ARUP

Appendix G

Sewage Treatment and Disposal Proposal Report

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)

Sewage Treatment and Disposal Proposal (STDP) Report

(rev. 2)

July 2025

Sewerage & Sewage Treatment Consultant:

何田顧問工程師有限公司
HO TIN & ASSOCIATES
CONSULTING ENGINEERS LIMITED
香港九龍官塘鴻圖道26號威登中心12樓1201-3室
電話:2895 2238 圖文傳真:2890 8872 電郵:admin@hotin.com.hk
Rooms 1201-3, Westin Centre, 26 Hung To Road, Kwun Tong, Kowloon, Hong Kong
Tel : 2895 2238 Fax : 2890 8872 E-mail : admin@hotin.com.hk

Content

FIGURES

TABLES

List of Abbreviations

EPD	Environmental Protection Department
GESF	EPD's Report No. EPD/TP 1/05 - Guidelines for Estimating Sewage Flows for Sewage Infrastructure Planning
GDSSTP	EPD's Guidelines for the Design of Small Sewage Treatment Plants
HTA	Ho Tin & Associates Consulting Engineers Limited
OZP	Outline Zoning Plan
ADWF	Average Dry Weather Flow
PDWF	Peak Dry Weather Flow

1. Introduction

1.1 Ho Tin & Associates Consulting Engineers Limited (HTA) has been appointed by the client to prepare a Sewage Treatment and Disposal Proposal (STDP) 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.

1.2 This report presents a technically feasible STDP for the subject proposed residential development under application.

1.3 The objectives of this STDP are to:-

- indicate any changes/increase in the sewage flow due to the subject proposed development scheme under application;
- assess any potential sewage impacts of the subject proposed development on the existing sewerage facilities; and
- propose mitigation measures and sewage treatment and disposal proposal to avoid any potential adverse environmental impact.

1.4 The scope of this STDP includes:-

- general site description;
- identification of existing sewerage facilities for the concerned area;
- estimation of sewage flow of the subject proposed development;
- feasibility of connection with existing public sewerage facilities; and
- proposal of sewage treatment and disposal to cater for sewage flow generated by the subject proposed development if found necessary.

2. General Site Description and the Subject Proposed Development

2.1 The subject site is currently zoned "Green Belt" and area shown as "Road" on the Draft Ho Chung Outline Zoning Plan No. S/SK-HC/12 (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. It is currently occupied by botanical gardens, temporary structures and an access road. A site location plan is shown in **Figure S1**.

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 360 persons, and a total of 10 nos. of management staff is presumed in the sewage estimation.

2.3 The proposed vehicular ingress/egress point of the subject site abuts on the west side of Hing Keng Shek Road after exit from the roundabout of Hiram's Highway at Pak Wai.

3. Existing Sewerage System

3.1 At present, there is no existing public sewers in the subject area or its vicinity.

4. Proposed Sewage Disposal Arrangement

4.1 Since there is no existing public sewers in the concerned area for connection, discharging sewage generated by the subject proposed development into public sewers in not feasible at least by the time of anticipated occupation of the subject proposed development. Therefore, an on-site sewage treatment plant is required until connection to public sewers can be carried out.

4.2 The subject site falls within Port Shelter catchment area where tidal flow is restricted. The subject proposed development shall be equipped with suitable on-site sewage treatment facility with treatment standards to handle the sewage generated from the proposal.

4.3 Sewage from the residential flats will be collected and carried down to the ground level via downpipes. Branch sewerage will be laid close to the blocks to receive sewage flows from the downpipes directly. The branch sewerage will then discharge into the trunk sewerage which will be laid running underneath the main access road. The trunk sewerage will collect and convey all sewage generated by the subject proposed development to an on-site sewage treatment plant located at the west of the subject site. A proposed sewerage management plan is shown in **Figure S2**.

4.4 All future treated effluent discharge shall comply with the Water Pollution Control Ordinance (Cap. 358). A licence granted under the Water Pollution Control Ordinance should be obtained before a new discharge is commenced.

4.5 All collected sewage will be treated in the proposed sewage treatment plant. The treated effluent shall comply with the mandatory standards and requirements in the TM-DSS, and will be discharged into the proposed stormwater drainage system of the subject proposed development and from which be discharged to the existing watercourse outside the subject site.

5. Design Sewage Flows and Criteria

5.1 General Criteria

5.1.1 The sewage flow generated from the subject proposed development for assessing sewers is estimated in accordance with the EPD's report No. EPD/TP 1/05 – "Guidelines for Estimating Sewage Flows for Sewage Infrastructure Planning" (GESF) and the Sewerage Manual Part 1 published by DSD (SM). For proposed on-site sewage treatment plant (STP), EPD's Guidelines for the Design of Small Sewage Treatment Plants (GDSSTP) is adopted.

5.2 Design Population

5.2.1 It is explicitly stated in the subject planning application statement that the design population will be about 360 persons plus 10 management staff. These design parameters are adopted in this STDP.

5.3 Unit Flow Factors

5.3.1 Unit flow factors as recommended in the Table T-1 and T-2 in GESF and Appendix 2 in GDSSTP are adopted to estimate the total sewage flow generated from the subject proposed development.

5.3.2 The unit flow factors for domestic flows adopted for this study are summarized in **Table 1** below.

Table 1 : Unit Flow Factors for Domestic Flows

Development Type	Unit	Unit Flow Factor (m^3/day)
Private R3	Person	0.370

5.3.3 The unit flow factors for commercial flows, i.e. from the management staff, adopted in this study are summarized in **Table 2** below.

Table 2 : Unit Flow Factors (UFF) of Commercial Flow from General Operation (referenced to GESF's Table T-2)

Description	Specific Trades	Unit (per)	Unit Flow Factors (m^3/day)
Commercial Employee	Not applicable	Employee	0.080
Commercial Activities	J11 (Community, Social and Personal Services)	Employee	0.200

Remark: A total of 0.280 m^3 per unit/day is same as the design flow rate for Services (shops etc.), i.e. 280 l/employee/day, recommended in GDSSTP.

5.4 Peaking Factors

5.4.1 In this assessment, contributing population is calculated as follows:

Contributing Population = (Calculated total average flow/ 0.27) persons
= 153.54/0.27 = 569 persons

5.4.2 The contributing population is <1,000, and the proposed sewers of the subject development would be newly constructed hence infiltration and inflow in the sewerage system would be negligible. Therefore, a peaking factor of 6 as given in Table T-5 in the GESF and listed in below **Table 3** is applicable for the design of internal sewers of the subject development.

Table 3 : Peaking Factors, P (Extracted from GESF)

Population Range for sewers	Peaking Factor (including stormwater allowance) for facility with existing upstream sewerage	Peaking Factor (excluding stormwater allowance) for facility with new upstream sewerage
<1,000	8	6

5.4.3 For STP, with reference to GDSSTP, the design peaking factor would be

- 6 for population equal to or under 1,000
- 4 for population over 1000 but not less than that based on 1000 population.

6. Estimated Peak Sewage Flows

6.1 The design population of the proposed development is about 360 persons plus 10 employee. Tentatively, a 15m x 25m x 1.2m (average water depth) swimming pool is proposed. An instantaneous peak discharge flow of sewage generated from the backwashing is estimated to be approximately 0.2025 l/s in accordance with the general operation of backwashing as shown in **Table 4** below.

Table 4 : Estimated Sewage Flow from Swimming Pool

Description	
Pool Area	15m x 25m = 375 m^2
Pool Depth	1.2 m
Pool Volume	375 x 1.2 = 450.0m^3
Turnover Rate	6 hrs
Surface Loading Rate of Filter	25 $m^3/m^2/hr$
Filter Areas Required	450.0 / 6 / 25 = 3.000 m^2
Backwash Duration	7 min/day
Backwash Flow Rate	50 $m^3/m^2/hr$
Design Flow of Swimming Pool	50 x 3.000 x 7 / 60 = 17.500 m^3/day (0.2025 l/s)

6.2 The estimated total sewage flow generated from the proposed development are summarized in **Table 5** below.

Table 5 : Summary of Estimated Sewage from the Subject Proposed Development

Development Type	Population (number of people)	Unit Flow Factors (m^3/day)	Catchment Inflow Factors	Peaking Factor	ADWF(1) (m^3/s)	PDWF(2) (m^3/s)
Domestic	360	0.370	Referenced to para. 10.1	6	0.001542	0.009252

J11 (Community, Social and Personal Services)	10	0.280	of the GESF – 'not applicable to new catchments which are deemed to be free from misconnect-ions and pipe defects'	6	0.000032	0.001920
Swimming Pool	/	10.500		/	0.000203	0.000203
				Total	0.001777 (153.54 m^3/day)	0.011375

Notes:

(1) ADWF – Average dry weather flow, which is equivalent to population x unit flow factor x catchment inflow factor / (60 x 60 x 24)

(2) PDWF – Peak dry weather flow, which is equivalent to ADWF x Peaking Factor

6.3 The peak total sewage generated from the subject proposed development is estimated to be 0.011375 m^3/s (i.e. 11.38 l/s).

7. Proposed Sewage Treatment

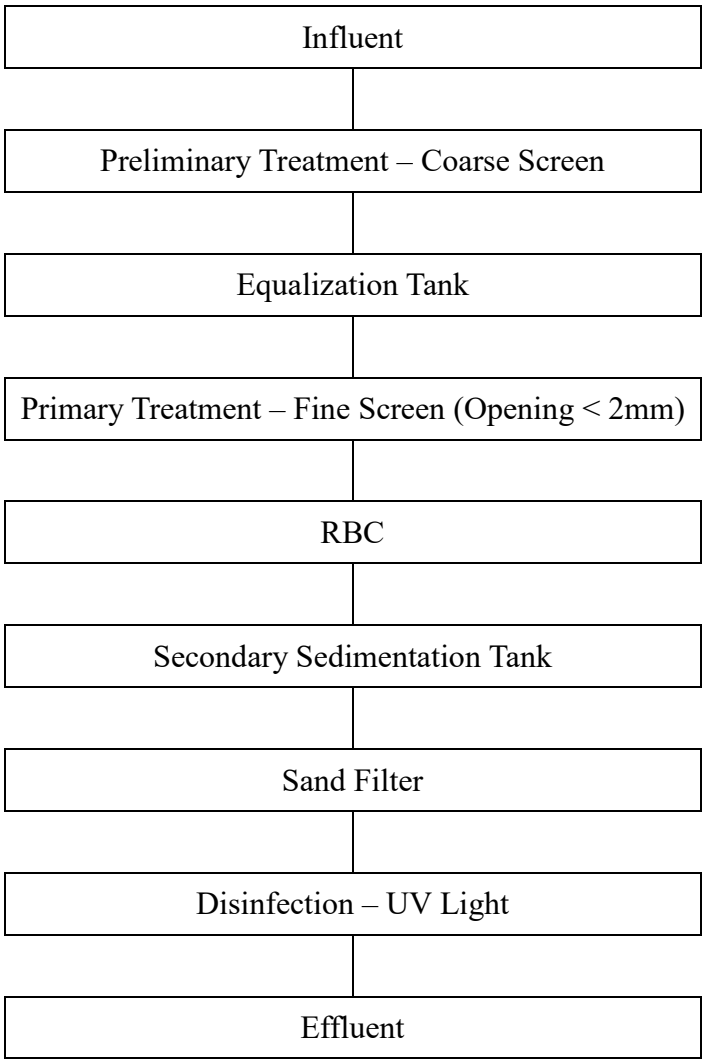
7.1 It is proposed to construct an on-site secondary sewage treatment plant (STP) as an interim measure to cater for the sewage generated from the subject proposed development. The plant will be abandoned after connection to public sewer is possible and acceptable to the authority. The STP will only be decommissioned after the sewer connection is satisfactorily completed.

7.2 The treated effluent will be discharged into the existing watercourse via the proposed stormwater system of the subject development. Effluent discharge will comply with the standards stipulated in the TM-DSS and be discharged into proposed stormwater drainage system.

7.3 Incoming sewage will pass through a coarse screen before discharging into the equalization tank. The sewage will be pumped to the fine screen chamber to prevent any sizeable solid and minimize the organic solid content into the RBC system. The mixed liquor will then be discharged to the final sedimentation tank. Sludge from the sedimentation tanks will be dewatered by mechanical dewatering unit such as filter press. The dewatering sludge will then be disposed off by land burial to the designated site by a

licensed contractor. The secondary treated sewage will pass the sand filter before disinfection process is carried out.

7.4 A flow chart of the proposed sewage treatment system is given below:



7.5 It is realized that on-site sewage treatment plants shall only be the last resort for any sewage treatment and disposal proposal, i.e. whenever sewer connection is not practicable. The pumping station within STP shall be capable of delivering the sewage from the development to the public sewer, when available, and the STP can then be abandoned when public sewer is available. It is envisaged to have no technical problem on sewage treatment process design.

7.6 The communal treatment plant serving the whole development is proposed to be located at the southern end near the entrance of the subject site. Sewage after treatment will be

discharged into the stormwater drainage of the subject site and from with the flow will be discharged via a stormwater terminal manhole into the existing watercourse running along the southern boundary of the subject site. The location of the STP has been selected with due consideration given to minimization of potential sewer, odour, noise and safety problems to the residents. The design standards and criteria will comply with the latest version of "Guidelines for the Design of Small Sewage Treatment Plants' published by EPD.

7.7 If on-site STP is to be constructed, the following action will be taken in order to avoid possible nuisance:

(a) The STP shall be fully enclosed by a concrete structure and equipped with deodorizing units at the ventilation and exhaust system.

(b) Ventilation exhaust pipes will be taken to roof level and away from neighbouring premises. It is recognized that odour from sewage treatment plants mainly originates form bad management. Fresh sewage is odourless and it is important that sewage should not be allowed to be accumulated in the inlet works which must be hosed down as frequent as possible to prevent any accumulation of sewage solids that will eventually become septic.

(c) The other source of odour in treatment plants is the sludge dewatering house. Odour will result from the exposed storage of sludge and the accumulation of sludge particles on floors which turn septic. Hence, the sludge dewatering house must be kept clean at all times and sludge storage bags be tied up as soon as they are full or drums be covered.

(d) All openable windows for ventilation, fresh air intake, and other planned outdoor locations for air sensitive uses of the proposed development should be located outside of the buffer regions to avoid potential air quality impact.

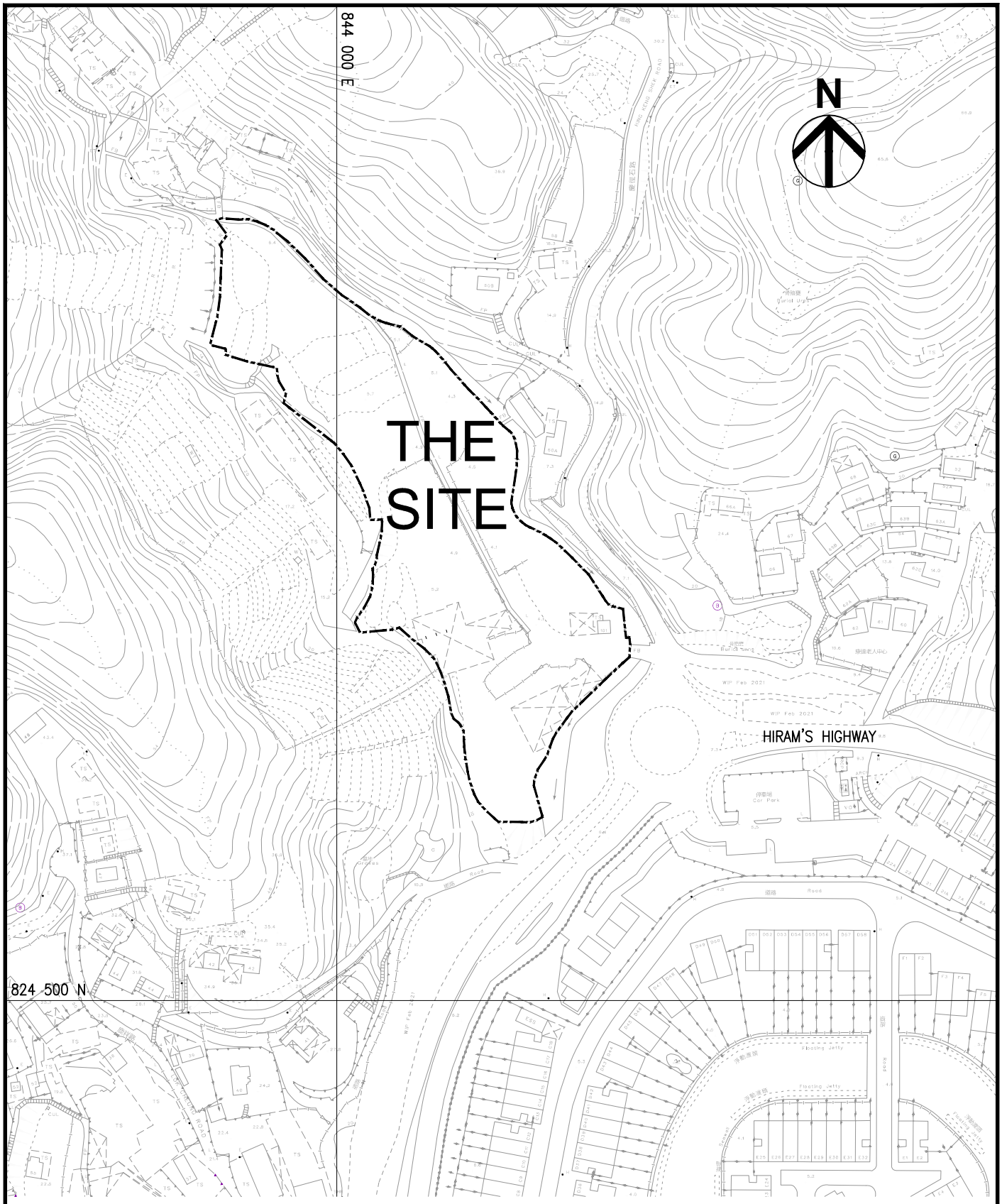
(e) Noise should not be problem since the selection of units will avoid the use of motors of high revolution. Air blowers too, will not be used. Instead, quiet machines such as submersible pumps and ejectors will be favoured. Particular attention shall be paid to the selection of exhaust fans and the design of intake and exhaust grills to prevent whistling noises.

8. Conclusion

8.1 Sewage generated from the proposed development will be properly treated by an on-site sewage treatment plant. The treated effluent will be discharged to nearby watercourse.

8.2 All future treated effluent discharge shall comply with the Water Pollution Control Ordinance (Cap. 358). A licence granted under the Water Pollution Control Ordinance should be obtained before a new discharge is commenced.

8.3 In conclusion, the subject proposed development would not impose any adverse sewerage impact.



LEGEND:

SUBJECT SITE BOUNDARY

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 S1

843 900 E | 844 000 E | 844 100 E | 844 200 E

824 700 N

824 600 N

N

SWIMMING POOL
WL +5.400

CLUBHOUSE
+10.400

+5.500

+5.500

BLOCK 1
4 STOREY
+9.800

RAMP DOWN TO CARPARK

BASEMENT CARPARK ENTRANCE
+5.500

BLOCK 2
4 STOREY
+9.500

+6.500

+6.500

BLOCK 3
4 STOREY
+9.800

+7.100

+6.500

+5.300

BLOCK 4
3 STOREY
+6.475

+5.500

UNDERGROUND SEWAGE TREATMENT PLANT (MIN. SIZE NOT LESS THAN 350M2 AND MIN. 4.5M HEADROOM)

DISCHARGE TO EXISTING STREAM

EXISTING TWIN 2500x2500mm BOX CULVERT

TREATED EFFLUENT

RIVER

FOOTPATH

骨殖甕
Burial Urns

康達老人中心

停車場
Car Park

WIP Feb 2021

WIP Feb 2021

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
TITLE	SEWERAGE MANAGEMENT PLAN
SCALE	1 : 1000 – A3
DRAWING No.	FIGURE S2

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

H:\21130_SaiKung\DRAWING\21130_FIG_D1 & D3 & D4 & S1 & S2_08.dwg, 10/7/2025 14:55:06, 1:1