Hydraulic Assessment for Existing and Proposed Sewerage System

Assumptions

1. Roughness = 0.003 m for Concrete Pipe
2. Kinematic Viscosity = 1.14E-06 m^2/s
3. All the sewage from Kowloon Station (166.21 l/s) is discharged to the sewer at Austin Road West

Hydraulic Calcutions for the Proposed Sewers at Austin Road West

Up Man	Down Man	ADWF(m3/d)	ADWF(l/s)	Contributing Population	Peak Factor	Peak Flow (m3/d)	Peak Flow (l/s)	Pipe Diameter(mm)	GL of Manhole(US)	GL of Manhole(DS)	Inv Level of Pipe at USG(mPD)	Inv Level of Pipe at DSG(mPD)	Gradient (1 in)	Length (m)	At Pipe flow full capactiy per pipe(l/s)	At Pipe flow full velocity(m/s)	utilization (%)
F1.1	F1.2	1,194.21	13.82	4,423.00	5	5,971.05	69.11	450	5.6	6	4.16	4.00	250	40	163.56	1.03	42.25
F1.2	F1.3	1,808.80	20.94	6,699.26	4	7,235.20	83.74	450	6	7.3	4.00	3.84	250	40	163.56	1.03	51.20
F1.3	F1.4	1,808.80	20.94	6,699.26	4	7,235.20	83.74	450	7.3	7.3	3.84	3.70	250	35	163.56	1.03	51.20
F1.4	FMH4028437	1,808.80	20.94	6,699.26	4	7,235.20	83.74	450	7.3	7.3	1.50	1.35	100	15	258.89	1.63	32.35
F1.5	F1.6	506.58	5.86	1,876.22	5	2,532.90	29.32	300	7.3	7.3	4.70	4.43	150	40	71.71	1.01	40.88
F1.6	F1.10	506.58	5.86	1,876.22	5	2,532.90	29.32	300	7.3	7.3	4.43	4.17	150	40	71.71	1.01	40.88
F1.7	F1.8	1,645.69	19.05	6,095.15	4	6,582.76	76.19	300	7.3	7.3	4.55	4.15	100	40	87.87	1.24	86.71
F1.8	F1.9	2,054.25	23.78	7,608.33	4	8,217.00	95.10	450	7.3	7.3	4.15	3.88	150	40	211.30	1.33	45.01
F1.9	F1.10	2,054.25	23.78	7,608.33	4	8,217.00	95.10	450	7.3	7.3	3.88	3.62	150	40	211.30	1.33	45.01
F1.10	FMH4028454	2,560.83	29.64	9,484.56	4	10,243.32	118.56	450	7.3	7.3	0.74	0.67	150	10	211.30	1.33	56.11

Hydraulic Calcutions for the Proposed Sewers within the Great Park

Up Man	Down Man	ADWF(m3/d)	ADWF(l/s)	Contributing Population	Peak Factor	Peak Flow (m3/d)	Peak Flow (l/s)	Pipe Diameter(mm)	GL of Manhole(US)	GL of Manhole(DS)	Inv Level of Pipe at USG(mPD)	Inv Level of Pipe at DSG(mPD)	Gradient (1 in)	Length (m)	At Pipe flow full capactiy per pipe(l/s)	At Pipe flow full velocity(m/s)	utilization (%)
F2.1	F2.2	22.62	0.26	84	6	135.72	1.57	225	6	6	3.75	3.35	100	40	40.70	1.02	3.86
F2.2	F2.3	22.62	0.26	84	6	135.72	1.57	225	6	6	3.35	2.95	100	40	40.70	1.02	3.86
F2.3	F2.4	22.62	0.26	84	6	135.72	1.57	225	6	6	2.95	2.55	100	40	40.70	1.02	3.86
F2.4	F2.5	22.62	0.26	84	6	135.72	1.57	225	6	6	2.55	2.15	100	40	40.70	1.02	3.86
F2.5	F2.6	22.62	0.26	84	6	135.72	1.57	225	6	6	2.15	1.95	75	15	47.02	1.18	3.34
F2.14	F2.13	15.20	0.18	56	6	91.20	1.06	225	5	5	3.87	3.47	100	40	40.70	1.02	2.59
F2.13	F2.12	15.20	0.18	56	6	91.20	1.06	225	5	5	3.47	3.07	100	40	40.70	1.02	2.59
F2.12	F2.11	423.02	4.90	1,567	5	2,115.10	24.48	225	5	6	3.07	2.67	100	40	40.70	1.02	60.15
F2.11	F2.10	423.02	4.90	1,567	5	2,115.10	24.48	225	6	6	2.67	2.27	100	40	40.70	1.02	60.15
F2.10	F2.6	423.02	4.90	1,567	5	2,115.10	24.48	225	6	6	2.27	1.95	62	20	51.52	1.30	47.52
F2.6	F2.7	445.64	5.16	1,651	5	2,228.20	25.79	300	6	7	1.95	1.55	100	40	87.87	1.24	29.35
F2.7	F2.8	445.64	5.16	1,651	5	2,228.20	25.79	300	7	7	1.55	1.15	100	40	87.87	1.24	29.35
F2.8	F2.9	445.64	5.16	1,651	5	2,228.20	25.79	300	7	7	1.15	1.00	100	15	87.87	1.24	29.35
F2.15	F2.9	55.21	0.64	204	6	331.26	3.83	225	6	7	3.00	2.85	100	15	40.70	1.02	9.42
F2.9	P1 at Freesapce	445.64	5.16	1,651	5	2,228.20	25.79	300	7	-	1.00	-	100	-	87.87	1.24	29.35
P1 at Freespace	F1.1	445.64	5.16	1,651	5	2,228.20	25.79	Rising Main	-	-	1.00	4.30	-	-	-	-	-

Hydraulic Calcutions for the Sewers at Austin Road West and Lin Cheung Road that to be upgraded under West Kowloon Terminus Development (Manhole nos. refer Drawings of MTRC Contract No. 810B)

Up Man	Down Man	ADWF(m3/d)	ADWF(l/s)	Contributing Population	Peak Factor	Peak Flow (m3/d)	Peak Flow (l/s)	Pipe Diameter(mm)	GL of Manhole(US)	GL of Manhole(DS)	Inv Level of Pipe at USG(mPD)	Inv Level of Pipe at DSG(mPD)	Gradient (1 in)	Length (m)	At Pipe flow full capactiy per pipe(l/s)	At Pipe flow full velocity(m/s)	utilization (%)
FMH4028437	FMH4028438	1,808.80	20.94	6,699	4.0	7,235.20	83.74	450	7.95	8.23	0.65	0.56	378	34	132.97	0.84	62.98
FMH4028438	EX2 (FMH4028439)	1,808.80	20.94	6,699	4.0	7,235.20	83.74	450	8.23	8.19	0.55	0.51	475	19	118.53	0.75	70.65
EX2 (FMH4028439)	P1	16,169.34	187.15	59,886	1.6	25,870.95	299.43	675	8.19	7.67	0.27	0.15	430	50	365.72	1.02	81.88
EX1 (FMH4028454)	P1	2,560.83	29.64	9,485	4.0	10,243.32	118.56	675	7.5	7.67	0.17	0.09	430	35	365.72	1.02	32.42
P1	P2	18,730.17	216.78	69,371	1.6	29,968.28	346.86	750	7.67	7	0.08	-0.03	430	47	483.48	1.09	71.74
P2	P3	18,730.17	216.78	69,371	1.6	29,968.28	346.86	750	7	6.6	-0.03	-0.13	430	42	483.48	1.09	71.74
P3	P4	18,730.17	216.78	69,371	1.6	29,968.28	346.86	750	6.6	6.1	-0.13	-0.24	430	50	483.48	1.09	71.74
P4	P5	18,730.17	216.78	69,371	1.6	29,968.28	346.86	750	6.1	5.68	-0.24	-0.34	430	40	483.48	1.09	71.74
P5	P6	18,730.17	216.78	69,371	1.6	29,968.28	346.86	750	5.68	5.26	-0.34	-0.40	430	25	483.48	1.09	71.74
P6	P7	18,730.17	216.78	69,371	1.6	29,968.28	346.86	750	5.26	5.55	-0.40	-0.54	350	50	536.04	1.21	64.71
P7	P8	18,730.17	216.78	69,371	1.6	29,968.28	346.86	750	5.55	5.37	-0.54	-0.69	350	52	536.04	1.21	64.71
P8	P9	18,730.17	216.78	69,371	1.6	29,968.28	346.86	750	5.37	4.9	-0.69	-0.88	350	68	536.04	1.21	64.71
P9	P9-1	18,730.17	216.78	69,371	1.6	29,968.28	346.86	750	4.9	5.05	-0.88	0.90	350	5	536.04	1.21	64.71

Hydraulic Calcutions for the Sewers at Canton Road

Up Man	Down Man	Pipe Diameter(mm)	No. of Pipe	GL of Manhole(US)	GL of Manhole(DS)	Inv Level of Pipe at USG(mPD)	Inv Level of Pipe at DSG(mPD)	Gradient (1 in)	Length (m)	At Pipe flow full capactiy per pipe(l/s)	At Pipe flow full velocity(m/s)
F3.1(Proposed)	FMH4002142	225	1	4.80	4.78	3.80	3.40	50.00	20	57.61	1.45
FMH4002142	FMH4002178	600	1	4.78	5.03	3.02	2.88	300.00	42	320.55	1.13
FMH4002178	FMH4044260	600	1	5.03	5.16	2.88	2.83	180.00	9	414.07	1.46
FMH4044260	FMH4002146	600	1	5.16	5.04	2.83	2.71	233.33	28	363.58	1.29
FMH4002146	FMH4002713	450	1	5.04	4.83	2.71	2.56	93.33	14	268.00	1.69
FMH4002713	FMH4002706	450	1	4.83	4.92	2.56	2.43	107.69	14	249.46	1.57
FMH4002706	FMH4002707	750	1	4.92	4.44	2.43	2.30	307.69	40	571.79	1.29
FMH4002178	FMH4002181	375	1	5.03	4.79	2.88	2.71	170.59	29	121.93	1.10
FMH4002181	FMH4002182	375	1	4.79	4.47	2.71	2.40	150.65	47	129.77	1.17
FMH4002182	FMH4002707	375	1	4.47	4.44	2.40	2.30	25.00	3	319.03	2.89
FMH4002707	FMH4002708	750	1	4.44	4.52	2.30	2.26	75.00	3	1159.52	2.62
FMH4002708	FMH4002709	750	1	4.52	4.50	2.26	2.22	500.00	20	448.26	1.01
FMH4002709	FMH4002710	750	1	4.50	4.50	2.22	2.09	215.38	28	683.68	1.55
FMH4002710	FMH4002711	750	1	4.50	4.21	2.09	2.04	420.00	21	489.22	1.11

in paralle
min. flow capacity = 371.38 l/s

The min. flow capacity of the existing sewers at Canton Road is 320.55 l/s.

Sewerage Flow Discharded to the Sewer at Canton Road

Venue	ADWF(m3/d)	ADWF(l/s)	Contributing Population	Peak Factor	Peak Flow (m3/d)	Peak Flow (l/s)	Min. Capacity of the Existing Sewerage System (l/s)
Parcel 1 (XIQU)	166.40	1.93	616	6	998	11.56	320.55
Total	166.40	1.93	616	6	998	11.56	320.55

The peak sewage flow discharged from WKCD to the existing sewer system is 1.93 l/s

Hydraulic Assessment for existing sewer at Canton Road

ADWF from existing catchment at upstream of manhole FM4002142 at Canton Road
= 98.64 l/s (8522.496 m3/d)

ADWF from sub-catchment S8 of WKCD
= 1.93 l/s (166.4 m3/d)

Total ADWF discharge to manhole FM4002142
= 100.57 l/s (8688.896 m3/d)

Contributing Population
= 8688.896 / 0.27 (Clause 12 of EPD Technical Paper – Report No.: EPD/TP1/05)
= 32181

Peaking Factor = 3 (Table T-5 of EPD Technical Paper – Report No.: EPD/TP1/05)

Peak Flow = 100.57 X 3
= 301.70 l/s

Utiltization = 301.70 / 320.55
= 94.12 %

The minimum flow capacity of the sewer at Canton Road is 320.55 l/s.
The utilization of the sewer at Canton Road will becom 94.12 % if the sewerage generated from sub-catchment S8 is discharged to manhole FM4002142.