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AIR VENTILATION ASSESSMENT OF THE PROPOSED REDEVELOPMENT OF EX-YUEN LONG ESTATE, PUBLIC HOUSING DEVELOPMENT (REVISED SCHEME)

INITIAL STUDY (FINAL REPORT)

Report Prepared by:
Allied Environmental Consultants Ltd.

COMMERCIAL-IN-CONFIDENCE

Issue No : 5
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EXECUTIVE SUMMARY

Allied Environmental Consultants Limited (AEC) was commissioned by the Hong Kong Housing Authority (HKHA) to undertake an Air Ventilation Assessment (AVA) Initial Study for the proposed public housing development at Ex-Yuen Long Estate Site, at On Lok Road, Yuen Long (the Project). The AVA is to assess air ventilation performance of the building design and its impacts to the surrounding pedestrian accessible locations.

Computational Fluid Dynamic (CFD) modelling is used for quantitative ventilation performance evaluation in the Initial AVA Study. There are two design schemes being reviewed in this Initial AVA Study including:

1. Scheme 1: evaluating ventilation performance within 500m of the subject site after the proposed development with previous design scheme is in place.
2. Scheme 2: evaluating ventilation performance within 500m of the subject site after the proposed development with current proposed scheme is in place.

A housing development proposed by Housing Authority in the Ex-Yuen Long Estate and details of proposed public housing development are summarized in ***Table i***.

Table i Conceptual Layout Plan of the Proposed Development

	Scheme 1	**Scheme 2**
Approximate Site Area	0.41ha	0.41 ha
No of Residential Blocks	2	2
No of Residential Storeys Over Podium	Block 1: 30 Block 2: 30	Block 1: 17 Block 2: 28
No of flats	400 units	Block 1: 102 flats Block 2: 335 flats
Podium	Single-storey retail podium at approximately 10 mPD	Single-storey retail podium at approximately 10 mPD
Building Height (main roof)	2 blocks up to 100mPD	2 blocks from approximately 68mPD to 100mPD
Carpark	Covered carpark under podium	Covered carpark under podium

There are two public housing design schemes, Scheme 1 (previous scheme design) and Scheme 2 (current proposed scheme). The details of these two design schemes are summarized in ***Figure i*** and ***Figure ii***.

Scheme 1 (previous design scheme)
The two L-shaped building towers are built on podium structure.
Internal street are being covered by the bulky podium structure.
The building gap is 20.7m.

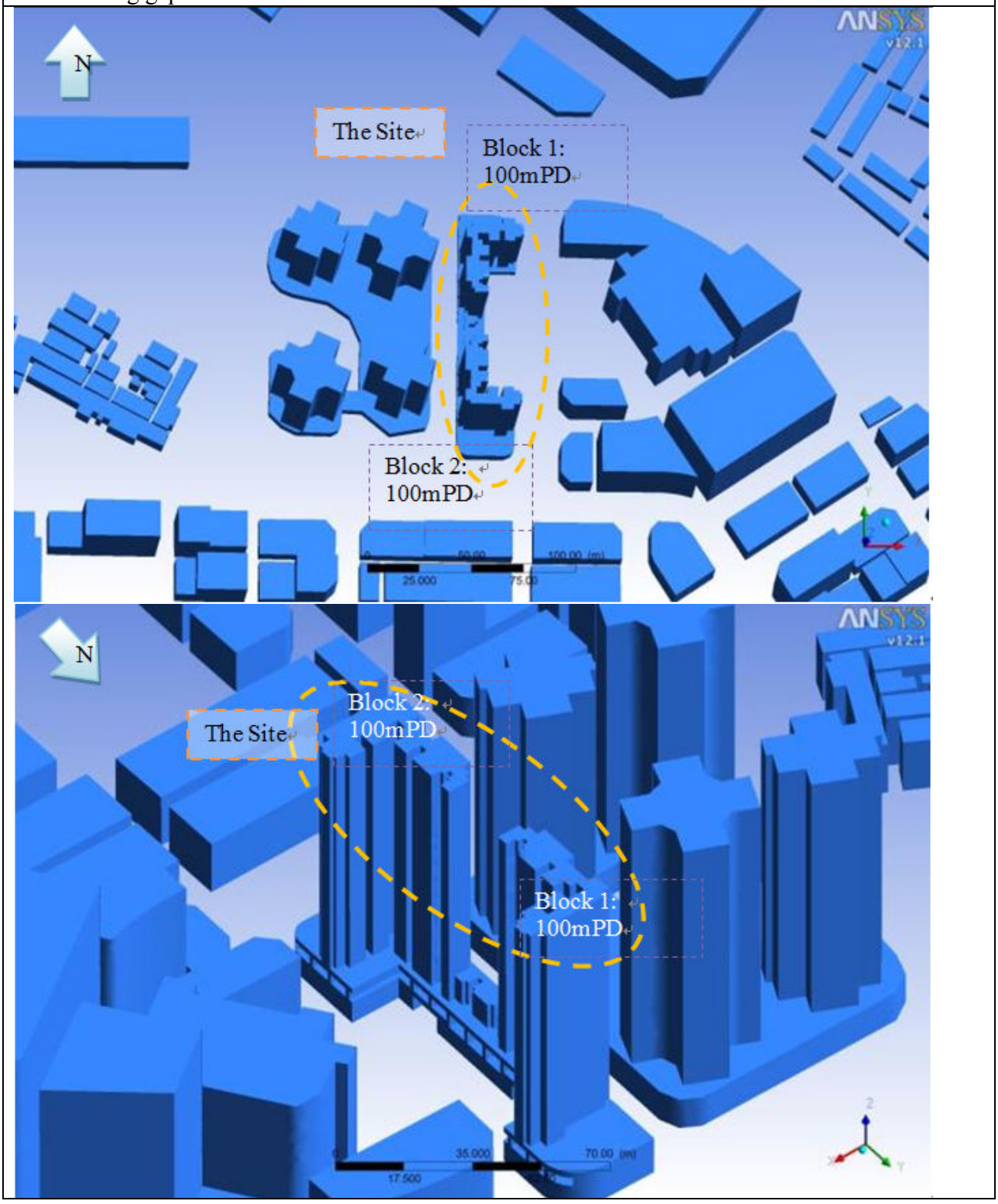


Figure i Previous Design of the Proposed Development (Scheme 1)

Scheme 2 (current design scheme)

The two proposed building towers are built on a separated podium structure for reducing the air blockage.

The north tower is reshaped to be in line with the prevailing winds and its height is reduced from 100 mPD to 68mPD, aiming to facilitate the penetration of prevailing winds to downwind areas.

Greater building gap of 21.3m is formed, as compared to 20.7m in Scheme 1, between two building towers.

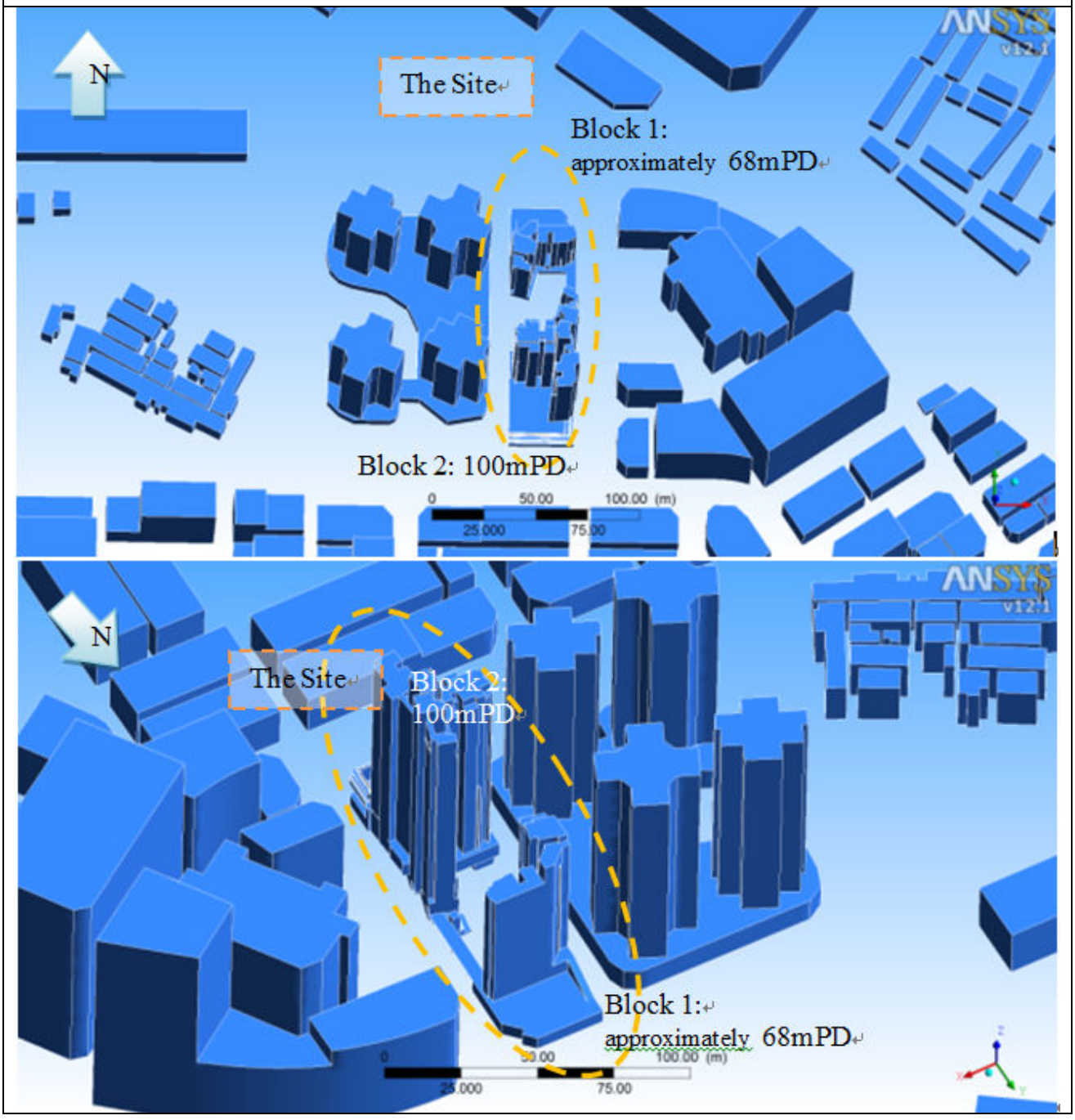


Figure ii Current Design of the Proposed Development (Scheme 2)

There are eight most prevailing winds of which the total probability exceeds 75% of a year in the Mesoscale Model (MM5) grid (16, 36) including ENE, NE, E, NNE, ESE, SSE, SSE and SSW.

The average wind velocities and wind probabilities of these eight probable winds are summarized in ***Table ii.***

Table ii **Summary of the Prevailing Wind Directions**

Prevailing Wind Direction	**Degree of Wind Direction**	**Average Wind Velocities (m/s)**	**Probability (%)**
ENE	67.5	8.48	16.6
NE	45	8.13	13.7
E	90	7.47	12.5
NNE	22.5	9.36	9.7
ESE	112.5	6.29	9.3
SSE	157.5	5.92	6.5
SE	135	5.62	6.2
SSW	202.5	6.91	5.3
		Total Probability:	**79.8**

The wind velocities under eight prevailing winds (ENE, NE, E, NNE, ESE, SSE, SSE and SSW) are simulated. Then the Local Velocity Ratio (LVR) and Site Velocity Ratio (SVR) are computed by analysing the group of 67 overall test points and 30 perimeter test points. The ventilation impacts due to the proposed developments have been evaluated based on the simulated results of the SVR and LVR which are tabulated in ***Table iii*** and ***Table iv.***

Table iii Summary of Site Velocity Ratios under Prevailing Wind Directions

Wind Directions	**Scheme 1, $VR_{average}$**	**Scheme 2, $VR_{average}$**	**$VR_{average}$ Change**	**% $VR_{average}$ Change**
ENE (67.5^o)	0.130	0.128	-0.002	-1.8
NE (45^o)	0.118	0.108	-0.010	-8.5
E (90^o)	0.106	0.104	-0.002	-1.9
NNE (22.5^o)	0.115	0.102	-0.012	-10.8
ESE (112.5^o)	0.104	0.093	-0.011	-10.2
SSE (157.5^o)	0.069	0.080	0.012	17.2
SE (135^o)	0.077	0.084	0.007	9.4
SSW (202.5^o)	0.084	0.083	-0.001	-1.1
SVRw	**0.107**	**0.103**		
% Change in SVRw	**-3.54**			

Table iv Summary of Local Velocity Ratios under Prevailing Wind Directions

Wind Directions	**Scheme 1, $VR_{average}$**	**Scheme 2, $VR_{average}$**	**$VR_{average}$ Change**	**% $VR_{average}$ Change**
ENE (67.5^o)	0.133	0.134	0.001	0.6
NE (45^o)	0.117	0.118	0.001	0.9
E (90^o)	0.110	0.110	0.000	-0.4
NNE (22.5^o)	0.114	0.099	-0.015	-13.4
ESE (112.5^o)	0.112	0.115	0.002	2.1
SE (135^o)	0.070	0.081	0.011	15.7
SSE (157.5^o)	0.088	0.099	0.011	13.0
SSW (202.5^o)	0.066	0.065	-0.001	-1.0
LVRw	**0.1089**	**0.1094**		
% Change in LVRw	**0.41**			

Note: Details of all the above figures and percentages can be referred to Appendix D.

As shown in the above results, Scheme 2 shows similar overall weighted SVR and LVR as Scheme 1 which indicate that both schemes have comparable air ventilation performance. Therefore, with reference to the conclusion in the approved Air Ventilation Assessment Report prepared for the Proposed Redevelopment of Ex-Yuen Long Estate, Scheme 2 as shown above would also unlikely have any adverse ventilation impact upon pedestrian areas in the vicinity and within the site.

1. Introduction

1.1. Project Background

Allied Environmental Consultants Limited (AEC) was commissioned by the Hong Kong Housing Authority (HKHA) to undertake an Air Ventilation Assessment (AVA) Initial Study for the proposed public housing development at Ex-Yuen Long Estate Site, at On Lok Road, Yuen Long (the Project)[1]. The AVA is to assess air ventilation performance of the building design and its impacts to the surrounding pedestrian accessible locations.

1.2. Project Objective

This AVA Initial Study is to assess wind performance at pedestrian level in the vicinity of the subject site compared between two schemes forth above public housing development, namely Scheme 1 (previous scheme design in previous AVA study for Ex-Yuen Long Estate) and Scheme 2 (revised design scheme) based on methodology outlined in the *Technical Guide for Air Ventilation Assessment for Development in Hong Kong* (Technical Guide) annexed in *Housing, Planning and* Lands *Bureau (HPLB) and Environment, Transport and Works Bureau* (ETWB) *Technical Circular No.1/06*. Under consideration to provide a direct comparison for the revised design scheme relative to the previous scheme design in previous AVA study for the Project, the surrounding environment of this AVA Initial Study was kept the same as the previous scheme although other developments may be planned and constructed within the years working in the revision of scheme. In addition, with regards to the planned developments at Tai Kiu Village, this village is not at the upwind location when compared with the highest 8 most probable prevailing wind directions at the site. Therefore, both the Baseline and Proposed Schemes would not be affected by the presence of the latest committed and planned developments. It is concluded that the Baseline and Proposed Schemes should result in comparable pedestrian wind environment within the assessment area in accordance with the simulation.

The main objectives of this AVA Initial Study include:

1. To assess the characteristics of the wind availability ($V\infty$) of the site;
2. To give a general pattern of the proposed development and a quantitative estimate of wind performance at the pedestrian level (2m above ground) reported using Wind Velocity Ratio (VR);
3. To identify ventilation performance of the proposed development and areas of concerns in the vicinity of the subject site;
4. To recommend design improvement and suggest recommendations on ventilation mitigation measures; and
5. To draw comparison between the two schemes and justify that the revised design scheme would not have any significant or unacceptable ventilation impact at pedestrian level in the vicinity.

[1] HKSAR Government proposes to build housing development in the Ex-Yuen Long Estate, which comprises of private and public housing development. The proposed private housing development is high-rise housing development. The air ventilation performance of the private development can be referred to *Initial Study for Air Ventilation Assessment of the Proposed Redevelopment of Ex-Yuen Long Estate* granted AVA Register at Planning Department website for details.

1.3. Project Details

A housing development proposed by Housing Authority in the Ex-Yuen Long Estate and details of proposed public housing development are summarized in ***Table 1***.

Table 1 Conceptual Layout Plan of the Proposed Development

	Scheme 1	**Scheme 2**
Approximate Site Area	0.41ha	0.41 ha
No of Residential Blocks	2	2
No of Residential Storeys Over Podium	Block 1: 30 Block 2: 30	Block 1: 17 Block 2: 28
No of flats	400 units	Block 1: 102 flats Block 2: 335 flats
Podium	Single-storey retail podium at approximately 10 mPD	Single-storey podium garden at approximately 10 mPD and retail at ground level
Building Height	2 blocks up to 100mPD	2 blocks from approximately 68mPD to 100mPD
Carpark	Covered carpark under podium	Covered carpark under podium

There are two public housing design schemes, Scheme 1 (previous design scheme) and Scheme 2 (revised design scheme). The details of these two design schemes are summarized in ***Figure 1*** and ***Figure 2***.

Scheme 1 (previous design scheme)

The two L-shaped building towers are built on podium structure.
Internal street are being covered by the bulky podium structure.
The building gap is 20.7m.

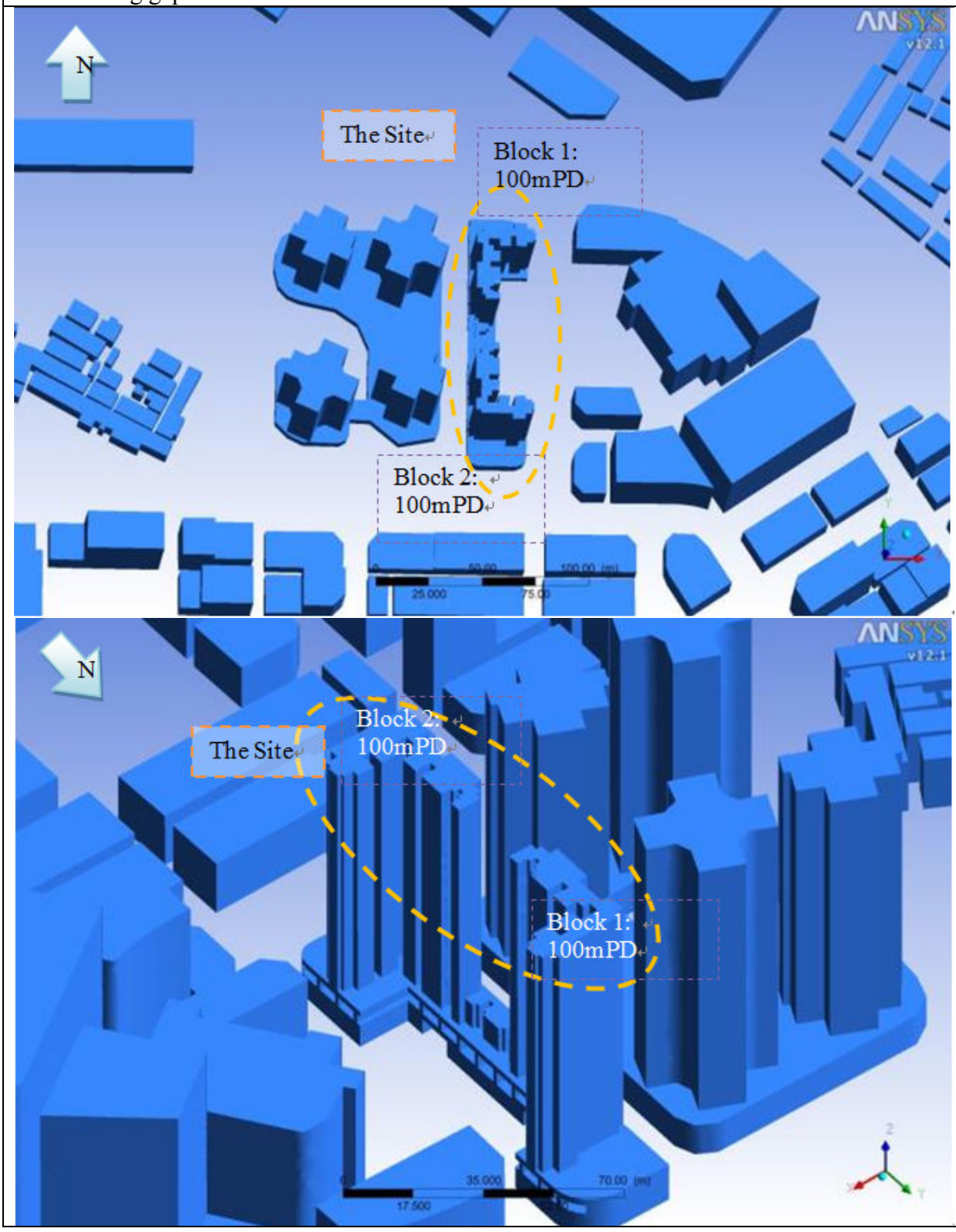


Figure 1 Previous Design of the Proposed Development (Scheme 1)

Scheme 2 (revised design scheme)

The two proposed building towers are built on a separated podium structure for reducing the air blockage.

The north tower is reshaped to be in line with the prevailing winds and its height is reduced from 100 mPD to approximately 68mPD, aiming to facilitate the penetration of prevailing winds to downwind areas.

Greater building gap of 21.3m is formed, as compared to 20.7m in Scheme 1, between two building towers

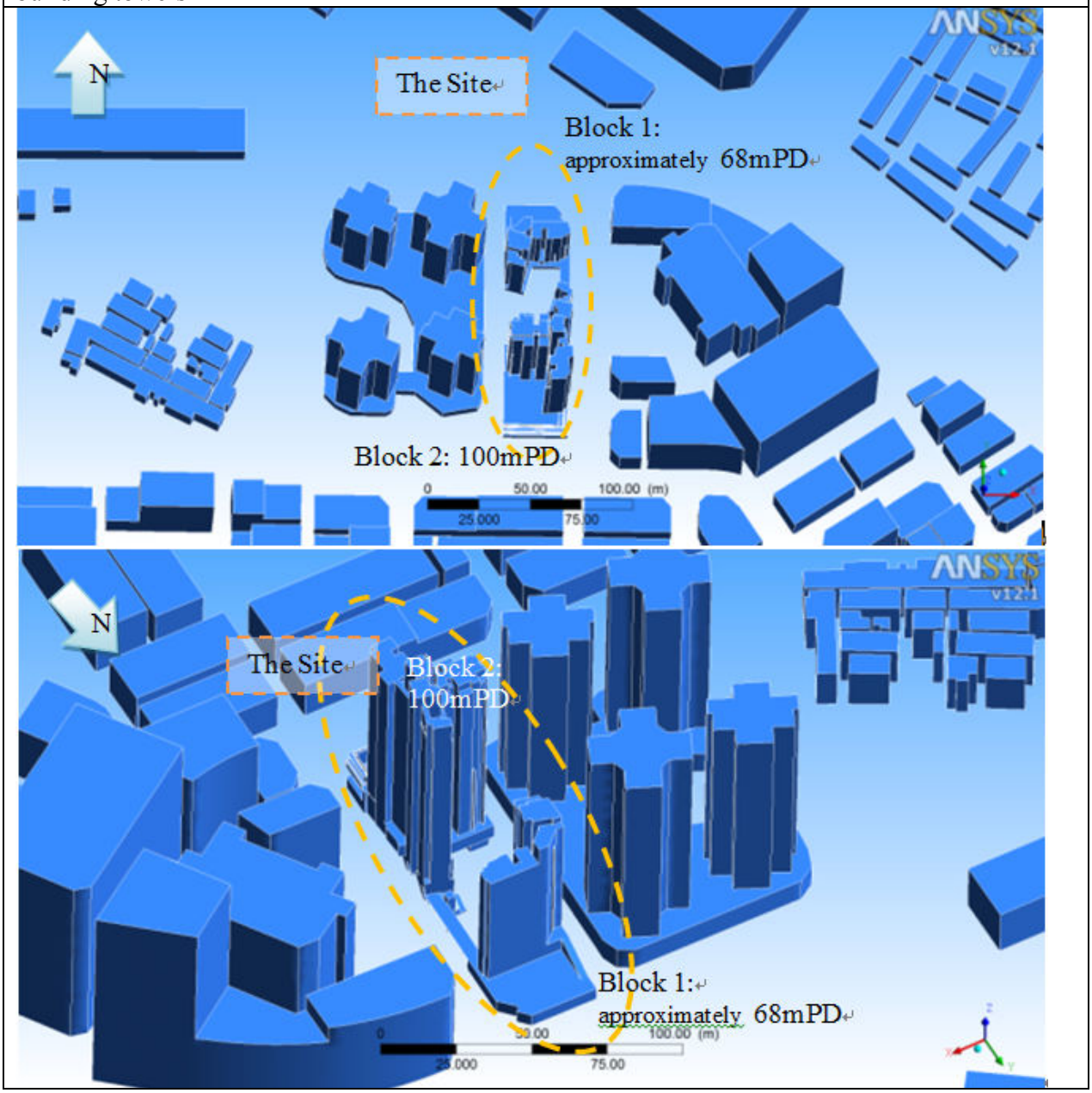


Figure 2 Revised Design of the Proposed Development (Scheme 2)

2. Expert Evaluation for Air Ventilation Assessment

2.1. Site Environment

The proposed redevelopment is located at the On Lok Road, Yuen Long and the current land use of the subject site is an outdoor carpark at 4 mPD.

As shown in ***Figure 3***, the subject is bounded by high-rise Forda Industrial Building, Tai Hang Building and Wing Wah Industrial Centre to its north, low-rise Tai Kiu Tsuen and a proposed high-rise private residential development (PPRD) to its west and cluster of residential buildings (ranges from 30 to 60 mPD) to its south. The West Rail Track is situated at the north of the subject site. Some medium-to high-rise industrial buildings (30 to 60 mPD) is situated approximately 90m from the north of the subject site and low-rise residential buildings, Kwan Lok San Tsuen is located at further east to the subject site.

Figure 3 Existing Land Use of the Proposed Development

2.2. Project Area, Assessment Area Boundary and Surrounding Area Boundary

The project area is defined by project site boundaries including both public and private housing development and all open areas for which pedestrian are likely to access. The shaded area as shown in ***Figure 4*** is equivalent to the project site area.

The assessment area (encoded by red boundary line) includes the site's surrounding environment up to a perpendicular distance H (where H is the height of the tallest building within the project site) as shown in ***Figure 4***. For the project site, H is 100m.

The surrounding area should normally up to a perpendicular distance of 2H from the project boundary, which is 200m for this study. However, there are tall buildings and obstructive buildings are located outside the assessment area regions; thus the surrounding area for this AVA Initial Study has been enlarged to 500m outside the project boundary as shown in ***Figure 4*** (encoded by blue boundary line).

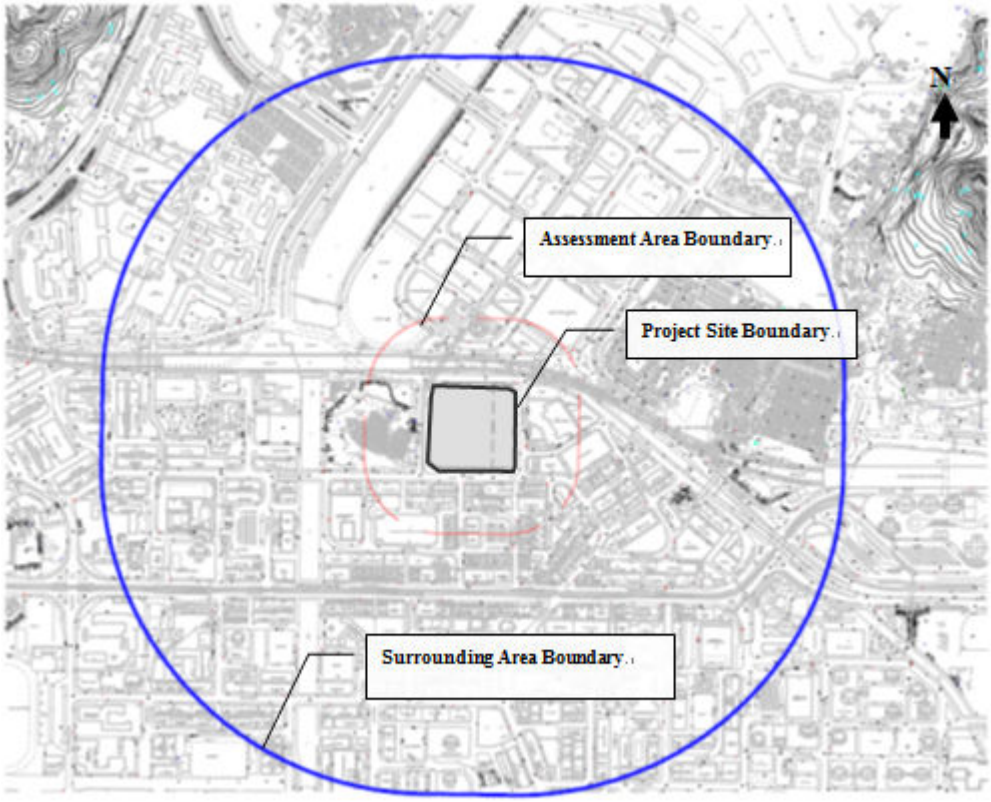


Figure 4 Project Site Boundary, Assessment Area Boundary and Surrounding Area Boundary

2.3. Prevailing Wind Condition for Existing Environment

With respect to the wind availability of the subject site, based on the site wind availability data provided by the Planning Department for the immediate vicinity of the subject site in Yuen Long region, north-north easterly to south-south westerly winds occurrence exceed 75% of the time throughout the year (Refer ***Section 3*** for details).

The potential wind barriers to the overall wind environment of the subject site are the high rise building blocks within close proximity including Forda Industrial Building, Tai Hang

Building and Wing Wah Industrial Centre located at immediate east to the subject site, medium-to high-rise industrial buildings situated to the north and east.

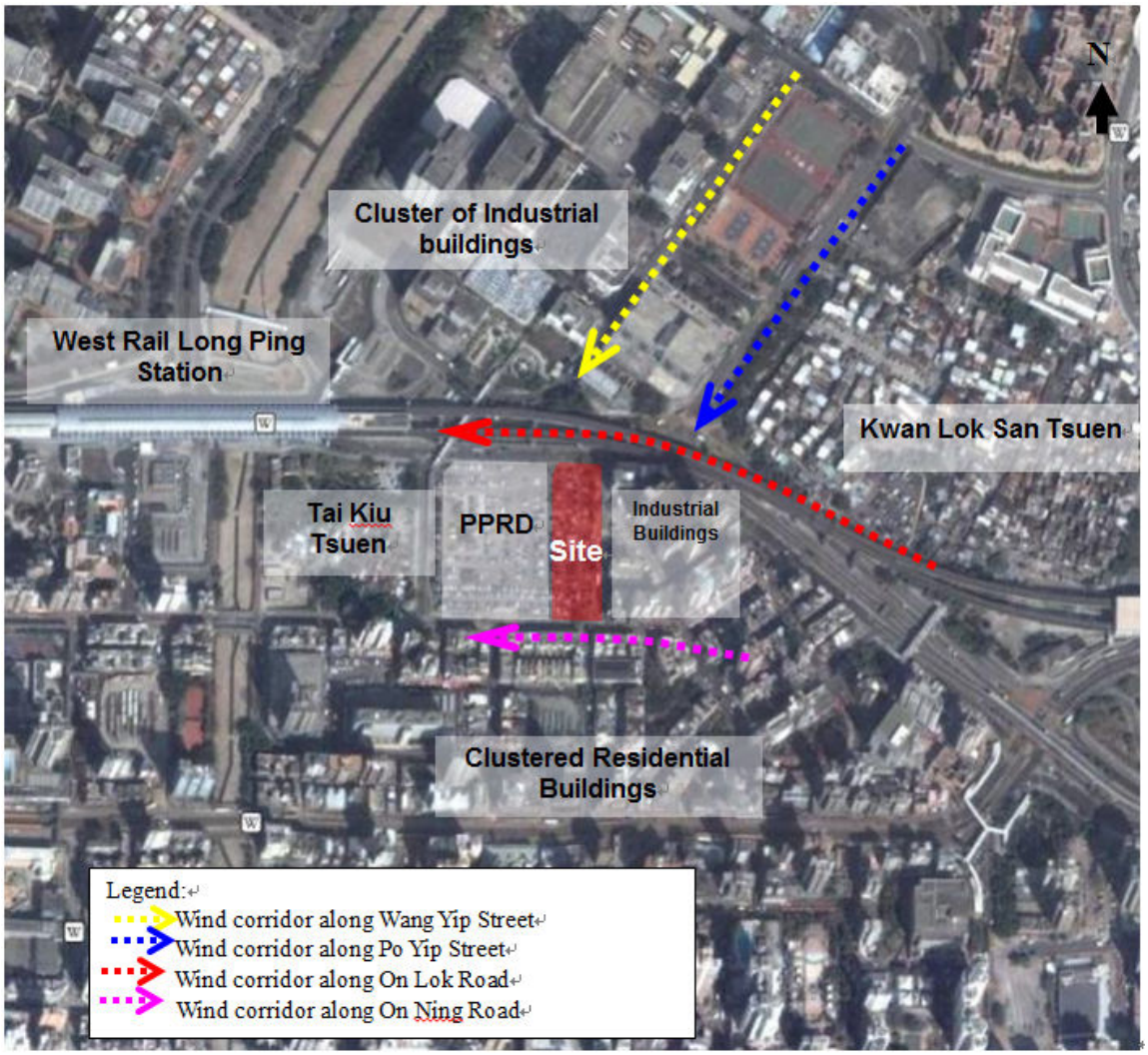


Figure 5 Wind Corridor Directing Air Circulation toward Subject Site

The low-rise Tai Kiu Tsuen and a proposed high-rise residential development (PPRD) situated at the immediate west of the subject site as well as open spaces and low-rise residential buildings situated to the south of the subject site encourage air circulation to the subject site; however wind enhancement to the subject site is substantially minimized due to the low probability occurrence of winds from these directions (Refer ***Section 3*** for details). Wind corridors are available along Po Yip Street and Wang Yip Street under north-eastern directions and allow penetration of prevailing winds to the subject site via passing through West Rail Track and diverting around building blocks. Also, On Lok Road and On Ning Road are wind corridors for prevailing winds under eastern direction passing through. However, the high rise industrial buildings located at immediate east to the subject site (areas with red mark as shown in ***Figure 5***) reduce penetrations of prevailing winds from north eastern directions. Thus it is anticipated that Tai Kiu Road and On Ning Road would be the potential problem areas.

Due to congested and high rise nature of surrounding development and topography, wind availability is likely to be limited and the inherent wind conditions on the subject site should

be relatively calm.

2.4. Wind Condition for Proposed Development

The site is currently used as outdoor carpark upon the demolition of Ex-Yuen Long Housing Estate as discussed in ***Section 2.1.*** It is anticipated that the proposed development on the subject site could potentially block prevailing winds from ENE, NE, NNE and E directions to pedestrian areas within close vicinity. The extent of these impacts was quantitatively investigated by CFD simulation and details of methodology are given in ***Section 4***.

3. Site Wind Availability Data

3.1. Wind Data from MM5

Wind data used in CFD modelling is referred to the "Site Wind Availability Data" published by the Planning Department which is simulated by Fifth-Generation NCAR/ Penn State Mesoscale Model (MM5), as recommended in "Technical Guide for Air Ventilation Assessment for Development in Hong Kong" published by Housing, Planning and Lands Bureau (HPLB) and Environment, Transport and Works Bureau (ETWB).

The wind rose of grid (16, 36) is the nearest grid to the subject site. The wind velocity ranges from 2.6 to 9.4ms^{-1} from 16 wind directions at 596m above the terrain level and the average wind velocity is 7.1 ms^{-1} at 596m above ground. The wind rose diagram of MM5 grid is shown in ***Figure 6***.

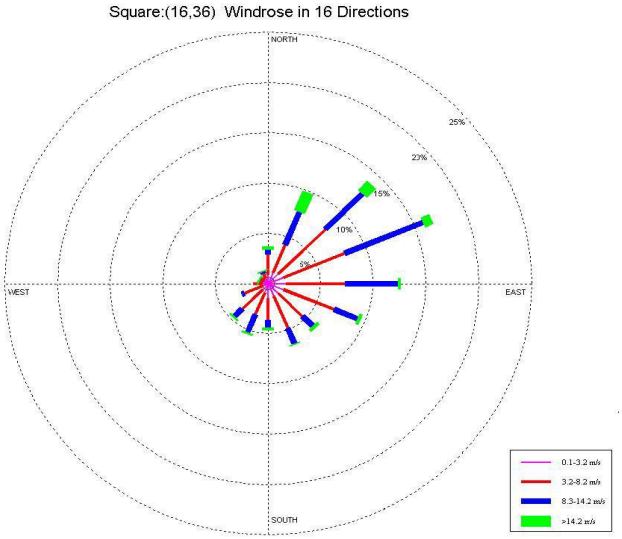


Figure 6 Wind Rose of Grid (16, 36), MM5

The Technical Guide recommends prevailing wind directions which exceed 75% of a year to be used in assess ventilation impacts of the proposed development in the Initial AVA Study. There are eight probable winds exceeded 75% of a year in the grid (16, 36) including ENE, NE, E, NNE, ESE, SSE, SE and SSW. The average wind velocities and wind probabilities of these eight probable winds are summarized in ***Table 2.*** Details of the eight most probable winds can be referred to ***Appendix A***.

Table 2 Summary of the Most Probable Wind Directions which Exceed 75% of a Year

Prevailing Wind Direction	Degree of Wind Direction	Average Wind Velocities (m/s)	Probability (%)
ENE	67.5	8.48	16.6
NE	45	8.13	13.7
E	90	7.47	12.5
NNE	22.5	9.36	9.7
ESE	112.5	6.29	9.3
SSE	157.5	5.92	6.5
SE	135	5.62	6.2
SSW	202.5	6.91	5.3
		Total Probability:	**79.8**

4. Assessment Approach and Methodology

4.1. Modelling Tool

A computational fluid dynamics (CFD) computer simulation model, ANSYS FLUENT, is used for the assessment. The CFD model solves algebraic equations resulting from the application of the conservation laws of physics to finite volumes of space and time to simulate wind flow.

There are two schemes being assessed by CFD modelling in this Initial AVA Study.

1. Scheme 1: evaluating ventilation performance within 500m of the subject site after the proposed development with previous design scheme used in previous AVA Study is in place.
2. Scheme 2: evaluating ventilation performance within 500m of the subject site after the proposed development with the revised design scheme is in place.

4.1. Geometry and Domain Setting

Geometry and simulation options for the subject development and surrounding environment have been set up to calculate the wind speed around the development and in the surrounding ambient. Related wind speeds around the development were assessed by setting up a geometry model of the development with surrounding building structures. Computational Fluid Dynamics (CFD) simulation software FLUENT ANSYS will be used in the Initial Study. Details regarding the CFD modelling settings will be described in the following.

In this study, 3-dimensional models within the surrounding and assessment area were built in order to conduct CFD simulation as shown in ***Figure 7***. The blockage ratio is about 2.2%.

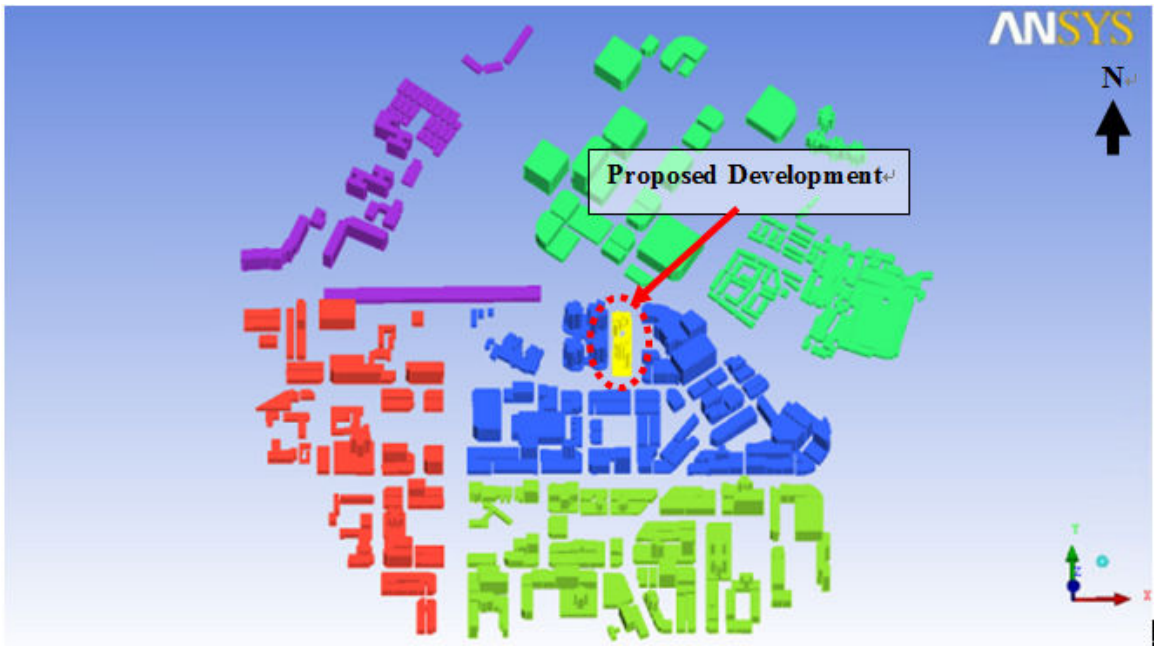


Figure 7 Dimensional Virtual Model of Proposed Scenario

The size of the computational domain is illustrated below and shown in Figure 8 and Figure 9

- x-direction = 6000m;
- y-direction = 6000m; and
- z-direction = 1000m

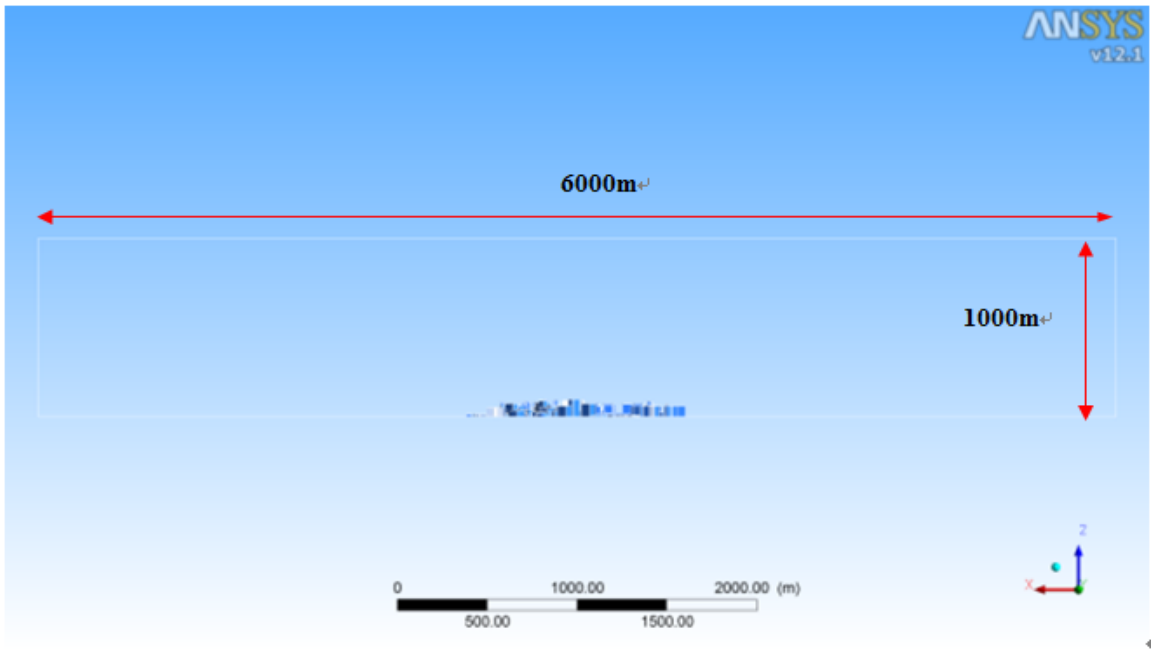


Figure 8 Side View of Domain Dimension

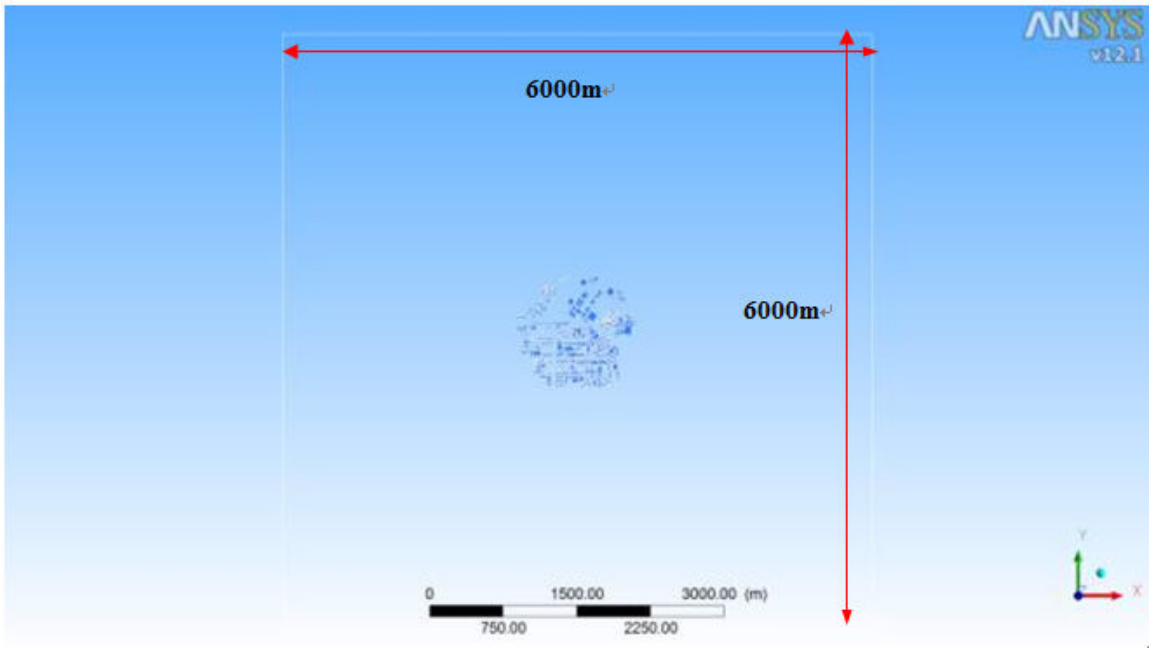


Figure 9 Top View of Domain Dimension

4.2. Mesh Setting

Unstructured grid has been constructed by ANSYS ICEM CFD and the grid size can be manually adjusted in the aforesaid meshing tools. Within the assessment area, as shown in ***Figure 10***, cells located across the x-axis and y-axis are posited with smaller intervals than those located further from the site location in order to produce a more precise result at higher resolution where it is required.

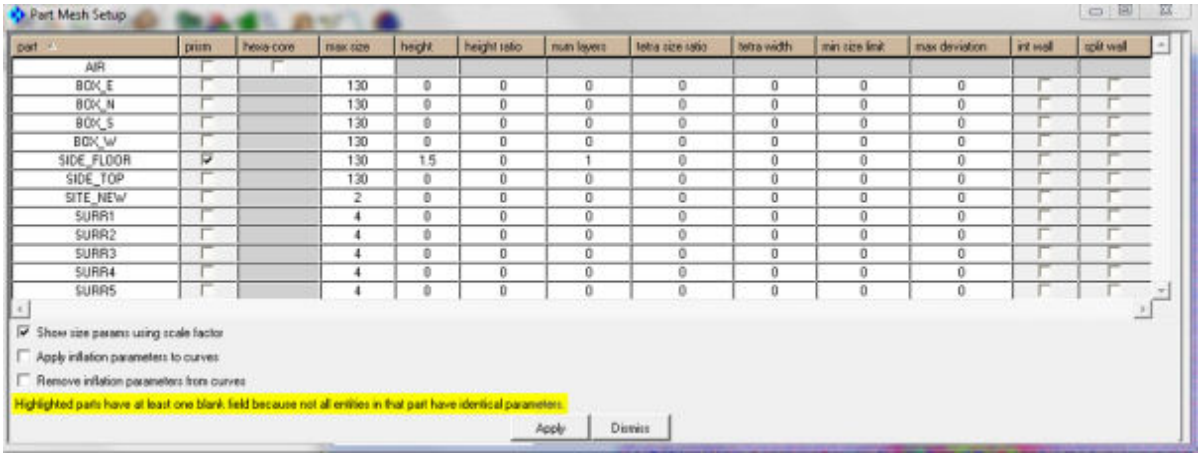


Figure 10 Mesh Set up

The grid arrangement within the assessment height of 2m above ground will be refined to facilitate the pedestrian wind environment study. For improved accuracy, smaller grid has been adopted in order to achieve a higher resolution at low levels of z-axis. Three prism layers at prism ratio of 1.5 are created at 1.5m above ground as shown in ***Figure 11***. The mesh of the model is illustrated in ***Figure 11***.

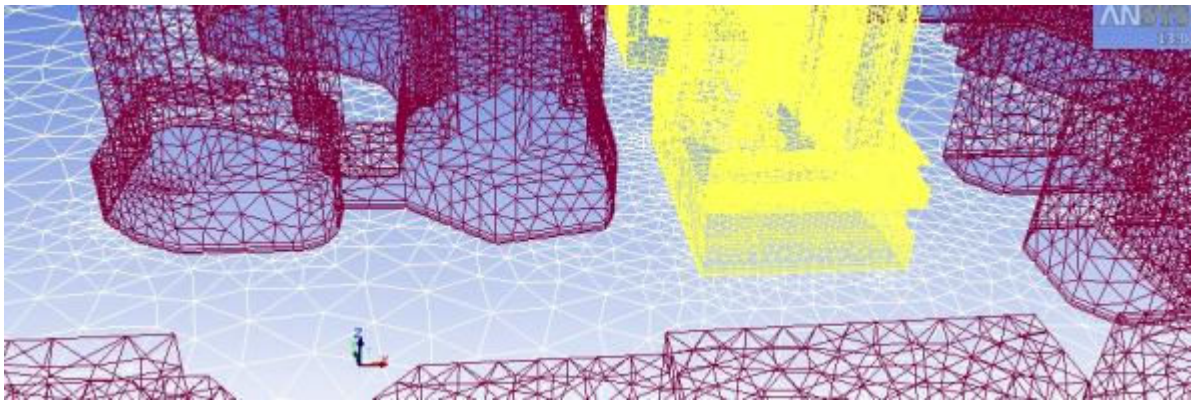
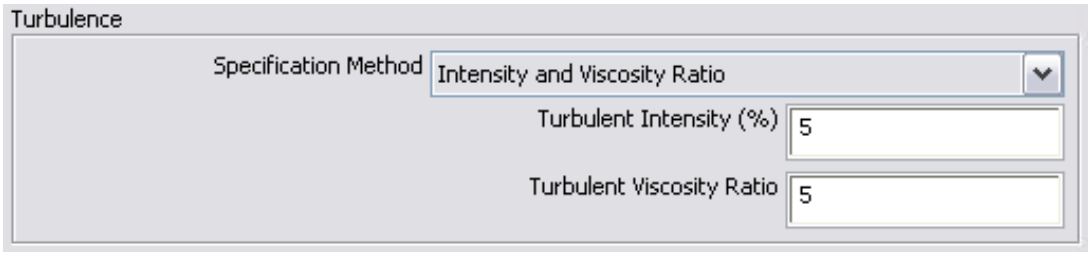


Figure 11 Side View of Meshing Arrangement near Ground Level

4.3. Numeric Scheme Setting

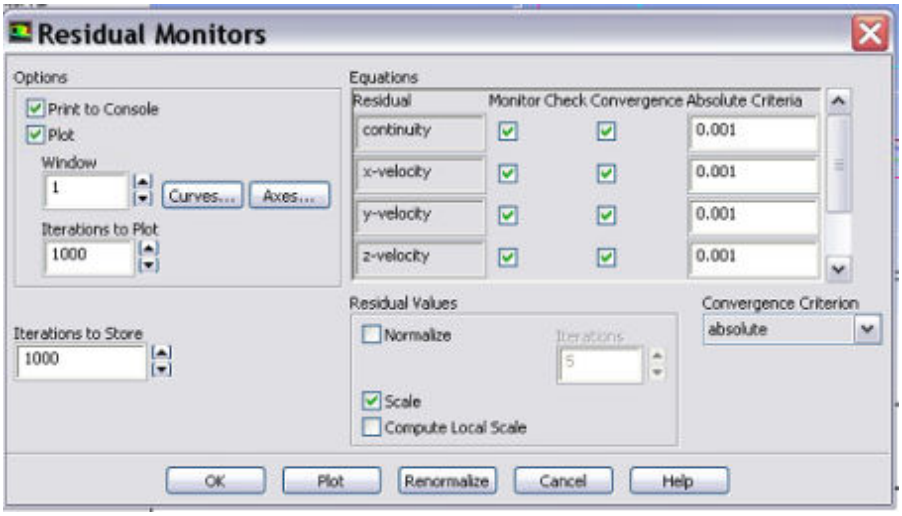
4.3.1. Turbulence Model

Turbulence model adopted in this study is Intensity and Viscosity Ratio, with Turbulent Intensity of 5% and Turbulent Viscosity Ratio of 5%.



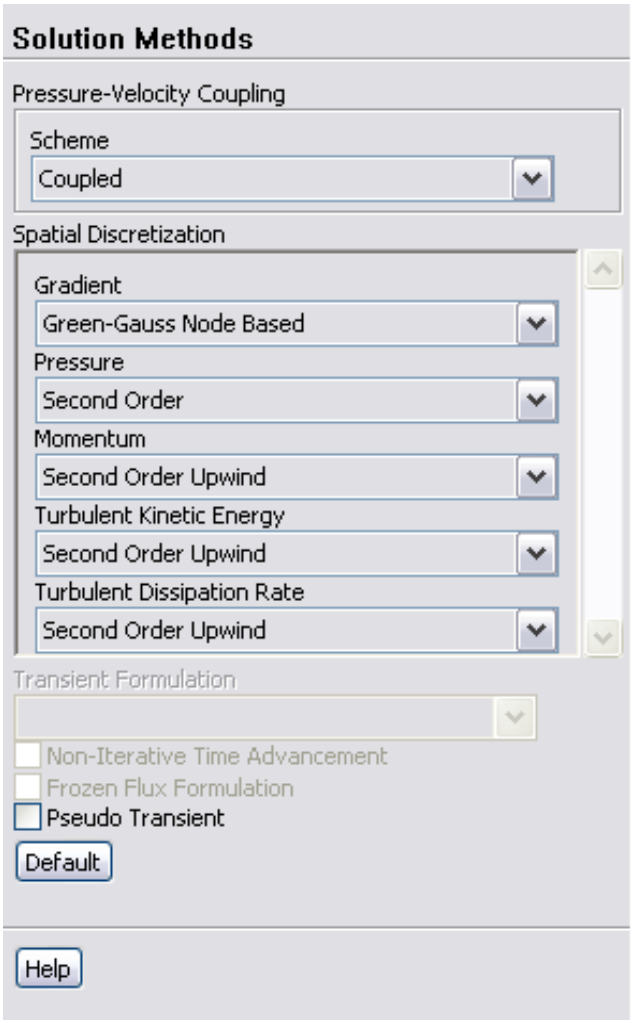
4.3.2. Convergence Criteria Input

FLUENT uses iterative methods to solve the algebraic system of equations. The termination criterion is usually based on the residuals of the corresponding equations. The termination criterion of 0.001 has been used in this study.



4.3.3. **Numerical**

Spatial discretization of 2nd order is used in the solution methods.



4.4. Boundary Condition

The boundary settings for each prevailing wind are listed in Table 3.

Table 3 Setting of Boundary Conditions in Fluent

Wind Direction	North	East	South	West	Top	Bottom
ENE	Velocity inlet	Velocity inlet	Pressure outlet	Pressure outlet	Symmetry	Wall
NE	Velocity inlet	Velocity inlet	Pressure outlet	Pressure outlet	Symmetry	Wall
E	Symmetry	Velocity inlet	Symmetry	Pressure outlet	Symmetry	Wall
NNE	Velocity inlet	Velocity inlet	Pressure outlet	Pressure outlet	Symmetry	Wall
ESE	Pressure outlet	Velocity inlet	Velocity inlet	Pressure outlet	Symmetry	Wall
SSE	Pressure outlet	Velocity inlet	Velocity inlet	Pressure outlet	Symmetry	Wall
SE	Pressure outlet	Velocity inlet	Velocity inlet	Pressure outlet	Symmetry	Wall
SSW	Pressure outlet	Pressure outlet	Velocity inlet	Velocity inlet	Symmetry	Wall

4.5. Wind Profile

Wind data used in CFD simulation should be referred to MM5 data published by Planning Department as recommended in the Technical Guide.

The occurrence of winds which exceed 75% of a reference year includes ENE, NE, E, NNE, ESE, SSE, SE and SSW winds. As MM5 data indicates wind availability at 596m above ground level, in order to evaluate wind availability at pedestrian level (2m above pedestrian walkway), the wind velocities of the eight probable winds obtained from MM5 are converted to pedestrian level. Wind profiles of different prevailing direction are determined using the Power Law:

$$\frac{U_z}{U_G} = \left(\frac{Z_Z}{Z_G}\right)^{\alpha}$$

Where U_Z is the wind speed at height z from ground;
U_G is the wind speed at reference height (top of wind boundary layer);
Z_Z is the height z from ground;
Z_G is the reference height (top of wind boundary layer); and
α is the power law exponent.

The power law exponent (α) is based on the roughness length of the approaching area outside the modelled area. As discussed in ***Section 2.1***, the terrain condition in the southern and western parts of the approaching area is low- to medium- rise residential buildings and building heights are more than 5 storeys; while buildings located at the northern and eastern parts are high-rise and building heights can be more than 20 storeys.

The power law exponent applied in calculation of local wind profile is 0.4, which is suggested by Givoni (1998)[2] for centre of city with buildings of more than 10 storeys.

The details of the wind profile for the prevailing winds defined at the inlet boundary are given in ***Table 4***. The detailed calculation for wind profiles are attached in ***Appendix A***. The graphical plots of the prevailing wind profiles of the prevailing winds are demonstrated in

[2] Givoni, B. (1998), *Climate Considerations in Building and Urban Design*, John Wiley & Sons

Figure 12.

Table 4 Details of the Wind Profile Defined at the Inlet Boundary

Wind direction	Gradient height (m)	Wind velocity at the gradient height (m/s)	Power law exponent
ENE	596	8.5	0.4
NE	596	8.1	0.4
E	596	7.5	0.4
NNE	596	9.4	0.4
ESE	596	6.3	0.4
SSE	596	5.9	0.4
SE	596	5.6	0.4
SSW	596	6.9	0.4

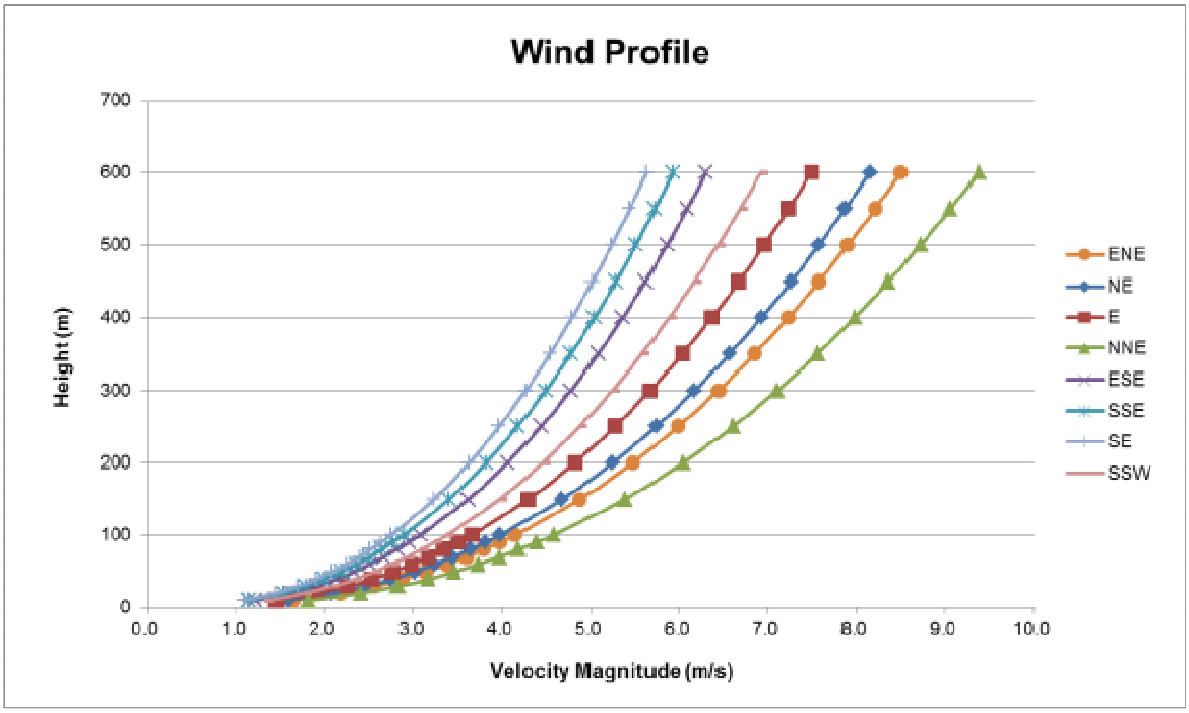


Figure 12 Graphical Plot of the Wind Profile for the Prevailing Winds

4.6. Test Points

Test Points are the locations where Wind Velocity Ratio (VRs) at pedestrian level i.e. 2m above pedestrian walkway is reported. Based on the VR of the test points, the resultant wind environment of the project can be assessed. Perimeter Test Points and Local Test Points are distributed around the project site.

Perimeter Test Points are distributed to areas around perimeters of the project site boundary which are likely to be frequently accessed by pedestrians. Test Points in this group are named with prefix “P” (i.e. P1, P2…). There is a total of 30 Perimeter Test Points distributed at a 15m interval along the perimeter of the subject site.

Local Test Points are distributed on areas within the assessment area boundary and project site boundary, which are frequently accessed by pedestrians. Test points in this group are named with prefix "O" (i.e. O1, O2…). There is a total of 67 overall test points evenly distributed on the streets, open space and places.

Special Test Points are positioned at the podium of proposed private development, where these areas are likely to be frequently accessed by pedestrians. Test points in this group are name with prefix "S" (i.e. S1, S2…). There is a total of 17 special test pints.

Locations of the perimeter test points, local test points and special test points are shown in ***Figure 13*** and coordinates of these test points are tabulated in ***Table 5***.

Table 5 Coordinates of Perimeter Test Points, Overall Test Points and Special Test Points

Test points	Location	Description	Z (mPD)
P1	Site Perimeter (West)	Pedestrian Walkway	6.1
P2	Site Perimeter (West)	Pedestrian Walkway	6.1
P3	Site Perimeter (West)	Pedestrian Walkway	6.1
P4	Site Perimeter (West)	Pedestrian Walkway	6.1
P5	Site Perimeter (West)	Pedestrian Walkway	6.1
P6	Site Perimeter (West)	Pedestrian Walkway	6.1
P7	Site Perimeter (West)	Pedestrian Walkway	6.1
P8	Site Perimeter (West)	Pedestrian Walkway	6.1
P9	Site Perimeter (West)	Pedestrian Walkway	6.1
P10	Site Perimeter (South)	Pedestrian Walkway	6.1
P11	Site Perimeter (South)	Pedestrian Walkway	6.1
P12	Site Perimeter (South)	Pedestrian Walkway	6.1
P13	Site Perimeter (South)	Pedestrian Walkway	6.1
P14	Site Perimeter (South)	Pedestrian Walkway	6.1
P15	Site Perimeter (South)	Pedestrian Walkway	6.1
P16	Site Perimeter (South)	Pedestrian Walkway	6.1
P17	Site Perimeter (North)	Pedestrian Walkway	6.1
P18	Site Perimeter (North)	Pedestrian Walkway	6.1
P19	Site Perimeter (North)	Pedestrian Walkway	6.1
P20	Site Perimeter (North)	Pedestrian Walkway	6.1
P21	Site Perimeter (North)	Pedestrian Walkway	6.1
P22	Site Perimeter (North)	Pedestrian Walkway	6.1
P23	Site Perimeter (East)	Pedestrian Walkway	6.1
P24	Site Perimeter (East)	Pedestrian Walkway	6.1
P25	Site Perimeter (East)	Pedestrian Walkway	6.1
P26	Site Perimeter (East)	Pedestrian Walkway	6.1
P27	Site Perimeter (East)	Pedestrian Walkway	6.1
P28	Site Perimeter (East)	Pedestrian Walkway	6.1
P29	Site Perimeter (East)	Pedestrian Walkway	6.1
P30	Site Perimeter (East)	Pedestrian Walkway	6.1
O1	Electric Sub-station (facing Wang Yip Street East)	Ground Floor	6.1
O2	Wang Yip Street East	Pedestrian Walkway	6.1
O3	Wang Yip Street South	Pedestrian Walkway	6.1

Test points	Location	Description	Z (mPD)
O4	Rest Garden (facing Wang Yip Street South)	Pedestrian Walkway	6.1
O5	Sun Shun Fuk Centre	Ground Floor	6.1
O6	Garden (facing Long Yip Street)	Pedestrian Walkway	6.1
O7	Electric Sub-station (facing Long Yip Street)	Ground Floor	6.1
O8	Long Yip Street	Pedestrian Walkway	6.1
O9	Long Yip Street	Pedestrian Walkway	6.1
O10	Long Yip Street	Pedestrian Walkway	6.1
O11	Long Yip Street	Pedestrian Walkway	6.1
O12	Long Yip Street	Pedestrian Walkway	6.1
O13	Long Yip Street	Pedestrian Walkway	6.1
O14	Long Yip Street	Pedestrian Walkway	6.1
O15	Long Yip Street	Pedestrian Walkway	6.1
O16	Po Yip Street	Pedestrian Walkway	6.1
O17	On Lok Industrial Building (facing Yuen Long On Lok Road)	Ground Level	6.1
O18	Keader Centre (facing Yuen Long On Lok Road)	Ground Level	6.1
O19	Yuen Long On Lok Road	Pedestrian Walkway	6.1
O20	Yuen Long On Lok Road	Pedestrian Walkway	6.1
O21	Yuen Long On Lok Road	Pedestrian Walkway	6.1
O22	Yuen Long On Lok Road	Pedestrian Walkway	6.1
O23	Yuen Long On Lok Road	Pedestrian Walkway	6.1
O24	Yuen Long On Lok Road	Pedestrian Walkway	6.1
O25	Yuen Long On Lok Road	Pedestrian Walkway	6.1
O26	Yuen Long On Lok Road	Pedestrian Walkway	6.1
O27	Yuen Long On Lok Road	Pedestrian Walkway	6.1
O28	Tai Kiu Road	Pedestrian Walkway	6.1
O29	Tai Kiu Road	Pedestrian Walkway	6.1
O30	Tai Kiu Road	Pedestrian Walkway	6.1
O31	Tai Kiu Road	Pedestrian Walkway	6.1
O32	Tai Kiu Road	Pedestrian Walkway	6.1
O33	Sun Wing Building (facing On Ning Road)	Ground Level	6.1
O34	Yue Fung Mansion (facing On Ning Road)	Ground Level	6.1
O35	Tung Cheong Building (facing On Ning Road)	Ground Level	6.1
O36	Fu Ning House (facing On Ning Road)	Ground Level	6.1
O37	On Lok House (facing On Ning Road)	Ground Level	6.1
O38	On Ding Building (facing On Ning Road)	Ground Level	6.1
O39	Hung Wan Building (facing On Ning Road)	Ground Level	6.1
O40	Hung Wan Building (facing On Ning Road)	Ground Level	6.1
O41	Fook Loi Building (facing On Ning Road)	Ground Level	6.1
O42	On Ning Road	Ground Level	6.1
O43	Sai Tai Street	Pedestrian Walkway	6.1
O44	Yuen Long Pau Cheung Square	Pedestrian Walkway	6.1
O45	Tung Lok Street	Pedestrian Walkway	6.1
O46	Hung Fook Building	Ground Level	6.1

Test points	Location	Description	Z (mPD)
O47	Yuen Long Government Offices and Tai Kiu Market (Squash Courts)	Ground Level	6.1
O48	Yuen Long Government Offices and Tai Kiu Market (Squash Courts)	Ground Level	6.1
O49	Yuen Long Government Offices and Tai Kiu Market (Squash Courts)	Ground Level	6.1
O50	Fook Tak Street	Pedestrian Walkway	6.1
O51	Kam Wah Building	Ground Level	6.1
O52	Fook Tak Street	Pedestrian Walkway	6.1
O53	Fook Tak Street	Pedestrian Walkway	6.1
O54	Fook Tak Street	Pedestrian Walkway	6.1
O55	Man Tat Building	Ground Level	6.1
O56	Yuen Long Theatre	Ground Level	6.1
O57	Yuen Long Pau Cheung Square	Pedestrian Walkway	6.1
O58	Tai Hing Building (facing Tai Lee Street)	Ground Level	6.1
O59	Tai Hing Building (facing Tai Lee Street)	Ground Level	6.1
O60	Koon Wong Mansion (facing Tai Lee Street)	Ground Level	6.1
O61	Shing Fat Industrial Building (facing Wang Chau Road)	Ground Level	6.1
O62	Wang Chau Road	Pedestrian Walkway	6.1
O63	Wang Chau Road	Pedestrian Walkway	6.1
O64	Keader Centre (facing Wang Chau Road)	Ground Level	6.1
O65	Tung Lok Street	Pedestrian Walkway	6.1
O66	Public Light Bus Terminus	Pedestrian Walkway	6.1
O67	Fook Hong Street	Pedestrian Walkway	6.1
S1	Proposed Private Development	Podium	16.2
S2	Proposed Private Development	Podium	16.2
S3	Proposed Private Development	Podium	16.2
S4	Proposed Private Development	Ground Level	6.1
S5	Proposed Private Development	Ground Level	6.1
S6	Proposed Private Development	Podium	16.2
S7	Proposed Private Development	Podium	16.2
S8	Entry of Proposed Public Development	Ground Level	6.1
S9	EVA between Proposed Private and Public Development	Ground Level	6.1
S10	EVA between Proposed Private and Public Development	Ground Level	6.1
S11	EVA between Proposed Private and Public Development	Ground Level	6.1
S12	EVA between Proposed Private and Public Development	Ground Level	6.1
S13	EVA between Proposed Private and Public Development	Ground Level	6.1
S14	EVA between Proposed Private and Public Development	Ground Level	6.1
S15	Proposed Private Development	Ground Level	6.1
S16	Proposed Private Development	Podium	16.2
S17	Proposed Private Development	Ground Level	6.1

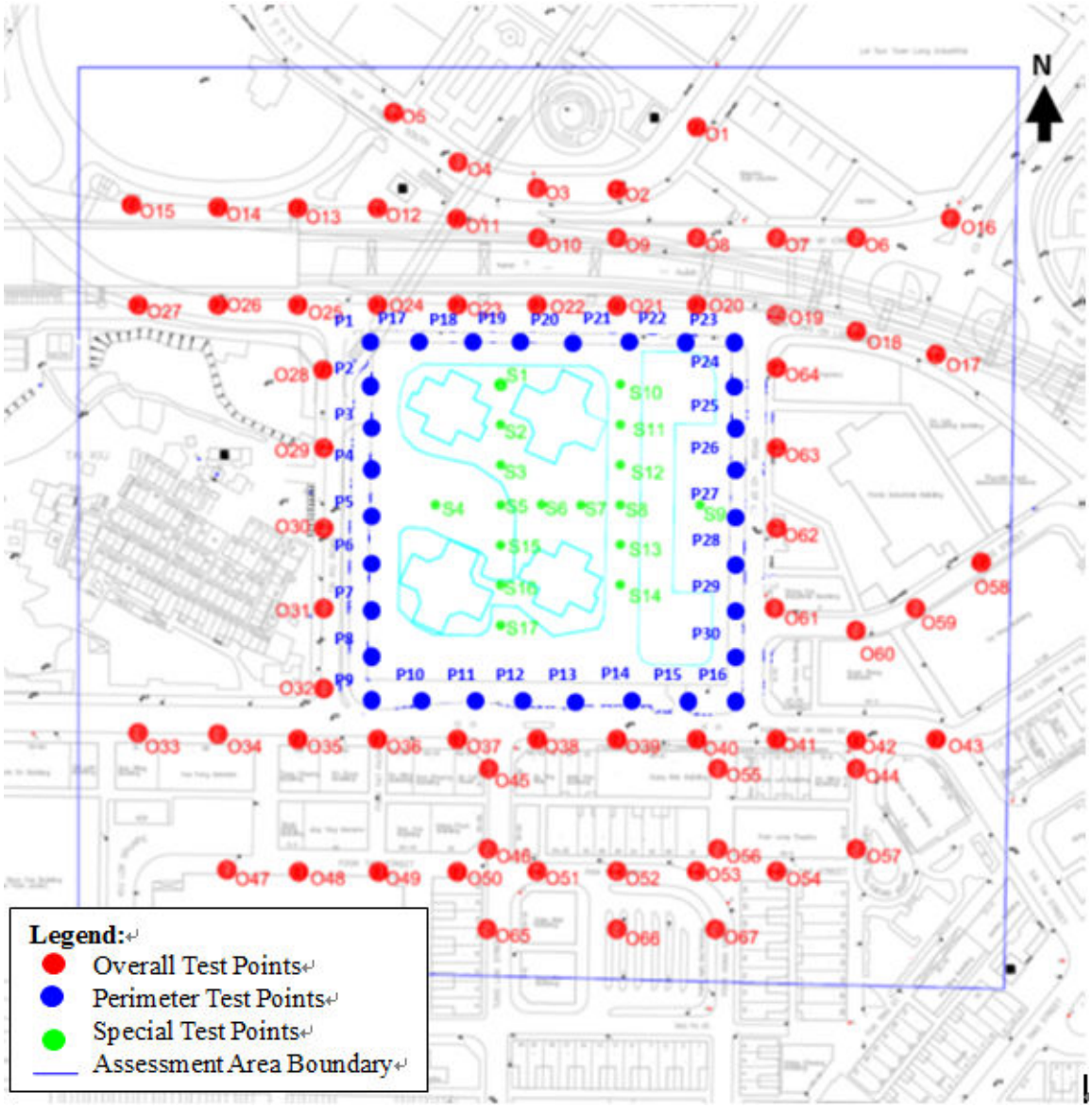


Figure 13 Positions for Perimeter Tests, Overall Test Points and Special Test Points

4.7. Wind Velocity Ratio

Wind velocity is assessed at 2m above ground level and podium level of the proposed residential tower. Wind Velocity Ratio (VR) should be used as an indicator of wind performance for the AVA. It indicates how much of the wind availability of a location could be experienced and enjoyed by pedestrians. The higher the wind velocity ratio, the less likely would be the impact of the proposed development on the wind availability.

Wind Velocity Ratio is defined as follows:

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

Where Vp is the wind velocity at the pedestrian level (2m above ground) after taking into account the effects of buildings; and

V is the wind availability of the site, i.e. wind velocity at the top of the wind boundary layer. MM5 data are used to determine velocity at infinity level for the project site

The assessment on the overall wind performance of the revised situation and the proposed development were analyzed by comparing the weighted-mean wind velocity ratio (VRw) to account for wind coming from the 8 wind directions. VRw is the sum of the Wind Velocity Ratio of wind from direction i (VRi) multiplied by the probability (Fi) of wind coming from that direction.

$$VRi = \frac{V_{pi}}{V_{\infty i}}$$

$$VR_w = \sum_{i=1}^{16} Fi \times VRi$$

Where Vpi is the wind velocity at the pedestrian level (2m above ground) when wind comes from direction i; and
Vi is the wind availability of the site, when wind comes from direction i
Fi is the frequency occurrence of wind from direction i, 16 directions are considered.
VRw is the wind velocity ratio

For the Site Air Ventilation Assessment, the Site spatial average Velocity Ratio (SVR) is reported, which takes into account the perimeter test points (Point P1 to P30) evenly positioned on the project site boundary as shown in ***Figure 13.***

For the Local Air Ventilation Assessment, the Local spatial average Velocity Ratio (LVR) is reported, which takes into account both perimeter test points and the overall test points evenly distributed and positioned in the open spaces, on the streets within the assessment area (Point O1 to O67) as shown in ***Figure 13.***

Special Test Points are assigned to evaluate the air ventilation performance on the internal street (Point S1 to S17) as shown in ***Figure 13***.

5. Air Ventilation Results and Analysis

The simulation results in terms of graphical plots of wind velocity contour and wind velocity vector at pedestrian level for two development schemes under eight prevailing wind directions are provided in Appendix B and Appendix C. The wind velocities at each test point as described in Section 4.6 are extracted for calculating the wind velocity ratio and for further wind performance assessment. The calculation details are provided in Appendix D.

The following sections provide discussions and a summary upon the study findings.

5.1. Wind Velocity Ratio

The weighted wind velocity ratio (VRw) at each perimeter test point between Scheme 1 and Scheme 2 are compared in ***Figure 14***, while VRw at each overall test point are compared in ***Figure 15*** and ***Figure 16***.

For the perimeter test points, the differences in Scheme 2 as compared with Scheme 1 vary from -0.025 to 0.013, and the differences for overall test points vary from -0.011 to 0.032.

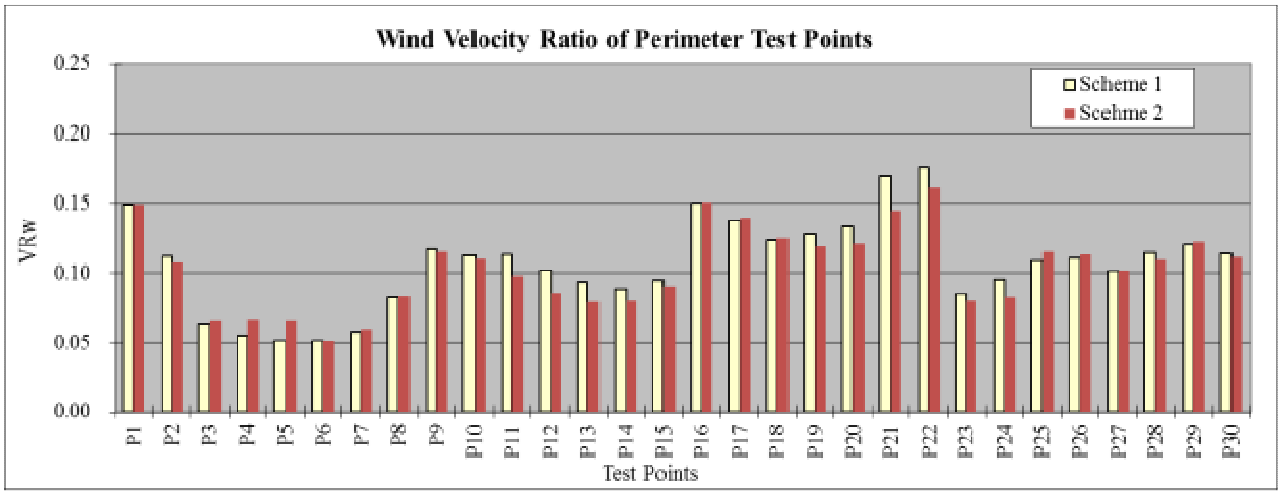


Figure 14 Comparison of Weighted Wind Velocity Ratio (VRw) at Perimeter Test Points for Scheme 1 and Scheme 2 (P1 to P30)

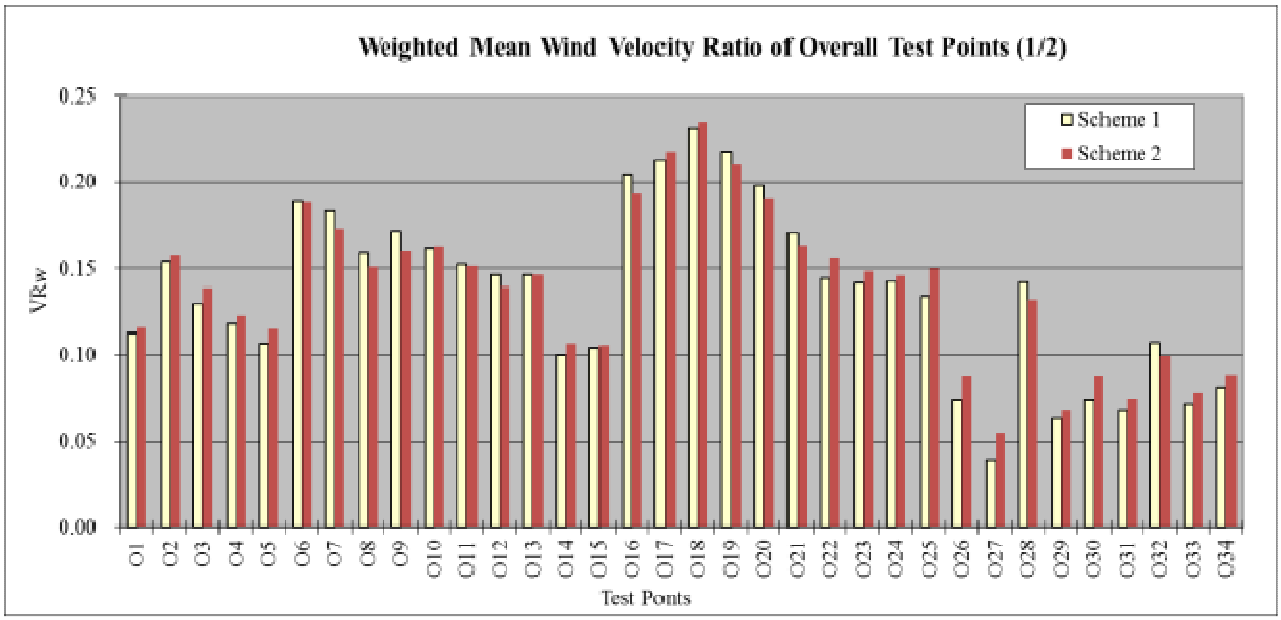


Figure 15 Comparison of Weighted Wind Velocity Ratio (VRw) at Overall Test Points for Scheme 1 and Scheme 2 (O1 to O34)

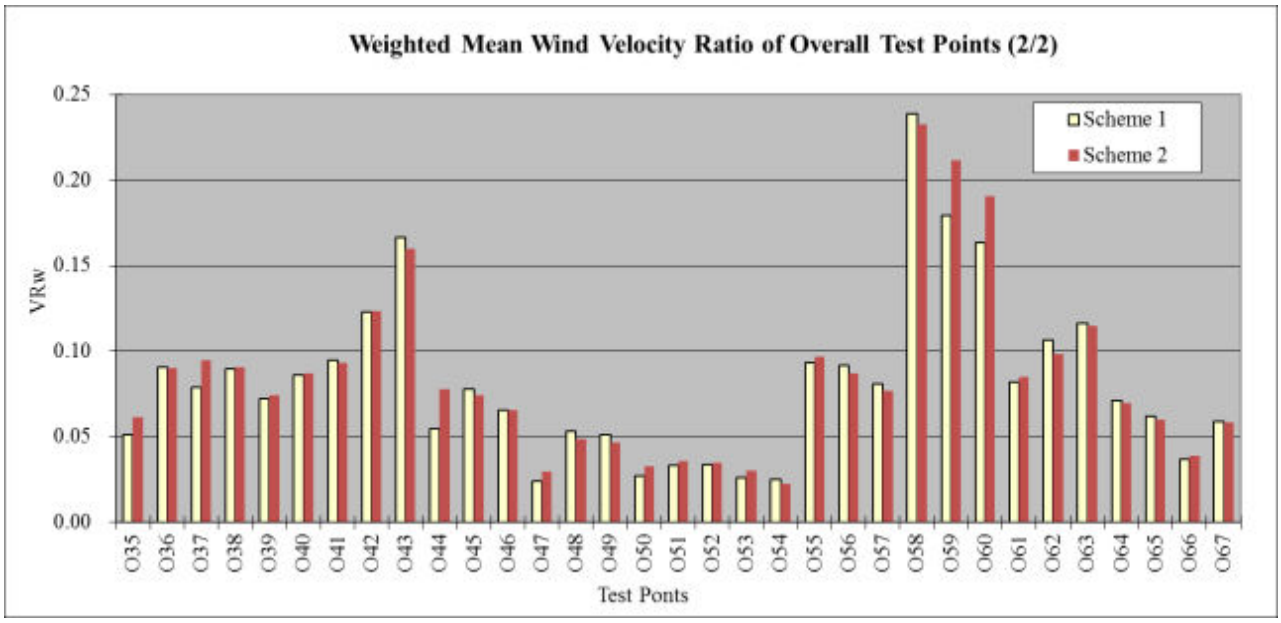


Figure 16 Comparison of Weighted Wind Velocity Ratio (VRw) at Overall Test Points for Scheme 1 and Scheme 2 (O35 to O67)

5.2. Site Air Ventilation Assessment Findings

The Site Velocity Ratio (SVR) is evaluated by considering perimeter test points (30 points) and the average SVR for each prevailing wind are tabulated in ***Table 6***.

Table 6 Summary of SVR under Prevailing Wind Directions

Wind Directions	**Scheme 1, $VR_{average}$**	**Scheme 2, $VR_{average}$**	**$VR_{average}$ Change**	**% $VR_{average}$ Change**
ENE (67.5°)	0.130	0.128	-0.002	-1.8
NE (45°)	0.118	0.108	-0.010	-8.5
E (90°)	0.106	0.104	-0.002	-1.9
NNE (22.5°)	0.115	0.102	-0.012	-10.8
ESE (112.5°)	0.104	0.093	-0.011	-10.2
SSE (157.5°)	0.069	0.080	0.012	17.2
SE (135°)	0.077	0.084	0.007	9.4
SSW (202.5°)	0.084	0.083	-0.001	-1.1
SVRw	**0.107**	**0.103**		
% Change in SVRw	**-3.54**			

Note: All the above figures are calculated and corrected from true values and details can be referred to Appendix D.

As revealed in ***Table 6***, the proposed development will have slightly negative impacts on the ventilation performance under ENE, NE, E, NNE, ESE and SSW directions and the reduction of $VR_{average}$ under these winds range from -10.8% to -1.1%. On the other hand, the proposed development has observable ventilation improvement on local wind environment under prevailing winds of SSE and SE, with an improvement of VR by 17.2% and 9.4%

respectively.

The average SVRw reduces from 0.107 in Scheme 1 to 0.103 in Scheme 2. The reduction of SVRw for Scheme 2 as compared with Scheme 1 is -3.54% which indicates slight adverse ventilation impact at pedestrian level.

The analysis of the directional effects of Scheme 1 and Scheme 2 has been summarized in ***Table 7***.

Table 7 Findings of SVR under Prevailing Wind Directions

Wind	Occurrence	SVR Range	Scheme 1	Scheme 2	Comparison	Summary
ENE	16.6%	Scheme 1 0.034 – 0.249 Scheme 2 0.035 – 0.235	Average VR 0.130	Average VR 0.128 Impacted Areas [#] - Immediate S, E & SE (Perimeter) of the site boundary. Improved Areas [##] - Immediate W (Perimeter) of the site boundary.	VR change from Scheme 1 to 2 -0.002 (-1.8%) Trend 16 out of 30 test points have been recorded with decrease in VR.	The absolute percentage change in VR is smaller than 5.0%, overall reduction in VR ratio suggests Scheme 2 has similar ventilation performance as compared with Scheme 1 and minimal impact on local wind environment is anticipated. *
NE	13.7%	Scheme 1 0.021 – 0.217 Scheme 2 0.014 – 0.217	Average VR 0.118	Average VR 0.108 Impacted Areas - Immediate SE, SW & NW (Perimeter) of the site boundary. Improved Areas - Immediate E (Perimeter) of the site boundary.	VR change from Scheme 1 to 2 -0.010 (-8.5%) Trend 19 out of 30 test points have been recorded with decreased VR.	The absolute percentage change in VR is less than 10%, thus overall reduction in VR ratio suggests Scheme 2 has slight reduction on local wind environment. *
E	12.5%	Scheme 1 0.015 – 0.249 Scheme 2 0.017 – 0.185	Average VR 0.106	Average VR 0.104 Affected Area - Immediate S (Perimeter) of the site boundary. Improved Areas - Immediate NE, E & W (Perimeter) of the site	VR change from Scheme 1 to 2 -0.002 (-1.9%) Trend 14 out of 30 test points have been recorded with decreased VR.	The absolute percentage change in VR is smaller than 5.0%, overall reduction in VR ratio suggests Scheme 2 has similar ventilation performance as compared with Scheme 1 and minimal impact on local wind environment is anticipated. *
NNE	9.7%	Scheme 1 0.038 – 0.176 Scheme 2 0.034 – 0.165	Average VR 0.115	Average VR 0.102 Affected Area - Immediate S (Perimeter) of the site. Improved Areas - Immediate N, NE, E, SE & W (Perimeter) of the site.	VR change from Scheme 1 to 2 -0.012 (-10.8%) Trend 20 out of 30 test points have been recorded with decreased VR.	The absolute percentage change in VR is larger than 10%, overall reduction in VR ratio suggests Scheme 2 has observable reduction on local wind environment.*

Wind	Occurrence	SVR Range	Scheme 1	Scheme 2	Comparison	Summary
ESE	9.3%	Scheme 1 0.022 – 0.194 Scheme 2 0.025 – 0.173	Average VR 0.104	Average VR 0.093 Affected Area - Immediate N & NW (Perimeter) of the site. Improved Areas - Immediate W & NE (Perimeter) of the site.	VR change from Scheme 1 to 2 -0.011 (-10.2%) Trend 17 out of 30 test points have been recorded with decreased VR.	The absolute percentage change in VR is larger than 10%, overall reduction in VR ratio suggests Scheme 2 has observable reduction on local wind environment.*
SSE	6.5%	Scheme 1 0.011 – 0.144 Scheme 2 0.023 – 0.155	Average VR 0.069	Average VR 0.080 Affected Area - Immediate SE (Perimeter) of the site Improved Areas - Immediate N, NW, W, S (Perimeter) of the site.	VR change from Scheme 1 to 2 0.012 (17.2%) Trend 6 out of 30 test points have been recorded with decreased VR.	The percentage change in VR is larger than 10%, thus it is considered that the Scheme 2 has observable improvement on local wind environment. *
SE	6.2%	Scheme 1 0.018 – 0.172 Scheme 2 0.014 – 0.179	Average VR 0.077	Average VR 0.084 Affected Area - Nil Improved Areas - Immediate W, NW & N (Perimeter) of the site.	VR change from Scheme 1 to 2 0.007 (9.4%) Trend 11 out of 30 test points have been recorded with slightly decreased VR.	The percentage change in VR is larger than 5%, thus it is considered that Scheme 2 has slight improvement on local wind environment. *
SSW	5.3%	Scheme 1 0.016 – 0.134 Scheme 2 0.018 – 0.139	Average VR 0.084	Average VR 0.083 Impacted Areas - Immediate N, SW & W (Perimeter) of the site Improved Areas - Immediate NE (Perimeter) of the site	VR change from Scheme 1 to 2 -0.001 (-1.1%) Trend 16 out of 30 test points have been recorded with decreased VR.	The absolute percentage change in VR is smaller than 5.0%, overall reduction in VR ratio suggests Scheme 2 has similar ventilation performance as compared with Scheme 1 and minimal impact on local wind environment is anticipated. *

Wind	Occurrence	SVR Range	Scheme 1	Scheme 2	Comparison	Summary
Weighted Average	79.8%	Scheme 1 0.051 – 0.176 Scheme 2 0.051 – 0.161	Average VR 0.107	Average VR 0.103 Affected Area - Immediate SE (Perimeter) of the site. Improved Areas - Immediate NE & W (Perimeter) of the site.	VR change from Scheme 1 to 2 -0.004 (-3.54%) Trend 17 out of 30 test points have been recorded with decreased VR.	The absolute percentage change in VR is much smaller than 5%, thus it is considered that Scheme 1 and Scheme 2 has similar ventilation performance on local wind environment and minimal impact on local wind environment is anticipated. *

Note:
* Scale of Changes: 0-5% Similar Ventilation; 6-10% Slight Change; >10% Observable Change
# "Impacted area" means those areas being impacted and reduction in ventilation is observed
"Improved area" means those areas where improved ventilation is observed

5.3. Local Air Ventilation Assessment Findings

The Local Velocity Ratio (LVR) are evaluated by considering both perimeter test points (30 points) and overall test points (67 test points), and the average LVR for each prevailing wind are tabulated in ***Table 8***.

Table 8 Summary of LVR under Prevailing Wind Directions

Wind Directions	Scheme 1, $VR_{average}$	Scheme 2, $VR_{average}$	$VR_{average}$ Change	% $VR_{average}$ Change
ENE (67.5°)	0.133	0.134	0.001	0.6
NE (45°)	0.117	0.118	0.001	0.9
E (90°)	0.1102	0.1098	-0.0004	-0.4
NNE (22.5°)	0.114	0.099	-0.015	-13.4
ESE (112.5°)	0.112	0.115	0.002	2.1
SSE (157.5°)	0.070	0.081	0.011	15.7
SE (135°)	0.088	0.099	0.011	13.0
SSW (202.5°)	0.066	0.065	-0.001	-1.0
LVRw	**0.1089**	**0.1094**		
% Change in LVRw	**0.41**			

Note: All the above figures are calculated and corrected from true values and details can be referred to Appendix D.

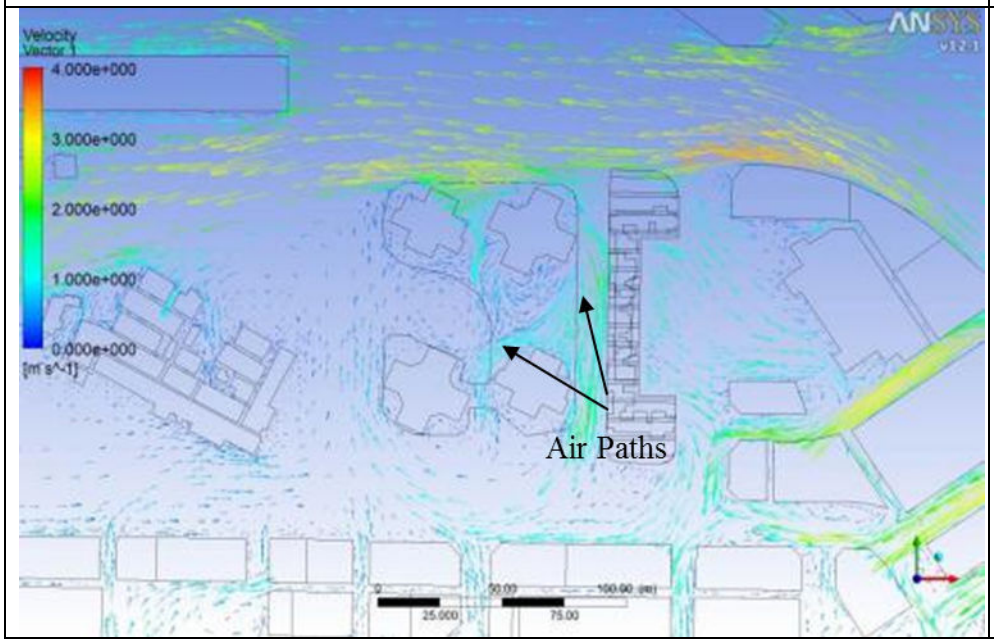
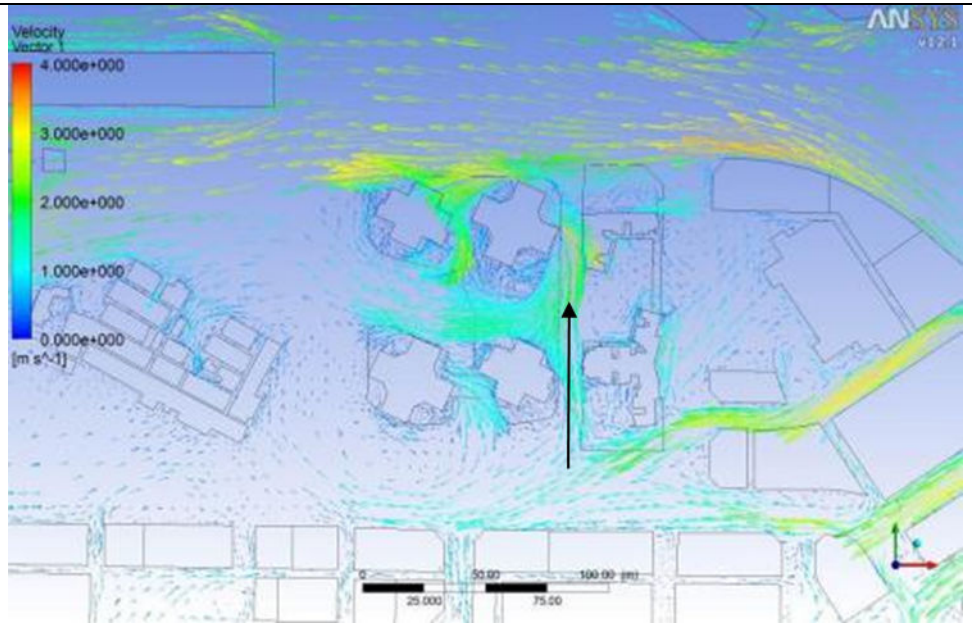
The LVR obtained from the CFD simulation results as shown in ***Table 9*** reveals a slight improvement of ventilation performance of 0.41% in Scheme 2 as compared with Scheme 1.

As predicted in ***Section 2.4***, the proposed development would potentially obstruct penetration of prevailing winds from ENE to ESE directions to residential buildings located at the downwind direction. Building gaps between public housing blocks as well as within private building blocks will form localized air paths facilitating air flows with the identified major breezeways along On Lok Road and On Ning Road. In addition, the increases of VRw recorded under prevailing wind ENE and NE show that increasing separation between towers and the reduced building height of Block 1 facilitates prevailing winds from these directions passing through downwind areas smoothly (***Figure 17*** and ***Figure 18).***

The reduction of VR is observed at Fuk Tak Street, Tai Lee Street, On Lok Road, Long Yip Road near Long Ping West Rail Station. However, with slight changes of LVR at minority test points, it is anticipated that the Scheme 2 will have no adverse impact on the wind environment of the local area.

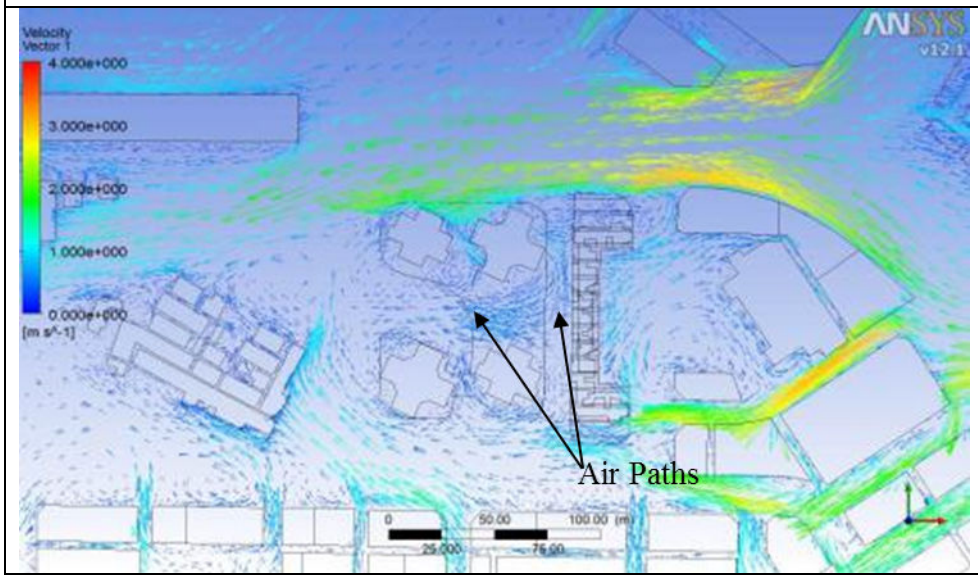
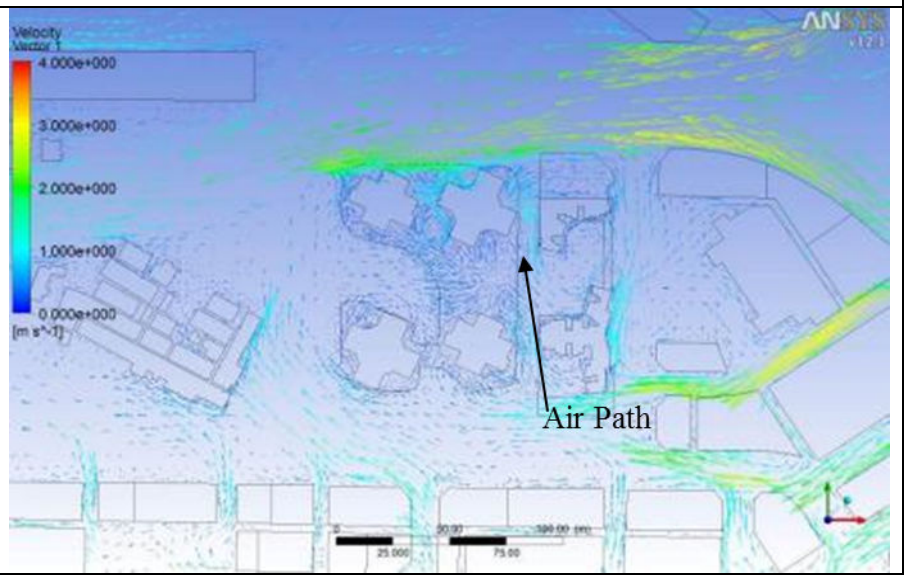
As compared with previous design scheme (Scheme 1), Scheme 2 has higher average local average wind speed (LVR=0.109) than average site average wind speed (SVR=0.103). Thus the vicinity of Scheme 2 can achieve relatively higher wind speed at the pedestrian level, in the district within 200m from the subject site.

The analysis of the directional effects of Scheme 1 and Scheme 2 has been summarized in ***Table 8***.

Scheme 1	Scheme 2
	

Note: The vectors are plotted at 16.2 mPD.

Figure 17 Wind Paths Created by the Building Separation within the Site under ENE Wind

Scheme 1	Scheme 2
	

Note: The vectors are plotted at 16.2 mPD.

Figure 18 Wind Paths Created by the Building Separation within the Site under NE Wind

Table 9 Findings of LVR under Prevailing Wind Directions

Wind	Occurrence	LVR Range	Scheme 1	Scheme 2	Comparison	Summary
ENE	16.6%	Scheme 1 0.012 – 0.322 Scheme 2 0.014 – 0.318	Average VR 0.133	Average VR 0.134 Impacted Areas [#] -Pedestrian walkway along Wang Chau Road near Shing Fat Industrial Building -Public light bus terminal and Fuk Tak Street S from the Site -Tai Kiu Tsuen Located West from the site -Long Yip Street and Po Yip Street located N from the Site Improved Areas [##] -Pedestrian walkway along Wang Chau Road near Shing Fat Industrial Building Long Yip Street near Long Ping Station -Buildings located along Wang Chau Road which is located immediate E from the Site. -Low-rise residential buildings located immediate S from the Site	VR change from Scheme 1 to 2 0.001 (0.6%) Trend 54 out of 97 test points have been recorded with slight decrease in VR.	The percentage change in VR is smaller than 5%, the Scheme 2 has similar ventilation performance as compared with Scheme 1. [*]
NE	13.7%	Scheme 1 0.004 – 0.280 Scheme 2 0.005 – 0.292	Average VR 0.117	Average VR 0.118 Impacted Areas -Pedestrian walkway along Wang Chau Road near Shing Fat Industrial Building -Public light bus terminal and Fuk Tak Street S from the Site -Low-rise residential buildings located along On Ning Road -Pedestrian walkway near On Lok Road near Long Ping Station. Improved Areas -Long Yip Street and Po Yip Street located N from the Site - Tai Kiu Tsuen Located West from the site	VR change from Scheme 1 to 2 0.001 (0.9%) Trend 34 out of 97 test points have been recorded with decreased VR.	The percentage change in VR is smaller than 5.0%, the Scheme 2 has similar ventilation performance as compared with Scheme 1. [*]
E	12.5%	Scheme 1 0.012 – 0.367 Scheme 2 0.023 – 0.290	Average VR 0.1102	Average VR 0.1098 Impacted Areas -Pedestrian walkway along Wang Chau Road near Shing Fat Industrial Building -Low-rise residential buildings located along On Ning Road Improved Areas -Public light bus terminal and Fuk Tak Street S from the Site	VR change from Scheme 1 to 2 -0.0004 (-0.4%) Trend 45 out of 97 test points have been recorded with decreased VR.	The absolute percentage change in VR is smaller than 5.0%, the Scheme 2 slightly reduces local wind ventilation and minimal impact is anticipated. [*]

Wind	Occurrence	LVR Range	Scheme 1	Scheme 2	Comparison	Summary
				- Tai Kiu Tsuen Located West from the site -Long Yip Street and Po Yip Street located N from the Site		
NNE	9.7%	Scheme 1 0.019 – 0.298 Scheme 2 0.015 – 0.226	Average VR 0.114	Average VR 0.099 Affected Area -Pedestrian walkway along Wang Chau Road near Shing Fat Industrial Building_ Improved Areas -Public light bus terminal located S from the Site - Tai Kiu Tsuen Located West from the site -Long Yip Street and Po Yip Street located N from the Site	VR change from Scheme 1 to 2 -0.015 (-13.4%) Trend 62 out of 97 test points have been recorded with decreased VR.	The absolute percentage change in VR is larger than 10%, overall reduction in VR ratio suggests Scheme 2 has observable reduction on local wind environment.*
ESE	9.3%	Scheme 1 0.022 – 0.296 Scheme 2 0.011 – 0.298	Average VR 0.112	Average VR 0.115 Affected Area -Long Ping Station near Tai Kiu Tsuen - Public Garden & Long Yip Road which located NE from the site. Improved Areas -Low-rise residential buildings located along On Ning Road -Public light bus terminal located S from the Site -Pedestrian walkway along Wang Chau Road near Shing Fat Industrial Building -On Ning Road and Fuk Tak Street located S from the site. - Public Garden & Long Yip Road which located NE from the site.	VR change from Scheme 1 to 2 0.002 (2.1%) Trend 45 out of 97 test points have been recorded with decreased VR.	The percentage change in VR is smaller than 5.0%, the Scheme 2 has similar ventilation performance as compared with Scheme 1. *
SSE	6.5%	Scheme 1 0.015 – 0.158 Scheme 2 0.016 – 0.164	Average VR 0.070	Average VR 0.081 Affected Area -Public light bus terminal located S from the Site -Long Ping Station near Tai Kiu Tsuen Improved Areas - Industrial buildings located immediate E from the Site. - On Ning Road and Fuk Tak Street located S from the site. - Public Garden & Long Yip Road which located NE from the site. - W to NW from the site near Tai Kiu Tsuen. - Public Garden & Long Yip Road which located NE from the site.	VR change from Scheme 1 to 2 0.011 (15.7%) Trend 18 out of 97 test points have been recorded with decreased VR.	The percentage change in VR is larger than 10%, thus it is considered that the Scheme 2 has observable improvement on local wind environment. *

Wind	Occurrence	LVR Range	Scheme 1	Scheme 2	Comparison	Summary
SE	6.2%	Scheme 1 0.014 – 0.206 Scheme 2 0.009 – 0.244	Average VR 0.088	Average VR 0.099 Affected Area - Wang Yip Street South located NW from the site. -Pedestrian walkway near On Lok Road near Long Ping Station. Improved Areas - On Ning Road located SE from the site. -W to NW from the site near Tai Kiu Tsuen.- -Pedestrian walkway along Wang Chau Road near Shing Fat Industrial Building -Along Fok Tak Street	VR change from Scheme 1 to 2 0.011 (13.0 %) Trend 28 out of 97 test points have been recorded with slight decreased VR.	The percentage change in VR is larger than 10%, thus it is considered that the Scheme 2 has observable improvement on local wind environment. *
SSW	5.3%	Scheme 1 0.008 – 0.156 Scheme 2 0.005 – 0.157	Average VR 0.066	Average VR 0.065 Impacted Areas -Pedestrian walkway near On Lok Road near Long Ping Station. -Keader Centre located immediate NE from the Site. Improved Areas - Tai Kiu Tsuen which locate W from the site. -Pedestrian walkway along Tai Lee Street -Buildings along Fuk Tak Street and On Ning Road - Public Garden & Long Yip Road which located NE from the site.	VR change from Scheme 1 to 2 -0.001 (-1.0%) Trend 48 out of 97 test points have been recorded with decreased VR.	The absolute percentage change in VR is smaller than 5.0%, overall reduction in VR ratio suggests Scheme 2 has similar ventilation performance as compared with Scheme 1. *
Weighted Average	79.8%	Scheme 1 0.024 – 0.239 Scheme 2 0.022 – 0.235	Average VR 0.1089	Average VR 0.1094 Affected Area - Nil Improved Areas - Nil	VR change from Scheme 1 to 2 0.002 (1.1%) Trend 46 out of 97 test points have been recorded with decreased VR.	The percentage change in VR is smaller than 5%, it is considered that the Scheme 2 has similar ventilation performance as compared with Scheme 1. *

Note:
* Scale of Changes: 0-5% Similar Ventilation; 6-10% Slight Change; >10% Observable Change
# "Impacted area" means those areas being impacted and reduction in ventilation is observed
"Improved area" means those areas where improved ventilation is observed

5.4. Air Ventilation Performance of Special Test Points

The ventilation performance at special test points is evaluated by assessing the wind velocity at the special test points which are extracted in CFD modeling results. The summary of VR for special test points are tabulated in ***Table 10*** and the details of the simulation results are summarized in Appendix D.

Table 10 Summary of VR for Special Test Points (S1 to S17) under Prevailing Wind Directions

Wind Directions	**Scheme 1, $VR_{average}$**	**Scheme 2, $VR_{average}$**	**$VR_{average}$ Change**	**% $VR_{average}$ Change**
ENE (67.5°)	0.085	0.116	0.030	35.2
NE (45°)	0.086	0.097	0.012	13.8
E (90°)	0.037	0.059	0.0219	59.6
NNE (22.5°)	0.092	0.081	-0.011	-12.1
ESE (112.5°)	0.075	0.091	0.017	22.2
SSE (157.5°)	0.085	0.084	-0.001	-1.4
SE (135°)	0.084	0.084	0.001	0.6
SSW (202.5°)	0.103	0.098	-0.005	-4.9
Special VRw	**0.078**	**0.090**		
% Change in Special VRw	**15.2**			

Note: All the above figures and percentages shown are calculated and corrected from true values and details can be referred to Appendix D.

As shown in ***Table 10***, except prevailing winds of NNE, SSE and SSW, ventilation performance of special test points under Scheme 2 is enhanced with the $VR_{average}$ improvement ranging from 0.6% to 59.6%. The separated podium structure enhances air blockage and maximizes flow of prevailing winds to the proposed private residential development located immediate to west of the subject site.

The wind barrier and obstructive nature of the site under prevailing winds of NNE, SSE and SSW with reductions of up to 12.1%. Taking into account of the annual probability occurrence of prevailing winds, the overall ventilation performance at pedestrian level for special test points on site has an observable improvement by 15.2%

5.5. Air Ventilation Performance of Focus Areas

For easy comparison of the wind performance at various areas between two schemes, overall test points are referred to 11 main focus areas and changes in VRw for these focus areas are assessed. The focus areas include main roads, bus terminal and square.

Zoning of the focus areas is demonstrated in ***Figure 19***, and the wind performance assessment results for each area are presented in ***Table 11***.

Figure 19 Focus Areas in the Assessment Area

Table 11 Summary of VR at Focus Areas

Focus Area	Test Point	Scheme 1, VRw	Scheme 2, VRw	Average VRw Change	Average VRw Change%
Fuk Tak Street	O47	0.024	0.030	0.001	5.5%
	O48	0.053	0.049		
	O49	0.051	0.047		
	O50	0.027	0.033		
	O51	0.033	0.036		
	O52	0.034	0.035		
	O53	0.026	0.030		
	O54	0.025	0.022		
Long Yip Street	O6	0.190	0.189	-0.004	-1.7%
	O7	0.183	0.173		
	O8	0.159	0.151		
	O9	0.171	0.161		
	O10	0.162	0.163		
	O11	0.152	0.152		
	O12	0.147	0.139		
	O13	0.146	0.146		
	O14	0.100	0.107		
	O15	0.104	0.106		
	O16	0.204	0.194		
Public Light Bus Terminal	O66	0.037	0.039	0.001	2.9%
	O67	0.059	0.058		
Tai Kiu Road	O28	0.142	0.132	0.001	4.2%
	O29	0.063	0.068		
	O30	0.074	0.087		
	O31	0.068	0.075		
	O32	0.107	0.099		
Tai Lee Street	O58	0.239	0.233	0.018	10.7%
	O59	0.179	0.212		
	O60	0.163	0.190		
Tung Lok Road	O45	0.078	0.074	-0.002	-2.7%
	O46	0.065	0.065		
	O65	0.062	0.060		
Wang Chau Road	O61	0.082	0.085	-0.002	-1.8%
	O62	0.106	0.098		
	O63	0.116	0.114		
	O64	0.071	0.069		
Wang Yip Street South	O1	0.112	0.116	0.006	4.9%
	O2	0.154	0.158		
	O3	0.129	0.139		
	O4	0.118	0.123		
	O5	0.107	0.115		

Focus Area	Test Point	Scheme 1, VRw	Scheme 2, VRw	Average VRw Change	Average VRw Change%
Yuen Long On Lok Road	O17	0.213	0.218	0.005	7.4%
	O18	0.231	0.235		
	O19	0.218	0.211		
	O20	0.198	0.191		
	O21	0.170	0.164		
	O22	0.144	0.156		
	O23	0.141	0.149		
	O24	0.142	0.146		
	O25	0.134	0.150		
	O26	0.074	0.087		
	O27	0.038	0.055		
Yuen Long On Ning Road	O33	0.071	0.078	0.003	5.4%
	O34	0.081	0.088		
	O35	0.051	0.061		
	O36	0.091	0.090		
	O37	0.079	0.094		
	O38	0.090	0.090		
	O39	0.072	0.074		
	O40	0.086	0.087		
	O41	0.095	0.093		
	O42	0.123	0.123		
	O43	0.167	0.160		
Yuen Long Pau Cheung Square	O57	0.081	0.077	-0.004	-5.4%

As indicated in ***Table 11***, at majority focus areas the wind performance is improved in Scheme 2 as compared with Scheme 1 by 2.9% to 10.7%, and only 4 out of 11 focus areas experience an overall decrease in VRw in scheme 2, which are Long Yip Street, Tung Lok Road, Wang Chau Road and Yuen Long Pau Cheung Square. The overall wind performance at the potential problem areas of Tai Kiu Road and On Ning Road, which are identified in ***Section 2.4***, can be slightly enhanced by 4.2% and 5.4% respectively.

It follows that Scheme 2 would unlikely have any significant adverse ventilation impact at pedestrian level in the vicinity of the site.

6. Conclusion

Under consideration to provide a direct comparison for the revised design scheme relative to the previous scheme design in previous AVA study for the Project, the surrounding environment of this AVA Initial Study was kept the same as the previous scheme although other developments may be planned and constructed within the years working in the revision of scheme. In addition, with regards to the planned developments at Tai Kiu Village, this village is not at the upwind location when compared with the highest 8 most probable prevailing wind directions at the site. Therefore, both the Baseline and Proposed Schemes

would not be affected by the presence of the latest committed and planned developments. It is concluded that the Baseline and Proposed Schemes should result in comparable pedestrian wind environment within the assessment area in accordance with the simulation.

According to the overall analysis of SVR and LVR, the revised design (Scheme 2) of public housing development has a similar SVR and LVR as compared with previous design Scheme (Scheme 1). The findings further reveal that the modified design adopted in Scheme 2 including lower building height of block 1, increase the width of building separation and modified building shapes of building blocks would unlikely have any adverse impact on air ventilation and have slightly improvement on pedestrian level air ventilation in the vicinity.

Appendix A.
Calculation of Wind Profile

A.1 MM5 Wind Data

Square	**(16,36)**	**N**	**NNE**	**NE**	**ENE**	**E**	**ESE**	**SE**	**SSE**	**S**	**SSW**	**SW**	**WSW**	**W**	**WNW**	**NW**	**NNW**
V	infinity	0.037	0.097	0.137	0.166	0.125	0.093	0.062	0.065	0.046	0.053	0.047	0.027	0.014	0.009	0.009	0.013
0_to_1		0.001	0.0005	0.001	0.001	0.001	0.0015	0.0005	0.0015	0.0015	0.0005	0.0005	0.0005	0.0005	0.001	0.0005	0.0005
1_to_2		0.003	0.0045	0.0045	0.0075	0.0075	0.006	0.0075	0.006	0.0075	0.0045	0.0045	0.003	0.0045	0.0015	0.003	0.003
2_to_3		0.0125	0.0125	0.015	0.0175	0.0175	0.0175	0.015	0.0125	0.015	0.01	0.0075	0.0075	0.005	0.005	0.005	0.0075
3_to_4		0.0175	0.0245	0.0385	0.0315	0.035	0.028	0.0175	0.0175	0.0105	0.014	0.0105	0.0105	0.007	0.0035	0.007	0.014
4_to_5		0.0315	0.036	0.054	0.054	0.0405	0.045	0.027	0.0315	0.018	0.0225	0.018	0.0225	0.0135	0	0.0045	0.009
5_to_6		0.033	0.044	0.066	0.0715	0.0495	0.0715	0.0385	0.0385	0.022	0.022	0.044	0.0275	0.0055	0.0055	0	0
6_to_7		0.013	0.026	0.104	0.0975	0.0845	0.078	0.052	0.0455	0.0325	0.0325	0.0325	0.026	0.0065	0.0065	0.0065	0
7_to_8		0.0075	0.0225	0.0825	0.0975	0.105	0.06	0.0525	0.0525	0.03	0.0375	0.045	0.0225	0.0075	0	0	0
8_to_9		0.0085	0.0595	0.0935	0.1105	0.119	0.0765	0.034	0.051	0.017	0.051	0.051	0.0085	0	0	0	0
9_to_10		0.019	0.0665	0.076	0.152	0.1045	0.0665	0.0475	0.0475	0.019	0.0475	0.0285	0.0095	0	0	0	0
10_to_11		0.021	0.084	0.1155	0.189	0.084	0.042	0.021	0.0315	0.021	0.0315	0.0105	0.0105	0	0	0	0.0105
11_to_12		0	0.0575	0.115	0.1725	0.115	0.0345	0.023	0.023	0.0115	0.023	0	0	0	0	0	0
12_to_13		0	0.0375	0.075	0.15	0.0875	0.025	0.0125	0.0125	0	0.025	0.0125	0	0	0	0	0
13_to_14		0.0135	0.0675	0.081	0.0945	0.054	0.0135	0	0.0135	0	0.0135	0	0	0	0	0	0
14_to_15		0	0.1015	0.058	0.058	0.029	0	0	0	0	0.0145	0	0	0	0	0	0
15_to_16		0	0.093	0.031	0.031	0	0	0	0	0	0	0	0	0	0	0	0
16_to_17		0.0165	0.099	0.0495	0.0165	0	0	0	0	0.0165	0.0165	0	0	0	0	0	0
17_to_18		0.0175	0.0525	0.035	0.0175	0	0	0	0	0	0	0	0	0	0	0	0
18_to_19		0	0.0185	0.0185	0.0185	0	0	0	0	0.0185	0	0	0	0	0	0	0
19_to_20		0	0	0	0.0195	0	0.0195	0	0	0	0	0	0	0	0	0	0
20_to_21		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21_to_22		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22_to_23		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23_to_24		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24_to_25		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		0.215	0.9075	1.1135	1.4075	0.9335	0.585	0.3485	0.3845	0.2405	0.366	0.265	0.1485	0.05	0.023	0.0265	0.0445
		5.811	9.356	8.128	8.479	7.468	6.290	5.621	5.915	5.228	6.906	5.638	5.500	3.571	2.556	2.944	3.423

A.2 Wing Profile

Power Law: Uz/Ug= (Zz/Zg)^a

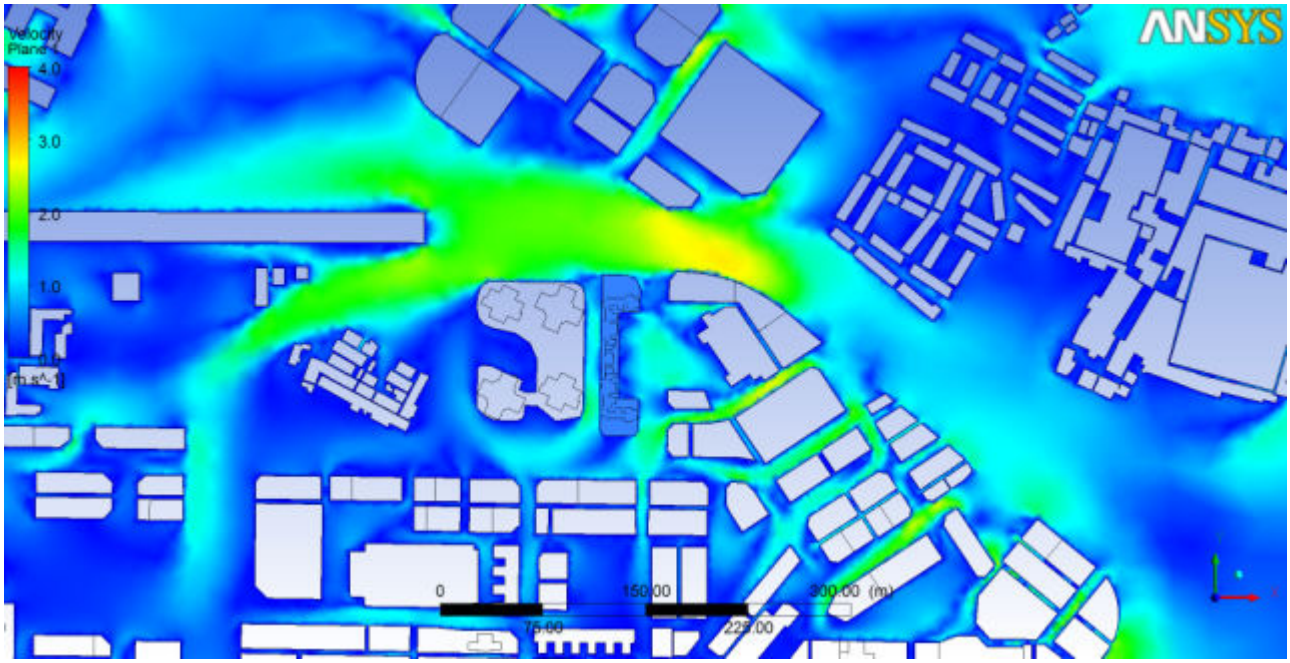
	ENE	**NE**	**E**	**NNE**	**ESE**	**SSE**	**SE**	**SSW**
Ug	8.48	8.13	7.47	9.36	6.29	5.92	5.62	6.91
Zg	596	596	596	596	596	596	596	596
a	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Zz	Uz	Uz	Uz	Uz	Uz	Uz	Uz	Uz
10	1.65	1.58	1.46	1.82	1.23	1.15	1.10	1.35
20	2.18	2.09	1.92	2.41	1.62	1.52	1.45	1.78
30	2.57	2.46	2.26	2.83	1.90	1.79	1.70	2.09
40	2.88	2.76	2.53	3.18	2.14	2.01	1.91	2.34
50	3.15	3.02	2.77	3.47	2.33	2.20	2.09	2.56
60	3.38	3.24	2.98	3.73	2.51	2.36	2.24	2.76
70	3.60	3.45	3.17	3.97	2.67	2.51	2.39	2.93
80	3.80	3.64	3.34	4.19	2.82	2.65	2.52	3.09
90	3.98	3.82	3.51	4.39	2.95	2.78	2.64	3.24
100	4.15	3.98	3.66	4.58	3.08	2.90	2.75	3.38
150	4.88	4.68	4.30	5.39	3.62	3.41	3.24	3.98
200	5.48	5.25	4.83	6.04	4.06	3.82	3.63	4.46
250	5.99	5.74	5.28	6.61	4.44	4.18	3.97	4.88
300	6.44	6.18	5.67	7.11	4.78	4.50	4.27	5.25
350	6.85	6.57	6.04	7.56	5.08	4.78	4.54	5.58
400	7.23	6.93	6.37	7.98	5.36	5.04	4.79	5.89
450	7.58	7.26	6.67	8.36	5.62	5.29	5.02	6.17
500	7.90	7.58	6.96	8.72	5.86	5.51	5.24	6.44
550	8.21	7.87	7.23	9.06	6.09	5.73	5.44	6.69
600	8.50	8.15	7.49	9.38	6.31	5.93	5.64	6.92

Appendix B.
Contour and Vector Plots of CFD Modelling Results (Wind Velocity)

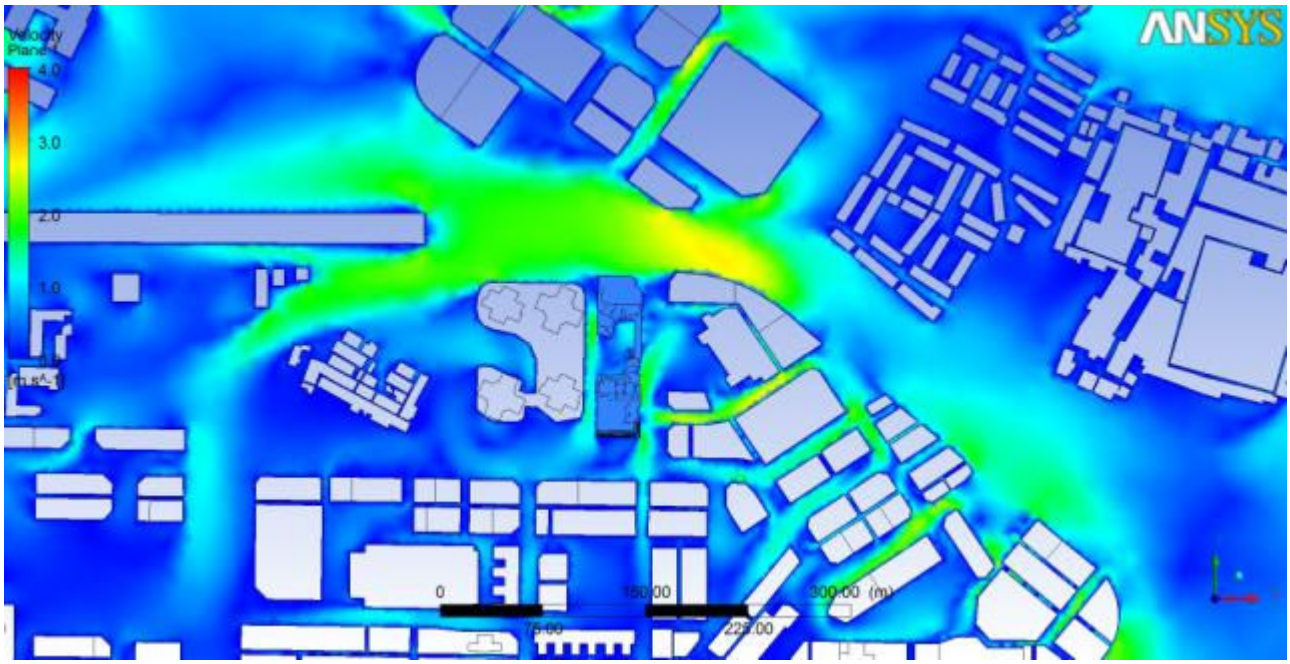
B.1 ENE wind

B.1.1 Wind Velocity Contour (2m above ground)

Scheme 1

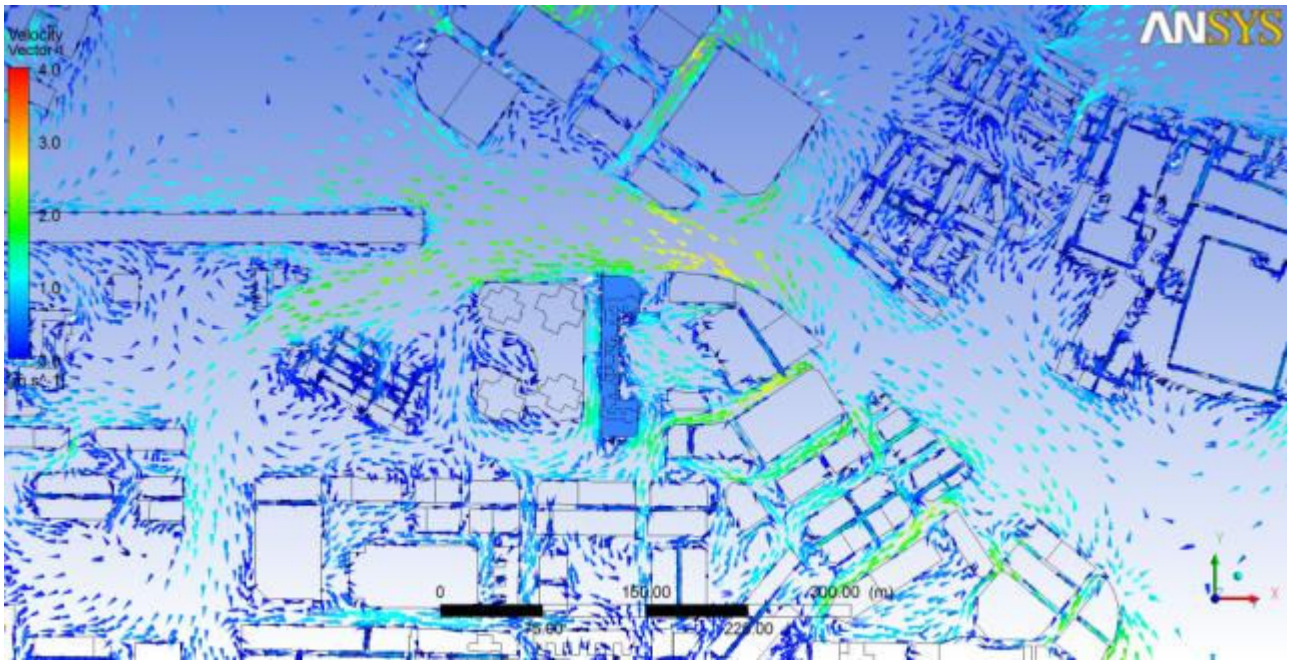


Scheme 2

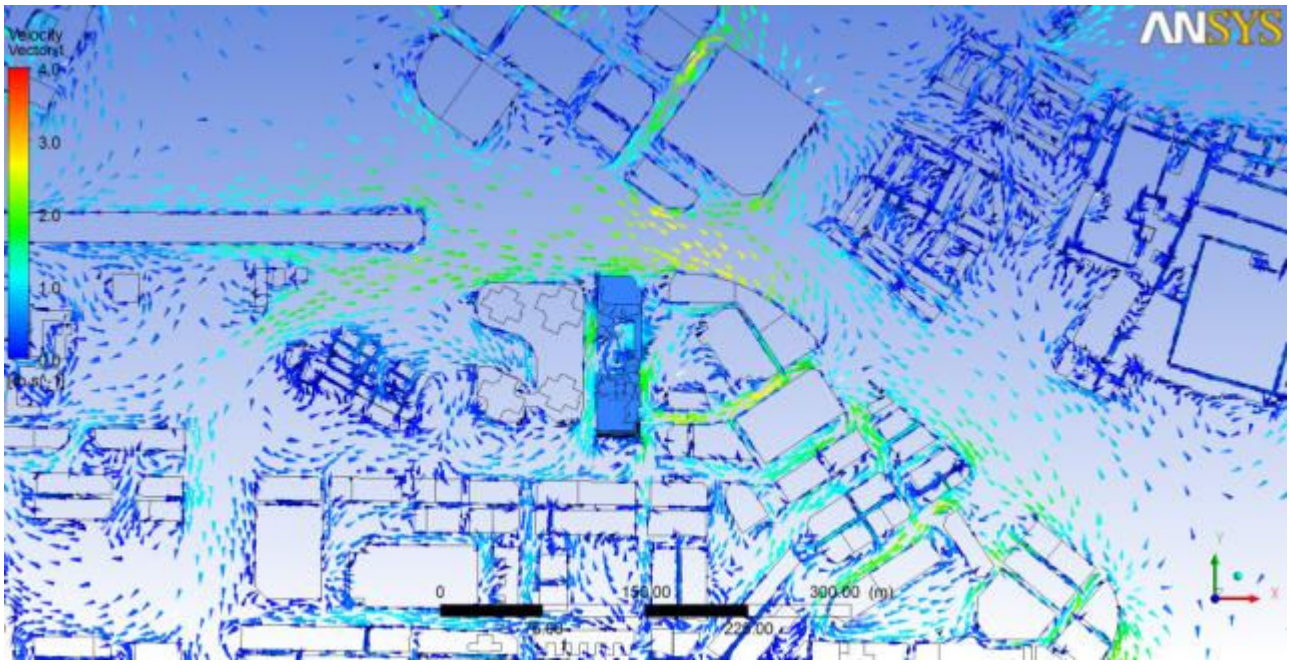


B.1.2 Wind Velocity Vector (2m above ground)

Scheme 1



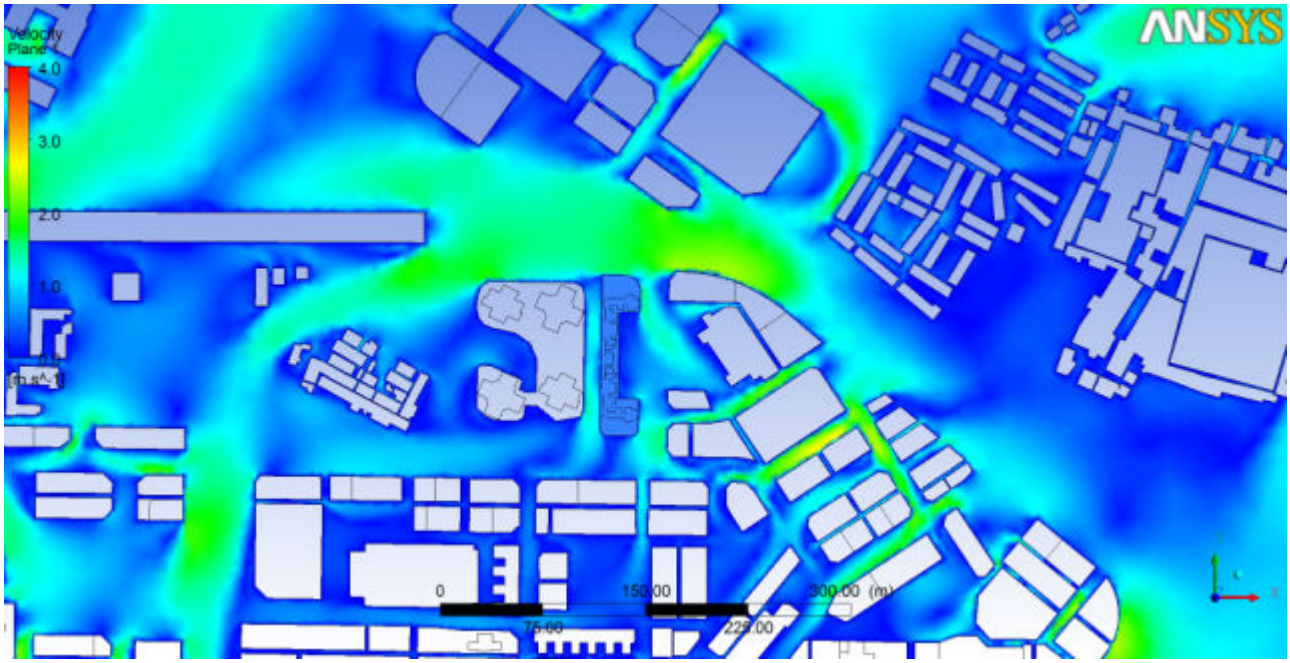
Scheme 2



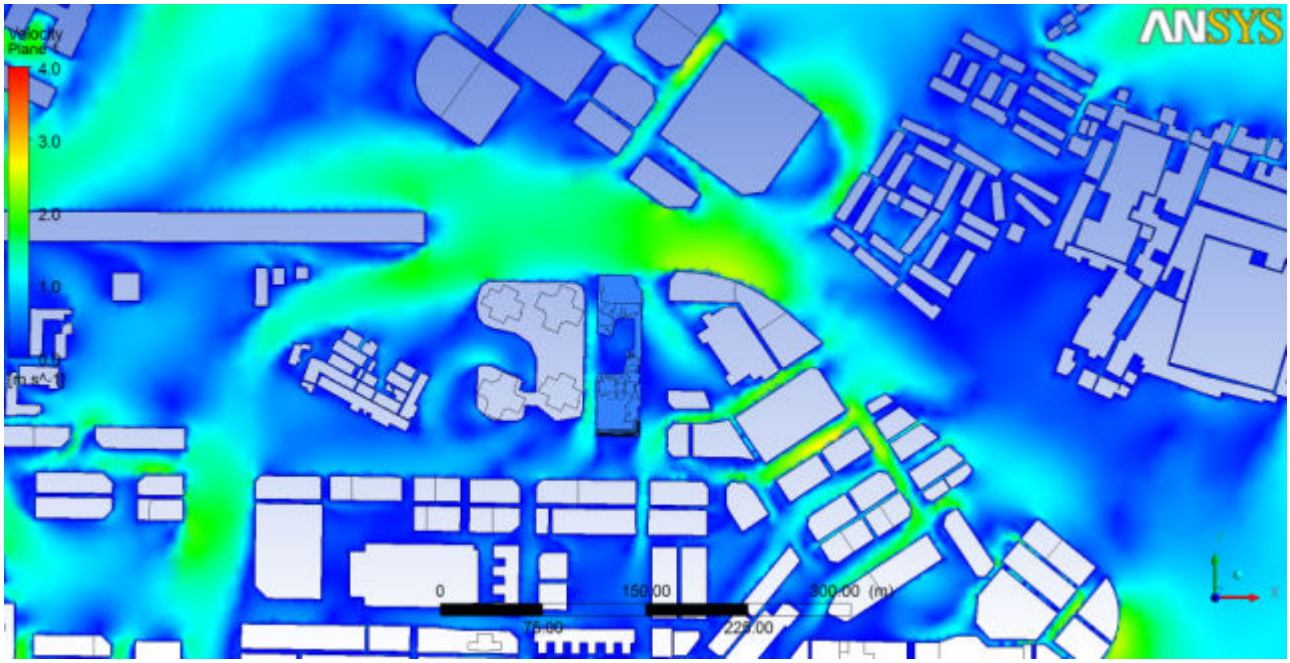
B.2 NE wind

B.2.1 Wind Velocity Contour (2m above ground)

Scheme 1

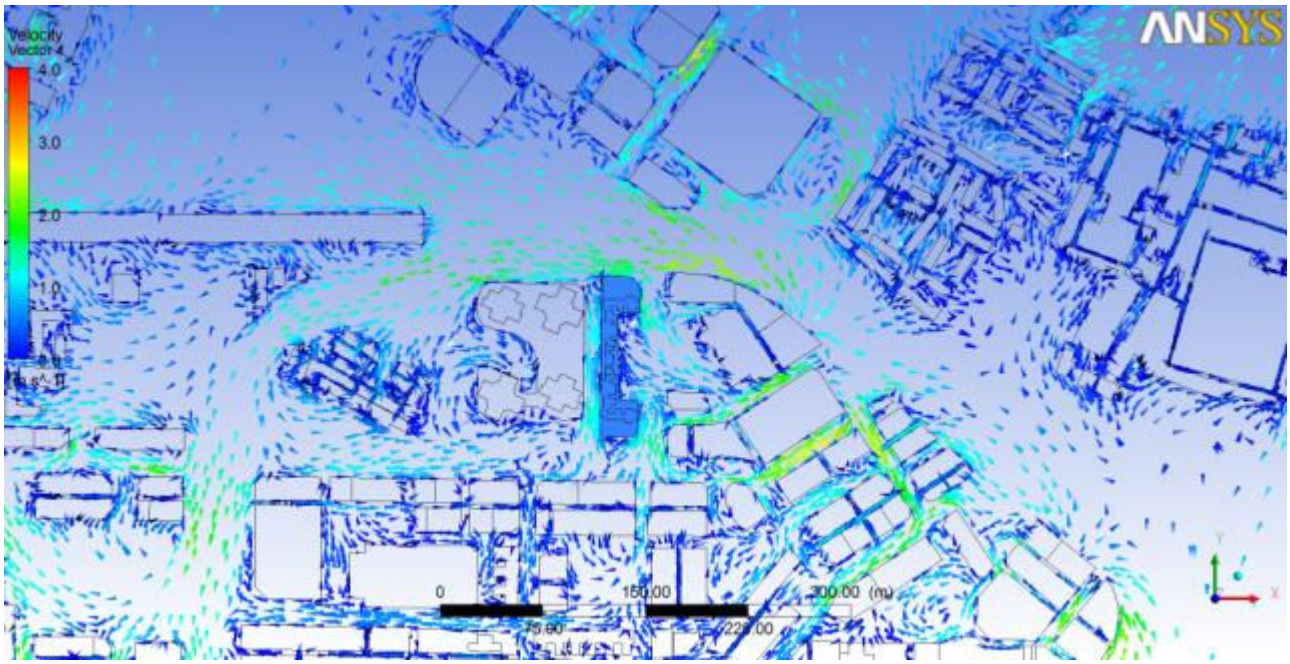


Scheme 2

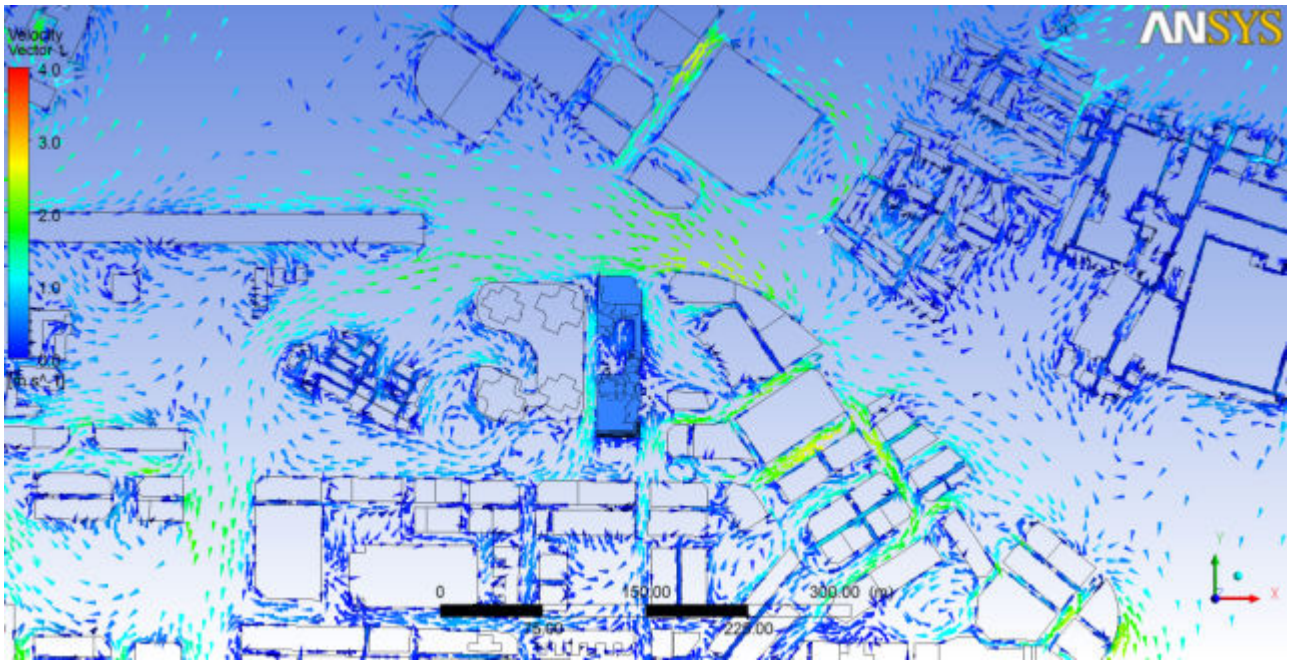


B.2.2 Wind Velocity Vector (2m above ground)

Scheme 1



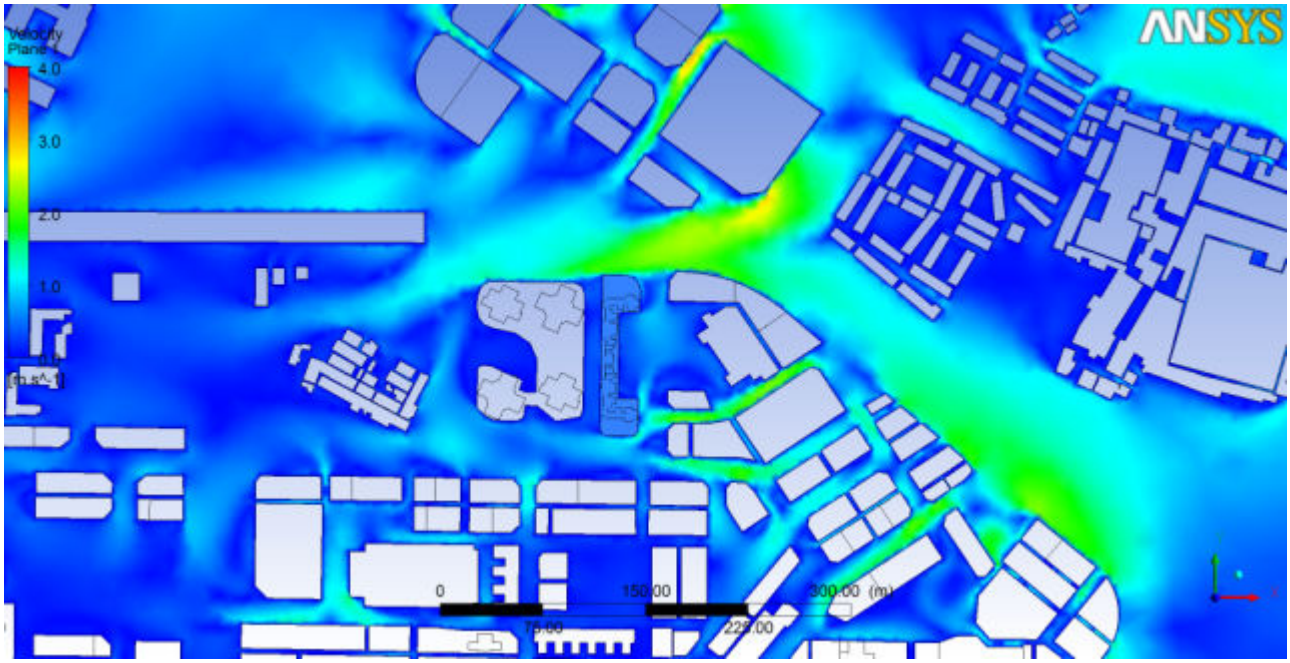
Scheme 2



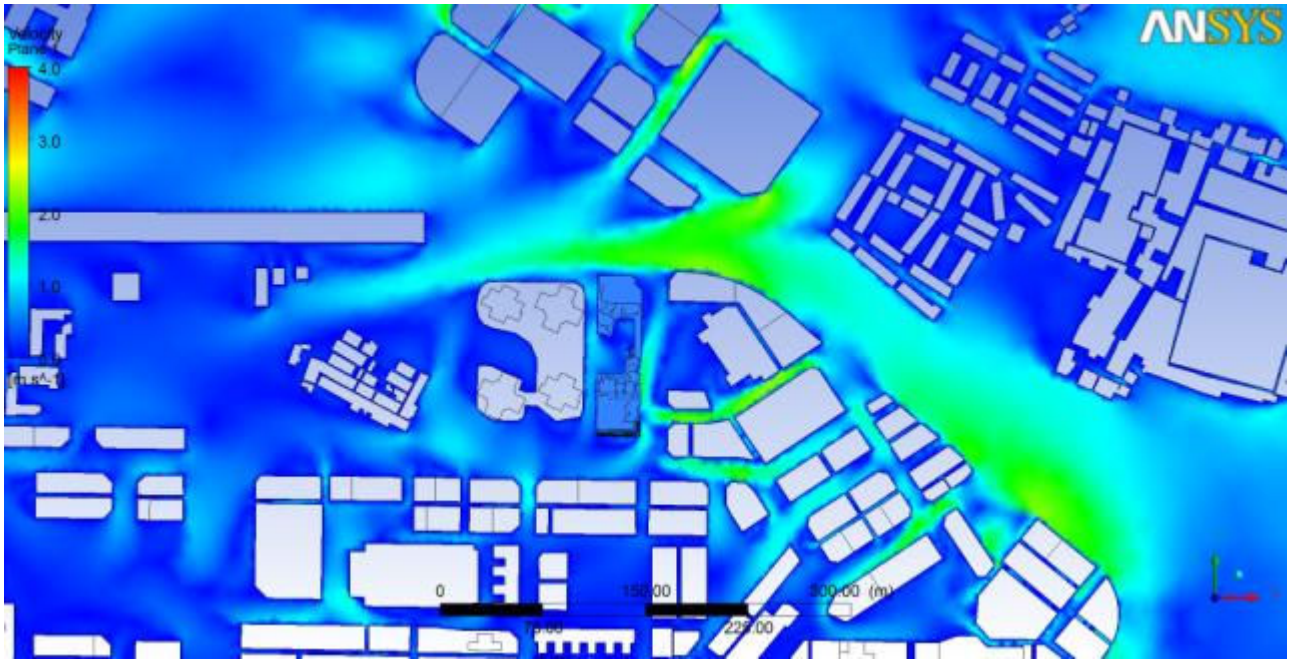
B.3 E wind

B.3.1 Wind Velocity Contour (2m above ground)

Scheme 1

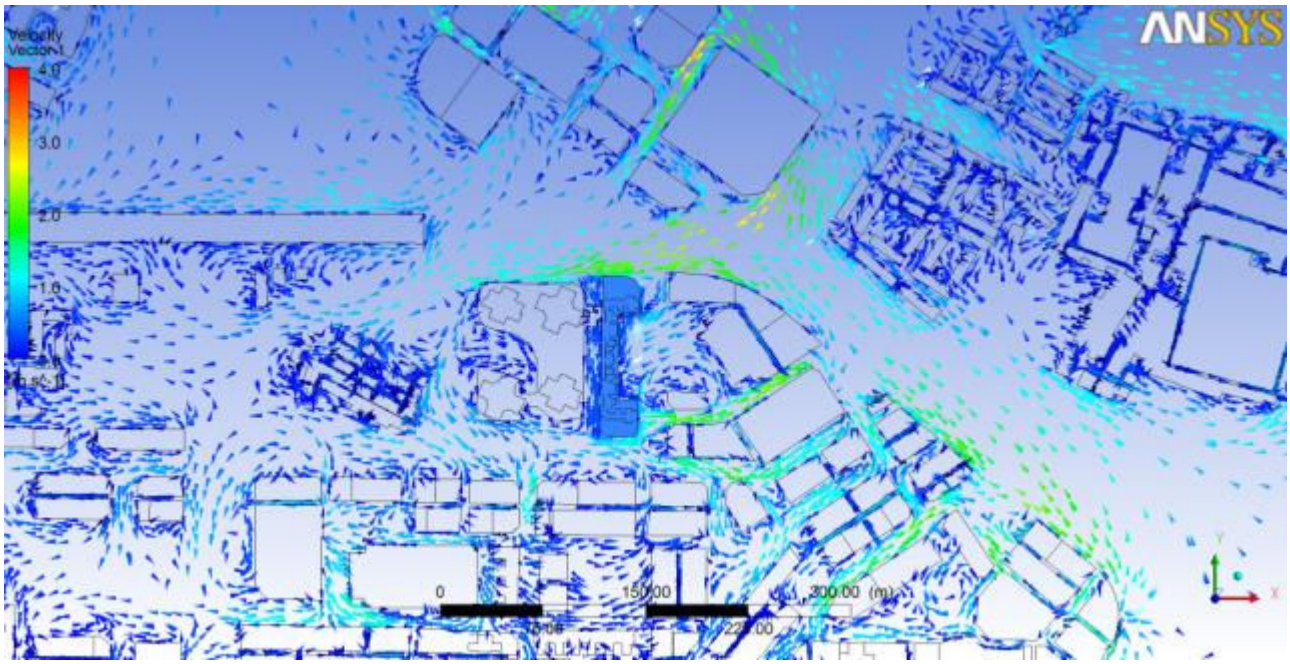


Scheme 2

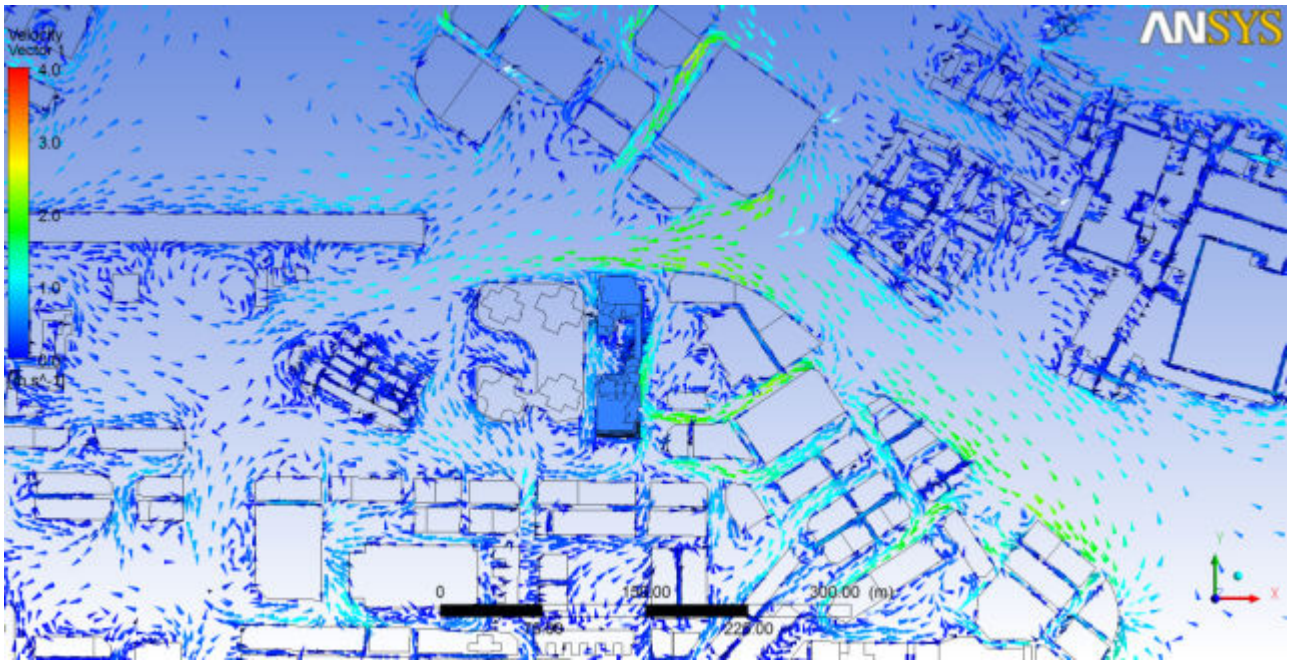


B.3.2 Wind Velocity Vector (2m above ground)

Scheme 1



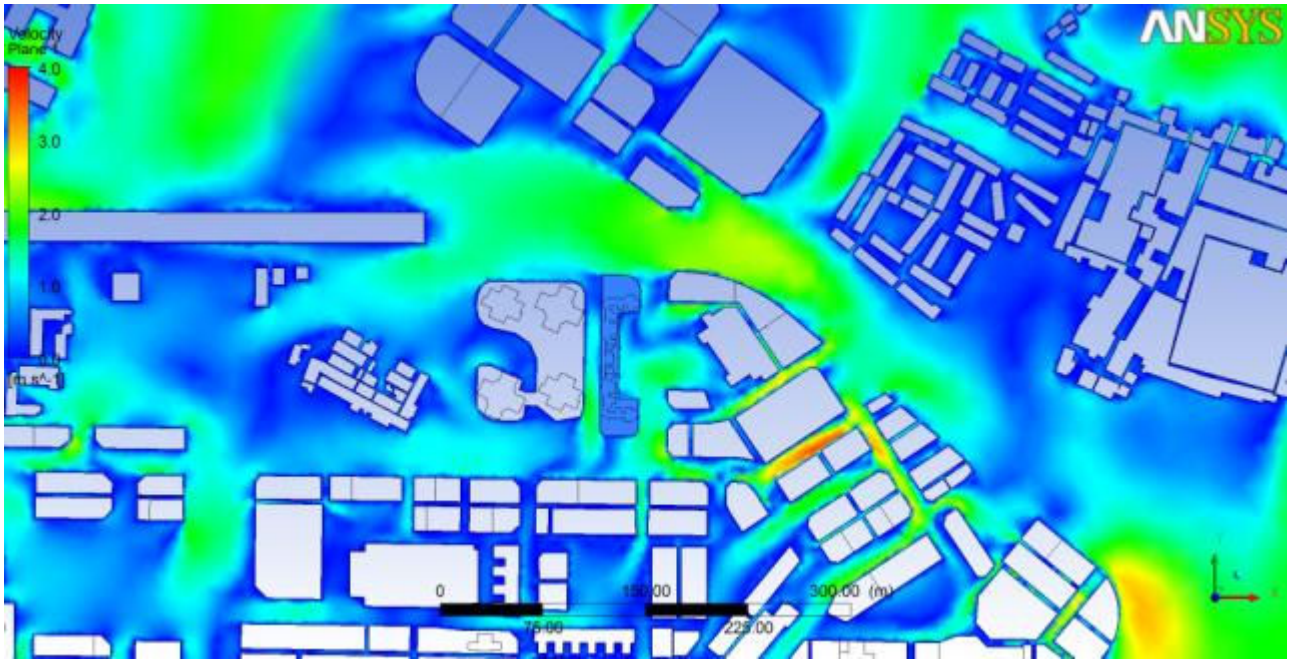
Scheme 2



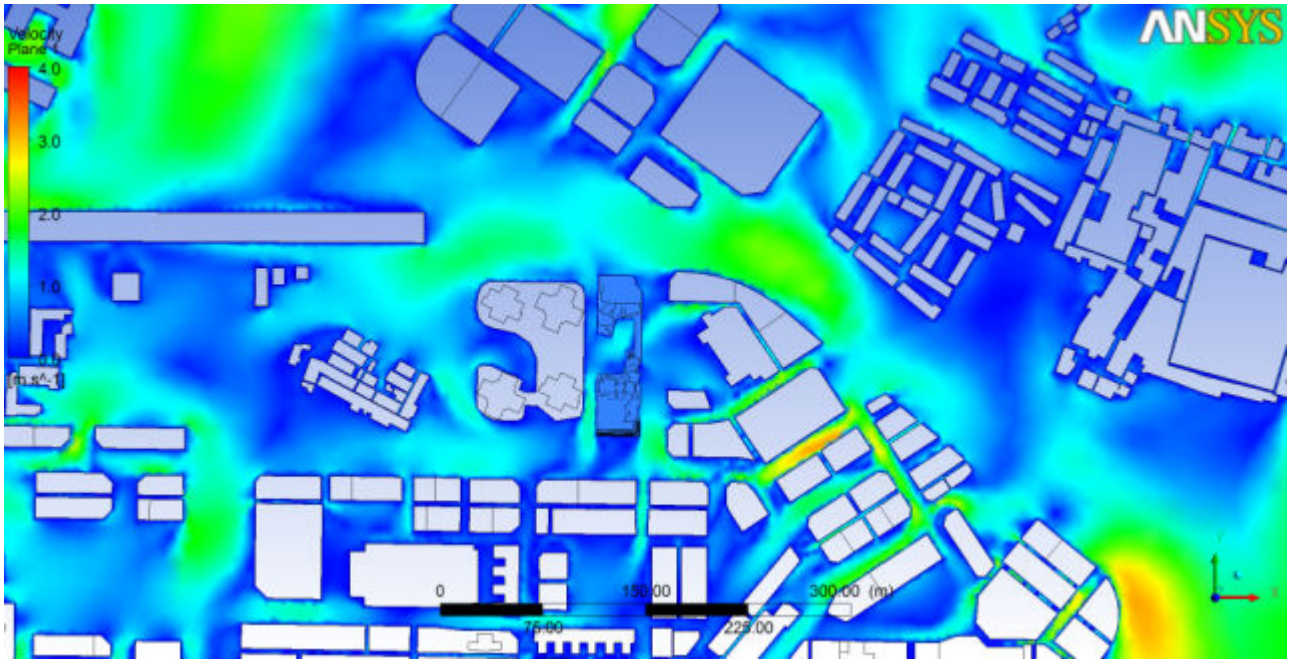
B.4 NNE wind

B.4.1 Wind Velocity Contour (2m above ground)

Scheme 1

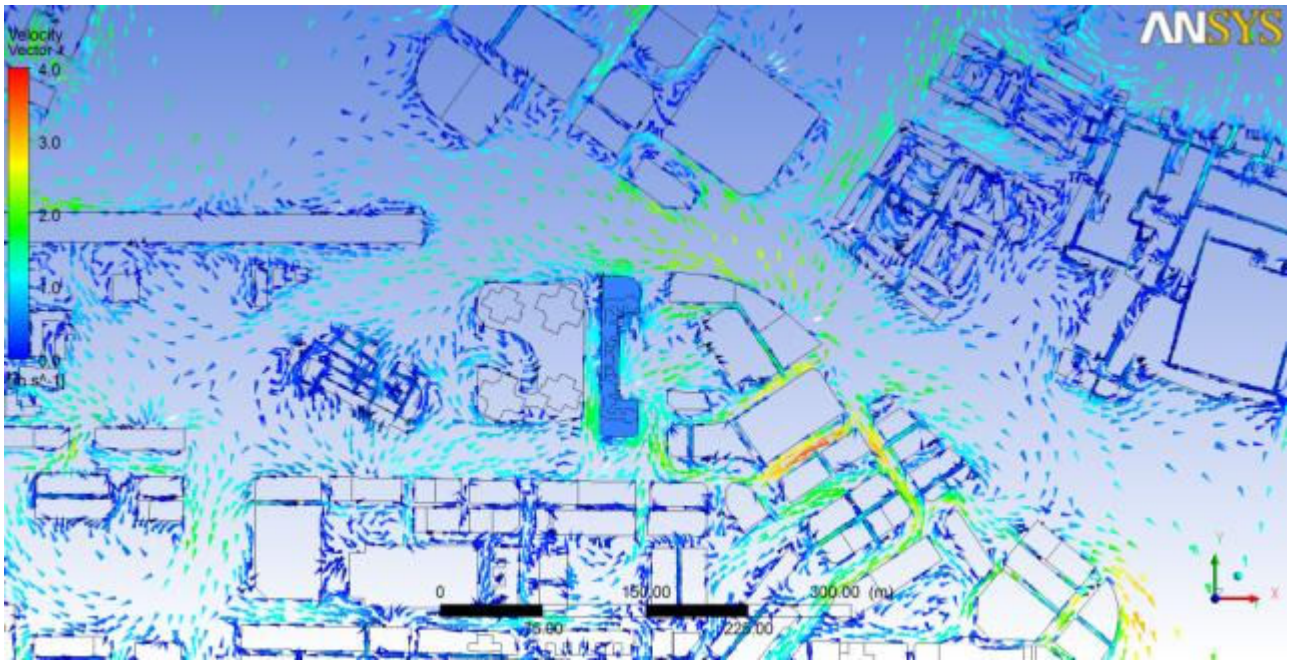


Scheme 2

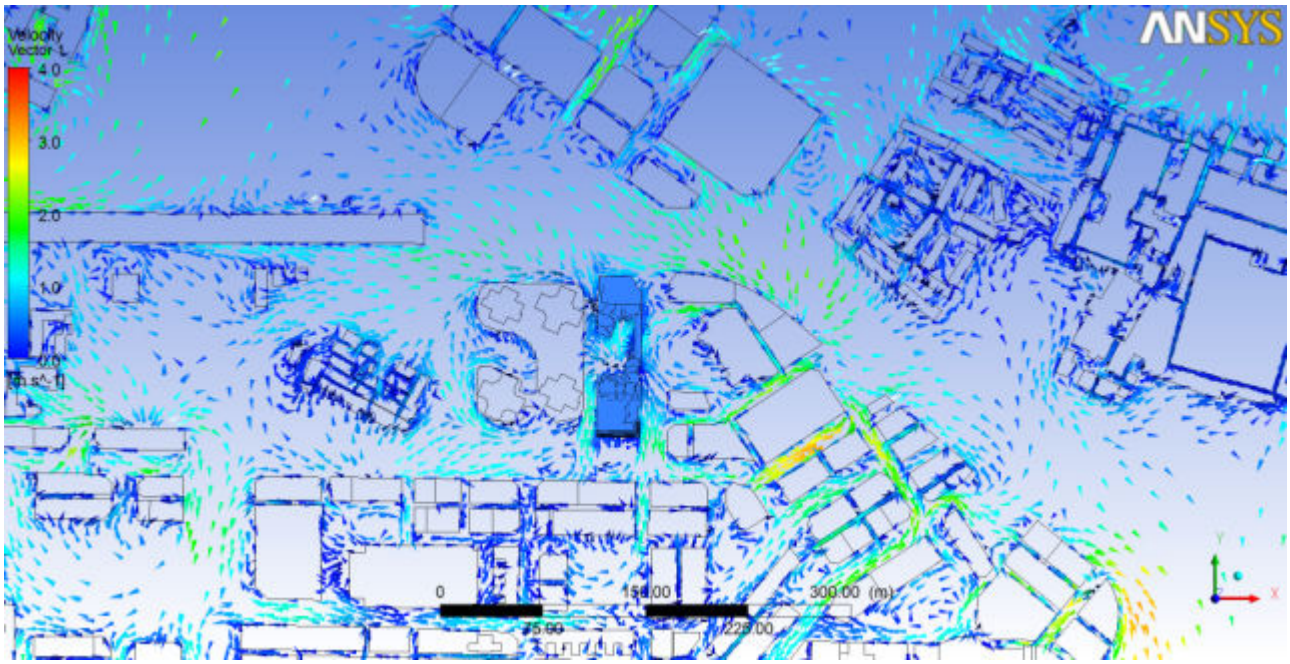


B.4.2 Wind Velocity Vector (2m above ground)

Scheme 1



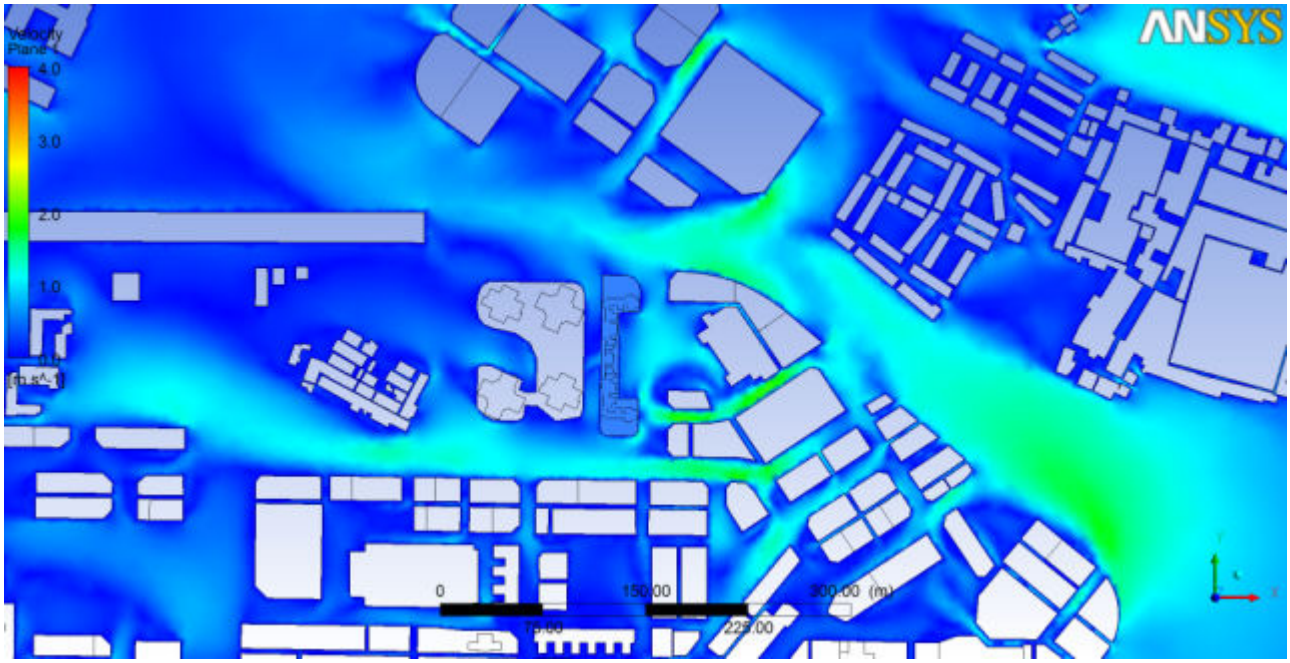
Scheme 2



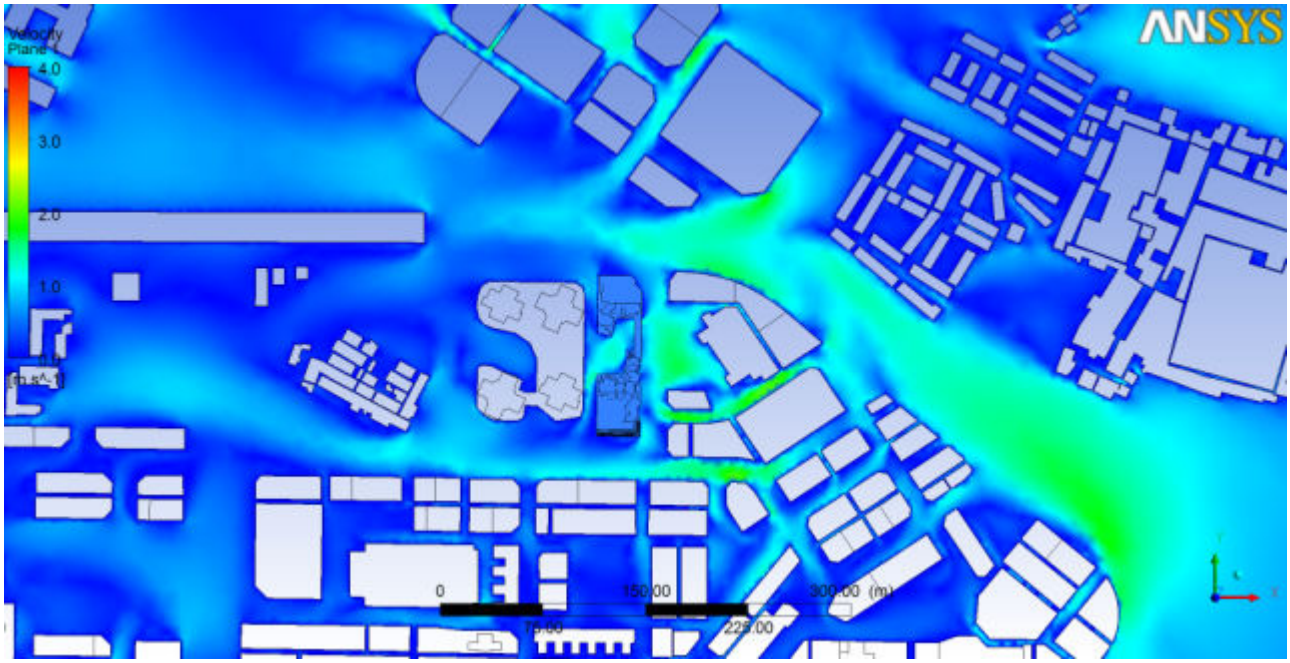
B.5 ESE wind

B.5.1 Wind Velocity Contour (2m above ground)

Scheme 1

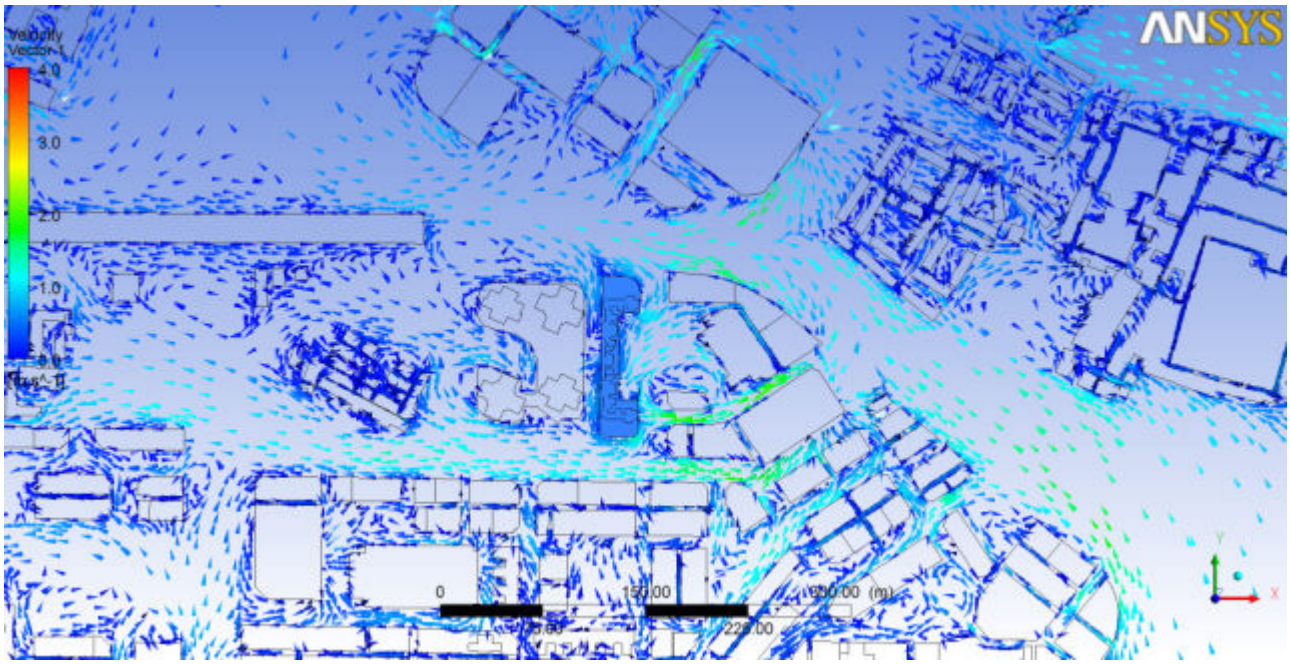


Scheme 2

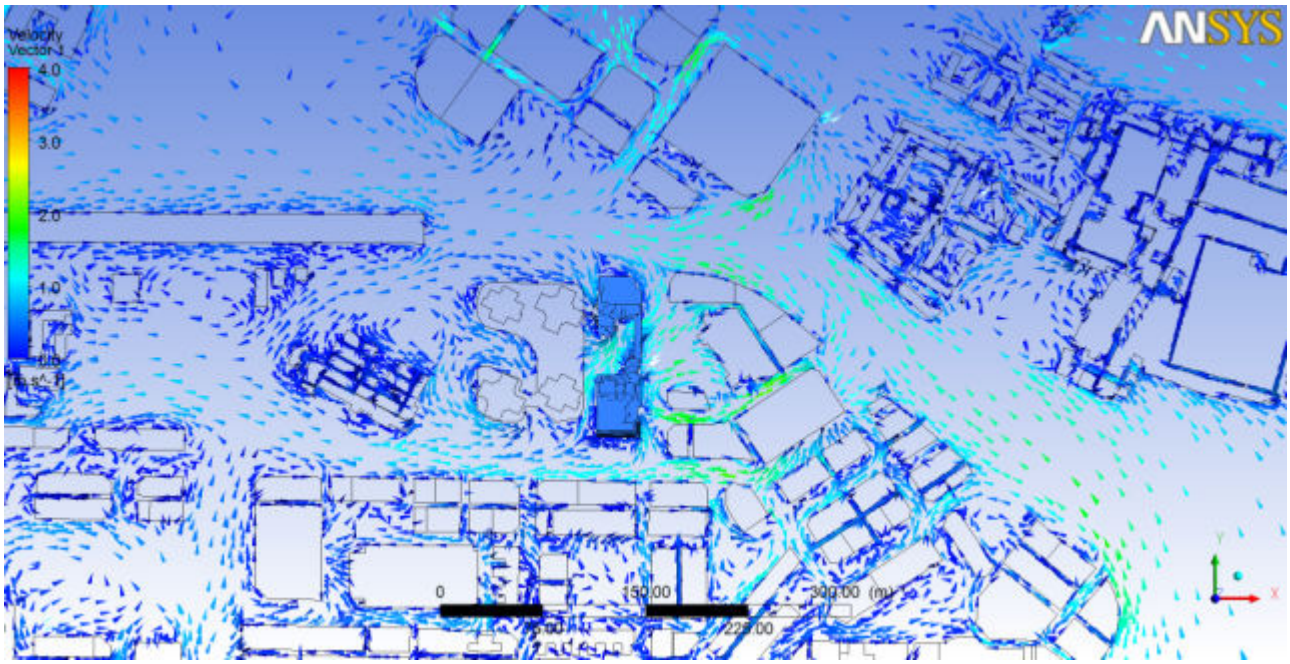


B.5.2 Wind Velocity Vector (2m above ground)

Scheme 1



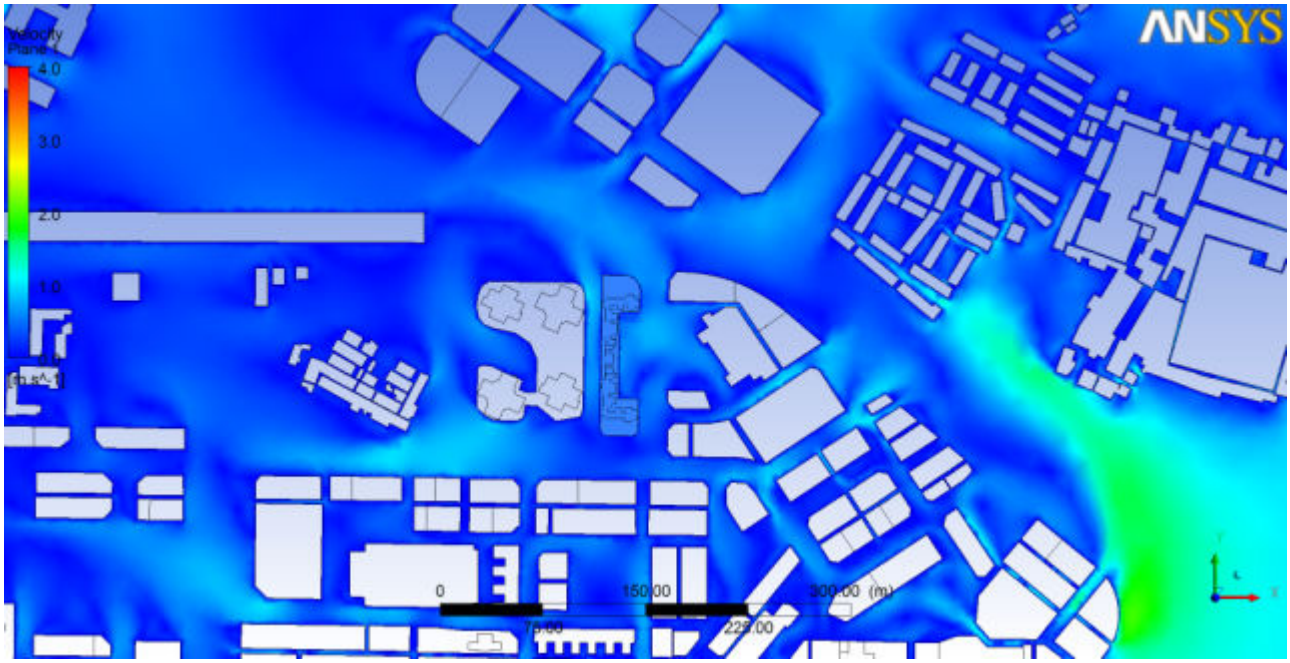
Scheme 2



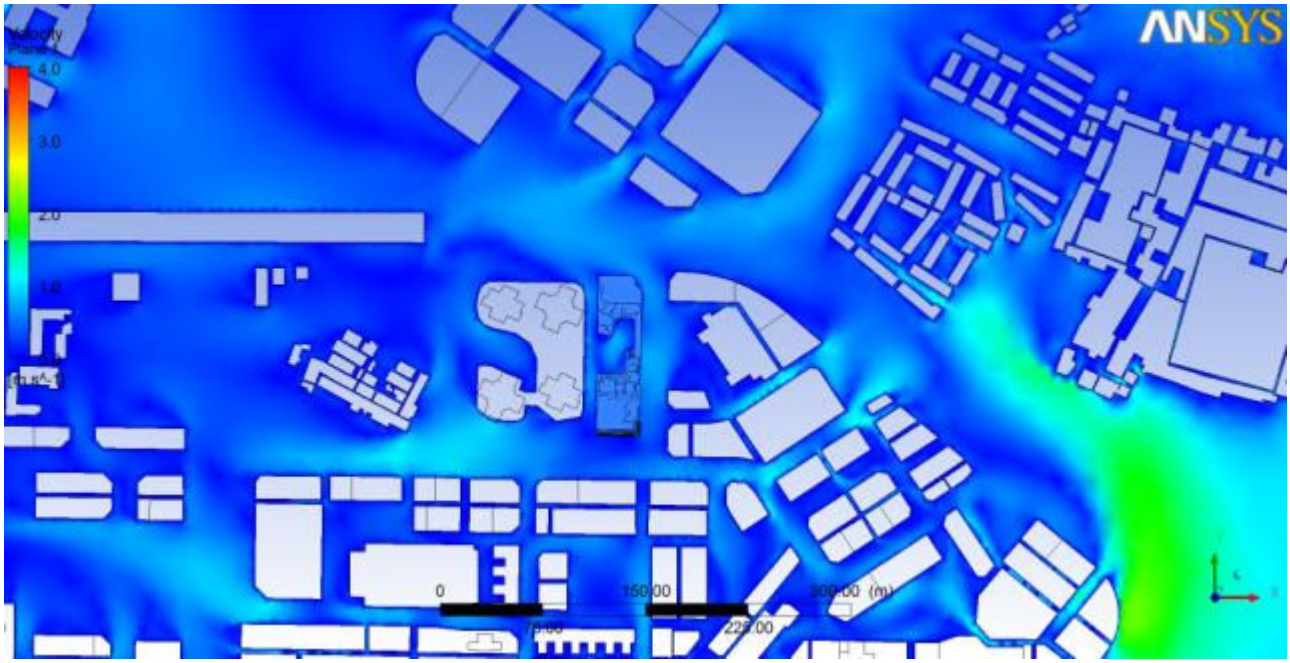
B.6 SSE wind

B.6.1 Wind Velocity Contour (2m above ground)

Scheme 1

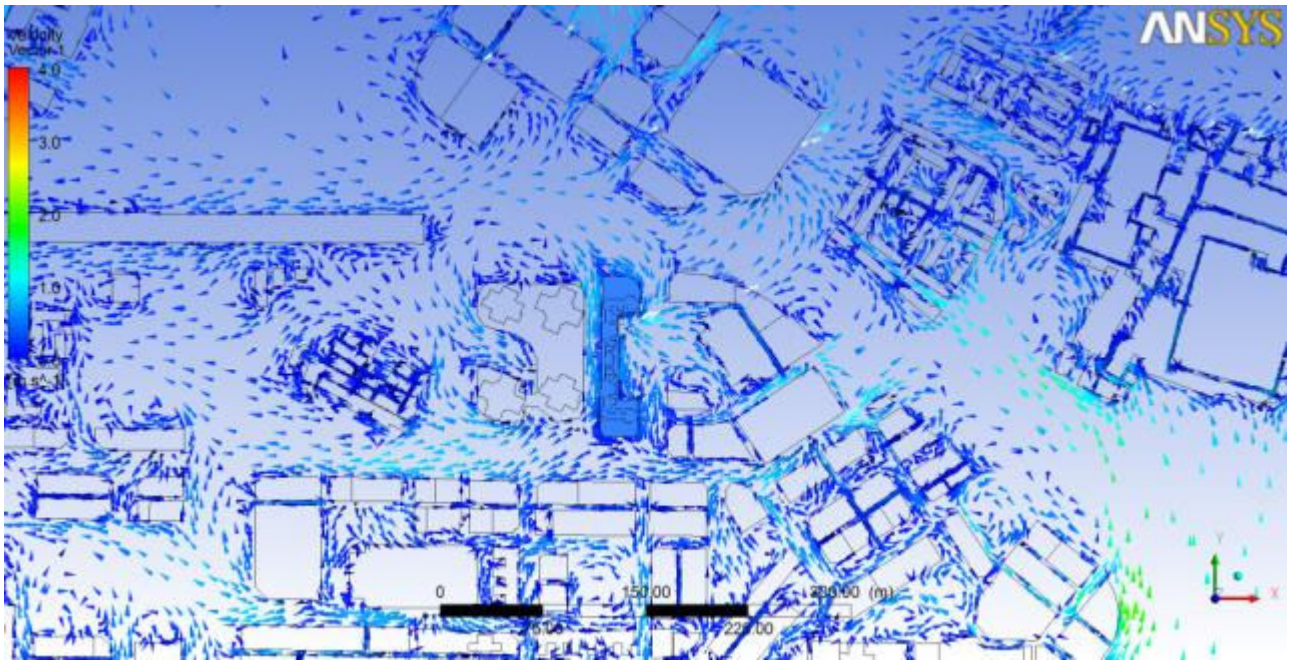


Scheme 2

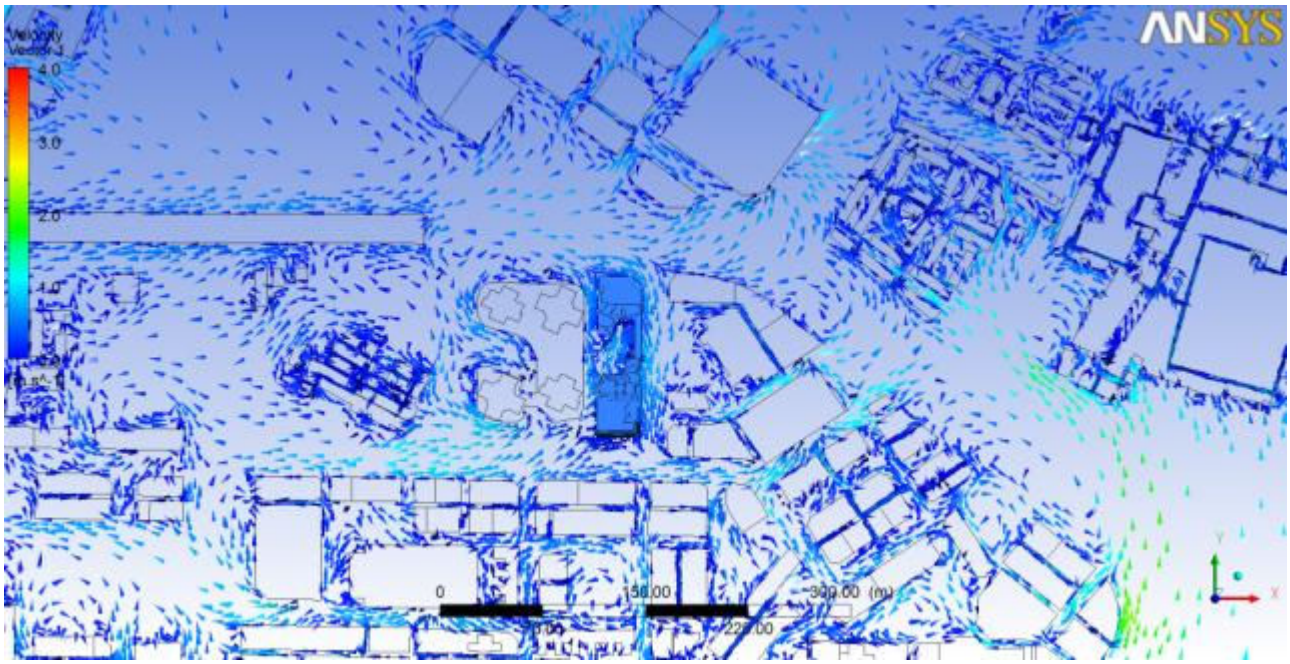


B.6.2 Wind Velocity Vector (2m above ground)

Scheme 1



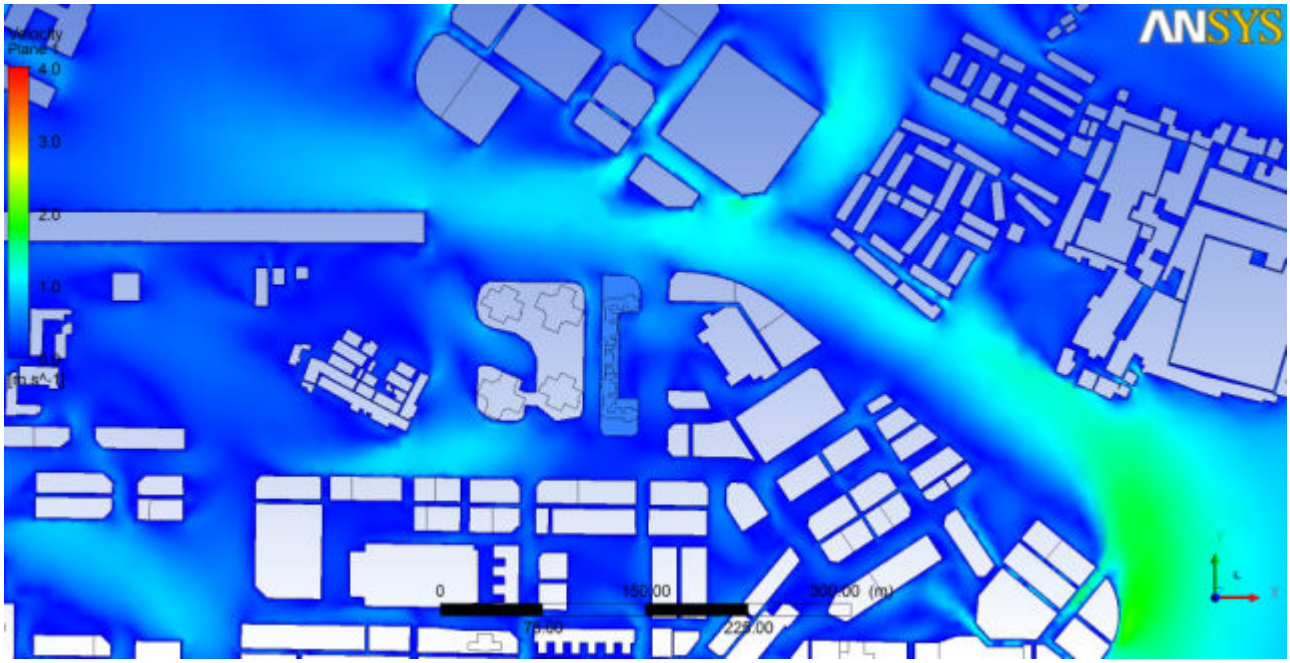
Scheme 2



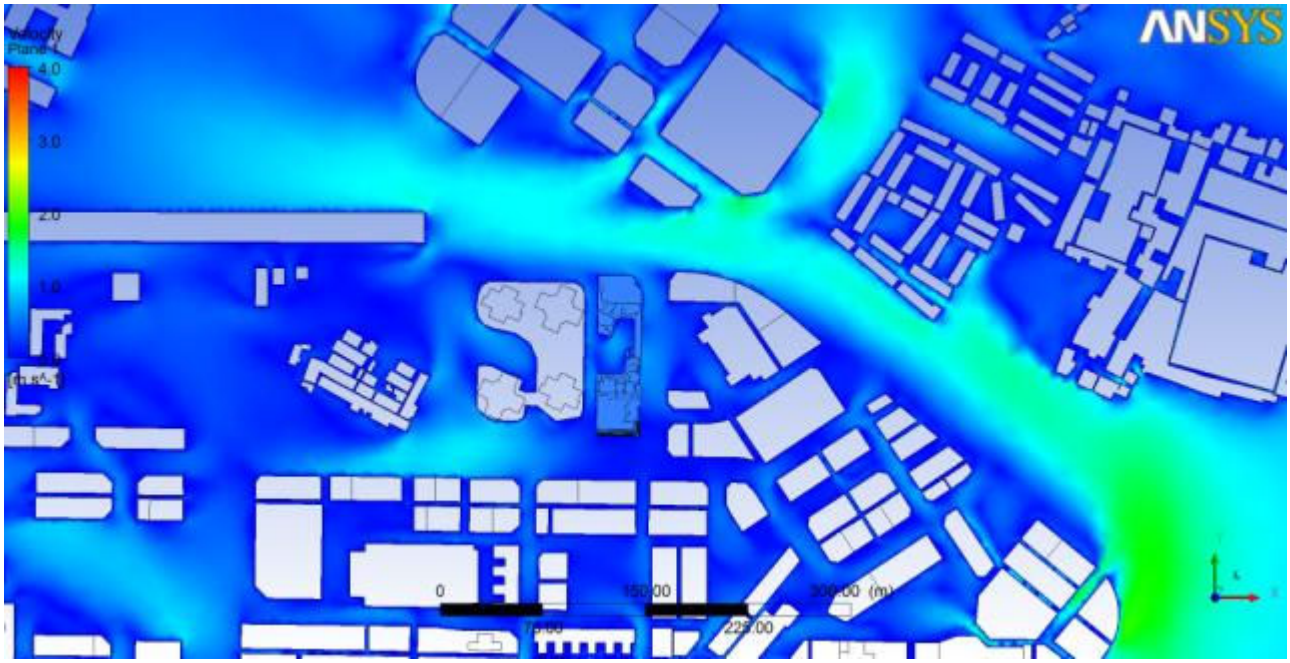
B.7 SE wind

B.7.1 Wind Velocity Contour (2m above ground)

Scheme 1

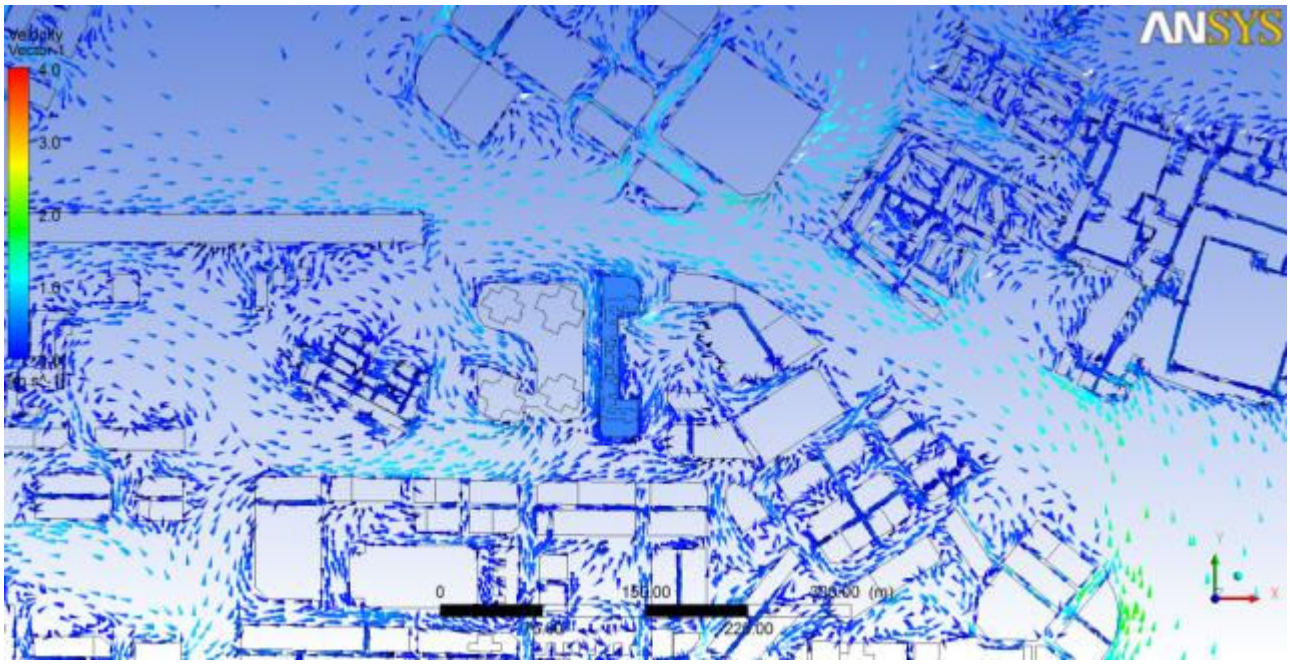


Scheme 2

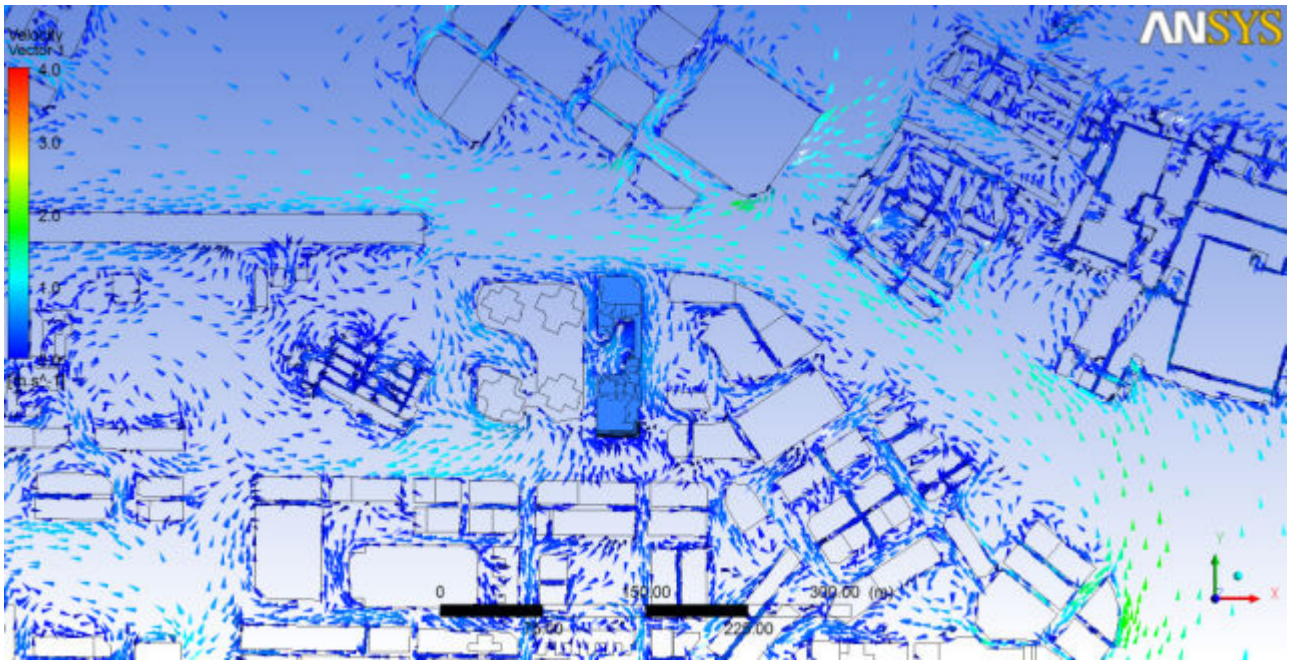


B.7.2 Wind Velocity Vector (2m above ground)

Scheme 1



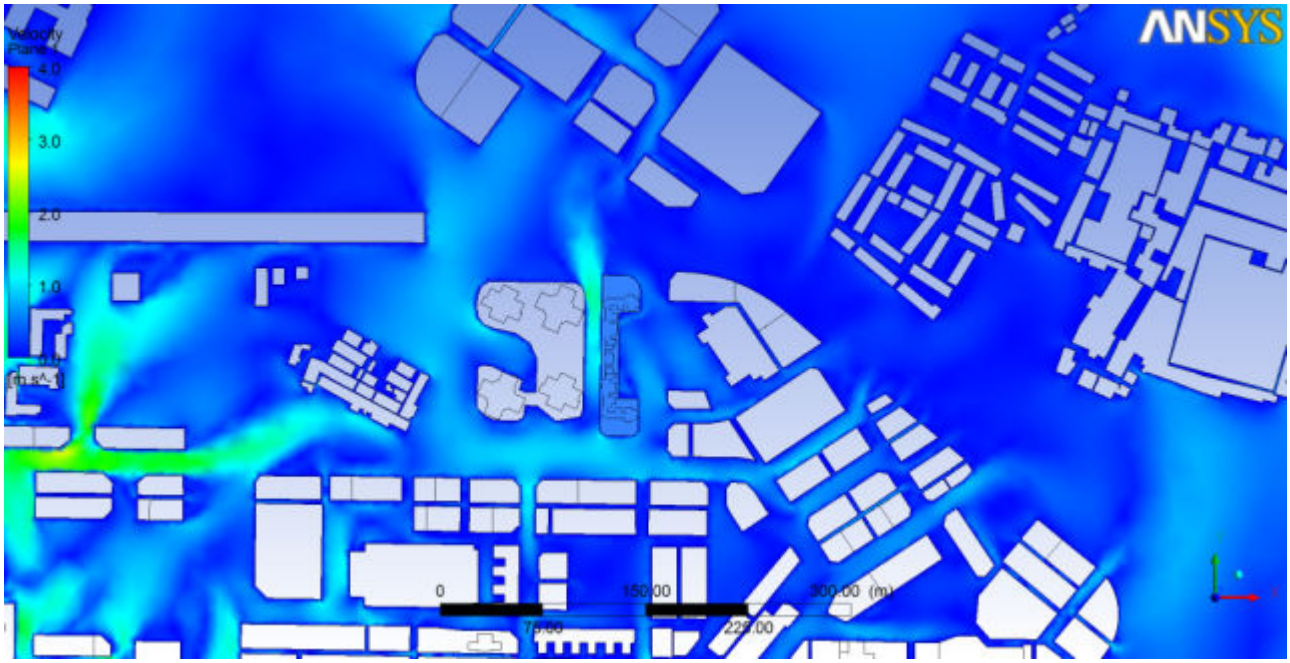
Scheme 2



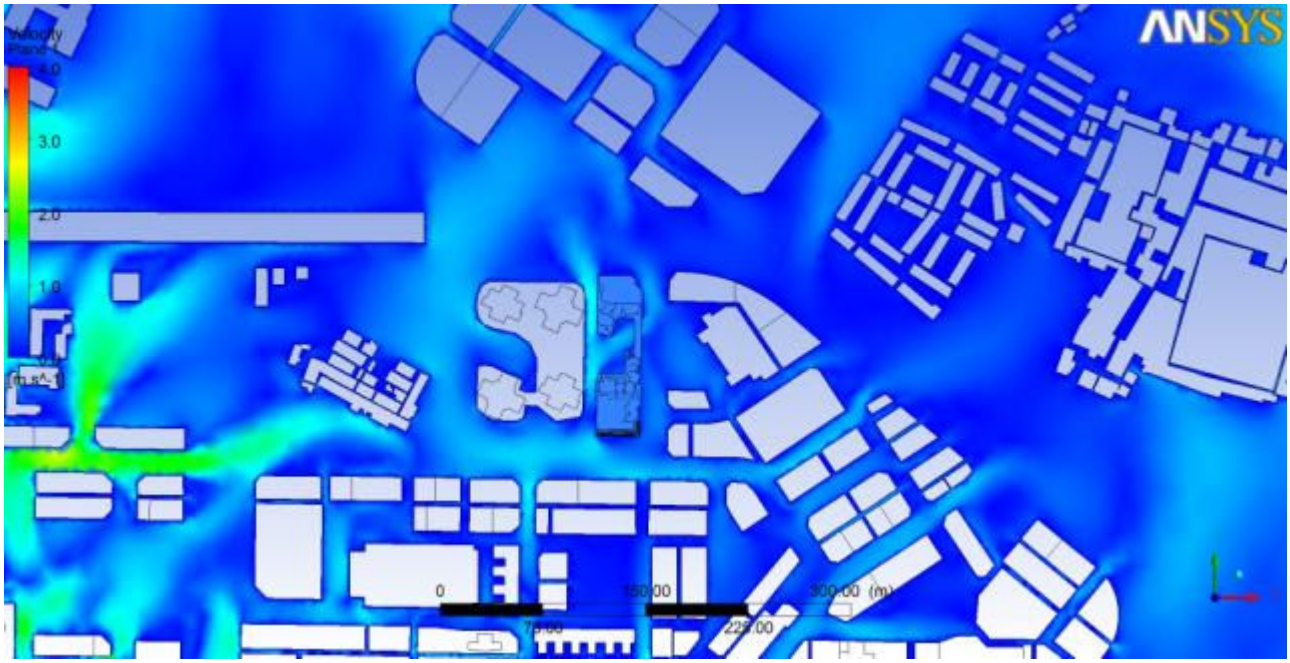
B.8 SSW wind

B.8.1 Wind Velocity Contour (2m above ground)

Scheme 1

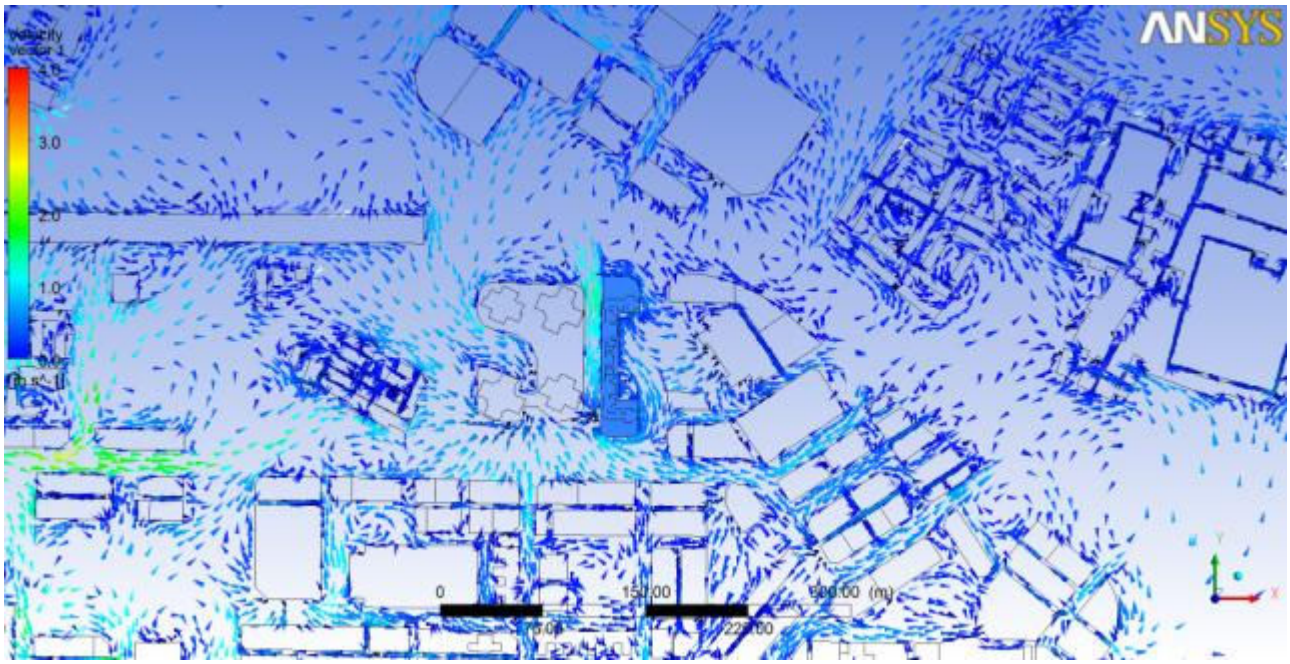


Scheme 2

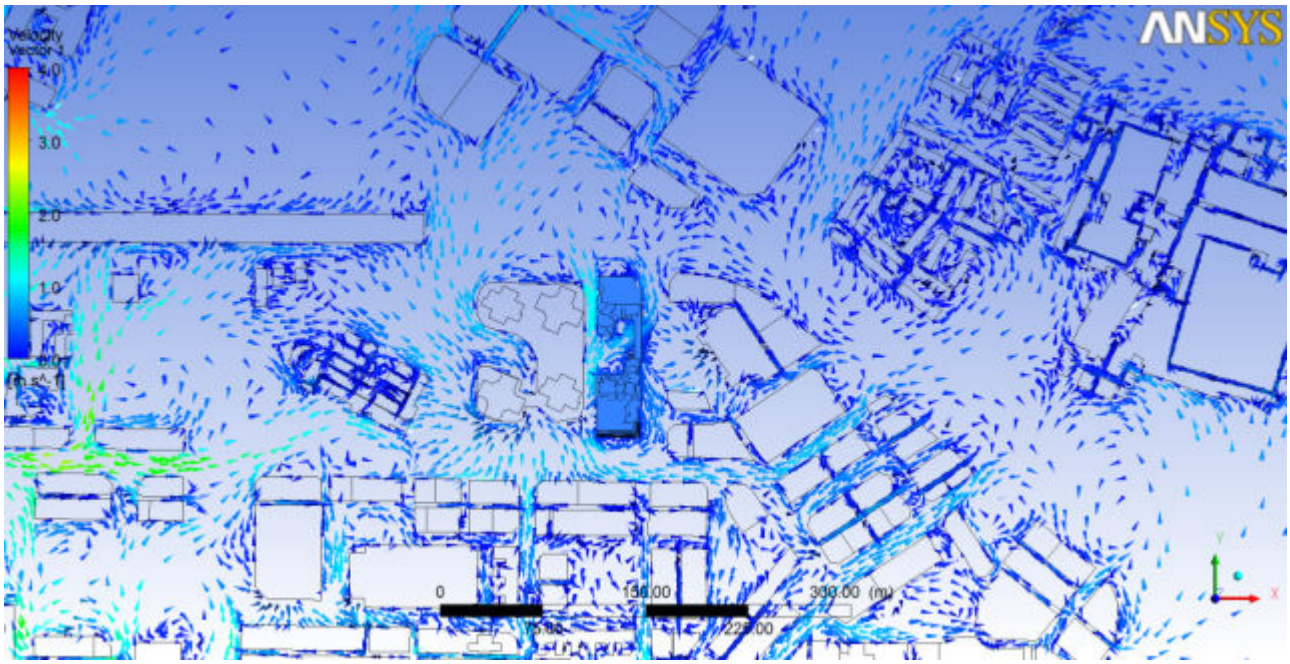


B.8.2 Wind Velocity Vector (2m above ground)

Scheme 1



Scheme 2

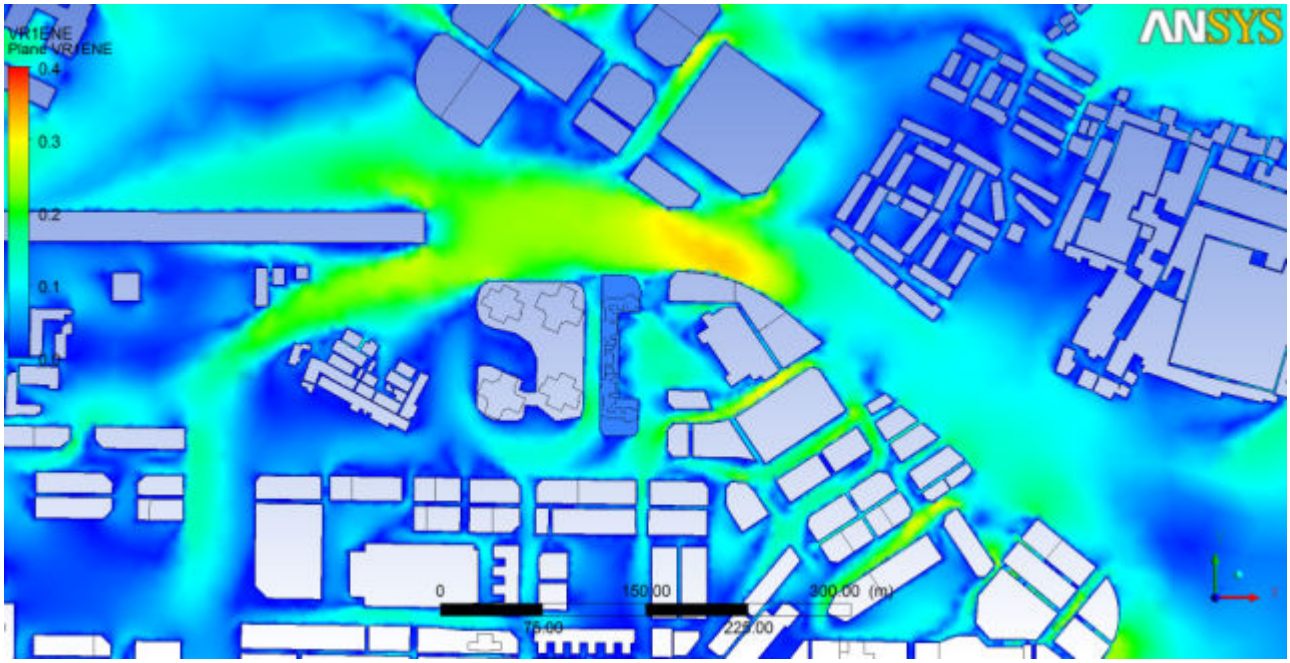


Appendix C.
Contour and Vector Plots of CFD Modelling Results (Velocity Ratio)

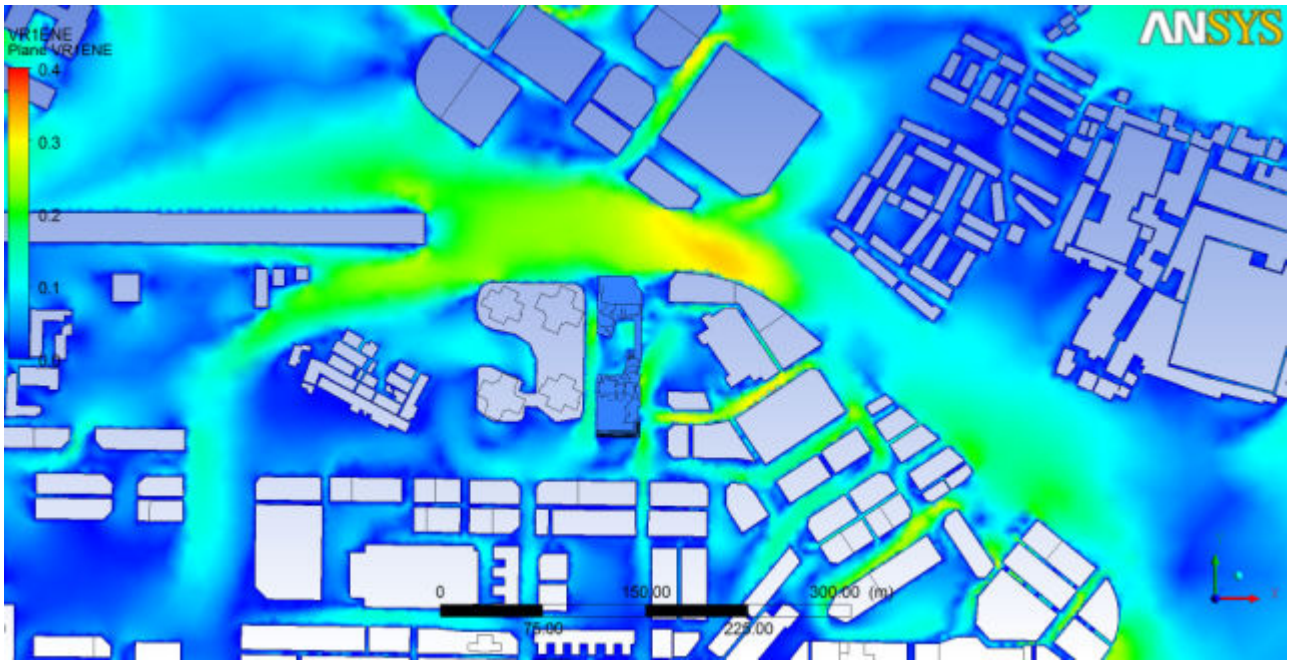
C.1 ENE wind

C.1.1 Wind Velocity Ratio Contour (2m above ground)

Scheme 1

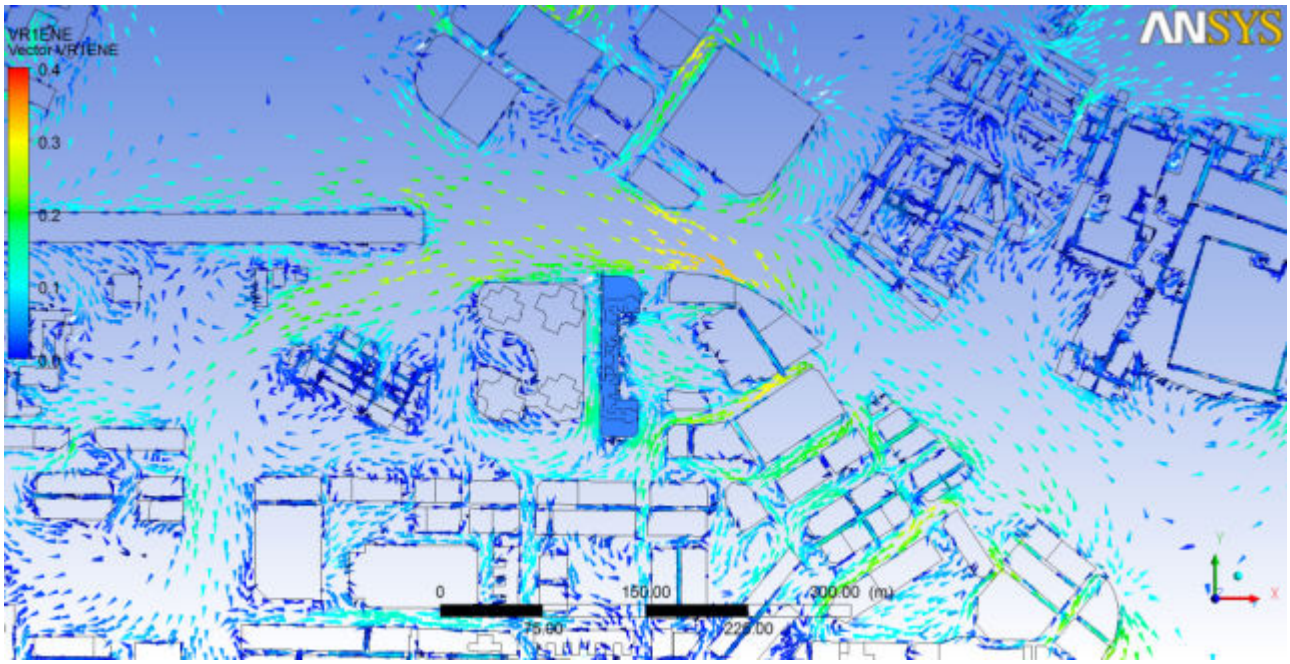


Scheme 2

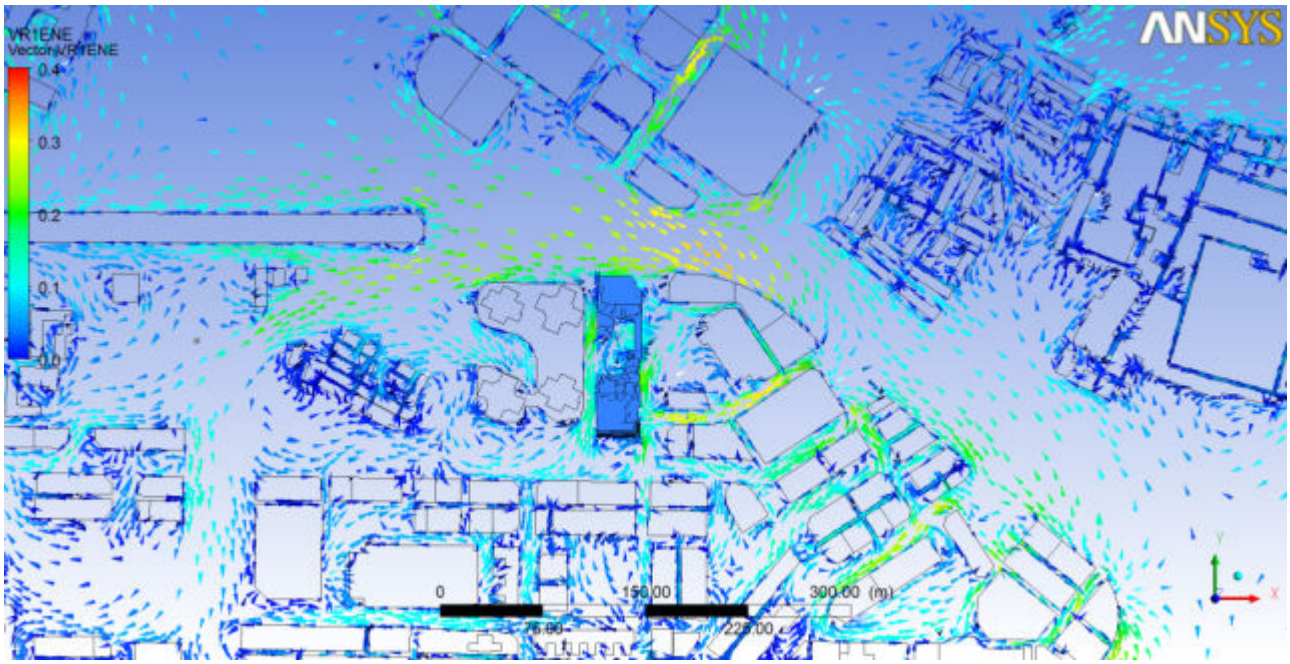


C.1.2 Wind Velocity Ratio Vector (2m above ground)

Scheme 1



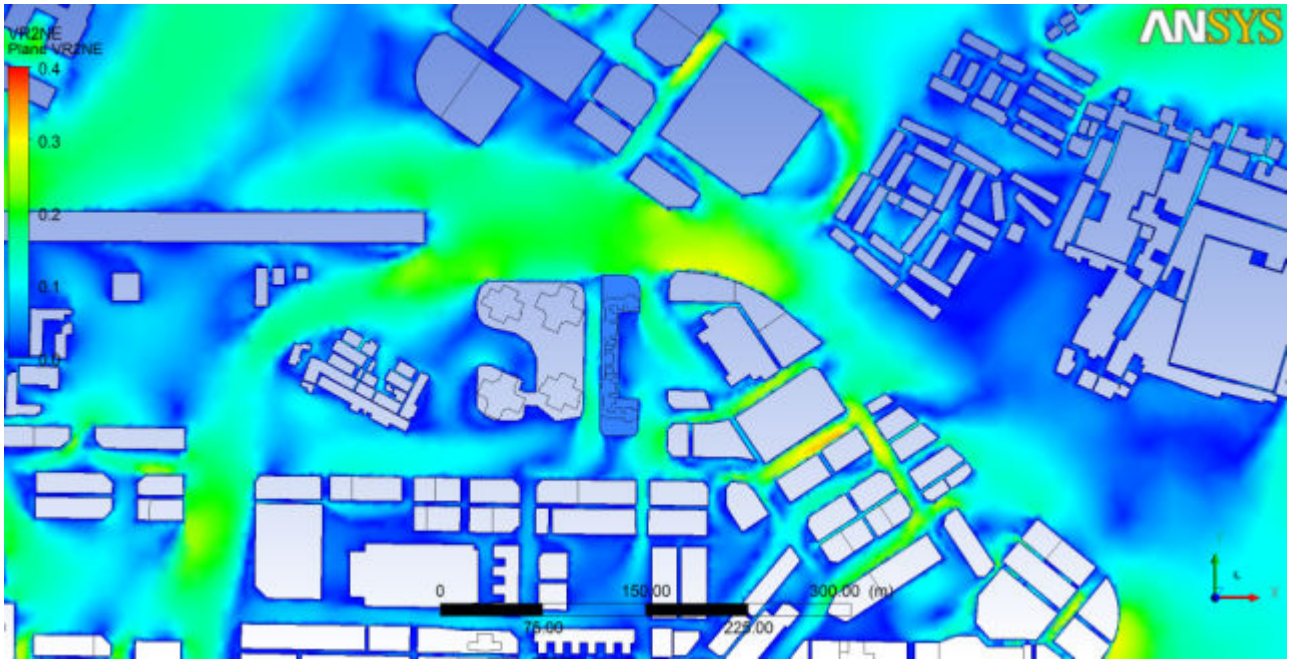
Scheme 2



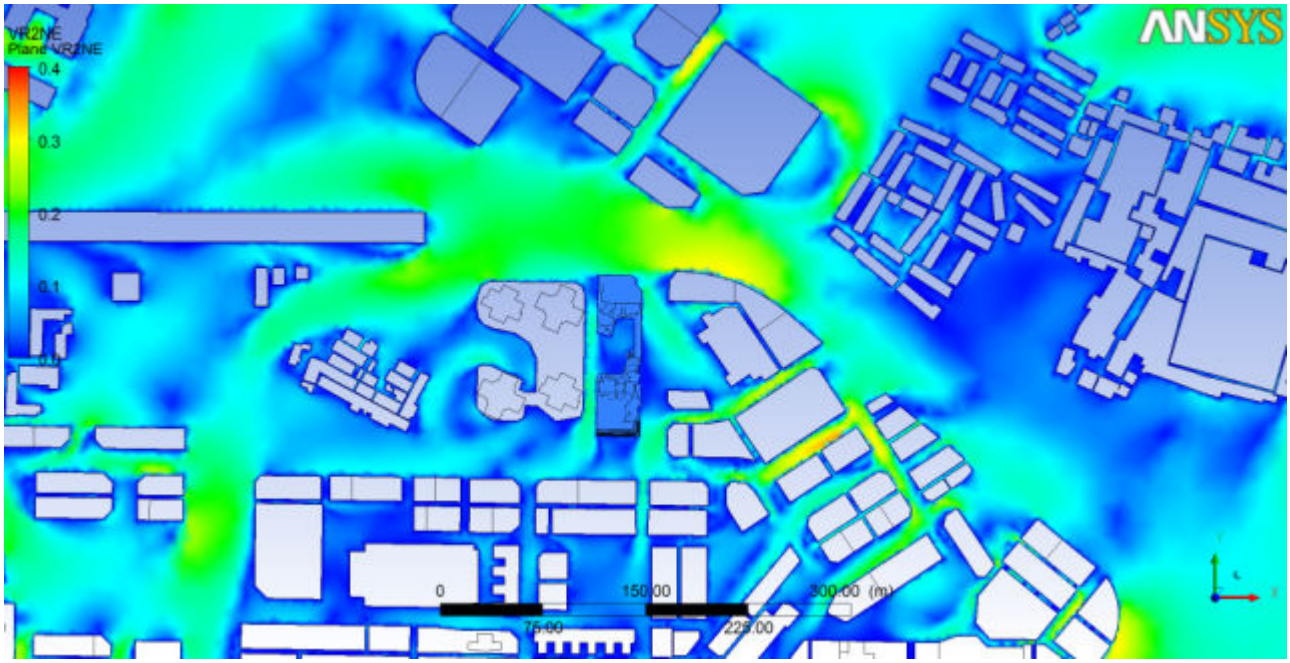
C.2 NE wind

C.2.1 Wind Velocity Ratio Contour (2m above ground)

Scheme 1

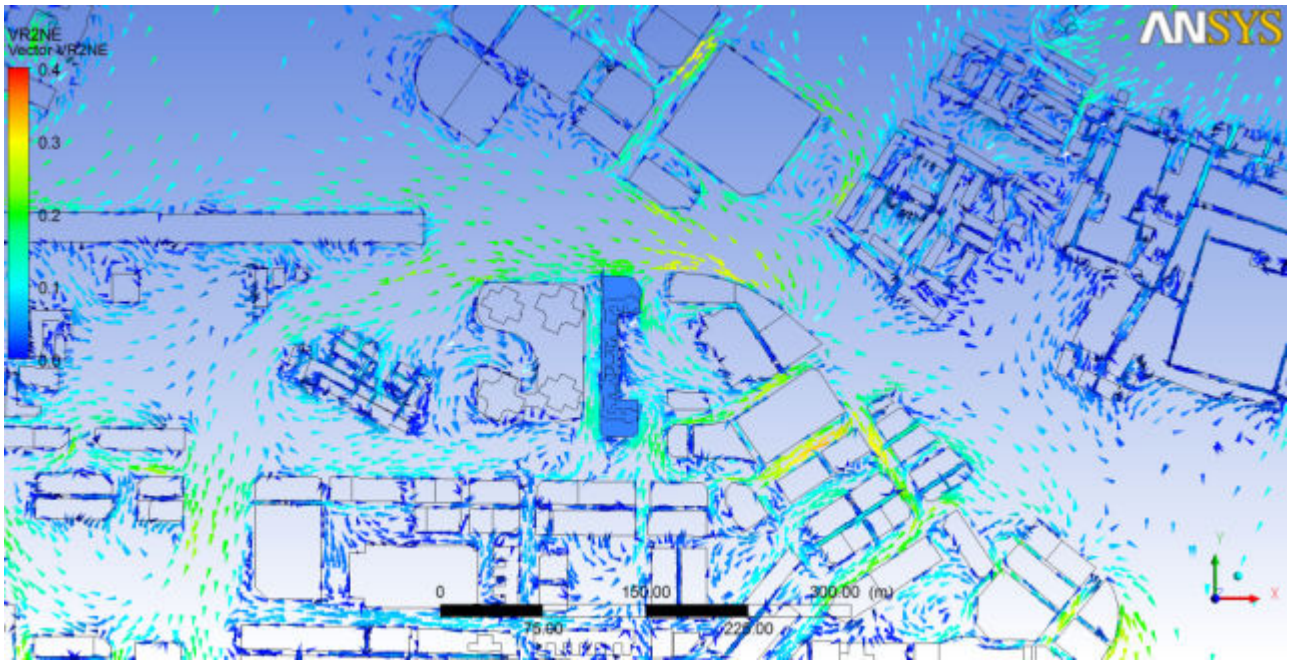


Scheme 2

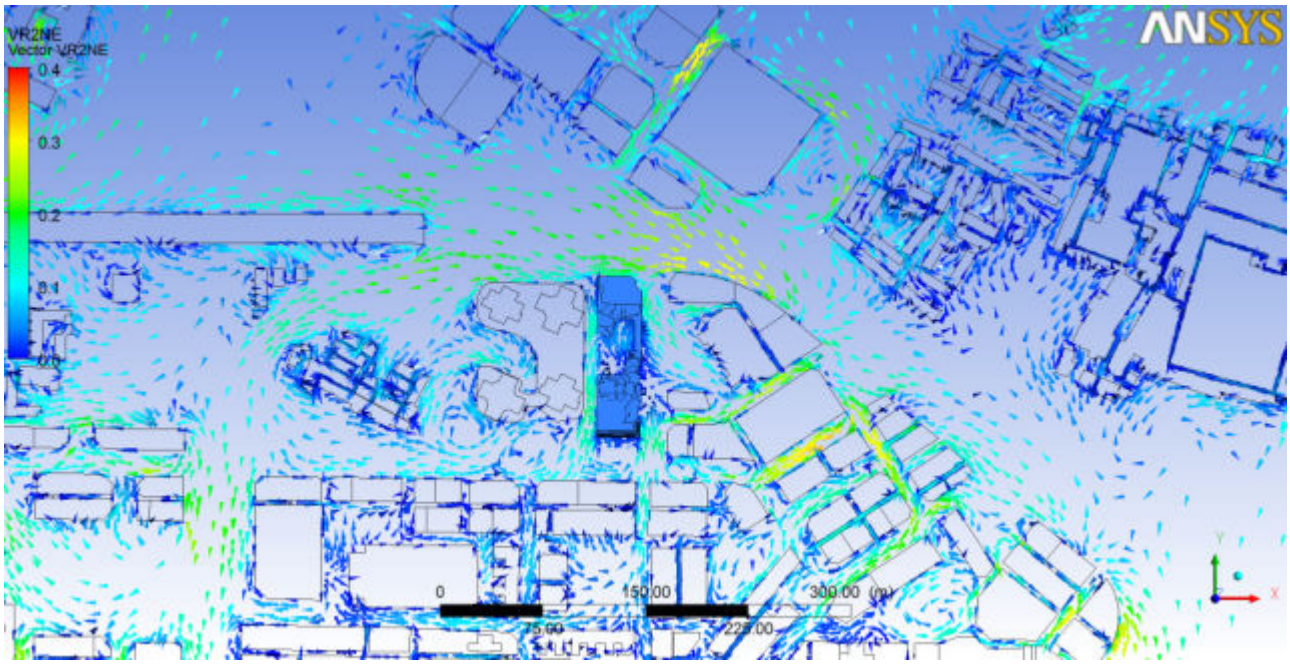


C.2.2 Wind Velocity Ratio Vector (2m above ground)

Scheme 1



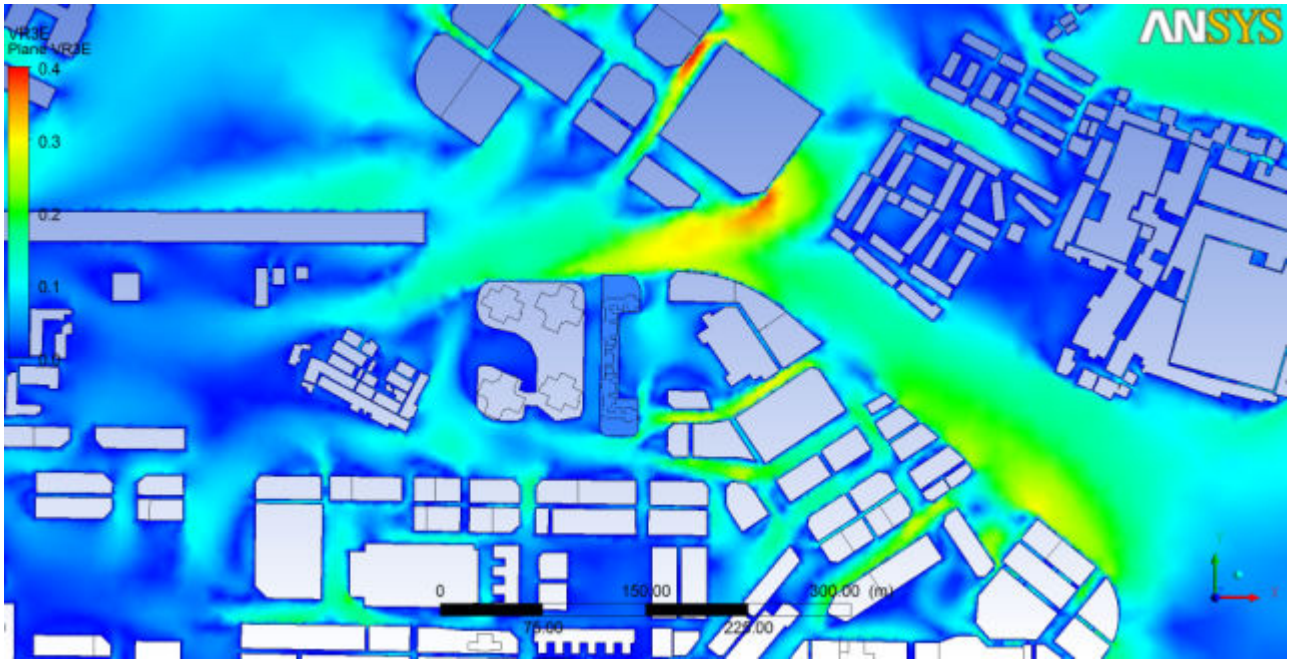
Scheme 2



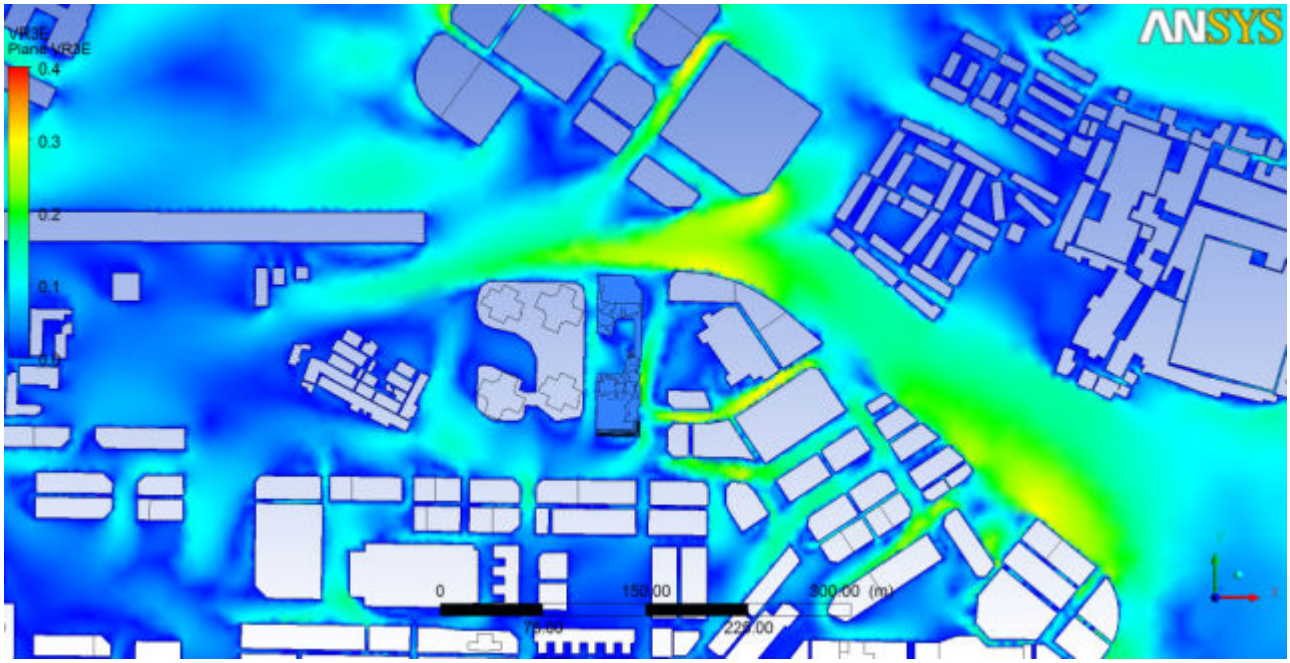
C.3 E wind

C.3.1 Wind Velocity Ratio Contour (2m above ground)

Scheme 1

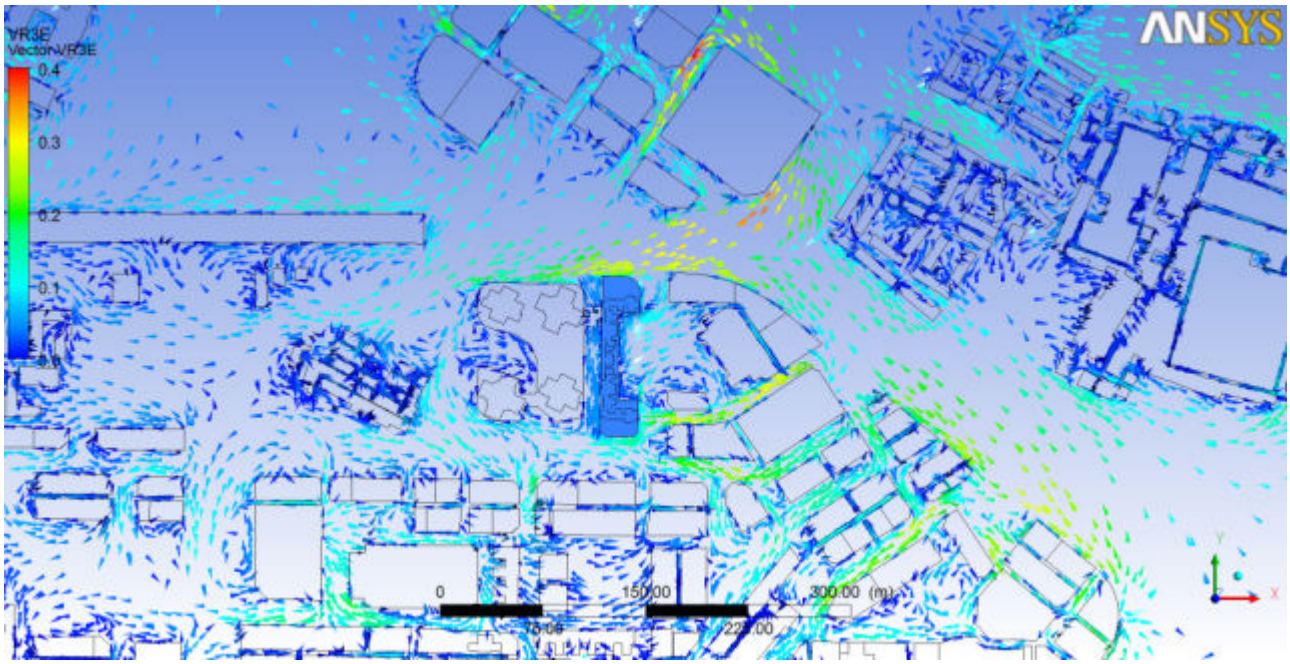


Scheme 2

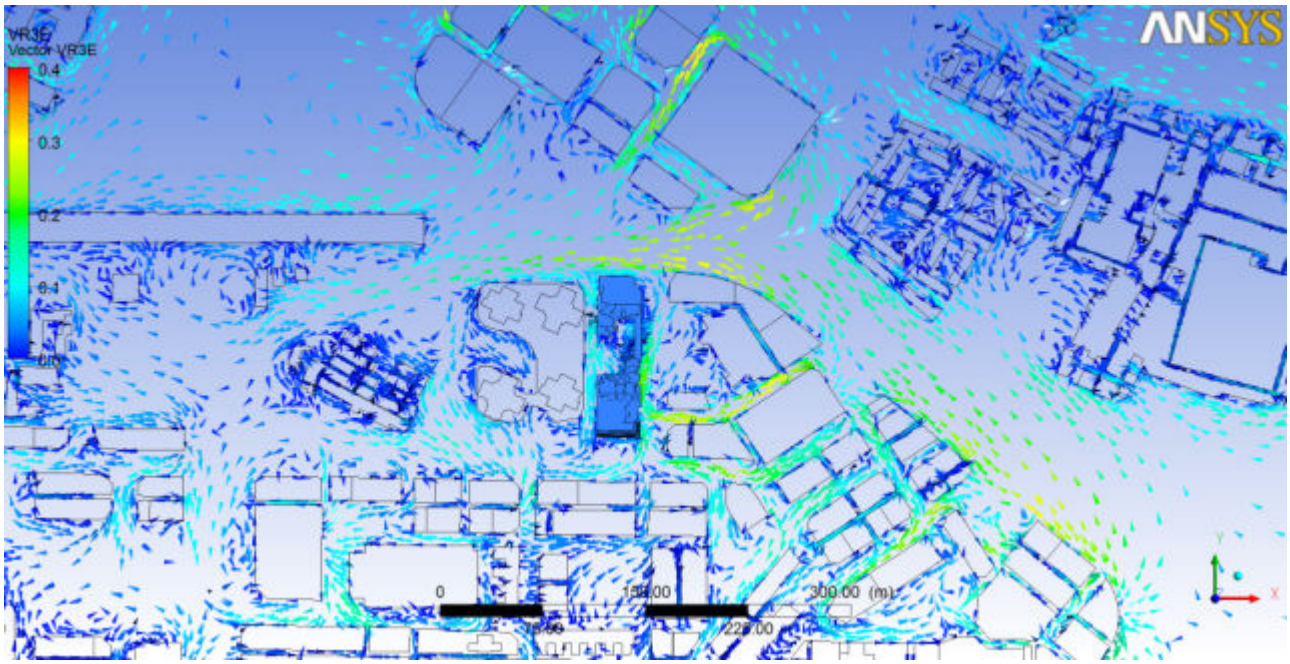


C.3.2 Wind Velocity Ratio Vector (2m above ground)

Scheme 1



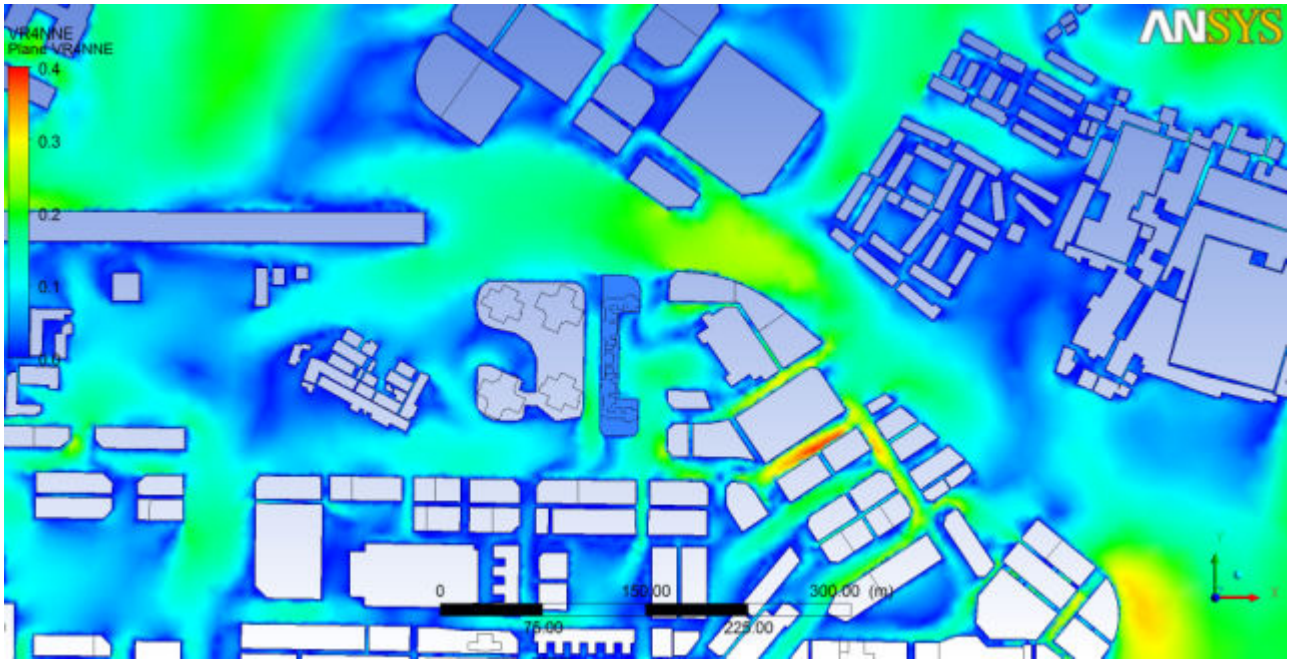
Scheme 2



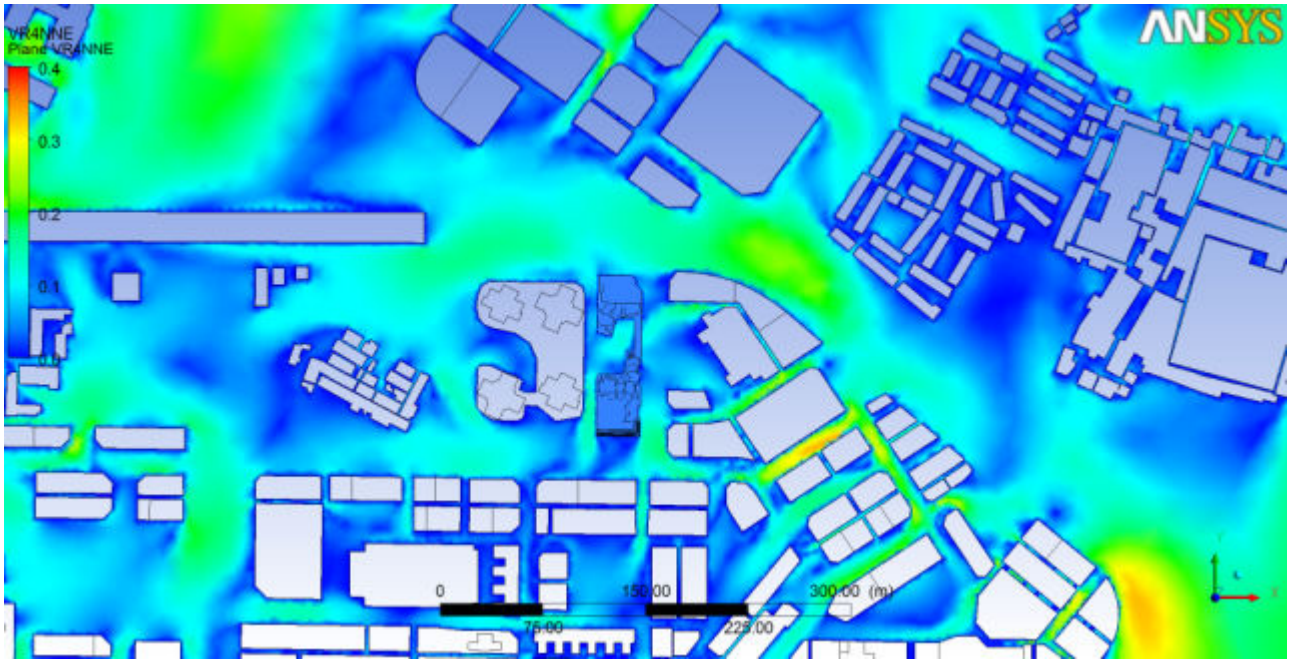
C.4 NNE wind

C.4.1 Wind Velocity Ratio Contour (2m above ground)

Scheme 1

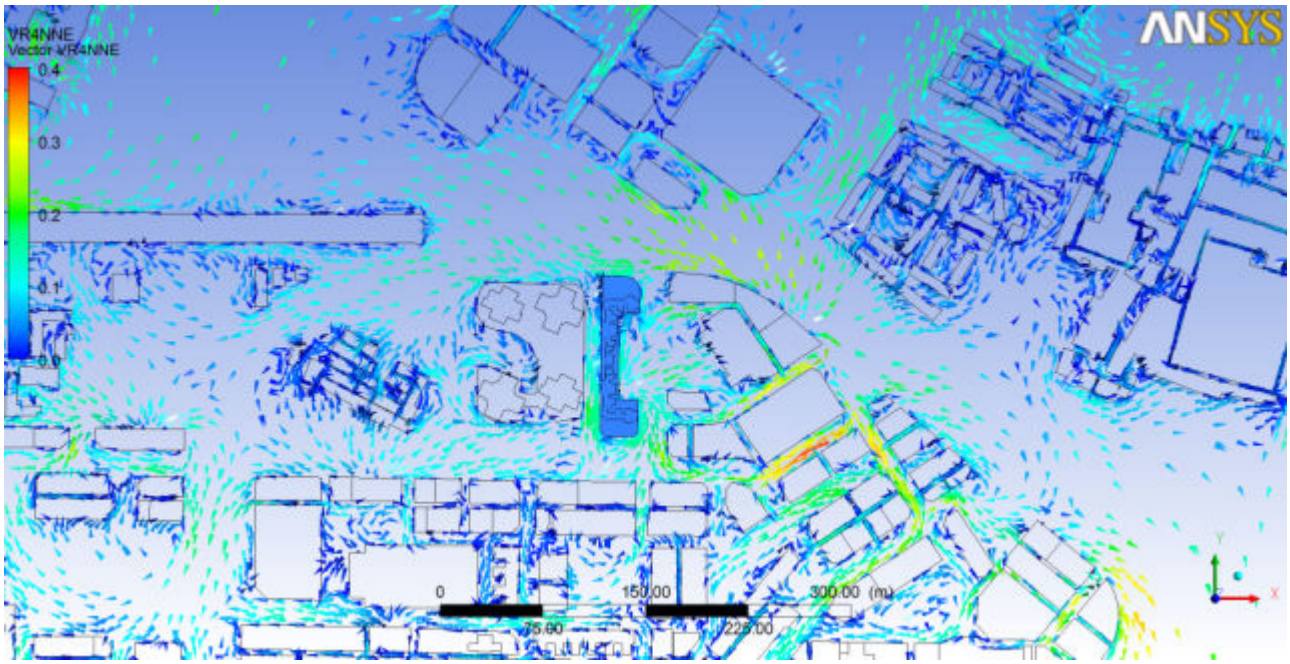


Scheme 2

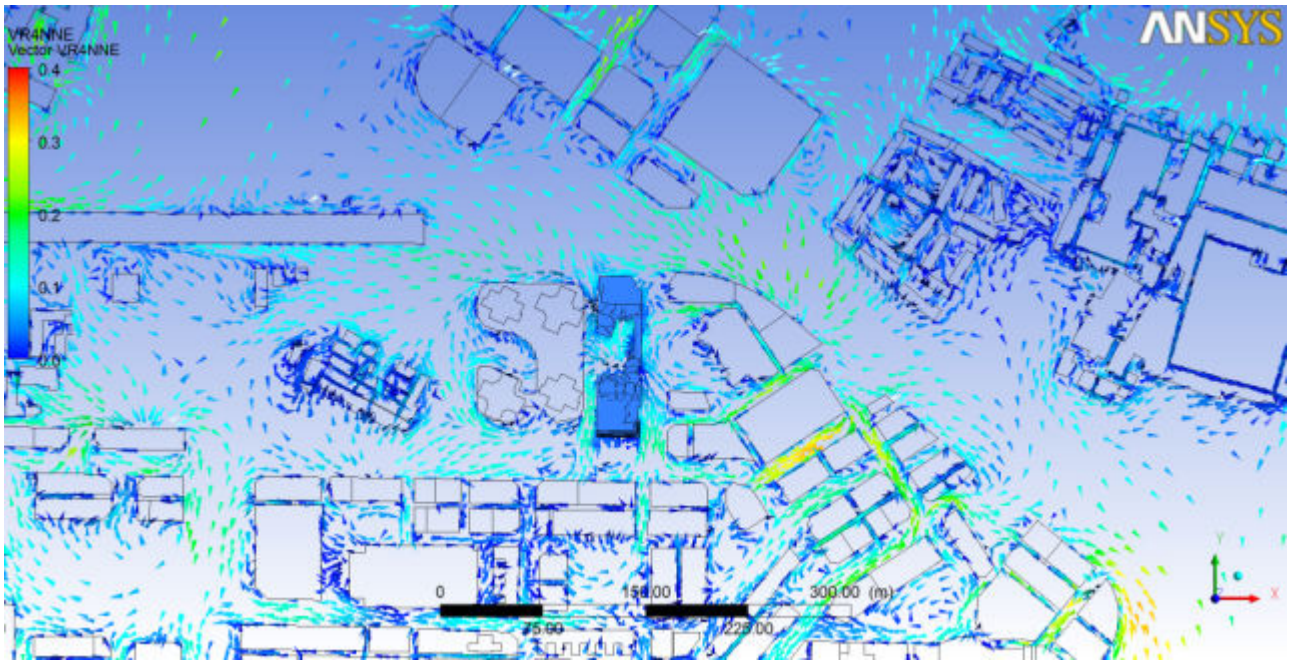


C.4.2 Wind Velocity Ratio Vector (2m above ground)

Scheme 1



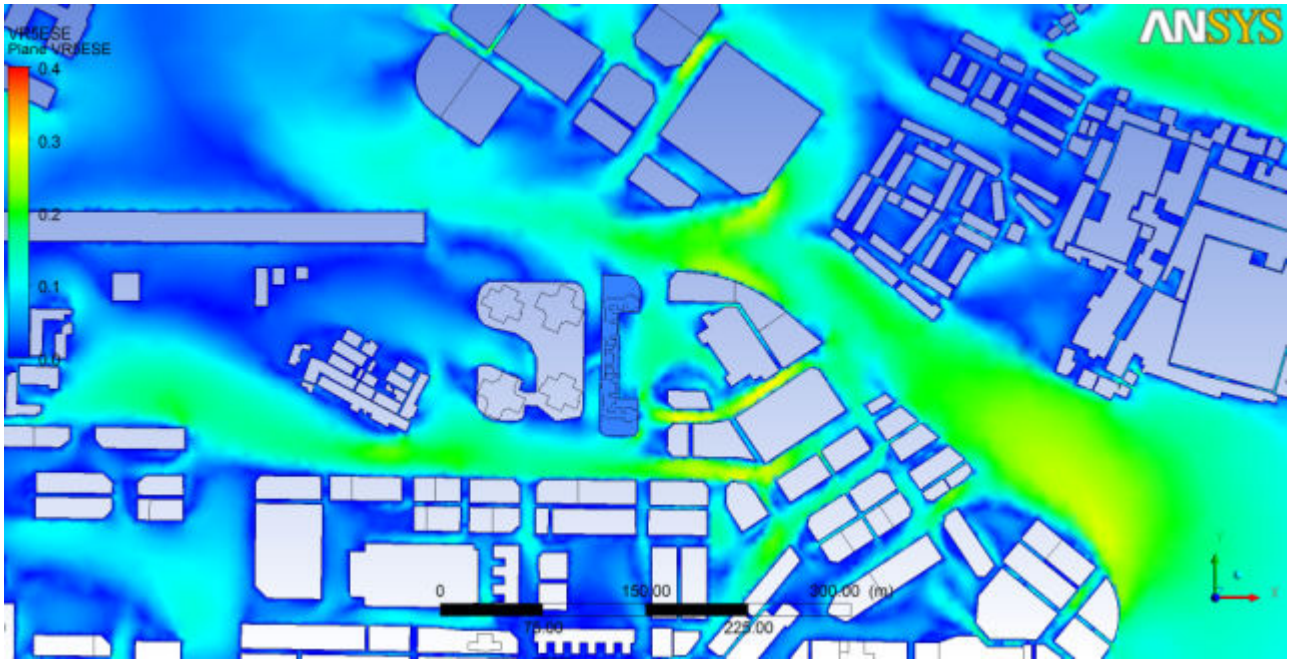
Scheme 2



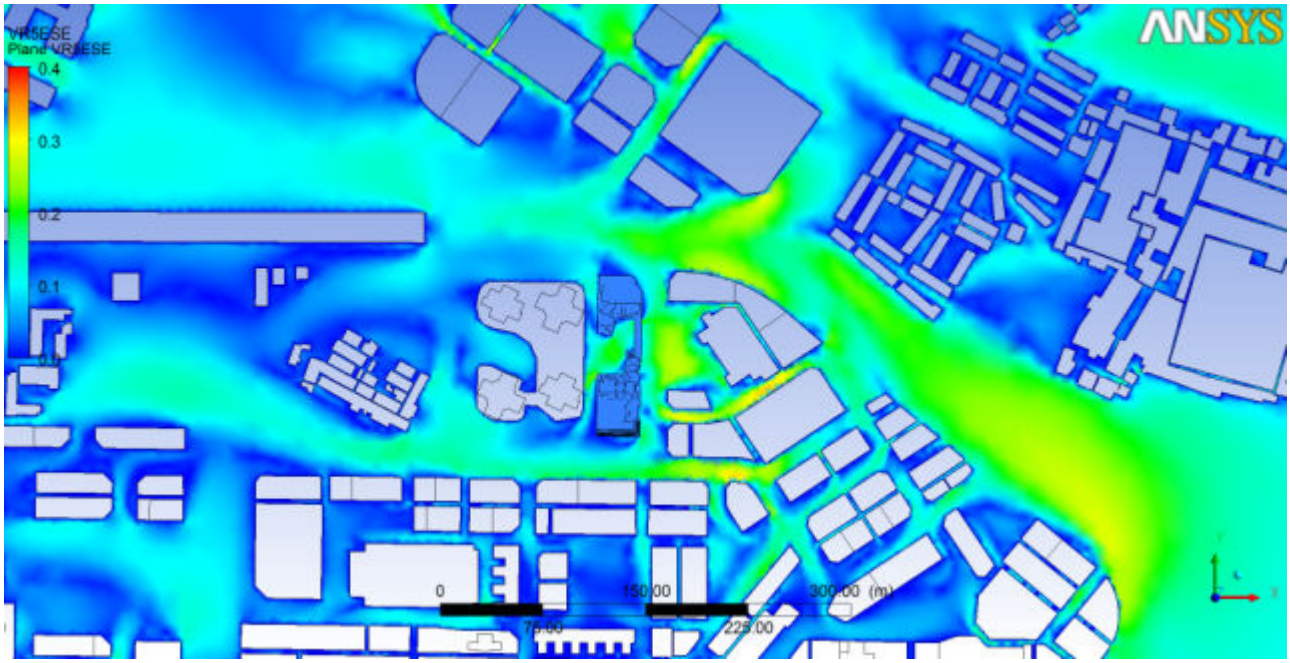
C.5 ESE wind

C.5.1 Wind Velocity Ratio Contour (2m above ground)

Scheme 1

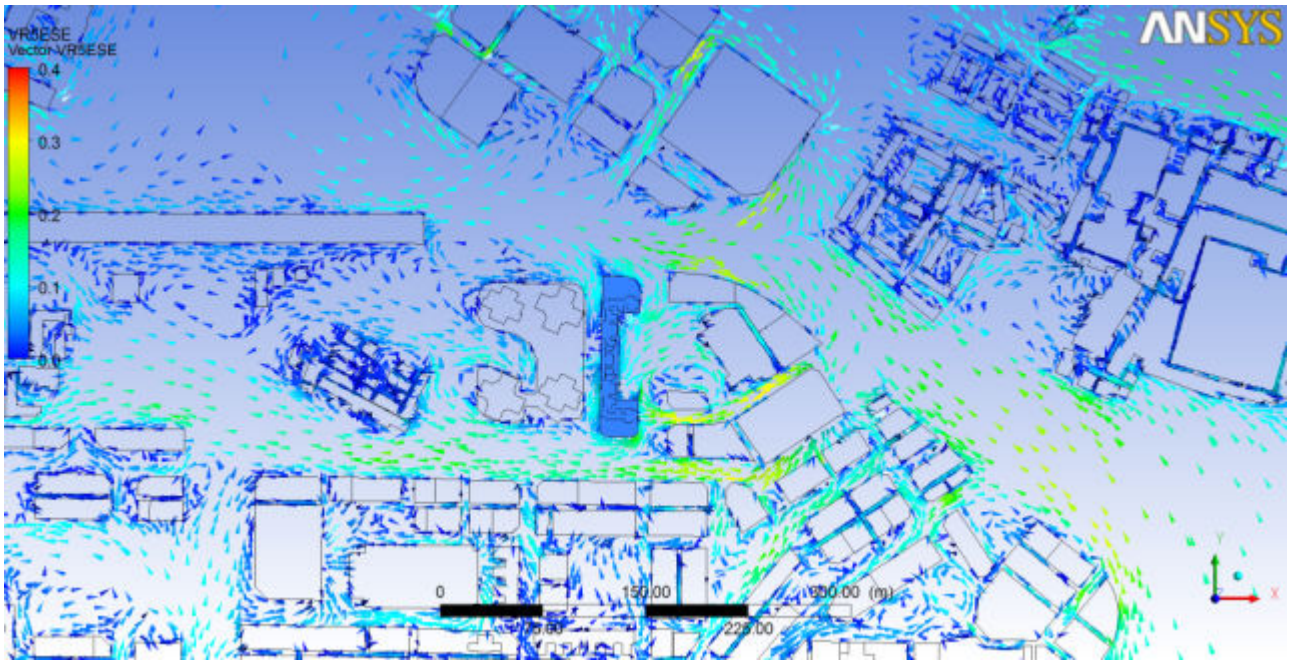


Scheme 2

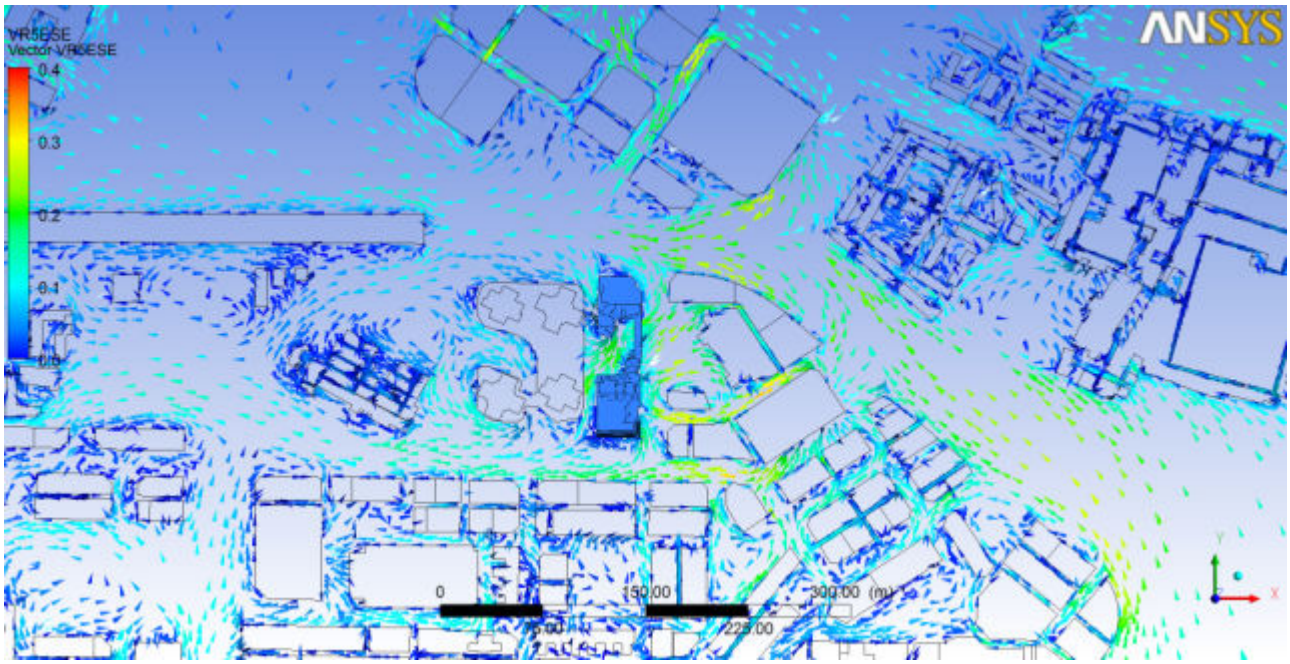


C.5.2 Wind Velocity Ratio Vector (2m above ground)

Scheme 1



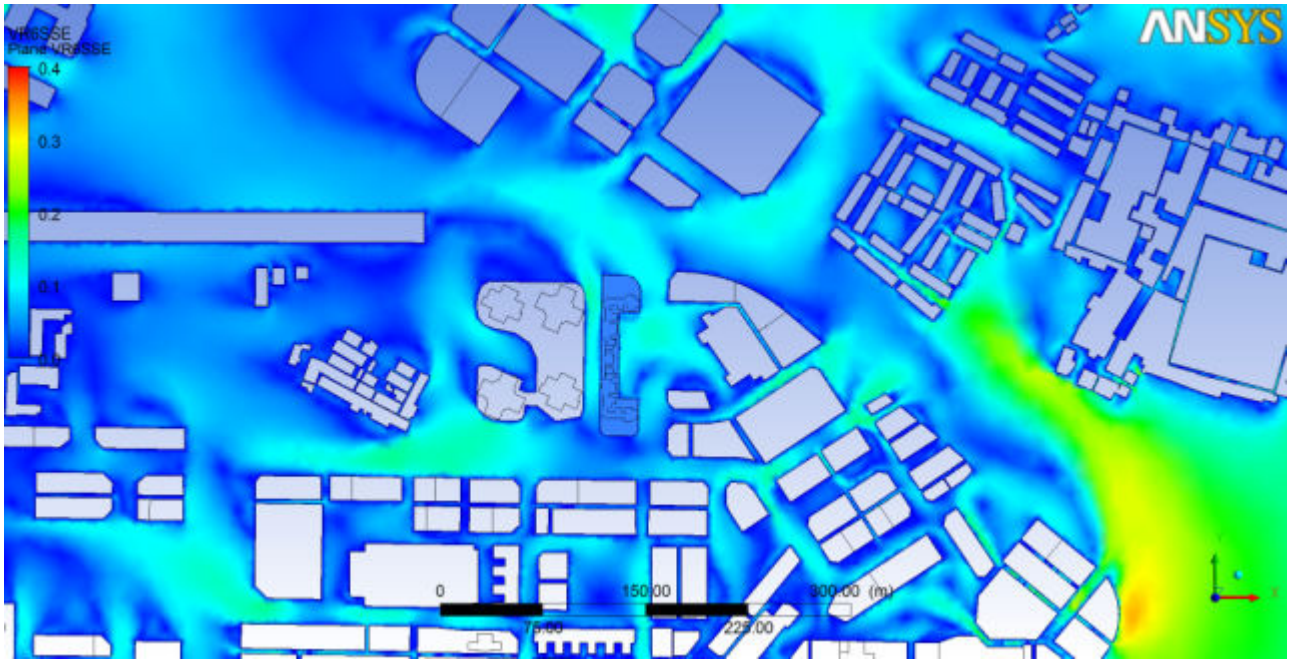
Scheme 2



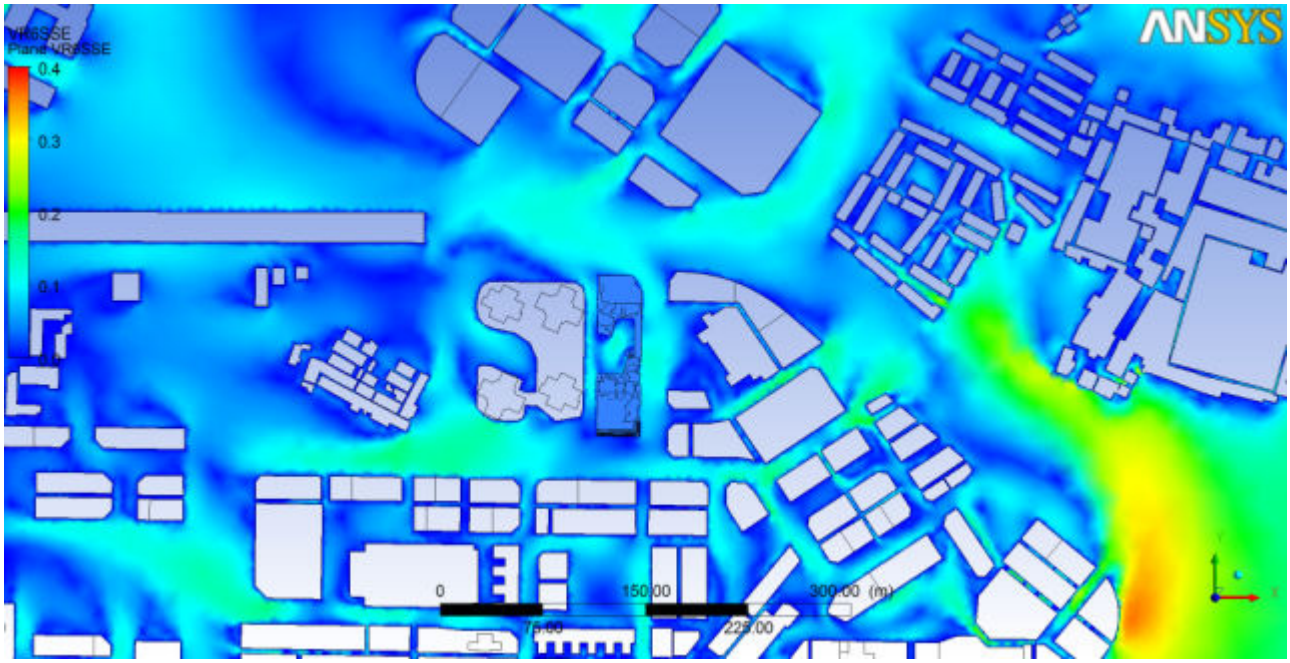
C.6 SSE wind

C.6.1 Wind Velocity Ratio Contour (2m above ground)

Scheme 1

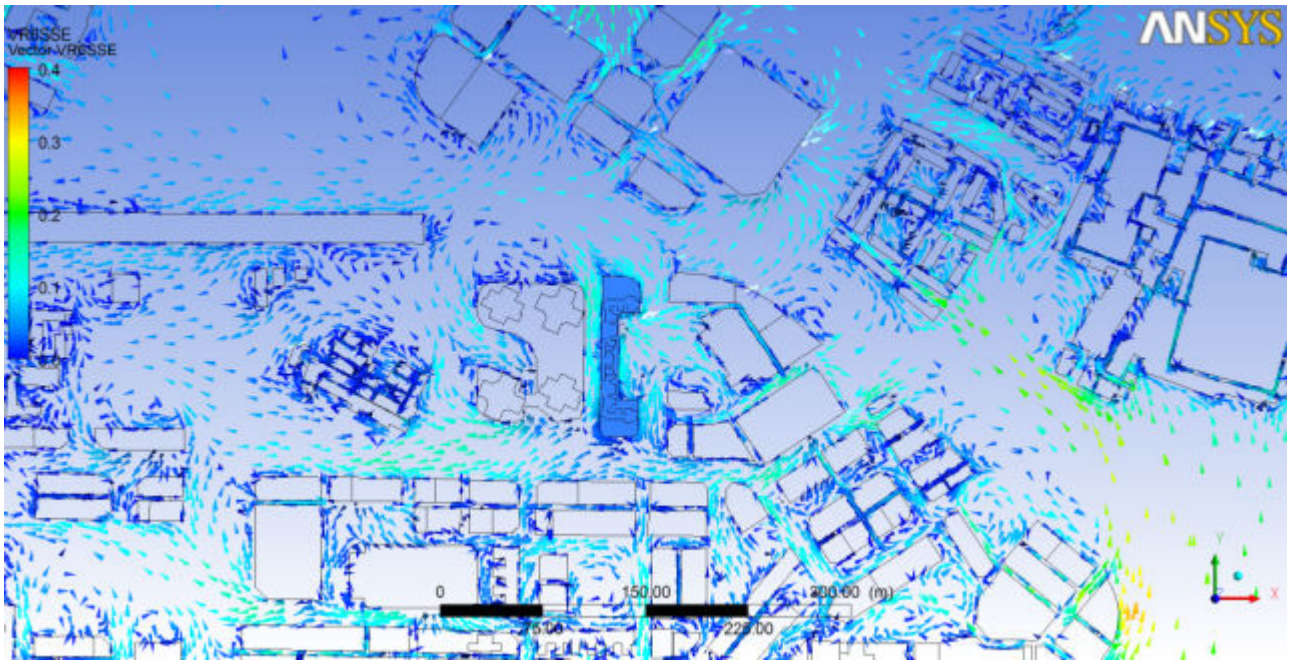


Scheme 2

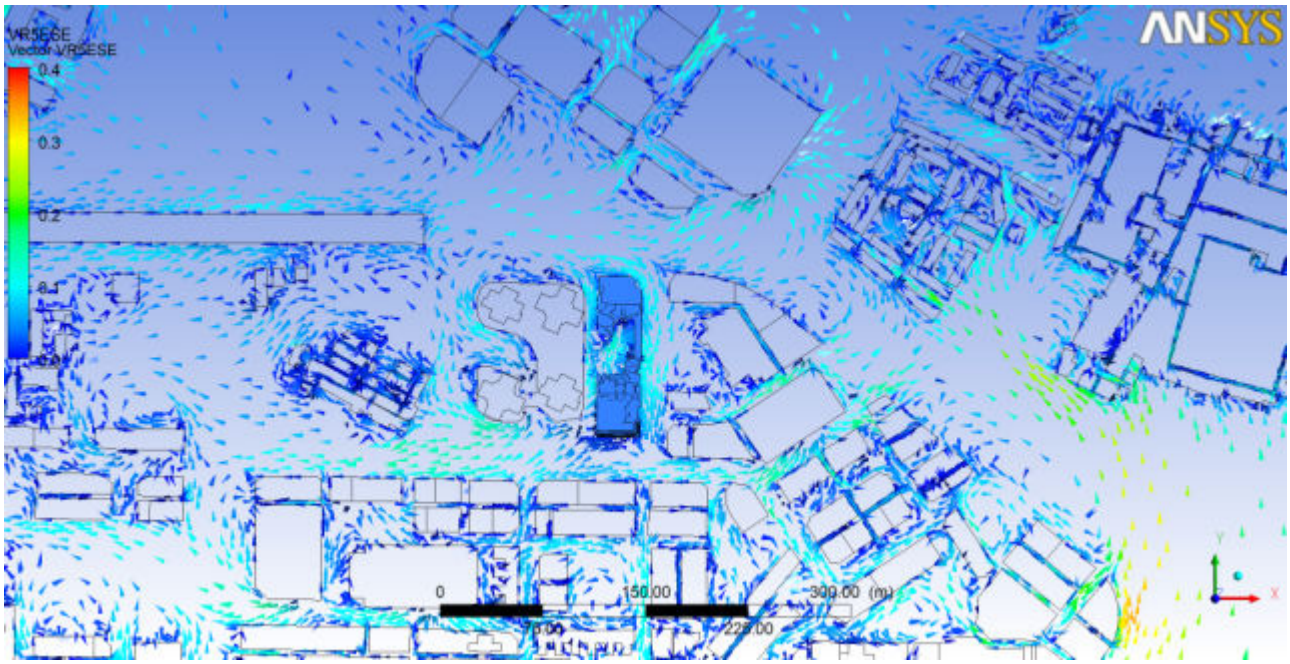


C.6.2 Wind Velocity Ratio Vector (2m above ground)

Scheme 1



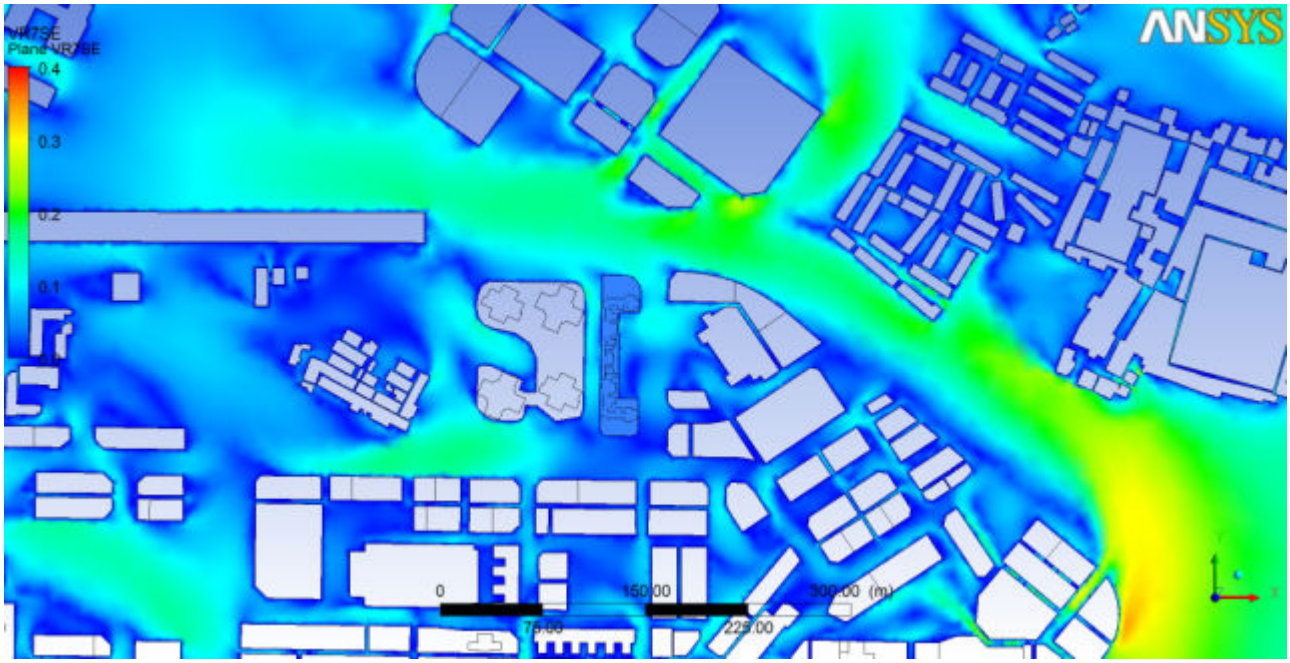
Scheme 2



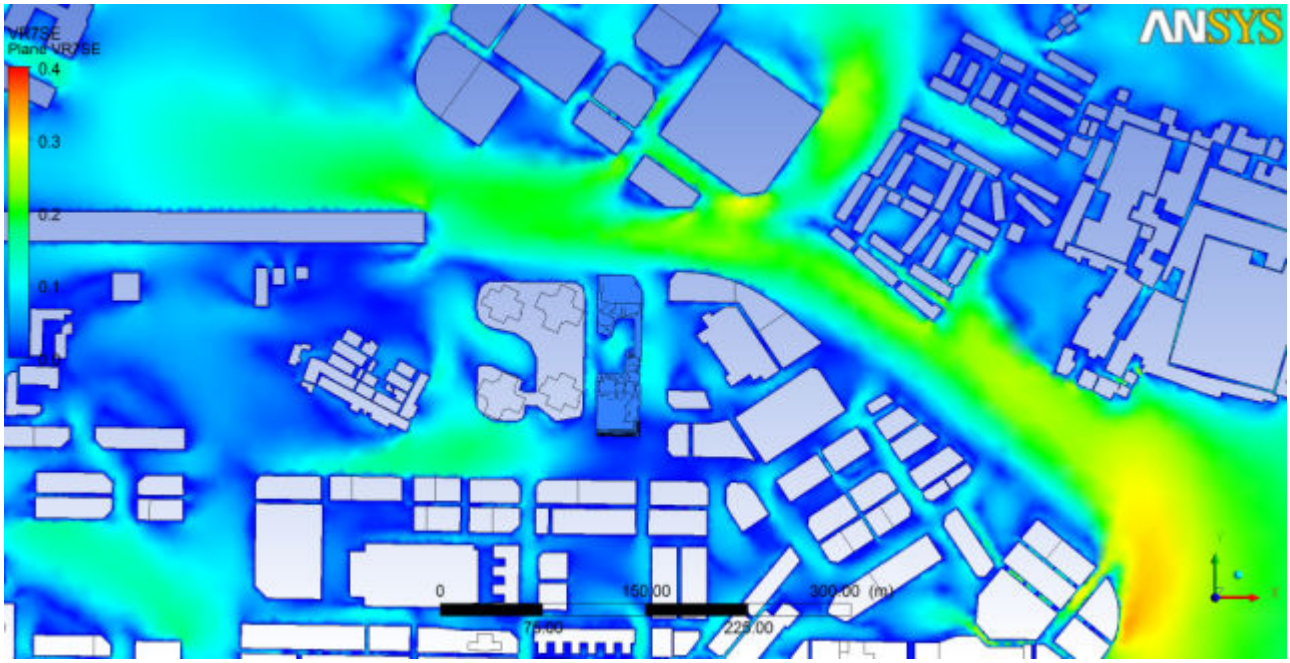
C.7 SE wind

C.7.1 Wind Velocity Ratio Contour (2m above ground)

Scheme 1

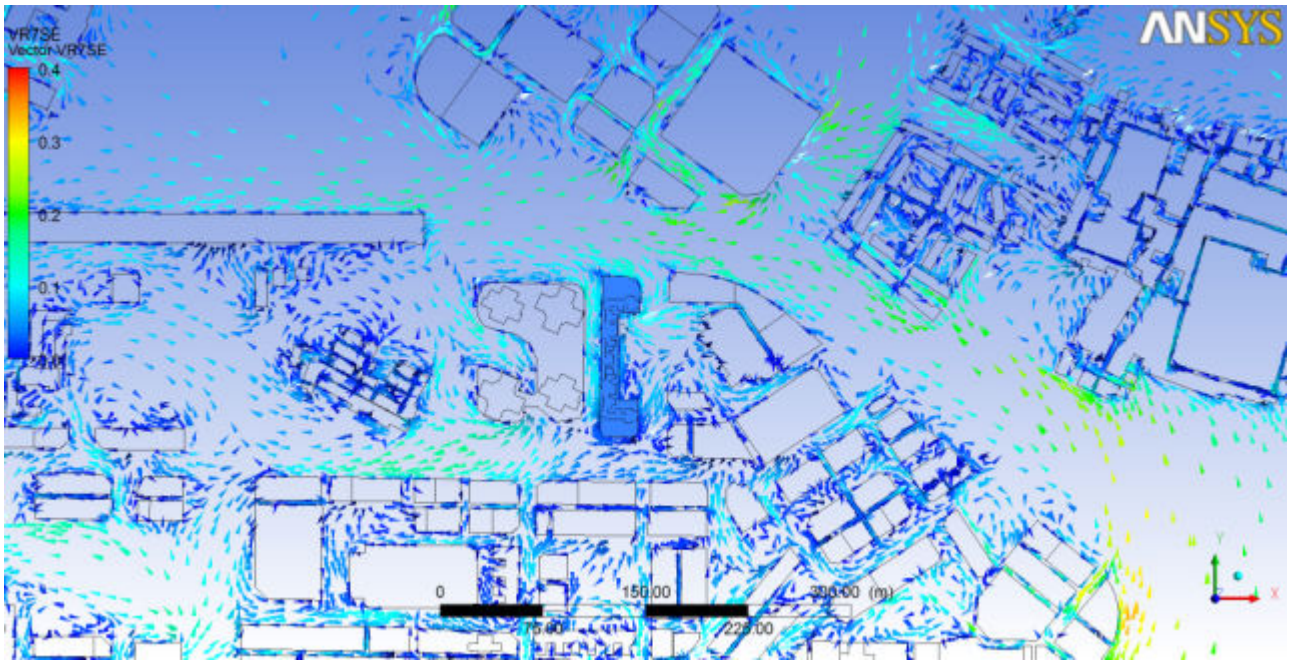


Scheme 2

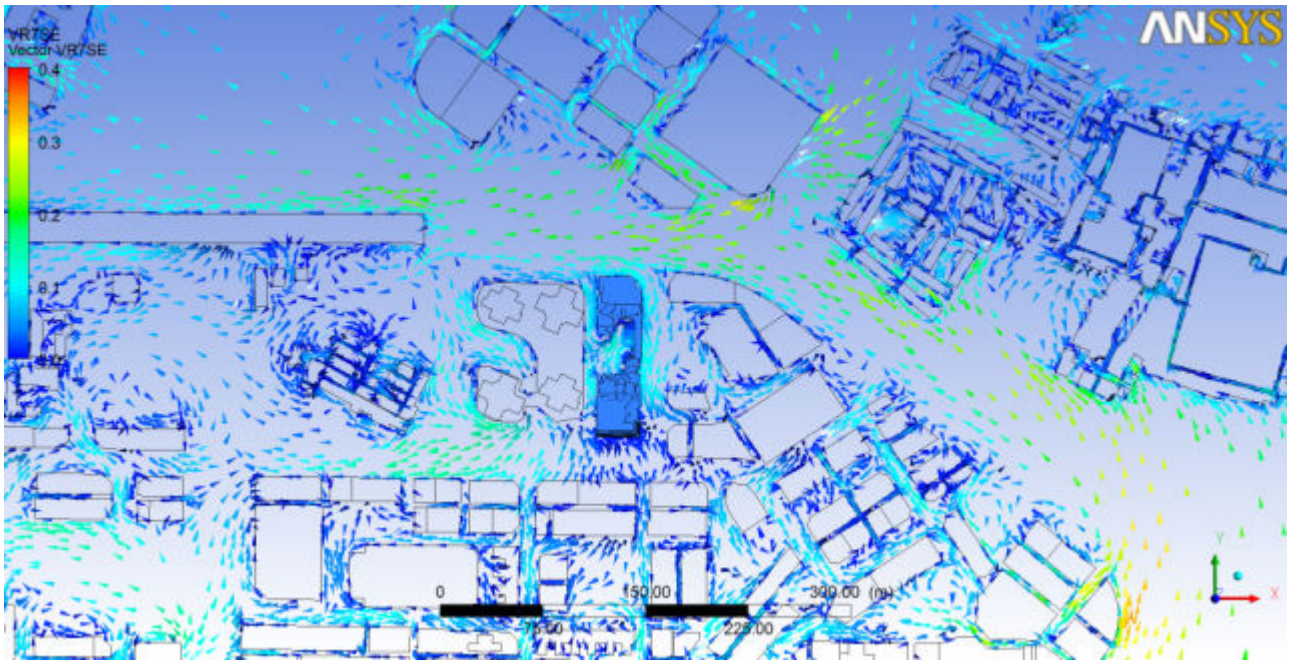


C.7.2 Wind Velocity Ratio Vector (2m above ground)

Scheme 1



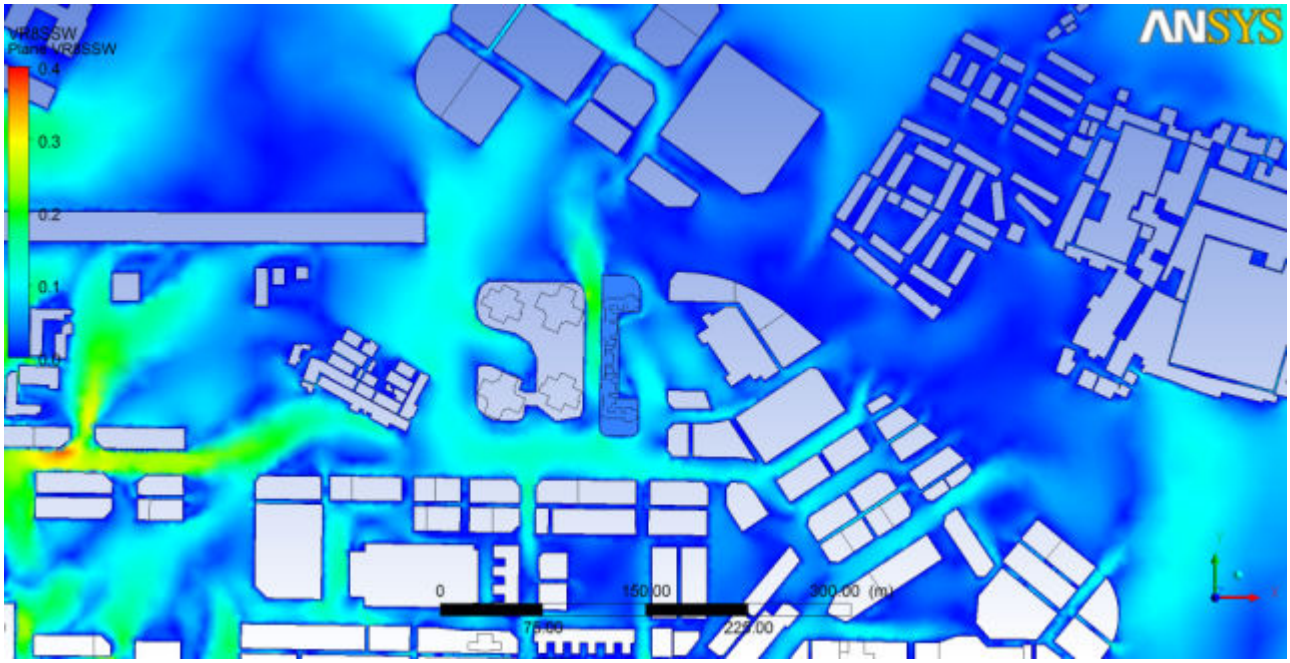
Scheme 2



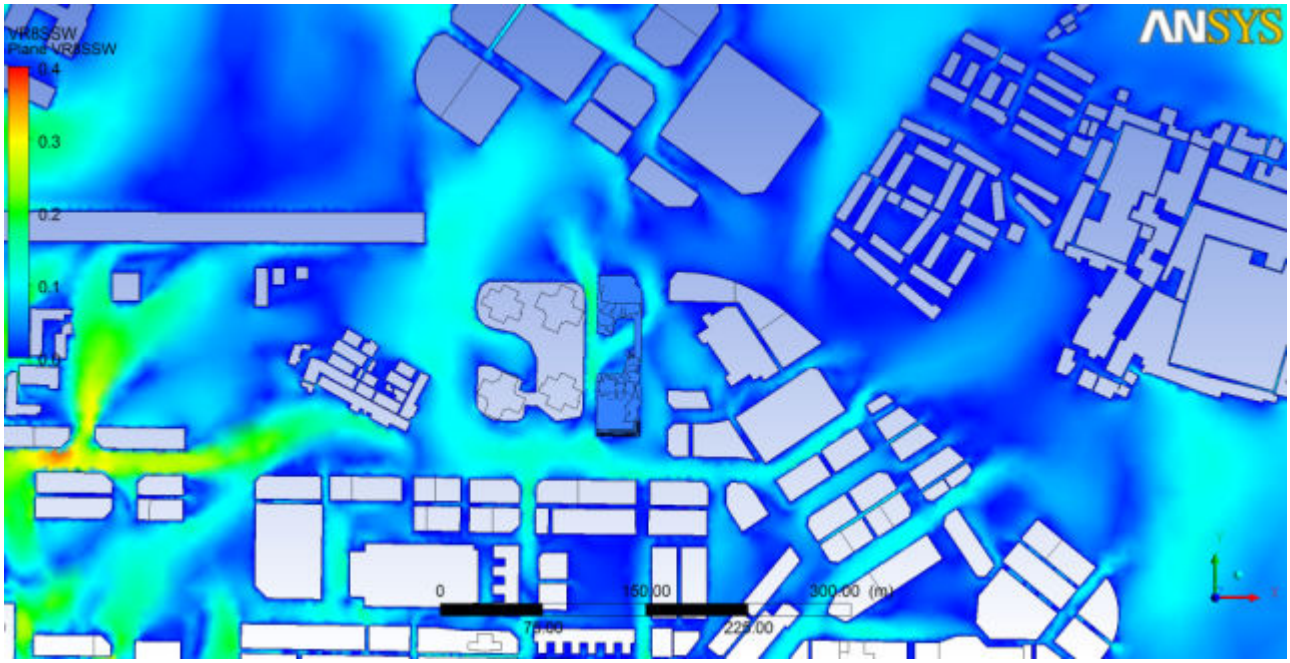
C.8 SSW wind

C.8.1 Wind Velocity Ratio Contour (2m above ground)

Scheme 1

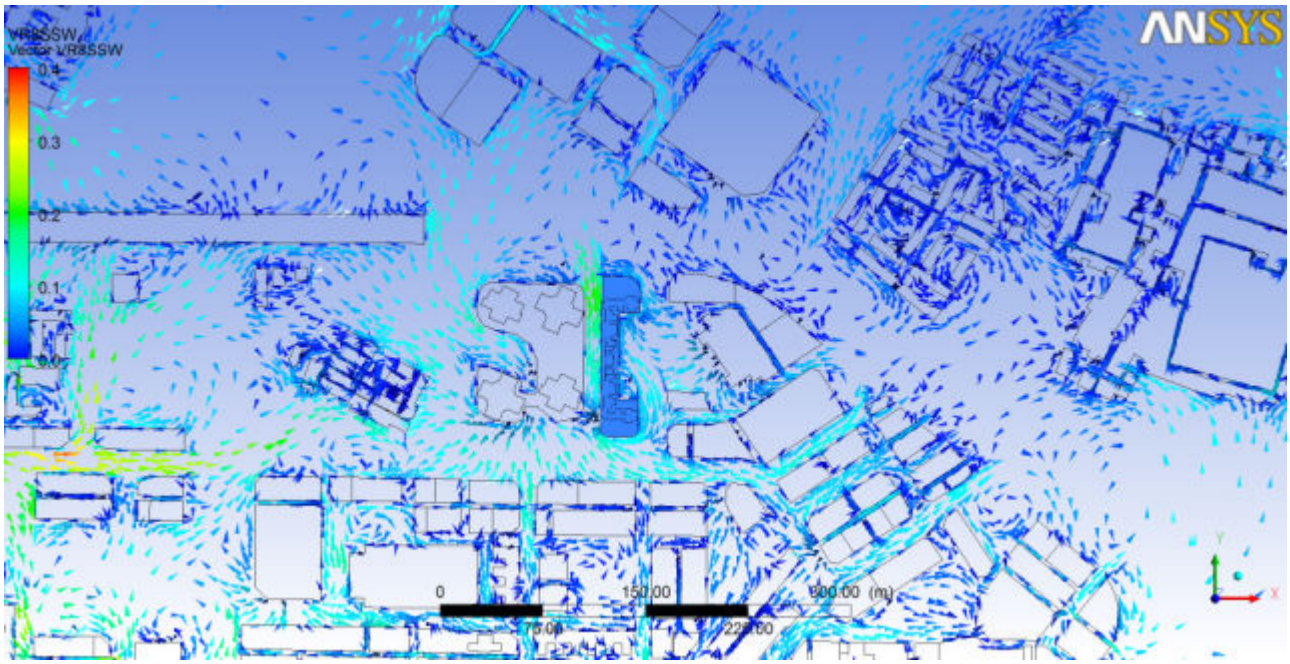


Scheme 2

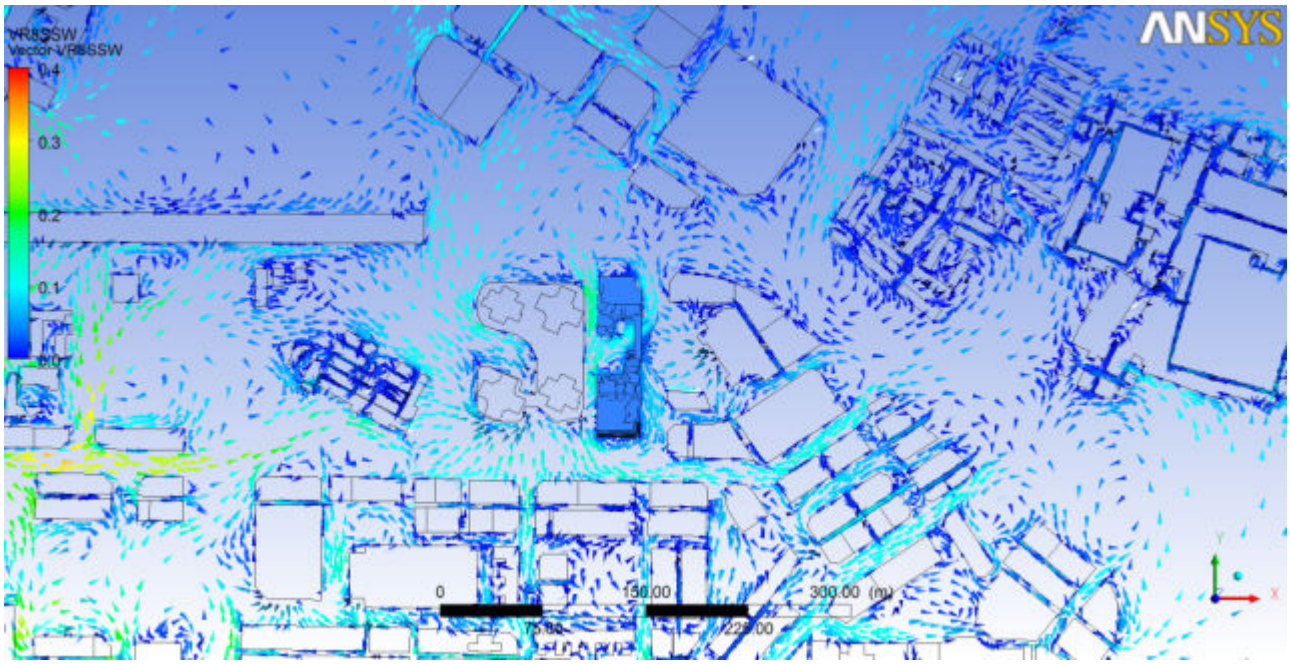


C.8.2 Wind Velocity Ratio Vector (2m above ground)

Scheme 1



Scheme 2



Appendix D.
CFD Modelling Results

D.1 ENE wind

D.1.1 Perimeter Test Point

Test point	x	y	z	Velocity (Scheme 1) (m/s)	VR (Scheme 1)	Velocity (Scheme 2) (m/s)	VR (Scheme 2)	VR Diff (Scheme 1&2)	VR Change %
P01	820897	834224	2.0	2.03	0.239	1.93	0.227	-0.01	-0.61
P02	820897	834209	2.0	1.37	0.161	1.34	0.157	-0.00	-0.25
P03	820897	834194	2.0	0.29	0.034	0.39	0.046	0.01	4.15
P04	820897	834179	2.0	0.34	0.040	0.75	0.088	0.05	13.94
P05	820897	834164	2.0	0.48	0.057	0.86	0.102	0.04	9.32
P06	820897	834149	2.0	0.58	0.068	0.30	0.035	-0.03	-5.72
P07	820897	834134	2.0	0.66	0.078	0.31	0.037	-0.04	-6.19
P08	820897	834119	2.0	0.74	0.087	0.39	0.046	-0.04	-5.45
P09	820897	834090	2.0	0.39	0.045	0.60	0.070	0.03	6.48
P10	820912	834090	2.0	0.53	0.062	0.54	0.064	0.00	0.26
P11	820927	834090	2.0	1.01	0.119	0.56	0.065	-0.05	-5.30
P12	820942	834090	2.0	1.03	0.121	0.62	0.073	-0.05	-4.72
P13	820957	834090	2.0	1.06	0.124	0.65	0.076	-0.05	-4.55
P14	820972	834090	2.0	1.06	0.125	0.83	0.098	-0.03	-2.54
P15	820987	834090	2.0	0.60	0.071	0.86	0.101	0.03	4.93
P16	820912	834224	2.0	2.12	0.249	2.00	0.235	-0.01	-0.65
P17	820927	834224	2.0	1.98	0.233	1.87	0.220	-0.01	-0.65
P18	820942	834224	2.0	1.78	0.210	1.67	0.197	-0.01	-0.72
P19	820957	834224	2.0	1.70	0.200	1.65	0.194	-0.01	-0.40
P20	820972	834224	2.0	1.47	0.173	1.54	0.181	0.01	0.52
P21	821017	834224	2.0	1.74	0.205	1.88	0.221	0.02	0.90
P22	821034	834224	2.0	1.92	0.225	1.93	0.227	0.00	0.09
P23	821034	834209	2.0	0.62	0.073	0.36	0.042	-0.03	-5.00
P24	821034	834194	2.0	0.47	0.056	0.57	0.067	0.01	2.44
P25	821034	834164	2.0	1.30	0.153	1.36	0.160	0.01	0.51
P26	821034	834149	2.0	1.20	0.141	1.67	0.196	0.05	4.55
P27	821034	834134	2.0	0.87	0.102	1.42	0.167	0.07	7.50
P28	821034	834119	2.0	0.91	0.108	1.33	0.157	0.05	5.38
P29	821034	834104	2.0	1.49	0.175	1.27	0.149	-0.03	-1.72
P30	821034	834090	2.0	1.46	0.171	1.18	0.139	-0.03	-2.20

D.1.2 Overall Test Point

Test point	x	y	z	Velocity (Scheme 1) (m/s)	VR (Scheme 1)	Velocity (Scheme 2) (m/s)	VR (Scheme 2)	VR Diff (Scheme 1&2)	VR Change %
O01	821020	834303	2.0	0.98	0.115	1.02	0.120	0.00	0.45
O02	820990	834279	2.0	1.91	0.225	1.98	0.233	0.01	0.41
O03	820960	834280	2.0	1.74	0.205	1.82	0.214	0.01	0.56
O04	820930	834290	2.0	1.44	0.169	1.59	0.187	0.02	1.25
O05	820906	834308	2.0	1.09	0.128	1.20	0.141	0.01	1.20

Test point	x	y	z	Velocity (Scheme 1) (m/s)	VR (Scheme 1)	Velocity (Scheme 2) (m/s)	VR (Scheme 2)	VR Diff (Scheme 1&2)	VR Change %
O06	821080	834261	2.0	1.79	0.211	1.86	0.218	0.01	0.42
O07	821050	834261	2.0	2.40	0.282	2.51	0.296	0.01	0.56
O08	821020	834261	2.0	2.28	0.269	2.28	0.268	-0.00	-0.01
O09	820990	834261	2.0	2.05	0.241	2.05	0.241	-0.00	-0.02
O10	820960	834261	2.0	2.05	0.241	1.97	0.232	-0.01	-0.45
O11	820930	834268	2.0	2.00	0.235	1.89	0.223	-0.01	-0.60
O12	820900	834272	2.0	1.84	0.217	1.76	0.207	-0.01	-0.52
O13	820870	834272	2.0	2.01	0.236	1.95	0.229	-0.01	-0.34
O14	820840	834273	2.0	0.92	0.108	1.02	0.119	0.01	1.25
O15	820807	834274	2.0	1.15	0.136	1.14	0.135	-0.00	-0.10
O16	821115	834269	2.0	2.01	0.237	1.99	0.234	-0.00	-0.12
O17	821110	834218	2.0	2.56	0.301	2.56	0.301	0.00	0.01
O18	821080	834226	2.0	2.74	0.322	2.70	0.318	-0.00	-0.16
O19	821050	834233	2.0	2.53	0.298	2.45	0.288	-0.01	-0.40
O20	821020	834236	2.0	2.20	0.259	2.18	0.256	-0.00	-0.13
O21	820990	834236	2.0	1.93	0.227	1.87	0.220	-0.01	-0.38
O22	820960	834236	2.0	1.92	0.226	1.89	0.223	-0.00	-0.15
O23	820930	834236	2.0	1.98	0.233	1.90	0.224	-0.01	-0.44
O24	820900	834236	2.0	1.96	0.231	1.86	0.219	-0.01	-0.60
O25	820870	834236	2.0	2.08	0.245	2.04	0.240	-0.00	-0.21
O26	820840	834436	2.0	1.21	0.143	1.14	0.134	-0.01	-0.74
O27	820810	834236	2.0	0.27	0.032	0.97	0.114	0.08	30.85
O28	820880	834212	2.0	1.89	0.223	1.65	0.194	-0.03	-1.51
O29	820880	834183	2.0	0.35	0.041	0.61	0.072	0.03	8.96
O30	820880	834153	2.0	0.31	0.037	0.49	0.057	0.02	6.71
O31	820880	834123	2.0	0.37	0.044	0.30	0.035	-0.01	-2.44
O32	820880	834097	2.0	0.36	0.042	0.28	0.034	-0.01	-2.41
O33	820805	834078	2.0	0.34	0.039	0.44	0.052	0.01	3.64
O34	820845	834078	2.0	0.15	0.018	0.19	0.023	0.01	3.42
O35	820880	834074	2.0	0.10	0.012	0.14	0.017	0.00	4.39
O36	820900	834074	2.0	0.43	0.050	0.38	0.044	-0.01	-1.37
O37	820930	834074	2.0	0.35	0.041	0.83	0.098	0.06	16.09
O38	820960	834074	2.0	0.91	0.107	0.82	0.097	-0.01	-1.13
O39	820990	834074	2.0	0.89	0.104	0.57	0.067	-0.04	-4.22
O40	821020	834074	2.0	0.74	0.087	0.74	0.087	-0.00	-0.02
O41	821050	834074	2.0	0.48	0.056	0.29	0.034	-0.02	-4.68
O42	821080	834074	2.0	0.91	0.108	0.92	0.108	0.00	0.05
O43	821110	834074	2.0	1.39	0.163	1.22	0.143	-0.02	-1.40
O44	821080	834063	2.0	0.18	0.021	0.48	0.056	0.03	19.22
O45	820947	834063	2.0	0.70	0.083	0.52	0.061	-0.02	-3.09
O46	820946	834033	2.0	0.58	0.068	0.63	0.074	0.01	1.13
O47	820843	834025	2.0	0.10	0.012	0.23	0.027	0.01	13.65
O48	820870	834025	2.0	0.43	0.051	0.42	0.049	-0.00	-0.41
O49	820900	834025	2.0	0.53	0.062	0.48	0.056	-0.01	-1.16
O50	820930	834025	2.0	0.14	0.016	0.17	0.020	0.00	2.45
O51	820960	834025	2.0	0.26	0.031	0.25	0.030	-0.00	-0.32
O52	820990	834025	2.0	0.24	0.028	0.24	0.028	-0.00	-0.20

Test point	x	y	z	Velocity (Scheme 1) (m/s)	VR (Scheme 1)	Velocity (Scheme 2) (m/s)	VR (Scheme 2)	VR Diff (Scheme 1&2)	VR Change %
O53	821020	834025	2.0	0.19	0.022	0.19	0.022	0.00	0.15
O54	821050	834025	2.0	0.21	0.025	0.12	0.014	-0.01	-5.00
O55	821028	834063	2.0	1.29	0.152	1.20	0.141	-0.01	-0.81
O56	821028	834033	2.0	0.99	0.117	0.85	0.100	-0.02	-1.64
O57	821080	834033	2.0	0.68	0.080	0.85	0.099	0.02	2.79
O58	821127	834140	2.0	2.50	0.294	2.50	0.294	0.00	0.03
O59	821102	834123	2.0	1.90	0.223	2.40	0.282	0.06	3.14
O60	821060	834115	2.0	1.74	0.205	2.44	0.287	0.08	4.73
O61	821043	834123	2.0	0.39	0.045	0.70	0.082	0.04	9.56
O62	821043	834153	2.0	1.25	0.147	1.02	0.120	-0.03	-2.12
O63	821043	834183	2.0	0.93	0.109	0.79	0.093	-0.02	-1.67
O64	821043	834211	2.0	0.50	0.059	0.22	0.026	-0.03	-6.55
O65	820946	834003	2.0	0.87	0.102	0.87	0.103	0.00	0.07
O66	820990	834003	2.0	0.42	0.049	0.43	0.051	0.00	0.41
O67	821027	834003	2.0	0.67	0.079	0.51	0.060	-0.02	-2.74

D.1.3 Special Test Point

Test point	x	y	z	Velocity (Scheme 1) (m/s)	VR (Scheme 1)	Velocity (Scheme 2) (m/s)	VR (Scheme 2)	VR Diff (Scheme 1&2)	VR Change %
S01	820946	834206	12.1	0.80	0.09	1.19	0.14	0.045	47.4
S02	820946	834191	12.1	1.23	0.14	1.19	0.14	-0.005	-3.4
S03	820946	834176	12.1	0.73	0.09	0.71	0.08	-0.003	-3.0
S04	820912	834164	2.0	0.19	0.02	0.92	0.11	0.086	379.9
S05	820935	834161	2.0	0.15	0.02	0.66	0.08	0.059	329.5
S06	820962	834162	12.1	0.16	0.02	1.24	0.15	0.127	671.0
S07	820976	834161	12.1	1.06	0.13	1.06	0.12	-0.001	-0.5
S08	820991	834161	2.0	1.05	0.12	1.47	0.17	0.050	40.3
S09	821005	834161	2.0	0.39	0.05	0.33	0.04	-0.007	-14.9
S10	820991	834207	2.0	0.79	0.09	0.37	0.04	-0.049	-52.6
S11	820991	834191	2.0	1.12	0.13	1.44	0.17	0.038	28.6
S12	820991	834176	2.0	1.13	0.13	1.78	0.21	0.077	57.9
S13	820991	834147	2.0	1.07	0.13	1.16	0.14	0.011	8.6
S14	820991	834132	2.0	1.44	0.17	1.23	0.14	-0.024	-14.5
S15	820946	834146	2.0	0.13	0.02	0.80	0.09	0.079	520.2
S16	820946	834131	12.1	0.70	0.08	1.05	0.12	0.040	48.7
S17	820946	834116	2.0	0.21	0.03	0.13	0.02	-0.010	-40.2

D.2 NE wind

D.2.1 Perimeter Test Point

Test point	x	y	z	Velocity (Scheme 1) (m/s)	VR (Scheme 1)	Velocity (Scheme 2) (m/s)	VR (Scheme 2)	VR Diff (Scheme 1&2)	VR Change %
P01	820897	834224	2.0	1.70	0.208	1.65	0.202	-0.01	-0.34
P02	820897	834209	2.0	1.35	0.165	1.35	0.166	0.00	0.08
P03	820897	834194	2.0	0.61	0.074	0.60	0.074	-0.00	-0.05
P04	820897	834179	2.0	0.23	0.028	0.23	0.028	0.00	0.02
P05	820897	834164	2.0	0.41	0.051	0.70	0.086	0.03	8.44
P06	820897	834149	2.0	0.55	0.067	0.62	0.076	0.01	1.59
P07	820897	834134	2.0	0.21	0.026	0.24	0.029	0.00	1.75
P08	820897	834119	2.0	0.17	0.021	0.34	0.041	0.02	11.78
P09	820897	834090	2.0	0.83	0.102	0.72	0.088	-0.01	-1.62
P10	820912	834090	2.0	0.79	0.097	0.72	0.089	-0.01	-1.01
P11	820927	834090	2.0	0.69	0.085	0.60	0.074	-0.01	-1.52
P12	820942	834090	2.0	0.57	0.070	0.26	0.032	-0.04	-6.68
P13	820957	834090	2.0	0.32	0.040	0.47	0.058	0.02	5.45
P14	820972	834090	2.0	0.36	0.044	0.69	0.085	0.04	11.24
P15	820987	834090	2.0	0.92	0.113	1.01	0.124	0.01	1.24
P16	820912	834224	2.0	1.77	0.217	1.67	0.205	-0.01	-0.69
P17	820927	834224	2.0	1.62	0.199	1.55	0.190	-0.01	-0.57
P18	820942	834224	2.0	1.42	0.174	1.34	0.164	-0.01	-0.70
P19	820957	834224	2.0	1.35	0.166	1.23	0.151	-0.02	-1.12
P20	820972	834224	2.0	1.33	0.163	1.21	0.148	-0.01	-1.13
P21	821017	834224	2.0	1.64	0.201	1.60	0.196	-0.00	-0.29
P22	821034	834224	2.0	1.70	0.208	1.77	0.217	0.01	0.52
P23	821034	834209	2.0	1.14	0.140	1.15	0.141	0.00	0.10
P24	821034	834194	2.0	1.31	0.161	1.14	0.140	-0.02	-1.58
P25	821034	834164	2.0	0.80	0.098	0.31	0.038	-0.06	-7.51
P26	821034	834149	2.0	0.69	0.085	0.12	0.014	-0.07	-10.22
P27	821034	834134	2.0	0.82	0.100	0.13	0.016	-0.08	-10.34
P28	821034	834119	2.0	0.93	0.114	0.56	0.068	-0.05	-4.93
P29	821034	834104	2.0	1.34	0.165	1.16	0.143	-0.02	-1.65
P30	821034	834090	2.0	1.30	0.160	1.29	0.158	-0.00	-0.14

D.2.2 Overall Test Point

Test point	x	y	z	Velocity (Scheme 1) (m/s)	VR (Scheme 1)	Velocity (Scheme 2) (m/s)	VR (Scheme 2)	VR Diff (Scheme 1&2)	VR Change %
O01	821020	834303	2.0	0.89	0.109	0.91	0.112	0.00	0.31
O02	820990	834279	2.0	1.46	0.180	1.54	0.189	0.01	0.67
O03	820960	834280	2.0	1.24	0.152	1.40	0.172	0.02	1.63
O04	820930	834290	2.0	1.13	0.138	1.31	0.160	0.02	1.97
O05	820906	834308	2.0	1.16	0.143	1.27	0.156	0.01	1.11
O06	821080	834261	2.0	1.60	0.197	1.71	0.209	0.01	0.79

Test point	x	y	z	Velocity (Scheme 1) (m/s)	VR (Scheme 1)	Velocity (Scheme 2) (m/s)	VR (Scheme 2)	VR Diff (Scheme 1&2)	VR Change %
O07	821050	834261	2.0	1.86	0.229	1.92	0.235	0.01	0.34
O08	821020	834261	2.0	1.65	0.202	1.74	0.214	0.01	0.70
O09	820990	834261	2.0	1.52	0.187	1.58	0.194	0.01	0.47
O10	820960	834261	2.0	1.47	0.181	1.53	0.187	0.01	0.44
O11	820930	834268	2.0	1.43	0.176	1.47	0.180	0.00	0.30
O12	820900	834272	2.0	1.37	0.168	1.42	0.174	0.01	0.46
O13	820870	834272	2.0	1.49	0.183	1.60	0.196	0.01	0.85
O14	820840	834273	2.0	1.09	0.134	1.19	0.146	0.01	1.11
O15	820807	834274	2.0	1.06	0.131	1.13	0.138	0.01	0.71
O16	821115	834269	2.0	1.02	0.125	1.06	0.130	0.00	0.48
O17	821110	834218	2.0	2.17	0.266	2.26	0.278	0.01	0.54
O18	821080	834226	2.0	2.28	0.280	2.38	0.292	0.01	0.53
O19	821050	834233	2.0	2.15	0.263	2.20	0.271	0.01	0.33
O20	821020	834236	2.0	1.71	0.209	1.74	0.214	0.00	0.27
O21	820990	834236	2.0	1.54	0.188	1.54	0.189	0.00	0.02
O22	820960	834236	2.0	1.52	0.186	1.48	0.182	-0.00	-0.30
O23	820930	834236	2.0	1.62	0.199	1.57	0.193	-0.01	-0.35
O24	820900	834236	2.0	1.62	0.199	1.60	0.196	-0.00	-0.20
O25	820870	834236	2.0	1.58	0.194	1.61	0.198	0.00	0.26
O26	820840	834436	2.0	0.51	0.063	0.68	0.084	0.02	4.11
O27	820810	834236	2.0	0.26	0.032	0.29	0.036	0.00	1.53
O28	820880	834212	2.0	1.61	0.198	1.53	0.188	-0.01	-0.60
O29	820880	834183	2.0	0.62	0.076	0.53	0.065	-0.01	-1.85
O30	820880	834153	2.0	0.31	0.038	0.55	0.067	0.03	9.14
O31	820880	834123	2.0	0.42	0.051	0.71	0.088	0.04	8.64
O32	820880	834097	2.0	0.69	0.085	0.65	0.079	-0.01	-0.80
O33	820805	834078	2.0	0.87	0.107	0.91	0.112	0.00	0.53
O34	820845	834078	2.0	0.84	0.103	0.87	0.107	0.00	0.49
O35	820880	834074	2.0	0.47	0.058	0.60	0.074	0.02	3.42
O36	820900	834074	2.0	0.58	0.071	0.58	0.072	0.00	0.07
O37	820930	834074	2.0	0.29	0.036	0.44	0.054	0.02	6.30
O38	820960	834074	2.0	0.76	0.094	0.88	0.108	0.01	1.88
O39	820990	834074	2.0	0.35	0.043	0.44	0.054	0.01	3.11
O40	821020	834074	2.0	0.56	0.069	0.47	0.058	-0.01	-2.01
O41	821050	834074	2.0	0.92	0.113	0.94	0.116	0.00	0.31
O42	821080	834074	2.0	0.56	0.069	0.89	0.109	0.04	6.99
O43	821110	834074	2.0	1.30	0.160	1.35	0.165	0.01	0.43
O44	821080	834063	2.0	0.60	0.073	0.29	0.036	-0.04	-6.27
O45	820947	834063	2.0	0.30	0.037	0.29	0.036	-0.00	-0.40
O46	820946	834033	2.0	0.47	0.057	0.44	0.054	-0.00	-0.69
O47	820843	834025	2.0	0.08	0.010	0.07	0.009	-0.00	-0.77
O48	820870	834025	2.0	0.03	0.004	0.04	0.005	0.00	2.11
O49	820900	834025	2.0	0.25	0.030	0.26	0.032	0.00	0.80
O50	820930	834025	2.0	0.09	0.011	0.14	0.017	0.01	5.94
O51	820960	834025	2.0	0.18	0.022	0.19	0.023	0.00	0.37
O52	820990	834025	2.0	0.17	0.021	0.25	0.030	0.01	5.23
O53	821020	834025	2.0	0.20	0.024	0.21	0.026	0.00	0.78

Test point	x	y	z	Velocity (Scheme 1) (m/s)	VR (Scheme 1)	Velocity (Scheme 2) (m/s)	VR (Scheme 2)	VR Diff (Scheme 1&2)	VR Change %
O54	821050	834025	2.0	0.10	0.013	0.13	0.016	0.00	3.09
O55	821028	834063	2.0	1.04	0.128	1.23	0.151	0.02	2.19
O56	821028	834033	2.0	0.95	0.117	0.95	0.116	-0.00	-0.01
O57	821080	834033	2.0	0.15	0.019	0.26	0.032	0.01	8.70
O58	821127	834140	2.0	1.99	0.244	2.01	0.246	0.00	0.09
O59	821102	834123	2.0	1.53	0.188	1.83	0.224	0.04	2.38
O60	821060	834115	2.0	1.25	0.154	1.67	0.205	0.05	4.09
O61	821043	834123	2.0	0.60	0.074	0.26	0.031	-0.04	-7.09
O62	821043	834153	2.0	0.80	0.098	0.53	0.065	-0.03	-4.22
O63	821043	834183	2.0	1.20	0.148	1.14	0.140	-0.01	-0.68
O64	821043	834211	2.0	0.43	0.053	0.52	0.064	0.01	2.68
O65	820946	834003	2.0	0.52	0.064	0.63	0.077	0.01	2.38
O66	820990	834003	2.0	0.26	0.032	0.30	0.036	0.00	1.51
O67	821027	834003	2.0	0.56	0.068	0.57	0.070	0.00	0.27

D.2.3 Special Test Point

Test point	x	y	z	Velocity (Scheme 1) (m/s)	VR (Scheme 1)	Velocity (Scheme 2) (m/s)	VR (Scheme 2)	VR Diff (Scheme 1&2)	VR Change %
S01	820946	834206	12.1	0.30	0.04	0.66	0.08	0.045	123.9
S02	820946	834191	12.1	1.24	0.15	0.95	0.12	-0.036	-23.7
S03	820946	834176	12.1	0.80	0.10	0.88	0.11	0.010	10.3
S04	820912	834164	2.0	0.62	0.08	0.91	0.11	0.035	46.4
S05	820935	834161	2.0	0.30	0.04	0.48	0.06	0.022	61.4
S06	820962	834162	12.1	0.62	0.08	1.18	0.14	0.069	90.7
S07	820976	834161	12.1	0.95	0.12	1.04	0.13	0.011	9.5
S08	820991	834161	2.0	0.97	0.12	0.92	0.11	-0.005	-4.6
S09	821005	834161	2.0	0.09	0.01	0.20	0.03	0.014	122.0
S10	820991	834207	2.0	0.69	0.08	0.28	0.03	-0.051	-60.0
S11	820991	834191	2.0	1.04	0.13	0.97	0.12	-0.008	-6.3
S12	820991	834176	2.0	1.08	0.13	1.15	0.14	0.008	5.8
S13	820991	834147	2.0	1.01	0.12	1.08	0.13	0.008	6.3
S14	820991	834132	2.0	1.22	0.15	1.27	0.16	0.005	3.6
S15	820946	834146	2.0	0.31	0.04	0.62	0.08	0.038	100.5
S16	820946	834131	12.1	0.53	0.06	0.67	0.08	0.018	27.4
S17	820946	834116	2.0	0.09	0.01	0.23	0.03	0.018	161.2

D.3 E wind

D.3.1 Perimeter Test Point

Test point	x	y	z	Velocity (Scheme 1) (m/s)	VR (Scheme 1)	Velocity (Scheme 2) (m/s)	VR (Scheme 2)	VR Diff (Scheme 1&2)	VR Change %
P01	820897	834224	2.0	1.19	0.159	1.24	0.165	0.01	0.55

Test point	x	y	z	Velocity (Scheme 1) (m/s)	VR (Scheme 1)	Velocity (Scheme 2) (m/s)	VR (Scheme 2)	VR Diff (Scheme 1&2)	VR Change %
P02	820897	834209	2.0	0.72	0.096	0.54	0.072	-0.02	-3.39
P03	820897	834194	2.0	0.37	0.050	0.31	0.042	-0.01	-2.14
P04	820897	834179	2.0	0.44	0.058	0.36	0.049	-0.01	-2.20
P05	820897	834164	2.0	0.24	0.032	0.26	0.035	0.00	1.41
P06	820897	834149	2.0	0.11	0.015	0.12	0.017	0.00	1.78
P07	820897	834134	2.0	0.30	0.040	0.28	0.037	-0.00	-1.15
P08	820897	834119	2.0	0.64	0.086	0.63	0.083	-0.00	-0.41
P09	820897	834090	2.0	0.92	0.123	0.94	0.125	0.00	0.21
P10	820912	834090	2.0	0.71	0.094	0.75	0.100	0.01	0.82
P11	820927	834090	2.0	0.51	0.068	0.59	0.079	0.01	2.18
P12	820942	834090	2.0	0.44	0.059	0.67	0.089	0.03	6.70
P13	820957	834090	2.0	0.52	0.069	0.40	0.054	-0.02	-3.00
P14	820972	834090	2.0	0.60	0.080	0.35	0.047	-0.03	-5.46
P15	820987	834090	2.0	0.72	0.097	0.33	0.043	-0.05	-7.36
P16	820912	834224	2.0	1.30	0.174	1.39	0.185	0.01	0.91
P17	820927	834224	2.0	1.21	0.162	1.34	0.179	0.02	1.44
P18	820942	834224	2.0	1.18	0.158	1.22	0.163	0.00	0.41
P19	820957	834224	2.0	1.34	0.179	1.15	0.154	-0.03	-1.91
P20	820972	834224	2.0	1.62	0.217	1.17	0.156	-0.06	-3.72
P21	821017	834224	2.0	1.86	0.249	1.27	0.170	-0.08	-4.22
P22	821034	834224	2.0	1.85	0.247	1.35	0.181	-0.07	-3.58
P23	821034	834209	2.0	0.28	0.037	0.20	0.027	-0.01	-3.61
P24	821034	834194	2.0	0.56	0.075	0.16	0.021	-0.05	-9.63
P25	821034	834164	2.0	0.60	0.080	1.30	0.174	0.09	15.69
P26	821034	834149	2.0	0.60	0.080	1.25	0.167	0.09	14.42
P27	821034	834134	2.0	0.54	0.073	0.96	0.128	0.06	10.23
P28	821034	834119	2.0	0.98	0.130	1.20	0.160	0.03	3.00
P29	821034	834104	2.0	0.78	0.104	0.90	0.121	0.02	2.15
P30	821034	834090	2.0	0.59	0.079	0.64	0.086	0.01	1.22

D.3.2 Overall Test Point

Test point	x	y	z	Velocity (Scheme 1) (m/s)	VR (Scheme 1)	Velocity (Scheme 2) (m/s)	VR (Scheme 2)	VR Diff (Scheme 1&2)	VR Change %
O01	821020	834303	2.0	1.36	0.182	1.19	0.158	-0.02	-1.73
O02	820990	834279	2.0	0.81	0.108	0.97	0.130	0.02	2.63
O03	820960	834280	2.0	0.45	0.060	0.53	0.071	0.01	2.46
O04	820930	834290	2.0	0.57	0.076	0.43	0.058	-0.02	-3.16
O05	820906	834308	2.0	0.67	0.090	0.85	0.113	0.02	3.48
O06	821080	834261	2.0	1.98	0.265	1.79	0.239	-0.03	-1.31
O07	821050	834261	2.0	1.33	0.177	0.80	0.107	-0.07	-5.29
O08	821020	834261	2.0	0.64	0.085	0.40	0.054	-0.03	-4.94
O09	820990	834261	2.0	1.06	0.141	0.92	0.123	-0.02	-1.77

Test point	x	y	z	Velocity (Scheme 1) (m/s)	VR (Scheme 1)	Velocity (Scheme 2) (m/s)	VR (Scheme 2)	VR Diff (Scheme 1&2)	VR Change %
O10	820960	834261	2.0	0.98	0.130	0.98	0.130	-0.00	-0.00
O11	820930	834268	2.0	0.64	0.086	0.66	0.088	0.00	0.29
O12	820900	834272	2.0	0.77	0.103	0.61	0.082	-0.02	-2.75
O13	820870	834272	2.0	0.67	0.089	0.73	0.097	0.01	1.19
O14	820840	834273	2.0	0.96	0.129	0.94	0.126	-0.00	-0.32
O15	820807	834274	2.0	1.08	0.144	0.95	0.127	-0.02	-1.59
O16	821115	834269	2.0	2.75	0.367	2.17	0.290	-0.08	-2.79
O17	821110	834218	2.0	1.67	0.223	1.86	0.249	0.03	1.56
O18	821080	834226	2.0	1.95	0.261	2.17	0.290	0.03	1.53
O19	821050	834233	2.0	2.20	0.294	2.00	0.267	-0.03	-1.24
O20	821020	834236	2.0	2.01	0.268	1.91	0.255	-0.01	-0.64
O21	820990	834236	2.0	1.49	0.199	1.70	0.226	0.03	1.83
O22	820960	834236	2.0	1.20	0.160	1.53	0.204	0.04	3.61
O23	820930	834236	2.0	1.15	0.154	1.25	0.167	0.01	1.16
O24	820900	834236	2.0	1.04	0.139	0.98	0.132	-0.01	-0.76
O25	820870	834236	2.0	0.67	0.090	0.67	0.089	-0.00	-0.07
O26	820840	834436	2.0	0.23	0.030	0.56	0.074	0.04	19.70
O27	820810	834236	2.0	0.45	0.060	0.27	0.036	-0.02	-5.34
O28	820880	834212	2.0	1.12	0.150	0.97	0.129	-0.02	-1.86
O29	820880	834183	2.0	0.31	0.041	0.32	0.042	0.00	0.30
O30	820880	834153	2.0	0.71	0.095	0.66	0.088	-0.01	-0.99
O31	820880	834123	2.0	0.72	0.096	0.73	0.097	0.00	0.16
O32	820880	834097	2.0	0.94	0.126	0.94	0.126	-0.00	-0.02
O33	820805	834078	2.0	0.22	0.030	0.31	0.042	0.01	5.31
O34	820845	834078	2.0	0.36	0.048	0.41	0.055	0.01	2.05
O35	820880	834074	2.0	0.17	0.022	0.26	0.035	0.01	7.50
O36	820900	834074	2.0	0.59	0.079	0.59	0.079	0.00	0.11
O37	820930	834074	2.0	0.61	0.082	0.66	0.089	0.01	1.08
O38	820960	834074	2.0	0.34	0.046	0.36	0.048	0.00	0.57
O39	820990	834074	2.0	0.09	0.012	0.60	0.080	0.07	72.08
O40	821020	834074	2.0	0.30	0.040	0.47	0.063	0.02	7.66
O41	821050	834074	2.0	0.32	0.042	0.34	0.046	0.00	1.16
O42	821080	834074	2.0	1.22	0.164	1.33	0.178	0.01	1.20
O43	821110	834074	2.0	1.67	0.223	1.61	0.214	-0.01	-0.53
O44	821080	834063	2.0	0.69	0.091	0.82	0.109	0.02	2.57
O45	820947	834063	2.0	1.27	0.170	1.17	0.157	-0.01	-1.05
O46	820946	834033	2.0	0.51	0.068	0.44	0.059	-0.01	-1.81
O47	820843	834025	2.0	0.35	0.047	0.19	0.025	-0.02	-6.24
O48	820870	834025	2.0	0.74	0.099	0.55	0.074	-0.03	-3.42
O49	820900	834025	2.0	0.73	0.097	0.57	0.076	-0.02	-2.93
O50	820930	834025	2.0	0.30	0.039	0.27	0.035	-0.00	-1.34
O51	820960	834025	2.0	0.24	0.033	0.36	0.048	0.02	6.37
O52	820990	834025	2.0	0.22	0.030	0.26	0.034	0.00	1.81
O53	821020	834025	2.0	0.22	0.029	0.40	0.054	0.02	11.23
O54	821050	834025	2.0	0.19	0.025	0.18	0.024	-0.00	-0.71
O55	821028	834063	2.0	0.39	0.052	0.45	0.060	0.01	1.88
O56	821028	834033	2.0	0.35	0.047	0.28	0.037	-0.01	-2.86

Test point	x	y	z	Velocity (Scheme 1) (m/s)	VR (Scheme 1)	Velocity (Scheme 2) (m/s)	VR (Scheme 2)	VR Diff (Scheme 1&2)	VR Change %
O57	821080	834033	2.0	0.87	0.116	0.96	0.129	0.01	1.46
O58	821127	834140	2.0	2.09	0.279	2.13	0.284	0.01	0.26
O59	821102	834123	2.0	1.66	0.222	2.04	0.272	0.05	3.05
O60	821060	834115	2.0	2.01	0.269	2.06	0.274	0.01	0.27
O61	821043	834123	2.0	0.51	0.068	0.60	0.080	0.01	2.31
O62	821043	834153	2.0	0.45	0.060	0.39	0.052	-0.01	-1.71
O63	821043	834183	2.0	0.74	0.099	0.82	0.110	0.01	1.46
O64	821043	834211	2.0	0.64	0.085	0.57	0.076	-0.01	-1.45
O65	820946	834003	2.0	0.31	0.042	0.17	0.023	-0.02	-5.93
O66	820990	834003	2.0	0.16	0.021	0.24	0.033	0.01	7.16
O67	821027	834003	2.0	0.18	0.025	0.20	0.027	0.00	1.27

D.3.3 Special Test Point

Test point	x	y	z	Velocity (Scheme 1) (m/s)	VR (Scheme 1)	Velocity (Scheme 2) (m/s)	VR (Scheme 2)	VR Diff (Scheme 1&2)	VR Change %
S01	820946	834206	12.1	0.52	0.07	0.33	0.04	-0.025	-36.5
S02	820946	834191	12.1	0.56	0.07	0.33	0.04	-0.030	-40.7
S03	820946	834176	12.1	0.18	0.02	0.32	0.04	0.020	82.9
S04	820912	834164	2.0	0.19	0.02	0.18	0.02	-0.001	-2.3
S05	820935	834161	2.0	0.17	0.02	0.29	0.04	0.017	72.9
S06	820962	834162	12.1	0.07	0.01	0.30	0.04	0.030	319.2
S07	820976	834161	12.1	0.31	0.04	0.10	0.01	-0.028	-67.2
S08	820991	834161	2.0	0.35	0.05	0.85	0.11	0.066	140.0
S09	821005	834161	2.0	0.09	0.01	0.49	0.07	0.052	414.1
S10	820991	834207	2.0	0.37	0.05	0.85	0.11	0.064	130.6
S11	820991	834191	2.0	0.18	0.02	0.45	0.06	0.036	149.1
S12	820991	834176	2.0	0.30	0.04	0.90	0.12	0.081	202.8
S13	820991	834147	2.0	0.33	0.04	0.71	0.09	0.050	112.6
S14	820991	834132	2.0	0.33	0.04	0.66	0.09	0.045	102.4
S15	820946	834146	2.0	0.06	0.01	0.25	0.03	0.025	291.3
S16	820946	834131	12.1	0.33	0.04	0.14	0.02	-0.025	-56.7
S17	820946	834116	2.0	0.33	0.04	0.30	0.04	-0.005	-10.3

D.4 NNE wind

D.4.1 Perimeter Test Point

Test point	x	y	z	Velocity (Scheme 1) (m/s)	VR (Scheme 1)	Velocity (Scheme 2) (m/s)	VR (Scheme 2)	VR Diff (Scheme 1&2)	VR Change %
P01	820897	834224	2.0	1.47	0.157	1.55	0.165	0.01	0.53
P02	820897	834209	2.0	1.04	0.110	1.03	0.110	-0.00	-0.03
P03	820897	834194	2.0	0.64	0.068	0.65	0.070	0.00	0.19

Test point	x	y	z	Velocity (Scheme 1) (m/s)	VR (Scheme 1)	Velocity (Scheme 2) (m/s)	VR (Scheme 2)	VR Diff (Scheme 1&2)	VR Change %
P04	820897	834179	2.0	0.40	0.042	0.65	0.069	0.03	6.84
P05	820897	834164	2.0	0.35	0.038	0.66	0.071	0.03	9.29
P06	820897	834149	2.0	0.75	0.080	0.99	0.105	0.03	3.38
P07	820897	834134	2.0	0.85	0.091	1.18	0.126	0.04	4.17
P08	820897	834119	2.0	0.84	0.090	1.19	0.127	0.04	4.49
P09	820897	834090	2.0	1.18	0.126	1.14	0.121	-0.00	-0.41
P10	820912	834090	2.0	1.16	0.124	1.19	0.127	0.00	0.26
P11	820927	834090	2.0	1.09	0.116	1.13	0.120	0.00	0.35
P12	820942	834090	2.0	0.96	0.102	0.93	0.099	-0.00	-0.32
P13	820957	834090	2.0	0.86	0.092	0.72	0.077	-0.02	-1.75
P14	820972	834090	2.0	0.61	0.065	0.44	0.047	-0.02	-3.04
P15	820987	834090	2.0	1.18	0.125	1.19	0.127	0.00	0.16
P16	820912	834224	2.0	1.46	0.155	1.45	0.154	-0.00	-0.06
P17	820927	834224	2.0	1.25	0.133	1.23	0.132	-0.00	-0.12
P18	820942	834224	2.0	1.08	0.115	1.05	0.111	-0.00	-0.36
P19	820957	834224	2.0	1.04	0.111	0.93	0.099	-0.01	-1.10
P20	820972	834224	2.0	1.01	0.107	0.86	0.092	-0.02	-1.51
P21	821017	834224	2.0	1.61	0.172	0.89	0.095	-0.08	-4.77
P22	821034	834224	2.0	1.60	0.171	1.07	0.114	-0.06	-3.53
P23	821034	834209	2.0	0.76	0.081	0.51	0.054	-0.03	-3.47
P24	821034	834194	2.0	0.67	0.071	0.32	0.034	-0.04	-5.54
P25	821034	834164	2.0	0.90	0.096	0.65	0.069	-0.03	-2.99
P26	821034	834149	2.0	1.65	0.176	0.47	0.050	-0.13	-7.66
P27	821034	834134	2.0	1.37	0.146	0.63	0.067	-0.08	-5.75
P28	821034	834119	2.0	1.32	0.141	1.13	0.121	-0.02	-1.54
P29	821034	834104	2.0	1.53	0.163	1.45	0.154	-0.01	-0.56
P30	821034	834090	2.0	1.64	0.175	1.50	0.160	-0.01	-0.88

D.4.2 Overall Test Point

Test point	x	y	z	Velocity (Scheme 1) (m/s)	VR (Scheme 1)	Velocity (Scheme 2) (m/s)	VR (Scheme 2)	VR Diff (Scheme 1&2)	VR Change %
O01	821020	834303	2.0	0.29	0.031	0.36	0.039	0.01	2.58
O02	820990	834279	2.0	1.71	0.182	1.10	0.118	-0.06	-3.78
O03	820960	834280	2.0	1.46	0.156	0.94	0.101	-0.06	-3.78
O04	820930	834290	2.0	1.33	0.142	0.83	0.089	-0.05	-3.99
O05	820906	834308	2.0	1.08	0.116	0.89	0.094	-0.02	-1.94
O06	821080	834261	2.0	2.06	0.219	1.50	0.160	-0.06	-2.87
O07	821050	834261	2.0	1.98	0.211	1.34	0.143	-0.07	-3.46
O08	821020	834261	2.0	1.93	0.206	1.32	0.141	-0.06	-3.36
O09	820990	834261	2.0	1.74	0.185	1.13	0.120	-0.06	-3.74
O10	820960	834261	2.0	1.65	0.176	1.23	0.131	-0.05	-2.74
O11	820930	834268	2.0	1.60	0.170	1.17	0.124	-0.05	-2.87
O12	820900	834272	2.0	1.38	0.147	0.96	0.102	-0.05	-3.28
O13	820870	834272	2.0	1.12	0.119	0.72	0.077	-0.04	-3.78

Test point	x	y	z	Velocity (Scheme 1) (m/s)	VR (Scheme 1)	Velocity (Scheme 2) (m/s)	VR (Scheme 2)	VR Diff (Scheme 1&2)	VR Change %
O14	820840	834273	2.0	0.35	0.037	0.38	0.040	0.00	1.02
O15	820807	834274	2.0	0.40	0.043	0.21	0.023	-0.02	-4.99
O16	821115	834269	2.0	1.40	0.149	1.23	0.131	-0.02	-1.27
O17	821110	834218	2.0	2.17	0.232	1.80	0.192	-0.04	-1.83
O18	821080	834226	2.0	2.28	0.243	1.68	0.179	-0.06	-2.82
O19	821050	834233	2.0	2.15	0.229	1.51	0.161	-0.07	-3.18
O20	821020	834236	2.0	1.85	0.197	1.22	0.130	-0.07	-3.65
O21	820990	834236	2.0	1.57	0.167	1.02	0.109	-0.06	-3.72
O22	820960	834236	2.0	1.37	0.146	1.47	0.157	0.01	0.81
O23	820930	834236	2.0	1.45	0.154	1.51	0.161	0.01	0.48
O24	820900	834236	2.0	1.48	0.158	1.58	0.168	0.01	0.72
O25	820870	834236	2.0	1.52	0.162	1.59	0.170	0.01	0.54
O26	820840	834436	2.0	0.59	0.063	0.63	0.067	0.00	0.70
O27	820810	834236	2.0	0.53	0.056	0.97	0.103	0.05	8.79
O28	820880	834212	2.0	1.32	0.141	1.37	0.146	0.01	0.42
O29	820880	834183	2.0	0.66	0.071	0.89	0.095	0.02	3.69
O30	820880	834153	2.0	0.84	0.089	1.07	0.114	0.02	2.91
O31	820880	834123	2.0	0.36	0.039	0.43	0.046	0.01	2.04
O32	820880	834097	2.0	1.11	0.119	1.02	0.109	-0.01	-0.89
O33	820805	834078	2.0	0.78	0.083	0.99	0.106	0.02	2.87
O34	820845	834078	2.0	0.75	0.080	0.82	0.087	0.01	0.94
O35	820880	834074	2.0	0.69	0.074	0.87	0.093	0.02	2.80
O36	820900	834074	2.0	1.10	0.117	1.15	0.122	0.00	0.44
O37	820930	834074	2.0	1.01	0.108	0.98	0.105	-0.00	-0.30
O38	820960	834074	2.0	0.71	0.076	0.49	0.053	-0.02	-3.25
O39	820990	834074	2.0	0.71	0.076	0.40	0.043	-0.03	-4.67
O40	821020	834074	2.0	1.07	0.114	0.79	0.084	-0.03	-2.81
O41	821050	834074	2.0	1.38	0.147	1.35	0.144	-0.00	-0.24
O42	821080	834074	2.0	1.46	0.155	0.86	0.092	-0.06	-4.34
O43	821110	834074	2.0	1.69	0.180	1.42	0.152	-0.03	-1.67
O44	821080	834063	2.0	0.33	0.035	0.84	0.090	0.06	16.98
O45	820947	834063	2.0	0.19	0.020	0.32	0.034	0.01	7.71
O46	820946	834033	2.0	0.39	0.041	0.37	0.040	-0.00	-0.44
O47	820843	834025	2.0	0.31	0.033	0.48	0.051	0.02	5.92
O48	820870	834025	2.0	0.41	0.044	0.48	0.051	0.01	1.81
O49	820900	834025	2.0	0.25	0.027	0.33	0.035	0.01	3.33
O50	820930	834025	2.0	0.18	0.019	0.24	0.025	0.01	3.56
O51	820960	834025	2.0	0.21	0.022	0.29	0.031	0.01	4.27
O52	820990	834025	2.0	0.20	0.022	0.14	0.015	-0.01	-3.05
O53	821020	834025	2.0	0.32	0.034	0.27	0.029	-0.00	-1.47
O54	821050	834025	2.0	0.27	0.029	0.25	0.027	-0.00	-0.90
O55	821028	834063	2.0	1.41	0.150	1.40	0.150	-0.00	-0.03
O56	821028	834033	2.0	1.43	0.153	1.32	0.140	-0.01	-0.88
O57	821080	834033	2.0	0.76	0.081	0.42	0.045	-0.04	-4.72
O58	821127	834140	2.0	2.80	0.298	2.12	0.226	-0.07	-2.56
O59	821102	834123	2.0	1.90	0.202	1.91	0.204	0.00	0.08
O60	821060	834115	2.0	0.60	0.064	0.95	0.101	0.04	6.02

Test point	x	y	z	Velocity (Scheme 1) (m/s)	VR (Scheme 1)	Velocity (Scheme 2) (m/s)	VR (Scheme 2)	VR Diff (Scheme 1&2)	VR Change %
O61	821043	834123	2.0	1.30	0.138	0.80	0.086	-0.05	-4.07
O62	821043	834153	2.0	1.58	0.169	0.63	0.067	-0.10	-6.42
O63	821043	834183	2.0	1.06	0.113	1.06	0.113	-0.00	-0.05
O64	821043	834211	2.0	0.45	0.048	0.29	0.031	-0.02	-3.78
O65	820946	834003	2.0	0.36	0.038	0.23	0.024	-0.01	-3.94
O66	820990	834003	2.0	0.58	0.062	0.57	0.061	-0.00	-0.27
O67	821027	834003	2.0	0.46	0.049	0.42	0.045	-0.00	-0.94

D.4.3 Special Test Point

Test point	x	y	z	Velocity (Scheme 1) (m/s)	VR (Scheme 1)	Velocity (Scheme 2) (m/s)	VR (Scheme 2)	VR Diff (Scheme 1&2)	VR Change %
S01	820946	834206	12.1	0.35	0.04	0.50	0.05	0.015	40.8
S02	820946	834191	12.1	1.57	0.17	1.32	0.14	-0.026	-15.9
S03	820946	834176	12.1	1.12	0.12	1.58	0.17	0.049	41.4
S04	820912	834164	2.0	0.74	0.08	0.57	0.06	-0.018	-23.3
S05	820935	834161	2.0	0.41	0.04	0.37	0.04	-0.004	-9.6
S06	820962	834162	12.1	0.97	0.10	1.10	0.12	0.014	13.6
S07	820976	834161	12.1	1.16	0.12	0.81	0.09	-0.037	-30.4
S08	820991	834161	2.0	1.15	0.12	0.49	0.05	-0.070	-57.2
S09	821005	834161	2.0	0.42	0.04	0.96	0.10	0.058	129.6
S10	820991	834207	2.0	0.42	0.04	0.59	0.06	0.018	41.1
S11	820991	834191	2.0	0.82	0.09	0.53	0.06	-0.031	-35.6
S12	820991	834176	2.0	1.11	0.12	0.55	0.06	-0.060	-50.2
S13	820991	834147	2.0	1.33	0.14	0.88	0.09	-0.048	-33.8
S14	820991	834132	2.0	1.64	0.17	1.24	0.13	-0.042	-24.1
S15	820946	834146	2.0	0.44	0.05	0.43	0.05	-0.001	-2.7
S16	820946	834131	12.1	0.87	0.09	0.92	0.10	0.005	5.1
S17	820946	834116	2.0	0.23	0.02	0.12	0.01	-0.011	-46.5

D.5 ESE wind

D.5.1 Perimeter Test Point

Test point	x	y	z	Velocity (Scheme 1) (m/s)	VR (Scheme 1)	Velocity (Scheme 2) (m/s)	VR (Scheme 2)	VR Diff (Scheme 1&2)	VR Change %
P01	820897	834224	2.0	0.35	0.056	0.40	0.063	0.01	1.98
P02	820897	834209	2.0	0.20	0.031	0.16	0.025	-0.01	-2.96
P03	820897	834194	2.0	0.16	0.026	0.29	0.045	0.02	11.92
P04	820897	834179	2.0	0.41	0.065	0.36	0.056	-0.01	-2.16
P05	820897	834164	2.0	0.57	0.090	0.20	0.032	-0.06	-10.15
P06	820897	834149	2.0	0.27	0.043	0.31	0.050	0.01	2.51
P07	820897	834134	2.0	0.36	0.057	0.54	0.085	0.03	8.09

Test point	x	y	z	Velocity (Scheme 1) (m/s)	VR (Scheme 1)	Velocity (Scheme 2) (m/s)	VR (Scheme 2)	VR Diff (Scheme 1&2)	VR Change %
P08	820897	834119	2.0	0.78	0.123	0.78	0.123	-0.00	-0.03
P09	820897	834090	2.0	1.22	0.194	0.92	0.146	-0.05	-3.91
P10	820912	834090	2.0	1.14	0.181	0.85	0.135	-0.05	-4.06
P11	820927	834090	2.0	1.04	0.166	0.68	0.108	-0.06	-5.51
P12	820942	834090	2.0	0.94	0.149	0.56	0.089	-0.06	-6.36
P13	820957	834090	2.0	0.89	0.142	0.58	0.093	-0.05	-5.46
P14	820972	834090	2.0	0.86	0.136	0.64	0.101	-0.04	-4.12
P15	820987	834090	2.0	0.84	0.134	0.52	0.083	-0.05	-6.04
P16	820912	834224	2.0	0.34	0.055	0.42	0.066	0.01	3.36
P17	820927	834224	2.0	0.27	0.044	0.40	0.064	0.02	7.49
P18	820942	834224	2.0	0.14	0.022	0.35	0.055	0.03	23.76
P19	820957	834224	2.0	0.35	0.055	0.37	0.058	0.00	1.01
P20	820972	834224	2.0	0.59	0.094	0.45	0.071	-0.02	-3.80
P21	821017	834224	2.0	0.71	0.113	0.44	0.070	-0.04	-6.13
P22	821034	834224	2.0	0.89	0.142	0.87	0.138	-0.00	-0.36
P23	821034	834209	2.0	0.63	0.100	0.70	0.112	0.01	1.80
P24	821034	834194	2.0	0.87	0.138	0.81	0.128	-0.01	-1.20
P25	821034	834164	2.0	1.01	0.160	1.09	0.173	0.01	1.31
P26	821034	834149	2.0	1.02	0.161	0.90	0.142	-0.02	-1.88
P27	821034	834134	2.0	0.85	0.135	0.92	0.146	0.01	1.34
P28	821034	834119	2.0	1.05	0.166	0.50	0.080	-0.09	-8.25
P29	821034	834104	2.0	0.52	0.082	0.97	0.153	0.07	13.88
P30	821034	834090	2.0	0.37	0.058	0.67	0.106	0.05	13.05

D.5.2 Overall Test Point

Test point	x	y	z	Velocity (Scheme 1) (m/s)	VR (Scheme 1)	Velocity (Scheme 2) (m/s)	VR (Scheme 2)	VR Diff (Scheme 1&2)	VR Change %
O01	821020	834303	2.0	0.78	0.123	1.00	0.158	0.03	4.43
O02	820990	834279	2.0	0.67	0.105	0.86	0.136	0.03	4.54
O03	820960	834280	2.0	0.55	0.087	0.66	0.105	0.02	3.35
O04	820930	834290	2.0	0.48	0.077	0.47	0.075	-0.00	-0.43
O05	820906	834308	2.0	0.65	0.104	0.61	0.098	-0.01	-0.92
O06	821080	834261	2.0	1.08	0.171	1.31	0.208	0.04	3.35
O07	821050	834261	2.0	0.61	0.097	0.76	0.121	0.02	4.01
O08	821020	834261	2.0	0.56	0.089	0.62	0.098	0.01	1.55
O09	820990	834261	2.0	0.92	0.146	0.95	0.151	0.00	0.51
O10	820960	834261	2.0	0.89	0.141	0.95	0.151	0.01	1.17
O11	820930	834268	2.0	0.86	0.137	0.80	0.127	-0.01	-1.11
O12	820900	834272	2.0	0.78	0.124	0.63	0.101	-0.02	-2.95
O13	820870	834272	2.0	0.84	0.133	0.86	0.136	0.00	0.39
O14	820840	834273	2.0	0.67	0.107	0.62	0.098	-0.01	-1.29
O15	820807	834274	2.0	0.48	0.076	0.54	0.086	0.01	2.18
O16	821115	834269	2.0	1.67	0.264	1.70	0.270	0.01	0.32
O17	821110	834218	2.0	1.43	0.227	1.48	0.234	0.01	0.47

Test point	x	y	z	Velocity (Scheme 1) (m/s)	VR (Scheme 1)	Velocity (Scheme 2) (m/s)	VR (Scheme 2)	VR Diff (Scheme 1&2)	VR Change %
O18	821080	834226	2.0	1.53	0.243	1.61	0.256	0.01	0.85
O19	821050	834233	2.0	1.21	0.191	1.24	0.197	0.01	0.47
O20	821020	834236	2.0	1.15	0.183	1.10	0.175	-0.01	-0.73
O21	820990	834236	2.0	0.67	0.106	0.59	0.094	-0.01	-1.88
O22	820960	834236	2.0	0.59	0.094	0.43	0.069	-0.03	-4.30
O23	820930	834236	2.0	0.17	0.027	0.36	0.058	0.03	17.70
O24	820900	834236	2.0	0.26	0.042	0.43	0.068	0.03	9.90
O25	820870	834236	2.0	0.24	0.037	0.66	0.105	0.07	28.67
O26	820840	834436	2.0	0.54	0.086	0.71	0.112	0.03	4.80
O27	820810	834236	2.0	0.14	0.022	0.07	0.011	-0.01	-7.82
O28	820880	834212	2.0	0.15	0.024	0.40	0.063	0.04	25.60
O29	820880	834183	2.0	0.40	0.064	0.29	0.047	-0.02	-4.26
O30	820880	834153	2.0	0.55	0.087	0.62	0.099	0.01	2.18
O31	820880	834123	2.0	0.63	0.100	0.66	0.105	0.00	0.79
O32	820880	834097	2.0	1.11	0.176	0.87	0.138	-0.04	-3.44
O33	820805	834078	2.0	0.58	0.092	0.29	0.046	-0.05	-7.95
O34	820845	834078	2.0	0.89	0.141	0.75	0.119	-0.02	-2.46
O35	820880	834074	2.0	0.47	0.075	0.30	0.048	-0.03	-5.70
O36	820900	834074	2.0	0.84	0.133	0.76	0.121	-0.01	-1.46
O37	820930	834074	2.0	1.01	0.161	0.97	0.154	-0.01	-0.66
O38	820960	834074	2.0	1.06	0.168	1.14	0.181	0.01	1.20
O39	820990	834074	2.0	1.10	0.174	1.17	0.185	0.01	0.95
O40	821020	834074	2.0	1.14	0.180	1.21	0.191	0.01	0.98
O41	821050	834074	2.0	1.21	0.192	1.34	0.212	0.02	1.71
O42	821080	834074	2.0	1.50	0.238	1.48	0.234	-0.00	-0.25
O43	821110	834074	2.0	1.62	0.257	1.57	0.248	-0.01	-0.55
O44	821080	834063	2.0	0.33	0.052	0.93	0.147	0.10	28.71
O45	820947	834063	2.0	0.30	0.047	0.25	0.040	-0.01	-2.43
O46	820946	834033	2.0	0.69	0.110	0.59	0.093	-0.02	-2.38
O47	820843	834025	2.0	0.19	0.030	0.32	0.050	0.02	10.65
O48	820870	834025	2.0	0.53	0.084	0.50	0.079	-0.00	-0.89
O49	820900	834025	2.0	0.28	0.045	0.32	0.051	0.01	2.11
O50	820930	834025	2.0	0.27	0.042	0.26	0.041	-0.00	-0.52
O51	820960	834025	2.0	0.18	0.028	0.12	0.020	-0.01	-4.67
O52	820990	834025	2.0	0.23	0.036	0.31	0.049	0.01	5.52
O53	821020	834025	2.0	0.17	0.027	0.22	0.035	0.01	4.45
O54	821050	834025	2.0	0.22	0.035	0.12	0.019	-0.02	-7.39
O55	821028	834063	2.0	0.29	0.047	0.40	0.063	0.02	5.64
O56	821028	834033	2.0	0.51	0.080	0.67	0.106	0.03	5.07
O57	821080	834033	2.0	0.96	0.152	0.33	0.052	-0.10	-10.38
O58	821127	834140	2.0	1.82	0.289	1.88	0.298	0.01	0.53
O59	821102	834123	2.0	1.45	0.229	1.70	0.269	0.04	2.75
O60	821060	834115	2.0	1.87	0.296	1.82	0.289	-0.01	-0.37
O61	821043	834123	2.0	0.90	0.142	1.30	0.206	0.06	7.13
O62	821043	834153	2.0	0.82	0.130	1.48	0.234	0.10	12.69
O63	821043	834183	2.0	0.94	0.149	1.33	0.211	0.06	6.54
O64	821043	834211	2.0	0.76	0.120	1.18	0.188	0.07	9.01

Test point	x	y	z	Velocity (Scheme 1) (m/s)	VR (Scheme 1)	Velocity (Scheme 2) (m/s)	VR (Scheme 2)	VR Diff (Scheme 1&2)	VR Change %
O65	820946	834003	2.0	0.28	0.045	0.10	0.015	-0.03	-10.42
O66	820990	834003	2.0	0.22	0.035	0.17	0.026	-0.01	-3.80
O67	821027	834003	2.0	0.24	0.038	0.41	0.065	0.03	10.90

D.5.3 Special Test Point

Test point	x	y	z	Velocity (Scheme 1) (m/s)	VR (Scheme 1)	Velocity (Scheme 2) (m/s)	VR (Scheme 2)	VR Diff (Scheme 1&2)	VR Change %
S01	820946	834206	12.1	0.21	0.03	0.28	0.04	0.012	35.3
S02	820946	834191	12.1	0.40	0.06	0.10	0.02	-0.047	-74.5
S03	820946	834176	12.1	0.50	0.08	0.25	0.04	-0.039	-49.6
S04	820912	834164	2.0	0.71	0.11	0.46	0.07	-0.040	-35.1
S05	820935	834161	2.0	0.47	0.07	0.58	0.09	0.018	24.8
S06	820962	834162	12.1	0.98	0.16	0.54	0.09	-0.071	-45.2
S07	820976	834161	12.1	0.87	0.14	0.60	0.09	-0.044	-31.5
S08	820991	834161	2.0	0.20	0.03	0.68	0.11	0.075	232.0
S09	821005	834161	2.0	0.35	0.06	1.27	0.20	0.147	265.6
S10	820991	834207	2.0	0.71	0.11	0.78	0.12	0.011	9.9
S11	820991	834191	2.0	0.42	0.07	0.27	0.04	-0.024	-35.8
S12	820991	834176	2.0	0.12	0.02	0.63	0.10	0.081	441.6
S13	820991	834147	2.0	0.37	0.06	1.28	0.20	0.145	250.1
S14	820991	834132	2.0	0.58	0.09	0.68	0.11	0.015	16.7
S15	820946	834146	2.0	0.53	0.08	0.32	0.05	-0.034	-39.7
S16	820946	834131	12.1	0.43	0.07	0.76	0.12	0.052	75.1
S17	820946	834116	2.0	0.14	0.02	0.29	0.05	0.024	103.8

D.6 SSE wind

D.6.1 Perimeter Test Point

Test point	x	y	z	Velocity (Scheme 1) (m/s)	VR (Scheme 1)	Velocity (Scheme 2) (m/s)	VR (Scheme 2)	VR Diff (Scheme 1&2)	VR Change %
P01	820897	834224	2.0	0.33	0.055	0.35	0.058	0.00	1.02
P02	820897	834209	2.0	0.42	0.070	0.39	0.067	-0.00	-0.85
P03	820897	834194	2.0	0.51	0.086	0.48	0.081	-0.01	-1.04
P04	820897	834179	2.0	0.45	0.076	0.41	0.070	-0.01	-1.31
P05	820897	834164	2.0	0.21	0.035	0.17	0.029	-0.01	-2.75
P06	820897	834149	2.0	0.14	0.024	0.14	0.024	-0.00	-0.05
P07	820897	834134	2.0	0.27	0.046	0.34	0.057	0.01	3.95
P08	820897	834119	2.0	0.60	0.102	0.64	0.107	0.01	0.91
P09	820897	834090	2.0	0.85	0.144	0.92	0.155	0.01	1.28
P10	820912	834090	2.0	0.80	0.134	0.90	0.152	0.02	2.19

Test point	x	y	z	Velocity (Scheme 1) (m/s)	VR (Scheme 1)	Velocity (Scheme 2) (m/s)	VR (Scheme 2)	VR Diff (Scheme 1&2)	VR Change %
P11	820927	834090	2.0	0.70	0.118	0.80	0.134	0.02	2.37
P12	820942	834090	2.0	0.59	0.100	0.69	0.117	0.02	2.86
P13	820957	834090	2.0	0.49	0.083	0.60	0.102	0.02	3.80
P14	820972	834090	2.0	0.36	0.061	0.44	0.074	0.01	3.43
P15	820987	834090	2.0	0.25	0.042	0.28	0.047	0.00	1.99
P16	820912	834224	2.0	0.10	0.016	0.31	0.052	0.04	37.20
P17	820927	834224	2.0	0.06	0.011	0.21	0.036	0.02	39.66
P18	820942	834224	2.0	0.06	0.011	0.17	0.029	0.02	28.30
P19	820957	834224	2.0	0.11	0.018	0.14	0.023	0.01	4.68
P20	820972	834224	2.0	0.17	0.030	0.39	0.066	0.04	21.02
P21	821017	834224	2.0	0.54	0.091	0.60	0.101	0.01	1.88
P22	821034	834224	2.0	0.59	0.099	0.48	0.081	-0.02	-3.10
P23	821034	834209	2.0	0.54	0.091	0.62	0.105	0.01	2.62
P24	821034	834194	2.0	0.57	0.097	0.58	0.098	0.00	0.27
P25	821034	834164	2.0	0.63	0.106	0.69	0.116	0.01	1.59
P26	821034	834149	2.0	0.28	0.047	0.69	0.116	0.07	24.97
P27	821034	834134	2.0	0.50	0.085	0.58	0.098	0.01	2.67
P28	821034	834119	2.0	0.47	0.080	0.52	0.088	0.01	1.81
P29	821034	834104	2.0	0.34	0.057	0.41	0.069	0.01	3.58
P30	821034	834090	2.0	0.25	0.041	0.33	0.055	0.01	5.59

D.6.2 Overall Test Point

Test point	x	y	z	Velocity (Scheme 1) (m/s)	VR (Scheme 1)	Velocity (Scheme 2) (m/s)	VR (Scheme 2)	VR Diff (Scheme 1&2)	VR Change %
O01	821020	834303	2.0	0.47	0.079	0.63	0.105	0.03	5.51
O02	820990	834279	2.0	0.59	0.099	0.72	0.121	0.02	3.65
O03	820960	834280	2.0	0.56	0.095	0.69	0.116	0.02	3.70
O04	820930	834290	2.0	0.42	0.071	0.51	0.086	0.02	3.56
O05	820906	834308	2.0	0.29	0.049	0.34	0.058	0.01	2.97
O06	821080	834261	2.0	0.54	0.092	0.65	0.110	0.02	3.34
O07	821050	834261	2.0	0.40	0.068	0.47	0.079	0.01	2.61
O08	821020	834261	2.0	0.52	0.088	0.44	0.075	-0.01	-2.59
O09	820990	834261	2.0	0.61	0.103	0.63	0.107	0.00	0.65
O10	820960	834261	2.0	0.52	0.087	0.71	0.119	0.03	6.18
O11	820930	834268	2.0	0.36	0.060	0.66	0.111	0.05	14.29
O12	820900	834272	2.0	0.35	0.060	0.54	0.091	0.03	8.78
O13	820870	834272	2.0	0.36	0.061	0.38	0.064	0.00	0.81
O14	820840	834273	2.0	0.37	0.062	0.37	0.063	0.00	0.33
O15	820807	834274	2.0	0.40	0.068	0.44	0.074	0.01	1.38
O16	821115	834269	2.0	0.68	0.115	0.72	0.121	0.01	0.96
O17	821110	834218	2.0	0.27	0.045	0.34	0.057	0.01	4.28
O18	821080	834226	2.0	0.29	0.050	0.38	0.064	0.01	4.72
O19	821050	834233	2.0	0.30	0.051	0.33	0.055	0.00	1.50
O20	821020	834236	2.0	0.64	0.108	0.58	0.098	-0.01	-1.50

Test point	x	y	z	Velocity (Scheme 1) (m/s)	VR (Scheme 1)	Velocity (Scheme 2) (m/s)	VR (Scheme 2)	VR Diff (Scheme 1&2)	VR Change %
O21	820990	834236	2.0	0.55	0.092	0.60	0.102	0.01	1.73
O22	820960	834236	2.0	0.13	0.021	0.51	0.086	0.07	51.91
O23	820930	834236	2.0	0.13	0.023	0.18	0.030	0.01	5.49
O24	820900	834236	2.0	0.28	0.046	0.26	0.044	-0.00	-0.89
O25	820870	834236	2.0	0.16	0.027	0.27	0.046	0.02	11.86
O26	820840	834436	2.0	0.09	0.015	0.11	0.018	0.00	3.90
O27	820810	834236	2.0	0.12	0.020	0.17	0.028	0.01	7.47
O28	820880	834212	2.0	0.39	0.065	0.20	0.033	-0.03	-8.32
O29	820880	834183	2.0	0.42	0.070	0.38	0.064	-0.01	-1.56
O30	820880	834153	2.0	0.60	0.102	0.61	0.102	0.00	0.08
O31	820880	834123	2.0	0.46	0.077	0.49	0.083	0.01	1.37
O32	820880	834097	2.0	0.81	0.137	0.87	0.147	0.01	1.18
O33	820805	834078	2.0	0.49	0.083	0.71	0.120	0.04	7.53
O34	820845	834078	2.0	0.76	0.128	0.94	0.159	0.03	4.10
O35	820880	834074	2.0	0.47	0.080	0.67	0.112	0.03	6.86
O36	820900	834074	2.0	0.66	0.112	0.73	0.124	0.01	1.79
O37	820930	834074	2.0	0.52	0.088	0.60	0.102	0.01	2.55
O38	820960	834074	2.0	0.43	0.072	0.51	0.086	0.01	3.39
O39	820990	834074	2.0	0.27	0.046	0.36	0.061	0.02	5.71
O40	821020	834074	2.0	0.30	0.051	0.45	0.077	0.03	8.42
O41	821050	834074	2.0	0.45	0.076	0.65	0.110	0.03	7.35
O42	821080	834074	2.0	0.45	0.076	0.54	0.092	0.02	3.52
O43	821110	834074	2.0	0.67	0.113	0.73	0.123	0.01	1.46
O44	821080	834063	2.0	0.43	0.073	0.53	0.090	0.02	3.80
O45	820947	834063	2.0	0.32	0.054	0.40	0.068	0.01	4.34
O46	820946	834033	2.0	0.10	0.017	0.13	0.022	0.01	5.55
O47	820843	834025	2.0	0.13	0.023	0.18	0.030	0.01	5.28
O48	820870	834025	2.0	0.22	0.037	0.24	0.040	0.00	1.47
O49	820900	834025	2.0	0.18	0.031	0.16	0.028	-0.00	-1.66
O50	820930	834025	2.0	0.31	0.053	0.38	0.065	0.01	3.84
O51	820960	834025	2.0	0.51	0.087	0.54	0.090	0.00	0.74
O52	820990	834025	2.0	0.56	0.094	0.58	0.098	0.00	0.70
O53	821020	834025	2.0	0.18	0.031	0.21	0.035	0.00	2.39
O54	821050	834025	2.0	0.26	0.043	0.31	0.052	0.01	3.50
O55	821028	834063	2.0	0.15	0.025	0.13	0.022	-0.00	-1.99
O56	821028	834033	2.0	0.42	0.071	0.40	0.068	-0.00	-0.69
O57	821080	834033	2.0	0.54	0.090	0.67	0.113	0.02	4.22
O58	821127	834140	2.0	0.93	0.158	0.97	0.164	0.01	0.71
O59	821102	834123	2.0	0.57	0.097	0.91	0.154	0.06	9.91
O60	821060	834115	2.0	0.25	0.042	0.09	0.016	-0.03	-10.49
O61	821043	834123	2.0	0.42	0.072	0.39	0.066	-0.01	-1.30
O62	821043	834153	2.0	0.42	0.071	0.67	0.112	0.04	9.86
O63	821043	834183	2.0	0.73	0.123	0.52	0.088	-0.03	-4.79
O64	821043	834211	2.0	0.61	0.103	0.49	0.082	-0.02	-3.38
O65	820946	834003	2.0	0.37	0.062	0.40	0.067	0.01	1.37
O66	820990	834003	2.0	0.26	0.043	0.27	0.046	0.00	0.88
O67	821027	834003	2.0	0.59	0.100	0.61	0.102	0.00	0.47

D.6.3 Special Test Point

Test point	x	y	z	Velocity (Scheme 1) (m/s)	VR (Scheme 1)	Velocity (Scheme 2) (m/s)	VR (Scheme 2)	VR Diff (Scheme 1&2)	VR Change %
S01	820946	834206	12.1	0.23	0.04	0.32	0.05	0.015	38.1
S02	820946	834191	12.1	0.40	0.07	0.32	0.05	-0.013	-19.0
S03	820946	834176	12.1	0.47	0.08	0.60	0.10	0.021	27.1
S04	820912	834164	2.0	0.40	0.07	0.34	0.06	-0.011	-15.8
S05	820935	834161	2.0	0.41	0.07	0.45	0.08	0.007	10.2
S06	820962	834162	12.1	0.42	0.07	0.58	0.10	0.026	37.1
S07	820976	834161	12.1	0.54	0.09	0.72	0.12	0.030	32.9
S08	820991	834161	2.0	0.63	0.11	0.52	0.09	-0.018	-16.8
S09	821005	834161	2.0	0.35	0.06	0.63	0.11	0.048	82.2
S10	820991	834207	2.0	0.85	0.14	0.55	0.09	-0.051	-35.3
S11	820991	834191	2.0	0.78	0.13	0.51	0.09	-0.046	-35.0
S12	820991	834176	2.0	0.68	0.11	0.45	0.08	-0.039	-34.1
S13	820991	834147	2.0	0.62	0.10	0.60	0.10	-0.003	-2.9
S14	820991	834132	2.0	0.56	0.09	0.56	0.09	-0.000	-0.5
S15	820946	834146	2.0	0.23	0.04	0.20	0.03	-0.004	-9.8
S16	820946	834131	12.1	0.69	0.12	0.76	0.13	0.012	10.1
S17	820946	834116	2.0	0.35	0.06	0.37	0.06	0.004	6.4

D.7 SE wind

D.7.1 Perimeter Test Point

Test point	x	y	z	Velocity (Scheme 1) (m/s)	VR (Scheme 1)	Velocity (Scheme 2) (m/s)	VR (Scheme 2)	VR Diff (Scheme 1&2)	VR Change %
P01	820897	834224	2.0	0.15	0.027	0.16	0.029	0.00	1.05
P02	820897	834209	2.0	0.37	0.066	0.40	0.070	0.00	1.12
P03	820897	834194	2.0	0.58	0.103	0.56	0.099	-0.00	-0.73
P04	820897	834179	2.0	0.52	0.093	0.50	0.089	-0.00	-0.61
P05	820897	834164	2.0	0.24	0.043	0.25	0.045	0.00	0.83
P06	820897	834149	2.0	0.16	0.029	0.24	0.043	0.01	8.57
P07	820897	834134	2.0	0.33	0.059	0.47	0.083	0.02	7.34
P08	820897	834119	2.0	0.54	0.095	0.60	0.106	0.01	2.00
P09	820897	834090	2.0	0.97	0.172	1.01	0.178	0.01	0.64
P10	820912	834090	2.0	0.92	0.164	1.01	0.179	0.02	1.64
P11	820927	834090	2.0	0.81	0.144	0.90	0.159	0.01	1.80
P12	820942	834090	2.0	0.65	0.116	0.73	0.130	0.01	2.25
P13	820957	834090	2.0	0.51	0.090	0.57	0.100	0.01	1.99
P14	820972	834090	2.0	0.35	0.062	0.42	0.075	0.01	3.73
P15	820987	834090	2.0	0.20	0.036	0.24	0.042	0.01	2.94
P16	820912	834224	2.0	0.22	0.039	0.16	0.028	-0.01	-4.92

Test point	x	y	z	Velocity (Scheme 1) (m/s)	VR (Scheme 1)	Velocity (Scheme 2) (m/s)	VR (Scheme 2)	VR Diff (Scheme 1&2)	VR Change %
P17	820927	834224	2.0	0.35	0.062	0.28	0.050	-0.01	-3.58
P18	820942	834224	2.0	0.41	0.073	0.39	0.069	-0.00	-0.87
P19	820957	834224	2.0	0.44	0.077	0.44	0.078	0.00	0.08
P20	820972	834224	2.0	0.51	0.091	0.50	0.089	-0.00	-0.37
P21	821017	834224	2.0	0.65	0.115	0.68	0.120	0.01	0.91
P22	821034	834224	2.0	0.60	0.107	0.53	0.093	-0.01	-2.30
P23	821034	834209	2.0	0.49	0.088	0.55	0.097	0.01	1.87
P24	821034	834194	2.0	0.56	0.099	0.53	0.094	-0.00	-0.81
P25	821034	834164	2.0	0.32	0.056	0.58	0.103	0.05	15.00
P26	821034	834149	2.0	0.26	0.047	0.59	0.104	0.06	21.66
P27	821034	834134	2.0	0.36	0.065	0.49	0.087	0.02	5.98
P28	821034	834119	2.0	0.26	0.047	0.25	0.044	-0.00	-0.87
P29	821034	834104	2.0	0.10	0.018	0.08	0.014	-0.00	-3.76
P30	821034	834090	2.0	0.11	0.020	0.11	0.019	-0.00	-0.84

D.7.2 Overall Test Point

Test point	x	y	z	Velocity (Scheme 1) (m/s)	VR (Scheme 1)	Velocity (Scheme 2) (m/s)	VR (Scheme 2)	VR Diff (Scheme 1&2)	VR Change %
O01	821020	834303	2.0	1.01	0.180	1.03	0.183	0.00	0.25
O02	820990	834279	2.0	0.96	0.171	1.06	0.188	0.02	1.82
O03	820960	834280	2.0	0.85	0.151	1.10	0.195	0.04	5.12
O04	820930	834290	2.0	0.73	0.129	1.01	0.180	0.05	7.06
O05	820906	834308	2.0	0.60	0.106	0.74	0.131	0.02	4.17
O06	821080	834261	2.0	1.02	0.182	1.16	0.206	0.02	2.35
O07	821050	834261	2.0	1.05	0.186	1.10	0.195	0.01	0.89
O08	821020	834261	2.0	0.85	0.151	0.90	0.160	0.01	1.13
O09	820990	834261	2.0	0.94	0.166	1.05	0.187	0.02	2.22
O10	820960	834261	2.0	0.93	0.166	1.11	0.196	0.03	3.27
O11	820930	834268	2.0	0.95	0.168	1.11	0.197	0.03	3.10
O12	820900	834272	2.0	0.89	0.158	1.06	0.188	0.03	3.35
O13	820870	834272	2.0	0.96	0.170	1.20	0.213	0.04	4.51
O14	820840	834273	2.0	0.79	0.141	1.03	0.183	0.04	5.38
O15	820807	834274	2.0	0.75	0.132	0.94	0.167	0.03	4.56
O16	821115	834269	2.0	1.16	0.206	1.37	0.244	0.04	3.28
O17	821110	834218	2.0	0.81	0.143	0.88	0.156	0.01	1.67
O18	821080	834226	2.0	0.88	0.157	1.03	0.182	0.03	2.88
O19	821050	834233	2.0	0.67	0.119	1.00	0.177	0.06	8.64
O20	821020	834236	2.0	0.77	0.137	1.00	0.177	0.04	5.17
O21	820990	834236	2.0	0.65	0.115	0.88	0.156	0.04	6.22
O22	820960	834236	2.0	0.62	0.110	0.83	0.147	0.04	6.03
O23	820930	834236	2.0	0.53	0.094	0.73	0.130	0.04	6.76
O24	820900	834236	2.0	0.29	0.052	0.50	0.088	0.04	12.48
O25	820870	834236	2.0	0.37	0.066	0.74	0.132	0.07	17.69
O26	820840	834436	2.0	0.23	0.042	0.28	0.050	0.01	3.77

Test point	x	y	z	Velocity (Scheme 1) (m/s)	VR (Scheme 1)	Velocity (Scheme 2) (m/s)	VR (Scheme 2)	VR Diff (Scheme 1&2)	VR Change %
O27	820810	834236	2.0	0.15	0.027	0.05	0.009	-0.02	-11.88
O28	820880	834212	2.0	0.39	0.069	0.31	0.055	-0.01	-3.57
O29	820880	834183	2.0	0.42	0.075	0.42	0.074	-0.00	-0.28
O30	820880	834153	2.0	0.58	0.102	0.63	0.113	0.01	1.77
O31	820880	834123	2.0	0.41	0.073	0.46	0.082	0.01	2.25
O32	820880	834097	2.0	0.86	0.153	0.89	0.158	0.00	0.53
O33	820805	834078	2.0	0.66	0.118	0.82	0.145	0.03	4.14
O34	820845	834078	2.0	0.85	0.150	1.02	0.180	0.03	3.51
O35	820880	834074	2.0	0.54	0.095	0.72	0.128	0.03	6.16
O36	820900	834074	2.0	0.74	0.131	0.79	0.140	0.01	1.33
O37	820930	834074	2.0	0.54	0.096	0.56	0.099	0.00	0.65
O38	820960	834074	2.0	0.36	0.064	0.38	0.068	0.00	1.02
O39	820990	834074	2.0	0.17	0.030	0.10	0.017	-0.01	-7.45
O40	821020	834074	2.0	0.20	0.035	0.11	0.019	-0.02	-8.03
O41	821050	834074	2.0	0.27	0.047	0.05	0.009	-0.04	-14.52
O42	821080	834074	2.0	0.23	0.041	0.16	0.028	-0.01	-5.75
O43	821110	834074	2.0	0.22	0.039	0.31	0.055	0.02	7.37
O44	821080	834063	2.0	0.39	0.069	0.33	0.058	-0.01	-2.74
O45	820947	834063	2.0	0.35	0.062	0.43	0.077	0.01	4.16
O46	820946	834033	2.0	0.36	0.063	0.43	0.077	0.01	3.84
O47	820843	834025	2.0	0.11	0.020	0.20	0.036	0.02	14.02
O48	820870	834025	2.0	0.31	0.054	0.31	0.054	0.00	0.10
O49	820900	834025	2.0	0.34	0.061	0.29	0.052	-0.01	-2.55
O50	820930	834025	2.0	0.22	0.039	0.29	0.052	0.01	5.86
O51	820960	834025	2.0	0.25	0.045	0.27	0.048	0.00	1.17
O52	820990	834025	2.0	0.20	0.035	0.17	0.031	-0.00	-2.11
O53	821020	834025	2.0	0.12	0.022	0.13	0.023	0.00	0.80
O54	821050	834025	2.0	0.08	0.014	0.12	0.021	0.01	9.33
O55	821028	834063	2.0	0.27	0.049	0.22	0.039	-0.01	-3.68
O56	821028	834033	2.0	0.37	0.065	0.31	0.056	-0.01	-2.66
O57	821080	834033	2.0	0.34	0.059	0.37	0.065	0.01	1.72
O58	821127	834140	2.0	0.43	0.076	0.39	0.069	-0.01	-1.66
O59	821102	834123	2.0	0.15	0.027	0.11	0.019	-0.01	-5.35
O60	821060	834115	2.0	0.14	0.026	0.25	0.044	0.02	12.96
O61	821043	834123	2.0	0.33	0.058	0.39	0.070	0.01	3.73
O62	821043	834153	2.0	0.30	0.053	0.50	0.089	0.04	11.82
O63	821043	834183	2.0	0.60	0.106	0.41	0.073	-0.03	-5.57
O64	821043	834211	2.0	0.51	0.091	0.37	0.066	-0.03	-4.93
O65	820946	834003	2.0	0.39	0.070	0.48	0.086	0.02	3.96
O66	820990	834003	2.0	0.12	0.021	0.14	0.025	0.00	3.40
O67	821027	834003	2.0	0.38	0.067	0.37	0.066	-0.00	-0.24

D.7.3 Special Test Point

Test point	x	y	z	Velocity (Scheme 1) (m/s)	VR (Scheme 1)	Velocity (Scheme 2) (m/s)	VR (Scheme 2)	VR Diff (Scheme 1&2)	VR Change %
S01	820946	834206	12.1	0.32	0.06	0.38	0.07	0.010	16.7
S02	820946	834191	12.1	0.46	0.08	0.33	0.06	-0.022	-27.2
S03	820946	834176	12.1	0.44	0.08	0.42	0.07	-0.003	-3.6
S04	820912	834164	2.0	0.47	0.08	0.42	0.07	-0.010	-11.6
S05	820935	834161	2.0	0.54	0.10	0.58	0.10	0.006	6.0
S06	820962	834162	12.1	0.44	0.08	0.53	0.09	0.015	19.6
S07	820976	834161	12.1	0.48	0.09	0.57	0.10	0.016	18.1
S08	820991	834161	2.0	0.49	0.09	0.39	0.07	-0.018	-20.2
S09	821005	834161	2.0	0.24	0.04	0.53	0.09	0.052	121.3
S10	820991	834207	2.0	0.65	0.11	0.42	0.07	-0.041	-35.7
S11	820991	834191	2.0	0.63	0.11	0.49	0.09	-0.026	-22.8
S12	820991	834176	2.0	0.56	0.10	0.51	0.09	-0.009	-9.1
S13	820991	834147	2.0	0.49	0.09	0.55	0.10	0.010	11.9
S14	820991	834132	2.0	0.46	0.08	0.50	0.09	0.008	9.3
S15	820946	834146	2.0	0.23	0.04	0.26	0.05	0.004	10.9
S16	820946	834131	12.1	0.72	0.13	0.81	0.14	0.016	12.4
S17	820946	834116	2.0	0.41	0.07	0.41	0.07	0.001	0.8

D.8 SSW wind

D.8.1 Perimeter Test Point

Test point	x	y	z	Velocity (Scheme 1) (m/s)	VR (Scheme 1)	Velocity (Scheme 2) (m/s)	VR (Scheme 2)	VR Diff (Scheme 1&2)	VR Change %
P01	820897	834224	2.0	0.69	0.099	0.74	0.106	0.01	1.02
P02	820897	834209	2.0	0.73	0.105	0.76	0.110	0.01	0.69
P03	820897	834194	2.0	0.85	0.122	0.81	0.117	-0.01	-0.62
P04	820897	834179	2.0	0.73	0.106	0.70	0.100	-0.01	-0.71
P05	820897	834164	2.0	0.52	0.075	0.53	0.077	0.00	0.35
P06	820897	834149	2.0	0.46	0.066	0.48	0.069	0.00	0.59
P07	820897	834134	2.0	0.50	0.072	0.51	0.073	0.00	0.28
P08	820897	834119	2.0	0.65	0.094	0.64	0.093	-0.00	-0.13
P09	820897	834090	2.0	0.81	0.116	0.73	0.105	-0.01	-1.37
P10	820912	834090	2.0	0.86	0.125	0.86	0.124	-0.00	-0.12
P11	820927	834090	2.0	0.90	0.129	0.91	0.132	0.00	0.26
P12	820942	834090	2.0	0.93	0.134	0.94	0.136	0.00	0.28
P13	820957	834090	2.0	0.91	0.132	0.90	0.130	-0.00	-0.16
P14	820972	834090	2.0	0.89	0.129	0.88	0.127	-0.00	-0.22
P15	820987	834090	2.0	0.89	0.129	0.96	0.139	0.01	1.12
P16	820912	834224	2.0	0.50	0.072	0.55	0.080	0.01	1.45
P17	820927	834224	2.0	0.32	0.046	0.33	0.048	0.00	0.56
P18	820942	834224	2.0	0.25	0.037	0.24	0.035	-0.00	-0.51

Test point	x	y	z	Velocity (Scheme 1) (m/s)	VR (Scheme 1)	Velocity (Scheme 2) (m/s)	VR (Scheme 2)	VR Diff (Scheme 1&2)	VR Change %
P19	820957	834224	2.0	0.23	0.033	0.19	0.027	-0.01	-2.65
P20	820972	834224	2.0	0.22	0.031	0.19	0.028	-0.00	-1.38
P21	821017	834224	2.0	0.29	0.042	0.13	0.018	-0.02	-8.22
P22	821034	834224	2.0	0.11	0.016	0.48	0.069	0.05	48.41
P23	821034	834209	2.0	0.43	0.062	0.70	0.101	0.04	9.20
P24	821034	834194	2.0	0.42	0.060	0.65	0.094	0.03	8.25
P25	821034	834164	2.0	0.45	0.066	0.22	0.032	-0.03	-7.51
P26	821034	834149	2.0	0.68	0.098	0.37	0.054	-0.04	-6.51
P27	821034	834134	2.0	0.70	0.100	0.45	0.064	-0.04	-5.18
P28	821034	834119	2.0	0.57	0.083	0.52	0.075	-0.01	-1.33
P29	821034	834104	2.0	0.42	0.061	0.45	0.064	0.00	0.87
P30	821034	834090	2.0	0.53	0.076	0.40	0.058	-0.02	-3.55

D.8.2 Overall Test Point

Test point	x	y	z	Velocity (Scheme 1) (m/s)	VR (Scheme 1)	Velocity (Scheme 2) (m/s)	VR (Scheme 2)	VR Diff (Scheme 1&2)	VR Change %
O01	821020	834303	2.0	0.23	0.034	0.10	0.015	-0.02	-8.16
O02	820990	834279	2.0	0.40	0.057	0.25	0.036	-0.02	-5.37
O03	820960	834280	2.0	0.29	0.042	0.46	0.067	0.02	8.24
O04	820930	834290	2.0	0.56	0.081	0.69	0.100	0.02	3.51
O05	820906	834308	2.0	0.35	0.051	0.38	0.055	0.00	1.06
O06	821080	834261	2.0	0.24	0.035	0.17	0.025	-0.01	-4.15
O07	821050	834261	2.0	0.06	0.009	0.11	0.016	0.01	11.71
O08	821020	834261	2.0	0.12	0.018	0.30	0.044	0.03	21.85
O09	820990	834261	2.0	0.64	0.093	0.28	0.041	-0.05	-8.09
O10	820960	834261	2.0	0.28	0.040	0.39	0.056	0.02	5.63
O11	820930	834268	2.0	0.55	0.080	0.65	0.094	0.01	2.71
O12	820900	834272	2.0	0.72	0.104	0.74	0.106	0.00	0.29
O13	820870	834272	2.0	0.38	0.055	0.29	0.041	-0.01	-3.55
O14	820840	834273	2.0	0.11	0.016	0.15	0.022	0.01	5.35
O15	820807	834274	2.0	0.12	0.018	0.23	0.033	0.02	12.87
O16	821115	834269	2.0	0.18	0.026	0.16	0.023	-0.00	-1.74
O17	821110	834218	2.0	0.05	0.008	0.14	0.020	0.01	23.05
O18	821080	834226	2.0	0.14	0.020	0.20	0.029	0.01	6.99
O19	821050	834233	2.0	0.12	0.017	0.18	0.027	0.01	8.30
O20	821020	834236	2.0	0.11	0.016	0.33	0.048	0.03	28.71
O21	820990	834236	2.0	1.06	0.153	0.60	0.087	-0.07	-6.27
O22	820960	834236	2.0	0.16	0.022	0.13	0.019	-0.00	-2.10
O23	820930	834236	2.0	0.36	0.052	0.40	0.058	0.01	1.65
O24	820900	834236	2.0	0.68	0.098	0.74	0.108	0.01	1.33
O25	820870	834236	2.0	0.50	0.072	0.52	0.075	0.00	0.78
O26	820840	834436	2.0	0.71	0.103	0.73	0.105	0.00	0.24
O27	820810	834236	2.0	0.39	0.056	0.24	0.035	-0.02	-5.37
O28	820880	834212	2.0	0.78	0.113	0.76	0.110	-0.00	-0.44

Test point	x	y	z	Velocity (Scheme 1) (m/s)	VR (Scheme 1)	Velocity (Scheme 2) (m/s)	VR (Scheme 2)	VR Diff (Scheme 1&2)	VR Change %
O29	820880	834183	2.0	0.75	0.109	0.74	0.106	-0.00	-0.37
O30	820880	834153	2.0	0.81	0.118	0.79	0.114	-0.00	-0.42
O31	820880	834123	2.0	0.68	0.098	0.64	0.093	-0.01	-0.79
O32	820880	834097	2.0	0.64	0.092	0.54	0.078	-0.01	-2.20
O33	820805	834078	2.0	0.33	0.047	0.28	0.040	-0.01	-2.21
O34	820845	834078	2.0	0.44	0.064	0.51	0.074	0.01	2.37
O35	820880	834074	2.0	0.36	0.051	0.40	0.058	0.01	1.99
O36	820900	834074	2.0	0.70	0.102	0.67	0.097	-0.00	-0.60
O37	820930	834074	2.0	0.48	0.069	0.45	0.065	-0.00	-0.80
O38	820960	834074	2.0	0.46	0.066	0.47	0.067	0.00	0.21
O39	820990	834074	2.0	0.59	0.085	0.59	0.085	-0.00	-0.05
O40	821020	834074	2.0	0.82	0.118	0.91	0.131	0.01	1.51
O41	821050	834074	2.0	0.72	0.103	0.78	0.112	0.01	1.25
O42	821080	834074	2.0	0.71	0.103	0.65	0.093	-0.01	-1.37
O43	821110	834074	2.0	0.66	0.095	0.67	0.097	0.00	0.18
O44	821080	834063	2.0	0.19	0.027	0.31	0.045	0.02	9.47
O45	820947	834063	2.0	1.08	0.156	1.09	0.157	0.00	0.07
O46	820946	834033	2.0	0.70	0.101	0.81	0.118	0.02	2.34
O47	820843	834025	2.0	0.14	0.021	0.13	0.019	-0.00	-0.95
O48	820870	834025	2.0	0.41	0.059	0.34	0.049	-0.01	-2.53
O49	820900	834025	2.0	0.19	0.027	0.11	0.015	-0.01	-6.30
O50	820930	834025	2.0	0.10	0.015	0.32	0.047	0.03	31.41
O51	820960	834025	2.0	0.16	0.023	0.09	0.012	-0.01	-6.75
O52	820990	834025	2.0	0.23	0.033	0.04	0.006	-0.03	-11.71
O53	821020	834025	2.0	0.13	0.018	0.04	0.005	-0.01	-10.37
O54	821050	834025	2.0	0.12	0.018	0.15	0.022	0.00	3.33
O55	821028	834063	2.0	0.20	0.030	0.19	0.027	-0.00	-1.20
O56	821028	834033	2.0	0.13	0.018	0.08	0.012	-0.01	-5.21
O57	821080	834033	2.0	0.35	0.051	0.46	0.066	0.02	4.27
O58	821127	834140	2.0	0.36	0.052	0.40	0.058	0.01	1.86
O59	821102	834123	2.0	0.47	0.068	0.16	0.023	-0.04	-9.46
O60	821060	834115	2.0	0.49	0.070	0.19	0.028	-0.04	-8.78
O61	821043	834123	2.0	0.52	0.076	0.50	0.072	-0.00	-0.60
O62	821043	834153	2.0	0.41	0.059	0.28	0.040	-0.02	-4.55
O63	821043	834183	2.0	0.35	0.051	0.29	0.041	-0.01	-2.77
O64	821043	834211	2.0	0.10	0.015	0.36	0.052	0.04	36.47
O65	820946	834003	2.0	0.29	0.041	0.52	0.075	0.03	11.78
O66	820990	834003	2.0	0.08	0.011	0.10	0.015	0.00	4.92
O67	821027	834003	2.0	0.30	0.043	0.31	0.044	0.00	0.51

D.8.3 Special Test Point

Test point	x	y	z	Velocity (Scheme 1) (m/s)	VR (Scheme 1)	Velocity (Scheme 2) (m/s)	VR (Scheme 2)	VR Diff (Scheme 1&2)	VR Change %
S01	820946.22	834206.45	12.1	0.67	0.10	0.88	0.13	0.030	31.0

Test point	x	y	z	Velocity (Scheme 1) (m/s)	VR (Scheme 1)	Velocity (Scheme 2) (m/s)	VR (Scheme 2)	VR Diff (Scheme 1&2)	VR Change %
S02	820946	834206	12.1	0.66	0.10	0.46	0.07	-0.029	-30.8
S03	820946	834191	12.1	0.41	0.06	0.43	0.06	0.003	5.5
S04	820946	834176	2.0	0.44	0.06	0.31	0.05	-0.018	-28.4
S05	820912	834164	2.0	0.56	0.08	0.54	0.08	-0.002	-2.8
S06	820935	834161	12.1	0.46	0.07	0.69	0.10	0.033	50.1
S07	820962	834162	12.1	0.56	0.08	0.35	0.05	-0.029	-36.3
S08	820976	834161	2.0	0.99	0.14	0.90	0.13	-0.013	-8.8
S09	820991	834161	2.0	0.44	0.06	0.61	0.09	0.025	38.4
S10	821005	834161	2.0	1.44	0.21	1.14	0.16	-0.043	-20.8
S11	820991	834207	2.0	1.32	0.19	1.12	0.16	-0.029	-15.1
S12	820991	834191	2.0	1.14	0.17	1.00	0.14	-0.021	-12.6
S13	820991	834176	2.0	0.90	0.13	1.00	0.14	0.013	10.2
S14	820991	834147	2.0	0.60	0.09	0.70	0.10	0.013	15.4
S15	820991	834132	2.0	0.21	0.03	0.20	0.03	-0.002	-5.4
S16	820946	834146	12.1	0.90	0.13	0.81	0.12	-0.013	-10.1
S17	820946	834131	2.0	0.38	0.06	0.36	0.05	-0.003	-6.3