427		4590	4590	500	500							657.7	53	0191	301	910.05			00559	250	160	0785	00747	683 683	5471 4672	100 180	
426		5100	9690	450	950							657.7	53	3545	637	360.11			01180	450	130	0830	01274	683 679	4578 3995	180 234	
425		6110	15800	400	1350							657.7	54	0139	1039	250.19			01925	600	160	0869	02456	679 675	3833 3197	229 289	

SEWAGE FLOW CALCULATION TABLE (NORTH DHAKA WEST)

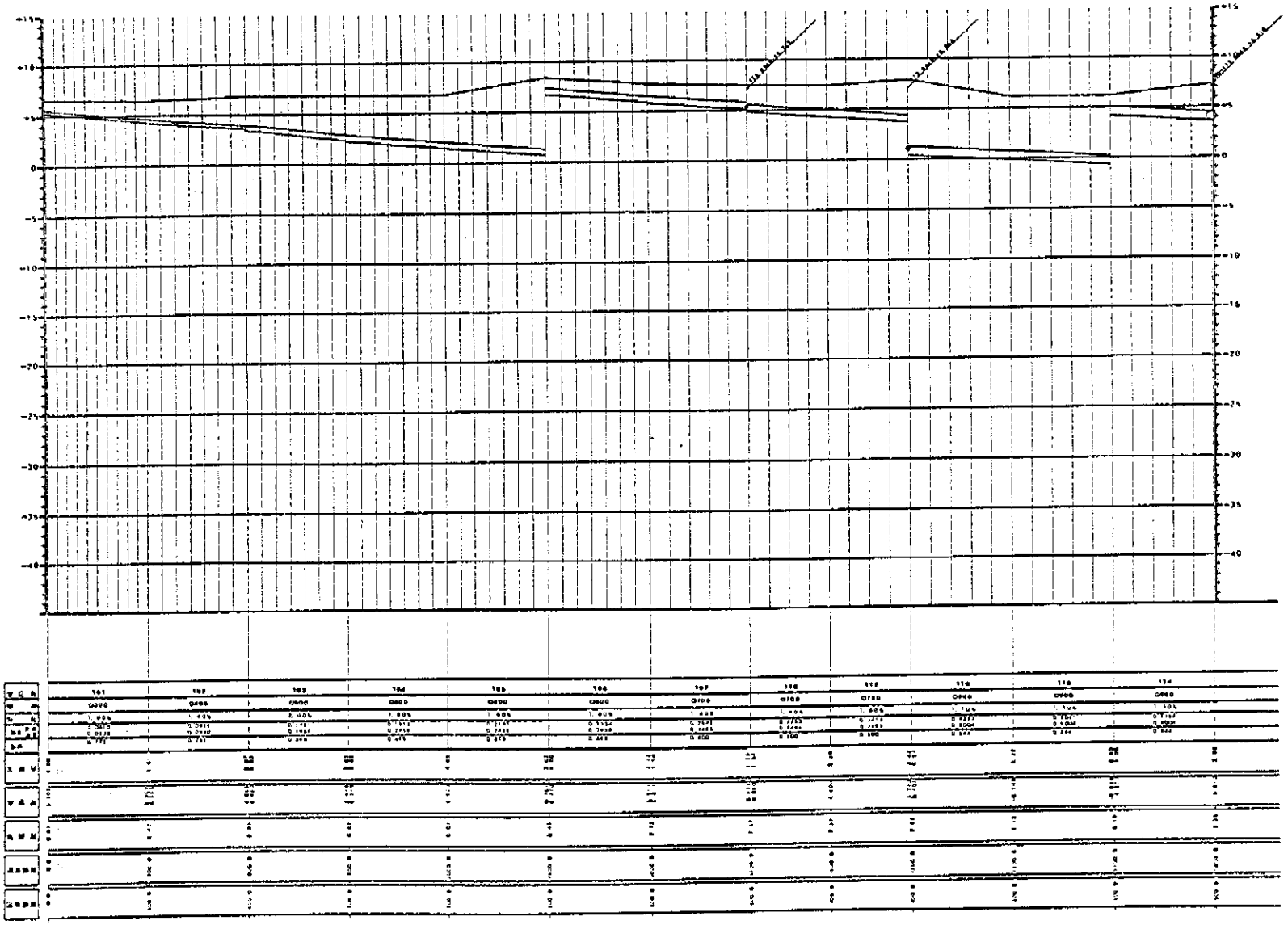
No. of Sewers	No. of Sewers Downstream	Drainage Area		Length		Concentration Time	Storm Run-off						Sewage Flow				Other Sewage		Total Sewage Flow	Design Sewers							Remarks
		Area	Total	Length	Total		Rainfall	per ha	Run-off Coeffi.	Converted Area		Rainfall	Pop. Density	Population		Sewage Flow	per Sewer	Total		Diameter	Slope	Velocity	Flow	Elevation	Invert Level	Earth Cover	
										Area	Total			per Sewer	Total											
		ha	ha	m	m	min	/	·ha		ha	ha	/	P/ha	Per	Person	/	/	/	/	mm		m/	/	M	M	m	
424		9940	25740	500	1850								657.7	5653	201693	50.31			03135	700	140	0900	03465	675 719	3097 2397	288 402	
423		4590	30330	500	2350								657.7	5301	311994	60.36			03694	800	120	0911	04581	719 699	2297 1697	401 441	
422	421	1780	32110	500	2850								657.7	5117	082112	40.39			03911	800	120	0911	04581	699 842	1697 1097	441 644	
418		9430	9430	450	450								657.7	5620	26 620	260.11			01149	450	130	0830	01274	842 842	6964 6382	100 158	
419		7390	16820	450	900								657.7	5486	081105	340.20			02049	600	150	0869	02456	842 842	6226 5504	154 226	
420		6110	22930	500	1400								657.7	5401	391508	230.27			02793	700	140	0900	03465	842 842	5404 4704	225 295	
421		2550	57590	500	3350								657.7	5167	733787	990.70			07015	1000	100	0965	07582	842 842	0897 0397	642 692	
417		18340	154150	500	6400								657.7	5120	631101	392 1.			18776	1500	090	1200	21207	842 1003	5770 5292	100 309	
416		19620	173770	500	6900								657.7	5129	051114	293 2.			21166	1500	090	1200	21207	1003 1165	5292 4844	309 516	
415		22670	196440	500	7400								657.7	5149	112129	205 2.			23928	1600	090	1253	25189	1165 1008	4744 4294	515 403	
414		17830	214270	500	7900								657.7	5117	276140	231 2.			25099	1700	090	1304	29609	1008 851	4194 3744	402 290	
413	T	32350	246620	400	8300								657.7	5212	783162	214 3.	00333	00333	30373	1800	090	1355	34484	851 1018	3644 3284	292 495	


Trunk Main Profile(Tongi)
The Study on the Sewerage System in North Dhaka



Trunk Main Profile(Tongi)

The Study on the Sewerage System in North Dhaka



管	渠	号	表	
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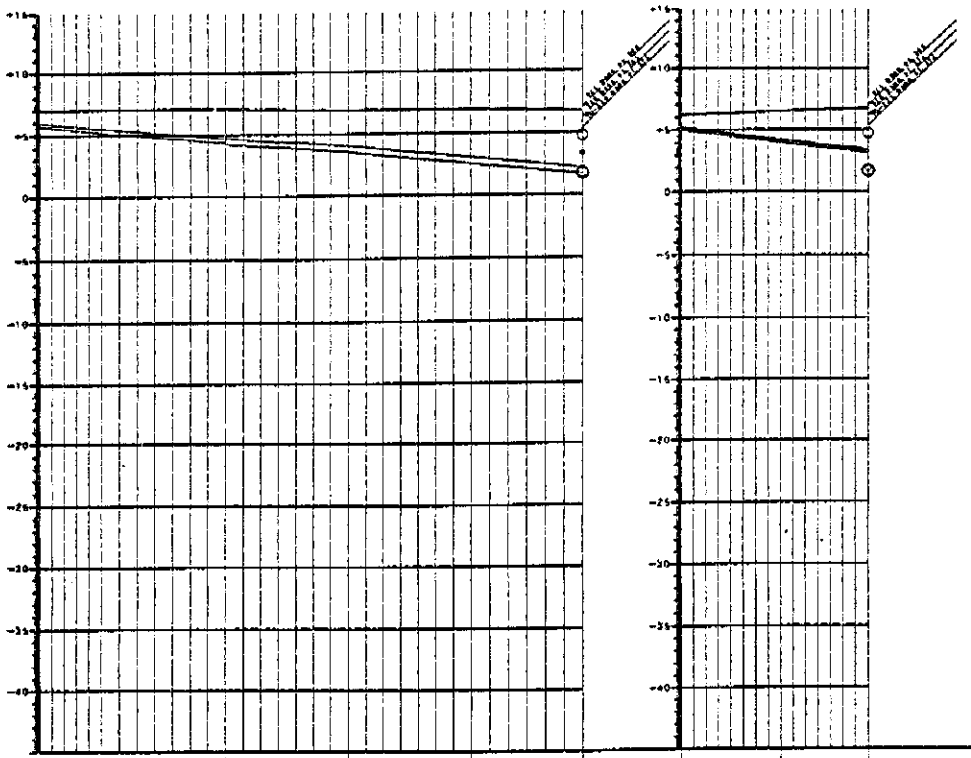
106	107	108	117	118
119	120			

Trunk Main Profile(Tongi)

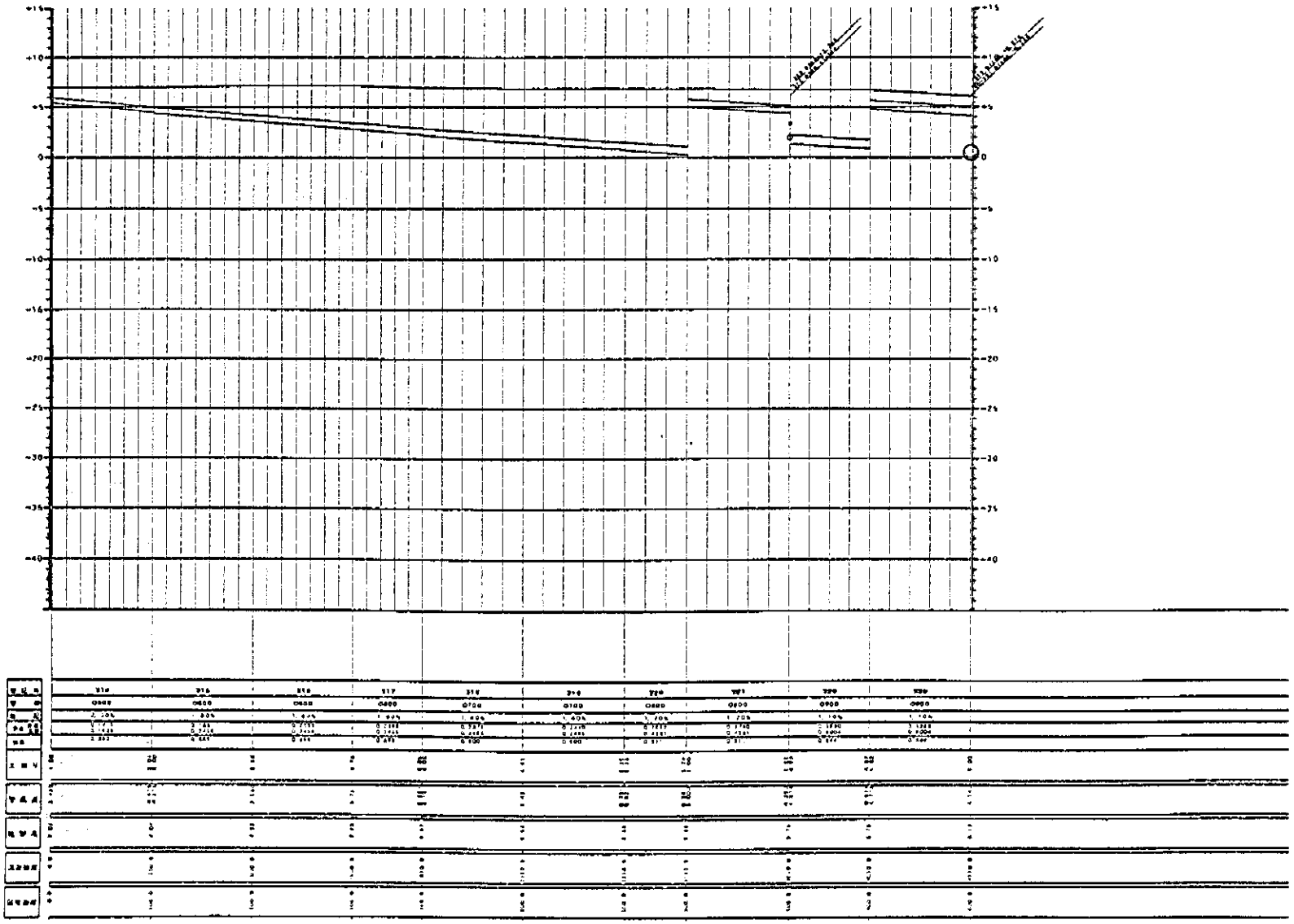
The Study on the Sewerage System in North Dhaka



管記号表				
322	323	324	325	326
327	328			

Trunk Main Profile(East)

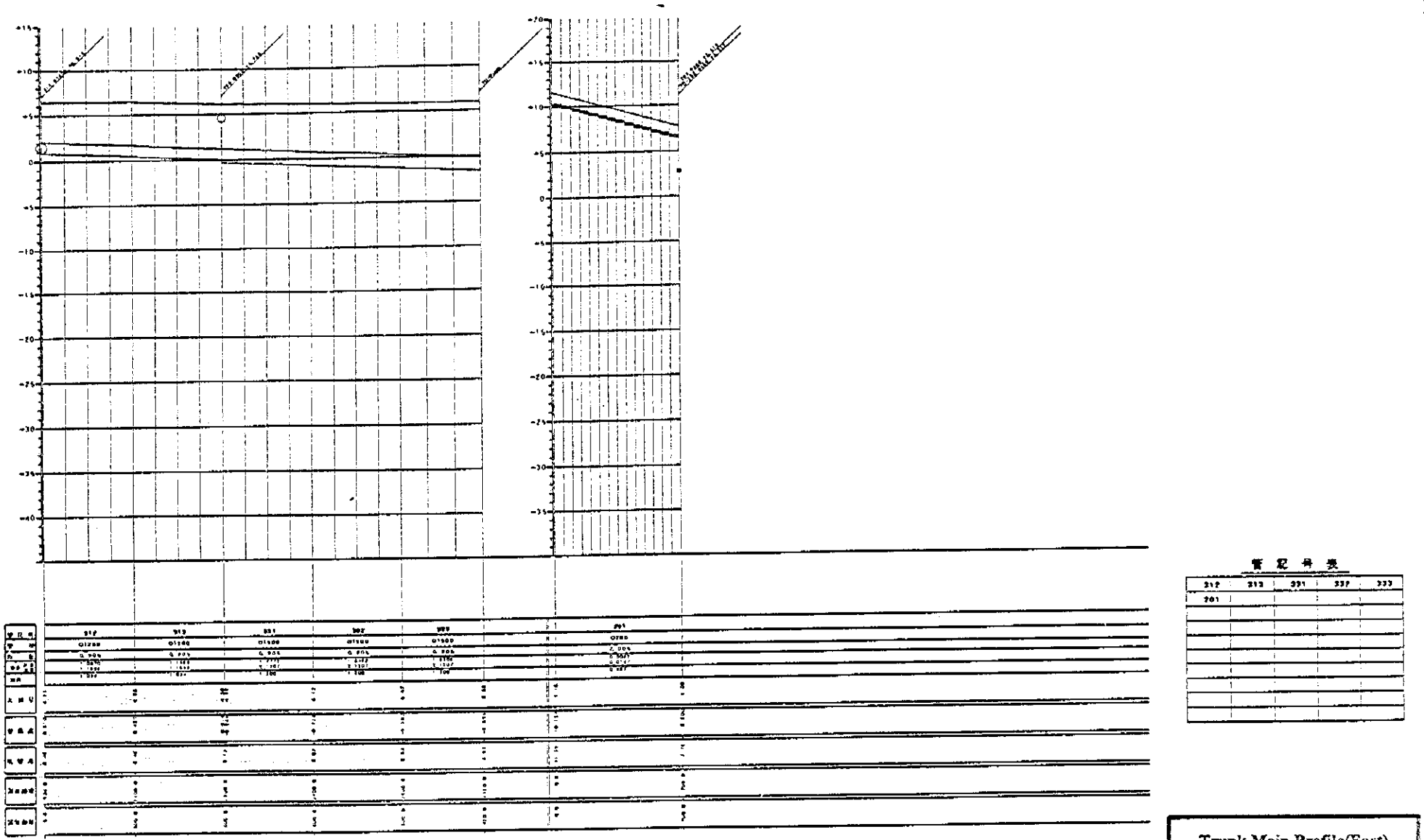
The Study on the Sewerage System in North Dhaka



314	315	316	317	318
319	320	321	329	330

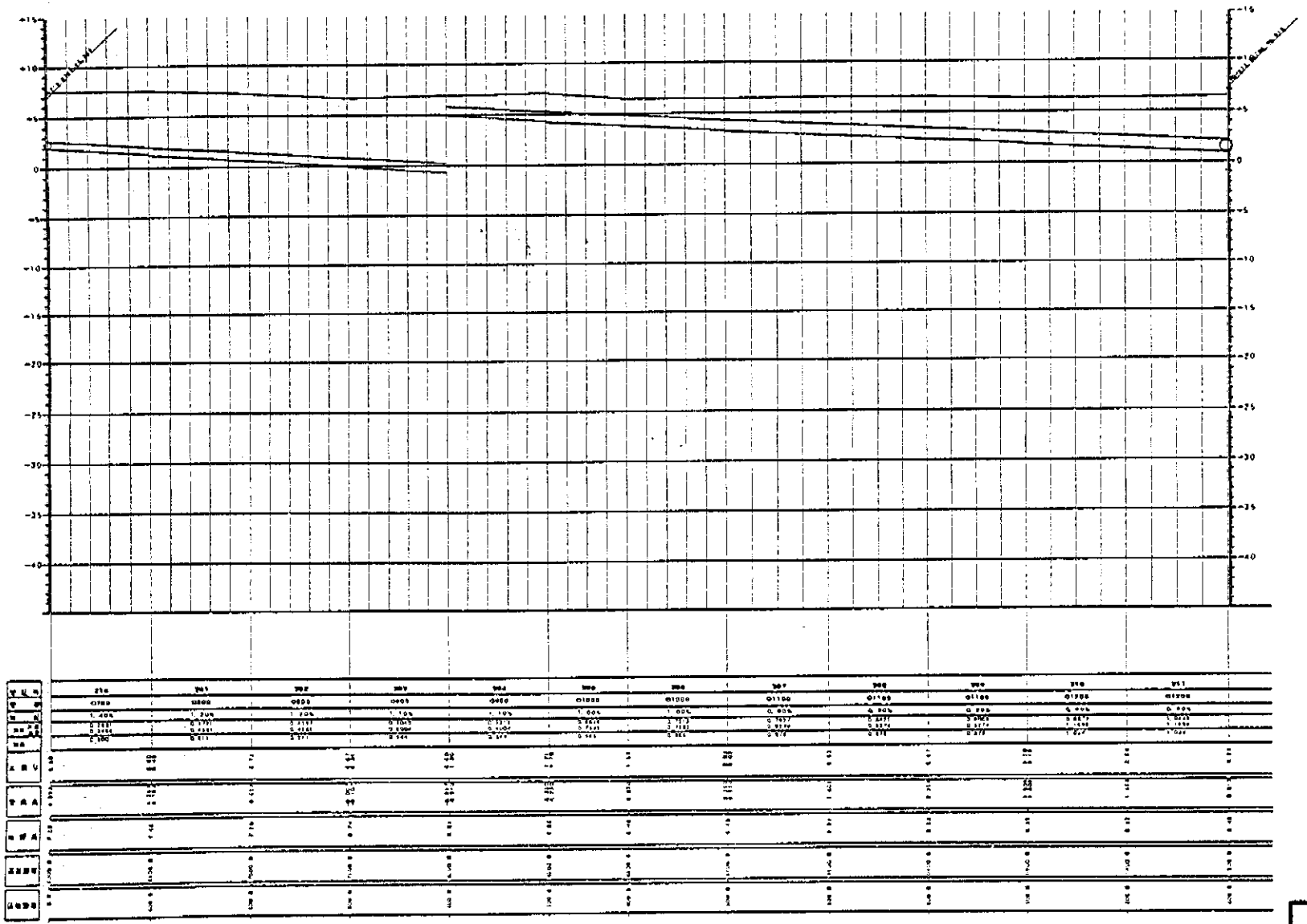
Trunk Main Profile(East)

The Study on the Sewerage System in North Dhaka



Trunk Main Profile(East)

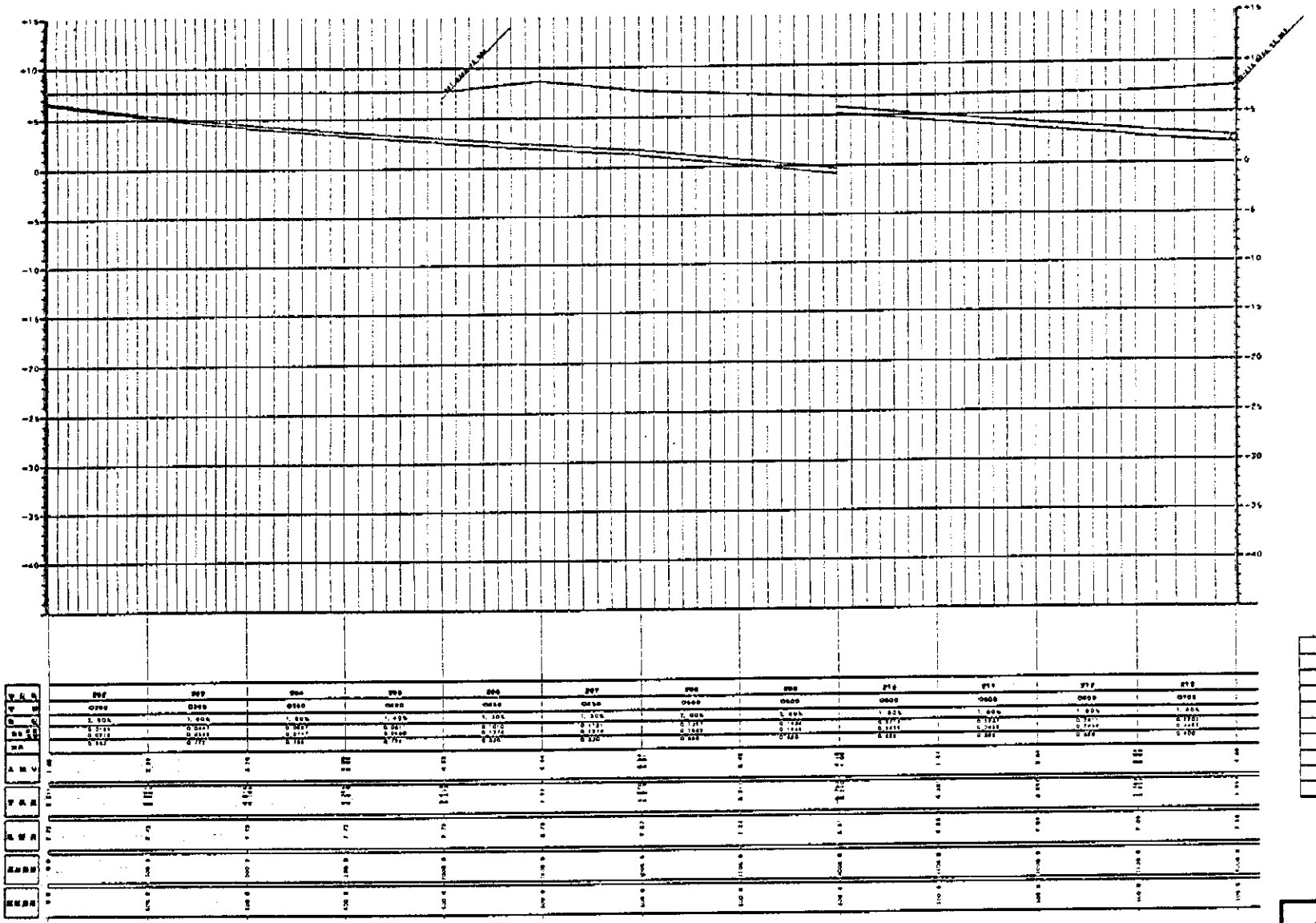
The Study on the Sewerage System in North Dhaka



管渠番号				
214	301	302	303	304
305	308	307	308	309
310	311			

Trunk Main Profile(East)

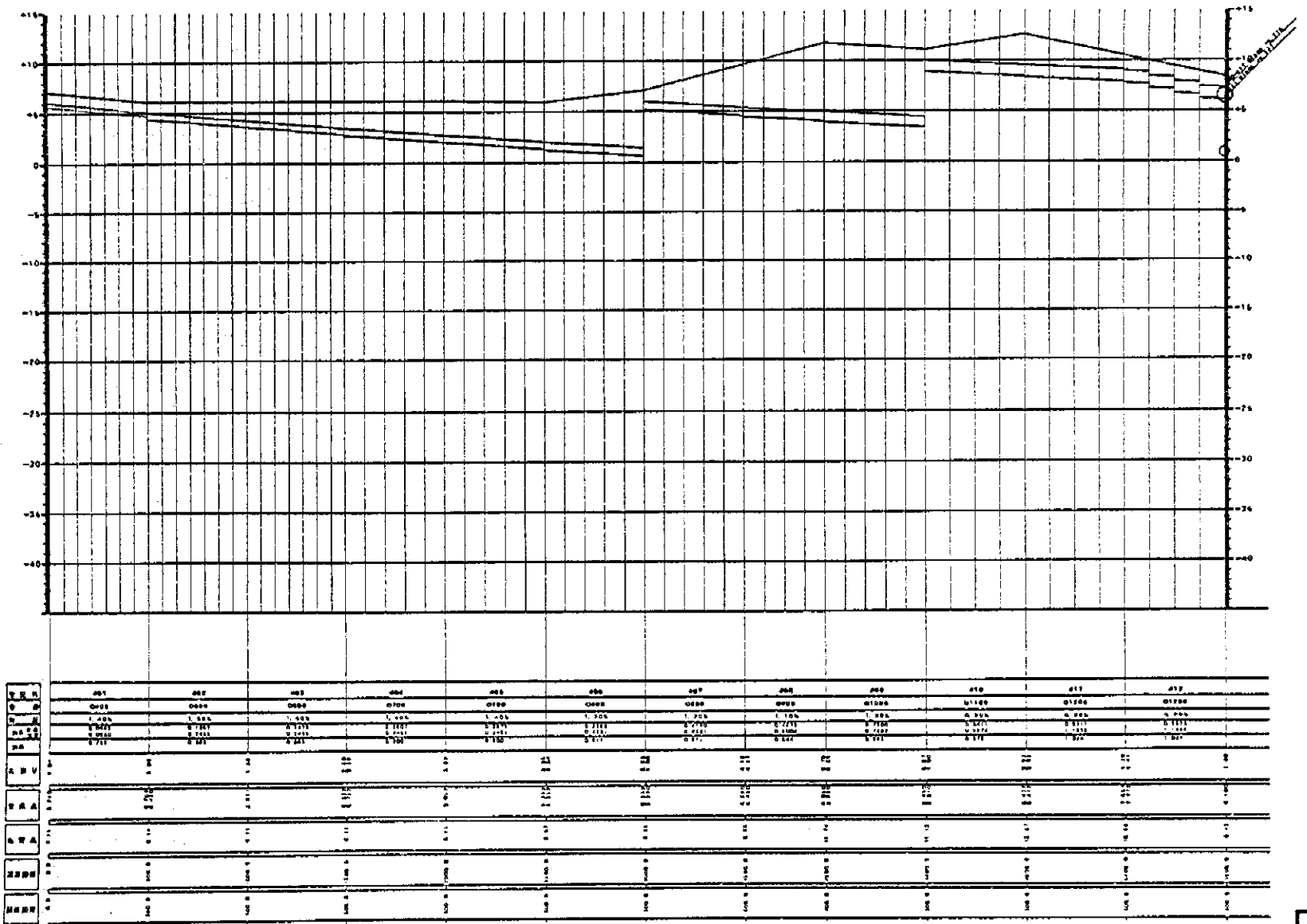
The Study on the Sewerage System in North Dhaka



管	況	年	表	
202	203	204	205	206
207	208	209	210	211
212	213			

Trunk Main Profile(East)

The Study on the Sewerage System in North Dhaka

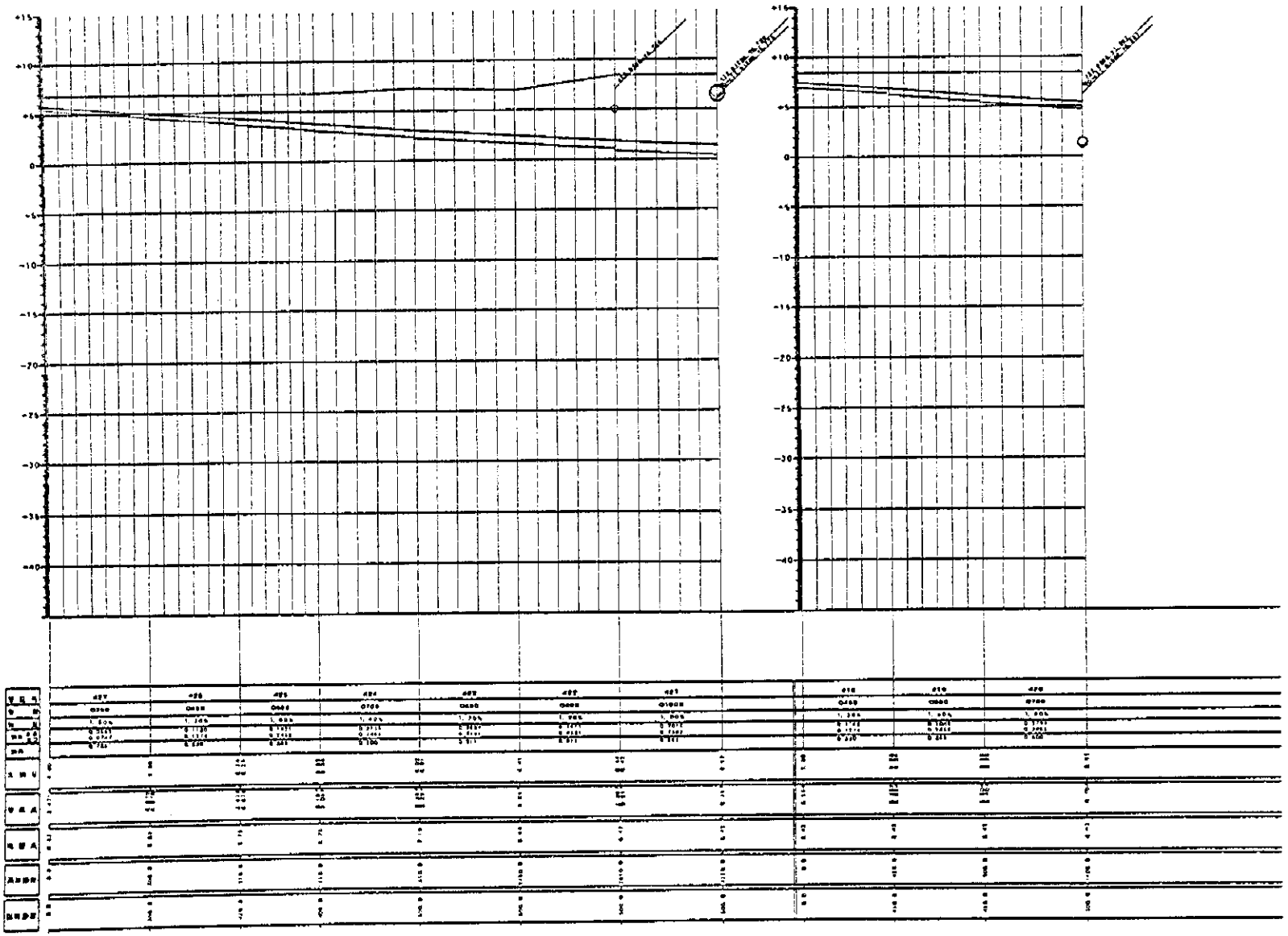


管 尺 寸 表				
401	402	403	404	405
406	407	408	409	410
411	412			

Trunk Main Profile (West)

The Study on the Sewerage System in North Dhaka

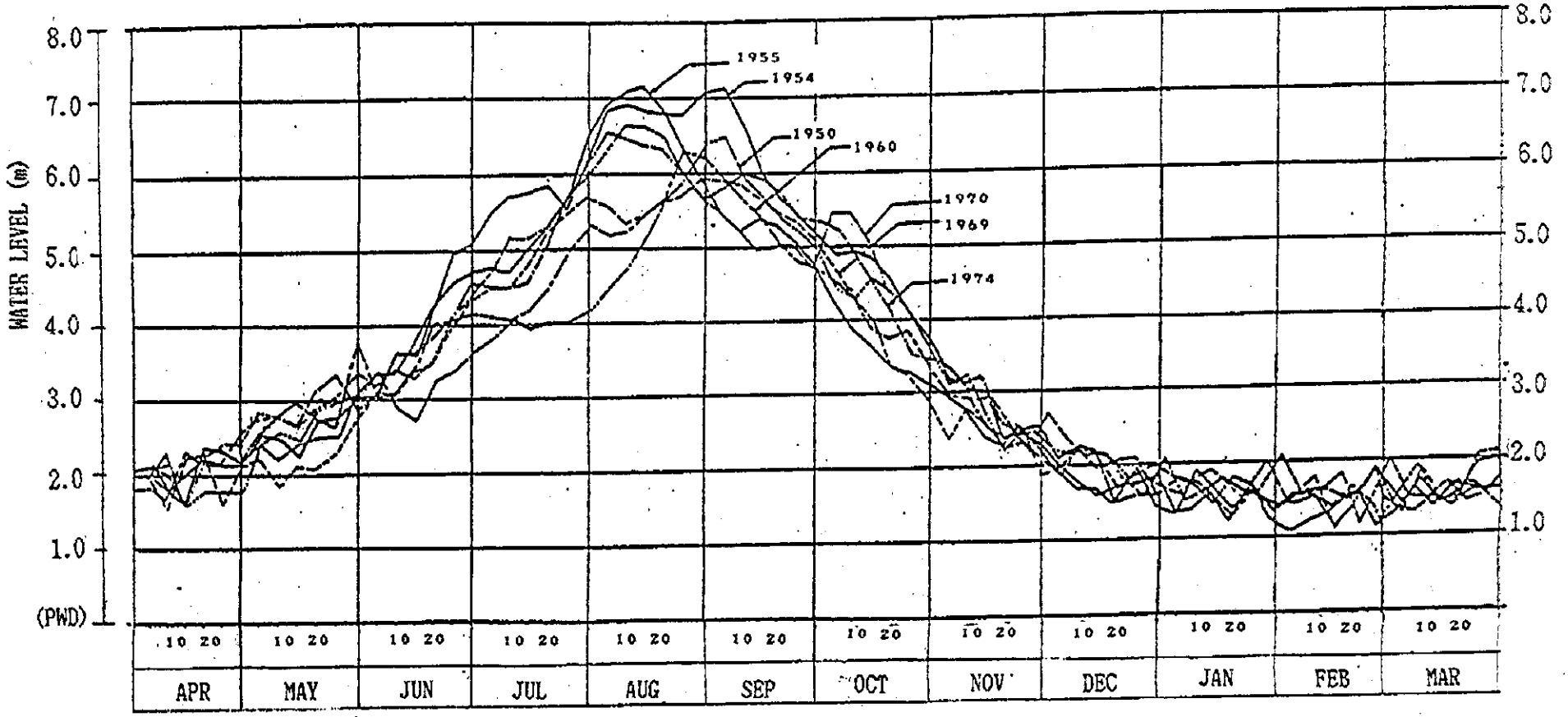
Trunk Main Profile (West)
The Study on the Sewerage System in North Dhaka



427	426	425	424	423
422	421	418	418	420

Trunk Main Profile (West)

The Study on the Sewerage System in North Dhaka



Appendix 8.5.5 The river water level in Buriganga River

Appendix 8.5.6 Capacity Calculation of Facilities (Stabilization Pond)

Name		Tongi	North Dhaka East	North Dhaka West	REMARKS
1. Design Criteria					
1)Population					
Population	persons	304,000	1,045,000	1,632,000	
2)Flow					
Daily Average	m3/day	30,400	104,500	163,200	
Daily Maximum	m3/day	38,000	130,625	204,000	
Hourly Maximum(Dry)	m3/day	48,640	167,200	261,120	
Hourly Maximum(Rain)	m3/day				
3)Water Quality					
Influent					
BOD5	mg/l	200	200	200	
SS	mg/l	200	200	200	
Effluent					
BOD5	mg/l	40	40	40	
SS	mg/l	100	100	100	
Removal Rate					
BOD5	%	80	80	80	
SS	%	50	50	50	
4)Load (Influent)					
BOD5 Load	kg-BOD5/day	8	26	41	
SS Load	kg-SS/day	8	26	41	
2.Outline of Major Facilities					
1)Grit Chamber					
Type		Rectangular	ditto	ditto	
Surface load	m3/m2/day	1,800	1,800	1,800	
Req'd Surface Area	m2	27	93	145	
Flow rate	m/s	0.30	0.30	0.30	
Depth	m	0.60	0.60	0.60	
Req'd Length	m	8.63	8.65	8.64	
Width	m	3.13	10.75	16.79	
Dimension L=	m	7.0	12.0	14.5	
W=	m	1.0	2.0	2.5	
D=	m	0.6	0.6	0.6	
Number	units	4	4	4	
(check)					
Surface load	m3/m2/day	1,737	1,742	1,801	
Flow rate	m/s	0.23	0.40	0.50	
Retention Time	s	29.8	29.8	28.8	
2)Primary Sedimention Tank					
Type					
surface Load	m3/m2/day	50	50	50	
BOD Removal	%	40	40	40	
SS Removal	%	60	60	60	
Req,d Surface Area	m2	760	2,613	4,080	
Sedimented Sludge					
Volume		228	784	1,224	
Depth	m	3.5	3.5	3.5	
Dimension					
Diameter	m	16.0	21.0	26.0	
Depth	m	3.5	3.5	3.5	
Number	units	4	8	8	

Name		Tongi	North Dhaka East	North Dhaka West	REMARKS
(check)					
Surface Area	m2	804	2,769	4,245	
Surface Load		47	47	48	
Capacity	m3	2,814	9,692	14,858	
Retention Time	hours	1.8	1.8	1.7	
BOD-Effluent	mg/l	120	120	120	
3)Facultative Pond					
Type		Embanket Rectng ctang. Pond	Embanket Rectng ctang. Pond	ditto	
Influent BOD5 Load	kg-BOD5/day	3,648	12,540	19,584	
BOD Area Load	kg-BOD5/ha/day	250	250	250	60.3*1.0993^T
where Temperature	℃	18	18	18	from 1995 data
Safty Rate		1.33	1.33	1.33	1/4stanby: 4/3=1.33
Req'd Surface Area	ha	14.59	50.16	78.34	
Depth	m	1.5	1.5	1.5	
Dimension					
L(surface)=	m	200	330	400	
(bottom) =		191	321	391	
W(surface)=	m	100	200	260	
(bottom) =		91	191	251	
D =	m	1.5	1.5	1.5	
Numbers	unit	8	8	8	
(check)					
Capacity	m3	224,102	763,693	1,212,676	
Surface Area	ha	14.94	50.91	80.85	
Retention Days	days	5.9	5.8	5.9	
Area Load against					
Influent BOD5 Load	kg-BOD5/ha/day	228	238	235	
Volume of Sludge	m3/5years	22,800	78,375	122,400	need check
Dumping Sludge Volume	m3/5years	3,420	11,756	18,360	at 15%moisture
Depth of Sedimented Sludge	m	0.15	0.15	0.15	
4)Disinfection Pond					
Type					
Retention time	min	15	15	15	
Req'd Volume	m3	317	1,089	1,700	
Dimension L=	m	16	25	30	
W=	m	5	11	15	
D=	m	2	2	2	
Numbers	units	2	2	2	
(check)					
volume		320	1,100	1,800	
Retention time		15	15	16	
5)Sludge Lagoon					
Type		Embanket Rectng ctang. Pond	Embanket Rectng ctang. Pond	ditto	
Design SS Area Load	kg/m2/year	70	70	70	
Influent SS Volume	kg/day	3,648	12,540	19,584	from Primary
Req'd Surface Area	m2	19,022	65,387	102,117	thickner
Digestion Period	months/year	6	6	6	
Drying Period	months/year	6	6	6	
Depth D=	m	1	1	1	
Aqu'd Area	m2	19,022	65,387	102,117	
Dimension					

Name		Tongi	North Dhaka East	North Dhaka West	REMARKS
L(surface)=	m	100	180	270	
(bottom) =		94	174	264	
W(surface)=	m	50	100	100	
(bottom) =		50	94	94	
D =	m	1	1	1	
Numbers	unit	8	8	8	
(drying,incliude)	unit	4	4	4	
(check)					
Surface Area	m2	19,397	68,686	103,601	
Capacity	m3	19,397	68,686	103,601	
Retention days	days	106	110	106	
3.Power Consumption					
excluding:					
-office					
-lighting					
4.Area Requirement					
Grit Chamber	m2	28	96	145	
Primary Thickning	m2	804	2,769	4,245	
Facultative Pond	m2	149,400	509,100	808,500	
Disinfection pond	m2	80	275	450	
Sludge Lagoon	m2	19,397	68,686	103,601	
Total	m2	169,709	580,926	916,941	
Approx.(see fig ***)	ha	17	58	92	

A. 9

PROJECT COST

Appendix 9.3.1 Concept of Construction Cost Estimate

1. Sanitary Sewer

- Type of pipe foundation are three (3) namely, Sand, Gravel and Concrete.
- Thickness of sand and gravel foundation shall be bigger than 1/4 of outer pipe diameter.
- Preferably, the dimension of concrete foundation shall be designed by soil pressure analysis, the estimation was carried out by 180° concrete foundation.
- Pipe supporting degree of sand foundation was standardised to 180°.
- Pipe materials are Concrete, PVC and Steel.
- Temporary work for pipe installation shall be as follows:
  - If the pipe coverage depth is below 3m, the work will be done by open-cut method.
  - If the pipe coverage depth is above 3m, the work will be done by steel sheet pile (Type-III) trench method.
- Pavement thickness was assumed as 30 cm.
- Affected range of the pavement shall be 30 cm, the assumed pavement thickness.
- Machinery excavation shall be as follows:
  - If the excavation depth is below 6m, the work will be done by back hoe (bucket capacity is 0.6 m^3).
  - If the excavation depth is above 6m, the work will be done by clamshell.
- Machinery backfilling shall be as follows:
  - Machinery backfilling 1 : back hoe filling + manual compaction.
  - Machinery backfilling 2 : back hoe filling + machine compaction.
- Maximum pipe coverage depth is set to 8 m, considering the critical depth of steel sheet pile method is 10 m. Further, concrete foundation will be adopted to the pipe whose coverage depth exceeds 3 m, since sand foundation will not be durable at that depth.
- Steel sheet pile length is set by every 1 m. The embedment depth of sheet pile must be more than 3 m or more than 1.8 times of the excavation depth, considering high groundwater table.
- Support shall be installed according to the excavation depth as follows:
  - If the excavation depth is below 6 m, the step of support will be two(2).
  - If the excavation depth is 6 m to 8 m, the step of support will be three(3).
  - If the excavation depth is above 8 m, the step of support will be four(4).

  Support material will be H-steel, 300 x 300 x 10 x 15.

2. Pumping Station

- The coverage depth of inlet pipe is set by 7 m.
- Diameter of inlet pipe is 1,000mm.
- Excavation depth of the station is 10 m.
- The structure of the station will be one (1) story on ground and three (3) stories underground.
- The step of the support will be four (4).
- The plan of the pumping station is also attached.

- Quantity calculation formula

(1) Concrete

$\{(W\times0.4\times2)+((L-0.4\times2)\times0.4\times2)\}\times10+(W\times L\times1.0)+(W\times L\times0.4\times3)+(W\times0.4\times10) = W\times(2.2\times L+12)+8\times L-6.4$

(2) Form

$(W+L)\times2\times10.0+\{((W-0.4\times2)+(L-0.4\times2))\times2\}\times(10.0-1.0-0.3\times3)+\{(W-0.4\times2)\times(L-0.4\times2)\}\times3 = 33.8\times W+33.8\times L+3\times W\times L-24.0$

(3) Sopport

$(W+L)\times2\times0.15\times4 = 1.2\times(W+L)$

3. Sewage Treatment Plant

- Design sewage flow will be 20,000, 50,000, 100,000 m^3/day.
- Design ground level will be +11.0 and +9.0. First, banking and compaction will be done up to this level, then the excavation, construction, backfilling will be carried out.

- Quantity calculation formula

(1) Design sewage flow : 20,000 m^3/day

1) Machinery excavation

a. Grid Chamber

$(10m+1m\times2)\times(8m+1m\times2)\times(1.5m+1.5m)=360\ m^3$

b. Primary Sedimentation Tank

$\pi/4\times22^2m\times5.5m\times2=4,184\ m^3$

c. Facultative Lagoon

$A1=(220m+3m)\times(120m+3m)=27,429\ m^2$

$A2=211m\times111m=23,421\ m^2$

$V = 1/3 \times 2.0 \times (A1 + A2 + (A1 \times A2)^{1/2}) \times 4$

$= 1/3 \times 2.0 \times (27,429 + 23,421 + (27,429 \times 23,421)^{1/2}) \times 4$

$= 203,189\ m^3$

d. Sludge Lagoon

$A1 = (120m + 3m) \times (95m + 3m) = 12,054\ m^2$

$A2 = 114m \times 89m = 10,146\ m^2$

$V = 1/3 \times 1.5 \times (A1 + A2 + (A1 \times A2)^{1/2}) \times 4$

$= 1/3 \times 1.5 \times (12,054 + 10,146 + (12,054 \times 11,146)^{1/2}) \times 4$

$= 67,582\ m^3$

e. Disinfection Pond

$\{(35m + 2m) + (1m \times 2)\} \times \{(4m + 2m) + (1m \times 2)\} \times 4m = 1,248\ m^3$

2) Manual subgrading

a. Grid Chamber

$10m \times 8m = 80\ m^2$

b. Primary Sedimentation Tank

$\pi / 4 \times 20^2 m \times 2 = 628\ m^2$

c. Facultative Lagoon

$211m \times 111m \times 4 = 93,684\ m^2$

d. Sludge Lagoon

$114m \times 89m \times 4 = 40,584\ m^2$

e. Disinfection Pond

$37m \times 6m = 222\ m^2$

3) Banking slope trimming

a. Facultative Lagoon

$[\{(223m + 211m) \times 1/2 \times (2.0^2 m + 6.0^2 m)^{1/2} \times 2\} + \{(123m + 111m) \times 1/2 \times (2.0^2 m + 6.0^2 m)^{1/2} \times 2\}] \times 4$

$= 16,899\ m^2$

b. Sludge Lagoon

$[\{(123m + 114m) \times 1/2 \times (1.5^2 m + 4.5^2 m)^{1/2} \times 2\} + \{(98m + 89m) \times 1/2 \times (1.5^2 m + 4.5^2 m)^{1/2} \times 2\}] \times 4$

$= 8,045\ m^2$

4) Gravel foundation

a. Grid Chamber

$80m^2 \times 0.2m = 16\ m^3$

b. Primary Sedimentation Tank

$628m^2 \times 0.2m = 126\ m^3$

c. Disinfection Pond

$222m^2 \times 0.2m = 45\ m^2$

5) Plain concrete

a. Grid Chamber

$80m^2 \times 0.1m = 8\ m^3$

b. Primary Sedimentation Tank

$628m^2 \times 0.1m = 63\ m^3$

c. Facultative Pond

$(93,684m^2 + 16,899m^2) \times 0.2m = 22,117\ m^3$

d. Sludge Lagoon

$(40,584m^2 + 8,045m^2) \times 0.2m = 9,726\ m^3$

e. Disinfection Pond

$222m^2 \times 0.1m = 22\ m^3$

6) Reinforced concrete

a. Grid Chamber

$(10m \times 8m \times 1.0m) + (10m + 8m) \times 2 \times 1.5m \times 0.4m = 102\ m^3$

b. Primary Sedimentation Tank

$\{\pi/4 \times 20^2m \times 1m + (\pi/4 \times 20^2m - \pi/4 \times 19.5^2m) \times 4.5m\} \times 2$

$= 768\ m^3$

c. Disinfection Pond

$\{(35m + 0.5m \times 2) \times (4m + 0.5m \times 2) \times 1m\} + \{(35m + 0.5m \times 2 + 4m + 0.5m \times 2) \times 2 \times 3m \times 0.5m$

$= 303\ m^3$

7) Backfilling

a. Grid Chamber

$360m^2 - (10m \times 8m \times 1.5m \times 2) = 120\ m^3$

b. Primary Sedimentation Tank

$4{,}184m^3 - (\pi/4 \times 20^2m \times 5.5m \times 2) = 728\ m^3$

c. Disinfection Pond

$1{,}248m^3 - (36m \times 6m \times 4m) = 384\ m^3$

(2) Design sewage flow : 50,000 m^3/day

1) Machinery excavation

a. Grid Chamber

$(12m + 1m \times 2) \times (8m + 1m \times 2) \times (1.5m + 1.5m) = 420\ m^3$

b. Primary Sedimentation Tank

$\pi/4 \times 34^2m \times 5.5m \times 2 = 9{,}987\ m^3$

c. Facultative Lagoon

$A1 = (350m + 3m) \times (180m + 3m) = 64{,}599\ m^2$

$A2 = 341m \times 171m = 58{,}311\ m^2$

$V = 1/3 \times 2.0 \times (A1 + A2 + (A1 \times A2)^{1/2}) \times 4$

$= 1/3 \times 2.0 \times (64{,}599 + 58{,}311 + (644{,}599 \times 58{,}311)^{1/2}) \times 4$

$= 491{,}425\ m^3$

d. Sludge Lagoon

$A1 = (180m + 3m) \times (95m + 3m) = 17{,}934\ m^2$

$A2 = 174m \times 89m = 15{,}486\ m^2$

$V = 1/3 \times 1.5 \times (A1 + A2 + (A1 \times A2)^{1/2}) \times 4$

$1/3 \times 1.5 \times (17{,}934 + 15{,}486 + (17{,}934 \times 15{,}486)^{1/2}) \times 4$

$100{,}170\ m^3$

e. Disinfection Pond

$\{(35m + 2m) + (1m \times 2)\} \times \{(10m + 2m) + (1m \times 2)\} \times 4m = 2{,}184\ m^3$

2) Manual subgrading

a. Grid Chamber

$12m \times 8m = 96\ m^2$

b. Primary Sedimentation Tank

$\pi/4 \times 32^2m \times 2 = 1{,}608\ m^2$

c. Facultative Pond

$341m \times 171m \times 4 = 233{,}244\ m^2$

d. Sludge Lagoon

$174m \times 89m \times 4 = 61,944\ m^2$

c. Disinfection Pond

$37m \times 12m = 444\ m^2$

3) Banking slope trimming

a. Facultative Pond

$[\{(353m + 341m) \times 1/2 \times (2.0^2m + 6.0^2m)^{1/2} \times 2\} + \{(183m + 171m) \times 1/2 \times (2.0^2m + 6.0^2m)^{1/2} \times 2\}] \times 4$

$= 26,513\ m^2$

b. Sludge Lagoon

$[\{(183m + 174m) \times 1/2 \times (1.5^2m + 4.5^2m)^{1/2} \times 2\} + \{(98m + 89m) \times 1/2 \times (1.5^2m + 4.5^2m)^{1/2} \times 2\}] \times 4$

$= 10,322\ m^2$

4) Gravel Foundation

a. Grid Chamber

$96m^2 \times 0.2m = 19\ m^3$

b. Primary Sedimentation Tank

$1,608m^2 \times 0.2m = 322\ m^3$

c. Disinfection Pond

$444m^2 \times 0.2m = 89\ m^3$

5) Plain concrete

a. Grid Chamber

$96m^2 \times 0.1m = 10\ m^3$

b. Primary Sedimentation Tank

$1,608m^2 \times 0.1m = 161\ m^3$

c. Facultative Pond

$(233,244m^2 + 26,513m^2) \times 0.2m = 51,951\ m^3$

d. Sludge Lagoon

$(61,944m^2 + 10,322m^2) \times 0.2m = 14,453\ m^3$

e. Disinfection Pond

$444m \times 4m \times 0.1m = 44\ m^3$

6) Reinforced concrete

a. Grid Chamber

$(12m \times 8m \times 1.0m) + (10m + 8m) \times 2 \times 1.5m \times 0.4m = 102\ m^3$

b. Primary Sedimentation Tank

$\{\pi/4 \times 32^2m \times 1m + (\pi/4 \times 32^2m - \pi/4 \times 31.5^2m) \times 4.5m\} \times 2 = 1,833\ m^3$

c. Disinfection Pomd

$\{(35m + 0.5m \times 2) \times (10m + 0.5m \times 2) \times 1m\} + \{(35m + 0.5m \times 2 + 4m + 0.5$

$m \times 2) \times 2 \times 3m \times 0.5m$

$= 519\ m^3$

7) Backfilling

a. Grid Chamber

$420m^2 - (12m \times 8m \times 1.5m \times 2) = 132\ m^3$

b. Primary Sedimentation Tank

$9,987m^3 - (\pi/4 \times 32^2m \times 5.5m \times 2) = 1,140\ m^3$

c. Disinfection Pond

$2,184m^3 - (36m \times 12m \times 4m) = 456\ m^3$

(3) design sewage flow : 100,000 m^3/day

1) Machinery excavation

a. Grid Chamber

$(12m + 1m \times 2) \times (8m + 1m \times 2) \times (1.5m + 1.5m) = 420m^3$

b. Primary Sedimentation Tank

$\pi / 4 \times 34^2m \times 5.5m \times 4 = 19,974m^3$

c. Facultative Lagoon

$A1 = (350m + 3m) \times (180m + 3m) = 64,599m^2$

$A2 = 341m \times 171m = 58,311m^2$

$V = 1/3 \times 2.0 \times (A1 + A2 + (A1 \times A2)^{1/2}) \times 8$

$= 1/3 \times 2.0 \times (64,599 + 58,311 + (64,599 \times 58,311)^{1/2}) \times 8$

$= 982,851m^3$

d. Sludge Lagoon

$A1 = (180m + 3m) \times (95m + 3m) = 17,934m^2$

$A2 = 174m \times 89m = 15,486m^2$

$V = 1/3 \times 1.5 \times (A1 + A2 + (A1 \times A2)^{1/2}) \times 8$

$=1/3\times1.5\times(17{,}934+15{,}486+(17{,}934\times15{,}486)^{1/2})\times8$

$=200{,}340m^3$

c. Disinfection Pond

$\{(35m+2m)+(1m\times2)\}\times\{(20m+2m)+(1m\times2)\}\times4m=3{,}744m^3$

2) Manual subgrading

a. Grid Chamber

$12m\times8m=96m^2$

b. Primary Sedimentation Tank

$\pi/4\times32^2m\times4=3{,}217m^2$

c. Facultative Pond

$341m\times171m\times8=466{,}488m^2$

d. Sludge Lagoon

$174m\times89m\times8=123{,}888m^2$

e Disinfection Pond

$37m\times22=814m^2$

3) Banking slope trimming

a. Facultative Pond

$[\{(353m+341m)\times1/2\times(2.0^2m+6.0^2m)^{1/2}\times2\}+\{(183m+171m)\times1/2\times(2.0^2m+6.0^2m)^{1/2}\times2\}]\times8$

$=53{,}025m^2$

b. Sludge Lagoon

$[\{(183m+174m)\times1/2\times(1.5^2m+4.5^2m)^{1/2}\times2\}+\{(98m+89m)\times1/2\times(1.5^2m+4.5^2m)^{1/2}\times2\}]\times8$

$=20{,}643m^2$

4) Gravel Foundation

a. Grid Chamber

$96m^2\times0.2m=19m^3$

b. Primary Sedimentation Tank

$3{,}217m^2\times0.2m=643m^3$

c. Disinfection Pond

$814m^2\times0.2m=163m^2$

5) Plain concrete

a. Grid Chamber

$96m^2 \times 0.1m = 10m^3$

b. Primary Sedimentation Tank

$3,217m^2 \times 0.1m = 322m^3$

c. Facultative Pond

$(466,488m^2 + 53,025m^2) \times 0.2m = 103,903m^3$

b. Sludge Lagoon

$(123,888m^2 + 20,643m^2) \times 0.2m = 28,906m^3$

c. Disinfection Pond

$814m^2 \times 0.1m = 81m^3$

6) Reinforced concrete

a. Grid Chamber

$(12m \times 8m \times 1.0m) + (10m + 8m) \times 2 \times 1.5m \times 0.4m = 102m^3$

b. Primary Sedimentation Tank

$\{\pi / 4 \times 32^2m \times 1m + (\pi / 4 \times 32^2m - \pi / 4 \times 31.5^2m) \times 4.5m\} \times 4 = 3,666m^3$

c. Disinfection Pomd

$\{(35m + 0.5m \times 2) \times (20m + 0.5m \times 2) \times 1m\} + \{(35m + 0.5m \times 2 + 20m + 0.5$

$m \times 2) \times 2 \times 3m \times 0.5m$

$= 927m^3$

7) Backfilling

a. Grid Chamber

$420m^2 - (12m \times 8m \times 1.5m \times 2) = 132m^3$

b. Primary Sedimentation Tank

$19,974m^3 - (\pi / 4 \times 32^2m \times 5.5m \times 4) = 2,281m^3$

c. Disinfection Pond

$3,744m^3 - (36m \times 22m \times 4m) = 576m^3$

4. Unit Facilities Construction Cost of Wastewater

4.1 Wastewater Collection Facilities

(1) Concrete Pipe Laying (including materials + installation)

Diameter		Pipe Materials	Unit Cost	
150	mm	RCC Pipe	640	TAKA/m
200	mm	ditto	780	TAKA/m
250	mm	ditto	920	TAKA/m
300	mm	ditto	1,240	TAKA/m
350	mm	ditto	1,520	TAKA/m
400	mm	ditto	1,790	TAKA/m
450	mm	ditto	2,070	TAKA/m
500	mm	ditto	3,290	TAKA/m
600	mm	ditto	4,040	TAKA/m
700	mm	ditto	4,840	TAKA/m
800	mm	ditto	5,740	TAKA/m
900	mm	ditto	6,730	TAKA/m
1000	mm	ditto	8,980	TAKA/m
1100	mm	ditto	11,070	TAKA/m
1200	mm	ditto	13,010	TAKA/m
1300	mm	ditto	15,360	TAKA/m
1400	mm	ditto	17,700	TAKA/m
1500	mm	ditto	20,050	TAKA/m
1600	mm	ditto	22,870	TAKA/m
1700	mm	ditto	25,560	TAKA/m
1800	mm	ditto	28,600	TAKA/m
1900	mm	ditto	31,800	TAKA/m
2000	mm	ditto	35,180	TAKA/m
2100	mm	ditto	38,740	TAKA/m
2200	mm	ditto	42,470	TAKA/m
2400	mm	ditto	46,930	TAKA/m

(2) Earth Works

Excavation	(Backhoe 0.7m^3)	90	TAKA/m^3
Excavation	(Cramshell)	160	TAKA/m^3
Excavation	(Manpower)	100	TAKA/m^3
Backfilling	(Backhoe, Original Soil)	150	TAKA/m^3
Backfilling	(Cramshell, Original Soil)	220	TAKA/m^3
Disposal	10km	230	TAKA/m^3
Sheet Pile	including driving and removal cost		TAKA/m sheet
Pavement	Asphalt (Sub base course 300mm, Asphalt carpetting 38mm, Seal coat 12mm)	1,520	TAKA/m^3

(3) Manhole (including materials + installation)

H= 2.0m	1,500×1,500×200	62,200	TAKA/pc
H= 3.0m	1,500×1,500×200	88,100	TAKA/pc
H= 4.0m	1,500×1,500×200	114,100	TAKA/pc
H= 5.0m	1,500×1,500×250	164,000	TAKA/pc
H= 6.0m	1,500×1,500×250	194,300	TAKA/pc
H= 7.0m	1,500×1,500×300	259,000	TAKA/pc
H= 8.0m	1,500×1,500×300	293,900	TAKA/pc
H= 9.0m	1,500×1,500×300	328,900	TAKA/pc

4.2 Sewage Treatment Plant

Excavation	(Bulldozer)	110	TAKA/m^3
Backfilling	(Bulldozer)	40	TAKA/m^3
Banking	(Bulldozer + Soil)	620	TAKA/m^3
Slope Protection	(Manpower)	50	TAKA/m^2
Plain Concrete	180kg/cm^2 (including form-board)	7,200	TAKA/m^3
Reinforced Concrete(A) (for Base)	210kg/cm^2 (including reinforcing bar and form-board)	11,500	TAKA/m^3
Reinforced Concrete(B) (for beam and column)	210kg/cm^2 (including reinforcing bar and form-board)	20,700	TAKA/m^3

Road	Pavement (Asphalt) Surface 50mm	1,020	TAKA/m^2
do	Gravel t=300mm	500	TAKA/m^2
Architecture	Administration Office	37,500	TAKA/m^2
Fence	including materials + installation	610	TAKA/m
Water Supply	Administration Office		TAKA
Electric Power			TAKA
Telephone	Administration Office		TAKA

4.3 Civil Materials

Sand	Shylet Sand	860	TAKA/m^3
Gravel	for concreat	2,000	TAKA/m^3
Crushed Stone	Nominated Dia 40mm	2,600	TAKA/m^3
Cement		7,700	TAKA/ton
Reinforcing Bar	Grade 40	34,300	TAKA/ton

4.4 Labor Cost

Forman	260	TAKA/day
Operator	260	TAKA/day
Rigger	210	TAKA/day
Skilled Worker	130	TAKA/day
Unskilled Worker	100	TAKA/day
Carpenter	210	TAKA/day
Welder	210	TAKA/day
Mason	210	TAKA/day

Note: 1) These unit costs are not included the tax and the overhead.

2) Exchange rate: 1Yen = 0.3786 Taka

3) Exchange rate: US$ 1.00= 43.732 Taka

Appendix 9.3.2. Unit Construction Cost Caluculation for Sanitary Sewer

Table 9.3.2.1 Pipe Installation Cost, Earth Corvering Depth = 1.0 m (Sand Foundation)

Diameter (mm)		250	300	350	400	450	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2400
(1) Quantity																									
Excavation(Pavement)	(m3)	0.85	0.88	0.92	0.95	0.98	1.01	1.09	1.15	1.22	1.28	1.36	1.42	1.50	1.59	1.63	1.70	1.77	1.83	1.91	1.97	2.06	2.12	2.18	2.32
Excavation(1)	(m3)	1.64	1.64	1.91	2.08	2.26	2.45	2.99	3.44	4.08	4.59	5.33	5.92	6.75	7.75	8.33	9.08	10.10	10.90	12.02	12.90	14.41	15.36	16.35	18.76
Excavation(2)	(m3)																								
Sand Foundation	(m3)	0.20	0.23	0.32	0.36	0.39	0.43	0.59	0.69	0.89	0.99	1.23	1.36	1.63	1.77	2.07	2.24	2.58	2.75	3.13	3.32	3.95	4.16	4.39	5.10
Backfilling(1)	(m3)	0.54	0.60	0.69	0.75	0.82	0.90	1.08	1.24	1.46	1.64	1.88	2.10	2.36	2.72	2.89	3.15	3.48	3.75	4.10	4.40	4.85	5.17	5.51	6.28
Backfilling(2)	(m3)	0.75	0.79	0.85	0.89	0.93	0.97	1.07	1.15	1.25	1.33	1.43	1.52	1.62	1.74	1.80	1.88	1.98	2.06	2.17	2.25	2.37	2.45	2.53	2.71
Sheetpile	(sheet)																								
Timbering	(t)																								
Steel Pipe Laying	(m)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Pavement	(m2)	2.8	2.9	3.1	3.2	3.3	3.4	3.6	3.8	4.1	4.3	4.5	4.7	5.0	5.2	5.4	5.7	5.9	6.1	6.4	6.6	6.9	7.1	7.3	7.7
(2) Construction Cost (TAKA/m)																									
Excavation(Pavement)	90	76	79	82	85	88	90	98	103	109	115	122	127	135	143	146	153	159	164	171	177	185	190	196	208
Excavation(1)	90	147	147	171	187	203	220	269	309	367	413	479	532	607	697	749	817	909	981	1,081	1,161	1,296	1,382	1,471	1,688
Excavation(2)	90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sand Foundation	860	172	197	275	309	335	369	507	593	765	851	1,057	1,169	1,401	1,522	1,780	1,926	2,218	2,365	2,691	2,855	3,397	3,577	3,775	4,386
Backfilling(1)	150	81	90	103	112	123	135	162	186	219	246	282	315	354	408	433	472	522	562	615	660	727	775	826	942
Backfilling(2)	150	112	118	127	133	139	145	160	172	187	199	214	228	243	261	270	282	297	309	325	337	355	367	379	406
Sheetpile(driving and removal)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Timbering		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Steel Pipe Laying		2,083	3,569	3,623	3,678	3,732	5,498	6,014	6,846	7,442	8,039	10,855	13,643	16,605	20,922	25,578	30,475	32,666	34,063	38,357	41,764	45,403	49,922	54,864	64,780
Pavement	456	1,276	1,322	1,413	1,459	1,504	1,550	1,641	1,732	1,869	1,960	2,052	2,143	2,280	2,371	2,462	2,599	2,690	2,781	2,918	3,009	3,146	3,237	3,328	3,511
Manhole	36000	720	720	480	480	480	480	480	360	360	360	360	240	240	240	240	240	240	240	240	240	240	240	240	180
Total		4,667	6,242	6,274	6,443	6,604	8,487	9,331	10,301	11,318	12,183	15,421	18,397	21,865	26,564	31,658	36,964	39,701	41,465	46,398	50,203	54,749	59,690	65,079	76,101
Total (including tax etc.)																									

Table 9.3.2.2 Quantity Calculation for Pipe Installation, Earth Corvering Depth = 1.0 m (Sand Foundation)

D1	D2	D3	H1	H2	H3	H4	H5	H6	H7	H8	H9	H	W1	W2	W3	W4	W5	W6	Excavation	Excavation (1)	Excavation (2)	Gravel	Concrete Foundation	Backfilling (1)
250	6.6	263.2	1000	100	231.6	300	363.2	300	663.2	400	1063	1363	300	863.2	1095	1526	2226	2826	0.85	1.64	0.20	0.54	0.75	2.8
300	6.9	313.8	1000	100	256.9	300	413.8	300	713.8	400	1014	1414	300	913.8	1171	1628	2328	2928	0.88	1.64	0.23	0.60	0.79	2.9
350	6	362	1000	150	331	300	512	300	812	400	1112	1512	300	962	1293	1774	2474	3074	0.92	1.91	0.32	0.69	0.85	3.1
400	6	412	1000	150	356	300	562	300	862	400	1162	1562	300	1012	1368	1874	2574	3174	0.95	2.08	0.36	0.75	0.89	3.2
450	6	462	1000	150	381	300	612	300	912	400	1212	1612	300	1062	1443	1974	2674	3274	0.98	2.26	0.39	0.82	0.93	3.3
500	6	512	1000	150	406	300	662	300	962	400	1262	1662	300	1112	1518	2074	2774	3374	1.01	2.45	0.43	0.90	0.97	3.4
600	6	612	1000	200	506	300	812	300	1112	400	1412	1812	300	1212	1718	2324	3024	3624	1.09	2.99	0.59	1.08	1.07	3.6
700	7	714	1000	200	557	300	914	300	1214	400	1514	1914	300	1314	1871	2528	3228	3828	1.15	3.44	0.69	1.24	1.15	3.8
800	8	816	1000	250	658	300	1066	300	1366	400	1666	2066	300	1416	2074	2782	3482	4082	1.22	4.08	0.89	1.46	1.25	4.1
900	8	916	1000	250	708	300	1166	300	1466	400	1766	2166	300	1516	2224	2982	3682	4282	1.28	4.59	0.99	1.64	1.33	4.3
1000	9	1018	1000	300	809	300	1318	300	1618	400	1918	2318	300	1618	2427	3236	3936	4536	1.36	5.33	1.23	1.88	1.43	4.5
1100	10	1120	1000	300	860	300	1420	300	1720	400	2020	2420	300	1720	2580	3440	4140	4740	1.42	5.92	1.36	2.10	1.52	4.7
1200	11	1222	1000	350	961	300	1572	300	1872	400	2172	2572	300	1822	2783	3694	4394	4994	1.50	6.75	1.63	2.36	1.62	5.0
1300	12	1324	1000	350	1012	300	1674	300	1974	400	2274	2674	300	1924	2936	3898	4598	5198	1.56	7.42	1.77	2.60	1.70	5.2
1400	12	1424	1000	400	1112	300	1824	300	2124	400	2424	2824	300	2024	3136	4148	4848	5448	1.63	8.33	2.07	2.89	1.80	5.4
1500	14	1528	1000	400	1164	300	1928	300	2228	400	2528	2928	300	2128	3292	4356	5056	5656	1.70	9.08	2.24	3.15	1.88	5.7
1600	15	1630	1000	450	1265	300	2080	300	2380	400	2680	3080	300	2230	3495	4610	5310	5910	1.77	10.10	2.58	3.48	1.98	5.9
1700	15	1730	1000	450	1315	300	2180	300	2480	400	2780	3180	300	2330	3645	4810	5510	6110	1.83	10.90	2.75	3.75	2.06	6.1
1800	16	1832	1000	500	1416	300	2332	300	2632	400	2932	3332	300	2432	3848	5064	5764	6364	1.91	12.02	3.13	4.10	2.17	6.4
1900	17	1934	1000	500	1467	300	2434	300	2734	400	3034	3434	300	2534	4001	5268	5968	6568	1.97	12.90	3.32	4.40	2.25	6.6
2000	18	2036	1000	600	1618	300	2636	300	2936	400	3236	3636	300	2636	4254	5572	6272	6872	2.06	14.41	3.95	4.85	2.37	6.9
2100	18	2136	1000	600	1668	300	2736	300	3036	400	3336	3736	300	2736	4404	5772	6472	7072	2.12	15.36	4.16	5.17	2.45	7.1
2200	19	2238	1000	600	1719	300	2838	300	3138	400	3438	3838	300	2838	4557	5976	6676	7276	2.18	16.35	4.39	5.51	2.53	7.3
2400	20	2440	1000	650	1870	300	3090	300	3390	400	3690	4090	300	3040	4910	6430	7130	7730	2.32	18.76	5.10	6.28	2.71	7.7

Table 9.3.2.3 Pipe Installation Cost, Earth Corvering Depth = 1.0 m (Sand Foundation)

Diameter (mm)		250	300	350	400	450	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2400
(1) Quantity																									
Excavation(Trench)	(m3)	0.87	0.91	0.95	0.99	1.02	1.06	1.14	1.22	1.29	1.38	1.45	1.53	1.60	1.68	1.76	1.83	1.91	1.98	2.07	2.16	2.24	2.31	2.41	2.58
Excavation(1)	(m3)	1.78	1.79	2.09	2.29	2.51	2.74	3.38	4.08	4.67	5.51	6.18	7.10	7.86	8.92	9.99	10.85	12.08	13.00	14.58	16.03	17.54	18.73	20.07	24.12
Excavation(2)	(m3)																								
Sand Foundation	(m3)	0.22	0.26	0.36	0.40	0.44	0.49	0.67	0.89	1.01	1.27	1.41	1.70	1.87	2.20	2.55	2.74	3.14	3.35	3.98	4.47	4.97	5.25	6.06	7.24
Backfilling(1)	(m3)	0.59	0.66	0.76	0.83	0.92	1.00	1.22	1.46	1.67	1.95	2.19	2.49	2.76	3.10	3.44	3.73	4.12	4.44	4.90	5.36	5.83	6.23	6.80	7.85
Backfilling(2)	(m3)	0.78	0.83	0.89	0.94	0.98	1.03	1.14	1.25	1.35	1.46	1.55	1.66	1.75	1.86	1.97	2.06	2.17	2.26	2.38	2.50	2.61	2.70	2.84	3.06
Sheetpile	(sheet)																								
Timbering	(t)																								
Concrete Pipe Laying	(m)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Pavement	(m2)	2.9	3.0	3.2	3.3	3.4	3.5	3.8	4.1	4.3	4.6	4.8	5.1	5.3	5.6	5.9	6.1	6.4	6.6	6.9	7.2	7.5	7.7	8.0	8.6
(2) Construction Cost (TAKA/m)																									
Excavation(Trench)	90	78	81	85	89	91	95	102	109	116	124	130	137	144	151	158	164	171	178	186	194	201	207	216	232
Excavation(1)	90	160	161	188	206	225	246	304	367	420	495	556	639	707	802	899	976	1,087	1,170	1,312	1,442	1,578	1,685	1,806	2,170
Excavation(2)	90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sand Foundation	860	189	223	309	344	378	421	576	765	868	1,092	1,212	1,462	1,608	1,892	2,193	2,356	2,700	2,881	3,422	3,844	4,274	4,515	5,211	6,226
Backfilling(1)	150	88	99	114	124	138	150	183	219	250	292	328	373	414	465	516	559	618	666	735	804	874	934	1,020	1,177
Backfilling(2)	150	117	124	133	141	147	154	171	187	202	219	232	249	262	279	295	309	325	339	357	375	391	405	426	459
Sheetpile(driving and removal)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Timbering		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Concrete Pipe Laying		920	1,240	1,520	1,790	2,070	3,290	4,040	4,840	5,740	6,730	8,980	11,070	13,010	15,360	17,700	20,050	22,870	25,560	28,600	31,800	35,180	38,740	42,470	46,930
Pavement	456	1,322	1,368	1,459	1,504	1,550	1,596	1,732	1,869	1,960	2,097	2,188	2,325	2,416	2,553	2,690	2,781	2,918	3,009	3,146	3,283	3,420	3,511	3,648	3,921
Manhole	36000	720	720	480	480	480	480	480	360	360	360	360	240	240	240	240	240	240	240	240	240	240	240	240	180
Total		3,594	4,016	4,288	4,678	5,079	6,432	7,588	8,716	9,916	11,409	13,986	16,495	18,801	21,742	24,691	27,435	30,929	34,043	37,998	41,982	46,158	50,237	55,037	61,295
Total (including tax etc.)																									

Table 9.3.2.4 Quantity Calculation for Pipe Installation, Earth Corvering Depth = 1.0 m (Sand Foundation)

D1	D2	D3	H1	H2	H3	H4	H5	H6	H7	H8	H9	H	W1	W2	W3	W4	W5	W6	Excavation	Excavation (1)	Excavation (2)	Gravel	Concrete Foundation	Backfilling (1)
250	28	306	1000	100	253	300	406	300	706	400	1106	1406	300	906	1159	1612	2312	2912	0.87	1.78	0.22	0.59	0.78	2.9
300	30	360	1000	100	280	300	460	300	760	400	1060	1460	300	960	1240	1720	2420	3020	0.91	1.79	0.26	0.66	0.83	3.0
350	32	414	1000	150	357	300	564	300	864	400	1164	1564	300	1014	1371	1878	2578	3178	0.95	2.09	0.36	0.76	0.89	3.2
400	35	470	1000	150	385	300	620	300	920	400	1220	1620	300	1070	1455	1990	2690	3290	0.99	2.29	0.40	0.83	0.94	3.3
450	38	526	1000	150	413	300	676	300	976	400	1276	1676	300	1126	1539	2102	2802	3402	1.02	2.51	0.44	0.92	0.98	3.4
500	42	584	1000	150	442	300	734	300	1034	400	1334	1734	300	1184	1626	2218	2918	3518	1.06	2.74	0.49	1.00	1.03	3.5
600	50	700	1000	200	550	300	900	300	1200	400	1500	1900	300	1300	1850	2500	3200	3800	1.14	3.38	0.67	1.22	1.14	3.8
700	58	816	1000	250	658	300	1066	300	1366	400	1666	2066	300	1416	2074	2782	3482	4082	1.22	4.08	0.89	1.46	1.25	4.1
800	66	932	1000	250	716	300	1182	300	1482	400	1782	2182	300	1532	2248	3014	3714	4314	1.29	4.67	1.01	1.67	1.35	4.3
900	75	1050	1000	300	825	300	1350	300	1650	400	1950	2350	300	1650	2475	3300	4000	4600	1.38	5.51	1.27	1.95	1.46	4.6
1000	82	1164	1000	300	882	300	1464	300	1764	400	2064	2464	300	1764	2646	3528	4228	4828	1.45	6.18	1.41	2.19	1.55	4.8
1100	88	1276	1000	350	988	300	1626	300	1926	400	2226	2626	300	1876	2864	3802	4502	5102	1.53	7.10	1.70	2.49	1.66	5.1
1200	95	1390	1000	350	1045	300	1740	300	2040	400	2340	2740	300	1990	3035	4030	4730	5330	1.60	7.86	1.87	2.76	1.75	5.3
1300	103	1506	1000	400	1153	300	1906	300	2206	400	2506	2906	300	2106	3259	4312	5012	5612	1.68	8.92	2.20	3.10	1.86	5.6
1400	108	1616	1000	450	1258	300	2066	300	2366	400	2666	3066	300	2216	3474	4582	5282	5882	1.76	9.99	2.55	3.44	1.97	5.9
1500	112	1724	1000	450	1312	300	2174	300	2474	400	2774	3174	300	2324	3636	4798	5498	6098	1.83	10.85	2.74	3.73	2.06	6.1
1600	120	1840	1000	500	1420	300	2340	300	2640	400	2940	3340	300	2440	3860	5080	5780	6380	1.91	12.08	3.14	4.12	2.17	6.4
1700	123	1946	1000	500	1473	300	2446	300	2746	400	3046	3446	300	2546	4019	5292	5992	6592	1.98	13.00	3.35	4.44	2.26	6.6
1800	127	2054	1000	600	1627	300	2654	300	2954	400	3254	3654	300	2654	4281	5608	6308	6908	2.07	14.58	3.98	4.90	2.38	6.9
1900	136	2172	1000	650	1736	300	2822	300	3122	400	3422	3822	300	2772	4508	5894	6594	7194	2.16	16.03	4.47	5.36	2.50	7.2
2000	145	2290	1000	700	1845	300	2990	300	3290	400	3590	3990	300	2890	4735	6180	6880	7480	2.24	17.54	4.97	5.83	2.61	7.5
2100	152	2404	1000	700	1902	300	3104	300	3404	400	3704	4104	300	3004	4906	6408	7108	7708	2.31	18.73	5.25	6.23	2.70	7.7
2200	160	2520	1000	800	2060	300	3320	300	3620	400	3920	4320	300	3120	5180	6740	7440	8040	2.41	20.70	6.06	6.80	2.84	8.0
2400	175	2750	1000	900	2275	300	3650	300	3950	400	4250	4650	300	3350	5625	7300	8000	8600	2.58	24.12	7.24	7.85	3.06	8.6

Table 9.3.2.5 Pipe Installation Cost, Earth Corvering Depth = 2.0 m (Sand Foundation)

Diameter (mm)		250	300	350	400	450	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2400
(1) Quantity																									
Excavation(Pavement)	(m3)	1.17	1.21	1.25	1.29	1.32	1.36	1.44	1.52	1.59	1.68	1.75	1.83	1.90	1.98	2.06	2.13	2.21	2.28	2.37	2.46	2.54	2.61	2.71	2.88
Excavation(1)	(m3)	2.12	2.32	2.67	2.90	3.14	3.40	4.13	4.91	5.57	6.48	7.22	8.21	9.03	10.17	11.33	12.24	13.55	14.53	16.21	17.74	19.33	20.58	22.66	26.24
Excavation(2)	(m3)																								
Sand Foundation	(m3)	0.22	0.26	0.36	0.40	0.44	0.49	0.67	0.89	1.01	1.27	1.41	1.70	1.87	2.20	2.55	2.74	3.14	3.35	3.98	4.47	4.97	5.25	6.06	7.24
Backfilling(1)	(m3)	0.59	0.66	0.76	0.83	0.92	1.00	1.22	1.46	1.67	1.95	2.19	2.49	2.76	3.10	3.44	3.73	4.12	4.44	4.90	5.36	5.83	6.23	6.80	7.85
Backfilling(2)	(m3)	3.45	3.60	3.82	3.98	4.13	4.30	4.69	5.08	5.41	5.81	6.13	6.51	6.83	7.23	7.60	7.91	8.30	8.60	9.04	9.44	9.84	10.16	10.63	11.41
Sheetpile	(sheet)																								
Timbering	(t)																								
Concrete Pipe Laying	(m)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Pavement	(m2)	3.9	4.0	4.2	4.3	4.4	4.5	4.8	5.1	5.3	5.6	5.8	6.1	6.3	6.6	6.9	7.1	7.4	7.6	7.9	8.2	8.5	8.7	9.0	9.6
(2) Construction Cost (TAKA/m)																									
Excavation(Pavement)	90	105	108	112	116	118	122	129	136	143	151	157	164	171	178	185	191	198	205	213	221	228	234	243	259
Excavation(1)	90	190	208	240	261	282	306	371	441	501	583	649	738	812	915	1,019	1,101	1,219	1,307	1,458	1,596	1,739	1,852	2,039	2,361
Excavation(2)	90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sand Foundation	860	189	223	309	344	378	421	576	765	868	1,092	1,212	1,462	1,608	1,892	2,193	2,356	2,700	2,881	3,422	3,844	4,274	4,515	5,211	6,226
Backfilling(1)	150	88	99	114	124	138	150	183	219	250	292	328	373	414	465	516	559	618	666	735	804	874	934	1,020	1,177
Backfilling(2)	150	517	540	573	597	619	645	703	762	811	871	919	976	1,024	1,084	1,140	1,186	1,245	1,290	1,356	1,416	1,476	1,524	1,594	1,711
Sheetpile(driving and removal)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Timbering		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Concrete Pipe Laying		920	1,240	1,520	1,790	2,070	3,290	4,040	4,840	5,740	6,730	8,980	11,070	13,010	15,360	17,700	20,050	22,870	25,560	28,600	31,800	35,180	38,740	42,470	46,930
Pavement	456	1,778	1,824	1,915	1,960	2,006	2,052	2,188	2,325	2,416	2,553	2,644	2,781	2,872	3,009	3,146	3,237	3,374	3,465	3,602	3,739	3,876	3,967	4,104	4,377
Manhole	62200	1,244	1,244	829	829	829	829	829	622	622	622	622	414	414	414	414	414	414	414	414	414	414	414	414	311
Total		5,031	5,486	5,612	6,021	6,440	7,815	9,019	10,110	11,351	12,894	15,511	17,978	20,325	23,317	26,313	29,094	32,638	35,788	39,800	43,834	48,061	52,180	57,095	63,352
Total (including tax etc.)																									

Table 9.3.2.6 Quantity Calculation for Pipe Installation, Earth Corvering Depth = 2.0 m (Sand Foundation)

D1	D2	D3	H1	H2	H3	H4	H5	H6	H7	H8	H9	H	W1	W2	W3	W4	W5	W6	Excavation	Excavation (1)	Excavation (2)	Gravel	Concrete Foundation	Backfilling (1)
250	28	306	2000	100	253	300	406	300	706	1400	1006	2406	300	906	1159	1612	3312	3912	1.17	2.12	0.22	0.59	3.45	3.9
300	30	360	2000	100	280	300	460	300	760	1400	1060	2460	300	960	1240	1720	3420	4020	1.21	2.32	0.26	0.66	3.60	4.0
350	32	414	2000	150	357	300	564	300	864	1400	1164	2564	300	1014	1371	1878	3578	4178	1.25	2.67	0.36	0.76	3.82	4.2
400	35	470	2000	150	385	300	620	300	920	1400	1220	2620	300	1070	1455	1990	3690	4290	1.29	2.90	0.40	0.83	3.98	4.3
450	38	526	2000	150	413	300	676	300	976	1400	1276	2676	300	1126	1539	2102	3802	4402	1.32	3.14	0.44	0.92	4.13	4.4
500	42	584	2000	150	442	300	734	300	1034	1400	1334	2734	300	1184	1626	2218	3918	4518	1.36	3.40	0.49	1.00	4.30	4.5
600	50	700	2000	200	550	300	900	300	1200	1400	1500	2900	300	1300	1850	2500	4200	4800	1.44	4.13	0.67	1.22	4.69	4.8
700	58	816	2000	250	658	300	1066	300	1366	1400	1666	3066	300	1416	2074	2782	4482	5082	1.52	4.91	0.89	1.46	5.08	5.1
800	66	932	2000	250	716	300	1182	300	1482	1400	1782	3182	300	1532	2248	3014	4714	5314	1.59	5.57	1.01	1.67	5.41	5.3
900	75	1050	2000	300	825	300	1350	300	1650	1400	1950	3350	300	1650	2475	3300	5000	5600	1.68	6.48	1.27	1.95	5.81	5.6
1000	82	1164	2000	300	882	300	1464	300	1764	1400	2064	3464	300	1764	2646	3528	5228	5828	1.75	7.22	1.41	2.19	6.13	5.8
1100	88	1276	2000	350	988	300	1626	300	1926	1400	2226	3626	300	1876	2864	3802	5502	6102	1.83	8.21	1.70	2.49	6.51	6.1
1200	95	1390	2000	350	1045	300	1740	300	2040	1400	2340	3740	300	1990	3035	4030	5730	6330	1.90	9.03	1.87	2.76	6.83	6.3
1300	103	1506	2000	400	1153	300	1906	300	2206	1400	2506	3906	300	2106	3259	4312	6012	6612	1.98	10.17	2.20	3.10	7.23	6.6
1400	108	1616	2000	450	1258	300	2066	300	2366	1400	2666	4066	300	2216	3474	4582	6282	6882	2.06	11.33	2.55	3.44	7.60	6.9
1500	112	1724	2000	450	1312	300	2174	300	2474	1400	2774	4174	300	2324	3636	4798	6498	7098	2.13	12.24	2.74	3.73	7.91	7.1
1600	120	1840	2000	500	1420	300	2340	300	2640	1400	2940	4340	300	2440	3860	5080	6780	7380	2.21	13.55	3.14	4.12	8.30	7.4
1700	123	1946	2000	500	1473	300	2446	300	2746	1400	3046	4446	300	2546	4019	5292	6992	7592	2.28	14.53	3.35	4.44	8.60	7.6
1800	127	2054	2000	600	1627	300	2654	300	2954	1400	3254	4654	300	2654	4281	5608	7308	7908	2.37	16.21	3.98	4.90	9.04	7.9
1900	136	2172	2000	650	1736	300	2822	300	3122	1400	3422	4822	300	2772	4508	5894	7594	8194	2.46	17.74	4.47	5.36	9.44	8.2
2000	145	2290	2000	700	1845	300	2990	300	3290	1400	3590	4990	300	2890	4735	6180	7880	8480	2.54	19.33	4.97	5.83	9.84	8.5
2100	152	2404	2000	700	1902	300	3104	300	3404	1400	3704	5104	300	3004	4906	6408	8108	8708	2.61	20.58	5.25	6.23	10.16	8.7
2200	160	2520	2000	800	2060	300	3320	300	3620	1400	3920	5320	300	3120	5180	6740	8440	9040	2.71	22.66	6.06	6.80	10.63	9.0
2400	175	2750	2000	900	2275	300	3650	300	3950	1400	4250	5650	300	3350	5625	7300	9000	9600	2.88	26.24	7.24	7.85	11.41	9.6

Table 9.3.2.7 Pipe Installation Cost, Earth Corvering Depth = 3.0 m (Sand Foundation)

Diameter (mm)		250	300	350	400	450	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2400
(1) Quantity																									
Excavation(Pavement)	(m3)	1.47	1.51	1.55	1.59	1.62	1.66	1.74	1.82	1.89	1.98	2.05	2.13	2.20	2.28	2.36	2.43	2.51	2.58	2.67	2.76	2.84	2.91	3.01	3.18
Excavation(1)	(m3)	2.62	2.85	3.25	3.51	3.78	4.07	4.88	5.75	6.46	7.46	8.25	9.32	10.20	11.42	12.66	13.62	15.02	16.05	17.84	19.45	21.13	22.43	24.62	28.37
Excavation(2)	(m3)																								
Sand Foundation	(m3)	0.22	0.26	0.36	0.40	0.44	0.49	0.67	0.89	1.01	1.27	1.41	1.70	1.87	2.20	2.55	2.74	3.14	3.35	3.98	4.47	4.97	5.25	6.06	7.24
Backfilling(1)	(m3)	0.59	0.66	0.76	0.83	0.92	1.00	1.22	1.46	1.67	1.95	2.19	2.49	2.76	3.10	3.44	3.73	4.12	4.44	4.90	5.36	5.83	6.23	6.80	7.85
Backfilling(2)	(m3)	7.11	7.37	7.75	8.02	8.28	8.56	9.24	9.92	10.47	11.16	11.71	12.36	12.91	13.59	14.24	14.76	15.43	15.94	16.70	17.39	18.07	18.62	19.42	20.76
Sheetpile	(sheet)																								
Timbering	(t)																								
Concrete Pipe Laying	(m)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Pavement	(m2)	4.9	5.0	5.2	5.3	5.4	5.5	5.8	6.1	6.3	6.6	6.8	7.1	7.3	7.6	7.9	8.1	8.4	8.6	8.9	9.2	9.5	9.7	10.0	10.6
(2) Construction Cost (TAX/no)																									
Excavation(Pavement)	90	132	135	139	143	145	149	156	163	170	178	184	191	198	205	212	218	225	232	240	248	255	261	270	286
Excavation(1)	90	235	256	292	315	340	366	439	517	581	671	742	838	918	1,027	1,139	1,225	1,351	1,444	1,605	1,750	1,901	2,018	2,215	2,553
Excavation(2)	90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sand Foundation	860	189	223	309	344	378	421	576	765	868	1,092	1,212	1,462	1,608	1,892	2,193	2,356	2,700	2,881	3,422	3,844	4,274	4,515	5,211	6,226
Backfilling(1)	150	88	99	114	124	138	150	183	219	250	292	328	373	414	465	516	559	618	666	735	804	874	934	1,020	1,177
Backfilling(2)	150	1,066	1,105	1,162	1,203	1,242	1,284	1,386	1,488	1,570	1,674	1,756	1,854	1,936	2,038	2,136	2,214	2,314	2,391	2,505	2,608	2,710	2,793	2,913	3,114
Sheetpile(driving and removal)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Timbering		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Concrete Pipe Laying		920	1,240	1,520	1,790	2,070	3,290	4,040	4,840	5,740	6,730	8,980	11,070	13,010	15,360	17,700	20,050	22,870	25,560	28,600	31,800	35,180	38,740	42,470	46,930
Pavement	456	2,234	2,280	2,371	2,416	2,462	2,508	2,644	2,781	2,872	3,009	3,100	3,237	3,328	3,465	3,602	3,693	3,830	3,921	4,058	4,195	4,332	4,423	4,560	4,833
Manhole	88100	1,762	1,762	1,174	1,174	1,174	1,174	1,174	881	881	881	881	587	587	587	587	587	587	587	587	587	587	587	587	587
Total		6,626	7,100	7,081	7,509	7,949	9,342	10,598	11,654	12,932	14,527	17,183	19,612	21,999	25,039	28,085	30,902	34,495	37,682	41,752	45,836	50,113	54,271	59,246	65,706
Total (including tax etc.)																									

Table 9.3.2.8 Quantity Calculation for Pipe Installation, Earth Corvering Depth = 3.0 m (Sand Foundation)

D1	D2	D3	H1	H2	H3	H4	H5	H6	H7	H8	H9	H	W1	W2	W3	W4	W5	W6	Excavation	Excavation (1)	Excavation (2)	Gravel	Concrete Foundation	Backfilling (1)
250	28	306	3000	100	253	300	406	300	706	2400	1006	3406	300	906	1159	1612	4312	4912	1.47	2.62	0.22	0.59	7.11	4.9
300	30	360	3000	100	280	300	460	300	760	2400	1060	3460	300	960	1240	1720	4420	5020	1.51	2.85	0.26	0.66	7.37	5.0
350	32	414	3000	150	357	300	564	300	864	2400	1164	3564	300	1014	1371	1878	4578	5178	1.55	3.25	0.36	0.76	7.75	5.2
400	35	470	3000	150	385	300	620	300	920	2400	1220	3620	300	1070	1455	1990	4690	5290	1.59	3.51	0.40	0.83	8.02	5.3
450	38	526	3000	150	413	300	676	300	976	2400	1276	3676	300	1126	1539	2102	4802	5402	1.62	3.78	0.44	0.92	8.28	5.4
500	42	584	3000	150	442	300	734	300	1034	2400	1334	3734	300	1184	1626	2218	4918	5518	1.66	4.07	0.49	1.00	8.56	5.5
600	50	700	3000	200	550	300	900	300	1200	2400	1500	3900	300	1300	1850	2500	5200	5800	1.74	4.88	0.67	1.22	9.24	5.8
700	58	816	3000	250	658	300	1066	300	1366	2400	1666	4066	300	1416	2074	2782	5482	6082	1.82	5.75	0.89	1.46	9.92	6.1
800	66	932	3000	250	716	300	1182	300	1482	2400	1782	4182	300	1532	2248	3014	5714	6314	1.89	6.46	1.01	1.67	10.47	6.3
900	75	1050	3000	300	825	300	1350	300	1650	2400	1950	4350	300	1650	2475	3300	6000	6600	1.98	7.46	1.27	1.95	11.16	6.6
1000	82	1164	3000	300	882	300	1464	300	1764	2400	2064	4464	300	1764	2646	3528	6228	6828	2.05	8.25	1.41	2.19	11.71	6.8
1100	88	1276	3000	350	988	300	1626	300	1926	2400	2226	4626	300	1876	2864	3802	6502	7102	2.13	9.32	1.70	2.49	12.36	7.1
1200	95	1390	3000	350	1045	300	1740	300	2040	2400	2340	4740	300	1990	3035	4030	6730	7330	2.20	10.20	1.87	2.76	12.91	7.3
1300	103	1506	3000	400	1153	300	1906	300	2206	2400	2506	4906	300	2106	3259	4312	7012	7612	2.28	11.42	2.20	3.10	13.59	7.6
1400	108	1616	3000	450	1258	300	2066	300	2366	2400	2666	5066	300	2216	3474	4582	7282	7882	2.36	12.66	2.55	3.44	14.24	7.9
1500	112	1724	3000	450	1312	300	2174	300	2474	2400	2774	5174	300	2324	3636	4798	7498	8098	2.43	13.62	2.74	3.73	14.76	8.1
1600	120	1840	3000	500	1420	300	2340	300	2640	2400	2940	5340	300	2440	3860	5080	7780	8380	2.51	15.02	3.14	4.12	15.43	8.4
1700	123	1946	3000	500	1473	300	2446	300	2746	2400	3046	5446	300	2546	4019	5292	7992	8592	2.58	16.05	3.35	4.44	15.94	8.6
1800	127	2054	3000	600	1627	300	2654	300	2954	2400	3254	5654	300	2654	4281	5608	8308	8908	2.67	17.84	3.98	4.90	16.70	8.9
1900	136	2172	3000	650	1736	300	2822	300	3122	2400	3422	5822	300	2772	4508	5894	8594	9194	2.76	19.45	4.47	5.36	17.39	9.2
2000	145	2290	3000	700	1845	300	2990	300	3290	2400	3590	5990	300	2890	4735	6180	8880	9480	2.84	21.13	4.97	5.83	18.07	9.5
2100	152	2404	3000	700	1902	300	3104	300	3404	2400	3704	6104	300	3004	4906	6408	9108	9708	2.91	22.43	5.25	6.23	18.62	9.7
2200	160	2520	3000	800	2060	300	3320	300	3620	2400	3920	6320	300	3120	5180	6740	9440	10040	3.01	24.62	6.06	6.80	19.42	10.0
2400	175	2750	3000	900	2275	300	3650	300	3950	2400	4250	6650	300	3350	5625	7300	10000	10600	3.18	28.37	7.24	7.85	20.76	10.6

Table 9.3.2.9 Pipe Installation Cost, Earth Corvering Depth = 4.0 m (Concrete Foundation)

Diameter (mm)		250	300	350	400	450	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2400
(1) Quantity																									
Excavation(Pavement)	(m3)	0.59	0.60	0.62	0.64	0.65	0.67	0.71	0.74	0.78	0.81	0.85	0.88	0.91	0.95	0.98	1.01	1.05	1.08	1.11	1.15	1.18	1.22	1.25	1.32
Excavation(1)	(m3)	5.79	6.08	6.49	6.79	7.15	7.52	8.31	9.10	10.01	10.82	11.80	12.64	13.52	14.61	15.53	16.61	17.60	18.59	19.61	20.74	22.01	23.20	24.35	26.79
Excavation(2)	(m3)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.31	0.76	1.13	1.49	1.88	2.33	2.97	3.47	4.00	5.13
Gravel	(m3)	0.11	0.11	0.12	0.13	0.14	0.15	0.22	0.24	0.27	0.29	0.31	0.34	0.36	0.38	0.40	0.43	0.45	0.47	0.49	0.52	0.54	0.56	0.58	0.63
Concrete Foundation	(m3)	0.09	0.11	0.15	0.17	0.19	0.22	0.26	0.31	0.42	0.47	0.61	0.67	0.74	0.91	0.99	1.17	1.26	1.36	1.46	1.57	1.79	1.91	2.02	2.27
Backfilling(1)	(m3)	0.93	1.01	1.15	1.24	1.34	1.44	1.69	1.93	2.22	2.48	2.80	3.07	3.36	3.72	4.04	4.39	4.73	5.07	5.42	5.82	6.27	6.69	7.12	8.00
Backfilling(2)	(m3)	4.62	4.79	5.00	5.17	5.37	5.58	5.95	6.36	6.77	7.14	7.55	7.92	8.30	8.70	9.08	9.45	9.83	10.20	10.57	10.98	11.36	11.76	12.14	12.92
Sheetpile	(sheet)	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Timbering	(t)	0.446	0.449	0.452	0.455	0.459	0.462	0.469	0.476	0.483	0.490	0.497	0.504	0.510	0.776	0.787	0.796	0.806	0.816	0.826	0.837	0.847	0.857	0.867	0.888
Concrete Pipe Laying	(m)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Pavement	(m2)	2.0	2.0	2.1	2.1	2.2	2.2	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.1	4.2	4.4
(2) Construction Cost (TAX,etc)																									
Excavation(Pavement)	90	53	54	55	57	58	60	63	66	70	72	76	79	81	85	88	90	94	97	99	103	106	109	112	118
Excavation(1)	90	521	547	584	611	643	676	747	819	900	973	1,062	1,137	1,216	1,314	1,397	1,494	1,584	1,673	1,764	1,866	1,980	2,088	2,191	2,411
Excavation(2)	90	0	0	0	0	0	0	0	0	0	0	0	0	0	1	27	68	101	134	169	209	267	312	360	461
Gravel	2000	220	220	240	260	280	300	440	480	540	580	620	680	720	760	800	860	900	940	980	1,040	1,080	1,120	1,160	1,260
Concrete Foundation	11500	1,035	1,265	1,725	1,955	2,185	2,530	2,990	3,565	4,830	5,405	7,015	7,705	8,510	10,465	11,385	13,455	14,490	15,640	16,790	18,055	20,585	21,965	23,230	26,105
Sheetpile(driving and	150	139	151	172	186	201	216	253	289	333	372	420	460	504	558	606	658	709	760	813	873	940	1,003	1,068	1,200
Backfilling(2)	150	693	718	750	775	805	837	892	954	1,015	1,071	1,132	1,188	1,245	1,305	1,362	1,417	1,474	1,530	1,585	1,647	1,704	1,764	1,821	1,938
Sheetpile(driving and removal)		21,915	21,915	21,915	21,915	21,915	21,915	25,705	25,705	25,705	25,705	25,705	25,705	25,705	25,705	28,950	28,950	28,950	28,950	28,950	33,820	33,820	33,820	33,820	33,820
Timbering		2,332	2,347	2,363	2,379	2,400	2,415	2,452	2,489	2,525	2,562	2,598	2,635	2,666	4,057	4,115	4,162	4,214	4,266	4,319	4,376	4,428	4,481	4,531	4,643
Concrete Pipe Laying		920	1,240	1,520	1,790	2,070	3,290	4,040	4,840	5,740	6,730	8,980	11,070	13,010	15,360	17,700	20,050	22,870	25,560	28,600	31,800	35,180	38,740	42,470	46,930
Pavement	456	912	912	957	957	1,003	1,003	1,094	1,140	1,185	1,231	1,276	1,322	1,368	1,459	1,504	1,550	1,596	1,641	1,687	1,732	1,778	1,869	1,915	2,006
Manhole	114100	2,282	2,282	1,521	1,521	1,521	1,521	1,521	1,141	1,141	1,141	1,141	760	760	760	760	760	760	760	760	760	760	760	760	760
Total		31,022	31,651	31,802	32,406	33,081	34,763	40,197	41,488	43,984	45,842	50,025	52,741	55,785	61,829	68,694	73,514	77,742	81,951	86,516	96,281	102,628	108,031	113,438	121,652
Total (including tax etc.)																									

Table 9.3.2.10 Quantity Calculation for Pipe Installation, Earth Corvering Depth = 4.0 m (Concrete Foundation)

D1	D2	D3	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H	W1	W2	W3	W4	W5	Excavation	Excavation (1)	Excavation (2)	Gravel	Concrete Foundation	Backfilling (1)	Backfilling (2)	Sheetpile III (t)	Sheetpile III (m)(Sheets)	Timbering (t)	Pavement
250	28	306	4000	100	150	300	253	300	556	3400	856	4256	4556	102	510	300	1360	1960	0.59	5.79	0.00	0.11	0.09	0.93	4.62	2.700	9	0.446	2.0
300	30	360	4000	100	150	300	280	300	610	3400	910	4310	4610	100	560	300	1410	2010	0.60	6.08	0.00	0.11	0.11	1.01	4.79	2.700	9	0.449	2.0
350	32	414	4000	150	150	300	357	300	714	3400	1014	4414	4714	103	620	300	1470	2070	0.62	6.49	0.00	0.12	0.15	1.15	5.00	2.700	9	0.452	2.1
400	35	470	4000	150	150	300	385	300	770	3400	1070	4470	4770	100	670	300	1520	2120	0.64	6.79	0.00	0.13	0.17	1.24	5.17	2.700	9	0.455	2.1
450	38	526	4000	150	150	300	413	300	826	3400	1126	4526	4826	102	730	300	1580	2180	0.65	7.15	0.00	0.14	0.19	1.34	5.37	2.700	9	0.462	2.2
500	42	584	4000	150	150	300	442	300	884	3400	1184	4584	4884	103	790	300	1640	2240	0.67	7.52	0.00	0.15	0.22	1.44	5.58	2.700	9	0.462	2.2
600	50	700	4000	150	200	300	500	300	1050	3400	1350	4750	5050	100	900	300	1750	2350	0.71	8.31	0.00	0.22	0.26	1.69	5.95	3.600	10	0.469	2.4
700	58	816	4000	150	200	300	558	300	1166	3400	1466	4866	5166	102	1020	300	1870	2470	0.74	9.10	0.00	0.24	0.31	1.93	6.36	3.000	10	0.476	2.5
800	66	932	4000	200	200	300	666	300	1332	3400	1632	5032	5332	104	1140	300	1990	2590	0.78	10.01	0.00	0.27	0.42	2.22	6.77	3.000	10	0.483	2.6
900	75	1050	4000	200	200	300	725	300	1450	3400	1750	5150	5450	100	1250	300	2100	2700	0.81	10.82	0.00	0.29	0.47	2.48	7.14	3.000	10	0.490	2.7
1000	82	1164	4000	250	200	300	832	300	1614	3400	1914	5314	5614	103	1370	300	2220	2820	0.85	11.80	0.00	0.31	0.61	2.80	7.55	3.300	11	0.497	2.8
1100	88	1276	4000	250	200	300	888	300	1726	3400	2026	5426	5726	102	1480	300	2330	2930	0.88	12.64	0.00	0.34	0.67	3.07	7.92	3.300	11	0.504	2.9
1200	95	1390	4000	250	200	300	945	300	1840	3400	2140	5540	5840	100	1590	300	2440	3040	0.91	13.52	0.00	0.36	0.74	3.36	8.30	3.300	11	0.510	3.0
1300	103	1506	4000	300	200	300	1053	300	2006	3400	2306	5706	6006	102	1710	300	2560	3160	0.95	14.61	0.02	0.38	0.91	3.72	8.70	3.300	11	0.776	3.2
1400	108	1616	4000	300	200	300	1108	300	2116	3400	2416	5816	6116	102	1820	300	2670	3270	0.98	15.53	0.31	0.40	0.99	4.04	9.08	3.600	12	0.786	3.3
1500	112	1724	4000	350	200	300	1212	300	2274	3400	2574	5974	6274	103	1930	300	2780	3380	1.01	16.61	0.76	0.43	1.17	4.39	9.45	3.600	12	0.796	3.4
1600	120	1840	4000	350	200	300	1270	300	2390	3400	2690	6090	6390	100	2040	300	2890	3490	1.05	17.60	1.13	0.45	1.26	4.73	9.83	3.600	12	0.806	3.5
1700	123	1946	4000	350	200	300	1323	300	2496	3400	2796	6196	6496	102	2150	300	3000	3600	1.08	18.59	1.49	0.47	1.36	5.07	10.20	3.600	12	0.826	3.7
1800	127	2054	4000	350	200	300	1377	300	2604	3400	2904	6304	6604	103	2260	300	3110	3710	1.11	19.61	1.88	0.49	1.46	5.42	10.57	3.600	12	0.837	3.8
1900	136	2172	4000	350	200	300	1436	300	2722	3400	3022	6422	6722	104	2380	300	3230	3830	1.15	20.74	2.33	0.52	1.57	5.82	10.98	3.900	13	0.847	3.9
2000	145	2290	4000	400	200	300	1545	300	2890	3400	3190	6590	6890	100	2490	300	3340	3940	1.18	22.01	2.97	0.54	1.79	6.27	11.36	3.900	13	0.857	4.1
2100	152	2404	4000	400	200	300	1602	300	3004	3400	3304	6704	7004	103	2610	300	3460	4060	1.22	23.20	3.47	0.56	1.91	6.69	11.76	3.900	13	0.867	4.2
2200	160	2520	4000	400	200	300	1660	300	3120	3400	3420	6820	7120	100	2720	300	3570	4170	1.25	24.35	4.00	0.58	2.02	7.12	12.14	3.900	13	0.867	4.2
2400	175	2750	4000	400	200	300	1775	300	3350	3400	3650	7050	7350	100	2950	300	3800	4400	1.32	26.79	5.13	0.63	2.27	8.00	12.92	4.200	14	0.888	4.4

Table 9.3.2.11 Pipe Installation Cost, Earth Corvering Depth = 5.0 m (Concrete Foundation)

Diameter (mm)		250	300	350	400	450	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2400
(1) Quantity																									
Excavation(Pavement)	(m3)	0.59	0.60	0.62	0.64	0.65	0.67	0.71	0.74	0.78	0.81	0.85	0.88	0.91	0.95	0.98	1.01	1.05	1.08	1.11	1.15	1.18	1.22	1.25	1.32
Excavation(1)	(m3)	7.15	7.49	7.96	8.31	8.73	9.16	10.06	10.97	12.00	12.92	14.02	14.97	15.96	17.17	18.20	19.39	20.49	21.59	22.72	23.97	25.35	26.66	27.92	30.59
Excavation(2)	(m3)	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.31	0.66	0.95	1.36	1.69	2.05	2.58	2.98	3.54	4.02	4.49	4.99	5.56	6.31	6.93	7.57	8.96
Gravel	(m3)	0.11	0.11	0.12	0.13	0.14	0.15	0.22	0.24	0.27	0.29	0.31	0.34	0.36	0.38	0.40	0.43	0.45	0.47	0.49	0.52	0.54	0.56	0.58	0.63
Concrete Foundation	(m3)	0.09	0.11	0.15	0.17	0.19	0.22	0.26	0.31	0.42	0.47	0.61	0.67	0.74	0.91	0.99	1.17	1.26	1.36	1.46	1.57	1.79	1.91	2.02	2.27
Backfilling(1)	(m3)	0.93	1.01	1.15	1.24	1.34	1.44	1.69	1.93	2.22	2.48	2.80	3.07	3.36	3.72	4.04	4.39	4.73	5.07	5.42	5.82	6.27	6.69	7.12	8.00
Backfilling(2)	(m3)	5.98	6.20	6.47	6.69	6.95	7.22	7.70	8.23	8.76	9.24	9.77	10.25	10.74	11.26	11.75	12.23	12.72	13.20	13.68	14.21	14.70	15.22	15.71	16.72
Sheetpile	(sheet)	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Timbering	(t)	0.446	0.449	0.452	0.455	0.459	0.462	0.704	0.714	0.725	0.735	0.746	0.756	0.766	0.776	0.786	0.796	0.806	0.816	0.826	0.837	0.847	1.143	1.156	1.184
Concrete Pipe Laying	(m)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Pavement	(m2)	2.0	2.0	2.1	2.1	2.2	2.2	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.1	4.2	4.4
(2) Construction Cost (TAKA/m)																									
Excavation(Pavement)	90	53	54	55	57	58	60	63	66	70	72	76	79	81	85	88	90	94	97	99	103	106	109	112	118
Excavation(1)	90	643	674	716	747	785	824	905	987	1,080	1,162	1,261	1,347	1,436	1,545	1,638	1,745	1,844	1,943	2,044	2,157	2,281	2,399	2,512	2,753
Excavation(2)	90	0	0	0	0	0	0	8	27	59	85	122	152	184	232	268	318	361	404	449	500	567	623	681	806
Gravel	2000	220	220	240	260	280	300	440	480	540	580	620	680	720	760	800	860	900	940	980	1,040	1,080	1,120	1,160	1,260
Concrete Foundation	11500	1,035	1,265	1,725	1,955	2,185	2,530	2,990	3,565	4,830	5,405	7,015	7,705	8,510	10,465	11,385	13,455	14,490	15,640	16,790	18,055	20,585	21,965	23,230	26,105
Sheetpile(driving and	150	139	151	172	186	201	216	253	289	333	372	420	460	504	558	606	658	709	760	813	873	940	1,003	1,068	1,200
Backfilling(2)	150	897	930	970	1,003	1,042	1,083	1,155	1,234	1,314	1,386	1,465	1,537	1,611	1,689	1,762	1,834	1,908	1,980	2,052	2,131	2,205	2,283	2,356	2,508
Sheetpile(driving and removed)		25,705	25,705	25,705	25,705	25,705	25,705	25,705	28,950	28,950	28,950	28,950	33,820	33,820	33,820	33,820	33,820	33,820	33,820	33,820	33,820	33,820	33,820	33,820	33,820
Timbering		2,332	2,347	2,363	2,379	2,400	2,415	3,681	3,733	3,791	3,843	3,900	3,953	4,005	4,057	4,109	4,162	4,214	4,266	4,319	4,376	4,428	5,976	6,044	6,191
Concrete Pipe Laying		920	1,240	1,520	1,790	2,070	3,290	4,040	4,840	5,740	6,730	8,980	11,070	13,010	15,360	17,700	20,050	22,870	25,560	28,600	31,800	35,180	38,740	42,470	46,930
Pavement	456	912	912	957	957	1,003	1,003	1,094	1,140	1,185	1,231	1,276	1,322	1,368	1,459	1,504	1,550	1,596	1,641	1,687	1,732	1,778	1,869	1,915	2,006
Manhole	164000	3,280	3,280	2,186	2,186	2,186	2,186	2,186	1,640	1,640	1,640	1,640	1,093	1,093	1,093	1,093	1,093	1,093	1,093	1,093	1,093	1,093	1,093	1,093	1,093
Total		36,136	36,778	36,609	37,225	37,915	39,612	42,520	46,951	49,532	51,456	55,725	63,218	66,342	71,123	74,773	79,635	83,899	88,144	92,746	97,680	104,063	111,000	116,461	124,790
Total (including tax etc.)																									

Table 9.3.2.12 Quantity Calculation for Pipe Installation, Earth Corvering Depth = 5.0 m (Concrete Foundation)

D1	D2	D3	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H	W1	W2	W3	W4	W5	Excavation	Excavation (1)	Excavation (2)	Gravel	Concrete Foundation	Backfilling (1)	Backfilling (2)	Sheetpile III (t)	Sheetpile III (m)(5sheets)	Timbering (t)	Pavement
250	28	306	5000	100	150	300	253	300	556	4400	856	5256	5556	102	510	300	1360	1960	0.59	7.15	0.00	0.11	0.09	0.93	5.98	3.300	11	0.446	2.0
300	30	360	5000	100	150	300	280	300	610	4400	910	5310	5610	100	560	300	1410	2010	0.60	7.49	0.00	0.11	0.11	1.01	6.20	3.300	11	0.449	2.0
350	32	414	5000	150	150	300	357	300	714	4400	1014	5414	5714	103	620	300	1470	2070	0.62	7.96	0.00	0.12	0.15	1.15	6.47	3.300	11	0.452	2.1
400	35	470	5000	150	150	300	385	300	770	4400	1070	5470	5770	100	670	300	1520	2120	0.64	8.31	0.00	0.13	0.17	1.24	6.69	3.300	11	0.455	2.1
450	38	526	5000	150	150	300	413	300	826	4400	1126	5526	5826	102	730	300	1580	2180	0.65	8.73	0.00	0.14	0.19	1.34	6.95	3.300	11	0.459	2.2
500	42	584	5000	150	150	300	442	300	884	4400	1184	5584	5884	103	790	300	1640	2240	0.67	9.16	0.00	0.15	0.22	1.44	7.22	3.300	11	0.462	2.2
600	50	700	5000	150	200	300	500	300	1050	4400	1350	5750	6050	100	900	300	1750	2350	0.71	10.06	0.09	0.22	0.26	1.69	7.70	3.300	11	0.704	2.4
700	58	816	5000	150	200	300	558	300	1166	4400	1466	5866	6166	102	1020	300	1870	2470	0.74	10.97	0.31	0.24	0.31	1.93	8.23	3.600	12	0.714	2.5
800	66	932	5000	200	200	300	666	300	1332	4400	1632	6032	6332	104	1140	300	1990	2590	0.78	12.00	0.66	0.27	0.42	2.22	8.76	3.600	12	0.725	2.6
900	75	1050	5000	200	200	300	725	300	1450	4400	1750	6150	6450	100	1250	300	2100	2700	0.81	12.92	0.95	0.29	0.47	2.48	9.24	3.600	12	0.735	2.7
1000	82	1164	5000	250	200	300	832	300	1614	4400	1914	6314	6614	103	1370	300	2220	2820	0.85	14.02	1.36	0.31	0.61	2.80	9.77	3.600	12	0.746	2.8
1100	88	1276	5000	250	200	300	888	300	1726	4400	2026	6426	6726	102	1480	300	2330	2930	0.88	14.97	1.69	0.34	0.67	3.07	10.25	3.900	13	0.756	2.9
1200	95	1390	5000	250	200	300	945	300	1840	4400	2140	6540	6840	100	1590	300	2440	3040	0.91	15.96	2.05	0.36	0.74	3.36	10.74	3.900	13	0.766	3.0
1300	103	1506	5000	300	200	300	1053	300	2006	4400	2306	6706	7006	102	1710	300	2560	3160	0.95	17.17	2.58	0.38	0.91	3.72	11.26	3.900	13	0.776	3.2
1400	108	1616	5000	300	200	300	1108	300	2116	4400	2416	6816	7116	102	1820	300	2670	3270	0.98	18.20	2.98	0.40	0.99	4.04	11.75	3.900	13	0.786	3.3
1500	112	1724	5000	350	200	300	1212	300	2274	4400	2574	6974	7274	103	1930	300	2780	3380	1.01	19.39	3.54	0.43	1.17	4.39	12.23	4.200	14	0.796	3.4
1600	120	1840	5000	350	200	300	1270	300	2390	4400	2690	7090	7390	100	2040	300	2890	3490	1.05	20.49	4.02	0.45	1.26	4.73	12.72	4.200	14	0.806	3.5
1700	123	1946	5000	350	200	300	1323	300	2496	4400	2796	7196	7496	102	2150	300	3000	3600	1.08	21.59	4.49	0.47	1.36	5.07	13.20	4.200	14	0.816	3.6
1800	127	2054	5000	350	200	300	1377	300	2604	4400	2904	7304	7604	103	2260	300	3110	3710	1.11	22.72	4.99	0.49	1.46	5.42	13.68	4.200	14	0.826	3.7
1900	136	2172	5000	350	200	300	1436	300	2722	4400	3022	7422	7722	104	2380	300	3230	3830	1.15	23.97	5.56	0.52	1.57	5.82	14.21	4.200	14	0.837	3.8
2000	145	2290	5000	400	200	300	1545	300	2890	4400	3190	7590	7890	100	2490	300	3340	3940	1.18	25.35	6.31	0.54	1.79	6.27	14.70	4.500	15	0.847	3.9
2100	152	2404	5000	400	200	300	1602	300	3004	4400	3304	7704	8004	103	2610	300	3460	4060	1.22	26.66	6.93	0.56	1.91	6.69	15.22	4.500	15	1.143	4.1
2200	160	2520	5000	400	200	300	1660	300	3120	4400	3420	7820	8120	100	2720	300	3570	4170	1.25	27.92	7.57	0.58	2.02	7.12	15.71	4.500	15	1.156	4.2
2400	175	2750	5000	400	200	300	1775	300	3350	4400	3650	8050	8350	100	2950	300	3800	4400	1.32	30.59	8.93	0.63	2.27	8.00	16.72	4.800	16	1.184	4.4

Table 9.3.2.13 Pipe Installation Cost, Earth Corvering Depth = 6.0 m (Concrete Foundation)

Diameter (mm)		250	300	350	400	450	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2400
(1) Quantity																									
Excavation(Pavement)	(m3)	0.59	0.60	0.62	0.64	0.65	0.67	0.71	0.74	0.78	0.81	0.85	0.88	0.91	0.95	0.98	1.01	1.05	1.08	1.11	1.15	1.18	1.22	1.25	1.32
Excavation(1)	(m3)	8.51	8.90	9.43	9.83	10.31	10.80	11.81	12.84	13.99	15.02	16.24	17.30	18.40	19.73	20.87	22.17	23.38	24.59	25.83	27.20	28.69	30.12	31.49	34.39
Excavation(2)	(m3)	0.76	0.86	1.05	1.17	1.31	1.45	1.84	2.18	2.65	3.05	3.58	4.02	4.49	5.14	5.65	6.32	6.91	7.49	8.10	8.79	9.65	10.39	11.14	12.73
Gravel	(m3)	0.11	0.11	0.12	0.13	0.14	0.15	0.22	0.24	0.27	0.29	0.31	0.34	0.36	0.38	0.41	0.43	0.45	0.47	0.49	0.52	0.54	0.56	0.58	0.63
Concrete Foundation	(m3)	0.09	0.11	0.15	0.17	0.19	0.22	0.26	0.31	0.42	0.47	0.61	0.67	0.74	0.91	0.99	1.17	1.26	1.36	1.46	1.57	1.79	1.91	2.02	2.27
Backfilling(1)	(m3)	0.93	1.01	1.15	1.24	1.34	1.44	1.69	1.93	2.22	2.48	2.80	3.07	3.36	3.72	4.04	4.39	4.73	5.07	5.42	5.82	6.27	6.69	7.12	8.00
Backfilling(2)	(m3)	7.34	7.61	7.94	8.21	8.53	8.86	9.45	10.10	10.75	11.34	11.99	12.58	13.18	13.82	14.42	15.01	15.61	16.20	16.79	17.44	18.04	18.68	19.28	20.52
Sheetpile	(sheet)	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Timbering	(t)	0.668	0.673	0.678	0.683	0.688	0.694	0.704	0.714	0.725	0.735	0.746	0.756	0.766	1.035	1.048	1.062	1.075	1.088	1.101	1.116	1.129	1.143	1.156	1.184
Concrete Pipe Laying	(m)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Pavement	(m2)	2.0	2.0	2.1	2.1	2.2	2.2	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.1	4.2	4.4
(2) Construction Cost (TAKA/m)																									
Excavation(Pavement)	90	53	54	55	57	58	60	63	66	70	72	76	79	81	85	88	90	94	97	99	103	106	109	112	118
Excavation(1)	90	765	801	848	884	927	972	1,062	1,155	1,259	1,351	1,461	1,557	1,656	1,775	1,878	1,995	2,104	2,213	2,324	2,448	2,582	2,710	2,834	3,095
Excavation(2)	90	68	77	94	105	117	130	165	196	238	274	322	361	404	462	508	568	621	674	729	791	868	935	1,002	1,145
Gravel	2000	220	220	240	260	280	300	440	480	540	580	620	680	720	760	820	860	900	940	980	1,040	1,080	1,120	1,160	1,260
Concrete Foundation	11500	1,035	1,265	1,725	1,955	2,185	2,530	2,990	3,565	4,830	5,405	7,015	7,705	8,510	10,465	11,385	13,455	14,490	15,640	16,790	18,055	20,585	21,965	23,230	26,105
Sheetpile(driving and	150	139	151	172	186	201	216	253	289	333	372	420	460	504	558	606	658	709	760	813	873	940	1,003	1,068	1,200
Backfilling(2)	150	1,101	1,141	1,191	1,231	1,279	1,329	1,417	1,515	1,612	1,701	1,798	1,887	1,977	2,073	2,163	2,251	2,341	2,430	2,518	2,616	2,706	2,802	2,892	3,078
Sheetpile(driving and removal)		28,950	28,950	33,820	33,820	33,820	33,820	33,820	33,820	33,820	33,820	33,820	33,820	33,820	33,820	33,820	33,820	33,820	33,820	33,820	33,820	36,800	36,800	36,800	36,800	40,590	40,590	40,590	40,590
Timbering		3,492	3,519	3,545	3,571	3,597	3,628	3,681	3,733	3,791	3,843	3,900	3,953	4,005	5,412	5,479	5,553	5,621	5,689	5,757	5,835	5,903	5,976	6,044	6,191
Concrete Pipe Laying		920	1,240	1,520	1,790	2,070	3,290	4,040	4,840	5,740	6,730	8,980	11,070	13,010	15,360	17,700	20,050	22,870	25,560	28,600	31,800	35,180	38,740	42,470	46,930
Pavement	456	912	912	957	957	1,003	1,003	1,094	1,140	1,185	1,231	1,276	1,322	1,368	1,459	1,504	1,550	1,596	1,641	1,687	1,732	1,778	1,869	1,915	2,006
Manhole	194300	3,886	3,886	2,590	2,590	2,590	2,590	2,590	1,943	1,943	1,943	1,943	1,295	1,295	1,295	1,295	1,295	1,295	1,295	1,295	1,295	1,295	1,295	1,295	1,295
Total		41,541	42,216	46,757	47,406	48,127	49,868	51,615	52,742	55,361	57,322	61,631	64,189	67,350	73,524	77,246	82,145	89,441	93,739	98,392	103,388	113,613	119,114	124,612	133,013
Total (including tax etc.)																									

Table 9.3.2.14 Quantity Calculation for Pipe Installation, Earth Covering Depth = 6.0 m (Concrete Foundation)

D1	D2	D3	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H	W1	W2	W3	W4	W5	Excavation	Excavation (1)	Excavation (2)	Gravel	Concrete Foundation	Backfilling (1)	Backfilling (2)	Sheetpile III (t)	Sheetpile III (m)(5sheets)	Timbering (t)	Pavement
250	25	306	6000	100	150	300	253	300	556	5400	856	6256	6556	102	510	300	1360	1960	0.59	8.51	0.76	0.11	0.09	0.93	7.34	3.600	12	0.668	2.0
300	30	360	6000	100	150	300	280	300	610	5400	910	6310	6610	100	560	300	1410	2010	0.60	8.90	0.86	0.11	0.11	1.01	7.61	3.600	12	0.673	2.0
350	32	414	6000	150	150	300	357	300	714	5400	1014	6414	6714	103	620	300	1470	2070	0.62	9.43	1.05	0.12	0.15	1.15	7.94	3.900	13	0.678	2.1
400	35	470	6000	150	150	300	385	300	770	5400	1070	6470	6770	100	670	300	1520	2120	0.64	9.83	1.17	0.13	0.17	1.24	8.21	3.900	13	0.680	2.1
450	38	526	6000	150	150	300	413	300	826	5400	1126	6526	6826	102	730	300	1580	2180	0.65	10.31	1.31	0.14	0.19	1.34	8.53	3.900	13	0.688	2.2
500	42	584	6000	150	150	300	442	300	884	5400	1184	6584	6884	103	790	300	1640	2240	0.67	10.80	1.45	0.15	0.22	1.44	8.86	3.900	13	0.694	2.2
600	50	700	6000	150	200	300	500	300	1050	5400	1350	6750	7050	100	900	300	1750	2350	0.71	11.81	1.84	0.22	0.26	1.69	9.45	3.900	13	0.704	2.4
700	58	816	6000	150	200	300	558	300	1166	5400	1466	6866	7166	102	1020	300	1870	2470	0.74	12.84	2.18	0.24	0.31	1.93	10.10	3.900	13	0.714	2.5
800	66	932	6000	200	200	300	666	300	1332	5400	1632	7032	7332	104	1140	300	1990	2590	0.78	13.99	2.65	0.27	0.42	2.22	10.75	4.200	14	0.725	2.6
900	75	1050	6000	200	200	300	725	300	1450	5400	1750	7150	7450	100	1250	300	2100	2700	0.81	15.02	3.05	0.29	0.47	2.48	11.34	4.200	14	0.735	2.7
1000	82	1164	6000	250	200	300	832	300	1614	5400	1914	7314	7614	103	1370	300	2220	2820	0.85	16.24	3.58	0.31	0.61	2.80	11.99	4.200	14	0.746	2.8
1100	88	1276	6000	250	200	300	888	300	1726	5400	2026	7426	7726	102	1480	300	2330	2930	0.88	17.30	4.02	0.34	0.67	3.07	12.58	4.200	14	0.756	2.9
1200	95	1390	6000	250	200	300	945	300	1840	5400	2140	7540	7840	100	1590	300	2440	3040	0.91	18.40	4.49	0.36	0.74	3.36	13.18	4.500	15	0.766	3.0
1300	103	1506	6000	300	200	300	1053	300	2006	5400	2306	7706	8006	102	1710	300	2560	3160	0.95	19.73	5.14	0.38	0.91	3.72	13.82	4.500	15	1.035	3.2
1400	108	1616	6000	300	200	300	1108	300	2116	5400	2416	7816	8116	102	1820	300	2670	3270	0.98	20.87	5.65	0.40	0.99	4.04	14.42	4.500	15	1.048	3.3
1500	112	1724	6000	350	200	300	1212	300	2274	5400	2574	7974	8274	103	1930	300	2780	3380	1.01	22.17	6.32	0.43	1.17	4.39	15.01	4.500	15	1.062	3.4
1600	120	1840	6000	350	200	300	1270	300	2390	5400	2690	8090	8390	100	2040	300	2890	3490	1.05	23.38	6.91	0.45	1.26	4.73	15.61	4.800	16	1.075	3.5
1700	123	1946	6000	350	200	300	1323	300	2496	5400	2796	8196	8496	102	2150	300	3000	3600	1.08	24.59	7.49	0.47	1.36	5.07	16.20	4.800	16	1.088	3.6
1800	127	2054	6000	350	200	300	1377	300	2604	5400	2904	8304	8604	103	2260	300	3110	3710	1.11	25.83	8.10	0.49	1.46	5.42	16.79	4.800	16	1.101	3.7
1900	136	2172	6000	350	200	300	1436	300	2722	5400	3022	8422	8722	104	2380	300	3230	3830	1.15	27.20	8.79	0.52	1.57	5.82	17.44	4.800	16	1.116	3.8
2000	145	2290	6000	400	200	300	1545	300	2890	5400	3190	8590	8890	100	2490	300	3340	3940	1.18	28.69	9.65	0.54	1.79	6.27	18.04	5.100	17	1.129	3.9
2100	152	2404	6000	400	200	300	1602	300	3004	5400	3304	8704	9004	103	2610	300	3460	4060	1.22	30.12	10.39	0.56	1.91	6.69	18.68	5.100	17	1.143	4.1
2200	160	2520	6000	400	200	300	1660	300	3120	5400	3420	8820	9120	100	2720	300	3570	4170	1.25	31.49	11.14	0.58	2.02	7.12	19.28	5.100	17	1.156	4.2
2400	175	2750	6000	400	200	300	1775	300	3350	5400	3650	9050	9350	100	2950	300	3800	4400	1.32	34.39	12.73	0.63	2.27	8.00	20.52	5.100	17	1.184	4.4

Table 9.3.2.15 Pipe Installation Cost, Earth Covering Depth = 7.0 m (Concrete Foundation)

Diameter (mm)		250	300	350	400	450	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2400
(1) Quantity																									
Excavation(Pavement)	(m3)	0.59	0.60	0.62	0.64	0.65	0.67	0.71	0.74	0.78	0.81	0.85	0.88	0.91	0.95	0.98	1.01	1.05	1.08	1.11	1.15	1.18	1.22	1.25	1.32
Excavation(1)	(m3)	9.87	10.31	10.90	11.35	11.89	12.44	13.56	14.71	15.98	17.12	18.46	19.63	20.84	22.29	23.54	24.95	26.27	27.59	28.94	30.43	32.03	33.58	35.06	38.19
Excavation(2)	(m3)	2.12	2.27	2.52	2.69	2.89	3.09	3.59	4.05	4.64	5.15	5.80	6.35	6.93	7.70	8.32	9.10	9.80	10.49	11.21	12.02	12.99	13.85	14.71	16.53
Gravel	(m3)	0.11	0.11	0.12	0.13	0.14	0.15	0.22	0.24	0.27	0.29	0.31	0.34	0.36	0.38	0.41	0.43	0.45	0.47	0.49	0.52	0.54	0.56	0.58	0.63
Concrete Foundation	(m3)	0.09	0.11	0.15	0.17	0.19	0.22	0.26	0.31	0.42	0.47	0.61	0.67	0.74	0.91	0.99	1.17	1.26	1.36	1.46	1.57	1.79	1.91	2.02	2.27
Backfilling(1)	(m3)	0.93	1.01	1.15	1.24	1.34	1.44	1.69	1.93	2.22	2.48	2.80	3.07	3.36	3.72	4.04	4.39	4.73	5.07	5.42	5.82	6.27	6.69	7.12	8.00
Backfilling(2)	(m3)	8.70	9.02	9.41	9.73	10.11	10.50	11.20	11.97	12.74	13.44	14.21	14.91	15.62	16.38	17.09	17.79	18.50	19.20	19.90	20.67	21.38	22.14	22.85	24.32
Sheetpile	(sheet)	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Timbering	(t)	0.668	0.673	0.678	0.683	0.688	0.694	0.938	0.952	0.967	0.980	0.994	1.008	1.021	1.035	1.048	1.062	1.075	1.088	1.101	1.116	1.129	1.143	1.156	1.184
Concrete Pipe Laying	(m)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Pavement	(m2)	2.0	2.0	2.1	2.1	2.2	2.2	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.1	4.2	4.4
(2) Construction Cost (TAKA/m)																									
Excavation(Pavement)	90	53	54	55	57	58	60	63	66	70	72	76	79	81	85	88	90	94	97	99	103	106	109	112	118
Excavation(1)	90	888	927	981	1,021	1,070	1,119	1,220	1,323	1,438	1,540	1,661	1,766	1,875	2,006	2,118	2,245	2,364	2,483	2,604	2,738	2,882	3,022	3,155	3,437
Excavation(2)	90	190	204	226	242	260	278	323	364	417	463	522	571	623	693	748	819	882	944	1,008	1,081	1,169	1,246	1,323	1,487
Gravel	2000	220	220	240	260	280	300	440	480	540	580	620	680	720	760	820	860	900	940	980	1,040	1,080	1,120	1,160	1,260
Concrete Foundation	11500	1,035	1,265	1,725	1,955	2,185	2,530	2,990	3,565	4,830	5,405	7,015	7,705	8,510	10,465	11,385	13,455	14,490	15,640	16,790	18,055	20,585	21,965	23,230	26,105
Sheetpile(driving and	150	139	151	172	186	201	216	253	289	333	372	420	460	504	558	606	658	709	760	813	873	940	1,003	1,068	1,200
Backfilling(2)	150	1,305	1,353	1,411	1,459	1,516	1,575	1,680	1,795	1,911	2,016	2,131	2,236	2,343	2,457	2,563	2,668	2,775	2,880	2,985	3,100	3,207	3,321	3,427	3,648
Sheetpile(driving and removal)		33,820	33,820	33,820	33,820	33,820	33,820	33,820	33,820	33,820	36,800	36,800	36,800	36,800	40,590	40,590	40,590	40,590	40,590	40,590	40,590	40,590	40,590	40,590	40,590
Timbering		3,492	3,519	3,545	3,571	3,597	3,628	4,904	4,978	5,056	5,124	5,197	5,270	5,338	5,412	5,479	5,553	5,621	5,689	5,757	5,835	5,903	5,976	6,044	6,191
Concrete Pipe Laying		920	1,240	1,520	1,790	2,070	3,290	4,040	4,840	5,740	6,730	8,980	11,070	13,010	15,360	17,700	20,050	22,870	25,560	28,600	31,800	35,180	38,740	42,470	46,930
Pavement	456	912	912	957	957	1,003	1,003	1,094	1,140	1,185	1,231	1,276	1,322	1,368	1,459	1,504	1,550	1,596	1,641	1,687	1,732	1,778	1,869	1,915	2,006
Manhole	259000	5,180	5,180	5,453	5,453	5,453	5,453	5,453	2,590	2,590	2,590	2,590	1,726	1,726	1,726	1,726	1,726	1,726	1,726	1,726	1,726	1,726	1,726	1,726	1,726
Total		48,154	48,845	48,105	48,771	49,513	51,272	54,280	55,250	57,930	62,923	67,288	69,685	72,898	81,571	85,327	90,264	94,617	98,950	103,639	108,673	115,146	120,687	126,220	134,698
Total (including tax etc.)																									

Table 9.3.2.16 Quantity Calculation for Pipe Installation, Earth Corvering Depth = 7.0 m (Concrete Foundation)

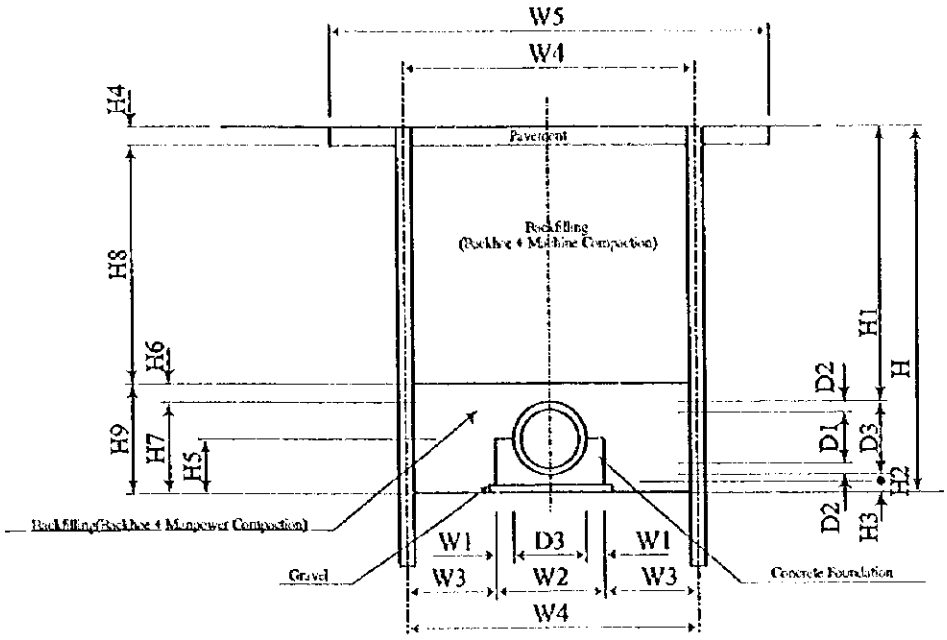
D1	D2	D3	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H	W1	W2	W3	W4	W5	Excavation	Excavation (1)	Excavation (2)	Gravel	Concrete Foundation	Backfilling (1)	Backfilling (2)	Sheetpile III (t)	Sheetpile III (m)(Sheets)	Timbering (t)	Pavement
250	28	305	7000	100	150	300	253	300	556	6400	856	7256	7556	102	510	300	1360	1960	0.59	9.87	2.12	0.11	0.09	0.93	8.70	4.200	14	0.668	2.0
300	30	360	7000	100	150	300	280	300	610	6400	910	7310	7610	100	560	300	1410	2010	0.60	10.31	2.27	0.11	0.11	1.01	9.02	4.200	14	0.673	2.0
350	32	414	7000	150	150	300	357	300	714	6400	1014	7414	7714	103	620	300	1470	2070	0.62	10.90	2.52	0.12	0.15	1.15	9.41	4.200	14	0.678	2.1
400	35	470	7000	150	150	300	385	300	770	6400	1070	7470	7770	100	670	300	1520	2120	0.64	11.35	2.69	0.13	0.17	1.24	9.73	4.200	14	0.683	2.1
450	38	526	7000	150	150	300	413	300	826	6400	1126	7526	7826	102	730	300	1580	2180	0.65	11.89	2.89	0.14	0.19	1.34	10.11	4.500	15	0.688	2.2
500	42	584	7000	150	150	300	442	300	884	6400	1184	7584	7884	103	790	300	1640	2240	0.67	12.44	3.09	0.15	0.22	1.44	10.50	4.500	15	0.694	2.2
600	50	700	7000	150	200	300	500	300	1050	6400	1350	7750	8050	100	900	300	1750	2350	0.71	13.56	3.59	0.22	0.26	1.69	11.20	4.500	15	0.938	2.4
700	58	816	7000	150	200	300	558	300	1166	6400	1466	7866	8166	102	1020	300	1870	2470	0.74	14.71	4.05	0.24	0.31	1.93	11.97	4.500	15	0.952	2.5
800	66	932	7000	200	200	300	666	300	1332	6400	1632	8032	8332	104	1140	300	1990	2590	0.78	15.98	4.64	0.27	0.42	2.22	12.74	4.500	15	0.967	2.6
900	75	1050	7000	200	200	300	725	300	1450	6400	1750	8150	8450	100	1250	300	2100	2700	0.81	17.12	5.15	0.29	0.47	2.48	13.44	4.800	16	0.980	2.7
1000	82	1164	7000	250	200	300	832	300	1614	6400	1914	8314	8614	103	1370	300	2220	2820	0.85	18.46	5.80	0.31	0.61	2.80	14.21	4.800	16	0.994	2.8
1100	88	1270	7000	250	200	300	888	300	1726	6400	2026	8426	8726	102	1480	300	2330	2930	0.88	19.63	6.35	0.34	0.67	3.07	14.91	4.800	16	1.008	2.9
1200	95	1390	7000	250	200	300	945	300	1840	6400	2140	8540	8840	100	1590	300	2440	3040	0.91	20.84	6.93	0.36	0.74	3.36	15.62	4.800	16	1.021	3.0
1300	103	1506	7000	300	200	300	1053	300	2006	6400	2306	8706	9006	102	1710	300	2560	3160	0.95	22.29	7.70	0.38	0.91	3.72	16.38	5.100	17	1.035	3.2
1400	108	1610	7000	300	200	300	1108	300	2116	6400	2416	8816	9116	102	1820	300	2670	3270	0.98	23.54	8.32	0.40	0.99	4.04	17.09	5.100	17	1.048	3.3
1500	112	1724	7000	350	200	300	1212	300	2274	6400	2574	8974	9274	103	1930	300	2780	3380	1.01	24.95	9.10	0.43	1.17	4.39	17.79	5.100	17	1.062	3.4
1600	120	1840	7000	350	200	300	1270	300	2390	6400	2690	9090	9390	100	2040	300	2890	3490	1.05	26.27	9.80	0.45	1.26	4.73	18.50	5.100	17	1.075	3.5
1700	123	1946	7000	350	200	300	1323	300	2496	6400	2796	9196	9496	102	2150	300	3000	3600	1.08	27.59	10.49	0.47	1.36	5.07	19.20	5.400	18	1.088	3.6
1800	127	2054	7000	350	200	300	1377	300	2604	6400	2904	9304	9604	103	2260	300	3110	3710	1.11	28.94	11.21	0.49	1.46	5.42	19.90	5.400	18	1.101	3.7
1900	136	2172	7000	350	200	300	1436	300	2722	6400	3022	9422	9722	104	2380	300	3230	3830	1.15	30.43	12.02	0.52	1.57	5.82	20.67	5.400	18	1.116	3.8
2000	145	2290	7000	400	200	300	1545	300	2890	6400	3190	9590	9890	100	2490	300	3340	3940	1.18	32.03	12.99	0.54	1.79	6.27	21.38	5.400	18	1.129	3.9
2100	152	2404	7000	400	200	300	1602	300	3004	6400	3304	9704	10004	103	2610	300	3460	4060	1.22	33.58	13.85	0.56	1.91	6.69	22.14	5.700	19	1.143	4.1
2200	160	2520	7000	400	200	300	1660	300	3120	6400	3420	9820	10120	100	2720	300	3570	4170	1.25	35.06	14.71	0.58	2.02	7.12	22.85	5.700	19	1.156	4.2
2400	175	2750	7000	400	200	300	1775	300	3350	6400	3650	10050	10350	100	2950	300	3800	4400	1.32	38.19	16.53	0.63	2.27	8.00	24.32	5.700	19	1.184	4.4

Table 9.3.2.17 Pipe Installation Cost, Earth Corvering Depth = 8.0 m (Concrete Foundation)

Diameter (mm)		250	300	350	400	450	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2400
(1) Quantity																									
Excavation(Pavement)	(m3)	0.59	0.60	0.62	0.64	0.65	0.67	0.71	0.74	0.78	0.81	0.85	0.88	0.91	0.95	0.98	1.01	1.05	1.08	1.11	1.15	1.18	1.22	1.25	1.32
Excavation(1)	(m3)	11.23	11.72	12.37	12.87	13.47	14.08	15.31	16.58	17.97	19.22	20.68	21.96	23.28	24.85	26.21	27.73	29.16	30.59	32.05	33.66	35.37	37.04	38.63	41.99
Excavation(2)	(m3)	3.48	3.68	3.99	4.21	4.47	4.73	5.34	5.92	6.63	7.25	8.02	8.68	9.37	10.26	10.99	11.88	12.69	13.49	14.32	15.25	16.33	17.31	18.28	20.33
Gravel	(m3)	0.11	0.11	0.12	0.13	0.14	0.15	0.22	0.24	0.27	0.29	0.31	0.34	0.36	0.38	0.40	0.43	0.45	0.47	0.49	0.52	0.54	0.56	0.58	0.63
Concrete Foundation	(m3)	0.09	0.11	0.15	0.17	0.19	0.22	0.26	0.31	0.42	0.47	0.61	0.67	0.74	0.91	0.99	1.17	1.26	1.36	1.46	1.57	1.79	1.91	2.02	2.27
Backfilling(1)	(m3)	0.93	1.01	1.15	1.24	1.34	1.44	1.69	1.93	2.22	2.48	2.80	3.07	3.36	3.72	4.04	4.39	4.73	5.07	5.42	5.82	6.27	6.69	7.12	8.00
Backfilling(2)	(m3)	10.06	10.43	10.88	11.25	11.69	12.14	12.95	13.84	14.73	15.54	16.43	17.24	18.06	18.94	19.76	20.57	21.39	22.20	23.01	23.90	24.72	25.60	26.42	28.12
Sheetpile	(sheet)	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Timbering	(t)	0.891	0.897	0.904	0.910	0.918	0.925	0.938	0.952	0.967	0.980	0.994	1.008	1.021	1.035	1.048	1.062	1.075	1.088	1.101	1.116	1.129	1.143	1.156	1.184
Concrete Pipe Laying	(m)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Pavement	(m2)	2.0	2.0	2.1	2.1	2.2	2.2	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.1	4.2	4.4
(2) Construction Cost (¥/A/m)																									
Excavation(Pavement)	90	53	54	55	57	58	60	63	66	70	72	76	79	81	85	88	90	94	97	99	103	106	109	112	118
Excavation(1)	90	1,010	1,054	1,113	1,158	1,212	1,267	1,377	1,492	1,617	1,729	1,861	1,976	2,095	2,236	2,358	2,495	2,624	2,753	2,884	3,029	3,183	3,333	3,476	3,779
Excavation(2)	90	313	331	359	378	402	425	480	532	596	652	721	781	843	923	989	1,069	1,142	1,214	1,288	1,372	1,469	1,557	1,645	1,829
Gravel	2000	220	220	240	260	280	300	440	480	540	580	620	680	720	760	800	860	900	940	980	1,040	1,080	1,120	1,160	1,260
Concrete Foundation	11500	1,035	1,265	1,725	1,955	2,185	2,530	2,990	3,565	4,830	5,405	7,015	7,705	8,510	10,465	11,385	13,455	14,490	15,640	16,790	18,055	20,585	21,965	23,230	26,105
Sheetpile(driving and	150	139	151	172	186	201	216	253	289	333	372	420	460	504	558	606	658	709	760	813	873	940	1,003	1,068	1,200
Backfilling(2)	150	1,509	1,564	1,632	1,687	1,753	1,821	1,942	2,076	2,209	2,331	2,464	2,586	2,709	2,841	2,964	3,085	3,208	3,330	3,451	3,585	3,708	3,840	3,963	4,218
Sheetpile(driving and removing)		36,800	36,800	36,800	36,800	36,800	36,800	40,590	40,590	40,590	40,590	40,590	40,590	40,590	40,590	40,590	40,590	40,590	40,590	40,590	40,590	40,590	40,590	40,590	40,590
Timbering		4,659	4,690	4,727	4,758	4,800	4,836	4,904	4,978	5,056	5,124	5,197	5,270	5,338	5,412	5,479	5,553	5,621	5,689	5,757	5,835	5,903	5,976	6,044	6,191
Concrete Pipe Laying		920	1,240	1,520	1,790	2,070	3,290	4,040	4,840	5,740	6,730	8,980	11,070	13,010	15,360	17,700	20,050	22,870	25,560	28,600	31,800	35,180	38,740	42,470	46,930
Pavement	456	912	912	957	957	1,003	1,003	1,094	1,140	1,185	1,231	1,276	1,322	1,368	1,459	1,504	1,550	1,596	1,641	1,687	1,732	1,778	1,869	1,915	2,006
Manhole	293900	5,878	5,878	3,918	3,918	3,918	3,918	3,918	2,939	2,939	2,939	2,939	1,959	1,959	1,959	1,959	1,959	1,959	1,959	1,959	1,959	1,959	1,959	1,959	1,959
Total		53,448	54,159	53,218	53,904	54,682	56,466	62,091	62,987	65,705	67,755	72,159	74,478	77,727	82,648	86,422	91,414	95,803	100,173	104,898	109,973	116,481	122,061	127,632	136,185
Total (including tax etc.)																									

Table 9.3.2.18 Quantity Calculation for Pipe Installation, Earth Corvering Depth = 8.0 m (Concrete Foundation)

D1	D2	D3	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H	W1	W2	W3	W4	W5	Excavation	Excavation (1)	Excavation (2)	Gravel	Concrete Foundation	Backfilling (1)	Backfilling (2)	Sheetpile III (t)	Sheetpile III (m)(5sheets)	Timbering (t)	Pavement
250	28	306	8000	100	150	300	253	300	556	7400	856	8256	8556	102	510	300	1360	1960	0.59	11.23	3.48	0.11	0.09	0.93	10.06	4.800	16	0.891	2.0
300	30	360	8000	100	150	300	280	300	610	7400	910	8310	8610	100	560	300	1410	2010	0.60	11.72	3.68	0.11	0.11	1.01	10.43	4.800	16	0.897	2.0
350	32	414	8000	150	150	300	357	300	714	7400	1014	8414	8714	103	620	300	1470	2070	0.62	12.37	3.99	0.12	0.15	1.15	10.88	4.800	16	0.904	2.1
400	35	470	8000	150	150	300	385	300	770	7400	1070	8470	8770	100	670	300	1520	2120	0.64	12.87	4.21	0.13	0.17	1.24	11.25	4.800	16	0.910	2.1
450	38	526	8000	150	150	300	413	300	826	7400	1126	8526	8826	102	730	300	1580	2180	0.65	13.47	4.47	0.14	0.19	1.34	11.69	4.800	16	0.918	2.2
500	42	584	8000	150	150	300	442	300	884	7400	1184	8584	8884	103	790	300	1640	2240	0.67	14.08	4.73	0.15	0.22	1.44	12.14	4.800	16	0.925	2.2
600	50	700	8000	150	200	300	500	300	1050	7400	1350	8750	9050	100	900	300	1750	2350	0.71	15.31	5.34	0.22	0.26	1.69	12.95	5.100	17	0.938	2.4
700	58	816	8000	150	200	300	558	300	1166	7400	1466	8866	9166	102	1020	300	1870	2470	0.74	16.58	5.92	0.24	0.31	1.93	13.84	5.100	17	0.952	2.5
800	66	932	8000	200	200	300	666	300	1332	7400	1632	9032	9332	104	1140	300	1990	2590	0.78	17.97	6.63	0.27	0.42	2.22	14.73	5.100	17	0.967	2.7
900	75	1050	8000	200	200	300	725	300	1450	7400	1750	9150	9450	100	1250	300	2100	2700	0.81	19.22	7.25	0.29	0.47	2.48	15.54	5.400	18	0.980	2.7
1000	82	1164	8000	250	200	300	832	300	1614	7400	1914	9314	9614	103	1370	300	2220	2820	0.85	20.68	8.02	0.31	0.61	2.80	16.43	5.400	18	0.994	2.8
1100	88	1276	8000	250	200	300	888	300	1726	7400	2026	9426	9726	102	1480	300	2330	2930	0.88	21.96	8.68	0.34	0.67	3.07	17.24	5.400	18	1.008	2.9
1200	95	1390	8000	250	200	300	945	300	1840	7400	2140	9540	9840	100	1590	300	2440	3040	0.91	23.28	9.37	0.36	0.74	3.36	18.06	5.400	18	1.021	3.0
1300	103	1506	8000	300	200	300	1053	300	2006	7400	2306	9706	10006	102	1710	300	2560	3160	0.95	24.85	10.26	0.38	0.91	3.72	18.94	5.700	19	1.035	3.2
1400	108	1616	8000	300	200	300	1108	300	2116	7400	2416	9816	10116	102	1820	300	2670	3270	0.98	26.21	10.99	0.40	0.99	4.04	19.76	5.700	19	1.048	3.3
1500	112	1724	8000	350	200	300	1212	300	2274	7400	2574	9974	10274	103	1930	300	2780	3380	1.01	27.73	11.88	0.43	1.17	4.39	20.57	5.700	19	1.062	3.4
1600	120	1840	8000	350	200	300	1270	300	2390	7400	2690	10090	10390	100	2040	300	2890	3490	1.05	29.16	12.69	0.45	1.26	4.73	21.39	5.700	19	1.075	3.5
1700	123	1946	8000	350	200	300	1323	300	2496	7400	2796	10196	10496	102	2150	300	3000	3600	1.08	30.59	13.49	0.47	1.36	5.07	22.20	5.700	19	1.088	3.6
1800	127	2054	8000	350	200	300	1377	300	2604	7400	2904	10304	10604	103	2260	300	3110	3710	1.11	32.05	14.32	0.49	1.46	5.42	23.01	6.000	20	1.101	3.7
1900	136	2172	8000	350	200	300	1436	300	2722	7400	3022	10422	10722	104	2380	300	3230	3830	1.15	33.66	15.25	0.52	1.57	5.82	23.90	6.000	20	1.116	3.8
2000	145	2290	8000	400	200	300	1545	300	2890	7400	3190	10590	10890	100	2490	300	3340	3940	1.18	35.37	16.33	0.54	1.79	6.27	24.72	6.000	20	1.129	3.9
2100	152	2404	8000	400	200	300	1602	300	3004	7400	3304	10704	11004	103	2610	300	3460	4060	1.22	37.04	17.31	0.56	1.91	6.69	25.60	6.000	20	1.143	4.1
2200	160	2520	8000	400	200	300	1660	300	3120	7400	3420	10820	11120	100	2720	300	3570	4170	1.25	38.63	18.28	0.58	2.02	7.12	26.42	6.300	21	1.156	4.2
2400	175	2750	8000	400	200	300	1775	300	3350	7400	3650	11050	11350	100	2950	300	3800	4400	1.32	41.99	20.33	0.63	2.27	8.00	28.12	6.300	21	1.184	4.4



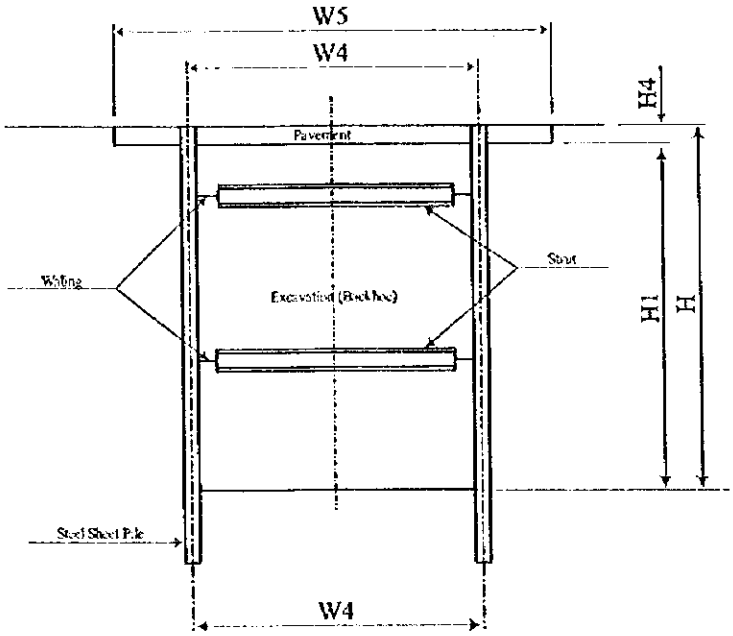
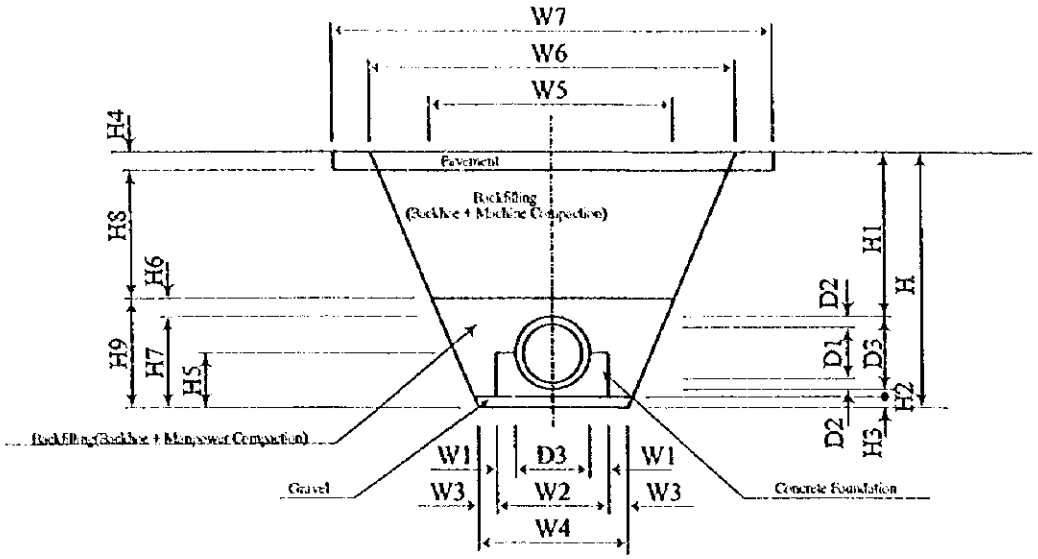


Figure 9.3.2.1
Typical Standard of Pipe Laying
(Sheet Pile & Concrete Foundation)

The Study on the Sewerage System in North Dhaka



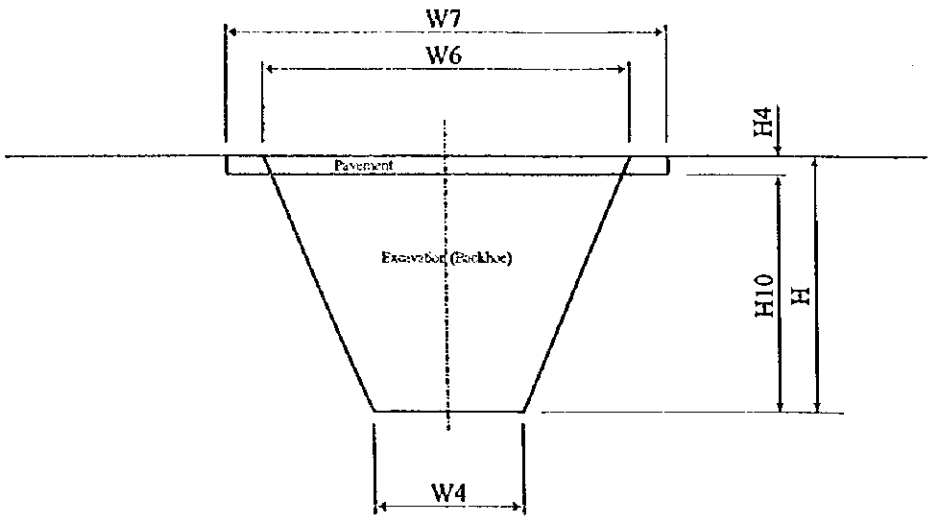


Figure 9.3.2.2
Typical Standard of Pipe Laying
(Open Cut & Concrete Foundation)

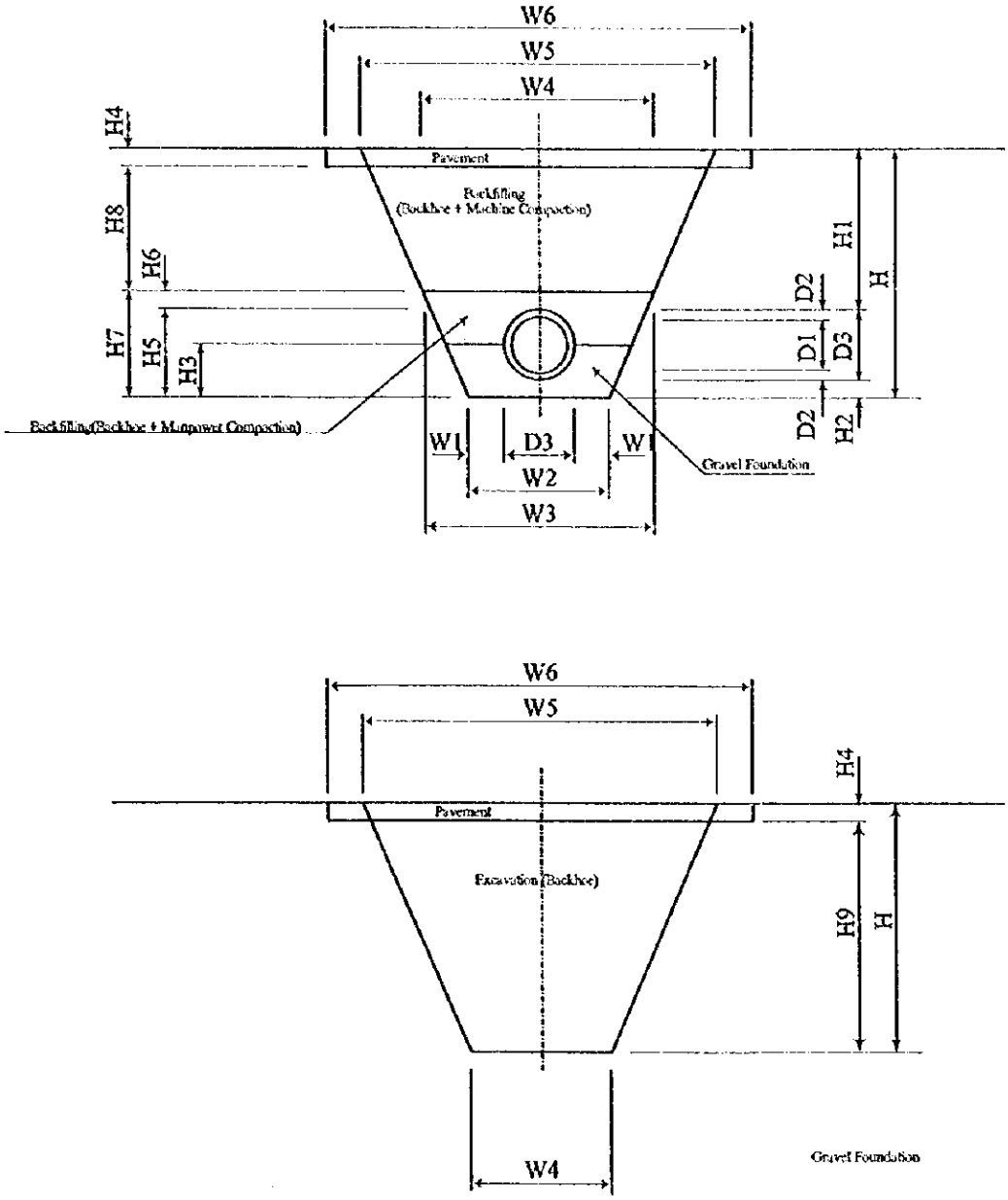


Figure 9.3.2.3
Typical Standard of Pipe Laying
(Open Cut & Gravel Foundation)

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Appendix 9.3.3. Pumping Station Construction Cost by Capacity

Table 9.3.3.1 Total Cost of Pumping Station by Capacity

Item	Sewage Flow (m3/day)	Total Construction Cost			Electrical Demand	
		Archtectural/Civil Construction Cost	Mecanical/Electrical Construction Cost	Total Cost in Taka	Required Power (kW)	Power Consumption (kW/year)
P/S	20,000	TK20,117,760	¥310,717,000	TK137,755,216	120.5kW	623,968kW
	50,000	TK27,228,776	¥700,646,000	TK292,493,352	283.5kW	1,483,258kW
	100,000	TK31,680,222	¥872,114,000	TK361,862,582	455.0kW	2,408,463kW

Exchange Rate: TK1.00 = ¥0.3786

Table 9.3.3.2 Civil Construction Cost Estimation of Pumping Station (20,000m³/day)

Pump Station 20,000m3/ W= 8 L= 20

	Unit	Quantity	Unit Price	Sub Total
Sheet Pile Installation	Lraf	160	4,925	788,000
Sheet Pile Withdrawal	Lraf	160	3,193	510,880
Steel Support Installatopn	t	22.400	5,229	117,130
Excavation(Backhoe-1)	m3	506.0	90	45,540
Excavation(Cramshell)	m3	1948.1	90	175,329
Excavation(Backhoe-2)	m3	75.9	90	6,831
Manual Subgrading	m2	253	50	12,650
Reinforced Concrete	m3	602	20,700	12,461,400
Architecture	m2	160	37,500	6,000,000

Total = TK20,117,760

Table 9.3.3.3 Civil Construction Cost Estimation of Pumping Station (50,000m³/day)

Pump Station 50,000m3/ W= 10 L= 23

	Unit	Quantity	Unit Price	Sub Total
Sheet Pile Installation	Lraf	185	4,925	911,125
Sheet Pile Withdrawal	Lraf	185	3,193	590,705
Staal Support Installation	t	26.400	5,229	138,046
Excavation(Backhoe-1)	m3	676.0	90	60,840
Excavation(Cramshell)	m3	2602.6	90	234,234
Excavation(Backhoe-2)	m3	101.4	90	9,126
Manual Subgrading	m2	338	50	16,900
Reinforced Concrete	m3	804	20,700	16,642,800
Architecture	m2	230	37,500	8,625,000

Total = TK27,228,776

Table 9.3.3.4 Civil Construction Cost Estimation of Pumping Station (100,000m³/day)

Pump Station 100,000m3 W= 12 L= 23

	Unit	Quantity	Unit Price	Sub Total
Sheet Pile Instaallation	Lraf	195	4,925	960,375
Sheet Pile Withdrawal	Lraf	195	3,193	622,635
Steel Support Installation	t	28.000	5,229	146,412
Excavation(Backhoe-1)	m3	780.0	90	70,200
Excavation(Cramshell)	m3	3003.0	90	270,270
Excavation(Backhoe-2)	m3	117.0	90	10,530
Manual Subgrading	m2	390	50	19,500
Reinforced Concrete	m3	929	20,700	19,230,300
Architecture	m2	276	37,500	10,350,000

Total = TK31,680,222

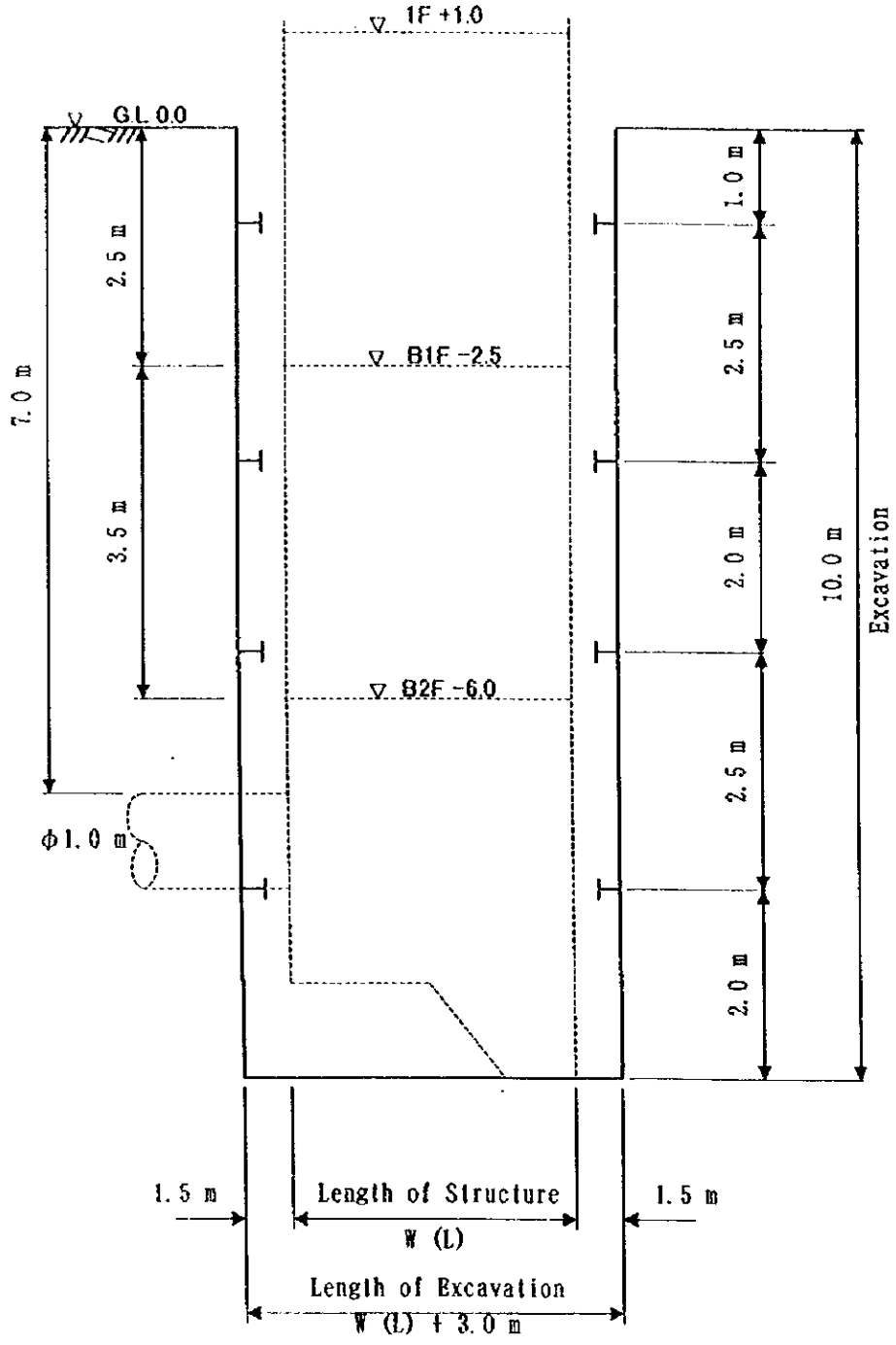

Figure 9.3.3.1

Designed Sectional Drawing for Pumping Station Cost Estimation

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Table 9.3.3.5 Calculation for Unit Price of Civil Construction

Steel Sheet Pile Jackinging (Hydraulic Sheet Piler) L = 4.5 m

Items	Specification	Unit	Quantity	Unit Cost	Cost	Remarks
Foreman		person	0.91	260	236	
Scaffolder		person	1.82	210	382	
Skilled Labor		person	0.91	148	134	
Sheet Piler Operation	100-130 t	day	0.91	43,179	39,292	
Generator Operation	75kVA	day	0.91	4,310	3,922	
Truck Crane Operation	25ton	hr	0.91	5,812	5,288	
Total					49,254	
Per 1 sheet					4,925	

Steel Sheet Pile Withdrawing (Hydraulic Sheet Piler) L = 4.5 m

Items	Specification	Unit	Quantity	Unit Cost	Cost	Remarks
Foreman		person	0.59	260	153	
Scaffolder		person	1.18	210	247	
Skilled Labor		person	0.59	148	87	
Sheet Piler Operation	100-130 ton	day	0.59	43,179	25,475	
Generator Operation	75kVA	day	0.59	4,310	2,543	
Truck Crane Operation	25ton	hr	0.59	5,812	3,428	
Total					31,933	
Per 1 sheet					3,193	

Hydraulic Sheet Piler Operation Cost

Items	Specification	Unit	Quantity	Unit Cost	Cost	Remarks
Ownership Cost		day	1.62	70,400	114,048	
Miscellaneous Cost		Unit			0	
Total					114,048	

Strut and Wale Installation Cost

Items	Specification	Unit	Quantity	Unit Cost	Cost	Remarks
Foreman		person	1.6	260	416	
Scaffolder		person	3.2	210	672	
Welder		person	1.6	210	336	
Unskilled Labor		person	3.2	130	416	
Truck Crane Rental Fee	15-16ton	day	1.6	15,144	24,230	
Welding Machine Operation C	250A	day	1.6	6,058	9,692	
Miscellaneous Cost		unit			129	7% of labor
Total	per 10 ton				35,891	
Per 1 ton					3,589	

Support Installation Cost

Strut and Wale Withdrawal Cost

Items	Specification	Unit	Quantity	Unit Cost	Cost	Remarks
Foreman		person	1.0	260	260	
Scaffolder		person	2.0	210	420	
Welder		person	1.0	210	210	
Unskilled Labor		person	2.0	130	260	
Truck Crane Rental Fee	15-16ton	day	1.0	15,144	15,144	
Miscellaneous Cost		unit			115	10% of labor
Total	per 10 ton				16,409	
Per 1 ton					1,640	

Table 9.3.3.6 Calculation Sheet for Number of Sheet pile

Length of Sheet Pile L = 4.5
Installation Time per Sheet Pile Nmax = 15
Installation No. per Day N = 11

	L≦2m	2m<L≦4m	4m<L≦6m	6m<L≦9m	9m<L≦12m	12m<L≦16m	16m<L≦20m
Nmax<10	50	42	32	25	19	16	13
10<Nmax<20	46	38	29	22	17	13	11
20<Nmax<30	43	35	26	19	15	12	

Length of Sheet Pile L = 4.5
Withdrawal Time per Sheet Pile Nmax = 15
Withdrawal No. per Day N = 17

	L≦2m	2m<L≦4m	4m<L≦7m	7m<L≦11m	11m<L≦15m	15m<L≦20m
No. of Pile	65	55	40	28	21	17

Table 9.3.3.7 Equipment Cost & Power Consumption Estimation of Pumping Station (20,000m^3/day)

Daily Average/Daily Maximum/Hourly Maximum 20,000/25,000/33,000m^3/Day					
Designation	**Specification**		**Unit Cost**	**No.**	**Total**
Mechanical Equipment					**(YEN'000)**
Gate	Hand Operated Cast Iron Type	□1300mm	¥3,696	7	¥25,872
Lifting Pump	Vertical Centifugial Mixed Flow Pump	φ350mm× 11.5m^3/min×	¥5,623	3(1)	¥16,869
Delivery Valve	Motor Operated Vaterfly Valve	φ350mm×0.75kw	¥1,341	3	¥4,023
Suction Valve	Hand Operated Vaterfly Valve	φ350mm	¥824	3	¥2,472
Check Valve	Swing Check Valve	φ350mm	¥686	3	¥2,058
Screen	Hand Raked Bar Screen	W1.2m× Open20mm×	¥2,000	3	¥6,000
Instalation Work	Complete Set			1	¥15,711
Electrical Equipment					**(YEN'000)**
Power Distribution Facility	Complete Set			1	¥25,000
Operating Facility	Complete Set			1	¥14,000
Monitoring & Instrumentation Facility	Complete Set			1	¥31,900
Standby Power Plant	Complete Set			1	¥53,300
Installation Work	Complete Set			1	¥58,630
Transportation Cost	Complete Set			1	¥31,124
Grand Total					¥310,717
Electrical Load					**(kW)**
Lifting Pump Motor	Wound Rotor Induction Motor	55kW		2	110.0kW
Delivery Valve	Motor Operated Vaterfly Valve	0.75kw		2	1.5kW
Lighting Facilities	Complete Set	9.0kW		1	9.0kW
Total					120.5kW
Annual Power Consumption					623,968kW

Table 9.3.3.8 Equipment Cost & Power Consumption Estimation of Pumping Station (50,000m^3/day)

Daily Average/Daily Maximum/Hourly Maximum 50,000/63,000/82,000m^3/Day					
Designation	Specification		Unit Cost	No.	Total
Mechanical Equipment					(YEN'000)
Gate	Hand Operated Cast Iron Type	1100×1500mm	¥5,089	7	¥35,623
Lifting Pump	Vertical Centifugial Mixed Flow Pump	φ500mm×19.1m^3/min×17mH	¥21,750	4(1)	¥87,000
Lifting Pump Motor	Wound Rotor Induction Motor	90kw	¥9,130	4(1)	¥36,520
Delivery Valve	Motor Operated Vaterfly Valve	φ500mm×1.5kw	¥2,576	4	¥10,304
Suction Valve	Hand Operated Vaterfly Valve	φ500mm	¥1,702	4	¥6,808
Check Valve	Swing Check Valve	φ500mm	¥1,668	4	¥6,672
Screen	Hand Raked Bar Screen	W2.5m×Open20mm×	¥3,000	3	¥9,000
Instalation Work	Complete Set			1	¥95,964
Electrical Equipment					(YEN'000)
Power Distribution Facility	Complete Set			1	¥52,600
Operating Facility	Complete Set			1	¥14,000
Monitoring & Instrumentation Facility	Complete Set			1	¥31,900
Standby Power Plant	Complete Set			1	¥81,400
Installation Work	Complete Set			1	¥89,540
Transportation Cost	Complete Set			1	¥74,365
Grand Total					¥700,646
Electrical Load					(kW)
Lifting Pump Motor	Wound Rotor Induction Motor	90kw		3	270.0kW
Delivery Valve	Motor Operated Vaterfly Valve	1.5kw		3	4.5kW
Lighting Facilities	Complete Set	9.0kW		1	9.0kW
Total					283.5kW
Annual Power Consumption					1,483,258kW

Table 9.3.3.9 Equipment Cost & Power Consumption Estimation of Pumping Station (100,000m^3/day)

Daily Average/Daily Maximum/Hourly Maximum 100,000/125,000/163,000m^3/Day					
Designation	**Specification**		**Unit Cost**	**No.**	**Total**
Mechanical Equipment					**(YEN'000)**
Gate	Hand Operated Cast Iron Type	□1500mm	Y5,089	11	Y55,979
Lifting Pump	Vertical Centrifugal Mixed Flow Pump	ϕ500mm× 28.4m^3/min×17mH	Y21,750	5(1)	Y108,750
Lifting Pump Motor	Wound Rotor Induction Motor	110kw	Y12,366	5(1)	Y61,830
Delivery Valve	Motor Operated Vaterfly Valve	ϕ500mm×1.5kw	Y1,221	5	Y6,105
Suction Valve	Hand Operated Vaterfly Valve	ϕ500mm	Y1,702	5	Y8,510
Check Valve	Swing Check Valve	ϕ500mm	Y1,668	5	Y8,340
Screen	Hand Raked Bar Screen	W2.5m× Open20mm×	Y3,000	5	Y15,000
Instalation Work				1	Y132,257
Electrical Equipment					**(YEN'000)**
Power Distribution Facility	Complete Set			1	Y52,600
Operating Facility	Complete Set			1	Y14,000
Monitoring & Instrumentation Facility	Complete Set			1	Y31,900
Standby Power Plant	Complete Set			1	Y102,300
Installation Work	Complete Set			1	Y112,530
Transportation Cost	Complete Set			1	Y93,063
Grand Total					Y872,114
Electrical Load					**(kW)**
Lifting Pump Motor	Wound Rotor Induction Motor	110kw		4	440.0kW
Delivery Valve	Motor Operated Vaterfly Valve	1.5kw		4	6.0kW
Lighting Facilities	Complete Set	9.0kW		1	9.0kW
Total					455.0kW
Annual Power Consumption					2,408,463kW

Appendix 9.3.4. Sewage Treatment Plant Construction Cost by Capacity

Table 9.3.4.1 Total Cost of Sewerage Treatemt Plant by Capacity

Item	Sewage Flow (m3/day)	Total Construction Cost									Electrical Demand	
		Pipe Installation Cost						Archtectural/Civil Construction Cost	Mecanical/Electrical Construction Cost	Total	Required Power (kW)	Power Consumption (kW/year)
		No. of Train	Pipe Diameter (mm)	Site Area (ha)	Pipe length (m)	Unit Cost (Taka/m)	Sub-Total					
STP	20,000	4	350	30	1,500	4,288	TK6,432,000	TK294,952,310	¥482,117,000	TK483,913,806	22kW	69,496kW
	50,000	4	600	63	3,150	7,588	TK23,902,200	TK602,778,280	¥666,482,000	TK879,010,565	35kW	104,828kW
	100,000	8	600	106	5,300	7,588	TK40,216,400	TK1,192,525,400	¥1,173,321,000	TK1,676,961,131	60kW	163,228kW

Pipe Installation (Earth Coverage = 1m, Pipe Length = 50 m/ha)

Exchange Rate: TK1.00 = ¥0.3786