Appendix B

Replacement Pages of Updated Drainage & Sewerage Impact Assessment

SECTION 16 APPLICATION FOR PROPOSED FLATS, SHOP AND SERVICES, AND EATING PLACES WITH MINOR RELAXATION AND DOMESTIC AND NON-DOMESTIC PLOT RATIO AND BUILDING HEIGHT RESTRICTION IN "RESIDENTIAL (GROUP E)" ZONE AT NO.4 TUNG YUEN STREET, YAU TONG, KOWLOON

DRAINAGE & SEWERAGE IMPACT ASSESSMENT

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3. SEWERAGE IMPACT ASSESSMENT

3.1 Scope of Work

3.1.1 The aim of this SIA is to assess whether the capacity of the sewerage network serving the Application Site is sufficient to cope with the sewage flow from the proposed development.

3.2 Assessment Criteria and Methodology

3.2.1 The Commercial and Industrial Floor Space Utilization Survey (CIFSUS) conducted by the Planning Department has been used to determine the worker density for various economic activities and planned usage types.

3.2.2 Environmental Protection Department's (EPD's) Guidelines for Estimating Sewage Flows for Sewage Infrastructure Planning, Version 1 (GESF) has been referred to for the purposes of estimating the quantity of the sewage generated from the Proposed Development and the existing catchment area. Sewage flow parameters and global peaking factors in this document have been adopted for this SIA.

3.2.3 According to the GESF, the overall unit flow is composed of flows due to employees and the associated activities. The following unit flow factors have been adopted in the SIA calculation in accordance with Tables T-1, T-2 and T-3 of the GESF:

- Residential housing: 0.27m^3/day (Private R2)
- Restaurant & Hotel: 1.58m^3/day (Commercial Employee and J10 – Restaurant & Hotel)
- Wholesale & Retail: 0.28m^3/day (Commercial Employee and J4 – Wholesale & Retail)
- Industrial: 1.08m^3/day (Industrial Employee and J1 – Yau Tong)
- Community, Social & Personal Services: 0.28m^3/day (Commercial Employee and J11- Community, Social & Personal Services)

3.2.4 The catchment inflow factor, PCIF of 1.1 (East Kowloon), is adopted in catchment calculations.

3.3 Existing and Future Sewerage System

3.3.1 With reference to the sewerage system shown in Geo-info Map, all the sewage generated from the proposed development will be discharged to the terminal manhole (T0) which is located at the eastern side of the proposed development. The terminal manhole TMH-01 (S0) is connected to the exciting manhole FMH4034524 (S1) outside the proposed development via a new Ø300mm polyethylene pipe. The sewer eventually discharges the collected sewage to Yau Tong Sewage Pumping Station.

3.3.2 The Yau Tong Sewage Pumping Station (YTSPS) is located at the junction of Ko Fai Road and Tung Yuen Street which is next to the Application Site. Based on the information for DSD, The YTSPS currently has a design capacity with 28,800m^3/day.

3.3.3 The existing sewers and catchment areas in the vicinity of Application Site are shown in Figure 3.1.

3.4 Wastewater Generated by the Proposed Development

3.4.1 The sewage generated by the proposed development will be mainly contributed by the residential units, club house, retail and F&B facilities. Detailed calculation of

Appendix 3.1 Detailed Sewerage Impact Assessment Calculations

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

1. Proposed Residential Development			**Remarks**
1. Residential Towers (T1-T3)			
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	=	0.27	m^3/person/day -- (Private R2 in Table T-1 of GESF)
d. Sewage Generation rate	=	**230.9**	m^3/day
2. Club House			
a. Assumed used area	=	725	m^2
b. Assumed floor area per employee	=	30.3	m^2 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	=	**6.7**	m^3/day
3. Swimming Pool			
a. Assumed Area of Swimming Pool	=	250	m2
b. Average Depth of Water	=	1.5	m
c. Volume of Swimming Pool	=	375	m3
d. Turnover Rate	=	6	hr (CAP132, Section 42 Swimming Pools Regulation (open air pool))
e. Surface Loading Rate of Filter	=	50	m3/m2/hr
f. Filter Areas required	=	1.3	m2
g. Backwash flow rate	=	30	$m^3/m^2/hr$
h. Design flow for Swimming Pool Backwashing	=	37.5	m^3/hr
i. Backwash Duration	=	7	min/day
j. Backwash generation rate	=	3.75	m^3/day
k. Design flow for Swimming Pool Backwashing	=	**10.4**	litre/sec
4. Retail			
a. Assumed used area	=	1306.2	m^2
b. Assumed floor area per employee	=	28.6	m^2 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	=	**12.9**	m^3/day
5. F&B			
a. Assumed used area	=	870.8	m^2
b. Assumed floor area per employee	=	19.6	m^2 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	=	**69.5**	m^3/day
Total Flow at Manhole T0			
Flow Rate (Without Swimming Pool)	=	320.0	m^3/day
Flow Rate with inflow factor (Without Swimming Pool)	=	352.0	m^3/day (Catchment Inflow Factor for East Kowloon = 1.1)
Population	=	1304	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)	=	24.4	litre/sec
Peak Flow (With Swimming Pool)	=	**34.9**	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_s	s	v	V	Area	Q	Estimated Capacity
			mm	m	mPD	mPD	m/s^2	m		m^2/s	m/s	m^2	m^3/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	675	41.7	0.97	0.94	9.81	0.0060	0.001	0.000001	0.51	0.36	0.18	183
S2-S3	FMH4034525	FMH4034509	675	8.0	-	-	9.81	0.0060	0.001	0.000001	0.51	0.36	0.18	183
S3-S4	FMH4034509	FMH4034510	1425	17.6	-	-	9.81	0.0030	0.002	0.000001	1.37	1.59	2.19	2186
S4-S5	FMH4034510	Yau Tong Sewage Puminp Station	1425	6.4	-	-	9.81	0.0030	0.002	0.000001	1.37	1.59	2.19	2186

Remarks: (1) g=gravitational acceleration; k_s=equivalent sand roughness; s=gradient; v=kinematic viscosity of water; V=mean velocity

(2) The value of k_s = 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 k_s = 3 mm and 6 mm are used with reference to Slimed Concrete Sewers, poor example in Table 5 of Sewerage Manual Part 1.

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

(5) Equation used:

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

(6) 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)

(7) According to DSD Drainage Records, the downstream invert level of manholes FMH4034525 is missing, as a conservative approach, the slope of the upstream Segment (i.e. S1-S2) is used instead.

(8) According to DSD Drainage Records, the invert level of manholes FMH4034509 and FMH4034510 are missing, as a conservative approach, the slope 0.002 is used .

The Invert Level 1 is reference the FWD4036916 downstream 1.22mPD and the Invert Level 2 is reference the FWD4036741 downstream 0.98mPD with length

Table 3a Hydraulic Capacity of Sewers (Catchment A)

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

Pipe Reference	Manhole Reference	Manhole Reference	Pipe Dia.	Pipe Length	Upstream Invert Level	Downstream Invert Level	g	k_s	s	v	V	Area	Q	Estimated Capacity
			mm	m	mPD	mPD	m/s^2	m		m^2/s	m/s	m^2	m^3/s	L/s
FWD4036773	FMH4034555	FMH4034556	600	38.9	1.89	1.86	9.81	0.006	0.001	0.000001	0.49	0.28	0.14	138
FWD4125280	FMH4099933	FMH4034556	225	6.1	2.15	2.10	9.81	0.006	0.008	0.000001	0.81	0.04	0.03	32
													Sub-total	**170**

Remarks:

(1) g=gravitational acceleration; k_s=equivalent sand roughness; s=gradient; v=kinematic viscosity of water; V=mean velocity

(2) The value of k_s = 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 Application No A/K15/121

Residential (Phase 1)

a. Total number of units	=	135	units
b. Total number of residents	=	338	people -- (average household size of 2.5 from Hong Kong 2021 Population Census -Yau Tong West)
c. Design flow	=	0.27	m^3/person/day -- (Private R2 in Table T-1 of GESF)
d. Sewage Generation rate	=	**91**	m^3/day

Residential (Phase 2)

a. Total number of units	=	201	units
b. Total number of residents	=	503	people -- (average household size of 2.5 from Hong Kong 2021 Population Census -Yau Tong West)
c. Design flow	=	0.27	m^3/person/day -- (Private R2 in Table T-1 of GESF)
d. Sewage Generation rate	=	**136**	m^3/day

Total Dewerage Generate rate = **227** m^3/day

3. With reference Planning Application No. A/K15/126 (https://www.tpb.gov.hk/tc/plan_application/Attachment/20200828/s16_A_K15_126_0_gist.pdf)

Residential

a. Total number of units	=	1393	units
b. Total number of residents	=	3483	people -- (average household size of 2.5 from Hong Kong 2021 Population Census -Yau Tong West)
c. Design flow	=	0.27	m^3/person/day -- (Private R2 in Table T-1 of GESF)
d. Sewage Generation rate	=	**940.3**	m^3/day

Club House

a. Assumed used area	=	950	m^2
b. Assumed floor area per employee	=	30.3	m^2 per employee -- (refer to Table 8 of CIFSUS - Community, Social & Personal Services)
c. Total number of employees	=	31	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	=	**8.7**	m^3/day

Outdoor Swimming Pool

a.Assumed area	=	112.1	m^2
b. Assumed depth of water	=	1.5	m
c. Volume of water	=	168.2	m^3
d. Turnover Rate	=	6.0	hr (CAP132, Section 42 Swimming Pools Regulation (open air pool))
e. Surface loading rate of filter	=	50.0	$m^3/m^2/hr$
f. Filter areas required	=	0.6	m^2
g. Backwashing flow rate	=	30.0	$m^3/m^2/hr$
h. Design flow for backwashing	=	16.8	m^3/hr
i. Backwash duration	=	7.0	min/day
j. Backwash generation rate	=	1.96	m^3/day
k. Backwash generation rate	=	**4.67**	litre/sec

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))

1a. Total number of units	=	929	units
1b. Total number of residents	=	2323	people -- (average household size of 2.5 from Hong Kong 2021 Population Census -Yau Tong West)
1c. Design flow	=	0.27	m^3/person/day -- (Private R2 in Table T-1 of GESF)
a. Sewage Generation rate	=	**627**	m^3/day

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. Assumed used Area	=	4,870	m^2 (Refer to Table 5)
b. Assumed floor area per employee	=	43.5	m^2 per employee (worker densities refer to Table 8 in CIFSUS- Wholesale Trade)
c. Total number of employees	=	112	employees
d. Design flow for industrial employee	=	80	litre/employee/day -- (refer to Table T-3 of GESF)
e. Design flow for industrial activities	=	1500	litre/employee/day -- (refer to Table T-2 of J4 GESF)
f. Sewage generation rate	=	**177.0**	m^3/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))

1a. Total number of units	=	256	units
1b. Total number of residents	=	640	people -- (average household size of 2.5 from Hong Kong 2021 Population Census -Yau Tong West)
1c. Design flow	=	0.27	m^3/person/day -- (Private R2 in Table T-1 of GESF)
1d. Sewage Generation rate	=	**172.8**	m^3/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))

2a. Assumed used Area	=	1,098.5	m^2
2b. Assumed floor area per employee	=	43.5	m^2 per employee (worker densities refer to Table 8 in CIFSUS- Manufacturing)
2c. Total number of employees	=	25	employees
2d. Design flow for industrial employee	=	80	litre/employee/day -- (refer to Table T-3 of GESF)
2e. Design flow for industrial activities	=	1,000.00	litre/employee/day -- (refer to Table T-3 - Yau Tong)
2f. Sewage generation rate	=	**27.0**	m^3/day

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

Flow Rate (Without Swimming Pool & Item 1 o	=	2499.6	m^3/day
Flow Rate with inflow factor (Without Swimmi	=	2749.5	m^3/day (Catchment Inflow Factor for East Kowloon = 1.1)
Population	=	10183	people
Peaking factor	=	4	Refer to Table T-5 of GESF for population 10,000 - 50,000 including stormwater allowance)
Peak Flow (Without Swimming Pool)	=	297.6	litre/sec
Peak Flow (With Swimming Pool)	=	**312.7**	litre/sec

Table 3b Calculation for Sewage Generation Rate of the Existing Surrounding Building (Catchment B)

1. Yau Tong industrial City Block A			
a. Assumed used area	=	38543	m^2 (reference from Geoinfo map and Open 3Dhk)
b. Assumed floor area per employee	=	43.5	m^2 per employee -- (refer to Table 8 of CIFSUS -Manufacturing)
c. Total number of employees	=	886	employees
d. Design flow for commercial employee	=	80	litre/employee/day -- (refer to Table T-3 of GESF)
e. Design flow for commercial activities	=	1000	litre/employee/day -- (refer to Table T-3 of GESF Yau Tong)
f. Sewage generation rate	=	**956.9**	m^3/day
2. Yau Tong industrial City Block B			
a. Assumed used area	=	32379	m^2 (reference from Geoinfo map and Open 3Dhk)
b. Assumed floor area per employee	=	43.5	m^2 per employee -- (refer to Table 8 of CIFSUS -Manufacturing)
c. Total number of employees	=	745	employees
d. Design flow for commercial employee	=	80	litre/employee/day -- (refer to Table T-3 of GESF)
e. Design flow for commercial activities	=	1000	litre/employee/day -- (refer to Table T-3 of GESF Yau Tong)
f. Sewage generation rate	=	**804.6**	m^3/day
3. Union Industrial Building Blook A&B			
a. Assumed used area	=	8376	m^2 (reference from Geoinfo map and Open 3Dhk)
b. Assumed floor area per employee	=	43.5	m^2 per employee -- (refer to Table 8 of CIFSUS -Manufacturing)
c. Total number of employees	=	193	employees
d. Design flow for commercial employee	=	80	litre/employee/day -- (refer to Table T-3 of GESF)
e. Design flow for commercial activities	=	1000	litre/employee/day -- (refer to Table T-3 of GESF Yau Tong)
f. Sewage generation rate	=	**208.4**	m^3/day
4. Gloria Weaving & Knitting Factory Limited			
a. Assumed used area	=	9181	m^2 (reference from Geoinfo map and Open 3Dhk)
b. Assumed floor area per employee	=	43.5	m^2 per employee -- (refer to Table 8 of CIFSUS -Manufacturing)
c. Total number of employees	=	211	employees
d. Design flow for commercial employee	=	80	litre/employee/day -- (refer to Table T-3 of GESF)
e. Design flow for commercial activities	=	1000	litre/employee/day -- (refer to Table T-3 of GESF Yau Tong)
f. Sewage generation rate	=	**227.9**	m^3/day

Table 3b Calculation for Sewage Generation Rate of the Existing Surrounding Building (Catchment B)

5. Well Town Industrial Building

a. Assumed used area	=	9298	m^2 (reference from Geoinfo map and Open 3Dhk)
b. Assumed floor area per employee	=	43.5	m^2 per employee -- (refer to Table 8 of CIFSUS -Manufacturing)
c. Total number of employees	=	214	employees
d. Design flow for commercial employee	=	80	litre/employee/day -- (refer to Table T-3 of GESF)
e. Design flow for commercial activities	=	1000	litre/employee/day -- (refer to Table T-3 of GESF Yau Tong)
f. Sewage generation rate	=	**231.1**	m^3/day

6. Long Lift Industrial Building

a. Assumed used area	=	9595	m^2 (reference from Geoinfo map and Open 3Dhk)
b. Assumed floor area per employee	=	43.5	m^2 per employee -- (refer to Table 8 of CIFSUS -Manufacturing)
c. Total number of employees	=	221	employees
d. Design flow for commercial employee	=	80	litre/employee/day -- (refer to Table T-3 of GESF)
e. Design flow for commercial activities	=	1000	litre/employee/day -- (refer to Table T-3 of GESF Yau Tong)
f. Sewage generation rate	=	**238.7**	m^3/day

Total Flow of Catchment B

Flow Rate (Without Swimming Pool & Item 1 of Catchment A)	=	2667.6	m^3/day
Flow Rate with inflow factor (Without Swimming Pool)	=	2934.4	m^3/day (Catchment Inflow Factor for East Kowloon = 1.1)
Population	=	10868	people
Peaking factor	=	4	Refer to Table T-5 of GESF for population 10,000 - 50,000 including stormwater allowance)
Peak Flow (Without Swimming Pool)	=	**135.9**	litre/sec

Total Flow at Manhole S3 (FMH4034509), including Catchment A and Catchment B

Flow Rate (Without Swimming Pool & Item 1 of Catchment A)	=	5167.2	m^3/day
Flow Rate with inflow factor (Without Swimming Pool)	=	5683.9	m^3/day (Catchment Inflow Factor for East Kowloon = 1.1)
Population	=	21051	people
Peaking factor	=	4	Refer to Table T-5 of GESF for population 10,000 - 50,000 including stormwater allowance)
Peak Flow (Without Swimming Pool)	=	263.1	litre/sec
Peak Flow (With Swimming Pool)	=	**277.6**	litre/sec

Table 3c Calculation for Sewage Generation Rate of the Existing Surrounding Building (Catchment C)

Pipe Reference	Manhole Reference	Manhole Reference	Pipe Dia. mm	Pipe Length m	Upstream Invert Level mPD	Downstream 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	Estimated Capacity L/s
Catchment C (Assume Full Bore of Pipes FWD4036724 and FWD4036727)														
FWD4036724	FMH4034505	FMH4034501	300	7.9	1.74	1.15	9.81	0.0006	0.075	0.000001	4.32	0.07	0.31	305
FWD4036727	FMH4034506	FMH4034501	1125	17.1	1.17	1.15	9.81	0.006	0.001	0.000001	0.91	0.99	0.91	906
Catchment D (Assume Full Bore of Pipes FWD4036732 and FWD4036733)														
FWD4036732	FMH4034511	FMH4034512	225	37.6	2.49	1.90	9.81	0.0006	0.016	0.000001	1.64	0.04	0.07	65
FWD4036733	FMH4034513	FMH4034514	225	15.8	2.59	1.73	9.81	0.0006	0.054	0.000001	3.07	0.04	0.12	122
Catchment E (Assume Full Bore of Pipe FWD4036743)														
FWD4036743	FMH4034521	FMH4034509	300	9.1	-	-	9.81	0.0030	0.001	0.000001	0.33	0.07	0.02	23
													Sub-total	**1422**

Remarks:

(1) g=gravitational acceleration; k_s=equivalent sand roughness; s=gradient; v=kinematic viscosity of water; V=mean velocity

(2) The value of k_s = 6mm is used for the calculation of concrete sewer (based on Table 5: Recommended roughness values in Sewerage Manual)

(3) The value of k_s = 3 mm and 0.6 mm are used with reference to clay sewers (based on Table 5: Recommended roughness values in Sewerage Manual)

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

(5) Equation used: $$V = -\sqrt{(8gDs)}\log\left(\frac{k_s}{3.7D} + \frac{2.51\nu}{D\sqrt{(2gDs)}}\right)$$

(6) The pipe information is obtained from Geoinfo Map.

Total Flow at Manhole S1 (FMH4034524), including Proposed development, Cathment A, Catchment B, Catchment C, Catchment D, and Catchment E

Peak Flow (Without Swimming Pool) = 1685.3 litre/sec

Peak Flow (With Swimming Pool) = **1700.4** litre/sec

Table 4 Hydraulic Capacity at Sewers After Upgrading

Segment	Manhole Reference	Manhole Reference	Pipe Dia.	Pipe Length	Invert Level 1	Invert Level 2	g	k_s	s	v	V	Area	Q	Estimated Capacity
			mm	m	mPD	mPD	m/s^2	m		m^2/s	m/s	m^2	m^3/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	825	41.7	0.97	0.94	9.81	0.0015	0.001	0.000001	0.71	0.53	0.38	379
S2-S3	FMH4034525	FMH4034509	825	8.0	-	-	9.81	0.0015	0.001	0.000001	0.71	0.53	0.38	379
S3-S4	FMH4034509	FMH4034510	1425	17.6	-	-	9.81	0.0030	0.002	0.000001	1.37	1.59	2.19	2186
S4-S5	FMH4034510	Yau Tong Sewage Puminp Station	1425	6.4	-	-	9.81	0.0030	0.002	0.000001	1.37	1.59	2.19	2186

Remarks:
(1) g=gravitational acceleration; k_s=equivalent sand roughness; s=gradient; v=kinematic viscosity of water; V=mean velocity
(2) The value of k_s = 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 k_s = 3 mm and 6 mm are used with reference to Slimed Concrete Sewers, poor example in Table 5 of Sewerage Manual Part 1.
(4) The value of velocity (V) is referred to the Tables for the hydraulic design of pipes, sewers and channels (8th edition)
(5) Equation used:

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

(6) 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)
(7) According to DSD Drainage Records, the downstream invert level of manholes FMH4034525 is missing, as a conservative approach, the slope of the upstream Segment (i.e. S1-S2) is used instead.
(8) According to DSD Drainage Records, the invert level of manholes FMH4034509 and FMH4034510 are missing, as a conservative approach, the slope 0.002 is used .
The Invert Level 1 is reference the FWD4036916 downstream 1.22mPD and the Invert Level 2 is reference the FWD4036741 downstream 0.98mPD with length

Table 4a Comparision 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	34.9	41.4%	OK	34.9	41.4%	OK	--
S1-S2	675	41.7	0.0007	183	34.9	19.1%	OK	312.7	171.4%	Spill	A
S2-S3	675	8.0	0.0007	183	34.9	19.1%	OK	312.7	171.4%	Spill	A
S3-S4	1425	17.6	0.0016	2186	34.9	1.6%	OK	1700.4	77.8%	OK	A+B+C+D+E
S4-S5	1425	6.4	0.0016	2186	34.9	1.6%	OK	1700.4	77.8%	OK	A+B+C+D+E

Table 4b Comparision of the Hydraulic Capacity of Upgrading 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	34.9	41.4%	OK	34.9	41.4%	OK	--
S1-S2	825	41.7	0.0007	379	34.9	9.2%	OK	312.7	82.5%	OK	A
S2-S3	825	8.0	0.0007	379	34.9	9.2%	OK	312.7	82.5%	OK	A
S3-S4	1425	17.6	0.0016	2186	34.9	1.6%	OK	1700.4	77.8%	OK	A+B+C+D+E
S4-S5	1425	6.4	0.0016	2186	34.9	1.6%	OK	1700.4	77.8%	OK	A+B+C+D+E

Table 5 Future Flows to Yau Tong Seage Pumping Station

Existing Designed Capacity	28800	m^3/day (DSD)
Estimated Flow from the Proposed Development - (With Catchment Inflow Factor)	352.0	m^3/day
Average Daily Flow at YTSPS (From DSD's Data of Mar 2025))	17443.0	m^3/day
Contribution	62%	(of designed capacity)