SUBMISSION REPORT
FOR
DRAINAGE PROPOSAL DESIGN
FOR PROPOSED DEVELOPMENT
ON
LOT 1314, 1315, 1316 ANDF 1317 IN D.D.119

Report no. SPDD19-001B

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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 proposal is prepared for the proposed stormwater drainage works for the NTEH development at lot 1314, 1315, 1316 and 1317 in D.D.119.

2. Existing Drainage Condition

A plan showing the existing catchments is enclosed in **Appendix B**. Currently, the surface runoff collected from the site is discharging to the existing stream and watercourse located at the west and east of the site respectively as shown in **Appendix A**. 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.

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, Third 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 urban 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 1 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 stream and watercourse located at the west and east of the site respectively. 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

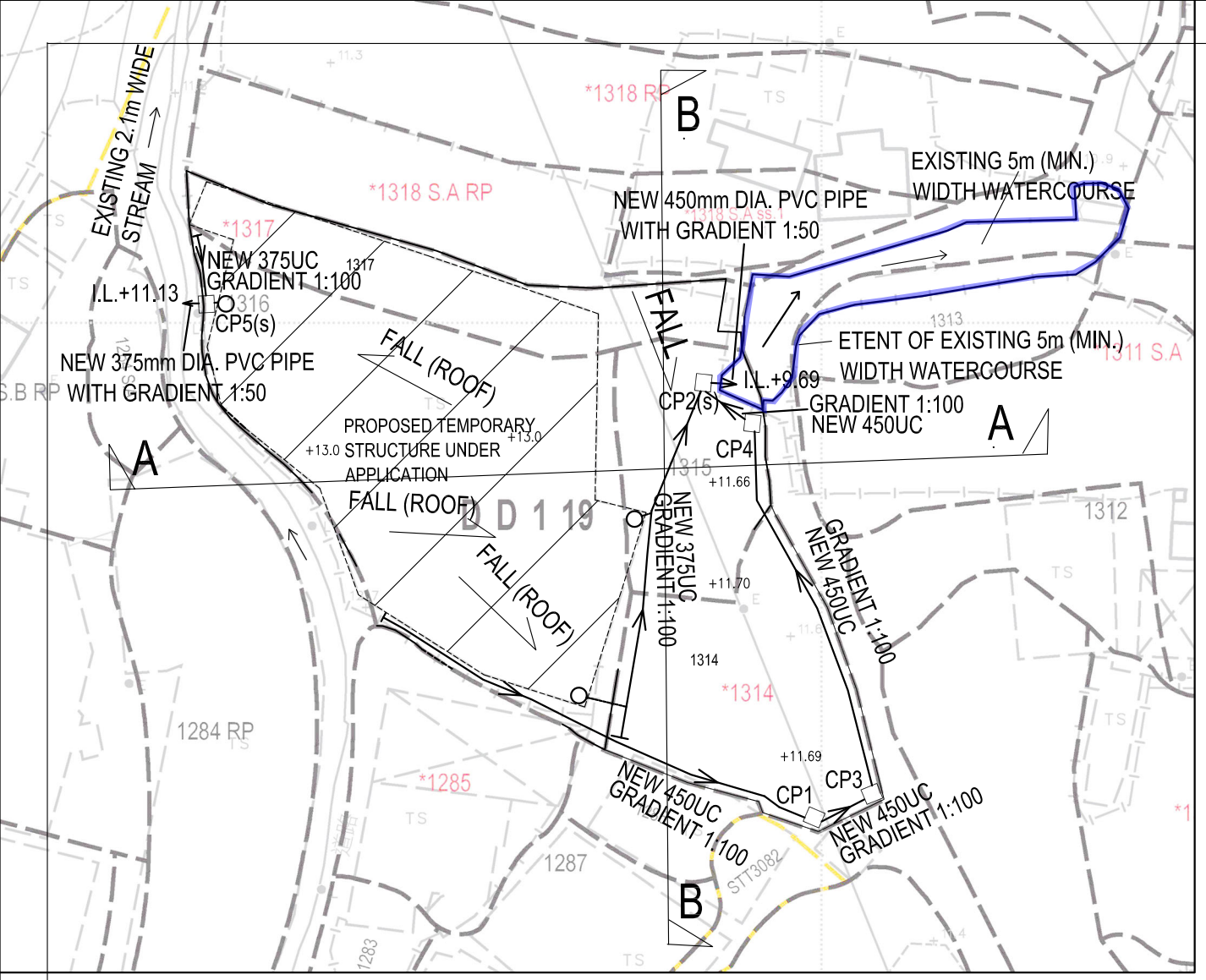
The drainage design of the proposed U-channel is presented in **Appendix B**. Since no wall or hoarding would be erected in this development, it is considered that the existing overland flow passing through the site would not be affected.

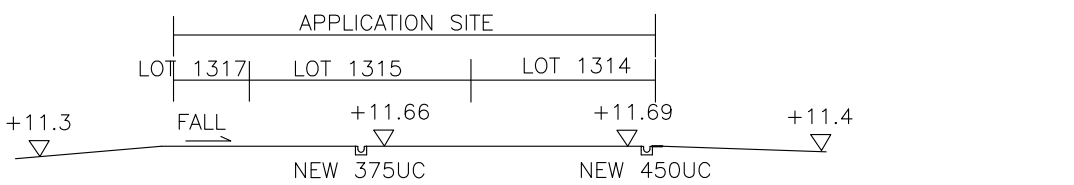
6. Conclusion

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.

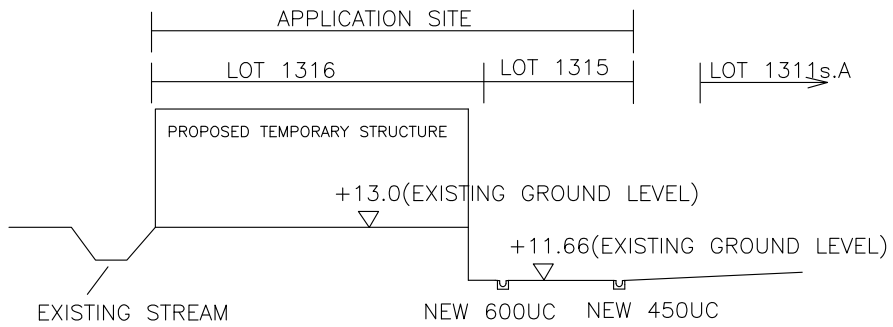
Appendix A

Stormwater Drainage Proposal Plan

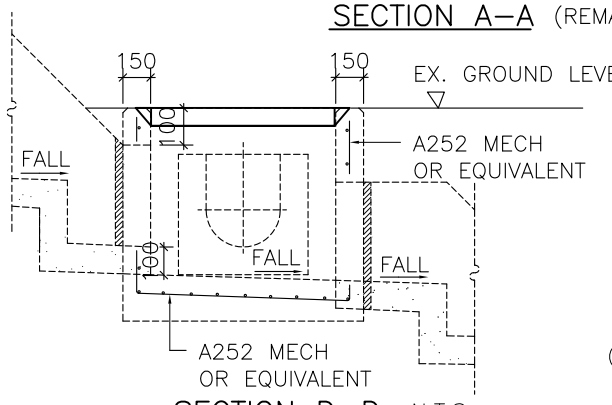




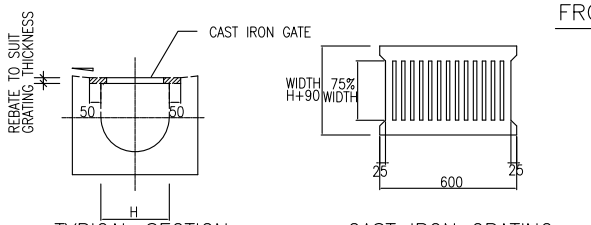
SECTION B–B (REMARKS : NO FILLING WORKS FOR THIS APPLICATION)



SECTION A–A (REMARKS : NO FILLING WORKS FOR THIS APPLICATION)



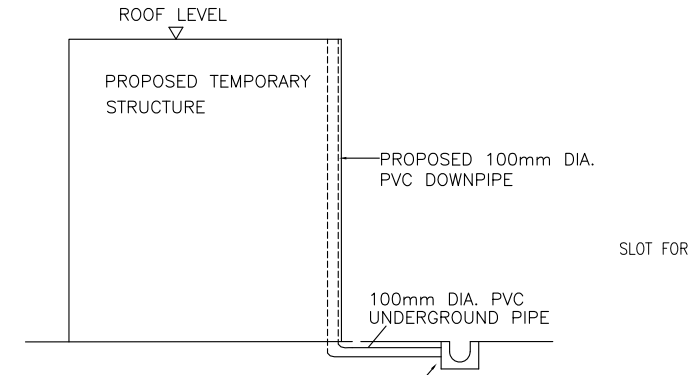
SECTION D–D N.T.S.



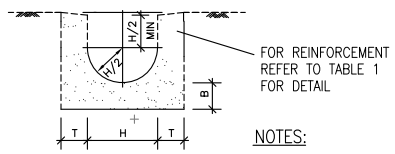
TYPICAL SECTION CAST IRON GRATING

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

U–CHANNEL WITH CAST IRON GRATING



ELEVATION FOR DOWNPIPE FROM ROOF TO GROUND LEVEL



NOTES:

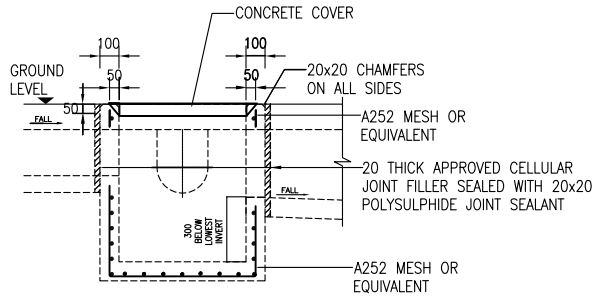
1. H = NOMINAL CHANNEL SIZE.

U–CHANNEL

COMPLY WITH FIG 8.11 OF GEOTECHNICAL MANUAL FOR SLOPES

LEGEND:

+13.0	EXISTING GROUND LEVEL AT +13.0mPD
GRADIENT 1:100 NEW 450UC →	PROPOSED 450mm U–CHANNEL WITH GRATING AT FALL 1: 100 (MIN)
GRADIENT 1:100 NEW 375UC →	PROPOSED 375mm U–CHANNEL WITH GRATING AT FALL 1: 100 (MIN)
CP5(s) □	PROPOSED COVERED DESILTED CATCHPIT NO. CP5
CP1 □	PROPOSED COVERED CATCHPIT NO. CP1
○	50mm DIA. PVC DOWNPIPE FROM ROOF TO GROUND TO DISCHARGE RUNOFF FROM ROOF

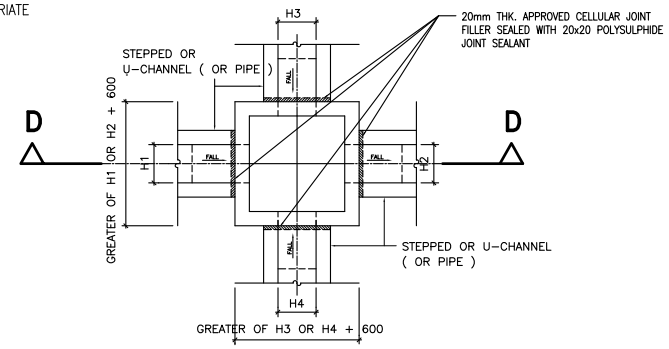


SECTION D – D WITH DESILTED TRAP

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

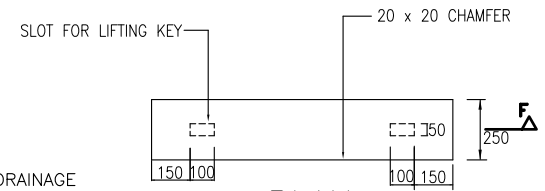
CATCHPITS

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



PLAN

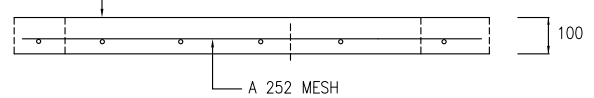
TYPICAL DETAILS OF CATCHPIT



PLAN

N.T.S.

GRADE 25D CONCRETE WITH ONE LAYER OF A 252 MESH REINFORCEMENT PLACED CENTRALLY F2 AND U2 FINISH



PRECAST CONCRETE COVERS FOR CATCHPIT

N.T.S.

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	11.69	10.69
CP2(s)	11.66	10.00
CP3	11.69	10.64
CP4	11.66	10.20
CP5(s)	13.00	12.00

REV	DESCRIPTION	CHECKED	APPROVED	DWN	DATE
B	RESUBMISSION NO.2	RC	AY	RY	NOV 24
A	RESUBMISSION NO.1	RC	AY	RY	JULY 24
	PLANNING DEPARTMENT SUBMISSION	RC	AY	RY	APRIL 24

PROJECT TITLE:

STORMWATER DRAINAGE PROPOSAL
LOT 1314, 1315, 1316 & 1317 IN D.D. 119

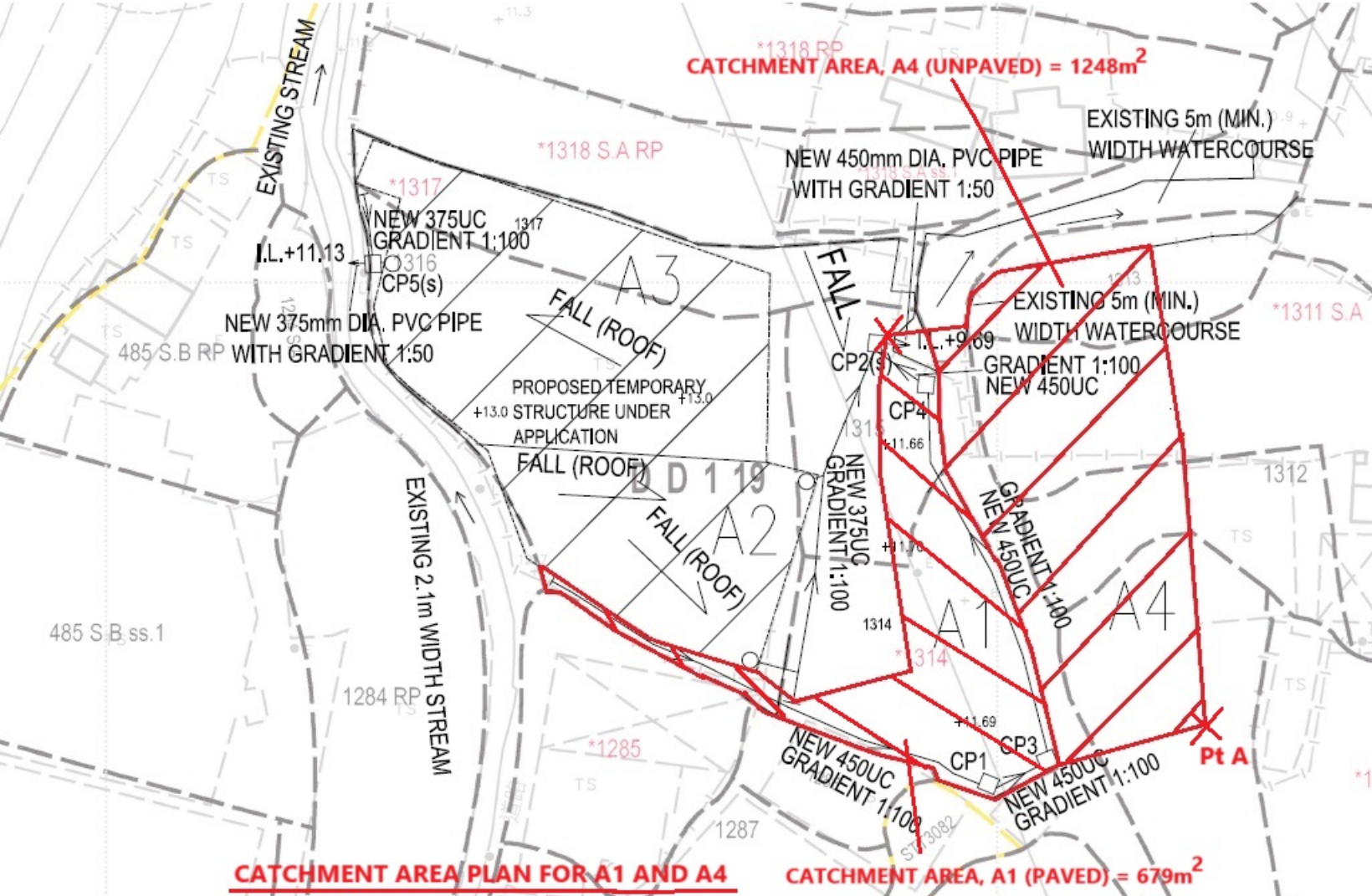
DRAWING TITLE:

DRAINAGE PROPOSAL PLAN AND TYPICAL DETAILS

SCALE :	N.T.S.		CAD FILE: CAD_REF
DRAWN	KELLI CHENG		DRAWING NO.
S.D	RY		SDP001B
DESIGNED	RC		
CHECKED	AY		
			B.D. REF. NO.:

Appendix B

Surface Drainage Design


CATCHMENT AREA, A4 (UNPAVED) = 1248m2
EXISTING STREAM
EXISTING 5m (MIN.) WIDTH WATERCOURSE
NEW 450mm DIA. PVC PIPE WITH GRADIENT 1:50
*1318 S.A RP
*1317
NEW 375UC GRADIENT 1:100
I.L.+11.13
CP5(s)
NEW 375mm DIA. PVC PIPE WITH GRADIENT 1:50
485 S.B RP
A3
FALL (ROOF)
PROPOSED TEMPORARY STRUCTURE UNDER APPLICATION
+13.0
FALL (ROOF)
A2
FALL
I.L.+9.69
CP2(3)
EXISTING 5m (MIN.) WIDTH WATERCOURSE
GRADIENT 1:100
NEW 450UC
CP4
+11.66
NEW 375UC GRADIENT 1:100
GRADIENT 1:100 NEW 450UC
A1
A4
1314
*1314
+11.69
CP3
CP1
Pt A
NEW 450UC GRADIENT 1:100
NEW 450UC GRADIENT 1:100
EXISTING 2.1m WIDTH STREAM
485 S.B ss.1
1284 RP
*1285
1287
*1311 S.A
1312
CATCHMENT AREA PLAN FOR A1 AND A4
CATCHMENT AREA, A1 (PAVED) = 679m2

Drainage Design at lot 1314, 1315, 1316
Project No.: and 1317 D.D.119 Date: 16-Nov-24
Prepared by: Ray Cheng

Check for the drainage capactiy of proposed 450UC

Catchment area,	A1	=	679	m^2	Assume k =	1.0 for paved surface
	A4	=	1248	m^2		0.3 for unpaved surface
	Total Catchment Area =	A1 + 0.3xA4 =	**1053.4**	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, CP2(s) (Ld) = 78.00 m
Shortest distance from summit point to outlet, CP2(s) (Ls) = 58.00 m

Elevation of remote point (Pt A) = 11.60 mPD
Elevation of outlet point, CP2(s) = 10.00 mPD

Average fall, H = $(z_1-z_2)/L_s$ x 100
= 2.76 m per 100m

From TGN30

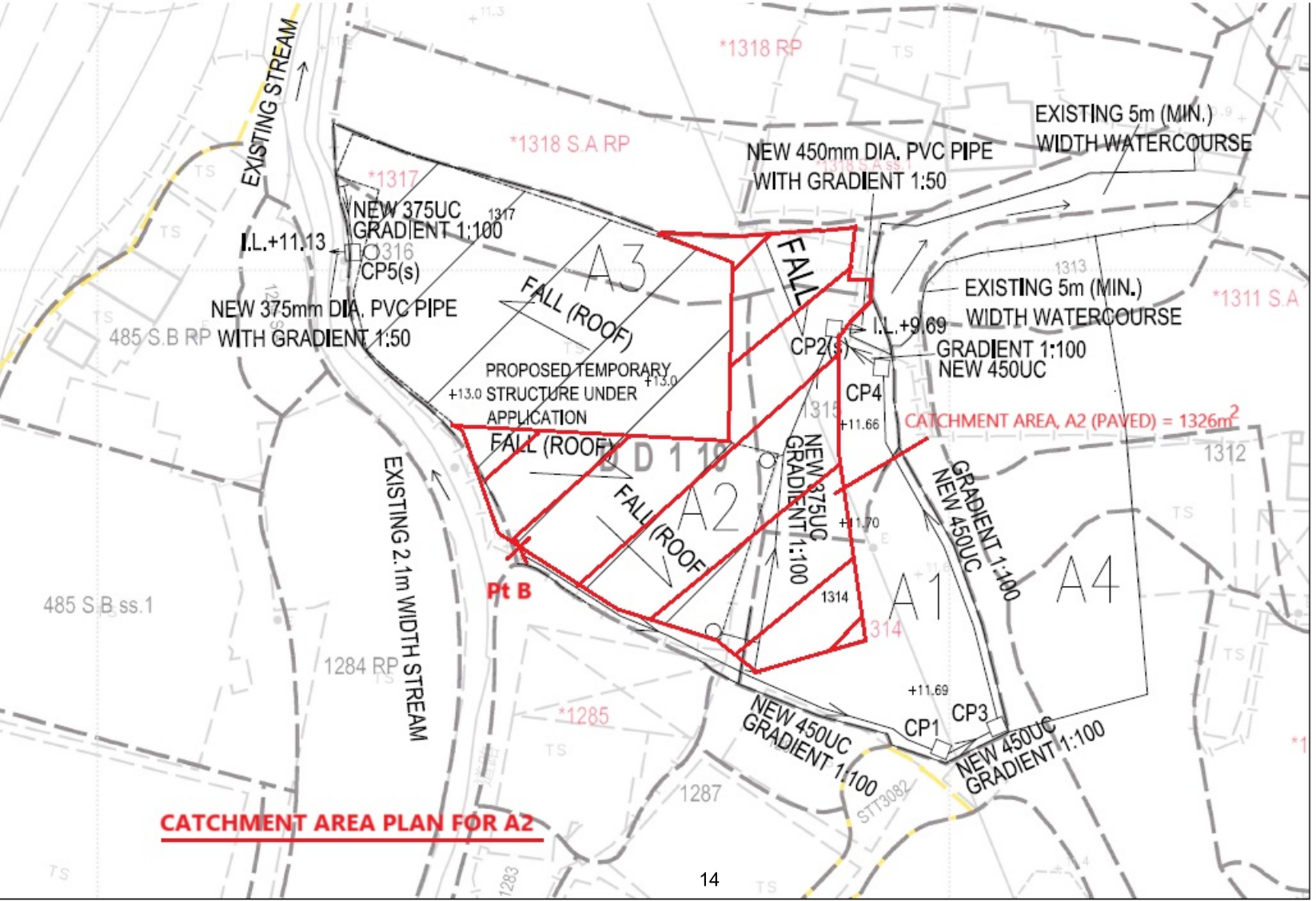
T_c = 0.14465 x L_d / ($H^{0.2}$ x $A^{0.1}$)
= 4.59 min

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

i = 330 mm/hr
Q = kiA/60 x 1.138
6593 lit/min

From TGN 43A1
For proposed 450 UC with 1 in 100 gradient

Maximum capacity	=	22500	lit/min	>	6593	o.k.
The corresponding velocity	=	2.25	m/s	<	4	o.k.



CATCHMENT AREA PLAN FOR A2

Drainage Design at lot 1314, 1315,
Project No.: 1316 and 1317 D.D.119 Date: 13-Jul-24
Prepared by: Ray Cheng

Check for the drainage capactiy of proposed 375UC

Catchment area, A2 = 1326 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, CP2(s) (Ld) = 78.00 m
Shortest distance from summit point to outlet, CP2(s) (Ls) = 48.00 m

Elevation of remote point (Pt B) = 13.00 mPD
Elevation of outlet point, CP2(s) = 10.00 mPD

Average fall, H = $(z_1-z_2)/L_s$ x 100
= 6.25 m per 100m

From TGN30

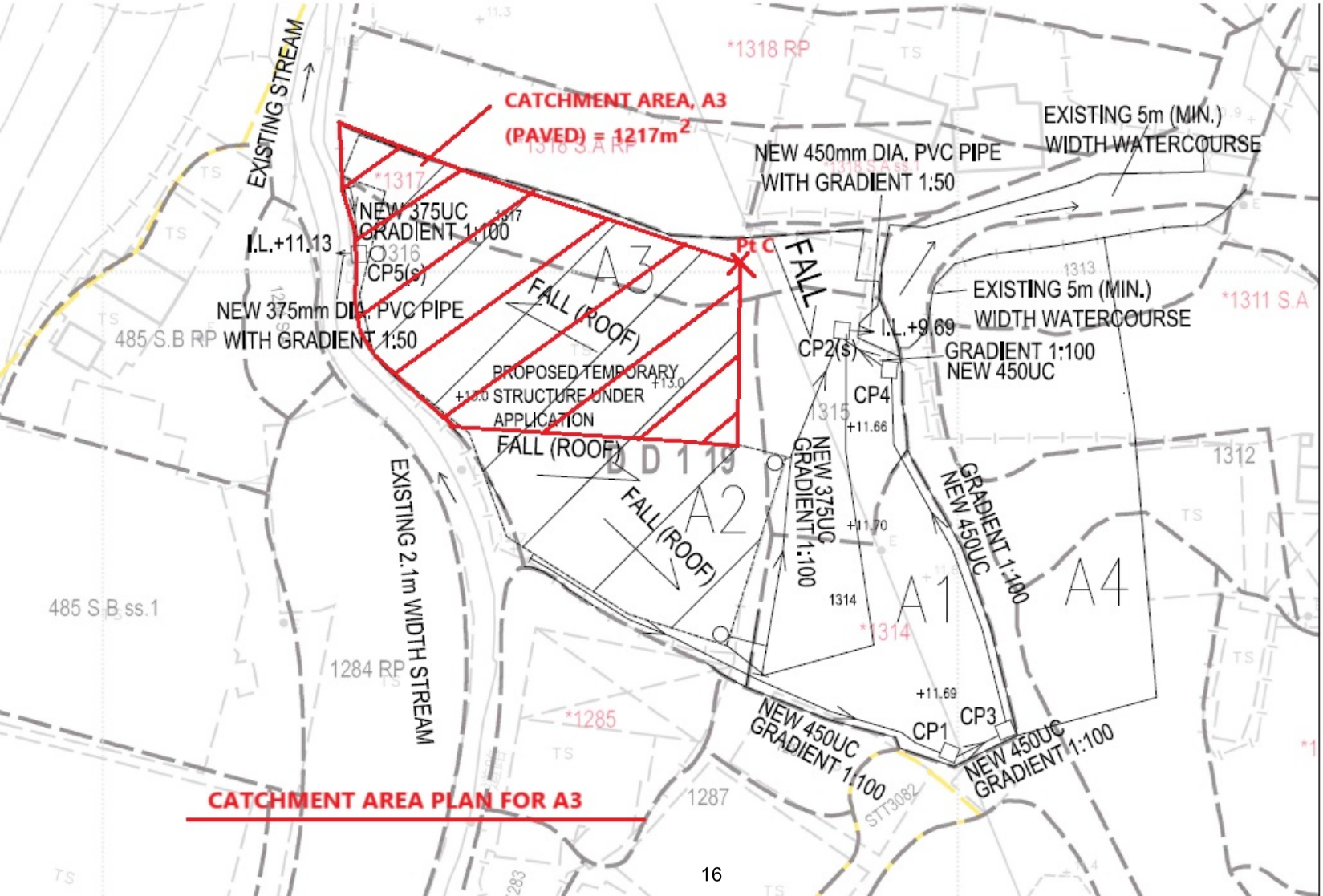
T_c = $0.14465 \times L_d / (H^{0.2} \times A^{0.1})$
= 3.81 min

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

i = 345 mm/hr
Q = kiA/60 x 1.138
8677 lit/min

From TGN 43A1
For proposed 375 UC with 1 in 100 gradient

Maximum capacity	=	13500	lit/min	>	8677	o.k.
The corresponding velocity	=	1.95	m/s	<	4	o.k.


EXISTING STREAM
CATCHMENT AREA, A3
(PAVED) = 1217m2
*1318 RP
EXISTING 5m (MIN.)
WIDTH WATERCOURSE
NEW 450mm DIA. PVC PIPE
WITH GRADIENT 1:50
*1317
NEW 375UC
GRADIENT 1:100
I.L.+11.13
CP5(s)
NEW 375mm DIA. PVC PIPE
WITH GRADIENT 1:50
485 S.B RP
A3
FALL (ROOF)
PROPOSED TEMPORARY
STRUCTURE UNDER
APPLICATION
FALL (ROOF)
Pt C
FALL
EXISTING 5m (MIN.)
WIDTH WATERCOURSE
I.L.+9.69
GRADIENT 1:100
NEW 450UC
CP2(s)
CP4
+11.66
1315
1313
*1311 S.A
1312
NEW 375UC
GRADIENT 1:100
+11.70
A2
A1
A4
GRADIENT 1:100
NEW 450UC
1314
*1314
EXISTING 2.1m WIDTH STREAM
485 S.B ss.1
1284 RP
+11.69
CP3
CP1
NEW 450UC
GRADIENT 1:100
NEW 450UC
GRADIENT 1:100
*1285
1287
STT3082
CATCHMENT AREA PLAN FOR A3

Drainage Design at lot 1314, 1315,
Project No.: 1316 and 1317 D.D.119 Date: 13-Jul-24
Prepared by: Ray Cheng

Check for the drainage capactiy of proposed 375UC

Catchment area, A3 = 1217 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, CP5(s) (Ld) = 85.00 m
Shortest distance from summit point to outlet, CP5(s) (Ls) = 48.00 m

Elevation of remote point (Pt C) = 13.00 mPD
Elevation of outlet point, CP5s) = 12.00 mPD

Average fall, H = $(z_1-z_2)/L_s$ x 100
= 2.08 m per 100m

From TGN30

T_c = 0.14465 x L_d / ($H^{0.2}$ x $A^{0.1}$)
= 5.22 min

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

i = 320 mm/hr
Q = kiA/60 x 1.138
7386 lit/min

From TGN 43A1
For proposed 375 UC with 1 in 100 gradient

Maximum capacity =	13500	lit/min	>	7386	o.k.
The corresponding velocity =	1.90	m/s	<	4	o.k.

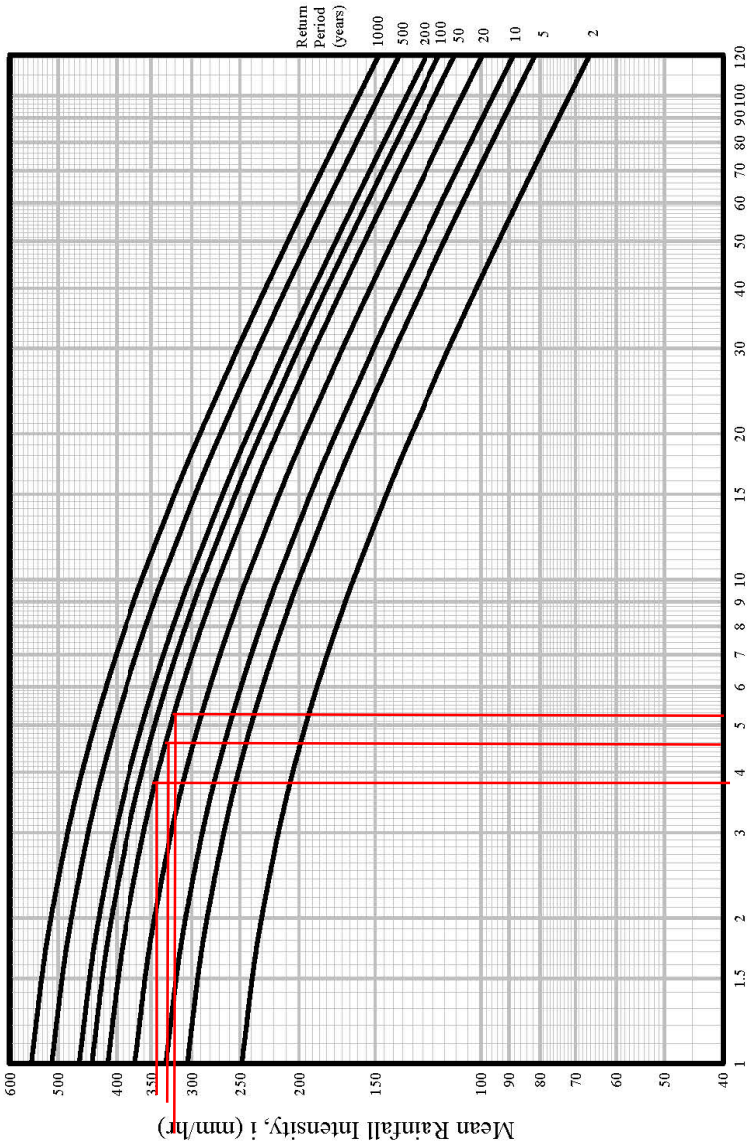
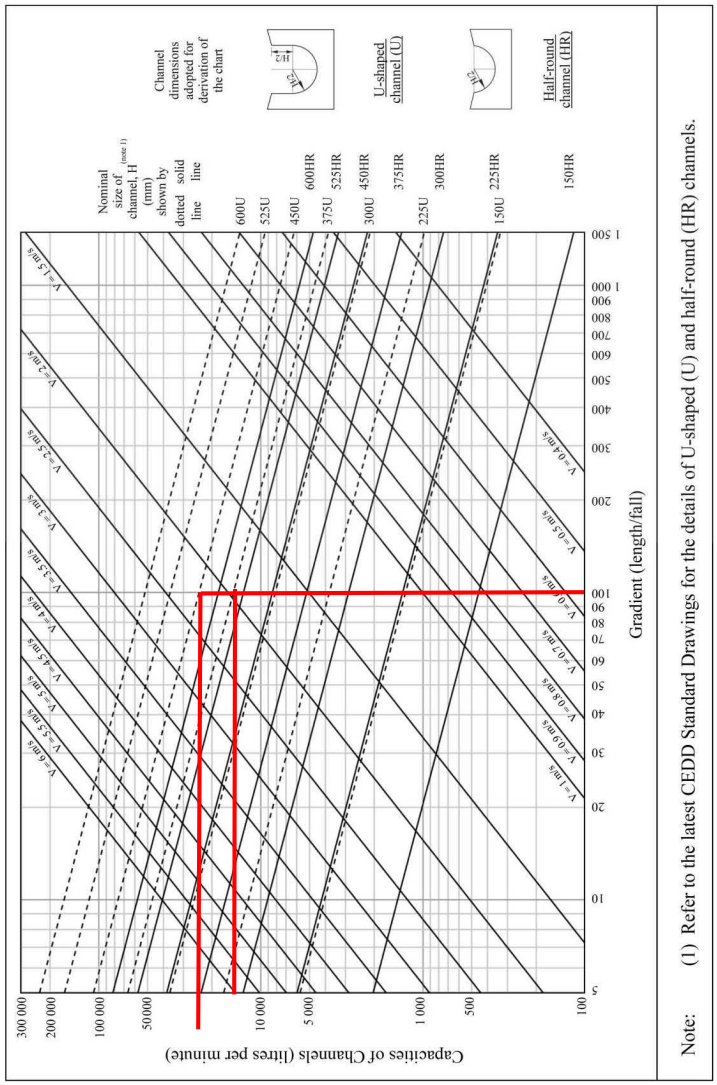


Figure 1 – Updated Intensity-Duration-Frequency Curves

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) 450UC should be 25000 x 0.9 = 22500 lit/min,
2) 375UC should be 15000 x 0.9 = 13500 lit/min,

ANNEX TGN 43 A1

CHECKING CAPACITY OF PROPOSED 375mm DIA. PIPE

The flow of A3 = 7386 l/min = 0.1231 m^3/s

< 0.283 m^3/s x 0.9 = 0.254 m^3/s

ks = 0·600mm
i = 0·004 to 0·1

ie hydraulic gradient =
1 in 250 to 1 in 10

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

velocities in m/s
discharges in m^3/s

continued

Gradient	Pipe diameters in mm: 350	375	400	450	500	525	600	675	700	750	800	825
0.02000	2.456	2.566	2.673	2.879	3.076	3.171	3.448	3.710	3.795	3.962	4.123	4.203
1/ 50	0.236	0.283	0.336	0.458	0.604	0.687	0.975	1.328	1.461	1.750	2.073	2.247
0.02200	2.577	2.692	2.804	3.020	3.227	3.327	3.617	3.892	3.981	4.156	4.325	4.409
1/ 45	0.248	0.297	0.352	0.480	0.634	0.720	1.023	1.393	1.532	1.836	2.174	2.357
0.02400	2.692	2.812	2.929	3.155	3.371	3.476	3.778	4.066	4.159	4.341	4.518	4.605
1/ 42	0.259	0.311	0.368	0.502	0.662	0.752	1.068	1.455	1.601	1.918	2.271	2.462
0.02600	2.803	2.928	3.050	3.284	3.509	3.618	3.933	4.233	4.329	4.519	4.703	4.794
1/ 38	0.270	0.323	0.383	0.522	0.689	0.783	1.112	1.515	1.666	1.996	2.364	2.563
0.02800	2.909	3.039	3.165	3.409	3.642	3.755	4.082	4.393	4.493	4.690	4.882	4.975
1/ 36	0.280	0.336	0.398	0.542	0.715	0.813	1.154	1.572	1.729	2.072	2.454	2.660
0.03000	3.012	3.146	3.277	3.529	3.770	3.888	4.226	4.548	4.652	4.855	5.053	5.151
1/ 33	0.290	0.347	0.412	0.561	0.740	0.842	1.195	1.627	1.790	2.145	2.540	2.753

CHECKING THE CAPACITY OF PROPOSED 450mm DIA. PIPE

Total flow of A1, A4 and A2 = 6593 + 8677 = 15,270 l/min

= 0.25 m^3/s

< 0.458 m^3/s x 0.9 = 0.412 m^3/s

ks = 0·600mm
i = 0·004 to 0·1
ie hydraulic gradient = 1 in 250 to 1 in 10

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

velocities in m/s
discharges in m^3/s

continued

Gradient	Pipe diameters in mm: 350	375	400	450	500	525	600	675	700	750	800	825
0.02000 1/ 50	2.456	2.566	2.673	2.879	3.076	3.171	3.448	3.710	3.795	3.962	4.123	4.203
	0.236	0.283	0.336	0.458	0.604	0.687	0.975	1.328	1.461	1.750	2.073	2.247
0.02200 1/ 45	2.577	2.692	2.804	3.020	3.227	3.327	3.617	3.892	3.981	4.156	4.325	4.409
	0.248	0.297	0.352	0.480	0.634	0.720	1.023	1.393	1.532	1.836	2.174	2.357
0.02400 1/ 42	2.692	2.812	2.929	3.155	3.371	3.476	3.778	4.066	4.159	4.341	4.518	4.605
	0.259	0.311	0.368	0.502	0.662	0.752	1.068	1.455	1.601	1.918	2.271	2.462
0.02600 1/ 38	2.803	2.928	3.050	3.284	3.509	3.618	3.933	4.233	4.329	4.519	4.703	4.794
	0.270	0.323	0.383	0.522	0.689	0.783	1.112	1.515	1.666	1.996	2.364	2.563
0.02800 1/ 36	2.909	3.039	3.165	3.409	3.642	3.755	4.082	4.393	4.493	4.690	4.882	4.975
	0.280	0.336	0.398	0.542	0.715	0.813	1.154	1.572	1.729	2.072	2.454	2.660
0.03000 1/ 33	3.012	3.146	3.277	3.529	3.770	3.888	4.226	4.548	4.652	4.855	5.053	5.151
	0.290	0.347*	0.412	0.561	0.740	0.842	1.195	1.627	1.790	2.145	2.540	2.753
0.03200 1/ 31	3.111	3.250	3.385	3.645	3.895	4.015	4.365	4.697	4.805	5.015	5.220	5.320
	0.299	0.359	0.425	0.580	0.765	0.869	1.234	1.681	1.849	2.216	2.624	2.844

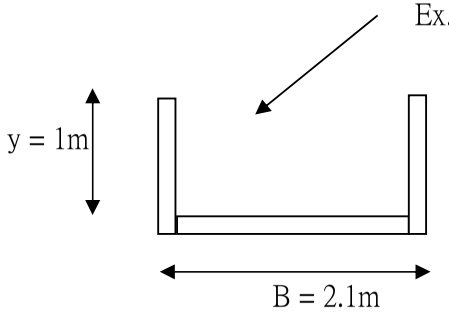
Drainage Design and Checking Page no.

Project No.: Date: 14-Jul-24
Prepared by: Ray Cheng

Check for the drainage capactiy **(Existing 2.1m width Stream course)**

From Manning Equation, for existing 2.1m width and 1m depth rectangular streamcourse

Ex. Streamcourse



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

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

R= 0.51 k = 1.49
S = 0.01 n = 0.04

Q = 475069 lit/min > 7386 lit/min for Catchment area A3

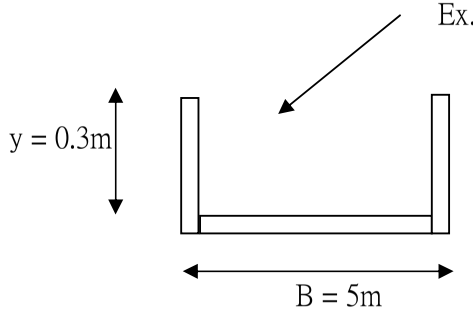
Drainage Design and Checking Page no.

Project No.: Date: 16-Nov-24
Prepared by: Ray Cheng

Check for the drainage capactiy **(Existing 5.0m width Watercourse)**

From Manning Equation, for existing 5m width and 0.3m depth rectangular watercourse

Ex. Watercourse



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

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

R= 0.27 k = 1.49
S = 0.01 n = 0.04

Q = 220263 lit/min > 6593+8677 = 15,270 l/min for for Catchment area A1, A4 and A2

Appendix C

Photo of Existing Stream and Watercourse

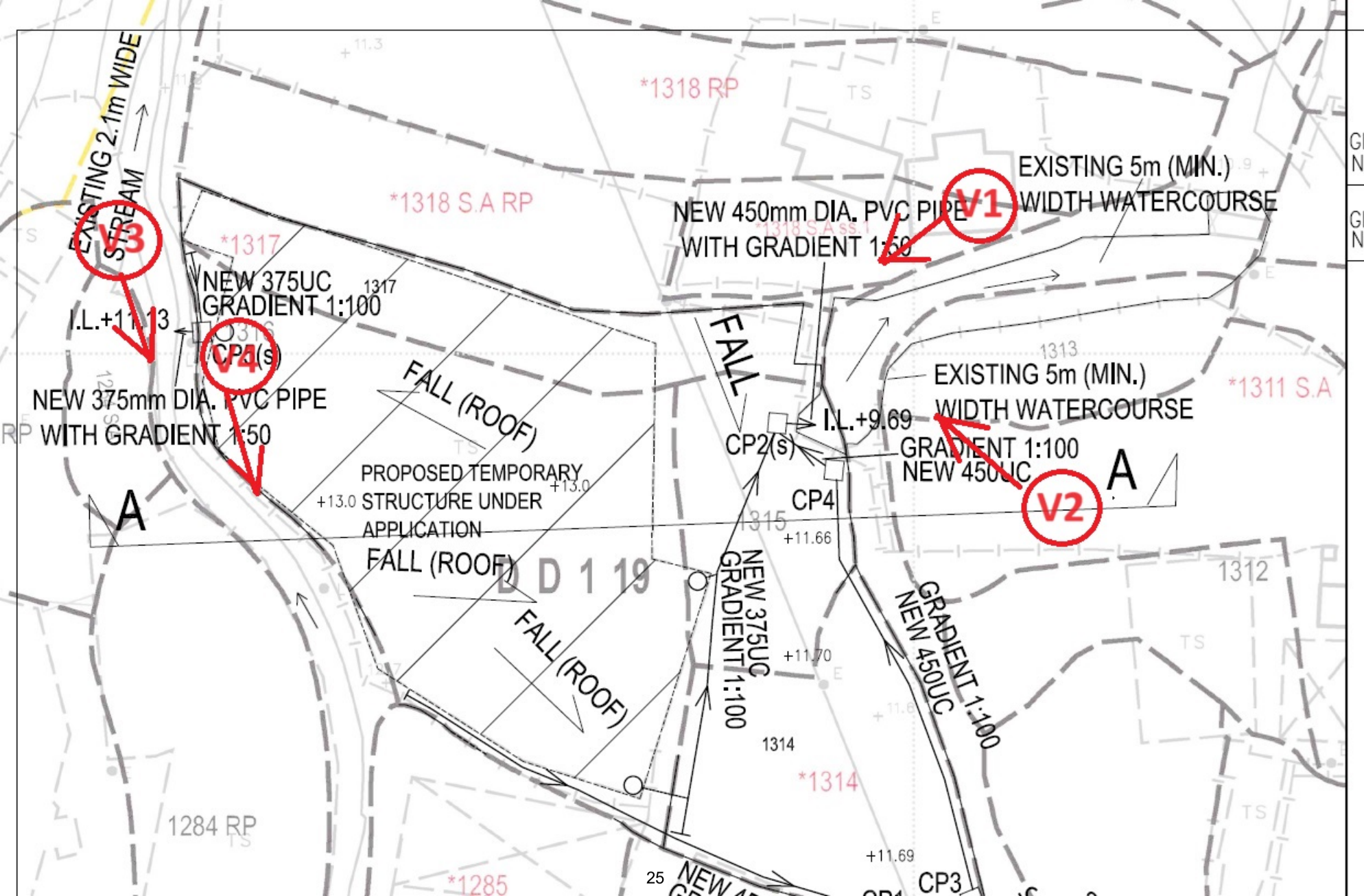

EXISTING 2.1m WIDE STREAM
V3
V4
V1
V2
NEW 375UC
GRADIENT 1:100
I.L.+11.13
CP4(s)
NEW 375mm DIA. PVC PIPE
WITH GRADIENT 1:50
NEW 450mm DIA. PVC PIPE
WITH GRADIENT 1:50
EXISTING 5m (MIN.)
WIDTH WATERCOURSE
FALL
FALL (ROOF)
PROPOSED TEMPORARY
STRUCTURE UNDER
APPLICATION
FALL (ROOF)
FALL (ROOF)
I.L.+9.69
CP2(s)
GRADIENT 1:100
NEW 450UC
CP4
+11.66
EXISTING 5m (MIN.)
WIDTH WATERCOURSE
A
A
NEW 375UC
GRADIENT 1:100
GRADIENT 1:100
NEW 450UC
+11.70
+11.69
CP3
*1318 RP
*1318 S.A RP
*1317
*1314
*1285
1284 RP
1317
1315
1314
1313
1312
*1311 S.A
+13.0
+13.0

Photo of existing watercourse, V1

Photo of existing watercourse, V2

Photo of existing stream, V3

Photo of existing watercourse, V4