ARUP

Appendix G

Revised Drainage Impact Assessment

Application for Amendment of Plan under Section 12A of the Town Planning Ordinance (Cap. 131) to Rezone the Application Site from "Green Belt" and Area Shown as "Road" to "Residential (Group C)5" for Proposed Residential Development at Various Lots in D.D. 210 and Adjoining Government Land, Pak Wai, Sai Kung

(HT21130)

Drainage Impact Assessment

May 2026

Drainage Consultant:

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1. Background

1.1 Ho Tin & Associates Consulting Engineers Limited (HTA) has been appointed by the client to prepare a Drainage Impact Assessment (DIA) Report in support of an Application for Amendment of Plan under Section 12A of the Town Planning Ordinance (Cap. 131) to Rezone the Application Site from "Green Belt" and Area Shown as "Road" to "Residential (Group C)5" for Proposed Residential Development at Various Lots in D.D. 210 and Adjoining Government Land, Pak Wai, Sai Kung.

2. The Subject Site and Proposed Development

2.1 The subject site is currently zoned "Green Belt" and shown as "Road" on the Approved Ho Chung Outline Zoning Plan No. S/SK-HC/13 (the OZP). It is located in the northwest side of Marina Cove on the opposite side of Hiram's Highway at Pak Wai, Sai Kung. To its east is Hing Keng Shek Road at the uphill area. It is currently occupied by botanical gardens, temporary structures and an access road. A site location plan is shown in **Figure D1**.

2.2 It is proposed to change the land use of the subject site to "Residential (Group C)5" with a plot ratio of 0.6 and maximum building heights of 4 storey (excluding basements). The proposed rezoning development covers a site area of about 12,692m^2 with a total GFA of about 7,615.2m^2. The designed total population is about 288 persons, and a total of 10 nos. of management staff is presumed in the sewage estimation.

3. Existing Drainage Conditions of the Site

3.1 The subject site is in elongated shape in general and is located within a valley having a principle major axis between the northwest and the southeast. There is an existing stream course running along its boundary from the northern end to the southern end. Surface runoff in the existing stream course is collected into an existing twin 2500 x 2500 box culvert with a gradient of 1 in 200 which conveys the flow and discharges into the Marina Cove on the opposite side of Hiram's Highway. A copy of as-built plan showing existence of the afore-mentioned box culvert is reproduced as **Figure D2** in this report.

3.2 The subject site is currently occupied by botanical gardens, temporary structures and an access road. It is generally hard paved (refer to **Plate No. 1** and **2**). The existing site levels slope gently downward from about +6.5mPD at the north to about +4.1mPD at the south. The level of the section of Hiram's Highway in front of the subject site is at about +7.3mPD.

3.3 The subject site is at elevations relatively lower than its surroundings and abuts on an existing stream course along its boundary from the northern end to the southern end. Surface runoff from the area to its east is intercepted by the existing stream course without entering into the subject site. Surface runoff from the area to its west would flow toward the subject site before flowing into the existing stream course. The existing drainage flow paths and catchment areas of the concerned area are shown in **Figure D3**.

3.4 Colour photos (locations of the photo taken shown in **Figure D1**) showing the existing drainage conditions in the vicinity are shown in the following:

	
Plate No. 1 – Existing conditions of the subject site (1)	Plate No. 2 – Existing conditions of the subject site (2)
	
Plate No. 3 – Existing watercourse running underpassing the subject site entrance	Plate No. 4 – Existing watercourse running along the southeastern site boundary
	
Plate No. 5 – Enlarged width of the existing watercourse outside the southern tip of the subject site	Plate No. 6 – Existing twin 2500x2500mm box culvert receiving flows of the existing watercourse at the downstream area of the subject site

4. Proposed Drainage Works

4.1 Peripheral channels with catchpits will be constructed to intercept all surface runoff running across the subject site boundary. Surface runoff of the subject proposed development will be collected by the proposed channel system. Underground drainage will be used within the subject site boundary only when necessary. The flows inside the channels/drainage will be discharged via a terminal manhole with desilting trap (details refer to DSD Standard Drawing No. DS 1091) into the existing watercourse near the southeastern boundary of the subject site (refer to the above **Plate No. 4**), and from which the water is conveyed to the further downstream into an existing twin 2500x2500mm box culvert running underpassing Hiram's Highway into the Marina Cove (refer to the above **Plate No. 6**).

4.2 Having taken into account of the existing baseflow along the natural stream channel, the narrowest section of the existing watercourse into which the subject site would discharge its flow is about 5.0m (wide) x 2m (deep) in size (refer to the above **Plate No. 4**).

4.3 Assessment criteria is based on the recommendation set out in the Stormwater Drainage Manual (Fifth edition, Jan 2018) (SDM) and its Corrigendum Nos. 1/2022, 1/2024 and 2/2024 issued by DSD. Design Return Period of 200 years is being adopted.

Design Assumptions

Design return period = 200 years (suitable of 'Urban Drainage Trunk Systems')

It is assumed that building platforms of the existing village houses occupy 10% of the remaining area of the catchment, i.e. excluding the area of the subject site, such that,

runoff coefficient = 0.95 (for concrete/asphalt – the subject site area and 10% of the remaining area of the catchment)
0.35 (for grassland (heavy soil), steep – 90% of the remaining area of the catchment)

Catchment Area

The subject site is located near the outlet of a catchment below Sam Fai Tin to the northwest side of Marina Cove at Sai Kung. The catchment consists of heavily vegetated valleys with village houses scattering on the plateaus near the lower portion of the catchment. There would be no change in the existing catchment boundary and area after the proposed development. Since the subject site is currently generally hard paved (refer to the above paragraph 3.2), the overall paved and unpaved areas and drainage conditions of the catchment before and after the subject development are basically the same.

At present, the concerned catchment consists of a main discharge route of which its lower reach runs along the northeast boundary of the subject site. The main discharge route would be undisturbed after the subject development. The major change in the drainage path within the concerned catchment area is that the flow from the subject site would be conveyed to the downstream via engineered channels instead of overland flows.

Catchment area of the narrowest section of the existing watercourse (including the subject site area) (refer to **Figure D3**) = (12,692 + 43,736 + 854,721)m^2 = 911,149m^2

Time of Concentration

Brandy-Williams method is used in calculation of the time of concentration. The surface runoff will flow into the existing watercourse and be conveyed to the existing twin 2500x2500mm box culvert.

H = (389 – 2)/1800 x 100 = 21.50,

then, time of concentration $t_d = 0.14465L/ (H^{0.2}A^{0.1})$
$= 0.14465 \times 1800 / (21.50^{0.2} \times 911{,}149^{0.1}) = 35.74$ min.

Design Rainfall Intensity

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 in the Corrigendum No. 1/2024 of SDM, the rainfall profiles are derived based on the following equation:

$$i = a / (t_d + b)^c$$

where i = extreme mean intensity in mm/hr
t_d = duration in minutes ($t_d \leq 240$)
a, b, c = storm constants given in the table below

Table 2 : Storm Constants

Return Period (years)	200
a	508.8
b	3.46
c	0.322

the rainfall intensity for 1 in 200 years return period $i = 156.14$ mm/hr

A 16.0% rainfall increase has to be adopted in the hydraulic calculation to cater for effects due to climate change and further 12.1% rainfall increase due to design allowance anticipated in end 21st Century as suggested in the item (e), (k) and (n) in the Corrigendum No. 1/2022 of SDM.

Hence, the revised rainfall intensity for 1 in 200 years return period $i = 156.14 \times 1.16 \times 1.121 = 203.04$ mm/hr

Estimated Increase in Surface Runoff

The runoff is estimated by Rational Method.

The runoff coefficient of the subject site area is conservatively taken as 0.95 and that of the remaining area of the same catchment is collectively taken as 0.35 with reference to the recommended values given in "Stormwater Drainage Manual" published by DSD. The areas of paved and grass land are adopted as those shown in **Figure D5**.

Estimated runoff for 1 in 200 years $Q = C \times i \times A / (3600 \times 1000)$
$= (0.95 \times (12{,}692 + 42{,}143) + 0.35 \times (43{,}736 + (854{,}721 - 42{,}143))) \times 203.04 / (3600 \times 1000)$
$= 19.84\ m^3/s$

In addition, peak dry weather flow of the proposed sewage treatment plant is estimated to be 0.051111 m^3/s (the estimation is illustrated in the Sewage Treatment and Disposal Proposal Report submitted under this same Application for Amendment of Plan). In this assessment of stormwater flow, the figure of the peak dry weather flow is conservatively adopted in spite of the fact that discharge of the sewage treatment plant would be regulated by the pumping system.

Therefore, the adopted total peak runoff would be $(19.84 + 0.051111)\ m^3/s = 19.90\ m^3/s$.

Assessment of Adequacy of the 5m (wide) x 2m (deep) Section (adopted conservatively) of the Existing Watercourse (in front of the inlet of the Existing Twin 2500x2500mm Box Culvert)

Manning Equation is adopted in evaluating capacity of the existing watercourse, such that $Q = A \times R^{2/3} \times S_f^{1/2} / n$

Adopting n = 0.050 (natural stream channel, winding some pools and shoals, clean, some weeds and stones under bad condition), and $S_f = 1/1000$, then $Q = (5 \times 2) \times (2+5+2)^{2/3} \times (0.001)^{1/2} / 0.050 = 27.36\ m^3/s$

Capacity of the 5m x 2m section of the existing watercourse = $27.36\ m^3/s > 19.90\ m^3/s$, therefore acceptable. The existing watercourse is capable to convey the estimated flow and will not flood.

4.4 It is envisaged to have no insurmountable technical problems in the detailed drainage design which will be submitted to relevant government departments for approval at the later stage. Subject to the detailed design at the later stage, required sizes of the peripheral channel and the discharge drain pipe of the subject proposed development are estimated as shown in the **Appendix** for reference.

4.5 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 after this application is approved.

4.6 The subject proposed development would not alter the existing drainage conditions 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 occur. The proposed stormwater drainage management plan is shown in **Figure D4**.

5. Blue-green Concept Provisions

5.1 Aiming at improvement of the sustainability and resilience of Hong Kong's drainage system, application of blue-green drainage infrastructure which facilitates the infiltration of rainfall and the process of natural filtering to reduce the quantity and improve the quality of runoff, will be considered under the subject proposed development. Tentatively, green roofs, porous pavements and rainwater harvesting facilities will be recommended for consideration. The harvested water, if appropriate or after treatment, will be used for toilet flushing, drip irrigation, sprayed irrigation, water features, car washing and street cleansing, etc.

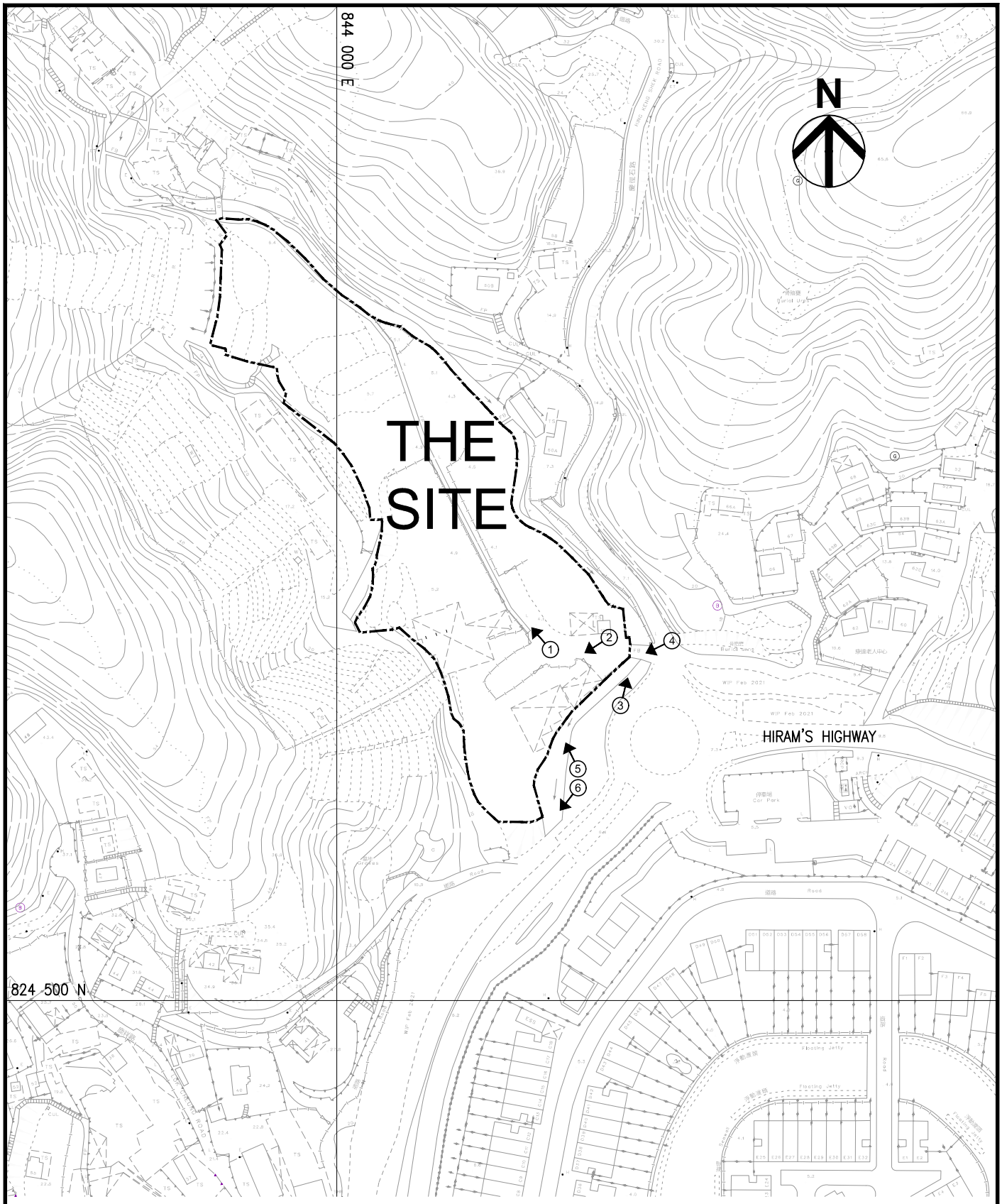
6. Conclusion and Recommendations

6.1 The subject development will be for a proposed residential development. The subject site area is now occupied by botanical gardens, temporary structures and an access road with an existing watercourse running from the northwest to the southeast along the eastern boundary of the subject site. The existing watercourse collects surface runoff from the subject site at present and will be maintained after the proposed development. Stability of the banks of the watercourses will be assessed and upgrading works will be proposed if necessary at the later detailed design stage to ensure safety of the public.

6.2 Peripheral channels with catchpits will be constructed to intercept all surface runoff running across the subject site boundary. A comprehensive channel system will be constructed within the subject proposed development and to convey the collected flows via a terminal manhole with desilting trap to the existing watercourse to the south of the subject site. The existing watercourse will convey its flow into a twin 2500x2500mm box culvert running underpassing Hiram's Highway into the Marina Cove. The additional flow incurred by the subject development would not overload the existing watercourse. Detailed drainage design, including blue-green drainage facilities, will be submitted to relevant government departments for approval at the later stage. No insurmountable technical problems is envisaged.

6.3 The subject proposed development will not alter the existing drainage conditions of the area.

6.4 Besides, 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 after this application is approved. In conclusion, the subject development with implementation of the proposed drainage works will not cause any adverse drainage impacts onto the area.



LEGEND:

SUBJECT SITE BOUNDARY

LOCATION OF PHOTO TAKEN (N-PLATE No.)

PROJECT	APPLICATION FOR AMENDMENT OF PLAN UNDER SECTION 12A OF THE TOWN PLANNING ORDINANCE (CAP.131) TO REZONE THE APPLICATION SITE FROM "GREEN BELT" AND AREA SHOWN AS "ROAD" TO "RESIDENTIAL (GROUP C)5" FOR PROPOSED RESIDENTIAL DEVELOPMENT AT VARIOUS LOTS IN D.D.210 AND ADJOINING GOVERNMENT LAND, PAK WAI, SAI KUNG	何田顧問工程師有限公司 HO TIN & ASSOCIATES CONSULTING ENGINEERS LIMITED
TITLE SITE LOCATION PLAN	SCALE 1 : 2000 – A4	DRAWING No. FIGURE D1

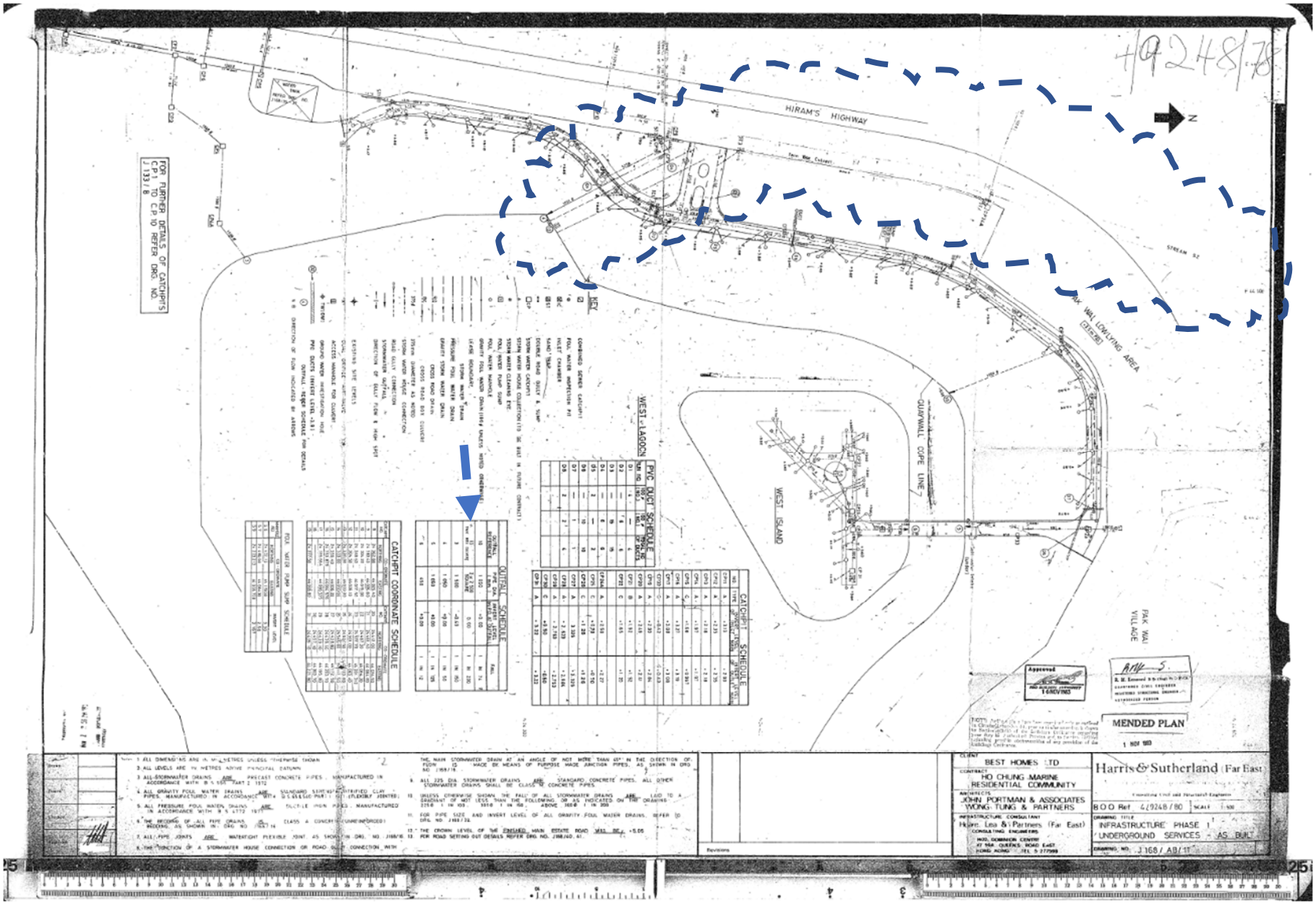


FIGURE D2 - Copy of As-built Plan showing Existence of Box Culvert receiving Surface Runoff from the Site

843 000 E

843 500 E

844 000 E

844 500 E

N

825 500 N

825 000 N

824 500 N

854,721m²

30,946m²

43,736m²

THE SITE
12,692m²

6,752m²

3,883m²

1,932m²

223m²

FALL

LEGEND:

SUBJECT SITE BOUNDARY

CATCHMENT BOUNDARY

SUB-CATCHMENT BOUNDARY

DRAINAGE PATH (BEFORE AND AFTER THE SUBJECT DEVELOPMENT)

PROPOSED INTERNAL DRAINAGE OF THE SUBJECT DEVELOPMENT

PROJECT APPLICATION FOR AMENDMENT OF PLAN UNDER SECTION 12A OF THE TOWN PLANNING ORDINANCE (CAP.131) TO REZONE THE APPLICATION SITE FROM "GREEN BELT" AND AREA SHOWN AS "ROAD" TO "RESIDENTIAL (GROUP C)5" FOR PROPOSED RESIDENTIAL DEVELOPMENT AT VARIOUS LOTS IN D.D.210 AND ADJOINING GOVERNMENT LAND, PAK WAI, SAI KUNG

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TITLE EXISTING DRAINAGE FLOW PATHS AND CATCHMENT AREAS

SCALE 1 : 5000 – A3

DRAWING No. FIGURE D3

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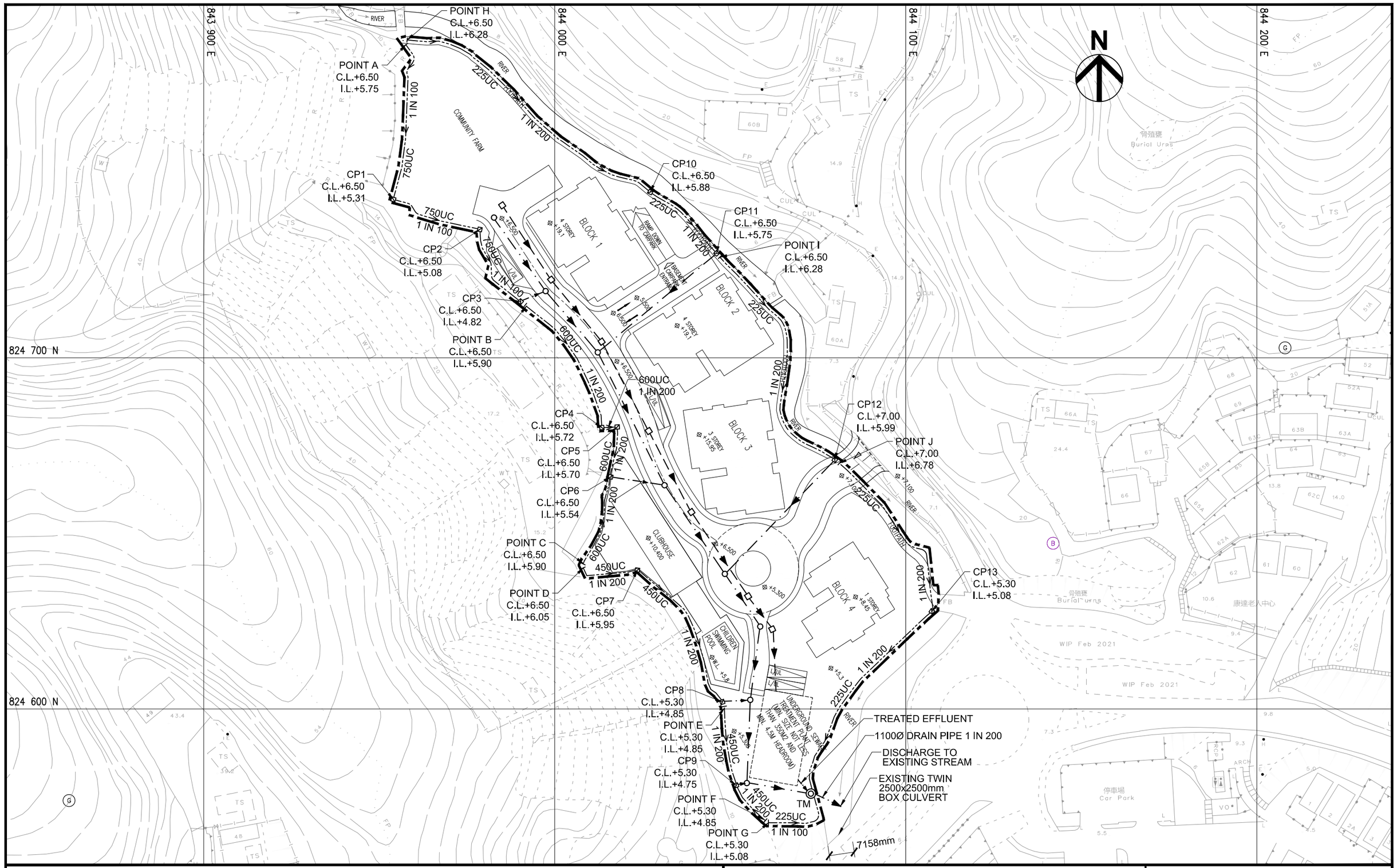

LEGEND:

SUBJECT SITE BOUNDARY	PROPOSED STORMWATER TERMINAL MANHOLE
4.100 PROPOSED GROUND LEVEL	PROPOSED STORMWATER DRAIN & MANHOLE
	PROPOSED U-CHANNEL & CATCH PIT
	PROPOSED SEWER & MANHOLE

PROJECT: APPLICATION FOR AMENDMENT OF PLAN UNDER SECTION 12A OF THE TOWN PLANNING ORDINANCE (CAP.131) TO REZONE THE APPLICATION SITE FROM "GREEN BELT" AND AREA SHOWN AS "ROAD" TO "RESIDENTIAL (GROUP C)5" FOR PROPOSED RESIDENTIAL DEVELOPMENT AT VARIOUS LOTS IN D.D.210 AND ADJOINING GOVERNMENT LAND, PAK WAI, SAI KUNG

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HO TIN & ASSOCIATES
CONSULTING ENGINEERS LIMITED

TITLE: STORMWATER DRAINAGE MANAGEMENT PLAN

SCALE: 1 : 1000 – A3

DRAWING No.: FIGURE D4

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843 000 E
843 500 E
844 000 E
844 500 E
825 500 N
825 000 N
824 500 N
N
854,721m²
43,736m²
FALL
THE SITE
12,692m²
PAVED AREA (TOTAL = 42,143m²)

LEGEND:

- SUBJECT SITE BOUNDARY
- CATCHMENT BOUNDARY
- DRAINAGE PATH (BEFORE AND AFTER THE SUBJECT DEVELOPMENT)
- PROPOSED INTERNAL DRAINAGE OF THE SUBJECT DEVELOPMENT

PROJECT: APPLICATION FOR AMENDMENT OF PLAN UNDER SECTION 12A OF THE TOWN PLANNING ORDINANCE (CAP.131) TO REZONE THE APPLICATION SITE FROM "GREEN BELT" AND AREA SHOWN AS "ROAD" TO "RESIDENTIAL (GROUP C)5" FOR PROPOSED RESIDENTIAL DEVELOPMENT AT VARIOUS LOTS IN D.D.210 AND ADJOINING GOVERNMENT LAND, PAK WAI, SAI KUNG

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HO TIN & ASSOCIATES CONSULTING ENGINEERS LIMITED

TITLE: EXISTING PAVED AREAS

SCALE: 1 : 5000 – A3

DRAWING No.: FIGURE D5

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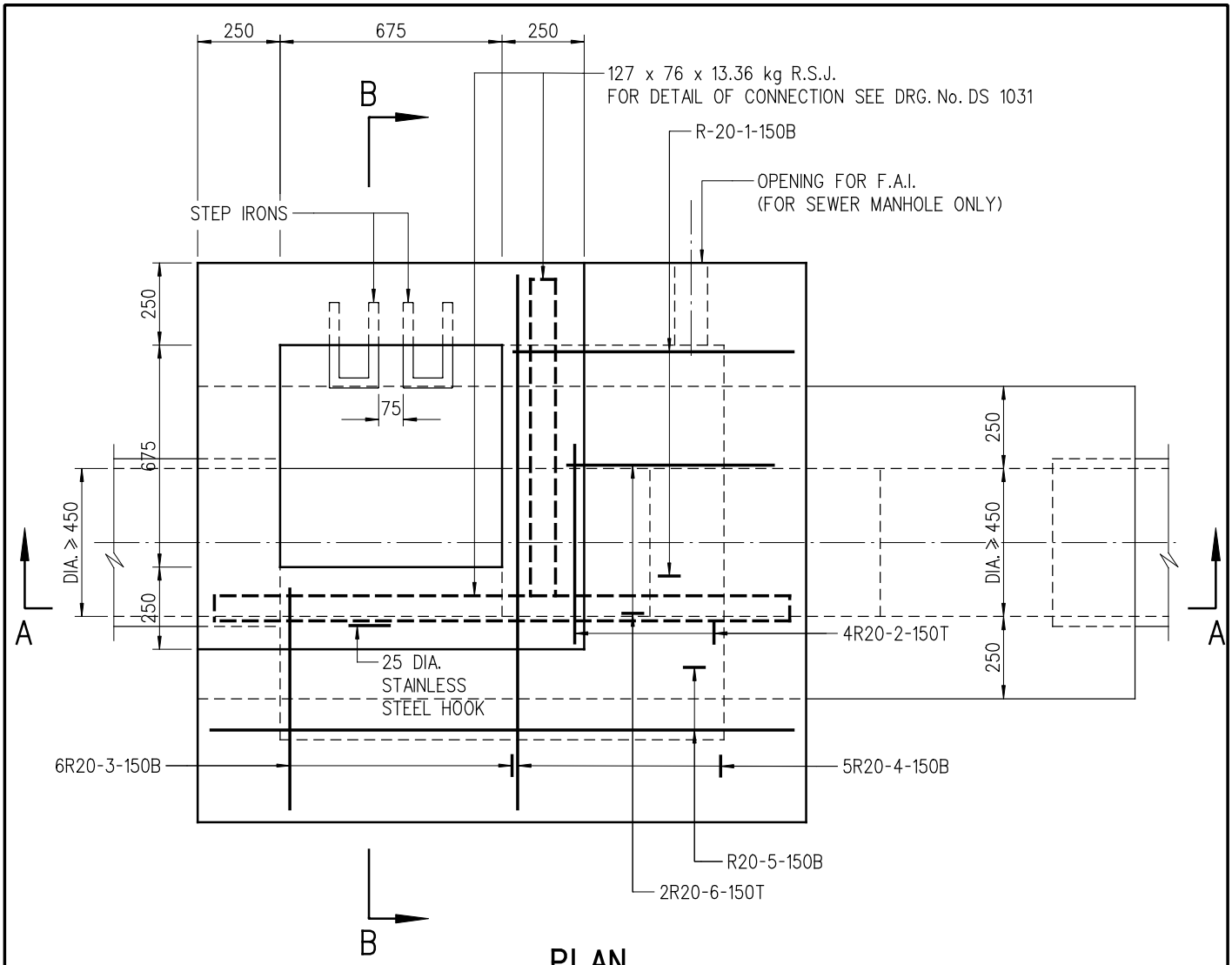


PLAN

NOTES:

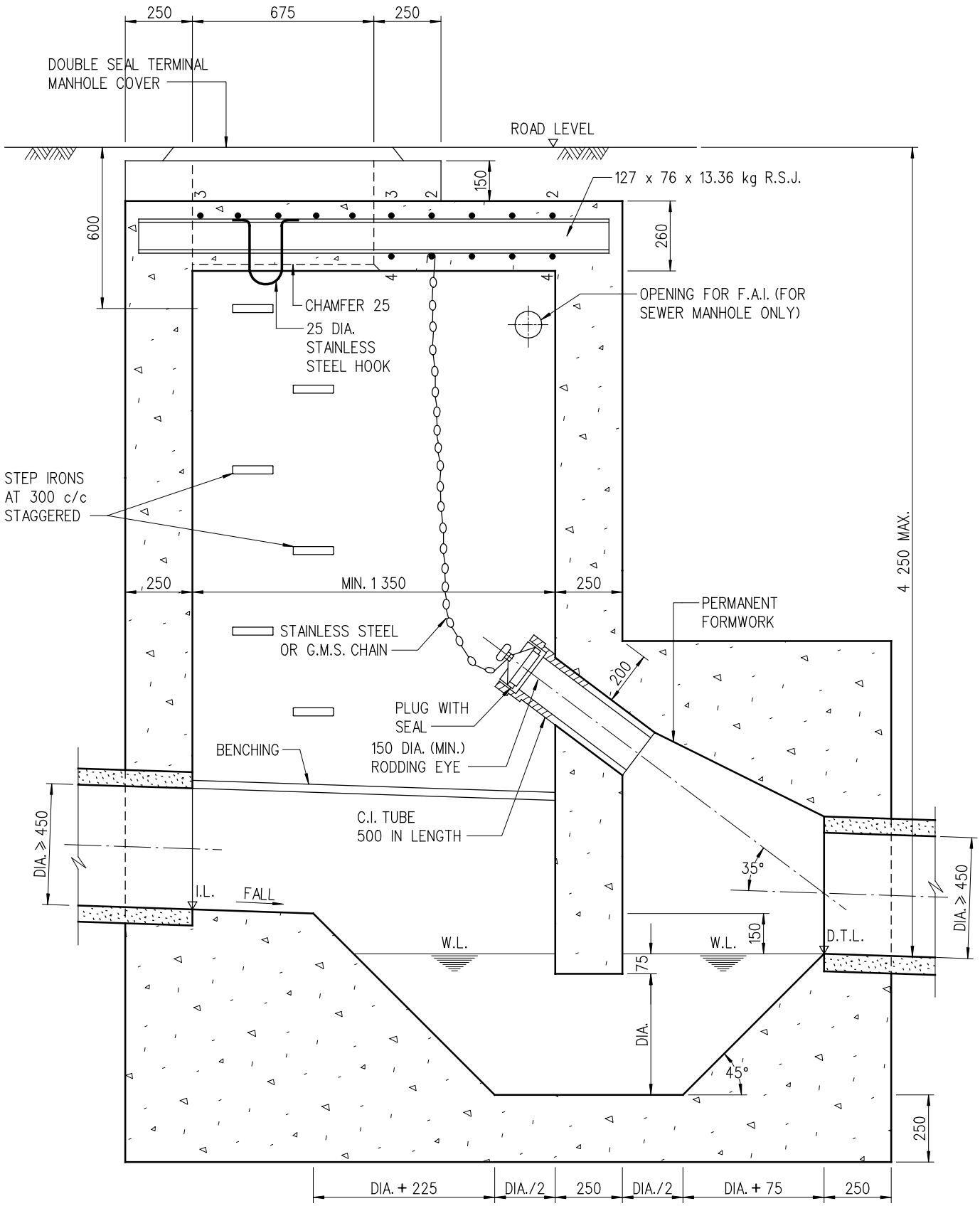
1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. NOTATION OF REINFORCEMENT : THE SEQUENCE OF DESCRIPTION OF IDENTIFICATION MARKS ON DRAWINGS FOR STEEL REINFORCING BARS FOR CONCRETE WORK IS AS FOLLOWS (NUMBER, TYPE, SIZE, MARK, SPACING, LOCATION OR COMMENT)
3. B DENOTES GRADE 500B RIBBED REINFORCEMENT.
4. R DENOTES GRADE 250 PLAIN REINFORCEMENT.
5. PIPE DIAMETER : EQUAL OR GREATER THAN 450 mm
6. NORMAL RANGE OF DEPTH : 1 750 TO 4 250 mm (MEASURED FROM ROAD LEVEL TO LOWEST INVERT)
7. USED IN : STORMWATER DRAIN AND SEWER
8. JUNCTION : POSITION OF JUNCTION TO BE DETERMINED IN EACH INDIVIDUAL CASE. CHANNELS IMMEDIATELY UNDER ACCESS TO MANHOLE SHOULD BE AVOIDED.
9. TOP TREATMENT : SEE DRAWING No. DS 1032
10. STEP IRON : SEE DRAWING No. DS 1043
11. FOUNDATION : FOUNDATION OF MANHOLE VARIES WITH SITE CONDITION. THEREFORE, IT SHOULD BE DETERMINED ON SITE BY THE ENGINEER.
12. CONCRETE MIX : GRADE 30/20
13. DIAMETER OF F.A.I. NORMALLY 100 mm
14. MINIMUM COVER AT END OF BARS 40 mm
15. COVER AND FRAME NOT SHOWN ON PLAN FOR CLARITY.

	NEW ISSUE	ORIGINAL SIGNED	13.1.2016
REV.	DESCRIPTION	SIGNATURE	DATE

TERMINAL MANHOLE TYPE T2_1

DRAINAGE SERVICES DEPARTMENT

REFERENCE	DRAWING No.
SCALE 1 : 20	DS 1091 (SHEET 1 OF 3)



SECTION A-A

REV.	DESCRIPTION	SIGNATURE	DATE
	NEW ISSUE	ORIGINAL SIGNED	13.1.2016

TERMINAL MANHOLE TYPE T2_1

DRAINAGE SERVICES DEPARTMENT

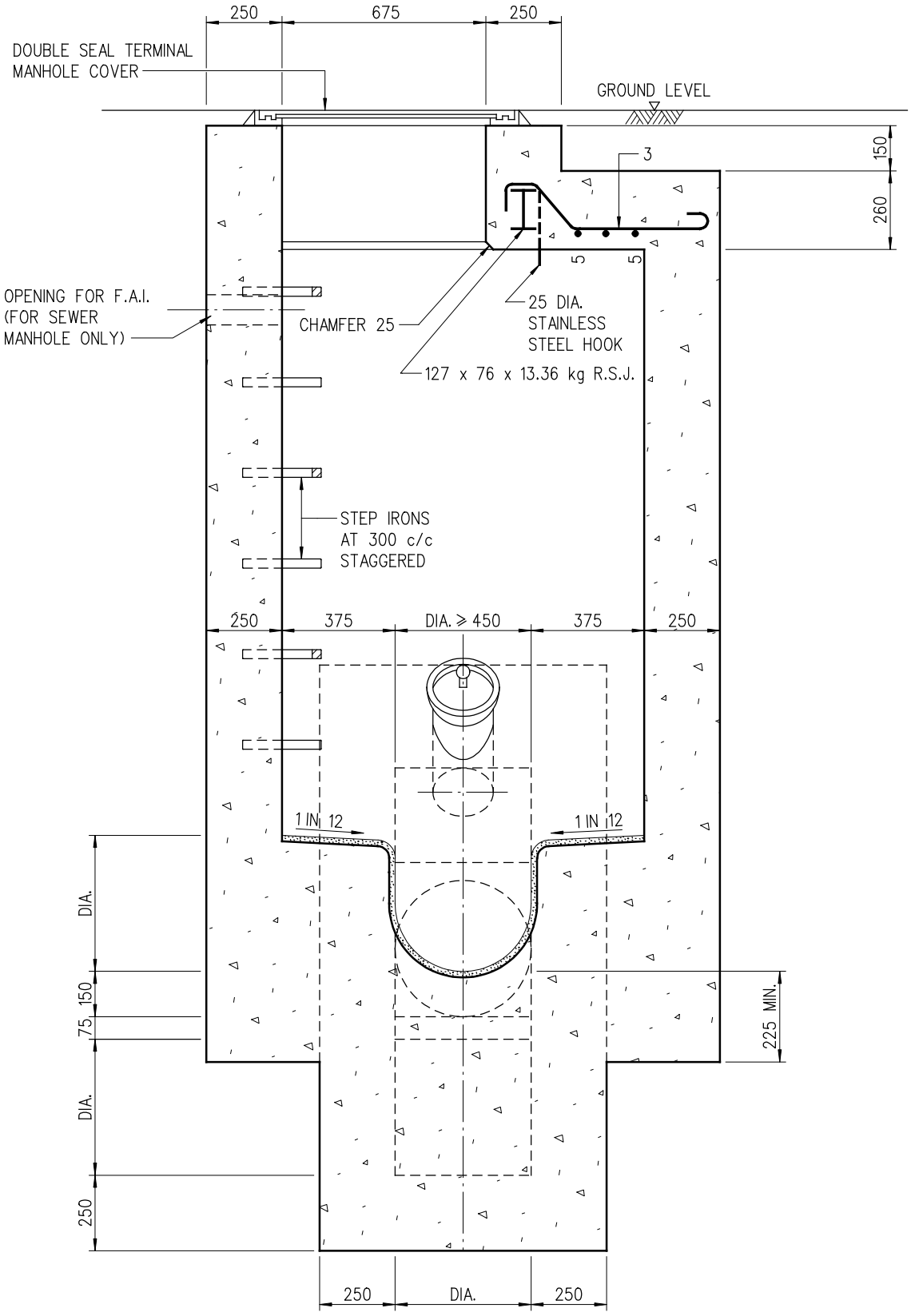
REFERENCE

DRAWING No.

DS 1091

SCALE 1 : 20

(SHEET 2 OF 3)



SECTION B-B

REV.	DESCRIPTION	SIGNATURE	DATE
	NEW ISSUE	ORIGINAL SIGNED	13.1.2016

TERMINAL MANHOLE TYPE T2_1

DRAINAGE SERVICES DEPARTMENT

REFERENCE	DRAWING No.
	DS 1091
SCALE 1 : 20	(SHEET 3 OF 3)

Assessment of Hydraulic Capacities of the Proposed Peripheral Channels for 1 in 50 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 (for channel flow)

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 = 505.5 , b= 3.29 and c= 0.355 in 50 year design return period (for 'Main Rural Catchment Drainage Channel' in SDM is adopted)
referenced from Table 3a in SDM Corrigendum No. 1/2022 - Storm Constants for Different Return Periods of HKO Headquarters

Using Bransby William's Equation

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	(2) DSCP/DSMH	(3) Collected Runoff from Catchment (refer to Figure D3 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.2/2022]	(20) RUNOFF COEF. C	(21) SUB-CATCHMENT AREA A (m^2)	(22) EFFECTIVE CATCHMENT AREA (m^2)	(23) CUM. EFFECTIVE CATCHMENT 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) 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	
Point A	CP1	30,946m^2	6.50	6.50	5.75	5.31	0.44	44.00	0.010	100	290.00	29.48	7.58	0.29	7.87	214.69	249.04	277.85	0.35	30,946	10,831	10,831	0.841	750	UC	2.55	1.28	1.15	0.311	73.0%	OK!
CP1	CP2	ditto	6.50	6.50	5.31	5.08	0.23	23.00	0.010	100	-	-	7.87	0.15	8.02	213.67	247.86	277.85	0.35	0	0	10,831	0.837	750	UC	2.55	1.28	1.15	0.315	72.6%	OK!
CP2	CP3	ditto	6.50	6.50	5.08	4.82	0.26	26.00	0.010	100	-	-	8.02	0.17	8.19	212.54	246.55	276.38	0.35	0	0	10,831	0.832	750	UC	2.55	1.28	1.15	0.320	72.2%	OK!
Point B	CP4	6,752m^2	6.50	6.50	5.90	5.72	0.19	37.00	0.005	200	140.00	38.93	4.03	0.40	4.43	244.71	283.86	318.21	0.35	6,752	2,363	2,363	0.209	600	UC	1.55	0.50	0.45	0.240	46.5%	OK!
CP4	CP5	ditto	6.50	6.50	5.72	5.70	0.02	3.00	0.005	200	-	-	4.43	0.03	4.46	244.35	283.44	317.74	0.35	0	0	2,363	0.209	600	UC	1.55	0.50	0.45	0.240	46.5%	OK!
CP5	CP6	ditto	6.50	6.50	5.70	5.64	0.06	12.00	0.005	200	-	-	4.46	0.13	4.59	242.92	281.79	315.89	0.35	0	0	2,363	0.208	600	UC	1.55	0.50	0.45	0.242	46.2%	OK!
Point C	CP6	ditto	6.50	6.50	5.90	5.77	0.13	26.00	0.005	200	-	-	4.59	0.28	4.87	239.94	278.33	312.01	0.35	0	0	2,363	0.205	600	UC	1.55	0.50	0.45	0.244	45.6%	OK!
Point D	CP7	3,883m^2	6.50	6.50	6.05	5.95	0.11	21.00	0.005	200	100.00	58.50	2.81	0.27	3.08	262.00	303.92	340.69	0.35	3,883	1,359	1,359	0.129	450	UC	1.28	0.23	0.21	0.080	61.7%	OK!
CP7	CP8	ditto	6.50	5.30	5.95	4.85	0.19	38.00	0.005	200	-	-	3.08	0.49	3.57	255.14	295.96	331.77	0.35	0	0	1,359	0.125	450	UC	1.28	0.23	0.21	0.083	60.1%	OK!
Point E	CP9	1,932m^2	5.30	5.30	4.85	4.75	0.11	21.00	0.005	200	63.00	58.25	1.90	0.27	2.17	276.71	320.98	359.82	0.35	1,932	676	676	0.068	450	UC	1.28	0.23	0.21	0.141	32.4%	OK!
Point F	CP9	ditto	5.30	5.30	4.85	4.78	0.07	14.00	0.005	200	82.00	47.20	2.57	0.18	2.76	266.86	309.56	347.01	0.35	1,932	676	676	0.065	450	UC	1.28	0.23	0.21	0.143	31.3%	OK!
Point G	TM	223m^2	5.30	5.30	5.08	4.88	0.20	20.00	0.010	100	10.00	1.00	0.84	0.29	1.13	298.16	345.87	387.72	0.35	223	78	78	0.008	225	UC	1.14	0.05	0.05	0.038	18.1%	OK!
Point H	CP10	nominal	6.50	6.50	6.28	5.88	0.40	79.00	0.005	200	-	-	2.00	1.63	3.63	254.38	295.08	330.78	0.95	0	0	0	0.000	225	UC	0.81	0.04	0.03	0.033	0.0%	OK!
CP10	CP11	nominal	6.50	6.50	5.88	5.75	0.14	27.00	0.005	200	-	-	3.63	0.56	4.19	247.48	287.08	321.81	0.95	0	0	0	0.000	225	UC	0.81	0.04	0.03	0.033	0.0%	OK!
Point I	CP12	nominal	6.50	7.00	6.28	5.99	0.29	57.00	0.005	200	-	-	2.00	1.18	3.18	260.58	302.27	338.85	0.95	0	0	0	0.000	225	UC	0.81	0.04	0.03	0.033	0.0%	OK!
Point J	CP13	nominal	7.00	5.30	6.78	5.08	0.23	46.00	0.005	200	-	-	2.00	0.95	2.95	263.91	306.13	343.17	0.95	0	0	0	0.000	225	UC	0.81	0.04	0.03	0.033	0.0%	OK!
CP13	TM	nominal	5.30	5.30	5.08	4.77	0.31	61.00	0.005	200	-	-	2.95	1.26	4.21	247.24	286.80	321.50	0.95	0	0	0	0.000	225	UC	0.81	0.04	0.03	0.033	0.0%	OK!
TM	Proposed outfall	43736 m^2 + Application Site area	5.30	5.30	3.30	3.29	0.01	2.00	0.005	200	-	-	8.19	0.01	8.20	212.46	246.45	276.27	0.95	12,692	12,057	27,365	1.875	1100	pipe	2.50	2.38	2.14	0.267	87.5%	OK!

catchment	m^2	
A1	30,946	grassland (heavy soil) - steep
A2	6,752	grassland (heavy soil) - steep
A3	3,883	grassland (heavy soil) - steep
A4	1,932	grassland (heavy soil) - steep
A5	223	grassland (heavy soil) - steep
The Site	12,692	hardpaved
total	56,428	