Our Ref: 32326

# TEMPORARY ANIMAL BOARDING ESTABLISHMENT WITH ANCILLARY FACILITIES FOR A PERIOD OF 3 YEARS AND FILLING OF LAND

## LOTS 2158 (PART), 2161 & 2163 (PART) IN DD102 NGAU TAM MEI, YUEN LONG, N.T. (Planning Application No. A/STT/37)

# DRAINAGE IMPACT ASSESSMENT

**SEP 2026**

**CONTENTS**



**FIGIRES**



**APPENDICES**

## 1. Introduction

1.1 On 24 August 2026, the applicant Pawsome Resort Limited received an email from Planning Department (Planning Application No. A/STT/37) stating that Drainage Services Department (DSD) had requested the Applicant to submit a Drainage Impact Assessment (DIA) Report for the Temporary Animal Boarding Establishment (TABE) with ancillary facilities for a period of 3 years and filling of land in DD 102 Lot 2158 (part), 2161 & 2163 (part), Ngau Tam Mei, N.T. (the Site). DSD's email is attached in A**ppendix A** for reference.

1.2 Henry Chan & Partners Consultant Engineering Ltd. was commissioned by the Applicant to carry out DIA for the TABE. This Assessment Report forms part of planning application document to demonstrate that the TABE is viable in terms of drainage.

1.3 Figure 1 shows the lot boundary of the Site. It lies at Pang Loon Tei near Hadden Hill and is east of the Luk Mei Tsuen, San Tin, Yuen Long, N.T. The Site comprises two portions: paved area of about 1561.60m² on the periphery and unpaved area 284.40m² in the center. The Site is bounded by private properties and has only one entrance at the northeast corner.

1.4 This DIA report outlines the existing drainage arrangements within and in the vicinity of the Site. The Report also identifies and quantifies the potential drainage impacts due to the proposed TABE on this Site and proposes appropriate mitigation measures before and after completion. These include the provision of adequate surrounding drainage and maintenance of the existing and proposed drainage systems.

1.5 It should be noted that this Application for a TABE is only temporary. The Site will be reclaimed in the future for the development of San Tin Technopole with reference to "Resumption of Land for the Development of San Tin Technopole (Phase 2)".

## 2. Existing Drainage and Flooding Condition

*Existing Site Condition*

The Site is located in Pang Loon Tei, the east of Luk Mei Tsuen about +12.2mPD. Hoarding is erected surrounding the Site boundary. The Site was previously occupied by a paint-spray workshop. There has been no alternation to the ground profile of the Site since it has converted into a TABE. Only the majority of the hard paved area has been converted into a lawn to serve as an open space for animals (Dogs). Existing site conditions are shown in photographs attached in **Appendix B**.

*Existing Site Drainage and its Surrounding Area*

The Site and its adjacent area have no proper surface discharged drainage system provided. All surface run-off naturally finds its way towards the nearby open stream course. The open stream course passes through the east side of the Site, then turns to northwest, pass through Luk Mei Tsuen, Ki Lun Tsuen and San Tin Interchange. Finally, the open stream course meanders around Tun Yu Road and discharge the storm water to Sham Chun River finally.

*Flood Risk*

This has been no flooding reported in this Area. It seems that even without any proper drainages, this area is not prone to flooding, which proves that the existing open stream course has adequate capacity to serve the whole area during rainstorms.

## 3. Drainage Impacts of the (TABE)

3.1 The Site understudy is a flat place of land, and its surroundings areas are also flat. There were no proper discharges provided within the Site and its surrounding areas. Based on Aerial Photographs and HK government 1:1000 survey map sheet, the Site and its surrounding areas can be subdivided into 7 Catchments, where all stormwater run-off naturally find its way towards an existing open stream course (Figure 2 & 3 refers). Only Catchments 1 to 4 are associated the TABE; Catchment 5 & 7 will not run through the TABE.

3.2 Drainage Impact Assessment

A comparison was made between the Site before and after it was converted to a TABE.

(i) Before

The Site area is approximately 1936 sqm in total, which was used as a vehicle spray-painting workshop. Hence, the whole Site area was hard paved for vehicle access, spray-painting activities and the storage of paint (General View attached in Appendix C).

(ii) After

It is now converted into TABE, which is in an environmentally more friendly condition, with the majority of the area covered in lawn.

3.3 The amount of runoff generated from infiltration before and after the temporary animal boarding establishment is estimated in **Appendix D**. The estimated total runoff is from all catchments area is 23,243 L/min and 22,293 L/min under the return-period of design rainfall intensity is 1 in 10 years for North District Area respectively, due to 284.4 sq. m hard paved area is changed into lawn area after development. Therefore, the TABE actually has improved the surrounding drainage conditions in terms of run-off discharge.

## 4. Proposed Drainage Impact Mitigation Measures

4.1 As discussed in the previous sections, the potential impacts of the development include a decrease in surface runoff. Although there is no potential drainage impact for existing open stream course, a proper drainage discharge system such as peripheral channels and underground precast concrete pipe for the projected site is proposed to be built along the site boundary to collect, convey and discharge any flow accrued on the Site and the overland flow intercepted from the adjacent lands which not lower than the level of the Site as shown in figure 3 to 5. Moreover, adequate openings for hoarding at west and south, which facing catchment 3 and 4, are provided to allow existing overland flow from higher level adjoining lots to pass through. The design of peripheral channels and underground precast concrete pipes is attached in **Appendix D**.

4.2 In addition, peripheral channels and underground precast concrete pipe in figure 3 are considered the catchment area 1, 2, 3, 4 and 6 only as the surface runoff of catchment 5 and 7 flow into the nearest open stream course directly.

4.3 As the underground precast concrete pipe is located outside the Site, the applicant should seek consent from the relevant owner(s) for any drainage work outside the Site before the commencement of the drainage work for underground precast concrete pipe.

## 5. Maintenance Consideration

5.1 The drainage facilities are provided as part of proposed development inside the TABE and will be maintained by the Applicant after completion.

5.2 Regular maintenance should be undertaken for these new drainage works in accordance with standard practice. It is considered desirable that the drains should be inspected annually before commencement of wet season (April to October) to ensure these drains can still function properly.

## 6. Conclusion

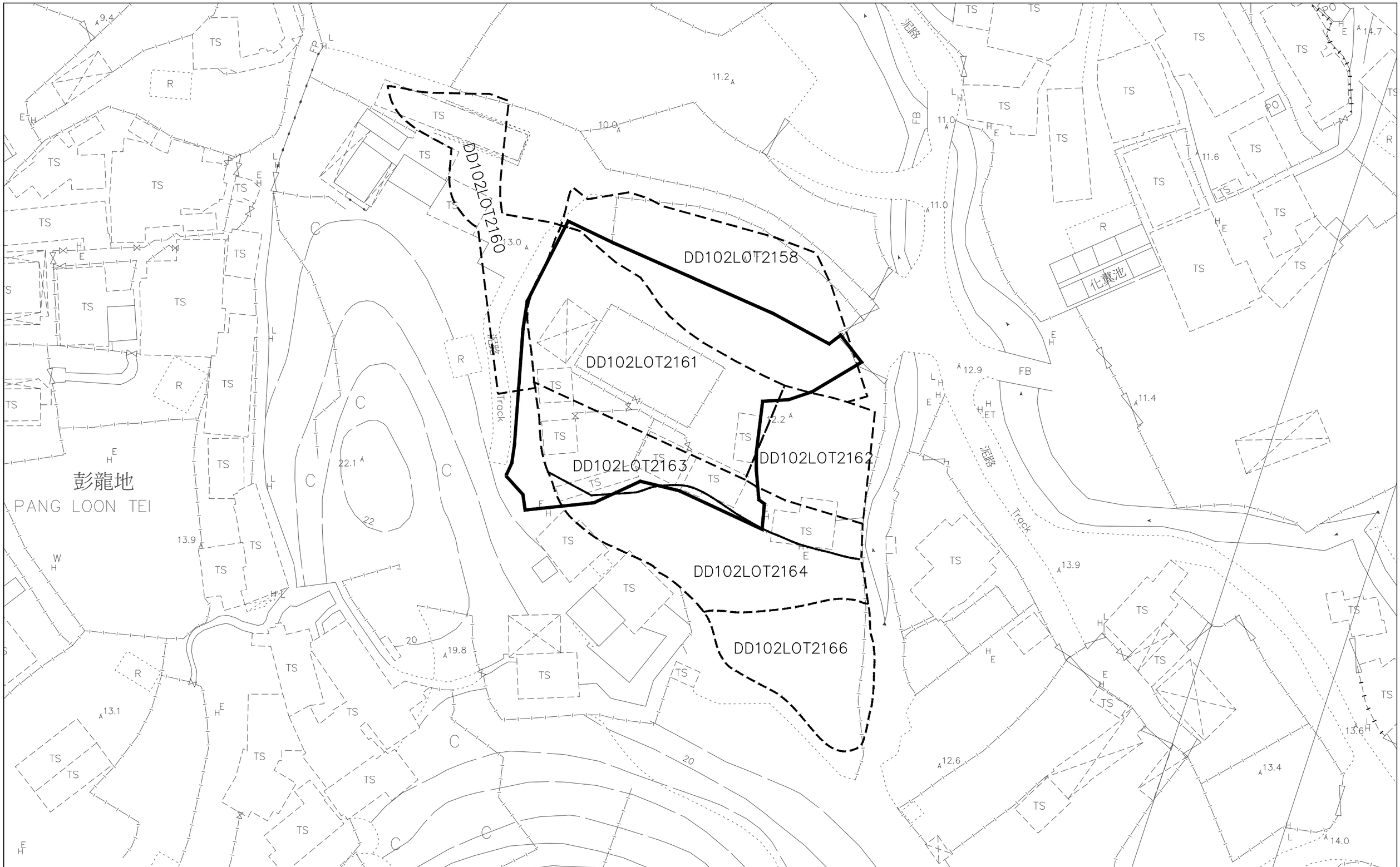
6.1 The potential drainage impacts arising from the TABE include a decrease in the quantity runoff due to some original paving part of the Site become lawn area. The existing TABE has neither obstructed overland flow nor adversely affected on the existing open stream course and the adjacent areas. Since there is no proper existing drainage system to cater the surface runoff from the Site and the surrounding catchment area, peripheral channels is proposed to collect and convey the surface runoff accrued on the Site and the surrounding catchment area to the nearby open stream course. All the proposed drainage works are placed 3m away from top of the bank of the existing open stream course. All the proposed works in the vicinity of the watercourses should not create any adverse drainage impacts, both during and after construction.

6.2 The proposed peripheral channels will only enhance the serviceability of the TABE itself. As the Site do not affect the existing catchments, and the existing stream has been servicing the surrounding area well during rainstorm periods, the drainage impact of the TABE on its surroundings is insignificant.

6.3 The Application will be fully responsible for the maintenance of the future peripheral channels and constructed drainage system under this Application.

6.4 As the underground precast concrete pipe is located outside the Site, the applicant should seek consent from the relevant owner(s) for any drainage work outside the Site before the commencement of the drainage work for underground precast concrete pipe.

# Figure




LEGEND:

SITE BOUNDARY

LOT BOUNDARY

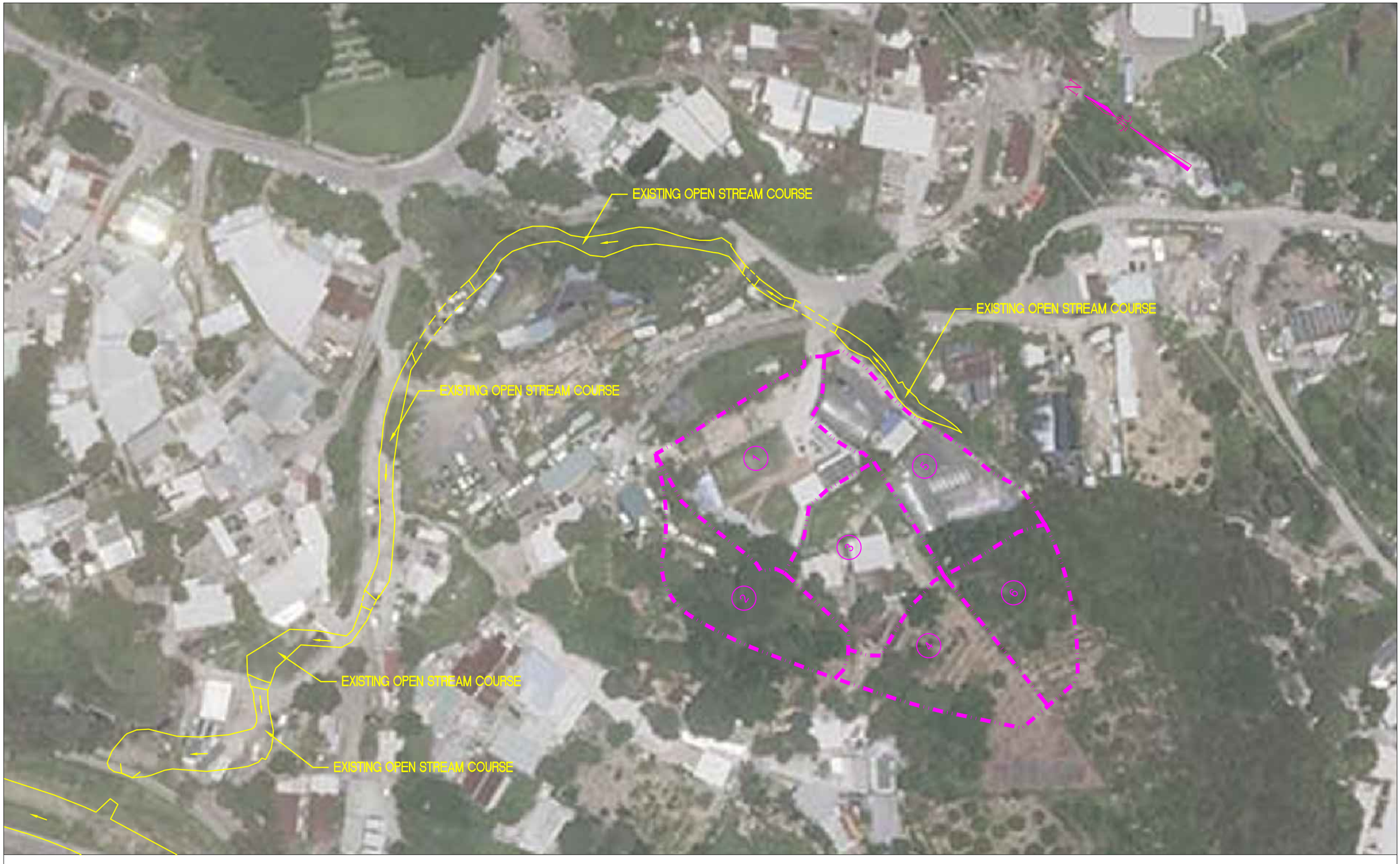
DD102 LOT 2158(PART),
LOT 2161 & LOT 2163(PART),
NGAU TAM MEI, N.T.

TITLE

# LOT BOUNDARY OF THE SITE

FIGURE NO 1

SCALE 1 : 600




LEGEND:

CATCHMENT AREA BOUNDARY

1 CATCHMENT AREA MARK

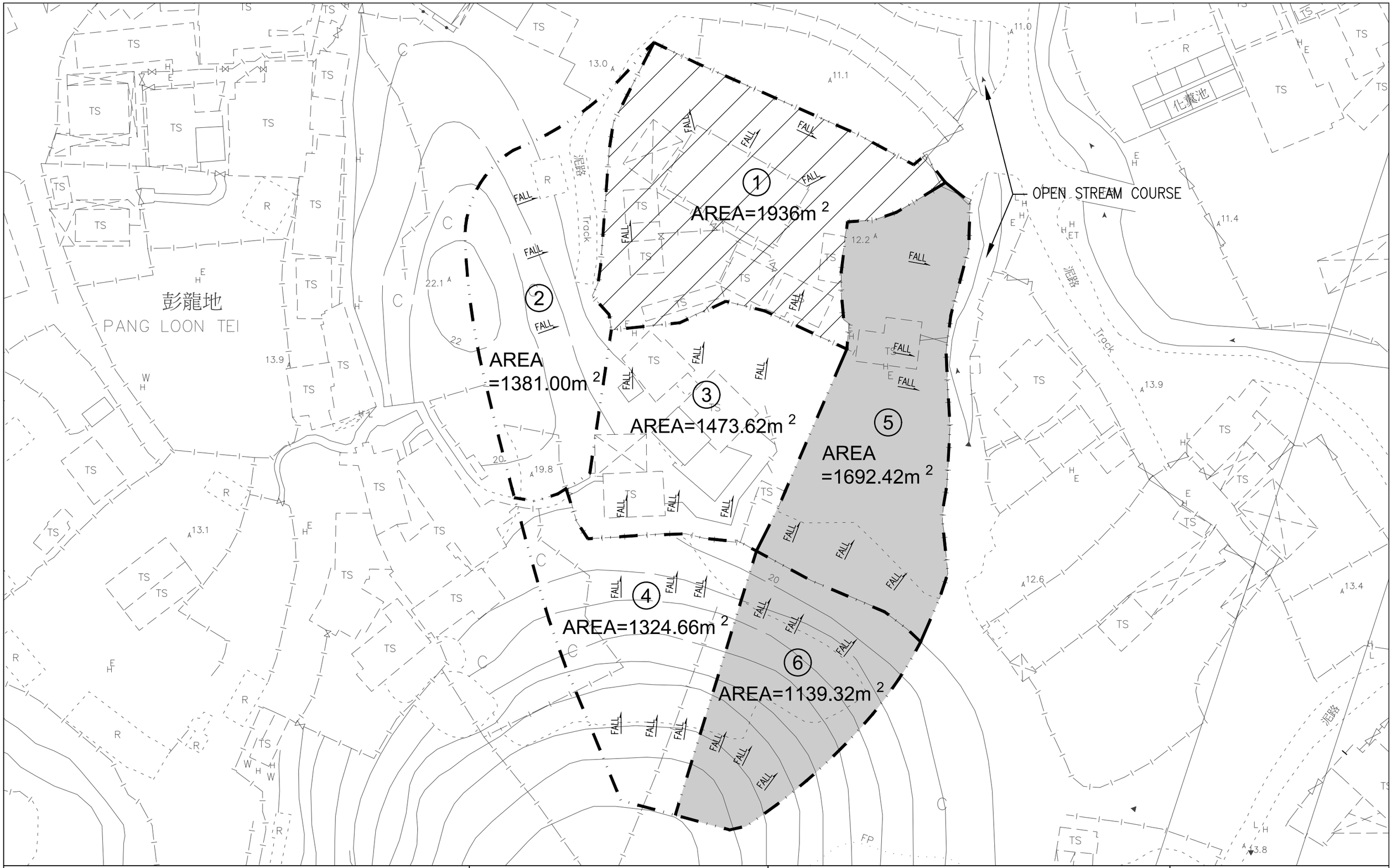
DD102 LOT 2158(PART),
LOT 2161 & LOT 2163(PART),
NGAU TAM MEI, N.T.

TITLE

# AERIAL PHOTO OF CATCHMENTS UNDER THIS STUDY

FIGURE NO 2

SCALE 1 : 1000




LEGEND:

- CATCHMENT AREA BOUNDARY
- (1) CATCHMENT AREA MARK
- FALL — FLOW DIRECTION
- THE SITE
- CATCHMENT NOT AFFECT SITE UNDER STUDY

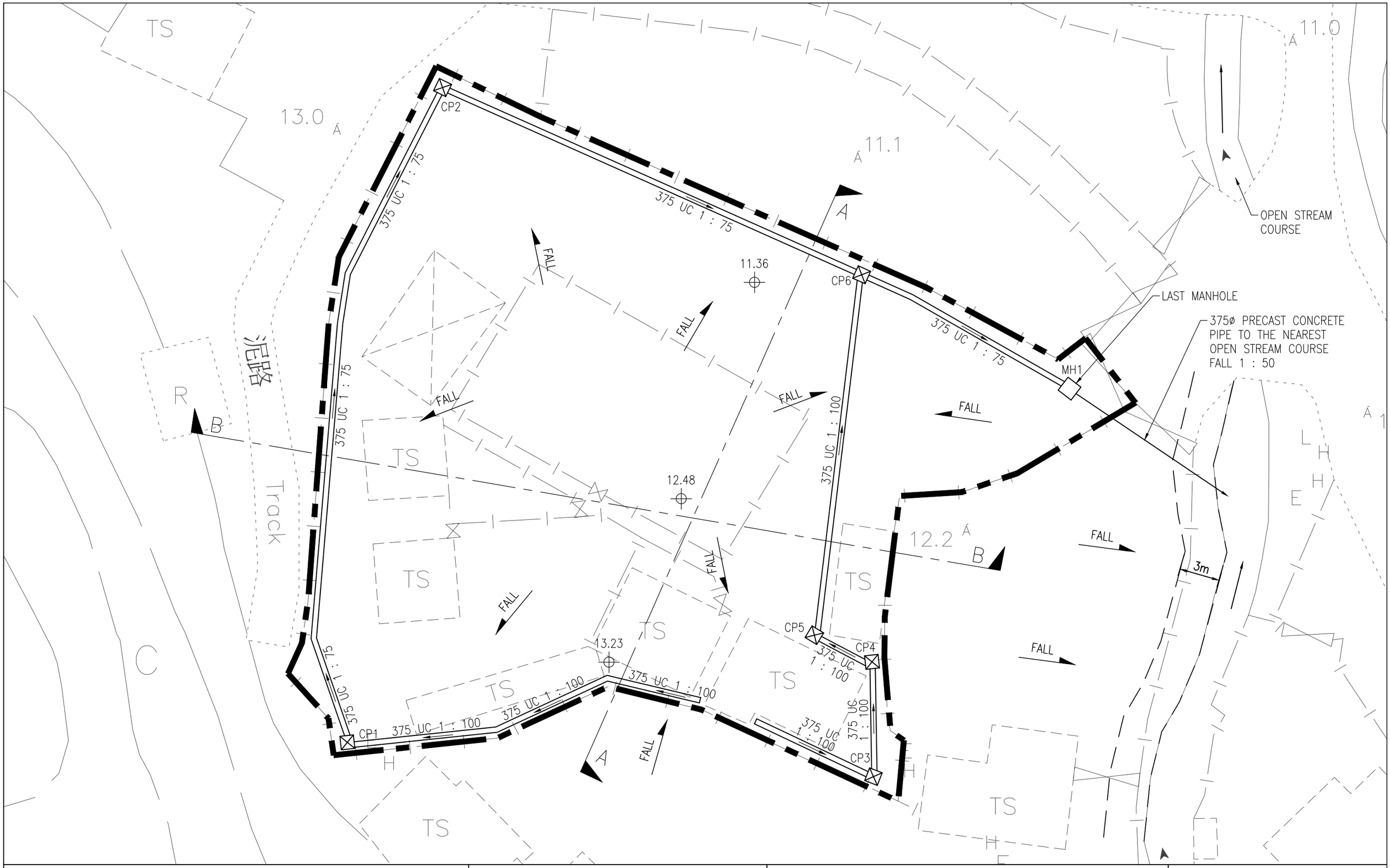
DD102 LOT 2158(PART),
LOT 2161 & LOT 2163(PART),
NGAU TAM MEI, N.T.

TITLE

# CATCHMENT OF THE SITE

FIGURE NO 3

SCALE 1 : 600




LEGEND:

- SITE BOUNDARY
- 325 UC — PROPOSED 325 UC
- PROPOSED 350ø PIPE
- PROPOSED CATCHPIT
- PROPOSED MANHOLE
- FALL — FLOW DIRECTION

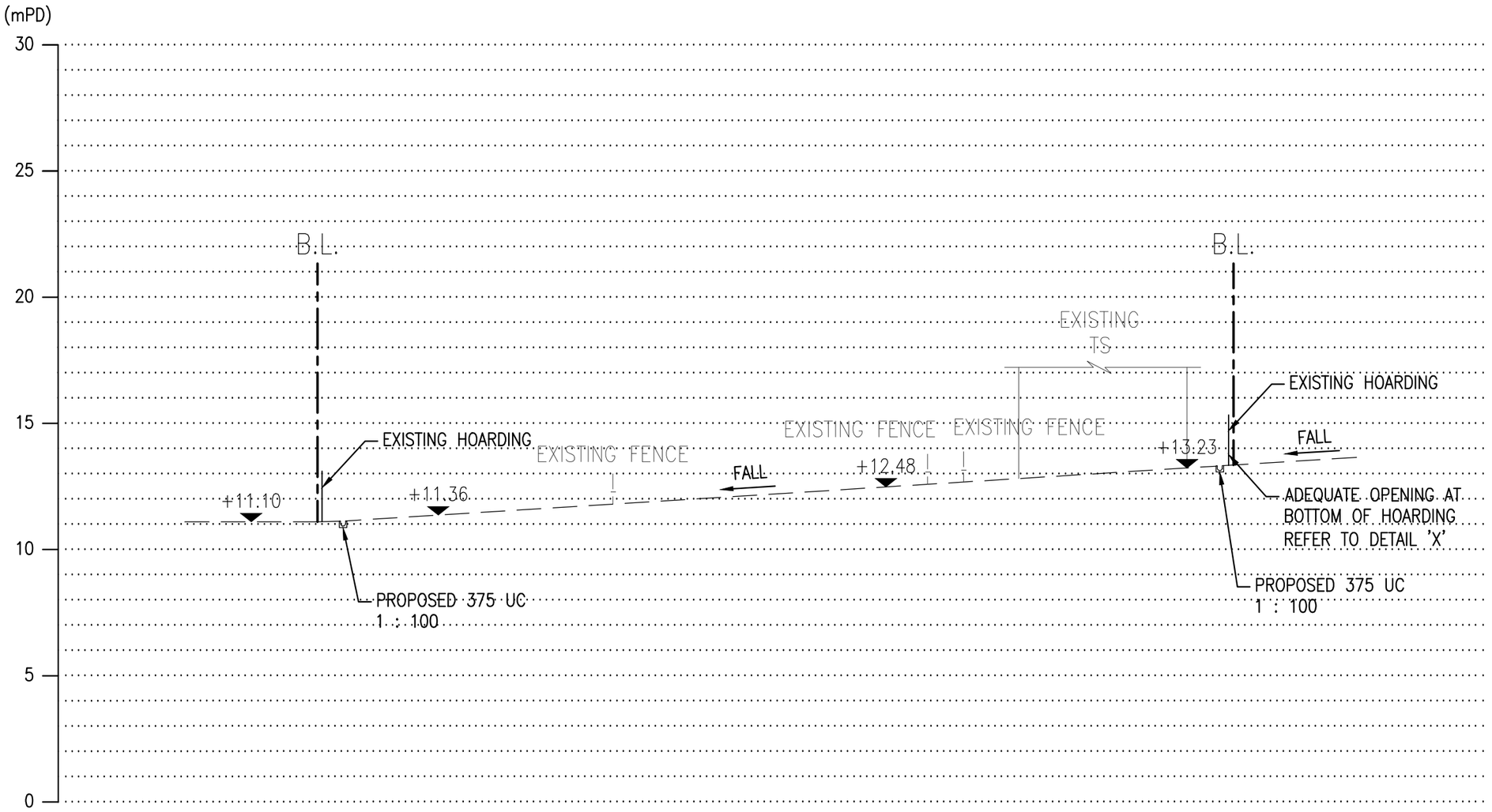
DD102 LOT 2158(PART),
LOT 2161 & LOT 2163(PART),
NGAU TAM MEI, N.T.

TITLE

# CONCEPTUAL DRAINAGE PLAN

FIGURE NO 4

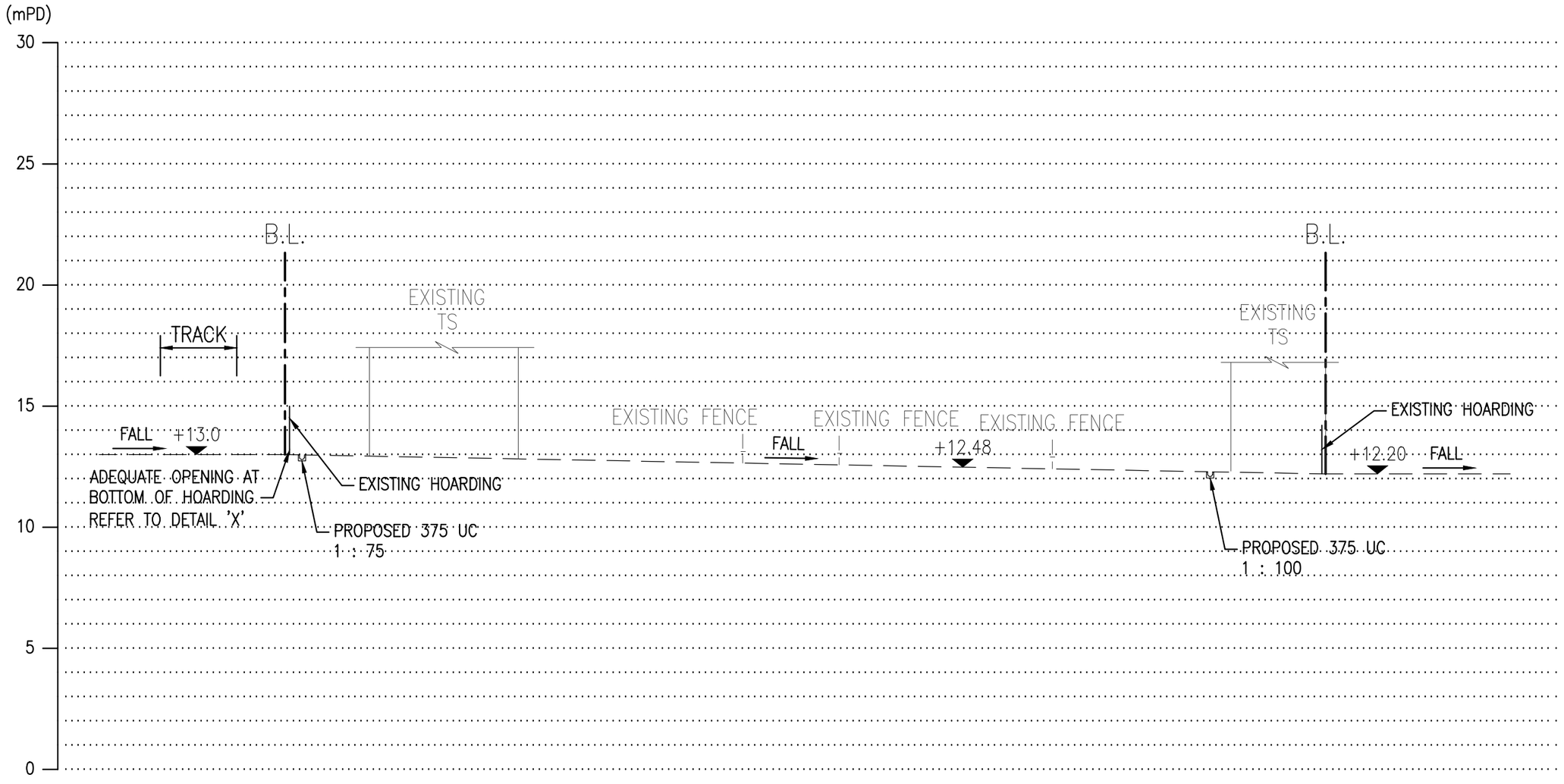
SCALE 1 : 250




SECTION A–A

1 : 200

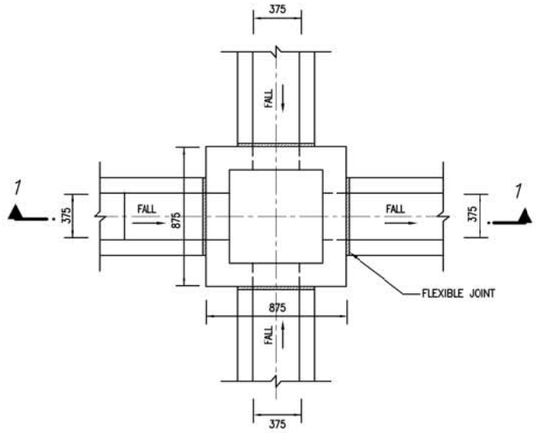
| | | | |
|---|---|---|---|
| LEGEND: | DD102 LOT 2158(PART), LOT 2161 & LOT 2163(PART), NGAU TAM MEI, N.T. | TITLE<br>SECTION A–A | FIGURE NO 5<br>SCALE 1 : 200 |

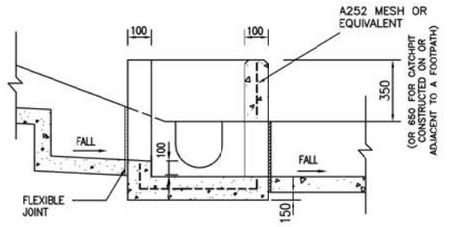



## SECTION B–B

1 : 200

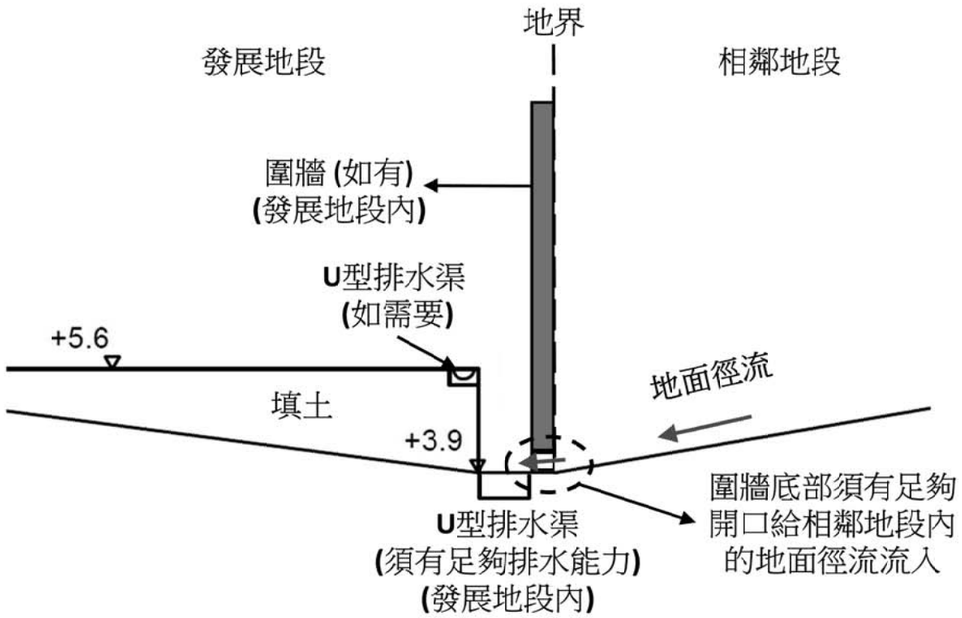
| | | | |
|---|---|---|---|
| LEGEND: | DD102 LOT 2158(PART),<br>LOT 2161 & LOT 2163(PART),<br>NGAU TAM MEI, N.T. | TITLE<br>SECTION B–B | FIGURE NO 6<br>SCALE 1 : 200 |



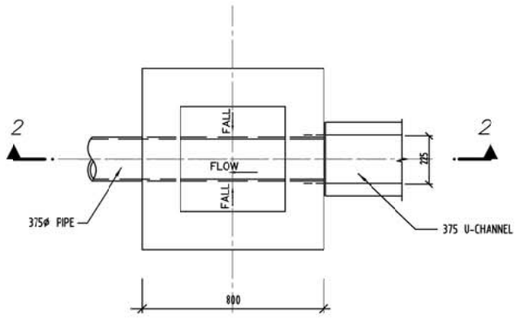




SECTION 1–1

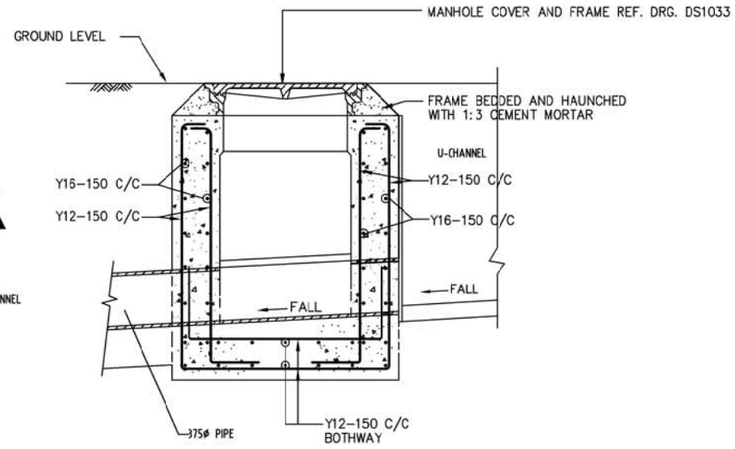
TYPICAL DETAILS OF CATCHPIT CP1 TO CP6



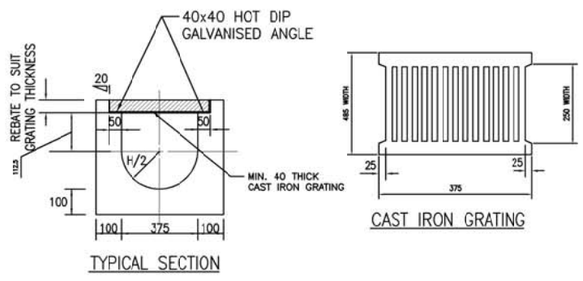

DETAILS FOR HOARDING OPENINGS AT BOTTOM
(DETAILS 'X')




PLAN FOR MANHOLE "MH1"




SECTION 2 – 2




(DIMENSIONS ARE FOR GUIDANCE ONLY, CONTRACTOR MAY SUBMIT EQUIVALENT TYPE)

U CHANNELS WITH CAST IRON GRATING
UP TO H OF 525 U CHANNEL

| | | | |
|---|---|---|---|
| LEGEND: | DD102 LOT 2158(PART),<br>LOT 2161 & LOT 2163(PART),<br>NGAU TAM MEI, N.T. | TITLE<br>DETAILS | FIGURE NO 7<br>SCALE N.T.S. |

# Appendix A

# Email from Planning Department on 24-Aug-2026

Gmail Christopher Chau [redacted]

# Fwd: Planning Application No. A/STT/37 - Departmental Comments

1 封郵件

**venus li** [redacted] 2026年8月28日 上午9:09
收件者: [redacted]

---------- 轉寄的訊息 ---------
寄件者： **Chloe Kit Ying LEUNG/PLAND** <ckyleung@pland.gov.hk>
日期：2026年8月24日 週一，17:38
寄件者：Planning Application No. A/STT/37 - Departmental Comments
收件者：[redacted]
副本：Karen Kei Yee CHAN/PLAND <kkychan2@pland.gov.hk>, Yen PY LEUNG/PLAND <pyleung@pland.gov.hk>

Dear Venus,

I refer to the captioned application. Please find the departmental comments below for responses.

**Comments from Fire Services Department (FSD) (Contact: Mr. WONG Cheuk Kei at 2733 7737)**

1. In consideration of the design/nature of the proposal, fire services installations (FSIs) are anticipated to be required. Relevant layout plans incorporated with the proposed FSIs shall be submitted to FSD for approval. The layout plans should be drawn to scale and depicted with dimensions and nature of occupancy. The location of where the proposed FSIs to be installed should be clearly marked on the layout plans.

2. If the proposed structures are required to comply with the Buildings Ordinance (BO) (Cap. 123), detailed fire safety requirements will be formulated upon receipt of formal submission of general building plans;

**Comments from Drainage Services Department (DSD) (Contact: Ms. CHENG Wai Ting at 3965 8870)**

1. The applicant shall submit a drainage submission to demonstrate how he will collect, convey and discharge rain water falling onto or flowing to the Site. A clear drainage plan showing full details of the existing drains and the proposed drains (e.g. cover and invert levels of pipes/catchpits/outfalls and ground levels justifying waterflow etc.) with supporting design calculations and charts should be included. (For preparation of the drainage proposal, the Guideline on preparation of the drainage proposal is available in DSD homepage at https://www.dsd.gov.hk/EN/Files/Technical_Manual/dsd_guideline/Drainage_Submission.pdf for reference). The applicant is reminded that approval of the drainage proposal must be sought prior to the implementation of drainage works on Site.

2. After completion of the required drainage works, the applicant shall provide DSD for reference a set of record photographs showing the completed drainage works with corresponding photograph locations marked clearly on the approved drainage plan. DSD will inspect the completed drainage works jointly with the applicant with reference to the set of photographs.

3. The applicant shall ascertain that all existing flow paths would be properly intercepted and maintained without increasing the flooding risk of the adjacent areas (reference could be referred to ***Appendix A***).

4. The applicant is reminded that the proposed drainage proposal/works as well as the site boundary should not cause encroachment upon areas outside his jurisdiction.

5. No public sewerage maintained by DSD is currently available for connection. For sewage disposal and treatment, agreement from the Director of Environmental Protection Department shall be obtained.

6. The applicant should consult District Lands Office, Yuen Long regarding all the proposed drainage works outside the lot boundary in order to ensure the unobstructed discharge from the Site in future.

7. All the proposed drainage facilities should be constructed and maintained by the applicant at his own cost. The applicant should ensure and keep all drainage works on Site under proper maintenance at all times.

8. To encourage a higher quality submission and avoid rounds of comments, thereby shortening the processing time, the applicant is advised to complete the attached checklist (***Appendix A***). Otherwise, a longer processing time may be required by DSD.

*[See attachment "Appendix A.pdf"]*

*[See attachment "Sketch A_sketch of periphereal drains.pdf"]*

Should you have any questions, please do not hesitate to contact the undersigned. Thank you.

Regards,

Chloe LEUNG

TPG/FSYLE5

Tel: 3168 4028



**2 個附件**

**Appendix A.pdf**
196K

**Sketch A_sketch of periphereal drains.pdf**
288K

**Appendix A**

**Responses on DSD's Requirements and Reminders**

Planning Application No.: _____

Location: Lot No. _____

_____

in D.D. _____

Site Area: _____ $m^2$

Land filling works involved? Yes / No

Maximum increase in formation level: _____ m

Maximum level difference with adjoining lot: _____ m

Filling of pond(s) involved? Yes / No

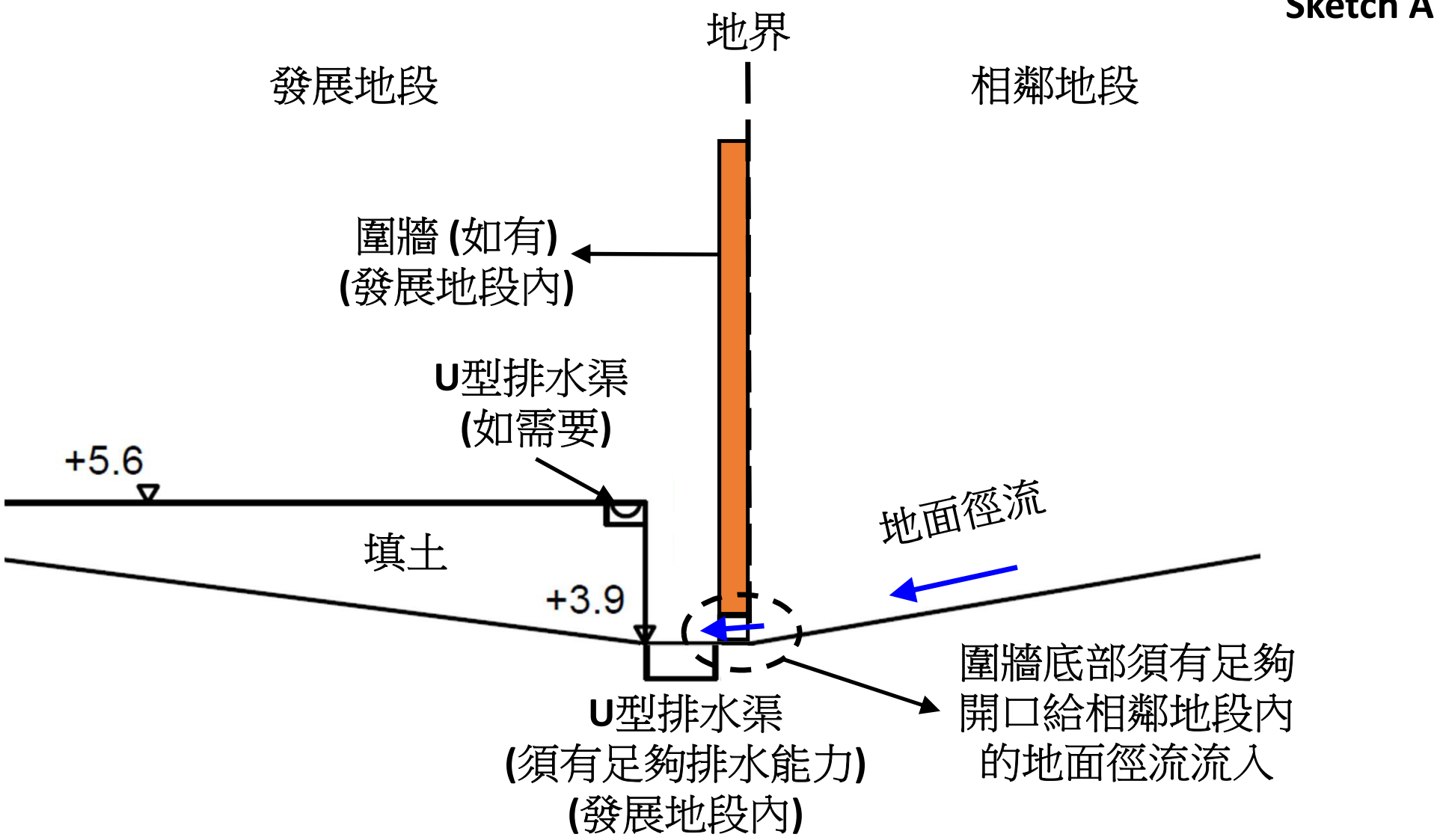
Estimated size of pond to be filled: _____ $m^3$

| No. | (A) DSD's Requirements | Fulfilled in the submission? (Yes / No) |
|---|---|---|
| 1 | For sites considered complex (those 1 hectare or larger, in flood-prone areas, or involving pond filling or major earthworks), you should hire a qualified engineer (Registered Professional Engineer in the Civil Engineering discipline) to follow DSD Advice Note No. 1 and submit a proposal signed and certified by the engineer. For other sites, it is also advisable to hire a qualified engineer to prepare your drainage proposal. | |
| 2 | The proposed development should neither obstruct overland flow nor adversely affect any existing natural streams, village drains, ditches and the adjacent areas, etc., unless there is proper diversion. | |
| 3 | Adequate surface channels shall be provided to collect and convey the surface runoff accrued on the application site. | |
| 4 | If there is existing surface runoff flowing from the adjoining lots towards the application site, peripheral surface channels with sufficient drainage capacity, set at a level lower than the adjoining lots, should be constructed to collect and convey the runoff (See **Sketch A**). | |
| 5 | Where boundary walls or hoarding are erected, adequate openings should be provided to allow existing overland flow from the adjoining lots to pass through (see **Sketch A**). | |
| 6 | The applicant shall be required to place all the proposed works 3m away from the top of the bank of any existing watercourses or natural streams. All the proposed works in the vicinity of the watercourses should not create any adverse drainage impacts, both during and after construction. Adequate measures should be provided byf the applicant to DSD's satisfaction in order to prevent the subject site from being eroded and flooded and to ensure that the capacity of watercourses and the flooding susceptibility of the adjoining areas would not be adversely affected by the proposed development. | |
| 7 | The applicant should indicate the proposed and existing ground levels of the application site and ground levels of adjacent areas on the drainage plan. | |
| 8 | Cross sections showing the proposed drainage facilities and existing and proposed ground levels of the application site with respect to the adjacent areas should be given. | |
| 9 | The proposal should indicate how the runoff (the flow direction) within the site and from the adjacent areas would be discharged to the proposed drainage system. | |
| 10 | Sand trap or provision alike should be clearly indicated on the proposed drainage plan and provided before the collected runoff is discharged to the existing drainage facilities. | |
| 11 | The applicant should clearly indicate the full alignment of the discharge path from the application site all the way down to the ultimate discharge point (e.g. a well-established stream course/public drainage system). | |

| | | |
|---|---|---|
| 12 | The applicant should clearly indicate the existing drainage facilities on the proposed drainage plan. Site photos of existing drainage facilities including the discharge point (e.g. existing local village drain and its downstream drainage facilities) should be provided in order to demonstrate the presence and reflect condition of the existing drainage system. Also, the applicant should provide site photo(s) to demonstrate size of the existing drainage facilities. | |
| 13 | Cover levels and invert levels of the proposed and existing drainage facilities should be shown on the drainage plan. Invert levels of drainage facilities at the upstream should be higher than that at the downstream. Also, gradients and sizes of the proposed and existing drainage facilities should be shown on the drainage plan. | |
| 14 | The applicant should demonstrate with hydraulic calculation that the proposed drainage facilities are adequate to collect, convey and discharge the surface runoff accrued on the application site and the overland flow intercepted from the adjacent lands. External catchment shall be properly considered | |
| 15 | Connection to existing drainage facilities should be designed and constructed to prevent back flows at the drainage outlet when water level at the existing drainage facilities is high. | |
| 16 | Stormwater Drainage Manual (SDM) and the newly promulgated SDM - Corrigendum published by DSD shall be considered in the hydraulic calculation. Also, storm constants of HKO Headquarters shall be adopted. In generael, a 10-year design return period is sufficient for village drainage systems. | |
| 17 | Deposition of sediment in stormwater drainage system should be considered in the hydraulic calculation as per the requirement in Stormwater Drainage Manual (Section 9.3). | |
| 18 | The applicant should check flow velocity of the proposed drainage facilities. The flow velocity is suggested to be within a range, i.e. 0.75 m/s to 3.0 m/s. | |
| 19 | Catchpit should be provided at where a proposed surface channel changes direction / gradient. | |
| 20 | The applicant should provide construction details of the proposed drainage facilities. | |
| 21 | The applicant should provide details for connection of the proposed and existing drainage facilities. | |
| 22 | Grating should be provided for the surface channels. | |
| 23 | Precast concrete pipe should generally be used for stormwater connection. | |
| 24 | Connection of the proposed and existing drainage facilities shall be designed and constructed such that there is no water leakage at the proposed connection. | |
| 25 | For the construction details of the proposed drainage facilities, reference should be made to current CEDD’s standard drawings. | |
| | (B) DSD's Reminders | Fulfilled in the submission? (Yes / No) |
| 1 | Any existing drainage facilities within/outside the application site should not be disturbed or interfered with until any necessary diversion works, which have been accepted by the owner of the existing drainage facilities, have been satisfactorily completed. Such diversion works should be carried out by the applicant at his/her own cost. Moreover, sufficient allowance for future maintenance of the existing drainage facilities should be provided. | |
| 2 | No construction debris, silt and sediments, or cementitious materials should be discharged into or deposited inside any existing natural streams, watercourses, drains, ditches or sewers from the application site without prior approval. Any blockage or damage arising from the proposed development shall be made good at the cost of the applicant and to DSD's satisfaction. The applicant shall also be liable for and shall indemnify against all claims and demands arising out of or in connection with this regard. | |

| | | |
|---|---|---|
| 3 | The applicant should be reminded to minimize the possible adverse environmental impacts on any existing watercourses in his design and during construction. EPD and AFCD should be consulted on possible environmental and/or ecological impacts of the proposed development which is in the vicinity of any existing watercourses. | |
| 4 | The applicant is required to rectify/modify the drainage system if they are found to be inadequate or ineffective during operation. The applicant shall also be liable for and shall indemnify claims and demands arising out of damage or nuisance caused by a failure of the drainage system. | |
| 5 | For any proposed connection to DSD's drainage facilities, the applicant should submit form HBP1 to this Division for application of technical audit. Upon our acceptance of the connection application, the applicant shall carry out the proposed connection works in accordance with DSD's Standard Drawings at the resources of the applicant. | |
| 6 | If the existing drainage facilities, to which the applicant proposed to discharge the stormwater from the application site was not maintained by this office, the applicant should identify the owner of the existing drainage facilities and seek agreement from the owner prior to commencement of the proposed works. In the case that it is a local village drains, DO/YL should be consulted. | |
| 7 | The applicant should consult DLO/YL and seek consent from the relevant owners for any drainage works to be carried out outside his lot boundary before commencement of the drainage works. | |
| 8 | Comments from HyD, TD and RMO shall be sought if drainage works are proposed to be carried out within highway polygon or on carriageway. | |

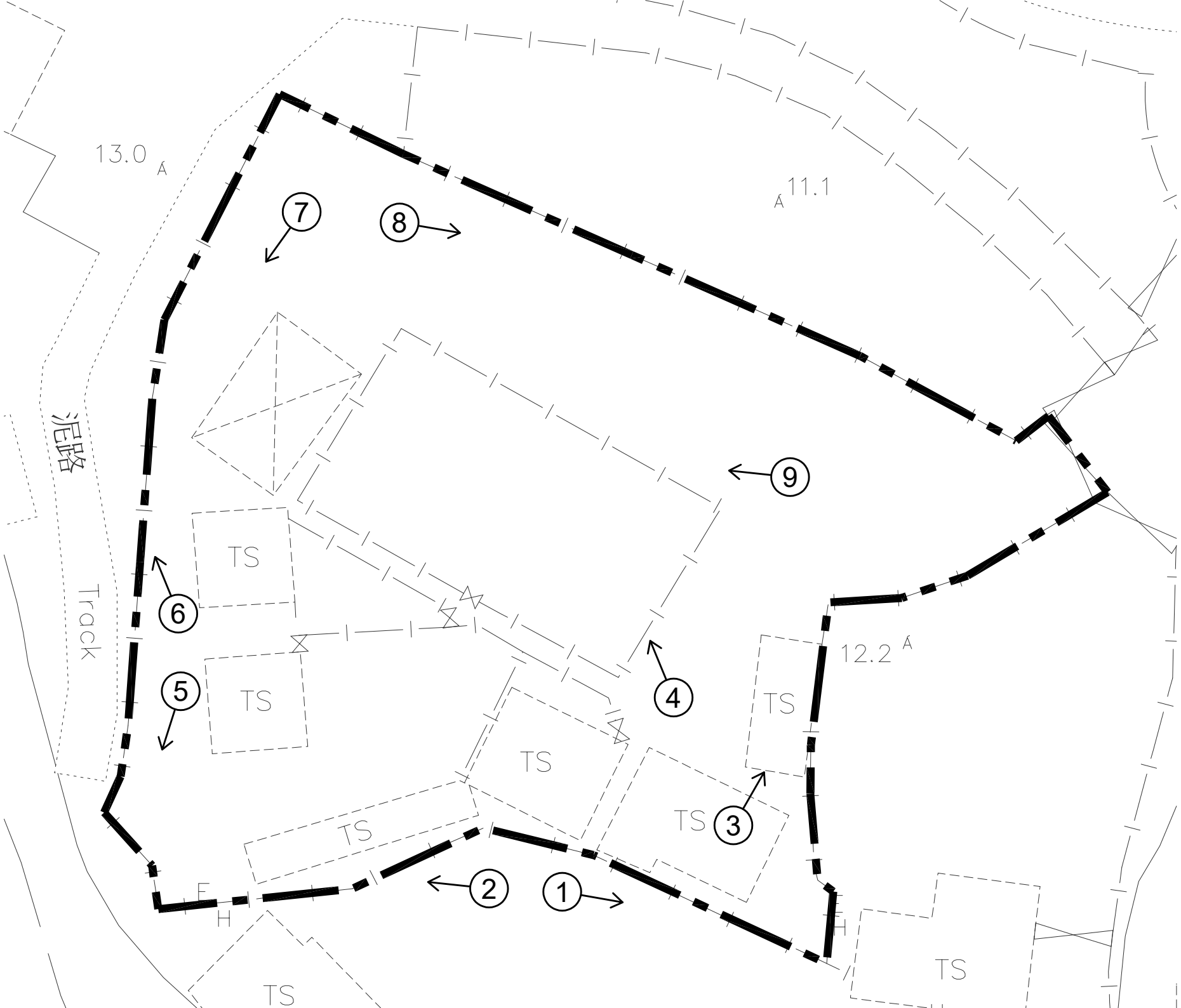
**Sketch A**


地界
發展地段
相鄰地段
圍牆 (如有)
(發展地段內)
U型排水渠
(如需要)
+5.6
填土
+3.9
地面徑流
圍牆底部須有足夠
開口給相鄰地段內
的地面徑流流入
U型排水渠
(須有足夠排水能力)
(發展地段內)

# Appendix B

# Site Photos for the TABE and

# Existing Open Stream Course


13.0 A
A 11.1
泥路
Track
TS
TS
TS
TS
TS
TS
TS
12.2 A
E
H
H
1
2
3
4
5
6
7
8
9

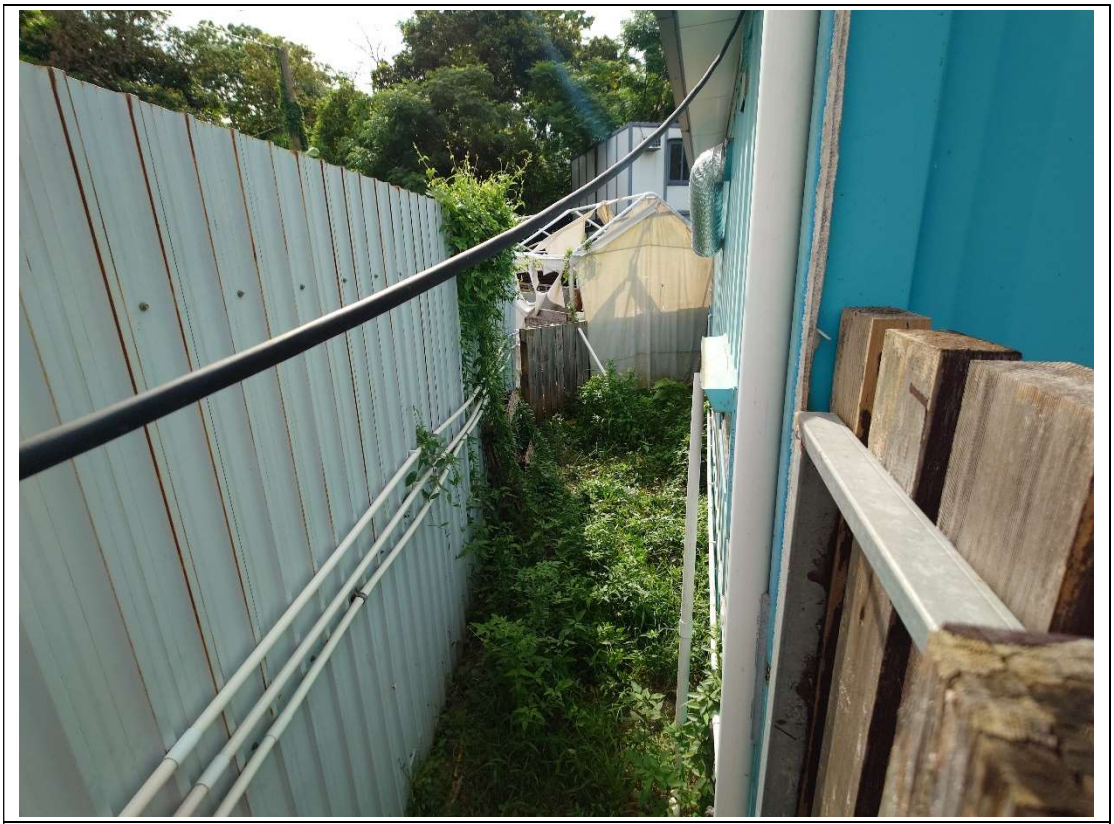


Photo 1

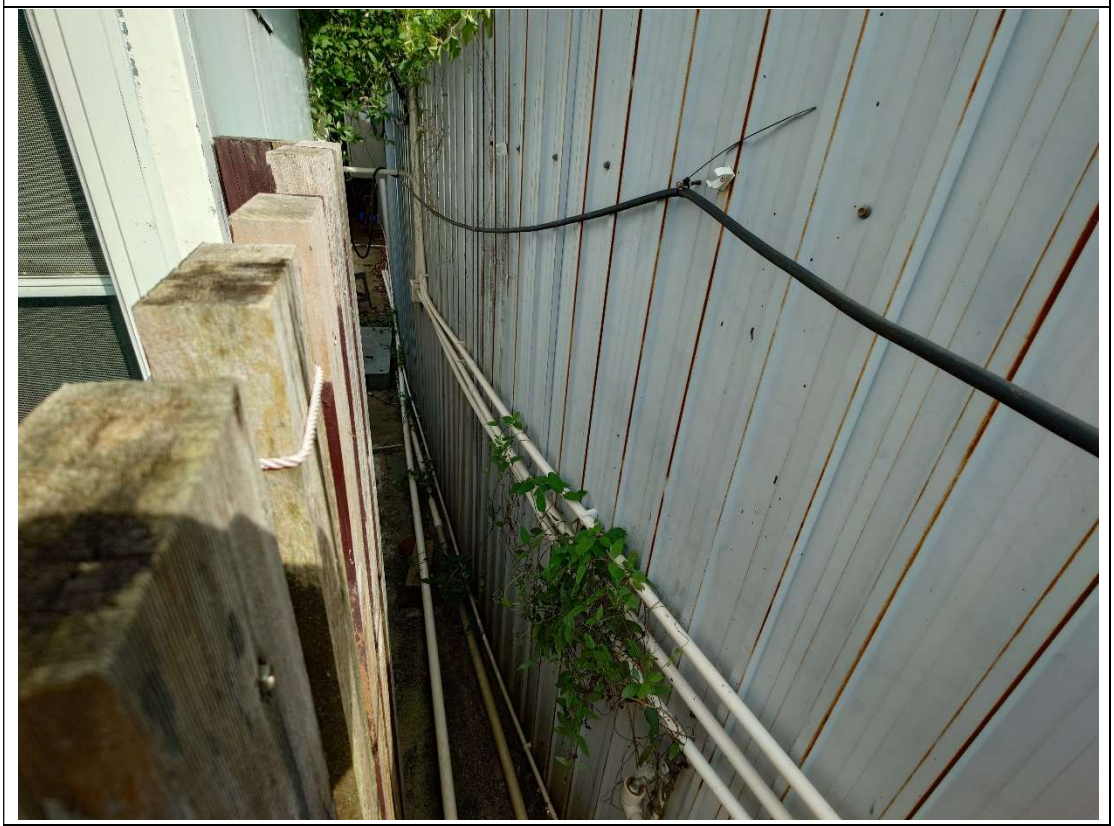


Photo 2

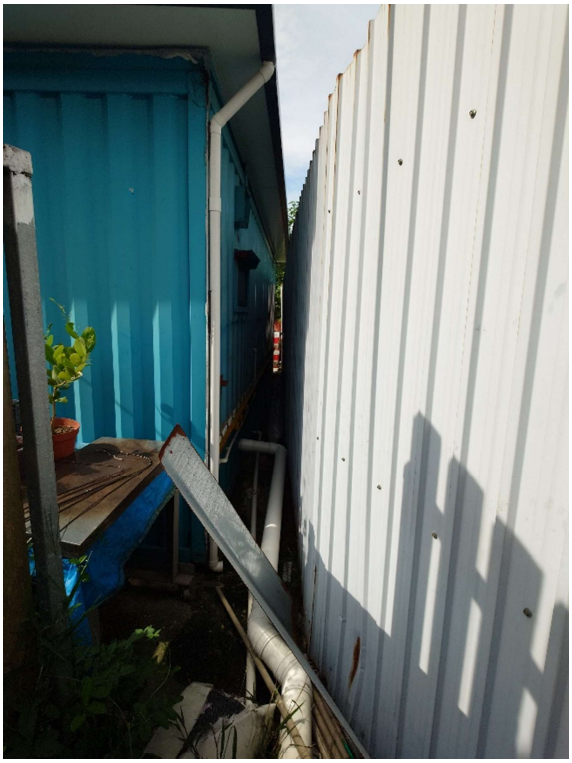


Photo 3

Photo 4

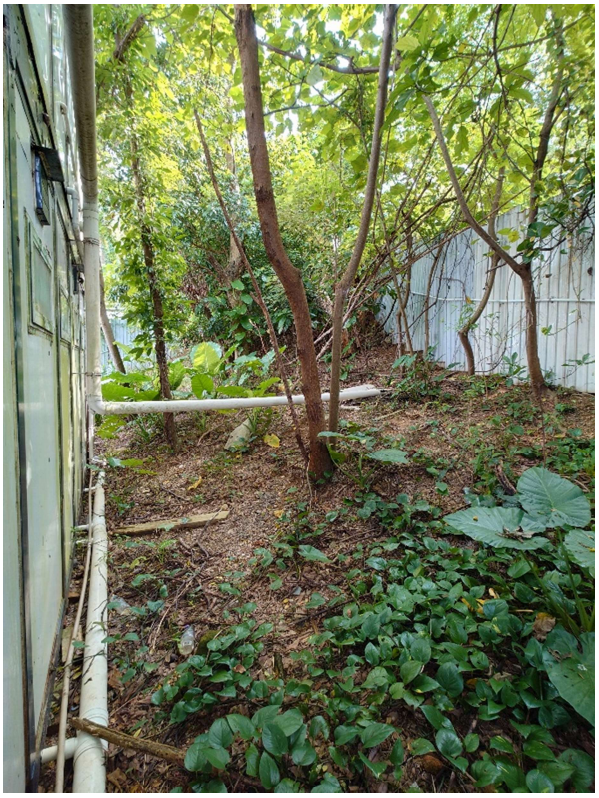


Photo 5

Photo 6

Photo 7

Photo 8

Photo 9

Photo for Existing Open Stream Course

# Appendix C

# General View of Previous Spray-painting Workshop

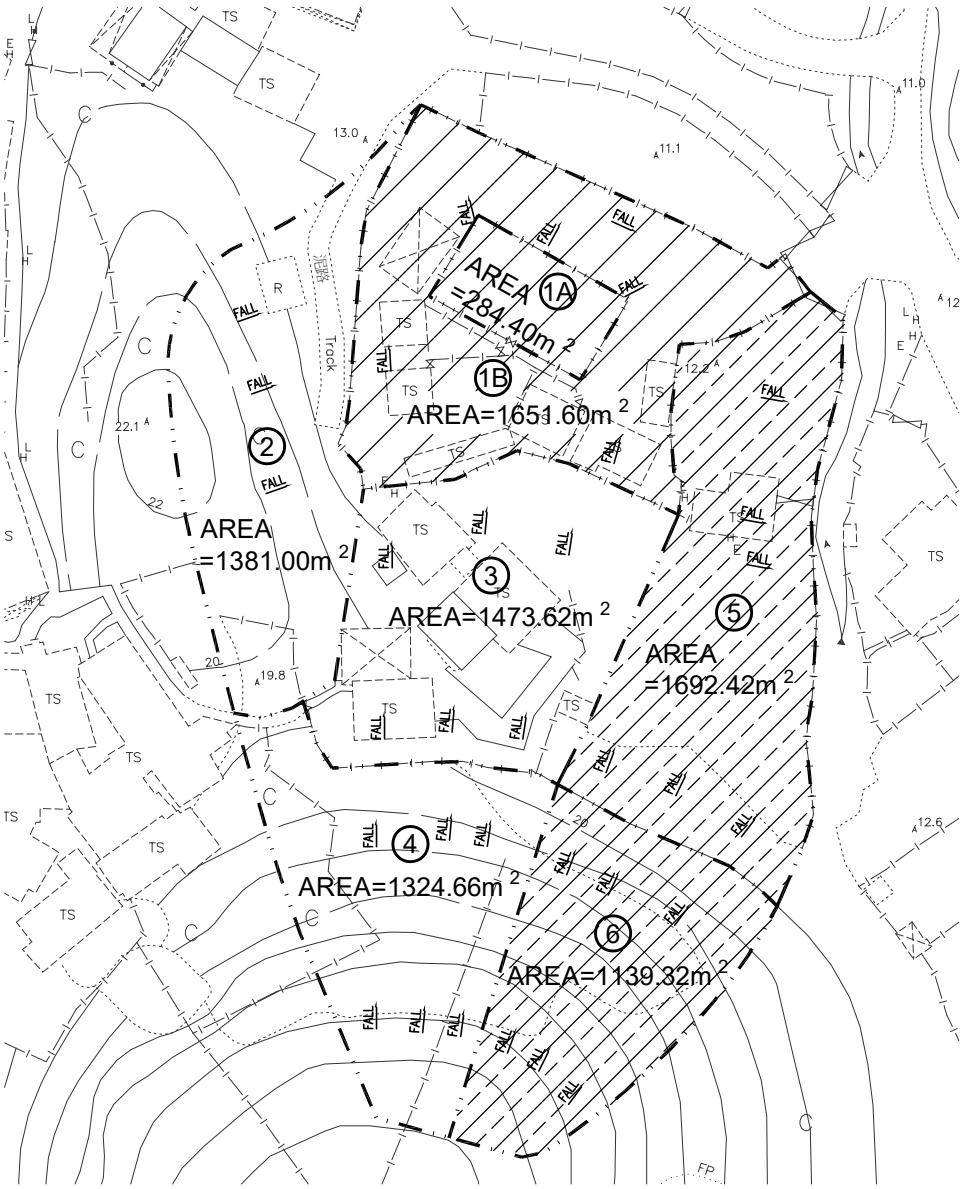
Photo for Site Condition before the TABE

# Appendix D

# Hydrological calculation for Surface Runoff

# (Before and After TABE) &

# Hydraulic Calculations for Channel & Pipe




Catchment Layout Plan for Hydrological & Hydraulic Calculation

**Estimation of Runoff:** (With Proposed Drainage for the Application Site Before Development)

| Catchment Location | Catchment Area, A $m^2$ | Longest Distance, L (m) | Average Fall, $H_{avg}$ (m per 100) | Time of Concentration, t (min) | Runoff Coefficient, K | Rainfall Increase due to Climate Change | Rainfall Intensity, i (mm/hr) | Design Flow $m^3/s$ | Maximum runoff, Q (litre/min) |
|---|---|---|---|---|---|---|---|---|---|
| 1A | 284.40 | 22.43 | 0.82 | 1.92 | 0.95 | 1.1 | 250.60 | 0.019 | 1128 |
| 1B | 1651.60 | 56.95 | 1.12 | 3.84 | 0.95 | 1.1 | 220.88 | 0.096 | 5776 |
| 2 | 1381.00 | 21.52 | 47.86 | 0.70 | 0.20 | 1.1 | 278.77 | 0.021 | 1283 |
| 3 | 1473.62 | 41.71 | 13.91 | 1.72 | 0.95 | 1.1 | 254.55 | 0.099 | 5939 |
| 5 | 1692.42 | 20.00 | 4.00 | 1.04 | 0.95 | 1.1 | 269.71 | 0.120 | 7227 |
| 4 | 1324.66 | 90.75 | 33.23 | 3.17 | 0.20 | 1.1 | 229.76 | 0.017 | 1015 |
| 6 | 1139.32 | 88.30 | 33.04 | 3.14 | 0.20 | 1.1 | 230.27 | 0.015 | 875 |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

| | Shortest Distance (I | H1 | H2 |
|---|---|---|---|
| Catchment 1A | 12.16 | 12.3 | 12.2 |
| Catchment 1B | 8.93 | 12.3 | 12.2 |
| Catchment 2 | 21.52 | 22.5 | 12.2 |
| Catchment 3 | 41.71 | 18 | 12.2 |
| Catchment 5 | 20 | 13 | 12.2 |
| Catchment 4 | 48.15 | 36 | 20 |
| Catchment 6 | 48.42 | 36 | 20 |

Average Fall, $H_{avg} = \frac{H1 - H2}{I \times 100}$

**Legend:**

A = area of catchment ($m^2$)

L = distance in metres measured on the line of natural flow between the design section and that point of the catchment from which water would take the longest time to reach the design section

$H_{avg}$ = average fall (m per 100m) from the summit of catchment to the point of design

$t_d$ = time of concentration (min)

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

i = design mean intensity of rainfall (mm/hr) which is dependent upon the time of concentration
The return-period of design rainfall intensity is 1 in 10 years using algebraic equation in Section 4.3.3

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

Return Period,10 Years, North District Area (Table 3d)
Storm Constants(HKO Headquarters): a = 454.90 b = 3.44 c = 0.412

K = runoff coefficient
= 0.2 for steep grass area, 0.15 for flat grass area & 0.95 for hard paved area

Q = maximum runoff (litre/min)

$$= \frac{K \; i \; A}{60}$$

**2.2 Estimation of Surface Channel Capacity:**

| Catchments Considered | Qtotal (litre/min) | Design Flow $m^3/s$ |
|---|---|---|
| All (to nearest open stream course) | 23243 | 0.252 |
| | | |

**Estimation of Runoff:** (With Proposed Drainage for the Application Site After Development)

| Catchment Location | Catchment Area, A $m^2$ | Longest Distance, L (m) | Average Fall, $H_{avg}$ (m per 100) | Time of Concentration, t (min) | Runoff Coefficient, K | Rainfall Increase due to Climate Change | Rainfall Intensity, i (mm/hr) | Design Flow $m^3/s$ | Maximum runoff, Q (litre/min) |
|---|---|---|---|---|---|---|---|---|---|
| 1A | 284.40 | 22.43 | 0.82 | 1.92 | 0.15 | 1.1 | 250.60 | 0.003 | 178 |
| 1B | 1651.60 | 56.95 | 1.12 | 3.84 | 0.95 | 1.1 | 220.88 | 0.096 | 5776 |
| 2 | 1381.00 | 21.52 | 47.86 | 0.70 | 0.20 | 1.1 | 278.77 | 0.021 | 1283 |
| 3 | 1473.62 | 41.71 | 13.91 | 1.72 | 0.95 | 1.1 | 254.55 | 0.099 | 5939 |
| 5 | 1692.42 | 20.00 | 4.00 | 1.04 | 0.95 | 1.1 | 269.71 | 0.120 | 7227 |
| 4 | 1324.66 | 90.75 | 33.23 | 3.17 | 0.20 | 1.1 | 229.76 | 0.017 | 1015 |
| 6 | 1139.32 | 88.30 | 33.04 | 3.14 | 0.20 | 1.1 | 230.27 | 0.015 | 875 |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

| | Shortest Distance (I | H1 | H2 |
|---|---|---|---|
| Catchment 1A | 12.16 | 12.3 | 12.2 |
| Catchment 1B | 8.93 | 12.3 | 12.2 |
| Catchment 2 | 21.52 | 22.5 | 12.2 |
| Catchment 3 | 41.71 | 18 | 12.2 |
| Catchment 5 | 20 | 13 | 12.2 |
| Catchment 4 | 48.15 | 36 | 20 |
| Catchment 6 | 48.42 | 36 | 20 |

Average Fall, $H_{avg} = \frac{H1 - H2}{I \times 100}$

**Legend:**

A = area of catchment ($m^2$)

L = distance in metres measured on the line of natural flow between the design section and that point of the catchment from which water would take the longest time to reach the design section

$H_{avg}$ = average fall (m per 100m) from the summit of catchment to the point of design

$t_d$ = time of concentration (min)

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

i = design mean intensity of rainfall (mm/hr) which is dependent upon the time of concentration
The return-period of design rainfall intensity is 1 in 10 years using algebraic equation in Section 4.3.3

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

Return Period,10 Years, North District Area (Table 3d)
Storm Constants(HKO Headquarters): a = 454.90 b = 3.44 c = 0.412

K = runoff coefficient
= 0.2 for steep grass area, 0.15 for flat grass area & 0.95 for hard paved area

Q = maximum runoff (litre/min)

$$= \frac{K \; i \; A}{60}$$

**2.2 Estimation of Surface Channel Capacity:**

| Catchments Considered | Qtotal (litre/min) | Design Flow $m^3/s$ |
|---|---|---|
| All (to nearest open stream course) | 22293 | 0.372 |
| 1A+1B+3+4 (for drainage design) | 12908 | 0.215 |
| 1A+1B+2+3+4 (for drainage design) | 14191 | 0.237 |

**2.3 Estimation of Surface Channel and Underground Pipe Capacity:**

| Catchments Considered | Qtotal (litre/min) | Gradient | Size | Type | Velocity* (> 0.75 m/s & < 3.0 m/s) (m/s) | | Flow Capacity* $m^3/s$ | Run off Capacity* (litre/min) | |
|---|---|---|---|---|---|---|---|---|---|
| 1A+1B+3+4 | 12908 | 1 in 100 | 375 | U | 1.98 | <3.0 O.K. | 0.223 | 13380 | O.K. |
| 1A+1B+2+3+4 | 14191 | 1 in 75 | 375 | U | 2.29 | <3.0 O.K. | 0.258 | 15480 | O.K. |
| 1A+1B+2+3+4 | 14191 | 1 in 50 | 375 | Pipe | 2.41 | <3.0 O.K. | 0.239 | 14340 | O.K. |
| | | | | | | | | | |
| | | | | | | | | | |

* Refer to Section 9.3 of SDM, deposition of sediment in storm water is considered (10% Reduction in flow area)

**Legends for Channel and Pipe:**

n = Manning's coefficien (Table 13)
= 0.012 (Concrete-lined Channel and Concrete Pipe)

R = Hydraulic Radius
= $\frac{A}{P}$ For Channel = $\frac{D}{4}$ (For Pipe)

V = Manning 's flow velocity equatio (m/sec)
= $\frac{R^{0.67} \times S^{0.5}}{n}$

Q = Manning 's flow capacity equatio (litre/min)
= V x A x 1000 x 60