

Appendix E

Drainage and Sewerage Impact Assessment

Application for Planning Permission Under Section 16 of the Town Planning Ordinance (Cap. 131) for Proposed Temporary Educational Institution (Teaching Farm) for a Period of Three Years and Excavation of Land at Various Lots in D.D. 16, Wo Tong Pui, Tai Po, New Territories

Drainage and Sewerage Impact Assessment

Reference: 312796-ARUP-W-RP-S16-B-DSIA-001-0

Final | July 2026

This report takes into account the particular instructions and requirements of our client. It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 312796

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1. Introduction

1.1 Project Background

- 1.1.1** The existing temporary teaching farm located at Lam Tuen, Tai Po is operated by the Jockey Club College of Veterinary Medicine and Life Sciences of the City University of Hong Kong (CityUHK) since 2022 (i.e. Farm 1.0 with a site area of about 9,330m²)¹. As Hong Kong's only working dairy farm, it is mainly for the milking of Jersey cows for veterinary students to gain hands-on experience with the cattle and for promoting One Health, public health, research into zoonotic diseases, and animal welfare.
- 1.1.2** The expansion of the existing CityUHK Farm will provide essential facilities for hands-on training in bovine medicine, animal husbandry, and farm management. Covering site area approximately 6,169m² (Farm 2.0), the expansion will include additional dairy barn, caretakers' accommodation and other supporting facilities for long-term operations.
- 1.1.3** After the expansion, CityUHK Farm (Farm 1.0 + Farm 2.0), with a total site area of 15,457 m², will enhance Hong Kong's only active dairy farm in support of the city's sole veterinary medicine degree, delivering public benefits through improved public health and food safety, while strengthening Hong Kong's role as a hub for research and training in veterinary medicine and life sciences.
- 1.1.4** The Application Site (i.e. Farm1.0 + Farm 2.0) comprises Lots 175 S.A ss.1, 175 S.B, 176, 179 RP, 333, 334, 335 S.B (Part), 336AB, 336C, 337 S.B, 338, 339, 340, 341, 342 RP, 345 S.A, and 346 in D.D. 16, Wo Tong Pui, Tai Po, New Territories. Since the land is zoned for "Recreation" (REC) use in the Outline Zoning Plan (OZP), a Town Planning Town (TPB) application under Section 16 (S16) of the Town Planning Ordinance will be required to obtain approval for Proposed Temporary Educational Institution (Teaching Farm) for a Period of Three Years and Excavation of Land at the Application Site.

1.2 Objectives of this Report

- 1.2.1** The purpose of this drainage and sewerage impact assessment report is to analyse the implications of the CityUHK Farm expansion on storm water and sewage flows within the Application Site. The key objectives are as follows:
- **Infrastructure Capacity:** To determine whether the existing drainage and sewerage infrastructure can accommodate the anticipated increase in flows brought about by the addition of new facilities—including laboratories, accommodation, and hydroponics—without resulting in flooding or overwhelming the municipal systems.
 - **Environmental Protection:** To evaluate the potential impacts on storm water and sewage discharge, ensuring that the development does not contribute to water pollution, environmental harm, or pose risks to public health.
 - **Regulatory Compliance:** To provide the necessary technical evidence required by the Town Planning Board and relevant authorities, confirming that the proposed development aligns

¹ To avoid intrusion to the surrounding "Green Belt" zone, a minor portion of the existing temporary Farm1.0 that falls within the "GB" zone (about 56m²), has been excluded from the Application Site of the subject S16 planning applications.

with statutory and planning regulations, particularly in light of the intended change of land use to educational purposes.

- **Sustainable Development:** To proactively address possible drainage and sewerage challenges, thereby supporting the long-term sustainability of the project and reducing the likelihood of operational or environmental issues arising in the future.

1.3 This Report

1.3.1 This report contains the following Chapters:

- **Chapter 1** provides an introduction of the Project and this Report;
- **Chapter 2** describes the site condition;
- **Chapter 3** provides the drainage impact assessment of the Study Area;
- **Chapter 4** provides the sewerage impact assessment of the Study Area;
- **Chapter 5** provides a conclusion of the drainage and sewerage impact review.

2. Project Outline

2.1 Site Condition

- 2.1.1** The Project is situated in Lam Tsuen as illustrated in Figure 2-1, occupying an area of about 591m² (Site A) and 5,579m² (Site C&D) for the CityUHK Farm Expansion (Farm 2.0). Adjacent to this site is the existing CityUHK Farm 1.0, which covers approximately 9,274 m² (Site B)².

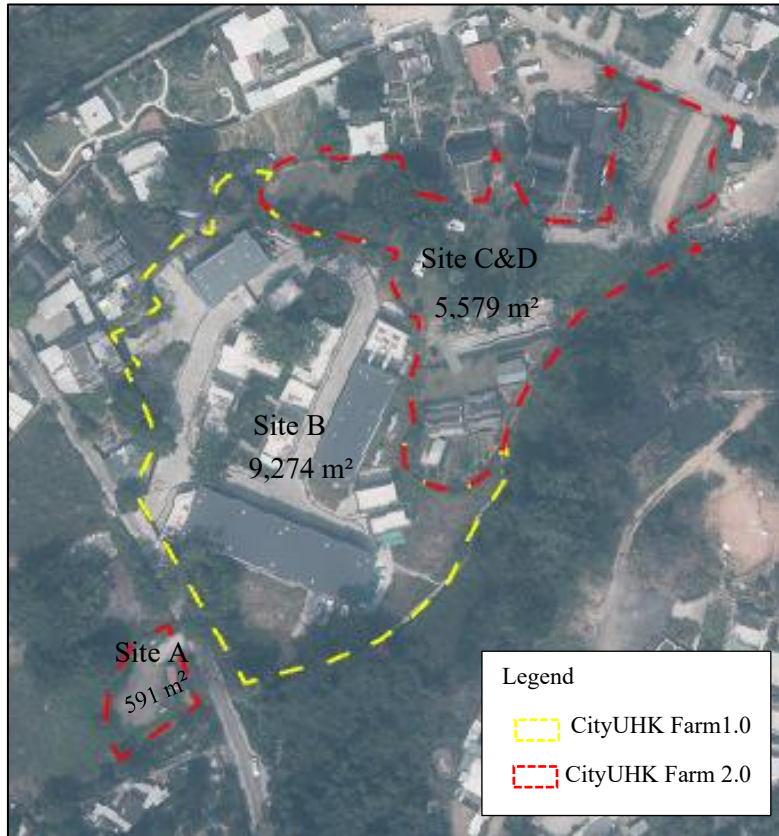


Figure 2-1 Site Plan

2.2 Interface Project

- 2.2.1** No foreseeable interaction or conflict with other development projects in the vicinity of the Site was identified when this DSIA was conducted.

² To avoid intrusion to the surrounding “Green Belt” zone, a minor portion of the existing temporary Farm1.0 that falls within the “GB” zone (about 56m²), has been excluded from the Application Site of the subject S16 planning applications.

3. Drainage Impact Assessment

3.1 Existing Drainage System

- 3.1.1 Lam Tsuen River is located approx. 100m far on the north of the site. There is an existing DN450 rising main along Ngau Kwu Leng Path to convey the collected surface runoff from the Site to the nearby Lam Tsuen River. The existing drainage records are shown in **Appendix B**.

3.2 Proposed Drainage System

- 3.2.1 The existing DN450 D.I pipe will be kept for conveying the collected surface runoff from the site after its expansion.
- 3.2.2 To manage potentially contaminated surface runoff from the carriageway and car park areas within Farm 1.0 (Site B) and Farm 2.0 (Site C&D), a separate drainage system, together with a holding tank, is proposed to collect and retain this runoff. The holding tank is designed to handle runoff generated from carriageway and carparking area during a 1-in-2 year rainstorm event, specifically retaining 20 minutes of runoff. If the surface runoff collected from the carriageway exceeds the capacity of the holding tank, the excess surface runoff will overflow into a stormwater pump pit and subsequently be discharged into Lam Tsuen River. All potentially contaminated collected flow stored in the holding tank will be discharged to the existing sewers along Hang Kai Lane, effectively preventing potentially polluted water from entering natural waterways. Details of the capacity assessment of sewerage systems is included in Section 4 of this Report.
- 3.2.3 Conversely, runoff from roof and landscaped areas, which is considered as uncontaminated, will be collected and pumped directly for discharge into Lam Tsuen River.

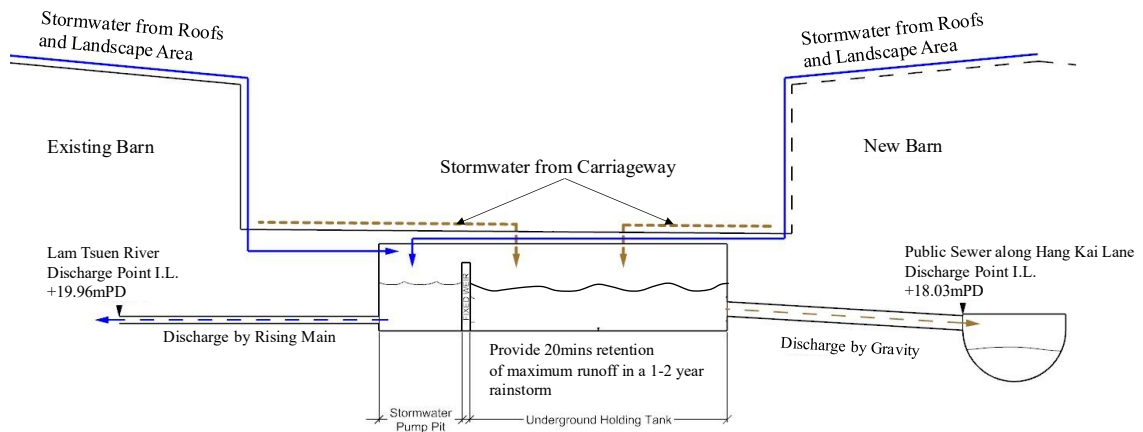


Figure 3-1 Proposed Stormwater Management Diagram

- 3.2.4 Farm 2.0 (Site A) comprises roof and landscape area, the surface runoff from Site A will be conveyed to stormwater pump pit in Farm 1.0 (Site B) and Farm 2.0 (Site C&D) and further discharge to Lam Tsuen River.
- 3.2.5 Perimeter channel is provided along the site boundary to intercept and convey the runoff generated within the site.

3.2.6 The proposed drainage system for Farm 1.0+2.0 are shown in **Appendix B**.

3.3 Design Criteria

3.3.1 The drainage impact assessment is undertaken in accordance with the guidelines set out in:

- DSD's Stormwater Drainage Manual – Planning, Design and Management, Fifth Edition, January 2018 (SDM);
- DSD's SDM Corrigendum No.1/2022 and SDM Corrigendum No.1/2024 and No.2/2024;
- DSD Advice Note No. 1 - Application of the Drainage Impact Assessment Process to Private Sector Projects ;
- ProPECC PN2/24 Construction Site Drainage

Flood Protection Standard

3.3.2 In accordance with DSD's SDM, the flood protection standard for drainage system is shown in **Table 3-1**.

Table 3-1 Flood Protection Standard: Design Return Periods based on Flood Levels

Intensively Used Agricultural Land	2 – 5 years
Village Drainage including Internal Drainage System under a Polder Scheme	10 years ^{1, 3}
Main Rural Catchment Drainage Channels	50 years ^{2, 3}
Urban Drainage Trunk Systems	200 years ⁴
Urban Drainage Branch Systems	50 years ⁴

Notes:

- 1. The impact of a 50-year event should be assessed in each village to check whether a higher standard than 10 years can be justified.*
- 2. Embanked channels must be capable of passing a 200-year flood within banks.*
- 3. For definitions of Village Drainage and Main Rural Catchment Drainage Channels, refer to Section 6.6.1 of SDM.*
- 4. For definitions of Urban Drainage Branch and Urban Drainage Trunk Systems, refer to Section 6.6.2 of SDM*

3.3.3 According to Table 3-1, 50-year flood protection standard for drainage system was adopted for the Site as it discharged to Lam Tsuen River which is categorised as Main Rural Catchment Drainage Channel. 200-year flood protection standard was adopted for assessing the impact from the proposed site development to Lam Tsuen River.

Protection Standard for Potentially Contaminated Stormwater

3.3.4 In accordance with the design requirements for petrol interceptor in ProPECC 2/24 Construction Site Drainage, 20 minutes retention to the maximum runoff collected in a 1 in 2 year rainstorm is adopted for sizing the holding tank for storage of the potentially contaminated stormwater.

Surface Runoff Estimation

3.3.5 For the purpose of runoff calculation, runoff coefficients of 0.95 and 0.35 have been adopted for the paved areas and unpaved areas of the existing drainage catchment areas in accordance with SDM.

3.3.6 Peak instantaneous runoff has been calculated using the Rational Method in accordance with Section 7.5.2 of SDM and assuming uniform intensity rainfall.

$$Q = 0.278CiA$$

Where Q – the runoff (m^3/s)

i – the rainfall intensity (mm/hr)

A – the catchment area (km^2)

C – the runoff coefficient

Rainfall Intensity

3.3.7 The average rainfall intensity (i) is estimated on the basis of the design rainfall duration and return period from the IDF relationships provided in Section 4.3.3 and Table 3 of the SDM, using the following formula:

$$i = \frac{a}{(t_d + b)^c}$$

Where: i – extreme mean intensity in mm/hr

t_d – duration in minutes

a, b, c – storm constants (from Table 3a of the SDM)

3.3.8 For 2 year and 50 year return period rainfall event, the storm constants used to calculate the rainfall intensity are shown in **Table 3-2**:

Table 3-2 Storm Constants for 2 Year/50 Year/200 Year Return Period Rainfall Event

Return Period (year)	a	b	c
2	446.1	3.38	0.463
50	505.5	3.29	0.355
200	508.8	3.46	0.322

Effect of Sedimentation

3.3.9 According to Section 9.3 of SDM, the following effect of flow capacity due to materials deposited on the bed is considered in this assessment:

(i) 5% reduction in flow area if the gradient is greater than 1 in 25.

(ii) 10% reduction in flow area in other cases.

3.4 Assessment Results

Surface runoff to Lam Tsuen River

- 3.4.1** Catchment and landuse plan before and after farm expansion is shown in **Appendix A**. Preliminary hydraulic calculation for assessing the increased surface runoff under 1-50years rainfall event is shown in **Appendix C**. The summary of the catchment characteristics and surface runoff is shown in **Table 3-3**

Table 3-3 Summary of Catchment Characteristics and Surface Runoff

Catchment ID	Existing Condition			After Farm Expansion			Increase in Surface runoff (m ³ /s)	Flooding Black Spot
	Paved Area (m ²)	Unpaved Area (m ²)	Surface Runoff (m ³ /s)	Paved Area (m ²)	Unpaved Area (m ²)	Surface Runoff (m ³ /s)		
Farm 1.0(Site B)+Farm 2.0(Site C&D)	6219	8634	0.590	9797	5056	0.732	0.142	No
Farm 2.0 (Site A)	190	401	0.021	253	338	0.024	0.002	No

- 3.4.2** Based on the preliminary hydraulic assessment in **Appendix C**, the existing DN450 D.I pipe will be sufficient for conveying the pumped stormwater from site to the downstream Lam Tsuen River. The surface runoff generated from the Site only takes up 0.3% of the total capacity of Lam Tsuen River under 1 in 200 year rainfall event and the proposed development would result in a water level rise of only 1.5mm in Lam Tsuen River. Therefore, it is expected that there is no drainage impact to the existing Lam Tsuen River.

Potentially contaminated surface runoff

- 3.4.3** Based on the preliminary hydraulic assessment in **Appendix C**, the holding tank designed for storing 20 minutes of surface runoff under 1 in 2year rainfall event from carriageway and car park area in Farm 1.0(Site B) +Farm 2.0(Site C&D) is 145m³. The stored surface runoff will be discharged to the existing sewers along Hang kai Lane. The discharge flow rate is 20L/s based on the assessment of the spare capacity of the existing sewers as stated in Section 4.4.3.

3.5 Flooding Susceptibility

- 3.5.1** Referring to topo information of the site, the application site ground level is varying from around +20.1mPD to + 23.8mPD which is much higher than the design extreme sea level of 1 in 50 return period which is 4.41mPD referring to DSD SDM Corrigendum No.1/2022 Table 8. There is no record of flood blackspot found for the application site or adjacent area. In general, foreseeing there is slim chance of the application site been affected by backwater effect under extreme weather.

4. Sewerage Impact Assessment

4.1 Existing Sewerage System

- 4.1.1 There are existing 200mm dia. to 225mm dia. sewers along Hang Kai Lane and further connected to Lam Tsuen Valley sewage pumping station. The existing sewerage records are shown in **Appendix D**.

4.2 Proposed Sewerage System

- 4.2.1 The existing 200mm dia. to 225mm dia. sewers along Hang Kai Lane will be used for conveying the sewage and potentially contaminated surface runoff generated from the site. The proposed discharge location is shown in **Appendix D**.

4.3 Design Criteria

- 4.3.1 This sewerage impact assessment is conducted with reference to the following technical manual, guideline, and approved reports:
- Sewerage Manual Part 1 (with Eurocodes incorporated) – Key Planning Issues and Gravity Collection System Third Edition (Drainage Services Department, 2013)
 - Sewerage Manual Part 2 (with Eurocodes incorporated) – Pumping Stations and Rising Mains Second Edition (Drainage Services Department, 2013)
 - Corrigendum No.1/2024 Sewerage Manual
 - EPD Report No. EPD/TP1/05 Guidelines for Estimating Sewage Flows (GESF)
- 4.3.2 Unit flow factor presented in **Table 4-1** below have been adopted for estimating the sewage generated due to human activities from the Site. Sewage generated from animal is based on the number estimated by cattle specialist.

Table 4-1 Unit Sewage Flow Factor

Type	Unit Flow Factor (m ³ /day)	Reference
Commercial Employee -General Territorial Average	0.28	EPD's GESF
Visitors	0.015	Previous project experience in West Kowloon Station

- 4.3.3 Other parameters adopted for hydraulic calculations for sewerage system is shown in **Appendix E**

4.4 Assessment Results

- 4.4.1 Sewage generated from CityUHK Farm site is summarised in **Table 4-2**. The animal waste will be pretreated to meet the discharge standard set in Technical Memorandum Standards for Effluents Discharged into Drainage and Sewerage Systems, inland and Coastal Waters. The separated liquid fraction after pre-treatment will be discharged into the existing sewers. The human waste will be directly enter the existing sewers.

Table 4-2 Summary of Sewage Generated from City U Farm

Type	ADWF (m ³ /day)	Peak Flow (L/s)
Animal waste	9.71	-
Human waste	3.41	-
Total	13.12	1.21

- 4.4.2** Based on the hydraulic assessment in **Appendix E**, the existing 200mm dia. and 225mm dia, sewers along Hang Kai Lane will have sufficient capacity for conveying the increased sewage generated from CityUHK Farm site. The capacity of the downstream Lam Tsuen Valley Sewage Pumping Station is 5400m³/day. The sewage generated from the Project Site takes up 0.2% of the capacity of Lam Tsuen Valley Sewage Pumping Station. The pumping station will have sufficient capacity for conveying the sewage from the Farm Site.
- 4.4.3** The minimum spare capacity of existing downstream sewers is 20.5L/s based on the hydraulic assessment in **Appendix E**. The potentially contaminated stormwater (see Section 3.2.2) collected during rainy day will be discharged into the existing 200mm to 225mm sewers along Hang Kai Lane, using the spare capacity. The proposed discharge flow rate will be 20L/s.

5. Conclusion

5.1 General

- 5.1.1** A drainage impact assessment and sewerage impact assessment for the existing drainage and sewerage system due to implementation of CityUHK Farm Expansion is conducted.

5.2 Drainage Impact Assessment

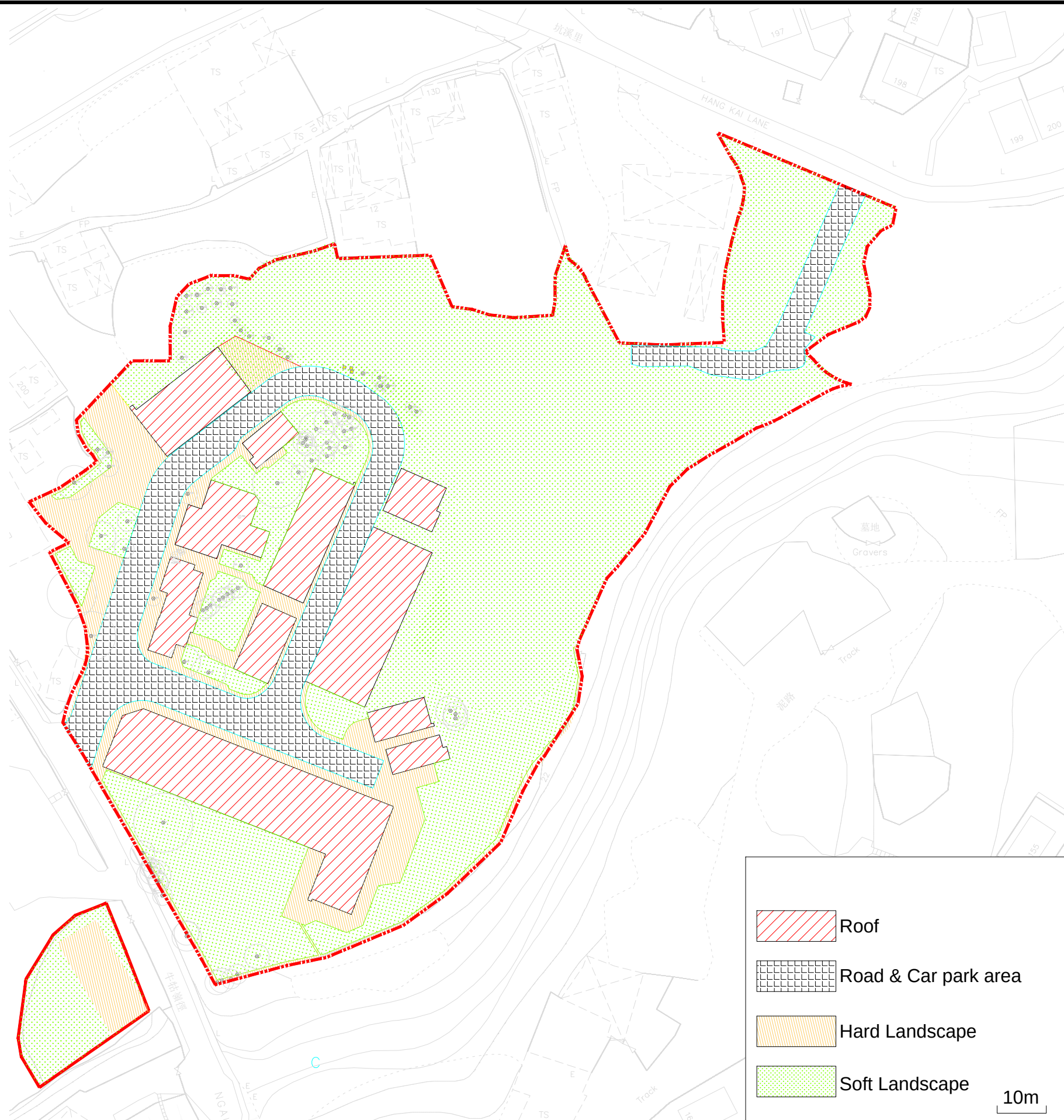
- 5.2.1** Based on the drainage impact assessment, it is found that the existing DN450 D.I pipe along Ngau Kwu Leng Path do have adequate capacity to convey the additional surface runoff generated from the farm. The surface runoff generated from the Site only takes up 0.3% of the total capacity of Lam Tsuen River under 1 in 200 year rainfall event and the proposed development would result in a water level rise of only 1.5mm in Lam Tsuen River. Therefore, it is expected that there is no drainage impact to the existing Lam Tsuen River.
- 5.2.2** The potentially contaminated surface runoff from carriageway and car park area in Farm 1.0 (Site B) and Farm 2.0 (Site C&D) will be collected by separate drainage system and stored by a holding tank and gradually discharge to the existing sewers utilizing the sewers' spare capacity.

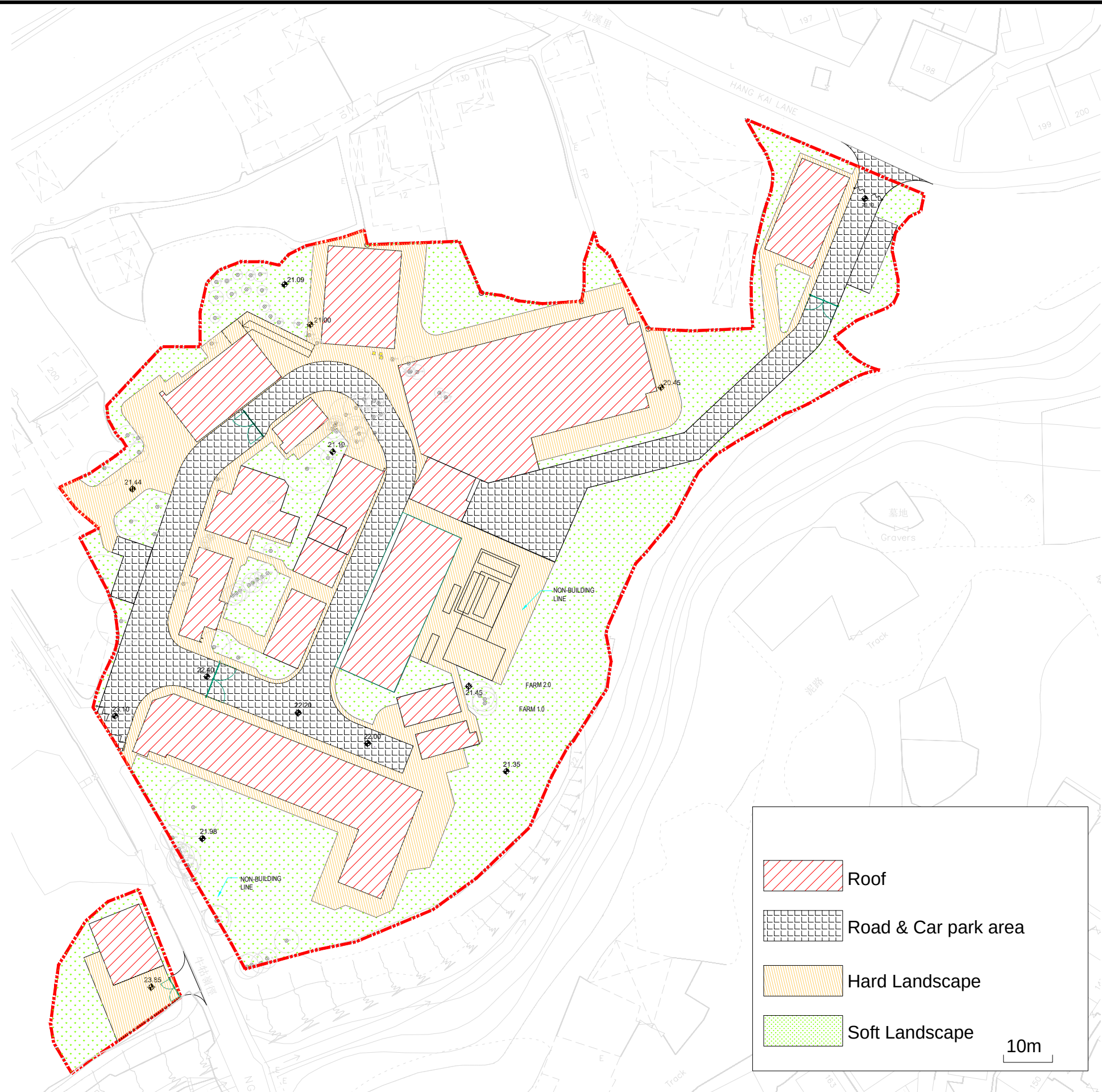
5.3 Sewerage Impact Assessment

- 5.3.1** Based on the sewerage impact assessment, it is found that the existing sewage system along Hang Kai Lane and the downstream Lam Tsuen Valley Sewage Pumping Station do have adequate capacity to convey the additional sewage flow generated from the farm. The sewage system will also have spare capacity for conveying the potentially contaminated surface runoff from the farm with a controlled flow rate below 20L/s.

Appendix A

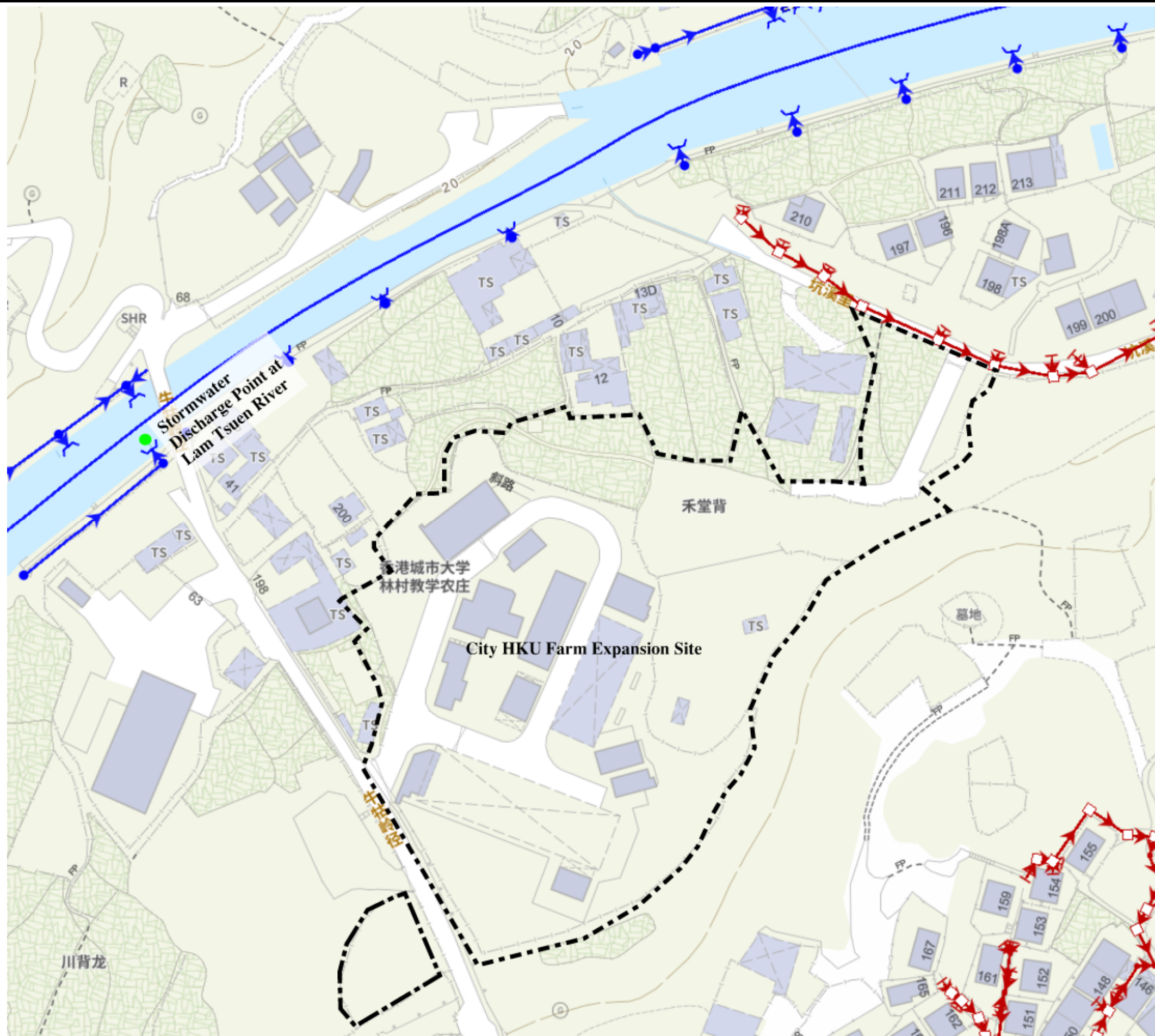
Catchment and Land Use Plan

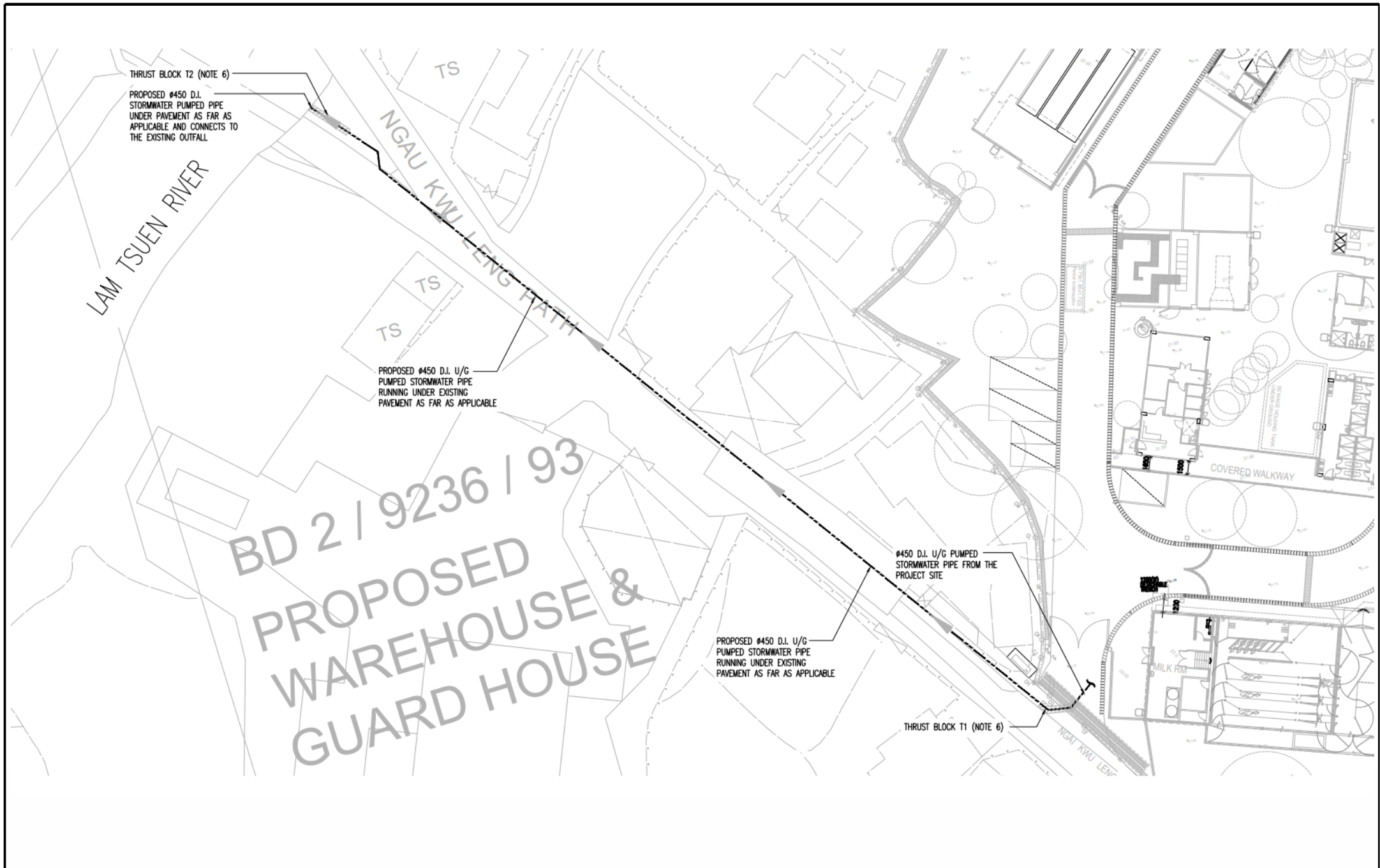




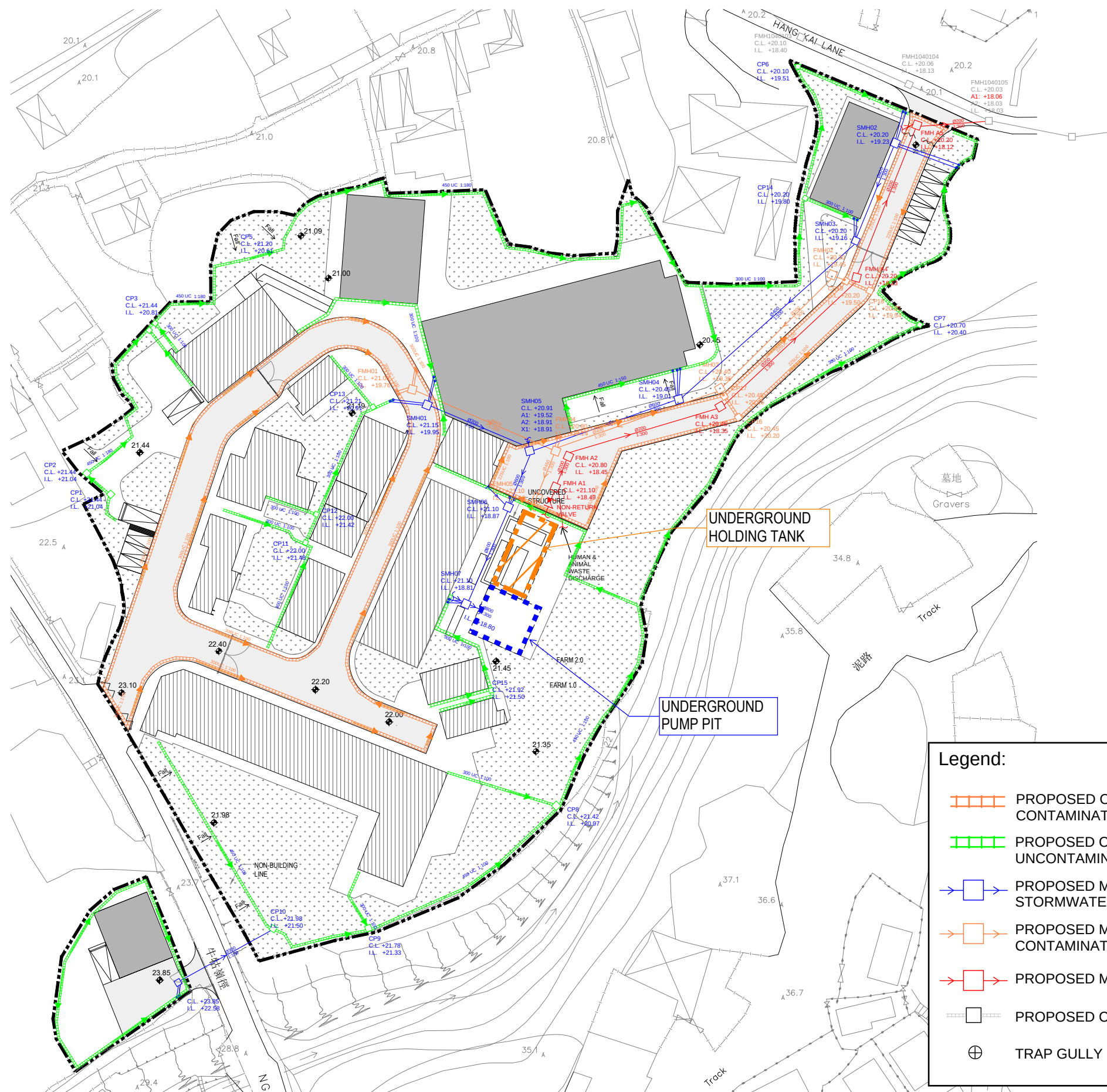
Appendix B

Existing and Proposed Drainage System



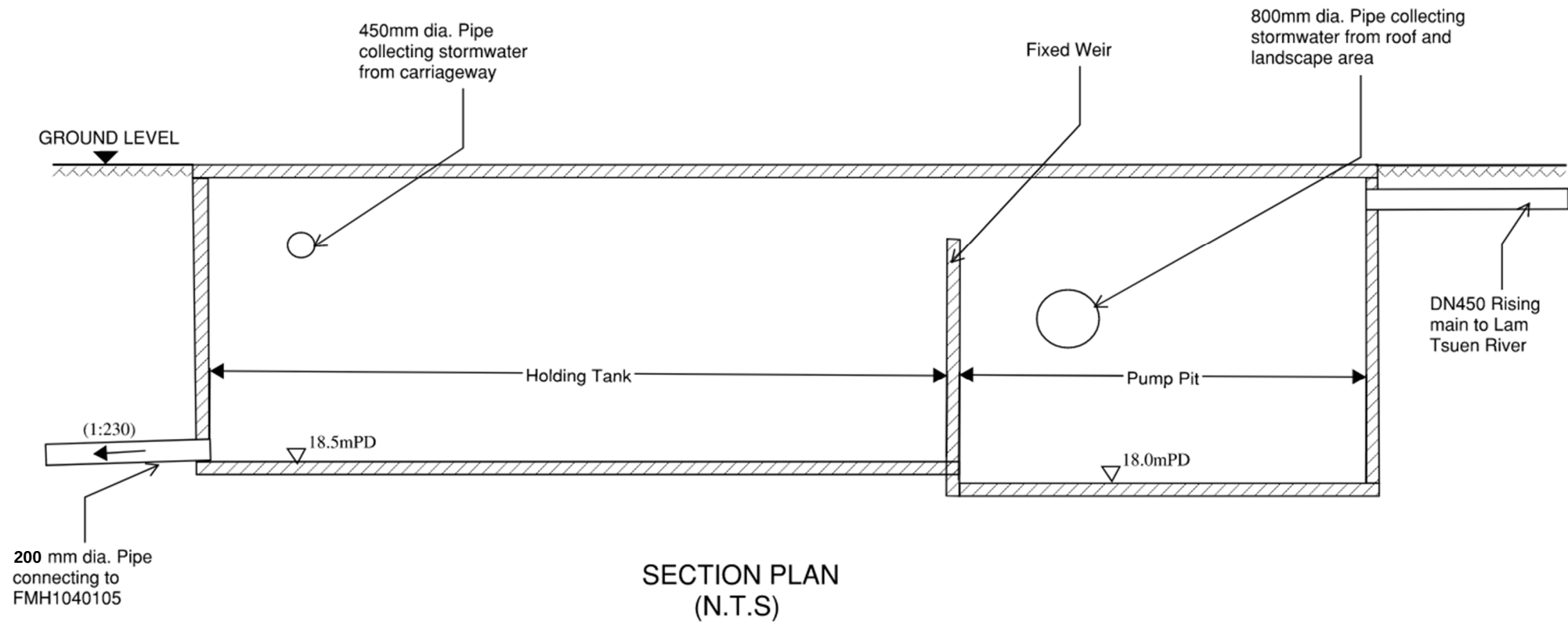


 香港城市大學 City University of Hong Kong	Job Title Application for Planning Permission Under Section 16 of the Town Planning Ordinance (Cap. 131) for Proposed Temporary Educational Institution (Teaching Farm) for a Period of Three Years and Excavation of Land at Various Lots in D.D. 16, Wo Tong Pui, Tai Po, New Territories	Drawing Title Existing and Proposed Drainage System Existing DN450 D.I Pipe Connecting Farm Site and Lam Tsuen River	ARUP Scale: NTS Drawn by: Date: 07/2026 Checked: Approved: Job No. 312796 Figure No. B.2
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Legend:

- PROPOSED CHANNEL TO DISCHARGE THE POTENTIAL CONTAMINATED STORMWATER
- PROPOSED CHANNEL TO DISCHARGE THE UNCONTAMINATED STORMWATER
- PROPOSED MANHOLE AND PIPE (UNCONTAMINATED STORMWATER)
- PROPOSED MANHOLE AND PIPE (POTENTIAL CONTAMINATED STORMWATER)
- PROPOSED MANHOLE AND PIPE (SEWAGE)
- PROPOSED CATCHPIT
- TRAP GULLY



Appendix C

Hydraulic Assessment for Drainage System

APPENDIX A - PEAK RUNOFF ESTIMATION- EXISTING CONDITION
HYDRAULIC ASSESSMENT PARAMETERS

In accordance with DSD Stormwater Drainage Manual (SDM) Planning, Design and Management (Fifth Edition, January 2018) and SDM Corrigendum No. 1/2022 and SDM Corrigendum No. 1/2024

Return Period:

Return Period (years)	System	Pipe Diameter
50	Main Rural Catchment	

Storm constants:

Return Period (years)	a	b	c
50	505.5	3.29	0.355

Notes:

[1] Storm constants from Table 3a were adopted

Rainfall intensity (i):

$$i = \frac{a}{(t_d + b)^c}$$
 (Gumbel Equation)

a, b, c Storm constants

t_d Rainfall duration

Rainfall duration (t_d):

$$t_d = t_c = t_o + t_f$$

t_c Time of concentration

t_o Inlet time

t_f Flow time

Inlet time (t_o):

$$t_o = \frac{0.14465L}{H^{0.2}A^{0.1}}$$
 (Bransby Williams Equation)

L Longest distance measured on the line of natural flow between the summit and point under consideration (m)

H Average slope (m per 100m)

A Sub-catchment area (m²)

Runoff coefficient (C):

The following runoff coefficients were applied for existing contributing catchments:

C _P	C _U
0.95	0.35

$$C = \frac{(C_P A_P + C_U A_U)}{A_T}$$

C_P Runoff coefficient for paved area

C_U Runoff coefficient for unpaved area

A_P Paved catchment area

A_U Unpaved catchment area

A_T Total catchment area

Peak runoff (Q):

$$Q = 0.278CiA$$
 (Rational Method)

ESTIMATION OF RAINFALL DURATION

Contributing Catchment ^[1]	A (m ²)	L (m)	US_GL (mPD)	DS_GL (mPD)	H (m per 100m)	t _o (min)	t _f ^[2] (min)	t _d (min)
Farm 1.0 (Site B) + Farm 2.0 (Site C&D)	14,853	108	23	20	2.2	5.10	0.0	5.10
Farm 2.0 (Site A)	591	33	24	24	0.0	5.07	0.0	5.07

Notes:

[1] Assuming t_i =0 min for internal drainage system within catchment.

ESTIMATION OF PEAK RUNOFF

Contributing Catchment ^[1]	A (m ²)	A _P (m ²)	A _U (m ²)	C	i (mm/hr)	Q (m ³ /s)	Q (l/s)
Farm 1.0 (Site B)	9,274	5,804	3,470	0.73	238	0.444	444.4
Farm 2.0 (Site C&D)	5,579	415	5,164	0.39	238	0.145	145.4
Farm 2.0 (Site A)	591	190	401	0.54	238	0.021	21.2

APPENDIX A - PEAK RUNOFF ESTIMATION- AFTER DEVELOPMENT
HYDRAULIC ASSESSMENT PARAMETERS

In accordance with DSD Stormwater Drainage Manual (SDM) Planning, Design and Management (Fifth Edition, January 2018) and SDM Corrigendum No. 1/2022 and SDM Corrigendum No. 1/2024

Return Period:

Return Period (years)	System	Pipe Diameter
50	Main Rural Catchment	

Storm constants:

Return Period (years)	a	b	c
50	505.5	3.29	0.355

Notes:

[1] Storm constants from Table 3a were adopted

Rainfall intensity (i):

$$i = \frac{a}{(t_d + b)^c}$$
 (Gumbel Equation)

a, b, c

Storm constants

t_d

Rainfall duration

Rainfall duration (t_r):

$$t_d = t_c = t_o + t_f$$

t_c

Time of concentration

t_o

Inlet time

t_f

Flow time

Inlet time (t_o):

$$t_o = \frac{0.14465L}{H^{0.2}A^{0.1}}$$
 (Bransby Williams Equation)

L

Longest distance measured on the line of natural flow between the summit and point under consideration (m)

H

Average slope (m per 100m)

A

Sub-catchment area (m²)

Runoff coefficient (C):

The following runoff coefficients were applied for existing contributing catchments:

C _P	C _U
0.95	0.35

$$C = \frac{(C_P A_P + C_U A_U)}{A_T}$$

C_P

Runoff coefficient for paved area

C_U

Runoff coefficient for unpaved area

A_P

Paved catchment area

A_U

Unpaved catchment area

A_T

Total catchment area

Peak runoff (Q):

$$Q = 0.278CiA$$
 (Rational Method)

ESTIMATION OF RAINFALL DURATION

Contributing Catchment ^[1]	A (m ²)	L (m)	US_GL (mPD)	DS_GL (mPD)	H (m per 100m)	t _o (min)	t _f ^[2] (min)	t _d (min)
Farm1.0(Site B) + Farm 2.0(Site C&D)	14,853	108	23	20	2.2	5.10	0.0	5.10
Farm 2.0(Site A)	591	33	24	24	0.0	5.07	0.0	5.07

Notes:

[1] Assuming t_f =0 min for internal drainage system within catchment.

ESTIMATION OF PEAK RUNOFF

Contributing Catchment ^[1]	A (m ²)	A _P (m ²)	A _U (m ²)	C	i (mm/hr)	Q (m ³ /s)	Q (l/s)
Farm1.0(Site B) + Farm 2.0(Site C&D)	14,853	9,797	5,056	0.75	238	0.732	731.7
Farm 2.0(Site A)	591	253	338	0.61	238	0.024	23.7

APPENDIX A - HYDRAULIC PERFORMANCE OF EXISTING STORMWATER DRAINAGE SYSTEM-LAM Tsuen River

In accordance with *DSD Stormwater Drainage Manual (SDM) Planning, Design and Management (Fifth Edition, January 2018)* and *SDM Corrigendum No. 1/2022*and *SDM Corrigendum No. 1/2024*

As per Table 10 of SDM, 200years adopted for assessing the impact on Lam Tsuen River as embanked channel

Storm constants:

Return Period (years)	a	b	c
200	508.8	3.46	0.322

ESTIMATION OF PEAK RUNOFF-BEFORE DEVELOPMENT

Contributing Catchment ^[1]	A	A _p	A _U	C	i	Q	
	(m ²)	(m ²)	(m ²)		(mm/hr)	(m ³ /s)	(l/s)
Farm 1.0 (Site B)	9,274	5,804	3,470	0.73	255	0.477	476.8
Farm 2.0 (Site C&D)	5,579	415	5,164	0.39	255	0.156	156.0
Farm 2.0 (Site A)	591	190	401	0.54	255	0.023	22.8

ESTIMATION OF PEAK RUNOFF-AFTER DEVELOPMENT

Contributing Catchment ^[1]	A	A _p	A _U	C	i	Q	
	(m ²)	(m ²)	(m ²)		(mm/hr)	(m ³ /s)	(l/s)
Farm1.0(Site B) + Farm 2.0(Site C&D)	14853	9797	5056	0.75	255	0.785	784.9
Farm 2.0(Site A)	591	253	338	0.61	255	0.025	25.4

Pipe Capacity

Q_p=VA

$$V = \frac{1}{n} R^{2/3} \sqrt{S}$$

Roughness Coeff.,n =0.033mm (Existing canal, refer to the Table 13 of SDM)

Existing Drainage Channel																								
Inflow Parameters		Section	Type	Link Parameters																Velocity ^[4]		Capacity		
Contributing Catchment ^[1]	ACC_Q (m³/s)			US_MH	DS_MH	W _U or D ^[2] (m)	W _L ^[2] (m)	H (m)	L (m)	US_GL (mPD)	DS_GL (mPD)	US_IL (mPD)	DS_IL (mPD)	US_Cover (mPD)	S (1 in X)	S (-)	A ^[3] (m²)	P (m)	R (m)	n	V (m/s)	C (m³/s)	ACC_Q/C (%)	Check
Lam Tsuen River																								
Farm 1.0+Farm 2.0	0.810		OC			15.000		4.000	50.00	20.42	20.20	16.59	16.20		116	0.009	60.00	23.00	2.61	0.033	5.33	319.91	0.3%	OK

Abbreviations:

US_MH	Upstream Manhole	US_IL	Upstream Invert Lev	Upstream Invert Level
DS_MH	Downstream Manhole	DS_IL	Downstream Invert L	Downstream Invert Level
W or D	Width or Diameter	S	Hydraulic Gradient	Hydraulic Gradient
L	Length	P	Flow Perimeter	Flow Perimeter
US_GL	Upstream Ground Level	R	Hydraulic Radius	Hydraulic Radius
DS_GL	Downstream Ground Level	n	Manning's Roughnes	Manning's Roughness Coefficient

V	Velocity
ACC_Q	Accumulated Runoff
C	Capacity
OC	Open Channel
BC	Box Culvert
TPC	Trapezoindal Open Channel

ARUP	Job No.		Sheet No.		Rev.	
	312796		4		-	
	Member/Location					
Job Title	Application for Planning Permission Under Section 16 of the Town Planning Ordinance (Cap. 131) for Proposed Temporary Educational Institution (Teaching Farm) for a Period of Three Years and Excavation of Land at Various Lots in D.D. 16, Wo Tong Pui, Tai Po, New Territories					Drg. Ref.
Calculation	Hydraulic Calculation for Existing Drainage Rising Main for City U Farm					Made by YT Date July 2026 Chd. YL

Hydraulic Calculation for Proposed Drainage Rising Main

Friction Head Loss Equation (Hazen William Equation)

$$h_f = \frac{10.7 Q^{1.85} L}{C^{1.85} D^{4.87}}$$

where

Q = flow rate (m3/s)

D = diameter of rising main (m)

L = length of rising main (m)

C = discharge coefficient (110 for D < 600mm, 120 for D > 600mm)

	Peak Flow (m³/s)	Proposed Size of Water Main (mm)	Equivalent Pipe Flow Area (m²)	Discharge Coefficient C	Length(m)	Friction Head Loss (m)	Velocity (m/s)	Minor Head Loss (m) ⁽¹⁾	Total Head Loss (m)	Ground level at Proposed pumping station(m)	Highest ground level at along the proposed pipe alignment(m)	Required minimum pumping head
Drainage rising main along Ngau Kwu Leng Path	0.76	450	0.16	110	110	5.724	4.750	0.572	6.296	21.30	23.10	8.10

Note:

(1) Minor loss is considered as 10% of friction loss

APPENDIX A - CALCULATION FOR SIZING OF HOLDING TANK
For Farm Carriageway and Parking Area

In accordance with DSD Stormwater Drainage Manual (SDM) Planning, Design and Management (Fifth Edition, January 2018) and SDM Corrigendum No. 1/2022 and SDM Corrigendum No. 1/2024, ProPECC PN2/24 Construction Site Drainage

Storm constants:

Return Period (years)	a	b	c
2	446.1	3.38	0.463

Notes:

- [1] Referring to design of petrol interceptor in ProPECCPN 2/24 Construction Site Drainage, holding tank is to be designed to provide 20 minutes retention to the maximum runoff collected in a 1 in 2 year rainstorm
[2] Storm constants from Table 3a of SDM were adopted

Rainfall intensity (i):

$$i = \frac{a}{(t_d + b)^c}$$

(Gumbel Equation)
a, b, c Storm constants
 t_d Rainfall duration

Rainfall duration (t_d):

$$t_d = t_c = t_o + t_f$$

 t_c Time of concentration
 t_o Inlet time
 t_f Flow time

Inlet time (t_o):

$$t_o = \frac{0.14465L}{H^{0.2}A^{0.1}}$$

(Bransby Williams Equation)
L Longest distance measured on the line of natural flow between the summit and point under consideration (m)
H Average slope (m per 100m)
A Sub-catchment area (m^2)

Runoff coefficient (C):

The following runoff coefficients were applied for existing contributing catchments:

C_P	C_U
0.95	0.35

$$C = \frac{(C_P A_P + C_U A_U)}{A_T}$$

C_P Runoff coefficient for paved area
 C_U Runoff coefficient for unpaved area
 A_P Paved catchment area
 A_U Unpaved catchment area
 A_T Total catchment area

Peak runoff (Q):

$$Q = 0.278 C i A$$

(Rational Method)

ESTIMATION OF PEAK RUNOFF

Contributing Catchment ^[1]	A (m^2)	A_P (m^2)	A_U (m^2)	C	i ^[1] (mm/hr)	Q (m^3/s) (l/s)	
Farm 1.0 (Site B)+ Farm 2.0 (Site C&D) - Carriageway and Parking Area	2,746	2,746	0	0.95	167	0.121	120.9

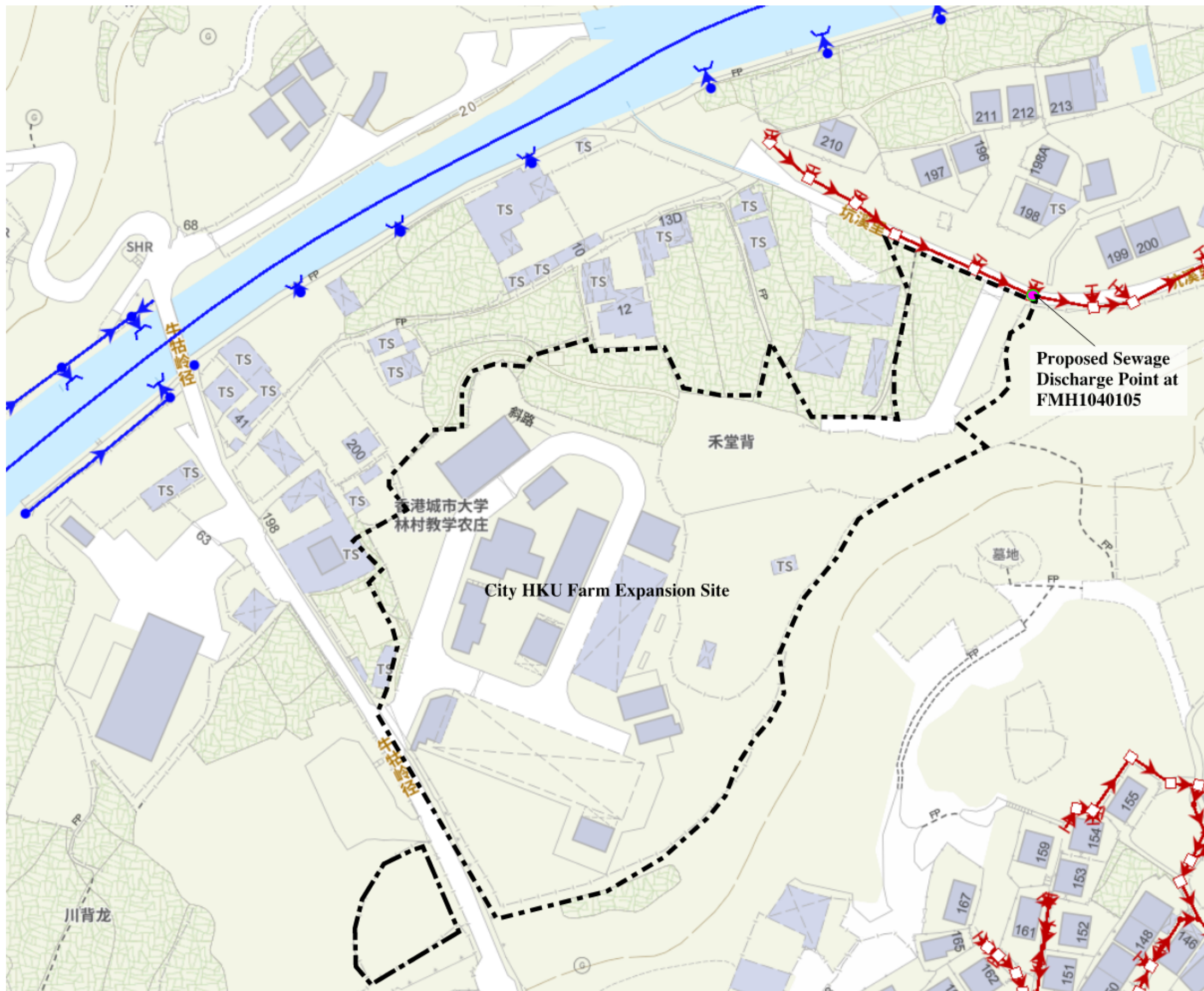
Notes:

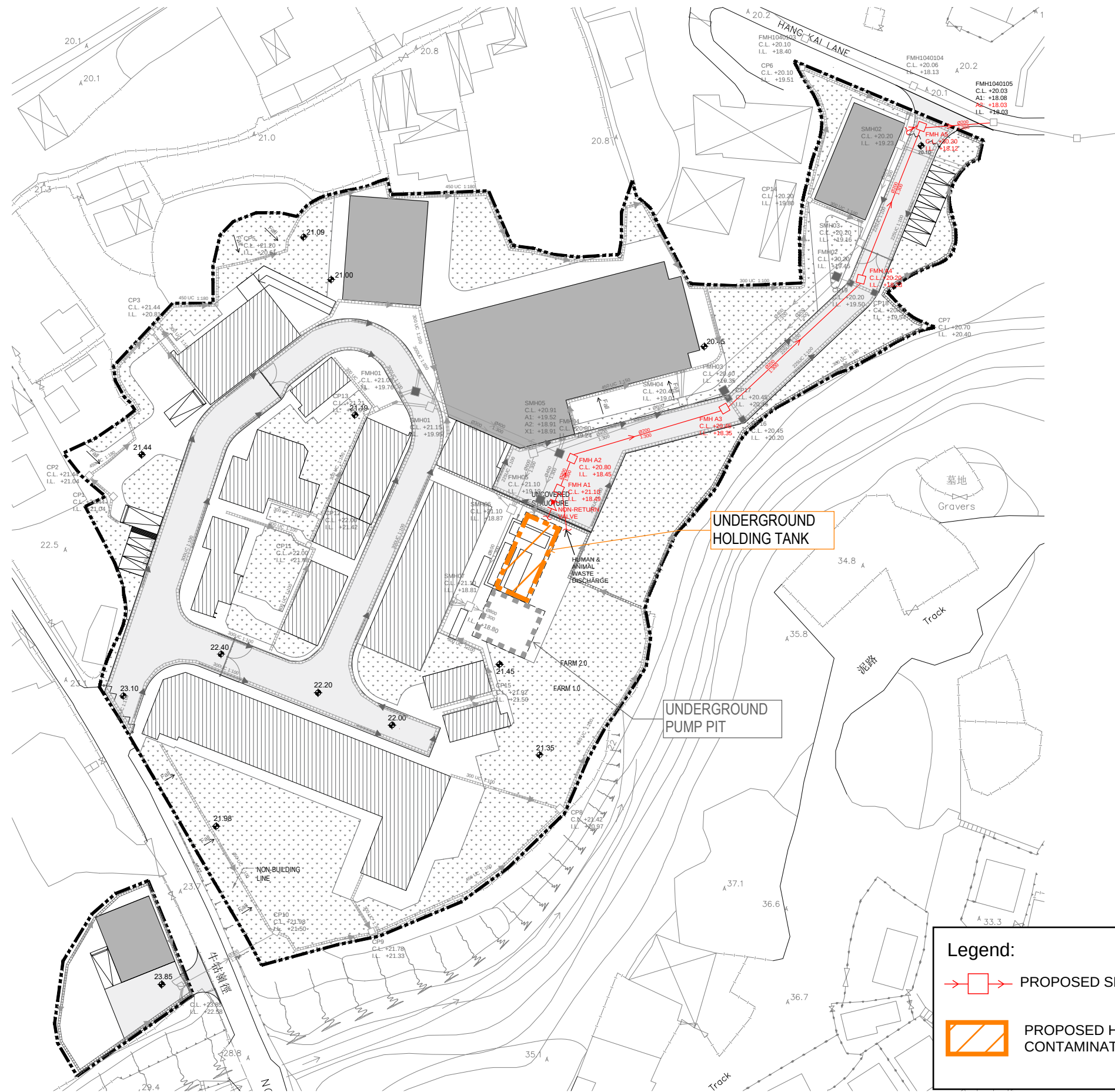
- [1] Assuming t_c = 5 min for internal catchment.

Retention Time 20 min
Total Volume of Rain 145 m^3

Appendix D

Existing and Proposed Sewerage System





Appendix E

Hydraulic Assessment for Sewerage System

	Job No.		Sheet No.		Rev.			
	312796		B1		0			
	Member/Location							
Job Title	Application for Planning Permission Under Section 16 of the Town Planning Ordinance (Cap. 131) for Proposed Temporary Educational Institution (Teaching Farm) for a Period of Three Years and Excavation of Land at					Drg. Ref.		
Calculation	Sewage Generation from the Redevelopment and Sewerage Network Capacity Check					Made by YQT	Date 31/01/26	Chd. YL

Calculation for Sewage Generation

After Development

City U Farm-Sewage from Animal		
	Estimated Sub-total ADWF⁽¹⁾	9.71 m³/day
City U Farm-Sewage from Human		
Employee Population ⁽²⁾	9	head
Unit Flow Factor for Employee ⁽³⁾	0.28	m ³ /day
No. of visitors	59	head
Unit Flow Factor for Visitor ⁽⁴⁾	0.015	m ³ /day
	Estimated Sub-total ADWF	3.41 m³/day
	Total ADWF	13.12 m³/day
	Catchment Factor for Tai Po	1.00
	Contribution Population	49
	Peaking Factor	8.00
	Peak Flow	1.21 L/s

Remarks:

- (1) Total animal waste including total manure, urine and wastewater is estimated by cattle specialist
- (2) Employee population include farm staff, security guards, AHEMS student
- (3) Unit flow factor = 0.08m³/day (commercial employee) +0.2m³/day (General territorial average) =0.28 m³/day based on EPD's GESF Table T-2;
- (4) Unit flow factor = 0.015m³/day for visitors as refer to West Kowloon Station;

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	312796	B2	0
	Member/Location		
	Drg. Ref.		
Job Title	Application for Planning Permission Under Section 16 of the Town Planning Ordinance (Cap. 131) for Proposed Temporary Educational Institution (Teaching Farm) for a Period of Three Years and Excavation of Land at Various Lots in D.D. 16, Wo Tong Pui, Tai Po, New Territories		
Calculation	Sewage Generation from the Redevelopment and Sewerage Network Capacity Check		
Made by	YQT	Date	31/01/26
		Chd.	YL

Calculation for Sewage Generation
Existing Upstream and downstream Sewage Generations:

Sewage from village houses discharge to sewers along Hang Kai Lane			
Discharge Manhole ID			
1.1	FMH1040100		
	No. of village houses ⁽¹⁾	2	
	Residential Population ⁽²⁾	6	head
	Unit Flow Factor for Residential ⁽³⁾	0.27	m³/day
	Estimated Sub-total ADWF		1.62 m³/day
1.2	FMH1040101		
	Catchment Factor for Tai Po	1	1.62
	Residential Population ⁽²⁾	3	3.24 head
	Unit Flow Factor for Residential ⁽³⁾	0.27	m³/day
	Estimated Sub-total ADWF		0.81 m³/day
1.3	FMH1040102		
	No. of village houses ⁽¹⁾	4	
	Residential Population ⁽²⁾	12	head
	Unit Flow Factor for Residential ⁽³⁾	0.27	m³/day
	Estimated Sub-total ADWF		3.24 m³/day
1.4	FMH1040104		
	No. of village houses ⁽¹⁾	4	Nos.
	Residential Population ⁽²⁾	12	head
	Unit Flow Factor for Residential ⁽³⁾	0.27	m³/day
	Estimated Sub-total ADWF		3.24 m³/day
1.5	FMH1040107		
	No. of village houses ⁽¹⁾	5	
	Residential Population ⁽²⁾	15	head
	Unit Flow Factor for Residential ⁽³⁾	0.27	m³/day
	Estimated Sub-total ADWF		4.05 m³/day
1.6	FMH1040111		
	No. of village houses ⁽¹⁾	5	
	Residential Population ⁽²⁾	15	head
	Unit Flow Factor for Residential ⁽³⁾	0.27	m³/day
	Estimated Sub-total ADWF		4.05 m³/day
1.7	FMH1040128		
	No. of village houses ⁽¹⁾	17	
	Residential Population ⁽²⁾	51	head
	Unit Flow Factor for Residential ⁽³⁾	0.27	m³/day
	Estimated Sub-total ADWF		13.77 m³/day
1.8	FMH1040129		
	No. of village houses ⁽¹⁾	10	Nos.
	Residential Population ⁽²⁾	30	head
	Unit Flow Factor for Residential ⁽³⁾	0.27	m³/day
	Estimated Sub-total ADWF		8.10 m³/day
1.9	FMH1040130		
	No. of village houses ⁽¹⁾	1	
	Residential Population ⁽²⁾	3	head
	Unit Flow Factor for Residential ⁽³⁾	0.27	m³/day
	Estimated Sub-total ADWF		0.81 m³/day
1.10	FMH1040132		
	No. of village houses ⁽¹⁾	2	
	Residential Population ⁽²⁾	6	head
	Unit Flow Factor for Residential ⁽³⁾	0.27	m³/day
	Estimated Sub-total ADWF		1.62 m³/day
1.11	FMH1052870		
	No. of village houses ⁽¹⁾	14	
	Residential Population ⁽²⁾	42	head
	Unit Flow Factor for Residential ⁽³⁾	0.27	m³/day
	Estimated Sub-total ADWF		11.34 m³/day
	Total ADWF		57.51 m³/day
	Catchment Factor for TaiPo	1.00	
	Contribution Population	213	
	Peaking Factor	8.00	
	Peak Flow		5.33 L/s

Remarks:

(1) No. of building house obtained from available online source Geoinfo map and Google map

(2) Flat occupancy 3 person/house is assumed based on previous project experience.

(3) Unit flow factor = 0.27m³/day (Modern village) has been adopted;

ARUP

Job Title

Application for Planning Permission Under Section 16 of the Town Planning Ordinance (Cap. 131) for Proposed Temporary Educational Institution (Teaching Farm) for a Period of Three Years and Excavation

Calculation

Sewage Generation from the Redevelopment and Sewerage Network Capacity Check

Job No.

312796

Sheet No.

B3

Rev.

0

Member/Location

Drg. Ref.

Made by

YQT

Date

13/01/26

Chd.

YL

Downstream Sewer Capacity:

Location of Sewer (from M/H to M/H)		Invert Level (mPD)		Length (m)	Gradient		Sewer Size (mm)	Area (m²)	Wetted Perimeter (m)	Hydraulic Radius (m)	Pipe Roughness (mm)	Velocity * (m/s)	Before Development				After Development				Sewer Capacity		% of Peak Flow to Sewer Capacity		Spare Capacity
Upstream	Downstream	Upstream	Downstream		%	1 in							ADWF (m³/d)	Contribution Population	Peak Factor	Peak Flow (L/s)	ADWF (m³/d)	Contribution Population	Peak Factor	Peak Flow (L/s)	(m³/s)	(L/s)	Before Development	After Development	After Development (L/s)
FMH1040105	FMH1040106	18.03	17.93	16.1	0.62%	160.50	225	0.04	0.71	0.06	1.500	0.90	8.91	33	8.00	0.83	22.03	82	8.00	2.04	0.04	36.0	2%	5.7%	33.9
FMH1040106	FMH1040107	17.93	17.82	10.4	1.06%	94.45	225	0.04	0.71	0.06	1.500	1.18	8.91	33	8.00	0.83	22.03	82	8.00	2.04	0.05	47.0	1.8%	4.3%	44.9
FMH1040107	FMH1040108	17.82	17.55	22.1	1.22%	81.85	225	0.04	0.71	0.06	1.500	1.27	12.96	48	8.00	1.20	26.08	97	8.00	2.41	0.05	50.5	2.4%	4.8%	48.0
FMH1040108	FMH1040109	17.55	17.44	10.4	1.05%	94.82	225	0.04	0.71	0.06	1.500	1.18	12.96	48	8.00	1.20	26.08	97	8.00	2.41	0.05	46.9	2.6%	5.2%	44.5
FMH1040109	FMH1040111	17.44	17.30	19.8	0.71%	141.71	225	0.04	0.71	0.06	1.500	0.96	12.96	48	8.00	1.20	26.08	97	8.00	2.41	0.04	38.3	3.1%	6.3%	35.9
FMH1040111	FMH1040112	17.29	17.10	30.5	0.62%	160.47	225	0.04	0.71	0.06	1.500	0.90	17.01	63	8.00	1.58	30.13	112	8.00	2.79	0.04	36.0	4.4%	7.8%	33.2
FMH1040112	FMH1040128	17.10	16.69	24.7	1.66%	60.17	225	0.04	0.71	0.06	1.500	1.48	17.01	63	8.00	1.58	30.13	112	8.00	2.79	0.06	58.9	2.7%	4.7%	56.1
FMH1040128	FMH1040129	16.49	16.44	10.8	0.46%	215.80	225	0.04	0.71	0.06	1.500	0.78	30.78	114	8.00	2.85	43.90	163	8.00	4.06	0.03	31.0	9.2%	13.1%	26.9
FMH1040129	FMH1040130	16.44	16.39	11.1	0.45%	222.00	225	0.04	0.71	0.06	1.500	0.77	38.88	144	8.00	3.60	52.00	193	8.00	4.81	0.03	30.6	11.8%	15.8%	25.7
FMH1040130	FMH1040131	16.39	16.31	19.7	0.41%	246.50	225	0.04	0.71	0.06	1.500	0.73	39.69	147	8.00	3.68	52.81	196	8.00	4.89	0.03	29.0	12.7%	16.9%	24.1
FMH1040131	FMH1040132	16.31	16.23	21.1	0.38%	263.88	225	0.04	0.71	0.06	1.500	0.70	39.69	147	8.00	3.68	52.81	196	8.00	4.89	0.03	28.0	13.1%	17.5%	23.1
FMH1040132	FMH1040133	16.22	16.17	11.0	0.45%	220.00	225	0.04	0.71	0.06	1.500	0.77	41.31	153	8.00	3.83	54.43	202	8.00	5.04	0.03	30.7	12.5%	16.4%	25.7
FMH1040133	FMH1040134	16.17	16.12	11.0	0.45%	220.00	225	0.04	0.71	0.06	1.500	0.77	41.31	153	8.00	3.83	54.43	202	8.00	5.04	0.03	30.7	12.5%	16.4%	25.7
FMH1040134	FMH1040135	16.11	16.04	18.3	0.38%	261.86	225	0.04	0.71	0.06	1.500	0.71	41.31	153	8.00	3.83	54.43	202	8.00	5.04	0.03	28.1	13.6%	17.9%	23.1
FMH1040135	FMH1040136	16.03	15.97	16.1	0.37%	268.83	225	0.04	0.71	0.06	1.500	0.70	41.31	153	8.00	3.83	54.43	202	8.00	5.04	0.03	27.8	13.8%	18.2%	22.7
FMH1040136	FMH1040137	15.97	15.94	7.0	0.43%	233.33	225	0.04	0.71	0.06	1.500	0.75	41.31	153	8.00	3.83	54.43	202	8.00	5.04	0.03	29.8	12.8%	16.9%	24.8
FMH1040137	FMH1062882	15.94	15.88	10.0	0.60%	167.33	225	0.04	0.71	0.06	1.500	0.89	41.31	153	8.00	3.83	54.43	202	8.00	5.04	0.04	35.2	10.9%	14.3%	30.2
FMH1062882	FMH1052870	15.88	15.78	3.5	2.86%	35.00	200	0.03	0.63	0.05	0.600	2.06	41.31	153	8.00	3.83	54.43	202	8.00	5.04	0.06	64.6	5.9%	7.8%	59.6
FMH1052870	FMH1052871	15.78	15.65	6.0	2.17%	46.15	200	0.03	0.63	0.05	0.600	1.79	52.65	195	8.00	4.88	65.77	244	8.00	6.09	0.06	56.2	8.7%	10.8%	50.1
FMH1052871	FSH1006169	15.65	15.53	13.5	0.89%	112.50	200	0.03	0.63	0.05	0.600	1.14	52.65	195	8.00	4.88	65.77	244	8.00	6.09	0.04	35.9	13.6%	17.0%	29.8
FSH1006169	FSH1006170	15.53	15.44	15.6	0.58%	173.85	200	0.03	0.63	0.05	0.600	0.92	52.65	195	8.00	4.88	65.77	244	8.00	6.09	0.03	28.8	16.9%	21.2%	22.7
FSH1006170	FSH1006171	15.43	15.35	15.1	0.53%	188.43	200	0.03	0.63	0.05	0.600	0.88	52.65	195	8.00	4.88	65.77	244	8.00	6.09	0.03	27.6	17.6%	22.0%	21.5
FSH1006171	FSH1006172	15.35	15.25	11.2	0.89%	112.14	200	0.03	0.63	0.05	0.600	1.14	52.65	195	8.00	4.88	65.77	244	8.00	6.09	0.04	35.9	13.6%	17.0%	29.8
FSH1006172	FSH1006173	15.25	15.19	8.0	0.75%	133.89	200	0.03	0.63	0.05	0.600	1.05	52.65	195	8.00	4.88	65.77	244	8.00	6.09	0.03	32.8	14.8%	18.5%	26.8
FSH1006173	FSH1006174	15.18	15.14	8.2	0.49%	204.28	200	0.03	0.63	0.05	0.600	0.84	52.65	195	8.00	4.88	65.77	244	8.00	6.09	0.03	26.5	18.4%	23.0%	20.4
FSH1006174	FMH1063724	15.13	14.19	5.3	17.61%	5.68	200	0.03	0.63	0.05	0.600	5.12	52.65	195	8.00	4.88	65.77	244	8.00	6.09	0.16	161.0	3.0%	3.8%	154.9

Note:
*Fullbore velocity was cacluated using Colebrook-White equation. Ks=0.6 for DI pipe with normal condition. Ks=1.5 for VC pipe with normal condition. Fullbore velocity was cacluated using Colebrook-White equation.

Colebrook-White

$$\bar{V} = -\sqrt{32gRS_f} \log \left[\frac{k_s}{14.8R} + \frac{1.25\nu}{R_s\sqrt{32gRS_f}} \right]$$

where:
V: fullbore velocity
g: acceleration
R: Hydraulic radius
S_f: gradient

PEAK TIME no. of people on farm

	Farm Staff	Farm Transport	Security guards	Specialist Contractors	CDO & Contractors	FMO & Contractors	Government Officials	Visitors	Student Practicals	AHEMS students	Faculty	Feed/ Material Delivery/ Collection of Samples
No. of people	5	1	2	0	1	2	0	2	50	2	2	1

Peak no. of people: 67