

Appendix 3.7 - Calculation of Surface Roughness Height for CALINE4

The surface roughness height for each PATH grid was estimated by considering the percentage of areas of different land use types within the PATH grid:

$$\text{Weighted Surface Roughness} = \sum (\text{Surface Roughness}_{\text{landuse}} \times \text{Percentage of Area}_{\text{landuse}})$$

Study Area (1km x 1km PATH Grid from the Site)

Landuse	Surface Roughness	Percentage of Area in PATH Grid			
	(cm)	35,52	35,53	36,52	36,53
Urban ^(a)	370	32.25%	77.83%	67.51%	80.27%
New Development Area ^(a)	100	11.74%	0.09%	4.35%	2.83%
Rural ^(b)	50	56.01%	19.81%	28.13%	16.90%
Open Water ^(c)	0.1	0.00%	2.28%	0.00%	0.00%
Area-Weighted Surface Roughness (cm)		159	298	268	308

Wind directional variability was calculated based on the following formula according to the stability class with reference to Irwin, J.S., 1980. (d)

$$S_o = S \times \left(\frac{z_0}{15\text{cm}}\right)^{0.2}$$

Where

z_0 = surface roughness length (in cm) of the PATH grid;

S_o = standard deviation of the horizontal wind direction Fluctuations (in degrees); and

S = standard deviation of the horizontal wind direction fluctuations (in degrees) for an aerodynamic surface roughness length of 15cm with reference to Irwin, J.S., 1980. S is a function of Pasquill stability class.

Summary of The Standard Deviation of the Horizontal Wind Direction Fluctuations under Different Pasquill Stability Categories for Each PATH Grids

PATH Grid		35,52	35,53	36,52	36,53
Pasquill Stability Class	S	So			
A	22.5	36.1	40.9	40.1	41.2
B	22.5	36.1	40.9	40.1	41.2
C	17.5	28.1	31.8	31.2	32.0
D	12.5	20.0	22.7	22.3	22.9
E	7.5	12.0	13.6	13.4	13.7
F	3.8	6.1	6.9	6.8	7.0

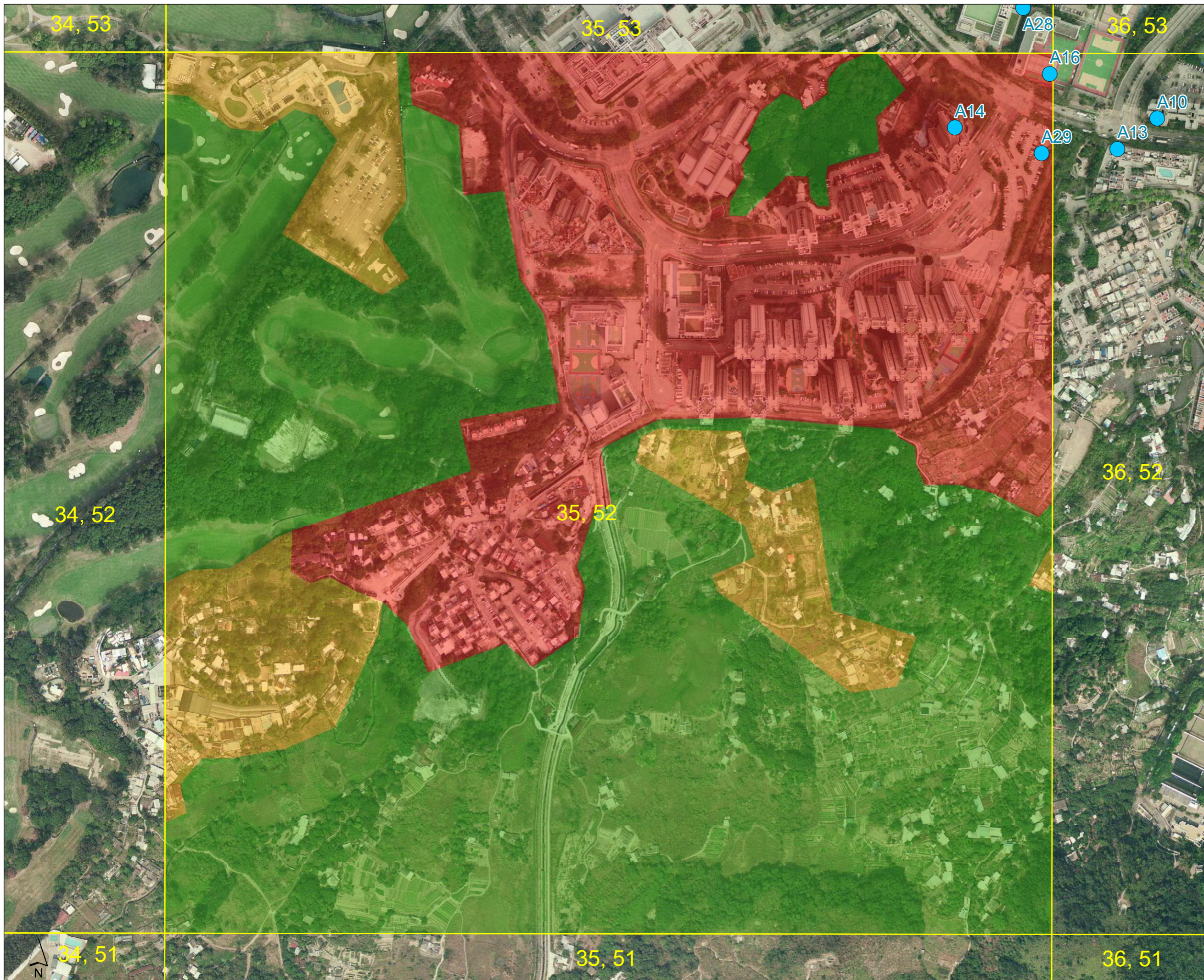
Notes:

(a) Surface roughness height for Urban and New Development Area was made reference to Section 2.2 of "Guidelines on Choice of Models and Model Parameters", (EPD, 2021).

(b) Surface roughness height for Rural was made reference to that adopted in the approved EIA Report for "Housing Sites in Yuen Long South" (AEIAR-215/2017) (see Section 4.5.3.16).

(c) Surface roughness height for Open Water was made reference to that adopted in the approved EIA Report "Tuen Mun - Chek Lap Kok Link" (AEIAR-146/2009) (see Appendix B8), and "Air Pollution Meteorology and Dispersion", (Arya S.P., 1999).

(d) Referenced from "Dispersion Estimate Suggestion #8: Estimation of Pasquill Stability Categories". U.S. Environmental Protection Agency, Research Triangle Park, NC. (Docket Reference No.II-B-10), Irwin, J.S., 1980.



Legend

- Air Sensitive Receiver
- Path Grid
- Landuse
- Urban
- New development area
- Rural

Rev	Description	By	Date

Consultant



Project Title
 AGREEMENT NO. CE 1/2021(HY)
 IMPROVEMENT TO SO KWUN PO INTERCHANGE -
 INVESTIGATION, DESIGN AND CONSTRUCTION

Title
 Landuse for PATH Grid 35, 52 (CALINE4)

Drawing No. Appendix 3.7	Rev.
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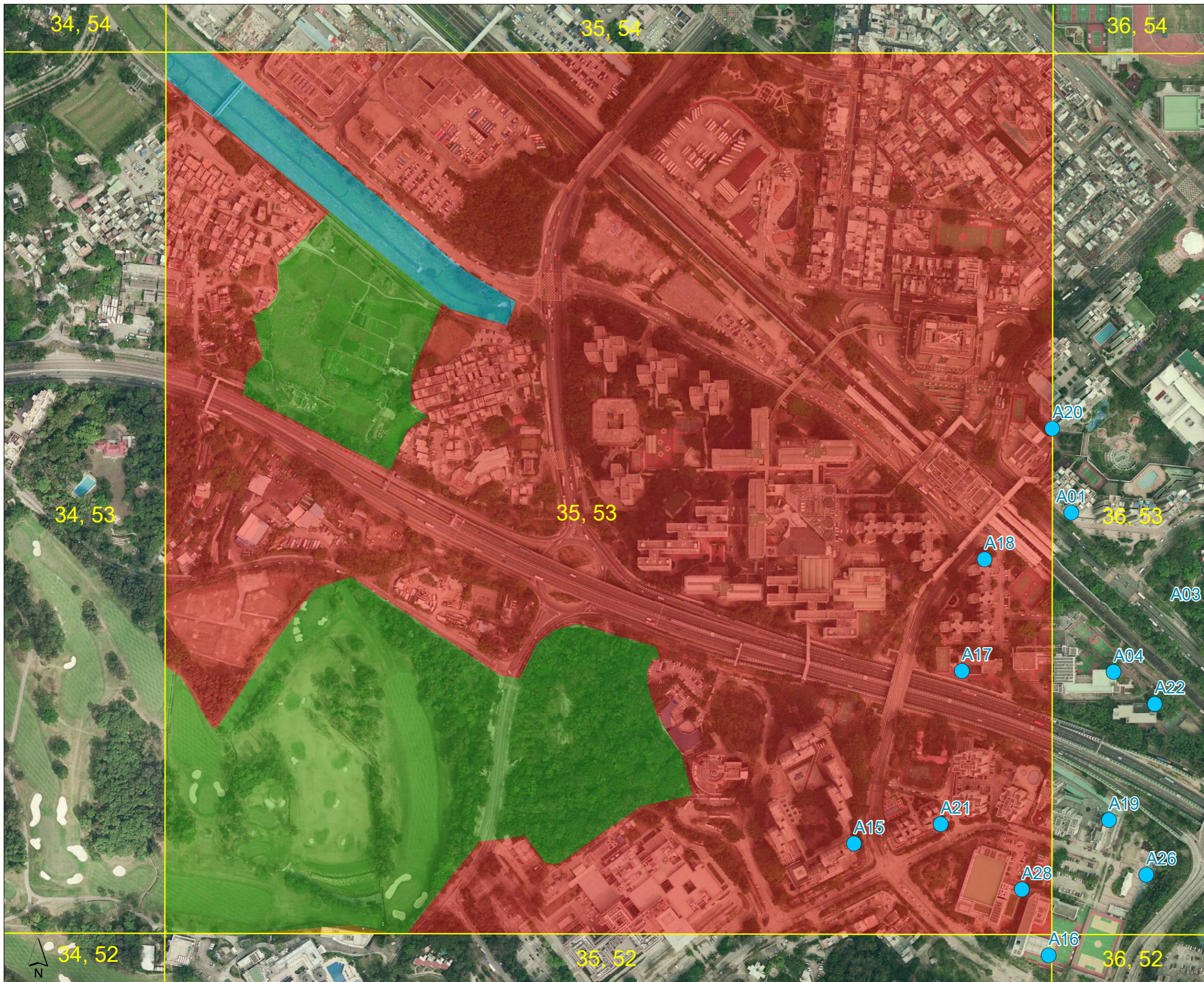
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Legend

- Air Sensitive Receiver
- Path Grid
- Landuse
- Urban
- Rural
- Water

Rev	Description	By	Date

Consultant



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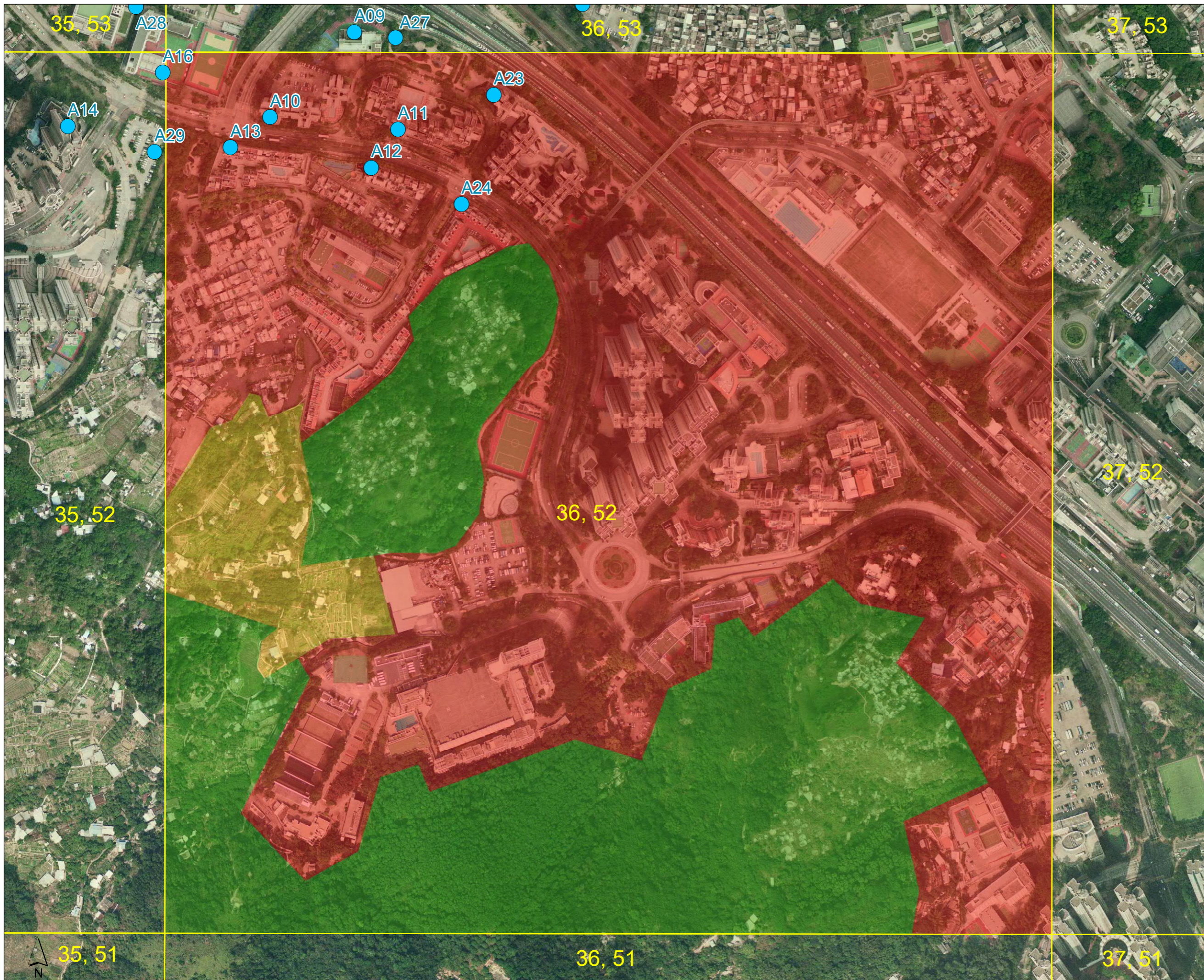
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Legend

- Air Sensitive Receiver
- Path Grid
- Landuse
- Urban
- New development area
- Rural

Rev	Description	By	Date

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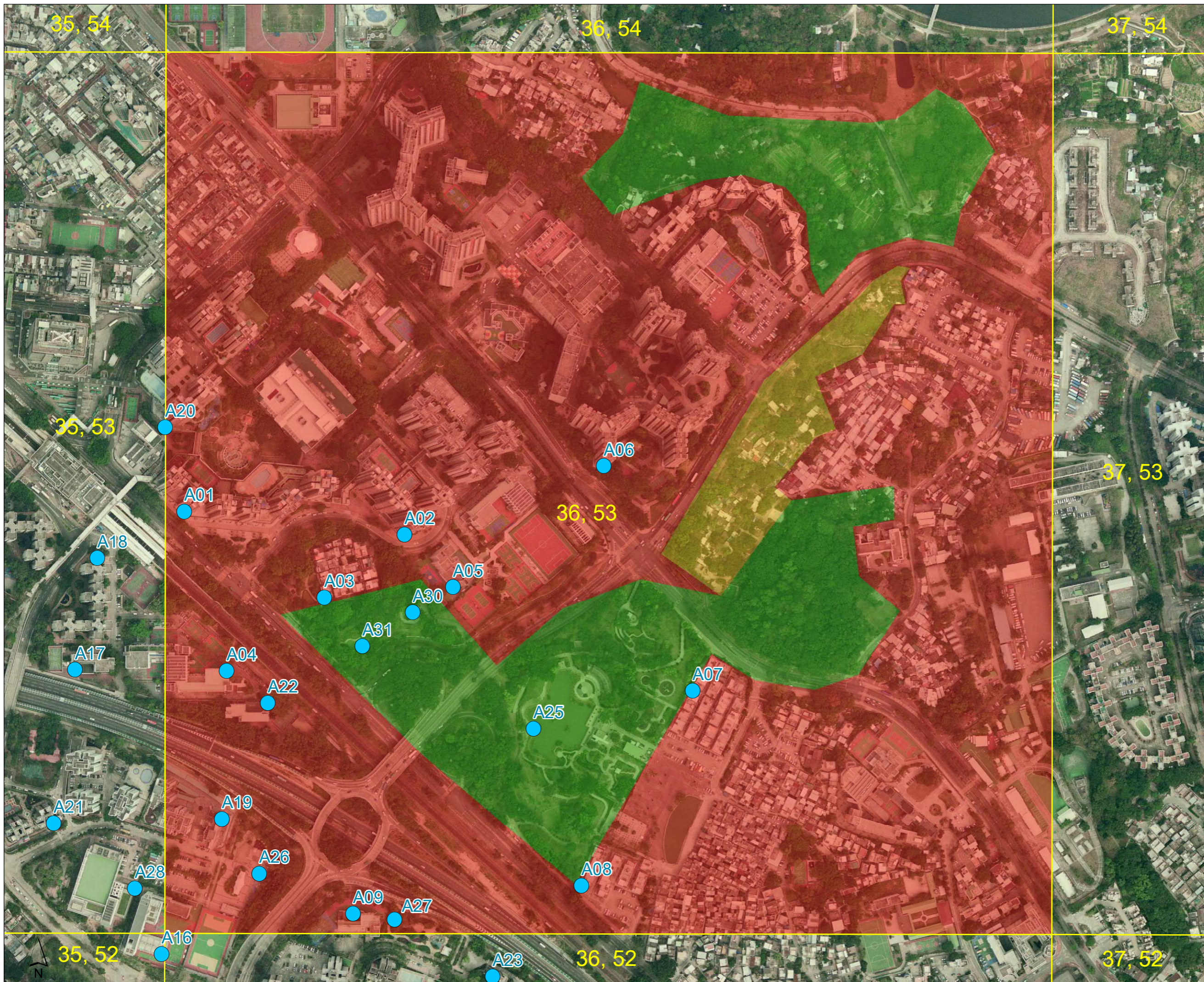
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