

1. INTRODUCTION

In January 2014, it was decided by the client that only Phase 1 of public housing (PH) site will be developed, and Phase 2 & 3 of PH site and Yuen Long Industrial Estate Extension (YLIEE) would be shelved. Arup was commissioned to carry out the separate study for the “Phase 1 development only”. This paper is to present the findings of the preliminary operational air quality impact assessment for Phase 1 development.

2. Air Quality Objectives

The new AQOs has been adopted in this study. The new AQOs stipulate limits on concentrations for seven pollutants including sulphur dioxide (SO₂), Total Suspended Particulates (TSP), Respirable Suspended Particulates (RSP), Fine Suspended Particulates (FSP), Nitrogen Dioxide (NO₂), Carbon Monoxide (CO), Ozone (O₃) and Lead (Pb). **Table 2.1** below summarises the proposed new AQOs.

Table 2.1 Hong Kong New Air Quality Objectives

Pollutant	Limits on Concentration, µg/m ³ ^[1] (Number of Exceedance in brackets)				
	10-min	1-hr	8-hr	24-hr ^[2]	Annual ^[2]
Sulphur Dioxide	500 (3)			125 (3)	
Respirable Suspended Particulates (PM ₁₀) ^[3]				100 (9)	50 (0)
Fine Suspended Particulates (PM _{2.5}) ^[4]				75 (9)	35 (0)
Carbon Monoxide		30,000 (0)	10,000 (0)		
Nitrogen Dioxide		200 (18)			40 (0)
Ozone			160 (9)		
Lead					0.5 (0)

Notes:

[1] Measured at 298K and 101.325kPa.

[2] Arithmetic mean.

[3] Respirable suspended particulates means suspended particulates in air with a nominal aerodynamic diameter of 10 micrometres or smaller.

[4] Fine suspended particulates means suspended particulates in air with a nominal aerodynamic diameter of 2.5 micrometres or smaller.

3. Air Sensitive Receivers

The preliminary air quality assessment is based on the development layout of Phase 1 as presented in the previous TR-3. The representative existing and planned ASRs for operational air quality impact assessment are presented in TR-3 and those in relation to Phase 1 development are summarized in **Table 3.1** below and their locations are shown in **Figure 1**.

Table 3.1 Representative ASRs for operational air quality impact assessment

Location	Assessment Points	Landuse ^[1]	No. of Storey ^[2]
Fu Ting Garden	A001	R	3
Fuk Hing Garden	A002	R	3
Fuk Fai Garden	A003	R	3
Sai Tau Wai	A004	R	3
	A005	R	3
	A006	R	3
	A007	R	3
Yuk Yat Garden	A008	R	3
Temporary Structure near Fuk Hi Street	A009	R	3
Residential Premises near Kai Shan	A010	R	3
Temporary Structure near Kai Shan	A011	R	3
Residential Premises near Kai Shan	A012	R	3
Temporary Structure near Kai Shan	A013	R	3
Temporary Structure along Long Ping Road	A014	R	2
Temporary Structure along Long Ping Road	A015	R	1
Long Ping Estate	A016	R	35
Yeung Uk San Tsuen	A017	R	3
Long Ping Estate	A018	R	35
	A019	R	35
TWGH Lo Kon Ting Memorial College	A020	E	7
Shui Tin Tsuen	A021	R	3
Residential Premises along Long Ping Road	A022	R	3
Umah International Primary School	A023	E	1
Residential Premises along Long Ping Road	A024	R	3
Fung Chi Tsuen	A025	R	3
Temporary Structure near Wing Ning Tsuen	A026	R	3
Temporary Structure near Wing Ning Tsuen	A027	R	3
PH site (Block 10)	A901	R	31
PH site (Block 9)	A902	R	36
PH site (Block 8)	A903	R	36
PH site (Block 7)	A904	R	36
PH site (Block 6)	A905	R	31
PH site (School 3)	A906	E	8
	A907	E	8
PH site (Block 5)	A908	R	31
PH site (Block 3)	A909	R	36
PH site (Block 4)	A910	R	31
PH site (Block 2)	A911	R	36
PH site (Integrated social welfare building)	A912	G	5
	A913	G	5
PH site (Retail)	A801	C	2
	A802	C	2
	A803	C	2
	A804	C	2
	A805	C	2

Location	Assessment Points	Landuse ^[1]	No. of Storey ^[2]
	A806	C	2

Notes:

[1] R– Residential Premises; E – Educational Institutions; G – Government use; C – Commercial

[2] No. of domestic storeys includes lobby level.

4. ASSESSMENT ASSUMPTIONS AND METHODOLOGY

The air pollution impacts of future road traffic shall be calculated based on the highest emission strength from road within the next 15 years upon commissioning of the proposed development. In previous TR-3, it was found that the first population intake year of the PH site (i.e. 2024 based on the previous programme at that time) is the worst assessment year. Thus, for purpose of this preliminary operational air quality assessment, it is also assumed that the worst emission scenario will occur in the first population year of Phase 1, i.e. Year 2025 as advised by HD.

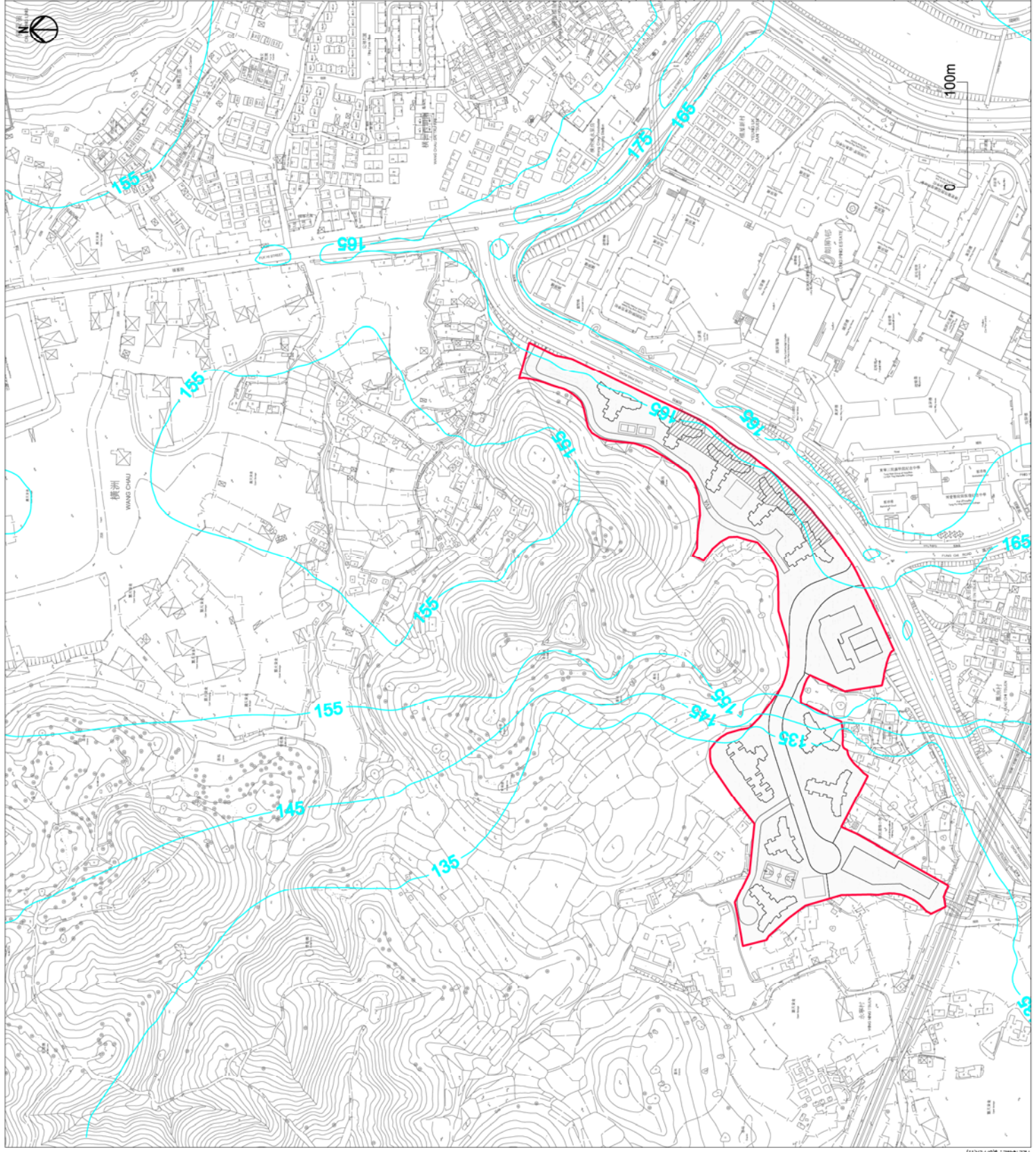
The key representative pollutant parameters for operational air quality assessments are NO₂, PM₁₀, PM_{2.5} and SO₂. All Project induced contribution and pollutant-emitting activities in the immediate neighbourhood are considered as near-field source impacts and are predicted using local-scale models (i.e. CALINE4 and ISCST3). These sources include vehicular emission from open roads including proposed roads and all existing roads, as well as chimney emission from existing YLIE. Other far-field pollution source impacts not accounted for by the above, i.e. background concentration, are predicted using PATH. The cumulative operational air quality is then a combination of the emission impacts contributed from the near-field and far-field sources.

The latest EMFAC-HK v2.6 recently launched by EPD was adopted to estimate the vehicular emission and hourly emission rates for each vehicle class for NO_x, PM₁₀ and PM_{2.5}. Whereas, SO₂ emission factors are calculated based on vehicle fuel efficiency and fuel Sulphur (S) content. The detailed emission inventory and assessment methodology have been presented in TR-3. The traffic forecast for Year 2025 for this study was prepared by Arup traffic engineer, which has taken into account induced traffic from other concurrent projects including housing sites in Yuen Long South and Hung Shui Kiu New Development Area etc. Hence the associated vehicular emission has also been addressed in the cumulative air quality impact assessment.

5. ASSESSMENT RESULTS AND RECOMMENDATIONS

Figures 2 to 9 show the contours of predicted concentrations beyond the allowance limit for different pollutants at 1.5m above ground for Year 2025 (i.e. the 19th largest concentration for 1-hour NO₂; the 10th largest concentration for 24-hour PM₁₀; the 10th largest concentration for 24-hour PM_{2.5}; the 4th largest concentration for 10-minute SO₂; and the 4th largest concentration for 24-hour SO₂). The contour plots indicate that the cumulative air quality at all ASRs including the existing receivers, and the planned residential blocks, school and ISWB in Phase 1 are able to comply with the new AQO for all pollutants, except the annual NO₂ at the facade of shops at street level (1.5m) close to Long Ping Road. In order to ensure the compliance of the new AQO, it is recommended that the fresh air intake for the street shops shall be positioned at least 5m above ground, and the positive pressure system

and air curtain at the doors of shops close to Long Ping Road shall be provided. With such proper design, no adverse operational air quality impacts are anticipated. The contour plot for annual NO₂ at 5m above ground is given in **Figure 10**.



Legend

Public Housing Site (PH Site)

Remark

1 Hour NO₂ New AQO : 200 µg/m³
(18 allowed exceedance)

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A	FIRST ISSUE	KY	03/14

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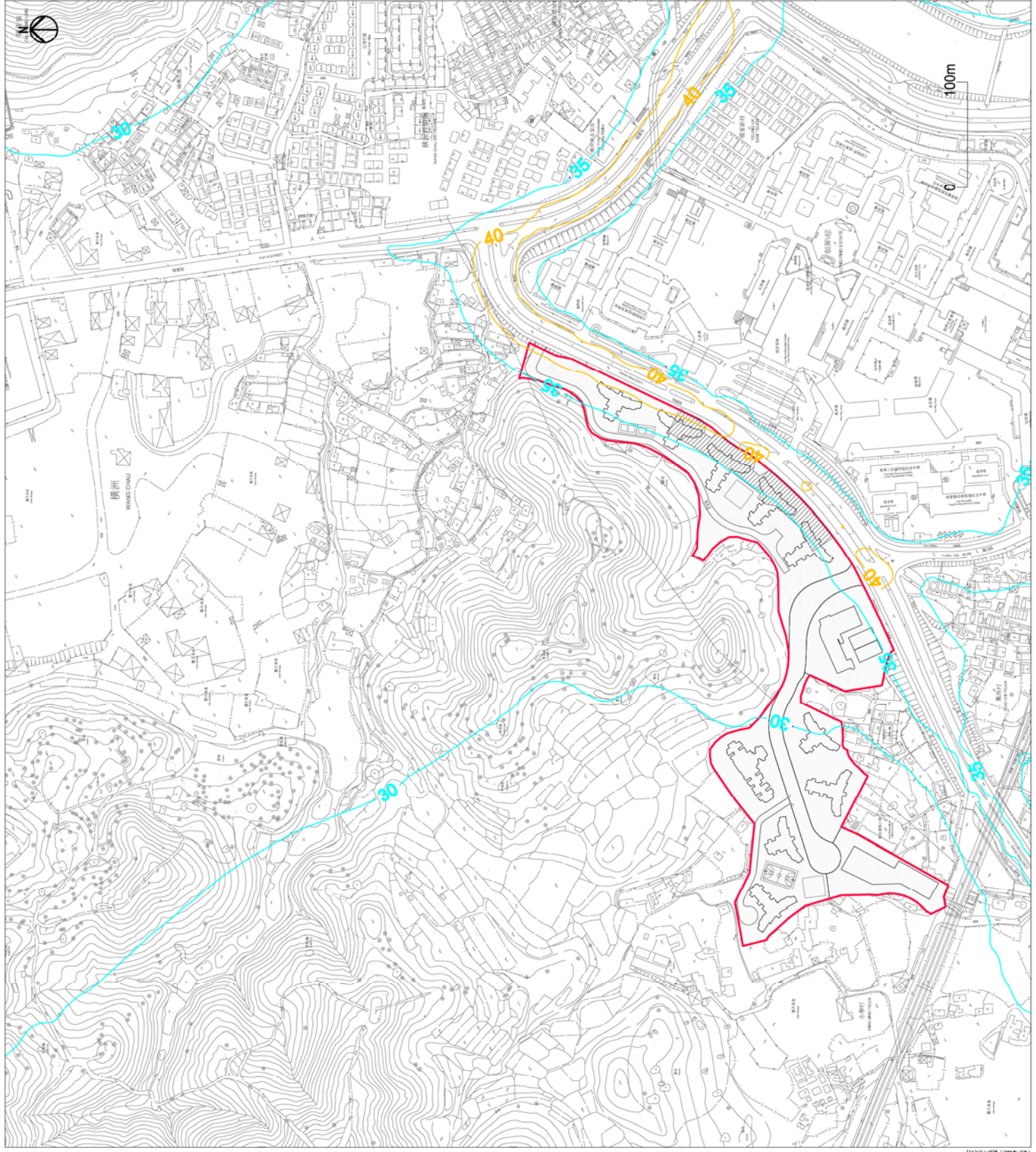
Project title
Agreement No. CB201/20293
Planning and Engineering Study for the Public Housing Site
and Yuen Long Industrial Estate Extension at Wang Chau

Drawing title
Contours of Cumulative 1-Hour NO₂ Concentration
at 1.5m above Ground in Year 2025
(19th Highest Concentration Level)

Figure 2	Rev.
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Public Housing Site (PH Site)

Remark

Annual NO₂ New AQP : 40 µg/m³

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Drawing title
 Contours of Cumulative Annual NO₂ Concentration
 at 1.5m above Ground in Year 2025

Drawing no.	Rev.
Figure 3	A

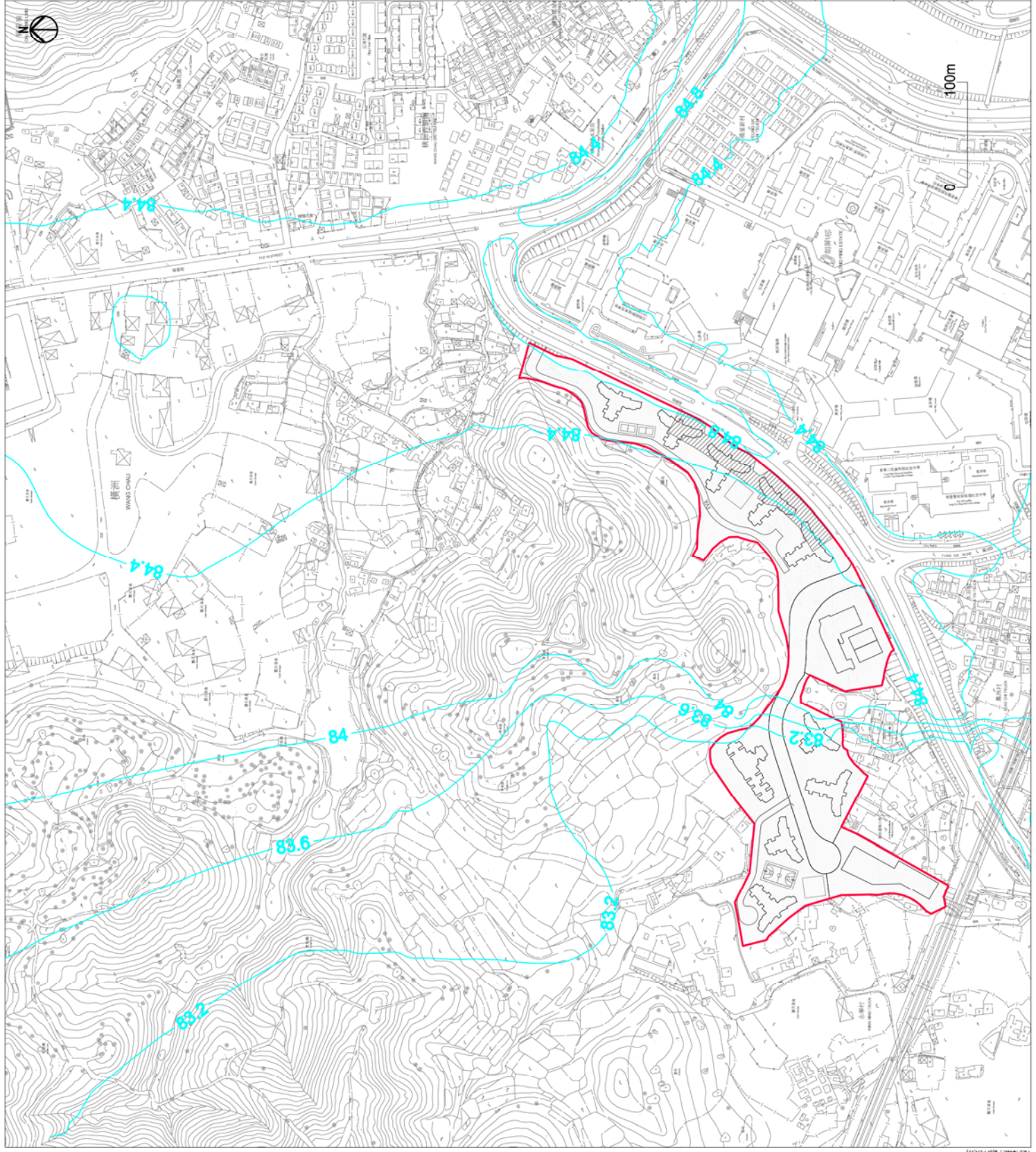
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 Public Housing Site (PH Site)

Remark
 24hr PM₁₀ New AQO : 100 µg/m³
 (9 allowed exceedance)

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 Contours of Cumulative 24-Hour PM₁₀ Concentration
 at 1.5m above Ground in Year 2025
 (10th Highest Concentration Level)

Drawing no.	Rev.
Figure 4	A

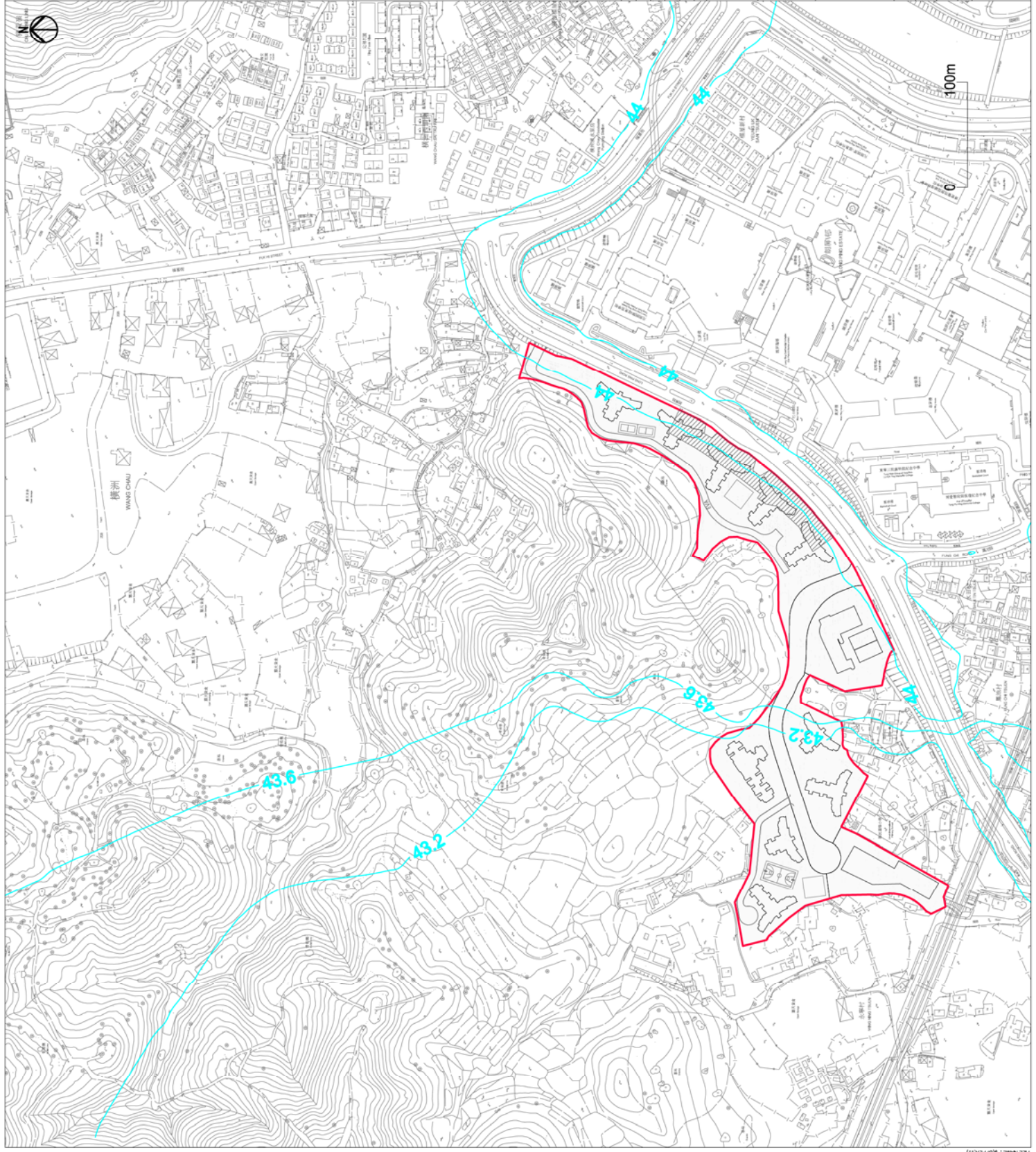
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Public Housing Site (PH Site)

Remark

Annual PM₁₀ New AQO : 50 µg/m³

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 Contours of Cumulative Annual PM₁₀ Concentration
 at 1.5m above Ground in Year 2025

Drawing no.	Rev.
Figure 5	A

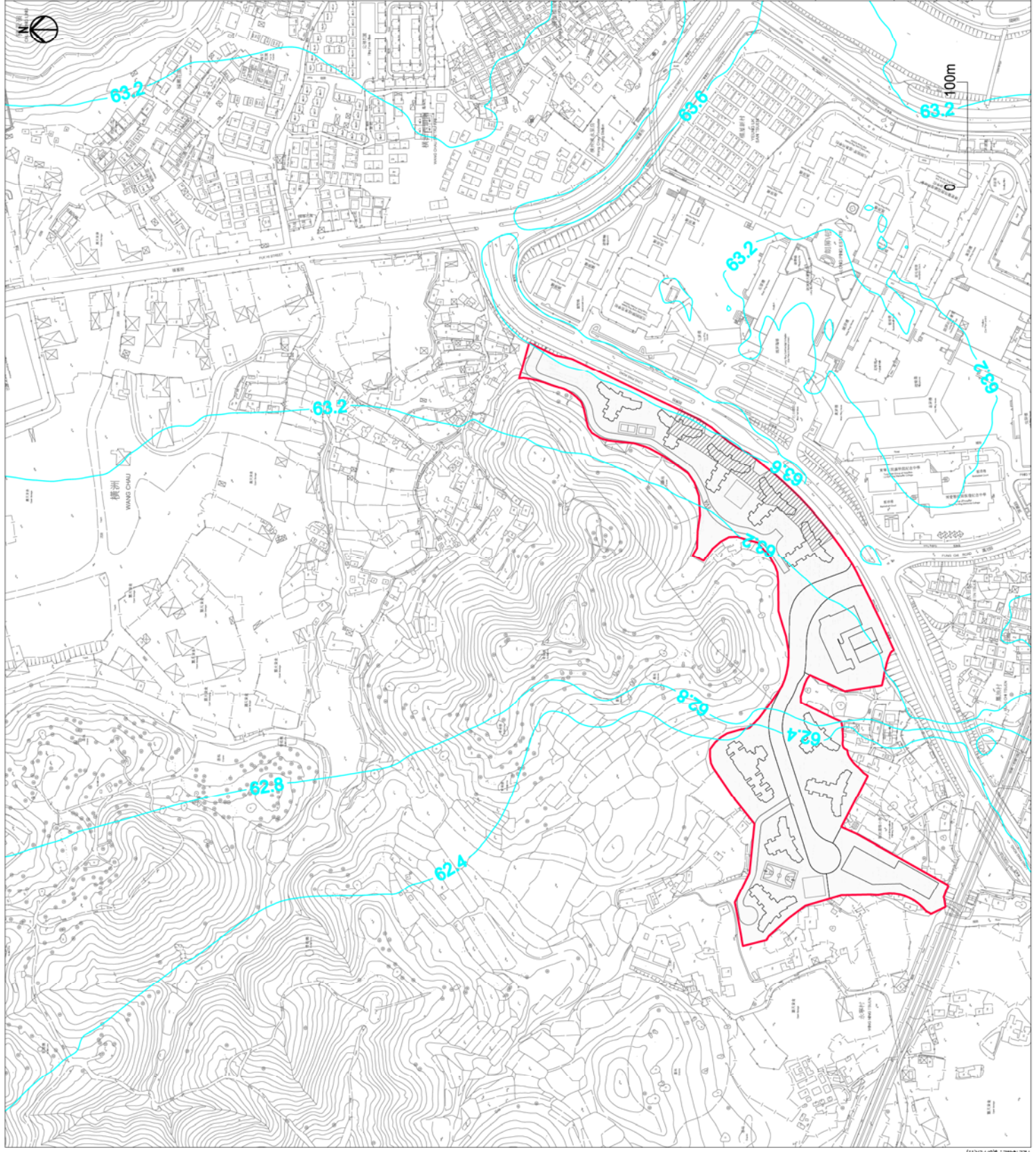
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 Public Housing Site (PH Site)

Remark
 24hr PM_{2.5} New AQO : 75 µg/m³
 (9 allowed exceedance)

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Drawing title
 Contours of Cumulative 24-Hour PM_{2.5} Concentration
 at 1.5m above Ground in Year 2025
 (10th Highest Concentration Level)

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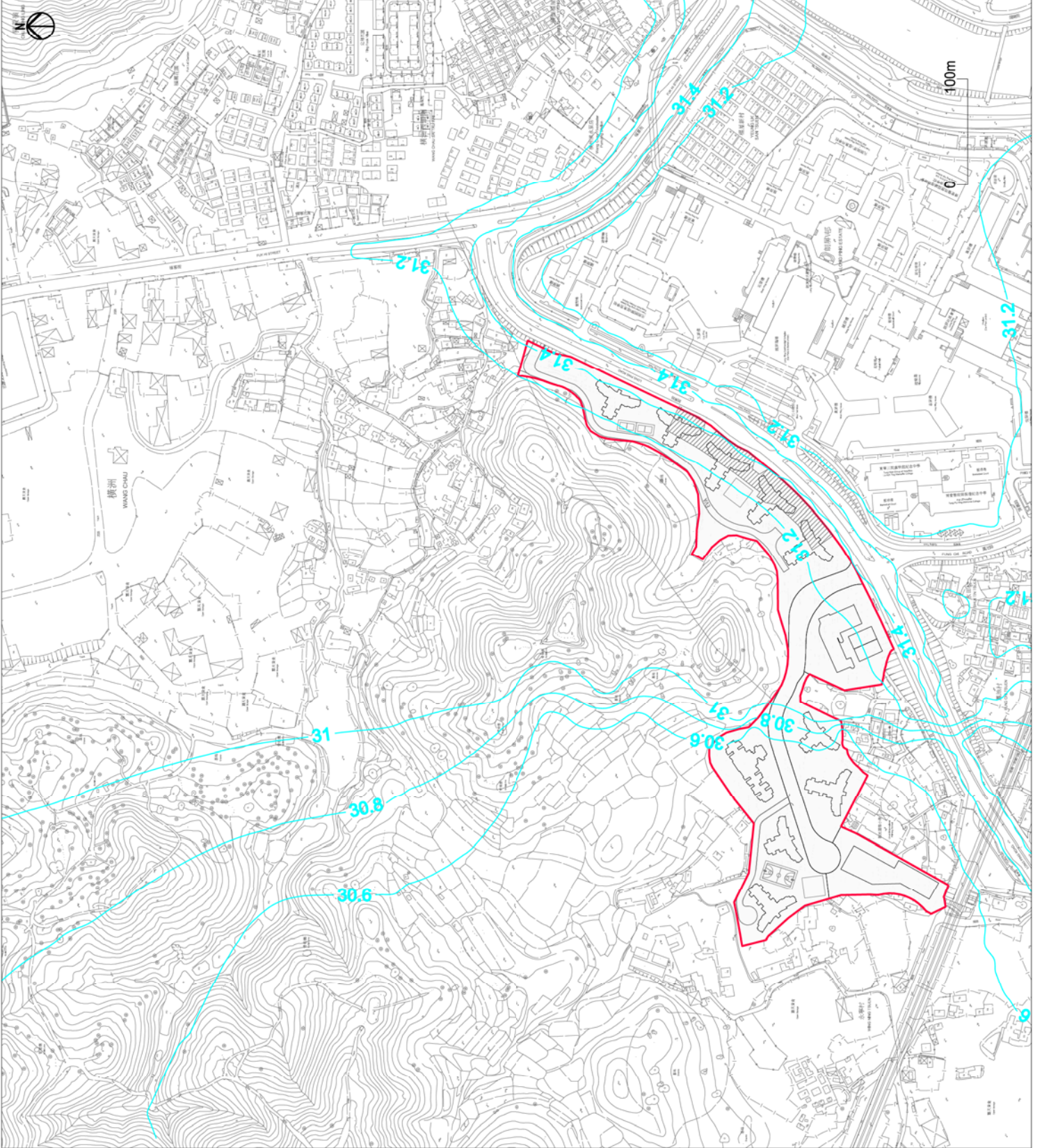
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Public Housing Site (PH Site)

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Annual PM_{2.5} New AQO : 35 µg/m³



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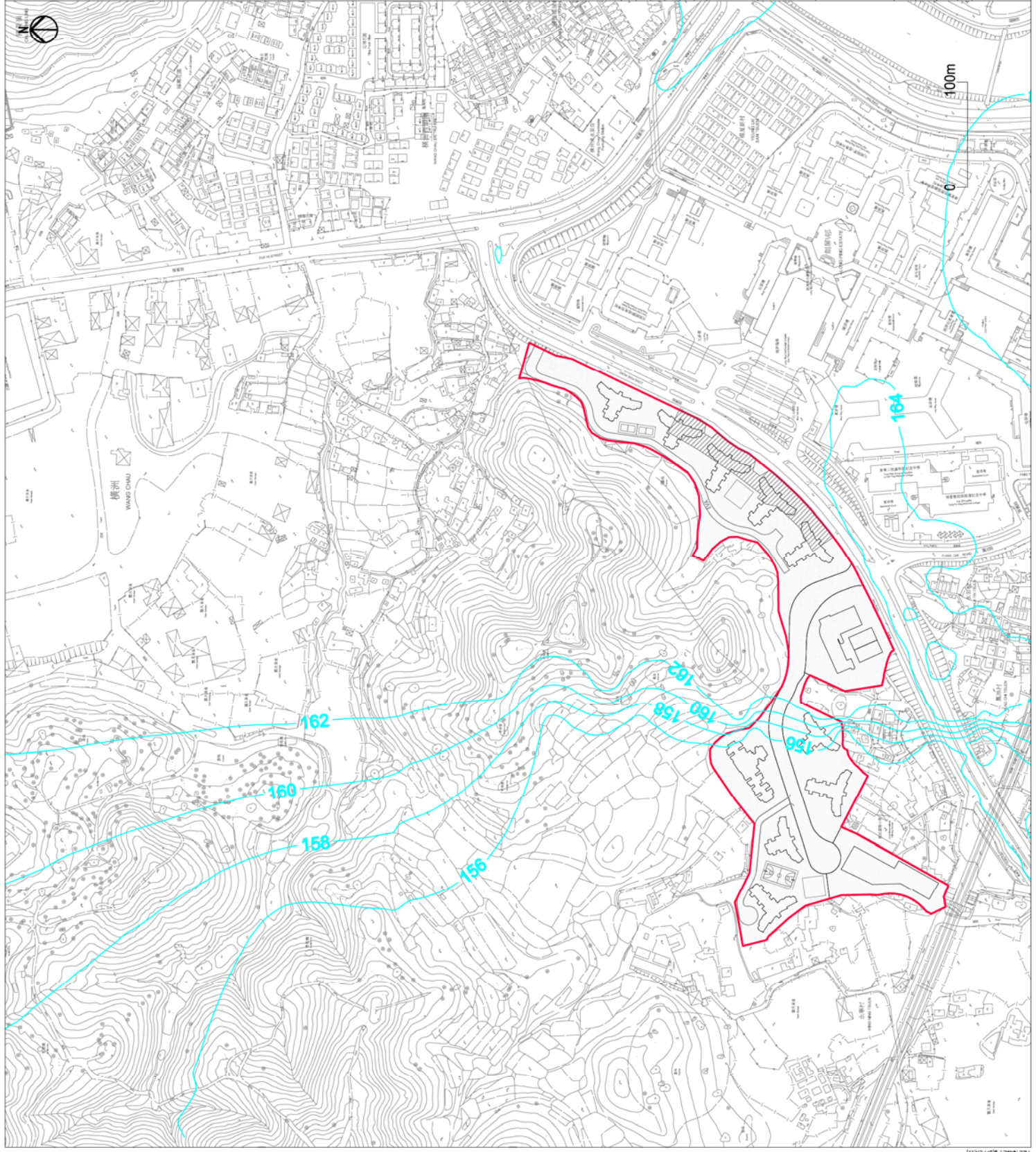
Drawing title

Contours of Cumulative Annual PM_{2.5} Concentration
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 Public Housing Site (PH Site)

Remark
 10min SO₂: New AQO : 500 µg/m³
 (3 allowed exceedance)

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	Consultant		

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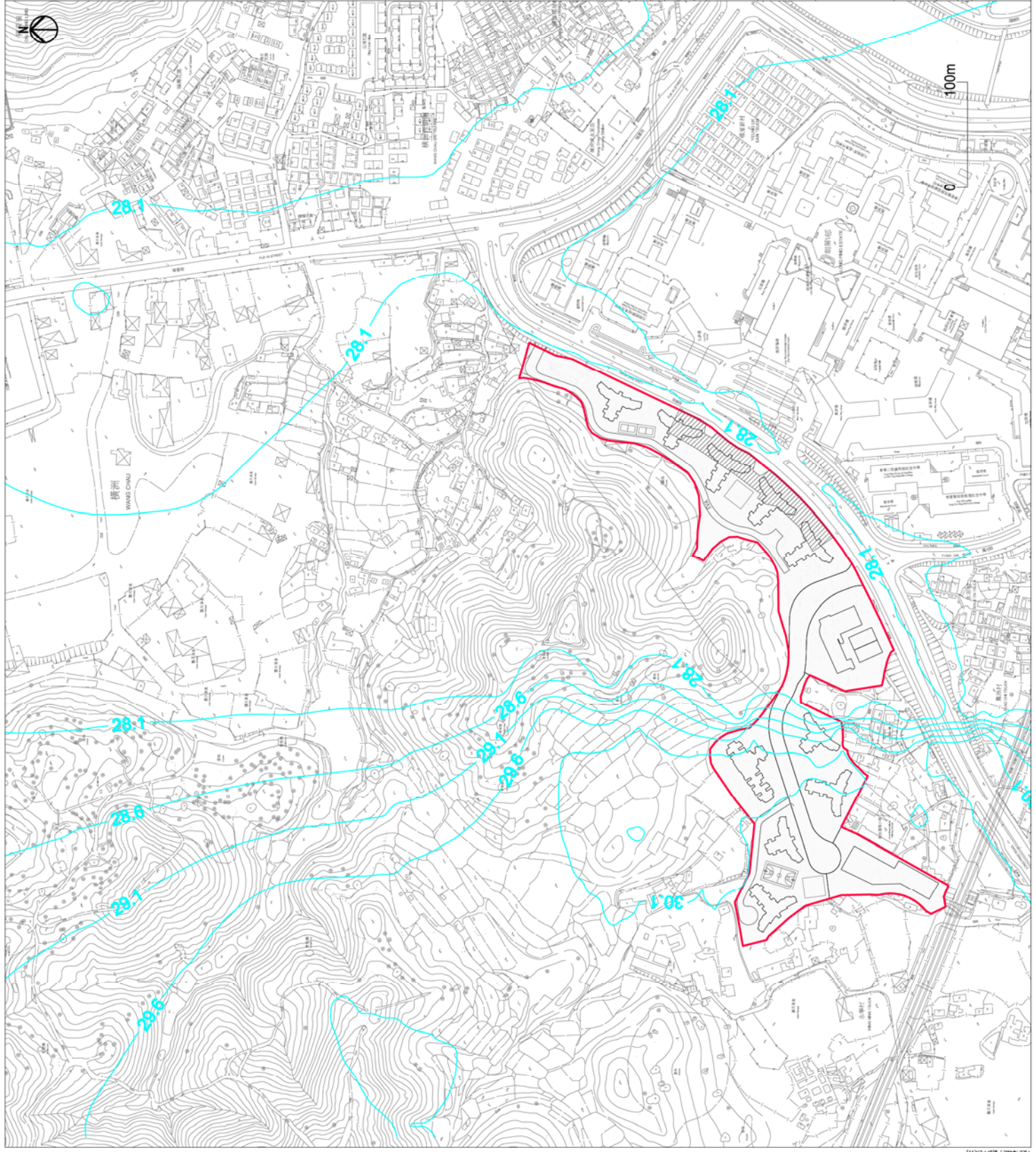
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Drawing title
 Contours of Cumulative 10-Min SO₂ Concentration
 at 1.5m above Ground in Year 2025
 (4th Highest Concentration Level)

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 Public Housing Site (PH Site)

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 24hr SO₂ New AQO : 125 µg/m³
 (3 allowed exceedance)

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 Contours of Cumulative 24-Hour SO₂ Concentration
 at 1.5m above Ground in Year 2025
 (4th Highest Concentration Level)

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Figure 5	A

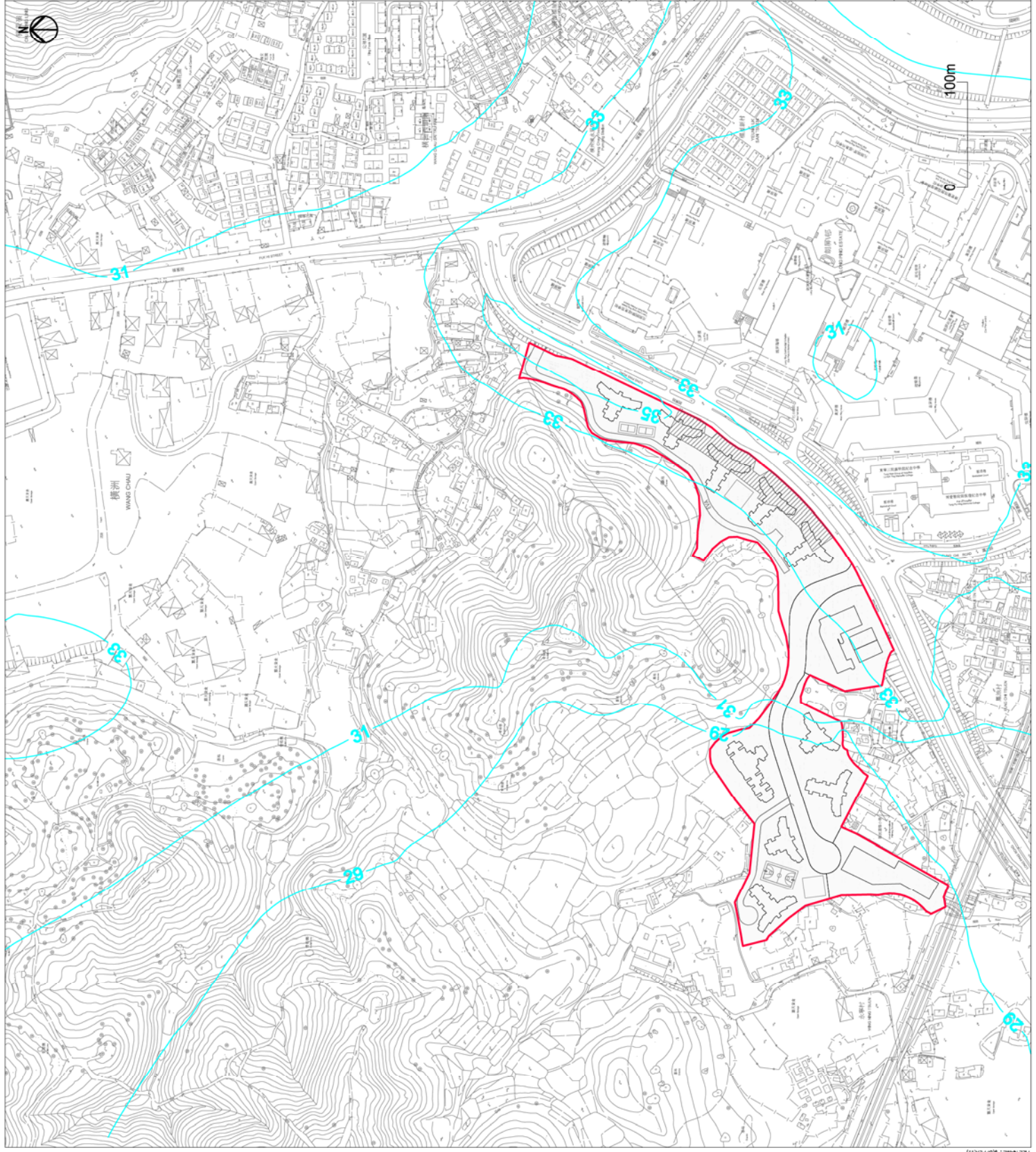
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Public Housing Site (PH Site)

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Annual NO₂ New AQO : 40 µg/m³

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Drawing title
 Contours of Cumulative Annual NO₂ Concentration
 at 5m above Ground in Year 2025

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Figure 10	A

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