Annex 3

Drainage Proposal

SUBMISSION REPORT
FOR
DRAINAGE PROPOSAL DESIGN
FOR TEMPORARY SHOP AND SERVICES WITH INSTALLATION OF SOLAR PHOTOVOLTAIC SYSTEM AND ANCILLARY OFFICE
ON
LOT 491RP IN D.D.130, LAM TEI, TUEN MUN

Date : August 2025

TABLE OF CONTENTS

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 proposal is prepared for the proposed stormwater drainage works for the proposed temporary shop and services with installation of solar photovoltaic system and ancillary office at lot 491RP in D.D.130, Lam Tei, Tuen Mun.

2. Existing Drainage Condition

A plan showing the existing catchments are enclosed in **Appendix B**. Currently, the surface runoff collected from the site is discharging to the existing government manhole no. SCH1009266 as shown in **Appendix A**. As per the existing site condition, additional peripheral U-channels area considered necessary for the proposed development. Drainage proposal is required to be carried out for the proposed development.

3. 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 year 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 (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 0.95 for developed area. For vegetated ground, the value of K is taken as 0.3.

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 manhole. Catchpits with 300mm sump are proposed at the discharged points of 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

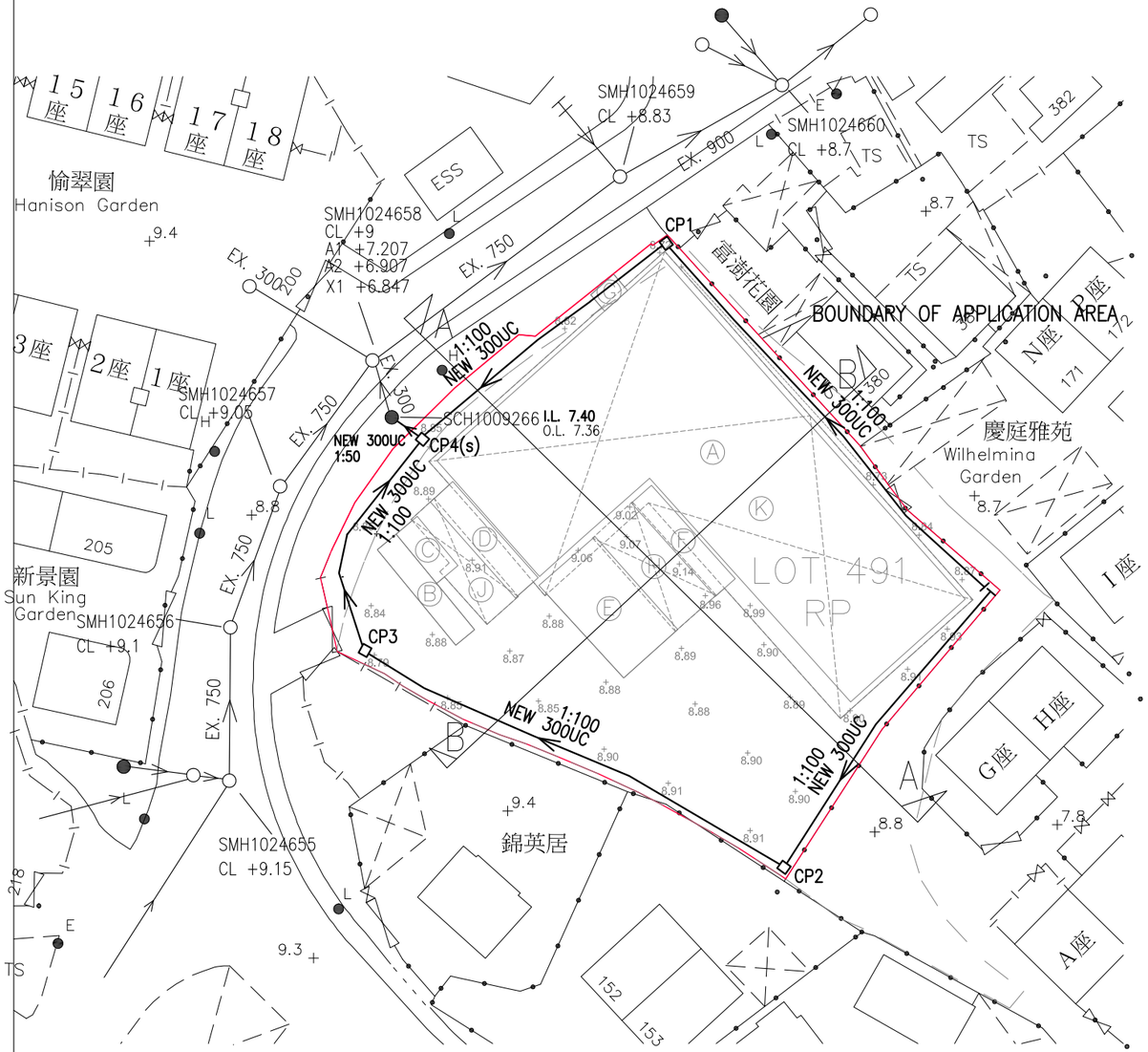
The drainage design of the proposed U-channel are presented in **Appendix B**.

6. Conclusion

Peripheral channels are to be provided along the site boundary where necessary to intercept runoff from crossing the site. The drainage conditions of adjacent areas will not be adversely affected.

Appendix A

Stormwater Drainage Proposal Plan



LEGEND:

1:100 NEW 300UC — PROPOSED 300mm U-CHANNEL WITH GRATING AT FALL 1: 100 (MIN)

CP4(s) □ — PROPOSED COVERED DESILTED CATCHPIT NO. CP4

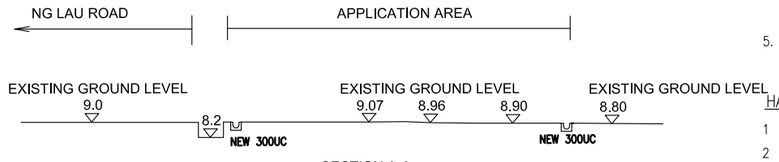
CP1 □ — PROPOSED COVERED CATCHPIT NO. CP1

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.

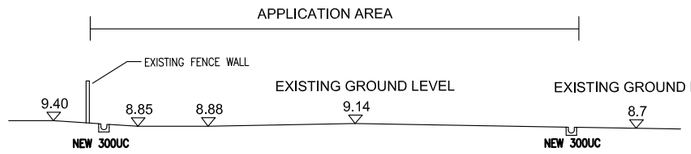
CONCRETE STRENGTH AND STEEL REINFORCEMENT SPECIFICATION FOR DRAINAGE DETAILS

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.



SECTION A-A

(NO FILLING WORKS WOULD BE PROPOSED IN THIS APPLICATION)



SECTION B-B

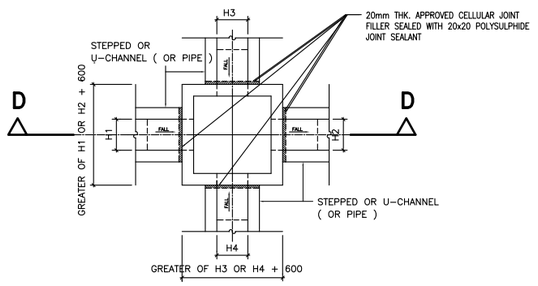
(NO FILLING WORKS WOULD BE PROPOSED IN THIS APPLICATION)

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

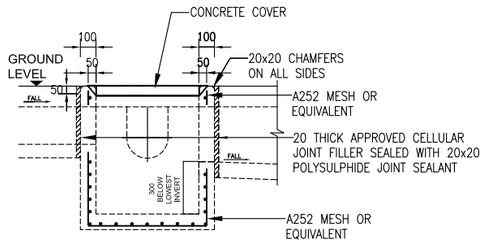
TABLE 1 : DIMENSION OF U-CHANNEL AND HALF-ROUND CHANNEL

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



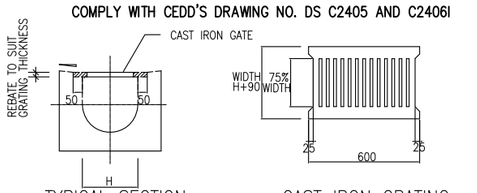
PLAN

TYPICAL DETAILS OF CATCHPIT



SECTION D - D WITH DESILTED TRAP

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



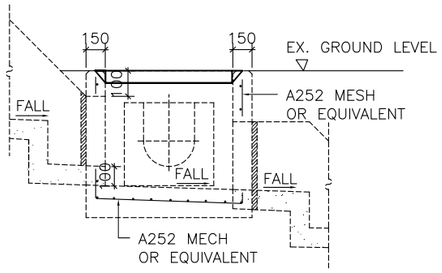
TYPICAL SECTION — CAST IRON GRATING

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

U-CHANNEL WITH CAST IRON GRATING

PROPOSED CATCHPIT SCHEDULE

CATCHPIT NO.	C.L. (mPD)	I.L. (mPD)
CP1	8.72	7.93
CP2	8.90	8.23
CP3	8.79	7.73
CP4(s)	8.85	7.49

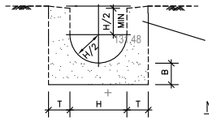


SECTION D-D

N.T.S.

CATCHPITS

1 ALL DIMENSIONS ARE IN MILLIMETRES
2 CONCERTE SURFACE FINISH SHALL BE CLASS U2 OR F3 AS APPROPRIATE



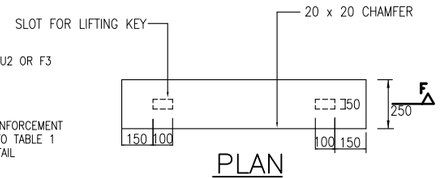
FOR REINFORCEMENT REFER TO TABLE 1 FOR DETAIL

NOTES:

1. H = NOMINAL CHANNEL SIZE.

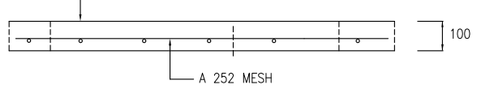
U-CHANNEL

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
	DLO SUBMIT	RC	AY	RY	AUG 25

PROJECT TITLE:

STORMWATER DRAINAGE PROPOSAL

LOT NO. 491 RP IN D.D. 130

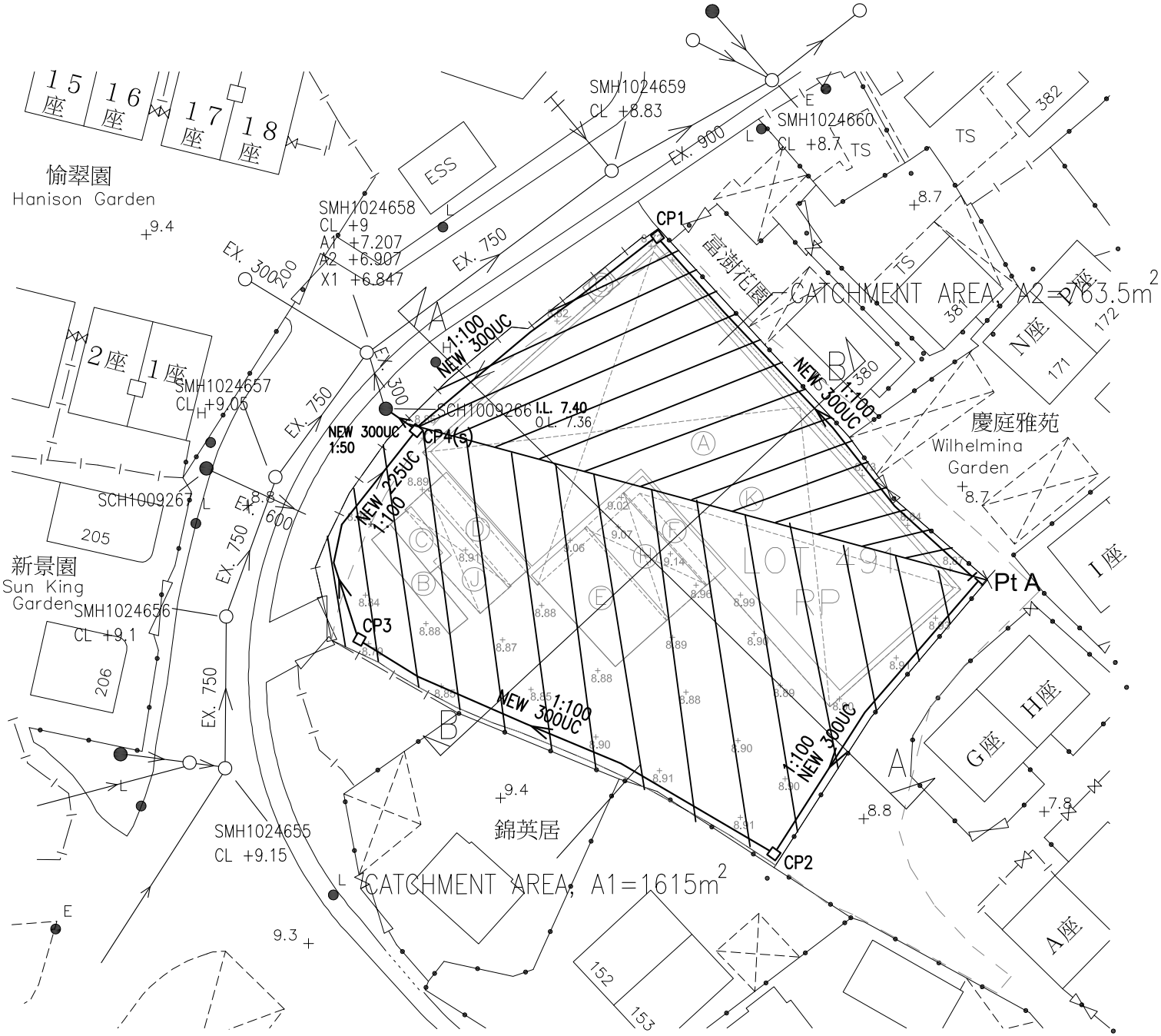
DRAWING TITLE:

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

Surface Drainage Design



CATCHMENT AREA PLAN

Drainage Design Page no.

Drainage Design at lot 491RP
Project No.: D.D.130 Date: 24-Jul-25
Prepared by: Ray Cheng

Check for the drainage capactiy of proposed 300UC

Catchment area, A1 = 1615 m^2 Assume k = 0.95 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, CP4(s) (Ld) = 110.00 m
Shortest distance from summit point to outlet, CP4(s) (Ls) = 60.00 m

Elevation of remote point (Pt A) = 8.93 mPD
Elevation of outlet point (CP4(s)) = 7.49 mPD

Average fall, H = $(z_1-z_2)/L_s$ x 100
= 2.40 m per 100m

T_c = $0.14465 \times L_d / (H^{0.2} \times A^{0.1})$
= 6.38 min

Assume a 1 in 50 year design rainfall return period for rural area
From SDM Corrigendum No. 1/2024

i = 210 mm/hr rainfall increase
Q = kiA/60 x 1.16
6229 lit/min

From TGN 43A1
For proposed 300 UC with 1 in 100 gradient

Maximum capacity	=	8000	lit/min	>	6229	o.k.
The corresponding velocity	=	1.70	m/s	<	4	o.k.

Drainage Design Page no.

Drainage Design at lot 491RP
Project No.: D.D.130 Date: 24-Jul-25
Prepared by: Ray Cheng

Check for the drainage capactiy of proposed 300UC

Catchment area, A2 = 763.5 m^2 Assume k = 0.95 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, CP4(s) (Ld) = 80.00 m
Shortest distance from summit point to outlet, CP4(s) (Ls) = 60.00 m

Elevation of remote point (Pt A) = 8.93 mPD
Elevation of outlet point (CP4(s)) = 7.40 mPD

Average fall, H = $(z_1-z_2)/L_s$ x 100
= 2.55 m per 100m

T_c = 0.14465 x L_d / ($H^{0.2}$ x $A^{0.1}$)
= 4.94 min

Assume a 1 in 50 year design rainfall return period for rural area
From SDM Corrigendum No. 1/2024

i = 220 mm/hr rainfall increase
Q = kiA/60 x 1.16
3085 lit/min

From TGN 43A1
For proposed 300 UC with 1 in 100 gradient

Maximum capacity =	8000	lit/min	>	3085	o.k.
The corresponding velocity =	1.70	m/s	<	4	o.k.

Drainage Design Page no.

Project No.: Drainage Design at lot 491RP D.D.130 Date: 31-Jul-25
Prepared by: Ray Cheng

Check for the drainage capactiy of proposed 300UC (between CP4(s) and manhole SCG1009266

Catchment area,	A1	=	1615	m^2	Assume k = 0.95 for paved surface
	A2	=	763.5	m^2	
	Total area = A1 +A2 =		2378.5	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, SCH1009266 (Ld) = 113.00 m
Shortest distance from summit point to outlet, SCH1009266 (Ls) = 63.00 m

Elevation of remote point (Pt A) = 8.93 mPD
Elevation of outlet point SCH1009266 = 7.40 mPD

Average fall, H = $(z_1-z_2)/L_s$ x 100
= 2.43 m per 100m

T_c = 0.14465 x L_d / ($H^{0.2}$ x $A^{0.1}$)
= 6.29 min

Assume a 1 in 50 year design rainfall return period for rural area
From SDM Corrigendum No. 1/2024

i = 210 mm/hr rainfall increase
Q = kiA/60 x 1.16
9174 lit/min

From TGN 43A1
For proposed 300 UC with 1 in 50 gradient

Maximum capacity	=	12500	lit/min	>	9174	o.k.
The corresponding velocity	=	2.45	m/s	<	4	o.k.

Checking the existing 300m dia. pipe

The gradient of pipe = 5000 / (7.36-7.207) (where length of pipe = 5m)
= 1 : 33

Water (or sewage) at 15° C
full bore conditions.

velocities in m/s
discharges in l/s

continued

The capacity of 300mm dia. pipe = 193.03 x 60 =11,581 l/min > **9174** l/min O.K.

Gradient	Pipe diameters in mm: 50	75	80	100	125	150	175	200	225	250	275	300
0.02000	0.683	0.900	0.940	1.091	1.264	1.424	1.575	1.717	1.852	1.982	2.107	2.227
1/ 50	1.341	3.975	4.724	8.566	15.512	25.172	37.879	53.942	73.655	97.296	125.132	157.418
0.02200	0.717	0.944	0.986	1.145	1.326	1.495	1.652	1.802	1.944	2.080	2.210	2.336
1/ 45	1.408	4.172	4.958	8.990	16.277	26.413	39.744	56.597	77.278	102.080	131.282	165.152
0.02400	0.749	0.987	1.031	1.196	1.386	1.562	1.726	1.882	2.031	2.173	2.309	2.441
1/ 42	1.471	4.361	5.181	9.394	17.009	27.599	41.527	59.134	80.740	106.651	137.158	172.541
0.02600	0.780	1.028	1.073	1.246	1.443	1.626	1.798	1.960	2.114	2.262	2.404	2.541
1/ 38	1.532	4.541	5.396	9.783	17.711	28.736	43.237	61.567	84.061	111.035	142.794	179.629
0.02800	0.810	1.067	1.114	1.293	1.498	1.688	1.866	2.034	2.195	2.348	2.495	2.638
1/ 36	1.591	4.715	5.602	10.156	18.386	29.830	44.882	63.908	87.256	115.254	148.217	186.449
0.03000	0.839	1.105	1.154	1.339	1.551	1.748	1.932	2.106	2.272	2.431	2.584	2.731
1/ 33	1.648	4.883	5.801	10.516	19.037	30.886	46.470	66.167	90.339	119.324	153.450	193.030
0.03200	0.867	1.142	1.192	1.383	1.603	1.806	1.996	2.176	2.347	2.511	2.669	2.821
1/ 31	1.703	5.045	5.994	10.865	19.668	31.908	48.005	68.352	93.320	123.261	158.511	199.394
0.03400	0.895	1.177	1.230	1.426	1.652	1.862	2.058	2.243	2.420	2.589	2.751	2.908
1/ 29	1.756	5.202	6.180	11.203	20.278	32.898	49.493	70.470	96.210	127.077	163.416	205.563
0.03600	0.921	1.212	1.266	1.468	1.701	1.916	2.118	2.309	2.490	2.664	2.832	2.993
1/ 28	1.808	5.355	6.362	11.531	20.871	33.859	50.938	72.527	99.017	130.782	168.180	211.553

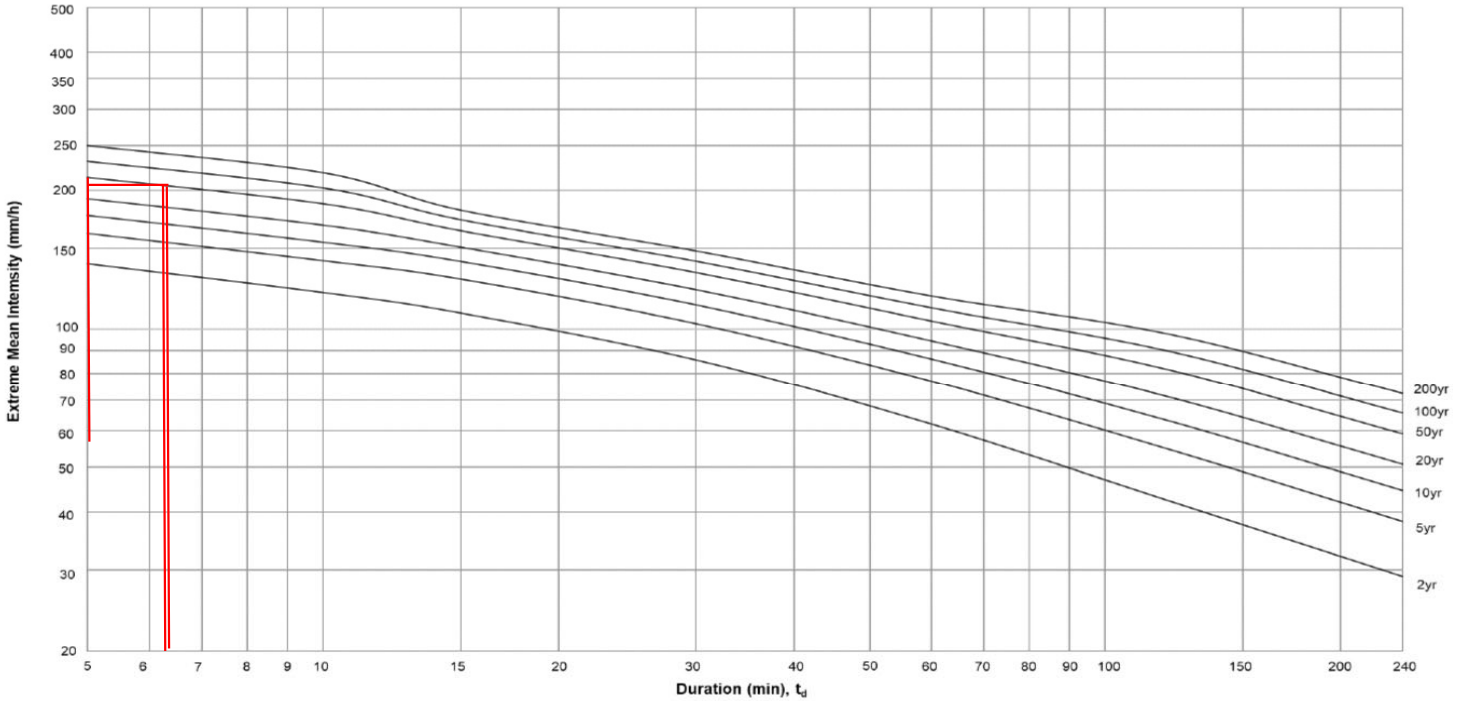
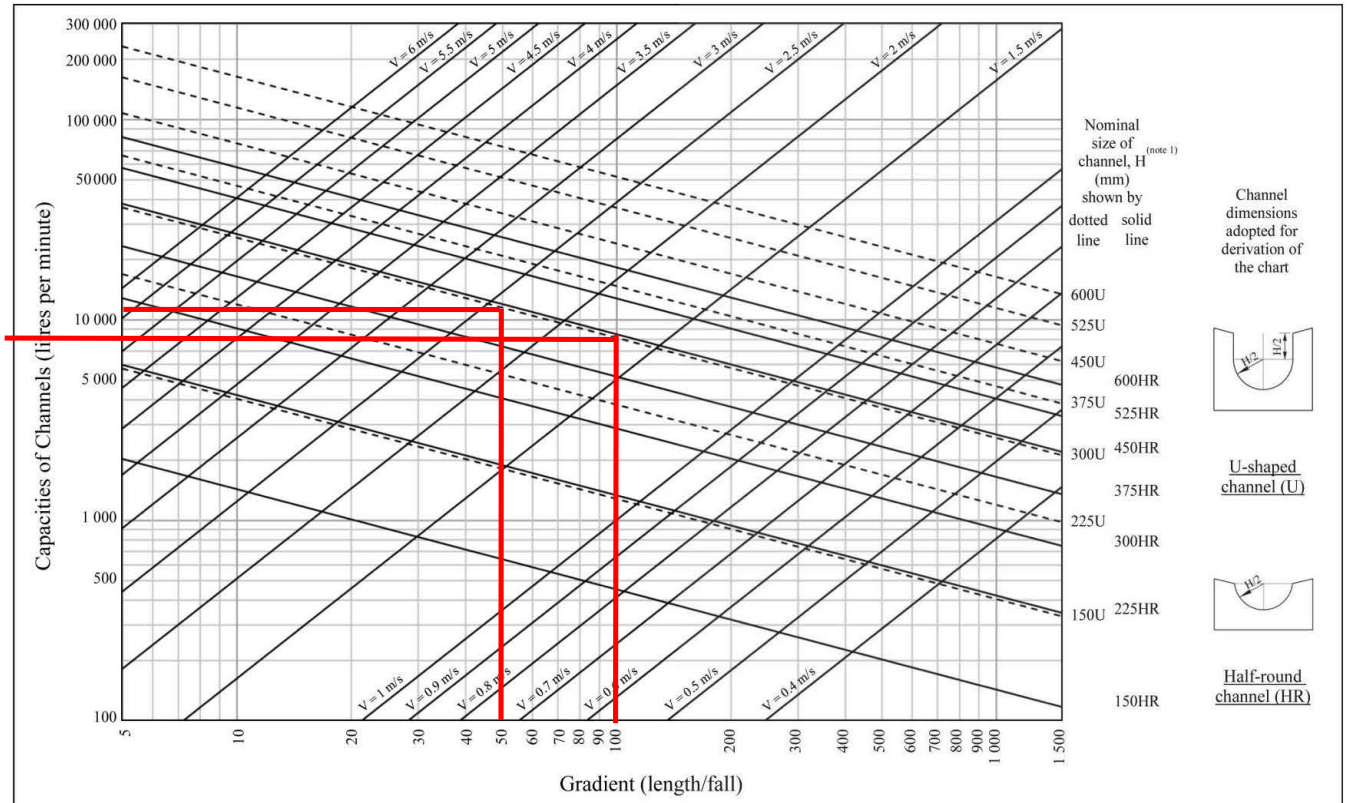


Figure 4d – Intensity-Duration-Frequency Curves of North District Area
(for durations not exceeding 4 hours)

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.

ANNEX TGN