# DRAINAGE IMPACT ASSESSMENT REPORT

# FOR

# PROPOSED TEMPORARY WAREHOUSE (STORAGE OF CONSTRUCTION MATERIALS, METAL AND ELECTRONIC PARTS) AND OPEN STORAGE OF CONSTRUCTION MATERIALS FOR A PERIOD OF 3 YEARS AT LOTS 130 (PART), 131, 132 (PART), 134(PART), 260(PART), 261(PART), 262, 263, 264 AND 268(PART) IN D.D.128 AND ADJOINING GOVERNMENT LAND, HA TSUEN, YUEN LONG, NEW TERRITORIES

Date : July 2024

Report no. SDP/HT/001

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**APPENDIX**



REFERENCES

1. Stormwater Drainage Manual, Planning Design and Management by DSD
2. Geotechnical Manual for Slopes by GEO
3. Standard Drawings by DSD

## 1. Introduction

This report presents the drainage impact assessment (DIA) to the existing drainage system outside the site from the proposed temporary warehouse (storage of construction materials, metal and electronic parts) and open storage of construction materials at lots 130 (part), 131, 132 (part), 134 (part), 260 (part), 261 (part), 262, 263, 264 and 268 (part) in D.D.128 and adjoining Government Land, Ha Tsuen, Yuen Long, New Territories.

The objective of the DIA report is to outline the catchment areas in the vicinity of the site, identifies and quantifies the potential drainage impact due to the proposed works and recommend the necessary mitigation measures to alleviate the impacts. The plan showing the the proposed surface channel and existing drainage system in the vicinity of the site is appended in **Appendix A**.

## 2. Design Parameters & Assumptions

The design criteria to be used for the modeling assessment are based on the standards set out in the Stormwater Drainage Manual, Third Edition (SDM). According to Section 6.6.2 of the SDM, the existing rural drainage system in the vicinity of the development is classified as rural drainage branch system. Table 10 of the SDM recommends to be adopted a 50 years design return period storm event for the rural drainage branch system.

<u>Stormwater Runoff (Q)</u>

The rate of stormwater runoff used in this assessment report is estimated by the "Rational method" in which the peak runoff is calculated from the formula:

$$Q = K \times i \times A / 3600$$

where
- $Q$ = maximum runoff (L/s)
- $i$ = design mean intensity of rainfall (mm/hr)
- $A$ = area of catchment ($m^2$)
- $K$ = runoff coefficient

Time of Concentration (tc)

The time of concentration is defined as the time required for stormwater runoff to flow from the most remote part of the catchment area to the point in the drainage system under consideration. Based on the assumptions adopted in the Rational Method, this is the time taken for the peak runoff to become established at the considered section.

The time of concentration comprises the time for water flowing within natural catchments and along the man-made drainage pipes/channels. For natural catchments, the time of concentration is estimated by the modified form of the Brandsby William's equation.

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

Where $t_o$ = time of concentration of a natural catchment (min.)

A = catchment area ($m^2$)

H = average slope (m per 100m), measured along the line of natural flow, from the summit of the catchment to the point under consideration

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

Mean Rainfall Intensity (i)

Mean rainfall intensity-duration curves attached in this report are based on the Statistical analysis of long term rainfall records from the Hong Kong Observatory. A return period of 50 years is adopted.

Runoff Coefficient (K)

The value of K is taken as 1 for developed paved area. For vegetated ground, the value of K is taken as 0.3.

Calculation of flow capacity for Existing Stream

Manning's Formula can be used to determine the capacity of the existing stream

$$Q = K\ A\ R^{2/3}\ S^{1/2} \div n$$

Q = flow rate
A = cross sectional area of stream
R = hydraulic radius
S = slope of the stream
K = constant which is 1.49 for S.I. unit
n = surface roughness

## 3. Existing Drainage Condition

A plan showing the existing catchments is enclosed in **Appendix A**. Currently, the surface runoff collected from the site is discharging to the existing 1.5m wide stream located at the west of the site. As per the existing site condition, an additional peripheral U-channels area is considered necessary for the proposed development. A drainage proposal is required to be carried out for the proposed development.

## 4. Proposed Stormwater Drainage

The proposed stormwater drainage works include surface U-channels at the peripheral of the site collecting the runoff from catchments within the site. The U-channels will connect and discharge the surface runoff to the existing stream located at the west of the site. Catchpits with 300mm sump are proposed at the discharged points of the proposed U-Channel to desilt the surface water before discharging to the drainage outside. The proposed stormwater drainage layout plan is shown in **Appendix A**.

## 5. Effect on Drainage Characteristics and Potential Drainage Impact from Proposed Works

Since the proposed works only consist of the proposed temporary warehouse (storage of construction materials, metal and electronic parts) and open storage of construction materials, it is found that the proposed works would not obstruct the flow of the rain water run-off collected from the catchment areas to existing stream neither at its up-stream nor immediately down-stream. Besides, the catchment areas have no significant changes before and after the proposed works. It is considered the proposed works will not induce any adverse effect to the existing rain-water discharge system.

The capacity of the existing stream was checked and presented in **Appendix B**. Based on the assessment, it is found that the existing stream has enough capacity to collect the run-off from its up-stream catchment area.

## 6. Mitigation Measures On The Existing Streamcourse During Construction Stage and Operation Stage

A desilted catchpit would be proposed at the runoff's terminated discharge point prior to the discharging the runoff to the existing stream. The desilted catchpit would be constructed during the construction stage to prevent the sand / construction debris discharged into the existing stream during the construction works. Erosion protection measures such as discharge apron would be provided to the existing streamcourse at the outlet of proposed outfall.

## 7. The Monitoring of Mitigation Measures

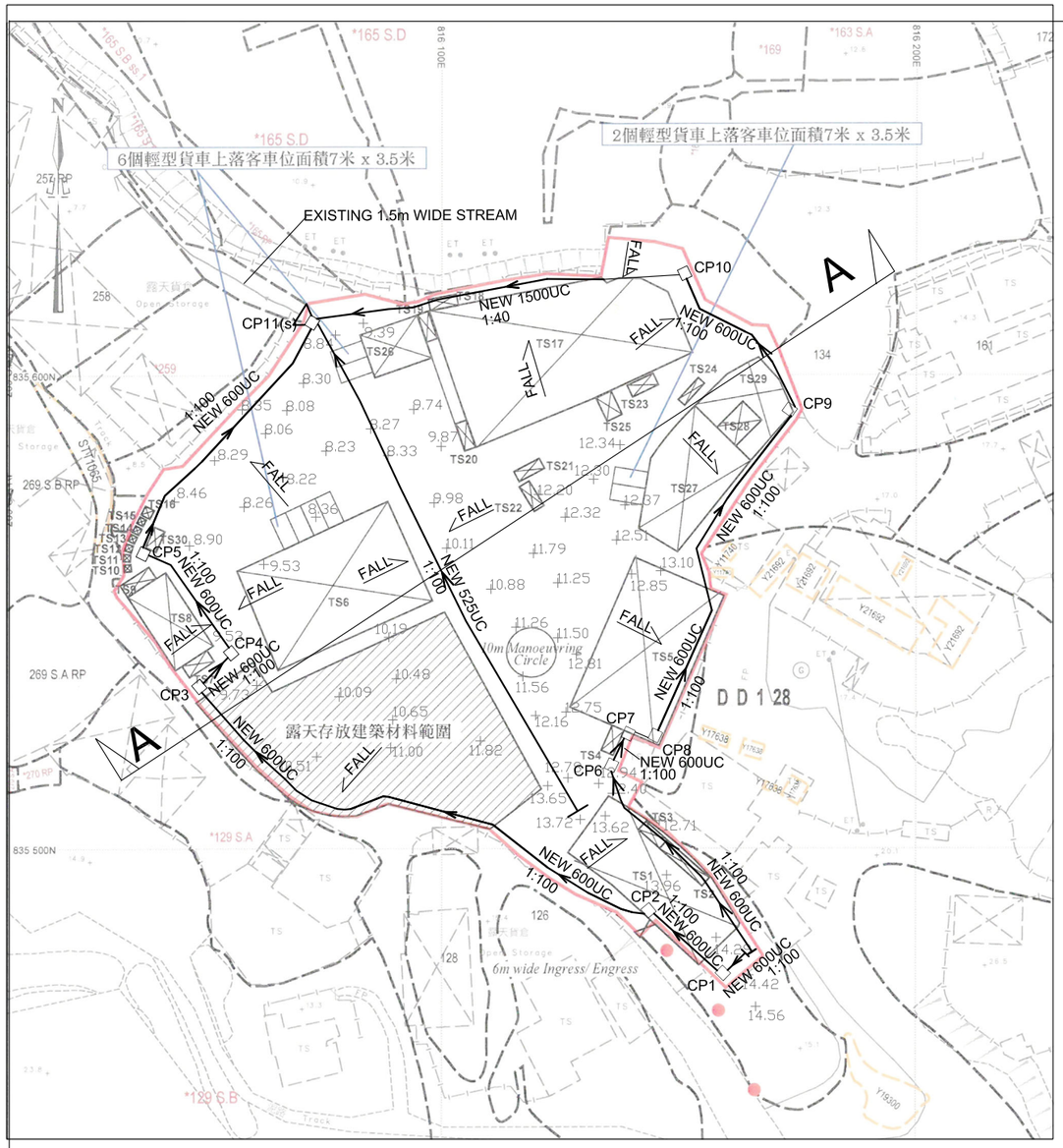
The proposed desilted catchpit would be regularly desilted by the applicant to prevent sand, silt, cementitious material or other objects from being washed down into the existing streamcourse.

## 8. Conclusion

Based on the above discussion, it is considered that no potential drainage impact would be raised to the existing drainage system in the vicinity of the proposed works because the stream has enough capacity to collect the runoff from its up-stream catchment areas where the proposed works located. The proposed works are considered acceptable from the stormwater drainage point of view and will have no adverse effect on the drainage system outside

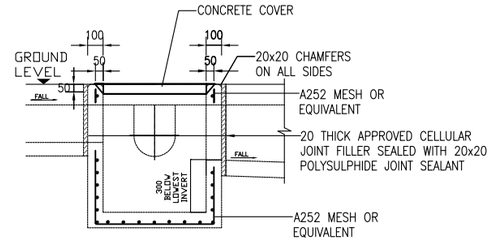
# Appendix A

# The Plan of the Proposed Works



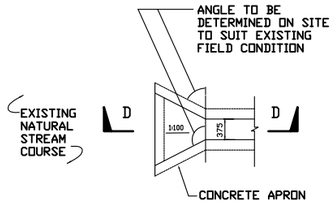

## LEGEND:

| | |
|---|---|
| +12.34 | EXISTING GROUND LEVEL AT +12.34mPD |
| 1:100 NEW 600UC | PROPOSED 600mm U-CHANNEL WITH GRATING AT FALL 1: 100 (MIN) |
| 1:100 NEW 525UC | PROPOSED 525mm U-CHANNEL WITH GRATING AT FALL 1: 100 (MIN) |
| CP11(s) | PROPOSED COVERED DESILTED CATCHPIT NO. CP2 |
| CP1 | PROPOSED COVERED CATCHPIT NO. CP1 |
| | PROPOSED DISCHARGE APRON |



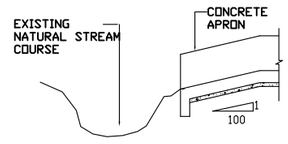

## SECTION D – D WITH DESILTED TRAP

COMPLY WITH CEDD'S DRAWING NO. DS C2405 AND C2406I



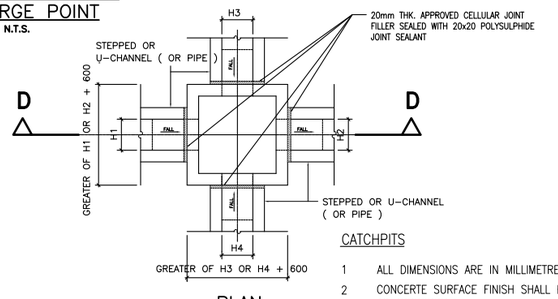

## PLAN OF U-CHANNEL DISCHARGE POINT

N.T.S.




## SECTION D – D

N.T.S.




## PLAN

## TYPICAL DETAILS OF CATCHPIT

CATCHPITS

1 ALL DIMENSIONS ARE IN MILLIMETRES

2 CONCERTE SURFACE FINISH SHALL BE CLASS U2 OR F3 AS APPROPRIATE

## GENERAL NOTE

1. THE PROPOSED DRAINAGE WORK, WHETHER WITHIN OR OUTSIDE THE LOT BOUNDARY, SHOULD BE CONSTRUCTED AND MAINTAINED BY THE LOT OWNER AT HIS OWN EXPENSE. FOR WORKS TO BE UNDERTAKEN OUTSIDE THE LOT BOUNDARY, PRIOR CONSENT AND AGREEMENT FROM DLO AND/OR RELEVANT PRIVATE LOT OWNER SHOULD BE SOUGHT.

## CONCRETE STRENGTH AND STEEL REINFORCEMENT SPECIFICATION FOR DRAINAGE DETAILS

1. CONCRETE GRADE FOR CATCHPITS AND U-CHANNEL SHALL BE 30D DESIGN IN COMPLIANCE WITH CS1 : 2010
   FOR BLINDING LAYER SHALL BE 15D, DESIGN COMPLY WITH CS1-2010.
2. ALL MAIN BARS TO BE HOT ROLLED HIGH YIELD STEEL DEFORMED BAR COMPLM WITH CS2 : 2012
   Y – HIGH YIELD BAR 500 MPa
   M – MILD STEEL BAR 250 MPa
3. CONCRETE COVER TO MAIN REINFORCEMENT TO BE 50mm.
4. LAP LENGTH FOR ALL BARS TO BE 46x DIAMETER OF LARGER BAR TO BE LAPPED.
5. REACTIVE ALKALI CONTENT EXPRESSED IN SODIUM OXIDE PER CUBIC METER OF CONCRETE SHOULD NOT EXCEED 3KG AS PER PNAP APP-74.

## HALF ROUND, U, AND STEPPED – CHANNELS

1 ALL DIMENSIONS ARE IN MILLIMETERS

2 CONCRETE SURFACE FINISHING SHALL BE CLASS U2 OR F2 AS APPROPRIATE

3 FOR HALF ROUND AND U – CHANNEL, SPACING OF EXPANSION JOINT IN CHANNELS, BERMS AND APRON TO BE 10m MAXIMUN. FOR STEPPED CHANNELS, EXPANSION JOINTS TO BE PROVIDED AT A MAXIMUN SPACING OF 10m.

4 DIMENSIONS FOR HALF ROUND AND U-CHANNELS SEE TABLE 1.

5 THE COVER FOR U-CHANNELS AND CATCHPIT SHALL COMPLY WITH CEDD'S STANDARD DRAWINGS NO. C2405 TO C2407 AND C2412.

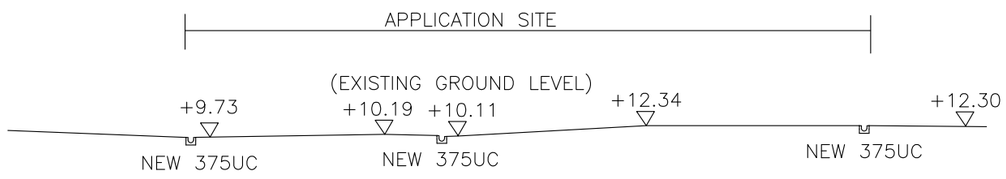
6 ALL PROPOSED U-CHANNELS SHALL BE COVERED WITH GRATING

## TABLE 1 : DIMENSION OF U-CHANNEL AND HALF-ROUND CHANNEL

| NORMAL SIZE H | T | B | REINFORCING |
|---|---|---|---|
| <300 | 100 | 100 | NIL |
| 375 – 675 | 150 | 150 | NIL |
| 750 – 900 | 175 | 175 | A252 MESH PLACED CENTRALLY |

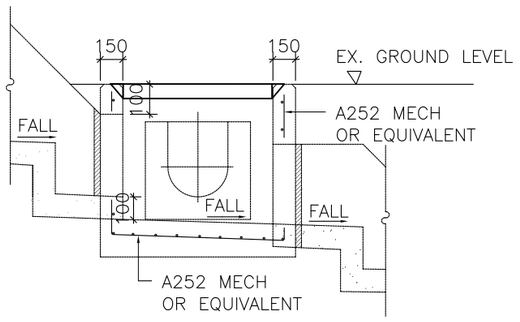
## PROPOSED CATCHPIT SCHEDULE

| CATCHPIT NO. | C.L. (mPD) | I.L. (mPD) |
|---|---|---|
| CP1 | 14.29 | 13.59 |
| CP2 | 13.96 | 13.26 |
| CP3 | 9.73 | 9.03 |
| CP4 | 9.73 | 8.95 |
| CP5 | 8.90 | 8.20 |
| CP6 | 12.94 | 12.24 |
| CP7 | 12.94 | 12.17 |
| CP8 | 12.94 | 12.12 |
| CP9 | 12.37 | 11.35 |
| CP10 | 12.30 | 10.98 |
| CP11(s) | 8.84 | 7.59 |



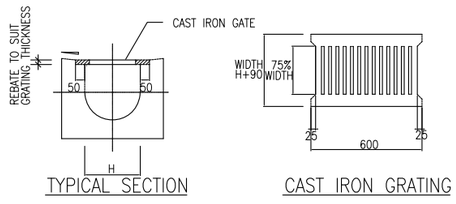

## SECTION A–A

REMARKS : NO FILLING WORKS FOR THIS APPLICATION




## SECTION D–D

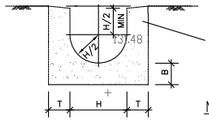
N.T.S.




TYPICAL SECTION CAST IRON GRATING

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

## U-CHANNEL WITH CAST IRON GRATING

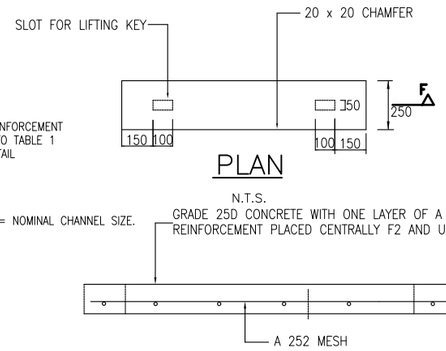



NOTES:

1. H = NOMINAL CHANNEL SIZE.

## U-CHANNEL

COMPLY WITH FIG 8.11 OF GEOTECHNICAL MANUAL FOR SLOPES




## PLAN

N.T.S.

## PRECAST CONCRETE COVERS FOR CATCHPIT

N.T.S.

| REV | DESCRIPTION | CHECKED | APPROVED | DWN | DATE |
|---|---|---|---|---|---|
| | PLANNING SUBMISSION | RC | AY | RY | JULY 24 |

PROJECT TITLE:

STORMWATER DRAINAGE PROPOSAL AT LOTS 130(PART) 131, 132(PART), 134(PART), 260(PART), 261(PART) 262, 263, 264 AND 268(PART) IN D.D.128 HA TSUEN, YUEN LONG, NEW TERRITORIES

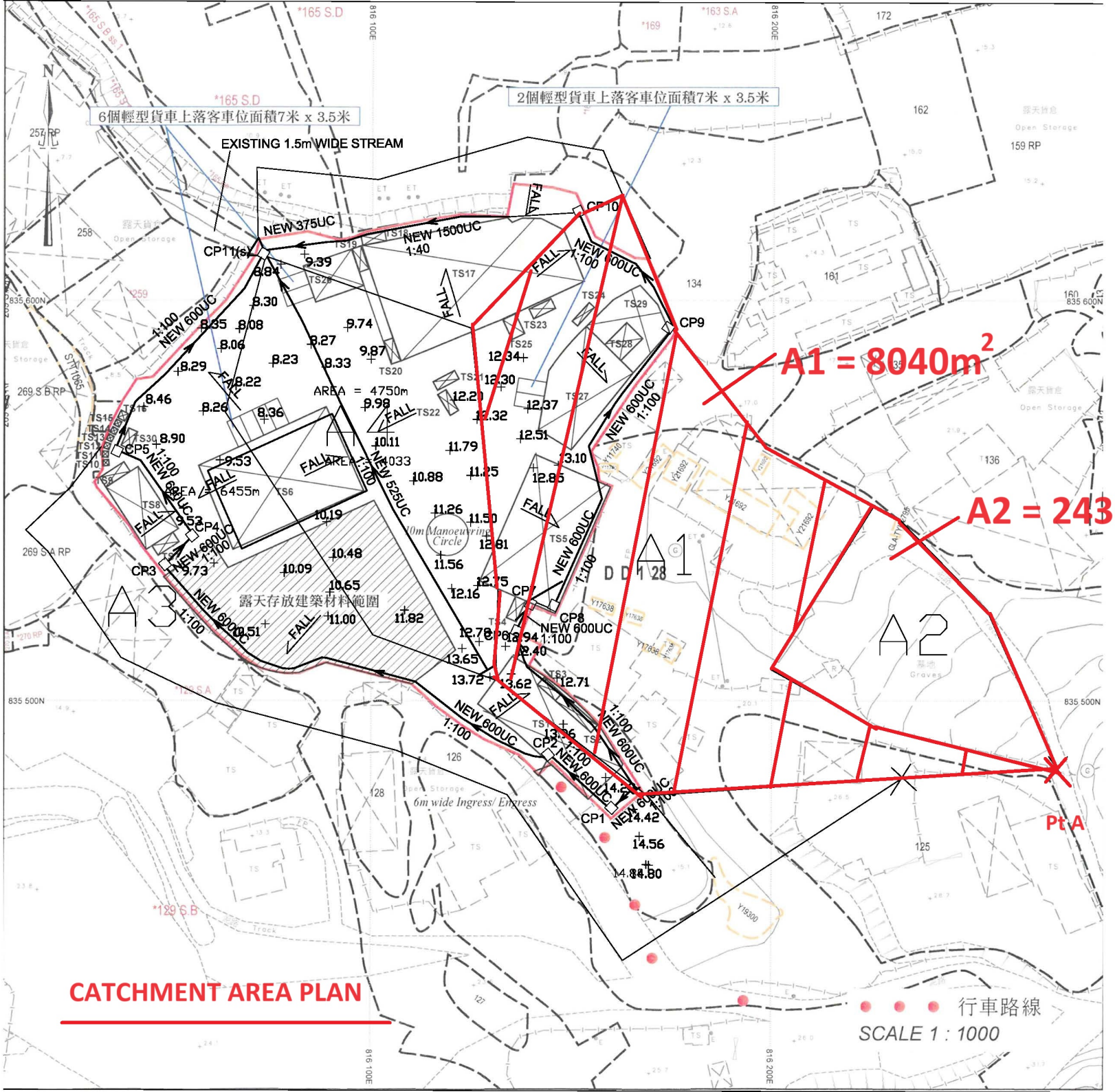
DRAWING TITLE:

DRAINAGE PROPOSAL PLAN AND TYPICAL DETAILS

| | | | |
|---|---|---|---|
| SCALE : | N.T.S. | | CAD FILE: CAD_REF |
| DRAWN | RY | | DRAWING NO. |
| S.D | RY | | SDP001 |
| DESIGNED | RC | | |
| CHECKED | AY | | |
| | | | B.D. REF. NO.: |

# Appendix B

# Drainage Design of Proposed U-channel and Existing 1.5m Wide Stream


6個輕型貨車上落客車位面積7米 x 3.5米
2個輕型貨車上落客車位面積7米 x 3.5米
EXISTING 1.5m WIDE STREAM
A1 = 8040m²
A2 = 2436m²
AREA = 4750m
AREA = 6455m
露天存放建築材料範圍
10m Manoeuvring Circle
6m wide Ingress/ Egress
Pt A
CP1
CP2
CP3
CP4
CP5
CP6
CP7
CP8
CP9
CP10
CP11(s)
NEW 375UC
NEW 1500UC 1:40
NEW 600UC 1:100
NEW 525UC 1:100
FALL
CATCHMENT AREA PLAN
行車路線
SCALE 1 : 1000

Drainage Design at lot 130, 131, 132, 134, 260 to 264, 268 in DD128 Ha

Project No.: Tsuen, Yuen Long Date: 13-Jul-24

Prepared by: Ray Cheng

Check for the drainage capactiy of proposed 600UC

| | | | | | |
|---|---|---|---|---|---|
| Catchment area, | A1 | = | 8040 | $m^2$ | Assume k = 1.0 for paved surface |
| | A2 | = | 2436 | $m^2$ | Assume k = 0.3 for unpaved surface |
| | Total Area, A | = | 9240 + 0.3x2436 | | |
| | | = | 8770.8 | $m^2$ | |

Use Rational Method from Geo-Manual

$Q = kiA/3600$ where,

Q = Maximum runoff (lit/sec)
k = Runoff coefficient
i = Design mean intensity of rainfall (mm/hr)
A = Total catchment area ($m^2$)

Longest distance from summit point to outlet, CP10 (Ld) = 310.00 m

Shortest distance from summit point to outlet, CP10 (Ls) = 175.00 m

| | | | |
|---|---|---|---|
| Elevation of remote point (Pt A) | = | 35.20 | mPD |
| Elevation of outlet point, CP10 | = | 10.98 | mPD |
| Average fall, H | = | $(z_1-z_2)/L_s$ x 100 | |
| | = | 13.84 | m per 100m |

From TGN30

$T_c = 0.14465 \times L_d / (H^{0.2} \times A^{0.1})$

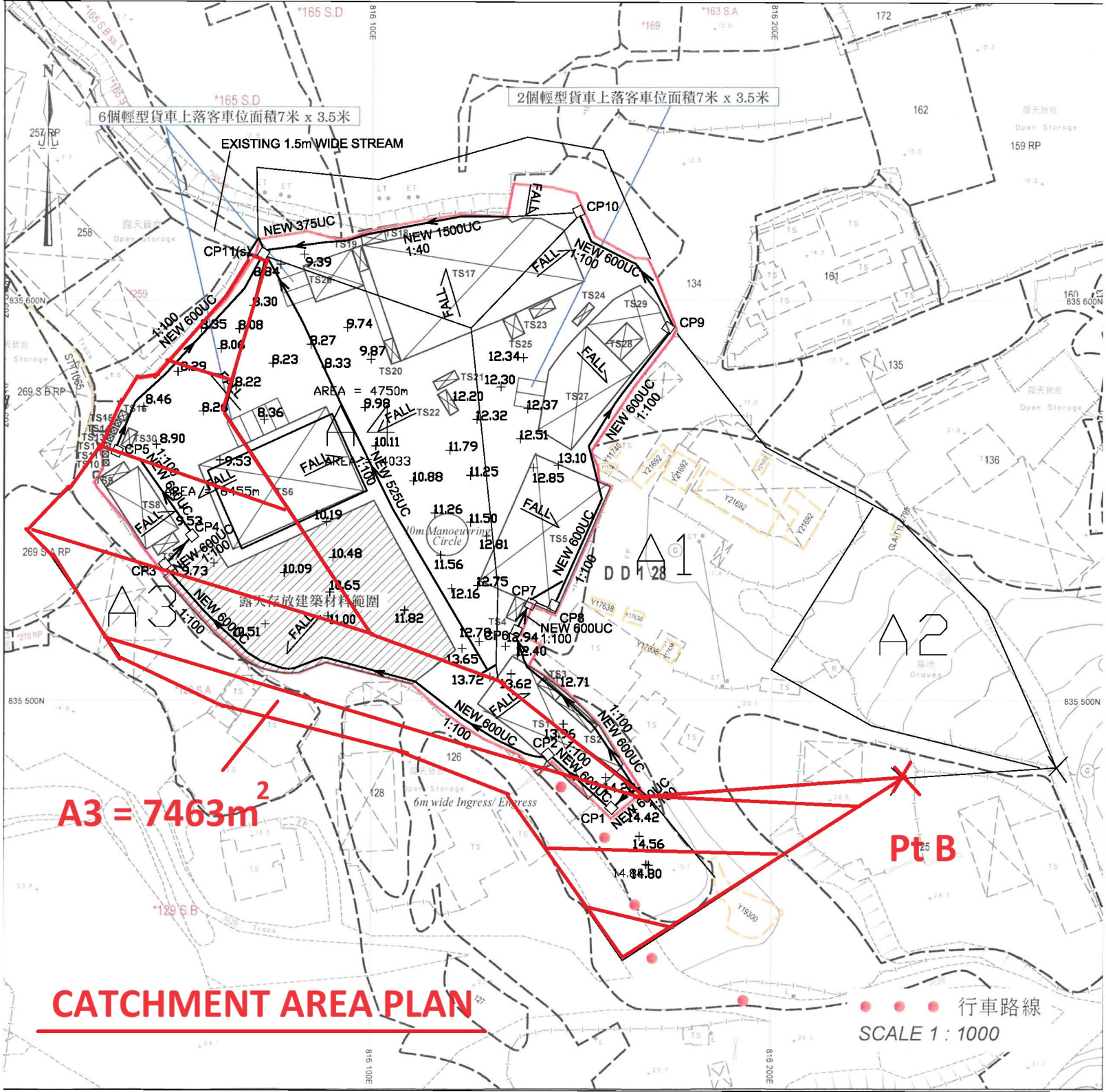
$= 10.51$ min

Assume a 1 in 50 year design rainfall return period for rural area
From Geo-Manual (Fig 8.2)

| | | | |
|---|---|---|---|
| i | = | 265 | mm/hr |
| Q | = | kiA/60 | x 1.138 |
| | | 44084 | lit/min |

From TGN 43A1
For proposed 600 UC with 1 in 100 gradient

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Maximum capacity | = | 47700 | lit/min | > | 44084 | o.k. |
| The corresponding velocity | = | 2.70 | m/s | < | 4 | o.k. |


6個輕型貨車上落客車位面積7米 x 3.5米
2個輕型貨車上落客車位面積7米 x 3.5米
EXISTING 1.5m WIDE STREAM
NEW 375UC
NEW 1500UC 1:40
NEW 600UC 1:100
NEW 525UC 1:100
CP1
CP2
CP3
CP4
CP5
CP6
CP7
CP8
CP9
CP10
CP11(s)
AREA = 4750m
AREA = 1033
AREA = 1455m
10m Manoeuvring Circle
6m wide Ingress/ Egress
露天存放建築材料範圍
A1
A2
A3
DD 128
A3 = 7463m2
Pt B
CATCHMENT AREA PLAN
行車路線
SCALE 1 : 1000

Drainage Design at lot 130, 131, 132, 134, 260 to 264, 268 in DD128 Ha

Project No.: Tsuen, Yuen Long Date: 13-Jul-24

Prepared by: Ray Cheng

Check for the drainage capactiy of proposed 600UC

Catchment area, A3 = 7463 $m^2$ Assume k = 1.0 for paved surface

Use Rational Method from Geo-Manual

$Q = kiA/3600$ where,

Q = Maximum runoff (lit/sec)
k = Runoff coefficient
i = Design mean intensity of rainfall (mm/hr)
A = Total catchment area ($m^2$)

Longest distance from summit point to outlet, CP11(s) (Ld) = 360.00 m
Shortest distance from summit point to outlet, CP11(s) (Ls) = 206.00 m

Elevation of remote point (Pt A) = 26.50 mPD
Elevation of outlet point, CP11(s) = 7.59 mPD

Average fall, H = $(z_1-z_2)/L_s$ x 100
= 9.18 m per 100m

From TGN30

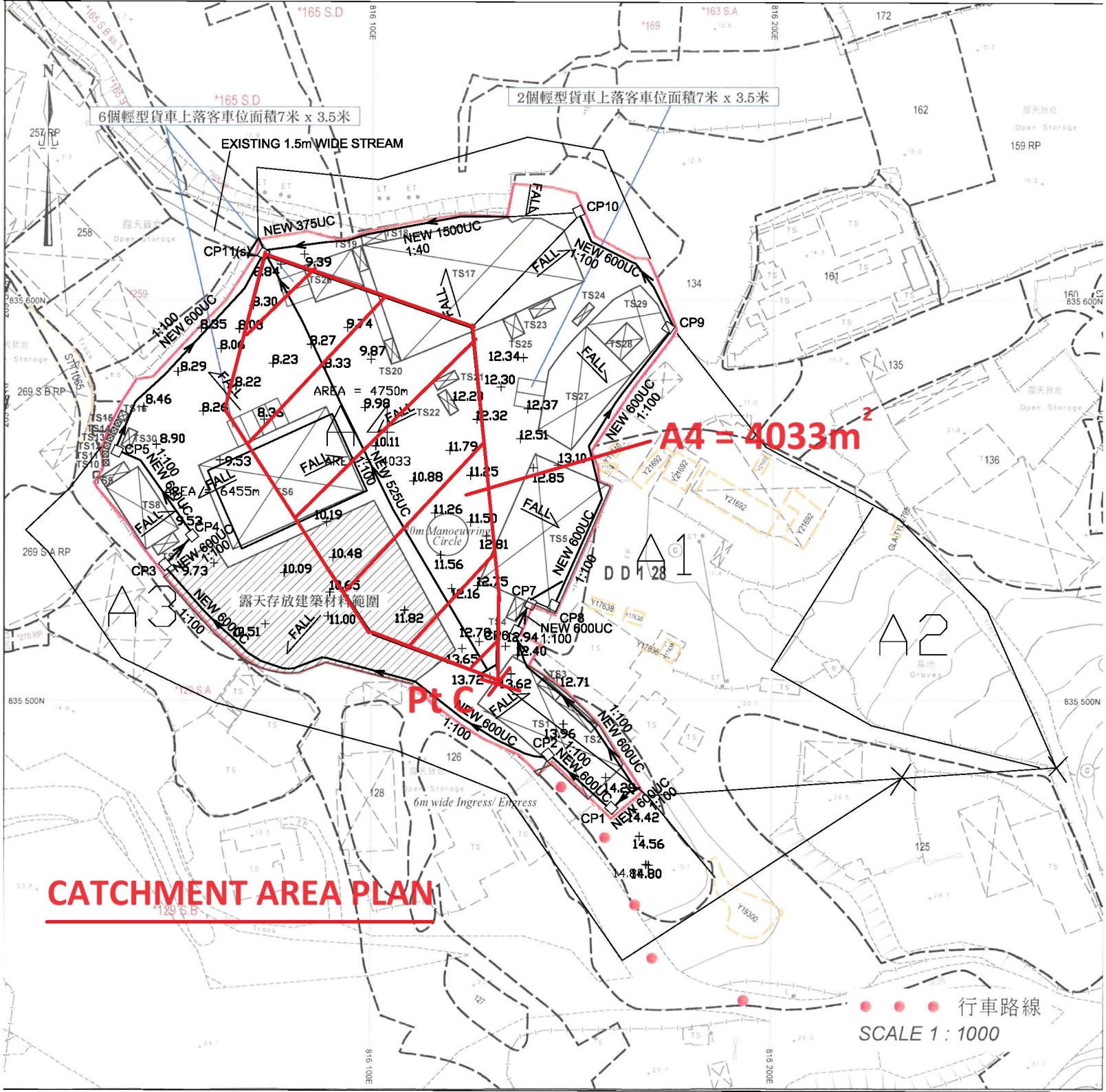
$T_c$ = $0.14465 \times L_d / (H^{0.2} \times A^{0.1})$
= 13.70 min

Assume a 1 in 50 year design rainfall return period for rural area
From Geo-Manual (Fig 8.2)

i = 240 mm/hr
Q = kiA/60 x 1.138
33972 lit/min

From TGN 43A1
For proposed 600 UC with 1 in 100 gradient

| | | | | | | |
|---|---|---|---|---|---|---|
| Maximum capacity | = | 47700 | lit/min | > | 33972 | o.k. |
| The corresponding velocity | = | 2.70 | m/s | < | 4 | o.k. |


6個輕型貨車上落客車位面積7米 x 3.5米
2個輕型貨車上落客車位面積7米 x 3.5米
EXISTING 1.5m WIDE STREAM
NEW 375UC
NEW 1500UC 1:40
NEW 600UC 1:100
NEW 525UC 1:100
CP1
CP2
CP3
CP4
CP5
CP7
CP8
CP9
CP10
CP11(s)
AREA = 4750m
AREA 6455m
AREA 4033
A4 = 4033m²
Pt C
露天存放建築材料範圍
10m Manoeuvring Circle
6m wide Ingress/ Egress
DD 128
A1
A2
A3
行車路線
SCALE 1 : 1000
CATCHMENT AREA PLAN

**Drainage Design** Page no.

Drainage Design at lot 130, 131, 132, 134, 260 to 264, 268 in DD128 Ha
Project No.: Tsuen, Yuen Long Date: 13-Jul-24
Prepared by: Ray Cheng

Check for the drainage capactiy of proposed 525UC

Catchment area, A4 = 4033 $m^2$ Assume k = 1.0 for paved surface

Use Rational Method from Geo-Manual

$Q = kiA/3600$ where,

Q = Maximum runoff (lit/sec)
k = Runoff coefficient
i = Design mean intensity of rainfall (mm/hr)
A = Total catchment area ($m^2$)

Longest distance from summit point to outlet, CP11(s) (Ld) = 137.00 m
Shortest distance from summit point to outlet, CP11(s) (Ls) = 120.00 m

Elevation of remote point (Pt C) = 13.72 mPD
Elevation of outlet point, CP11(s) = 7.59 mPD

Average fall, H = $(z_1-z_2)/L_s$ x 100
= 5.11 m per 100m

From TGN30

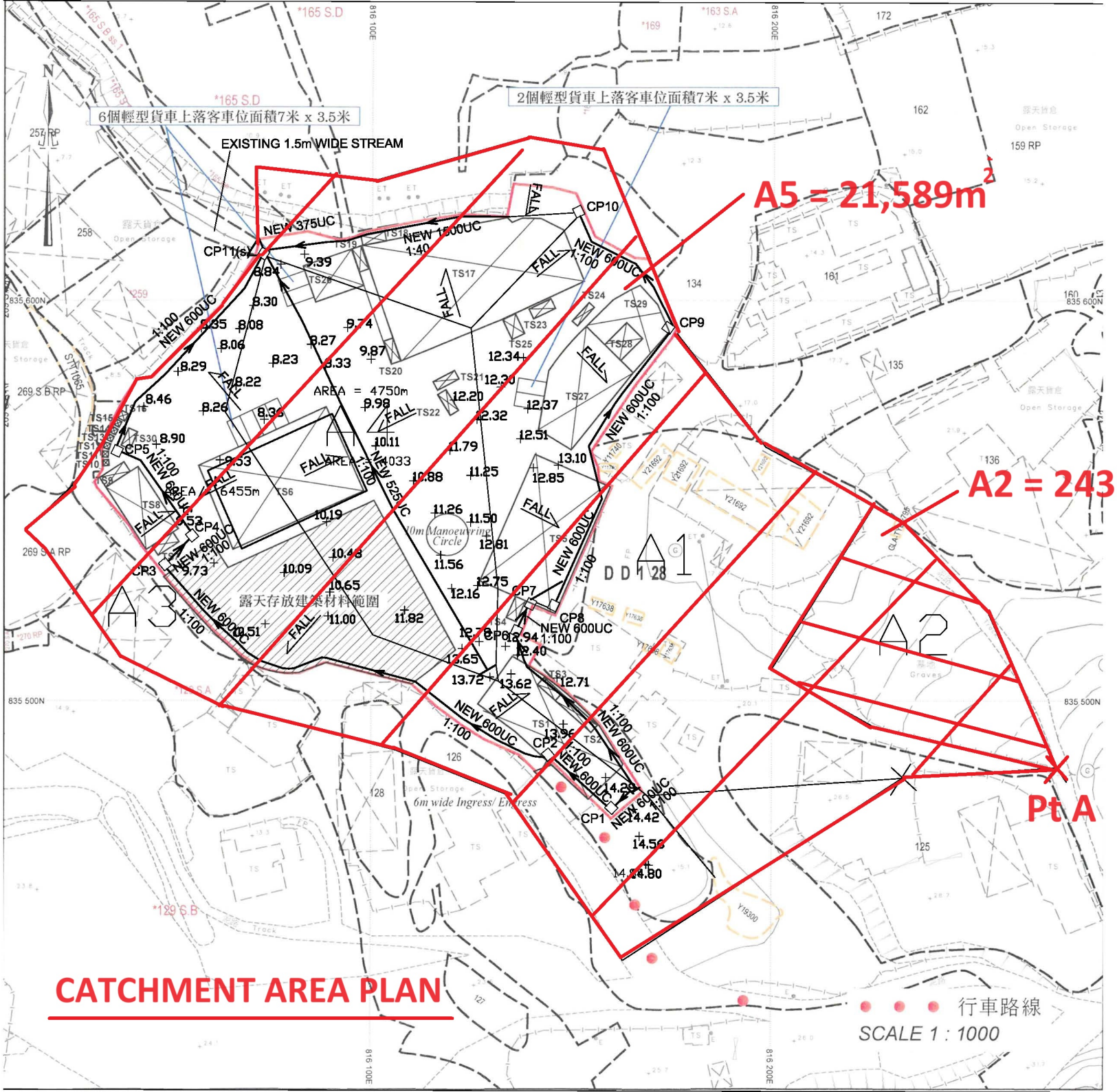
$T_c$ = 0.14465 x $L_d$ / ($H^{0.2}$ x $A^{0.1}$)
= 6.23 min

Assume a 1 in 50 year design rainfall return period for rural area
From Geo-Manual (Fig 8.2)

i = 310 mm/hr
Q = kiA/60 x 1.138
23713 lit/min

From TGN 43A1
For proposed 525 UC with 1 in 100 gradient

| | | | | | | |
|---|---|---|---|---|---|---|
| Maximum capacity | = | 32400 | lit/min | > | 23713 | o.k. |
| The corresponding velocity | = | 2.50 | m/s | < | 4 | o.k. |


6個輕型貨車上落客車位面積7米 x 3.5米
2個輕型貨車上落客車位面積7米 x 3.5米
EXISTING 1.5m WIDE STREAM
A5 = 21,589m²
A2 = 2436m²
Pt A
AREA = 4750m
AREA = 6455m
AREA = 1033
露天存放建築材料範圍
10m Manoeuvring Circle
6m wide Ingress/ Egress
CP1
CP2
CP3
CP4
CP5
CP6
CP7
CP8
CP9
CP10
CP11(s)
NEW 375UC
NEW 600UC
NEW 525 UC
NEW 1500UC
1:100
1:40
FALL
CATCHMENT AREA PLAN
行車路線
SCALE 1 : 1000

Drainage Design at lot 130, 131, 132,
134, 260 to 264, 268 in DD128 Ha

Project No.: Tsuen, Yuen Long Date: 13-Jul-24

Prepared by: Ray Cheng

Check for the drainage capactiy of proposed 1500UC and 1.5m wide stream

| | | | | | |
|---|---|---|---|---|---|
| Catchment area, | A5 | = | 21589 | $m^2$ | Assume k = 1.0 for paved surface |
| | A2 | = | 2436 | $m^2$ | Assume k = 0.3 for unpaved surface |
| | Total Area, A | = | 21589 + 0.3x2436 | | |
| | | = | 22319.8 | $m^2$ | |

Use Rational Method from Geo-Manual

$Q = kiA/3600$ where,

Q = Maximum runoff (lit/sec)
k = Runoff coefficient
i = Design mean intensity of rainfall (mm/hr)
A = Total catchment area ($m^2$)

Longest distance from summit point to outlet, CP11(s) (Ld) = 405.00 m
Shortest distance from summit point to outlet, CP11(s) (Ls) = 238.00 m

Elevation of remote point (Pt A) = 35.20 mPD
Elevation of outlet point, CP11(s) = 7.59 mPD

Average fall, H = $(z_1-z_2)/L_s$ x 100
= 11.60 m per 100m

From TGN30

$T_c$ = 0.14465 x $L_d$ / ($H^{0.2}$ x $A^{0.1}$)
= 13.09 min

Assume a 1 in 50 year design rainfall return period for rural area
From Geo-Manual (Fig 8.2)

i = 250 mm/hr
Q = kiA/60 x 1.138
105833 lit/min

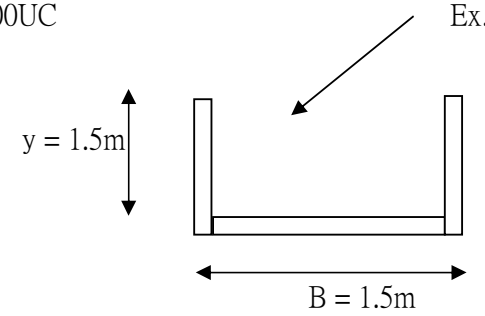
**Drainage Design and Checking** Page no.

Project No.: Date: 13-Jul-24
Prepared by: Ray Cheng

Check for the drainage capactiy **(Existing 1.5m width Stream course and 1500UC)**

From Manning Equation, for existing 1.5m width and 1.5m depth rectangular streamcourse and 1500UC

Ex. Streamcourse




Max. capacity of streamcourse, $Q = \frac{k (R^{2/3})(S^{1/2})}{n} A$

$R = A/P$ and $P = 2y + B$

R= 0.50 k = 1.49
S = 0.025 n = 0.04

Q = 500891 lit/min > 105,833 lit/min O.K.


Figure 1 – Updated Intensity-Duration-Frequency Curves

Notes:
1. These IDF curves are to supersede those given in Figure 8.2 of the Geotechnical Manual for Slopes (GCO, 1984).
2. These IDF curves have not incorporated any projected climate change effects. Except for temporary slope drainage design, the mean rainfall intensity given by these IDF curves shall be increased by 13.8% for incorporating climate change effects.
3. The mathematical formulae of these IDF curves are shown in Table 1 of Annex TGN 30 A1.

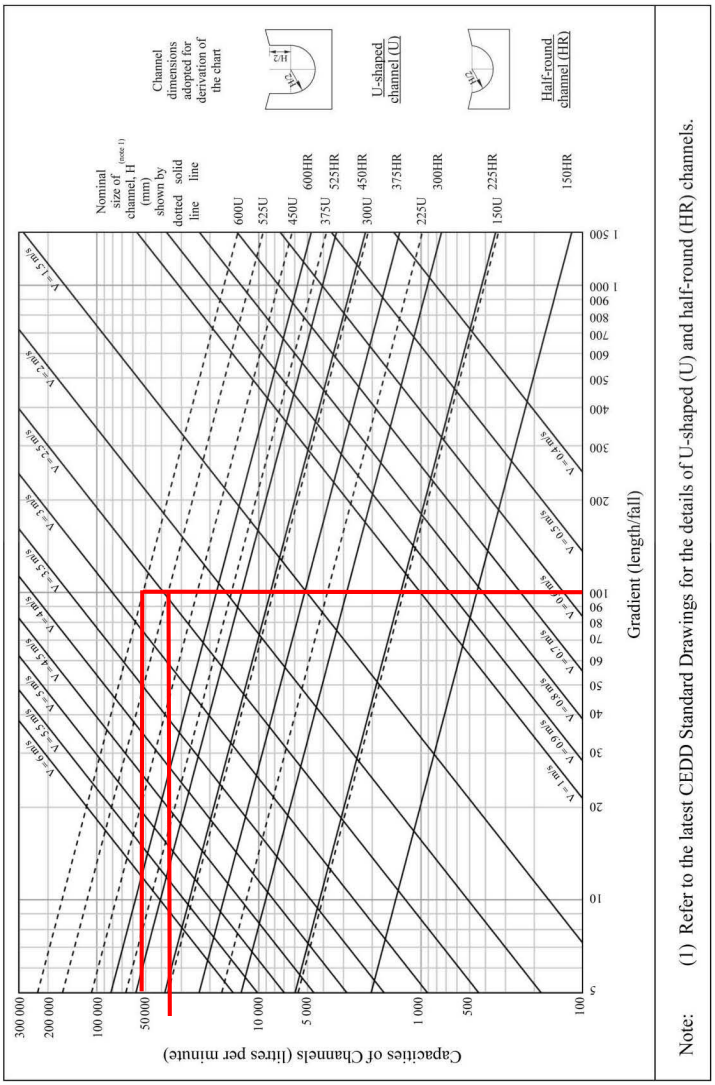



Figure 1 - Chart for the rapid design of U-shaped and half-round channels up to 600 mm

Note: (1) Refer to the latest CEDD Standard Drawings for the details of U-shaped (U) and half-round (HR) channels.

**Since 10% reduction would be considered for deposition of sediment, the capacity of the proposed**
**1) 600UC should be 53000 x 0.9 = 47,700 lit/min,**
**2) 525UC should be 36000 x 0.9 = 32,400 lit/min,**

# Appendix C

# Photo of Existing Stream

**Photo of Existing Stream**