ARUP

Appendix G Sewerage Impact Assessment

ARUP

Proposed Minor Relaxation of Plot Ratio (PR), Site Coverage (SC) and Building Height (BH) Restrictions for Permitted/Proposed Commercial Development, Public Transport Station and Underground Vehicle Tunnel at Kai Tak Area 4C Sites 4 and 5 and Adjoining Road Portion of Shing King Street; and Minor Relaxation of PR and BH Restrictions for Permitted Private Housing Development with Proposed Eating Place, Shop and Services and Social Welfare Facilities at Kai Tak Area 3E Sites 1 and 2

Sewerage Impact Assessment Report

| March 2025

Ove Arup & Partners HK Limited
Level 5 Festival Walk
80 Tat Chee Avenue
Kowloon Tong
Kowloon, Hong Kong
arup.com

Contents

Tables

Figures

Appendices

1. Introduction

1.1 Project Background

1.1.1 Ove Arup & Partners Hong Kong Ltd. has been commissioned by Civil Engineering and Development Department to undertake the Sewerage Impact Assessment to support the Proposed Minor Relaxation of Plot Ratio (PR), Site Coverage (SC) and Building Height (BH) Restrictions for Permitted/Proposed Commercial Development, Public Transport Station and Underground Vehicle Tunnel at Kai Tak Area 4C Sites 4 and 5 and Adjoining Road Portion of Shing King Street; and Minor Relaxation of PR and BH Restrictions for Permitted Private Housing Development with Proposed Eating Place, Shop and Services and Social Welfare Facilities at Kai Tak Area 3E Sites 1 and 2 under the approved Kai Tak Outline Zoning Plan No. S/K22/8 (Proposed Development). The location of the Proposed Development is shown in **Figure 1-1**. The project implementation year is 2030.

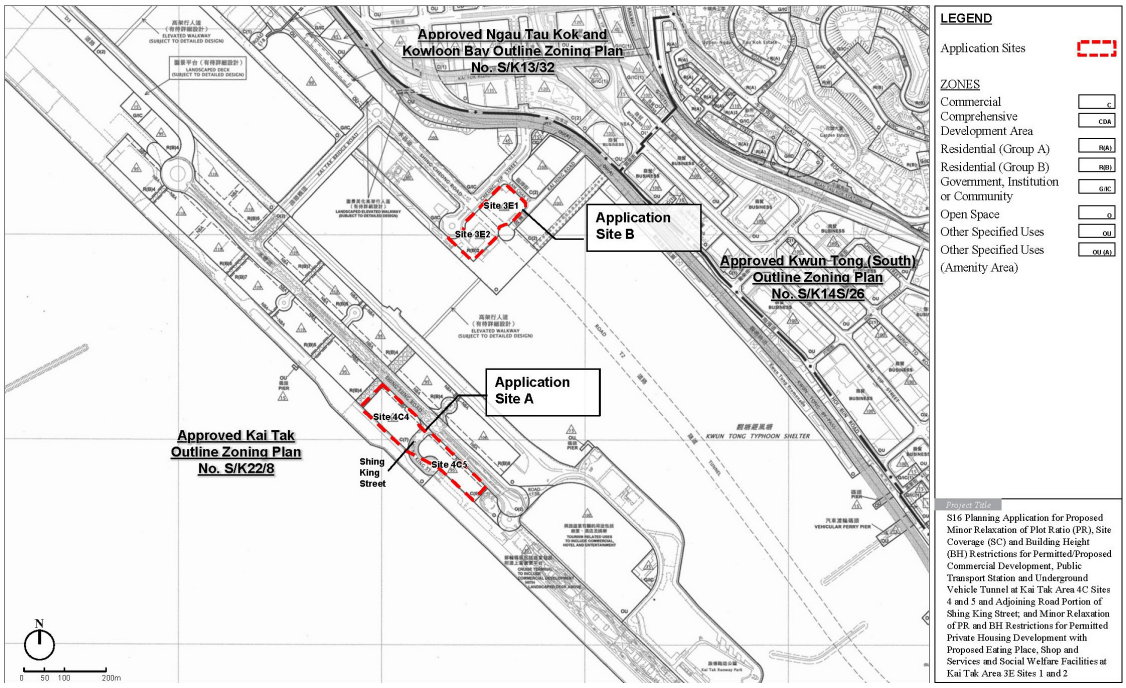


Figure 1-1 Study Area and Sites Locations

1.1.2 The aim of this Sewerage Impact Assessment (SIA) Study is to review and update the sewerage network arising from the minor relaxation of plot ratio, site coverage, and building height restrictions of the Proposed Development; to assess the impact of the Proposed Development on the existing sewerage network and to propose mitigation measures (if required).

2. Methodology and Design Criteria

2.1 Overview

2.1.1 This chapter describes the methodology for assessing the sewerage network performance under both existing and proposed conditions.

2.2 Design Standards and Guidelines

2.2.1 The SIA has been prepared in accordance with the following design manuals and information have been adopted:

- Drainage Services Department (DSD) Sewerage Manual (SM) Third Edition, January 2013;
- DSD SM – Corrigendum No. 1/2024;
- Technical Circular No. 1/2022 "Handling of Abandoned Pipes under DSD's Purview", DSD.
- Environmental Protection Department (EPD) - Report No. EPD/TP 1/05 "*Guidelines for Estimating Sewage Flows for Sewage Infrastructure Planning Version 1.0*" (GESF);
- Planning Department (PlanD) - Commercial and Industrial Floor Space Utilization Survey (CIFSUS);
- Sewerage Record Plans obtained from the GeoInfo[1] Map services of the Lands Department:
- As built sewerage drawings from Kai Tak Development Stage 2 and Stage 3.

2.3 Design Criteria

2.3.1 The SM 2024 defines velocity requirements to prevent siltation and avoid sewer erosion as shown in **Table 2-1** below.

Table 2-1 Design Standards

Criteria	Conditions	Requirement
Minimum Velocity	DN<300mm (alternatives)	0.7 m/s
Minimum Gradient		1:DN
Minimum Velocity	DN>300mm	1.0 m/s
Maximum Velocity	No erosion protection	3 m/s
	With erosion protection	6 m/s

[1] https://www.map.gov.hk/gm/

2.4 Method of Analysis

Sewerage Network Performance

2.4.1 The sewerage network performance has been assessed through Colebrook-White formula as per SM 2024 Section 5.2.

Design Roughness

2.4.2 The adopted roughness coefficients are consistent with SM Table 15; and are summarised in **Table 2-2**.

Table 2-2 Adopted Roughness Coefficients

Sewerage Network Element	Description	Colebrook Roughness [mm]
Existing Sewerage Pipes	Slimed Clayware; velocity 0.75m/s	3.0
	Slimed Clayware; velocity 1.2m/s	0.6
	Slimed Ductile Iron; velocity 1.2m/s	0.3
	Slimed Concrete; velocity 0.75m/s	6.0
	Slimed Concrete; velocity 1.2m/s	3.0
Proposed Sewerage Pipes	Ductile Iron	0.3

2.4.3 Ductile Iron roughness has been adopted consistent with DSD SM. In SM Table 5 for metal pipes, ductile iron is defined as having plastic lining (polyurethane). The closes material to polyurethane for slimed conditions is uPVC; therefore the roughness stated for uPVC has been adopted for ductile iron.

2.5 Sewage Flows

Population Density

2.5.1 The CIFSUS conducted by the PlanD has been used to determine the worker density for various economic activities and planned usage types which are summarised in **Table 2-3**.

Table 2-3 Adopted Worker Density

Economic Activity	GFA (m^2) per Worker
Manufacturing	43.5
Retail Trade	28.6
Import/Export Trade	30.3
Business Services	18.2
Restaurants	19.6

Unit Flow Factor – Commercial Flows

2.5.2 The sewerage flows from commercial units are the are composed of flows due to employees and the associated commercial activities. The Unit Flow Factors (UFFs) for commercial sewage flows due to employed population of the proposed development and the existing sewerage catchment are shown in **Table 2-4** based on the Table T-2 of GESF.

Table 2-4 Adopted Unit Flow Factor for Commercial Flows

Commercial Type	UFF (m^3/employee/day)
Commercial Employee	0.080
Industrial Employee	0.080
Commercial Activities	
J11 – Community, Social & Personal Services	0.200
J6 – Business Services	-
J4 – Wholesale & Retail	0.200
J10 – Restaurant and Hotels	1.500
Industrial Activities	
J1 – Manufacturing – East Kowloon	0.450

Catchment Inflow Factor

2.5.3 The Catchment Inflow Factor (PCIF) indicate the net overall ingress of water or wastewater to the sewerage system. The values defined in GESF Table T-4 have been adopted, as summarised in **Table 2-5**.

Table 2-5 Adopted Catchment Inflow Factor

Catchment	Catchment Inflow Factor
East Kowloon	1.10
Central Kowloon	1.00

Peaking Factor

2.5.4 Combination of flow variation due to diurnal and seasonal characteristics have been incorporated through the adoption of a peaking factor; the adopted peaking factor depend on the assessed equivalent population and have been adopted as per GESF Table T-5 inclusive of stormwater allowance.

3. Existing Conditions

3.1 Overview

3.1.1 This chapter describes the existing sewerage network. The design flows are defined and the performance of the existing sewerage network in such conditions is assessed.

3.2 Existing Sewerage Infrastructure

3.2.1 The sites of the proposed developments are located on areas already served by existing infrastructure. Such sewerage infrastructure has been designed and provided to serve the sites under current development parameters. The existing sewerage network in the proximity of each site is described below.

Sites 3E1 and 3E2

3.2.2 The sites are flanked by existing sewerage network along Cheung Yip Street and Kai Hing Road, which collects also the inflows from Lam Chan Street, as shown in Drawing SEW_EX_NET_3E. Both the sewer beneath Cheung Yip Street and Kai Hing Road discharge to the existing sewerage box culvert along Hoi Bun Road and finally Kwun Tong Preliminary Treatment Works.

3.2.3 Beneath Cheung Yip Street there is an existing 300mm diameter sewer with a dedicated tapping point for development of Sites 3E1 and 3E2 just upstream of existing manhole FMH4096818 as shown in **Appendix B**. The existing sewer proceeds along Cheung Yip Street progressively increasing in size, up to 600mm before the connection to the existing sewage box culvert.

3.2.4 Beneath Kai Hing Road there is an existing 225mm sewer which already serves the area of the proposed development. After receiving the flows from the existing sewer beneath Lam Chak Street, the sewer increases to 450mm diameter ultimately reaching 525mm diameter before the connection to the existing sewage box culvert. The sites' combined flows are then discharged to Kwun Tong Preliminary Treatment Works.

Sites 4C4 and 4C5

3.2.5 The sites are served by dedicated sewerage network constructed under Kai Tak Development as shown in Drawing SEW_EX_NET_4C. Site 4C4 is served by a dedicated tapping point (FTH4011157) and 300mm diameter sewer pipe, upstream of existing manhole FMH4098424 as shown in **Appendix B**.

3.2.6 Site 4C5 is served by a dedicated tapping point (FTH4011160) and 300mm diameter sewer pipe, upstream of existing manhole FMH4098431 as shown in **Appendix B**.

3.2.7 Sewage flow from both sites is conveyed by the existing sewers to Shing Fung Road Sewage Pumping Station and pumped to the existing sewerage box culvert beneath Hoi Bun Road, finally discharging to Kwun Tong Preliminary Treatment Works.

3.3 Sewage Generation from the Existing Development

3.3.1 The existing sewerage infrastructure at the assessed sites, has been designed and constricted to cater for the current approved land use and development parameters. The estimated sewerage flows are provided in **Appendix C** and summarised in **Table 3-1**.

Table 3-1 Sewage Flow Estimation for the Existing Conditions

Sites	Estimated ADWF (m^3/day)
3E1	218.1
3E2	237.1
4C4	1,550.4
4C5	1,101.2

3.4 Performance of Existing Network

3.4.1 The existing sewerage network has generally sufficient capacity to discharge the existing flows as detailed in **Appendix C**. Limited sewerage network sections have been assessed without spare capacity as summarised in **Table 3-2**.

Table 3-2 Existing Sewers Without Spare Capacity

From Manhole	To Manhole	Diameter [mm]	Capacity [l/s]	Flow [l/s]	Utilisation [%]	Serving Site
FMH4100328	FMH4061903	300	56	86	153%	3E2
FMH4061903	FMH4061905	300	34	86	256%	
FMH4043143	FMH4043144	225	52	84	161%	3E1
FMH4043144	FMH4043145	225	51	84	164%	

4. Proposed Conditions

4.1 Overview

4.1.1 This chapter describes the proposed development, the generated sewage flows and the proposed network and its performance.

4.2 Sewage Generation from the Proposed Development

4.2.1 The proposed development will impact the sites as shown in **Table 4-1**. The proposed amendment will generate sewerage flows as summarised in **Table 4-2** and further detailed in **Appendix C**.

Table 4-1 Proposed Development Parameters Compared to Existing Approved Conditions

Sites	Site area	Baseline			Proposed		
		OZP Zoning	Plot Ratio	GFA [m2]	Plot Ratio	GFA [m2]	
						Domestic	Non-Domestic
Site 3E1	7,064	R(B)2	4.5	31,788	7	44,098	3,532
Site 3E2	7,686	R(B)2	4.5	34,587		51,777	3,843
Site 4C4	10,694	C(7)	7.5	80,205	8.16 (about)	0	102,232
Site 4C5	9,480	C(5)	6.0	56,880		0	79,334
Site as Road	2,376	-	-	2,376		-	2,376

4.2.2 The assumptions of Baseline development GFA and flats has been derived from existing planning information as detailed in **Appendix C** and **Appendix D**.

Table 4-2 Sewage Flow Estimation for the Proposed Development

Sites	ADWF (m^3/day)		
	Baseline	Proposed	Increase
3E1	218.1	508.0	289.9
3E2	237.1	590.6	353.5
4C4	1,550.4	1,654.9	104.5
4C5	1,101.2	1,301.2	200.0

4.3 Proposed Development Sewerage System

4.3.1 The sites are already served by dedicated existing sewers. Under the proposed developments, the sites will discharge to the existing dedicated sewer network. A summary of the proposed discharge point for each site is shown in **Table 4-3**.

Table 4-3 Proposed Sewage Discharge Locations

Sites	Upstream Manhole	Downstream Manhole	Sewer size (mm)	Upstream Invert Level (mPD)	Downstream Invert Level (mPD)	Capacity (L/s)
3E1	FMH4036432	FMH4043143	225	2.00	1.84	39.75
3E2	FMH4096818	FMH4100328	300	2.54	1.11	236.15
4C4	FTH4011157	FMH4098424	300	2.48	2.13	175.41
4C5	FTH4011160	FMH4098431	300	1.74	1.35	195.71

4.3.2 The existing sewer at the discharge location has sufficient capacity to convey the proposed flows as detailed in **Appendix C**.

4.3.3 The development terminal manhole will be located close to the lot boundary, exact location will be determined in detailed design.

4.3.4 The proposed development utilizes the existing sewer networks; no existing sewer pipe is proposed to be abandoned. In case future detailed design will require the abandoning of existing sewers, these should comply with DSD Technical Circular No. 1/2022 - Handling of Abandoned Pipes under DSD's Purview.

5. Potential Sewerage Impacts and Mitigation Measures

5.1 Overview

5.1.1 In this chapter the identified sewerage impacts and associated mitigation measures are discussed.

5.2 Impacts on Existing Sewerage Network

5.2.1 The proposed development will discharge to the existing network; the additional flows from the development may affect the existing network performance. The impacts for each site are detailed below and calculations are provided in **Appendix C**.

Sites 3E1 and 3E2

5.2.2 The proposed development will discharge to two discharge points: one at the existing sewer along Kai Hing Road (at manhole FMH4036432), and one the existing sewer along Cheung Yip Street (at manhole FMH4096818). The proposed flow split will alleviate the sewer along Kai Hing Road, increasing spare capacity. The existing utilisation rate of the first sewage pipe at Kai Hing Road downstream of Site 3E1 proposed discharge point, has utilisation rate close to 90%. The existing sewer is proposed to be upgraded to allow development flexibility, as shown in **Table 5-1**.

Table 5-1 Proposed Sewerage Upgrades at Sites 3E1

Sites	Upstream Manhole	Downstream Manhole	Existing			Proposed		
			US IL (mPD)	DS IL (mPD)	Capacity (L/s)	US IL (mPD)	DS IL (mPD)	Capacity (L/s)
3E1	FMH4036432	FMH4043143	2.00	1.84	39.75	2.05	1.80	57.22

5.2.3 The existing sewer along Cheung Yip Street will need to be upgraded due to existing insufficient capacity, as shown in **Table 5-2**.

Table 5-2 Proposed Sewerage Upgrades at Site 3E2

Sites	Upstream Manhole	Downstream Manhole	Existing		Proposed	
			Sewer size (mm)	Capacity (L/s)	Sewer size (mm)	Capacity (L/s)
3E2	FMH4100328	FMH4061903	300	56.26	525	328.65
	FMH4061903	FMH4061905	300	33.66	525	165.60

5.2.4 The existing sewer along Kai Hing Road will need to be upgraded due to existing insufficient capacity, as shown in **Table 5-3**. The adjacent redevelopment of Lot KNIL5813 approved under application no. A/422/27 *"... has proposed to upgrade sewer size as mitigation measure."* [2]. During detailed design, close coordination between the development under this application and at Lot KNIL5813 is recommended to ensure sewerage upgrading works will suit both developments and minimise disruption.

Table 5-3 Proposed Sewerage Upgrades at Site 3E1

Sites	Upstream Manhole	Downstream Manhole	Existing		Proposed	
			Sewer size (mm)	Capacity (L/s)	Sewer size (mm)	Capacity (L/s)
3E1	FMH4043143	FMH4043144	225	51.89	300	120.30
	FMH4043144	FMH4043145	225	51.04	300	118.31

Sites 4C4 and 4C5

5.2.5 The proposed developments will discharge to the dedicated tapping points. The downstream network has sufficient capacity to convey the design flows.

5.2.6 The existing utilisation rate of the sewage pipe downstream of Site 4C4 proposed discharge point, has utilisation rate exceeding 90%. The existing sewer is proposed to be upgraded to allow development flexibility, as shown in **Table 5-4**; no sewerage upgrading work is required for Site 4C5.

Table 5-4 Proposed Sewerage Upgrades at Site 4C4

Site	Upstream Manhole	Downstream Manhole	Existing		Proposed	
			Sewer size (mm)	Capacity (L/s)	Sewer size (mm)	Capacity (L/s)
4C4	FMH4098424	FMH4098421	375	93.81	450	163.34

5.2.7 The existing sewers downstream of the propose discharge points of Sites 4C4 and 4C5, range from 750mm diameter to 900mm diameter. Their utilisation rate after the proposed developments is less than 80% as detailed in **Table 5-5**, the impacts are deemed acceptable.

Table 5-5 Additional Sewerage Utilisation Rate Downstream of Site 4C4 and 4C5

Site	Upstream Manhole	Downstream Manhole	Sewer size (mm)	Capacity (L/s)	Baseline Inflow (L/s)	Proposed Inflow (L/s)	Proposed Usage
4C4	FMH4098421	FMH4098427	750	729.22	555	560	77%
	FMH4098427	FMH4098429	750	707.51	555	560	79%
	FMH4098429	FSH4007922	750	888.82	616	621	70%

[2] A_K22_27_MainPaper(revised).pdf

Site	Upstream Manhole	Downstream Manhole	Sewer size (mm)	Capacity (L/s)	Baseline Inflow (L/s)	Proposed Inflow (L/s)	Proposed Usage
4C5	FSH4007922	FMH4098438	900	1273.46	820	832	65%
	FMH4098438	FMH4098439	900	1323.05	820	832	63%
	FMH4098439	FSH4007923	900	1328.58	984	996	75%

6. Conclusion

6.1.1 Under the proposed developments at Sites 3E1, 3E2, 4C4 and 4C5, minor relaxation of Plot Ratio (PR) restriction is proposed. The sites of the proposed developments are located on areas already served by existing infrastructure. Such sewerage infrastructure has been designed and provided to serve the sites under current development parameters. This SIA has been conducted to identify the impacts of the proposed modified development parameters and propose mitigations measures, if found necessary.

6.1.2 The expected sewerage flows form the proposed development have been assessed and the impact on the performance of the existing sewerage network in the vicinity has been quantified.

6.1.3 The capacity of existing sewerage system is sufficient to convey the sewage flows from the proposed developments at 4C4, and 4C5. Hence, no upgrading works are required.

6.1.4 The existing sewer beneath Kai Hing Road will need to be upgraded to cater for the additional flows from development site 3E1. The proposed works upgrade the existing sewer from 225mm diameter to 300mm diameter between existing manhole FMH4043143 and existing manhole FMH4043145. Coordination with sewer upgrading works defined under the adjacent redevelopment of Lot no. NKIL5813 is recommended in detailed design.

6.1.5 The existing sewer beneath Cheung Yip Street will need to be upgraded to cater for the additional flows from development site 3E2. The proposed works upgrade the existing sewer from 300mm diameter to 525mm diameter between existing manhole FMH4100328 and existing manhole FMH4061905.

6.1.6 To support development flexibility, the upgrade of two sewers with utilisation rate close to 90% in the immediate vicinity of the sites has been proposed. Downstream of Site 3E1, the existing 225mm diameter sewer between manhole FMH4036432 and manhole FMH4043143 is to be reconstructed with steeper gradient to increase capacity. Downstream of Site 4C4, the existing 375mm diameter sewer between manhole FMH4098424 and manhole FMH4098421 is to be upgraded to 450mm diameter.

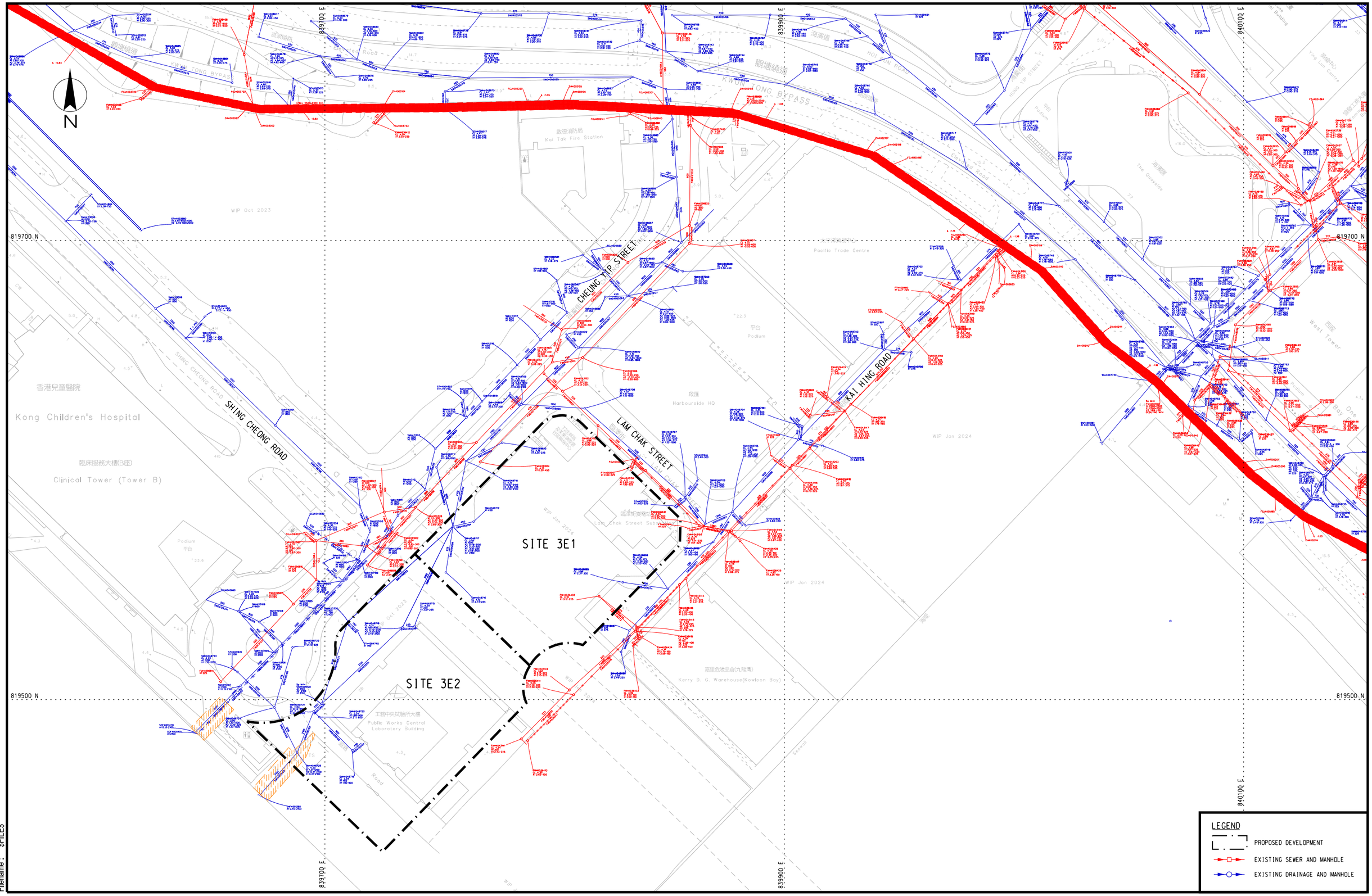
6.1.7 This SIA confirms the feasibility of the Proposed Developments in terms of its sewerage impacts.

Abbreviation List

Abbreviation	Definition
ADWF	Average Dry Weather Flow
CIFSUS	Commercial and Industrial Floor Space Utilization Survey
DN	Nominal Diameter
DSD	Drainage Services Department
EPD	Environmental Protection Department
GESF	Guidelines for Estimating Sewage Flows
GFA	Domestic Gross Floor Area
OZP	Outline Zoning Plan
PCIF	Catchment Inflow Factor
PlanD	Planning Department
PPF	Person Per Flat
PR	Plot Ratio
SIA	Sewerage Impact Assessment
SM	Sewerage Manual
UFF	Unit Flow Factor

Appendix A

Drawings



Printed by : $DATE$
Filename : $FILE$

土木工程拓展署
Civil Engineering and Development Department

ARUP

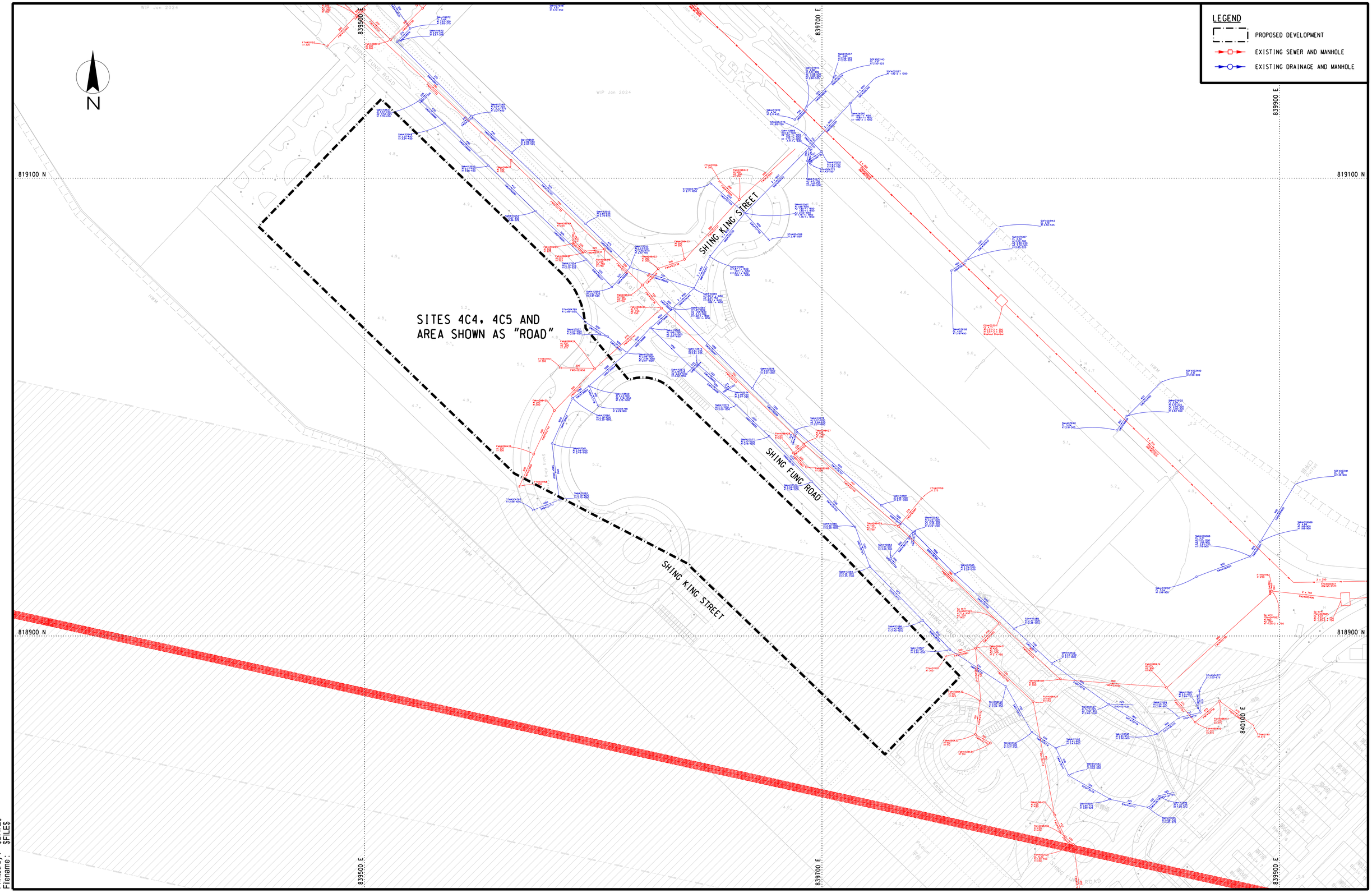
Job Title
Proposed Minor Relaxation of Plot Ratio (PR), Site Coverage (SC) and Building Height (BH) Restrictions for Permitted/Proposed Commercial Development, Public Transport Station and Underground Vehicle Tunnel at Kai Tak Area 4C Sites 4 and 5 and Adjoining Road Portion of Shing King Street; and Minor Relaxation of PR and BH Restrictions for Permitted Private Housing Development with Proposed Eating Place, Shop and Services and Social Welfare Facilities at Kai Tak Area 3E Sites 1 and 2

Drawing Title
Existing Sewerage and Drainage Networks Sites: 3E1, 3E2

Drawn	RY	Date	02/25
Checked	NP	Approved	JW
Scale	1:1500 @A3		

Drawing No. SEW/EX/NET/3E/01

Rev. A



Printed by : $DATE$
Filename : $FILE$

CEDD 土木工程拓展署
Civil Engineering and Development Department

ARUP

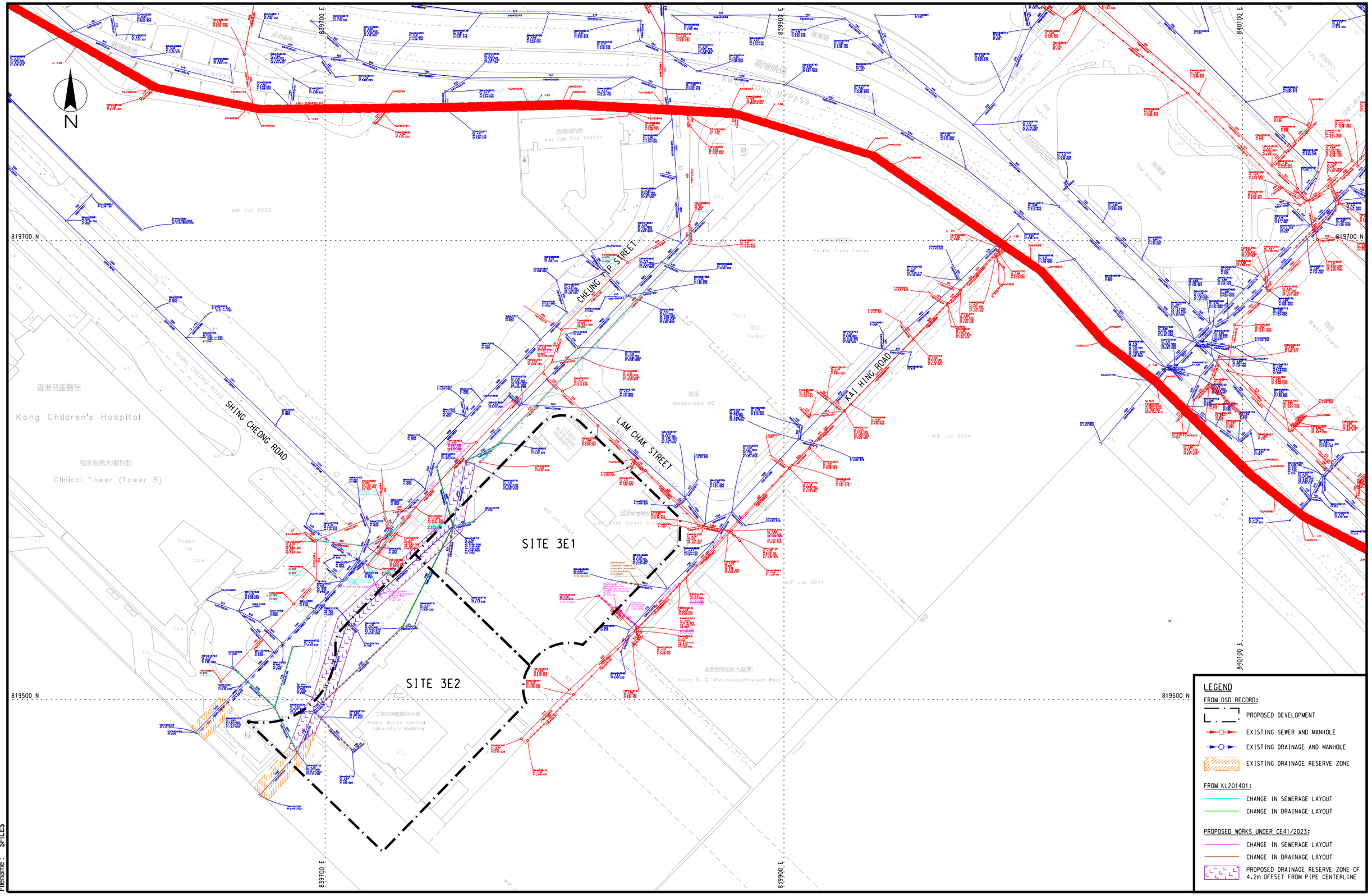
Job Title
Proposed Minor Relaxation of Plot Ratio (PR), Site Coverage (SC) and Building Height (BH) Restrictions for Permitted/Proposed Commercial Development, Public Transport Station and Underground Vehicle Tunnel at Kai Tak Area 4C Sites 4 and 5 and Adjoining Road Portion of Shing King Street; and Minor Relaxation of PR and BH Restrictions for Permitted Private Housing Development with Proposed Eating Place, Shop and Services and Social Welfare Facilities at Kai Tak Area 3E Sites 1 and 2

Drawing Title
Existing Sewerage and Drainage Networks Sites: 4C4, 4C5

Drawn	RY	Date	02/25
Checked	NP	Approved	JW
Scale	1:1500 @A3		

Drawing No.
SEW/EX/NET/4C/01

Rev. A



Printed by : $DATE$
Filename : $FILE$

土木工程拓展署
Civil Engineering and Development Department

ARUP

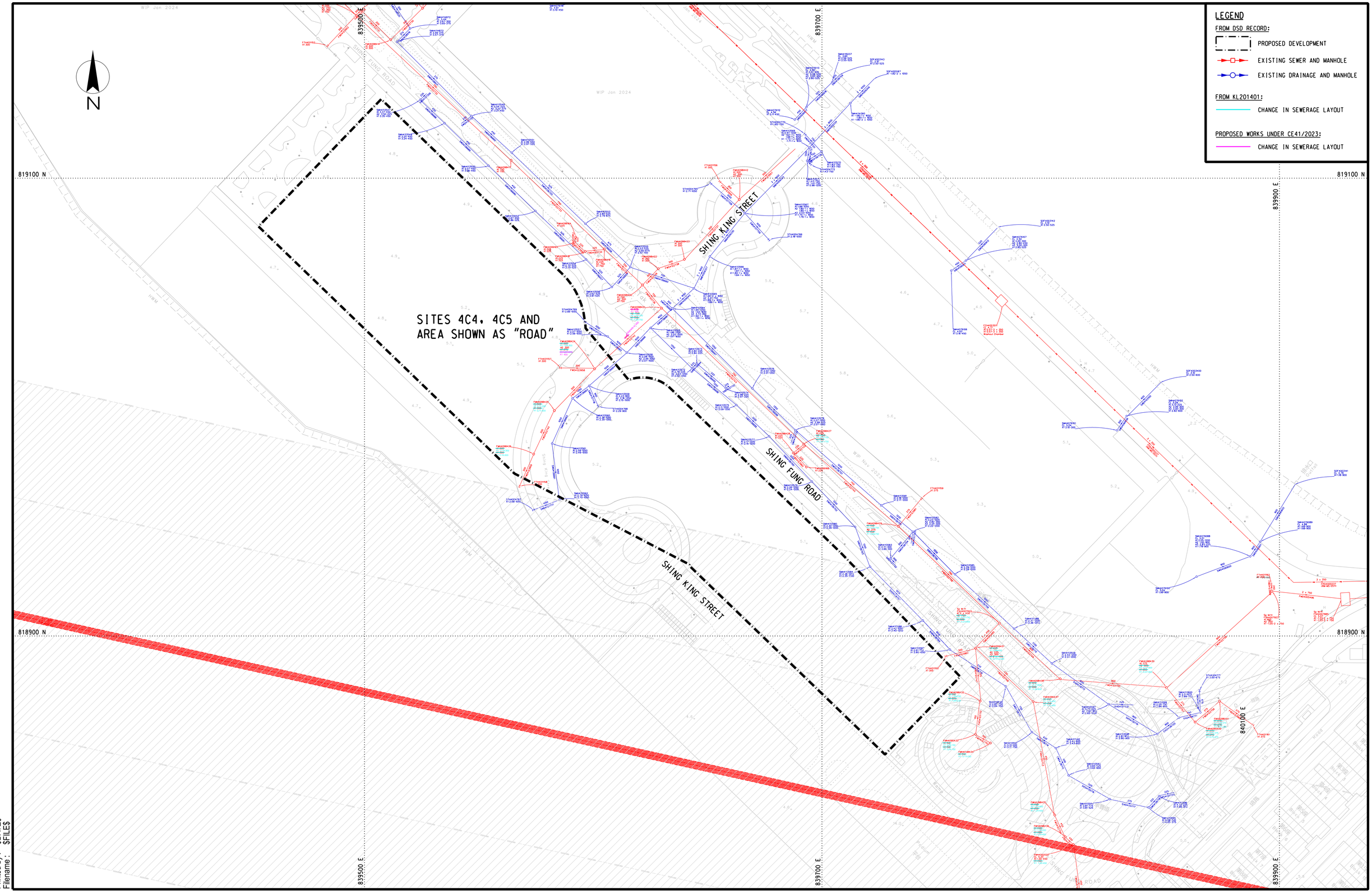
Job Title
Proposed Minor Relaxation of Plot Ratio (PR), Site Coverage (SC) and Building Height (BH) Restrictions for Permitted/Proposed Commercial Development, Public Transport Station and Underground Vehicle Tunnel at Kai Tak Area 4C Sites 4 and 5 and Adjoining Road Portion of Shing King Street; and Minor Relaxation of PR and BH Restrictions for Permitted Private Housing Development with Proposed Eating Place, Shop and Services and Social Welfare Facilities at Kai Tak Area 3E Sites 1 and 2

Drawing Title
Proposed Sewerage and Drainage Networks Sites: 3E1, 3E2

Drawn	RY	Date	02/25
Checked	NP	Approved	JW
Scale	1:1500 @A3		

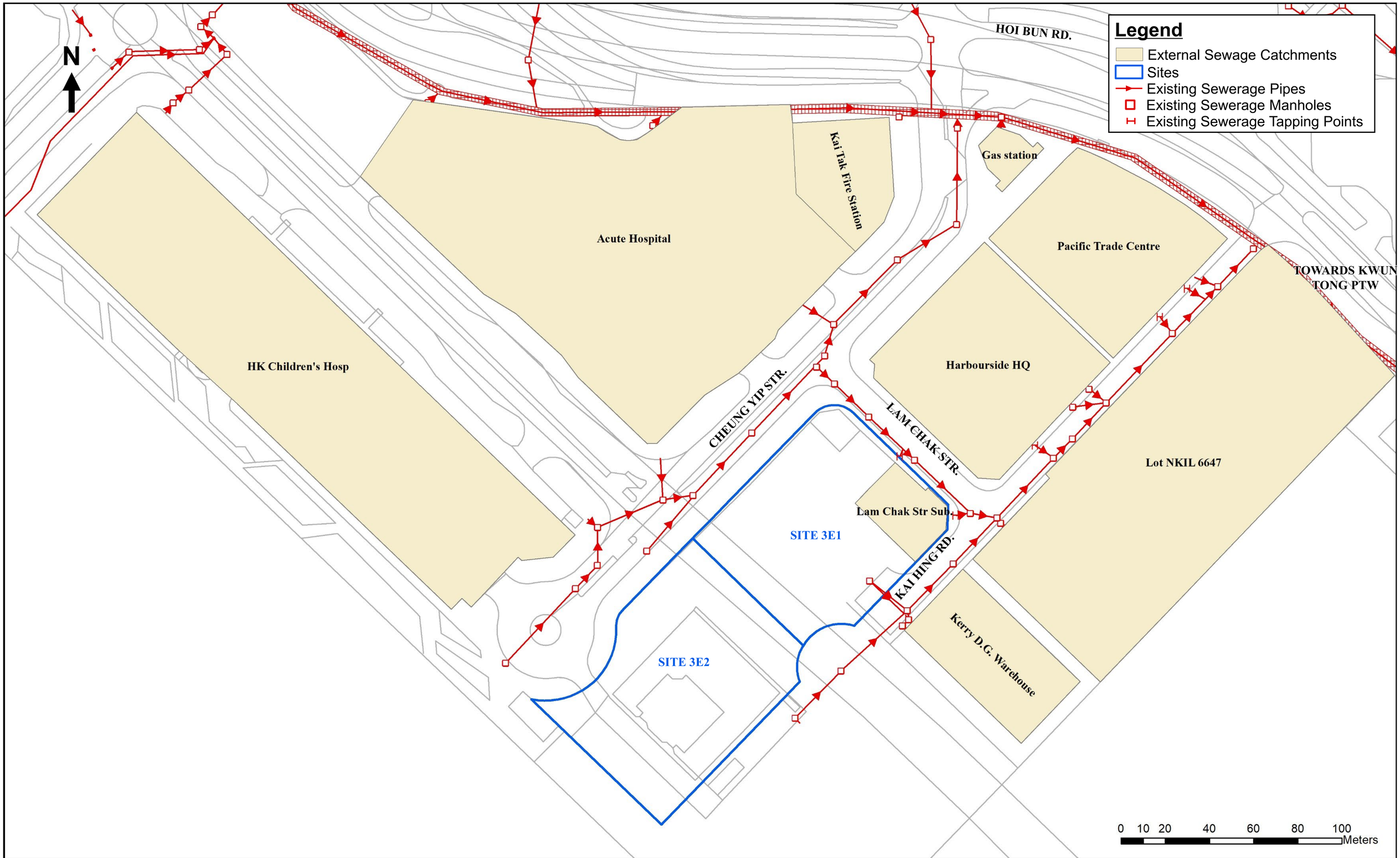
Drawing No.
SEW/PRO/NET/3E/01

Rev. A



Printed by : $DATE$
Filename : $FILE$

CEDD 土木工程拓展署 Civil Engineering and Development Department	ARUP	Job Title: Proposed Minor Relaxation of Plot Ratio (PR), Site Coverage (SC) and Building Height (BH) Restrictions for Permitted/Proposed Commercial Development, Public Transport Station and Underground Vehicle Tunnel at Kai Tak Area 4C Sites 4 and 5 and Adjoining Road Portion of Shing King Street; and Minor Relaxation of PR and BH Restrictions for Permitted Private Housing Development with Proposed Eating Place, Shop and Services and Social Welfare Facilities at Kai Tak Area 3E Sites 1 and 2	Drawing Title: Proposed Sewerage and Drainage Networks Sites: 4C4, 4C5	Drawn: RY; Date: 02/25; Checked: NP; Approved: JW; Scale: 1:1500 @A3	Drawing No.: SEW/PRO/NET/4C/01; Rev.: A



CIVIL ENGINEERIGN and DEVELOPMENT DEPARTMENT HONG KONG

Job Title

Proposed Minor Relaxation of Plot Ratio (PR), Site Coverage (SC) and Building Height (BH) Restrictions for Permitted/Proposed Commercial Development, Public Transport Station and Underground Vehicle Tunnel at Kai Tak Area 4C Sites 4 and 5 and Adjoining Road Portion of Shing King Street; and Minor Relaxation of PR and BH Restrictions for Permitted Private Housing Development with Proposed Eating Place, Shop and Services and Social Welfare Facilities at Kai Tak Area 3E Sites 1 and 2

Drawing Title

Sewage Catchments Sites: 3E1, 3E2

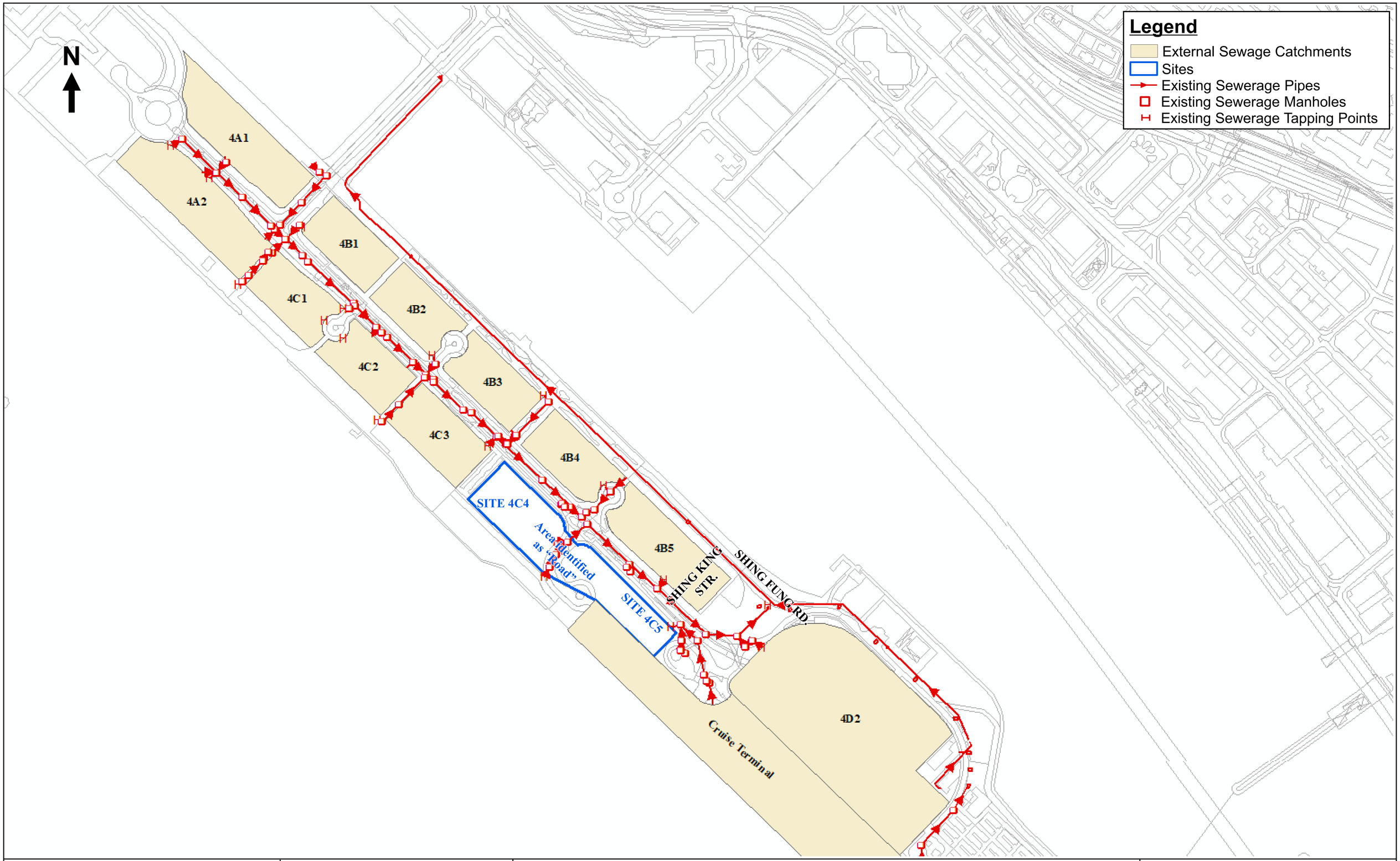
ARUP

Scale: N.T.S.

Drawn: NP Date: 02/2025 Checked: NP Approved: NP

Job No. 295879

Drawing No. SEW_CATCH_3E



CIVIL ENGINEERIGN and DEVELOPMENT DEPARTMENT HONG KONG

Job Title

Proposed Minor Relaxation of Plot Ratio (PR), Site Coverage (SC) and Building Height (BH) Restrictions for Permitted/Proposed Commercial Development, Public Transport Station and Underground Vehicle Tunnel at Kai Tak Area 4C Sites 4 and 5 and Adjoining Road Portion of Shing King Street; and Minor Relaxation of PR and BH Restrictions for Permitted Private Housing Development with Proposed Eating Place, Shop and Services and Social Welfare Facilities at Kai Tak Area 3E Sites 1 and 2

Drawing Title

Sewage Catchments
Sites: 4C4, 4C5, and area identified as "Road"

ARUP

Scale: N.T.S.

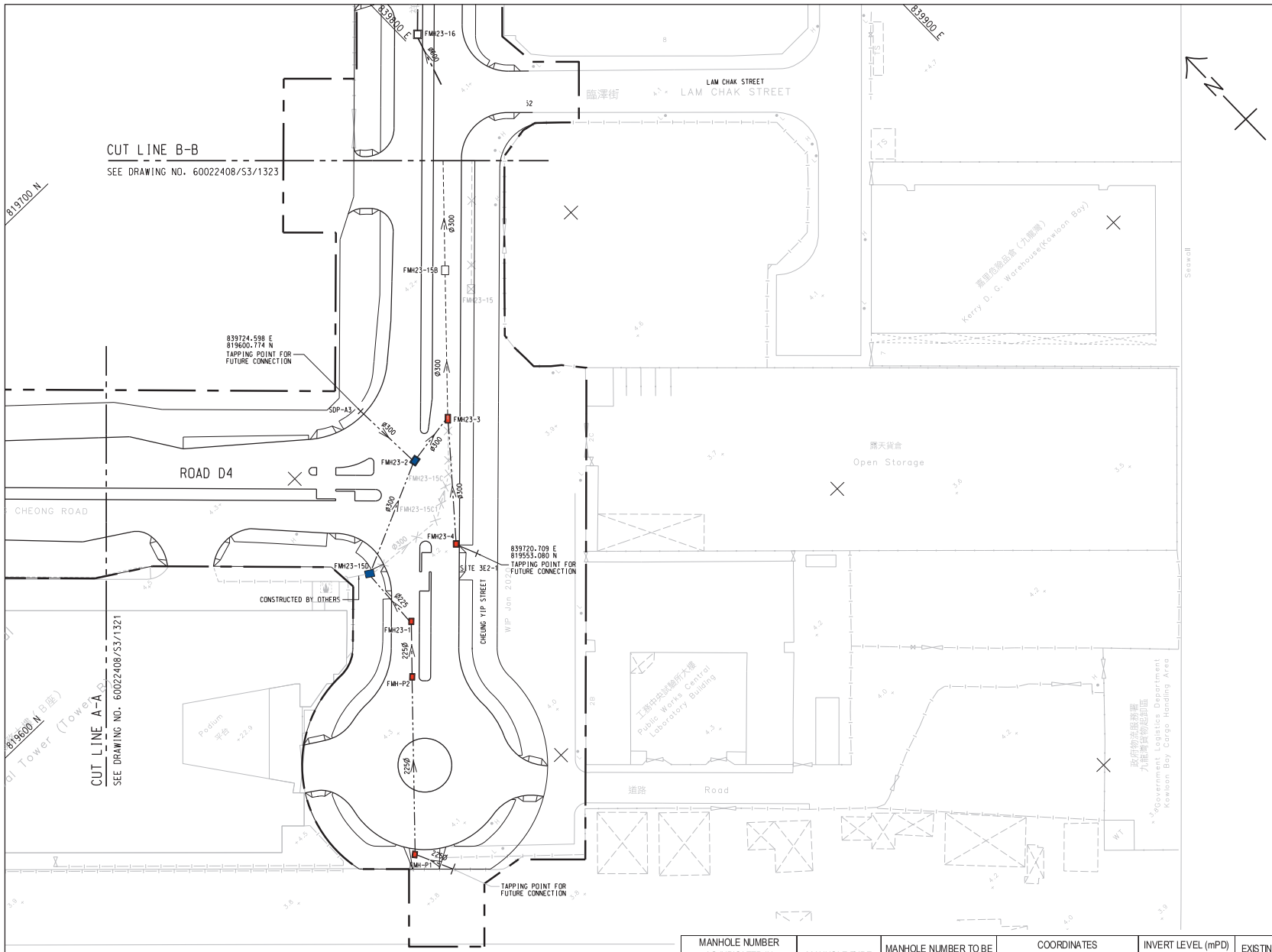
Drawn: NP Date: 02/2025 Checked: NP Approved: NP

Job No. 295879

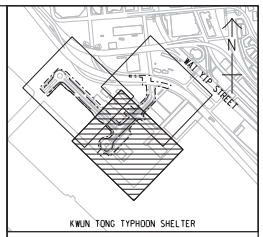
Drawing No. SEW_CATCH_4C

Appendix B

As Built Information



MANHOLE NUMBER AS INDICATED IN WORKING DRAWING	MANHOLE TYPE	MANHOLE NUMBER TO BE ASSIGNED BY DSD	COORDINATES		INVERT LEVEL (mPD)		EXISTING MANHOLE NUMBER
			EASTING	NORTHING	INLET	OUTET	
FMH-P1	E1	FMH4096814	839654.58	819507.81	+2.350	+2.350	---
FMH-P2	F1	FMH4096815	839686.24	819541.61	+1.656	+1.052	---
FMH23-1	F1	FMH4096816	839696.10	819552.17	+0.922	+0.918	---
FMH23-2	L	FMH4096817	839725.84	819581.67	+0.614	+0.598	---
FMH23-3	F1	FMH4061902	839739.61	819583.60	+1.109	+0.522	---
FMH23-4	E1	FMH4096818	839718.51	819558.62	+3.151	+2.540	---



KEY PLAN
SCALE A1 1 : 10000
A3 1 : 20000

NOTES:

1. FOR NOTES AND LEGEND, REFER TO DRAWING NO. 60022408/SK/1321.

Rev.	Date	Drawn	Description	Checked	Approved
ACD	JAN 2020	PS	AS-CONSTRUCTED	PL	S.MAK

Hyder MEINHARDT
Hyder-Meinhardt JV

CLIENT
CEDD 土木工程拓展署 Civil Engineering and Development Department 東拓展處 East Development Office

PROJECT
CONTRACT NO. KL/2014/03
KAI TAK DEVELOPMENT - STAGE 3
INFRASTRUCTURE WORKS FOR DEVELOPMENTS AT THE SOUTHERN PART OF THE FORMER RUNWAY

TITLE
SEWERAGE LAYOUT

SHEET 2 OF 3

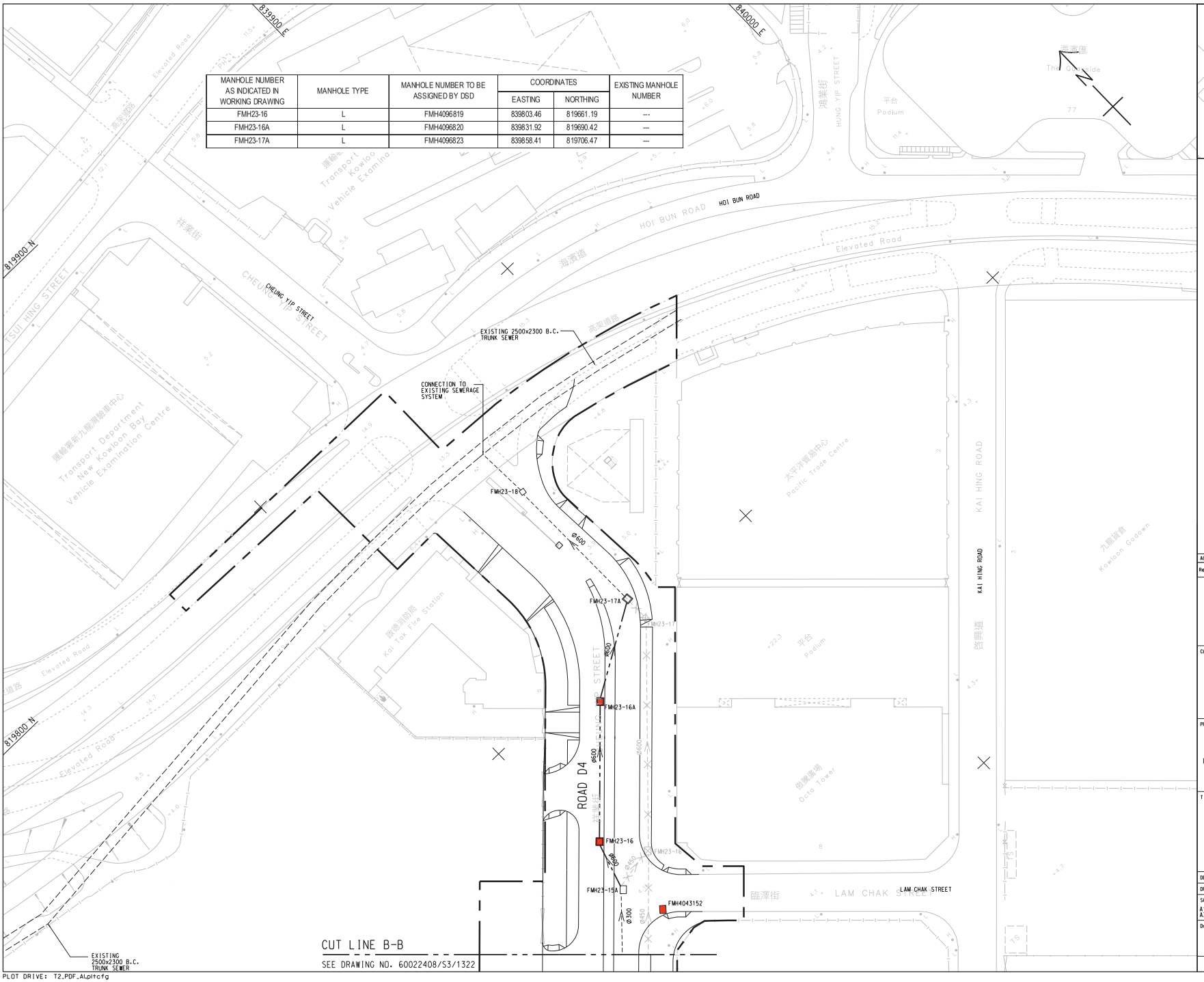
DESIGNED	OSB	CHECKED	PL
DRAWN	PS	APPROVED	S.MAK

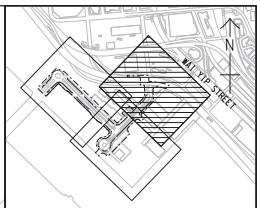
SCALE AT A1	STATUS	REV
1 : 500	AS-CONSTRUCTED	ACD

Drawing No.
60022408/S3/1322

PRINTED BY: rstol 3/10/2024 9:59:01 am
FILENAME: Z:\Drawing Sketches\As_Constructed Drawings\Drawing\60022408_S3_1322_ACD.dgn
PLOT DRIVE: T2_PDF_A1.pltcfg

MANHOLE NUMBER AS INDICATED IN WORKING DRAWING	MANHOLE TYPE	MANHOLE NUMBER TO BE ASSIGNED BY DSD	COORDINATES		EXISTING MANHOLE NUMBER
			EASTING	NORTHING	
FMH23-16	L	FMH4096819	839803.46	819661.19	---
FMH23-16A	L	FMH4096820	839831.92	819690.42	---
FMH23-17A	L	FMH4096823	839858.41	819706.47	---





KEY PLAN
SCALE A1 1 : 10000
A3 1 : 20000

NOTES:

1. FOR NOTES AND LEGEND, REFER TO DRAWING NO. 60022408/SK/1321.

Rev.	Date	Drawn	Description	Checked	Approved
ACD		PS	AS-CONSTRUCTED	PL	S.MAK

Hyder-Meinhardt JV

CLIENT

土木工程拓展署
Civil Engineering and Development Department
東拓展處
East Development Office

PROJECT

CONTRACT NO. KL/2014/03
KAI TAK DEVELOPMENT - STAGE 3
INFRASTRUCTURE WORKS FOR DEVELOPMENTS AT THE SOUTHERN PART OF THE FORMER RUNWAY

TITLE

SEWERAGE LAYOUT

SHEET 3 OF 3

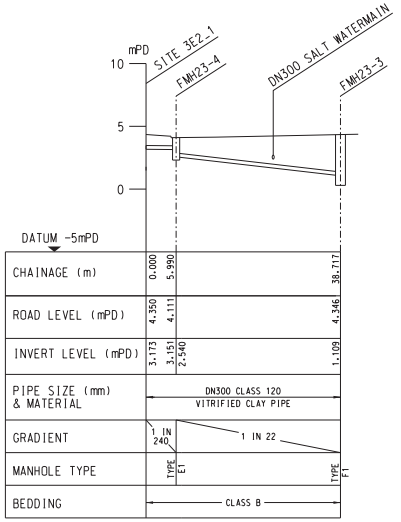
DESIGNED	OSB	CHECKED	PL
DRAWN	PS	APPROVED	S.MAK

SCALE AT A1	STATUS	REV
A1 1 : 500 A3 1 : 1000	AS-CONSTRUCTED	ACD

Drawing No.

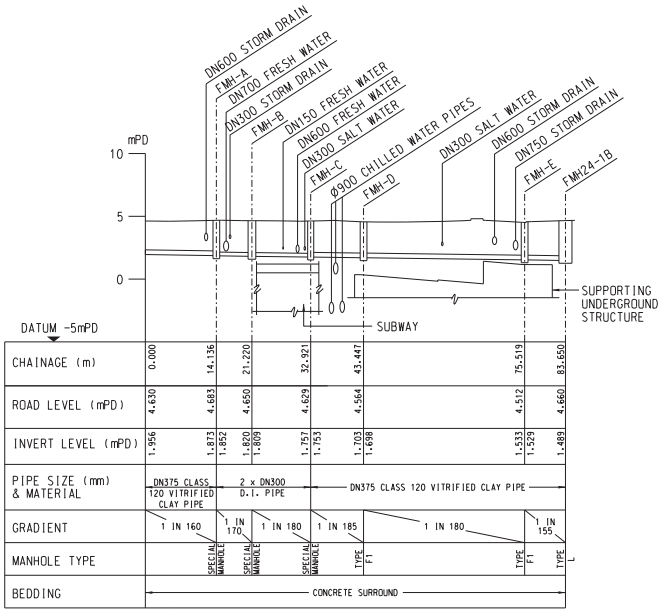
60022408/S3/1323

PRINTED BY: rstol 3/10/2024 10:00:18 am
FILENAME: Z:\Drawing Sketches\As_Constructed Drawings\Drawing\60022408_S3_1323_ACD.dgn
PLOT DRIVE: T2_PDF_A1.pltcfg



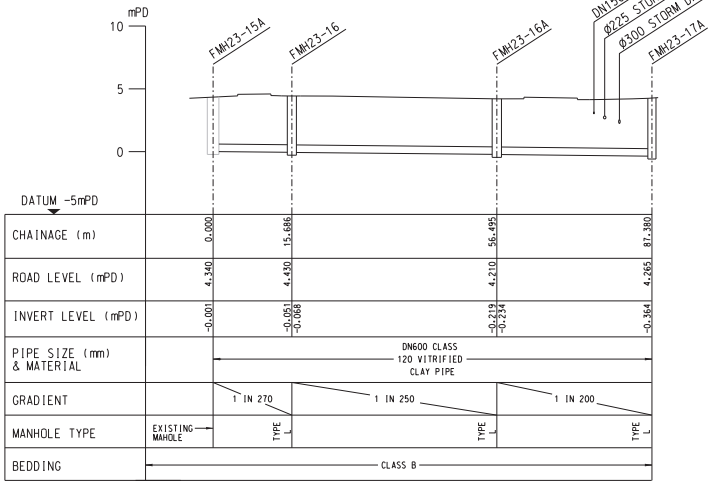
MANHOLE SITE 3E2_1 TO FMH23-3

SCALE HORIZONTAL A1 1 : 500
A3 1 : 1000
SCALE VERTICAL A1 1 : 200
A3 1 : 400



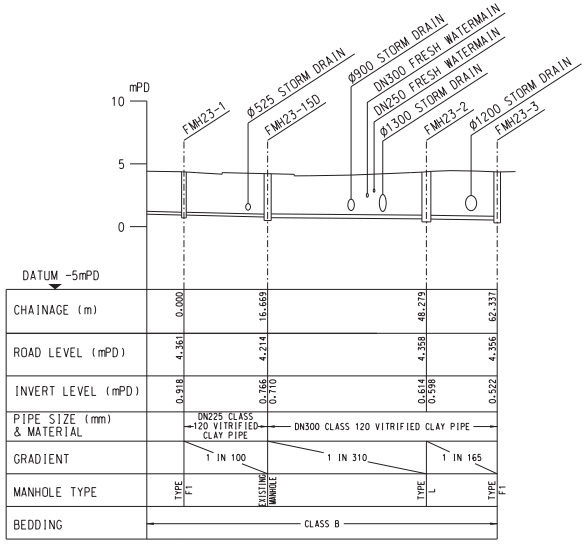
TAPPING POINT ROAD L10 TO MANHOLE FMH24-1B

SCALE HORIZONTAL A1 1 : 500
A3 1 : 1000
SCALE VERTICAL A1 1 : 200
A3 1 : 400



MANHOLE FMH23-15A TO FMH23-17A

SCALE HORIZONTAL A1 1 : 500
A3 1 : 1000
SCALE VERTICAL A1 1 : 200
A3 1 : 400



MANHOLE FMH23-1 TO FMH23-3

SCALE HORIZONTAL A1 1 : 500
A3 1 : 1000
SCALE VERTICAL A1 1 : 200
A3 1 : 400

Rev.	Date	Drawn	Description	Checked	Approved
ACD	JAN 2020	PS	AS-CONSTRUCTED	PL	S.MAK

Hyder-Meinhardt JV

CLIENT

土木工程拓展署
Civil Engineering and Development Department
東拓展處
East Development Office

PROJECT

CONTRACT NO. KL/2014/03
KAI TAK DEVELOPMENT - STAGE 3
INFRASTRUCTURE WORKS FOR DEVELOPMENTS AT THE SOUTHERN PART OF THE FORMER RUNWAY

TITLE

SEWERAGE - LONGITUDINAL PROFILE

DESIGNED	OSB	CHECKED	PL
DRAWN	PS	APPROVED	S.MAK

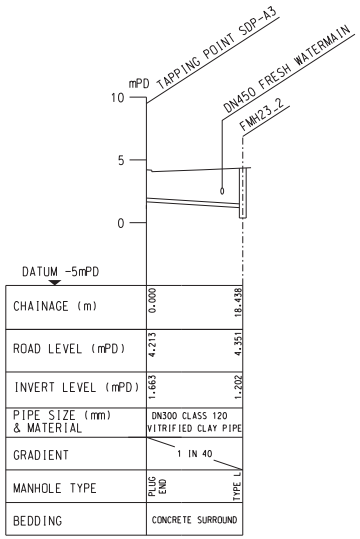
SCALE AT A1	STATUS	REV
AS SHOWN	AS-CONSTRUCTED	ACD

Drawing No.

60022408/S3/1324

PRINTED BY: rstol 3/10/2024 10:03:34 am
FILENAME: Z:\Drawing Sketches\As_Constructed Drawings\Drawing\60022408_S3_1324_ACD.dgn

PLOT DRIVE: T2_PDF_A1.pltcfg



TAPPING POINT FOR SDP-A3 TO FMH23-2

SCALE HORIZONTAL A1 1 : 500
A3 1 : 1000
SCALE VERTICAL A1 1 : 200
A3 1 : 400

Rev.	Date	Drawn	Description	Checked	Approved
ACD	JAN 2020	PS	AS-CONSTRUCTED	PL	S.MAK

Hyder-Meinhardt JV

CLIENT

土木工程拓展署
Civil Engineering and Development Department
東拓展處
East Development Office

PROJECT

CONTRACT NO. KL/2014/03
KAI TAK DEVELOPMENT - STAGE 3
INFRASTRUCTURE WORKS FOR DEVELOPMENTS AT THE SOUTHERN PART OF THE FORMER RUNWAY

TITLE

SEWERAGE -
LONGITUDINAL PROFILE
(SDP-A3)

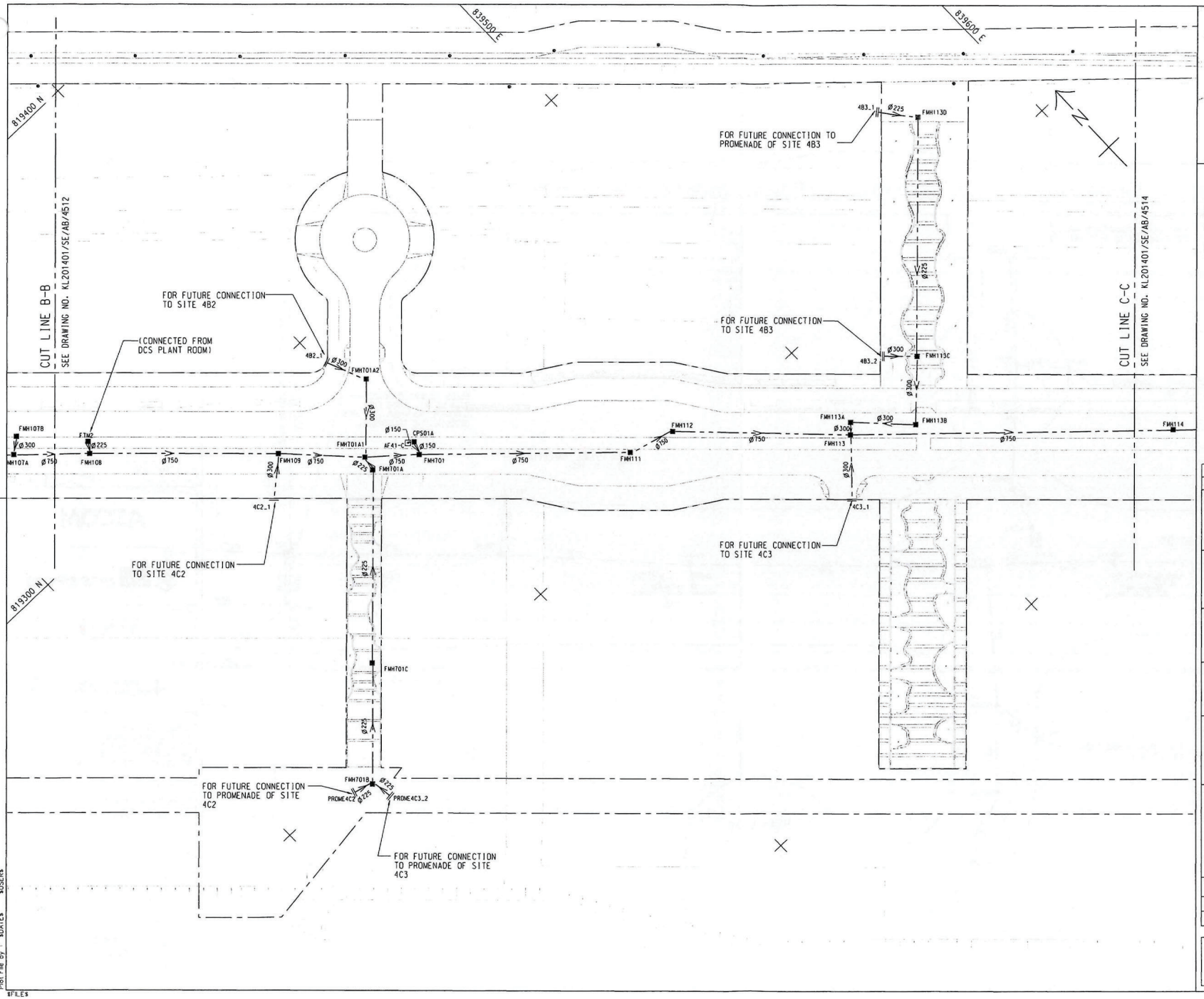
DESIGNED	OSB	CHECKED	PL
DRAWN	PS	APPROVED	S.MAK

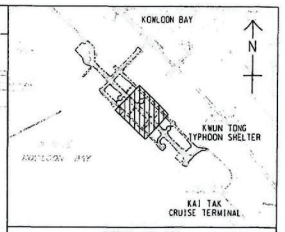
SCALE AT A1	STATUS	REV
AS SHOWN	AS-CONSTRUCTED	ACD

Drawing No.

60022408/S3/1327

PRINTED BY: rstol 3/10/2024 10:06:09 am
FILENAME: Z:\Drawing Sketches\As.Constructed Drawings\Drawing\60022408_S3_1327_ACD.dgn
PLOT DRIVE: T2_PDF_A1.pltcfg





KEY PLAN
SCALE A1 1 : 20000

NOTES:

1. FOR NOTES AND LEGEND, REFER TO DRAWING NO. KL201401/SE/AB/4511.
2. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH DRAWING NO. KL201401/SE/AB/4511 AND 4512, 4514 TO 4516.

Rev	Description	By	Date
Z1	FIRST ISSUE	AI	02/20

Supervising Officer: AECOM

Contractor: CCC 大陸工程·捷泰建築聯營 CEC · CCC JOINT VENTURE

Designer: WSP

Architect: A.LEAD architects ltd. 標展建築師事務所有限公司

Landscape Architect: AD1

Contract title:
CONTRACT NO. KL/2014/01
KAI TAK DEVELOPMENT - STAGE 2
INFRASTRUCTURE WORKS FOR DEVELOPMENTS AT THE SOUTHERN PART OF THE FORMER RUNWAY

Drawing title:
SEWERAGE WORKS - GROUND LEVEL LAYOUT PLAN

SHEET 3 OF 6

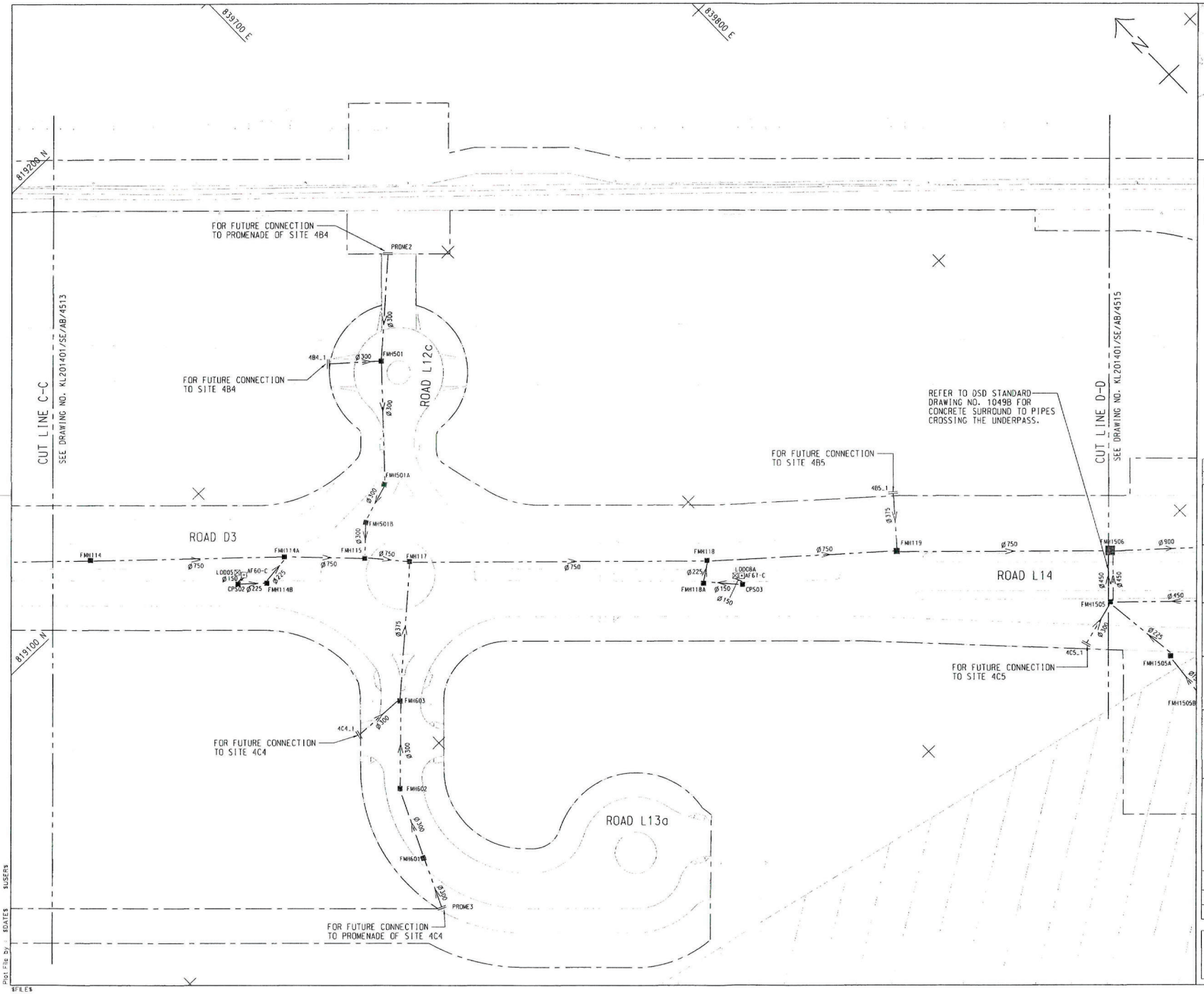
Drawing no.	Rev.
KL201401/SE/AB/4513	Z1

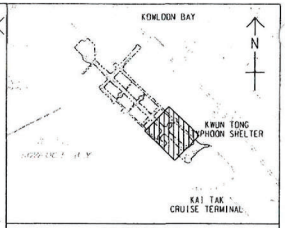
Drawn	Date	Checked	Approved
RL	-	LYL	AI

Scale: 1:500 (A1)
Status: AS BUILT DRAWING

CEDD 土木工程拓展署 CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT 九龍拓展處 KOWLOON DEVELOPMENT OFFICE

Plot File by : $USER$ $DATE$ $FILE$





KEY PLAN
SCALE A1 1 : 20000

NOTES:

1. FOR NOTES AND LEGEND, REFER TO DRAWING NO. KL201401/SE/AB/4511.
2. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH DRAWING NO. KL201401/SE/AB/4501 TO 4503, 4511 TO 4513, 4515 AND 4516.

Rev.	Description	By	Date
Z1	FIRST ISSUE	AI	02/20

Supervising Officer: AECOM

Contractor: CCC 大陸工程 · 建業建築聯營 CEC - CCC JOINT VENTURE

Designer: WSP

Architect: A.LEAD architects ltd. 領建建築師事務所有限公司

Landscape Architect: ADI

Contract title:
CONTRACT NO. KL/2014/01
KAI TAK DEVELOPMENT - STAGE 2
INFRASTRUCTURE WORKS FOR DEVELOPMENTS AT THE SOUTHERN PART OF THE FORMER RUNWAY

Drawing title:
SEWERAGE WORKS -
GROUND LEVEL LAYOUT PLAN

SHEET 4 OF 6

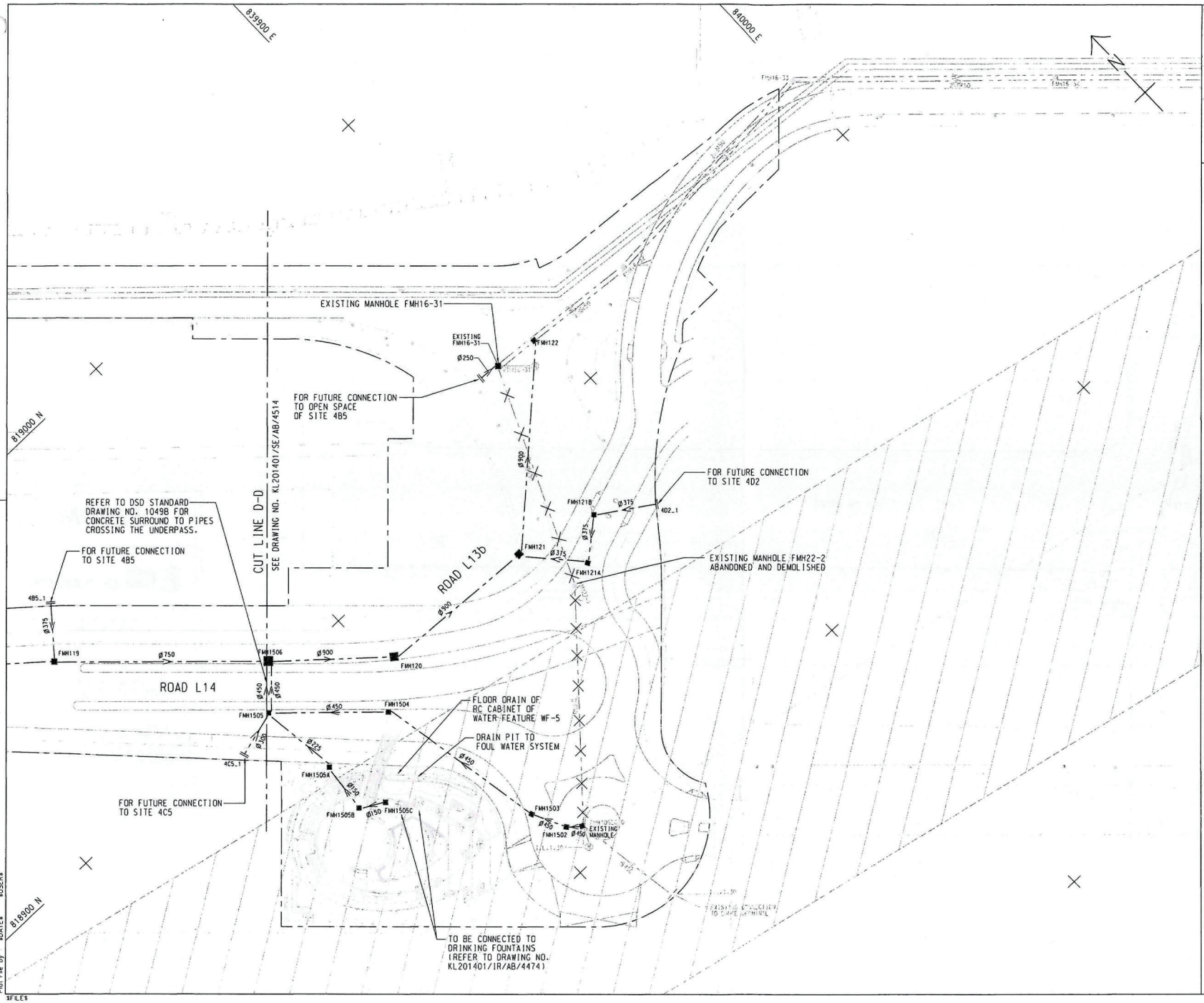
Drawing no.	Rev.
KL201401/SE/AB/4514	Z1

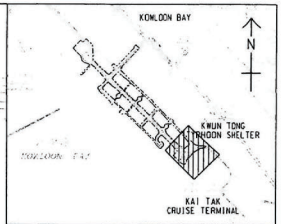
Drawn	Date	Checked	Approved
RL	-	LYL	AI

Scale: 1:500 (A1) | Status: AS BUILT DRAWING

CEDD 土木工程拓展署 CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT 九龍拓展處 KOWLOON DEVELOPMENT OFFICE

Plot File by : $DATE$ $USER$
$FILE$





KEY PLAN
SCALE A1 1 : 20000

NOTES:

1. FOR NOTES AND LEGEND, REFER TO DRAWING NO. KL201401/SE/AB/4511.
2. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH DRAWING NO. KL201401/SE/AB/4511 TO 4514 AND 4516.
3. SURROUND TO PIPES CROSSING UNDERPASS SHALL COMPLY WITH DSD STANDARD DRAWING NO. DS 1049B UNLESS OTHERWISE STATED.

Rev	Description	By	Date
Z1	FIRST ISSUE	AI	02/20

Supervising Officer: AECOM

Contractor: CCC 大陸工程·建築建築聯營 CEC - CCC JOINT VENTURE

Designer: WSP

Architect: A.LEAD architects ltd. 雅建築師事務所有限公司

Landscape Architect: AD1

Contract title:
CONTRACT NO. KL/2014/01
KAI TAK DEVELOPMENT - STAGE 2
INFRASTRUCTURE WORKS FOR DEVELOPMENTS AT THE SOUTHERN PART OF THE FORMER RUNWAY

Drawing title:
SEWERAGE WORKS - GROUND LEVEL LAYOUT PLAN

SHEET 5 OF 6

Drawing no.	Rev.
KL201401/SE/AB/4515	Z1

Drawn	Date	Checked	Approved
RL	-	LYL	AI

Scale: 1:500 (A1)
Status: AS BUILT DRAWING

土木工程拓展署
CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT
九龍拓展處
KOWLOON DEVELOPMENT OFFICE

Plot File by: $USER$ $DATE$
$FILE$

MANHOLE SCHEDULE

US MH/OTG No.	DS MH/OTG No.	Length (m)	Trial Dia (mm)	US GL (mPD)	US IL (mPD)	DS IL (mPD)	Cover Level (mPD)	Cover (m)	Gradient (1 in x)	US Manhole Type	DS Manhole Type	Bedding Type	Pipe Material/Class	Remark for US Manhole
Metro Park**	FMH100	16.837	375	5.330	3.537	3.484	3.912	1.42	318	PLUG	E1	B	V.C. / F	
FMH100	FMH102	70.035	375	5.150	3.470	3.325	3.845	1.31	483	E1	E1	B	V.C./ F	
FMH102	FMH103	50.402	600	5.402	3.235	3.125	3.835	1.57	458	E1	E1	B	V.C. / F	
FMH103	FMH103A	59.056	500	5.090	3.122	2.976	3.622	1.47	404	E1	E1	B	V.C. / F	
FMH103A	FMH104	6.659	600	4.985	2.658	2.650	3.238	1.73	832	E1	E1	B	V.C. / F	
FMH104	FMH105	19.234	600	5.009	2.645	2.575	3.225	1.76	275	E1	G1	B	V.C. / F	
FMH105	FMH106AA	32.887	750	5.178	2.575	2.544	3.301	1.85	1061	G1	H	B	CONC. / M	DS
FMH106AA	FMH106	11.553	750	5.413	2.544	2.527	3.303	2.12	680	H	H	B	CONC. / M	
FMH106	FMH107	91.623	750	5.455	2.527	2.433	3.290	2.18	975	H	H	B	CONC. / M	
FMH107	FMH107A	43.175	750	5.140	2.433	2.383	3.191	1.96	864	H	H	B	CONC. / M	
FMH107A	FMH108	20.209	750	5.440	2.383	2.346	3.133	2.31	546	H	H	B	CONC. / M	DS
FMH108	FMH109	52.031	750	5.460	2.333	2.278	3.083	2.38	946	H	H	B	CONC. / M	
FMH109	FMH701A1	23.530	750	5.080	2.275	2.251	3.025	2.06	980	H	E1	B	CONC. / M	DS
FMH701A1	FMH701	14.387	750	4.783	2.248	2.227	2.998	1.79	685	E1	H	B	CONC. / M	
FMH701	FMH111	59.355	750	4.882	2.224	2.168	2.974	1.91	1060	H	H	B	CONC. / M	
FMH111	FMH112	12.393	750	5.170	2.140	2.111	2.890	2.28	427	H	H	B	CONC. / M	
FMH112	FMH113	49.454	750	5.240	2.096	2.042	2.846	2.39	916	H	H	B	CONC. / M	
FMH113	FMH114	91.192	750	5.420	2.038	1.896	2.788	2.63	642	H	I	B	CONC. / M	DS
FMH114	FMH114A	55.075	750	5.093	1.735	1.309	2.485	2.61	129	I	I	B	CONC. / M	
FMH114A	FMH115	21.212	750	5.320	1.251	1.076	2.001	3.32	121	I	L	B	CONC. / M	
FMH115	FMH117	11.259	750	5.020	0.753	0.483	1.503	3.52	42	L	L/BD3	B	CONC. / M	DS
FMH117	FMH118	84.184	750	5.248	0.477	0.221	1.227	4.02	329	L/BD3	L	B	CONC. / M	BD, DS
FMH118	FMH119	52.941	750	5.070	0.212	0.045	0.962	4.11	317	L	L	B	CONC. / M	DS
FMH119	FMH1506	59.136	750	4.730	0.037	-0.222	0.787	3.94	228	L	SS2	CS	CONC. / M	DS
FMH1506	FMH120	33.913	900	4.780	-0.233	-0.365	0.667	4.11	257	SS2	L	CS	CONC. / M	DS
FMH120	FMH121	44.965	900	5.000	-0.376	-0.566	0.524	4.48	237	L	L	B	CONC. / M	
FMH121	FMH122	58.665	900	5.427	-0.868	-1.119	0.032	5.40	234	L	SS3	B	CONC. / H	DS
FMH122_PULG	FMH16-1	1.668	225	4.730	2.722	2.685	2.947	1.78	45	PLUG	SS3	B	V.C./ F	
4A1_1**	FMH102	21.742	375	5.000	3.377	3.326	3.742	1.25	426	PLUG	E1	B	V.C./ F	
4A2_1**	FMH102	12.403	375	5.000	3.340	3.300	3.715	1.29	310	PLUG	E1	B	V.C./ F	
PROME1**	FMH201A	0.684	300	4.800	3.119	3.052	3.419	1.38	10	PLUG	E1	B	V.C./ F	
FMH201A	FMH201	9.953	300	5.000	3.048	3.009	3.348	1.65	255	E1	E1	B	V.C./ F	
FMH201	FMH202	53.293	300	4.980	3.001	2.730	3.301	1.68	197	E1	E1	B	V.C./ F	
FMH202	FMH104A	44.552	300	4.530	2.730	2.660	3.028	1.50	636	E1	E1	B	V.C./ F	
FMH104A	FMH103A	11.558	300	4.960	2.660	2.640	2.980	2.00	578	E1	E1	B	V.C./ F	
4B1_1**	FMH301	4.908	300	5.000	2.712	2.664	3.012	1.99	102	PLUG	E1	B	V.C./ F	
FMH301	FMH105	27.563	300	4.480	2.650	2.556	2.950	1.53	293	E1	G1	B	V.C./ F	
4B2_1**	FMH701A2	11.402	300	5.000	2.632	2.504	2.932	2.07	89	PLUG	E1	B	V.C./ F	
FMH701A2	FMH701A1	20.297	300	4.700	2.430	2.250	2.730	1.97	113	E1	H	B	V.C./ F	
4B3_2**	FMH113C	9.976	300	5.300	3.034	2.979	3.334	1.97	181	PLUG	E1	B	V.C./ F	
4B4_1**	FMH501	14.114	300	5.000	2.434	2.178	2.734	2.27	55	PLUG	F1	B	V.C./ F	
4B5_1**	FMH119	15.930	375	5.000	1.513	0.580	1.888	3.11	17	PLUG	L	CS	V.C./ F	
4C1_1**	FMH401	7.267	300	5.000	3.029	2.930	3.329	1.67	73	PLUG	E1	B	V.C./ F	
FMH401	FMH107	6.597	300	4.850	2.724	2.465	3.024	1.83	25	E1	H	B	V.C./ F	
4C2_1**	FMH109	11.337	300	5.500	2.679	2.559	2.979	2.52	94	PLUG	H	B	V.C./ F	
4C3_1**	FMH113	17.835	300	5.000	2.495	2.087	2.795	2.21	44	PLUG	H	B	V.C./ F	
4C4_1**	FMH603	15.429	300	5.000	2.483	2.128	2.783	2.22	43	PLUG	F1	B	V.C./ F	
4C5_1**	FMH1505	13.028	300	4.800	1.740	1.348	2.040	2.76	33	PLUG	SS1	B	V.C./ F	
4D2_1**	FMH121B	17.465	375	5.425	1.995	1.279	2.370	3.06	24	PLUG	F1	B	V.C./ F	
FMH121B	FMH121A	12.506	375	5.130	1.270	0.763	1.645	3.49	25	F1	L	B	V.C./ F	
FMH121A	FMH121	17.727	375	5.340	0.746	-0.749	1.121	4.22	12	L	L	B	V.C./ F	

Notes:

DS = Desilting Opening = Temporary Plug
SS1 =Sewerage Special Manhole Type 1
CP = Catchpit
SS2 =Sewerage Special Manhole Type 2
SS3 =Sewerage Special Manhole Type 3
DP = Down Pipe

MANHOLE SCHEDULE

US MH/OTG No.	DS MH/OTG No.	Length (m)	Trial Dia (mm)	US GL (mPD)	US IL (mPD)	DS IL (mPD)	Cover Level (mPD)	Cover (m)	Gradient (1 in x)	US Manhole Type	DS Manhole Type	Bedding Type	Pipe Material/Class	Remark for US Manhole
PROME4A2**	FMH105A	2.154	225	4.600	3.346	3.335	3.571	1.03	196	PLUG	E1	B	V.C./ F	
FMH105A	FMH105B	42.480	225	4.620	3.284	3.007	3.509	1.11	153	E1	E1	B	V.C./ F	
FMH105B	FMH105C	13.377	225	4.920	2.993	2.908	3.218	1.70	157	E1	E1	B	V.C./ F	
FMH105C	FMH105D	3.493	225	5.010	2.907	2.886	3.132	1.88	166	E1	E1	B	V.C./ F	
FMH105D	FMH105	27.762	225	5.019	2.872	2.631	3.097	1.92	115	E1	G1	B	V.C./ F	
PROME4B3_1**	FMH113D	11.041	225	5.300	3.251	3.210	3.476	1.82	269	PLUG	E1	B	V.C./ F	
FMH113D	FMH113C	66.620	225	4.960	3.162	2.976	3.387	1.57	358	E1	E1	B	V.C./ F	
FMH113C	FMH113B	18.302	300	5.450	2.973	2.889	3.273	2.18	218	E1	E1	B	V.C./ F	
FMH113B	FMH113A	17.127	300	5.203	2.879	2.842	3.179	2.02	463	E1	E1	B	V.C./ F	
FMH113A	FMH113	1.695	300	5.305	2.825	2.602	3.125	2.18	8	E1	H	B	V.C./ F	
PROME4C3_2**	FMH701B	2.041	225	5.300	2.581	2.513	2.806	2.49	30	PLUG	E1	B	V.C./ F	
FMH701B	FMH701C	33.511	225	4.950	2.506	2.403	2.731	2.22	325	E1	E1	CS	V.C./ F	
FMH701C	FMH701A	54.072	225	4.900	2.397	2.290	2.622	2.28	505	E1	E1	CS	V.C./ F	
FMH701A	FMH701A1	3.149	225	4.780	2.290	2.250	2.515	2.27	79	E1	H	CS	V.C./ F	
PROME4C2**	FMH701B	3.634	200	5.300	2.596	2.531	2.796	2.50	56	PLUG	E1	B	V.C./ F	
PROME2**	FMH501	31.709	300	5.000	1.753	1.588	2.053	2.95	192	PLUG	F1	B	V.C./ F	
FMH501	FMH501A	34.103	300	5.020	1.580	1.406	1.880	3.14	196	F1	F1	B	V.C./ F	
FMH501A	FMH501B	10.872	300	5.210	1.404	1.337	1.704	3.51	162	F1	F1	B	V.C./ F	
FMH501B	FMH115	8.298	300	5.310	1.326	1.263	1.626	3.68	132	F1	L	B	V.C./ F	
PROME3**	FMH601	14.742	300	5.200	2.236	2.186	2.536	2.66	295	PLUG	E1	B	V.C./ F	
FMH601	FMH602	19.797	300	4.980	2.183	2.115	2.483	2.50	291	E1	F1	B	V.C./ F	
FMH602	FMH603	23.891	300	4.910	2.112	1.679	2.412	2.50	55	F1	F1	B	V.C./ F	
FMH603	FMH117	36.955	375	5.060	1.670	1.543	2.045	3.02	291	F1	L/BD3	B	V.C./ F	
FMH1505C	FMH1505B	6.560	150	5.130	3.165	3.092	3.315	1.82	90	E1	E1	B	uPVC	
FMH1505B	FMH1505A	13.478	150	5.130	3.035	1.883	3.185	1.95	12	E1	SS7	B	uPVC	
FMH1505A	FMH1505	22.075	225	5.020	1.889	1.356	2.114	2.91	41	SS7	SS1	B	V.C./ F	
FMH4062020	FMH1502	3.254	450	5.000	1.299	1.286	1.749	3.25	250	EXISTING	L	CS	V.C./ F	
FMH1502	FMH1503	8.805	450	5.650	1.275	1.253	1.725	3.93	400	L	L	CS	V.C./ F	
FMH1503	FMH1504	48.937	450	5.530	1.235	1.136	1.685	3.85	494	L	L	B	V.C./ F	
FMH1504	FMH1505	32.167	450	5.020	1.122	0.985	1.572	3.45	235	L	SS1	CS	V.C./ F	
FMH1505	FMH1506	13.624	2 x 450	4.780	0.749	0.283	1.199	3.58	29	SS1	SS2	CS	V.C./ F	DS, CS
FTM1	FMH106	2.920	225	6.327	4.111	3.733	4.336	1.99	8	EXISTING	H	B	V.C./ F	
FTM2	FMH108	2.602	225	5.440	3.040	2.696	3.265	2.18	8	EXISTING	H	B	V.C./ F	
CPS01A	FMH701	3.046	150	5.682	3.222	3.043	3.372	2.31	17	E1	H	B	uPVC	
AF60-C	CPS02	1.944	200	5.000	4.380	2.649	4.580	0.42	1	CP	E1	B	uPVC	DP
CPS02	FMH114B	5.312	225	5.430	2.595	2.524	2.820	2.61	75	E1	F1	B	V.C./ F	
FMH114B	FMH114A	7.608	225	5.410	1.992	1.898	2.217	3.19	81	F1	I	B	V.C./ F	
CPS03	FMH118A	9.095	225	5.050	2.225	1.675	2.450	2.60	17	F1	F1	B	uPVC	
FMH118A	FMH118	4.415	225	5.130	1.667	0.826	1.892	3.24	5	F1	L	B	V.C./ F	
LDB01A	FMH107	3.882	150	5.950	3.462	2.428	3.612	2.34	4	CP	H	B	uPVC	

Notes:

DS = Desilting Opening = Temporary Plug
SS1 =Sewerage Special Manhole Type 1
CP = Catchpit
SS2 =Sewerage Special Manhole Type 2
SS3 =Sewerage Special Manhole Type 3
DP = Down Pipe

NOTES

1. FOR GENERAL NOTES AND LEGEND SHALL REFER TO DRAWING NO. KL201401/SE/AB/4521.
2. THE MANHOLE TYPE IN SCHEDULE SHALL REFER TO DOWNSTREAM MANHOLE.
3. CONTENT IN THE REMARK SHALL REFER TO DOWNSTREAM MANHOLE.
4. THE GROUND LEVEL OF MANHOLE SHALL BE VERIFIED ON SITE.

Rev	Description	By	Date
Z1	FIRST ISSUE	AI	11/19

Supervising Officer: AECOM

Contractor: CCC 大陸工程·建華建築聯營 CEC - CCC JOINT VENTURE

Designer: WSP

Architect: A.LEAD architects ltd. 雅建建築師事務所有限公司

Landscape Architect: AD1

Contract title:
CONTRACT NO. KL/2014/01
KAI TAK DEVELOPMENT - STAGE 2
INFRASTRUCTURE WORKS FOR
DEVELOPMENTS AT THE
SOUTHERN PART OF THE FORMER RUNWAY

Drawing title:
SEWERAGE WORKS -
MANHOLE SCHEDULE

Drawing no.	Rev.
KL201401/SE/AB/4522	Z1

Drawn	Date	Checked	Approved
RL	-	LYL	AI

Scale: N.T.S.
Status: AS BUILT DRAWING

CEDD 土木工程拓展署 CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT 九龍拓展處 KOWLOON DEVELOPMENT OFFICE

Plot File by : 2023-06-01 KTN

\\192.168.100.1\sf001169\00. Personal Folder\CCJV\DGN-Latest\KL201401-SE-AB-4522-Z1.dgn

Appendix C

Detailed Sewerage Impact Assessment Calculations

Estimation of Sewage Flows Estimation from Catchments Not Affected by the Proposed Development

Design Code

1. Based on EPD Guidelines for Estimating Sewage Flows for Sewage Infrastructure Planning.
2. Planning Department CIFSUS.
3. BS EN 12056-2:2000 Gravity drainage systems inside buildings

External Discharge - Near Sites 3E1 and 3E2

ADWF Sewage Flow Estimates	Estimation	Unit	Remark
E_1 **Kai Tak Fire Station**			
Type	Social Services	-	
Total GFA	6,450	m^2	Building footprint on 5 floors
Assumed GFA per Employee	30.3	m^2/Person	Table 8 CIFSUS - Social Services
Employee Population	213	Persons	
Unit flow factor (UFF)	0.28	m^3/person/day	Table T-2: Empolyee & Community, Social & Personal Services
Catchment Inflow Factors(PCIF)	1.1	-	Table T-4 of GESF - East Kowloon
ADWF	65.60	m^3/day	
Total building ADWF	65.60	m^3/day	
Dischages to:			
FMH4096823	65.60	m^3/day	assumed
E_2 **Pacific Trade Centre**			
Type	Manufacturing	-	
Total GFA	70,856	m^2	Building footprint time 17 floors. Source: geoinfo and https://property.jll.com.hk/en/industrial-lease/hong-kong/kowloon-bay/pacific-trade-centre-hk-p-1933
Assumed GFA per Employee	43.5	m^2/Person	Table 8 CIFSUS - Manufacturing
Employee Population	1,630	Persons	
Unit flow factor (UFF)	0.53	m^3/person/day	Table T-3: Empolyee & J1 Manufacturing - East Kowloon
Catchment Inflow Factors(PCIF)	1.1	-	Table T-4 of GESF - East Kowloon
ADWF	950.29	m^3/day	
Total building ADWF	950.29		
Dischages to:			
FMH4043148	475.15		Assumed 50% flow split between the two discharge locations
FMH4043149	475.15		Assumed 50% flow split between the two discharge locations
E_3 **Harbourside HQ**			
Type	Business Services	-	
Total GFA	63,080	m^2	Source: https://office.propwiser.com.hk/en/Building/kowloon-bay/harbourside-hq/316
Assumed GFA per Employee	18.2	m^2/Person	Table 8 CIFSUS - Business Services
Employee Population	3,470	Persons	
Unit flow factor (UFF)	0.08	m^3/person/day	Table T-2: Empolyee & J6 Finance, Insurance, Real Estate & Business Services
Catchment Inflow Factors(PCIF)	1.1	-	Table T-4 of GESF - East Kowloon
ADWF	42.81	m^3/day	
Total building ADWF	42.81		
Dischages to:			
FMH4043146	42.81		
E_4 **Kerry D.G. Warehouse**			Source: https://www.tpb.gov.hk/en/papers/MPC/K/A_K22_27/A_K22_27_MainPaper(revised).pdf
Type	Business Services	-	
Total GFA	26,917	m^2	Assumed 55% office
Assumed GFA per Employee	18.2	m^2/Person	Table 8 CIFSUS - Business Services
Employee Population	1,481	Persons	
Unit flow factor (UFF)	0.08	m^3/person/day	Table T-2: Empolyee & J6 Finance, Insurance, Real Estate & Business Services
Catchment Inflow Factors(PCIF)	1.1	-	Table T-4 of GESF - East Kowloon
ADWF	130.33	m^3/day	
Type	Retail Trade	-	
Total GFA	17,129	m^2	Assumed 35% retail trade
Assumed GFA per Employee	28.6	m^2/Person	Table 8 CIFSUS - Retail Trade
Employee Population	600	Persons	
Unit flow factor (UFF)	0.28	m^3/person/day	Table T-2: Empolyee & J4 Retail
Catchment Inflow Factors(PCIF)	1.1	-	Table T-4 of GESF - East Kowloon
ADWF	184.80	m^3/day	
Type	Restaurants	-	
Total GFA	4,894	m^2	Assumed 10% restaurants
Assumed GFA per Employee	19.6	m^2/Person	Table 8 CIFSUS - Restaurants
Employee Population	250	Persons	
Unit flow factor (UFF)	1.58	m^3/person/day	Table T-2: Empolyee-Customers & J10 Restaurants
Catchment Inflow Factors(PCIF)	1.1	-	Table T-4 of GESF - East Kowloon
ADWF	434.50	m^3/day	
Total building ADWF	749.63	m^3/day	
Dischages to:			
FMH4043143	749.63	m^3/day	
E_5 **NKIL 6647**			
Type	Residential	-	
Number of flats	1,782	flats	Source: https://www.tpb.gov.hk/tc/plan_application/Attachment/20210803/s16fi_A_K22_31_4_gist.pdf
Average household	2.7	Persons/flat	Census, Household Characteristics of Population in Kowloon City District, 2021
Population	4,812	Persons	
Unit flow factor (UFF)	0.27	m^3/person/day	Table T-1 of GESF - Residential R2
Catchment Inflow Factors(PCIF)	1.0	-	GESF section 10 - Not applicable for new developments.
ADWF	1,299.24	m^3/day	
Type	Social Services	-	Club house
Total GFA	5,500	m^2	assumed
Assumed GFA per Employee	30.3	m^2/Person	Table 8 CIFSUS - Social Services
Employee Population	182	Persons	
Unit flow factor (UFF)	0.28	m^3/person/day	Table T-2: Empolyee & Community, Social & Personal Services
Catchment Inflow Factors(PCIF)	1.0	-	GESF section 10 - Not applicable for new developments.
ADWF	50.96	m^3/day	
Total building ADWF	1,350.20	m^3/day	
Dischages to:			
FMH4043145	450.07	m^3/day	Assumed split in 3 terminal manholes
FMH4043147	450.07	m^3/day	Assumed split in 3 terminal manholes
FMH4043149	450.07	m^3/day	Assumed split in 3 terminal manholes
E_6 **Gas station**			
Type	Retail Trade	-	
Total GFA	106	m^2	Source: plan form geoinfo map
Assumed GFA per Employee	28.6	m^2/Person	Table 8 CIFSUS - Retail Trade
Employee Population	4	Persons	
Unit flow factor (UFF)	0.28	m^3/person/day	Table T-2: Empolyee & J4 Retail
Catchment Inflow Factors(PCIF)	1.1	-	Table T-4 of GESF - East Kowloon
ADWF	1.23	m^3/day	
Total building ADWF	1.23	m^3/day	
Dischages to:			
FMH4036900	1.23	m^3/day	EXTERNAL (on box culvert)

Localised Sewage Flow Estimates	Estimation	Unit	Remark
EL_1 **Hong Kong Children's Hospital**			
Total building Localised Flow	36.24	l/s	information provided by development
Dischages to:			

Estimation of Sewage Flows Estimation from Catchments Not Affected by the Proposed Development

Design Code

1. Based on EPD Guidelines for Estimating Sewage Flows for Sewage Infrastructure Planning.
2. Planning Department CIFSUS.
3. BS EN 12056-2:2000 Gravity drainage systems inside buildings

External Discharge - Near Sites 3E1 and 3E2

ADWF Sewage Flow Estimates	Estimation	Unit	Remark
FMH4100328	36.24	l/s	information provided by development
EL_2 **Acute Hospital**			New Acute Hospital at Kai Tak (under construction)
Design sewerage flows	100.00	l/s	information provided by development
Total building Localised Flow	100.00	l/s	information provided by development
Dischages to:			
FMH4096819	50.00		50% flow split between the two discharge locations (information provided by development)
FMH4100328	50.00		50% flow split between the two discharge locations (information provided by development)
EL_2 **NKIL 6647 Swimming pool**			
Pool Area	225	m^2	assumed
Pool Depth	1.20	m	assumed
Pool Water Volume	270.00	m^3	
Turnover Period	6.00	hours	Assumed outdoor pool (6 hours for open air pools, 4 hours for indoor pools). Source Cap. 132CA Swimming Pool Regulation, Section 6 paragraph j
Recirculation Flow	45.00	m^3/h	
Filter flow rate	30.00	$m^3/m^2/h$	Source: Medium Rate Sand Filter, from Table 5.1, WHO, Guidelines for Safe Recreational Water Environments, Volume 2, Swimming Pools and Similar Environment
filter area	1.50	m^2	
backwash unit flow	37.00	$m^3/m^2/h$	Source: Medium Rate Sand Filter, from Table 5.1, WHO, Guidelines for Safe Recreational Water Environments, Volume 2, Swimming Pools and Similar Environment
backwash flow	55.50	m^3/h	
	15.42	l/s	
Design sewerage flows	15.42	l/s	
Total building Localised Flow	15.42	l/s	
Dischages to:			
FMH4043145	15.42		assumed at the most upstream manhole

Estimation of Sewage Flows Estimation for Existing Development

Design Code

1. Based on EPD Guidelines for Estimating Sewage Flows for Sewage Infrastructure Planning.
2. Planning Department CIFSUS.
3. BS EN 12056-2:2000 Gravity drainage systems inside buildings

Existing Discharge - Sites 3E1 and 3E2

ADWF Sewage Flow Estimates		Estimation	Unit	Remark
B_1	**Site 3E1**			
	Type	Residential	-	Residential R(B)2 from OZP
	Total GFA	31,815	m^2	From Maximum Plot Ratio stated in OZP 4.5 of Net Site Area of around 7,070 m2.
	Assumed GFA per flat	75.0	m^2/flats	Kai Tak Planning Report; https://www.tpb.gov.hk/en/resources/general_papers.html?category=&year=2022&month=#content
	Number of flats	425	flats	
	Average household	2.7	Persons/flat	Census, Household Characteristics of Population in Kowloon City District, 2021
	Population	1,148	Persons	
	Unit flow factor (UFF)	0.19	m^3/person/day	Table T-1 of GESF - Residential R1
	Catchment Inflow Factors(PCIF)	1.0	-	GESF section 10 - Not applicable for new developments.
	ADWF	218.12	m^3/day	
	Total building ADWF	218.12	m^3/day	
	Dischages to:			
	FMH4036432	218.12	m^3/day	
B_2	**Site 3E2**			
	Type	Residential	-	Residential R(B)2 from OZP
	Total GFA	34,605	m^2	From Maximum Plot Ratio stated in OZP 4.5 of Net Site Area of around 7,690 m2.
	Assumed GFA per flat	75.0	m^2/flats	Kai Tak Planning Report; https://www.tpb.gov.hk/en/resources/general_papers.html?category=&year=2022&month=#content
	Number of flats	462	flats	
	Average household	2.7	Persons/flat	Census, Household Characteristics of Population in Kowloon City District, 2021
	Employee Population	1,248	Persons	
	Unit flow factor (UFF)	0.19	m^3/person/day	Table T-1 of GESF - Residential R1
	Catchment Inflow Factors(PCIF)	1.0	-	GESF section 10 - Not applicable for new developments.
	ADWF	237.12	m^3/day	
	Total building ADWF	237.12	m^3/day	
	Dischages to:			
	FMH4043141	237.12	m^3/day	
TOT	**ADWF**	**455.24**	**m^3/day**	

Table - Capacity Performance of Existing Sewer

Notes:
(1) Calculate by Colebrook-White Equation

$$\overline{V} = -\sqrt{32gRS_f}\,\log\left[\frac{k_s}{14.8R} + \frac{1.255\nu}{R\sqrt{32gRS_f}}\right]$$

ν is kinematic viscosity of fluid = 1.14 x 10-6 m2/s and g is the gravity = 9.81m/s2
V is the velocity, D is the diameter of the sewer and S is the gradient of the sewer.
Assumed data

	Roughness ks (mm)		
Pipe Materal	V 0.75m/s	V 1.2m/s	0.75 < V < 1.2
VC	3.0	0.6	interpolated
PC	6.0	3.0	interpolated
PE	1.5	0.3	interpolated

Existing Network - Sites 3E1 and 3E2

Manhole							Existing Pipe Parameter												New Sewer
UP_MAN No.	DN_MAN No.	Catchment inflow	CON_POP	PEAKING FACTOR	ACC_ADWF (m^3/d)	Peak Flow (L/s)	DIA (D) (mm)	LEN (m)	UP_GL (mPD)	DN_GL (mPD)	UP_INV (mPD)	DN_INV (mPD)	Gradient (S)	Pipe Materal ks (mm)	VEL (m/s)	CAP (L/s)	F/C (%)	Sufficient Capacity?	Adequate Velocity?
FMH4100328	FMH4061903	EL_1, EL_2	0	8	0.00	86.24	300	38.0	4.36	4.17	0.52	0.37	250	VC, interpolated, ks=2.8 mm	0.80	56.26	153.3%	NO	Existing
FMH4061903	FMH4061905		0	8	0.00	86.24	300	47.3	4.17	4.15	0.37	0.30	676	VC, V<=0.75, ks=3 mm	0.48	33.66	256.2%	NO	Existing
FMH4061905	FMH4096819		0	8	0.00	86.24	600	13.90	4.15	4.43	0.00	-0.05	278	VC, V>=1.2, ks=0.6 mm	1.45	410.85	21.0%	YES	Existing
FMH4096819	FMH4096820	EL_2	0	8	0.00	136.24	600	40.4	4.43	4.21	-0.07	-0.22	267	VC, V>=1.2, ks=0.6 mm	1.48	419.14	32.5%	YES	Existing
FMH4096820	FMH4096823		0	8	0.00	136.24	600	30.6	4.21	4.27	-0.23	-0.36	235	VC, V>=1.2, ks=0.6 mm	1.58	447.06	30.5%	YES	Existing
FMH4096823	FMH4061908	E_1	243	8	65.60	142.31	600	42.9	4.27	4.59	-0.60	-0.93	130	PC, V>=1.2, ks=3 mm	1.72	487.14	29.2%	YES	Existing
FMH4061908	Box Culvert		243	8	65.60	142.31	600	3.90	4.59	4.59	-1.02	-1.03	390	PC, interpolated, ks=4.8 mm	0.92	260.74	54.6%	YES	Existing
FMH4096818	FMH4100328		0	8	0.00	0.00	300	31.9	4.1	4.36	2.54	1.11	22	VC, V>=1.2, ks=0.6 mm	3.34	236.15	0.0%	YES	Existing
FMH4043141	FMH4043142	B_2	878	8	237.12	21.96	225	29.1	4.34	3.83	2.43	2.15	104	VC, V>=1.2, ks=0.6 mm	1.28	50.89	43.1%	YES	Existing
FMH4043142	FMH4043143		878	8	237.12	21.96	225	39.8	3.83	4.05	2.15	1.76	102	VC, V>=1.2, ks=0.6 mm	1.29	51.36	42.7%	YES	Existing
FMH4043143	FMH4043144	E_4	4,462	6	1204.87	83.67	225	29.0	4.05	4.24	1.76	1.47	100	VC, V>=1.2, ks=0.6 mm	1.31	51.89	161.3%	NO	Existing
FMH4043144	FMH4043145		4,462	6	1204.87	83.67	225	27.9	4.24	4.53	1.47	1.20	103	VC, V>=1.2, ks=0.6 mm	1.28	51.04	163.9%	NO	Existing
FMH4043145	FMH4043146	E_5 EL_2 BL_5	6,129	5	1654.93	111.19	450	36.4	4.53	4.39	0.97	0.83	260	VC, V>=1.2, ks=0.6 mm	1.25	199.40	55.8%	YES	Existing
FMH4043146	FMH4043203	E_3	6,288	5	1697.75	113.67	525	11.5	4.39	4.31	0.73	0.69	288	VC, V>=1.2, ks=0.6 mm	1.31	284.35	40.0%	YES	Existing
FMH4043203	FMH4043147		6,288	5	1697.75	113.67	525	21.6	4.91	4.23	0.69	0.63	360	VC, interpolated, ks=1.3 mm	1.06	230.36	49.3%	YES	Existing
FMH4043147	FMH4043148		7,955	5	2147.81	139.71	525	42.6	4.23	4.20	0.63	0.49	304	VC, V>=1.2, ks=0.6 mm	1.28	276.31	50.6%	YES	Existing
FMH4043148	FMH4043149	E_2	9,715	5	2622.96	167.21	525	28.8	4.20	4.25	0.49	0.40	320	VC, V>=1.2, ks=0.6 mm	1.24	269.36	62.1%	YES	Existing
FMH4043149	FMH4043150	E_2	13,141	4	3548.17	179.68	525	22.7	4.25	3.96	0.40	0.32	284	VC, V>=1.2, ks=0.6 mm	1.32	286.24	62.8%	YES	Existing
FMH4043150	Box Culvert		13,141	4	3548.17	179.68	525	1.4	3.96	3.96	0.32	0.00	4	VC, V>=1.2, ks=0.6 mm	10.76	2327.43	7.7%	YES	Existing
FMH4036432	FMH4043143	B_1	808	8	218.12	20.20	225	20.6	4.05	4.05	2.00	1.84	127	VC, interpolated, ks=1.7 mm	1.00	39.75	50.8%	YES	Existing

Abbreviation:

UP_MAN	Upstream Manhole
DN_MAN	Downstream Manhole
ADWF	Average Dry Weather Flow
ACC_ADWF	Accumulated Average Dry
CON_POP	Contributing Population
DIA	Diameter
LEN	Length
UP_GL	Upstream Ground Level
DN_GL	Downstream Ground Level
UP_INV	Upstream Invert Level
DN_INV	Downstream Invert Level
VEL	Peak Pipe Velocity
PE	Polyethylene PE100 Pipe or Concrete UPVC/HDPE lined Pipe
CAP	Peak Pipe Capacity
F/C	Peak Flow/Capacity
VC	Vitrified Clay Pipe
PC	Precast Concrete Pipe

Estimation of Sewage Flows Estimation for Proposed Development

Design Code

1. Based on EPD Guidelines for Estimating Sewage Flows for Sewage Infrastructure Planning.
2. Planning Department CIFSUS.
3. BS EN 12056-2:2000 Gravity drainage systems inside buildings

Proposed Discharge - Sites 3E1 and 3E2

ADWF Sewage Flow Estimates		Estimation	Unit	Remark
P_1	**Site 3E1**			
	Type	Residential	-	
	Number of flats	888	flats	
	Average household	2.7	Persons/flat	Census, Household Characteristics of Population in Kowloon City District, 2021
	Population	2,398	Persons	
	Unit flow factor (UFF)	0.19	m^3/person/day	Table T-1 of GESF - Residential R1
	Catchment Inflow Factors(PCIF)	1.0	-	GESF section 10 - Not applicable for new developments.
	ADWF	455.62	m^3/day	
	Type	Retail Trade	-	
	Total GFA	2,405	m^2	FROM PRELIM LAYOUT
	Assumed GFA per Employee	28.6	m^2/Person	Table 8 CIFSUS - Retail Trade
	Employee Population	85	Persons	
	Unit flow factor (UFF)	0.28	m^3/person/day	Table T-2: Empolyee & J4 Retail
	Catchment Inflow Factors(PCIF)	1.0	-	GESF section 10 - Not applicable for new developments.
	ADWF	23.80	m^3/day	
	Type	Social Services	-	Club house and social and welfare facilities
	Total GFA	3,087	m^2	FROM PRELIM LAYOUT
	Assumed GFA per Employee	30.3	m^2/Person	Table 8 CIFSUS - Social Services
	Employee Population	102	Persons	
	Unit flow factor (UFF)	0.28	m^3/person/day	Table T-2: Empolyee & Community, Social & Personal Services
	Catchment Inflow Factors(PCIF)	1.0	-	GESF section 10 - Not applicable for new developments.
	ADWF	28.56	m^3/day	
	Total building ADWF	507.98	m^3/day	
	Dischages to:			
	TMH_3E1	507.98	m^3/day	
P_2	**Site 3E2**			
	Type	Residential	-	
	Number of flats	1,040	flats	
	Average household	2.7	Persons/flat	Census, Household Characteristics of Population in Kowloon City District, 2021
	Employee Population	2,808	Persons	
	Unit flow factor (UFF)	0.19	m^3/person/day	Table T-1 of GESF - Residential R1
	Catchment Inflow Factors(PCIF)	1.0	-	GESF section 10 - Not applicable for new developments.
	ADWF	533.52	m^3/day	
	Type	Retail Trade	-	
	Total GFA	3,843	m^2	FROM PRELIM LAYOUT
	Assumed GFA per Employee	28.6	m^2/Person	Table 8 CIFSUS - Retail Trade
	Employee Population	135	Persons	
	Unit flow factor (UFF)	0.28	m^3/person/day	Table T-2: Empolyee & J4 Retail
	Catchment Inflow Factors(PCIF)	1.0	-	GESF section 10 - Not applicable for new developments.
	ADWF	37.80	m^3/day	
	Type	Social Services	-	Club house and social
	Total GFA	2,065	m^2	FROM PRELIM LAYOUT
	Assumed GFA per Employee	30.3	m^2/Person	Table 8 CIFSUS - Social Services
	Employee Population	69	Persons	
	Unit flow factor (UFF)	0.28	m^3/person/day	Table T-2: Empolyee & Community, Social & Personal Services
	Catchment Inflow Factors(PCIF)	1.0	-	GESF section 10 - Not applicable for new developments.
	ADWF	19.32	m^3/day	
	Total building ADWF	590.64	m^3/day	
	Dischages to:			
	TMH_3E2	590.64	m^3/day	
TOT	**ADWF**	**1,098.62**	**m^3/day**	

Table - Capacity Performance of Existing and Proposed Sewer under Development Scenario

Notes:
(1) Calculate by Colebrook-White Equation

$$\overline{V} = -\sqrt{32gRS_f}\,\log\left[\frac{k_s}{14.8R} + \frac{1.255\nu}{R\sqrt{32gRS_f}}\right]$$

ν is kinematic viscosity of fluid = 1.14 x 10-6 m2/s and g is the gravity = 9.81m/s2
V is the velocity, D is the diameter of the sewer and S is the gradient of the sewer.
Assumed data

	Roughness ks (mm)		
Pipe Materal	V 0.75m/s	V 1.2m/s	0.75 < V < 1.2
VC	3.0	0.6	interpolated
PC	6.0	3.0	interpolated
PE	1.5	0.3	interpolated

Existing and Proposed Network - Sites 3E1 and 3E2

Manhole								Existing Pipe Parameter												New Sewer
UP_MAN No.	DN_MAN No.	Existing / New / Upgraded	Catchment inflow	CON_POP	PEAKING FACTOR	ACC_ADWF (m^3/d)	Peak Flow (L/s)	DIA (D) (mm)	LEN (m)	UP_GL (mPD)	DN_GL (mPD)	UP_INV (mPD)	DN_INV (mPD)	Gradient (S)	Pipe Materal ks (mm)	VEL (m/s)	CAP (L/s)	F/C (%)	Sufficient Capacity?	Adequate Velocity?
FMH4100328	FMH4061903		EL_1, EL_2	2,188	6	590.64	127.26	300	38.0	4.36	4.17	0.52	0.37	250	VC, interpolated, ks=2.8 mm	0.80	56.26	226.2%	NO	Existing
FMH4061903	FMH4061905			2,188	6	590.64	127.26	300	47.3	4.17	4.15	0.37	0.30	676	VC, V<=0.75, ks=3 mm	0.48	33.66	378.1%	NO	Existing
FMH4061905	FMH4096819			2,188	6	590.64	127.26	600	13.90	4.15	4.43	0.00	-0.05	278	VC, V>=1.2, ks=0.6 mm	1.45	410.85	31.0%	YES	Existing
FMH4096819	FMH4096820		EL_2	2,188	6	590.64	177.26	600	40.4	4.43	4.21	-0.07	-0.22	267	VC, V>=1.2, ks=0.6 mm	1.48	419.14	42.3%	YES	Existing
FMH4096820	FMH4096823			2,188	6	590.64	177.26	600	30.6	4.21	4.27	-0.23	-0.36	235	VC, V>=1.2, ks=0.6 mm	1.58	447.06	39.6%	YES	Existing
FMH4096823	FMH4061908		E_1	2,431	6	656.24	181.81	600	42.9	4.27	4.59	-0.60	-0.93	130	PC, V>=1.2, ks=3 mm	1.72	487.14	37.3%	YES	Existing
FMH4061908	Box Culvert			2,431	6	656.24	181.81	600	3.90	4.59	4.59	-1.02	-1.03	390	PC, interpolated, ks=4.8 mm	0.92	260.74	69.7%	YES	Existing
TMH_3E2	Exist_tapping	NEW	P_2	2,188	5	590.64	34.18	300	7.7	4.35	4.35	3.21	3.17	208	PE, interpolated, ks=0.6 mm	1.08	76.30	44.8%	YES	YES
Exist_tapping	FMH4096818			2,188	6	590.64	41.02	300	6.0	4.4	4.11	3.17	3.15	272	VC, interpolated, ks=3 mm	0.75	53.19	77.1%	YES	Existing
FMH4096818	FMH4100328			2,188	6	590.64	41.02	300	31.9	4.1	4.36	2.54	1.11	22	VC, V>=1.2, ks=0.6 mm	3.34	236.15	17.4%	YES	Existing
FMH4043141	FMH4043142			0	8	0.00	0.00	225	29.1	4.34	3.83	2.43	2.15	104	VC, V>=1.2, ks=0.6 mm	1.28	50.89	0.0%	YES	Existing
FMH4043142	FMH4043143			0	8	0.00	0.00	225	39.8	3.83	4.05	2.15	1.76	102	VC, V>=1.2, ks=0.6 mm	1.29	51.36	0.0%	YES	Existing
FMH4043143	FMH4043144		E_4	4,658	6	1257.61	87.33	225	29.0	4.05	4.24	1.76	1.47	100	VC, V>=1.2, ks=0.6 mm	1.31	51.89	168.3%	NO	Existing
FMH4043144	FMH4043145			4,658	6	1257.61	87.33	225	27.9	4.24	4.53	1.47	1.20	103	VC, V>=1.2, ks=0.6 mm	1.28	51.04	171.1%	NO	Existing
FMH4043145	FMH4043146		E_5 EL_2	6,325	5	1707.67	114.24	450	36.4	4.53	4.39	0.97	0.83	260	VC, V>=1.2, ks=0.6 mm	1.25	199.40	57.3%	YES	Existing
FMH4043146	FMH4043203		E_3	6,483	5	1750.49	116.72	525	11.5	4.39	4.31	0.73	0.69	288	VC, V>=1.2, ks=0.6 mm	1.31	284.35	41.0%	YES	Existing
FMH4043203	FMH4043147			6,483	5	1750.49	116.72	525	21.6	4.91	4.23	0.69	0.63	360	VC, interpolated, ks=1.3 mm	1.06	230.36	50.7%	YES	Existing
FMH4043147	FMH4043148			8,150	5	2200.55	142.76	525	42.6	4.23	4.20	0.63	0.49	304	VC, V>=1.2, ks=0.6 mm	1.28	276.31	51.7%	YES	Existing
FMH4043148	FMH4043149		E_2	9,910	5	2675.70	170.26	525	28.8	4.20	4.25	0.49	0.40	320	VC, V>=1.2, ks=0.6 mm	1.24	269.36	63.2%	YES	Existing
FMH4043149	FMH4043150		E_2	13,337	4	3600.91	182.13	525	22.7	4.25	3.96	0.40	0.32	284	VC, V>=1.2, ks=0.6 mm	1.32	286.24	63.6%	YES	Existing
FMH4043150	Box Culvert			13,337	4	3600.91	182.13	525	1.4	3.96	3.96	0.32	0.00	4	VC, V>=1.2, ks=0.6 mm	10.76	2327.43	7.8%	YES	Existing
TMH_3E1	FMH4043143		P_1	1,881	6	507.98	35.28	225	12.3	4.05	4.05	1.93	1.84	127	VC, interpolated, ks=1.7 mm	1.00	39.80	88.6%	YES	Existing

Abbreviation:

UP_MAN	Upstream Manhole
DN_MAN	Downstream Manhole
ADWF	Average Dry Weather Flow
ACC_ADWF	Accumulated Average Dry
CON_POP	Contributing Population
DIA	Diameter
LEN	Length
UP_GL	Upstream Ground Level
DN_GL	Downstream Ground Level
UP_INV	Upstream Invert Level
DN_INV	Downstream Invert Level
VEL	Peak Pipe Velocity
PE	Polyethylene PE100 Pipe or Concrete UPVC/HDPE lined Pipe
CAP	Peak Pipe Capacity
F/C	Peak Flow/Capacity
VC	Vitrified Clay Pipe
PC	Precast Concrete Pipe

Table - Capacity Performance of Existing and Proposed Sewer under Development Scenario - Mitigated

Notes:
(1) Calculate by Colebrook-White Equation

$$\overline{V} = -\sqrt{32gRS_f}\log\left[\frac{k_s}{14.8R} + \frac{1.255v}{R\sqrt{32gRS_f}}\right]$$

v is kinematic viscosity of fluid = 1.14 x 10-6 m2/s and g is the gravity = 9.81m/s2
V is the velocity, D is the diameter of the sewer and S is the gradient of the sewer.

Assumed data
Proposed Improvememnts

	Roughness ks (mm)		
Pipe Materal	V 0.75m/s	V 1.2m/s	0.75 < V < 1.2
PE	1.5	0.3	interpolated
VC	3.0	0.6	interpolated
PC	6.0	3.0	interpolated

Existing and Proposed Network - Sites 3E1 and 3E2

Manhole							Existing Pipe Parameter											New Sewer	Utilisation Rate Comparison	
UP_MAN No.	DN_MAN No.	Catchment inflow	CON_POP	PEAKING FACTOR	ACC_ADWF (m^3/d)	Peak Flow (L/s)	DIA (D) (mm)	LEN (m)	UP_GL (mPD)	DN_GL (mPD)	UP_INV (mPD)	DN_INV (mPD)	Gradient (S)	Pipe Materal ks (mm)	VEL (m/s)	CAP (L/s)	F/C (%)	Sufficient Capacity?	Adequate Velocity?	Existing F/C (%)	Proposed F/C (%)
FMH4100328	FMH4061903	EL_1, EL_2	2,188	6	590.64	127.26	525	38.0	4.36	4.17	0.52	0.37	250	PE, V>=1.2, ks=0.3 mm	1.52	328.65	38.7%	YES	Existing	153%	**39%**
FMH4061903	FMH4061905		2,188	6	590.64	127.26	525	47.3	4.17	4.15	0.37	0.30	676	PE, interpolated, ks=1.5 mm	0.77	165.60	76.8%	YES	Existing	256%	**77%**
FMH4061905	FMH4096819		2,188	6	590.64	127.26	600	13.90	4.15	4.43	0.00	-0.05	278	VC, V>=1.2, ks=0.6 mm	1.45	410.85	31.0%	YES	Existing	21%	**31%**
FMH4096819	FMH4096820	EL_2	2,188	6	590.64	177.26	600	40.4	4.43	4.21	-0.07	-0.22	267	VC, V>=1.2, ks=0.6 mm	1.48	419.14	42.3%	YES	Existing	33%	**42%**
FMH4096820	FMH4096823		2,188	6	590.64	177.26	600	30.6	4.21	4.27	-0.23	-0.36	235	VC, V>=1.2, ks=0.6 mm	1.58	447.06	39.6%	YES	Existing	30%	**40%**
FMH4096823	FMH4061908	E_1	2,431	6	656.24	181.81	600	42.9	4.27	4.59	-0.60	-0.93	130	PC, V>=1.2, ks=3 mm	1.72	487.14	37.3%	YES	Existing	29%	**37%**
FMH4061908	Box Culvert		2,431	6	656.24	181.81	600	3.90	4.59	4.59	-1.02	-1.03	390	PC, interpolated, ks=4.8 mm	0.92	260.74	69.7%	YES	Existing	55%	**70%**
TMH_3E2	Exist_tapping	P_2	2,188	5	590.64	34.18	300	7.7	4.35	4.35	3.21	3.17	208	PE, interpolated, ks=0.6 mm	1.08	76.30	44.8%	YES	YES	0%	**45%**
Exist_tapping	FMH4096818		2,188	6	590.64	41.02	300	6.0	4.4	4.11	3.17	3.15	272	VC, interpolated, ks=3 mm	0.75	53.19	77.1%	YES	Existing	0%	**77%**
FMH4096818	FMH4100328		2,188	6	590.64	41.02	300	31.9	4.1	4.36	2.54	1.11	22	VC, V>=1.2, ks=0.6 mm	3.34	236.15	17.4%	YES	Existing	43%	17%
FMH4043141	FMH4043142		0	8	0.00	0.00	225	29.1	4.34	3.83	2.43	2.15	104	VC, V>=1.2, ks=0.6 mm	1.28	50.89	0.0%	YES	Existing	43%	0%
FMH4043142	FMH4043143		0	8	0.00	0.00	225	39.8	3.83	4.05	2.15	1.76	102	VC, V>=1.2, ks=0.6 mm	1.29	51.36	0.0%	YES	Existing	43%	0%
FMH4043143	FMH4043144	E_4	4,658	6	1257.61	87.33	300	29.0	4.05	4.24	1.76	1.47	100	PE, V>=1.2, ks=0.3 mm	1.70	120.30	72.6%	YES	Existing	161%	73%
FMH4043144	FMH4043145		4,658	6	1257.61	87.33	300	27.9	4.24	4.53	1.47	1.20	103	PE, V>=1.2, ks=0.3 mm	1.67	118.31	73.8%	YES	Existing	164%	74%
FMH4043145	FMH4043146	E_5 EL_2	6,325	5	1707.67	114.24	450	36.4	4.53	4.39	0.97	0.83	260	VC, V>=1.2, ks=0.6 mm	1.25	199.40	57.3%	YES	Existing	56%	**57%**
FMH4043146	FMH4043203	E_3	6,483	5	1750.49	116.72	525	11.5	4.39	4.31	0.73	0.69	288	VC, V>=1.2, ks=0.6 mm	1.31	284.35	41.0%	YES	Existing	40%	**41%**
FMH4043203	FMH4043147		6,483	5	1750.49	116.72	525	21.6	4.91	4.23	0.69	0.63	360	VC, interpolated, ks=1.3 mm	1.06	230.36	50.7%	YES	Existing	49%	**51%**
FMH4043147	FMH4043148		8,150	5	2200.55	142.76	525	42.6	4.23	4.20	0.63	0.49	304	VC, V>=1.2, ks=0.6 mm	1.28	276.31	51.7%	YES	Existing	51%	**52%**
FMH4043148	FMH4043149	E_2	9,910	5	2675.70	170.26	525	28.8	4.20	4.25	0.49	0.40	320	VC, V>=1.2, ks=0.6 mm	1.24	269.36	63.2%	YES	Existing	62%	**63%**
FMH4043149	FMH4043150	E_2	13,337	4	3600.91	182.13	525	22.7	4.25	3.96	0.40	0.32	284	VC, V>=1.2, ks=0.6 mm	1.32	286.24	63.6%	YES	Existing	63%	**64%**
FMH4043150	Box Culvert		13,337	4	3600.91	182.13	525	1.4	3.96	3.96	0.32	0.00	4	VC, V>=1.2, ks=0.6 mm	10.76	2327.43	7.8%	YES	Existing	8%	**8%**
TMH_3E1	FMH4043143	P_1	1,881	5	507.98	29.40	225	12.3	4.05	4.05	2.05	1.80	49	PE, V>=1.2, ks=0.3 mm	2.03	80.83	36.4%	YES	YES	51%	**36%**
			0	8	0.00	0.00															

Abbreviation:

UP_MAN	Upstream Manhole
DN_MAN	Downstream Manhole
ADWF	Average Dry Weather Flow
ACC_ADWF	Accumulated Average Dry
CON_POP	Contributing Population
DIA	Diameter
LEN	Length
UP_GL	Upstream Ground Level
DN_GL	Downstream Ground Level
UP_INV	Upstream Invert Level
DN_INV	Downstream Invert Level
VEL	Peak Pipe Velocity
PE	Polyethylene PE100 Pipe or Concrete UPVC/HDPE lined Pipe
CAP	Peak Pipe Capacity
F/C	Peak Flow/Capacity
VC	Vitrified Clay Pipe
PC	Precast Concrete Pipe

Estimation of Sewage Flows Estimation from Catchments Not Affected by the Proposed Development

Design Code

1. Based on EPD Guidelines for Estimating Sewage Flows for Sewage Infrastructure Planning.
2. Planning Department CIFSUS.
3. BS EN 12056-2:2000 Gravity drainage systems inside buildings

External Discharge - Near Sites 4C4 and 4C5

E_A	**Upstream Developments**			
	Type	Residential	-	
	Number of flats	7,985	flats	Catchments: 4A1 (2138), 4A2 (2060), 4B1 (1590), 4B2 (1059), 4C1 (582), 4C2 (556).
	Average household	2.7	Persons/flat	Census, Household Characteristics of Population in Kowloon City District, 2021
	Population	21,560	Persons	
	Unit flow factor (UFF)	0.19	m^3/person/day	Table T-1 of GESF - Residential R1, PlanD classification R2 obtained from OZP plot ratio >6
	Catchment Inflow Factors(PCIF)	1.0	-	GESF section 10 - Not applicable for new developments.
	ADWF	4,096.40	m^3/day	
	Type	Residential	-	Catchments: 4B3 (1219), 4B4 (1305), 4C3 (439).
	Number of flats	2,963	flats	
	Average household	2.7	Persons/flat	Census, Kowloon City District, 2021
	Population	8,001	Persons	
	Unit flow factor (UFF)	0.27	m^3/person/day	Table T-1 of GESF - Residential R2, from OZP plot ratio <6
	Catchment Inflow Factors(PCIF)	1.0	-	GESF section 10 - Not applicable for new developments.
	ADWF	2,160.27	m^3/day	
	Type	Retail Trade	-	
	Total GFA	5,666	m^2	Catchments: 4C1 (92m2), 4C2 (2787m2), 4C3 (2787m2).
	Assumed GFA per Employee	28.6	m^2/Person	Table 8 CIFSUS - Retail Trade
	Employee Population	199	Persons	
	Unit flow factor (UFF)	0.28	m^3/person/day	Table T-2: Empolyee & J4 Retail
	Catchment Inflow Factors(PCIF)	1.0	-	GESF section 10 - Not applicable for new developments.
	ADWF	55.72	m^3/day	
	Type	Social Services	-	Club house
	Total GFA	26,199	m^2	Catchments: 4A1 (2088)), 4A2 (2500), 4B1 (7340), 4B2 (3784), 4B3 (2861),4B4 (905), 4C1 (2540), 4C2 (3161), 4C3 (3520).
	Assumed GFA per Employee	30.3	m^2/Person	Table 8 CIFSUS - Social Services
	Employee Population	865	Persons	
	Unit flow factor (UFF)	0.28	m^3/person/day	Table T-2: Empolyee & Community, Social & Personal Services
	Catchment Inflow Factors(PCIF)	1.0	-	GESF section 10 - Not applicable for new developments.
	ADWF	242.20	m^3/day	
	Total building ADWF	6,554.59	m^3/day	
	Dischages to:			
	FMH4098421	6,554.59	m^3/day	
E_B	**Development 4B5**			
	Type	Residential	-	
	Number of flats	2,557	flats	From pro-rata based on on plot ratio and site 4B4 no. of apartments
	Average household	2.7	Persons/flat	Census, Household Characteristics of Population in Kowloon City District, 2021
	Population	6,904	Persons	
	Unit flow factor (UFF)	0.19	m^3/person/day	Table T-1 of GESF - Residential R1, PlanD classification R2 obtained from OZP plot ratio =7.5
	Catchment Inflow Factors(PCIF)	1.0	-	GESF section 10 - Not applicable for new developments.
	ADWF	1,311.76	m^3/day	
	Type	Social Services	-	Club house
	Total GFA	1,300	m^2	From pro-rata based on on plot ratio and site 4B4 club house size
	Assumed GFA per Employee	30.3	m^2/Person	Table 8 CIFSUS - Social Services
	Employee Population	43	Persons	
	Unit flow factor (UFF)	0.28	m^3/person/day	Table T-2: Empolyee & Community, Social & Personal Services
	Catchment Inflow Factors(PCIF)	1.0	-	GESF section 10 - Not applicable for new developments.
	ADWF	12.04	m^3/day	
	Total building ADWF	1,323.80	m^3/day	
	Dischages to:			
	FMH4098429	1,323.80	m^3/day	
E_C	**Cruise Terminus**			
	ADWF	3,121.00	m^3/day	Catchments: Cruise Terminus
	Total building ADWF	3,121.00	m^3/day	
	Dischages to:			
	FMH4098431	3,121.00	m^3/day	From KL/2014/01 Kai Tak Development-Stage 2 Infrastructure works for Developments at the Southern Part of the Former Runway, Design for Sewerage Design
E_D	**Downstream Developments**			
	ADWF	4,200.00	m^3/day	Catchments: 4D2: 4D3
	Total building ADWF	4,200.00	m^3/day	
	Dischages to:			
	FMH4098439	4,200.00	m^3/day	From KL/2014/01 Kai Tak Development-Stage 2 Infrastructure works for Developments at the Southern Part of the Former Runway, Design for Sewerage Design

Plot	Source
4C3	https://richitt.com/%E5%A4%A9%E7%92%BD%C2%B7%E6%B5%B7/
4C2	https://richitt.com/%E5%A4%A9%E7%80%A7/
4C1	https://richitt.com/%E6%BE%90%E7%92%9F/
4A2	https://richitt.com/kaitakarea4asite2development/
4B3	https://www.info.gov.hk/gia/general/201811/07/P2018110700761.htm
4B2	https://www.landsd.gov.hk/doc/en/consent/monthly/t1_2106.pdf
4B1	https://www.doublecoast1.hk/api/data/911e6c92/NKIL6576_Phase1_20241104.pdf
4A1	https://richitt.com/%E5%95%9F%E5%BE%B7%E6%B5%B7%E7%81%A31/
4B4	https://richitt.com/%E6%9F%8F%E8%94%9A%E6%A3%AE/

Localised Sewage Flow Estimates	Estimation	Unit	Remark
EL_3	**Upstream Swimming pools**		
	Unit backwash flow	20	l/s/development	assumed
	Design sewerage flows	180.00	l/s	Catchments: 4A1, 4A2, 4B1, 4B2, 4B3, 4B4, 4C1, 4C2, 4C3.
	Total building Localised Flow	180.00	l/s	
	Dischages to:			
	FMH4098421	180.00		
TOT	**Localised Flow**	**331.66**	**l/s**	

Estimation of Sewage Flows Estimation for Existing Development

Design Code

1. Based on EPD Guidelines for Estimating Sewage Flows for Sewage Infrastructure Planning.
2. Planning Department CIFSUS.
3. BS EN 12056-2:2000 Gravity drainage systems inside buildings

Existing Discharge - Sites 4C4 and 4C5

ADWF Sewage Flow Estimates	Estimation	Unit	Remark
B_3 **Site 4C4**			
Type	Hotels	-	
Total GFA	24,062	m^2	From Maximum Plot Ratio stated in OZP 7.5 of Net Site Area of around 10,700 m2 (30% as Hotel).
Assumed GFA per Employee	31.3	m^2/Person	Table 8 CIFSUS - Hotels
Employee Population	770	Persons	
Unit flow factor (UFF)	1.58	m^3/person/day	Table T-2: Empolyee-Customers & J10 Hotels
Catchment Inflow Factors(PCIF)	1.0	-	GESF section 10 - Not applicable for new developments.
ADWF	1,216.60	m^3/day	
Type	Retail Trade	-	
Total GFA	16,041	m^2	From Maximum Plot Ratio stated in OZP 7.5 of Net Site Area of around 10,700 m2 (20% as Retail).
Assumed GFA per Employee	28.6	m^2/Person	Table 8 CIFSUS - Retail Trade
Employee Population	562	Persons	
Unit flow factor (UFF)	0.28	m^3/person/day	Table T-2: Empolyee & J4 Retail
Catchment Inflow Factors(PCIF)	1.0	-	GESF section 10 - Not applicable for new developments.
ADWF	157.36	m^3/day	
Type	Business Services	-	Office
Total GFA	40,103	m^2	From Maximum Plot Ratio stated in OZP 7.5 of Net Site Area of around 10,700 m2 (50% as Office).
Assumed GFA per Employee	18.2	m^2/Person	Table 8 CIFSUS - Business Services
Employee Population	2,206	Persons	
Unit flow factor (UFF)	0.08	m^3/person/day	Table T-2: Empolyee & J6 Finance, Insurance, Real Estate & Business Services
Catchment Inflow Factors(PCIF)	1.0	-	GESF section 10 - Not applicable for new developments.
ADWF	176.48	m^3/day	
Total building ADWF	1,550.44	m^3/day	
Dischages to:			
FTH4011157	1,550.44	m^3/day	
B_4 **Site 4C5**			
Type	Hotels	-	
Total GFA	17,064	m^2	From Maximum Plot Ratio stated in OZP 6.0 of Net Site Area of around 9,490 m2 (30% as Hotel).
Assumed GFA per Employee	31.3	m^2/Person	Table 8 CIFSUS - Hotels
Employee Population	547	Persons	
Unit flow factor (UFF)	1.58	m^3/person/day	Table T-2: Empolyee-Customers & J10 Hotels
Catchment Inflow Factors(PCIF)	1.0	-	GESF section 10 - Not applicable for new developments.
ADWF	864.26	m^3/day	
Type	Retail Trade	-	
Total GFA	11,376	m^2	From Maximum Plot Ratio stated in OZP 6.0 of Net Site Area of around 9,490 m2 (20% as Retail).
Assumed GFA per Employee	28.6	m^2/Person	Table 8 CIFSUS - Retail Trade
Employee Population	399	Persons	
Unit flow factor (UFF)	0.28	m^3/person/day	Table T-2: Empolyee & J4 Retail
Catchment Inflow Factors(PCIF)	1.0	-	GESF section 10 - Not applicable for new developments.
ADWF	111.72	m^3/day	
Type	Business Services	-	Office
Total GFA	28,440	m^2	From Maximum Plot Ratio stated in OZP 6.0 of Net Site Area of around 9,490 m2 (50% as Retail).
Assumed GFA per Employee	18.2	m^2/Person	Table 8 CIFSUS - Business Services
Employee Population	1,565	Persons	
Unit flow factor (UFF)	0.08	m^3/person/day	Table T-2: Empolyee & J6 Finance, Insurance, Real Estate & Business Services
Catchment Inflow Factors(PCIF)	1.0	-	GESF section 10 - Not applicable for new developments.
ADWF	125.20	m^3/day	
Total building ADWF	1,101.18	m^3/day	
Dischages to:			
FTH4011160	1,101.18	m^3/day	
TOT ADWF	**2,651.62**	**m^3/day**	

Localised Sewage Flow Estimates	Estimation	Unit	Remark
BL_5 **Lam Chak Street Substation**			
Emergency discharge	0.00	l/s	Assumed no discharge during normal operations
Total building Localised Flow	0.00	l/s	
Dischages to:			
FMH4043145	0.00	l/s	Transformer buildign sewer discharge is related to leakage or emergencies, assumed zero or neglegible during normal operations
TOT Localised Flow	**0.00**	**l/s**	

Table - Capacity Performance of Existing Sewer

Notes:
(1) Calculate by Colebrook-White Equation

$$\overline{V} = -\sqrt{32gRS_f}\,\log\left[\frac{k_s}{14.8R} + \frac{1.255\nu}{R\sqrt{32gRS_f}}\right]$$

ν is kinematic viscosity of fluid = 1.14 x 10-6 m2/s and g is the gravity = 9.81m/s2
V is the velocity, D is the diameter of the sewer and S is the gradient of the sewer.
Assumed data

	Roughness ks (mm)		
Pipe Materal	V 0.75m/s	V 1.2m/s	0.75 < V < 1.2
VC	3.0	0.6	interpolated
PC	6.0	3.0	interpolated
PE	1.5	0.3	interpolated

Existing Network - Sites 4C4 and 4C5

Manhole							Existing Pipe Parameter												New Sewer
UP_MAN No.	DN_MAN No.	Catchment inflow	CON_POP	PEAKING FACTOR	ACC_ADWF (m^3/d)	Peak Flow (L/s)	DIA (D) (mm)	LEN (m)	UP_GL (mPD)	DN_GL (mPD)	UP_INV (mPD)	DN_INV (mPD)	Gradient (S)	Pipe Materal ks (mm)	VEL (m/s)	CAP (L/s)	F/C (%)	Sufficient Capacity?	Adequate Velocity?
FTH4011157	FMH4098424	B_3	5,742	5	1550.44	89.72	300	14.3	5.00	5.06	2.48	2.13	40	PE, V>=1.2, ks=0.3 mm	2.70	190.66	47.1%	YES	Existing
FMH4098424	FMH4098421		5,742	5	1550.44	89.72	375	38.8	5.06	5.25	1.67	1.54	306	PE, interpolated, ks=0.9 mm	0.98	108.45	82.7%	YES	Existing
FMH4098421	FMH4098427	E_A EL_3	30,019	4	8105.03	555.23	750	84.0	5.25	5.07	0.48	0.22	328	PE, V>=1.2, ks=0.3 mm	1.65	729.22	76.1%	YES	Existing
FMH4098427	FMH4098429		30,019	4	8105.03	555.23	750	54.0	4.95	4.82	0.20	0.05	348	PE, V>=1.2, ks=0.3 mm	1.60	707.51	78.5%	YES	Existing
FMH4098429	FSH4007922		34,922	4	9428.83	616.52	750	60.4	4.82	4.82	0.04	-0.23	222	PE, V>=1.2, ks=0.3 mm	2.01	888.82	69.4%	YES	Existing
FTH4011160	FMH4098431	B_4	4,078	6	1101.18	76.47	300	12.7	4.80	4.78	1.74	1.35	32	PE, V>=1.2, ks=0.3 mm	3.01	212.82	35.9%	YES	Existing
FMH4098431	FSH4007922	E_C	15,638	4	4222.18	195.47	450	14.0	4.78	4.78	0.75	0.28	30	PE, V>=1.2, ks=0.3 mm	4.03	640.61	30.5%	YES	Existing
FSH4007922	FMH4098438		50,559	4	13651.01	820.33	900	35.3	4.82	4.91	-0.23	-0.36	280	PE, V>=1.2, ks=0.3 mm	2.00	1273.46	64.4%	YES	Existing
FMH4098438	FMH4098439		50,559	4	13651.01	820.33	900	46.0	4.91	5.11	-0.38	-0.56	260	PE, V>=1.2, ks=0.3 mm	2.08	1323.05	62.0%	YES	Existing
FMH4098439	FSH4007923		66,115	4	17851.01	984.32	900	61.8	5.11	5.11	-0.88	-1.12	258	PE, V>=1.2, ks=0.3 mm	2.09	1328.58	74.1%	YES	Existing

Abbreviation:

UP_MAN	Upstream Manhole
DN_MAN	Downstream Manhole
ADWF	Average Dry Weather Flow
ACC_ADWF	Accumulated Average Dry
CON_POP	Contributing Population
DIA	Diameter
LEN	Length
UP_GL	Upstream Ground Level
DN_GL	Downstream Ground Level
UP_INV	Upstream Invert Level
DN_INV	Downstream Invert Level
VEL	Peak Pipe Velocity
PE	Polyethylene PE100 Pipe or Concrete UPVC/HDPE lined Pipe
CAP	Peak Pipe Capacity
F/C	Peak Flow/Capacity
VC	Vitrified Clay Pipe
PC	Precast Concrete Pipe

Estimation of Sewage Flows Estimation for Proposed Development

Design Code

1. Based on EPD Guidelines for Estimating Sewage Flows for Sewage Infrastructure Planning.
2. Planning Department CIFSUS.
3. BS EN 12056-2:2000 Gravity drainage systems inside buildings

Existing Discharge - Sites 4C4 and 4C5

ADWF Sewage Flow Estimates		Estimation	Unit	Remark
P_3	**Site 4C4**			
	Type	Hotels	-	
	Total GFA	24,522	m^2	FROM PRELIM LAYOUT
	Assumed GFA per Employee	31.3	m^2/Person	Table 8 CIFSUS - Hotels
	Employee Population	785	Persons	
	Unit flow factor (UFF)	1.58	m^3/person/day	Table T-2: Empolyee-Customers & J10 Hotels
	Catchment Inflow Factors(PCIF)	1.0	-	GESF section 10 - Not applicable for new developments.
	ADWF	1,240.30	m^3/day	
	Type	Retail Trade	-	
	Total GFA	20,086	m^2	FROM PRELIM LAYOUT
	Assumed GFA per Employee	28.6	m^2/Person	Table 8 CIFSUS - Retail Trade
	Employee Population	704	Persons	
	Unit flow factor (UFF)	0.28	m^3/person/day	Table T-2: Empolyee & J4 Retail
	Catchment Inflow Factors(PCIF)	1.0	-	GESF section 10 - Not applicable for new developments.
	ADWF	197.12	m^3/day	
	Type	Business Services	-	Office
	Total GFA	49,422	m^2	FROM PRELIM LAYOUT
	Assumed GFA per Employee	18.2	m^2/Person	Table 8 CIFSUS - Business Services
	Employee Population	2,719	Persons	
	Unit flow factor (UFF)	0.08	m^3/person/day	Table T-2: Empolyee & J6 Finance, Insurance, Real Estate & Business Services
	Catchment Inflow Factors(PCIF)	1.0	-	GESF section 10 - Not applicable for new developments.
	ADWF	217.52	m^3/day	
	Total building ADWF	1,654.94	m^3/day	
	Dischages to:			
	FTH4011157	1,654.94	m^3/day	
P_4	**Site 4C5**			
	Type	Hotels	-	
	Total GFA	20,864	m^2	FROM PRELIM LAYOUT
	Assumed GFA per Employee	31.3	m^2/Person	Table 8 CIFSUS - Hotels
	Employee Population	668	Persons	
	Unit flow factor (UFF)	1.58	m^3/person/day	Table T-2: Empolyee-Customers & J10 Hotels
	Catchment Inflow Factors(PCIF)	1.0	-	GESF section 10 - Not applicable for new developments.
	ADWF	1,055.44	m^3/day	
	Type	Retail Trade	-	
	Total GFA	8,380	m^2	FROM PRELIM LAYOUT
	Assumed GFA per Employee	28.6	m^2/Person	Table 8 CIFSUS - Retail Trade
	Employee Population	294	Persons	
	Unit flow factor (UFF)	0.28	m^3/person/day	Table T-2: Empolyee & J4 Retail
	Catchment Inflow Factors(PCIF)	1.0	-	GESF section 10 - Not applicable for new developments.
	ADWF	82.32	m^3/day	
	Type	Business Services	-	Office
	Total GFA	37,128	m^2	FROM PRELIM LAYOUT
	Assumed GFA per Employee	18.2	m^2/Person	Table 8 CIFSUS - Business Services
	Employee Population	2,043	Persons	
	Unit flow factor (UFF)	0.08	m^3/person/day	Table T-2: Empolyee & J6 Finance, Insurance, Real Estate & Business Services
	Catchment Inflow Factors(PCIF)	1.0	-	GESF section 10 - Not applicable for new developments.
	ADWF	163.44	m^3/day	
	Total building ADWF	1,301.20	m^3/day	
	Dischages to:			
	FTH4011160	1,301.20	m^3/day	
TOT	**ADWF**	**2,956.14**	**m^3/day**	

Table - Capacity Performance of Existing and Proposed Sewer under Development Scenario

Notes:
(1) Calculate by Colebrook-White Equation

$$\overline{V} = -\sqrt{32gRS_f}\,\log\left[\frac{k_s}{14.8R} + \frac{1.255\nu}{R\sqrt{32gRS_f}}\right]$$

ν is kinematic viscosity of fluid = 1.14 x 10-6 m2/s and g is the gravity = 9.81m/s2
V is the velocity, D is the diameter of the sewer and S is the gradient of the sewer.
Assumed data

	Roughness ks (mm)		
Pipe Materal	V 0.75m/s	V 1.2m/s	0.75 < V < 1.2
VC	3.0	0.6	interpolated
PC	6.0	3.0	interpolated
PE	1.5	0.3	interpolated

Existing and Proposed Network - Sites 4C4 and 4C5

Manhole							Existing Pipe Parameter												New Sewer
UP_MAN No.	DN_MAN No.	Catchment inflow	CON_POP	PEAKING FACTOR	ACC_ADWF (m^3/d)	Peak Flow (L/s)	DIA (D) (mm)	LEN (m)	UP_GL (mPD)	DN_GL (mPD)	UP_INV (mPD)	DN_INV (mPD)	Gradient (S)	Pipe Materal ks (mm)	VEL (m/s)	CAP (L/s)	F/C (%)	Sufficient Capacity?	Adequate Velocity?
FTH4011157	FMH4098424	P_3	6,129	5	1654.94	95.77	300	14.3	5.00	5.06	2.48	2.13	40	PE, V>=1.2, ks=0.3 mm	2.70	190.66	50.2%	YES	Existing
FMH4098424	FMH4098421		6,129	5	1654.94	95.77	375	38.8	5.06	5.25	1.67	1.54	306	PE, interpolated, ks=0.9 mm	0.98	108.45	88.3%	YES	Existing
FMH4098421	FMH4098427	E_A EL_3	30,406	4	8209.53	560.07	750	84.0	5.25	4.95	0.48	0.22	328	PE, V>=1.2, ks=0.3 mm	1.65	729.22	76.8%	YES	Existing
FMH4098427	FMH4098429		30,406	4	8209.53	560.07	750	54.0	4.95	4.82	0.20	0.05	348	PE, V>=1.2, ks=0.3 mm	1.60	707.51	79.2%	YES	Existing
FMH4098429	FSH4007922		35,309	4	9533.33	621.36	750	60.4	4.82	4.82	0.04	-0.23	222	PE, V>=1.2, ks=0.3 mm	2.01	888.82	69.9%	YES	Existing
FTH4011160	FMH4098431	P_4	4,819	6	1301.20	90.36	300	12.7	4.80	4.78	1.74	1.35	32	PE, V>=1.2, ks=0.3 mm	3.01	212.82	42.5%	YES	Existing
FMH4098431	FSH4007922	E_C	16,379	4	4422.20	204.73	450	14.0	4.78	4.82	0.75	0.28	30	PE, V>=1.2, ks=0.3 mm	4.03	640.61	32.0%	YES	Existing
FSH4007922	FMH4098438		51,687	4	13955.53	832.45	900	35.3	4.82	4.91	-0.23	-0.36	280	PE, V>=1.2, ks=0.3 mm	2.00	1273.46	65.4%	YES	Existing
FMH4098438	FMH4098439		51,687	4	13955.53	832.45	900	46.0	4.91	5.11	-0.38	-0.56	260	PE, V>=1.2, ks=0.3 mm	2.08	1323.05	62.9%	YES	Existing
FMH4098439	FSH4007923		67,243	4	18155.53	995.96	900	61.8	5.11	5.11	-0.88	-1.12	258	PE, V>=1.2, ks=0.3 mm	2.09	1328.58	75.0%	YES	Existing
			0	8	0.00	0.00													

Abbreviation:

UP_MAN	Upstream Manhole
DN_MAN	Downstream Manhole
ADWF	Average Dry Weather Flow
ACC_ADWF	Accumulated Average Dry
CON_POP	Contributing Population
DIA	Diameter
LEN	Length
UP_GL	Upstream Ground Level
DN_GL	Downstream Ground Level
UP_INV	Upstream Invert Level
DN_INV	Downstream Invert Level
VEL	Peak Pipe Velocity
PE	Polyethylene PE100 Pipe or Concrete UPVC/HDPE lined Pipe
CAP	Peak Pipe Capacity
F/C	Peak Flow/Capacity
VC	Vitrified Clay Pipe
PC	Precast Concrete Pipe

Table - Capacity Performance of Existing and Proposed Sewer under Development Scenario - Mitigated

Notes:
(1) Calculate by Colebrook-White Equation

$$\overline{V} = -\sqrt{32gRS_f}\log\left[\frac{k_s}{14.8R} + \frac{1.255v}{R\sqrt{32gRS_f}}\right]$$

v is kinematic viscosity of fluid = 1.14 x 10-6 m2/s and g is the gravity = 9.81m/s2
V is the velocity, D is the diameter of the sewer and S is the gradient of the sewer.

Assumed data
Proposed Improvememnts

	Roughness ks (mm)		
Pipe Materal	V 0.75m/s	V 1.2m/s	0.75 < V < 1.2
PE	1.5	0.3	interpolated
VC	3.0	0.6	interpolated
PC	6.0	3.0	interpolated

Existing and Proposed Network - Sites 4C4 and 4C5

Manhole							Existing Pipe Parameter												New Sewer	Utilisation Rate Comparison	
UP_MAN No.	DN_MAN No.	Catchment inflow	CON_POP	PEAKING FACTOR	ACC_ADWF (m^3/d)	Peak Flow (L/s)	DIA (D) (mm)	LEN (m)	UP_GL (mPD)	DN_GL (mPD)	UP_INV (mPD)	DN_INV (mPD)	Gradient (S)	Pipe Materal ks (mm)	VEL (m/s)	CAP (L/s)	F/C (%)	Sufficient Capacity?	Adequate Velocity?	Existing F/C (%)	Proposed F/C (%)
FTH4011157	FMH4098424	P_3	6,129	5	1654.94	95.77	300	14.3	5.00	5.06	2.48	2.13	40	PE, V>=1.2, ks=0.3 mm	2.70	190.66	50.2%	YES	Existing	47%	**50%**
FMH4098424	FMH4098421		6,129	5	1654.94	95.77	450	38.8	5.06	5.25	1.67	1.54	306	PE, V>=1.2, ks=0.3 mm	1.25	197.94	48.4%	YES	Existing	83%	**48%**
FMH4098421	FMH4098427	E_A EL_3	30,406	4	8209.53	560.07	750	84.0	5.25	5.07	0.48	0.22	328	PE, V>=1.2, ks=0.3 mm	1.65	729.22	76.8%	YES	Existing	76%	**77%**
FMH4098427	FMH4098429		30,406	4	8209.53	560.07	750	54.0	4.95	4.82	0.20	0.05	348	PE, V>=1.2, ks=0.3 mm	1.60	707.51	79.2%	YES	Existing	78%	**79%**
FMH4098429	FSH4007922		35,309	4	9533.33	621.36	750	60.4	4.82	4.82	0.04	-0.23	222	PE, V>=1.2, ks=0.3 mm	2.01	888.82	69.9%	YES	Existing	69%	**70%**
FTH4011160	FMH4098431	P_4	4,819	6	1301.20	90.36	300	12.7	4.80	4.78	1.74	1.35	32	PE, V>=1.2, ks=0.3 mm	3.01	212.82	42.5%	YES	Existing	36%	**42%**
FMH4098431	FSH4007922	E_C	16,379	4	4422.20	204.73	450	14.0	4.78	4.78	0.75	0.28	30	PE, V>=1.2, ks=0.3 mm	4.03	640.61	32.0%	YES	Existing	31%	**32%**
FSH4007922	FMH4098438		51,687	4	13955.53	832.45	900	35.3	4.82	4.91	-0.23	-0.36	280	PE, V>=1.2, ks=0.3 mm	2.00	1273.46	65.4%	YES	Existing	64%	**65%**
FMH4098438	FMH4098439		51,687	4	13955.53	832.45	900	46.0	4.91	5.11	-0.38	-0.56	260	PE, V>=1.2, ks=0.3 mm	2.08	1323.05	62.9%	YES	Existing	62%	**63%**
FMH4098439	FSH4007923		67,243	4	18155.53	995.96	900	61.8	5.11	5.11	-0.88	-1.12	258	PE, V>=1.2, ks=0.3 mm	2.09	1328.58	75.0%	YES	Existing	74%	**75%**
			0	8	0.00	0.00															

Abbreviation:

UP_MAN	Upstream Manhole
DN_MAN	Downstream Manhole
ADWF	Average Dry Weather Flow
ACC_ADWF	Accumulated Average Dry
CON_POP	Contributing Population
DIA	Diameter
LEN	Length
UP_GL	Upstream Ground Level
DN_GL	Downstream Ground Level
UP_INV	Upstream Invert Level
DN_INV	Downstream Invert Level
VEL	Peak Pipe Velocity
PE	Polyethylene PE100 Pipe or Concrete UPVC/HDPE lined Pipe
CAP	Peak Pipe Capacity
F/C	Peak Flow/Capacity
VC	Vitrified Clay Pipe
PC	Precast Concrete Pipe

Appendix D

Baseline Conditions

Baseline: OZP conditions

- 13 -

S/K22/8

RESIDENTIAL (GROUP B) (Cont'd)

Remarks

(1) No new development, or addition, alteration and/or modification to or redevelopment of an existing building shall result in a total development and/or redevelopment in excess of the maximum plot ratio and maximum site coverage specified below, or the plot ratio and site coverage of the existing building, whichever is the greater:

Sub-area	Maximum Plot Ratio	Maximum Site Coverage (excluding basement(s))
Residential (Group B)1	5.0	40%
Residential (Group B)2	4.5	40%
Residential (Group B)3	3.5	44%
Residential (Group B)4	5.5	40%
Residential (Group B)5	6.1	40%
Residential (Group B)6	6.6	40%
Residential (Group B)7	7.0	40%
Residential (Group B)8	7.5	40%

Source: https://www.ozp.tpb.gov.hk/

Baseline: OZP conditions

COMMERCIAL (Cont'd)

Planning Intention

This zone is intended primarily for commercial developments, which may include uses such as office, shop, services, place of entertainment, eating place and hotel, functioning as territorial business/financial centre and regional or district commercial/shopping centre. These areas are usually major employment nodes.

Remarks

(1) On land designated "Commercial (2)",

(a) no new development, or addition, alteration and/or modification to or redevelopment of an existing building shall result in a total development and/or redevelopment in excess of the maximum plot ratio of 9.5 for a non-domestic building, or the plot ratio of the existing building, whichever is the greater.

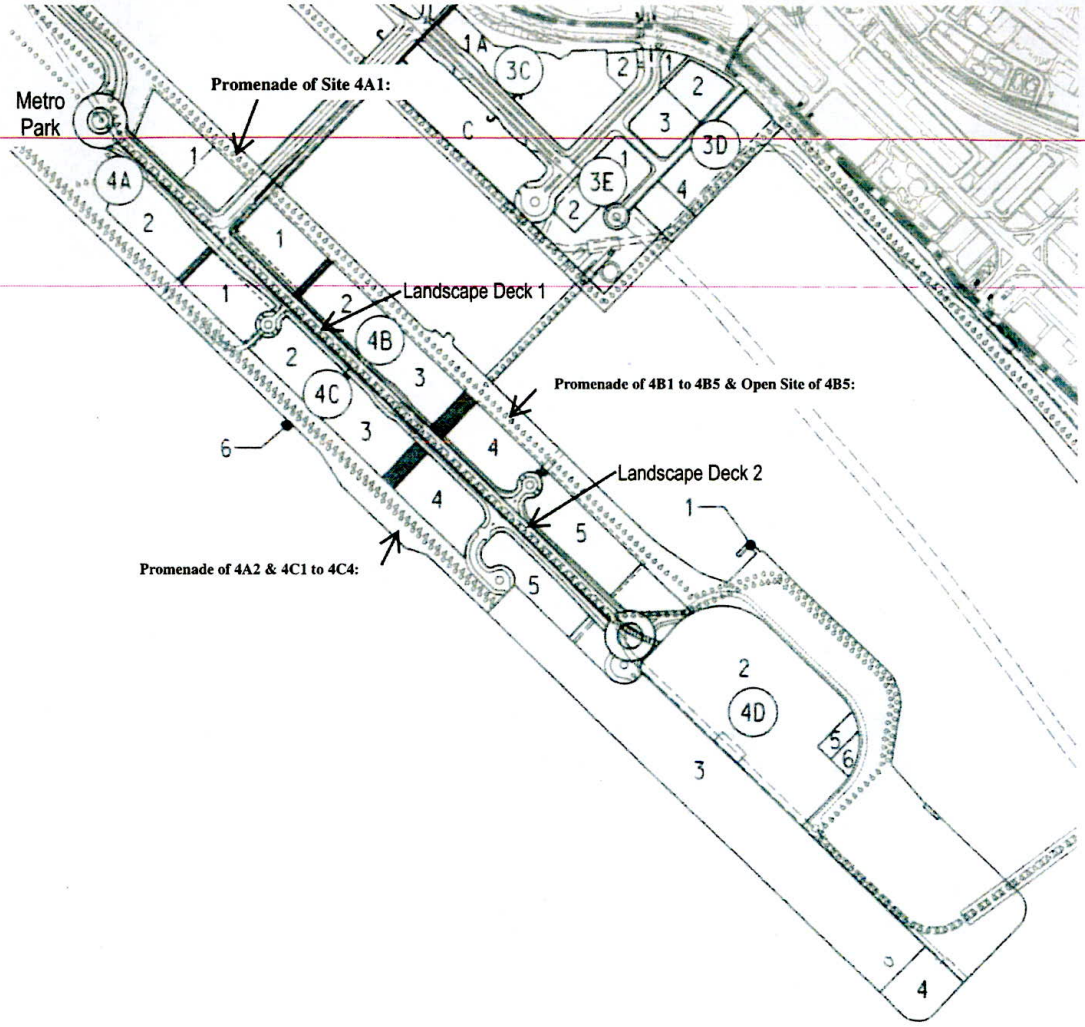
(b) for a domestic building or a building that is partly domestic and partly non-domestic on the site, the maximum plot ratio shall not exceed 5.0.

(2) On land designated "Commercial (2)", no new development, or addition, alteration and/or modification to or redevelopment of an existing building shall result in a total development and/or redevelopment in excess of the maximum site coverage (excluding basement(s)) of 65% or the site coverage of the existing building, whichever is the greater.

(3) On land designated "Commercial (1)", "Commercial (5)", "Commercial (6)", "Commercial (7)", "Commercial (8)" and "Commercial (9)", no new development, or addition, alteration and/or modification to or redevelopment of an existing building shall result in a total development and/or redevelopment in excess of the maximum plot ratio and maximum site coverage specified below, or the plot ratio and site coverage of the existing building, whichever is the greater:

Sub-area	Maximum Plot Ratio	Maximum Site Coverage (excluding basement(s))
Commercial (1)	5.8	65%
Commercial (5)	6.0	80%
Commercial (6)	6.0	65%
Commercial (7)	7.5	80%
Commercial (8)	8.0	65%
Commercial (9)	9.5	65%

Source: https://www.ozp.tpb.gov.hk/



Sewage Demand Layout

Catchment Area	m3/d	l/sec
4A1	1200.00	13.89
4A2	1525.00	17.65
4B1	860.00	9.95
4B2	830.00	9.61
4B3	910.00	10.53
4B4	910.00	10.53
4B5	2078.20	24.05
4C1	1093.00	12.65
4C2	1311.00	15.17
4C3	1520.00	17.59
4C4	1460.00	16.90
4C5	1030.00	11.92
4D2	4040.00	46.76
4D3	160.00	1.85
4D4	20.00	0.23
Cruise	3121.00	36.12
Prom of Site 4A1	63.59	0.74
Prom of Site 4A2	40	0.46
Prom of Site 4C3	40	0.46
Prom of Site 4B3	40	0.46
Prom of Site 4B4	40	0.46
Prom of Site 4B5	40	0.46
Prom of Site 4B1 to 4B2 & Open Site of 4B5	254.37	2.94
Prom of Site 4C1, 4C2 & 4C4	254.37	2.94
Metro Park	1694.35	19.61