Air Ventilation Assessment for S16 Application for Minor Relaxation of Building Height Proposed Government Building in Area 67, TKO

Prepared for:

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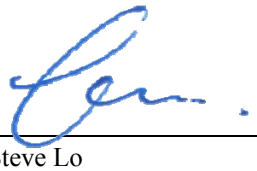

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1.0 Introduction

1.1 Project Background

PlanArch Consultants Ltd. is commissioned by Architectural Services Department (ArchSD) for the planning application under Section 16 of Town Planning Ordinance for building height relaxation for the proposed Government Buildings (including the Specialist Departmental Building (SDB) and the Joint-User Building (JUB)) in Area 67 Tseung Kwan O.

ENVIRON Hong Kong Limited has been commissioned by the project proponent to conduct this AVA based on the development scheme provided by Architectural Service Department (ArchSD)(the project architect).

1.2 Objectives

This report contains a qualitative (expert evaluation) and quantitative (using CFD) assessment of the air ventilation impact with respect to the Base Scheme and the Proposed Notional Schemes.

1.3 Subject Site and its Environs

The subject site is bounded by Po Yap Road to the north, proposed future road P2 to the west and Tong Yin Street (South) (or road L673) to the south. Tong Yin Street (East) is located further east of the subject site with the future site for the planned cultural complex with height restriction of 75 m above ground and two secondary schools with height restriction of 40 m above ground located in between. Chi Shin Street is located between the future site for cultural complex and two secondary schools, connecting the Tong Yin Street (East) to the middle of the subject site. The ground elevation around subject site is generally flat and around 6mPD.

The Subject Site falls within "G/IC(1)" and "G/IC(4)" on the draft Tseung Kwan O Outline Zoning Plan (OZP) No. S/TKO/21. According to the Notes of the OZP, the maximum building height in "G/IC(1)" and "G/IC(4)" is 75m and 40m respectively. The Base Scheme is prepared to fully complies with the building height stipulations of "G/IC(1)" and "G/IC(4)"

There are existing high-rise developments located to the north of subject, i.e. Park Central, where Ocean Shore located to the southwest of subject site with the Po Yap Road located in between. Areas to the east and south of subject site are currently construction sites. The areas to the south are planned for low to medium rise residential developments with 35 to 60 mPD height restriction. The area to east of the Tong Yin Street (East) is designated for residential development with the building restriction of 100 mPD.

1.4 Base Scheme

The Base Scheme is provided by ArchSD for assessment purpose. There are three towers of SDB located to the north of the subject site with the building height about 75m, with the main roof of 77mPD to 80mPD as indicated in **Appendix B**. All three towers are connected together without building separation or any ground floor opening.

The JUB contain one tower only with main roof level about at 78mPD located to the south of the subject site. Similar to the SDB, there is no opening in JUB.

The Subject Site falls within "G/IC(1)" and "G/IC(4)" on the draft Tseung Kwan O Outline Zoning Plan (OZP) No. S/TKO/21. According to the Notes of the OZP, the maximum building height in "G/IC(1)" and "G/IC(4)" is 75m and 40m respectively. Therefore, The Base Scheme is prepared to fully complies with the building height stipulations of "G/IC(1)" and "G/IC(4)"

The MLP of base scheme is provided in **Appendix B.**

1.5 Proposed Notional Scheme

In the Proposed Notional Scheme, there are two towers in SDB located to the north of the subject site with building height not more than 100mPD. There are several building setback and opening as indicated in the **Figure 8**, i.e. a setback at G/F to 2/F to the northeast under Tower 2 (North Wing), A void at 1/F to 2/F and 12/F to 14/F in the Tower 2 (Linked Area), a setback to the south at 1/F to 2/F of Tower 1, and some carriageway/ carpark area at G/F. Such opening to the lower level increase building permeability and allow more wind penetration. Thus, it is expected these opening will enhance the wind flow at leeward area. These proposed notional permeable elements are presented to illustrate that the proposed notional scheme is a feasible scheme that will enhance the air ventilation performance. The future design will be subject to detailed design.

On the other hand, the JUB separated in two towers with around 7m building gap along west-east (as indicated in **Figure 8**) in the proposed notional scheme. The building bulk is generally smaller of the JUB in the proposed notional scheme. However, the disposition is similar in both the base scheme and proposed notional scheme.

2.0 Site Wind Availability

2.1 Site Wind Availability Data

There is no measurement data of wind speed and wind direction near the Subject Site. Wind monitoring data at station such as Waglan Island is not considered suitable to be adopted for the Subject Site due to completely different topography and building morphology and in turn the effect on the wind availability.

Hong Kong University of Science and Technology (HKUST) have simulated a set of wind data using MM5 (a regional mesoscale model designed to simulate or predict atmospheric circulation). The data period covers the whole year of 2004. The simulated data allows to project different elevations. The simulated data at 450m is representative of wind data above urban canopy and generally least affected by topography and building morphology. Site wind availability data are summarized in **Table 1**.

This evaluation is not a detailed study of the air ventilation performance. It is therefore considered acceptable to use the simulated MM5 data for Site Wind Availability initially as a starting point. The use of MM5 data is preferred over measurement data at Waglan Island as it can reflect the effect of topography to wind availability.

Table 1 Experimental Site Wind Availability Data for the Study Area (at 450m above ground)

	Percentage Occurrence (%) for Wind Speed Ranges:	
Wind Angle	**Summer**	**Annual**
0	2.6%	1.2%
22.5*	**2.6%**	**10.8%**
45*	**2.6%**	**16.8%**
67.5*	**6.7%**	**22.8%**
90*	**11.4%**	**13.8%**
112.5*	**8.3%**	**6.0%**
135*	**8.8%**	**4.8%**
157.5*	**8.8%**	**6.0%**
180*	**8.8%**	**4.8%**
202.5*	**9.6%**	**3.6%**
225*	**9.8%**	**3.6%**
247.5*	**7.8%**	**3.6%**
270	4.1%	1.2%
292.5	2.8%	1.2%
315	2.6%	0.0%
337.5	2.6%	0.0%
TOTAL	100%	100%
TOTAL Selected*	**85.2%**	**96.4%**

The wind direction and average wind speed selected for this assessment represents the condition at infinity height. Wind profile(s) for the site could be appropriated from the V∞ data with reference to

the Power Law or Log Law using coefficients appropriate to the site conditions so that the near ground wind condition can be deduced. In this study, Log Law has been employed. The reference height of V∞ is assumed at +450mPD.

According to the Wind data, the dominant wind direction for annual is from east to north quarters; while that for summer is mainly from east to southwest (See **Figure 2**).

2.2 Topography and Building Morphology

Figure 9 shows surrounding planned/ planning development.

Topography

The subject site is located between Tseung Kwan O area and Junk Bay where it is relatively flat around the site. Subject site and surrounding area is an open space now. But it is understood that there will be numerous planned/ planning project in these area. The ground level of the immediate surrounding areas is around 6 mPD and there are hilly topography from the north to south west but all located around 1km from the subject site.

Building Morphology

As mentioned, there are several planned development from the east to west of the subject site. The building outline and building height within the assessment area are indicated in **Figure 10**. Basically, there are high-rise development (more than 100mPD) to the north of Po Yap Road (to the north and northeast of subject site), e.g. Park Central and The Wings, and to the east of Tong Yin Street (East) (to the east of subject site), e.g. Proposed residential development at TKOTL 113 and TKOTL 114. On the other hand, the subject site is surrounded by the mid-rise development from the east to northwest (less than 100mPD), for example, the planned cultural complex and school site to the east of subject site, proposed residential development at TKOTL125 and TKOTL95 to the south and proposed Police Station and Clinic to the west.

The building height in mPD of the neighbouring buildings/developments is tabulated as follows and indicated in the **Figure 10**:

Table 2 Building Height of Existing/Planned Neighbouring Developments

Name of Building	Site Condition	Maximum Building Height (mPD)	Location from Subject site
Park Central	Existing	~170	North
The Wings	Existing	~180	Northeast
Tiu Keng Leng Sport Center and Library	Existing	~35	Northwest
HKIVE (LWL) Campus	Existing	~50	Northwest
The Wings (Phase II)	Existing	~100	East
Planned residential development at TKOTL 113	Planned	~100	East
Planned residential development at TKOTL 114	Planned	~100	East
Planned residential development at TKOTL 117	Planned	~65	East
Planned residential development at TKOTL 119	Planned	~100	East

Name of Building	Site Condition	Maximum Building Height (mPD)	Location from Subject site
Planned residential development at TKOTL 115	Planned	~100	East
Planned residential development at TKOTL 118	Planned	~66	East
Planned residential development at TKOTL 95	Planned	~64	Southeast
Planned residential development at TKOTL 125	Planned	~50	South
Planned Cultural Complex*	Planned	~64	East
2 x planning school site*	Planned	~33	East
Planned Police Station and Clinic	Planned	~45	West

*Remark: the height restriction according to OZP for cultural complex and school site shall be 80mPD and 45mPD respectively.

2.3 Summary of Site Wind Availability

With reference to AVA EE for Tseung Kwan O Area (dated Nov 2013), there are four breezeways identified in previous planning study in Tseung Kwan O Town Centre Sub Area, i.e. Po Shun Road, Tong Yin Street (north and east), Tong Chun Street and Po Hong Road. In addition, the Central Avenue act an additional air path to allows southerly wind penetration.

According to the wind availability data, the annual wind directions of the area include easterlies, north-easterlies and northerlies. From **Table 1**, the wind probability from the ENE direction is 22.8% and is considered to be the dominant wind direction for the area. The E (13.8%) and NE (16.8%) wind are also dominant prevailing wind directions other than the ENE wind. As there are numerous high-rise building/ development located to the northeast and east area, including but not limit to Park Central, The Wings and some planned residential development to the east, most of the prevailing wind will be obstructed by the above-mentioned development and only limited amount of wind could reach area near subject site. It is anticipated that Po Yap Road is the main air corridor of the district area under annual condition.

During Summer Condition, Wind from the southwest to east are the dominant wind directions. From **Table 1**, the wind probability from the E direction is 11.4% and is considered to be the dominant wind direction under summer condition for the area. The SW (9.8%) and SSW (9.6%) wind are also dominant prevailing wind directions other than the E wind under summer condition. The planned residential development at TKOTL 117, TKOTL 125 and TKOTL 95 would slightly reduce the wind speed from the southeast to south. However, considering the building height are generally lower in the above-mentioned area (i.e. less than 100mPD) and more building separation at the Tong Yin Street (East) and the future road to the west of the subject site, the summer wind should possibly reach area near subject site and downwind area, i.e. Po Shun Road and Tong Yin Street (North). In addition, Po Shun Road and Tong Yin Street (North) would be act as important breezeway under summer condition and benefit inland residential development, i.e. Choi Ming Court, Tong Ming Court, Sheung Tak Estate, etc.

3.0 Discussion on Important Pedestrian Areas and Problem Area

3.1 Important Pedestrian Areas

The proposed building height (H) is about 100mPD. On the other hand, The Wings is the highest building in the surrounding area with building height around 180mPD. In our study, the assessment area is larger than 1H of the highest building nearby (i.e. 180m) from the site boundary, as indicated in **Figure 3**, in order to cover all surrounding important pedestrian areas.

Important pedestrian areas that the public would often access are identified and these include: the planned school development to the east and the planned cultural complex, waterfront promenade, and future Centre Avenue located between developments at TKOTL113 and TKO119, etc.

3.2 Problem Areas

As discussed in the section 2.3, there are numerous existing/ planned high-rise development to the northeast. It is anticipated that there would be some area, behind these buildings, with relative low wind speed when the wind direction is from the upstream of these buildings. For example, under the north-eastern wind, the wind speed at the area near subject site will be relatively low as the above-mentioned development blocks the north-easterly wind under annual condition. On the other hand, the summer wind availability is slight better, since the building height is generally low in the upwind location.

4.0 Expert Evaluation of Air Ventilation Performance of the Proposed Development

4.1 Good design Direction for Site Level

According to the guidelines in Chapter 11 of HKPSG, the key principles to consider in order to improve air ventilation performance in site level include podium structure, building disposition, building permeability, building form, landscaping, projecting obstruction and cool materials.

Podium Structure. Compact integrated developments and podium structures with full or large ground coverage on extensive sites typically found in Hong Kong are particularly impeding air movement. The principle to improve air ventilation is to reduce coverage, provide setback, designate open area and improve building permeability.

Building Disposition. Adequate wide gaps should be provided between buildings. The axis of buildings should be in parallel to prevailing wind direction where possible. Staggering building to allow blocks behind to receive wind through gap and erecting towers above the podium edge facing pedestrian area to enable most of the downwash are also preferred in general.

Building Permeability. The focus is to create building gap and highly permeable podium garden.

Building Form. Building form to amplify wind around it is preferable.

Landscaping, Projecting Obstruction and Cool Materials. Landscaping & use of cool materials would be encouraged whereas projecting obstruction would be avoided.

4.2 Comparison of Design Features of the Base Scheme and Proposed Notional Scheme

Podium Structure

The base scheme adopted a podium free design and would be erected at grade. On the other hand, the proposed notional scheme have a podium deck with permeable opening at ground floor between Tower 1/ Tower 2 and to the east of the tower 2 (as indicated in **Figure 8**). Therefore, it is anticipated that the wind penetration at pedestrian level is better in the proposed notional scheme.

Building Height

The building height is 75mPD in the base scheme. In the proposed notional scheme the building height is not more than 100mPD. It is understood that the building height is higher in the proposed notional scheme, and generally would obstruct the wind flow at higher level. Furthermore, the taller building height is anticipated to impose a larger wake area to leeward area. However, there are several mitigation measure provide for enhancing pedestrian wind flow (as indicated in Figure 8). It is expected that the air ventilation at lower level will be better in the proposed notional scheme.

Building Disposition and Building Form

The building disposition and form of both schemes are generally similar. There are three towers of SDB located to the north of the subject site where one tower in the south of subject site in the base scheme. All three towers of SDB are connected together and both SDB and JUB do not have any building separation or any ground floor opening.

In the Proposed Notional Scheme, there are three towers in SDB located to the north of the subject site. There are several building setback and opening as indicated in the **Figure 8**, i.e. a setback at G/F to 2/F to the northeast under Tower 2 (North Wing), A void at 1/F to 2/F and 12/F to 14/F in the Tower 2 (Linked Area), a setback to the south at 1/F to 2/F of Tower 1, and some carriageway/ carpark area at G/F. Please also noted that towers in the SDB are aligned to the Po Yap Road which major wind corridor under annual condition. The building disposition and setback to toward ENE are mitigation measure provided for enhancing the prevailing ENE and E wind (the setback along Po Yap Road are around 4-48m for Base Scheme and around 8-43m for the Proposed Notional Scheme). On the other hand, the JUB is separated in two towers with a building gap along west-east in the proposed notional scheme. The building bulk is generally smaller in the proposed notional scheme. However, the disposition is generally similar in both the base scheme and the proposed notional scheme in JUB.

Generally, the proposed notional scheme have a better ventilation performance in term of building disposition by providing more building separations, building setback and openings.

Building Permeability

As discussed, the proposed notional scheme provided several building setback and opening as indicated in the **Figure 8**, i.e. a setback at G/F to 2/F to the northeast under Tower 2 (North Wing), A void at 1/F to 2/F and 12/F to 14/F in the Tower 2 (Linked Area), a setback to the south at 1/F to 2/F of Tower 1, some carriageway/ carpark area at G/F (i.e. one under Tower 2 (South Wing) to the east and south, one under the landscaped roof between Tower 1 and Tower 2 (North Wing), one under the landscaped roof to the south of Tower 1) and one building separation (around 7m) between Tower A and B of JUB. Therefore, the building permeability is better in the proposed notional scheme. The above-mentioned mitigation measures would possibly benefit the wind penetration, especially in pedestrian level. For example, the void at G/F and the void at 1/F to 2/F and 12/F to 14/F in the Tower 2 (Linked Area) setback to the south at 1/F to 2/F of Tower 1 and setback to the south at 1/F to 2/F of Tower 1 the would possibly enhance the East-west wind flow within the site and toward downwind area under annual condition, i.e. ENE and E wind could easily pass though the void and reach area within the subject site and downwind area (future Road P2) under both annual and summer condition (The void at 12/F to 14/F would benefit wind penetration at higher level only) . The setback at G/F to 2/F to the northeast under Tower 2 (North Wing) and the natural ventilated carpark under Tower 2 (South Wing) to the east can impose more North-south wind flow along Po Yap Road and area between Cultural Complex and Tower 2 and benefit Chi Shin Street and two proposed school site under Northerly wind under annual condition, and benefit Po Yap Road under summer condition. The natural ventilated carpark under Tower 2 (South Wing) to the south and carriageway under landscaped roof to the south of Tower 1 would enhance the East-west wind flow along Chi Shin Street and Road P2 at pedestrian level under both annual and summer condition. The carriageway under the landscaped roof between Tower 1 and Tower 2 (North Wing) would enhance the north-south wind flow and benefit Po Yap Road under summer condition. On the other hand, the 7m building

separation and disposition in JUB would possibly enhance the wind flow at Road P2 and Po Shun Road under summer condition.

As discussed in section 2.3, there are four breezeway identified in in the AVA EE for Tseung Kwan O Area (dated Nov 2013), i.e. Po Shun Road, Tong Yin Street (north and east), Tong Chun Street and Po Hong Road. In addition, the Central Avenue act an additional air path to allows southerly wind penetration. Since Po Hong Road, Tong Chun Street and Central Avenue are away from the subject site and there are numerous located between subject site and the above-mentioned area, it is anticipated the building design in the subject site would not have any implication to these three breezeways/ air path. On the other hand, since the proposed scheme provided several building setback and opening toward at lower level, it is expected there will not have adverse impact at Po Shun Road and Tong Yin Street (north and east) in the proposed notional scheme.

Landscaping, Projecting Obstruction and Cool Materials

Greening and use of cool materials can help to reduce heat island effect. Landscaping will be provided to ameliorate possible wind amplification problem as well. Greening and cool materials will be incorporated into both schemes where practicable. Cool materials including water features, materials with high emissivity will be employed where appropriate. It is expected that it is possible to adopt similar extent of greening and cool materials for both schemes.

Conclusion

The air ventilation performance of the Base Scheme and the Proposed Notional Scheme has been appraised. The Proposed Notional Scheme is considered relatively better than the Base Scheme, since several mitigation measures are provided for in the proposed notional scheme, i.e. the setback toward north boundary and the overall building aligned with ENE direction in SDB would enhance the wind flow along Po Yap Road, several setback and void are proposed in order to enhance the overall air movement to downwind area in both summer and annual condition.

5.0 Quantitative Assessment Methodology

5.1 CFD Code and Major Parameters

A quantitative assessment based on requirement for Initial Study stipulated in the technical guide was conducted for the purpose to verify the air ventilation performance for the Proposed Notional Scheme over the Base Scheme.

The quantitative assessment was conducted using a commercial CFD code, PHOENICS. PHOENICS employs structured grid with fine-grid embedding to fit small-scale flow features without the computational overhead of fully-unstructured grids. Turbulence models include various versions of K-epsilon model (such as RNG & Low Reynolds Number Model), LVEL, Kolmogorov-Wilcox two-equation k-f model and other models such as RSM and Sub-Grid-Scale LES model.

Modified version of K-epsilon turbulence models which give better prediction of separation and vortexes are adopted for air ventilation assessment. In this study, the Chen-Kim modified KE-EP turbulence model has been employed. The Chen-Kim model is a variant of K-ε based on comparison with experimental data. This model involves a modification which improves the dynamic response of the EP equation by introducing an additional time scale (KE/PK), where PK is the volumetric production rate of KE. The model maintains good agreement with experimental data on classical turbulent shear layers. Moreover, this is based on the KE-EP model which is appropriate for high-reynolds number problem such as external flow. These models are statistical turbulence models and are generally regarded as practical to model steady state condition. It uses different constants, and has an addition term in the ε equation. The effect of the changes is to reduce the turbulent viscosity in regions of high shear - e.g. in recirculation zones. Hence, it predicts a longer recirculation zone, in agreement with experimental evidence. The Chen-Kim model gives better prediction of separation and vortexes. It does not only keep the merits or Renormalization Group (RNG) model but also have nice results happening to jet stream fluid and feather fluid. The equation and parameters adopted in Chen-Kim turbulence model is shown below for reference:

Equation	Φ	Γ_Φ	S_Φ
Turbulent Kinetic Energy	k	ν_t/σ_k	$\rho(G-\varepsilon)$
Dissipation Rate	ε	ν_t/σ_ε	$\rho(\varepsilon/k)(C_{\varepsilon1}G - C_{\varepsilon2}\varepsilon) + \rho\, C_{\varepsilon3}G^2/k$

$$G = \nu_t (\partial_k U_i + \partial_i U_k) \partial_k U_i$$

$$\nu_t = C_\mu k^2 / \varepsilon$$

$\sigma_k = 0.75$, $\sigma_\varepsilon = 1.15$, $C_{\varepsilon1} = 1.15$, $C_{\varepsilon2} = 1.9$, $C_{\varepsilon3} = 0.25$, $C_\mu = 0.09$

It is understood that LES/DES generally requires careful application by the user, because compared to statistical turbulence modeling, the approach requires more accurate spatial resolution on finer meshes and small time steps, and as a consequence significant amounts of computer time. Typically, the time step should be in the range 1/200 to 1/50 of the large-eddy turnover time. Otherwise, there will be inadequate time resolution. Also, there is always the possibility of numerical damping of the

fluctuations. LES and DES have the potential to produce more accurate solutions than statistical turbulence models, but misuse of these methods is fairly common due to inadequate temporal and spatial resolution. Considering the practicability issue, statistical turbulence model is considered a viable choice which can achieve generally acceptable level of accuracy.

The domain covers an area of over 420m (>2H where H=210m is the maximum height of the surrounding development) from the project site boundary. The domain dimension is about 2450m x 2500m and with an elevation of 2000m. 1-phase fluid is modelled at standard pressure. Nearly 7,000,000 grid cells are defined to simulate the air flow. Cartesian coordinate cell grid system is adopted with refinement within an area which is within about H from the subject site (and with denser grid near ground level). The grid size is generally smaller within the assessment area (<1m) and coarse outside and within the study area. The grid expansion ration is controlled to not more than 1.2.The grid size near the domain boundary on 4 sides and ceilings are >50m. It is defined in such a way that there will be at least 3 cells within major building gaps. For relevant streets/roads containing the test point, generally 8 to 10 cells would be defined between walls/objects. The test point will be assigned in such a way that there will be at least 2 to 3 cells from the building façade or major obstacle. Within the level of 0 to 2m aboveground, the grid height of the layer near ground is about 0.5m and there will be 4 cells defined so that the result taken would be taken at the 3rd cell, instead of the cell adjacent to ground. Similarly, all test points would not be taken at the cell adjacent to wall/object.

Lateral clearance is around 1260m (more than 5H) on each side. The vertical distance between the proposed development and the ceiling of the CFD domain amounts to more than 1680m. Top and lateral boundary area defined as symmetric plane in the CFD. The distance between the proposed development and the inflow amounts to around 1200m. The distance between the proposed development and the outflow amounts to around 1200m. The percentage blockage is less than 3% with the surrounding public housing and private residential developments considered. The convergence criteria adopted in this study is 0.1%. In addition, spot values are checked to ensure that steady value can be obtained from simulation. The windward boundary is defined as inflow with the wind profile defined (as discussed below). The leeward boundary is defined as outflow. The sky and lateral boundaries are defined as neutral.

The commonly used hybrid-differencing numerical scheme in PHOENICS is adopted (this scheme employs the 1st-order upwind-differencing scheme (UDS) in high-convection regions; and the 2nd-order central-differencing scheme (CDS) in low-convection regions automatically to strike a balance between accuracy and computing efficiency with the low-convection region using higher order scheme).

5.2 Atmospheric Conditions

Log Law is used to approximate the wind profile. The roughness length and friction velocity under Log Law for each wind direction is assumed as below:

Log Law, $Uz = U^* \div \sigma \times \ln(Z \div Zo)$ where

Uz=wind speed at height z from ground;

σ=von Karman constant = 0.4

Zo=roughness length

U*=friction velocity (determined when Uz=average wind speed based on MM5 data and Z = 450m aboveground);

Z=height z from ground

Table 3 Friction Velocity adopted under Different Wind Direction

Wind Direction	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW
Zo (note)	3	3	3	3	3	3	0.1	0.1	0.1	3	3
U*	0.753	0.712	0.724	0.650	0.487	0.432	0.280	0.211	0.313	0.464	0.446

Note: roughness values depend on building density and topography outside the model area and are determined based on professional judgement ("3" means upwind area is urbanized area with building; "0.1" means upwind area is seawater with least blockage)

Appendix C showed captured CFD models.

5.3 Test Point Location

Onsite survey was conducted to identify major pedestrian areas and features. Test points are selected and shown in **Figure 3**. Test points include perimeter test point defined along the boundary of the subject site, and overall test points from the subject site for the surrounding area. The boundary of the assessment area more than 180m radius and surrounding area of this AVA study is also shown in **Figures 3**.

6.0 Key Findings

6.1 Spatial Average Wind Velocity Ratios

The velocity ratio under a specific wind direction at a test point is calculated by dividing the simulated wind speed at the test point under this wind direction with the velocity at gradient height under the same wind direction. All test point located at 2m above the ground level.

Figure 3 shows the location of the test points within the assessment area. A total of 186 test points are selected including 30 number of perimeter test points, 148 number of overall test points and 8 number of special test points. **Table 4** shows the site spatial average velocity ratio (SVR), local spatial average velocity ratio (LVR) and average wind velocity ratio along surrounding air sensitive uses area during Annual Condition and Summer Condition respectively for the Proposed Notional Scheme (PNS) and Base Scheme (BS).

The wind velocity ratios of individual test points are shown in **Figure 4** and **Figure 5** respectively for annual condition and summer condition for base scheme, where **Figure 6** and **Figure 7** respectively for annual condition and summer condition for the proposed notional scheme. All test points results are taken at 2m above pedestrian level. Appendix C shows detailed simulation result of the proposed notional scheme and base scheme respectively.

Table 4 Summary of Spatial Average Wind Velocity Ratios (VR) – Annual Condition

		Annual		Summer	
Spatial Average Wind Velocity Ratio (VR)	**Testpoint**	**PNS**	**BS**	**PNS**	**BS**
SVR	P01-P30	0.13	0.13	0.16	0.16
LVR	P01-P30, T01-T148	0.14	0.14	0.16	0.16
Chui Ling Road	T08-T11, T13, T112- T113	0.11	0.11	0.12	0.12
Po Yap Road	P01,P25-P30, T07,T14-T26, T30-T32,T98	0.18	0.18	0.22	0.22
Po Shun Road	T01-T07, T12, T114-T115	**0.16**	**0.15**	**0.16**	**0.15**
Tong Yin Street	P15-P17,T26-T30,T32,T35-T39,T42-T43,T46-47,T49-T53,T60-T62,T64,T66-T73,T75-T76,T79,T110-T111,T129-T131	0.15	0.15	0.17	0.17
Tong Yin Street(North)	T27-T30,T796-T97	**0.27**	**0.26**	**0.24**	**0.23**
Tong Yin Street(East)	T26,T32,T35-T39,T42-T43,T46-T47,T49-T53,T60	**0.17**	**0.16**	**0.15**	**0.15**
Tong Yin Street(South)	P15-P17,T60-T62,T64,T66-T73,T75-T76,T79,T109	0.12	0.12	0.17	0.17
Tong Yin Street (Southwest)	T110-T111,T128-T131	0.16	0.16	0.20	0.20
Chi Shin Street	P06-P11,T48-T50, T54,T56,T58,T103	0.12	0.12	0.13	0.13
Chui Shin Street	T08,T10,T84,T86-T90	**0.10**	**0.10**	**0.13**	**0.12**
Near Chui Shin Street	T72,T74,T77-T78,T80-T81,T83-T84,T110-T111	0.15	0.15	0.20	0.20
GIC(4)	T50,T52-T55,T57-T59,T61,T64-T65	0.12	0.12	0.13	0.13
Cultural Complex (GIC1)	P01-P05,T25-T26, T33-T35,T37-T38, T43,T47	0.17	0.17	0.15	0.15
TKOTL113	T32,T36,T39-T42, T44-T46, T48, T100-T102	0.15	0.15	0.15	0.15
TKOTL95	T62-63,T91-T93, T107-T108	0.09	0.09	0.12	0.12
TKOTL125	T68-T71,T94-T95	0.12	0.12	0.12	0.12
Tong Tak Street	T116-T118, T138-T141	0.14	0.14	0.12	0.12
Future Road P2	P20-P23,T74,T77-T78,T81-T82,T84-T88,T110	**0.12**	**0.11**	**0.16**	**0.15**

		Annual		Summer	
Spatial Average Wind Velocity Ratio (VR)	**Testpoint**	**PNS**	**BS**	**PNS**	**BS**
Choi Ming Street	T134-T137	0.16	0.16	0.20	0.20
Centre Avenue	T119-T128	0.16	0.16	0.16	0.16
HK Design Institute	T113,T134,T142-T143,T145	0.11	0.11	0.16	0.16
HK IVE (LWL)	T144-T145,T147	0.10	0.10	0.14	0.14
Tiu Keng Leng Sport Center	T146-T148	0.08	0.08	0.09	0.09
TKO Waterfront Park/Promenade.	S01-S08	0.15	0.15	0.18	0.18

6.2 Discussions on Air Ventilation Performance

6.2.1 Overall Performance

According to the spatial average VR result, it is noted that SVR and LVR of the proposed notional scheme and base scheme are generally similar in both annual and summer condition, where there are some area have slight improvement in VR in the proposed notional scheme, i.e. Po Shun Road (both annual and summer condition), Tong Yin Street (North) (both annual and summer condition), Future Road P2 (both annual and summer condition),Tong Yin Street (East) (Annual Condition only) and Chui Shin Street (summer condition only).

The proposed notional scheme and base scheme have a comparable ventilation performance in surrounding area, i.e. Chui Ling Road, Po Yap Road, Tong Yin Street (South and Southwest), Chi Shin Street, Chui Shin Street, Area Near Chui Shin Street, Area for GIC(4), Cultural Complex (GIC(1)), TKOTL113, TKOTL95, TKOTL125, Tong Tak Street, Choi Ming Street, Centre Avenue, HK Design Institute, HKIVE (LWL) Tiu Keng Leng Sport Center and TKO Water front Park/ Promenade.

Therefore it is considered that the proposed notional scheme would not have more adverse impact to surrounding air ventilation as compared to the Base Scheme. In addition, since several mitigation measure are provided, wind flow slightly enhanced in the proposed notional scheme along two major wind corridor (i.e. Po Shun Road and Tong Yin Street (North) under summer condition. On the other hand, more building separation is provided in the SDB and JUB of proposed notional scheme, and enhanced the wind flow to leeward area under annual and summer condition.

6.2.2 Wind Direction Discussion

Wind performance under Wind Direction of NNE

Under NNE wind, the wind flow is similar for base and proposed notional scheme, i.e. high-rise building to the north and future development to the east will reduce the wind availability and only limited wind could reach the subject site. Most of the wind come from Tong Yin Street (North) and Po Yap Road. It is observed that wind come Tong Yin Street (North) is stronger and therefore obstructed the wind to flow along Po Yap Road. There is a large wake area observed at Po Yap Road between the subject site and Park Central, due to the large building frontage facing north in Park Central. The wind flow would be slight stronger to the north of the subject site in the base scheme. It is found that the eastern tower of SDB directed some wind from Tong Yin Street (North) toward the wake area under NNE wind in the base scheme. On the other hand, it is observed the larger building

gap between SDB and cultural complex in proposed notional scheme and allowed more wind passed through, and therefore some NNE wind from Tong Yin Street (North) and Po Yap Road flow toward the building gap between SDB and cultural complex rather than flow toward the building gap between SDB and Park Central. Setback to the northeast under Tower 2 of SDB is provided as mitigation measure and enhance the wind flow to the above-mentioned wake area between SDB and Park Central, there are some NNE wind pass through the setback and flow toward northwest at the setback under tower 2 of SDB. However, it is observed that the wind penetrate flow slightly further towards the future school in the base scheme through the building bap between the Tower 2 (South Wing) and Cultural Complex, due to the stronger channelize effect in the base scheme.

Wind performance under Wind Direction of NE

Similar to NNE wind, the current and future development from the north to east will reduce the wind availability to reach the subject site under NE wind. Po Yap Road would be the major wind corridor to the north of subject site. It is observed that the wind flow along Po Yap Road is slightly stronger in the proposed notional scheme, since the building disposition of SDB is aligned to the Po Yap Road and setback from northern boundary in the proposed notional scheme enhanced the wind flow at the Po Yap Road and future road P2 to the west of SDB. It is also observed the larger building gap between SDB and cultural complex in proposed notional scheme and allowed more wind passed through, and therefore some NE wind from Tong Yin Street (North) and Po Yap Road flow toward the building gap between SDB and cultural complex. However, it is observed that the wind penetrate flow slightly further towards the future school in the base scheme through the building bap between the Tower 2 (South Wing) and Cultural Complex, due to the stronger channelize effect in the base scheme. On the other hand, the void at ground floor between Tower 1 and Tower 2 of SDB in the proposed notional scheme could direct some NE wind to enter Chi Shin Street.

Wind performance under Wind Direction of ENE

Under ENE wind, both the base scheme and proposed notional scheme have comparable ventilation performance in surrounding area, including Po Yap Road, Tong Yin Street (North and East), Po Shun Road, etc. According to the contour plot, the wind flow between the Tower 2 of SDB and the planned cultural complex is slightly stronger in the base scheme due to the channelized effect and move straight toward south and pass through building gap between two planned school sites. Some mitigation measures are provided in the proposed notional scheme, i.e. there is a setback toward northeast at G/F to 2/F under Tower 2 (north wing) and the natural ventilated carpark at lower level to the east under Tower 2 (south wing), in order to enhance the ventilation to the west of the planned cultural complex and Chi Shin Street. It is observed that, in proposed notional scheme, wind passed through Tower 2 of SDB and cultural complex will move toward two planned school site and some wind benefited the Chi Shin Street. In addition, the void at ground floor between Tower 1 and Tower 2 in the proposed notional scheme would also allow some ENE wind to enter Chi Shin Street. Similar to NE wind, the building disposition of SDB aligned to Po Yap Road and setback from northern boundary in the proposed notional scheme could enhance the wind flow at Po Yap Road and future road P2 to the west of SDB slight better than the Base Scheme.

Wind performance under Wind Direction of E

According to the VR plot, the wind availability is generally higher in the E wind, compare to NNE to ENE wind, since the future development to the east is lower than the current building to the northeast.

Po Yap Road still act as the major air corridor under E wind. It is observed that overall ventilation performance is similar in surrounding area in both the base scheme and the proposed notional scheme. Similar to ENE wind, the wind flow between the Tower 2 of SDB and the planned cultural complex is slightly stronger in the base scheme due to channelized effect. Since setback under Tower 2 provided in proposed notional scheme to enhance the wind flow at that area, it is observed that the VR between two school sites are generally similar. On the other hand it is observed that the wind flow the wind flow is slightly stronger in base scheme to the south of JUB along Tong Yin Street (South) and therefore wind flow is a bit stronger in the future road P2, due to slightly stronger wind flow between Tower 2 of SDB and the planned cultural complex and therefore wind imposed southern area. Also, stepping design adopted in the proposed notional scheme at JUB created better wind at higher levels and then downwash to benefit pedestrian area, the wind flow is slightly stronger between JUB and planned school site due to channelized effect.

Wind performance under Wind Direction of ESE

Under ESE wind, It is observed that the wind flow mainly pass through the future road P2 and Tong Yin Street (South) to enter Po Shun Road and Tong Yin Street (North) respectively. It is noted that the VR contour is similar at the windward location, i.e. TKOTL 125 and TKOTL 95. However, it is also observed that the SDB will obstruct the ESE wind and create a wake area between SDB and Park Central in the base scheme. Therefore, mitigation measure is provided, i.e. the void at ground floor between Tower 1 and Tower 2. According to the contour plot, the building separation between Tower 1 and Tower 2 and the ground floor opening in the proposed notional scheme allow ESE wind flow to the wake area to the north of the subject site and enter the Po Shun Road (which is an important wind corridor to the inland residential development). It is observed that there are more wind flow pass thought the ground floor opening between Tower 1 and Tower 2 for SDB (and benefit Po Yap Road) and between Tower 1 of SDB and Tower B of the JUB (and benefit future road P2). On the other hand, the wind flow between the Tower 2 of SDB and the planned cultural complex is slightly stronger in the base scheme due to the channelized effect, but there are no observable different between base scheme and proposed notional scheme at the planned cultural complex.

Wind performance under Wind Direction of SE

The wind flow of SE wind is similar to ESE wind in upwind area. However, it is noted that there is a higher VR in between SDB and Park Central, due to the downwash wind generated by the Park Central. The downwash effect is stronger in the base scheme, since the building height is generally lower in the SDB of the base scheme, hence more wind can pass though at higher level and downwash to Po Yap Road and further flow toward north at Po Shun Road. In the proposed notional scheme, mitigation measure is provided in the proposed notional scheme and try to provide more opening at lower level and enhance the permeability at pedestrian level. It is observed that there are more wind flow pass thought the ground floor opening and the building separation between Tower 1 of SDB and Tower B of the JUB (and benefit future road P2) and the centre of subject site. On the other hand, the wind along road P2 is slightly stronger in the proposed notional scheme, since the building bulk is generally smaller in JUB of the proposed notional scheme and allowed more wind to enter road P2 at higher level and then downwash to benefit pedestrian area.

Wind performance under Wind Direction of SSE

Under SSE Wind, Tong Yin Street (North and east) become the major wind corridor allowing wind enter inland area. Downwash wind also observed at Po Yap Road to the north of subject site in both base and proposed notional scheme. The downwash effect is slightly stronger in the base scheme, since the building height is generally lower in the SDB of the base scheme, hence more wind can pass though at higher level and downwash to Po Yap Road. It is noted that the wind flow at future road P2 is slightly stronger in proposed notional scheme, due to the building separation is provide for JUB between Tower A and Tower B, and thus some wind can pass through. On the other hand, the wind along road P2 is slightly stronger in the proposed notional scheme, due to the smaller building bulk of the JUB in proposed notional scheme and allowed more wind to enter road P2 at higher level and downwash to benefit lower level area. However, it is observed that the VRs is slightly lower along Road P2 near the future Police Station and Clinic under the proposed Notional scheme, due to the higher building height in reduce the wind flow at higher level and therefore reduced the downwash effect to abovementioned area.

Wind performance under Wind Direction of S

Po Shun Road and future Road P2 act as major wind corridor under S wind. It is observed that there are higher VR in the proposed notional scheme at these two road, due to the building profile of the JUB (i.e. building separation is provide for JUB between Tower A and Tower B and smaller building bulk of the JUB in proposed notional scheme) mainly directed S wind flow along road P2 in the proposed notional scheme and benefit the Po Shun Road in the proposed notional scheme, rather than S wind in base scheme enter downwind area not only by road P2, but also by Chui Ling Road and building separation between SDB and JUB (as indicated in the streamline plot in **Appendix C**). In addition, the stepping design of Tower B of JUB enhanced wind flow to the south of subject site by stronger downwash effect. However, since more wind distributed to the west area of subject site, less wind flow to the east area of subject site in the proposed notional scheme. Therefore the VRs to the northeast (i.e. area between cultural Complex) and east (i.e. Chi Shin Street) of the subject site is slightly higher in the base scheme,

Wind performance under Wind Direction of SSW

Similar to S wind, the VRs is higher in proposed notional scheme at Po Shun Road and future road P2, due to the higher building permeability and the building profile of JUB, i.e. building separation is provide for JUB between Tower A and Tower B and smaller building bulk of the JUB in proposed notional scheme. But VRs is low in the proposed notional scheme to the northeast of subject site, due to the stronger downwash effect from Park Centre in base scheme, i.e. the lower building height in base scheme imposed more wind flow at higher level and therefore lead to a stronger downwash effect. On the other hand, it also observed that the wind flow along Chi Shin Street is better in the proposed notional scheme, since there are more opening, i.e. The natural ventilated carpark under Tower 2 (South Wing) to the south and carriageway under landscaped roof to the south of Tower 1, along west-east in both SDB and JUB of proposed notional scheme and the higher building height of SDB created a stronger downwash wind to abovementioned area. In addition, the stepping design of the JUB enhanced wind flow between JUB and planned school site by stronger downwash effect and thus benefited area in the centre of the site and Chi Shin Street.

Wind performance under Wind Direction of SW

According to the VR plot, the VR of SW wind is generally lower that southern wind, since the topography is higher to the southwest direction and obstructed the wind flow. Basically, the wind availability is similar for both the base scheme and the proposed notional scheme. The VR result are also comparable for two schemes. It is observed that the wind flow at Chi Shin Street is stronger in the base scheme, due to stronger channelized effect between SDB and JUB. Po Yap Road served as major wind corridor under SW wind and benefit the residential development to the northeast of subject site.

Wind performance under Wind Direction of WSW

Similar to SW wind, the wind availability is lower at WSW wind and the ventilation performance is similar in both the base scheme and the proposed notional scheme. It is observed that the wind flow at Chi Shin Street is stronger in the base scheme, it is due to smaller building gap between SDB and JUB in base scheme enhanced the wind flow by channelized effect. Also, since the wind flow to Chi Shin Street is stronger in the base scheme, less wind can enter the building separation between tower 2 of SDB and cultural complex. On the other hand, It is observed that there is a large wake area to the north of subject site in the base scheme, since the large building frontage of SDB in base scheme obstructed the southwest wind flow. Furthermore, the ventilation performance of the proposed notional scheme is better to the north and northeast of subject site, the provide opening (i.e. carriageway under the landscaped roof between Tower 1 and Tower 2 (North Wing), and to the south of Tower 1) and setback (i.e. at to the south at 1/F to 2/F of Tower 1) enhanced the wind flow at leeward area.

6.2.3 Mitigation Measure

As discussed in above section, the higher building height in the proposed notional scheme would reduce the downwash wind along Po Yap Road from Park Centre. However, the proposed notional scheme provided several building setback and opening as indicated in the **Figure 8**, i.e. a setback at G/F to 2/F to the northeast under Tower 2 (North Wing), A void at 1/F to 2/F and 12/F to 14/F in the Tower 2 (Linked Area), a setback to the south at 1/F to 2/F of Tower 1, some carriageway/ carpark area at G/F (i.e. one under Tower 2 (South Wing) to the east and south, one under the landscaped roof between Tower 1 and Tower 2 (North Wing), one under the landscaped roof to the south of Tower 1) and one building separation (around 7m) between Tower A and B of JUB.

According to the CFD simulation, the building permeability is better in the proposed notional scheme and benefit the wind penetration, especially in pedestrian level. For example, the void at G/F and the void at 1/F to 2/F and 12/F to 14/F in the Tower 2 (Linked Area) setback to the south at 1/F to 2/F of Tower 1 and setback to the south at 1/F to 2/F of Tower 1 the would possibly enhance the East-west wind flow within the site and toward downwind area under annual condition, i.e. ENE and E wind could easily pass though the void and reach area within the subject site and downwind area (future Road P2) under both annual and summer condition. The setback at G/F to 2/F to the northeast under Tower 2 (North Wing) and the natural ventilated carpark under Tower 2 (South Wing) to the east can impose more North-south wind flow along Po Yap Road and area between Cultural Complex and Tower 2 and benefit Chi Shin Street and two proposed school site under Northerly wind under annual condition, and benefit Po Yap Road under summer condition. The natural ventilated carpark under

Tower 2 (South Wing) to the south and carriageway under landscaped roof to the south of Tower 1 would enhance the East-west wind flow along Chi Shin Street and Road P2 at pedestrian level under both annual and summer condition. The carriageway under the landscaped roof between Tower 1 and Tower 2 (North Wing) would enhance the north-south wind flow and benefit Po Yap Road under summer condition. On the other hand, the 7m building separation and disposition in JUB would possibly enhance the wind flow at Road P2 and Po Shun Road under summer condition.

7.0 Conclusion

The Base and Proposed Notional Schemes at the subject site at TKO area 67 have been evaluated from air ventilation standpoint. It is noted that the proposed notional scheme provided several mitigation measures in order to enhance the wind flow, i.e. a setback at G/F to 2/F to the northeast under Tower 2 (North Wing), A void at 1/F to 2/F and 12/F to 14/F in the Tower 2 (Linked Area), a setback to the south at 1/F to 2/F of Tower 1, some carriageway/ carpark area at G/F (i.e. one under Tower 2 (South Wing) to the east and south, one under the landscaped roof between Tower 1 and Tower 2 (North Wing), one under the landscaped roof to the south of Tower 1) and one building separation (around 7m) between Tower A and B of JUB.

According to the expert evaluation, the Proposed Notional Scheme is considered better than the Base Scheme in terms of building disposition and building permeability whereas the Base Scheme will result in slightly less blockage due to building height. Overall speaking, it is likely that the Proposed Notional Scheme would have better air ventilation performance.

According to the quantitative assessment result, the VRs are generally similar in order, but the proposed notional scheme have slightly better spatial average VRs at Po Shun Road and Tong Yin Street (north) which are two major breezeway to inland area under summer wind. It is observed that the proposed mitigation measure can effectively enhance the wind flow at pedestrian level in the proposed notional scheme.

This study demonstrates that the Proposed Notional Scheme will perform better than the Base Scheme from air ventilation standpoint.

Figures

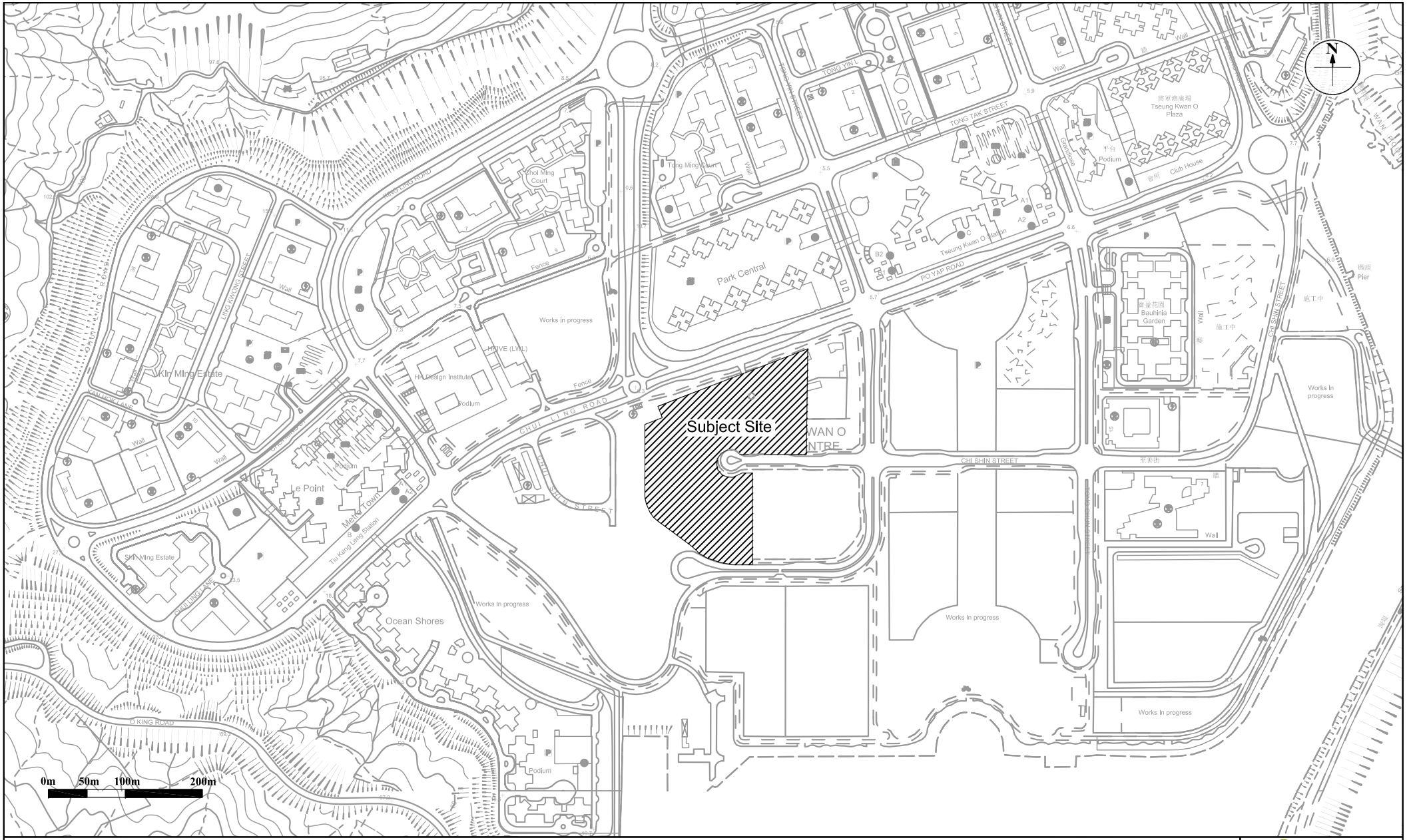
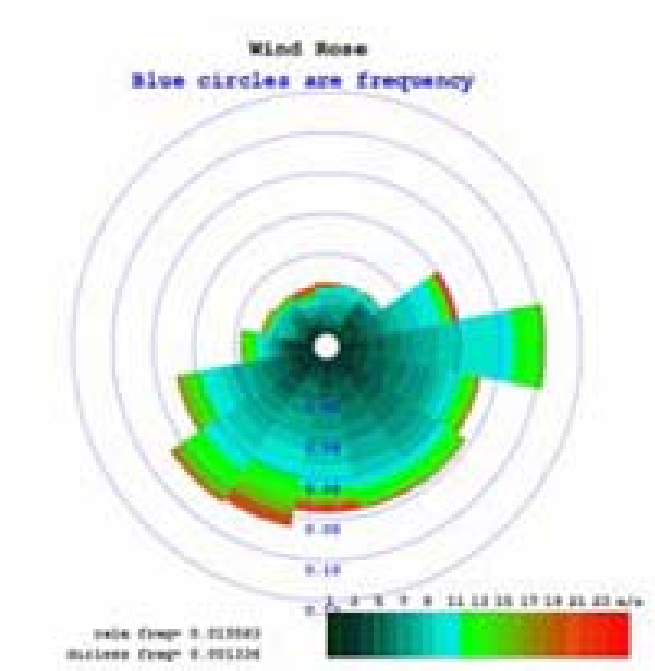


Figure: 1	ENVIRON
Title: Location of the Application Site and its Environs	Drawn by: CC Checked by: TC
Project: S16 Application for Minor Relaxation of Building Height, Proposed Government Buildings in Area 67, TKO	Rev.: 1.0 Date: Apr 15

Summer
Height: 450m



Annual
Height: 450m

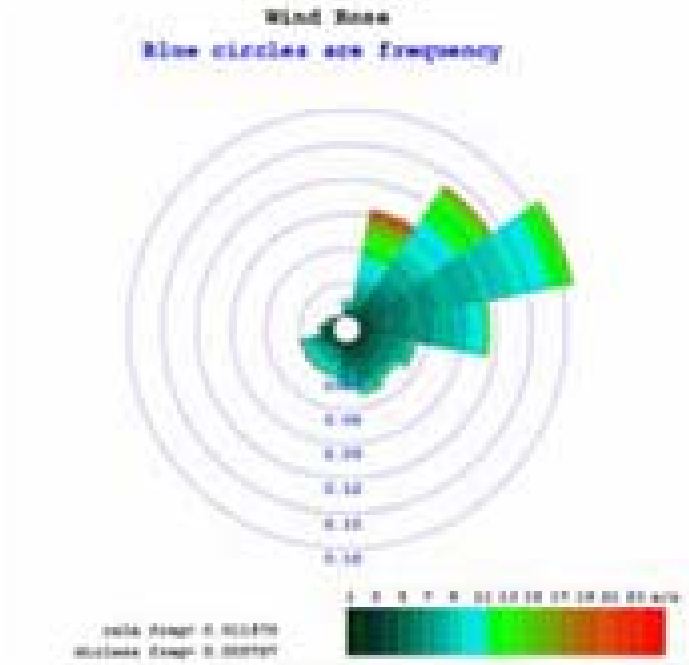


Figure:	2	ENVIRON
Title:	**Windrose Diagram representing V∞ of the Area under Concern**	Drawn by: JL Checked by: CC
Project:	**S16 Application for Minor Relaxation of Building Height, Proposed Government Buildings in Area 67, TKO**	Rev.: 1.0 Date: May 2015

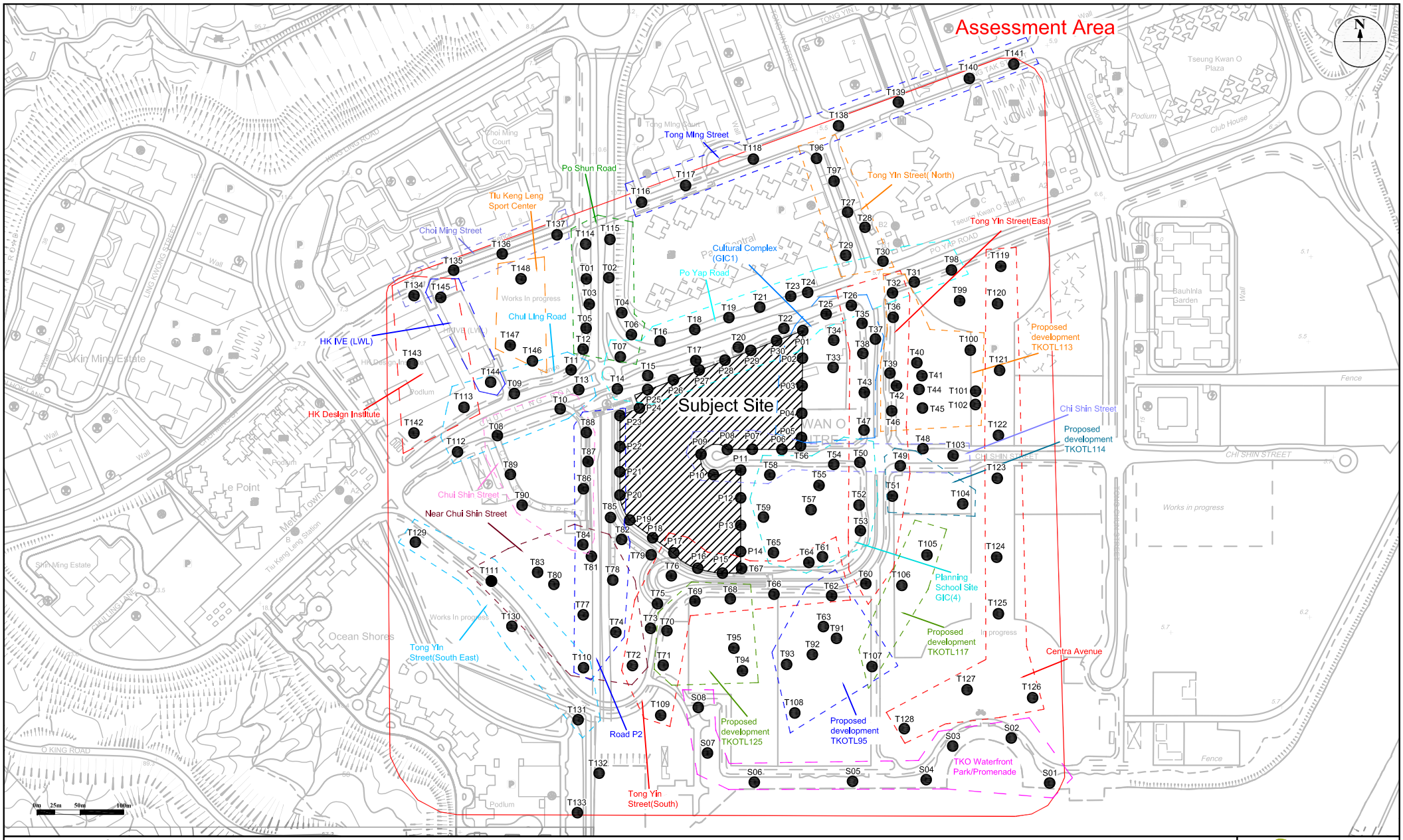


Figure: 3	ENVIRON
Title: Test Points selected for Quantitative Air Ventilation Assessment	Drawn by: JL Checked by: CC
Project: S16 Application for Minor Relaxation of Building Height, Proposed Government Buildings in Area 67, TKO	Rev.: 1.1 Date: June 2015

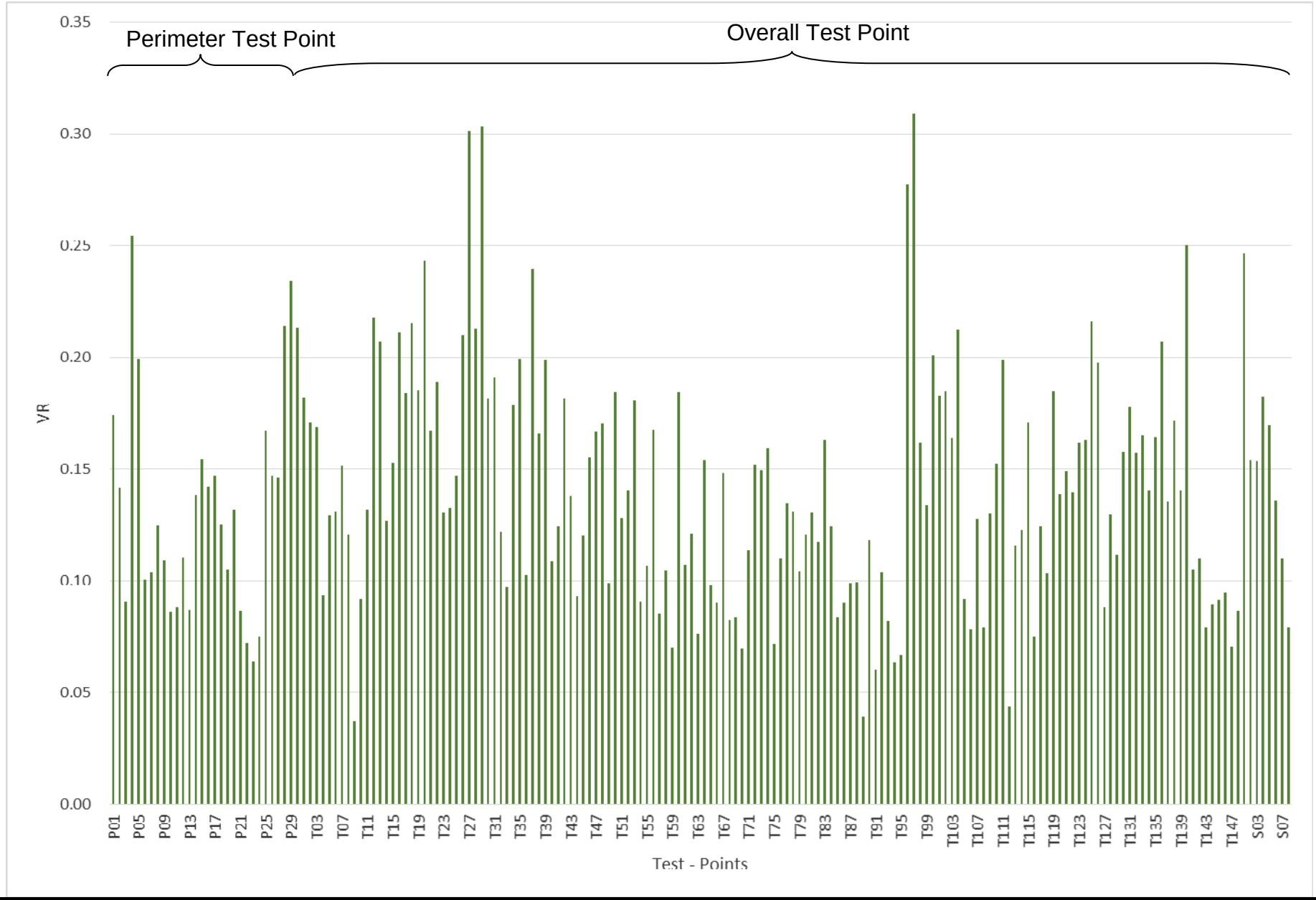


Figure: 4	ENVIRON
Title: Wind Velocity Ratios of Individual Test Points for Base Scheme (Annual)	Drawn by: JL
	Checked by: CC
Project: S16 Application for Minor Relaxation of Building Height, Proposed Government Buildings in Area 67, TKO	Rev.: 1.1
	Date: June 2015

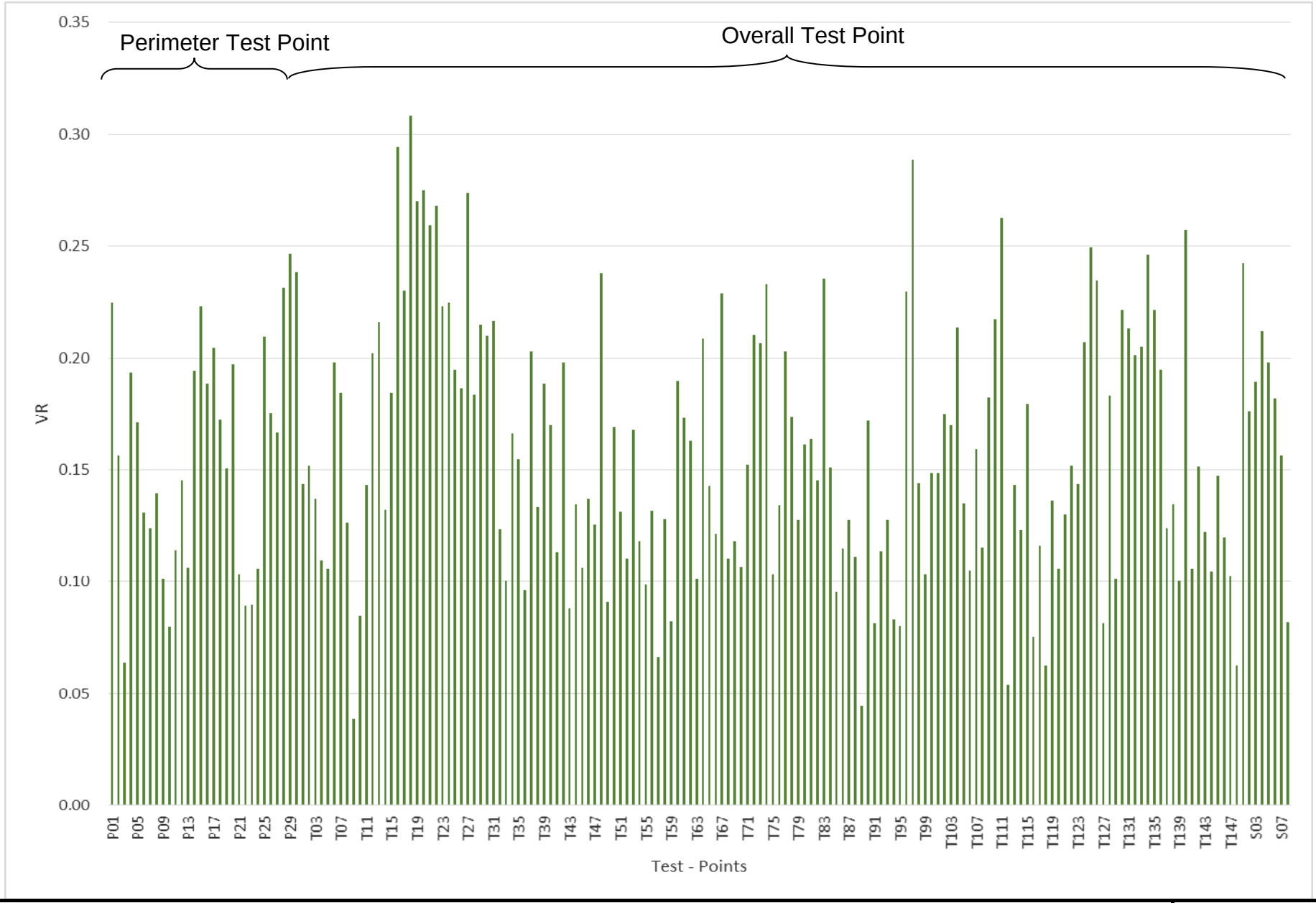


Figure: 5	ENVIRON
Title: Wind Velocity Ratios of Individual Test Points for Base Scheme (Summer)	Drawn by: JL
	Checked by: CC
Project: S16 Application for Minor Relaxation of Building Height, Proposed Government Buildings in Area 67, TKO	Rev.: 1.1
	Date: June 2015

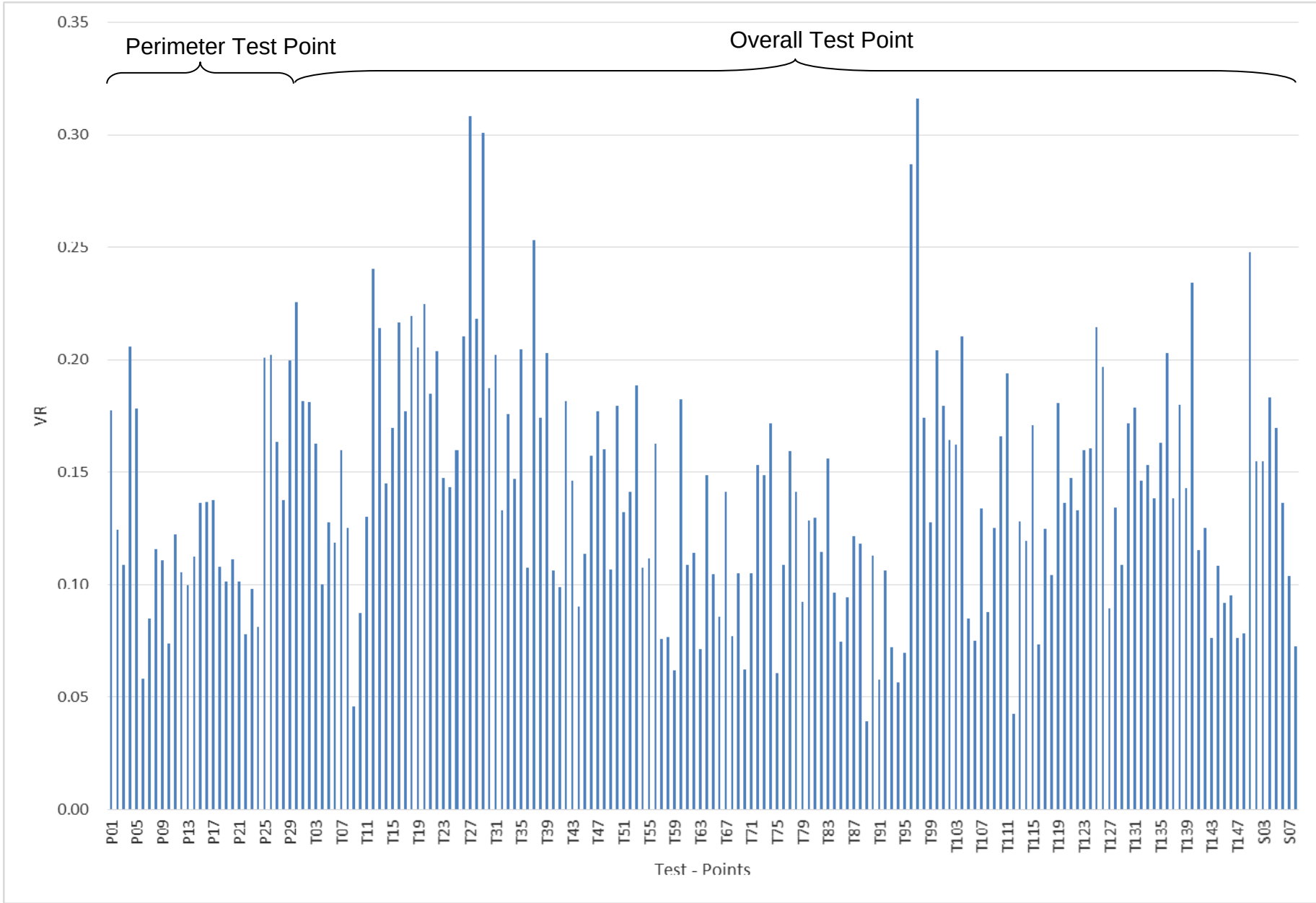


Figure: 6	ENVIRON
Title: Wind Velocity Ratios of Individual Test Points for Proposed Notional Scheme (Annual)	Drawn by: JL Checked by: CC
Project: S16 Application for Minor Relaxation of Building Height, Proposed Government Buildings in Area 67, TKO	Rev.: 1.1 Date: June 2015

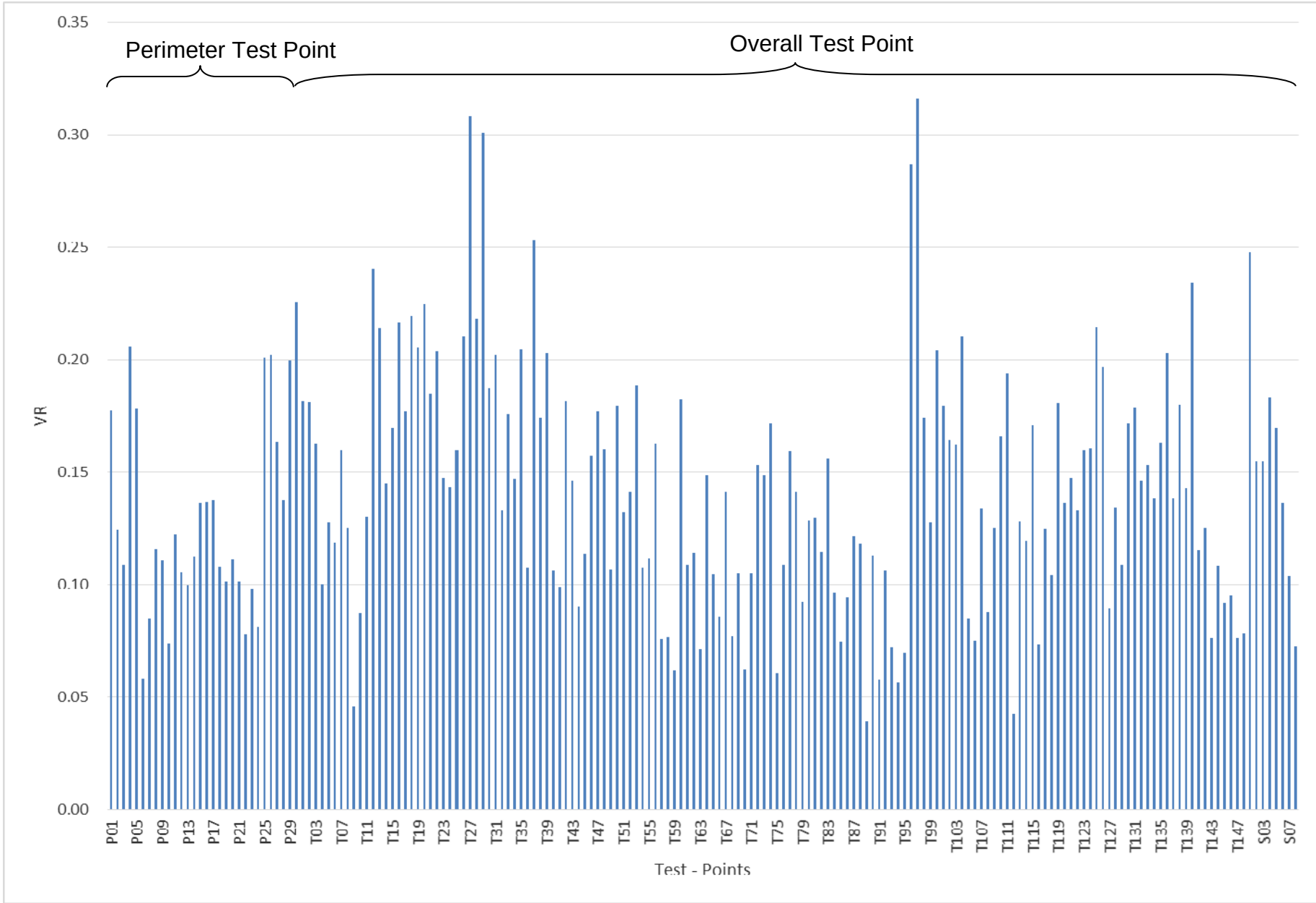


Figure: 7	ENVIRON
Title: **Wind Velocity Ratios of Individual Test Points for Proposed Notional Scheme (Summer)**	Drawn by: JL
	Checked by: CC
Project: **S16 Application for Minor Relaxation of Building Height, Proposed Government Buildings in Area 67, TKO**	Rev.: 1.1
	Date: June 2015

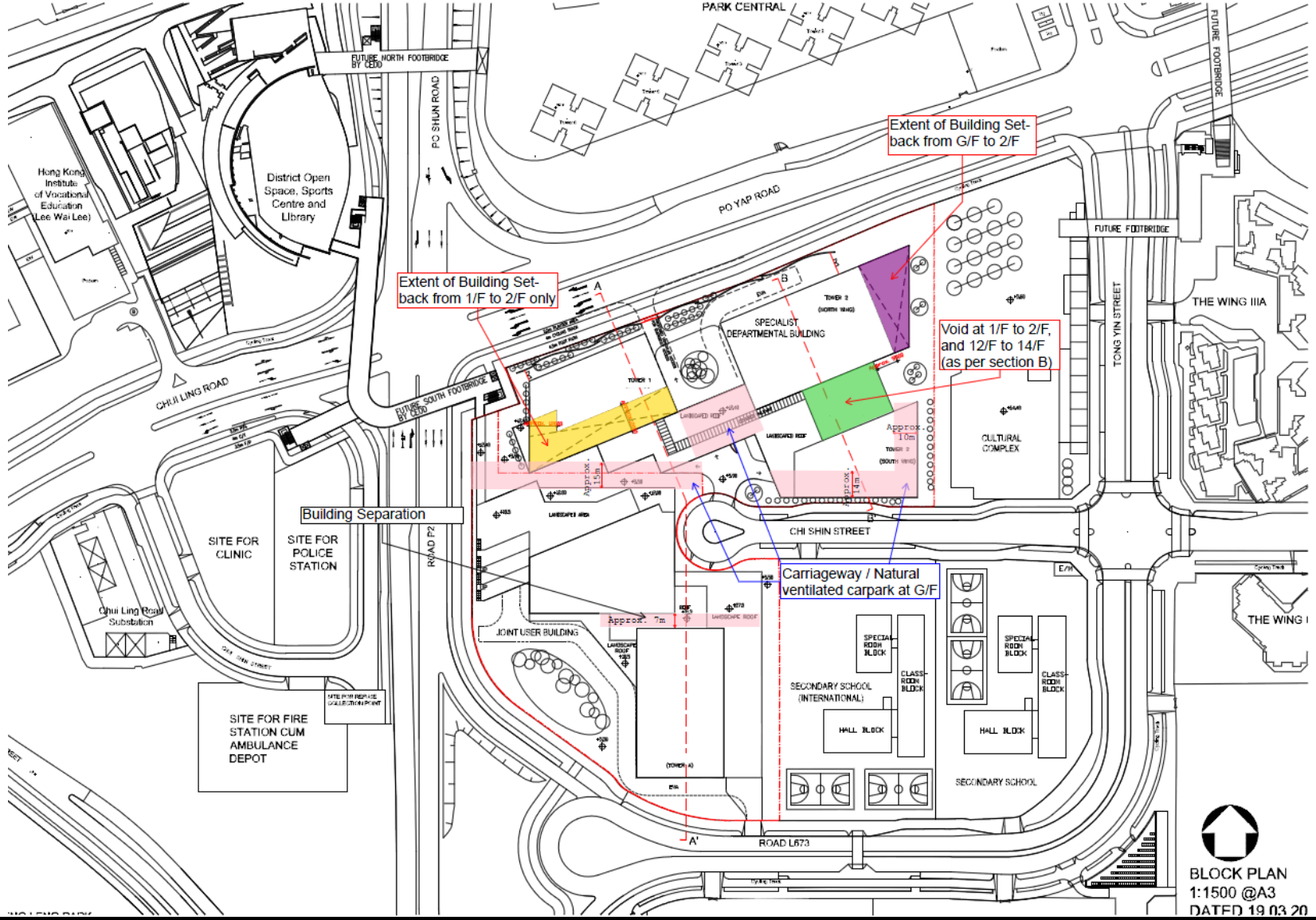


Figure: 8	ENVIRON
Title: Extent of Building Setback and void of the Proposed Notional Scheme	Drawn by: JL Checked by: CC
Project: S16 Application for Minor Relaxation of Building Height, Proposed Government Buildings in Area 67, TKO	Rev.: 1.1 Date: June 2015

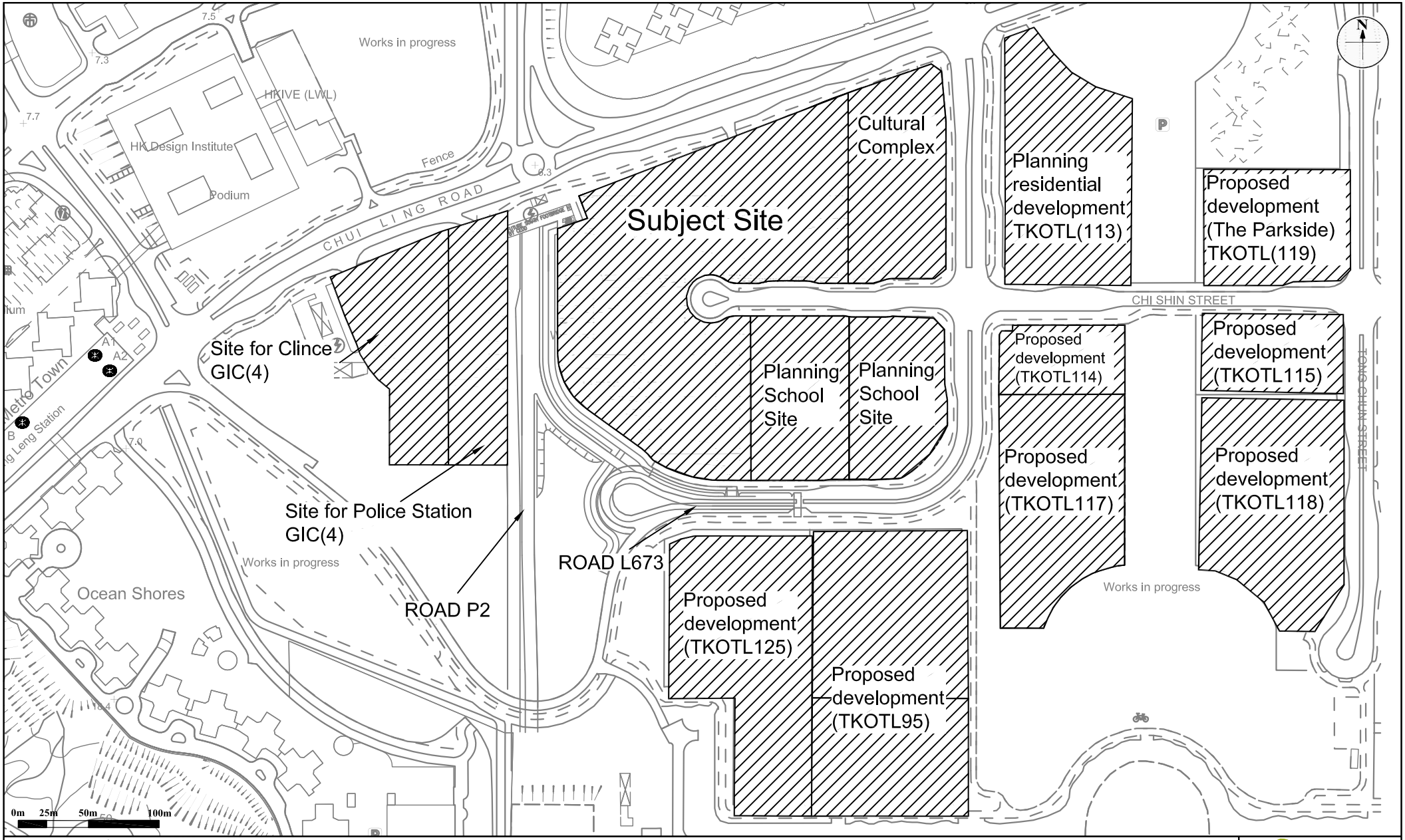


Figure: 9	ENVIRON
Title: Surrounding planned/ planning development	Drawn by: JL Checked by: CC
Project: S16 Application for Minor Relaxation of Building Height, Proposed Government Buildings in Area 67, TKO	Rev.: 1.0 Date: May 2015

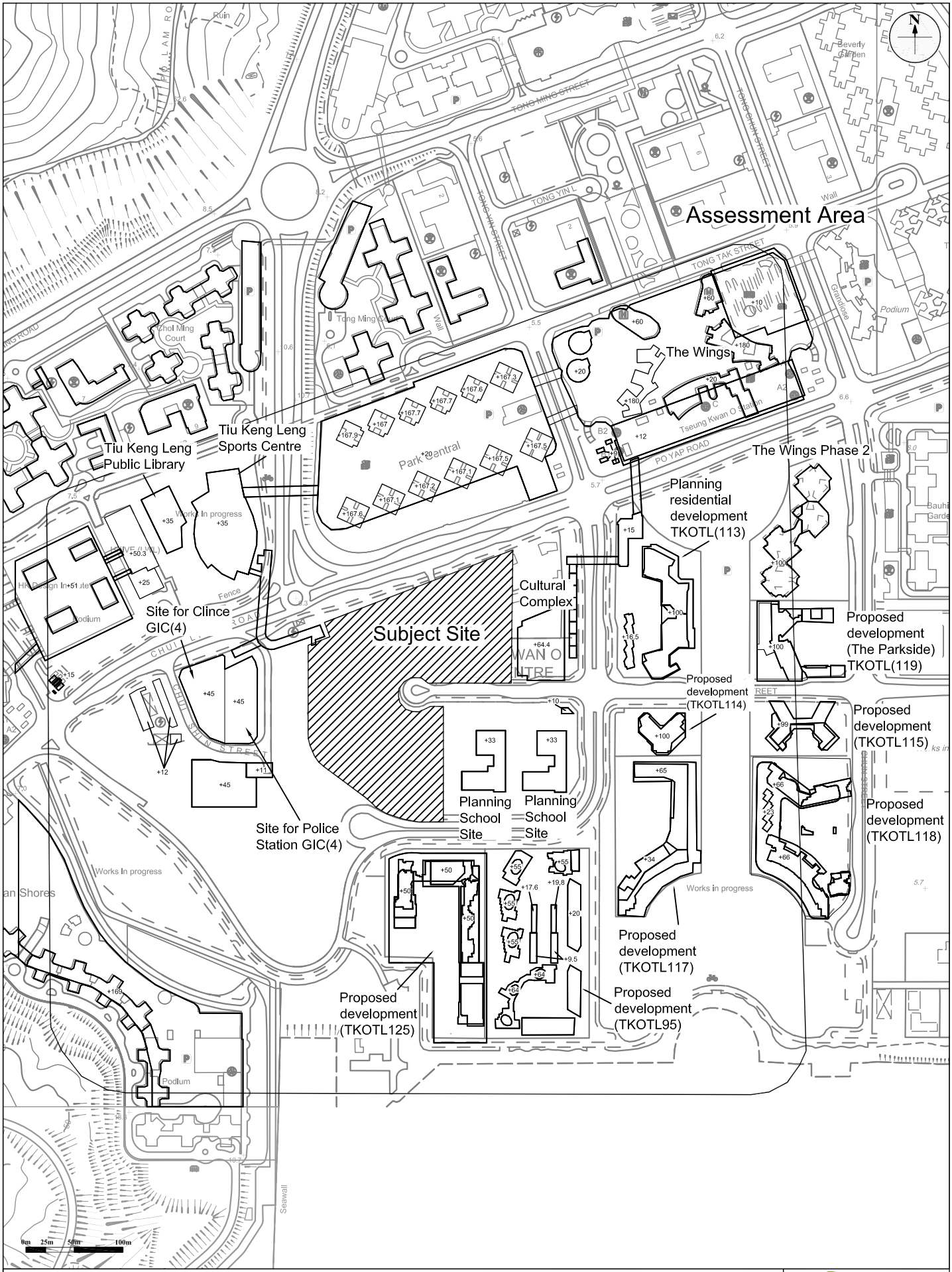
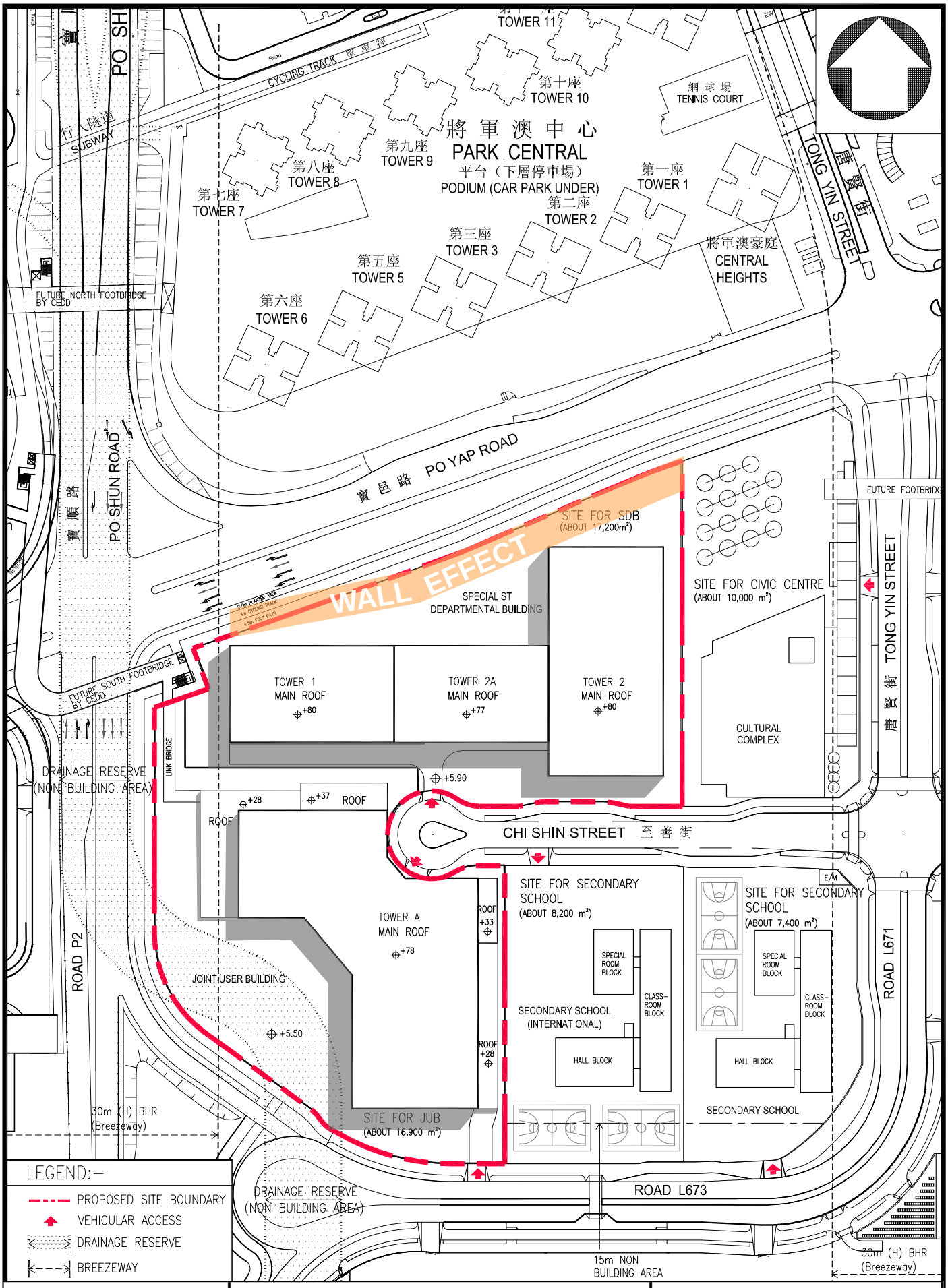


Figure: 10		ENVIRON
Title: Building Height of Surrounding Developments		Drawn by: JL
		Checked by: CC
Project: S16 Application for Minor Relaxation of Building Height, Proposed Government Buildings in Area 67, TKO		Rev.: 1.1
		Date: June 2015

Appendix A:
Layout of the Proposed Notional Scheme



Source:
Architectural Services Department

Base Scheme

Proposed Government Building in Area 67, Tseung Kwan O

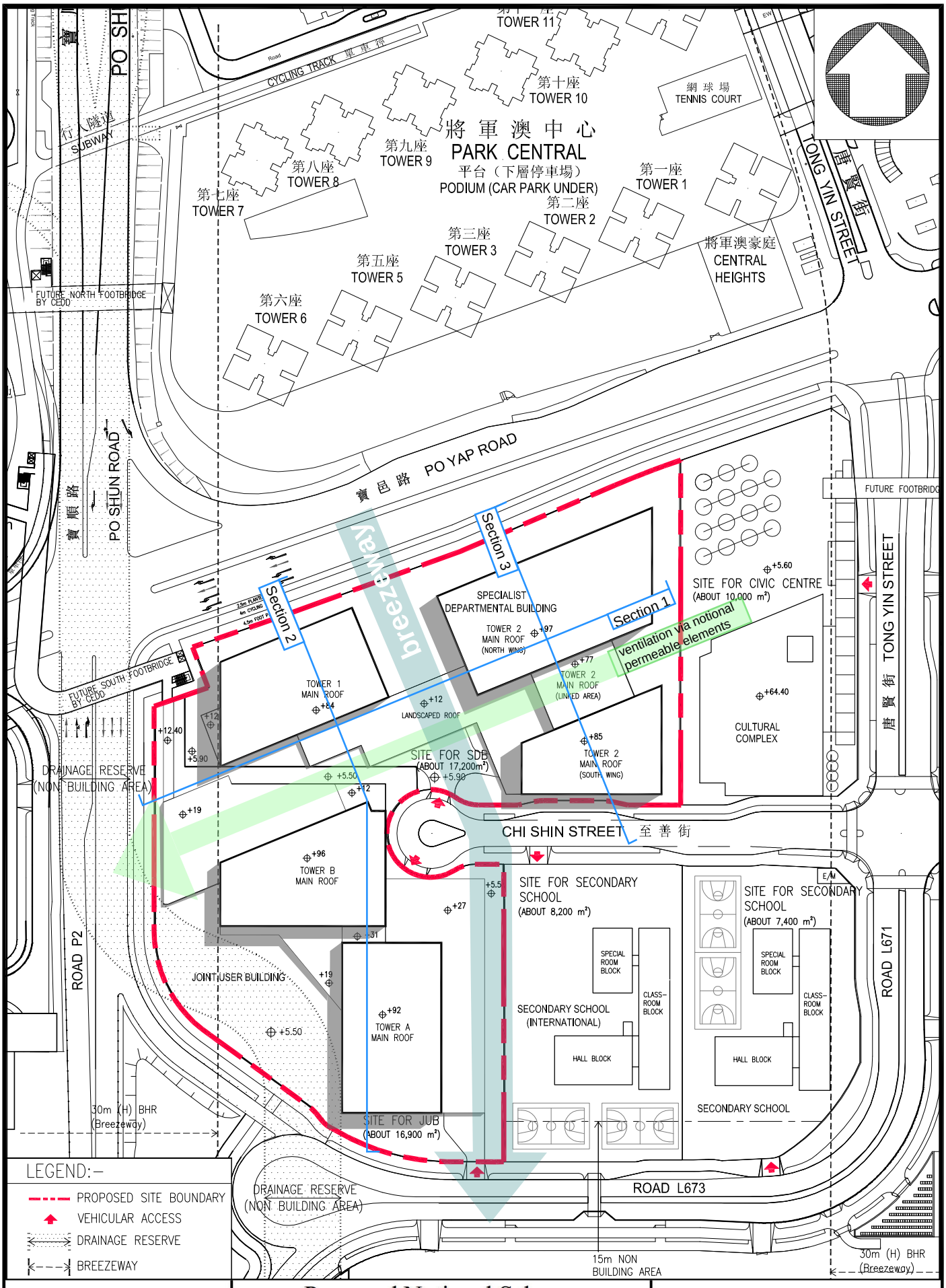
Scale 1 : 2 000

Plan 3.1

PlanArch Consultants Ltd.

Revision: Date: 27.5.2015

Appendix B:
Layout of the Base Scheme



Source:
Architectural Services Department

Proposed Notional Scheme

Proposed Government Building in Area 67, Tseung Kwan O

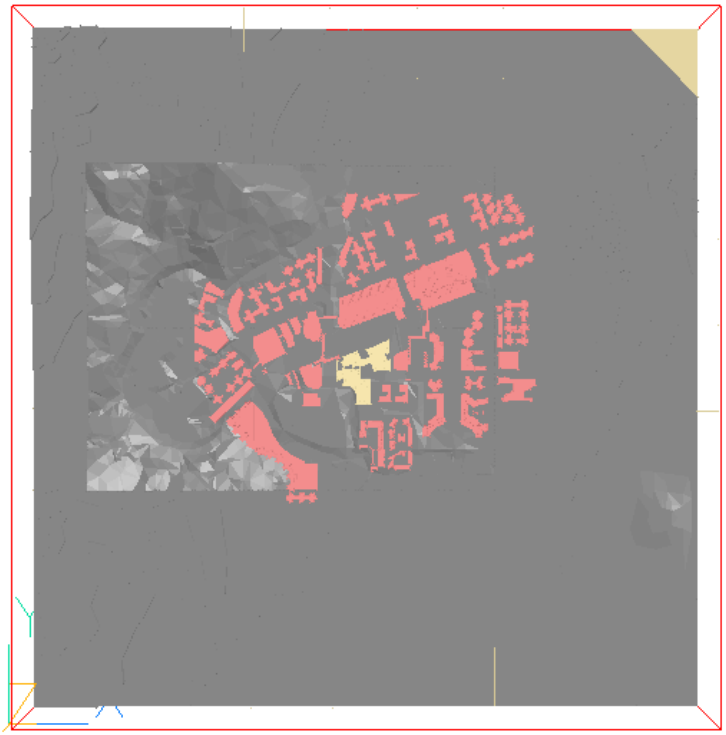
Scale 1 : 2 000

Plan 3.2

PlanArch Consultants Ltd.

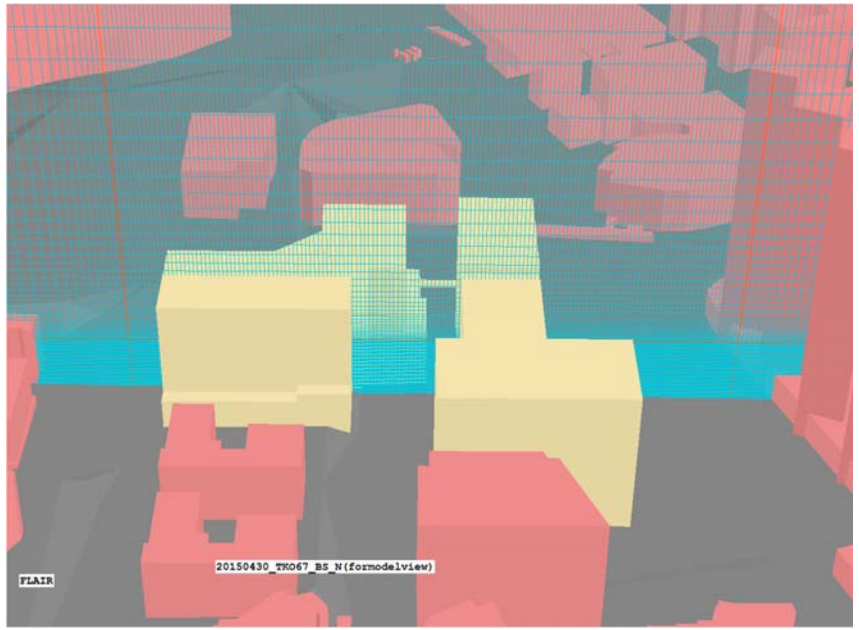
Revision: Date: 27.5.2015

Appendix C:
Captured Pictures of the CFD Model



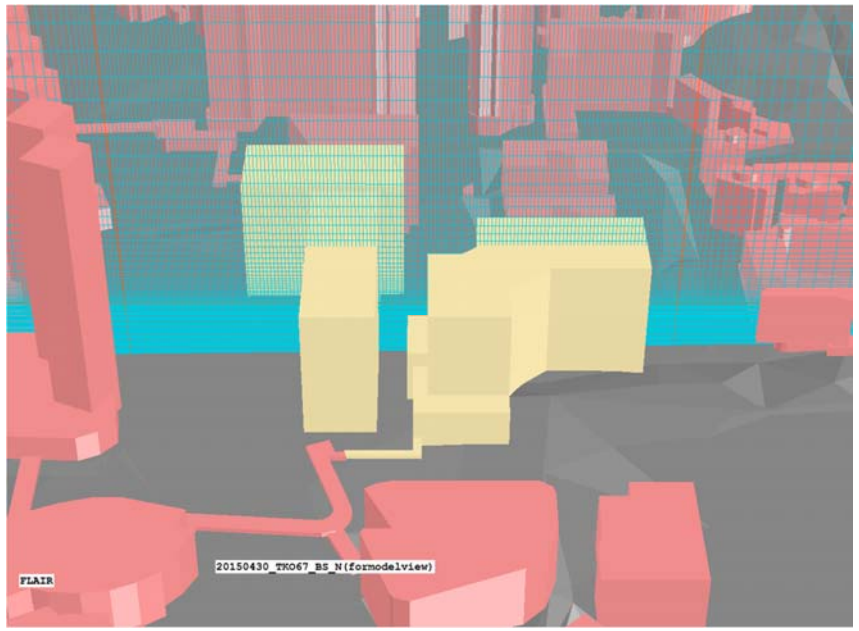
Domain

Base Scheme - N

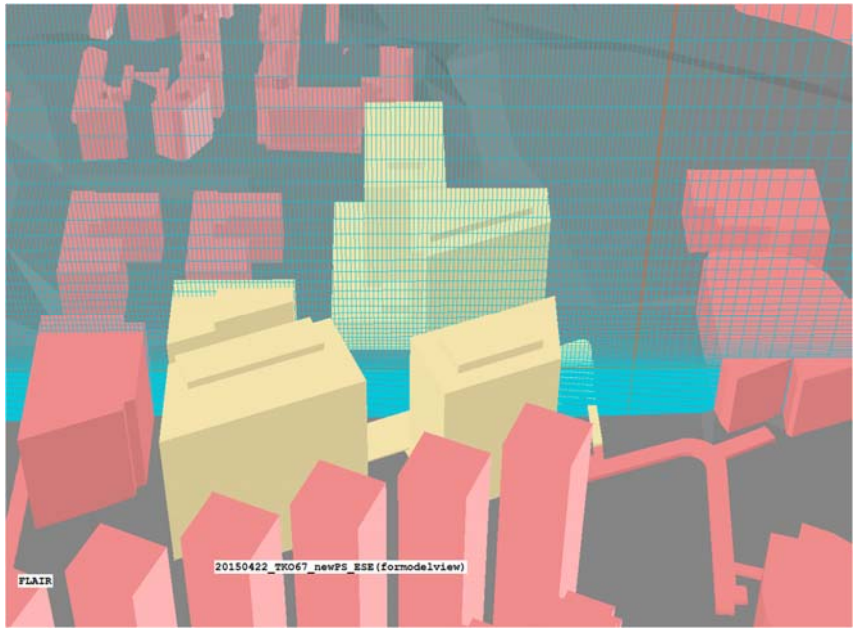


Base Scheme - E

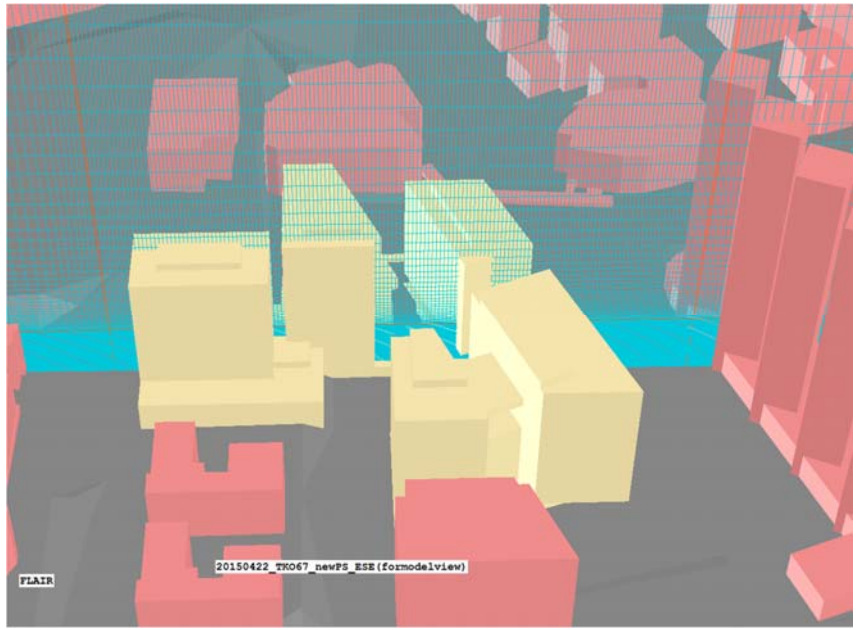
Base Scheme - S



Base Scheme - W

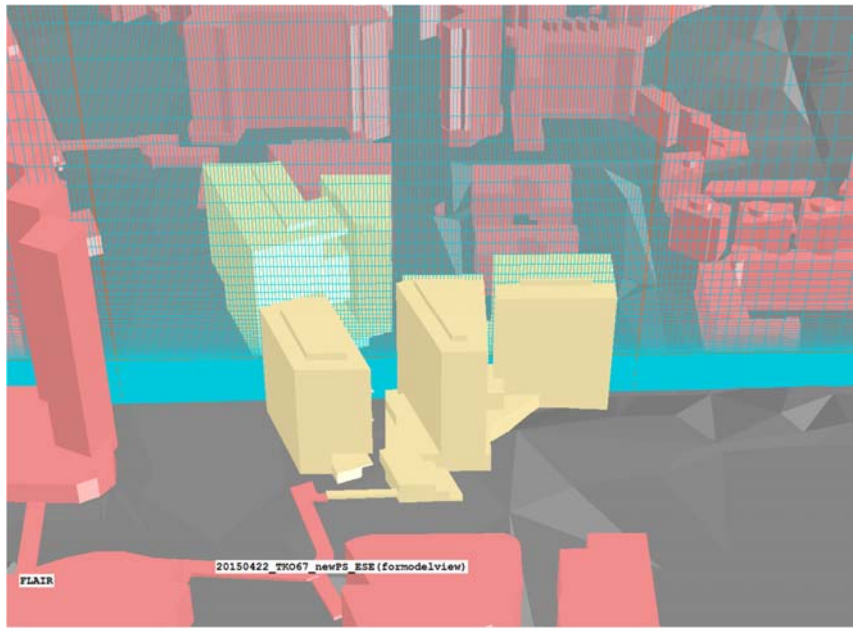


Proposed Notional Scheme - N

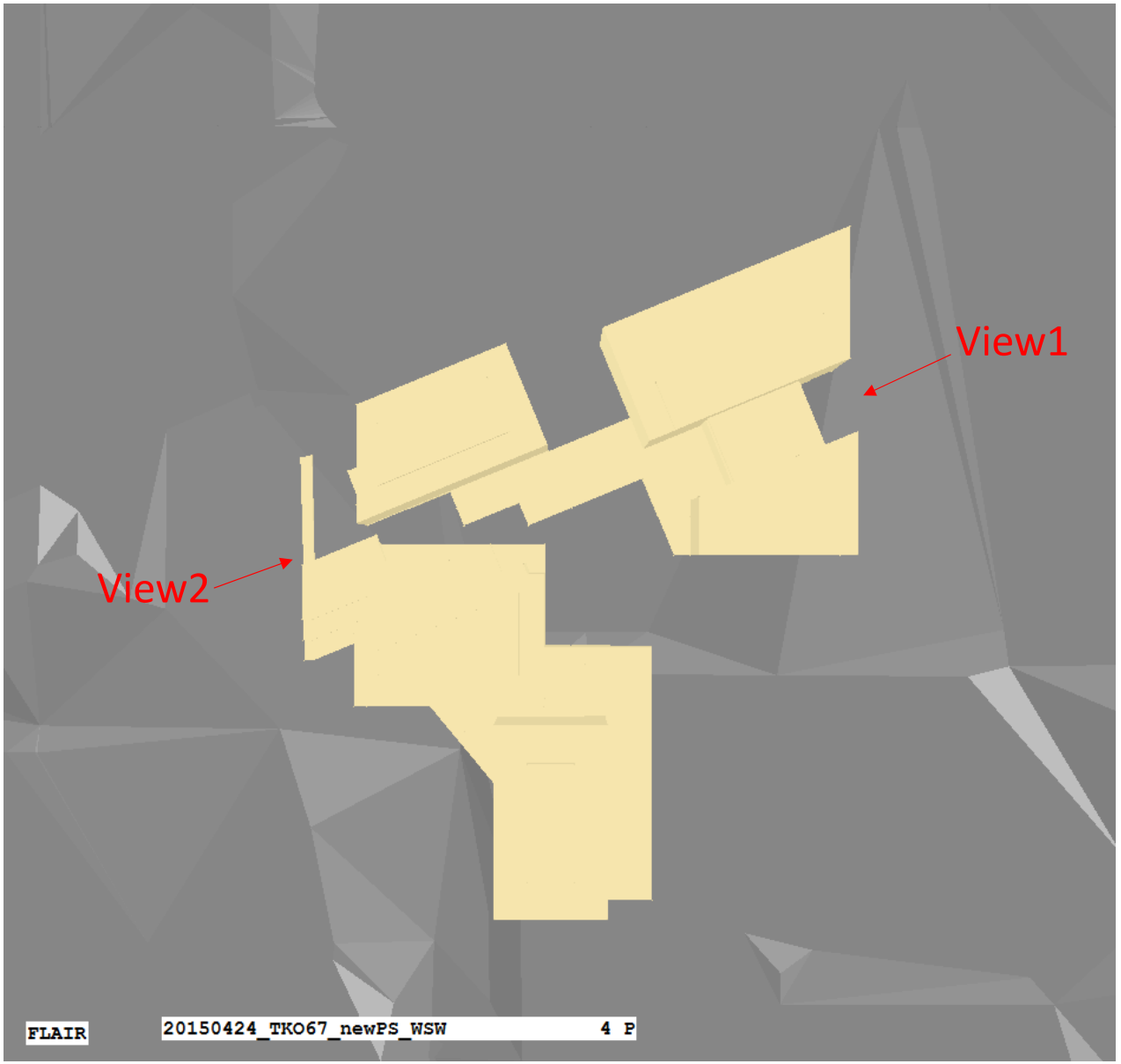


Proposed Notional Scheme - E

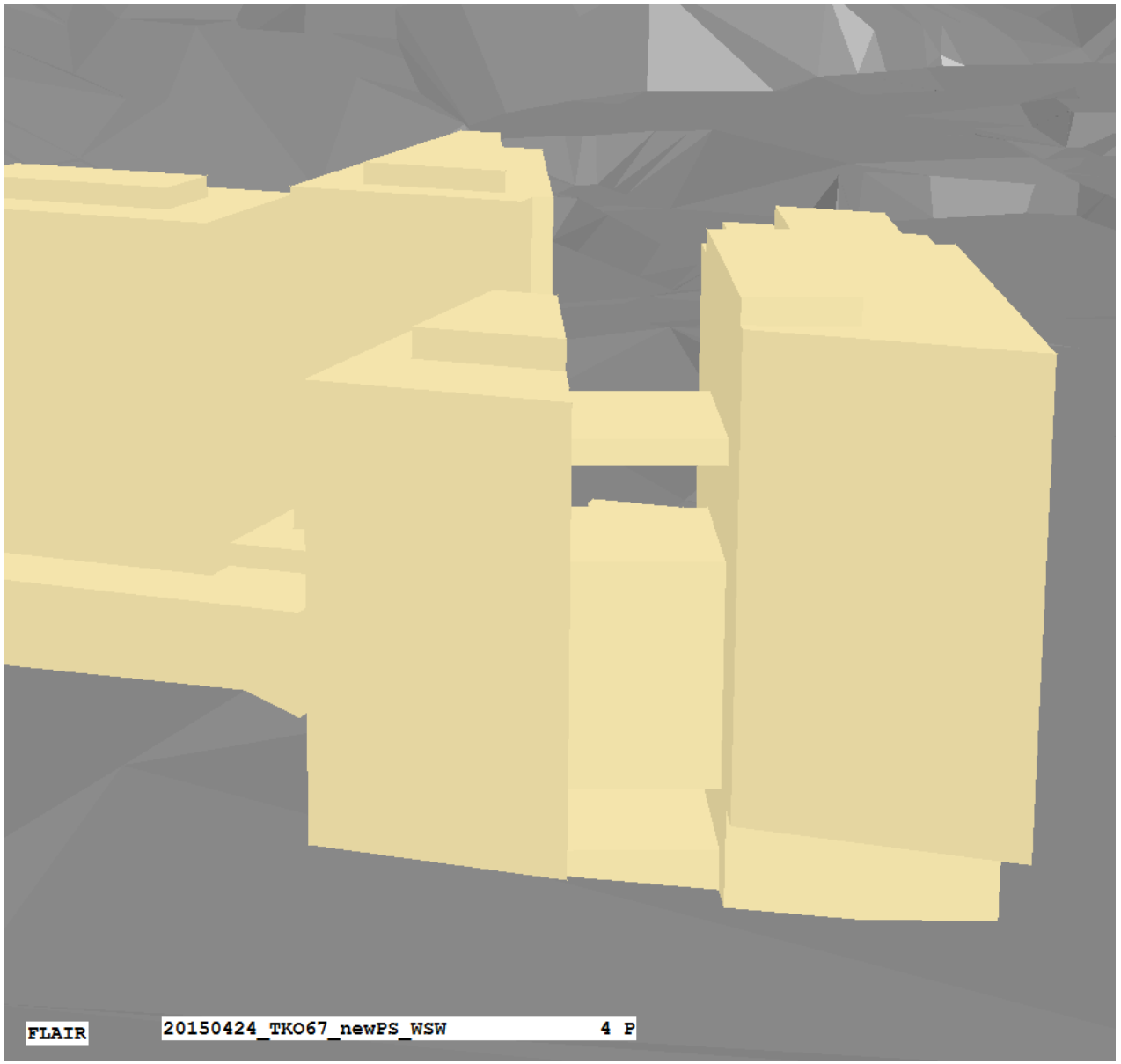
Proposed Notional Scheme - S



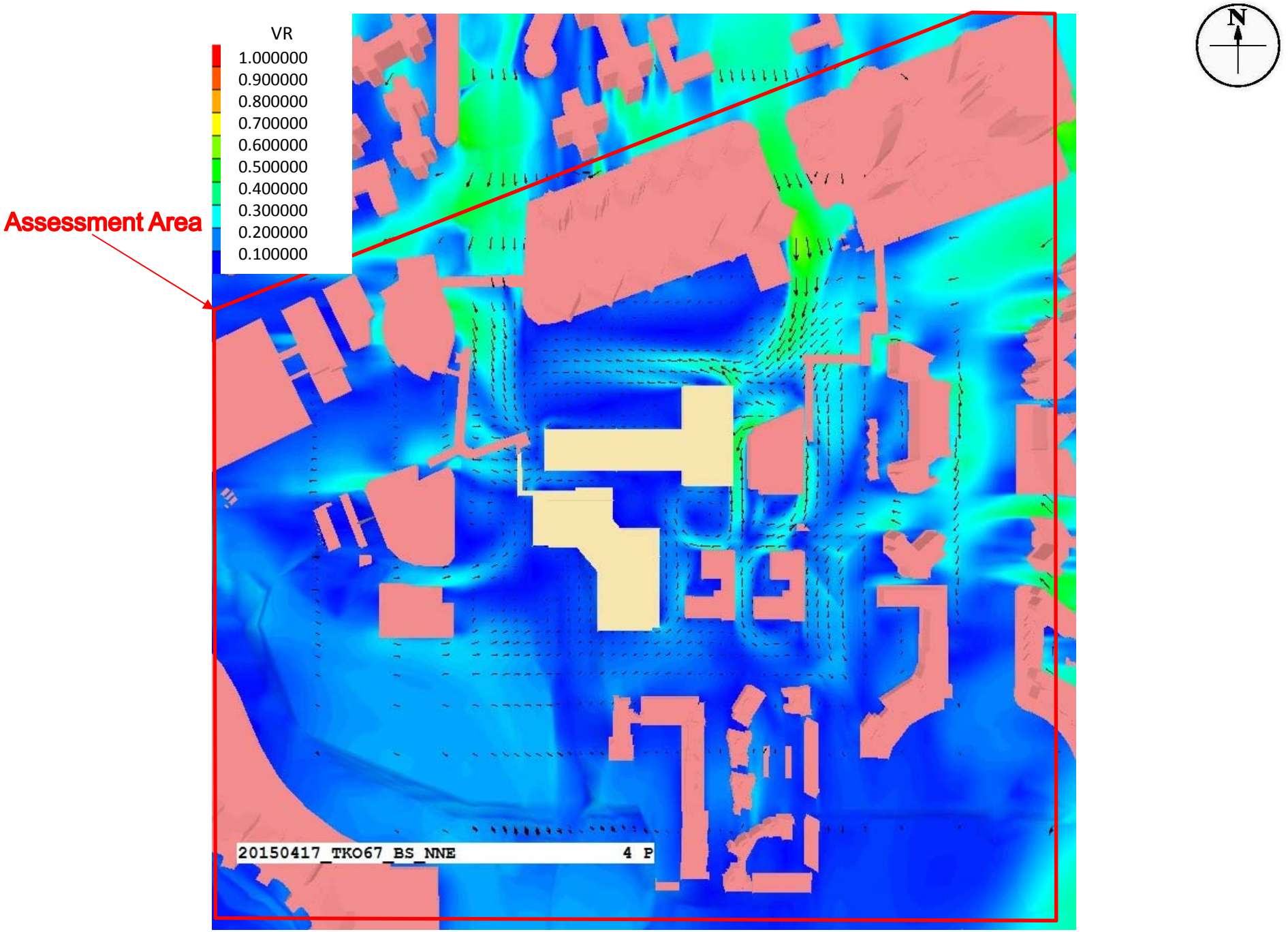
Proposed Notional Scheme - W



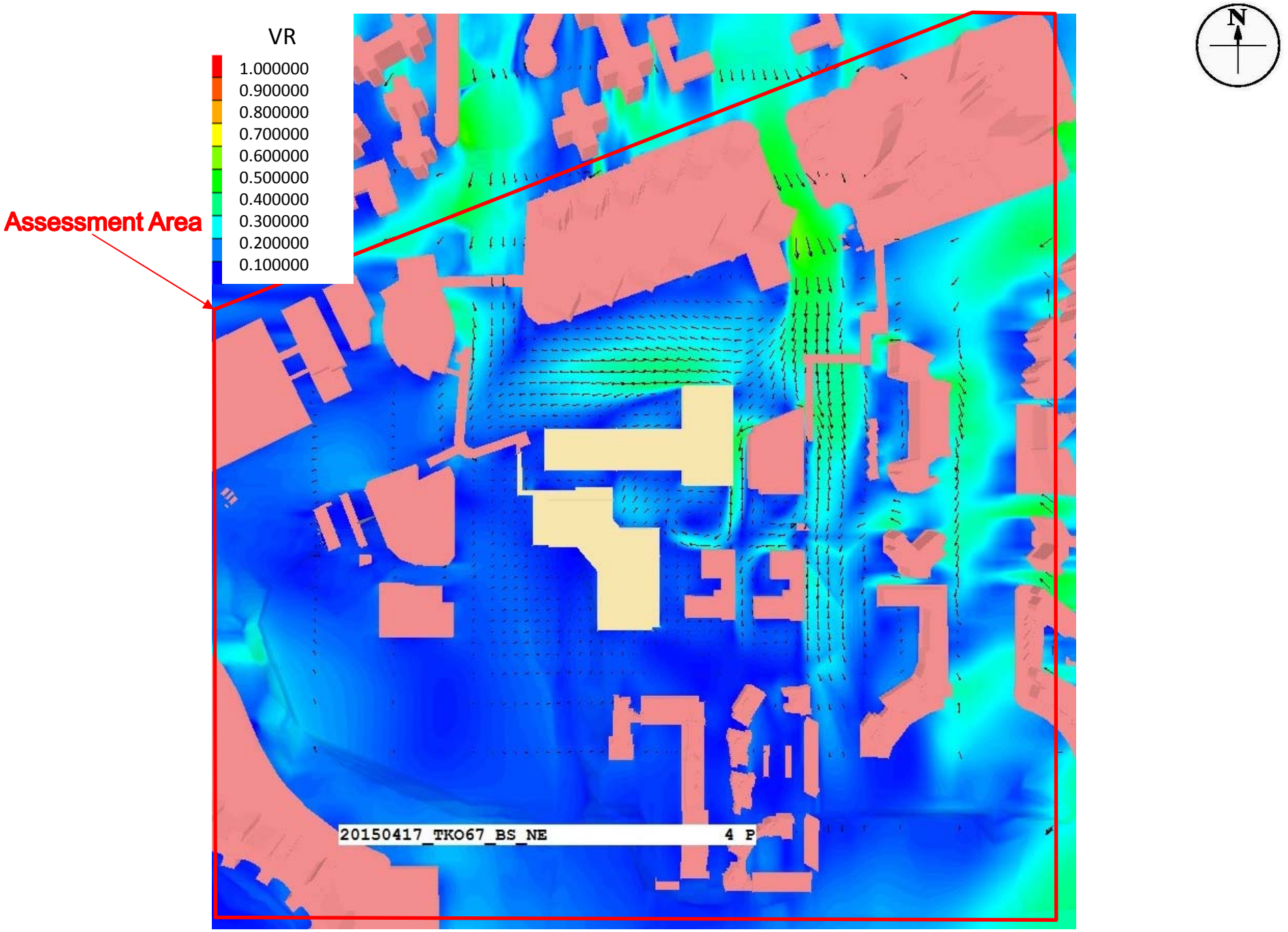
Overview



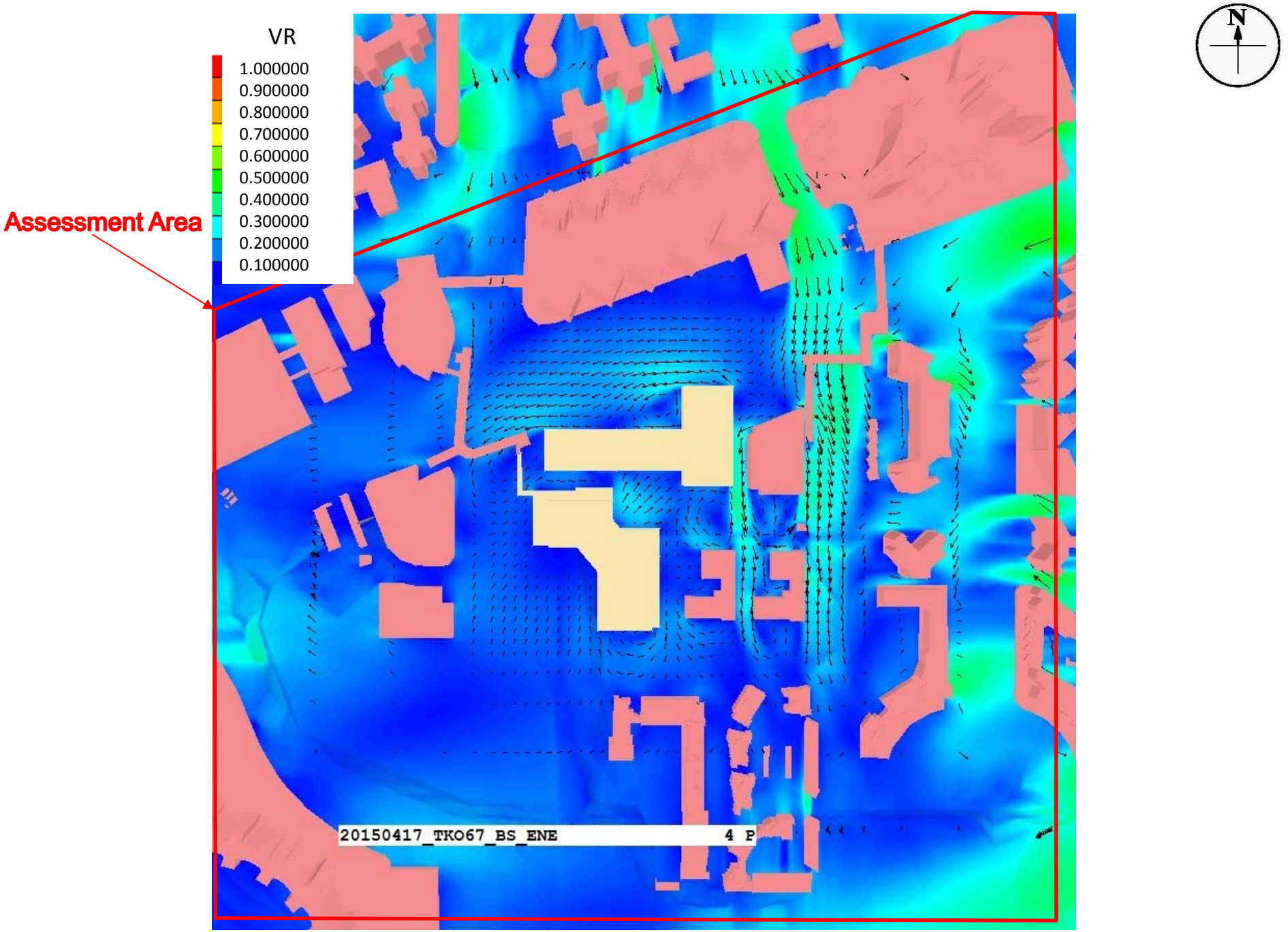
View1



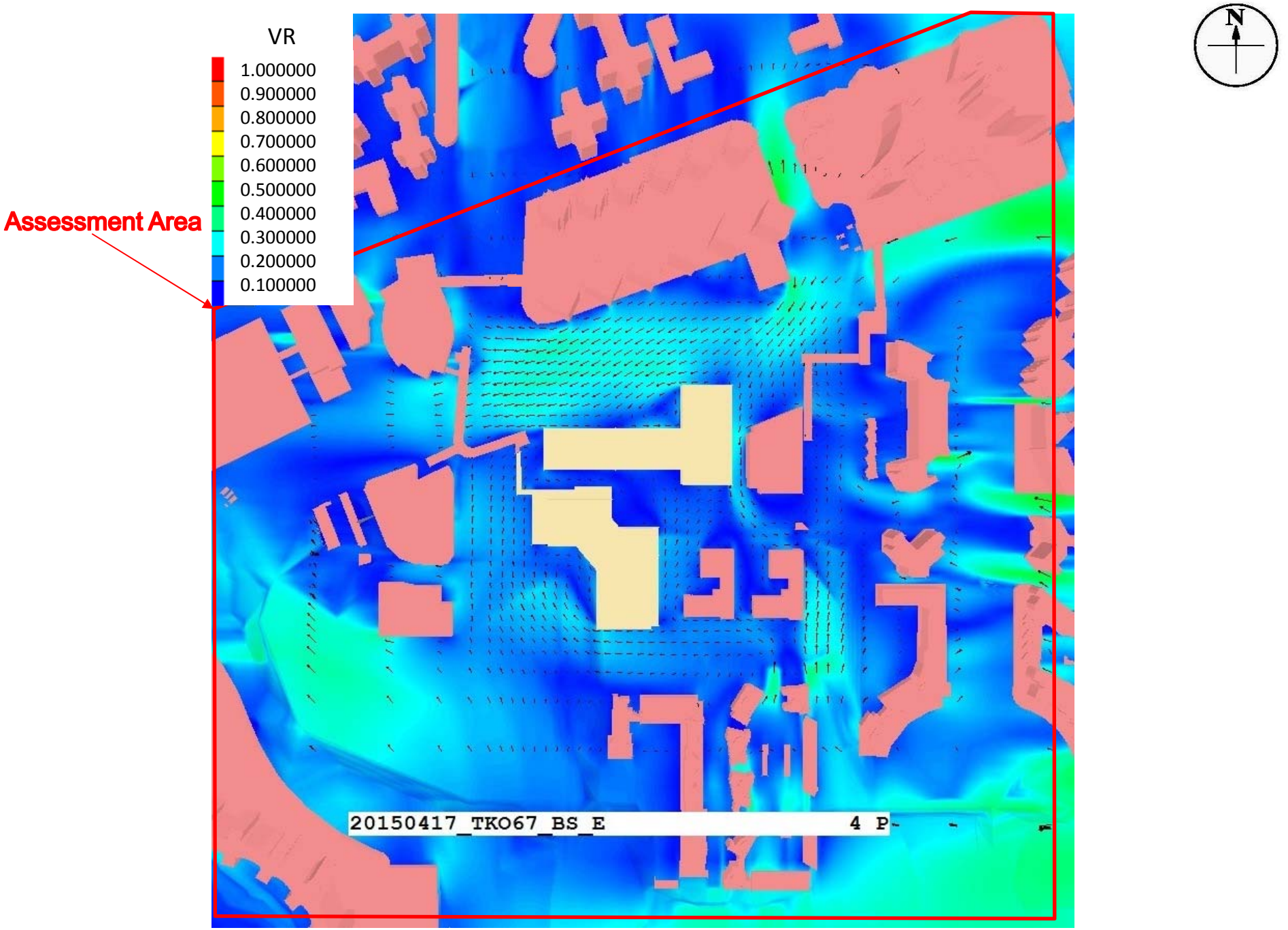
Base Scheme - Wind speed colour and vector plot at pedestrian level under NNE Wind



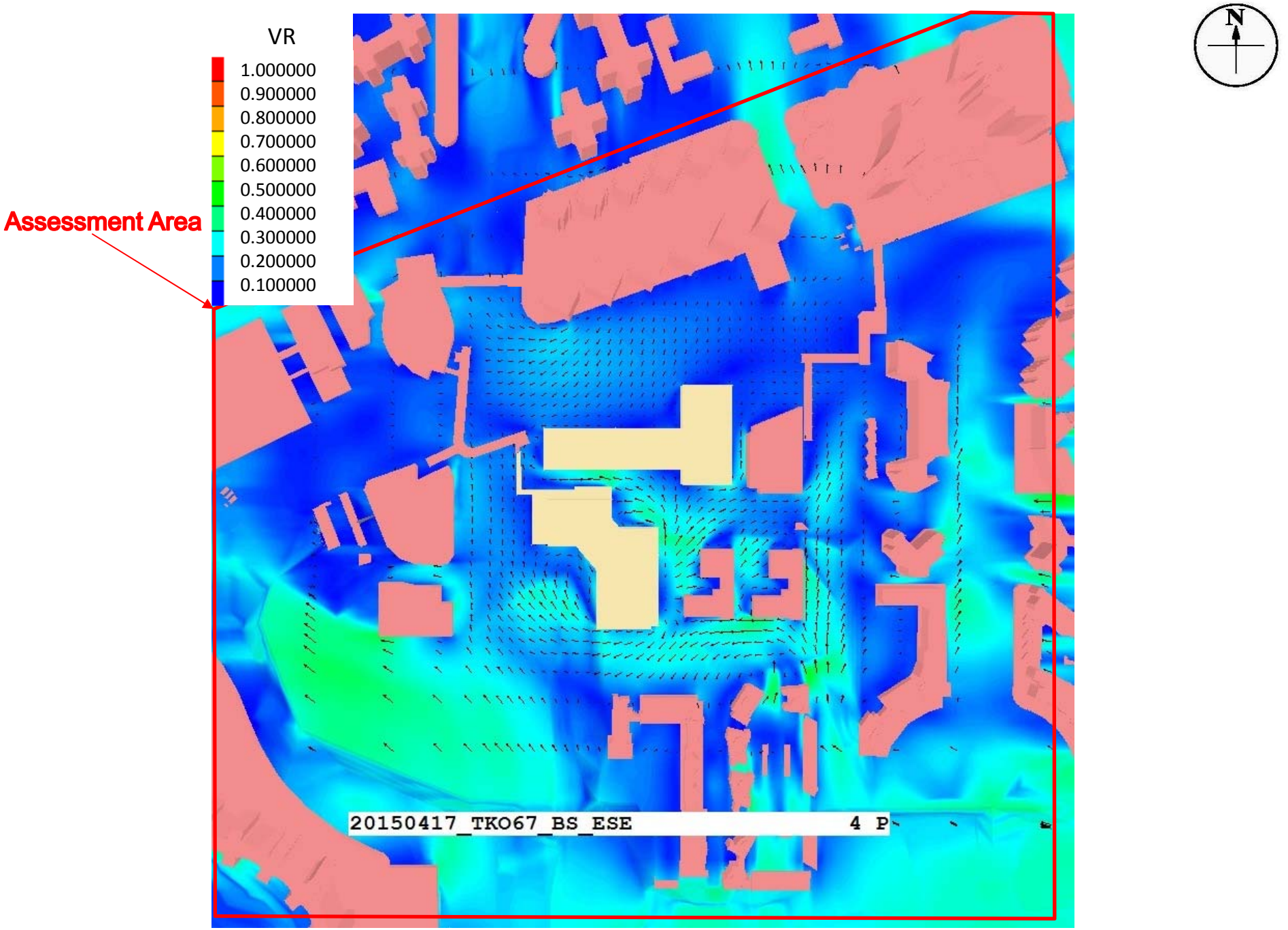
Base Scheme - Wind speed colour and vector plot at pedestrian level under NE Wind



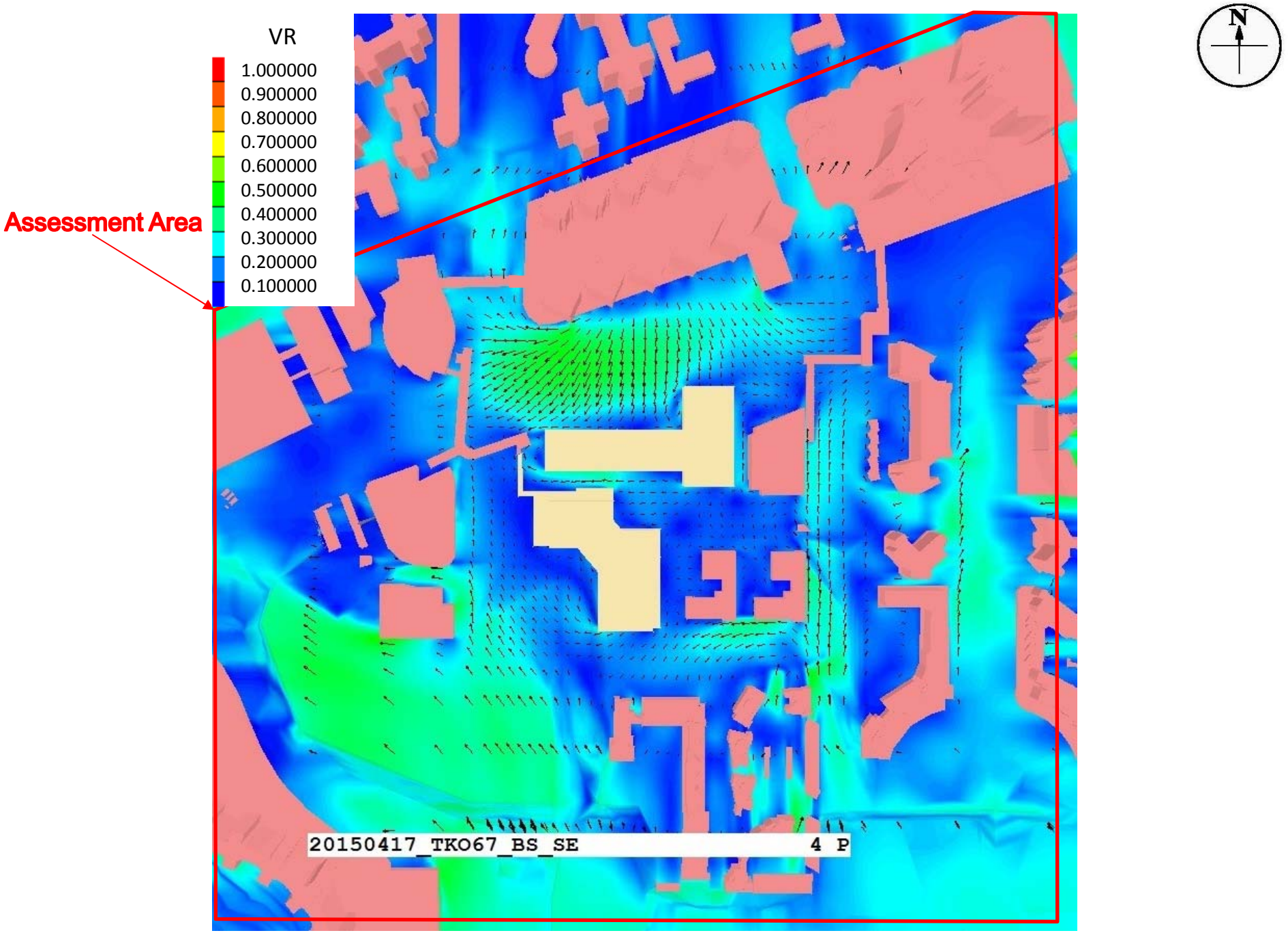
Base Scheme - Wind speed colour and vector plot at pedestrian level under ENE Wind



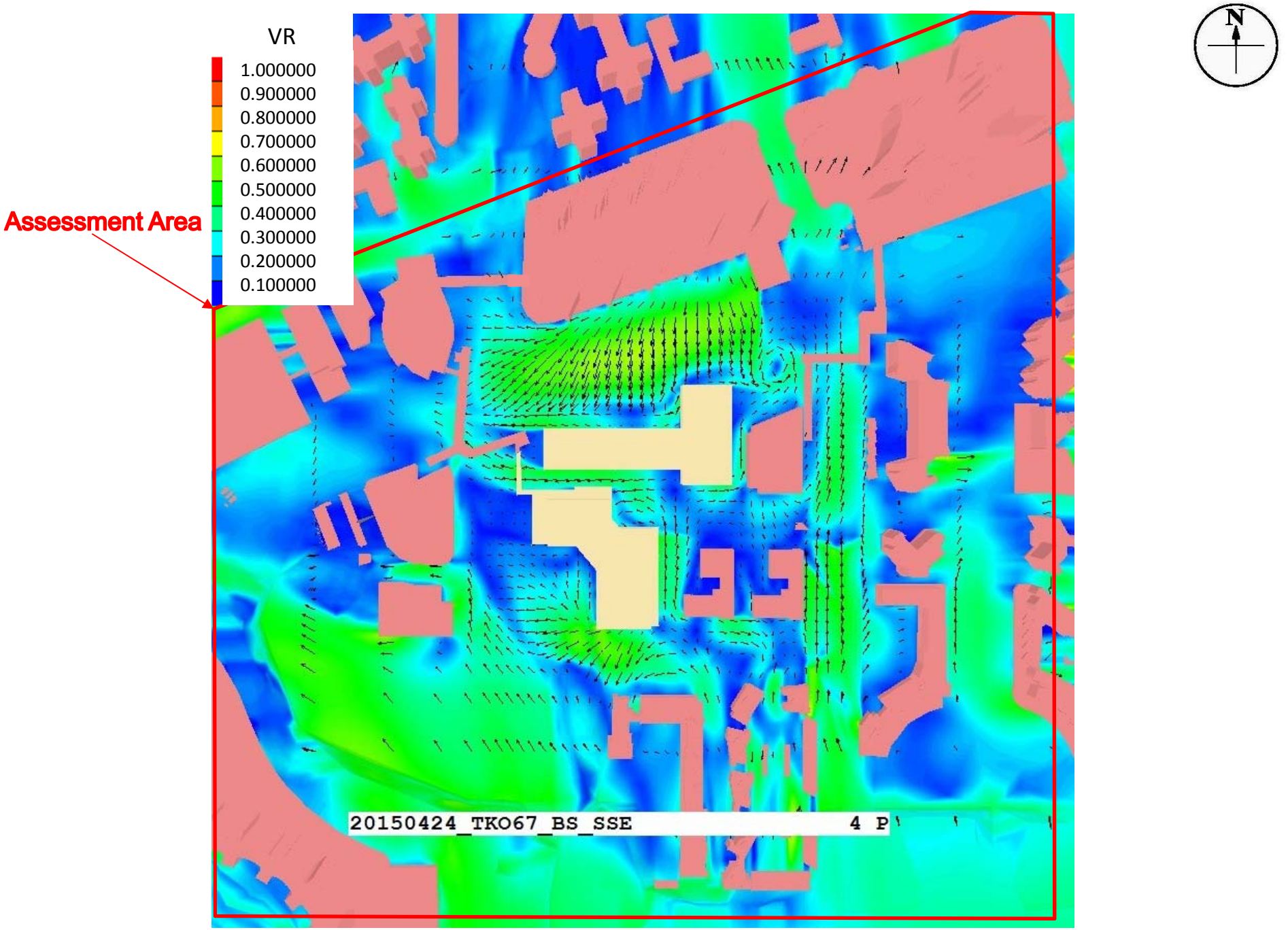
Base Scheme - Wind speed colour and vector plot at pedestrian level under E Wind



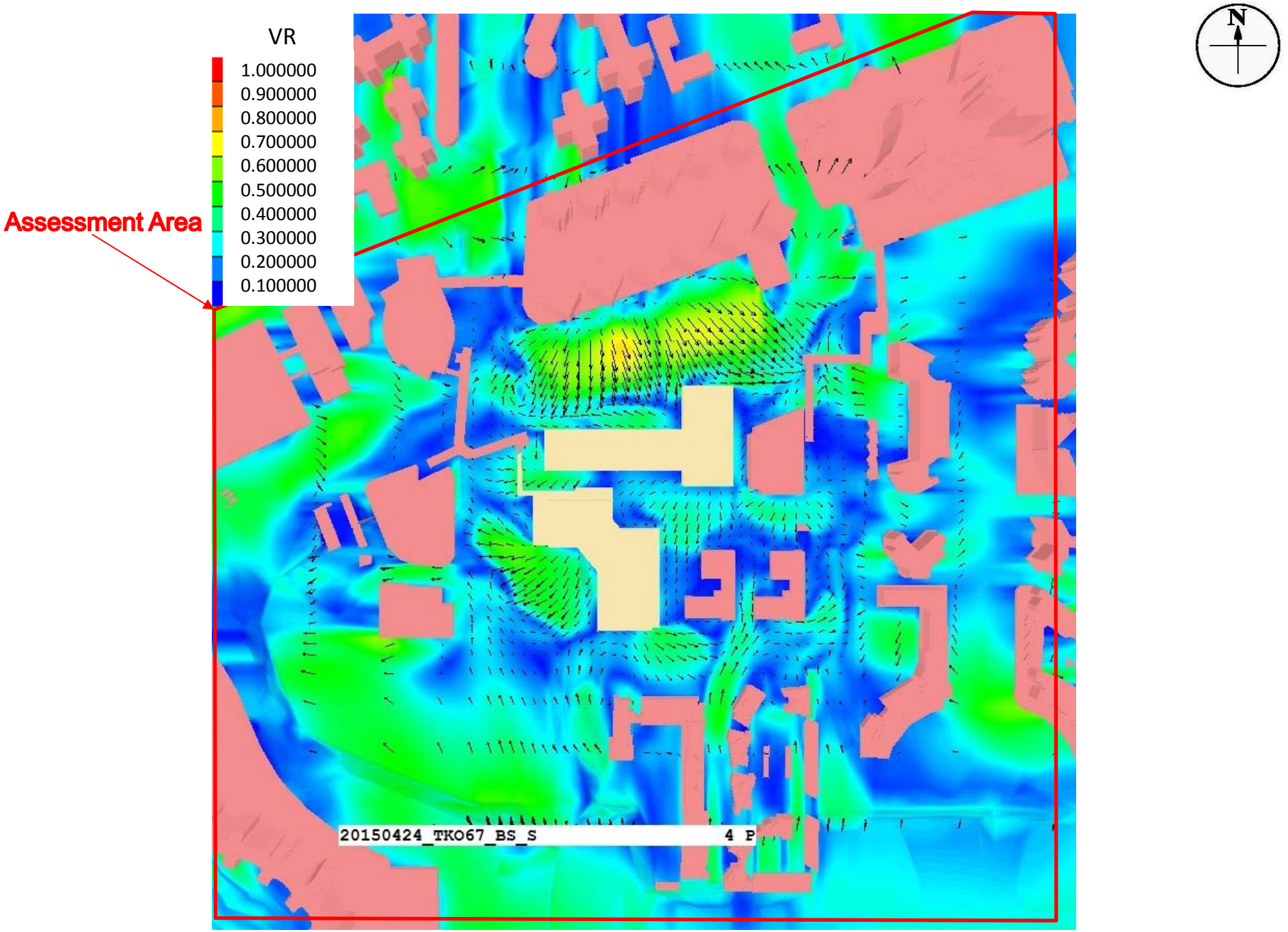
Base Scheme - Wind speed colour and vector plot at pedestrian level under ESE Wind



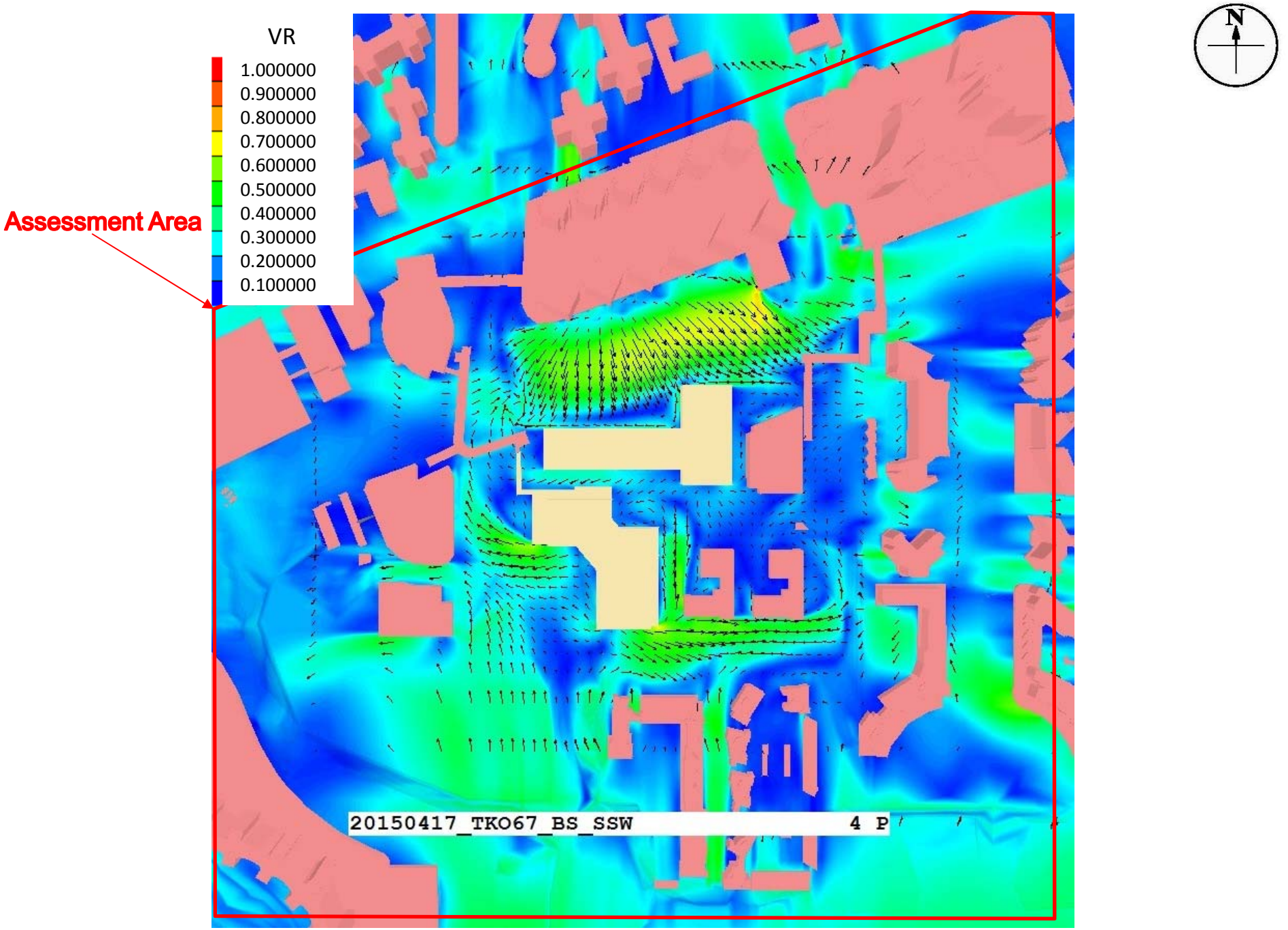
Base Scheme - Wind speed colour and vector plot at pedestrian level under SE Wind



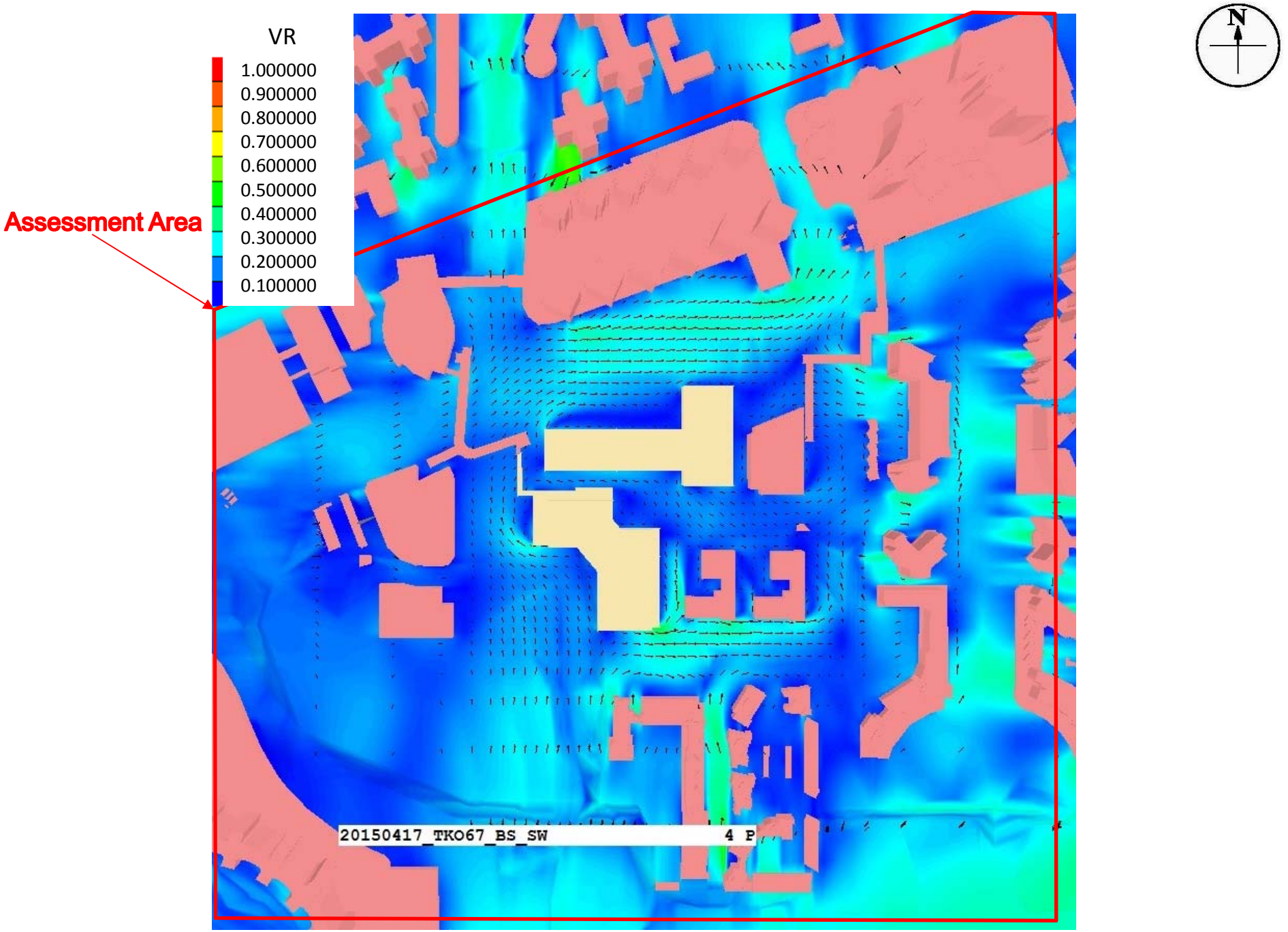
Base Scheme - Wind speed colour and vector plot at pedestrian level under SSE Wind



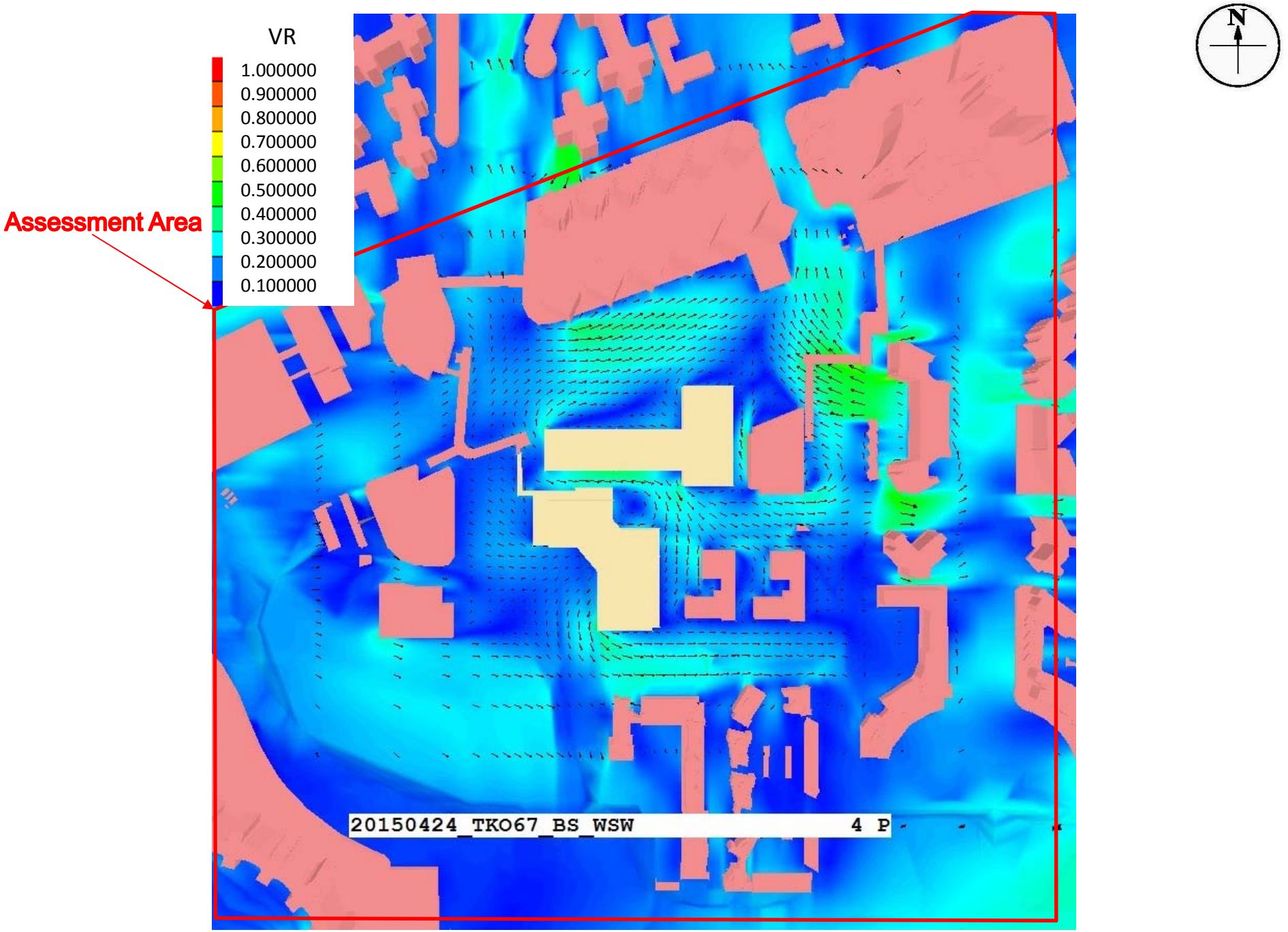
Base Scheme - Wind speed colour and vector plot at pedestrian level under S Wind



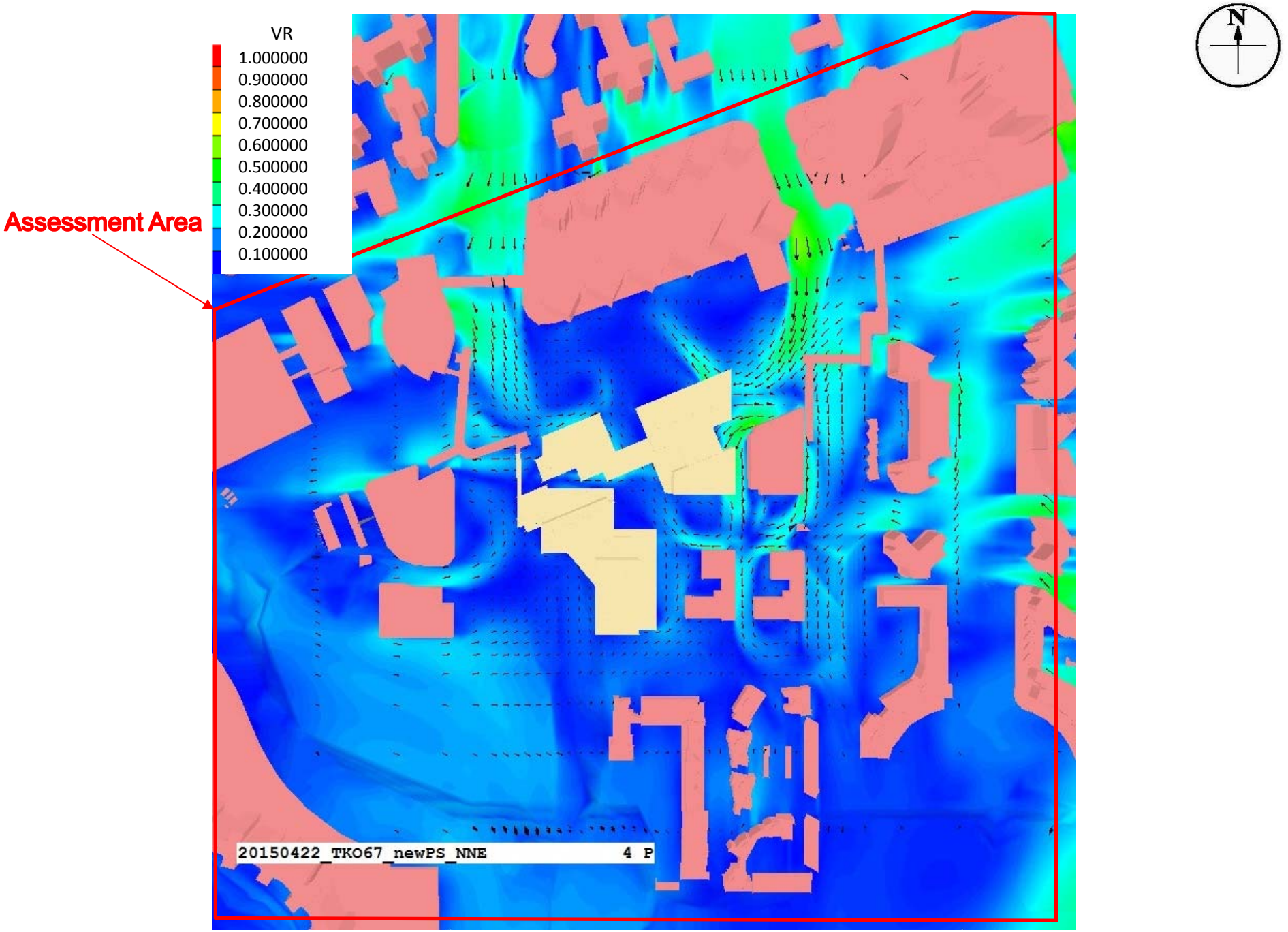
Base Scheme - Wind speed colour and vector plot at pedestrian level under SSW Wind



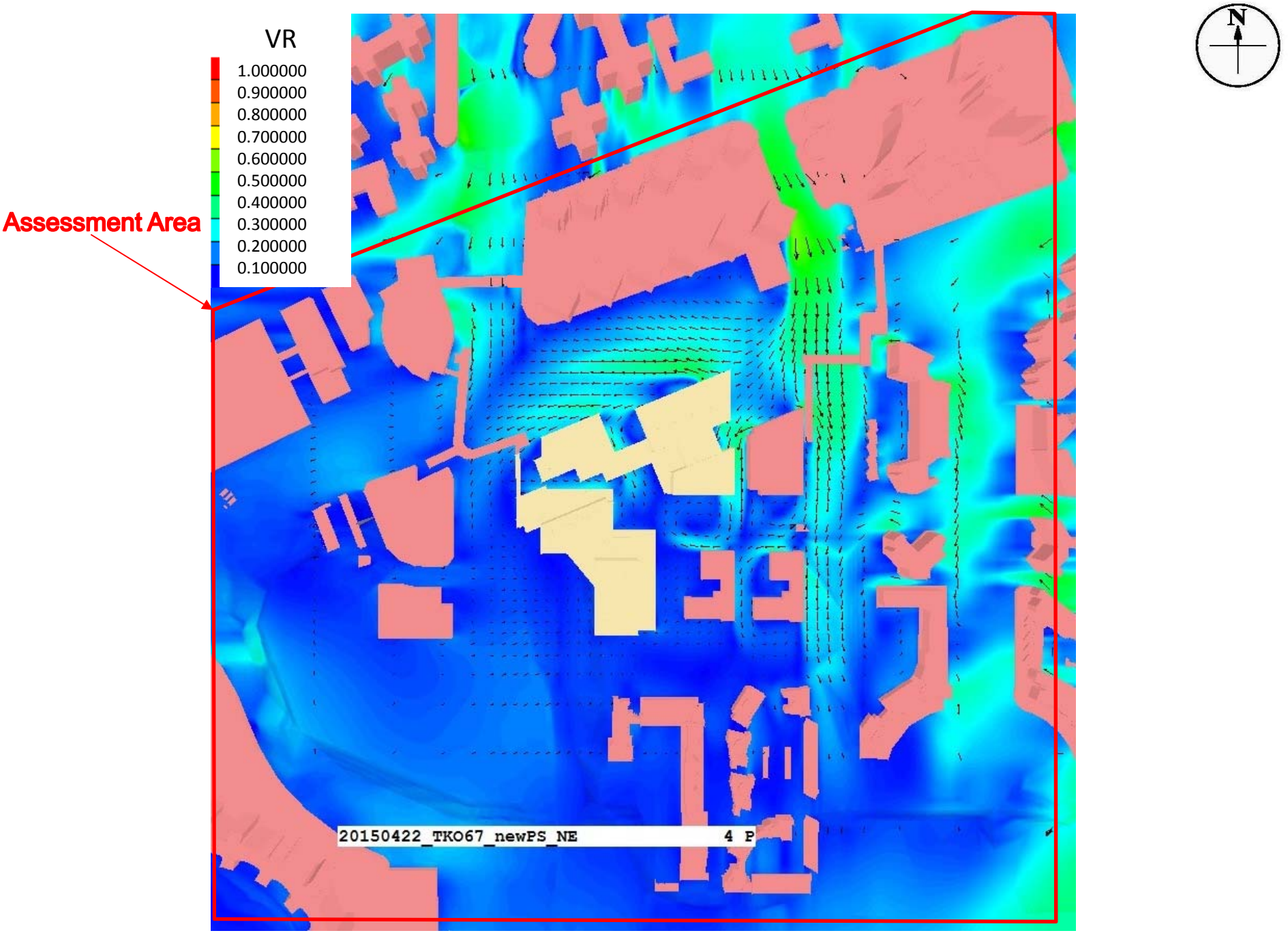
Base Scheme - Wind speed colour and vector plot at pedestrian level under SW Wind



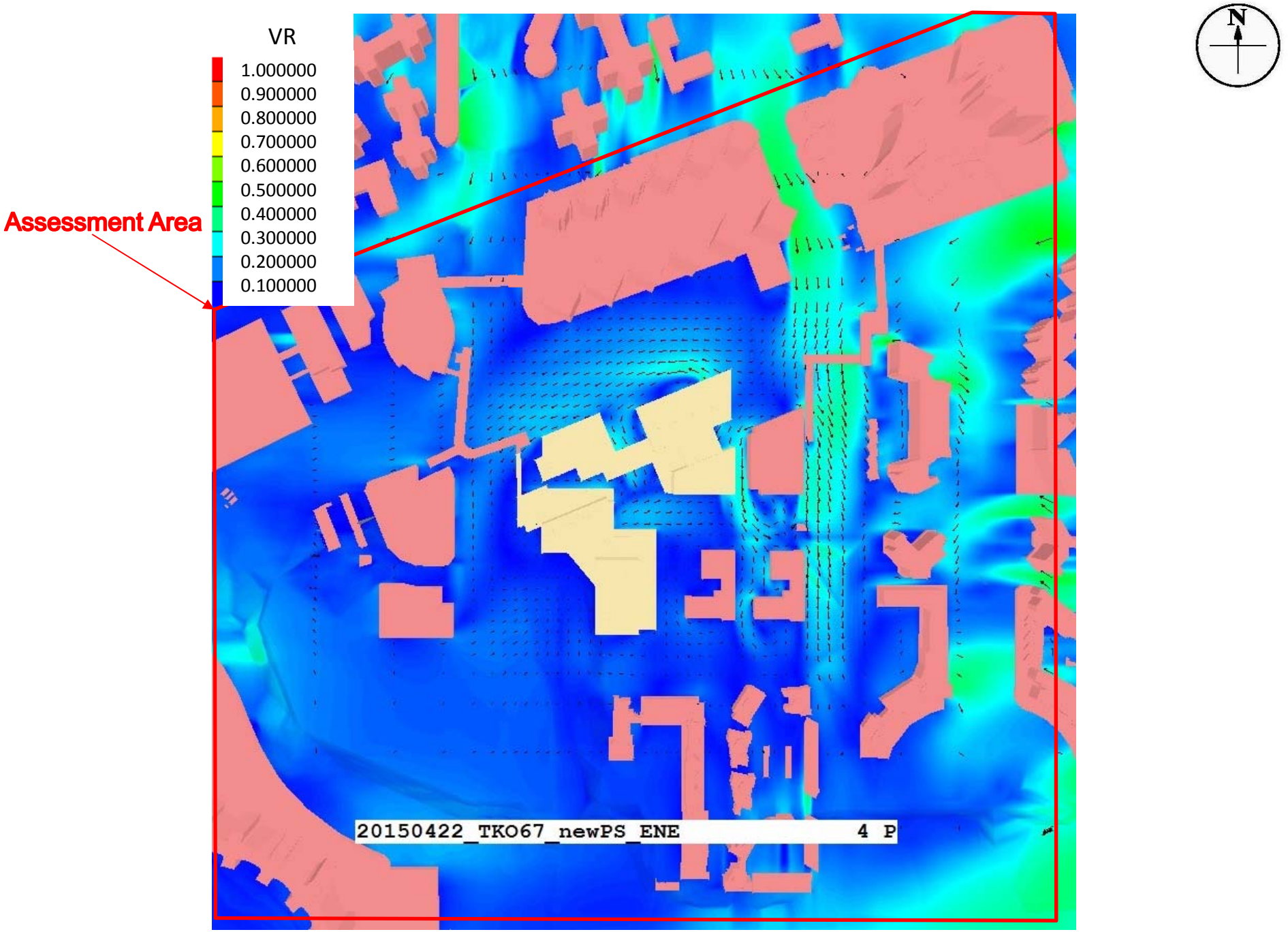
Base Scheme - Wind speed colour and vector plot at pedestrian level under WSW Wind



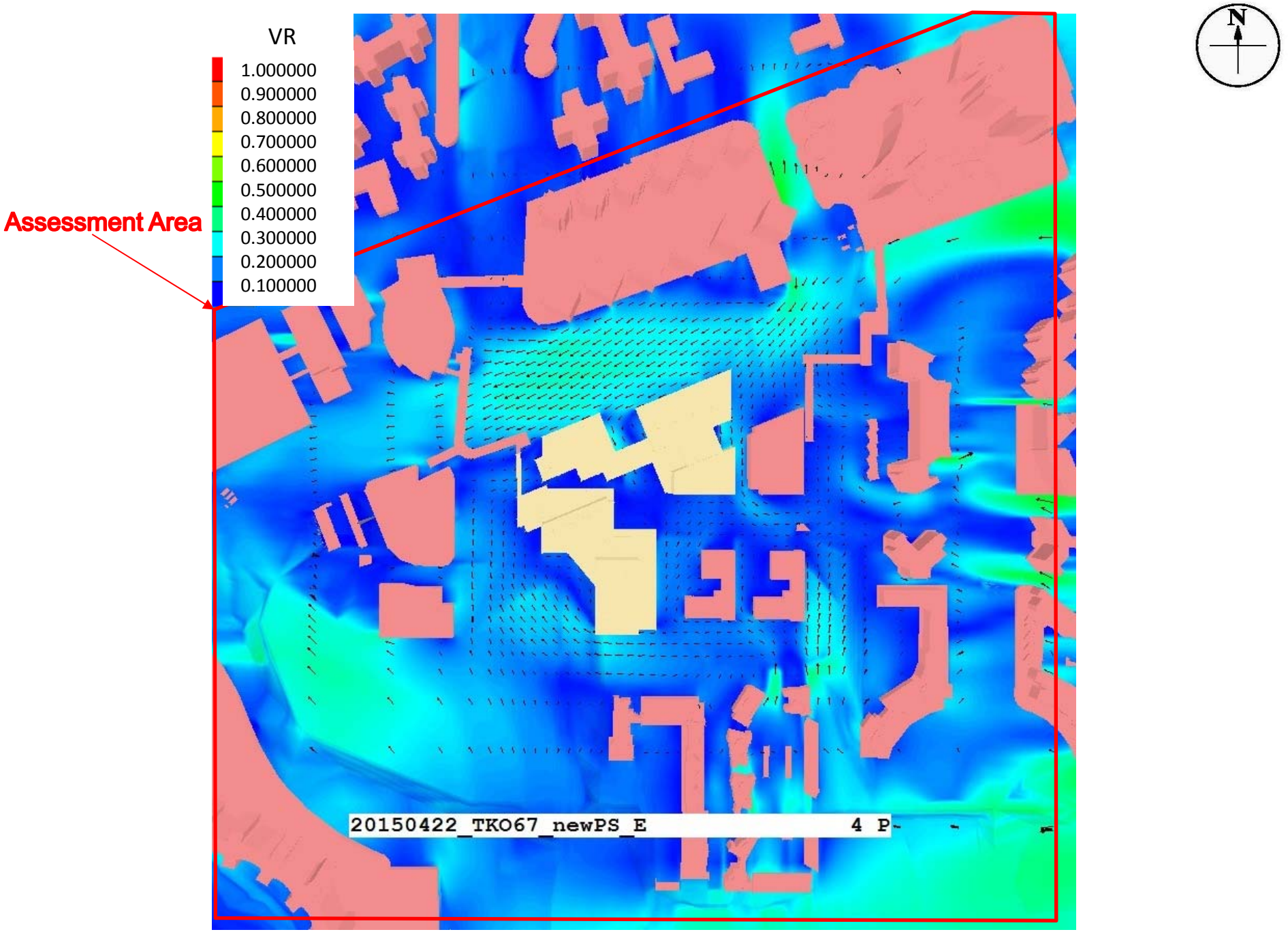
Proposed Notional Scheme - Wind speed colour and vector plot at pedestrian level under NNE Wind



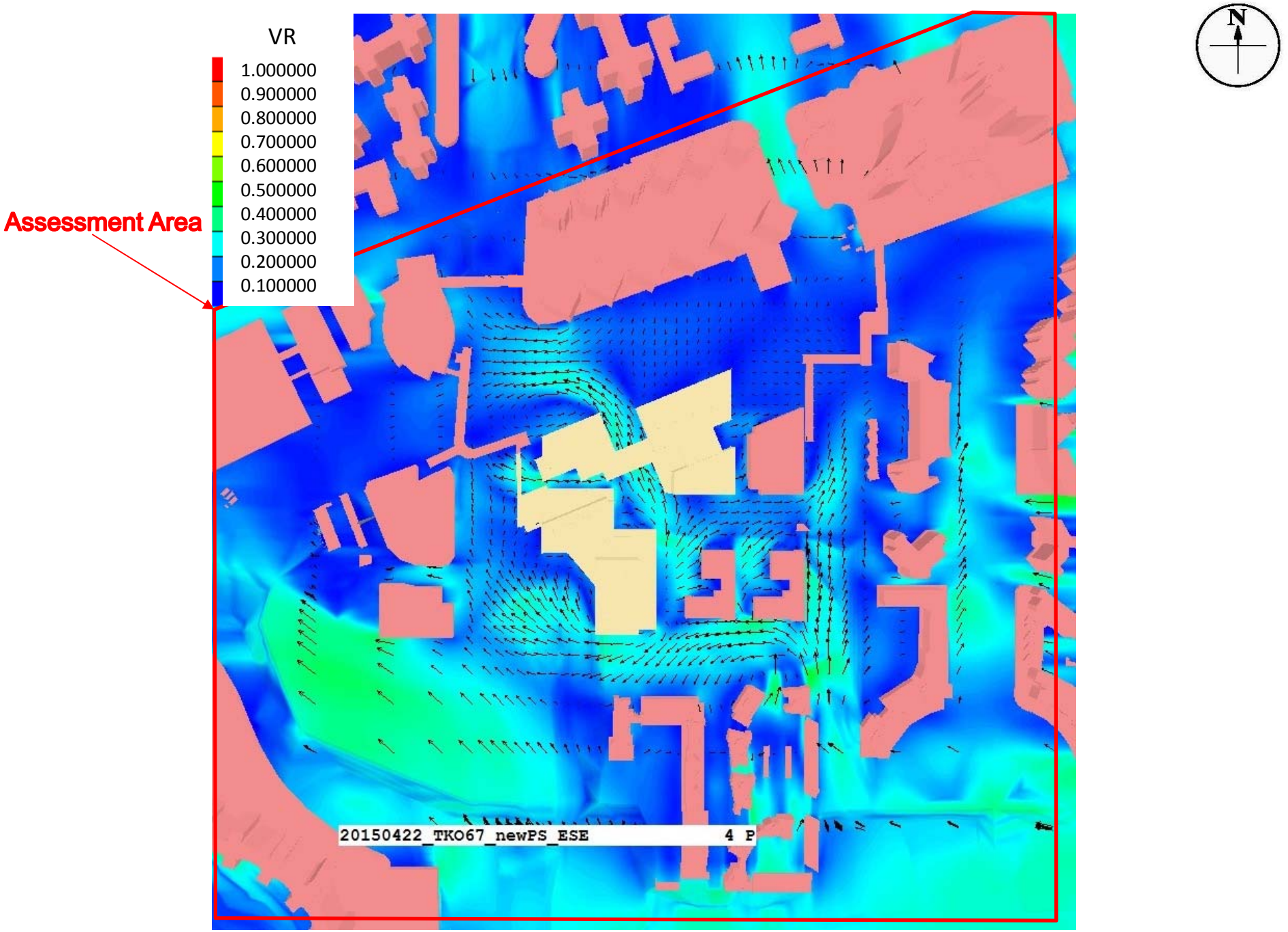
Proposed Notional Scheme - Wind speed colour and vector plot at pedestrian level under NE Wind



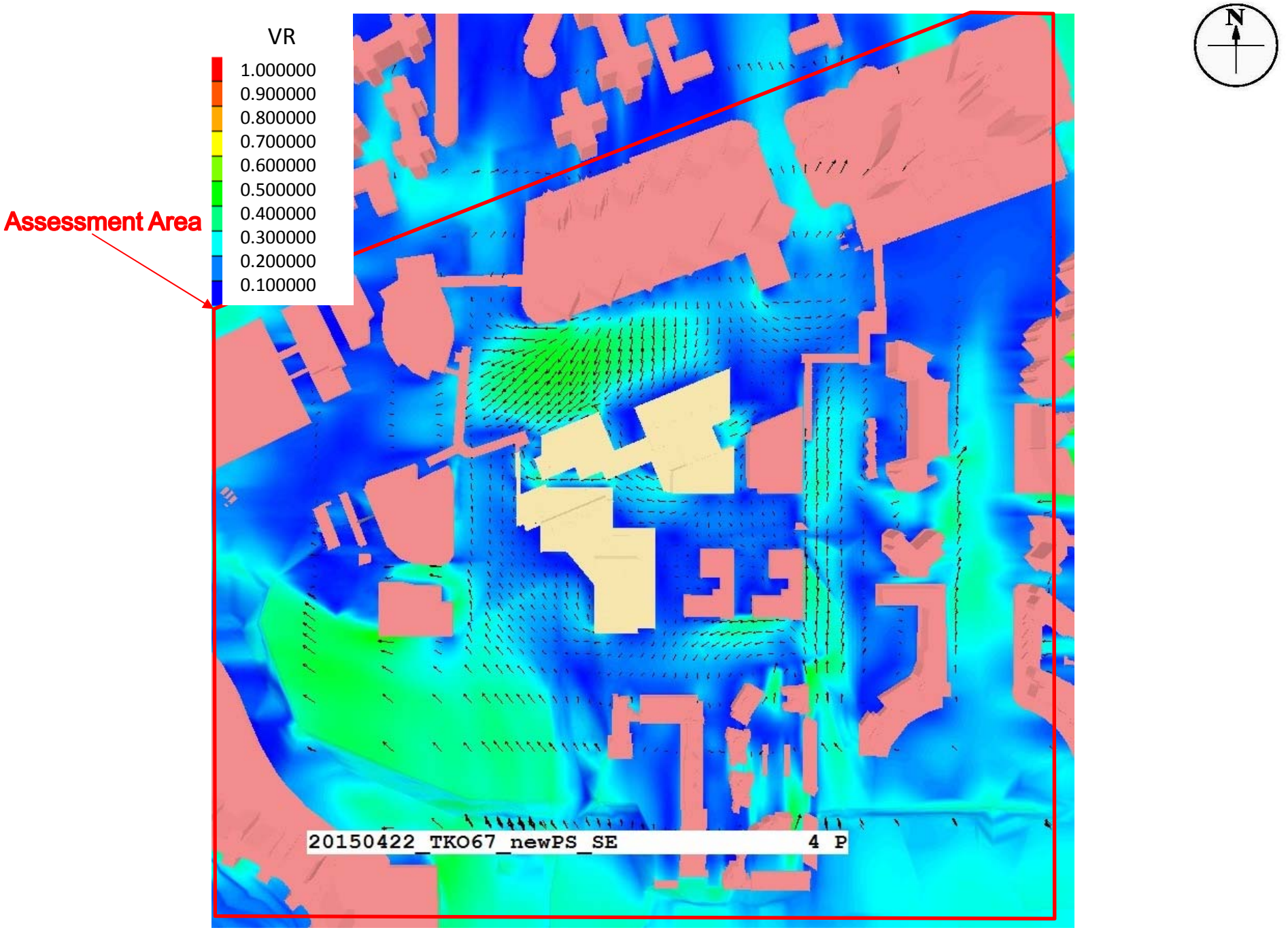
Proposed Notional Scheme - Wind speed colour and vector plot at pedestrian level under ENE Wind



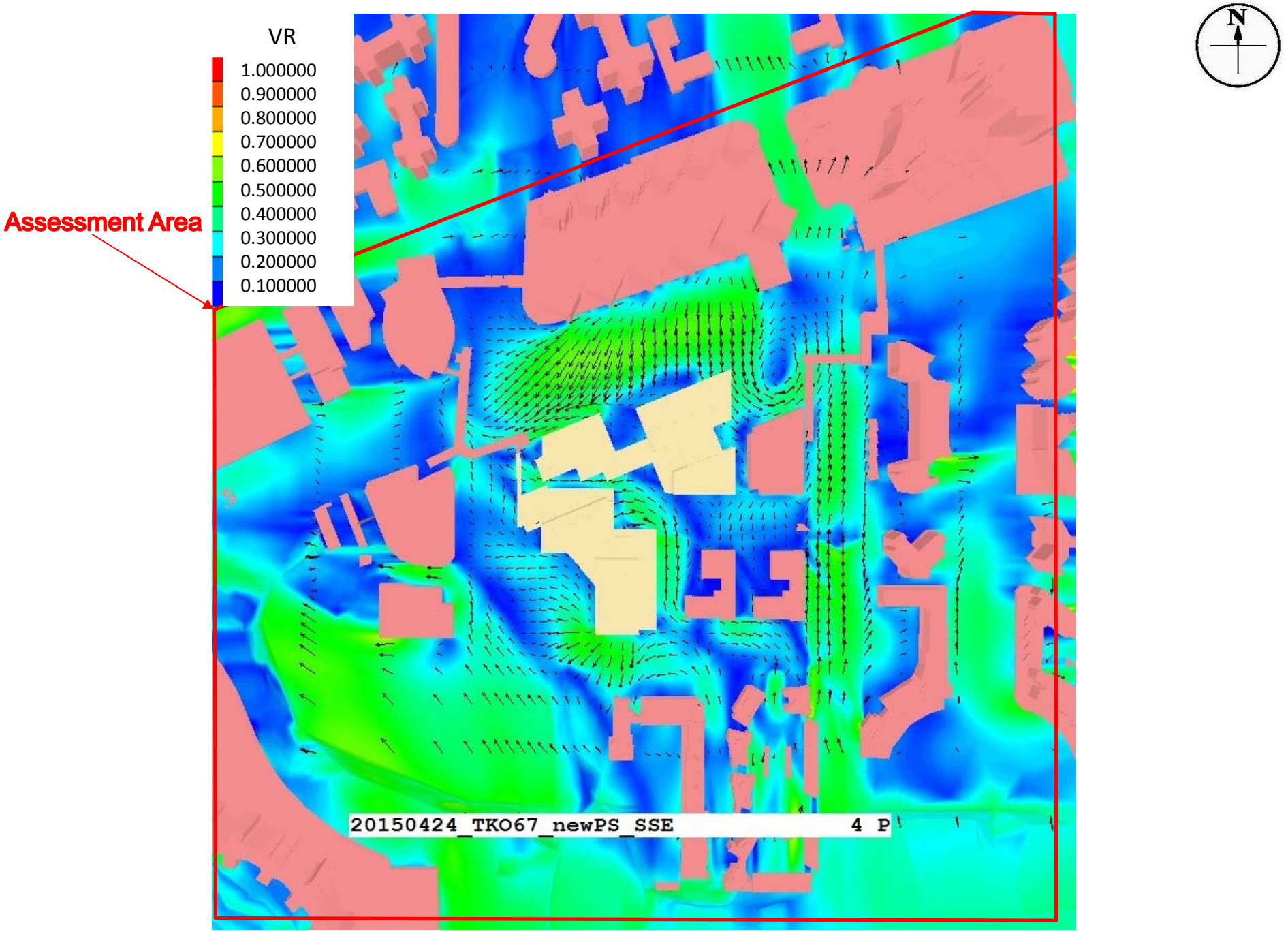
Proposed Notional Scheme - Wind speed colour and vector plot at pedestrian level under E Wind



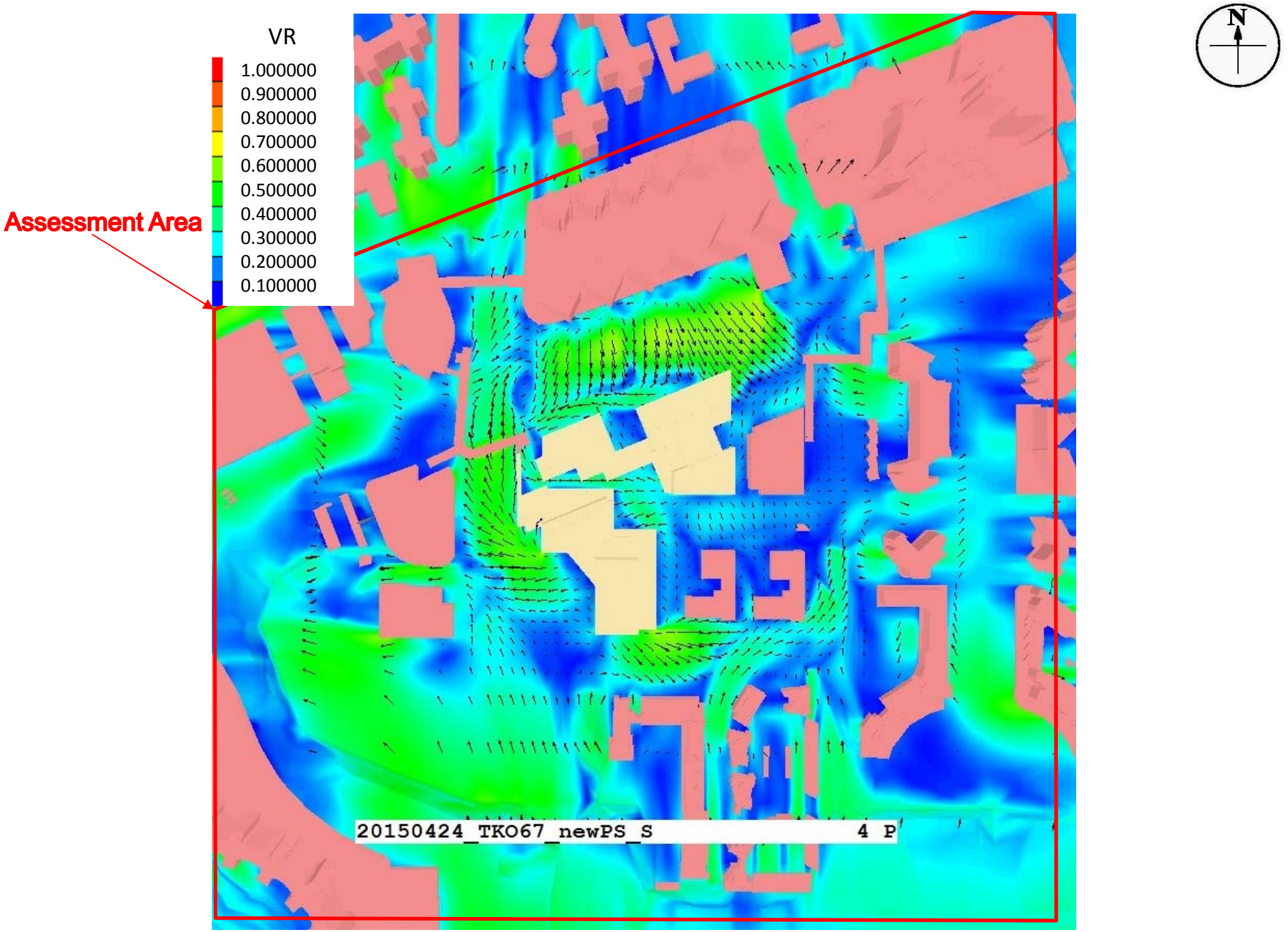
Proposed Notional Scheme - Wind speed colour and vector plot at pedestrian level under ESE Wind



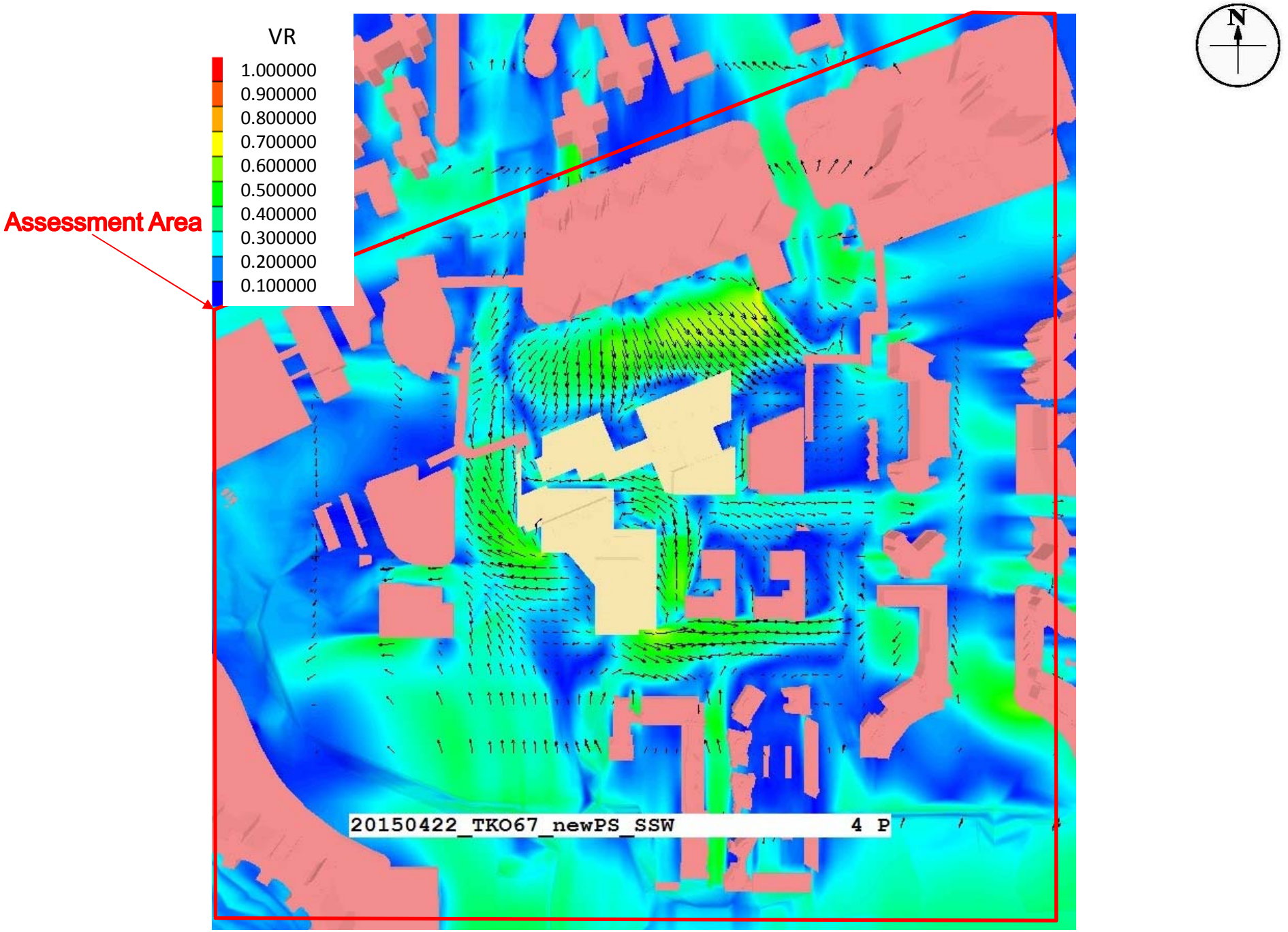
Proposed Notional Scheme - Wind speed colour and vector plot at pedestrian level under SE Wind



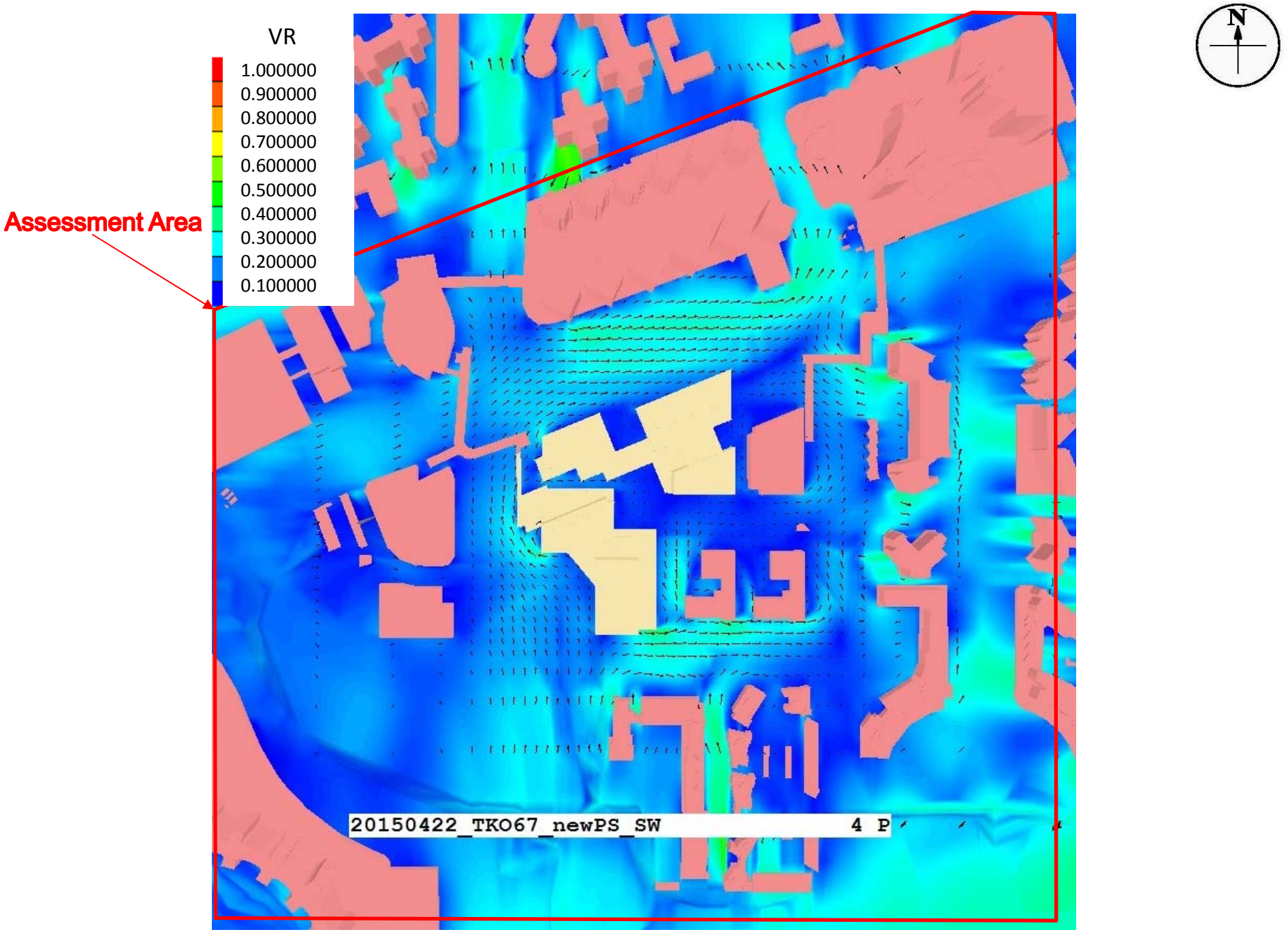
Proposed Notional Scheme - Wind speed colour and vector plot at pedestrian level under SSE Wind



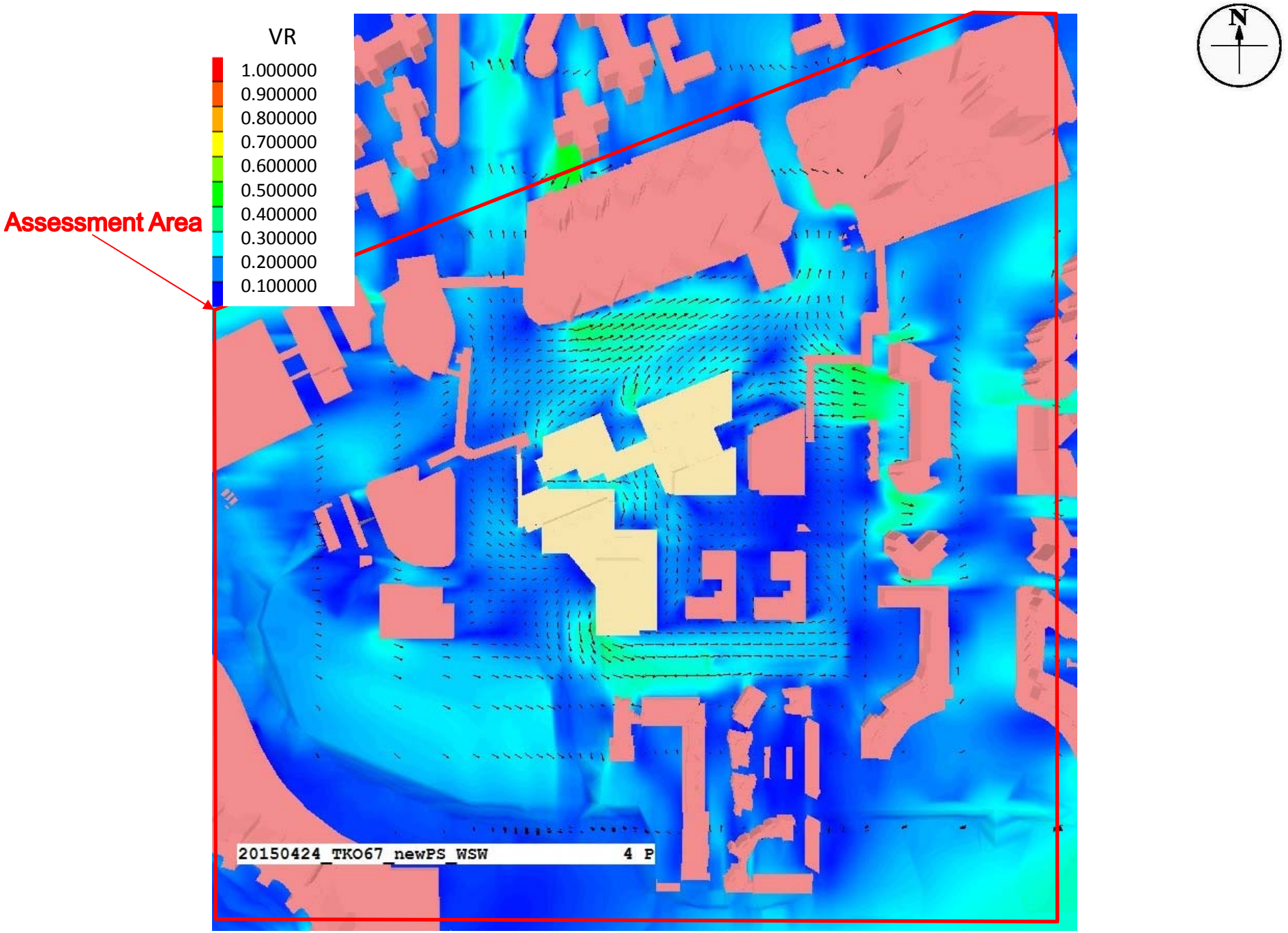
Proposed Notional Scheme - Wind speed colour and vector plot at pedestrian level under S Wind



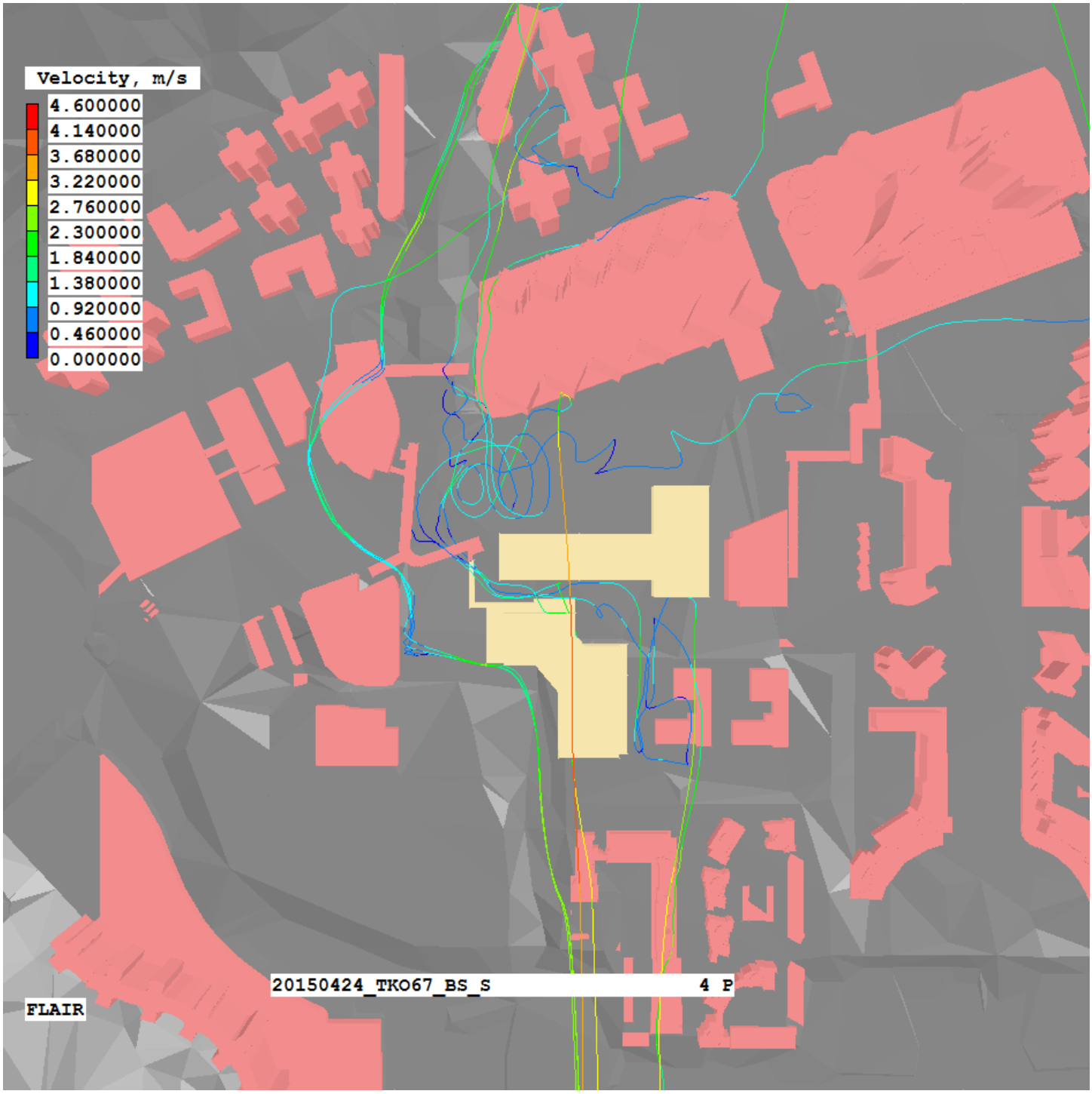
Proposed Notional Scheme - Wind speed colour and vector plot at pedestrian level under SSW Wind



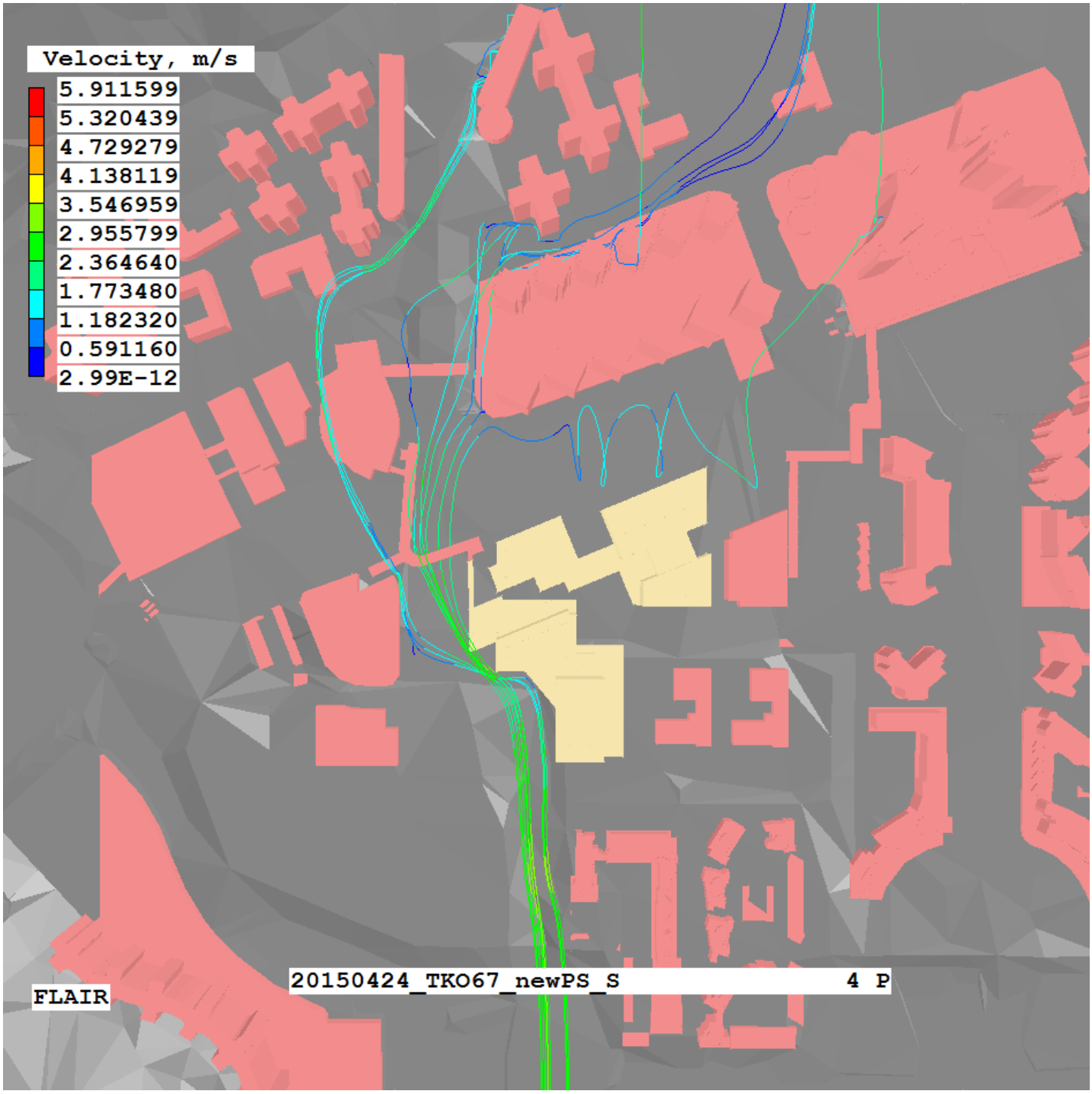
Proposed Notional Scheme - Wind speed colour and vector plot at pedestrian level under SW Wind



Proposed Notional Scheme - Wind speed colour and vector plot at pedestrian level under WSW Wind



Streamline plot under S wind for Base Scheme



Streamline plot under S wind for Proposed Notional Scheme

Appendix D:
Detailed CFD Simulation Result for Selected Test Points

	Proposed Notional Scheme (VR)												
Testpoint	**NNE**	**NE**	**ENE**	**E**	**ESE**	**SE**	**SSW**	**SW**	**SSE**	**S**	**WSW**	**Annual**	**Summer**
P01	0.09	0.20	0.09	0.19	0.02	0.09	0.48	0.18	0.37	0.52	0.16	0.18	0.23
P02	0.18	0.14	0.09	0.12	0.04	0.02	0.15	0.02	0.29	0.21	0.07	0.12	0.12
P03	0.19	0.16	0.09	0.10	0.07	0.10	0.06	0.03	0.08	0.05	0.06	0.11	0.08
P04	0.31	0.34	0.24	0.18	0.02	0.10	0.23	0.04	0.12	0.12	0.06	0.21	0.14
P05	0.25	0.24	0.24	0.11	0.10	0.13	0.24	0.08	0.08	0.12	0.03	0.18	0.13
P06	0.08	0.05	0.03	0.02	0.12	0.04	0.11	0.05	0.10	0.12	0.10	0.06	0.08
P07	0.06	0.06	0.09	0.05	0.10	0.18	0.25	0.02	0.04	0.16	0.11	0.08	0.11
P08	0.07	0.06	0.10	0.03	0.22	0.18	0.32	0.04	0.25	0.25	0.18	0.12	0.16
P09	0.04	0.17	0.12	0.03	0.24	0.11	0.14	0.06	0.12	0.10	0.09	0.11	0.11
P10	0.02	0.06	0.13	0.03	0.08	0.01	0.23	0.04	0.10	0.07	0.08	0.07	0.08
P11	0.11	0.07	0.13	0.04	0.20	0.10	0.22	0.04	0.27	0.25	0.15	0.12	0.15
P12	0.11	0.02	0.03	0.12	0.19	0.03	0.38	0.15	0.34	0.15	0.12	0.11	0.16
P13	0.10	0.05	0.05	0.11	0.09	0.02	0.39	0.16	0.28	0.13	0.07	0.10	0.14
P14	0.14	0.08	0.07	0.04	0.13	0.09	0.40	0.21	0.11	0.34	0.02	0.11	0.16
P15	0.09	0.03	0.06	0.15	0.22	0.10	0.21	0.22	0.28	0.46	0.25	0.14	0.21
P16	0.06	0.05	0.05	0.20	0.26	0.12	0.16	0.09	0.44	0.22	0.32	0.14	0.20
P17	0.08	0.05	0.06	0.18	0.22	0.17	0.24	0.13	0.45	0.17	0.25	0.14	0.20
P18	0.05	0.04	0.05	0.17	0.22	0.14	0.16	0.11	0.21	0.22	0.12	0.11	0.15
P19	0.02	0.06	0.05	0.11	0.15	0.13	0.30	0.13	0.14	0.36	0.09	0.10	0.16
P20	0.07	0.05	0.01	0.10	0.08	0.09	0.49	0.19	0.21	0.51	0.14	0.11	0.20
P21	0.09	0.02	0.03	0.06	0.07	0.08	0.46	0.23	0.15	0.47	0.17	0.10	0.18
P22	0.03	0.02	0.02	0.08	0.13	0.11	0.26	0.16	0.06	0.36	0.09	0.08	0.14
P23	0.06	0.10	0.09	0.07	0.04	0.07	0.20	0.12	0.10	0.29	0.10	0.10	0.12
P24	0.06	0.07	0.07	0.02	0.02	0.17	0.11	0.16	0.15	0.10	0.17	0.08	0.10
P25	0.14	0.21	0.17	0.22	0.11	0.27	0.16	0.19	0.34	0.34	0.21	0.20	0.22
P26	0.09	0.25	0.16	0.23	0.04	0.31	0.14	0.13	0.39	0.39	0.13	0.20	0.21
P27	0.10	0.19	0.13	0.19	0.18	0.18	0.19	0.14	0.21	0.25	0.14	0.16	0.18
P28	0.02	0.13	0.14	0.19	0.05	0.16	0.19	0.14	0.17	0.20	0.23	0.14	0.16
P29	0.07	0.34	0.25	0.22	0.04	0.16	0.19	0.16	0.12	0.14	0.18	0.20	0.16
P30	0.19	0.29	0.18	0.19	0.04	0.17	0.40	0.20	0.32	0.45	0.21	0.23	0.24
T01	0.32	0.32	0.17	0.02	0.14	0.16	0.02	0.19	0.06	0.21	0.22	0.18	0.14
T02	0.35	0.27	0.11	0.07	0.05	0.14	0.30	0.22	0.06	0.39	0.19	0.18	0.18
T03	0.32	0.27	0.13	0.04	0.14	0.12	0.05	0.15	0.06	0.24	0.17	0.16	0.13
T04	0.16	0.13	0.03	0.06	0.14	0.20	0.06	0.08	0.13	0.22	0.05	0.10	0.11
T05	0.21	0.21	0.11	0.09	0.06	0.09	0.09	0.10	0.11	0.05	0.11	0.13	0.10
T06	0.08	0.01	0.05	0.20	0.17	0.33	0.26	0.10	0.28	0.13	0.09	0.12	0.18
T07	0.17	0.07	0.09	0.22	0.16	0.34	0.18	0.15	0.32	0.23	0.12	0.16	0.20
T08	0.25	0.15	0.08	0.10	0.06	0.08	0.09	0.16	0.11	0.12	0.18	0.13	0.12
T09	0.02	0.05	0.04	0.05	0.02	0.03	0.04	0.05	0.11	0.07	0.05	0.05	0.05
T10	0.20	0.06	0.07	0.11	0.07	0.10	0.04	0.10	0.06	0.08	0.02	0.09	0.08
T11	0.06	0.14	0.11	0.19	0.10	0.17	0.14	0.16	0.12	0.16	0.14	0.13	0.14
T12	0.35	0.31	0.13	0.25	0.13	0.24	0.45	0.23	0.03	0.51	0.20	0.24	0.25
T13	0.14	0.16	0.14	0.32	0.08	0.29	0.43	0.21	0.25	0.53	0.17	0.21	0.27
T14	0.08	0.14	0.13	0.19	0.04	0.14	0.15	0.14	0.19	0.36	0.09	0.14	0.16
T15	0.05	0.18	0.14	0.21	0.03	0.29	0.21	0.17	0.30	0.25	0.17	0.17	0.19
T16	0.05	0.16	0.11	0.26	0.19	0.43	0.38	0.19	0.52	0.51	0.19	0.22	0.30
T17	0.12	0.18	0.14	0.20	0.15	0.25	0.29	0.16	0.31	0.11	0.17	0.18	0.20
T18	0.03	0.18	0.12	0.24	0.08	0.39	0.50	0.24	0.52	0.56	0.28	0.22	0.32
T19	0.04	0.19	0.13	0.21	0.08	0.29	0.43	0.25	0.42	0.54	0.24	0.21	0.28
T20	0.05	0.33	0.23	0.23	0.06	0.24	0.31	0.22	0.26	0.32	0.18	0.22	0.23
T21	0.05	0.17	0.10	0.16	0.07	0.22	0.52	0.23	0.45	0.48	0.24	0.18	0.27
T22	0.05	0.23	0.13	0.20	0.04	0.15	0.56	0.20	0.45	0.55	0.17	0.20	0.27
T23	0.03	0.12	0.05	0.09	0.06	0.16	0.49	0.21	0.44	0.51	0.20	0.15	0.24
T24	0.03	0.15	0.03	0.07	0.05	0.19	0.52	0.19	0.41	0.52	0.15	0.14	0.23
T25	0.13	0.15	0.07	0.21	0.04	0.16	0.44	0.17	0.22	0.41	0.13	0.16	0.21
T26	0.31	0.31	0.22	0.22	0.05	0.15	0.06	0.18	0.10	0.14	0.17	0.21	0.15
T27	0.35	0.38	0.31	0.27	0.19	0.22	0.35	0.19	0.38	0.35	0.20	0.31	0.28
T28	0.29	0.30	0.22	0.14	0.14	0.17	0.23	0.17	0.23	0.24	0.11	0.22	0.19
T29	0.50	0.50	0.37	0.12	0.04	0.12	0.33	0.28	0.18	0.15	0.15	0.30	0.21
T30	0.13	0.22	0.20	0.12	0.12	0.12	0.44	0.20	0.19	0.31	0.16	0.19	0.21
T31	0.16	0.14	0.23	0.25	0.04	0.11	0.31	0.28	0.22	0.31	0.26	0.20	0.22
T32	0.16	0.13	0.15	0.12	0.04	0.11	0.16	0.17	0.11	0.18	0.16	0.13	0.13
T33	0.13	0.13	0.35	0.07	0.05	0.06	0.13	0.08	0.31	0.15	0.14	0.18	0.14

	Proposed Notional Scheme (VR)												
Testpoint	**NNE**	**NE**	**ENE**	**E**	**ESE**	**SE**	**SSW**	**SW**	**SSE**	**S**	**WSW**	**Annual**	**Summer**
T34	0.31	0.25	0.03	0.17	0.06	0.08	0.22	0.02	0.09	0.23	0.09	0.15	0.12
T35	0.24	0.33	0.23	0.17	0.05	0.11	0.06	0.10	0.19	0.17	0.20	0.20	0.15
T36	0.16	0.10	0.12	0.05	0.01	0.08	0.05	0.13	0.23	0.12	0.14	0.11	0.10
T37	0.31	0.34	0.30	0.11	0.05	0.11	0.20	0.23	0.31	0.30	0.34	0.25	0.22
T38	0.21	0.26	0.19	0.08	0.06	0.05	0.04	0.14	0.30	0.15	0.26	0.17	0.14
T39	0.17	0.26	0.25	0.08	0.07	0.16	0.17	0.18	0.30	0.27	0.30	0.20	0.19
T40	0.07	0.07	0.07	0.04	0.05	0.08	0.22	0.28	0.10	0.36	0.35	0.11	0.16
T41	0.11	0.11	0.11	0.05	0.05	0.07	0.11	0.15	0.04	0.16	0.20	0.10	0.10
T42	0.13	0.20	0.19	0.10	0.13	0.18	0.19	0.19	0.28	0.21	0.35	0.18	0.20
T43	0.16	0.26	0.22	0.02	0.00	0.16	0.08	0.08	0.12	0.06	0.12	0.15	0.10
T44	0.07	0.08	0.07	0.02	0.07	0.07	0.20	0.21	0.02	0.29	0.27	0.09	0.13
T45	0.14	0.18	0.15	0.05	0.05	0.06	0.16	0.12	0.01	0.03	0.18	0.11	0.09
T46	0.11	0.21	0.20	0.07	0.14	0.19	0.06	0.11	0.32	0.08	0.05	0.16	0.13
T47	0.17	0.24	0.25	0.05	0.12	0.25	0.04	0.11	0.29	0.05	0.06	0.18	0.14
T48	0.12	0.14	0.10	0.15	0.15	0.27	0.32	0.31	0.06	0.27	0.38	0.16	0.22
T49	0.17	0.15	0.06	0.02	0.04	0.04	0.19	0.12	0.22	0.18	0.14	0.11	0.11
T50	0.15	0.21	0.24	0.08	0.18	0.22	0.23	0.09	0.25	0.13	0.04	0.18	0.16
T51	0.13	0.16	0.12	0.04	0.12	0.12	0.11	0.10	0.35	0.19	0.12	0.13	0.14
T52	0.12	0.19	0.20	0.07	0.17	0.18	0.04	0.05	0.20	0.05	0.05	0.14	0.11
T53	0.13	0.19	0.17	0.19	0.25	0.27	0.08	0.06	0.40	0.22	0.06	0.19	0.19
T54	0.10	0.03	0.17	0.09	0.09	0.08	0.18	0.06	0.18	0.14	0.01	0.11	0.11
T55	0.14	0.16	0.14	0.04	0.19	0.08	0.12	0.03	0.07	0.07	0.04	0.11	0.09
T56	0.21	0.19	0.21	0.10	0.12	0.08	0.22	0.06	0.18	0.11	0.07	0.16	0.13
T57	0.11	0.06	0.11	0.04	0.20	0.05	0.01	0.01	0.05	0.01	0.04	0.08	0.06
T58	0.04	0.02	0.07	0.08	0.15	0.10	0.19	0.08	0.03	0.19	0.07	0.08	0.10
T59	0.05	0.04	0.02	0.08	0.20	0.06	0.19	0.06	0.01	0.09	0.08	0.06	0.09
T60	0.11	0.17	0.14	0.27	0.32	0.31	0.05	0.06	0.34	0.04	0.16	0.18	0.19
T61	0.02	0.06	0.02	0.11	0.26	0.25	0.35	0.21	0.21	0.17	0.15	0.11	0.19
T62	0.05	0.02	0.02	0.26	0.28	0.28	0.11	0.06	0.29	0.09	0.03	0.11	0.16
T63	0.04	0.04	0.04	0.11	0.09	0.08	0.06	0.07	0.13	0.17	0.08	0.07	0.09
T64	0.12	0.08	0.11	0.11	0.23	0.23	0.32	0.20	0.26	0.22	0.17	0.15	0.20
T65	0.05	0.06	0.05	0.10	0.19	0.09	0.32	0.19	0.13	0.33	0.07	0.10	0.16
T66	0.07	0.01	0.06	0.10	0.16	0.14	0.10	0.05	0.27	0.04	0.23	0.09	0.12
T67	0.11	0.04	0.04	0.12	0.22	0.12	0.48	0.25	0.25	0.52	0.22	0.14	0.24
T68	0.05	0.05	0.02	0.09	0.11	0.07	0.20	0.12	0.10	0.19	0.20	0.08	0.12
T69	0.10	0.06	0.08	0.03	0.13	0.08	0.26	0.21	0.20	0.22	0.19	0.11	0.15
T70	0.02	0.03	0.03	0.05	0.05	0.14	0.10	0.11	0.19	0.18	0.06	0.06	0.10
T71	0.07	0.06	0.05	0.11	0.14	0.19	0.20	0.15	0.20	0.24	0.11	0.10	0.15
T72	0.14	0.10	0.08	0.12	0.21	0.27	0.24	0.18	0.34	0.31	0.19	0.15	0.21
T73	0.14	0.12	0.07	0.10	0.15	0.27	0.27	0.21	0.33	0.27	0.21	0.15	0.20
T74	0.16	0.11	0.08	0.16	0.24	0.30	0.31	0.20	0.34	0.31	0.21	0.17	0.23
T75	0.03	0.04	0.04	0.03	0.07	0.13	0.06	0.12	0.18	0.10	0.08	0.06	0.09
T76	0.07	0.06	0.07	0.13	0.16	0.08	0.09	0.11	0.40	0.04	0.23	0.11	0.14
T77	0.16	0.09	0.08	0.17	0.25	0.29	0.29	0.12	0.32	0.23	0.19	0.16	0.21
T78	0.15	0.10	0.09	0.12	0.14	0.23	0.23	0.14	0.26	0.20	0.17	0.14	0.17
T79	0.05	0.05	0.05	0.15	0.18	0.11	0.10	0.11	0.17	0.08	0.13	0.09	0.12
T80	0.16	0.06	0.06	0.16	0.22	0.24	0.20	0.07	0.21	0.13	0.18	0.13	0.16
T81	0.12	0.08	0.09	0.14	0.14	0.22	0.26	0.10	0.25	0.23	0.03	0.13	0.16
T82	0.05	0.07	0.08	0.18	0.24	0.18	0.23	0.15	0.03	0.20	0.05	0.11	0.15
T83	0.17	0.05	0.04	0.17	0.24	0.30	0.33	0.08	0.37	0.35	0.21	0.16	0.23
T84	0.06	0.05	0.02	0.15	0.12	0.22	0.19	0.04	0.27	0.18	0.08	0.10	0.14
T85	0.02	0.06	0.04	0.11	0.12	0.11	0.19	0.09	0.06	0.13	0.10	0.07	0.10
T86	0.03	0.04	0.10	0.15	0.13	0.14	0.17	0.10	0.06	0.14	0.11	0.09	0.12
T87	0.09	0.06	0.06	0.10	0.12	0.11	0.45	0.16	0.13	0.47	0.14	0.12	0.19
T88	0.07	0.11	0.09	0.07	0.09	0.12	0.32	0.09	0.18	0.40	0.08	0.12	0.16
T89	0.03	0.04	0.04	0.01	0.02	0.02	0.02	0.04	0.09	0.15	0.04	0.04	0.05
T90	0.10	0.05	0.05	0.05	0.07	0.15	0.20	0.09	0.38	0.42	0.16	0.11	0.17
T91	0.05	0.03	0.02	0.10	0.07	0.06	0.05	0.06	0.15	0.13	0.02	0.06	0.07
T92	0.10	0.11	0.06	0.06	0.14	0.16	0.04	0.02	0.36	0.22	0.03	0.11	0.12
T93	0.10	0.01	0.03	0.06	0.05	0.05	0.33	0.29	0.12	0.13	0.09	0.07	0.13
T94	0.07	0.04	0.03	0.04	0.04	0.04	0.14	0.13	0.15	0.05	0.05	0.06	0.07
T95	0.06	0.07	0.04	0.07	0.08	0.09	0.05	0.08	0.16	0.11	0.07	0.07	0.08
T96	0.34	0.36	0.32	0.22	0.25	0.18	0.27	0.16	0.32	0.26	0.12	0.29	0.24

	Proposed Notional Scheme (VR)												
Testpoint	**NNE**	**NE**	**ENE**	**E**	**ESE**	**SE**	**SSW**	**SW**	**SSE**	**S**	**WSW**	**Annual**	**Summer**
T97	0.33	0.36	0.32	0.33	0.23	0.19	0.37	0.22	0.35	0.38	0.18	0.32	0.29
T98	0.22	0.20	0.20	0.16	0.03	0.07	0.21	0.16	0.17	0.22	0.11	0.17	0.15
T99	0.15	0.19	0.17	0.09	0.05	0.07	0.07	0.05	0.08	0.14	0.06	0.13	0.09
T100	0.20	0.27	0.29	0.13	0.13	0.16	0.12	0.15	0.14	0.11	0.16	0.20	0.16
T101	0.27	0.31	0.20	0.02	0.15	0.14	0.21	0.20	0.06	0.07	0.17	0.18	0.14
T102	0.08	0.25	0.16	0.17	0.17	0.17	0.18	0.19	0.13	0.06	0.18	0.16	0.16
T103	0.16	0.16	0.16	0.14	0.06	0.13	0.24	0.18	0.18	0.24	0.23	0.16	0.17
T104	0.22	0.23	0.20	0.13	0.23	0.26	0.24	0.10	0.34	0.26	0.15	0.21	0.21
T105	0.06	0.07	0.06	0.04	0.06	0.07	0.34	0.13	0.09	0.26	0.07	0.09	0.12
T106	0.04	0.04	0.03	0.12	0.10	0.08	0.16	0.08	0.20	0.08	0.06	0.07	0.10
T107	0.04	0.11	0.07	0.16	0.21	0.24	0.11	0.03	0.35	0.34	0.04	0.13	0.17
T108	0.07	0.05	0.04	0.10	0.08	0.06	0.17	0.20	0.23	0.20	0.05	0.09	0.12
T109	0.09	0.06	0.08	0.09	0.16	0.23	0.28	0.14	0.32	0.30	0.07	0.13	0.18
T110	0.14	0.10	0.09	0.17	0.25	0.27	0.32	0.16	0.30	0.29	0.18	0.17	0.22
T111	0.13	0.07	0.09	0.27	0.33	0.36	0.25	0.11	0.45	0.43	0.17	0.19	0.27
T112	0.05	0.06	0.02	0.03	0.01	0.03	0.08	0.04	0.06	0.08	0.05	0.04	0.05
T113	0.08	0.12	0.09	0.14	0.03	0.06	0.15	0.15	0.20	0.42	0.16	0.13	0.15
T114	0.16	0.17	0.11	0.04	0.05	0.10	0.10	0.09	0.18	0.18	0.12	0.12	0.11
T115	0.29	0.24	0.12	0.06	0.06	0.17	0.22	0.23	0.20	0.24	0.20	0.17	0.17
T116	0.11	0.09	0.07	0.05	0.06	0.03	0.05	0.13	0.03	0.08	0.14	0.07	0.07
T117	0.19	0.18	0.16	0.00	0.02	0.03	0.16	0.21	0.03	0.16	0.21	0.12	0.11
T118	0.19	0.19	0.13	0.03	0.02	0.04	0.08	0.06	0.02	0.06	0.06	0.10	0.06
T119	0.24	0.26	0.28	0.03	0.07	0.08	0.16	0.10	0.15	0.15	0.15	0.18	0.13
T120	0.20	0.18	0.16	0.10	0.10	0.12	0.07	0.06	0.11	0.02	0.16	0.14	0.10
T121	0.16	0.20	0.16	0.12	0.12	0.17	0.11	0.15	0.04	0.03	0.25	0.15	0.13
T122	0.10	0.15	0.09	0.16	0.23	0.21	0.08	0.10	0.19	0.15	0.06	0.13	0.14
T123	0.16	0.24	0.18	0.03	0.15	0.22	0.05	0.18	0.21	0.18	0.08	0.16	0.14
T124	0.05	0.13	0.15	0.07	0.25	0.25	0.18	0.24	0.36	0.29	0.18	0.16	0.21
T125	0.11	0.23	0.22	0.14	0.11	0.18	0.44	0.22	0.35	0.44	0.13	0.21	0.24
T126	0.03	0.09	0.21	0.32	0.29	0.23	0.21	0.22	0.31	0.20	0.22	0.20	0.24
T127	0.03	0.13	0.09	0.10	0.12	0.09	0.03	0.10	0.06	0.07	0.09	0.09	0.08
T128	0.04	0.08	0.07	0.19	0.19	0.20	0.23	0.20	0.28	0.25	0.11	0.13	0.19
T129	0.09	0.10	0.12	0.14	0.11	0.10	0.13	0.07	0.08	0.12	0.08	0.11	0.10
T130	0.12	0.09	0.08	0.22	0.28	0.30	0.20	0.12	0.39	0.36	0.17	0.17	0.23
T131	0.14	0.14	0.14	0.15	0.24	0.31	0.27	0.15	0.35	0.29	0.06	0.18	0.21
T132	0.13	0.10	0.07	0.12	0.19	0.26	0.28	0.18	0.34	0.32	0.04	0.15	0.20
T133	0.12	0.14	0.09	0.09	0.09	0.27	0.32	0.18	0.39	0.36	0.04	0.15	0.20
T134	0.03	0.06	0.00	0.09	0.25	0.24	0.26	0.21	0.51	0.52	0.20	0.14	0.24
T135	0.13	0.13	0.09	0.09	0.19	0.19	0.23	0.16	0.48	0.46	0.12	0.16	0.22
T136	0.28	0.25	0.18	0.11	0.13	0.07	0.18	0.15	0.39	0.26	0.23	0.20	0.19
T137	0.17	0.18	0.15	0.05	0.07	0.12	0.18	0.06	0.16	0.27	0.08	0.14	0.13
T138	0.30	0.21	0.22	0.15	0.13	0.07	0.13	0.12	0.12	0.10	0.09	0.18	0.13
T139	0.22	0.22	0.17	0.10	0.10	0.06	0.10	0.04	0.10	0.09	0.04	0.14	0.10
T140	0.25	0.35	0.20	0.04	0.05	0.23	0.25	0.33	0.40	0.41	0.31	0.23	0.25
T141	0.14	0.10	0.13	0.13	0.09	0.06	0.11	0.12	0.12	0.10	0.09	0.12	0.11
T142	0.07	0.08	0.07	0.14	0.08	0.14	0.18	0.15	0.28	0.34	0.19	0.13	0.17
T143	0.09	0.06	0.02	0.01	0.03	0.11	0.07	0.17	0.23	0.24	0.19	0.08	0.12
T144	0.05	0.09	0.08	0.12	0.01	0.04	0.09	0.13	0.31	0.34	0.10	0.11	0.13
T145	0.05	0.07	0.01	0.13	0.10	0.12	0.23	0.24	0.17	0.14	0.20	0.09	0.15
T146	0.03	0.07	0.07	0.15	0.05	0.05	0.23	0.03	0.19	0.28	0.02	0.10	0.12
T147	0.05	0.06	0.03	0.08	0.08	0.06	0.22	0.10	0.08	0.28	0.10	0.08	0.11
T148	0.14	0.12	0.09	0.02	0.01	0.03	0.06	0.03	0.14	0.01	0.02	0.08	0.05
S01	0.22	0.26	0.26	0.25	0.23	0.21	0.27	0.25	0.26	0.23	0.23	0.25	0.25
S02	0.03	0.10	0.15	0.28	0.18	0.16	0.19	0.18	0.18	0.15	0.17	0.15	0.18
S03	0.02	0.09	0.15	0.23	0.22	0.20	0.21	0.20	0.22	0.20	0.16	0.16	0.19
S04	0.04	0.14	0.20	0.23	0.21	0.19	0.26	0.23	0.24	0.22	0.19	0.18	0.21
S05	0.02	0.11	0.18	0.29	0.25	0.15	0.23	0.24	0.14	0.15	0.20	0.17	0.20
S06	0.08	0.03	0.08	0.24	0.26	0.24	0.16	0.14	0.25	0.20	0.12	0.14	0.18
S07	0.10	0.05	0.05	0.06	0.12	0.17	0.23	0.18	0.28	0.26	0.07	0.10	0.15
S08	0.08	0.05	0.06	0.09	0.07	0.09	0.08	0.09	0.07	0.09	0.08	0.07	0.08

	Base Scheme (VR)												
Testpoint	**NNE**	**NE**	**ENE**	**E**	**ESE**	**SE**	**SSW**	**SW**	**SSE**	**S**	**WSW**	**Annual**	**Summer**
P01	0.11	0.19	0.08	0.17	0.05	0.18	0.51	0.19	0.36	0.49	0.06	0.17	0.22
P02	0.21	0.13	0.09	0.13	0.04	0.10	0.27	0.07	0.23	0.38	0.06	0.14	0.16
P03	0.13	0.15	0.07	0.12	0.04	0.06	0.06	0.04	0.06	0.02	0.05	0.09	0.06
P04	0.37	0.36	0.26	0.21	0.16	0.18	0.14	0.06	0.26	0.19	0.21	0.25	0.19
P05	0.26	0.22	0.23	0.14	0.18	0.18	0.14	0.08	0.26	0.20	0.14	0.20	0.17
P06	0.07	0.07	0.07	0.06	0.16	0.07	0.16	0.10	0.26	0.21	0.14	0.10	0.13
P07	0.09	0.11	0.08	0.07	0.14	0.11	0.10	0.12	0.05	0.24	0.25	0.10	0.12
P08	0.02	0.14	0.15	0.03	0.21	0.13	0.16	0.07	0.28	0.19	0.13	0.12	0.14
P09	0.02	0.16	0.17	0.02	0.05	0.04	0.11	0.08	0.22	0.14	0.14	0.11	0.10
P10	0.01	0.12	0.13	0.02	0.10	0.04	0.09	0.05	0.16	0.10	0.08	0.09	0.08
P11	0.07	0.05	0.05	0.06	0.26	0.08	0.11	0.03	0.18	0.16	0.14	0.09	0.11
P12	0.10	0.05	0.05	0.15	0.20	0.04	0.24	0.08	0.34	0.11	0.11	0.11	0.15
P13	0.08	0.06	0.05	0.12	0.05	0.03	0.15	0.06	0.30	0.15	0.05	0.09	0.11
P14	0.15	0.08	0.13	0.06	0.22	0.12	0.57	0.34	0.08	0.21	0.03	0.14	0.19
P15	0.10	0.04	0.12	0.14	0.21	0.12	0.40	0.20	0.41	0.26	0.23	0.15	0.22
P16	0.08	0.06	0.09	0.17	0.22	0.13	0.13	0.09	0.50	0.18	0.28	0.14	0.19
P17	0.06	0.06	0.10	0.17	0.18	0.16	0.25	0.13	0.47	0.26	0.21	0.15	0.20
P18	0.05	0.05	0.07	0.17	0.23	0.13	0.13	0.11	0.26	0.42	0.10	0.13	0.17
P19	0.01	0.07	0.06	0.13	0.15	0.11	0.22	0.11	0.19	0.35	0.08	0.11	0.15
P20	0.11	0.08	0.07	0.13	0.12	0.08	0.48	0.17	0.12	0.49	0.14	0.13	0.20
P21	0.07	0.06	0.06	0.14	0.10	0.05	0.04	0.17	0.05	0.22	0.11	0.09	0.10
P22	0.01	0.05	0.06	0.10	0.08	0.03	0.03	0.11	0.08	0.23	0.12	0.07	0.09
P23	0.07	0.01	0.04	0.06	0.09	0.05	0.13	0.09	0.10	0.20	0.08	0.06	0.09
P24	0.06	0.04	0.04	0.08	0.08	0.16	0.06	0.10	0.07	0.26	0.13	0.07	0.11
P25	0.09	0.09	0.15	0.19	0.11	0.21	0.20	0.21	0.37	0.25	0.25	0.17	0.21
P26	0.01	0.14	0.13	0.19	0.11	0.23	0.21	0.12	0.22	0.27	0.15	0.15	0.18
P27	0.02	0.20	0.12	0.16	0.11	0.25	0.30	0.13	0.22	0.06	0.15	0.15	0.17
P28	0.16	0.27	0.16	0.19	0.11	0.28	0.36	0.13	0.40	0.30	0.13	0.21	0.23
P29	0.14	0.31	0.20	0.23	0.10	0.25	0.37	0.19	0.32	0.39	0.15	0.23	0.25
P30	0.23	0.26	0.14	0.16	0.07	0.21	0.40	0.21	0.35	0.42	0.14	0.21	0.24
T01	0.32	0.31	0.16	0.04	0.17	0.26	0.04	0.19	0.14	0.04	0.21	0.18	0.14
T02	0.34	0.26	0.10	0.07	0.10	0.26	0.09	0.21	0.20	0.09	0.17	0.17	0.15
T03	0.31	0.26	0.12	0.10	0.13	0.18	0.06	0.15	0.16	0.09	0.16	0.17	0.14
T04	0.12	0.10	0.02	0.11	0.12	0.22	0.09	0.08	0.19	0.09	0.04	0.09	0.11
T05	0.21	0.20	0.10	0.09	0.05	0.14	0.07	0.09	0.14	0.11	0.11	0.13	0.11
T06	0.01	0.05	0.06	0.21	0.14	0.32	0.33	0.10	0.35	0.24	0.08	0.13	0.20
T07	0.12	0.10	0.09	0.20	0.11	0.29	0.13	0.14	0.38	0.21	0.12	0.15	0.18
T08	0.24	0.14	0.07	0.04	0.08	0.10	0.11	0.16	0.17	0.20	0.18	0.12	0.13
T09	0.02	0.04	0.04	0.05	0.01	0.02	0.04	0.05	0.03	0.06	0.05	0.04	0.04
T10	0.20	0.07	0.06	0.12	0.07	0.13	0.04	0.10	0.12	0.03	0.05	0.09	0.08
T11	0.04	0.15	0.12	0.19	0.07	0.16	0.17	0.16	0.17	0.12	0.13	0.13	0.14
T12	0.36	0.30	0.12	0.25	0.10	0.24	0.21	0.22	0.23	0.14	0.19	0.22	0.20
T13	0.20	0.20	0.17	0.29	0.12	0.22	0.23	0.20	0.31	0.19	0.18	0.21	0.22
T14	0.12	0.09	0.14	0.16	0.04	0.12	0.21	0.12	0.22	0.09	0.08	0.13	0.13
T15	0.04	0.14	0.14	0.19	0.11	0.24	0.24	0.17	0.25	0.19	0.17	0.15	0.18
T16	0.10	0.17	0.10	0.23	0.16	0.40	0.49	0.17	0.47	0.51	0.18	0.21	0.29
T17	0.07	0.21	0.12	0.17	0.11	0.29	0.39	0.14	0.36	0.34	0.16	0.18	0.23
T18	0.09	0.18	0.10	0.21	0.14	0.35	0.49	0.22	0.49	0.59	0.24	0.22	0.31
T19	0.01	0.17	0.10	0.19	0.11	0.27	0.49	0.22	0.46	0.44	0.21	0.19	0.27
T20	0.15	0.30	0.18	0.22	0.11	0.31	0.49	0.21	0.45	0.32	0.18	0.24	0.28
T21	0.03	0.14	0.07	0.14	0.09	0.22	0.49	0.21	0.45	0.51	0.21	0.17	0.26
T22	0.05	0.19	0.09	0.17	0.07	0.21	0.55	0.19	0.45	0.56	0.14	0.19	0.27
T23	0.05	0.09	0.03	0.06	0.07	0.19	0.47	0.19	0.43	0.47	0.17	0.13	0.22
T24	0.03	0.13	0.02	0.04	0.06	0.22	0.50	0.18	0.43	0.49	0.13	0.13	0.22
T25	0.12	0.14	0.07	0.19	0.05	0.20	0.45	0.18	0.16	0.34	0.09	0.15	0.19
T26	0.27	0.28	0.20	0.21	0.08	0.16	0.26	0.19	0.04	0.29	0.18	0.21	0.19
T27	0.34	0.37	0.31	0.26	0.19	0.20	0.37	0.18	0.35	0.39	0.17	0.30	0.27
T28	0.28	0.29	0.21	0.13	0.13	0.16	0.19	0.17	0.25	0.26	0.10	0.21	0.18
T29	0.48	0.49	0.36	0.11	0.07	0.11	0.10	0.27	0.21	0.40	0.22	0.30	0.21
T30	0.12	0.20	0.19	0.11	0.12	0.11	0.42	0.19	0.16	0.39	0.22	0.18	0.21
T31	0.16	0.13	0.21	0.24	0.06	0.09	0.37	0.25	0.20	0.25	0.30	0.19	0.22
T32	0.15	0.12	0.13	0.11	0.05	0.09	0.19	0.16	0.11	0.10	0.16	0.12	0.12
T33	0.16	0.12	0.04	0.08	0.06	0.10	0.11	0.07	0.22	0.15	0.04	0.10	0.10

	Base Scheme (VR)												
Testpoint	**NNE**	**NE**	**ENE**	**E**	**ESE**	**SE**	**SSW**	**SW**	**SSE**	**S**	**WSW**	**Annual**	**Summer**
T34	0.26	0.24	0.13	0.17	0.05	0.16	0.23	0.09	0.17	0.27	0.15	0.18	0.17
T35	0.23	0.32	0.22	0.17	0.05	0.16	0.24	0.09	0.10	0.03	0.27	0.20	0.15
T36	0.16	0.10	0.12	0.04	0.02	0.06	0.08	0.12	0.20	0.05	0.17	0.10	0.10
T37	0.29	0.33	0.29	0.12	0.04	0.11	0.15	0.19	0.24	0.26	0.43	0.24	0.20
T38	0.19	0.25	0.19	0.09	0.07	0.08	0.06	0.10	0.19	0.12	0.30	0.17	0.13
T39	0.16	0.25	0.25	0.08	0.08	0.14	0.18	0.17	0.29	0.22	0.36	0.20	0.19
T40	0.08	0.07	0.07	0.05	0.05	0.09	0.25	0.26	0.10	0.36	0.38	0.11	0.17
T41	0.33	0.11	0.11	0.05	0.05	0.08	0.11	0.14	0.05	0.16	0.22	0.12	0.11
T42	0.12	0.20	0.19	0.10	0.12	0.17	0.20	0.18	0.27	0.24	0.37	0.18	0.20
T43	0.15	0.25	0.21	0.02	0.01	0.16	0.07	0.06	0.08	0.02	0.16	0.14	0.09
T44	0.08	0.08	0.07	0.02	0.07	0.08	0.22	0.20	0.03	0.30	0.27	0.09	0.13
T45	0.13	0.18	0.15	0.05	0.05	0.04	0.18	0.11	0.03	0.16	0.19	0.12	0.11
T46	0.10	0.21	0.20	0.07	0.13	0.18	0.10	0.09	0.32	0.04	0.14	0.16	0.14
T47	0.16	0.23	0.24	0.05	0.12	0.22	0.07	0.03	0.20	0.14	0.08	0.17	0.13
T48	0.11	0.15	0.11	0.16	0.15	0.27	0.36	0.30	0.05	0.31	0.49	0.17	0.24
T49	0.17	0.16	0.08	0.02	0.03	0.02	0.09	0.13	0.20	0.07	0.16	0.10	0.09
T50	0.14	0.22	0.25	0.05	0.18	0.20	0.09	0.09	0.23	0.28	0.22	0.18	0.17
T51	0.13	0.16	0.11	0.05	0.12	0.12	0.13	0.10	0.32	0.22	0.01	0.13	0.13
T52	0.11	0.19	0.19	0.07	0.17	0.18	0.07	0.04	0.15	0.10	0.04	0.14	0.11
T53	0.13	0.19	0.18	0.20	0.24	0.27	0.10	0.05	0.39	0.04	0.05	0.18	0.17
T54	0.10	0.04	0.09	0.02	0.08	0.08	0.11	0.07	0.19	0.32	0.17	0.09	0.12
T55	0.11	0.16	0.07	0.10	0.19	0.08	0.08	0.07	0.11	0.04	0.14	0.11	0.10
T56	0.22	0.19	0.22	0.14	0.13	0.09	0.15	0.06	0.11	0.21	0.06	0.17	0.13
T57	0.11	0.06	0.15	0.02	0.21	0.05	0.02	0.03	0.01	0.07	0.07	0.09	0.07
T58	0.04	0.04	0.13	0.09	0.23	0.06	0.07	0.11	0.09	0.28	0.17	0.10	0.13
T59	0.04	0.06	0.05	0.09	0.23	0.07	0.08	0.04	0.01	0.06	0.14	0.07	0.08
T60	0.11	0.17	0.14	0.28	0.32	0.31	0.02	0.07	0.34	0.10	0.16	0.18	0.19
T61	0.06	0.06	0.03	0.10	0.20	0.26	0.40	0.21	0.18	0.10	0.10	0.11	0.17
T62	0.05	0.03	0.04	0.26	0.28	0.28	0.09	0.07	0.31	0.08	0.09	0.12	0.16
T63	0.05	0.04	0.04	0.11	0.09	0.08	0.06	0.07	0.12	0.24	0.11	0.08	0.10
T64	0.12	0.07	0.13	0.12	0.24	0.24	0.35	0.21	0.28	0.23	0.15	0.15	0.21
T65	0.06	0.06	0.06	0.11	0.18	0.11	0.38	0.19	0.14	0.06	0.06	0.10	0.14
T66	0.08	0.01	0.07	0.10	0.16	0.12	0.09	0.05	0.29	0.06	0.22	0.09	0.12
T67	0.12	0.02	0.11	0.13	0.22	0.15	0.48	0.25	0.24	0.35	0.20	0.15	0.23
T68	0.07	0.06	0.05	0.08	0.12	0.08	0.19	0.11	0.12	0.08	0.19	0.08	0.11
T69	0.11	0.07	0.06	0.01	0.09	0.08	0.25	0.21	0.11	0.08	0.19	0.08	0.12
T70	0.03	0.04	0.04	0.05	0.08	0.16	0.12	0.11	0.19	0.21	0.05	0.07	0.11
T71	0.08	0.06	0.08	0.11	0.16	0.20	0.21	0.15	0.21	0.18	0.11	0.11	0.15
T72	0.15	0.07	0.08	0.12	0.22	0.27	0.24	0.18	0.34	0.31	0.19	0.15	0.21
T73	0.16	0.10	0.07	0.11	0.18	0.28	0.29	0.21	0.32	0.22	0.21	0.15	0.21
T74	0.16	0.07	0.06	0.16	0.25	0.30	0.32	0.21	0.35	0.29	0.21	0.16	0.23
T75	0.04	0.04	0.05	0.04	0.08	0.14	0.09	0.12	0.18	0.20	0.07	0.07	0.10
T76	0.07	0.06	0.09	0.11	0.13	0.06	0.05	0.12	0.37	0.15	0.18	0.11	0.13
T77	0.15	0.04	0.02	0.17	0.26	0.29	0.30	0.12	0.32	0.20	0.19	0.13	0.20
T78	0.16	0.07	0.06	0.12	0.17	0.24	0.24	0.14	0.27	0.15	0.19	0.13	0.17
T79	0.06	0.06	0.07	0.14	0.17	0.10	0.08	0.11	0.30	0.10	0.10	0.10	0.13
T80	0.15	0.04	0.05	0.16	0.22	0.23	0.19	0.07	0.19	0.18	0.19	0.12	0.16
T81	0.14	0.07	0.09	0.13	0.16	0.24	0.27	0.09	0.29	0.20	0.02	0.13	0.16
T82	0.06	0.08	0.09	0.16	0.19	0.19	0.24	0.13	0.14	0.14	0.03	0.12	0.15
T83	0.16	0.04	0.07	0.18	0.25	0.29	0.32	0.07	0.36	0.44	0.21	0.16	0.24
T84	0.09	0.07	0.10	0.13	0.17	0.24	0.19	0.02	0.31	0.15	0.08	0.12	0.15
T85	0.03	0.08	0.07	0.12	0.11	0.11	0.17	0.07	0.05	0.08	0.09	0.08	0.10
T86	0.01	0.07	0.06	0.15	0.12	0.16	0.17	0.08	0.15	0.07	0.08	0.09	0.11
T87	0.08	0.05	0.06	0.16	0.14	0.10	0.21	0.14	0.06	0.17	0.12	0.10	0.13
T88	0.15	0.07	0.07	0.09	0.12	0.09	0.15	0.08	0.18	0.14	0.08	0.10	0.11
T89	0.03	0.04	0.04	0.03	0.01	0.03	0.04	0.04	0.04	0.13	0.04	0.04	0.04
T90	0.10	0.06	0.06	0.09	0.08	0.16	0.30	0.09	0.28	0.36	0.15	0.12	0.17
T91	0.05	0.03	0.02	0.10	0.07	0.06	0.05	0.06	0.15	0.17	0.05	0.06	0.08
T92	0.10	0.10	0.06	0.06	0.14	0.17	0.04	0.02	0.36	0.16	0.03	0.10	0.11
T93	0.10	0.03	0.06	0.06	0.05	0.03	0.33	0.29	0.12	0.13	0.09	0.08	0.13
T94	0.07	0.04	0.05	0.04	0.05	0.04	0.15	0.13	0.14	0.11	0.05	0.06	0.08
T95	0.05	0.06	0.04	0.06	0.08	0.09	0.06	0.08	0.15	0.11	0.07	0.07	0.08
T96	0.34	0.35	0.32	0.20	0.24	0.17	0.25	0.15	0.30	0.26	0.15	0.28	0.23

	Base Scheme (VR)												
Testpoint	**NNE**	**NE**	**ENE**	**E**	**ESE**	**SE**	**SSW**	**SW**	**SSE**	**S**	**WSW**	**Annual**	**Summer**
T97	0.32	0.35	0.31	0.32	0.23	0.18	0.38	0.21	0.33	0.39	0.19	0.31	0.29
T98	0.21	0.18	0.19	0.15	0.03	0.06	0.23	0.16	0.17	0.20	0.08	0.16	0.14
T99	0.15	0.19	0.17	0.09	0.04	0.08	0.11	0.06	0.10	0.17	0.08	0.13	0.10
T100	0.20	0.27	0.29	0.13	0.14	0.16	0.06	0.15	0.13	0.09	0.19	0.20	0.15
T101	0.26	0.31	0.20	0.01	0.15	0.14	0.19	0.20	0.05	0.15	0.21	0.18	0.15
T102	0.21	0.25	0.16	0.17	0.17	0.17	0.16	0.19	0.13	0.20	0.19	0.18	0.18
T103	0.16	0.17	0.17	0.14	0.06	0.12	0.17	0.18	0.18	0.19	0.34	0.16	0.17
T104	0.22	0.23	0.21	0.14	0.23	0.26	0.23	0.10	0.34	0.27	0.16	0.21	0.21
T105	0.06	0.07	0.06	0.05	0.06	0.08	0.33	0.13	0.10	0.37	0.06	0.09	0.14
T106	0.04	0.04	0.04	0.12	0.10	0.08	0.16	0.08	0.19	0.13	0.05	0.08	0.11
T107	0.04	0.10	0.07	0.17	0.21	0.24	0.11	0.03	0.35	0.26	0.04	0.13	0.16
T108	0.08	0.03	0.04	0.09	0.08	0.09	0.16	0.20	0.23	0.09	0.06	0.08	0.12
T109	0.09	0.06	0.09	0.09	0.17	0.23	0.29	0.14	0.32	0.29	0.07	0.13	0.18
T110	0.14	0.05	0.08	0.17	0.25	0.27	0.32	0.16	0.30	0.27	0.18	0.15	0.22
T111	0.13	0.10	0.11	0.27	0.33	0.36	0.25	0.11	0.43	0.40	0.17	0.20	0.26
T112	0.05	0.06	0.02	0.01	0.03	0.04	0.07	0.04	0.10	0.13	0.05	0.04	0.05
T113	0.09	0.11	0.09	0.08	0.03	0.03	0.12	0.15	0.21	0.44	0.16	0.12	0.14
T114	0.16	0.17	0.11	0.03	0.05	0.12	0.11	0.13	0.17	0.26	0.11	0.12	0.12
T115	0.28	0.23	0.11	0.06	0.02	0.22	0.21	0.22	0.18	0.36	0.19	0.17	0.18
T116	0.12	0.08	0.07	0.05	0.06	0.03	0.06	0.13	0.06	0.08	0.14	0.08	0.08
T117	0.18	0.17	0.16	0.00	0.08	0.01	0.18	0.20	0.04	0.18	0.20	0.12	0.12
T118	0.19	0.18	0.13	0.02	0.04	0.02	0.05	0.06	0.09	0.04	0.06	0.10	0.06
T119	0.24	0.26	0.28	0.05	0.07	0.08	0.16	0.10	0.15	0.15	0.18	0.18	0.14
T120	0.20	0.18	0.16	0.11	0.10	0.12	0.04	0.06	0.11	0.05	0.18	0.14	0.11
T121	0.16	0.21	0.16	0.12	0.12	0.17	0.08	0.15	0.04	0.06	0.26	0.15	0.13
T122	0.10	0.15	0.09	0.16	0.24	0.21	0.06	0.10	0.19	0.23	0.09	0.14	0.15
T123	0.16	0.24	0.18	0.03	0.16	0.22	0.03	0.18	0.21	0.22	0.07	0.16	0.14
T124	0.05	0.13	0.15	0.09	0.25	0.25	0.18	0.24	0.36	0.26	0.18	0.16	0.21
T125	0.11	0.23	0.22	0.14	0.11	0.18	0.44	0.22	0.35	0.49	0.13	0.22	0.25
T126	0.03	0.09	0.21	0.32	0.29	0.23	0.21	0.22	0.32	0.17	0.22	0.20	0.23
T127	0.03	0.12	0.09	0.10	0.12	0.09	0.03	0.10	0.06	0.05	0.09	0.09	0.08
T128	0.05	0.07	0.06	0.19	0.20	0.21	0.23	0.20	0.28	0.20	0.11	0.13	0.18
T129	0.08	0.12	0.13	0.14	0.11	0.09	0.13	0.07	0.08	0.07	0.08	0.11	0.10
T130	0.13	0.08	0.03	0.22	0.27	0.29	0.19	0.13	0.38	0.33	0.17	0.16	0.22
T131	0.14	0.12	0.15	0.15	0.24	0.31	0.27	0.15	0.35	0.28	0.06	0.18	0.21
T132	0.13	0.13	0.09	0.12	0.19	0.26	0.28	0.18	0.34	0.31	0.04	0.16	0.20
T133	0.12	0.18	0.11	0.09	0.10	0.27	0.32	0.18	0.39	0.35	0.04	0.17	0.21
T134	0.03	0.07	0.01	0.07	0.25	0.30	0.27	0.21	0.51	0.50	0.20	0.14	0.25
T135	0.13	0.12	0.09	0.09	0.18	0.26	0.23	0.16	0.48	0.44	0.12	0.16	0.22
T136	0.28	0.25	0.19	0.13	0.11	0.10	0.16	0.16	0.36	0.30	0.22	0.21	0.19
T137	0.17	0.18	0.15	0.04	0.06	0.05	0.19	0.06	0.16	0.31	0.08	0.14	0.12
T138	0.19	0.21	0.22	0.14	0.13	0.07	0.13	0.12	0.14	0.14	0.08	0.17	0.13
T139	0.17	0.22	0.17	0.11	0.10	0.06	0.10	0.04	0.10	0.13	0.06	0.14	0.10
T140	0.36	0.35	0.20	0.04	0.06	0.23	0.28	0.34	0.40	0.44	0.30	0.25	0.26
T141	0.03	0.10	0.13	0.13	0.09	0.06	0.11	0.12	0.12	0.13	0.08	0.10	0.11
T142	0.08	0.08	0.07	0.08	0.11	0.14	0.18	0.15	0.22	0.28	0.19	0.11	0.15
T143	0.08	0.06	0.02	0.01	0.09	0.13	0.09	0.17	0.19	0.26	0.19	0.08	0.12
T144	0.06	0.08	0.07	0.12	0.04	0.05	0.03	0.12	0.03	0.39	0.10	0.09	0.10
T145	0.05	0.07	0.01	0.12	0.10	0.13	0.24	0.24	0.17	0.13	0.20	0.09	0.15
T146	0.03	0.07	0.06	0.17	0.06	0.10	0.22	0.03	0.11	0.31	0.01	0.09	0.12
T147	0.05	0.06	0.03	0.07	0.04	0.07	0.14	0.10	0.07	0.32	0.10	0.07	0.10
T148	0.14	0.12	0.09	0.06	0.04	0.03	0.06	0.03	0.14	0.05	0.02	0.09	0.06
S01	0.22	0.26	0.26	0.25	0.23	0.21	0.27	0.25	0.26	0.21	0.23	0.25	0.24
S02	0.03	0.10	0.15	0.28	0.18	0.16	0.19	0.18	0.18	0.11	0.17	0.15	0.18
S03	0.03	0.09	0.15	0.23	0.22	0.20	0.21	0.20	0.22	0.16	0.16	0.15	0.19
S04	0.05	0.13	0.20	0.23	0.21	0.19	0.26	0.23	0.24	0.20	0.19	0.18	0.21
S05	0.02	0.11	0.18	0.29	0.25	0.15	0.23	0.24	0.14	0.13	0.20	0.17	0.20
S06	0.07	0.03	0.08	0.24	0.26	0.24	0.16	0.14	0.25	0.19	0.12	0.14	0.18
S07	0.11	0.05	0.07	0.06	0.12	0.17	0.23	0.18	0.28	0.25	0.06	0.11	0.16
S08	0.10	0.05	0.08	0.09	0.08	0.09	0.08	0.09	0.07	0.08	0.07	0.08	0.08