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**Appendix I**

**Sewerage Impact Assessment**

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# Section 12A Planning Application for Proposed Amendments to the Tung Chung Valley Outline Zoning Plan to Rezone “Residential (Group C)2” Zone to “Residential (Group B)” Zone in Support of Private Residential Development at Various Lots in D.D. 1 Tung Chung and Adjoining Government Land, Tung Chung, Lantau Island

Sewerage Impact Assessment

December 2024

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# 1. Introduction

## 1.1 Background

- 1.1.1 AECOM Asia Company Limited (AECOM) was commissioned by the project proponent to act as the engineering consultant to conduct a Sewerage Impact Assessment (SIA) for a private residential development in Tung Chung, Lantau Island.
- 1.1.2 The Application Site, with a total site area of 33,808m<sup>2</sup>, is mostly covered by vegetation and with some open space areas and car parking areas. The Site is located at the west side of Chung Mun Road, within Ngau Au. The Application Site is also next to river outfall of Tung Chung Bay. The location of the Application Site is shown in **SIA/Figure 1**.
- 1.1.3 The Application Site is currently zoned "Residential (Group C)2" with a maximum plot ratio of 1 on the Approved Tung Chung Valley Outline Zoning Plan No. S/I-TCV/2. The Applicant now proposes to increase the domestic plot ratio to not more than 2.10 to optimise valuable land resources and infrastructural capacity.
- 1.1.4 This SIA report serves as a supporting document for rezoning the Site from "Residential (Group C)2" Zone to "Residential (Group B)" Zone.

## 1.2 Objective of this Submission

- 1.2.1 This report outlines the assessment results of the potential water supply impacts caused by the Application Site. The main objectives of this assessment include the followings:
- (i) Review the existing and planned sewerage infrastructure near the Application Site;
  - (ii) Outline the methodology adopted in this assessment;
  - (iii) Identify any potential impact on the current or planned sewerage system due to the additional sewage discharge from the Application Site and the existing developments/villages nearby;
  - (iv) Propose sewerage mitigation measures where appropriate to mitigate the potential sewerage impact.

## 1.3 Nomenclature

1.3.1 The following abbreviations and shortened expressions in **Table 1** are adopted in this report.

ADWF	Average Dry Weather Flow
AECOM	AECOM Asia Company Limited
CEDD	Civil Engineering and Development Department
CIFSUS	Commercial and Industrial Floor Space Utilization Survey (PlanD)
DSD	Drainage Services Department
EPD	Environmental Protection Department
GFA	Gross Floor Area
mPD	Metres above Principal Datum
PlanD	Planning Department
UFF	Unit Flow Factor
UDD	Unit Daily Demand
SIA	Sewage Impact Assessment

**Table 1 – Nomenclature**

## 2. Development Proposal

### 2.1 The Proposed Development

- 2.1.1 The Application Site area is approximately 33,808m<sup>2</sup>. The Application Site consists of 9 residential blocks, 1 covered private transport lay-by, 1 kindergarten and retail facilities. The residential blocks are ranging from 6 to 22 storeys above a 1 to 3-storey podium, providing about 1,783 units in total.
- 2.1.2 The anticipated population intake year of the Application Site is 2030.
- 2.1.3 The Master Layout Plan (MLP) of the Application Site is shown in **SIA/Figure 2**. The proposed development schedule is summarised in **Table 2** below.

	Proposed Development
<b>Site Area</b>	About 33,808m <sup>2</sup>
<b>GFA</b>	About 78,292m <sup>2</sup>
- Domestic Portion	About 70,997m <sup>2</sup>
- Non-Domestic Portion	About 7,295m <sup>2</sup>
<b>Plot Ratio</b>	Not more than 2.32
- Domestic Portion	Not more than 2.10
- Non-Domestic Portion	Not more than 0.22
<b>Maximum Site Coverage</b>	Not more than 33.3%
<b>Maximum Building Height (main roof level)</b>	
- Area (a)	Not more than 50mPD
- Area (b)	Not more than 80mPD
- Area (c)	Not more than 100mPD
<b>No. of Storeys <sup>(1)</sup></b>	6 to 22 storeys above a 1 to 3 storey(s) podium
<b>Domestic Portion</b>	
<b>Domestic GFA</b>	About 70,997m <sup>2</sup>
<b>Domestic Plot Ratio</b>	Not more than 2.10
<b>No. of Blocks</b>	9
<b>No. of Units</b>	About 1,783
<b>Average Flat Size</b>	About 39.8m <sup>2</sup>
<b>Anticipated Population <sup>(2)</sup></b>	About 5,171
<b>Private Open Space <sup>(3)</sup></b>	Not less than 5,171m <sup>2</sup>
<b>Non-Domestic Portion – Commercial and Covered Private Transport Lay-by</b>	
<b>Commercial GFA <sup>(4)</sup></b>	About 4,145m <sup>2</sup>
<b>Covered Private Transport Lay-by GFA</b>	About 3,150m <sup>2</sup>
<b>Maximum Building Height</b>	Not more than 19mPD
<b>Residents' Clubhouses <sup>(5)</sup></b>	
<b>Clubhouse GFA</b>	About 3,000m <sup>2</sup>
<b>No. of Storeys</b>	1

**Table 2 – Key Development Parameters**

Remarks:

- (1) Excluding basement floor(s) for car park and transfer plate; including above ground floors for commercial / covered private transport lay-by / ramp / E&M facilities / clubhouse / residential lobby / residential floors. The indicative typical floor-to-floor height is 3.25m which is subject to refinement at detailed design stage.
- (2) Adopting a person per flat ratio of 2.9 as per Tung Chung New Town under 2021 Population Census covering the Application Site
- (3) Not less than 1m<sup>2</sup> per person in accordance with Hong Kong Planning Standards and Guidelines (HKPSG) requirement
- (4) Commercial GFA refers to commercial uses ('Eating Place' and 'Shop and Services'), 'School' (kindergarten, nursery, language, computer, commercial and tutorial schools, art school, ballet and other types of schools providing interest / hobby related courses), 'Place of Entertainment' and 'Place of Recreation, Sports or Culture'. A kindergarten with a GFA of about 930m<sup>2</sup> is proposed.
- (5) Residents' clubhouse GFA is based on the maximum GFA concession for clubhouse according to Buildings Department's Practice Note APP-104 and shall be disregarded from the total GFA calculation

## 3. Assessment Methodology

### 3.1 Sewerage Impact Assessment Methodology

- 3.1.1 Capacity analysis of the sewage pipes was carried out to assess the adequacy of the proposed sewerage system. The design assumption and basis are shown in **Table 3**.

Design Standard	DSD Sewerage Design Manual, Part 1 & 2
Flow Formula	Colebrook-White Formula
Roughness	Proposed Gravity Sewer Ks = 0.3 mm (HDPE)
Unit Flow Factor	EPD Guideline for Estimating Sewage Flows for Sewage Infrastructure Planning (GESF): Table T-2 <u>Proposed Development:</u> 0.27 m <sup>3</sup> /day/head ("Domestic Private Housing (R2)") 0.28 m <sup>3</sup> /day/head ("Commercial Employee" plus "Community, Social & Personal Services" J11) 1.58 m <sup>3</sup> /day/head ("Commercial Employee" plus "Restaurant" J10) 0.28 m <sup>3</sup> /day/head ("Commercial Employee" plus "Wholesale & Retail" J4) 0.04 m <sup>3</sup> /day/head (Student)
Catchment Inflow Factor	EPD Guideline for Estimating Sewage Flows for Sewage Infrastructure Planning: Table T-4 1.0 (Tung Chung)
Peaking Factors	EPD Guideline for Estimating Sewage Flows for Sewage Infrastructure Planning: Table T-5
Economic Activity and Planned Usage Type	PlanD Commercial and Industrial Floor Space Utilization Survey (CIFSUS) Table 8 <u>Proposed Development:</u> 5.1 employees per 100 m <sup>2</sup> ("Restaurant") 3.5 employees per 100 m <sup>2</sup> ("Retail Trade")

**Table 3 – Design Assumption and Basis**

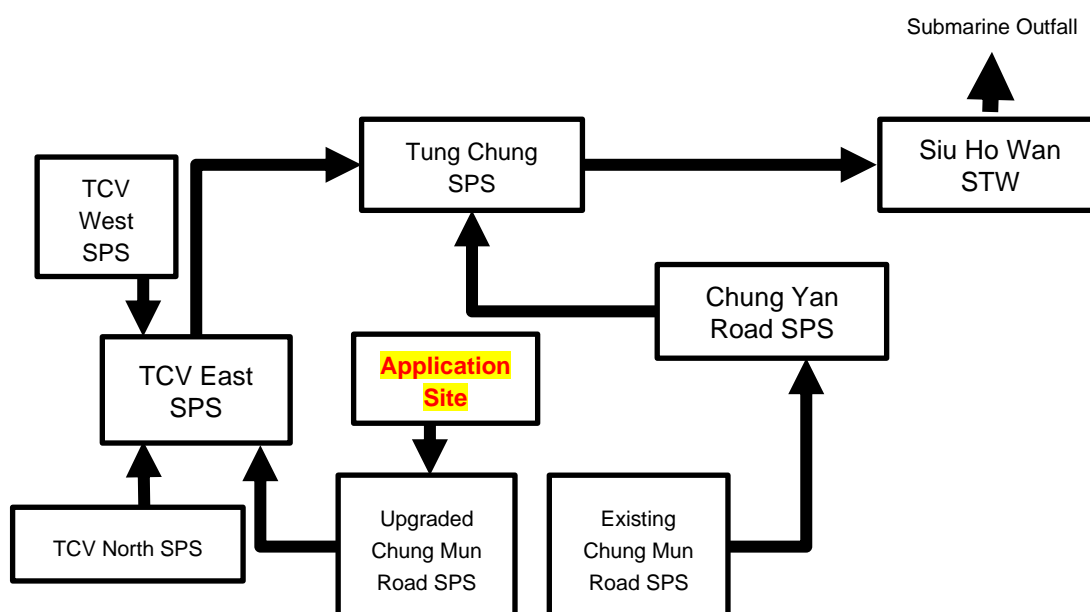
## 4. Review on Existing and Planned Sewerage System

### 4.1 Existing Sewerage System

- 4.1.1 According to sewerage record in GeoInfo. Map, there is no public sewerage system within the subject site. The nearest sewerage facilities are the public sewerage system along Chung Mun Road, east of the application site, discharge to existing Chung Mun Road Sewage Pumping Station (CMRSPS). Existing public sewer is available along Chung Mun Road, via a series of DN300 & DN375 sewer towards CMRSPS. The sewage is finally conveyed to Siu Ho Wan Sewage Treatment Work (SHWSTW) for treatment through two existing sewage pumping stations i.e. Chung Yan Road Sewage Pumping Station (CYRSPS) and Tung Chung Sewage Pumping Station (TCSPS).

### 4.2 Planned Sewerage System

- 4.2.1 CEDD will construct a planned sewerage network connecting the "Upgraded CMRSPS" (CEDD assigned name of a new sewage pumping station to be constructed next to the original CMRSPS) under Yu Tung Road and Chung Mun Road. Sewerage manhole (FMH-H05) will be constructed at the junction of Yu Tung Road and Chung Mun Road to convey sewage to the Upgraded CMRSPS via proposed 560 mm outer diameter (OD560) sewer (refer to **SIA/Figure 4**).
- 4.2.2 CEDD planned sewerage network will construct a plug-end sewer (OD355) at the boundary of Area 60, reserved for sewage discharge from future development.
- 4.2.3 According to latest Overall Schematic of Proposed Sewerage Flow for Tung Chung West (TCW) Development from CEDD, the Upgraded CMRSPS would serve Areas 33, 36A, 38A, 38B, 38C, Sha Tsui Tau, MTR TCW, and the Application Site. As advised by CEDD, the design peak flow of the Upgraded CMRSPS is 8,300 m<sup>3</sup>/day (0.0961 m<sup>3</sup>/s). The Upgraded CMRSPS will discharge to TCV East SPS via new twin DN250 rising mains laid along Chung Mun Road. TCV East SPS will deliver flow with discharge to the TCSPS via new twin DN450 rising mains laid along Chung Mun Road and Yu Tung Road. Refer to **Design Flow Diagram** below.



Design Flow Diagram

- 4.2.4 The Overall Schematic of Proposed Sewerage Flow for the proposed public sewerage infrastructure adopted in this SIA was obtained from CEDD and is enclosed in **Annex 1**.

## 4.3 Application Site Sewage Estimation

- 4.3.1 The estimated Average Dry Weather Flow (ADWF) from the Application Site is approximately 1,712 m<sup>3</sup>/day. Detailed sewage flow estimation can be referred to **Annex 2** and summarized in **Table 4**.

Flow Type	Average Dry Daily Flow (ADWF) (m <sup>3</sup> /day)
Domestic	1396
Other Non-domestic Provisions	316
<b>Total ADWF</b>	<b>1,712</b>
Peaking Factor	4
Peak Flow (m <sup>3</sup> /s)	0.079

**Table 4 – Summary of Sewage Flow**

- 4.3.2 The adopted peaking factor excluding stormwater allowance is 4, in accordance with GESF, the estimated peak sewage flow is 0.079 m<sup>3</sup>/s.

## 5. Proposed Sewerage System

- 5.1.1 The existing Application Site is currently undeveloped with no existing sewerage system. The nearest sewage manhole available for connection is FMH-H05 to be constructed by CEDD.
- 5.1.2 The sewage generated from the Application Site would be discharged via internal sewerage networks leading to the terminal manhole FTMH-1 proposed at the eastern site boundary adjacent to Chung Mun Road. A short OD355 sewer will be required to complete the connection from FTMH-1 and the public plug-end OD355 sewer at Yu Tung Road. The sewage generated from the Application Site would be discharged to the Upgraded CMRSPS, then to TCV-East SPS, existing TCSPS and ultimately to SHWSTW. The proposed sewerage connection is indicated in **SIA/Figure 4**.
- 5.1.3 The capacity of the planned PE100 gravity sewer with size OD560 is able to cater for the sewage discharge from the Application Site, as well as the proposed Tung Chung West development areas. The estimated sewage flow discharge from the proposed Tung Chung West development areas refers to **Annex 3**. The detailed calculation refers to **Annex 5**.
- 5.1.4 The planned design peak flow of the Upgraded CMRSPS according to the latest information provided by CEDD is 0.0961 m<sup>3</sup>/s, which is insufficient to cater for the combined peak flow of 0.102 m<sup>3</sup>/s from the Application Site and other planned catchments. Therefore, the pumping rate of the Upgraded CMRSPS is proposed to be upgraded from 0.0961 m<sup>3</sup>/s to at least 0.108 m<sup>3</sup>/s, providing >5% contingency. The utilisation of the Upgraded CMRSPS is calculated in **Annex 6** and summarised in **Table 5**.

Sewage Flow	
Sewage generated from the Application Site in ADWF (m <sup>3</sup> /day)	1,712
Sewage generated from other planned catchments in ADWF ((m <sup>3</sup> /day) (breakdown in <b>Annex 3</b> )	1,829
Total ADWF (m <sup>3</sup> /day)	3,541
Peaking Factor	2.5
Peak Flow (m <sup>3</sup> /s)	0.102
Planned design peak flow of the Upgraded Chung Mun Road Sewage Pumping Station (m <sup>3</sup> /s)	0.0961
Proposed upgrading of pump rate of the Upgraded Chung Mun Road Sewage Pumping Station (m <sup>3</sup> /s)	0.108
<b>Utilization after Upgrading of Pump Rate</b>	<b>94.9%</b>

**Table 5 – Utilization of Upgraded CMRSPS**

- 5.1.5 The downstream public gravity sewer connecting to TCV-East SPS has sufficient capacity to cater for the upgraded pumps. Hydraulic checking refers to **Annex 5**. The sewage flow estimation and catchment area plan can be referred to **Annex 4** and **Annex 7** respectively. The pumping rate of TCV-West SPS and TCV-North SPS adopted in the hydraulic analysis is 0.0231 m<sup>3</sup>/s and 0.0255 m<sup>3</sup>/s respectively, which are provided by CEDD.
- 5.1.6 The planned sewage discharge to TCV-East SPS in accordance with the latest Overall Schematic of Proposed Sewerage Flow for TCW Development from CEDD is summarised in **Table 6**. In accordance with the latest information provided by CEDD, the planned design peak flow of TCV-East SPS will be 33,264 m<sup>3</sup>/day (0.385 m<sup>3</sup>/s) with a peaking factor of 2, equals to ADWF of 33,264/2 = 16,632 m<sup>3</sup>/day. With the addition of sewage generated from the Application Site, the utilization of TCV-East SPS will become 67.6%.



Development	ADWF (m <sup>3</sup> /day)
Area 42	4,072
Area 46	1,047
Area 61A	299
Area 66A	259
Area 67	64
Area 68A/B	154
Area 71A	756
Area 71B	115
Area 72	173
Area 73	36
Area 74	27
Area 75	209
Area 76	197
Area 77	186
River Park	100
From Upgraded CMRSPS	3,541
Total ADWF	11,236
Design Capacity of TCV-East SPS	16,632
<b>Utilization</b>	<b>67.6%</b>

**Table 6 – Utilization of TCV-East SPS**

Note:

Latest design capacity and sewage flow information from Civil Engineering and Development Department – Overall Schematic of Proposed Sewerage Flow for TCW Development.

- 5.1.7 For any unforeseeable reason or difficulties, in which further upgrading of the Upgraded CMRSPS is not recommended, the development also proposed a fallback option to mitigate the sewerage issue, to be discussed in **Annex 8**.
- 5.1.8 The internal sewerage network and all relevant fittings will be determined in detailed design stage.

## 6. Maintenance Responsibility

- 6.1.1 The development is responsible for the construction of terminal manhole FTMH-1 and the downstream connection to the plug-end of public sewer near the Application Site Boundary. The development is also responsible for the construction of the internal sewerage infrastructure within the private development portion.
- 6.1.2 The development will bear the infrastructure cost to further upgrade the pump rate of the Upgraded CMRSPS from 0.0961 m<sup>3</sup>/s to at least 0.108 m<sup>3</sup>/s to cater for the additional sewage discharge from the Application Site. While the Upgraded CMRSPS and other public sewerage system will remain to be operated and maintained by the government.
- 6.1.3 Future development will be responsible for the maintenance of the terminal manhole FTMH-1 and its upstream sewerage infrastructure within the Application Site.
- 6.1.4 The government will take over the maintenance of the sewers and sewerage infrastructure downstream of terminal manhole FTMH-1, including the sewers between manhole FMH-H05 to FMH-I01a which are partially located within the private development portion. For the portions of sewer within the private development, a drainage reserve with a width of approximately 6.2m would be provided.

## 7. Conclusion

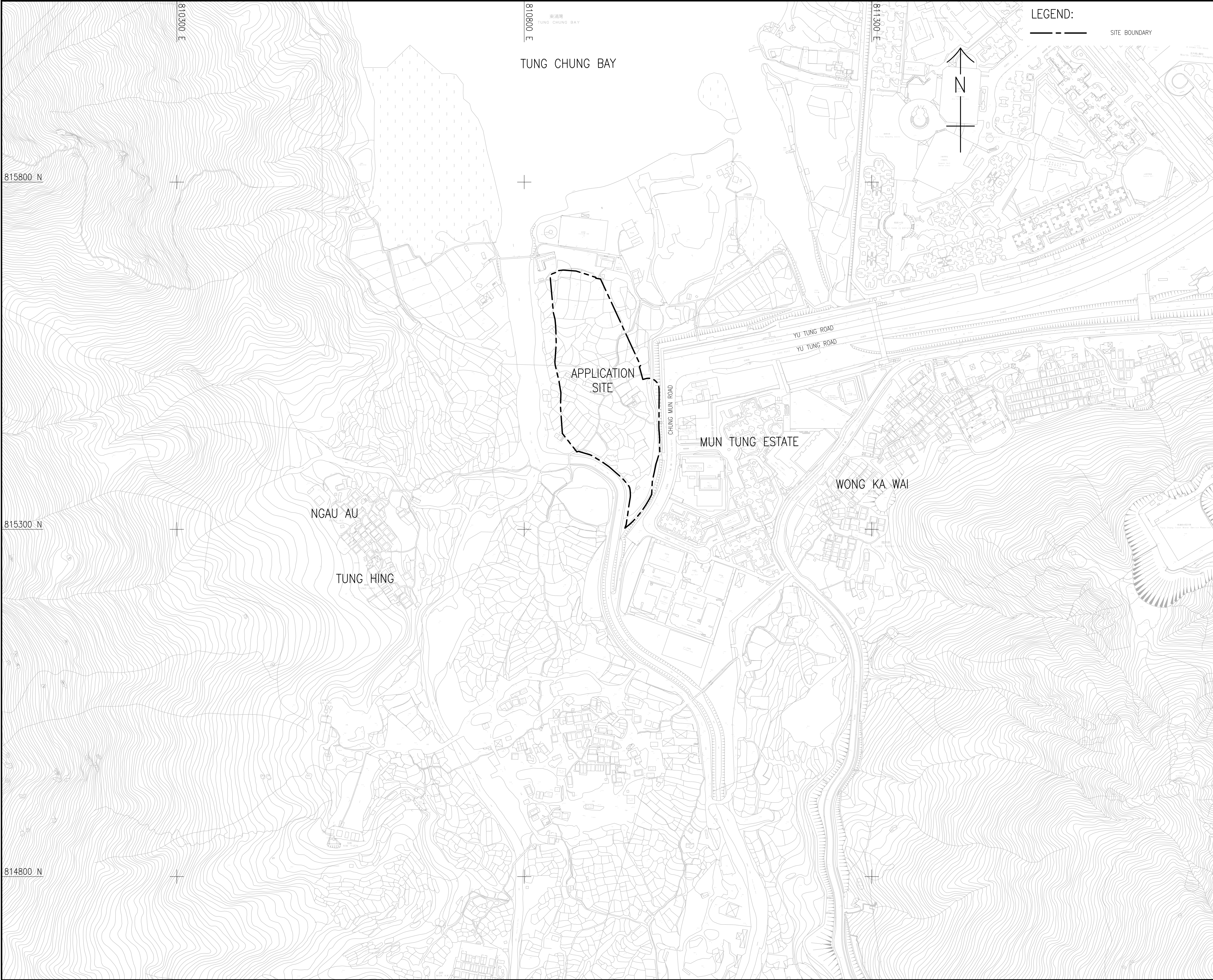
- 7.1.1 The Application Site is designated for residential use under the current OZP with a plot ratio of 1. The Applicant proposes to have a domestic plot ratio of 2.1 for the site by rezoning the site from "R(C)2" to "R(B)". The SIA has been carried out to assess the impact on the existing, planned and proposed sewerage system due to the proposed development.
- 7.1.2 The estimated total Average Dry Weather Flow (ADWF) from the Application Site is approximately 1,712 m<sup>3</sup>/day.
- 7.1.3 Planned OD560 PE100 gravity sewers will be constructed by others from planned sewerage manhole FMH-H05 to the Upgraded CMRSPS according to CEDD. The sewage from the Upgraded CMRSPS will be conveyed to the TCV-E SPS and ultimately to SHWSTW for centralized sewage treatment.
- 7.1.4 The planned OD560 PE100 gravity sewers from FMH-H05 to the Upgraded CMRSPS is designed to cater for the sewage flow from the Application Site, Sha Tsui Tau, MTR TCW and Areas 33, 36A, 38A, 38B and 38C.
- 7.1.5 The current design of the Upgraded CMRSPS could have underestimated the development potential of Tung Chung West. It is worth to review the SPS design capacity and select pump set with at least 0.108 m<sup>3</sup>/s to cope with the development need.
- 7.1.6 After successful upgrade of the Upgraded CMRSPS and completion of TCV-East SPS, the public sewerage infrastructure would have adequate capacity to cater for the proposed discharge. No adverse sewerage impact is anticipated.

**End of Report**

# Figures



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SECTION 12A PLANNING APPLICATION FOR PROPOSED AMENDMENTS TO THE TUNG CHUNG VALLEY OUTLINE ZONING PLAN TO REZONE "RESIDENTIAL (GROUP C)2" ZONE TO "RESIDENTIAL (GROUP B)" ZONE IN SUPPORT OF PRIVATE RESIDENTIAL DEVELOPMENT AT VARIOUS LOTS IN D.D. 1 TUNG CHUNG AND ADJOINING GOVERNMENT LAND, TUNG CHUNG, LANTAU ISLAND

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**STATUS**  
階段

SCALE	DIMENSION UNIT
比例	尺寸單位
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**KEY PLAN**  
索引圖

PROJECT NO.	AGREEMENT NO.
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TUNG CHUNG WEST

**SHEET TITLE**  
圖紙名稱

LOCATION PLAN

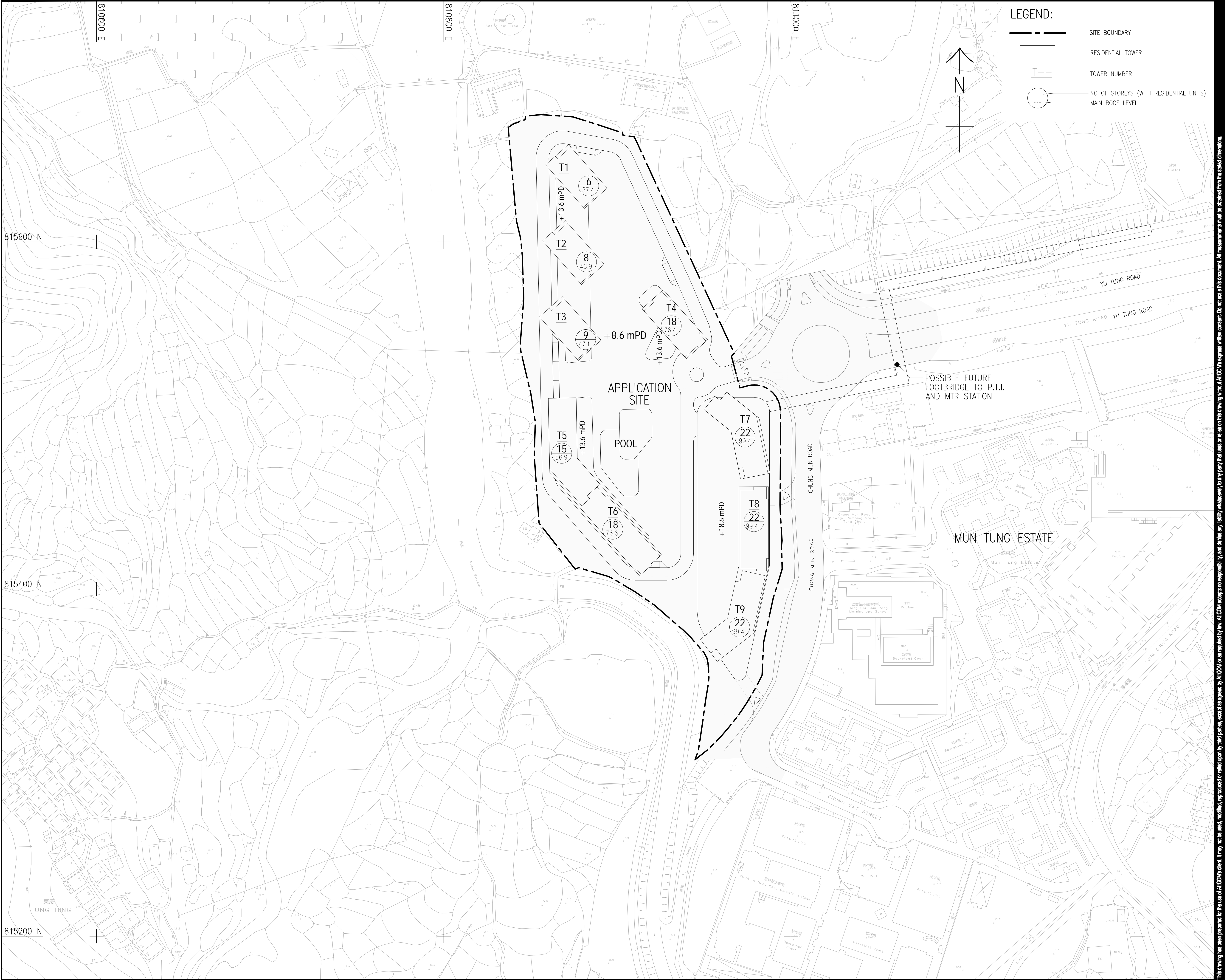
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SIA/FIGURE 1



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**SCALE**  
比例

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**DIMENSION UNIT**  
尺寸單位

METRES

**KEY PLAN**  
索引圖

**PROJECT NO.**  
項目編號

TUNG CHUNG WEST

**AGREEMENT NO.**  
協議編號

**SHEET TITLE**  
圖紙名稱

MASTER LAYOUT PLAN

**SHEET NUMBER**  
圖紙編號

SIA/FIGURE 2

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SITE BOUNDARY

EXISTING SEWER MANHOLE

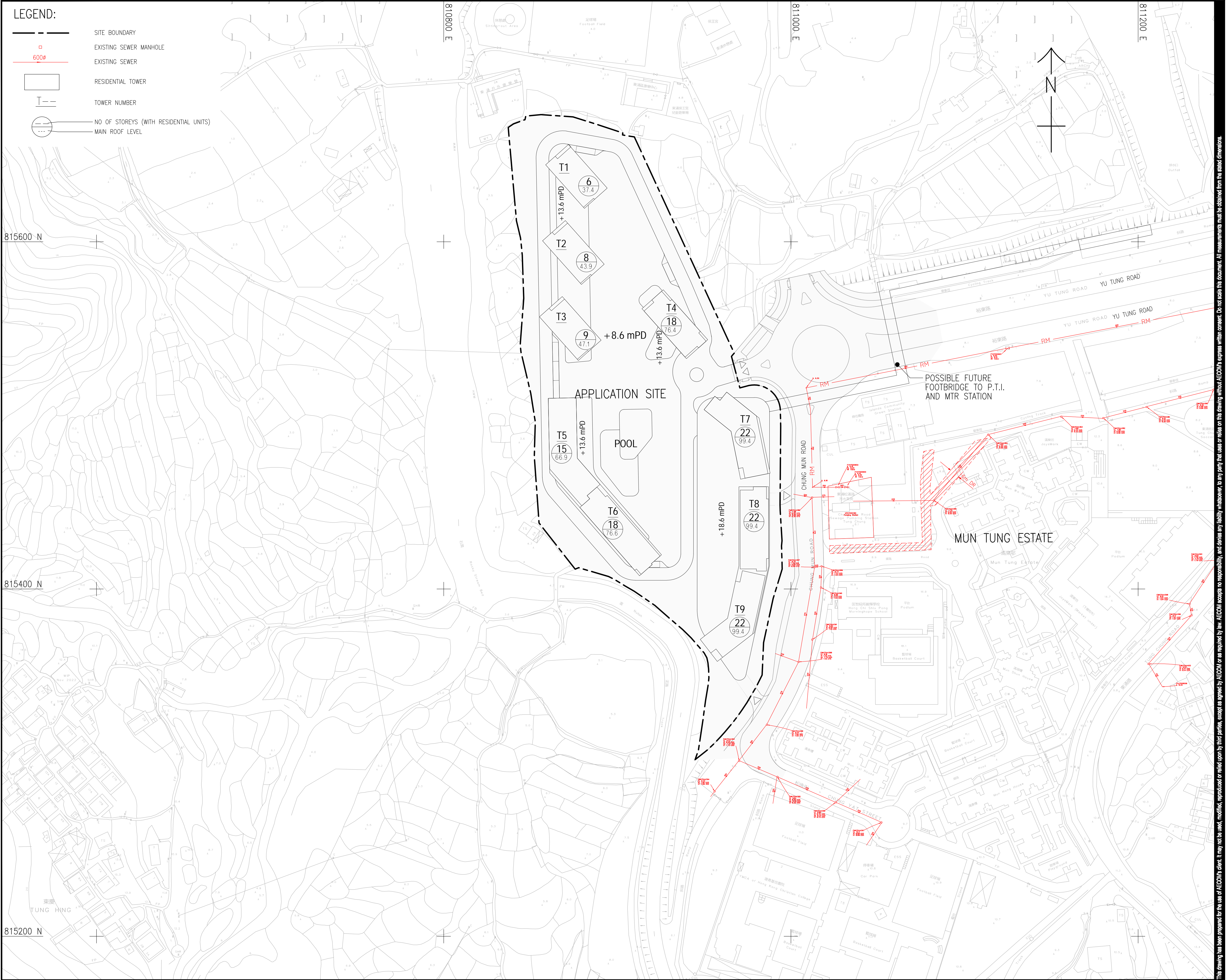
EXISTING SEWER

RESIDENTIAL TOWER

TOWER NUMBER

NO. OF STOREYS (WITH RESIDENTIAL UNITS)

MAIN ROOF LEVEL



AECOM

PROJECT

SECTION 12A PLANNING APPLICATION FOR PROPOSED AMENDMENTS TO THE TUNG CHUNG VALLEY OUTLINE ZONING PLAN TO REZONE "RESIDENTIAL (GROUP C)2" ZONE TO "RESIDENTIAL (GROUP B)" ZONE IN SUPPORT OF PRIVATE RESIDENTIAL DEVELOPMENT AT VARIOUS LOTS IN D.D. 1 TUNG CHUNG AND ADJOINING GOVERNMENT LAND, TUNG CHUNG, LANTAU ISLAND

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DIMENSION UNIT

METRES

KEY PLAN

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EXISTING SEWERAGE LAYOUT PLAN

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SIA/FIGURE 3

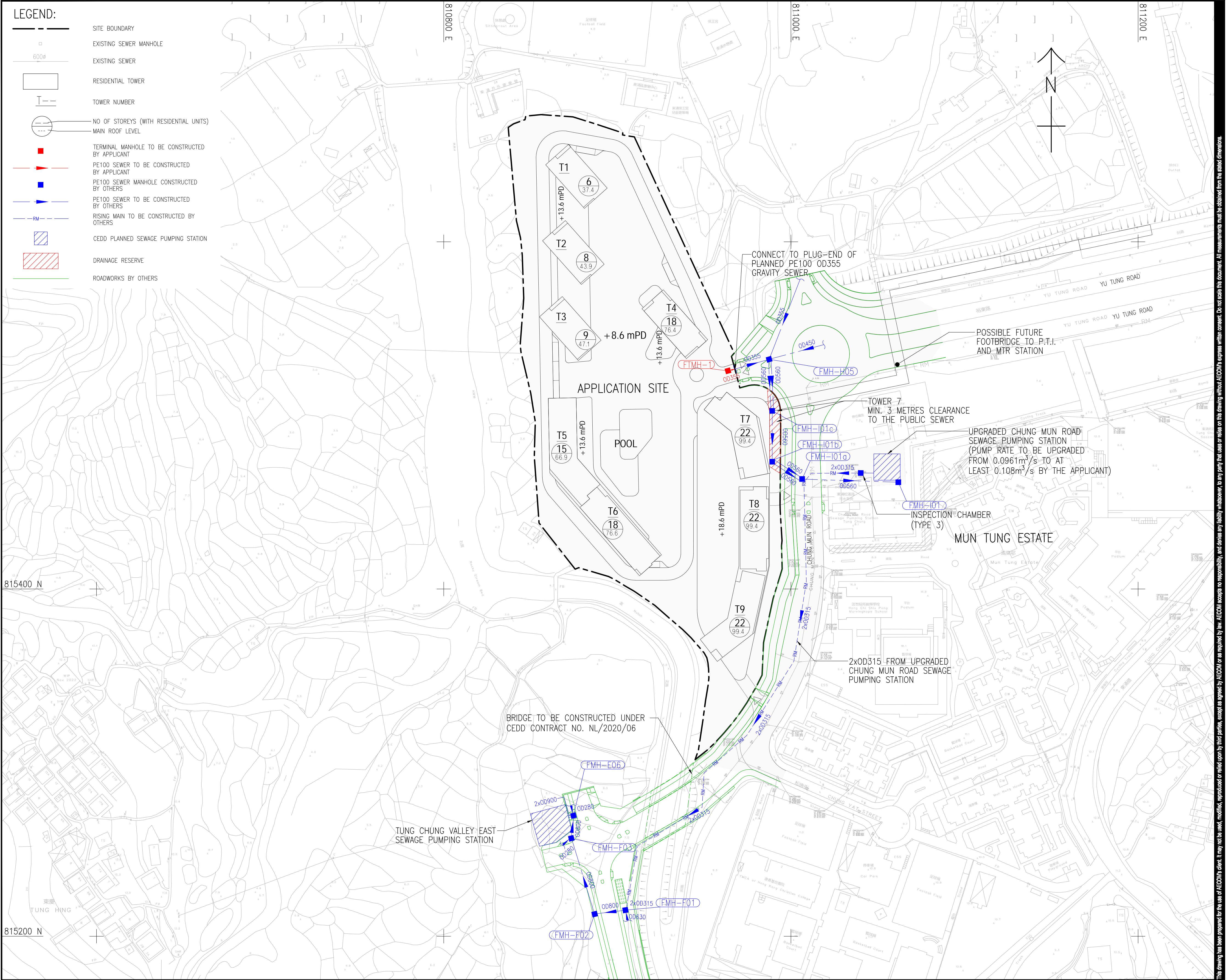
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- LEGEND:
- SITE BOUNDARY
  - EXISTING SEWER MANHOLE
  - EXISTING SEWER
  - RESIDENTIAL TOWER
  - TOWER NUMBER
  - NO OF STOREYS (WITH RESIDENTIAL UNITS)
  - MAIN ROOF LEVEL
  - TERMINAL MANHOLE TO BE CONSTRUCTED BY APPLICANT
  - PE100 SEWER TO BE CONSTRUCTED BY APPLICANT
  - PE100 SEWER MANHOLE CONSTRUCTED BY OTHERS
  - PE100 SEWER TO BE CONSTRUCTED BY OTHERS
  - RISING MAIN TO BE CONSTRUCTED BY OTHERS
  - CEDD PLANNED SEWAGE PUMPING STATION
  - DRAINAGE RESERVE
  - ROADWORKS BY OTHERS



AECOM

PROJECT  
項目  
SECTION 12A PLANNING APPLICATION FOR PROPOSED AMENDMENTS TO THE TUNG CHUNG VALLEY OUTLINE ZONING PLAN TO REZONE "RESIDENTIAL (GROUP C)2" ZONE TO "RESIDENTIAL (GROUP B)" ZONE IN SUPPORT OF PRIVATE RESIDENTIAL DEVELOPMENT AT VARIOUS LOTS IN D.D. 1 TUNG CHUNG AND ADJOINING GOVERNMENT LAND, TUNG CHUNG, LANTAU ISLAND

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A3 1 : 2000

DIMENSION UNIT  
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KEY PLAN  
索引圖

PROJECT NO.  
項目編號  
TUNG CHUNG WEST

SHEET TITLE  
圖紙名稱  
SEWERAGE LAYOUT PLAN

SHEET NUMBER  
圖紙編號  
SIA/FIGURE 4

AGREEMENT NO.  
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SHEET TITLE  
圖紙名稱

SHEET NUMBER  
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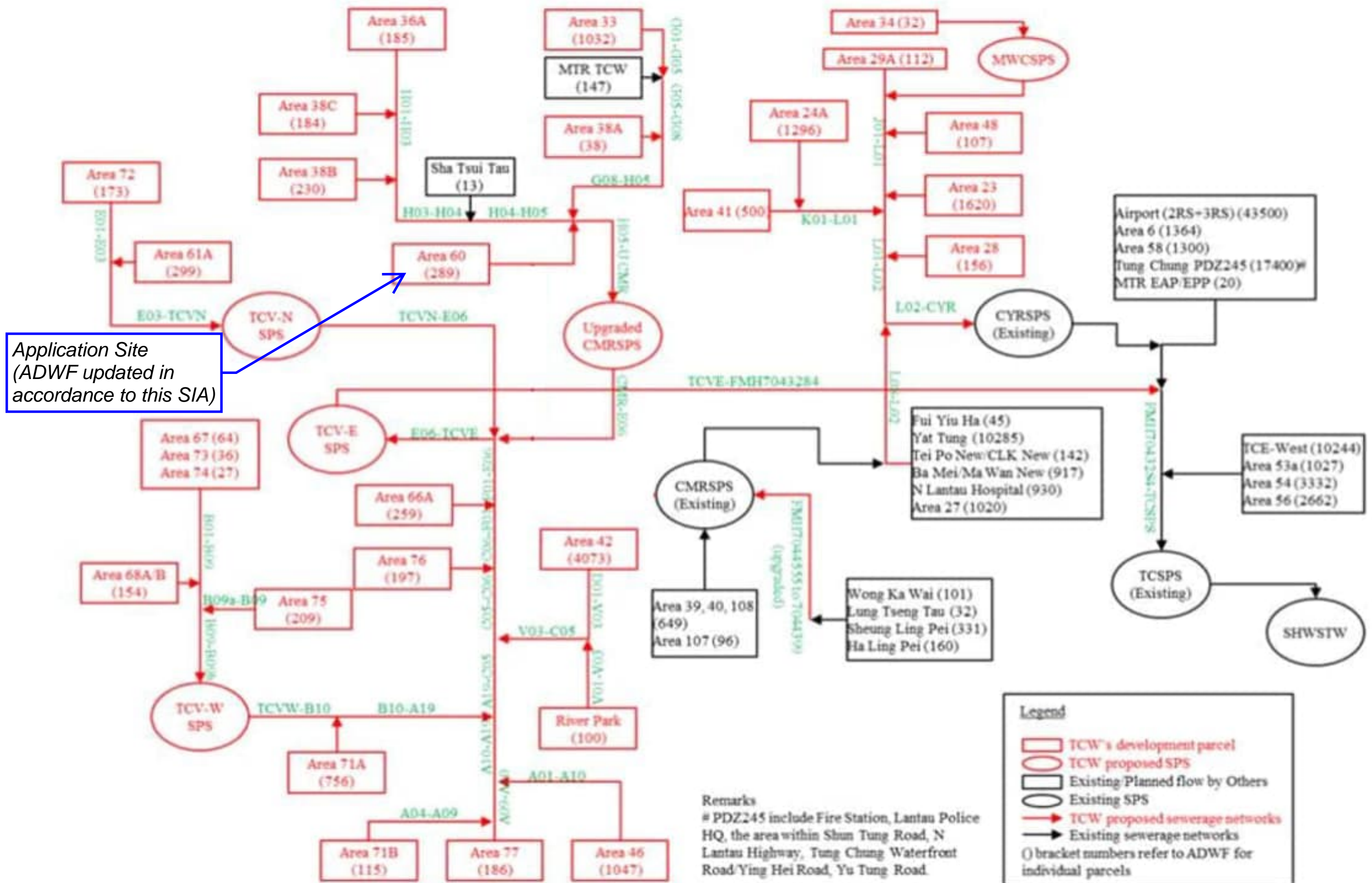
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# Annex 1

## Overall Schematic of Proposed Sewerage Flow obtained from CEDD

### Overall Schematic of Proposed Sewerage Flow for TCW Development



# Annex 2

## Estimated Sewage Flow Discharge from Application Site

**Section 12A Planning Application for Proposed Amendments to the Tung Chung Valley Outline Zoning Plan to Rezone “Residential (Group C)2” Zone to “Residential (Group B)” Zone in Support of Private Residential Development at Various Lots in D.D. 1 TC and Adjoining Government Land, Tung Chung, Lantau Island**

### Sewage Generation Estimation

11/21/2024

Development Type		GFA (m <sup>2</sup> )	Avg. Unit Size <sup>(1)</sup> (m <sup>2</sup> )	No. of Units	Person/Unit <sup>(3)</sup>	Person/m <sup>2</sup>	Population	Flow Type Description	Flow Type Abbreviation	UFF (m <sup>3</sup> /head/day)	Catchment Inflow Factor	ADWF (m <sup>3</sup> /day)	
Domestic		70,997.00	40	1,783	2.9	0.073	5,171	Domestic - Private R2	R2	0.27	1.00	1,396.20	
Commercial <sup>(7)</sup>		3,215											
	Retail	1,608				0.035	57	Commercial - Wholesale & Retail	J4	0.28	1.00	16.00	
	Restaurant	1,608				0.051	82	Commercial - Restaurants & Hotels	J10	1.58	1.00	129.60	
Kindergarten		930											
	Student						120	Student	school student	0.04	1.00	4.80	
	Teacher						12	Commercial - Community, Social & Personal Services	J11	0.28	1.00	3.40	
Clubhouse <sup>(2)</sup>		3,000											
	Retail	1,500				0.035	53	Commercial - Community, Social & Personal Services	J11	0.28	1.00	14.80	
	Restaurant	1,500				0.051	77	Commercial - Restaurants & Hotels	J10	1.58	1.00	121.70	
Backwash from swimming pool <sup>(4)</sup>												25.00	
		Total Population						5,572	Total ADWF (m <sup>3</sup> /day)				1,711.50
									Total ADWF without Backwash from swimming pool (m <sup>3</sup> /day)				1,686.50
Note 1:	Assuming the average unit size to be:		40.00	m <sup>2</sup>									
Note 2:	Assuming 50% clubhouse GFA be Retail and 50% be Restaurants. Person/m <sup>2</sup> information extracted from CIFSUS (PlanD, 2005)												
Note 3:	Based on a person per flat ratio of 2.9 by making reference to Tung Chung New Town under 2021 Population Census.												
Note 4:	For calculation of instant peak flow from swimming pool backwash, please refer to the attached swimming pool calculation sheet in Annex 1 - Proposed Swimming Pool - Backwash Calculation.												
Note 5:	Assume 30 student of 4 classes for Kindergarten												
Note 6:	Assuming a 1-to-11 Staff-to-Student Ratio (excluding principal), according to Education Bureau Circular No. 12/2020. The total no. of employee for kindergarten includes 1 no. of principal and 11 teachers.												
Note 7:	Assuming 50% Commercial GFA be Retail and 50% be Restaurants												



Section 12A Planning Application for Proposed Amendments to the Tung Chung Valley Outline Zoning Plan to  
Rezone “Residential (Group C)2” Zone to “Residential (Group B)” Zone in Support of Private Residential  
Development at Various Lots in D.D. 1 TC and Adjoining Government Land, Tung Chung, Lantau Island

Proposed Swimming Pool - Backwash Calculation

Date 8/26/2024

Backwash:

Plan Area of Pool =	989	m <sup>2</sup>	
Assuming Depth of Pool =	2.0	m	
Volume of Pool =	1,979	m <sup>3</sup>	
Turnover Rate =	6	hr	Outdoor Swimming Pool
Assuming Surface Loading Rate of Filter =	20	m <sup>3</sup> /m <sup>2</sup> /hr	
Filter Area Required =	1979/6/20		
=	16.50	m <sup>2</sup>	

Assumed Backwash Duration =	3.00	min
Assumed Backwash Flow Rate =	30.00	m <sup>3</sup> /m <sup>2</sup> /hr
Backwash Volume =	25.00	m <sup>3</sup>

Note:

1 no. of filter is assumed

Reference:

Cap 132CA Swimming Pools Regulation

General Specifications for Swimming Pool Water Treatment Installation (ArchSD, 2012)

## **Annex 3**

### **Estimated Sewage Flow Discharge from other planned development areas to Upgraded Chung Mun Road Sewage Pumping Station**

**Section 12A Planning Application for Proposed Amendments to the Tung Chung Valley Outline Zoning Plan to Rezone “Residential (Group C)2” Zone to “Residential (Group B)” Zone in Support of Private Residential Development at Various Lots in D.D. 1 TC and Adjoining Government Land, Tung Chung.**

**Sewerage Catchment**

no.	ref	ADWF (m <sup>3</sup> /day)
1	Area 33	1032.00
2	Area 36A	185.00
3	Area 38A	38.00
4	Area 38B	230.00
5	Area 38C	184.00
6	MTR TCW	147.00
7	Sha Tsui Tau	13.00
Total		1829.00

Note 1: Sewage Flow Estimation adopted from Overall Schematic of Proposed Sewerage Flow for TCW Development from CEDD.

# Annex 4

## Estimated Sewage Flow Discharge to Tung Chung Valley East Sewage Pumping Station



**Section 12A Planning Application for Proposed Amendments to the Tung Chung Valley Outline Zoning Plan to Rezone “Residential (Group C)2” Zone to “Residential (Group B)” Zone in Support of Private Residential Development at Various Lots**

**Sewerage Catchment**

no.	ref	ADWF (m <sup>3</sup> /day)	Downstream Pumping Station	Pump Rate (m <sup>3</sup> /s)
1	Area 67	64	TCV-W SPS	0.0255
2	Area 68A/B	154		
3	Area 73	36		
4	Area 74	27		
5	Area 75	209		
6	Area 61A	299	TCV-N SPS	0.0231
7	Area 72	173		
8	Area 42	4073	TCV-E SPS	0.385
9	Area 46	1047		
10	Area 66A	259		
11	Area 71A	756		
12	Area 71B	115		
13	Area 76	197		
14	Area 77	186		
15	River Park	100		
16	Upgraded CMRSPS	3541		
Total		11236		

Note 1: Sewage Flow Estimation adopted from Overall Schematic of Proposed Sewerage Flow for TCW Development from CEDD.

# Annex 5

## Hydraulic Checking of Gravity Sewers

Annex 5

<div><div>AECOM</div><div>Asia Co. Ltd.</div></div>		Section 12A Planning Application for Proposed Amendments to the Tung Chung Valley Outline Zoning Plan to Rezone “Residential (Group C)2” Zone to “Residential (Group B)” Zone in Support of Private Residential Development at Various Lots in D.D. 1 TC and Adjoining Government Land, Tung Chung, Lantau Island																				Project No.			
		Proposed Sewer																				Date	10/30/2024		
																						By	0		
Manhole		Ground		Pipe																					
U/S	D/S	Cover Level		Size	No. of	Invert Level		Length	Grad	Material	k <sub>s</sub>	Velocity	Time of	Capacity	Direct	Flow from	Total Average	Contributing	Peaking	Catchment	Upstream	Total Peak	Percentage	Factor of	
		U/S	D/S		Pipes	U/S	D/S								Discharge	Upstream	Flow	Population	Factor	Inflow Factor	Pump Rate	Flow	Capacity	Safety	
		mPD	mPD	mm		mPD	mPD	m	1 in		mm	m/s	min	m³/s	m³/s	m³/day	m³/day		Incl. Storm			m³/s	%		
															ADWF	ADWF	ADWF					PWWF			
FTMH-1	FMH-H05	8.60	8.60	355	1	2.55	2.21	34.0	100.0	PE100	0.300	1.71	0.33	0.1206	1711.50	0.00	1711.50	6339.00	4.0	1.00	0.00	0.0792	65.70%	1.52	Sewage Flow Estimation adopted from Overall Schematic of Proposed Sewerage Flow for TCW Development from CEDD
FMH-H05	FMH-I01c	8.60	6.11	560	2	2.21	1.80	31.0	75.6	PE100	0.300	2.70	0.19	1.0621	1829.00	1711.50	3540.50	13113.00	3.0	1.00	0.00	0.1229	11.57%	8.64	
FMH-I01c	FMH-I01b	6.11	6.30	560	1	1.80	1.71	30.0	333.3	PE100	0.300	1.28	0.39	0.2505	0.00	3540.50	3540.50	13113.00	3.0	1.00	0.00	0.1229	49.08%	2.04	
FMH-I01b	FMH-I01a	6.30	7.99	560	2	1.71	1.67	21.0	525.0	PE100	0.300	1.01	0.35	0.3974	0.00	3540.50	3540.50	13113.00	3.0	1.00	0.00	0.1229	30.94%	3.23	
FMH-I01a	FMH-I01	7.99	8.25	560	1	1.67	-0.06	55.0	31.8	PE100	0.300	4.18	0.22	0.8216	0.00	3540.50	3540.50	13113.00	3.0	1.00	0.00	0.1229	14.96%	6.68	
FMH-I01	Upgraded CMRSPS	8.25	8.25	560	1	-0.06	-0.07	2.0	300.0	PE100	0.300	1.35	0.02	0.2643	0.00	3540.50	3540.50	13113.00	3.0	1.00	0.00	0.1229	46.52%	2.15	
FMH-F01	FMH-F02	11.30	11.30	800	1	5.18	5.14	17.9	446.3	PE100	0.300	1.33	0.22	0.4745	6474.00	0.00	6474.00	23978.00	3.0	1.00	0.13	0.3583	75.51%	1.32	Including upgraded capacity of upgraded CMRSPS (0.108m³/s) and TCV-W SPS (0.0255m³/s)
FMH-F02	FMH-F03	11.30	11.45	800	1	5.14	5.04	45.9	458.8	PE100	0.300	1.31	0.58	0.4679	0.00	6474.00	6474.00	23978.00	3.0	1.00	0.13	0.3583	76.58%	1.31	
FMH-F03	FMH-E06	11.45	11.30	800	1	5.04	5.01	12.8	427.3	PE100	0.300	1.36	0.16	0.4851	259.00	6474.00	6733.00	24937.00	3.0	1.00	0.13	0.3673	75.72%	1.32	
FMH-E06	TCV-E SPS	11.30	11.30	900	2	5.18	5.17	3.7	500.0	PE100	0.300	1.42	0.04	1.5153	0.00	6733.00	6733.00	24937.00	3.0	1.00	0.16	0.3904	25.76%	3.88	Including upgraded capacity of upgraded CMRSPS (0.108m³/s), TCV-W SPS (0.0255m³/s) and TCV-N SPS (0.0231m³/s)
Notes: 1. The invert level, length and gradient of public sewer between FMH-H05 and the upgraded CMRSPS is based on TCW development design drawings. They shall be verified on site. 2. The invert level, length and gradient of public sewer FMH-E06 and the TCV-E SPS shall be verified on site.																									

# Annex 6

## Capacity Checking of Upgraded Chung Mun Road Sewage Pumping Station

# Utilization of Upgraded Chung Mun Road Sewage Pumping Station

## Combinations of ADWF from Different Development

Site	ADWF
	(m <sup>3</sup> /d)
The Application Site (Towers T1, T2, T3, T4, T7 and associated commercial and clubhouse + kindergarten)	1712
Areas 33, 36A, 38A, 38B, 38C, MTR TCW and Sha Tsui Tau	1829
<b>Total</b>	<b>3541</b>

## Utilization of Upgraded Chung Mun Road Sewage Pumping Station

<b>Total ADWF to Upgraded CMRSPS</b>	=	<b>3541 m<sup>3</sup>/d</b>
Contributing Population	=	13113
Peaking Factor	=	2.5
Peak Flow	=	<b>0.102 m<sup>3</sup>/s</b>
<i><u>Design information of Upgraded CMRSPS from CEDD</u></i>		
Capacity of Upgraded CMRSPS	=	2,767 m <sup>3</sup> /d
Pump Rate of the Upgraded CMRSPS	=	0.096 m <sup>3</sup> /s
<i><u>Proposed upgrading works</u></i>		
Proposed upgraded pump rate of Upgraded CMRSPS	=	<b>0.108 m<sup>3</sup>/s</b>
Design ADWF after upgrading	=	<b>3732 m<sup>3</sup>/d</b>
<b>Utilisation after upgrading</b>	=	<b>94.9%</b>



## Velocity Checking of Twin OD315 Rising Main

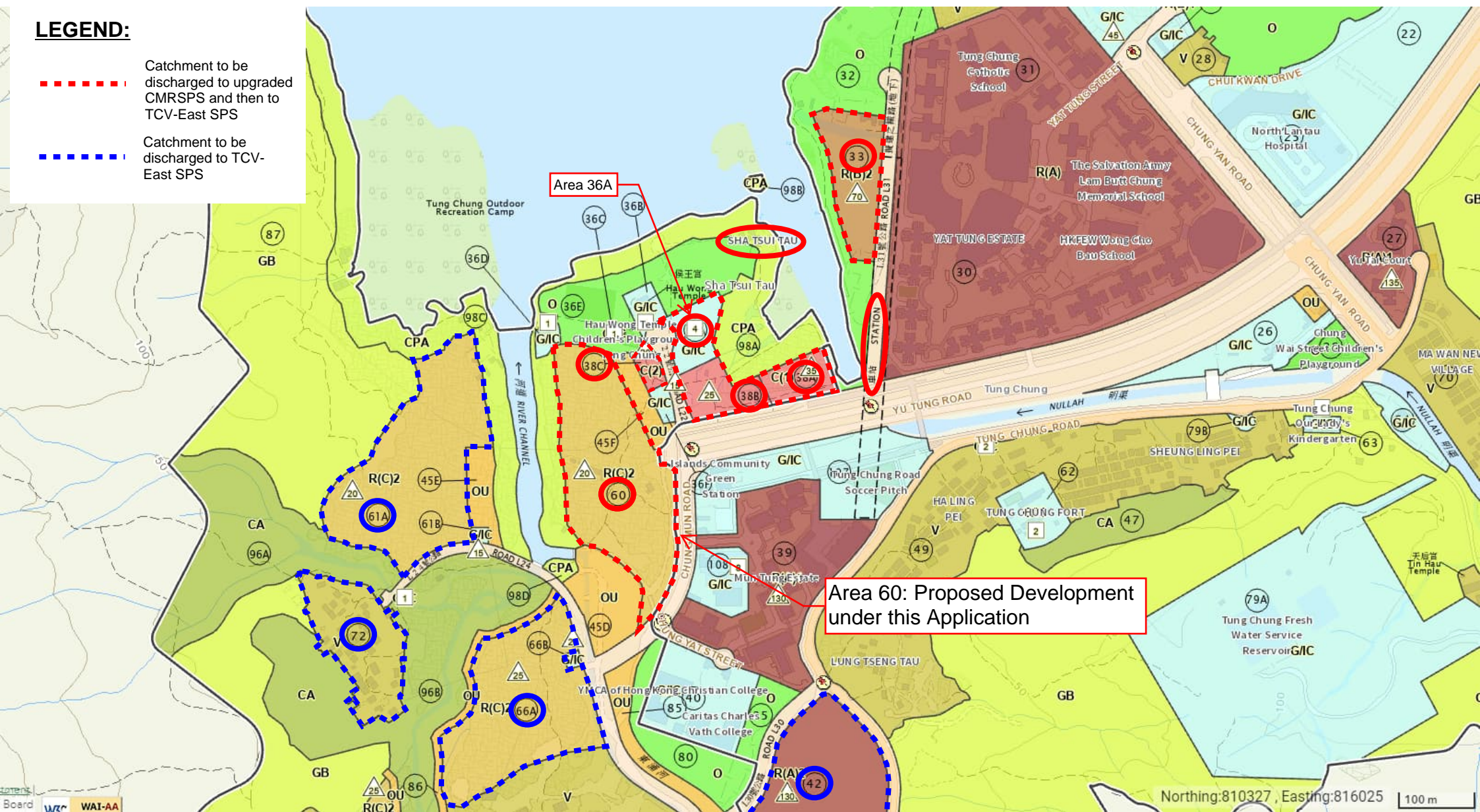
Inner diameter of OD315	=	250 mm
Flow area of twin OD315 rising main	=	0.0982 m <sup>2</sup>
Flow velocity	=	1.10 m/s
<b>Within desirable range of rising main stated in DSD's Sewerage Manual Part 2</b>		

# Annex 7

## Sewage Pumping Station Service Catchments

**LEGEND:**

-  Catchment to be discharged to upgraded CMRSPS and then to TCV-East SPS
-  Catchment to be discharged to TCV-East SPS



Note: Sewage Flow Catchment Area adopted from Overall Schematic of Proposed Sewerage Flow for TCW Development from CEDD







# Annex 8

## Sewerage Proposal of Fallback Option

## **Annex 8**

1. A split flow arrangement is proposed as a fallback option. A portion of the sewage generated by the development will utilize the remaining capacity of the Upgraded CMRSPS through the public plug-end sewer at FMH-H05. To avoid overloading of the Upgraded CMRSPS, the remaining portion of sewage generated from the site will be discharged to the TCV-East SPS via twin rising mains proposed by the development exiting the southern site boundary. The allocation of split flow is summarised in **Table A**. An indicative sewerage layout of this fallback option and preliminary hydraulic checking are presented in the same Annex. The design of the private pumping station and rising main will be further developed in the detailed design stage.

<b>Sewage Flow</b>	<b>ADWF (m<sup>3</sup>/day)</b>
Sewage discharged to Upgraded CMRSPS via. public manhole FMH-H05	937 <sup>(1)</sup>
Sewage to bypass Upgraded CMRSPS to be directly discharged to TCV-East via. rising main	775
<b>Total ADWF</b>	<b>1,712</b>

**Table A – Split Flow Summary of Fallback Option**

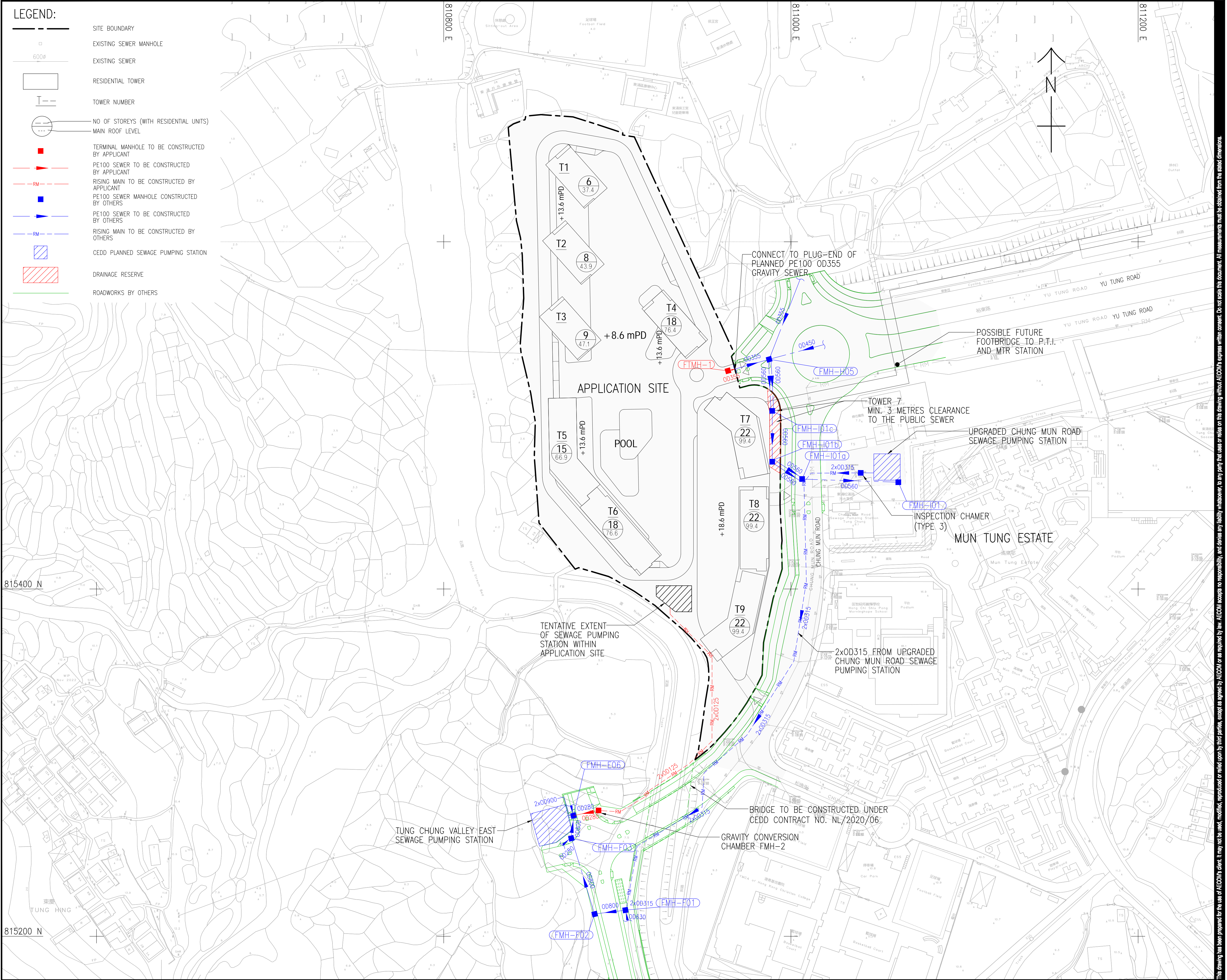
**Remarks:**

- (1) The planned design peak flow of the Upgraded CMRSPS according to the latest information provided by CEDD is 8,300 m<sup>3</sup>/day with a peaking factor of 3, corresponding to an ADWF of 2,767 m<sup>3</sup>/day. Subtracting the sewage generated from other planned catchments (1,829 m<sup>3</sup>/day), the remaining capacity of Upgraded CMRSPS that can be utilized by the Application Site is 937 m<sup>3</sup>/day.
2. The development will be responsible for the construction and maintenance of the sewage pumping station within the Application Site, the twin OD125 rising mains, the gravity conversion chamber FMH-2, and the downstream OD280 gravity sewer up to the connection to the public manhole FMH-E06.



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- LEGEND:
- SITE BOUNDARY
  - EXISTING SEWER MANHOLE
  - EXISTING SEWER
  - RESIDENTIAL TOWER
  - TOWER NUMBER
  - NO OF STOREYS (WITH RESIDENTIAL UNITS)
  - MAIN ROOF LEVEL
  - TERMINAL MANHOLE TO BE CONSTRUCTED BY APPLICANT
  - PE100 SEWER TO BE CONSTRUCTED BY APPLICANT
  - RISING MAIN TO BE CONSTRUCTED BY APPLICANT
  - PE100 SEWER MANHOLE CONSTRUCTED BY OTHERS
  - PE100 SEWER TO BE CONSTRUCTED BY OTHERS
  - RISING MAIN TO BE CONSTRUCTED BY OTHERS
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  - ROADWORKS BY OTHERS



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圖紙名稱  
SEWERAGE LAYOUT PLAN (FALLBACK OPTION)

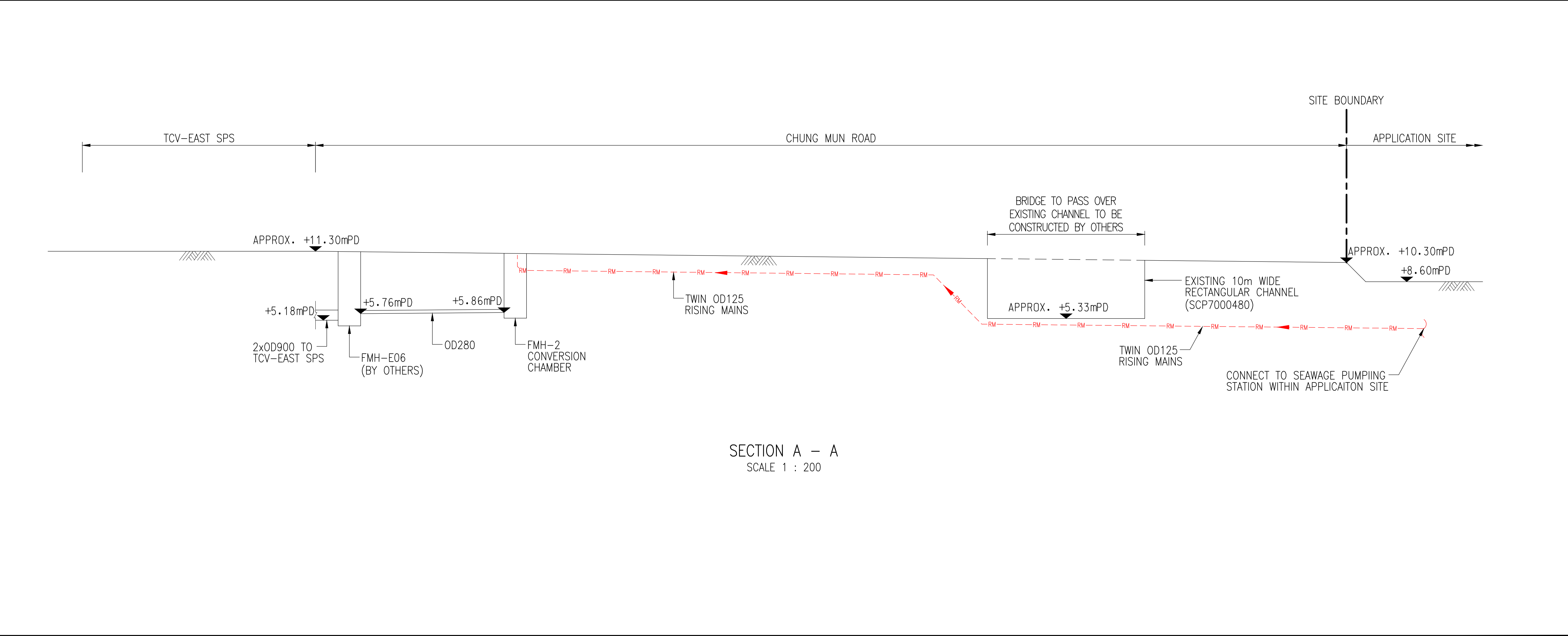
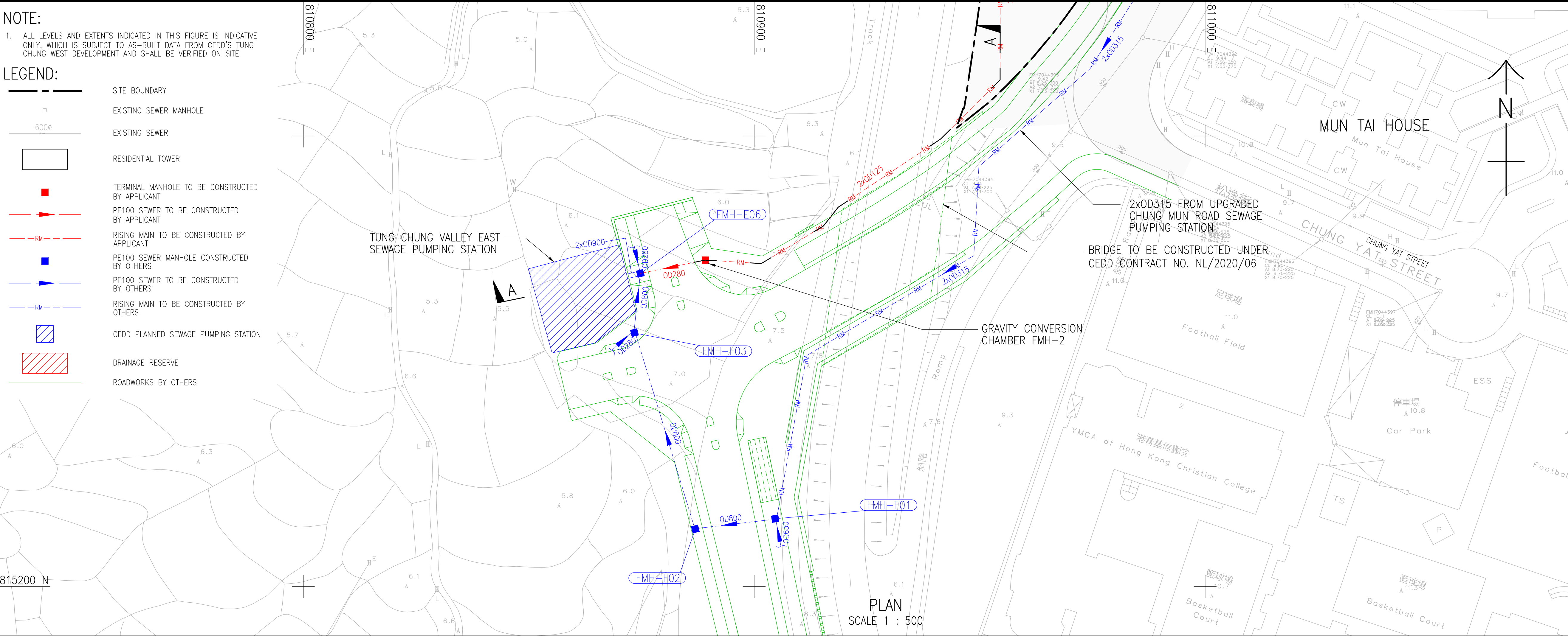
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圖紙名稱  
INDICATIVE SECTION FROM APPLICAITON SITE TO TCV-EAST SPS (FALLBACK OPTION)

**SHEET NUMBER**  
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Annex 8

<div><div>AECOM</div><div>Asia Co. Ltd.</div></div>		Section 12A Planning Application for Proposed Amendments to the Tung Chung Valley Outline Zoning Plan to Rezone “Residential (Group C)2” Zone to “Residential (Group B)” Zone in Support of Private Residential Development at Various Lots in D.D. 1 TC and Adjoining Government Land, Tung Chung, Lantau Island																				Project No.				
		Proposed Sewer																				Date	10/30/2024			
																						By	0			
Manhole		Ground		Pipe																						
U/S	D/S	Cover Level		Size	No. of	Invert Level		Length	Grad	Material	k <sub>s</sub>	Velocity	Time of	Capacity	Direct	Flow from	Total Average	Contributing	Peaking	Catchment	Upstream	Total Peak	Percentage	Factor of Safety	Discharge	
		U/S	D/S		Pipes	U/S	D/S								Upstream	Flow	Population	Factor	Inflow Factor	Pump Rate	Flow	Capacity			Remarks	
		mPD	mPD	mm		mPD	mPD	m	1 in		mm	m/s	min	m³/s	m³/s	m³/day	m³/day		Incl. Storm			m³/s	%			
															ADWF	ADWF	ADWF					PWWF				
FTMH-1	FMH-H05	8.60	8.60	355	1	2.55	2.21	34.0	100.0	PE100	0.300	1.71	0.33	0.1206	937.00	0.00	937.00	3470.00	5.0	1.00	0.00	0.0542	44.96%	2.22	Split flow from Application Site	
FMH-H05	FMH-I01c	8.60	6.11	560	2	2.21	1.80	31.0	75.6	PE100	0.300	2.70	0.19	1.0621	1829.00	937.00	2766.00	10244.00	3.0	1.00	0.00	0.0960	9.04%	11.06	Sewage Flow Estimation adopted from Overall Schematic of Proposed Sewerage Flow for TCW Development from CEDD	
FMH-I01c	FMH-I01b	6.11	6.30	560	1	1.80	1.71	30.0	333.3	PE100	0.300	1.28	0.39	0.2505	0.00	2766.00	2766.00	10244.00	3.0	1.00	0.00	0.0960	38.34%	2.61		
FMH-I01b	FMH-I01a	6.30	7.99	560	2	1.71	1.67	21.0	525.0	PE100	0.300	1.01	0.35	0.3974	0.00	2766.00	2766.00	10244.00	3.0	1.00	0.00	0.0960	24.17%	4.14		
FMH-I01a	FMH-I01	7.99	8.25	560	1	1.67	-0.06	55.0	31.8	PE100	0.300	4.18	0.22	0.8216	0.00	2766.00	2766.00	10244.00	3.0	1.00	0.00	0.0960	11.69%	8.55		
FMH-I01	Upgraded CMRSPS	8.25	8.25	560	1	-0.06	-0.07	2.0	300.0	PE100	0.300	1.35	0.02	0.2643	0.00	2766.00	2766.00	10244.00	3.0	1.00	0.00	0.0960	36.34%	2.75		
FMH-2	FMH-E06	11.30	11.30	280	1	5.86	5.76	14.3	150.0	PE100	0.300	1.24	0.19	0.0607	0.00	0.00	0.00	0.00	6.0	1.00	0.0269	0.0269	44.32%	2.26	Including private SPS (0.027m³/s)	
FMH-E06	TCV-E SPS	11.30	11.30	900	2	5.18	5.17	3.7	500.0	PE100	0.300	0.76	0.08	0.8100	6733.00	0.00	6733.00	24937.00	3.0	1.00	0.17	0.4054	50.04%	2.00	Including capacity of upgraded CMRSPS (0.0961m³/s), TCV-W SPS (0.0255m³/s) and TCV-N SPS (0.0231m³/s) and private SPS (0.027m³/s)	
Notes: 1. The invert level, length and gradient of public sewer between FMH-H05 and the upgraded CMRSPS is based on TCW development design drawings. They shall be verified on site. 2. The invert level, length and gradient of public sewer FMH-E06 and the TCV-E SPS shall be verified on site.																										

## Sizing of Rising Main

Total ADWF for rising main	=	775.0 m <sup>3</sup> /d
Contributing Population	=	2870
Peaking factor for pumping stations (for facility with new upstream sewerage)	=	3
Design peak flow	=	0.027 m <sup>3</sup> /s
Inner diameter of OD125 rising main	=	100 mm
Flow area of twin OD125 rising main	=	0.016 m <sup>2</sup>
Flow velocity	=	1.71 m/s

**Therefore, provide twin OD125 PE pipe.**

