Design and Construction of Rank and File Quarters for Fire Services Department (FSD) at Area 106, Pak Shing Kok, Tseung Kwan O

Initial Study Report (Rev.2)

November 2018

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1.0 INTRODUCTION

1.1 PROJECT BACKGROUND

1.1.1 An Air Ventilation Assessment (AVA) Initial Study using Computational Fluid Dynamics (CFD) is conducted for an instructed project at Area 106, Pak Shing Kok, Tsueng Kwan O.

1.1.2 This consultancy study is based on the Air Ventilation Assessment framework as set out in Technical Circular No. 1/06 issued jointly by Housing, Planning and Lands Bureau and Environment, Transport and Works Bureau and its Annex A – Technical Guide for Air Ventilation Assessment for Development in Hong Kong.

1.2 STUDY OBJECTIVES

1.2.1 This Instructed Project (the Project) will assess the air ventilation impacts of the proposed mid-rise residential developments on the surrounding environment. It is also the purpose of this project to recommend any design improvements and/or mitigation measures which may be adopted to minimise any adverse air ventilation impact.

1.2.2 A more detailed CFD simulation has been adopted in this S16A submission when compared with the previous approved S16 scheme (i.e. Application No. A/TKO/105). The different parameters are summarized below:
1. Finer grid system
2. Larger computational domain
3. Higher level of details in the surrounding topography
4. Lower blockage ratio
5. Inclusion in additional surrounding buildings

1.2.3 It is believed that current simulation shall give a better illustration on the wind environment. In addition, identical settings are adopted for both baseline and proposed case simulations hence a more accurate relative performance between the two schemes should be truly reflected.

2.0 SITE CHARACTERISTICS

2.1 PROJECT AREA AND ITS SURROUNDING AREA

2.1.1 The Project Area is currently an unoccupied site with an area of approximately 1.2ha. It is located at Area 106, Pak Shing Kok, Tsueng Kwan O, opposite to the Fire and Ambulance Services Academy (namely "FASA") and bounded by Pak Shing Kok Road to the west.

2.1.2 According to the "Draft Tseung Kwan O Outline Zoning Plan No. S/TKO/25", the Project Area is zoned as "G/IC(4)" and areas to the immediate north, east and south of the Project Area are all zoned as "Green Belt" ("GB").

2.1.3 To the northeast, east, southeast and south of the Project Area lies the mountainous regions of Sheung Yeung Shan, Ha Yeung Shan, Miu Tsai Tun and Siu Chik Sha respectively, with a summit elevation of approximately 250mPD, 260mPD, 300mPD and 46.4mPD.

2.1.4 To the west of the Project Area across Pak Shing Kok Road lies a site reserved for a "Chinese Medicine Hospital and Future GIC Uses", which is currently zoned as "G/IC(8)", with a building height of approximately 106mPD.

2.1.5 To the southwest of the Project Area lies a "R(A)7" zone for a proposed residential development with a building height up to approximately 199mPD. To the further southwest of the Project Area lies the development of Hong Kong Movie City (zoned as "G/IC") with a building height of approximately 91mPD.

2.1.6 To the northwest of the Project Area across Pak Shing Kok Road lies the development of Fire and Ambulance Services Academy (zoned as Area (a) in "G/IC(7)") with a building height of approximately 110mPD, except a building tower located at High Angle Rescue Training Area [zoned as Area (b) in "G/IC(7)"].

2.1.7 **Figure 1** shows an overview of the Project Area (marked in Blue) and its surroundings. **Figure 2** shows a close-up view of the Project Area (marked in Blue) and its surroundings as shown on the OZP.

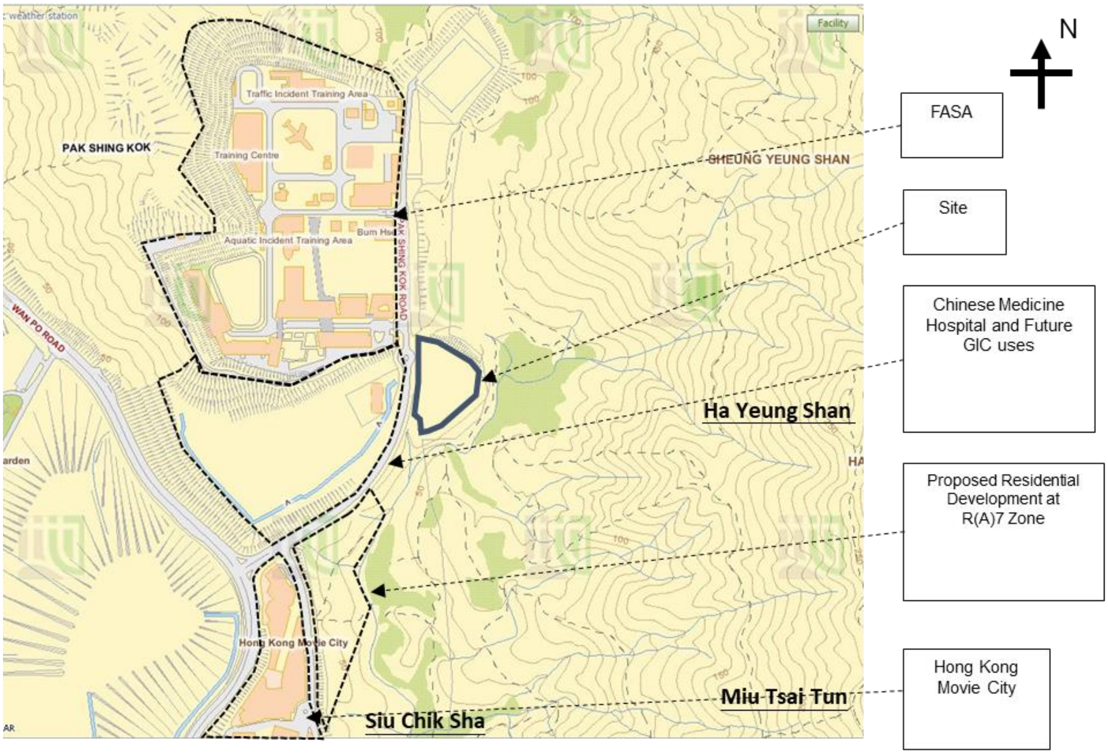


Figure 1: Overview of the Project Area and its Surroundings (Source: Lands Department)

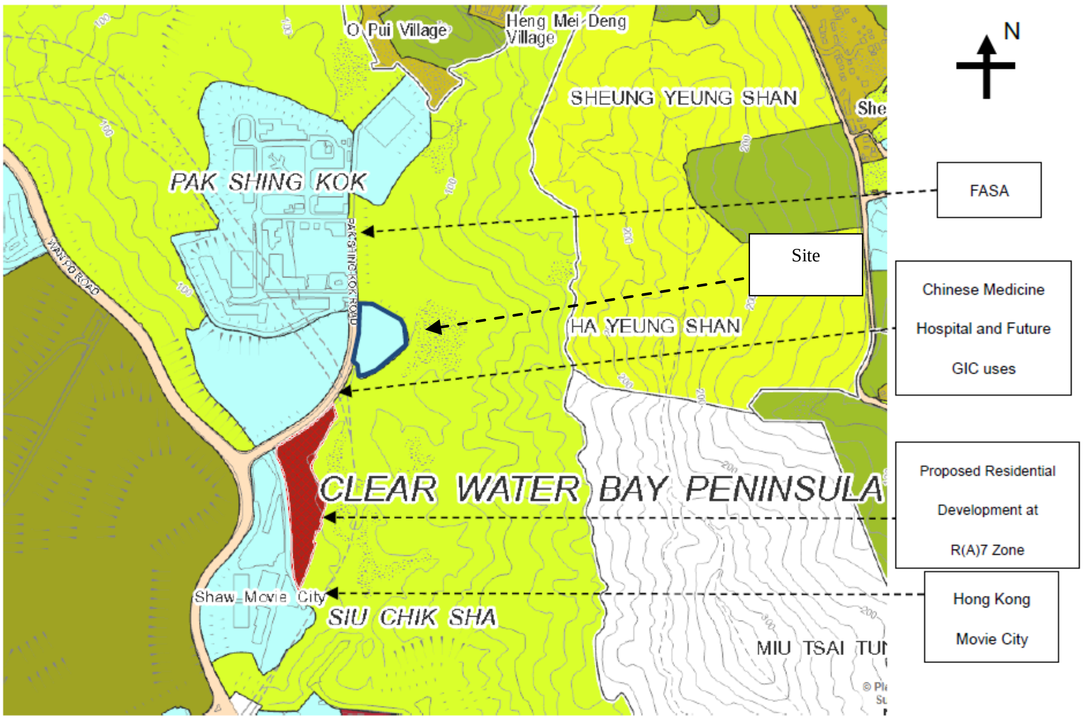


Figure 2: Close-up view of the Project Area and its Surroundings as shown on the OZP (Source: Town Planning Board)

2.2 STUDIED SCENARIOS

2.2.1 Both the Baseline Scheme and Proposed Scheme are assessed under annual and summer wind conditions. A 3D model will be built according to the GIS information obtained from Lands Department. All known planned/committed developments, including those under approved planning applications, rezoning proposals and approved building plans, within the Surrounding Area are also included in the model. The Assessment Area (marked in Blue) and Surrounding Area (Marked in Green) have also been incorporated in the simulation model as shown in **Figure 3**. The isometric views of the 3D simulation model are shown in **Figure 4** to **Figure 7**.

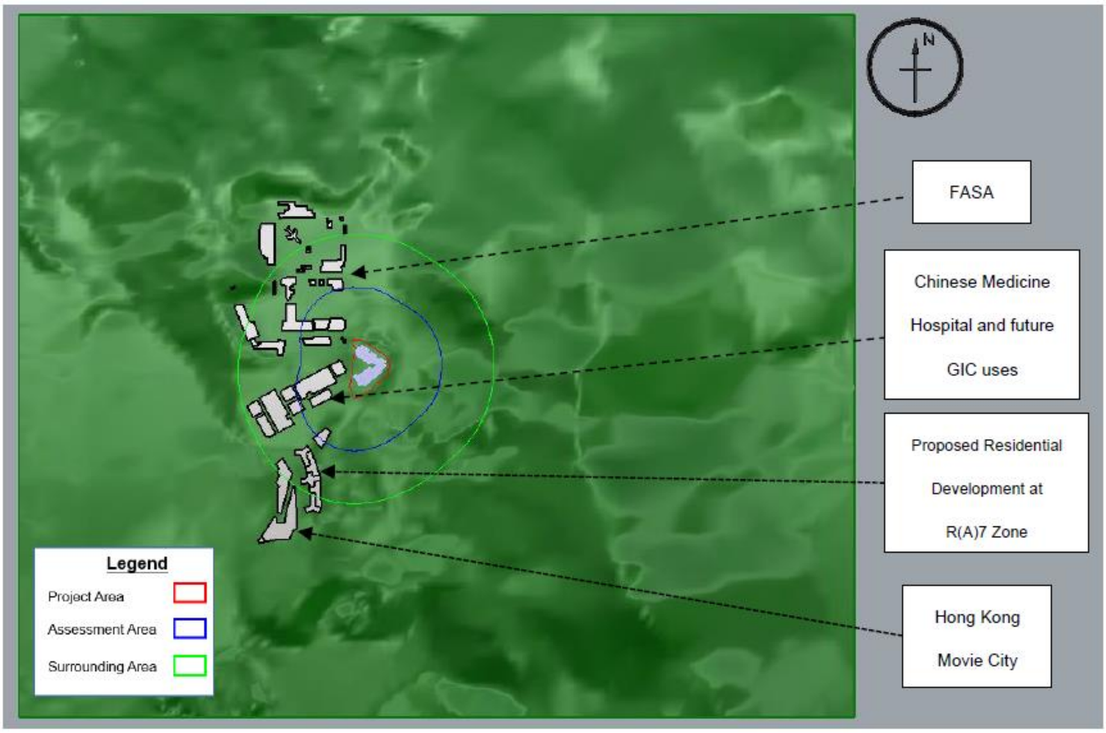


Figure 3: Overview of the 3D Model

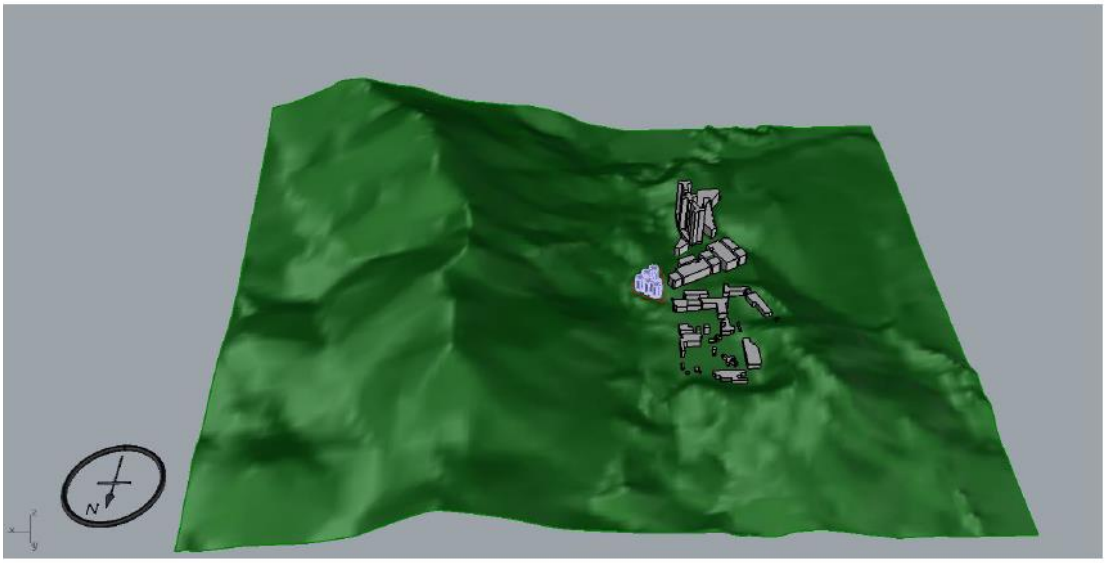


Figure 4: Overview of the 3D Model from the North

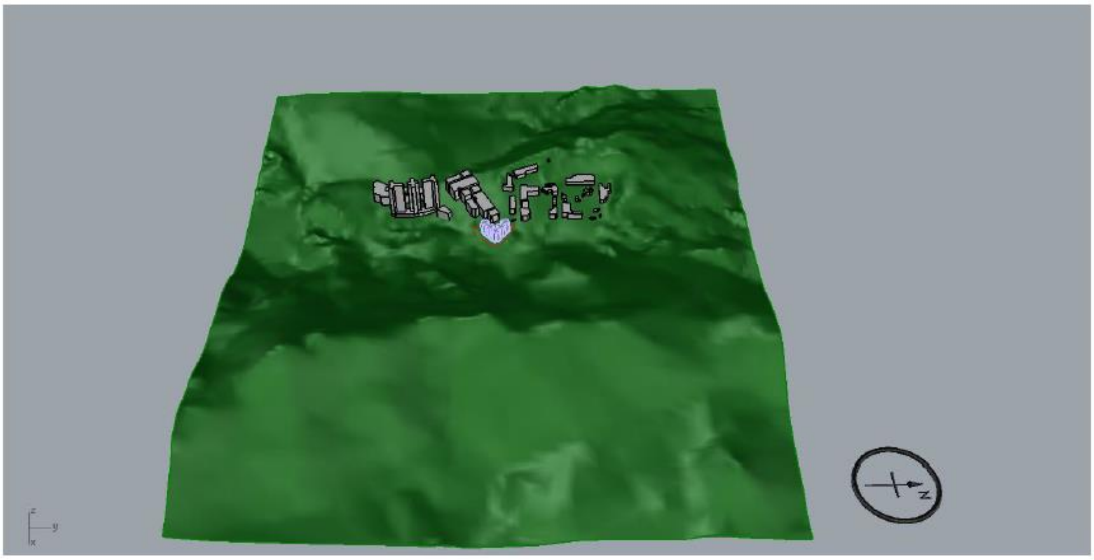


Figure 5: Overview of the 3D Model from the East

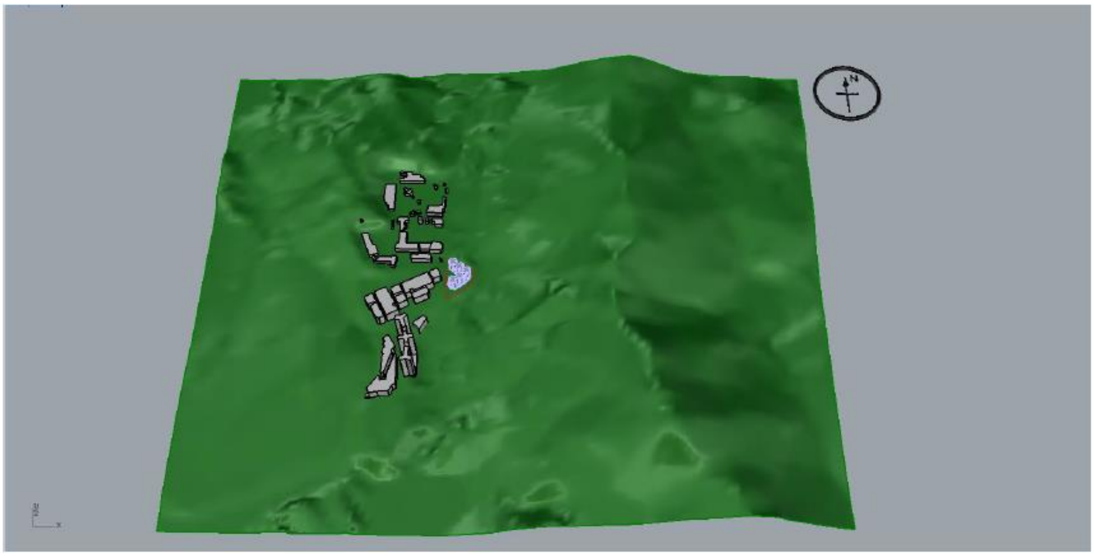


Figure 6: Overview of the 3D Model from the South

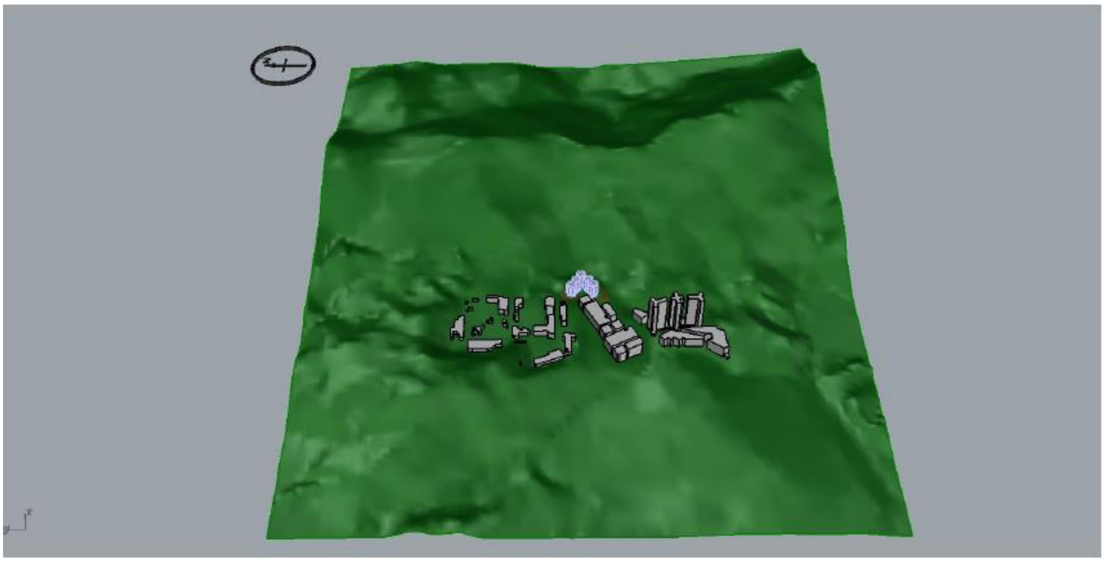


Figure 7: Overview of the 3D Model from the West

Baseline Scheme

2.2.2 The Baseline Scheme adopts the previous design of the Proposed Scheme presented in the quantitative AVA for the previously approved planning application (i.e. Application No. A/TKO/105). The Baseline Scheme consists of four 16-storey residential towers (i.e. Towers A, B, D and E) and one 17-storey residential tower (i.e. Tower C) with a building height of approximately 118mPD and 1 open area of children's play area / landscape area. The ground level of the site is approximately 66mPD.

2.2.3 The architectural fins were not modeled in the current simulation due to simplification on the model geometry. Such simplification is made under the following reasons:

1. The architectural fins are located within two arms of the cruciform towers, hence the overall projected façade frontage length remain unchanged.
2. The architectural fins are located above the podium, hence direct wind impact to pedestrian level is minimal.
3. Dimension of fins is small while compared with the overall massing.

2.2.4 Also, by referring to the CFD simulation from the approved AVA report by Ramboll Environ, the flow pattern at pedestrian level is mainly affected by podium structure. No significant wind impact by the architectural fins is observed. It gives an insight that current simplification is fit for the purpose to investigate the overall wind performance at pedestrian level.

2.2.5 **Figure 8** shows the existing site plan of Project Area. The isometric views of the Baseline Scheme model are shown in **Figure 9** to **Figure 12**.

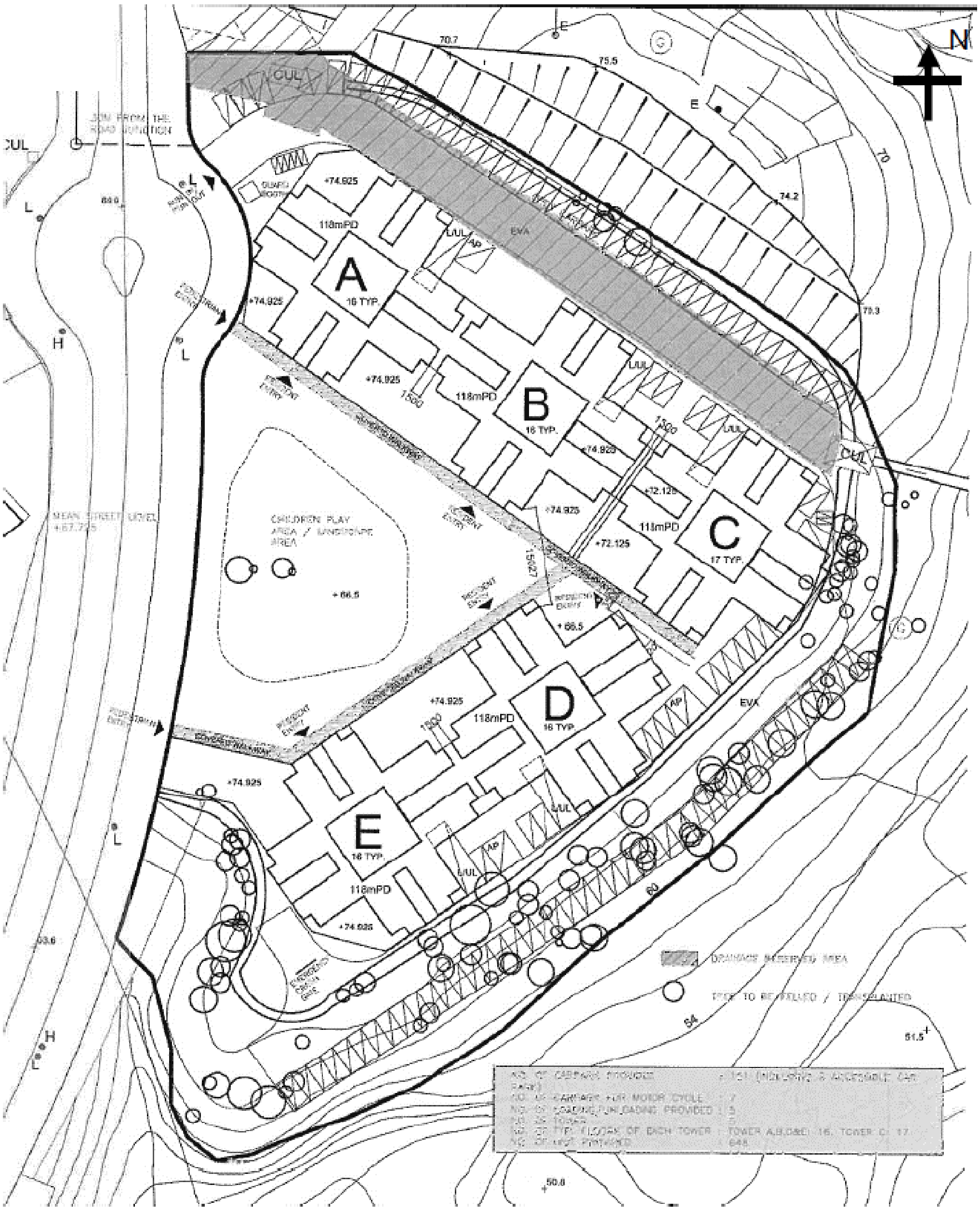


Figure 8: Master Layout Plan of the Baseline Scheme

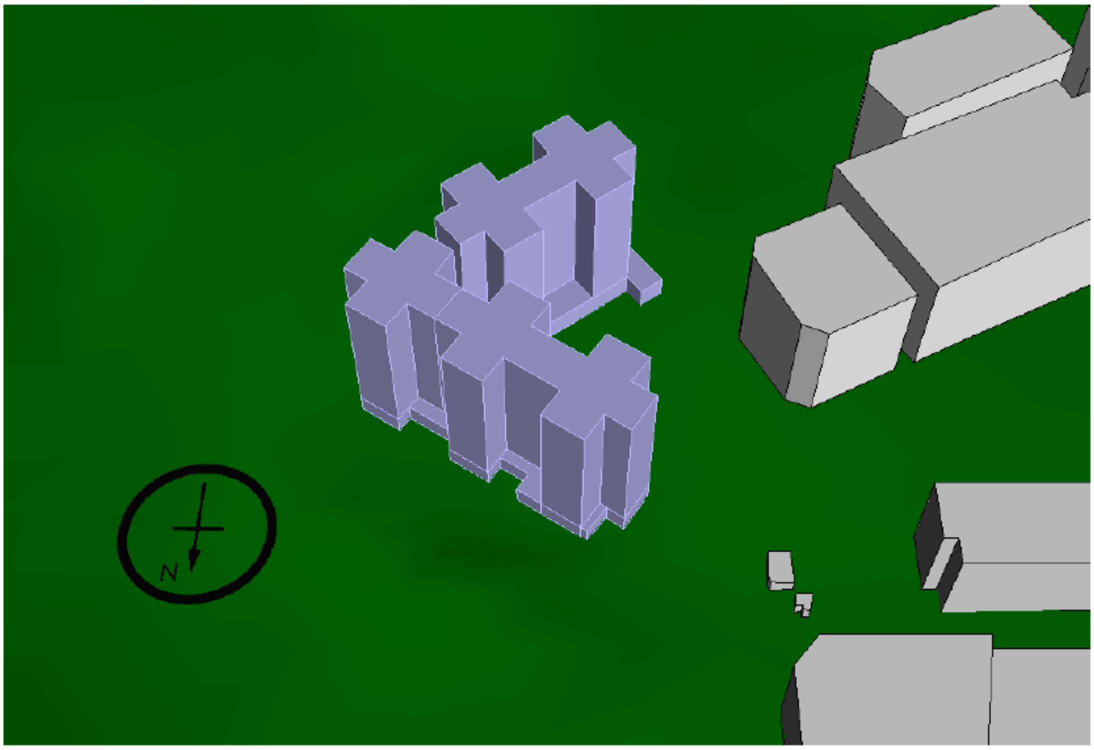


Figure 9: Zoomed-in view of the Baseline Scheme from the North

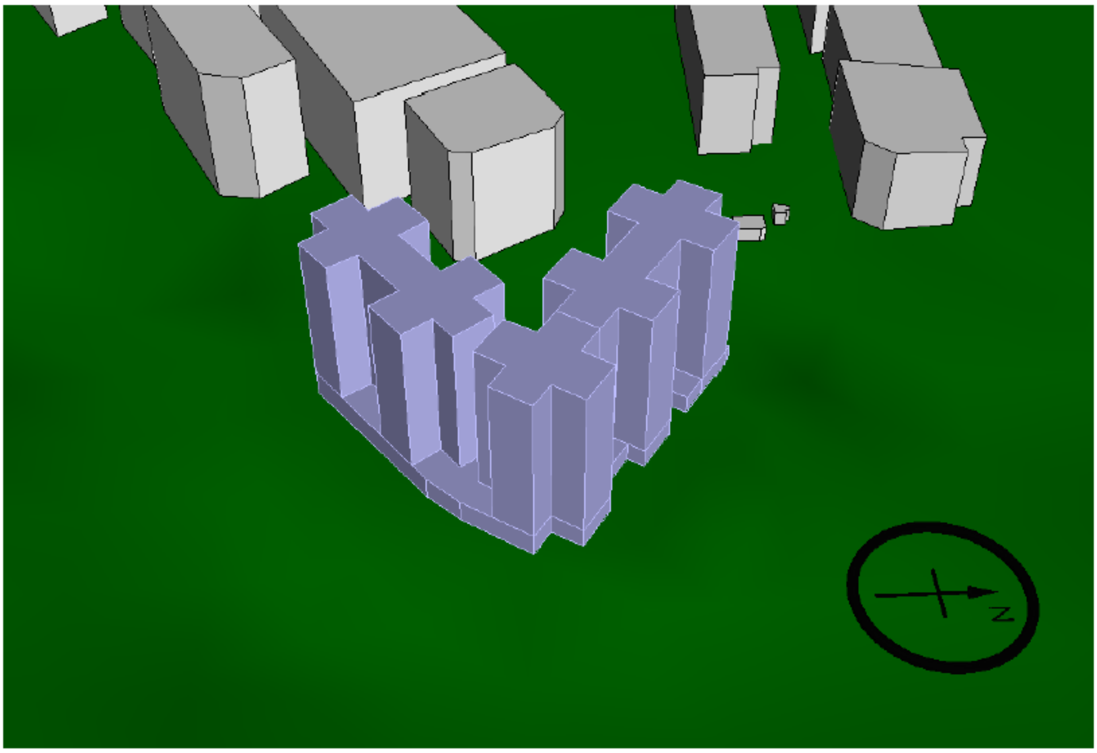


Figure 10: Zoomed-in view of the Baseline Scheme from the East

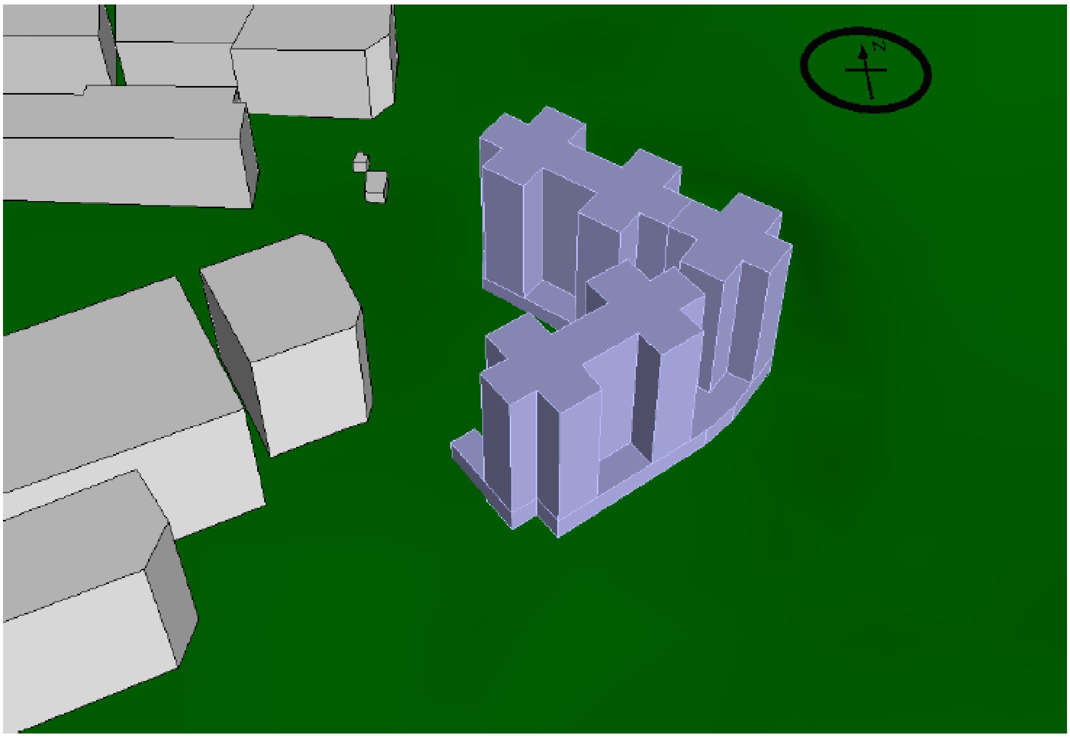


Figure 11: Zoomed-in view of the Baseline Scheme from the South

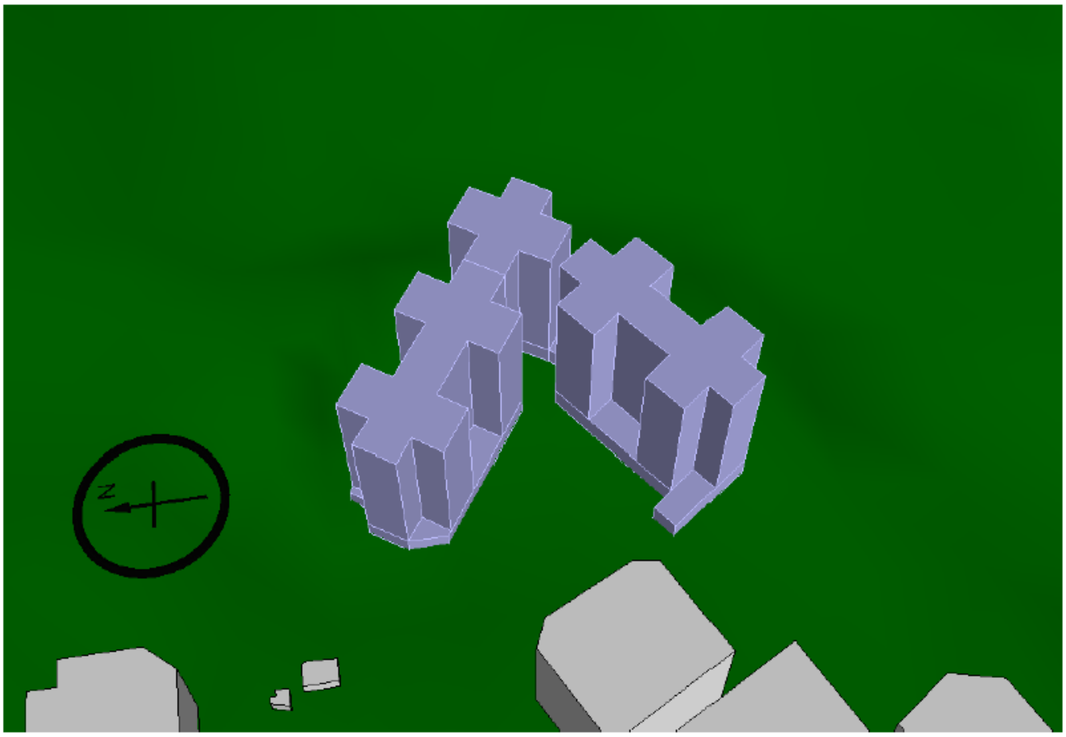


Figure 12: Zoomed-in view of the Baseline Scheme from the West

Proposed Scheme

2.2.6 Similar to the Baseline Scheme, the Proposed Scheme also comprises of five residential towers (i.e. Towers 1 to Tower 5), an open-area at the central portion of the Project Area as well as low-rise above ground structures including guard house, master meter room & gas control room, multi-function room, transformer rooms, refuse chamber, water scrubber room and street fire hydrant water tank.

2.2.7 Four of the five residential towers are 16-storeies (i.e. Tower 1, 2, 3 and 5) whereas the remaining residential tower is 17-stories (i.e. Tower 4). Towers 1 and 2 have a building height of 118.00mPD whereas Towers 3, 4 and 5 have a building height of 115.70mPD, 117.55mPD and 114.75mPD respectively. The building height of the aforementioned low-rise above ground structures are all less than +72mPD.

2.2.8 Two building separations are incorporated in the Proposed Scheme. The building separation between Tower 2 & Tower 3 and Tower 3 & Tower 4 are both 15m. However, the building separation between Tower 2 and Tower 3 is only valid above 71.30mPD as low-rise structures (i.e. street fire hydrant water tank & pump room and water scrubber room and refuse storage and material recovery chamber) occupy the space between Tower 2 and Tower 3. The site permeability at pedestrian level is also enhanced due to incorporation of loading/unloading bays & open-air carparking spaces between Towers 1 & 2 and Towers 4 & 5, which will minimize blockage effect from building structures at ground floor.

2.2.9 **Figure 13** shows the master layout plan of the Proposed Scheme. The isometric views of the Proposed Scheme model are shown in **Figure 14** to **Figure 17**.

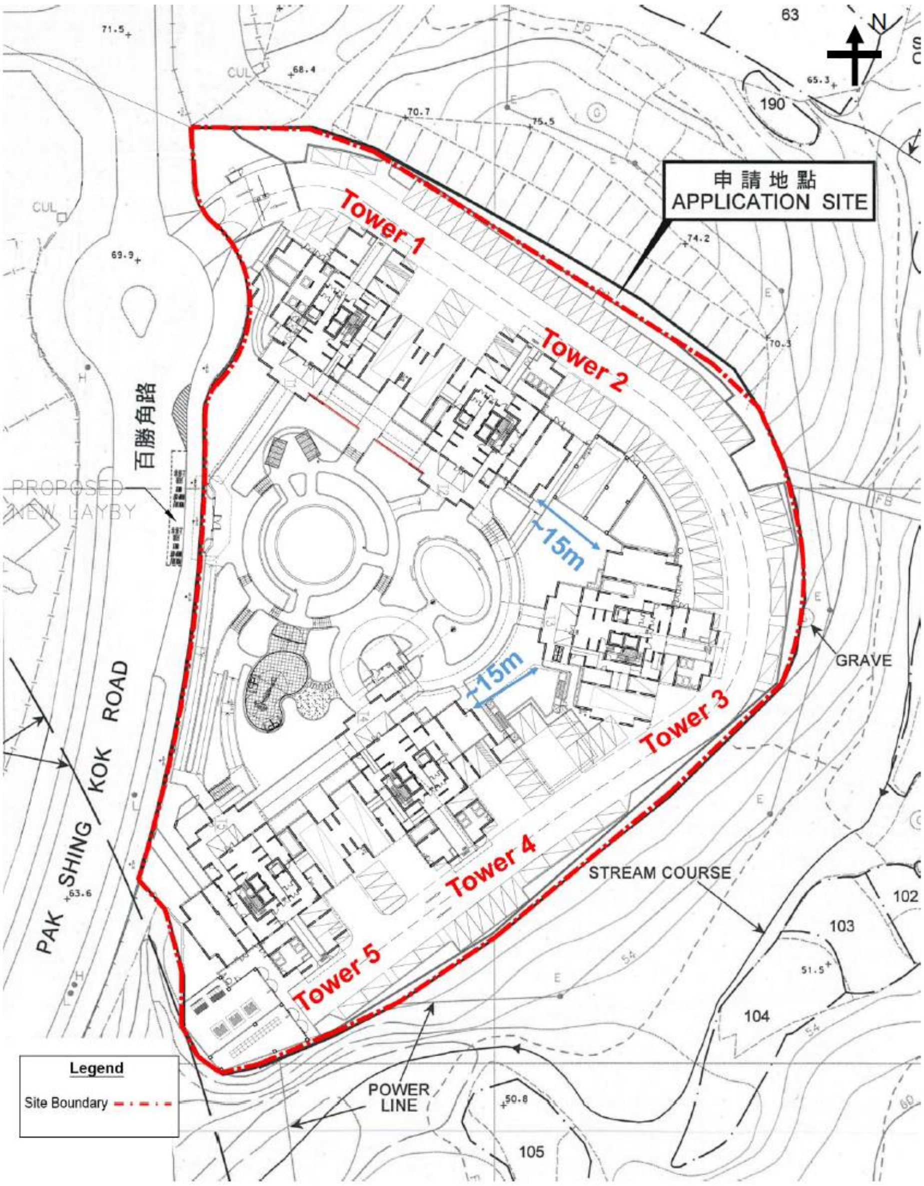


Figure 13: Master Layout Plan of the Proposed Scheme

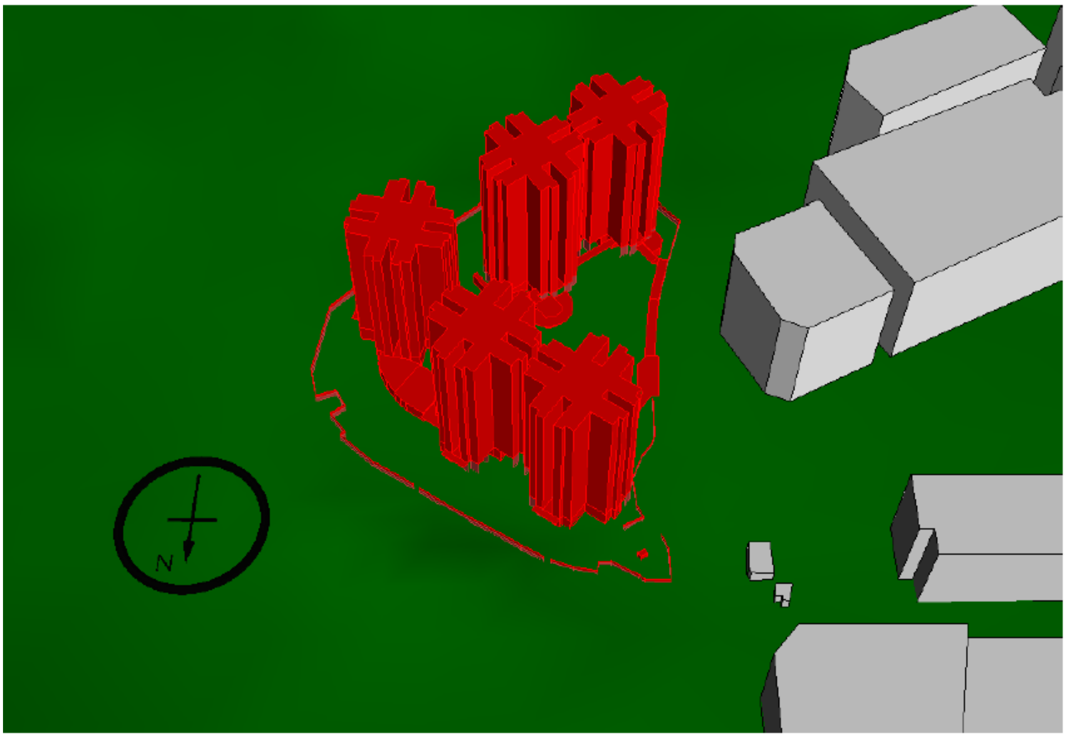


Figure 14: Zoomed-in view of the Proposed Scheme from the North

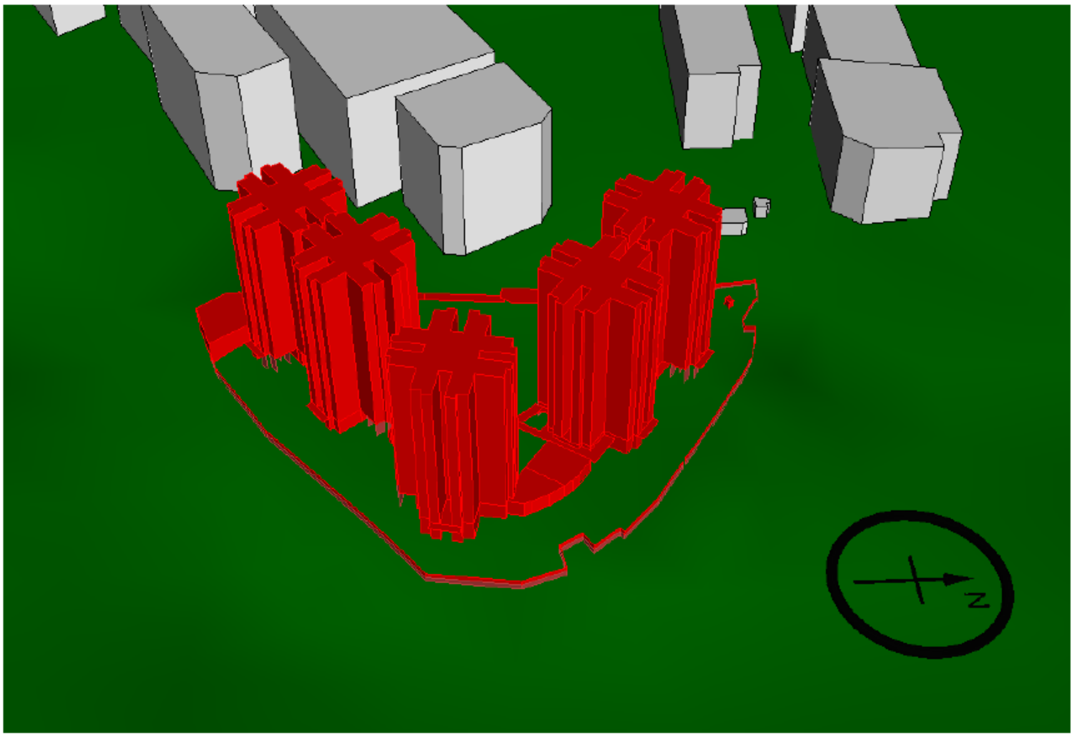


Figure 15: Zoomed-in view of the Proposed Scheme from the East

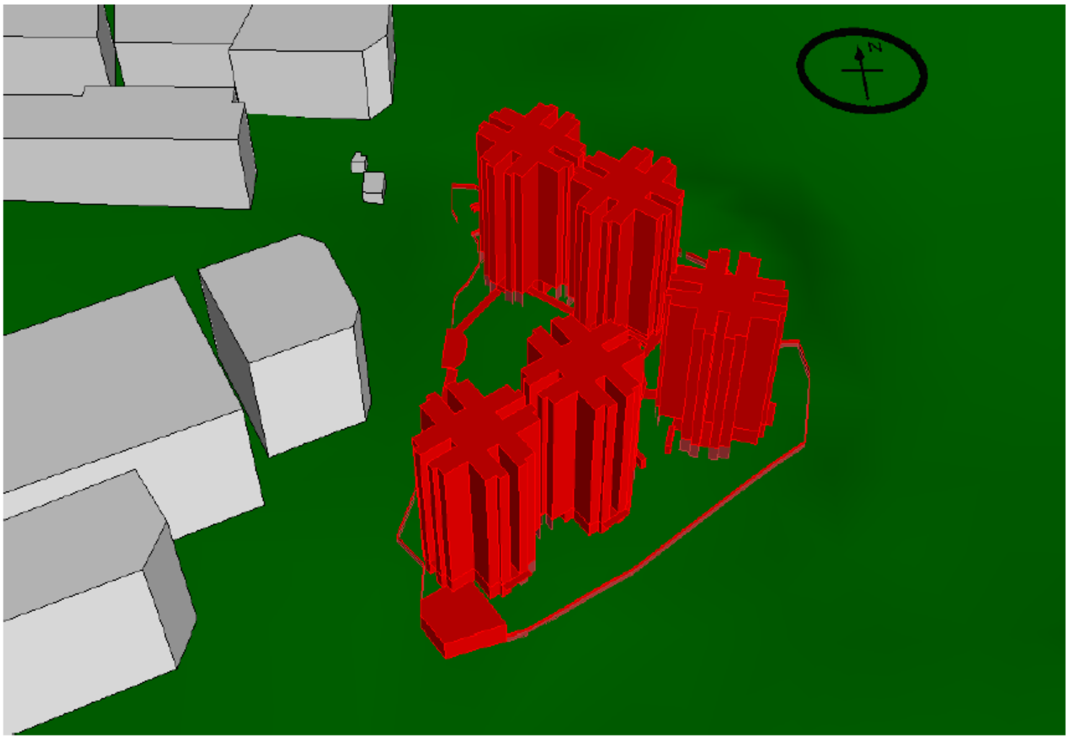


Figure 16: Zoomed-in view of the Proposed Scheme from the South

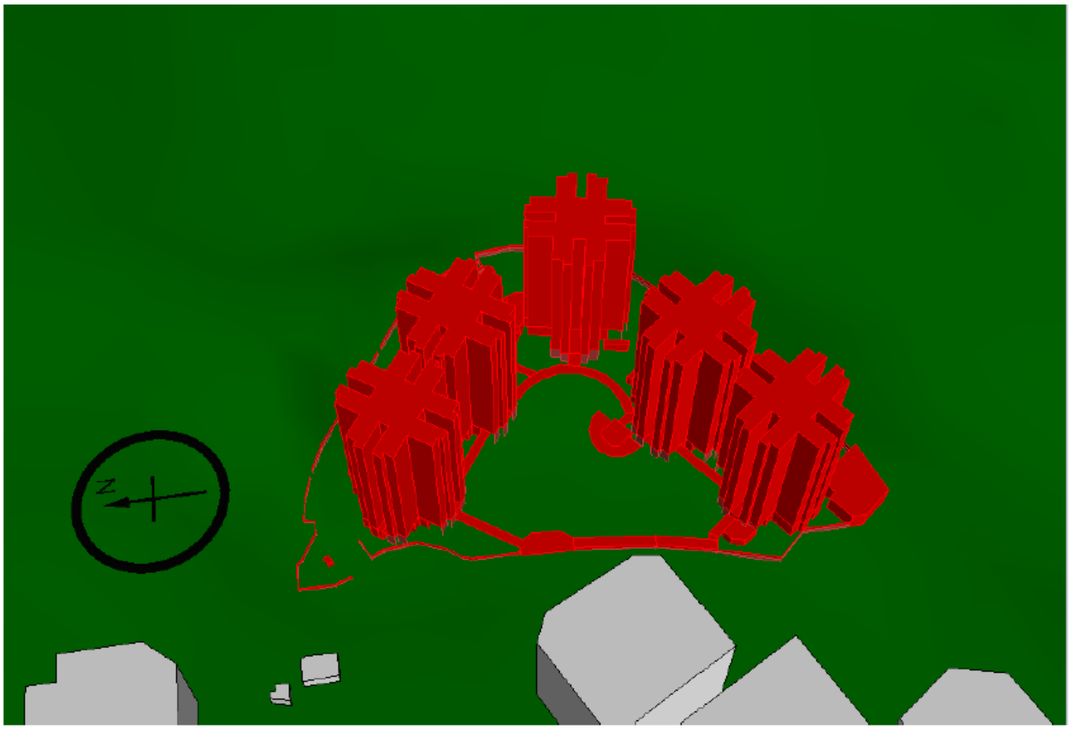


Figure 17: Zoomed-in view of the Proposed Scheme from the West

3.0 SITE WIND AVAILABILITY

3.1.1 The wind profile input for the CFD simulation requires wind data at different heights and at the wind boundary level. The characteristic of the site wind availability should be identified in order to investigate the wind performance of the Project Area. Site wind availability data could be used to assess the wind characteristics in terms of the magnitude and frequency of approaching wind from each wind direction. In this study, the simulated Regional Atmospheric Modelling System (RAMS) wind data will be used for the quantitative assessment.

3.2 RAMS WIND DATA

3.2.1 City University of Hong Kong (CityU) utilized the meso-scale numerical model Regional Atmospheric Modeling System (RAMS) to produce site wind availability data for Hong Kong and is available at Planning Department's website . Based on the archived dataset, wind statistics and wind roses for each 0.5km×0.5km gird box at different height levels could be extracted. Simulated data at grid (X101, Y039) corresponds to the location of the Project Area and both annual and summer wind conditions at 500m above ground are referenced in this study. The location of grid (X101, Y039) is shown in **Figure 18**. The extracted wind roses shows that north easterlies dominate under the annual wind condition while south westerlies dominate under the summer wind condition. **Figure 19** and **Figure 20** show the annual and summer wind roses at 500m above ground level for grid (X101, Y039) respectively.

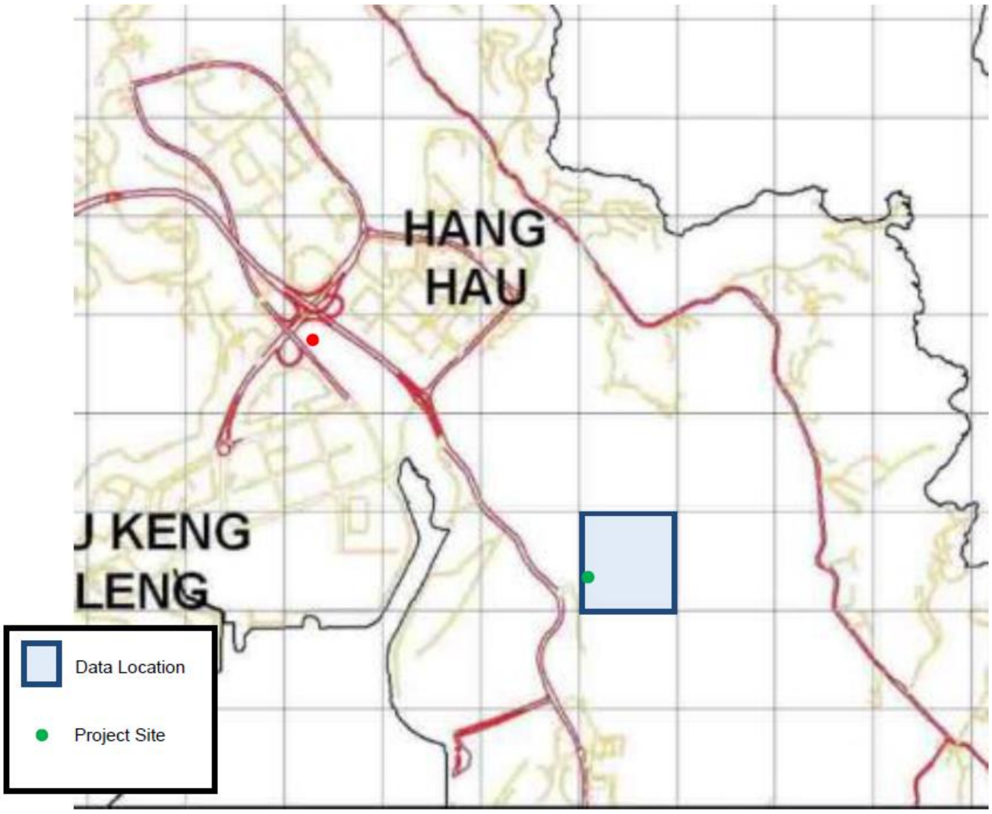


Figure 18: Location of the Selected RAMS Wind Data - Grid (X101, Y039)

[1] http://www.pland.gov.hk/pland_en/info_serv/site_wind/site_wind/index.html

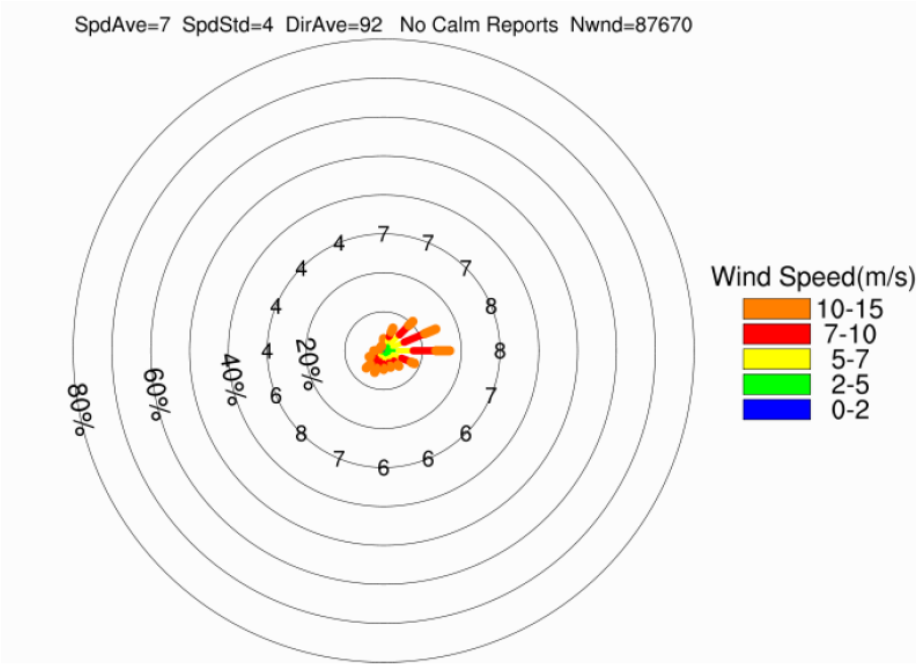


Figure 19: Annual Wind Rose at 500m - Grid (X101, Y039)

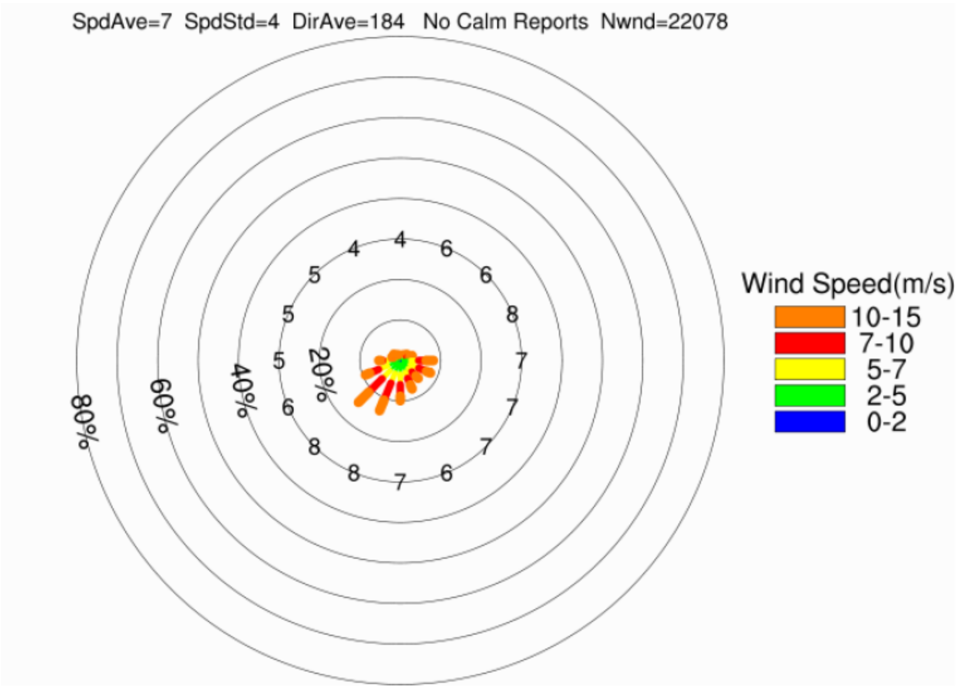


Figure 20: Summer Wind Rose at 500m - Grid (X101, Y039)

Annual Prevailing Wind

3.2.2 Eight prevailing wind directions (bolded in **Table 1**) are considered in this quantitative assessment which covers 76.6% of the total annual wind frequency. They are North-Northeast (6.5%), Northeast (10.9%), East-Northeast (14.9%), East (17.4%), East-Southeast (8.8%), Southeast (5.6%), South-Southwest (6.1%) and Southwest (6.4%).

Table 1: Annual Wind Frequency at 500m

Direction	N	**NNE**	**NE**	**ENE**	**E**	**ESE**	**SE**	SSE
Frequency (%)	3.3	**6.5**	**10.9**	**14.9**	**17.4**	**8.8**	**5.6**	4.7
Direction	S	**SSW**	**SW**	WSW	W	WNW	NW	NNW
Frequency (%)	4.9	**6.1**	**6.4**	4.1	2.5	1.1	1.2	1.3

Summer Prevailing Wind

3.2.3 Eight prevailing wind directions (bolded in **Table 2**) are considered in this quantitative assessment which covers 79.6% of the total summer wind frequency. They are East (8.5%), East-Southeast (8.3%), Southeast (6.4%), South-Southeast (7.7%), South (10.3%), South-Southwest (13.8%), Southwest (15.2%) and West-Southwest (9.4%) winds.

Table 2: Summer Wind Frequency at 500m

Direction	N	NNE	NE	ENE	**E**	**ESE**	**SE**	**SSE**
Frequency (%)	1.1	1.6	2.4	3.5	**8.5**	**8.3**	**6.4**	**7.7**
Direction	**S**	**SSW**	**SW**	**WSW**	W	WNW	NW	NNW
Frequency (%)	**10.3**	**13.8**	**15.2**	**9.4**	5.4	2.3	2.2	1.6

3.3 WIND PROFILE

3.3.1 As mentioned in Section 3.2, the RAMS wind data extracted from Planning Department's Website will be adopted in this AVA Initial Study. The wind profile data from 10 – 500m will be directly adopted as it reflects the exact wind data whereas the power law equation will be used to approximate near ground wind profile (i.e. 0 – 10m). For wind data above 500m, wind velocity shall be assumed as the wind velocity at 500m. Figure 21 to Figure 24 indicates the overall wind profile curve adopted for wind directions of 22.5º - 112.4º, 112.5º - 202.4º, 202.5º - 292.4º and 292.5º - 22.4º respectively.

3.3.2 The vertical discretization of velocity profile is approximated by using an exponential law, which is a function of ground roughness and height:

$$U_Z = U_G\left(\frac{z}{z_G}\right)^n$$

where *UG = reference velocity at height zG* *UZ = velocity at height z*
ZG = reference height *n = power law exponent*
Z = height above ground

3.3.3 The power n is related to the ground roughness. A larger value of the power n represents the higher roughness of the ground i.e. the dense city. Alternatively, smaller n represents the lower ground roughness, i.e. the sea surface. **Table 3** shows the n value adopted for CFD simulation.

Table 3: Value of n (Power Law Exponent) Adopted for CFD Simulation

Direction	NNE	NE	ENE	E	ESE	SE	SSE
Value of *n*	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Direction	**S**	**SSW**	**SW**	**WSW**			
Value of *n*	0.15	0.35	0.15	0.15			

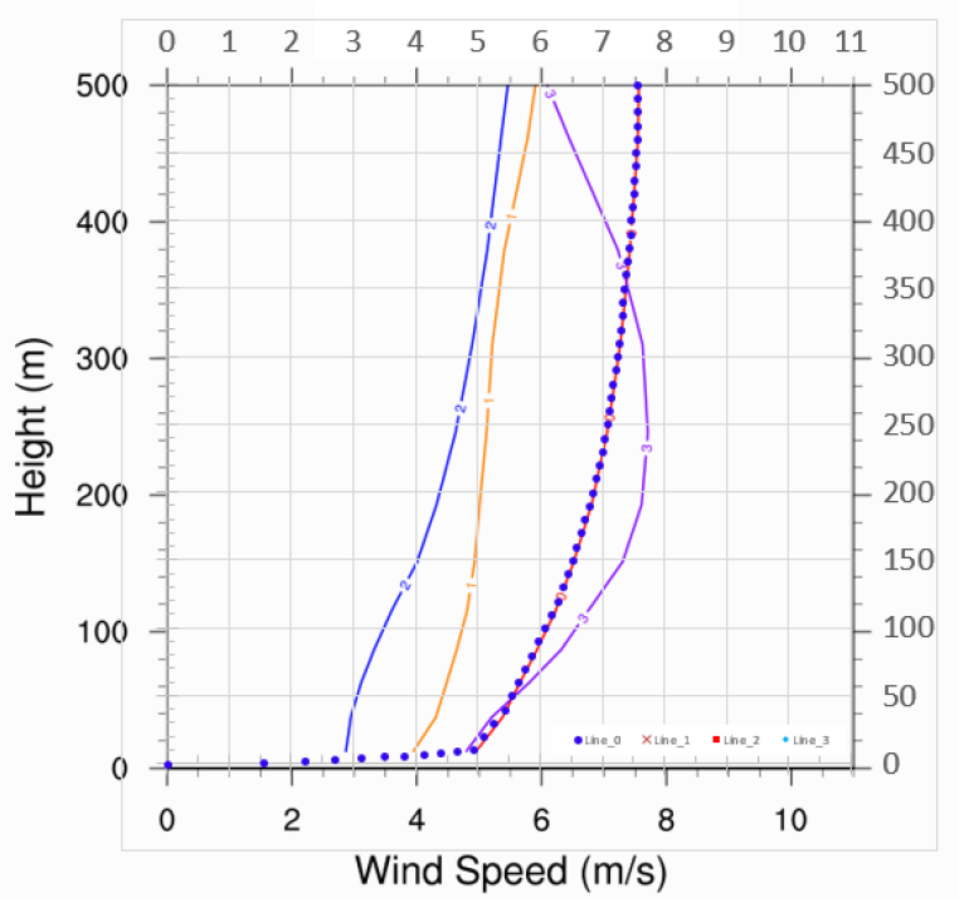


Figure 21: Wind Profile Curve for Wind Directions of 22.5º - 112.4º at Grid (X101, Y039) *(line – original data from RAMS, dots – input data adopted for CFD simulation)*

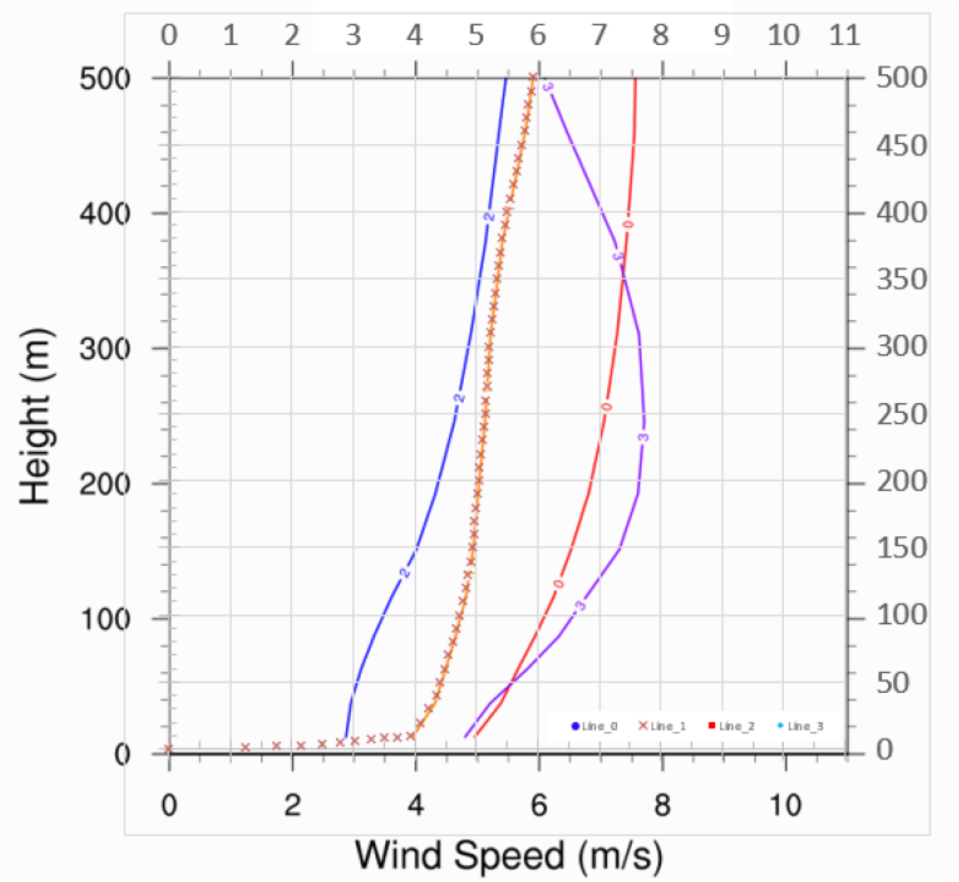


Figure 22: Wind Profile Curve for Wind Directions of 112.5º - 202.4º at Grid (X101, Y039) *(line – original data from RAMS, dots – input data adopted for CFD simulation)*

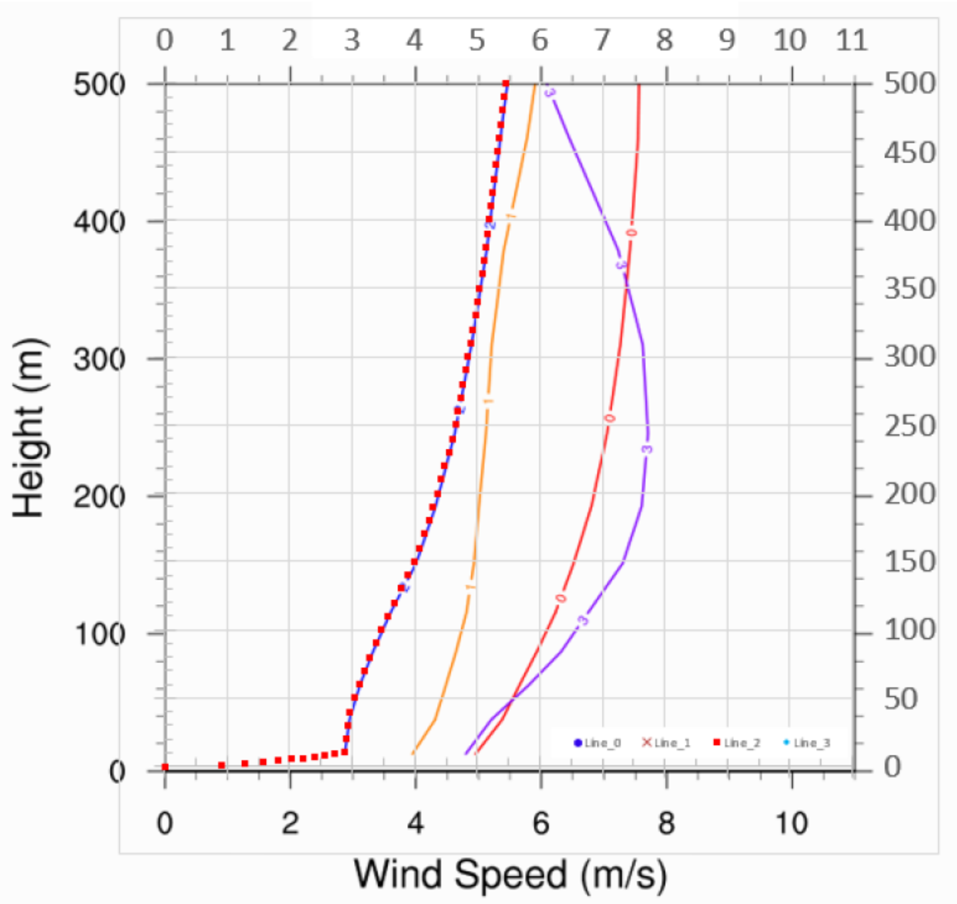


Figure 23: Wind Profile Curve for Wind Directions of 202.5º - 292.4º at Grid (X101, Y039) *(line – original data from RAMS, dots – input data adopted for CFD simulation)*

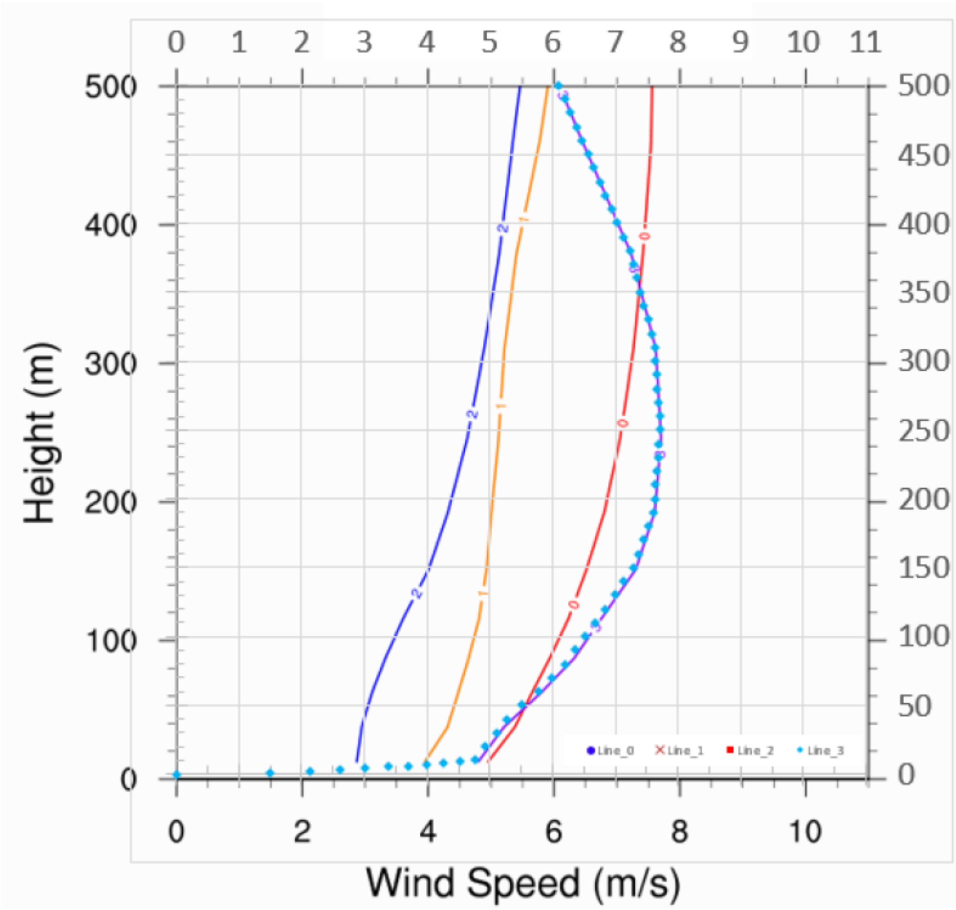


Figure 24: Wind Profile Curve for Wind Directions of 292.5º - 22.4º at Grid (X101, Y039) *(line – original data from RAMS, dots – input data adopted for CFD simulation)*

3.3.4 **Table 4** shows the data for each wind profile curve adopted in the current AVA Initial Study, which acts as the inlet boundary data in the CFD simulation.

Table 4: Wind Profile Data for All Wind Directions

Height (m)	Wind Speed (m/s)			
	22.5° – 112.4°	112.5° – 202.4°	202.5° – 292.4°	292.5° – 22.4°
0	0.00	0.00	0.00	0.00
10	4.92	3.92	2.87	4.77
20	5.10	4.08	2.91	4.94
40	5.42	4.34	2.96	5.27
60	5.64	4.48	3.11	5.77
80	5.86	4.61	3.28	6.20
100	6.08	4.73	3.47	6.53
150	6.52	4.93	4.01	7.30
200	6.85	5.04	4.37	7.63
250	7.08	5.14	4.65	7.72
300	7.23	5.21	4.85	7.64
350	7.36	5.34	5.04	7.41
400	7.46	5.51	5.19	7.03
450	7.54	5.74	5.34	6.56
500	7.57	5.92	5.46	6.10

4.0 METHODOLOGY FOR CFD SIMULATION

4.1.1 The AVA methodology for this study follows the guidelines set out in the Technical Guide in Annex A of the AVA Technical Circular No. 1/06. The following section describes the study methodology in detail.

4.2 ASSESSMENT AND SURROUNDING AREAS

4.2.1 With reference to the Technical Guide, the Assessment Area of the Instructed Project should include the project's surrounding up to at least a perpendicular distance H from the site boundary of the Project Area, where H is the height of the tallest building on site. The Surrounding Area will be up to at least a perpendicular distance of 2H from the site boundary of the Project Area.

4.2.2 The coverage of the Assessment and Surrounding Areas are extended to 150m and 300m respectively measured from the site boundary of the Project Area. The model takes information on the surrounding buildings and site topography via the Geographical Information System (GIS) platform. The computational domain of the CFD model for this AVA Initial Study has been enlarged and is approximately 2400m (L) x 2000m (W) x 2000m (H).

4.2.3 **Figure 25** shows the size and location of the Project Area, Assessment Area, Surrounding Area and the computational domain.

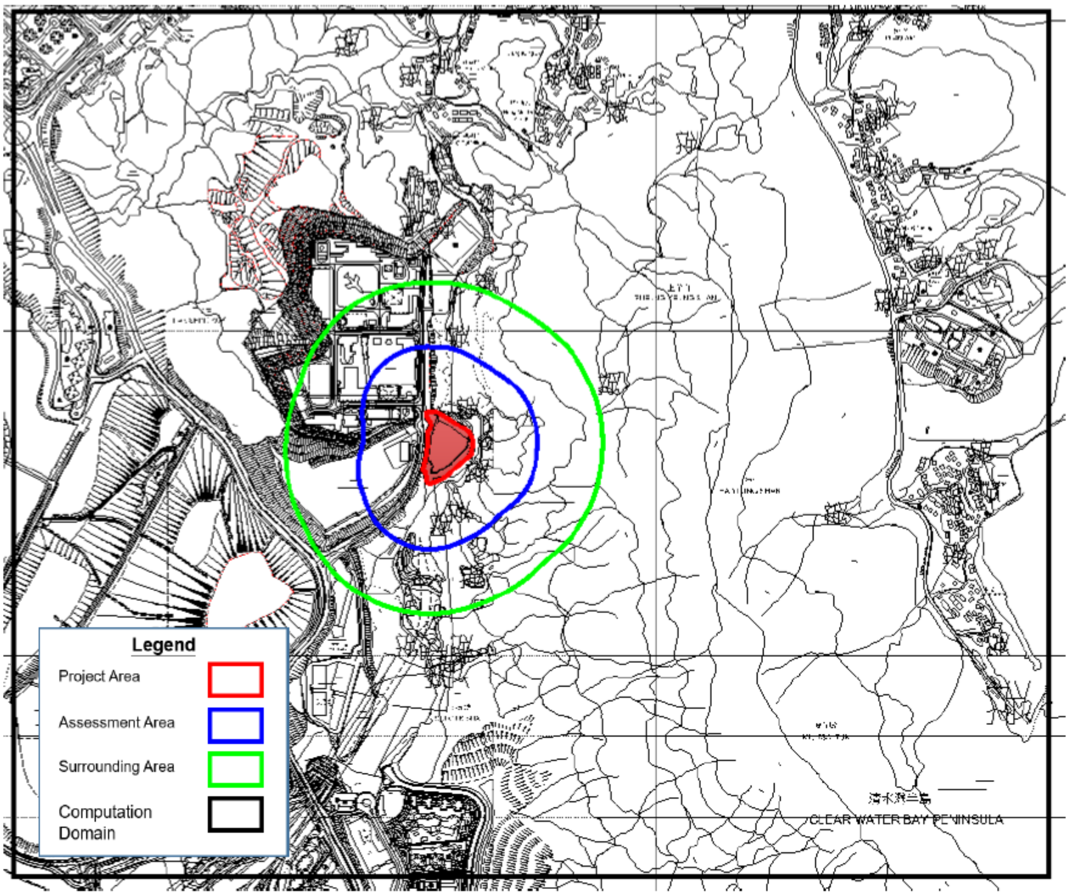


Figure 25: Project, Assessment and Surrounding Areas along with the Computational Domain

4.3 MODELLING TOOL

4.3.1 CFD technique was utilized for the current AVA Initial Study. A commercial CFD package ANSYS ICEM CFD and ANSYS-Fluent were used which are widely adopted in the industry for AVA studies and other types of complex fluid flow related problems.

4.4 MESH SETUP

4.4.1 Body-fitted unstructured grid technique is used to fit the geometry to reflect the geometry details which is essential for proper modeling on turbulence flow. A prism layer of 3m above ground (totally 6 layers and each layer is 0.5m) is incorporated in the meshing so as to better capture the approaching wind near ground as shown in **Figure 26**. The expansion ratio is 1.3 while the maximum blockage ratio is 2%.

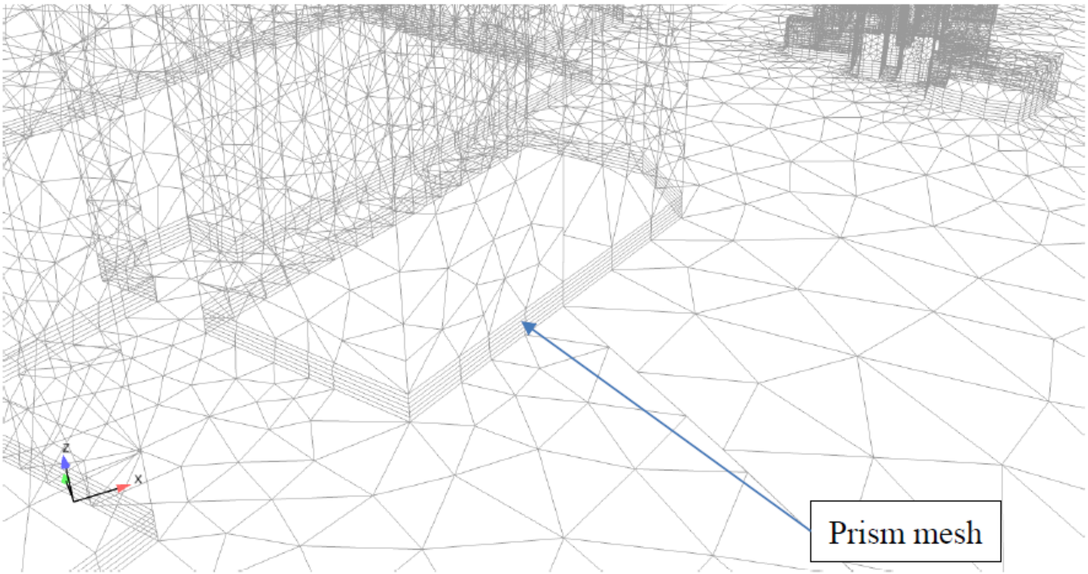


Figure 26: Prism Meshes at Ground Level

4.5 TURBULENCE MODEL

4.5.1 Nowadays, various turbulence models are available in the market which most of them are mature for industrial use.

4.5.2 According to COST Action C14 (2004)[2], realizable k – ε turbulence model could attenuate the stagnation point anomaly without leading to worse results in the wake. It is recommended for modeling pedestrian wind environment, as this technique provides more accurate representation of the levels of turbulence that can be expected in an urban environment.

[2] J. Franke, C. Hirsch, A.G. Jensen, H.W. Krüs, M. Schatzmann, P.S. Westbury, S.D. Miles, J.A. Wisse and N.G. Wright, Recommendations on the use of CFD in Wind Engineering, In J.P.A.J. van Beek (Ed.), Proc. Int. Conf. on Urban Wind Engineering and Building Aerodynamics: COST C14 – Impact of Wind and Storm on City life and Built Environment, Rhode-Saint-Genèse, 2004

4.6 CALCULATION METHOD AND BOUNDARY CONDITION

4.6.1 Pressure-Based segregated algorithm will be adopted to solve the governing equations. The pressure and velocity coupling will be handled by SIMPLE algorithm or its variation. A collocated variable arrangement with Rhie-and-Chow-type approach is also adopted to prevent checker board problem. A higher order differencing scheme is applied to discretize all governing equations. The convergence criterion is set to 0.0001 on mass, momentum and turbulence equations. The calculation will repeat until the solution satisfies this convergence criterion. The prevailing wind direction is set to inlet boundary of the model with respective wind profile as detailed in Section 3.3. The downwind boundary is set to pressure with value of atmospheric pressure. The top and side boundaries are set to symmetry. In addition, to eliminate the boundary effects, the model domain is built more than 5H from the Surrounding Area as recommended in the Technical Circular.

4.7 SUMMARY

4.7.1 Based on previous sections, the detail parameters of the model are summarized below **Table 5**.

Table 5: Parameters of the CFD Model

	CFD Model
Computational Model Scale	1:1 scale to real environment
Model details	Topography, Buildings blocks, Streets/highways, all major elevated structures and noise barriers are included. No minor structures like signboard, street light, trees, shrubs, turfs, etc. are included in the simulation model.
Domain	2400m (L) x 2000m (W) x 2000m (H)
Assessment Area	Min. 150m from the Project Area
Surrounding building Area	Min. 300m from the Project Area
Turbulence Model	Realizable k-ε model
Grid Expansion Ratio	maximum expansion ratio = 1.3
Prismatic layer	6 layer of prismatic layers and 0.5m each (i.e. total 3m above ground)
Inflow boundary Condition	Respective wind profile obtained from RAMS
Outflow boundary	Pressure boundary condition with pressure equal to zero
Wall boundary condition	Logarithmic law boundary
Solving algorithms	SIMPLE with Rhie and Chow approach + Higher order differencing scheme
Blockage ratio	≤ 2%
Convergence criteria	$\leq 1.0E\text{-}^{4}$

4.8 AVA INDICATOR

Wind Velocity Ratio

4.8.1 The Wind Velocity Ratio (VR) as proposed by the Technical Circular was employed to assess the ventilation performance of the proposed development and its surrounding environment. Higher VR implies better ventilation. The calculation of VR is given by the following formula:

$$VR = \frac{V_p}{V_\infty}$$

V_P= the wind velocity at the pedestrian level (2m above ground).

V_∞= the wind velocity at the top of the wind boundary layer (typically assumed to be around 500m above the center of the site of concern, or at a height where wind is unaffected by the urban roughness below).

4.8.2 The Average VR is defined as the frequency weighted average VR with respect to the percentage of occurrence of all considered wind directions. This gives a general idea of the ventilation performance at the considered location at both annual and summer wind conditions.

Spatial average velocity Ratio

4.8.3 CFD simulations were conducted to study the wind environment under annual and summer wind conditions. As specified in the Technical Circular, indicator of ventilation performance should be the Wind Velocity Ratio (VR), defined as the ratio of the wind velocity at the pedestrian level to the wind velocity at the top of the wind boundary layer. Site spatial average velocity ratio (SVR) and a Local spatial average velocity ratio (LVR) should be determined as below **Table 6**.

4.8.4 The SVR gives an idea of how the lower portion of the proposed development may affect the immediate surroundings. When problems are detected, it is likely that design changes may be needed for the lower portion of the development (e.g. the coverage of the podium).

4.8.5 The LVR gives an idea of how the upper portion of the proposed development may affect the local surroundings. When problems are detected, it is likely that design changes may be needed for the upper portion of the development (e.g. re-orientation of blocks and building height adjustment on the towers).

Table 6: Terminology of the AVA Initial Study

Terminology	*Description*
Site spatial average velocity ratio (SVR)	The SVR represent the average VR of all perimeter test points at the site boundary as identified in the report.
Local spatial average velocity ratio (LVR)	The LVR represents the average VR of all points, i.e. perimeter and overall test points within the Assessment Area, as identified in the report.

4.9 TEST POINTS FOR SVR AND LVR

4.9.1 Test points are evenly placed along the site boundary and open spaces, on the streets and places of the Project and Assessment Areas which are accessed frequently by pedestrians for determining the pedestrian ventilation performance. Test points will be placed 2m above ground or podium level for determining the pedestrian ventilation performance. Three types of test points have been adopted in this study.

Perimeter Test Points

4.9.2 Perimeter test points are the points positioned at the site boundary of the Project Area. In accordance with the Technical Circular for AVA, 30 perimeter test points for site are evenly positioned in areas that are accessible to pedestrians as shown in **Figure 27**.

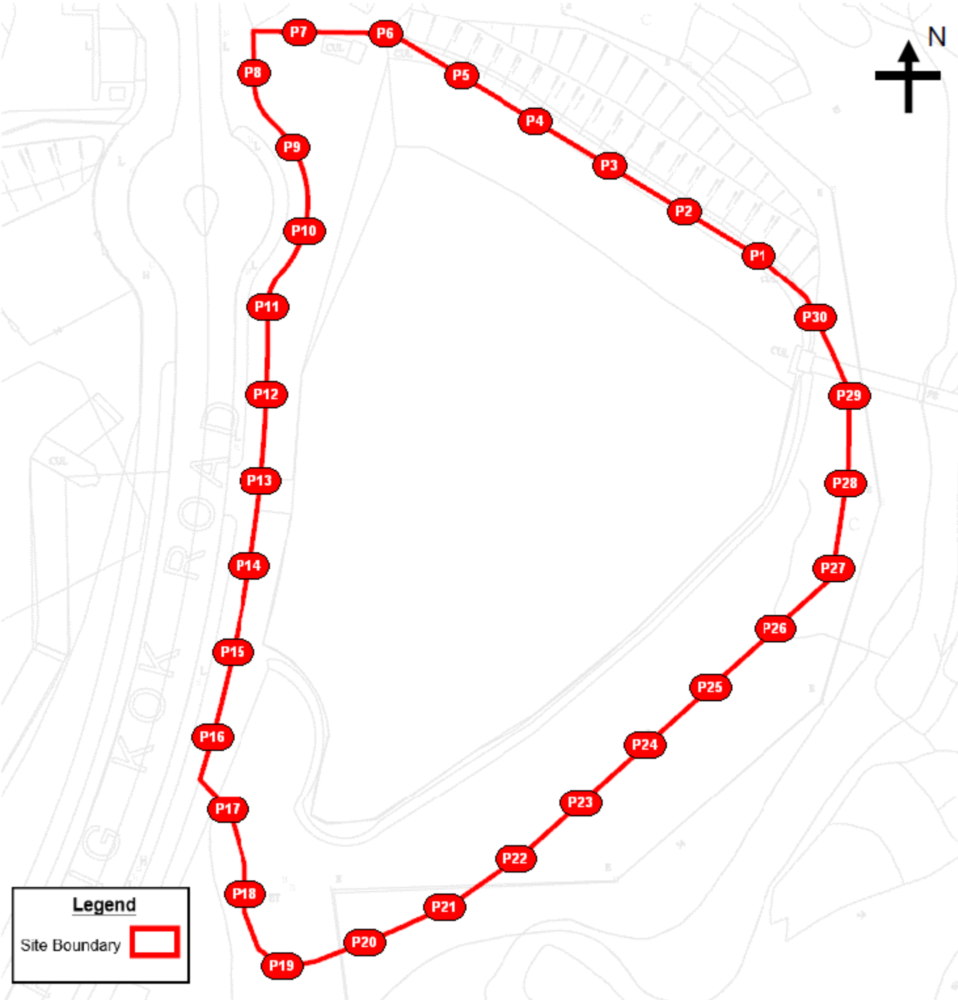


Figure 27: Location of the Perimeter Test Points

Overall Test Points

4.9.3 Overall test points are those points evenly positioned in the open spaces, on the streets and places where pedestrian frequently access within the Assessment Area. 59 overall test points are selected and shown in

4.9.4 **Figure** 28.

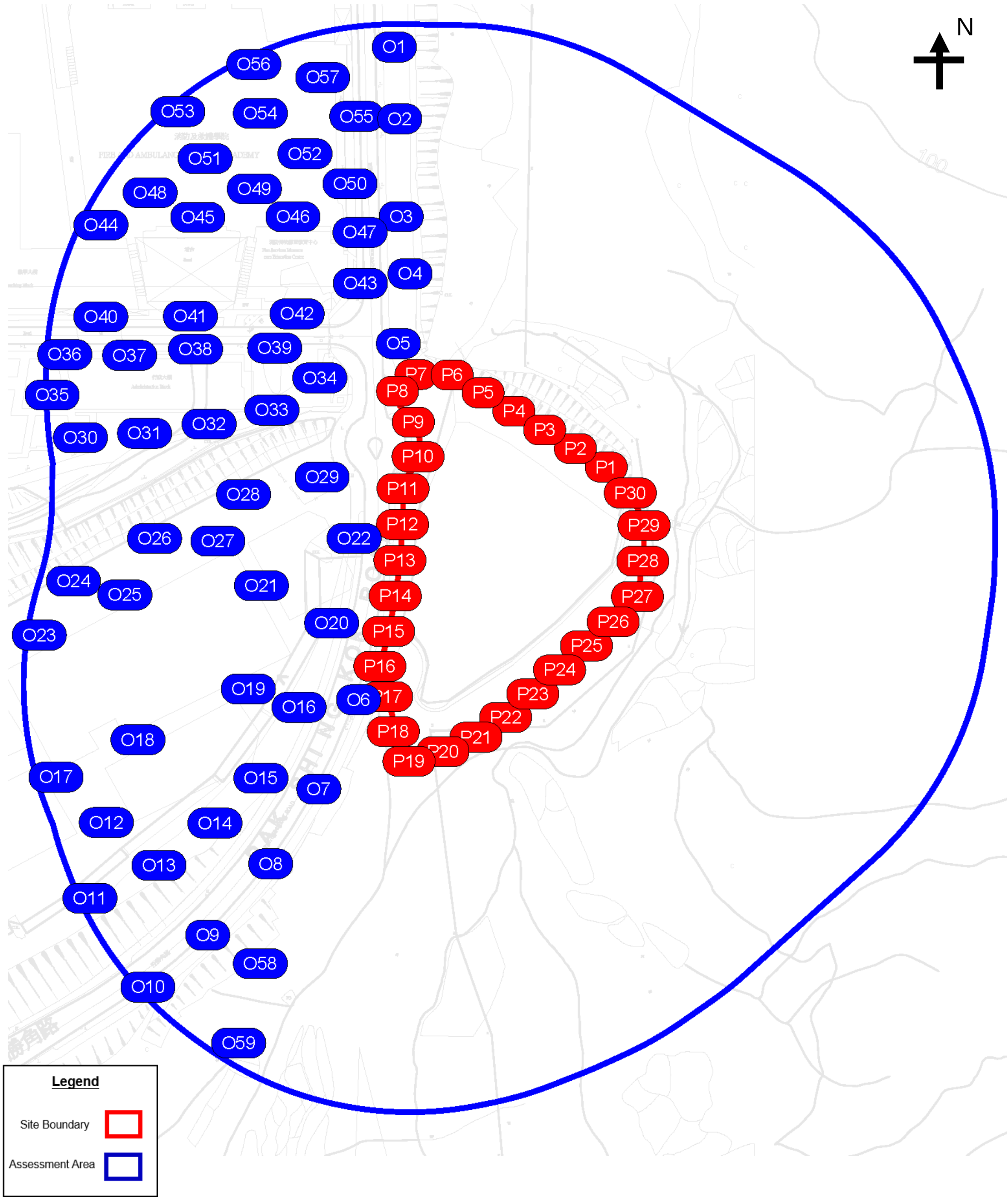


Figure 28: Location of the Overall Test Points

Special Test Points

4.9.5 Besides the overall test points, special test points are selected within the site boundary of Project Area. 4 special test points are selected as shown in **Figure 29**.

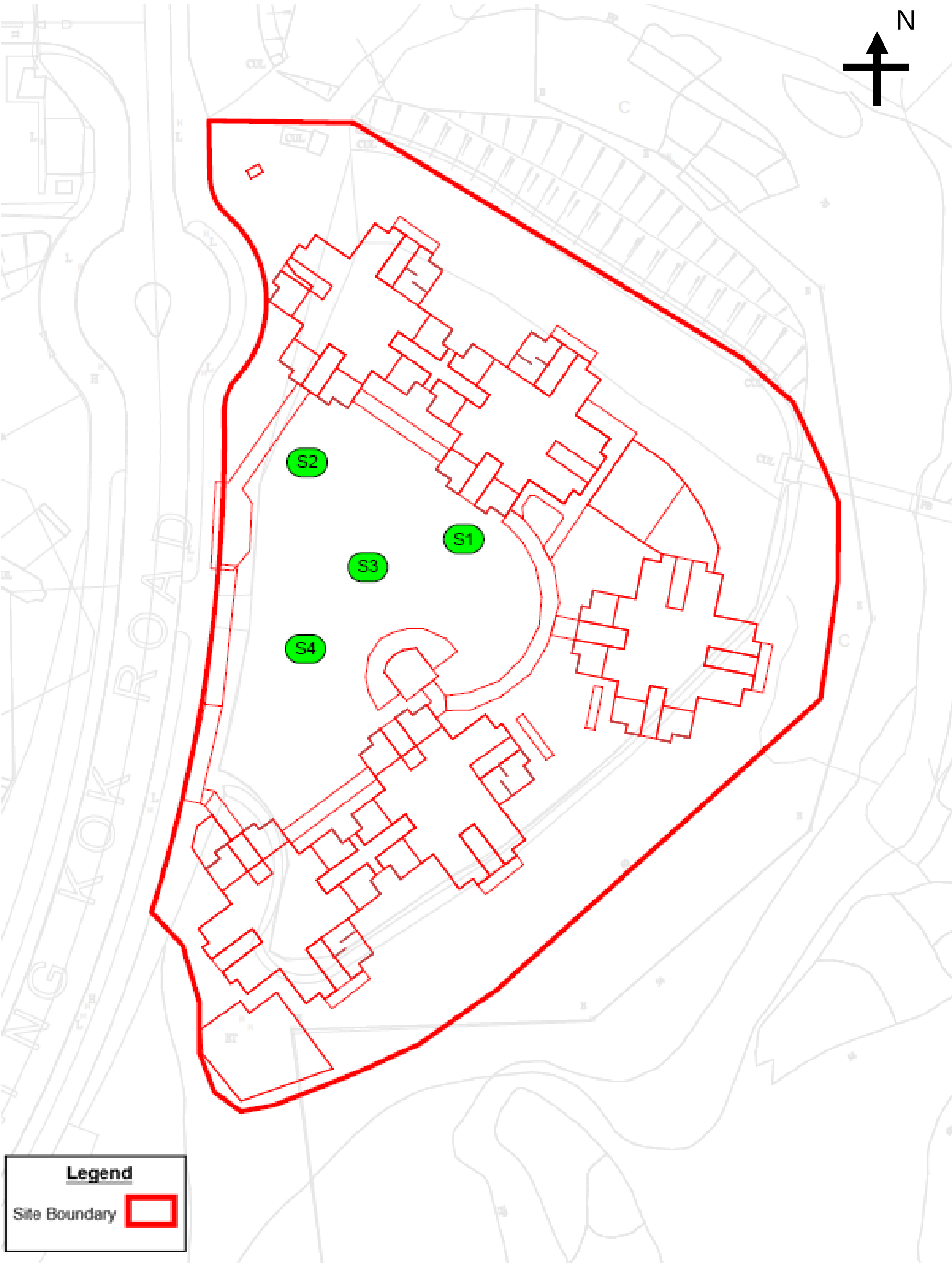


Figure 29: Location of the Special Test Points

Focus Areas

4.9.6 In addition to the SVR (i.e. P1-P30) and LVR (i.e. P1-30 and O1-O59), the spatial average wind velocity ratio of various focus areas will be presented for in-depth quantitative analysis. **Table 7** and **Figure 30** show the various focus areas and their representative test points.

Table 7: Focus Areas and their Representative Test Points

Focus Areas	Test Points
1. Pak Shing Kok Road	P9, P11, P13, P15 O1 – O10
2. Chinese Medicine Hospital and future GIC uses	O11 – O29
3. Fire and Ambulance Services Academy (FASA)	O30 – O57
4. Proposed Residential Development at R(A)7 Zone	O58 – O59
5. Special Test Points within Project Area	S1 – S4

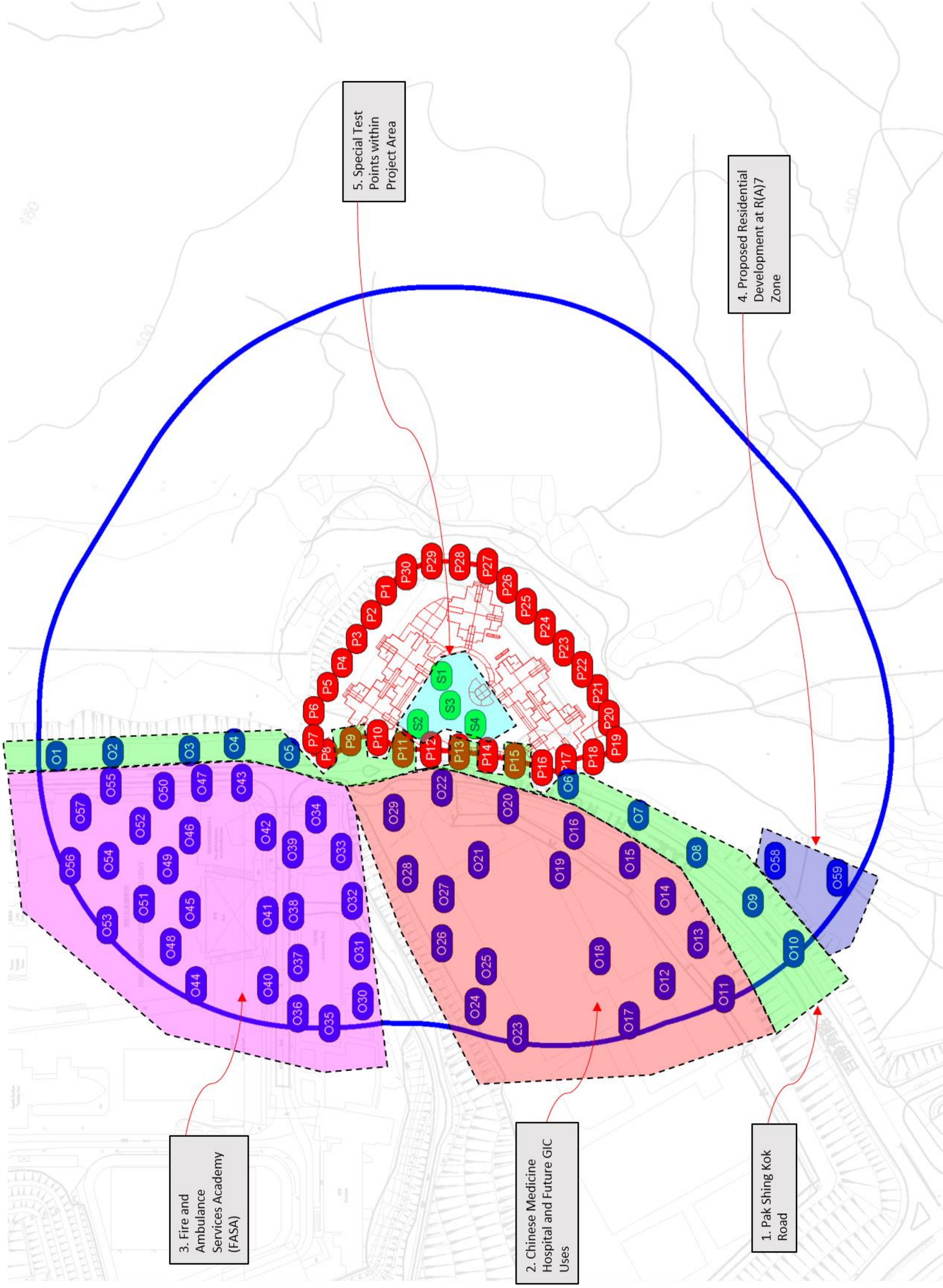


Figure 30: Location of the Focus Areas within the Assessment Area

5.0 RESULTS AND DISCUSSION

5.1.1 The following section presents the SVR, LVR and spatial average velocity ratio (SAVR) results of all focus areas for the Baseline Scheme and Proposed Scheme under annual and summer wind condition.

5.2 DIRECTIONAL ANALYSIS

NNE Wind

5.2.1 Under NNE wind, site wind availability of the Project Area mainly relies on undisturbed downhill wind from Sheung Yeung Shan.

5.2.2 In the Baseline Scheme, Towers A, B and C will obstruct NNE wind from entering the Project Area thus a portion of NNE wind is diverted eastwards to the Ha Yeung Shan (Purple Arrow in **Figure 32**) hence Towers A, B and C will affect wind flow to the Children's Playground within the Project Area. Hence, lower VRs are observed for the Special Test Points within Project Area when compared with the Proposed Scheme. In addition, Block 1 of "Chinese Medicine Hospital and Future GIC Uses" causes a portion of NNE wind to be diverted southwards (Blue Arrow in **Figure 32**).

5.2.3 In the Proposed Scheme, the high-rise nature of Towers 1 and 2 will result in downwash effect (Purple Arrows in **Figure 34**). As the Proposed Scheme adopted a higher permeability design, NNE wind is observed to penetrate through the Project Area via the building gap between Towers 1 & 2 and Towers 2 & 3 (Blue Arrows in **Figure 34**). As mentioned in Section 2.2.6 to 2.2.9, the building separation between Tower 2 and Tower 3 is only valid above 71.30mPD as low-rise structures (i.e. street fire hydrant water tank & pump room and water scrubber room and refuse storage and material recovery chamber) occupy the space between Tower 2 and Tower 3. Hence, higher VRs are observed for the Open Area within the Project Area when compared with the Baseline Scheme. Consequently, combined with wind flow from the northern section of Pak Shing Kok Road, the higher site permeability also resulted in more NNE wind flow to improve the ventilation performance of the immediate downstream regions thus higher VR is observed around the area immediate southwest of the Project Area when compared with the Baseline Scheme (Magenta Arrow in **Figure 34**).

5.2.4 However, drawback of the higher permeability design of the Proposed Scheme is that less wind flow is directed towards the Chinese Medicine Hospital and Future GIC Uses, hence lower VR is observed for this region when compared to the Baseline Scheme. In other words, the wall-like nature of the Baseline Scheme is able to direct more wind flow to the Chinese Medicine Hospital and Future GIC Uses (Orange Arrow in **Figure 32**) when compared with the Proposed Scheme. In addition, the effect of the fence wall is shown to be localized and does not pose a significant adverse impact to the pedestrian wind environment of the immediate surroundings as the fence wall is permeable

5.2.5 **Figure 31** and **Figure 33** shows the VR contour plots for the Baseline Scheme and Proposed Scheme respectively. **Figure 32** and **Figure 34** shows the VR vector plots for the Baseline Scheme and Proposed Scheme respectively.

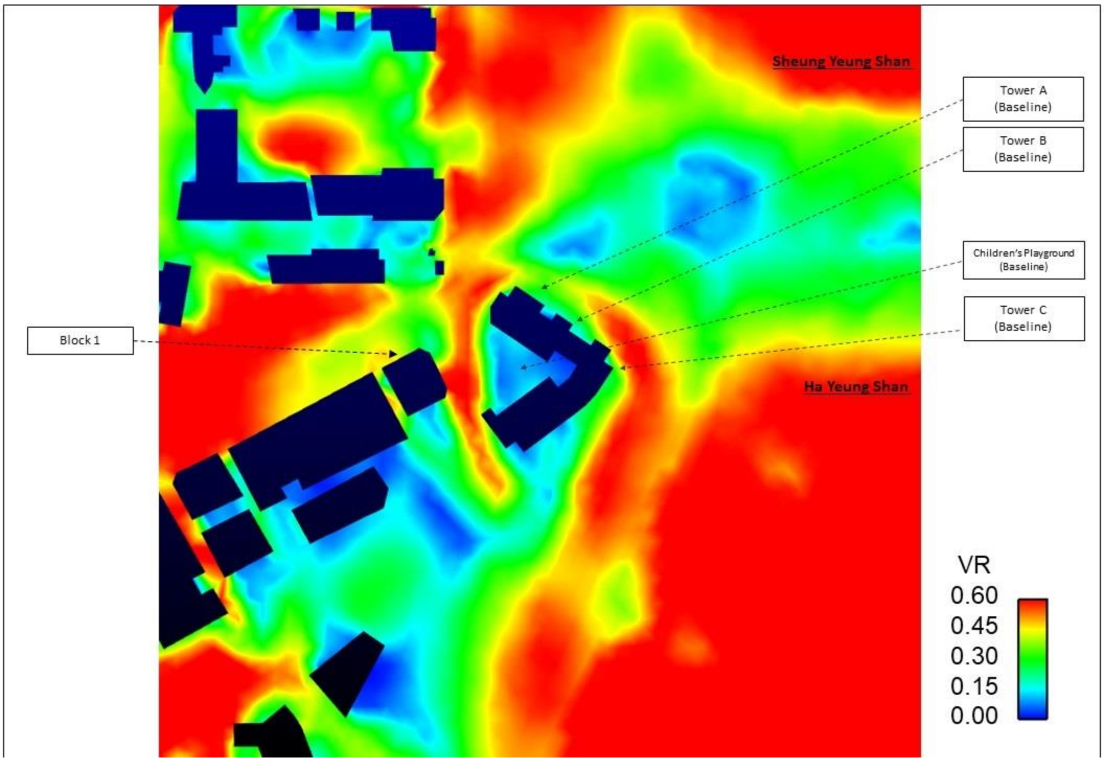


Figure 31: VR Contour Plot at Pedestrian Level under NNE Wind for Baseline Scheme

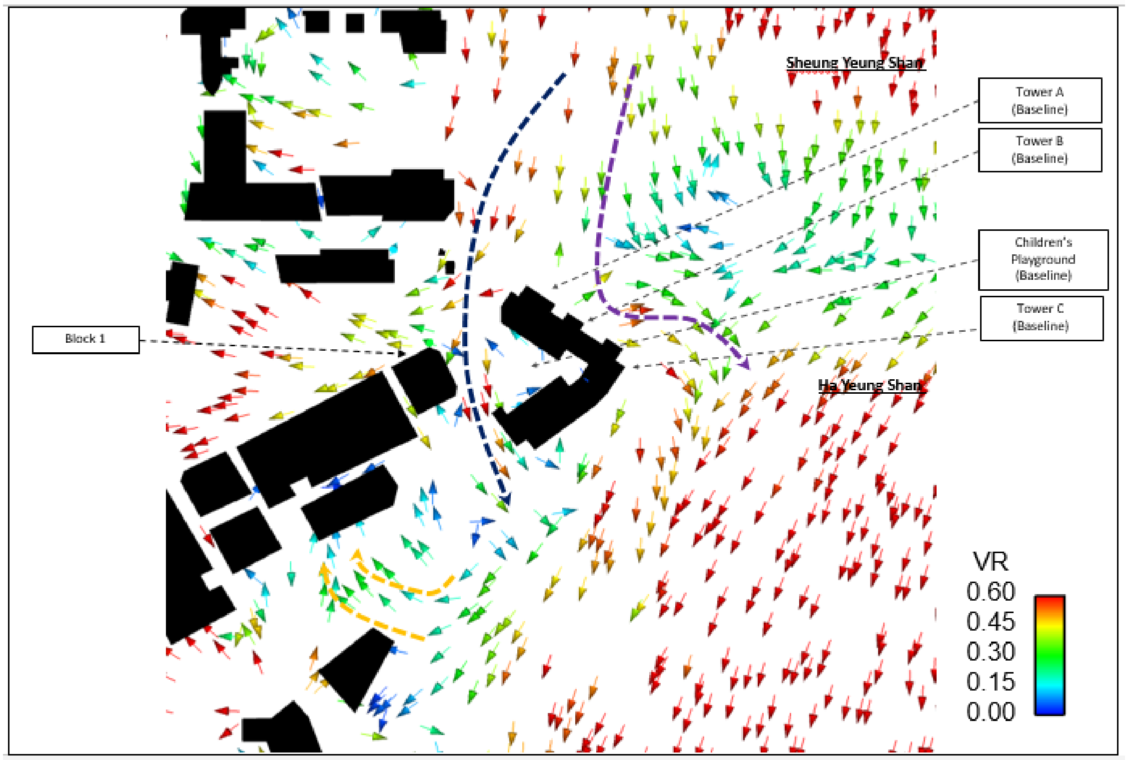


Figure 32: VR Vector Plot at Pedestrian Level under NNE Wind for Baseline Scheme

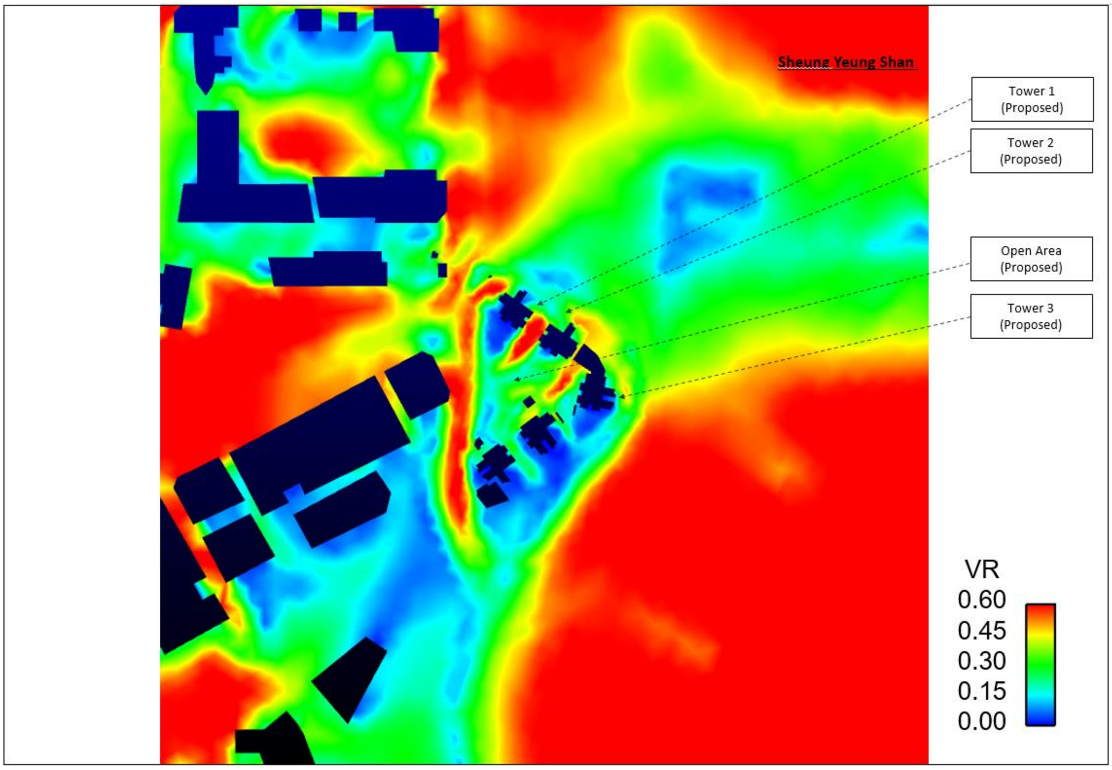


Figure 33: VR Contour Plot at Pedestrian Level under NNE Wind for Proposed Scheme

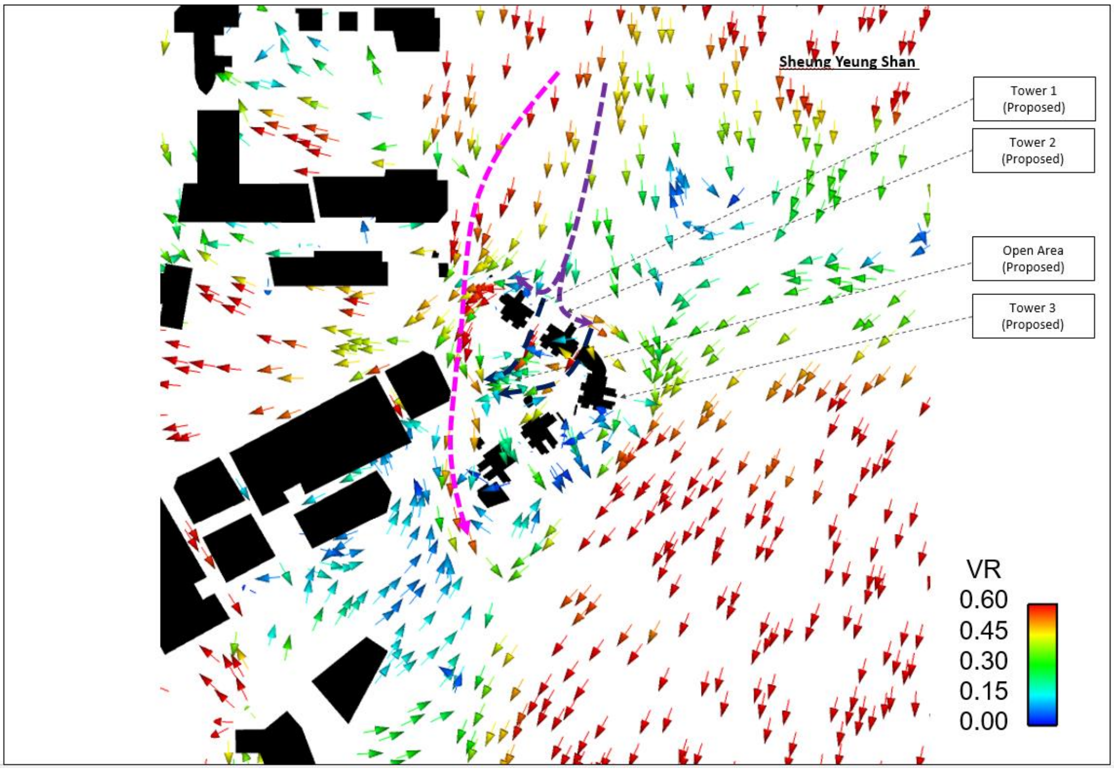


Figure 34: VR Vector Plot at Pedestrian Level under NNE Wind for Proposed Scheme

NE Wind

5.2.6 Similar to NNE wind, site wind availability of the Project Area mainly relies on undisturbed downhill wind from Sheung Yeung Shan.

5.2.7 In the Baseline Scheme, the high-rise nature of Towers A, B and C will result in downwash effect, which diverted high-level wind towards pedestrian level (Purple Arrows in **Figure 36**). Towers A, B and C would also cause some obstruction to the NE wind thus affecting wind flow to the Children's Playground within the Project Area. Hence, lower VRs are observed for the Special Test Points within Project Area when compared with the Proposed Scheme. In addition, Block 1 of "Chinese Medicine Hospital and Future GIC Uses" causes a portion of NNE wind to be diverted westwards (Blue Arrow in **Figure 36**).

5.2.8 In the Proposed Scheme, the high-rise nature of Towers 1 and 2 will also result in downwash effect (Purple Arrows in **Figure 38**). In addition, the higher permeability design is adopted and NNE wind is observed to penetrate through the Project Area via the building gap between Towers 1 & 2 and Towers 2 & 3 (Blue Arrows in **Figure 38**). Hence, higher VRs are observed for the Open Area within the Project Area when compared with the Baseline Scheme. Similar to NNE wind, combined with wind flow from the northern section of Pak Shing Kok Road, the higher site permeability also resulted in more NE wind flow to improve the ventilation performance of the immediate downstream regions thus higher VR is observed around the area immediate southwest of the Project Area when compared with the Baseline Scheme (Magenta Arrow in **Figure 38**).

5.2.9 Similar to NNE wind, the drawback of the higher permeability design of the Proposed Scheme is that less wind flow is directed towards the further downstream areas thus more downwash effect is observed in the Baseline Scheme when compared to the Proposed Scheme (Orange Arrows in **Figure 36**). Consequently, this results in a lower VR for the Chinese Medicine Hospital and Future GIC Uses as well as the region immediate north of the Proposed Residential Development at R(A)7 Zone in the Proposed Scheme when compared to the Baseline Scheme. In addition, the effect of the fence wall is shown to be localized and does not pose a significant adverse impact to the pedestrian wind environment of the immediate surroundings as the fence wall is permeable

5.2.10 **Figure 35** and **Figure 37** shows the VR contour plots for the Baseline Scheme and Proposed Scheme respectively. **Figure 36** and **Figure 38** shows the VR vector plots for the Baseline Scheme and Proposed Scheme respectively.

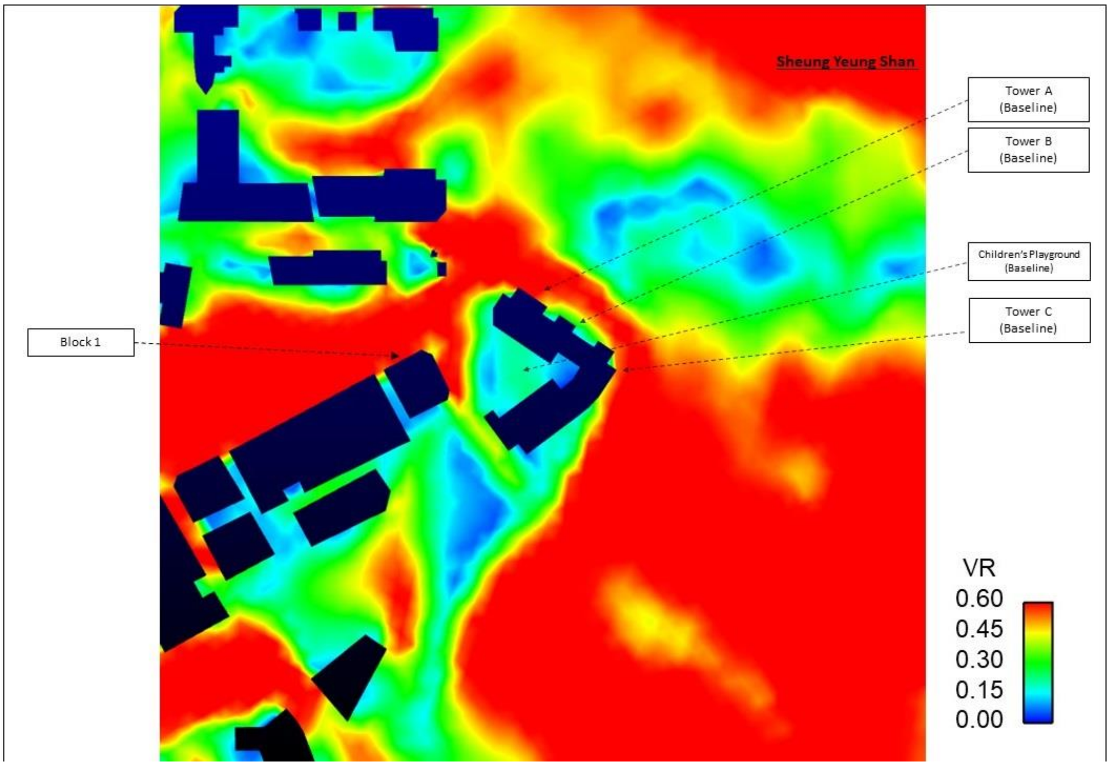


Figure 35: VR Contour Plot at Pedestrian Level under NE Wind for Baseline Scheme

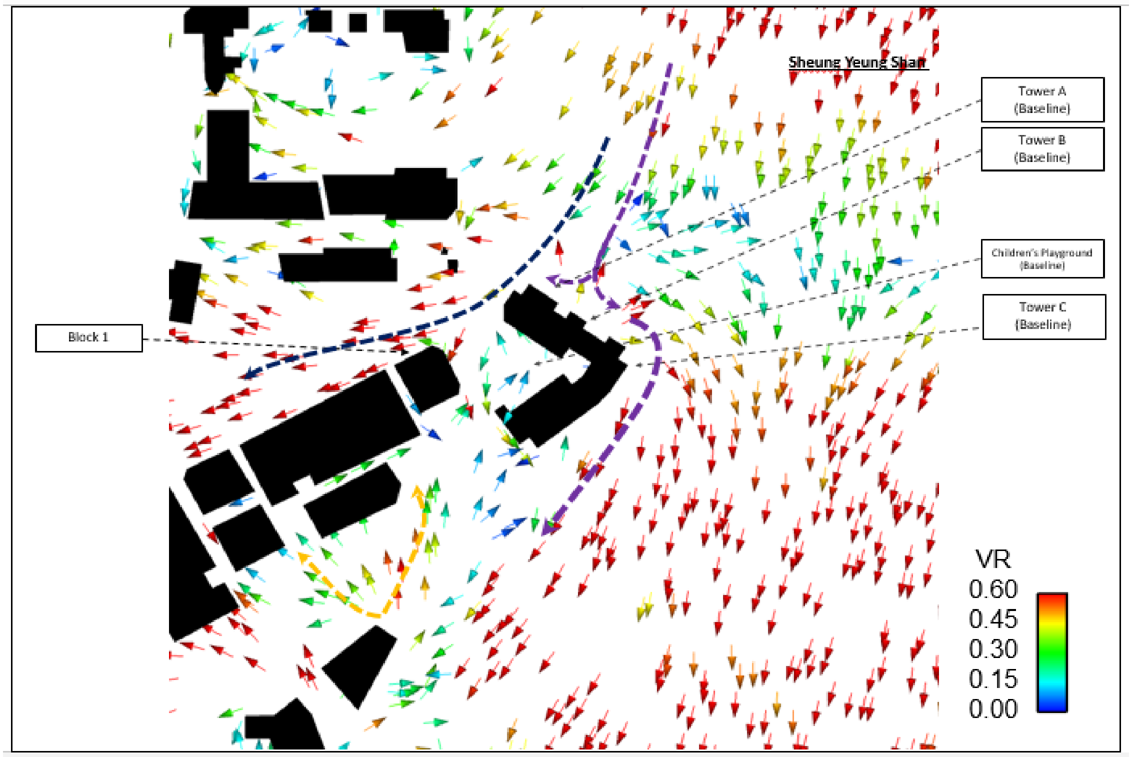


Figure 36: VR Vector Plot at Pedestrian Level under NE Wind for Baseline Scheme

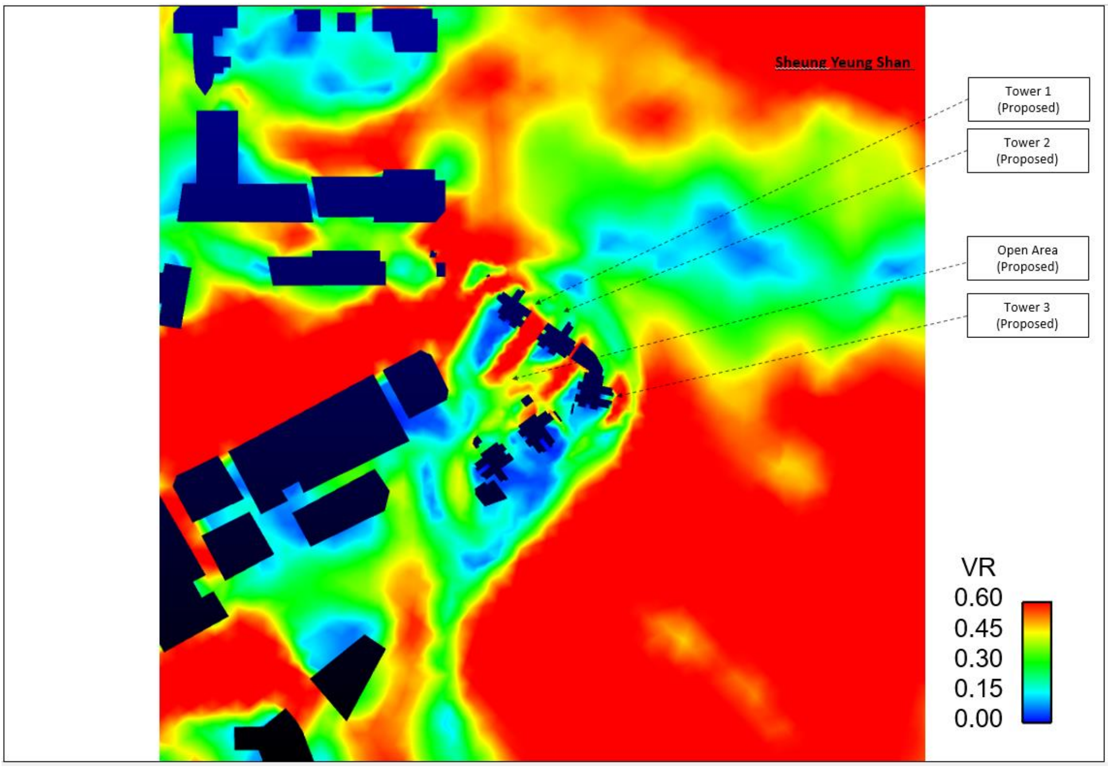


Figure 37: VR Contour Plot at Pedestrian Level under NE Wind for Proposed Scheme

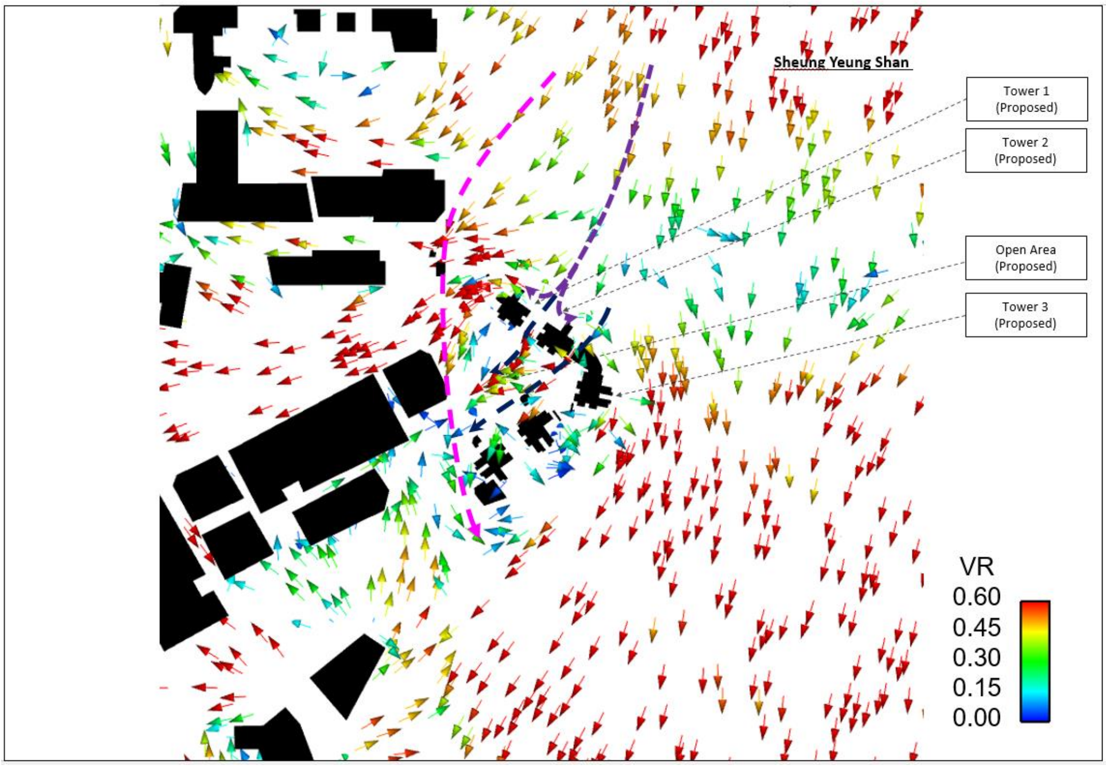


Figure 38: VR Vector Plot at Pedestrian Level under NE Wind for Proposed Scheme

ENE Wind

5.2.11 Under ENE wind, site wind availability of the Project Area mainly relies on undisturbed downhill wind from Sheung Yeung Shan.

5.2.12 In the Baseline Scheme, Tower A and Tower B would cause some obstruction to the ENE wind and divert the ENE wind flow towards the northwest (Purple Arrows in **Figure 40**). In addition, Tower C to Tower E would also cause some obstruction to the ENE and direct wind flow to the Block 3 of "Chinese Medicine Hospital and Future GIC Uses". Subsequently, Block 3 of "Chinese Medicine Hospital and Future GIC Uses" will divert some ENE wind flow back towards the Children's Playground in Project Area (Blue Arrow in **Figure 40**).

5.2.13 In the Proposed Scheme, the higher permeability design allowed ENE wind to penetrate through the Project Area at pedestrian level via the building gap between Towers 1 & 2 and Towers 2 & 3 (Purple Arrows in **Figure 42**). Hence, higher VRs are observed for the Open Area within the Project Area when compared with the Baseline Scheme. In addition, Towers 1 and 2 also diverted more wind towards the northwest thus higher VRs are observed for the region between the Administration Block and Fire Services Museum cum Education Centre of FASA (Magenta Arrow in **Figure 42**). However, Tower 3 to Tower 5 and the low-rise structure of LV Switch Room would cause some obstruction to the ENE wind thus affecting some wind flow to Pak Shing Kok Road (Blue Arrow in **Figure 42**) hence lower VRs are observed for Pak Shing Kok Road when compared with the Baseline Scheme.

5.2.14 The higher permeability design of the Proposed Scheme allows more wind flow to penetrate through the Project Area to create a zone of higher pressure within the Project Area. In comparison, the wall-like nature of the Baseline Scheme creates a zone of lower pressure within the Project Area when compared with the Project Scheme. As a result, this causes more downwash and backflow towards the Project Area in the Baseline Scheme (Blue Arrow in **Figure 40**) thus higher VRs are observed at the Chinese Medicine Hospital and Future GIC Uses as well as the section of Pak Shing Kok Road immediate west of the Project Area when compared to the Proposed Scheme. In addition, the effect of the fence wall is shown to be localized and does not pose a significant adverse impact to the pedestrian wind environment of the immediate surroundings as the fence wall is permeable

5.2.15 **Figure 39** and **Figure 41** shows the VR contour plots for the Baseline Scheme and Proposed Scheme respectively. **Figure 40** and **Figure 42** shows the VR vector plots for the Baseline Scheme and Proposed Scheme respectively.

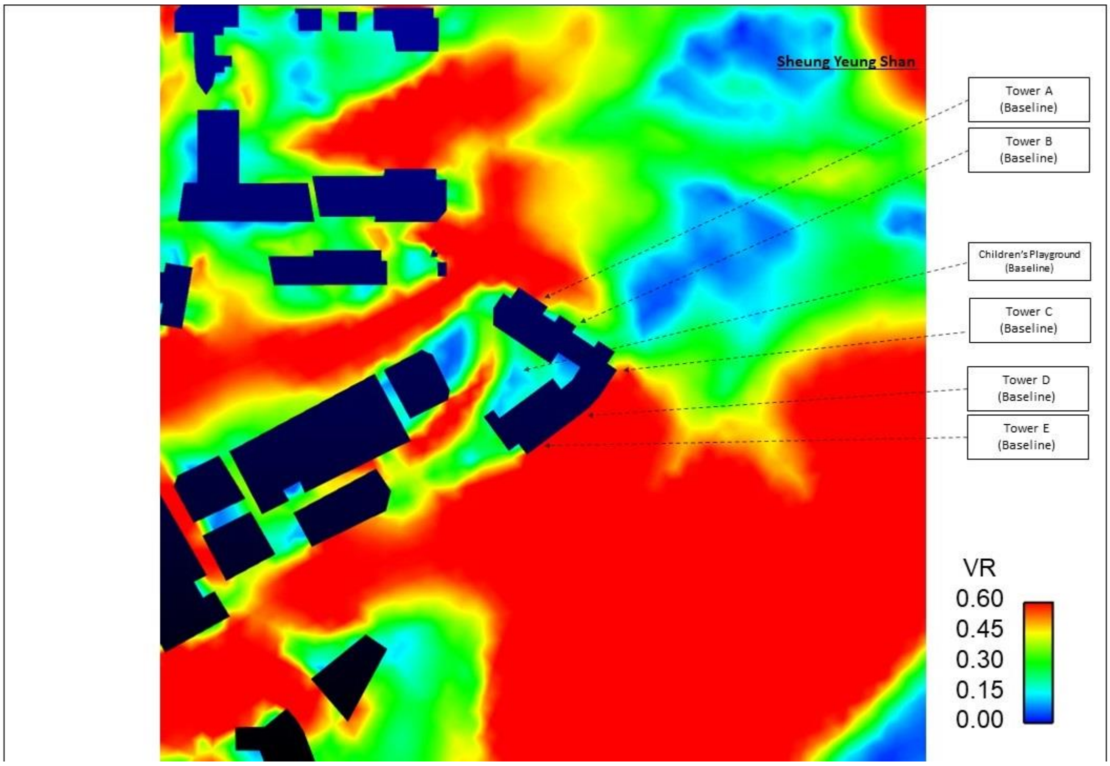


Figure 39: VR Contour Plot at Pedestrian Level under ENE Wind for Baseline Scheme

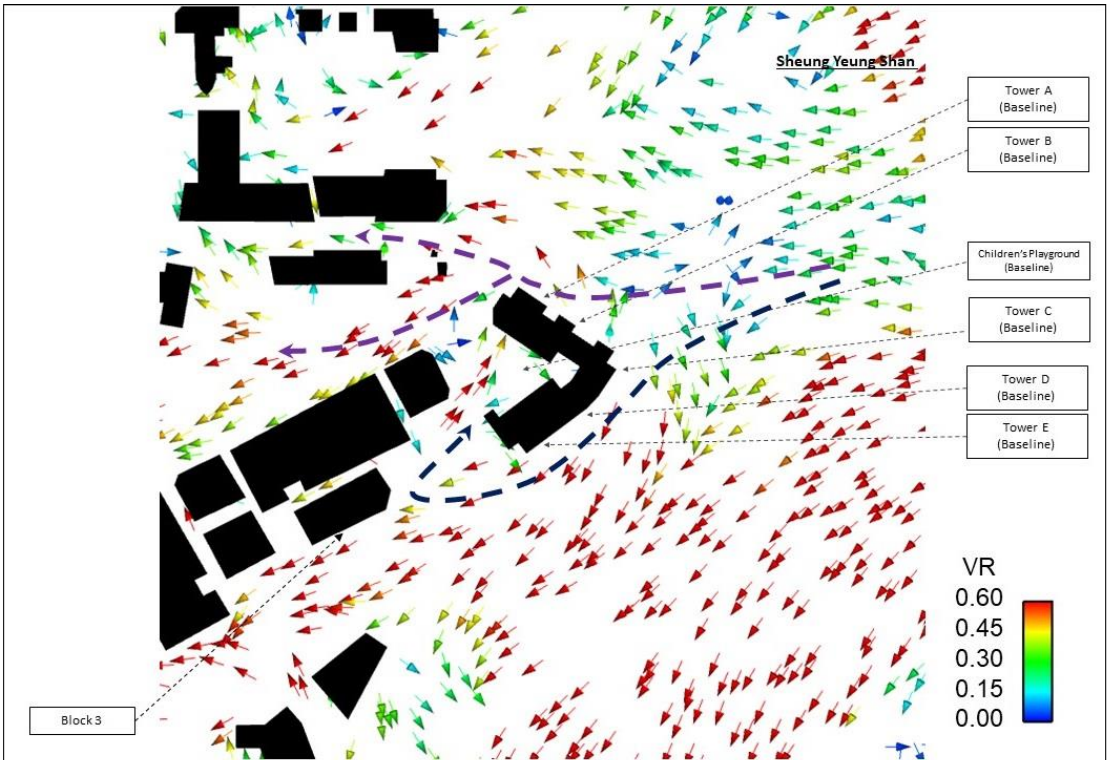


Figure 40: VR Vector Plot at Pedestrian Level under ENE Wind for Baseline Scheme

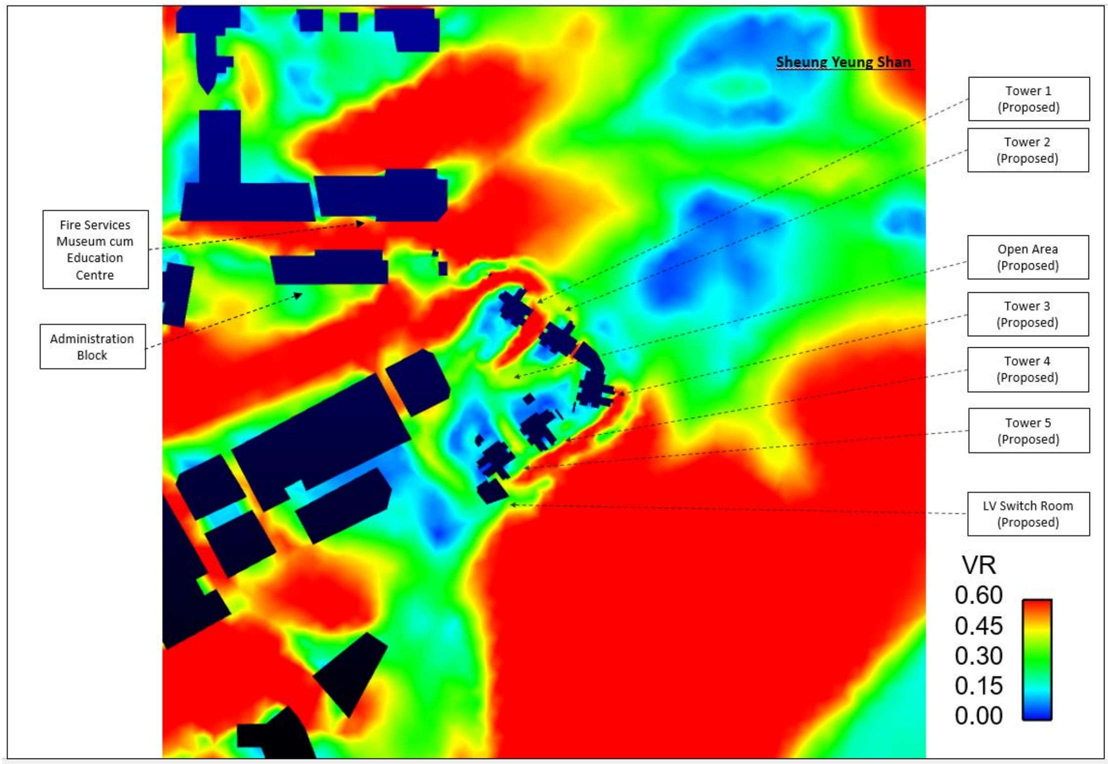


Figure 41: VR Contour Plot at Pedestrian Level under ENE Wind for Proposed Scheme

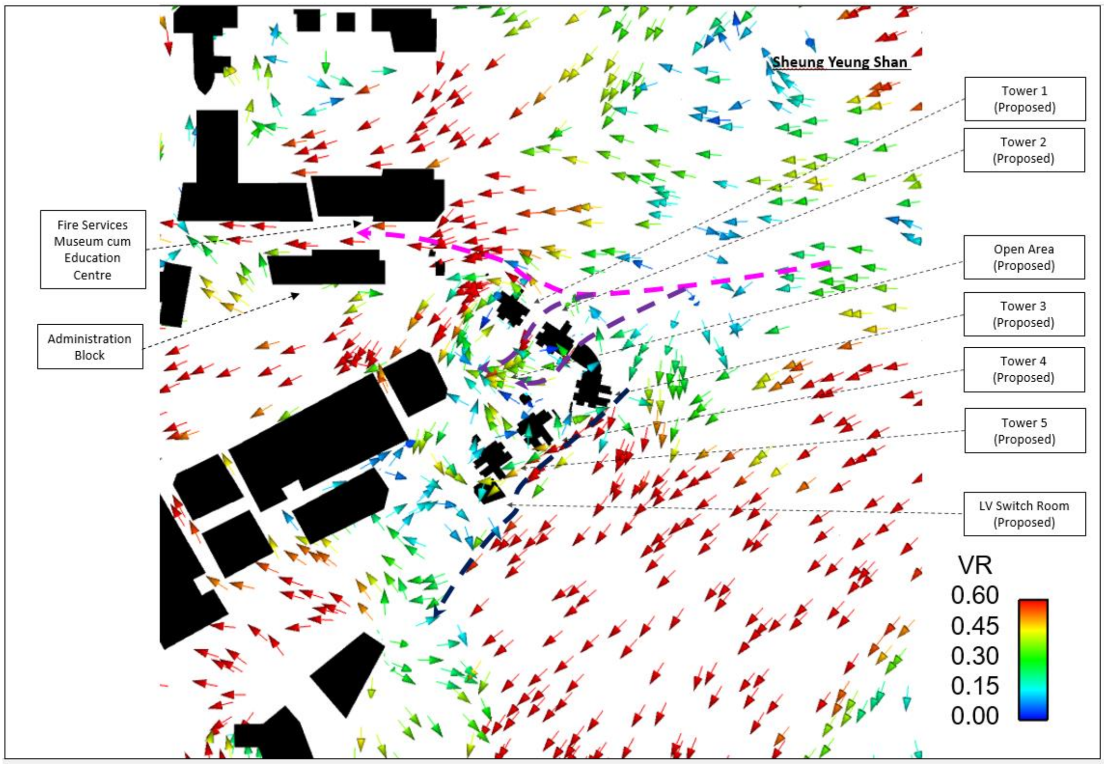


Figure 42: VR Vector Plot at Pedestrian Level under ENE Wind for Proposed Scheme

E Wind

5.2.16 Under E wind, site wind availability of the Project Area mainly relies on undisturbed downhill wind from Sheung Yeung Shan and Ha Yeung Shan.

5.2.17 In the Baseline Scheme, Towers A, B & C and Towers C, D & E would cause a portion of E wind to be diverted backwards towards Ha Yeung Shan hence turbulence zones are observed in the upwind regions (Purple Arrows in **Figure 44**). In addition, Fire Services Museum cum Education Centre of FASA would divert E wind southwards towards Tower A, which then subsequently diverts the wind towards the "Chinese Medicine Hospital and Future GIC Uses" hence higher VR is observed when compared with the Proposed Scheme (Blue Arrow in **Figure 44**).

5.2.18 In the Proposed Scheme, Towers 1, 2 & 3 and Towers 3, 4 & 5 would also cause a portion of E wind to be diverted backwards towards Ha Yeung Shan hence turbulence zones are observed in the upwind regions (Purple Arrows in **Figure 46**). However, due to the higher permeability design of the Proposed Scheme, a portion of E wind is able to penetrate through the Project Area via the building gap between Towers 1 & 2 and building separation between Towers 3 & 4 to ventilate the Open Area and immediate downstream regions hence higher VRs are observed for the Open Area within the Project Area when compared with the Baseline Scheme (Blue Arrows in **Figure 46**).

5.2.19 Two high velocity air paths either side of Tower 1 creates a wake zone immediately behind Tower 1 which otherwise is absent in the Baseline Scheme. In contrast, the wall-like nature of the Baseline Scheme creates a zone of lower pressure within the Project Area when compared with the Project Scheme. As a result, this causes more downwash and backflow towards the Project Area in the Baseline Scheme (Orange Arrow in **Figure 44**). In addition, the effect of the fence wall is shown to be localized and does not pose a significant adverse impact to the pedestrian wind environment of the immediate surroundings as the fence wall is permeable

5.2.20 **Figure 43** and **Figure 45** shows the VR contour plots for the Baseline Scheme and Proposed Scheme respectively. **Figure 44** and **Figure 46** shows the VR vector plots for the Baseline Scheme and Proposed Scheme respectively.

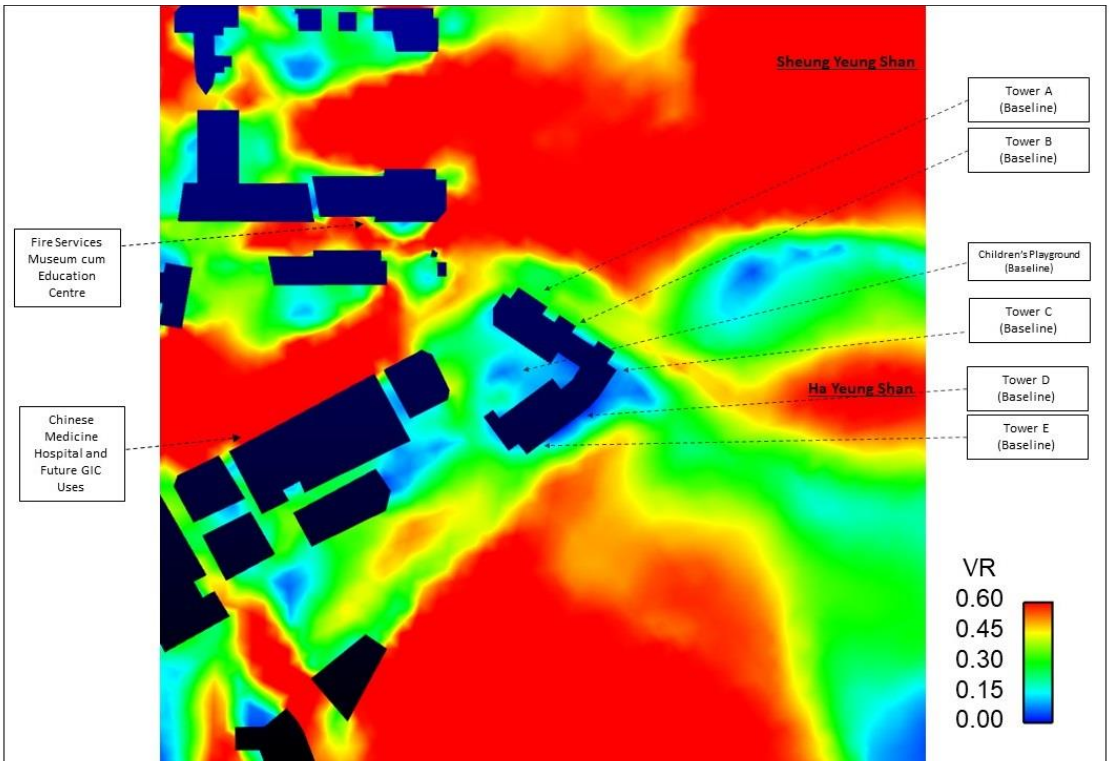


Figure 43: VR Contour Plot at Pedestrian Level under E Wind for Baseline Scheme

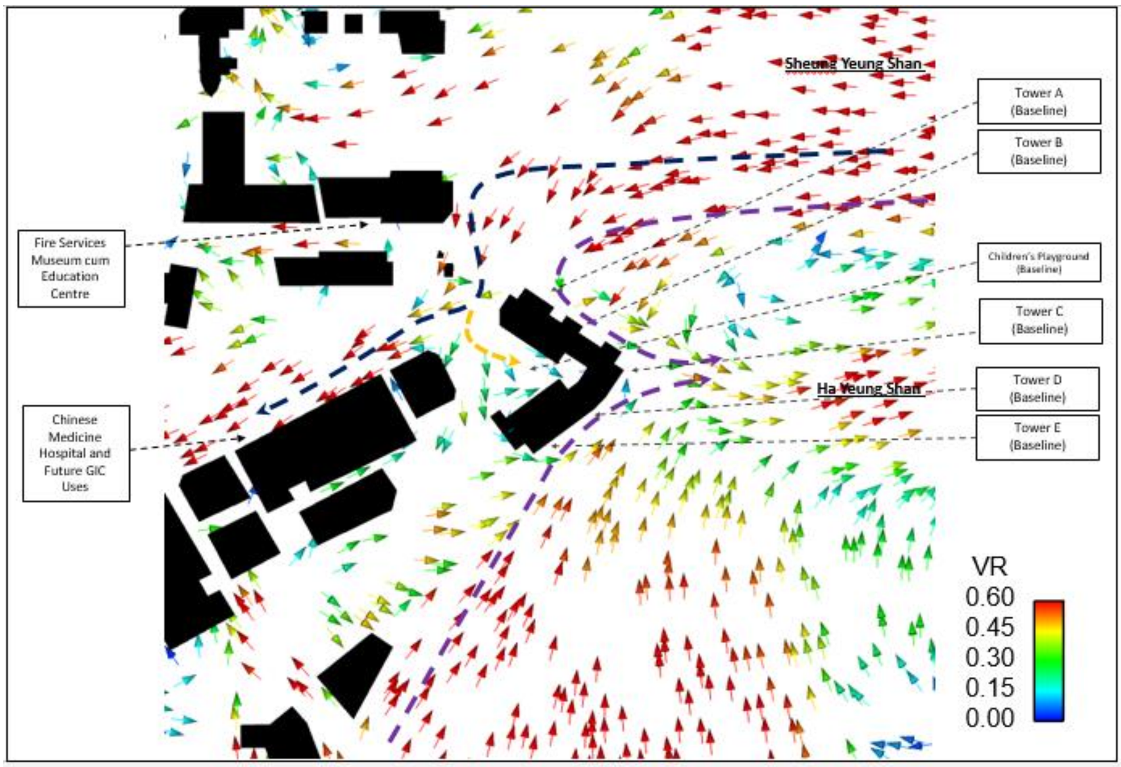


Figure 44: VR Vector Plot at Pedestrian Level under E Wind for Baseline Scheme

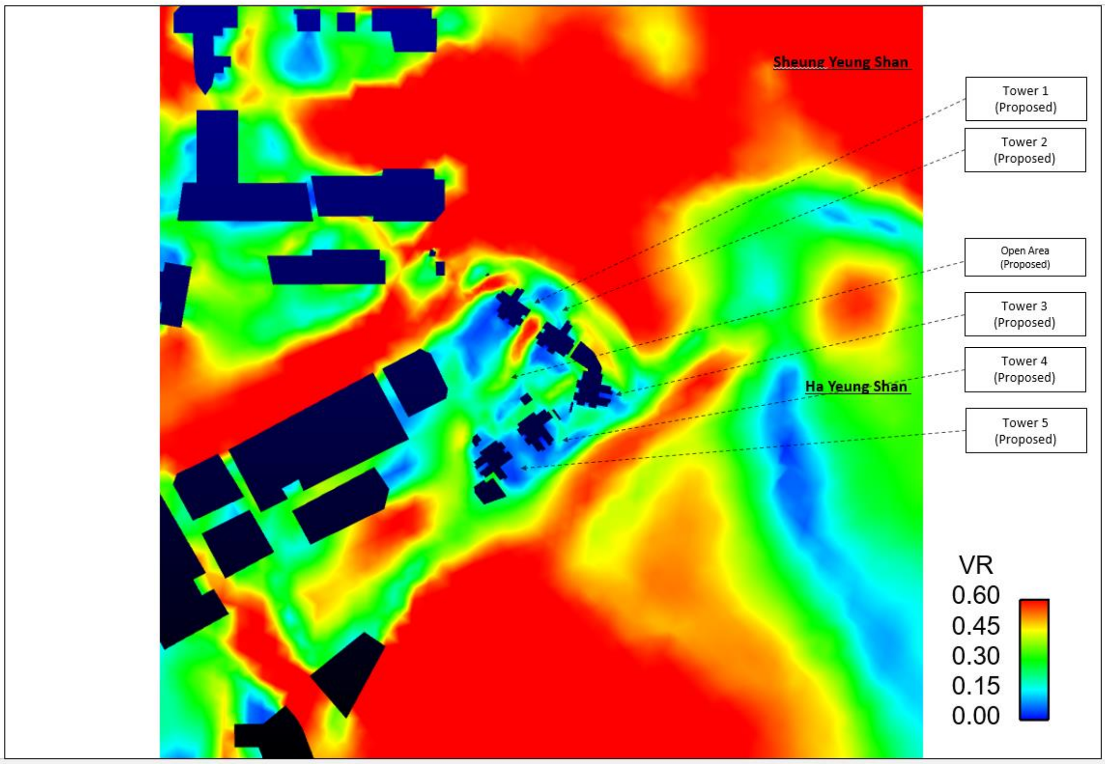


Figure 45: VR Contour Plot at Pedestrian Level under E Wind for Proposed Scheme

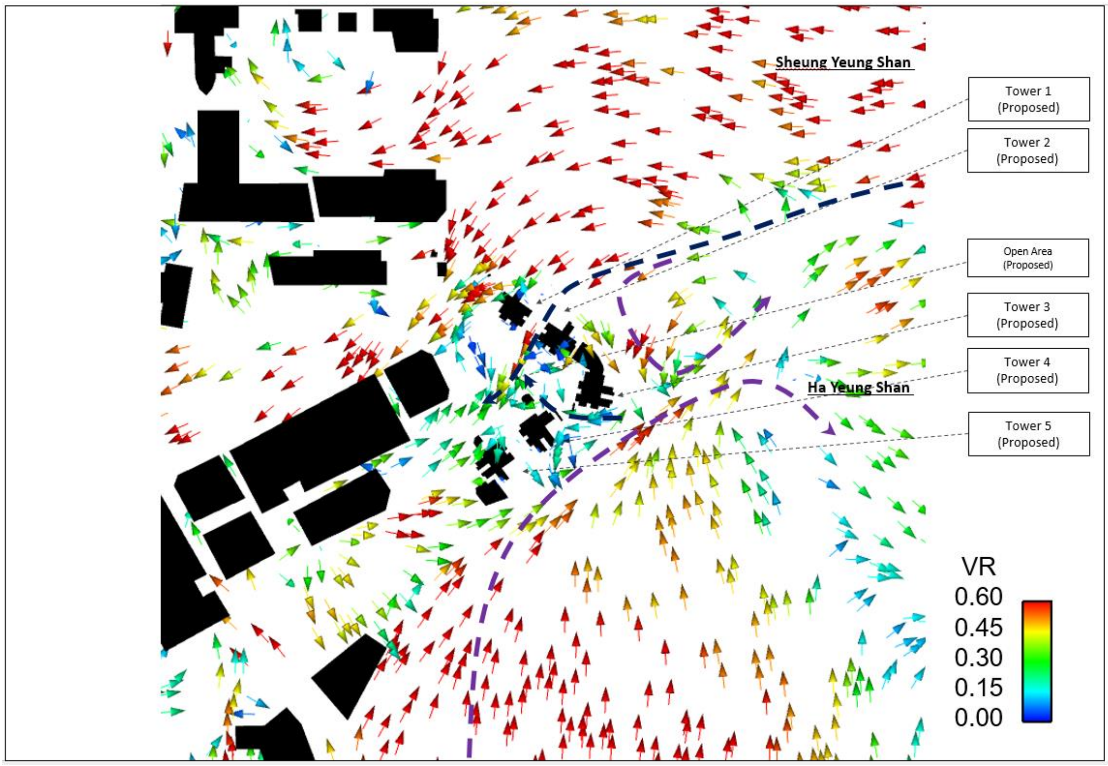


Figure 46: VR Vector Plot at Pedestrian Level under E Wind for Proposed Scheme

ESE Wind

5.2.21 Under ESE wind, site wind availability of the Project Area mainly relies on undisturbed downhill wind from Miu Tsai Tun.

5.2.22 In the Baseline Scheme, downwash effect is observed as a result of the high-rise nature of Towers C, D & E with Tower C diverting a portion of ESE wind towards the north (Purple Arrow in **Figure 48**). In addition, Block 1 of "Chinese Medicine Hospital and Future GIC Uses" diverted the ESE wind towards Tower A, which then subsequently diverted a portion of ESE wind towards the "Chinese Medicine Hospital and Future GIC Uses" hence higher VR is observed when compared with the Proposed Scheme (Blue Arrow in **Figure 48**).

5.2.23 In the Proposed Scheme, downwash effect is also observed as a result of the high-rise nature of Towers 3, 4 & 5 (Purple Arrows in **Figure 50**). In addition, the higher permeability design of the Proposed Scheme allowed more ESE wind to penetrate through the Project Area via the building separation between Towers 3 & 4 and building gap between Towers 4 & 5 thus more wind flow is able to reach the Open Area within the Project Area. Hence, higher VRs are observed for the Open Area within Project Area when compared with the Baseline Scheme (Blue Arrows in **Figure 50**).

5.2.24 Drawback of the higher permeability design of the Proposed Scheme is that this creates a wake zone immediately behind Tower 1 and Tower 2 which otherwise is absent in the Baseline Scheme. In contrast, the towers in the Baseline Scheme are packed closer together, which allows more wind flow to be directed towards the immediate downstream regions north of the Project Area (Orange Arrow in **Figure 48**). In addition, the effect of the fence wall is shown to be localized and does not pose a significant adverse impact to the pedestrian wind environment of the immediate surroundings as the fence wall is permeable

5.2.25 **Figure 47** and **Figure 49** shows the VR contour plots of ESE wind for the Baseline Scheme and Proposed Scheme respectively. **Figure 48** and **Figure 50** shows the VR vector plots of ESE wind for the Baseline Scheme and Proposed Scheme respectively.

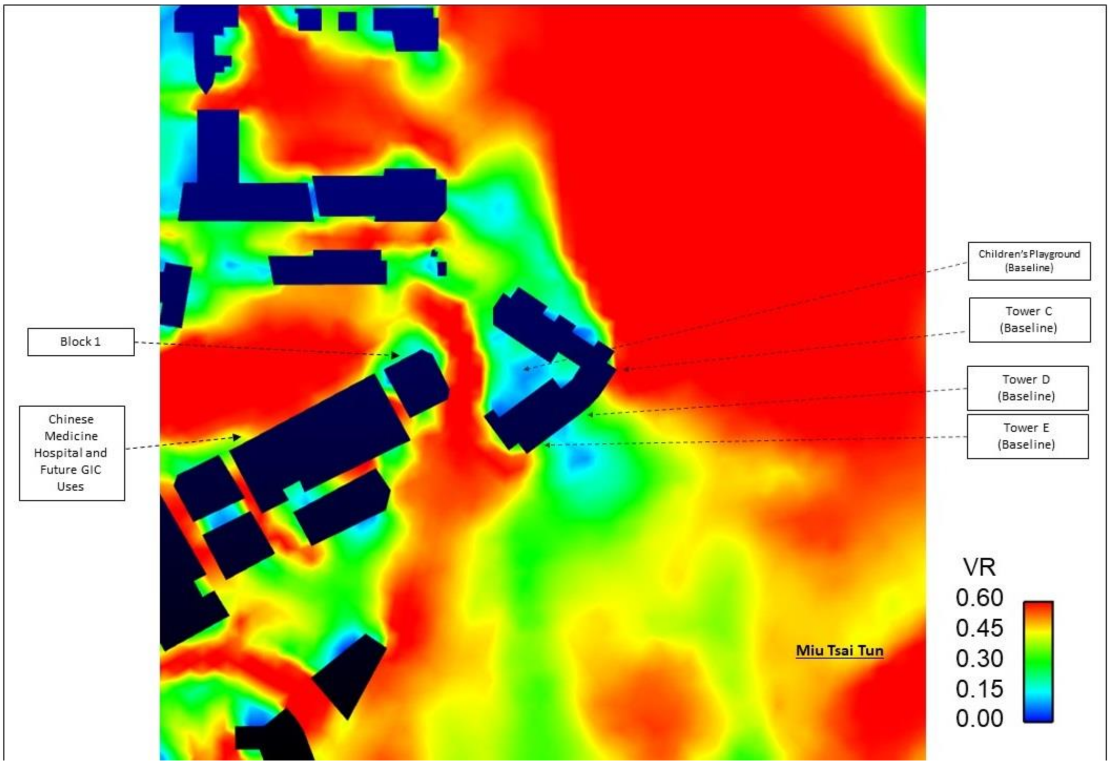


Figure 47: VR Contour Plot at Pedestrian Level under ESE Wind for Baseline Scheme

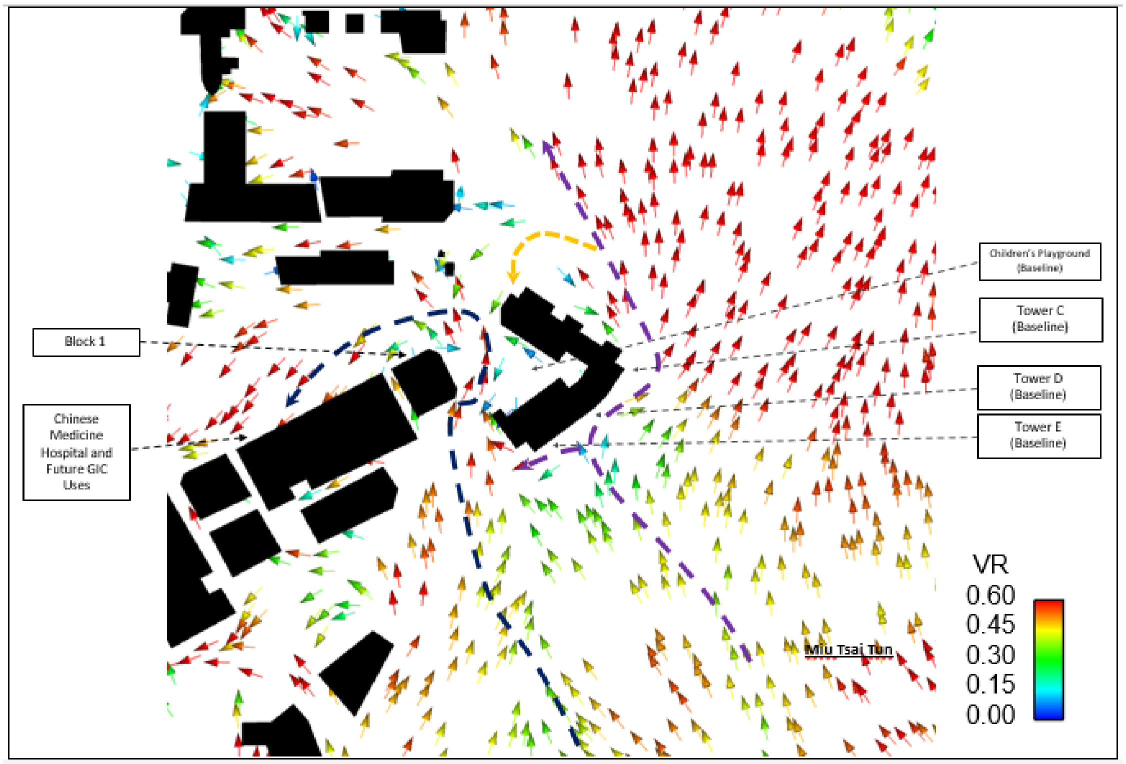


Figure 48: VR Vector Plot at Pedestrian Level under ESE Wind for Baseline Scheme

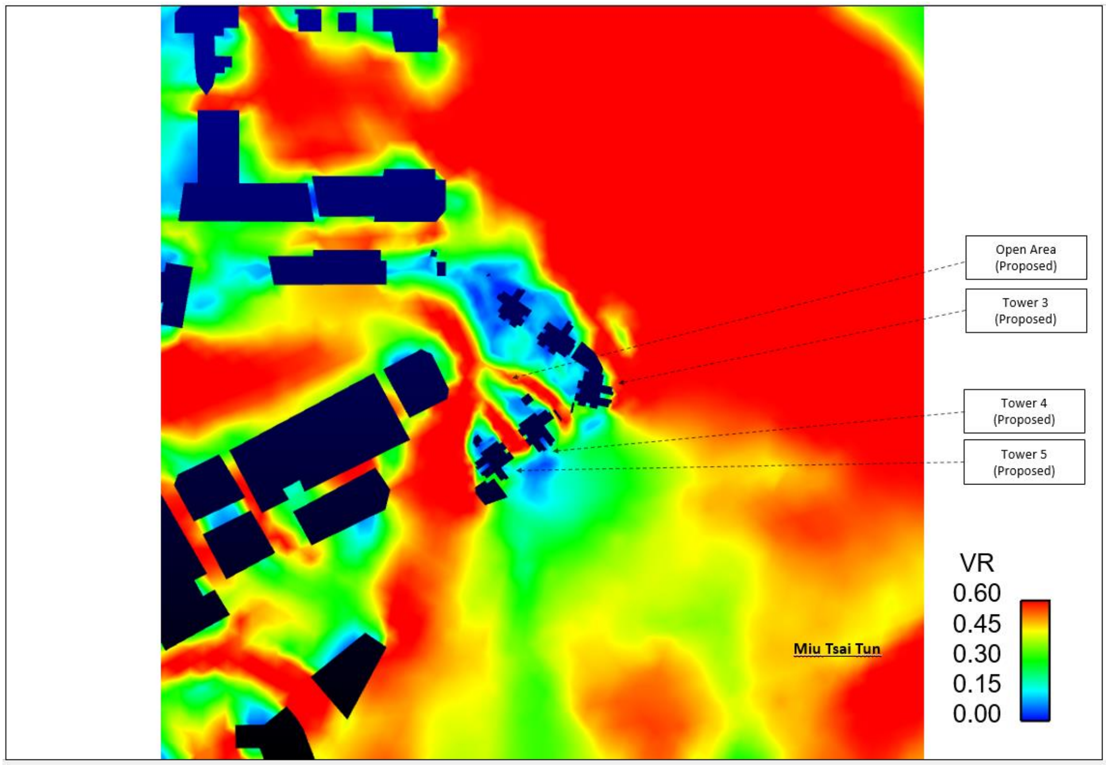


Figure 49: VR Contour Plot at Pedestrian Level under ESE Wind for Proposed Scheme

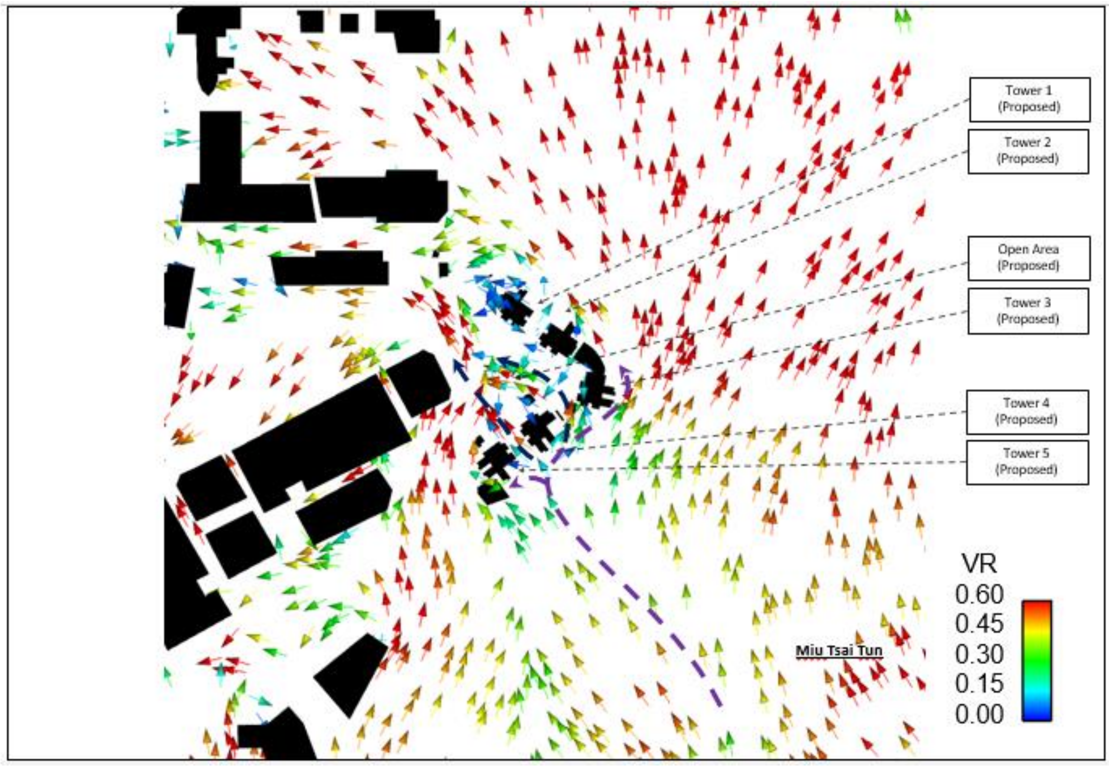


Figure 50: VR Vector Plot at Pedestrian Level under ESE Wind for Proposed Scheme

SE Wind

5.2.26 Under SE wind, site wind availability of the Project Area mainly relies on undisturbed downhill wind from Miu Tsai Tun.

5.2.27 In the Baseline Scheme, downwash effect is observed as a result of the high-rise nature of Towers C, D & E with Tower C diverting a portion of SE wind towards the north (Purple Arrow in **Figure 52**). Block 1 of “Chinese Medicine Hospital and Future GIC Uses” diverted the SE wind towards Tower A, which then subsequently diverted a portion of ESE wind towards the Administration Block of FASA hence higher VR is observed at the southern portion of Administration Block of FASA when compared with the Proposed Scheme (Blue Arrow in **Figure 52**).

5.2.28 Similar to ESE wind, downwash effect is also observed as a result of the high-rise nature of Towers 3, 4 & 5 for SE wind (Purple Arrows in **Figure 54**). The higher permeability design of the Proposed Scheme allowed more ESE wind to penetrate through the Project Area via the building separation between Towers 3 & 4 and building gap between Towers 4 & 5 thus more wind flow is able to reach the Open Area within the Project Area. Hence, higher VRs are observed for the Open Area within Project Area when compared with the Baseline Scheme (Blue Arrows in **Figure 54**).

5.2.29 However, the disposition of the towers in the Proposed Scheme (i.e. Tower 5) reduced the effective width of the incoming air path under SE wind. In other words, the effective width of the incoming air path under SE wind is greater in the Baseline Scheme as the towers are packed closer together thus more wind flow is directed towards the further downstream regions including FASA (i.e. higher VR is observed for this region) when compared to the Proposed Scheme (Blue Arrows in **Figure 52**). In addition, the effect of the fence wall is shown to be localized and does not pose a significant adverse impact to the pedestrian wind environment of the immediate surroundings as the fence wall is permeable

5.2.30 **Figure 51** and **Figure 53** shows the VR contour plots of SE wind for the Baseline Scheme and Proposed Scheme respectively. **Figure 52** and **Figure 54** shows the VR vector plots of SE wind for the Baseline Scheme and Proposed Scheme respectively.

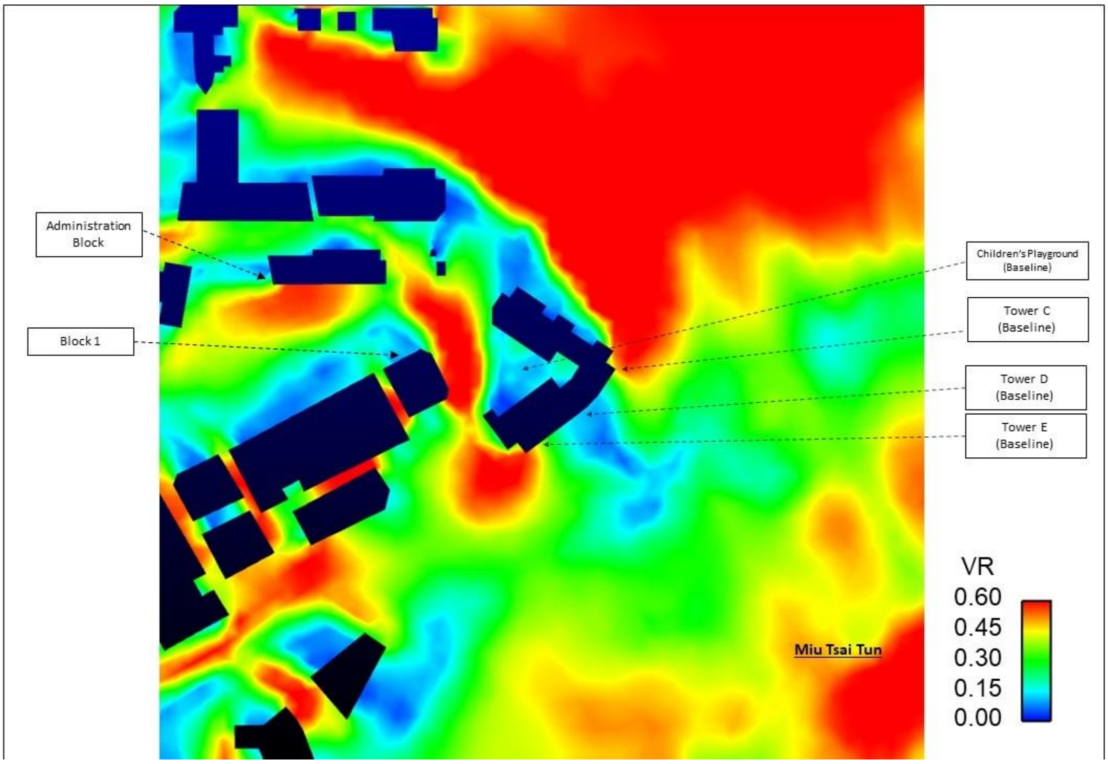


Figure 51: VR Contour Plot at Pedestrian Level under SE Wind for Baseline Scheme

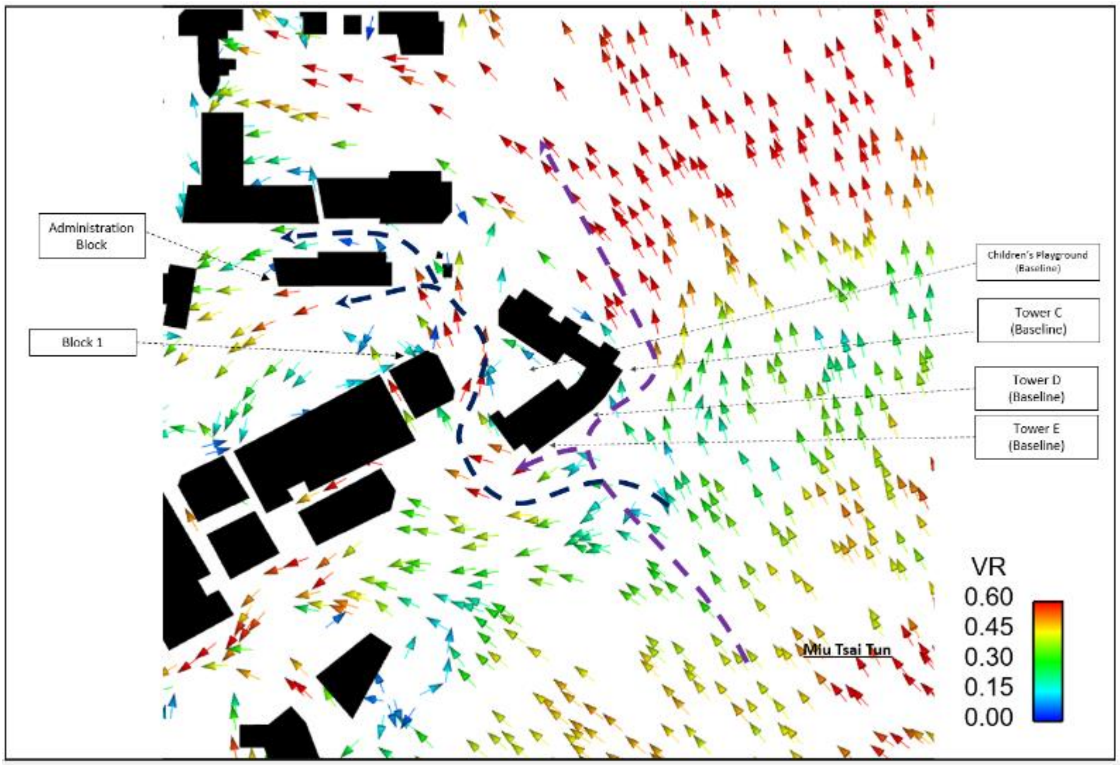


Figure 52: VR Vector Plot at Pedestrian Level under SE Wind for Baseline Scheme

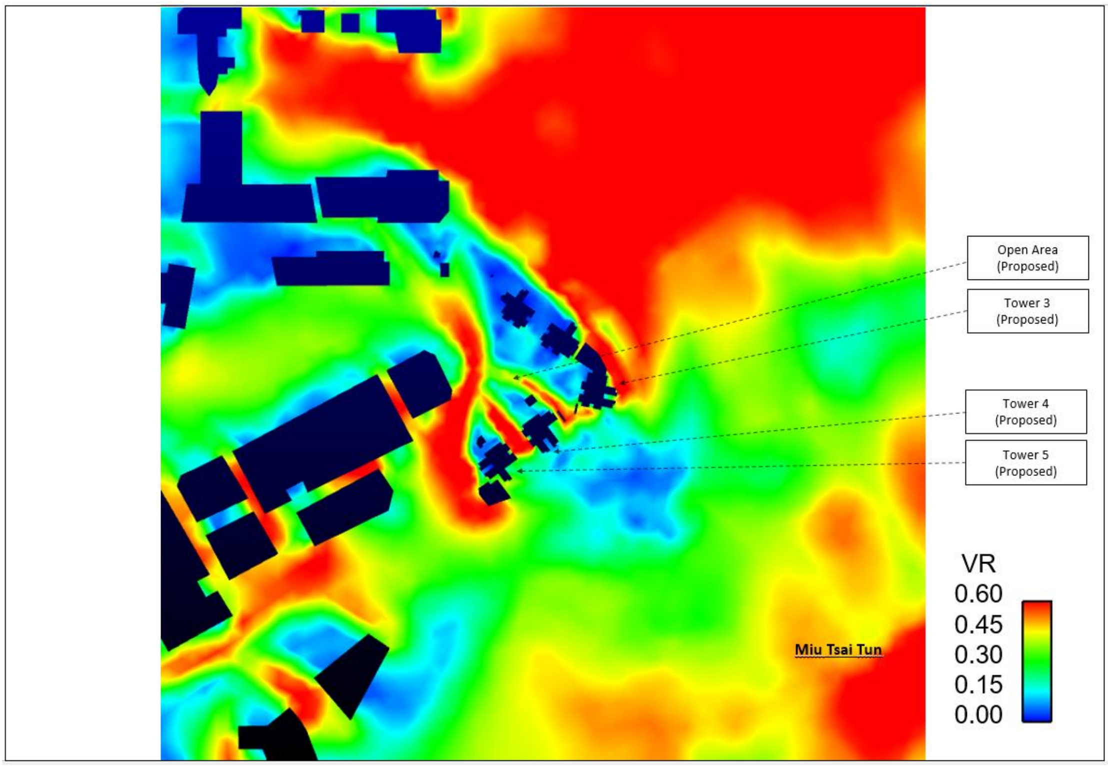


Figure 53: VR Contour Plot at Pedestrian Level under SE Wind for Proposed Scheme

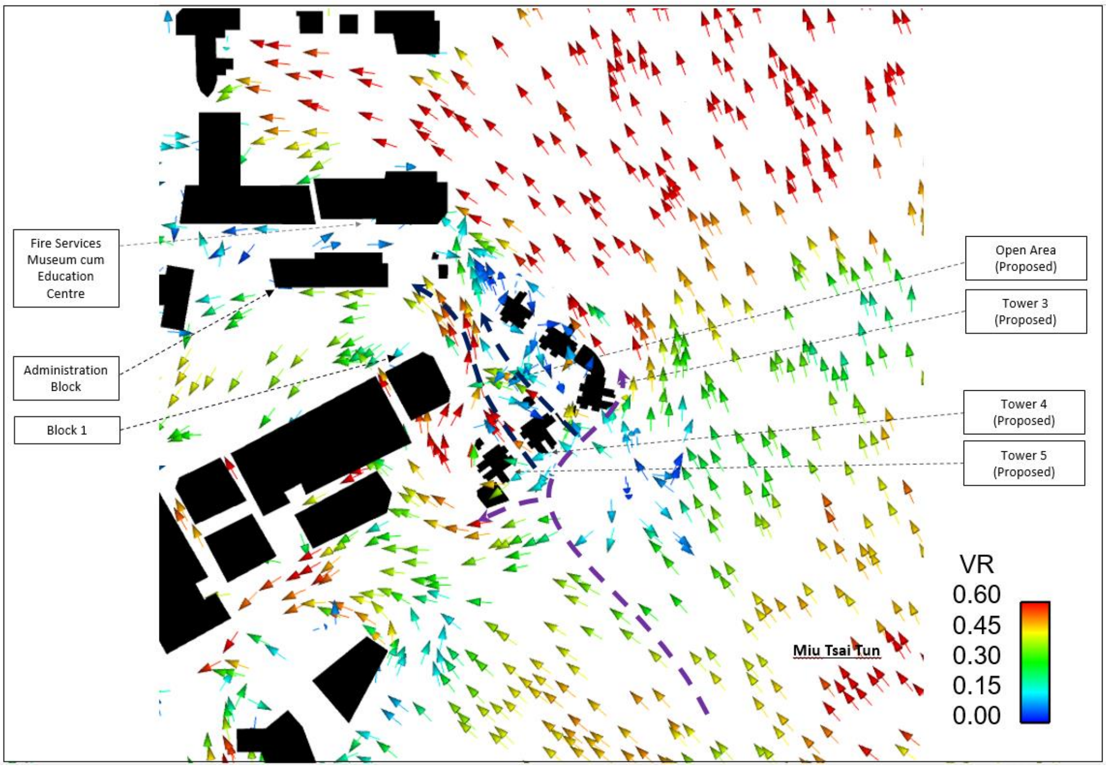


Figure 54: VR Vector Plot at Pedestrian Level under SE Wind for Proposed Scheme

SSE Wind

5.2.31 Similar to SE wind, SSE wind availability of the Project Area mainly relies on undisturbed downhill wind from Miu Tsai Tun and Siu Chik Sha.

5.2.32 In the Baseline Scheme, Towers C, D and E diverted incoming SSE wind towards the north (Purple Arrow in **Figure 56**). In addition, Proposed Residential Development at R(A)7 Zone causes a portion of SSE wind to be diverted towards the north and only a portion of SSE wind is able to reach the Children's Playground within the Project Area (Blue Arrow in **Figure 56**).

5.2.33 In the Proposed Scheme, downwash effect is also observed as a result of the high-rise nature of Towers 3, 4 & 5 with a portion of SSE wind diverted towards the north and a portion diverted towards the west and thus benefitting the ventilation performance of Pak Shing Kok Road (Purple Arrows in **Figure 58**). The higher permeability design of the Proposed Scheme also allowed more wind flow to penetrate through the Project Area to reach the immediate downstream regions and Open Area via the building separation between Towers 3 & 4 and building gap between Towers 4 & 5 hence higher VRs are observed for the Open Area within Project Area when compared with the Baseline Scheme (Blue Arrows in **Figure 58**).

5.2.34 Similar to SE wind, the effective width of the incoming air path under SSE wind is greater in the Baseline Scheme as the towers are packed closer together thus more wind flow is directed towards the further downstream regions including FASA (i.e. higher VR is observed for this region) when compared to the Proposed Scheme (Orange Arrow in **Figure 56**). In addition, the effect of the fence wall is shown to be localized and does not pose a significant adverse impact to the pedestrian wind environment of the immediate surroundings as the fence wall is permeable

5.2.35 **Figure 55** and **Figure 57** shows the VR contour plots for the Baseline Scheme and Proposed Scheme respectively. **Figure 56** and **Figure 58** shows the VR vector plots for the Baseline Scheme and Proposed Scheme respectively.

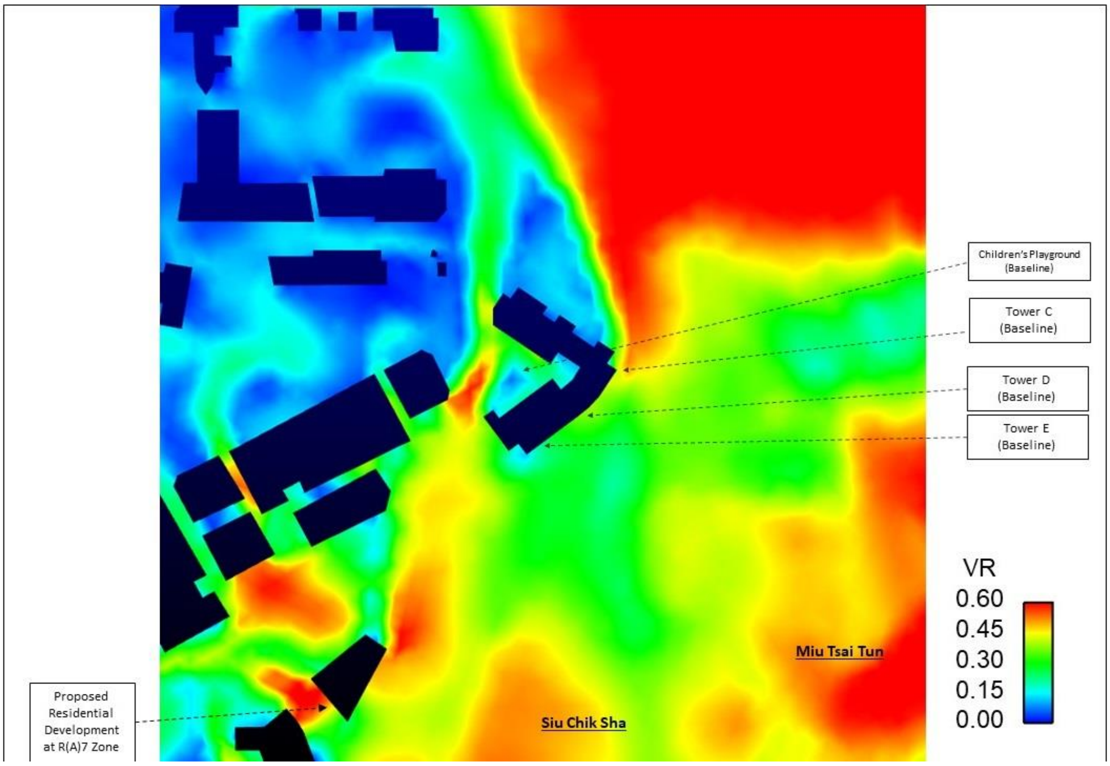


Figure 55: VR Contour Plot at Pedestrian Level under SSE Wind for Baseline Scheme

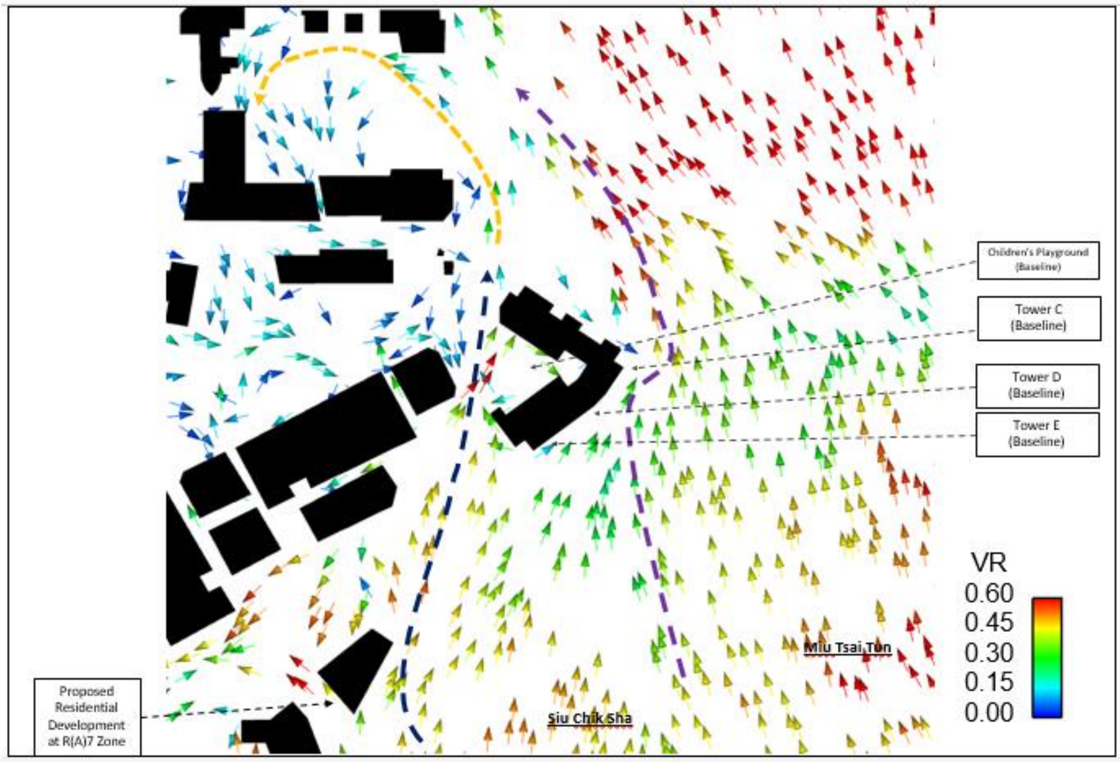


Figure 56: VR Vector Plot at Pedestrian Level under SSE Wind for Baseline Scheme

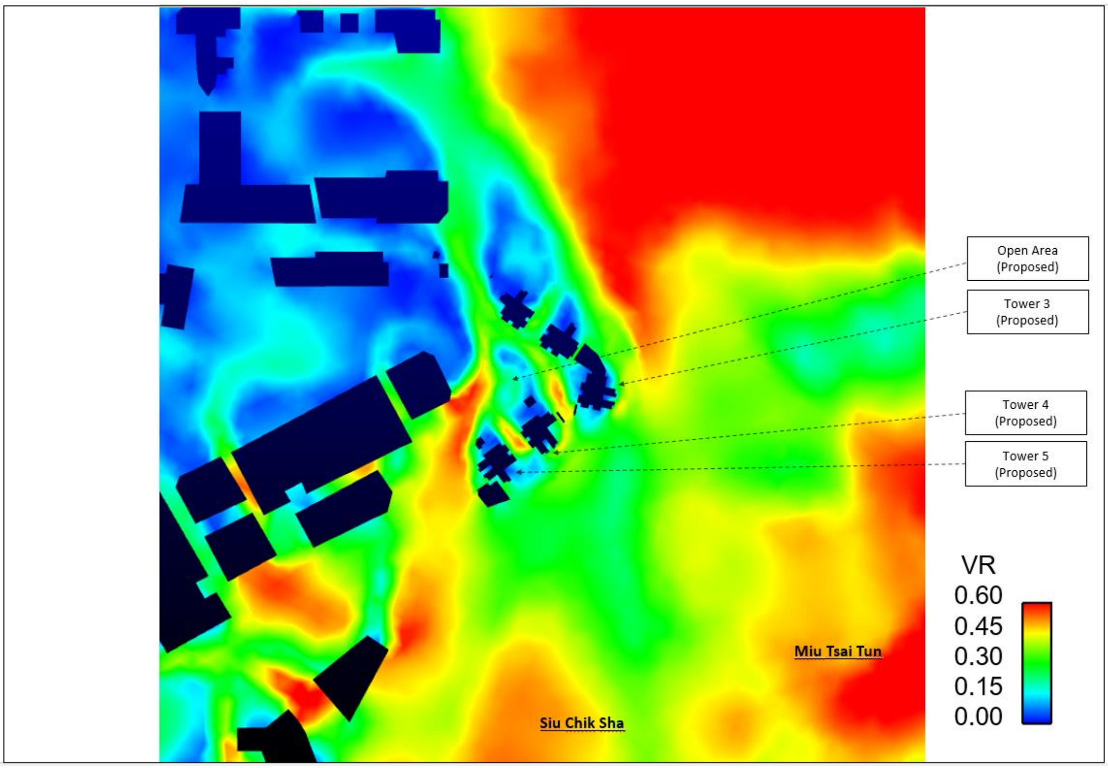


Figure 57: VR Contour Plot at Pedestrian Level under SSE Wind for Proposed Scheme

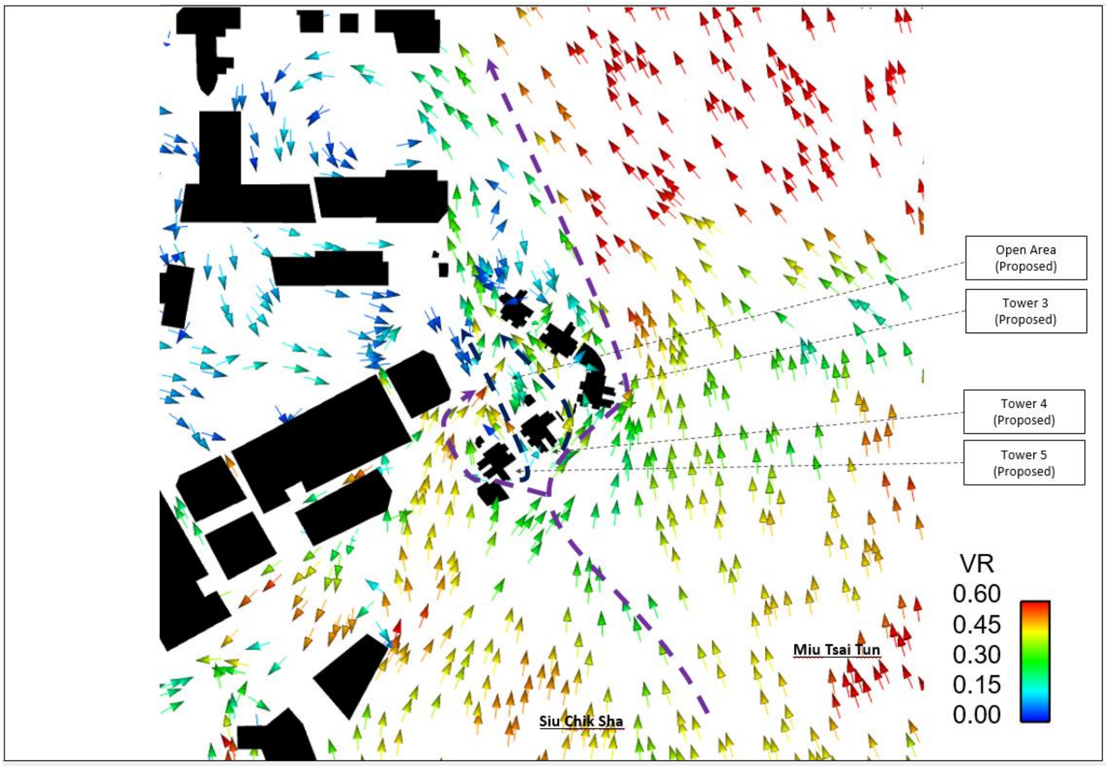


Figure 58: VR Vector Plot at Pedestrian Level under SSE Wind for Proposed Scheme

S Wind & SSW Wind

5.2.36 Incoming S/SSW wind will come from undisturbed downhill wind from Siu Chik Sha to reach the Project Area.

5.2.37 In the Baseline Scheme, Towers C, D & E will divert the incoming S/SSW wind towards the northeast (Purple Arrow in **Figure 60** and **Figure 64**). In addition, a small wake region is observed at the Children's Playground due to the wall effect of Towers C, D & E hence lower VRs are observed within the Project Area when compared with the Proposed Scheme. Proposed Residential Development at R(A)7 Zone is also observed to direct a portion of S/SSW wind to travel northwards along Pak Shing Kok Road (Blue Arrow in **Figure 60** and **Figure 64**).

5.2.38 In the Proposed Scheme, Towers 3, 4 & 5 will divert the incoming S/SSW wind towards the northeast (Purple Arrow in **Figure 62** and **Figure 66**). The higher permeability design of the Proposed Scheme allowed more S/SSW wind to penetrate through the Project Area via the building separation between Towers 3 & 4 and building gap between Towers 4 & 5 to benefit the immediate downstream region hence higher VRs are observed for the Open Area within Project Area when compared with the Baseline Scheme (Blue Arrows in **Figure 62** and **Figure 66**).

5.2.39 The higher permeability design of the Proposed Scheme creates a smaller wake at the downstream region of the Project Area when compared with the Baseline Scheme. However, this also constitutes to a zone of low pressure and as a result creates more suction and more downwash is observed from FASA in the Baseline Scheme when compared with the Proposed Scheme (Orange Arrows in **Figure 60** and **Figure 64**). In addition, the effect of the fence wall is shown to be localized and does not pose a significant adverse impact to the pedestrian wind environment of the immediate surroundings as the fence wall is permeable

5.2.40 **Figure 59** and **Figure 61** shows the VR contour plots of S wind for the Baseline Scheme and Proposed Scheme respectively. **Figure 60** and **Figure 62** shows the VR vector plots of S wind for the Baseline Scheme and Proposed Scheme respectively.

5.2.41 **Figure 63** and **Figure 65** shows the VR contour plots of SSW wind for the Baseline Scheme and Proposed Scheme respectively. **Figure 64** and **Figure 66** shows the VR vector plots of SSW wind for the Baseline Scheme and Proposed Scheme respectively.

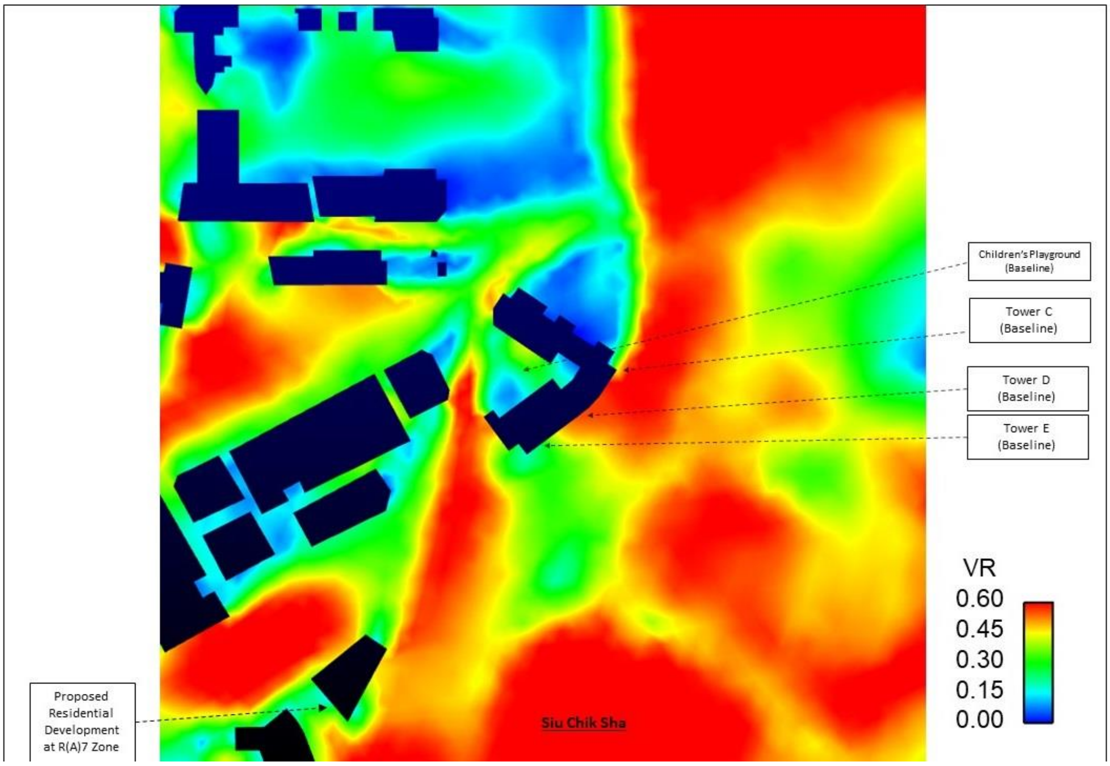


Figure 59: VR Contour Plot at Pedestrian Level under S Wind for Baseline Scheme

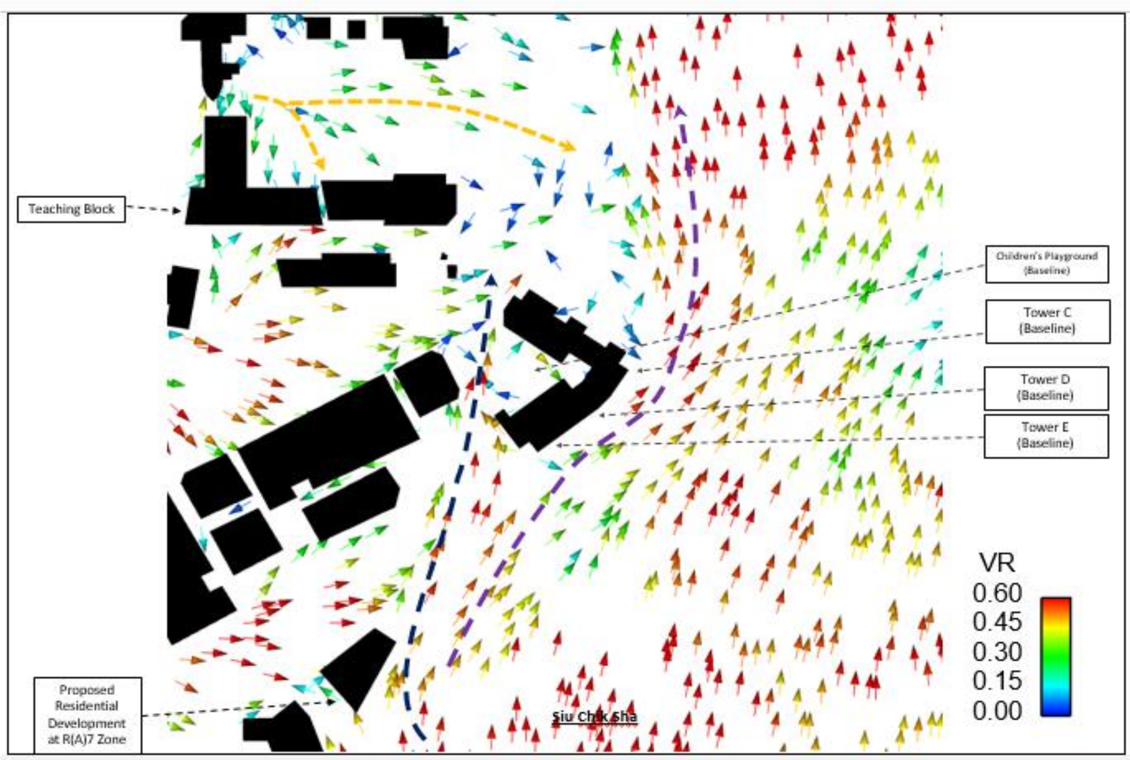


Figure 60: VR Vector Plot at Pedestrian Level under S Wind for Baseline Scheme

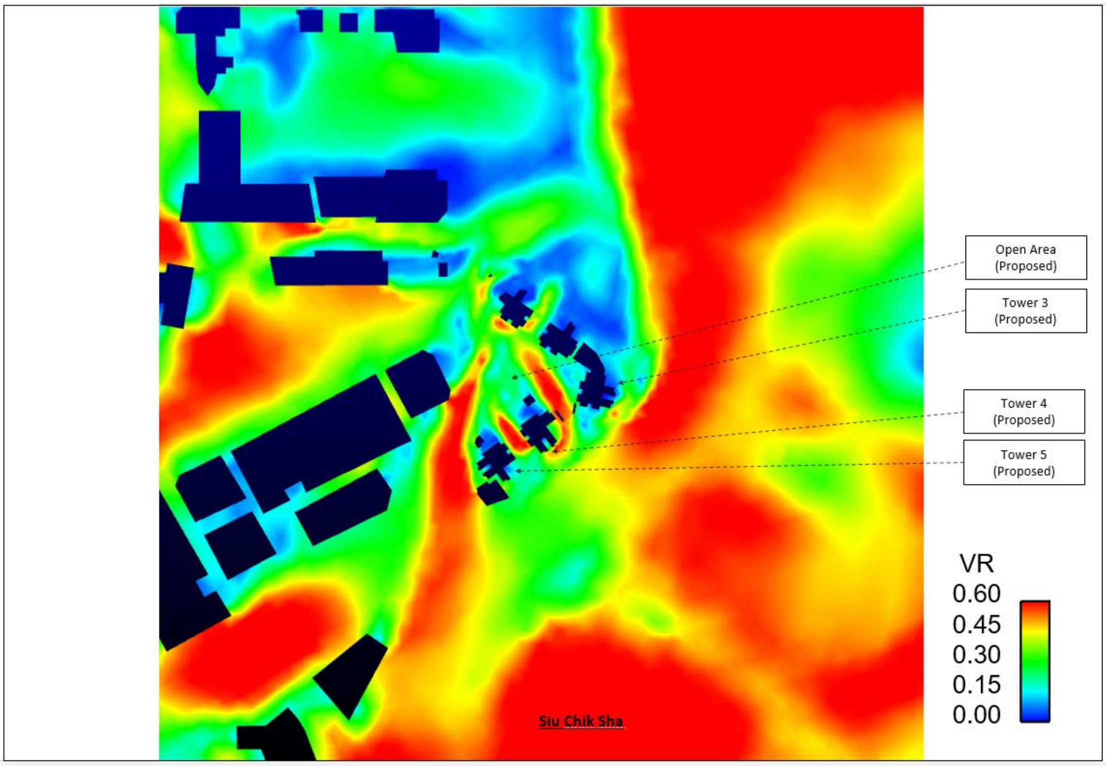


Figure 61: VR Contour Plot at Pedestrian Level under S Wind for Proposed Scheme

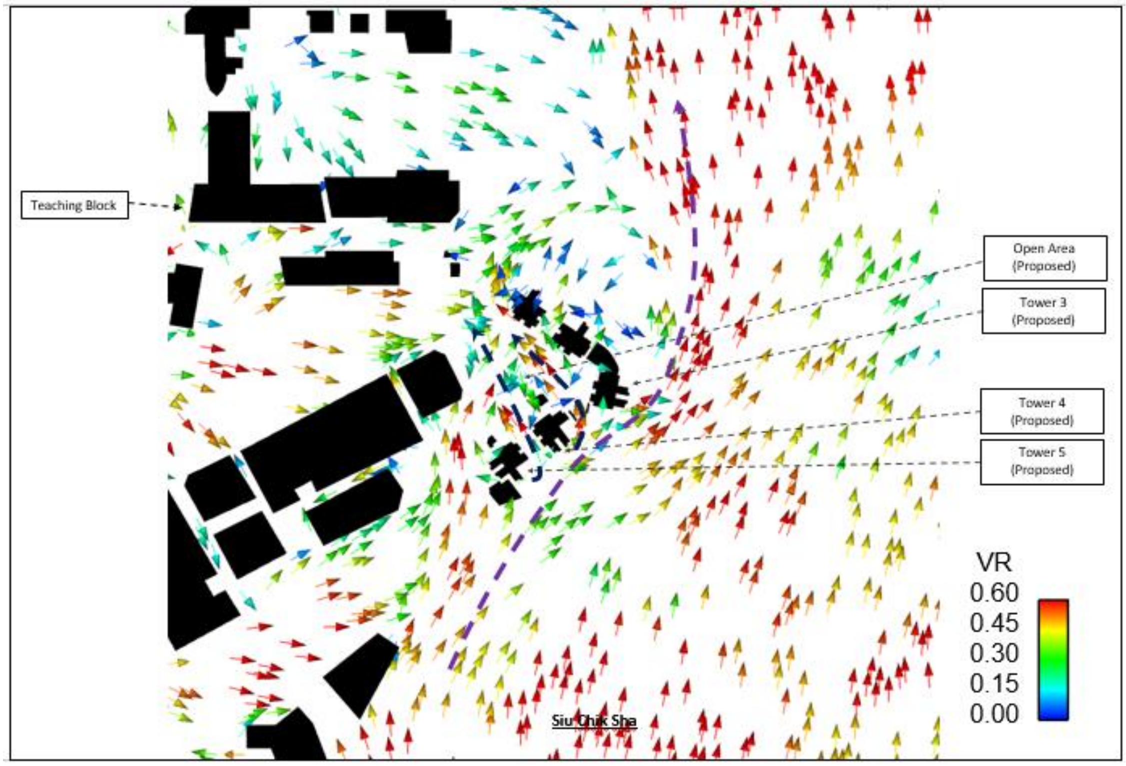


Figure 62: VR Vector Plot at Pedestrian Level under S Wind for Proposed Scheme

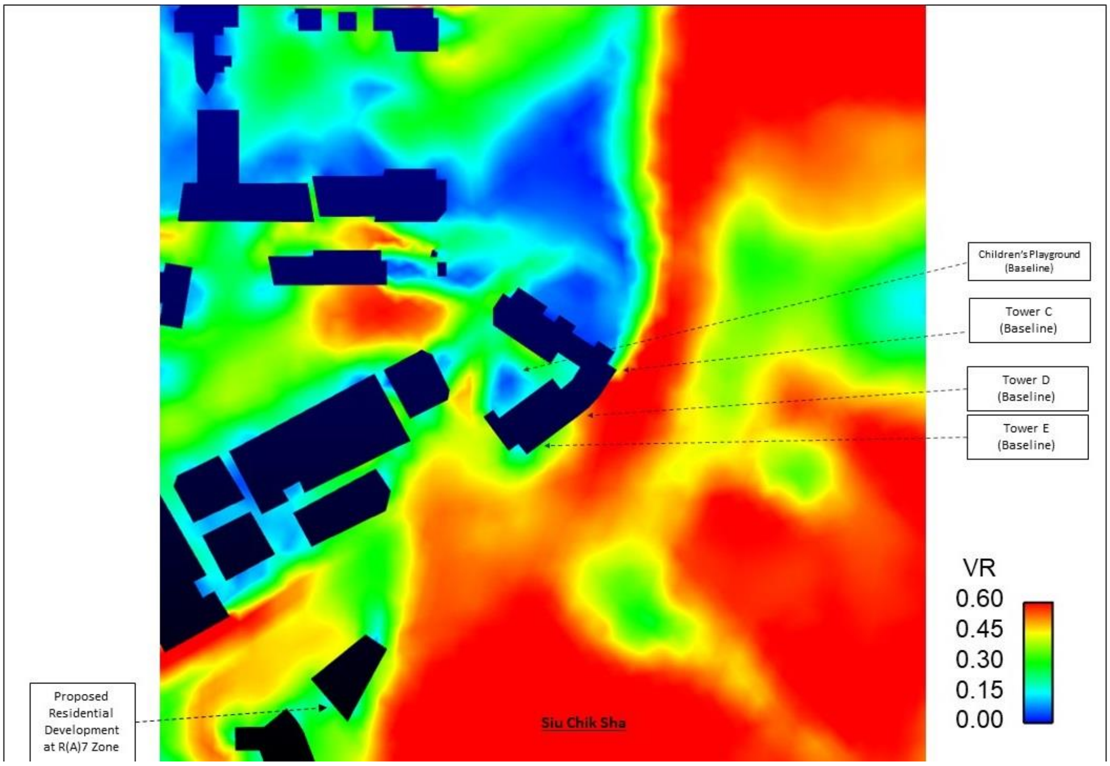


Figure 63: VR Contour Plot at Pedestrian Level under SSW Wind for Baseline Scheme

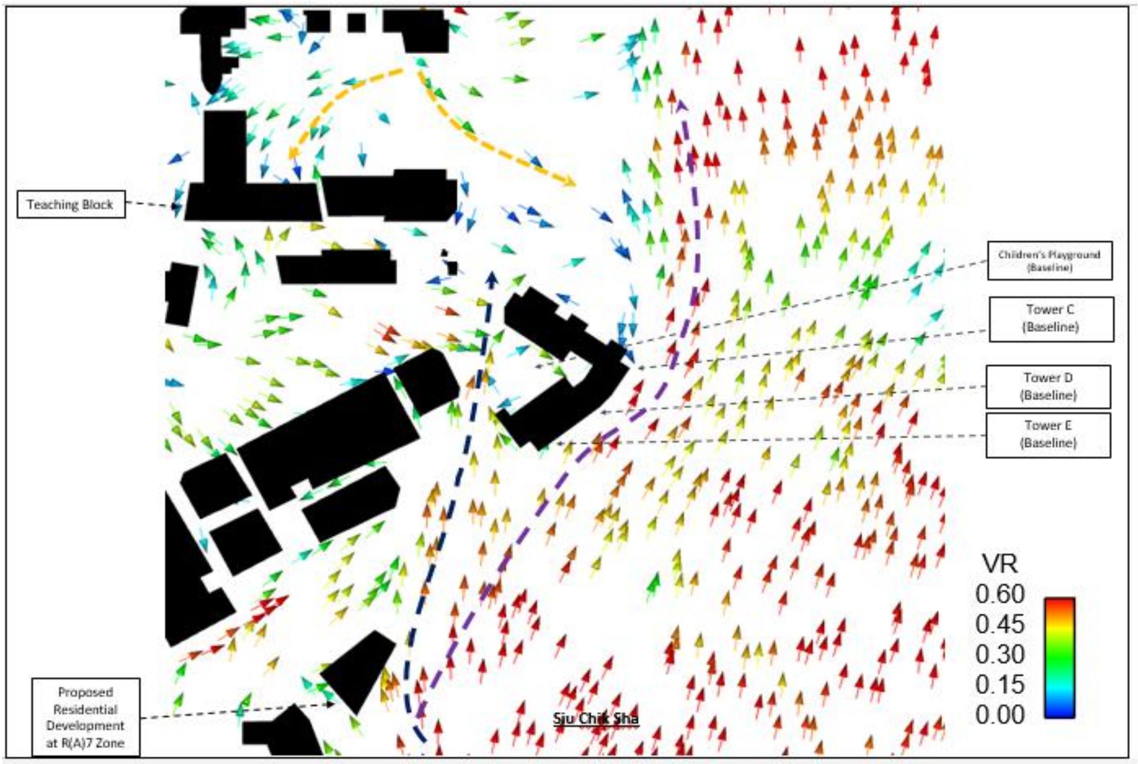


Figure 64: VR Vector Plot at Pedestrian Level under SSW Wind for Baseline Scheme

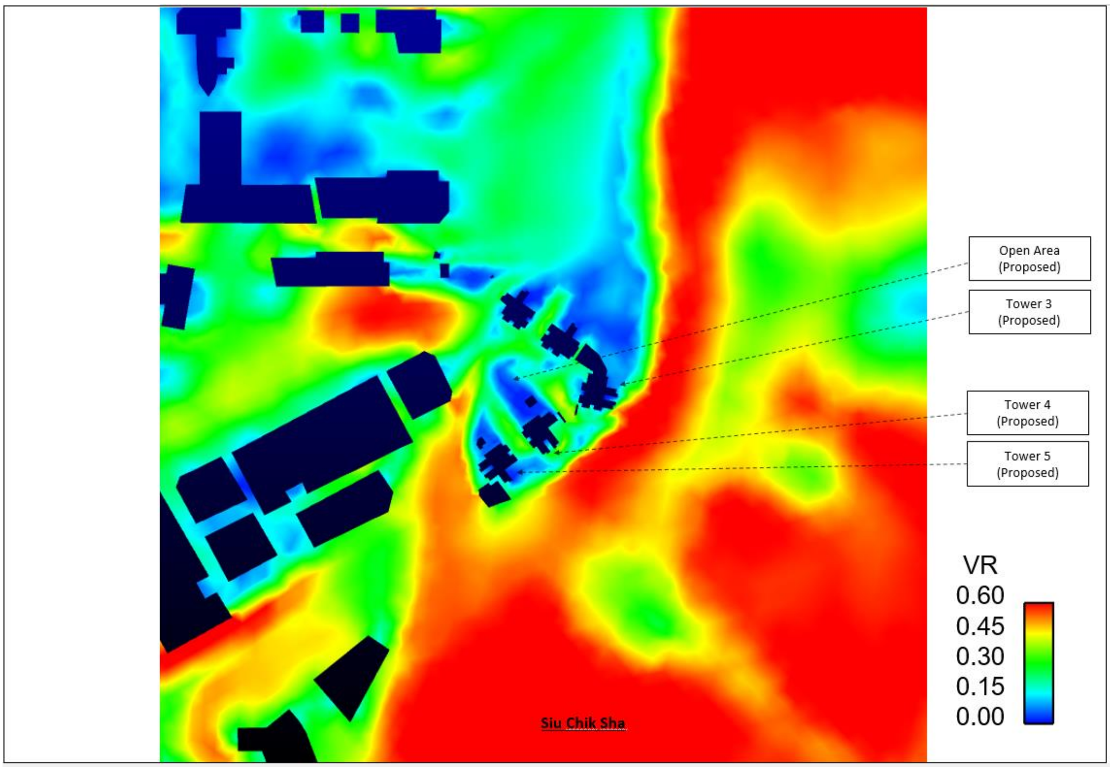


Figure 65: VR Contour Plot at Pedestrian Level under SSW Wind for Proposed Scheme

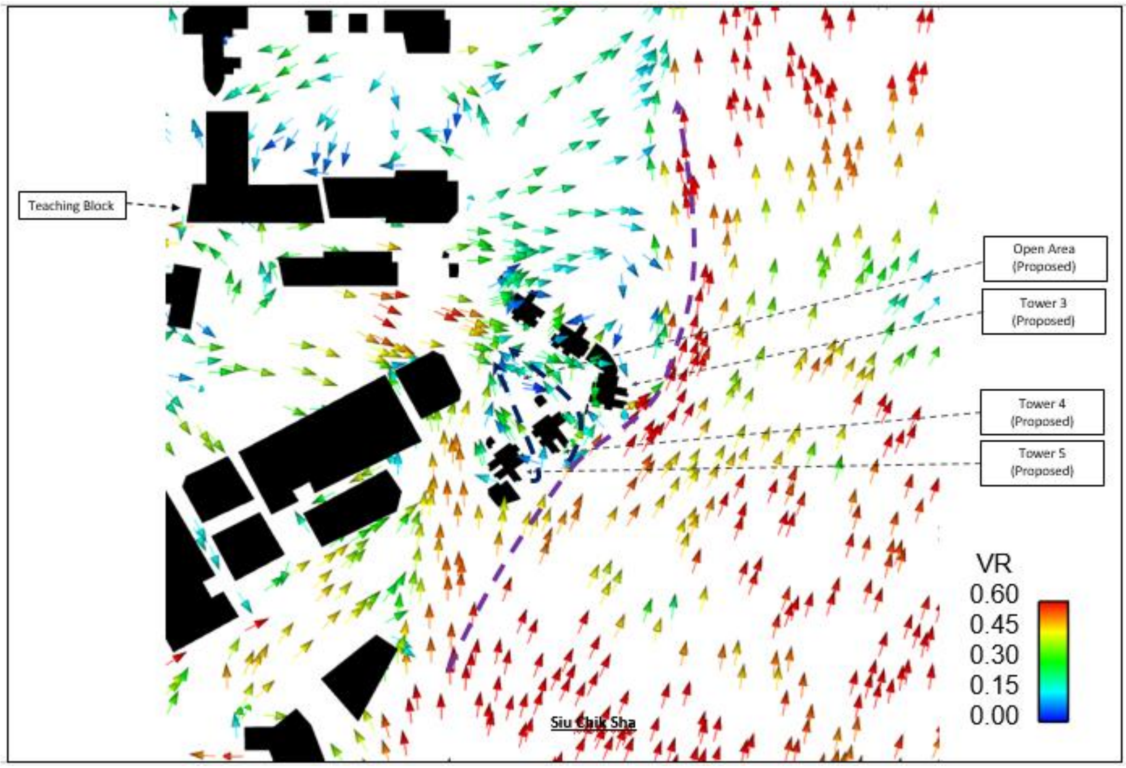


Figure 66: VR Vector Plot at Pedestrian Level under SSW Wind for Proposed Scheme

SW Wind

5.2.42 Under SW wind, Proposed Residential Development at R(A)7 Zone causes slight obstruction to the SW wind but is able to reach the Project Area via Pak Shing Kok Road between Chinese Medicine Hospital and Future GIC Uses and Proposed Residential Development at R(A)7 Zone.

5.2.43 In the Baseline Scheme, Towers C, D & E will divert the incoming SW wind towards the northeast (Purple Arrow in **Figure 68**). Similar to S/SSW wind, a small wake region is observed at the Children's Playground due to the wall effect of Towers A, B & C hence lower VRs are observed for the Children's Playground when compared with the Proposed Scheme.

5.2.44 In the Proposed Scheme, downwash effect is also observed as a result of the high-rise nature of Towers 3, 4 & 5, which causes a portion of SW wind to be diverted to the northeast (Purple Arrow in **Figure 70**). The higher permeability design of the Proposed Scheme will allow more SW wind to penetrate through the Project Area via the building separation gap between Towers 3 & 4 to improve the ventilation performance of the Project Area and immediate downstream regions hence higher VRs are observed for the Open Area within Project Area and region to the immediate northwest of the Project Area (Blue Arrows in **Figure 70**).

5.2.45 The drawback of the higher permeability design of the Proposed Scheme is that the towers in the Baseline Scheme are packed closer together thus more wind flow is directed towards the further downstream regions. As a result, less wind flow in the Proposed Scheme is able to reach the further downstream regions thus creating a larger wake zone at the immediate downstream region when compared to the Baseline Scheme (Orange Arrows in **Figure 68**). In addition, the effect of the fence wall is shown to be localized and does not pose a significant adverse impact to the pedestrian wind environment of the immediate surroundings as the fence wall is permeable

5.2.46 **Figure 67** and **Figure 69** shows the VR contour plots for the Baseline Scheme and Proposed Scheme respectively. **Figure 68** and **Figure 70** shows the VR vector plots for the Baseline Scheme and Proposed Scheme respectively.

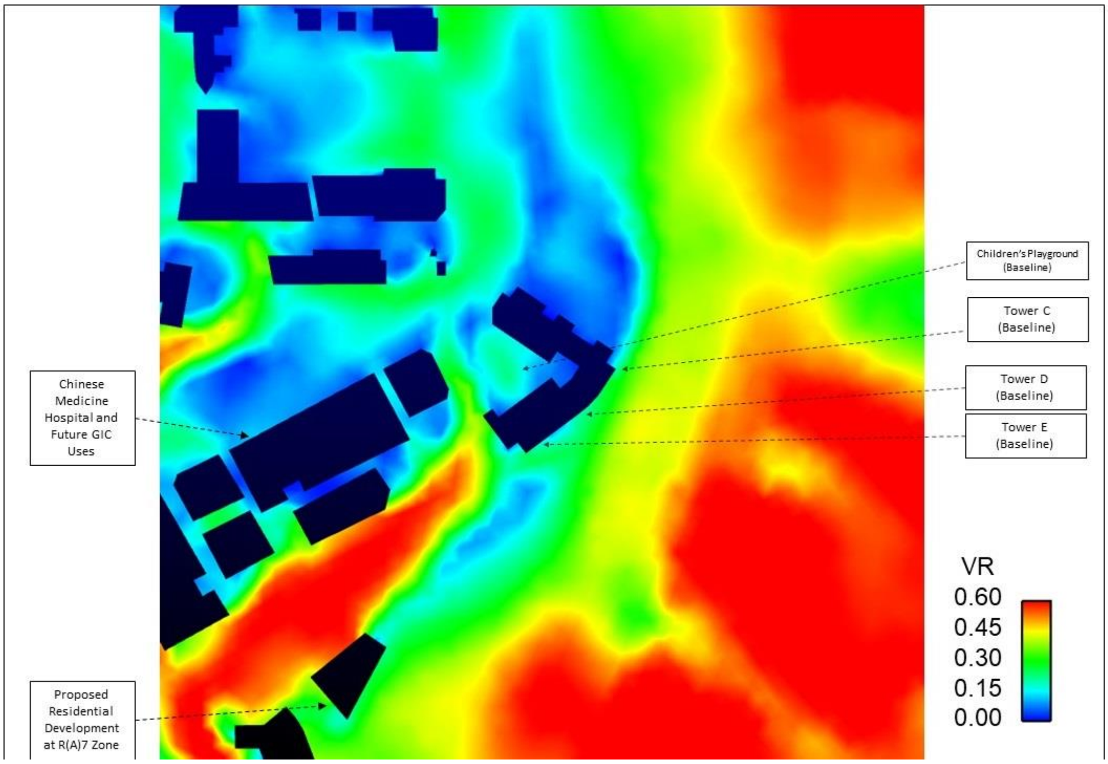


Figure 67: VR Contour Plot at Pedestrian Level under SW Wind for Baseline Scheme

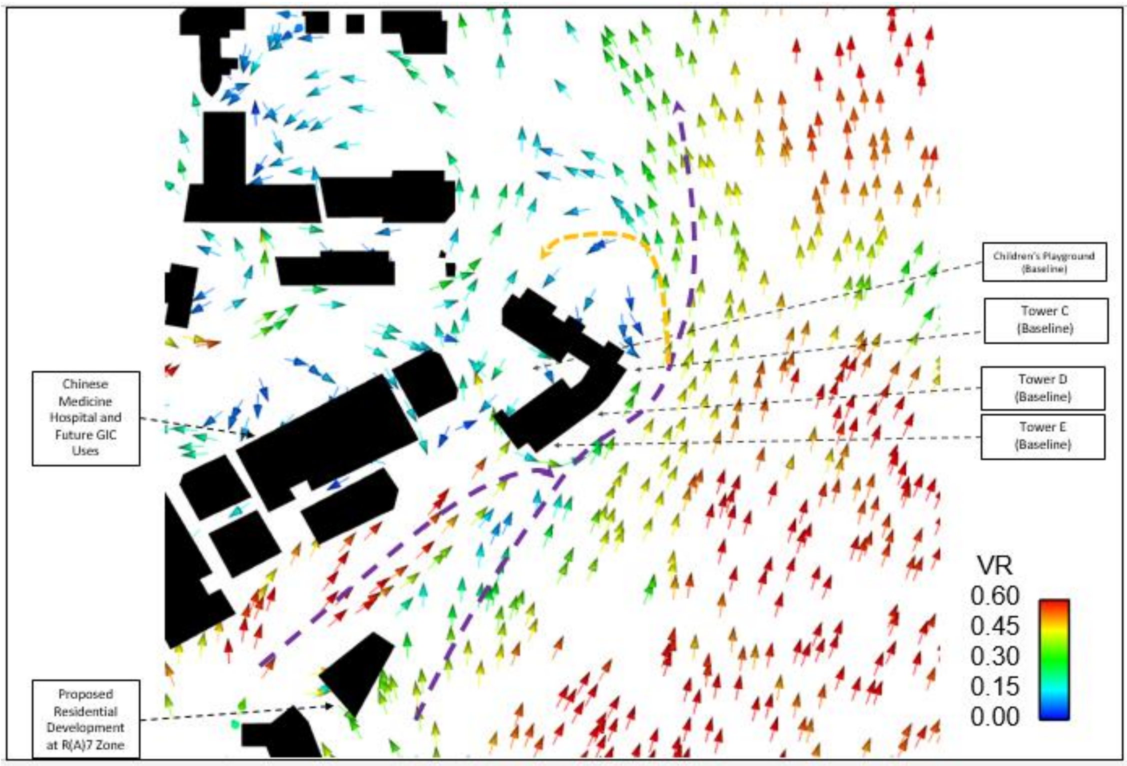


Figure 68: VR Vector Plot at Pedestrian Level under SW Wind for Baseline Scheme

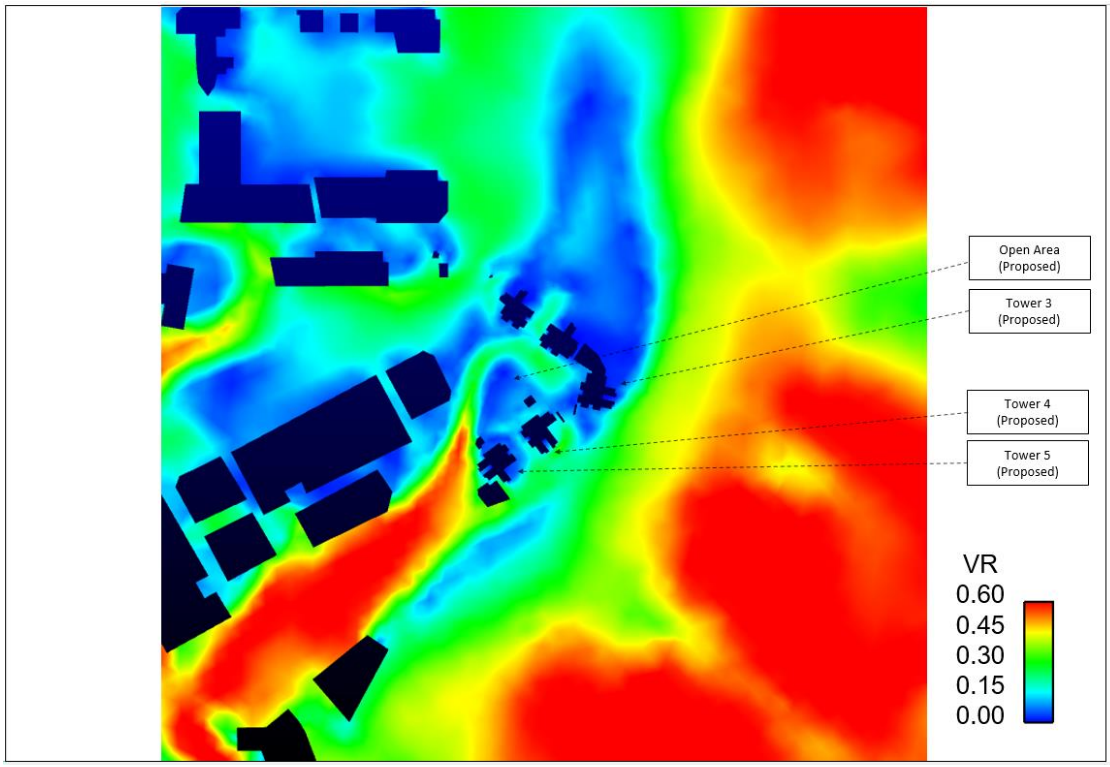


Figure 69: VR Contour Plot at Pedestrian Level under SW Wind for Proposed Scheme

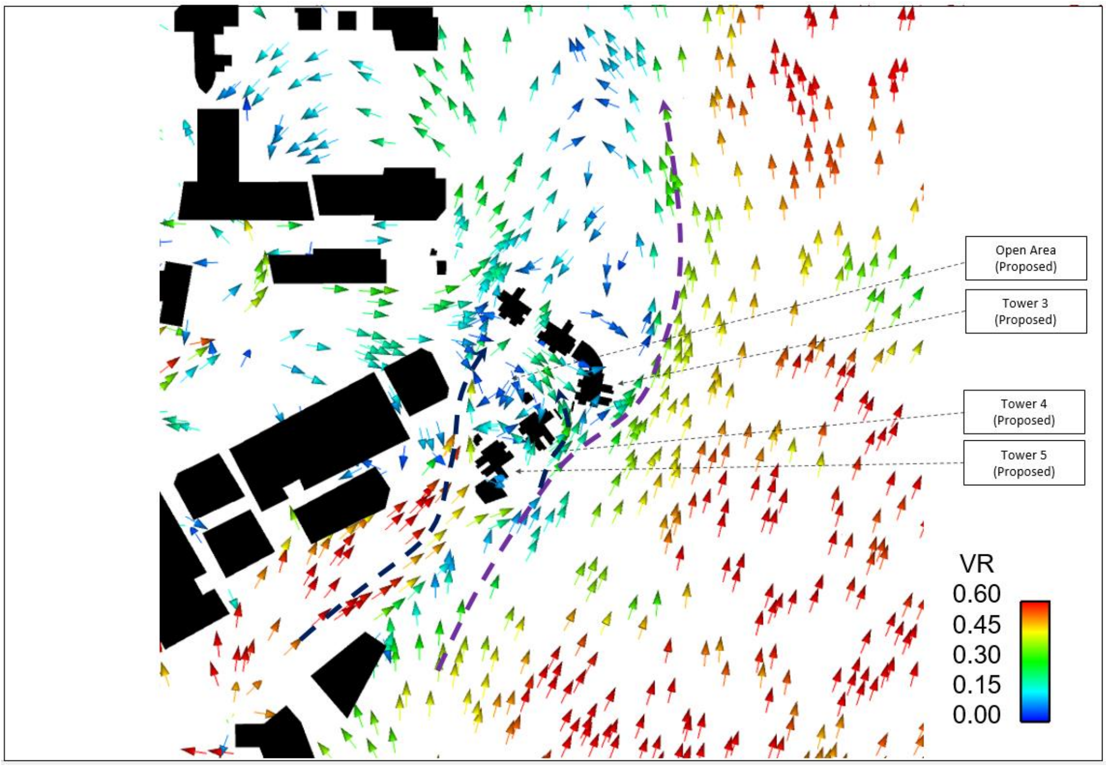


Figure 70: VR Vector Plot at Pedestrian Level under SW Wind for Proposed Scheme

WSW Wind

5.2.47 Proposed Residential Development at R(A)7 Zone causes slight obstruction to the WSW wind but is able to reach the Project Area via Pak Shing Kok Road between Chinese Medicine Hospital and Future GIC Uses and Proposed Residential Development at R(A)7 Zone. In addition, a portion of WSW wind is also able to reach the Project Area via the opening between the Chinese Medicine Hospital and Future GIC Uses and Administration Block of FASA.

5.2.48 In the Baseline Scheme, Towers C, D & E will direct the incoming WSW wind towards the northeast (Purple Arrow in **Figure 72**) with a portion of WSW wind diverted northwards (Blue Arrow in **Figure 72**). A small wake region is observed within the Project Area due to the wall effect of Towers C, D & E hence lower VRs are observed for the Children's Playground when compared with the Proposed Scheme.

5.2.49 In the Proposed Scheme, the higher permeability design of the Proposed Scheme allowed more WSW wind to pass through the building separation between Towers 3 & 4 thus more wind is able to penetrate the Project Area and higher VRs are observed for the Open Area within Project Area when compared with the Baseline Scheme (Purple Arrow in **Figure 74**).

5.2.50 The less permeable design of the Baseline Scheme created an air path with lower velocity flowing to the northeast (Blue Arrow in **Figure 72**) when compared to the Proposed Scheme, which resulted in more suction and backflow in the further northern regions (Orange Arrow in **Figure 72**) when compared with the Proposed Scheme. In addition, the effect of the fence wall is shown to be localized and does not pose a significant adverse impact to the pedestrian wind environment of the immediate surroundings as the fence wall is permeable

5.2.51 **Figure 71** and **Figure 73** shows the VR contour plots for the Baseline Scheme and Proposed Scheme respectively. **Figure 72** and **Figure 74** shows the VR vector plots for the Baseline Scheme and Proposed Scheme respectively.

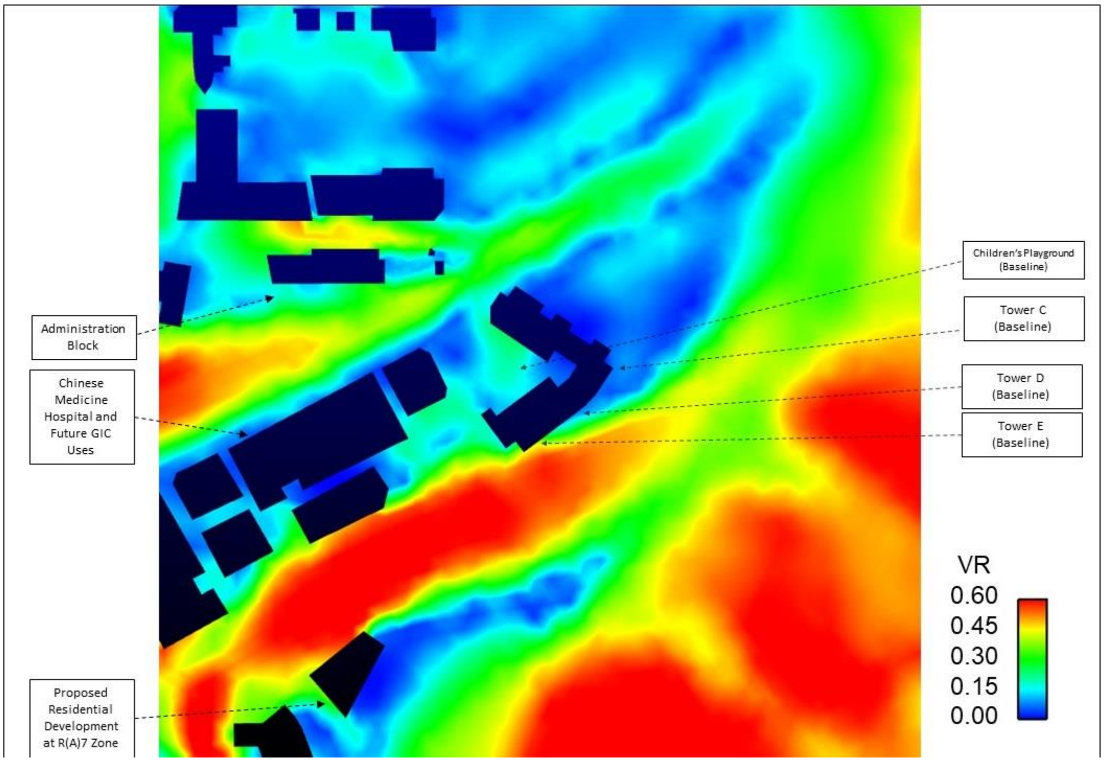


Figure 71: VR Contour Plot at Pedestrian Level under WSW Wind for Baseline Scheme

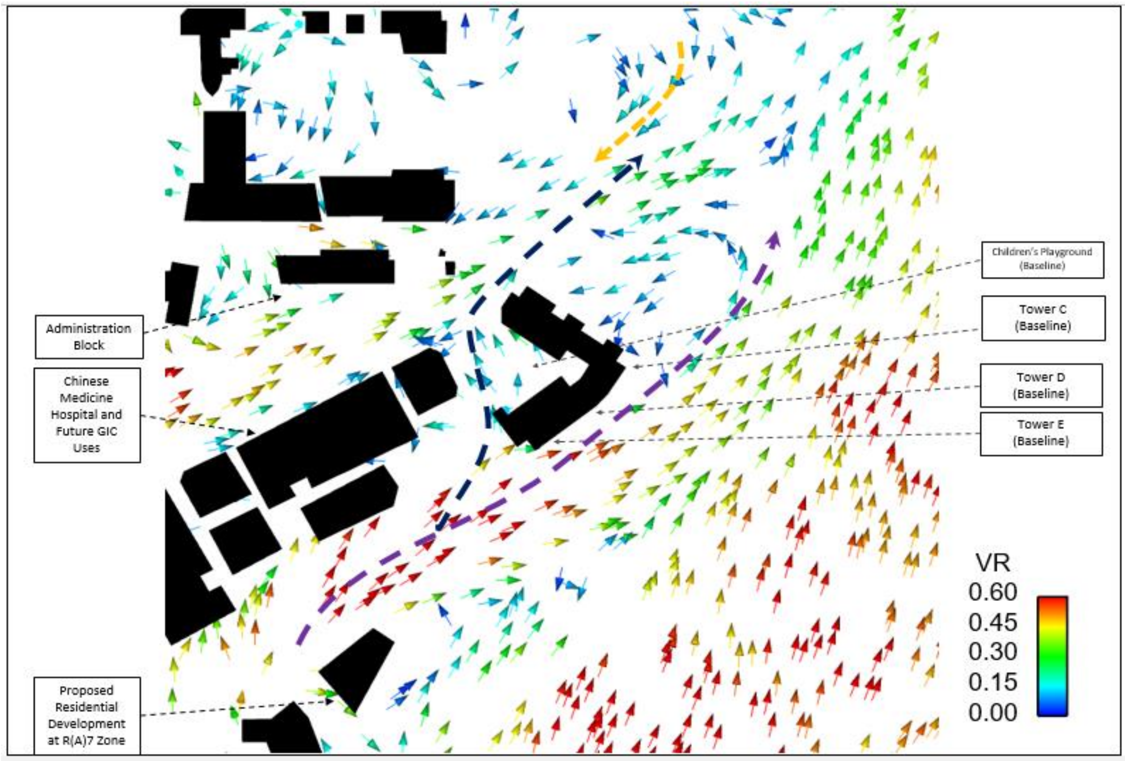


Figure 72: VR Vector Plot at Pedestrian Level under WSW Wind for Baseline Scheme

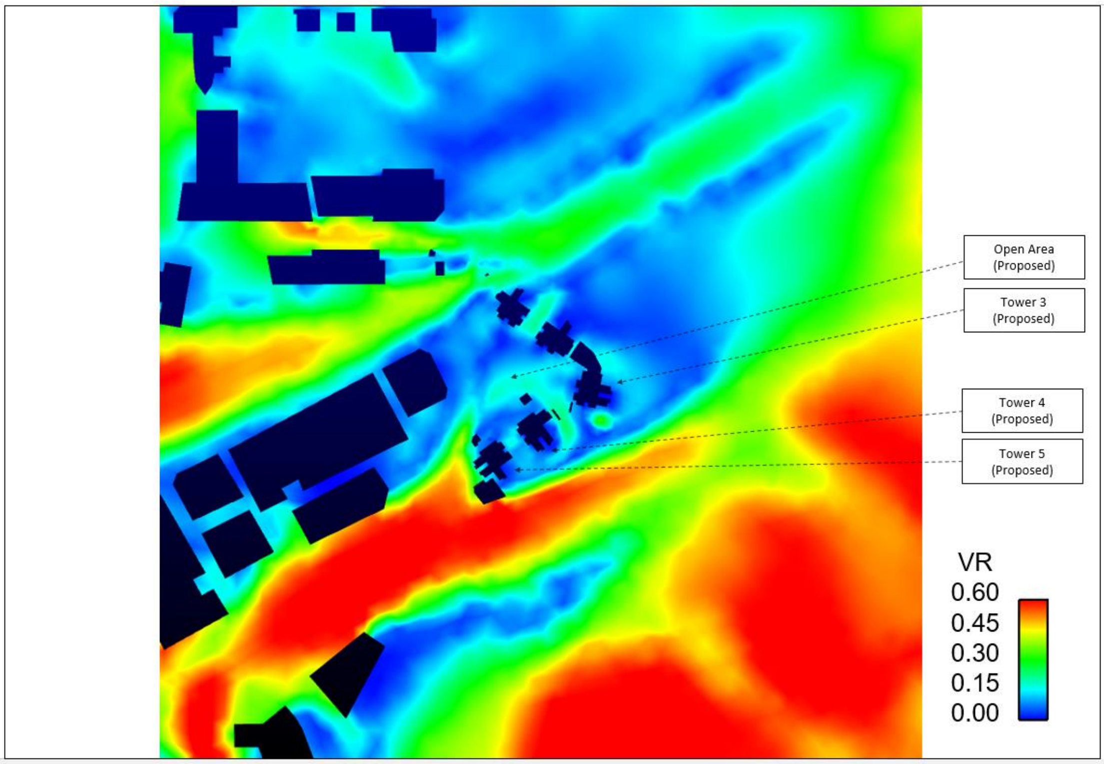


Figure 73: VR Contour Plot at Pedestrian Level under WSW Wind for Proposed Scheme

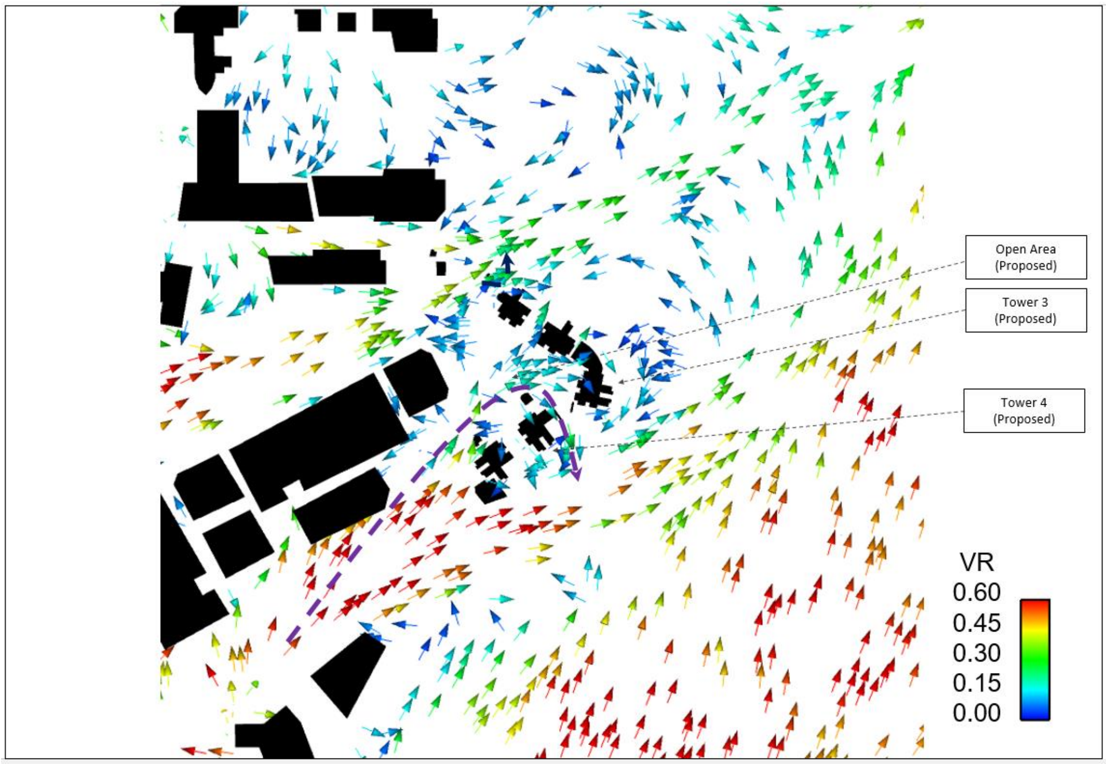


Figure 74: VR Vector Plot at Pedestrian Level under WSW Wind for Proposed Scheme

5.3 SUMMARY OF VELOCITY RATIO (VR) RESULTS UNDER ANNUAL WIND CONDITION

5.3.1 According to the average VR results under annual wind condition in **Table 8**, the SVR of the Baseline Scheme is higher (i.e. 0.40) than the Proposed Scheme (i.e. 0.33) whereas the LVR of the Baseline Scheme is slightly higher (i.e. 0.40) than the Proposed Scheme (i.e. 0.39).

5.3.2 As the residential towers in the Baseline Scheme are packed closer together than the Proposed Scheme, the wall-like effect of the residential towers will enhance the downwash effect and bring more high-level annual wind towards the pedestrian level at the site boundary. In contrast, the more permeable design in the Proposed Scheme caused less downwash effect as more annual wind is able to penetrate the Project Area. As mentioned in Section 2.2.6 to 2.2.9, the incorporation of two 15m building separations between Tower 2 & Tower 3 (i.e. above 71.30mPD only) and Tower 3 & Tower 4 in the Proposed Scheme enhanced the wind permeability which allowed more annual wind flow to reach the open area within the Project Area as well as immediate downstream regions. Thus, higher VRs are observed for the Special Test Points within the Project Area in the Proposed Scheme (i.e. 0.24) when compared with the Baseline Scheme (i.e. 0.17) as well as Fire and Ambulance Services Academy (FAMA) in the Proposed Scheme (i.e. 0.41) when compared with the Baseline Scheme (i.e. 0.40) and Pak Shing Kok Road in the Proposed Scheme (i.e. 0.42) when compared with the Baseline Scheme (i.e. 0.41).

5.3.3 For the Proposed Residential Development at R(A)7 zone, higher VRs are observed in the Baseline Scheme (i.e. 0.36) when compared with the Proposed Scheme (i.e. 0.35) due to the drawback of the higher permeability design of the Proposed Scheme resulting in less annual wind flow directed towards the further downstream regions (i.e. Proposed Residential Development at R(A)7 zone.

5.3.4 For the remaining focus areas (i.e. “Chinese Medicine Hospital and Future GIC Uses”), the wind performance of the surrounding environment is comparable for both schemes.

5.3.5 The annual weighted average VR contour plots for the Baseline Scheme and Proposed Scheme are shown in **Figure 75** and **Figure 76** respectively.

5.3.6 Since there is a substantiate change in building layout, size of building bulk, overall building massing orientation, design details like building separations, etc., it results in a large difference in overall building frontage length, building permeability and incident wind angle to façade between baseline and proposed case. Hence, the flow structure and flow pattern around the project site would be significantly different in the two schemes due to the presence of turbulence zones in the upwind regions. In addition, the site vicinity is relatively open which makes the wind environment sensitive to any change induced by the building (i.e. no narrow street to confine the flow direction), therefore, the immediate upwind zone is also affected by the current building design. Please also refer to the directional analysis for winds coming from the north-eastern quadrant in the report (**Sections 5.2.1** to **5.2.16**) and arrows (**Figures 31** to **46**) for more detailed explanatory.

Table 8: Summary of SVR, LVR and SAVR Results under Annual Wind Condition for Baseline Scheme and Proposed Scheme

	Test Points	Baseline Scheme	Proposed Scheme
SVR	P1 – P30	0.40	0.33
LVR	P1 – P30, O1 – O59	0.40	0.39
1. Pak Shing Kok Road	P9, P11, P13, P15 O1 – O10	0.41	0.42
2. "Chinese Medicine Hospital and Future GIC Uses"	O11 – O29	0.40	0.40
3. Fire and Ambulance Services Academy (FASA)	O30 – O57	0.40	0.41
4. Proposed Residential Development at R(A)7 Zone	O58 – O59	0.36	0.35
5. Special Test Points within Project Area	S1 – S4	0.17	0.24

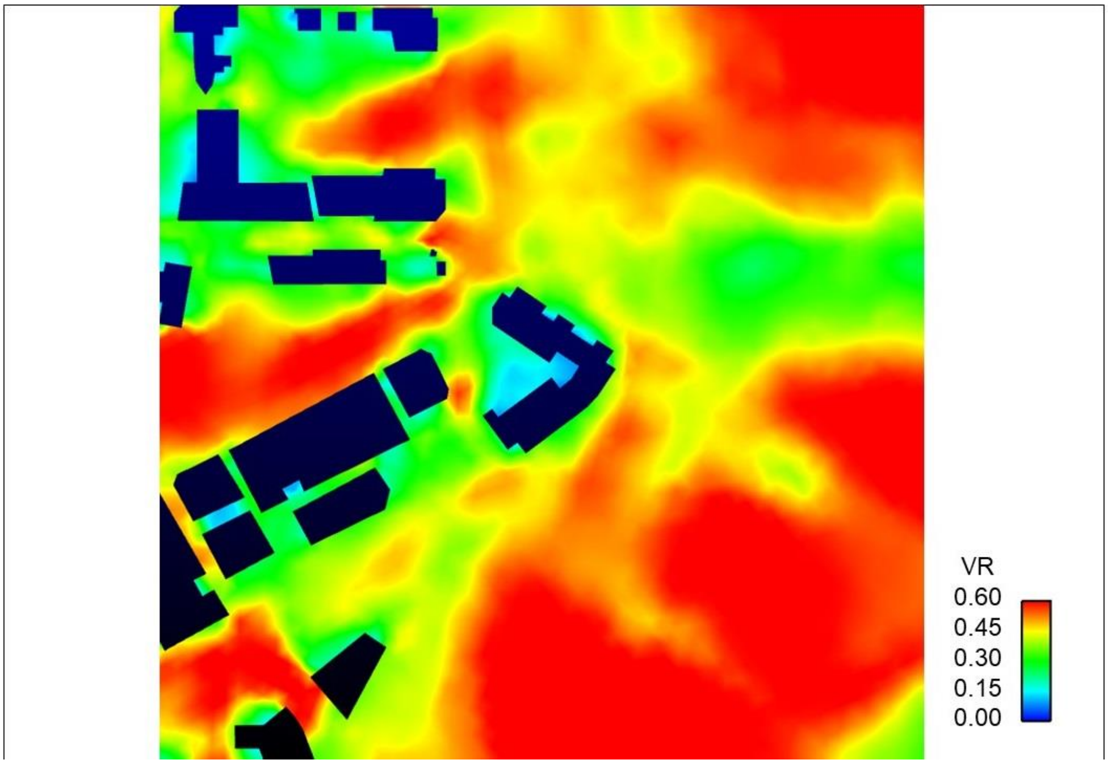


Figure 75: Annual Weighted Average VR Contour Plot at Pedestrian Level for Baseline Scheme

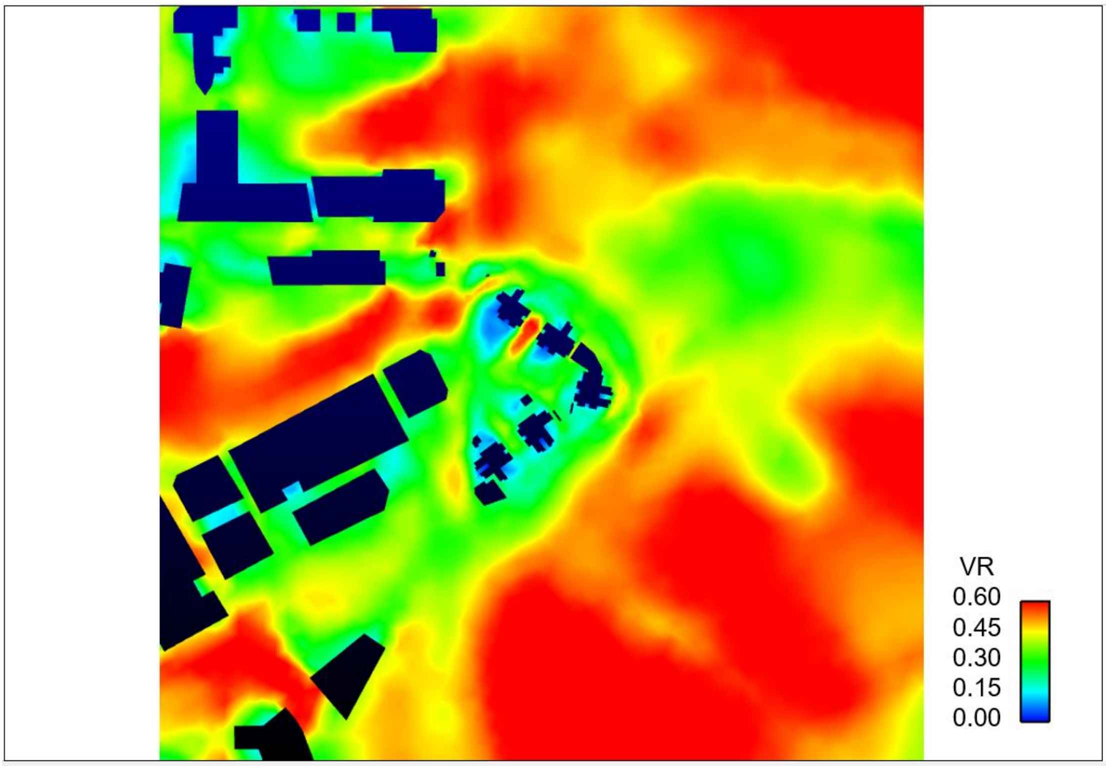


Figure 76: Annual Weighted Average VR Contour Plot at Pedestrian Level for Proposed Scheme

5.4 SUMMARY OF VELOCITY RATIO (VR) RESULTS UNDER SUMMER WIND CONDITION

5.4.1 According to the average VR results under summer wind condition in **Table 9**, the SVR is the higher in the Proposed Scheme (i.e. 0.34) when compared with the Baseline Scheme (i.e. 0.31).whilst the LVR is slightly higher in the Proposed Scheme (i.e. 0.32) when compared with the Baseline Scheme (i.e. 0.31).

5.4.2 The higher permeability design of the Proposed Scheme also allowed more summer wind to penetrate the Project Area and reach the immediate downwind regions. Similar to the annual condition, the incorporation of two 15m building separations between Tower 2 & Tower 3 (i.e. above 71.30mPD only) and Tower 3 & Tower 4 in the Proposed Scheme enhanced the wind permeability. In addition, Tower 5 would also direct more summer wind northwards thus further benefitting the ventilation performance in the immediate downstream regions thus higher VR is observed in the Proposed Scheme for Pak Shing Kok Road (i.e. 0.39) when compared with the Baseline Scheme (i.e. 0.35) and Chinese Medicine Hospital and Future GIC Uses in the Proposed Scheme (i.e. 0.33) when compared with the Baseline Scheme (i.e. 0.32).

5.4.3 For the Proposed Residential Development at R(A)7 zone, higher VRs are observed in the Baseline Scheme (i.e. 0.34) when compared with the Proposed Scheme (i.e. 0.31) due to the drawback of the higher permeability design of the Proposed Scheme resulting in less summer wind flow directed towards this region.

5.4.4 For the remaining focus areas (i.e. Fire and Ambulance Services Academy and Special Test Points within the Project Area), the wind performance of the surrounding environment is comparable for both schemes.

5.4.5 The summer weighted average VR contour plots for the Baseline Scheme and Proposed Scheme are shown in **Figure 77** and **Figure 78**.

Table 9: Summary of SVR, LVR and SAVR Results under Summer Wind Condition for Baseline Scheme and Proposed Scheme

	Test Points	Baseline Scheme	Proposed Scheme
SVR	P1 – P30	0.31	0.34
LVR	P1 – P30, O1 – O59	0.31	0.32
1. Pak Shing Kok Road	P9, P11, P13, P15 O1 – O10	0.35	0.39
2. "Chinese Medicine Hospital and Future GIC Uses"	O11 – O29	0.32	0.33
3. Fire and Ambulance Services Academy (FASA)	O30 – O57	0.28	0.28
4. Proposed Residential Development at R(A)7 Zone	O58 – O59	0.34	0.31
5. Special Test Points within Project Area	S1 – S4	0.18	0.18

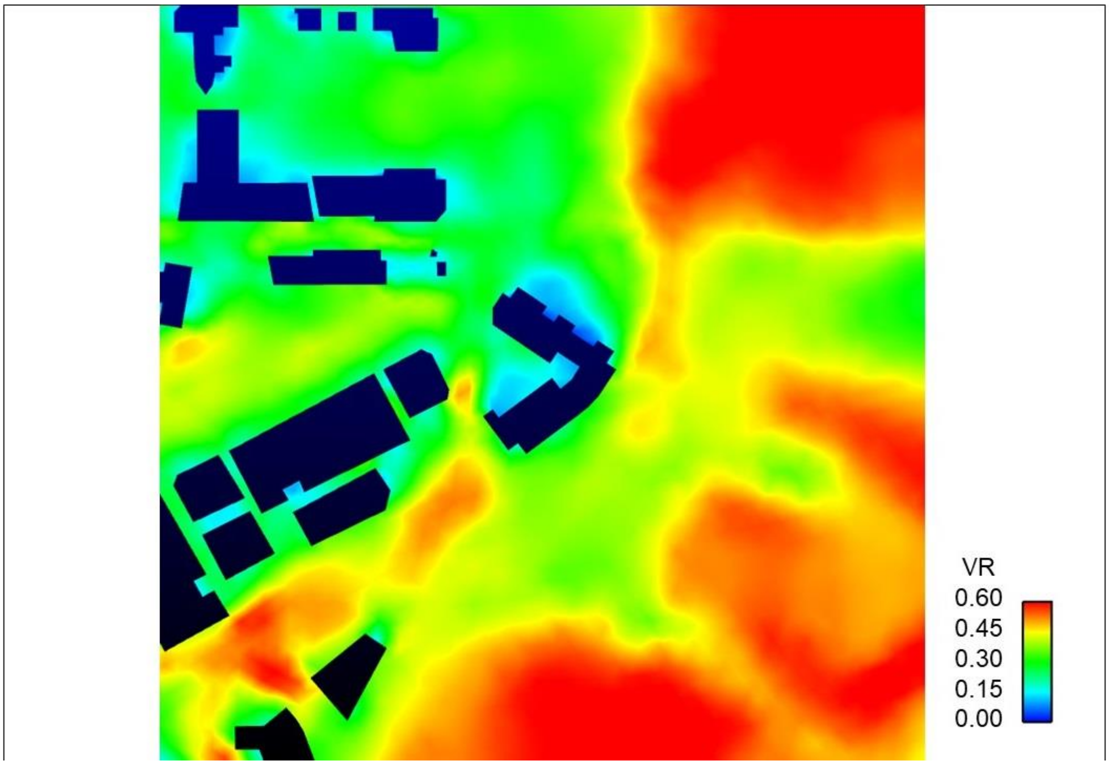


Figure 77: Summer Weighted Average VR Contour Plot at Pedestrian Level for Baseline Scheme

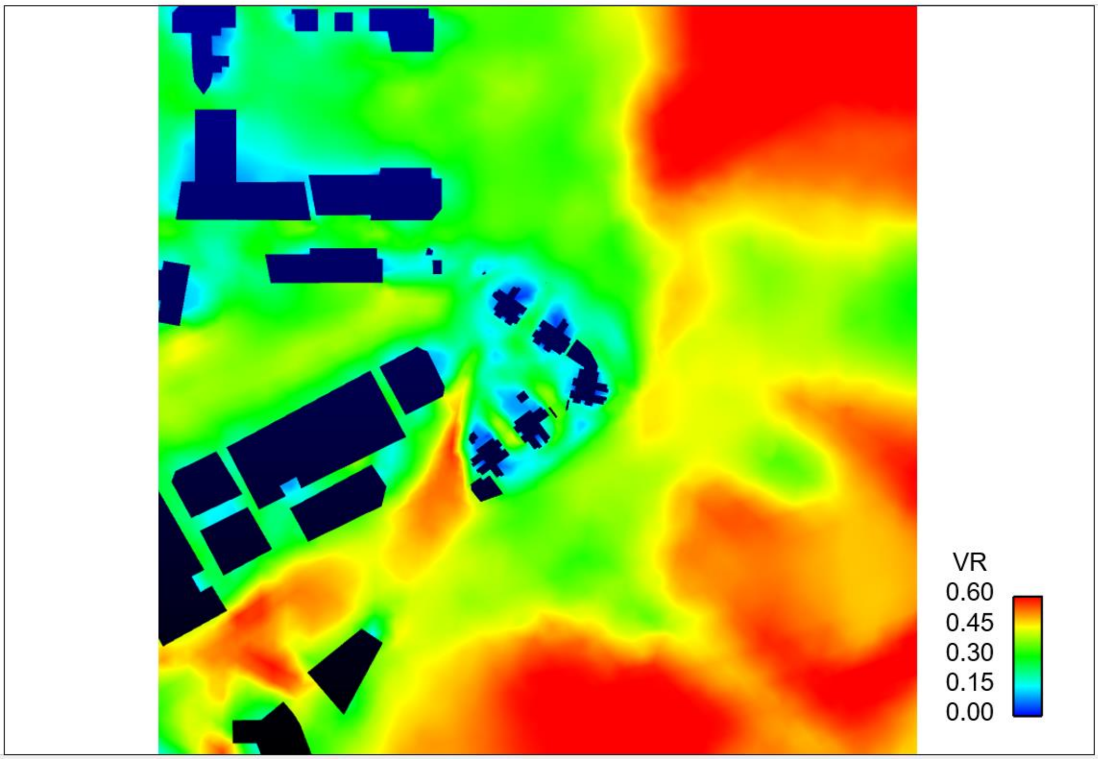


Figure 78: Summer Weighted Average VR Contour Plot at Pedestrian Level for Proposed Scheme

6.0 GOOD DESIGN FEATURES FOR WIND ENHANCEMENT

6.1 BUILDING SEPARATIONS BETWEEN TOWERS 2 & 3 AND TOWERS 3 & 4

6.1.1 As mentioned in Section 2.2.6 to 2.2.9, two building separations are incorporated in the Proposed Scheme. The building separation between Tower 2 & Tower 3 and Tower 3 & Tower 4 are both 15m. However, the building separation between Tower 2 and Tower 3 is only valid above 71.30mPD as low-rise structures (i.e. street fire hydrant water tank & pump room and water scrubber room and refuse storage and material recovery chamber) occupy the space between Tower 2 and Tower 3.

6.1.2 In addition, the site permeability at pedestrian level is also enhanced due to incorporation of loading/unloading bays & open-air carparking spaces between Towers 1 & 2 and Towers 4 & 5, which will minimize blockage effect from building structures at ground floor.

6.1.3 These good design features help enhance the wind permeability of the Project Area thus more wind flow is observed in both annual and summer conditions that will facilitate wind penetration through the Project Area. The quantitative analysis in the previous section demonstrated that the building separations in the Proposed Scheme are effective in improving wind performance within the Project Area and immediate surroundings from higher VRs for the Special Test Points within Project Area, Pak Shing Kok Road and Fire and Ambulance Services Academy for annual scenario as well as higher SVR, LVR, VRs for Pak Shing Kok Road and Chinese Medicine Hospital and Future GIC Uses.

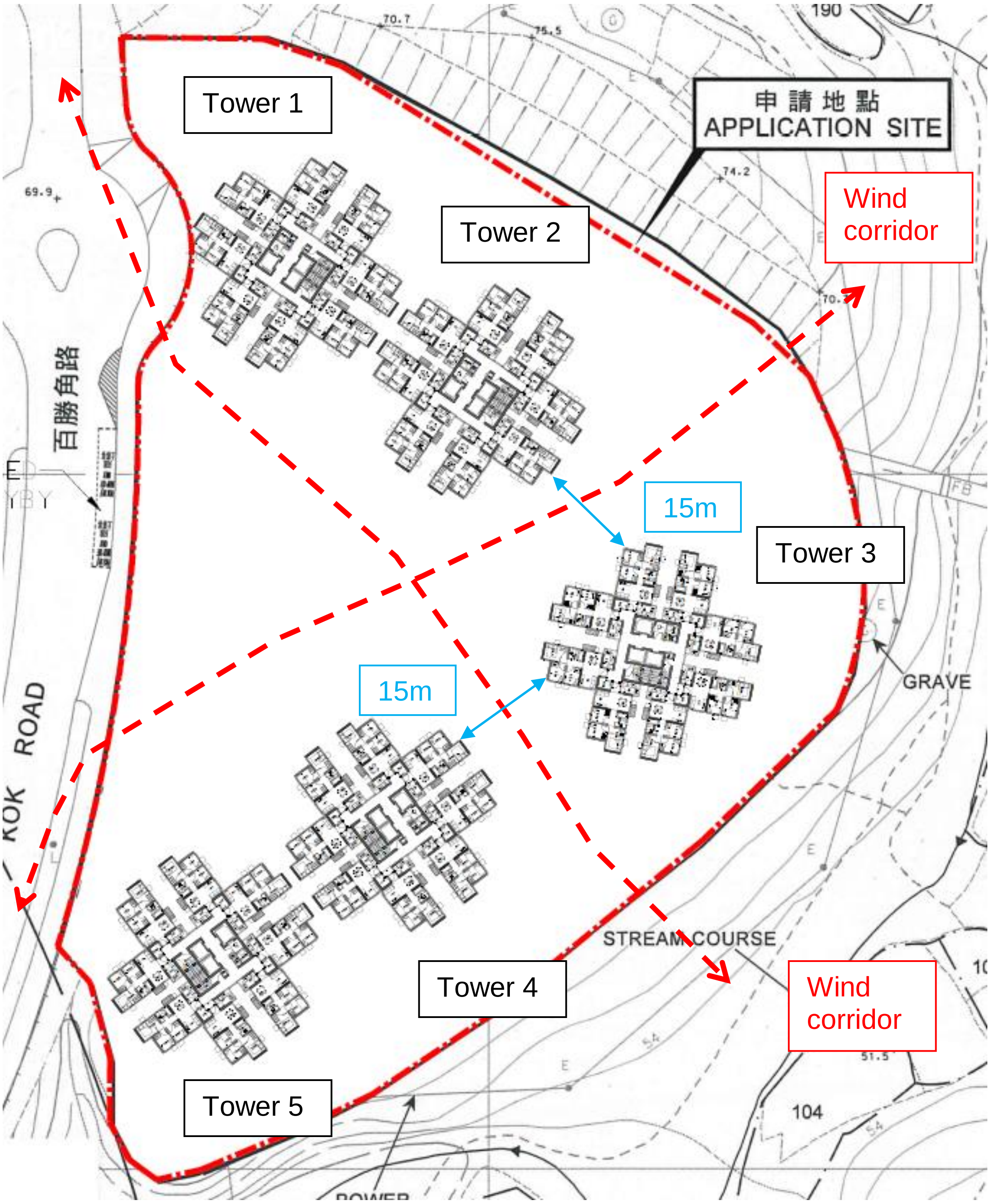


Figure 79: Design Features for Proposed Scheme

7.0 CONCLUSION

7.1.1 An Air Ventilation Assessment (AVA) – Initial Study was conducted to assess the ventilation performance of the area within the Project Area and the surrounding environment at Pak Shing Kok, Tseung Kwan O.

7.1.2 The major findings of this study could be summarized as follows:

AVA Study

7.1.3 A series of CFD simulation using realizable k- ε turbulence model were performed based on the Air Ventilation Assessment (AVA) methodology for the Initial Study as stipulated in the Technical Guide. A total of eleven wind directions covering about 76.6% occurrence of annual wind and about 79.6% of summer wind were studied. The ventilation performance for the proposed development at the Project Area and all focus areas within the Assessment Area were assessed.

7.1.4 According to the Technical Guide, the Velocity Ratio of each test point was assessed in terms of SVR, LVR and SAVR of various focus areas within the Assessment Area. A total of 30 perimeter test points, 59 overall test points and 4 special test points were selected to assess the ventilation performance.

- The annual weighted Site Spatial Average Velocity Ratio (SVRw) for the Baseline Scheme and Proposed Scheme is 0.40 and 0.33 respectively. The summer weighted Site Spatial Average Velocity Ratio (SVRw) for the Baseline Scheme and Proposed Scheme is 0.31 and 0.34 respectively.

- The annual weighted Local Spatial Average Velocity Ratio (LVRw) for the Baseline Scheme and Proposed Scheme is 0.40 and 0.39 respectively. The summer weighted Local Spatial Average Velocity Ratio (LVRw) for the Baseline Scheme and Proposed Scheme is 0.31 and 0.32 respectively.

- The Spatial Average Velocity Ratio (SAVR) of the open area within the Project Area for the Baseline and Proposed Scheme is 0.17 & 0.24 respectively for annual condition and 0.18 in both schemes for summer condition. This shows that the good design features mentioned in Section 6 have improved the ventilation performance within the Project Area for the Proposed Scheme when compared with the Baseline Scheme.

APPENDIX A

DETAILED VELOCITY RATIO OF EACH TEST POINT

Velocity Ratio of Individual Test Points for Baseline Scheme

	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	Annual	Summer
Annual	6.50%	10.90%	14.90%	17.40%	8.80%	5.60%			6.10%	6.40%		76.60%	
Summer				8.50%	8.30%	6.40%	7.70%	10.30%	13.80%	15.20%	9.40%		79.60%
O1	0.57	0.50	0.51	0.57	0.51	0.48	0.22	0.20	0.42	0.24	0.12	0.50	0.33
O2	0.51	0.56	0.63	0.70	0.50	0.63	0.23	0.29	0.30	0.16	0.10	0.55	0.33
O3	0.43	0.42	0.49	0.67	0.41	0.69	0.24	0.08	0.16	0.17	0.10	0.47	0.27
O4	0.56	0.47	0.57	0.63	0.19	0.26	0.26	0.05	0.07	0.24	0.11	0.44	0.21
O5	0.46	0.70	0.74	0.55	0.35	0.21	0.27	0.26	0.19	0.24	0.24	0.50	0.28
O6	0.25	0.10	0.40	0.33	0.55	0.50	0.43	0.56	0.45	0.53	0.44	0.37	0.48
O7	0.13	0.27	0.56	0.49	0.50	0.32	0.45	0.47	0.52	0.54	0.60	0.44	0.50
O8	0.24	0.56	0.57	0.44	0.51	0.37	0.45	0.32	0.36	0.53	0.65	0.47	0.46
O9	0.25	0.24	0.53	0.38	0.23	0.50	0.36	0.46	0.34	0.53	0.61	0.38	0.43
O10	0.27	0.19	0.25	0.26	0.26	0.07	0.35	0.56	0.44	0.53	0.54	0.27	0.41
O11	0.29	0.23	0.60	0.07	0.45	0.58	0.56	0.64	0.56	0.61	0.61	0.38	0.52
O12	0.14	0.15	0.32	0.25	0.63	0.40	0.30	0.21	0.07	0.40	0.38	0.29	0.31
O13	0.14	0.34	0.63	0.20	0.38	0.59	0.40	0.42	0.43	0.59	0.62	0.40	0.46
O14	0.14	0.27	0.60	0.31	0.22	0.41	0.22	0.28	0.35	0.57	0.59	0.37	0.39
O15	0.17	0.46	0.45	0.44	0.40	0.23	0.35	0.31	0.42	0.60	0.56	0.41	0.44
O16	0.06	0.34	0.41	0.07	0.52	0.34	0.39	0.27	0.45	0.09	0.08	0.28	0.27
O17	0.29	0.14	0.33	0.35	0.51	0.50	0.32	0.14	0.11	0.18	0.10	0.31	0.24
O18	0.04	0.33	0.41	0.32	0.17	0.49	0.11	0.22	0.23	0.04	0.01	0.28	0.18
O19	0.03	0.08	0.36	0.06	0.31	0.30	0.23	0.22	0.20	0.08	0.08	0.18	0.17
O20	0.10	0.19	0.75	0.21	0.52	0.19	0.35	0.19	0.30	0.05	0.22	0.33	0.24
O21	0.53	0.11	0.14	0.10	0.58	0.69	0.38	0.43	0.32	0.14	0.10	0.26	0.31
O22	0.56	0.63	0.04	0.34	0.85	0.77	0.06	0.35	0.26	0.39	0.07	0.43	0.37
O23	0.55	0.78	0.29	0.82	0.50	0.07	0.13	0.29	0.15	0.12	0.04	0.49	0.25
O24	0.52	0.77	0.50	0.92	0.71	0.16	0.03	0.52	0.37	0.09	0.40	0.59	0.38
O25	0.44	0.75	0.35	0.90	0.54	0.10	0.14	0.26	0.15	0.10	0.06	0.51	0.26
O26	0.41	0.82	0.62	1.00	0.70	0.07	0.14	0.42	0.31	0.12	0.38	0.62	0.37
O27	0.41	0.84	0.53	0.88	0.56	0.10	0.05	0.27	0.20	0.10	0.11	0.55	0.26
O28	0.40	0.83	0.74	0.70	0.53	0.11	0.19	0.37	0.48	0.15	0.35	0.58	0.36
O29	0.24	0.63	0.45	0.38	0.55	0.61	0.10	0.32	0.49	0.06	0.14	0.44	0.31
O30	0.70	0.45	0.28	0.22	0.51	0.56	0.13	0.44	0.19	0.14	0.14	0.35	0.27

Velocity Ratio of Individual Test Points for Baseline Scheme

	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	Annual	Summer
Annual	6.50%	10.90%	14.90%	17.40%	8.80%	5.60%			6.10%	6.40%		76.60%	
Summer				8.50%	8.30%	6.40%	7.70%	10.30%	13.80%	15.20%	9.40%		79.60%
O31	0.67	0.34	0.14	0.16	0.51	0.56	0.05	0.49	0.50	0.20	0.16	0.32	0.33
O32	0.58	0.35	0.05	0.11	0.52	0.46	0.03	0.52	0.57	0.27	0.29	0.29	0.36
O33	0.30	0.50	0.47	0.63	0.21	0.23	0.02	0.24	0.25	0.18	0.21	0.41	0.24
O34	0.24	0.11	0.03	0.12	0.05	0.39	0.10	0.10	0.15	0.19	0.06	0.13	0.14
O35	0.13	0.06	0.35	0.34	0.11	0.10	0.12	0.32	0.24	0.35	0.23	0.23	0.25
O36	0.27	0.46	0.39	0.54	0.44	0.29	0.12	0.58	0.41	0.22	0.27	0.41	0.36
O37	0.13	0.32	0.27	0.31	0.28	0.07	0.08	0.14	0.05	0.07	0.17	0.22	0.13
O38	0.18	0.35	0.22	0.41	0.54	0.06	0.15	0.15	0.44	0.04	0.41	0.31	0.27
O39	0.10	0.30	0.35	0.59	0.47	0.42	0.14	0.29	0.52	0.09	0.39	0.39	0.35
O40	0.15	0.36	0.06	0.65	0.34	0.33	0.13	0.63	0.47	0.23	0.53	0.34	0.41
O41	0.24	0.34	0.30	0.65	0.51	0.37	0.08	0.59	0.47	0.09	0.51	0.41	0.40
O42	0.17	0.51	0.34	0.12	0.46	0.16	0.06	0.37	0.13	0.08	0.27	0.26	0.20
O43	0.56	0.48	0.25	0.68	0.14	0.06	0.05	0.02	0.05	0.20	0.06	0.36	0.15
O44	0.66	0.53	0.19	0.32	0.62	0.16	0.08	0.10	0.05	0.13	0.12	0.34	0.18
O45	0.48	0.54	0.45	0.50	0.57	0.07	0.11	0.10	0.08	0.18	0.16	0.41	0.21
O46	0.33	0.60	0.63	0.79	0.10	0.14	0.11	0.11	0.12	0.23	0.14	0.47	0.21
O47	0.57	0.24	0.49	0.27	0.62	0.35	0.06	0.04	0.09	0.24	0.09	0.36	0.20
O48	0.64	0.61	0.67	0.68	0.63	0.31	0.12	0.22	0.12	0.14	0.09	0.54	0.26
O49	0.36	0.65	0.81	0.89	0.55	0.29	0.05	0.23	0.12	0.26	0.11	0.60	0.30
O50	0.41	0.32	0.59	0.66	0.62	0.66	0.03	0.17	0.23	0.22	0.03	0.50	0.30
O51	0.48	0.58	0.77	0.87	0.56	0.44	0.07	0.28	0.13	0.16	0.12	0.59	0.30
O52	0.45	0.58	0.77	0.86	0.59	0.69	0.02	0.24	0.28	0.27	0.04	0.63	0.35
O53	0.26	0.06	0.25	0.47	0.61	0.64	0.13	0.28	0.20	0.12	0.13	0.33	0.29
O54	0.38	0.13	0.57	0.99	0.53	0.71	0.10	0.34	0.12	0.22	0.17	0.52	0.35
O55	0.70	0.56	0.68	0.74	0.45	0.62	0.18	0.33	0.31	0.22	0.09	0.58	0.34
O56	0.38	0.23	0.20	0.11	0.52	0.72	0.21	0.34	0.23	0.22	0.22	0.28	0.30
O57	0.27	0.30	0.72	0.91	0.32	0.51	0.19	0.36	0.37	0.24	0.07	0.53	0.35
O58	0.22	0.49	0.14	0.29	0.53	0.53	0.44	0.29	0.29	0.17	0.04	0.32	0.30
O59	0.02	0.16	0.39	0.77	0.60	0.06	0.50	0.44	0.37	0.29	0.01	0.40	0.37

Velocity Ratio of Individual Test Points for Baseline Scheme

	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	Annual	Summer
Annual	6.50%	10.90%	14.90%	17.40%	8.80%	5.60%			6.10%	6.40%		76.60%	
Summer				8.50%	8.30%	6.40%	7.70%	10.30%	13.80%	15.20%	9.40%		79.60%
P1	0.53	0.65	0.37	0.41	0.64	0.72	0.08	0.07	0.09	0.06	0.03	0.44	0.22
P2	0.40	0.55	0.46	0.41	0.30	0.36	0.12	0.08	0.05	0.07	0.03	0.37	0.15
P3	0.37	0.57	0.51	0.45	0.14	0.08	0.14	0.07	0.05	0.06	0.04	0.35	0.12
P4	0.38	0.72	0.69	0.25	0.22	0.11	0.13	0.07	0.05	0.06	0.02	0.37	0.10
P5	0.43	0.89	0.85	0.12	0.26	0.14	0.12	0.07	0.25	0.07	0.14	0.42	0.14
P6	0.43	0.90	0.80	0.25	0.33	0.03	0.08	0.46	0.17	0.15	0.25	0.44	0.22
P7	0.42	0.80	0.80	0.43	0.41	0.23	0.32	0.24	0.14	0.22	0.32	0.50	0.27
P8	0.50	0.77	0.77	0.42	0.42	0.29	0.38	0.34	0.05	0.20	0.33	0.49	0.28
P9	0.60	0.42	0.23	0.40	0.35	0.28	0.45	0.45	0.28	0.17	0.18	0.34	0.31
P10	0.19	0.03	0.13	0.05	0.23	0.19	0.44	0.40	0.21	0.09	0.13	0.12	0.21
P11	0.38	0.21	0.36	0.17	0.10	0.42	0.34	0.30	0.20	0.15	0.16	0.24	0.22
P12	0.32	0.07	0.49	0.21	0.35	0.44	0.50	0.29	0.29	0.20	0.14	0.29	0.28
P13	0.43	0.03	0.61	0.11	0.53	0.48	0.55	0.28	0.30	0.12	0.14	0.31	0.29
P14	0.58	0.27	0.58	0.17	0.80	0.62	0.56	0.60	0.48	0.38	0.14	0.44	0.45
P15	0.59	0.50	0.35	0.26	0.60	0.47	0.43	0.49	0.41	0.42	0.14	0.42	0.40
P16	0.47	0.19	0.29	0.21	0.57	0.50	0.42	0.56	0.41	0.46	0.23	0.34	0.42
P17	0.27	0.06	0.15	0.26	0.58	0.48	0.42	0.56	0.43	0.49	0.32	0.30	0.45
P18	0.35	0.08	0.90	0.41	0.53	0.57	0.42	0.56	0.46	0.40	0.58	0.48	0.48
P19	0.36	0.05	0.90	0.37	0.43	0.48	0.39	0.50	0.49	0.09	0.60	0.43	0.40
P20	0.44	0.04	0.96	0.37	0.49	0.55	0.40	0.50	0.47	0.21	0.57	0.47	0.43
P21	0.29	0.20	0.84	0.43	0.38	0.46	0.29	0.35	0.46	0.07	0.53	0.43	0.35
P22	0.18	0.14	0.95	0.47	0.29	0.43	0.26	0.30	0.46	0.11	0.55	0.44	0.35
P23	0.18	0.41	0.87	0.49	0.12	0.25	0.27	0.32	0.51	0.21	0.54	0.44	0.35
P24	0.25	0.49	0.84	0.45	0.02	0.12	0.26	0.37	0.51	0.24	0.52	0.43	0.33
P25	0.31	0.58	0.81	0.29	0.25	0.12	0.29	0.49	0.54	0.27	0.41	0.44	0.35
P26	0.42	0.77	0.76	0.21	0.36	0.10	0.29	0.54	0.62	0.32	0.27	0.47	0.37
P27	0.46	0.78	0.71	0.13	0.47	0.27	0.29	0.57	0.63	0.34	0.06	0.47	0.37
P28	0.52	0.72	0.58	0.05	0.61	0.43	0.37	0.60	0.63	0.37	0.04	0.45	0.40
P29	0.70	0.71	0.30	0.30	0.77	0.62	0.49	0.58	0.61	0.30	0.09	0.50	0.46
P30	0.64	0.68	0.20	0.46	0.80	0.77	0.51	0.11	0.07	0.03	0.06	0.45	0.28

Velocity Ratio of Individual Test Points for Baseline Scheme

	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	Annual	Summer
Annual	6.50%	10.90%	14.90%	17.40%	8.80%	5.60%			6.10%	6.40%		76.60%	
Summer				8.50%	8.30%	6.40%	7.70%	10.30%	13.80%	15.20%	9.40%		79.60%
S1	0.05	0.14	0.30	0.14	0.07	0.07	0.38	0.35	0.37	0.13	0.06	0.17	0.20
S2	0.11	0.20	0.37	0.22	0.13	0.15	0.34	0.32	0.25	0.22	0.23	0.23	0.24
S3	0.11	0.22	0.07	0.11	0.07	0.07	0.10	0.27	0.14	0.20	0.20	0.12	0.15
S4	0.03	0.22	0.11	0.26	0.15	0.03	0.12	0.09	0.05	0.17	0.17	0.15	0.13

Velocity Ratio of Individual Test Points for Proposed Scheme

	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	Annual	Summer
Annual	6.50%	10.90%	14.90%	17.40%	8.80%	5.60%			6.10%	6.40%		76.60%	
Summer				8.50%	8.30%	6.40%	7.70%	10.30%	13.80%	15.20%	9.40%		79.60%
O1	0.60	0.52	0.53	0.59	0.57	0.40	0.38	0.14	0.37	0.28	0.15	0.51	0.35
O2	0.53	0.58	0.66	0.74	0.66	0.58	0.32	0.28	0.11	0.25	0.08	0.57	0.34
O3	0.43	0.44	0.44	0.75	0.63	0.68	0.19	0.08	0.20	0.24	0.07	0.51	0.32
O4	0.58	0.50	0.65	0.82	0.50	0.70	0.17	0.07	0.24	0.28	0.11	0.58	0.33
O5	0.47	0.70	0.67	0.75	0.40	0.18	0.20	0.19	0.23	0.25	0.28	0.54	0.30
O6	0.65	0.40	0.25	0.32	0.71	0.69	0.52	0.65	0.52	0.55	0.48	0.45	0.55
O7	0.07	0.25	0.04	0.50	0.55	0.40	0.46	0.54	0.53	0.56	0.63	0.34	0.53
O8	0.07	0.51	0.32	0.39	0.58	0.40	0.50	0.40	0.41	0.50	0.67	0.40	0.48
O9	0.13	0.09	0.68	0.45	0.26	0.52	0.38	0.46	0.36	0.56	0.64	0.40	0.46
O10	0.30	0.16	0.33	0.19	0.28	0.11	0.35	0.57	0.46	0.55	0.57	0.28	0.42
O11	0.16	0.33	0.64	0.15	0.46	0.57	0.56	0.64	0.58	0.63	0.64	0.41	0.54
O12	0.16	0.20	0.56	0.32	0.61	0.42	0.32	0.25	0.09	0.41	0.39	0.37	0.34
O13	0.18	0.31	0.57	0.29	0.40	0.62	0.44	0.41	0.44	0.62	0.64	0.42	0.49
O14	0.08	0.18	0.38	0.47	0.18	0.42	0.31	0.28	0.34	0.60	0.61	0.34	0.42
O15	0.13	0.26	0.18	0.62	0.33	0.19	0.33	0.30	0.42	0.60	0.58	0.34	0.43
O16	0.08	0.25	0.08	0.12	0.59	0.43	0.39	0.26	0.45	0.05	0.05	0.22	0.27
O17	0.26	0.12	0.48	0.32	0.52	0.55	0.35	0.17	0.15	0.17	0.10	0.33	0.26
O18	0.12	0.21	0.18	0.34	0.35	0.34	0.17	0.26	0.28	0.02	0.01	0.24	0.20
O19	0.09	0.16	0.10	0.22	0.42	0.46	0.43	0.28	0.25	0.04	0.04	0.20	0.24
O20	0.04	0.05	0.39	0.18	0.61	0.54	0.38	0.28	0.35	0.09	0.11	0.27	0.29
O21	0.52	0.02	0.57	0.11	0.57	0.67	0.39	0.48	0.33	0.12	0.09	0.33	0.31
O22	0.50	0.44	0.44	0.15	0.19	0.08	0.07	0.17	0.19	0.07	0.05	0.27	0.12
O23	0.62	0.74	0.17	0.89	0.40	0.18	0.11	0.30	0.17	0.10	0.04	0.47	0.25
O24	0.59	0.69	0.68	0.75	0.61	0.38	0.10	0.54	0.40	0.11	0.43	0.59	0.40
O25	0.55	0.73	0.23	0.69	0.40	0.05	0.10	0.26	0.16	0.07	0.09	0.42	0.22
O26	0.49	0.74	0.78	0.69	0.57	0.29	0.16	0.44	0.34	0.16	0.41	0.58	0.37
O27	0.50	0.83	0.63	0.75	0.47	0.22	0.05	0.27	0.25	0.14	0.17	0.55	0.28
O28	0.42	0.78	0.65	0.84	0.39	0.27	0.20	0.40	0.53	0.22	0.39	0.59	0.40
O29	0.40	0.74	0.80	0.58	0.59	0.39	0.10	0.37	0.56	0.22	0.28	0.58	0.38
O30	0.71	0.51	0.27	0.34	0.43	0.30	0.15	0.45	0.19	0.14	0.14	0.36	0.25

Velocity Ratio of Individual Test Points for Proposed Scheme

	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	Annual	Summer
Annual	6.50%	10.90%	14.90%	17.40%	8.80%	5.60%			6.10%	6.40%		76.60%	
Summer				8.50%	8.30%	6.40%	7.70%	10.30%	13.80%	15.20%	9.40%		79.60%
O31	0.68	0.41	0.14	0.34	0.49	0.33	0.10	0.49	0.50	0.22	0.15	0.36	0.33
O32	0.48	0.19	0.30	0.42	0.51	0.40	0.07	0.52	0.54	0.32	0.25	0.38	0.39
O33	0.36	0.38	0.59	0.69	0.24	0.20	0.02	0.25	0.28	0.22	0.24	0.44	0.27
O34	0.17	0.08	0.22	0.42	0.10	0.02	0.09	0.09	0.16	0.22	0.04	0.21	0.15
O35	0.08	0.08	0.31	0.22	0.09	0.08	0.09	0.33	0.25	0.37	0.24	0.20	0.23
O36	0.26	0.41	0.59	0.45	0.41	0.04	0.15	0.58	0.41	0.23	0.27	0.40	0.33
O37	0.14	0.26	0.37	0.21	0.25	0.06	0.07	0.14	0.05	0.07	0.17	0.21	0.12
O38	0.09	0.25	0.75	0.04	0.55	0.12	0.15	0.16	0.46	0.13	0.44	0.32	0.26
O39	0.24	0.25	0.22	0.48	0.50	0.35	0.15	0.26	0.57	0.09	0.43	0.34	0.34
O40	0.15	0.49	0.59	0.49	0.30	0.17	0.15	0.61	0.46	0.24	0.53	0.41	0.38
O41	0.14	0.41	0.57	0.57	0.44	0.31	0.03	0.56	0.45	0.04	0.50	0.42	0.35
O42	0.18	0.33	0.60	0.34	0.37	0.05	0.12	0.35	0.17	0.14	0.26	0.33	0.22
O43	0.62	0.57	0.37	0.80	0.12	0.30	0.27	0.04	0.10	0.24	0.05	0.45	0.22
O44	0.64	0.57	0.56	0.31	0.57	0.36	0.09	0.08	0.02	0.04	0.11	0.41	0.16
O45	0.50	0.63	0.66	0.79	0.53	0.27	0.10	0.10	0.11	0.08	0.13	0.54	0.23
O46	0.29	0.59	0.66	0.79	0.11	0.15	0.07	0.05	0.11	0.08	0.12	0.46	0.17
O47	0.64	0.28	0.16	0.18	0.71	0.62	0.28	0.03	0.22	0.27	0.06	0.33	0.27
O48	0.61	0.60	0.68	0.60	0.59	0.42	0.05	0.19	0.06	0.11	0.09	0.52	0.23
O49	0.37	0.63	0.82	0.79	0.51	0.44	0.07	0.18	0.16	0.19	0.11	0.58	0.28
O50	0.45	0.41	0.64	0.62	0.66	0.68	0.22	0.13	0.20	0.26	0.05	0.53	0.32
O51	0.42	0.52	0.75	0.87	0.55	0.56	0.02	0.25	0.12	0.12	0.13	0.57	0.29
O52	0.45	0.55	0.75	0.79	0.64	0.71	0.17	0.22	0.12	0.27	0.08	0.60	0.33
O53	0.26	0.06	0.24	0.40	0.61	0.60	0.08	0.27	0.15	0.12	0.13	0.30	0.26
O54	0.36	0.08	0.55	0.91	0.58	0.63	0.20	0.33	0.17	0.19	0.19	0.50	0.36
O55	0.69	0.53	0.65	0.72	0.51	0.52	0.24	0.31	0.17	0.26	0.10	0.56	0.33
O56	0.37	0.23	0.20	0.24	0.57	0.68	0.26	0.31	0.26	0.21	0.23	0.31	0.32
O57	0.23	0.29	0.69	0.89	0.34	0.42	0.23	0.32	0.36	0.25	0.08	0.52	0.35
O58	0.07	0.24	0.26	0.28	0.49	0.52	0.36	0.27	0.21	0.15	0.04	0.28	0.26
O59	0.12	0.33	0.48	0.71	0.57	0.05	0.47	0.43	0.34	0.27	0.01	0.43	0.35

Velocity Ratio of Individual Test Points for Proposed Scheme

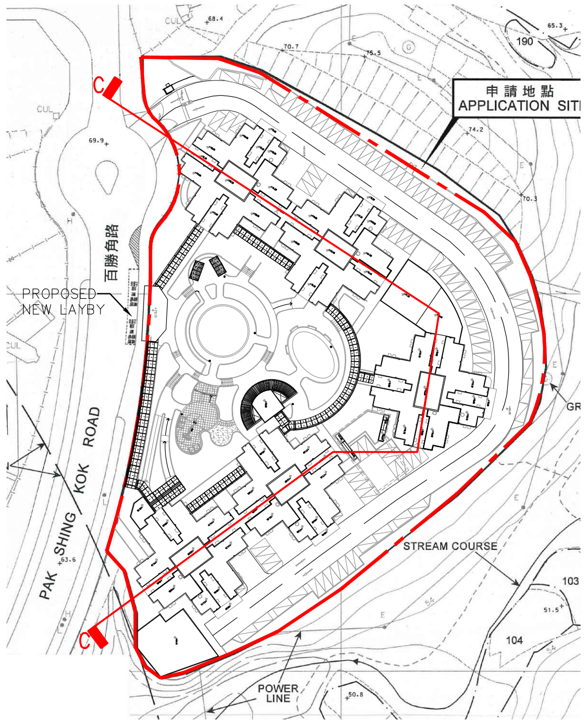
	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	Annual	Summer
Annual	6.50%	10.90%	14.90%	17.40%	8.80%	5.60%			6.10%	6.40%		76.60%	
Summer				8.50%	8.30%	6.40%	7.70%	10.30%	13.80%	15.20%	9.40%		79.60%
P1	0.29	0.27	0.19	0.53	0.34	0.73	0.31	0.07	0.09	0.08	0.05	0.33	0.23
P2	0.29	0.21	0.27	0.46	0.63	0.54	0.40	0.10	0.10	0.08	0.06	0.34	0.25
P3	0.12	0.10	0.18	0.35	0.66	0.41	0.30	0.09	0.04	0.04	0.03	0.25	0.20
P4	0.13	0.06	0.30	0.38	0.64	0.54	0.20	0.15	0.09	0.01	0.05	0.28	0.21
P5	0.18	0.37	0.48	0.43	0.50	0.52	0.15	0.09	0.18	0.08	0.24	0.38	0.24
P6	0.30	0.63	0.58	0.49	0.19	0.34	0.15	0.14	0.24	0.11	0.17	0.42	0.22
P7	0.47	0.74	0.70	0.47	0.27	0.03	0.05	0.29	0.25	0.22	0.23	0.46	0.24
P8	0.29	0.32	0.18	0.38	0.14	0.20	0.36	0.36	0.03	0.27	0.30	0.25	0.24
P9	0.66	0.80	0.80	0.64	0.11	0.09	0.20	0.49	0.26	0.23	0.17	0.53	0.28
P10	0.03	0.05	0.15	0.07	0.09	0.09	0.39	0.60	0.12	0.08	0.12	0.09	0.19
P11	0.03	0.02	0.12	0.06	0.16	0.27	0.34	0.40	0.14	0.09	0.14	0.10	0.19
P12	0.24	0.05	0.13	0.14	0.48	0.47	0.47	0.58	0.26	0.30	0.02	0.22	0.33
P13	0.44	0.34	0.22	0.18	0.39	0.52	0.59	0.70	0.23	0.21	0.14	0.29	0.35
P14	0.59	0.09	0.12	0.18	0.84	0.67	0.58	0.73	0.52	0.48	0.13	0.35	0.51
P15	0.59	0.16	0.08	0.40	0.85	0.65	0.58	0.64	0.40	0.57	0.28	0.40	0.53
P16	0.67	0.36	0.11	0.48	0.88	0.72	0.62	0.75	0.55	0.62	0.48	0.49	0.63
P17	0.26	0.36	0.16	0.35	0.82	0.62	0.47	0.57	0.45	0.45	0.42	0.40	0.51
P18	0.41	0.42	0.28	0.32	0.77	0.68	0.50	0.63	0.55	0.40	0.48	0.44	0.53
P19	0.10	0.07	0.17	0.32	0.53	0.69	0.34	0.43	0.43	0.44	0.67	0.30	0.47
P20	0.09	0.21	0.29	0.29	0.29	0.53	0.24	0.27	0.36	0.40	0.64	0.29	0.38
P21	0.11	0.06	0.07	0.28	0.11	0.27	0.33	0.37	0.47	0.35	0.57	0.19	0.36
P22	0.06	0.08	0.46	0.36	0.17	0.18	0.37	0.42	0.53	0.29	0.43	0.29	0.36
P23	0.05	0.24	0.67	0.47	0.19	0.14	0.39	0.47	0.59	0.22	0.15	0.37	0.34
P24	0.12	0.26	0.59	0.50	0.27	0.20	0.38	0.48	0.61	0.23	0.04	0.39	0.35
P25	0.12	0.25	0.39	0.49	0.29	0.21	0.33	0.45	0.61	0.24	0.07	0.35	0.35
P26	0.20	0.30	0.26	0.23	0.39	0.17	0.33	0.45	0.67	0.31	0.12	0.30	0.36
P27	0.19	0.26	0.28	0.11	0.63	0.43	0.41	0.29	0.75	0.36	0.14	0.33	0.41
P28	0.25	0.36	0.40	0.11	0.67	0.58	0.47	0.04	0.20	0.17	0.13	0.32	0.26
P29	0.34	0.50	0.25	0.47	0.68	0.64	0.52	0.18	0.21	0.06	0.11	0.40	0.31
P30	0.34	0.46	0.28	0.58	0.50	0.73	0.52	0.14	0.05	0.03	0.05	0.40	0.26

Velocity Ratio of Individual Test Points for Proposed Scheme

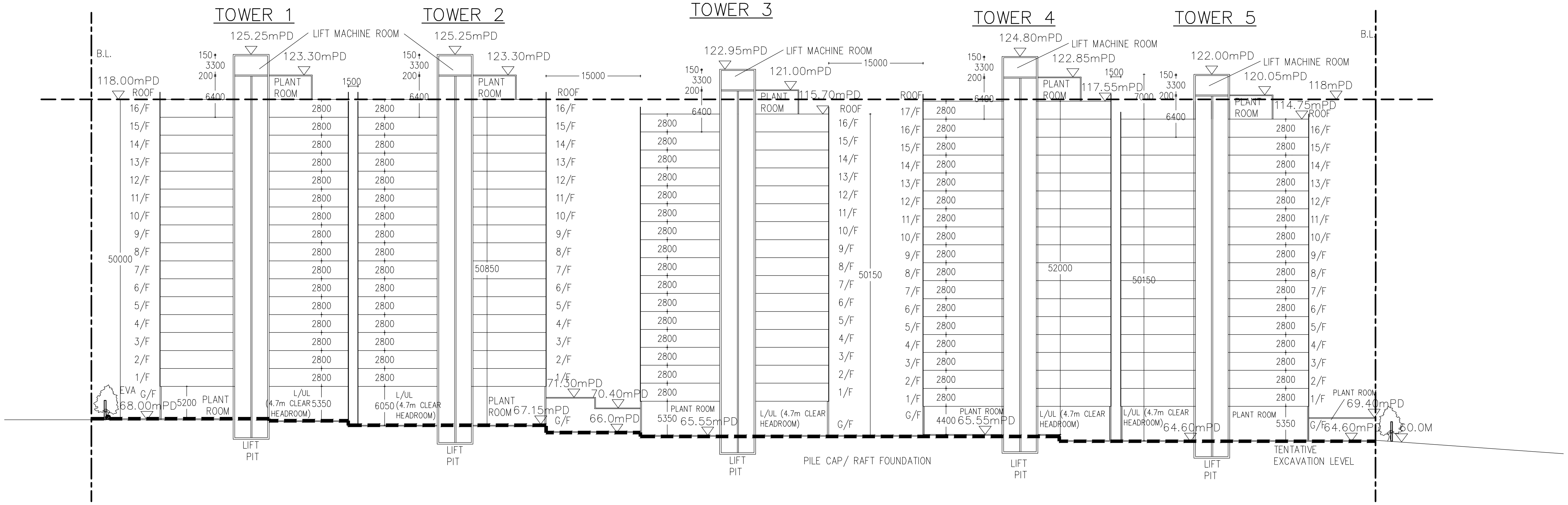
	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	Annual	Summer
Annual	6.50%	10.90%	14.90%	17.40%	8.80%	5.60%			6.10%	6.40%		76.60%	
Summer				8.50%	8.30%	6.40%	7.70%	10.30%	13.80%	15.20%	9.40%		79.60%
S1	0.30	0.54	0.34	0.12	0.21	0.10	0.38	0.49	0.09	0.27	0.13	0.26	0.22
S2	0.06	0.39	0.27	0.14	0.14	0.12	0.14	0.18	0.33	0.23	0.01	0.21	0.18
S3	0.15	0.36	0.40	0.18	0.37	0.19	0.13	0.31	0.23	0.10	0.14	0.26	0.20
S4	0.29	0.45	0.24	0.21	0.25	0.11	0.12	0.04	0.04	0.06	0.19	0.23	0.12

APPENDIX B

SECTION DRAWING FOR PROPOSED SCHEME



KEY PLAN



SECTION C–C

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1st/2nd/3rd AIP/DDA Submission

( )CONSENT IS GIVEN WITHOUT CONDITIONS
( )CONSENT IS GIVEN WITH CONDITIONS
( )CONSENT NOT GRANTED

FOR AND ON BEHALF OF ARCHITECTURAL SERVICES DEPARTMENT

SIGN:

NAME:
FOR THE SUPERVISING OFFICER:
DATE:

Architectural Designer :
HO & PARTNERS ARCHITECTS, ENGINEERS & DEVELOPMENT CONSULTANTS LTD.
SIGN:

NAME: HO HIN NGAI, BOSCO DATE:

Architectural Design Checker:
BEN YEUNG & ASSOCIATES LTD.
SIGN:

NAME: LUI WING SHING, RAYMOND DATE:

Rev.No.	Date	Particulars	Drawn	Checked	Approved
–	–	–	–	–	–

Client :
建築署
Architectural Services Department

Main Contractor :
有利建築有限公司
Yau Lee Construction Co., Ltd.

Architectural Designer : hpa

Structural, Civil and Geotechnical Designer : JACOBS

Traffic, Environmental & Sustainability Designer : MEINHARDT

Building Services Designer : wsp

Landscape Designer : ADI

Project :
CONTRACT NO. SS E502
DESIGN AND CONSTRUCTION OF
PAK SHING KOK QUARTERS
(PSKQ)

Drawing Title :
SECTION C–C

Designed By : NC	Drawn By : AF
Date : 19–03–2018	Approved : TC

CAD REF :
L:\Project\NT\NT1632 – TKOSQ\6_Sketch\Tower\Tower Section 20180803

Scale : 1:500

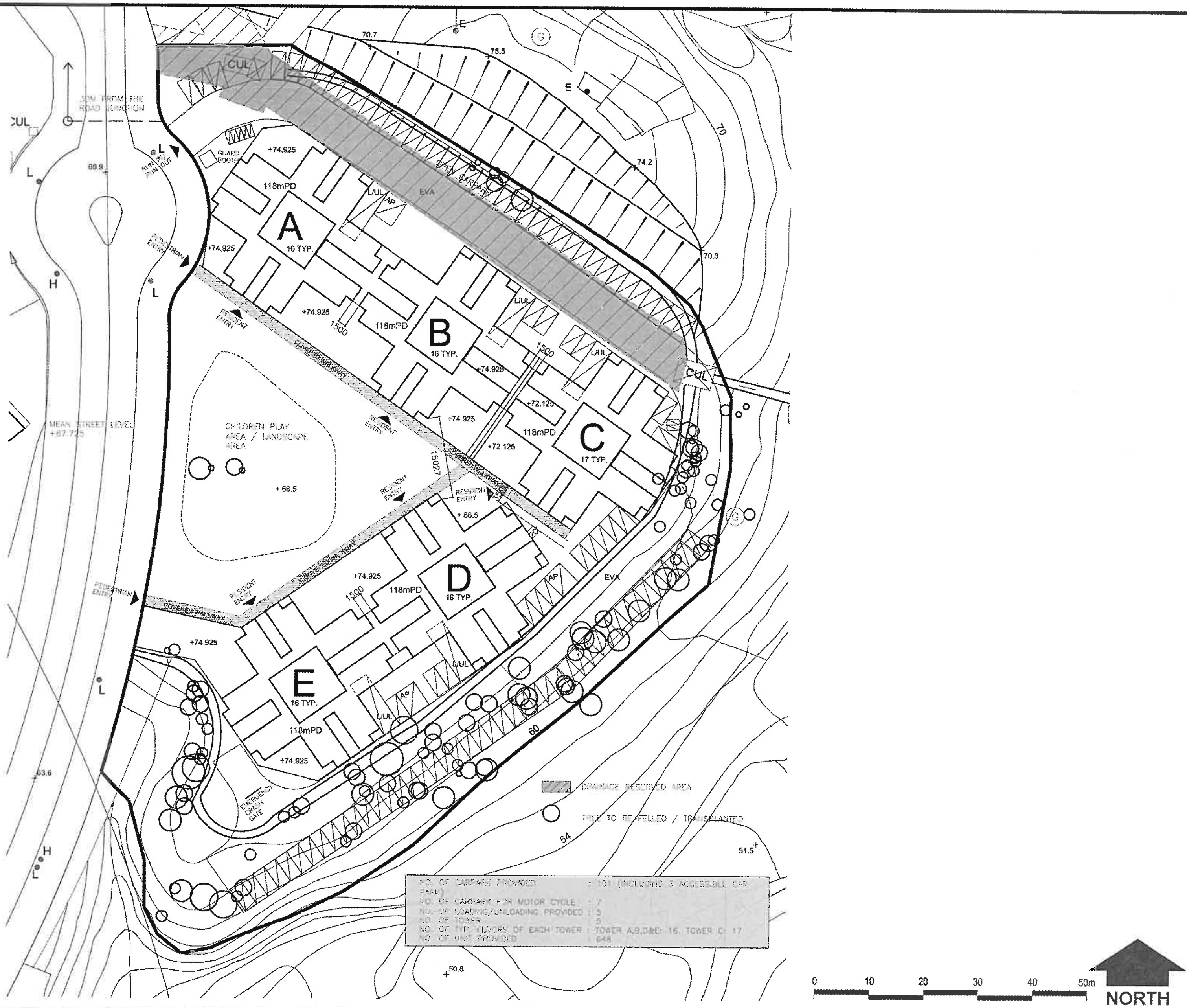
Drawing No. SK–024

Job No. :	Drawing Status.	Rev.	Size
NT1632	–	–	A3

CAD Ref.: 08AUG18-12:13:00 ANC L:\PROJECT\NT\NT1632 – TKOSQ\6_SKETCH\TOWER\TOWER SECTION 20180803.DWG

APPENDIX C

LAYOUT PLAN OF BASELINE SCHEME

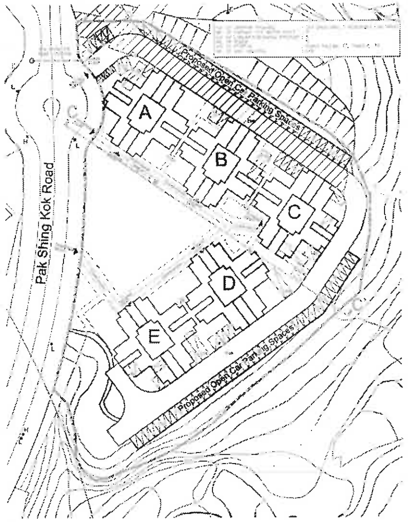


Contract No. 001/15/PMB203 **(Programme No. 64JA)**

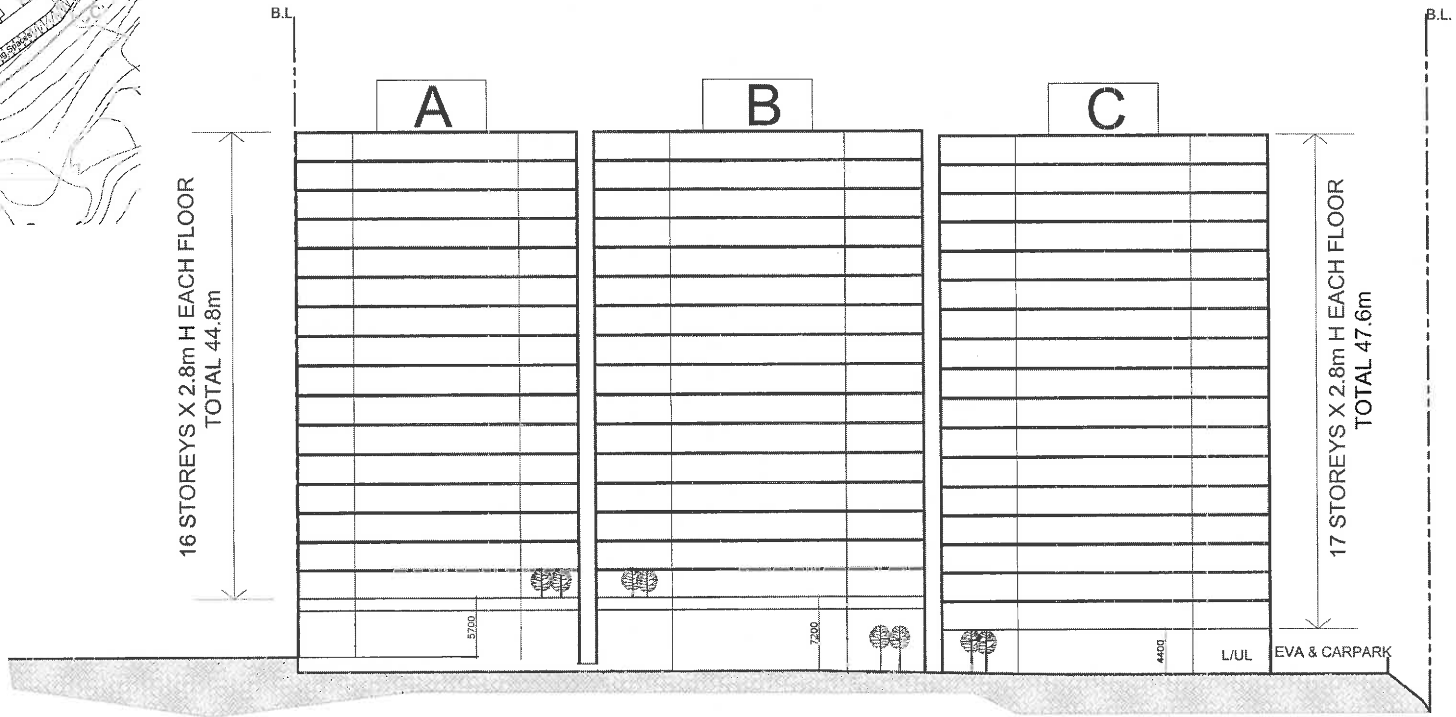
Consultancy Services for Town Planning Application, Preliminary Environmental Review, Associated Studies, Tree Removal Application and Utility Mapping for Construction of Rank and File Quarters for Fire Services Department at Area 106, Pak Shing Kok, Tseung Kwan O

Urbis Limited 雅邦

Title		
Master Layout Plan		
Scale: 1:750@ A3	Date: September 2016	Figure No.



Keyplan

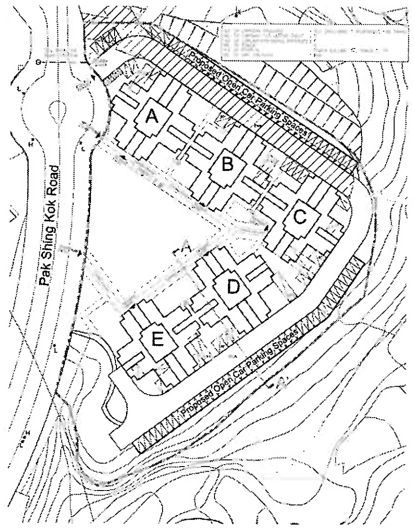


Contract No. 001/15/PMB203 (Programme No. 64JA)

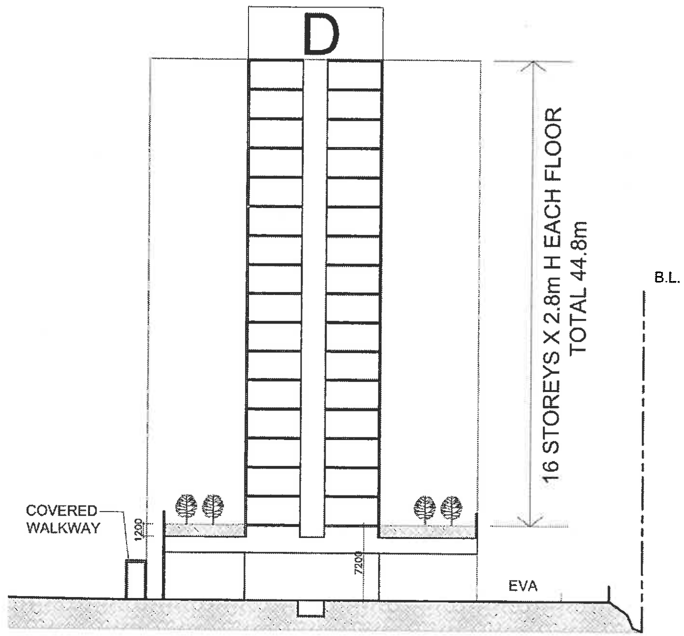
Consultancy Services for Town Planning Application, Preliminary Environmental Review, Associated Studies, Tree Removal Application and Utility Mapping for Construction of Rank and File Quarters for Fire Services Department at Area 106, Pak Shing Kok, Tseung Kwan O

Urbis Limited

Title	Section C-C' of the Proposed Development
Scale	1:500@ A3
Date	December 2015
Figure No.	1.8



Keyplan



NOTE (S):

Subject to the detail design, elevation of Tower E and Tower D would be identical.

0 10 20 30m

Contract No. 001/15/PMB203 (Programme No. 64JA)

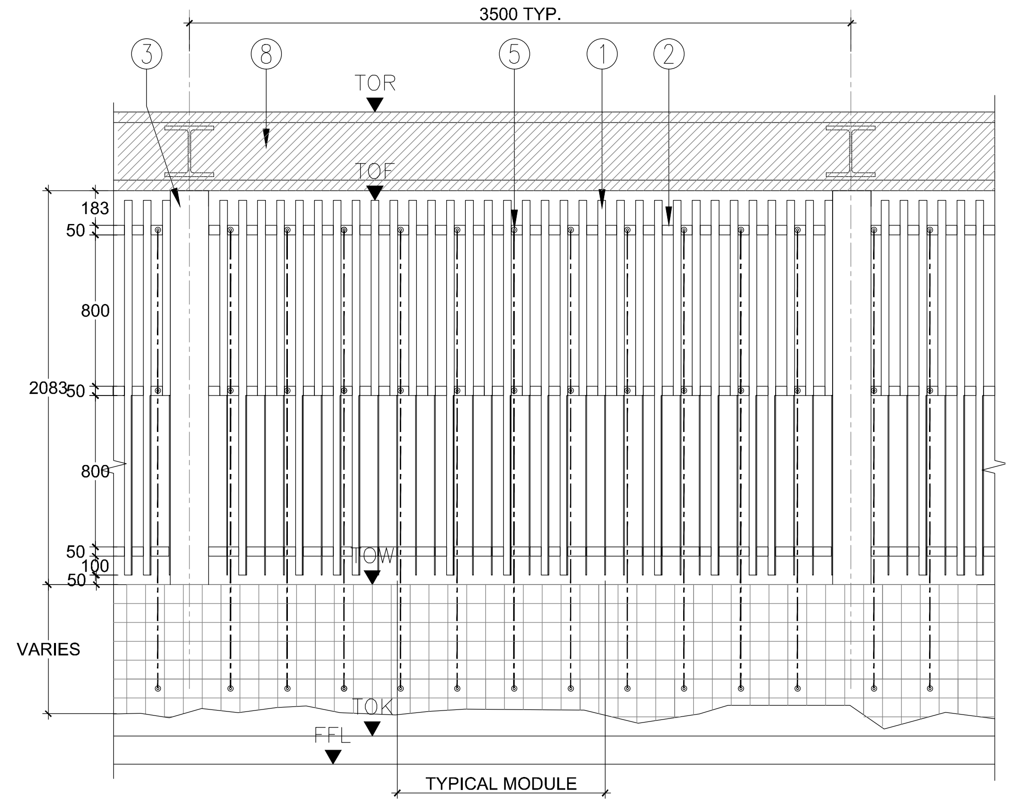
Consultancy Services for Town Planning Application, Preliminary Environmental Review, Associated Studies, Tree Removal Application and Utility Mapping for Construction of Rank and File Quarters for Fire Services Department at Area 106, Pak Shing Kok, Tseung Kwan O

Urbis Limited

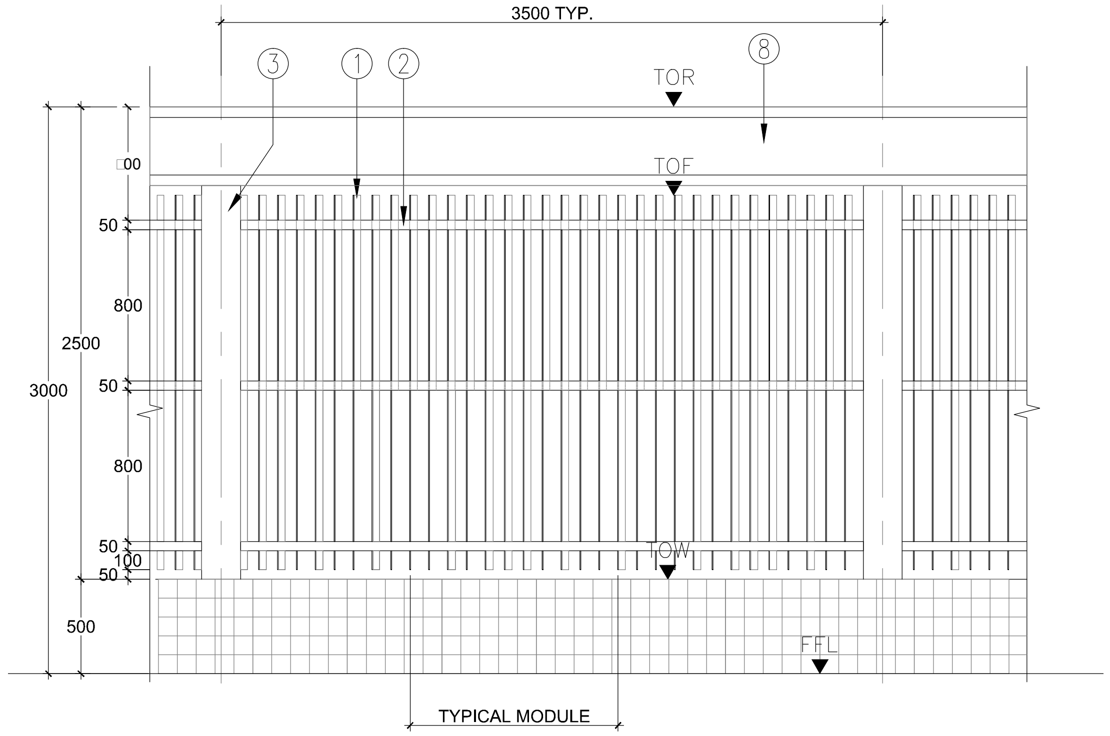
Title	Section A-A' of the Proposed Development
Scale	1:500@ A3
Date	December 2015
Figure No.	1.7

APPENDIX D

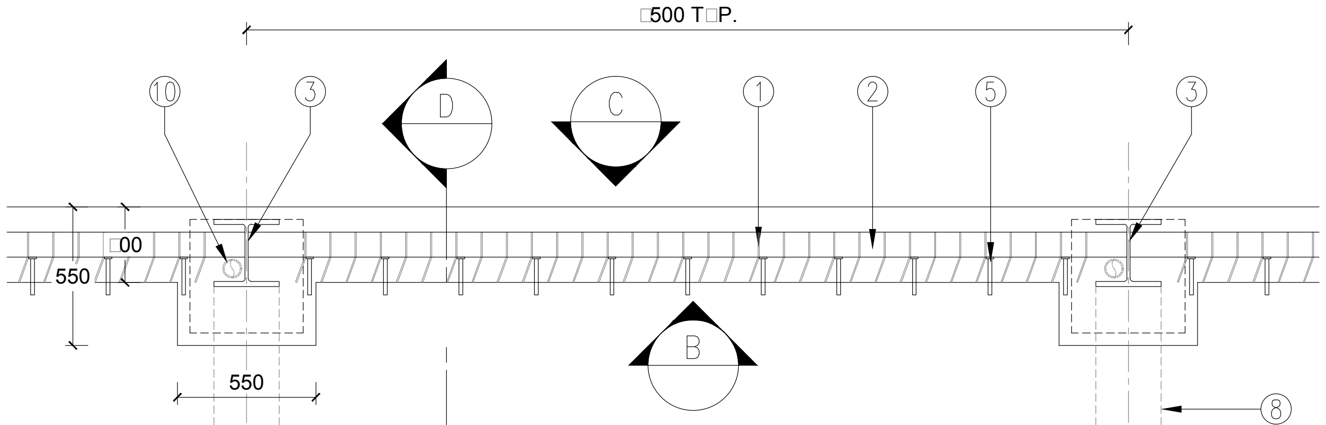
DETAILS OF FENCE WALL



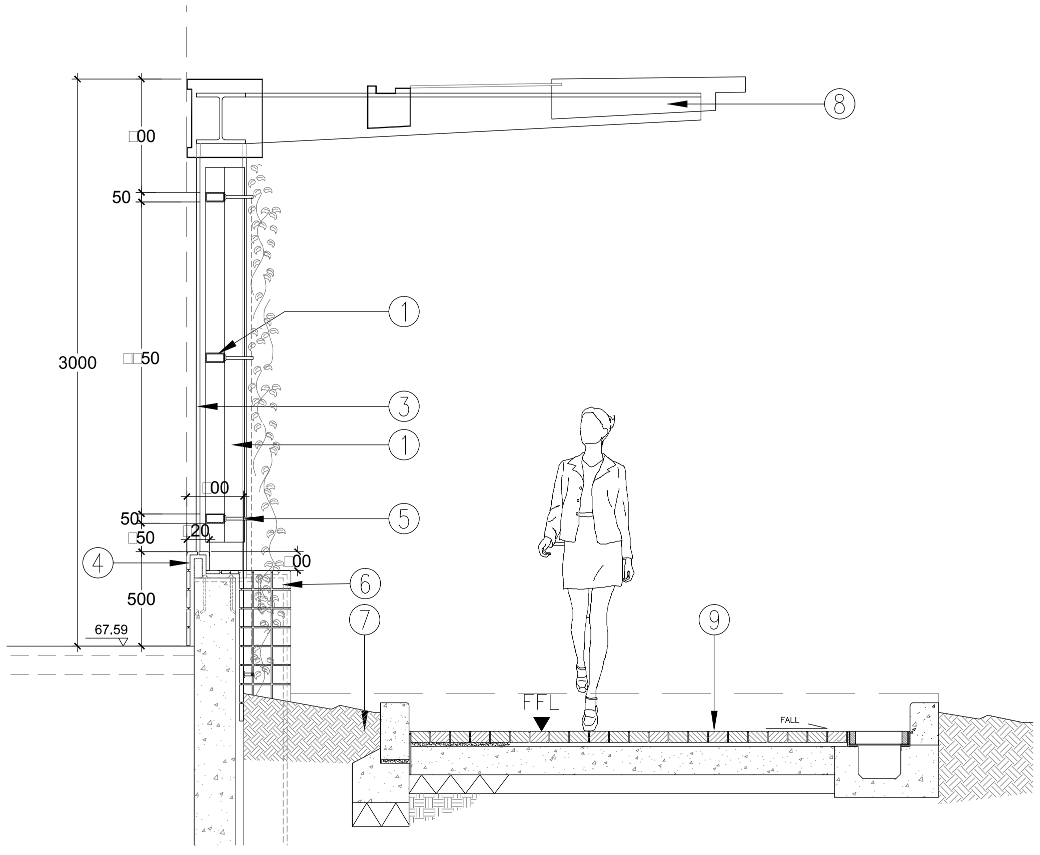
B SECTION ELEVATION
SCALE 1:40



C ELEVATION
SCALE 1:40



A DETAIL PLAN
SCALE 1:30



D SECTION
SCALE 1:40

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2. 100X50X5MM THK. GMS HOLLOW SECTION SUPPORT IN PAINT FINISH COLOUR: DARK GREY
3. 203X203X46UC COLUMN IN POWDER COAT PAINT FINISH COLOUR: DARK GREY
4. 92X92X18MM THK ARTIFICIAL GRANITE WALL FACING COLOUR: GREY
5. VERTICAL GREEN CLIMBER (PROPRIETARY WIRE SYSTEM)
6. R.C. STRUCTURE TO ENGINEER'S DETAIL
7. PLANTING SOIL MIXTURE AS SPECIFIED
8. COVERED WALKWAY REFER TO ARCHITECT'S DETAIL
9. ADJACENT PAVING REFER TO MATERIAL PLAN
10. DRAIN PIPE REFER TO ENGINEER'S DETAIL

TOW TOP OF WALL
TOS TOP OF SOIL
TOF TOP OF FENCE

NOTES:

DO NOT SCALE FROM THIS DRAWING. ALL DIMENSIONS MUST BE CHECKED ON SITE.

Rev.No.	Date	Particulars	Drawn	Checked	Approved
–	–	–	–	–	–

Client : 建築署 Architectural Services Department

Main Contractor : 有利建築有限公司 Yau Lee Construction Co., Ltd.

Architectural Designer : hpa

Structural and Geotechnical Designer : JACOBS

Traffic, Environmental & Sustainability Designer : MEINHARDT

Building Services Designer : wsp

Landscape Designer : ADI

Project :
CONTRACT NO. SS E502
DESIGN AND CONSTRUCTION OF
PAK SHING KOK QUARTERS
(PSKQ)

Drawing Title :
□ERTICA□ GREEN ON META□ FENCE DETAI□
(AT CO□ERED □A□K□ A□)

Designed By : CCH	Drawn By : CAD
Date : FE□ 20□□	Approved : A□□
CAD REF : □	
Scale : AS SHO□N □ A□	
Drawing No. □□A□□□□□E□ □□0	

Job No. :	Drawing Status.	Rev.	Size
□	□	□	

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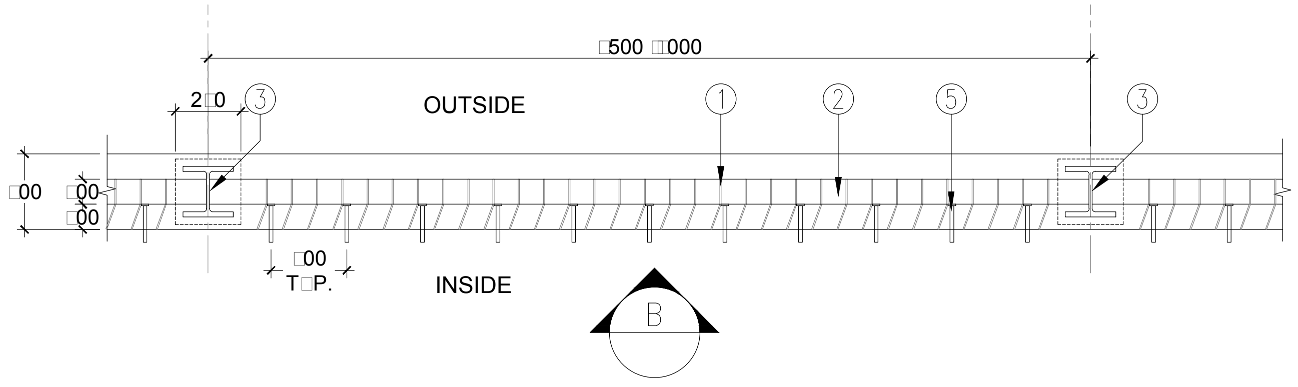
1. 100+100MM X 5MM GMS (20° ANGLE BEND) FLAT BAR IN PAINT FINISH COLOR: DARK GREY
2. 100X50X5MM THK. GMS HOLLOW SECTION SUPPORT IN PAINT FINISH COLOUR: DARK GREY
3. 203X203X46UC COLUMN IN POWDER COAT PAINT FINISH COLOUR: DARK GREY
4. 92X92X18MM THK ARTIFICIAL GRANITE WALL FACING COLOUR: GREY
5. VERTICAL GREEN CLIMBER (PROPRIETARY WIRE SYSTEM)
6. R.C. STRUCTURE TO ENGINEER'S DETAIL
7. PLANTING SOIL MIXTURE AS SPECIFIED



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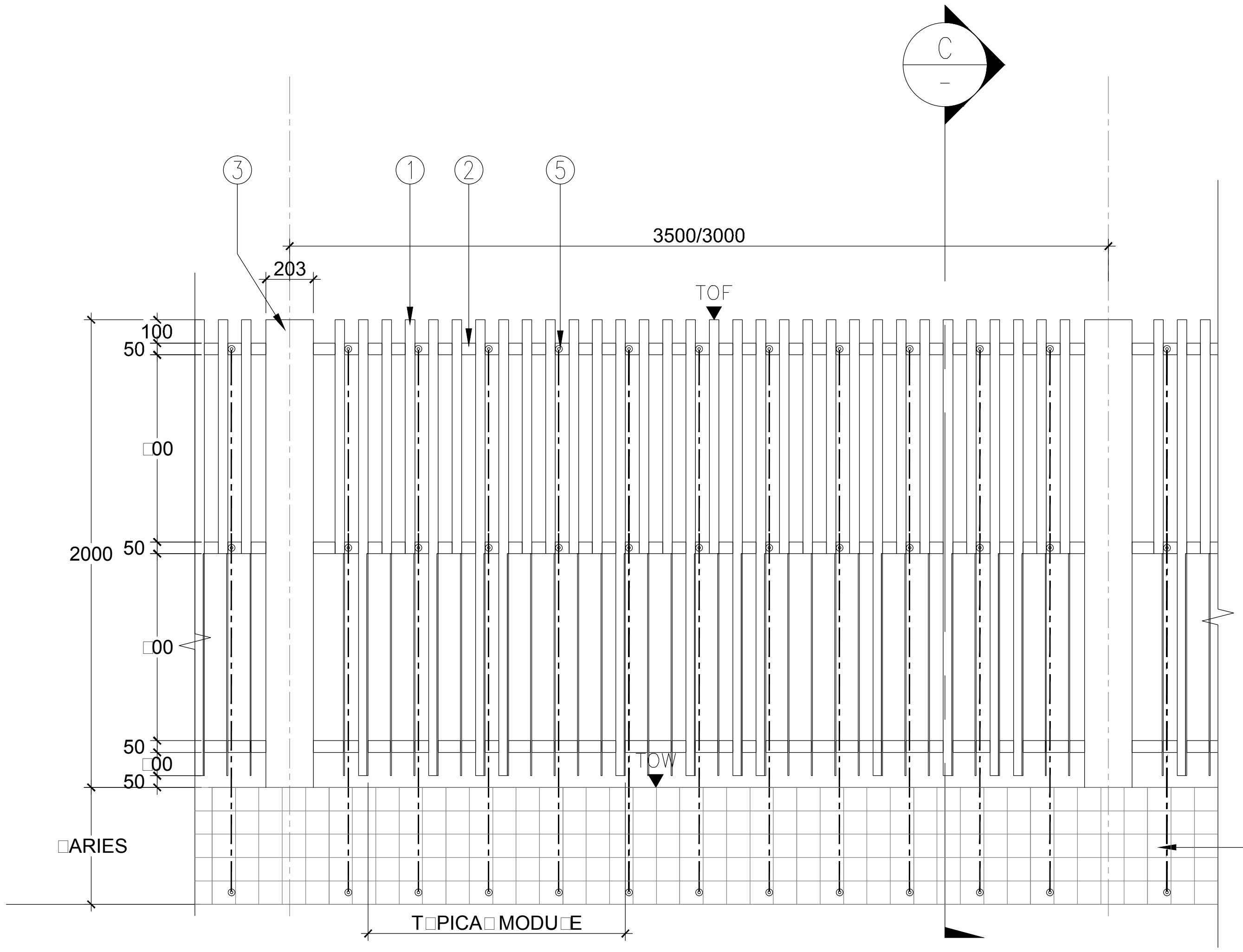
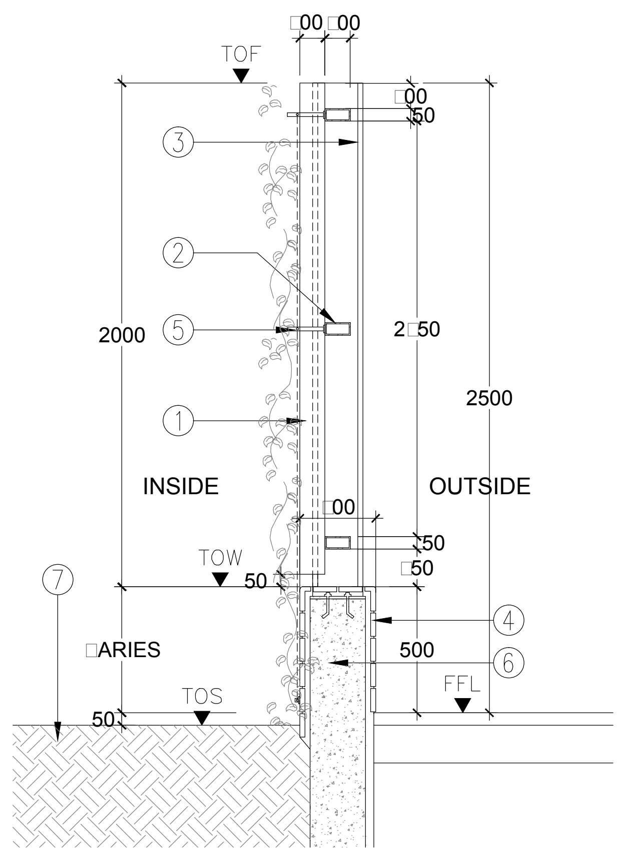
SCALE 1:30



B E□E□ATION
SCALE 1:30



C SECTION
SCALE 1:30

TOW TOP OF WALL
TOS TOP OF SOIL
TOF TOP OF FENCE

Rev.No.	Date	Particulars	Drawn	Checked	Approved
–	–	–	–	–	–

Client : 建築署 Architectural Services Department

Main Contractor : 有利建築有限公司 Yau Lee Construction Co., Ltd.

Architectural Designer : hpa

Structural and Geotechnical Designer : JACOBS

Traffic, Environmental & Sustainability Designer : MEINHARDT

Building Services Designer : WSP

Landscape Designer : ADI

Project :
CONTRACT NO. SS E502
DESIGN AND CONSTRUCTION OF PAK SHING KOK QUARTERS (PSKQ)

Drawing Title :
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Designed By : CCH
Drawn By : CAD
Date : □AN 20□□
Approved : A□□
CAD REF : □
Scale : AS SHO□N □ A□
Drawing No. □□A□□□□□E□ □□0.□
Job No. : □
Drawing Status.
Rev. □
Size

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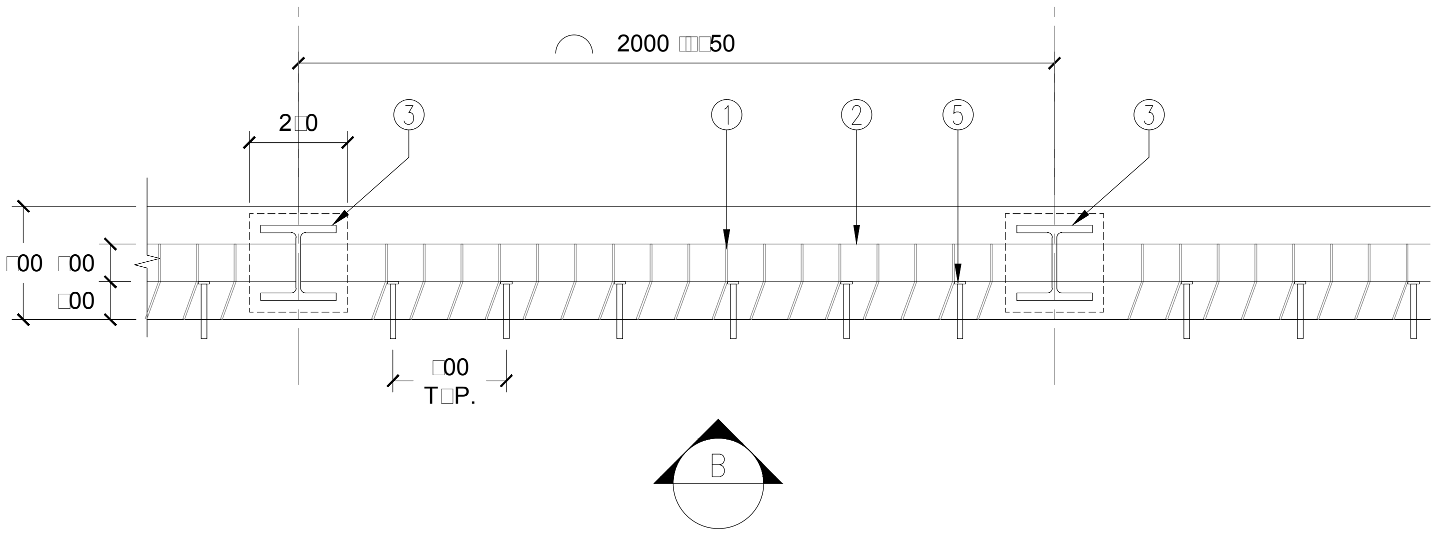

A DETAI□ P□AN
SCALE 1:20

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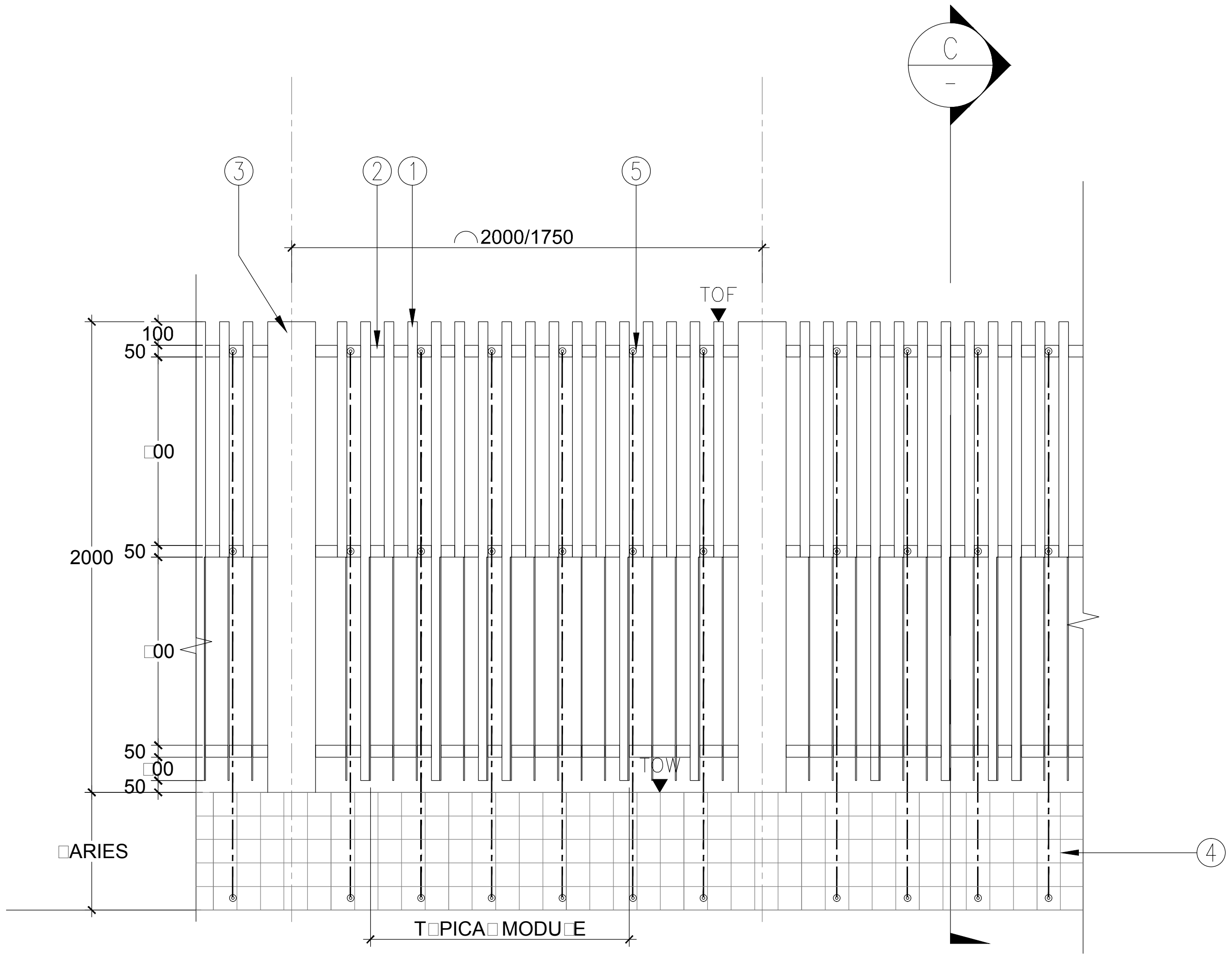
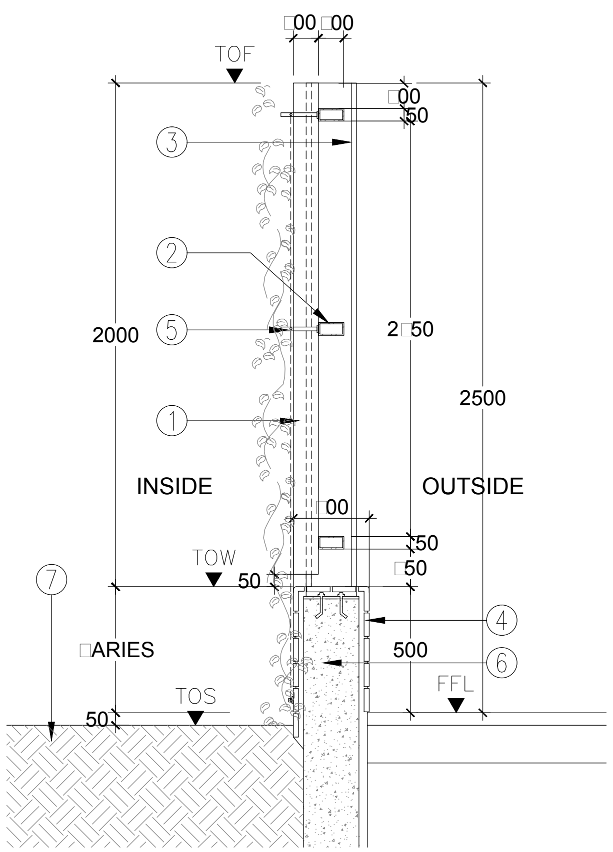
2. 100X50X5MM THK. GMS HOLLOW SECTION SUPPORT IN PAINT FINISH COLOUR: DARK GREY
3. 203X203X46UC COLUMN IN POWDER COAT PAINT FINISH COLOUR: DARK GREY
4. 92X92X18MM THK ARTIFICIAL GRANITE WALL FACING COLOUR: GREY
5. VERTICAL GREEN CLIMBER (PROPRIETARY WIRE SYSTEM)
6. R.C. STRUCTURE TO ENGINEER'S DETAIL
7. PLANTING SOIL MIXTURE AS SPECIFIED



B E□E□ATION
SCALE 1:30



C SECTION
SCALE 1:30

TOW TOP OF WALL
TOS TOP OF SOIL
TOF TOP OF FENCE

Rev.No.	Date	Particulars	Drawn	Checked	Approved
–	–	–	–	–	–

Client : 建築署 Architectural Services Department

Main Contractor : 有利建築有限公司 Yau Lee Construction Co., Ltd.

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Project :
CONTRACT NO. SS E502
DESIGN AND CONSTRUCTION OF PAK SHING KOK QUARTERS (PSKQ)

Drawing Title :
□ERTICA□ GREEN ON META□ FENCE DETAI□ (CA□□E □IRE S□STEM)

Designed By : CCH	Drawn By : CAD
Date : □AN 20□□	Approved : A□□
CAD REF : □	
Scale : AS SHO□N □ A□	
Drawing No. □□A□□□□□E□ □□0.2	
Job No. : □	Drawing Status.
Rev. □	Size

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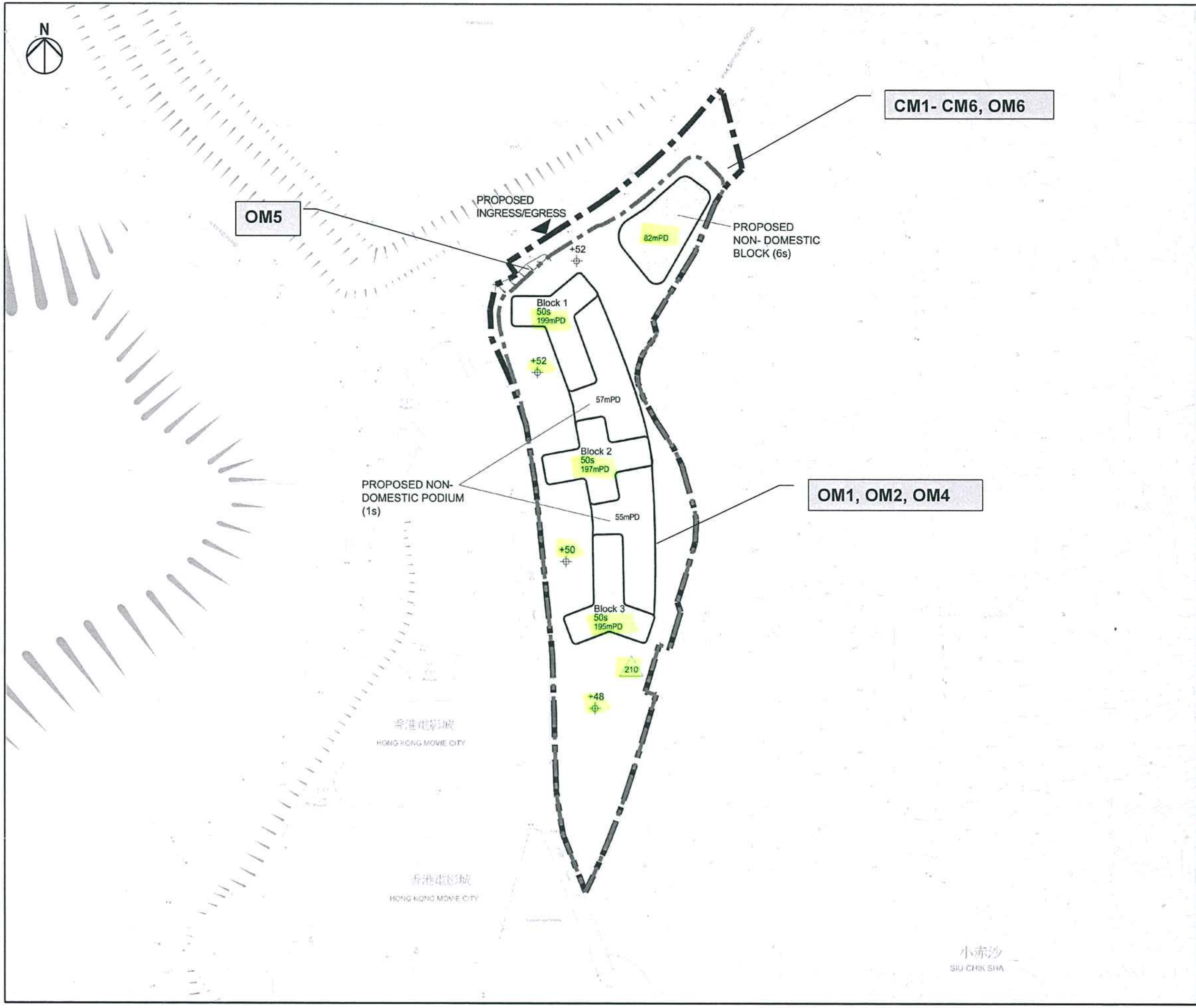
APPENDIX E

REFERENCE OF THE PLANNED/ COMMITTED RESIDENTIAL DEVELOPMENT R(A)7 – TPB GENERAL PAPER – "PROPOSED AMENDMENTS TO THE APPROVIED TSEUNG KWAN O OUTLINE ZINING PLN NO. S/TKO/24, RNTPC PAPER NO.6/17"



Study Area

Proposed Public Housing Site Area (Subject to detail design)

[redacted]
Measures [redacted]. The
[redacted] design stage.
Greening [redacted]
Appendix A.

Rev	Description	By	Date

Consultant

ARUP

Contract No. and Title

Agreement No. NTE/03/2015
air ventilation and visual impact assessments for potential Housing sites in the vicinity of Tseung Kwan O – FS

Drawing title

SK[redacted])

Drawing no.		Rev. A	
Drawn SYU	Date 10/15	Checked KC	Approved SYC
Scale		Status	

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

APPENDIX F

REFERENCE OF THE PLANNED/ COMMITED ZONE FOR THE CHINESE MEDICIEN HOSPITAL AND FUTURE GIC USES – APPROVED AVA REPORT BY RAMBOLL ENVRON

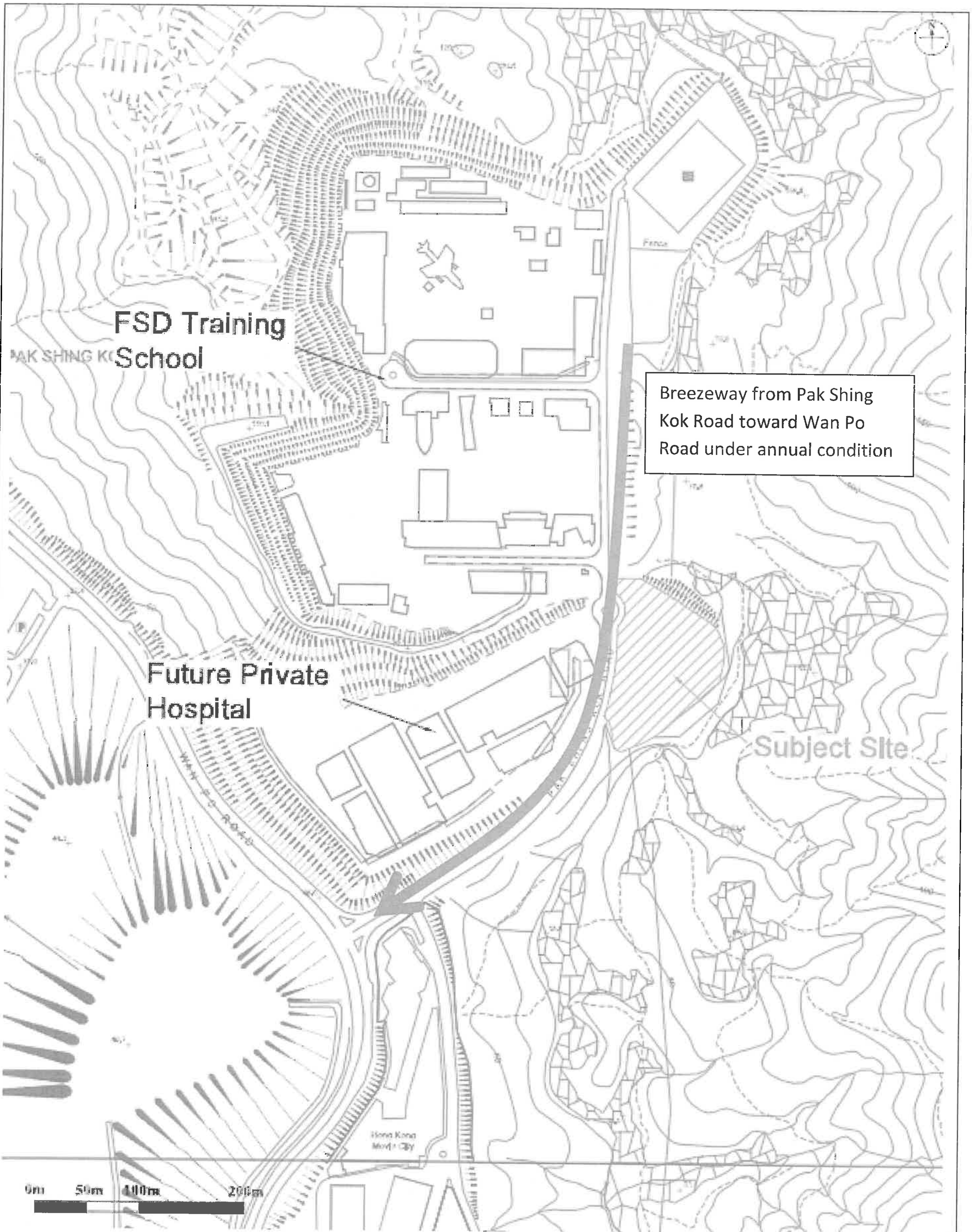


Figure:	6	RAMBOLL ENVIRON
Title:	Major Breezeway near Subject Site	Drawn by: SL
		Checked by: CC
Project:	Consultancy Services for Town Planning Application, Preliminary Environmental Review, Associated Studies, Tree Removal Application and Utility Mapping for Construction of Rank and File Quarters for Fire Services Department at Area 106, Pak Shing Kok,Tseung Kwan O	Rev.: 1.0
		Date: Aug 2015

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