

**Table 1 Calculation for Sewage Generation Rate of the Proposed Residential Development at the Application Site**

<b>1. Proposed Residential Development</b>	<b>Remarks</b>
<b>1. Residential Towers (T1-T3)</b>	
a. Total number of units	= 342 units
b. Total number of residents	= 855 people -- (average household size of 2.5 from Hong Kong 2021 Population Census -Yau Tong West)
c. Design flow	= 0.19 m <sup>3</sup> /person/day -- (Private R1 in Table T-1 of GESF)
d. Sewage Generation rate	= <b>162.5</b> m <sup>3</sup> /day
<b>2. Club House</b>	
a. Assumed used area	= 735 m <sup>2</sup>
b. Assumed floor area per employee	= 30.3 m <sup>2</sup> per employee -- (refer to Table 8 of CIFSUS - Community, Social & Personal Services)
c. Total number of employees	= 24 employees
d. Design flow for commercial employee	= 80 litre/employee/day -- (refer to Table T-2 of GESF)
e. Design flow for commercial activities	= 200 litre/employee/day -- (refer to Table T-2 of GESF Job Type J11)
f. Sewage generation rate	= <b>6.7</b> m <sup>3</sup> /day
<b>3. Swimming Pool</b>	
a. Assumed Area of Swimming Pool	= 250 m <sup>2</sup>
b. Average Depth of Water	= 1.5 m (assumption)
c. Volume of Swimming Pool	= 375 m <sup>3</sup>
d. Turnover Rate	= 6 hr
e. Surface Loading Rate of Filter	= 50 m <sup>3</sup> /m <sup>2</sup> /hr
f. Filter Areas required	= 1.3 m <sup>2</sup>
g. Backwash Duration	= 3 min/d
h. Backwash flow rate	= 30 m <sup>3</sup> /m <sup>2</sup> /hr
i. Design flow for Swimming Pool Backwashing	= 37.5 m <sup>3</sup> /hr
j. Design flow for Swimming Pool Backwashing	= <b>10.4</b> litre/sec
<b>4. Retail</b>	
a. Assumed used area	= 1306.2 m <sup>2</sup>
b. Assumed floor area per employee	= 28.6 m <sup>2</sup> per employee -- (refer to Table 8 of CIFSUS - Retail Trade)
c. Total number of employees	= 46 employees
d. Design flow for commercial employee	= 80 litre/employee/day -- (refer to Table T-2 of GESF)
e. Design flow for commercial activities	= 200 litre/employee/day -- (refer to Table T-2 of GESF Job Type J4)
f. Sewage generation rate	= <b>12.9</b> m <sup>3</sup> /day
<b>5. F&amp;B</b>	
a. Assumed used area	= 870.8 m <sup>2</sup>
b. Assumed floor area per employee	= 19.6 m <sup>2</sup> per employee -- (refer to Table 8 of CIFSUS - Restaurant)
c. Total number of employees	= 44 employees
d. Design flow for commercial employee	= 80 litre/employee/day -- (refer to Table T-2 of GESF)
e. Design flow for commercial activities	= 1500 litre/employee/day -- (refer to Table T-2 of GESF Job Type J10)
f. Sewage generation rate	= <b>69.5</b> m <sup>3</sup> /day
<b>Total Flow at Manhole T0</b>	
Flow Rate (Without Swimming Pool)	= 251.6 m <sup>3</sup> /day
Flow Rate with inflow factor (Without Swimming Pool)	= 276.7 m <sup>3</sup> /day (Catchment Inflow Factor for East Kowloon = 1.1)
Population	= 1025 people
Peaking factor	= 6 Refer to Table T-5 of GESF for population 1,000 - 5,000 including stormwater allowance
Peak Flow (Without Swimming Pool)	= 17.5 litre/sec
Peak Flow (With Swimming Pool)	= <b>27.9</b> litre/sec

*Table 2a Hydraulic Capacity at Sewers along Tung Yuen Street, Yau Tong*

Segment	Manhole Reference	Manhole Reference	Pipe Dia.	Pipe Length	Invert Level 1	Invert Level 2	g	k <sub>s</sub>	s	v	V	Area	Q	Estimated Capacity
			mm	m	mPD	mPD	m/s <sup>2</sup>	m	m <sup>2</sup> /s	m/s	m <sup>2</sup>	m <sup>3</sup> /s	L/s	
T0-S1	Terminal Manhole	FMH4034524	300	9.5	1.04	0.97	9.81	0.0015	0.007	0.000001	1.19	0.07	0.08	84
S1-S2	FMH4034524	FMH4034525	900	41.7	0.97	0.94	9.81	0.0015	0.001	0.000001	0.75	0.64	0.48	477
S2-S3	FMH4034525	FMH4034509	900	8.0	0.94	0.93	9.81	0.0015	0.001	0.000001	0.99	0.64	0.63	629

Remarks: (1) g=gravitational acceleration; k<sub>s</sub>=equivalent sand roughness; s=gradient; v=kinematic viscosity of water; V=mean velocity

(2) The value of k<sub>s</sub> = 1.5 mm is used with reference to Slimed uPVC Sewers, poor example in Table 5 of Sewerage Manual Part 1.

(3) The value of velocity (V) is referred to the Tables for the hydraulic design of pipes, sewers and channels (8th edition)

(4) Equation used:

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

(5) The pipe information in Table 2a is obtained from Sewerage Impact Assessment for Proposed Development at YTML No. 57 and YTILs 4 sB & 9, and Adjoining Government Land, Yau Tong (R7481\_v1.3)

Table 3a Hydraulic Capacity of Sewers (Catchment A)

1. Full Bore of Pipes FWD4036773, FWD4036778 and FWD4125280 (Assumption)

Pipe Reference	Manhole Reference	Manhole Reference	Pipe Dia.	Pipe Length	Upstream Invert Level	Downstream Invert Level	g	k <sub>s</sub>	s	v	V	Area	Q	Estimated Capacity
			mm	m	mPD	mPD	m/s <sup>2</sup>	m	m <sup>2</sup> /s	m/s	m <sup>2</sup>	m <sup>3</sup> /s	L/s	
FWD4036773	FMH4034555	FMH4034556	600	39.7	1.89	1.86	9.81	0.006	0.001	0.000001	0.48	0.28	0.14	137
FWD4036778	FMH4034561	FMH4034556	225	46.7	2.14	1.84	9.81	0.006	0.006	0.000001	0.72	0.04	0.03	29
FWD4125280	FMH4099933	FMH4034556	225	15.9	2.14	2.10	9.81	0.006	0.003	0.000001	0.45	0.04	0.02	18
													Sub-total	183

Remarks:

- (1) g=gravitational acceleration; k<sub>s</sub>=equivalent sand roughness; s=gradient; v=kinematic viscosity of water; V=mean velocity
- (2) The value of k<sub>s</sub> = 6mm is used for the calculation of concrete sewer (based on Table 5: Recommended roughness values in Sewerage Manual)
- (3) The value of velocity (V) is referred to the Tables for the hydraulic design of pipes, sewers and channels (8th edition)
- (4) Equation used: 
$$V = -\sqrt{(8gDs)} \log\left(\frac{k_s}{3.7D} + \frac{2.51v}{D\sqrt{(2gDs)}}\right)$$
- (5) The pipe information is obtained from Geoinfo Map.

2. 18 Tung Yuen Street (From Sewerage Impact Assessment for Proposed Development at YTML No. 57 and YTILs 4 sB & 9, and Adjoining Government Land, Yau Tong (R7481\_v1.3))

- a. Sewage Generation rate at FMH4034557 = 91 m<sup>3</sup>/day (from EPD)
- b. Sewage Generation rate at FMH4034558 = 136 m<sup>3</sup>/day (from EPD)
- c. Total Dewaterage Generate rate = 227 m<sup>3</sup>/day

3. Application for Proposed Admendments to Approved Scheme (under Application No. A/K15/119) in “CDA(3)” Zone and Area Shown as ‘Road’, at YTML No. 57, YTILs No. 4 sB and 9, and Adjoining Government Land, Tung Yuen Street, Yau Tong, Kowloon (R7481\_v1.3)

- a. Sewage Generation rate = 1075.2 m<sup>3</sup>/day

4. Residential (Other Proposed Residential Development ref. YTML No. 69 & YTIL No. 4RP) (From Sewerage Impact Assessment for Proposed Development at YTML No. 57 and YTILs 4 sB & 9, and Adjoining Government Land, Yau Tong (R7481\_v1.3))

- a. Sewage Generation rate = 627 m<sup>3</sup>/day (from EPD)

5. Commercial (Kwun Tong Wholesale Fish Market and Tung Yuen Street Cooked Food Market) (From Sewerage Impact Assessment for Proposed Development at YTML No. 57 and YTILs 4 sB & 9, and Adjoining Government Land, Yau Tong (R7481\_v1.3))

- a. Sewage Generation rate = 30 m<sup>3</sup>/day

6. Peninsula East (From Sewerage Impact Assessment for Proposed Development at YTML No. 57 and YTILs 4 sB & 9, and Adjoining Government Land, Yau Tong (R7481\_v1.3))

- a. Sewerage Generate rate = 193.5 m<sup>3</sup>/day

7. Industrial (Redland Concrete Limited) (From Sewerage Impact Assessment for Proposed Development at YTML No. 57 and YTILs 4 sB & 9, and Adjoining Government Land, Yau Tong (R7481\_v1.3))

- a. Sewerage Generate rate = 27 m<sup>3</sup>/day

Total Flow at Manhole S1 (FMH4034524), including Proposed Development and Catchment A

- Flow Rate (Without Swimming Pool & Item 1 of Catchment A) = 2431.3 m<sup>3</sup>/day
- Flow Rate with inflow factor (Without Swimming Pool) = 2674.4 m<sup>3</sup>/day (Catchment Inflow Factor for East Kowloon = 1.1)
- Population = 9905 people
- Peaking factor = 5 Refer to Table T-5 of GESF for population 5,000 - 10,000 including stormwater allowance)
- Peak Flow (Without Swimming Pool) = 323.8 litre/sec
- Peak Flow (With Swimming Pool) = 334.2 litre/sec

*Table 4a Comparison of the Hydraulic Capacity of Existing Sewers for Sewerage generated from the Proposed Development and Surrounding Catchment Areas*

Segment	Pipe Dia. (mm)	Pipe Length (m)	Gradient	Estimated Capacity (L/s)	Estimated Flow including the Proposed Development only (L/s)	Contributed by the Proposed Development only (%)	Status	Estimated Flow including the Proposed Development and Catchment Areas (L/s)	Contributed by the Proposed Development and the Surrounding Catchment Areas (%)	Status	Included Catchment Area
T0-S1	300	9.5	0.0074	84	27.9	33.2%	OK	27.9	33.2%	OK	A
S1-S2	900	41.7	0.0007	477	27.9	5.9%	OK	334.2	70.1%	OK	A
S2-S3	900	8.0	0.0012	629	27.9	4.4%	OK	334.2	53.1%	OK	A