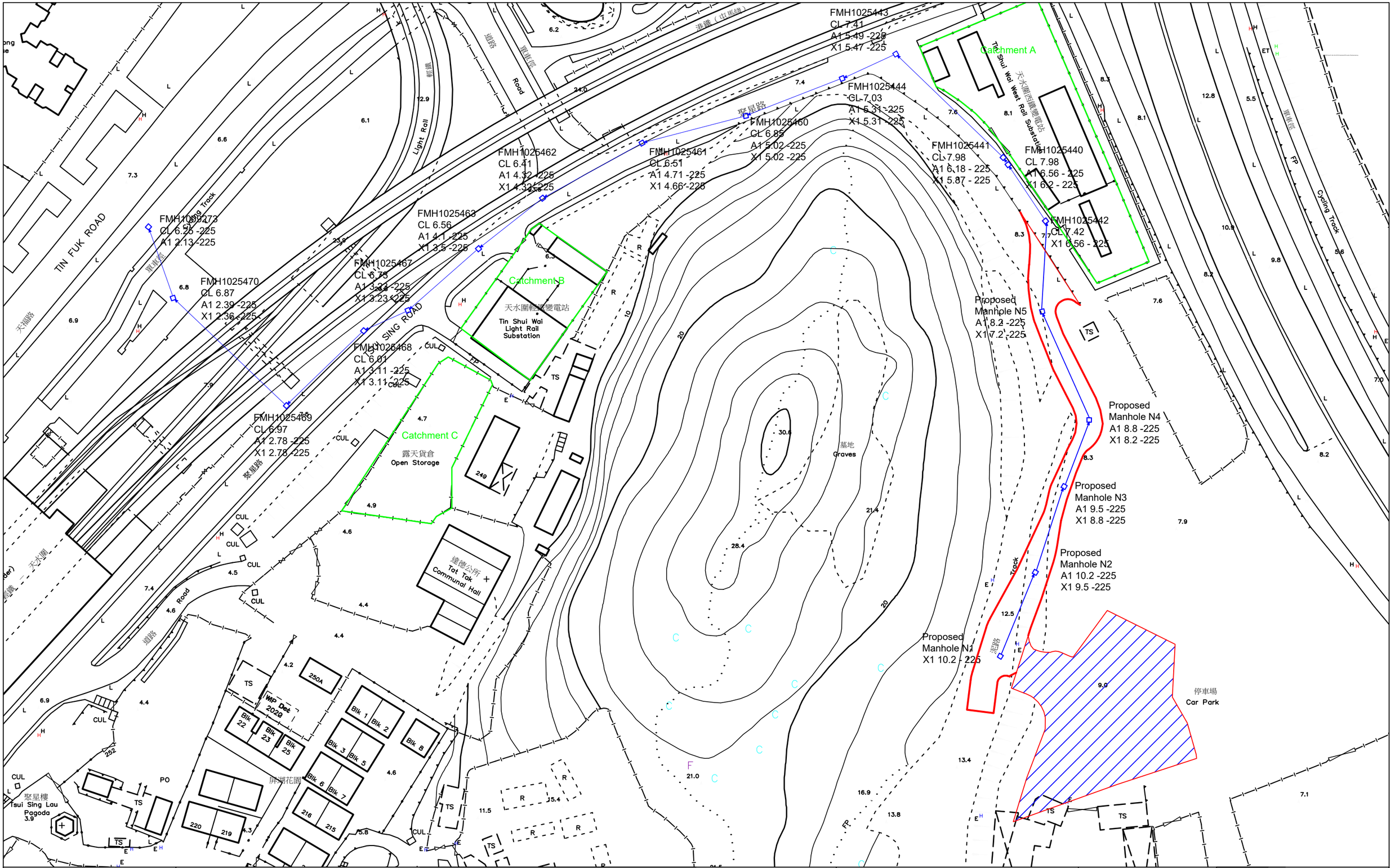
Appendix 7

Sewerage Impact Analysis



Town Planner DeSPACE (International) Limited	Title Sewerage Network and Catchments in the vicinity of the Application Site	Legend Development Site Application Site Catchments	Drawn By ML Date September 2023	Figure No. **1** Scale **1:1000 at A3**

Table 1 Calculation for Sewage Generation Rate of the Proposed Development

RCHE Use		
Total Number of Residents	420	
Unit Flow Factor	0.19	GESF(Table T-1) - UFF for Domestic Flows 0.190 (Institutional and special class)
Total Number of Employee	150	
Unit Flow Factor	0.28	GESF(Table T-2) - UFF for Commercial Flow and Student Flow 0.08 (Commerical Employee) + 0.2 (Community, Social & Personal Services)
Estimated Dry Weather Flow	121.80	m^3/day
Senior Hostel		
Estimated Population	18	
Unit Flow Factor	0.27	GESF(Table T-1) - UFF for Domestic Flows 0.270 (Private R2)
Estimated Dry Weather Flow	4.86	m^3/day
Total Flow from Proposed Development		
Flow Rate	126.66	m^3/day
Catchment Inflow Factor	1.00	Catchment Inflow Factor = 1.00 (Yuen Long) based on EPD's GESF Table T-4
Flow Rate (including catchment inflow	126.66	m^3/day
Contributing Population	469.11	
Peaking Factor	8	Peaking Factor=8 for population (including stormwater allowance) base on EPD's GESF Table T-5
Peak Flow	**11.73**	L/s

Table 2 Calculation for Sewage Generation

			Remarks
A	1a Tin Shui Wai West Rail Substation		
	Assumed number of employees	5	Reference is made to the SIA of the approved Town Planning Application No.: A/YL-PS/623
	Unit Flow Factor	0.33 m^3/person/day	GESF(Table T-2) - UFF for Commercial Flow and Student Flow 0.080 (Commercial Employee) +0.25 (J2 Electricity Gas & Water)
	Estimated Dry Weather Flow	1.65 m^3/person/day	
B	2 LRT Rectifier Station		
	Assumed number of employees	5	Reference is made to the SIA of the approved Town Planning Application No.: A/YL-PS/623
	Unit Flow Factor	0.33 m^3/person/day	GESF(Table T-2) - UFF for Commercial Flow and Student Flow 0.080 (Commercial Employee) +0.25 (J2 Electricity Gas & Water)
	Estimated Dry Weather Flow	1.65 m^3/day	
C	3 North Site of the approved Transitional Housing		
	Estimated number of residents	114	Reference is made to the SIA of the approved Town Planning Application No.: A/YL-PS/623
	Unit Flow Factor	0.27	GESF(Table T-1) - UFF for Domestic Flows 0.270 (Private R2)
	Estimated Dry Weather Flow	30.78 m^3/day	

Table 3 Total Estimated Peak Flow

Catchment	From the Most Upstream	Total Estimated Dry Weather Flow (m^3/day)	Catchment Inflow Factor[1]	Cumulative Average Dry Weather Flow (m^3/day)	Contributing Population[2]	Peaking Factor [3]	Total Estimated Peak Flow (m^3/day)	Total Estimated Peak Flow (L/s)
	Proposed Development	126.66	1	126.66	469.11	8	1013.28	11.73
A	Tin Shui Wai West Rail Substation	1.65	1	128.31	475.22	8	1026.48	11.88
A to B	LRT Rectifier Station	1.65	1	129.96	481.33	8	1039.68	12.03
A to C	North Site of the approved Transitional Housing	30.78	1	160.74	595.33	8	1285.92	14.88

Remarks:
[1] Catchment Inflow Factor = 1.00 (Yuen Long) based on EPD's GESF Table T-4
[2] Based on the equation from GESF: $\text{Contributing Population} = \frac{\text{Calculated total average flow } (m^3/day)}{0.27\ (m^3/person/day)}$

[3]Peaking Factor=8 for population <1000, and 6 for population 1000-5000 (including stormwater allowance) base on EPD's GESF Table T-5

Table 4 Sewer Capacity Check

Catchment	Pipe Name	Manhole Reference		Pipe Diameter (m)	Pipe Length (m)	Invert Level (mPD)		g (m/s^2)	k_s (m)	s	v (m^2/s)	V (m/s)	Area (m^2)	Q (m^3/s)	Sewer Capacity (L/s)	Sewage Flow (L/s)	% of Peak Flow to Sewer Capacity
		Upstream	Downstream			Upstream	Downstream										
Proposed Development	S1	N1	N2	0.225	25	10.2	9.5	9.81	0.003	0.0280	0.00000114	1.7149	0.040	0.068	68.19	11.73	17.20%
	S2	N2	N3	0.225	25	9.5	8.8	9.81	0.003	0.0280	0.00000114	1.7149	0.040	0.068	68.19	11.73	17.20%
	S3	N3	N4	0.225	19.4	8.8	8.2	9.81	0.0006	0.0309	0.00000114	2.3071	0.040	0.092	91.73	11.73	12.78%
	S4	N4	N5	0.225	33	8.2	7.2	9.81	0.0006	0.0303	0.00000114	2.2836	0.040	0.091	90.80	11.73	12.92%
	S5	N5	FMH1025442	0.225	25	7.2	6.56	9.81	0.0006	0.0256	0.00000114	2.0977	0.040	0.083	83.41	11.73	14.06%
A	FWD1028401	FMH1025442	FMH1025440	0.225	18.2	6.56	6.2	9.81	0.0006	0.0198	0.00000114	1.8422	0.040	0.073	73.25	11.88	16.22%
	FWD1028402	FMH1025440	FMH1025441	0.225	1.2	6.2	6.18	9.81	0.003	0.0167	0.00000114	1.3224	0.040	0.053	52.58	11.88	22.60%
	FWD1028403	FMH1025441	FMH1025443	0.225	41.8	5.87	5.49	9.81	0.003	0.0091	0.00000114	0.9759	0.040	0.039	38.80	11.88	30.62%
	FWD1028404	FMH1025443	FMH1025444	0.225	15.8	5.47	5.31	9.81	0.003	0.01013	0.00000114	1.0301	0.040	0.041	40.96	11.88	29.01%
	FWD1028420	FMH1025444	FMH1025460	0.225	28.5	5.31	5.02	9.81	0.003	0.01018	0.00000114	1.0326	0.040	0.041	41.06	11.88	28.94%
	FWD1028421	FMH1025460	FMH1025461	0.225	29.7	5.02	4.71	9.81	0.003	0.01044	0.00000114	1.0459	0.040	0.042	41.59	11.88	28.57%
	FWD1028422	FMH1025461	FMH1025462	0.225	31.5	4.66	4.32	9.81	0.003	0.01079	0.00000114	1.0636	0.040	0.042	42.29	11.88	28.09%
	FWD1028424	FMH1025462	FMH1025463	0.225	22.4	4.32	4.1	9.81	0.003	0.00982	0.00000114	1.0144	0.040	0.040	40.34	11.88	29.45%
A+B	FWD1028427	FMH1025463	FMH1025467	0.225	25.5	3.5	3.23	9.81	0.003	0.011	0.00000114	1.0534	0.040	0.042	41.88	12.03	28.73%
A+B+C	FWD1028428	FMH1025467	FMH1025468	0.225	12.7	3.23	3.11	9.81	0.003	0.009	0.00000114	0.9950	0.040	0.040	39.56	14.88	37.62%
	FWD1028429	FMH1025468	FMH1025469	0.225	30.3	3.11	2.78	9.81	0.003	0.011	0.00000114	1.0684	0.040	0.042	42.48	14.88	35.04%
	FWD1028430	FMH1025469	FMH1025470	0.225	43.6	2.78	2.39	9.81	0.003	0.009	0.00000114	0.9680	0.040	0.038	38.49	14.88	38.67%
	FWD1028432	FMH1025470	FMH1009273	0.225	20	2.36	2.13	9.81	0.003	0.0115	0.00000114	1.0980	0.040	0.044	43.66	14.88	34.09%

Remarks:
(1) g=gravitational acceleration; k_s=equivalent pipeline roughness; s=hydraulic gradient; v=kinematic viscosity of fluid; V=mean velocity
(2) The value of k_s = 0.6mm (for velocities greater than 1.2m/s, otherwise 3mm) is adopted for the calculation of slimed clayware sewer, poor condition (based on Table 5: Recommended Roughness Values in Sewerage Manual)
(3) The mean velocity is calculated using the Colebrook-White Equation:

$$V = -\sqrt{(8gDs)}\log\left(\frac{k_s}{3.7D} + \frac{2.51v}{D\sqrt{(2gDs)}}\right)$$