

## **Annex F**

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*Updated Report of the Drainage Impact Assessment*

# **Lot 4822 in D.D. 104, Kam Pok Road and Adjoining Government Land, Mai Po, Yuen Long**

## **Drainage Impact Assessment**

**December 2025**

<b>Date</b>	<b>Revision</b>	<b>Prepared by</b>	<b>Checked by</b>	<b>Approved by</b>
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邁進基建環保工程顧問有限公司

## **TABLE OF CONTENTS**

<b>1. INTRODUCTION .....</b>	<b>2</b>
<b>2. GENERAL SITE DESCRIPTION.....</b>	<b>2</b>
<b>3. DEVELOPMENT PROPOSAL.....</b>	<b>2</b>
<b>4. EXISTING STORMWATER DRAINAGE SYSTEM OF THE AREA.....</b>	<b>3</b>
<b>5. PROPOSED STORMWATER DRAINAGE SYSTEM OF THE AREA.....</b>	<b>3</b>
<b>6. DESIGN CRITERIA, ASSUMPTIONS AND METHODOLOGY OF DRAINAGE IMPACT ASSESSMENT.....</b>	<b>3</b>
<b>7. DRAINAGE IMPACT ASSESSMENT.....</b>	<b>5</b>
<b>8. MAINTENANCE RESPONSIBILITY.....</b>	<b>6</b>
<b>9. CONCLUSION.....</b>	<b>6</b>

## **LIST OF APPENDICES**

Appendix A Site Location and Master Layout Plan

Appendix B Existing Drainage Layout Plan

Appendix C Proposed Drainage Layout Plan

Appendix D Detailed Calculations for Drainage Impact Assessment

Appendix E Sections showing Existing Ground Level and Proposed Ground Level

## 1. INTRODUCTION

- 1.1 Meinhardt Infrastructure & Environmental Ltd (MIEL) has been commissioned to conduct this Drainage Impact Assessment (“DIA”) to demonstrate the proposed medium-rise residential development on the Application Site is technically feasible in the drainage aspect.
- 1.2 The Application Site (hereinafter referred to as “the Site”) is located east of Kam Pok Road near Fairview Park in Yuen Long. The Site location is shown in Figure 1 in **Appendix A**.
- 1.3 The objectives of this DIA are:
  - Review the existing drainage conditions of the Application Site based on available information;
  - Outline the methodology adopted in this assessment;
  - Outline changes to the drainage characteristics and potential drainage impacts which may arise due to the Proposed Development, especially in the respect of the following:
    - Effect on the existing drainage conditions;
    - Susceptibility to flooding of neighboring areas upstream or downstream of the Proposed Development; and
    - Assessing the drainage impact upon completion of the Proposed Development.
  - Propose drainage mitigation measures where appropriate to mitigate the potential drainage impact arise from the Proposed Development.

## 2. GENERAL SITE DESCRIPTION

- 2.1 The Site is bounded by Fung Chuk Road, Ha Chuk Yuen Road, Kam Pok Road and Ha San Wai Road with an area of about 37,870m<sup>2</sup>. It locates in the vicinity of Fairview Park, Villa Camellia, Helene Terrace, 3-storey village dwellings in Ha San Wai and Light Public Housing at Yau Pok Road.
- 2.2 The existing topography of the Site is sloping gently from the north towards the south with ground level varies from +7.0mPD to +4.3mPD approximately.

## 3. DEVELOPMENT PROPOSAL

- 3.1 The Proposed Development comprises five medium-rise residential buildings with a domestic plot ratio of 1.5, and one 2-storey facility compound containing one club house, one 6-classroom kindergarten and a neighbourhood elderly centre. The building heights of these 5 residential towers are 16 residential storeys high. The total domestic GFA is about 56,805m<sup>2</sup>. Upon completion in 2031, the Proposed Development will provide a total of 1,303 private high-quality flats.
- 3.2 The Proposed Development also includes a two-storey facility compound comprising a clubhouse (about 2,272m<sup>2</sup> exempted non-domestic GFA), which includes a restaurant, an indoor swimming pool and an outdoor swimming pool; one clubhouse, the 6-classroom kindergarten of about 380 m<sup>2</sup> GFA and one neighbourhood elderly centre of about 303m<sup>2</sup> in NOFA.
- 3.3 The proposed master layout plan is shown in Figure 1 in **Appendix A**.

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#### **4. EXISTING STORMWATER DRAINAGE SYSTEM OF THE AREA**

- 4.1 The Site is surrounded by **existing** open channels. A main drainage channel, Ngau Tam Mei Channel (NTMC), is running alongside Kam Pok Road to the west of the Site. Two rectangular channels of 6.0m and 7.2m wide are located **to** the east and south of the Site along Ha Chuk Yuen Road and Ha San Wai Road respectively. The 6m rectangular channel along Ha Chuk Yuen Road connects to the flood relief pond located at the north of Fung Chuk Road. The stormwater storage in the flood relief pond is **then** pumped to NTMC by Chuk Yuen Stormwater Pumping Station (CYSPS).
- 4.2 There are stormwater drains of diameter ranging from 225mm to 750mm along carriageways of Fung Chuk Road, Ha Chuk Yuen Road and Ha San Wai Road to collect surface runoff from road gullies and surface channels for subsequent discharge to the abovementioned open channels.
- 4.3 There are surface channels with size ranging from 300mm to 600mm at north and north-east of the Site that connect to the stormwater drains along carriageways of Fung Chuk Road and Ha Chuk Yuen Road.
- 4.4 In addition, there are surface channels with size ranging from 225mm to 375mm at west of the Site for discharging surface runoff to NTMC via 3 nos. of existing 450mm dia. pipe (Outlet 1, 3 & 4) and a 2.5m (H) x 2.1m (W) box culvert (Outlet 2). Flap valves are found installed at all outlets to prevent back flows from NTMC.
- 4.5 The existing drainage layout plan and catchment plan are shown in Figure 2 in **Appendix B**.

#### **5. PROPOSED STORMWATER DRAINAGE SYSTEM OF THE AREA**

- 5.1 The existing connecting drains that connect between the Site and the public drainage system and **Outlets** 1, 2, 3 and 4 will be retained to convey the surface runoff from the proposed residential development. However, the existing surface channels are proposed to be demolished to suit the proposed residential development.
- 5.2 It is proposed that the surface runoff from the proposed residential development will be conveyed by the proposed internal drains within the site boundary and be discharged to the abovementioned connecting drains and **Outlets**. The delineation of catchments for the proposed residential development is presented in Figure 3 in **Appendix C**.
- 5.3 In order to match the formation level of the subject development, the existing uncovered wing wall structure at upstream of the existing box culvert within the site will be demolished and decked over.
- 5.4 The internal drains will be designed and assessed in the detailed design stage while the capacities of the connecting drains and **Outlets** have been assessed and discussed in section 7.

#### **6. DESIGN CRITERIA, ASSUMPTIONS AND METHODOLOGY OF DRAINAGE IMPACT ASSESSMENT**

##### **Design Standards**

- 6.1 The following design manual(s) have been used in this drainage impact assessment:
  - Stormwater Drainage Manual (SDM) 5th Edition published by Drainage Services Department (DSD)

- Stormwater Drainage Manual Corrigendum No. 1/2022 published by Drainage Services Department (DSD)
- Stormwater Drainage Manual Corrigendum No. 1/2024 published by Drainage Services Department (DSD)
- Advice Note No.1 – Application of the Drainage Impact Assessment Process to Private Sector Projects published by Drainage Services Department (DSD)

### **Flood Protection Level**

6.2 The **Proposed Development** is located at a suburb area currently. It is noted that there are various developments in the vicinity of the Site. As such, it is anticipated that the area surrounded the Site will change to an urban area. Therefore, the flood protection levels adopted in this assessment are as follows:

- 1 in 50-year return period flood protection level for branch drainage system
- 1 in 200-year return period flood protection level for trunk drainage system

### **Rainfall Intensity**

6.3 The rainfall profile adopted in this assessment are formulated by the following equations as stipulated in section 4.3.3 of SDM.

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

where  $i$  = extreme mean intensity in mm/hr  
 $t_d$  = rainstorm duration (in minutes)  
 $a, b, c$  = storm constants

6.4 The storm constants are referenced to **Table 6.1** which is duplicated from Table 3a in SDM Corrigendum No.1/2024.

**Table 6.1 Storm Constants of HKO Headquarters**

<b>Return Period</b>	<b>a</b>	<b>b</b>	<b>c</b>
50	505.5	3.29	0.355
200	508.8	3.46	0.322

6.5 The rainfall intensity should be multiplied by a factor of 1.16 for the climate change effect up to end-21st century and a factor of 1.121 for design allowance.

### **Runoff Coefficient**

6.6 Rational Method is adopted for estimation of surface runoff for the Site. The runoff coefficients used are shown in below **Table 6.2**.

**Table 6.2 Storm Constants of HKO Headquarters**

<b>Surface Characteristics</b>	<b>Runoff Coefficient, C</b>
Paved Area	0.95
Unpaved Area	0.30

### **Sediment Depth**

6.7 5% sediment depth is applied for the pipe gradient greater than 1 in 25 and 10% sediment depth is applied for the pipe gradient equal and less than 1 in 25.

### **Hydraulic Analysis**

6.8 Colebrook-White Equation is adopted for the hydraulic analyses.

### **Roughness Coefficient**

6.9 A roughness coefficient  $k_s=3\text{mm}$  is adopted for the Colebrook-White Equation.

### **Gradient**

6.10 The gradient of drains is calculated based on the available information. For those drains without sufficient information to determine the gradient, 1 in 150 is assumed in this assessment.

## **7. DRAINAGE IMPACT ASSESSMENT**

### **Change in Catchment Characteristics**

7.1 The proposed residential development will change the catchment characteristics within the site boundary. The summary of changes is presented in below **Table 7.1**.

**Table 7.1 Change in Catchment Characteristics**

	<b>Paved Area (<math>\text{m}^2</math>)</b>	<b>Unpaved Area (<math>\text{m}^2</math>)</b>	<b>Total Area within the Site Boundary (<math>\text{m}^2</math>)</b>
<b>Pre-Development</b>	24,085	13,785	37,870
<b>Post-Development</b>	22,670	15,200	37,870

### **Change in Surface Runoff**

7.2 The amount of surface runoff in the post-development condition is different from the pre-development condition due to the change in catchment characteristics. The surface runoff under 1 in 50-year return period and 1 in 200-year return period flood protection level are presented in below **Table 7.2**. Detailed calculations are shown in **Appendix D**.

**Table 7.2 Change in Surface Runoff**

<b>Site Condition</b>	<b>Rainfall Intensity (1 in 50-year return period) (mm/hr)</b>	<b>Surface Runoff (1 in 50-year return period) (<math>\text{m}^3/\text{s}</math>)</b>	<b>Rainfall Intensity (1 in 200-year return period) (mm/hr)</b>	<b>Surface Runoff (1 in 200-year return period) (<math>\text{m}^3/\text{s}</math>)</b>
Pre-Development	310.24	2.330	332.66	2.498
Post-Development	310.24	2.251	332.66	2.413

### **Drainage Impact Assessment**

7.3 It is noted that the total amount of surface runoff in post-development condition is less than that in pre-development due to the increase in unpaved area. As such, there will be no adverse drainage impacts to the existing drainage system including NTMC.

7.4 The capacities of the connecting drains and Outlets have been assessed. The results show that all of them have sufficient capacities to convey the surface runoff from the proposed residential development. The summaries of the results are presented in Tables 7.3 and 7.4 and detail calculations are shown in Appendix D.

**Table 7.3 Summary of Drainage Impact Assessment Results for 1 in 50-year Return Period Flood Protection Level**

Discharge Point	Drain Size (mm)	Gradient	Peak Surface Runoff (m <sup>3</sup> /s)	Capacity (m <sup>3</sup> /s)	Spare Capacity (m <sup>3</sup> /s)	Full Bore Velocity (m/s)
Outlet 1	450	1 in 150	0.080	0.181	0.100	1.263
Outlet 3	450	1 in 150	0.035	0.181	0.146	1.265
Outlet 4	450	1 in 150	0.016	0.181	0.165	1.264
SMH1038285	600	1 in 50	0.036	0.665	0.628	2.612
SMH1038283	600	1 in 13	0.068	1.423	1.355	5.297
SMH1038240	600	1 in 55	0.080	0.636	0.556	2.499
SCH1019340	450	1 in 10	0.013	0.756	0.743	5.007

**Table 7.4 Summary of Drainage Impact Assessment Results for 1 in 200-year Return Period Flood Protection Level**

Discharge Point	Drain Size (m)	Gradient	Peak Surface Runoff (m <sup>3</sup> /s)	Capacity (m <sup>3</sup> /s)	Spare Capacity (m <sup>3</sup> /s)	Full Bore Velocity (m/s)
Outlet 2	2.1(W) x 2.5(H)	1 in 500	1.560	8.220	6.659	1.740

## **8. MAINTENANCE RESPONSIBILITY**

8.1 During the construction phase, the Applicant will be responsible for the maintenance of all existing surface channels, internal drainage system within the boundary of the Site, while the existing outlet pipes outside the Site boundary/ box culvert with wing walls shall be maintained by corresponding government departments.

8.2 Upon the completion of construction, no additional drainage outlet will be resulted and the Applicant will be responsible for the maintenance of proposed surface channels and internal drainage system, including the proposed sand trap within the Site boundary.

8.3 The maintenance responsibility of all drainage facilities outside the Site will remain unchanged.

## **9. CONCLUSION**

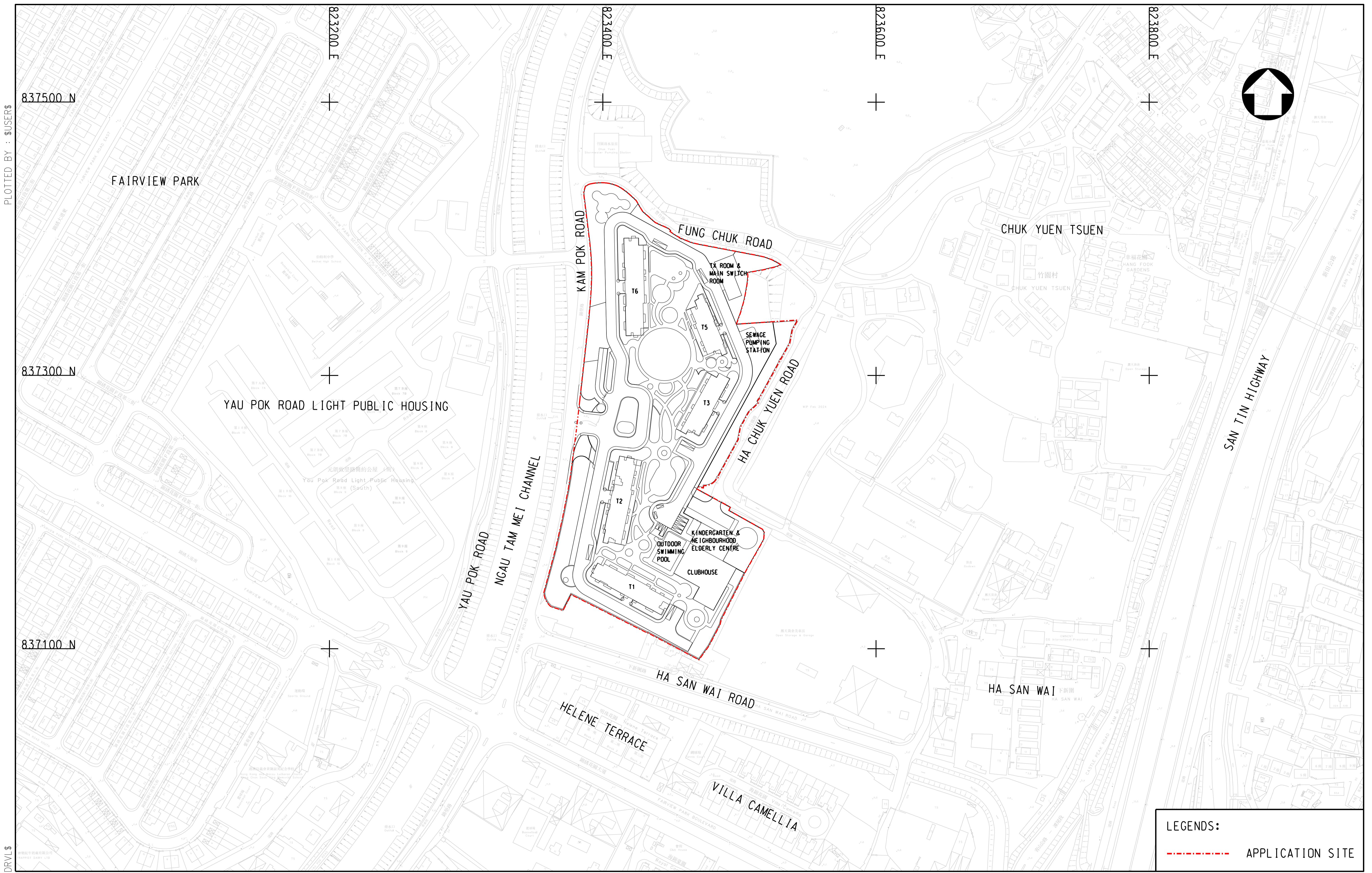
9.1 This report has assessed the drainage impact due to the proposed development of Lot 4822 in D.D. 104 and adjoining government land, Kam Pok Road, Mai Po, Yuen Long.

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- 9.2 The surface runoff to be collected from the proposed development will be conveyed by the proposed internal drainage system, which will be designed in detailed design stage, and then be discharged to the connecting drains between the Site and public drainage system.
- 9.3 Based on the assessment results, the surface runoff in post-development status is less than that of the pre-development status. As such, it is anticipated that there is no adverse drainage impact to the existing drainage system due to the proposed residential development.
- 9.4 The connecting drains are also assessed and the results show that all connecting drains have sufficient capacities to cater the surface runoff from the Site.

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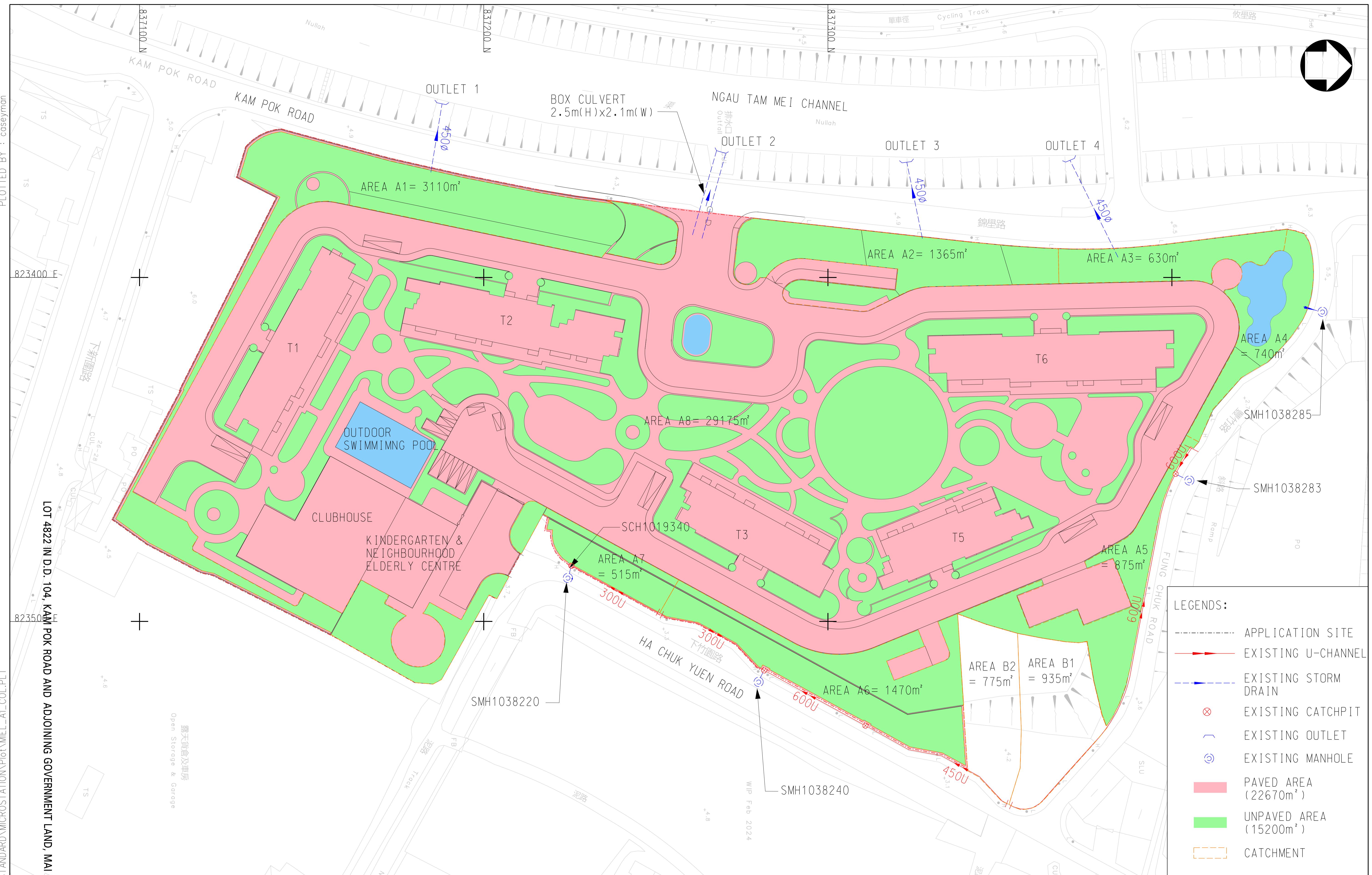
**APPENDIX A –**  
**SITE LOCATION AND MASTER LAYOUT PLAN**



**APPENDIX B –**  
**EXISTING DRAINAGE LAYOUT PLAN**



**APPENDIX C –  
PROPOSED DRAINAGE LAYOUT PLAN**



**APPENDIX D –**  
**DETAILED CALCULATIONS FOR DRAINAGE**  
**IMPACT ASSESSMENT**

91469 - Lot 4822 in D.D. 104, Kam Pok Road and Adjoining Government Land, Mai Po, Yuen Long - Drainage Impact Assessment (Discharge Points Assessment) (1 in 50-year return period)

US	DS	Catchment Area						Channel character						Hydraulic parameter		Time of Concentration	i	Peak Runoff	Full bore Capacity	Full bore Velocity	Q <sub>check</sub> (capacity - peak runoff)		
		Paved Area		Unpaved Area		Total		channel shape	No. of pipes	pipe size		invert level		channel slope	ks (mm)	3.0000							
		Sub-catchment	Accumulative Area	Sub-catchment	Accumulative Area	Sub-catchment	Accumulative Area			(mm)	(mm)	length	US	DS	(m <sup>2</sup> )	(m)	(min)	(mm/h)	(m <sup>3</sup> /s)	(m <sup>3</sup> /s)	(m/s)		
		(m <sup>2</sup> )			(mm)	(mm)	(m)	(mPD)	(mPD)		(m <sup>2</sup> )	(m)	(min)	(mm/h)	(m <sup>3</sup> /s)	(m <sup>3</sup> /s)	(m/s)						
Catchment A1	Outlet 1	0	0	3,110	3,110	3,110	3,110	CC	1	450	450	19.1	2,620	2,493	0.007	0.143	1.375	5.00	310.24	0.080	0.181	1.263	0.100
Catchment A2	Outlet 3	0	0	1,365	1,365	1,365	1,365	CC	1	450	450	25.7	2,150	1,978	0.007	0.143	1.375	5.00	310.24	0.035	0.181	1.265	0.146
Catchment A3	Outlet 4	0	0	630	630	630	630	CC	1	450	450	36.4	1,350	1,107	0.007	0.143	1.375	5.00	310.24	0.016	0.181	1.264	0.165
Catchment A4	SMH1038285	306	306	434	434	740	740	CC	1	600	600	10.3	1,250	1,050	0.020	0.254	1.833	5.00	310.24	0.036	0.665	2.612	0.628
Catchment A5 + Catchment B1	SMH1038283	375	375	1,435	1,435	1,810	1,810	CC	1	600	600	3.9	1,400	1,100	0.076	0.269	1.860	5.00	310.24	0.068	1.423	5.297	1.355
Catchment A6 + Catchment B2	SMH1038240	385	385	1,860	1,860	2,245	2,245	CC	1	600	600	5.6	1,780	1,680	0.018	0.254	1.833	5.00	310.24	0.080	0.636	2.499	0.556
Catchment A7	SCH1019340	0	0	515	515	515	515	CC	1	450	450	3.7	2,520	2,150	0.099	0.151	1.395	5.00	310.24	0.013	0.756	5.007	0.743

Notes:

Rational Method is adopted for the peak runoff estimate i.e.  $Q_p = 0.278 C i A$

The runoff coefficient of 0.95 for the paved area and 0.3 for the unpaved area have been adopted.

The time of concentration is assumed to be 5 minutes.

91469 - Lot 4822 in D.D. 104, Kam Pok Road and Adjoining Government Land, Mai Po, Yuen Long - Drainage Impact Assessment (Discharge Points Assessment) (1 in 200-year return period)

US	DS	Catchment Area						Channel character						Hydraulic parameter		Time of Concentration $t_c$	i 200	Peak Runoff	Full bore Capacity	Full bore Velocity	Q <sub>check</sub> (capacity - peak runoff)		
		Paved Area		Unpaved Area		Total		channel shape	pipe size			invert level											
		Sub-catchment	Accumulative Area	Sub-catchment	Accumulative Area	Sub-catchment	Accumulative Area		No. of pipes	width (mm)	height (mm)	length (m)	US (mPD)	DS (mPD)	channel slope	cross area (m <sup>2</sup> )	Wetted Perimeter (m)	(min)	(mm/h)	(m <sup>3</sup> /s)	(m/s)	(m <sup>3</sup> /s)	
Catchment A8	Outlet 2	15,495	15,495	7,175	7,175	22,670	22,670	BC	1	2100	2500	33.0	2,000	1,950	0.002	4.725	8.700	5.00	332.66	1,560	8,220	1,740	6.659

Notes: Rational Method is adopted for the peak runoff estimate i.e.  $Q_p = 0.278 C i A$

The runoff coefficient of 0.95 for the paved area and 0.3 for the unpaved area have been adopted.

The time of concentration is assumed to be 5 minutes.

**91469 - Lot 4822 in D.D. 104, Kam Pok Road and Adjoining Government Land, Mai Po, Yuen Long - Drainage Impact Assessment**  
**(Estimation of Surface Runoff) (1 in 50-year)**

Condition	Catchment Area						Time of Concentration $t_c$	i <b>50</b> yr	Peak Runoff ( $m^3/s$ )			
	Paved Area		Unpaved Area		Total							
	Sub-catchment ( $m^2$ )	Accumulative Area ( $m^2$ )	Sub-catchment ( $m^2$ )	Accumulative Area ( $m^2$ )	Sub-catchment ( $m^2$ )	Accumulative Area ( $m^2$ )						
Pre-development	24,085	24,085	13,785	13,785	37,870	37,870	5.00	310.24	2.330			
Post-development	22,670	22,670	15,200	15,200	37,870	37,870	5.00	310.24	2.251			

Notes: Rational Method is adopted for the peak runoff estimate i.e.  $Q_p = 0.278 C i A$   
The runoff coefficient of 0.95 for the paved area, 0.3 for the unpaved area and 1.0 for pond area have been adopted.  
The time of concentration is assumed to be 5 minutes.

**91469 - Lot 4822 in D.D. 104, Kam Pok Road and Adjoining Government Land, Mai Po, Yuen Long - Drainage Impact Assessment**

**(Estimation of Surface Runoff) (1 in 200-year)**

Condition	Catchment Area						Time of Concentration $t_c$	i <b>200</b>	Peak Runoff			
	Paved Area		Unpaved Area		Total							
	Sub-catchment (m <sup>2</sup> )	Accumulative Area (m <sup>2</sup> )	Sub-catchment (m <sup>2</sup> )	Accumulative Area (m <sup>2</sup> )	Sub-catchment (m <sup>2</sup> )	Accumulative Area (m <sup>2</sup> )						
Pre-development	24,085	24,085	13,785	13,785	37,870	37,870	5.00	332.66	2.498			
Post-development	22,670	22,670	15,200	15,200	37,870	37,870	5.00	332.66	2.413			

Notes: Rational Method is adopted for the peak runoff estimate i.e.  $Q_p = 0.278 C i A$

The runoff coefficient of 0.95 for the paved area, 0.3 for the unpaved area and 1.0 for pond area have been adopted.

The time of concentration is assumed to be 5 minutes.

**APPENDIX E –**  
**SECTIONS SHOWING EXISTING GROUND LEVEL**  
**AND PROPOSED GROUND LEVEL**

