Drainage Submission

in support of

Section 12A Application for Proposed Rezoning from "Comprehensive Development Area" and "Green Belt" Zones to "Residential (Group A)4" Zone and To Amend the Notes of the Zone Applicable to the Site for Proposed Residential Development and Social Welfare Facility (Residential Care Home for the Elderly) at Lots 398 RP and 2188 in D.D. 121, Tai Tao Tsuen, Hung Shui Kiu, New Territories

(HT 23121)

March 2026

Drainage Consultant:

何田顧問工程師有限公司
HO TIN & ASSOCIATES
CONSULTING ENGINEERS LIMITED
[redacted]

Prepared & approved by	LEE Kwok Cheung *RPE(Civil)* *(Registration No. RP0159301)*	

1. Background

1.1 Ho Tin & Associates Consulting Engineers Limited was appointed by the Client to prepare this drainage submission to support a Section 12A Application for proposed rezoning from "Comprehensive Development Area" and "Green Belt" Zones to "Residential (Group A)4" Zone and amend the Notes of the Zone applicable to the site for Proposed Residential Development and Proposed Social Welfare Facility (Residential Care Home for the Elderly).

2. Objectives and Scope of this Report

2.1 The objective of this report is to propose drainage works in support of the proposed development (the 'subject development') in ensuring no unacceptable adverse drainage impact to be caused on the subject site and the surrounding areas.

2.2 The scope of this report includes:

(i) identifying existing/planned drainage conditions of the subject area;
(ii) evaluating flooding susceptibility and potential drainage impacts on the subject area; and
(iii) proposing drainage improvement works.

3. The Subject Site and Proposed Development

3.1 The subject site comprises of at Lots 398 RP and 2188 in D.D. 121, Tai Tao Tsuen, Hung Shui Kiu, New Territories. It has an area of about 2,138m^2 and is located on the southeastern side of the 'Uptown' residential development and is bounded by Fui Sha Wai South Road on the northeastern side. It is proposed to develop a Proposed Residential Development and Social Welfare Facility (Residential Care Home for the Elderly). The site location is shown on **Figure D1**.

4. Existing Drainage Conditions of the Subject Site

4.1 The subject site is located on a generally flat area bounded by the 'Uptown' residential development and Fui Sha Wai South Road/Hung Tin Road which are now served by own stormwater drainage systems and would not discharge onto the subject site.

4.2 The subject site was previously used as open storage and is vacant and fenced off at present. With respect to the drainage information retrieved recently from the GEOINFO Map, there should have an existing 450U channel running to the southeast in front of the northeastern boundary of the subject site. The 450U channel would discharge into a 525mm diameter drain and then into an existing 2000mm x 2000mm box culvert to the east of the subject site.

4.3 Besides, there is an existing 300mm diameter drain at the east side of the subject site collecting surface flow from the subject site and discharging into the existing 2000mm x 2000mm box culvert. An extract of the relevant records of the existing drainage information of the area retrieved from the GEOINFO Map is shown on **Figure D2**.

4.4 Colour photos (locations of the photo taken shown in **Figure D3**) showing the existing drainage conditions of the subject area are shown in the following:

	
Plate No. 1 – Existing conditions of the subject site	Plate No. 2 – General view of Fui Sha Wai South Road in front of the subject site entrance (an existing village-type refuse collection point is located on the opposite side of the subject site)

	
Plate No. 3 – Existing conditions of the subject site entrance (Existing Catchpit 1 is located on the right hand side of the entrance but no existing 450U channel is found)	Plate No. 4 – Existing Catchpit 1 and the adjacent existing U channel which is separated from the Existing Catchpit 1 and conveys flow toward Castle Peak Road – Hung Shui Kiu
	
Plate No. 5 – Far view toward the existing 2000mm x 2000mm channel showing existing Catchpit 2 located beside Fui Sha Wai South Road	Plate No. 6 – Existing Catchpit 2 which should receive flow from an existing 450U channel and discharge into an existing 525mm diameter drain with respect to the GEOINFO Map

	
Plate No. 7 – View back toward the subject site entrance from the existing 2000mm x 2000mm channel/box culvert	Plate No. 8 – Existing 2000mm x 2000mm channel to the east of the subject site
	
Plate No. 9 – Outlet of an existing 525mm diameter drain at the existing 2000mm x 2000mm box culvert (under the road) to the east of the subject site	Plate No. 10 – Outlet of an existing 300mm diameter drain at the existing 2000mm x 2000mm channel to the east of the subject site

5. Approach and Methodology of Drainage Assessment

5.1 Capability of the existing drainage is assessed and new drainage is proposed in this report. Assessment criteria is based on the recommendation set out in the Stormwater Drainage Manual (Fifth edition, Jan 2018) (SDM) and its Corrigendum No. 1/2022, 1/2024 and 2/2024 issued by DSD. Design Return Period of 200 and 50 years (recommended for 'Main Rural Catchment Drainage Channel' in SDM) is adopted for assessing the internal drainage and the existing 2000mm x 2000mm channel respectively.

5.2 Flow directions of the surface runoff and catchment boundaries of the subject area is shown in **Figure D1**, and assessment of the major drainage is illustrated in the **Appendix** of this report.

5.3 The corresponding runoffs under rainfall intensity for various return period are worked out with reference to Rational Method. Brandy-Williams method is used in calculation of the time of concentration. A uniformly distributed rainfall with an intensity is determined by the Intensity-Duration-Frequency. With referenced to Table 3a - Storm Constants for different return periods of HKO Headquarters from SDM, the rainfall profiles are derived based on the following equation:

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

where i = mean rainfall intensity (mm/hr)
t = duration time of concentration (min)
a, b and c = storm constants given in Table below

Table : Storm Constants

Return Period (years)	200	50
a	508.8	505.5
b	3.46	3.29
c	0.322	0.355

5.4 A 16.0% rainfall increase is adopted in the hydraulic calculation to cater for effects due to climate change in accordance with the table 28 with projection to End of 21st Century as stipulated in the item (e) and (k) of the SDM - Corrigendum No. 1/2022. Besides, taking into consideration of design allowance in End of 21st Century, a further 12.1% rainfall increase is incorporated into the hydraulic assessment.

5.5 Hydraulic assessment is enclosed in the **Appendix**. 10% reduction in flow area has been incorporated to cater for potential deposition of sediment in stormwater channels and pipes as recommended in the SDM. The proposed channels and underground drainage are designed to cater for the estimated runoff under the designed rainstorms. With respect to the calculation, the proposed stormwater drainage system is capable to cater for the surface runoff without causing any adverse drainage impacts on the subject site and its surroundings. Since all drainage would have sufficient spare capacity, no water backup will occur at the upstream under the design rainstorm return periods.

5.6 The subject proposed development would not alter the existing drainage patterns of the area and the surface runoff of the subject proposed development would be properly collected and conveyed to an appropriate discharge point. No blockage of any existing flow paths would be incurred.

6. Proposed Drainage Works

6.1 Peripheral channels with catchpits will be constructed to intercept all surface runoff running across the subject site boundary. Stormwater falling onto the roofs of the proposed building(s) of the subject development will be collected and conveyed to proposed channels on ground level by building drains.

6.2 The flows inside the surface channels and peripheral channels will be eventually discharged into a terminal manhole with desilting trap (details refer to DSD Standard Drawing No. DS 1090) from which the flows will be further discharged into the existing 2000 x 2000mm channel to the east of the subject site. The existing 300mm diameter discharge pipe would be abandoned and a new 450mm diameter drain will be constructed to connect the proposed terminal manhole to the existing 2000 x 2000mm channel.

6.3 With respect to the hydraulic assessment enclosed in the **Appendix** of this report, the proposed drainage is adequate to properly convey the estimated peak flow into the existing 2000mm x 2000mm box culvert to the east of the subject site without causing any flooding.

6.4 Capacity of the existing 2000mm x 2000mm channel/box culvert has also been assessed and is confirmed to be adequate to convey the estimated peak flow without flooding. A summary table showing the hydraulic capacity/utilisation for the existing and proposed drainage facilities in the designed return period is shown below for reference:

USCP/USMH (refer to Figure D4)	DSCP/DSMH (refer to Figure D4)	SLOPE (1 in)	SIZE (mm)	CHANNEL TYPE	VELOCITY (m/s)	ADOPTED 90% FLOW CAPACITY (m^3/s) (to cater for potential deposition of sediment)	OCCUPANCY OF THE PROPOSED PIPE / CHANNEL
Starting Point A	CP1.1	200	450	UC	1.28	0.21	65.1%
CP1.1	CP1.2	200	450	UC	1.28	0.21	64.6%
CP1.2	CP1.3	200	450	UC	1.28	0.21	62.7%
CP1.3	CP1.4	200	450	UC	1.28	0.21	61.4%
CP1.4	CP1.5	200	450	UC	1.28	0.21	61.1%
CP1.5	TM	200	450	UC	1.28	0.21	60.9%
Starting Point B	CP2.1	200	450	UC	1.28	0.21	70.1%
CP2.1	CP2.2	200	450	UC	1.28	0.21	69.6%
CP2.2	CP2.3	200	450	UC	1.28	0.21	69.2%
CP2.3	CP2.4	200	450	UC	1.28	0.21	68.5%
CP2.4	CP2.5	200	450	UC	1.28	0.21	68.3%
CP2.5	CP2.6	200	450	UC	1.28	0.21	66.7%
CP2.6	CP2.7	200	450	UC	1.28	0.21	66.2%
CP2.7	CP2.8	200	450	UC	1.28	0.21	65.8%
CP2.8	CP2.9	200	450	UC	1.28	0.21	65.4%
CP2.9	TM	200	450	UC	1.28	0.21	65.2%
TM	Outlet	50	450	concrete pipe	2.88	0.41	62.9%
The Existing 2000mm x 2000mm Box Culvert							
highest point	Point Z	-	-	-	-	-	-
Point Z	Point Y	500	2000	box culvert	2.13	7.68	67.7%

6.5 A proposed stormwater drainage layout is shown on **Figure D4**. Detailed designs of the drainage system (including building drains) will be submitted to relevant government departments via Buildings Department's central processing mechanism for approval at the later stage. No insurmountable technical problems is envisaged.

6.6 The applicant is committed to obtain all necessary consents from the relevant government departments and lot owners, where necessary, in constructing the proposed drainage provisions outside the subject site boundary before construction.

7. Conclusion and Recommendations

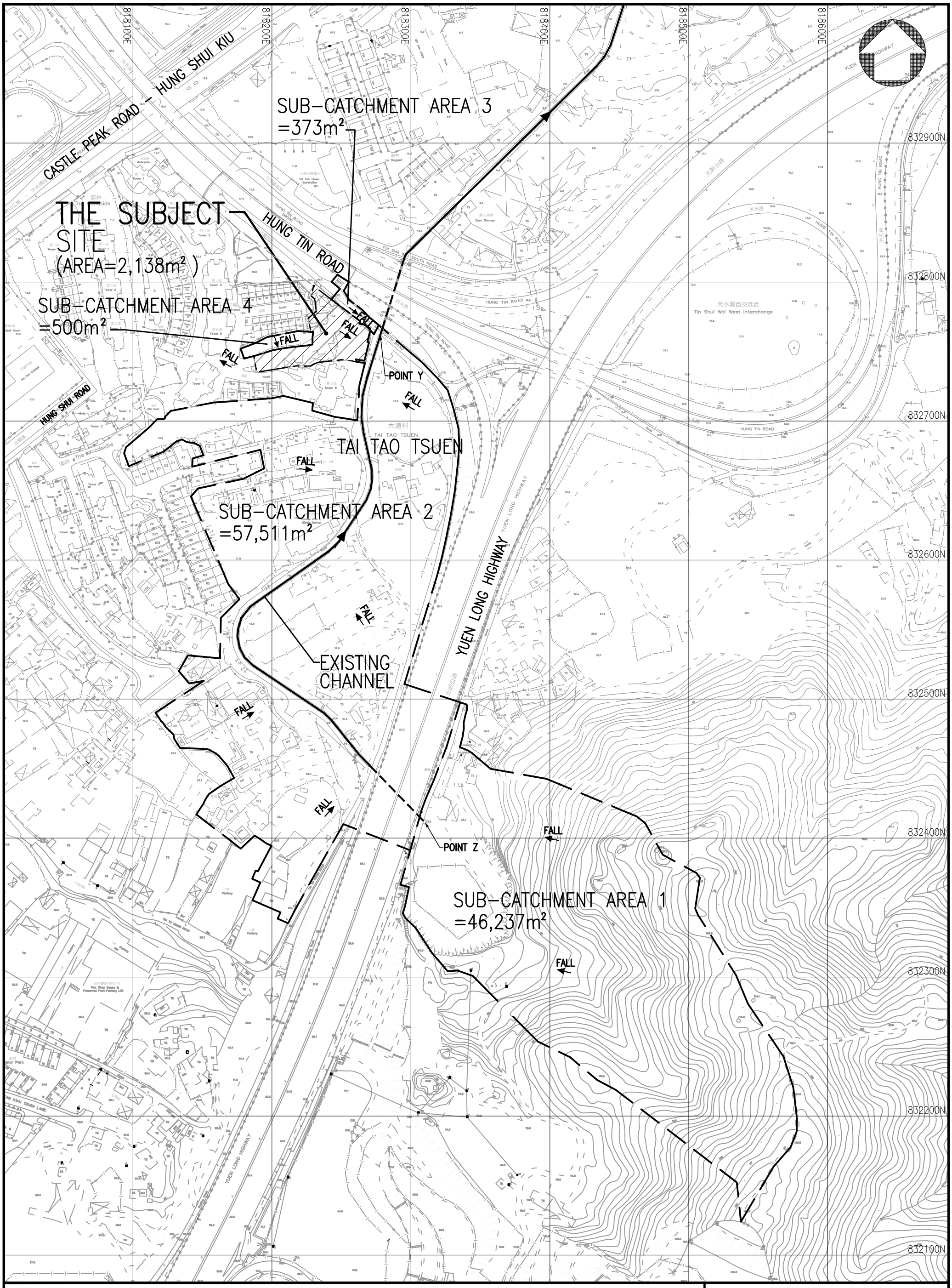
7.1 The subject site area is now vacant and fenced off. It is proposed to be developed into a residential development and Social Welfare Facility (Residential Care Home for the Elderly).

7.2 All stormwater collected by the surface channels and building drains of the subject development will be conveyed into a terminal manhole with desilting trap from which the flows will be discharged via a proposed new 450mm diameter drain (the existing 300mm diameter drain would be abandoned) to the existing 2000mm x 2000mm channel to the east of the subject site which was checked to be adequate to convey the estimated peak flow. The flow incurred by the subject development would not overload the existing drainage of the subject area.

7.3 Detailed drainage connecting works designs will be submitted to the Building Authority for central processing for approval at the later stage. No insurmountable technical problems is envisaged.

7.4 The applicant will obtain all necessary consents from the relevant government departments and lot owners, where necessary, for constructing the proposed drainage provisions outside the subject site boundary prior to construction.

7.5 The subject proposed development would neither alter the existing drainage patterns nor obstruct the flow paths of the area. In conclusion, the subject development with implementation of the proposed drainage connecting works will not cause any adverse drainage impacts onto the area.



PROJECT

何田顧問工程師有限公司
HO TIN & ASSOCIATES
CONSULTING ENGINEERS LIMITED

TITLE

DRAINAGE PATH AND CATCHMENT AREAS

SCALE

1 : 2500 – A3

DRAWING No.

FIGURE D1

H:\23121_Lot 2188\DRAWING\23121_FIGURE D1_01 D3_00 & D4_01.dwg, 11/2/2026 12:01:41

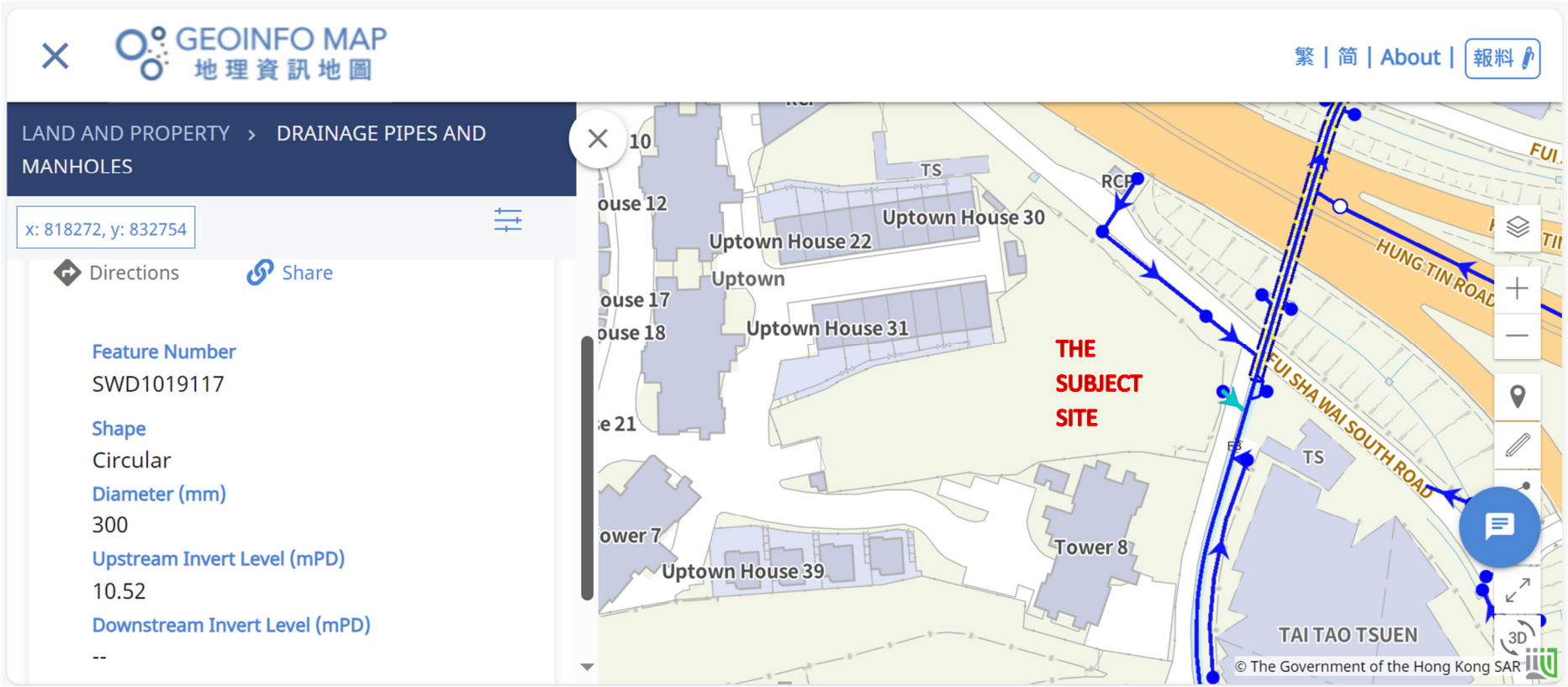
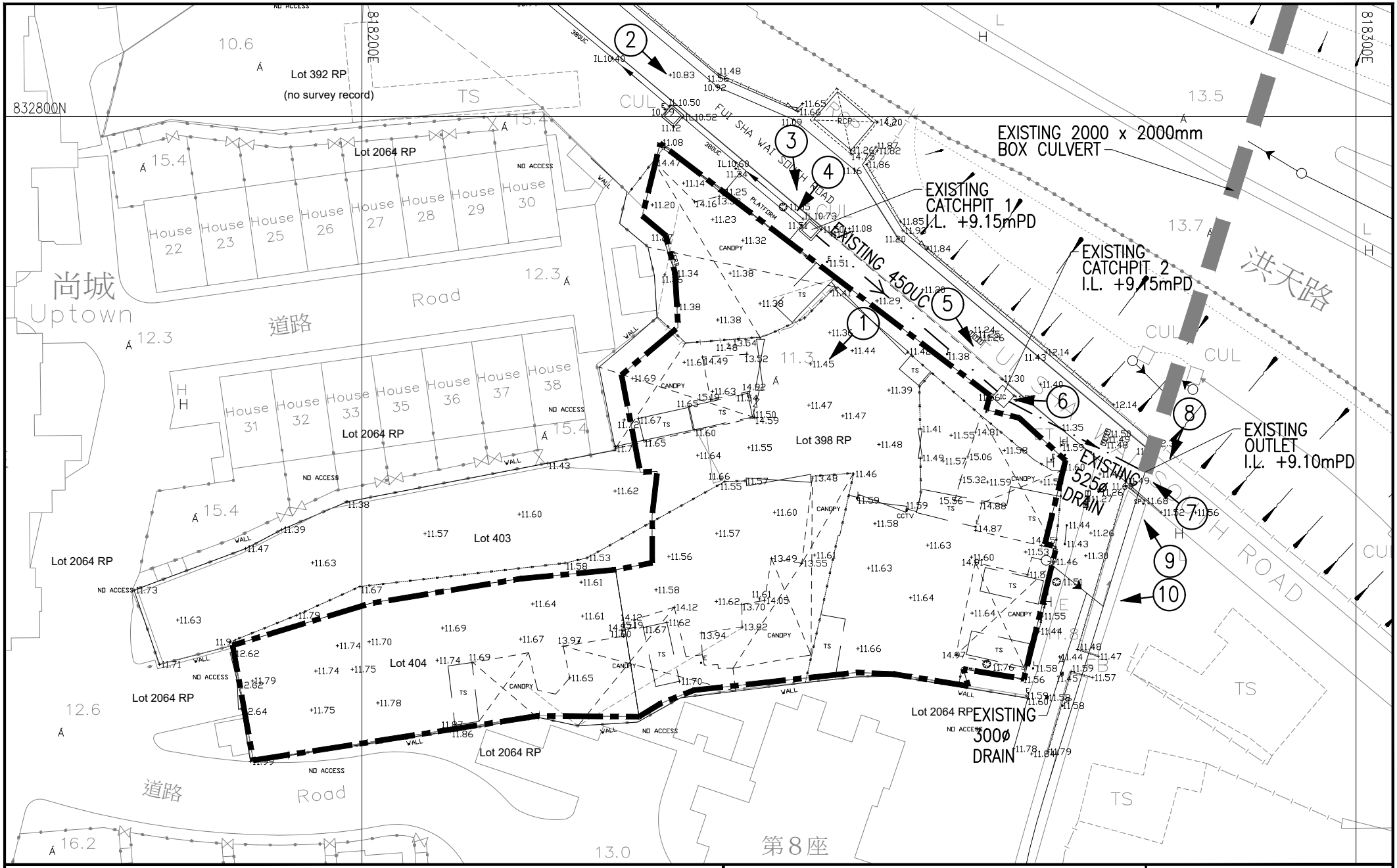


FIGURE D2 - Extract of the Relevant Recorded Existing Drainage Information of the Area retrieved from the GEOINFO Map



LEGEND:

- THE SUBJECT SITE
- LOCATION OF PHOTO TAKEN (N-PLATE NO.)
- 450UC — EXISTING U-CHANNEL
- 525ø — EXISTING DRAIN
- EXISTING STORMWATER DRAINAGE

PROJECT

TITLE: EXISTING PUBLIC STORMWATER DRAINAGE LAYOUT IN THE IMMEDIATE VICINITY (REFER TO GEOINFO MAP'S INFORMATION)

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SCALE: 1 : 500 – A4

DRAWING No.: FIGURE D3

H:\23121_Lot 2188\DRAWING\23121_FIGURE D1 D3 & D4.dwg, 26/8/2025 14:59:10

CP2.5
C.L. +11.30
I.L. +10.83

CP2.4
C.L. +11.30
I.L. +10.85

CP2.3
C.L. +11.50
I.L. +11.05

CP2.2
C.L. +11.70
I.L. +11.16

CP2.6
C.L. +11.50
I.L. +10.69

POINT B
C.L. +11.70
I.L. +11.25

POINT A
C.L. +11.70
I.L. +11.25

CP2.1
C.L. +11.70
I.L. +11.20

CP2.7
C.L. +11.60
I.L. +10.64

CP2.8
C.L. +11.60
I.L. +10.60

CP2.9
C.L. +11.60
I.L. +10.57

CP1.1
C.L. +12.00
I.L. +11.04

CP1.2
C.L. +12.00
I.L. +11.00

CP1.3
C.L. +11.70
I.L. +10.82

CP1.4
C.L. +11.70
I.L. +10.67

CP1.5
C.L. +11.60
I.L. +10.64

AREA A
1289m²

AREA B
849m²

Lot 392 RP
(no survey record)

Lot 2064 RP

Lot 403

Lot 404

Lot 398 RP

EXISTING 300ø DRAIN

EXISTING 2000 x 2000mm
BOX CULVERT

EXISTING
CATCHPIT 1
I.L. +9.65mPD

EXISTING 450UC

EXISTING
525ø
DRAIN

EXISTING
OUTLET
I.L. +9.10mPD

EXISTING 300ø DRAIN
TO BE ABANDONED

PROPOSED OUTLET
I.L. +10.27

PROPOSED 450ø
DRAIN

TM
C.L. +11.60
A1 +10.61
A2 +10.54
X1 +10.54
D.T.L. +10.39

FUI SHA WAI SOUTH ROAD

Proposed Run-in/out

洪天路

第5座
Tower 5

第6座
Tower 6

第8座
Tower 8

尚城
Uptown

道路
Road

House 22
House 23
House 25
House 26
House 27
House 28
House 29
House 30
House 31
House 32
House 33
House 35
House 36
House 37
House 38
House 40
House 41
House 42

LEGEND:

- THE SUBJECT SITE
- PROPOSED 450 U-CHANNEL @ 1 IN 200
- PROPOSED CATCH PIT
- PROPOSED TERMINAL MANHOLE
- EXISTING UC
- BOUNDARY OF SITE CATCHMENT
- EXISTING DRAIN
- EXISTING STORMWATER DRAINAGE

PROJECT

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CONSULTING ENGINEERS LIMITED

TITLE
PROPOSED STORMWATER DRAINAGE LAYOUT

SCALE
1 : 400 – A3

DRAWING No.
FIGURE D4

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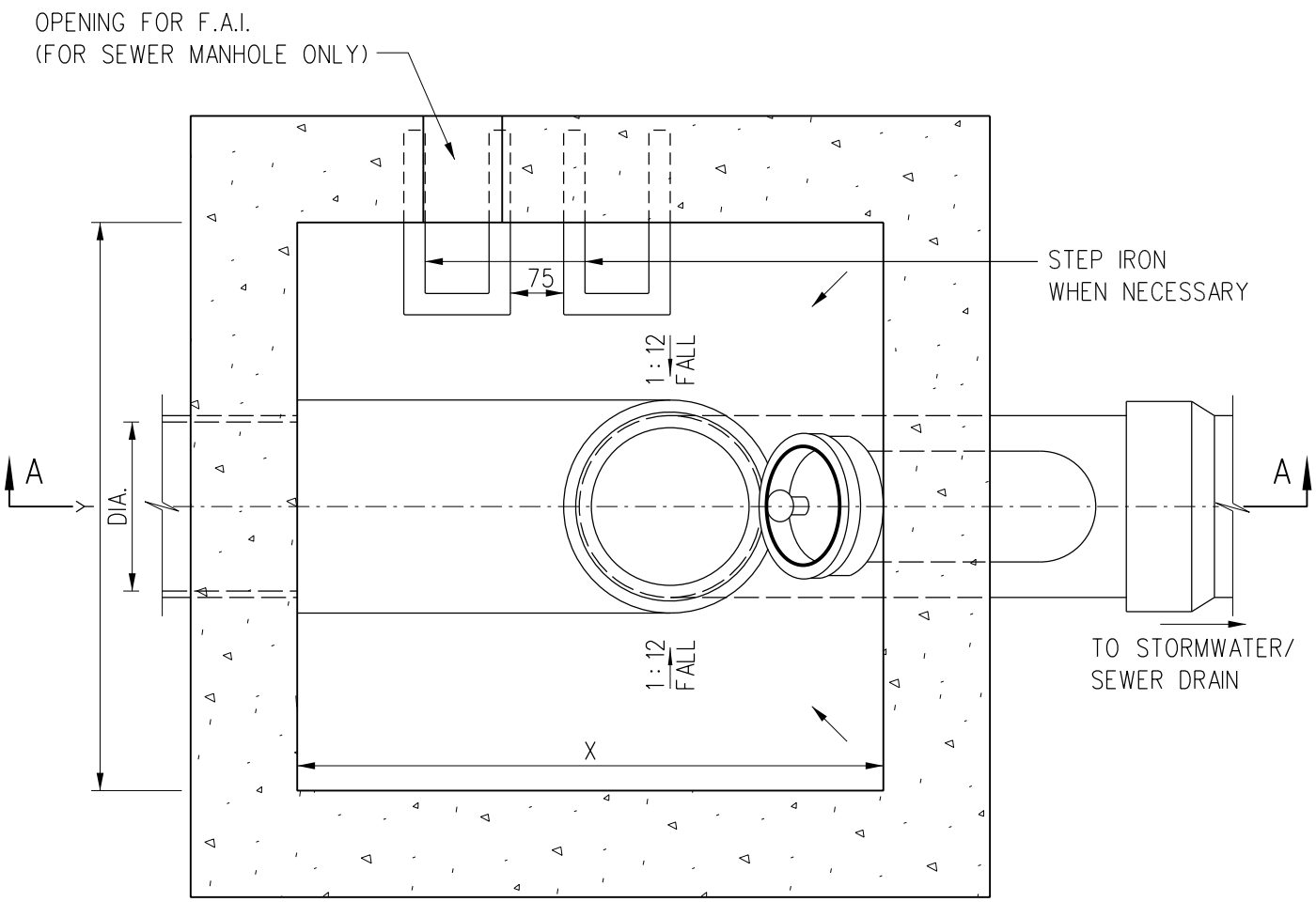


SECTIONAL PLAN

MANHOLE COVER OPENING SIZE (mm)	450	675
X (mm)	600 (min)	825 (min)
Y (mm)	(DIA. + 500)	(DIA. + 500) OR 675, WHICHEVER IS GREATER

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. CONCRETE IS TO BE GRADE 30/20.
3. PIPE DIAMETER OF PIPE TO BE LESS THAN OR EQUAL TO 450 mm.
4. FOR MANHOLE COVER OPENING SIZE 675, RECESS WITH SQUARE STEEL ROD SHALL BE PROVIDED AT TOP OF MANHOLE CHAMBER FOR INSTALLING MONITORING DEVICE(S). DETAILS REFER TO DSD STANDARD DRAWING NO. DS 1099.

REV.	DESCRIPTION	SIGNATURE	DATE
A	NOTE 4 ADDED & DRAWING AMENDED	ORIGINAL SIGNED	2.8.2022
	NEW ISSUE	ORIGINAL SIGNED	13.1.2016

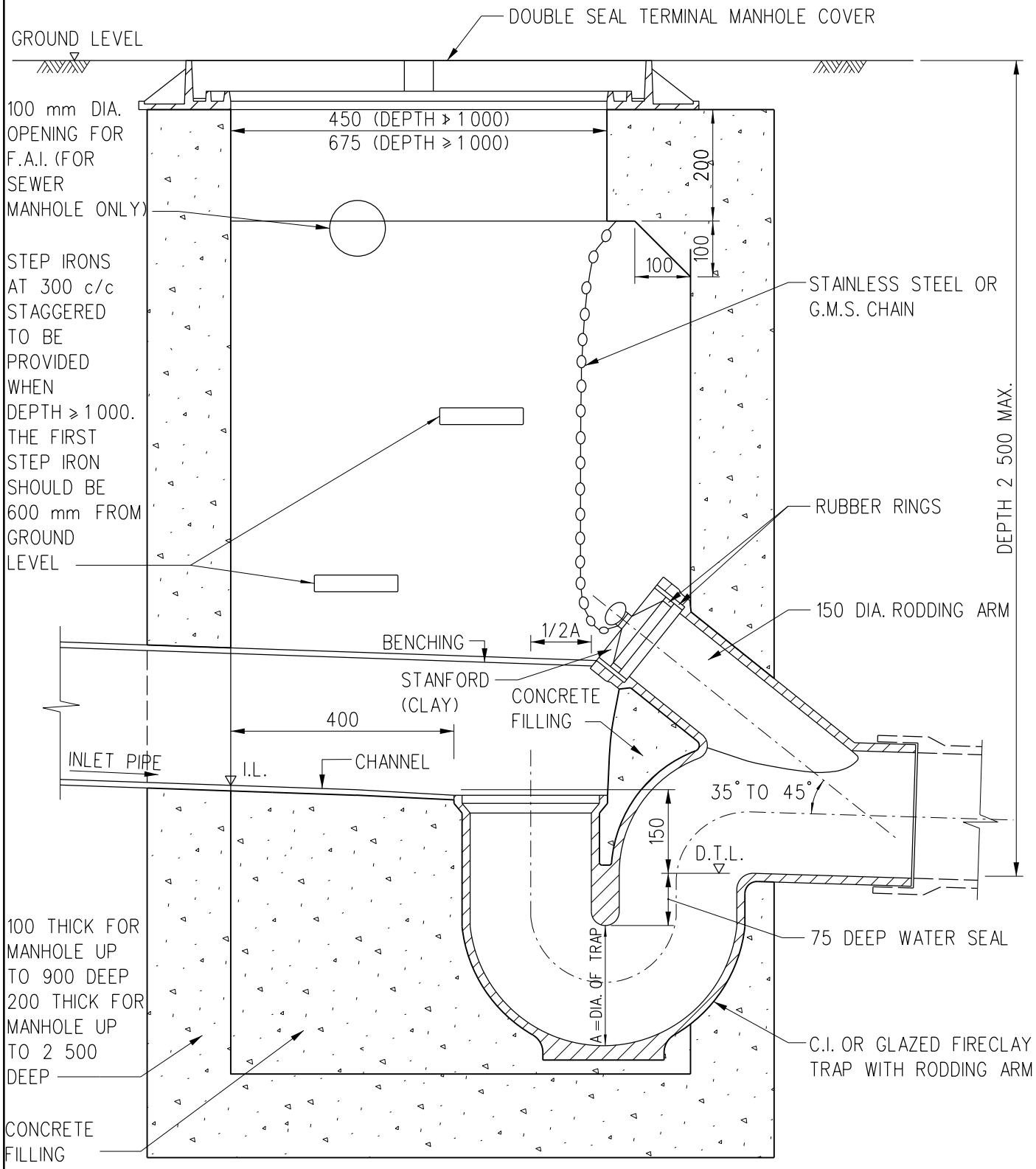
TERMINAL MANHOLE TYPE T1_1

DRAINAGE SERVICES DEPARTMENT

REFERENCE

SCALE 1 : 10

DRAWING No. DS 1090A



SECTION A-A

REV.	DESCRIPTION	SIGNATURE	DATE
A	NOTE 4 ADDED & DRAWING AMENDED	ORIGINAL SIGNED	2.8.2022
	NEW ISSUE	ORIGINAL SIGNED	13.1.2016

TERMINAL MANHOLE TYPE T1_1

DRAINAGE SERVICES DEPARTMENT

REFERENCE

SCALE 1 : 10

DRAWING No. DS 1090A

(SHEET 2 OF 2)

APPENDIX - HYDRAULIC CALCULATION

Assessment of Hydraulic Capacities of the Proposed Drainage System for 1 in 200 year design return period

Using Rational Method

Design Flow = 0.278CiA m^3/s for grassland (heavy soil) - steep, C = 0.35
for grassland (heavy soil) - flat, C = 0.25
for concrete surface, C = 0.95

Using Manning Equation

Design Mean Velocity = $R^{1/6}/n(RS_f)^{1/2}$ where n = 0.016 for concrete-lined open channel with fair surface
0.045 for natural stream channels, winding some pools and shoals with some weeds and stones with fair surface
(ref. Table13 in SDM)

Using GEV distribution model in frequency analysis

Rainfall intensity = $a / (t_d+b)^c$ where a = 508.8 , b= 3.46 and c= 0.322 in 200 year design return period, for internal drainage
505.5 3.29 0.355 in 50 year design return period, for Main Rural Catchment Drainage Channels
referenced from Table 3a in Corrigendum No. 1/2024 of SDM - Storm Constants for Different Return Periods of HKO Headquarters

Using Bransby William's Equation (for channel flow)

Inlet time t_0 = $0.14465L/ (H^{0.2}A^{0.1})$ or 2 when the distance is too short

Using Colebrook's White Equation (for pipe flow)

V = - Sqt (8gDs) x log [k_s / 3.7D + 2.51v / (D x Sqt (2gDs))]

For precast concrete pipes with 'O' ring joints with poor condition,

k_s (mm) = 0.6 k_s (m) = 0.0006

v (m^2/s) = 1.00E-06

g (m^2/s) = 9.81

(1) USCP/USMH (refer to Figure D4)	(2) DSCP/DSMH (refer to Figure D4)	(3) Collected Runoff from Catchment (refer to Figure D1 and D4)	(4) USGL (mPD)	(5) DSGL (mPD)	(6) USIL (mPD)	(7) DSIL (mPD)	(8) INVERT DIFF. (m)	(9) LENGTH OF CHANNEL / DRAIN l (m)	(10) SLOPE s	(11) SLOPE (1 in)	(12) LENGTH FOR CALCULATION OF INLET TIME L (m)	(13) AVERAGE SLOPE OF GROUND FOR CALCULATION OF INLET TIME H (m per 100m)	(14) INLET TIME t_0 (min) = 0.14465 x [L/($H^{0.2}$ x $A^{0.1}$)]	(15) TIME OF FLOW INSIDE CHANNEL/ DRAIN t_f (min) = l/V (i.e. Column (9) ÷ Column (26) ÷ 60)	(16) TIME OF CONCENTRATION t_c (min) = t_0 + t_f	(17) RAINFALL INTENSITY i (mm/hr)	(18) RAINFALL INTENSITY INCLUDING EFFECT OF CLIMATE CHANGE (+16.0%*) (mm/hr) [refer to item (e) and (k) in SDM Corrigendum No. 1/2022]	(19) ADOPTED RAINFALL INTENSITY INCLUDING EFFECT OF CLIMATE CHANGE (+16.0%) & DESIGN ALLOWANCE (12.1%) (mm/hr) [refer to item (e), (k) and (n) in SDM Corrigendum No. 1/2022]	(20) RUNOFF COEF. C	(21) SUB-CATCHMENT AREA A (m^2)	(22) EFF. CAT. AREA (m^2)	(23) CUM. EFF. CAT. AREA (m^2)	(24) DESIGN FLOW (m^3/s)	(25) SIZE (mm)	(26) CHANNEL TYPE	(27) VELOCITY (m/s)	(28) FLOW CAPACITY (m^3/s)	(29) ADOPTED 90% FLOW CAPACITY (m^3/s) (to cater for potential deposition of sediment)	(30) SPARE CAPACITY (m^3/s)	(31) OCCUPANCY OF THE PROPOSED PIPE / CHANNEL	
Starting Point A	CP1.1	Site Area A	11.70	12.00	11.25	11.04	0.21	41.50	0.005	200	10.00	0.50	0.81	0.54	1.35	306.80	355.89	398.95	0.95	1,289	1,225	1,225	0.136	450	UC	1.28	0.23	0.21	0.073	65.1%	OK!
CP1.1	CP1.2	ditto	12.00	12.00	11.04	11.00	0.05	9.00	0.005	200	-	-	1.35	0.12	1.47	304.44	353.15	395.88	0.95	0	0	1,225	0.135	450	UC	1.28	0.23	0.21	0.074	64.6%	OK!
CP1.2	CP1.3	ditto	12.00	11.70	11.00	10.82	0.18	36.00	0.005	200	-	-	1.47	0.47	1.94	295.67	342.98	384.48	0.95	0	0	1,225	0.131	450	UC	1.28	0.23	0.21	0.078	62.7%	OK!
CP1.3	CP1.4	ditto	11.70	11.70	10.82	10.67	0.15	29.00	0.005	200	-	-	1.94	0.38	2.31	289.31	335.60	376.21	0.95	0	0	1,225	0.128	450	UC	1.28	0.23	0.21	0.081	61.4%	OK!
CP1.4	CP1.5	ditto	11.70	11.60	10.67	10.64	0.04	7.00	0.005	200	-	-	2.31	0.09	2.40	287.86	333.92	374.32	0.95	0	0	1,225	0.127	450	UC	1.28	0.23	0.21	0.081	61.1%	OK!
CP1.5	TM	ditto	11.60	11.60	10.64	10.61	0.03	5.00	0.005	200	-	-	2.40	0.06	2.47	286.84	332.73	373.00	0.95	0	0	1,225	0.127	450	UC	1.28	0.23	0.21	0.082	60.9%	OK!
Starting Point B	CP2.1	Site Area B + Sub-catchment 4	11.70	11.70	11.25	11.20	0.05	10.00	0.005	200	10.00	0.50	0.81	0.13	0.94	315.80	366.33	410.65	0.95	1,349	1,282	1,282	0.146	450	UC	1.28	0.23	0.21	0.062	70.1%	OK!
CP2.1	CP2.2	ditto	11.70	11.70	11.20	11.16	0.04	8.00	0.005	200	-	-	0.94	0.10	1.04	313.43	363.58	407.58	0.95	0	0	1,282	0.145	450	UC	1.28	0.23	0.21	0.063	69.6%	OK!
CP2.2	CP2.3	ditto	11.70	11.50	11.16	11.05	0.03	6.50	0.005	200	-	-	1.04	0.08	1.13	311.56	361.41	405.14	0.95	0	0	1,282	0.144	450	UC	1.28	0.23	0.21	0.064	69.2%	OK!
CP2.3	CP2.4	ditto	11.50	11.30	11.05	10.85	0.05	10.50	0.005	200	-	-	1.13	0.14	1.26	308.63	358.02	401.34	0.95	0	0	1,282	0.143	450	UC	1.28	0.23	0.21	0.066	68.5%	OK!
CP2.4	CP2.5	ditto	11.30	11.30	10.85	10.83	0.02	4.00	0.005	200	-	-	1.26	0.05	1.32	307.55	356.76	399.92	0.95	0	0	1,282	0.142	450	UC	1.28	0.23	0.21	0.066	68.3%	OK!
CP2.5	CP2.6	ditto	11.30	11.50	10.83	10.69	0.14	28.50	0.005	200	-	-	1.32	0.37	1.69	300.24	348.27	390.42	0.95	0	0	1,282	0.139	450	UC	1.28	0.23	0.21	0.070	66.7%	OK!
CP2.6	CP2.7	ditto	11.50	11.60	10.69	10.64	0.05	9.00	0.005	200	-	-	1.69	0.12	1.80	298.07	345.76	387.60	0.95	0	0	1,282	0.138	450	UC	1.28	0.23	0.21	0.071	66.2%	OK!
CP2.7	CP2.8	ditto	11.60	11.60	10.64	10.60	0.04	8.50	0.005	200	-	-	1.80	0.11	1.91	296.08	343.46	385.01	0.95	0	0	1,282	0.137	450	UC	1.28	0.23	0.21	0.071	65.8%	OK!
CP2.8	CP2.9	ditto	11.60	11.60	10.60	10.57	0.04	7.00	0.005	200	-	-	1.91	0.09	2.00	294.49	341.60	382.94	0.95	0	0	1,282	0.136	450	UC	1.28	0.23	0.21	0.072	65.4%	OK!
CP2.9	TM	ditto	11.60	11.60	10.57	10.54	0.02	4.50	0.005	200	-	-	2.00	0.06	2.06	293.48	340.43	381.63	0.95	0	0	1,282	0.136	450	UC	1.28	0.23	0.21	0.073	65.2%	OK!
TM	Outlet	Site Area + Sub-catchment 4	11.60	11.50	10.39	10.27	0.12	6.00	0.020	50	-	-	2.47	0.03	2.50	286.30	332.11	372.30	0.95	0	0	2,506	0.259	450	concrete pipe	2.88	0.46	0.41	0.153	62.9%	OK!
The Existing 2000mm x 2000mm Box Culvert																															
highest point	Point Z	Sub-catchment 1	133.30	20.90	-	-	-	-	-	-	370.00	30.38	9.24	0.00	9.24	-	-	-	0.35	46,237	16,183	18,689	-	-	-	-	-	-	-	-		
Point Z	Point Y	Sub-catchment 1, 2, 3 & 4 + Site Area	20.90	11.69	18.90	9.10	0.90	450.00	0.002	500	-	-	9.24	3.52	12.75	188.73	218.93	245.42	0.95	57,884	54,990	76,185	5.198	2000	box culvert	2.13	8.53	7.68	2.481	67.7%	OK!
																						Flow inside the channel	5.198	m^3/s	corresponding water level inside the channel	1.35	m	10.45	mPD		

check total catchment 106,759

Sub-Catchment Area 1 = 46,237
Sub-Catchment Area 2 = 57,511
Sub-Catchment Area 3 = 373
Sub-Catchment Area 4 = 500
Area A = 1,289 Area of The Site (A+B) = 2,138
Area B = 849
Total = 106,759 m^2