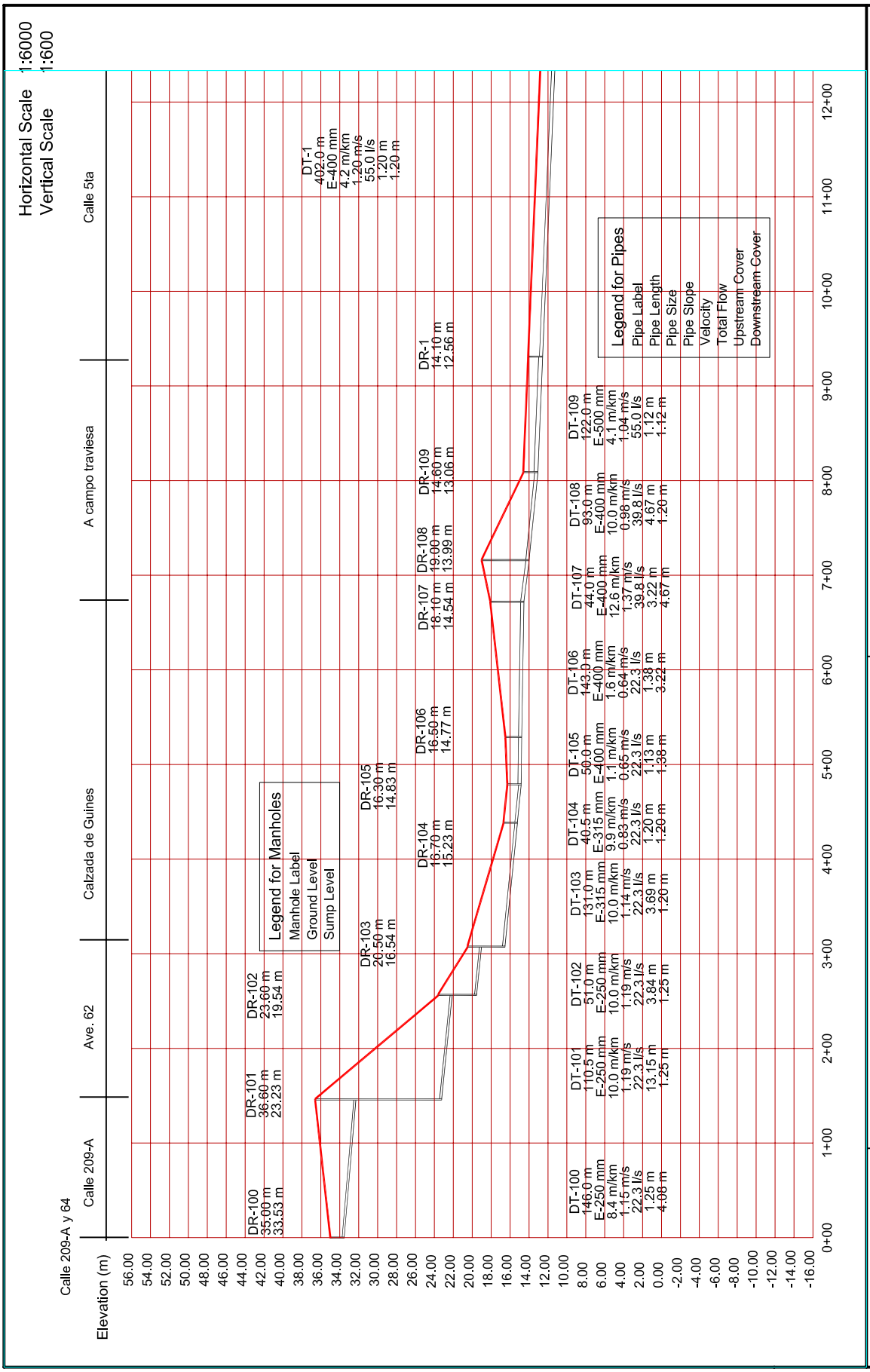
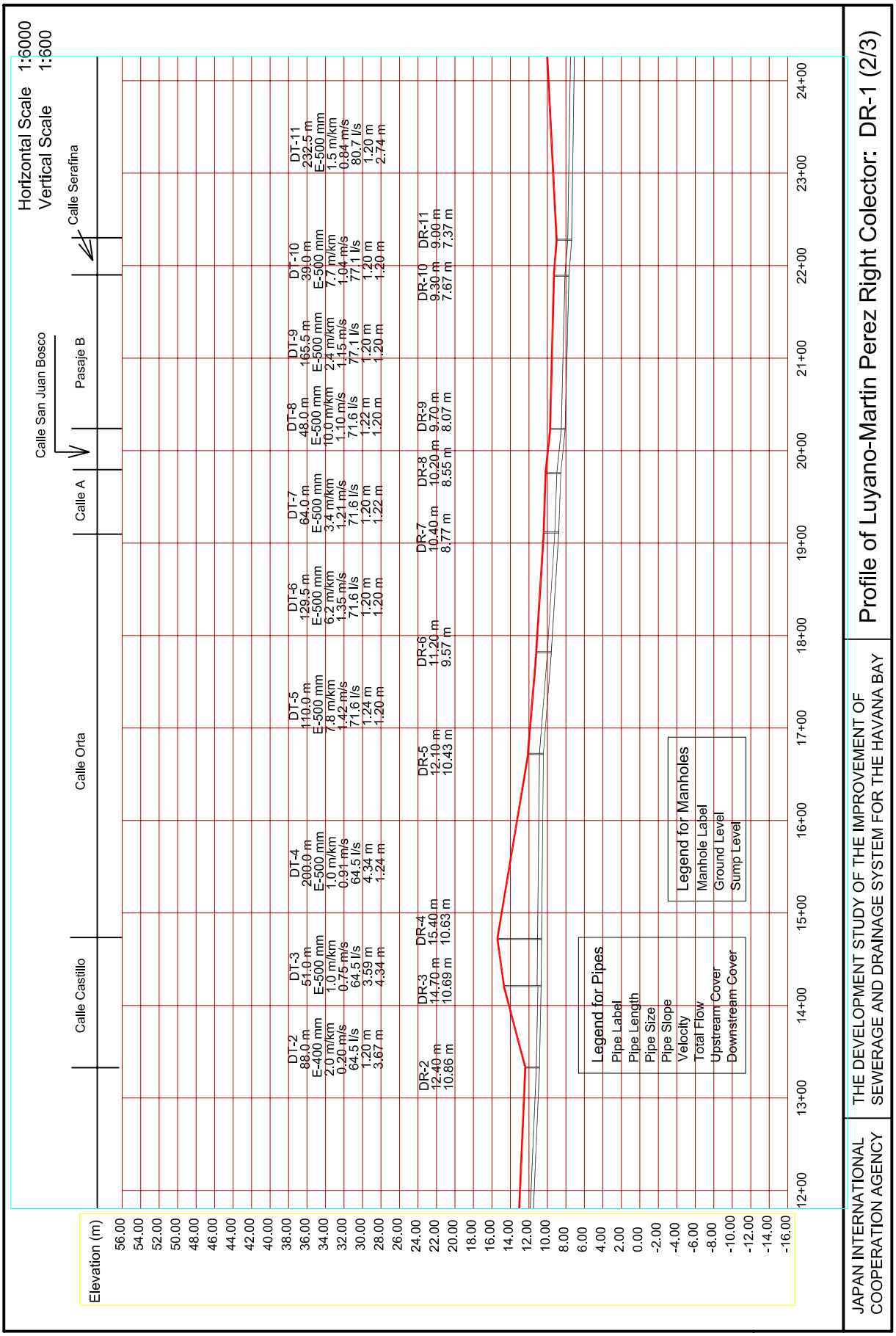


JAPAN INTERNATIONAL COOPERATION AGENCY

THE DEVELOPMENT STUDY OF THE IMPROVEMENT OF SEWERAGE AND DRAINAGE SYSTEM FOR THE HAVANA BAY

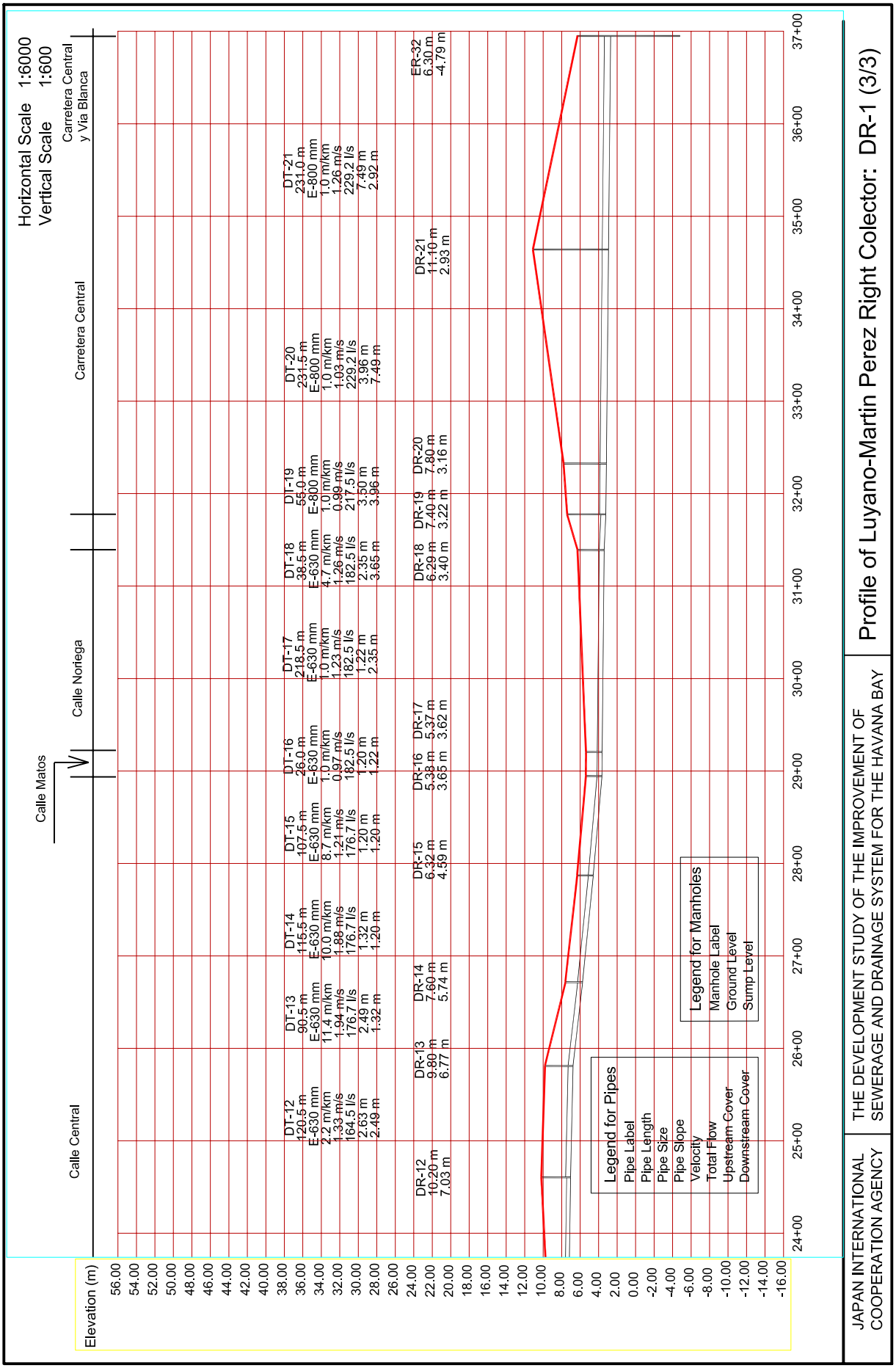
Profile of Luyano-Martin Perez Right Colector: DR-1 (1/3)



JAPAN INTERNATIONAL COOPERATION AGENCY

THE DEVELOPMENT STUDY OF THE IMPROVEMENT OF SEWERAGE AND DRAINAGE SYSTEM FOR THE HAVANA BAY

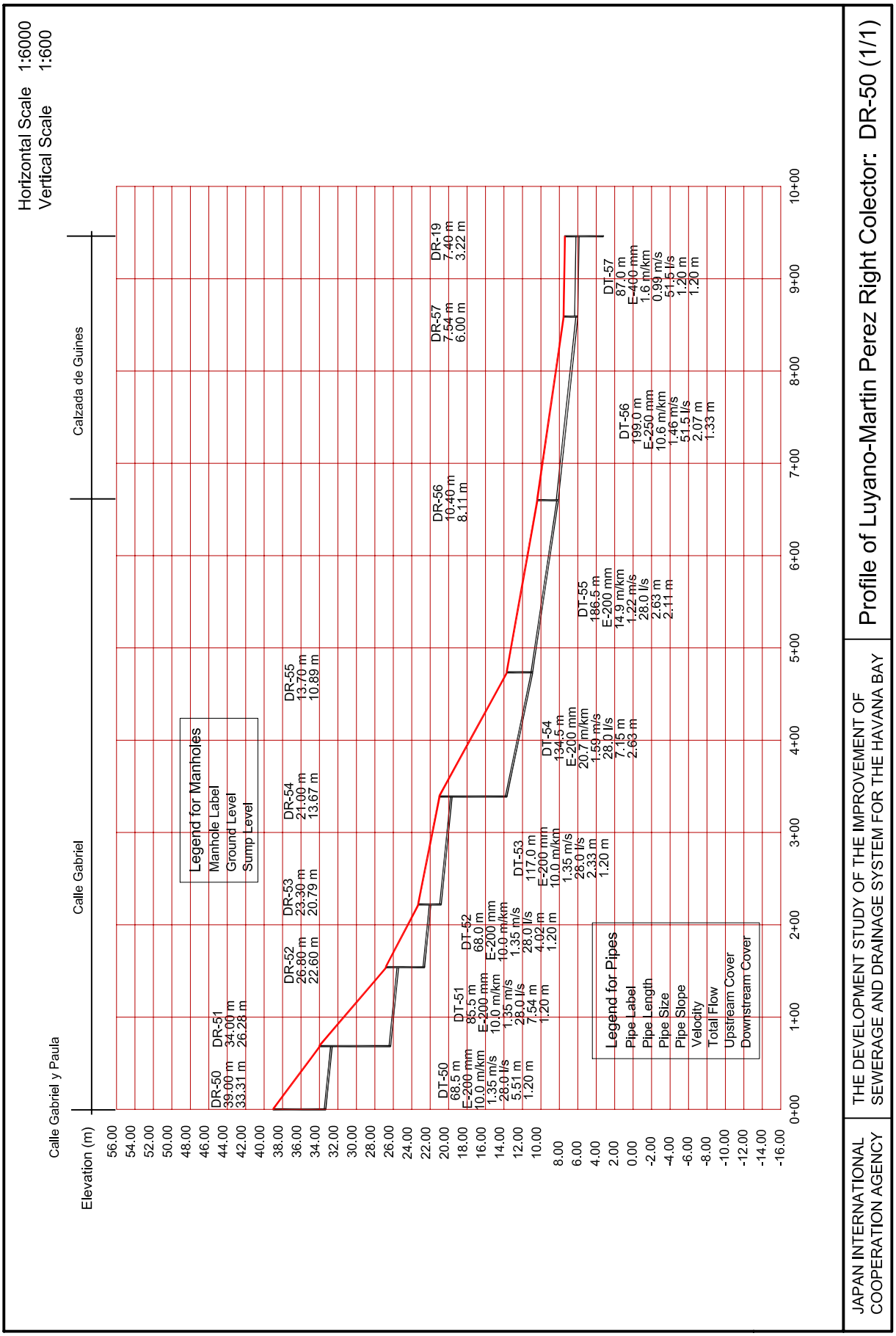
Profile of Luyano-Martin Perez Right Colector: DR-1 (2/3)



JAPAN INTERNATIONAL COOPERATION AGENCY

THE DEVELOPMENT STUDY OF THE IMPROVEMENT OF SEWERAGE AND DRAINAGE SYSTEM FOR THE HAVANA BAY

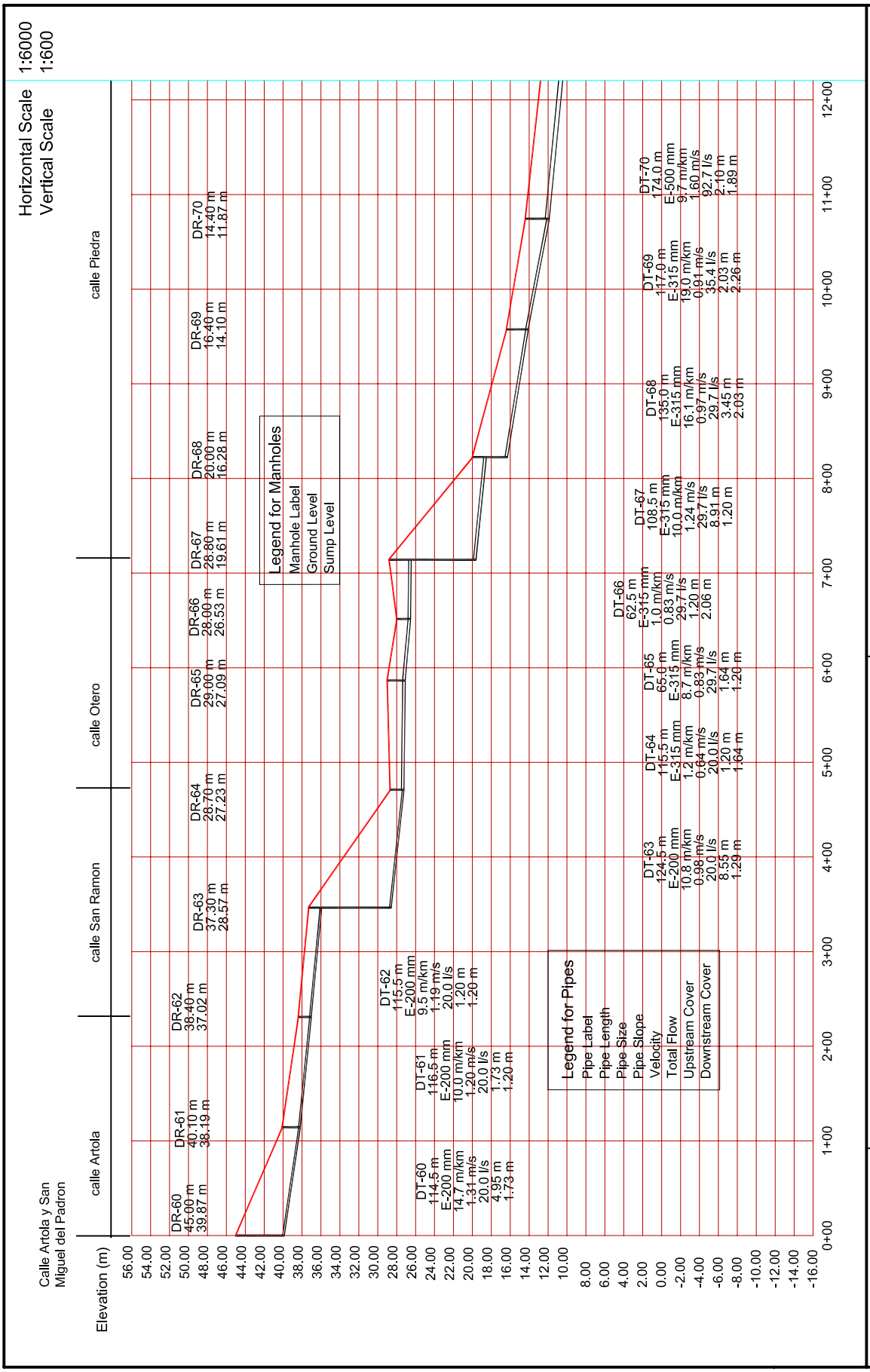
Profile of Luyano-Martin Perez Right Colector: DR-1 (3/3)



JAPAN INTERNATIONAL COOPERATION AGENCY

THE DEVELOPMENT STUDY OF THE IMPROVEMENT OF SEWERAGE AND DRAINAGE SYSTEM FOR THE HAVANA BAY

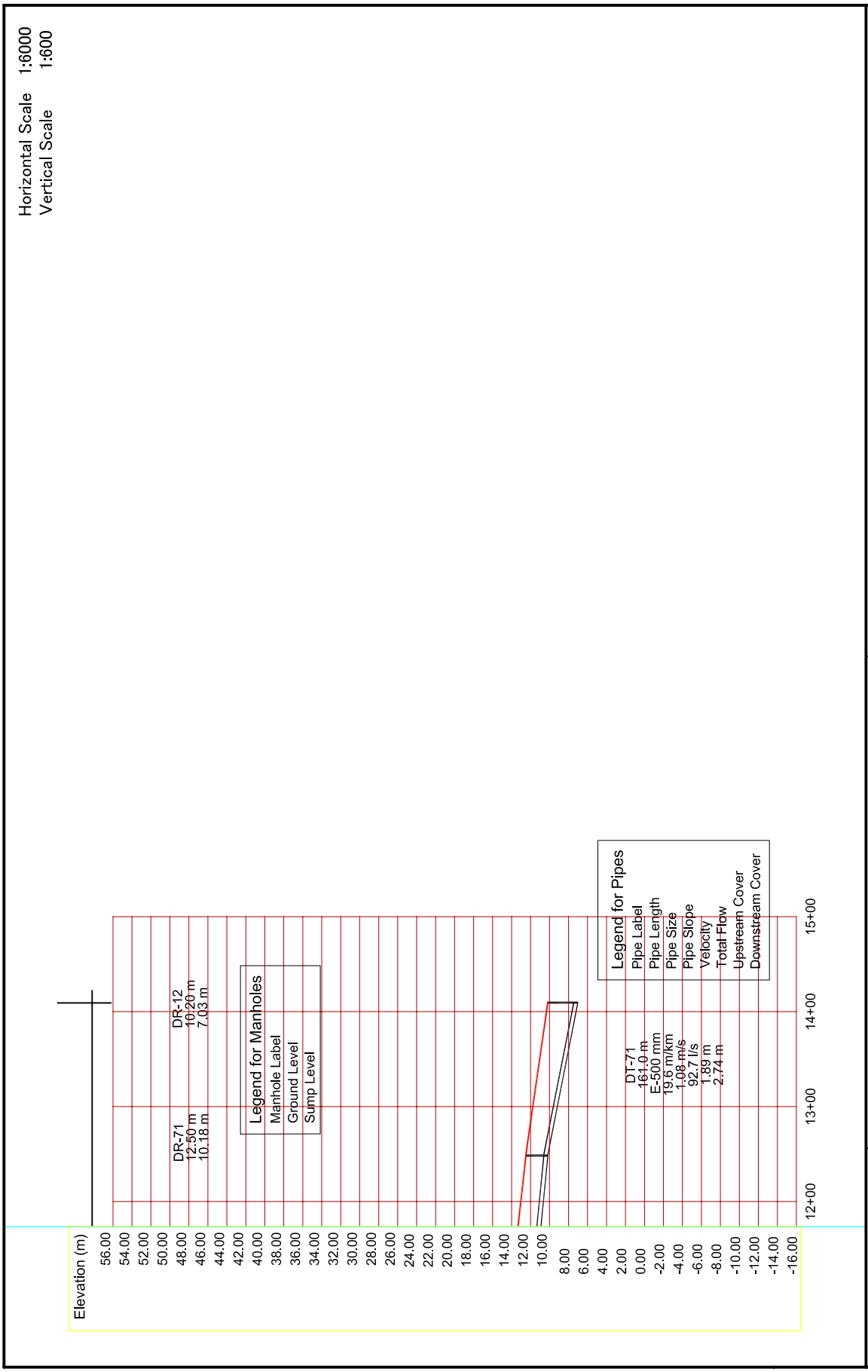
Profile of Luyano-Martin Perez Right Colector: DR-50 (1/1)



JAPAN INTERNATIONAL COOPERATION AGENCY

THE DEVELOPMENT STUDY OF THE IMPROVEMENT OF SEWERAGE AND DRAINAGE SYSTEM FOR THE HAVANA BAY

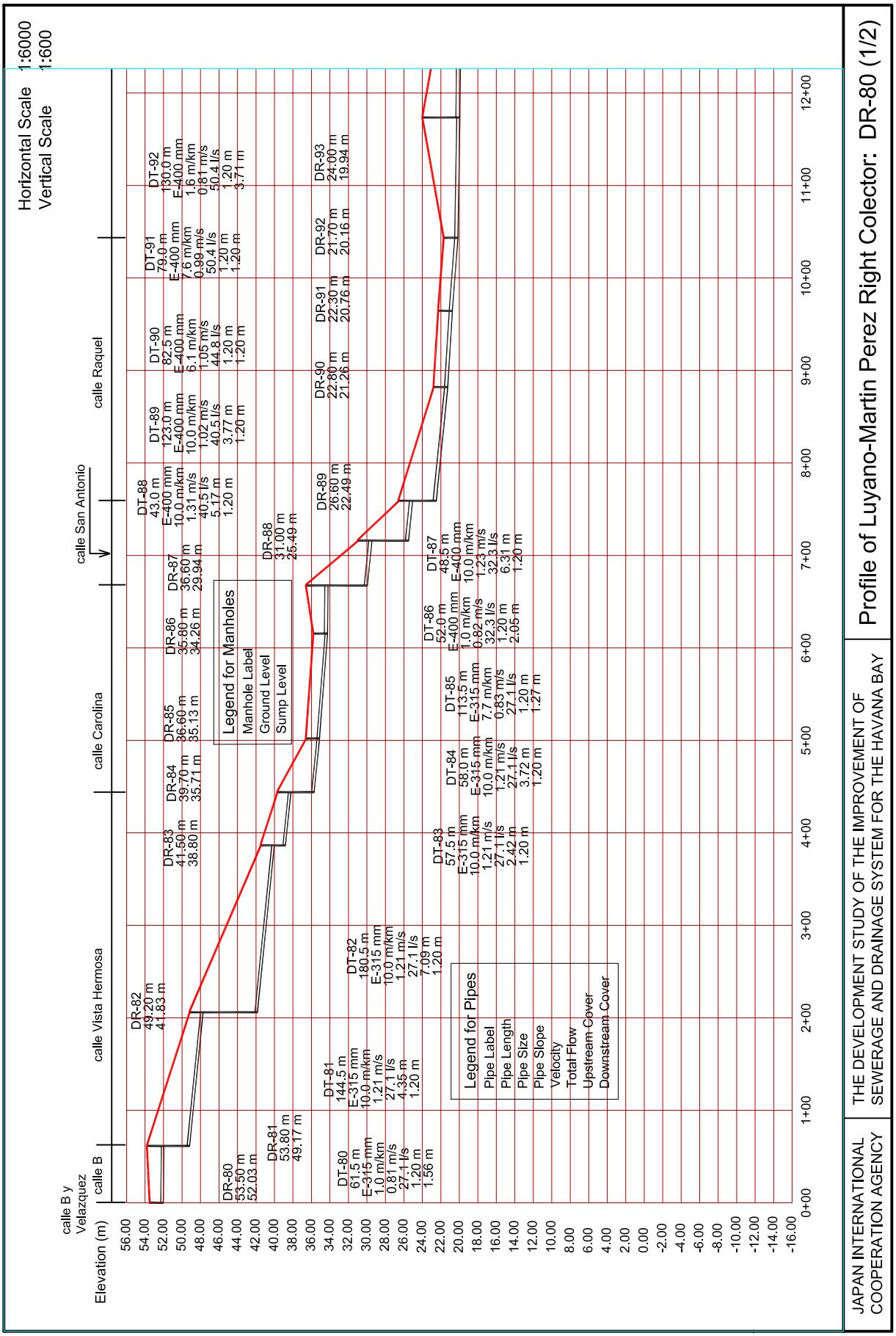
Profile of Luyano-Martin Perez Right Colector: DR-60 (1/2)



JAPAN INTERNATIONAL COOPERATION AGENCY

THE DEVELOPMENT STUDY OF THE IMPROVEMENT OF SEWERAGE AND DRAINAGE SYSTEM FOR THE HAVANA BAY

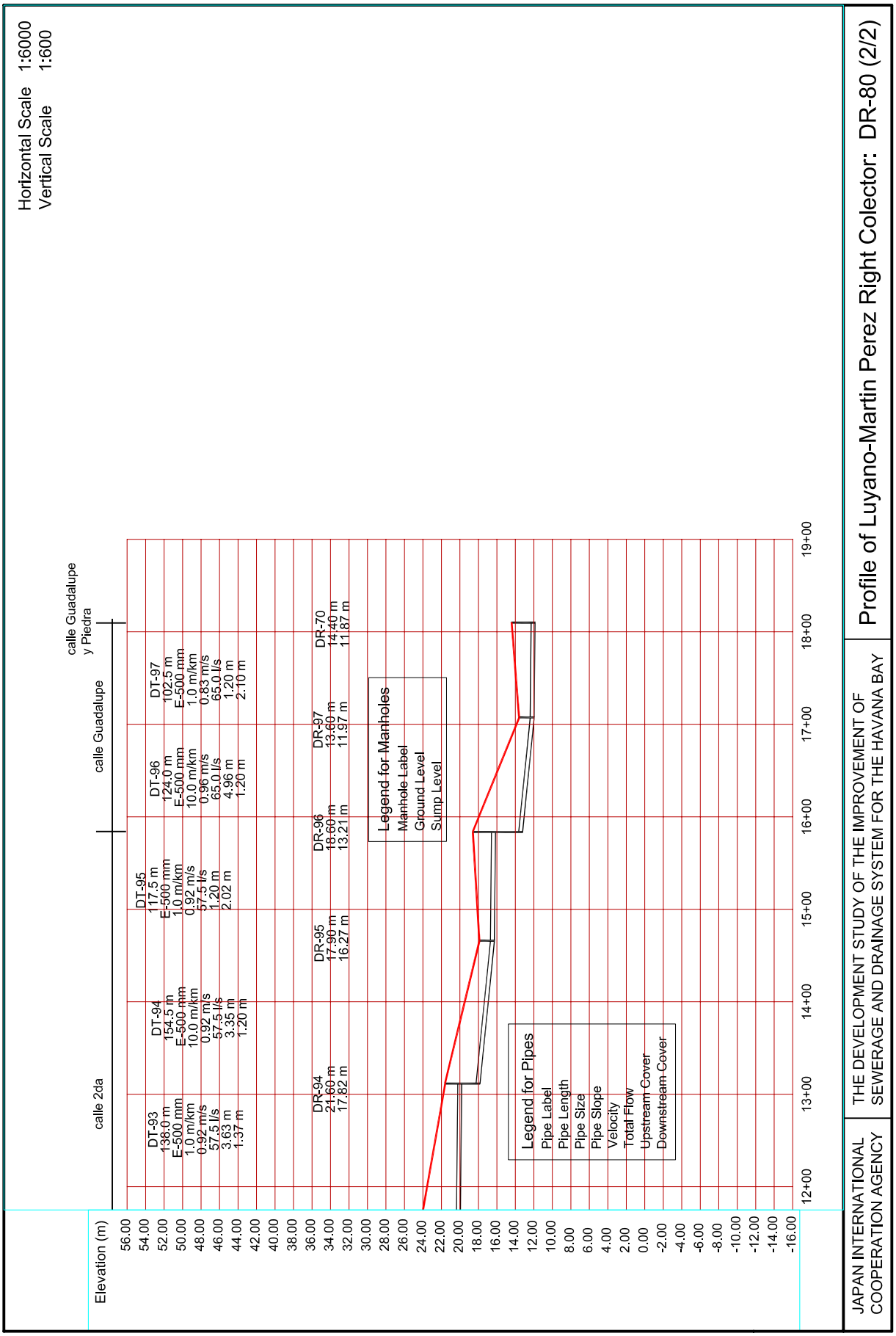
Profile of Luyano-Martin Perez Right Colector: DR-60 (2/2)



JAPAN INTERNATIONAL COOPERATION AGENCY

THE DEVELOPMENT STUDY OF THE IMPROVEMENT OF SEWERAGE AND DRAINAGE SYSTEM FOR THE HAVANA BAY

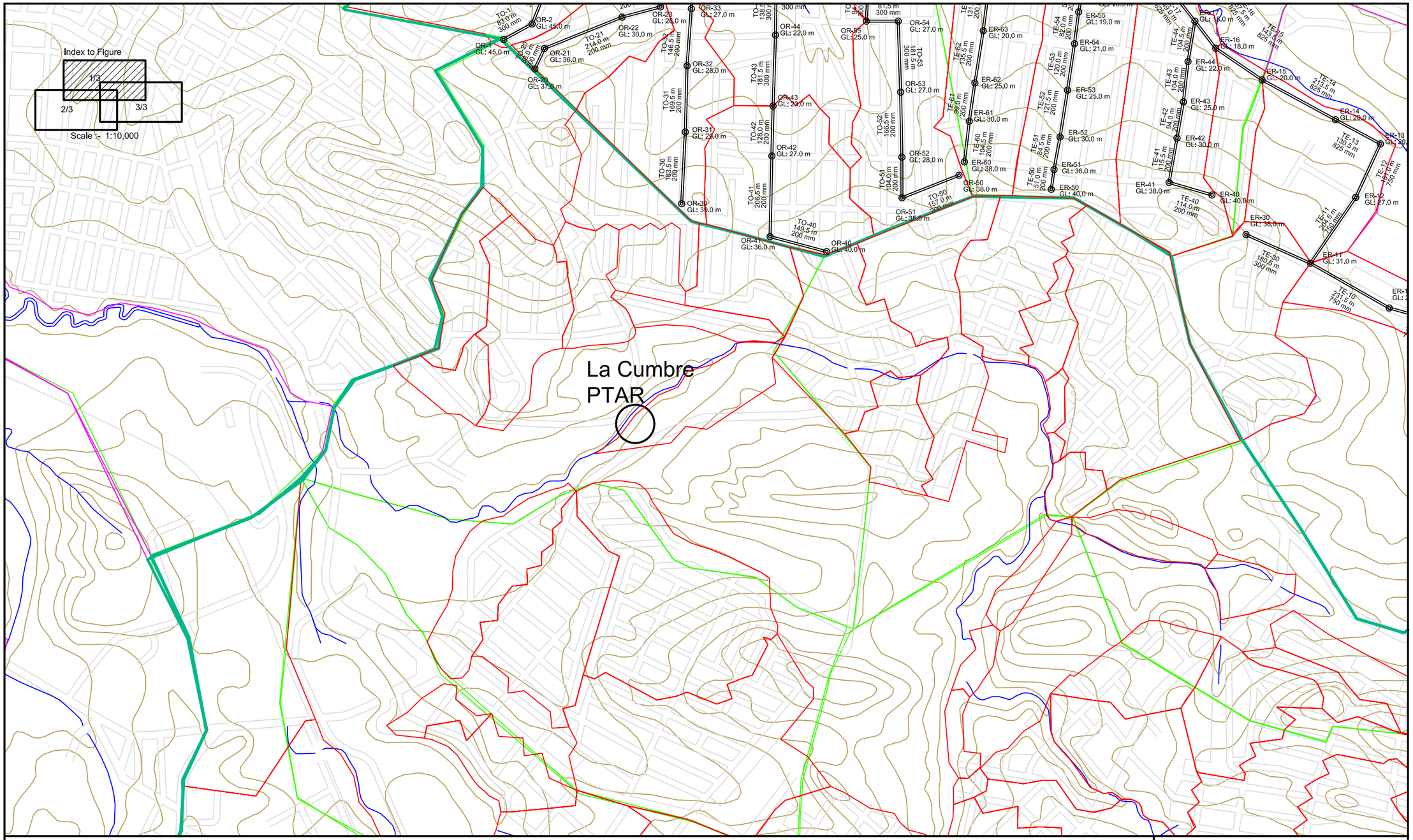
Profile of Luyano-Martin Perez Right Colector: DR-80 (1/2)



JAPAN INTERNATIONAL COOPERATION AGENCY

THE DEVELOPMENT STUDY OF THE IMPROVEMENT OF SEWERAGE AND DRAINAGE SYSTEM FOR THE HAVANA BAY

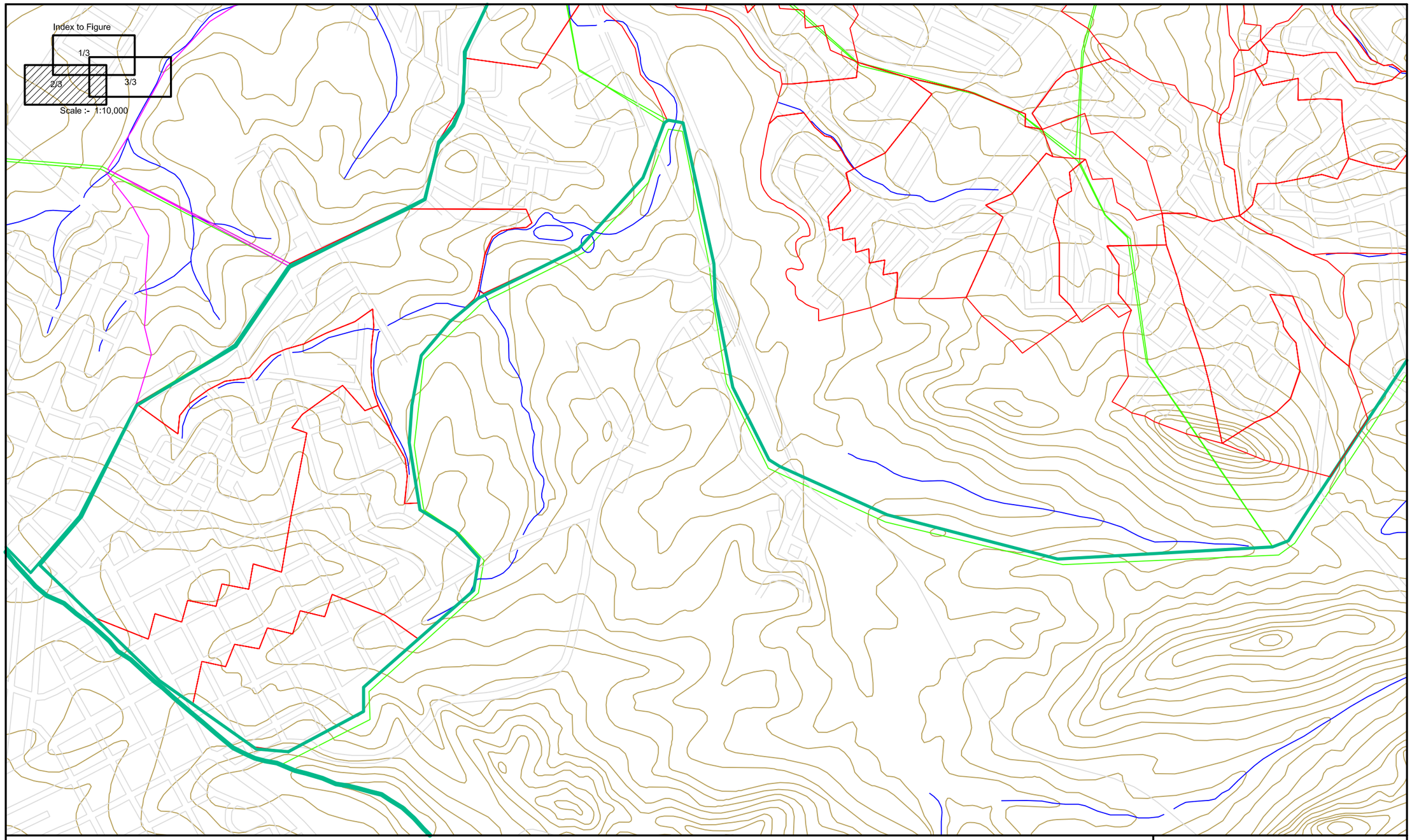
Profile of Luyano-Martin Perez Right Colector: DR-80 (2/2)



THE DEVELOPMENT STUDY OF THE IMPROVEMENT OF SEWERAGE AND DRAINAGE SYSTEM FOR THE HAVANA BAY

JAPAN INTERNATIONAL COOPERATION AGENCY

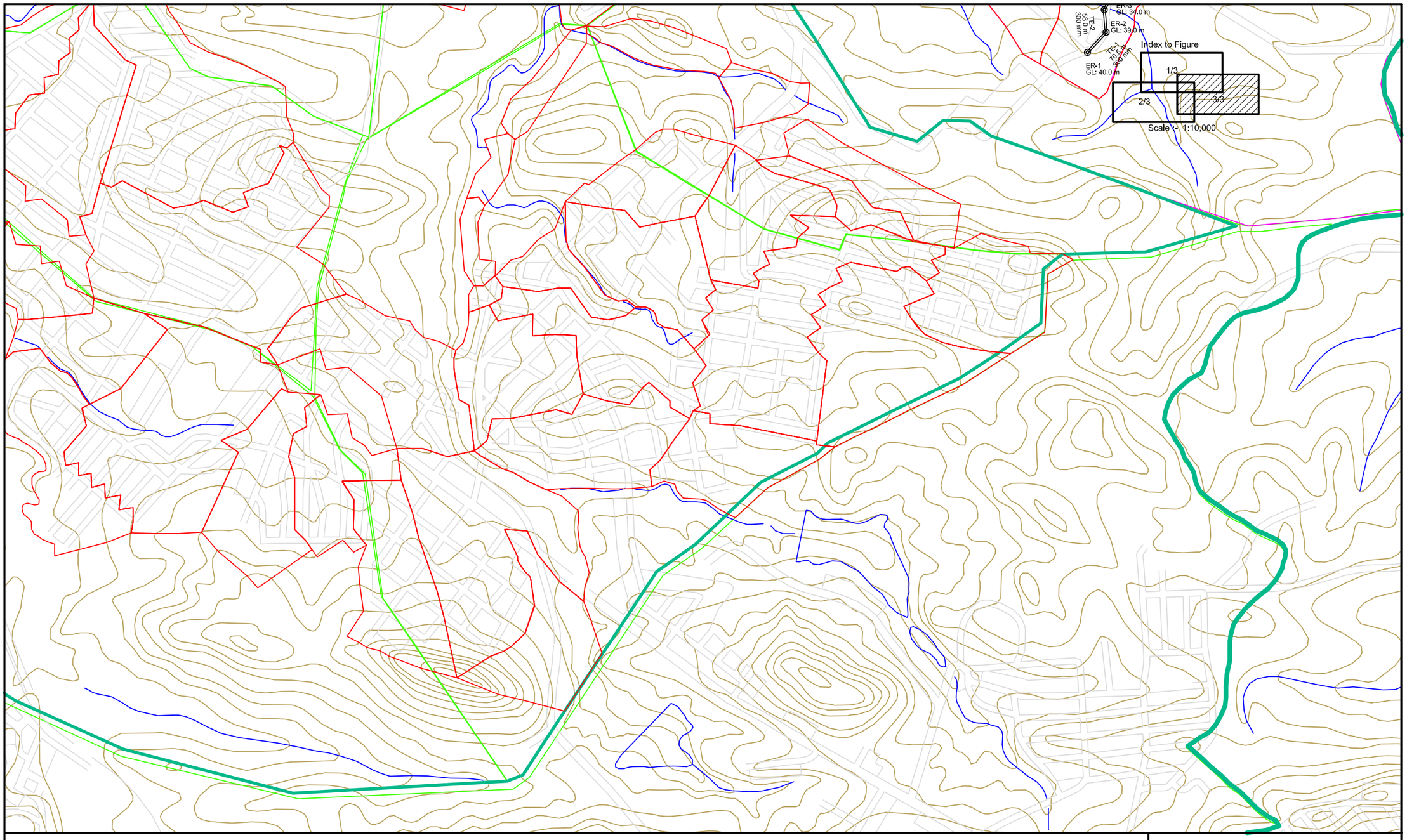
Figure A10.15
Route of Luyano Arriba Colector (1/3)



THE DEVELOPMENT STUDY OF THE IMPROVEMENT OF SEWERAGE AND DRAINAGE SYSTEM FOR THE HAVANA BAY

JAPAN INTERNATIONAL COOPERATION AGENCY

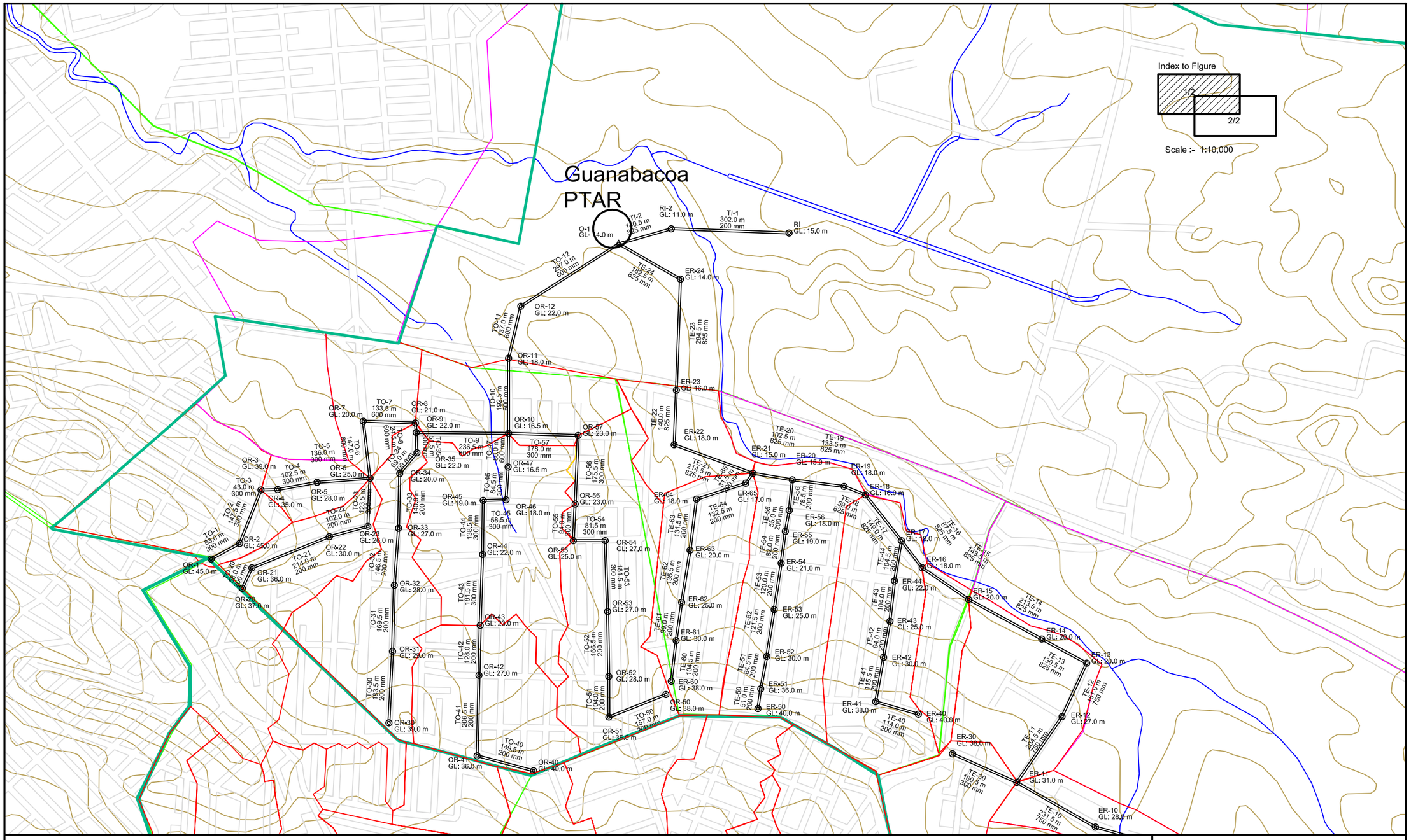
Figure A10.15
Route of Luyano Arriba Colector (2/3)



THE DEVELOPMENT STUDY OF THE IMPROVEMENT OF SEWERAGE AND DRAINAGE SYSTEM FOR THE HAVANA BAY

JAPAN INTERNATIONAL COOPERATION AGENCY

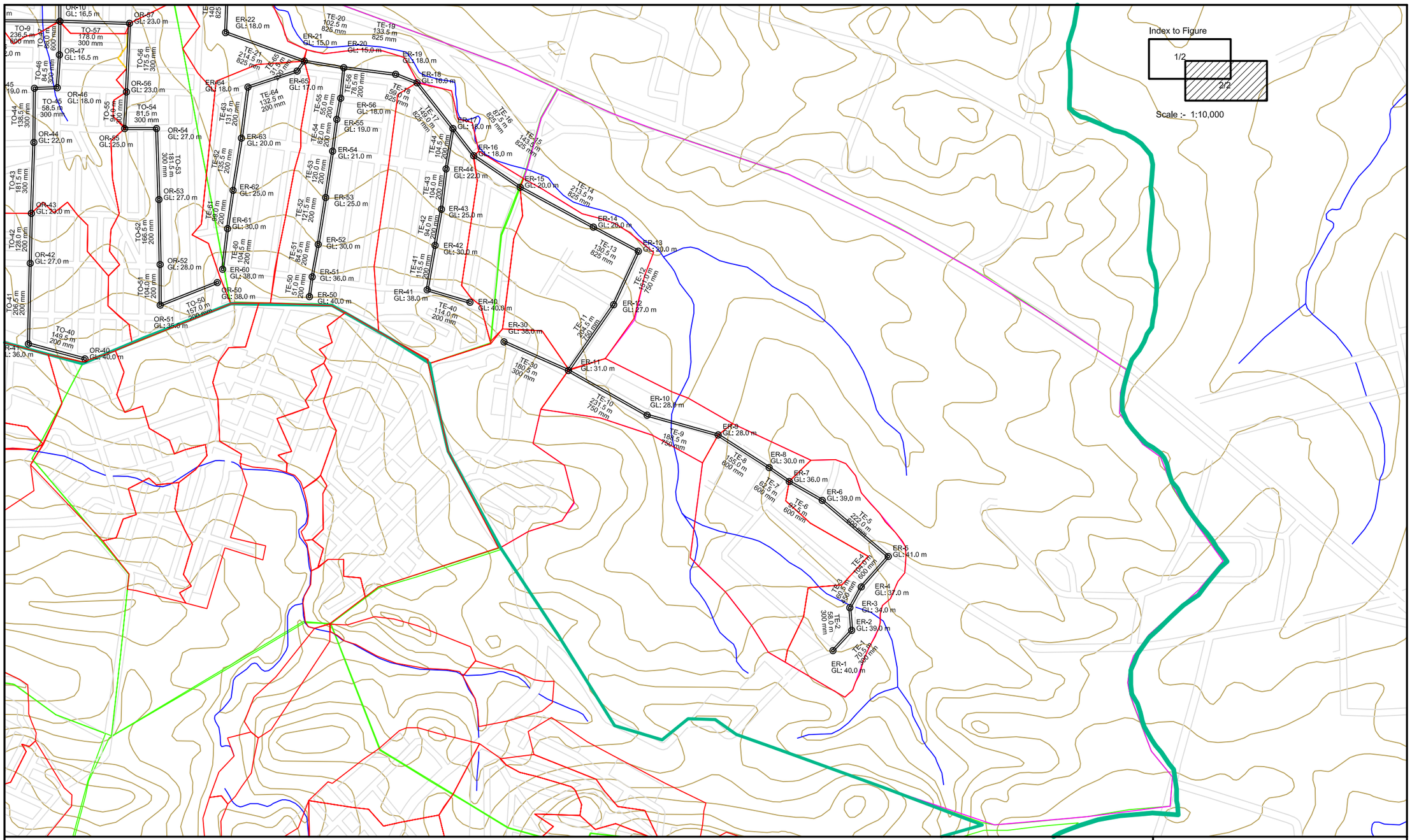
Figure A10.15
Route of Luyano Arriba Colector (3/3)



THE DEVELOPMENT STUDY OF THE IMPROVEMENT OF SEWERAGE AND DRAINAGE SYSTEM FOR THE HAVANA BAY

JAPAN INTERNATIONAL COOPERATION AGENCY

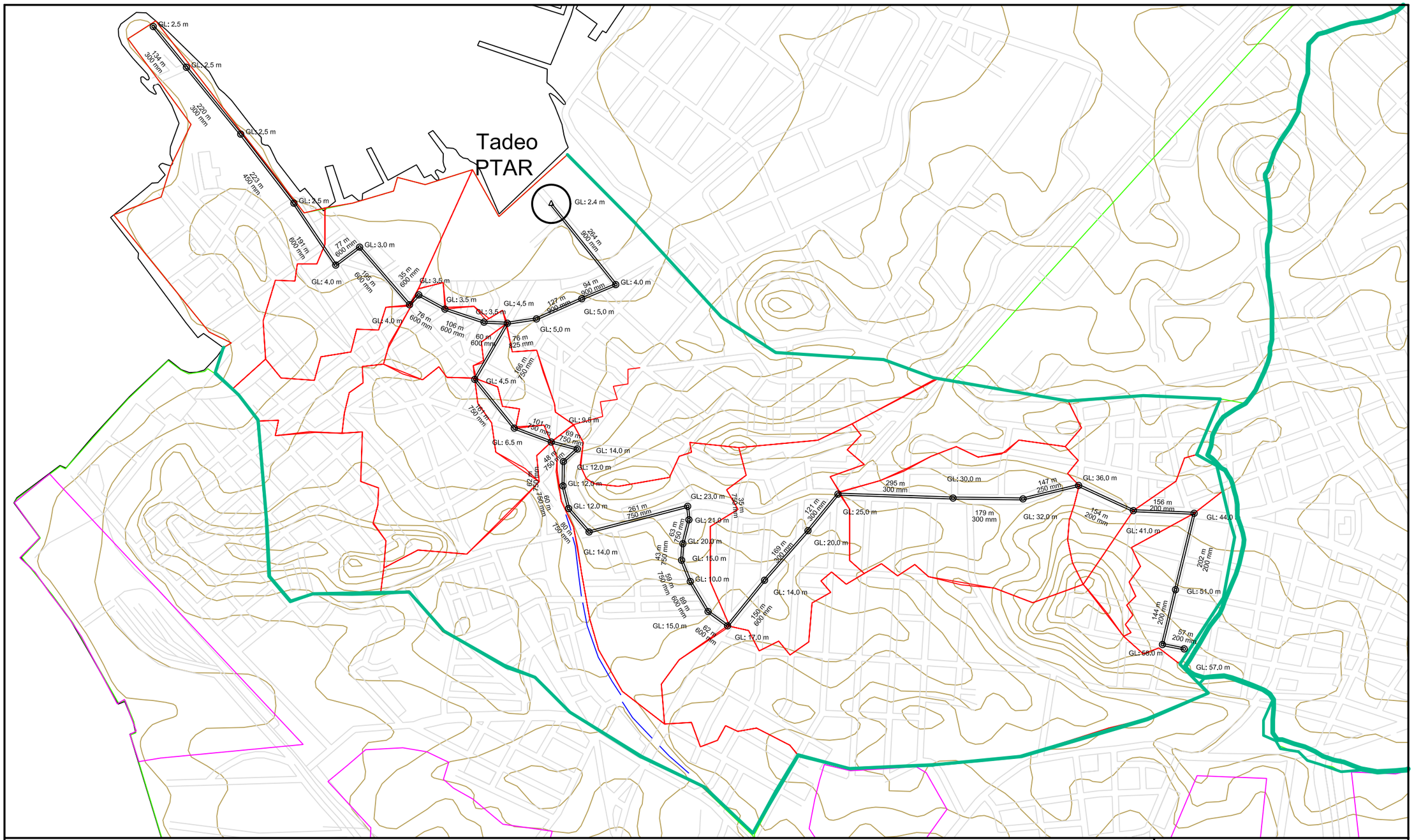
Figure A10.16
Route of Martin Perez Arriba Colector (1/2)



THE DEVELOPMENT STUDY OF THE IMPROVEMENT OF SEWERAGE AND DRAINAGE SYSTEM FOR THE HAVANA BAY

JAPAN INTERNATIONAL COOPERATION AGENCY

Figure A10.16
Route of Martin Perez Arriba Colector (2/2)



THE DEVELOPMENT STUDY OF THE IMPROVEMENT OF SEWERAGE AND DRAINAGE SYSTEM FOR THE HAVANA BAY

JAPAN INTERNATIONAL COOPERATION AGENCY

Figure A10.17
Route of Tadeo Colector

Table A10.1 Design Flows - Central System - without Luyano Left Bank Area A

Colector	Sector	Area	Branch	Cumulative Area	Hourly Maximum Flow	Peak Factor Cumulative (Hammond)	Equivalent Population	Cumulative Equivalent Population	Domestic Wastewater Generation	Non-domestic Wastewater by Small Consumer	Non-domestic Wastewater by Large Consumer	Overall Wastewater Generation	Cumulative Overall Wastewater Generation	Infiltration & Inflow	Cumulative Infiltration & Inflow	Overall Average Wastewater Flow
		ha		ha	L/s		ha		m3/d	m3/d	m3/d	m3/d	m3/d	m3/d	m3/d	m3/d
Centro Habana	CH1-1	163.41		163.41	**355**	2.375	38,200	38,200	6,025	5,523	752	12,301	12,301	1,435	1,435	13,736
	CH1-2	17.27		180.68	**387**	2.332	4,154	42,354	639	586	113	1,338	13,639	152	1,587	15,226
		9.11	to Ce2-1	189.79	**402**	2.313	2,030	44,384	308	281	65	654	14,293	74	1,661	15,954
Cerro	Ce1-1	228.11	to Ce1-2	228.11	**374**	2.347	40,923	40,923	5,854	5,366	1,958	13,177	13,177	1,393	1,393	14,570
	Ce12-1	143.69	to Ce1-2	143.69	**158**	2.789	14,638	14,638	2,068	1,897	749	4,713	4,713	492	492	5,205
	Ce1-2	56.14		427.94	**557**	2.154	10,501	66,062	1,547	1,419	414	3,382	21,272	369	2,254	23,526
	Ce2-1	26.65		644.38	**919**	1.935	10,010	120,456	1,682	1,542	0	3,223	38,788	400	4,315	43,103
	Ce2-2	57.73	to SS2-1	702.11	**1,031**	1.889	17,732	138,188	2,895	2,653	162	5,710	44,498	690	5,005	49,503
Sur 1	S11-1	156.50	to S1-1	156.50	**267**	2.519	27,186	27,186	4,359	3,996	400	8,754	8,754	1,038	1,038	9,792
	S12-1	36.24		36.24	**100**	3.022	8,557	8,557	1,376	1,261	119	2,755	2,755	328	328	3,083
	S12-2	88.95		125.19	**287**	2.484	21,004	29,561	3,376	3,095	292	6,763	9,518	804	1,132	10,650
	S12-3	74.87		200.06	**424**	2.288	17,679	47,240	2,842	2,605	246	5,693	15,211	677	1,809	17,020
	S12-4	53.69	to S1-1	253.75	**516**	2.192	12,678	59,918	2,038	1,868	176	4,082	19,293	485	2,294	21,587
	S1-1	18.32		428.57	**733**	2.032	4,326	91,430	695	637	60	1,393	29,440	166	3,498	32,938
		71.30	to SS1-1	499.87	**844**	1.972	16,836	108,266	2,706	2,481	234	5,421	34,861	644	4,142	39,003
Sur 3	S3-1	124.36		124.36	**264**	2.527	26,722	26,722	4,481	4,107	16	8,604	8,604	1,067	1,067	9,671
	S3-2	130.74	to S2-1	255.10	**477**	2.232	27,565	54,287	4,603	4,220	54	8,876	17,480	1,096	2,163	19,643
Sur 2	S2-1	130.89		385.99	**613**	2.112	19,525	73,812	2,706	2,480	1,102	6,287	23,767	644	2,807	26,574
	S2-2	62.26		448.25	**676**	2.067	9,287	83,099	1,287	1,180	524	2,991	26,758	306	3,113	29,871
	S21-1	55.02	to SS1-1	503.27	**734**	2.031	8,647	91,746	1,225	1,123	437	2,785	29,543	292	3,405	32,948
Sur	SS1-1	52.89	to SS2-1	1056.03	**1,504**	1.748	16,235	216,247	2,602	2,384	242	5,227	69,631	619	8,166	77,797
	SS2-1	97.49		1855.63	**2,506**	1.586	40,691	395,126	6,363	5,834	906	13,103	127,232	1,516	14,687	141,919
	SS2-2	26.66		1882.29	**2,567**	1.579	11,297	406,423	1,761	1,614	263	3,638	130,870	419	15,106	145,976
	SS3-1	68.65		1950.94	**2,686**	1.567	21,875	428,298	3,612	3,310	121	7,044	137,914	860	15,966	153,880
	SS3-2	31.03		1981.97	**2,733**	1.562	8,789	437,087	1,466	1,344	21	2,830	140,744	349	16,315	157,059
	N2	52.81		2034.78	**2,804**	1.555	13,077	450,164	2,197	2,014	0	4,211	144,955	523	16,838	161,793
Sub-total		2034.78					450,164		70,713	64,820	9,426	144,955		16,838		
Norte		766.90		2801.68	**3,763**	1.480	183,439	633,603	26,729	24,501	7,837	59,067	204,022	6,364	23,202	227,224
Diversion flow of Cerro and Sur during rehabilitation (sum of Ce2-2 and SS1-1)																
				1,758	**2,283**	1.613		354,435	5,497	5,037	404	10,937	114,129	1,309	13,171	127,300

Note: These flows are used to check the capacity of existing sewers

Table 10.2 Design Flows - Central System - with Luyano Left Bank Area A

Colector	Sector	Area	Branch	Cumulative Area	Hourly Maximum Flow	Peak Factor Cumulative (Hammond)	Equivalent Population	Cumulative Equivalent Population	Domestic Wastewater Generation	Non-domestic Wastewater by Small Consumer	Non-domestic Wastewater by Large Consumer	Overall Wastewater Generation	Cumulative Overall Wastewater Generation	Infiltration & Inflow	Cumulative Infiltration & Inflow	Overall Average Wastewater Flow
		ha		ha	L/s				m3/d	m3/d	m3/d	m3/d	m3/d	m3/d	m3/d	m3/d
Centro Habana	CH1-1	163.41		163.4	**355**	2.375	38,200	38,200	6,025	5,523	752	12,301	12,301	1,435	1,435	13,736
	CH1-2	17.27		180.7	**387**	2.332	4,154	42,354	639	586	113	1,338	13,639	152	1,587	15,226
		9.11	to Ce2-1	189.8	**402**	2.313	2,030	44,384	308	281	65	654	14,293	74	1,661	15,954
Cerro	Ce1-1	228.11	to Ce1-2	228.1	**374**	2.347	40,923	40,923	5,854	5,366	1,958	13,177	13,177	1,393	1,393	14,570
	Ce12-1	143.69	to Ce1-2	143.7	**158**	2.789	14,638	14,638	2,068	1,897	749	4,713	4,713	492	492	5,205
	Ce1-2	56.14		427.9	**557**	2.154	10,501	66,062	1,547	1,419	414	3,382	21,272	369	2,254	23,526
	Ce2-1	26.65		644.4	**919**	1.935	10,010	120,456	1,682	1,542	0	3,223	38,788	400	4,315	43,103
	Ce2-2	57.73	to SS2-1	702.1	**1,031**	1.889	17,732	138,188	2,895	2,653	162	5,710	44,498	690	5,005	49,503
Sur 1	S11-1	156.50	to S1-1	156.5	**267**	2.519	27,186	27,186	4,359	3,996	400	8,754	8,754	1,038	1,038	9,792
	S12-1	36.24		36.2	**100**	3.022	8,557	8,557	1,376	1,261	119	2,755	2,755	328	328	3,083
	S12-2	88.95		125.2	**287**	2.484	21,004	29,561	3,376	3,095	292	6,763	9,518	804	1,132	10,650
	S12-3	74.87		200.1	**424**	2.288	17,679	47,240	2,842	2,605	246	5,693	15,211	677	1,809	17,020
	S12-4	53.69	to S1-1	253.8	**516**	2.192	12,678	59,918	2,038	1,868	176	4,082	19,293	485	2,294	21,587
	S1-1	18.32		428.6	**733**	2.032	4,326	91,430	695	637	60	1,393	29,440	166	3,498	32,938
		71.30	to SS1-1	499.9	**844**	1.972	16,836	108,266	2,706	2,481	234	5,421	34,861	644	4,142	39,003
Sur 3	S3-1	124.36		124.4	**264**	2.527	26,722	26,722	4,481	4,107	16	8,604	8,604	1,067	1,067	9,671
	S3-2	130.74	to S2-1	255.1	**477**	2.232	27,565	54,287	4,603	4,220	54	8,876	17,480	1,096	2,163	19,643
LuyanoLeft		508.70	to S2-1	508.7	**751**	2.009	97,507	97,507	15,405	14,122	1,870	31,397	31,397	1,834	1,834	33,231
Sur 2	S2-1	130.89		894.7	**1,215**	1.819	19,525	171,319	2,706	2,480	1,102	6,287	55,164	644	4,641	59,805
	S2-2	62.26		957.0	**1,271**	1.803	9,287	180,606	1,287	1,180	524	2,991	58,155	306	4,947	63,102
	S21-1	55.02	to SS1-1	1012.0	**1,322**	1.788	8,647	189,253	1,225	1,123	437	2,785	60,940	292	5,239	66,179
Sur	SS1-1	52.89	to SS2-1	1564.7	**2,039**	1.645	16,235	313,754	2,602	2,384	242	5,227	101,028	619	10,000	111,028
	SS2-1	97.49		2364.3	**3,008**	1.534	40,691	492,633	6,363	5,834	906	13,103	158,629	1,516	16,521	175,150
	SS2-2	26.66		2391.0	**3,068**	1.529	11,297	503,930	1,761	1,614	263	3,638	162,267	419	16,940	179,207
	SS3-1	68.65		2459.6	**3,184**	1.520	21,875	525,805	3,612	3,310	121	7,044	169,311	860	17,800	187,111
	SS3-2	31.03		2490.7	**3,231**	1.516	8,789	534,594	1,466	1,344	21	2,830	172,141	349	18,149	190,290
	N2	52.81		2543.5	**3,300**	1.511	13,077	547,671	2,197	2,014	0	4,211	176,352	523	18,672	195,024
Sub-total		2543.48					547,671		86,118	78,942	11,296	176,352		18,672		
Norte		766.90		3310.4	**4,244**	1.451	183,439	731,110	26,729	24,501	7,837	59,067	235,419	6,364	25,036	260,455

Note: These design flows are for the case when Luyano Left Bank area is connected to Central System

Table A10.3 Design Flows - Central System - without Sur 3 and S2-1 (Design Flow for Rehabilitated Colector Sur)

Colector	Sector	Area	Branch	Cumulative Area	Hourly Maximum Flow	Peak Factor Cumulative (Hammond)	Equivalent Population	Cumulative Equivalent Population	Domestic Wastewater Generation	Non-domestic Wastewater by Small Consumer	Non-domestic Wastewater by Large Consumer	Overall Wastewater Generation	Cumulative Overall Wastewater Generation	Infiltration & Inflow	Cumulative Infiltration & Inflow	Overall Average Wastewater Flow
		ha		ha	L/s		ha		m3/d	m3/d	m3/d	m3/d	m3/d	m3/d	m3/d	m3/d
Centro Habana	CH1-1	163.41		163.41	**355**	2.375	38,200	38,200	6,025	5,523	752	12,301	12,301	1,435	1,435	13,736
	CH1-2	17.27		180.68	**387**	2.332	4,154	42,354	639	586	113	1,338	13,639	152	1,587	15,226
		9.11	to Ce2-1	189.79	**402**	2.313	2,030	44,384	308	281	65	654	14,293	74	1,661	15,954
Cerro	Ce1-1	228.11	to Ce1-2	228.11	**374**	2.347	40,923	40,923	5,854	5,366	1,958	13,177	13,177	1,393	1,393	14,570
	Ce12-1	143.69	to Ce1-2	143.69	**158**	2.789	14,638	14,638	2,068	1,897	749	4,713	4,713	492	492	5,205
	Ce1-2	56.14		427.94	**557**	2.154	10,501	66,062	1,547	1,419	414	3,382	21,272	369	2,254	23,526
	Ce2-1	26.65		644.38	**919**	1.935	10,010	120,456	1,682	1,542	0	3,223	38,788	400	4,315	43,103
	Ce2-2	57.73	to SS2-1	702.11	**1,031**	1.889	17,732	138,188	2,895	2,653	162	5,710	44,498	690	5,005	49,503
Sur 1	S11-1	156.50	to S1-1	156.50	**267**	2.519	27,186	27,186	4,359	3,996	400	8,754	8,754	1,038	1,038	9,792
	S12-1	36.24		36.24	**100**	3.022	8,557	8,557	1,376	1,261	119	2,755	2,755	328	328	3,083
	S12-2	88.95		125.19	**287**	2.484	21,004	29,561	3,376	3,095	292	6,763	9,518	804	1,132	10,650
	S12-3	74.87		200.06	**424**	2.288	17,679	47,240	2,842	2,605	246	5,693	15,211	677	1,809	17,020
	S12-4	53.69	to S1-1	253.75	**516**	2.192	12,678	59,918	2,038	1,868	176	4,082	19,293	485	2,294	21,587
	S1-1	18.32		428.57	**733**	2.032	4,326	91,430	695	637	60	1,393	29,440	166	3,498	32,938
		71.30	to SS1-1	499.87	**844**	1.972	16,836	108,266	2,706	2,481	234	5,421	34,861	644	4,142	39,003
Sur 3	S3-1	124.36		124.36	**0**											
	S3-2	130.74	to S2-1	255.10	**0**											
Sur 2	S2-1	130.89		385.99	**0**											
	S2-2	62.26		448.25	**107**	2.987	9,287	9,287	1,287	1,180	524	2,991	2,991	306	306	3,297
	S21-1	55.02	to SS1-1	503.27	**187**	2.700	8,647	17,934	1,225	1,123	437	2,785	5,776	292	598	6,374
Sur	SS1-1	52.89	to SS2-1	1056.03	**1,059**	1.879	16,235	142,435	2,602	2,384	242	5,227	45,864	619	5,359	51,223
	SS2-1	97.49		1855.63	**2,100**	1.639	40,691	321,314	6,363	5,834	906	13,103	103,465	1,516	11,880	115,345
	SS2-2	26.66		1882.29	**2,162**	1.630	11,297	332,611	1,761	1,614	263	3,638	107,103	419	12,299	119,402
	SS3-1	68.65		1950.94	**2,284**	1.613	21,875	354,486	3,612	3,310	121	7,044	114,147	860	13,159	127,306
	SS3-2	31.03		1981.97	**2,332**	1.607	8,789	363,275	1,466	1,344	21	2,830	116,977	349	13,508	130,485
	N2	52.81		2034.78	**2,404**	1.598	13,077	376,352	2,197	2,014	0	4,211	121,188	523	14,031	135,219
Sub-total		2034.78					450,164		58,923	54,013	8,254	121,188		14,031		
Norte		766.9		2801.68	**3,378**	1.506	183,439	559,791	26,729	24,501	7,837	59,067	180,255	6,364	20,395	200,650

Note: These design flows are for the design of rehabilitated Colector Sur since the wastewater from S3-1, S3-2 and S2-1 are excluded. Wastewater from these three areas are to be transported by Colector Sur A. It is also to be noted that S2-2 is included in both Sur A and rehabilitated Sur since the direction of connection need to be determined in detail as this area is in the junction and the flow is small.

Table A10.4 Capacity of Existing Colector Cerro

Colector Label	Up. Node	Upstream Ground Elevation m	Dn. Node	Length m	Up. Invert Elevation m	Dn. Invert Elevation m	Constructed Slope (m/km)	Section Size (mm)	Mannings n	Material	Full Capacity L/s	Design Capacity L/s	Accumulated Length m	Diameter	Length (< Capacity)
CeT 1-2	CeR-1	6.06	CeR-2	95	2.57	2.23	3.6	675	0.016	Conc.	426	557	95	675 mm	95 m
CeT 2-3	CeR-2	5.63	CeR-3	217.3	2.23	0.42	8.3	675	0.016	Conc.	650	557	312	-	-
CeT 3-4	CeR-3	5.62	CeR-4	45	0.42	-0.76	26.2	675	0.016	Conc.	1,154	557	357	-	-
CeT 4-5	CeR-4	4.65	CeR-5	27.9	-0.76	-0.85	3.2	675	0.016	Conc.	405	557	385	675 mm	28 m
CeT 5-6	CeR-5	4.09	CeR-6	82	-0.85	-0.61	-2.9	675	0.016	Conc.	(385)	557	467	675 mm	82 m
CeT 6-7	CeR-6	4.24	CeR-7	89.4	-0.61	-1.11	5.6	675	0.016	Conc.	533	557	557	675 mm	89 m
CeT 7-8	CeR-7	3.40	CeR-8	284.8	-1.11	-1.31	0.7	1200	0.016	Conc.	876	919	841	1200 mm	285 m
CeT 8-9	CeR-8	2.47	CeR-9	279	-1.31	-1.35	0.1	1350	0.016	Conc.	542	919	1,120	1350 mm	279 m
CeT 9-10	CeR-9	2.18	CeR-10	134	-1.35	-1.45	0.7	1350	0.016	Conc.	1,236	1031	1,254	-	-
CeT 10-11	CeR-10	2.02	CeR-11	101	-1.45	-1.50	0.5	1350	0.016	Conc.	1,007	1031	1,355	1350 mm	101 m
CeT 11-12	CeR-11	1.74	CeR-12	80	-1.50	-2.54	13.0	1350	0.016	Conc.	5,158	1031	1,435	-	-
		0.90													

Note: The last value for the Upstream Ground Elevation is for the ultimate node.

Summary

675 mm	294 m
1200 mm	285 m
1350 mm	380 m
Total	**959 m**

Table A10.5 Capacity of Existing Colector Centro Habana

Colector Label	Up. Node	Upstream Ground Elevation m	Dn. Node	Length m	Up. Invert Elevation m	Dn. Invert Elevation m	Constructed Slope (m/km)	Section Size (mm)	Mannings n	Material	Full Capacity L/s	Design Capacity L/s	Accumulated Length m	Diameter	Length (< Capacity)
ChT 1-2	ChR-1	6.78	ChR-2	62.3	3.61	3.31	4.8	450	0.016	Conc.	168	355	62	450 mm	62 m
ChT 2-3	ChR-2	6.25	ChR-3	11.5	3.31	3.25	5.2	450	0.016	Conc.	175	355	74	450 mm	12 m
ChT 3-4	ChR-3	6.25	ChR-4	84	3.25	2.00	14.9	450	0.016	Conc.	295	355	158	450 mm	84 m
ChT 4-5	ChR-4	5.23	ChR-5	23.5	2.00	1.99	0.4	450	0.016	Conc.	50	355	181	450 mm	24 m
ChT 5-6	ChR-5	5.25	ChR-6	25	1.99	1.92	2.8	450	0.016	Conc.	128	355	206	450 mm	25 m
ChT 6-7	ChR-6	5.40	ChR-7	26.5	1.92	1.74	6.8	450	0.016	Conc.	199	355	233	450 mm	27 m
ChT 7-8	ChR-7	5.53	ChR-8	81.5	1.74	1.24	6.1	450	0.016	Conc.	189	355	314	450 mm	82 m
ChT 8-9	ChR-8	5.24	ChR-9	76.1	1.24	0.58	8.7	675	0.016	Conc.	664	355	390	-	-
ChT 9-10	ChR-9	5.78	ChR-10	92	0.58	0.43	1.6	675	0.016	Conc.	288	355	482	675 mm	92 m
ChT 10-11	ChR-10	4.53	ChR-11	73.5	0.43	0.36	1.0	675	0.016	Conc.	220	402	556	675 mm	74 m
ChT 11-12	ChR-11	4.36	ChR-12	84	0.36	0.15	2.5	675	0.016	Conc.	356	402	640	675 mm	84 m
ChT 12-13	ChR-12	3.92	ChR-13	83.2	0.15	-0.29	5.3	750	0.016	Conc.	686	402	723	-	-
ChT 13-14	ChR-13	3.01	ChR-14	86	-0.29	-0.48	2.2	750	0.016	Conc.	444	402	809	-	-
ChT 14-15	ChR-14	3.09	ChR-15	82.5	-0.48	-0.78	3.6	750	0.016	Conc.	569	402	892	-	-
ChT 15-15'	ChR-15	3.26	ChR-15'	86	-0.78	-0.86	0.9	750	0.016	Conc.	288	402	978	750 mm	86 m
ChT 15'-16	ChR-15'	3.50	ChR-16	29.3	-0.86	-0.89	1.0	750	0.016	Conc.	302	402	1,007	750 mm	29 m
		3.40													

Note: The last value for the Upstream Ground Elevation is for the ultimate node.

Summary

450 mm	314 m
675 mm	250 m
750 mm	115 m
Total	**679 m**

Table 10.6 Capacity of Existing Colector Sur 1

Colector Label	Up. Node	Upstream Ground Elevation m	Dn. Node	Length m	Up. Invert Elevation m	Dn. Invert Elevation m	Constructed Slope (m/km)	Section Size (mm)	Mannings n	Material	Full Capacity L/s	Design Capacity L/s	Accumulated Length m	Diameter	Length (< Capacity)
SuT 1-2	SuR-1	31.15	SuR-2	80.5	26.64	25.56	13.4	900	0.016	Conc.	1,777	267	81	-	-
SuT 2-3	SuR-2	30.17	SuR-3	80.5	25.56	25.40	2.0	900	0.016	Conc.	684	267	161	-	-
SuT 3-4	SuR-3	29.14	SuR-4	82.5	25.40	25.17	2.8	900	0.016	Conc.	810	267	244	-	-
SuT 4-5	SuR-4	28.06	SuR-5	101.5	25.17	24.10	10.5	900	0.016	Conc.	1,576	267	345	-	-
SuT 5-6	SuR-5	26.48	SuR-6	86.5	24.10	23.17	10.8	900	0.016	Conc.	1,591	267	432	-	-
SuT 6-7	SuR-6	25.17	SuR-7	59.5	23.17	22.08	18.3	900	0.016	Conc.	2,077	267	491	-	-
SuT 7-8	SuR-7	24.35	SuR-8	75.8	22.08	21.17	12.0	900	0.016	Conc.	1,681	267	567	-	-
SuT 8-9	SuR-8	23.42	SuR-9	50.5	21.17	20.44	14.5	900	0.016	Conc.	1,845	267	617	-	-
SuT 9-10	SuR-9	22.78	SuR-10	51.2	20.44	19.81	12.3	900	0.016	Conc.	1,702	267	669	-	-
SuT 10-11	SuR-10	22.06	SuR-11	54	19.81	19.24	10.6	900	0.016	Conc.	1,577	267	723	-	-
SuT 11-12	SuR-11	21.21	SuR-12	51.5	19.24	18.40	16.3	900	0.016	Conc.	1,960	267	774	-	-
SuT 12-13	SuR-12	20.6	SuR-13	54.4	18.40	17.85	10.1	900	0.016	Conc.	1,543	267	828	-	-
SuT 13-14	SuR-13	19.83	SuR-14	72.1	17.85	16.89	13.3	900	0.016	Conc.	1,771	267	901	-	-
SuT 14-15	SuR-14	18.87	SuR-15	66.5	16.89	16.07	12.3	900	0.016	Conc.	1,704	267	967	-	-
SuT 15-16	SuR-15	18.05	SuR-16	70	16.07	15.16	13.0	900	0.016	Conc.	1,750	267	1,037	-	-
SuT 16-17	SuR-16	17.15	SuR-17	111.5	15.16	13.95	10.9	900	0.016	Conc.	1,599	267	1,149	-	-
SuT 17-18	SuR-17	15.71	SuR-18	66	13.95	12.96	15.0	900	0.016	Conc.	1,879	267	1,215	-	-
SuT 18-19	SuR-18	14.75	SuR-19	80.5	12.96	12.49	5.8	900	0.016	Conc.	1,172	267	1,295	-	-
SuT 19-20	SuR-19	13.76	SuR-20	30.2	12.49	12.31	6.0	900	0.016	Conc.	1,185	267	1,325	-	-
SuT 20 -21	SuR-20	13.35	SuR-21	101.5	12.31	9.86	24.1	900	0.016	Conc.	2,384	267	1,427	-	-
SuT 21-22	SuR-21	14.15	SuR-22	124.8	9.86	7.58	18.3	900	0.016	Conc.	2,074	267	1,552	-	-
SuT 22-23	SuR-22	10.78	SuR-23	116	7.58	3.85	32.2	900	0.016	Conc.	2,752	267	1,668	-	-
SuT 23-24	SuR-23	7.95	SuR-24	112.5	3.85	2.40	12.9	900	0.016	Conc.	1,742	844	1,780	-	-
SuT 24-25	SuR-24	5.73	SuR-25	208.5	2.40	1.08	6.3	900	0.016	Conc.	1,221	844	1,989	-	-
SuT 25-26	SuR-25	5.78	SuR-26	25	1.08	0.95	5.2	900	0.016	Conc.	1,107	844	2,014	-	-
SuT 26-27	SuR-26	6.38	SuR-27	110	0.95	0.50	4.1	900	0.016	Conc.	981	844	2,124	-	-
SuT 27-28	SuR-27	5.3	SuR-28	113.8	0.50	-0.18	6.0	900	0.016	Conc.	1,186	844	2,237	-	-
SuT 28-29	SuR-28	4.04	SuR-29	130	-0.18	-0.40	1.7	900	0.016	Conc.	631	844	2,367	900 mm	130 m
SuT 29-30	SuR-29	3.42	SuR-30	80	-0.40	-0.46	0.7	900	0.016	Conc.	410	844	2,447	900 mm	80 m
		3.31													

Note: The last value for the Upstream Ground Elevation is for the ultimate node.

Summary	
900 mm	**210 m**

Table 10.7 Capacity of Existing Colector Sur 2

Colector Label	Up. Node	Upstream Ground Elevation m	Dn. Node	Length m	Up. Invert Elevation m	Dn. Invert Elevation m	Constructed Slope (m/km)	Section Size (mm)	Mannings n	Material	Full Capacity L/s	Design Capacity L/s	Accumulated Length m	Diameter	Length (< Capacity)
SdT 1-2	SdR-1	9.06	SdR-2	157.3	4.56	3.75	5.1	600	0.016	Conc.	373		157		
SdT 2-3	SdR-2	7.40	SdR-3	22.5	3.75	3.50	11.1	900	0.016	Conc.	1,617		180		
SdT 3-4	SdR-3	7.62	SdR-4	96.9	3.50	3.28	2.3	900	0.016	Conc.	731		277		
SdT 4-5	SdR-4	6.58	SdR-5	263.4	3.28	2.88	1.5	900	0.016	Conc.	598		540		
SdT 5-6	SdR-5	5.43	SdR-6	175	2.88	2.48	2.3	900	0.016	Conc.	734		715		
SdT 6-7	SdR-6	4.48	SdR-7	92	2.48	2.37	1.2	900	0.016	Conc.	531		807		
SdT 7-8	SdR-7	4.28	SdR-8	82.2	2.37	2.29	1.0	900	0.016	Conc.	479		889		
SdT 8-9	SdR-8	3.90	SdR-9	79.7	2.29	2.18	1.4	900	0.016	Conc.	570		969		
SdT 9-10	SdR-9	4.23	SdR-10	64	2.18	2.20	-0.3	900	0.016	Conc.	(271)		1,033		
SdT 10-11	SdR-10	4.10	SdR-11	102	2.20	2.15	0.5	900	0.016	Conc.	340		1,135		
SdT 11-12	SdR-11	3.80	SdR-12	43.6	2.15	2.05	2.3	900	0.016	Conc.	734		1,179		
SdT 12-13	SdR-12	3.65	SdR-13	65.6	2.05	1.94	1.7	900	0.016	Conc.	628		1,244		
SdT 13-14	SdR-13	3.13	SdR-14	588.3	1.94	1.59	0.6	750	0.016	Conc.	230		1,833		
SdT 14-15	SdR-14	8.74	SdR-15	253.6	1.59	1.08	2.0	750	0.016	Conc.	423	613	2,086	750 mm	254
SdT 15-16	SdR-15	7.83	SdR-16	264.2	1.08	0.50	2.2	750	0.016	Conc.	442	613	2,350	750 mm	264
SdT 16-17	SdR-16	3.52	SdR-17	76.5	0.50	0.07	5.6	750	0.016	Conc.	708	613	2,427	-	-
SdT 17-18	SdR-17	3.19	SdR-18	81.2	0.07	-0.05	1.5	900	0.016	Conc.	590	676	2,508	900 mm	81
SdT 18-19	SdR-18	3.07	SdR-19	73.9	-0.05	-0.11	0.8	900	0.016	Conc.	437	676	2,582	900 mm	74
SdT 19-20	SdR-19	3.37	SdR-20	74.5	-0.11	-0.16	0.7	900	0.016	Conc.	398	676	2,656	900 mm	75
SdT 20-21	SdR-20	3.60	SdR-21	78.2	-0.16	-0.34	2.3	900	0.016	Conc.	736	676	2,735	-	-
SdT 21-22	SdR-21	3.38	SdR-22	161.8	-0.34	-0.40	0.4	900	0.016	Conc.	296	734	2,896	900 mm	162
		3.42													

Note: The last value for the Upstream Ground Elevation is for the ultimate node.

Summary

750 mm	518 m
900 mm	391 m
Total	**909 m**

Table 10.8 Capacity of Existing Colector Sur 3

Colector Label	Up. Node	Upstream Ground Elevation m	Dn. Node	Length m	Up. Invert Elevation m	Dn. Invert Elevation m	Constructed Slope (m/km)	Section Size (mm)	Mannings n	Material	Full Capacity L/s	Design Capacity L/s	Accumulated Length m	Diameter	Length (< Capacity)
StT 1-2	StR-1	20.02	StR-2	109	15.92	11.91	36.8	350	0.016	Conc.	227	264	109	350 mm	109 m
StT 2-3	StR-2	18.6	StR-3	120	11.91	11.57	2.8	350	0.016	Conc.	63	264	229	350 mm	120 m
StT 3-4	StR-3	16.45	StR-4	113	11.57	11.12	4.0	400	0.016	Conc.	107	477	342	400 mm	113 m
StT 4-5	StR-4	15.17	StR-5	113.1	11.12	10.29	7.3	400	0.016	Conc.	145	477	455	400 mm	113 m
StT 5-6	StR-5	13.74	StR-6	26.1	10.29	10.14	5.7	400	0.016	Conc.	128	477	481	400 mm	26 m
StT 6-7	StR-6	13.72	StR-7	45.5	10.14	9.76	8.4	400	0.016	Conc.	155	477	527	400 mm	46 m
StT 7-8	StR-7	13.4	StR-8	65.1	9.76	9.35	6.3	400	0.016	Conc.	134	477	592	400 mm	65 m
StT 8-9	StR-8	12.95	StR-9	66.1	9.35	8.72	9.5	400	0.016	Conc.	165	477	658	400 mm	66 m
StT 9-10	StR-9	13.97	StR-10	41.5	8.72	7.94	18.8	400	0.016	Conc.	232	477	699	400 mm	42 m
StT 10-11	StR-10	12.14	StR-11	37.2	7.94	7.69	6.7	400	0.016	Conc.	139	477	737	400 mm	37 m
StT 11-12	StR-11	12.84	StR-12	26.4	7.69	5.94	66.2	400	0.016	Conc.	435	477	763	400 mm	26 m
StT 12-13	StR-12	9.13	StR-13	55.1	5.94	5.63	5.6	400	0.016	Conc.	127	477	818	400 mm	55 m
StT 13-14	StR-13	8.41	StR-14	114	5.63	4.96	5.9	400	0.016	Conc.	130	477	932	400 mm	114 m
StT 14-15	StR-14	6.74	StR-15	57	4.96	4.75	3.7	750	0.016	Conc.	573	477	989	-	-
StT 15-16	StR-15	6.27	StR-16	58.1	4.75	4.31	7.6	750	0.016	Conc.	821	477	1,047	-	-
StT 16-17	StR-16	6.01	StR-17	51	4.31	3.99	6.3	750	0.016	Conc.	747	477	1,098	-	-
StT 17-18	StR-17	5.9	StR-18	67	3.99	3.25	11.0	750	0.016	Conc.	992	477	1,165	-	-
StT 18-19	StR-18	5.7	StR-19	114	3.25	3.21	0.4	750	0.016	Conc.	177	477	1,279	750 mm	114 m
StT 19-20	StR-19	5.35	StR-20	113.8	3.21	2.95	2.3	750	0.016	Conc.	451	477	1,393	750 mm	114 m
StT 20-21	StR-20	6.14	StR-21	113.9	2.95	2.71	2.1	750	0.016	Conc.	433	477	1,507	750 mm	114 m
StT 21-22	StR-21	5.49	StR-22	21.2	2.71	2.73	-0.9	750	0.016	Conc.	(290)	477	1,528	750 mm	21 m
StT 22-23	StR-22	5.43	StR-23	5.2	2.73	2.67	11.5	750	0.016	Conc.	1,014	477	1,533	-	-
StT 23-24	StR-23	5.45	StR-24	101	2.67	2.60	0.7	750	0.016	Conc.	248	477	1,634	750 mm	101 m
StT 24-25	StR-24	7.6	StR-25	110.1	2.60	2.44	1.5	750	0.016	Conc.	360	477	1,744	750 mm	110 m
StT 25-26	StR-25	8.54	StR-26	110	2.44	1.81	5.7	750	0.016	Conc.	714	477	1,854	-	-
StT 26-27	StR-26	8.47	StR-27	109	1.81	1.61	1.8	750	0.016	Conc.	404	477	1,963	750 mm	109 m
StT 27-28	StR-27	8.98	StR-28	100	1.61	1.59	0.2	750	0.016	Conc.	133	477	2,063	750 mm	100 m
		8.74													

Note: The last value for the Upstream Ground Elevation is for the ultimate node.

Summary

350 mm	229 m
400 mm	703 m
750 mm	783 m
Total	**1715 m**

Table 10.9 Capacity of Existing Colector Sur

Colector Label	Up. Node	Upstream Ground m	Dn. Node	Length m	Up. Invert Elevation m	Dn. Invert Elevation m	Constructed Slope (m/km)	Section Size (mm)	Mannings n	Material	Full Capacity L/s	Design Capacity L/s	Accumulated Length m	Diameter	Length (< Capacity)
T 1-2	R-1	3.31	R-2	45	-0.97	-1.01	0.9	1500	0.016	Conc.	1,786	1504	45	-	-
T 2-3	R-2	3.54	R-3	25	-1.01	-1.05	1.6	1500	0.016	Conc.	2,397	1504	70	-	-
T 3-4	R-3	3.35	R-4	125	-1.05	-1.27	1.8	1500	0.016	Conc.	2,514	1504	195	-	-
T 4-5	R-4	2.42	R-5	90	-1.27	-1.38	1.2	1500	0.016	Conc.	2,095	1504	285	-	-
T 5-6	R-5	1.84	R-6	85	-1.38	-1.45	0.8	1500	0.016	Conc.	1,719	1504	370	-	-
T 6-7	R-6	1.71	R-7	200	-1.45	-1.68	1.2	1500	0.016	Conc.	2,032	1504	570	-	-
T 7-8	R-7	3.93	R-8	50	-1.68	-1.70	0.4	1500	0.016	Conc.	1,198	1504	620	1500 mm	50 m
T 8-9	R-8	4.96	R-9	110	-1.70	-1.76	0.6	1500	0.016	Conc.	1,399	1504	730	1500 mm	110 m
T 9-10	R-9	1.81	R-10	120	-1.76	-1.79	0.3	1500	0.016	Conc.	947	1504	850	1500 mm	120 m
T 10-11	R-10	2.14	R-11	100	-1.79	-1.82	0.3	1500	0.016	Conc.	1,038	1504	950	1500 mm	100 m
T 11-12	R-11	2.42	R-12	115	-1.82	-1.96	1.2	1500	0.016	Conc.	2,091	1504	1,065	-	-
T 12-13	R-12	1.31	R-13	60	-1.96	-2.54	9.7	1500	0.016	Conc.	5,891	1504	1,125	-	-
T 13-14	R-13	0.9	R-14	159	-2.54	-2.64	0.6	1950	0.016	Conc.	3,025	2,506	1,284	-	-
T 14-15	R-14	1.52	R-15	45.4	-2.64	-2.71	1.5	1950	0.016	Conc.	4,736	2,506	1,329	-	-
T 15-16	R-15	0.99	R-16	41.1	-2.71	-2.71	0.0	1950	0.016	Conc.	-	2,506	1,371	1950 mm	41 m
T 16-17	R-16	1.08	R-17	60.8	-2.71	-2.76	0.8	1950	0.016	Conc.	3,459	2,506	1,431	-	-
T 17-18	R-17	1.78	R-18	79.5	-2.76	-2.77	0.1	1950	0.016	Conc.	1,353	2,506	1,511	1950 mm	80 m
T 18-19	R-18	3.32	R-19	73.8	-2.77	-2.80	0.4	1950	0.016	Conc.	2,432	2,506	1,585	1950 mm	74 m
T 19-20	R-19	6.33	R-20	74.5	-2.80	-2.84	0.5	1950	0.016	Conc.	2,795	2,506	1,659	-	-
T 20-21	R-20	5.69	R-21	74	-2.84	-2.93	1.2	1950	0.016	Conc.	4,206	2,506	1,733	-	-
T 21-22	R-21	3.67	R-22	85.4	-2.93	-2.99	0.7	1950	0.016	Conc.	3,197	2,506	1,819	-	-
T 22-23	R-22	3.36	R-23	407.5	-2.99	-3.17	0.4	1950	0.016	Conc.	2,535	2,567	2,226	1950 mm	408 m

Table 10.9 Capacity of Existing Colector Sur

Colector Label	Up. Node	Upstream Ground m	Dn. Node	Length m	Up. Invert Elevation m	Dn. Invert Elevation m	Constructed Slope (m/km)	Section Size (mm)	Mannings n	Material	Full Capacity L/s	Design Capacity L/s	Accumulated Length m	Diameter	Length (< Capacity)
T 23-24	R-23	6.31	R-24	62.1	-3.17	-3.17	0.0	2100	0.016	Conc.	-	2,686	2,288	2100 mm	62 m
T 24-25	R-24	5.71	R-25	68	-3.17	-3.21	0.6	2100	0.016	Conc.	3,565	2,686	2,356	-	-
T 25-26	R-25	6.09	R-26	64.5	-3.21	-3.23	0.3	2100	0.016	Conc.	2,588	2,686	2,421	2100 mm	65 m
T 26-27	R-26	6.21	R-27	96	-3.23	-3.38	1.6	2100	0.016	Conc.	5,810	2,686	2,517	-	-
T 27-28	R-27	5.39	R-28	70.2	-3.38	-3.37	-0.1	2100	0.016	Conc.	(1,754)	2,686	2,587	2100 mm	70 m
T 28-29	R-28	4.79	R-29	80.9	-3.37	-3.39	0.3	2100	0.016	Conc.	2,311	2,686	2,668	2100 mm	81 m
T 29-30	R-29	4.34	R-30	78.5	-3.39	-3.41	0.3	2100	0.016	Conc.	2,346	2,686	2,746	2100 mm	79 m
T 30-31	R-30	3.67	R-31	5.9	-3.41	-3.42	1.7	2100	0.016	Conc.	6,051	2,686	2,752	-	-
T 31-32	R-31	3.64	R-32	45	-3.42	-3.44	0.4	2100	0.016	Conc.	3,098	2,686	2,797	-	-
T 32-33	R-32	3.41	R-33	70	-3.44	-3.47	0.4	2100	0.016	Conc.	3,043	2,686	2,867	-	-
T 33-34	R-33	3.56	R-34	60.6	-3.47	-3.42	-0.8	2100	0.016	Conc.	(4,222)	2,686	2,928	2100 mm	61 m
T 34-35	R-34	3.56	R-35	62.9	-3.42	-3.50	1.3	2100	0.016	Conc.	5,241	2,686	2,991	-	-
T 35-36	R-35	3.15	R-36	118	-3.50	-3.84	2.9	2100	0.016	Conc.	7,889	2,686	3,109	-	-
T 36-37	R-36	2.61	R-37	77.5	-3.84	-3.86	0.3	2100	0.016	Conc.	2,361	2,686	3,186	2100 mm	78 m
T 37-38	R-37	2.94	R-38	65.2	-3.86	-3.95	1.4	2100	0.016	Conc.	5,460	2,686	3,251	-	-
T 38-39	R-38	3.76	R-39	67	-3.95	-3.97	0.3	2100	0.016	Conc.	2,539	2,686	3,318	2100 mm	67 m
T 39-40	R-39	3.73	R-40	30.3	-3.97	-3.91	-2.0	2100	0.016	Conc.	(6,546)	2,686	3,349	2100 mm	30 m
T 40-41	R-40	3.19	R-41	45	-3.91	-3.97	1.3	2100	0.016	Conc.	5,367	2,686	3,394	-	-
T 41-42	R-41	2.68	R-42	116	-3.97	-3.98	0.1	2100	0.016	Conc.	1,365	2,733	3,510	2100 mm	116 m
T 42-43	R-42	2.03	R-43	77.2	-3.98	-3.99	0.1	2100	0.016	Conc.	1,673	2,733	3,587	2100 mm	77 m
T 43-44	R-43	1.82	R-44	64.5	-3.99	-4.00	0.2	2100	0.016	Conc.	1,830	2,733	3,651	2100 mm	65 m
T 44-45	R-44	2.46	R-45	64	-4.00	-4.03	0.5	2100	0.016	Conc.	3,182	2,733	3,715	-	-
T 45-46	R-45	2.72	R-46	48	-4.03	-4.05	0.4	2100	0.016	Conc.	3,000	2,733	3,763	-	-
T 46-47	R-46	2.98	R-47	80	-4.05	-4.34	3.6	2100	0.016	Conc.	8,849	2,733	3,843	-	-
		2.46													

Note: The last value for the Upstream Ground Elevation is for the ultimate node.

Summary

1500 mm	380 m
1950 mm	602 m
2100 mm	849 m
Total	**1831 m**

Table A10.10 Capacity of Rehabilitated Colector Sur

Existing

Sector	Up. Node	Upstream Ground Elevation m	Dn. Node	Length m	Up. Invert Elevation m	Dn. Invert Elevation m	Average Constructed Slope (m/km)	Section Size (mm)	Material
SS1-1	R-1	3.31	R-13	1,125.0	-0.97	-2.54	1.40	1500	concrete
SS2-1	R-13	0.90	R-22	693.5	-2.54	-2.99	0.65	1950	concrete
SS2-2	R-22	3.36	R-23	407.5	-2.99	-3.17	0.44	1950	concrete
SS3-1	R-23	6.31	R-41	1,122.6	-3.17	-3.97	0.71	2100	concrete
SS3-2	R-41	2.68	R-47	494.7	-3.97	-4.34	0.75	2100	concrete
		2.46		3,843.3					

After Rehabilitation

Sector	Up. Node	Upstream Ground Elevation m	Dn. Node	Length m	Up. Invert Elevation m	Dn. Invert Elevation m	Constructed Slope (m/km)	Section Size (mm)	Section Size after Rehabilitation (mm)	Mannings n	Material	Full Capacity L/s	Design Flow L/s
SS1-1	R-1	3.31	R-13	1,125.0	-0.840	-1.965	1.00		1350	0.013	concrete	1689	1059
SS2-1	R-13	0.90	R-22	693.5	-2.169	-2.724	0.80		1750	0.013	concrete	3007	2100
SS2-2	R-22	3.36	R-23	407.5	-2.724	-3.050	0.80		1750	0.013	concrete	3007	2162
SS3-1	R-23	6.31	R-41	1,122.6	-3.050	-3.945	0.80		1900	0.013	concrete	3742	2284
SS3-2	R-41	2.68	R-47	494.7	-3.945	-4.340	0.80		1900	0.013	concrete	3742	2332
		2.46		3,843.3									

Table A10.11 Sewer Design - Colector Sur A

Pipe Label	Up Node	Increment Area (Aincr), ha	Branch	Cumulative Area (Atot), ha	Total Flow, L/s	Size	Length, m	Slope (S), m/km	Average Velocity, m/s	Material	Mannings Coefficient (n)	Full Flow Capacity, L/s	Upstream Ground Elevation (GLup), m	Upstream Invert Level (ILup), m	Downstream Invert Level (ILdn), m	Upstream Cover, m	Downstream Cover, m	Remarks
LST-1	LSR-1	508.72	from	508.72	751	1200 mm	133	1.0	1.17	Concrete	0.013	1,286	6.0	-1.00	-1.13	5.78	8.11	
LST-2	LSR-2		Luyano	508.72	751	1200 mm	129	1.0	1.21	Concrete	0.013	1,286	8.2	-1.13	-1.26	8.11	8.54	
LST-3	LSR-3		Left	508.72	751	1200 mm	110	1.0	1.50	Concrete	0.013	1,286	8.5	-1.26	-1.37	8.54	8.65	
LST-4	LSR-4	385.99	from Sur 3	894.71	1,215	1500 mm	103	1.0	1.29	Concrete	0.013	2,332	8.5	-1.67	-1.78	8.65	9.15	
LST-5	LSR-5			894.71	1,215	1500 mm	164	1.0	1.29	Concrete	0.013	2,332	8.9	-1.78	-1.94	9.15	11.92	
LST-6	LSR-6			894.71	1,215	1500 mm	246	1.0	1.28	Concrete	0.013	2,332	11.5	-1.94	-2.19	11.92	7.26	
LST-7	LSR-7	62.26		956.97	1,271	1500 mm	140	1.0	1.35	Concrete	0.013	2,332	6.6	-2.19	-2.33	7.26	5.50	
LST-8	LSR-8			956.97	1,271	1500 mm	188	1.0	1.70	Concrete	0.013	2,332	4.7	-2.33	-2.51	5.50	4.59	
LST-9	LSR-9			956.97	1,271	1500 mm	142	1.0	1.39	Concrete	0.013	2,332	3.6	-2.51	-2.65	4.91	3.65	
LST-10	LSR-10			956.97	1,271	1500 mm	113	1.0	1.73	Concrete	0.013	2,337	2.2	-2.65	-2.77	3.65	4.26	
LST-11	LSR-11			956.97	1,271	1500 mm	50	1.0	1.31	Concrete	0.013	2,332	2.7	-5.00	-5.05	6.18	6.23	Agua Dulce
LST-12	LSR-12			956.97	1,271	1500 mm	153	1.0	1.32	Concrete	0.013	2,332	2.7	-5.05	-5.20	6.23	8.68	
LST-13	LSR-13			956.97	1,271	1500 mm	130	1.0	1.34	Concrete	0.013	2,332	5.0	-5.20	-5.33	8.68	12.41	
LST-14	LSR-14			956.97	1,271	1500 mm	82	1.0	1.38	Concrete	0.013	2,332	8.6	-5.33	-5.41	12.41	9.89	
LST-15	LSR-15			956.97	1,271	1500 mm	90	1.0	1.46	Concrete	0.013	2,332	6.0	-5.41	-5.50	9.89	8.98	
LST-16	LSR-16		to Matadero Pumping	956.97	1,271	1500 mm	51	1.0	1.78	Concrete	0.013	2,321	5.0	-5.50	-5.55	8.98	9.03	

Sewer Design - Colector Sur A without inflow of Area A

Pipe Label	Up Node	Increment Area (Aincr), ha	Branch	Cumulative Area (Atot), ha	Total Flow, L/s	Size	Length, m	Slope (S), m/km	Average Velocity, m/s	Material	Mannings Coefficient (n)	Full Flow Capacity, L/s	Upstream Ground Elevation (GLup), m	Upstream Invert Level (ILup), m	Downstream Invert Level (ILdn), m	Upstream Cover, m	Downstream Cover, m	Remarks
Note: Starting Point of Colector for this case will be LSR-4																		
LST-4	LSR-4	385.99	from Sur 3	385.99	613	E-1200	103	1.0	1.32	HDPE	0.01	1,066	8.5	-1.674	-1.776	9.14	9.65	
LST-5	LSR-5			385.99	613	E-1200	164	1.0	1.32	HDPE	0.01	1,066	8.9	-1.776	-1.940	9.65	12.41	
LST-6	LSR-6			385.99	613	E-1200	246	1.0	1.27	HDPE	0.01	1,066	11.5	-1.940	-2.186	12.41	7.76	
LST-7	LSR-7	62.26		448.25	676	E-1200	140	1.0	1.37	HDPE	0.01	1,066	6.6	-2.186	-2.326	7.76	6.00	
LST-8	LSR-8			448.25	676	E-1200	188	1.0	1.62	HDPE	0.01	1,066	4.7	-2.326	-2.513	6.00	5.08	
LST-9	LSR-9			448.25	676	E-1200	142	1.0	1.39	HDPE	0.01	1,063	3.6	-2.513	-2.654	5.08	3.82	
LST-10	LSR-10			448.25	676	E-1200	113	1.0	1.64	HDPE	0.01	1,069	2.2	-2.654	-2.767	3.82	4.44	
LST-11	LSR-11			448.25	676	E-1200	50	1.0	1.36	HDPE	0.01	1,066	2.7	-5.000	-5.050	6.67	6.72	Agua Dulce
LST-12	LSR-12			448.25	676	E-1200	153	1.0	1.36	HDPE	0.01	1,066	2.7	-5.050	-5.203	6.72	9.17	
LST-13	LSR-13			448.25	676	E-1200	130	1.0	1.37	HDPE	0.01	1,066	5.0	-5.203	-5.332	9.17	12.90	
LST-14	LSR-14			448.25	676	E-1200	82	1.0	1.39	HDPE	0.01	1,066	8.6	-5.332	-5.414	12.90	10.38	
LST-15	LSR-15			448.25	676	E-1200	90	1.0	1.44	HDPE	0.01	1,066	6.0	-5.414	-5.504	10.38	9.47	
LST-16	LSR-16		to Matadero Pumping	448.25	676	E-1200	51	1.0	1.67	HDPE	0.01	1,061	5.0	-5.504	-5.554	9.47	9.52	

Table A10.12 Sewer Design - By-Pass Pipe for Colector Cerro and Colector Sur

Pipe Label	Up Node	Increment Area (Aincr), ha	Branch	Cumulative Area (Atot), ha	Total Flow, L/s	Size	Length, m	Slope (S), m/km	Average Velocity, m/s	Material	Mannings Coefficient (n)	Full Flow Capacity, L/s	Upstream Ground Elevation (GLup), m	Upstream Invert Level (ILup), m	Downstream Invert Level (ILdn), m	Upstream Cover, m	Downstream Cover, m	Remarks
BT-1	BR-1	702.11	From Cerro	702.11	1,031	E-1200	20	1.0	1.65	HDPE	0.010	1,067	2.0	-1.95	-1.97	2.8	2.5	
BT-2	BR-2			702.11	1,031	E-1200	76	1.0	1.90	HDPE	0.010	1,067	1.7	-1.97	-2.05	2.5	2.1	
BT-3	BR-3	1056.03	From Sur	1758.14	2,283	1500 mm	50	1.0	1.57	Concrete	0.013	2,332	1.3	-4.24	-4.29	4.0	4.2	
BT-4	BR-4			1758.14	2,283	1500 mm	125	1.0	1.61	Concrete	0.013	2,332	1.4	-4.29	-4.42	4.2	5.5	
BT-5	BR-5			1758.14	2,283	1500 mm	95	1.0	1.69	Concrete	0.013	2,332	2.6	-4.42	-4.51	5.5	5.0	
BT-6	BR-6			1758.14	2,283	1500 mm	41	1.0	1.78	Concrete	0.013	2,332	2.0	-4.51	-4.55	5.0	6.0	Dren
BT-7	BR-7			1758.14	2,283	1500 mm	32	1.0	1.86	Concrete	0.013	2,332	3.0	-4.55	-4.58	6.0	8.1	
BT-8	BR-8			1758.14	2,283	1500 mm	40	1.0	2.18	Concrete	0.013	2,332	5.0	-4.58	-4.62	8.1	8.1	

Table A10.13 Sewer Design - Colector Sur Nuevo

Pipe Label	Up Node	Increment Area (Aincr), ha	Branch	Cumulative Area (Atot), ha	Total Flow, L/s	Size	Length, m	Slope (S), m/km	Average Velocity, m/s	Material	Mannings Coefficient (n)	Full Flow Capacity, L/s	Upstream Ground Elevation (GLup), m	Upstream Invert Level (ILup), m	Downstream Invert Level (ILdn), m	Upstream Cover, m	Downstream Cover, m	Remarks
T-1	R-1	956.97	Matadero Pumping Station		1,271	1500 mm	140	1.0	1.3	Concrete	0.013	2,332	2.9	-2.1	-2.24	3.5	4.0	
T-2	R-2				1,271	1500 mm	80	1.0	1.3	Concrete	0.013	2,332	3.3	-2.24	-2.32	4.0	4.4	
T-3	R-3				1,271	1500 mm	50	1.0	1.3	Concrete	0.013	2,332	3.6	-2.32	-2.37	4.4	4.5	
T-4	R-4				1,271	1500 mm	180	1.0	1.3	Concrete	0.013	2,332	3.7	-2.37	-2.55	4.5	4.4	
T-5	R-5				1,271	1500 mm	190	1.0	1.3	Concrete	0.013	2,332	3.4	-2.55	-2.74	4.4	4.6	
T-6	R-6				1,271	1500 mm	50	1.0	1.3	Concrete	0.013	2,332	3.4	-2.74	-2.79	4.6	4.7	
T-7	R-7				1,271	1500 mm	70	1.0	1.3	Concrete	0.013	2,332	3.4	-2.79	-2.87	4.7	4.6	
T-8	R-8				1,271	1500 mm	170	1.0	1.3	Concrete	0.013	2,332	3.3	-2.87	-3.04	4.6	4.5	
T-9	R-9				1,271	1500 mm	110	1.0	1.3	Concrete	0.013	2,332	3	-3.04	-3.15	4.5	2.8	
T-10	R-10				1,271	1500 mm	110	1.0	1.3	Concrete	0.013	2,332	1.2	-3.15	-3.26	2.8	2.9	
T-11	R-11				1,271	1500 mm	80	1.0	1.3	Concrete	0.013	2,332	1.2	-3.26	-3.34	2.9	3.0	
T-12	R-12				1,271	1500 mm	90	1.0	1.3	Concrete	0.013	2,332	1.2	-3.34	-3.43	3.0	3.4	
T-13	R-13				1,271	1500 mm	130	1.0	1.3	Concrete	0.013	2,332	1.5	-3.43	-3.56	3.4	3.4	
T-14	R-14				1,271	1500 mm	120	1.0	1.3	Concrete	0.013	2,332	1.4	-3.56	-3.68	3.4	3.5	
T-15	R-15				1,271	1500 mm	110	1.0	1.3	Concrete	0.013	2,332	1.3	-3.68	-3.8	3.5	3.5	
T-16	R-16				1,271	1500 mm	110	1.0	1.3	Concrete	0.013	2,332	1.2	-3.8	-3.91	3.5	3.6	
T-17	R-17		to Caballeria		1,271	1500 mm	40	1.0	1.3	Concrete	0.013	2,332	1.2	-3.91	-3.95	3.6	3.6	

Note: The flow shown above is for the case when wastewater from Luyano Left Bank area is included.

Table A10.14 Design Flows - Luyano Left Colector

Manhole	Sub-District	Area	Cumulative Area	Population	Cumulative Population	Equivalent Population	Cumulative Equivalent Population	Average Sewage Flow	Cumulative Average Sewage Flow	Infiltration	Cumulative Infiltration	Hourly Peak Factor	Hourly Maximum WastewaterFlow	Daily Maximum Wastewater Flow	
		ha	ha	person	person	person	person	m3/d	m3/d	m3/d	m3/d		L/s	L/s	m3/d
LR-1	A3	14.68	14.68	730	730	730	730	235	235	15	15	3.884	10.7	3.4	297
LR-6	A3	16.80	81.07	835	4,031	835	4,031	269	1,298	17	81	3.330	51.0	19.0	1,638
LR-7	A3-A4	7.43	88.50	369	4,400	369	4,400	119	1,417	7	88	3.296	55.1	20.7	1,788
LR-7	A3-A4	7.43	95.92	2,011	6,411	2,011	6,411	647	2,064	40	128	3.143	76.6	30.2	2,605
LR-9	A4	44.34	140.26	12,007	18,417	12,007	18,417	3,866	5,930	240	368	2.688	188.8	86.6	7,485
LR-11	A4	17.10	157.36	4,630	23,048	4,630	23,048	1,491	7,421	93	461	2.591	227.9	108.4	9,366
LR-14	A4	12.79	170.15	3,463	26,511	3,463	26,511	1,115	8,536	69	530	2.530	256.1	124.7	10,774
LR-16	A4	15.47	185.62	4,189	30,700	4,189	30,700	1,349	9,885	84	614	2.467	289.4	144.4	12,476
LR-18	A5	2.65	374.26	562	63,187	630	65,544	203	21,105	11	1,264	2.157	541.5	307.7	26,589
LR-20	A5	20.76	395.02	4,402	67,590	4,935	70,479	1,589	22,694	88	1,352	2.129	574.8	330.8	28,584
LR-22	A5	5.14	400.16	1,090	68,680	1,222	71,701	393	23,087	22	1,374	2.123	583.2	336.6	29,078
LR-22	A5	9.14	409.30	1,938	70,618	2,173	73,874	700	23,787	39	1,412	2.112	597.8	346.7	29,957
LR-24	A5	7.69	416.99	1,631	72,248	1,828	75,702	589	24,376	33	1,445	2.102	609.7	355.3	30,696
LR-25	A5	7.21	424.20	1,529	73,777	1,714	77,416	552	24,927	31	1,476	2.094	621.2	363.3	31,388
LR-26	A5	4.79	442.43	1,016	77,643	1,139	81,749	367	26,323	20	1,553	2.073	649.5	383.6	33,140
LR-31	A5	7.07	449.50	1,499	79,142	1,681	83,430	541	26,864	30	1,583	2.066	660.7	391.4	33,820
LR-34	A5	9.23	458.73	1,957	81,099	2,194	85,624	707	27,571	39	1,622	2.056	674.8	401.7	34,707
LR-41	A5	5.87	464.60	1,245	82,344	1,395	87,019	449	28,020	25	1,647	2.050	683.9	408.2	35,271
LR-42	A5	29.65	494.25	6,287	88,632	7,048	94,067	2,270	30,289	126	1,773	2.022	729.4	441.2	38,120
LR-42	A5	6.97	501.22	1,478	90,110	1,657	95,724	534	30,823	30	1,802	2.016	740.1	449.0	38,790
LR-44	A5	7.50	508.72	1,590	91,700	1,783	97,507	574	31,397	32	1,834	2.009	751.3	457.3	39,510
to PTAR															
LR-50	A3	9.90	9.90	492	492	492	492	159	159	10	10	3.978	7.4	2.3	200
LR-56	A3	15.19	25.09	755	1,247	755	1,247	243	402	15	25	3.736	17.7	5.9	507
LR-57	A3	24.50	49.59	1,218	2,466	1,218	2,466	392	794	24	49	3.513	32.9	11.6	1,002
to LR-6															
LR-60	A1	10.13	10.13	1,095	1,095	1,182	1,182	381	381	22	22	3.752	16.8	5.5	479
LR-62	A1	9.36	19.49	1,012	2,107	1,092	2,274	352	732	20	42	3.542	30.5	10.7	921
LR-64	A1	8.17	27.66	883	2,990	953	3,228	307	1,039	18	60	3.415	41.8	15.1	1,307
LR-65	A1	11.64	39.30	1,258	4,248	1,358	4,586	437	1,477	25	85	3.280	57.0	21.5	1,857
LR-66	A1	12.42	88.82	1,342	9,600	1,449	10,364	467	3,337	27	192	2.939	115.7	48.6	4,196
LR-68	A2	10.29	99.11	2,406	12,006	2,544	12,908	819	4,156	48	240	2.844	139.6	60.5	5,227
LR-70	A2	4.11	103.22	961	12,967	1,016	13,924	327	4,483	19	259	2.811	148.9	65.3	5,639
LR-71	A2	17.04	120.26	3,984	16,950	4,213	18,136	1,356	5,840	80	339	2.695	186.1	85.0	7,347
LR-73	A5	1.42	185.99	301	31,925	338	34,214	109	11,017	6	639				
to LR-18															

Table A10.14 Design Flows - Luyano Left Colector

Manhole	Sub-District	Area	Cumulative Area	Population	Cumulative Population	Equivalent Population	Cumulative Equivalent Population	Average Sewage Flow	Cumulative Average Sewage Flow	Infiltration	Cumulative Infiltration	Hourly Peak Factor	Hourly Maximum WastewaterFlow	Daily Maximum Wastewater Flow	
		ha	ha	person	person	person	person	m3/d	m3/d	m3/d	m3/d		L/s	L/s	m3/d
LR-80	A1	7.90	7.90	854	854	922	922	297	297	17	17	3.823	13.3	4.3	373
LR-83	A1	8.67	16.57	937	1,791	1,012	1,933	326	623	19	36	3.597	26.3	9.1	783
LR-84	A1	12.91	29.48	1,395	3,186	1,506	3,440	485	1,108	28	64	3.391	44.2	16.1	1,393
LR-86	A1	7.62	37.10	824	4,010	889	4,329	286	1,394	16	80	3.302	54.2	20.3	1,753
to LR-66															
LR-90	A2	10.00	10.00	2,338	2,338	2,472	2,472	796	796	47	47	3.512	32.9	11.6	1,002
LR-92	A2	11.47	21.47	2,682	5,020	2,836	5,308	913	1,709	54	100	3.221	64.9	24.9	2,151
LR-93	A2	14.33	35.80	3,350	8,370	3,543	8,850	1,141	2,850	67	167	3.007	101.1	41.5	3,587
LR-97	A2	11.89	47.69	2,780	11,150	2,939	11,790	946	3,796	56	223	2.883	129.3	55.3	4,779
LR-98	A5	16.62	64.31	3,524	14,674	3,951	15,740	1,272	5,068	70	293	2.757	165.1	73.8	6,376
to LR-73												4.500	0.0	0.0	0
LR-100	A5	13.44	13.44	2,850	2,850	3,195	3,195	1,029	1,029	57	57	3.419	41.4	14.9	1,292
to LR-26															

Table A10.15 Sewer Design - Luyano Left Colector

Pipe Label	Up Node	Increment Area (Aincr), ha	Branch	Cumulative Area (Atot), ha	Total Flow, L/s	Size	Length, m	Slope (S), m/km	Average Velocity, m/s	Material	Mannings Coefficient (n)	Full Flow Capacity, L/s	Upstream Ground Elevation (GLup), m	Upstream Invert Level (ILup), m	Downstream Invert Level (ILdn), m	Upstream Cover, m	Downstream Cover, m	Remarks
LT-1	LR-1	14.68		14.68	10.7	E-200 mm	205	19.6	1.15	HDPE-HABANA	0.01	42.4	65.0	63.624	59.624	1.20	1.20	
LT-2	LR-2			14.68	10.7	E-200 mm	110	12.8	1.04	HDPE-HABANA	0.01	34.3	61.0	59.624	58.224	1.20	1.20	
LT-3	LR-3			14.68	10.7	E-200 mm	241	56.5	1.48	HDPE-HABANA	0.01	72.1	59.6	58.224	44.624	1.20	1.20	
LT-4	LR-4			14.68	10.7	E-200 mm	215	14.9	1.08	HDPE-HABANA	0.01	37.0	46.0	44.624	41.424	1.20	1.20	
LT-5	LR-5			14.68	10.7	E-200 mm	114	78.9	1.62	HDPE-HABANA	0.01	85.2	42.8	41.424	32.424	1.20	1.20	
LT-6	LR-6	16.80	from LT-59	81.07	51	E-500 mm	52	1.0	0.77	HDPE-HABANA	0.01	101.9	33.8	27.958	27.907	5.42	1.67	
LT-7	LR-7	14.86		95.93	76.6	E-500 mm	161	21.9	1.83	HDPE-HABANA	0.01	477.4	30.0	27.907	24.373	1.67	1.20	
LT-8	LR-8			95.93	76.6	E-500 mm	229	4.4	1.29	HDPE-HABANA	0.01	213.2	26.0	24.373	23.373	1.20	1.20	
LT-9	LR-9	44.34		140.27	188.8	E-630 mm	170	5.9	1.72	HDPE-HABANA	0.01	451.6	25.0	23.265	22.265	1.20	1.20	
LT-10	LR-10			140.27	188.8	E-630 mm	164	19.6	2.24	HDPE-HABANA	0.01	822.5	24.0	22.265	19.065	1.20	1.20	
LT-11	LR-11	17.10		157.37	227.9	E-800 mm	184	1.1	1.28	HDPE-HABANA	0.01	365.1	20.8	18.922	18.722	1.20	1.20	
LT-12	LR-12			157.37	227.9	E-800 mm	112	7.1	1.81	HDPE-HABANA	0.01	934.5	20.6	18.722	17.922	1.20	1.20	
LT-13	LR-13			157.37	227.9	E-800 mm	205	24.4	2.41	HDPE-HABANA	0.01	1,729.0	19.8	17.922	12.922	1.20	1.20	
LT-14	LR-14	12.79		170.16	256.1	E-800 mm	259	3.5	1.62	HDPE-HABANA	0.01	652.1	14.8	12.749	11.850	1.37	2.07	
LT-15	LR-15			170.16	256.1	E-800 mm	278	3.5	1.49	HDPE-HABANA	0.01	650.4	14.6	11.850	10.890	2.07	2.93	
LT-16	LR-16	15.47		185.63	289.4	E-800 mm	272	3.5	1.57	HDPE-HABANA	0.01	651.0	14.5	10.890	9.949	2.93	1.37	
LT-17	LR-17			185.63	289.4	E-800 mm	169	2.4	1.57	HDPE-HABANA	0.01	538.8	12.0	9.949	9.549	1.37	1.37	
LT-18	LR-18	2.65	from LT-73	374.27	541.5	E-1000 mm	120	2.8	1.86	HDPE-HABANA	0.01	1,066.8	11.6	9.380	9.049	1.37	1.20	
LT-19	LR-19			374.27	541.5	E-1200 mm	120	1.0	1.27	HDPE-HABANA	0.01	1,066.5	11.1	8.870	8.750	1.20	1.82	
LT-20	LR-20	20.76		395.03	574.8	E-1200 mm	111	1.0	1.56	HDPE-HABANA	0.01	1,066.5	11.6	8.750	8.639	1.82	4.53	
LT-21	LR-21			395.03	574.8	E-1200 mm	112	3.3	1.52	HDPE-HABANA	0.01	1,941.4	14.2	8.639	8.270	4.53	1.20	
LT-22	LR-22	14.28		409.31	597.8	E-1200 mm	218	1.0	1.32	HDPE-HABANA	0.01	1,066.5	10.5	8.270	8.052	1.20	8.82	
LT-23	LR-23			409.31	597.8	E-1200 mm	348	1.0	1.31	HDPE-HABANA	0.01	1,066.5	17.9	8.052	7.704	8.82	1.57	
LT-24	LR-24	7.69		417.00	609.7	E-1200 mm	139	1.0	1.34	HDPE-HABANA	0.01	1,066.5	10.3	7.704	7.566	1.57	4.10	
LT-25	LR-25	7.21		424.21	621.2	E-1200 mm	113	1.0	1.57	HDPE-HABANA	0.01	1,066.5	12.7	7.566	7.453	4.10	1.32	
LT-26	LR-26	4.79	from LT-105	442.44	649.5	E-1200 mm	117	2.4	1.86	HDPE-HABANA	0.01	1,663.7	9.8	7.453	7.170	1.32	1.20	
LT-27	LR-27			442.44	649.5	E-1200 mm	19	21.6	2.61	HDPE-HABANA	0.01	4,959.0	9.4	7.170	6.770	1.20	1.20	
LT-28	LR-28			442.44	649.5	E-1200 mm	62	17.7	1.59	HDPE-HABANA	0.01	4,492.1	9.0	6.770	5.670	1.20	1.20	
LT-29	LR-29			442.44	649.5	E-1200 mm	104	1.0	1.33	HDPE-HABANA	0.01	1,066.5	7.9	5.670	5.566	1.20	1.80	
LT-30	LR-30			442.44	649.5	E-1200 mm	9	1.0	1.32	HDPE-HABANA	0.01	1,066.5	8.4	5.566	5.557	1.80	1.91	
LT-31	LR-31	7.07		449.51	660.7	E-1200 mm	61	1.0	1.34	HDPE-HABANA	0.01	1,066.5	8.5	5.557	5.496	1.91	2.47	

Table A10.15 Sewer Design - Luyano Left Colector

Pipe Label	Up Node	Increment Area (Aincr), ha	Branch	Cumulative Area (Atot), ha	Total Flow, L/s	Size	Length, m	Slope (S), m/km	Average Velocity, m/s	Material	Mannings Coefficient (n)	Full Flow Capacity, L/s	Upstream Ground Elevation (GLup), m	Upstream Invert Level (ILup), m	Downstream Invert Level (ILdn), m	Upstream Cover, m	Downstream Cover, m	Remarks
LT-32	LR-32			449.51	660.7	E-1200 mm	35	1.0	1.34	HDPE-HABANA	0.01	1,066.5	9.0	5.496	5.462	2.47	2.61	
LT-33	LR-33			449.51	660.7	E-1200 mm	78	1.0	1.34	HDPE-HABANA	0.01	1,066.5	9.1	5.462	5.384	2.61	2.09	
LT-34	LR-34	9.23		458.74	674.8	E-1200 mm	14	1.0	1.36	HDPE-HABANA	0.01	1,066.5	8.5	5.384	5.370	2.09	2.60	
LT-35	LR-35			458.74	674.8	E-1200 mm	39	1.0	1.37	HDPE-HABANA	0.01	1,066.5	9.0	5.370	5.331	2.60	3.14	
LT-36	LR-36			458.74	674.8	E-1200 mm	27	1.0	1.37	HDPE-HABANA	0.01	1,066.5	9.5	5.331	5.305	3.14	3.47	
LT-37	LR-37			458.74	674.8	E-1200 mm	47	1.0	1.38	HDPE-HABANA	0.01	1,066.5	9.8	5.305	5.258	3.47	3.71	
LT-38	LR-38			458.74	674.8	E-1200 mm	37	1.0	1.39	HDPE-HABANA	0.01	1,066.5	10.0	5.258	5.221	3.71	4.25	
LT-39	LR-39			458.74	674.8	E-1200 mm	134	1.0	1.63	HDPE-HABANA	0.01	1,066.5	10.5	5.221	5.087	4.25	2.58	
LT-40	LR-40			458.74	674.8	E-1200 mm	191	7.4	1.85	HDPE-HABANA	0.01	2,909.1	8.7	5.087	3.670	2.58	1.20	
LT-41	LR-41	5.87		464.61	683.9	E-1200 mm	88	26.3	1.62	HDPE-HABANA	0.01	5,467.8	5.9	3.670	1.370	1.20	2.00	
LT-42	LR-42	36.62		501.23	740.1	E-1200 mm	146	1.2	1.48	HDPE-HABANA	0.01	1,168.3	4.4	1.370	1.195	2.00	2.78	
LT-43	LR-43			501.23	740.1	E-1200 mm	243	1.2	1.48	HDPE-HABANA	0.01	1,168.3	5.0	1.195	0.904	2.78	3.47	
LT-44	LR-44	7.50		508.73	751.3	E-1200 mm	195	1.2	1.5	HDPE-HABANA	0.01	1,168.3	5.4	-0.576	-0.814	4.95	6.38	Crossing Storm Drain
LT-45	LR-45			508.73	751.3	E-1200 mm	89	1.2	1.53	HDPE-HABANA	0.01	1,168.3	6.6	-0.814	-0.916	6.38	4.89	
LT-46	LR-46		to O-1 (PTAR)	508.73	751.3	E-1200 mm	71	1.2	1.74	HDPE-HABANA	0.01	1,168.3	5.0	-0.916	-1.000	4.89	4.97	
LT-50	LR-50	9.9		9.90	7.4	E-200 mm	155	27.8	1.12	HDPE-HABANA	0.01	50.6	61.0	59.624	55.324	1.20	1.20	
LT-51	LR-51			9.90	7.4	E-200 mm	68	54.4	1.32	HDPE-HABANA	0.01	70.7	56.7	55.324	51.624	1.20	1.20	
LT-52	LR-52			9.90	7.4	E-200 mm	64	50.0	1.29	HDPE-HABANA	0.01	67.8	53.0	51.624	48.424	1.20	1.20	
LT-53	LR-53			9.90	7.4	E-200 mm	70	40.3	1.22	HDPE-HABANA	0.01	60.9	49.8	48.424	45.624	1.20	1.20	
LT-54	LR-54			9.90	7.4	E-200 mm	117	59.8	1.35	HDPE-HABANA	0.01	74.2	47.0	45.624	38.624	1.20	1.20	
LT-55	LR-55			9.90	7.4	E-200 mm	89	32.8	0.59	HDPE-HABANA	0.01	54.9	40.0	38.624	35.724	1.20	1.20	
LT-56	LR-56	15.19		25.09	17.7	E-200 mm	110	35.5	1.54	HDPE-HABANA	0.01	57.1	37.1	35.724	31.824	1.20	1.20	
LT-57	LR-57	24.5		49.59	32.9	E-400 mm	105	1.0	0.81	HDPE-HABANA	0.01	56.8	33.2	31.657	31.553	1.20	4.30	
LT-58	LR-58			49.59	32.9	E-400 mm	113	30.0	0.81	HDPE-HABANA	0.01	311.5	36.2	31.553	28.157	4.30	1.20	
LT-59	LR-59		to LR-6	49.59	32.9	E-400 mm	115	1.0	0.81	HDPE-HABANA	0.01	56.8	29.7	28.157	28.042	1.20	5.42	
LT-60	LR-60	10.13		10.13	16.8	E-250 mm	206	1.7	0.78	HDPE-HABANA	0.01	21.4	50.8	49.329	48.984	1.25	1.20	
LT-61	LR-61			10.13	16.8	E-250 mm	239	4.2	0.77	HDPE-HABANA	0.01	33.9	50.4	48.500	47.500	1.68	2.68	
LT-62	LR-62	9.36		19.49	30.5	E-250 mm	226	23.3	1.59	HDPE-HABANA	0.01	80.0	50.4	47.500	42.229	2.68	1.25	
LT-63	LR-63			19.49	30.5	E-250 mm	167	49.1	1.02	HDPE-HABANA	0.01	116.0	43.7	42.229	34.029	1.25	1.25	
LT-64	LR-64	8.17		27.66	57	E-315 mm	83	30.1	1.96	HDPE-HABANA	0.01	166.4	35.5	34.029	31.529	1.20	1.20	
LT-65	LR-65	11.64		39.30	57	E-315 mm	251	17.1	1.72	HDPE-HABANA	0.01	125.5	33.0	31.529	27.229	1.20	1.20	

Table A10.15 Sewer Design - Luyano Left Colector

Pipe Label	Up Node	Increment Area (Aincr), ha	Branch	Cumulative Area (Atot), ha	Total Flow, L/s	Size	Length, m	Slope (S), m/km	Average Velocity, m/s	Material	Mannings Coefficient (n)	Full Flow Capacity, L/s	Upstream Ground Elevation (GLup), m	Upstream Invert Level (ILup), m	Downstream Invert Level (ILdn), m	Upstream Cover, m	Downstream Cover, m	Remarks
LT-66	LR-66	12.42	from LT-86	88.82	115.7	E-630 mm	97	1.0	0.87	HDPE-HABANA	0.01	185.9	28.7	26.965	26.868	1.20	8.60	
LT-67	LR-67			88.82	115.7	E-630 mm	349	1.0	1.08	HDPE-HABANA	0.01	185.9	36.0	26.868	26.519	8.60	5.95	
LT-68	LR-68	10.29		99.11	139.6	E-800 mm	120	1.0	1.1	HDPE-HABANA	0.01	349.7	33.0	26.376	26.256	5.95	10.07	
LT-69	LR-69			99.11	139.6	E-800 mm	205	31.9	1.26	HDPE-HABANA	0.01	1,974.1	37.0	26.256	19.722	10.07	1.20	
LT-70	LR-70	4.11		103.22	148.9	E-800 mm	197	13.2	1.05	HDPE-HABANA	0.01	1,271.9	21.6	19.722	17.122	1.20	1.20	
LT-71	LR-71	17.04		120.26	186.1	E-800 mm	123	1.0	1.2	HDPE-HABANA	0.01	349.7	19.0	17.122	16.999	1.20	1.32	
LT-72	LR-72			120.26	186.1	E-800 mm	330	19.4	1.19	HDPE-HABANA	0.01	1,540.1	19.0	16.999	10.598	1.32	2.32	
LT-73	LR-73	1.42	to LR-18	185.99	313.6	E-800 mm	121	7.2	2	HDPE-HABANA	0.01	940.9	13.6	10.598	9.722	2.32	1.20	
LT-80	LR-80	7.90		7.90	13.3	E-200 mm	178	27.6	1.33	HDPE-HABANA	0.01	50.4	62.0	60.624	55.724	1.20	1.20	
LT-81	LR-81			7.90	13.3	E-200 mm	136	25.1	1.3	HDPE-HABANA	0.01	48.0	57.1	55.724	52.324	1.20	1.20	
LT-82	LR-82			7.90	13.3	E-200 mm	120	25.9	0.77	HDPE-HABANA	0.01	48.8	53.7	52.324	49.224	1.20	1.20	
LT-83	LR-83	8.67		16.57	26.3	E-200 mm	134	82.4	2.19	HDPE-HABANA	0.01	87.0	50.6	49.224	38.224	1.20	1.20	
LT-84	LR-84	12.91		29.48	44.2	E-250 mm	146	35.7	2	HDPE-HABANA	0.01	99.0	39.6	38.184	32.984	1.20	1.20	
LT-85	LR-85			29.48	44.2	E-250 mm	146	20.5	1.75	HDPE-HABANA	0.01	75.0	34.4	32.984	29.984	1.20	1.20	
LT-86	LR-86	7.62	to LR-66	37.10	54.2	E-315 mm	151	17.9	1.71	HDPE-HABANA	0.01	128.4	31.4	29.929	27.229	1.20	1.20	
LT-90	LR-90	10.00		10.00	32.9	E-400 mm	211	1.0	0.81	HDPE-HABANA	0.01	56.8	51.0	49.457	49.246	1.20	1.91	
LT-91	LR-91			10.00	32.9	E-400 mm	260	61.5	0.81	HDPE-HABANA	0.01	445.6	51.5	49.246	33.257	1.91	1.20	
LT-92	LR-92	11.47		21.47	64.9	E-400 mm	298	43.6	1.09	HDPE-HABANA	0.01	375.3	34.8	33.257	20.257	1.20	1.20	
LT-93	LR-93	14.33		35.80	101.1	E-400 mm	160	17.2	1.96	HDPE-HABANA	0.01	235.9	21.8	20.257	17.500	1.20	1.46	
LT-94	LR-94			35.80	101.1	E-400 mm	122	13.5	1.85	HDPE-HABANA	0.01	208.5	19.3	17.500	15.857	1.46	1.20	
LT-95	LR-95			35.80	101.1	E-400 mm	220	13.5	1.85	HDPE-HABANA	0.01	208.5	17.4	15.857	12.901	1.20	1.86	
LT-96	LR-96			35.80	101.1	E-500 mm	114	8.2	1.22	HDPE-HABANA	0.01	291.2	15.1	12.901	11.970	1.77	1.20	
LT-97	LR-97	11.89		47.69	129.3	E-500 mm	114	8.8	1.41	HDPE-HABANA	0.01	301.8	13.6	11.973	10.973	1.20	1.20	
LT-98	LR-98	16.62	to LR-73	64.31	165.1	E-630 mm	124	1.0	1.21	HDPE-HABANA	0.01	185.9	12.6	10.865	10.741	1.20	2.32	
LT-100	LR-100	13.44		13.44	41.4	E-250 mm	172	25.2	1.79	HDPE-HABANA	0.01	83.1	29.0	27.584	23.250	1.20	2.53	
LT-101	LR-101			13.44	41.4	E-250 mm	229	35.7	1.95	HDPE-HABANA	0.01	98.9	26.0	23.250	15.084	2.53	1.20	
LT-102	LR-102			13.44	41.4	E-315 mm	114	19.3	1.59	HDPE-HABANA	0.01	133.2	16.5	15.030	12.830	1.20	1.20	
LT-103	LR-103			13.44	41.4	E-315 mm	86	19.8	1.6	HDPE-HABANA	0.01	134.8	14.3	12.830	11.130	1.20	1.20	
LT-104	LR-104			13.44	41.4	E-315 mm	70	8.6	1.33	HDPE-HABANA	0.01	88.7	12.6	11.129	10.529	1.20	1.20	
LT-105	LR-105		to LR-26	13.44	91.8	E-400 mm	112	20.8	1.98	HDPE-HABANA	0.01	259.0	12.0	10.457	8.140	1.20	1.32	

Table A10.16 Design Flows - Luyano Martin Perez Right Colector

Manhole	Sub-district	Area	Cumulative Area	Population	Cumulative Population	Equivalent Population	Cumulative Equivalent Population	Average Flow	Cumulative Average Flow	Infiltration	Cumulative Infiltration	Hourly Peak Factor	Hourly Maximum Wastewater Flow	Daily Maximum Wastewater Flow	
		ha	ha					m3/d	m3/d	m3/d	m3/d		L/s	L/s	m3/d
LMP - Colector Este															
ER-1	E2	4.23	4.23	277	277	277	277	89	89	6	6	4.093	4.3	1.3	113
ER-4	E2	12.19	16.42	798	1,075	798	1,075	257	346	16	22	3.779	15.4	5.1	437
ER-8	E2	7.01	23.43	459	1,534	459	1,534	148	494	9	31	3.672	21.4	7.2	624
ER-10	E2	14.60	38.03	956	2,491	956	2,491	308	802	19	50	3.510	33.2	11.7	1,012
ER-14	E2	5.74	78.44	376	5,137	376	5,137	121	1,654	8	103	3.234	63.1	24.2	2,088
ER-17	E2	2.27	101.36	149	6,730	149	6,780	48	2,183	3	135	3.120	80.4	31.9	2,754
ER-18	E2		147.20		9,732	0	9,782	0	3,150	0	195			46.0	3,974
ER-19	E2	6.48	166.34	424	10,985	424	11,036	137	3,554	8	220	2.912	122.3	51.9	4,484
ER-21	E2	3.54	169.88	232	11,217	232	11,268	75	3,628	5	224	2.903	124.5	53.0	4,578
ER-23	E4	4.27	174.15	402	11,619	444	11,712	143	3,771	8	232	2.886	128.7	55.1	4,758
ER-24			211.18		15,102		15,565		5,012		302			73.1	6,317
ER-25			262.70		19,947		20,926		6,739		399	2.633	210.0	98.2	8,485
ER-26	B2	8.67	271.37	814	20,761	940	21,866	303	7,042	16	415	2.614	217.8	102.6	8,865
ER-29	B2	6.58	289.78	617	22,491	714	23,818	230	7,670	12	450	2.577	234.0	111.7	9,654
ER-30	B2	3.71	293.49	348	22,839	402	24,220	130	7,800	7	457	2.569	237.2	113.6	9,816
ER-31	B2	2.01	453.02	189	40,000	218	44,757	70	14,412	4	800	2.310	394.6	209.4	18,094
ER-32	B3	103.90	770.98	9,600	71,900	9,600	77,595	3,092	24,986	192	1,438	2.093	621.9	363.7	31,421
to PTAR															
ER-40	E2	25.40	25.40	1,663	1,663	1,663	1,663	536	536	33	33	3.647	23.0	7.8	676
ER-48	E2	9.27	34.67	607	2,271	607	2,271	195	731	12	45	3.542	30.5	10.7	923
to ER-14															
ER-100	E1-E2	1.92	1.92	217	217	268	268	86	86	4	4	4.099	4.1	1.2	108
	E1-E2	1.92	3.84	126	343	126	393	40	127	3	7	4.026	6.0	1.8	159
ER-103	E2	11.22	15.06	735	1,078	735	1,128	237	363	15	22	3.766	16.1	5.3	457
ER-107	E2	5.59	20.65	366	1,444	366	1,494	118	481	7	29	3.681	20.8	7.0	606
to ER-17															
ER-60	E2	5.52	5.52	362	362	362	362	116	116	7	7	4.043	5.5	1.7	147
ER-63	E2	2.27	7.79	149	510	149	510	48	164	3	10	3.970	7.7	2.4	207
ER-63	E2	14.89	22.68	975	1,485	975	1,485	314	478	20	30	3.683	20.7	7.0	604
ER-65	E2	3.56	26.24	233	1,719	233	1,719	75	553	5	34	3.636	23.7	8.1	698
ER-67	E2	5.68	31.92	372	2,090	372	2,090	120	673	7	42	3.571	28.3	9.8	850
ER-68	E2	9.52	41.44	623	2,714	623	2,714	201	874	12	54	3.479	35.8	12.8	1,103
ER-71	E2	4.40	45.84	288	3,002	288	3,002	93	967	6	60	3.442	39.2	14.1	1,220
to ER-18															

Table A10.16 Design Flows - Luyano Martin Perez Right Colector

Manhole	Sub-district	Area	Cumulative Area	Population	Cumulative Population	Equivalent Population	Cumulative Equivalent Population	Average Flow	Cumulative Average Flow	Infiltration	Cumulative Infiltration	Hourly Peak Factor	Hourly Maximum Wastewater Flow	Daily Maximum Wastewater Flow	
		ha	ha					m3/d	m3/d	m3/d	m3/d		L/s	L/s	m3/d
ER-80	E2	12.66	12.66	829	829	829	829	267	267	17	17	3.851	12.1	3.9	337
to ER-19															
SR-1	E4	8.88	8.88	835	835	924	924	298	298	17	17	3.822	13.4	4.3	374
SR-3	E4	1.87	10.75	176	1,011	195	1,119	63	360	4	20	3.768	15.9	5.2	453
SR-4	E4	9.79	20.54	921	1,932	1,019	2,137	328	688	18	39	3.563	28.8	10.0	865
SR-5	E4	10.51	31.05	989	2,920	1,094	3,231	352	1,041	20	58	3.415	41.8	15.1	1,307
SR-6	E4	5.98	37.03	562	3,483	622	3,853	200	1,241	11	70	3.348	48.9	18.0	1,559
to ER-24															
SR-20	E4	15.61	15.61	1,468	1,468	1,624	1,624	523	523	29	29	3.654	22.5	7.6	657
SR-26	E4	8.60	24.21	809	2,277	895	2,519	288	811	16	46	3.506	33.4	11.8	1,019
SR-27	E4	11.64	35.85	1,095	3,372	1,211	3,730	390	1,201	22	67	3.360	47.5	17.5	1,509
SR-27	E4	5.62	41.47	529	3,901	585	4,315	188	1,390	11	78	3.304	54.0	20.2	1,746
SR-27	E4	2.57	44.04	242	4,142	267	4,583	86	1,476	5	83	3.280	57.0	21.5	1,854
SR-28	E4	7.48	51.52	704	4,846	778	5,361	251	1,726	14	97	3.217	65.4	25.1	2,169
to ER-25															
SR-40	E4	4.32	4.32	406	406	450	450	145	145	8	8	3.998	6.8	2.1	182
SR-44	E4	5.99	10.31	563	970	623	1,073	201	345	11	19	3.780	15.3	5.0	434
SR-46	B2	1.52	11.83	143	1,112	165	1,238	53	399	3	22	3.738	17.5	5.8	501
to ER-29															
LMP - Colector Norte															
Pumped	E1	19.19	19.19	2,171	2,171	2,674	2,674	861	861	43	43	3.484	35.2	12.5	1,077
NR-1	E1	6.19	25.38	700	2,871	863	3,537	278	1,139	14	57	3.381	45.2	16.5	1,424
NR-3	E1	5.45	30.83	616	3,487	759	4,296	245	1,383	12	70	3.305	53.7	20.0	1,730
	E1	4.07	34.90	460	3,947	567	4,863	183	1,566	9	79	3.256	59.9	22.7	1,958
	E1	4.89	39.79	553	4,501	681	5,545	219	1,785	11	90	3.203	67.2	25.8	2,233
NR-4	E1	21.40	61.19	2,420	6,921	2,982	8,527	960	2,746	48	138	3.023	97.7	39.7	3,433
NR-5	E1	20.03	101.14	2,266	11,440	2,791	14,094	899	4,538	45	229	2.805	150.0	65.7	5,675
NR-8	E1	12.76	113.90	1,443	12,883	1,778	15,872	573	5,111	29	258	2.754	165.9	74.0	6,391
NR-12	E3	2.39	116.29	224	13,107	224	16,096	72	5,183	4	262	2.747	167.8	75.0	6,482
NR-13	E3	4.20	120.49	393	13,500	393	16,490	127	5,309	8	270	2.737	171.3	76.9	6,641
NR-14	E3	6.06	126.55	568	14,068	568	17,057	183	5,492	11	281	2.722	176.3	79.5	6,872
NR-14	E3	6.57	133.12	615	14,683	615	17,672	198	5,690	12	294	2.707	181.7	82.4	7,121
NR-15	B2	11.16	144.28	1,047	15,730	1,210	18,883	390	6,080	21	315	2.678	192.1	88.1	7,610
NR-17	B2	8.36	152.64	784	16,515	907	19,790	292	6,372	16	330	2.657	199.8	92.3	7,976
NR-20	B2	4.88	157.52	458	16,972	529	20,319	170	6,542	9	339	2.646	204.3	94.8	8,190
to ER-31															

Table A10.16 Design Flows - Luyano Martin Perez Right Colector

Manhole	Sub-district	Area	Cumulative Area	Population	Cumulative Population	Equivalent Population	Cumulative Equivalent Population	Average Flow	Cumulative Average Flow	Infiltration	Cumulative Infiltration	Hourly Peak Factor	Hourly Maximum Wastewater Flow	Daily Maximum Wastewater Flow	
		ha	ha					m3/d	m3/d	m3/d	m3/d		L/s	L/s	m3/d
NR-30	E1	11.17	11.17	1,263	1,263	1,557	1,557	501	501	25	25	3.668	21.6	7.3	627
NR-33	E1	4.08	19.92	461	2,253	569	2,776	183	894	9	45	3.471	36.4	12.9	1,118
to NR-5															
NR-40	E1	4.67	4.67	528	528	651	651	210	210	11	11	3.913	9.6	3.0	262
to NR-33															
LMP - Colector Sur															
DR-100	B1	14.8	14.80	1,542	1,542	1,607	1,607	517	517	31	31	3.658	22.3	7.5	652
DR-107	B1	13.34	28.14	1,390	2,932	1,448	3,055	466	984	28	59	3.436	39.8	14.3	1,239
DR-109	B1	12.39	40.53	1,291	4,222	1,345	4,400	433	1,417	26	84	3.296	55.0	20.7	1,784
DR-2	B1	8.00	48.53	833	5,056	868	5,268	280	1,696	17	101	3.224	64.5	24.7	2,137
DR-5	B1	4.06	52.59	423	5,479	441	5,709	142	1,838	8	110	3.191	69.2	26.8	2,315
	B1	2.14	54.73	223	5,702	232	5,941	75	1,913	4	114	3.175	71.6	27.9	2,410
DR-9	B1	4.88	59.61	508	6,210	530	6,471	171	2,084	10	124	3.139	77.1	30.4	2,624
DR-11	B1	3.22	62.83	335	6,545	350	6,821	113	2,196	7	131	3.117	80.7	32.0	2,766
DR-12	B1	3.05	139.57	318	14,540	331	15,151	107	4,878	6	291	2.774	160.0	71.1	6,145
DR-12	B1	4.68	144.25	488	15,027	508	15,660	164	5,042	10	301	2.759	164.5	73.5	6,351
DR-13	B1	12.68	156.93	1,321	16,348	1,377	17,036	443	5,485	26	327	2.723	176.7	80.0	6,909
DR-16	B1	6.19	163.12	645	16,993	672	17,708	216	5,702	13	340	2.706	182.5	83.1	7,182
DR-19	B1	0.30	201.06	31	20,946	33	21,827	10	7,028	1	419	2.614	217.5	102.5	8,852
DR-20	B1	13.00	214.06	1,354	22,300	1,411	23,238	454	7,482	27	446	2.587	229.2	109.1	9,424
to ER-32															
DR-60	B1	13.19	13.19	1,374	1,374	1,432	1,432	461	461	27	27	3.694	20.0	6.7	581
DR-65	B1	7.10	20.29	740	2,114	771	2,203	248	709	15	42	3.553	29.7	10.3	893
DR-69	B1	4.38	24.67	456	2,570	475	2,678	153	862	9	51	3.484	35.4	12.6	1,086
DR-70			73.69		7,677		8,000		2,576		154	3.050	92.7	37.6	3,244
to DR-12															
DR-80	B1	18.39	18.39	1,916	1,916	1,996	1,996	643	643	38	38	3.586	27.1	9.4	810
DR-86	B1	3.93	22.32	409	2,325	427	2,423	137	780	8	47	3.520	32.3	11.4	983
DR-88	B1	6.39	28.71	666	2,991	694	3,117	223	1,003	13	60	3.428	40.5	14.6	1,264
DR-90	B1	3.45	32.16	359	3,350	375	3,491	121	1,124	7	67	3.386	44.8	16.4	1,416
DR-91	B1	4.58	36.74	477	3,827	497	3,988	160	1,284	10	77	3.334	50.4	18.7	1,618
DR-93	B1	5.84	42.58	608	4,436	634	4,622	204	1,488	12	89	3.276	57.5	21.7	1,875
DR-96	B1	6.44	49.02	671	5,107	699	5,322	225	1,713	13	102	3.220	65.0	25.0	2,158
to DR-70															
DR-50	B1	19.01	19.01	1,980	1,980	2,064	2,064	664	664	40	40	3.575	28.0	9.7	837
DR-56	B1	18.63	37.64	1,941	3,921	2,022	4,086	651	1,316	39	78	3.325	51.5	19.2	1,657
to DR-19															

Table A10.17 Sewer Design - Luyano Martin Perez Right Colector

Pipe Label	Up Node	Increment Area, (Aincr), ha	Branch	Cumulative Area (Atot), ha	Total Flow (l/s)	Size	Length, m	Slope (S), m/km)	Average Velocity, m/s	Material	Mannings Coeffficient (n)	Full Capacity, L/s	Upstream Ground Elevation (GLup), m	Upstream Invert (ILup), m	Downstream Invert Level (ILdn), m	Upstream Cover, m	Downstream Cover, m	Remarks
ET-1	ER-1	4.23		4.23	4.3	E-200 mm	108.5	3.4	0.60	HDPE-HABANA	0.01	17.7	50	48.62	48.25	1.20	3.57	
ET-2	ER-2			4.23	4.3	E-200 mm	191.5	3.4	0.60	HDPE-HABANA	0.01	17.7	52	48.25	47.6	3.57	4.22	
ET-3	ER-3			4.23	4.3	E-200 mm	59.5	3.4	0.62	HDPE-HABANA	0.01	17.7	52	47.6	47.4	4.22	3.43	
ET-4	ER-4	12.19		16.42	15.4	E-200 mm	200.5	10.8	1.13	HDPE-HABANA	0.01	31.5	51	35.53	33.36	15.29	1.36	
ET-5	ER-5			16.42	15.4	E-200 mm	53.5	10.0	1.11	HDPE-HABANA	0.01	30.3	34.9	33.36	32.82	1.36	1.20	
ET-6	ER-6			16.42	15.4	E-200 mm	58.5	10.7	1.12	HDPE-HABANA	0.01	31.3	34.2	29.21	28.58	4.81	1.24	
ET-7	ER-7			16.42	15.4	E-250 mm	111.5	8.6	0.80	HDPE-HABANA	0.01	48.6	30	28.58	27.62	1.20	3.16	
ET-8	ER-8	7.01		23.43	21.4	E-250 mm	104	16.4	1.31	HDPE-HABANA	0.01	67.1	31	27.62	25.91	3.16	1.87	
ET-9	ER-9			23.43	21.4	E-250 mm	33	10.0	0.88	HDPE-HABANA	0.01	52.4	28	25.91	25.58	1.87	1.20	
ET-10	ER-10	14.6		38.03	33.2	E-250 mm	99	16.0	1.50	HDPE-HABANA	0.01	66.2	27	25.58	24	1.20	1.98	
ET-11	ER-11			38.03	33.2	E-250 mm	216.5	11.3	1.39	HDPE-HABANA	0.01	55.7	26.2	21.75	19.3	4.23	1.48	
ET-12	ER-12			38.03	33.2	E-250 mm	171.5	12.4	1.42	HDPE-HABANA	0.01	58.4	21	19.3	17.16	1.48	1.62	
ET-13	ER-13			38.03	33.2	E-250 mm	158	14.3	1.08	HDPE-HABANA	0.01	62.6	19	17.16	14.91	1.62	1.88	
ET-14	ER-14	5.74	from ET-59	78.44	63.1	E-400 mm	175	10.0	1.50	HDPE-HABANA	0.01	179.7	17	14.91	13.16	1.75	1.20	
ET-15	ER-15			78.44	63.1	E-400 mm	129	10.0	1.50	HDPE-HABANA	0.01	179.7	14.7	11.35	10.06	3.01	1.20	
ET-16	ER-16			78.44	63.1	E-400 mm	159.5	12.6	1.13	HDPE-HABANA	0.01	201.4	11.6	6.65	4.65	4.60	1.61	
ET-17	ER-17	2.27	from ET-108	101.36	80.4	E-400 mm	104.5	21.7	1.21	HDPE-HABANA	0.01	264.4	6.6	4.65	2.39	1.61	2.67	
ET-18	ER-18		from ET-72	147.2	119.6	E-500 mm	137	3.0	1.37	HDPE-HABANA	0.01	176.5	5.4	2.39	1.97	2.59	2.40	
ET-19	ER-19	6.48	from ET-84	166.34	122.3	E-630 mm	114	3.0	1.32	HDPE-HABANA	0.01	322	4.8	1.97	1.63	2.29	3.03	
ET-20	ER-20			166.34	122.3	E-630 mm	212	4.4	1.31	HDPE-HABANA	0.01	390.9	5.2	1.63	0.7	3.03	2.77	
ET-21	ER-21	3.54		169.88	124.5	E-630 mm	43	13.3	1.81	HDPE-HABANA	0.01	678.7	4	0.7	0.12	2.77	1.34	
ET-22	ER-22			169.88	124.5	E-800 mm	41.5	1.0	0.82	HDPE-HABANA	0.01	349.7	2	-3.20	-3.25	4.52	4.57	Rio MartinPerez
ET-23	ER-23	4.27		174.15	128.7	E-800 mm	92	1.0	0.77	HDPE-HABANA	0.01	349.7	2	-3.25	-3.34	4.57	7.26	
ET-24	ER-24		from ST-6	211.18	177.6	E-800 mm	227	1.0	1.18	HDPE-HABANA	0.01	349.7	4.6	-3.34	-3.57	7.26	8.49	
ET-25	ER-25		from ST-31	262.70	210.0	E-800 mm	121.5	1.0	0.99	HDPE-HABANA	0.01	349.7	5.6	-3.71	-3.83	8.63	9.65	
ET-26	ER-26	8.67		271.37	217.8	E-800 mm	130.5	1.0	1.02	HDPE-HABANA	0.01	349.7	6.5	-3.83	-3.96	9.65	10.68	
ET-27	ER-27			271.37	217.8	E-800 mm	98	1.0	1.01	HDPE-HABANA	0.01	349.7	7.4	-3.96	-4.06	10.68	11.68	
ET-28	ER-28			271.37	217.8	E-800 mm	88.5	1.0	0.98	HDPE-HABANA	0.01	349.7	8.3	-4.06	-4.15	11.68	12.17	
ET-29	ER-29	6.58	from ST-46	289.78	234.0	E-800 mm	191.5	1.0	1.05	HDPE-HABANA	0.01	349.7	8.7	-4.15	-4.34	12.17	14.16	
ET-30	ER-30	3.71		293.49	237.2	E-800 mm	205.5	1.1	1.24	HDPE-HABANA	0.01	367.5	10.5	-4.34	-4.57	14.16	11.29	
ET-31	ER-31	2.01	from NT-20	453.02	394.6	E-1000 mm	247.5	1.0	1.07	HDPE-HABANA	0.01	641	7.4	-5.47	-5.72	12.02	11.17	Drop Manhole
ET-32	ER-32	103.9	from DT-21	770.98	621.9	E-1200 mm	416.5	1.0	1.33	HDPE-HABANA	0.01	1,066.50	6.3	-5.72	-6.13	10.99	10.10	

Table A10.17 Sewer Design - Luyano Martin Perez Right Colector

Pipe Label	Up Node	Increment Area, (Aincr), ha	Branch	Cumulative Area (Atot), ha	Total Flow (l/s)	Size	Length, m	Slope (S), m/km)	Average Velocity, m/s	Material	Mannings Coeffficient (n)	Full Capacity, L/s	Upstream Ground Elevation (GLup), m	Upstream Invert (ILup), m	Downstream Invert Level (ILdn), m	Upstream Cover, m	Downstream Cover, m	Remarks
ET-33	ER-33			770.98	621.9	E-1200 mm	281.5	1.0	1.33	HDPE-HABANA	0.01	1,066.50	5	-6.13	-6.41	10.10	8.78	
ET-34	ER-34			770.98	621.9	E-1200 mm	279.5	1.0	1.36	HDPE-HABANA	0.01	1,066.50	3.4	-6.41	-6.69	8.78	10.66	
ET-35	ER-35		**to O-**	770.98	621.9	E-1200 mm	88.5	1.0	1.60	HDPE-HABANA	0.01	1,066.50	5	-6.69	-6.78	10.66	10.75	
ET-40	ER-40	25.40		25.40	23.0	E-400 mm	134.5	1.1	0.60	HDPE-HABANA	0.01	59.5	41	39.53	39.38	1.13	6.28	
ET-41	ER-41			25.40	23.0	E-400 mm	170.5	1.1	0.60	HDPE-HABANA	0.01	59.5	46	39.38	39.19	6.28	8.46	
ET-42	ER-42			25.40	23.0	E-400 mm	120.5	1.1	0.60	HDPE-HABANA	0.01	59.5	48	39.19	39.06	8.46	13.60	
ET-43	ER-43			25.40	23.0	E-400 mm	174	1.1	0.60	HDPE-HABANA	0.01	59.5	53	39.06	38.87	13.60	7.79	
ET-44	ER-44			25.40	23.0	E-400 mm	149	1.1	0.60	HDPE-HABANA	0.01	59.5	47	38.87	38.71	7.79	7.95	
ET-45	ER-45			25.40	23.0	E-400 mm	141	1.1	0.60	HDPE-HABANA	0.01	59.5	47	38.71	38.55	7.95	2.90	
ET-46	ER-46			25.40	23.0	E-400 mm	109	1.1	0.68	HDPE-HABANA	0.01	59.5	41.8	38.55	38.43	2.90	4.22	
ET-47	ER-47			25.40	23.0	E-400 mm	72.5	2.1	0.67	HDPE-HABANA	0.01	82.2	43	38.43	38.28	4.22	5.38	
ET-48	ER-48	9.27		34.67	30.5	E-400 mm	151	1.0	0.80	HDPE-HABANA	0.01	56.8	44	38.28	38.13	5.38	7.53	
ET-49	ER-49			34.67	30.5	E-400 mm	76	32.2	1.58	HDPE-HABANA	0.01	322.5	46	38.13	35.68	7.53	3.97	
ET-50	ER-50			34.67	30.5	E-400 mm	122.5	10.0	1.21	HDPE-HABANA	0.01	179.7	40	35.68	34.46	3.97	1.20	
ET-51	ER-51			34.67	30.5	E-400 mm	237	4.2	0.80	HDPE-HABANA	0.01	116.7	36	34.46	33.46	1.20	1.20	
ET-52	ER-52			34.67	30.5	E-400 mm	165	1.0	0.80	HDPE-HABANA	0.01	56.8	35	33.46	33.29	1.20	6.37	
ET-53	ER-53			34.67	30.5	E-400 mm	254	8.2	1.16	HDPE-HABANA	0.01	163.2	40	33.29	31.2	6.37	1.46	
ET-54	ER-54			34.67	30.5	E-400 mm	274	20.7	1.42	HDPE-HABANA	0.01	258.6	33	31.2	25.52	1.46	4.13	
ET-55	ER-55			34.67	30.5	E-400 mm	206.5	10.0	0.80	HDPE-HABANA	0.01	179.7	30	25.52	23.46	4.13	1.20	
ET-56	ER-56			34.67	30.5	E-400 mm	129	1.0	0.80	HDPE-HABANA	0.01	56.8	25	23.46	23.33	1.20	1.23	
ET-57	ER-57			34.67	30.5	E-400 mm	171	25.6	1.50	HDPE-HABANA	0.01	287.4	24.9	23.33	18.95	1.23	4.60	
ET-58	ER-58			34.67	30.5	E-400 mm	199.5	12.2	1.26	HDPE-HABANA	0.01	198.1	23.9	18.95	16.53	4.60	1.63	
ET-59	ER-59		to ER-14	34.67	30.5	E-400 mm	107	15.1	0.78	HDPE-HABANA	0.01	221.1	18.5	16.53	14.91	1.63	1.75	
ET-60	ER-60	5.52		5.52	5.5	E-200 mm	157.5	10.1	0.82	HDPE-HABANA	0.01	30.5	18	11.7	10.11	6.12	1.21	
ET-61	ER-61			5.52	5.5	E-200 mm	48.5	23.4	0.98	HDPE-HABANA	0.01	46.4	11.5	10.11	8.97	1.21	1.85	
ET-62	ER-62			5.52	5.5	E-200 mm	105	10.5	0.49	HDPE-HABANA	0.01	31.1	11	8.97	7.87	1.85	1.25	
ET-63	ER-63	17.16		22.68	20.7	E-250 mm	104.5	10.0	1.22	HDPE-HABANA	0.01	52.4	9.3	7.87	6.82	1.21	1.16	
ET-64	ER-64			22.68	20.7	E-250 mm	90.5	8.8	1.05	HDPE-HABANA	0.01	49.2	8.2	6.82	6.02	1.16	1.16	
ET-65	ER-65	3.56		26.24	23.7	E-250 mm	126	9.5	1.13	HDPE-HABANA	0.01	51	7.4	6.02	4.83	1.16	1.25	
ET-66	ER-66			26.24	23.7	E-315 mm	106.5	1.9	0.79	HDPE-HABANA	0.01	41.5	6.3	4.83	4.63	1.20	1.20	
ET-67	ER-67	5.68		31.92	28.3	E-315 mm	128.5	6.0	0.82	HDPE-HABANA	0.01	74.3	6.1	4.63	3.86	1.20	1.27	
ET-68	ER-68	9.52		41.44	35.8	E-500 mm	75	1.0	0.84	HDPE-HABANA	0.01	101.9	5.4	3.86	3.78	1.12	1.49	

Table A10.17 Sewer Design - Luyano Martin Perez Right Colector

Pipe Label	Up Node	Increment Area, (Aincr), ha	Branch	Cumulative Area (Atot), ha	Total Flow (l/s)	Size	Length, m	Slope (S), m/km)	Average Velocity, m/s	Material	Mannings Coeffficient (n)	Full Capacity, L/s	Upstream Ground Elevation (GLup), m	Upstream Invert (ILup), m	Downstream Invert Level (ILdn), m	Upstream Cover, m	Downstream Cover, m	Remarks
ET-69	ER-69			41.44	35.8	E-500 mm	131	5.5	0.83	HDPE-HABANA	0.01	239.7	5.7	3.78	3.06	1.49	1.12	
ET-70	ER-70			41.44	35.8	E-500 mm	97	1.0	0.63	HDPE-HABANA	0.01	101.9	4.6	3.06	2.96	1.12	1.21	
ET-71	ER-71	4.40		45.84	39.2	E-500 mm	107	1.0	0.86	HDPE-HABANA	0.01	101.9	4.6	2.96	2.85	1.21	1.82	
ET-72	ER-72		to ER-18	45.84	39.2	E-500 mm	84	5.6	0.78	HDPE-HABANA	0.01	240.5	5.1	2.85	2.39	1.82	2.59	
ET-80	ER-80	12.66		12.66	12.1	E-200 mm	124	10.0	1.03	HDPE-HABANA	0.01	30.3	19.7	15.86	14.62	3.66	1.20	
ET-81	ER-81			12.66	12.1	E-200 mm	112	16.8	1.15	HDPE-HABANA	0.01	39.3	16	8.74	6.86	7.08	1.96	
ET-82	ER-82			12.66	12.1	E-200 mm	193.5	10.0	1.03	HDPE-HABANA	0.01	30.3	9	6.86	4.92	1.96	1.20	
ET-83	ER-83			12.66	12.1	E-200 mm	156.5	7.0	0.95	HDPE-HABANA	0.01	25.4	6.3	4.92	3.82	1.20	1.20	
ET-84	ER-84		to ER-19	12.66	12.1	E-200 mm	153.5	12.1	0.69	HDPE-HABANA	0.01	33.3	5.2	3.82	1.97	1.20	2.65	
ET-100	ER-100	3.84		3.84	6.0	E-200 mm	81.5	10.0	0.84	HDPE-HABANA	0.01	30.3	32.4	25.94	25.12	6.28	1.20	
ET-101	ER-101			3.84	6.0	E-200 mm	150.5	10.0	0.65	HDPE-HABANA	0.01	30.3	26.5	18.83	17.32	7.49	1.20	
ET-102	ER-102			3.84	6.0	E-200 mm	27.5	2.7	0.65	HDPE-HABANA	0.01	15.6	18.7	17.32	17.25	1.20	1.27	
ET-103	ER-103	11.22		15.06	16.1	E-200 mm	104.5	10.0	0.92	HDPE-HABANA	0.01	30.3	18.7	14.87	13.82	3.65	1.20	
ET-104	ER-104			15.06	16.1	E-250 mm	54	3.7	0.92	HDPE-HABANA	0.01	31.9	15.2	13.82	13.62	1.16	1.16	
ET-105	ER-105			15.06	16.1	E-250 mm	117	10.3	1.13	HDPE-HABANA	0.01	53.2	15	10.99	9.78	3.79	1.20	
ET-106	ER-106			15.06	16.1	E-250 mm	43	12.8	0.83	HDPE-HABANA	0.01	59.2	11.2	9.78	9.23	1.20	2.55	
ET-107	ER-107	5.59		20.65	20.8	E-250 mm	105	18.8	1.34	HDPE-HABANA	0.01	71.8	12	9.23	7.26	2.55	2.12	
ET-108	ER-108		to ER-17	20.65	20.8	E-250 mm	207.5	12.6	0.78	HDPE-HABANA	0.01	58.7	9.6	7.26	4.65	2.12	1.74	
NT-1	NR-1	25.38		25.38	45.2	E-315 mm	150.5	10.0	1.41	HDPE-HABANA	0.01	95.9	9.5	7.79	6.28	1.44	1.15	
NT-2	NR-2			25.38	45.2	E-315 mm	151.5	11.4	1.04	HDPE-HABANA	0.01	102.3	7.7	3.3	1.57	4.13	1.36	
NT-3	NR-3	14.41		39.79	67.2	E-630 mm	118.5	1.0	0.71	HDPE-HABANA	0.01	185.9	3.2	1.57	1.45	1.09	1.41	
NT-4	NR-4	21.40		61.19	97.7	E-630 mm	224.5	1.5	0.85	HDPE-HABANA	0.01	226.3	3.4	1.45	1.12	1.41	3.34	
NT-5	NR-5	20.03	from NT-34	101.14	150.0	E-800 mm	89.5	1.0	0.93	HDPE-HABANA	0.01	349.7	5	1.12	1.03	3.20	3.19	
NT-6	NR-6			101.14	150.0	E-800 mm	191.5	1.0	0.93	HDPE-HABANA	0.01	349.7	4.9	1.03	0.84	3.19	4.58	
NT-7	NR-7			101.14	150.0	E-800 mm	123	1.0	0.89	HDPE-HABANA	0.01	349.7	6.1	0.84	0.72	4.58	4.10	
NT-8	NR-8	12.76		113.9	165.9	E-800 mm	106	1.0	0.96	HDPE-HABANA	0.01	349.7	5.5	0.72	0.61	4.10	3.41	
NT-9	NR-9			113.9	165.9	E-800 mm	125	1.0	0.96	HDPE-HABANA	0.01	349.7	4.7	0.61	0.49	3.41	2.64	
NT-10	NR-10			113.9	165.9	E-800 mm	87	1.0	0.96	HDPE-HABANA	0.01	349.7	3.8	0.49	0.40	2.64	2.62	
NT-11	NR-11			113.9	165.9	E-800 mm	96	1.0	0.96	HDPE-HABANA	0.01	349.7	3.7	0.40	0.30	2.62	2.52	
NT-12	NR-12	2.39		116.29	167.8	E-800 mm	101.5	1.0	1.17	HDPE-HABANA	0.01	349.7	3.5	0.30	0.20	2.52	1.32	
NT-13	NR-13	4.2		120.49	171.3	E-800 mm	135.5	1.1	0.77	HDPE-HABANA	0.01	361.1	2.2	-4.00	-4.23	5.52	6.45	Rio Martin Pere
NT-14	NR-14	12.63		133.12	181.7	E-800 mm	279.5	1.0	1.18	HDPE-HABANA	0.01	349.7	2.9	-4.23	-4.41	6.45	6.73	

Table A10.17 Sewer Design - Luyano Martin Perez Right Colector

Pipe Label	Up Node	Increment Area, (Aincr), ha	Branch	Cumulative Area (Atot), ha	Total Flow (l/s)	Size	Length, m	Slope (S), m/km)	Average Velocity, m/s	Material	Mannings Coeffficient (n)	Full Capacity, L/s	Upstream Ground Elevation (GLup), m	Upstream Invert (ILup), m	Downstream Invert Level (ILdn), m	Upstream Cover, m	Downstream Cover, m	Remarks
NT-15	NR-15	11.16		144.28	192.1	E-800 mm	200	1.0	0.99	HDPE-HABANA	0.01	349.7	3	-4.41	-4.76	6.73	6.48	
NT-16	NR-16			144.28	192.1	E-800 mm	139.5	1.0	0.97	HDPE-HABANA	0.01	349.7	2.4	-4.76	-4.90	6.48	6.72	
NT-17	NR-17	8.36		152.64	199.8	E-800 mm	120	1.0	1.00	HDPE-HABANA	0.01	349.7	2.5	-4.9	-5.02	6.72	10.94	
NT-18	NR-18			152.64	199.8	E-800 mm	51	1.0	1.00	HDPE-HABANA	0.01	349.7	6.6	-5.02	-5.07	10.94	10.99	
NT-19	NR-19			152.64	199.8	E-800 mm	43	1.0	0.99	HDPE-HABANA	0.01	349.7	6.6	-5.07	-5.11	10.99	10.43	
NT-20	NR-20	4.88	to ER-31	157.52	204.3	E-800 mm	186.5	1.0	1.11	HDPE-HABANA	0.01	349.7	6	-5.11	-5.47	10.43	12.19	
NT-30	NR-30	11.17		11.17	21.6	E-315 mm	118.5	1.1	0.76	HDPE-HABANA	0.01	32.3	16.9	15.43	15.29	1.20	1.33	
NT-31	NR-31			11.17	21.6	E-315 mm	146	17.7	1.29	HDPE-HABANA	0.01	127.6	16.9	11.19	8.6	5.44	2.32	
NT-32	NR-32			11.17	21.6	E-315 mm	157.5	18.3	0.79	HDPE-HABANA	0.01	129.5	11.2	8.6	5.73	2.32	2.50	
NT-33	NR-33	4.08	from NT-43	19.92	36.4	E-315 mm	140	10.5	1.34	HDPE-HABANA	0.01	98.4	8.5	5.73	4.25	2.50	1.27	
NT-34	NR-34		to NR-5	19.92	36.4	E-315 mm	72.5	10.0	1.32	HDPE-HABANA	0.01	95.9	5.8	4.25	3.53	1.27	1.20	
NT-40	NR-40	4.67		4.67	9.6	E-250 mm	175	1.9	0.60	HDPE-HABANA	0.01	23	18.5	17.08	16.75	1.20	3.34	
NT-41	NR-41			4.67	9.6	E-250 mm	53.5	1.9	0.68	HDPE-HABANA	0.01	23	20.3	16.75	16.64	3.34	5.54	
NT-42	NR-42			4.67	9.6	E-250 mm	88.5	7.4	0.87	HDPE-HABANA	0.01	45.1	22.4	16.64	15.98	5.54	1.20	
NT-43	NR-43		to NR-33	4.67	9.6	E-250 mm	176.5	17.7	0.56	HDPE-HABANA	0.01	69.6	17.4	8.85	5.73	8.33	2.55	
ST-1	SR-1	8.88		8.88	13.4	E-200 mm	170.5	10.0	0.88	HDPE-HABANA	0.01	30.3	11	8.16	6.46	2.66	1.37	
ST-2	SR-2			8.88	13.4	E-250 mm	216	4.0	0.76	HDPE-HABANA	0.01	33.3	8	6.46	5.58	1.33	1.20	
ST-3	SR-3	1.87		10.75	15.9	E-315 mm	197	1.7	0.64	HDPE-HABANA	0.01	39.6	7	5.58	5.25	1.15	7.28	
ST-4	SR-4	9.79		20.54	28.8	E-315 mm	234.5	3.3	0.88	HDPE-HABANA	0.01	54.7	12.8	5.25	4.48	7.28	1.64	
ST-5	SR-5	10.51		31.05	41.8	E-315 mm	155.5	10.5	0.96	HDPE-HABANA	0.01	98.1	6.4	4.48	2.86	1.64	1.27	
ST-6	SR-6	5.98	to ER-24	37.03	48.9	E-400 mm	203.5	3.2	0.91	HDPE-HABANA	0.01	102.1	4.4	2.86	2.2	1.20	2.06	
ST-20	SR-20	15.61		15.61	22.5	E-250 mm	119	10.0	1.25	HDPE-HABANA	0.01	52.4	53	47.81	46.62	4.97	1.16	
ST-21	SR-21			15.61	22.5	E-250 mm	143.5	10.0	1.25	HDPE-HABANA	0.01	52.4	48	33.06	31.62	14.72	1.16	
ST-22	SR-22			15.61	22.5	E-250 mm	57	10.0	1.25	HDPE-HABANA	0.01	52.4	33	28.09	27.52	4.69	1.16	
ST-23	SR-23			15.61	22.5	E-250 mm	166	10.0	1.25	HDPE-HABANA	0.01	52.4	28.9	23.28	21.62	5.40	1.16	
ST-24	SR-24			15.61	22.5	E-250 mm	121.5	10.3	1.26	HDPE-HABANA	0.01	53.2	23	19.24	17.98	3.54	1.20	
ST-25	SR-25			15.61	22.5	E-315 mm	214	4.3	0.83	HDPE-HABANA	0.01	63.1	19.4	17.98	17.06	1.15	1.27	
ST-26	SR-26	8.60		24.21	33.4	E-400 mm	188	3.0	0.82	HDPE-HABANA	0.01	97.8	18.6	17.06	16.5	1.20	3.46	
ST-27	SR-27	19.83		44.04	57.0	E-400 mm	183.5	13.9	1.13	HDPE-HABANA	0.01	212	20.3	14.29	11.74	5.66	1.92	
ST-28	SR-28	7.48		51.52	65.4	E-400 mm	108	15.2	1.66	HDPE-HABANA	0.01	221.4	14	11.74	10.1	1.92	1.76	
ST-29	SR-29			51.52	65.4	E-400 mm	74	33.0	2.00	HDPE-HABANA	0.01	326.3	12.2	10.1	7.66	1.76	2.90	
ST-30	SR-30			51.52	65.4	E-400 mm	70	39.1	2.08	HDPE-HABANA	0.01	355.2	10.9	7.66	4.92	2.90	3.23	

Table A10.17 Sewer Design - Luyano Martin Perez Right Colector

Pipe Label	Up Node	Increment Area, (Aincr), ha	Branch	Cumulative Area (Atot), ha	Total Flow (l/s)	Size	Length, m	Slope (S), m/km)	Average Velocity, m/s	Material	Mannings Coeffficient (n)	Full Capacity, L/s	Upstream Ground Elevation (GLup), m	Upstream Invert (ILup), m	Downstream Invert Level (ILdn), m	Upstream Cover, m	Downstream Cover, m	Remarks
ST-31	SR-31		to ER-25	51.52	65.4	E-400 mm	86.5	10.0	1.51	HDPE-HABANA	0.01	179.7	8.5	4.92	4.06	3.23	1.20	
ST-40	SR-40	4.32		4.32	6.8	E-200 mm	64.5	10.0	0.87	HDPE-HABANA	0.01	30.3	35	33.37	32.72	1.45	1.20	GEF
ST-41	SR-41			4.32	6.8	E-200 mm	174	10.0	0.87	HDPE-HABANA	0.01	30.3	34.1	25.16	23.42	8.76	1.20	GEF
ST-42	SR-42			4.32	6.8	E-200 mm	82	10.0	0.87	HDPE-HABANA	0.01	30.3	24.8	20.84	20.02	3.78	1.20	GEF
ST-43	SR-43			4.32	6.8	E-200 mm	84.5	10.0	0.87	HDPE-HABANA	0.01	30.3	21.4	17.47	16.62	3.75	1.20	GEF
ST-44	SR-44	5.99		10.31	15.3	E-200 mm	58.5	10.0	1.10	HDPE-HABANA	0.01	30.3	18	15.21	14.62	2.61	1.20	GEF
ST-45	SR-45			10.31	15.3	E-200 mm	143.5	10.0	1.10	HDPE-HABANA	0.01	30.3	16	12.06	10.62	3.76	1.20	GEF
ST-46	SR-46	1.52	to ER-29	11.83	17.5	E-250 mm	188	10.0	1.15	HDPE-HABANA	0.01	52.4	12	9.2	7.32	2.58	1.16	
DT-1	DR-1		from DT-109	40.53	55.0	E-400 mm	402	4.2	1.20	HDPE-HABANA	0.01	116.8	14.1	12.56	10.86	1.20	1.20	GEF
DT-2	DR-2	8.00		48.53	64.5	E-400 mm	88	2.0	0.20	HDPE-HABANA	0.01	953.2	12.4	10.86	10.69	1.20	3.67	GEF
DT-3	DR-3			48.53	64.5	E-500 mm	51	1.0	0.75	HDPE-HABANA	0.01	101.9	14.7	10.69	10.63	3.59	4.34	GEF
DT-4	DR-4			48.53	64.5	E-500 mm	200	1.0	0.91	HDPE-HABANA	0.01	101.9	15.4	10.63	10.43	4.34	1.24	GEF
DT-5	DR-5	6.20		54.73	71.6	E-500 mm	110	7.8	1.42	HDPE-HABANA	0.01	285.1	12.1	10.43	9.57	1.24	1.20	GEF
DT-6	DR-6			54.73	71.6	E-500 mm	129.5	6.2	1.35	HDPE-HABANA	0.01	253.3	11.2	9.57	8.77	1.20	1.20	GEF
DT-7	DR-7			54.73	71.6	E-500 mm	64	3.4	1.21	HDPE-HABANA	0.01	188.9	10.4	8.77	8.55	1.20	1.22	GEF
DT-8	DR-8			54.73	71.6	E-500 mm	48	10.0	1.10	HDPE-HABANA	0.01	322.2	10.2	8.55	8.07	1.22	1.20	GEF
DT-9	DR-9	4.88		59.61	77.1	E-500 mm	165.5	2.4	1.15	HDPE-HABANA	0.01	158.4	9.7	8.07	7.67	1.20	1.20	GEF
DT-10	DR-10			59.61	77.1	E-500 mm	39	7.7	1.04	HDPE-HABANA	0.01	282.6	9.3	7.67	7.37	1.20	1.20	GEF
DT-11	DR-11	3.22		62.83	80.7	E-500 mm	232.5	1.5	0.84	HDPE-HABANA	0.01	123.3	9	7.37	7.03	1.20	2.74	GEF
DT-12	DR-12	7.73	from DT-71	144.25	164.5	E-630 mm	120.5	2.2	1.33	HDPE-HABANA	0.01	274.4	10.2	7.03	6.77	2.63	2.49	GEF
DT-13	DR-13	12.68		156.93	176.7	E-630 mm	90.5	11.4	1.94	HDPE-HABANA	0.01	627.2	9.8	6.77	5.74	2.49	1.32	GEF
DT-14	DR-14			156.93	176.7	E-630 mm	115.5	10.0	1.88	HDPE-HABANA	0.01	587.9	7.6	5.74	4.59	1.32	1.20	GEF
DT-15	DR-15			156.93	176.7	E-630 mm	107.5	8.7	1.21	HDPE-HABANA	0.01	549.8	6.32	4.59	3.65	1.20	1.20	GEF
DT-16	DR-16	6.19		163.12	182.5	E-630 mm	26	1.0	0.97	HDPE-HABANA	0.01	185.9	5.38	3.65	3.62	1.20	1.22	GEF
DT-17	DR-17			163.12	182.5	E-630 mm	218.5	1.0	1.23	HDPE-HABANA	0.01	185.9	5.37	3.62	3.4	1.22	2.35	GEF
DT-18	DR-18			163.12	182.5	E-630 mm	38.5	4.7	1.26	HDPE-HABANA	0.01	403.7	6.29	3.4	3.22	2.35	3.65	GEF
DT-19	DR-19	0.30	from DT-57	201.06	217.5	E-800 mm	55	1.0	0.99	HDPE-HABANA	0.01	349.7	7.4	3.22	3.16	3.50	3.96	GEF
DT-20	DR-20	13.00		214.06	229.2	E-800 mm	231.5	1.0	1.03	HDPE-HABANA	0.01	349.7	7.8	3.16	2.93	3.96	7.49	GEF
DT-21	DR-21		to ER-32	214.06	229.2	E-800 mm	231	1.0	1.26	HDPE-HABANA	0.01	349.7	11.1	2.93	2.7	7.49	2.92	
DT-50	DR-50	19.01		19.01	28.0	E-200 mm	68.5	10.0	1.35	HDPE-HABANA	0.01	30.3	39	33.31	32.62	5.51	1.20	GEF
DT-51	DR-51			19.01	28.0	E-200 mm	85.5	10.0	1.35	HDPE-HABANA	0.01	30.3	34	26.28	25.42	7.54	1.20	GEF
DT-52	DR-52			19.01	28.0	E-200 mm	68	10.0	1.35	HDPE-HABANA	0.01	30.3	26.8	22.6	21.92	4.02	1.20	GEF
DT-53	DR-53			19.01	28.0	E-200 mm	117	10.0	1.35	HDPE-HABANA	0.01	30.3	23.3	20.79	19.62	2.33	1.20	GEF
DT-54	DR-54			19.01	28.0	E-200 mm	134.5	20.7	1.59	HDPE-HABANA	0.01	43.6	21	13.67	10.89	7.15	2.63	GEF
DT-55	DR-55			19.01	28.0	E-200 mm	186.5	14.9	1.22	HDPE-HABANA	0.01	37	13.7	10.89	8.11	2.63	2.11	GEF
DT-56	DR-56	18.63		37.64	51.5	E-250 mm	199	10.6	1.46	HDPE-HABANA	0.01	54	10.4	8.11	6	2.07	1.33	GEF
DT-57	DR-57		to DR-19	37.64	51.5	E-400 mm	87	1.6	0.99	HDPE-HABANA	0.01	72.1	7.54	6	5.86	1.20	1.20	GEF
DT-60	DR-60	13.19		13.19	20.0	E-200 mm	114.5	14.7	1.31	HDPE-HABANA	0.01	36.7	45	39.87	38.19	4.95	1.73	GEF
DT-61	DR-61			13.19	20.0	E-200 mm	116.5	10.0	1.20	HDPE-HABANA	0.01	30.3	40.1	38.19	37.02	1.73	1.20	GEF

Table A10.17 Sewer Design - Luyano Martin Perez Right Colector

Pipe Label	Up Node	Increment Area, (Aincr), ha	Branch	Cumulative Area (Atot), ha	Total Flow (l/s)	Size	Length, m	Slope (S), m/km)	Average Velocity, m/s	Material	Mannings Coeffficient (n)	Full Capacity, L/s	Upstream Ground Elevation (GLup), m	Upstream Invert (ILup), m	Downstream Invert Level (ILdn), m	Upstream Cover, m	Downstream Cover, m	Remarks
DT-62	DR-62			13.19	20.0	E-200 mm	115.5	9.5	1.19	HDPE-HABANA	0.01	29.6	38.4	37.02	35.92	1.20	1.20	GEF
DT-63	DR-63			13.19	20.0	E-200 mm	124.5	10.8	0.98	HDPE-HABANA	0.01	31.5	37.3	28.57	27.23	8.55	1.29	GEF
DT-64	DR-64			13.19	20.0	E-315 mm	115.5	1.2	0.64	HDPE-HABANA	0.01	33	28.7	27.23	27.09	1.20	1.64	GEF
DT-65	DR-65	7.10		20.29	29.7	E-315 mm	65	8.7	0.83	HDPE-HABANA	0.01	89.2	29	27.09	26.53	1.64	1.20	GEF
DT-66	DR-66			20.29	29.7	E-315 mm	62.5	1.0	0.83	HDPE-HABANA	0.01	30.4	28	26.53	26.47	1.20	2.06	GEF
DT-67	DR-67			20.29	29.7	E-315 mm	108.5	10.0	1.24	HDPE-HABANA	0.01	95.9	28.8	19.61	18.53	8.91	1.20	GEF
DT-68	DR-68			20.29	29.7	E-315 mm	135	16.1	0.97	HDPE-HABANA	0.01	121.8	20	16.28	14.1	3.45	2.03	GEF
DT-69	DR-69	4.38		24.67	35.4	E-315 mm	117	19.0	0.91	HDPE-HABANA	0.01	132.3	16.4	14.1	11.87	2.03	2.26	GEF
DT-70	DR-70		from DT-97	73.69	92.7	E-500 mm	174	9.7	1.60	HDPE-HABANA	0.01	317.3	14.4	11.87	10.18	2.10	1.89	GEF
DT-71	DR-71		to DR-12	73.69	92.7	E-500 mm	161	19.6	1.08	HDPE-HABANA	0.01	450.8	12.5	10.18	7.03	1.89	2.74	GEF
DT-80	DR-80	18.39		18.39	27.1	E-315 mm	61.5	1.0	0.81	HDPE-HABANA	0.01	30.7	53.5	52.03	51.97	1.20	1.56	GEF
DT-81	DR-81			18.39	27.1	E-315 mm	144.5	10.0	1.21	HDPE-HABANA	0.01	95.9	53.8	49.17	47.73	4.35	1.20	GEF
DT-82	DR-82			18.39	27.1	E-315 mm	180.5	10.0	1.21	HDPE-HABANA	0.01	95.9	49.2	41.83	40.03	7.09	1.20	GEF
DT-83	DR-83			18.39	27.1	E-315 mm	57.5	10.0	1.21	HDPE-HABANA	0.01	95.9	41.5	38.8	38.23	2.42	1.20	GEF
DT-84	DR-84			18.39	27.1	E-315 mm	58	10.0	1.21	HDPE-HABANA	0.01	95.9	39.7	35.71	35.13	3.72	1.20	GEF
DT-85	DR-85			18.39	27.1	E-315 mm	113.5	7.7	0.83	HDPE-HABANA	0.01	84	36.6	35.13	34.26	1.20	1.27	GEF
DT-86	DR-86	3.93		22.32	32.3	E-400 mm	52	1.0	0.82	HDPE-HABANA	0.01	56.8	35.8	34.26	34.21	1.20	2.05	GEF
DT-87	DR-87			22.32	32.3	E-400 mm	48.5	10.0	1.23	HDPE-HABANA	0.01	179.7	36.6	29.94	29.46	6.31	1.20	GEF
DT-88	DR-88	6.39		28.71	40.5	E-400 mm	43	10.0	1.31	HDPE-HABANA	0.01	179.7	31	25.49	25.06	5.17	1.20	GEF
DT-89	DR-89			28.71	40.5	E-400 mm	123	10.0	1.02	HDPE-HABANA	0.01	179.7	26.6	22.49	21.26	3.77	1.20	GEF
DT-90	DR-90	3.45		32.16	44.8	E-400 mm	82.5	6.1	1.05	HDPE-HABANA	0.01	139.9	22.8	21.26	20.76	1.20	1.20	GEF
DT-91	DR-91	4.58		36.74	50.4	E-400 mm	79	7.6	0.99	HDPE-HABANA	0.01	156.6	22.3	20.76	20.16	1.20	1.20	GEF
DT-92	DR-92			36.74	50.4	E-400 mm	130	1.6	0.81	HDPE-HABANA	0.01	72.9	21.7	20.16	19.94	1.20	3.71	GEF
DT-93	DR-93	5.84		42.58	57.5	E-500 mm	138	1.0	0.92	HDPE-HABANA	0.01	101.9	24	19.94	19.81	3.63	1.37	GEF
DT-94	DR-94			42.58	57.5	E-500 mm	154.5	10.0	0.92	HDPE-HABANA	0.01	322.2	21.6	17.82	16.27	3.35	1.20	GEF
DT-95	DR-95			42.58	57.5	E-500 mm	117.5	1.0	0.92	HDPE-HABANA	0.01	101.9	17.9	16.27	16.16	1.20	2.02	GEF
DT-96	DR-96	6.44		49.02	65.0	E-500 mm	124	10.0	0.96	HDPE-HABANA	0.01	322.2	18.6	13.21	11.97	4.96	1.20	GEF
DT-97	DR-97		to DR-70	49.02	65.0	E-500 mm	102.5	1.0	0.83	HDPE-HABANA	0.01	101.9	13.6	11.97	11.87	1.20	2.10	GEF
DT-100	DR-100	14.8		14.8	22.3	E-250 mm	146	8.4	1.15	HDPE-HABANA	0.01	48	35	33.53	32.3	1.25	4.08	GEF
DT-101	DR-101			14.8	22.3	E-250 mm	110.5	10.0	1.19	HDPE-HABANA	0.01	52.4	36.6	23.23	22.13	13.15	1.25	GEF
DT-102	DR-102			14.8	22.3	E-250 mm	51	10.0	1.19	HDPE-HABANA	0.01	52.4	23.6	19.54	19.03	3.84	1.25	GEF
DT-103	DR-103			14.8	22.3	E-315 mm	131	10.0	1.14	HDPE-HABANA	0.01	95.9	20.5	16.54	15.23	3.69	1.20	GEF
DT-104	DR-104			14.8	22.3	E-315 mm	40.5	9.9	0.83	HDPE-HABANA	0.01	95.3	16.7	15.23	14.83	1.20	1.20	GEF
DT-105	DR-105			14.8	22.3	E-400 mm	50	1.1	0.65	HDPE-HABANA	0.01	60	16.3	14.83	14.77	1.13	1.38	GEF
DT-106	DR-106			14.8	22.3	E-400 mm	143	1.6	0.64	HDPE-HABANA	0.01	72.3	16.5	14.77	14.54	1.38	3.22	GEF
DT-107	DR-107	13.34		28.14	39.8	E-400 mm	44	12.6	1.37	HDPE-HABANA	0.01	201.7	18.1	14.54	13.99	3.22	4.67	GEF
DT-108	DR-108			28.14	39.8	E-400 mm	93	10.0	0.98	HDPE-HABANA	0.01	179.7	19	13.99	13.06	4.67	1.20	GEF
DT-109	DR-109	12.39	to DR-1	40.53	55.0	E-500 mm	122	4.1	1.04	HDPE-HABANA	0.01	206.3	14.6	13.06	12.56	1.12	1.12	GEF

Table 10.18 Design Flows - Luyano Arriba Colector

Manhole	West Colector	ha	ActPop	E-Pop	CumE-Pop	Av. Flow m3/d	CumAvgFlow m3/d	Infilt m3/d	CumInfil m3/d	PF	HourMax L/s
OR-1	C7	13.11	525	525	525	169	169	11	11	3.963	7.9
OR-4	C7	26.45	1,060	1,060	1,585	341	510	21	32	3.662	22.0
OR-10	C7	31.00	1,242	1,242	2,827	400	910	25	57	3.464	37.2
OR-13	C7	20.74	831	831	3,658	268	1,178	17	73	3.368	46.8
OR-15	C7	24.22	970	970	4,629	313	1,491	19	93	3.276	57.6
OR-22	C7	19.25	771	771	5,400	248	1,739	15	108	3.214	65.9
	C7	**134.77**	**5,400**	**5,400**		**1,739**		**108**			
OR-25	C6	8.5	1,587	1,623	7,023	523	2,262	32	140	3.105	82.9
	South Colector										
SR-1	C6	8.17	1,526	1,560	8,583	502	2,764	31	170	3.020	98.6
SR-8	C6	6.16	1,150	1,176	9,759	379	3,143	23	193	2.965	110.1
SR-10	C6	8.55	1,597	1,632	11,391	526	3,668	32	225	2.898	125.6
SR-11	C6	17.9	3,342	3,418	14,809	1,100	4,769	67	292	2.784	157.0
SR-15	C6	8.65	1,615	1,651	16,460	532	5,300	32	324	2.738	171.7
SR-16	C6	5.65	1,055	1,079	17,539	347	5,648	21	345	2.710	181.1
SR-17	C6	4.37	816	834	18,373	269	5,916	16	362	2.690	188.4
SR-20	C6	1.67	312	319	18,692	103	6,019	6	368	2.682	191.1
	C6	**69.62**	**13,000**	**13,292**		**4,280**		**260**			
SR-21	C5	4.24	407	407	19,099	131	6,150	8	376	2.673	194.6
SR-24	C5	13.62	1,307	1,307	20,406	421	6,571	26	402	2.644	205.7
SR-30	C1	7.13	925	946	946	305	305	18	18	3.815	13.7
SR-33	C1	16.63	2,156	2,207	3,153	711	1,015	43	62	3.424	40.9
SR-36	C1	3.50	454	464	3,618	150	1,165	9	71	3.372	46.3
SR-39	C1	10.57	1,371	1,403	5,020	452	1,616	27	98	3.243	61.8
SR-39	C5	19.86	1,906	1,906	6,926	614	2,230	38	136	3.111	81.9
SR-45	C5	10.69	1,026	1,026	7,952	330	2,561	21	157	3.053	92.3
SR-28	C5	16.2	1,555	1,555	29,912	501	9,632	31	590	2.478	283.1
	C5	**64.61**	**6,200**	**6,200**		**1,997**		**124**			
SR-28	C4	1.17	208	208	30,120	67	9,699	4	594	2.476	284.8
Manhole	East Colector										
ER-30	C1	8.06	1,045	1,070	1,070	344	344	21	21	3.781	15.3
ER-36	C1	11.43	1,482	1,517	2,586	488	833	30	51	3.496	34.3
ER-39	C1	16.80	2,178	2,229	4,816	718	1,550	44	94	3.260	59.6
ER-42	C1	8.83	1,145	1,172	5,988	377	1,928	23	117	3.172	72.1
ER-45	C1	2.67	346	354	6,342	114	2,042	7	124	3.148	75.8
ER-49	C1	1.47	191	195	6,537	63	2,105	4	128	3.135	77.8
ER-60	C1	5.95	772	790	790	254	254	15	15	3.864	11.5
ER-63	C1	9.24	1,198	1,226	2,016	395	649	24	39	3.583	27.4
ER-66	C1	7.43	963	986	3,002	317	966	19	59	3.442	39.2
ER-69	C1	0.76	99	101	3,103	32	999	2	61	3.430	40.4
ER-80	C1	8.28	1,074	1,099	1,099	354	354	21	21	3.773	15.7
ER-53	C1	0.92	119	122	10,861	39	3,497	2	212	2.919	120.6
ER-54	C1	2.18	283	289	11,150	93	3,590	6	218	2.908	123.3
	C1	**121.85**	**15,800**	**16,170**		**5,206**		**316**			
ER-1	C2	3.74	701	701	701	226	226	14	14	3.894	10.3
A	C2	2.57	482	482	1,183	155	381	10	24	3.752	16.8
B	C2	6.72	1,259	1,259	2,442	406	786	25	49	3.517	32.6
C	C2	6.71	1,257	1,257	3,699	405	1,191	25	74	3.364	47.2
ER-6	C2	1.4	262	262	3,962	84	1,276	5	79	3.337	50.2
ER-7	C2	2.66	499	499	4,460	161	1,436	10	89	3.291	55.7
ER-8	C2	2.88	540	540	5,000	174	1,610	11	100	3.245	61.6
	C2	**26.68**	**5,000**	**5,000**		**1,610**		**100**			
ER-9	C3	1.78	200	200	16,350	64	5,264	4	322	2.741	170.7
ER-11	C3	20.47	2,299	2,299	18,649	740	6,005	46	368	2.683	190.7
ER-11	C3	3.27	367	367	19,016	118	6,123	7	375	2.674	193.8
ER-14	C3	8.46	950	950	19,967	306	6,429	19	394	2.653	202.0
ER-15	C3	12.6	1,415	1,415	21,382	456	6,885	28	423	2.623	213.9
ER-16	C3	10.29	1,156	1,156	22,538	372	7,257	23	446	2.600	223.5
ER-19	C3	4.56	512	512	23,050	165	7,422	10	456	2.591	227.8
	C3	**61.43**	**6,900**	**6,900**		**2,222**		**138**			
ER-22	C4	5.01	890	890	32,342	287	10,414	18	642	2.445	302.1
	North Colector										
NR-10	C4	10.59	1,882	1,882	1,882	606	606	38	38	3.606	25.7
NR-14	C4	5.74	1,020	1,020	2,902	329	935	20	58	3.455	38.0

Table 10.18 Design Flows - Luyano Arriba Colector

Manhole	West Colector	ha	ActPop	E-Pop	CumE-Pop	Av. Flow m3/d	CumAvgFlow m3/d	Infilt m3/d	CumInfil m3/d	PF	HourMax L/s
NR-17	C4	5.42	963	963	3,866	310	1,245	19	77	3.347	49.1
NR-1	C4	4.58	814	814	814	262	262	16	16	3.856	11.9
F	C4	2.67	475	475	1,289	153	415	9	26	3.726	18.2
NR-5	C4	8.28	1,472	1,472	2,760	474	889	29	55	3.473	36.4
NR-6	C4	4.4	782	782	3,542	252	1,141	16	71	3.380	45.4
G	C4	2.91	517	517	4,059	167	1,307	10	81	3.328	51.3
NR-8	C4	2.68	476	476	4,536	153	1,461	10	91	3.284	56.6
	C4	**53.45**	**9,500**	**9,500**		**3,059**		**190**			

LU-Arriba1,C2,C3,C4,C5,C6,C7

Area	766.6	ha
Population	61,800	
Average wastewater f	21,349	m3/d
Overall equivalent pop	62,462	
Maximum hourly flow	0.521	L/s

Sub-distric	Area ha	Population person	E-Pop person	Avg. Flow m3/d	Infilt m3/d	Unsewered ha	Sewered ha	Total ha
C1	175.0	15,800	16,170	5,206	316	53.15	121.85	175.0
C2	54.8	5,000	5,000	1,610	100	28.1	26.7	54.8
C3	76.3	6,900	6,900	2,222	138	14.9	61.4	76.3
C4	105.5	9,500	9,500	3,059	190	52.1	53.5	105.5
C5	68.7	6,200	6,200	1,997	124	4.1	64.6	68.7
C6	154.6	13,000	13,292	4,280	260	85.0	69.6	154.6
C7	131.7	5,400	5,400	1,739	108	-3.1	134.8	131.7
	766.6	61,800	62,462	20,113	1,236	181.0	532.4	766.6

Table 10.19 Sewer Design - Luyano Arriba Colector

Pipe Label	Up Node	Aincr, ha	Branch	Atot, ha	Q (l/s)	Size	L (m)	S (m/km)	Avg. v (m/s)	Material	Mannings n	Qf (l/s)	Up. Gr Elev. (m)	Up. Invert (m)	Dn. Invert (m)	Up. Cover (m)	Dn. Cover (m)
ET-1	ER-1	19.74		19.74	10.3	200 mm	70	100	1.76	HDPE	0.009	156.3	80.0	74.65	67.70	5.2	1.1
ET-2	ER-2			19.74	10.3	200 mm	98	60.2	1.54	HDPE	0.009	121.3	69.0	67.70	61.80	1.1	1.0
ET-3	ER-3			19.74	10.3	200 mm	76	52.6	1.48	HDPE	0.009	113.4	63.0	61.80	57.80	1.0	1.0
ET-4	ER-4			19.74	10.3	200 mm	75	67.1	1.58	HDPE	0.009	128	59.0	57.80	52.80	1.0	1.0
ET-5	ER-5			19.74	10.3	200 mm	149	40.3	0.56	HDPE	0.009	99.2	54.0	52.80	46.80	1.0	1.0
ET-6	ER-6	1.40		21.14	50.2	200 mm	59	51.3	2.49	HDPE	0.009	111.9	48.0	46.80	43.80	1.0	1.0
ET-7	ER-7	2.66		23.80	55.7	300 mm	176	17	1.19	HDPE	0.009	190.2	45.0	43.75	40.75	1.0	1.0
ET-8	ER-8	2.88		26.68	61.6	300 mm	385	32.8	2.11	HDPE	0.009	263.8	42.0	40.75	28.13	1.0	6.6
ET-10	ER-9	1.78	ET-54	112.48	170.7	525 mm	56	5	1.45	Conc	0.013	317.2	35.0	27.92	27.65	6.5	1.8
ET-11	ER-10			112.48	170.7	525 mm	109	5	1.43	Conc	0.013	317.2	30.0	27.65	27.10	1.8	1.4
ET-12	ER-11	23.74		136.22	193.8	600 mm	72	5	1.48	Conc	0.013	452.9	29.0	27.10	26.74	1.3	1.7
ET-13	ER-12			136.22	193.8	600 mm	154	5	1.48	Conc	0.013	452.9	29.0	26.74	25.97	1.7	3.4
ET-14	ER-13			136.22	193.8	600 mm	85	5	1.44	Conc	0.013	452.9	30.0	25.97	25.55	3.4	3.9
ET-15	ER-14	8.46		144.68	202.0	600 mm	119	5	1.49	Conc	0.013	452.9	30.0	25.55	24.95	3.9	3.4
ET-16	ER-15	12.60		157.28	213.0	600 mm	89	5	1.48	Conc	0.013	452.9	29.0	24.88	24.43	3.5	3.0
ET-17	ER-16	10.29		167.57	223.5	600 mm	87	5	1.54	Conc	0.013	452.9	28.0	24.43	24.00	3.0	1.4
ET-18	ER-17			167.57	223.5	600 mm	73	21.1	2.08	Conc	0.013	931.3	26.0	24.00	22.47	1.4	0.9
ET-19	ER-18			167.57	223.5	600 mm	37	5	1.52	Conc	0.013	452.9	24.0	22.47	22.28	0.9	4.1
ET-20	ER-19	4.56		172.13	227.8	600 mm	87	5	1.55	Conc	0.013	452.9	27.0	22.28	21.85	4.1	1.5
ET-21	ER-20			172.13	227.8	600 mm	80	5	1.55	Conc	0.013	452.9	24.0	21.85	21.45	1.5	6.9
ET-22	ER-21			172.13	227.8	600 mm	140	5	1.4	Conc	0.013	452.9	29.0	21.45	20.75	6.9	2.6
ET-23	ER-22	5.01	NT-8, NT-20	224.41	302.1	600 mm	57	5	1.66	Conc	0.013	452.9	24.0	20.75	20.47	2.6	3.9
ET-24	ER-23			224.41	302.1	600 mm	284	5	1.68	Conc	0.013	452.9	25.0	20.47	19.05	3.9	6.3
ET-25	ER-24			224.41	302.1	600 mm	126	58.7	2.91	Conc	0.013	1,551.30	26.0	19.05	11.66	6.3	10.7
ET-26	ER-25		ST-28	532.38	585.2	750 mm	43	5	1.96	Conc	0.013	821.2	23.0	11.51	11.29	10.7	8.0
	O-1		**PTAR**	**532.38**									20.0				
ET-30	ER-30	8.06		8.06	15.3	200 mm	37	100	1.98	HDPE	0.009	156.3	94.0	92.35	88.70	1.5	1.1
ET-31	ER-31			8.06	15.3	200 mm	143	41.6	1.57	HDPE	0.009	100.8	90.0	88.70	82.75	1.1	4.1
ET-32	ER-32			8.06	15.3	200 mm	102	100	1.98	HDPE	0.009	156.3	87.0	82.75	72.60	4.1	1.0
ET-33	ER-33			8.06	15.3	200 mm	65	5	0.97	HDPE	0.009	34.9	73.8	72.60	72.27	1.0	1.5
ET-34	ER-34			8.06	15.3	200 mm	81	30.6	1.46	HDPE	0.009	86.4	74.0	72.27	69.80	1.5	1.0
ET-35	ER-35			8.06	15.3	200 mm	65	30.8	0.73	HDPE	0.009	86.7	71.0	69.80	67.80	1.0	1.0
ET-36	ER-36	11.43		19.49	34.3	200 mm	202	34.7	1.95	HDPE	0.009	92.1	69.0	67.80	60.80	1.0	1.0
ET-37	ER-37			19.49	34.3	200 mm	110	36.5	1.97	HDPE	0.009	94.5	62.0	60.80	56.80	1.0	1.0
ET-38	ER-38			19.49	34.3	200 mm	63	48	2.11	HDPE	0.009	108.3	58.0	56.80	53.80	1.0	1.0
ET-39	ER-39	16.80		36.29	59.6	300 mm	177	19.8	1.84	HDPE	0.009	204.9	55.0	53.75	50.25	1.0	1.0
ET-40	ER-40			36.29	59.6	350 mm	107	5	1.32	HDPE	0.009	149	51.5	50.20	49.66	1.0	1.0
ET-41	ER-41			36.29	59.6	350 mm	68	5	1.32	HDPE	0.009	149	51.0	49.66	49.32	1.0	6.3
ET-42	ER-42	8.83		45.12	72.1	350 mm	70	5	1.40	HDPE	0.009	149	56.0	49.28	48.93	6.4	4.7
ET-43	ER-43			45.12	72.1	350 mm	176	5	1.40	HDPE	0.009	149	54.0	48.93	48.05	4.7	1.6
ET-44	ER-44			45.12	72.1	350 mm	185	7.6	1.25	HDPE	0.009	183.5	50.0	48.05	46.65	1.6	1.0
ET-45	ER-45	2.67		47.79	75.8	350 mm	208	19.2	1.92	HDPE	0.009	292.2	48.0	46.65	42.65	1.0	1.0
ET-46	ER-46			47.79	75.8	350 mm	32	5	1.42	HDPE	0.009	149	44.0	42.65	42.49	1.0	5.2
ET-47	ER-47			47.79	75.8	350 mm	44	5	1.42	HDPE	0.009	149	48.0	42.49	42.27	5.2	5.4
ET-48	ER-48			47.79	75.8	350 mm	126	47.8	1.28	HDPE	0.009	460.9	48.0	42.27	36.27	5.4	6.4
ET-49	ER-49	1.47	ET-69	80.92	77.8	350 mm	57	45.9	2.41	HDPE	0.009	451.5	43.0	36.27	33.65	6.4	1.0
ET-50	ER-50			80.92	77.8	350 mm	130	7.7	1.57	HDPE	0.009	184.8	35.0	33.65	32.65	1.0	1.0
ET-51	ER-51			80.92	77.8	350 mm	65	30.8	2.17	HDPE	0.009	369.6	34.0	32.65	30.65	1.0	1.0

Table 10.19 Sewer Design - Luyano Arriba Colector

Pipe Label	Up Node	Aincr, ha	Branch	Atot, ha	Q (l/s)	Size	L (m)	S (m/km)	Avg. v (m/s)	Material	Mannings n	Qf (l/s)	Up. Gr Elev. (m)	Up. Invert (m)	Dn. Invert (m)	Up. Cover (m)	Dn. Cover (m)
ET-52	ER-52			80.92	77.8	350 mm	112	5	1.43	HDPE	0.009	149	32.0	30.65	30.09	1.0	4.6
ET-53	ER-53	0.92		81.84	120.6	525 mm	69	5	1.30	Conc	0.013	317.2	35.0	30.06	29.72	4.4	8.8
ET-54	ER-54	2.18		84.02	123.3	525 mm	344	5	1.32	Conc	0.013	317.2	39.0	29.72	28.00	8.8	6.5
	ER-9			84.02									35.0				
ET-60	ER-60	5.95		5.95	11.5	200 mm	67	44.8	1.47	HDPE	0.009	104.6	54.0	52.70	49.70	1.1	1.1
ET-61	ER-61			5.95	11.5	200 mm	94	5	0.89	HDPE	0.009	34.9	51.0	49.70	49.23	1.1	8.6
ET-62	ER-62			5.95	11.5	200 mm	168	5	0.65	HDPE	0.009	34.9	58.0	49.23	48.39	8.6	1.4
ET-63	ER-63	9.24		15.19	27.4	200 mm	195	28.8	1.72	HDPE	0.009	83.8	50.0	48.39	42.80	1.4	1.0
ET-64	ER-64			15.19	27.4	300 mm	72	5	1.08	HDPE	0.009	103	44.0	42.75	42.39	1.0	8.3
ET-65	ER-65			15.19	27.4	300 mm	167	21.9	0.86	HDPE	0.009	215.5	51.0	42.39	38.75	8.3	1.0
ET-66	ER-66	7.43		22.62	39.2	300 mm	156	5	1.20	HDPE	0.009	103	40.0	38.75	37.97	1.0	2.7
ET-67	ER-67			22.62	39.2	300 mm	74	5	1.20	HDPE	0.009	103	41.0	37.97	37.60	2.7	2.1
ET-68	ER-68			22.62	39.2	300 mm	136	6.3	1.07	HDPE	0.009	115.6	40.0	37.60	36.75	2.1	1.0
ET-69	ER-69	0.76	ET-88	31.66	40.4	300 mm	77	5	1.21	HDPE	0.009	103	38.0	36.75	36.36	1.0	6.3
	ER-49			**31.66**									43.0				
ET-80	ER-80	8.28		8.28	15.7	300 mm	70	28.6	1.35	HDPE	0.009	246.3	53.0	51.70	49.70	1.0	1.0
ET-81	ER-81			8.28	15.7	300 mm	77	5	0.92	HDPE	0.009	103	51.0	49.70	49.31	1.0	6.4
ET-82	ER-82			8.28	15.7	300 mm	62	5	0.92	HDPE	0.009	103	56.0	49.31	49.00	6.4	7.7
ET-83	ER-83			8.28	15.7	300 mm	89	5	0.75	HDPE	0.009	103	57.0	49.00	48.56	7.7	7.1
ET-84	ER-84			8.28	15.7	200 mm	93	5	0.98	HDPE	0.009	34.9	56.0	48.56	48.10	7.2	3.7
ET-85	ER-85			8.28	15.7	200 mm	84	5	0.98	HDPE	0.009	34.9	52.0	48.10	47.68	3.7	3.1
ET-86	ER-86			8.28	15.7	200 mm	71	5	0.98	HDPE	0.009	34.9	51.0	47.68	47.33	3.1	1.5
ET-87	ER-87			8.28	15.7	200 mm	90	28.3	1.44	HDPE	0.009	83.1	49.0	47.33	44.80	1.5	1.0
ET-88	ER-88			8.28	15.7	200 mm	115	69.6	1.81	HDPE	0.009	130.4	46.0	44.80	36.80	1.0	1.0
	ER-69			**8.28**									38.0				
NT-1	NR-1	7.25		7.25	11.9	200 mm	140	100	1.84	HDPE	0.009	156.3	60.0	53.70	39.70	6.1	1.1
NT-2	NR-2			7.25	11.9	200 mm	76	5	0.90	HDPE	0.009	34.9	41.0	39.70	39.32	1.1	6.2
NT-3	NR-3			7.25	11.9	200 mm	91	5.7	0.93	HDPE	0.009	37.4	45.7	39.32	38.80	6.2	1.0
NT-4	NR-4			7.25	11.9	200 mm	107	75.1	0.77	HDPE	0.009	135.5	40.0	38.80	30.80	1.0	1.0
NT-5	NR-5	8.28		15.53	36.4	250 mm	224	5	1.21	HDPE	0.009	63.4	32.0	30.75	29.63	1.0	7.1
NT-6	NR-6	7.31		22.84	45.4	300 mm	165	5	1.25	HDPE	0.009	103	37.0	29.58	28.75	7.1	1.9
NT-7	NR-7			22.84	45.4	300 mm	87	5	1.06	HDPE	0.009	103	31.0	28.75	28.32	1.9	6.9
NT-8	NR-8	2.68		25.52	56.6	300 mm	457	16.1	1.73	HDPE	0.009	184.6	35.5	28.32	20.98	6.9	2.7
	ER-22			**25.52**									24.0				
NT-10	NR-10	10.59		10.59	25.7	300 mm	206	5	1.06	HDPE	0.009	103	50.0	48.70	47.67	1.0	5.0
NT-11	NR-11			10.59	25.7	300 mm	149	5	1.06	HDPE	0.009	103	53.0	47.67	46.93	5.0	4.8
NT-12	NR-12			10.59	25.7	300 mm	101	5	1.06	HDPE	0.009	103	52.0	46.93	46.42	4.8	1.3
NT-13	NR-13			10.59	25.7	300 mm	100	26.7	0.83	HDPE	0.009	238.3	48.0	46.42	43.75	1.3	1.0
NT-14	NR-14	5.74		16.33	38.0	300 mm	109	22.9	1.67	HDPE	0.009	220.7	45.0	43.75	41.25	1.0	1.0
NT-15	NR-15			16.33	38.0	300 mm	148	29.1	1.77	HDPE	0.009	248.4	42.5	41.25	36.95	1.0	1.0
NT-16	NR-16			16.33	38.0	300 mm	186	28	0.99	HDPE	0.009	244	38.2	36.95	31.75	1.0	1.0
NT-17	NR-17	5.42		21.75	49.0	300 mm	162	37.2	2.03	HDPE	0.009	280.9	33.0	31.75	25.75	1.0	1.0
NT-18	NR-18			21.75	49.0	300 mm	44	5	1.28	HDPE	0.009	103	27.0	25.70	25.48	1.0	4.2
NT-19	NR-19			21.75	49.0	300 mm	95	5	1.28	HDPE	0.009	103	30.0	25.48	25.00	4.2	4.7
NT-20	NR-20			21.75	49.0	300 mm	104	38.7	2.05	HDPE	0.009	286.5	30.0	25.00	20.98	4.7	2.7
	ER-22			**21.75**									24.0				

Table 10.19 Sewer Design - Luyano Arriba Colector

Pipe Label	Up Node	Aincr, ha	Branch	Atot, ha	Q (l/s)	Size	L (m)	S (m/km)	Avg. v (m/s)	Material	Mannings n	Qf (l/s)	Up. Gr Elev. (m)	Up. Invert (m)	Dn. Invert (m)	Up. Cover (m)	Dn. Cover (m)
OT-1	OR-1	13.11		13.11	7.9	200 mm	116	51.7	1.37	HDPE	0.009	112.4	80.0	78.70	72.70	1.1	1.1
OT-2	OR-2			13.11	7.9	200 mm	193	46.2	1.33	HDPE	0.009	106.3	74.0	72.70	63.80	1.1	1.0
OT-3	OR-3			13.11	7.9	200 mm	277	21.7	0.57	HDPE	0.009	72.8	65.0	63.80	57.80	1.0	1.0
OT-4	OR-4	26.45		39.56	22.0	250 mm	226	5	1.04	HDPE	0.009	63.4	59.0	57.80	56.67	1.0	6.1
OT-5	OR-5			39.56	22.0	250 mm	116	5	0.91	HDPE	0.009	63.4	63.0	56.67	56.09	6.1	1.7
OT-6	OR-6			39.56	22.0	200 mm	116	62.9	1.96	HDPE	0.009	123.9	58.0	56.09	48.80	1.7	1.0
OT-7	OR-7			39.56	22.0	200 mm	153	32.8	1.66	HDPE	0.009	89.5	50.0	48.80	43.80	1.0	1.0
OT-8	OR-8			39.56	22.0	200 mm	45	5	1.09	HDPE	0.009	34.9	45.0	43.80	43.57	1.0	1.2
OT-9	OR-9			39.56	22.0	200 mm	51	35.1	0.91	HDPE	0.009	92.7	45.0	43.57	41.80	1.2	1.0
OT-10	OR-10	31.00		70.56	37.2	200 mm	47	63.8	2.34	HDPE	0.009	124.9	43.0	41.80	38.80	1.0	1.0
OT-11	OR-11			70.56	37.2	200 mm	154	26.1	1.87	HDPE	0.009	79.8	40.0	38.80	34.80	1.0	1.0
OT-12	OR-12			70.56	37.2	300 mm	54	5	1.18	HDPE	0.009	103	36.0	34.75	34.48	1.0	1.2
OT-13	OR-13	20.74		91.30	46.8	300 mm	257	5	1.26	HDPE	0.009	103	36.0	34.43	33.14	1.3	1.6
OT-14	OR-14			91.30	46.8	300 mm	208	5	1.10	HDPE	0.009	103	35.0	33.14	32.10	1.6	1.6
OT-15	OR-15	24.22		115.52	57.6	350 mm	115	5	1.31	HDPE	0.009	149	34.0	32.10	31.53	1.6	5.1
OT-16	OR-16			115.52	57.6	350 mm	148	5	1.31	HDPE	0.009	149	37.0	31.53	30.79	5.1	4.9
OT-17	OR-17			115.52	57.6	350 mm	48	5	1.31	HDPE	0.009	149	36.0	30.79	30.55	4.9	3.1
OT-18	OR-18			115.52	57.6	350 mm	79	5	1.31	HDPE	0.009	149	34.0	30.55	30.16	3.1	1.7
OT-19	OR-19			115.52	57.6	350 mm	64	38.8	2.10	HDPE	0.009	414.9	32.2	30.16	27.70	1.7	1.0
OT-20	OR-20			115.52	57.6	350 mm	172	35	2.05	HDPE	0.009	394.1	29.0	27.70	21.70	1.0	1.0
OT-21	OR-21			115.52	57.6	350 mm	182	11	1.12	HDPE	0.009	220.9	23.0	21.70	19.70	1.0	1.0
OT-22	OR-22	19.22		134.74	65.9	350 mm	54	5	1.36	HDPE	0.009	149	21.0	19.70	19.43	1.0	2.2
OT-23	OR-23			134.74	65.9	350 mm	47	5	1.36	HDPE	0.009	149	22.0	19.43	19.19	2.2	2.5
OT-24	OR-24			134.74	65.9	350 mm	137	5	1.36	HDPE	0.009	149	22.0	19.19	18.51	2.5	1.1
OT-25	OR-25	8.50		143.24	82.9	350 mm	118	5	1.46	HDPE	0.009	149	20.0	18.46	17.87	1.2	9.8
OT-26	OR-26			143.24	82.9	350 mm	81	28.4	2.17	HDPE	0.009	354.8	28.0	17.87	15.58	9.8	10.1
	SR-24			**143.24**									26.0				
ST-1	SR-1	8.17		8.17	98.6	300 mm	118	76.6	3.07	HDPE	0.009	403.3	74.0	72.70	63.70	1.0	1.0
ST-2	SR-2			8.17	98.6	300 mm	72	68.7	2.99	HDPE	0.009	382	65.0	63.70	58.75	1.0	1.0
ST-3	SR-3			8.17	98.6	300 mm	93	60.2	2.88	HDPE	0.009	357.6	60.0	58.75	53.15	1.0	1.0
ST-4	SR-4			8.17	98.6	300 mm	78	31	2.43	HDPE	0.009	256.4	54.4	53.15	50.75	1.0	1.0
ST-5	SR-5			8.17	98.6	300 mm	92	65.6	2.95	HDPE	0.009	373.1	52.0	50.75	44.75	1.0	1.0
ST-6	SR-6			8.17	98.6	300 mm	54	37	2.54	HDPE	0.009	280.4	46.0	44.75	42.75	1.0	1.0
ST-7	SR-7			8.17	98.6	350 mm	75	40.3	2.51	HDPE	0.009	422.8	44.0	42.75	39.75	0.9	0.9
ST-8	SR-8	6.16		14.33	110.1	350 mm	97	20.6	1.45	HDPE	0.009	302.5	41.0	39.70	37.70	1.0	1.0
ST-9	SR-9			14.33	125.6	350 mm	104	28.8	2.50	HDPE	0.009	357.8	39.0	37.70	34.70	1.0	1.0
ST-10	SR-10	8.55		22.88	125.6	350 mm	128	23.4	2.37	HDPE	0.009	322.6	36.0	34.70	31.70	1.0	1.0
ST-11	SR-11	17.90		40.78	157.0	525 mm	126	5	1.42	Conc	0.013	317.2	33.0	31.54	30.92	0.9	5.6
ST-12	SR-12			40.78	157.0	525 mm	115	11.9	1.42	Conc	0.013	490.1	37.0	30.92	29.54	5.6	0.9
ST-13	SR-13			40.78	157.0	525 mm	48	5	1.42	Conc	0.013	317.2	31.0	29.54	29.30	0.9	2.2
ST-14	SR-14			40.78	157.0	525 mm	152	18.2	1.38	Conc	0.013	605.6	32.0	29.30	26.54	2.2	0.9
ST-15	SR-15	8.65		49.43	171.7	525 mm	226	26.5	1.44	Conc	0.013	731	28.0	26.54	20.54	0.9	0.9
ST-16	SR-16	5.65		55.08	181.1	525 mm	91	22.1	2.02	Conc	0.013	667	22.0	20.54	18.54	0.9	0.9
ST-17	SR-17	4.37		59.45	188.4	600 mm	59	5	1.46	Conc	0.013	452.9	20.0	18.54	18.25	0.9	4.1
ST-18	SR-18			59.45	188.4	600 mm	161	5	1.46	Conc	0.013	452.9	23.0	18.25	17.45	4.1	5.0
ST-19	SR-19			59.45	188.4	600 mm	107	5	1.44	Conc	0.013	452.9	23.0	17.45	16.91	5.0	3.5
ST-20	SR-20	1.67		61.12	191.1	600 mm	128	5	1.45	Conc	0.013	452.9	21.0	16.91	16.28	3.5	12.1
ST-21	SR-21	4.24		65.36	194.6	600 mm	24	5	1.48	Conc	0.013	452.9	29.0	16.28	16.16	12.1	11.9

Table 10.19 Sewer Design - Luyano Arriba Colector

Pipe Label	Up Node	Aincr, ha	Branch	Atot, ha	Q (l/s)	Size	L (m)	S (m/km)	Avg. v (m/s)	Material	Mannings n	Qf (l/s)	Up. Gr Elev. (m)	Up. Invert (m)	Dn. Invert (m)	Up. Cover (m)	Dn. Cover (m)
ST-22	SR-22			65.36	194.6	600 mm	73	5	1.48	Conc	0.013	452.9	28.7	16.16	15.79	11.9	9.6
ST-23	SR-23			65.36	194.6	600 mm	65	5	1.44	Conc	0.013	452.9	26.0	15.79	15.47	9.6	9.9
ST-24	SR-24	13.62	OT-26	222.22	205.7	600 mm	118	5	1.50	Conc	0.013	452.9	26.0	15.47	14.88	9.9	4.5
ST-25	SR-25			222.22	205.7	600 mm	112	5	1.50	Conc	0.013	452.9	20.0	14.88	14.33	4.5	2.1
ST-26	SR-26			222.22	205.7	600 mm	101	5	1.50	Conc	0.013	452.9	17.0	14.33	13.82	2.1	3.9
ST-27	SR-27			222.22	205.7	600 mm	218	5	1.50	Conc	0.013	452.9	18.3	13.82	12.73	3.9	7.7
ST-28	SR-28	17.37	ST-50	307.97	283.1	600 mm	199	5	1.65	Conc	0.013	452.9	21.0	12.65	11.66	7.7	10.7
	ER-25			**307.97**									23.0				
ST-30	SR-30	7.13		7.13	13.7	200 mm	140	35.7	1.46	HDPE	0.009	93.4	60.0	58.70	53.70	1.1	1.1
ST-31	SR-31			7.13	13.7	200 mm	228	17.1	1.23	HDPE	0.009	64.7	55.0	53.70	49.80	1.1	1.0
ST-32	SR-32			7.13	13.7	200 mm	104	5	0.84	HDPE	0.009	34.9	51.0	49.80	49.28	1.0	1.5
ST-33	SR-33	16.63		23.76	40.9	300 mm	115	12.9	1.49	HDPE	0.009	165.8	51.0	49.23	47.75	1.5	1.0
ST-34	SR-34			23.76	40.9	300 mm	111	5	1.21	HDPE	0.009	103	49.0	47.75	47.19	1.0	1.5
ST-35	SR-35			23.76	40.9	300 mm	123	5	1.21	HDPE	0.009	103	49.0	47.19	46.58	1.5	2.1
ST-36	SR-36	3.50		27.26	46.3	300 mm	148	5	1.26	HDPE	0.009	103	49.0	46.53	45.79	2.2	2.9
ST-37	SR-37			27.26	46.3	300 mm	90	5	1.26	HDPE	0.009	103	49.0	45.79	45.34	2.9	1.4
ST-38	SR-38			27.26	46.3	300 mm	193	5.9	0.98	HDPE	0.009	112.4	47.0	45.34	44.20	1.4	1.0
ST-39	SR-39	30.43		57.69	81.9	300 mm	149	43.6	2.49	HDPE	0.009	304.4	45.5	44.20	37.70	1.0	2.0
ST-40	SR-40			57.69	81.9	300 mm	48	100	3.10	HDPE	0.009	460.8	40.0	37.70	32.90	2.0	1.0
ST-41	SR-41			57.69	81.9	300 mm	179	24.6	2.16	HDPE	0.009	228.8	34.2	32.90	28.50	1.0	1.0
ST-42	SR-42			57.69	81.9	350 mm	34	5	1.46	HDPE	0.009	149	29.8	28.45	28.28	1.0	1.4
ST-43	SR-43			57.69	81.9	350 mm	187	20.5	2.00	HDPE	0.009	301.9	30.0	28.28	24.45	1.4	1.0
ST-44	SR-44			57.69	81.9	350 mm	58	13.8	1.82	HDPE	0.009	247.4	25.8	24.45	23.65	1.0	1.0
ST-45	SR-45	10.69		68.38	92.3	525 mm	65	5	1.22	Conc	0.013	317.2	25.0	23.65	23.33	0.8	1.9
ST-46	SR-46			68.38	92.3	525 mm	105	25.6	1.71	Conc	0.013	718.2	25.8	23.33	20.65	1.9	0.8
ST-47	SR-47			68.38	92.3	525 mm	138	7.3	1.31	Conc	0.013	382.6	22.0	20.65	19.65	0.8	0.8
ST-48	SR-48			68.38	92.3	525 mm	179	5.6	1.24	Conc	0.013	335.3	21.0	19.65	18.65	0.8	0.8
ST-49	SR-49			68.38	92.3	525 mm	124	5	1.22	Conc	0.013	317.2	20.0	18.65	18.03	0.8	3.2
ST-50	SR-50			68.38	92.3	525 mm	88	59.3	2.09	Conc	0.013	1,092.90	21.8	18.03	12.84	3.2	7.6
	SR-28			**68.38**									21.0				

Table 10.20 Design Flows - Martin Perez Arriba Colector

Manhole		West Colector ha	ActPop	E-Pop	CumE-Pop	Av. Flow m3/d	CumAvgFlow m3/d	Infilt m3/d	CumInfil m3/d	PF	HourMax L/s
OR-1	D3	13.45	1,312	1,312	1,312	422	422	26.2	26	**3.721**	18.5
OR-3	D3	3.14	306	306	1,618	99	521	6.1	32	**3.655**	22.4
OR-20	*D3*	*6.88*	*671*	*671*	*671*	*216*	*216*	*13.4*	*46*	***3.905***	*10.3*
OR-6	D3	6.38	622	622	2,912	200	938	12.4	58	**3.453**	38.1
					2,912		938		58	**3.453**	38.1
OR-30	D3	13.57	1,324	1,324	1,324	426	426	26.5	26	**3.718**	18.6
OR-8					*4,235*		*1,364*		*85*	***3.311***	*53.2*
										4.500	0.0
OR-40	D3	12.53	1,222	1,222	1,222	394	394	24.4	24	**3.742**	17.3
OR-43	D3	17.89	1,745	1,745	2,967	562	955	34.9	59	**3.446**	38.8
OR-50	D3	18.73	1,827	1,827	1,827	588	588	36.5	37	**3.616**	25.0
OR-10	D3	9.95	971	971	971	313	313	19.4	19	**3.808**	14.0
OR-10					*10,000*		*3,220*		*200*		
	D3	**102.52**	10,000	10,000	10,000	3,220	3,220	200	200	**2.955**	112.4
		EastColector									
ER-1	D1	10.02	3,950	4,007	4,007	1,290	1,290	79.0	79	**3.333**	50.7
ER-7	D1	13.88	5,471	5,551	9,558	1,787	3,078	109.4	188	**2.974**	108.1
ER-9	D1	5.69	2,243	2,275	11,833	733	3,810	44.9	233	**2.882**	129.8
ER-30	D1	13.04	5,140	5,215	17,048	1,679	5,489	102.8	336	**2.722**	176.8
ER-11	D1	11.66	4,596	4,663	21,711	1,501	6,991	91.9	428	**2.617**	216.7
	D1	**54.29**	21,400	21,711	21,711	6,991	6,991	428.0	428	**2.617**	216.7
ER-15	D2	4.59	495	495	22,206	159	7,150	9.9	438	**2.607**	220.8
ER-40	D2	15.18	1,637	1,637	1,637	527	527	32.7	33	**3.652**	22.7
ER-17					23,843		7,678		471	**2.576**	234.4
ER-50	D2	16.4	1,769	1,769	1,769	570	570	35.4	35	**3.627**	24.3
ER-20					25,612		8,247		506	**2.545**	248.8
ER-60	D2	12.36	1,333	1,333	1,333	429	429	26.7	27	**3.716**	18.8
ER-21					26,945		8,676		533	**2.523**	259.5
ER-21	D2	6.17	666	666	27,611	214	8,891	13.3	546	**2.513**	264.9
	D2	**54.7**	5,900	5,900	27,611	1,900	8,891	118.0	546	**2.513**	264.9
RI-1	D4	356	14,600	34,476	34,476	11,101	11,101	292.0	292	**2.418**	314.1
	D4	**356**	14,600	34,476	34,476		11,101	292	292	**2.418**	314.1
Grand Total		**567.51**	**51900**	**72,087**	**72,087**		**23,212**		**1,038**	**2.121**	**581.8**

Summary
MP-Arriba Area D1, D2, D3 and D4

Area	770.8	ha
Population	51,900	
Average wastewater flow	23,212	m^3/d
Overall equivalent population	72,087	
Maximum hourly flow	0.582	L/s

									Unplanned Ar	lanned Are	Total
									ha	ha	ha
D1	**239.2**	ha	**21,400**	person	21,711	6,991	428		183.7	54.3	238.0
D2	**64.7**	ha	**5,900**	person	5,900	1,900	118		10.5	54.7	65.2
D3	**110.5**	ha	**10,000**	person	10,000	3,220	200		9.5	102.5	112.1
D4	**356.4**	ha	**14,600**	person	34,476	11,101	292			356.0	356.0
	770.8		**51,900**		**72,087**	23,212	1,038		**203.6**	**567.5**	**771.2**

Table 10.21 Sewer Design - Martin Perez Arriba Colector

Label	Up Node	Area Incr. (ha)	Branch	Area Tot. (ha)	Q (l/s)	Size	L (m)	S (m/km)	Avg. v (m/s)	Material	Mannings n	Qf (l/s)	Up. Gr Elev. (m)	Up. Invert (m)	Dn. Invert (m)	Up. Cover	Dn. Cover
TE-1	ER-1	10.02		10.02	50.7	300 mm	71	14.2	1.62	HDPE	0.009	173.5	40.0	38.8	37.8	0.9	0.9
TE-2	ER-2			10.02	50.7	300 mm	58	86.2	2.56	HDPE	0.009	427.8	39.0	37.8	32.8	0.9	0.9
TE-3	ER-3			10.02	50.7	450 mm	61	0.5	0.57	HDPE	0.010	89.6	34.0	32.62	32.59	0.9	4.0
TE-4	ER-4			10.02	50.7	600 mm	104	0.5	0.46	Conc	0.013	148.4	37.0	32.59	32.53	3.8	7.9
TE-5	ER-5			10.02	50.7	600 mm	222	0.5	0.73	Conc	0.013	148.4	41.0	32.53	32.41	7.9	6.0
TE-6	ER-6			10.02	50.7	600 mm	98	20.6	0.78	Conc	0.013	920.1	39.0	32.41	30.4	6.0	5.0
TE-7	ER-7	13.88		23.9	108.1	600 mm	63	28.5	1.8	Conc	0.013	1,081.30	36.0	30.4	28.62	5.0	0.8
TE-8	ER-8			23.9	108.1	600 mm	155	12.9	1.17	Conc	0.013	727.6	30.0	28.62	26.62	0.8	0.8
TE-9	ER-9	5.69		29.59	129.8	750 mm	189	0.5	0.59	Conc	0.013	259.7	28.0	26.47	26.37	0.8	0.9
TE-10	ER-10			29.59	129.8	750 mm	232	0.5	0.72	Conc	0.013	259.7	28.0	26.37	26.26	0.9	4.0
TE-11	ER-11	11.66	TE-30	54.29	216.7	750 mm	205	3.9	1.4	Conc	0.013	721.9	31.0	26.26	25.47	4.0	0.8
TE-12	ER-12			54.29	216.7	750 mm	151	46.4	1.32	Conc	0.013	2,500.60	27.0	25.47	18.47	0.8	0.8
TE-13	ER-13			54.29	216.7	825 mm	131	0.5	0.7	Conc	0.013	334.9	20.0	18.31	18.25	0.9	0.9
TE-14	ER-14			54.29	216.7	825 mm	214	0.5	1.04	Conc	0.013	334.9	20.0	18.25	18.14	0.9	1.0
TE-15	ER-15	4.59		58.88	220.8	825 mm	144	12.7	1.1	Conc	0.013	1,690.20	20.0	18.14	16.31	1.0	0.9
TE-16	ER-16			58.88	220.8	825 mm	88	0.5	1.07	Conc	0.013	334.9	18.0	16.31	16.27	0.9	0.9
TE-17	ER-17		TE-44	74.06	234.4	825 mm	149	13.1	1.15	Conc	0.013	1,715.90	18.0	16.27	14.31	0.9	0.9
TE-18	ER-18			74.06	234.4	825 mm	59	0.5	1.15	Conc	0.013	334.9	16.0	14.31	14.28	0.9	2.9
TE-19	ER-19			74.06	234.4	825 mm	134	7.3	1.03	Conc	0.013	1,276.80	18.0	14.28	13.31	2.9	0.9
TE-20	ER-20		TE-56	90.46	248.8	825 mm	103	0.5	0.68	Conc	0.013	334.9	15.0	13.31	13.26	0.9	0.9
TE-21	ER-21	6.17	TE-65	108.99	264.9	825 mm	215	0.5	0.77	Conc	0.013	334.9	15.0	13.26	13.16	0.9	4.0
TE-22	ER-22			108.99	264.9	825 mm	140	0.5	1.04	Conc	0.013	334.9	18.0	13.16	13.09	4.0	2.1
TE-23	ER-23			108.99	264.9	825 mm	285	2.7	1.38	Conc	0.013	779.8	16.0	13.09	12.31	2.1	0.9
TE-24	ER-24			108.99	264.9	825 mm	183	17.2	1.98	Conc	0.013	1,964.40	14.0	12.31	9.17	0.9	4.0
	O-1		**PTAR**	567.51									14.0				
TE-30	ER-30	13.04		13.04	176.8	300 mm	181	56.6	3.61	HDPE	0.009	346.6	38.0	36.7	26.49	1.0	4.2
	ER-11			**13.04**									31.0				
TE-40	ER-40	15.18		15.18	22.7	200 mm	114	17.5	1.44	HDPE	0.009	65.5	40.0	38.85	36.85	1.0	1.0
TE-41	ER-41			15.18	22.7	200 mm	116	69.3	2.03	HDPE	0.009	130.1	38.0	36.85	28.85	1.0	1.0
TE-42	ER-42			15.18	22.7	200 mm	94	53.2	1.89	HDPE	0.009	114	30.0	28.85	23.85	1.0	1.0
TE-43	ER-43			15.18	22.7	200 mm	104	28.8	1.62	HDPE	0.009	83.9	25.0	23.85	20.85	1.0	1.0
TE-44	ER-44			15.18	22.7	200 mm	105	38.7	1.74	HDPE	0.009	97.2	22.0	20.85	16.8	1.0	1.0
	ER-17			**15.18**									18.0				
TE-50	ER-50	16.4		16.40	24.3	200 mm	51	78.4	2.14	HDPE	0.009	138.4	40.0	38.85	34.85	1.0	1.0
TE-51	ER-51			16.40	24.3	200 mm	85	71	2.09	HDPE	0.009	131.7	36.0	34.85	28.85	1.0	1.0
TE-52	ER-52			16.40	24.3	200 mm	122	41.2	1.81	HDPE	0.009	100.3	30.0	28.85	23.85	1.0	1.0
TE-53	ER-53			16.40	24.3	200 mm	120	33.3	1.72	HDPE	0.009	90.2	25.0	23.85	19.85	1.0	1.0
TE-54	ER-54			16.40	24.3	200 mm	82	24.4	1.59	HDPE	0.009	77.2	21.0	19.85	17.85	1.0	1.0
TE-55	ER-55			16.40	24.3	200 mm	55	18.2	1.48	HDPE	0.009	66.6	19.0	17.85	16.85	1.0	1.0
TE-56	ER-56			16.40	24.3	200 mm	79	38.2	1.78	HDPE	0.009	96.6	18.0	16.85	13.85	1.0	1.0
	ER-20			**16.40**									15.0				
TE-60	ER-60	12.36		12.36	18.8	200 mm	105	76.6	1.97	HDPE	0.009	136.7	38.0	36.9	28.9	0.9	0.9
TE-61	ER-61			12.36	18.8	200 mm	99	50.5	1.76	HDPE	0.009	111.1	30.0	28.85	23.85	1.0	1.0
TE-62	ER-62			12.36	18.8	200 mm	136	36.9	1.63	HDPE	0.009	94.9	25.0	23.85	18.85	1.0	1.0
TE-63	ER-63			12.36	18.8	200 mm	132	15.2	1.31	HDPE	0.009	61	20.0	18.85	16.85	1.0	1.0
TE-64	ER-64			12.36	18.8	200 mm	133	7.5	1.13	HDPE	0.009	42.9	18.0	16.85	15.85	1.0	1.0
TE-65	ER-65			12.36	18.8	200 mm	32	65.1	1.88	HDPE	0.009	126.1	17.0	15.85	13.8	1.0	1.0
	ER-21			**12.36**									15.0				
TI-1	RI	356		356	314.1	200 mm	302	13.2	9.69	Conc	0.013	39.4	15.0	13.54	9.54	1.3	1.3
TI-2	RI-2			356	314.1	825 mm	141	1	1.26	Conc	0.013	473.6	11.0	9.31	9.17	0.9	4.0
	O-1		**PTAR**	**356**									14.0				

Table 10.21 Sewer Design - Martin Perez Arriba Colector

Label	Up Node	Area Incr. (ha)	Branch	Area Tot. (ha)	Q (l/s)	Size	L (m)	S (m/km)	Avg. v (m/s)	Material	Mannings n	Qf (l/s)	Up. Gr Elev. (m)	Up. Invert (m)	Dn. Invert (m)	Up. Cover	Dn. Cover
TO-1	OR-1	13.45		13.45	18.5	300 mm	83	1	0.73	HDPE	0.009	46.5	45.0	43.75	43.66	1.0	1.0
TO-2	OR-2			13.45	18.5	300 mm	148	40.1	0.8	HDPE	0.009	291.8	45.0	43.66	37.75	1.0	1.0
TO-3	OR-3	3.14		16.59	22.4	300 mm	43	93	2.04	HDPE	0.009	444.4	39.0	37.75	33.75	1.0	1.0
TO-4	OR-4			16.59	22.4	300 mm	103	68.3	1.88	HDPE	0.009	380.8	35.0	33.75	26.75	1.0	1.0
TO-5	OR-5			16.59	22.4	300 mm	136	22.1	0.86	HDPE	0.009	216.4	28.0	26.75	23.75	1.0	1.0
TO-6	OR-6	6.38	TO-23	29.85	38.1	600 mm	147	34	1.38	Conc	0.013	1,181.40	25.0	23.75	18.75	0.6	0.6
TO-7	OR-7			29.85	38.1	600 mm	134	0.6	0.48	Conc	0.013	160.2	20.0	18.62	18.54	0.8	1.9
TO-8	OR-8			29.85	53.2	600 mm	25	1.6	0.76	Conc	0.013	254.9	21.0	18.54	18.5	1.9	2.9
TO-9	OR-9		TO-35	43.42	71.8	600 mm	237	14.5	0.87	Conc	0.013	771.5	22.0	18.5	15.07	2.9	0.8
TO-10	OR-10	9.95	O-47, TO57	102.52	112.4	600 mm	193	1	0.72	Conc	0.013	202.6	16.5	14.99	14.8	0.9	2.6
TO-11	OR-11			102.52	112.4	600 mm	137	1	0.98	Conc	0.013	202.6	18.0	14.8	14.66	2.6	6.7
TO-12	OR-12			102.52	112.4	600 mm	297	17.7	1.27	Aluminu	0.024	461.7	22.0	14.66	9.4	6.7	4.0
	O-1		**PTAR**	**102.52**									14.0				
TO-20	OR-20	6.88		6.88	10.3	200 mm	58	17.2	1.13	HDPE	0.009	64.9	37.0	35.9	34.9	0.9	0.9
TO-21	OR-21			6.88	10.3	200 mm	214	28	1.27	HDPE	0.009	82.8	36.0	34.9	28.9	0.9	0.9
TO-22	OR-22			6.88	10.3	200 mm	102	39.2	1.38	HDPE	0.009	97.9	30.0	28.9	24.9	0.9	0.9
TO-23	OR-23			6.88	10.3	200 mm	124	8.1	0.96	HDPE	0.009	44.5	26.0	24.9	23.9	0.9	0.9
	OR-6			**6.88**									25.0				
TO-30	OR-30	13.57		13.57	18.6	200 mm	184	54.5	1.79	HDPE	0.009	115.4	39.0	37.85	27.85	1.0	1.0
TO-31	OR-31			13.57	18.6	200 mm	170	5.9	1.07	HDPE	0.009	38	29.0	27.8	26.8	1.0	1.0
TO-32	OR-32			13.57	18.6	200 mm	147	6.8	1.1	HDPE	0.009	40.8	28.0	26.8	25.8	1.0	1.0
TO-33	OR-33			13.57	18.6	200 mm	140	50	1.75	HDPE	0.009	110.5	27.0	25.8	18.8	1.0	1.0
TO-34	OR-34			13.57	18.6	300 mm	69	1	0.6	HDPE	0.009	46.4	20.0	18.75	18.68	1.0	3.0
TO-35	OR-35			13.57	18.6	300 mm	52	1	0.73	HDPE	0.009	46.4	22.0	18.68	18.62	3.0	3.1
	OR-9			**13.57**									22.0				
TO-40	OR-40	12.53		12.53	17.3	200 mm	150	26.8	1.46	HDPE	0.009	80.8	40.0	38.85	34.85	1.0	1.0
TO-41	OR-41			12.53	17.3	200 mm	207	43.6	1.65	HDPE	0.009	103.2	36.0	34.85	25.85	1.0	1.0
TO-42	OR-42			12.53	17.3	200 mm	128	31.2	1.52	HDPE	0.009	87.4	27.0	25.85	21.85	1.0	1.0
TO-43	OR-43	17.89		30.42	38.8	300 mm	182	5.5	1.22	HDPE	0.009	108.2	23.0	21.75	20.75	1.0	1.0
TO-44	OR-44			30.42	38.8	300 mm	139	21.7	1.65	HDPE	0.009	214.5	22.0	20.75	17.75	1.0	1.0
TO-45	OR-45			30.42	38.8	300 mm	59	17.1	1.56	HDPE	0.009	190.5	19.0	17.75	16.75	1.0	1.0
TO-46	OR-46			30.42	38.8	300 mm	85	17.8	1.58	HDPE	0.009	194.1	18.0	16.75	15.25	1.0	1.0
TO-47	OR-47			30.42	38.8	600 mm	86	0.6	0.37	Conc	0.013	159.3	16.5	15.12	15.07	0.8	0.8
	OR-10			**30.42**									16.5				
TO-50	OR-50	18.73		18.73	25	200 mm	157	19.1	1.51	HDPE	0.009	68.3	38.0	36.85	33.85	1.0	1.0
TO-51	OR-51			18.73	25	200 mm	104	67.3	2.08	HDPE	0.009	128.2	35.0	33.85	26.85	1.0	1.0
TO-52	OR-52			18.73	25	200 mm	167	6	1.17	HDPE	0.009	38.3	28.0	26.8	25.8	1.0	1.0
TO-53	OR-53			18.73	25	300 mm	182	0.8	0.77	HDPE	0.009	42	27.0	25.7	25.54	1.0	1.2
TO-54	OR-54			18.73	25	300 mm	82	22.7	1.47	HDPE	0.009	219.5	27.0	25.54	23.7	1.2	1.0
TO-55	OR-55			18.73	25	300 mm	94	21.3	0.77	HDPE	0.009	212.6	25.0	23.7	21.7	1.0	1.0
TO-56	OR-56			18.73	25	300 mm	176	0.8	0.77	HDPE	0.009	42	23.0	21.7	21.55	1.0	1.2
TO-57	OR-57			18.73	25	300 mm	178	36	0.76	HDPE	0.009	276.5	23.0	21.55	15.14	1.2	1.1
	OR-10			18.73									16.5				

Table 10.22 Design Flows - Tadeo Colector

Manhole	East Colector ha	ActPop	E-Pop	CumE-Pop	Av. Flow m3/d	CumAvgFlow m3/d	Infilt m3/d	CumInfil m3/d	PF	HourMax L/s
ET-1	7.62	559	761	761	245	245	11.2	11	**3.873**	11.1
ET-4	4.59	337	458	1,219	147	393	6.7	18	**3.743**	17.2
ET-5	10.18	746	1,016	2,235	327	720	14.9	33	**3.548**	29.9
	18.25	1,338	1,822	4,057	587	1,306	26.8	60	**3.328**	51.0
ET-6	9.32	683	931	4,988	300	1,606	13.7	73	**3.246**	61.2
ET-9	15.06	1,104	1,504	6,492	484	2,090	22.1	95	**3.138**	77.0
ET-12	46	3,373	4,593	11,085	1,479	3,569	67.5	163	**2.910**	122.1
ET-13	19.71	1,445	1,968	13,053	634	4,203	28.9	192	**2.839**	140.3
	24.93	1,828	2,489	15,542	801	5,005	36.6	228	**2.763**	162.7
ET-24	2.03	149	203	15,745	65	5,070	3.0	231	**2.757**	164.5
	15.84	1,162	1,581	17,326	509	5,579	23.2	254	**2.715**	178.3
ET-26	3.18	233	317	17,643	102	5,681	4.7	259	**2.707**	181.0
	176.71	12,958	17,643		5,681	5,681	259.2	259.1	**2.707**	181

	WestColector									
WT-30	20.38	1,494	2,035	2,035	655	655	29.9	30	**3.580**	27.5
	13.78	1,010	1,376	3,411	443	1,098	20.2	50	**3.394**	43.7
	5.51	404	550	3,961	177	1,275	8.1	58	**3.337**	49.9
WT-33	11.56	848	1,154	5,115	372	1,647	17.0	75	**3.236**	62.6
WT-40	4.39	322	438	5,553	141	1,788	6.4	82	**3.202**	67.2
	55.62									
	176.71									
ET-50	**45.95**	3,369	4,588	27,784	1,477	8,947	67.4	408.1	**2.510**	264.6
	278.28	20,406	27,784	27,784	8,947	8,947	408.1	408.1	**2.510**	265

Summary
Tadeo Area **F1**

Area	278.2	ha
Population	20,400	
Average wastewater flow	8,944	m^3/d
Overall equivalent population	27,776	
Maximum hourly flow	265	L/s

Table 10.23 Sewer Design - Tadeo Colector

Label	Up Node	Area Incr. (ha)	Branch	Area Tot. (ha)	Q (l/s)	Size	L (m)	S (m/km)	Avg. v (m/s)	Material	Manning s n	Qf (l/s)	Up. Gr Elev. (m)	Up. Invert (m)	Dn. Invert (m)	Up. Cover (m)	Dn. Cover (m)
T-1	ET-1	7.62		7.62	11.1	200 mm	56.5	1.4	0.71	HDPE	0.009	18.7	57.0	55.75	55.66	1.1	2.1
T-2	ET-2			7.62	11.1	200 mm	144	40.7	1.42	HDPE	0.009	99.8	58.0	55.66	49.80	2.1	1.0
T-3	ET-3			7.62	11.1	200 mm	201.5	34.7	0.71	HDPE	0.009	92.1	51.0	49.80	42.80	1.0	1.0
T-4	ET-4	4.59		12.21	17.2	200 mm	155.5	19.3	0.81	HDPE	0.009	68.6	44.0	42.80	39.80	1.0	1.0
T-5	ET-5	10.18		22.39	29.9	200 mm	154	32.5	1.05	HDPE	0.009	89.1	41.0	39.80	34.80	1.0	1.0
T-6	ET-6	27.57		49.96	61.2	250 mm	146.5	27	2.1	HDPE	0.009	147.1	36.0	34.80	30.85	0.9	0.9
T-7	ET-7			49.96	61.2	300 mm	179	11.2	1.63	HDPE	0.009	154	32.0	30.75	28.75	0.9	0.9
T-8	ET-8			49.96	61.2	300 mm	294.5	17	1.19	HDPE	0.009	189.9	30.0	28.75	23.75	0.9	0.9
T-9	ET-9	15.06		65.02	77	300 mm	121	41.3	2.4	HDPE	0.009	296.2	25.0	23.75	18.75	0.9	0.9
T-10	ET-10			65.02	77	300 mm	168.5	35.6	2.31	HDPE	0.009	275	20.0	18.75	12.75	0.9	0.9
T-11	ET-11			65.02	77	600 mm	150	0.8	0.86	Conc	0.013	183.1	14.0	12.47	12.34	0.9	4.0
T-12	ET-12	46.00		111.02	12	600 mm	62	3.5	0.35	Conc	0.013	378.3	17.0	12.34	12.13	4.0	2.3
T-13	ET-13	19.71		130.73	140	600 mm	89	41.1	1.14	Conc	0.013	1,299.20	15.0	12.13	8.47	2.3	0.9
T-14	ET-14			130.73	140	750 mm	59	0.6	0.62	Conc	0.013	280.4	10.0	8.39	8.36	0.8	5.9
T-15	ET-15			130.73	140	750 mm	42.5	0.6	0.62	Conc	0.013	280.4	15.0	8.36	8.33	5.9	10.9
T-16	ET-16			130.73	140	750 mm	63	0.6	0.62	Conc	0.013	280.4	20.0	8.33	8.29	10.9	11.9
T-17	ET-17			130.73	140	750 mm	34.5	0.6	0.62	Conc	0.013	280.4	21.0	8.29	8.27	11.9	14.0
T-18	ET-18			130.73	140	750 mm	260.5	0.6	0.63	Conc	0.013	280.4	23.0	8.27	8.12	14.0	5.1
T-19	ET-19			130.73	140	750 mm	79.5	0.6	0.65	Conc	0.013	280.4	14.0	8.12	8.08	5.1	3.2
T-20	ET-20			130.73	140	750 mm	59.5	0.6	0.67	Conc	0.013	280.4	12.0	8.08	8.04	3.2	3.2
T-21	ET-21			130.73	140	750 mm	62	0.6	0.7	Conc	0.013	280.4	12.0	8.04	8.01	3.2	3.2
T-22	ET-22			130.73	140	750 mm	48	0.6	0.79	Conc	0.013	280.4	12.0	8.01	7.98	3.2	5.3
T-23	ET-23			130.73	140	750 mm	69	1.3	0.98	Conc	0.013	412.8	14.0	7.98	7.89	5.3	0.8
T-24	ET-24	26.96		157.69	164.5	750 mm	101	29.7	1.98	Conc	0.013	2,001.60	9.5	7.89	4.89	0.8	0.8
T-25	ET-25			157.69	164.5	750 mm	160.5	12.5	1.63	Conc	0.013	1,296.50	6.5	4.89	2.89	0.8	0.8
T-26	ET-26	19.02		176.71	181	750 mm	166	18.8	0.99	Conc	0.013	1,592.40	4.5	2.75	-0.37	1.0	4.1
	WT40			**176.71**													
T-30	WT30	20.38		20.38	27.5	300 mm	134	0.8	0.6	HDPE	0.009	40.8	2.5	1.20	1.09	1.0	1.1
T-31	WT31			20.38	27.5	300 mm	220	0.8	0.69	HDPE	0.009	40.8	2.5	1.09	0.92	1.1	1.3
T-32	WT32			20.38	27.5	450 mm	222.5	0.8	0.74	HDPE	0.009	120.3	2.5	0.92	0.74	1.1	1.3
T-33	WT33	30.85		51.23	62.6	600 mm	191	0.9	0.76	Conc	0.013	197	2.5	0.59	0.41	1.3	3.0
T-34	WT34			51.23	67.2	600 mm	76.5	0.9	0.6	Conc	0.013	191.3	4.0	0.33	0.27	3.1	2.1
T-35	WT35			51.23	67.2	600 mm	195	0.9	0.6	Conc	0.013	191.3	3.0	0.27	0.09	2.1	3.3
T-36	WT36			51.23	67.2	600 mm	34.5	0.9	0.6	Conc	0.013	191.3	4.0	0.09	0.06	3.3	2.8
T-37	WT37			51.23	67.2	600 mm	76	0.9	0.6	Conc	0.013	191.3	3.5	0.06	-0.01	2.8	2.9
T-38	WT38			51.23	67.2	600 mm	105.5	0.9	0.6	Conc	0.013	191.3	3.5	-0.01	-0.10	2.9	3.0
T-39	WT39			51.23	67.2	600 mm	60	0.9	0.61	Conc	0.013	191.3	3.5	-0.10	-0.15	3.0	4.0
	WT40			**51.23**													
T-50	WT40	4.39	T-26, T-39	232.33	248.2	825 mm	75.5	0.5	0.84	Conc	0.013	334.9	4.5	-0.37	-0.41	4.0	4.6
T-51	ET-50	45.95		278.28	265	900 mm	127	0.5	0.71	Conc	0.013	422.3	5.0	-0.50	-0.56	4.6	4.6
T-52	ET-51			278.28	265	900 mm	94	0.5	0.73	Conc	0.013	422.3	5.0	-0.56	-0.61	4.6	3.7
T-53	ET-52			278.28	265	900 mm	262.5	0.5	1.09	Conc	0.013	423.9	4.0	-0.61	-0.74	3.7	2.2
	O-1			**278.28**													