

Appendix 5

Drainage and Sewerage Impact Assessment

Prepared for

WORLD FIRM LIMITED

STAR KEY DEVELOPMENT LIMITED

WISE EASE LIMITED

CENTRAL SKY INVESTMENT LIMITED

CENTRAL MIND INVESTMENT LIMITED

Prepared by

Ramboll Hong Kong Limited

**FOR PROPOSED FLAT WITH SHOP AND SERVICES/EATING
PLACE IN "COMMERCIAL" ZONE ON DRAFT WAN CHAI
OUTLINE ZONING PLAN NO. S/H5/32 AT 42-44 YIU WA
STREET AND 28-29 CANAL ROAD EAST, HONG KONG**

DRAINAGE AND SEWERAGE IMPACT ASSESSMENT

Date

September 2026

Prepared by

Miko Wan
Environmental Consultant

Signed

Approved by

Calvin Chiu
Technical Director

Signed

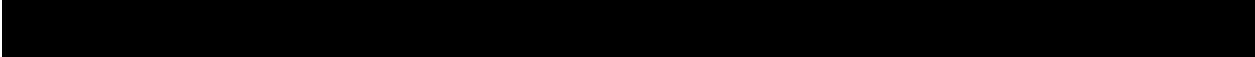
Project Reference

TKTYIUWAEI00

Document No.

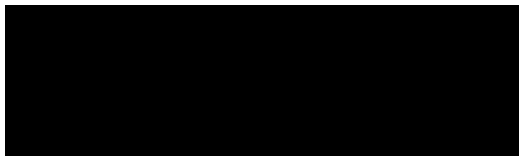
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1. INTRODUCTION

1.1 Project Background

- 1.1.1 The Application Site situated at 42-44 Yiu Wa Street and 28-29 Canal Road East is currently vacant with previous building demolished. It is intended to redevelop the Application Site to include residential flat with shop and services/eating place.
- 1.1.2 It is therefore to seek approval from Town Planning Board ("TPB") under Section 16 of the Town Planning Ordinance for the proposed flat with shop and services/eating place.
- 1.1.3 Ramboll Hong Kong Limited is commissioned by the Applicant to conduct this Drainage and Sewerage Impact Assessment (DSIA) based on the Proposed Development.

1.2 Application Site and its Environs

- 1.2.1 The Application Site is located on east side of Canal Road East and Canal Road Flyover. It is also bounded by Yiu Wa Street on north side and a back alley on south side. The area of the Application Site is approximately 274.2m².
- 1.2.2 The Application Site, together with other adjacent lots on east side of Canal Road East and Canal Road Flyover, falls within area currently zoned as "Commercial" ("C") under **Approved** Wan Chai Outline Zoning Plan (OZP) No. **S/H5/33**. Generally, it is surrounded by commercial buildings on north, east and south sides.
- 1.2.3 On the other hand, the areas on opposite side of Canal Road East and Canal Road Flyover are zoned as "Other Specified Uses (MIXED USE)". Both commercial and residential uses can be found.
- 1.2.4 The location of the Application Site and its surrounding environs are shown in **Figure 1.1**.

1.3 Proposed Development

- 1.3.1 The Proposed Development will consist of 1 residential tower, ancillary residential facilities (e.g. clubhouse) and F&B facilities. There is no swimming pool provided.
- 1.3.2 There will be altogether 66 flats, clubhouse of 52 m² and F&B commercial area of 162 m². The tentative occupation year of the development is **2030**.
- 1.3.3 The Master Layout Plan (MLP) of the Proposed Development is included in **Appendix 1.1**.

2. DRAINAGE IMPACT ASSESSMENT

2.1 Appraisal of Drainage Impact

- 2.1.1 The Application Site is served by existing drainage systems. According to the drainage plan (**Appendix 2.2**), a Ø300 mm drainage pipe runs along the back alley of the Application Site and connects to the existing Ø300 mm drainage pipe (SWD7015179), which then discharges to the Ø2250 mm drainage pipe along Canal Road East. The Application Site is vacant and 100% paved currently.
- 2.1.2 The estimated surface runoff under the existing and future conditions of the Application Site is shown in **Appendix 2.1**. 20% greenery coverage would be provided for the Proposed Development as a resilient measure. The peak 1-in-50-year runoff from the site remains unchanged at 0.0173 m³/s. The surface runoff generated from the Application Site will be collected and connected to the aforementioned drainage pipe (existing private stormwater manhole) and there is no change of flow regime.
- 2.1.3 Although greenery will be provided after development, it is expected that the surface runoff will remain unchanged. Therefore, it is anticipated that there is no adverse impact on the existing drainage pipe receiving runoff from the site.
- 2.1.4 The applicant will be responsible to maintain the proposed drainage pipeline connection.
- 2.1.5 It is expected that the Proposed Development (with reduced surface runoff and same flow regime) would not result in worsened drainage impact.

3. SEWERAGE IMPACT ASSESSMENT

3.1 Scope of Work

- 3.1.1 The aim of this study is to assess whether the existing sewerage facilities serving the Application Site are sufficient to cope with the sewage flow from the Proposed Development.

3.2 Assessment Criteria and Methodology

- 3.2.1 Environmental Protection Department's (EPD's) Guidelines for Estimating Sewage Flows for Sewage Infrastructure Planning, Version 1 (GESF) has been referred to for the purposes of estimating the quantity of the sewage generated from the Proposed Development and the existing catchment area. Sewage flow parameters and peaking factors in this document have been adopted for this SIA.
- 3.2.2 Based on the building types in the area, the following unit flow factors are used in the SIA calculation:
- Residents: 0.27 m³/person/day (R2)
 - Clubhouse Staff: 0.28 m³/day (J11 - Community, Social & Personal Services)
 - F&B employee: 1.58 m³/day (J10 - Restaurants & Hotels)
- 3.2.3 Catchment Inflow Factor (P_{CIF}) of Wan Chai (1.00) has been applied in the assessment.

3.3 Existing and Future Sewerage System

- 3.3.1 According to the existing drainage plan (**Appendix 2.2**), there is a Ø150mm private sewer along the lane at the back alley of the Application Site (to the south of the Application Site) and then connected to the existing public manhole (FMH7061661).
- 3.3.2 As the existing public sewer along Matheson Street is missing invert level, minimum velocity of 1m/s (based on DSD's sewerage manual) is adopted in the hydraulic calculation in this SIA to cater for worse scenario.
- 3.3.3 The latest drainage plan for the Application Site was approved on 2 February 2023. In accordance with that approved plan, the developer has already installed a new 225mm diameter sewerage pipeline from terminal manhole T1 to existing private sewerage manhole F15 in accordance with the approved plan. For the proposed development, the same connection which is already completed will be adopted.
- 3.3.4 The existing and future sewers in the vicinity of the Application Site are shown in **Figure 3.1**.

3.4 Wastewater Generated by the Proposed Development

- 3.4.1 Wastewater arising from the Proposed Development will be primarily contributed by residents and staff.
- 3.4.2 Detailed calculation for the Proposed Development is given in **Table 3.1** below and **Appendix 3.1**.

Table 3.1 Estimated Peak Flow

Development Parameters	Proposed Development		
	Residential Tower	Clubhouse	Commercial Area (F&B)
Total number of units	66	-	-
Assumed Area (m ²)	-	52	162
Number of Population	152 ⁽¹⁾	2	9
Design Flow (m ³ /person/day)	0.27 ⁽²⁾	0.28 ⁽³⁾	1.58 ⁽⁴⁾
Flow Rate (m³/day)	41.0	0.6	14.2
Total Flow Rate with P_{CHF} (m³/day)	55.8		
Peak Flow (L/s)	5.2		

(1) 2021 Population Census – Average Household Size of 2.3 in Canal Road

(2) Refer to Table T-1 of GESF – Private R2

(3) Refer to Table T-2 of GESF – J11 Community, Social & Personal Services

(4) Refer to Table T-2 of GESF – J10 Restaurants & Hotels

3.5 Discussion

- 3.5.1 Wastewater from the Proposed Development will be discharged to the existing private sewerage manhole F15.
- 3.5.2 The potential sewerage impact due to the Proposed Development has been quantitatively addressed. Sewage generation rate from the Application Site is estimated to be: 55.8m³/day.
- 3.5.3 According to Table 4a of **Appendix 3.1**, regarding the sewage generation rate from the Proposed Development and surrounding areas (**Figure 3.2**), seven of the existing private sewerage pipelines would not have adequate capacity to receive the flow, while the existing government sewerage pipelines would have adequate capacity.
- 3.5.4 Therefore, a sewage retention tank will be proposed for the Proposed Development such that the sewage will be discharged during non-peak sewage discharge period only. It is committed that the sewage would not be discharge during the peak sewage discharge period. Furthermore, the proposed sewage retention tank will be provided with adequate capacity to prevent potential overflow of sewage.
- 3.5.5 The applicant will be responsible to maintain the proposed sewerage pipeline connection which is already implemented, and the construction, operation & maintenance of the proposed sewage retention tank. With the proposed connection and sewage retention tank for the discharge of sewage during non-peak sewage discharge period in place, the sewerage system will have adequate capacity to cater the sewage from the Proposed Development and nearby catchments.

4. OVERALL CONCLUSION

4.1 Conclusion

- 4.1.1 A development including residential flat with shop and services/eating place is proposed at 42-44 Yiu Wa Street. The potential sewerage impact has been quantitatively addressed.
- 4.1.2 The Application Site is currently served by drainage system. The Proposed Development would result in reduced surface runoff and would follow the same flow regime as per existing condition (connected to the same stormwater manhole as it was before development). Resilient measures in terms of 20% greenery is proposed to reduce surface runoff when compared to the existing condition. No worsened drainage impact is therefore anticipated.
- 4.1.3 Sewage generated from the Proposed Development will be discharged and connected to the existing private manhole F15 at the back alley of the Application Site. The proposed connection resembles the connection shown in the drainage plan approved on 2 February 2023 and already implemented.
- 4.1.4 Based on the sewerage impact assessment results, it is found that the capacity of the existing private sewerage system serving the area would not be sufficient to cater for cumulative sewage generated from the Proposed Development and nearby catchment areas. Sewage retention tank for the Proposed Development will be proposed and the sewerage flow will be discharged during non-peak period.
- 4.1.5 With the proposed works and proposed holding tank, this SIA confirms the feasibility of the Proposed Development in terms of no insurmountable sewerage impacts on public sewerage system are anticipated. Nevertheless, surcharged conditions are identified in private sewers at the back alley of the Application Site.

Figures

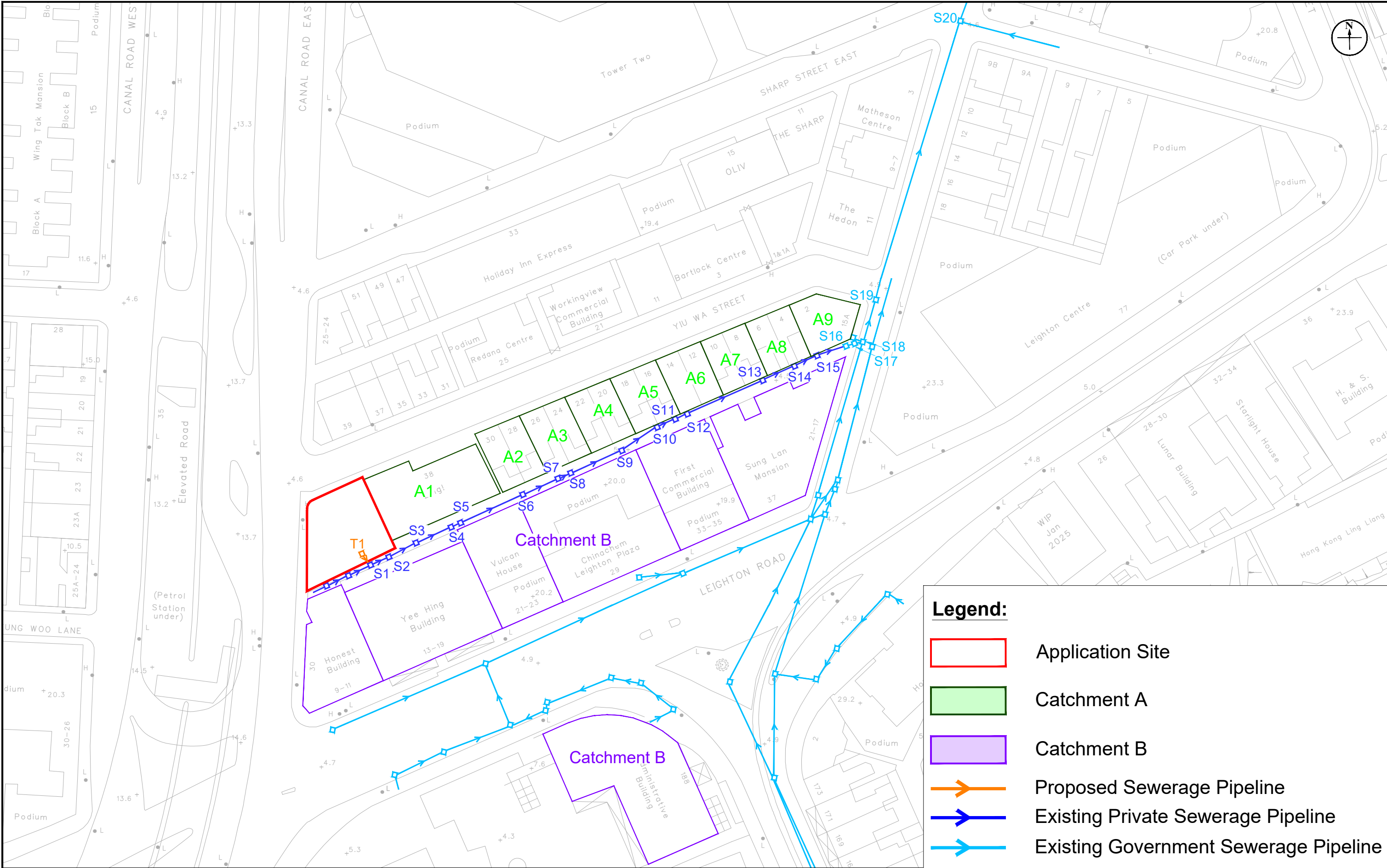
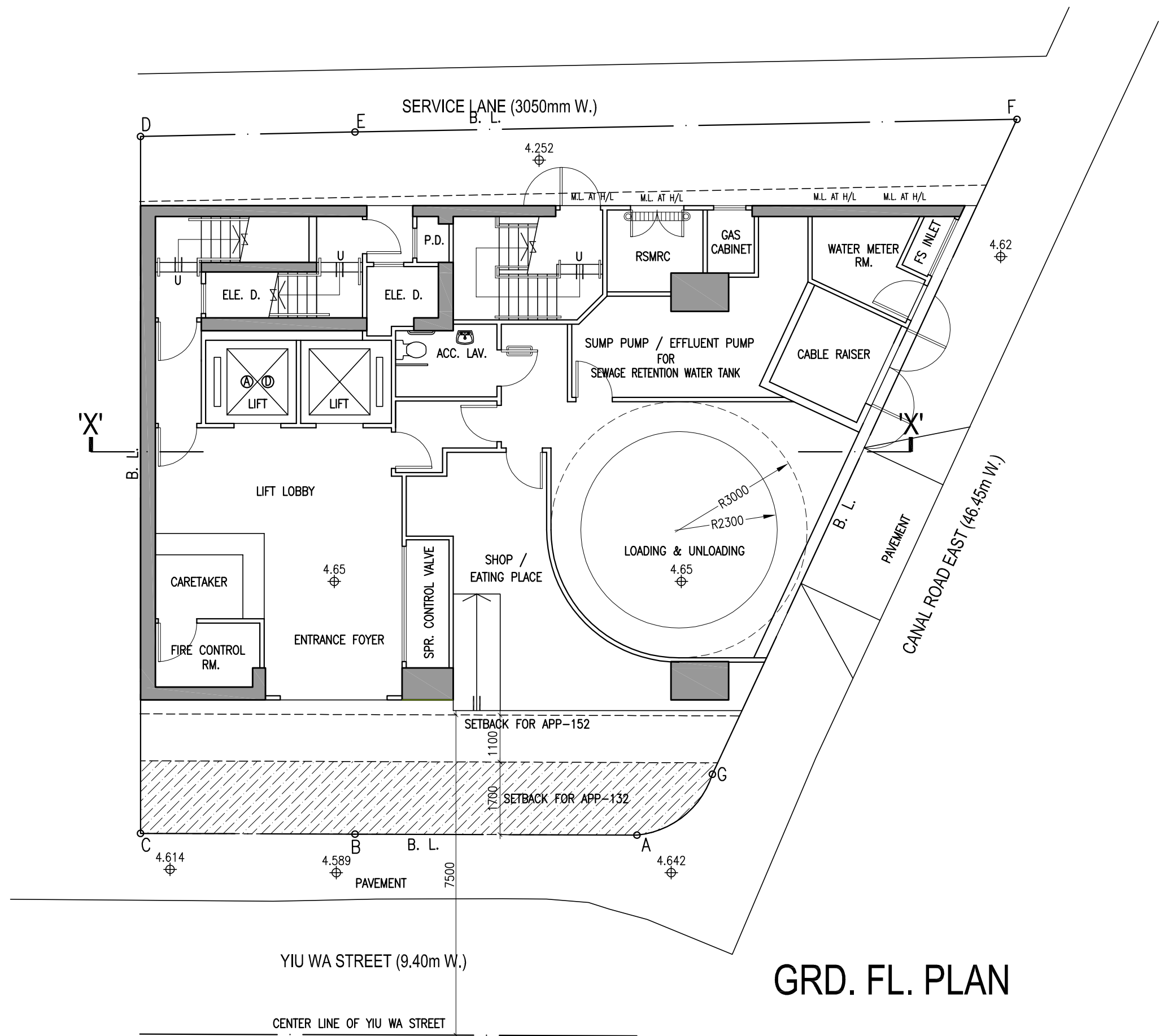


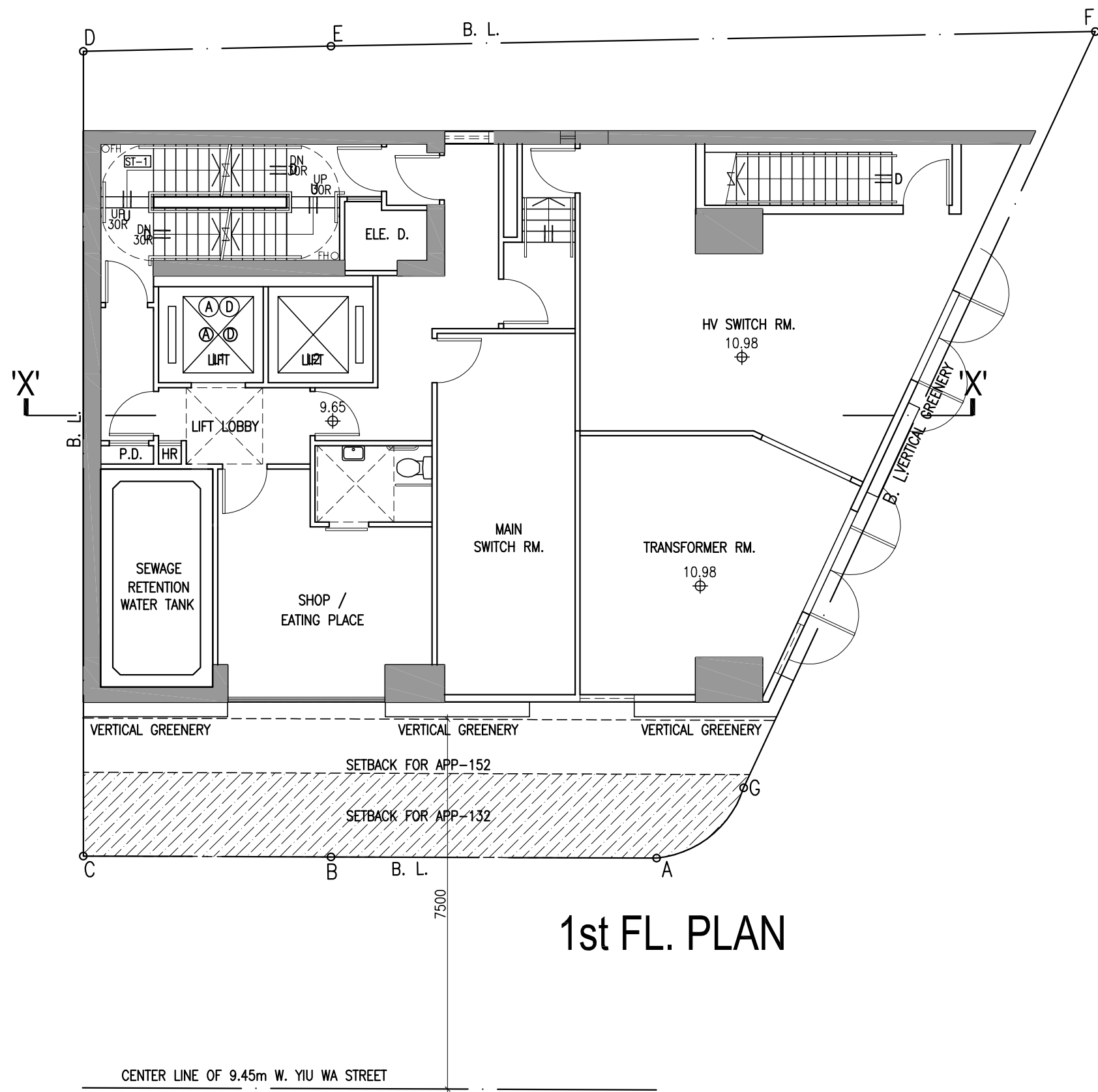
Figure: 3.2		RAMBOLL	
Title: Catchment Areas in the Vicinity of the Application Site		Drawn by: GW	
Project: For Proposed Flat with Shop and Services/Eating Place in "Commercial" Zone on Draft Wan Chai Outline Zoning Plan No. S/H5/32 at 42-44 Yiu Wa Street and 28-29 Canal Road East, Hong Kong		Checked by: CC	
		Rev.: 1.0	
		Date: Apr 2026	

Appendix 1.1 Master Layout Plan (MLP)



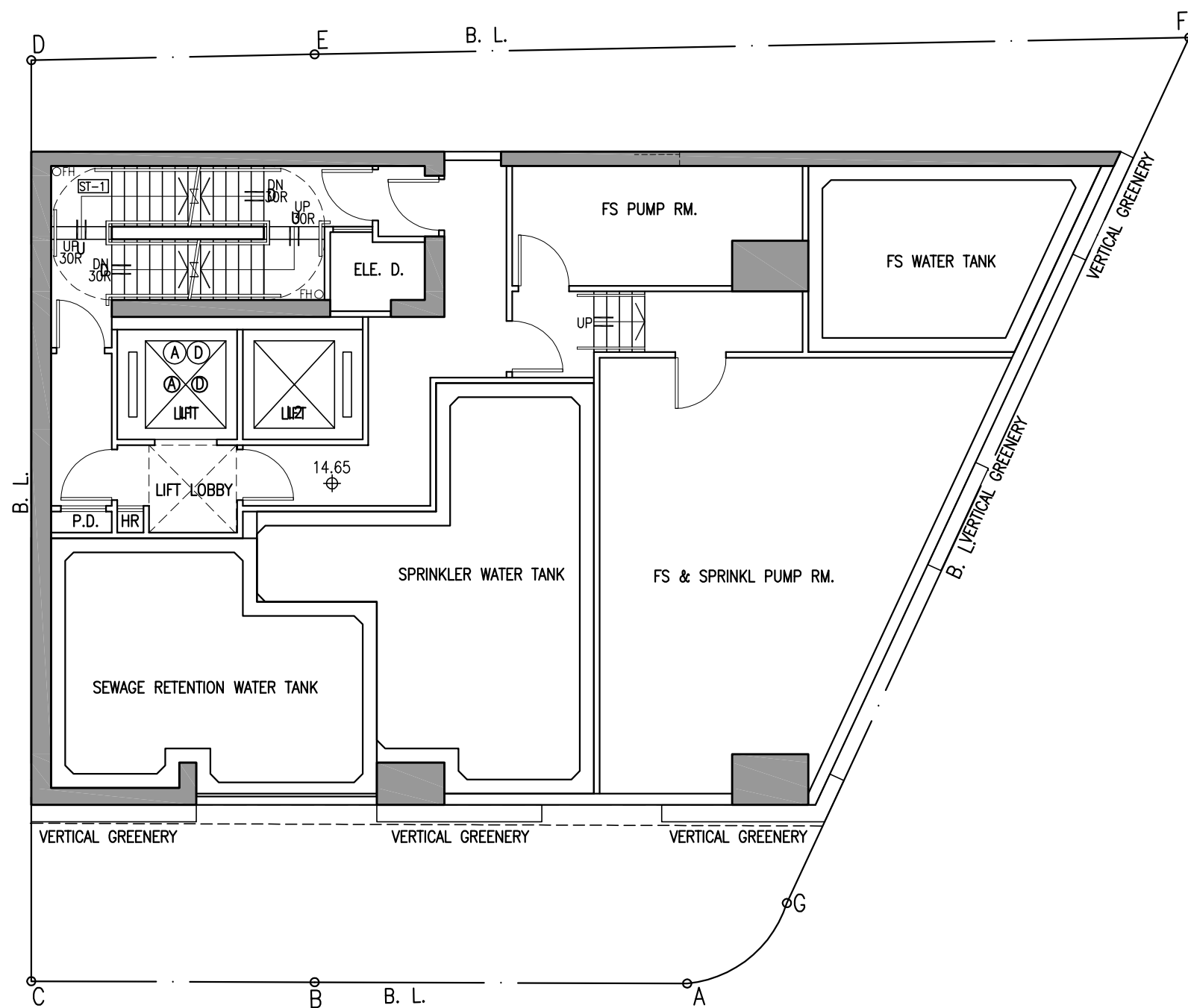
GRD. FL. PLAN

B.L.D. REF. NO.			
F.P.B. NO.			
PROJECT			
PROPOSED COMPOSITE BUILDING AT Nos. 42-44 YIU WAH STREET, CAUSEWAY BAY HONG KONG			
PLAN			
GRD. FL. PLAN			
SCALE			
1 : 100 (A3) 1 : 200 (A4)			
AUTHORIZED PERSON			
T.K. TSUI & ACCOSIATES LIMITED			
PLANNER			
DeSPACE (International) Limited			
ENVIRONMENTAL CONSULTANT			
RAMBOLL HONG KONG LIMITED			
TRAFFIC CONSULTANT			
CKM ASIA LIMITED			
DESIGN CONSULTANT			
LEO DESIGN LIMITED			
DRAWN			
CHECKED			
DRAWING NO.	DATE		
	A	05/03/2026	E
	B	24/03/2026	
	C	10/04/2026	
FIG-02	E		
	D	05/06/2026	



1st FL. PLAN

B.L.D. REF. NO.			
F.P.B. NO.			
PROJECT			
PROPOSED COMPOSITE BUILDING AT Nos. 42-44 YIU WAH STREET, CAUSEWAY BAY HONG KONG			
PLAN			
1st FL. PLAN			
SCALE			
1 : 100 (A3) 1 : 200 (A4)			
AUTHORIZED PERSON			
T.K. TSUI & ACCOSIATES LIMITED			
PLANNER			
DeSPACE (International) Limited			
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RAMBOLL HONG KONG LIMITED			
TRAFFIC CONSULTANT			
CKM ASIA LIMITED			
DESIGN CONSULTANT			
LEO DESIGN LIMITED			
DRAWN			
CHECKED			
DRAWING NO. FIG-03	DATE	26/02/2026	
	A	05/03/2026	E 17/09/2026
	B	24/03/2026	
	C	10/04/2026	
	D	05/06/2026	



2nd FL. PLAN

B.L.D. REF. NO.

F.P.B. NO.

PROJECT

PROPOSED COMPOSITE BUILDING
AT Nos. 42-44 YIU WAH STREET,
CAUSEWAY BAY
HONG KONG

PLAN

2nd FL. PLAN

SCALE

1 : 100 (A3)

1 : 200 (A4)

AUTHORIZED PERSON

T.K. TSUI & ACCOSIATES LIMITED

PLANNER

DeSPACE (International) Limited

ENVIRONMENTAL CONSULTANT

RAMBOLL HONG KONG LIMITED

TRAFFIC CONSULTANT

CKM ASIA LIMITED

DESIGN CONSULTANT

LEO DESIGN LIMITED

DRAWN

CHECKED

DRAWING NO.

DATE	
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26/02/2026	
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	A
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05/03/2026	
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E	B
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24/03/2026	
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	C
	D

10/04/2026	
05/06/2036	

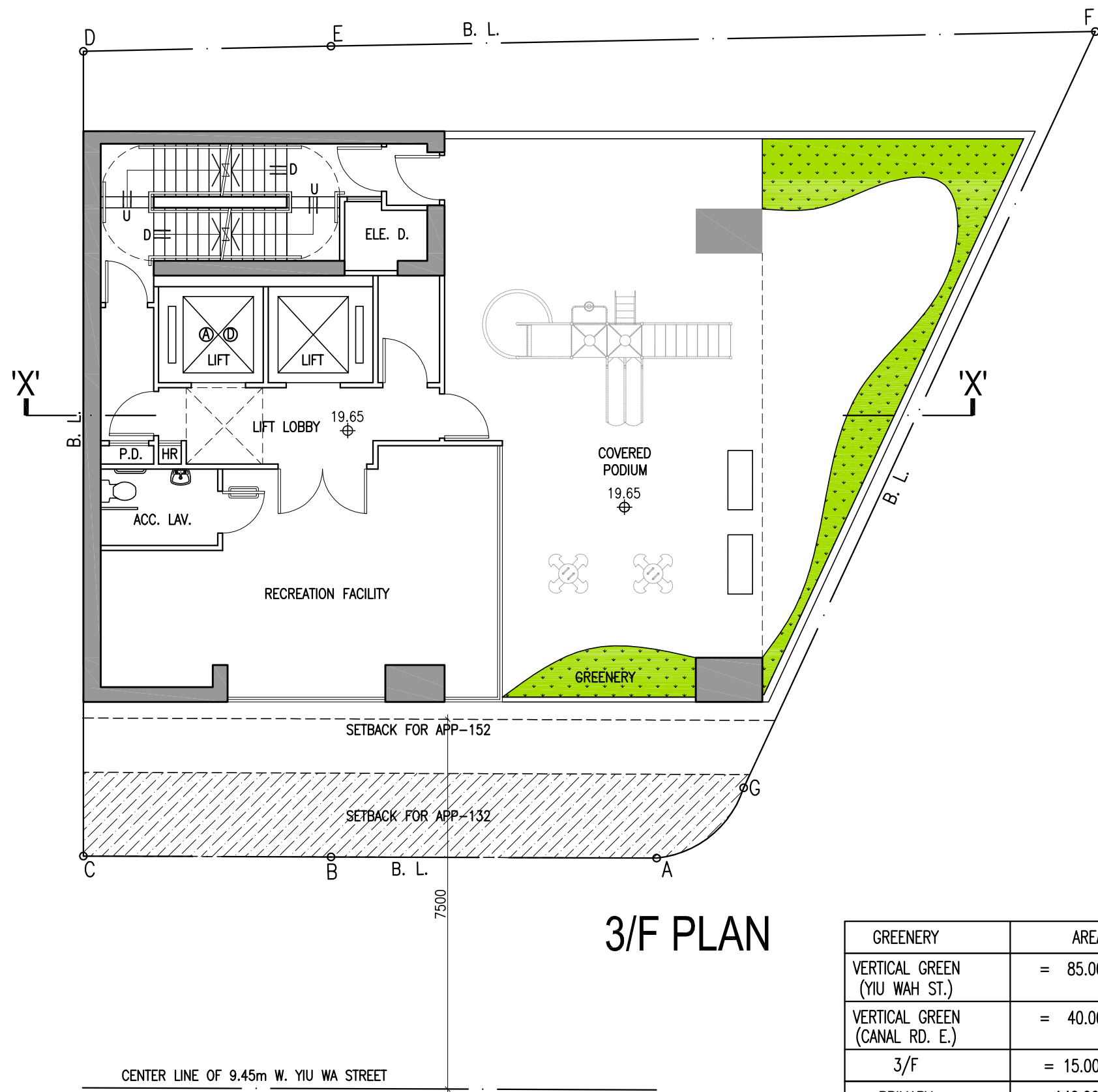
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03/06/2026	
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FIG-04

3	B	C
E		

24/03/2026	
10/04/2026	



3/F PLAN

GREENERY	AREA	PRIMARY	OVERALL
VERTICAL GREEN (YIU WAH ST.)	= 85.00s.m.	✓	✓
VERTICAL GREEN (CANAL RD. E.)	= 40.00s.m.	✓	✓
3/F	= 15.00s.m.	✓	✓
PRIMARY	= 140.00s.m. / 274.20 = 51.06% > 10%		
OVERALL	= 140.00s.m. / 274.20 = 51.06% > 20%		

B.I.D. REF. NO.

F.P.B. NO.

PROJECT

PROPOSED COMPOSITE BUILDING
AT Nos. 42-44 YIU WAH STREET,
CAUSEWAY BAY
HONG KONG

PLAN

3rd FL. PLAN

SCALE

1 : 100 (A3)
1 : 200 (A4)

AUTHORIZED PERSON

T.K. TSUI & ACCOSIATES LIMITED

PLANNER

DeSPACE (International) Limited

ENVIRONMENTAL CONSULTANT

RAMBOLL HONG KONG LIMITED

TRAFFIC CONSULTANT

CKM ASIA LIMITED

DESIGN CONSULTANT

LEO DESIGN LIMITED

DRAWN

CHECKED

DRAWING NO.

FIG-05

DATE

26/02/2026

05/03/2026

24/03/2026

10/04/2026

05/06/2026

E

A

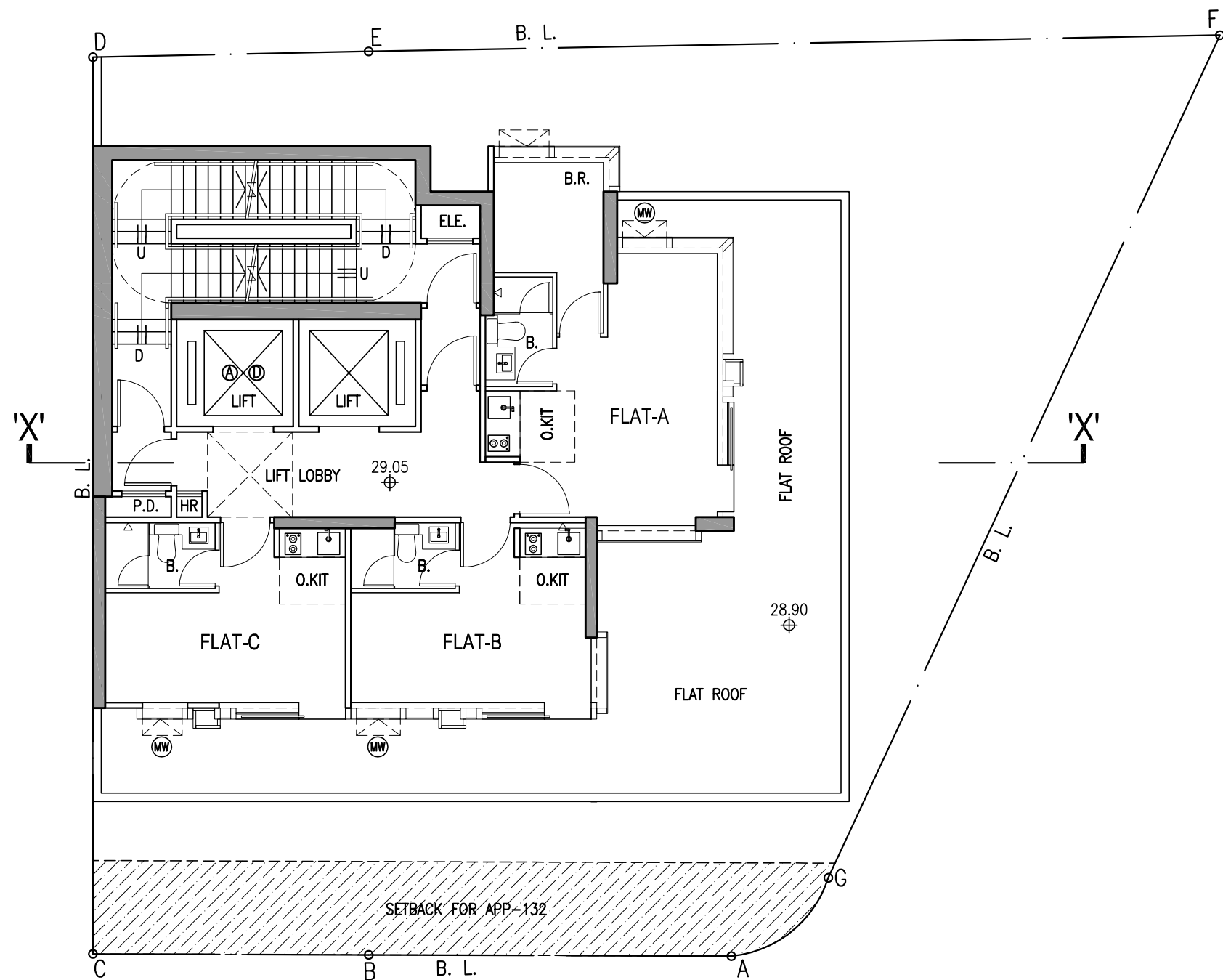
B

C

D

E

17/09/2026



5/F PLAN
(NO 4/F)
MW MAINTENANCE WINDOW

B.L.D. REF. NO.

F.P.B. NO.

PROJECT

PROPOSED COMPOSITE BUILDING
AT Nos. 42-44 YIU WAH STREET,
CAUSEWAY BAY
HONG KONG

PLAN

5th FL. PLAN

SCALE

1 : 100 (A3)
1 : 200 (A4)

AUTHORIZED PERSON

T.K. TSUI & ACCOSIATES LIMITED

PLANNER

DeSPACE (International) Limited

ENVIRONMENTAL CONSULTANT

RAMBOLL HONG KONG LIMITED

TRAFFIC CONSULTANT

CKM ASIA LIMITED

DESIGN CONSULTANT

LEO DESIGN LIMITED

DRAWN

CHECKED

DRAWING NO.

FIG-06

DATE

26/02/2026

05/03/2026

24/03/2026

10/04/2026

05/06/2026

E

A

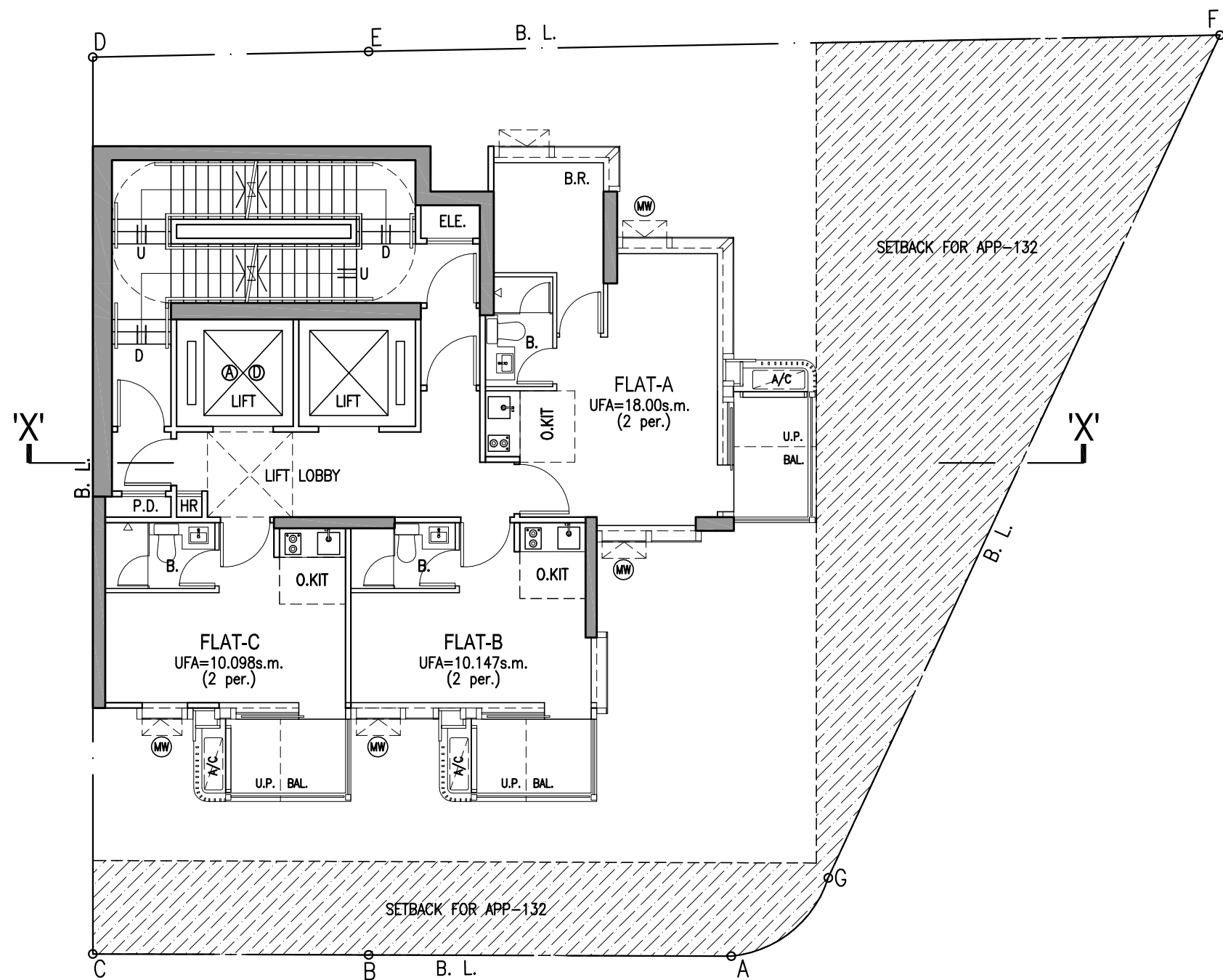
B

C

D

E

17/09/2026



6-29/F PLAN
(NO 13/F, 14/F & 24/F)
(MW) MAINTENANCE WINDOW

B.L.D. REF. NO.

F.P.B. NO.

PROJECT

PROPOSED COMPOSITE BUILDING
AT Nos. 42-44 YIU WAH STREET,
CAUSEWAY BAY
HONG KONG

PLAN

6th-29th FL. PLAN

SCALE

1 : 100 (A3)
1 : 200 (A4)

AUTHORIZED PERSON

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RAMBOLL HONG KONG LIMITED

TRAFFIC CONSULTANT

CKM ASIA LIMITED

DESIGN CONSULTANT

LEO DESIGN LIMITED

DRAWN

CHECKED

DRAWING NO.

FIG-07

DATE

26/02/2026

05/03/2026

24/03/2026

10/04/2026

05/06/2026

E

17/09/2026

Appendix 2.1 Detailed Drainage Impact Assessment Calculation

For Proposed Flat with Shop and Services/Eating Place in "Commercial" Zone on Draft Wan Chai Outline Zoning Plan No. S/H5/32 at 42-44 Yiu Wa Street and 28-29 Canal Road East, Hong Kong

Table 1 - Proposed Catchment Areas and Run-off (1 in 50 year)

$$Q_p = 0.278 \ C \ i \ A$$

Notes:

Site Area 274 m²

where Q_p = peak runoff in m³/s
 C = runoff coefficient (dimensionless)
 i = rainfall intensity in mm/hr
 A = catchment area in km²

Catchments are small, so Rational Method is appropriate

1 in 50-year (according to Table 3 of DSD Manual)

a= 505.5
b= 3.29
c= 0.355

Surface Characteristics	Runoff coefficient, C*
Asphalt	0.70 - 0.95
Concrete	0.80 - 0.95
Brick	0.70 - 0.85
Grassland (heavy soil**)	
Flat	0.13 - 0.25
Steep	0.25 - 0.35
Grassland (sandy soil)	
Flat	0.05 - 0.15
Steep	0.15 - 0.20

	Catchment	Discharge Manhole	Paved	Unpaved	Area	Total t _c ^[1]	Intensity	Weighted Runoff Coefficient	Run-off	Run-off ^[2]	Run-off ^[3]
					(m ²)	(min)	(mm/h)		(m ³ /s)	(m ³ /s)	(m ³ /s)
Existing	Subject Site										
	S1	T1	100%	0%	274	5.00	239	0.95	0.0173	0.0192	0.0200
Future	Subject Site										
	S1	T1	80%	20%	274	5.00	239	0.95	0.0173	0.0192	0.0200

Remarks:

- [1]. Assumed Time of Concentration
- [2]. Runoff includes rainfall increase due to Climate Change 11.1% in the mid 21st Century
- [3]. Runoff includes rainfall increase due to Climate Change 16% in the end of 21st Century

For Proposed Flat with Shop and Services/Eating Place in "Commercial" Zone on Draft Wan Chai Outline Zoning Plan No. S/H5/32 at 42-44 Yiu Wa Street and 28-29 Canal Road East, Hong Kong

Hydraulic Calculations of Proposed Drainage System

Table 2a - 1 in 50 year Runoff of Future Catchments (m³/s)

Runoff at	Catchment	
	S1	Total
T1	0.017	0.02

Table 3a - Hydraulic Capacities for Existing Drainage System

Segment	Manhole Reference	Manhole Reference	Type of Channel	Pipe Dia.	Pipe Length	Invert Level 1	Invert Level 2	g	k _s	s	Gradient	v	V	Area	Q	Q _{silt} ¹
				mm	m	mPD	mPD	m/s ²	m		1 in	m ² /s	m/s	m ²	m ³ /s	m ³ /s
T1 - S1	-	-	Circular	250	1.6	2.82	2.71	9.81	0.0030	0.073	14	0.000001	2.97	0.05	0.15	0.14

Table 4a - Comparison of Runoff from Proposed Catchments and Hydraulic Capacities of Existing Drainage System

Segment	Manhole Reference	Manhole Reference	Pipe Dia.	Q _{silt} ¹	Catchment Involved	Runoff	Occupancy	Sufficient Capacity?	Runoff [2]	Occupancy	Sufficient Capacity?	Runoff [3]	Occupancy	Sufficient Capacity?	Runoff [4]	Occupancy	Sufficient Capacity?
			mm	m ³ /s		m ³ /s			m ³ /s			m ³ /s			m ³ /s		
T1 - S1	-	-	250	0.14	S1	0.02	12.5%	YES	0.02	13.8%	YES	0.02	14.5%	YES	0.02	16.2%	YES

Remarks:

1. Qsilt: 10% reduction in flow for gradient is not greater than 1 in 25, 5% reduction in flow for gradient greater than 1 in 25.

Runoff [2] represents the situation in Mid 21st Century of 11.1%

Runoff [3] represents the situation in Late 21st Century of 16.0%

Runoff [4] represents the situation in Late 21st Century due to design allowance with additional runoff of 12.1%

Appendix 2.2 Existing Drainage Plan

VERNMENT

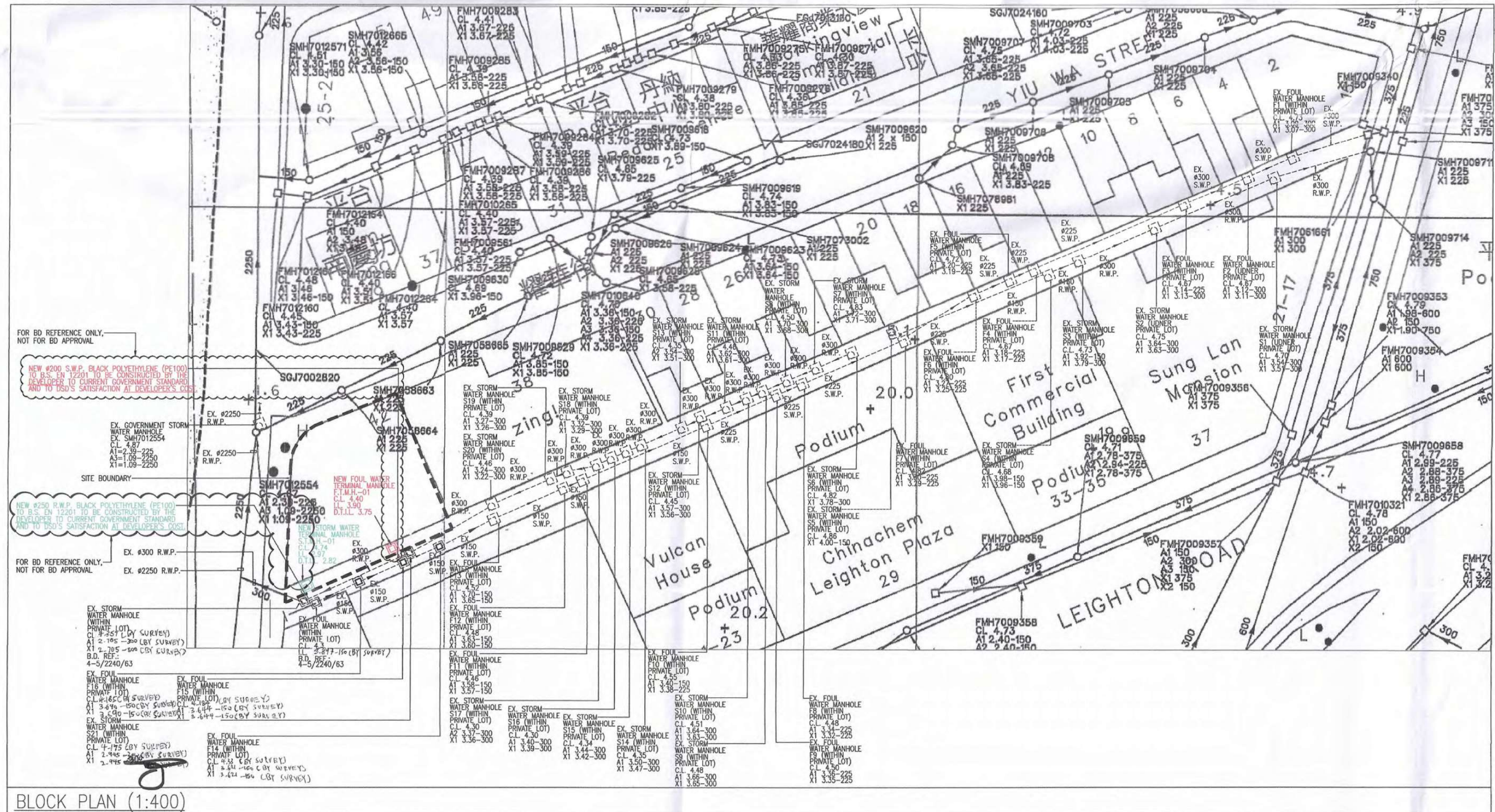
AL ELEMENTS
35.

PARATELY.

R LEVEL

TRAP

FLOOR LEVEL



Note: This plan has been curtailed check basis under processing system as prom ADM-19. The duties of the registered structural engineer/geotechnical engineer concerned under section 4(3)(b) and section 14(2)(c) of the Building Act of particular relevance in this

Plan Approved

YEUNG Pak
Senior Building
or BUILDING A

- 2 FEB

Appendix 3.1 Detailed Sewerage Impact Assessment Calculation

Table 1 Calculation for Sewage Generation Rate of the Proposed Development at the Application Site

Proposed Development (Catchment S)

1. Residential

Total number of units	=	66 unit
Total number of residents	=	152 people -- (2021 Population Census: Average Household Size of 2.3 in Canal Road)
Design flow	=	0.27 m ³ /person/day -- (refer to Table T-1 of GESF - R2)
Sewage Generation rate	=	41.0 m ³ /day

2. Clubhouse

Assumed Area	=	52 m ²
Assumed floor area per employee	=	30.30 m ² per worker -- (refer to Table 8 of CIFSUS - Community, Social & Personal Services)
Total number of employees	=	2 employees
Design flow for commercial activities	=	0.28 m ³ /employee/day -- (refer to Table T-2 of GESF - J11)
Sewage Generation rate	=	0.6 m ³ /day

3. F&B

Assumed Area	=	162 m ²
Assumed floor area per employee	=	19.61 m ² per worker -- (refer to Table 8 of CIFSUS - Restaurants)
Total number of employees	=	9 employees
Design flow for commercial activities	=	1.58 m ³ /employee/day -- (refer to Table T-2 of GESF - J10)
Sewage Generation rate	=	14.2 m ³ /day

Total flow from proposed development

Flow Rate (without Catchment Inflow Factor)	=	55.8 m ³ /day
Catchment Inflow Factor	=	1.00 Catchment Inflow Factor for Wan Chai in Table T-4 of GESF
Flow Rate (with Catchment Inflow Factor)	=	55.8 m ³ /day
Contributing Population	=	207 People
Peaking Factor	=	8 Refer to Table T-5 of GESF for population <1,000 incl. stormwater allowance
Peak Flow	=	5.2 litre/sec

Table 2a Hydraulic Capacity of Existing Private Sewers

Segment	Manhole Reference	Manhole Reference	Pipe Dia.	Pipe Length	Invert Level 1	Invert Level 2	g	k _s	s	v	V	Area	Q	Estimated Capacity
			mm	m	mPD	mPD	m/s ²	m		m ² /s	m/s	m ²	m ³ /s	L/s
S1 - S5 ^[1]	F15	F11	150	20.8	3.64	3.58	9.81	0.00060	0.003	0.000001	0.55	0.02	0.01	10
S5 - S6	F11	F10	150	14.3	3.57	3.40	9.81	0.00060	0.012	0.000001	1.10	0.02	0.02	19
S6 - S7	F10	F9	225	8.2	3.38	3.36	9.81	0.00060	0.002	0.000001	0.64	0.04	0.03	25
S7 - S8	F9	F8	225	3.2	3.35	3.34	9.81	0.00060	0.003	0.000001	0.73	0.04	0.03	29
S8 - S9	F8	F7	225	11.8	3.32	3.30	9.81	0.00060	0.002	0.000001	0.53	0.04	0.02	21
S9 - S10	F7	F6	225	8.9	3.29	3.27	9.81	0.00060	0.002	0.000001	0.61	0.04	0.02	24
S10 - S11	F6	F5	225	4.2	3.25	3.20	9.81	0.00060	0.012	0.000001	1.44	0.04	0.06	57
S11 - S12	F5	F4	225	2.8	3.19	3.18	9.81	0.00060	0.004	0.000001	0.78	0.04	0.03	31
S12 - S13	F4	F3	225	17.4	3.17	3.14	9.81	0.00060	0.002	0.000001	0.54	0.04	0.02	21
S13 - S14	F3	F2	300	7.4	3.13	3.12	9.81	0.00060	0.001	0.000001	0.57	0.07	0.04	40
S14 - S15	F2	F1	300	5.3	3.11	3.09	9.81	0.00060	0.004	0.000001	0.96	0.07	0.07	68

Table 2b Hydraulic Capacity of Existing Government Sewers

Segment	Manhole Reference	Manhole Reference	Pipe Dia.	Pipe Length	Invert Level 1	Invert Level 2	g	k _s	s	v	V ^[2]	Area	Q	Estimated Capacity
			mm	m	mPD	mPD	m/s ²	m		m ² /s	m/s	m ²	m ³ /s	L/s
S15 - S16	F1	FMH7009341	300	6.4	3.07	2.64	9.81	0.00060	0.067	0.000001	4.10	0.07	0.29	290
S16 - S17	FMH7009341	FMH7061661	300	1.6	2.64	-	9.81	0.00060	-	0.000001	1.00	0.07	0.07	71
S17 - S18	FMH7061661	FMH7009339	300	0.9	-	-	9.81	0.00060	-	0.000001	1.00	0.07	0.07	71
S18 - S19	FMH7009339	FMH7009338	375	8.5	-	-	9.81	0.00060	-	0.000001	1.00	0.11	0.11	110
S19 - S20	FMH7009338	FMH7009306	450	60.0	-	-	9.81	0.00060	-	0.000001	1.00	0.16	0.16	159

Table 2c Hydraulic Capacity of Proposed Sewers

Segment	Manhole Reference	Manhole Reference	Pipe Dia.	Pipe Length	Invert Level 1	Invert Level 2	g	k _s	s	v	V	Area	Q	Estimated Capacity
			mm	m	mPD	mPD	m/s ²	m		m ² /s	m/s	m ²	m ³ /s	L/s
T1 - S1	T1	F15	225	3.1	3.75	3.64	9.81	0.00030	0.034	0.000001	2.66	0.04	0.11	106

Notes: [1] Table 2a: According to the drainage plan, the invert level of upstream manhole F14 is lower than the invert level of downstream manhole F15. Therefore, it is assumed that F15 invert level will be connected to F11.

[2] Table 2b: According to the Geoinfo Map, the invert level of the existing manhole from FMH7061661 to FMH7009306 are missing. It is assumed that the minimum velocity of 1m/s will be adopted in this calculation.

Remarks: (1) g=gravitational acceleration; k_s=equivalent sand roughness; s=gradient; v=kinematic viscosity of water; V=mean velocity
(2) Table 2a-2b: The value of k_s = 0.6mm is used for the calculation of slimed clayware sewer, poor condition (based on Table 5: Recommended roughness values in Sewerage Manual)
(3) Table 2c-2d: The value of k_s = 0.3mm is used for the calculation of slimed polyethylene for the proposed sewers, poor condition (based on Table 5: Recommended roughness values in Sewerage Manual)
(4) The value of velocity (V) is referred to the Tables for the hydraulic design of pipes, sewers and channels (8th edition)
(5) Equation used:

$$V = \sqrt{(8gDs) \log \left(\frac{k_s}{3.7D} + \frac{2.51v}{D\sqrt{(2gDs)}} \right)}$$

Table 3 Calculation for Sewage Generation Rate of the Existing Surrounding Building

Catchment A1 (S5)		
Zing!		
Assumed Area	=	2362 m ²
Assumed floor area per employee	=	18.2 m ² per worker -- (refer to Table 8 of CIFSUS - Financial, Insurance, Real Estate & Business Services)
Total number of employees	=	130 employees
Design flow for commercial activities	=	0.08 m ³ /employee/day -- (refer to Table T-2 of GESF - J6)
Sewage Generation rate	=	10.4 m ³ /day
F&B		
Assumed Area	=	3544 m ²
Assumed floor area per employee	=	19.61 m ² per worker -- (refer to Table 8 of CIFSUS - Restaurants)
Total number of employees	=	181 employees
Design flow for commercial activities	=	1.58 m ³ /employee/day -- (refer to Table T-2 of GESF - J10)
Sewage Generation rate	=	285.5 m ³ /day
Total flow from Catchment A1		
Flow Rate (without Catchment Inflow Factor)	=	295.9 m ³ /day
Catchment Inflow Factor	=	1.00 Catchment Inflow Factor for Wan Chai in Table T-4 of GESF
Flow Rate (with Catchment Inflow Factor)	=	295.9 m ³ /day
Catchment A2 (S6)		
30, 28 Yiu Wa Street		
Total number of units	=	10 unit
Total number of residents	=	23 people -- (2021 Population Census: Average Household Size of 2.3 in Canal Road)
Design flow	=	0.27 m ³ /person/day -- (refer to Table T-1 of GESF - R2)
Sewage Generation rate	=	6.2 m ³ /day
F&B		
Assumed Area	=	107 m ²
Assumed floor area per employee	=	19.61 m ² per worker -- (refer to Table 8 of CIFSUS - Restaurants)
Total number of employees	=	5 employees
Design flow for commercial activities	=	1.58 m ³ /employee/day -- (refer to Table T-2 of GESF - J10)
Sewage Generation rate	=	8.7 m ³ /day
Total flow from Catchment A2		
Flow Rate (without Catchment Inflow Factor)	=	14.9 m ³ /day
Catchment Inflow Factor	=	1.00 Catchment Inflow Factor for Wan Chai in Table T-4 of GESF
Flow Rate (with Catchment Inflow Factor)	=	14.9 m ³ /day
Catchment A3 (S7)		
26, 24 Yiu Wa Street		
Total number of units	=	10 unit
Total number of residents	=	23 people -- (2021 Population Census: Average Household Size of 2.3 in Canal Road)
Design flow	=	0.27 m ³ /person/day -- (refer to Table T-1 of GESF - R2)
Sewage Generation rate	=	6.2 m ³ /day
F&B		
Assumed Area	=	107 m ²
Assumed floor area per employee	=	19.61 m ² per worker -- (refer to Table 8 of CIFSUS - Restaurants)
Total number of employees	=	5 employees
Design flow for commercial activities	=	1.58 m ³ /employee/day -- (refer to Table T-2 of GESF - J10)
Sewage Generation rate	=	8.6 m ³ /day
Total flow from Catchment A3		
Flow Rate (without Catchment Inflow Factor)	=	14.8 m ³ /day
Catchment Inflow Factor	=	1.00 Catchment Inflow Factor for Wan Chai in Table T-4 of GESF
Flow Rate (with Catchment Inflow Factor)	=	14.8 m ³ /day

Table 3 Calculation for Sewage Generation Rate of the Existing Surrounding Building

Catchment A4 (S9)		
22, 20 Yiu Wa Street		
Total number of units	=	10 unit
Total number of residents	=	23 people -- (2021 Population Census: Average Household Size of 2.3 in Canal Road)
Design flow	=	0.27 m ³ /person/day -- (refer to Table T-1 of GESF - R2)
Sewage Generation rate	=	6.2 m ³ /day
F&B		
Assumed Area	=	104 m ²
Assumed floor area per employee	=	19.61 m ² per worker -- (refer to Table 8 of CIFSUS - Restaurants)
Total number of employees	=	5 employees
Design flow for commercial activities	=	1.58 m ³ /employee/day -- (refer to Table T-2 of GESF - J10)
Sewage Generation rate	=	8.4 m ³ /day
Total flow from Catchment A4		
Flow Rate (without Catchment Inflow Factor)	=	14.6 m ³ /day
Catchment Inflow Factor	=	1.00 Catchment Inflow Factor for Wan Chai in Table T-4 of GESF
Flow Rate (with Catchment Inflow Factor)	=	14.6 m ³ /day
Catchment A5 (S10)		
18, 16 Yiu Wa Street		
Total number of units	=	10 unit
Total number of residents	=	23 people -- (2021 Population Census: Average Household Size of 2.3 in Canal Road)
Design flow	=	0.27 m ³ /person/day -- (refer to Table T-1 of GESF - R2)
Sewage Generation rate	=	6.2 m ³ /day
F&B		
Assumed Area	=	103 m ²
Assumed floor area per employee	=	19.61 m ² per worker -- (refer to Table 8 of CIFSUS - Restaurants)
Total number of employees	=	5 employees
Design flow for commercial activities	=	1.58 m ³ /employee/day -- (refer to Table T-2 of GESF - J10)
Sewage Generation rate	=	8.3 m ³ /day
Total flow from Catchment A5		
Flow Rate (without Catchment Inflow Factor)	=	14.5 m ³ /day
Catchment Inflow Factor	=	1.00 Catchment Inflow Factor for Wan Chai in Table T-4 of GESF
Flow Rate (with Catchment Inflow Factor)	=	14.5 m ³ /day
Catchment A6 (S12)		
14, 12 Yiu Wa Street		
Total number of units	=	10 unit
Total number of residents	=	23 people -- (2021 Population Census: Average Household Size of 2.3 in Canal Road)
Design flow	=	0.27 m ³ /person/day -- (refer to Table T-1 of GESF - R2)
Sewage Generation rate	=	6.2 m ³ /day
F&B		
Assumed Area	=	98 m ²
Assumed floor area per employee	=	19.61 m ² per worker -- (refer to Table 8 of CIFSUS - Restaurants)
Total number of employees	=	5 employees
Design flow for commercial activities	=	1.58 m ³ /employee/day -- (refer to Table T-2 of GESF - J10)
Sewage Generation rate	=	7.9 m ³ /day
Total flow from Catchment A6		
Flow Rate (without Catchment Inflow Factor)	=	14.1 m ³ /day
Catchment Inflow Factor	=	1.00 Catchment Inflow Factor for Wan Chai in Table T-4 of GESF
Flow Rate (with Catchment Inflow Factor)	=	14.1 m ³ /day

Table 3 Calculation for Sewage Generation Rate of the Existing Surrounding Building

Catchment A7 (S13)

10, 8 Yiu Wa Street

Total number of units	=	10 unit
Total number of residents	=	23 people -- (2021 Population Census: Average Household Size of 2.3 in Canal Road)
Design flow	=	0.27 m ³ /person/day -- (refer to Table T-1 of GESF - R2)
Sewage Generation rate	=	6.2 m ³ /day

F&B

Assumed Area	=	97 m ²
Assumed floor area per employee	=	19.61 m ² per worker -- (refer to Table 8 of CIFSUS - Restaurants)
Total number of employees	=	5 employees
Design flow for commercial activities	=	1.58 m ³ /employee/day -- (refer to Table T-2 of GESF - J10)
Sewage Generation rate	=	7.8 m ³ /day

Total flow from Catchment A7

Flow Rate (without Catchment Inflow Factor)	=	14.0 m ³ /day
Catchment Inflow Factor	=	1.00 Catchment Inflow Factor for Wan Chai in Table T-4 of GESF
Flow Rate (with Catchment Inflow Factor)	=	14.0 m ³ /day

Catchment A8 (S14)

6, 4 Yiu Wa Street

Total number of units	=	10 unit
Total number of residents	=	23 people -- (2021 Population Census: Average Household Size of 2.3 in Canal Road)
Design flow	=	0.27 m ³ /person/day -- (refer to Table T-1 of GESF - R2)
Sewage Generation rate	=	6.2 m ³ /day

F&B

Assumed Area	=	94 m ²
Assumed floor area per employee	=	19.61 m ² per worker -- (refer to Table 8 of CIFSUS - Restaurants)
Total number of employees	=	5 employees
Design flow for commercial activities	=	1.58 m ³ /employee/day -- (refer to Table T-2 of GESF - J10)
Sewage Generation rate	=	7.6 m ³ /day

Total flow from Catchment A8

Flow Rate (without Catchment Inflow Factor)	=	13.8 m ³ /day
Catchment Inflow Factor	=	1.00 Catchment Inflow Factor for Wan Chai in Table T-4 of GESF
Flow Rate (with Catchment Inflow Factor)	=	13.8 m ³ /day

Catchment A9 (S15)

2 Yiu Wa Street

Total number of units	=	5 unit
Total number of residents	=	12 people -- (2021 Population Census: Average Household Size of 2.3 in Canal Road)
Design flow	=	0.27 m ³ /person/day -- (refer to Table T-1 of GESF - R2)
Sewage Generation rate	=	3.1 m ³ /day

F&B

Assumed Area	=	98 m ²
Assumed floor area per employee	=	19.61 m ² per worker -- (refer to Table 8 of CIFSUS - Restaurants)
Total number of employees	=	5 employees
Design flow for commercial activities	=	1.58 m ³ /employee/day -- (refer to Table T-2 of GESF - J10)
Sewage Generation rate	=	7.9 m ³ /day

Total flow from Catchment A9

Flow Rate (without Catchment Inflow Factor)	=	11.0 m ³ /day
Catchment Inflow Factor	=	1.00 Catchment Inflow Factor for Wan Chai in Table T-4 of GESF
Flow Rate (with Catchment Inflow Factor)	=	11.0 m ³ /day

Table 3 Calculation for Sewage Generation Rate of the Existing Surrounding Building

Catchment B

Honest Building

Assumed Area	=	4992 m ²
Assumed floor area per employee	=	18.2 m ² per worker -- (refer to Table 8 of CIFSUS - Financial, Insurance, Real Estate & Business Services)
Total number of employees	=	275 employees
Design flow for commercial activities	=	0.08 m ³ /employee/day -- (refer to Table T-2 of GESF - J6)
Sewage Generation rate	=	22.0 m ³ /day

Yee Hing Building

Total number of units	=	47 unit
Total number of residents	=	108 people -- (2021 Population Census: Average Household Size of 2.3 in Canal Road)
Design flow	=	0.27 m ³ /person/day -- (refer to Table T-1 of GESF - R2)
Sewage Generation rate	=	29.2 m ³ /day

F&B

Assumed Area	=	867 m ²
Assumed floor area per employee	=	19.61 m ² per worker -- (refer to Table 8 of CIFSUS - Restaurants)
Total number of employees	=	44 employees
Design flow for commercial activities	=	1.58 m ³ /employee/day -- (refer to Table T-2 of GESF - J10)
Sewage Generation rate	=	69.9 m ³ /day

Vulcan House

Assumed Area	=	3759 m ²
Assumed floor area per employee	=	18.2 m ² per worker -- (refer to Table 8 of CIFSUS - Financial, Insurance, Real Estate & Business Services)
Total number of employees	=	207 employees
Design flow for commercial activities	=	0.08 m ³ /employee/day -- (refer to Table T-2 of GESF - J6)
Sewage Generation rate	=	16.5 m ³ /day

F&B

Assumed Area	=	289 m ²
Assumed floor area per employee	=	19.61 m ² per worker -- (refer to Table 8 of CIFSUS - Restaurants)
Total number of employees	=	15 employees
Design flow for commercial activities	=	1.58 m ³ /employee/day -- (refer to Table T-2 of GESF - J10)
Sewage Generation rate	=	23.3 m ³ /day

Chinachem Leighton Plaza

Assumed Area	=	6586 m ²
Assumed floor area per employee	=	18.2 m ² per worker -- (refer to Table 8 of CIFSUS - Financial, Insurance, Real Estate & Business Services)
Total number of employees	=	362 employees
Design flow for commercial activities	=	0.08 m ³ /employee/day -- (refer to Table T-2 of GESF - J6)
Sewage Generation rate	=	29.0 m ³ /day

F&B

Assumed Area	=	980 m ²
Assumed floor area per employee	=	19.61 m ² per worker -- (refer to Table 8 of CIFSUS - Restaurants)
Total number of employees	=	50 employees
Design flow for commercial activities	=	1.58 m ³ /employee/day -- (refer to Table T-2 of GESF - J10)
Sewage Generation rate	=	79.0 m ³ /day

Table 3 Calculation for Sewage Generation Rate of the Existing Surrounding Building

First Commercial Building

Assumed Area	=	4486 m ²
Assumed floor area per employee	=	18.2 m ² per worker -- (refer to Table 8 of CIFSUS - Financial, Insurance, Real Estate & Business Services)
Total number of employees	=	247 employees
Design flow for commercial activities	=	0.08 m ³ /employee/day -- (refer to Table T-2 of GESF - J6)
Sewage Generation rate	=	19.7 m ³ /day

Sung Lan Mansion

Total number of units	=	64 unit
Total number of residents	=	147 people -- (2021 Population Census: Average Household Size of 2.3 in Canal Road)
Design flow	=	0.27 m ³ /person/day -- (refer to Table T-1 of GESF - R2)
Sewage Generation rate	=	39.7 m ³ /day

F&B

Assumed Area	=	394 m ²
Assumed floor area per employee	=	19.61 m ² per worker -- (refer to Table 8 of CIFSUS - Restaurants)
Total number of employees	=	20 employees
Design flow for commercial activities	=	1.58 m ³ /employee/day -- (refer to Table T-2 of GESF - J10)
Sewage Generation rate	=	31.8 m ³ /day

Craigengowar Cricket Club

a. Assumed Pipe Capacity	=	100 %
b. Pipe Diameter	=	150 mm
c. Pipe Length	=	14.04 m
d. Invert Level 1	=	3.14 mPD
e. Invert Level 2	=	3.09 mPD
f. Invert Level Difference	=	0.05 m
g. Gravitational Acceleration	=	9.81 ms ⁻²
h. Equivalent Sand Roughness	=	0.0006 m
i. Gradient	=	0.0036
j. Kinematic Viscosity of Water	=	0.000001 m ² /s
k. Mean Velocity	=	0.59 m/s
l. Cross Sectional Area of the Pipe	=	0.02 m ²
m. Velocity of the Concerned Pipe	=	0.01 m ³ /s
n. Estimated Capacity	=	10.5 litre/sec

Sub-total

Peak Flow	=	10.5 litre/sec
Peaking factor	=	8.00 Refer to Table T-5 of GESF for population 420 incl. stormwater allowance
Contributing Population	=	420 people
Equivalent Flow Rate	=	113.5 m ³ /date

Remark:
According to the Geoinfo map, there are few discharge points for Craiagengower Cricket Club. As a conservative approach, the sewerage flow for the club was estimated using a full-bore calculation of the existing sewerage pipe (FWD7011134).

Swimming Pool (Outdoor)

Assumed Area of each Swimming Pool	=	360.0 m ²
Average Depth of Water	=	1.5 m
Volume of Swimming Pool (Ordinary Assumption)	=	540.0 m ³
Turnover Rate	=	6 hr
Required Surface Loading Rate of Filter	=	50 m ³ /m ² /hr (based on min. 2 identical filters)
Filter Area required	=	1.8 m ²
Backwash Duration	=	3 min/d
Backwash flow rate	=	30 m ³ /m ² /hr (based on min. 2 identical filters)
Design flow for Swimming Pool Backwashing	=	2.7 m ³ /day (based on min. 2 identical filters)
Design flow for Swimming Pool Backwashing	=	15.0 litre/sec (based on min. 2 identical filters)
Design Flowrate for Each Filter	=	7.5 litre/sec (assuming 2 identical filters to be used and operated sequentially)

Total flow from Catchment B

Flow Rate (without Catchment Inflow Factor)	=	473.6 m ³ /day
Catchment Inflow Factor	=	1.00 Catchment Inflow Factor for Wan Chai in Table T-4 of GESF
Flow Rate (with Catchment Inflow Factor)	=	473.6 m ³ /day

Table 4a Comparison of the Hydraulic Capacity of Existing Private Sewers for Sewerage generated from the Proposed Development and Surrounding Catchment Areas

Segment	Pipe Dia. (mm)	Pipe Length (m)	Gradient	Estimated Capacity (L/s)	Catchment Involved	ADWF (m ³ /day)	Contributing Population	Peaking Factor	Swimming Pool/Public Toilet (L/s)	Peak Flow from the Proposed Development and Catchment Areas (L/s)	Contribution from the Proposed Development and the Surrounding Catchment Areas (%)	Status
S1 - S5	150	20.8	0.003	10	S	56	207	8	0.0	5.2	52.9%	OK
S5 - S6	150	14.3	0.012	19	S + A1	352	1303	6	0.0	24.4	126.0%	Not OK
S6 - S7	225	8.2	0.002	25	S + A1 - A2	367	1358	6	0.0	25.5	100.2%	Not OK
S7 - S8	225	3.2	0.003	29	S + A1 - A3	381	1413	6	0.0	26.5	91.4%	Not OK
S8 - S9	225	11.8	0.002	21	S + A1 - A3	381	1413	6	0.0	26.5	125.5%	Not OK
S9 - S10	225	8.9	0.002	24	S + A1 - A4	396	1467	6	0.0	27.5	112.6%	Not OK
S10 - S11	225	4.2	0.012	57	S + A1 - A5	410	1520	6	0.0	28.5	49.9%	OK
S11 - S12	225	2.8	0.004	31	S + A1 - A5	410	1520	6	0.0	28.5	91.8%	Not OK
S12 - S13	225	17.4	0.002	21	S + A1 - A6	425	1573	6	0.0	29.5	138.3%	Not OK
S13 - S14	300	7.4	0.001	40	S + A1 - A7	439	1624	6	0.0	30.5	75.8%	OK
S14 - S15	300	5.3	0.004	68	S + A1 - A8	452	1676	6	0.0	31.4	46.1%	OK

Table 4b Comparison of the Hydraulic Capacity of Existing Government Sewers for Sewerage generated from the Proposed Development and Surrounding Catchment Areas

Segment	Pipe Dia. (mm)	Pipe Length (m)	Gradient	Estimated Capacity (L/s)	Catchment Involved	ADWF (m ³ /day)	Contributing Population	Peaking Factor	Swimming Pool/Public Toilet (L/s)	Peak Flow from the Proposed Development and Catchment Areas (L/s)	Contribution from the Proposed Development and the Surrounding Catchment Areas (%)	Status
S15 - S16	300	6.4	0.067	290	S + A1 - A9	463	1716	6	0.0	32.2	11.1%	OK
S16 - S17	300	1.6	-	71	S + A1 - A9	463	1716	6	0.0	32.2	45.5%	OK
S17 - S18	300	0.9	-	71	S + A1 - A9	463	1716	6	0.0	32.2	45.5%	OK
S18 - S19	375	8.5	-	110	S + A1 - A9 + B	937	3470	6	15.0	80.1	72.5%	OK
S19 - S20	450	60.0	-	159	S + A1 - A9 + B	937	3470	6	15.0	80.1	50.3%	OK

Table 4c Comparison of the Hydraulic Capacity of Proposed Sewers from the Terminal Manhole of the Proposed Development for Sewage generated from the Proposed Development

Segment	Pipe Dia. (mm)	Pipe Length (m)	Gradient	Estimated Capacity (L/s)	Catchment Involved	ADWF (m ³ /day)	Contributing Population	Peaking Factor	Swimming Pool/Public Toilet (L/s)	Peak Flow from the Proposed Development and Catchment Areas (L/s)	Contribution from the Proposed Development and the Surrounding Catchment Areas (%)	Status
T1 - S1	225	3.1	0.034	106	S	56	207	8	0.0	5.2	4.9%	OK