

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 : August 2024

Report no. SDP/HT/001A

Response to DSD's comment on 31st July 2024

Item	DSD's comment	Response to comment
1	<p>The ground to the east/south/north of the application site is generally/significantly higher. Since the overland flow from adjacent lands shall be probably intercepted, external catchment shall be considered in the calculation. Please justify the extent of the external catchment included in the DIA.</p>	<p>The catchment area for the overland flow intercepted from adjacent lands is considered in the calculation in this resubmission.</p>
2	<p>The existing stream for discharge of the runoff from the application site is not maintained by DSD. The applicant shall resolve any conflict/disagreement arisen from discharging the runoff from the application site to the proposed discharge point(s). Moreover, the applicant should ensure that this drainage system and the existing downstream drains/channels/streams have adequate capacity to convey the additional runoff from the application site. Regular Maintenance including the existing stream should be carried out by the applicant to avoid blockage of the system. In the case that it is a local village drains, District Officer (Yuen Long) should be consulted.</p>	<p>Noted.</p>
3	<p>The existing stream will discharge to a box culvert (not maintained by DSD). Please demonstrate with hydraulic calculation that the existing box culvert is adequate to collect, convey and discharge the surface runoff accrued on the application site and the overland flow intercepted from adjacent lands.</p>	<p>The hydraulic calculation of the existing box culvert is carried out and found adequate to collect and discharge the surface runoff accrued on the application site and the overland flow intercepted from adjacent lands.</p>

Response to DSD's comment on 31st July 2024

4	Further to (3) above, since there is no record of the said box culvert, please provide site photos to demonstrate its presence and existing condition.	The photo of the existing box culvert is appended in Appendix C of DIA report in this resubmission.
5	Cross sections showing the existing and <u>proposed</u> ground levels of the application site with respect to the adjacent areas should be given.	It is noted that no filling and excavation works would be carried out in the application site. Cross sections showing the existing ground levels of the application site with respect to the adjacent areas are provided on the drainage plan in this resubmission.
6	Where walls or hoardings are erected/laid along the site boundary, adequate opening should be provided to intercept the existing overland flow passing through the site.	100mm opening at 1m c/c at the bottom of walls or hoarding if any would be provided and indicated on general notes of drainage plan in this resubmission.
7	The development should neither obstruct overland flow nor adversely affect existing natural streams, village drains, ditches, adjacent areas, etc.	Noted.
8	The applicant shall resolve any conflict/disagreement with relevant lot owner(s) and seek Lands Department's permission for laying new drains/channels and/or modifying/upgrading existing ones on other private lots or Government land (where required) outside the application site.	Noted.

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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, Fifth Edition (SDM). According to Section 6.6.1 of the SDM, the existing village drainage system in the vicinity of the development is classified as main rural catchment drainage system. Table 10 of the SDM recommends to be adopted a 50 years design return period storm event for the main rural drainage branch system.

Stormwater Runoff (Q)

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 (m²)

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 and Box Culvert

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

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

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 and connected to existing 1.5m width and 1.1m depth box culvert. 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 and box culvert was checked and presented in **Appendix B**. Based on the assessment, it is found that the existing stream and box culvert 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

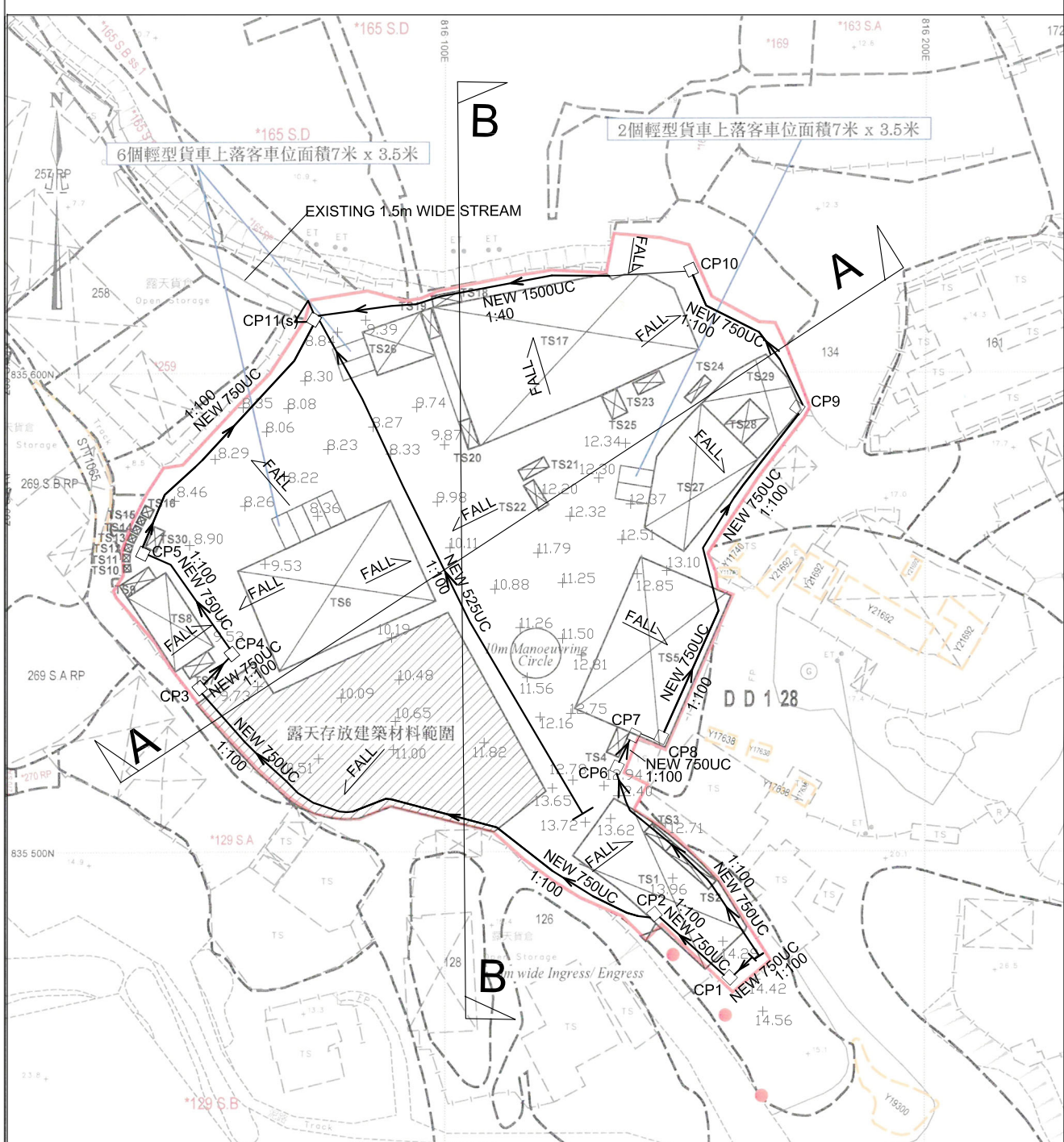
The proposed desilted catchpit would be regularly desilted by the applicant to prevent sand, silt, cementitious material or other objects from being washed down into the existing streamcourse.

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 and box culvert 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

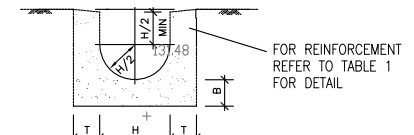
The Plan of the Proposed Works



LEGEND:

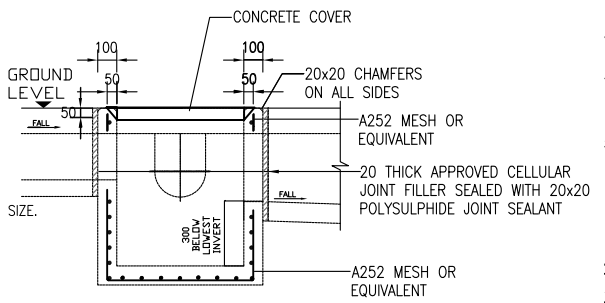
- +12.34 EXISTING GROUND LEVEL AT +12.34mPD
- 1:100 NEW 750UC PROPOSED 750mm U-CHANNEL WITH GRATING AT FALL 1: 100 (MIN)
- 1:100 NEW 525UC PROPOSED 525mm U-CHANNEL WITH GRATING AT FALL 1: 100 (MIN)

- CP11(s) □ PROPOSED COVERED DESILTED CATCHPIT NO. CP11
- CP1 □ PROPOSED COVERED CATCHPIT NO. CP1
- ◁ PROPOSED DISCHARGE APRON

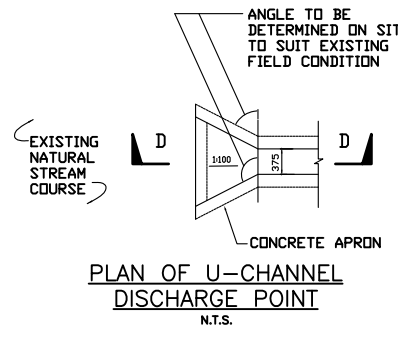


U-CHANNEL
COMPLY WITH FIG 8.11 OF GEOTECHNICAL MANUAL FOR SLOPES

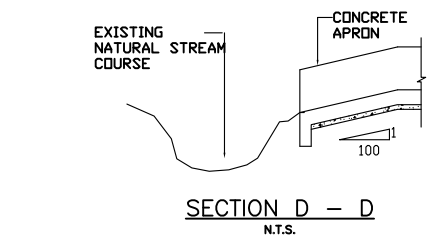
- CATCHPITS**
- ALL DIMENSIONS ARE IN MILLIMETRES
 - CONCRETE SURFACE FINISH SHALL BE CLASS U2 OR F3 AS APPROPRIATE



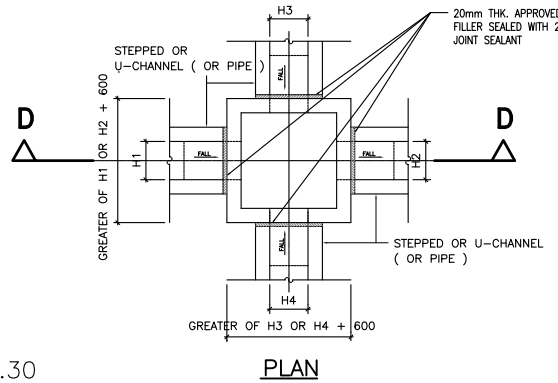
SECTION D - D WITH DESILTED TRAP
COMPLY WITH CEDD'S DRAWING NO. DS C2405 AND C2406



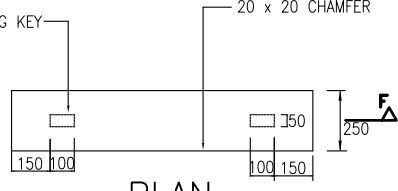
PLAN OF U-CHANNEL DISCHARGE POINT
N.T.S.



SECTION D - D
N.T.S.



TYPICAL DETAILS OF CATCHPIT
PLAN



PLAN
N.T.S.

GRADE 250 CONCRETE WITH ONE LAYER OF A 252 MESH REINFORCEMENT PLACED CENTRALLY F2 AND U2 FINISH

PRECAST CONCRETE COVERS FOR CATCHPIT

GENERAL NOTE

- 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.
- THE 100mm OPENING AT 1m C/C SHALL BE PROVIDED AT THE BOTTOM OF HOARDING OR WALLS IF ANY.

CONCRETE STRENGTH AND STEEL REINFORCEMENT SPECIFICATION FOR DRAINAGE DETAILS

- 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.
- ALL MAIN BARS TO BE HOT ROLLED HIGH YIELD STEEL DEFORMED BAR COMPLY WITH CS2 : 2012
Y - HIGH YIELD BAR 500 MPa
M - MILD STEEL BAR 250 MPa
- CONCRETE COVER TO MAIN REINFORCEMENT TO BE 50mm.
- LAP LENGTH FOR ALL BARS TO BE 46x DIAMETER OF LARGER BAR TO BE LAPPED.
- 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

- ALL DIMENSIONS ARE IN MILLIMETRES
- CONCRETE SURFACE FINISHING SHALL BE CLASS U2 OR F2 AS APPROPRIATE
- FOR HALF ROUND AND U - CHANNEL, SPACING OF EXPANSION JOINT IN CHANNELS, BERMS AND APRON TO BE 10m MAXIMUM. FOR STEPPED CHANNELS, EXPANSION JOINTS TO BE PROVIDED AT A MAXIMUM SPACING OF 10m.
- DIMENSIONS FOR HALF ROUND AND U-CHANNELS SEE TABLE 1.
- THE COVER FOR U-CHANNELS AND CATCHPIT SHALL COMPLY WITH CEDD'S STANDARD DRAWINGS NO. C2405 TO C2407 AND C2412.
- 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

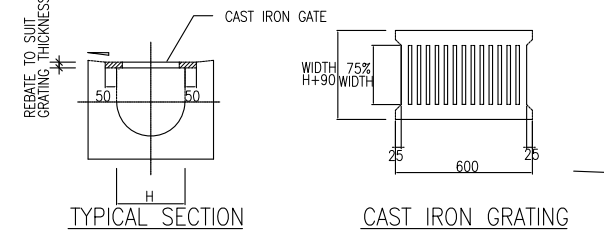
CATCHPIT NO.	C.L. (mPD)	I.L. (mPD)
CP1	14.29	13.44
CP2	13.96	13.11
CP3	9.73	8.88
CP4	9.73	8.80
CP5	8.90	8.05
CP6	12.94	12.09
CP7	12.94	12.02
CP8	12.94	11.97
CP9	12.37	11.20
CP10	12.30	10.70
CP11(s)	8.84	7.24

REV	DESCRIPTION	CHECKED	APPROVED	DATE	
A	DSD'S COMMENT	RC	AY	RY	AUG 24
	PLANNING SUBMISSION	RC	AY	RY	JULY 24

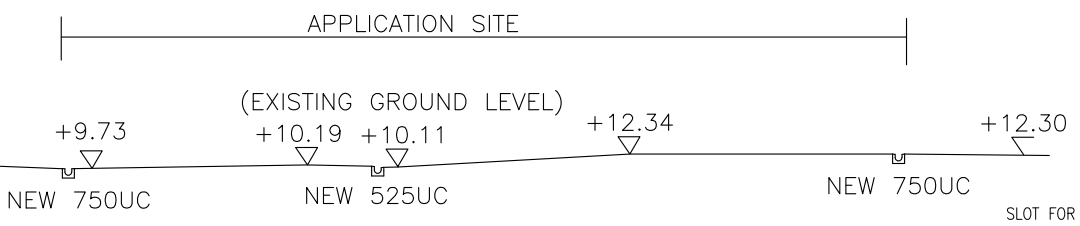
PROJECT TITLE:
STORMWATER DRAINAGE PROPOSAL AT LOTS 130(PART) 131, 132(PART), 134(PART), 260(PART), 261(PART) 262, 263, 264 AND 268(PART) IN D.D.128 HA TSUEN, YUEN LONG, NEW TERRITORIES

DRAWING TITLE:
DRAINAGE PROPOSAL PLAN AND TYPICAL DETAILS

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

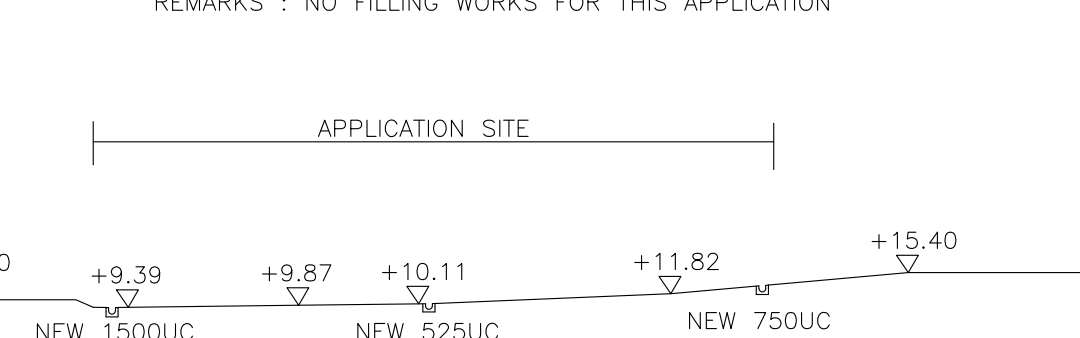


U-CHANNEL WITH CAST IRON GRATING
TYPICAL SECTION



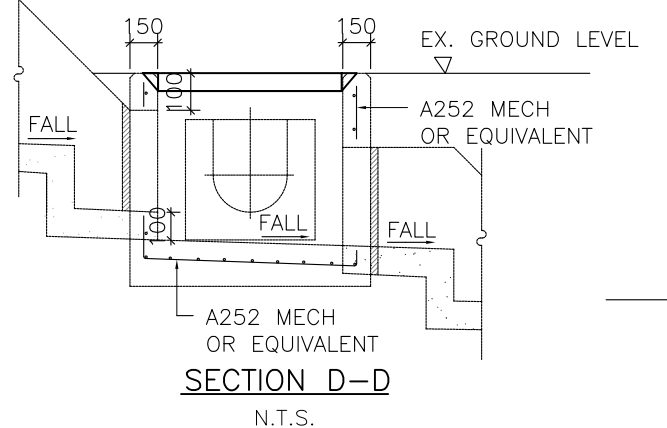
SECTION A-A

REMARKS : NO FILLING WORKS FOR THIS APPLICATION



SECTION B-B

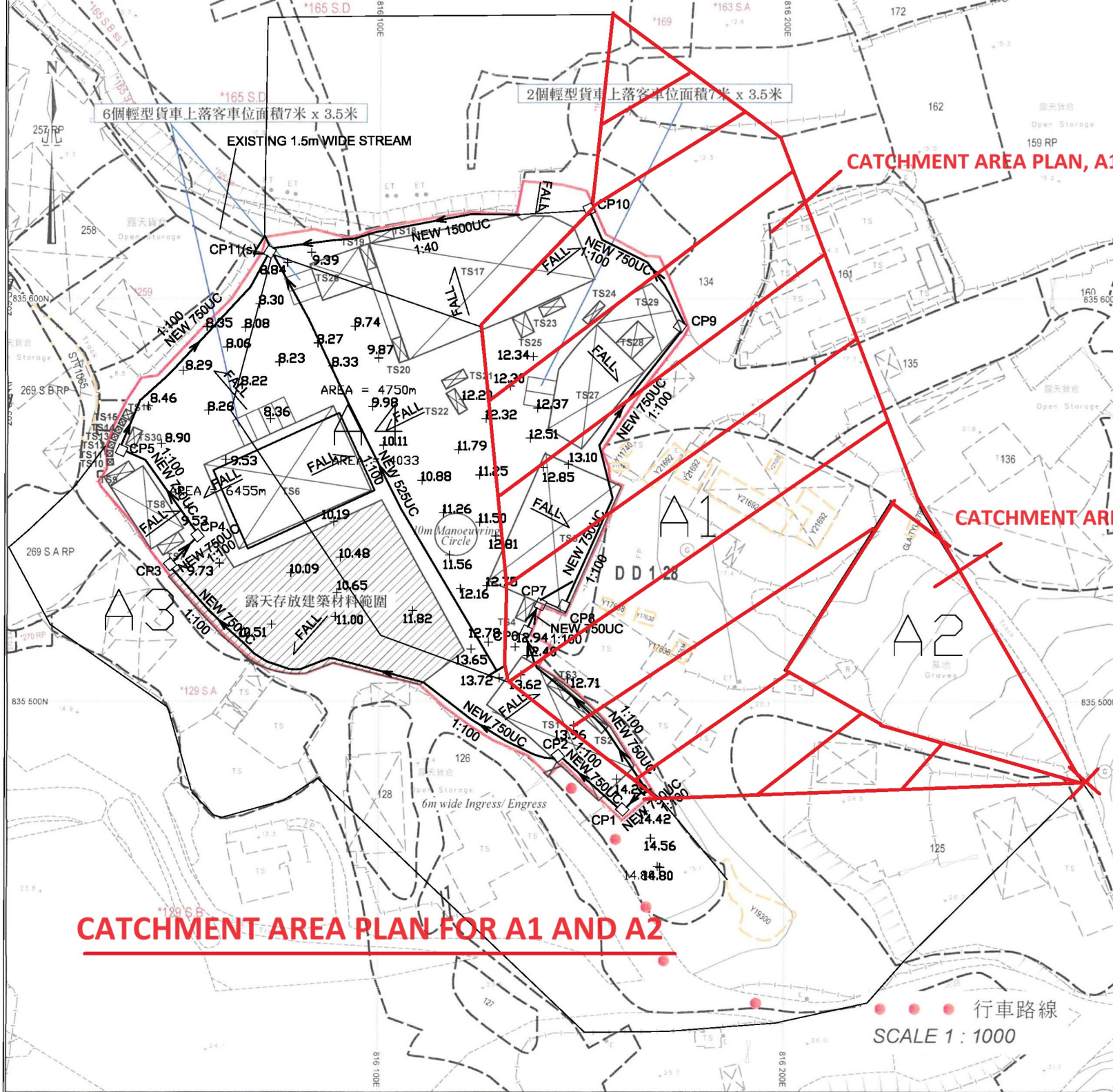
REMARKS : NO FILLING WORKS FOR THIS APPLICATION



SECTION D-D
N.T.S.

Appendix B

Drainage Design of Proposed U-channel and Existing 1.5m Wide Stream & Box Culvert



CATCHMENT AREA PLAN, A1 = 12696m²

CATCHMENT AREA, A2 = 2436m²

CATCHMENT AREA PLAN FOR A1 AND A2

● ● ● 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: 15-Aug-24
Prepared by: Ray Cheng

Check for the drainage capacity of proposed 750UC

Catchment area,	A1	=	12696	m ²	Assume k = 1.0 for paved surface
	A2	=	2436	m ²	Assume k = 0.3 for unpaved surface
	Total Area, A	=	16696 + 0.3x2436		
		=	13426.8	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 (m²)

Longest distance from summit point to outlet, CP10 (Ld) = 310.00 m
 Shortest distance from summit point to outlet, CP10 (Ls) = 183.00 m

Elevation of remote point (Pt A) = 35.20 mPD
 Elevation of outlet point, CP10 = 10.70 mPD

Average fall, H = $(z_1 - z_2) / L_s \times 100$
 = 13.39 m per 100m

From TGN30

$T_c = 0.14465 \times L_d / (H^{0.2} \times A^{0.1})$
 = 10.19 min

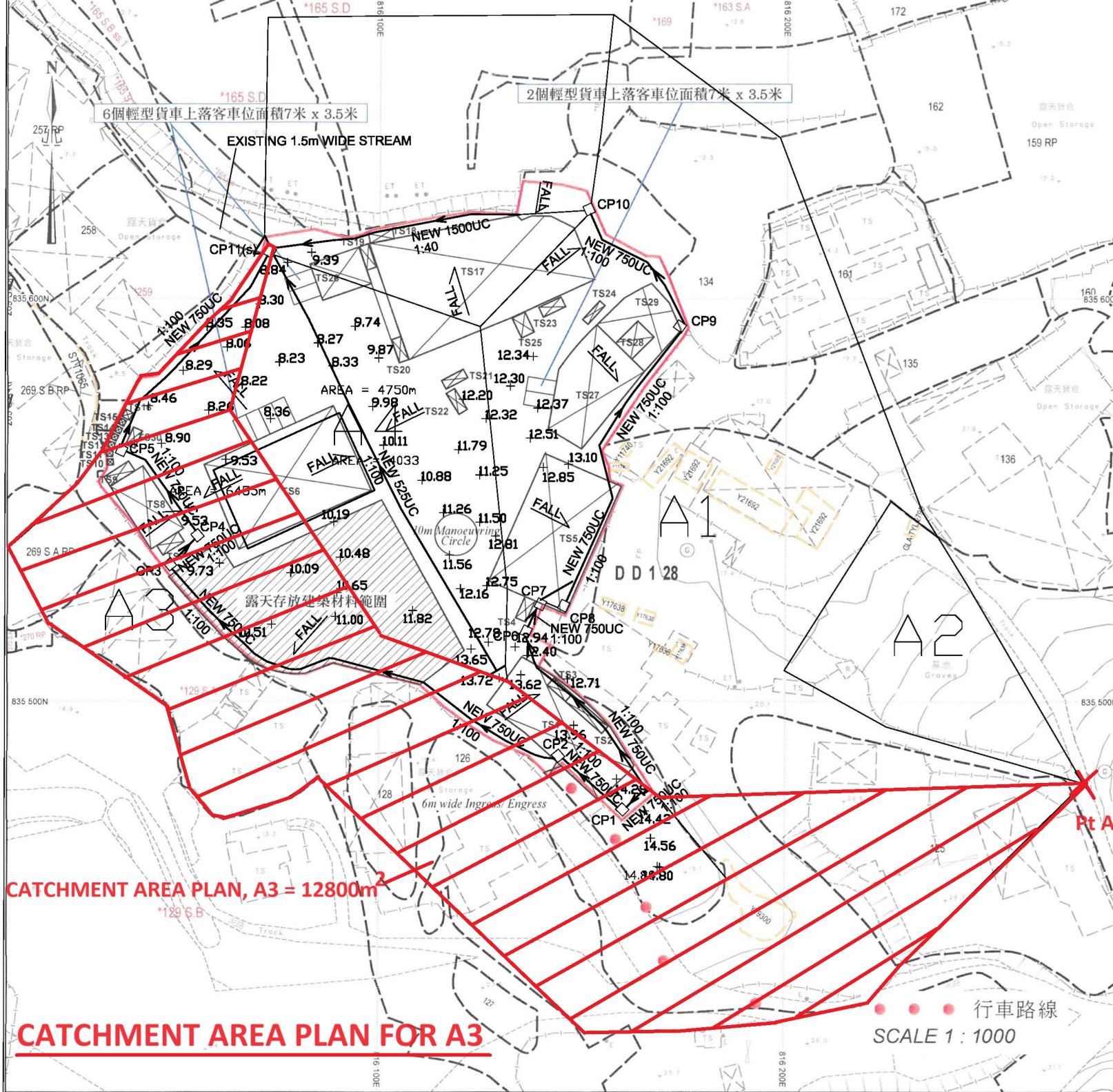
Assume a 1 in 50 year design rainfall return period for rural area
 From Geo-Manual (Fig 8.2)

$i = 265$ mm/hr
 $Q = kiA/60 \times 1.138$
 = 67485 lit/min

From TGN 43A1

For proposed 750 UC with 1 in 100 gradient

Maximum capacity = 74700 lit/min > 67485 o.k.
 The corresponding velocity = 3.35 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

CATCHMENT AREA PLAN, A3 = 12800m²

CATCHMENT AREA PLAN FOR A3

●●● 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: 15-Aug-24
Prepared by: Ray Cheng

Check for the drainage capacity of proposed 750UC

Catchment area, A3 = 12800 m² Assume k = 1.0 for paved surface

Use Rational Method from Geo-Manual

$Q = kiA/3600$ where, $Q = \text{Maximum runoff (lit/sec)}$
 $k = \text{Runoff coefficient}$
 $i = \text{Design mean intensity of rainfall (mm/hr)}$
 $A = \text{Total catchment area (m}^2\text{)}$

Longest distance from summit point to outlet, CP11(s) (Ld) = 375.00 m
 Shortest distance from summit point to outlet, CP11(s) (Ls) = 240.00 m

Elevation of remote point (Pt A) = 35.20 mPD
 Elevation of outlet point, CP11(s) = 7.24 mPD

Average fall, H = $(z_1 - z_2) / L_s \times 100$
 = 11.65 m per 100m

From TGN30

$T_c = 0.14465 \times L_d / (H^{0.2} \times A^{0.1})$
 = 12.89 min

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

$i = 255 \text{ mm/hr}$
 $Q = kiA/60 \times 1.138$
 = 61907 lit/min

From TGN 43A1

For proposed 750 UC with 1 in 100 gradient

Maximum capacity = 74700 lit/min > 61907 o.k.
 The corresponding velocity = 3.35 m/s < 4 o.k.

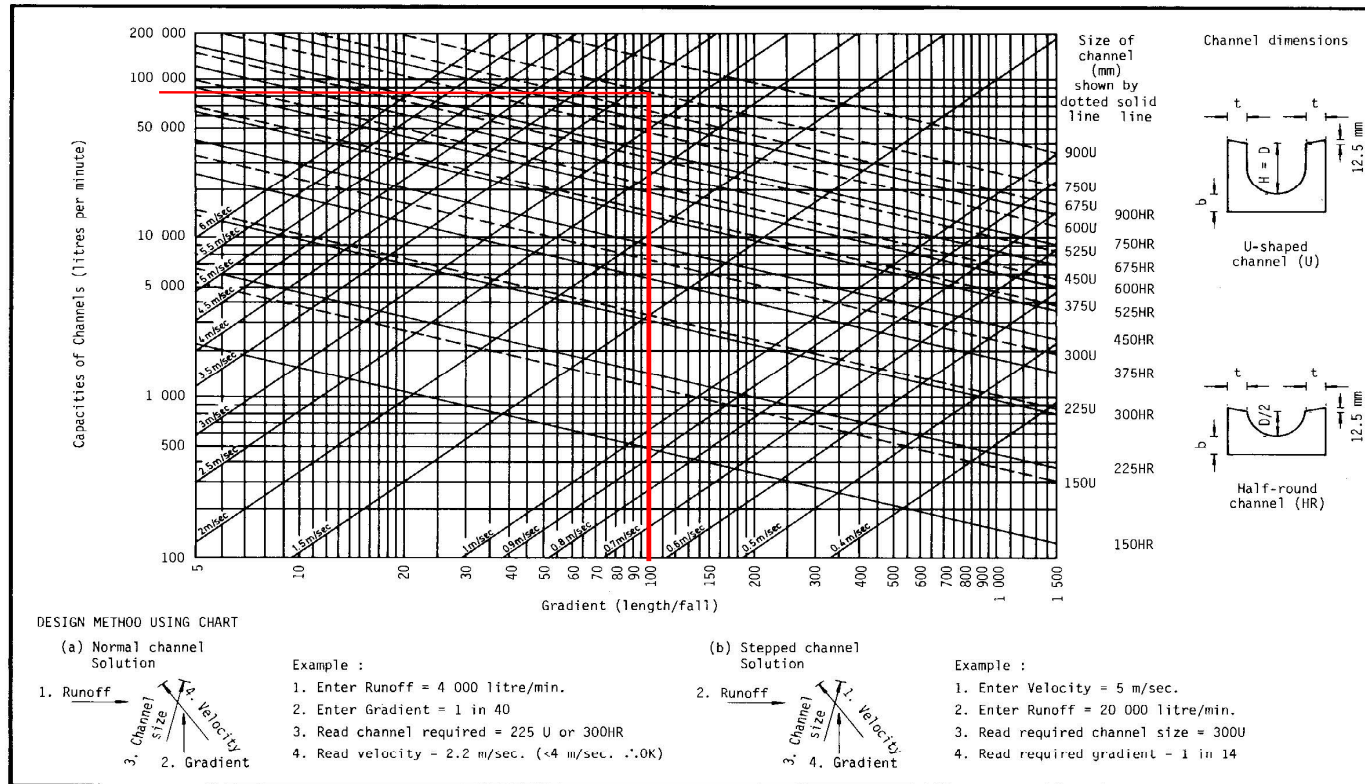
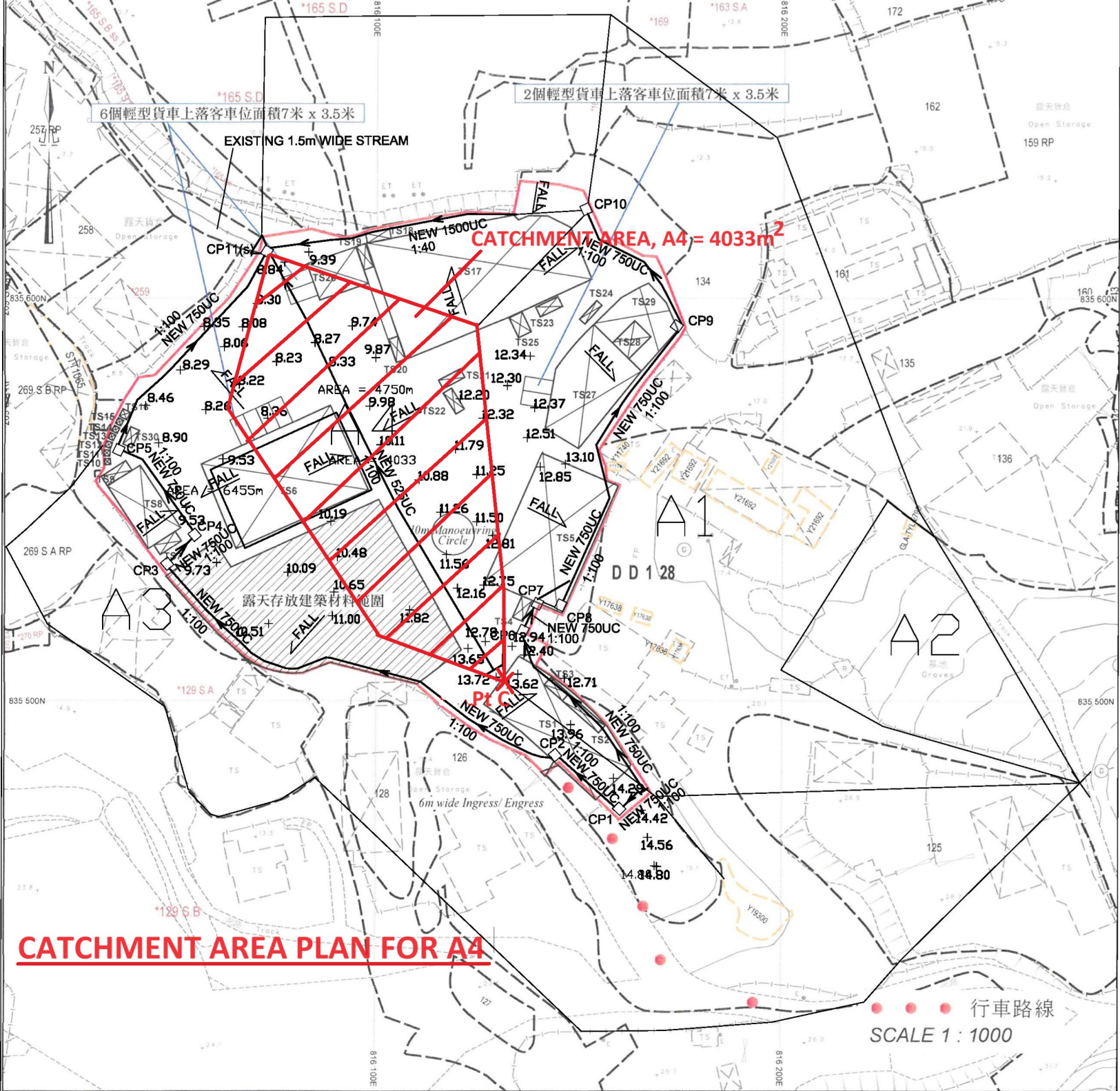


Figure 8.7 - Chart for the Rapid Design of Channels

Since 10% reduction would be considered for deposition of sediment, the capacity of the proposed 750UC should be $83000 \times 0.9 = 74,700$ lit/min,



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

CATCHMENT AREA, A4 = 4033m²

AREA = 4750m²

AREA = 6455m²

CATCHMENT AREA PLAN FOR A4

●●● 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: 15-Aug-24

Prepared by: Ray Cheng

Check for the drainage capacity of proposed 525UC

Catchment area, A4 = 4033 m² 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 (m²)

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) = 7.24 mPD

Average fall, H = $(z_1 - z_2) / L_s \times 100$
= 5.40 m per 100m

From TGN30

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

$$= 6.17 \text{ min}$$

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

$$i = 310 \text{ mm/hr}$$

$$Q = kiA/60 \times 1.138$$

$$= 23713 \text{ lit/min}$$

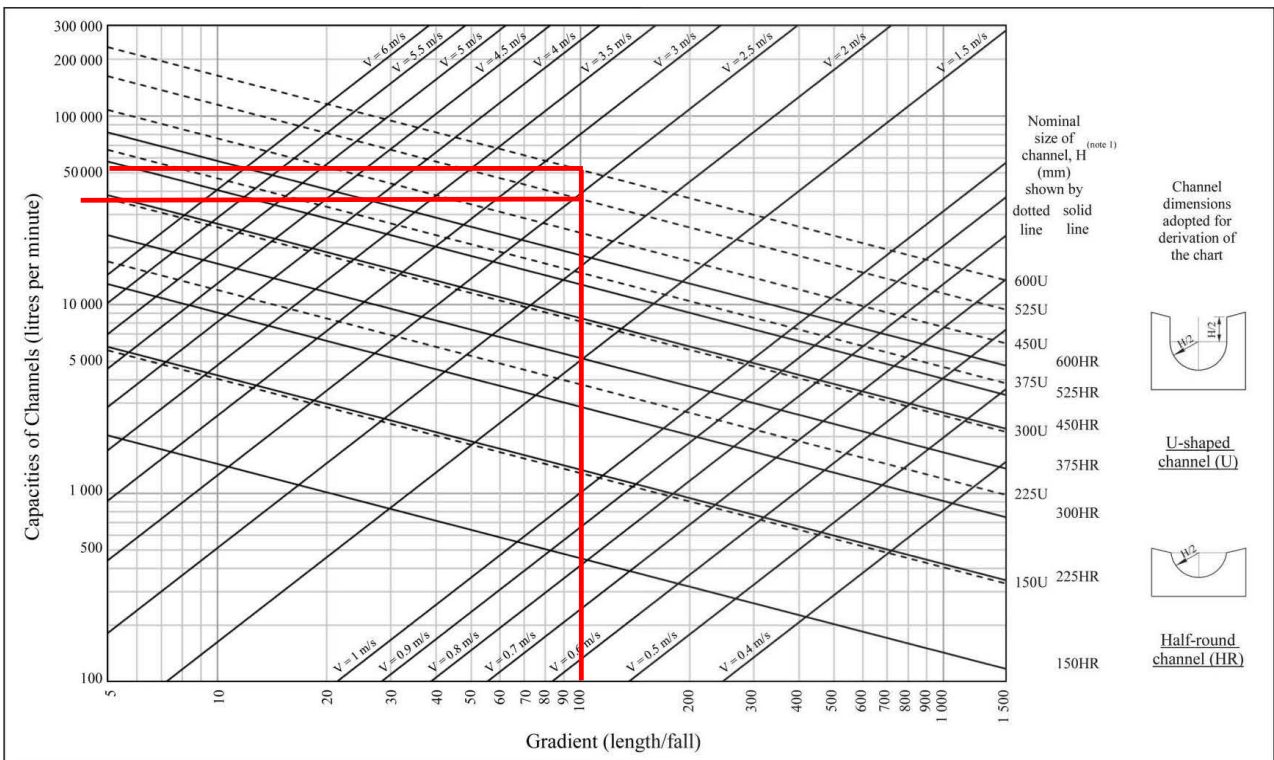
From TGN 43A1

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.

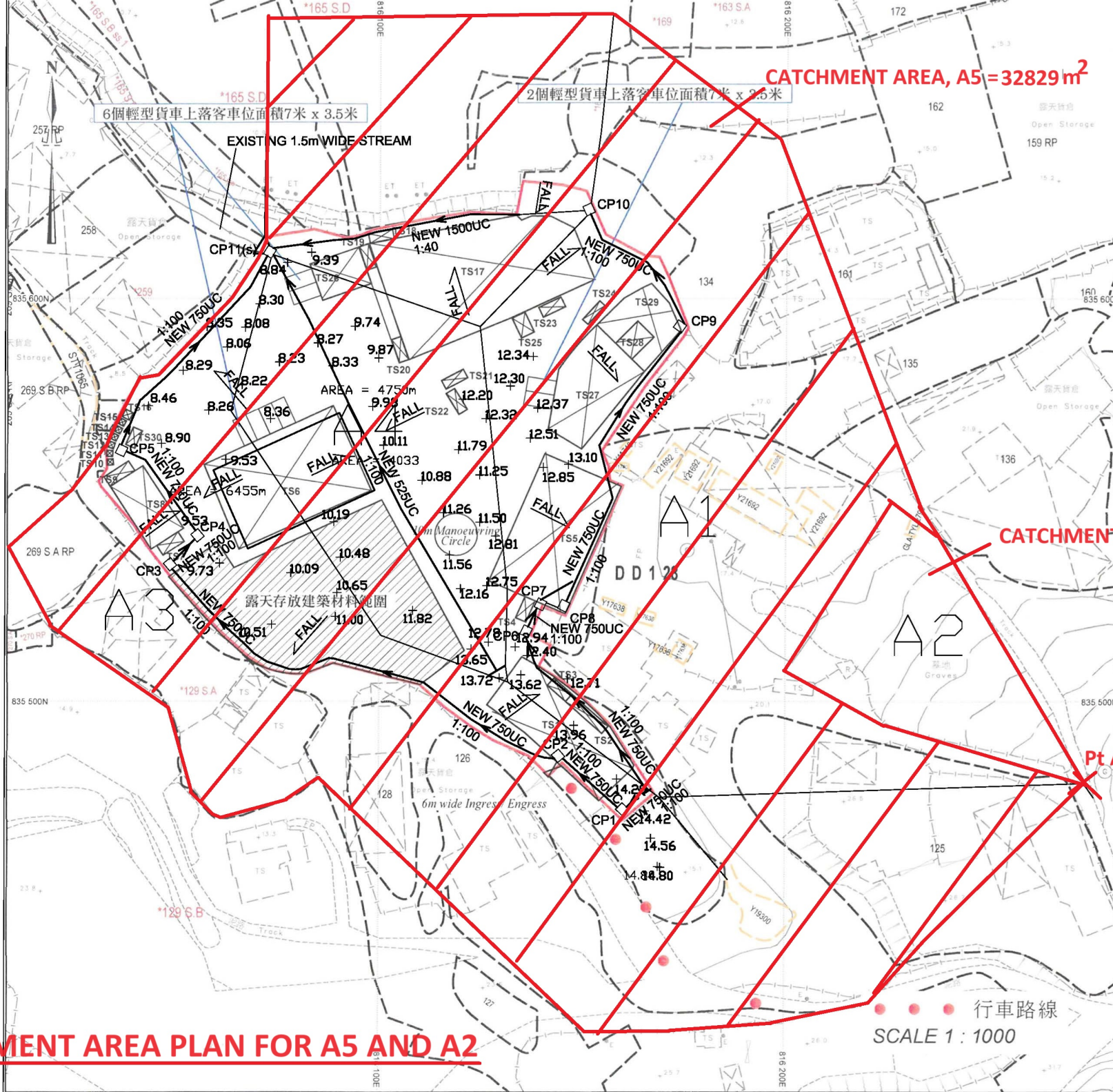
Figure 1 - Chart for the rapid design of U-shaped and half-round channels up to 600 mm



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 525UC should be $36000 \times 0.9 = 32,400$ lit/min,

CATCHMENT AREA PLAN FOR A5 AND A2



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: 15-Aug-24
Prepared by: Ray Cheng

Check for the drainage capacity of proposed 1500UC and 1.5m wide stream and box culvert

Catchment area,	A5	=	32829	m ²	Assume k = 1.0 for paved surface
	A2	=	2436	m ²	Assume k = 0.3 for unpaved surface
	Total Area, A	=	32829 + 0.3x2436		
		=	33559.8	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 (m²)

Longest distance from summit point to outlet, CP11(s) (Ld) = 375.00 m
 Shortest distance from summit point to outlet, CP11(s) (Ls) = 240.00 m

Elevation of remote point (Pt A) = 35.20 mPD
 Elevation of outlet point, CP11(s) = 7.24 mPD

Average fall, H = $(z_1 - z_2) / L_s \times 100$
 = 11.65 m per 100m

From TGN30

$T_c = 0.14465 \times L_d / (H^{0.2} \times A^{0.1})$
 = 11.65 min

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

$i = 260$ mm/hr
 $Q = kiA/60 \times 1.138$
 = 165495 lit/min

Drainage Design and Checking

Page no.

Project No.:

Date:

15-Aug-24

Prepared by:

Ray Cheng

Check for the drainage capacity

(Existing 1.5m width Stream course and 1500UC)

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

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

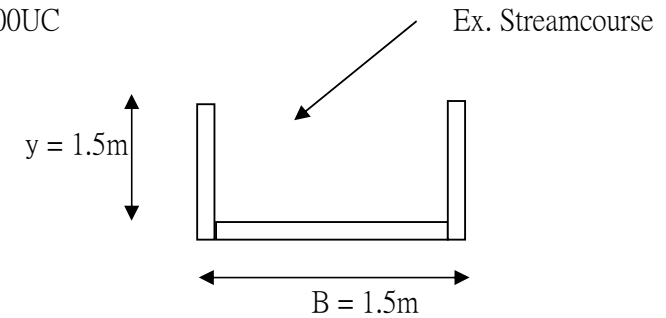
$$R = A/P \text{ and } P = 2y + B$$

$$R = 0.50 \quad k = 1.49$$

$$S = 0.025 \quad n = 0.04$$

$$Q = 500891 \quad \text{lit/min} \quad > 165495 \text{ lit/min}$$

O.K.



Drainage Design and Checking

Page no.

Project No.:

Date:

15-Aug-24

Prepared by:

Ray Cheng

Check for the drainage capacity

(Existing 1.5m width and 1.1m depth Box Culvert)

From Manning Equation, for existing 1.5m width and 1.1m depth Box Culvert

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

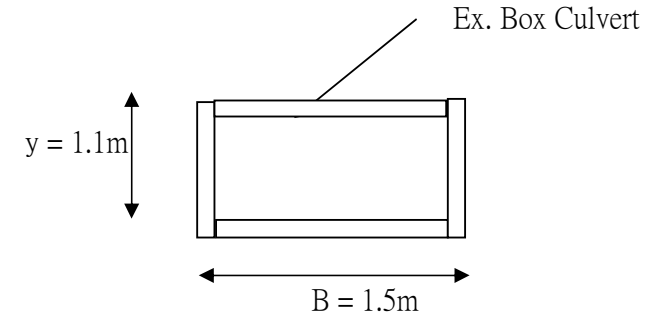
$$R = A/P \text{ and } P = 2y + B$$

$$R = 0.50 \quad k = 1.49$$

$$S = 0.025 \quad n = 0.04$$

$$Q = 402226 \quad \text{lit/min} \quad > 165495 \text{ lit/min}$$

O.K.



GEO Technical Guidance Note No. 30 (TGN 30)
Updated Intensity-Duration-Frequency Curves with Provision for
Climate Change for Slope Drainage Design

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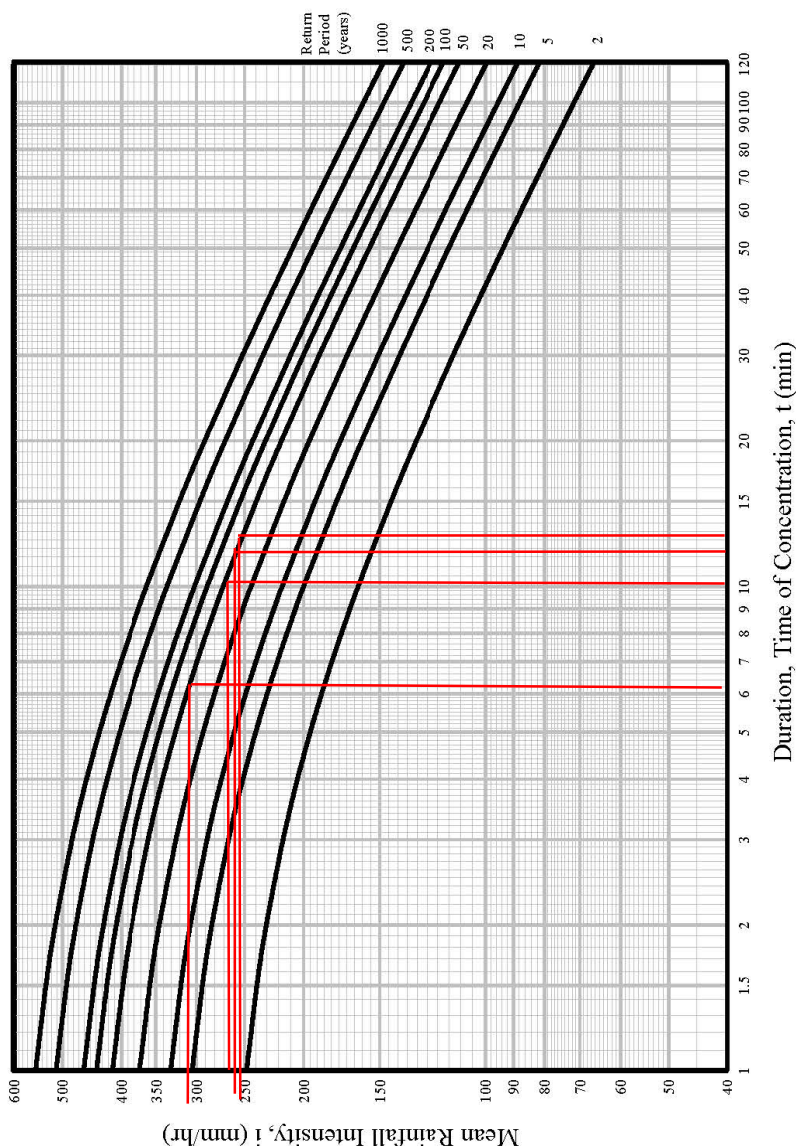


Figure 1 – Updated Intensity-Duration-Frequency Curves

- 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.

Appendix C

Photo of Existing Stream and Box Culvert



Photo of Existing Stream



Photo of Existing Box Culvert