Annex V

Revised Sewerage Impact Assessment

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Planning Application for

Temporary Concrete Batching Plant in Ping Che, New Territories
Sewerage Impact Assessment

Prepared for:
Doran (Hong Kong) Ltd

May 2025

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For and on behalf of
EnviroSolutions & Consulting

Gerald CHAN
Principal In Charge

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1 INTRODUCTION

1.1 Project Background

1.1.1 A temporary Concrete Batching Plant ("CBP" or "the Proposed Development") is planned to be erected at part of Lot 153 in D.D. 77 ("the Site") zoned Industrial (Group D) ("I(D)") under the Approved Ping Che and Ta Kwu Ling Outline Zoning Plan ("OZP") No. S/NE-TKL/14.

1.1.2 A Planning Application (Application No.: A/NE-TKL/681) was submitted and approved with conditions under Section 16 of the *Town Planning Ordinance* ("TPO")on 10 June 2022. Thereafter, several changes were made to the General Building Plan ("GBP") compared with the layout submitted in the aforementioned Planning Application. Furthermore, total cementitious material silo capacity was also changed from no more than 450 tonnes to no more than 800 tonnes due to amendment to the definition of silo capacity in accordance with the *Air Pollution Control Ordinance* ("APCO"). Therefore, a planning application for the CBP with the latest layout plans shall be submitted under Section 16 of TPO.

1.1.3 EnviroSolutions & Consulting Ltd ("ESC") has been appointed to prepare this Sewerage Impact Assessment ("SIA") Report to support the planning application for the Proposed Development.

1.2 Site Description

1.2.1 The Site is situated at part of Lot 153 in D.D. 77 in Ping Che, New Territories. As shown on **Figure 1-1**, its environs are summarised below:

- To the North: Village houses, warehouses and temporary structures with industrial use
- To the East: Open storage, temporary structures with industrial use and vegetation
- To the South: Workshop
- To the West: Open storage, warehouses and workshops

1.3 Project Description

1.3.1 The site area will be approx. 6,957m^2. The indicative layout of the Proposed CBP can be referred to the Planning Statement.

1.3.2 The maximum hourly concrete production rate of the Proposed CBP will be approx. 100 m^3/hour.

1.4 Objectives of the Report

1.4.1 The objectives of this SIA Report are to:

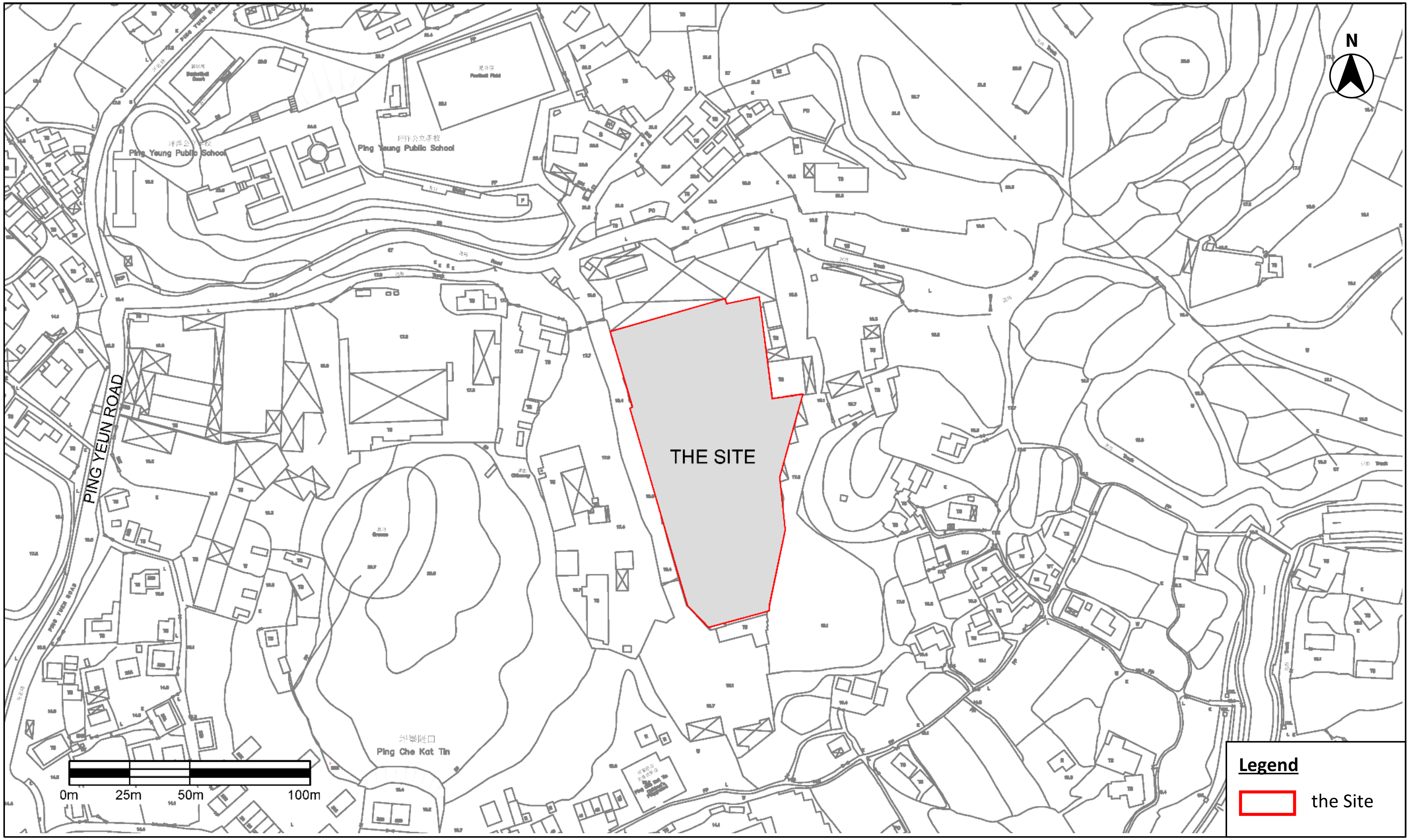
- Estimate the quantity of wastewater arising from the Proposed CBP and the nearby uses
- Recommend the necessary mitigation measures to handle the associated wastewater.

1.5 Reference Materials

1.5.1 In evaluating the sewerage impacts arising from the Proposed CBP, the following sources have been referred to:

- Drainage Services Department ("DSD") publication *Sewerage Manual (with Eurocodes incorporated) (Part 1) Key Planning Issues and Gravity Collection System, 3rd Edition, May 2013*
- DSD publication *Sewerage Manual (Part 1) - Corrigendum No. 1/2024*, 28 March 2024
- Environmental Protection Department ("EPD") publication *Guidelines for Estimating Sewage Flows for Sewage Infrastructure Planning Version 1.0, March 2005* ("GESF")
- Building (Standards of Sanitary Fitments, Plumbing, Drainage Works and Latrines) Regulations (Cap.123I)
- Practice Note for Professional Persons Drainage Plans subject to Comment by the Environmental Protection Department -Building (Standards of Sanitary Fitments, Plumbing, Drainage Works and Latrines) Regulations (ProPECC PN1/23)
- Sewerage data of GeoInfo Map checked on 05 February 2025

Figure 1-1 Site Location and its Environs



2 EVALUATION OF SEWERAGE IMAPCT

2.1 Existing Baseline Conditions

2.1.1 According to the sewerage data from GeoInfo Map checked on 5 February 2025, there are existing municipal sewers in the vicinity of the Site along the access road at the north and northwest of the Site. The nearest foul manhole is Manhole FMH1033261 which is located to the north of the Site. The existing municipal sewerage system near the Site is shown on **Figure 2-1**.

2.1.2 Wastewater from the existing CBP is currently collected and temporarily stored in sewage storage tank, and then tankered away by a licensed contractor.

2.2 Sewage Impact During the Construction Phase

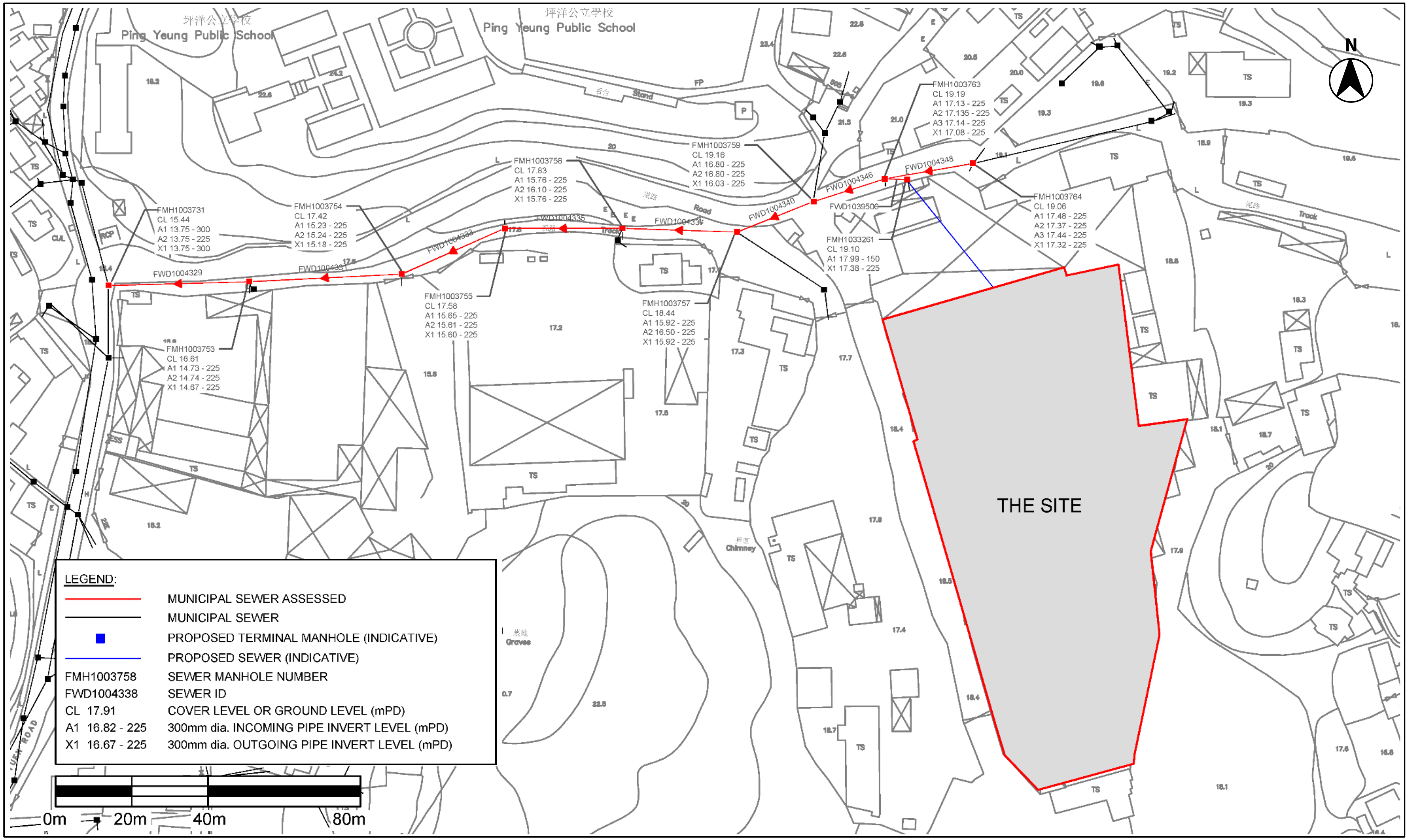
2.2.1 During the construction phase of the Proposed CBP, sewage generated by the construction workers will be collected by portable toilets, temporarily stored in sewage holding tanks with sufficient capacity, and then tankered away for off-site disposal in a municipal sewage treatment facility on a regular basis. With the implementation of the mitigation measures and good site practices as stated in paragraphs 4.4.2 to 4.4.5 of the EA report, no adverse sewerage impact from the Site during construction phase is anticipated.

2.3 Sewage Impact During the Operation Phase

2.3.1 During the operation of the Proposed CBP, the major source of wastewater will be industrial wastewater generated by wheel washing facilities and from concrete production, as well as sewage from toilets generated by the on-site staff and truck drivers. Industrial wastewater generated from the operation of the Proposed CBP will be 100% be recycled, as advised by the Applicant.

2.3.2 Two options, Option 1 and Option 2, are recommended to discharge sewage from toilets generated during the operation phase. For Option 1, sewage will be discharged into the public sewerage system underneath the access road via the proposed sewer to the northwest of the Site, as shown on **Figure 2-1**. For Option 2, sewage will be collected and temporarily stored, and then tankered away by a licensed contractor.

Figure 2-1 Sewerage Pipe Manhole Facilities in the Vicinity of the Site (Option 1)



3 SEWERAGE ANALYSIS

3.1 Review of Sewage Handling

3.1.1 As mentioned in **Section 2.2**, sewage generated by the on-site staff and truck drivers, i.e. wastewater generated from the washrooms e.g. flushing, handwashing and micturition, will be the only wastewater source to be discharged into the municipal sewerage system underneath the access road. For the other sources of wastewater including concrete production and vehicle washing, such industrial wastewater will be treated and recycled/reused, and will not be discharged.

3.2 Assumptions

3.2.1 In order to assess the acceptability of the sewage impact arising from the Proposed CBP, the maximum sewage generated has been estimated based on the assumptions listed in **Table 3-1**, below. The Average Dry Weather Flows (“ADWFs”) of the upstream, Proposed CBP and downstream catchments were estimated based on the Unit Flow Factors (“UFFs”) recommended in the GESF and in *Commercial and Industrial Floor Space Utilization Survey* (“CIFSUS”) published by the Planning Department (“PlanD”).

Table 3-1 Parameters for Estimating Wastewater Generation from the Proposed CBP

PARAMETER	VALUE	REMARK
GENERATION FROM ON-SITE STAFF		
No. of staff	22	As advised by the Applicant based on the scale and nature of the Proposed CBP
UFF of staff	0.23 m^3/day/staff	UFF for “Commercial Employee + J9 Construction” in Table T-2 of GESF
GENERATION FROM TRUCK DRIVERS		
Total no. of toilet visit	40 visits/ day	As advised by the client that approximately not more than 40 truck drivers (i.e. non-site staff) use the toilet on-site each day based on their previous observations
UFF of drivers	0.0091 m^3/day/driver	Assumed 200ml micturition[Note 1] + 7.5L flushing[Note 2] + 1.4L hand washing[Note 2]
CATCHMENT INFLOW FACTOR AND PEAKING FACTOR		
Catchment Inflow Factor	1.0	Catchment inflow factor for North District is adopted as stated in Table T-4 of GESF
Peaking Factor	8 for <1,000 6 for 1,000 – 5,000 5 for 5,000 – 10,000	Peaking factor (including stormwater allowance) for facility with existing upstream sewerage is adopted as stated in Table T-5 of GESF

Notes:
1. Human's micturition is assumed to be 200mL in accordance with p. 3081 of "Magill's Medical Guide", 6th ed.
2. BEAM Plus New Buildings Version 1.2 in July 2012.

3.3 Methodology for Option 1

3.3.1 To evaluate the capacities of sewers, the wastewater generation from the upstream and downstream catchments of the receiving sewers are estimated. This allows the acceptability of the sewerage impact arising from operation of the Proposed CBP to be determined.

3.3.2 Flow capacities for pipe segments between Manholes FMH1003764 and FMH1003731 along the access road have been calculated using the Colebrook-White Equation for circular pipes, assuming full bore flow with no surcharge, as shown below:

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

where V = mean velocity (m/s)
g = gravitational acceleration (m/s^2)
D = internal pipe diameter (m)
ks = hydraulic pipeline roughness (m)
n = kinematic viscosity of fluid (m^2/s)
s = hydraulic gradient (energy loss per unit length due to friction)

3.3.3 Sewerage systems are designed and sized to ensure that (when examined from any point) the downstream sections have sufficient capacity for the sewage flowing from all the sections upstream, provided that the capacity of the upstream sections is not exceeded. Thus, if the sewerage system can provide sufficient receiving capacity for the cumulative sewage quantities generated from the Proposed CBP and from the upstream catchments, there should be no unacceptable impact on the downstream sewerage system.

3.3.4 To evaluate the flow rate from on-site staff and truck drivers in the Proposed CBP, the UFFs recommended in GESF have been used.

3.3.5 According to TPB's website, a S16 Planning Application for a temporary CBP for a period of five years is proposed at the west of the Site (Application No.: A/NE-TKL/728). As stated in the planning statement, the sewage generated from container toilets during the operation phase of the CBP will be collected by sewage storage tanks for offsite disposal. Wastewater generated from water sprinklers and wheel washing facilities will be collected and diverted to sedimentation tank for silt removal and then be reused onsite. As such, no sewage from the adjacent proposed CBP will enter the municipal sewerage system and therefore it is excluded from the assessment.

3.3.6 Locations of the upstream and downstream catchments of the Site are shown in **Appendix A**. Sewage generation from the Site and the upstream and downstream catchments have been calculated and is detailed in **Appendix B**. Flow capacities for pipe segments of the receiving sewerage system are estimated via the Colebrook-White Equation. Details are provided in **Appendix C**.

3.4 Results and Discussion

3.4.1 For Option 1, detailed sewage generation calculations are provided in **Appendix B**. The total estimated ADWF from the Proposed CBP is calculated to be 5.42m^3/day, which will be discharged into Manhole FMH1033261.

3.4.2 To determine what impact this flow has on the existing sewerage system, the capacity of the downstream sewerage system has been evaluated. The utilisations when taking into consideration the sewage contributed by the Site as well as upstream/ downstream catchments between Manholes FMH1003764 and FMH1003731 are provided in **Appendix C**.

3.4.3 With the Proposed CBP, the capacity utilization of the proposed Ø225 sewer is 2%. The pipe capacity utilization between Manholes FMH1003764 and FMH1003731 ranges from

1% to 22%. This shows that less than 100% of the available capacity will be used under the worst-case scenario and the contribution of sewerage generation from the Proposed CBP to the downstream sewerage system is considered negligible.

3.4.4 For Option 2, detailed sewage generation calculations are provided in **Appendix D**. The total sewage generated from onsite staff and truck drivers is 5,060 L/day and 364 L/day respectively, therefore, total sewage generated from the Site will be 5,424 L/day.

3.4.5 Considering the small amount of sewage generated from the toilets of the Site, container toilets connected to temporary sewage storage tanks with a sufficient capacity is proposed to handle the sewage. Each temporary sewage storage tank is about 3,000 L. The utilisation of two temporary sewage storage tanks will have sufficient capacity to handle the sewage generation for one day.

3.4.6 Overall, the sewerage analysis indicates there will be no unacceptable impact on the existing municipal sewerage system under the worst-case scenario with the existing flows and the peak sewage discharge from the Site, for both Option 1 and Option 2. As such, no upgrading work for the existing network is required and no adverse sewerage impact is anticipated.

4 CONCLUSION AND RECOMMENDATIONS

4.1.1 Potential sewerage impacts arising from the Site has been assessed. The detailed sewage generation calculation shows that total estimated ADWF from the Site is calculated to be 5.42m^3/day (i.e. 5,424 L/day). Either Option 1 or Option 2 is recommended to discharge the sewage from toilets generated during the operation phase. For Option 1, sewage generated from the Site will be collected and conveyed to the municipal sewerage system beneath the access road at the north and northwest of the Site. For Option 2, considering the sewage from on-site staff and truck drivers will be in insignificant amount, sewage will be collected and temporarily stored, and then tankered away by a licensed contractor.

4.1.2 For Option 1, sewage generated from the Site is proposed to be collected and discharged into municipal sewerage system via Manhole FMH1033261. The capacity of the sewerage system has been evaluated. Sewage from other properties/uses upstream and downstream discharged to the sewerage system between the Manholes FMH1003764 and FMH1003731 have been taken into account in the evaluation.

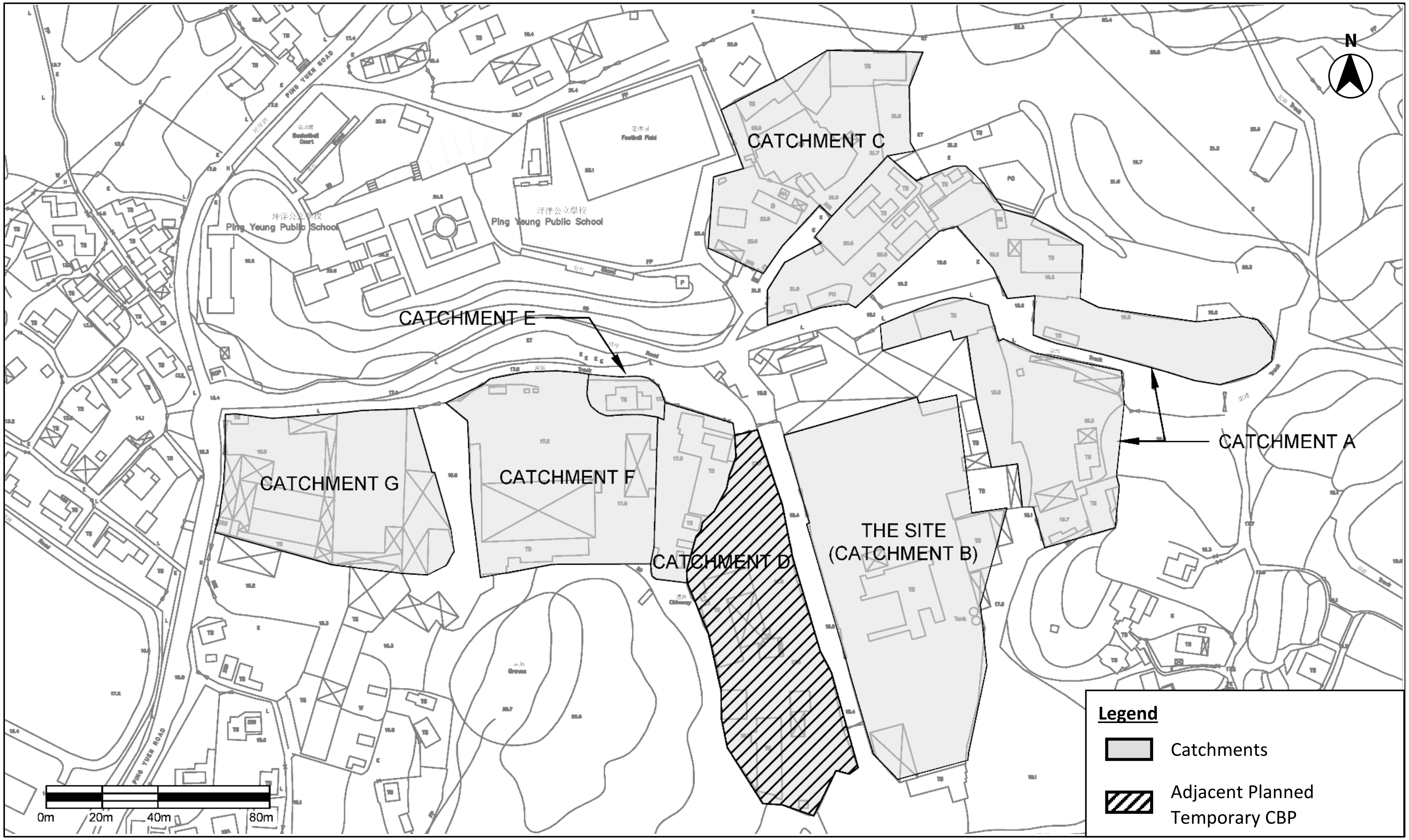
4.1.3 The capacity utilisation of the proposed sewer is 2%. The utilisation of existing sewer from Manholes FMH1003764 and FMH1003731 will be 1% to 22%. This shows that less than 100% of the available capacity will be used under the worst-case scenario and the contribution of sewerage generation from the Proposed CBP to the downstream sewerage system is considered negligible.

4.1.4 For Option 2, the sewage generated during the operation phase will be collected in the container toilets with aboveground storage tanks and then be tankered away, thus no significant impacts on the existing sewerage system is anticipated.

4.1.5 The total estimated average daily dry weather flow from the Proposed CBP is calculated to be 5,424 L/day (i.e., 5.42m^3/day). The minimum total capacity of the proposed sewage tanks will be 6,000 L, which is sufficient for temporally storage of the sewage generated from the on-site staff and truck drivers for a day. Therefore, there should be no unacceptable impact on the existing sewerage system resulting from the addition of the Proposed CBP.

4.1.6 Therefore, the sewerage analysis indicates there will be no unacceptable impact on the existing municipal sewerage system under the worst-case scenario with the existing flows and the peak sewage discharge from the Site. No upgrading works for the municipal sewerage system will be required for the Proposed Development.

Appendix A Location Plan of Catchment Areas


CATCHMENT C
CATCHMENT E
CATCHMENT A
CATCHMENT G
CATCHMENT F
CATCHMENT D
THE SITE
(CATCHMENT B)
Ping Yeung Public School
Ping Yeung Public School
PING YUEN ROAD
N
0m
20m
40m
80m
Legend
Catchments
Adjacent Planned
Temporary CBP

Appendix B Calculation of Sewage Flow Generation from the Proposed CBP, Upstream and Downstream Catchments (Option 1)

Calculation of Sewage Generation from the Proposed CBP, Upstream and Downstream Catchments				Remarks / Justification
Catchment A				
A1) Village Houses				
No. of Flats	=	4	flat	Based on desktop research and site observations.
No. of Residents	=	10.8	persons	Average household size of 2.7 for North District in 2023 from https://www.censtatd.gov.hk/en/web_table.html?id=130-06806.
Unit flow Factor (UFF) per resident	=	0.270	m^3/day/person	UFF for "Modern village" in Table T-1 of Ref. 2 is adopted.
Estimated Total Average Daily Dry Weather Flow Rate	=	2.9	m^3/day	
A2) Open Storage Use (Doran Precast Concrete Pipe)				
Estimated Floor Area	=	3902	m^2	
Staff Occupancy Density	=	250.0	m^2/staff	Worker density by Industry Group (All Type) for "Storage" is 0.4 staff in 100m^2 as stated in Table 8 of Ref.1.
No. of Staff	=	16	staff	
Unit flow Factor (UFF) per staff	=	0.180	m^3/day/person	UFF for "Commercial Employee + J3 Transport, Storage & Communication" in Table T-2 of Ref. 2 is adopted.
Estimated Total Average Daily Dry Weather Flow Rate	=	2.9	m^3/day	
A3) Religious Institution (Guadalupe Missioners)				
Estimated Floor Area	=	213	m^2	
Staff Occupancy Density	=	30.3	m^2/staff	Worker density by Industry Group (All Type) for "Community, Social & Personal Services" is 3.3 staff in 100m^2 as stated in Table 8 of Ref.1.
No. of Staff	=	8	staff	
Unit flow Factor (UFF) per staff	=	0.280	m^3/day/person	UFF for "Commercial Employee + J11 Community, Social & Personal" in Table T-2 of Ref. 2 is adopted.
Estimated Total Average Daily Dry Weather Flow Rate	=	2.2	m^3/day	
A4) Warehouse and Open Storage Use				
Estimated Floor Area	=	1075	m^2	
Staff Occupancy Density	=	250.0	m^2/staff	Worker density by Industry Group (All Type) for "Storage" is 0.4 staff in 100m^2 as stated in Table 8 of Ref.1.
No. of Staff	=	5	staff	
Unit flow Factor (UFF) per staff	=	0.180	m^3/day/person	UFF for "Commercial Employee + J3 Transport, Storage & Communication" in Table T-2 of Ref. 2 is adopted.
Estimated Total Average Daily Dry Weather Flow Rate	=	0.9	m^3/day	
Total Estimated Flow	=	**10.9**	**m^3/day**	
Catchment Inflow Factor	=	**1.0**		Catchement Inflow Factor for North District in Table T-4 of Ref. 2 is adopted.
Total Average Daily Dry Weather Flow of Catchment A	=	**10.9**	**m^3/day**	
Catchment B				
B1) Proposed CBP				
No. of On-site Staff	=	22	persons	As advised by the applicant based on the scale and nature of the Proposed CBP.
Unit Flow Factor (UFF) per Staff	=	0.23	m^3/day/person	UFF for "Commercial Employee + J9 Construction" in Table T-2 of Ref. 1.
No. of Toilet Visit for Truck Drivers	=	40	visits	As advised by the applicant.
Unit Flow Factor (UFF) per Drivers	=	0.0091	m^3/day/person	Assumed 200ml micturition + 7.5L flushing + 1.4L hand washing.
Estimated Total Average Daily Dry Weather Flow Rate	=	5.4	m^3/day	
Total Estimated Flow	=	**5.4**	**m^3/day**	
Catchment Inflow Factor	=	**1.0**		Catchement Inflow Factor for North District in Table T-4 of Ref. 2 is adopted.
Total Average Daily Dry Weather Flow of Catchment B	=	**5.4**	**m^3/day**	
Catchment C				
C1) Village Houses				
No. of Flats	=	1	flat	Based on desktop research and site observations.
No. of Residents	=	2.7	persons	Average household size of 2.7 for North District in 2023 from https://www.censtatd.gov.hk/en/web_table.html?id=130-06806.
Unit flow Factor (UFF) per resident	=	0.270	m^3/day/person	UFF for "Modern village" in Table T-1 of Ref. 2 is adopted.
Estimated Total Average Daily Dry Weather Flow Rate	=	0.7	m^3/day	
C2) Warehouse (Wisen Industries Limited)				
Estimated Floor Area	=	2685	m^2	
Staff Occupancy Density	=	250.0	m^2/staff	Worker density by Industry Group (All Type) for "Storage" is 0.4 staff in 100m^2 as stated in Table 8 of Ref.1.
No. of Staff	=	11	staff	
Unit flow Factor (UFF) per staff	=	0.180	m^3/day/person	UFF for "Commercial Employee + J3 Transport, Storage & Communication" in Table T-2 of Ref. 2 is adopted.
Estimated Total Average Daily Dry Weather Flow Rate	=	2.0	m^3/day	
Total Estimated Flow	=	**2.7**	**m^3/day**	
Catchment Inflow Factor	=	**1.0**		Catchement Inflow Factor for North District in Table T-4 of Ref. 2 is adopted.
Total Average Daily Dry Weather Flow of Catchment C	=	**2.7**	**m^3/day**	

Catchment D				
D1) Open Storage Use (Man Wah Welding Engineering Company Limited)				
Estimated Floor Area	=	1300	m^2	
Staff Occupancy Density	=	250.0	m^2/staff	Worker density by Industry Group (All Type) for "Storage" is 0.4 staff in 100m^2 as stated in Table 8 of Ref.1.
No. of Staff	=	6	staff	
Unit flow Factor (UFF) per staff	=	0.180	m^3/day/person	UFF for "Commercial Employee + J3 Transport, Storage & Communication" in Table T-2 of Ref. 2 is adopted.
Estimated Total Average Daily Dry Weather Flow Rate	=	1.1	m^3/day	
Total Estimated Flow	=	**1.1**	**m^3/day**	
Catchment Inflow Factor	=	**1.0**		Catchement Inflow Factor for North District in Table T-4 of Ref. 2 is adopted.
Total Average Daily Dry Weather Flow of Catchment D	**=**	**1.1**	**m^3/day**	
Catchment E				
E1) Village House				
No. of Flats	=	1	flat	Based on desktop research and site observations.
No. of Residents	=	2.7	persons	Average household size of 2.7 for North District in 2023 from https://www.censtatd.gov.hk/en/web_table.html?id=130-06806.
Unit flow Factor (UFF) per resident	=	0.270	m^3/day/person	UFF for "Modern village" in Table T-1 of Ref. 2 is adopted.
Estimated Total Average Daily Dry Weather Flow Rate	=	0.7	m^3/day	
Total Estimated Flow	=	**0.7**	**m^3/day**	
Catchment Inflow Factor	=	**1.0**		Catchement Inflow Factor for North District in Table T-4 of Ref. 2 is adopted.
Total Average Daily Dry Weather Flow of Catchment E	**=**	**0.7**	**m^3/day**	
Catchment F				
F1) Workshop (Freyssinet Hong Kong Limited Workshop)				
Estimated Floor Area	=	4237	m^2	
Staff Occupancy Density	=	43.5	m^2/staff	Worker density by Industry Group (All Type) for "Manufacturing" is 2.3 Staff in 100m^2 as stated in Table 8 of Ref.1.
No. of Staff	=	98	staff	
Unit flow Factor (UFF) per staff	=	0.640	m^3/day/person	UFF for "Industrial Employee + Industrial Activities of Territorial Average" in Table T-3 of Ref. 2 is adopted.
Estimated Total Average Daily Dry Weather Flow Rate	=	62.7	m^3/day	
Total Estimated Flow	=	**62.7**	**m^3/day**	
Catchment Inflow Factor	=	**1.0**		Catchement Inflow Factor for North District in Table T-4 of Ref. 2 is adopted.
Total Average Daily Dry Weather Flow of Catchment F	**=**	**62.7**	**m^3/day**	
Catchment G				
G1) Warehouse (World Plaza Engineering Limited)				
Estimated Floor Area	=	4032	m^2	
Staff Occupancy Density	=	250.0	m^2/staff	Worker density by Industry Group (All Type) for "Storage" is 0.4 staff in 100m^2 as stated in Table 8 of Ref.1.
No. of Staff	=	17	staff	
Unit flow Factor (UFF) per staff	=	0.180	m^3/day/person	UFF for "Commercial Employee + J3 Transport, Storage & Communication" in Table T-2 of Ref. 2 is adopted.
Estimated Total Average Daily Dry Weather Flow Rate	=	3.1	m^3/day	
Total Estimated Flow	=	**3.1**	**m^3/day**	
Catchment Inflow Factor	=	**1.0**		Catchement Inflow Factor for North District in Table T-4 of Ref. 2 is adopted.
Total Average Daily Dry Weather Flow of Catchment G	**=**	**3.1**	**m^3/day**	

Reference:
1 Commercial and Industrial Floor Space Utilization Survey, Planning Department, 2005
2 Guidelines for Estimating Sewage Flows for Sewage Infrastructure Planning Version 1.0, Environmental Protection Department of HK Government, March 2005

Appendix C Calculation of Flow Capacity

Pipe Segment ID	Pipe Segment between Manholes		Length	Level (In)	Level (Out)	d	r	A_w	P_w	R	s	k_s [1]	V	Q_C	ADWF	P_c	P	Q_p	Catchment	Is $Q_c > Q_p$?	% of capacity [2]
			m	mPD	mPD	m	m	m^2	m	m	-	mm	m/s	m^3/s	m^3/day			m^3/s		Y/N	%
sed sewer [3]	Terminal Manhole	FMH1033261	44.0	17.85	17.38	0.225	0.113	0.040	0.707	0.057	0.011	6	0.929	0.033	5.42	20	8	0.001	Proposed CBP	Y	2%
FWD1004348	FMH1003764	FMH1003763	21.3	17.32	17.13	0.225	0.113	0.040	0.707	0.057	0.009	6	0.848	0.031	10.92	40	8	0.001	Catchment A	Y	3%
FWD1039506	FMH1033261	FMH1003763	4.7	17.38	17.14	0.225	0.113	0.040	0.707	0.057	0.053	6	2.070	0.075	5.42	20	8	0.001	Catchment B (The Site)	Y	1%
FWD1004346	FMH1003763	FMH1003759	17.9	17.08	16.80	0.225	0.113	0.040	0.707	0.057	0.016	6	1.124	0.040	16.34	61	8	0.002	Catchment A to B	Y	4%
FWD1004340	FMH1003759	FMH1003757	19.5	16.03	15.92	0.225	0.113	0.040	0.707	0.057	0.006	6	0.674	0.024	19.05	71	8	0.002	Catchment A to C	Y	7%
FWD1004337	FMH1003757	FMH1003756	28.0	15.92	15.76	0.225	0.113	0.040	0.707	0.057	0.006	6	0.679	0.024	20.13	75	8	0.002	Catchment A to D	Y	8%
FWD1004335	FMH1003756	FMH1003755	29.0	15.76	15.65	0.225	0.113	0.040	0.707	0.057	0.004	6	0.553	0.020	20.86	77	8	0.002	Catchment A to E	Y	10%
FWD1004333	FMH1003755	FMH1003754	27.5	15.60	15.23	0.225	0.113	0.040	0.707	0.057	0.013	6	1.042	0.038	20.86	77	8	0.002		Y	5%
FWD1004331	FMH1003754	FMH1003753	38.0	15.18	14.73	0.225	0.113	0.040	0.707	0.057	0.012	6	0.978	0.035	83.58	310	8	0.008	Catchment A to F	Y	22%
FWD1004329	FMH1003753	FMH1003731	35.0	14.67	13.75	0.225	0.113	0.040	0.707	0.057	0.026	6	1.458	0.052	86.64	321	8	0.008	Catchment A to G	Y	15%

Legend

d = pipe diameter, m

r = pipe radius (m) = 0.5d

tted area (m^2) = (r^2/2) (b + sinq)

tted perimeter (m) = br

s = Slope of the total energy line

R = Hydraulic radius (m) = A_w/P_w

s = Slope of the total energy line

k_s = hydraulic pipeline roughness, mm

V = Velocity of flow calculated based on Colebrook-White Equation, m/s

Q_c = Flow Capacity (10% sedimentation incorporated), m^3/s

Q_p = Estimated total peak flow from the Site during peak season, m^3/s

P_c = Contributing Population = ADWF/0.27

P = Peaking Factor (including stormwater allowance) for facility with existing upstream sewerage

ADWF = Total average dry weather flow, m^3/day

Note

1. The roughness value is referred to Table 5 of the "Sewerage Manual, Key Planning Issues and Gravity Collection System" published by the Drainage Services Department (DSD). For conservative approach, the roughness value 6 is adopted, assuming with concrete pipe material under poor condition with a velocity approximately 0.75m/s when flowing half full.
2. Whilst sewage generation from the Site is estimated based on the "Guidelines for Estimating Sewage Flows for Sewage Infrastructure Planning Version 1.0" (published by the Environmental Protection Department (EPD), 2005) using the best available information, the flow capacities of pipe segments are calculated based on Colebrook-White Equation.
3. The invert levels and length of the proposed sewer are indicative only, subject to change during the detailed design stage.

Appendix D Calculation of Sewage Flow Generation from the Proposed CBP (Option 2)

Calculation of Sewage Generation from the Proposed CBP				Remarks / Justification
1) Sewage generated by on-site staff				
No. of On-site Staff	=	22	persons	As advised by the applicant.
Unit Flow Factor (UFF) per Staff	=	0.23	m^3/day/person	UFF for "Commercial Employee + J9 Construction" in Table T-2 of Ref. 1.
Total Sewage Generation	=	5,060	L/day	
2) Sewage generated by truck drivers				
No. of Toilet Visit for Truck Drivers	=	40	visits	As advised by the applicant.
Flow rate per flushing	=	7.5	L/flush	Refer to Ref. 2, the estimated toilet flush of 7.5 L/flush.
Flow rate per handwashing	=	1.4	L/handwashing	Refer to Ref. 2, wastewater used for handwashing = 8.3 L/min x 10s.
Flow rate from micturition per visit	=	0.2	L/visit	Refer to Ref.3, human's micturition is assumed to be 200ml.
Unit Flow Factor (UFF) per Drivers	=	9.1	L/day/person	
Total Sewage Generation	=	364	L/day	
Total Sewage Generation from the Proposed CBP	=	**5,424**	**L/day**	
	=	**5.42**	**m^3/day**	
Container Toilets				
Minimum Total Storage Capacity of Sewage Storage Tank	=	3,000	L/toilet	Container with size of 3,000L each will be installed as advised by the supplier.
No. of Containeres Required (3,000L each)	=	2	tanks	

Reference:
1 Guidelines for Estimating Sewage Flows for Sewage Infrastructure Planning Version 1.0, Environmental Protection Department of HK Government, March 2005
2 BEAM Plus New Buildings Version 1.2, July 2012
3 P.3081, Magill's Medical Guide, 6th ed., various medical editors, Salem Press, USA, 2011.

Accountability

We understand the importance of being accountable to each other and our clients.

Passion

We are completely passionate about providing practical solutions and outcomes that deliver for our clients.

Insight

We work in an environment that encourages and values insight as a critical quality which informs our decisions and our clients and supports practical solutions and project delivery.

Integrity

We behave with respect and honesty toward each other, our clients and our stakeholders.

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