Hong Kong Housing Authority

Cheung Sha Wan Wholesale Food Market Phase 2 and Fat Tseung Street West Developments

Air Ventilation Assessment - Initial Study

--

Issue | 21 November 2013

This report is for Subsidised Sale Flats Development at Fat Tseung Street West only.The final AVA report for Cheung Sha Wan Wholesale Food Market Development was uploaded to AVA Register on 3rd Quarter of 2016 with Project Ref. AVR/G/106.

Job number --

Level 5 Festival Walk
80 Tat Chee Avenue
Kowloon Tong
Kowloon
Hong Kong
www.arup.com

ARUP

Document Verification

ARUP

Job title		Cheung Sha Wan Wholesale Food Market Phase 2 and Fat Tseung Street West Developments		**Job number** --	
Document title		Air Ventilation Assessment - Initial Study		**File reference**	
Document ref		--			
Revision	**Date**	**Filename**	Draft_AVA_Report_CheungShaWan_Aug13.docx		
Draft 1	28 Aug 2013	**Description**	Draft 1		
			Prepared by	Checked by	Approved by
		Name	Various	Emma Leung	Sui-Hang Yan
		Signature			
Draft 2	30 Aug 2013	**Filename**	Draft_AVA_Report_CheungShaWan_Aug13.docx		
		Description	Draft 2		
			Prepared by	Checked by	Approved by
		Name	Various	Emma Leung	Sui-Hang Yan
		Signature			
Draft 3	16 Sep 2013	**Filename**	Draft_AVA_Report_CheungShaWan_Sep13.docx		
		Description	Draft 3		
			Prepared by	Checked by	Approved by
		Name	Various	Emma Leung	Sui-Hang Yan
		Signature			
Draft 4	3 Oct 2013	**Filename**	Draft_AVA_Report_CheungShaWan_Oct13.docx		
		Description	Draft 4		
			Prepared by	Checked by	Approved by
		Name	Various	Emma Leung	Sui-Hang Yan
		Signature			
				Issue Document Verification with Document	✓

Document Verification

Job title		Cheung Sha Wan Wholesale Food Market Phase 2 and Fat Tseung Street West Developments			**Job number** --
Document title		Air Ventilation Assessment - Initial Study			**File reference**
Document ref		--			
Revision	**Date**	**Filename**	Draft_AVA_Report_CheungShaWan_Nov13.docx		
Draft 5	4 Nov 2013	**Description**	Draft 5		
			Prepared by	Checked by	Approved by
		Name	Various	Emma Leung	Sui-Hang Yan
		Signature			
Draft 6	6 Nov 2013	**Filename**	Draft_AVA_Report_CheungShaWan_Nov13v5.docx		
		Description	Draft 6		
			Prepared by	Checked by	Approved by
		Name	Various	Emma Leung	Sui-Hang Yan
		Signature			
Draft 6	17 Nov 2013	**Filename**	Draft_AVA_Report_CheungShaWan_Nov13v8.docx		
		Description	Draft 7		
			Prepared by	Checked by	Approved by
		Name	Various	Emma Leung	Sui-Hang Yan
		Signature			
Issue	21 Nov 2013	**Filename**	AVA_Report_CheungShaWan_Nov13v11.docx		
		Description	ISSUE		
			Prepared by	Checked by	Approved by
		Name	Various	Sui-Hang Yan	Vincent Cheng
		Signature			
				Issue Document Verification with Document	✓

Contents

Appendices

Velocity Ratio Table of the Test Points

Appendix C

Directional VR Contour Plots

Appendix D

Directional VR Vector Plots

Appendix E

Proposed Amendments to the Approved South West Kowloon Outline Zoning Plan No. S/SK20/28

1 Introduction

1.1 Background of Study

Ove Arup & Partners Hong Kong Ltd. (Arup) was commissioned by the Hong Kong Housing Authority (HKHA) to carry out an Air Ventilation Assessment (AVA) – Initial Study for the proposed developments at the Cheung Sha Wan Wholesale Food Market Phase 2 (CSWWFM Ph. 2) Site and the Fat Tseung Street West (FTSW) Site. Both proposed developments are situated in Cheung Sha Wan.

The CSWWFM Ph. 2 Site largely falls within an area zoned "Other Specified Uses" annotated "Cargo Working Area, Wholesale Market and Industrial-Office", partly zoned "OU" annotated "Wholesale Market", with a minor portion zoned "OU" annotated "Pier" and an area shown as 'Road' while the FTSW Site falls within an area largely zoned "Government, Institution or Community" ("G/IC") and partly zoned "Open Space" ("O") and shown as 'Road' on the Approved South West Kowloon Outline Zoning Plan (OZP) No. S/SK20/28. Rezoning is required for the proposed developments and AVA is conducted to assess the air ventilation impact of the proposed developments in the area for consideration of the rezoning proposal. The extracted OZP indicating the proposed amendments regarding the CSWWFM Ph. 2 Site and the FTSW Site are attached in Appendix E.

1.2 Objective of the Study

The objective of the study is to investigate the air ventilation performance of the proposed developments using the methodology for Air Ventilation Assessment (AVA) as stipulated in the "Technical Circular No. 1/06 – Air Ventilation Assessments" (Technical Circular) and Annex A to the Technical Circular "Technical Guide for Air Ventilation Assessment for Developments in Hong Kong"(Technical Guide) jointly issued by Housing, Planning and Lands Bureau and Environmental, Transport and Works Bureau on 19th July 2006.

1.3 Scope of Study- Initial Study

The main scope of the study is to carry out an AVA Initial Study to assess the ventilation performance of the proposed development and surrounding environment.

The deliverables of this study can be summarised as follows:

- Evaluation of the wind performance to gather the typical wind characteristics
- Identification of the general ventilation performance over the assessment area
- Assessment of air ventilation performance at focus areas
- Recommendation of further wind enhancement features

2 Background Information

2.1 Site and Surrounding Area Characteristics

Two proposed developments are considered in this Study, i.e. the CSWWFM Ph. 2 Site and the FTSW Site. The proposed developments are located at Cheung Sha Wan which is on a relatively low elevation and gradually increases towards the north where Lion Rock Mountain locates. The CSWWFM Ph. 2 Site is near to the waterfront and bounded by the West Kowloon Highway to the north, Hing Wah Street West to the west and the existing CSWWFM Ph.1 to the east with a site area of about 9.65 hectares. For the FTSW Site, it is situated at the junction of Sham Mong Road and Fat Tseung Street West, with a site area of about 0.62 hectares.

There are some high-rise residential clusters located at the surroundings, such as, Fu Cheong Estate, Wing Cheong Estate and Hoi Lai Estate, etc. A committed development, namely Nam Cheong Station Development which is located on the eastern side of these sites, has been taken into account in the assessment model. Future residential development built to the development potential area permissible under the current OZP, namely Northwest Kowloon Reclamation (NWKR) Site 6, which is sandwiched between the proposed developments, is also included in the model.

Figure 1 Aerial photo of the proposed development and surrounding area (Image Source: Google Earth)

2.2 Study Scenarios

Two schemes are compared in this AVA study, namely the Baseline Scheme and Indicative Scheme.

2.2.1 Baseline Scheme

The Baseline Scheme consists of an 8-storey GIC building and a 5-a-side soccer pitch at FTSW Site (see Note 1) and low-rise market structures at CSWWFM Ph. 2 Site by making reference to the existing wholesale market structure of CSWWFM Ph. 1 (see Note 2), which are permitted under the current zoning of the sites.

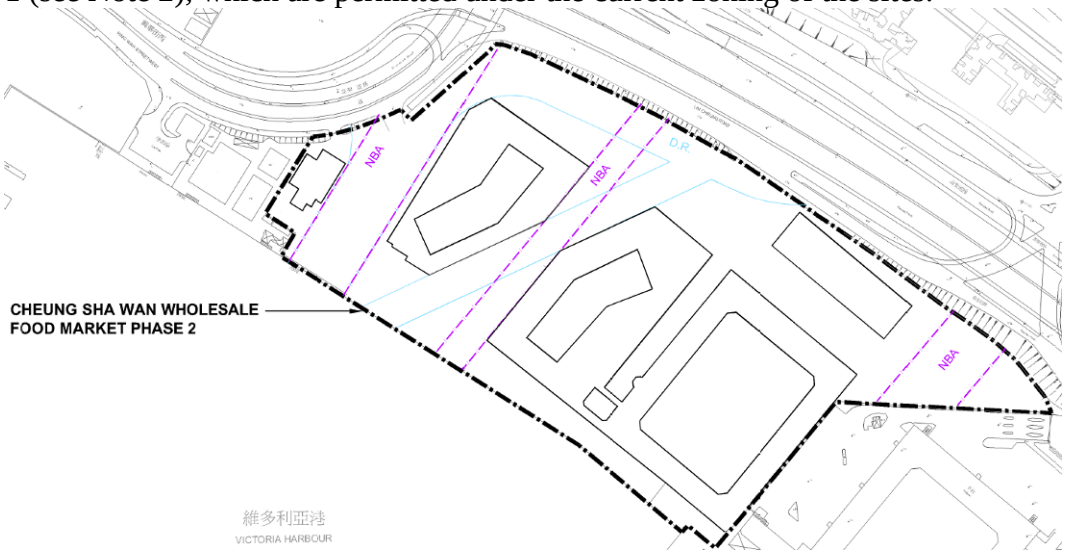


Figure 2 Master layout plan of Baseline Scheme for CSWWFM Ph. 2 Site

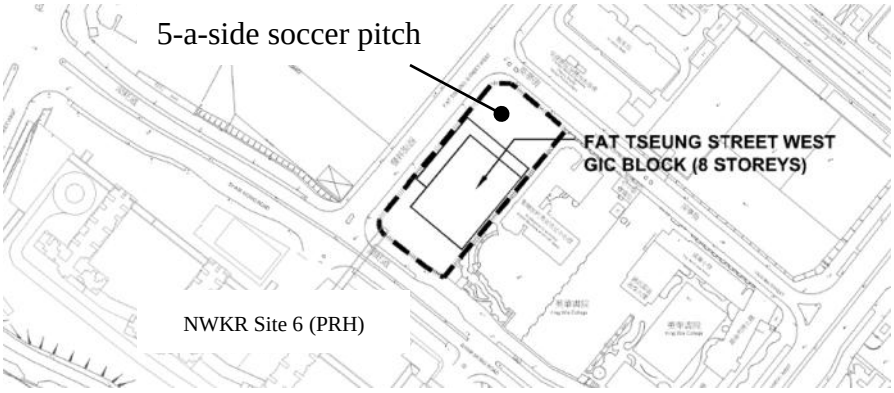


Figure 3 Master layout plan of Baseline Scheme for FTSW Site

Note 1: FTSW Site consists of 2 sites: one currently zoned "open space" and one zoned "GIC". They are proposed to be rezoned to Residential (A).

Note 2: The existing zoning of CSWWFM Ph. 2 Site is largely zoned "Other Specified Uses" annotated 'Cargo working Area, Wholesales and Industrial – Office'. It is mainly proposed to be rezoned to "Residential (Group A)", "Comprehensive Development Area" ("CDA") and "Government, Institute or Community" ("G/IC").

Table 1 Building Height at Baseline Scheme

Site	Building Height
CSWWFM Ph. 2 Site	+21.8mPD
FTSW Site GIC Block	+53.89mPD

The three-dimensional model showing the building mass at CSWWFM Ph. 2 Site permitted under the current zoning is shown at Figure 4 to Figure 7 at different angles of view.

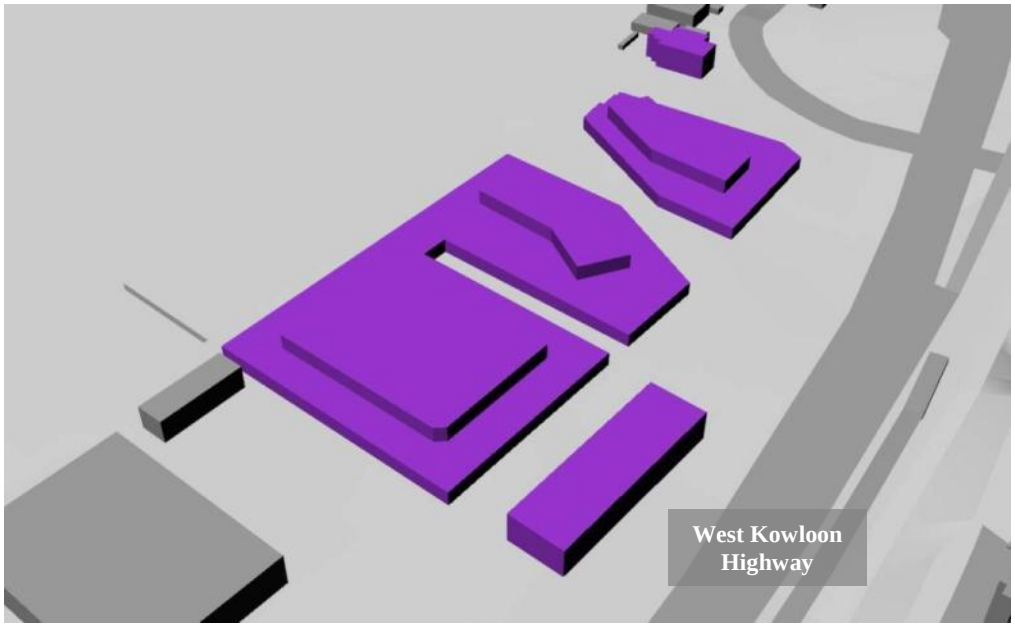


Figure 4 Easterly view of the Baseline Scheme for CSWWFM Ph. 2 Site

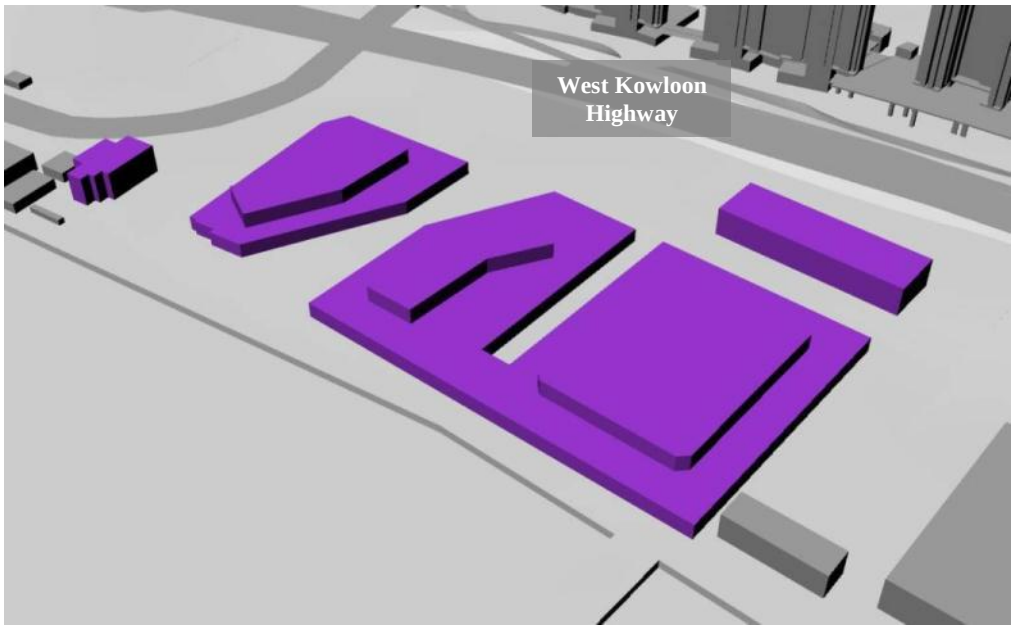


Figure 5 Southerly view of the Baseline Scheme for CSWWFM Ph. 2 Site

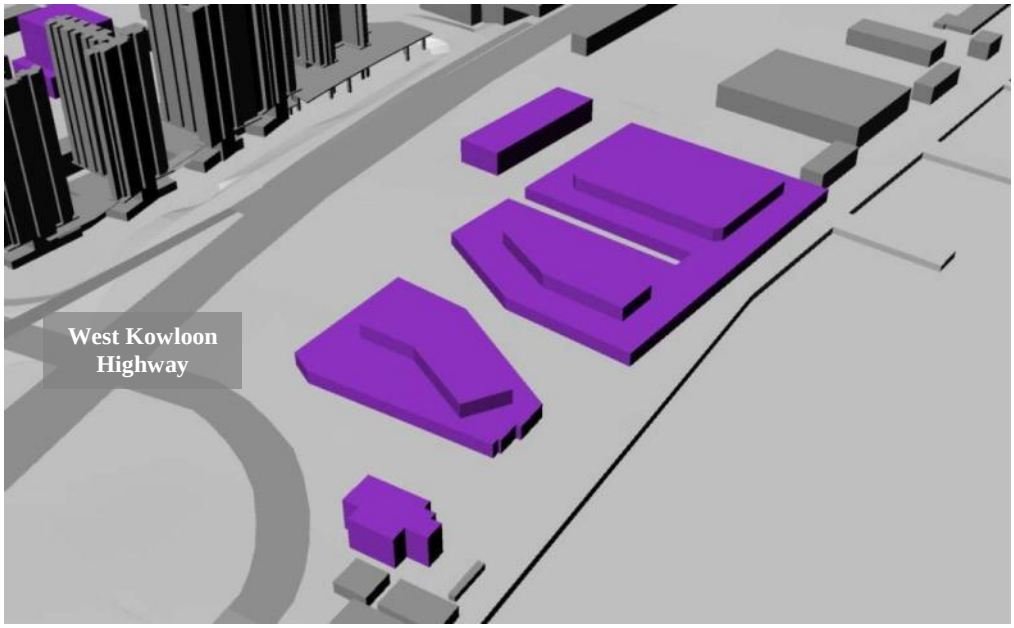


Figure 6 Westerly view of the Baseline Scheme for CSWWFM Ph. 2 Site

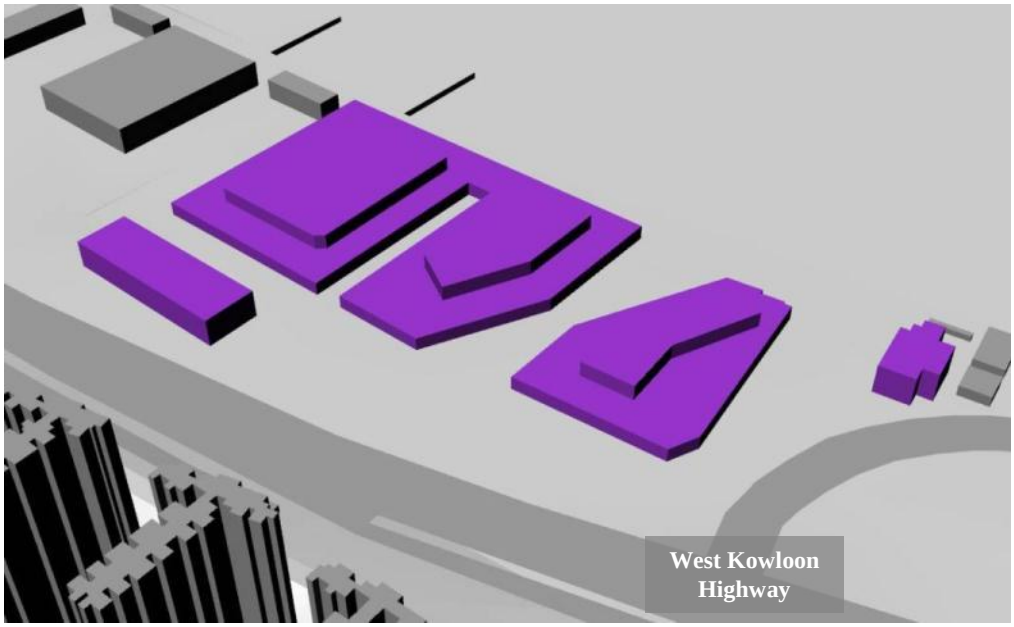


Figure 7 Northern view of the Baseline Scheme for CSWWFM Ph. 2 Site

The three-dimensional model showing the building mass at FTSW Site permitted under the current zoning is shown at Figure 8 to Figure 11 at different angles of view.

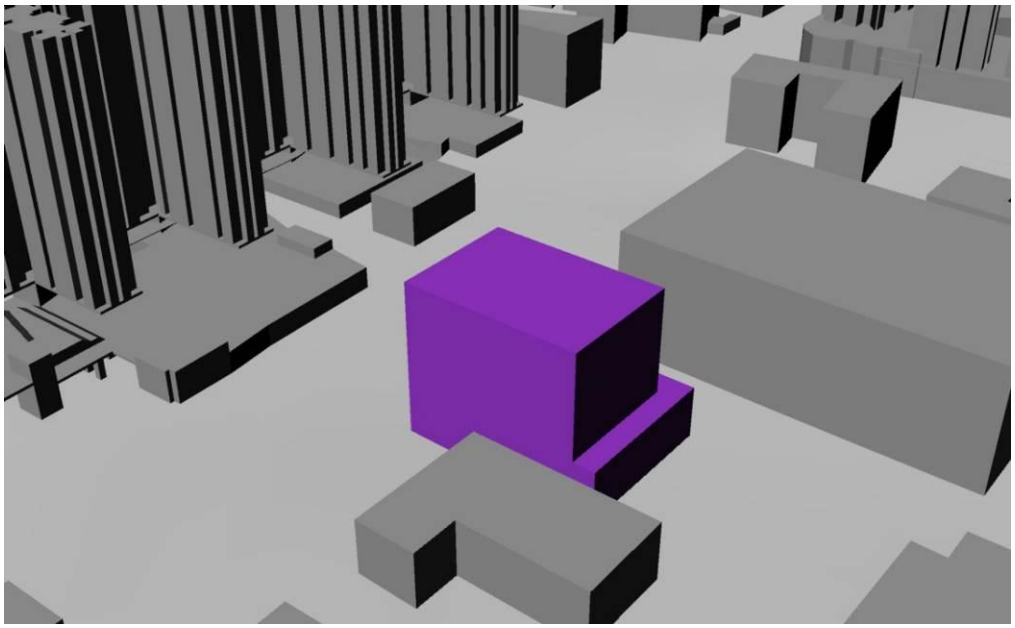


Figure 8 Easterly view of the Baseline Scheme for FTSW Site

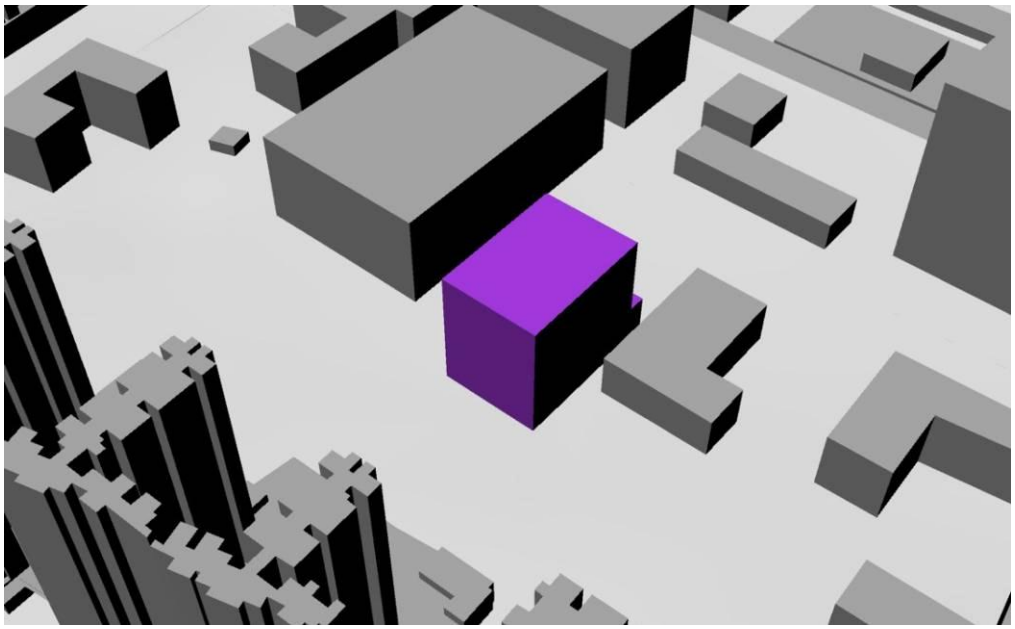


Figure 9 Southerly view of the Baseline Scheme for FTSW Site

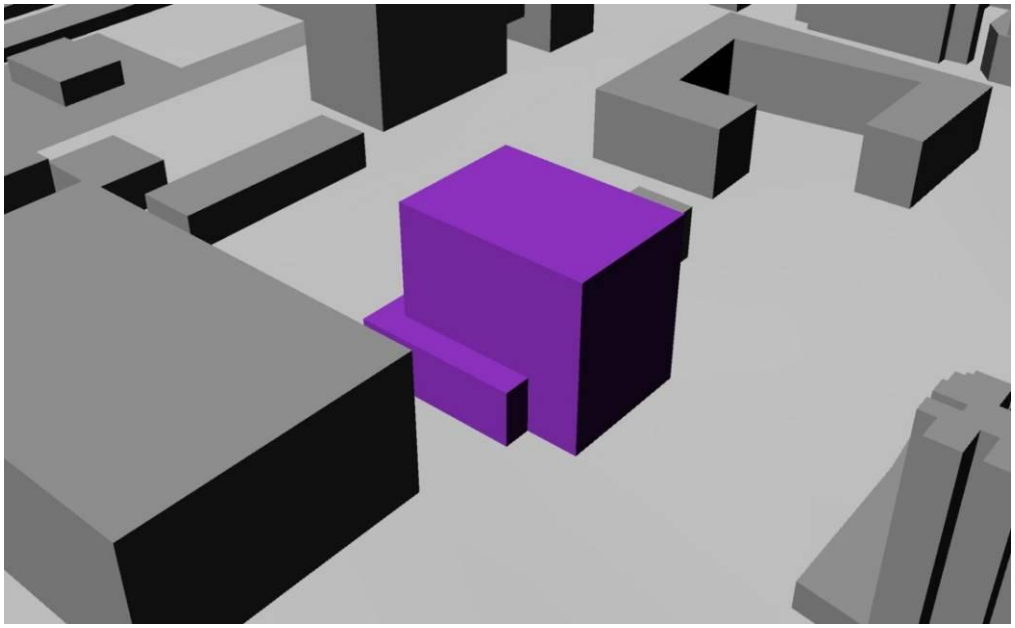


Figure 10 Westerly view of the Baseline Scheme for FTSW Site

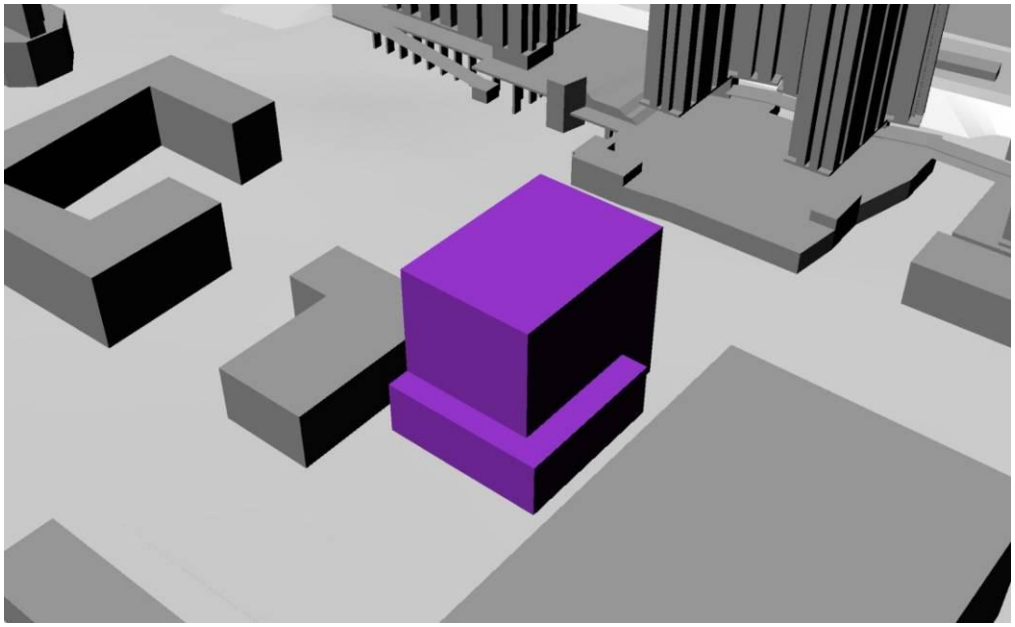


Figure 11 Northern view of the Baseline Scheme for FTSW Site

2.2.2 Indicative Scheme

With reference to the proposed development parameters, it is assumed that the Indicative Scheme for CSWWFM Ph. 2 Development consists of 14 domestic buildings and a hotel with height variations descending from the inland to the waterfront. The hotel development adopted in Site 4a in the Indicative Scheme has large building frontal area across the site and can be considered as the worst scenario. A standard primary school of eight-storey and a five-storey social welfare block are in the east and west of the site respectively. For FTSW Site, the Indicative Scheme includes two domestic buildings.

At CSWWFM Ph. 2 Site, large wind corridors of 45m, 22m and 30m in width (designated as non-building areas) aligned to the existing road is namely Hing Wah Street West, Fat Tseung Street West and Tonkin Street West respectively. A local air path of 20m has been incorporated into the Indicative Scheme of CSWWFM Ph. 2 Site (Figure 12). At FTSW Site a building gap of 15m (above ≈10mPD) has been designed to enhance the wind environment (Figure 13).

FTSW Site is also designed to be relatively permeable at low level, with urban window at podium (Figure 19) and empty bays at ground floor (Figure 18) to enhance air ventilation performance. The urban window faces Ying Wa Street is approximately 7.6m (H) by 15m (W) at +9.80mPD. Three empty bays are designed into the proposed buildings, where one faces Sham Mong Road is of approximately 13.8m (H) by 18m (W), one faces Fat Tseung Street West is of approximately 15.8m(H) by 12m(W), and the other one faces Ying Wa Street is of approximately 16.4m(H) by 9m(W). The maximum permitted buildings' heights for the CSWWFM Ph2 and FTSW Site are summarized in Table 2. A stepped height profile is adopted at the CSWWFM Ph.2 Site.

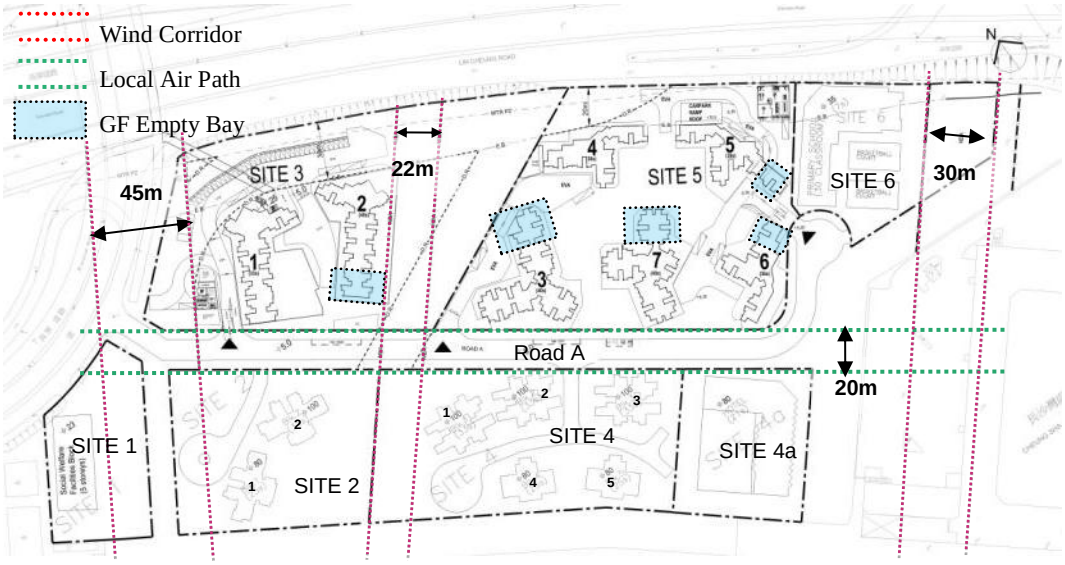


Figure 12 Master Layout plan of Indicative Scheme for CSWWFM Ph. 2 Site

Note 3: Proposed building height for Site 1 is +20mPD; Site 2 is +100mPD; Site 4 Block 1 to 3 +100mPD; Site 4 Block 4 to 5 is +80mPD; Site 4a +62mPD and Site 6 +29mPD.

Table 2 Maximum Permitted Building Height at Indicative Scheme

Site	Block No.	Maximum Permitted Building Height
CSWWFM Ph.2 Site		
Site 1	Social Welfare Block	5 Storeys
Site 2	1	+100.0mPD
	2	+100.0mPD
Site 3	1	+120.0mPD
	2	+120.0mPD
Site 4	1	+100.0mPD
	2	+100.0mPD
	3	+100.0mPD
	4	+100.0mPD
	5	+100.0mPD
Site 4a	Hotel	+100.0mPD
Site 5	3	+120.0mPD
	4	+120.0mPD
	5	+120.0mPD
	6	+120.0mPD
	7	+120.0mPD
Site 6	Primary School	8 Storeys
FTSW Site		
FTSW	1	+120.0mPD
	2	+120.0mPD

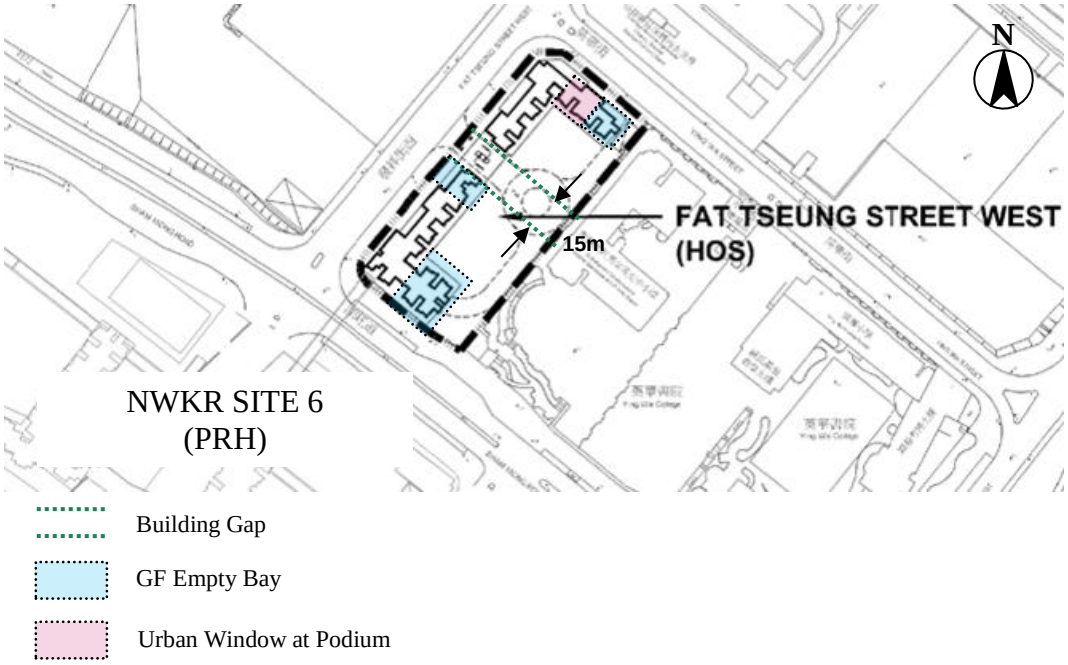


Figure 13 Master layout plan of Indicative Scheme for FTSW Site

The three-dimensional model of the proposed development at CSWWFM Ph. 2 Site is shown at Figure 14 to Figure 17 at angles of different view.

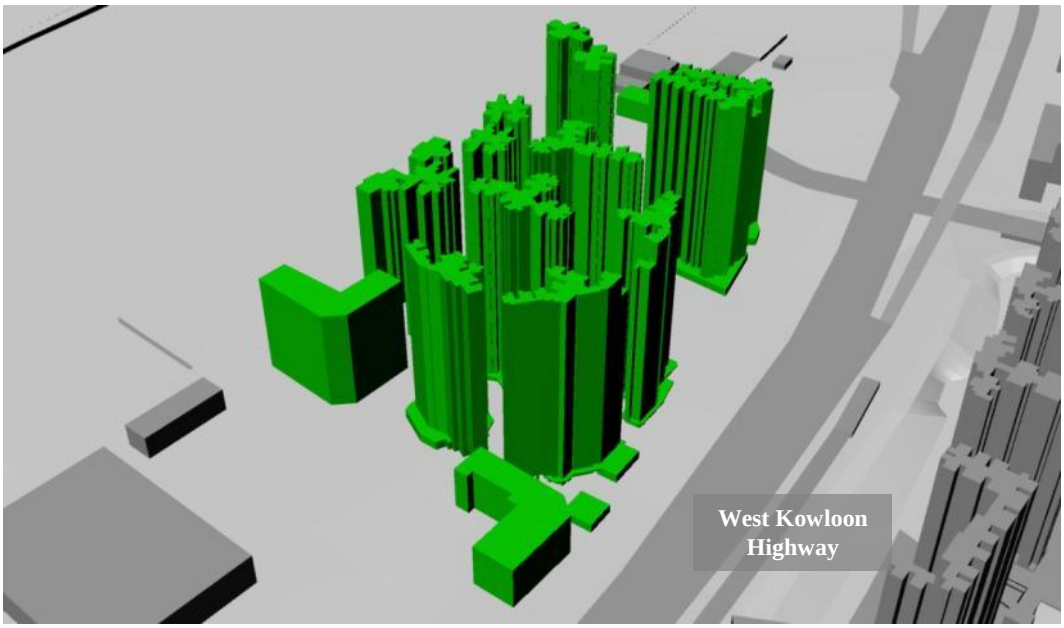


Figure 14 Easterly view of the Indicative Scheme for CSWWFM Ph. 2 Site

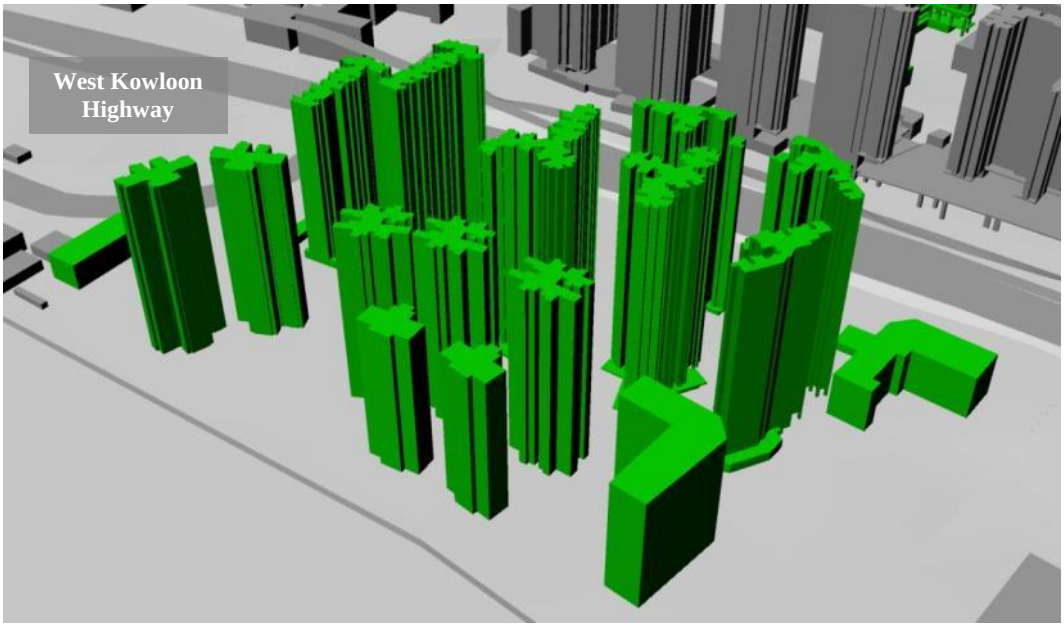


Figure 15 Southerly view of the Indicative Scheme for CSWWFM Ph. 2 Site

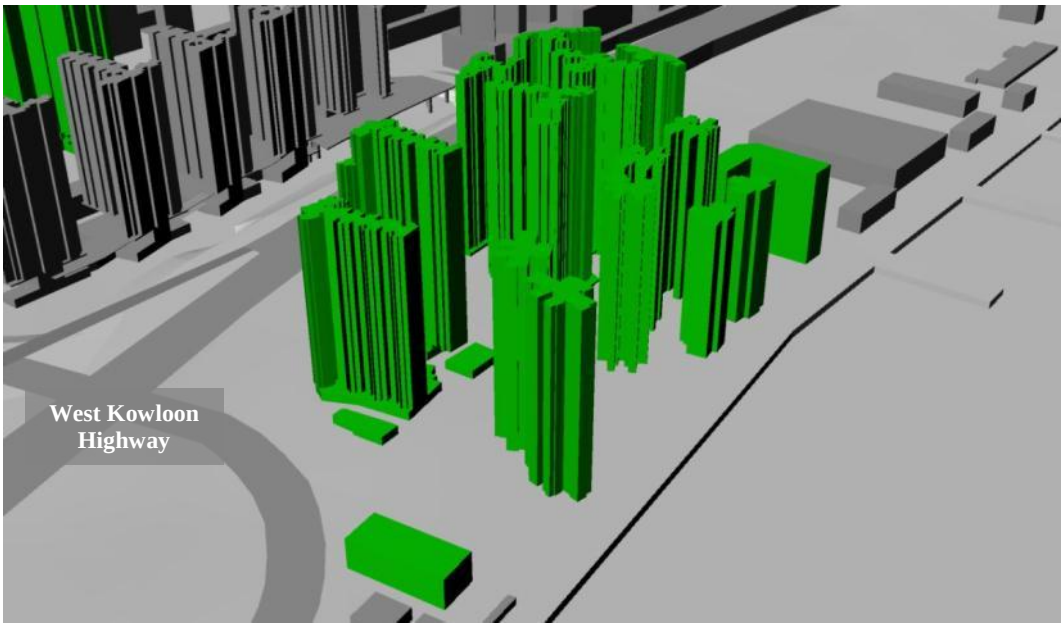


Figure 16 Westerly view of the Indicative Scheme for CSWWFM Ph. 2 Site

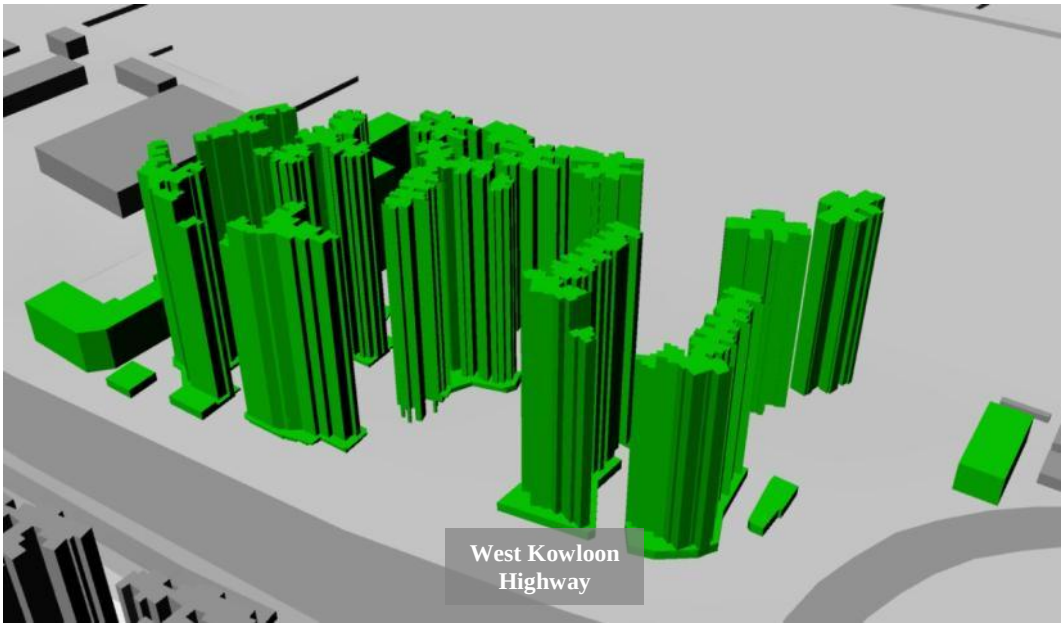


Figure 17 Northern view of the Indicative Scheme for CSWWFM Ph. 2 Site

The three-dimensional model of the proposed development at FTSW Site is shown at Figure 18 to Figure 21 at angles of different views.

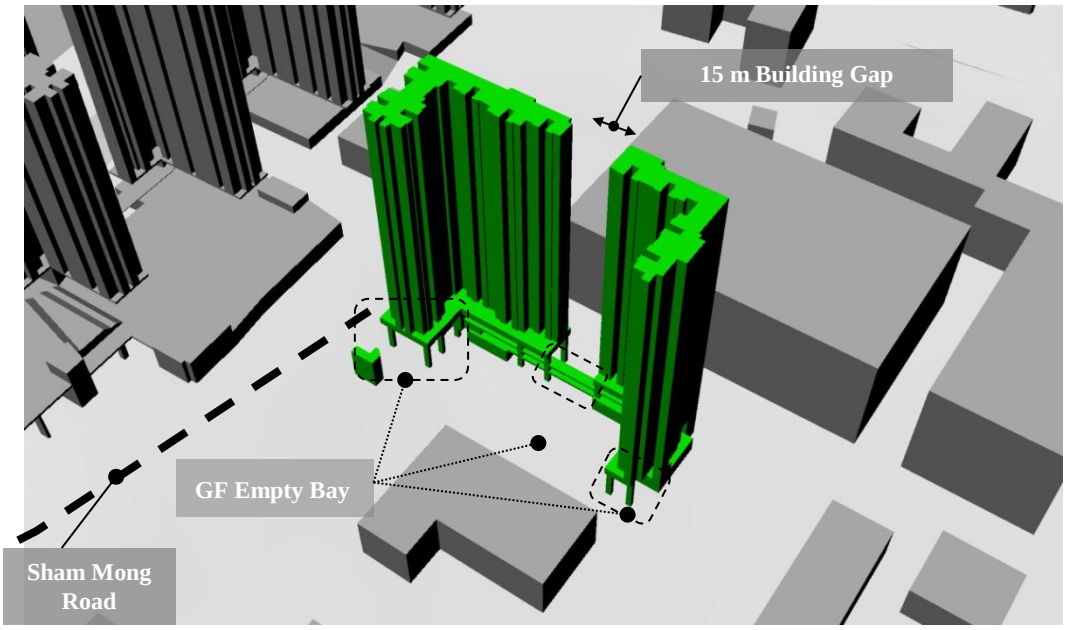


Figure 18 Easterly view of the Indicative Scheme for FTSW Site

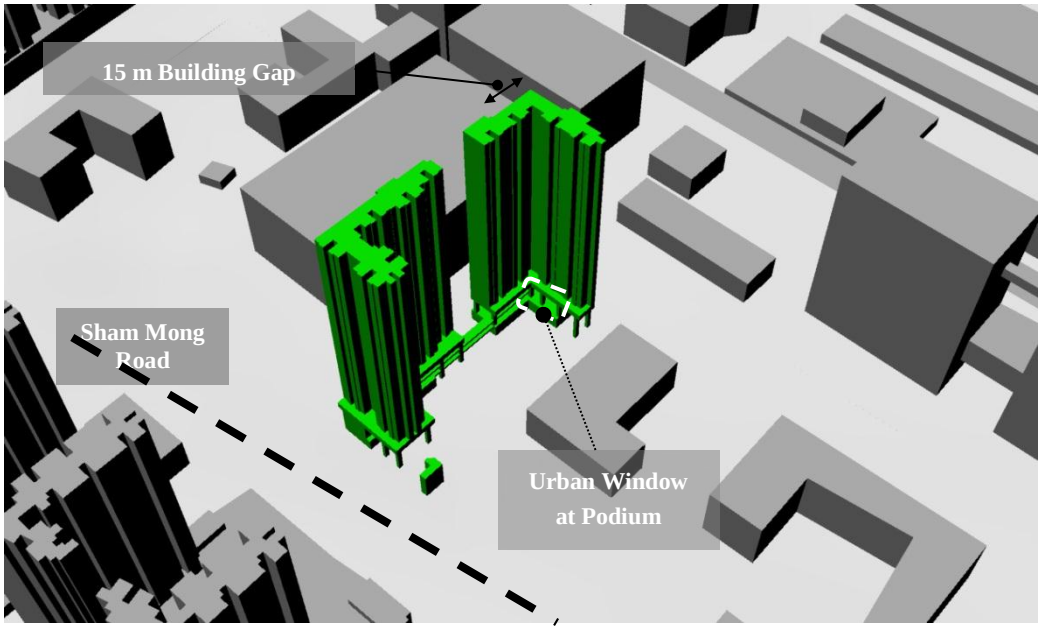


Figure 19 Southerly view of the Indicative Scheme for FTSW Site

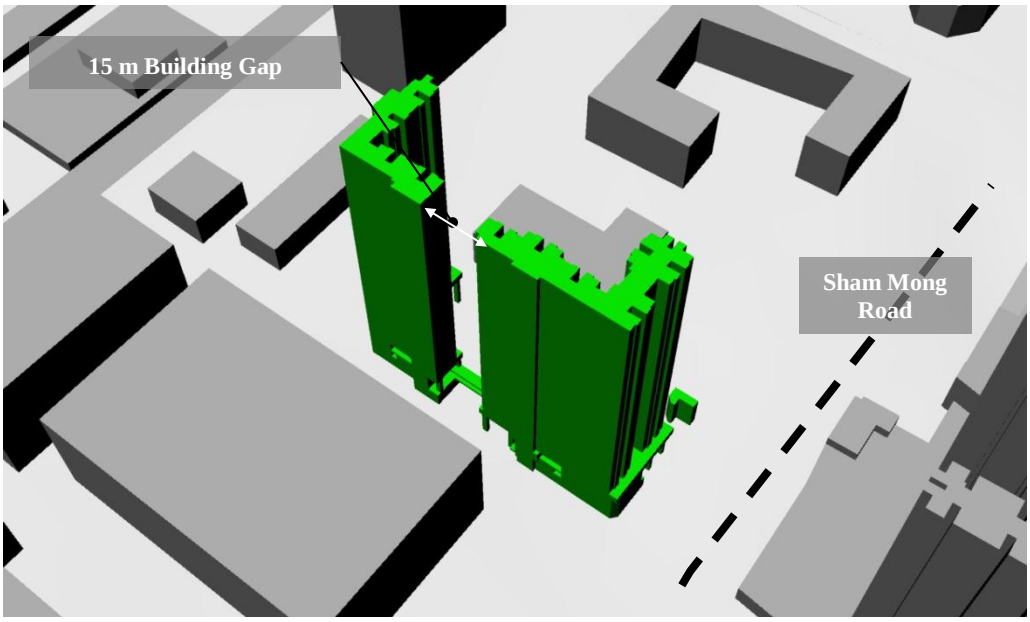


Figure 20 Westerly view of the Indicative Scheme for FTSW Site

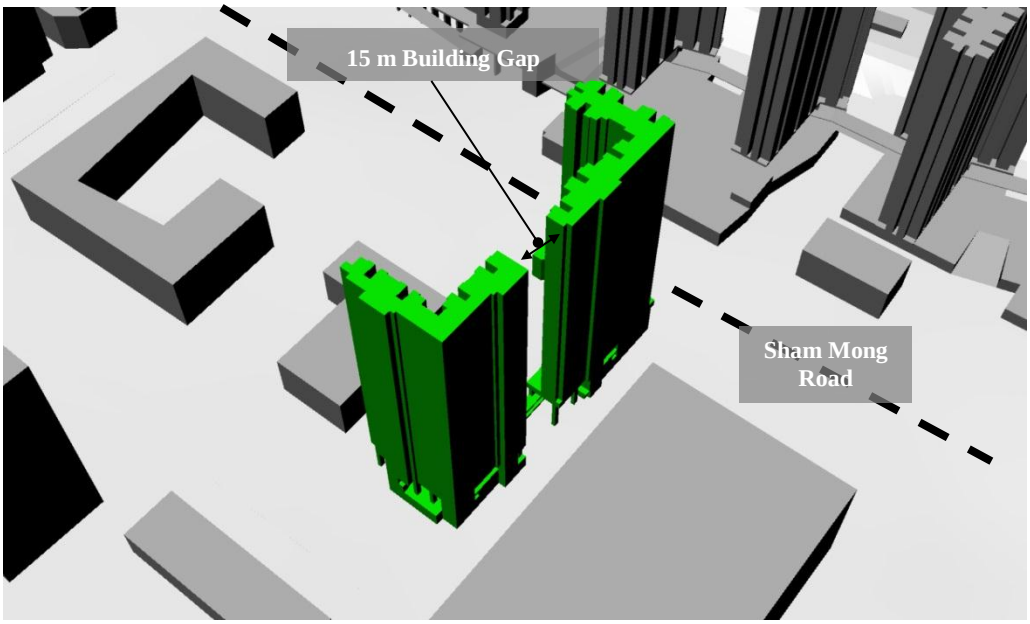


Figure 21 Northern view of the Indicative Scheme for FTSW Site

3 Methodology of AVA Study

This study adopted the AVA methodology for initial study as stipulated in Annex A of the Technical Circular on "Technical Guide for Air Ventilation Assessment for Developments in Hong Kong" (Technical Guide).

3.1 Wind Availability

Based on the methodology of AVA, the site wind availability data was obtained from the Urban Climatic Map (UCMap) Study for Cheung Sha Wan[1]. The annual and summer wind rose demonstrating the frequency of occurrence of different wind directions are shown in Figure 22.

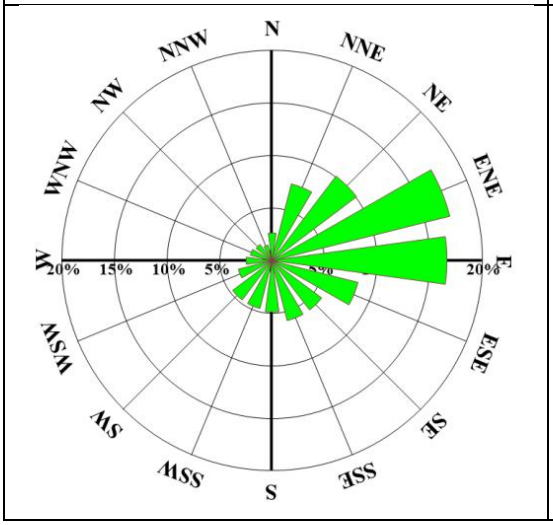
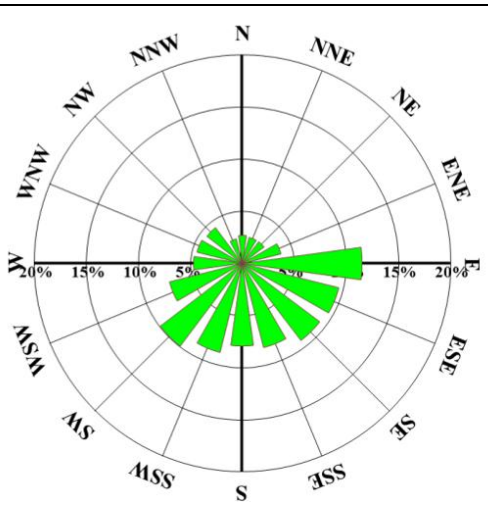
Annual (+450mPD)	Summer (+450mPD)
	

Figure 22 Wind rose for the Development under Annual and Summer Wind Condition

[1] Urban Climatic Map and Standards for Wind Environment – Feasibility Study, Department of Architecture, CUHK, 1/22/2009

3.1.1 Annual Prevailing Wind

Eight prevailing wind directions (highlighted in Red colour in Table 3) are considered in the AVA Initial Study which covers 76.6% of the total annual wind frequency. They are north-north-easterly (7.5%), north-easterly (10.1%), east-north-easterly (17.4%), easterly (16.6%), east-south-easterly (8.4%), south-easterly (5.9%), south-south-easterly (5.9%) and southerly (4.9%) winds.

Table 3 Annual wind frequency of the wind directions considered in this study

Wind Direction	N	NNE	NE	ENE	E	ESE	SE	SSE	
Frequency	2.6%	7.5%	10.1%	17.4%	16.6%	8.4%	5.9%	5.9%	
Wind Direction	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum
Frequency	4.9%	4.7%	4.7%	3.3%	2.5%	2.1%	1.9%	1.5%	76.6%

** The wind frequency showing in red colour represents the selected winds for the CFD simulation.*

3.1.2 Summer Prevailing Wind

Nine prevailing wind directions (highlighted in Red colour in Table 4) are considered in the AVA Initial Study which covers 77.1% of the total summer wind frequency (from 1 June to 30 August). They are easterly (11.5%), east-south-easterly (9.5%), south-easterly (9.3%), south-south-easterly (8.3%), southerly (7.9%), south-south-westerly (8.8%), south-westerly (9.9%), west-south-westerly (7.2%) and westerly (4.7%) winds.

Table 4 Summer wind frequency of the wind directions considered in this study

Wind Direction	N	NNE	NE	ENE	E	ESE	SE	SSE	
Frequency	2.7%	2.6%	2.6%	3.8%	11.5%	9.5%	9.3%	8.3%	
Wind Direction	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum
Frequency	7.9%	8.8%	9.9%	7.2%	4.7%	4.5%	4.3%	2.4%	77.1%

** The wind frequency showing in red colour represents the selected winds for the CFD simulation.*

3.1.3 Wind Profile

The vertical discretization of the 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

U_G = reference velocity at height z_G

Z_G = reference height

Z = height above ground

U_Z = velocity at height z

n = power law exponent

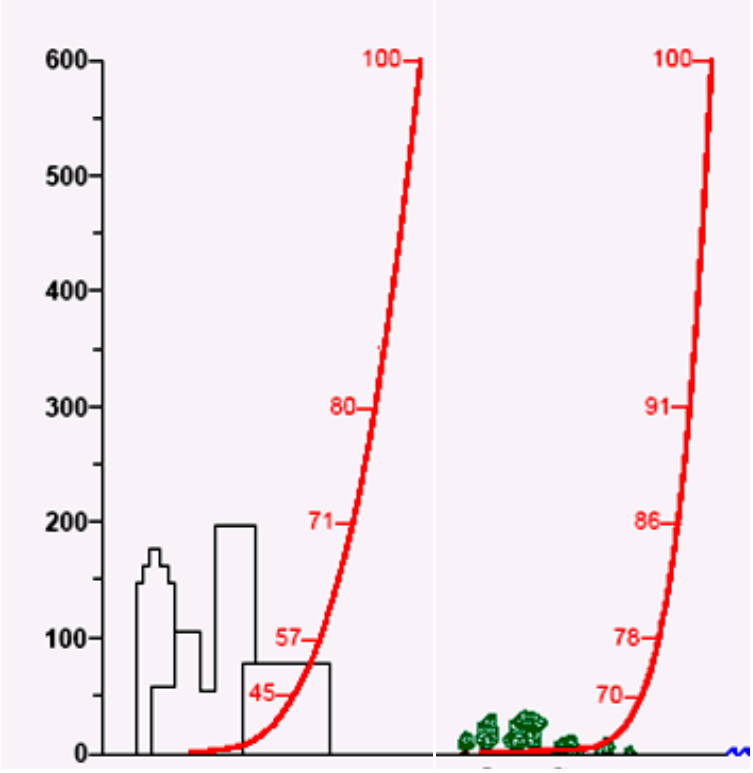


Figure 23 Wind Profile applied in the AVA Initial Study

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.

Terrain crossed by approaching wind	n-value
Sea and open space	~0.15
Suburban or mid-rise	~0.35
City centre or high-rise	~0.50

As the developments are located in the urban city and surrounded by medium rise building in NNE, NE, ENE, E, ESE, SE and SSE directions, the n-value was

assumed to be 0.35 for wind from these directions. Furthermore, developments are facing the waterfront in S directions, hence the n-value is assumed to be 0.15 for the wind from these directions.

Table 5 n-value for the prevailing wind directions

Wind Direction	NNE	NE	ENE	E	ESE	SE	SSE	S
n-value	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.15

3.2 Study Area

3.2.1 Project Assessment Area and Surrounding Areas

With reference to the Technical Guide, the areas of evaluation and assessment should include all area measured from the site boundary as well as a belt up to 1H, where H is the height of the tallest building of the proposed development, around the site boundary.

The tallest building of the proposed development is 120mPD and thus the Assessment Area is proposed to be around 120m. Notwithstanding, in order to capture a more representative wind profile of the surrounding area of the Project Site, the Surrounding Area are proposed to be 1100m respectively, which extend beyond 2H from the Project Site. The committed/planned development at the Nam Cheong Station Development and building density allowed under the current zoning at NWKR Site 6 are thus included. The neighbouring elevated structures, such as West Kowloon Highway are also modelled in the Study.

Figure 24 Site boundary, Assessment Area and Surrounding Area for the study (Image Source: Google Earth)

3.2.2 Assessment Parameter

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

$$VR = \frac{V_p}{V_\infty} \quad (2)$$

V_∞= the wind velocity at the top of the wind boundary layer (typically assumed to be around 596m above the centre of the site of concern, or at a height where wind is unaffected by the urban roughness below).

V_P= the wind velocity at the pedestrian level (2m above ground) after taking into account the effects of buildings.

The Average VR is defined as the 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 on an annual basis.

3.3 Test Point for Local and Site Ventilation Assessment

Monitoring test points are evenly placed along the site boundary and within the assessment area of the proposed development to determine the ventilation performance. There are two types of test points in the study:

3.3.1 Perimeter Test Points

Perimeter test points are the points positioned at the site boundary of the proposed developments. In accordance with the Technical Circular for AVA, perimeter points are positioned at interval of 10 – 15m alongside the site boundary. In total there are 39 perimeter test points within the assessment area.

3.3.2 Overall Test Points

Overall test points are those points evenly positioned in the open space on the streets and places where pedestrian frequently access within the assessment area. In total there are 53 overall test points within the assessment area.

Figure 25 shows the location of all perimeter and overall test points within the assessment area. The orange rectangle refers to the area as shown in Figure 26 close-up view and the white rectangle refers to the area as shown in Figure 27 close-up view.

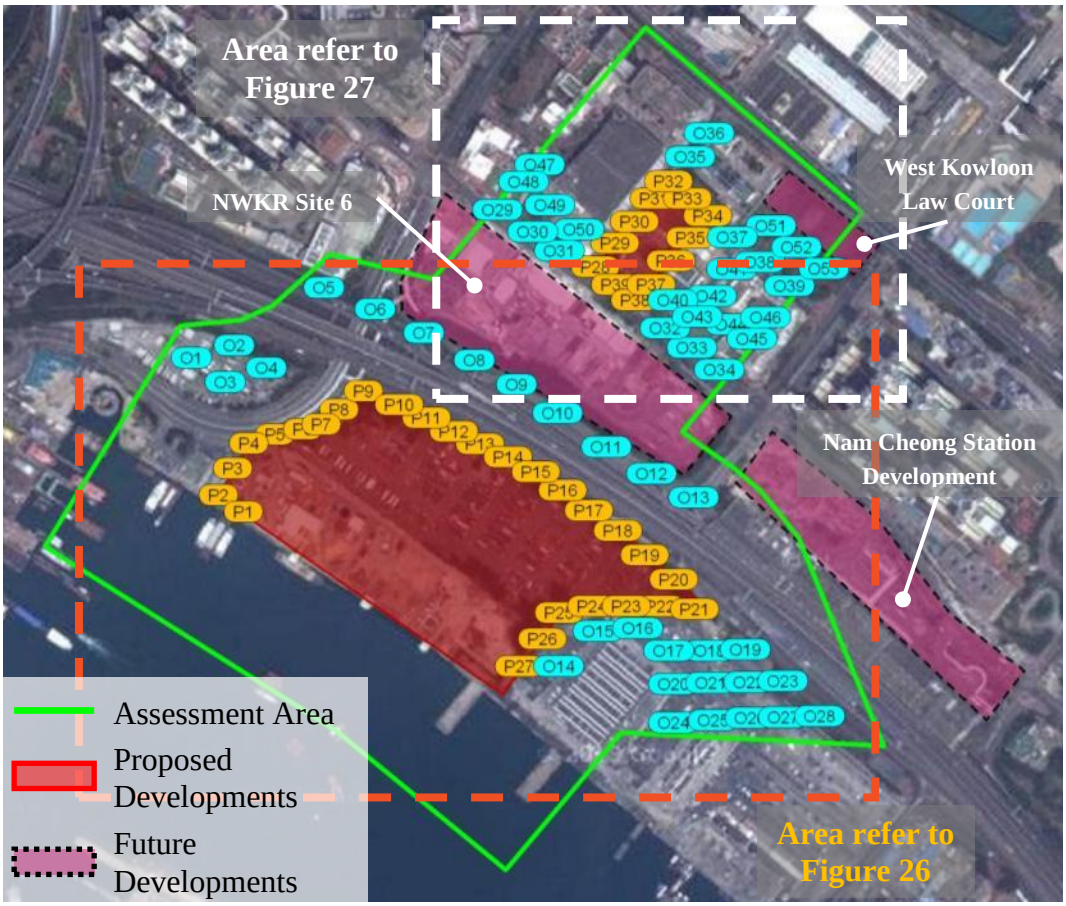


Figure 25 Location of overall and perimeter points – Overall Plan (Image Source: Google Map)

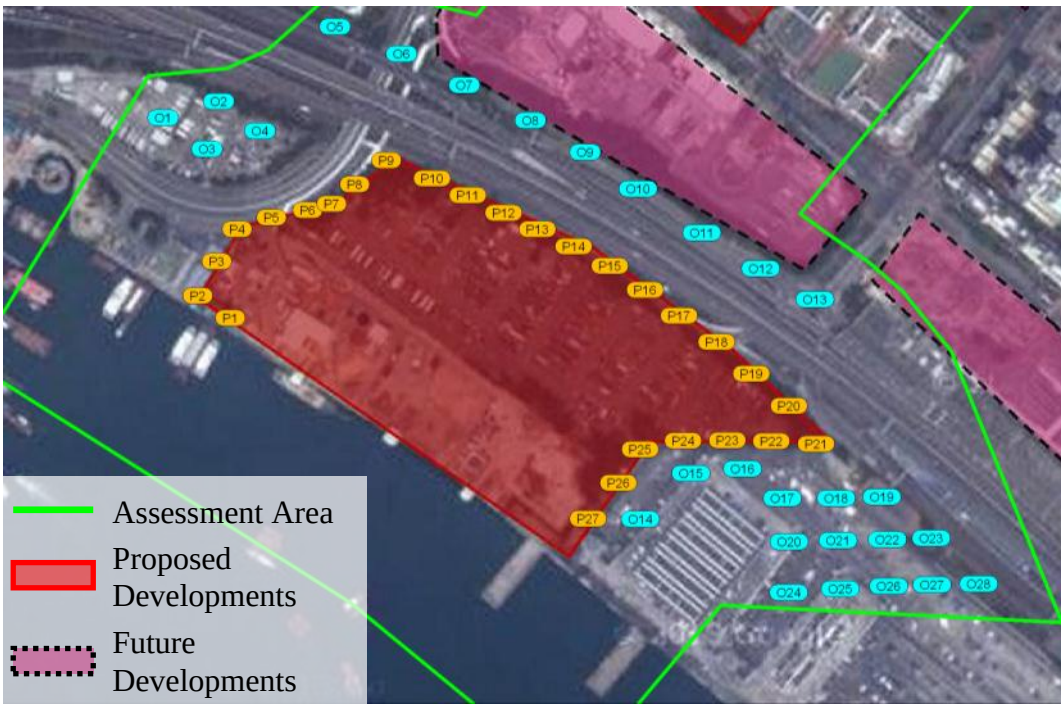


Figure 26 Location of overall and perimeter points – Plan A (Image Source: Google Map)

Figure 27 Location of overall and perimeter points – Plan B (Image Source: Google Map)

3.3.3 Special Test Points

Special test points are evenly positioned at the waterfront promenade, Hing Wah Street West, and Tonkin Street West to study the impact on wind performance due to the proposed developments. In total there are 25 special test points located at the locations mentioned.

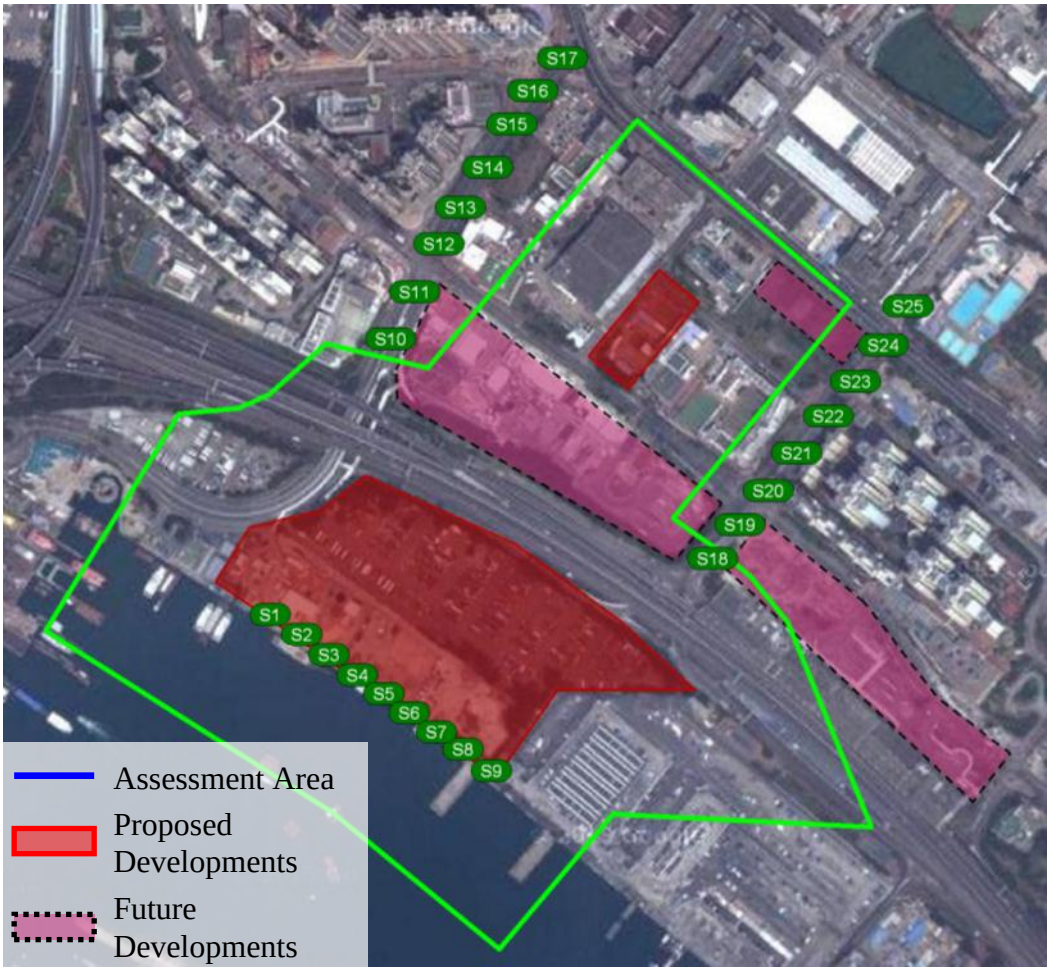


Figure 28 Location of special test points (Image Source: Google Map)

3.4 Assessment Tools

Computational Fluid Dynamics (CFD) technique is utilized for this AVA initial Study. The CFD software Star-CCM+ was used in this study. With the use of three-dimensional CFD method, the local airflow distribution can be visualised in detail. The air velocity distribution within the flow domain, being affected by the site-specific design and the surrounding buildings, has been simulated under the prevailing wind conditions round the year.

3.4.1 CFD Model

The size of the CFD model for this Study is approximately 5700m(L) x 5000m(W) x 1500m(H). The whole CFD domain covers the entire development and the surrounding buildings. The model also takes information of the surrounding buildings and site topography via Geographical Information System (GIS) platform. Body-fitted unstructured grid technique is used to fit the geometry to reflect the complexity of the development geometry. 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. The expansion ratio is 1.5 while the maximum blockage ratio is 3.5%.

Finer grid system (with the smallest grid size of 0.5m) is applied to the most concerned area based on preliminary judgement, while coarse grid system (grid size of more than 20m at location far away from the site) is applied to the area of surrounding buildings for better computational performance while maintaining satisfactory result.

3.4.2 Turbulence model

As highlighted in recent academic and industrial research literatures by CFD practitioners, the widely used standard k - ε turbulence model technique may not adequately model the effects of large scale turbulence around buildings and ignores the wind gusts leading to the relatively poor prediction in the recirculation regions around building. Therefore in this CFD simulation, realizable k – ε turbulence modelling method is applied. This technique provides more accurate representation of the levels of turbulence that can be expected in an urban environment.

3.4.3 Calculation Method

The Segregated Flow model solves the flow equations in a segregated manner. The linkage between the momentum and continuity equations adopted the predictor-corrector approach. A collocated variable arrangement and a Rhie-and-Chow-type pressure-velocity coupling combined with a SIMPLE-type algorithm. A higher order differencing scheme is applied to discretize the governing equations. The convergence criterion is set to 0.0005 on mass conservation. The calculation will repeat until the solution satisfies this convergence criterion.

The prevailing wind direction as mentioned in Section 3.1 is set to inlet boundary of the model with wind profile as detailed in Section 3.1.3. 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 beyond the Surrounding Area as required in the Technical Circular.

3.4.4 AVA study parameters

CFD simulations have been conducted to study the wind environment. 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 (2m above ground) 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. The details of the assessment result for the scheme would be presented in the next section.

Table 6 Terminology of the AVA Initial Study

Terminology	Description
Velocity Ratio (VR)	The velocity ratio (VR) represents the ratio of the air velocity at the measurement position to the value at the reference points.
Site spatial average velocity ratio (SVR)	The SVR (orange points) represent the average VR of all perimeter test points at the site boundary which identified in the report.
Local spatial average velocity ratio (LVR)	The LVR (blue and orange points) represent the average VR of all points, i.e. perimeter and overall test points at the site boundary which identified in the report.

4 Results and Discussion

4.1 Annual Overall Pattern of Ventilation Performance

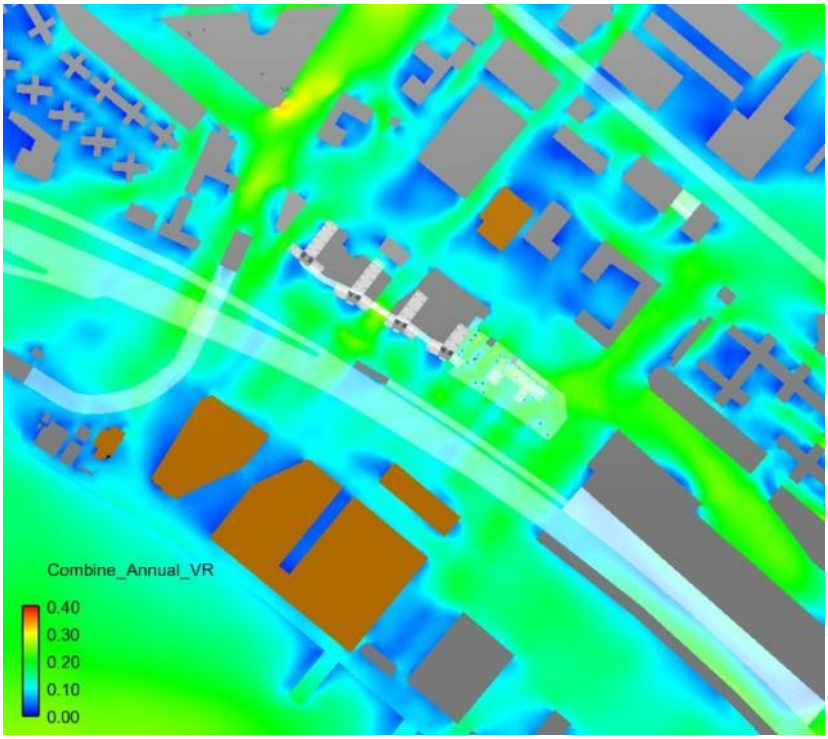


Figure 29 Contour Plot of Annual Average VR at 2m Pedestrian Level for Baseline Scheme

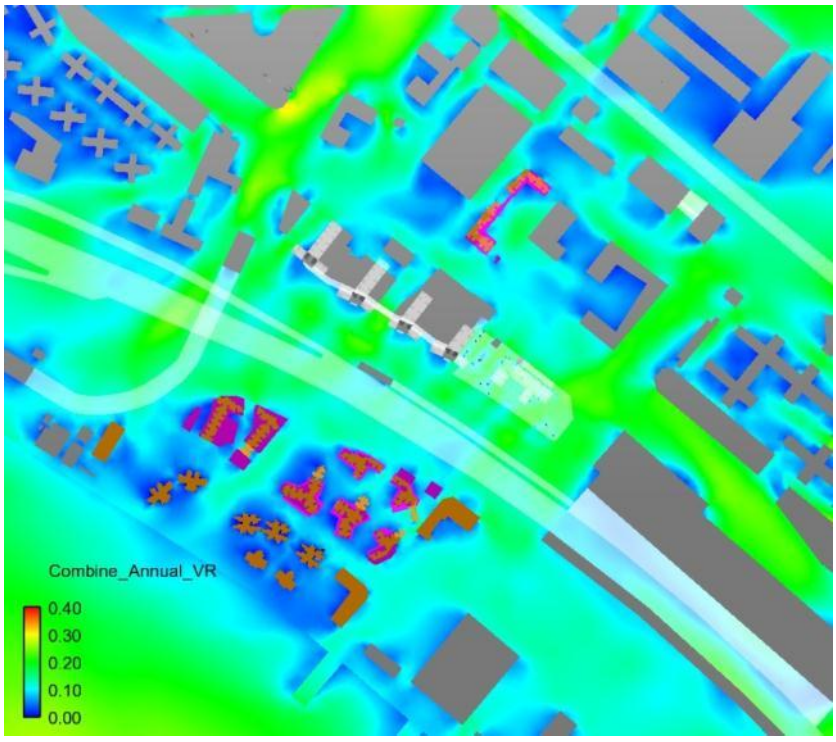


Figure 30 Contour Plot of Annual Average VR at 2m Pedestrian Level for Indicative Scheme

For the annual condition, eight wind directions were selected, accumulating to 76.6% occurrence frequency. The integrated effect of these winds indicates the overall wind ventilation performance. Annual wind is dominated by E (16.6%) and ENE (17.4%) directions. The above contour plots show that:

- The overall ventilation performances of the Baseline Scheme and Indicative Scheme are quite similar;
- The prevailing wind mainly approaches from the ENE and E directions, the existing dense building developments, such as Fu Cheong Estate will shield some of the approaching winds; and
- Both FTSW Site and CSWWFM Ph. 2 Site are located at the downwind side of the Cheung Sha Wan Area, thus there are no significant adverse impact to most of the surroundings in terms of ventilation performance.

4.2 Summer Overall Pattern of Ventilation Performance

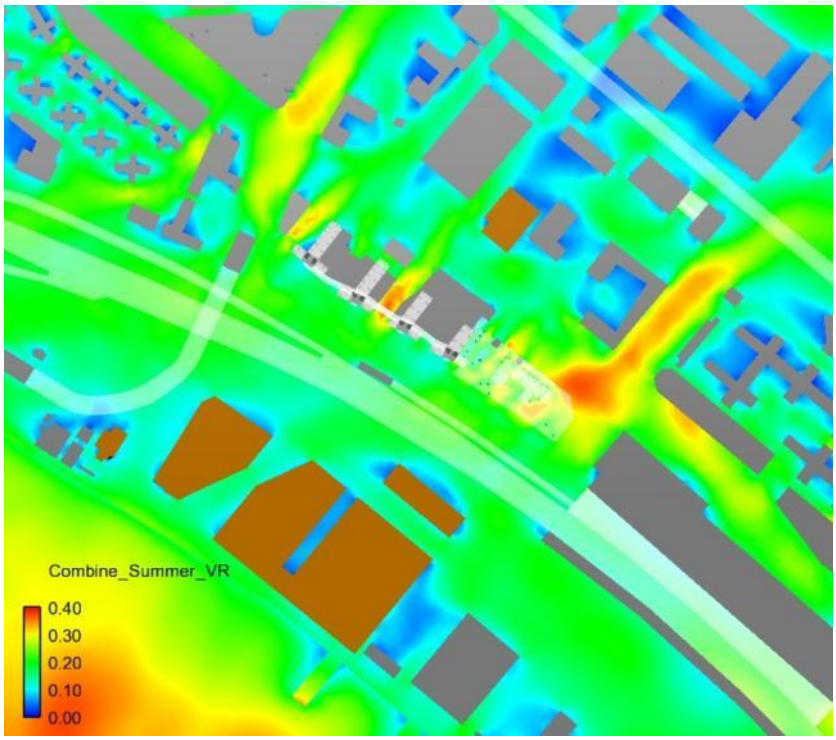


Figure 31 Contour Plot of Summer Average VR at 2m Pedestrian Level for Baseline Scheme

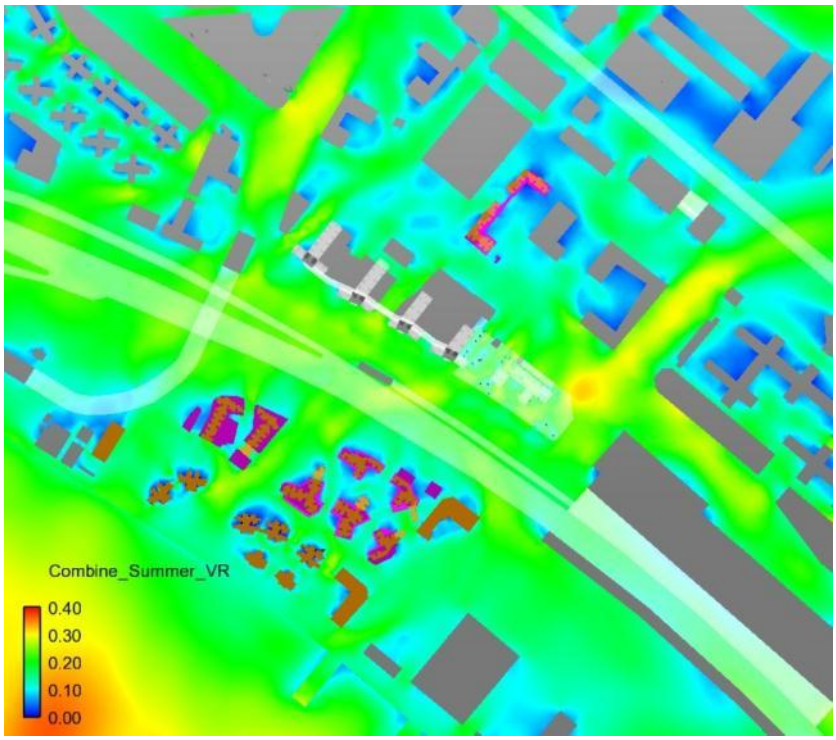


Figure 32 Contour Plot of Summer Average VR at 2m Pedestrian Level for Indicative Scheme

For the summer condition, nine wind cases were chosen, accumulating to 77.1% occurrence frequency. The integration of the effect of these winds indicates the overall wind ventilation performance. During the summer, including June to August, the summer prevailing wind is dominated by E (11.5%) and SW (9.9%) winds. The above contour plots show that:

- CSWWFM Ph. 2 Site is located next to the waterfront, upwind of Cheung Sha Wan. The building blocks of Baseline Scheme allow the incoming wind to skim over the top of the building and penetrate to the downwind side of the development with less obstruction;
- The Indicative Scheme of CSWWFM Ph. 2 Site is taller and denser than the Baseline Scheme; however, the three wind corridors in the Indicative Scheme allow wind penetration downwind to the development which reduces the adverse impacts of the development (refer to Figure 45);
- CSWWFM Ph. 2 Site and NWKR Site 6 are located upwind of FTSW Site. The wind environment at FTSW Site area is dominated by the upwind developments, hence it is expected that the ventilation performance of FTSW Site has minimal impact on the surrounding areas;

4.3 SVR and LVR

The average Velocity Ratios of all test points are determined and extracted. The results of all test points are presented in the Appendix B. According to the Technical Circular, the Velocity Ratio at each test point is assessed and the SVR and the LVR under the prevailing winds are determined and reported to assess the impact of the proposed development Schemes to the wind environment. The SVR and LVR value of the test points are summarized as follows:

Table 7 Annual SVR and LVR of the Assessment Area for the Development Schemes

Annual	Baseline Scheme	Indicative Scheme
SVR	0.11	0.12
LVR	0.11	0.11

Table 8 Summer SVR and LVR of the Assessment Area for the Development Schemes

Summer	Baseline Scheme	Indicative Scheme
SVR	0.15	0.15
LVR	0.15	0.15

4.3.1 Site Air Ventilation Assessment

Under annual wind condition, the SVR for both Baseline Scheme and Indicative Scheme is similar, where the SVR for Baseline Scheme is 0.11 and the SVR for Indicative Scheme is 0.12. Under summer wind condition the SVR for Baseline Scheme and Indicative Scheme is the same, where the SVR is 0.15 for both schemes. The results indicate slightly better wind performance at the immediate surroundings of the developments under Indicative Scheme for annual condition and similar wind performance at the immediate surroundings of the developments under both schemes for summer condition.

4.3.2 Local Air Ventilation Assessment

The LVR of the annual and summer wind condition is the same for both Baseline and Indicative Scheme. The LVR under annual wind condition for both schemes is 0.11 and the LVR under summer wind condition for both schemes is 0.15. The results indicate similar wind performance to the surrounding area under both Baseline and Indicative Scheme.

4.4 Directional Analysis

The directional analysis has been carried out for each quarter of wind directions, three wind directions are chosen for further directional analysis including Easterly, South-Easterly and South-Westerly wind directions.

4.4.1 Easterly Wind Direction

The easterly wind condition contributes to 16.6% of the annual prevailing wind condition and 11.5% of the summer prevailing wind condition.

CSWWFM Ph. 2 Site

Under easterly prevailing wind condition, the wind enters CSWWFM Ph. 2 Site from CSWWFM Ph. 1 and Tonkin Street West (red arrow in Figure 33).

Under the Baseline Scheme, the building bulk is large in footprint but the buildings are low in height. The resultant effect is a relatively satisfactory ventilation performance, mainly due to the low building height.

As CSWWFM Ph. 2 Site is located at the downwind side of the surrounding developments, there are no significant adverse impacts to the surroundings under the Indicative Scheme in terms of ventilation performance, except at the Waterfront Promenade. The building towers in Site 4 and 4a (red dotted line in Figure 34) in the Indicative Scheme induce wind shadows to the Waterfront Promenade areas and divert a portion of winds toward the sea. In this connection, a relatively better ventilation performance is found at the Waterfront Promenade under the Baseline Scheme.

FTSW Site

The site is surrounded by medium-rise buildings, such as St. Margaret's Co-educational English Secondary & Primary School and Ying Wa School. The incoming winds mainly enter the site from Ying Wa Street.

Under the Baseline Scheme, the building height is relatively similar to the medium rise buildings in the surrounding and the building frontage along Fat Tseung Street West is relatively short. As a result the ventilation impacts to the surrounding are minimal.

In the Indicative Scheme, the building facade helps to direct the downwash wind to the pedestrian level, which enhances the ventilation performance at the school sites (orange arrow in Figure 34). The empty bay design at the ground level also allows wind to penetrate to the leeward side of the building and enhances the wind environment at Sham Mong Road (white arrow in Figure 34).

Furthermore, the 15m building gap between the two tower blocks in the Indicative Scheme, also enhances the wind penetration to Fat Tseung Street West, and hence reduces the wake zone at the leeward side of the Development (white arrow in Figure 34).

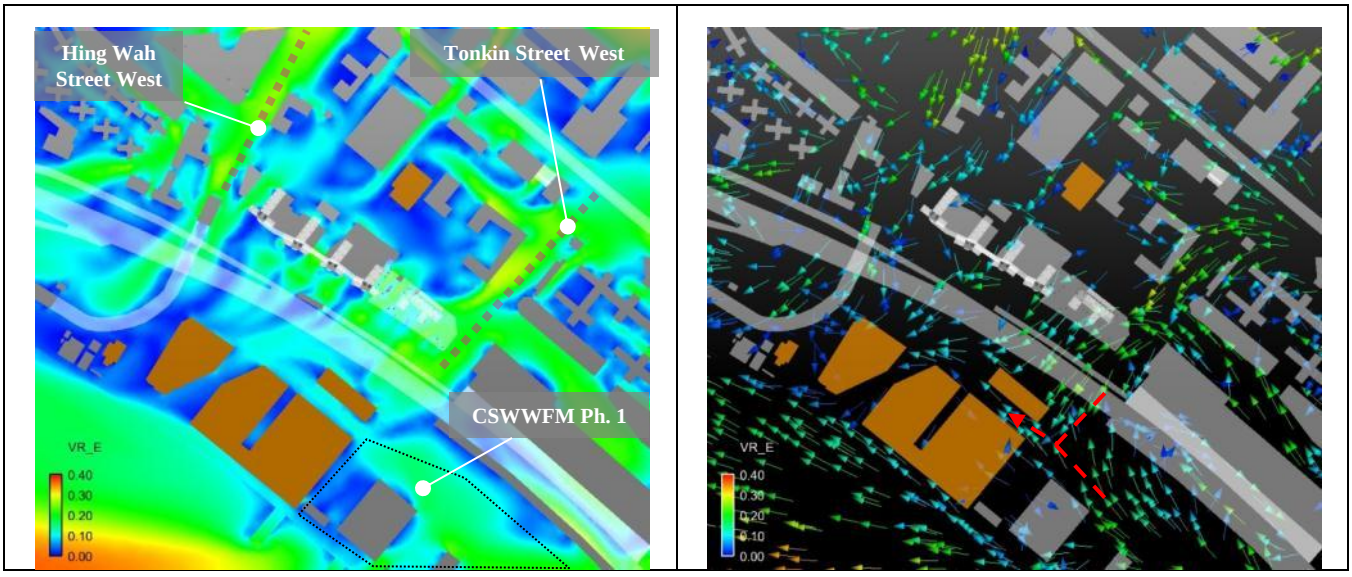


Figure 33 VR Contour and Vector Plot under E Wind of Baseline Scheme

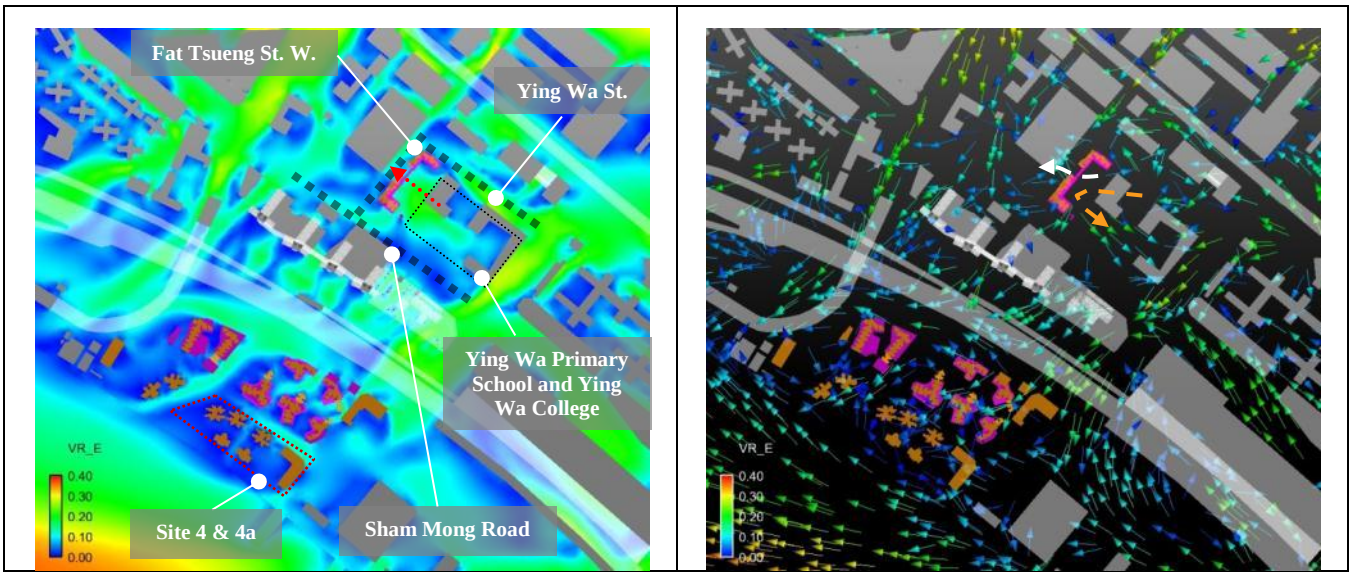


Figure 34 VR Contour and Vector Plot under E Wind of Indicative Scheme

4.4.2 South-Easterly Wind Direction

The south-easterly wind condition contributes to 5.9% of the annual prevailing wind condition and 9.3% of the summer prevailing wind condition.

CSWWFM Ph. 2 Site

The incoming wind enters CSWWFM Ph. 2 Site from CSWWFM Ph. 1 along the West Kowloon Highway.

In the Baseline Scheme, the market structures are relatively low so the prevailing wind enters the site and is able to skim over the buildings without introducing significant wind blockage at mid to high levels, allowing wind penetration to the downwind area.

Lin Cheung Road experiences better wind performance under the Indicative Scheme in comparison with the Baseline Scheme. As the prevailing wind enters the project site along the highway, the building blocks in the Indicative Scheme is able to deflect and downwash a portion of wind onto Lin Cheung Road (red arrow in Figure 36). Under the Indicative Scheme, the local air path is in alignment with the SE prevailing wind. This design feature enhances the permeability of the Development and allows SE wind to penetrate through the site to the downwind region (blue arrow in Figure 36).

FTSW Site

Similar to the east wind condition, due to the lower building height and shorter building frontage along Fat Tseung Street West under the Baseline Scheme, the ventilation impacts to the surrounding are minimal.

Under the Indicative Scheme, the findings are similar to the prevailing east wind condition. Wind along Sham Mong Road passes to the southwest of FTSW Site, but the site does not receive significant wind as it is surrounded by other buildings. The 15m building gap between the building blocks allows the prevailing wind to penetrate to the leeward side and mitigates the wake zone at the downwind side. Also, the building facade helps to direct downwash wind to the pedestrian level, which enhances the ventilation performance at the School Sites.

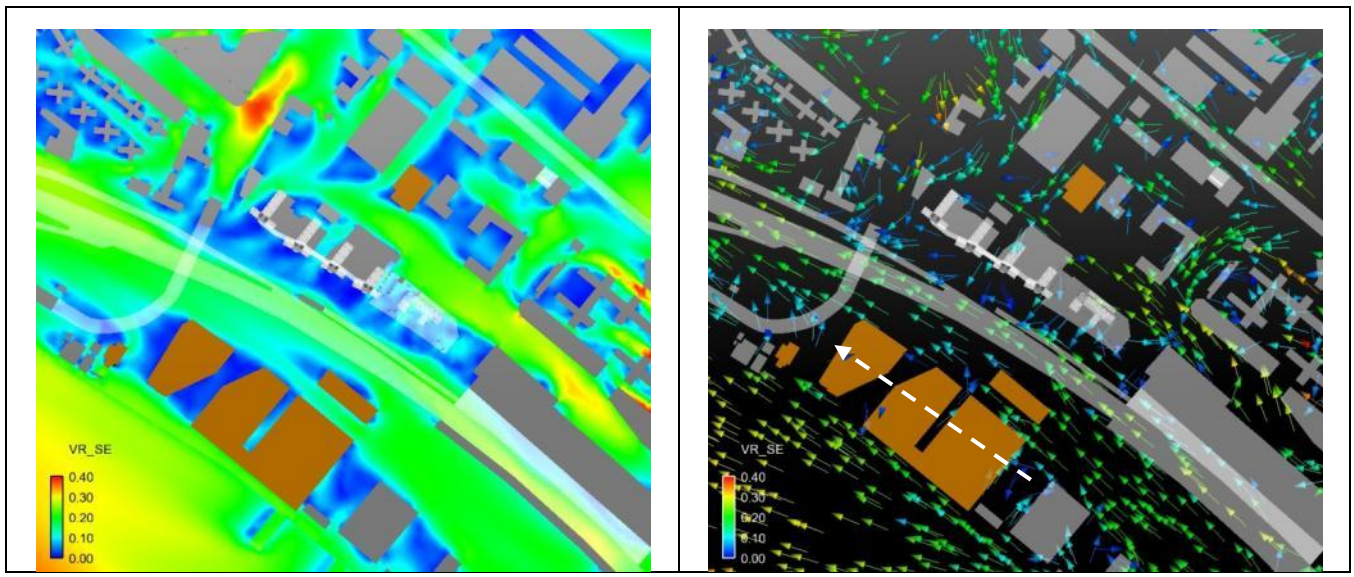


Figure 35 VR Contour and Vector Plot under SE Wind of Baseline Scheme

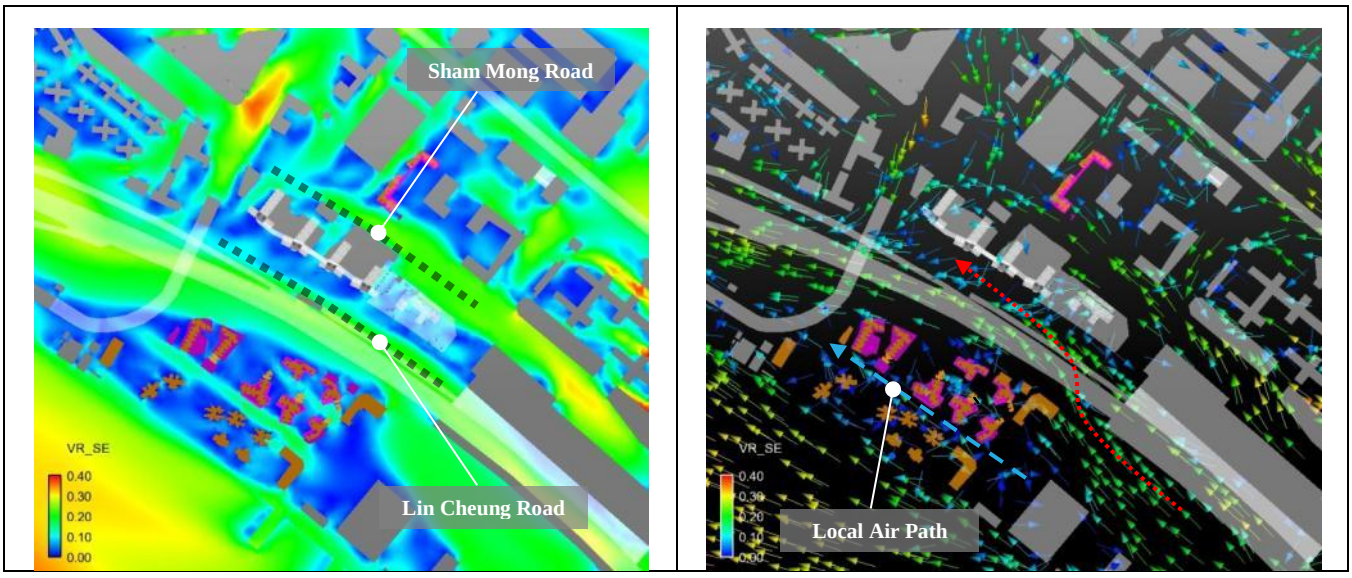


Figure 36 VR Contour and Vector Plot under SE Wind of Indicative Scheme

4.4.3 South-Westerly Wind Direction

The south-westerly wind condition contributes to 9.9% of the summer prevailing wind condition.

CSWWFM Ph. 2 Site

The incoming wind approaches CSWWFM Ph. 2 Site from the southwest along the waterfront.

Under the Baseline Scheme, the lower building heights of the Baseline Scheme allow the prevailing wind to skim through the development and penetrate into NWKR Site 6 effectively, as shown in Figure 39; hence a higher VR is observed downwind of CSWWFM Ph. 2 Site (refers to Figure 39 and Figure 40).

Under the Indicative Scheme, the proposed high rise CSWWFM Ph. 2 will impose some impact on the wind performance at the downwind area. The three wind corridors that are incorporated into the design of the Indicative Scheme will facilitate the channelling of the incoming wind into the downwind area.

One of the wind corridors located at the northwest of the site with a width of 45m is connected to Hing Wah Street West wind corridor. The 30m wide southeast wind corridor is connected to Tonkin Street West wind corridor. The third wind corridor of 22m width is connected to the wind corridor across NWKR Site 6. The results show a relatively high average VR value along the three wind corridors (black arrow in Figure 38).

The drainage reserve, which bisects the CSWWFM Ph. 2 Site into two main areas on the east-west axis, further increases the building separation at the developments and enhances the site permeability. Good wind penetration to Lin Cheung Road is achievable.

FTSW Site

The incoming winds are able to penetrate through the wind corridors of CSWWFM Ph. 2 and the building gap of NWKR Site 6 and reach the FTSW Site. However, the ventilation performance in FTSW varies due to the direction change of incoming wind in the presence of surrounding and upwind buildings.

Under Baseline Scheme, a larger unobstructed air mass is able to penetrate through Site 6 and reach FTSW; therefore, Fat Tseung Street West observes a better VR value. On the other hand, the larger building bulk at the CSWWFM Ph. 2 Site has shielded a portion of the incoming winds, while NWKR Site 6 further reduce the penetrate effect to the downwind regions and the wind performance at Fat Tseung Street West.

Figure 37 and Figure 38 shows the VR contour and vector plot under SW wind for both Baseline Scheme and Indicative Scheme.

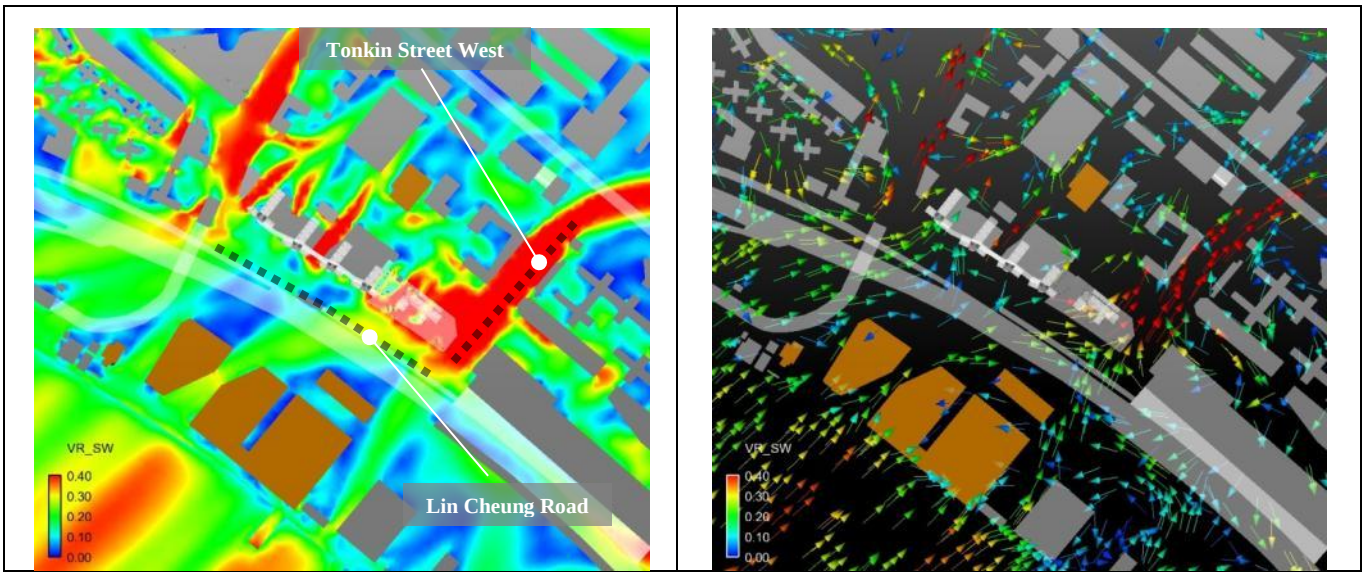


Figure 37 VR Contour and Vector Plot under SW Wind of Baseline Scheme

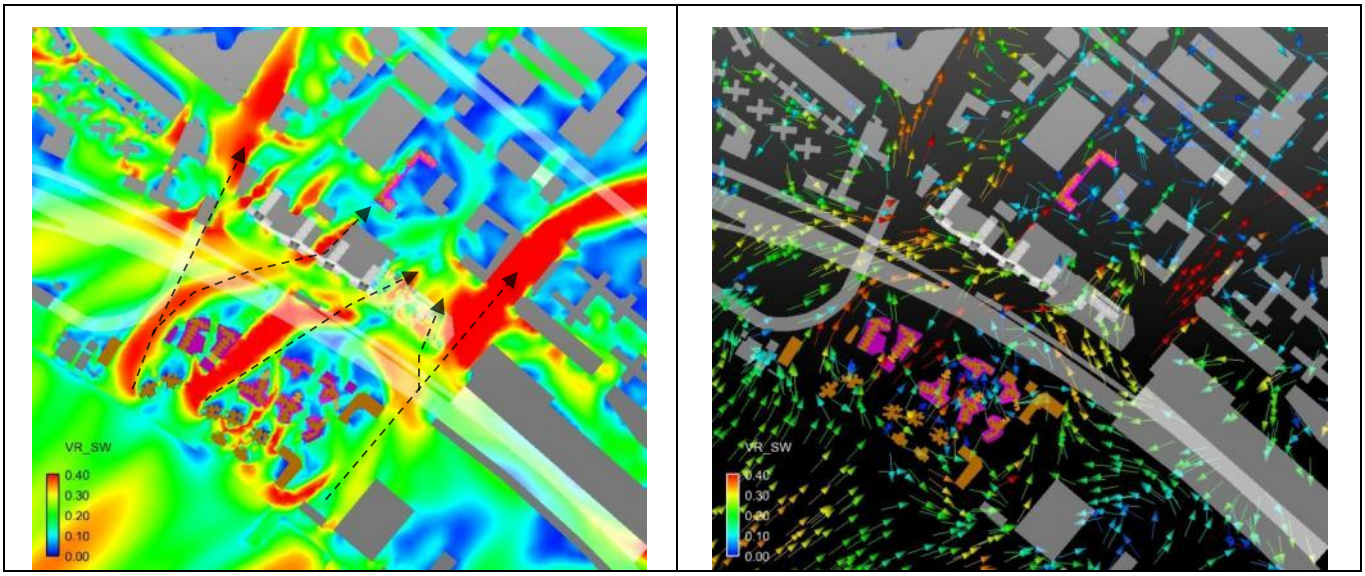


Figure 38 VR Contour and Vector Plot under SW Wind of Indicative Scheme

Figure 39 and Figure 40 shows the streamline diagrams at low level around CSWWFM Ph. 2 Site for both Baseline Scheme and Indicative Scheme.

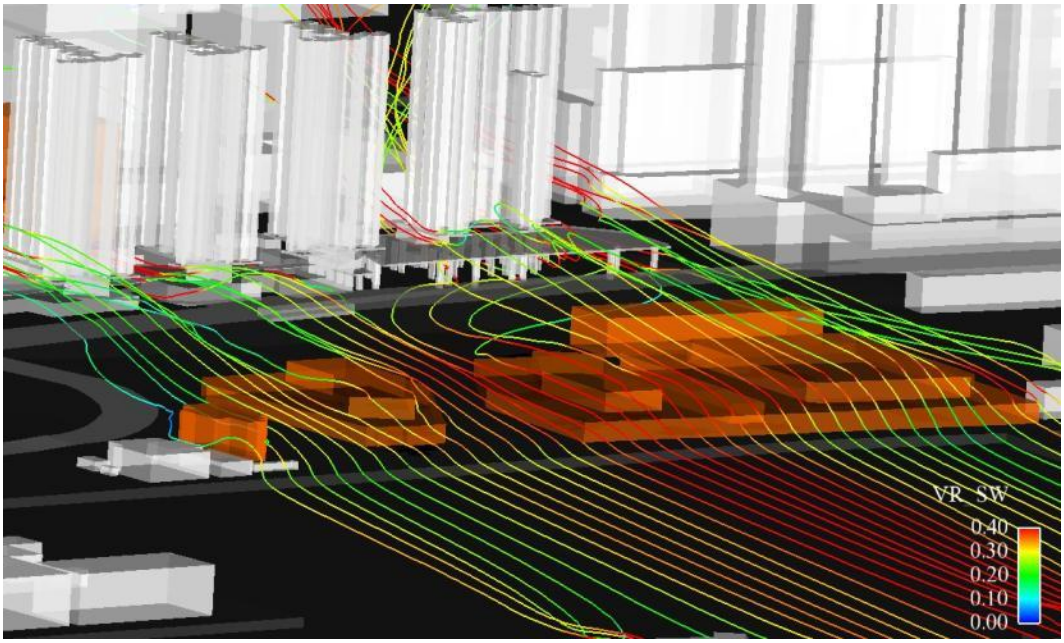


Figure 39 Low Level Wind Environment around CSWWFM Ph. 2 Site – Baseline Scheme

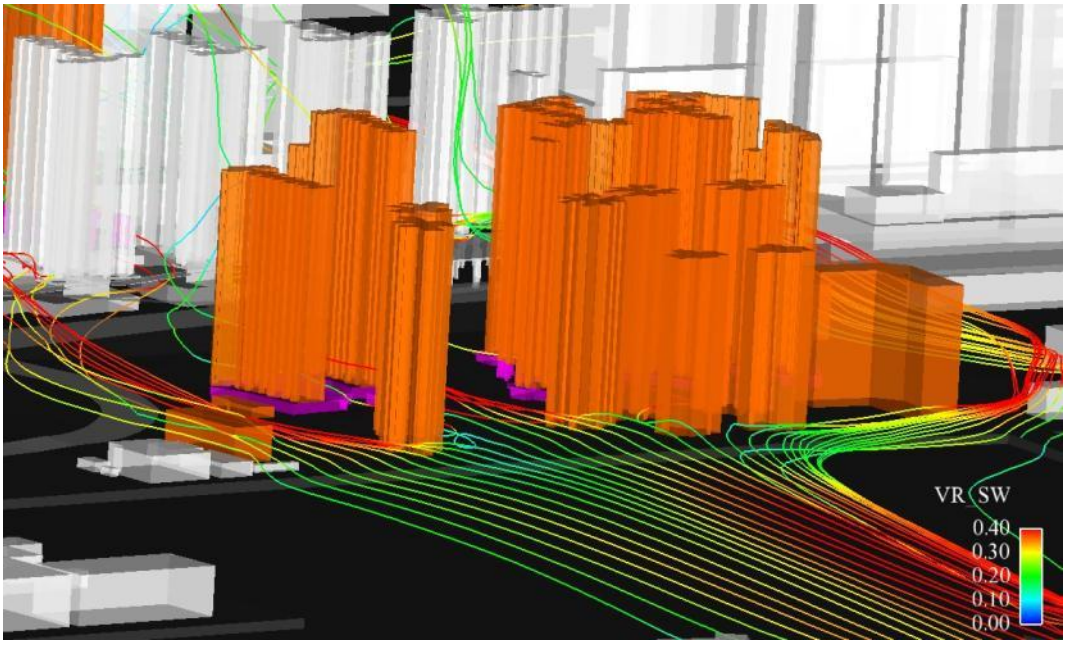


Figure 40 Low Level Wind Environment around CSWWFM Ph. 2 Site – Indicative Scheme

4.5 Focus Area

The Focus Areas for frequent pedestrian access and activity zones are defined for the detailed analysis as follows:

1. Fat Tseung Street West
2. Sham Mong Road
3. Ying Wa Street
4. Lin Cheung Road
5. St. Margaret's Co-educational English Secondary and Primary School, Ying Wa College and Ying Wa Primary School
6. CSWWFM Ph. 1
7. Yuen Fat Godown Carpark
8. West Kowloon Law Court Building

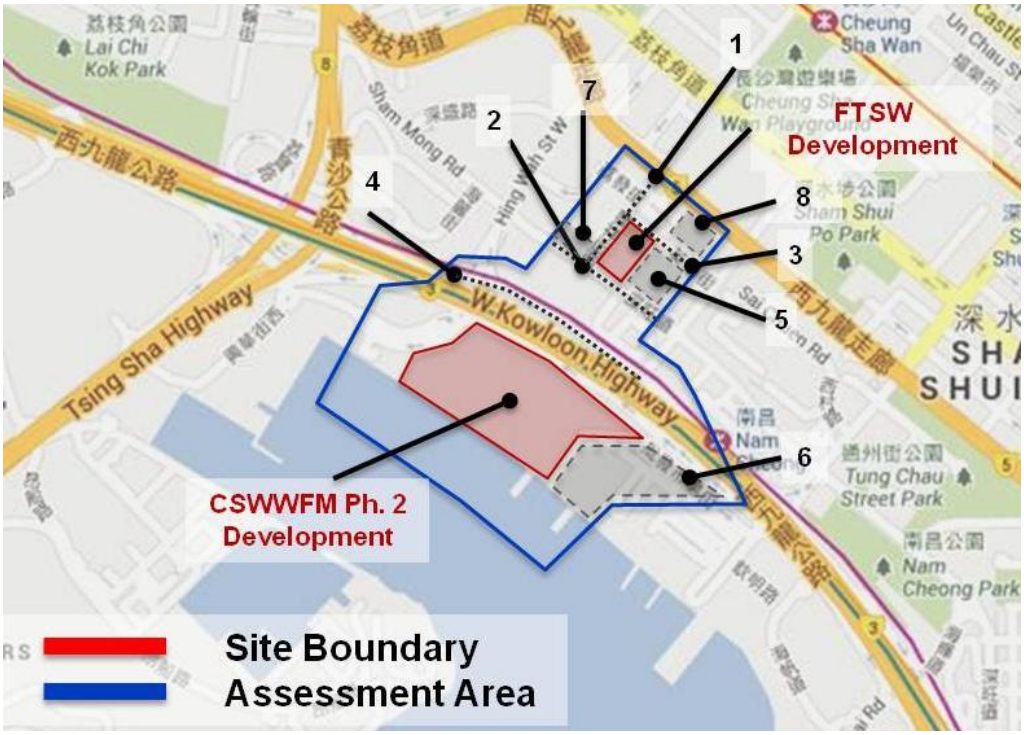


Figure 41 Focus Areas for the Study (Image Source: Google Earth)

4.5.1 Annual Wind Condition

Table 9 Average VR Results for Focus Areas of the Development Scheme under annual wind condition

Focus Areas		Test Points	Baseline Scheme	Indicative Scheme
1	Fat Tseung Street West	O35-O36, P28-P32	0.12	0.11
2	Sham Mong Road	O29-O34, P28, P38, P39	0.10	0.10
3	Ying Wa Street	O37-O39, P32-P34	0.10	0.11
4	Lin Cheung Road	O5-O13	0.14	0.14
5	St. Margaret's Co-educational English Secondary and Primary School, Ying Wa College and Ying Wa Primary School	O40-O46	0.07	0.07
6	CSWWFM Ph. 1	O14-O28	0.13	0.12
7	Yuen Fat Godown Carpark	O47-O50	0.10	0.11
8	West Kowloon Law Court Building	O51-O53	0.06	0.07

Under annual wind condition, most of the Focus Areas show a similar average VR value, such as Sham Mong Road (O29-O34, P28, P38, P39), Lin Cheung Road (O5-O13), St. Margaret's Co-educational English Secondary and Primary School, Ying Wa College and Ying Wa Primary School (O40-O46). The results indicate that the proposed development does not induce significant adverse ventilation impacts on these areas as compared with the Baseline Scheme.

For Ying Wa Street (O37-O39, P32-P34) and West Kowloon Law Court Building (O51-O53), a slightly higher average VR (i.e. 0.01) values is observed under the Indicative Scheme. This is due to the high-rise residential block at FTSW Site's Indicative Scheme helps to direct downwash wind to the pedestrian area and hence enhances the ventilation performance at Ying Wa Street.

The Yuen Fat Godown Carpark (O47-O50) is situated at the downwind side of FTSW Site under annual wind condition. The 15m building gap incorporated in the FTSW Site's Indicative Scheme allows the east wind to penetrate to the leeward side of the building and enhanced the ventilation performance at the Carpark of Yuen Fat Godown

Baseline Scheme achieved a slightly higher average VR (i.e. 0.01) at CSWWFM Ph. 1 (O14-O28). This might be due to the fact that the larger building bulk under the Indicative Schemes would inevitably induce certain air ventilation impacts on some localized areas. Nevertheless, differences in the average VR values observed are insignificant.

The average VR at Fat Tseung Street West has reduced by 0.01 in the Indicative Scheme as compared to the Baseline Scheme. This is mainly due to the fact that:

- Compared to the Indicative Scheme, the GIC Block under the Baseline Scheme has a smaller building bulk and larger setback along Ying Wa

Street. Thus it creates a wider wind entrance (Figure 42a red arrow) and allows wind penetrate to Fat Tseung West Street more effectively (Figure 42a **black** arrow) and lead to a slightly higher average VR (i.e. 0.01).

- The building block in Indicative Scheme has a higher frontal area along Fat Tseung Street West and lead to less permeability, thus the scheme is less favourable for wind penetration. However, the building gap incorporated in FTSW Site's Indicative Scheme helps the incoming wind penetrate through the Development (Figure 42b **black** arrow) and to enhance the wind performance in the downwind area.

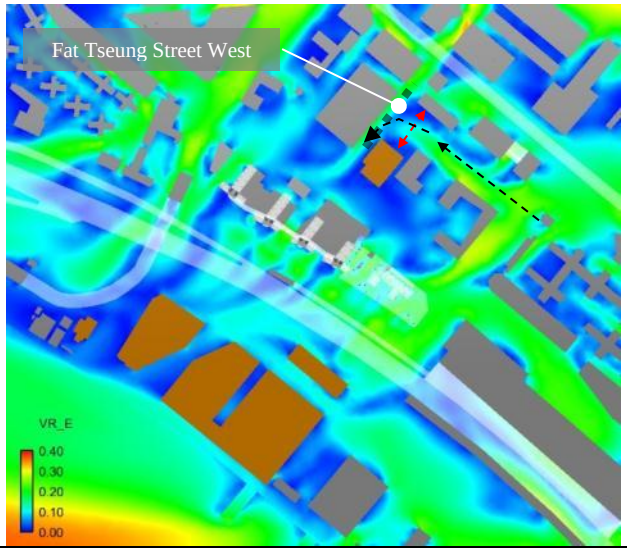
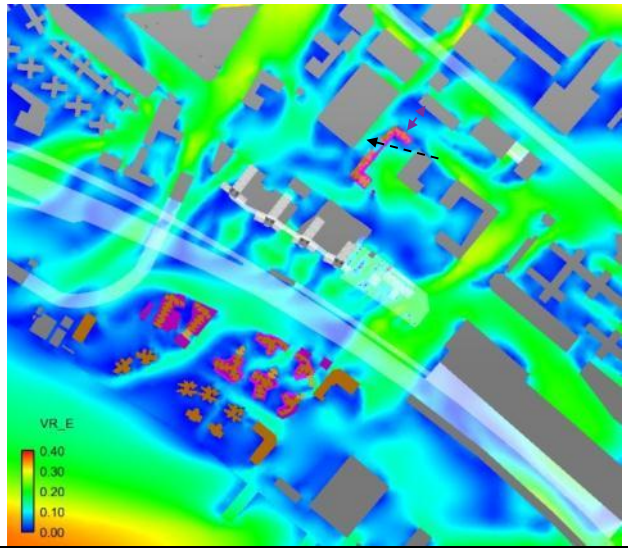
a. Baseline Scheme	b. Indcative Scheme
	

Figure 42 VR Contour under E Wind of Indicative Scheme

4.5.2 Summer Wind Condition

Table 10 Average VR Results for Focus Areas of the Development Scheme under summer wind condition

Focus Areas		Test Points	Baseline Scheme	Indicative Scheme
1	Fat Tseung Street West	O35-O36, P28-P32	0.15	0.11
2	Sham Mong Road	O29-O34, P28, P38, P39	0.16	0.15
3	Ying Wa Street	O37-O39, P32-P34	0.13	0.12
4	Lin Cheung Road	O5-O13	0.20	0.22
5	St. Margaret's Co-educational English Secondary and Primary School, Ying Wa College and Ying Wa Primary School	O40-O46	0.11	0.11
6	CSWWFM Ph. 1	O14-O28	0.15	0.15
7	Yuen Fat Godown Carpark	O47-O50	0.14	0.13
8	West Kowloon Law Court Building	O51-O53	0.13	0.12

Under summer wind condition, most of the Focus Areas except Fat Tseung Street West show a slight difference in average VR value between the Indicative Scheme and the Baseline Scheme. The results indicate that the proposed development does not induce significant adverse ventilation impacts on these areas as compared with the Baseline Scheme.

Lin Cheung Road's (O5-O13) wind performance benefits from the Indicative Scheme's wind corridors. The tall building blocks in the Indicative Scheme divert the prevailing wind into the wind corridors, which accelerates the wind. The wind corridors flow into Lin Cheung Road, and thus giving a better wind performance under Indicative Scheme than the Baseline Scheme (refer to Figure 36).

St. Margaret's Co-educational English Secondary and Primary School, Ying Wa College and Ying Wa Primary School (O40-O46) observe similar average VR for both of the schemes. These areas benefit from the downwash effect of FTSW Site's Indicative Scheme.

As CSWWFM Ph. 1 (O14-O28) is upstream of the proposed developments, the wind environment at this location experiences similar VR for both schemes.

The lower building blocks of CSWWFM Ph. 1 and Ph. 2 under the Baseline Scheme allow the incoming wind to skim over the top of the buildings. The wind is largely uninterrupted as it travels inland. Thus, higher average VR is observed under the Baseline Scheme at Sham Mong Road (O29-O34, P28, P38, P39), Ying Wa Street (O37-O39, P32-P34), Yuen Fat Godown Carpark (O47-O50), and West Kowloon Law Court (O51-O53).

The average VR at Fat Tseung Street West (O35-O36, P28-P32) has reduced by 0.04 in the Indicative Scheme as compared to the Baseline Scheme. The major

reasons for Fat Tseung Street West achieved a higher average VR under the Baseline Scheme are:

- Under the Baseline Scheme, the relatively low-rise building at the CSWWFM Ph. 2 Site allow the incoming wind skim over the top of the buildings (Figure 43a blue arrow and Figure 39 streamline plot) and effectively penetrates though NWKR Site 6 along the building gap (Figure 43a **black** arrow). Thus relatively high average VR is obtained at the Fat Tseung Street West.
- Under the Indicative Scheme, the incoming wind is still able to penetrate though the wind corridors in both the CSWWFM Ph. 2 Site and NWKR Site 6, and helps to reduce the adverse performance at Fat Tseung Street West (Purple Arrow at Figure 43b). Nevertheless, the larger building bulk at the CSWWFM Ph. 2 Site has shielded a portion of the incoming winds, while NWKR Site 6 further reduce the penetrate effect to the downwind regions and the wind performance at Fat Tseung Street West.

It is noteworthy that the design of the NWKR Site 6 is further revised to enhance the wind performance, the expert review of the design changes and detail simulation analysis can be referred to Section 7 and Appendix A respectively.

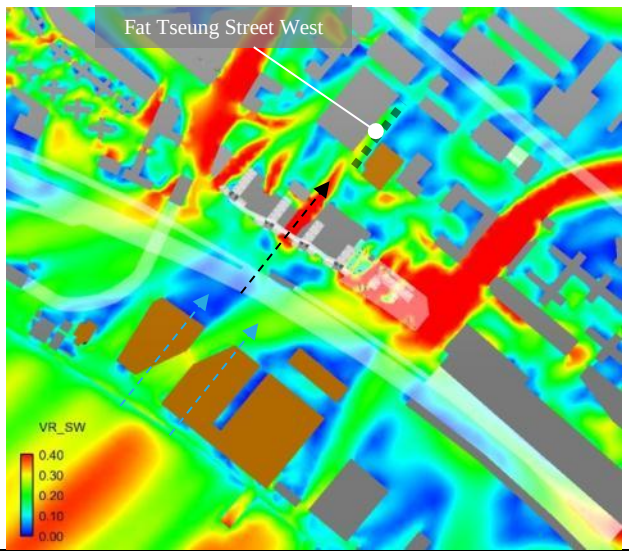
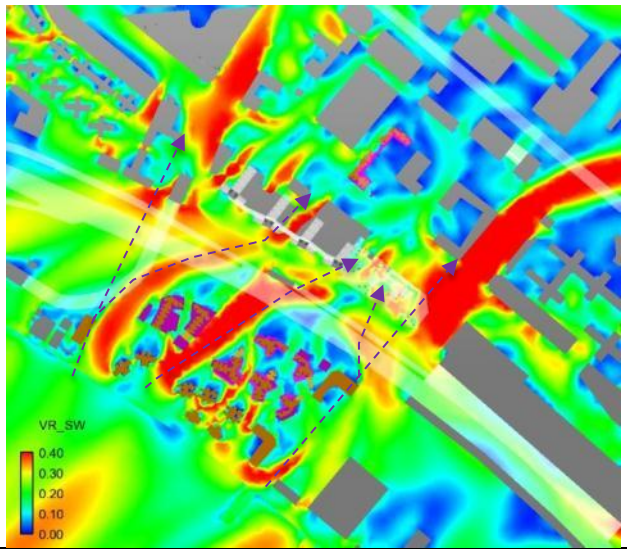
a. Baseline Scheme	b. Indcative Scheme
	

Figure 43 VR Contour under SW Wind of Indicative Scheme

4.6 Special Focus Area

The waterfront promenade at the southwest of CSWWFM Ph. 2, Hing Wah Street West, and Tonkin Street West are defined as special focus areas and are studied in detail below.

1. Waterfront Promenade
2. Hing Wah Street West
3. Tonkin Street West

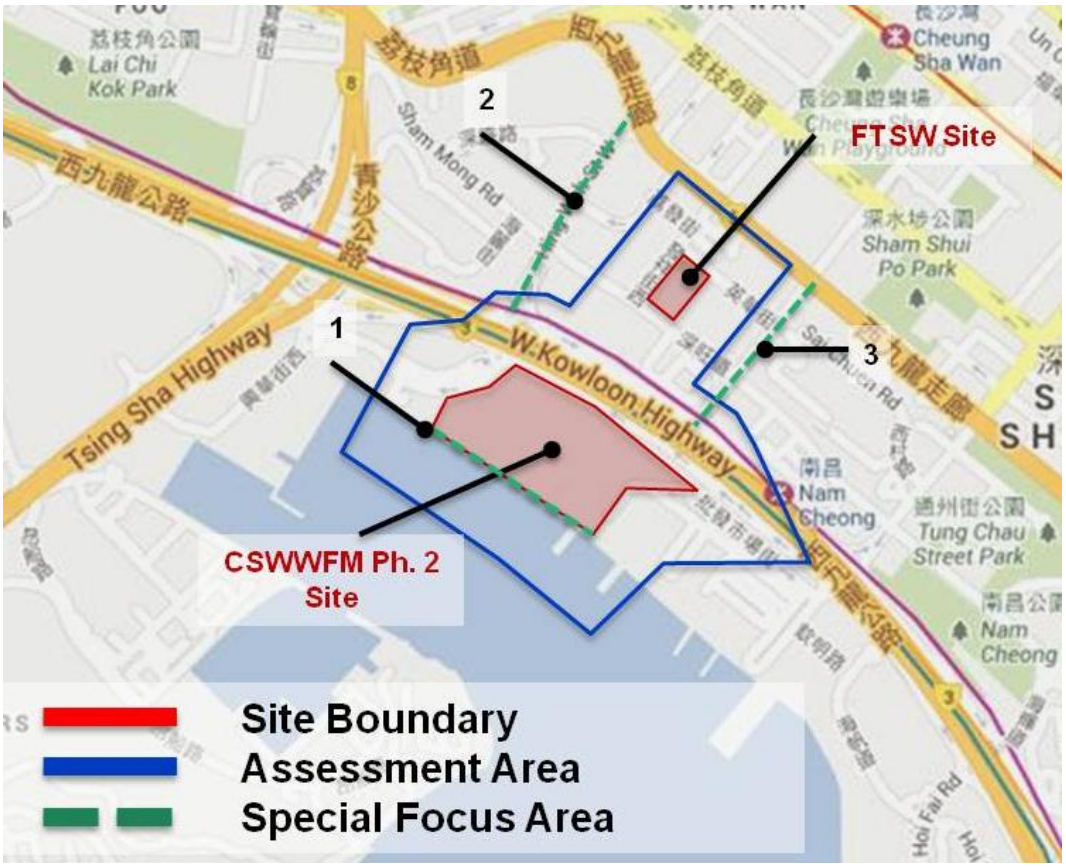


Figure 44 Special Focus Areas for the Study (Image Source: Google Earth)

4.6.1 Annual Wind Condition

Table 11 Average VR Results for Special Focus Areas of the Development Scheme under annual wind condition

Special Focus Areas		Test Points	Baseline Scheme	Indicative Scheme
1	Waterfront Promenade	S1-S9	0.09	0.07
2	Hing Wah Street West	S10-S17	0.25	0.25
3	Tonkin Street West	S18-S25	0.17	0.17

The Waterfront Promenade (S1-S9) is downwind of CSWWFM Ph. 2 Site under annual wind condition. The wind performance at Waterfront Promenade is slightly better in the Baseline Scheme. The building towers in Site 4 and 4a in the Indicative Scheme induce wind shadows to the Waterfront Promenade areas and divert a portion of winds toward the sea. In this connection, a relatively better ventilation performance is found at the Waterfront Promenade under the Baseline Scheme.

The results show that the average VR for both Baseline Scheme and Indicative Scheme is the same. Hing Wa Street West (S10-S17) is downwind of CSWWFM Ph. 2 Site and FTSW Site, albeit with some distance. The adopted wind enhancement features, such as building separations and wind corridors minimize the ventilation impact of the proposed developments on the Hing Wa Street.

Tonkin Street West (S18-S25) is upwind of both CSWWFM Ph. 2 Site and FTSW Site under annual wind condition. It can be expected that the developments will have minimal impact to Tonkin Street West. The results show the same VR under both Baseline Scheme and Indicative Scheme.

4.6.2 Summer Wind Condition

Table 12 Average VR Results for Special Focus Areas of the Development Scheme under summer wind condition

Special Focus Areas		Test Points	Baseline Scheme	Indicative Scheme
1	Waterfront Promenade	S1-S9	0.16	0.15
2	Hing Wah Street West	S10-S17	0.26	0.23
3	Tonkin Street West	S18-S25	0.28	0.24

Under the Baseline Scheme, the average VR at Waterfront Promenade (S1-S9) is slightly higher (i.e. 0.01) than the Indicative Scheme. As the easterly wind (11.5%) is also one of the major components of the summer condition, the building towers in Site 4 and 4a in the Indicative Scheme would induce wind shadows to the Waterfront Promenade areas. Thus, a relatively better ventilation performance is found at the Waterfront Promenade under the Baseline Scheme.

Hing Wah Street West (S10-S17) and Tonkin Street West (S18-S25) is at the downwind region of CSWWFM Ph. 2 Site under summer wind condition. The Baseline Scheme allows wind to skim over the top of the building and penetrate to the downwind area with less obstruction resulting in a better wind performance than the Indicative Scheme. Even so, the average VR values under the Indicative Scheme for both Hing Wah Street West and Tonkin Street West is higher than the LVR of the site (LVR = 0.15), which implies that both Hing Wah Street West and Tonkin Street West fulfil their function as wind corridors under the Indicative Scheme.

5 Wind Enhancement Features

Some wind enhancement features adopted in the Indicative Scheme of CSWWFM Ph. 2 Site and FTSW Site are discussed in this section, namely,

- Three major wind corridors and local air path in CSWWFM Ph. 2 Site
- 15m wide building gap in FTSW Site
- Ground floor empty bays and urban window in FTSW Site

5.1 Wind Corridors and Local Air Path

The 45m wide wind corridor at the northwest, the 22m wide wind corridor through the centre, and the 30m wide wind corridor at the southeast serve as the three wind corridors of CSWWFM Ph. 2 Site. These wind corridors are in alignment with the NE-SW direction. The northwest wind corridor is connected to the existing wind corridor of Hing Wah Street West and the southeast wind corridor is connected to the existing wind corridor of Tonkin Street West. As shown in Section 4.6.2, the VR values along Hing Wah Street West and Tonkin Street West are relatively higher than the value of the LVR under summer condition, thus the results imply that both the 45m and 30m wide wind corridors fulfil their function as wind corridors under the Indicative Scheme.

The width of the central wind corridor is enlarged at either end due to the existing drainage reserve which further enhances the wind penetration through the development and into the downwind region. Similarly, the average VR value along Lin Cheung Road is relatively higher than the assessment area's LVR value under summer condition, thus implying that the 22m wide wind corridor effectively fulfils its function as a wind corridor under the Indicative Scheme.

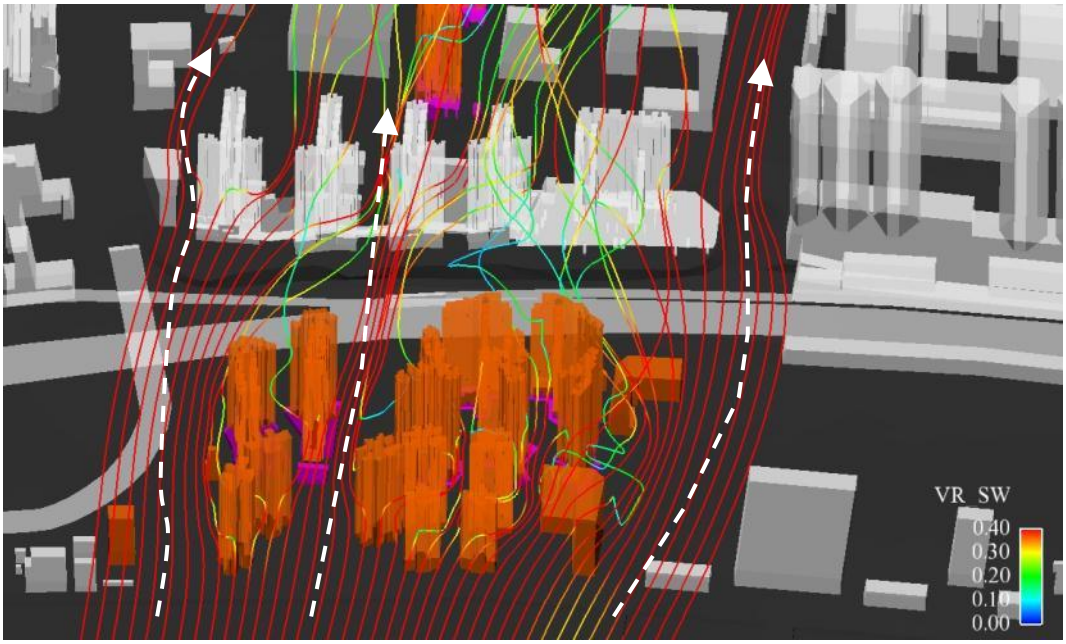


Figure 45 Wind corridors at CSWWFM Ph. 2 Site under southwest wind

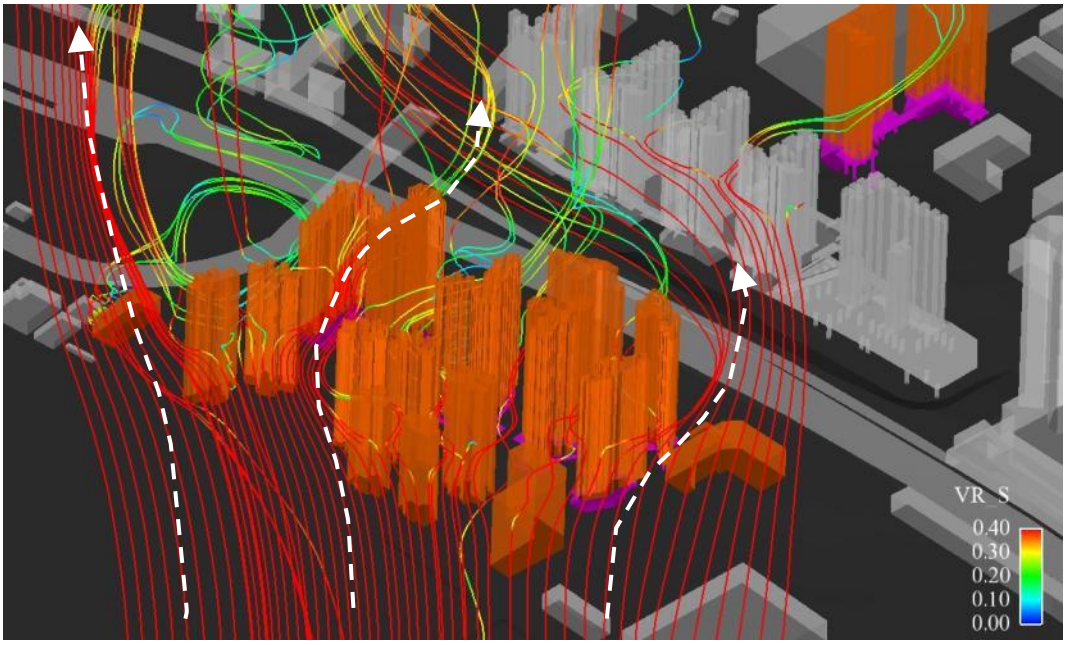


Figure 46 Wind corridors at CSWWFM Ph. 2 Site under south wind

Under southeast wind, the local air path, namely Road A in CSWWFM Ph. 2 Site, allows wind penetration to the downwind area. This feature further enhances the wind performance within the site.

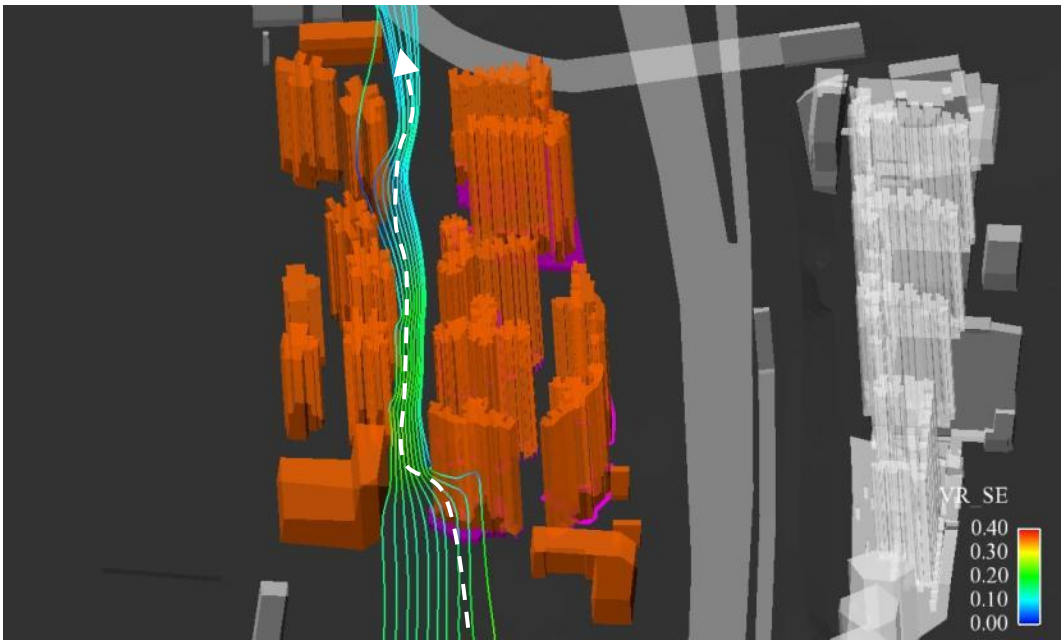


Figure 47 Local air path at CSWWFM Ph. 2 Site under southeast wind

5.2 Large Building Gap Design

A 15m wide building gap is incorporated between the two tower blocks in FTSW Site to allow east quarterly wind to penetrate to Fat Tseung Street West. This feature helps to minimize the impacts of the proposed development on the ventilation performance of the surroundings.

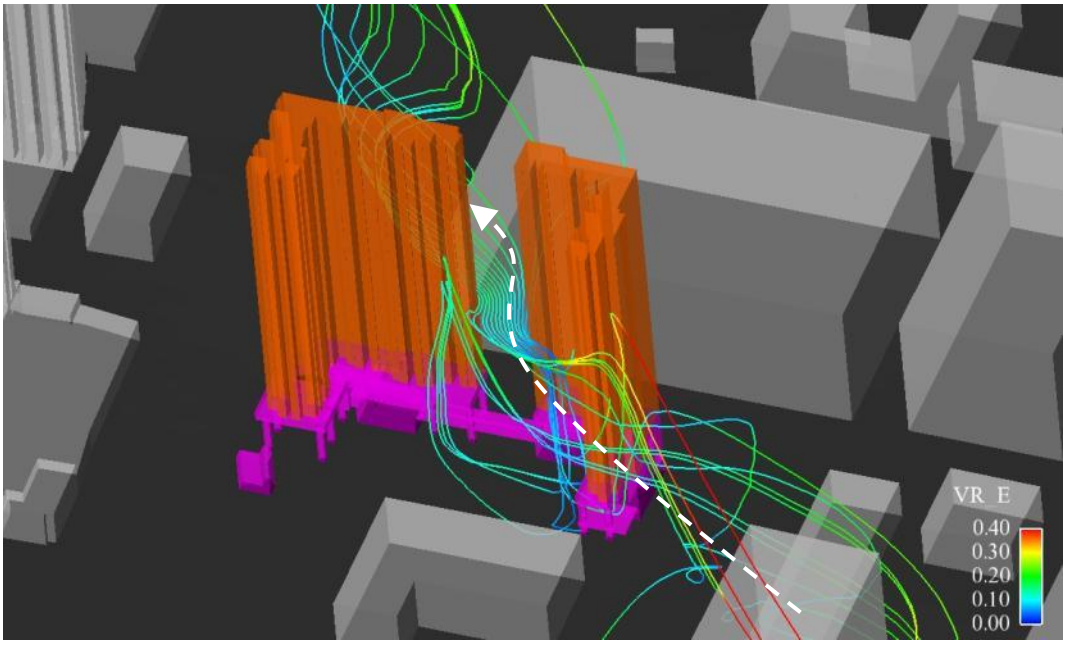


Figure 48 Performance of building gap design at FTSW Site under east wind

5.3 Ground Floor Empty Bays and Urban Window

Apart from the 15m building gap between the two blocks and set back of 10m from the common boundary with adjacent school site, the empty bays at ground level and an urban window at podium are incorporated at FTSW Site. The ground floor empty bays facing Sham Mong Road, Fat Tseung Street West, and Ying Wa Street are approximately 13.8m(H) by 18m(W), 16.8m(H) by 12m(W), and 16.4m(H) by 9m(W) respectively, while the urban window facing Ying Wa Street is approximately 7.6m (H) by 15m (W) at +9.80mPD. These design features allow wind penetration to Fat Tseung Street West and Sham Mong Road. They help to reduce the ventilation impacts of the proposed development.

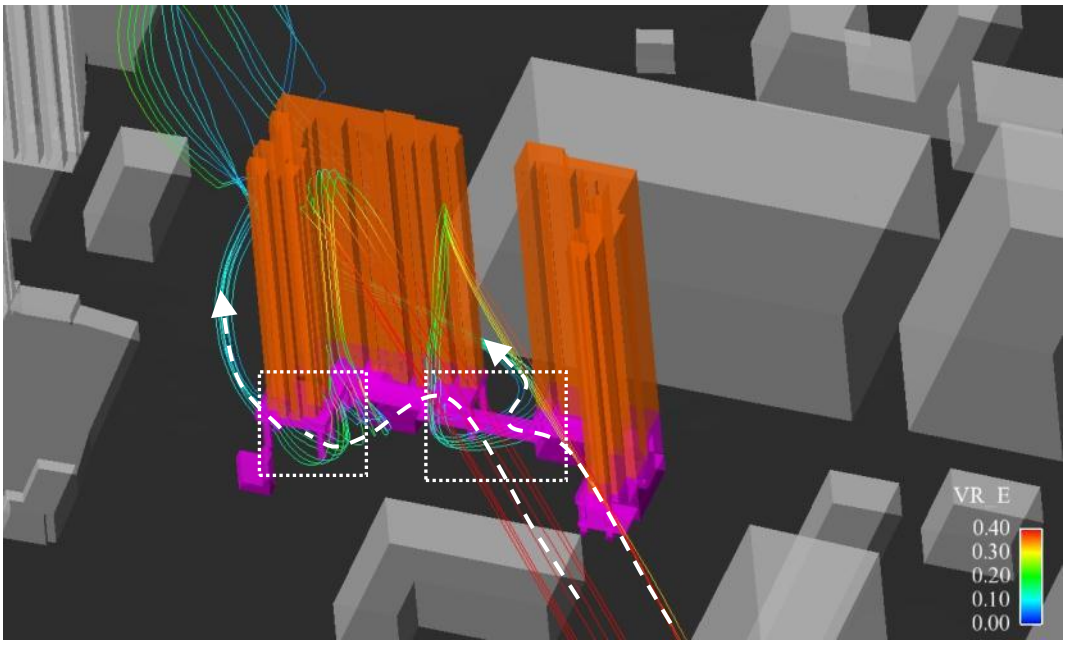


Figure 49 Performance of empty bay design at FTSW Site under east wind

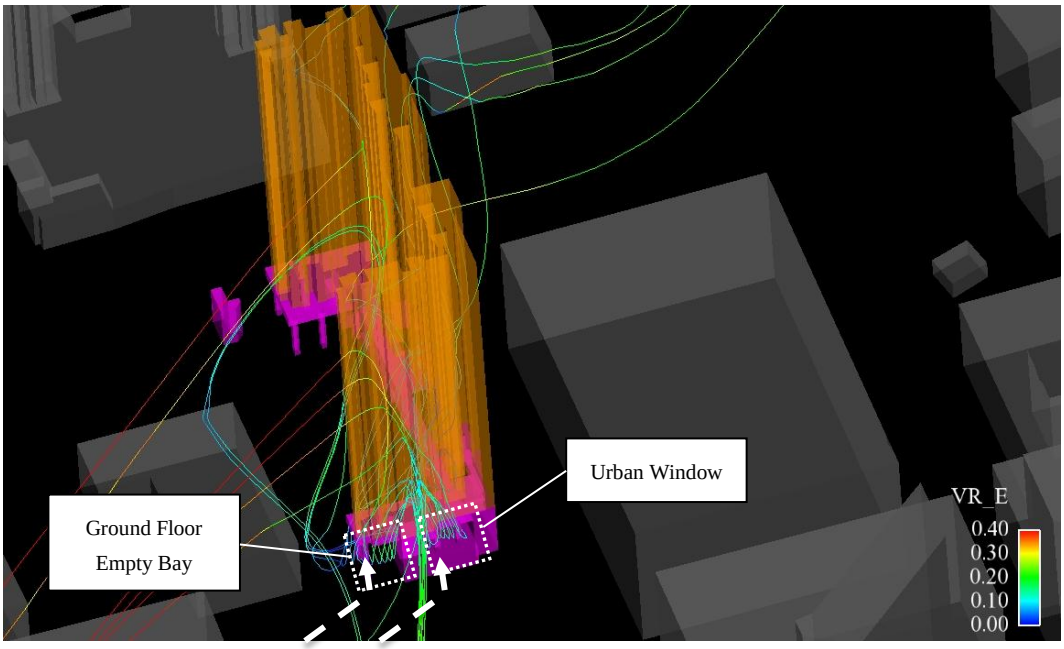


Figure 50 Performance of ground floor empty bay and urban window design at FTSW Site under east wind (Perspective View)

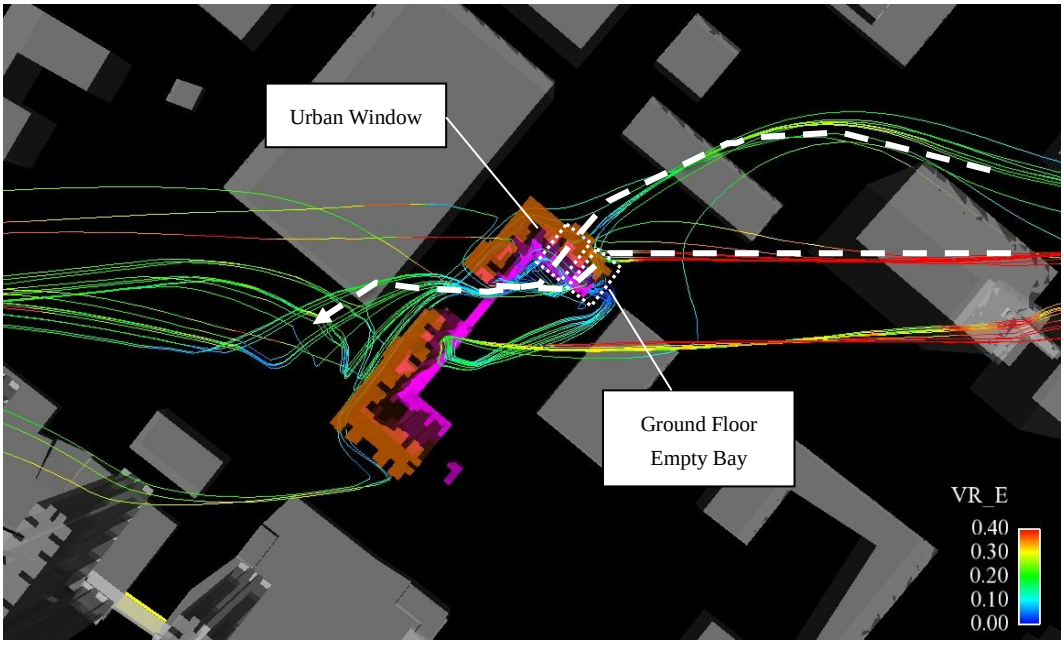


Figure 51 Performance of ground floor empty bay and urban window design at FTSW Site under east wind (Top View)

6 Recommendations – Additional Wind Enhancement Features

CSWWFM Ph. 2 Site is located at the waterfront area and situated at the upwind direction of some major developments under the summer prevailing wind condition, including NWKR Site 6 and FTSW Site. To further enhance the wind performance at surrounding areas, additional wind enhancement features for the CSWWFM Ph. 2 Site, including enlargement of empty bays at ground level, additional building setback, and urban windows at low levels of high-rise buildings can be considered during detailed design stage of the developments.

As aforementioned in Section 4.4.1, the building towers in Site 4 and 4a would induce wind shadows to the Waterfront Promenade areas, and thus affecting the ventilation performance of that region. Therefore, it is recommended to consider some wind enhancement features during design of Site 4 and 4a developments in the future to enhance the ventilation performance in the Waterfront Promenade areas.

7 Expert Review on the Further Enhanced Scheme (NWKR Site 6)

NWKR Site 6 is situated along Sham Mong Road, sandwiched between the CSWWFM Ph. 2 Site and FTSW Site. This section discusses on the anticipated impact on air ventilation performance under the scenario of changing one of the residential towers to a GIC building in NWKR Site 6 (Further Enhanced Scheme). The original scheme, which was used in the Initial Study, consists of five residential blocks and a social welfare block of 7 storeys at the western end of the site, as shown in Figure 52, which incorporates the permissible building density under the current zoning. There are several wind enhancement features adopted to enhance the ventilation performance on the surroundings, which include:

- Building separation
- Preservation of a 22m wide non-buildable area across the site
- Permeable podium design

In the Further Enhanced Scheme (Figure 53), the wind enhancement features adopted in the original scheme are maintained. In order to further enhance the ventilation performance, the high-rise residential building at the western end of the site is replaced with a medium-rise GIC building (about 42m high) and social welfare block (about 38m high) is relocated to the southern end of the site. The incoming wind would then be able to skim over the GIC building and social welfare block and there will be no significant wind blockage at medium to high levels. It is expected that the design changes of the Further Enhanced Scheme will pose better wind flow to Fat Tseung Street West and Yuen Fat Godown Carpark. The design changes will also further enhance the wind performance at surrounding areas and downwind developments under summer wind condition including Banyan Garden, Liberte, The Pacifica, and Aqua Marine.

Figure 52 Original NWKR Site 6 Layout Plan

Figure 53 Further Enhanced Scheme of the NWKR Site 6

8 Conclusion

Two proposed developments in Cheung Sha Wan are considered in this Study, namely CSWWFM Ph. 2 Site, which is near to the waterfront and bounded by the West Kowloon Highway, Hing Wah Street West and the existing CSWWFM Ph.1, and the FTSW Site, which is situated at the junction of Sham Mong Road and Fat Tseung Street West. To assess the ventilation performance of the areas within the proposed developments and their immediate surroundings, an Air Ventilation Assessment (AVA) – Initial Study was conducted for the two proposed developments.

A series of CFD simulations using realizable k – ε turbulence model are performed based on the AVA methodology for the Initial Study as stipulated in the Technical Circular and Technical Guide. Eight wind directions are considered in annual wind condition, which cover 76.6% of wind availability in a year. Nine wind directions are considered under summer wind condition, which cover 77.1% of wind availability in summer. The ventilation performance for the proposed developments at the site boundaries and within the assessment area was assessed.

According to the Technical Circular, the Velocity Ratio at each test point is assessed in terms of SVR and LVR, respectively. A total of 39 perimeter test points, 53 overall test points, and 25 special test points are selected to assess the ventilation performance of the proposed developments.

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

- In annual wind condition, the SVR is 0.11 for Baseline Scheme and 0.12 for Indicative Scheme. The LVR is 0.11 for both Baseline and Indicative Scheme;
- In summer wind condition, the SVR is 0.15 for both Baseline and Indicative Schemes. The LVR is 0.15 for both Baseline and Indicative Scheme;
- In general, the overall ventilation performance is similar under both Baseline and Indicative Scheme;
- Under annual wind condition, the average VR value at Ying Wa Street (O37-O39, P32-P34), Yuen Fat Godown Carpark (O47-O50), and West Kowloon Law Court Building (O51-O53) is slightly higher (i.e. 0.01) under Indicative Scheme;
- Under summer wind condition, the average VR value at Lin Cheung Road (O5-O13) is slightly higher (i.e. 0.02) under Indicative Scheme;
- Under annual wind condition, the Indicative Scheme slightly affects the wind performance at the downwind special focus area, e.g. the proposed Waterfront Promenade (S1-S9).
- Under summer wind condition, the Indicative Scheme slightly affects the wind performance at the downwind special focus areas of Hing Wah Street West (S10-S17) and Tonkin Street West (S18-S25).
- Under summer wind condition, the Indicative Scheme of CSWWFM Ph. 2 also shows a slightly reduce in the average VR at the Waterfront Promenade (S1-S9). However, the differences in the average VR values observed are insignificant and thus would not induce significantly adverse air ventilation impacts as compared with the Baseline Scheme.

The improvements in the Indicative Scheme can be attributed to the incorporation of the wind enhancement features, including the wind corridors and local air path at CSWWFM Ph. 2 Site, building gap, empty bays, and urban window at FTSW Site.

The major findings of the wind enhancement features could be summarized below:

- The three wind corridors of CSWWFM Ph. 2 Site enhances the permeability of the site and enhances wind penetration to the downwind side of the development;
- Local air path, namely Road A of CSWWFM Ph. 2 Site, allows wind penetration to the downwind region under southeast wind. The wind performance within the site is also improved;
- The 15m building gap at FTSW Site reduces the wake effect of the proposed development;
- Empty bay and urban window at FTSW Site allows wind penetration to the downwind side of the building block, enhancing the local wind environment.

The anticipated impact for the Further Enhanced Scheme at NWKR Site 6 as compared with the Original Scheme in terms of the ventilation performance:

- The Further Enhanced Scheme is expected to pose better wind flow to Fat Tseung Street West and further enhance the wind performance at surrounding areas

Appendix A

Expert Review on the Further Enhanced Scheme (NWKR Site 6)

A1 Ventilation Performance under the Further Enhanced Scheme (NWKR Site 6)

NWKR Site 6 is situated along Sham Mong Road, sandwiched between the CSWWFM Ph. 2 Site and FTSW Site. This section discusses on the impact on air ventilation performance under the scenario of changing one of the high-rise residential towers to a GIC building and relocating the social welfare block in NWKR Site 6 (Further Enhanced Scheme), as shown in Section 7 - Figure 53. The Original Scheme, which was used in the Initial Study, consists of five residential blocks and a social welfare block of 7 storeys at the western end of the site, as shown in Section 7, which indicates the permissible building density under the current zoning.

Ventilation Performance – Annual Condition

a. Original Scheme **b. Further Enhanced Scheme**

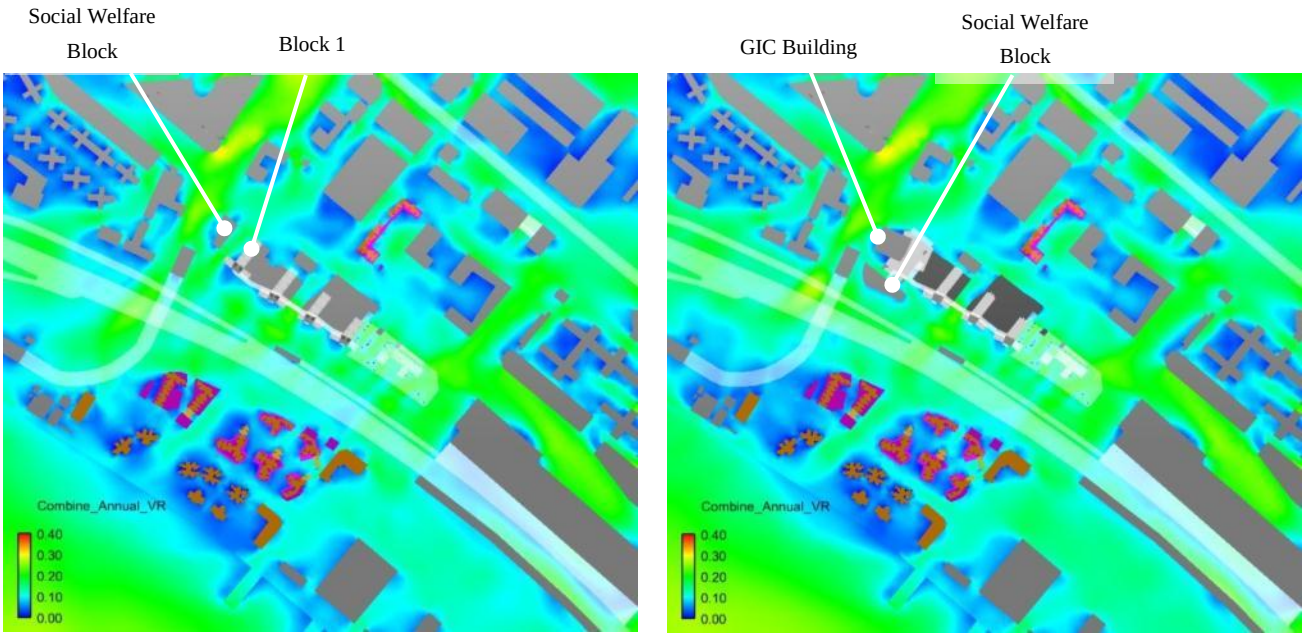


Figure A 1 Contour Plot of the average VR at 2m Pedestrian Level for Original Scheme and Further Enhanced Scheme – Annual Condition

Table A 1 Annual SVR and LVR of the Assessment Area for the Studies Schemes

Annual	Original Scheme of NWKR Site 6	Further Enhanced Scheme of NWKR Site 6
SVR	0.12	0.12
LVR	0.11	0.12

The annual condition under the Further Enhanced Scheme is compared with the Original Scheme. The following observations were made:

- The SVR for both Original Scheme and Further Enhanced Scheme are both 0.12, which indicates the ventilation performance at the immediately surrounding areas of CSWWFM Ph. 2 Site and FTSW Site is quite similar;
- The LVR for the Further Enhanced Scheme is slightly better (i.e. 0.01) than the Original Scheme;
- The Further Enhanced Scheme shows a slightly better ventilation performance at the local surrounding region as compared to the Original Scheme.

Ventilation Performance – Summer Condition

a. Original Scheme **b. Further Enhanced Scheme**

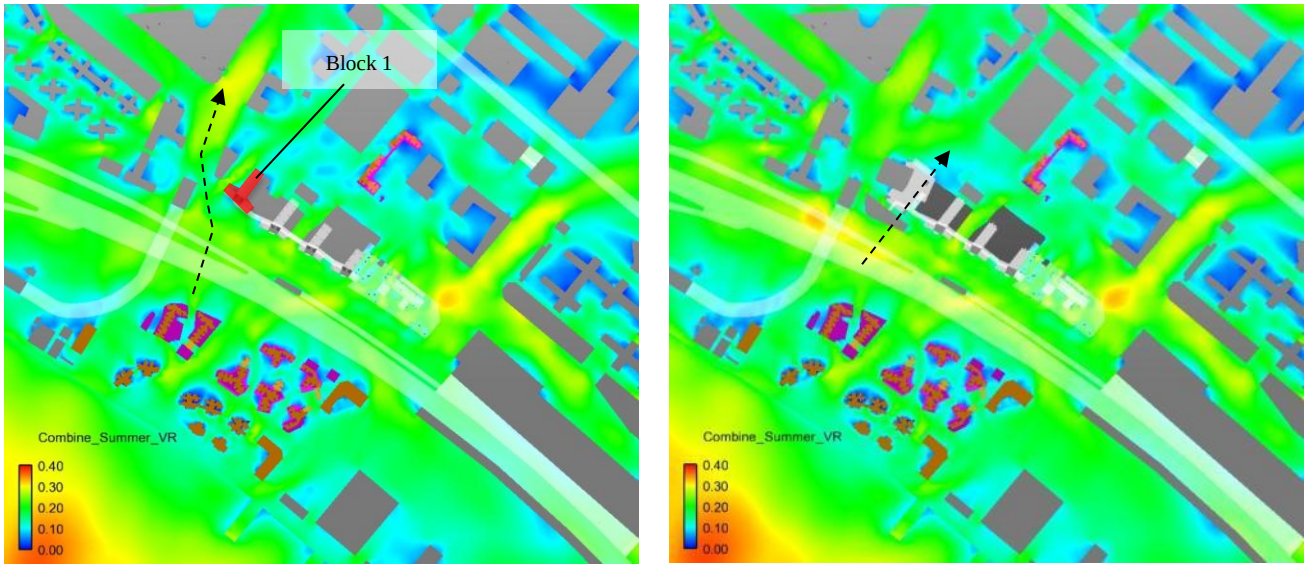


Figure A 2 Contour Plot of the VR at 2m Pedestrian Level for Original Scheme and Further Enhanced Scheme – Summer Condition

Table A 2 Summer SVR and LVR of the Assessment Area for the Studies Schemes

Summer	Original Scheme of NWKR Site 6	Further Enhanced Scheme of NWKR Site 6
SVR	0.15	0.16
LVR	0.15	0.16

The summer condition under the Further Enhanced Scheme was compared with the Original Scheme. The following observations were made:

- The SVR and LVR for the Further Enhanced Scheme is slightly better (i.e. 0.01) than the Original Scheme;
- In general, the ventilation performance of the Further Enhanced Scheme is slightly better as compared with the Original Scheme.

Focus Areas

Table A 3 VR Results for Focused Areas

Focus Areas		Test Points	Annual		Summer	
			Original Scheme of NWKR Site 6	Further Enhanced Scheme of NWKR Site 6	Original Scheme of NWKR Site 6	Further Enhanced Scheme of NWKR Site 6
1	Fat Tseung Street West	O35-O36, P28-P32	0.11	0.11	0.11	0.14
2	Sham Mong Road	O29-O34, P28, P38, P39	0.10	0.12	0.15	0.17
3	Ying Wa Street	O37-O39, P32-P34	0.11	0.11	0.12	0.14
4	Lin Cheung Road	O5-O13	0.14	0.16	0.22	0.23
5	St. Margaret's Co-educational English Secondary and Primary School, Ying Wa College and Ying Wa Primary School	O40-O46	0.07	0.07	0.11	0.11
6	CSWWFM Ph. 1	O14-O28	0.12	0.14	0.15	0.16
7	Yuen Fat Godown Carpark	O47-O50	0.11	0.12	0.13	0.16
8	West Kowloon Law Court Building	O51-O53	0.07	0.07	0.12	0.12
9	Waterfront Promenade	S1-S9	0.07	0.07	0.15	0.16
10	Hing Wah Street West	S10-S17	0.25	0.24	0.23	0.21
11	Tonkin Street West	S18-S25	0.17	0.16	0.24	0.24

Conclusion

The Further Enhanced Scheme of NWKR Site 6 was studied and compared to the Original Scheme. The major design amendments including replacement of a residential block by a GIC building and relocation of the social welfare block. The design changes at the Further Enhanced Scheme reduces the building height at northwest region, and allows the incoming wind to skim over the GIC building and social welfare block freely with less wind blockage, thus enhancing the wind environment at the immediate surroundings. Fat Tseung Street West (O35-O36, P28-P32) and Yuen Fat Godown Carpark (O47-O50) shows higher average VR at the Further Enhanced Scheme as compared to the Original Scheme under the summer prevailing wind condition.

Also, slightly worsen average VR is obtained at the Hing Wah Street for the Further Enhanced Scheme. It is mainly due to the lower building height of the GIC block and the social welfare block under the leeward regions more effectively (Black Arrow in Figure A 2b.), while less wind are diverted to the Hing Wah Street West (S10-S17). On the other hand, the high-rise building tower (Block 1 of the NWRK Site 6) at the southern end (Figure A 2a Highlighted in Red), helps to diverts the incoming winds to the Hing Wah Street West (Black Arrow in Figure A 2a). Therefore, higher VR is obtained at the Hing Wah Street West under the Original Scheme as compared to the Further Enhanced Scheme.

Appendix B

Velocity Ratio Table of the Test Points

B1 Baseline Scheme VR Tables

B1.1 Annual Condition

Table A 13 VR value for the Perimeter Points of Baseline Scheme under Annual Condition

	NNE	NE	ENE	E	ESE	SE	SSE	S	Overall
	7.5%	10.1%	17.4%	16.6%	8.4%	5.9%	5.9%	4.9%	76.6%
P1	0.16	0.05	0.04	0.05	0.11	0.21	0.19	0.16	**0.10**
P2	0.04	0.02	0.02	0.02	0.08	0.20	0.17	0.18	**0.06**
P3	0.10	0.05	0.12	0.03	0.01	0.11	0.13	0.21	**0.08**
P4	0.05	0.09	0.13	0.02	0.15	0.03	0.04	0.09	**0.08**
P5	0.08	0.12	0.18	0.05	0.16	0.13	0.18	0.30	**0.13**
P6	0.12	0.04	0.13	0.04	0.14	0.08	0.08	0.17	**0.09**
P7	0.09	0.09	0.10	0.02	0.09	0.03	0.05	0.07	**0.07**
P8	0.08	0.08	0.12	0.04	0.07	0.16	0.19	0.19	**0.10**
P9	0.19	0.05	0.12	0.07	0.15	0.16	0.25	0.17	**0.13**
P10	0.13	0.19	0.11	0.08	0.11	0.15	0.25	0.23	**0.14**
P11	0.34	0.11	0.11	0.10	0.09	0.14	0.23	0.24	**0.15**
P12	0.22	0.15	0.11	0.09	0.07	0.14	0.23	0.27	**0.14**
P13	0.19	0.03	0.01	0.12	0.10	0.13	0.23	0.27	**0.11**
P14	0.07	0.12	0.11	0.10	0.11	0.13	0.22	0.27	**0.12**
P15	0.11	0.05	0.10	0.10	0.13	0.14	0.20	0.27	**0.12**
P16	0.13	0.09	0.03	0.08	0.16	0.14	0.16	0.29	**0.11**
P17	0.12	0.10	0.06	0.06	0.16	0.14	0.15	0.34	**0.11**
P18	0.09	0.07	0.12	0.12	0.24	0.21	0.14	0.42	**0.15**
P19	0.24	0.18	0.15	0.12	0.25	0.19	0.13	0.45	**0.19**
P20	0.05	0.03	0.14	0.08	0.28	0.20	0.15	0.45	**0.14**
P21	0.08	0.08	0.11	0.11	0.29	0.20	0.17	0.40	**0.15**
P22	0.03	0.05	0.09	0.15	0.31	0.20	0.20	0.22	**0.14**
P23	0.22	0.11	0.06	0.14	0.31	0.20	0.21	0.18	**0.16**
P24	0.20	0.12	0.09	0.11	0.31	0.14	0.21	0.19	**0.15**
P25	0.09	0.11	0.01	0.04	0.15	0.05	0.14	0.12	**0.07**
P26	0.09	0.09	0.03	0.04	0.14	0.11	0.16	0.09	**0.08**
P27	0.11	0.05	0.03	0.04	0.13	0.05	0.10	0.14	**0.07**
P28	0.14	0.13	0.16	0.10	0.12	0.17	0.09	0.31	**0.14**
P29	0.11	0.19	0.19	0.14	0.16	0.16	0.11	0.24	**0.16**
P30	0.10	0.18	0.18	0.12	0.16	0.18	0.14	0.28	**0.16**
P31	0.09	0.10	0.12	0.08	0.14	0.15	0.15	0.12	**0.11**
P32	0.09	0.06	0.07	0.04	0.11	0.13	0.13	0.05	**0.08**
P33	0.06	0.06	0.06	0.09	0.05	0.03	0.02	0.12	**0.06**
P34	0.04	0.10	0.07	0.15	0.06	0.05	0.03	0.05	**0.08**
P35	0.04	0.05	0.02	0.04	0.05	0.02	0.09	0.21	**0.05**
P36	0.11	0.15	0.05	0.03	0.03	0.05	0.19	0.22	**0.09**

P37	0.04	0.09	0.04	0.01	0.05	0.11	0.14	0.27	**0.07**
P38	0.05	0.02	0.05	0.04	0.26	0.23	0.15	0.19	**0.10**
P39	0.12	0.05	0.06	0.04	0.23	0.21	0.09	0.12	**0.10**

Table A 14 VR value for the Overall Points of Baseline Scheme under Annual Condition

	NNE	NE	ENE	E	ESE	SE	SSE	S	Overall
	7.5%	**10.1%**	**17.4%**	**16.6%**	**8.4%**	**5.9%**	**5.9%**	**4.9%**	**76.6%**
O1	0.10	0.04	0.09	0.10	0.23	0.17	0.13	0.18	**0.12**
O2	0.12	0.05	0.05	0.08	0.20	0.20	0.22	0.22	**0.11**
O3	0.10	0.01	0.06	0.11	0.21	0.15	0.13	0.01	**0.09**
O4	0.09	0.04	0.01	0.13	0.17	0.19	0.23	0.21	**0.11**
O5	0.05	0.05	0.05	0.04	0.07	0.11	0.27	0.15	**0.08**
O6	0.03	0.07	0.07	0.06	0.03	0.08	0.34	0.28	**0.09**
O7	0.17	0.11	0.05	0.05	0.11	0.08	0.33	0.40	**0.12**
O8	0.28	0.08	0.06	0.12	0.13	0.07	0.31	0.34	**0.14**
O9	0.32	0.21	0.18	0.11	0.07	0.08	0.27	0.32	**0.18**
O10	0.08	0.20	0.16	0.04	0.03	0.03	0.24	0.29	**0.12**
O11	0.21	0.13	0.16	0.16	0.17	0.08	0.19	0.30	**0.17**
O12	0.11	0.11	0.25	0.23	0.24	0.14	0.09	0.14	**0.18**
O13	0.30	0.26	0.20	0.22	0.08	0.14	0.06	0.26	**0.20**
O14	0.14	0.02	0.01	0.02	0.13	0.01	0.02	0.07	**0.04**
O15	0.22	0.15	0.10	0.07	0.27	0.05	0.17	0.13	**0.13**
O16	0.08	0.03	0.12	0.14	0.32	0.19	0.20	0.16	**0.15**
O17	0.04	0.07	0.13	0.16	0.33	0.20	0.18	0.17	**0.15**
O18	0.07	0.09	0.12	0.13	0.32	0.19	0.18	0.31	**0.16**
O19	0.06	0.06	0.07	0.10	0.31	0.18	0.13	0.36	**0.13**
O20	0.08	0.10	0.09	0.15	0.31	0.18	0.15	0.15	**0.14**
O21	0.05	0.09	0.08	0.15	0.33	0.18	0.18	0.16	**0.14**
O22	0.05	0.07	0.09	0.13	0.32	0.18	0.16	0.37	**0.15**
O23	0.06	0.03	0.12	0.09	0.28	0.17	0.08	0.30	**0.12**
O24	0.03	0.06	0.12	0.14	0.30	0.02	0.13	0.11	**0.12**
O25	0.04	0.10	0.09	0.17	0.31	0.20	0.15	0.04	**0.14**
O26	0.04	0.08	0.09	0.14	0.28	0.18	0.14	0.34	**0.14**
O27	0.04	0.04	0.08	0.09	0.22	0.18	0.11	0.40	**0.12**
O28	0.06	0.06	0.11	0.05	0.16	0.18	0.06	0.23	**0.10**
O29	0.42	0.18	0.11	0.09	0.07	0.09	0.02	0.17	**0.14**
O30	0.05	0.08	0.07	0.05	0.03	0.03	0.05	0.07	**0.06**
O31	0.14	0.11	0.04	0.04	0.09	0.15	0.12	0.14	**0.09**
O32	0.06	0.01	0.03	0.03	0.27	0.22	0.14	0.02	**0.08**
O33	0.05	0.03	0.03	0.05	0.27	0.22	0.02	0.18	**0.09**
O34	0.07	0.10	0.08	0.08	0.29	0.23	0.06	0.37	**0.13**
O35	0.10	0.01	0.04	0.06	0.06	0.13	0.10	0.04	**0.06**
O36	0.11	0.05	0.13	0.23	0.13	0.14	0.18	0.02	**0.14**
O37	0.10	0.04	0.07	0.19	0.16	0.12	0.07	0.20	**0.12**
O38	0.03	0.01	0.10	0.22	0.15	0.16	0.04	0.28	**0.12**

O39	0.07	0.10	0.20	0.22	0.15	0.16	0.14	0.15	**0.16**
O40	0.03	0.04	0.01	0.01	0.11	0.14	0.14	0.24	**0.06**
O41	0.03	0.07	0.05	0.09	0.06	0.01	0.05	0.15	**0.06**
O42	0.07	0.05	0.06	0.08	0.07	0.04	0.12	0.12	**0.07**
O43	0.06	0.01	0.03	0.07	0.06	0.09	0.10	0.36	**0.07**
O44	0.02	0.05	0.09	0.02	0.08	0.08	0.01	0.12	**0.06**
O45	0.05	0.06	0.11	0.10	0.07	0.09	0.01	0.13	**0.09**
O46	0.03	0.05	0.05	0.09	0.04	0.05	0.03	0.21	**0.06**
O47	0.17	0.08	0.06	0.05	0.04	0.05	0.04	0.13	**0.07**
O48	0.49	0.24	0.13	0.10	0.08	0.13	0.05	0.14	**0.16**
O49	0.04	0.08	0.09	0.07	0.08	0.10	0.06	0.03	**0.07**
O50	0.15	0.05	0.07	0.07	0.06	0.02	0.01	0.21	**0.07**
O51	0.02	0.02	0.08	0.10	0.05	0.04	0.07	0.24	**0.08**
O52	0.03	0.05	0.02	0.03	0.03	0.07	0.08	0.28	**0.05**
O53	0.03	0.05	0.05	0.06	0.06	0.08	0.04	0.23	**0.06**

Table A 15 VR value for the Special Points of Baseline Scheme under Annual Condition

	NNE	**NE**	**ENE**	**E**	**ESE**	**SE**	**SSE**	**S**	**Overall**
	7.5%	**10.1%**	**17.4%**	**16.6%**	**8.4%**	**5.9%**	**5.9%**	**4.9%**	**76.6%**
S1	0.10	0.06	0.04	0.03	0.09	0.23	0.21	0.32	**0.10**
S2	0.02	0.02	0.07	0.05	0.11	0.20	0.14	0.30	**0.09**
S3	0.04	0.05	0.03	0.12	0.06	0.23	0.13	0.39	**0.10**
S4	0.01	0.01	0.02	0.12	0.09	0.23	0.12	0.35	**0.09**
S5	0.01	0.01	0.06	0.11	0.12	0.22	0.10	0.30	**0.10**
S6	0.03	0.02	0.07	0.10	0.10	0.22	0.08	0.22	**0.09**
S7	0.03	0.02	0.07	0.09	0.08	0.21	0.09	0.18	**0.08**
S8	0.04	0.05	0.07	0.10	0.11	0.23	0.10	0.23	**0.10**
S9	0.06	0.05	0.06	0.06	0.06	0.20	0.08	0.23	**0.08**
S10	0.10	0.16	0.24	0.25	0.20	0.20	0.04	0.17	**0.19**
S11	0.49	0.31	0.16	0.22	0.20	0.25	0.07	0.28	**0.24**
S12	0.06	0.03	0.24	0.24	0.22	0.38	0.14	0.36	**0.20**
S13	0.57	0.39	0.23	0.24	0.17	0.34	0.10	0.43	**0.29**
S14	0.56	0.32	0.16	0.24	0.09	0.28	0.05	0.42	**0.25**
S15	0.57	0.33	0.25	0.27	0.13	0.16	0.06	0.41	**0.27**
S16	0.56	0.43	0.32	0.29	0.21	0.11	0.10	0.38	**0.31**
S17	0.58	0.46	0.34	0.18	0.07	0.12	0.12	0.44	**0.29**
S18	0.27	0.26	0.16	0.22	0.07	0.09	0.08	0.47	**0.19**
S19	0.19	0.17	0.26	0.19	0.36	0.27	0.07	0.36	**0.23**
S20	0.16	0.08	0.04	0.07	0.29	0.25	0.12	0.32	**0.13**
S21	0.22	0.13	0.19	0.25	0.12	0.19	0.09	0.31	**0.19**
S22	0.25	0.23	0.18	0.22	0.10	0.21	0.04	0.43	**0.20**
S23	0.19	0.14	0.21	0.20	0.16	0.19	0.18	0.05	**0.18**
S24	0.18	0.10	0.15	0.12	0.13	0.04	0.10	0.09	**0.12**
S25	0.13	0.05	0.10	0.10	0.10	0.17	0.19	0.19	**0.11**

B1.2 Summer Condition

Table A 16 VR value for the Perimeter Points of Baseline Scheme under Summer Condition

	E	ESE	SE	SSE	S	SSW	SW	WSW	W	Overall
	11.5%	**9.5%**	**9.3%**	**8.3%**	**7.9%**	**8.8%**	**9.9%**	**7.2%**	**4.7%**	**77.1%**
P1	0.05	0.11	0.21	0.19	0.16	0.10	0.12	0.12	0.16	**0.13**
P2	0.02	0.08	0.20	0.17	0.18	0.17	0.06	0.12	0.14	**0.12**
P3	0.03	0.01	0.11	0.13	0.21	0.13	0.11	0.09	0.07	**0.10**
P4	0.02	0.15	0.03	0.04	0.09	0.13	0.11	0.16	0.20	**0.09**
P5	0.05	0.16	0.13	0.18	0.30	0.05	0.05	0.16	0.24	**0.13**
P6	0.04	0.14	0.08	0.08	0.17	0.29	0.05	0.21	0.23	**0.13**
P7	0.02	0.09	0.03	0.05	0.07	0.35	0.11	0.21	0.22	**0.12**
P8	0.04	0.07	0.16	0.19	0.19	0.23	0.11	0.27	0.28	**0.16**
P9	0.07	0.15	0.16	0.25	0.17	0.19	0.14	0.31	0.26	**0.18**
P10	0.08	0.11	0.15	0.25	0.23	0.14	0.08	0.27	0.27	**0.16**
P11	0.10	0.09	0.14	0.23	0.24	0.08	0.05	0.22	0.24	**0.14**
P12	0.09	0.07	0.14	0.23	0.27	0.05	0.03	0.14	0.22	**0.13**
P13	0.12	0.10	0.13	0.23	0.27	0.10	0.20	0.28	0.18	**0.17**
P14	0.10	0.11	0.13	0.22	0.27	0.07	0.25	0.37	0.21	**0.18**
P15	0.10	0.13	0.14	0.20	0.27	0.09	0.22	0.36	0.24	**0.18**
P16	0.08	0.16	0.14	0.16	0.29	0.10	0.11	0.12	0.11	**0.14**
P17	0.06	0.16	0.14	0.15	0.34	0.11	0.06	0.08	0.08	**0.13**
P18	0.12	0.24	0.21	0.14	0.42	0.30	0.07	0.03	0.04	**0.18**
P19	0.12	0.25	0.19	0.13	0.45	0.32	0.21	0.11	0.05	**0.21**
P20	0.08	0.28	0.20	0.15	0.45	0.33	0.12	0.10	0.08	**0.20**
P21	0.11	0.29	0.20	0.17	0.40	0.28	0.13	0.12	0.12	**0.20**
P22	0.15	0.31	0.20	0.20	0.22	0.24	0.04	0.07	0.07	**0.17**
P23	0.14	0.31	0.20	0.21	0.18	0.24	0.12	0.04	0.11	**0.18**
P24	0.11	0.31	0.14	0.21	0.19	0.21	0.13	0.06	0.04	**0.16**
P25	0.04	0.15	0.05	0.14	0.12	0.10	0.04	0.08	0.01	**0.08**
P26	0.04	0.14	0.11	0.16	0.09	0.06	0.11	0.08	0.05	**0.09**
P27	0.04	0.13	0.05	0.10	0.14	0.13	0.15	0.13	0.15	**0.11**
P28	0.10	0.12	0.17	0.09	0.31	0.41	0.40	0.14	0.21	**0.22**
P29	0.13	0.15	0.15	0.11	0.23	0.32	0.25	0.39	0.31	**0.21**
P30	0.12	0.15	0.17	0.13	0.26	0.32	0.29	0.05	0.08	**0.18**
P31	0.08	0.13	0.14	0.14	0.11	0.10	0.17	0.14	0.14	**0.13**
P32	0.04	0.11	0.13	0.13	0.05	0.07	0.11	0.13	0.03	**0.09**
P33	0.09	0.05	0.03	0.02	0.12	0.14	0.07	0.08	0.05	**0.07**
P34	0.15	0.06	0.05	0.03	0.05	0.30	0.08	0.08	0.10	**0.10**
P35	0.04	0.05	0.02	0.09	0.21	0.02	0.09	0.01	0.01	**0.06**
P36	0.03	0.03	0.05	0.19	0.22	0.08	0.28	0.06	0.06	**0.11**
P37	0.01	0.05	0.11	0.14	0.27	0.30	0.36	0.22	0.17	**0.17**
P38	0.04	0.26	0.23	0.15	0.19	0.22	0.20	0.21	0.18	**0.18**
P39	0.04	0.23	0.21	0.09	0.12	0.11	0.10	0.20	0.18	**0.14**

Table A 17 VR value for the Overall Points of Baseline Scheme under Summer Condition

	E	ESE	SE	SSE	S	SSW	SW	WSW	W	Overall
	11.5%	9.5%	9.3%	8.3%	7.9%	8.8%	9.9%	7.2%	4.7%	77.1%
O1	0.10	0.23	0.17	0.13	0.18	0.13	0.24	0.42	0.21	**0.19**
O2	0.08	0.20	0.20	0.22	0.22	0.17	0.22	0.43	0.28	**0.21**
O3	0.11	0.21	0.15	0.13	0.01	0.15	0.17	0.32	0.18	**0.15**
O4	0.13	0.17	0.19	0.23	0.21	0.05	0.18	0.39	0.26	**0.19**
O5	0.04	0.07	0.11	0.27	0.15	0.19	0.27	0.34	0.27	**0.18**
O6	0.06	0.03	0.08	0.34	0.28	0.20	0.28	0.25	0.25	**0.18**
O7	0.05	0.11	0.08	0.33	0.40	0.36	0.21	0.33	0.28	**0.22**
O8	0.12	0.13	0.07	0.31	0.34	0.24	0.13	0.37	0.28	**0.21**
O9	0.11	0.07	0.08	0.27	0.32	0.25	0.12	0.37	0.32	**0.19**
O10	0.04	0.03	0.03	0.24	0.29	0.17	0.17	0.24	0.24	**0.15**
O11	0.16	0.17	0.08	0.19	0.30	0.22	0.29	0.43	0.26	**0.22**
O12	0.23	0.24	0.14	0.09	0.14	0.19	0.26	0.35	0.28	**0.21**
O13	0.22	0.08	0.14	0.06	0.26	0.22	0.32	0.23	0.18	**0.19**
O14	0.02	0.13	0.01	0.02	0.07	0.04	0.09	0.07	0.10	**0.06**
O15	0.07	0.27	0.05	0.17	0.13	0.17	0.19	0.13	0.13	**0.14**
O16	0.14	0.32	0.19	0.20	0.16	0.20	0.02	0.08	0.12	**0.16**
O17	0.16	0.33	0.20	0.18	0.17	0.18	0.10	0.11	0.09	**0.17**
O18	0.13	0.32	0.19	0.18	0.31	0.22	0.09	0.10	0.09	**0.18**
O19	0.10	0.31	0.18	0.13	0.36	0.21	0.16	0.11	0.14	**0.19**
O20	0.15	0.31	0.18	0.15	0.15	0.12	0.06	0.17	0.11	**0.16**
O21	0.15	0.33	0.18	0.18	0.16	0.18	0.04	0.20	0.13	**0.17**
O22	0.13	0.32	0.18	0.16	0.37	0.12	0.09	0.25	0.14	**0.19**
O23	0.09	0.28	0.17	0.08	0.30	0.16	0.15	0.28	0.16	**0.18**
O24	0.14	0.30	0.02	0.13	0.11	0.12	0.05	0.02	0.06	**0.11**
O25	0.17	0.31	0.20	0.15	0.04	0.13	0.04	0.13	0.13	**0.15**
O26	0.14	0.28	0.18	0.14	0.34	0.04	0.11	0.16	0.15	**0.17**
O27	0.09	0.22	0.18	0.11	0.40	0.08	0.12	0.24	0.17	**0.17**
O28	0.05	0.16	0.18	0.06	0.23	0.06	0.05	0.31	0.18	**0.13**
O29	0.09	0.07	0.09	0.02	0.17	0.40	0.27	0.43	0.37	**0.20**
O30	0.05	0.03	0.03	0.05	0.07	0.19	0.22	0.26	0.34	**0.12**
O31	0.04	0.09	0.15	0.12	0.14	0.14	0.19	0.21	0.26	**0.14**
O32	0.03	0.27	0.22	0.14	0.02	0.07	0.14	0.14	0.18	**0.13**
O33	0.05	0.27	0.22	0.02	0.18	0.04	0.16	0.16	0.07	**0.13**
O34	0.08	0.29	0.23	0.06	0.37	0.29	0.28	0.23	0.07	**0.21**
O35	0.06	0.06	0.12	0.10	0.04	0.08	0.12	0.15	0.07	**0.09**
O36	0.22	0.12	0.13	0.17	0.02	0.11	0.09	0.03	0.02	**0.11**
O37	0.19	0.16	0.12	0.07	0.20	0.38	0.13	0.05	0.09	**0.16**
O38	0.22	0.15	0.16	0.04	0.28	0.37	0.19	0.09	0.11	**0.19**
O39	0.22	0.15	0.16	0.14	0.15	0.28	0.13	0.08	0.07	**0.16**
O40	0.01	0.11	0.14	0.14	0.24	0.33	0.28	0.28	0.25	**0.19**
O41	0.09	0.06	0.01	0.05	0.15	0.09	0.09	0.06	0.11	**0.08**
O42	0.08	0.07	0.04	0.12	0.12	0.25	0.17	0.19	0.15	**0.13**

O43	0.07	0.06	0.09	0.10	0.36	0.24	0.18	0.10	0.19	**0.15**
O44	0.02	0.08	0.08	0.01	0.12	0.09	0.13	0.10	0.11	**0.08**
O45	0.10	0.07	0.09	0.01	0.13	0.17	0.18	0.16	0.11	**0.11**
O46	0.09	0.04	0.05	0.03	0.21	0.08	0.06	0.03	0.02	**0.07**
O47	0.05	0.03	0.05	0.04	0.13	0.28	0.11	0.27	0.29	**0.12**
O48	0.10	0.08	0.13	0.05	0.13	0.36	0.25	0.39	0.34	**0.19**
O49	0.07	0.08	0.10	0.06	0.03	0.24	0.20	0.08	0.31	**0.12**
O50	0.07	0.06	0.02	0.01	0.21	0.22	0.18	0.35	0.32	**0.14**
O51	0.10	0.05	0.04	0.07	0.24	0.44	0.18	0.06	0.09	**0.14**
O52	0.03	0.03	0.07	0.08	0.28	0.31	0.23	0.11	0.09	**0.13**
O53	0.06	0.06	0.08	0.04	0.23	0.35	0.16	0.06	0.09	**0.13**

Table A 18 VR value for the Special Points of Baseline Scheme under Summer Condition

	E	**ESE**	**SE**	**SSE**	**S**	**SSW**	**SW**	**WSW**	**W**	**Overall**
	11.5%	**9.5%**	**9.3%**	**8.3%**	**7.9%**	**8.8%**	**9.9%**	**7.2%**	**4.7%**	**77.1%**
S1	0.03	0.09	0.23	0.21	0.32	0.18	0.16	0.26	0.18	**0.18**
S2	0.05	0.11	0.20	0.14	0.30	0.06	0.14	0.34	0.26	**0.16**
S3	0.12	0.06	0.23	0.13	0.39	0.15	0.15	0.29	0.23	**0.18**
S4	0.12	0.09	0.23	0.12	0.35	0.18	0.11	0.25	0.22	**0.18**
S5	0.11	0.12	0.22	0.10	0.30	0.28	0.10	0.28	0.20	**0.18**
S6	0.10	0.10	0.22	0.08	0.22	0.28	0.10	0.21	0.18	**0.16**
S7	0.09	0.08	0.21	0.09	0.18	0.17	0.05	0.12	0.19	**0.12**
S8	0.10	0.11	0.23	0.10	0.23	0.05	0.10	0.14	0.21	**0.13**
S9	0.06	0.06	0.20	0.08	0.23	0.21	0.12	0.12	0.22	**0.14**
S10	0.25	0.20	0.20	0.04	0.17	0.18	0.14	0.17	0.19	**0.17**
S11	0.22	0.20	0.25	0.07	0.28	0.37	0.43	0.49	0.32	**0.29**
S12	0.24	0.22	0.38	0.14	0.36	0.28	0.41	0.51	0.26	**0.31**
S13	0.24	0.17	0.34	0.10	0.43	0.40	0.44	0.51	0.22	**0.32**
S14	0.24	0.09	0.28	0.05	0.42	0.40	0.43	0.46	0.15	**0.28**
S15	0.27	0.13	0.16	0.06	0.41	0.33	0.38	0.19	0.10	**0.24**
S16	0.29	0.21	0.11	0.10	0.38	0.31	0.36	0.29	0.16	**0.25**
S17	0.18	0.07	0.12	0.12	0.44	0.29	0.35	0.29	0.17	**0.22**
S18	0.21	0.07	0.09	0.08	0.46	0.42	0.45	0.41	0.34	**0.27**
S19	0.18	0.35	0.26	0.07	0.35	0.39	0.50	0.51	0.40	**0.33**
S20	0.07	0.29	0.24	0.12	0.31	0.45	0.51	0.46	0.37	**0.30**
S21	0.25	0.12	0.18	0.09	0.30	0.52	0.56	0.54	0.41	**0.32**
S22	0.22	0.09	0.20	0.04	0.42	0.53	0.54	0.51	0.37	**0.32**
S23	0.20	0.16	0.18	0.18	0.05	0.54	0.52	0.52	0.39	**0.30**
S24	0.11	0.13	0.04	0.09	0.09	0.43	0.28	0.38	0.37	**0.20**
S25	0.09	0.10	0.16	0.18	0.19	0.40	0.09	0.01	0.16	**0.15**

B2 Indicative Scheme VR tables

B2.1 Annual Condition

Table A 19 VR value for the Perimeter Points of Indicative Scheme under Annual Condition

	NNE	NE	ENE	E	ESE	SE	SSE	S	Overall
	7.5%	10.1%	17.4%	16.6%	8.4%	5.9%	5.9%	4.9%	76.6%
P1	0.04	0.03	0.02	0.05	0.05	0.10	0.20	0.46	**0.08**
P2	0.02	0.09	0.07	0.02	0.06	0.08	0.11	0.42	**0.08**
P3	0.01	0.14	0.18	0.03	0.05	0.05	0.06	0.22	**0.09**
P4	0.16	0.12	0.17	0.07	0.05	0.03	0.01	0.03	**0.10**
P5	0.12	0.09	0.19	0.11	0.08	0.08	0.08	0.41	**0.14**
P6	0.27	0.11	0.06	0.11	0.01	0.02	0.02	0.11	**0.09**
P7	0.31	0.16	0.14	0.06	0.02	0.01	0.09	0.15	**0.12**
P8	0.24	0.16	0.14	0.14	0.19	0.16	0.17	0.12	**0.16**
P9	0.04	0.16	0.11	0.08	0.21	0.18	0.31	0.10	**0.13**
P10	0.27	0.18	0.10	0.10	0.21	0.16	0.30	0.42	**0.18**
P11	0.38	0.07	0.10	0.12	0.20	0.15	0.28	0.09	**0.15**
P12	0.03	0.02	0.05	0.14	0.18	0.13	0.27	0.24	**0.11**
P13	0.01	0.02	0.11	0.14	0.18	0.14	0.27	0.03	**0.11**
P14	0.03	0.16	0.10	0.12	0.17	0.14	0.28	0.05	**0.13**
P15	0.15	0.03	0.09	0.08	0.15	0.14	0.26	0.27	**0.12**
P16	0.07	0.09	0.07	0.09	0.10	0.13	0.23	0.22	**0.11**
P17	0.07	0.10	0.04	0.11	0.03	0.11	0.18	0.32	**0.10**
P18	0.08	0.09	0.12	0.08	0.01	0.07	0.17	0.19	**0.10**
P19	0.09	0.09	0.13	0.15	0.22	0.18	0.11	0.36	**0.15**
P20	0.15	0.15	0.06	0.10	0.24	0.18	0.11	0.38	**0.14**
P21	0.07	0.03	0.09	0.09	0.26	0.18	0.13	0.32	**0.12**
P22	0.11	0.14	0.06	0.04	0.27	0.18	0.14	0.04	**0.11**
P23	0.14	0.08	0.08	0.05	0.26	0.15	0.14	0.17	**0.12**
P24	0.12	0.19	0.06	0.10	0.26	0.03	0.13	0.26	**0.13**
P25	0.16	0.16	0.05	0.08	0.21	0.02	0.11	0.33	**0.12**
P26	0.17	0.18	0.07	0.07	0.13	0.06	0.11	0.31	**0.12**
P27	0.15	0.16	0.08	0.09	0.16	0.03	0.10	0.22	**0.11**
P28	0.17	0.18	0.05	0.06	0.07	0.10	0.14	0.17	**0.10**
P29	0.16	0.20	0.10	0.09	0.18	0.19	0.12	0.08	**0.13**
P30	0.14	0.24	0.11	0.07	0.13	0.19	0.12	0.12	**0.13**
P31	0.13	0.24	0.17	0.14	0.13	0.21	0.13	0.01	**0.15**
P32	0.11	0.05	0.03	0.02	0.04	0.13	0.12	0.11	**0.06**
P33	0.10	0.13	0.05	0.10	0.04	0.03	0.05	0.19	**0.08**
P34	0.08	0.16	0.07	0.09	0.08	0.06	0.08	0.24	**0.10**
P35	0.17	0.28	0.12	0.14	0.05	0.03	0.08	0.05	**0.13**
P36	0.18	0.26	0.13	0.13	0.04	0.04	0.06	0.06	**0.13**
P37	0.11	0.01	0.12	0.19	0.10	0.09	0.09	0.25	**0.12**

P38	0.03	0.10	0.02	0.09	0.23	0.22	0.11	0.13	**0.10**
P39	0.08	0.12	0.11	0.14	0.15	0.18	0.13	0.13	**0.13**

Table A 20 VR value for the Overall Points of Indicative Scheme under Annual Condition

	NNE	NE	ENE	E	ESE	SE	SSE	S	Overall
	7.5%	**10.1%**	**17.4%**	**16.6%**	**8.4%**	**5.9%**	**5.9%**	**4.9%**	**76.6%**
O1	0.02	0.02	0.08	0.09	0.19	0.19	0.07	0.35	**0.11**
O2	0.04	0.05	0.02	0.05	0.18	0.24	0.31	0.23	**0.10**
O3	0.27	0.09	0.09	0.10	0.20	0.18	0.01	0.33	**0.14**
O4	0.32	0.16	0.01	0.13	0.20	0.20	0.28	0.12	**0.15**
O5	0.03	0.06	0.06	0.03	0.06	0.10	0.23	0.11	**0.07**
O6	0.05	0.06	0.03	0.03	0.04	0.10	0.31	0.27	**0.08**
O7	0.16	0.17	0.05	0.03	0.05	0.10	0.33	0.43	**0.12**
O8	0.23	0.08	0.07	0.08	0.10	0.05	0.31	0.47	**0.14**
O9	0.37	0.08	0.17	0.16	0.09	0.10	0.28	0.46	**0.19**
O10	0.22	0.14	0.12	0.03	0.06	0.14	0.27	0.39	**0.14**
O11	0.15	0.01	0.14	0.12	0.13	0.20	0.20	0.36	**0.14**
O12	0.06	0.09	0.27	0.23	0.22	0.21	0.08	0.39	**0.20**
O13	0.24	0.24	0.18	0.21	0.11	0.17	0.03	0.31	**0.19**
O14	0.16	0.22	0.04	0.03	0.12	0.01	0.09	0.14	**0.09**
O15	0.15	0.16	0.05	0.07	0.25	0.02	0.15	0.13	**0.11**
O16	0.14	0.13	0.10	0.09	0.30	0.15	0.14	0.12	**0.14**
O17	0.02	0.04	0.12	0.13	0.32	0.19	0.13	0.02	**0.12**
O18	0.07	0.08	0.10	0.10	0.31	0.18	0.13	0.11	**0.13**
O19	0.07	0.10	0.06	0.05	0.30	0.18	0.09	0.35	**0.12**
O20	0.11	0.10	0.11	0.11	0.31	0.16	0.11	0.12	**0.13**
O21	0.09	0.11	0.09	0.11	0.33	0.18	0.13	0.04	**0.13**
O22	0.07	0.06	0.08	0.09	0.32	0.18	0.12	0.30	**0.13**
O23	0.07	0.05	0.15	0.04	0.28	0.18	0.07	0.32	**0.13**
O24	0.02	0.06	0.14	0.09	0.32	0.02	0.10	0.06	**0.11**
O25	0.03	0.09	0.11	0.11	0.33	0.20	0.12	0.03	**0.13**
O26	0.06	0.07	0.11	0.09	0.30	0.18	0.12	0.19	**0.13**
O27	0.06	0.01	0.12	0.04	0.23	0.18	0.10	0.37	**0.11**
O28	0.05	0.06	0.11	0.06	0.17	0.19	0.06	0.27	**0.11**
O29	0.44	0.20	0.11	0.10	0.10	0.11	0.05	0.07	**0.14**
O30	0.05	0.03	0.14	0.09	0.07	0.09	0.04	0.05	**0.08**
O31	0.06	0.05	0.05	0.05	0.08	0.04	0.13	0.05	**0.06**
O32	0.09	0.07	0.02	0.06	0.29	0.22	0.10	0.13	**0.10**
O33	0.07	0.04	0.01	0.07	0.28	0.22	0.10	0.21	**0.10**
O34	0.06	0.10	0.07	0.08	0.30	0.23	0.10	0.40	**0.14**
O35	0.12	0.02	0.02	0.01	0.04	0.13	0.09	0.04	**0.04**
O36	0.11	0.09	0.10	0.19	0.09	0.14	0.10	0.04	**0.12**
O37	0.12	0.16	0.08	0.20	0.14	0.11	0.08	0.27	**0.14**
O38	0.06	0.04	0.10	0.19	0.17	0.17	0.03	0.32	**0.13**

O39	0.12	0.10	0.19	0.21	0.14	0.12	0.08	0.20	**0.16**
O40	0.07	0.10	0.07	0.14	0.06	0.13	0.08	0.08	**0.09**
O41	0.09	0.09	0.02	0.05	0.05	0.02	0.07	0.08	**0.05**
O42	0.10	0.10	0.04	0.08	0.05	0.03	0.06	0.24	**0.08**
O43	0.08	0.06	0.04	0.09	0.03	0.11	0.03	0.32	**0.08**
O44	0.03	0.04	0.06	0.11	0.09	0.06	0.05	0.20	**0.08**
O45	0.05	0.06	0.08	0.09	0.03	0.09	0.04	0.12	**0.07**
O46	0.03	0.05	0.06	0.07	0.01	0.05	0.02	0.21	**0.06**
O47	0.18	0.08	0.07	0.07	0.06	0.07	0.05	0.03	**0.08**
O48	0.49	0.24	0.14	0.14	0.11	0.15	0.06	0.01	**0.17**
O49	0.15	0.12	0.14	0.14	0.13	0.13	0.05	0.04	**0.12**
O50	0.08	0.09	0.04	0.10	0.07	0.10	0.08	0.02	**0.07**
O51	0.03	0.03	0.11	0.09	0.03	0.07	0.06	0.28	**0.08**
O52	0.04	0.08	0.04	0.04	0.03	0.06	0.06	0.25	**0.06**
O53	0.03	0.05	0.05	0.06	0.06	0.09	0.02	0.28	**0.06**

Table A 21 VR value for the Special Points of Indicative Scheme under Annual Condition

	NNE	**NE**	**ENE**	**E**	**ESE**	**SE**	**SSE**	**S**	**Overall**
	7.5%	**10.1%**	**17.4%**	**16.6%**	**8.4%**	**5.9%**	**5.9%**	**4.9%**	**76.6%**
S1	0.06	0.02	0.04	0.01	0.02	0.08	0.15	0.46	**0.07**
S2	0.06	0.04	0.03	0.09	0.05	0.05	0.09	0.19	**0.07**
S3	0.15	0.14	0.06	0.03	0.12	0.06	0.11	0.30	**0.10**
S4	0.04	0.03	0.05	0.03	0.02	0.04	0.11	0.38	**0.06**
S5	0.07	0.06	0.06	0.01	0.01	0.04	0.06	0.22	**0.05**
S6	0.07	0.07	0.03	0.02	0.06	0.02	0.03	0.08	**0.04**
S7	0.05	0.05	0.02	0.03	0.07	0.06	0.08	0.12	**0.05**
S8	0.02	0.01	0.06	0.13	0.19	0.20	0.12	0.06	**0.09**
S9	0.04	0.05	0.07	0.08	0.04	0.19	0.01	0.21	**0.08**
S10	0.09	0.17	0.21	0.25	0.22	0.21	0.07	0.44	**0.21**
S11	0.51	0.31	0.15	0.23	0.23	0.24	0.10	0.17	**0.24**
S12	0.07	0.03	0.24	0.25	0.25	0.36	0.13	0.17	**0.20**
S13	0.55	0.40	0.23	0.26	0.19	0.34	0.08	0.23	**0.28**
S14	0.57	0.33	0.16	0.25	0.07	0.22	0.05	0.14	**0.23**
S15	0.57	0.34	0.25	0.28	0.14	0.15	0.07	0.26	**0.27**
S16	0.57	0.44	0.31	0.30	0.22	0.12	0.11	0.18	**0.30**
S17	0.59	0.46	0.33	0.20	0.10	0.11	0.02	0.13	**0.27**
S18	0.27	0.27	0.15	0.21	0.11	0.10	0.04	0.46	**0.19**
S19	0.21	0.19	0.26	0.18	0.35	0.24	0.08	0.33	**0.23**
S20	0.13	0.10	0.05	0.12	0.27	0.23	0.12	0.31	**0.14**
S21	0.19	0.12	0.18	0.25	0.07	0.19	0.06	0.31	**0.18**
S22	0.18	0.23	0.18	0.23	0.10	0.23	0.06	0.43	**0.20**
S23	0.15	0.14	0.20	0.19	0.15	0.19	0.17	0.27	**0.18**
S24	0.14	0.10	0.14	0.11	0.13	0.10	0.12	0.28	**0.13**
S25	0.08	0.04	0.10	0.09	0.09	0.17	0.19	0.15	**0.10**

B2.2 Summer Condition

Table A 22 VR value for the Perimeter Points of Indicative Scheme under Summer Condition

	E	ESE	SE	SSE	S	SSW	SW	WSW	W	Overall
	11.5%	**9.5%**	**9.3%**	**8.3%**	**7.9%**	**8.8%**	**9.9%**	**7.2%**	**4.7%**	**77.1%**
P1	0.05	0.05	0.10	0.20	0.46	0.25	0.21	0.14	0.05	**0.17**
P2	0.02	0.06	0.08	0.11	0.42	0.29	0.17	0.02	0.06	**0.14**
P3	0.03	0.05	0.05	0.06	0.22	0.09	0.08	0.03	0.06	**0.07**
P4	0.07	0.05	0.03	0.01	0.03	0.25	0.12	0.07	0.02	**0.08**
P5	0.11	0.08	0.08	0.08	0.41	0.23	0.12	0.04	0.06	**0.14**
P6	0.11	0.01	0.02	0.02	0.11	0.46	0.36	0.14	0.12	**0.15**
P7	0.06	0.02	0.01	0.09	0.15	0.23	0.37	0.22	0.15	**0.14**
P8	0.14	0.19	0.16	0.17	0.12	0.10	0.39	0.31	0.35	**0.20**
P9	0.08	0.21	0.18	0.31	0.10	0.10	0.38	0.36	0.32	**0.22**
P10	0.10	0.21	0.16	0.30	0.42	0.19	0.17	0.33	0.32	**0.23**
P11	0.12	0.20	0.15	0.28	0.09	0.05	0.08	0.07	0.29	**0.14**
P12	0.14	0.18	0.13	0.27	0.24	0.39	0.45	0.21	0.09	**0.24**
P13	0.14	0.18	0.14	0.27	0.03	0.18	0.48	0.28	0.27	**0.22**
P14	0.12	0.17	0.14	0.28	0.05	0.18	0.07	0.15	0.26	**0.15**
P15	0.08	0.15	0.14	0.26	0.27	0.18	0.13	0.26	0.02	**0.17**
P16	0.09	0.10	0.13	0.23	0.22	0.19	0.20	0.03	0.05	**0.14**
P17	0.11	0.03	0.11	0.18	0.32	0.33	0.04	0.03	0.03	**0.13**
P18	0.08	0.01	0.07	0.17	0.19	0.25	0.06	0.03	0.03	**0.10**
P19	0.15	0.22	0.18	0.11	0.36	0.38	0.33	0.30	0.10	**0.24**
P20	0.10	0.24	0.18	0.11	0.38	0.35	0.30	0.35	0.09	**0.23**
P21	0.09	0.26	0.18	0.13	0.32	0.27	0.18	0.25	0.13	**0.20**
P22	0.04	0.27	0.18	0.14	0.04	0.22	0.24	0.23	0.03	**0.16**
P23	0.05	0.26	0.15	0.14	0.17	0.22	0.17	0.22	0.16	**0.17**
P24	0.10	0.26	0.03	0.13	0.26	0.26	0.24	0.17	0.05	**0.17**
P25	0.08	0.21	0.02	0.11	0.33	0.33	0.26	0.07	0.03	**0.16**
P26	0.07	0.13	0.06	0.11	0.31	0.31	0.31	0.10	0.11	**0.17**
P27	0.09	0.16	0.03	0.10	0.22	0.24	0.51	0.45	0.30	**0.22**
P28	0.06	0.07	0.10	0.14	0.17	0.06	0.07	0.15	0.19	**0.10**
P29	0.09	0.18	0.19	0.12	0.08	0.14	0.32	0.29	0.32	**0.18**
P30	0.07	0.13	0.19	0.12	0.12	0.02	0.10	0.11	0.12	**0.11**
P31	0.14	0.13	0.21	0.13	0.01	0.06	0.11	0.08	0.04	**0.11**
P32	0.02	0.04	0.13	0.12	0.11	0.13	0.07	0.05	0.05	**0.08**
P33	0.10	0.04	0.03	0.05	0.19	0.15	0.10	0.12	0.11	**0.10**
P34	0.09	0.08	0.06	0.08	0.24	0.24	0.03	0.05	0.04	**0.10**
P35	0.14	0.05	0.03	0.08	0.05	0.10	0.03	0.05	0.05	**0.07**
P36	0.13	0.04	0.04	0.06	0.06	0.06	0.03	0.03	0.07	**0.06**
P37	0.19	0.10	0.09	0.09	0.25	0.15	0.04	0.04	0.10	**0.12**
P38	0.09	0.23	0.22	0.11	0.13	0.08	0.12	0.16	0.26	**0.15**

P39	0.14	0.15	0.18	0.13	0.13	0.07	0.17	0.22	0.26	**0.15**

Table A 23 VR value for the Overall Points of Indicative Scheme under Summer Condition

	E	ESE	SE	SSE	S	SSW	SW	WSW	W	Overall
	11.5%	**9.5%**	**9.3%**	**8.3%**	**7.9%**	**8.8%**	**9.9%**	**7.2%**	**4.7%**	**77.1%**
O1	0.09	0.19	0.19	0.07	0.35	0.14	0.22	0.29	0.14	**0.18**
O2	0.05	0.18	0.24	0.31	0.23	0.17	0.19	0.32	0.22	**0.20**
O3	0.10	0.20	0.18	0.01	0.33	0.20	0.23	0.27	0.14	**0.18**
O4	0.13	0.20	0.20	0.28	0.12	0.18	0.27	0.32	0.12	**0.20**
O5	0.03	0.06	0.10	0.23	0.11	0.21	0.36	0.34	0.30	**0.18**
O6	0.03	0.04	0.10	0.31	0.27	0.35	0.33	0.31	0.20	**0.21**
O7	0.03	0.05	0.10	0.33	0.43	0.39	0.32	0.33	0.27	**0.24**
O8	0.08	0.10	0.05	0.31	0.47	0.23	0.32	0.44	0.33	**0.24**
O9	0.16	0.09	0.10	0.28	0.46	0.36	0.26	0.09	0.33	**0.23**
O10	0.03	0.06	0.14	0.27	0.39	0.39	0.34	0.49	0.21	**0.24**
O11	0.12	0.13	0.20	0.20	0.36	0.32	0.26	0.08	0.36	**0.22**
O12	0.23	0.22	0.21	0.08	0.39	0.19	0.31	0.06	0.26	**0.22**
O13	0.21	0.11	0.17	0.03	0.31	0.27	0.29	0.18	0.07	**0.19**
O14	0.03	0.12	0.01	0.09	0.14	0.10	0.22	0.18	0.07	**0.11**
O15	0.07	0.25	0.02	0.15	0.13	0.11	0.28	0.32	0.17	**0.16**
O16	0.09	0.30	0.15	0.14	0.12	0.21	0.21	0.11	0.01	**0.16**
O17	0.13	0.32	0.19	0.13	0.02	0.16	0.16	0.25	0.09	**0.17**
O18	0.10	0.31	0.18	0.13	0.11	0.22	0.15	0.12	0.11	**0.16**
O19	0.05	0.30	0.18	0.09	0.35	0.20	0.14	0.14	0.13	**0.17**
O20	0.11	0.31	0.16	0.11	0.12	0.15	0.11	0.16	0.10	**0.15**
O21	0.11	0.33	0.18	0.13	0.04	0.17	0.10	0.11	0.14	**0.15**
O22	0.09	0.32	0.18	0.12	0.30	0.11	0.08	0.16	0.14	**0.17**
O23	0.04	0.28	0.18	0.07	0.32	0.17	0.15	0.21	0.11	**0.17**
O24	0.09	0.32	0.02	0.10	0.06	0.16	0.05	0.01	0.15	**0.10**
O25	0.11	0.33	0.20	0.12	0.03	0.12	0.03	0.07	0.20	**0.13**
O26	0.09	0.30	0.18	0.12	0.19	0.07	0.06	0.08	0.18	**0.14**
O27	0.04	0.23	0.18	0.10	0.37	0.07	0.13	0.11	0.12	**0.15**
O28	0.06	0.17	0.19	0.06	0.27	0.07	0.08	0.20	0.12	**0.13**
O29	0.10	0.10	0.11	0.05	0.07	0.28	0.28	0.38	0.35	**0.18**
O30	0.09	0.07	0.09	0.04	0.05	0.07	0.24	0.14	0.30	**0.11**
O31	0.05	0.08	0.04	0.13	0.05	0.08	0.05	0.18	0.25	**0.09**
O32	0.06	0.29	0.22	0.10	0.13	0.21	0.12	0.14	0.20	**0.16**
O33	0.07	0.28	0.22	0.10	0.21	0.33	0.06	0.20	0.11	**0.17**
O34	0.08	0.30	0.23	0.10	0.40	0.38	0.27	0.30	0.06	**0.24**
O35	0.01	0.04	0.13	0.09	0.04	0.12	0.14	0.17	0.11	**0.09**
O36	0.19	0.09	0.14	0.10	0.04	0.09	0.03	0.02	0.05	**0.09**
O37	0.20	0.14	0.11	0.08	0.27	0.27	0.10	0.23	0.08	**0.17**
O38	0.19	0.17	0.17	0.03	0.32	0.30	0.04	0.09	0.03	**0.16**
O39	0.21	0.14	0.12	0.08	0.20	0.19	0.08	0.11	0.04	**0.14**
O40	0.14	0.06	0.13	0.08	0.08	0.16	0.17	0.08	0.11	**0.11**

O41	0.05	0.05	0.02	0.07	0.08	0.14	0.12	0.23	0.12	**0.09**
O42	0.08	0.05	0.03	0.06	0.24	0.18	0.20	0.29	0.12	**0.13**
O43	0.09	0.03	0.11	0.03	0.32	0.28	0.14	0.29	0.18	**0.15**
O44	0.11	0.09	0.06	0.05	0.20	0.16	0.07	0.13	0.13	**0.11**
O45	0.09	0.03	0.09	0.04	0.12	0.13	0.13	0.13	0.10	**0.09**
O46	0.07	0.01	0.05	0.02	0.21	0.06	0.07	0.13	0.00	**0.07**
O47	0.07	0.06	0.07	0.05	0.03	0.06	0.17	0.27	0.31	**0.11**
O48	0.14	0.11	0.15	0.06	0.01	0.12	0.23	0.38	0.35	**0.16**
O49	0.14	0.13	0.13	0.05	0.04	0.19	0.10	0.01	0.28	**0.12**
O50	0.10	0.07	0.10	0.08	0.02	0.03	0.18	0.26	0.33	**0.12**
O51	0.09	0.03	0.07	0.06	0.28	0.32	0.04	0.13	0.08	**0.12**
O52	0.04	0.03	0.06	0.06	0.25	0.32	0.08	0.12	0.07	**0.11**
O53	0.06	0.06	0.09	0.02	0.28	0.38	0.16	0.14	0.06	**0.14**

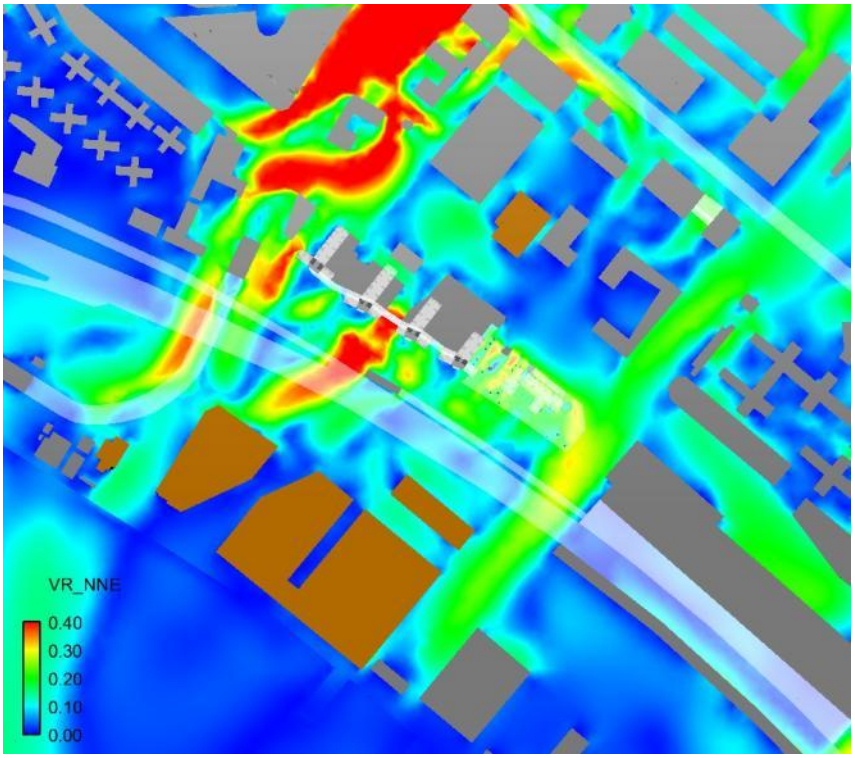
Table A 24 VR value for the Special Points of Indicative Scheme under Summer Condition

	E	**ESE**	**SE**	**SSE**	**S**	**SSW**	**SW**	**WSW**	**W**	**Overall**
	11.5%	**9.5%**	**9.3%**	**8.3%**	**7.9%**	**8.8%**	**9.9%**	**7.2%**	**4.7%**	**77.1%**
S1	0.01	0.02	0.08	0.15	0.46	0.41	0.37	0.14	0.19	**0.20**
S2	0.09	0.05	0.05	0.09	0.19	0.13	0.06	0.39	0.30	**0.13**
S3	0.03	0.12	0.06	0.11	0.30	0.17	0.20	0.30	0.25	**0.16**
S4	0.03	0.02	0.04	0.11	0.38	0.24	0.14	0.19	0.17	**0.14**
S5	0.01	0.01	0.04	0.06	0.22	0.22	0.16	0.29	0.29	**0.13**
S6	0.02	0.06	0.02	0.03	0.08	0.19	0.27	0.32	0.28	**0.13**
S7	0.03	0.07	0.06	0.08	0.12	0.25	0.31	0.32	0.29	**0.16**
S8	0.13	0.19	0.20	0.12	0.06	0.07	0.38	0.35	0.33	**0.20**
S9	0.08	0.04	0.19	0.01	0.21	0.24	0.14	0.21	0.33	**0.15**
S10	0.25	0.22	0.21	0.07	0.44	0.03	0.11	0.16	0.21	**0.19**
S11	0.23	0.23	0.24	0.10	0.17	0.26	0.37	0.46	0.38	**0.26**
S12	0.25	0.25	0.36	0.13	0.17	0.22	0.39	0.50	0.34	**0.29**
S13	0.26	0.19	0.34	0.08	0.23	0.33	0.42	0.51	0.28	**0.29**
S14	0.25	0.07	0.22	0.05	0.14	0.37	0.39	0.44	0.19	**0.24**
S15	0.28	0.14	0.15	0.07	0.26	0.33	0.26	0.14	0.12	**0.20**
S16	0.30	0.22	0.12	0.11	0.18	0.34	0.14	0.27	0.20	**0.21**
S17	0.20	0.10	0.11	0.02	0.13	0.31	0.20	0.28	0.19	**0.17**
S18	0.22	0.12	0.11	0.05	0.48	0.40	0.43	0.32	0.21	**0.26**
S19	0.18	0.37	0.25	0.08	0.34	0.36	0.51	0.30	0.22	**0.30**
S20	0.13	0.29	0.24	0.12	0.33	0.44	0.52	0.21	0.28	**0.28**
S21	0.26	0.07	0.20	0.06	0.33	0.53	0.57	0.33	0.28	**0.30**
S22	0.24	0.10	0.24	0.06	0.45	0.54	0.57	0.33	0.23	**0.31**
S23	0.20	0.16	0.20	0.17	0.28	0.41	0.55	0.28	0.16	**0.28**
S24	0.12	0.14	0.10	0.13	0.30	0.22	0.29	0.10	0.06	**0.17**
S25	0.09	0.10	0.18	0.20	0.15	0.10	0.05	0.06	0.02	**0.11**

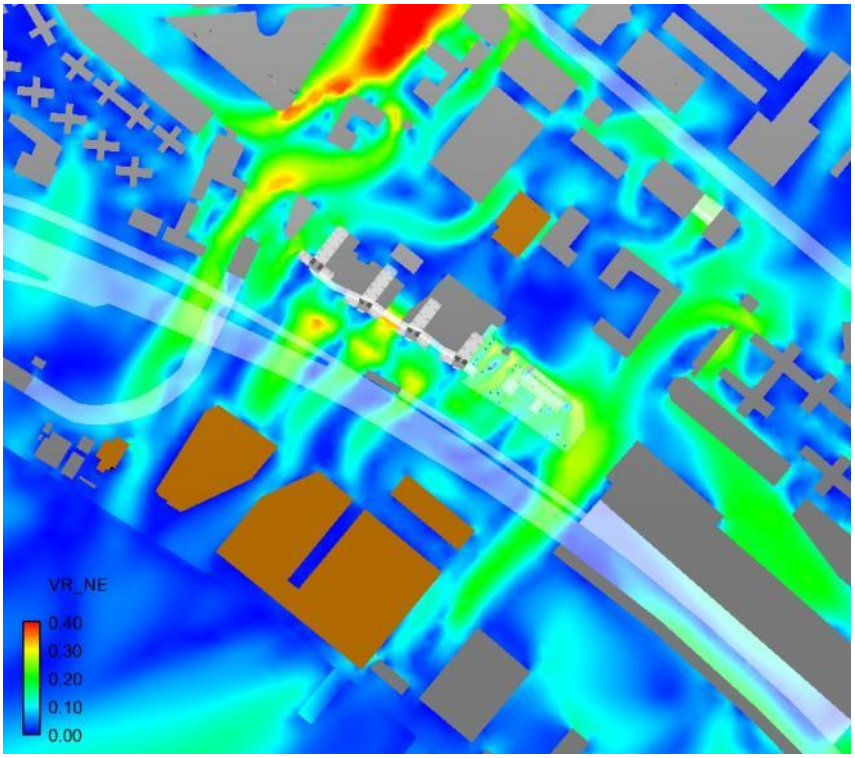
Appendix C

Directional VR Contour Plots

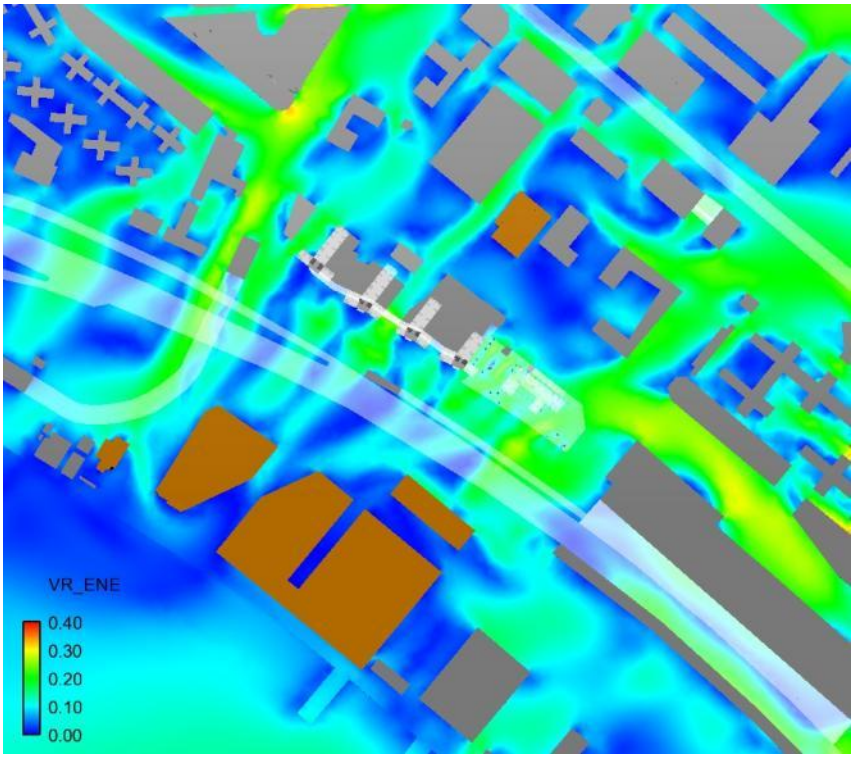
C1 Baseline Scheme Directional VR Contour Plots



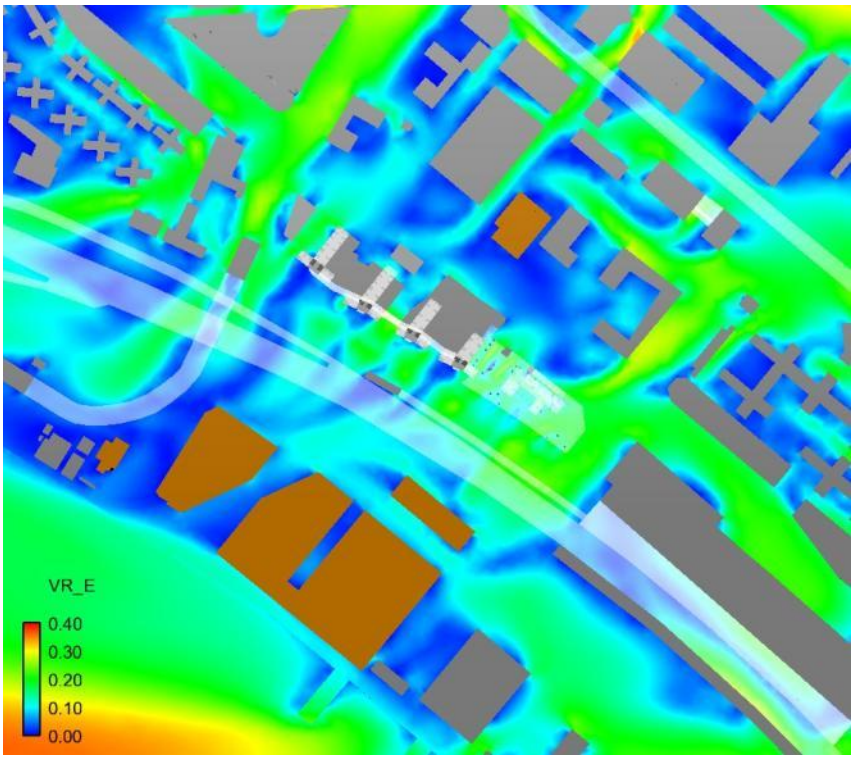
NNE Direction (Baseline Scheme)



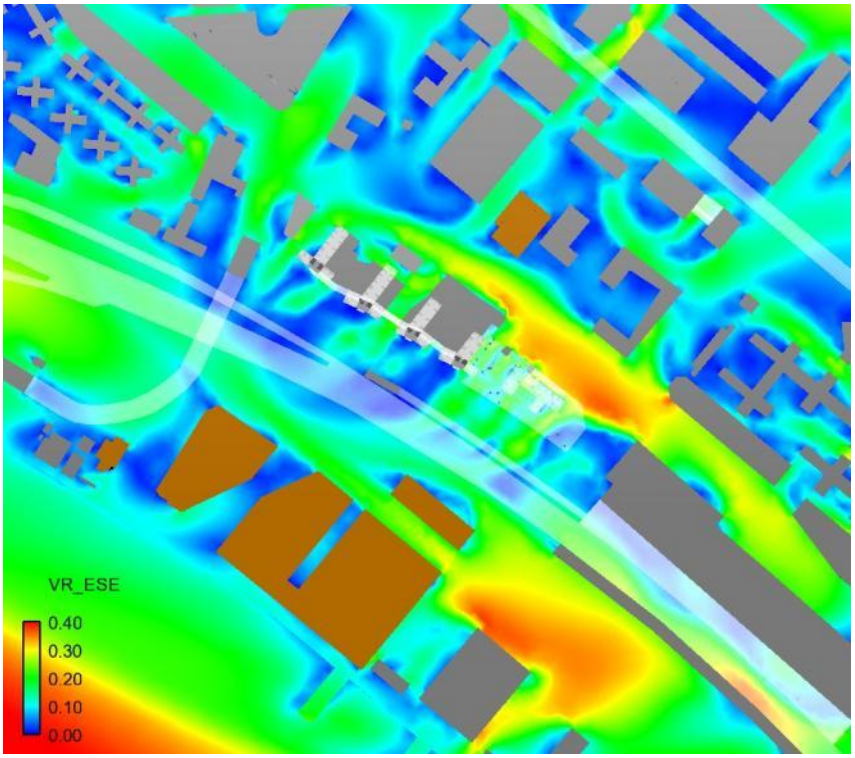
NE Direction (Baseline Scheme)



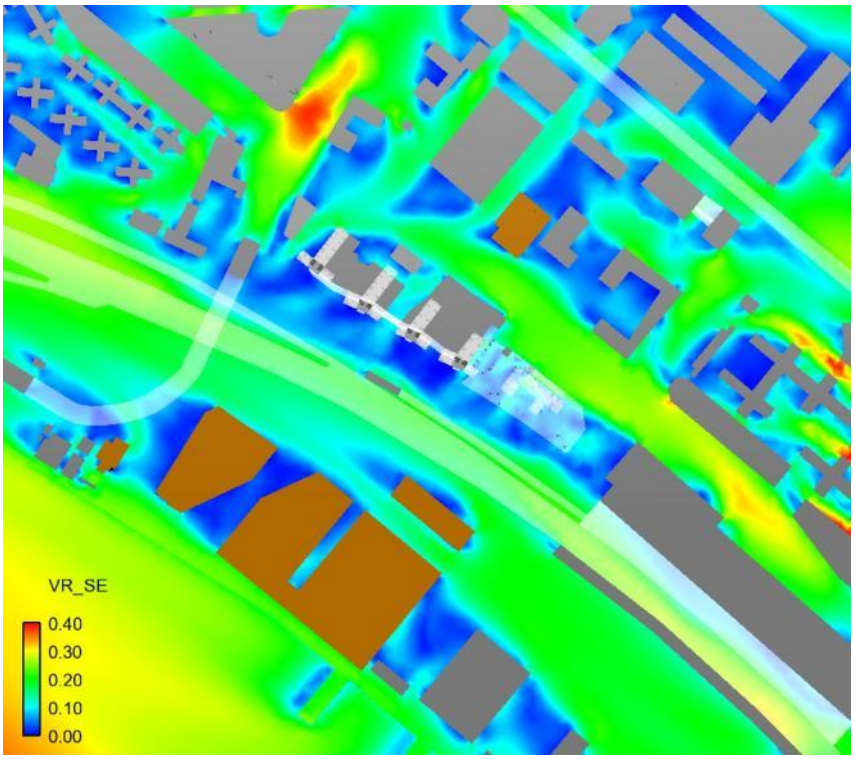
ENE Direction (Baseline Scheme)



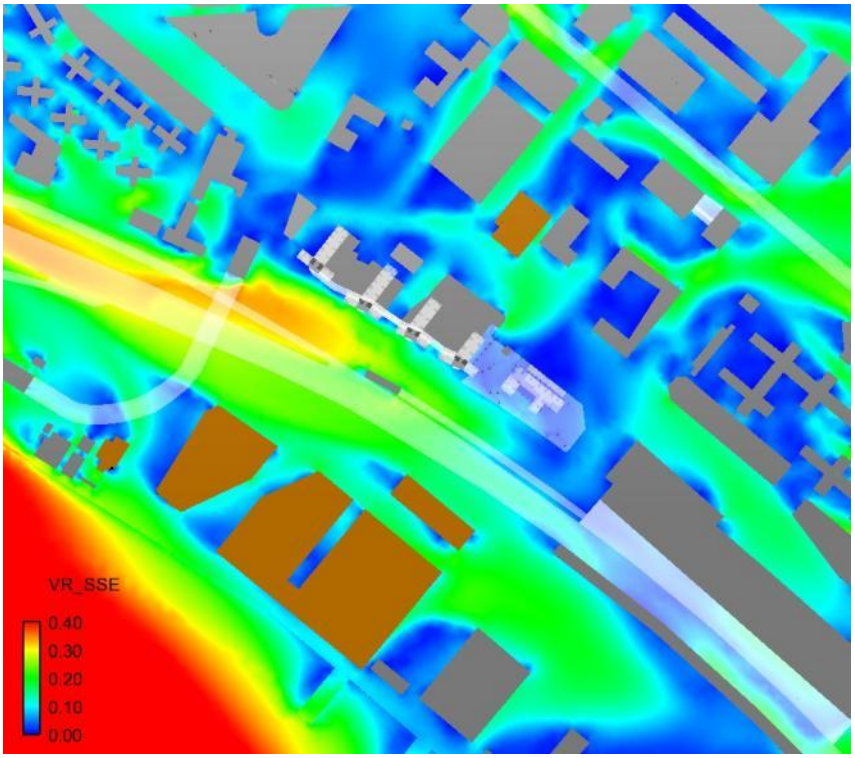
E Direction (Baseline Scheme)



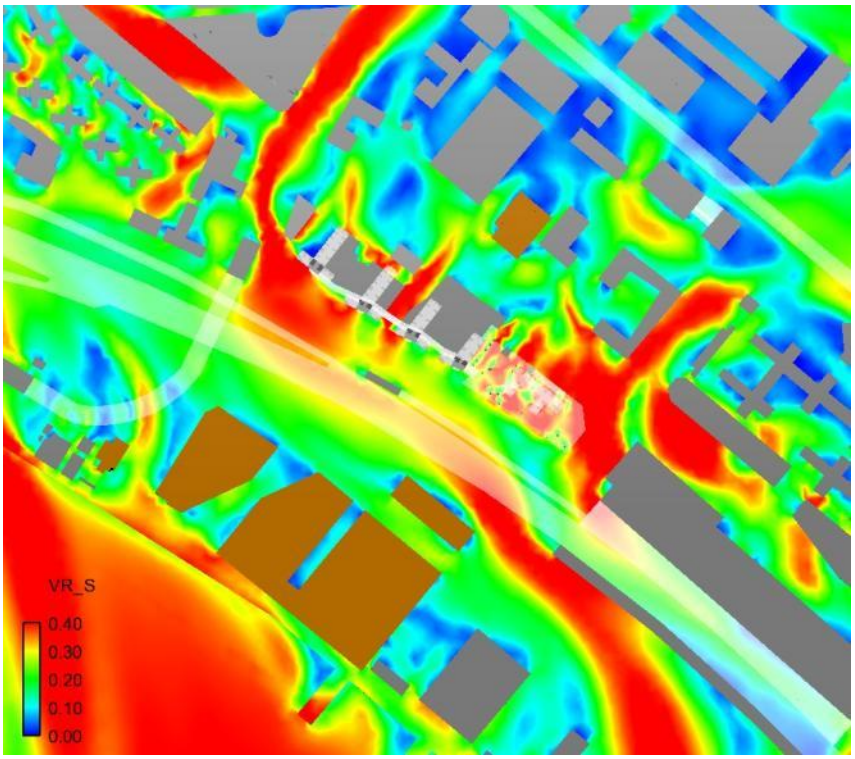
ESE Direction (Baseline Scheme)



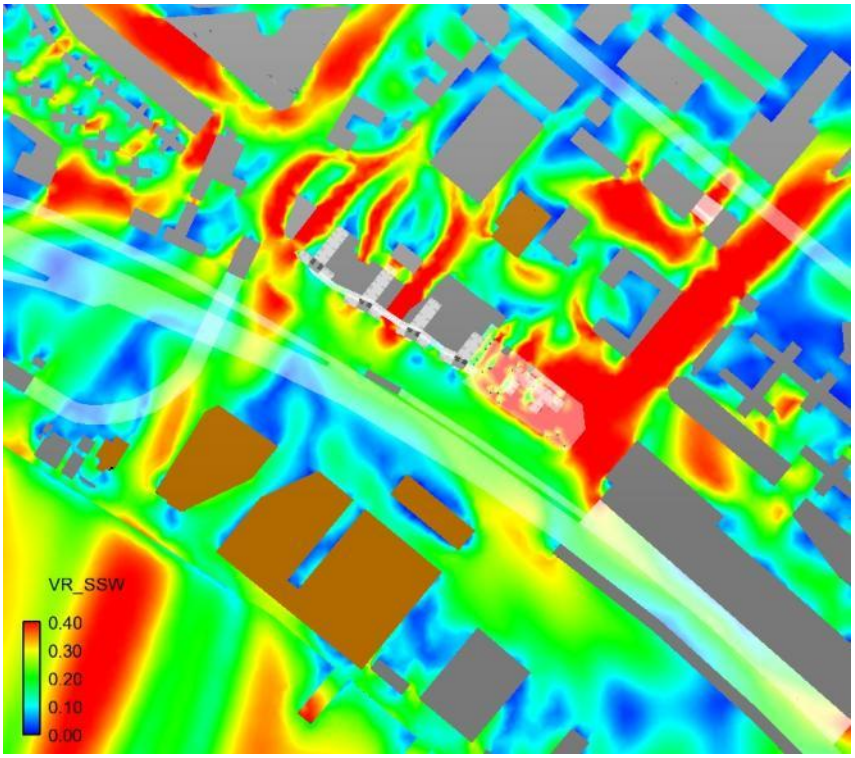
SE Direction (Baseline Scheme)



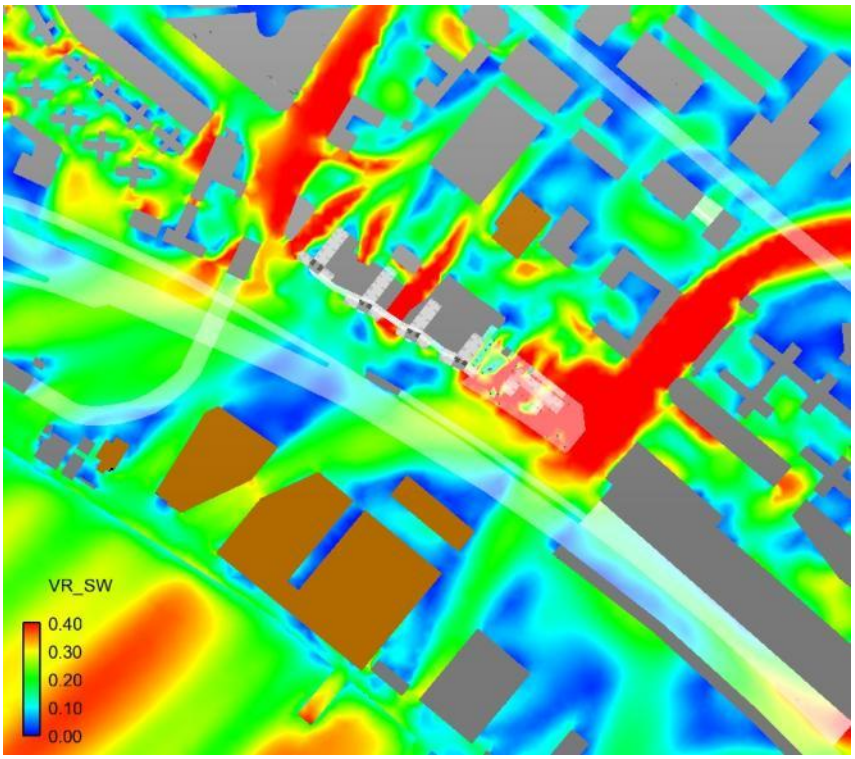
SSE Direction (Baseline Scheme)



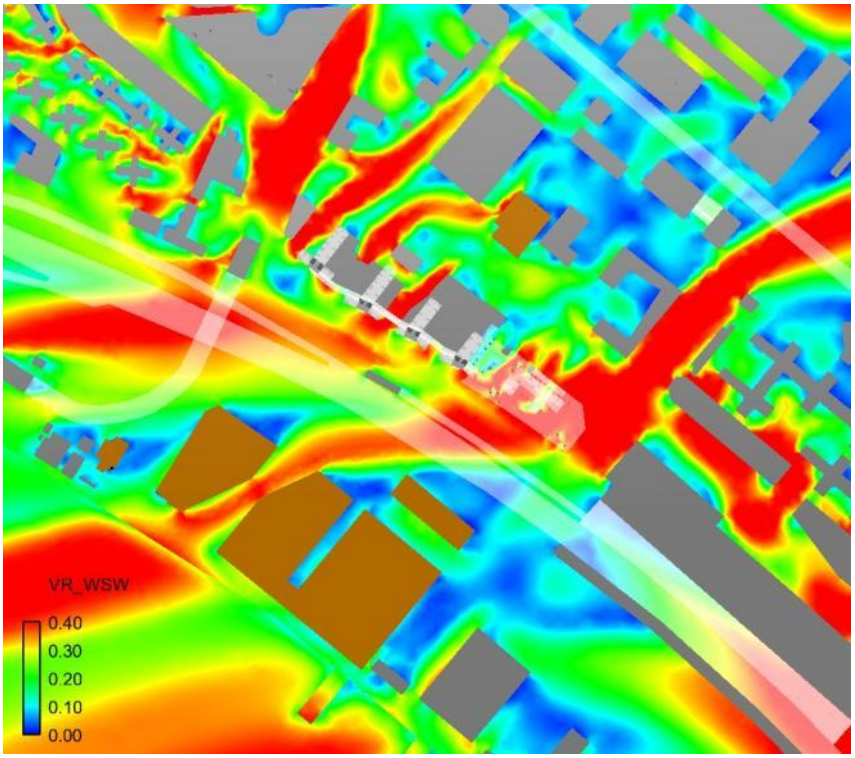
S Direction (Baseline Scheme)



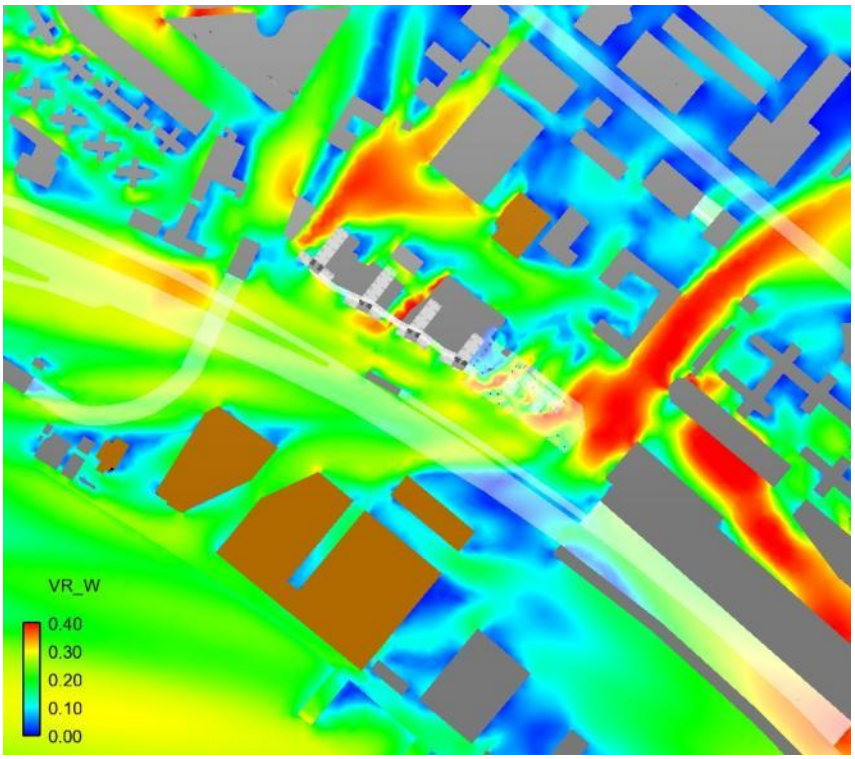
SSW Direction (Baseline Scheme)



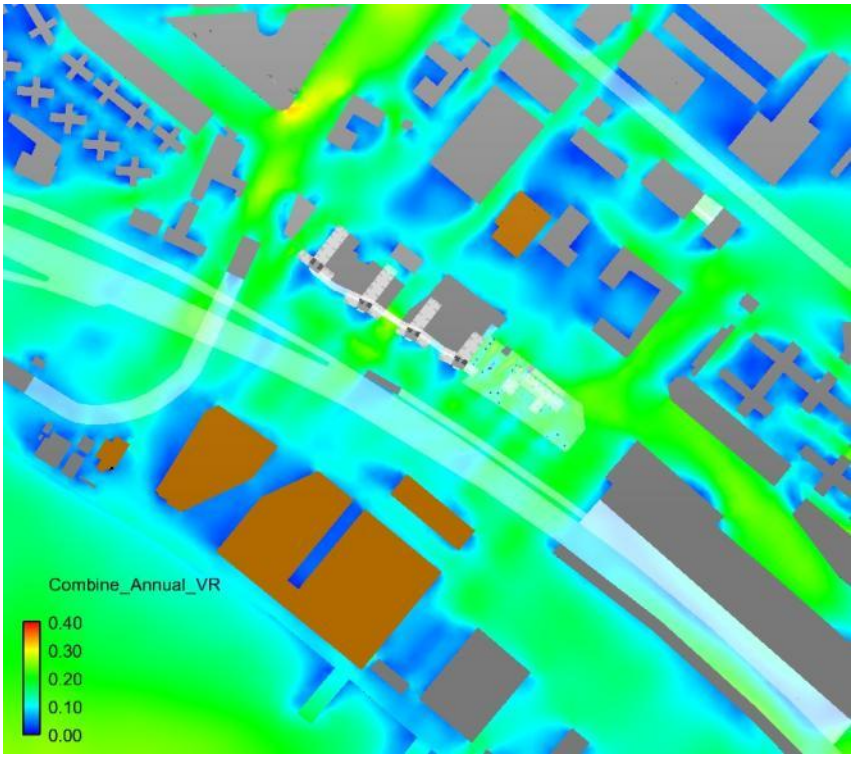
SW Direction (Baseline Scheme)



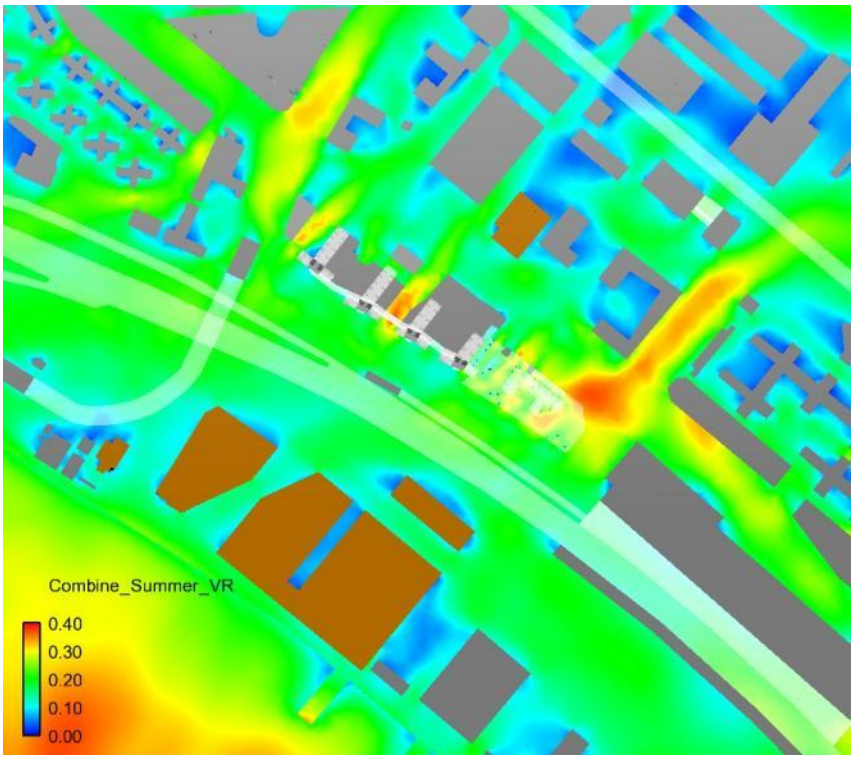
WSW Direction (Baseline Scheme)



W Direction (Baseline Scheme)

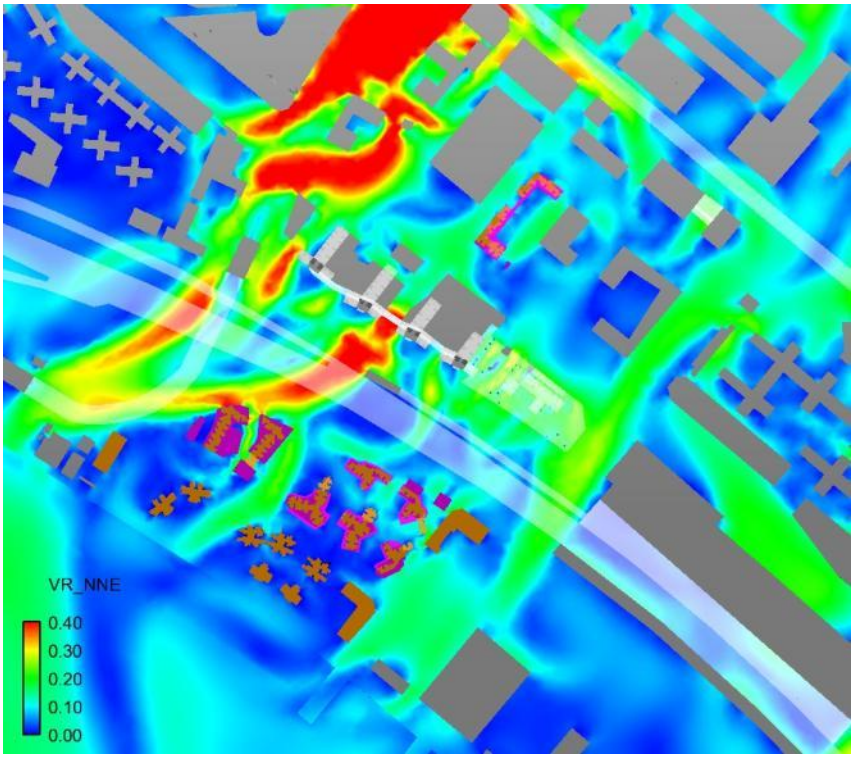


Combine Annual (Baseline Scheme)

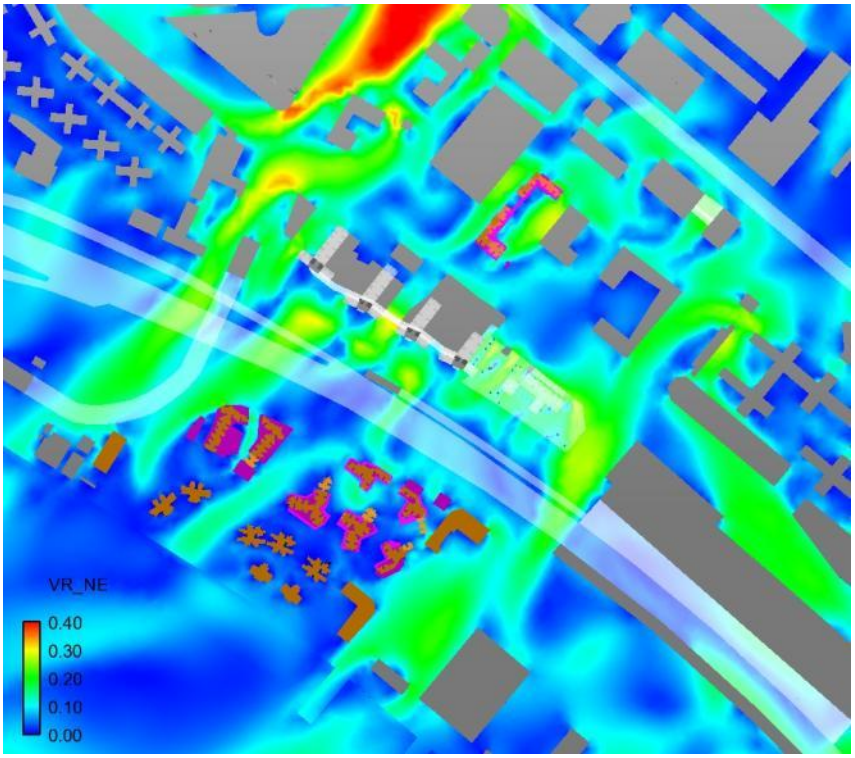


Combine Summer (Baseline Scheme)

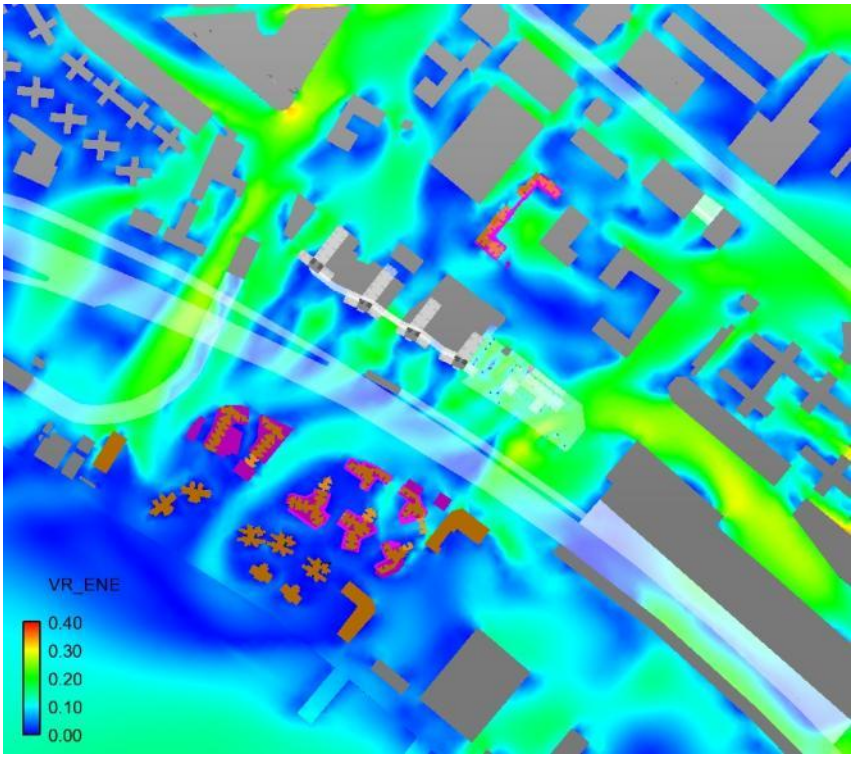
C2 Indicative Scheme Directional VR Contour Plots



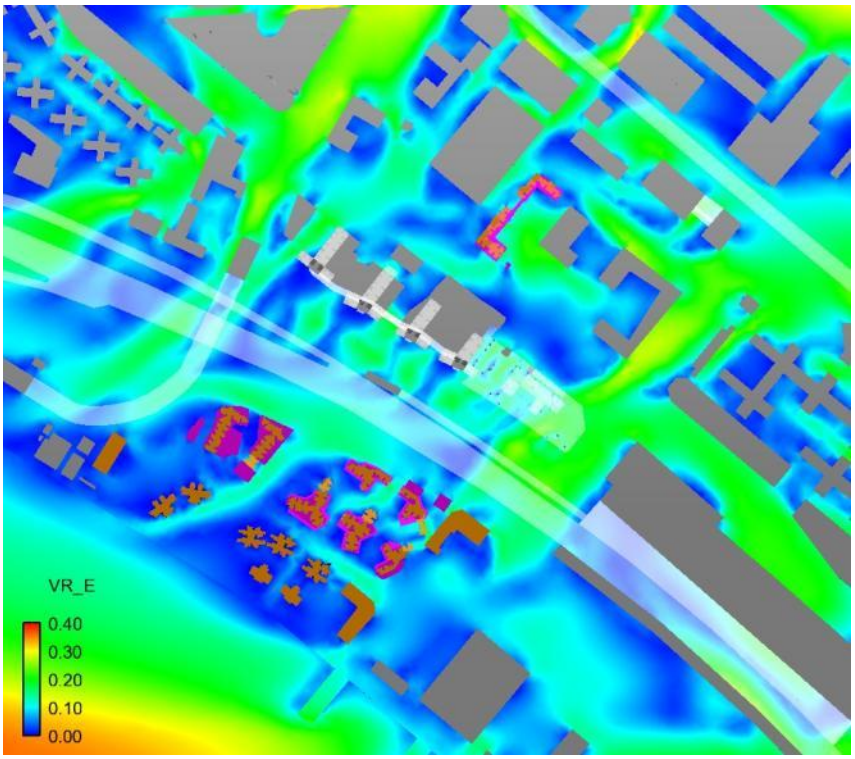
NNE Direction (Indicative Scheme)



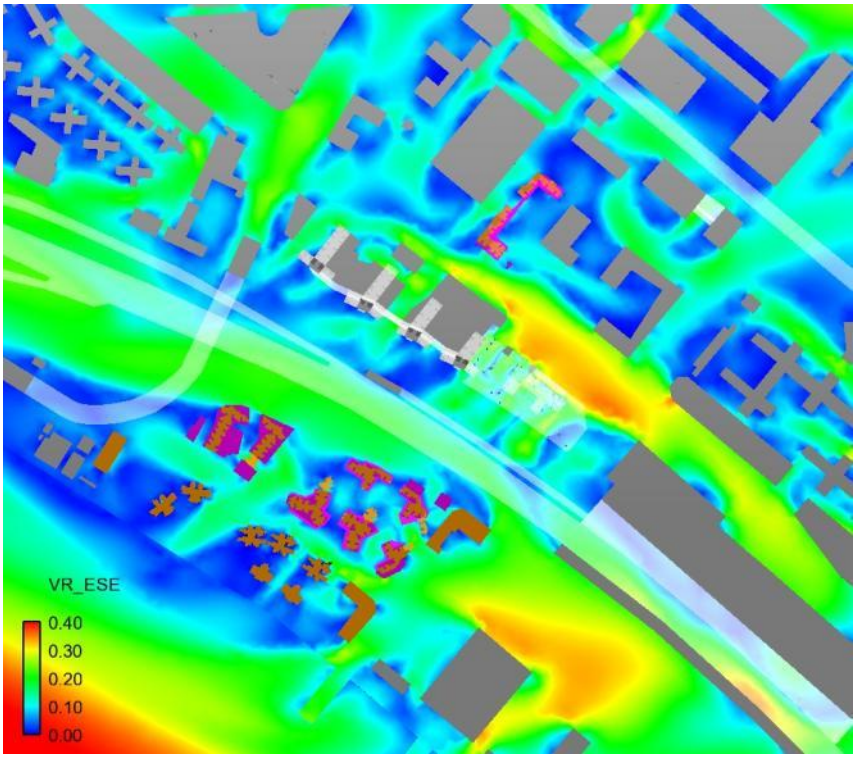
NE Direction (Indicative Scheme)



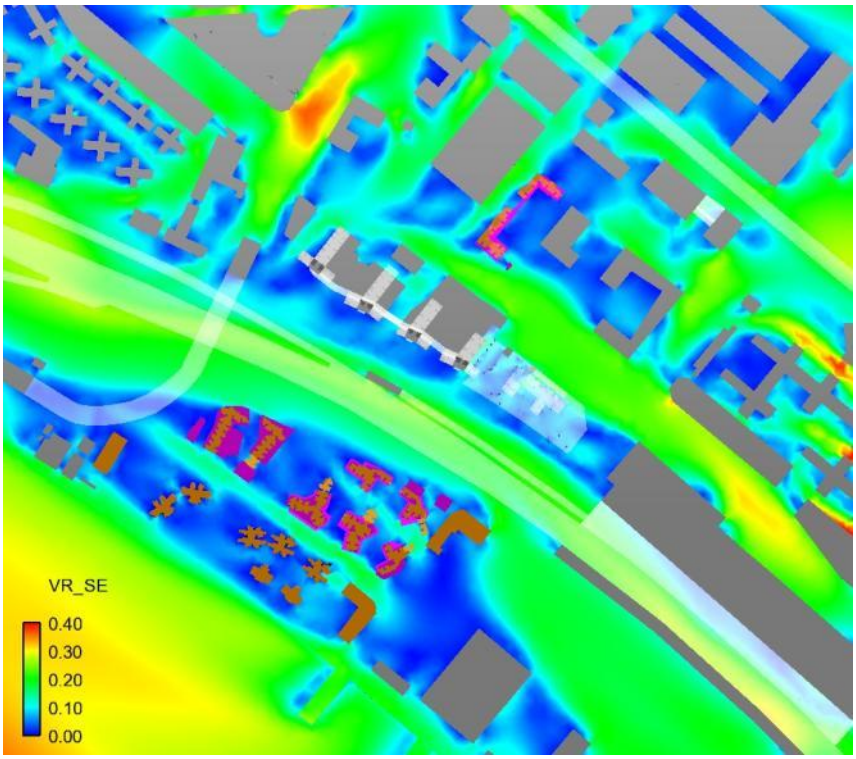
ENE Direction (Indicative Scheme)



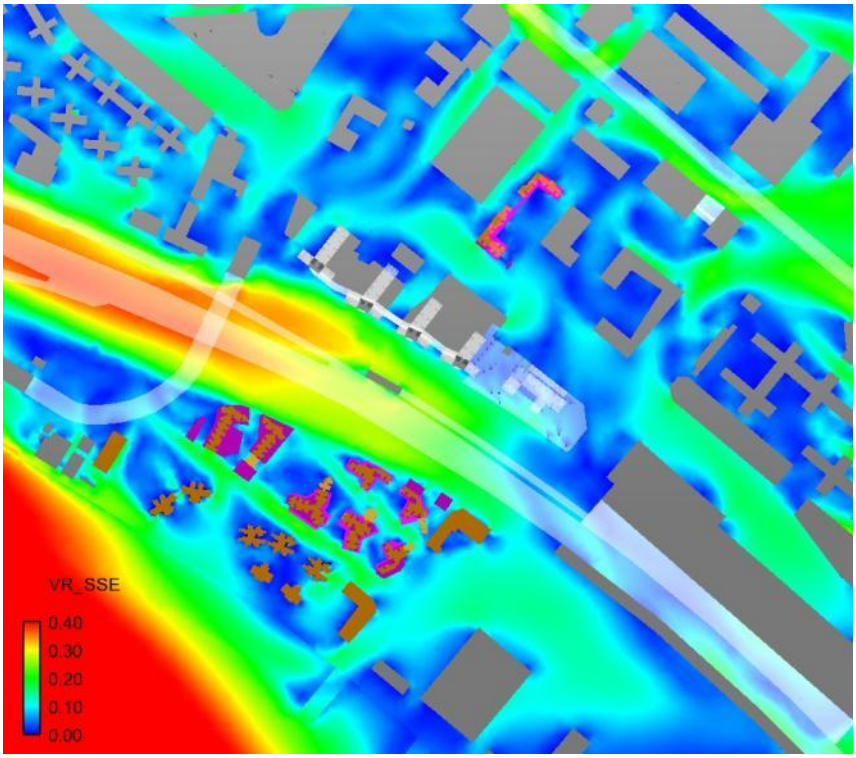
E Direction (Indicative Scheme)



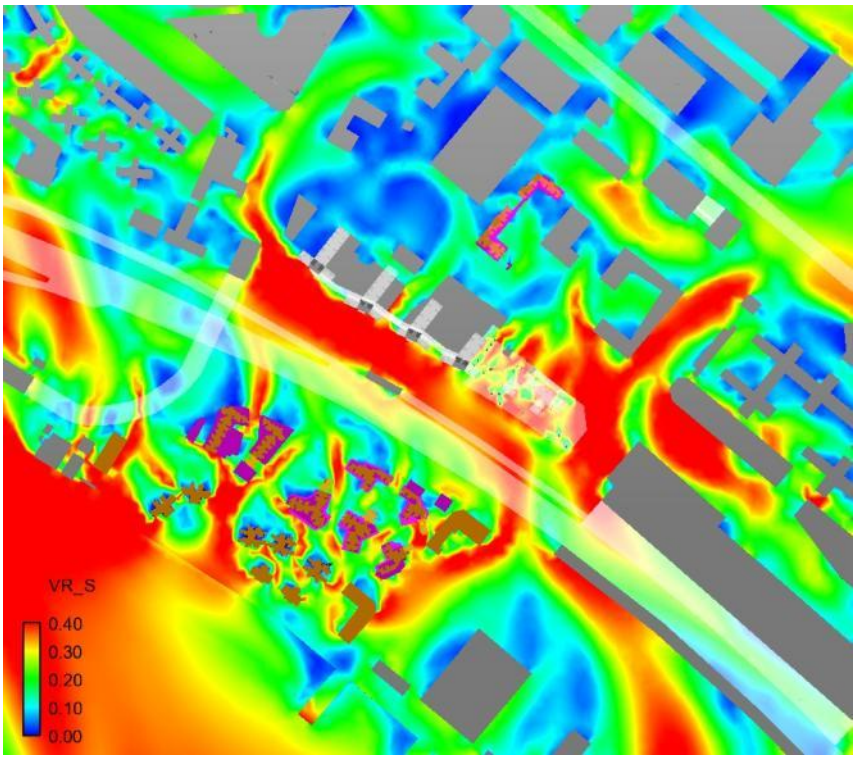
ESE Direction (Indicative Scheme)



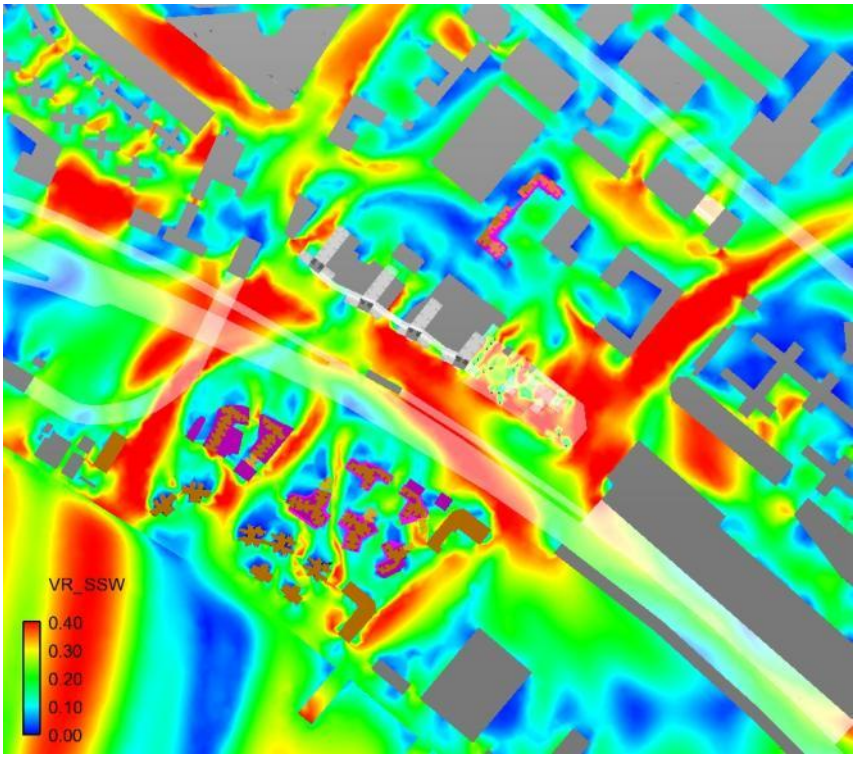
SE Direction (Indicative Scheme)



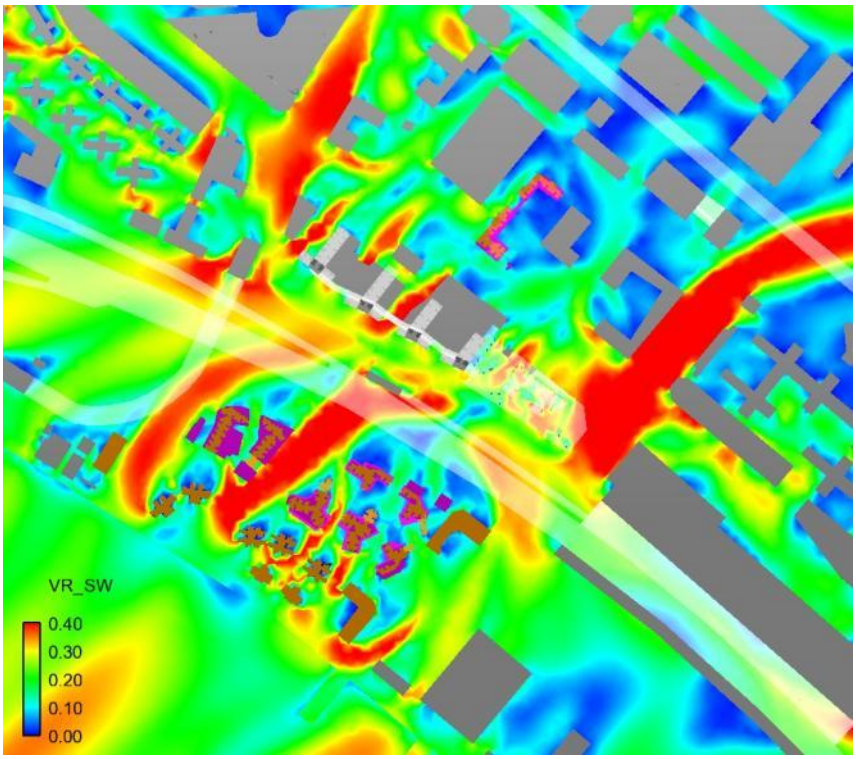
SSE Direction (Indicative Scheme)



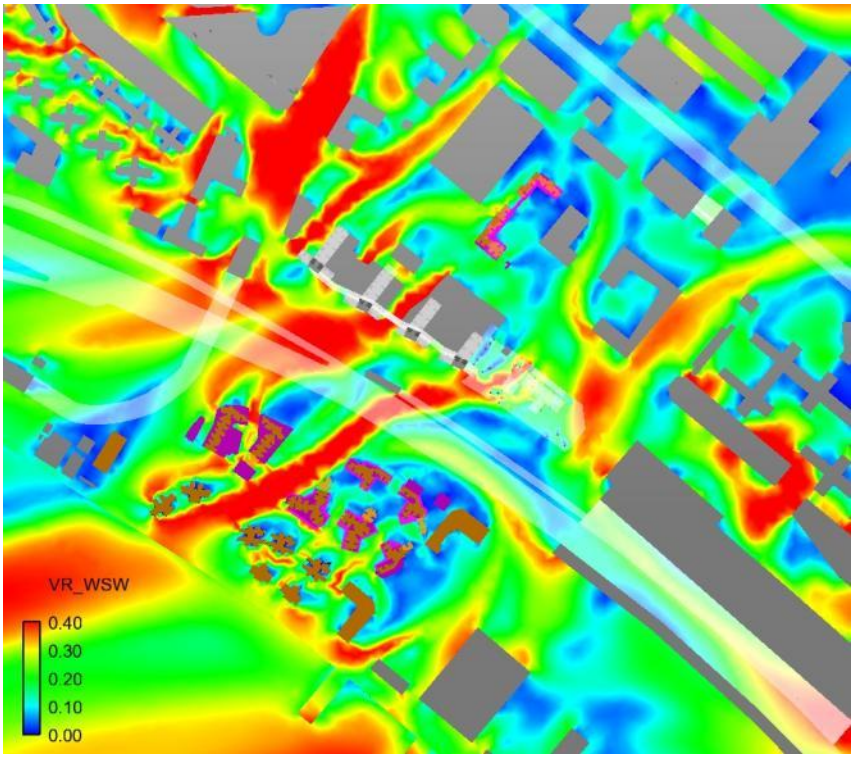
S Direction (Indicative Scheme)



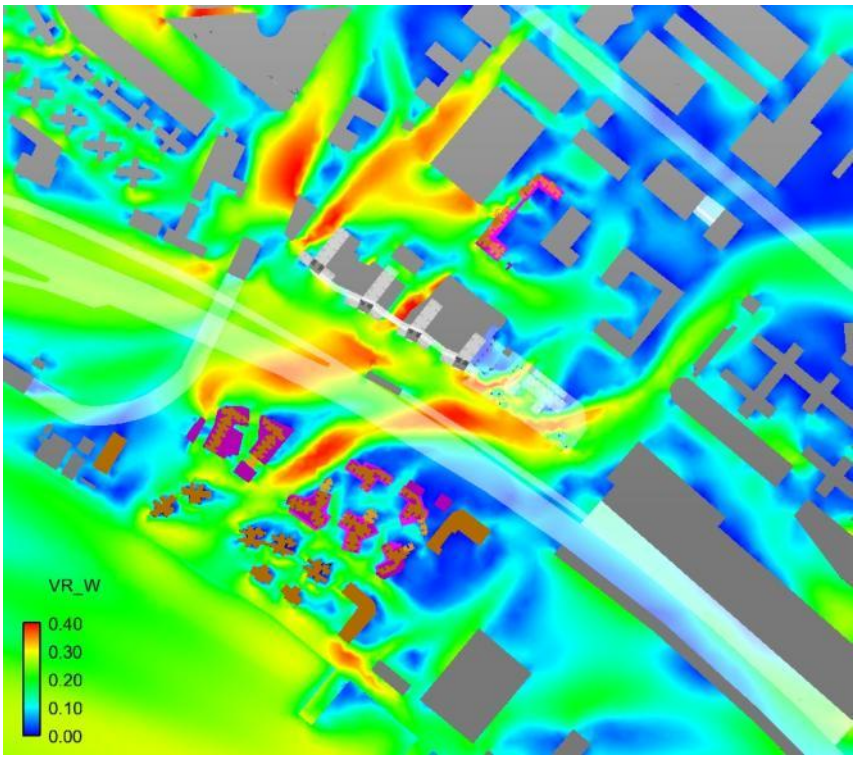
SSW Direction (Indicative Scheme)



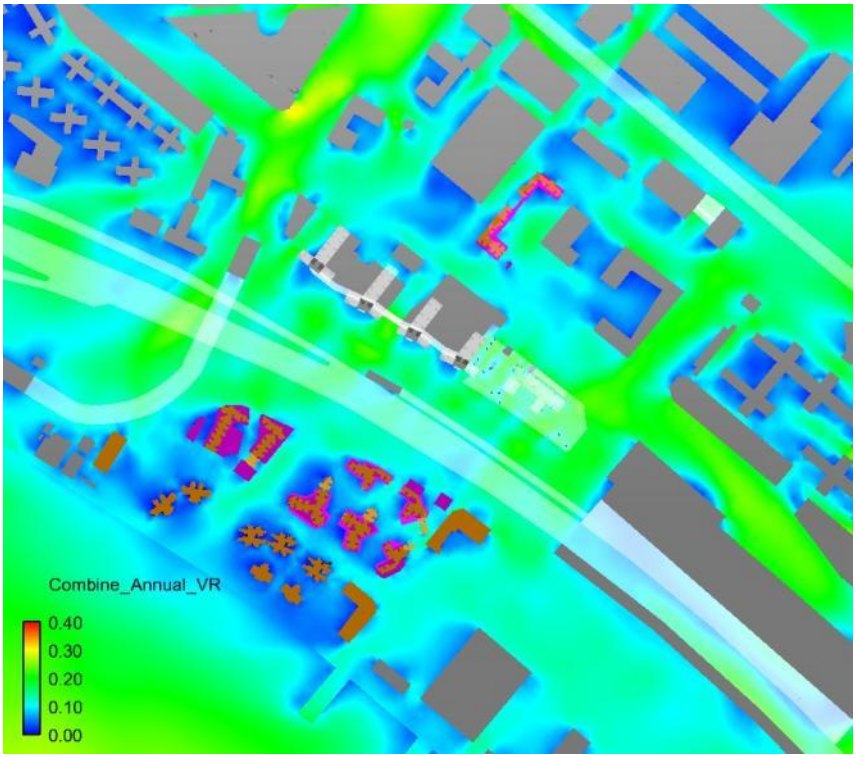
SW Direction (Indicative Scheme)



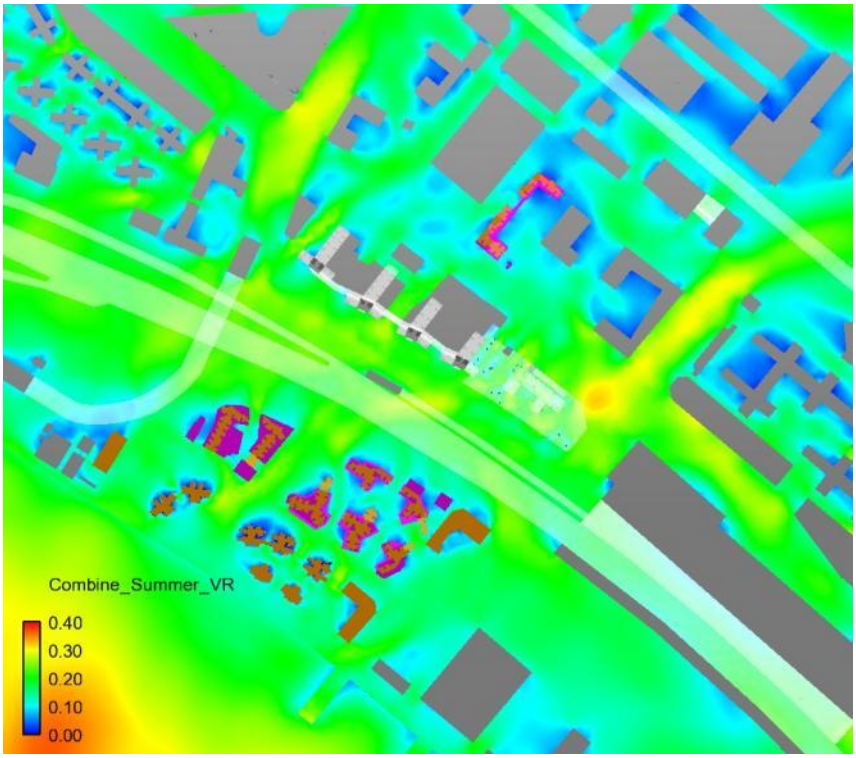
WSW Direction (Indicative Scheme)



W Direction (Indicative Scheme)

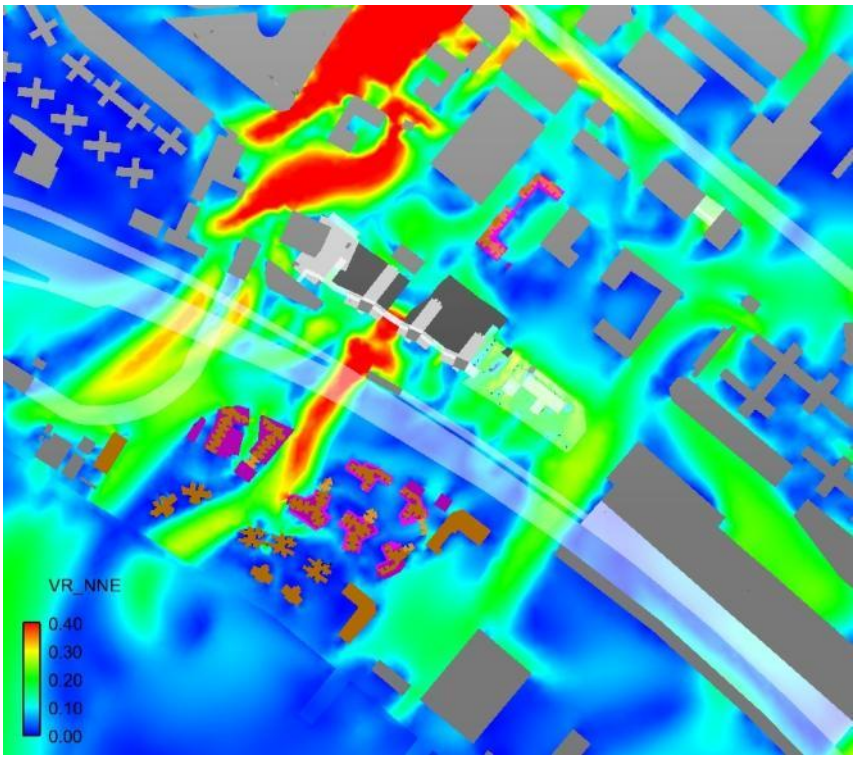


Combine Annual (Indicative Scheme)

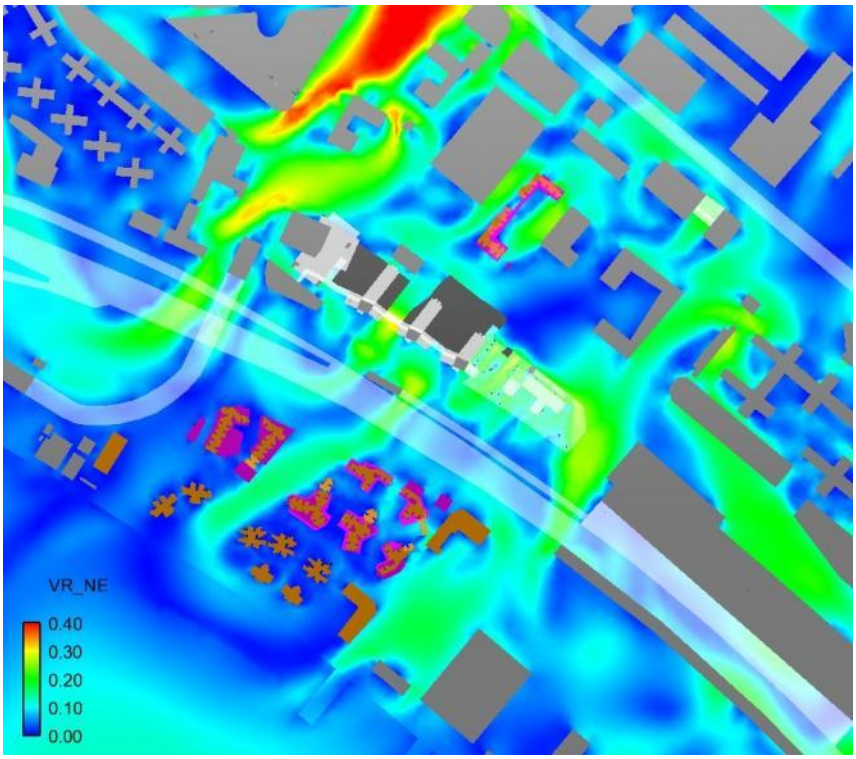


Combine Summer (Indicative Scheme)

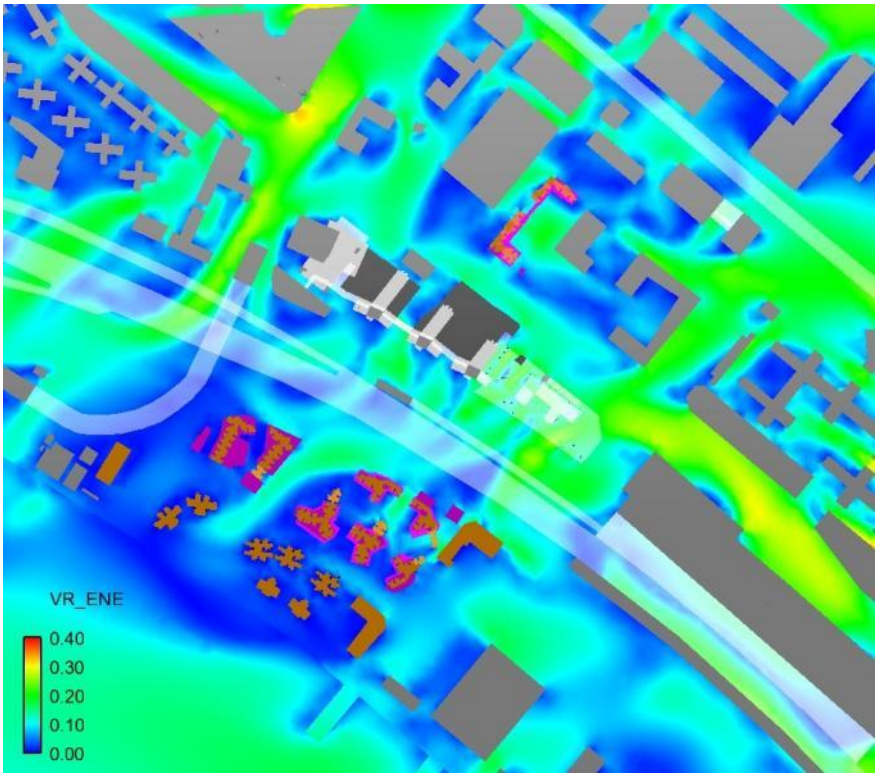
C3 Further Enhanced Scheme Directional VR Contour Plots



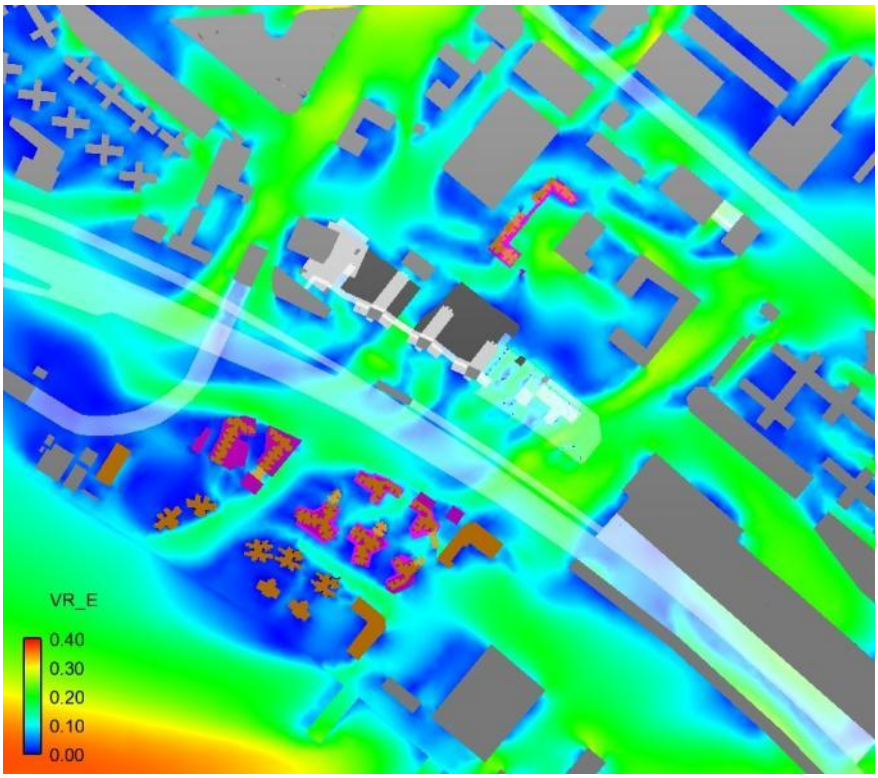
NNE Direction (Further Enhanced Scheme)



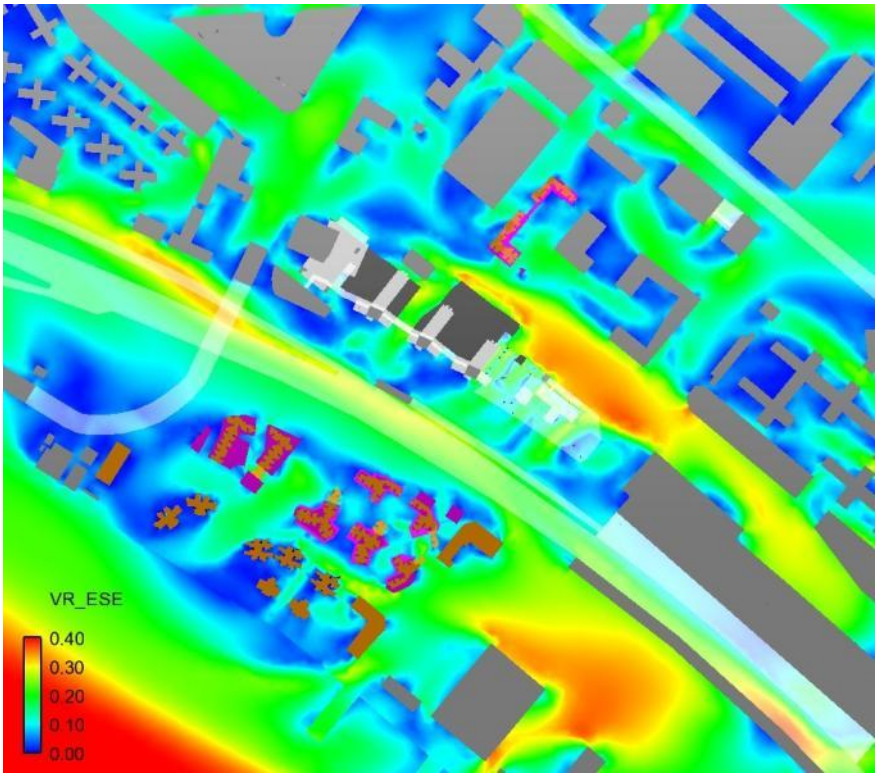
NE Direction (Further Enhanced Scheme)



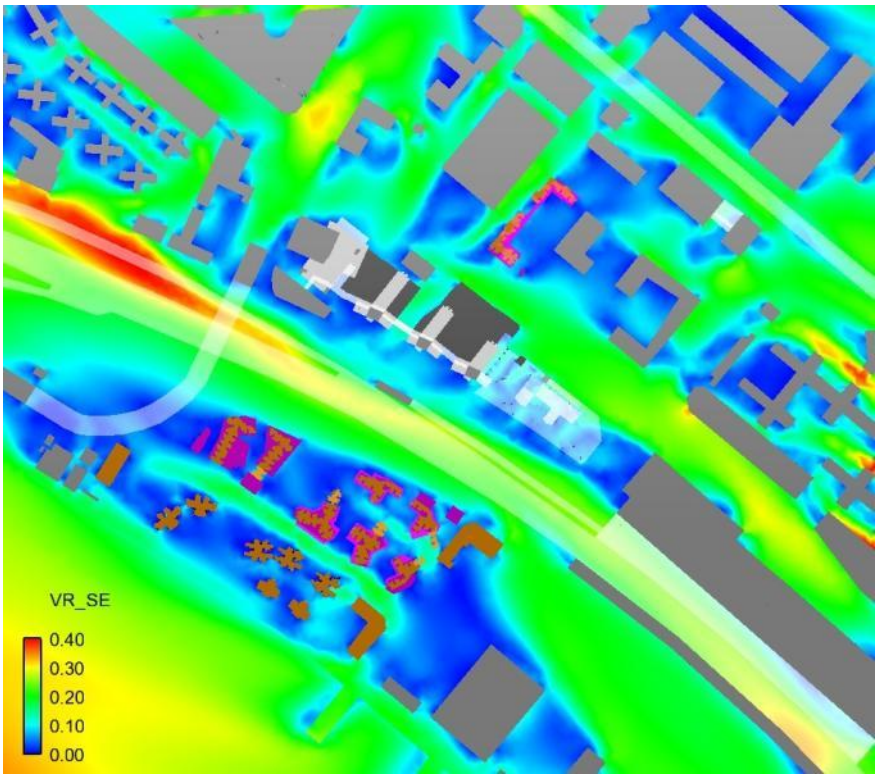
ENE Direction (Further Enhanced Scheme)



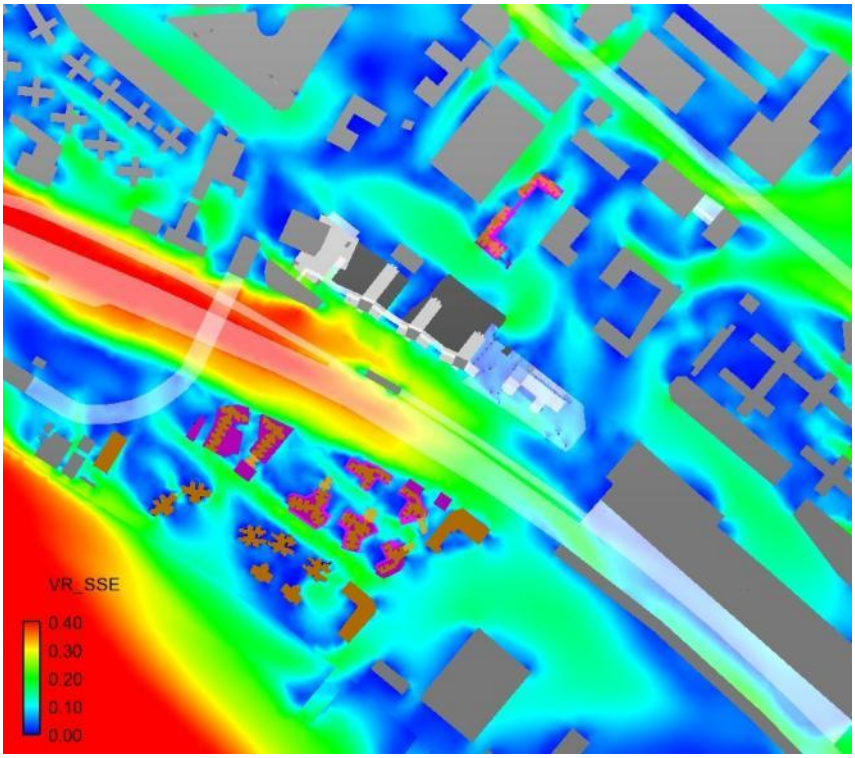
E Direction (Further Enhanced Scheme)



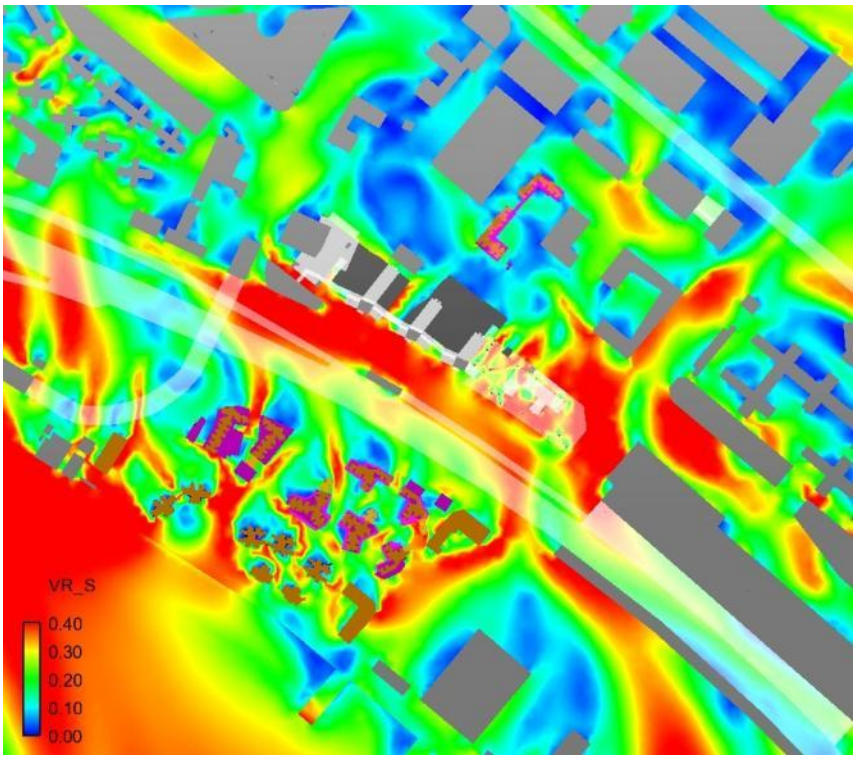
ESE Direction (Further Enhanced Scheme)



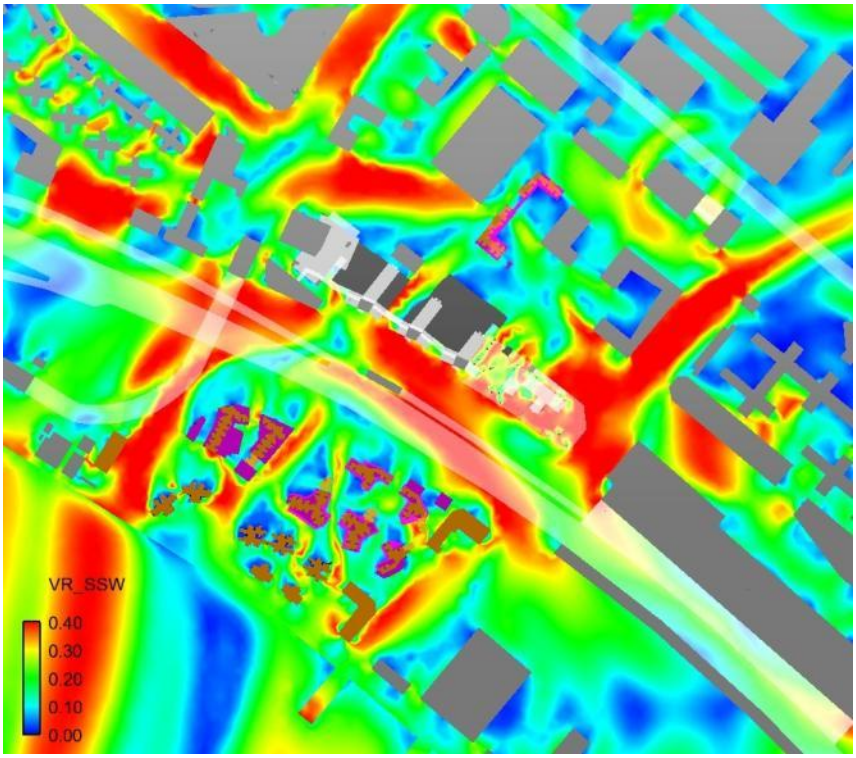
SE Direction (Further Enhanced Scheme)



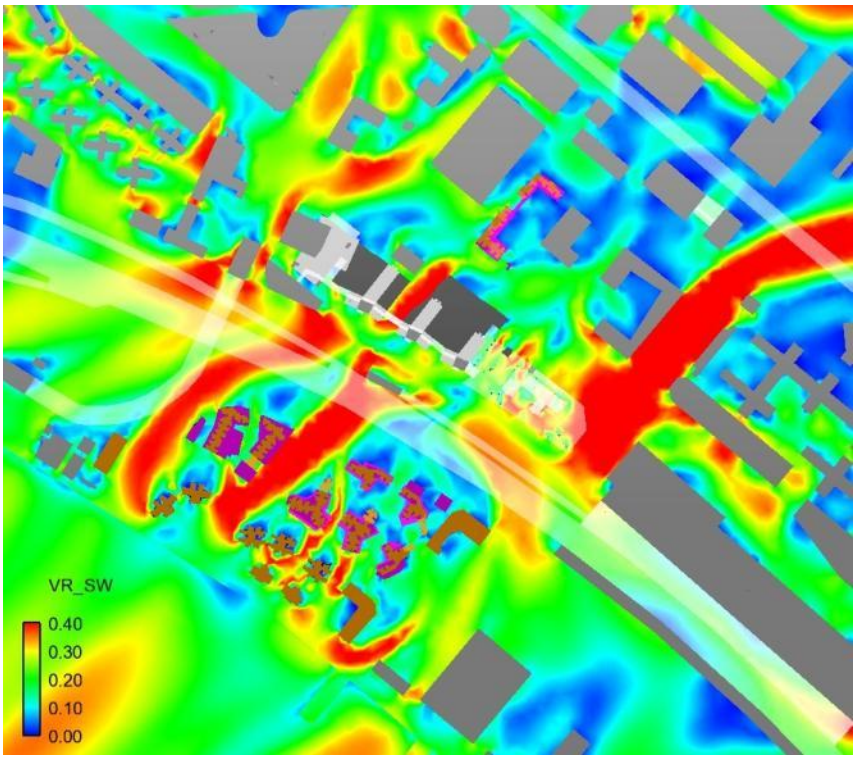
SSE Direction (Further Enhanced Scheme)



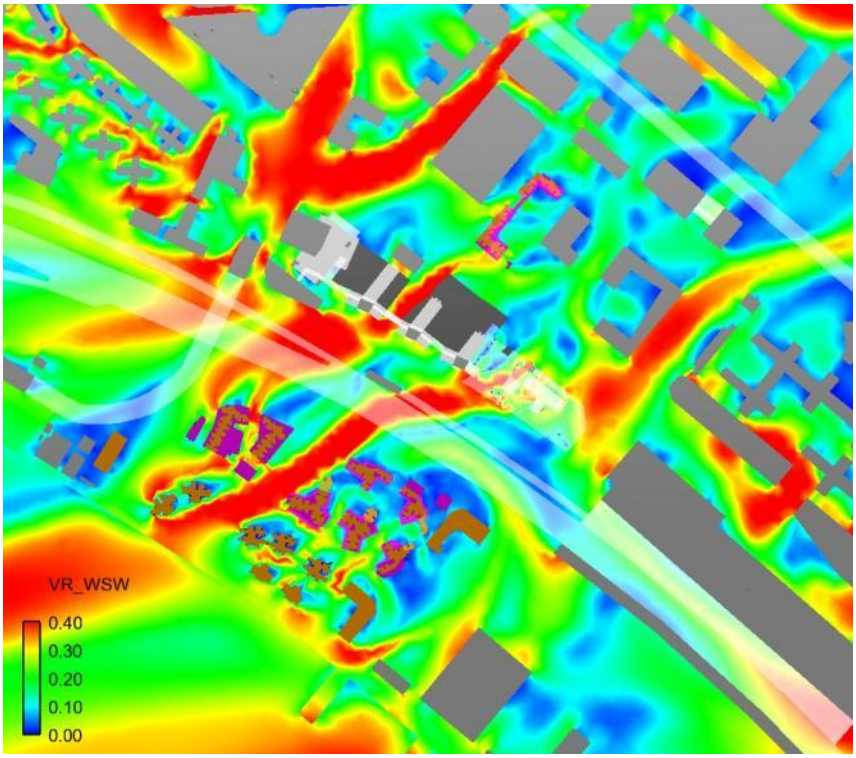
S Direction (Further Enhanced Scheme)



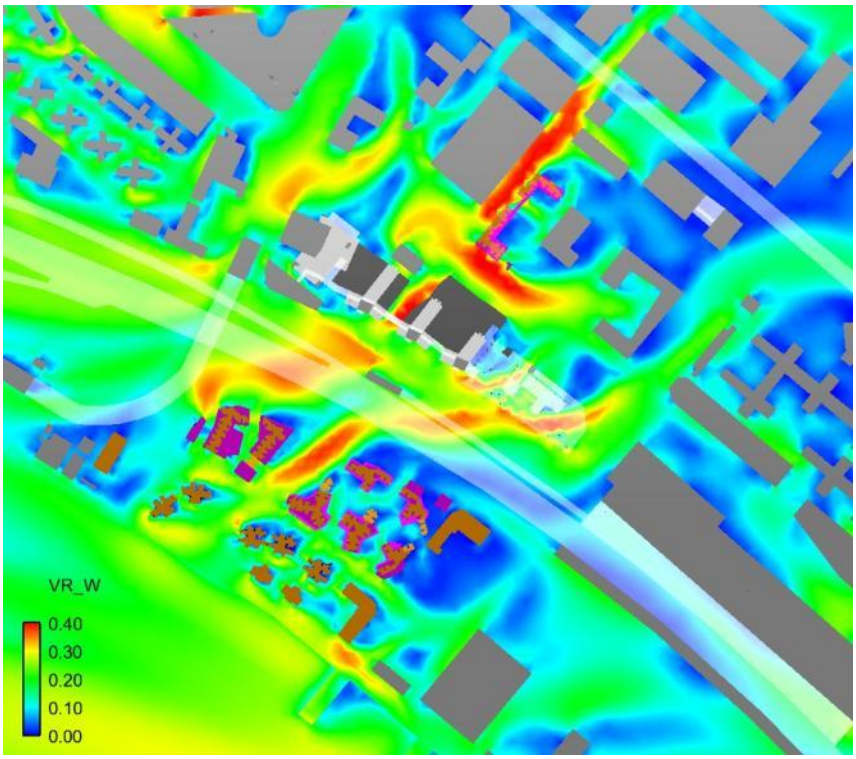
SSW Direction (Further Enhanced Scheme)



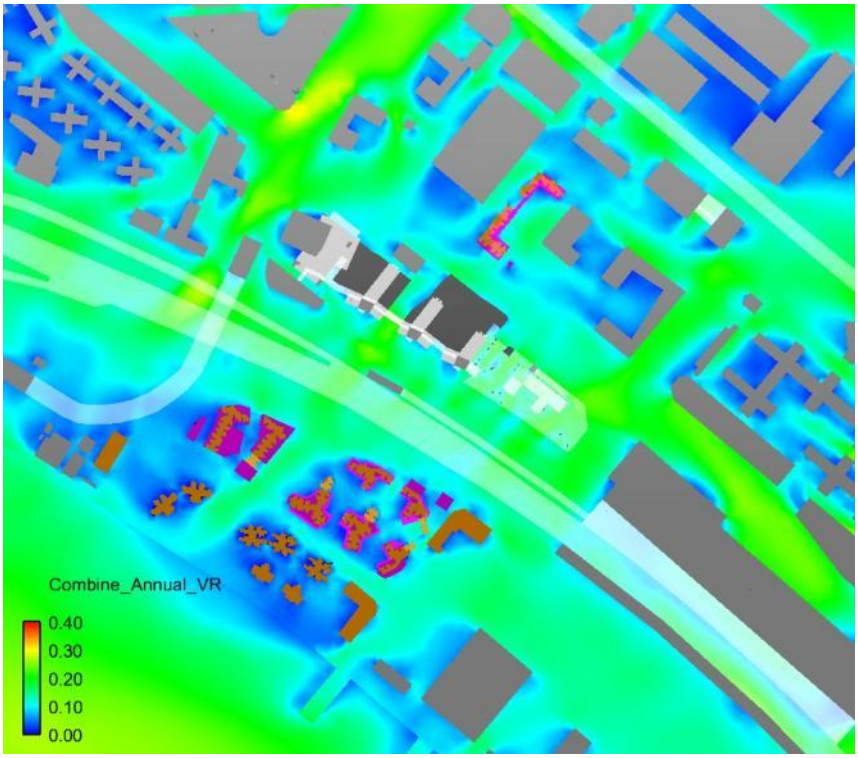
SW Direction (Further Enhanced Scheme)



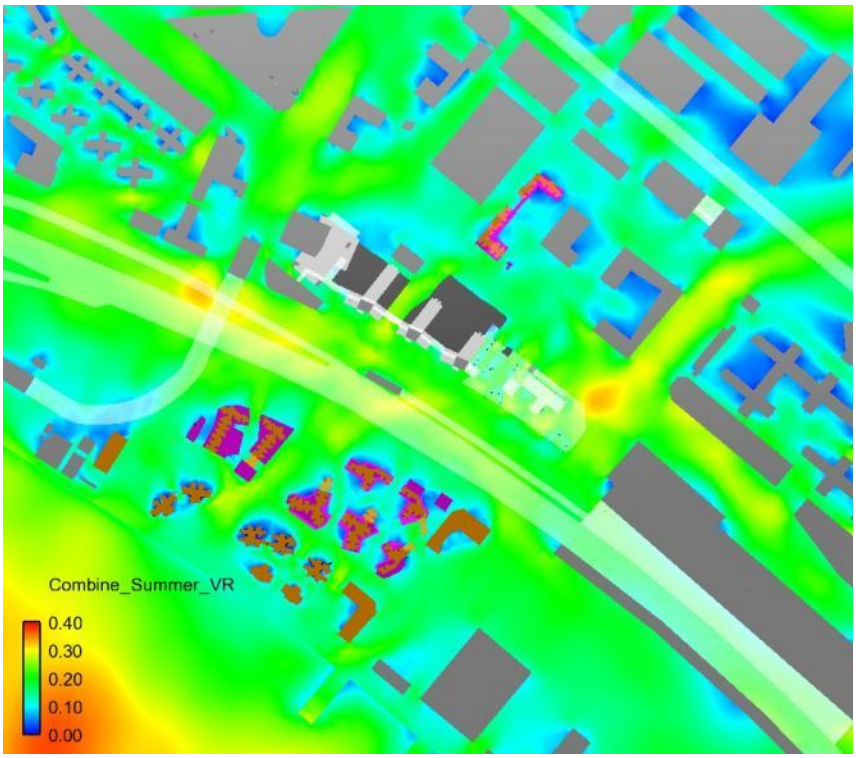
WSW Direction (Further Enhanced Scheme)



W Direction (Indicative Scheme)



9 Combine Annual (Further Enhanced Scheme)

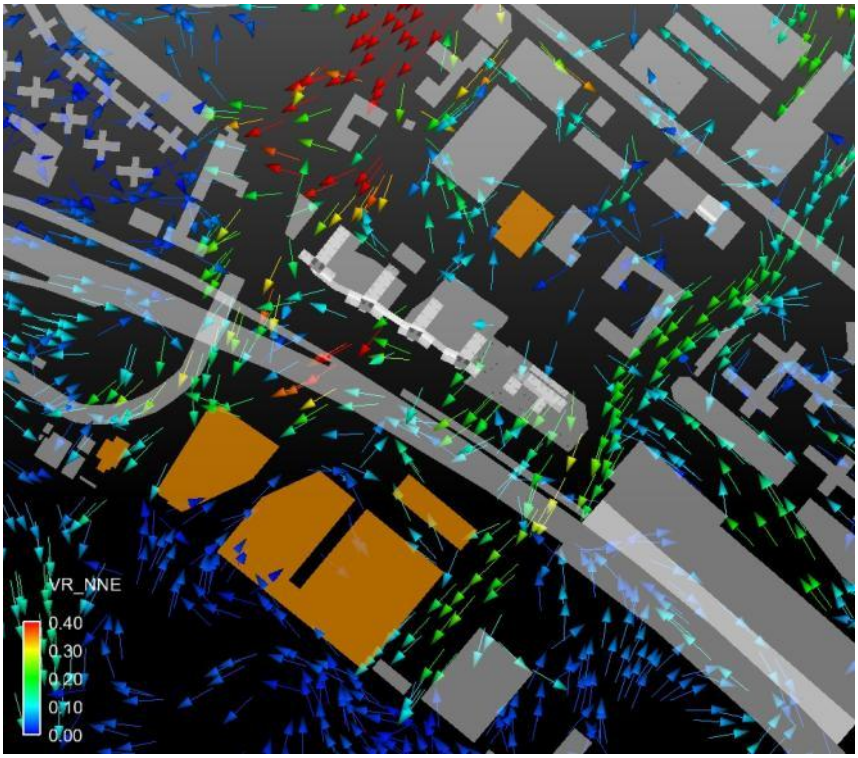


Combine Summer (Further Enhanced Scheme)

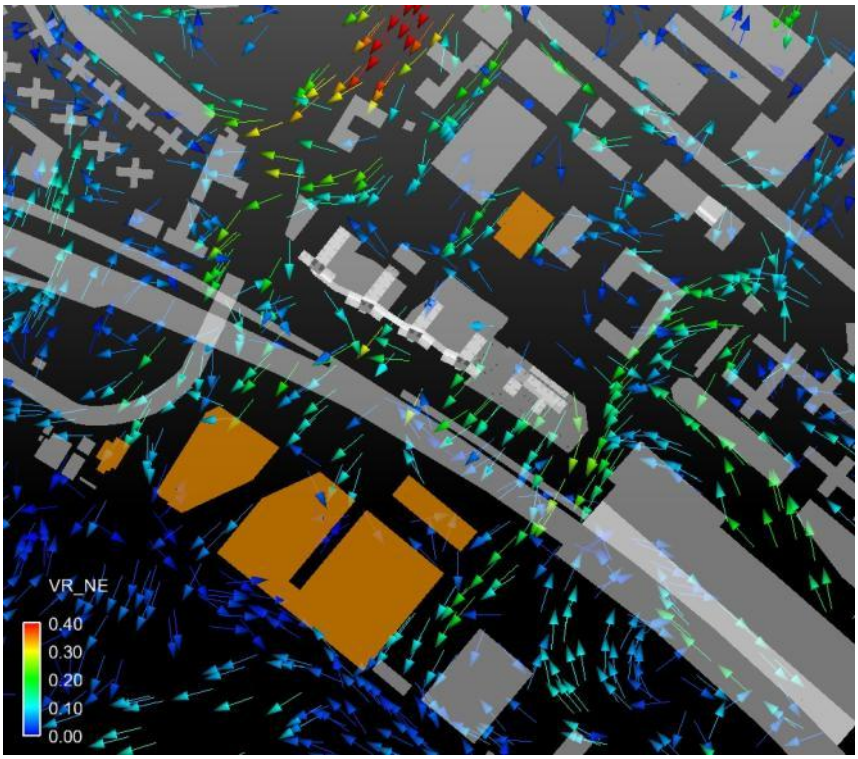
Appendix D

Directional VR Vector Plots

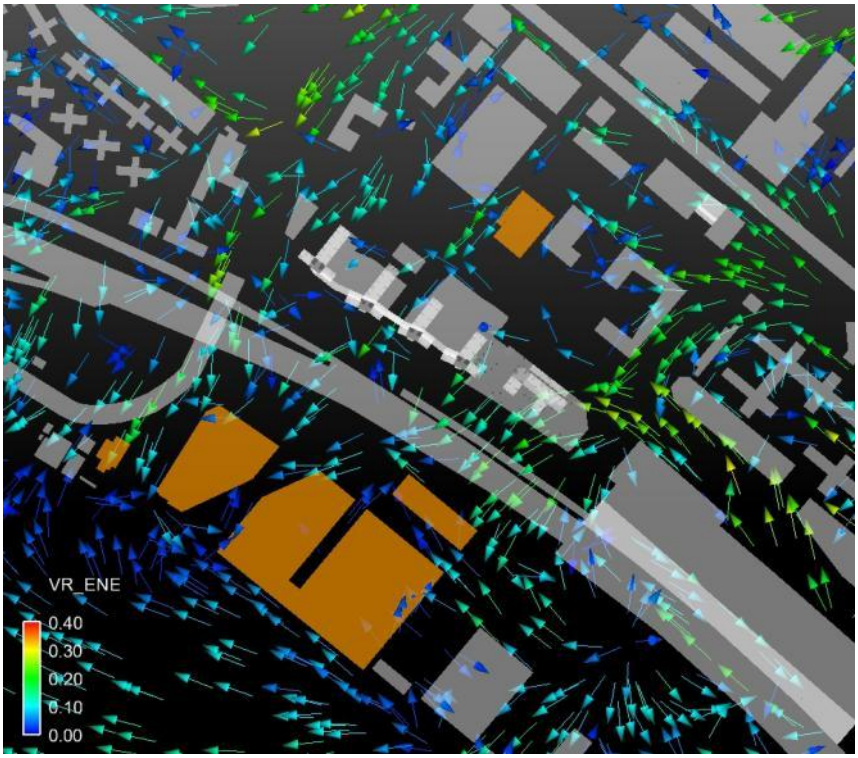
D1 Baseline Scheme Directional VR Vector Plots



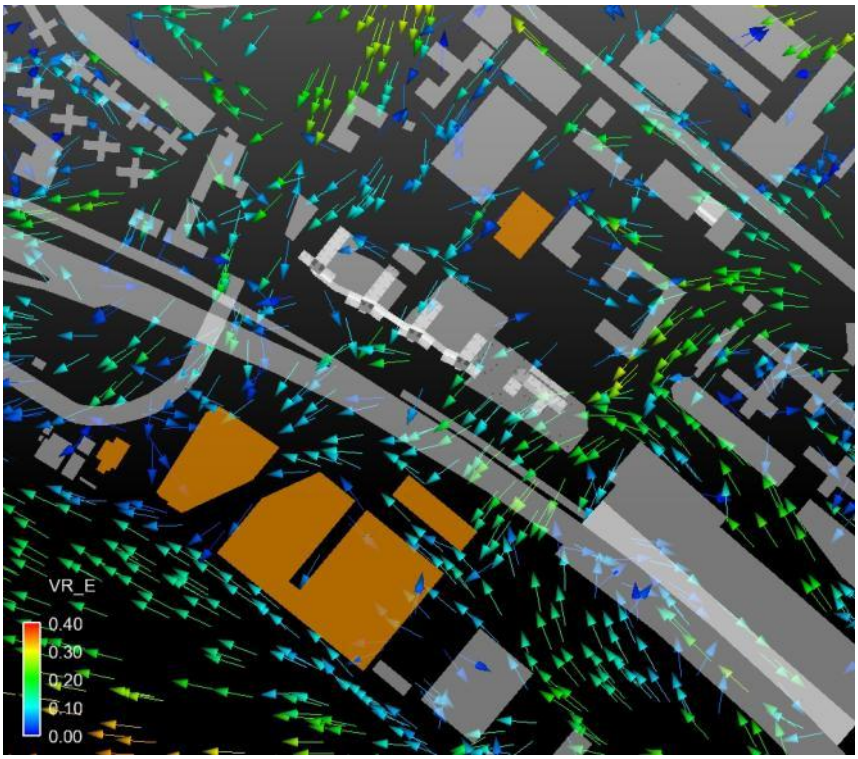
NNE Direction (Baseline Scheme)



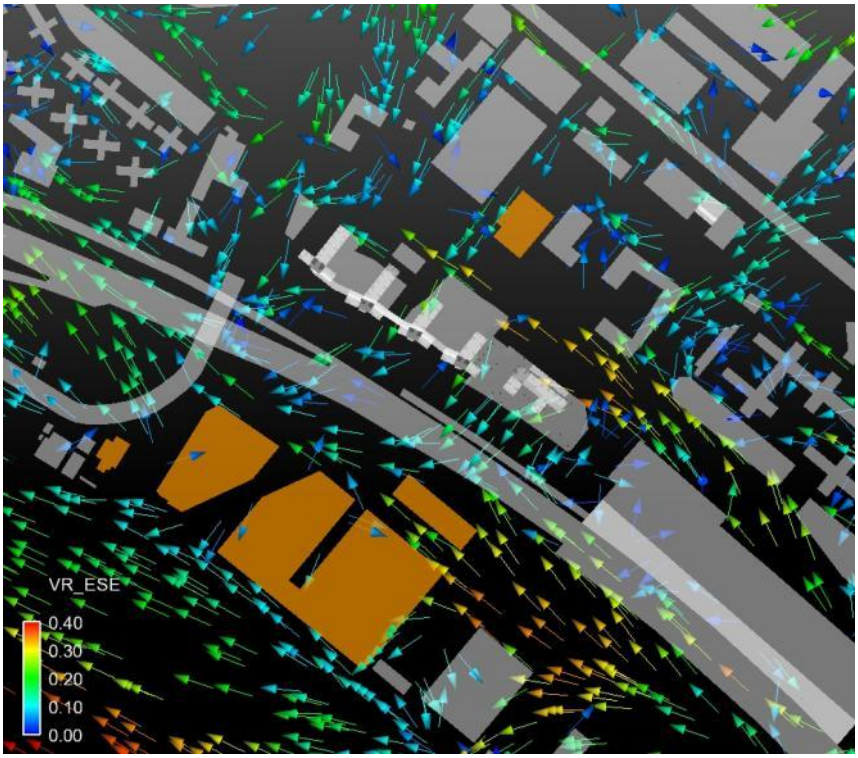
NE Direction (Baseline Scheme)



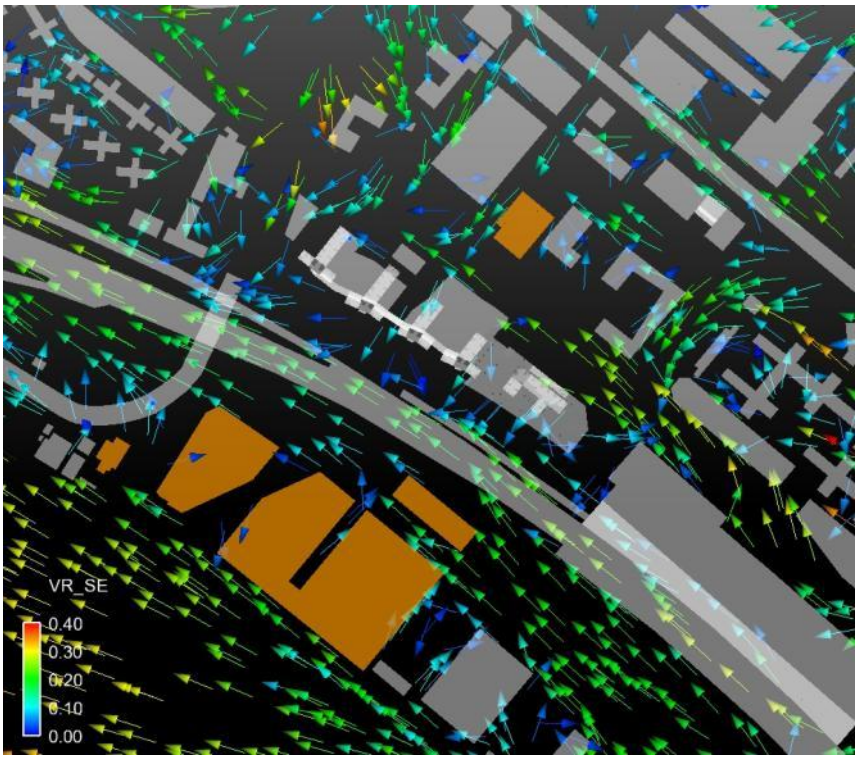
ENE Direction (Baseline Scheme)



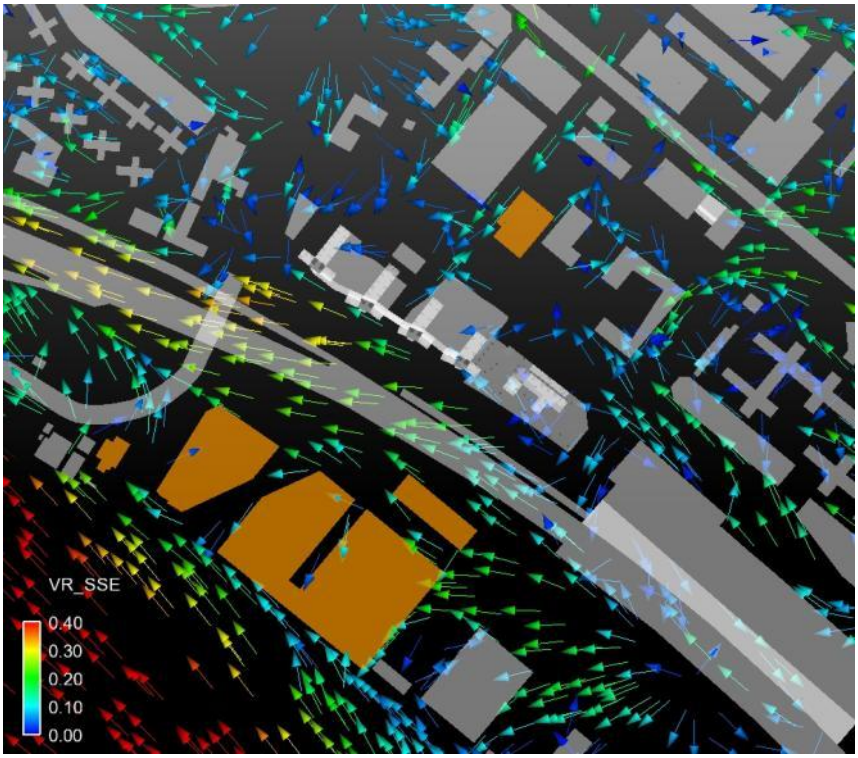
E Direction (Baseline Scheme)



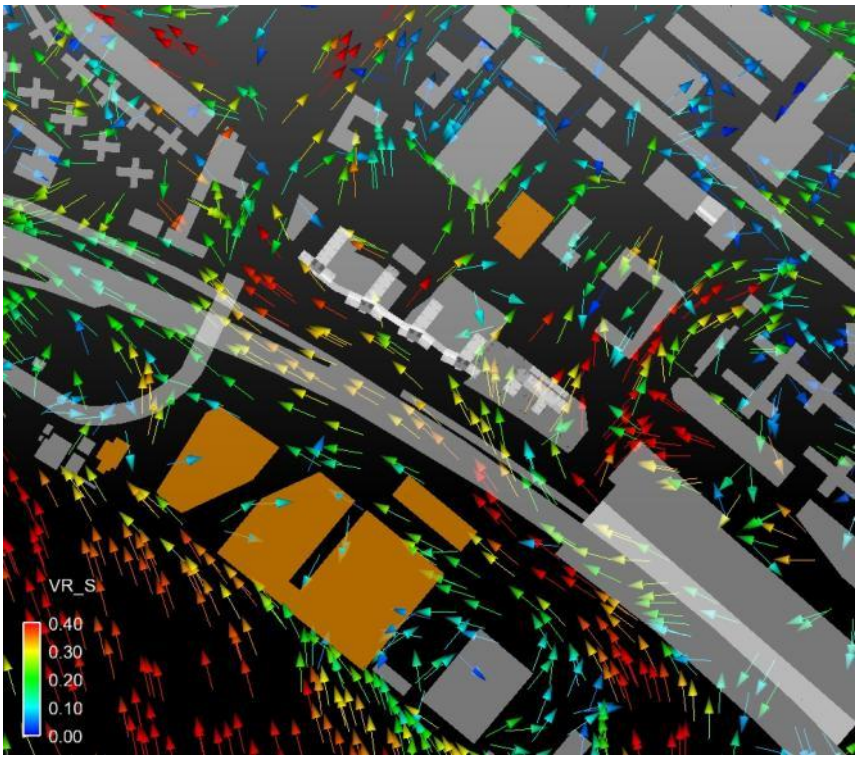
ESE Direction (Baseline Scheme)



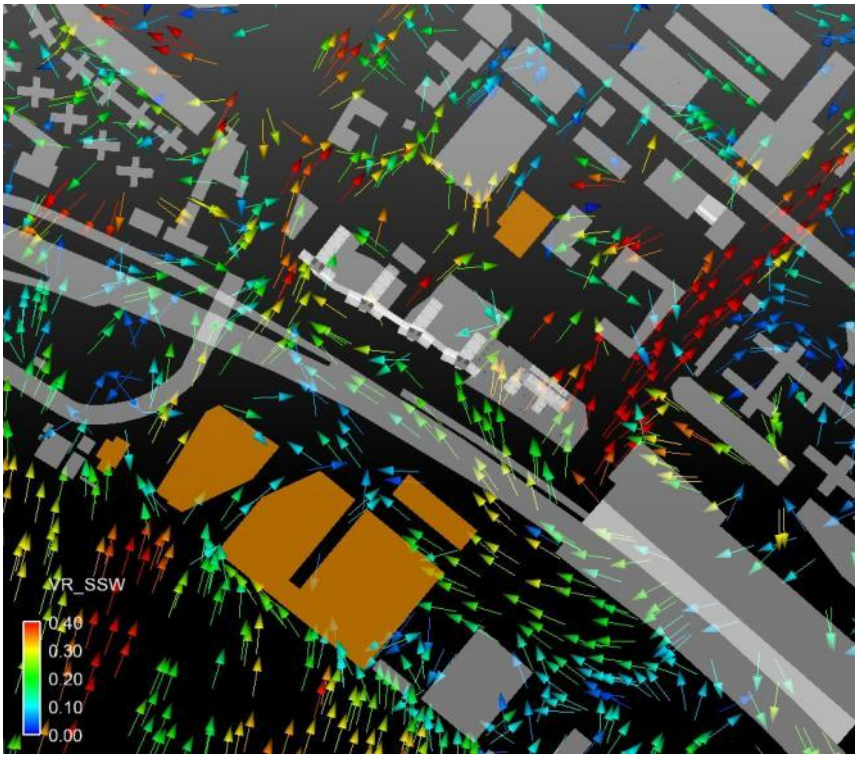
SE Direction (Baseline Scheme)



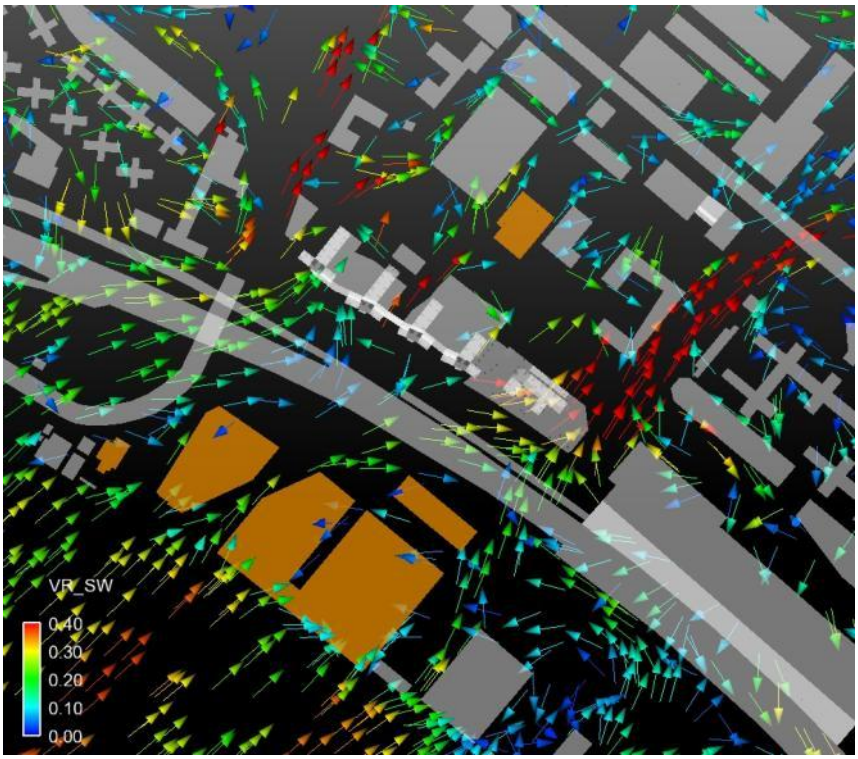
SSE Direction (Baseline Scheme)



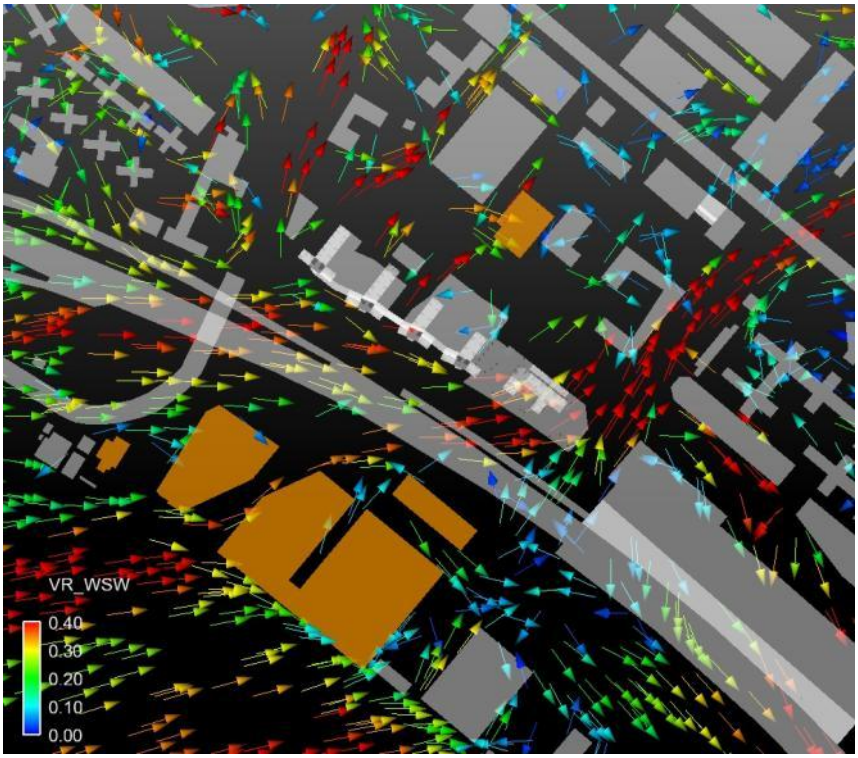
S Direction (Baseline Scheme)



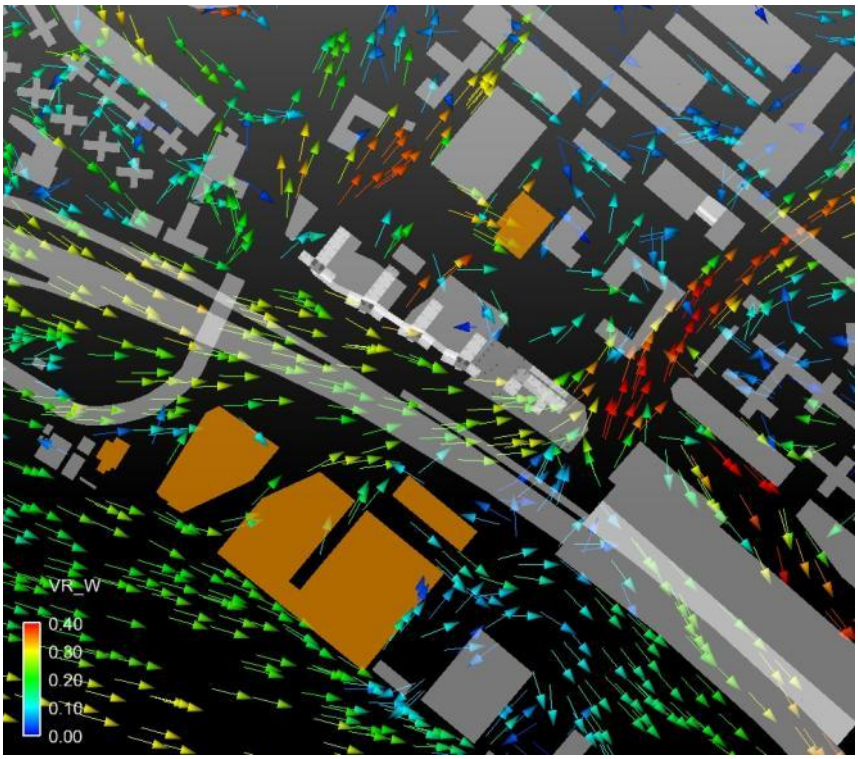
SSW Direction (Baseline Scheme)



SW Direction (Baseline Scheme)

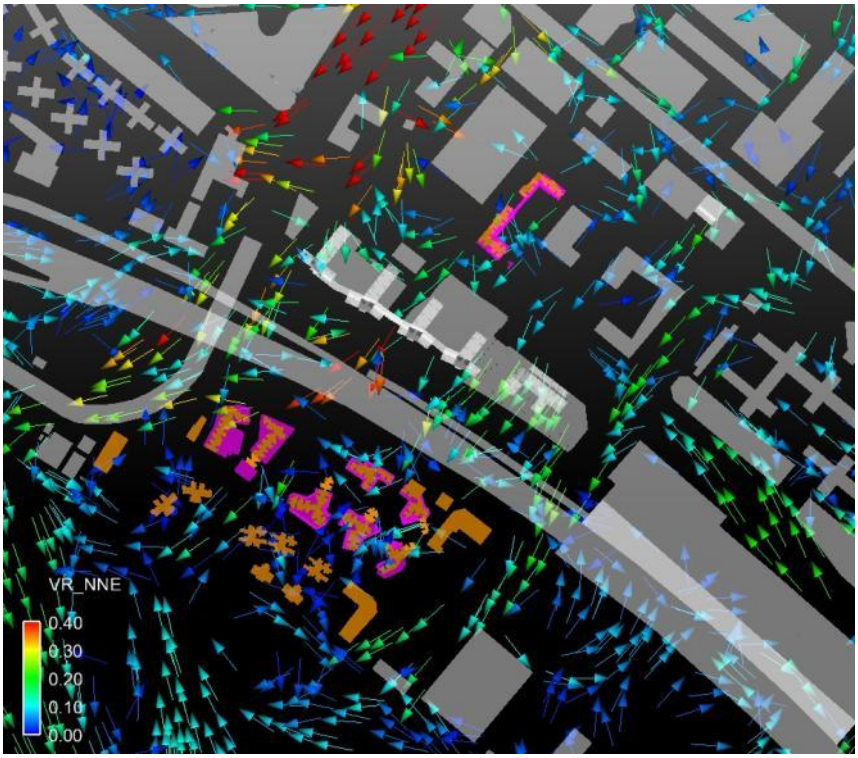


WSW Direction (Baseline Scheme)

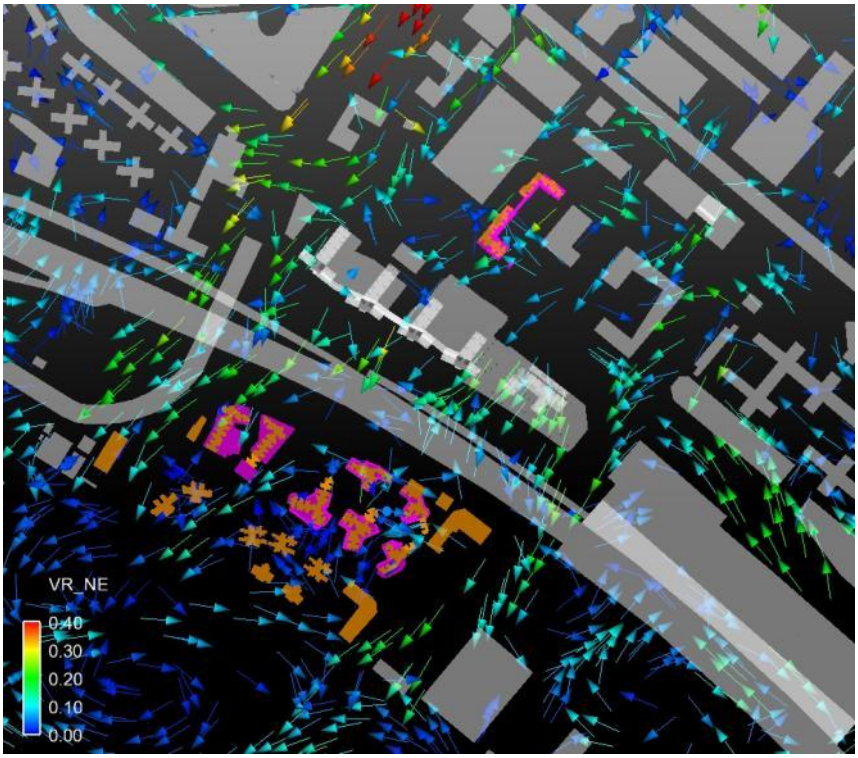


W Direction (Baseline Scheme)

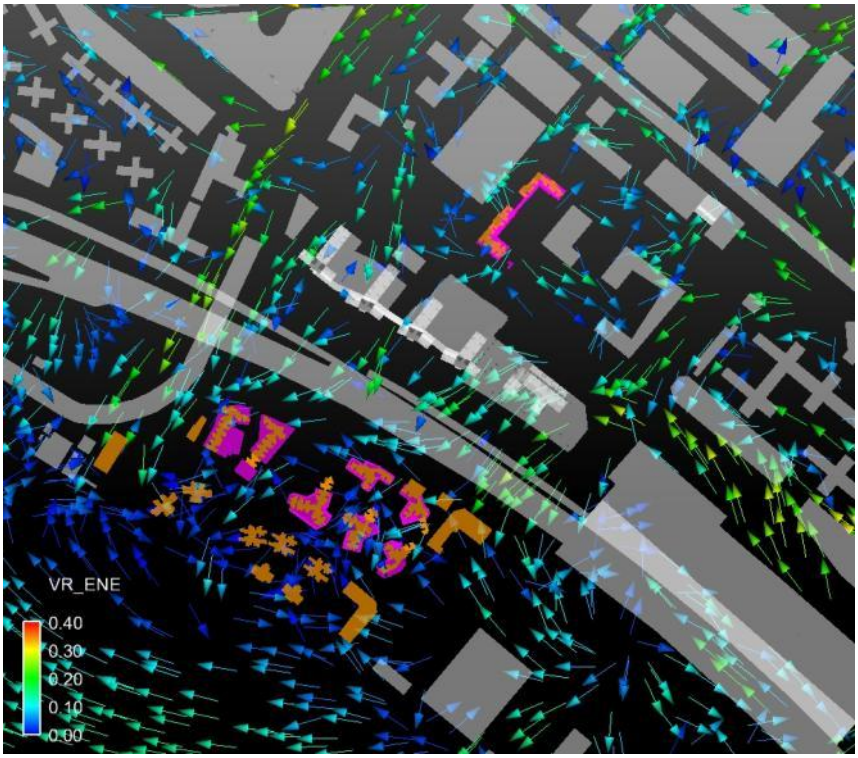
D2 Indicative Scheme Directional VR Vector Plots



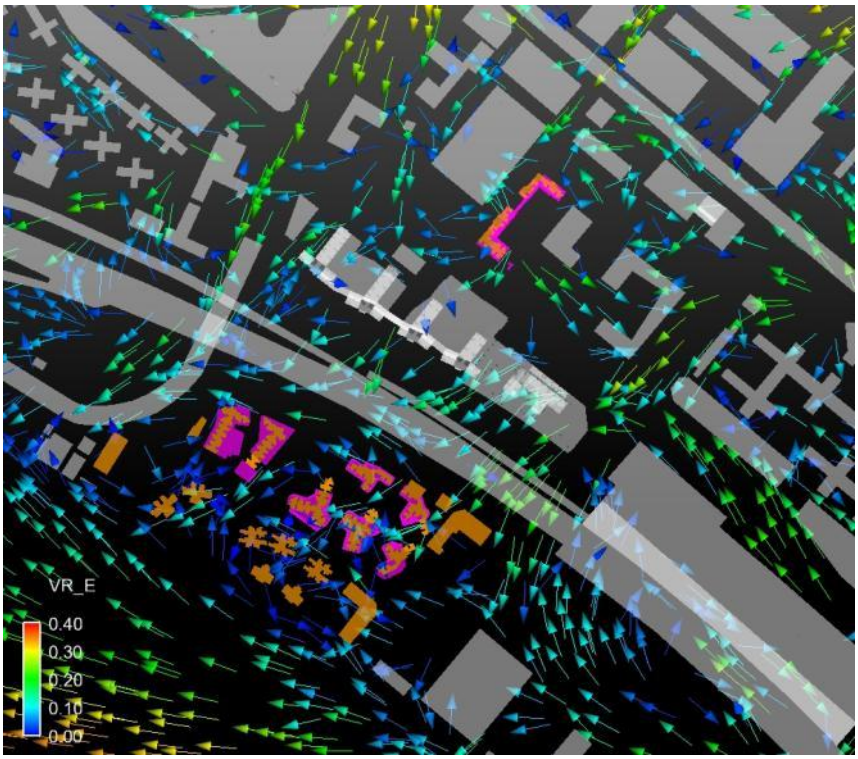
NNE Direction (Indicative Scheme)



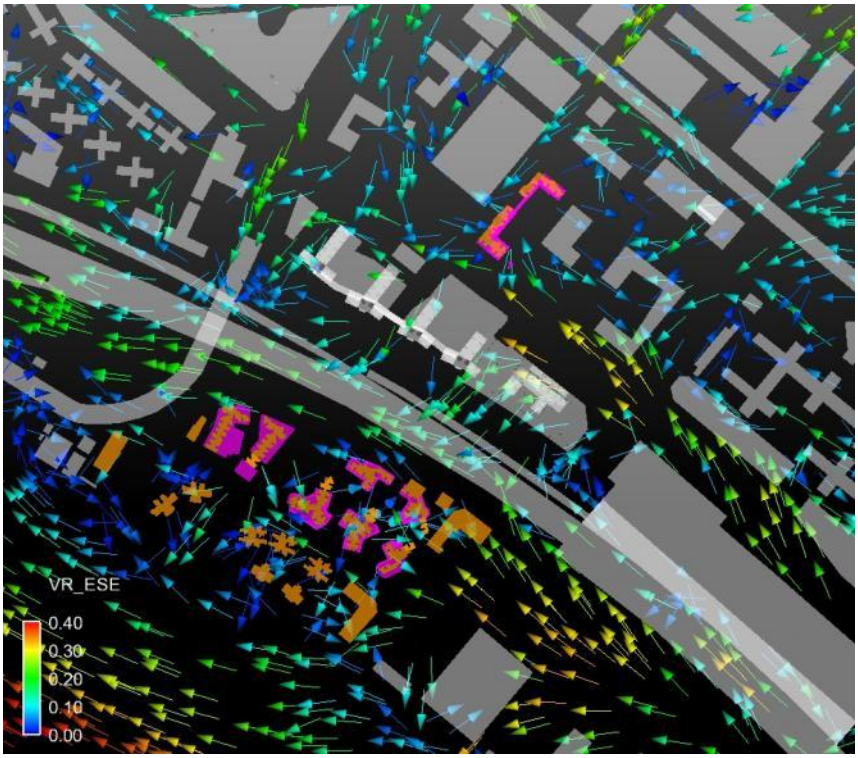
NE Direction (Indicative Scheme)



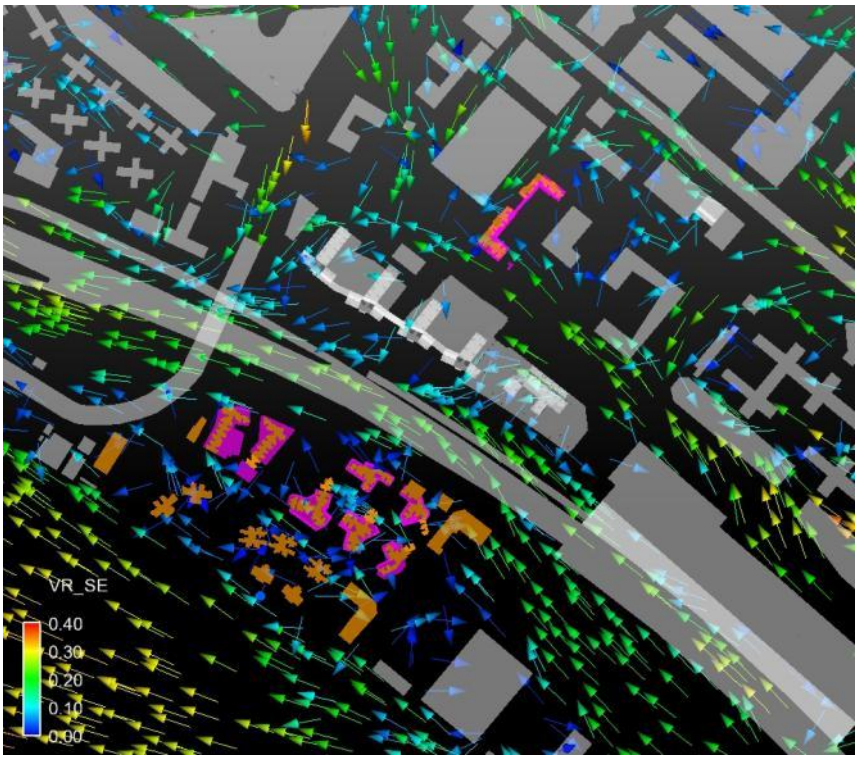
ENE Direction (Indicative Scheme)



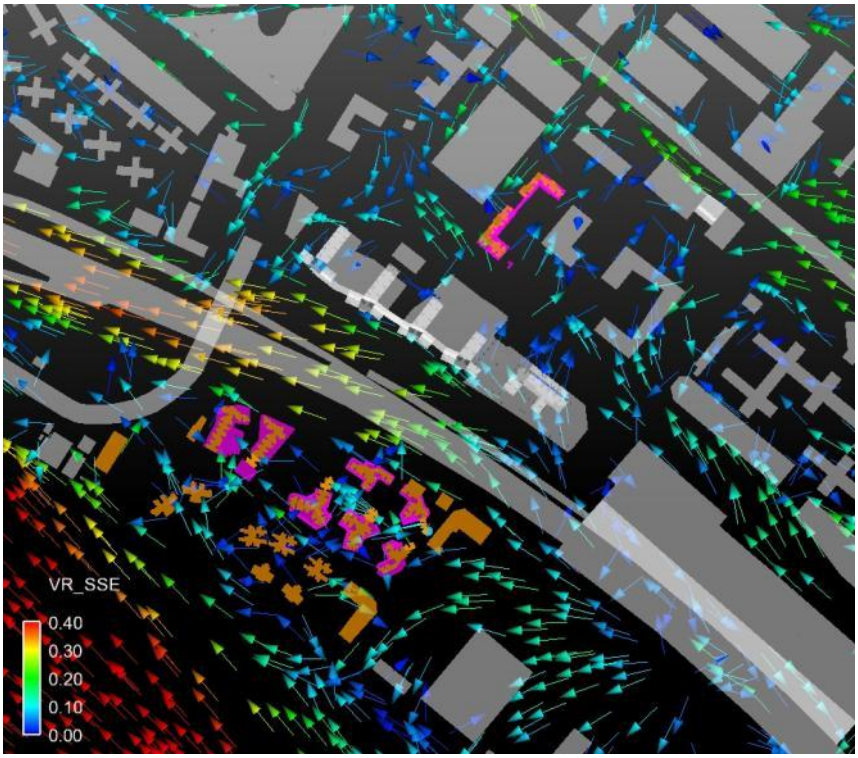
E Direction (Indicative Scheme)



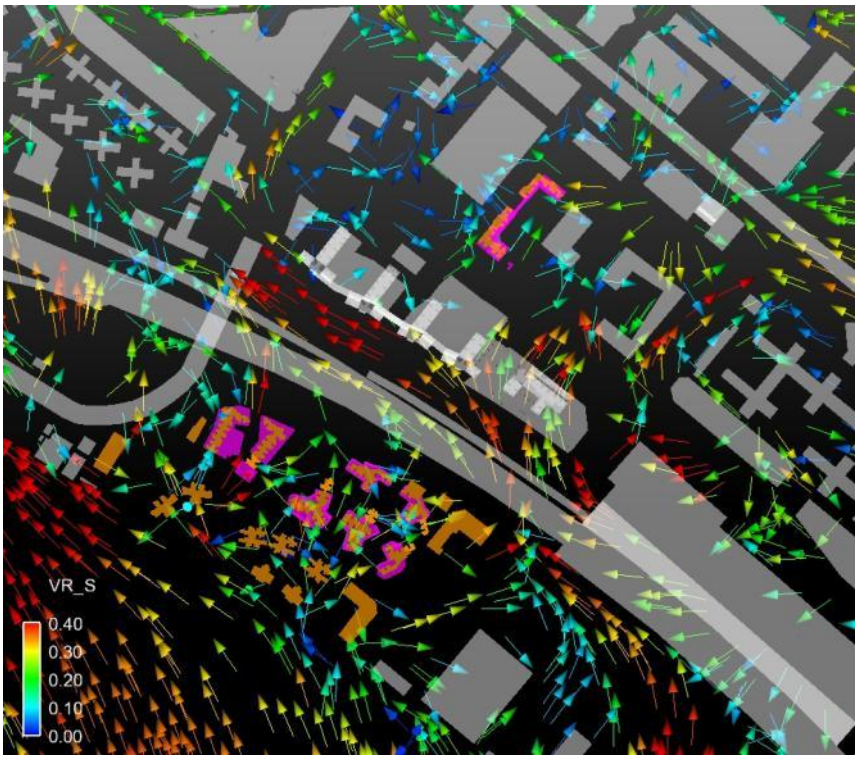
ESE Direction (Indicative Scheme)



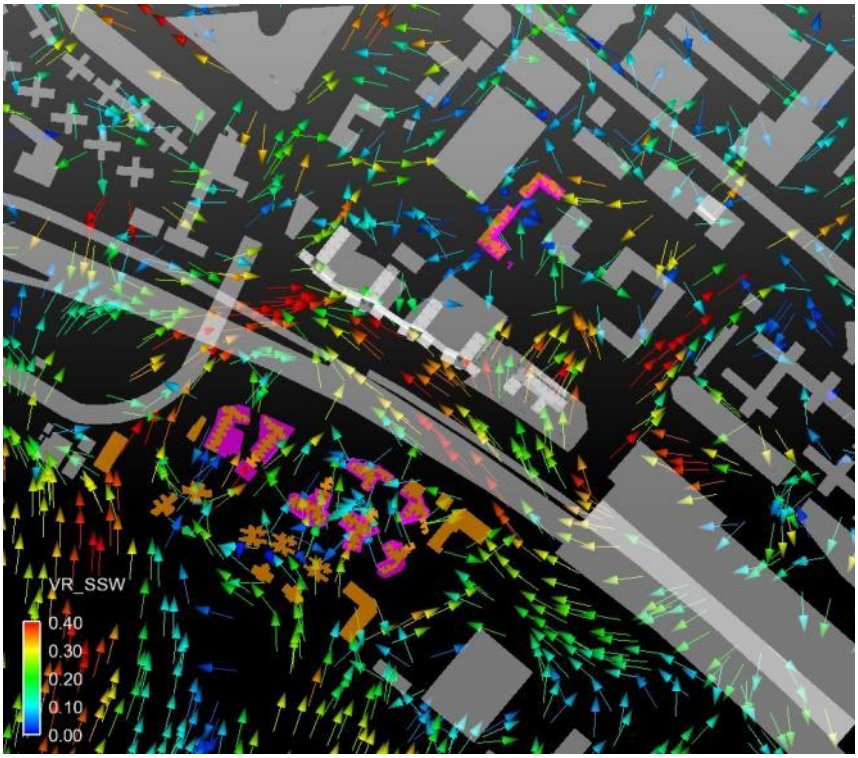
SE Direction (Indicative Scheme)



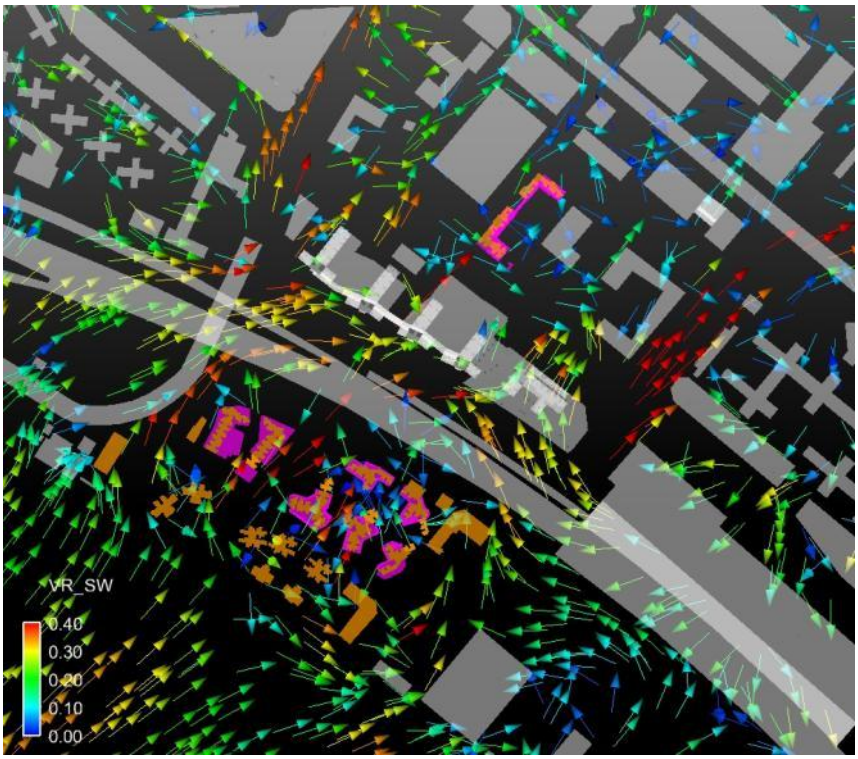
SSE Direction (Indicative Scheme)



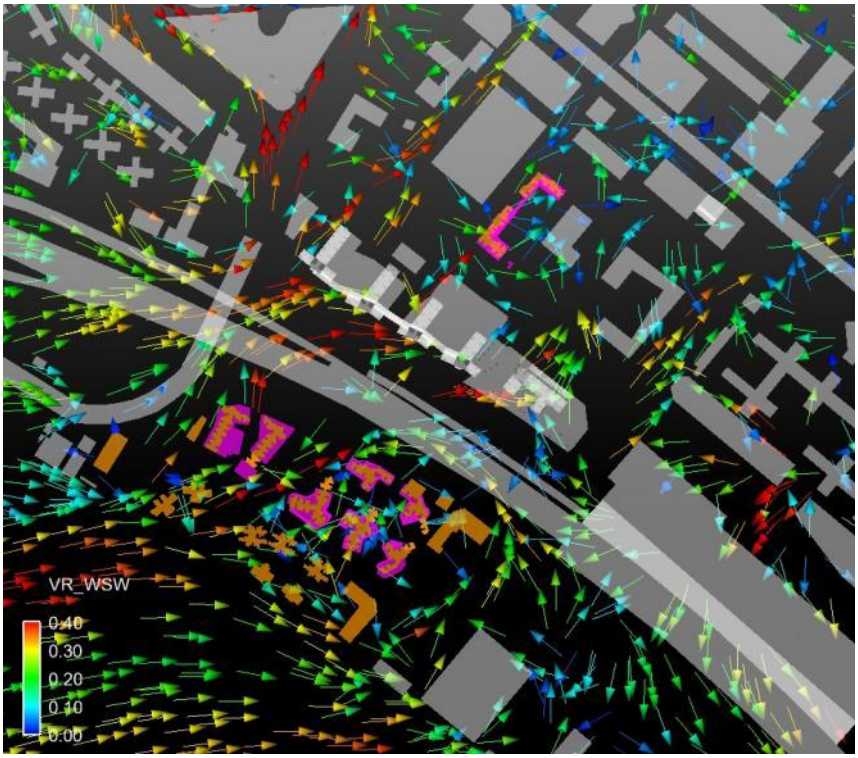
S Direction (Indicative Scheme)



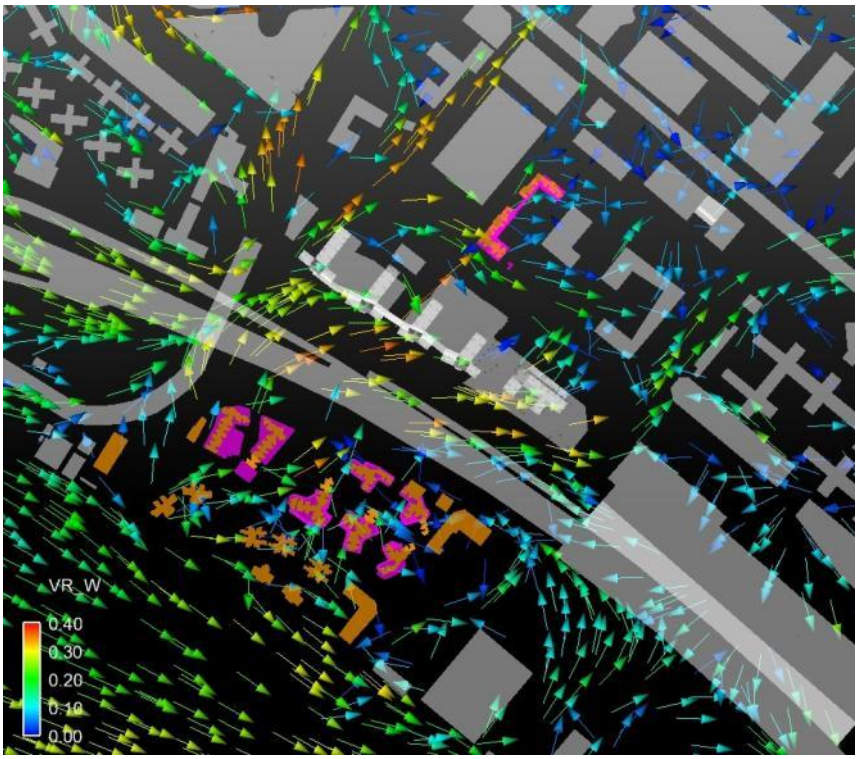
SSW Direction (Indicative Scheme)



SW Direction (Indicative Scheme)

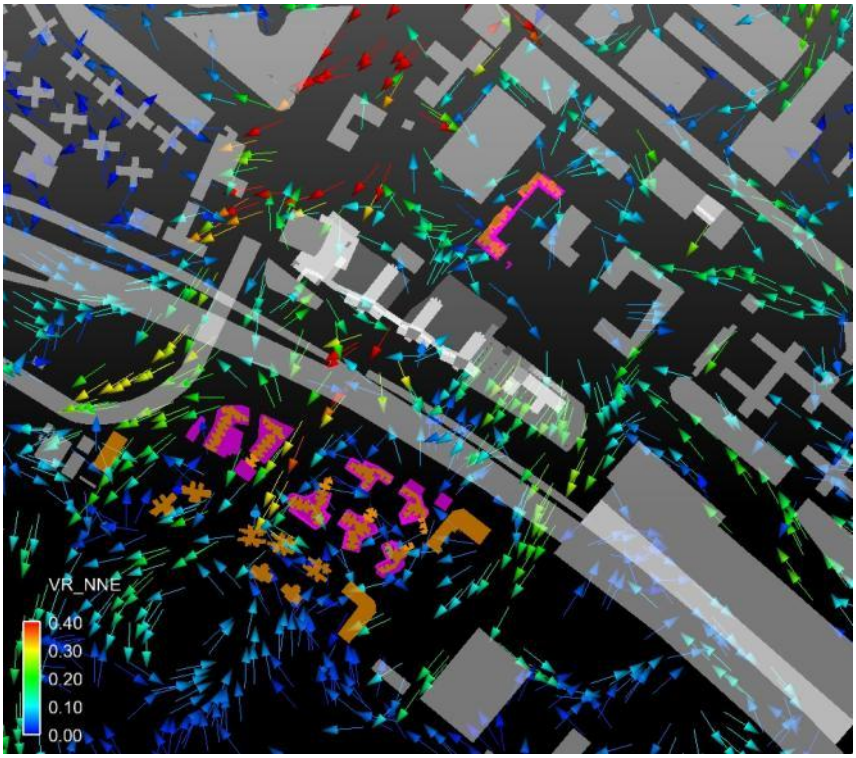


WSW Direction (Indicative Scheme)

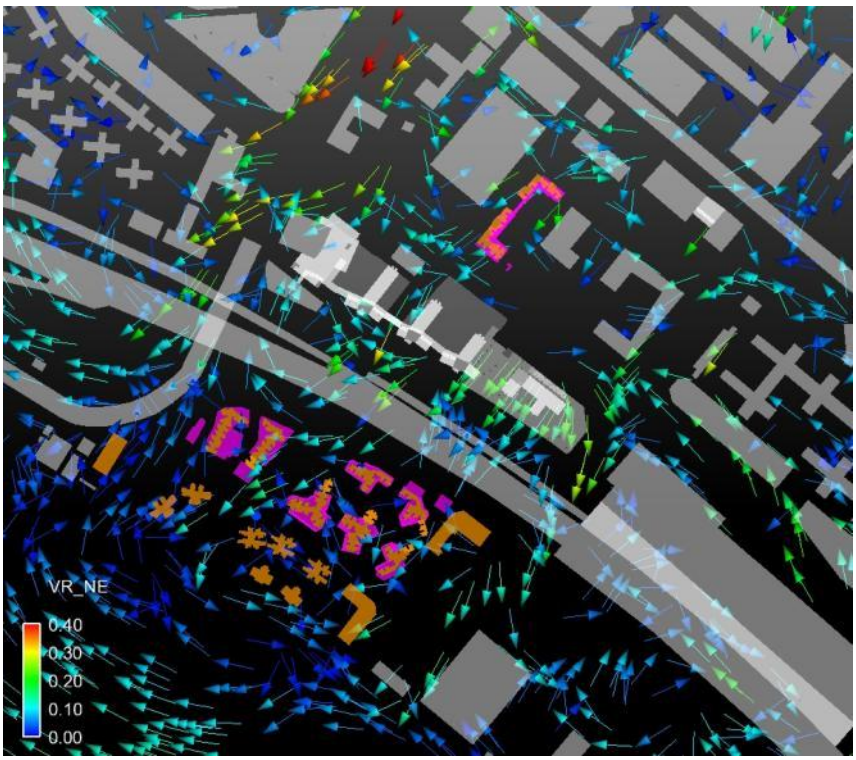


W Direction (Indicative Scheme)

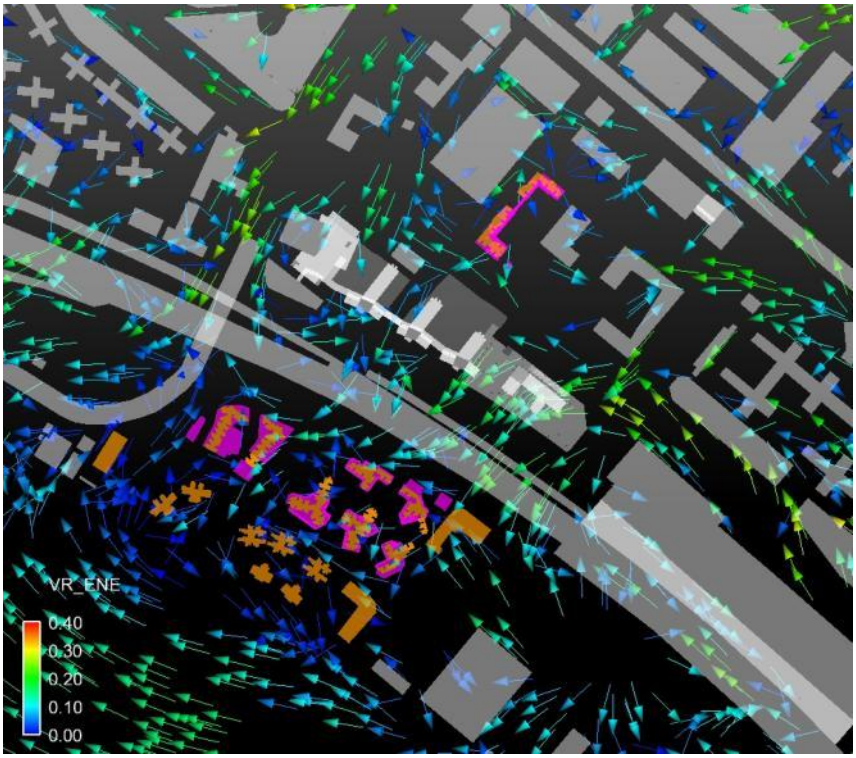
D3 Further Enhanced Scheme Directional VR Vector Plots



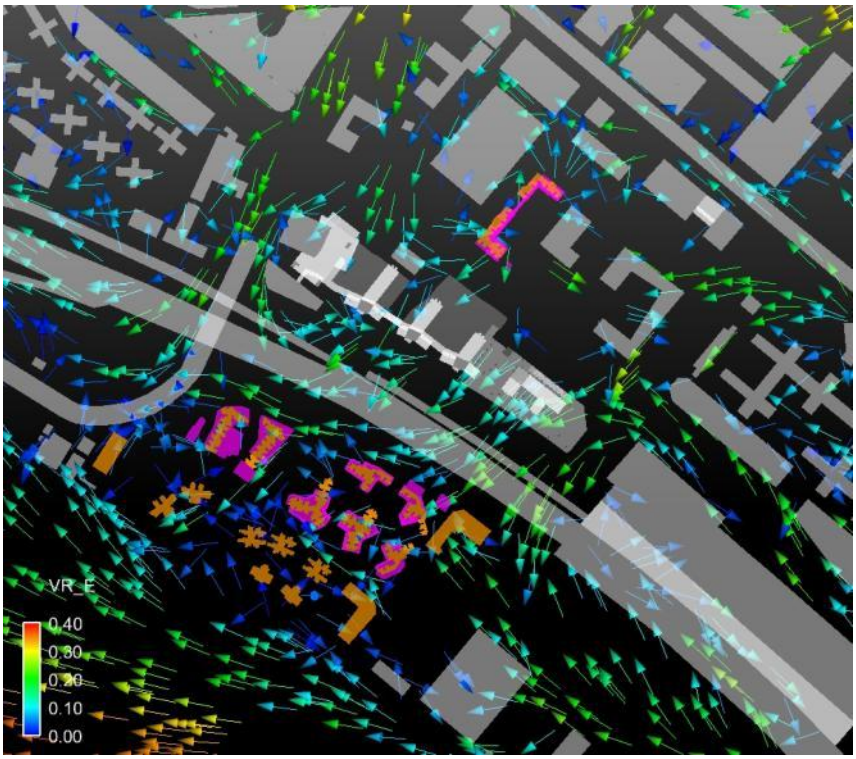
NNE Direction (Further Enhanced Scheme)



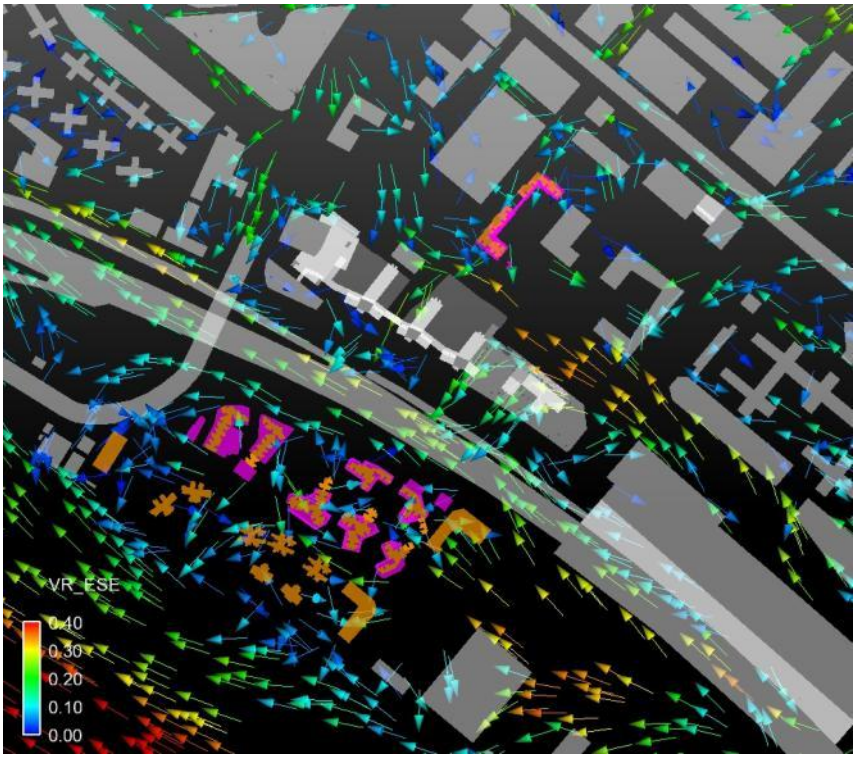
NE Direction (Further Enhanced Scheme)



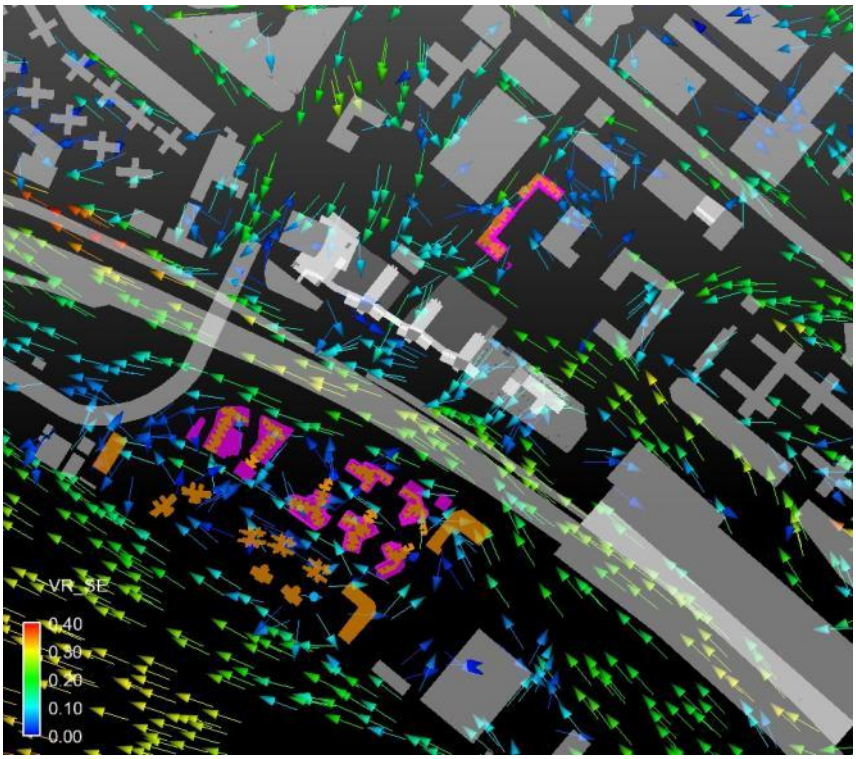
ENE Direction (Further Enhanced Scheme)



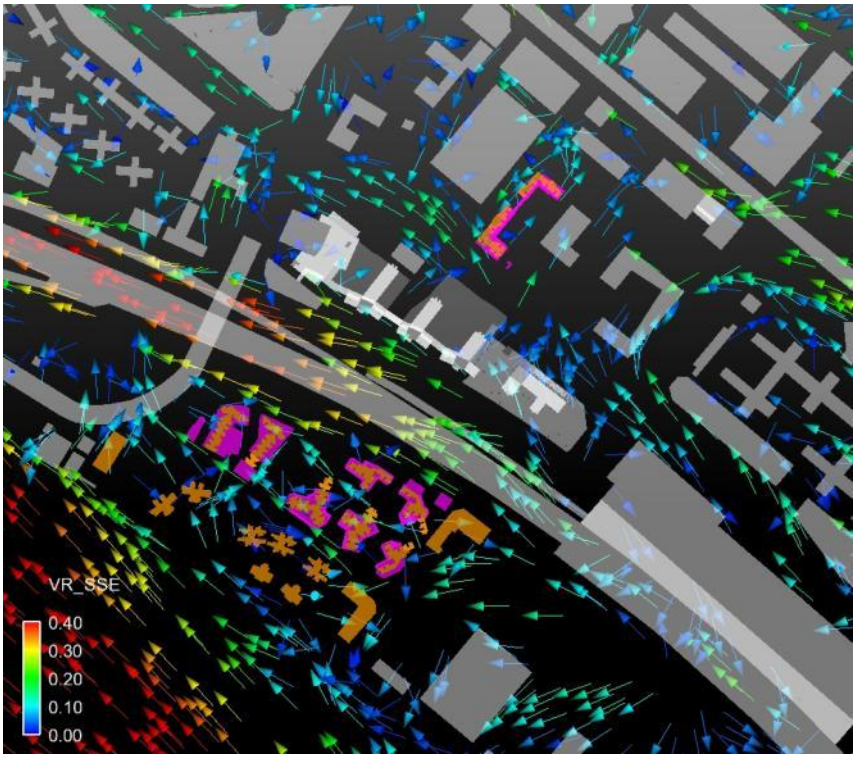
E Direction (Further Enhanced Scheme)



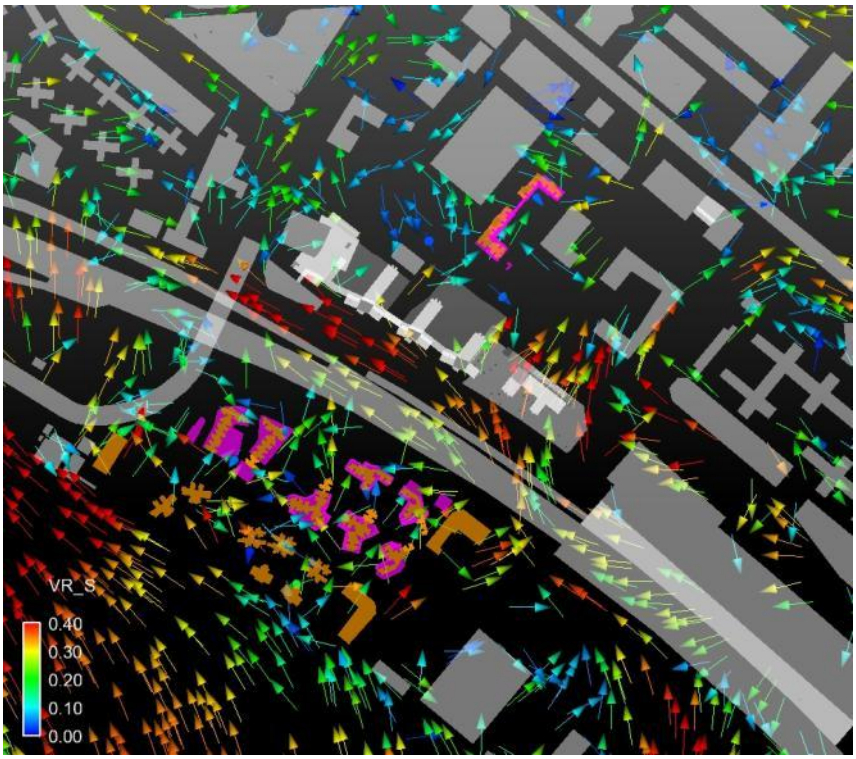
ESE Direction (Further Enhanced Scheme)



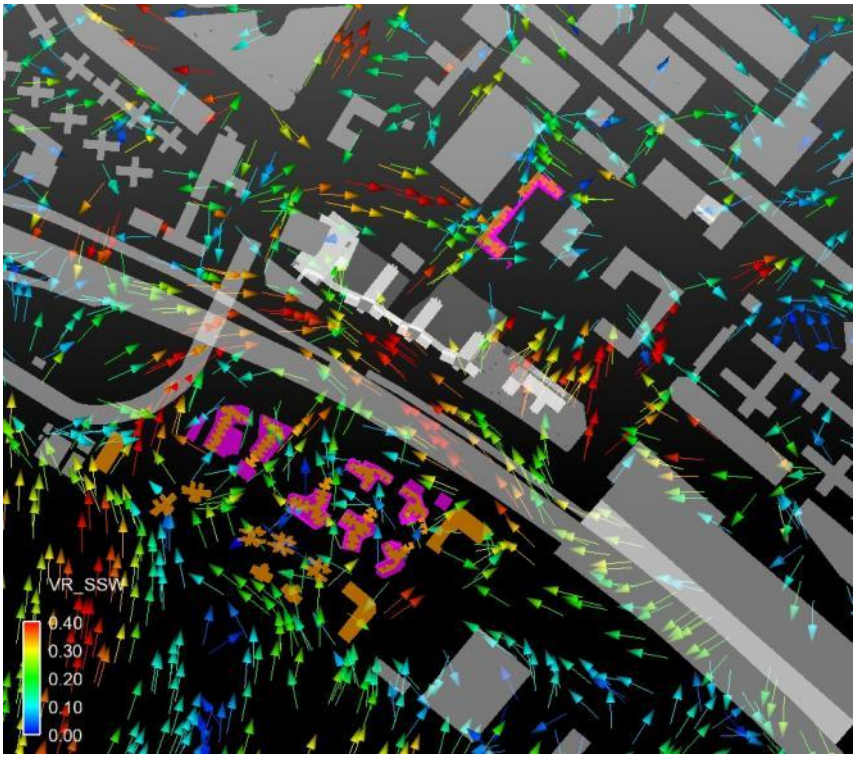
SE Direction (Further Enhanced Scheme)



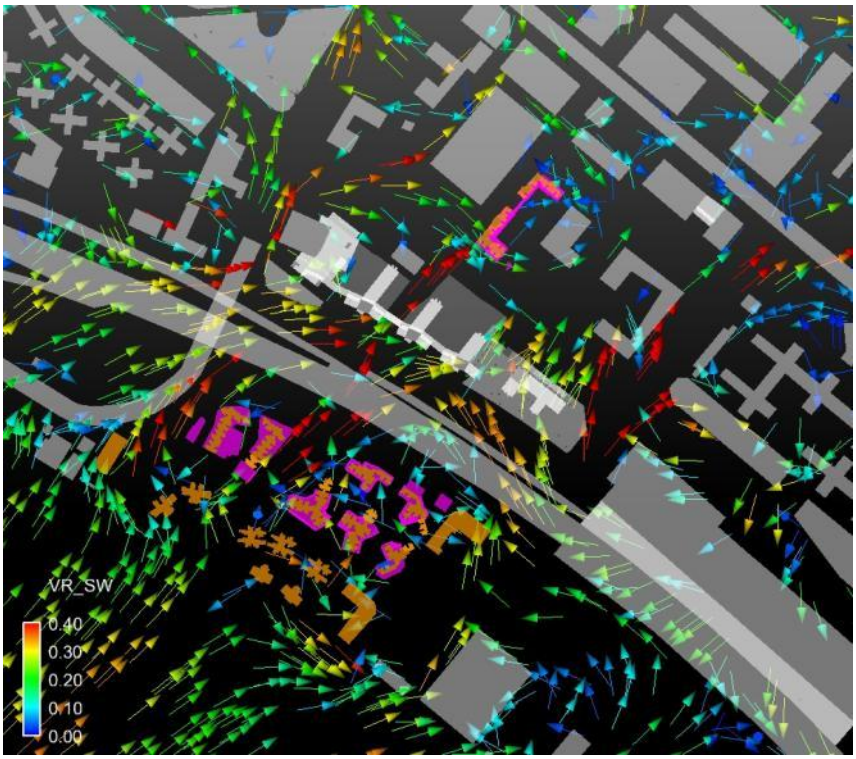
SSE Direction (Further Enhanced Scheme)



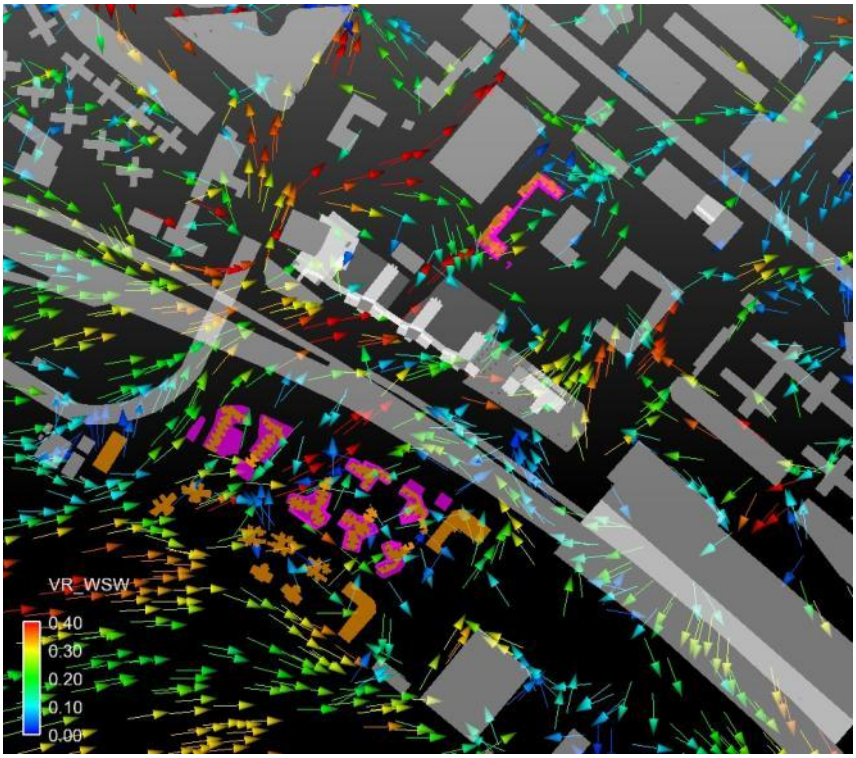
S Direction (Further Enhanced Scheme)



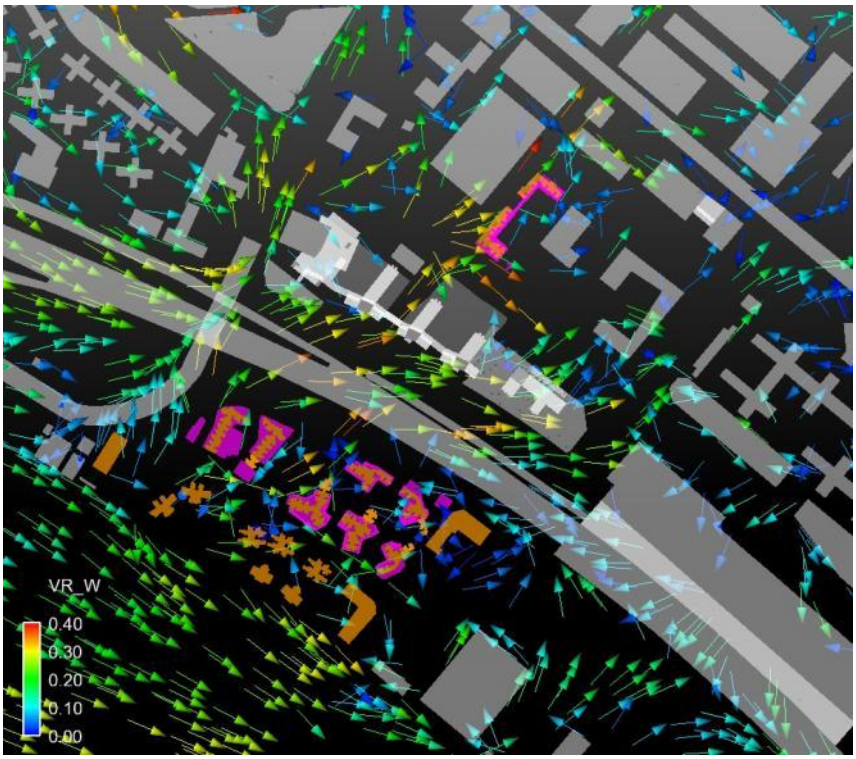
SSW Direction (Further Enhanced Scheme)



SW Direction (Further Enhanced Scheme)



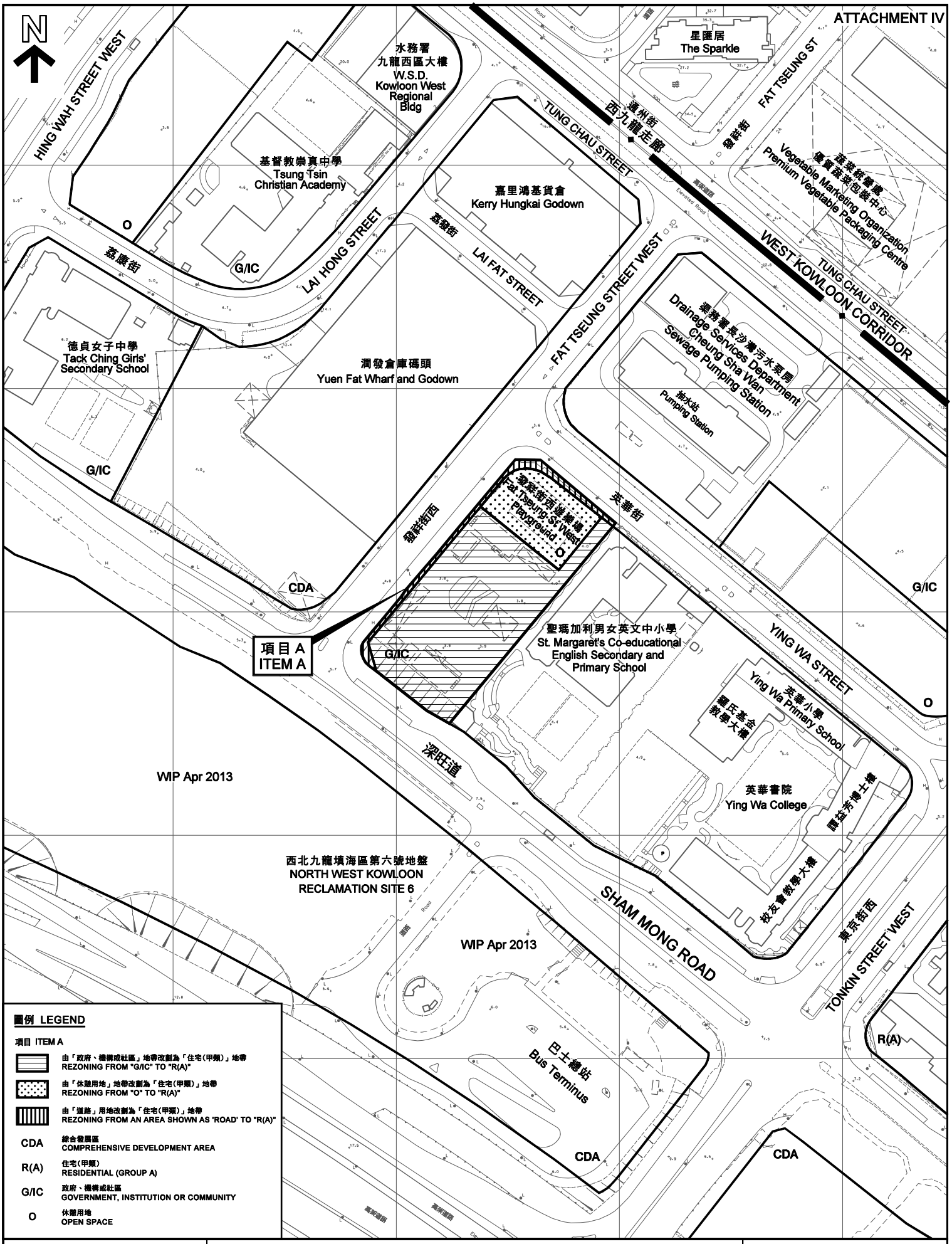
WSW Direction (Further Enhanced Scheme)



W Direction (Indicative Scheme)

Appendix E

Proposed Amendments to the Approved South West Kowloon Outline Zoning Plan No. S/SK20/28



圖例 LEGEND

項目 ITEM A

由「政府、機構或社區」地帶改劃為「住宅(甲類)」地帶
REZONING FROM "G/IC" TO "R(A)"

由「休憩用地」地帶改劃為「住宅(甲類)」地帶
REZONING FROM "O" TO "R(A)"

由「道路」用地改劃為「住宅(甲類)」地帶
REZONING FROM AN AREA SHOWN AS 'ROAD' TO "R(A)"

CDA	綜合發展區 COMPREHENSIVE DEVELOPMENT AREA
R(A)	住宅(甲類) RESIDENTIAL (GROUP A)
G/IC	政府、機構或社區 GOVERNMENT, INSTITUTION OR COMMUNITY
O	休憩用地 OPEN SPACE

本摘要圖於2013年4月22日擬備，
所根據的資料為測量圖編號11-NW-13A/B
EXTRACT PLAN PREPARED ON 22.4.2013
BASED ON SURVEY SHEETS No.
11-NW-13A/B

平面圖 - 項目A
SITE PLAN - ITEM A
西南九龍分區計劃大綱核准圖
編號 S/K20/28 的擬議修訂項目
PROPOSED AMENDMENTS TO
APPROVED SOUTH WEST KOWLOON OZP No. S/K20/28

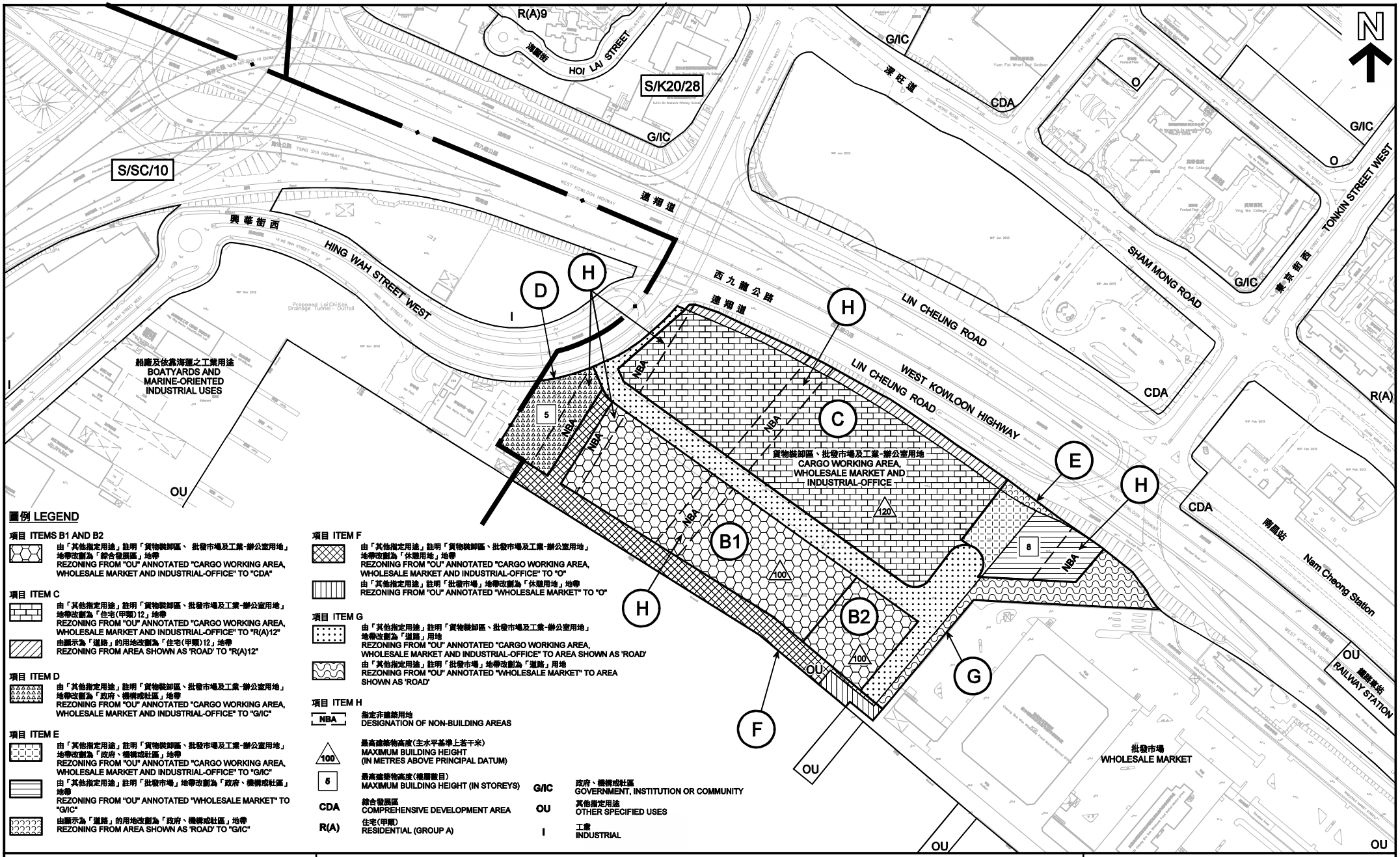
SCALE 1 : 1 500 比例尺

米 METRES 20 0 20 40 60 80 100 120 米 METRES

規劃署
PLANNING
DEPARTMENT

參考編號
REFERENCE No.
M/K20/13/9

圖 PLAN
3



圖例 LEGEND

項目 ITEMS B1 AND B2

由「其他指定用途」註明「貨物裝卸區、批發市場及工業-辦公室用地」地帶改劃為「綜合發展區」地帶
REZONING FROM "OU" ANNOTATED "CARGO WORKING AREA, WHOLESALE MARKET AND INDUSTRIAL-OFFICE" TO "CDA"

項目 ITEM C

由「其他指定用途」註明「貨物裝卸區、批發市場及工業-辦公室用地」地帶改劃為「住宅(甲類)12」地帶
REZONING FROM "OU" ANNOTATED "CARGO WORKING AREA, WHOLESALE MARKET AND INDUSTRIAL-OFFICE" TO "R(A)12"

由顯示為「道路」的用地改劃為「住宅(甲類)12」地帶
REZONING FROM AREA SHOWN AS 'ROAD' TO "R(A)12"

項目 ITEM D

由「其他指定用途」註明「貨物裝卸區、批發市場及工業-辦公室用地」地帶改劃為「政府、機構或社區」地帶
REZONING FROM "OU" ANNOTATED "CARGO WORKING AREA, WHOLESALE MARKET AND INDUSTRIAL-OFFICE" TO "G/IC"

項目 ITEM E

由「其他指定用途」註明「貨物裝卸區、批發市場及工業-辦公室用地」地帶改劃為「政府、機構或社區」地帶
REZONING FROM "OU" ANNOTATED "CARGO WORKING AREA, WHOLESALE MARKET AND INDUSTRIAL-OFFICE" TO "G/IC"

由「其他指定用途」註明「批發市場」地帶改劃為「政府、機構或社區」地帶
REZONING FROM "OU" ANNOTATED "WHOLESALE MARKET" TO "G/IC"

由顯示為「道路」的用地改劃為「政府、機構或社區」地帶
REZONING FROM AREA SHOWN AS 'ROAD' TO "G/IC"

項目 ITEM F

由「其他指定用途」註明「貨物裝卸區、批發市場及工業-辦公室用地」地帶改劃為「休閒用地」地帶
REZONING FROM "OU" ANNOTATED "CARGO WORKING AREA, WHOLESALE MARKET AND INDUSTRIAL-OFFICE" TO "O"

由「其他指定用途」註明「批發市場」地帶改劃為「休閒用地」地帶
REZONING FROM "OU" ANNOTATED "WHOLESALE MARKET" TO "O"

項目 ITEM G

由「其他指定用途」註明「貨物裝卸區、批發市場及工業-辦公室用地」地帶改劃為「道路」用地
REZONING FROM "OU" ANNOTATED "CARGO WORKING AREA, WHOLESALE MARKET AND INDUSTRIAL-OFFICE" TO AREA SHOWN AS 'ROAD'

由「其他指定用途」註明「批發市場」地帶改劃為「道路」用地
REZONING FROM "OU" ANNOTATED "WHOLESALE MARKET" TO AREA SHOWN AS 'ROAD'

項目 ITEM H

NBA 指定非建築用地 DESIGNATION OF NON-BUILDING AREAS

100 最高建築物高度(主水平基準上若干米) MAXIMUM BUILDING HEIGHT (IN METRES ABOVE PRINCIPAL DATUM)

5 最高建築物高度(樓層數目) MAXIMUM BUILDING HEIGHT (IN STOREYS)

CDA 綜合發展區 COMPREHENSIVE DEVELOPMENT AREA

R(A) 住宅(甲類) RESIDENTIAL (GROUP A)

G/IC 政府、機構或社區 GOVERNMENT, INSTITUTION OR COMMUNITY

OU 其他指定用途 OTHER SPECIFIED USES

I 工業 INDUSTRIAL

本摘要圖於2013年5月23日擬備，所根據的資料為
測量圖編號11-NW-12B、12D、13A、13B、13C和13D

EXTRACT PLAN PREPARED ON 23.5.2013 BASED ON SURVEY SHEETS No. 11-NW-12B, 12D, 13A, 13B, 13C AND 13D

平面圖 - 項目 B 至 H
SITE PLAN - ITEMS B to H

西南九龍分區計劃大綱核准圖編號 S/K20/28 的擬議修訂
PROPOSED AMENDMENTS TO APPROVED SOUTH WEST KOWLOON OZP No. S/K20/28

SCALE 1 : 3 000 比例尺

米 METRES 50 0 50 100 150 200 METRES 米

規劃署
PLANNING DEPARTMENT

參考編號 REFERENCE No.
M/SD/13/43

附件 Attachment
V

ARUP

Subject	Supplementary note for Cheung Sha Wan Wholesale Food Market Phase 2 and Fat Tseung Street West Developments –Air Ventilation Assessment – Initial Study
Date	11 June 2014
Job No/Ref	--

Ventilation Performance under Revised Scheme of Fat Tseung Street West Development

The proposed public housing development at Fat Tseung Street West is situated in Cheung Sha Wan area, near Ying Wa College. A quantitative Air Ventilation Assessment (AVA) study[1] was conducted for Cheung Sha Wan Wholesale Food Market Phase 2 (CSWWFM Ph. 2) and Fat Tseung Street West (FTSW) Developments on November 2013. According to HD's latest preliminary layout, the proposed FTSW development is revised from 2 tower design to 1 tower design, with objective the to further enhance air ventilation and maximize the distance between the proposed development and the adjacent school site. This supplementary information discusses the air ventilation impact of FTSW development on design changes.

Methodology

The proposed developments using the methodology for AVA as stipulated in the "Technical Circular No. 1/06 – Air Ventilation Assessments" (Technical Circular) and Annex A to the Technical Circular "Technical Guide for Air Ventilation Assessment for Developments in Hong Kong"(Technical Guide) jointly issued by Housing, Planning and Lands Bureau and Environmental, Transport and Works Bureau on 19th July 2006. For detailed methodology of the AVA study, please refer to the AVA Report[1] of CSWWFM Ph. 2 and FTSW.

Study Scenarios

Two schemes are compared in this AVA study, namely the Indicative Scheme and Revised Scheme.

Indicative Scheme - The indicative scheme is the previous approved scheme of FTSW development that conducted on November 2013. The development consists of 2 tower block and situated at the NE and SW portion of the site. For development details, please refer to the AVA Report[1] of CSWWFM Ph. 2 and FTSW.

Revised Scheme - The revised scheme of FTSW Site is a 1 tower scheme development. It is a 39-storeys development with the main roof at approximately 120mPD with around 5m of roof structure. Similar to the Indicative Scheme, a 2-story empty bay with approximately 10.0m (W) by 6.0m (H) is incorporated at the ground floor of the proposed development to enhance the air ventilation.

[1] Cheung Sha Wan Wholesale Food Market Phase 2 and Fat Tseung Street West Developments – Air Ventilation Assessment – Initial Study, November 2013

Subject	Supplementary note for Cheung Sha Wan Wholesale Food Market Phase 2 and Fat Tseung Street West Developments –Air Ventilation Assessment – Initial Study
Date	11 June 2014 Job No/Ref --

Study Area Project Assessment Area and Surrounding Areas

With reference to the Technical Guide, the areas of evaluation and assessment should include all area measured from the site boundary as well as a belt up to 1H, where H is the height of the tallest building of the proposed development, around the site boundary.

The tallest building height of the proposed development is around 125m and thus the Assessment Area is proposed to be around 125m. Notwithstanding, in order to capture a more representative wind profile of the surrounding area of the Project Site, the Surrounding Area are proposed to be 1100m respectively, which extended beyond 2H from the Project Site. The committed/planned development at the Nam Cheong Station Development and building density allowed under the current zoning at NWKR Site 6 are thus included. The neighbouring elevated structures, such as West Kowloon Highway are also modelled in the Study.

Figure 1 Site boundary, Assessment Area for the study (Image Source: Google Earth)

Test Points for Local and Site Ventilation Assessment

Monitoring test points are evenly placed along the site boundary and within the assessment area of the proposed development to determine the ventilation performance. There are two types of test points in the study:

Perimeter test points are the points positioned at the site boundary of the proposed development. There are totally 32 perimeter test points within the assessment area, which can be seen in the orange points in Figure 2 below.

Overall test points are those points evenly positioned in the open space on the streets and places where pedestrian frequently access within the assessment area. There are totally 73 overall test points within the assessment area which can be seen in the blue points in Figure 2 below.

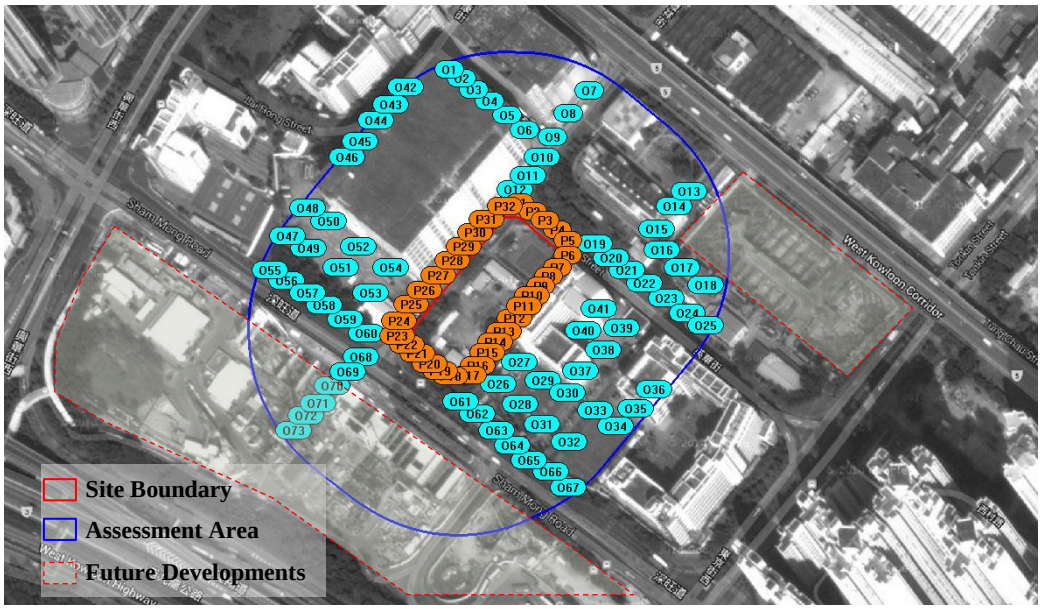


Figure 2 Site boundary, Assessment Area and Surrounding Area for the study (Image Source: Google Earth)

Ventilation Performance – Annual Condition

Indicative Scheme **Revised Scheme**

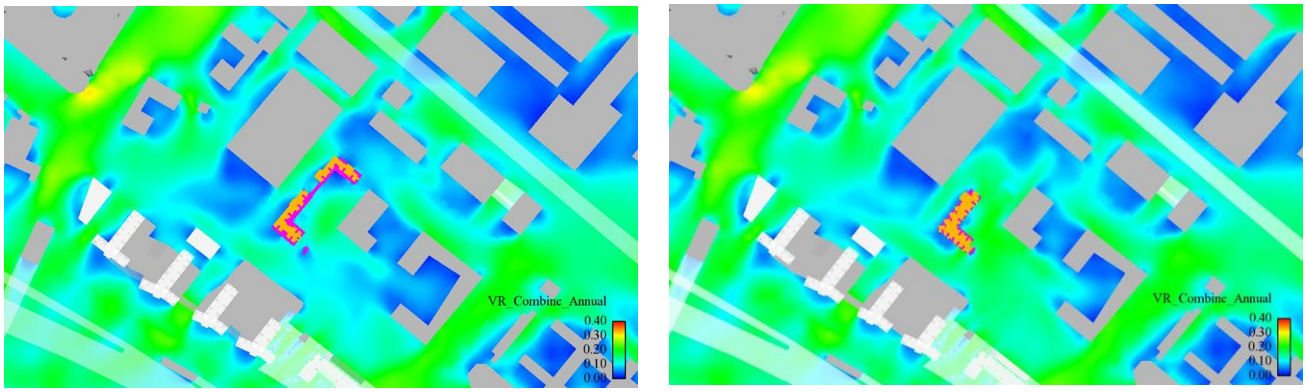


Figure 3 Contour Plot of the average VR at 2m Pedestrian Level for Indicative Scheme and Revised Scheme – Annual Condition

Table A 1 Annual SVR and LVR of the Assessment Area for the Studies Schemes

Annual	Indicative Scheme of FTSW	Revised Scheme of FTSW
SVR	0.11	0.13
LVR	0.10	0.12

The annual condition under the Revised Scheme is compared with the Indicative Scheme. The following observations were made:

- The Revised Scheme achieved a higher SVR and LVR than the Indicative Scheme;
- In general, the ventilation performance of the Revised Scheme is better as compared with the Indicative Scheme.

Ventilation Performance – Summer Condition

Indicative Scheme **Revised Scheme**

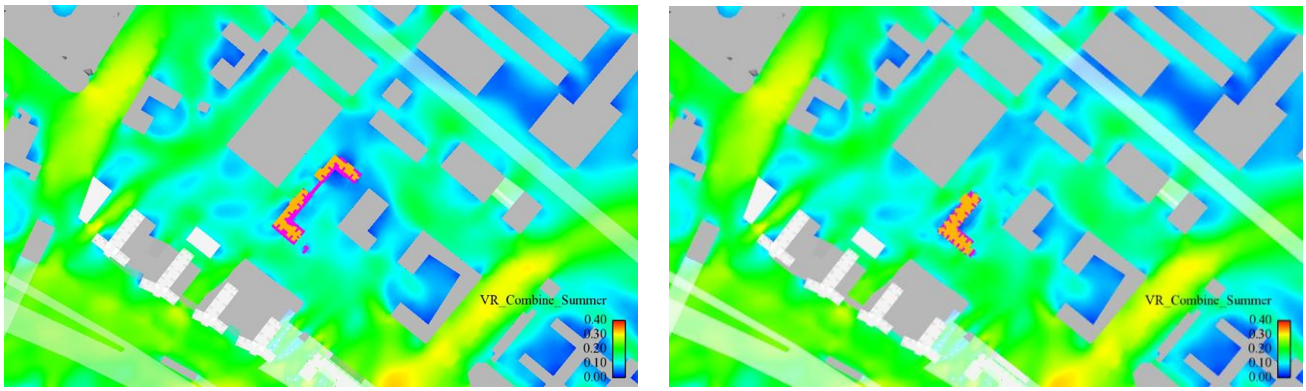


Figure 4 Contour Plot of the VR at 2m Pedestrian Level for Indicative Scheme and Revised Scheme – Summer Condition

Table A 2 Summer SVR and LVR of the Assessment Area for the Studies Schemes

Summer	Indicative Scheme of FTSW	Revised Scheme of FTSW
SVR	0.10	0.12
LVR	0.12	0.13

The summer condition under the Revised Scheme is compared with the Indicative Scheme. The following observations were made:

- The Revised Scheme achieved a higher SVR and LVR than the Indicative Scheme;
- In general, the ventilation performance of the Revised Scheme is better as compared with the Indicative Scheme.

Focus Area

The Focus Areas for frequent pedestrian access and actively zones are defined for the detailed analysis as follow:

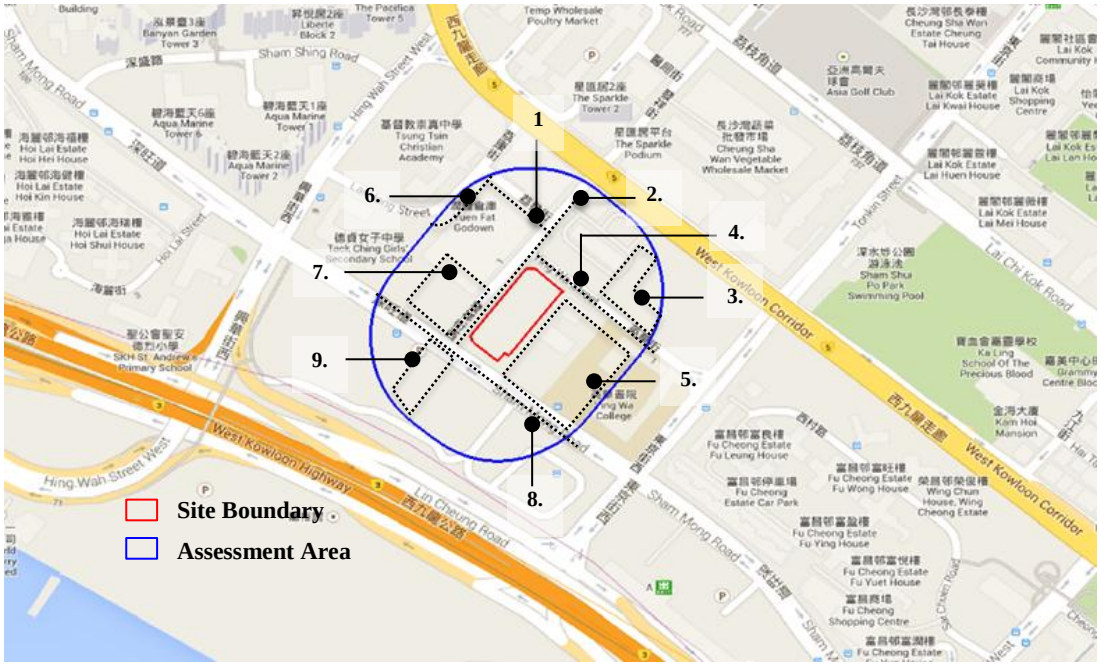


Figure 5 Focus Areas for the Study

Table A 3 VR Results for Focused Areas

Focus Areas		Test Points	Annual		Summer	
			Indicative Scheme of FTSW	Revised Scheme of FTSW	Indicative Scheme of FTSW	Revised Scheme of FTSW
1	Lai Fat Street	O1-O6	0.11	0.11	0.12	0.11
2	Fat Tseung Street West	P24 –P32, O7-O12	0.11	0.12	0.10	0.12
3	West Kowloon Law Court Building	O13-O18	0.10	0.10	0.12	0.12
4	Ying Wa Street	P1-P5, O19-O25	0.10	0.09	0.11	0.12
5	St. Margaret's Co-educational English Secondary and Primary School, Ying Wa College and Ying Wa Primary School	O26-O41	0.08	0.11	0.10	0.11
6	Lai Hong Street	O42-O46	0.13	0.13	0.15	0.15
7	Yuen Fat Godown Carpark	O47-O54	0.09	0.10	0.10	0.11
8	Sham Mong Road	P18-P23, O55-O67	0.10	0.12	0.14	0.14
9	Wind Corridor of NWKR Site 6	O68-O73	0.13	0.14	0.16	0.16

Conclusion

A quantitative AVA study was carried out for FTSW development to assess the ventilation impact on the design refinement from 2 tower design (Indicative Scheme) to 1 tower design (Revised Scheme). In general, the results show that the Revised Scheme achieved a relatively better ventilation performance in most of the areas as compared to the Indicative Scheme under both annual and summer conditions.

Under annual condition, most of the Focus Areas achieved a higher or similar VR results under the Revised Scheme except Ying Wa Street. Similarly, most of the Focus Areas achieved a higher or similar VR results under the Revised Scheme except Lai Fat Street for summer condition.

The design changes at the Revised Scheme reduce 1 building tower and enhanced the wind permeability at the NE portion of the site. Such permeable condition facilities wind penetration and thus relatively higher VR is observed at most of the areas.