Planning Department

Planning and Design Study on the Redevelopment of Government Sites at Sai Yee Street and Mong Kok East Station - Feasibility Study

Air Ventilation Assessment Initial Study for WP3

Agreement No. CE 58/2014 (TP)

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Abbreviations

"Arup"	Ove Arup & Partners Hong Kong Limited.
“B(P)R”	Building (Planning) Regulation
“CDG”	Completely Decomposed Granite
“DBS”	Diocesan Boys’ School
“EE”	Expert Evaluation
“ELS”	Excavation and lateral support
“ENE”	East-Northeast
“EVA”	Emergency Vehicular Access
“FEHD”	Food and Environmental Hygiene Department
“GFA”	Gross Floor Area
“GIC”	Government, Institution or Community
“GMB”	Green Mini buses
“HDG”	Highly Decomposed Granite
“HKPSG”	Hong Kong Planning and Standard Guideline
“HyD”	Highways Department
“KCRC”	Kowloon Canton Railway Corporation
“KCRCO Cap 372”	Kowloon Canton Railway Corporation Ordinance Chapter 372
“MK”	Mong Kok
“MKEP”	Mong Kok East Park
“MKES”	Mong Kok East Station
“MKFT”	Mong Kok Freight Terminal
“MKGO”	Mong Kok Government Offices
“MTRC”	Mass Transit Railway Corporation
“mPD”	Meters above Principal Datum
“N”	North
“NSR”	Noise Sensitive Receiver
“NNE”	North-northeast
“OVT”	Old and Valuable Tree
“OZP”	Outline Zoning Plan
“PNAP”	Practice Notes for Authorized Persons
“PlanD”	Planning Department
“PTI”	Public Transportation Interchange
“RDS”	Recommended Development Scheme
“RMB”	Red Mini buses
“SW”	South-west
“STT”	Short Term Tenancy
“SBDG”	Sustainable Building Design Guidelines
“SVP”	Strategic View Points

"RVD"	Rating and Valuation Department
"WSD"	Water Services Department

1. Introduction

1.1 Study Background

Planning Department (PlanD) commissioned Ove Arup and Partners Hong Kong Limited (Arup) on 24 March 2015 to undertake the Planning and Design Study on the Redevelopment of Government Sites at Sai Yee Street and Mong Kok East Station – Feasibility Study (the Study). The 12 month Study will investigate the planning, architectural and engineering feasibility of redeveloping the Study Site.

Key to the Study is to explore ways to maximize the Study Sites redevelopment potential with a range of land uses which may include residential, commercial/office/hotel, open space and/or Government, Institution or Community (GIC) facilities. The Study will also make recommendations to enhance the public realm and public transport facilities in the area.

The findings and recommendations of the Study will serve as a reference for amendments to the Outline Zoning Plan (OZP) and guide the future land disposal and development of the Study Site.

1.2 Purpose of this Report

The purpose of this report is to assess the wind performance of the Recommended Development Scheme (RDS) in compared with the Existing Scheme in form of Air Ventilation Assessment (AVA) Initial Study by using Computational Fluid Dynamics (CFD) techniques in accordance with the HPLB and ETWB Technical Circular No. 1/06 for Air Ventilation Assessments [1] (termed *AVA Technical Circular* hereafter).

This report will achieve the following tasks:

- Give a rough quantitative assessment of wind performances of RDS in compared with Existing Scheme at the pedestrian level reported using Velocity Ratio (*VR*) under both annual and summer wind conditions;
- Identify good design features and problem areas of RDS;
- Suggest remedial measures, if necessary;

The structure of this working paper is as follows:

- **Section 1** introduces the background to this Study and purpose of this working paper;
- **Section 2** provides the characteristic of Study Site and its surroundings;

- **Section 3** sets out the methodology on conducting this AVA Initial Study (including the wind data, wind profile and sub-models to be employed in Computational Fluid Dynamics (CFD) software;
- **Section 4** presents the results and discussion;
- **Section 5** concludes this Study;
- **Section 6** lists the reference made;

2 The Study Site

2.1 Study Site

The Study Site (see **Figure 1**) covers an area of 3.9 ha which is bounded by Argyle Street to the south, Sai Yee Street to the west, Grand Century Place to the north and the Diocesan Boys' School to the east. The Study Site composes of WSD office, FEHD offices-cum-vehicle depot, MKGO, sitting-out area, temporary open car park at Luen Wan Street, PTI, roads and the MKES. The eastern side of the Study Site is delineated by the rail track running beneath the MKES and MKGO.

The Study Area (see **Figure 1**), in which the main feasibility assessments are based, is bounded by Waterloo Road to the east, Dundas Street to the south, Shanghai Street to the west and Prince Edward Road West to the north.

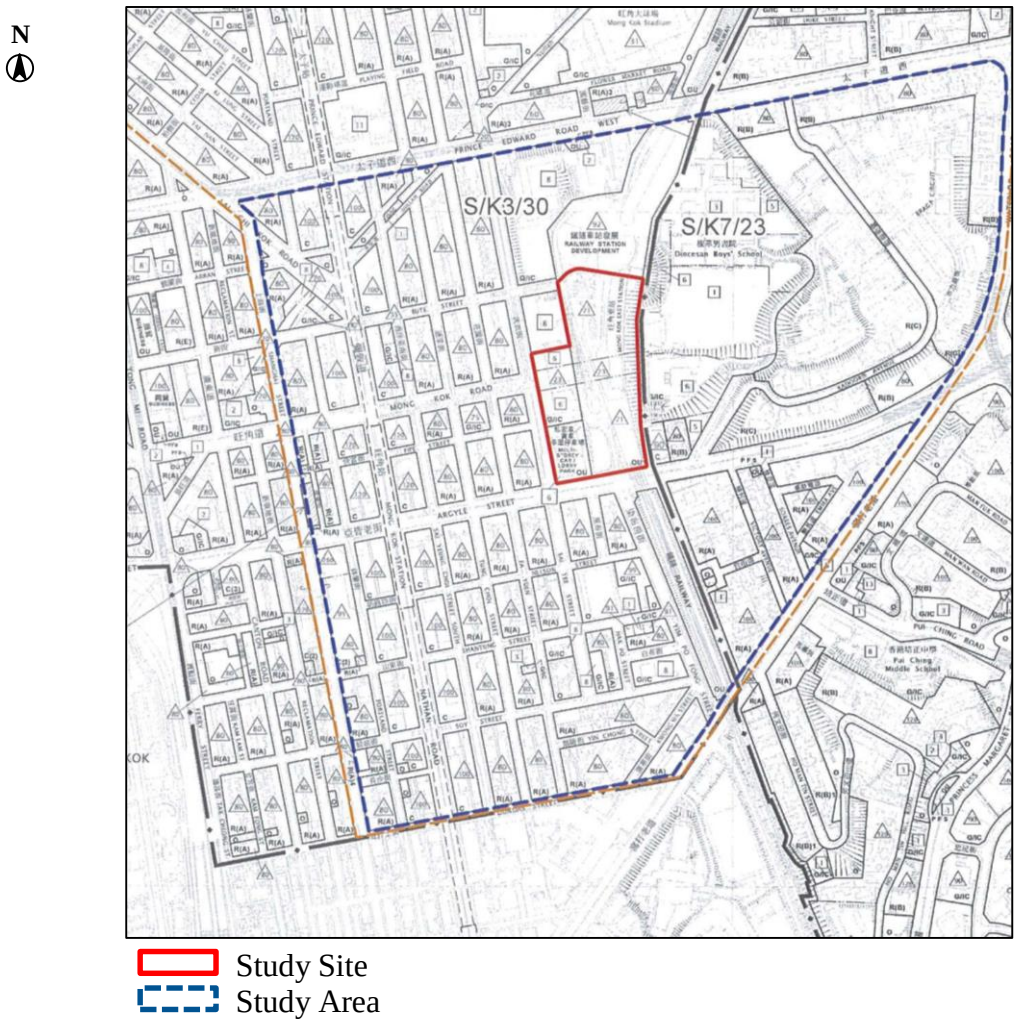


Figure 1 Study Site and Study Area

3 Methodology

3.1 Modelling Tool and Model Setup

The Air Ventilation Assessment (AVA) methodology for Initial Study as stipulated in the *AVA Technical Circular* [1] is employed for this AVA study. The following sections describe the details of the study methodology.

3.2 Site Wind Availability Study

3.2.1 Wind Roses

This study adopted the site wind availability data published in the Mong Kok Wind Tunnel Report [2]. The wind tunnel test was conducted by CLP Power Wind/Wave Tunnel Facility at the HKUST. The graphical presentations of annual and summer wind roses are given in Figure 2 and Figure 3 respectively.

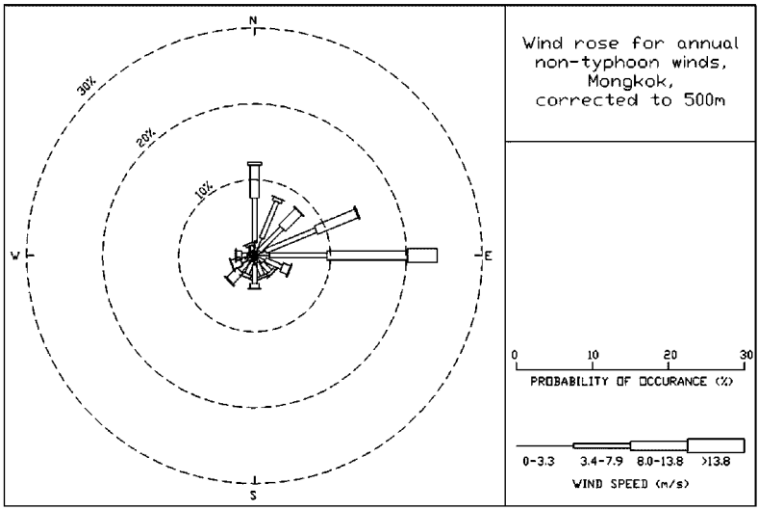


Figure 2 Wind rose for annual, non-typhoon winds for Mong Kok, corrected to 500 m

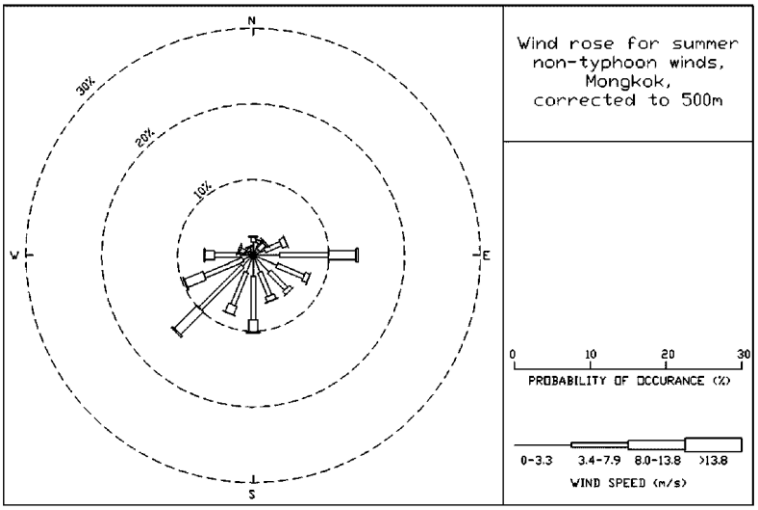


Figure 3 Wind rose for summer, non-typhoon winds for Mong Kok, corrected to 500m

3.2.2 Annual Wind Condition

Eight prevailing wind directions (highlighted in Red colour in Table 1) will be considered in this AVA Study which altogether cover 79.7% of the total annual wind frequency. They are north-north-easterly (8.0%), north-easterly (8.1%), east-north-easterly (14.3%), easterly (23.5%), east-south-easterly (4.8%), southerly (4.3%), south-westerly (4.6%) and northerly (12.1%) wind directions.

Table 1 Annual Wind Frequency

Wind Direction	NNE	NE	ENE	E	ESE	SE	SSE	S	
Wind Frequency	8.0%	8.1%	14.3%	23.5%	4.8%	3.2%	3.0%	4.3%	
Wind Direction	SSW	SW	WSW	W	WNW	NW	NNW	N	SUM
Wind Frequency	3.0%	4.6%	3.2%	3.1%	2.4%	0.7%	1.7%	12.1%	79.7%

** The wind frequency showing in red colour represents the selected winds for this study.*

3.2.3 Summer Wind Condition

Nine prevailing wind directions (highlighted in red in Table 2) will be considered in this AVA Study which cover 84.2% of the total summer wind frequency. They are easterly (13.9%), east-south-easterly (7.9%), south-easterly (6.8%), south-south-easterly (6.5%), southerly (10.2%), south-south-westerly (8.3%), south-westerly (14.4%), west (6.5%) and west-south-westerly (9.7%) wind directions.

Table 2 Summer Wind Frequency

Wind Direction	NNE	NE	ENE	E	ESE	SE	SSE	S	
Wind Frequency	2.1%	2.3%	4.6%	13.9%	7.9%	6.8%	6.5%	10.2%	
Wind Direction	SSW	SW	WSW	W	WNW	NW	NNW	N	SUM
Wind Frequency	8.3%	14.4%	9.7%	6.5%	2.0%	1.1%	1.2%	2.5%	84.2%

** The wind frequency showing in red colour represents the selected winds for this study.*

3.3 Wind Profile

With the wind data published in the Site Wind Availability Study of Mong Kok Area [2], the wind profile at 67.5° was shown in Figure 4 as an example. Wind profile of other wind directions are shown in Appendix A.

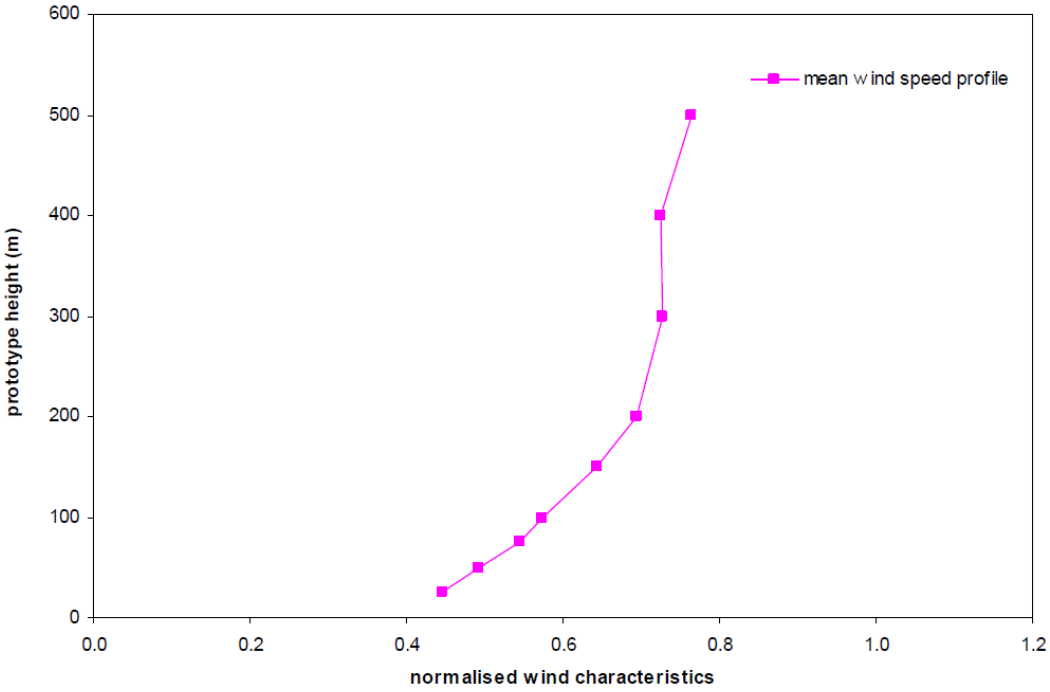


Figure 4 Mean wind speed profile at 67.5º

The vertical wind profile extracted from the Site Wind Availability Study for Mong Kok Area was taken as input parameter in the CFD models. The wind profiles below 25m will be assumed by the power law.

3.4 Assessment and Surrounding Areas

Upon the preparation of this methodology statement, the building height of RDS is +350mPD. Based on the maximum building height (*H*), being 344m absolute with road level at +6mPD, the 1*H* assessment area and the 2*H* surrounding area would be respectively extended to 344m and 688m away from the site boundary of the Study Area as indicated in Figure 5. All major noise barrier, such as those existing ones along the East Railway, and elevated structures, such as elevated footbridge, within the Surrounding Area will be included.

In order to allow incoming wind to be well-developed before reaching the Surrounding Area, the computational domain will be around 5,100m (L) x 5,000m (W) x 1,500m (H) as shown in Figure 6. The topology will be adopted throughout the computational domain.

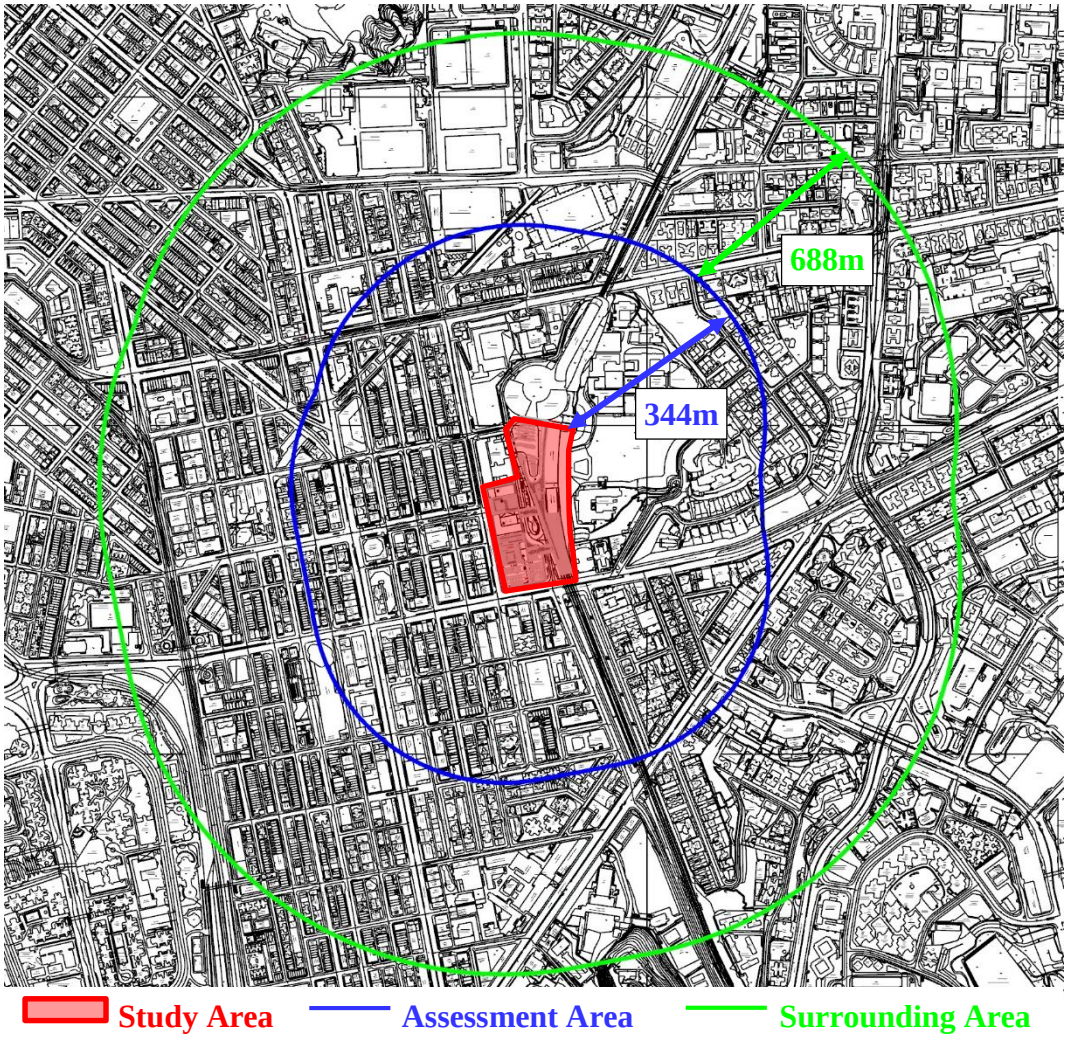


Figure 5 Site Area (Red), 1*H* Assessment Area (Blue) and 2*H* Surrounding Area (green) based on *H* = 344m

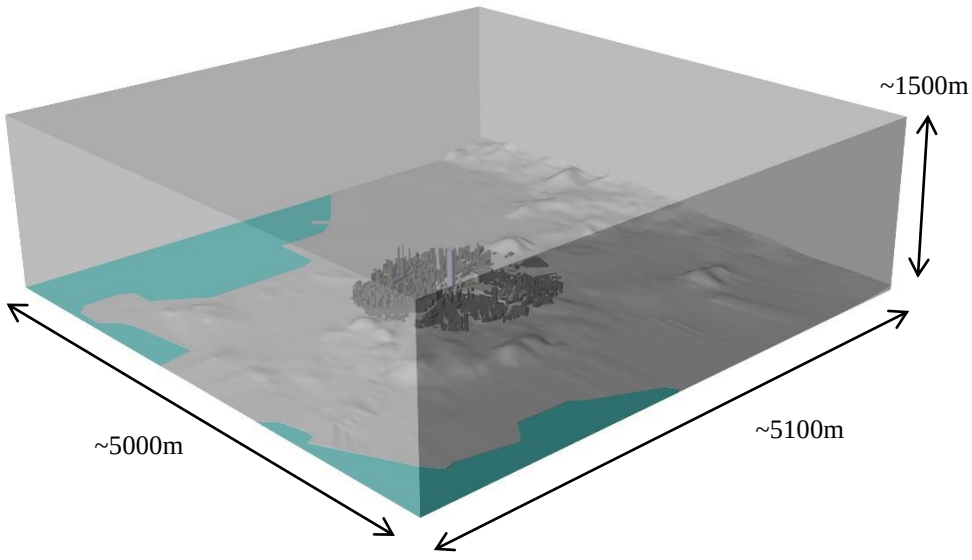


Figure 6 Computational domain for this AVA IS

3.5 Proposed/ Committed/ Planned Developments

Within the proposed Surrounding Area, the following proposed/ committed/ planned developments had been identified as indicated in Figure 7 and will be included in the AVA Initial Study. Close-up on these proposed/ committed/ planned developments shall refer to Appendix B.

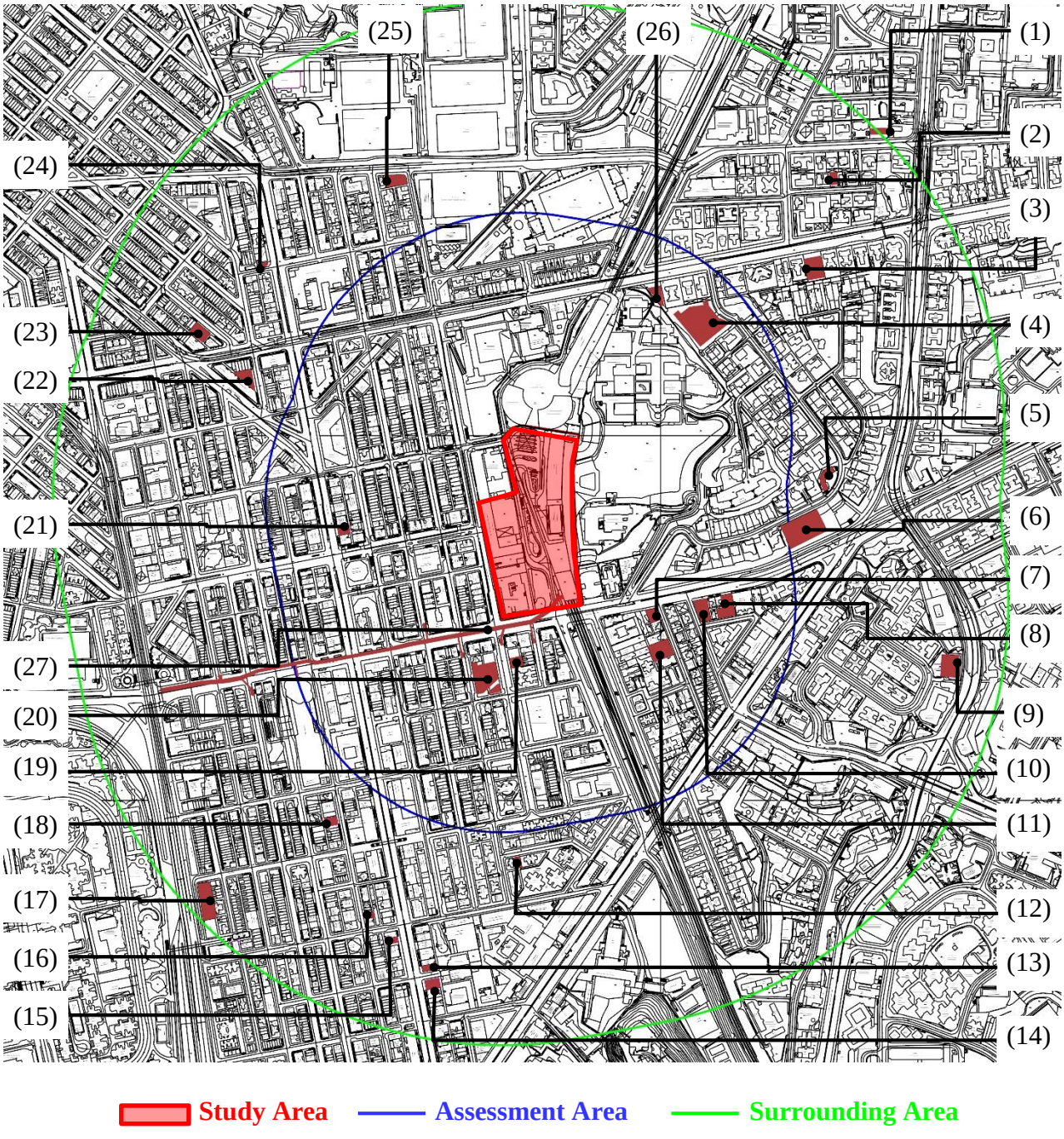


Figure 7 Location of Committed/Planned Development within the Surrounding Area

(1) 121 Boundary Street

(2) 9 Belfran Road

(3) Proposed residential development at 233-235 Prince Edward Road West

(4) Grand Court (residential development at 109-135 Kadoorie Avenue)

(5) Proposed residential development at 33 Kadoorie Avenue

(6) Preserved heritage (office & storage) of Ex-CLP Hong Kong Office at 139-147 Argyle Street

(7) residential development at 102 Argyle Street

(8) 3 Julia Avenue (residential development)

(9) Proposed Sports Training Center and Residential Development (25 Man Fuk Road, Ho Man Tin)

(10) Kadoorie Lookout

(11) Proposed Composite Building (7-7G Victory Avenue)

(12) 22 Yin Chong Street(Site Q10)

(13) 562 Nathan Road (Site Q9)

(14) 558-560 Nathan Road

(15) 575 Nathan Road (Site Q8)

(16) 130-132 Portland Street (Site Q7)

(17) Tak Cheong Street (Site Q5)

(18) Proposed residential development at 187-191 Portland Street

(19) Redevelopment of composite building at No.78-88 Sai Yee Street

(20) Proposed composite development at 61-87 Sai Yee Street & 78-98 Fa Yuen Street

(21) Commercial development at 724-726 Nathan Road

(22) CTS Court (residential development at 363 Portland Street)

(23) Proposed hotel development at 11-21 Tai Nan Street

(24) Additional MTR Exit Structure

(25) High Park Grand (residential development at 68 Boundary Street)

(26) Proposed residential development at 195 Prince Edward Road West

(27) Proposed footbridge along Argyle Street (assumed to be similar bridge design as the one running above Sai Yee Street and Mong Kok Road).

3.6 Technical Details for CFD simulation

Since there is no internationally unanimous guideline or standard in using the CFD technique for outdoor urban-scale studies, reference shall be made to other CFD guidelines on different aspects of wind flow to suggest a study approach to the current study. There have been a number of reference made to the recommendations by a working group of the European COST Action C14 [3]. The detailed parameters are summarized in Table 3.

Table 3 Detailed parameters to be adopted in the CFD model

	CFD Model
Program Tool	STAR-CCM+
Physical Model Scale	Real-scale model on 1:1 scale
Model details	Only include Topography, Buildings blocks, Streets, no landscape is included
Domain	Includes building information within the boundary Lateral, Inflow & Outflow: approximately 5H
Assessment Area	≥ 1H area
Surrounding Area	≥ 2H area
Grid Expansion Ratio	The grid should satisfy the grid resolution requirement with maximum expansion ratio = 1.3
Prismatic layer	Prism layer must cover pedestrian level at least 2m, spacing recommend 0.5 m for the first 3 m above ground level
Inflow boundary Condition	Incoming wind profile as measured from the previous wind tunnel test on Site Wind Availability
Outflow boundary	Pressure boundary condition with dynamic pressure equal to zero
Wall boundary condition	Logarithmic law boundary
Turbulent Model	Realizable k-ε model
Solving algorithms	*Rhie* and *Chow* SIMPLE for momentum equation Realisable k- ε for turbulence solver Hybrid model for all other equations
Blockage ratio	< 3%
Convergence criteria	Below $0.5x10^{-3}$

3.7 Data Presentation

The wind speed information at pedestrian level (2m above ground) will be acquired to determine the Wind Velocity Ratio (*VR*) as stipulated within the *AVA Technical Guide*, as defined as follow:

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

where V_p is the wind speed at the pedestrian height (2m above ground) and V_∞ is the wind velocity at the top of the boundary layer (defined as the height where wind is unaffected by urban roughness and determined from the topographic studies). Measurement will be taken in the following areas within the Assessment Area:

- Along the project site boundary (defined as "Perimeter" test points), such that the Site Spatial Average Velocity Ratio (*SVR*) can be defined (as per the *AVA Technical Guide*)
- Throughout the project site (defined as "Overall" test points), such that the Local Spatial Average Velocity Ratio (*LVR*) can be defined (as per the *AVA Technical Guide*)
- Within the project site (defined as "Special" test points), such that the wind enhancement features of RDS can be assessed.

3.8 Locations of Test Points

As per the technical circular, three types of test point – perimeter test point, overall test point and special test point will be adopted to understand the wind performance. The allocation of these test points will be distributed evenly as per the requirement stated in the *AVA Technical Circular*[1].

3.8.1 Perimeter Test Points

A total number of 30 perimeter test points are located around the perimeters of the project site boundary. Upon the proposed Assessment Area, the locations of perimeter test points are shown in Figure 8.

3.8.2 Overall Test Points

A total number of 173 overall test points are evenly distributed and positioned with a distance of around 50m to 60m within the assessment area and their locations are shown in Figure 9.

3.8.3 Special Test Points

A total number of 22 special test points for Existing Scheme and 23 special test points for Recommended Development Scheme are allocated. S1-S8 for Existing Schemes are located 2m above the podium level of MTR station while S9-S22 are allocated at 2m above ground level. For the RDS Scheme, S9-S15 and S22-S23 are be allocated at 2m above ground level while S1-S8 and S16-S21 are allocated at the 2m above the podium of MTR station, landscape deck and accessible podium levels. As their building coverage are different, the special test points may not at the same location among 2 schemes as shown in Figure 10.

In addition, 5 special test points were located right outside the boundary of Surrounding Area to include the two open spaces, shown as blue dots in Figure 9.

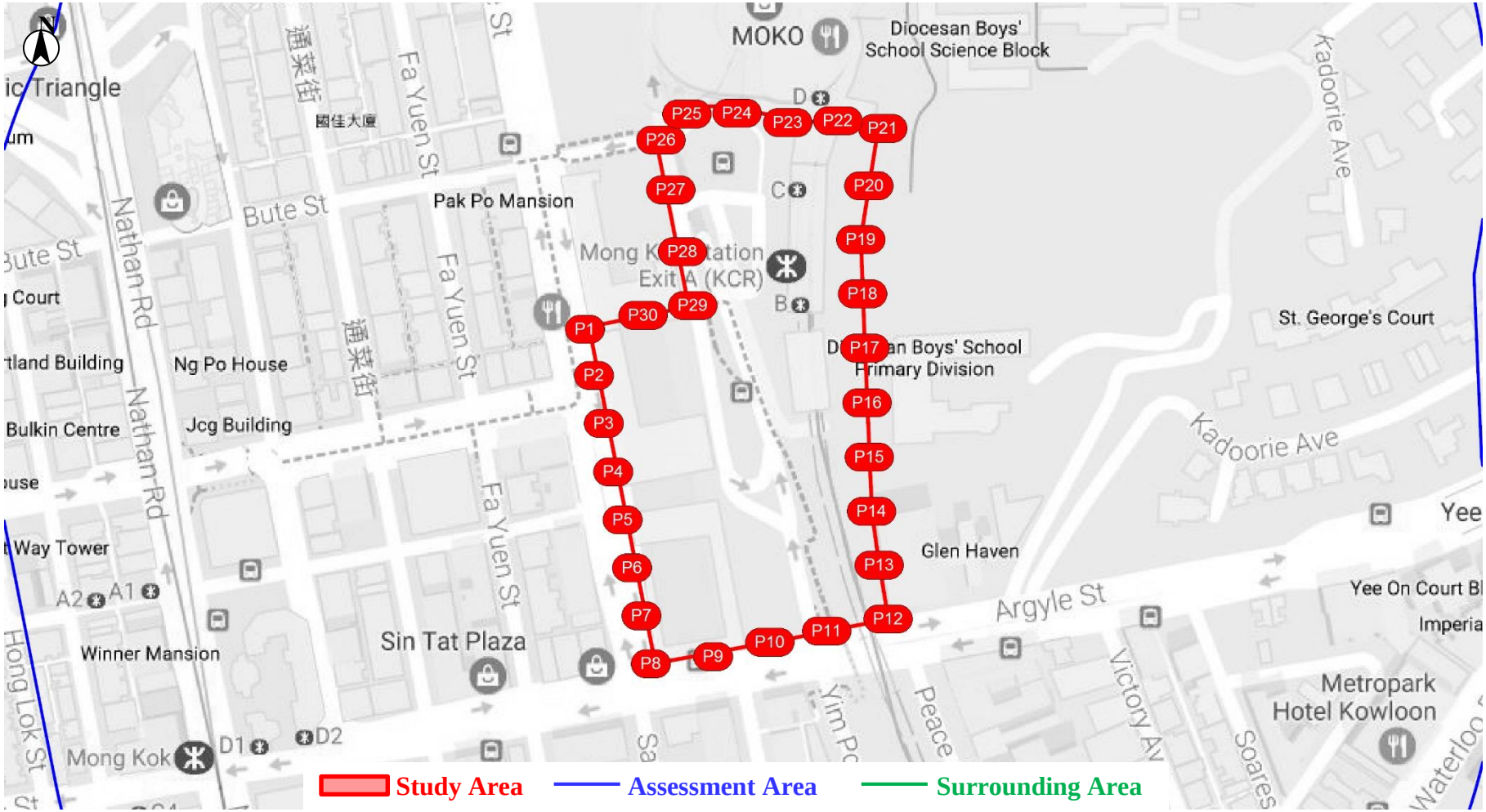


Figure 8 Locations of perimeter test points

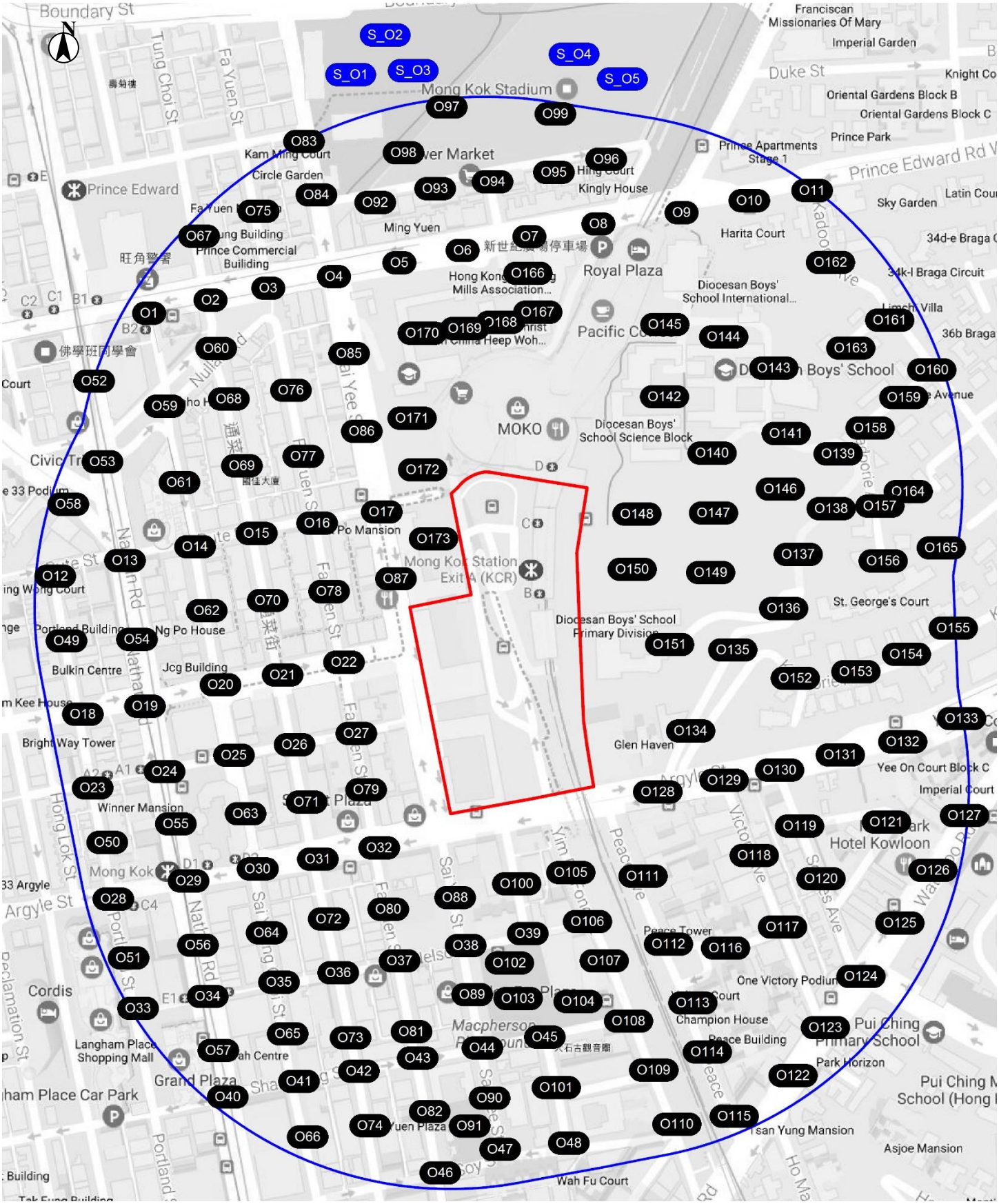
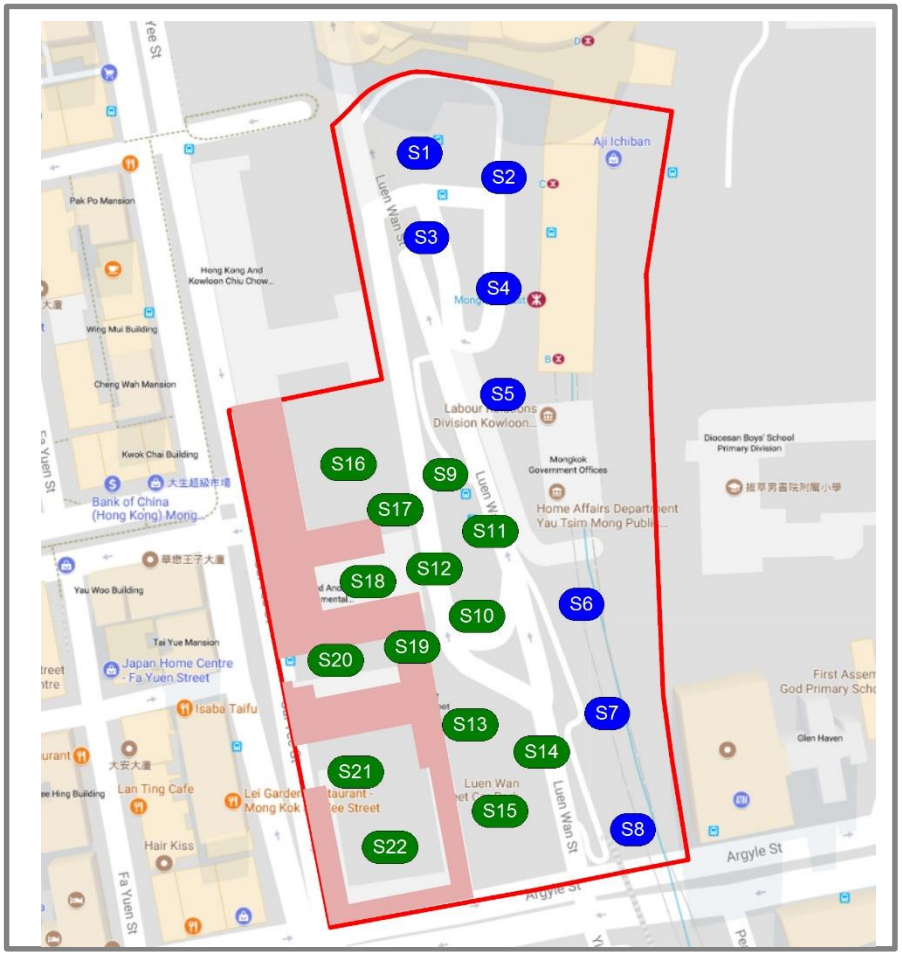
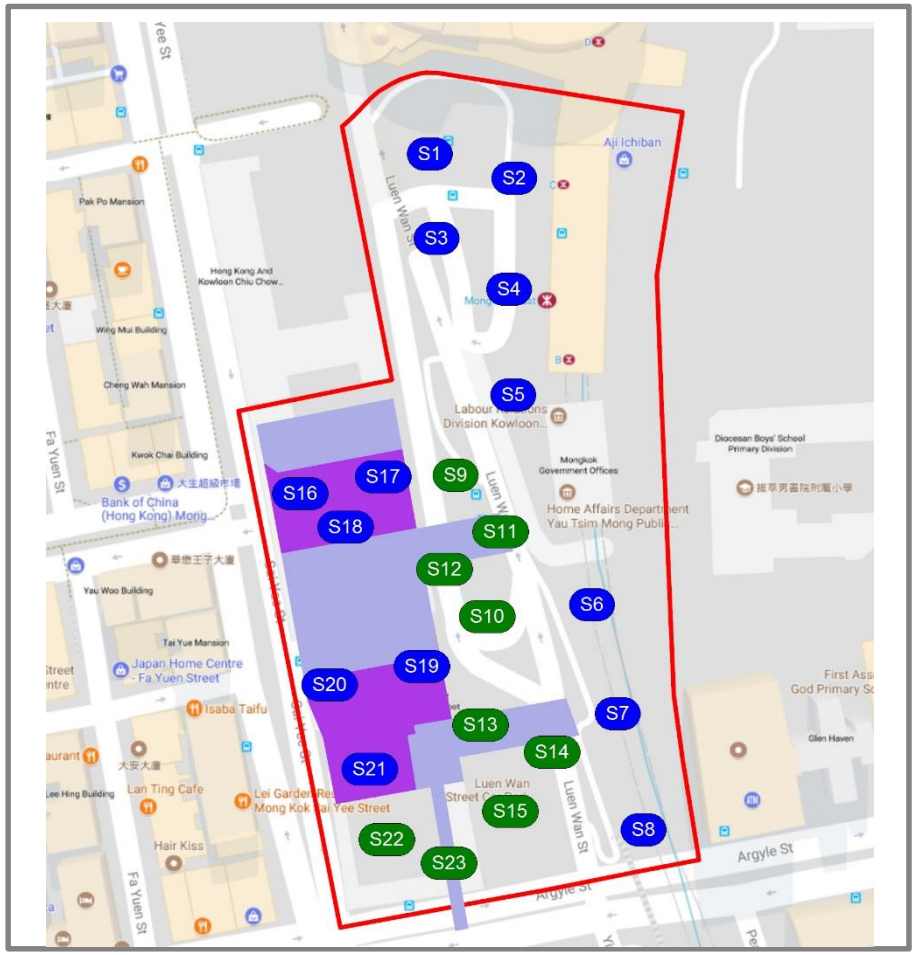


Figure 9 Locations of overall test points

Existing Scheme



RDS



Study Area S3 Test Points at Podium Level S16 Test Points at Ground Level

Figure 10 Locations of special test points

3.9 Studied Schemes

The AVA Initial study will compare the ventilation performance between the Recommended Development Scheme (RDS) and the Existing Scheme. Each scheme will briefly described in following sub-sections and four views of CFD model on each scheme are also presented.

3.9.1 Existing Scheme

The Study Site covers the governmental office buildings for Food and Environmental Hygiene Department (FEHD) and Water Supplies Department (WSD), Mong Kok Government Offices (MKGO), the Mong Kok East Station of the East Rail Line, a public transport terminus and a temporary open carpark on Luen Wan Street. The main roof level for existing governmental office buildings for FEHD and WSD within the Study Site are around +14mPD ~ +28mPD. The MKGO/ existing PTI are sitting atop of Mong Kok East Station, which will be retained. The perspective view of Existing Scheme are given in Figure 11 through Figure 14.

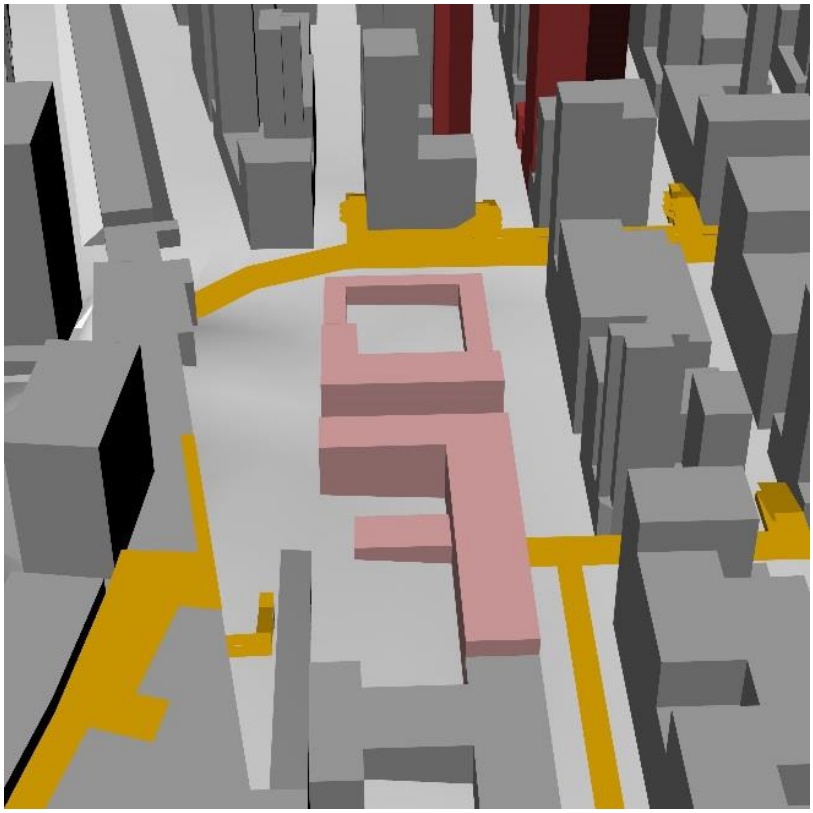


Figure 11 View from North on Existing Scheme

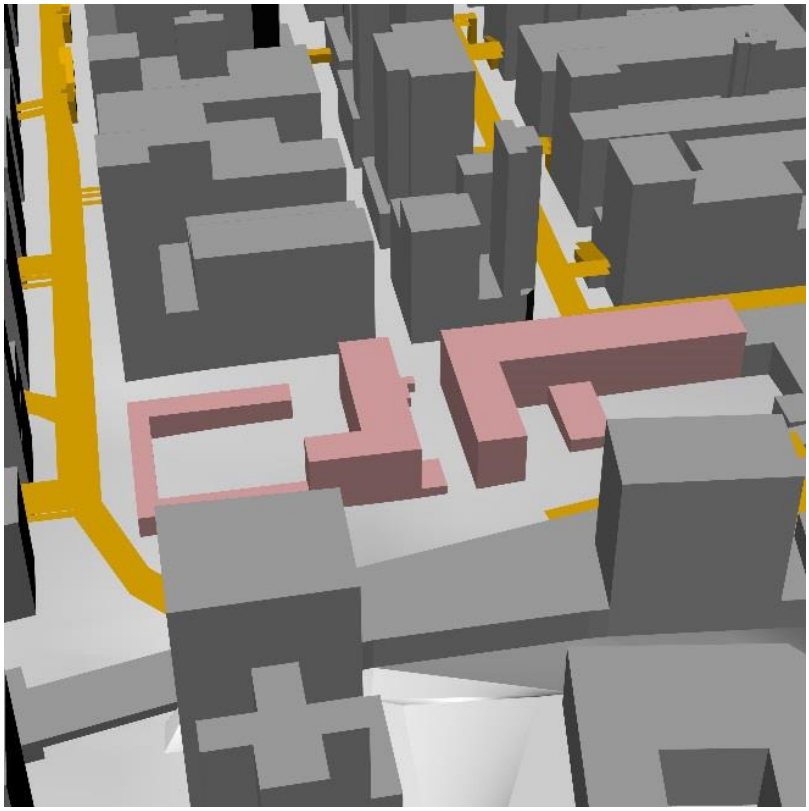


Figure 12 View from East on Existing Scheme

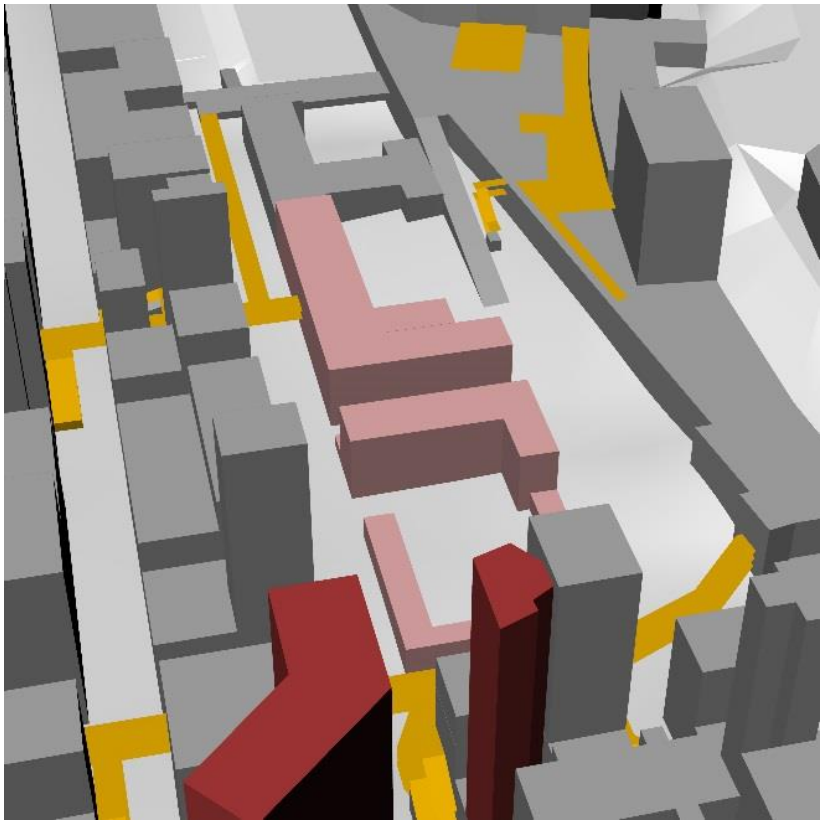


Figure 13 View from South on Existing Scheme

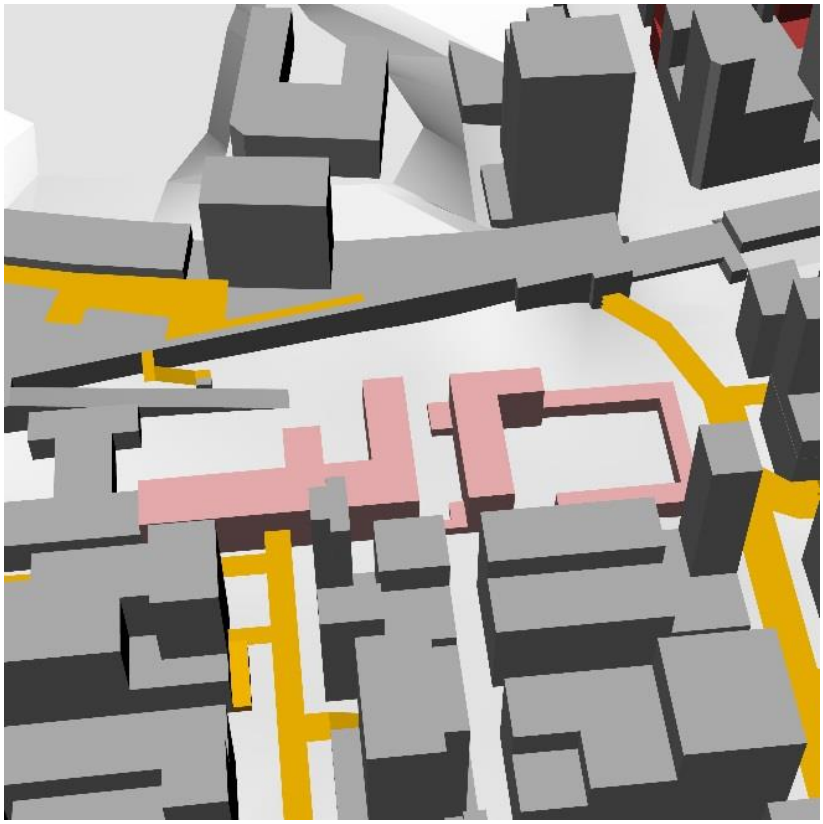


Figure 14 View from West on Existing Scheme

3.9.2 Recommended Development Scheme

Recommended Development Scheme (RDS) will have a mixed use tower (hotel and Office) with highest building height of +350mPD and a G/IC building (main roof level of +40mPD) sitting atop a retail podium with main spot height of +23mPD. A landscape deck will be provided at podium along Mong Kok Road. The MKGO/ existing PTI and Luen Wan Street will be retained. The perspective view of RDS are given in Figure 15 through Figure 18. The architectural layout of the RDS shall refer to Appendix C.

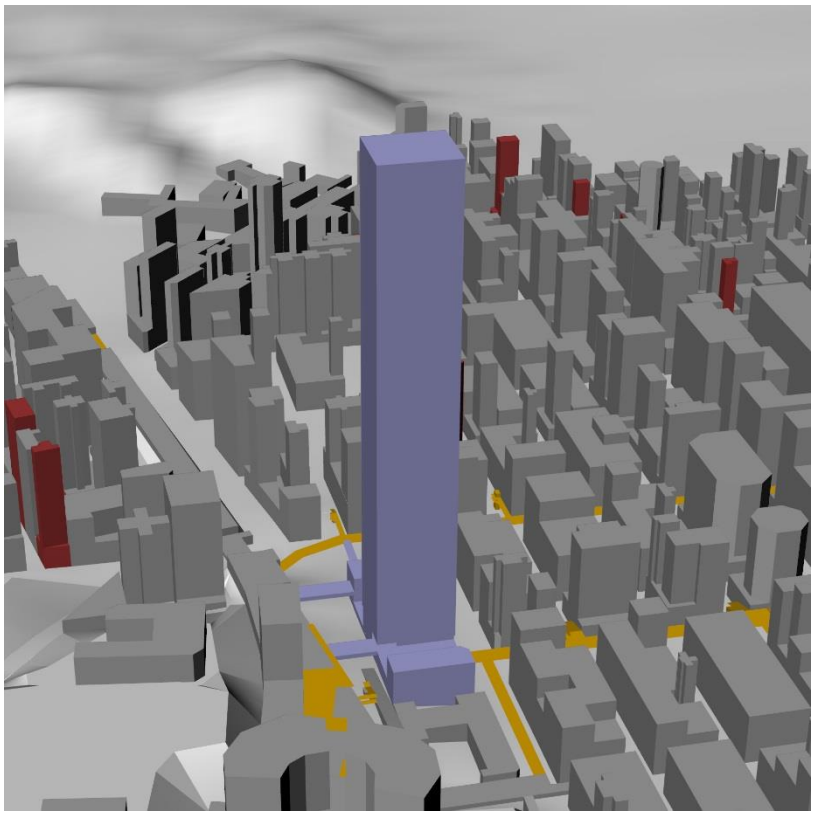


Figure 15 View from North on RDS

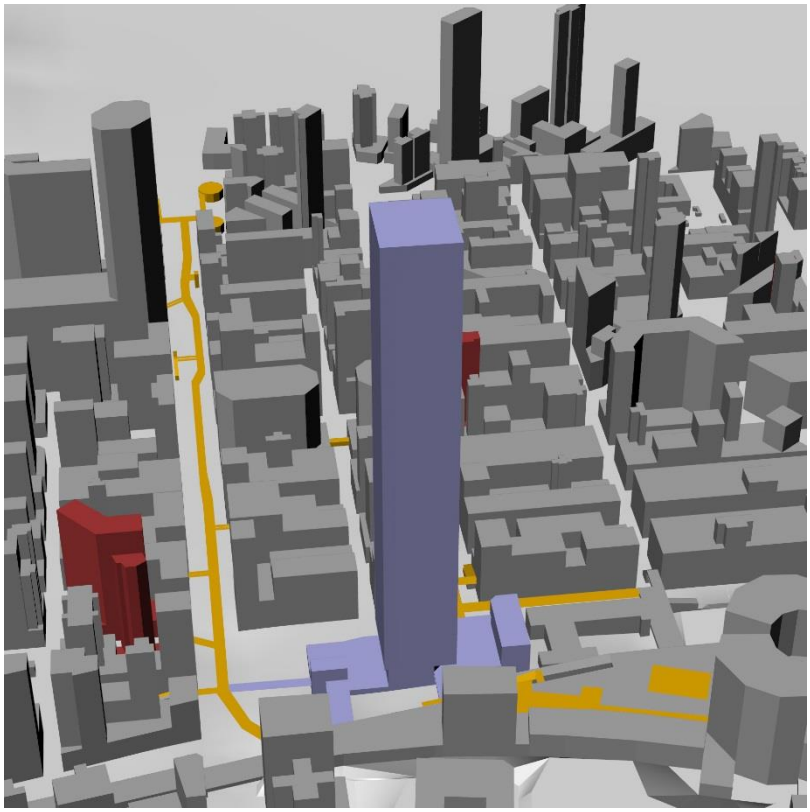


Figure 16 View from East on RDS

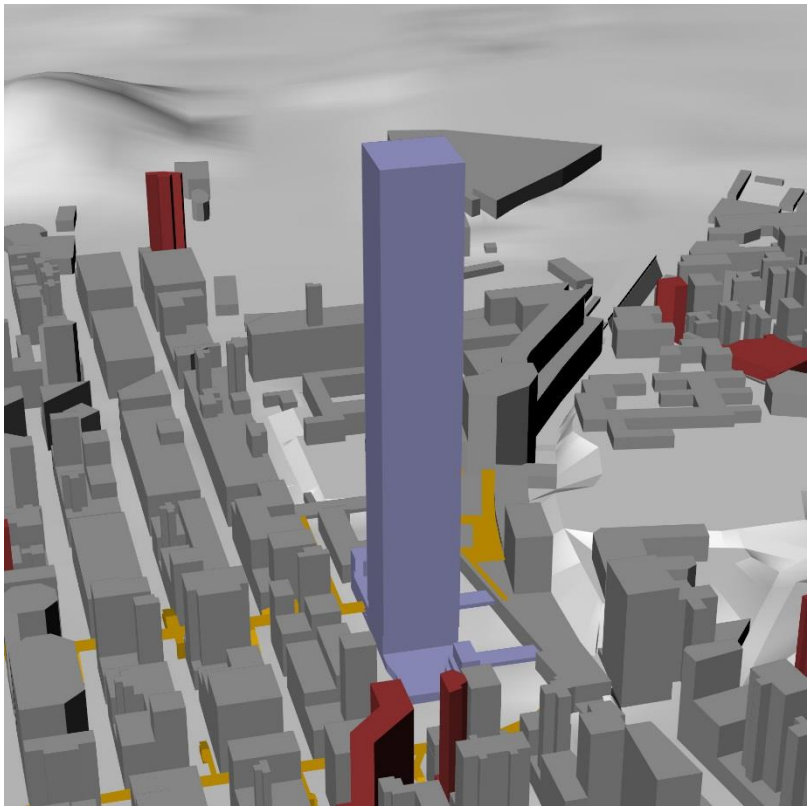


Figure 17 View from South on RDS

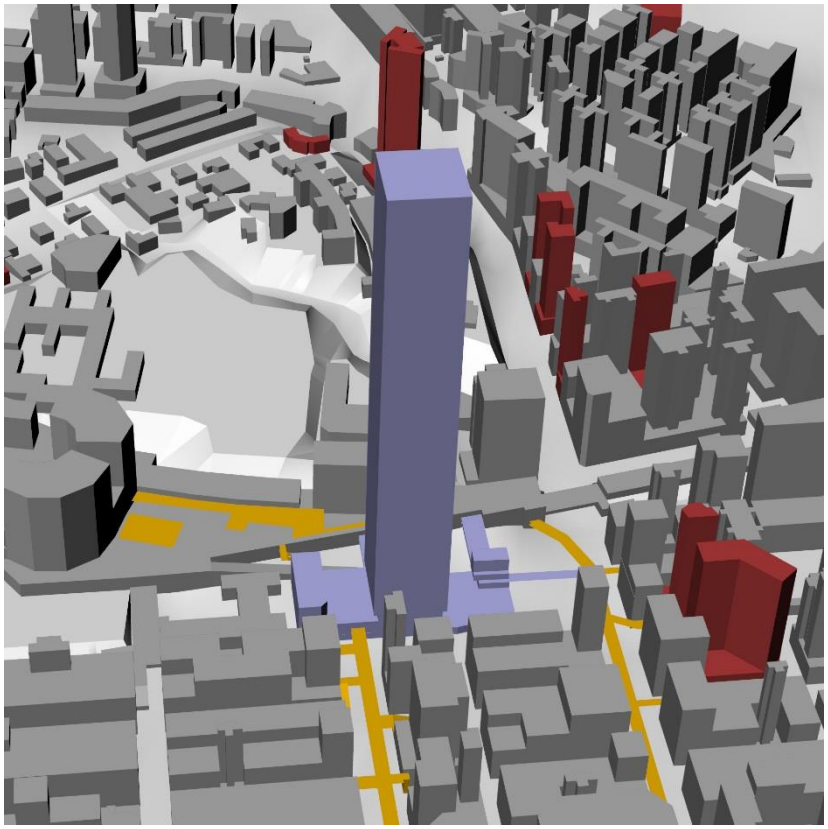


Figure 18 View from West on RDS

3.10 Assessment Tools

Computational Fluid Dynamics (CFD) technique is utilized for this AVA study. With the use of three-dimensional CFD method, the local airflow distribution can be visualized in details. The velocity distribution within the flow domain, being affected by the site-specific design and the nearby topography, will be simulated under selected wind directions as stated in Section 3.2 for annual and summer wind conditions.

3.11 CFD Model

Following the *AVA Technical Circular*[1], buildings within Surrounding Area shall be built in the CFD model. In order to simulate the approaching wind turbulence effect in a more accurate manner, the CFD model is built to include the highways or bridges as they may affect the approaching wind, even it is falling outside the Surrounding Area. In addition, the model domain is built far beyond the Surrounding Area as required in the Technical Circular in order to eliminate the boundary effects. Therefore, the studied size of CFD model of the development is approximately 5,100m (L) x 5,000m (W) x 1,500m (H) which contains more than 10,000,000 cells (Figure 23). Four perspective view on the computational model are shown in Figure 19 through Figure 22

The computational domain covers the site of the Development and provides sufficient consideration on surrounding topography. The model also contains information of the surrounding buildings and site topography via Geographical Information System (GIS) platform. The site topography would be modelled within the whole computational

domain. Body-fitted unstructured grid technique is used to fit the geometry and reflect the complexity of the development geometry. A prism layer of 3m above ground (totally 6 layers and each layer of 0.5m thick, shown in Figure 24 is incorporated in the meshing so as to better capture the approaching wind and wind condition at pedestrian level. A mesh expansion ratio of 1.3 is adopted and the blockage ratio was less than 3%.

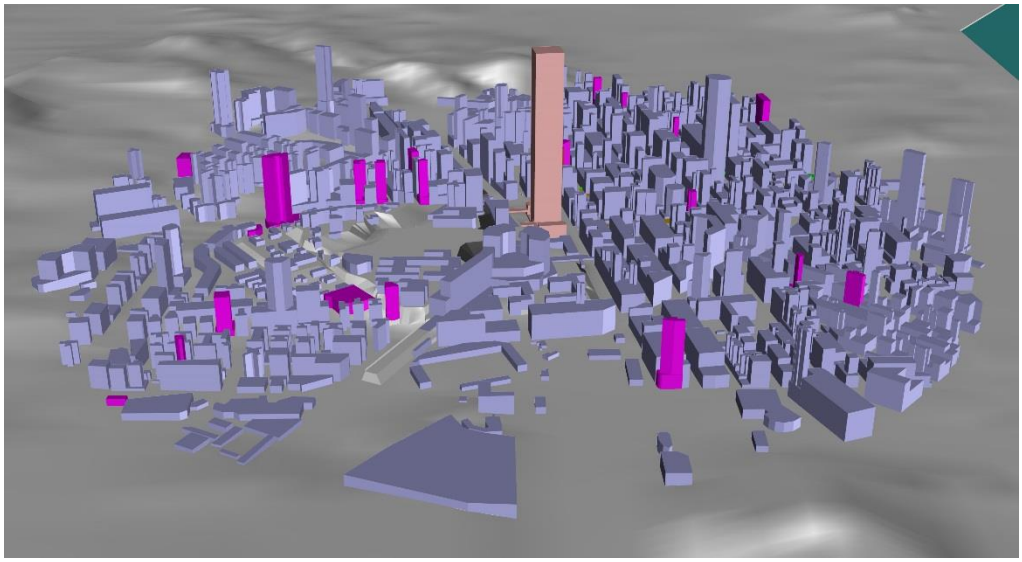


Figure 19 View from North on Computational Domain

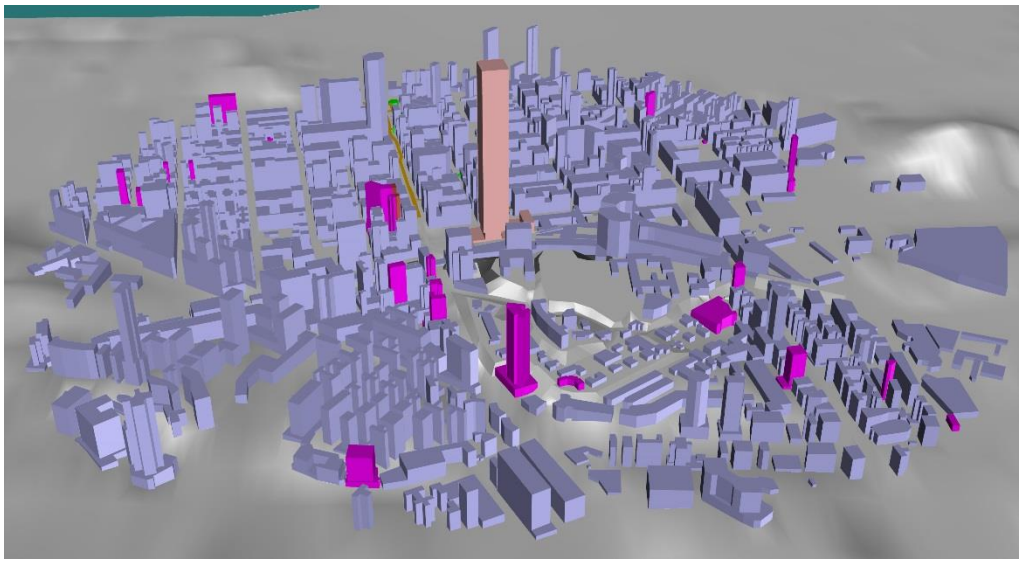


Figure 20 View from East on Computational Domain

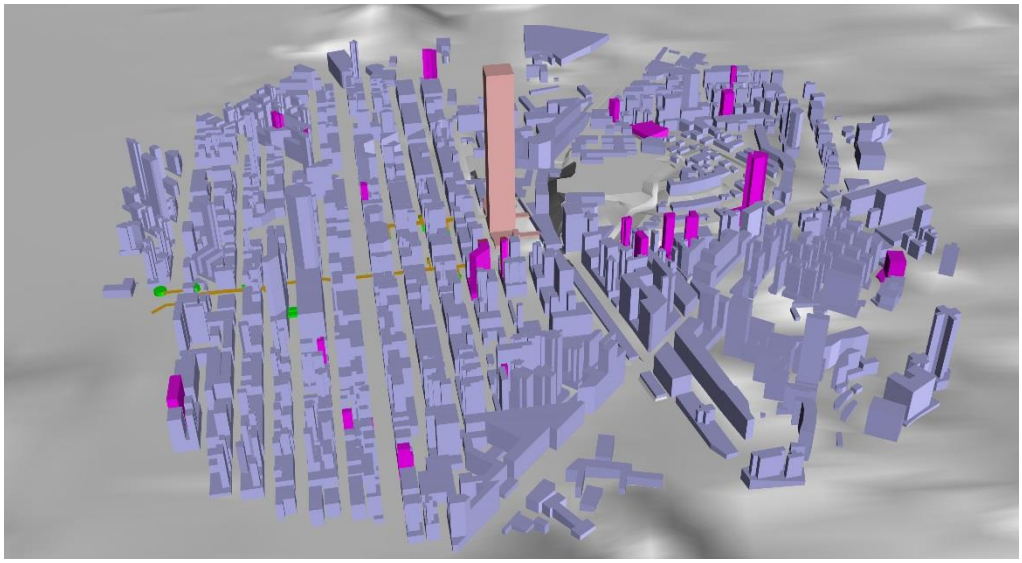


Figure 21 View from South on Computational Domain

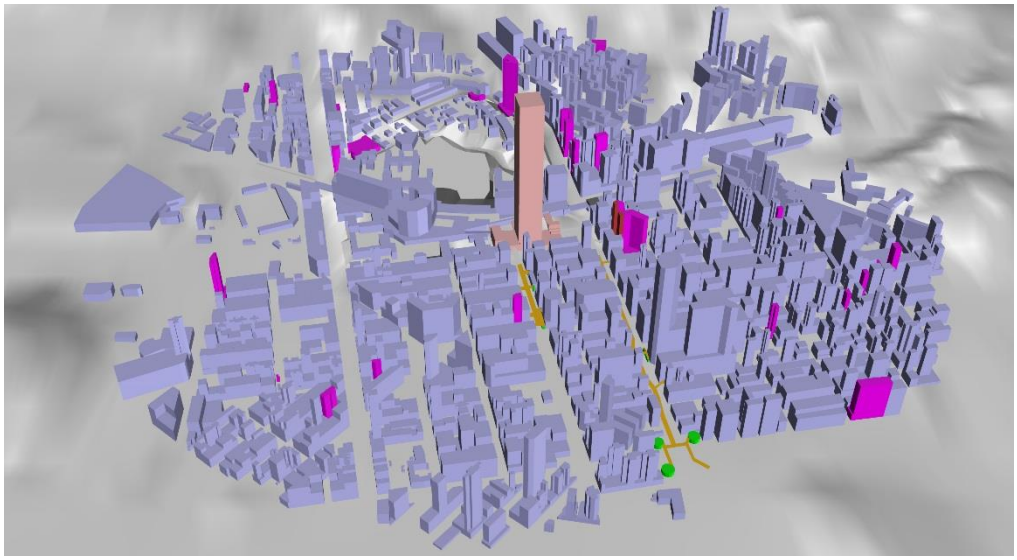


Figure 22 View from West on Computational Domain

3.12 Turbulence model

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

3.13 Calculation Method

The Segregated Flow model solves the flow equations in a segregated manner. The linkage between the momentum and continuity equations adopted the predictor-corrector approach. A collocated variable arrangement and a Rhie-and-Chow-type pressure-

velocity coupling combined with a SIMPLE-type algorithm. A higher order differencing scheme is applied to discretize the governing equations. The convergence criterion is set to 0.0005 on mass conservation. The calculation will repeat until the solution satisfies this convergence criterion.

The prevailing wind direction as mentioned in Section 3.2 is set to inlet boundary of the model with wind profile as detailed in Section 3.3. The downwind boundary is set to pressure with value of atmospheric pressure. The top and side boundaries are set to symmetry. In addition, to eliminate the boundary effects, the model domain is built beyond the Surrounding Area as required in the *AVA Technical Circular*[1].

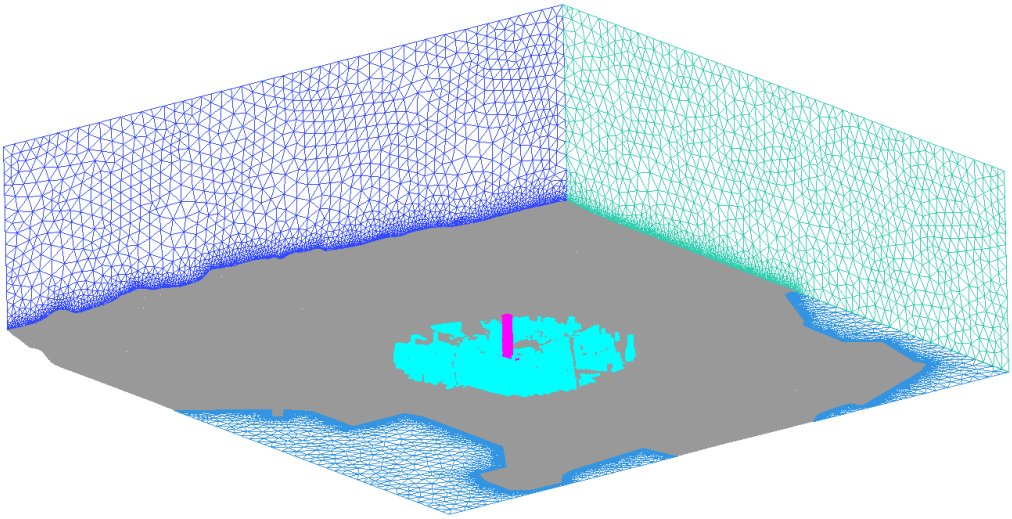


Figure 23 Mesh of Computational Domain

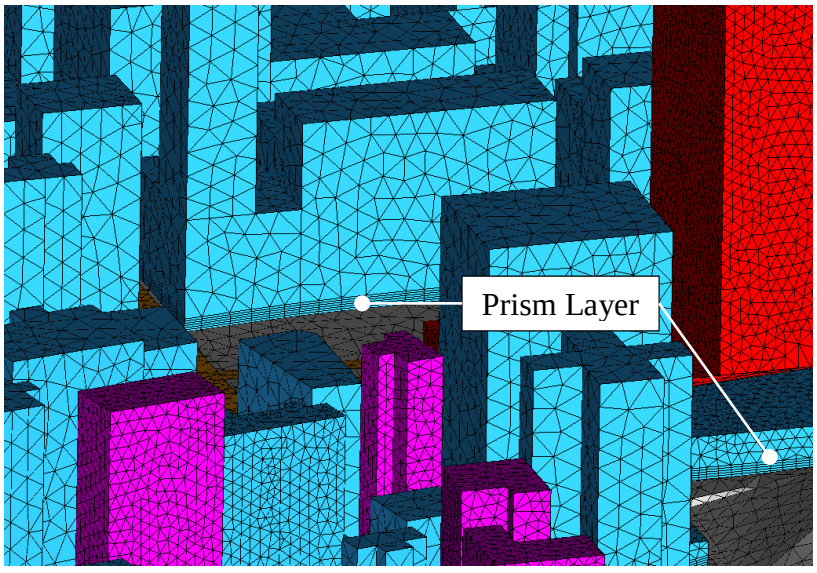


Figure 24 Prism Layers

4 Results and Discussion

4.1 Overall Pattern of Ventilation Performance

The contour plots will be presented in the following section in which the contour and vector plots of each studied wind directions may refer to Appendix D and Appendix E of this Report.

4.1.1 Annual Weighted Average

The contour plots of annual weighted VR of Existing Scheme and RDS are shown in Figure 25.

The overall ventilation performance of the surrounding area are similar for both Existing Scheme and RDS with slightly higher VR observed at close proximity to the Study Site.

Due to the high-rise tower (350mPD) proposed in RDS, significant downwash effect would be induced from NE quadrant winds, which would benefit the ventilation performance at close proximity to the proposed tower such as Sai Yee Street and Luen Wan Street. Higher VR would be observed in these areas, comparing to Existing Scheme. With the Mong Kok Road, Fife Street in general aligned with the facade of proposed tower in RDS under NE quadrant winds, the downwahsed wind would then be re-distributed through the road connected to Sai Yee Street, such as Mong Kok Road and Fife Street, to ventilate the Mong Kok Area. Slightly higher VR would be observed at Tung Choi Street, Argyle Street.

On the other hand, high-rise tower of the proposed RDS would shield some of the incoming wind. The incoming wind from E/ENE direction would be downwashed by RDS tower to travel along Sai Yee Street and Yim Po Street while the E/ENE wind under Existing Scheme would be downwashed by buildings to the west of Sai Yee Street, such as Mong Kok Building, Tai Yue Mansion, which would then be diverted by the building facade to travel along Mong Kok Road. Slightly lower VR would be observed at the western end of Mong Kok Road under RDS Scheme, highlighted in white circled area Figure 25.

4.1.2 Summer Weighted Average

The contour plots of summer weighted VR for Existing Scheme and RDS are shown in Figure 26. The wind performance at pedestrian level is generally calmer than that under annual wind condition due to the dense built-environment.

Similar to annual condition, the significant downwash effect from the 350mPD tower in RDS would affect the wind pattern and redistribute the wind flow near the Study Site, highlighted in pink circled area Figure 26. RDS would achieve better ventilation performance at areas close to the proposed development, especially at Sai Yee Street and Luen Wan Street on the podium of Mong Kok Station.

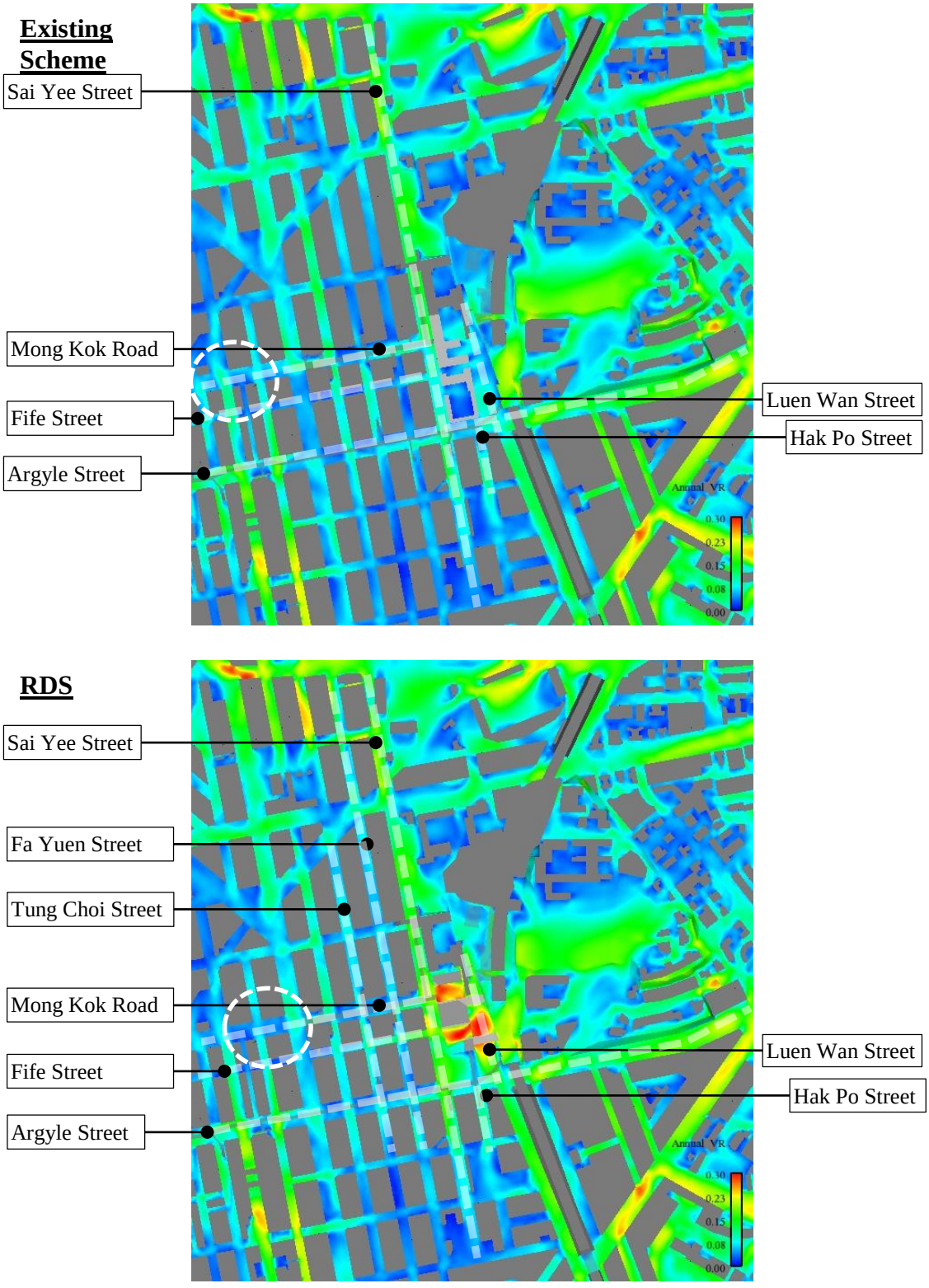


Figure 25 Contour plots of Annual Weighted VR of Existing Scheme and RDS

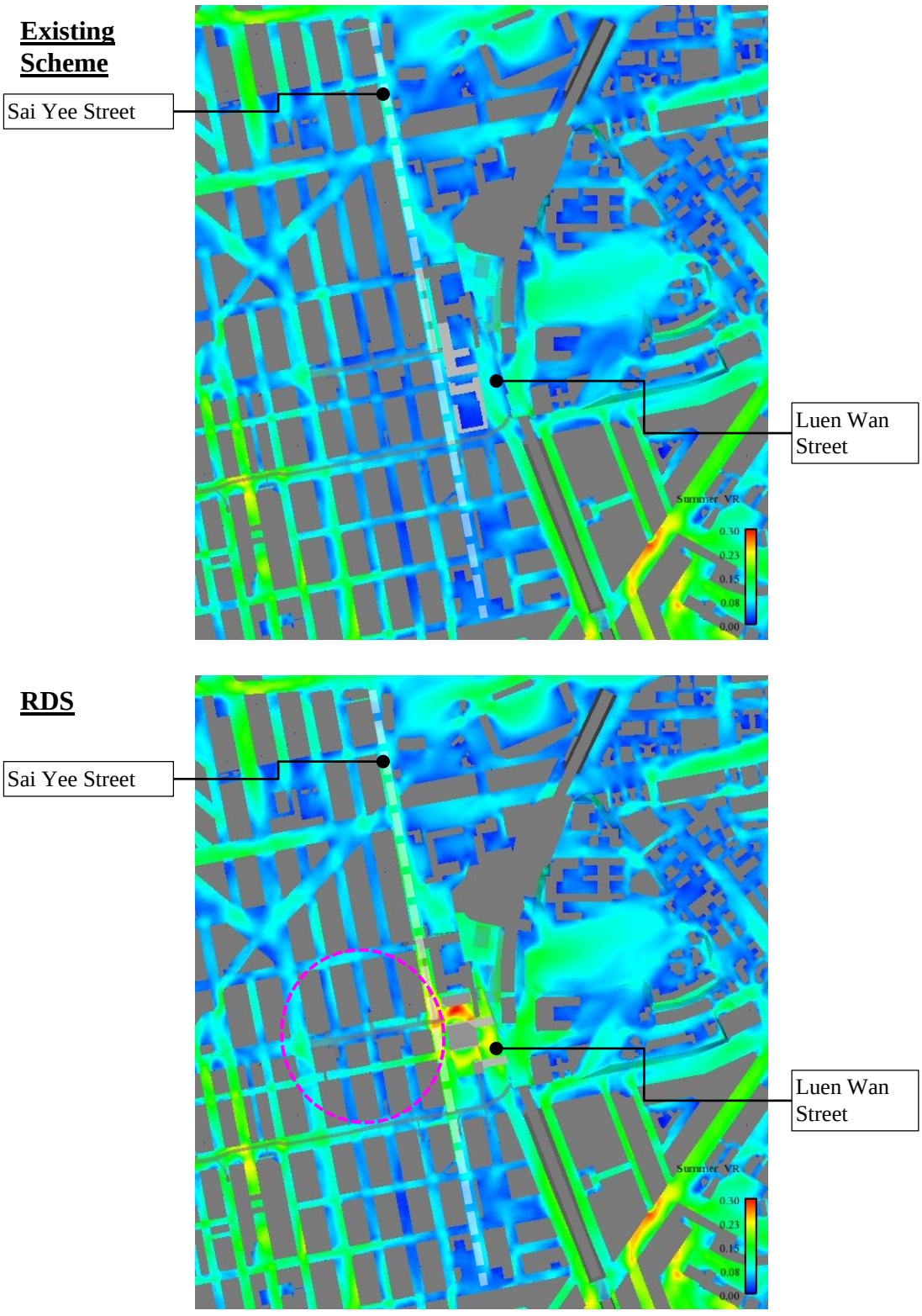


Figure 26 Contour plots of Summer Weighted VR of Existing Scheme and RDS

4.2 Directional Analysis

4.2.1 N Wind Direction

Sai Yee Street would be the major air path for N wind to serve the Study Site and the streets perpendicular to Sai Yee Street would also serve as secondary air paths for Mong Kok Area in both schemes, illustrated by pink arrow in in Figure 27.

Existing Scheme

Under Existing Scheme, as the building height of the existing buildings within the site are generally lower than the surrounding buildings, the incoming N wind would skim over the existing buildings and reach the areas at leeward side, such as Argyle Street, Hak Po Street and Macpherson Playground, shown as orange arrow in Figure 27.

RDS

With the proposed RDS, the incoming wind at higher level would be separated by the proposed tower (350mPD) within RDS and diverted to travel around the tall building to reach the Sai Yee Street, Mong Kok Road, Fa Yuen Street and Tung Choi Street to the west of the proposed tower and Luen Wan Street, podium above Mong Kok East Station to the east of the proposed tower, shown as black arrows under RDS in Figure 27. Some of the wind travelling to the east of the RDS would then skim over the podium and reach the Hang Seng 113, where the downwashed wind would result in higher VR at the slope in the southern part of the campus of Diocesan Boy's School (shown as orange circled area in Figure 27), while the other would be diverted towards the Fu Tao Building (73mPD) to the southeast of the Study Site, which would subsequently induce downwash effect and enhance the localized VR at Argyle Street, shown as white circled area in Figure 27.

In addition, with the building height of 350mPD within the RDS, corner effect would enhance the adjacent area on podium. The high-rise nature of the RDS would downwash the incoming wind towards Sai Yee Street and Luen Wan Street where higher VR was observed.

On the other hand, the 350mPD tower within the Study Site would inevitable impose some wind shadow at its leeward side, hence a slightly calmer wind environment would be observed near the Macpherson Playground. Comparing to the relatively open space at mid- to high-level of the Study Site under Existing Scheme, the permeability at leeward side would be relatively lower under RDS. Together with the wake zone associated with MOKO building, RDS would have larger wake zone which would overlap with the one created by DBS. Hence, lower VR would be observed at the sports ground of DBS, shown as purple circled area in Figure 27.

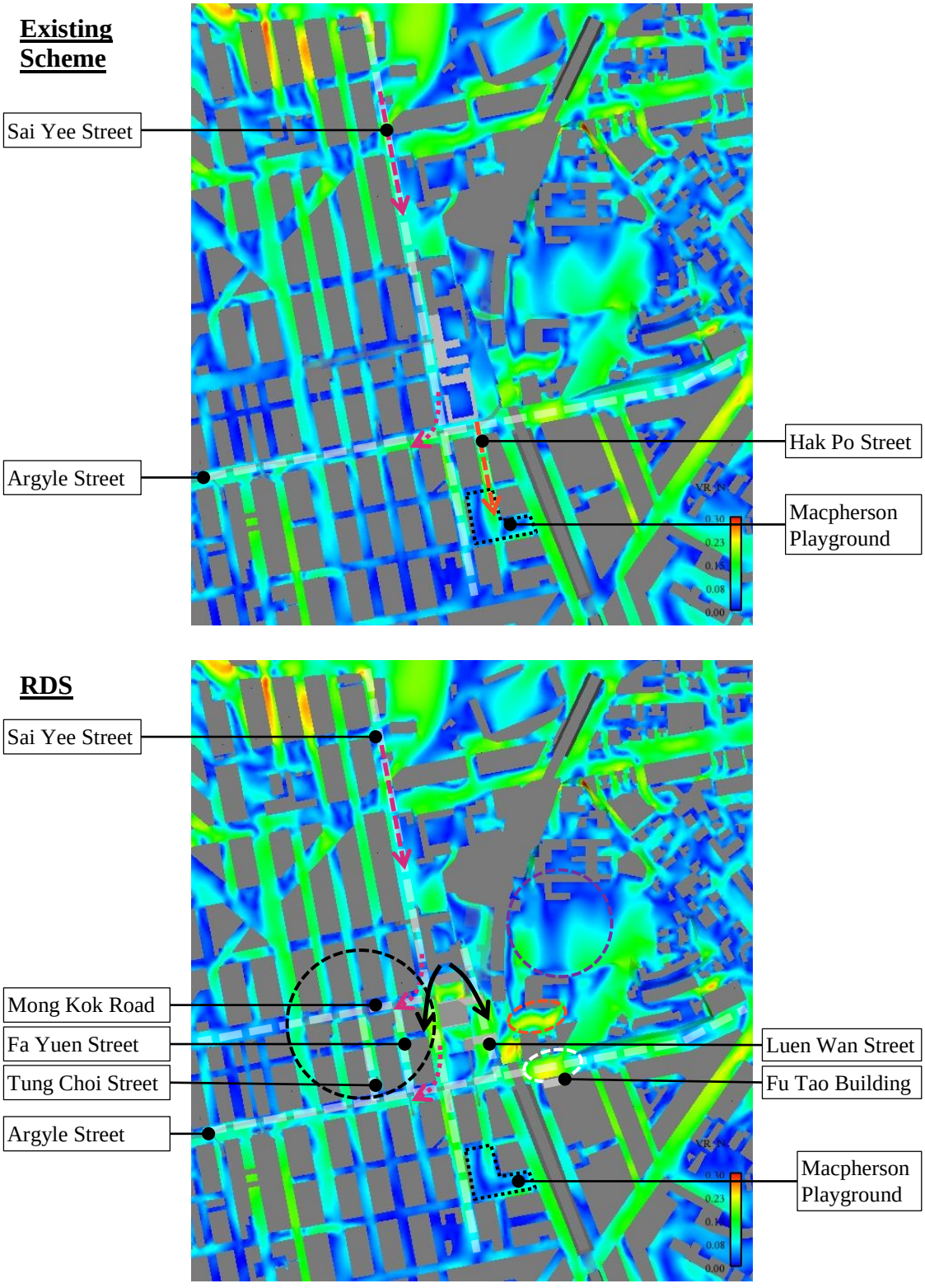


Figure 27 Contour plots of VR of Existing and RDS Schemes under N wind

4.2.2 NNE Wind Direction

Under NNE wind, the incoming wind would reach the site by traveling along Sai Yee Street and coming down the slope of Diocesan Boys' School and skimming over the podium of Mong Kok East Station, shown as pink arrows in Figure 28. The Study Site is located at the leeward side of the MOKO building (92mPD) hence a relatively calm wind environment would be resulted.

Existing Scheme

Due to the relatively lower building height within the Study Site under Existing Scheme, the incoming wind would be shielded by the MOKO building and Mong Kok East Station. On the other hand, the incoming wind would travel along the western boundary of the Study Site, i.e. along Sai Yee Street. With the Argyle Street, Fife Street and Mong Kok Road perpendicular to and connected with Sai Yee Street, the wind would infiltrate towards the densely built up area in Mong Kok, shown as black arrows in Figure 28. The high level wind would continue to travel towards the SW of the site to reach Langham Place (+230mPD), where some downwash effect would be induced by the northeastern facade of Langham Place and the ventilation at Portland Street and near Langham Place would be enhanced, highlighted in white circled area in Figure 28.

RDS

The +350mPD tower within the Study Site would create an earlier separation point at the upwind location at the playground of Diocesan Boy's School, where a wake zone would be created and lower VR were observed, highlighted in white circled area in Figure 28. Some of the incoming wind at upwind location would be slightly diverted more towards to the south and reach the facade of Fu Tao Building (+73mPD), which result in some localized acceleration at Argyle Street, highlighted in orange circled area. While other would continue to travel down the hill and skim over the podium to reach the Study Site.

The facade of high-rise tower would separate and divert the wind to travel around the facade towards west and south direction, shown as black arrows in Figure 28. The incoming wind would penetrate through the site and continue to travel along Mong Kok Road, which aligned with the direction of northern facade of the tower. On the other hand, the incoming wind diverted by the eastern facade would reach the Hak Po Street to the south of the site, where the ventilation performance would be slightly improved. The diversion of the wind would also result in less mid-level wind reaching the facade of Langham Place, hence, less wind would be downwahsed and lower VR were observed around Langham Place, comparing to Existing Scheme.

In addition, similar to N wind condition, high-level wind would be downwashed by the facade of the high-rise tower. VR at Sai Yee Street and Luan Wan Street located at close proximity to the proposed tower would be enhanced. The downwashed wind would then be re-distributed through the in the inter-connected road networks within Mong Kok Area. The VR at part of Fa Yuen Street, Tung Choi Street, Sai Yeung Choi Street South, Nathan Road and Bute Street would be further enhanced, highlighted in pink circled area.

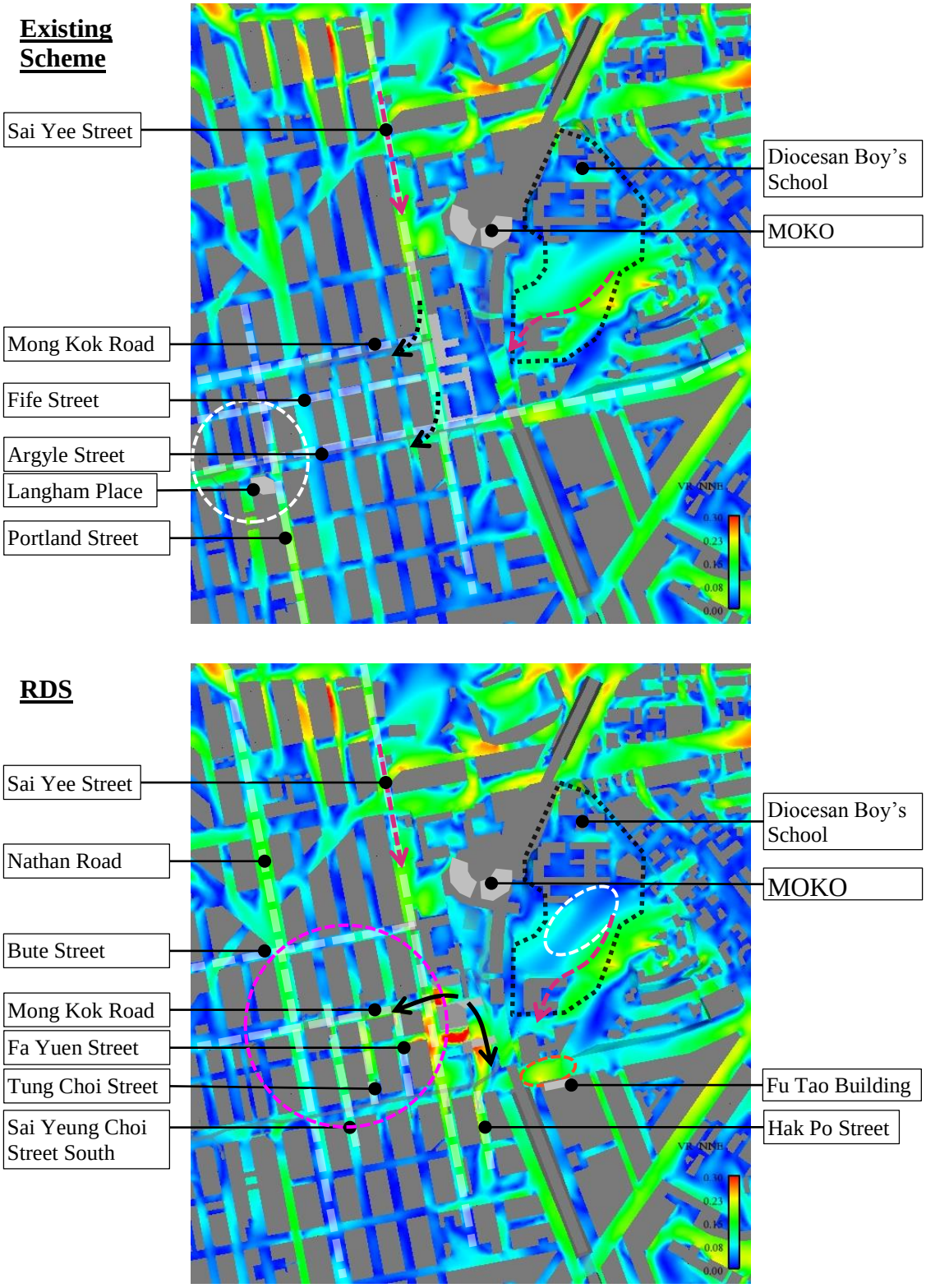


Figure 28 Contour Plots of VR of Existing Scheme and RDS under NNE wind

4.2.3 NE Wind Direction

The sport ground of Diocesan Boys' School campus, Prince Edward Road West and Argyle Street would become the major wind corridors to the Study Site as indicated by the pink arrows in both schemes of Figure 29.

Existing Scheme

Due to the low-rise buildings under Existing Scheme, which would provide a relative open space within the built up area of Mong Kok, the mid- to high-level NE wind coming from Prince Edward Road West would tend to travel along Sai Yee Street to reach the Study Site, shown as black arrow in Figure 29. Hence, slightly higher VR would be observed along part of Sai Yee Street and Bute Street.

RDS

Due to the taller building under RDS decreasing the permeability of the Study Site at higher level, some of the high-level incoming NE wind from Prince Edward Road West would continue to travel along NE direction to skim over the mid-rise buildings and reach the facade of Pioneer Center where downwash effect would be induced, highlighted in white circled area in Figure 29. Hence, slightly higher would be observed at some localized area of Sai Yeung Choi Street South. On the other hand, more wind travelling along the Argyle Street at higher level would be diverted to travel through the south of the site, illustrated by black arrow in Figure 29. Together with the high rise building along Yim Po Fong Street (+85mPD to +99mPD), more high level wind would be captured and channelled along Yim Po Fong Street, where slightly higher VR were observed at some localized area, highlighted in orange circled area.

The incoming wind at mid and high level would be diverted to travel around the RDS tower. Comparing to Existing Scheme, more wind would be diverted to travel through the southern part of the RDS and more NE wind would be diverted to reach the facade of Langham Place to the southwest of the study site, where downwash effect would be induced and result in higher VR along the southern part of Portland Street and Shanghai Street, highlighted in black circled area in Figure 29.

In addition, downwashed effect would be induced by the larger facade area with taller building height of the tower under RDS. The building separation of the RDS are aligned with the Fife Street and Mong Kok Road, hence, the downwashed would be diverted by the northern and eastern facade and redistributed through the inter-connected road networks within Mong Kok area. The VR at part of Sai Yee Street, Fa Yuen Street, Tung Choi Street, Sai Yeung Choi Street South, Nathan Road, Fife Street, and Mong Kok Road to the west of the Study Site and Luen Wan Street to the immediate east of the site would be enhanced.

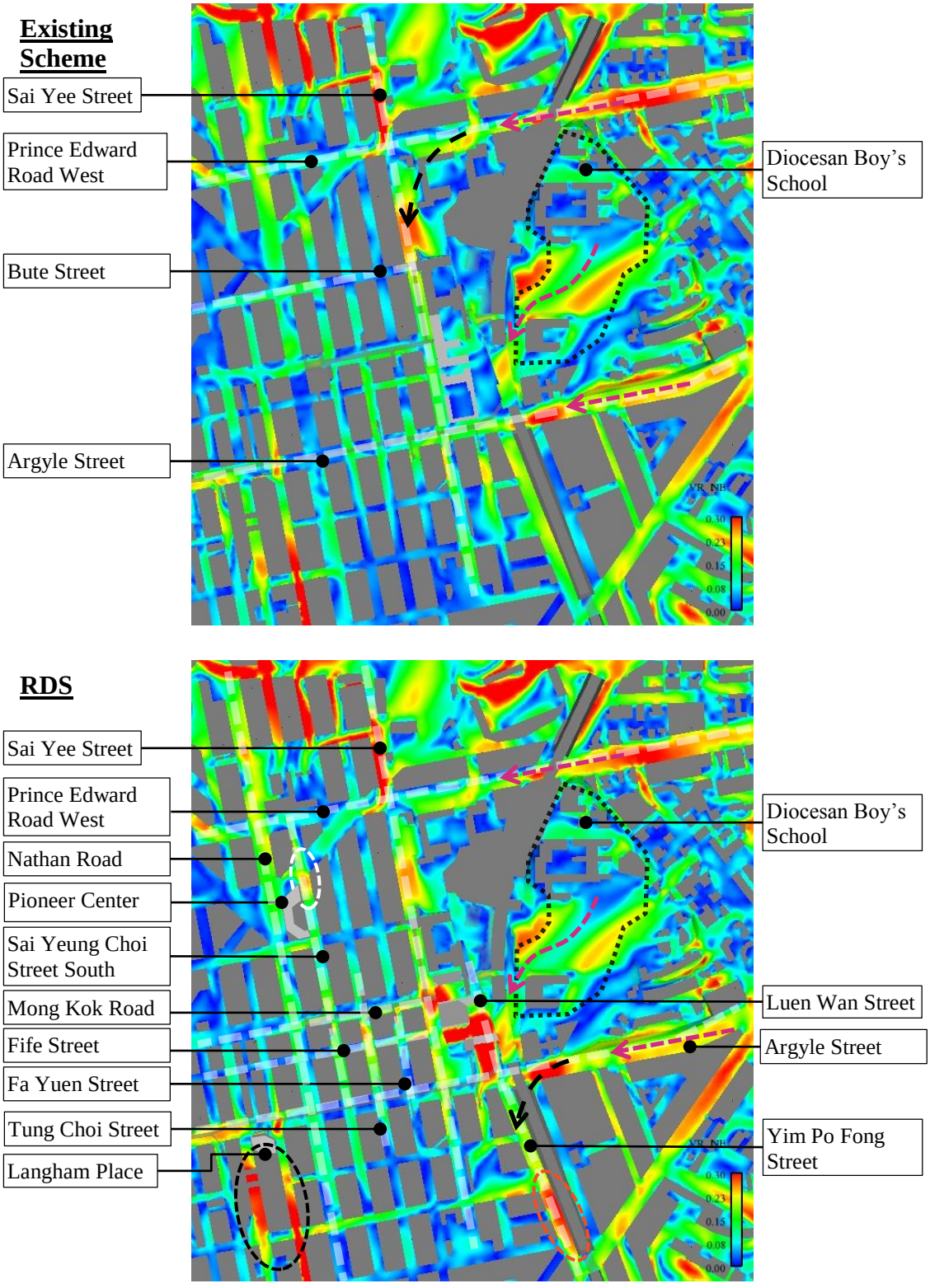


Figure 29 Contour plots of VR of Existing Scheme and RDS under NE wind

4.2.4 ENE Wind Direction

~~The wind performance under ENE and E winds would be generally similar and therefore, the following discussion under ENE wind is presented, as an example.~~

The sport ground of Diocesan Boys' School Campus, Prince Edward Road West and Argyle Street would become the major wind corridors to the Study Site as indicated by pink arrows in both schemes of Figure 30.

Existing Scheme

Similar to NE wind condition, due to the relative openness of the existing scheme at high level, the incoming wind from Prince Edward Road West would be attracted to travel along Sai Yee Street towards the Study Site, shown as black arrow in Figure 30. Hence, the VR at the northern part of Sai Yee Street would be slightly enhanced, highlighted in orange circled area in Figure 30. Some of slightly diverted ENE wind would continue to travel and reach the facade of Pioneer Center, where downwash would be induced and slightly higher VR would be observed along Sai Yeung Choi Street South, illustrated by orange arrow and white circled area in Figure 30. In addition, the incoming wind coming down from the playground of Diocesan Boys' School would skim over the existing buildings and continue to travel through Bute Street, Mong Kok Road perpendicular to and connected with Sai Yee Street towards the built-up area in Mong Kok area.

RDS

Majority of the incoming wind would reach the site from the playground of Diocesan Boys' School. The proposed high-rise tower under RDS would divert the incoming wind to travel around its northern and southern facade, shown as black arrow in Figure 30. Together with the corner effect of the proposed tower, the stream of air at mid-level diverted towards the northern and southern part of the Study Site would be downwashed and accelerated by the facade and travel along Sai Yee Street and result in a slightly higher VR at some localized area along Sai Yee Street; while high-level wind would travel between the building separations of other high-rise buildings in Mong Kok area and serve Yau Ma Tei area.

Although the northern and southern facades are roughly aligned with Mong Kok Road and Fife Street, the high-rise proposed tower would shield some of the incoming ENE~~/ E~~ wind which trades-off the effectiveness of the downwashed wind penetration through the inter-connected road network. Slightly calmer wind environment would be observed at some localized area at Mong Kok Road, Sai Yeung Choi Street South, Nathan Road and Portland Street at further distance to the downwind area of RDS.

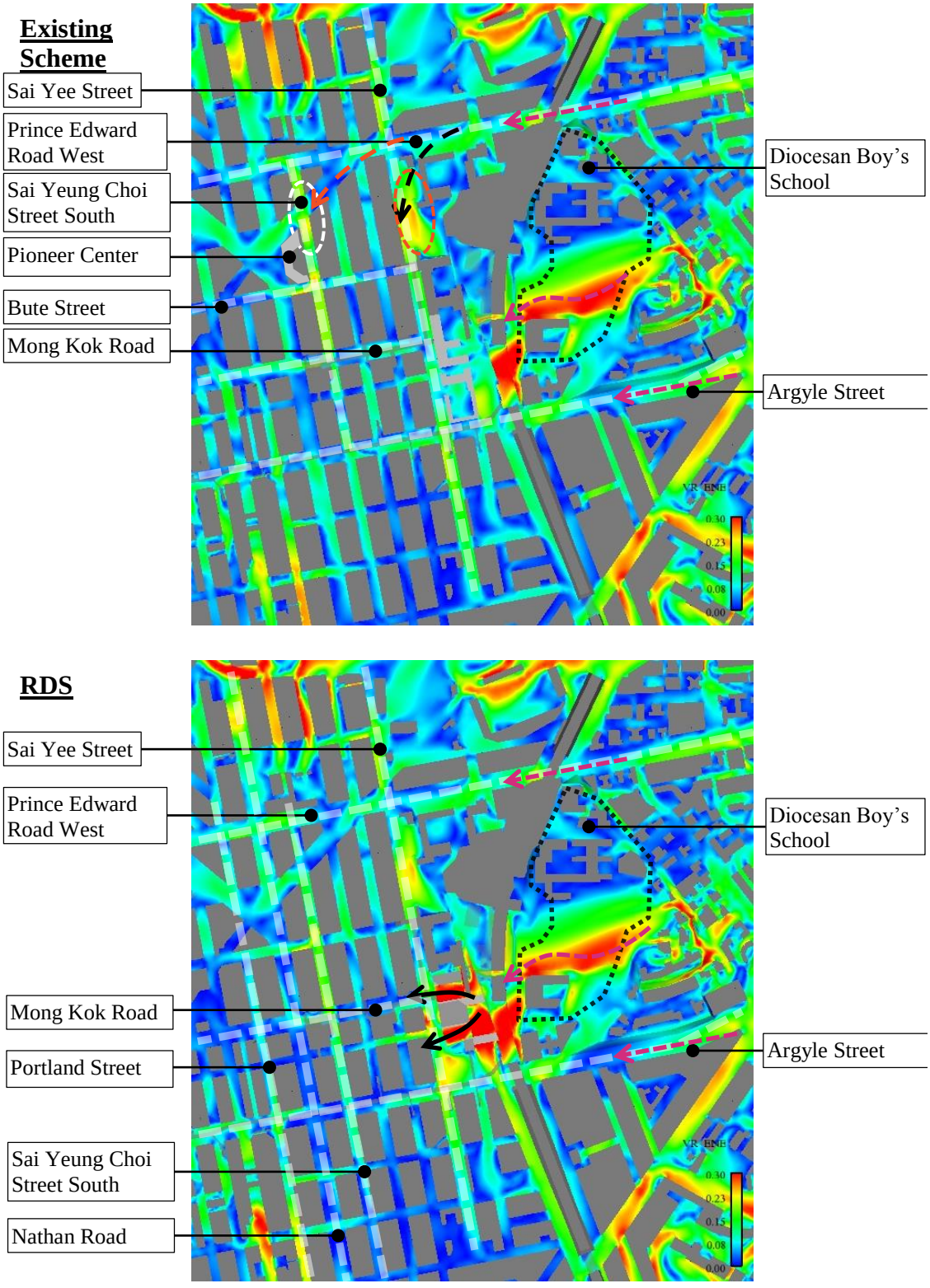


Figure 30 Contour plots of VR of Existing Scheme and RDS under ENE wind

4.2.5 E Wind Direction

Similar to ENE wind, the E wind would reach the study site and Mong Kok area from the sport ground of Diocesan Boys' School Campus, Prince Edward Road West and Argyle Street pink arrows in both schemes of Figure 31. The incoming wind would skim over the Mong Kok East Station building and downwashed by continuous facade opposite to Hong Kok Chiu Chow School, i.e. Pak Po Mansion, Wing Mui Building and Cheng Wah Mansion. Higher VR would be observed along Sai Yee Street underneath the footbridge, highlighted in orange circled area in Figure 31.

Existing Scheme

Due to the low-rise nature of the Existing Scheme, the incoming wind would easily skim over the existing buildings and continue to travel along Mong Kok Road, shown as black arrow in Figure 30, through which the wind could be distributed towards part of Tung Choi Street, Sai Yeung Choi Street South and Nathan Road, highlighted in white circled area Figure 30.

RDS

Similar to ENE wind, the incoming wind would be downashed by the eastern facade of the proposed high-rise tower under RDS and diverted to travel along its northern and southern facade, shown as black arrow in Figure 30. The downwashed wind would reach Luen Wan Street and the podium within the Study Site.

The downwashed wind reach Luen Wan Street would continue to travel along Yim Po Street, where higher VR would be observed. The stream of air reaching the podium would travel across the site and channelled by the array of continuous facade along the western side of Sai Yee Street to travel northwards and southwards along Sai Yee Street. Hence, slightly higher VR would be observed at northern part of Tung Choi Street and Fa Yuen Street to northeast and southern part of Tung Choi Street, Fa Yuen Street and Macpherson Playground to the southwest of the study site, highlighted in black circled area in Figure 30.

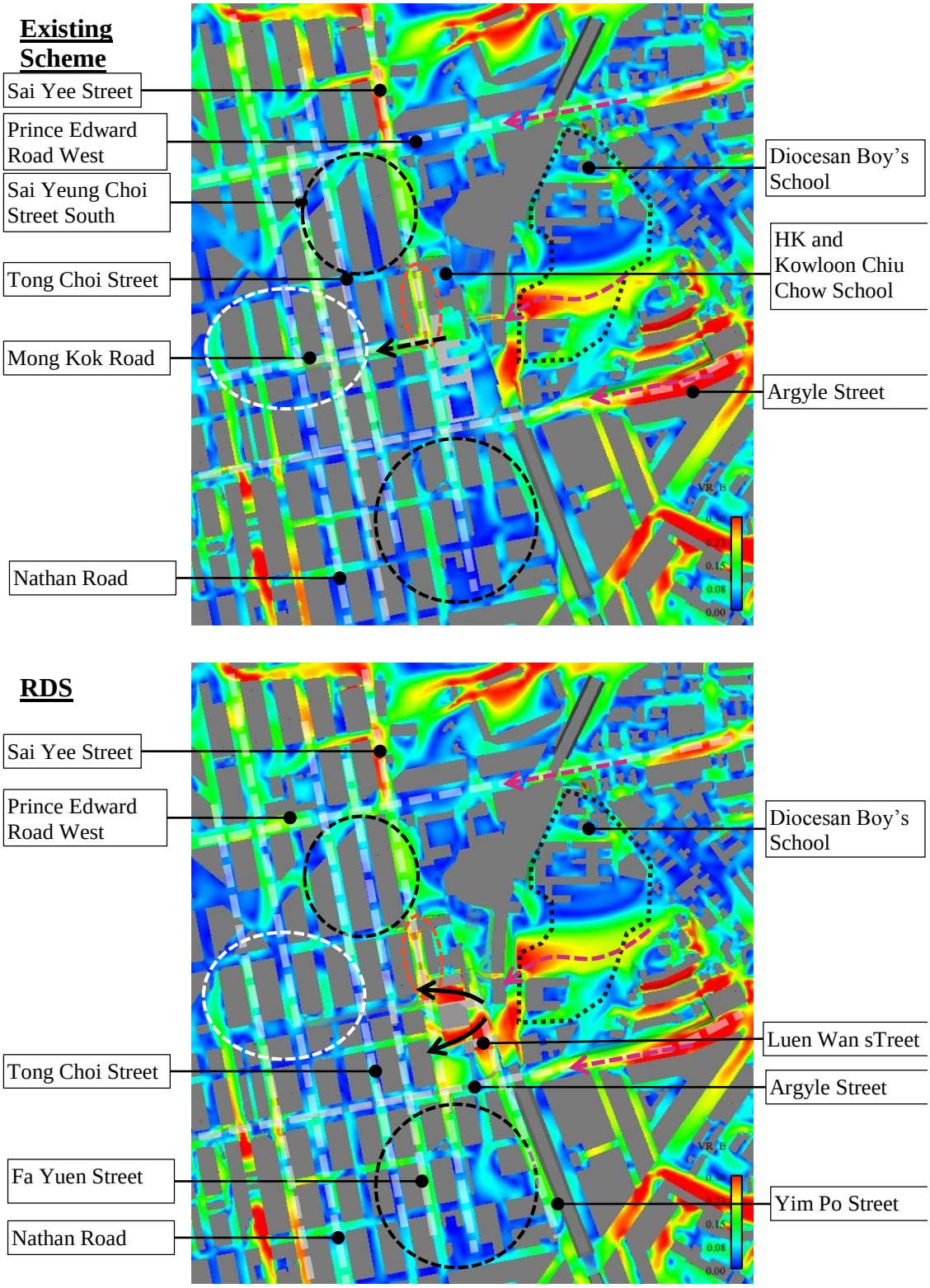


Figure 31 Contour plots of VR of Existing Scheme and RDS under E wind

4.2.6 ESE Wind Direction

Under ESE wind, the incoming wind would enter the study area from Pui Ching Road, shown as pink arrow in Figure 32. Travelling through the building separation, the ESE wind would reach Hang Seng 113 and Glen Haven, where downwash effect were induced and higher VR were observed along Argyle Street.

Existing Scheme

Under ESE wind, the Study Site is located at the leeward side of the existing building clusters, such as Fu Tao Building, Shing Tak Mansion, Peace Mansion, where the incoming wind would be generally shield by its surrounding buildings. Hence, a relatively calm wind environment would be observed within and near the Study Site. Due to the low-rise nature of the Existing Scheme, the wind environment within the Study Site would be dominated by the surrounding buildings.

RDS

Due to the proposed high-rise tower within the Study Site, a wake zone would be created at its leeward side. The incoming wind would travel through the building separation between the Mong Kok Government Office (MKGO) and the proposed +350mPD tower to ventilate the leeward side, illustrated by orange arrow in Figure 32. The incoming wind would be downwashed by the eastern facade and ventilate the pedestrian level at Luen Wan Street.

In addition, the downwashed wind would continue to travel through the building separation align with Mong Kok Road, shown as black arrow in Figure 32. Together with the corner effect, the wind would be accelerated to penetrate across the site and reach the Sai Yee Street to the west of the Study Site, where slightly higher VR would be observed, highlighted in white circled area in Figure 32. With the Mong Kok Road and Fife Street roughly aligned with the facade of the proposed tower, the downwashed wind would then be distributed through the Mong Kok Road and Fife Street and subsequently ventilate Fa Yuen Street, Tung Choi Street, Sai Yeung Choi Street South, where slightly higher VR would be observed at some localized areas.

On the other hand, with the tall building height of +350mPD under RDS, some shielding effect would be imposed at further distance in the leeward side where the downwashed wind could not reach. Some localized area near the junction of Nathan Road, Lai Chi Kok Road and Nullah Road would achieve slightly lower VR, highlighted in orange circled area. The proposed tower would also change the course of incoming ESE wind. The wind would travel more towards the west direction and reach the continuous facade of several high-rise buildings along Nathan Road, such as Silver Commercial Building, Nan Sing Building, Chun Yee Building and Kingland Apartments. The wind would be downwashed and channelled towards the northern part of Nathan Road and slightly alleviate the wind shadow herein in which slightly higher VR would be observed.

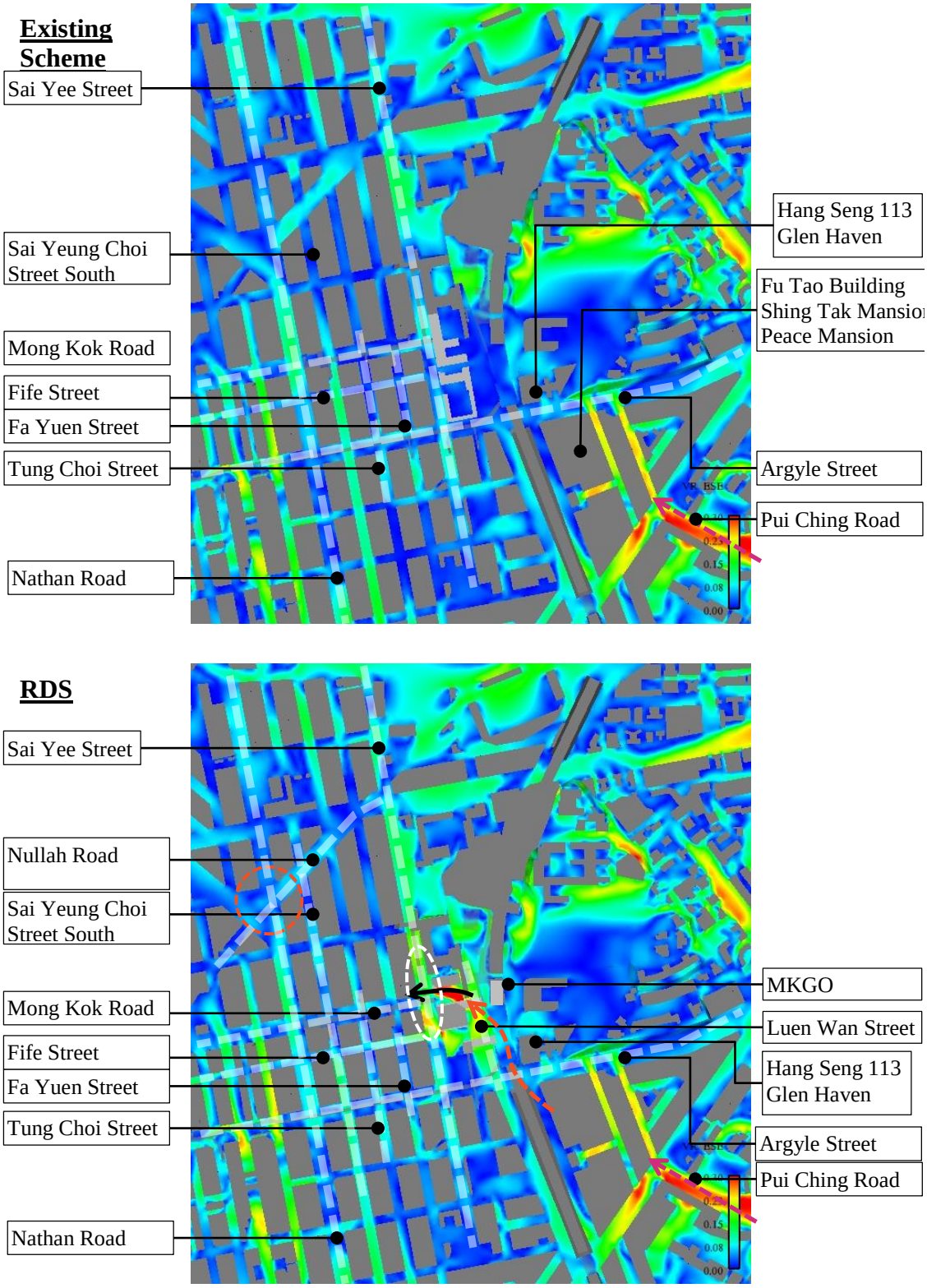


Figure 32 Contour plots of VR of Existing Scheme and RDS under ESE wind

4.2.7 SE Wind Direction

Yim Po Fong Street and Peace Avenue would become the major wind corridors to the Study Site as indicated by pink arrows in both schemes of Figure 33.

Existing Scheme

Due to the relatively lower building height of the existing G/IC buildings in the Study Site, which would provide a relative open space at high level within the dense building clusters, the incoming wind from Yim Po Fong Street and Peace Avenue, would skim over the existing G/IC buildings and channelled along Sai Yee Street and Argyle Street, shown as black arrows in Figure 33. The VR at the northern part of Sai Yee Street would be enhanced.

RDS

With the proposed +350mPD tower within the Study Site, the incoming SE wind at higher level would be split to travel westwards and northwards. The stream of area travelling westwards would travel along the Argyle Street, where higher VR would be observed, shown as purple arrow in Figure 33. On the other hand, the stream of air travelling northwards would reach the facade of Hang Seng 113 and Glen Havent, through the building separation between MKGO and the building within Diocesan Boy's School and towards the Study Site, illustrated by black arrow, orange arrow and white arrow respectively in Figure 33. As a result, the incoming wind would be downwashed by the Hang Seng 113 and Glen Haven, and subsequently along the slope of Kadoorie Avenue and road to Diocesan Boy's School, where slightly higher VR would be observed, highlighted in white circled area in Figure 33. Some of the air traveling towards the Study Site would be channelled by the facade of RDS and continue to reach the facade of MOKO building, with the coupling of downwash and corner effect herein, higher VR were resulted at the podium to the south of MOKO building.

The incoming wind would be downwashed by the southern and eastern facade of the proposed tower within the Study Site. The downwashed wind would then travel around the facade and reach the pedestrian level of Sai Yee Street to the west of the site and Luen Wan Street to the east of the proposed tower. With the Mong Kok Road and Fife Street being perpendicular and connected with Sai Yee Street, the downwashed wind would then be distributed through Mong Kok Road and Fife Street, and would subsequently ventilate part of Tung Choi Street and Bute Street.

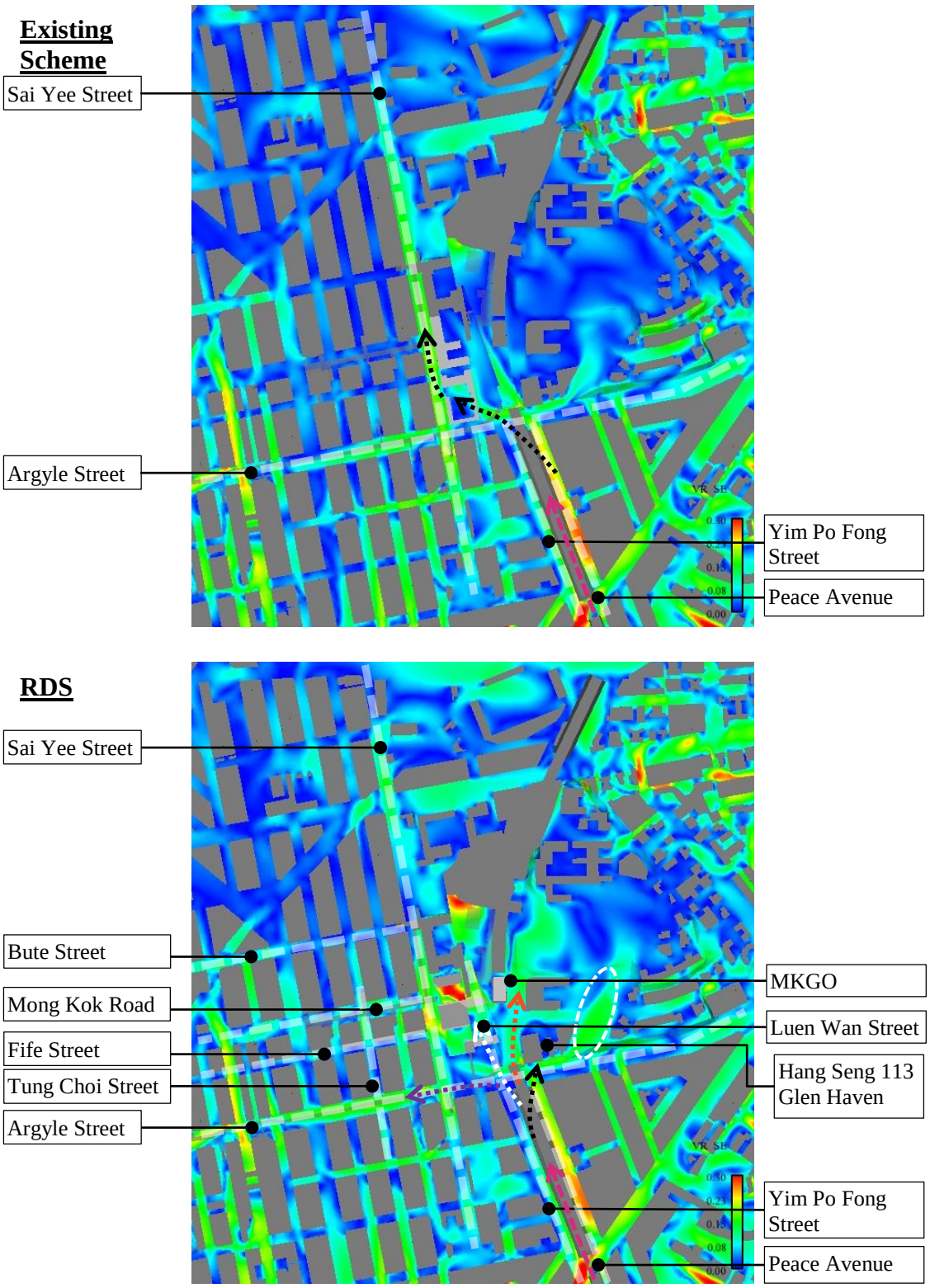


Figure 33 Contour plots of VR of Existing Scheme and RDS under SE wind

4.2.8 SSE/ S Wind Direction

The wind performance pattern under SSE and S winds would be generally similar.

Under SSE/ S winds, most of the streets running in SSE/NNW direction would be the air paths, especially Yim Po Fong Street/ Peace Avenue and Nathan Road. Secondary air path such as Waterloo Road would facilitate wind penetration towards Mong Kok and Kowloon City areas.

With the relatively taller buildings near the southern part of Mong Kok Area, the entire assessment area would have encountered relatively calm wind environment.

Existing Scheme

The presence of sports ground of Queen Elizabeth School and HK & Kowloon Chiu Chow Public Association Secondary School next to the low-rise Existing Scheme would allow the wind to reattach to the pedestrian level and more wind would be downwashed by the residential clusters along Prince Edward Road West. Therefore, relatively higher VR was found comparing to nearby area (white circled area in Figure 34 and Figure 35).

The presence of Hang Seng 113, Glen Haven and First Assembly of God Church at the junction of Kadoorie Avenue and Argyle Street would divert the incoming wind towards south bound of Kadoorie Avenue (pink arrow in Figure 34 and Figure 35).

RDS

The presence of proposed towers and podium under RDS would have downwashed the incoming wind towards pedestrian level at Sai Yee Street, Luen Wan Street, Argyle Street and Diocsean's Boy School (DBS) campus where relatively higher VR was found.

Such significant downwash effect would redistribute the wind flow near the Study Site. In particular, the wind environment at Fife Street, Mong Kok Road and Nathan Road was enhanced in compared to the Existing Scheme. The wind environment at other streets connected to these streets in Prince Edward area would also be slightly enhanced. In the presence of larger wake zone due to RDS and the adjacent developments, the downwashed wind would then travel towards the wake zone. Therefore, the wind environment near the Mong Kok Stadium would be slightly enhanced under RDS Scheme. In addition, under SSE wind, the tall tower under RDS and MOKO buildings would divert the wind to travel through the building separation in between and constrain the wind direction towards the residential building clusters along Prince Edward Road West, where downwashed would be induced and slightly higher VR would be observed (purple circled area in Figure 34).

Nevertheless, the wind shadow of the RDS would be casted over the north-eastern area of Prince Edward Road West (pink circled area in Figure 34 and Figure 35) where relatively lower VR than that of Existing Scheme was found. The combined wind shadow induced by RDS and MOKO buildings would shield the downwash effect at Prince Edward Road West under S wind and lower VR would be observed (purple circled area in Figure 35).

South bound of Kadoorie Avenue would also be enhanced under RDS as the captured wind by the proposed high-rise tower in RDS would travel towards the east side of East Railway in the presence of slope of DBS's campus. With the downwashed wind towards DBS's Primary Division (black arrow in Figure 34 and Figure 35), the wind environment at the south bound of Kadoorie Avenue would be enhanced than the Existing Scheme (black circled area in Figure 34 and Figure 35).

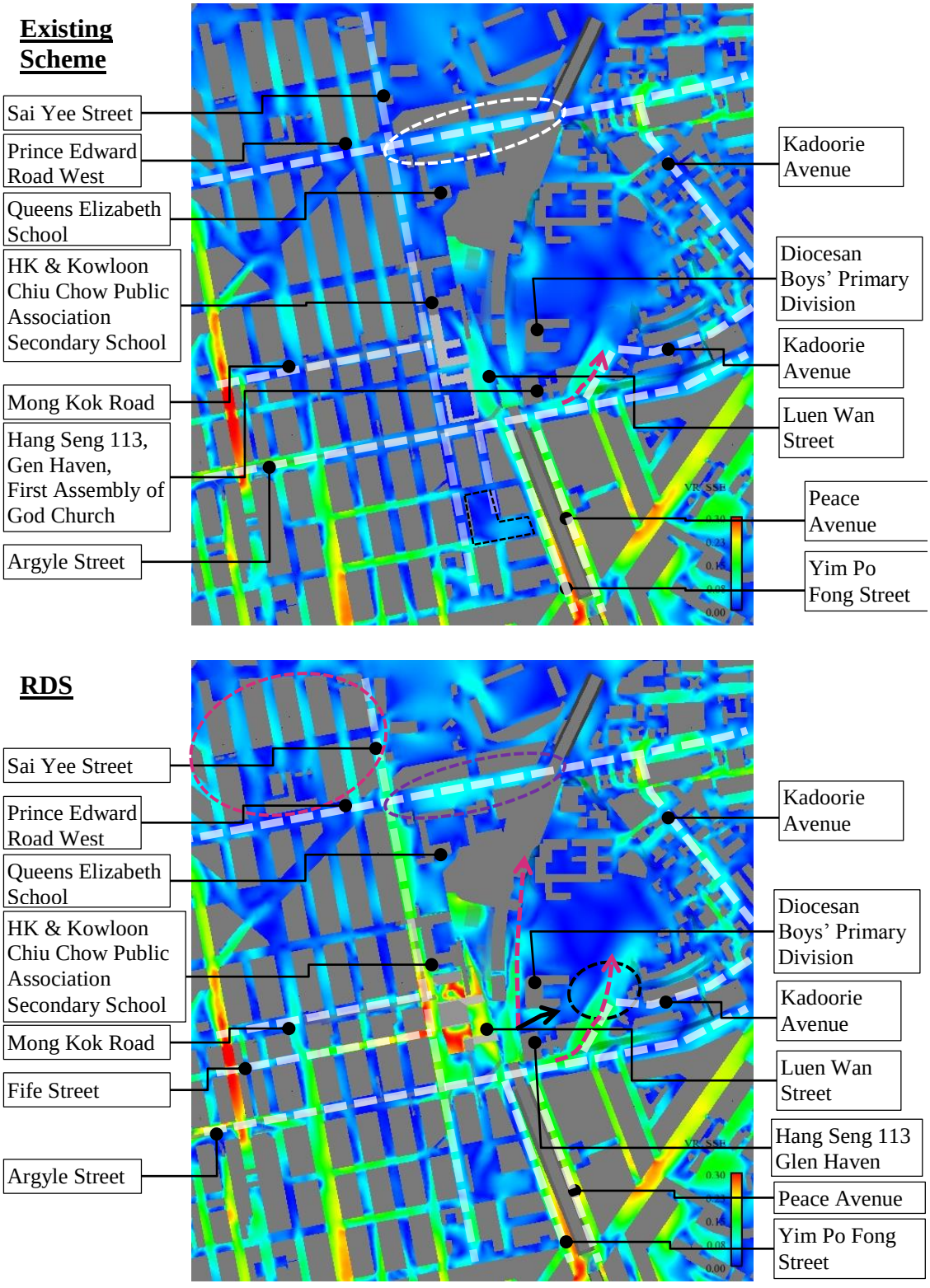


Figure 34 Contour plots of VR of Existing Scheme and RDS under SSE wind

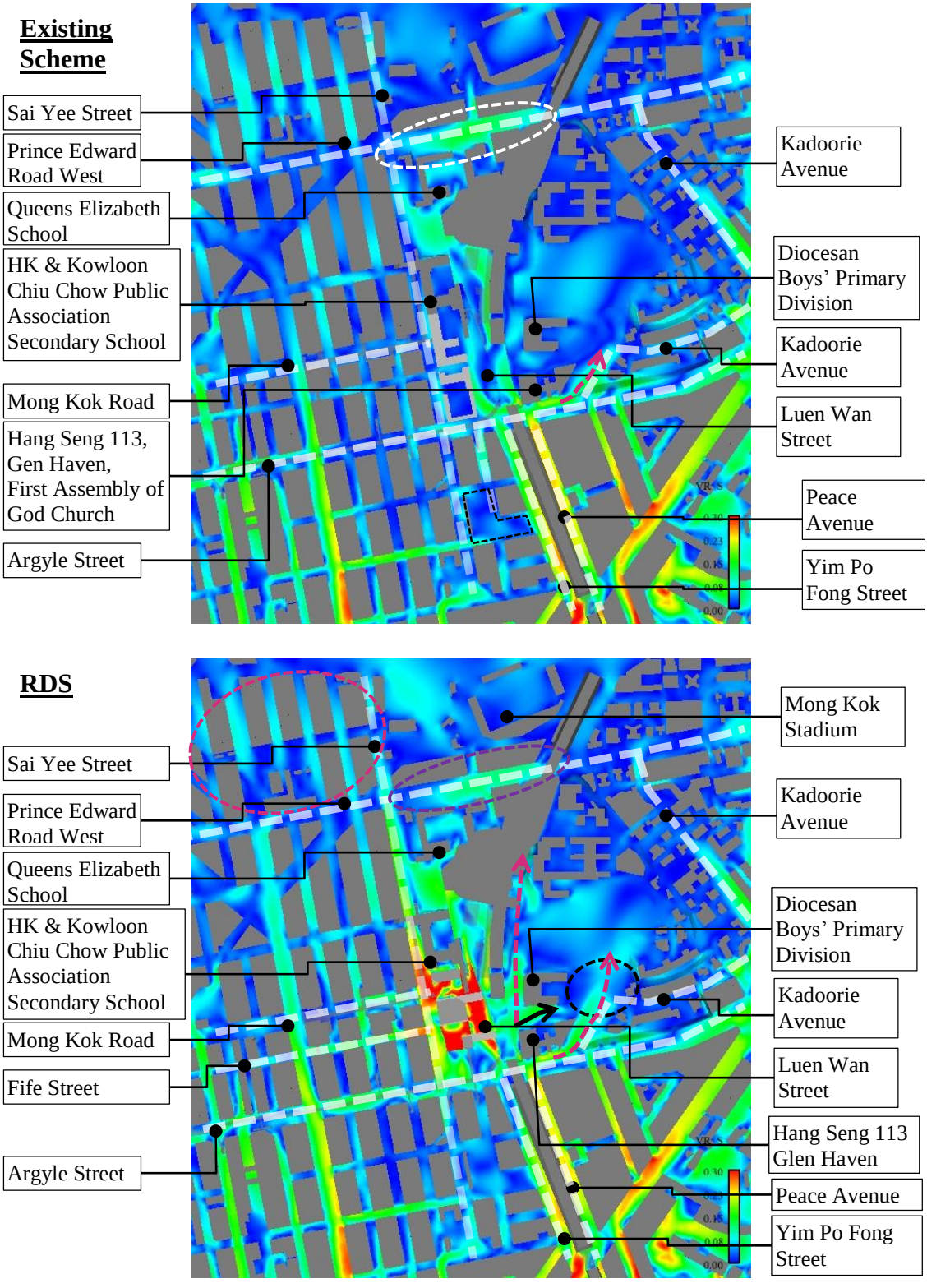


Figure 35 Contour plots of VR of Existing Scheme and RDS under S wind

4.2.9 SSW Wind Direction

The SSW wind would serve Mong Kok Area via Argyle Street and Mong Kok Road. Various localized areas with relatively higher VR was observed due to the downwash effect by building height difference. The presence of the East Railway would allow and channel the incoming wind to flow towards the Study Site (shown as black arrow in Figure 36) and therefore, relatively higher VR was observed along Argyle Street and Yim Po Fong Street/ Peace Avenue.

Existing Scheme

As the northern area to the Study Site area (i.e. Prince Edward area which was indicated by the white dotted circle in Figure 36) generally have relatively lower building height than those in Mong Kok Area, the wind environment of Prince Edward area would have relatively calmer wind environment as those buildings in Mong Kok Area would have shielded the incoming SSW wind.

The presence of Hang Seng 113, Glen Haven and First Assembly of God Church at the junction of Kadoorie Avenue and Argyle Street would divert the incoming wind towards south bound of Kadoorie Avenue which would counter-flow against another air stream flowing from opposite direction in the presence of wake zone of these developments (pink arrows in Figure 36). Therefore, the eastern area of DBS Primary Division would have resulted in a relatively lower VR (black circled area in Figure 36).

RDS

The presence of proposed high-rise building of 350mPD under RDS would introduce significant downwash effect in which the downwashed wind would redistribute the wind flow around the Study Area. In this connection, the wind environment at Sai Yee Street, Luen Wan Street, south bound of Kadoorie Avenue, area along Mong Kok East Station and etc. would be enhanced in compared to the Existing Scheme.

In particular, the proposed building of +350mPD would have diverted the incoming wind towards Fife Street such that its wind environment would be enhanced in compared to the Existing Scheme.

Southern part of Kadoorie Avenue would have relatively higher VR than that under Existing Scheme. It would be due to the stronger downwash by the proposed +350mPD building of RDS which more wind would travel along the Mong Kok East Station and therefore less wind would flow in opposite direction against those being diverted by Hang Seng 113, Glen Haven and First Assembly of God Church at the junction of Kadoorie Avenue and Argyle Street (pink arrows in Figure 36). As a result, the area to the east of DBS Primary Division would have relatively higher VR than that under Existing Scheme (black circled area in Figure 36).

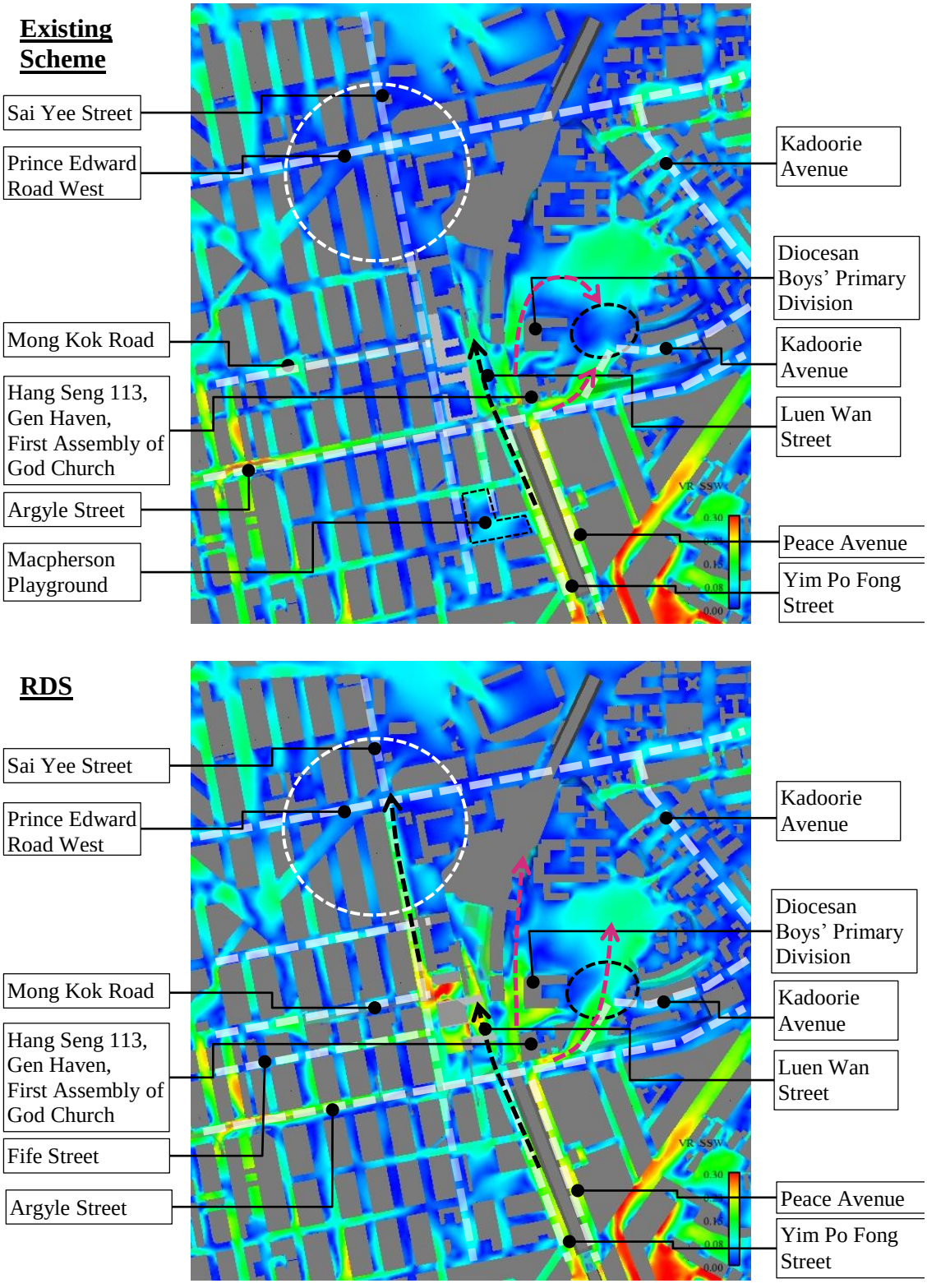


Figure 36 Contour plots of VR of Existing Scheme and RDS under SSW wind

4.2.10 SW Wind Direction

Under SW wind, Prince Edwards Road West and Argyle Street would become the major air path where relatively higher VR was observed. Other localized areas with relatively higher VR was observed along Nathan Road and Yim Po Fong Street due to the downwash effect from staggered building arrangement and presence of Macpherson Playground, respectively.

Existing Scheme

The presence of Macpherson Playground would allow the incoming wind to reach Yim Po Fong Street, together with the wake zone due to the adjacent mid- to high-rise buildings along Yim Po Fong Street, the wind would then travel northward reach Luen Wan Street and reach further to sports ground of Queen Elizabeth School as indicated by the black arrow in Figure 37.

In addition, the incoming wind would be downwashed by the facade of MOKO building. Some of the downwashed wind would reach the PTI above podium level within the study site while other would travel sideways along Sai Yee Street (as indicated by the orange arrows in Figure 37). The continuous facades of Hong Kong and Kowloon Chiu Chow School and the Food and Environmental Hygiene Department would help to channel the wind to travel southwards along Sai Yee Street.

Besides, the wind environment among those existing clusters bounded by Prince Edward Road West and Kadoorie Avenue (pink circled area in Figure 37) would have some localized area with relatively higher VR. This would be due to the localized downwash by relatively taller buildings of that area.

RDS

In the presence of +350mPD proposed building of RDS, significant downwash effect would enhance the wind environment near the proposed tower and the Study Site, such as Sai Yee Street, Luen Wan Street, sports ground of Queen Elizabeth School. In additional, the DBS's sports ground and the existing clusters bounded by Prince Edward Road West and Kadoorie Avenue would be enhanced in compared to the Existing Scheme. However, to the eastern part of the DBS campus, the wind environment would be relatively calmer than that under Existing Scheme which would be due to the wind shadow of the proposed high-rise building with +350mPD of RDS.

Such significant downwash effect would redistribute the wind flow of adjacent area such that a portion of downwashed wind would travel towards adjacent wake zones created by the surrounding buildings, such as the southern section of Sai Yee Street (as indicated by the pink arrow in Figure 37).

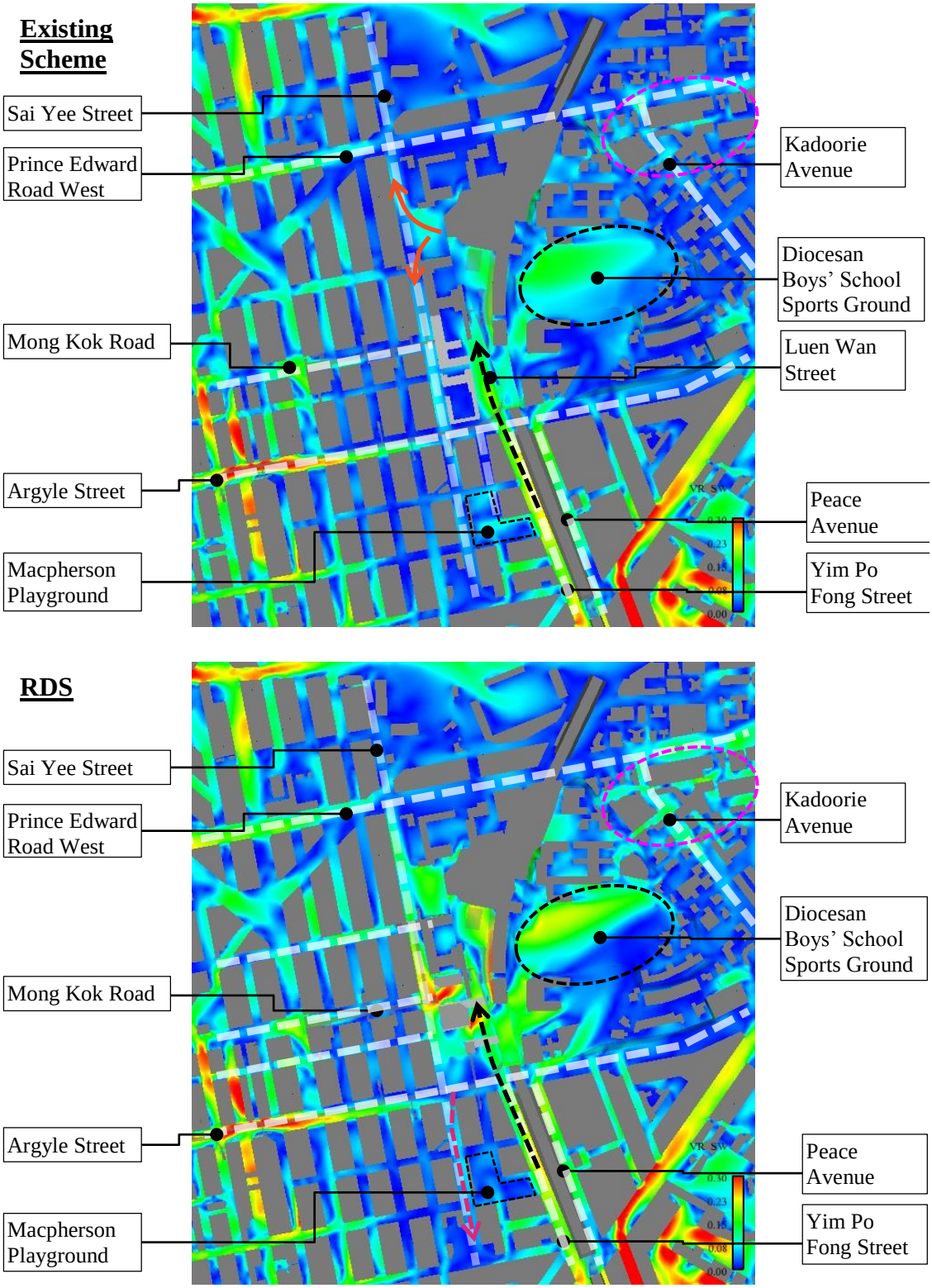


Figure 37 Contour plots of VR of Existing Scheme and RDS under SW wind

4.2.11 WSW Wind Direction

Due to the street alignment parallels to the WSW wind, the WSW wind would easier to penetrate along the ENE-WSW direction. Among all, Prince Edward Road West, Bute Street, Fife Street, Argyle Street would be the major wind paths for WSW wind, particularly Fife Street and Bute Street would serve the Study Site. Nathan Road would become the secondary air path where the WSW wind would be captured by the staggered buildings along Nathan Road and redistribute the wind flow in the leeward area.

Existing Scheme

Given the Existing Scheme has generally lower building height than the RDS, ~~the wind environment at~~ DBS Sports Ground would enjoy the incoming WSW wind.

On the other hand, the presence of mid- to high-rise building along Yim Po Fong Street would create a wake zone on its immediate leeward side where the incoming wind would travel towards it as indicated by the black arrows in Figure 36. The wind would then travel further north towards the Study Site.

Although Fife Street is relatively narrow, straight-through nature without any elevated footbridge would allow slightly better wind penetration than Mong Kok Road. The channelled wind would then reach the Study Site and being diverted towards two ends of Sai Yee Street as indicated by orange arrows in Figure 36.

RDS

With the proposed RDS, the high-rise nature of RDS would capture the incoming WSW wind towards Sai Yee Street and Luen Wan Street where relatively higher VR was found. Such downwash would also enhance the wind environment near Mong Kok Road, Fife Street and Argyle Street where relatively higher VR was found in these street. On the other hand, a wind shadow would be imposed by the high-rise RDS at the leeward side, hence, the area with higher VR would be reduced at the DBS Sports Ground and residential areas near Kadoorie Avenue, as marked in the black circled area in Figure 38.

The +350mPD tower in RDS would significantly redistribute the wind movement comparing to Existing Scheme. Since the significant downwash would take place near Sai Yee Street which would enhance the wind performance of the interconnected roads (such as Mong Kok Street, Fife Street, Argyle Street etc.). With such enhanced wind performance at various street, it would increase the flow resistance and then lead to relatively lower VR in the windward side, such as southern part of Nathan Road, Nelson Street and Shan Tung Street.

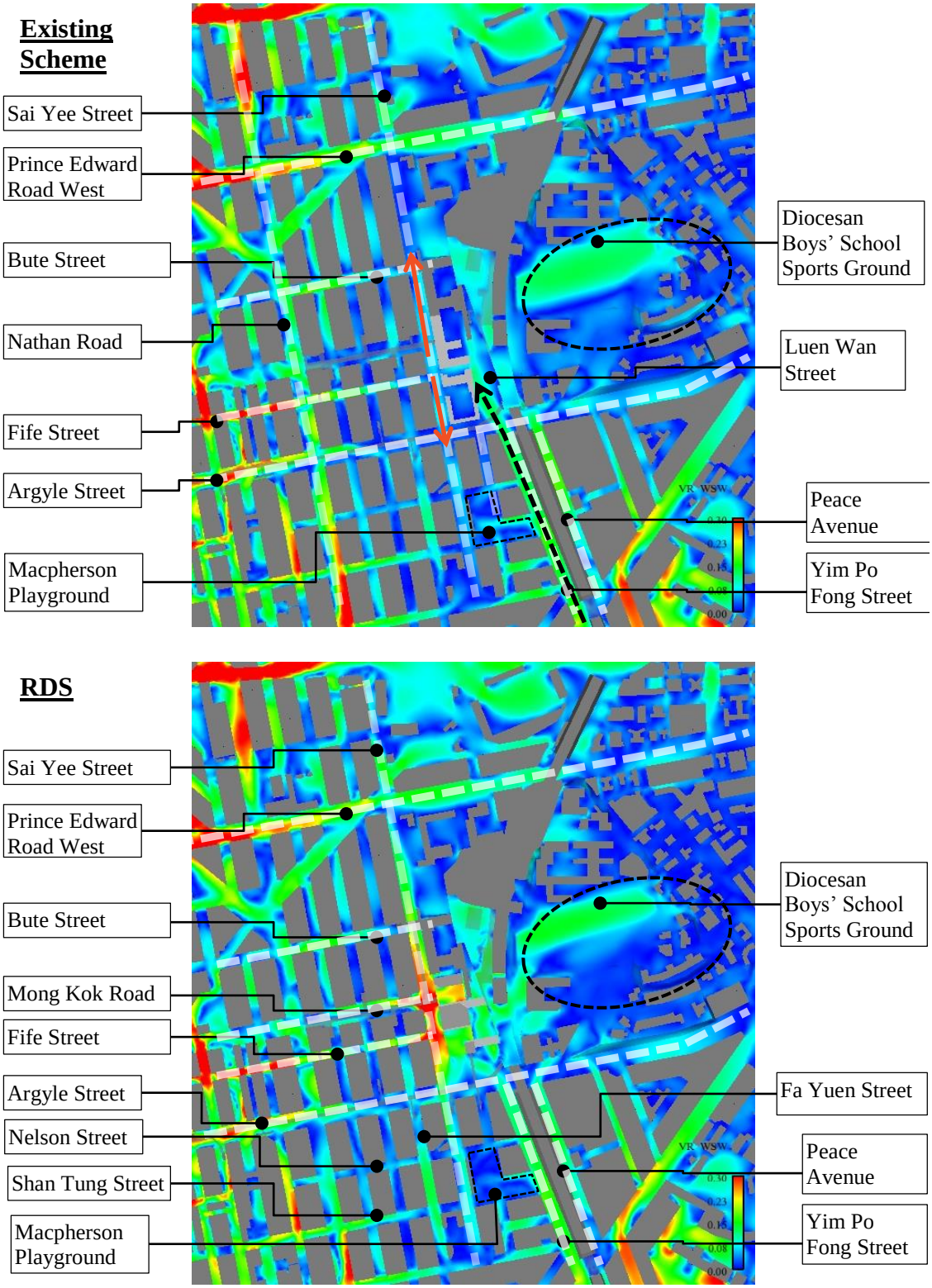


Figure 38 Contour plots of VR of Existing Scheme and RDS under WSW wind

4.2.12 W Wind Direction

Bute Street and Argyle Street would become the major wind path for W wind to serve the Study Site; while Nullah Road would also serve as the wind path for Prince Edward/ Mong Kok areas under both schemes. The western facade of MOKO building would induce downwash effect to ventilate the sport ground of Queen Elizabeth School and the podium of Mong Kok Station.

Existing Scheme

Given the Existing Scheme has generally lower building height than the RDS, ~~the wind environment at~~ Diocesan Boys' School Sports Ground would enjoy the incoming W wind. The W wind would also being captured by the MOKO building and serve Luen Wan Street. Such downwashed wind would than travel towards Argyle Street as indicated by the pink arrows in Figure 39.

RDS

With the proposed RDS, the high-rise nature of RDS would redistribute the incoming wind that the entire Diocesan Boys' School and junction of Argyle Street and Peace Avenue Street would also be enhanced. On the other hand, the wind environment at its immediate western boundary along Sai Yee Street would be enhanced due to downwash effect. With such downwashed wind, the adjacent street, such as Mong Kok Road, Fife Street, would be slightly enhanced.

The downwashed wind travelling northwards along Sai Yee Street would meet the southwards downwashed wind induced by MOKO buildings, where counter flow were observed, shown as purple arrows in Figure 39. Relatively lower VR were observed near the white circled area in Figure 39.

However, the wind environment at the western bound of Argyle Street would be slightly windier as the downwashed wind by +350mPD tower would travel towards Argyle Street and Peace Avenue as indicated by black arrows in Figure 39.

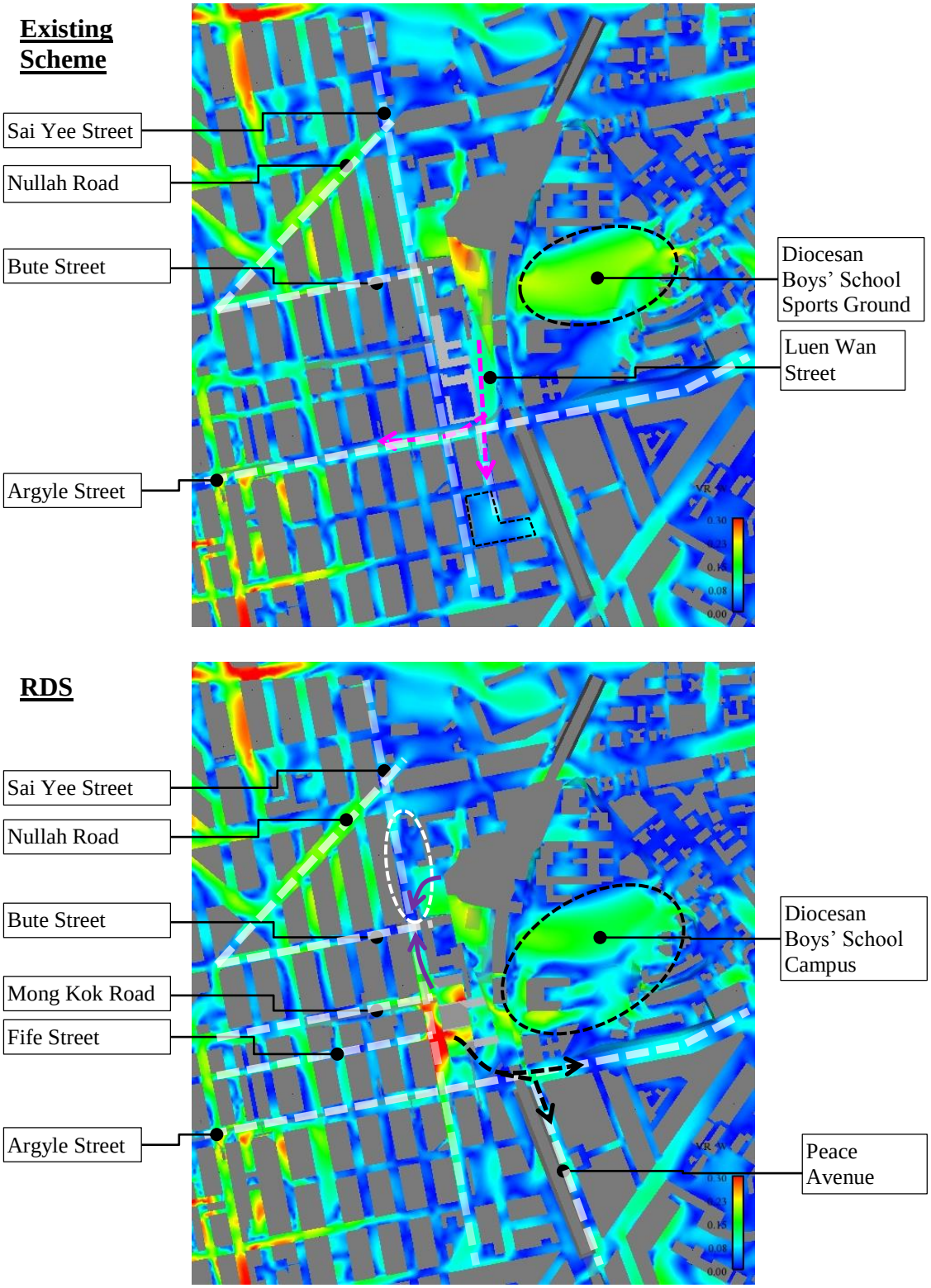


Figure 39 Contour plots of VR of Existing Scheme and RDS under W wind

4.3 VR of Test Points

Table 4 summarizes the values of SVR and LVR between the two studied schemes. The VR of individual test point may refer to Appendix F of this Report.

Table 4 Comparison of the SVR and LVR between 2 Schemes

		Existing Scheme	RDS Scheme
Annual weighted	SVR	0.09	0.13
	LVR	0.10	0.10
Summer weighted	SVR	0.07	0.12
	LVR	0.08	0.09

Under the annual wind condition, Existing Scheme obtained lower SVR but similar LVR, as compared to RDS, which indicates that the RDS achieved slightly better wind environment at close proximity to the Study Site but similar overall ventilation performance in surrounding area.

Under summer wind condition, Existing Scheme would achieve lower SVR and slightly lower LVR by 0.01, comparing to RDS. The result shows that RDS achieved better wind environment at areas near the Study Site due to the downwash effect induced by the +350mPD tower.

4.4 Focus Areas

There are total 39 focus areas identified for this study, which includes an open space fallen outside the Assessment Area to further assess the impact of the RDS in term of wind environment. These focus areas are marked in Figure 40. All relevant test points regarding each focus area are tabulated in Table 5 and Table 6.

Within the Assessment Area given in Figure 5, 39 focus areas are marked in Figure 40, which are mainly school sites and pedestrian accessible roads. A list of focus areas and its special averaged VR were tabulated in Table 7.

Table 5 Focus areas and associated test points

	Focus Areas	Test Points
1	Boundary Street Playground	S_O1-S_O3
2	Queen Elizabeth School	O169-O172
3	Sai Yee Street	O4, O17, O38, O44, O47, O83-O90, P1-P8
4	Fa Yuen Street	O3, O16, O22, O27, O32, O37, O43, O46, O75-O82
5	Tung Choi Street	O2, O15, O21, O26, O31, O36, O42, O60, O67-O74
6	Sai Yeung Choi Street South	O1, O14, O20, O25, O30, O35, O41, O59, O61-O66
7	Bute Street	O12-O17
8	HK and Kowloon Chiu Chow School	O17, O87, O173
9	Mong Kok Road	O18-O22

	Focus Areas	Test Points
10	Fife Street	O23-O27
11	Argyle Street	O28-O32, O128-O133, P8-P12
12	Nathan Road	O13, O19, O24, O29, O34, O40, O52-O57
13	Portland Street	O12, O18, O23, O28, O33, O49-O51
14	Nelson Street	O33-O39, O106
15	Shan Tung Street	O40-O45, O108
16	Sai Yee Street Garden	O46-O47, O82, O90-O91
17	Hak Po Street	O39, O100
18	Mongkok Stadium	O99, S_O4-S_O5
19	Flower Market Road	O92-O96
20	Prince Edward Road West	O1-O11
21	Kadoorie Ave I	O11, O156-O162
22	The CCC Heep Woh Primary School	O166-O168
23	Diocesan Boys' School	O140-O151
24	Road to Diocesan Boys' School	O128, O134-O139
25	Kadoorie Ave II	O128, O134, O152-O155
26	Soares Ave	O119-O120, O124, O130
27	Julia Ave & Emma Ave	O119-O121
28	Victory Ave	O117-O118, O123, O129
29	Liberty Ave	O116-O117
30	Peace Ave	O111-O115
31	Yim Po Fong Street	O105-O110
32	Waterloo Road	O122-O127
33	Macpherson Playground	O102-O104
34	Soy Street	O46-O48, O110

Table 6 Focus areas and associated test points within Study Site

	Focus Areas	Test Points
35	Podium aligned with Fife Street	S19-S20
36	Luen Wan Street	S9-S14
37	Mong Kong East Station	S1-S5
38	Podium aligned with Mong Kok Road	S16-S18
39	Thoroughfare	P1, P29-P30

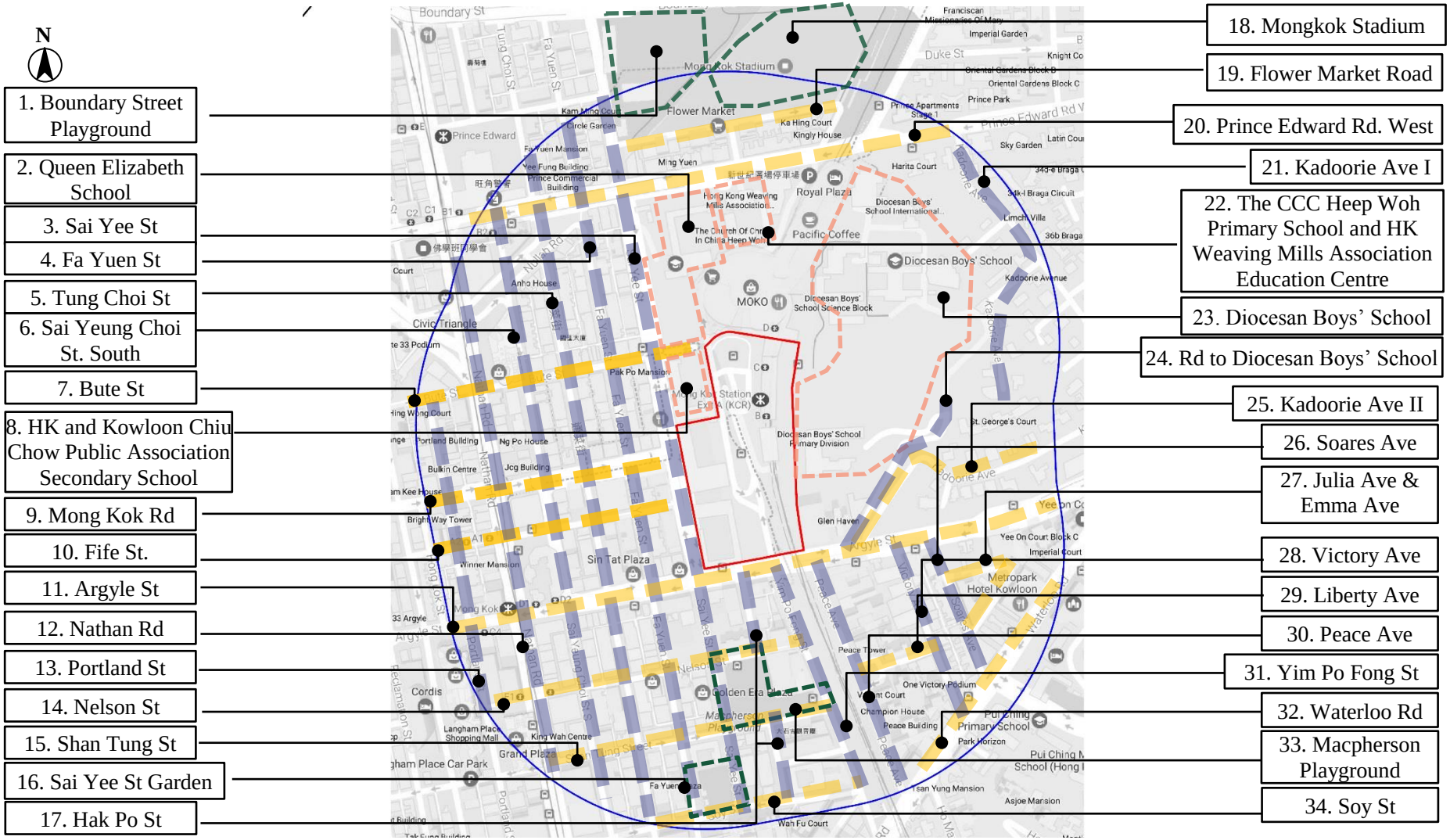


Figure 40 Focus Areas within Assessment Area

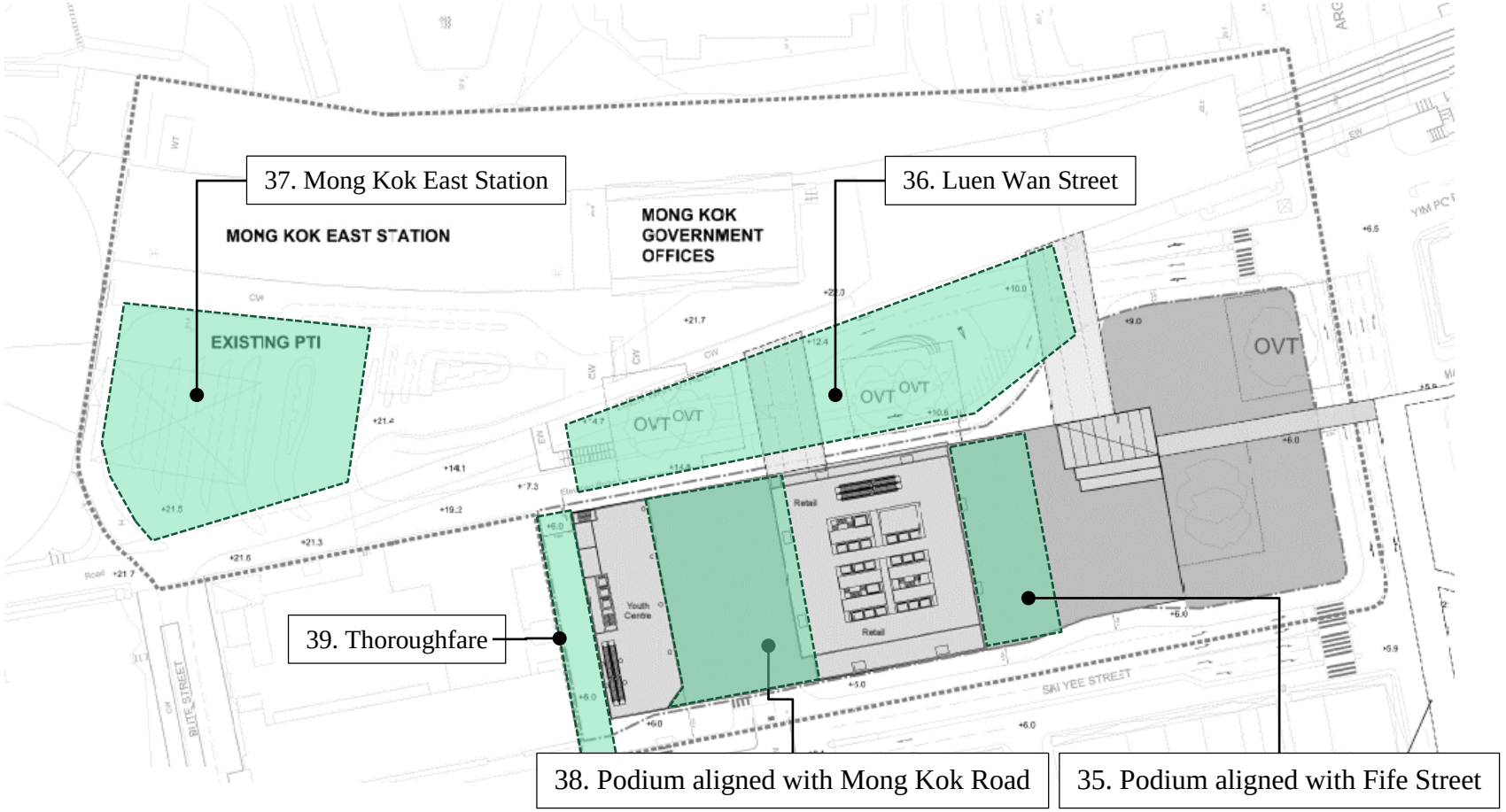


Figure 41 Focus Areas within Study Area

Table 7 Spatial averaged VR for each focus area under Annual Wind Condition

	Focus Areas	Annual Wind Condition		Summer Wind Condition	
		Existing Scheme	RDS	Existing Scheme	RDS
1	Boundary Street Playground	0.13	0.13	0.07	0.07
2	Queen Elizabeth School	0.07	0.06	0.06	0.06
3	Sai Yee Street	0.11	0.14	0.07	0.13
4	Fa Yuen Street	0.07	0.08	0.06	0.08
5	Tung Choi Street	0.06	0.07	0.06	0.07
6	Sai Yeung Choi Street South	0.09	0.09	0.08	0.08
7	Bute Street	0.10	0.11	0.08	0.09
8	HK and Kowloon Chiu Chow School	0.12	0.13	0.06	0.13
9	Mong Kok Road	0.09	0.08	0.07	0.09
10	Fife Street	0.09	0.10	0.08	0.11
11	Argyle Street	0.12	0.13	0.09	0.10
12	Nathan Road	0.09	0.09	0.08	0.09
13	Portland Street	0.11	0.11	0.10	0.11
14	Nelson Street	0.10	0.11	0.09	0.09
15	Shan Tung Street	0.08	0.09	0.09	0.09
16	Sai Yee Street Garden	0.05	0.05	0.06	0.07
17	Hak Po Street	0.11	0.11	0.06	0.06
18	Mongkok Stadium	0.13	0.13	0.07	0.08
19	Flower Market Road	0.09	0.09	0.04	0.05
20	Prince Edward Road West	0.10	0.10	0.08	0.08
21	Kadoorie Ave I	0.10	0.09	0.07	0.06
22	The CCC Heep Woh Primary School	0.09	0.09	0.05	0.06
23	Diocesan Boys' School	0.09	0.09	0.07	0.07
24	Road to Diocesan Boys' School	0.11	0.11	0.06	0.07
25	Kadoorie Ave II	0.14	0.14	0.08	0.09
26	Soares Ave	0.17	0.16	0.15	0.15
27	Julia Ave & Emma Ave	0.12	0.11	0.09	0.09
28	Victory Ave	0.18	0.17	0.16	0.16
29	Liberty Ave	0.15	0.15	0.13	0.12

	Focus Areas	Annual Wind Condition		Summer Wind Condition	
		Existing Scheme	RDS	Existing Scheme	RDS
30	Peace Ave	0.06	0.06	0.12	0.12
31	Yim Po Fong Street	0.12	0.16	0.13	0.13
32	Waterloo Road	0.22	0.22	0.20	0.19
33	Macpherson Playground	0.04	0.06	0.05	0.05
34	Soy Street	0.08	0.09	0.09	0.09
35	Podium aligned with Fife Street	0.05	0.24	0.05	0.19
36	Luen Wan Street	0.07	0.23	0.08	0.19
37	Mong Kong East Station	0.06	0.07	0.08	0.10
38	Podium aligned with Mong Kok Road (for RDS only)	-	0.26	-	0.24
39	Thoroughfare	0.08	0.15	0.07	0.17

Under annual condition, the majority of the wind comes from NE quadrant. As discussed in Section 4.2, due to the high-rise tower in RDS (+350mPD), significant downwash would be induced, together with the corner effect, the downwashed wind would then travel around the facade of the tower and reach the pedestrian level. Hence, the VR at areas close to the +350mPD tower would be enhanced, such as Sai Yee Street (#3), Luen Wan Street (#36), the Podium aligned with Fife Street (#35) and Thoroughfare in the northern part of the site (#39).

In addition, as the Mong Kok Road (#9) and Fife Street (#10) are generally aligned with the building separation in RDS under the major prevailing wind directions, the downwashed wind would then continue to travel along these streets and re-distribute to the Mong Kok Area, which would result in slightly higher VR near localized area such as Tung Choi Street (#5) and Fife Street (#10). Although Mong Kok Road (#9) would be the dedicated air path for Mong Kok Area, the wind performance under RDS would be slightly calmer than that under Existing Scheme. Under RDS Scheme, the incoming wind from E/ENE direction would be downwashed by RDS tower to travel along Sai Yee Street and Yim Po Street; while the E/ENE wind under Existing Scheme would be downwashed by eastern facades of buildings along Sai Yee Street, such as Mong Kok Building and Tai Yue Mansion and travel further towards Mong Kok Road. Therefore, Existing Scheme would have relatively higher VR than that of RDS Scheme.

However, due to the taller building height in RDS, wind shadow would be casted at the downwind area. The VR at Soares Avenue (#26), Julia Avenue & Emma Avenue (#27) and Victory Avenue (#28) would be slightly lower comparing to Existing Scheme.

Under summer condition, majority of the wind comes from SW quadrant. The incoming wind would be downwashed by southern and western facade of the +350mPD tower in RDS. The downwashed wind would then travel along the facades to ventilate areas near the proposed high-rise tower, such as Sai Yee Street (#3), HK and Kowloon Chiu Chow

Public Association Secondary School (#8), Mong Kok Road (#9), Fife Street (#10), Thoroughfare in the northern part of the site (#39), Podium aligned with Fife Street (#35), Luen Wan Street (#36) and Mong Kok East Station (#37).

5 Conclusions and Recommendations

5.1 Overview

An Air Ventilation Assessment (AVA) Initial Study was conducted to assess the ventilation performance of Recommended Development Scheme (RDS) of the Redevelopment of Government Sites at Sai Yee Street and Mong Kok East Station, in accordance with the *AVA Technical Circular* No. 1/06, "*Environment, Transport and Works Bureau - Technical Circular No. 1/06*" issued on 19th July 2006 and "*Annex A of Technical Circular - Technical Guide for Air Ventilation Assessment for Development in Hong Kong*".

Existing Scheme and RDS were assessed by using Computational Fluid Dynamics (CFD) techniques. A series of CFD simulations using Realizable k–ε turbulence model were performed under annual and summer wind conditions with reference to the methodology for AVA Initial Study as stipulated in the *AVA Technical Circular*. For the annual wind condition, N, NNE, NE, ENE, E, ESE, S and SW were selected which give total wind frequency of 79.7% over a year; while E, ESE, SE, SSE, S, SSW, SW, WSW and W are selected which gives total wind frequency of 84.2% in summer months.

The Velocity Ratio (*VR*) as proposed by the *AVA Technical Circular* was employed to assess the ventilation performance under RDS and its impact to the surroundings in compared to the Existing Scheme.

With reference to the *AVA Technical Circular*, 30 perimeter test points and 173 overall test points (with aid of another 22 special test points for Exiting Scheme and 23 special test points for RDS) were allocated to assess the overall and local ventilation performance.

5.2 Results

Upon CFD simulation, RDS obtained higher SVR under both annual and summer condition, comparing to Existing Scheme. In term of LVR, both scheme achieve similar LVR under annual condition with RDS achieving slightly higher LVR by 0.01 under summer condition.

The results of the overall ventilation performance could are summarized as following:

		Existing Scheme	RDS Scheme
Annual weighted	SVR	0.09	0.13
	LVR	0.10	0.10
Summer weighted	SVR	0.07	0.12
	LVR	0.08	0.09

The results indicate that the RDS achieved slightly better wind environment at close proximity to the Study Site under both annual and summer condition due to the downwash effect induced by the +350mPD tower. The two schemes achieved similar overall

ventilation performance in surrounding area under annual condition and summer condition.

Following wind enhancement features have been adopted and would help to enhance the ventilation performance around and within the Study Area.

- Height profile within the Study Site provided by +350mPD tower in the central part and lower building height in the northern and southern part;
- Building separation with width of around 30m located to the immediate north of the high-rise building (+350mPD), aligned with Mong Kok Road;
- Building separation with width of around 20m located to the immediate south of the high-rise building (+350mPD), aligned with Fife Street.

With the high-rise tower (+350mPD) located in the central of the Study Site, more facade area would be available for inducing downwash effect, which would then subsequently ventilate the pedestrian level. In addition, the building separations adjacent to the high-rise tower (+350mPD), the induced downwash wind could be diverted to travel through Mong Kok Road and Fife Street and redistributed towards the densely built-up area in Mong Kok.

6 Reference

[1] Housing, Planning and Lands Bureau and Environment, Transport a& Works Bureau, Technical Circular No.1/06 Air Ventilation Assessment and its Annex A – Technical Guide for Air Ventilation Assessment for Developments in Hong Kong, dated 19th July, 2006.

[2] Experimental Site Wind Availability Study For Mong Kok, Hong Kong, Planning Department's AVA Register, available at: http://www.pland.gov.hk/pland_en/info_serv/site_wind/wwtf007_2007_final.pdf

[3] European Cooperation in Science and Technology COST – Impact of Wind and Storm on City Life and Built Environment, available at: http://www.consilium.europa.eu/ueDocs/cms_Data/docs/dynadoc/out/cost/en/COST_AT_C14.PDF

Appendix A

Summary of Site Wind Availability Data of Mong Kok Area

A1 Mong Kok Study Area

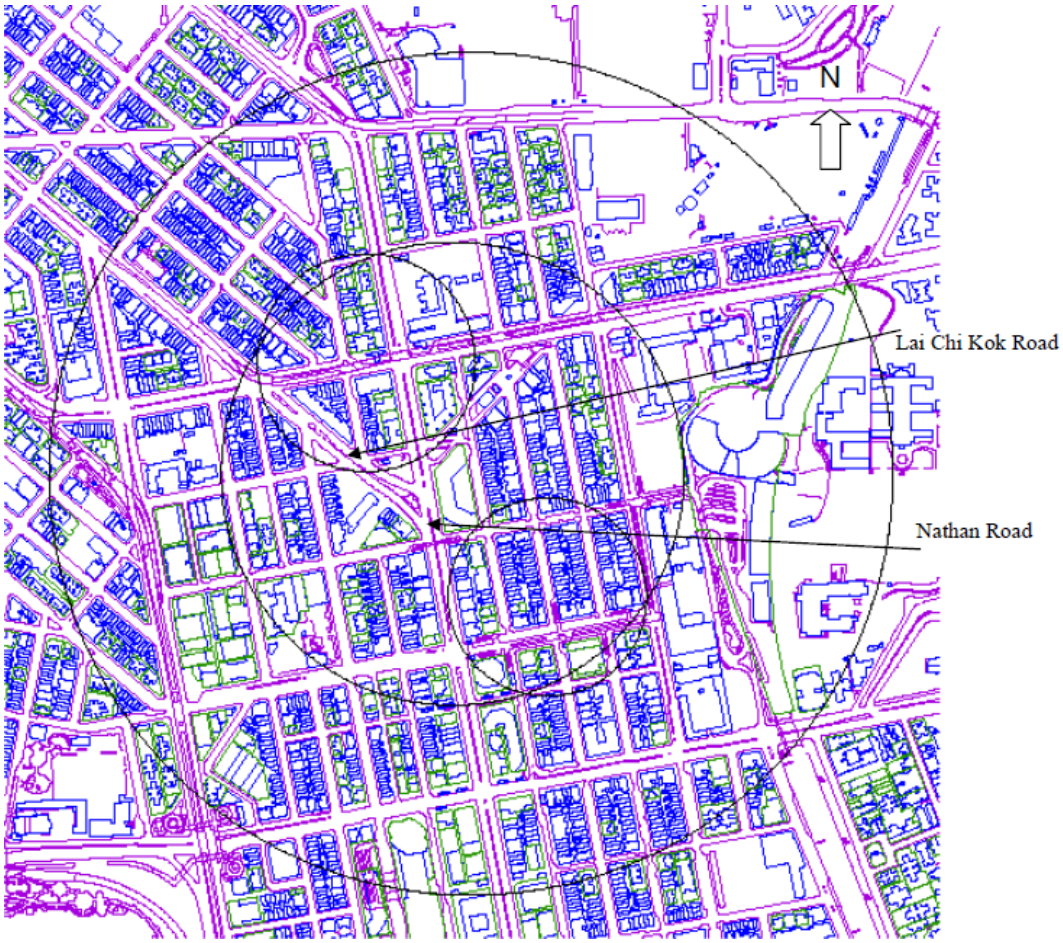


Figure A 1 Mong Kok study area

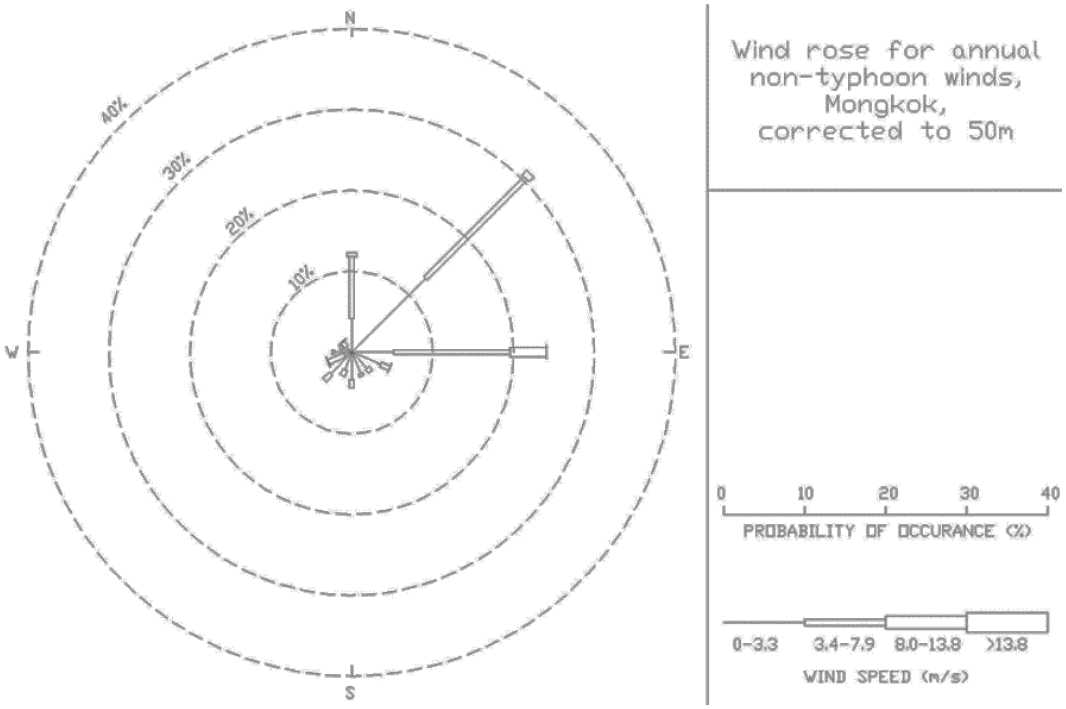


Figure A 2 Annual Wind Roses for Mong Kok study area at 100m

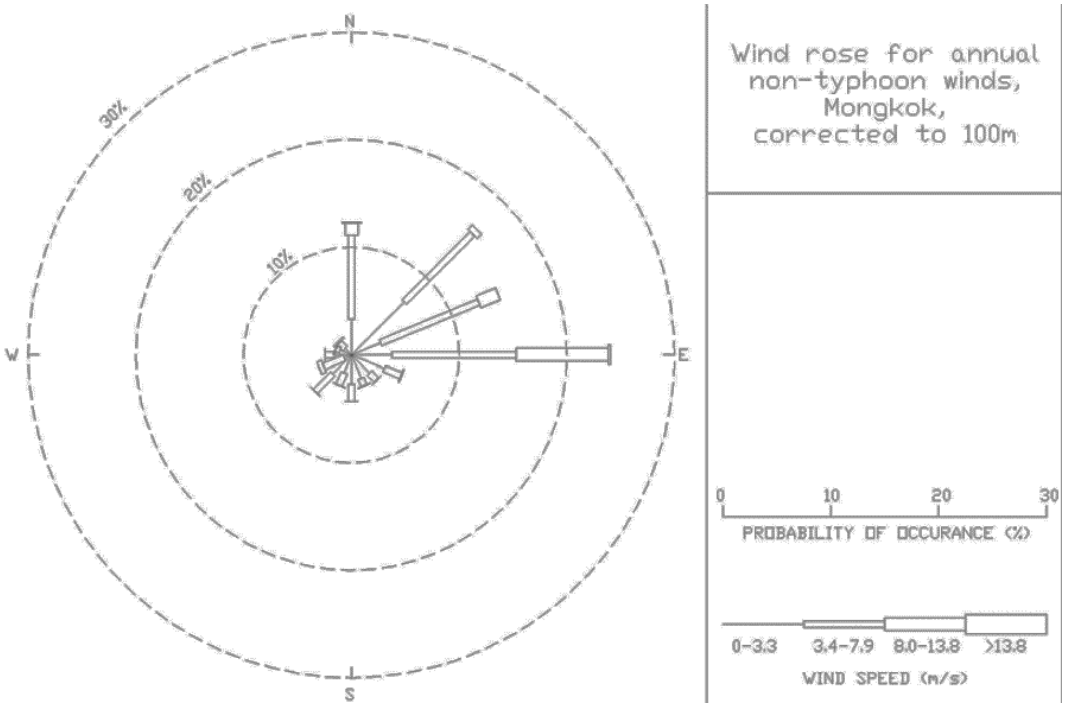


Figure A 3 Annual Wind Roses for Mong Kok study area at 100m

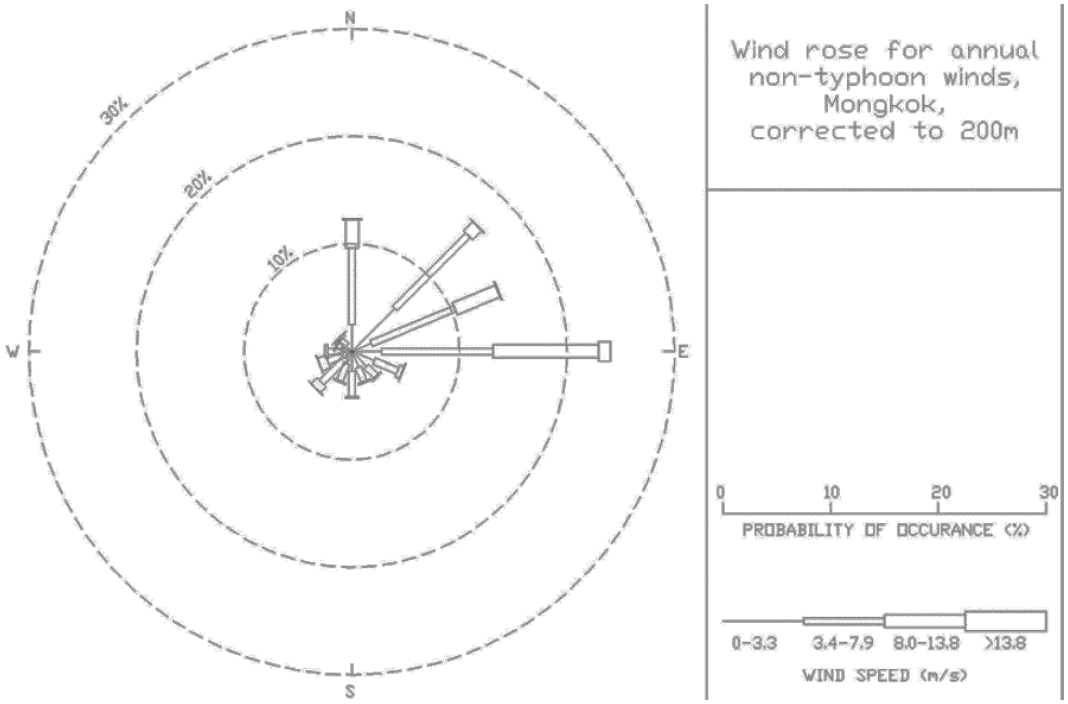


Figure A 4 Annual Wind Roses for Mong Kok study area at 200m

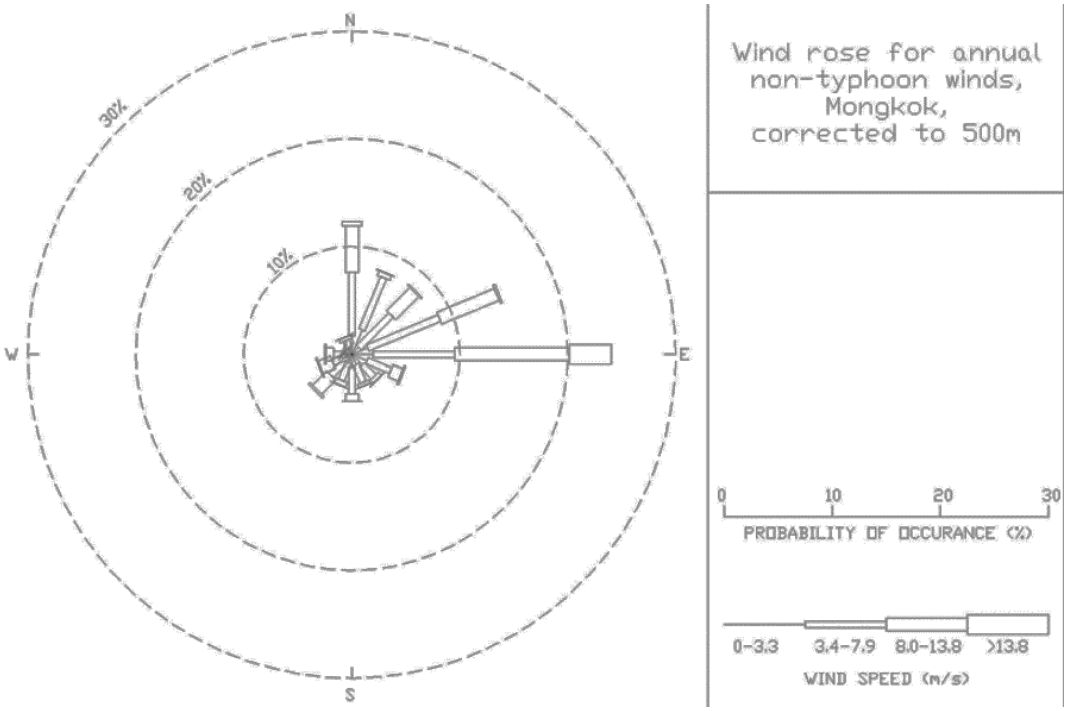


Figure A 5 Annual Wind Roses for Mong Kok study area at 500m

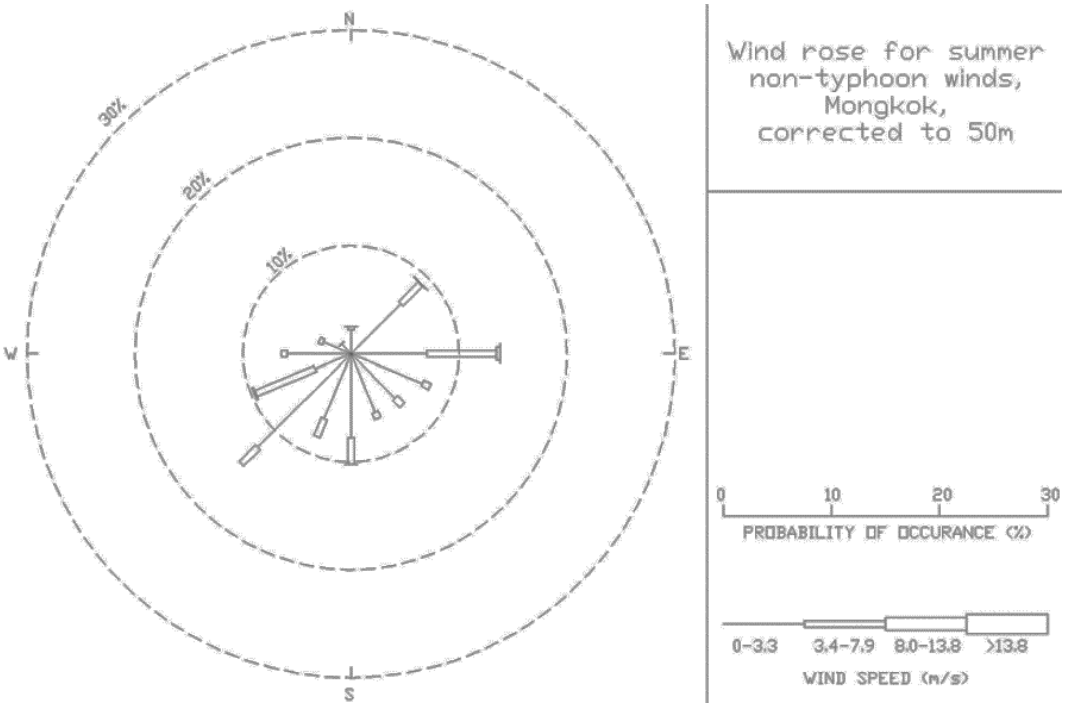


Figure A 6 Summer Wind Roses for Mong Kok study area at 100m

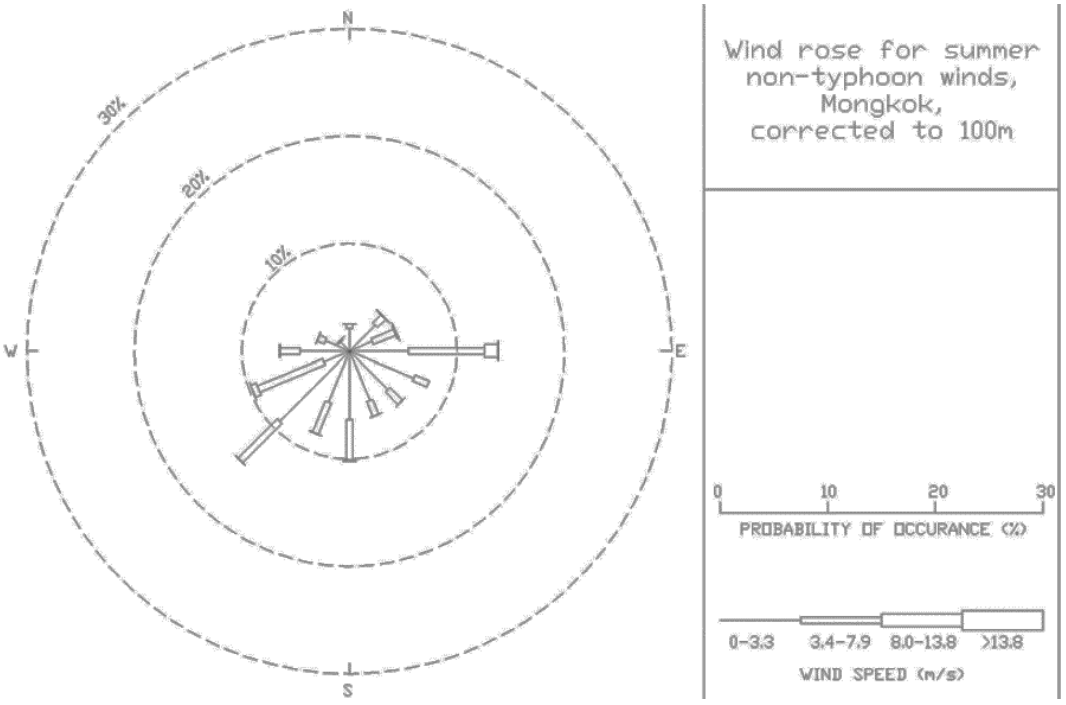


Figure A 7 Summer Wind Roses for Mong Kok study area at 100m

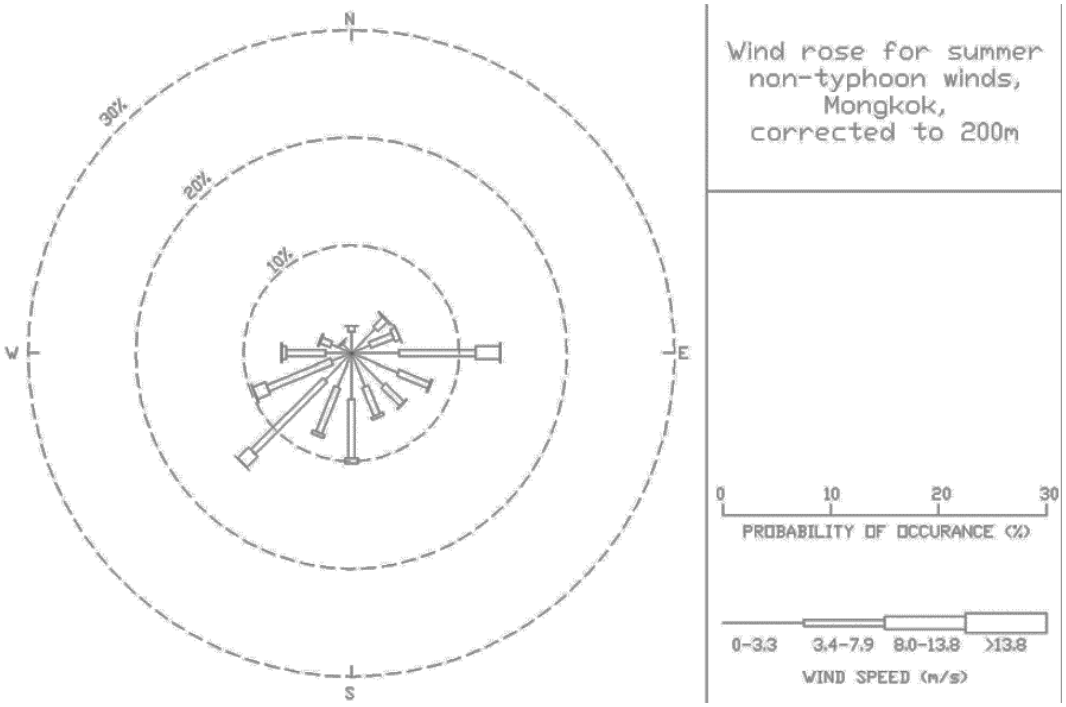


Figure A 8 Summer Wind Roses for Mong Kok study area at 200m

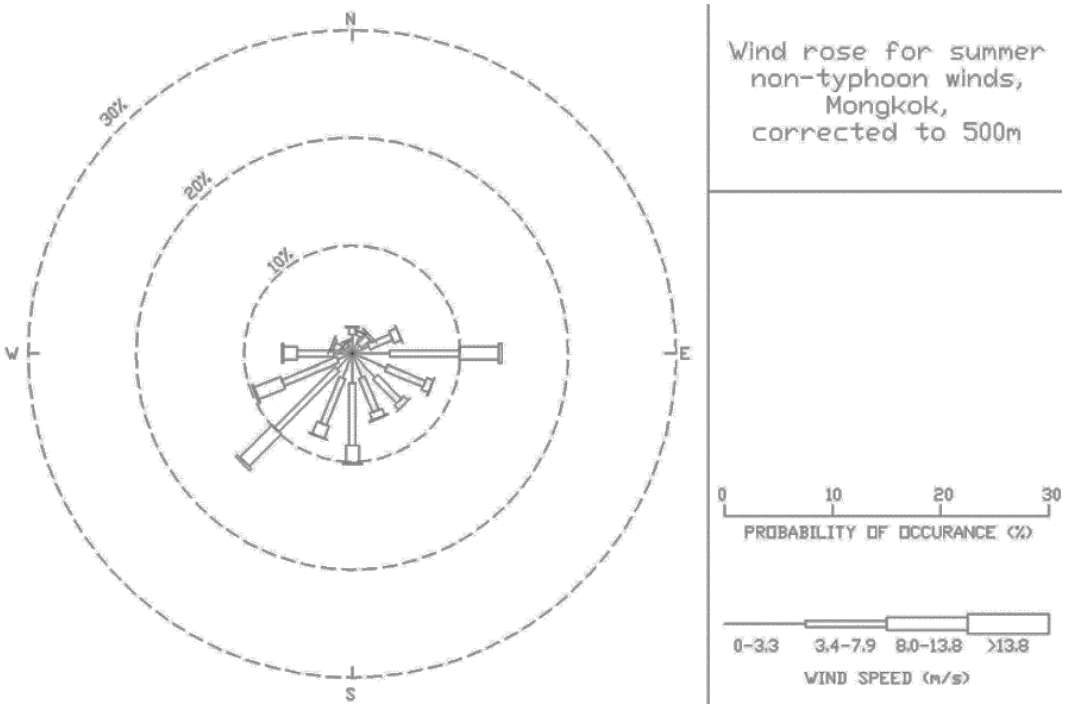


Figure A 9 Summer Wind Roses for Mong Kok study area at 500m

A2 Wind Profiles of those selected Wind Directions

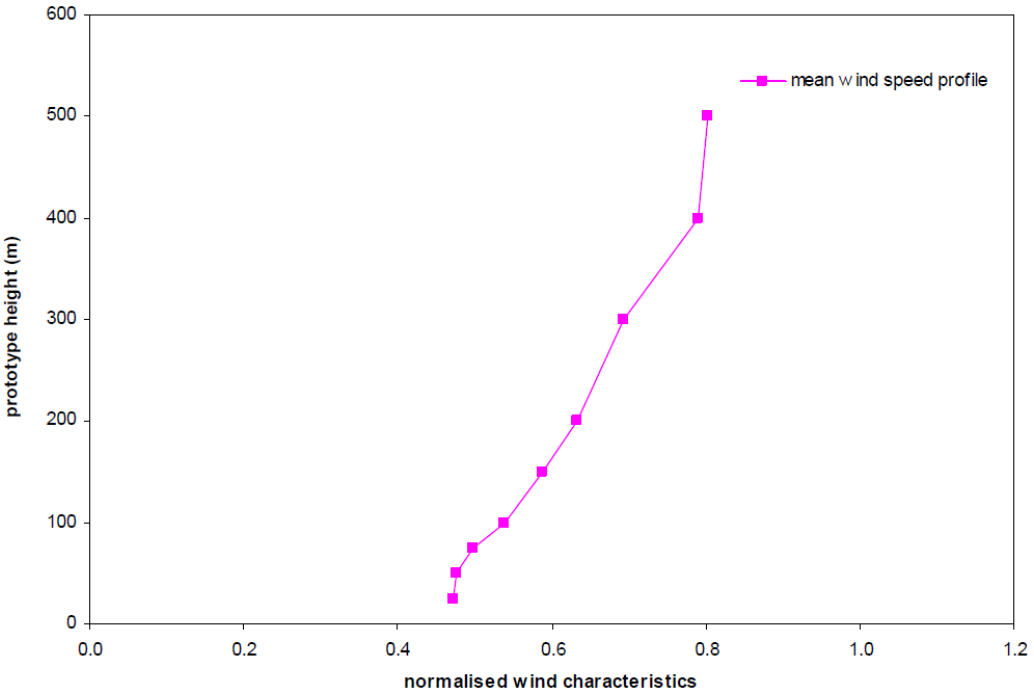


Figure A10 Mean wind speed profile at 0º

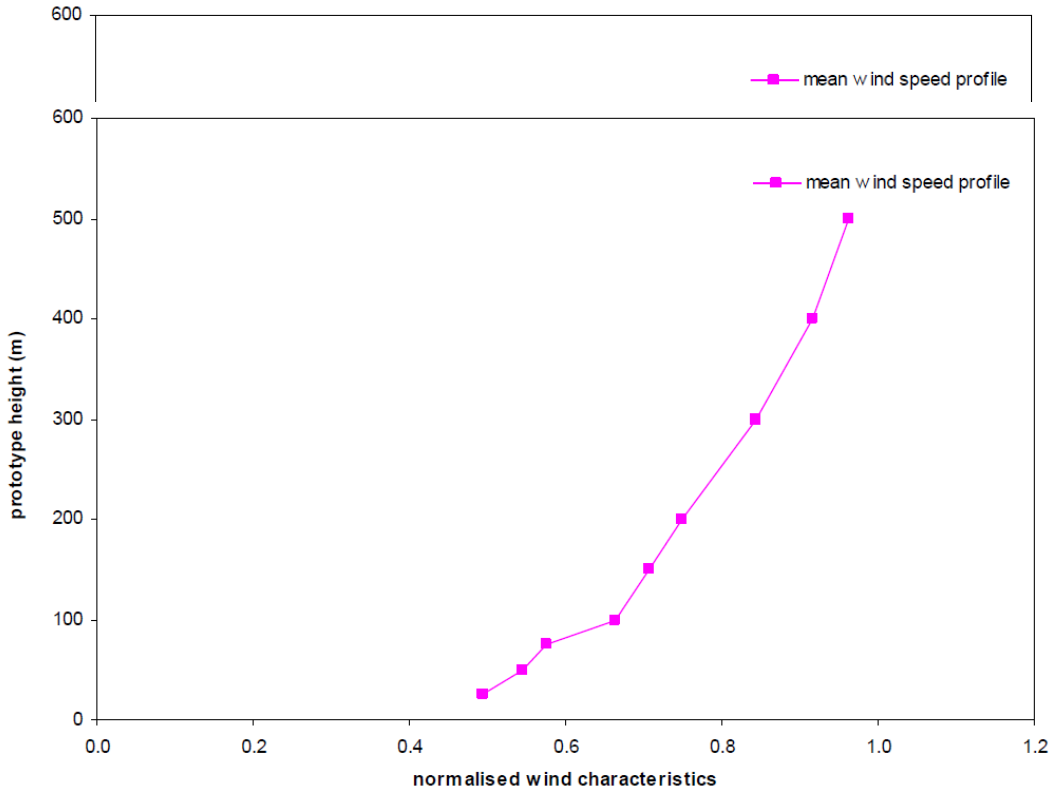


Figure A12 Mean wind speed profile at 45º

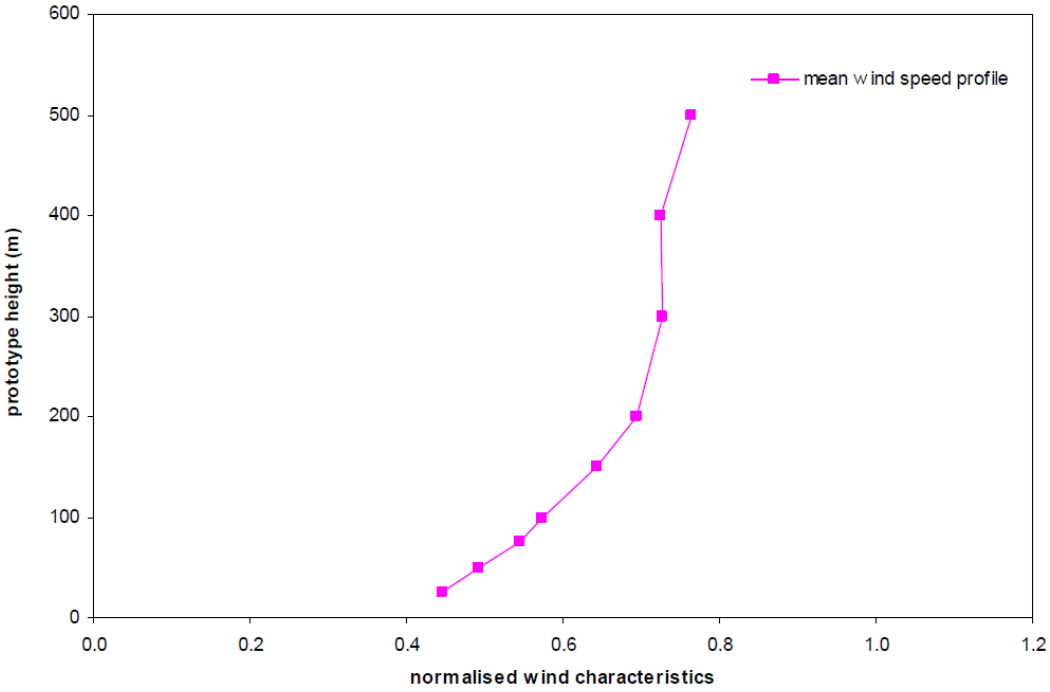


Figure A13 Mean wind speed profile at 67.5º

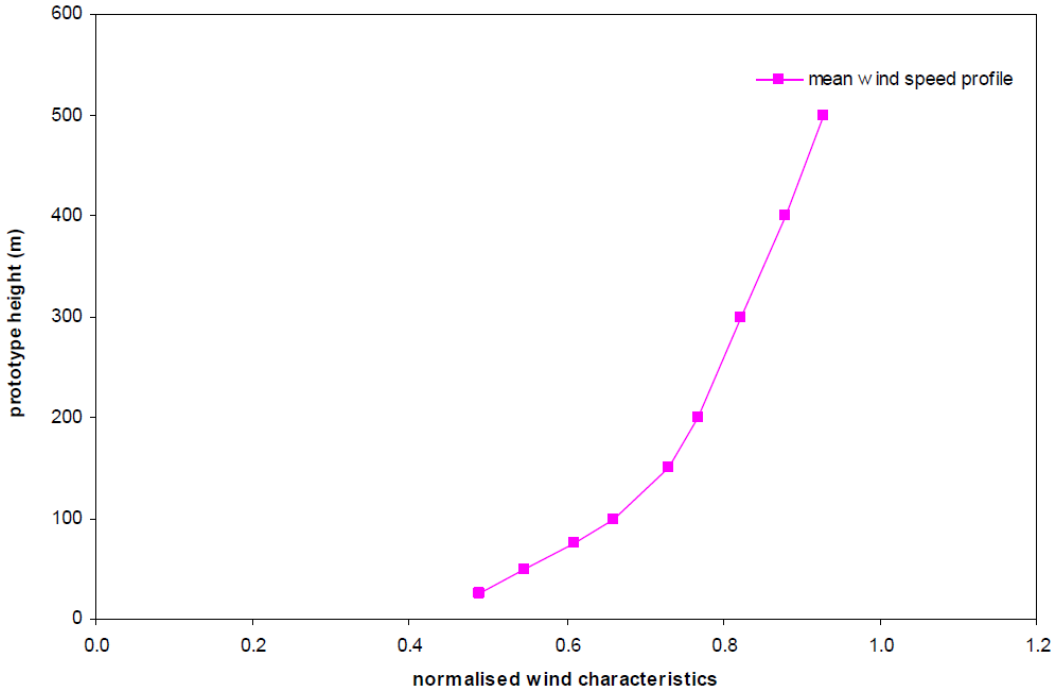


Figure A14 Mean wind speed profile at 90º

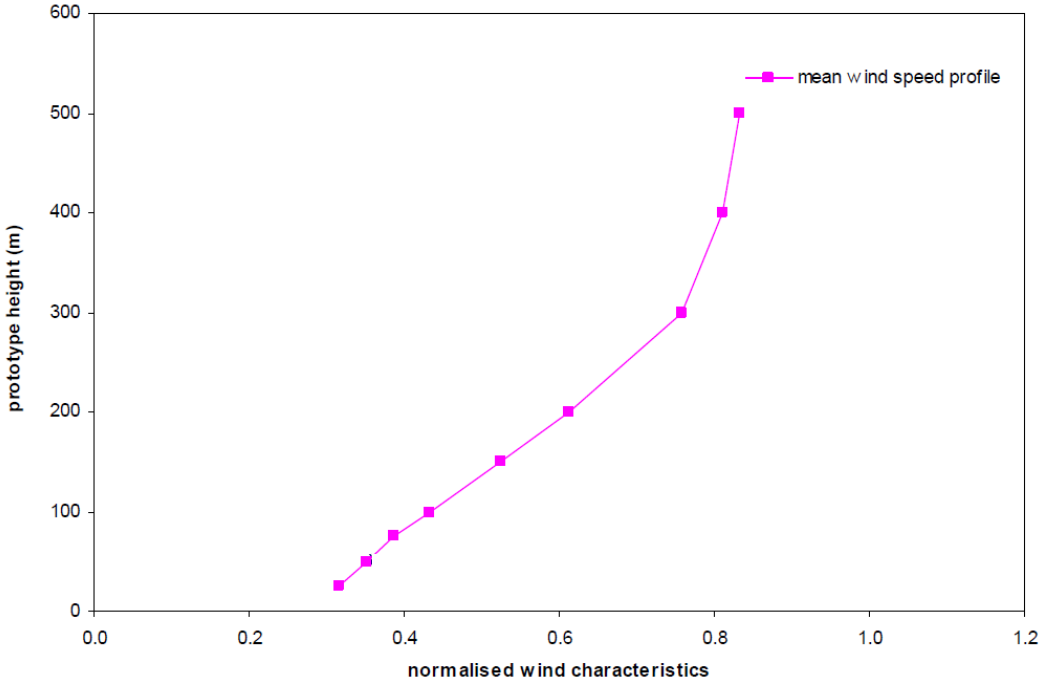


Figure A15 Mean wind speed profile at 112.5º

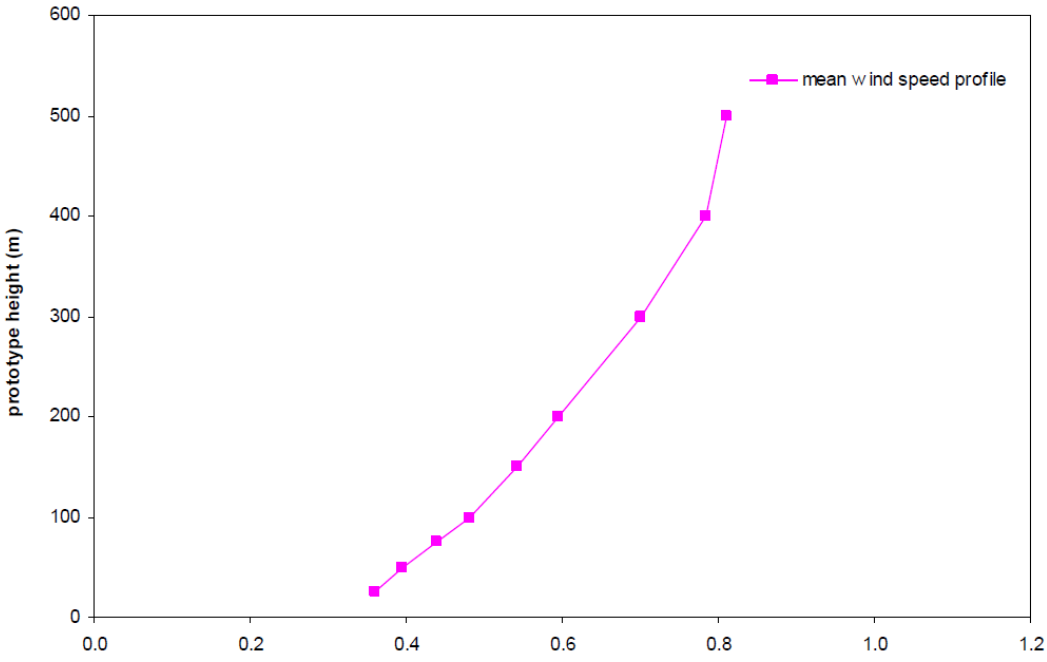


Figure A16 Mean wind speed profile at 135º

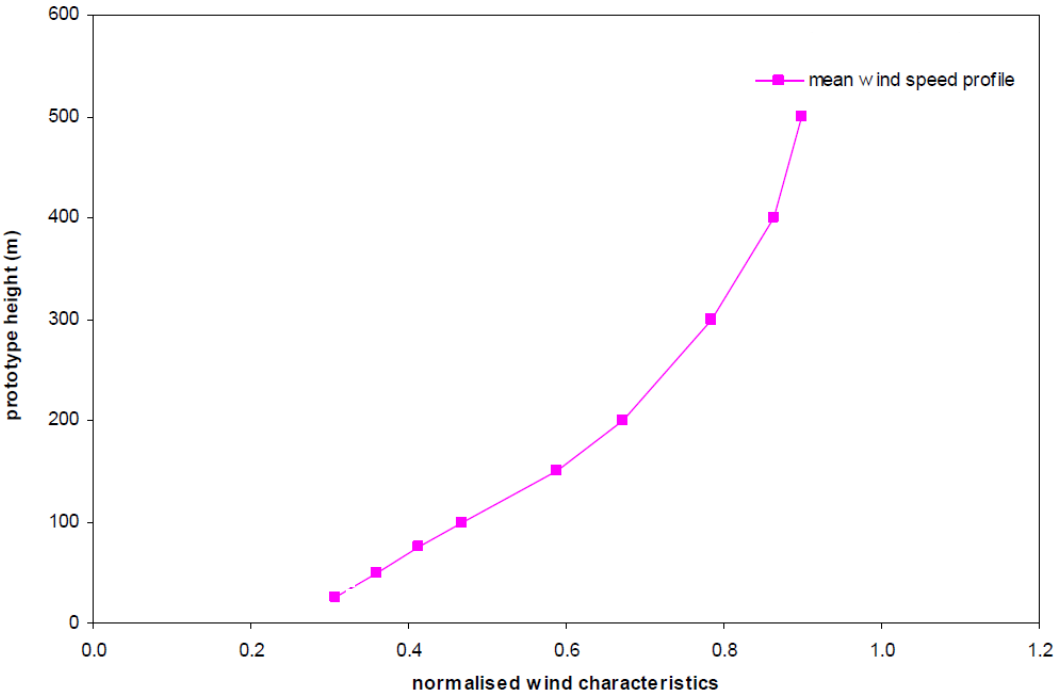


Figure A17 Mean wind speed profile at 157.5º

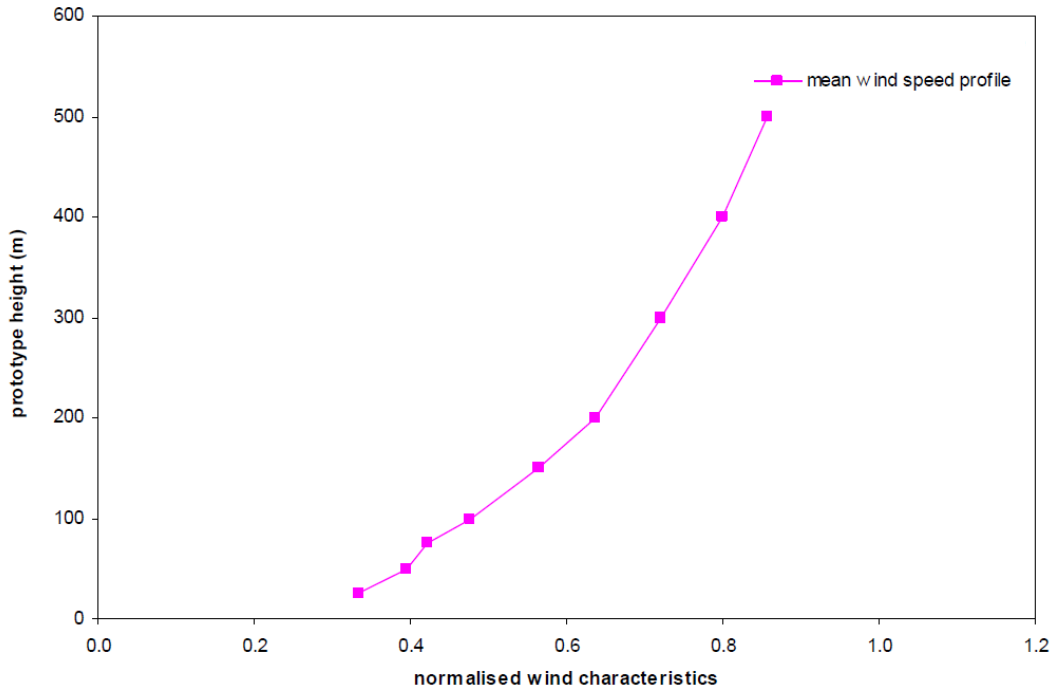


Figure A18 Mean wind speed profile at 180º

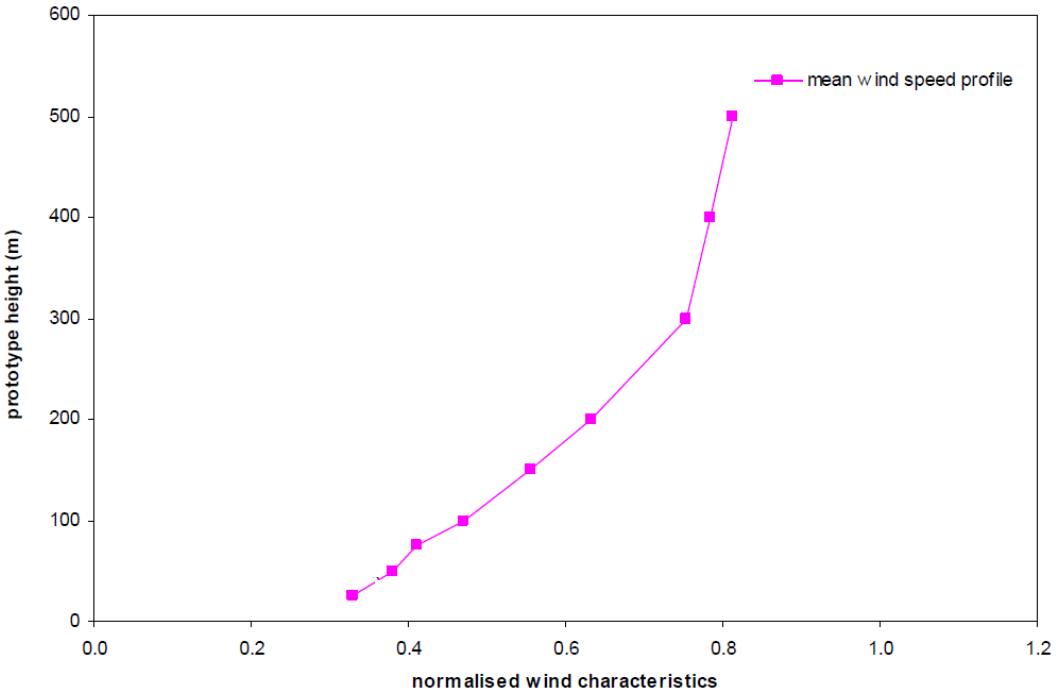


Figure A19 Mean wind speed profile at 202.5º

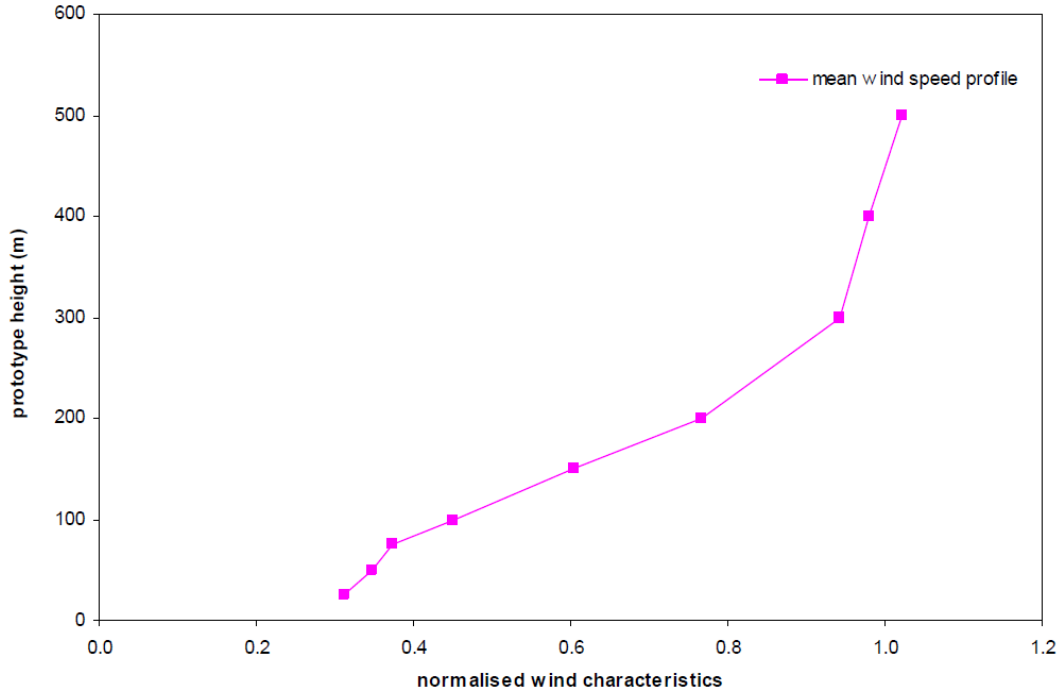


Figure A20 Mean wind speed profile at 225º

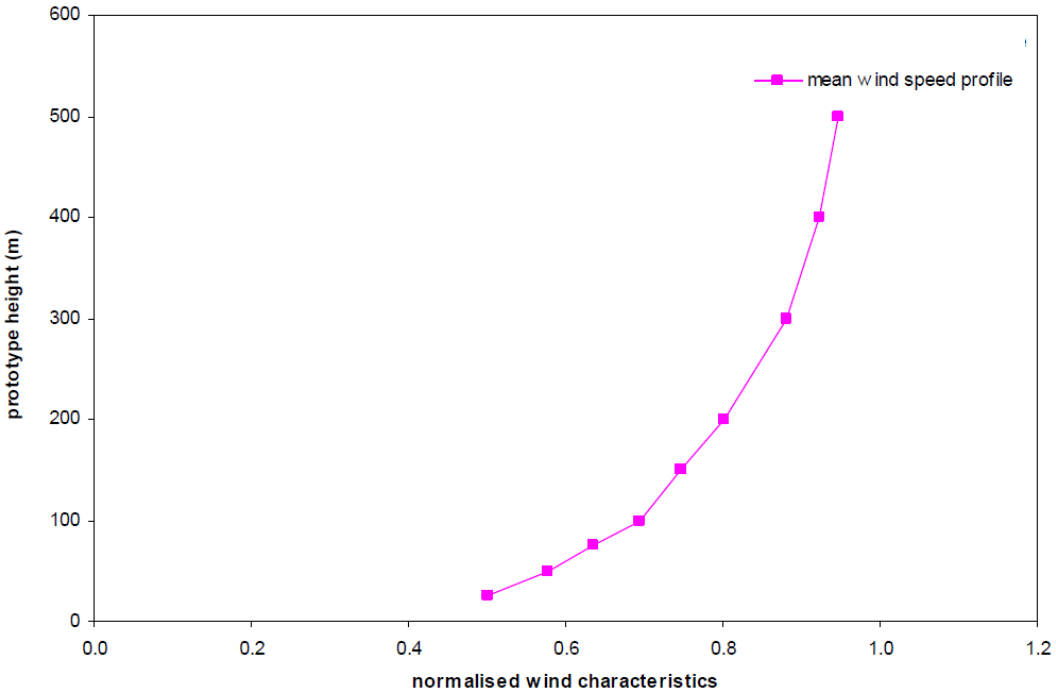


Figure A21 Mean wind speed profile at 247.5º

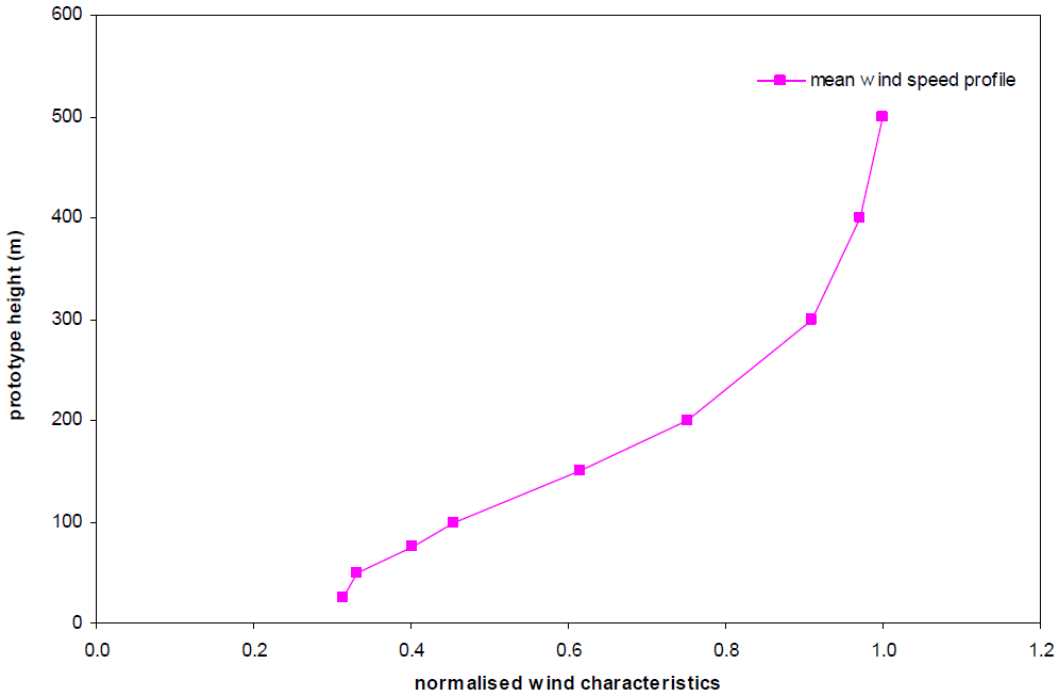


Figure A22 Mean wind speed profile at 270º

Appendix B

Planned/ Committed/ Proposed Development within Surrounding Area

B1 Proposed/ Planned/ Committed Developments

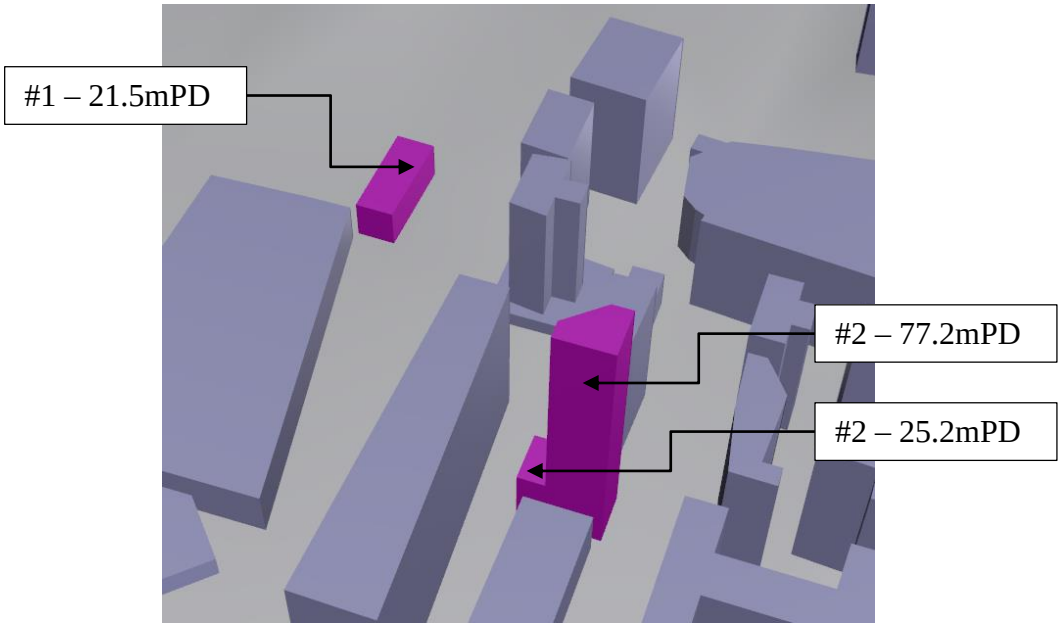


Figure B1 Development #1 - 121 Boundary Street; Development #2 - 9 Belfran Road

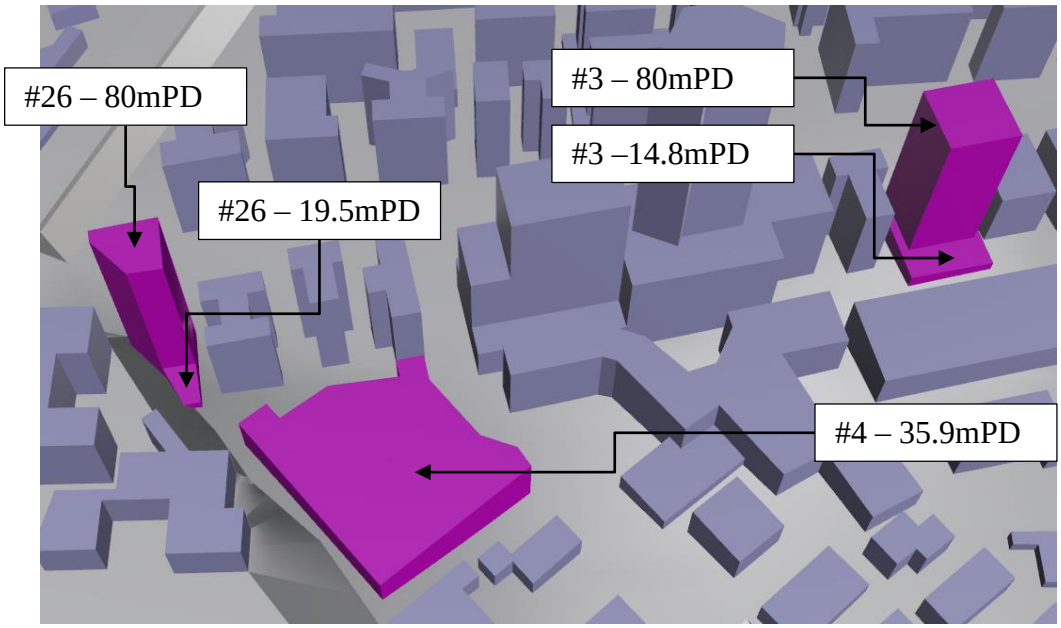


Figure B2 Development #3 - Proposed residential development at 233-235 Prince Edward Road West; Development #4 - Grand Court; Development #26 - Proposed residential development at 195 Prince Edward Road West

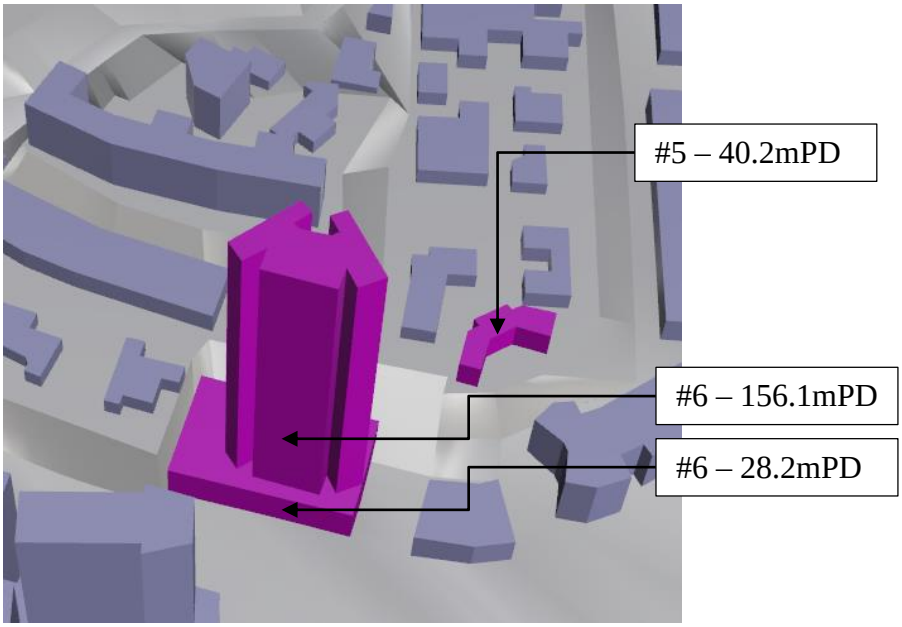


Figure B3 Development #5 - Proposed residential development at 33 Kadoorie Avenue; Development #6 - Preserved heritage (office & storage) of Ex-CLP Hong Kong Office at 139-147 Argyle Street

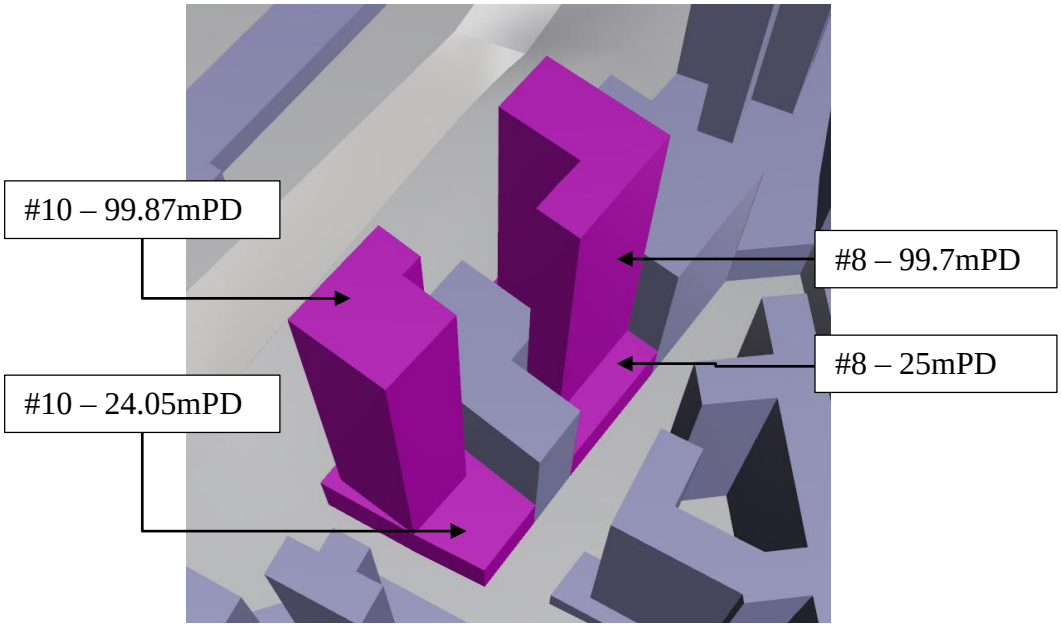


Figure B4 Development #8 - 3 Julia Avenue; Development #10 - Kadoorie Lookout

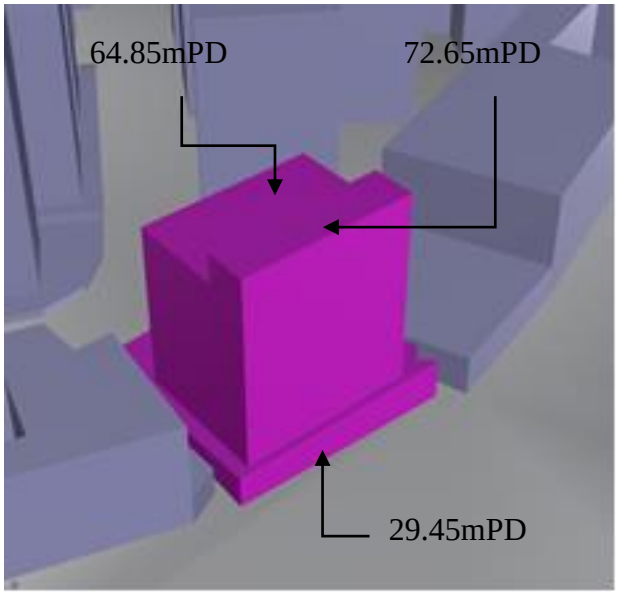


Figure B5 Development #9 - Proposed Sports Training Center and Residential Development

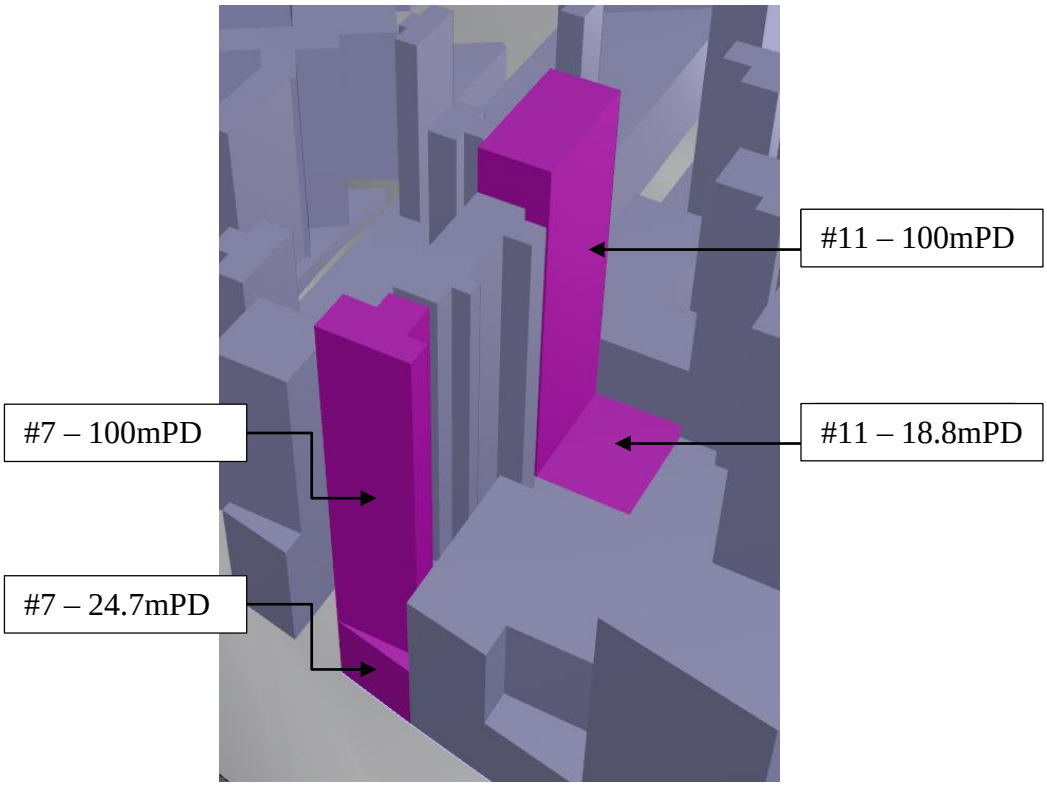


Figure B6 Development #7 - residential development at 102 Argyle Street; Development #11 - Proposed Composite Building at 7-7G Victory Avenue

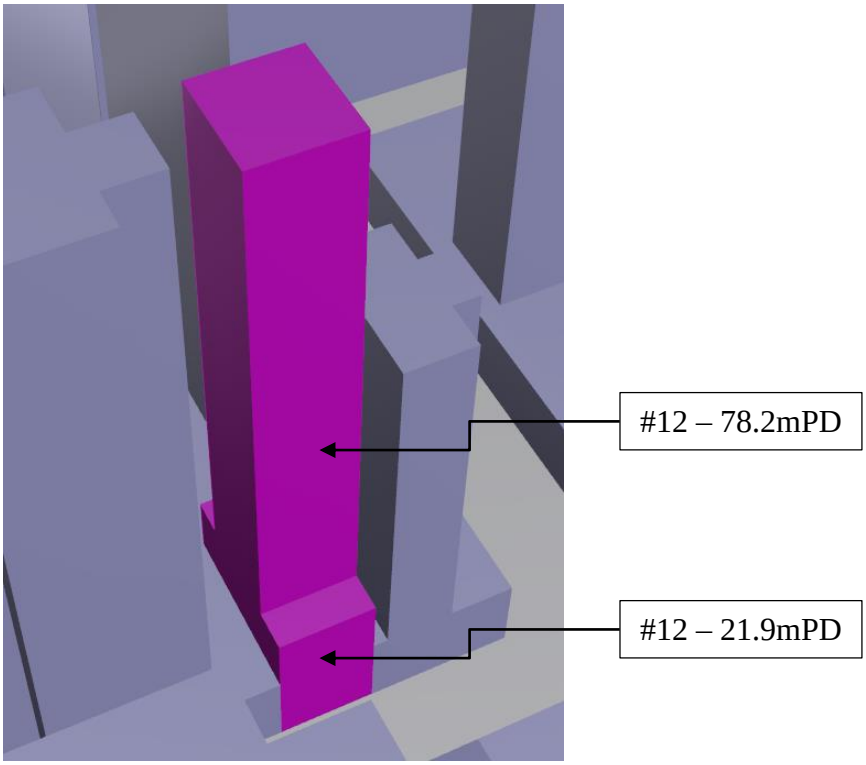


Figure B7 Development #12 - 22 Yin Chong Street

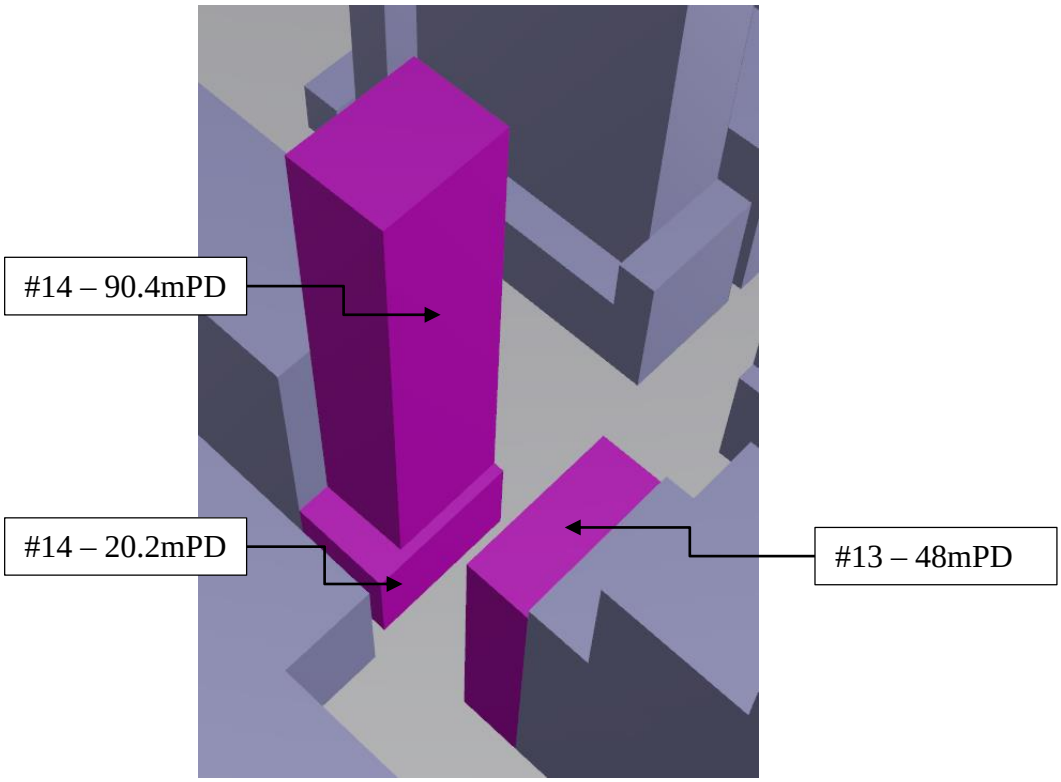


Figure B8 Development #13 - 562 Nathan Road; Development #14 - 558-560 Nathan Road

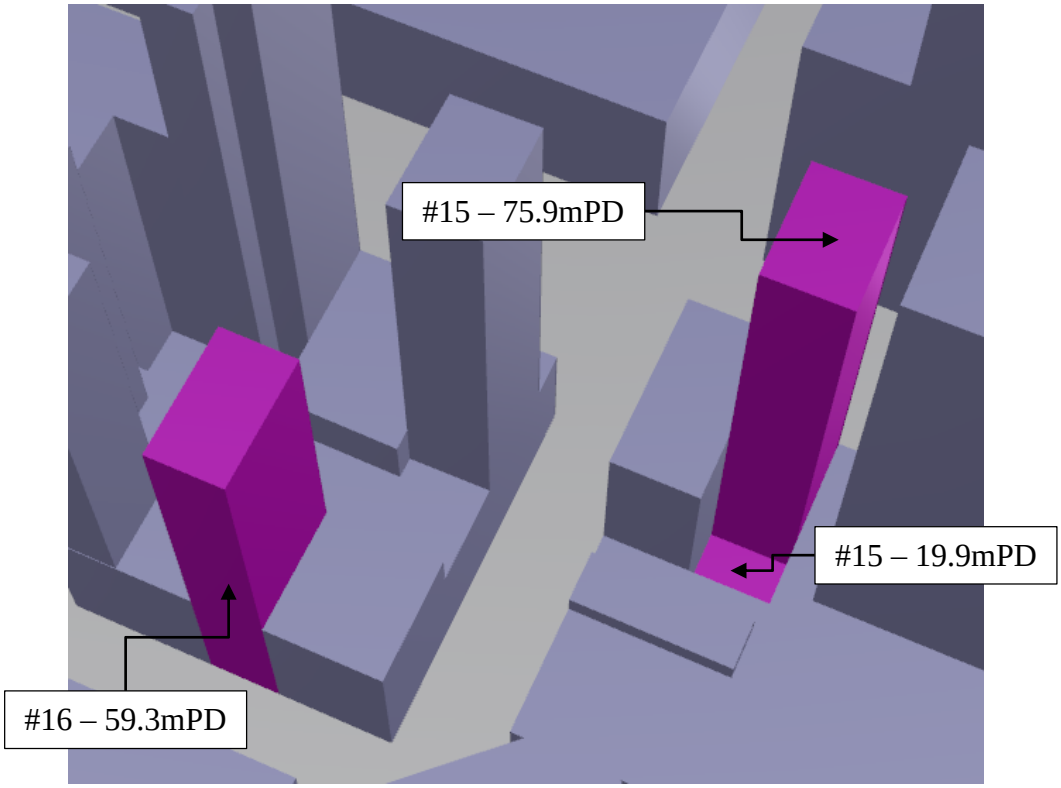


Figure B9 Development #15 - 575 Nathan Road; Development #16 - 130-132 Portland Street

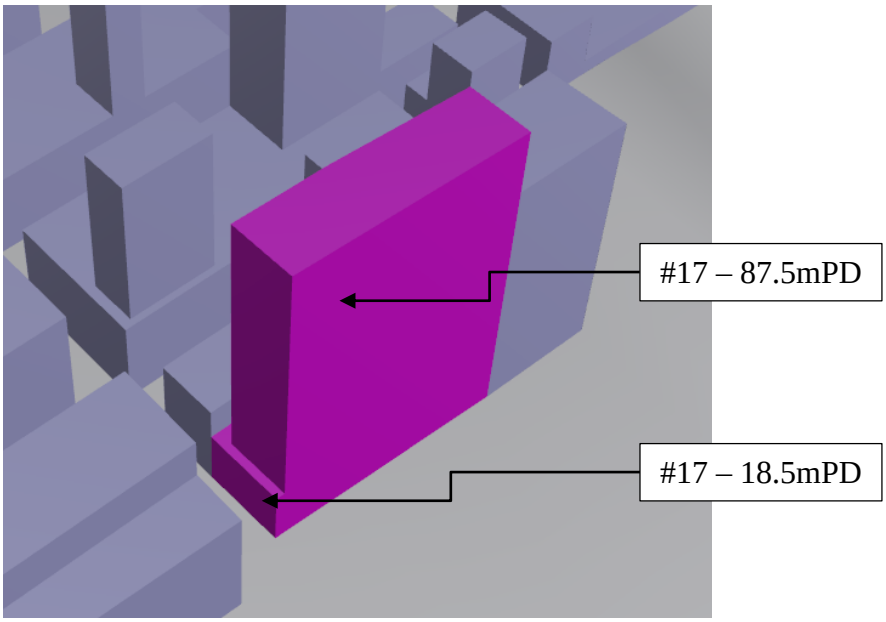


Figure B10 Development #17 - Tak Cheong Street

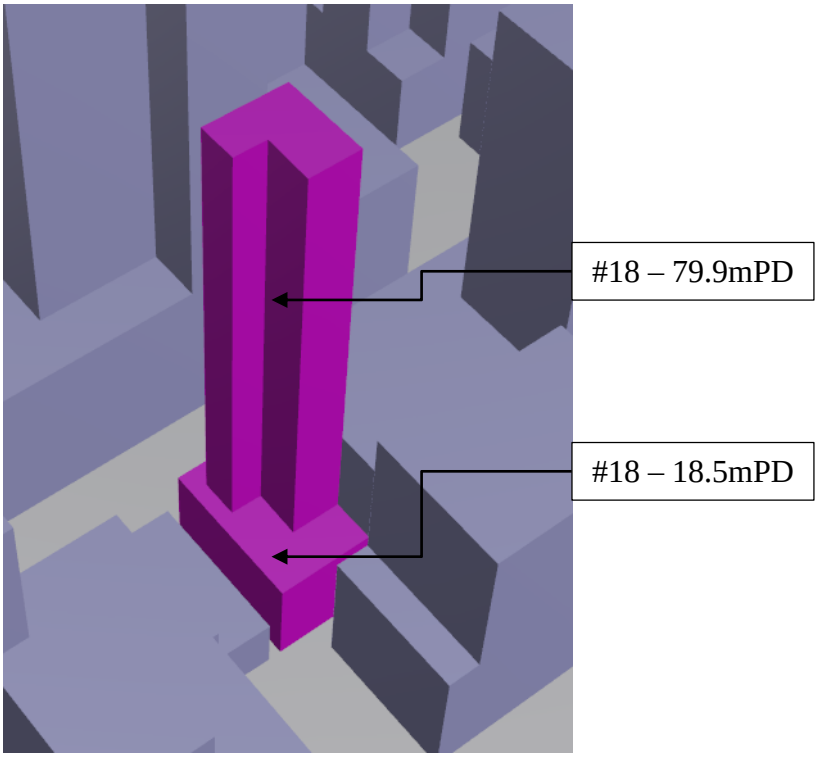


Figure B11 Development #18 - Proposed residential development at 187-191 Portland Street

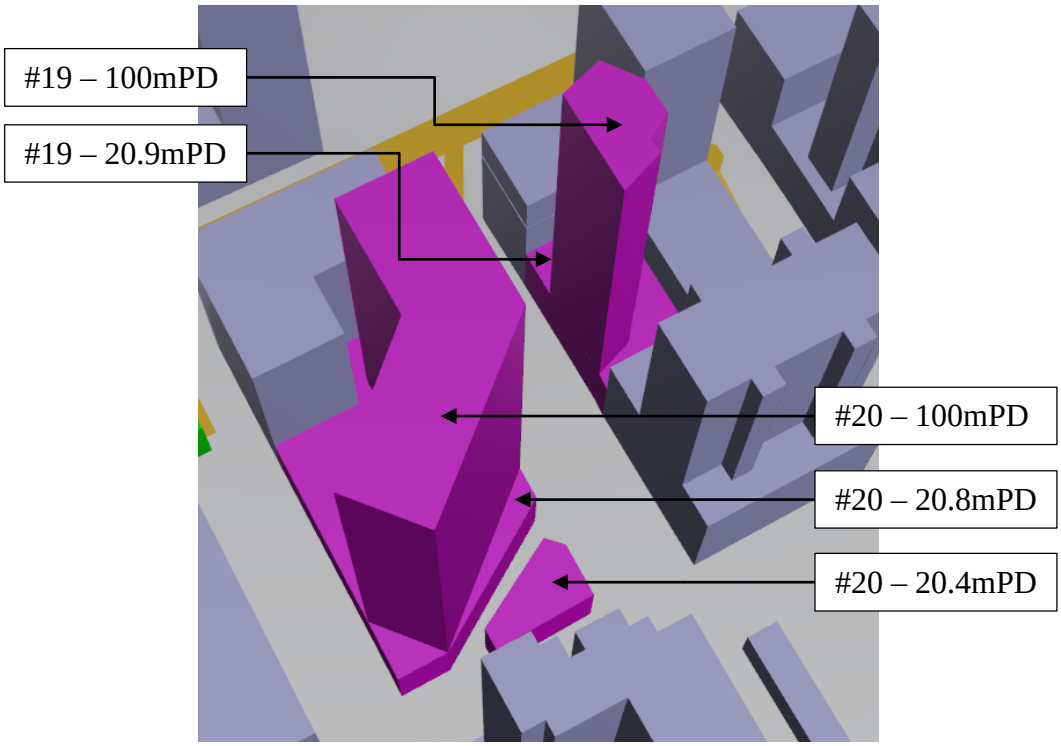


Figure B12 **Development #19** - Redevelopment of composite building at No.78-88 Sai Yee Street; **Development #20** - Proposed composite development at 61-87 Sai Yee Street & 78-98 Fa Yuen Street

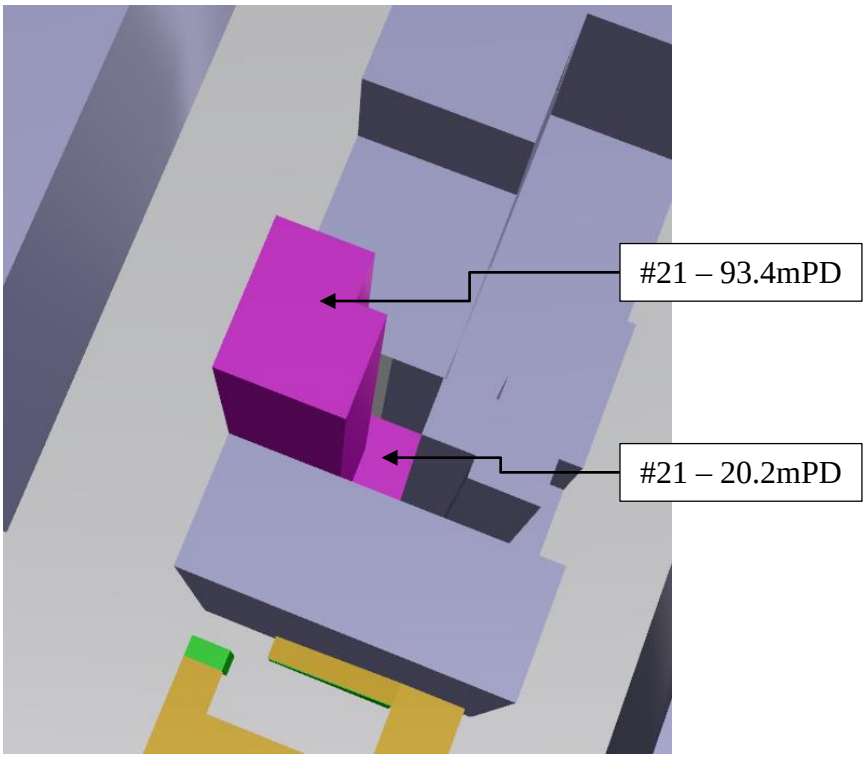


Figure B13 Development #21 - Commercial development at 724-726 Nathan Road

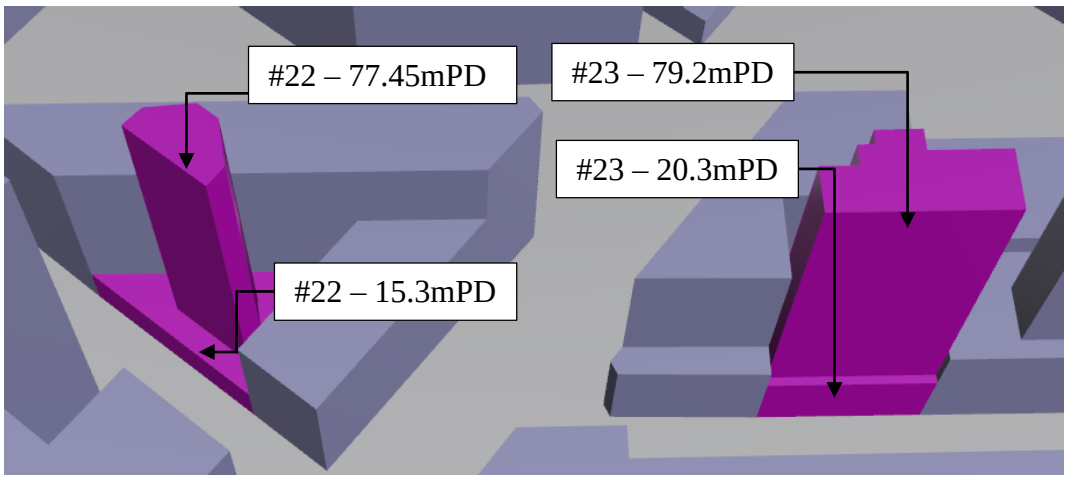


Figure B14 Development #22 - CTS Court; Development #23 - Proposed hotel development at 11-21 Tai Nan Street

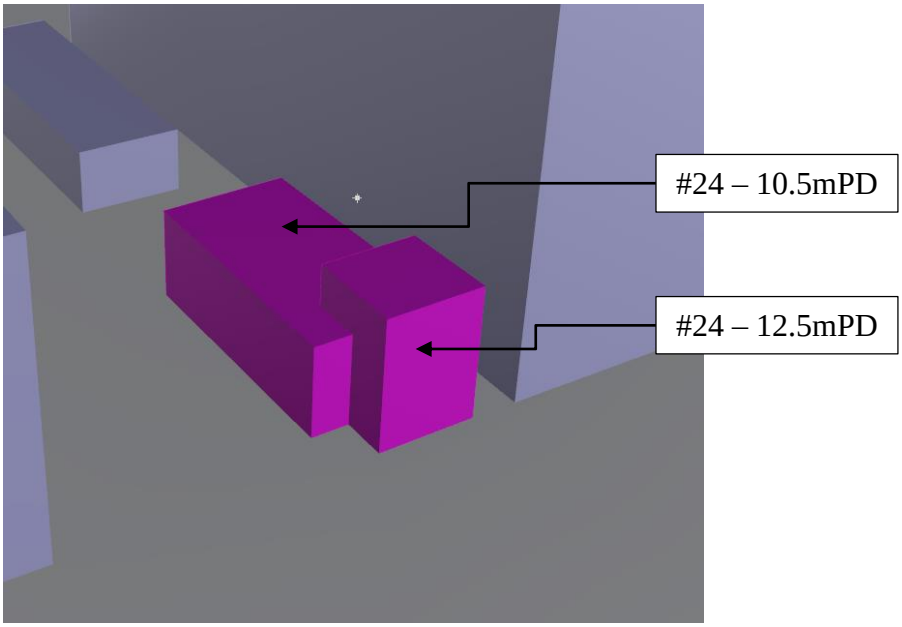


Figure B15 Development #24 – Additional MTR Exit Structure

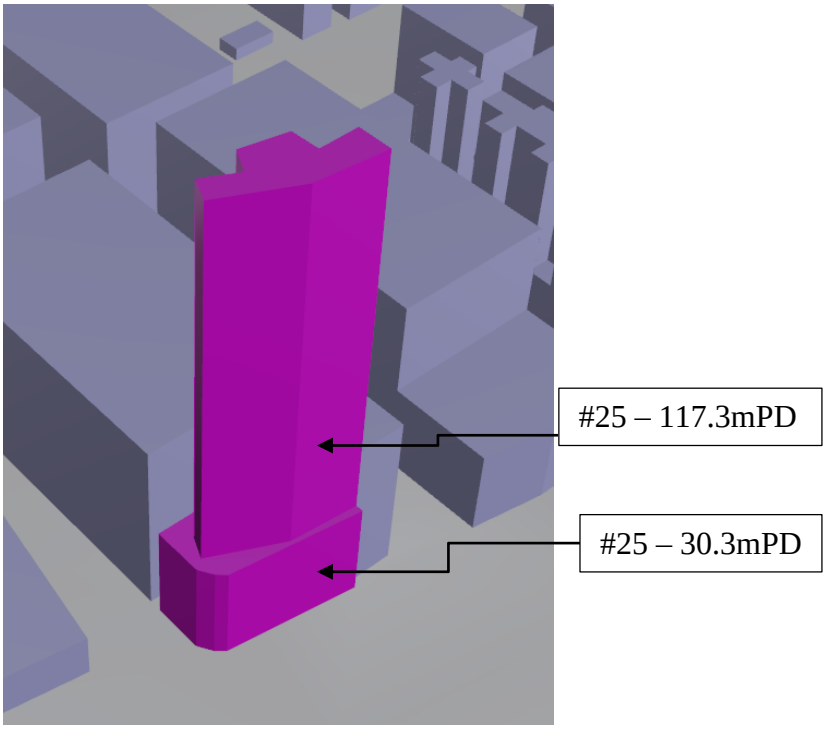


Figure B16 Development #25 - High Park Grand

Figure B17 Development #27 - Proposed footbridge along Argyle Street (walkway level | roof level)

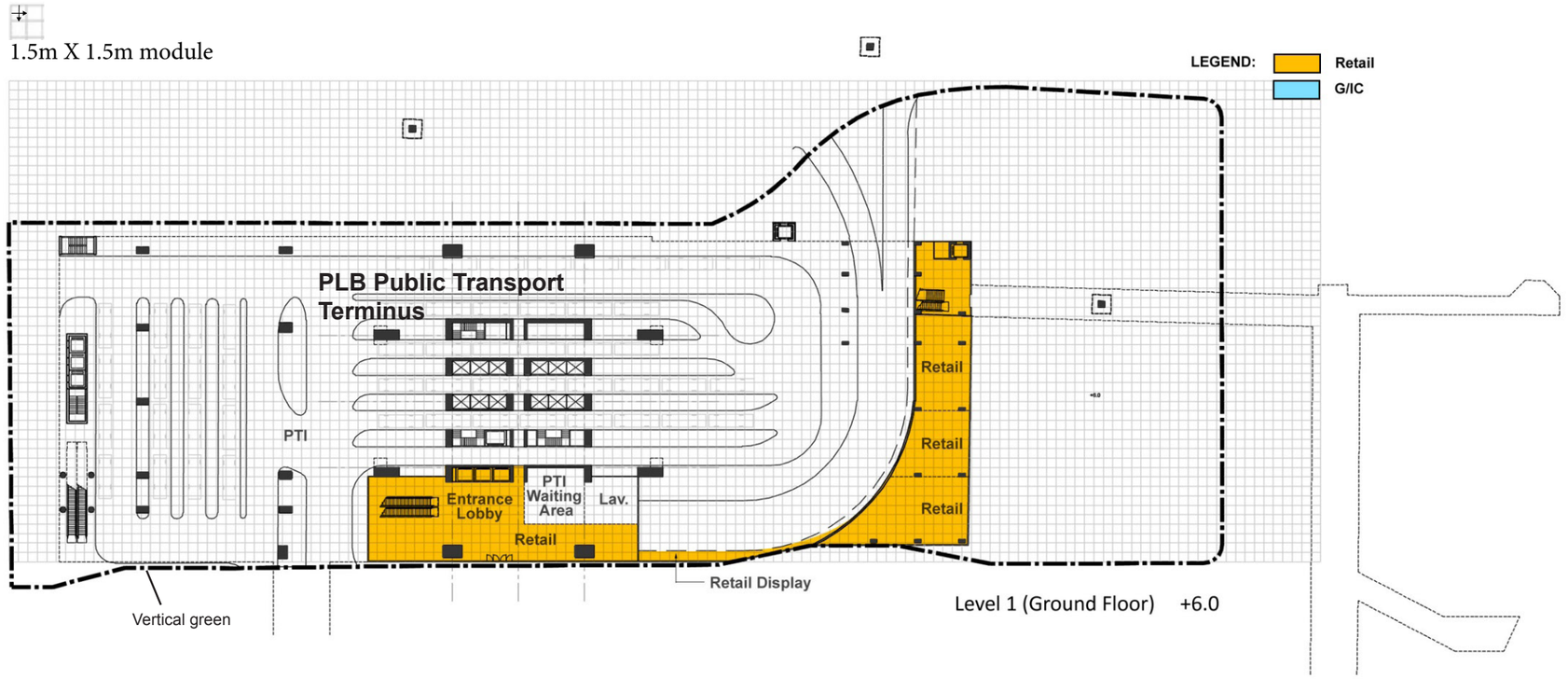
Appendix C

Architectural Drawing of Recommended Development Scheme

RETAIL = 522 s.m.

PTI = 4,000 s.m.

NET AREA = 3,960 s.m.
Efficiency = 87.6% (approx.)



RETAIL HUB = 284 s.m.

RETAIL = 1,166 s.m.

GIC
COMMUNITY HALL = 951 s.m.
INT. COMMUNITY CTR. = 658 s.m.

NET AREA = 2,221 s.m.
Efficiency = 72.6% (approx.)

ARUP

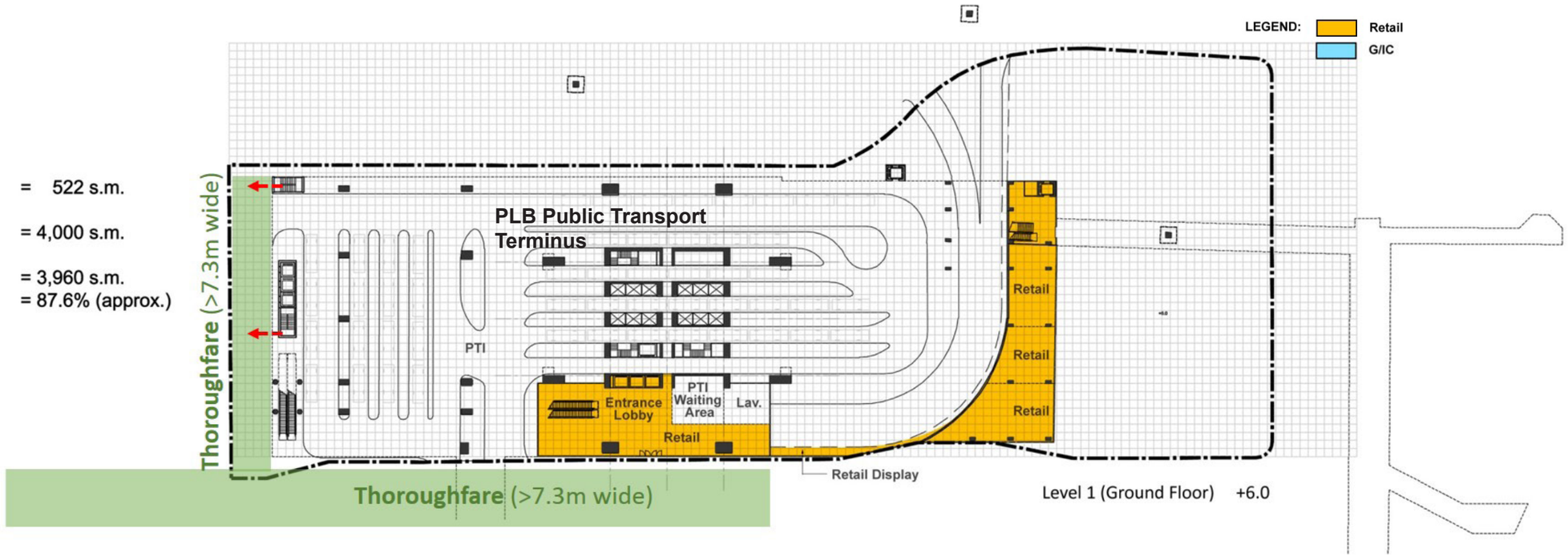
Redevelopment at Sai Yee St & MongKok East Station

Figure Title	Revision / Initials	Scale	Date	Figure No.
Revised RDS – Level 1 and Level 2 Floor Plan	003 / AGC	N/A	20/01/17	3.4.1

RETAIL = 522 s.m.

PTI = 4,000 s.m.

NET AREA = 3,960 s.m.
Efficiency = 87.6% (approx.)



RETAIL HUB = 284 s.m.

RETAIL = 1,166 s.m.

GIC
COMMUNITY HALL = 951 s.m.
INT. COMMUNITY CTR. = 658 s.m.

NET AREA = 2,221 s.m.
Efficiency = 72.6% (approx.)

ARUP

Redevelopment at Sai Yee St & MongKok East Station

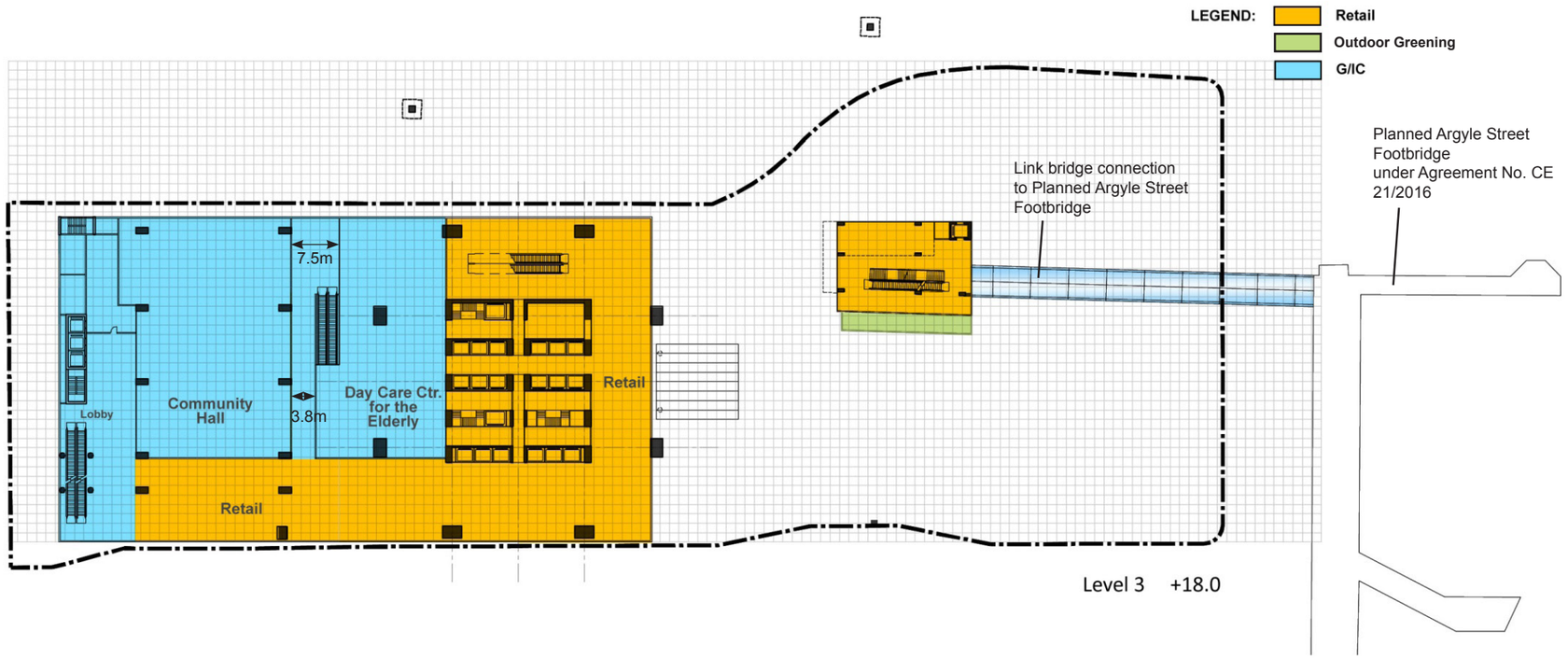
Figure Title	Revision / Initials	Scale	Date	Figure No.
Revised RDS – Level 1 and Level 2 Floor Plan (Thoroughfare)			19/01/17	3.4.1a

RETAIL HUB = 223 s.m.

RETAIL = 1,852 s.m.

GIC
COMMUNITY HALL = 982 s.m.
DAY CARE CTR. = 709 s.m.

NET AREA = 2,654 s.m.
Efficiency = 70.5% (approx.)

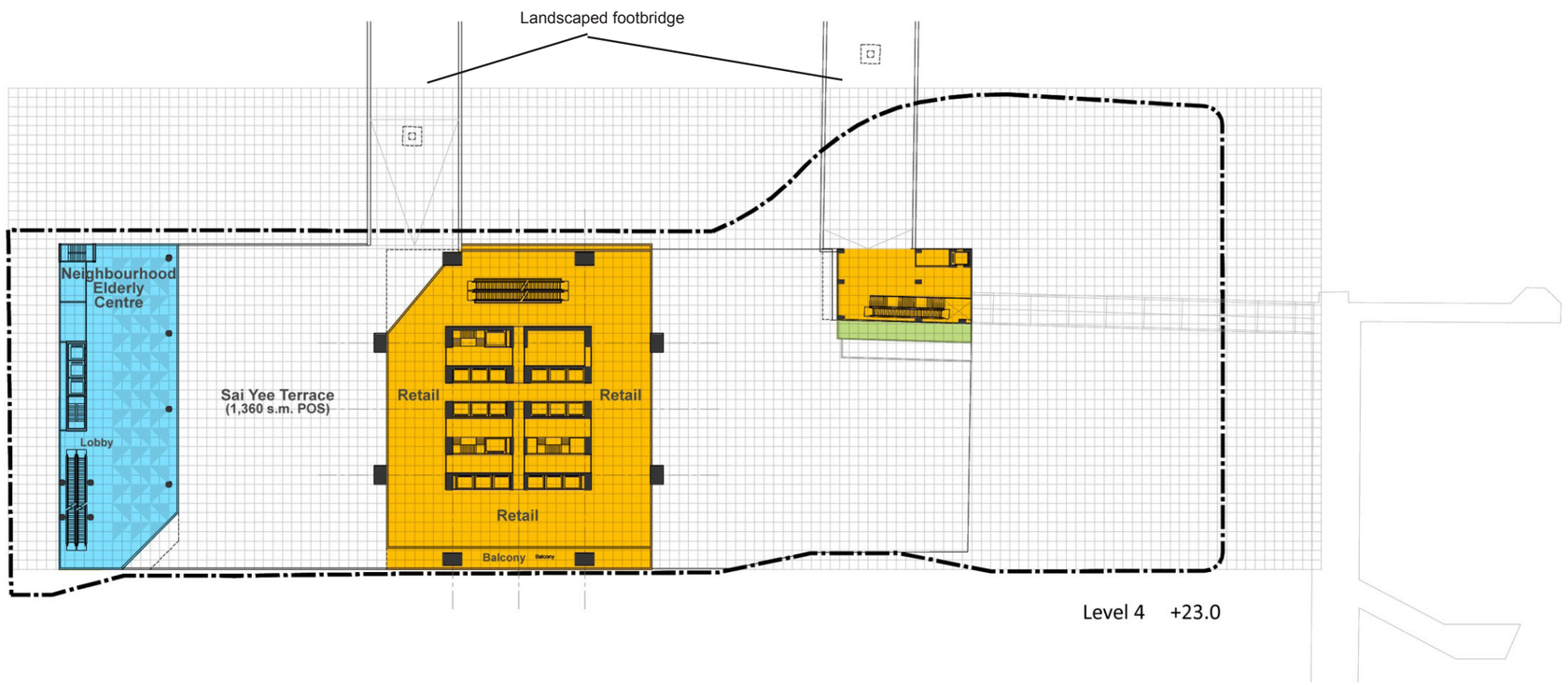


RETAIL HUB = 159 s.m.

RETAIL = 1,394 s.m.

GIC = 520 s.m.

NET AREA = 1,352 s.m.
Efficiency = 65.2% (approx.)

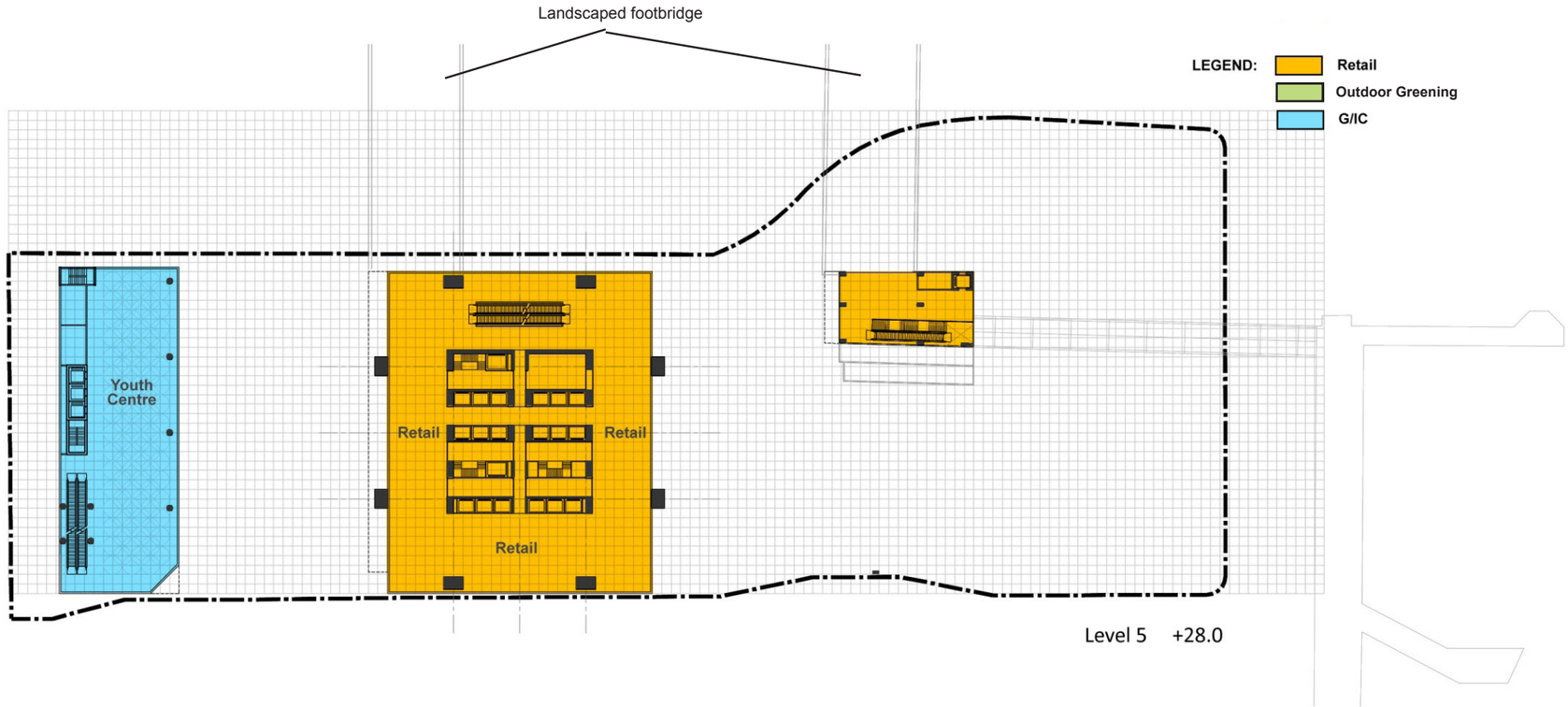


RETAIL HUB = 159 s.m.

RETAIL = 1,514 s.m.

GIC = 479 s.m.

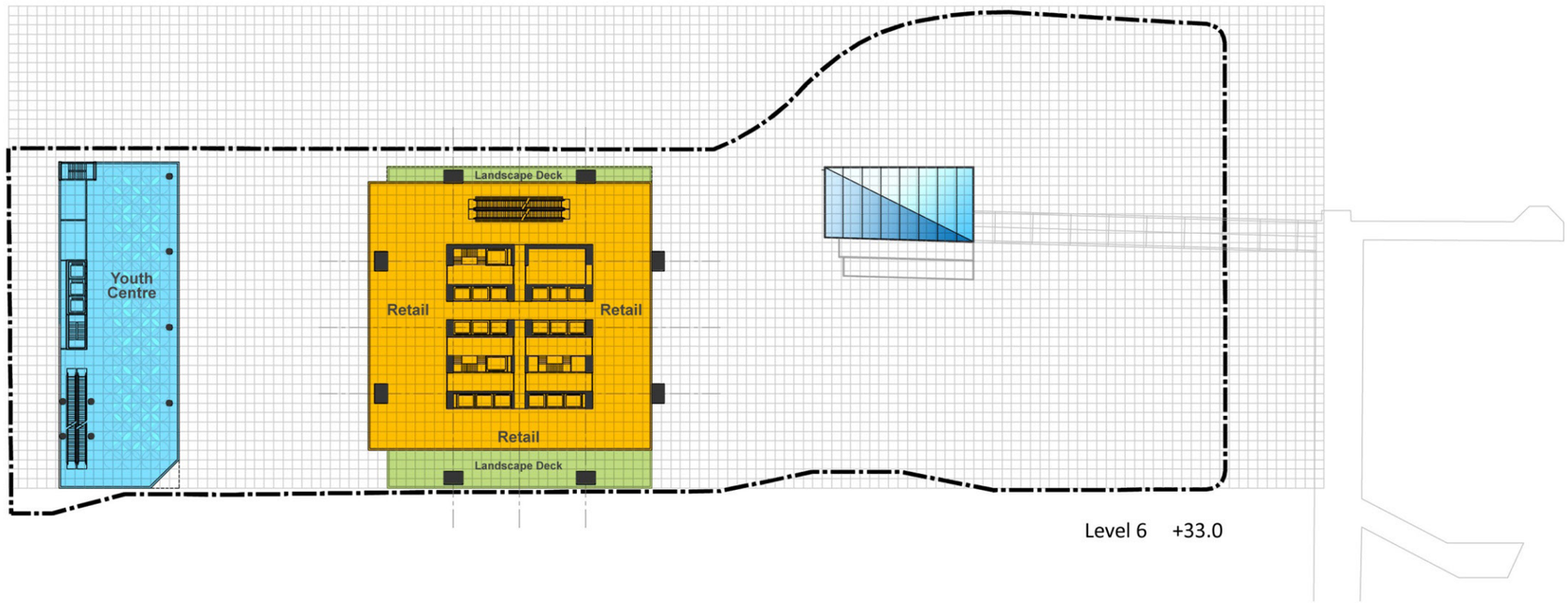
NET AREA = 1,431.5 s.m.
Efficiency = 66.5% (approx.)



RETAIL = 1,325 s.m.

GIC = 479 s.m.

NET AREA = 1,280.5 s.m.
Efficiency = 64.1% (approx.)



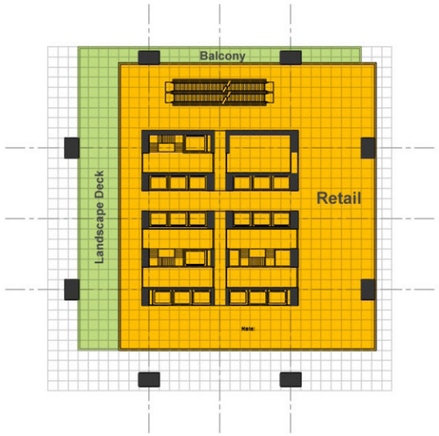
ARUP

Redevelopment at Sai Yee St & MongKok East Station

Figure Title	Revision / Initials	Scale	Date	Figure No.
Revised RDS – Level 5 and Level 6 Floor Plan	003 / AGC	N/A	20/01/17	3.4.3

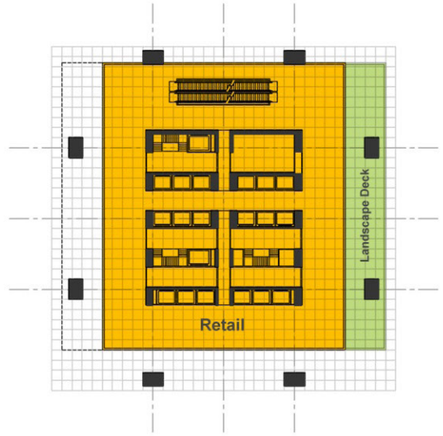
LEGEND: Retail
Outdoor Greening

RETAIL = 1,157 s.m.
NET AREA = 642 s.m.
Efficiency = 55.5% (approx.)



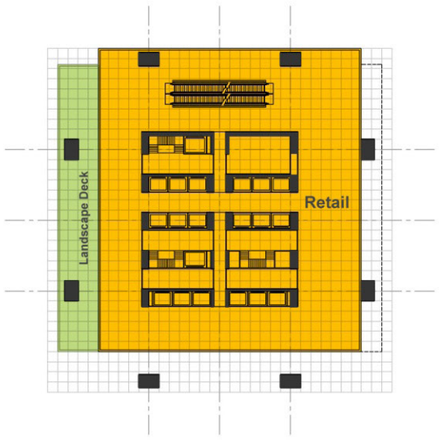
Level 8

RETAIL = 1,107 s.m.
NET AREA = 592 s.m.
Efficiency = 53.5% (approx.)



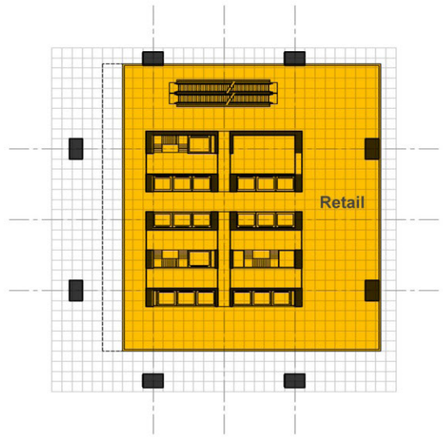
Level 10

RETAIL = 1,254 s.m.
NET AREA = 739 s.m.
Efficiency = 58.9% (approx.)



Level 7

RETAIL = 1,157 s.m.
NET AREA = 642 s.m.
Efficiency = 55.5% (approx.)



Level 9

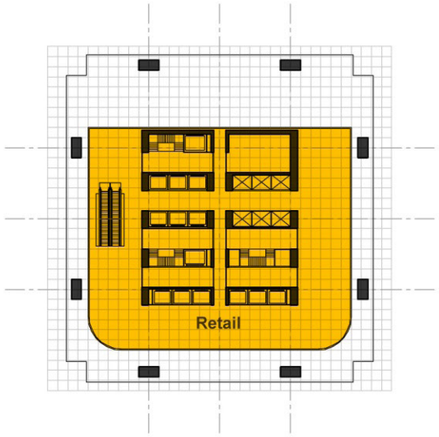
ARUP

Redevelopment at Sai Yee St & MongKok East Station

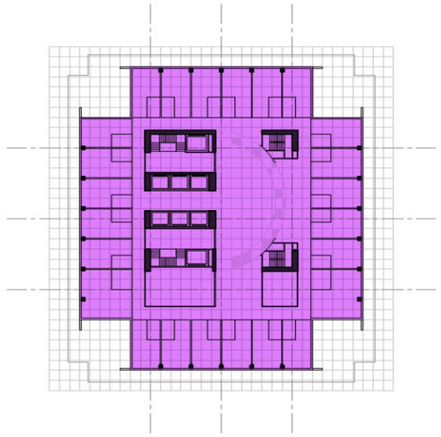
Figure Title	Revision / Initials	Scale	Date	Figure No.
Revised RDS – Level 7 to Level 10 Floor Plan			19/01/17	3.4.4

LEGEND:
- Hotel
- Retail
- Office
- Outdoor Greening

RETAIL
GFA = 1,184 s.m.
NET AREA = 669 s.m.
Efficiency = 56.5% (approx.)



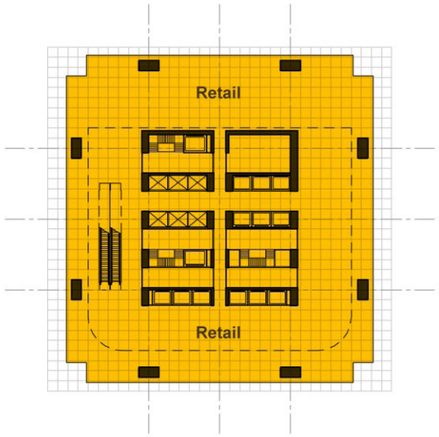
SKY LOBBY - UPPER



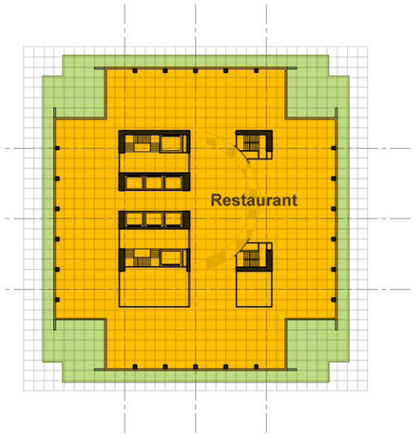
HOTEL

HOTEL = 16,000 s.m.
GFA = 1,600 s.m.
NET AREA = 1,354 s.m.
Efficiency = 85% (approx.)
No. of Storeys = 10
No. of Units = 240

RETAIL
GFA = 2,055 s.m.
NET AREA = 1,540 s.m.
Efficiency = 74.9% (approx.)



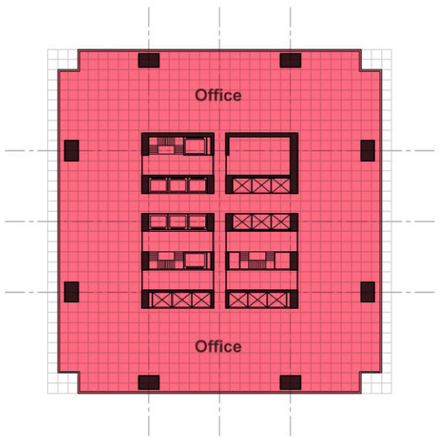
SKY LOBBY - LOWER



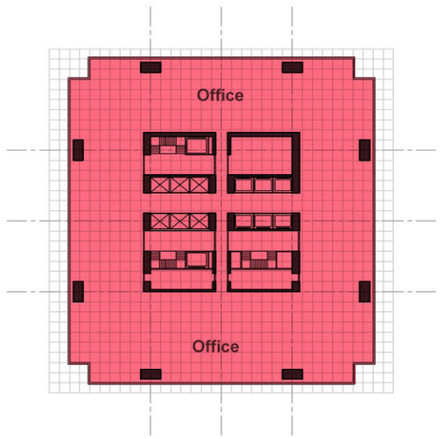
SKY RESTAURANT

RETAIL - SKY RESTAURANT
GFA = 1,600 s.m.
NET AREA = 1,354 s.m.
Efficiency = 85% (approx.)

OFFICE (L.Zone) = 50,160 s.m.
GFA = 2,280 s.m.
NET AREA = 1,754 s.m.
Efficiency = 77% (approx.)
No. of Storeys = 22



Low Zone



High Zone

OFFICE (H.Zone) = 41,100 s.m.
GFA = 2,055 s.m.
NET AREA = 1,600 s.m.
Efficiency = 78% (approx.)
No. of Storeys = 20

ARUP

Redevelopment at Sai Yee St & MongKok East Station

Figure Title	Revision / Initials	Scale	Date	Figure No.
Revised RDS – Office Floor & Hotel Floor Plan			19/01/17	3.4.5

Appendix D

Contour Plots of VR

D1 Existing Scheme

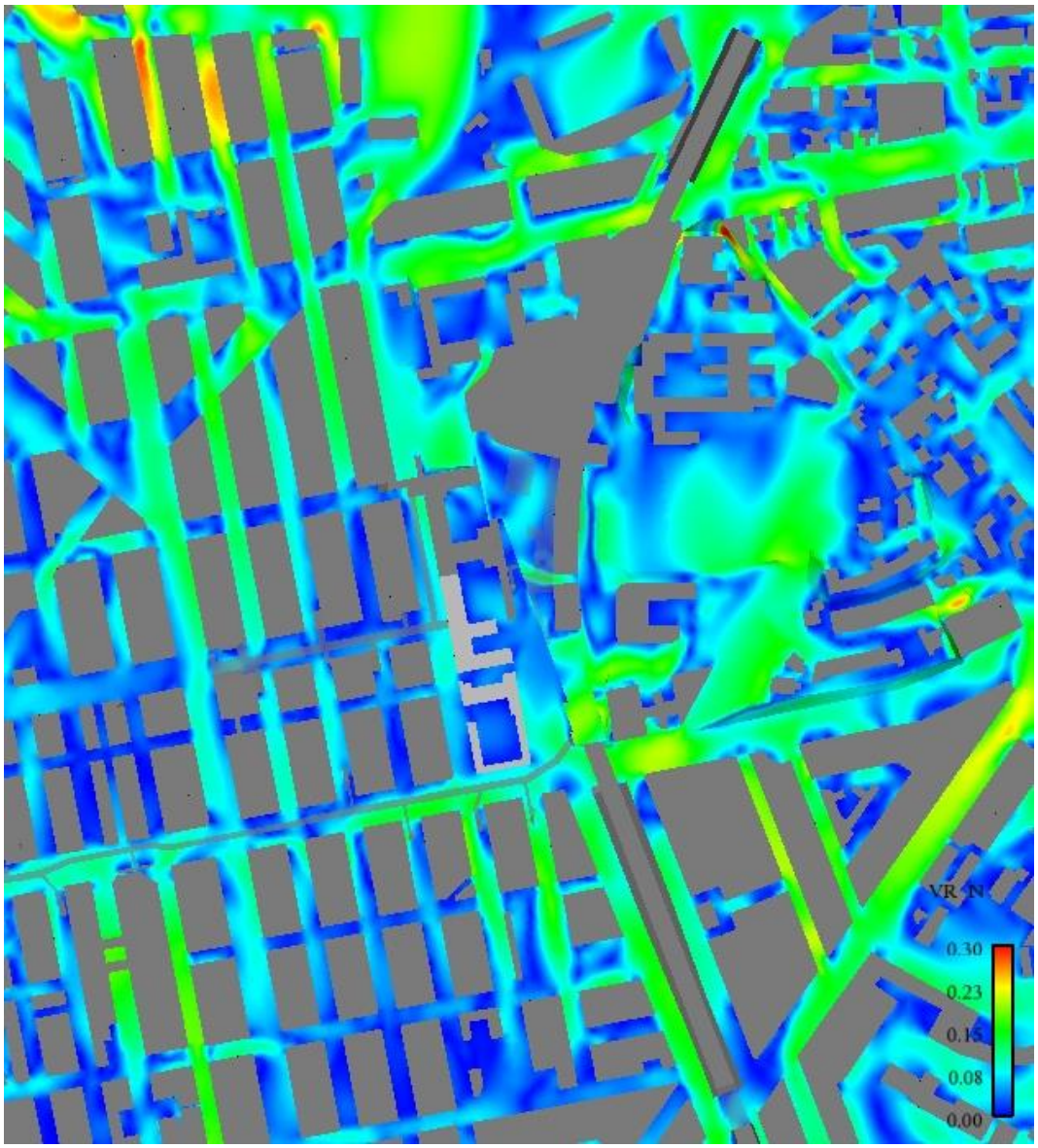


Figure D1 Contour plot of VR of Existing Scheme under N wind

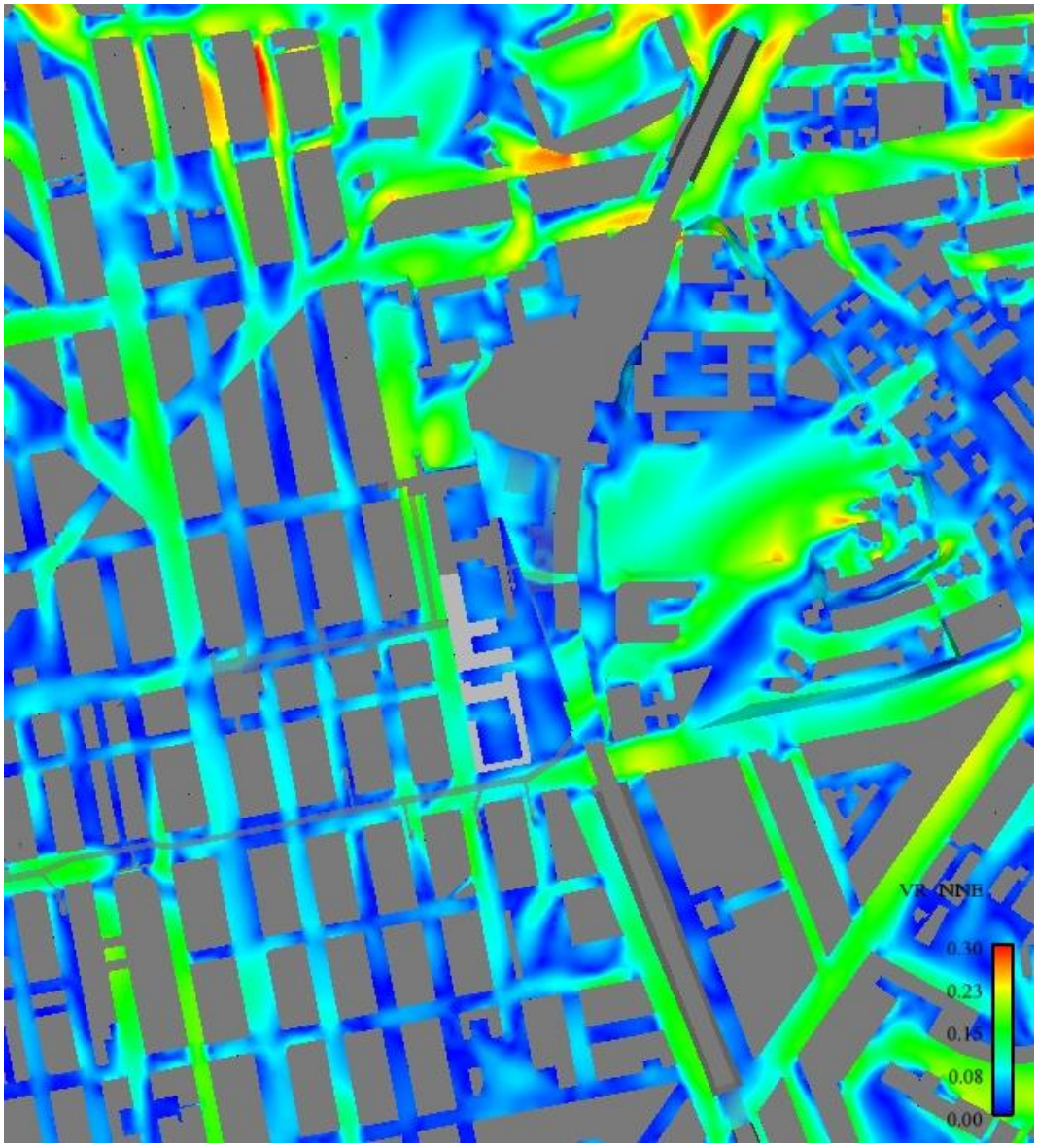


Figure D2 Contour plot of VR of Existing Scheme under NNE wind

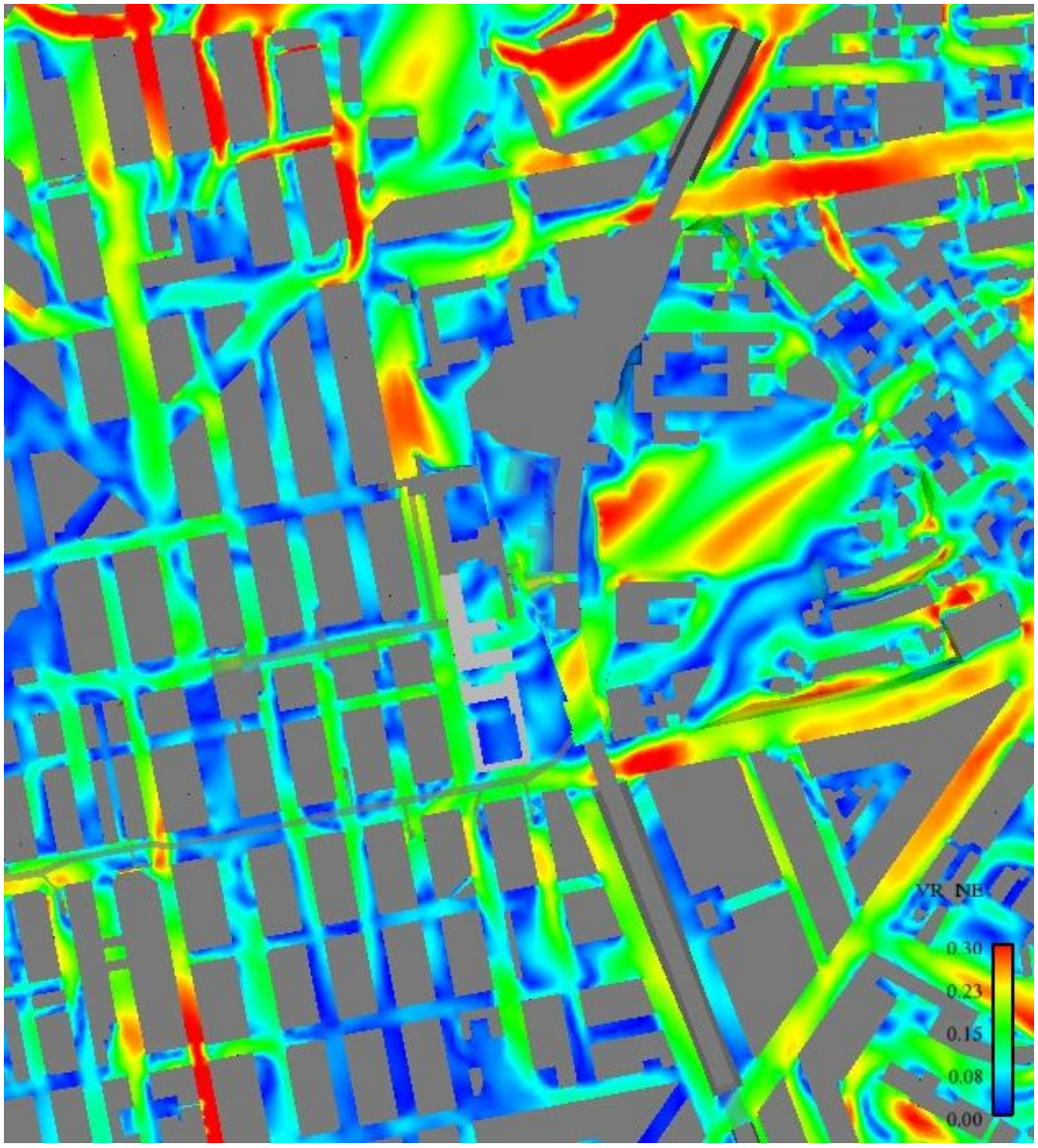


Figure D3 Contour plot of VR of Existing Scheme under NE wind

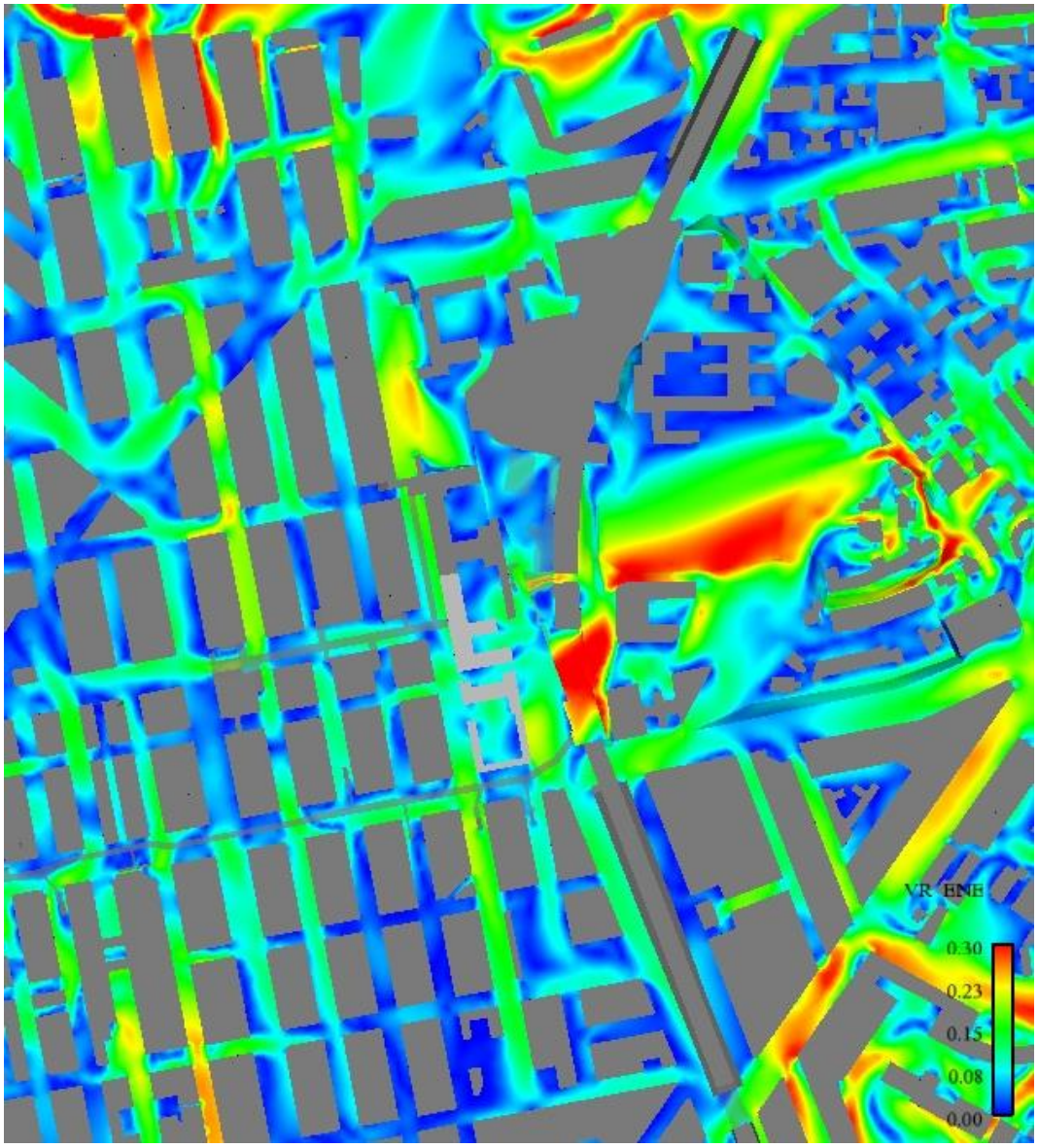


Figure D4 Contour plot of VR of Existing Scheme under ENE wind

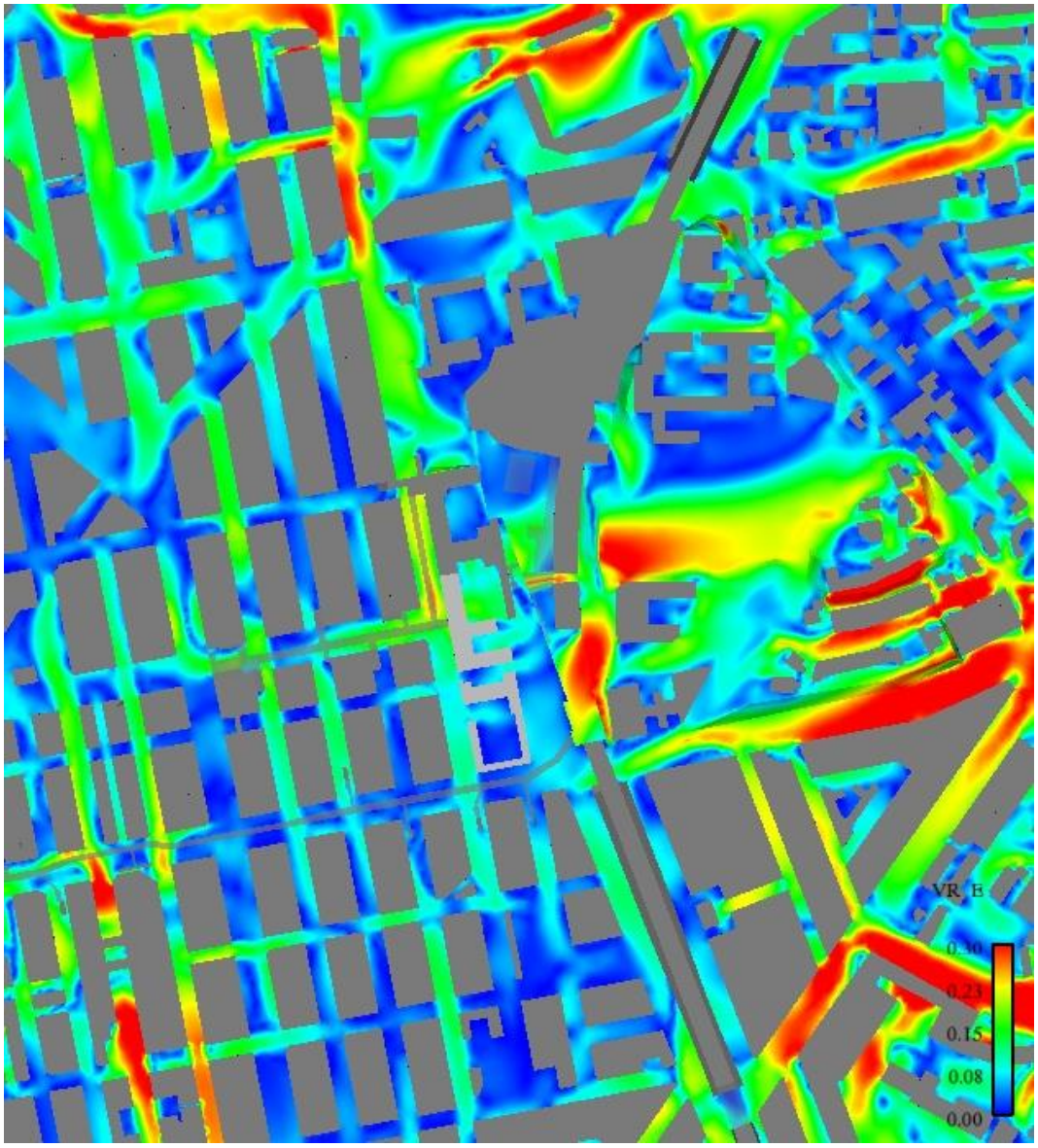


Figure D5 Contour plot of VR of Existing Scheme under E wind

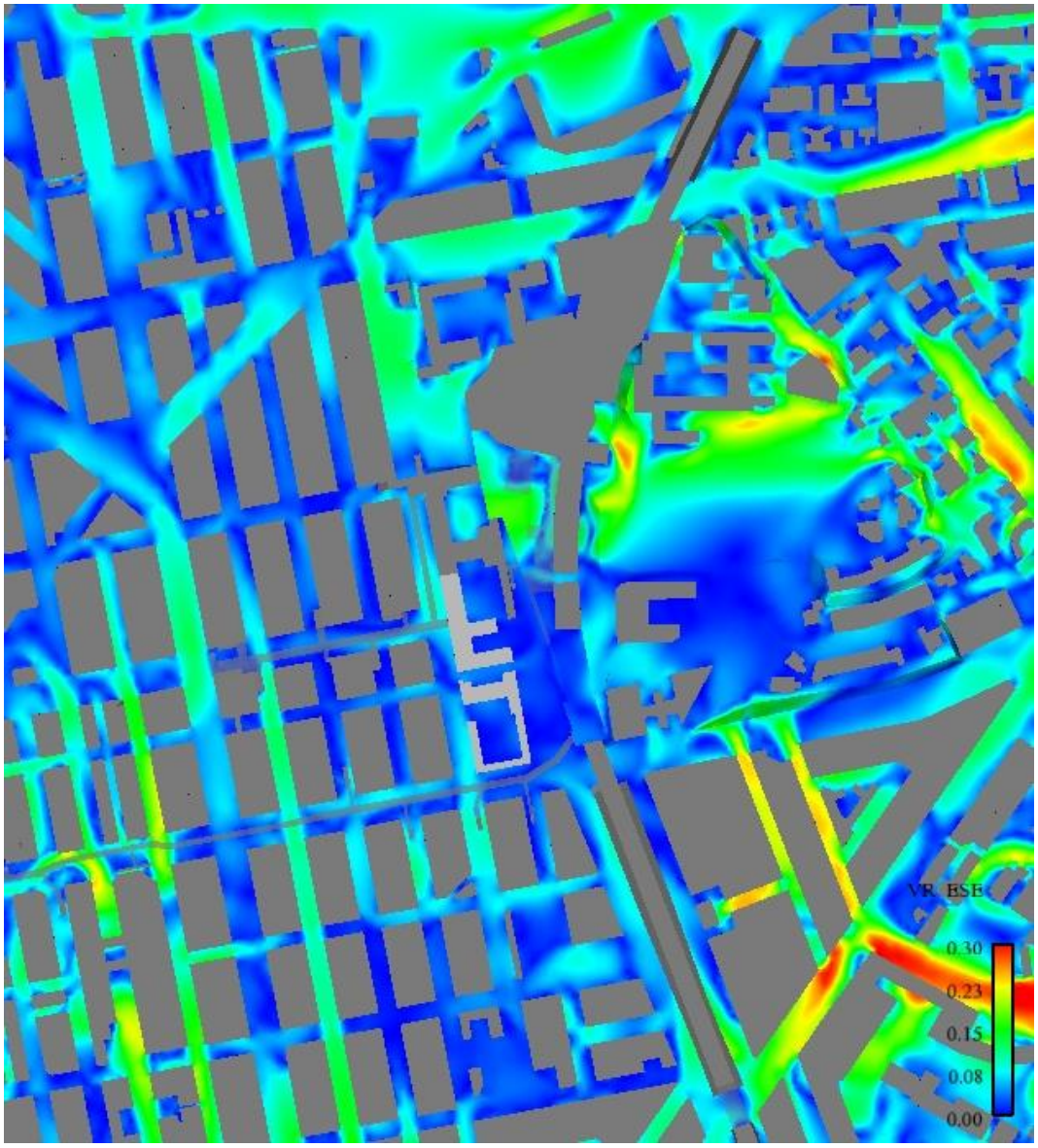


Figure D6 Contour plot of VR of Existing Scheme under ESE wind

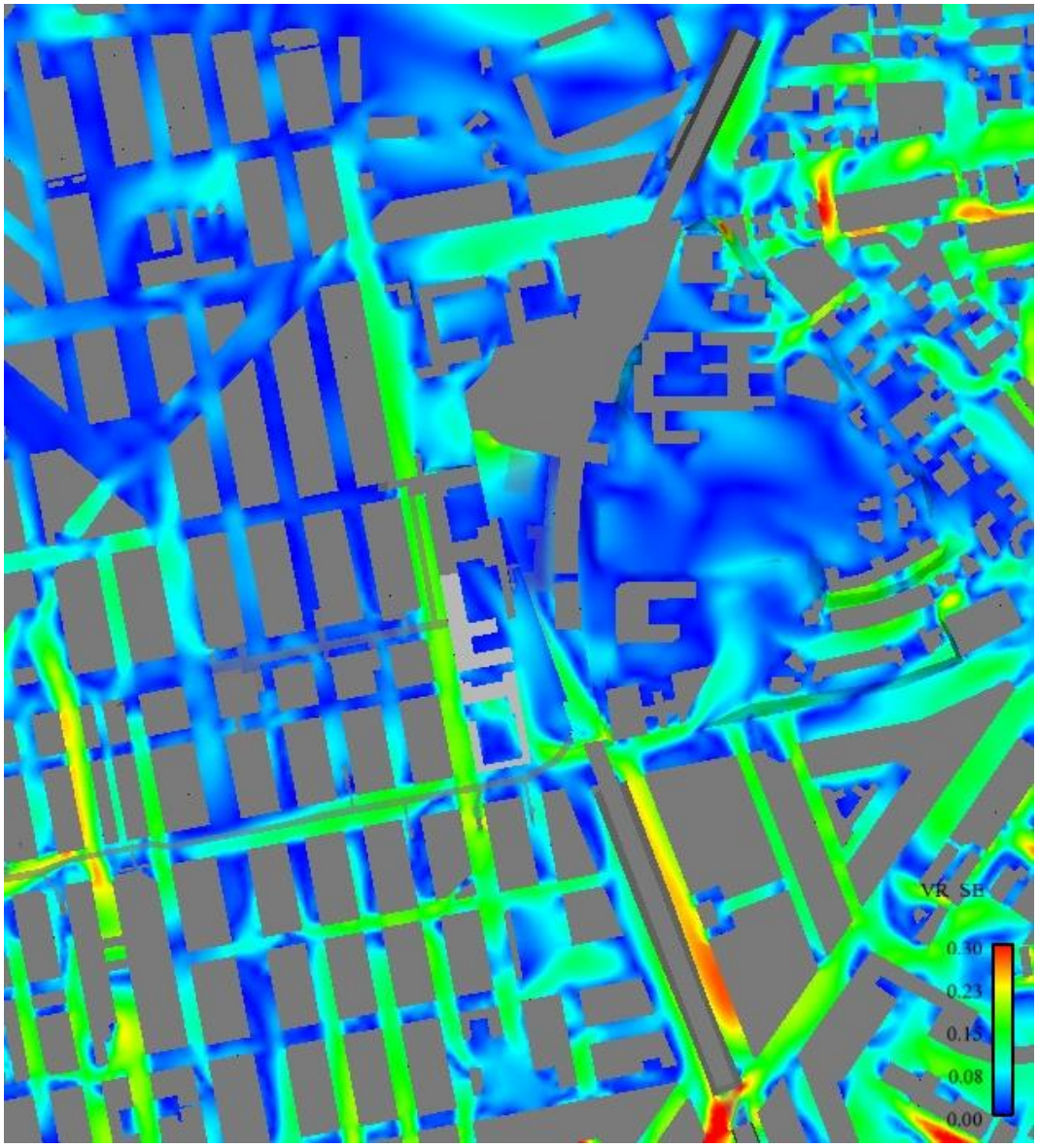


Figure D7 Contour plot of VR of Existing Scheme under SE wind

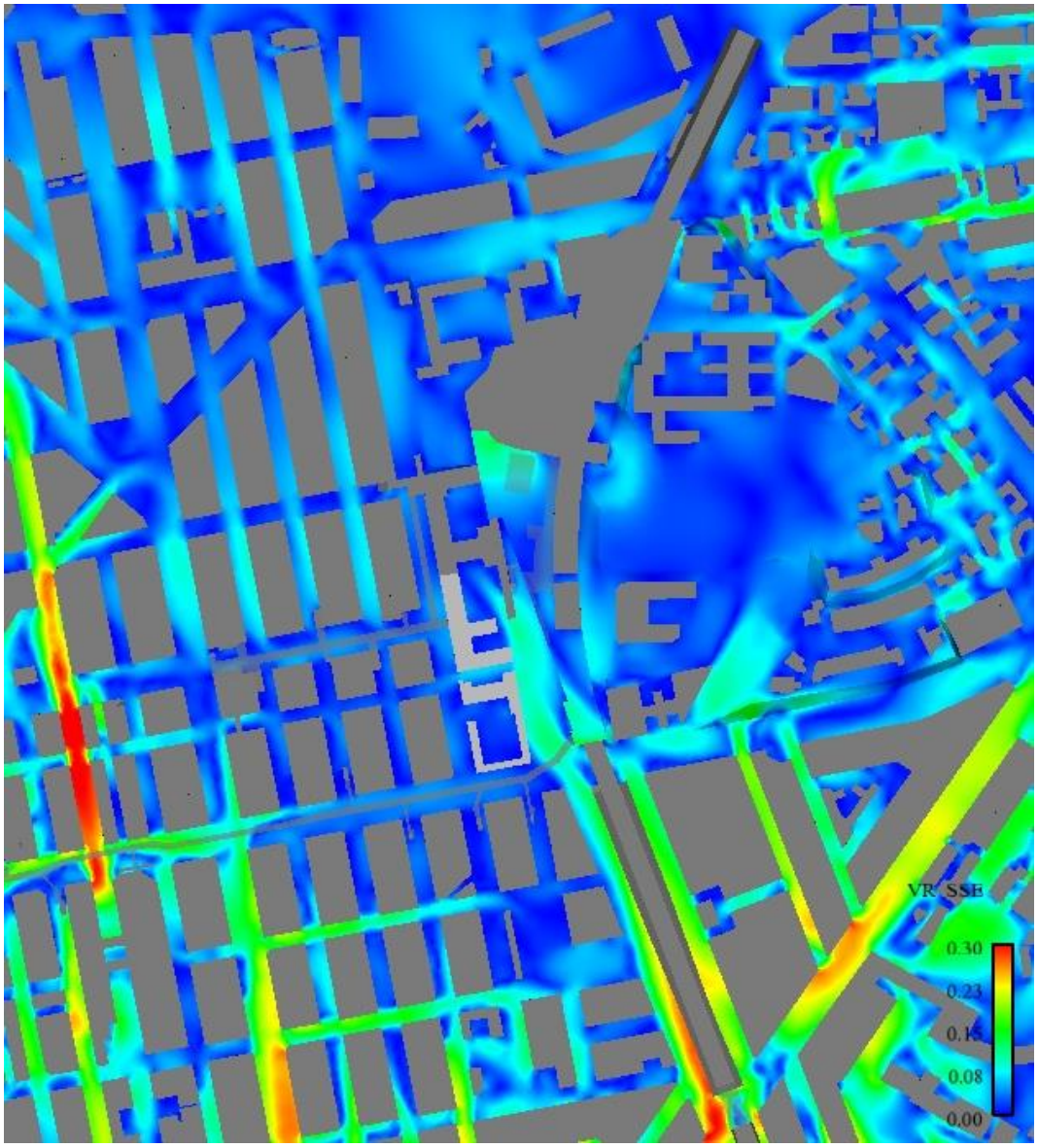


Figure D8 Contour plot of VR of Existing Scheme under SSE wind

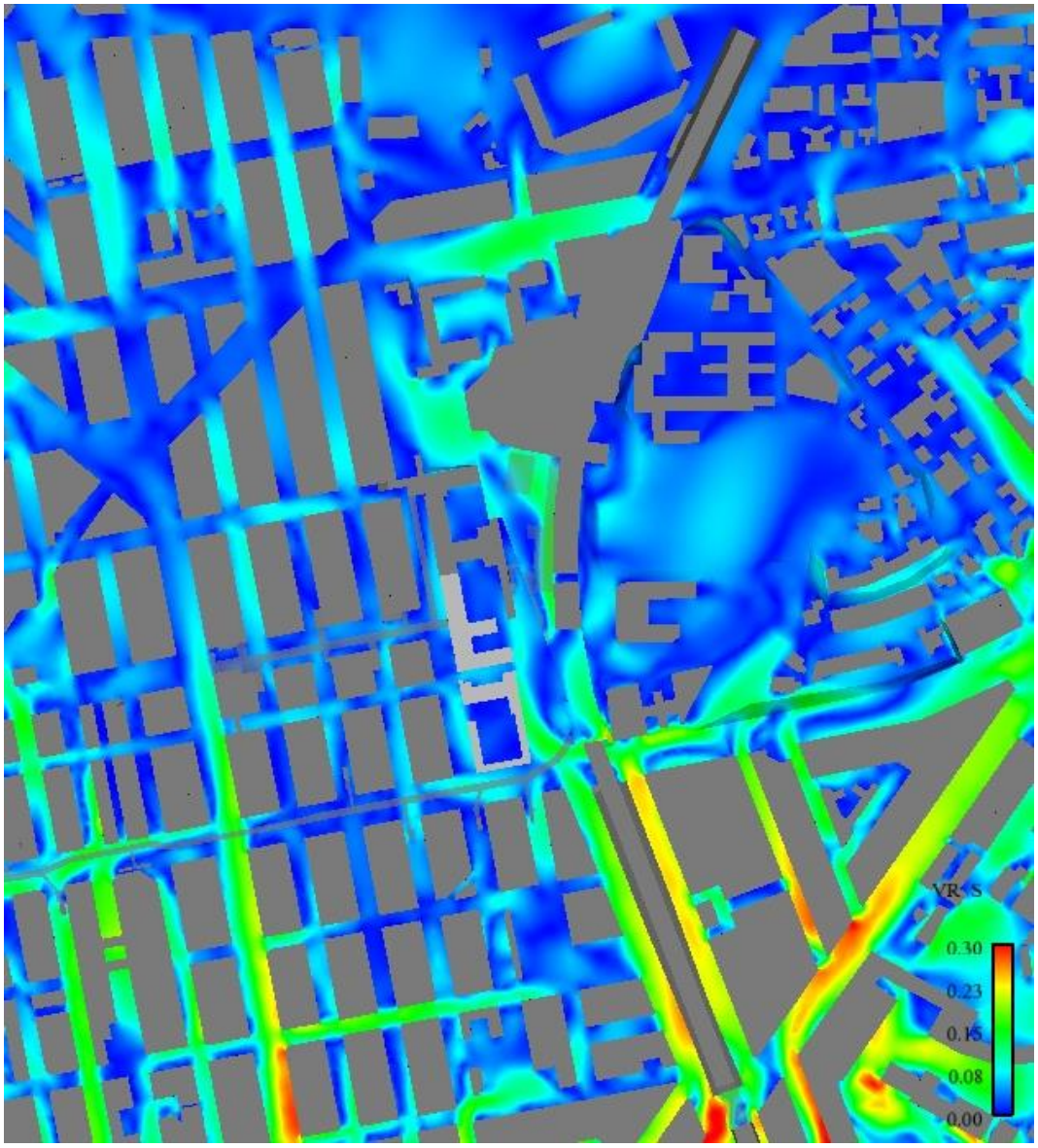


Figure D9 Contour plot of VR of Existing Scheme under S wind

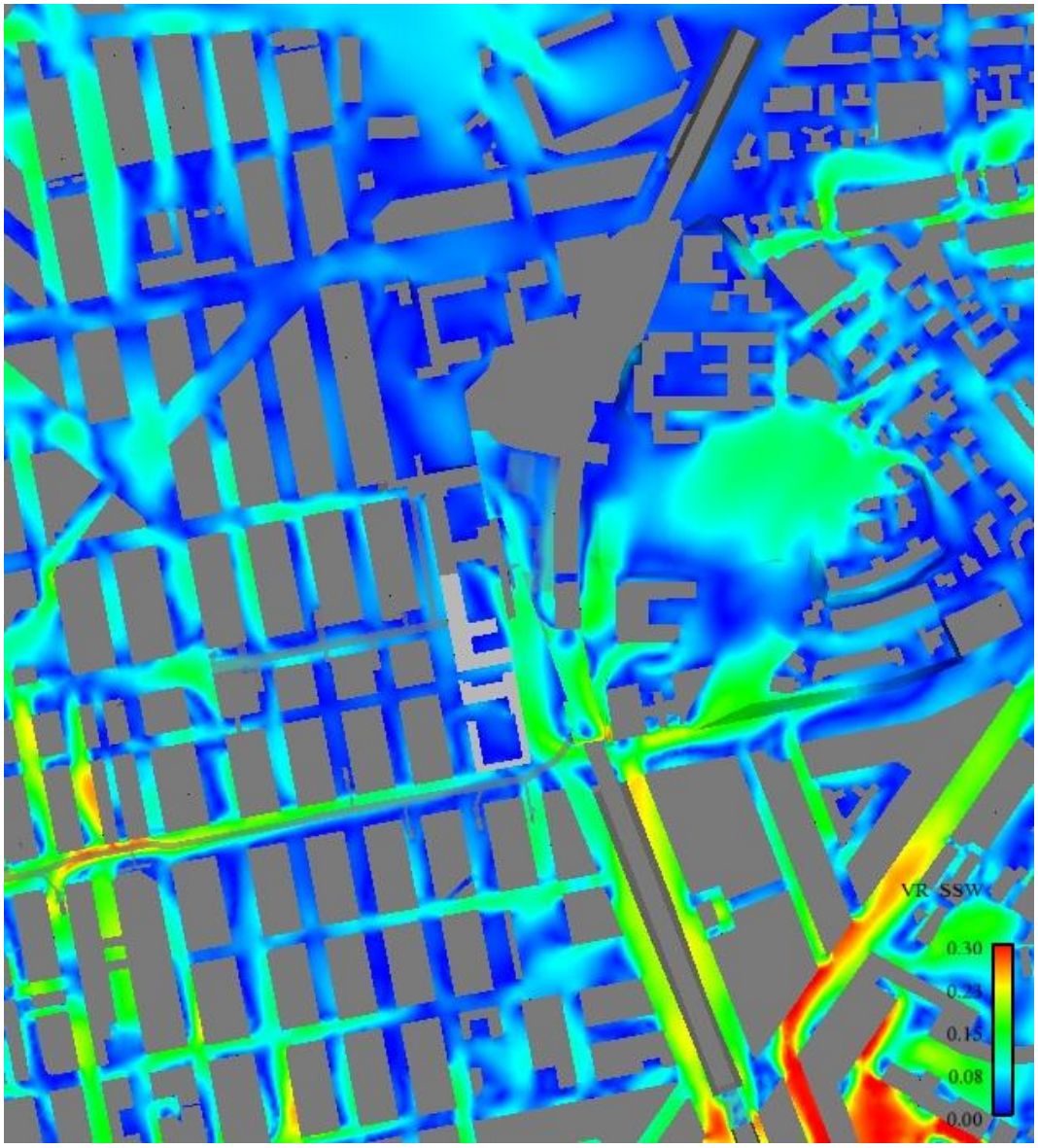


Figure D10 Contour plot of VR of Existing Scheme under SSW wind

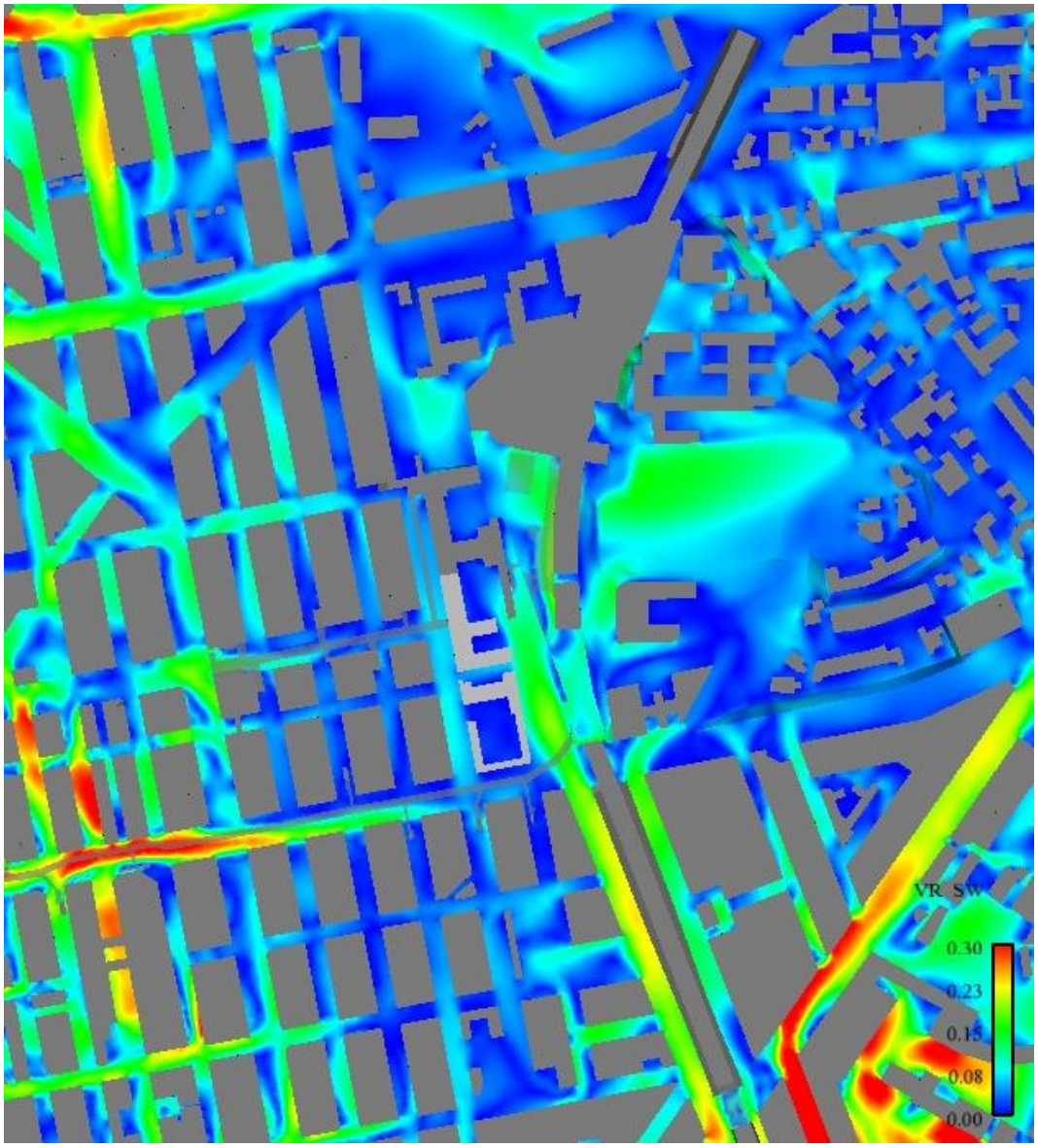


Figure D11 Contour plot of VR of Existing Scheme under SW wind

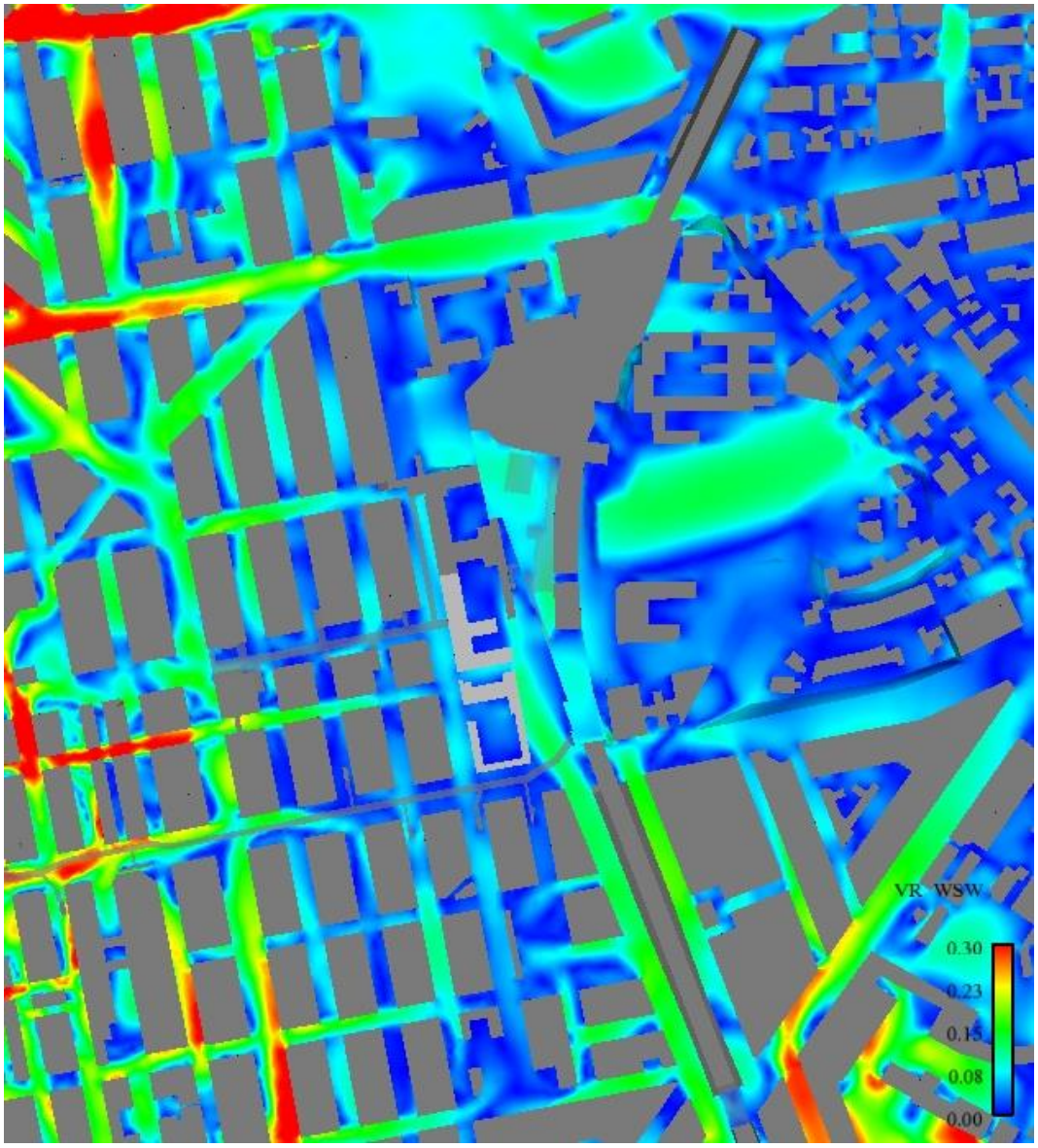


Figure D12 Contour plot of VR of Existing Scheme under WSW wind

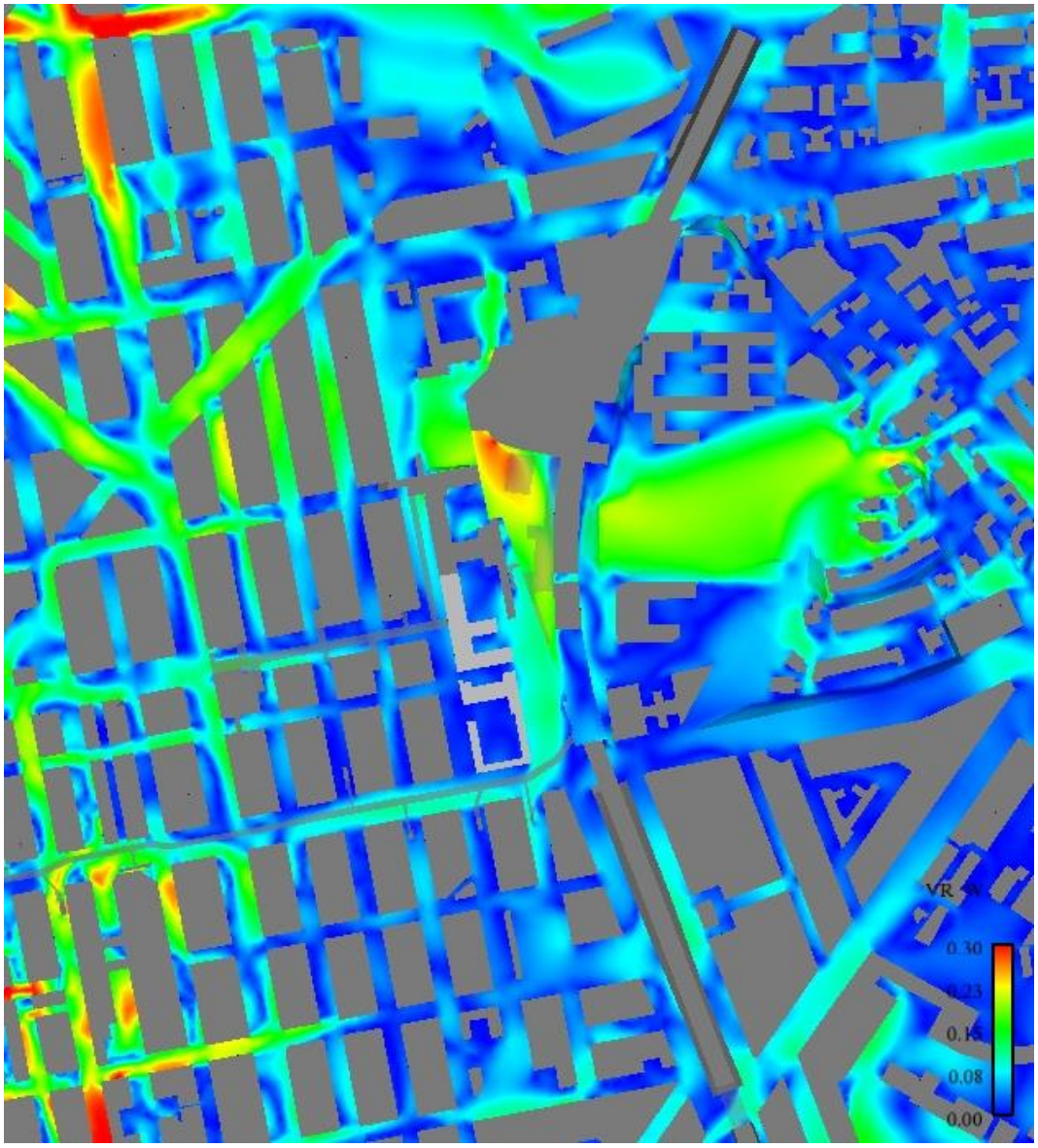


Figure D13Contour plot of VR of Existing Scheme under W wind

Figure D14 Contour plot of Annual Weighted VR of Existing Scheme

Figure D15 Contour plot of Summer Weighted VR of Existing Scheme

D2 Recommended Development Scheme

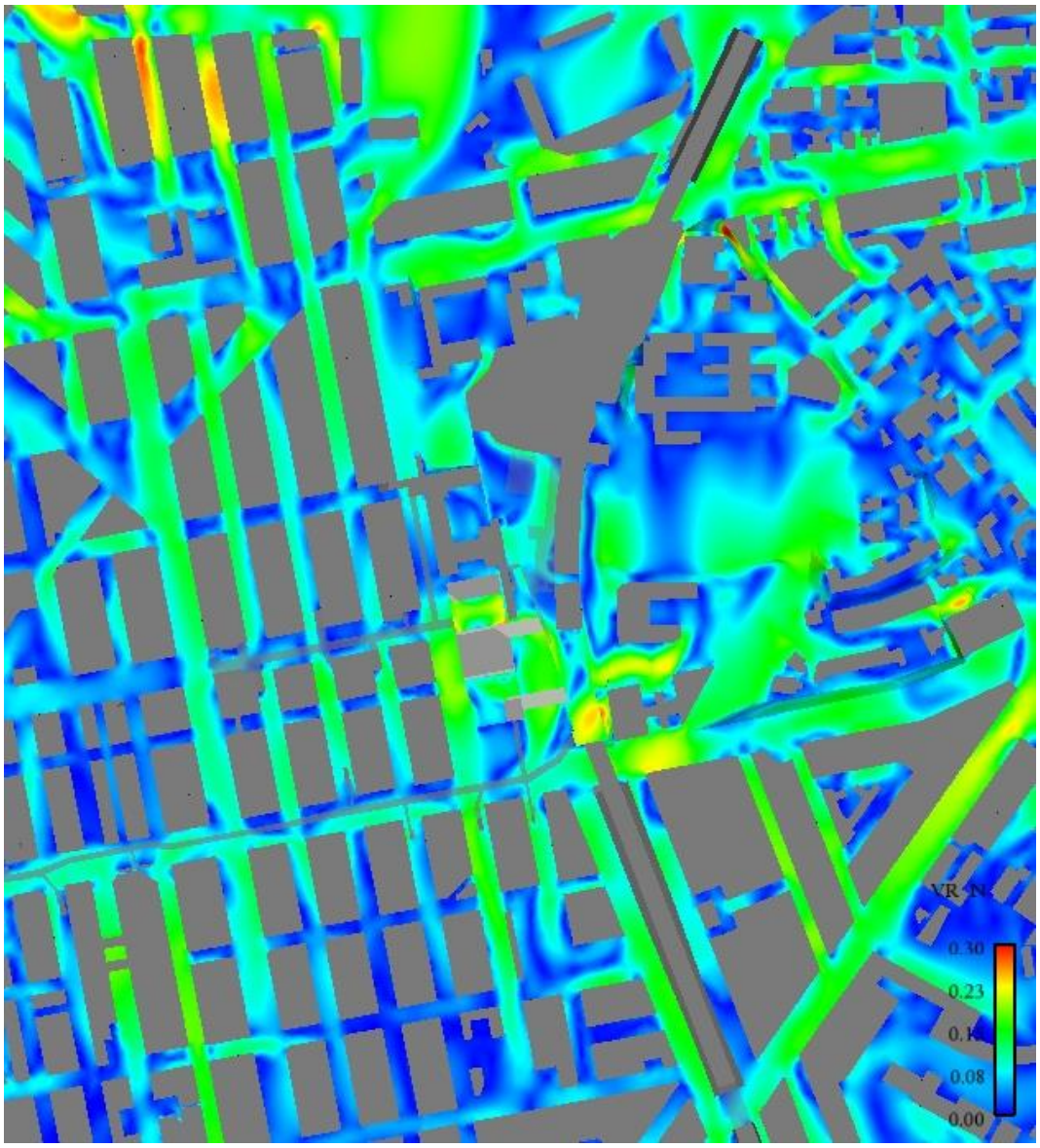


Figure D16 Contour plot of VR of RDS under N wind

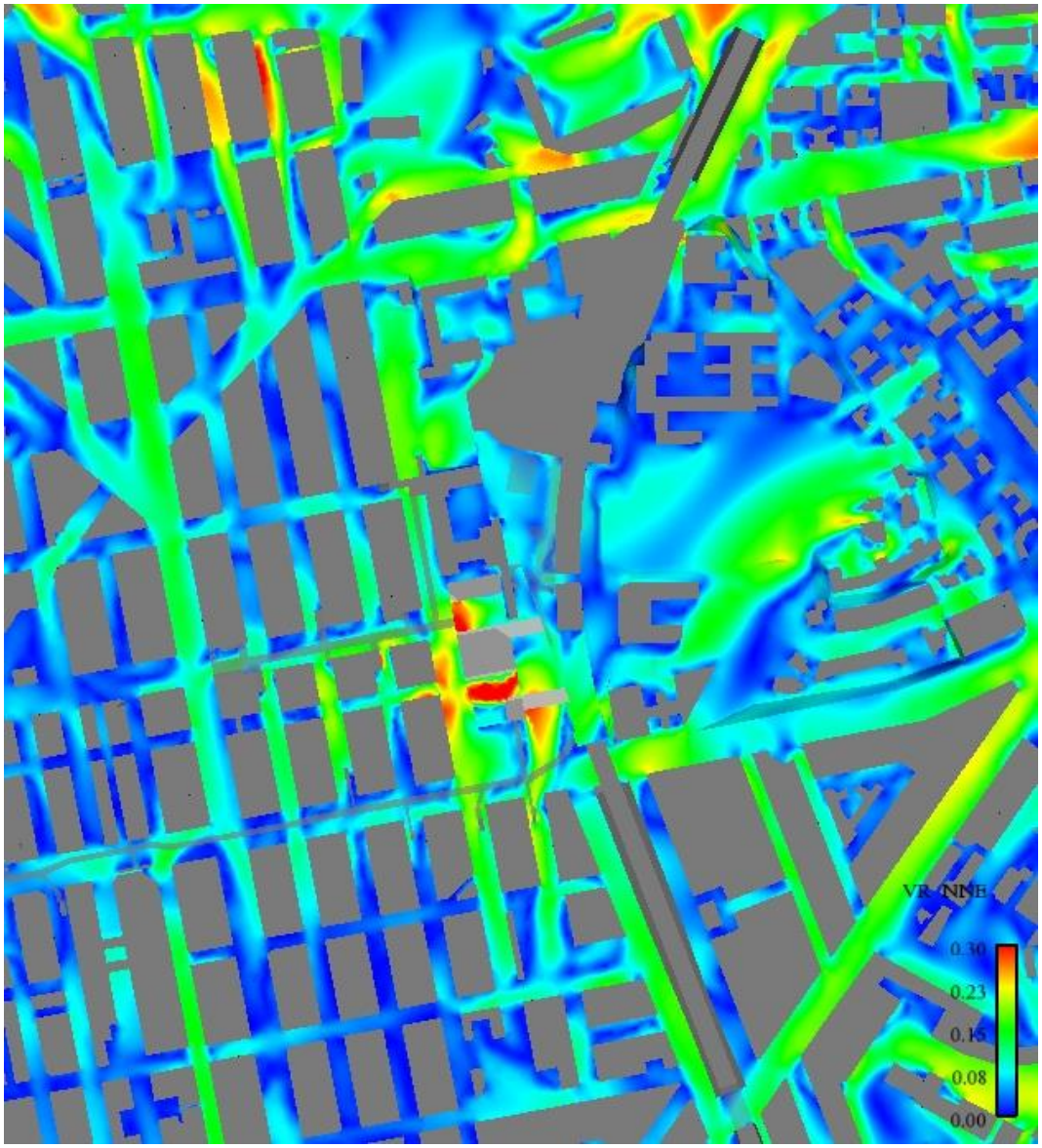


Figure D17 Contour plot of VR of RDS under NNE wind

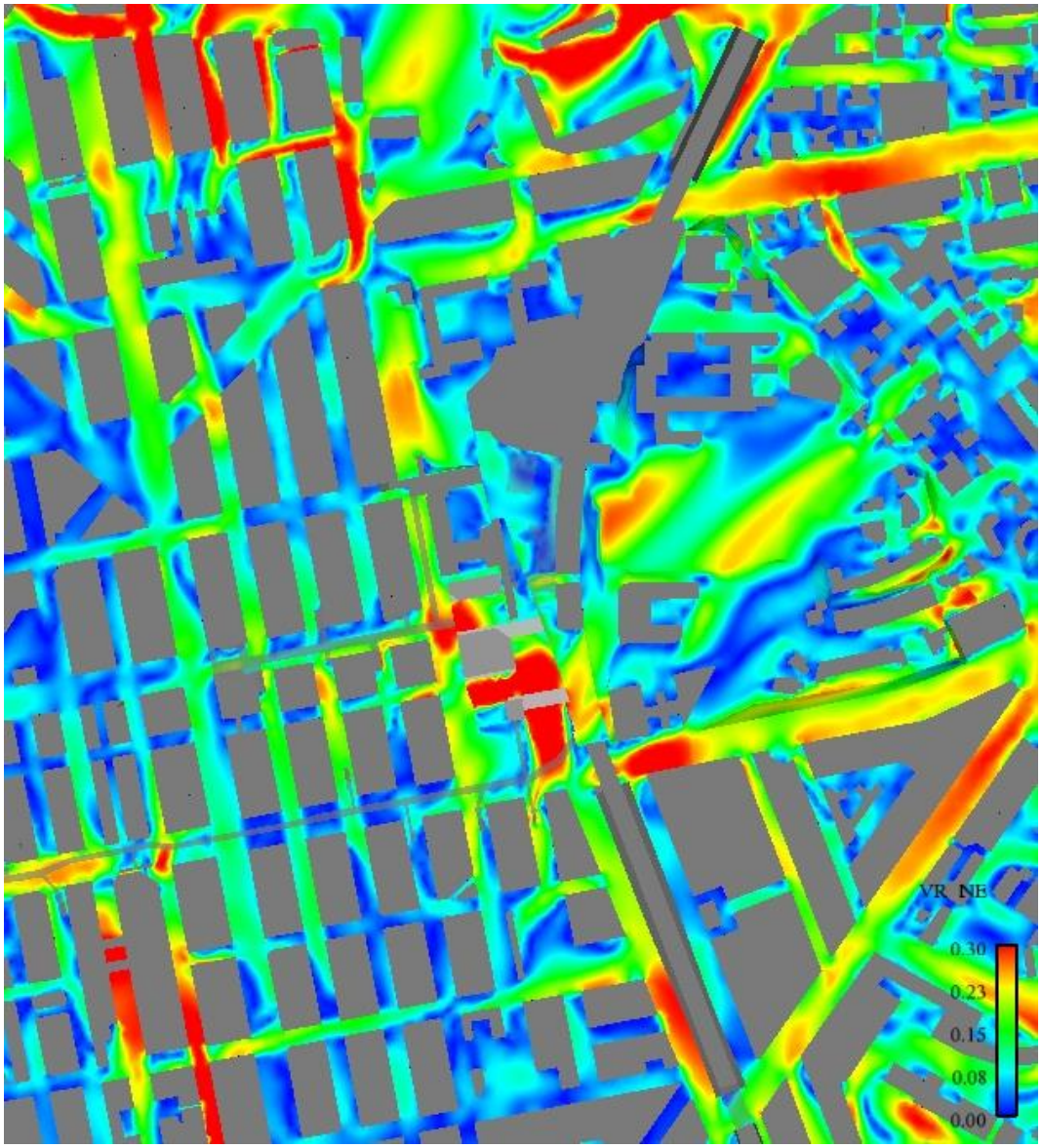


Figure D18 Contour plot of VR of RDS under NE wind

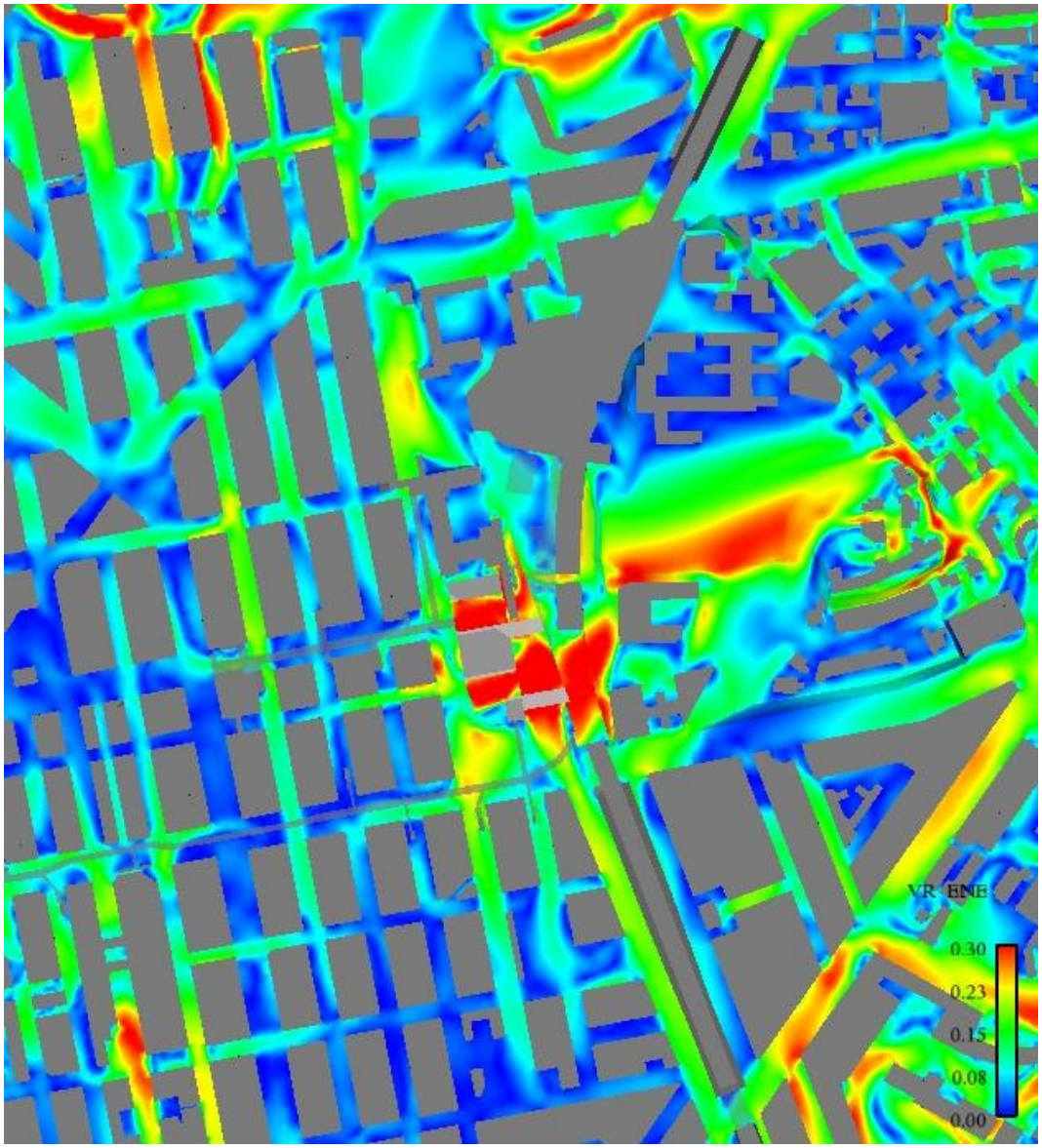


Figure D19 Contour plot of VR of RDS under ENE wind

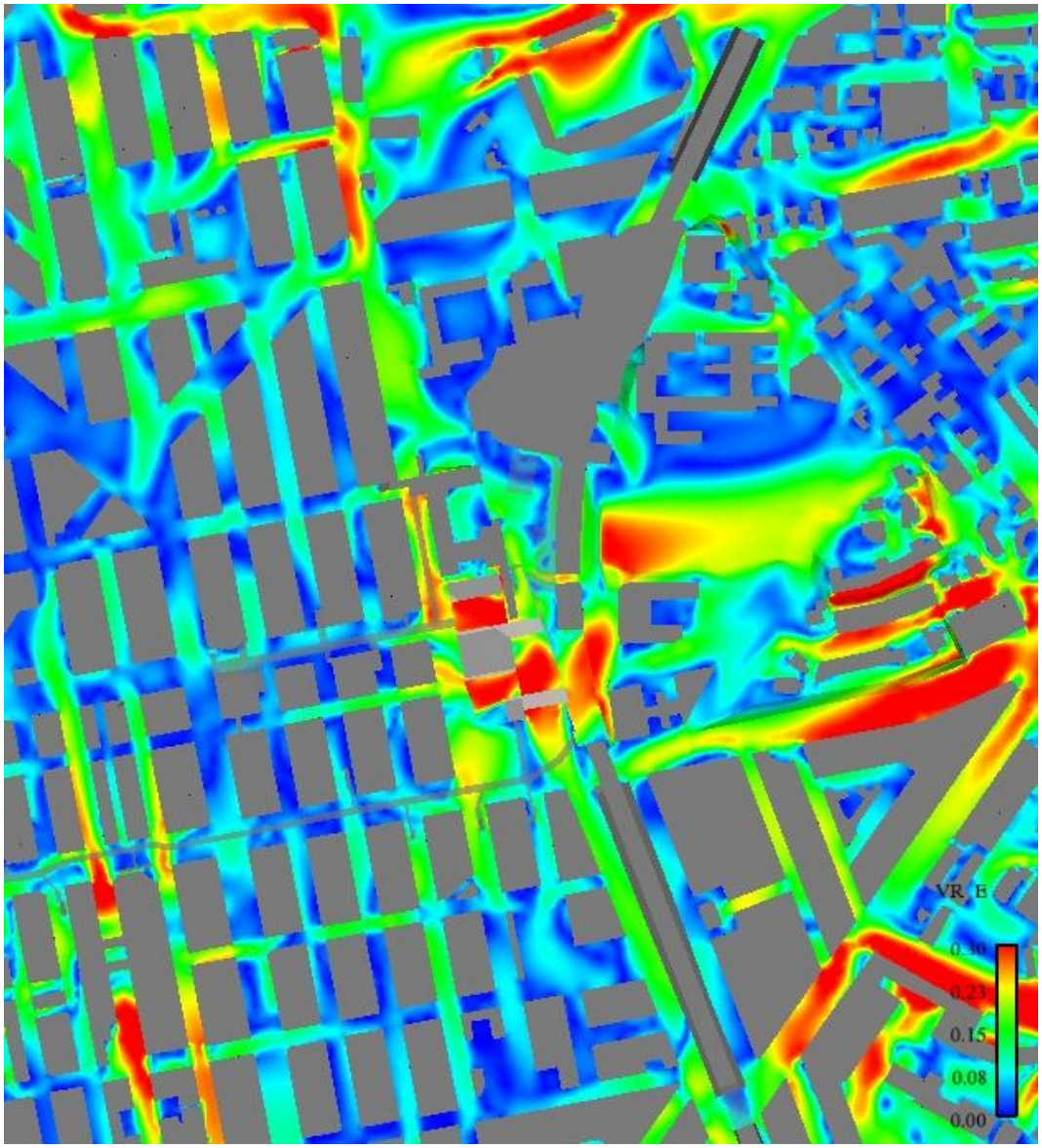


Figure D20 Contour plot of VR of RDS under E wind

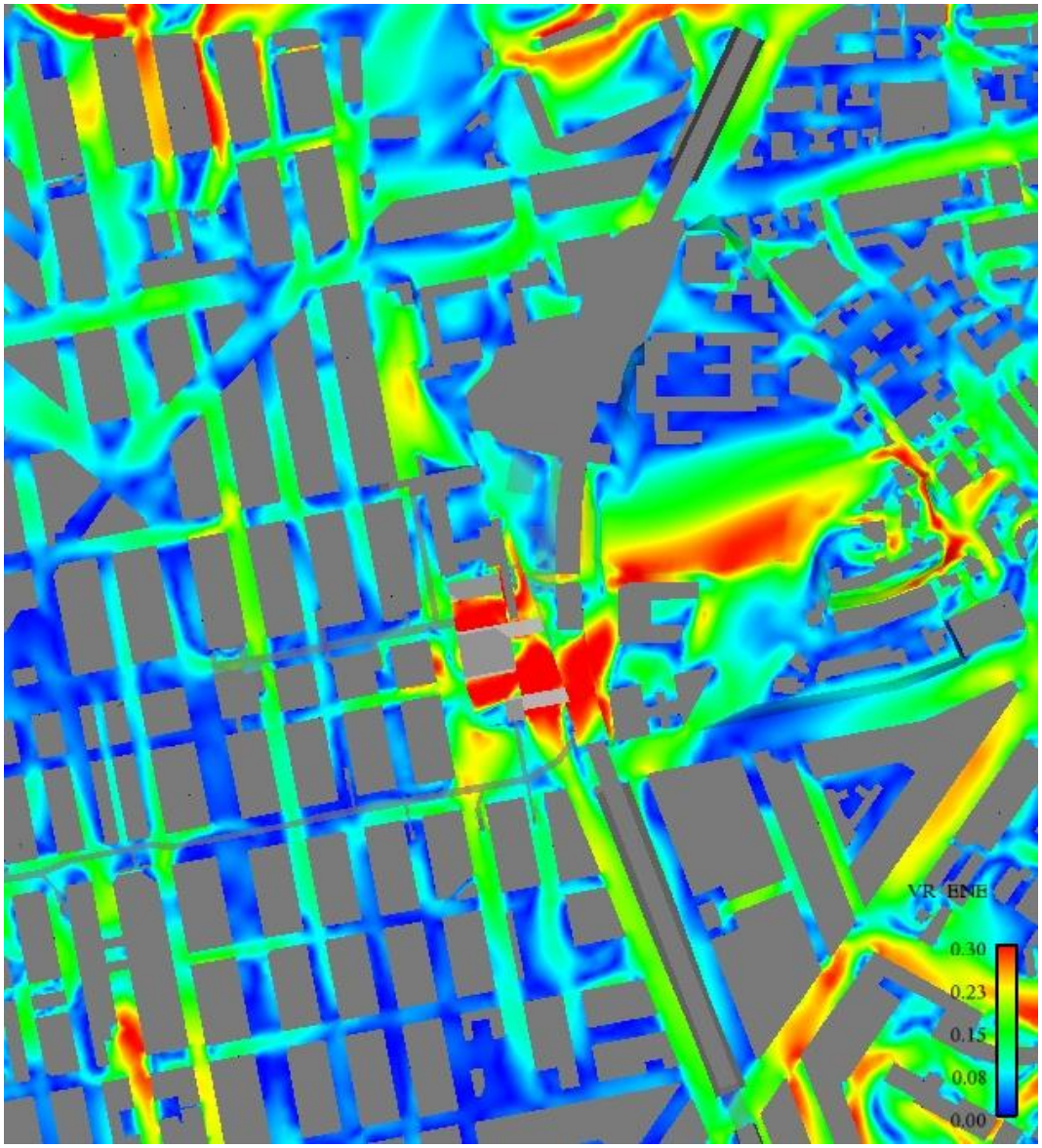


Figure D21 Contour plot of VR of RDS under ESE wind

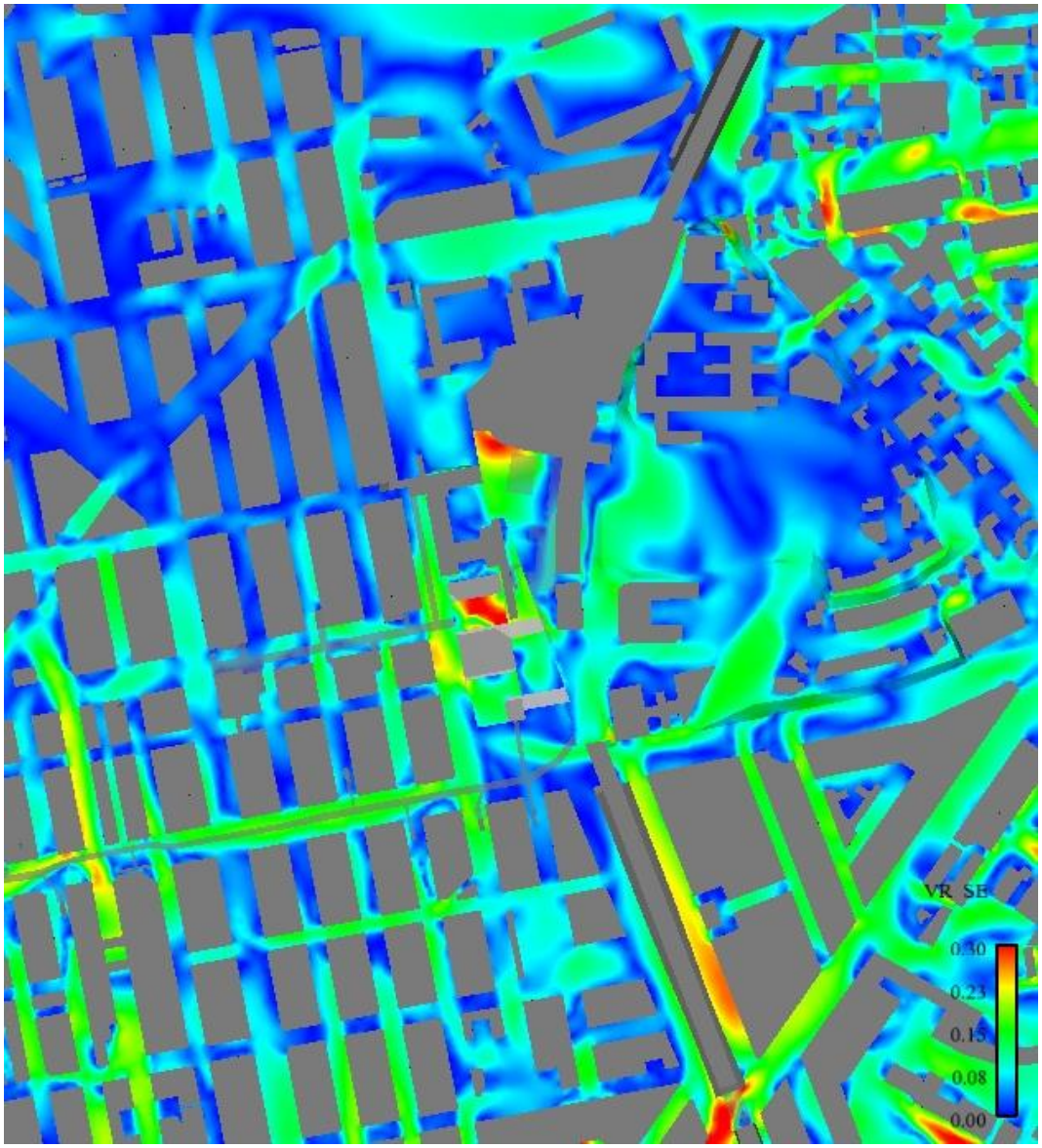


Figure D22 Contour plot of VR of RDS under SE wind

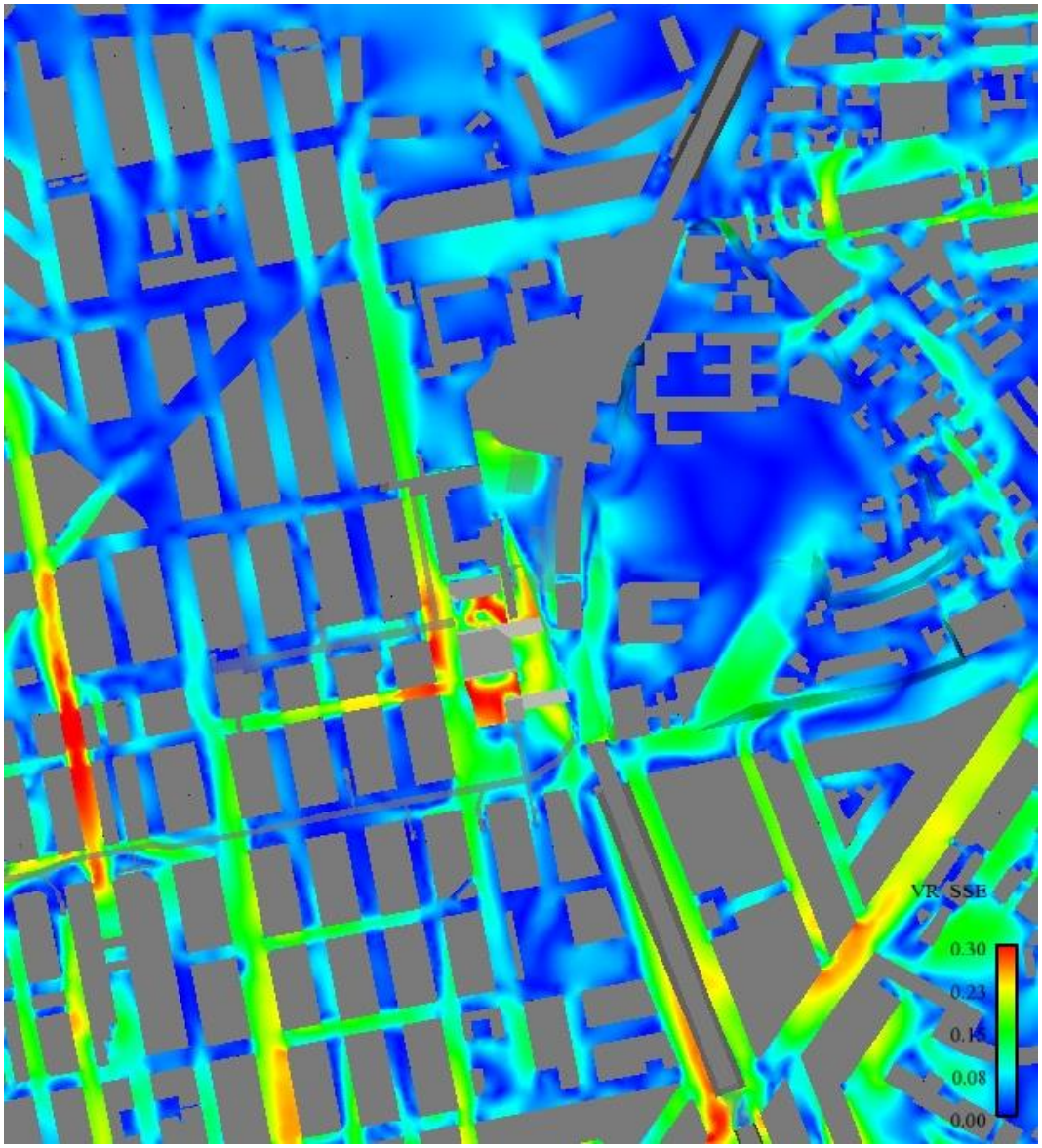


Figure D23 Contour plot of VR of RDS under SSE wind

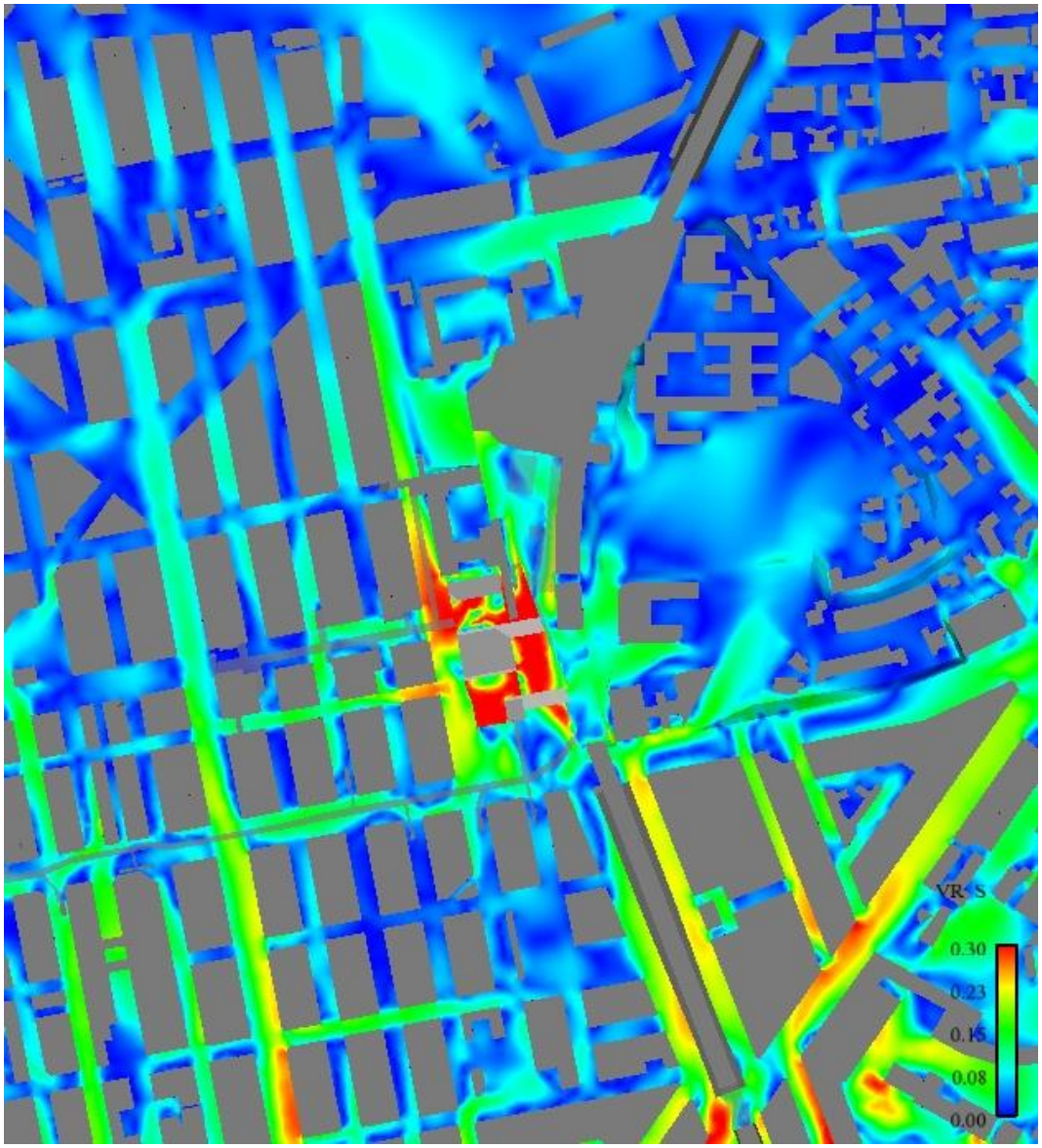


Figure D24 Contour plot of VR of RDS under S wind

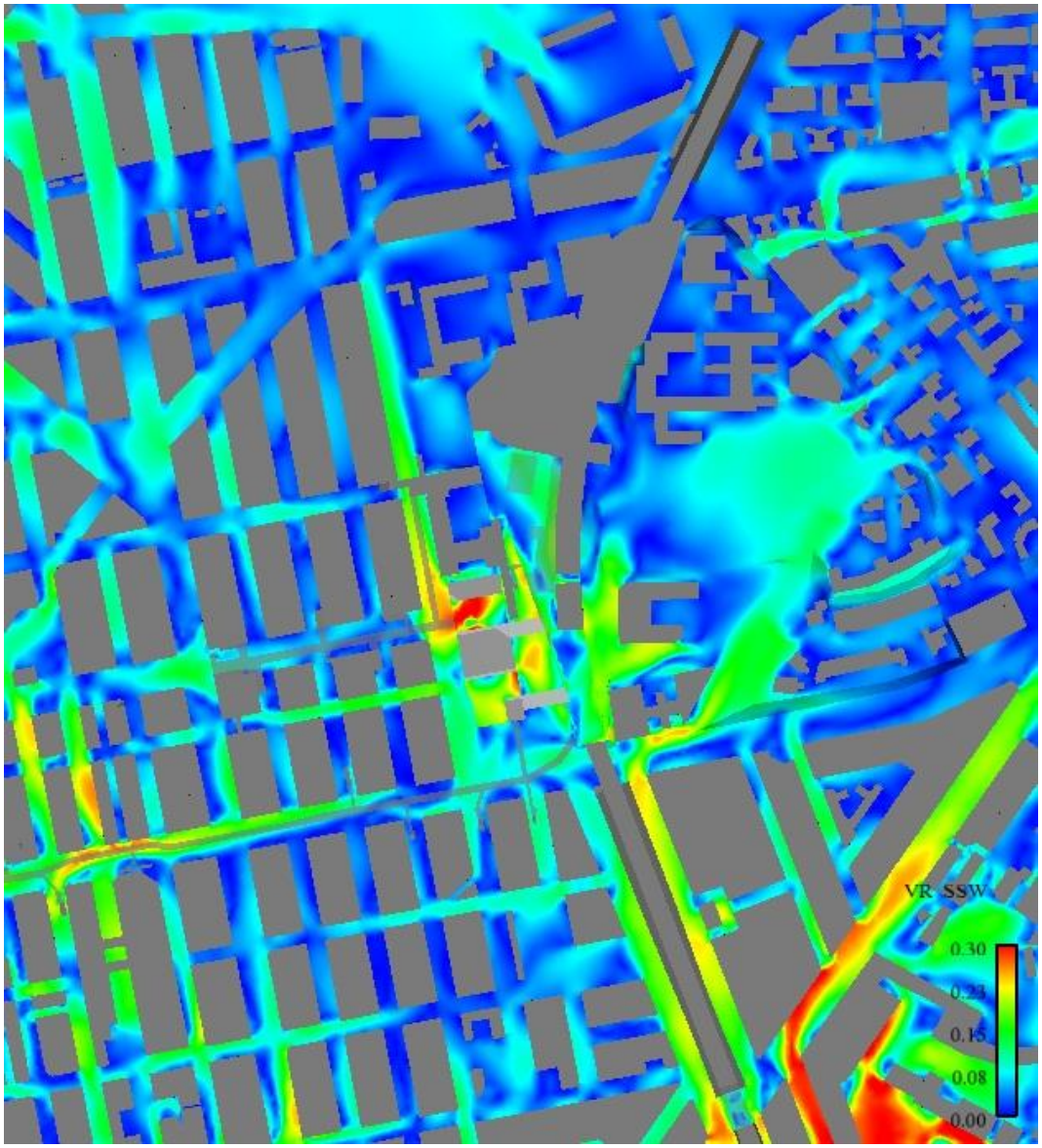


Figure D25 Contour plot of VR of RDS under SSW wind

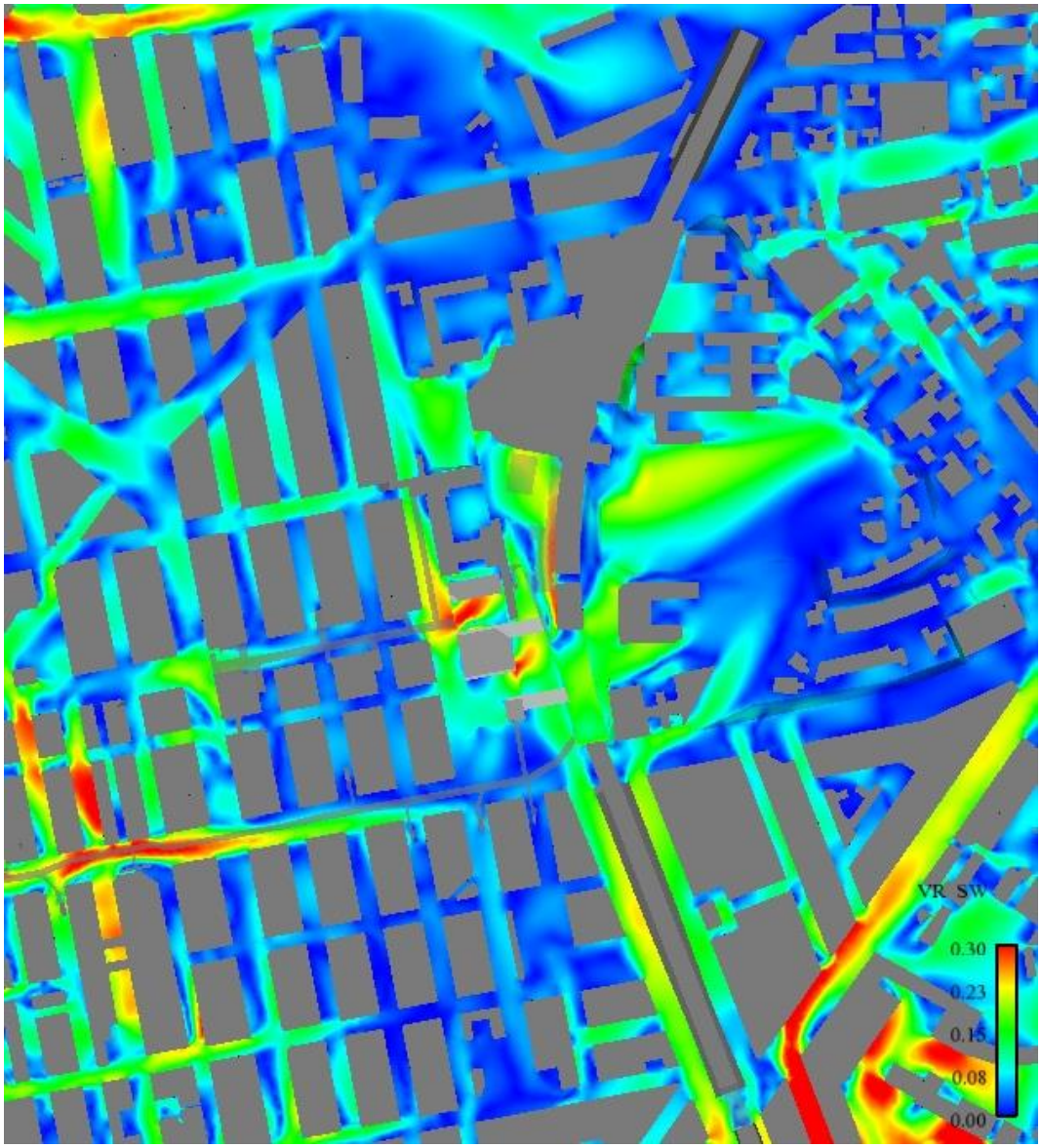


Figure D26 Contour plot of VR of RDS under SW wind

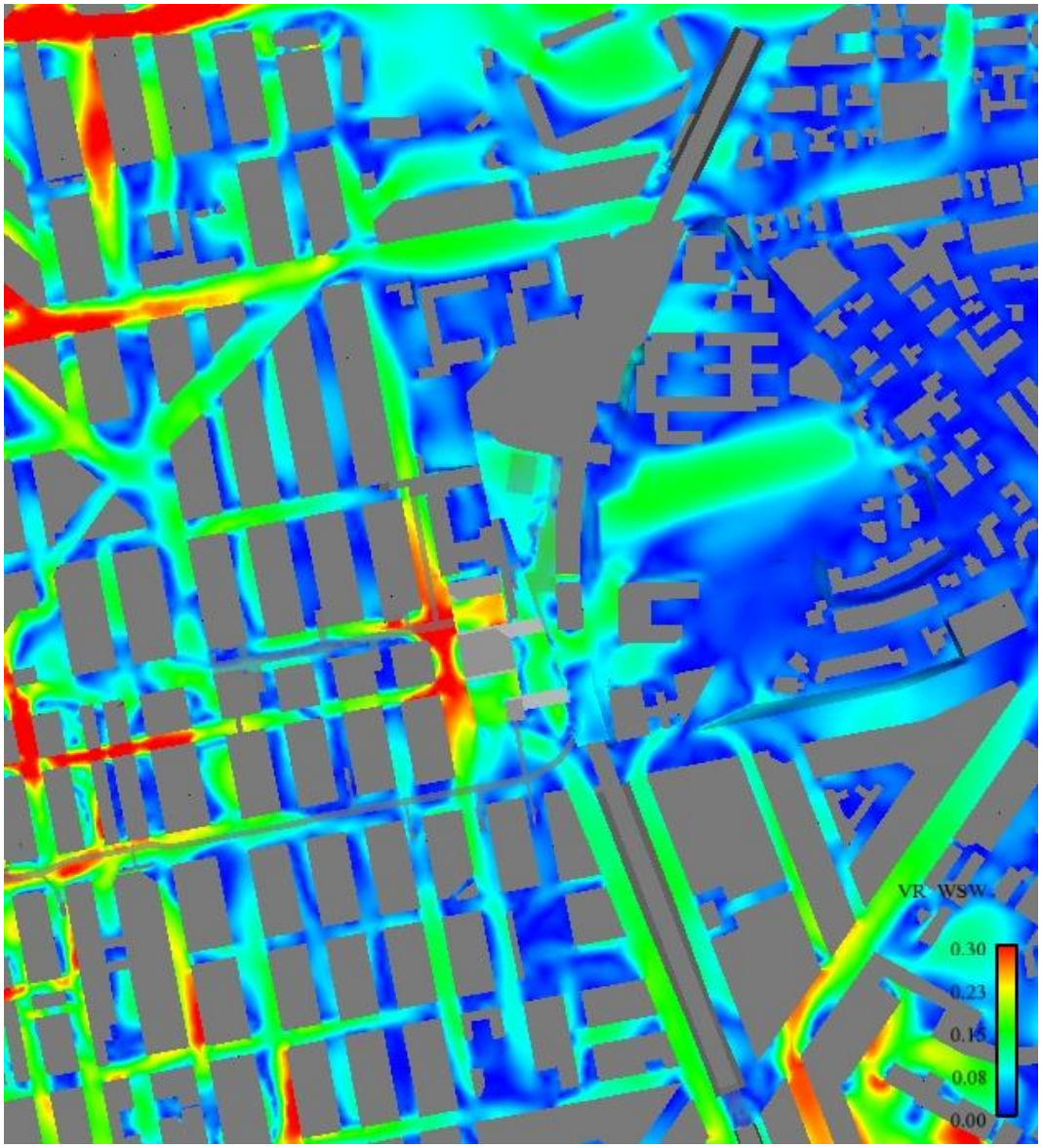


Figure D27 Contour plot of VR of RDS under WSW wind

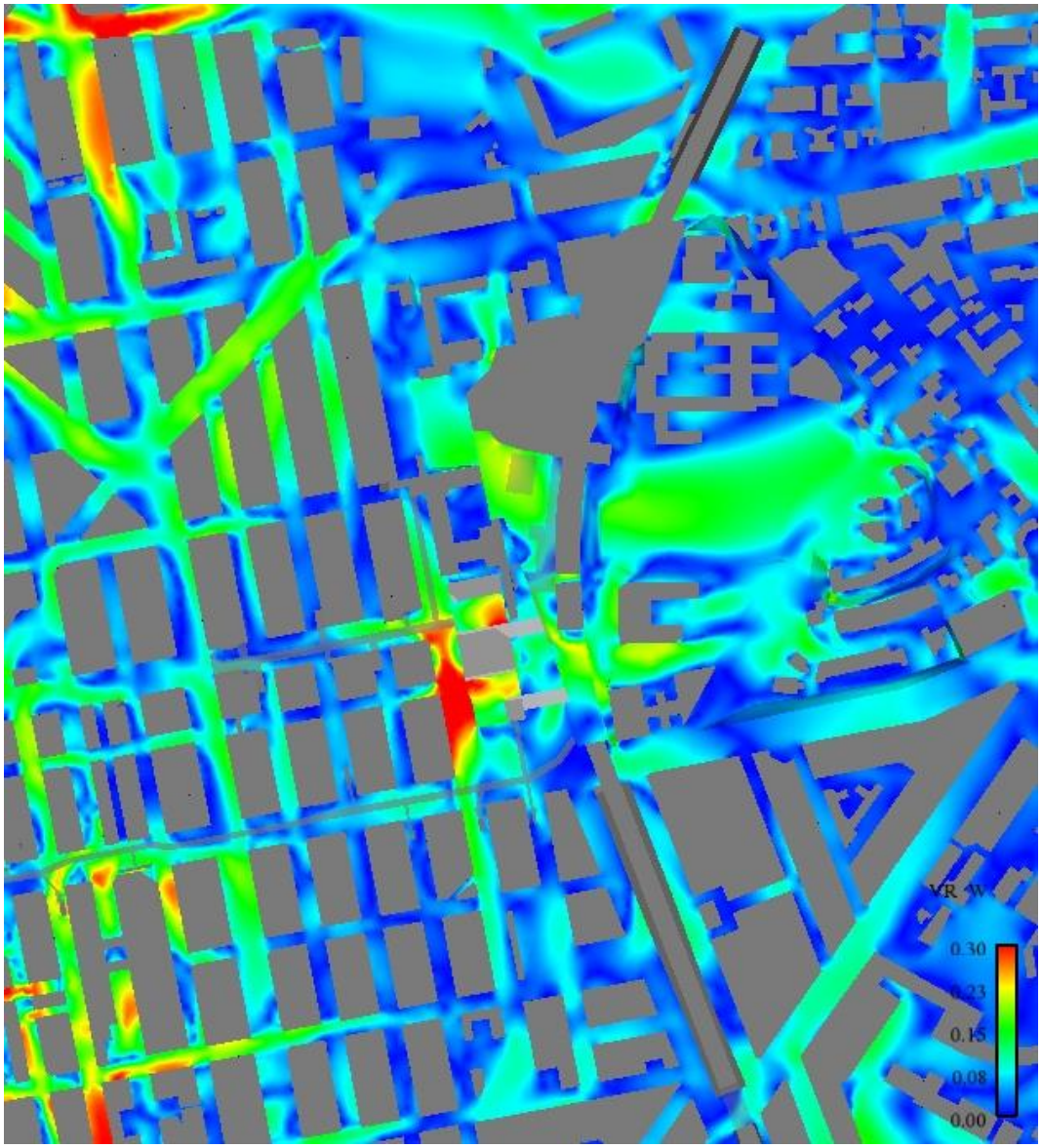


Figure D28Contour plot of VR of RDS under W wind

Figure D29 Contour plot of Annual Weighted VR of RDS

Figure D30 Contour plot of Summer Weighted VR of RDS

Appendix E

Vector Plots of VR

E1 Existing Scheme

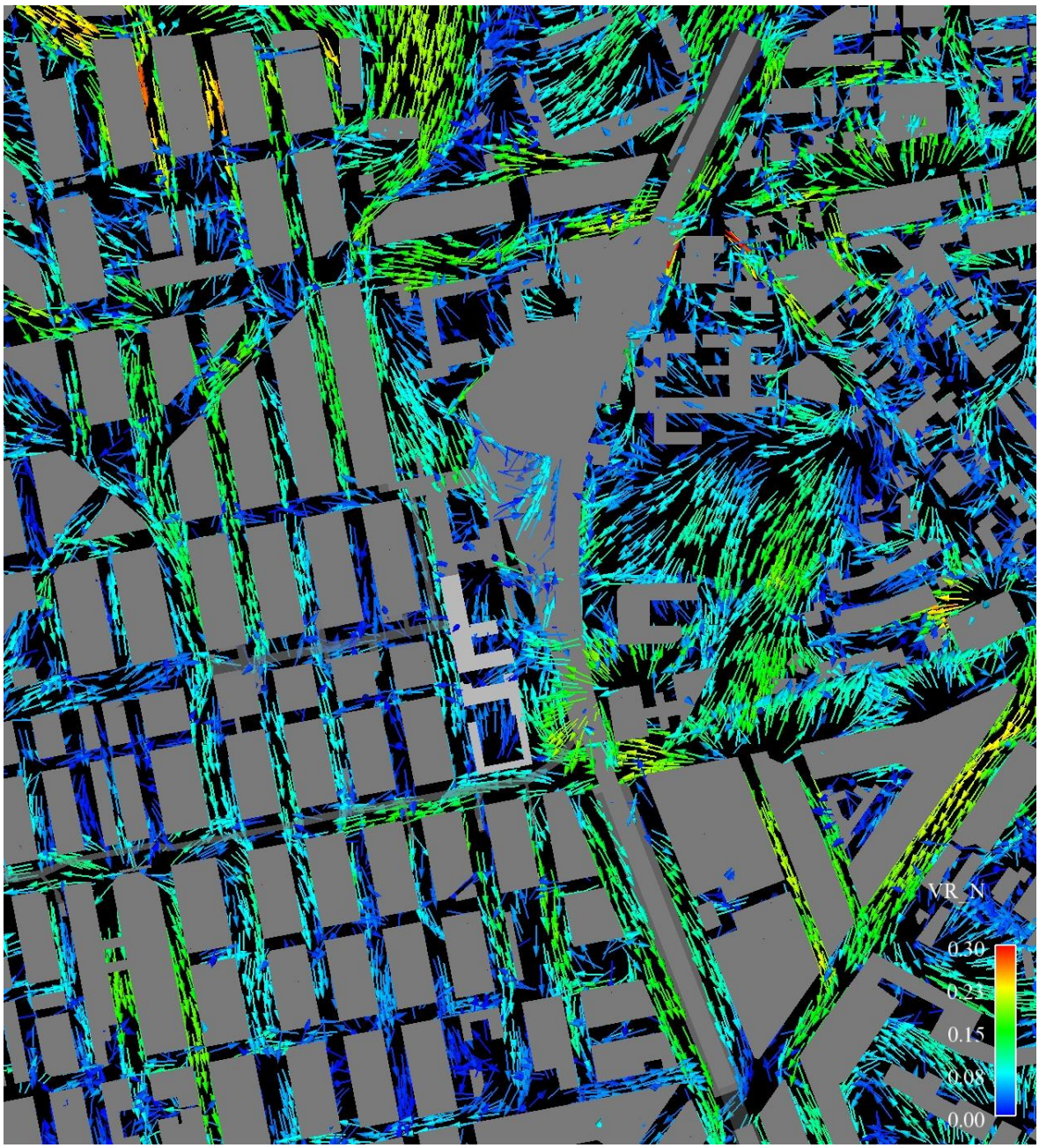


Figure E1 Vector plot of VR of Existing Scheme under N wind

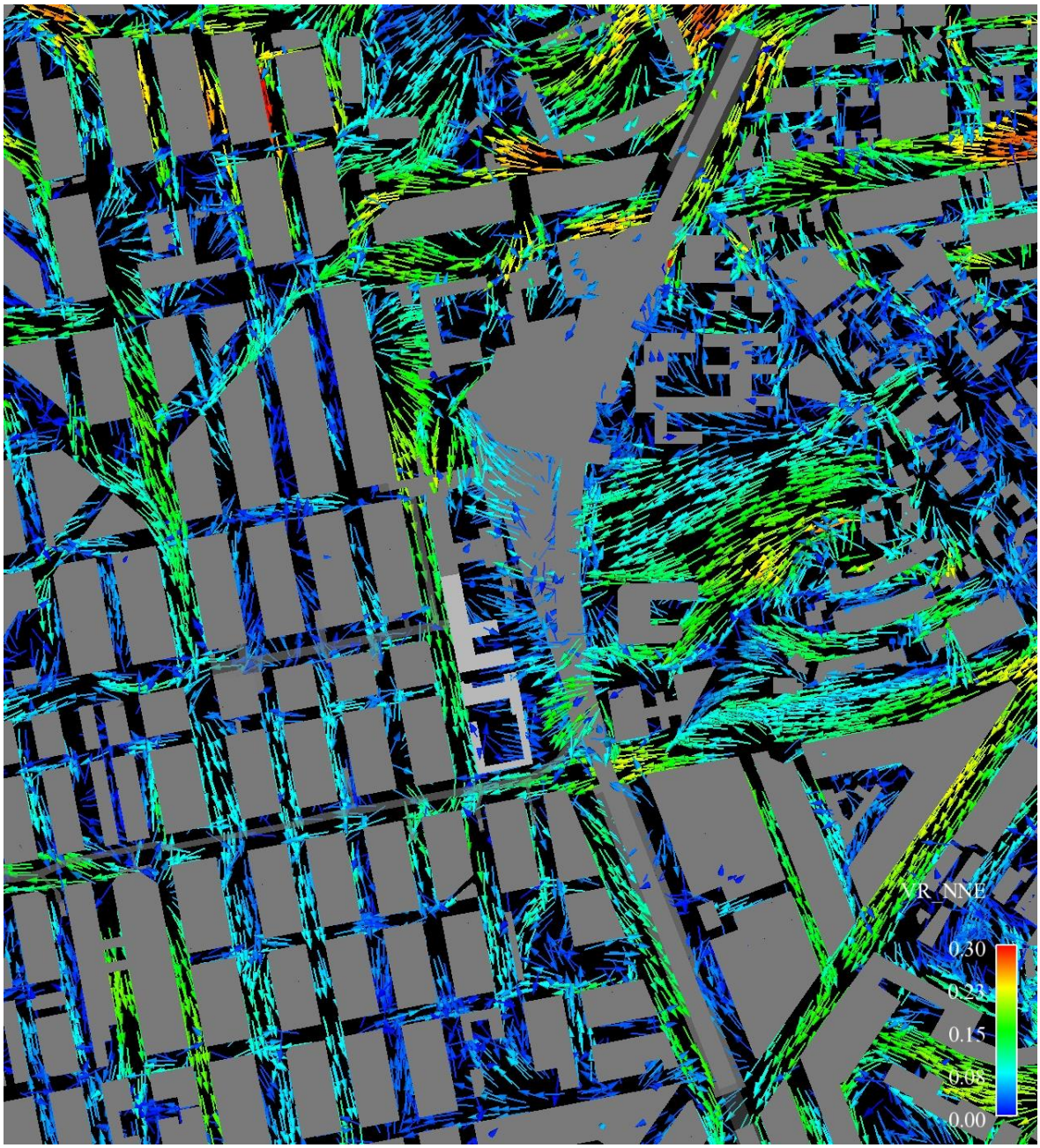


Figure E2 Vector plot of VR of Existing Scheme under NNE wind

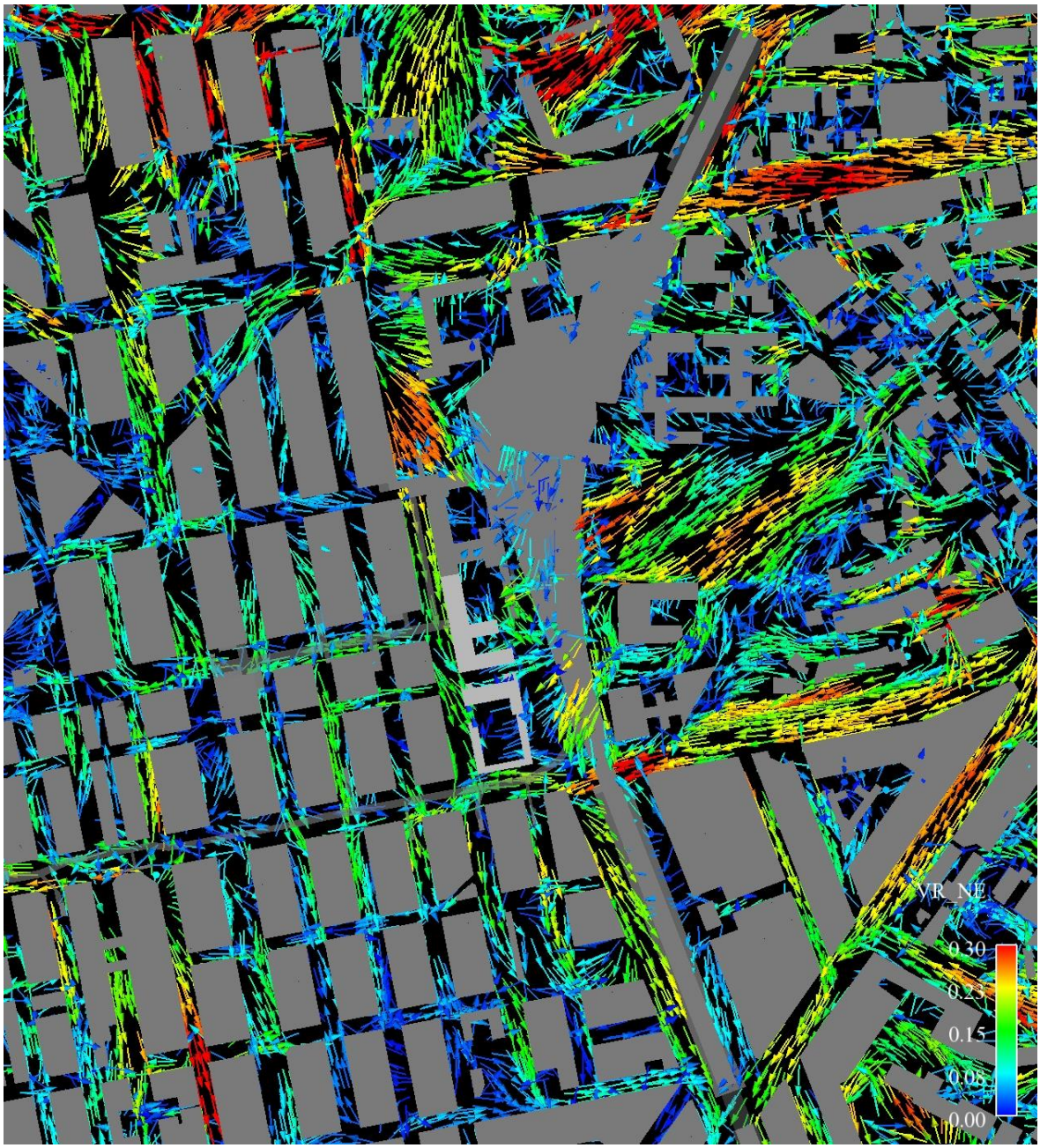


Figure E3 Vector plot of VR of Existing Scheme under NE wind

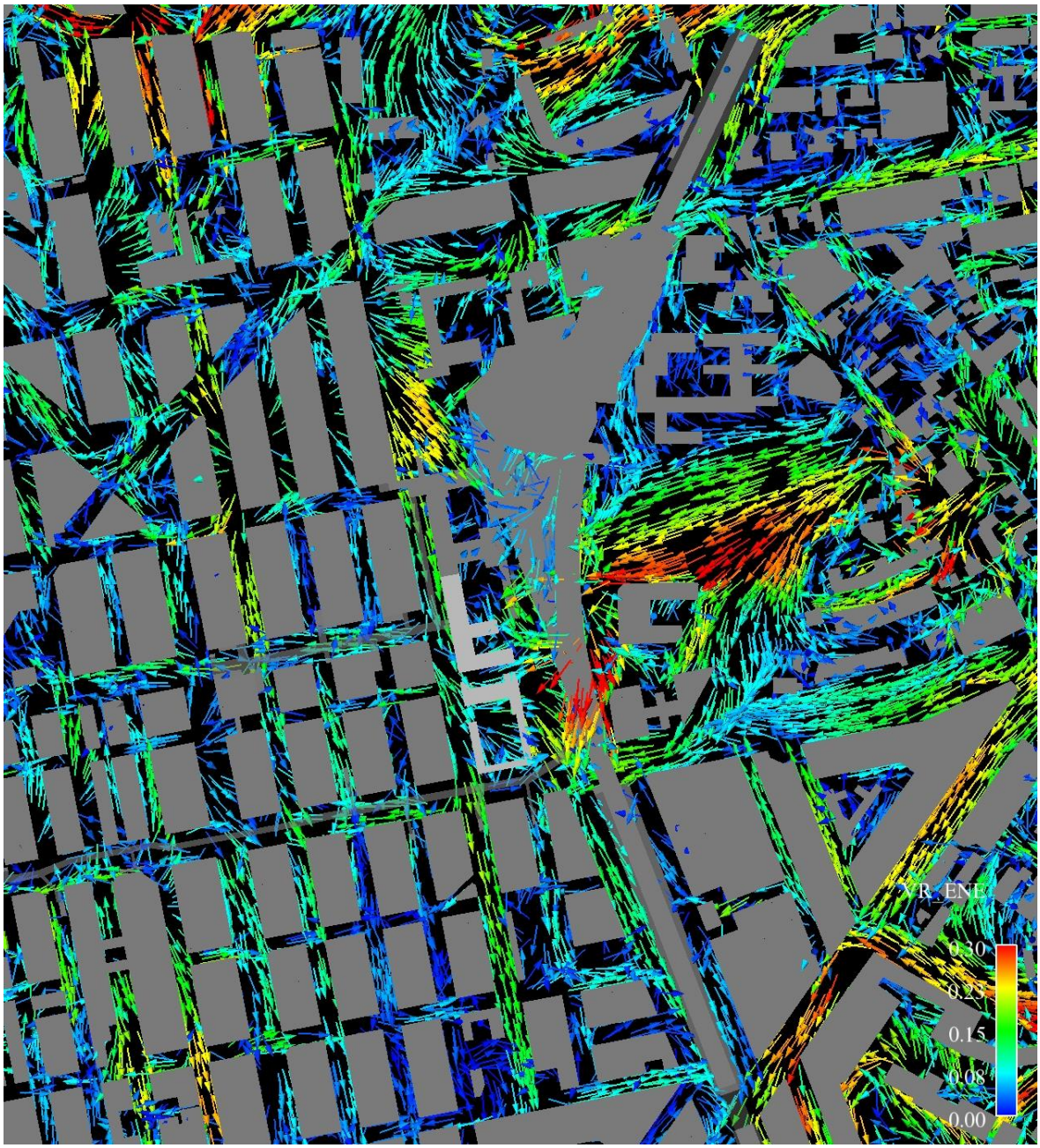


Figure E4 Vector plot of VR of Existing Scheme under ENE wind

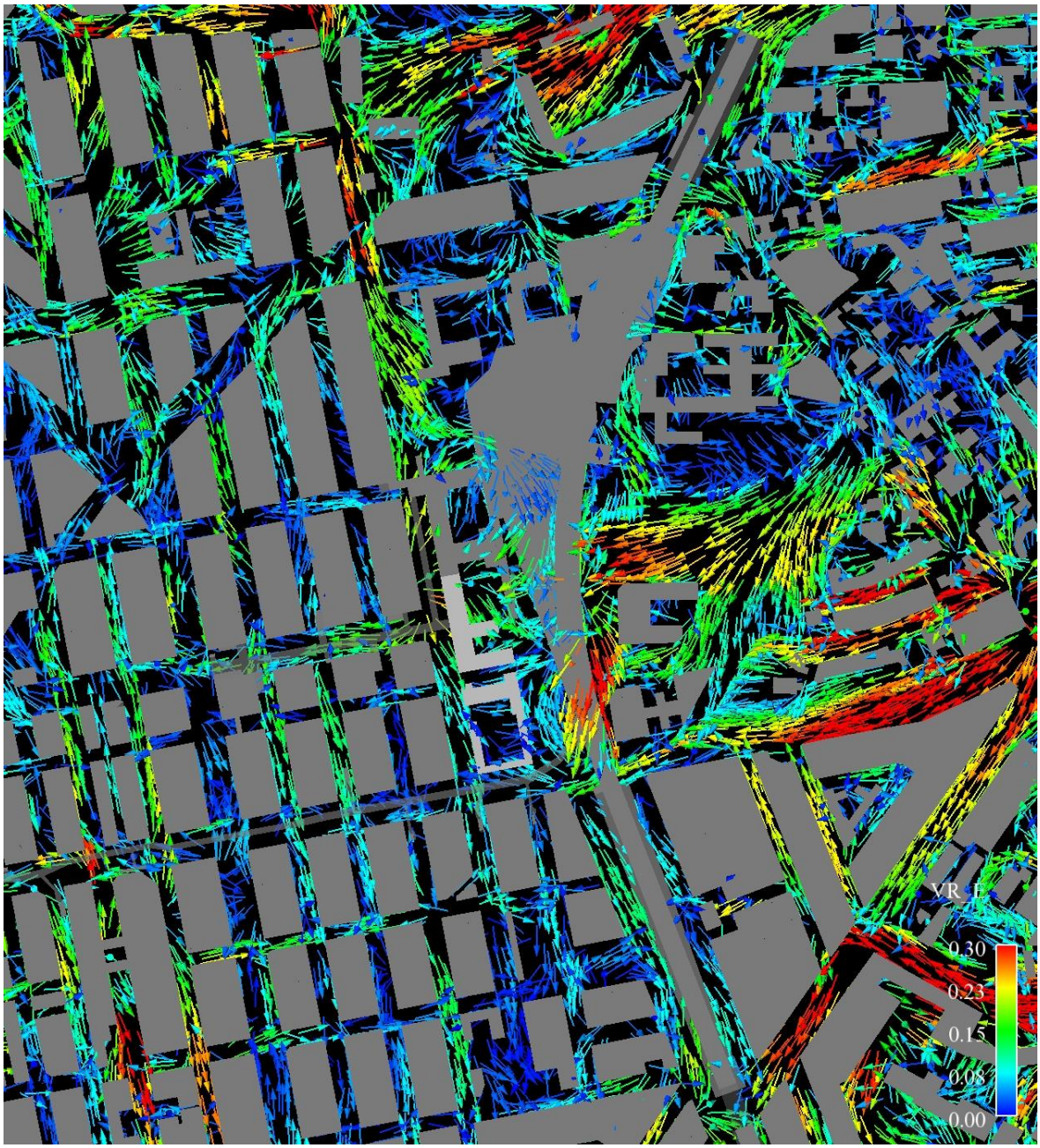


Figure E5 Vector plot of VR of Existing Scheme under E wind

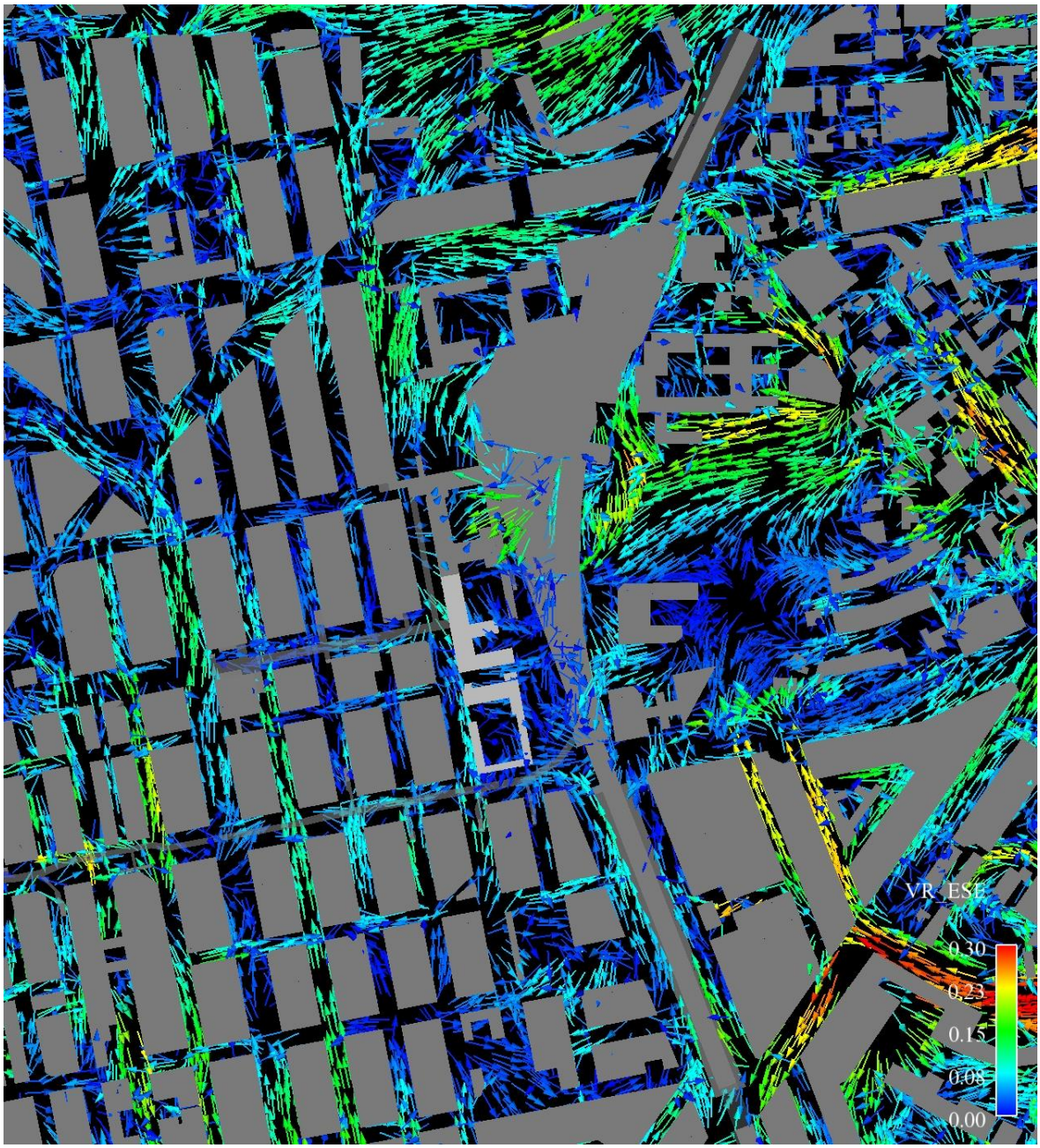


Figure E6 Vector plot of VR of Existing Scheme under ESE wind

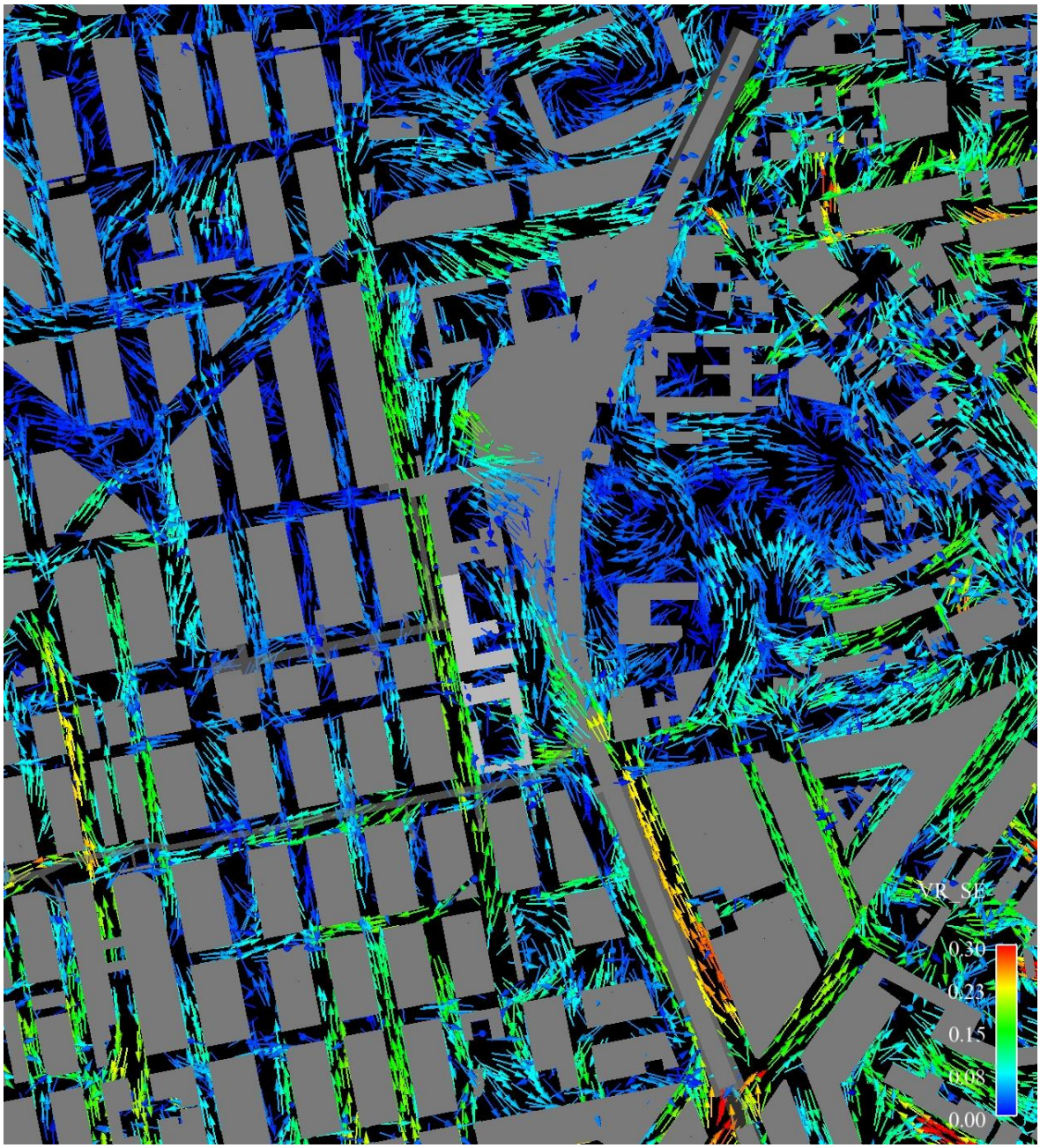


Figure E7 Vector plot of VR of Existing Scheme under SE wind

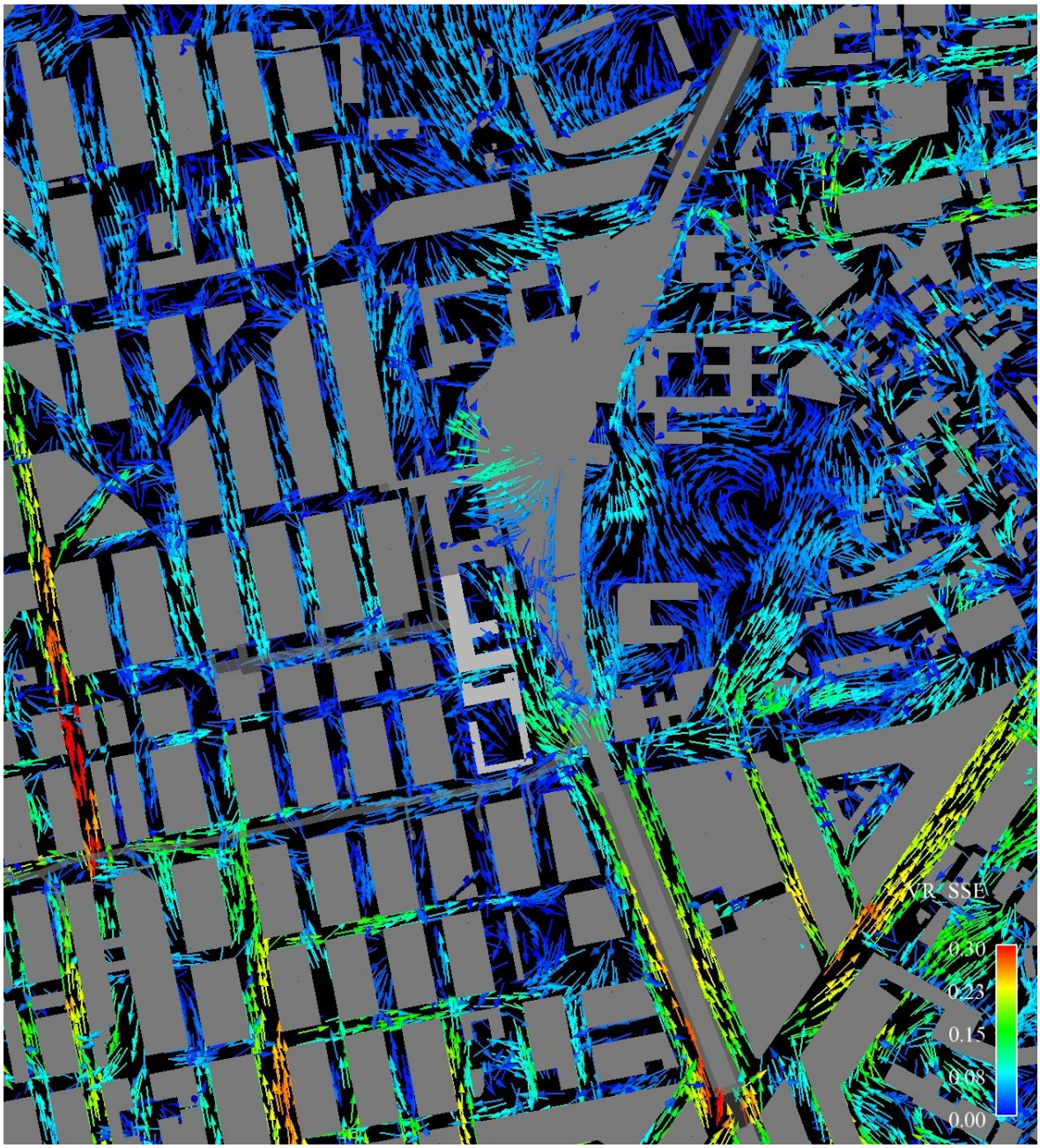


Figure E8 Vector plot of VR of Existing Scheme under SSE wind

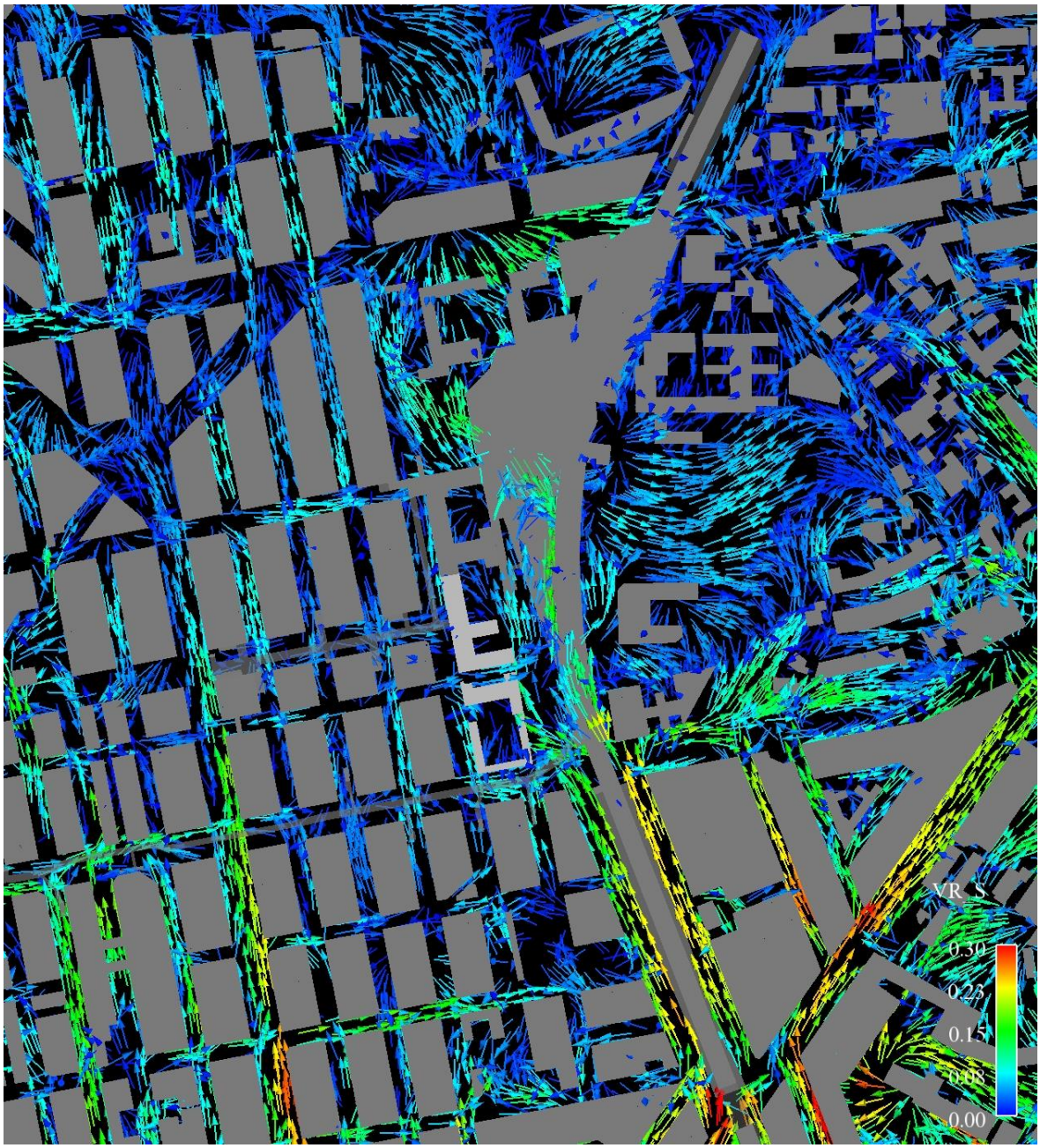


Figure E9 Vector plot of VR of Existing Scheme under S wind

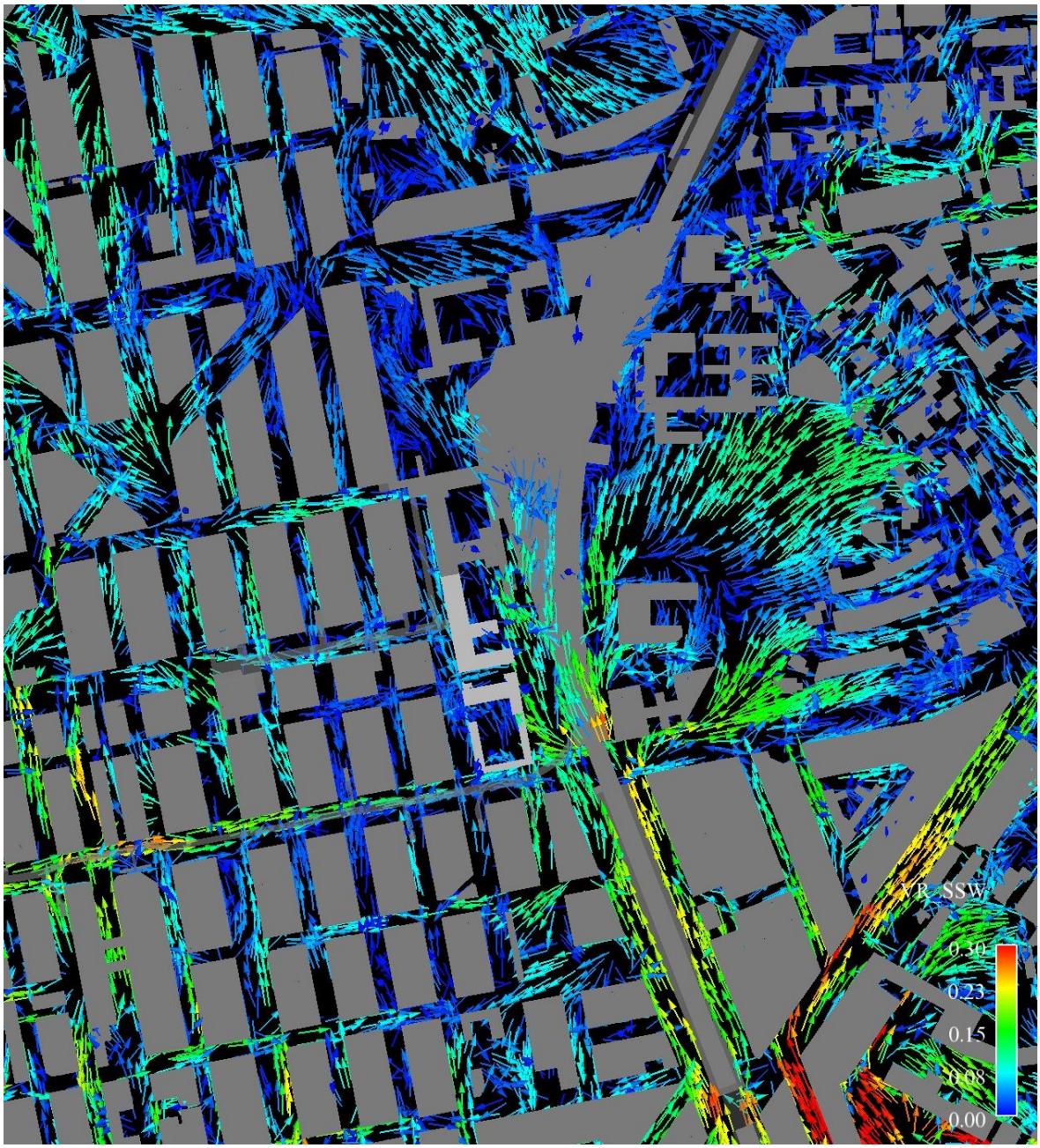


Figure E10 Vector plot of VR of Existing Scheme under SSW wind

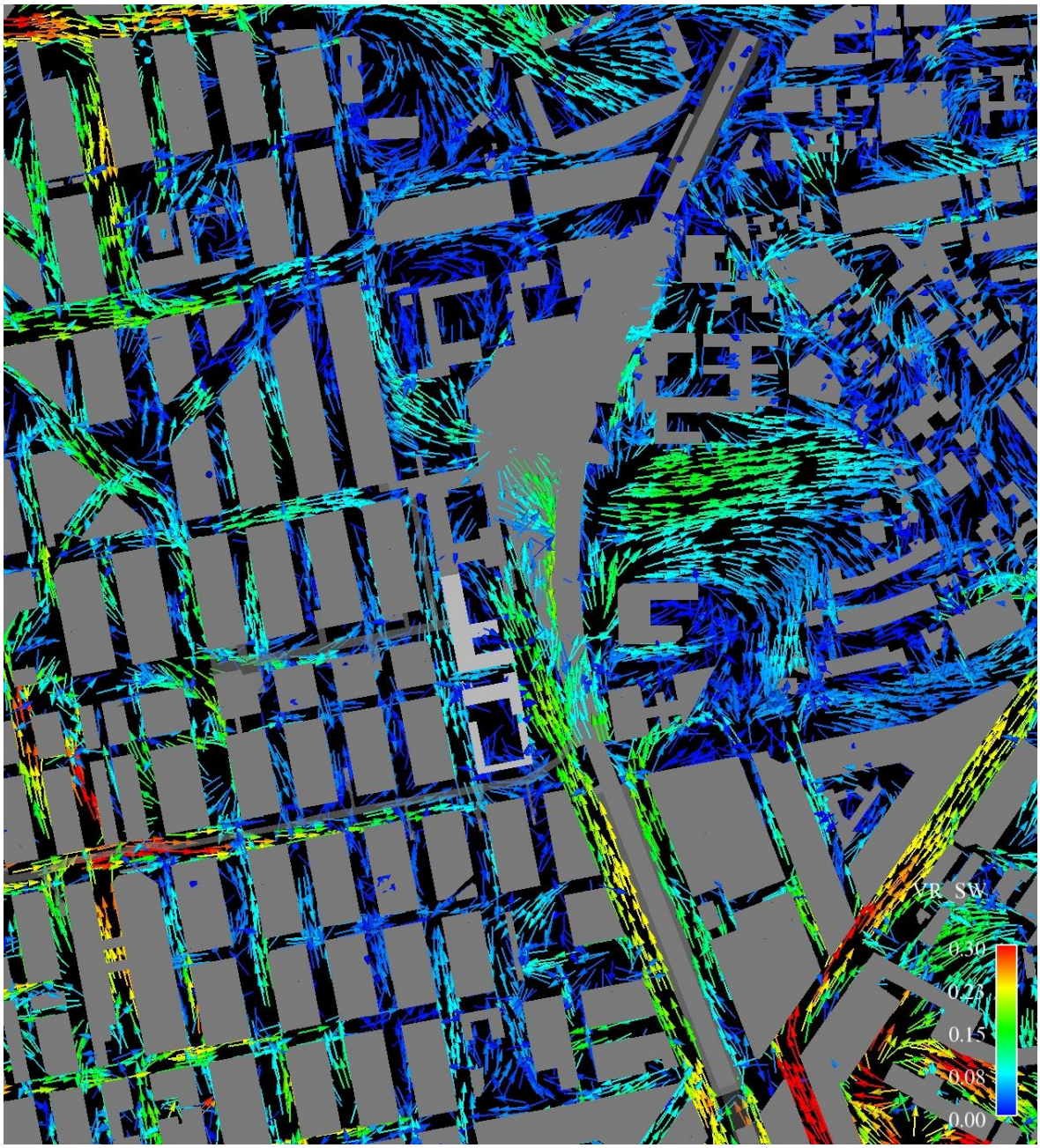


Figure E11 Vector plot of VR of Existing Scheme under SW wind

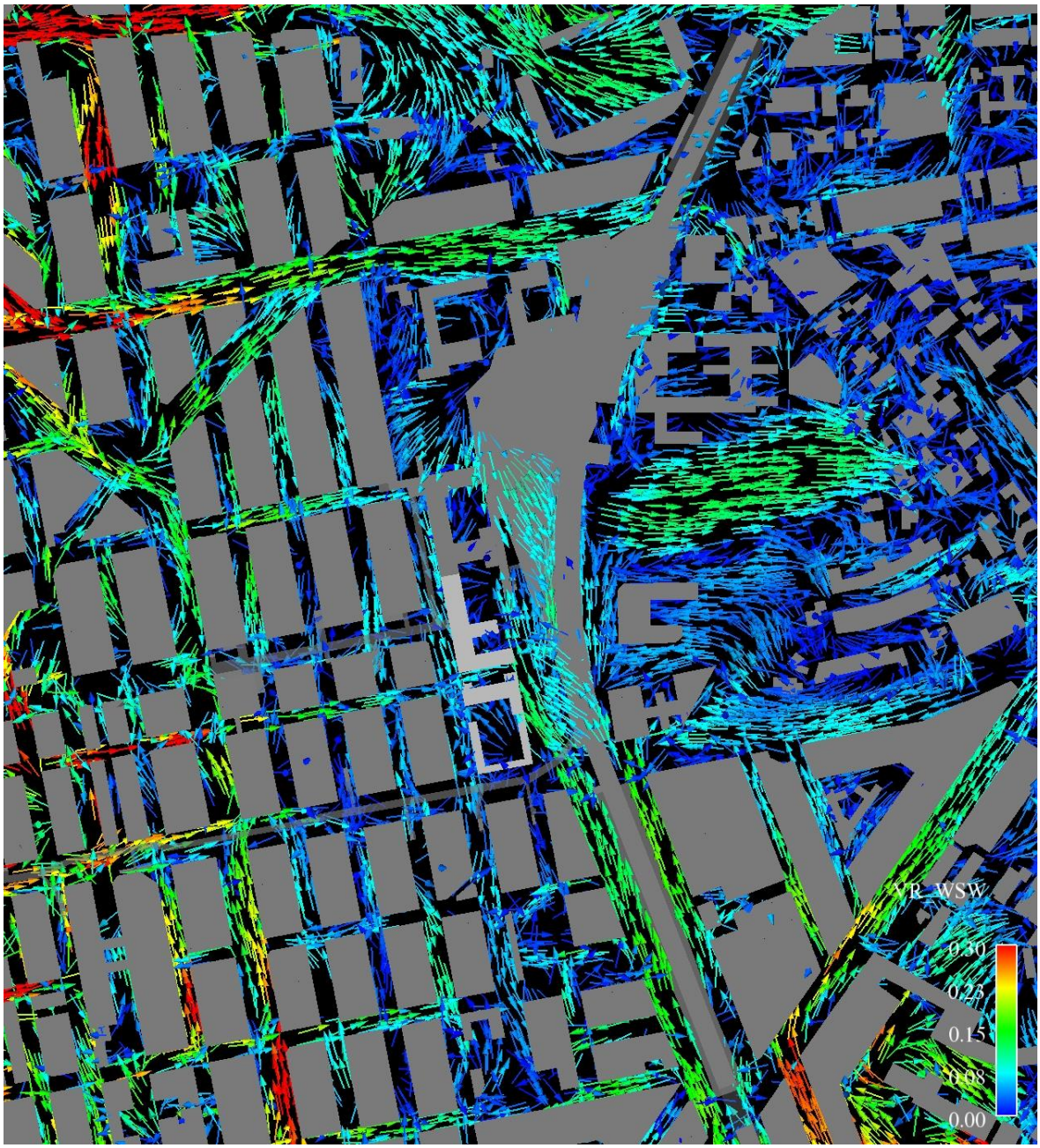


Figure E12 Vector plot of VR of Existing Scheme under WSW wind

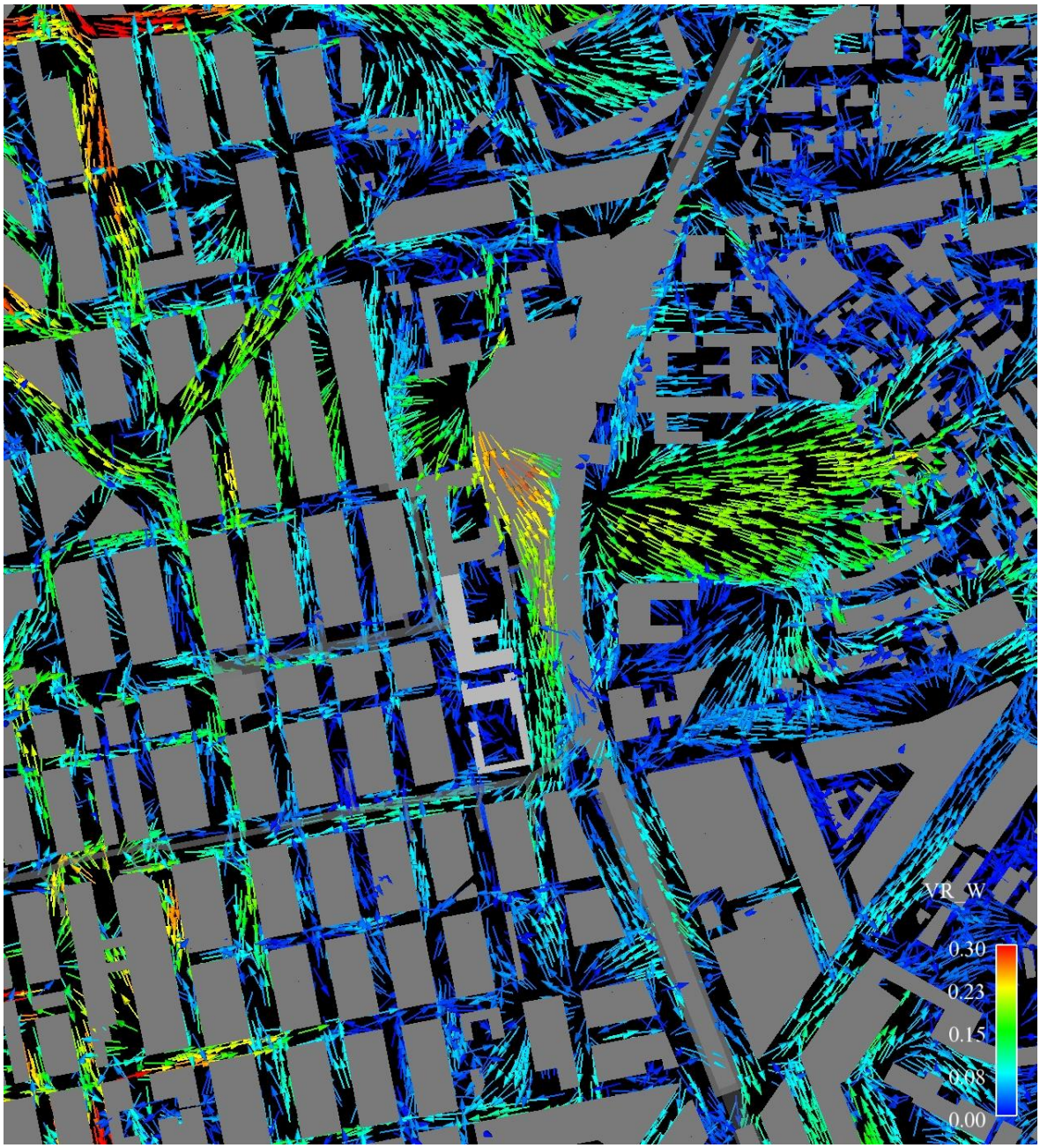


Figure E13 Vector plot of VR of Existing Scheme under W wind

E2 Recommended Development Scheme

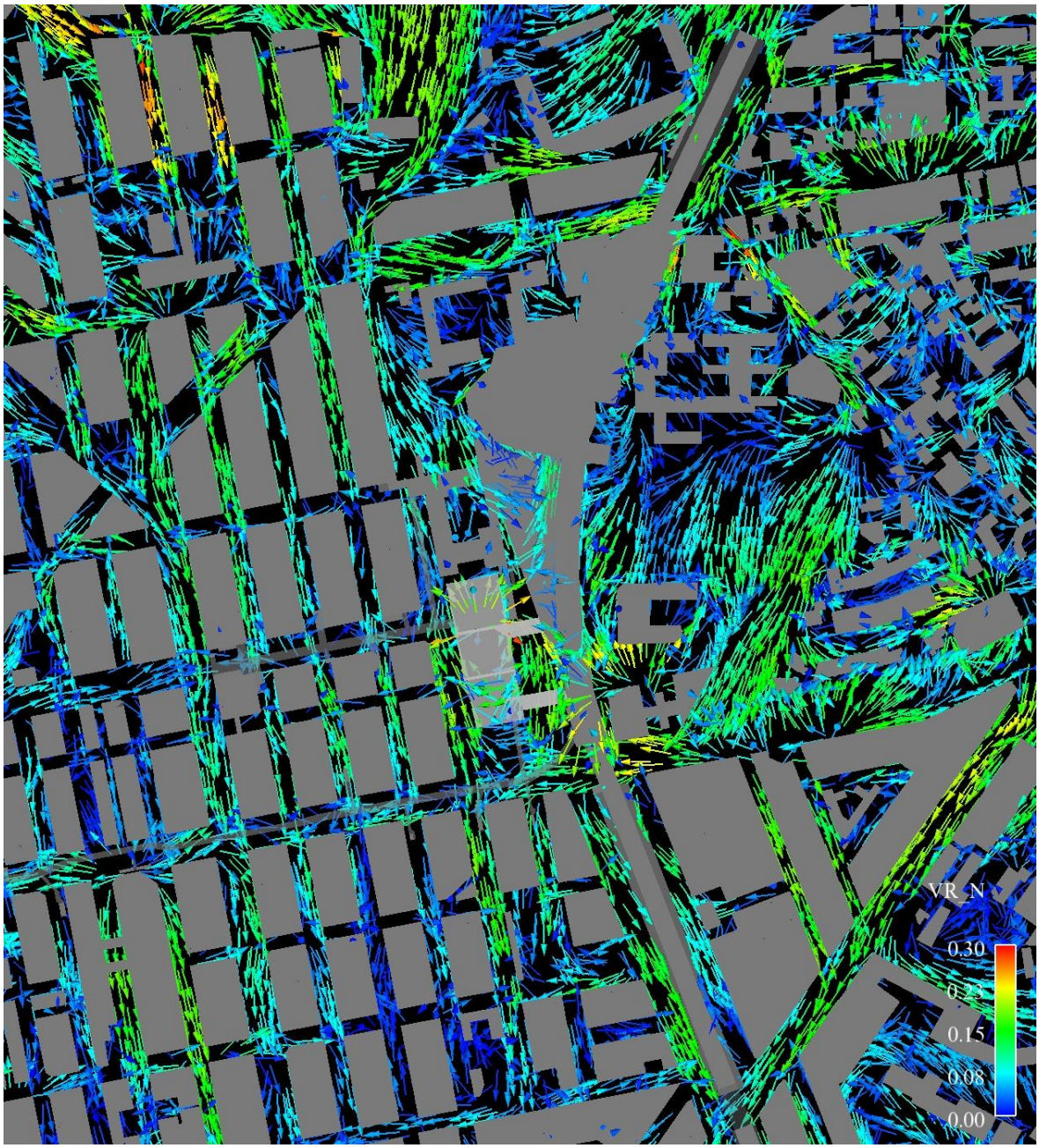


Figure E14 Vector plot of VR of RDS under N wind

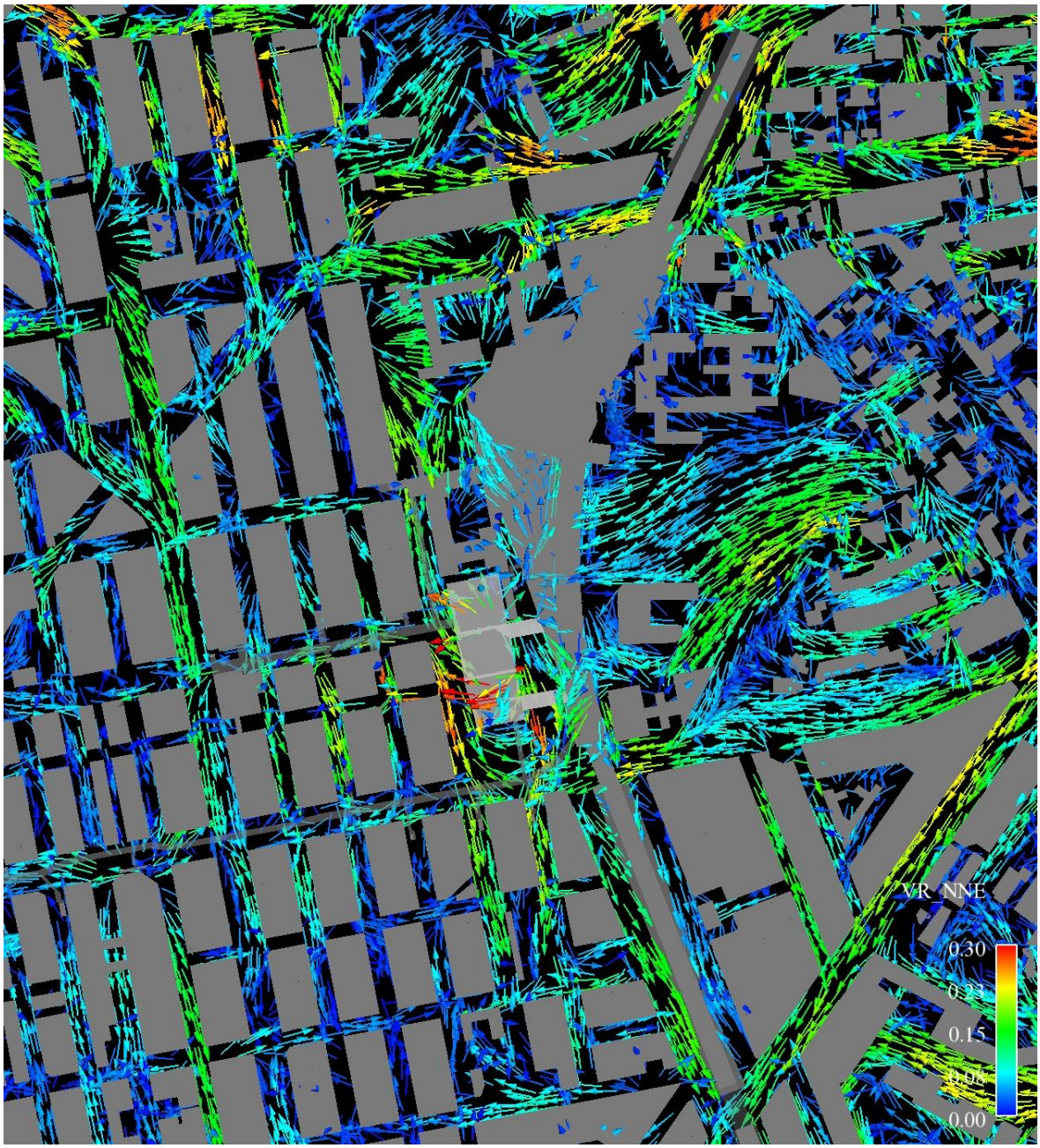


Figure E15 Vector plot of VR of RDS under NNE wind

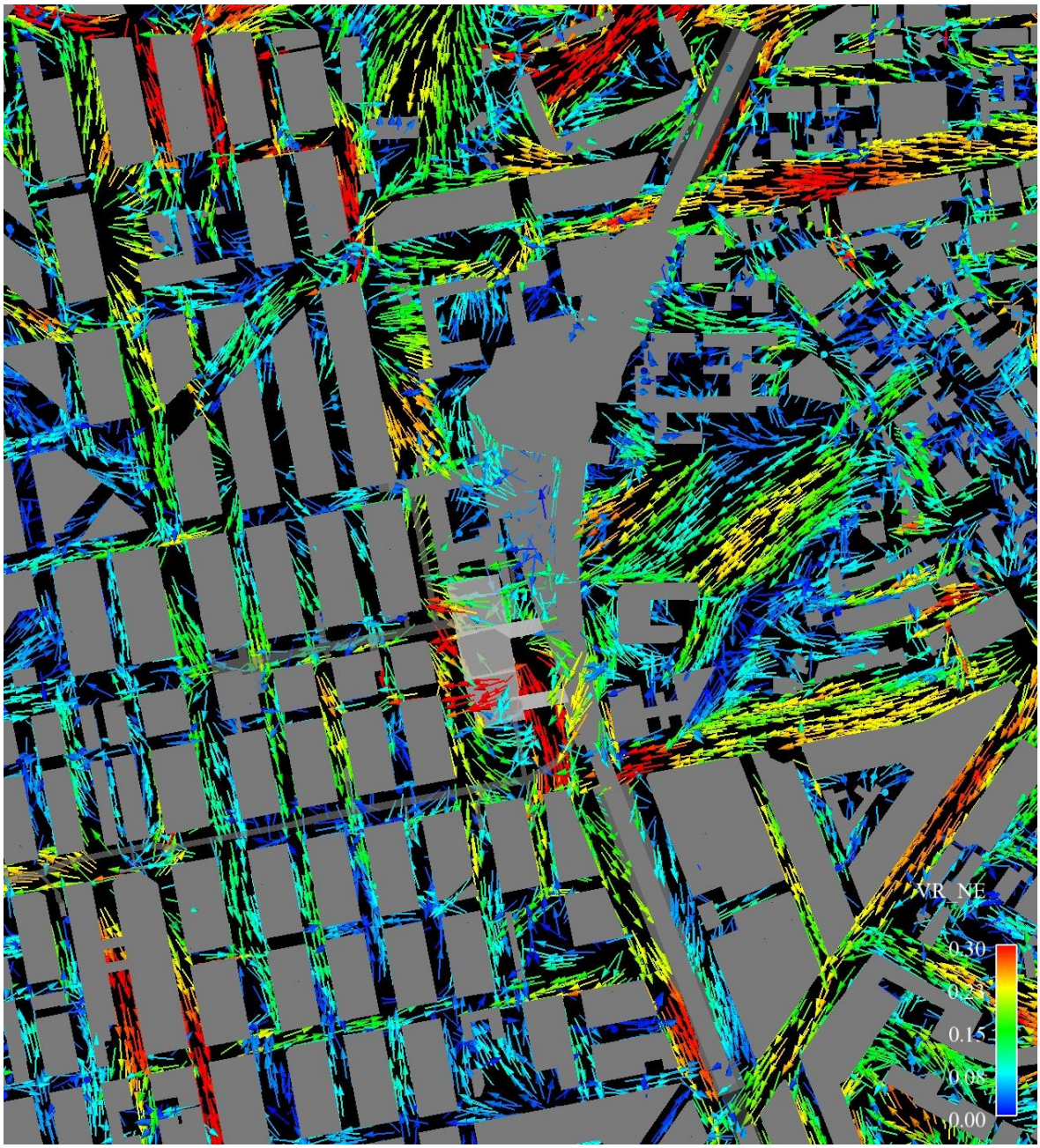


Figure E16 Vector plot of VR of RDS under NE wind

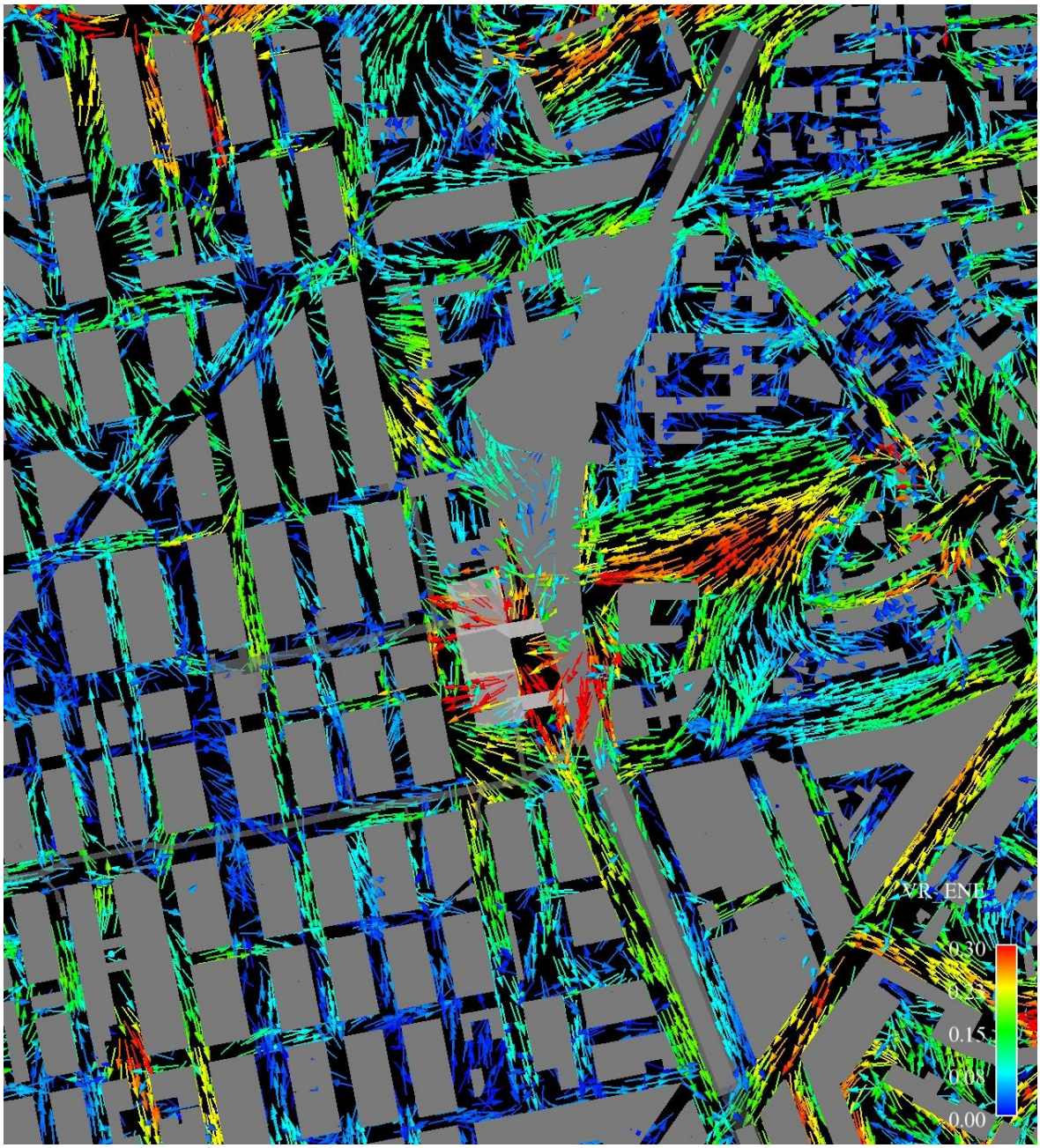


Figure E17 Vector plot of VR of RDS under ENE wind

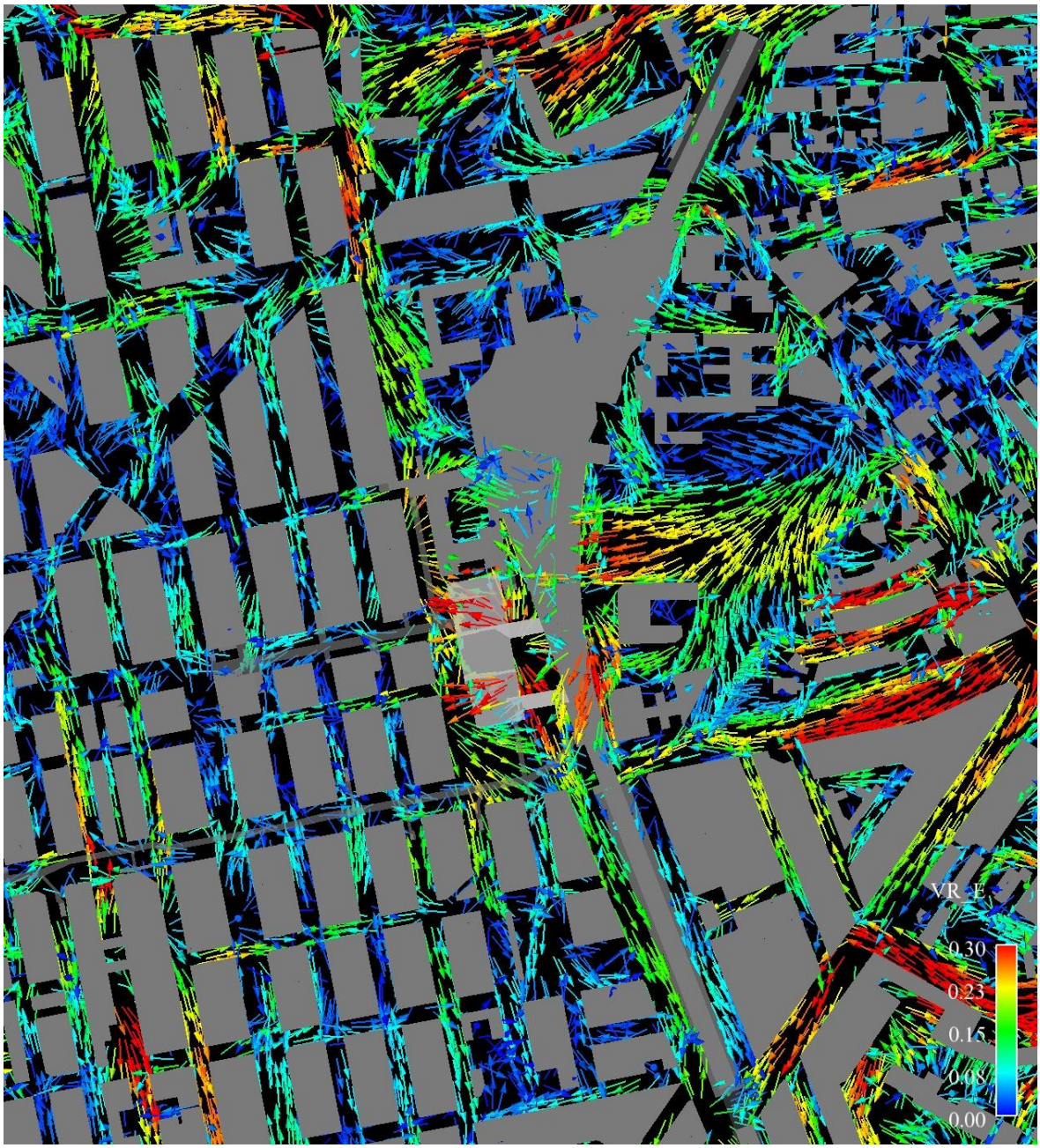


Figure E18 Vector plot of VR of RDS under E wind

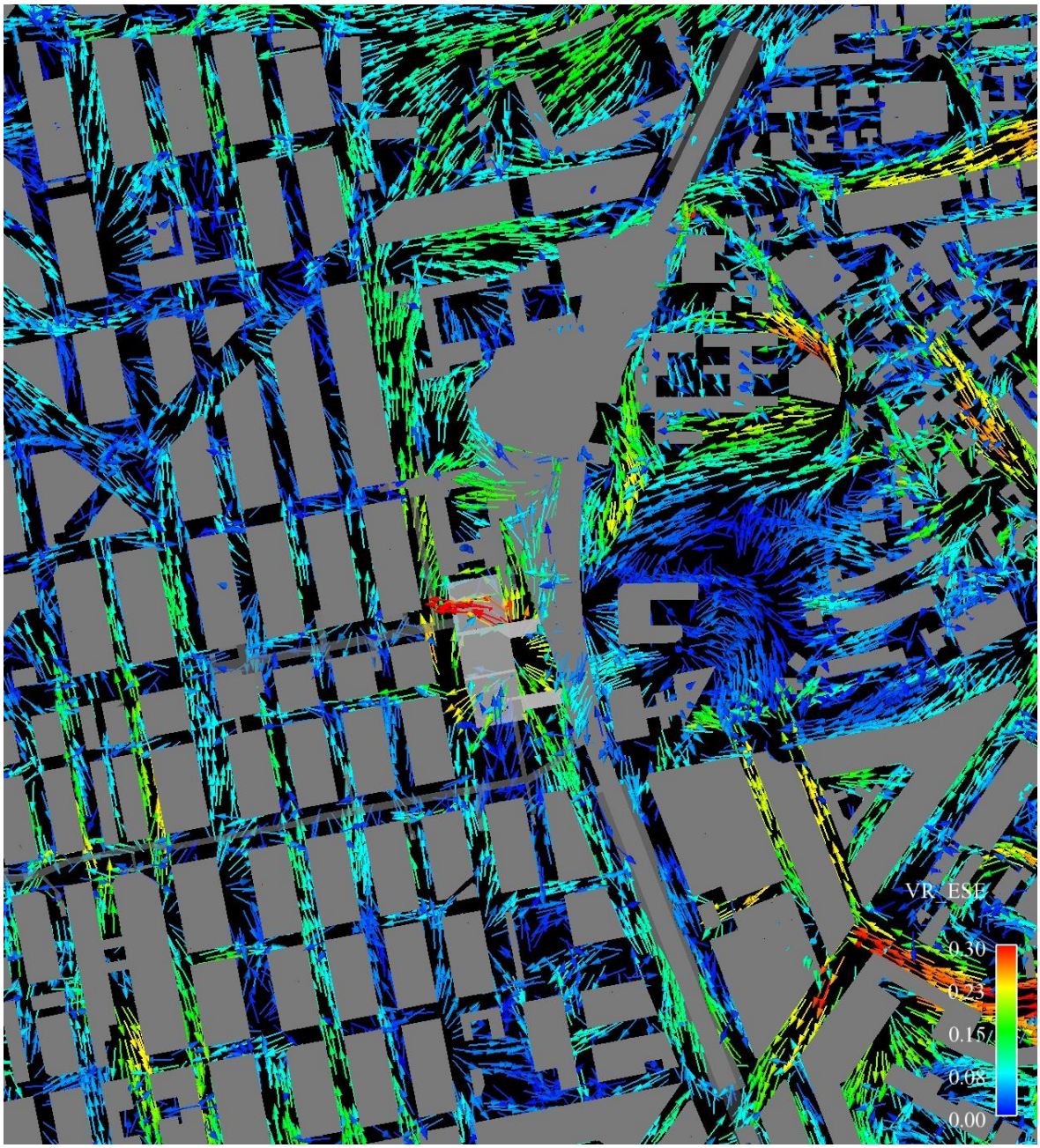


Figure E19 Vector plot of VR of RDS under ESE wind

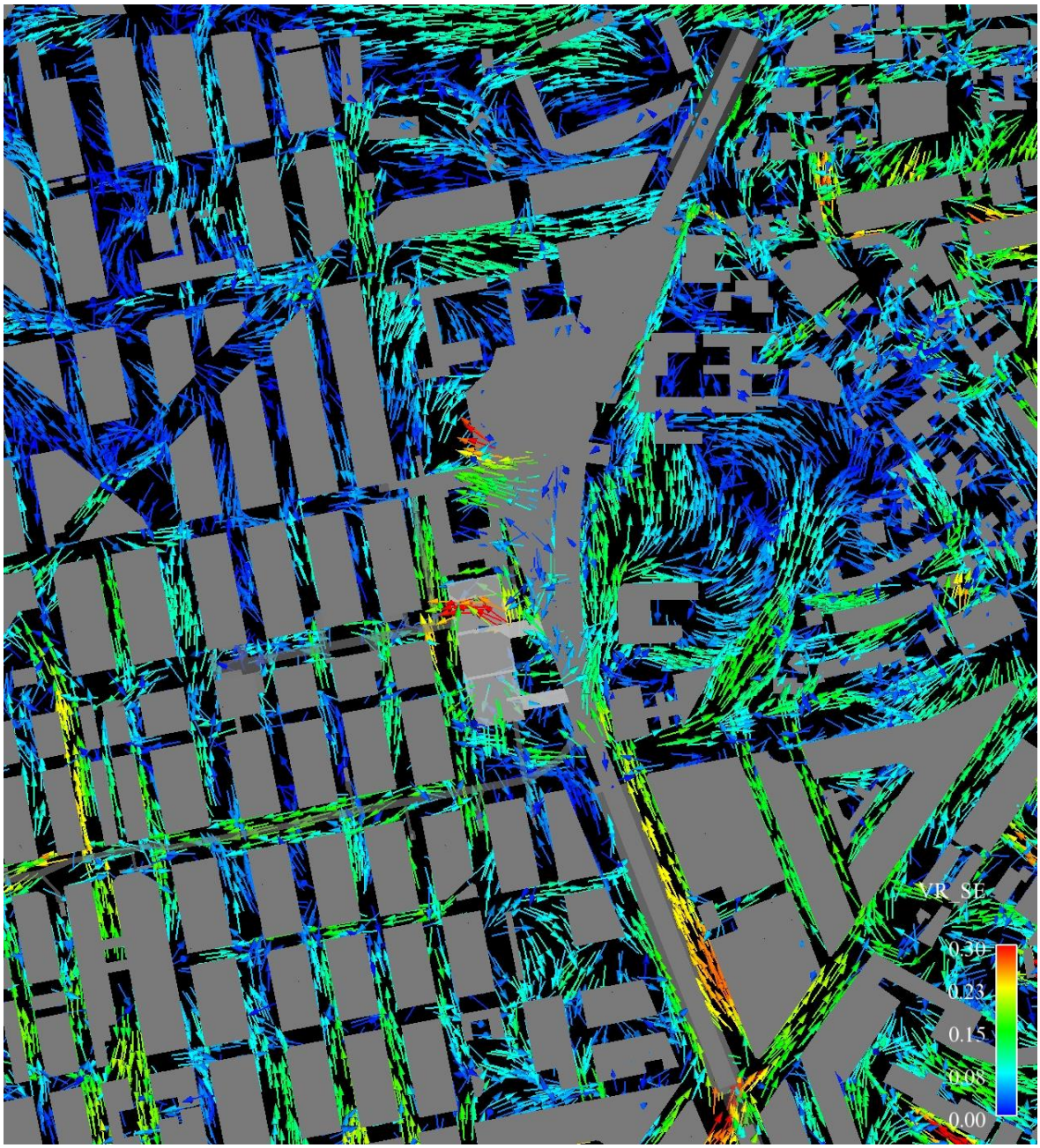


Figure E20 Vector plot of VR of RDS under SE wind

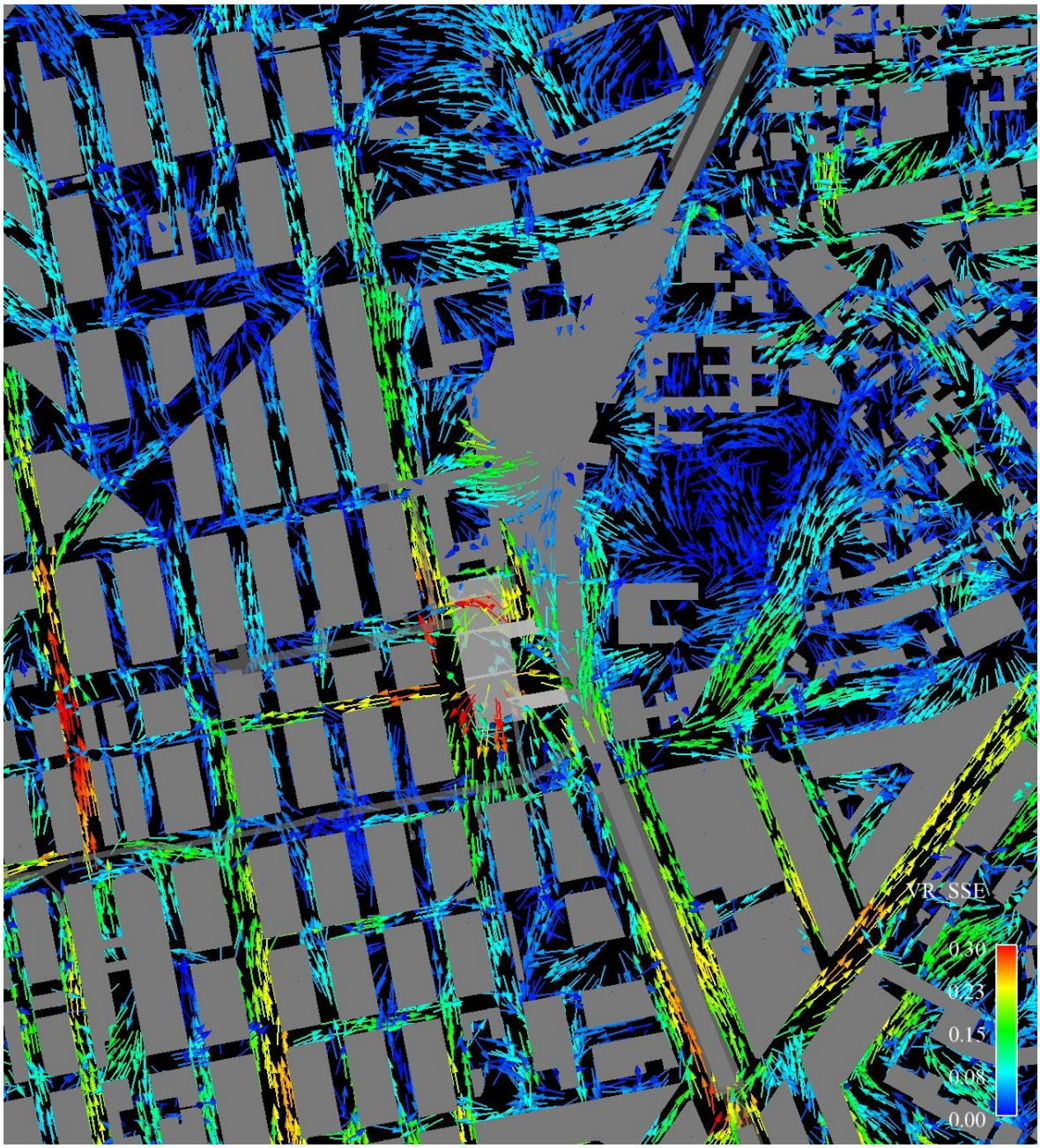


Figure E21 Vector plot of VR of RDS under SSE wind

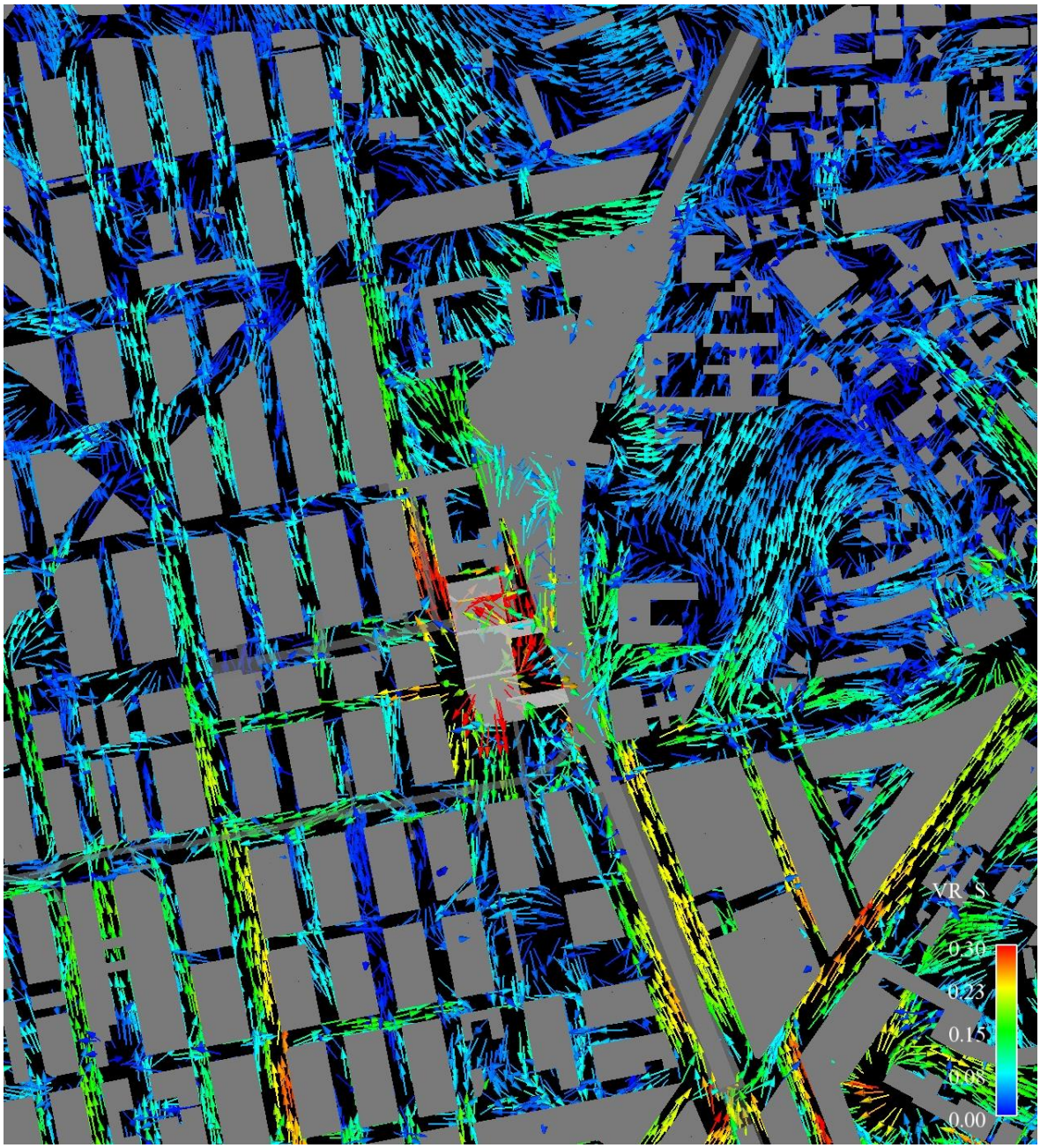


Figure E22 Vector plot of VR of RDS under S wind

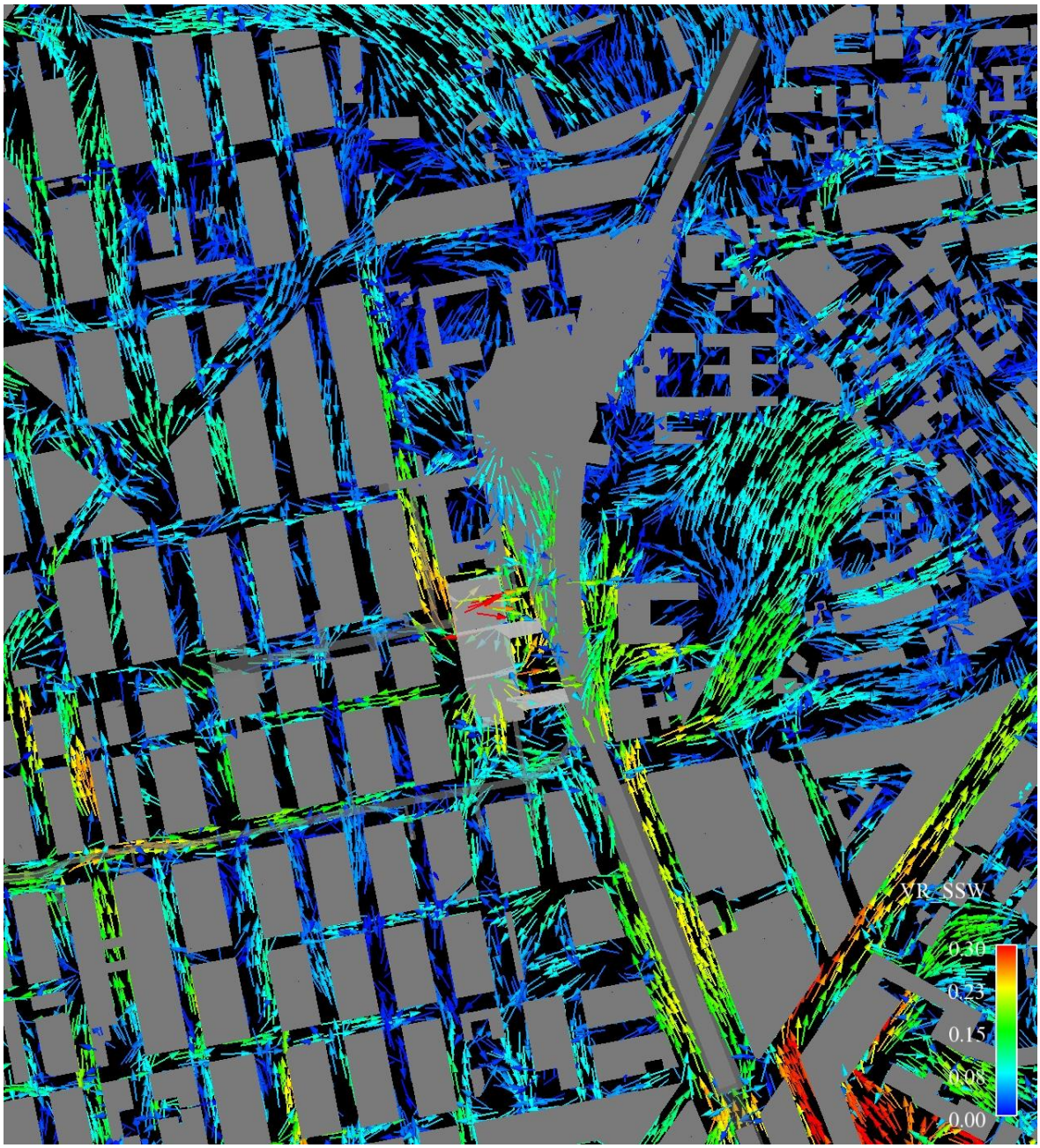


Figure E23 Vector plot of VR of RDS under SSW wind

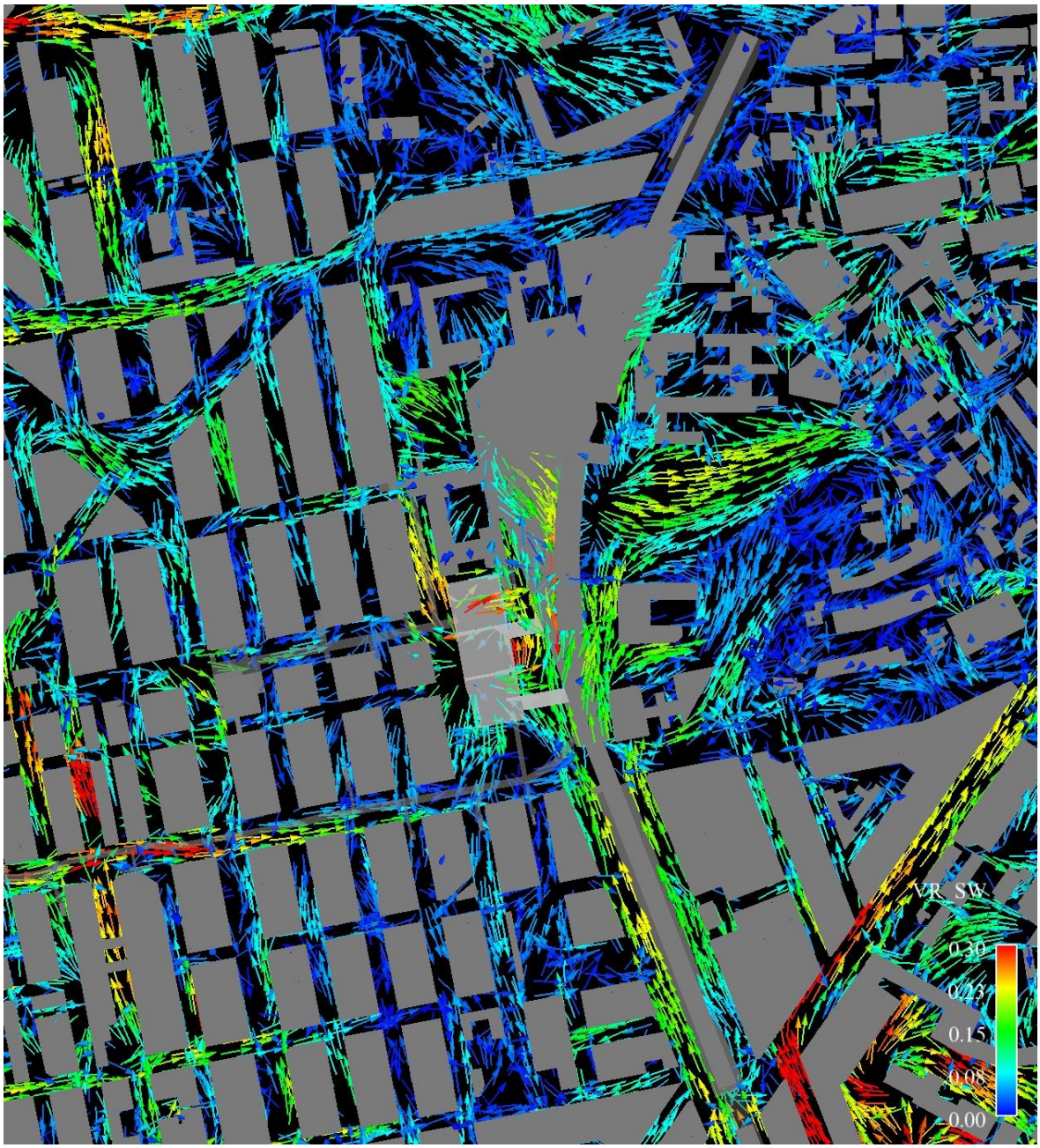


Figure E24 Vector plot of VR of RDS under SW wind

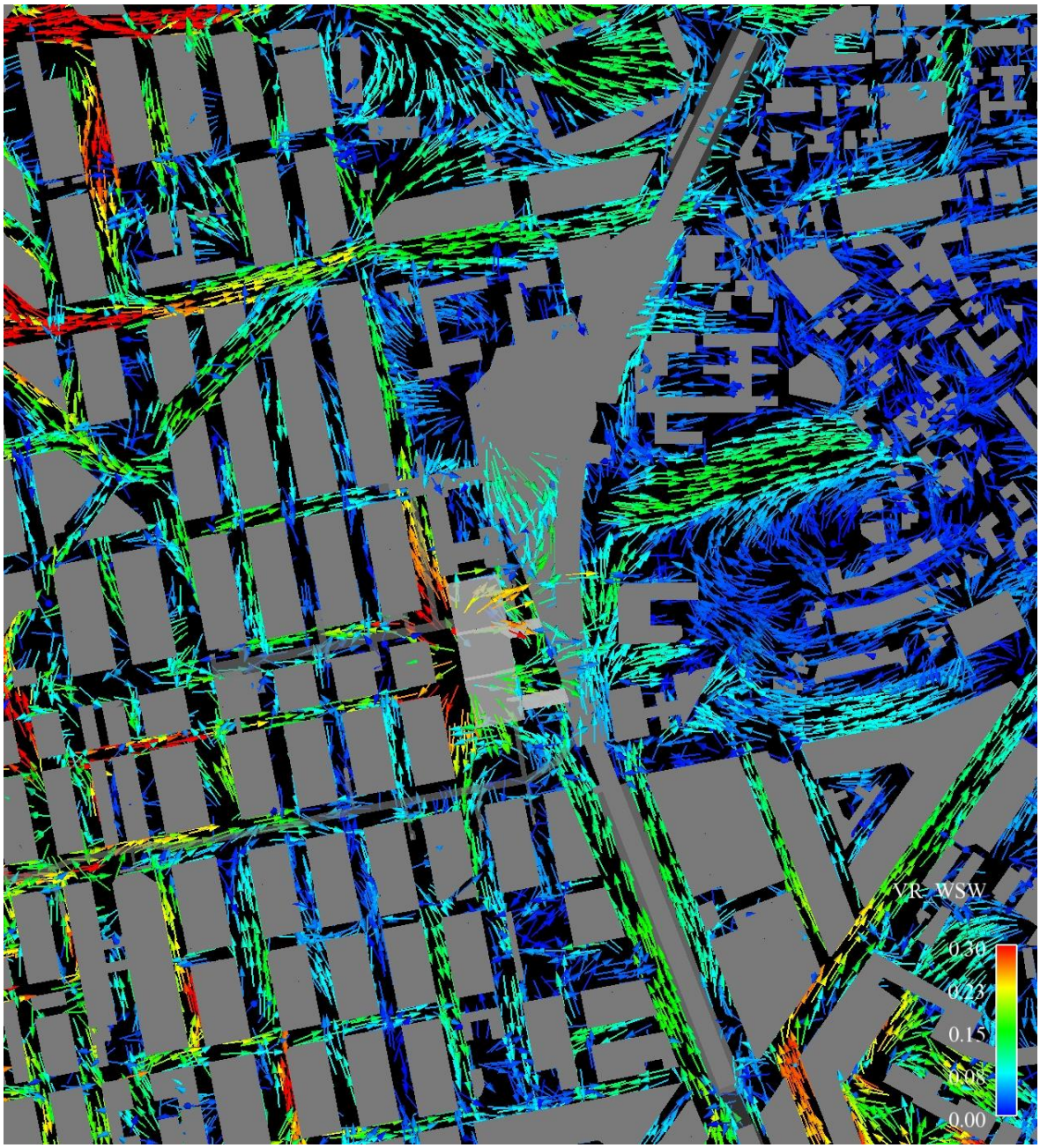


Figure E25 Vector plot of VR of RDS under WSW wind

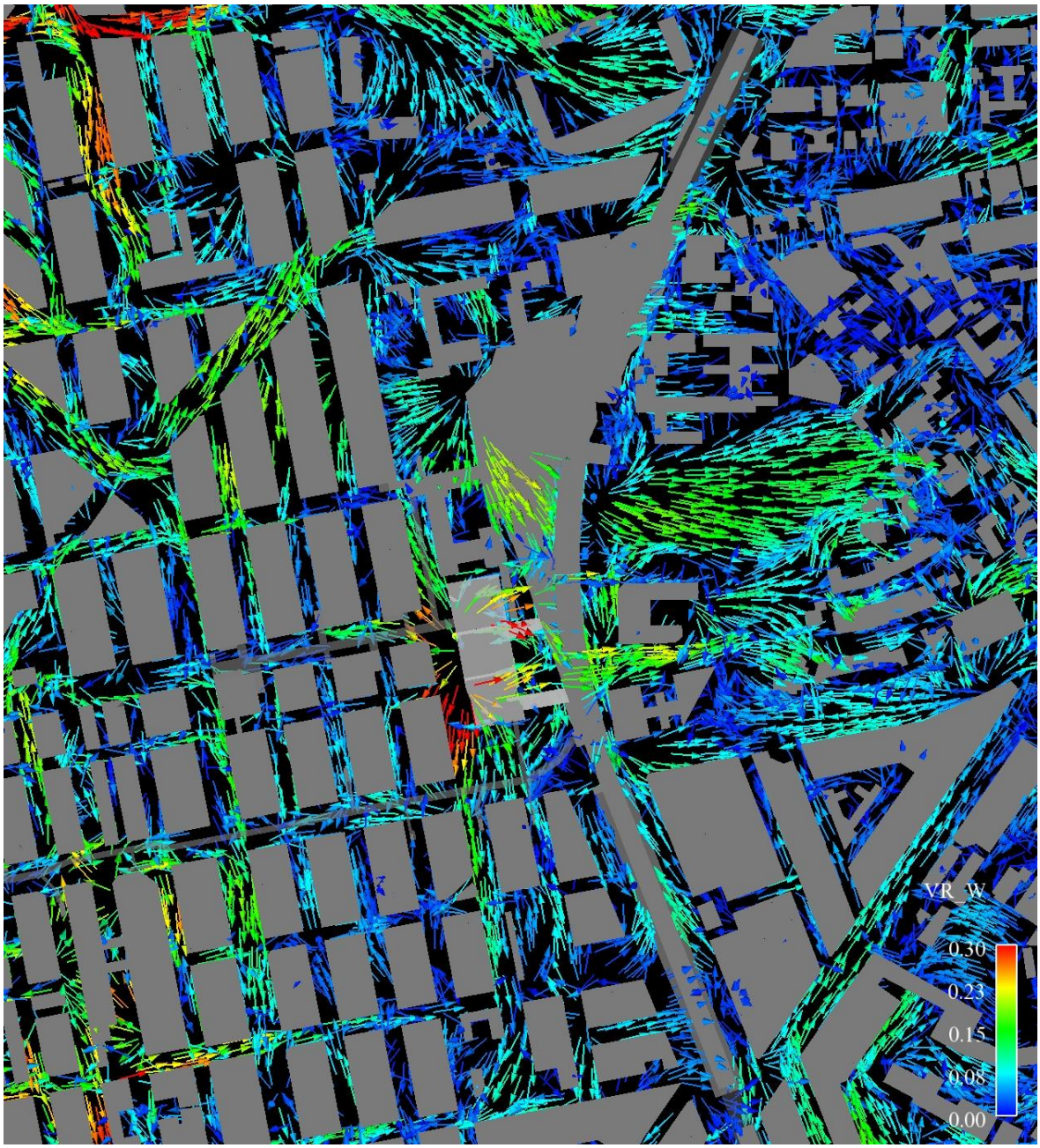


Figure E26 Vector plot of VR of RDS under W wind

Appendix F

VR of All Test Points

F1 Perimeter Test Points

F1.1 Existing Scheme

	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	N	Annual Weighted	Summer Weighted
P1	0.14	0.18	0.15	0.19	0.08	0.17	0.03	0.07	0.06	0.06	0.06	0.07	0.08	0.14	0.09
P2	0.14	0.18	0.15	0.21	0.08	0.16	0.05	0.07	0.06	0.06	0.06	0.06	0.08	0.15	0.10
P3	0.13	0.15	0.12	0.17	0.07	0.17	0.05	0.04	0.05	0.06	0.06	0.06	0.08	0.12	0.08
P4	0.13	0.13	0.08	0.12	0.06	0.16	0.04	0.04	0.05	0.06	0.06	0.05	0.09	0.10	0.07
P5	0.12	0.14	0.09	0.08	0.02	0.13	0.01	0.05	0.01	0.06	0.06	0.02	0.05	0.08	0.05
P6	0.09	0.13	0.06	0.08	0.06	0.13	0.03	0.09	0.02	0.05	0.05	0.01	0.05	0.08	0.06
P7	0.09	0.13	0.10	0.10	0.08	0.15	0.02	0.08	0.06	0.05	0.05	0.01	0.02	0.08	0.07
P8	0.09	0.08	0.17	0.10	0.07	0.13	0.03	0.07	0.09	0.05	0.02	0.04	0.07	0.10	0.07
P9	0.03	0.12	0.05	0.02	0.04	0.04	0.02	0.05	0.07	0.01	0.02	0.03	0.07	0.05	0.03
P10	0.04	0.09	0.19	0.07	0.02	0.11	0.07	0.06	0.08	0.06	0.08	0.10	0.07	0.09	0.07
P11	0.02	0.01	0.06	0.06	0.02	0.18	0.08	0.15	0.15	0.11	0.06	0.01	0.13	0.06	0.09
P12	0.13	0.03	0.11	0.04	0.05	0.10	0.04	0.11	0.08	0.03	0.07	0.05	0.14	0.08	0.06
P13	0.12	0.17	0.21	0.20	0.02	0.05	0.01	0.05	0.08	0.07	0.02	0.01	0.15	0.16	0.07
P14	0.08	0.14	0.15	0.18	0.05	0.02	0.04	0.02	0.11	0.05	0.04	0.07	0.12	0.13	0.07
P15	0.04	0.15	0.32	0.29	0.05	0.07	0.07	0.04	0.06	0.05	0.05	0.04	0.08	0.18	0.09
P16	0.07	0.15	0.25	0.23	0.08	0.03	0.06	0.07	0.13	0.11	0.06	0.01	0.07	0.16	0.10
P17	0.03	0.05	0.10	0.10	0.04	0.03	0.03	0.07	0.14	0.11	0.04	0.07	0.03	0.07	0.08
P18	0.09	0.20	0.22	0.30	0.11	0.03	0.03	0.02	0.14	0.04	0.05	0.15	0.12	0.18	0.10
P19	0.09	0.21	0.11	0.17	0.10	0.05	0.03	0.06	0.09	0.07	0.08	0.16	0.12	0.13	0.09
P20	0.09	0.22	0.08	0.10	0.18	0.02	0.06	0.01	0.02	0.07	0.04	0.07	0.09	0.10	0.06
P21	0.02	0.05	0.01	0.04	0.03	0.03	0.05	0.04	0.01	0.04	0.01	0.04	0.01	0.03	0.03
P22	0.03	0.12	0.08	0.13	0.13	0.06	0.08	0.03	0.01	0.02	0.02	0.01	0.02	0.08	0.06
P23	0.05	0.05	0.06	0.02	0.09	0.01	0.01	0.05	0.02	0.07	0.03	0.04	0.01	0.04	0.04
P24	0.03	0.05	0.04	0.04	0.06	0.10	0.09	0.11	0.03	0.12	0.07	0.16	0.06	0.05	0.08
P25	0.06	0.06	0.03	0.05	0.08	0.14	0.10	0.08	0.04	0.08	0.09	0.26	0.01	0.05	0.09
P26	0.08	0.02	0.05	0.03	0.12	0.10	0.10	0.06	0.05	0.04	0.09	0.22	0.08	0.05	0.08
P27	0.05	0.09	0.11	0.04	0.16	0.06	0.06	0.09	0.07	0.03	0.07	0.19	0.08	0.07	0.08
P28	0.06	0.04	0.05	0.09	0.12	0.04	0.04	0.09	0.10	0.02	0.06	0.17	0.04	0.07	0.08
P29	0.02	0.11	0.09	0.16	0.05	0.05	0.06	0.05	0.11	0.04	0.01	0.12	0.01	0.09	0.08
P30	0.04	0.06	0.04	0.11	0.02	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.06	0.04

F1.2 Recommended Development Scheme

	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	N	Annual Weighted	Summer Weighted
P1	0.09	0.15	0.15	0.27	0.13	0.14	0.18	0.27	0.22	0.22	0.26	0.15	0.05	0.17	0.22
P2	0.17	0.23	0.18	0.26	0.13	0.15	0.22	0.30	0.25	0.26	0.29	0.17	0.09	0.20	0.24
P3	0.23	0.31	0.12	0.19	0.10	0.15	0.20	0.29	0.23	0.23	0.34	0.25	0.14	0.19	0.22
P4	0.23	0.16	0.06	0.20	0.23	0.21	0.23	0.06	0.10	0.14	0.29	0.29	0.19	0.16	0.19
P5	0.19	0.13	0.16	0.19	0.11	0.11	0.12	0.19	0.09	0.11	0.30	0.41	0.19	0.17	0.18
P6	0.15	0.17	0.17	0.13	0.06	0.08	0.15	0.22	0.12	0.09	0.24	0.32	0.15	0.14	0.15
P7	0.16	0.17	0.23	0.22	0.07	0.09	0.16	0.20	0.11	0.06	0.19	0.20	0.10	0.17	0.14
P8	0.18	0.20	0.23	0.22	0.05	0.10	0.14	0.13	0.09	0.05	0.07	0.09	0.09	0.17	0.11
P9	0.08	0.09	0.13	0.10	0.02	0.04	0.13	0.16	0.08	0.01	0.02	0.10	0.05	0.09	0.07
P10	0.20	0.31	0.08	0.15	0.08	0.06	0.01	0.10	0.11	0.01	0.06	0.03	0.08	0.13	0.07
P11	0.07	0.10	0.08	0.06	0.03	0.13	0.07	0.11	0.10	0.09	0.04	0.01	0.13	0.08	0.07
P12	0.13	0.04	0.10	0.05	0.05	0.11	0.05	0.12	0.08	0.04	0.02	0.14	0.14	0.08	0.07
P13	0.15	0.23	0.24	0.21	0.06	0.03	0.10	0.02	0.13	0.12	0.04	0.02	0.19	0.18	0.09
P14	0.10	0.11	0.15	0.18	0.07	0.08	0.06	0.13	0.19	0.15	0.08	0.17	0.16	0.14	0.13
P15	0.02	0.13	0.31	0.27	0.04	0.08	0.03	0.09	0.16	0.14	0.06	0.08	0.07	0.18	0.12
P16	0.05	0.13	0.26	0.24	0.06	0.11	0.09	0.12	0.18	0.19	0.12	0.13	0.10	0.17	0.15
P17	0.02	0.05	0.03	0.04	0.06	0.12	0.11	0.13	0.16	0.14	0.10	0.10	0.08	0.06	0.11
P18	0.06	0.18	0.19	0.26	0.03	0.15	0.11	0.12	0.11	0.03	0.03	0.06	0.15	0.17	0.11
P19	0.09	0.23	0.15	0.25	0.12	0.12	0.08	0.03	0.02	0.11	0.07	0.11	0.13	0.17	0.11
P20	0.07	0.21	0.08	0.06	0.17	0.02	0.05	0.04	0.04	0.07	0.05	0.05	0.09	0.09	0.06
P21	0.02	0.04	0.01	0.03	0.02	0.04	0.04	0.05	0.02	0.05	0.01	0.02	0.01	0.03	0.03
P22	0.01	0.12	0.05	0.08	0.15	0.12	0.10	0.16	0.05	0.05	0.02	0.02	0.03	0.07	0.08
P23	0.05	0.06	0.07	0.08	0.09	0.01	0.01	0.04	0.04	0.08	0.04	0.04	0.02	0.06	0.05
P24	0.03	0.03	0.03	0.05	0.07	0.23	0.17	0.10	0.13	0.23	0.12	0.17	0.11	0.07	0.14
P25	0.07	0.10	0.09	0.03	0.08	0.26	0.17	0.07	0.08	0.10	0.11	0.20	0.02	0.06	0.11
P26	0.07	0.10	0.06	0.07	0.14	0.19	0.13	0.16	0.03	0.03	0.09	0.18	0.06	0.08	0.10
P27	0.05	0.05	0.13	0.13	0.16	0.16	0.07	0.15	0.01	0.05	0.06	0.15	0.06	0.10	0.10
P28	0.10	0.09	0.27	0.28	0.20	0.11	0.17	0.13	0.16	0.03	0.07	0.10	0.07	0.18	0.14
P29	0.08	0.03	0.33	0.29	0.21	0.17	0.20	0.26	0.16	0.07	0.06	0.03	0.06	0.19	0.17
P30	0.06	0.09	0.09	0.11	0.07	0.10	0.11	0.18	0.14	0.13	0.11	0.07	0.05	0.09	0.12

F2 Overall Test Points

F2.1 Existing Scheme

	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	N	Annual Weighted	Summer Weighted
O1	0.06	0.10	0.11	0.15	0.10	0.04	0.02	0.02	0.04	0.09	0.22	0.01	0.13	0.11	0.09
O2	0.06	0.08	0.07	0.05	0.04	0.01	0.03	0.05	0.01	0.11	0.22	0.06	0.07	0.06	0.07
O3	0.11	0.09	0.13	0.12	0.05	0.04	0.06	0.06	0.04	0.08	0.19	0.15	0.13	0.11	0.09
O4	0.13	0.06	0.07	0.21	0.11	0.10	0.03	0.06	0.06	0.04	0.15	0.06	0.07	0.12	0.10
O5	0.16	0.11	0.07	0.03	0.10	0.08	0.04	0.08	0.04	0.03	0.15	0.06	0.14	0.08	0.06
O6	0.02	0.02	0.03	0.03	0.11	0.11	0.06	0.12	0.04	0.02	0.13	0.04	0.06	0.04	0.07
O7	0.10	0.11	0.08	0.11	0.12	0.10	0.07	0.13	0.01	0.05	0.10	0.07	0.11	0.10	0.08
O8	0.23	0.25	0.17	0.02	0.02	0.08	0.06	0.09	0.03	0.02	0.10	0.06	0.20	0.12	0.05
O9	0.16	0.24	0.10	0.14	0.08	0.02	0.02	0.06	0.03	0.05	0.07	0.08	0.10	0.12	0.07
O10	0.12	0.27	0.04	0.05	0.05	0.14	0.02	0.01	0.01	0.04	0.02	0.04	0.10	0.08	0.04
O11	0.17	0.31	0.11	0.17	0.13	0.30	0.20	0.07	0.13	0.12	0.04	0.01	0.08	0.15	0.13
O12	0.06	0.13	0.04	0.09	0.08	0.08	0.03	0.04	0.04	0.08	0.09	0.10	0.03	0.07	0.07
O13	0.13	0.14	0.15	0.03	0.09	0.09	0.07	0.05	0.06	0.10	0.12	0.12	0.13	0.10	0.08
O14	0.06	0.12	0.21	0.19	0.03	0.06	0.07	0.05	0.06	0.11	0.18	0.12	0.12	0.14	0.10
O15	0.05	0.05	0.12	0.05	0.02	0.02	0.06	0.08	0.11	0.10	0.13	0.09	0.08	0.07	0.07
O16	0.08	0.07	0.05	0.07	0.05	0.02	0.06	0.04	0.09	0.07	0.08	0.06	0.07	0.06	0.06
O17	0.20	0.24	0.18	0.19	0.03	0.16	0.03	0.03	0.02	0.01	0.04	0.06	0.12	0.16	0.07
O18	0.08	0.09	0.07	0.12	0.12	0.08	0.01	0.06	0.07	0.04	0.09	0.06	0.04	0.08	0.07
O19	0.08	0.16	0.12	0.09	0.11	0.05	0.03	0.03	0.16	0.21	0.16	0.11	0.06	0.10	0.11
O20	0.05	0.15	0.18	0.16	0.07	0.04	0.02	0.06	0.01	0.02	0.03	0.02	0.08	0.12	0.05
O21	0.05	0.06	0.09	0.08	0.04	0.02	0.04	0.06	0.04	0.01	0.03	0.04	0.04	0.06	0.04
O22	0.05	0.10	0.10	0.15	0.01	0.03	0.02	0.04	0.02	0.03	0.07	0.04	0.04	0.09	0.06
O23	0.05	0.17	0.07	0.11	0.14	0.10	0.07	0.05	0.08	0.08	0.29	0.09	0.01	0.08	0.11
O24	0.07	0.05	0.05	0.05	0.05	0.07	0.06	0.05	0.09	0.13	0.24	0.05	0.09	0.06	0.09
O25	0.07	0.13	0.12	0.13	0.12	0.04	0.04	0.07	0.05	0.04	0.18	0.07	0.09	0.11	0.09
O26	0.08	0.16	0.12	0.13	0.03	0.02	0.02	0.06	0.01	0.04	0.13	0.04	0.09	0.10	0.06
O27	0.07	0.16	0.09	0.08	0.05	0.04	0.02	0.04	0.02	0.04	0.08	0.06	0.05	0.08	0.05
O28	0.11	0.26	0.17	0.23	0.21	0.15	0.06	0.03	0.10	0.29	0.10	0.12	0.09	0.18	0.16
O29	0.07	0.04	0.13	0.05	0.04	0.07	0.08	0.11	0.14	0.26	0.04	0.01	0.07	0.08	0.10
O30	0.06	0.14	0.14	0.09	0.12	0.13	0.04	0.05	0.04	0.16	0.02	0.08	0.05	0.10	0.09
O31	0.04	0.09	0.09	0.08	0.04	0.13	0.03	0.03	0.05	0.10	0.03	0.10	0.07	0.07	0.07

	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	N	Annual Weighted	Summer Weighted
O32	0.11	0.15	0.12	0.02	0.01	0.14	0.04	0.07	0.03	0.08	0.07	0.11	0.14	0.08	0.06
O33	0.16	0.22	0.15	0.15	0.10	0.05	0.04	0.11	0.09	0.09	0.24	0.03	0.16	0.15	0.11
O34	0.06	0.09	0.08	0.16	0.10	0.10	0.10	0.14	0.05	0.03	0.17	0.07	0.07	0.10	0.10
O35	0.06	0.07	0.11	0.08	0.11	0.11	0.16	0.07	0.03	0.04	0.08	0.04	0.04	0.08	0.08
O36	0.02	0.08	0.04	0.12	0.02	0.17	0.13	0.01	0.07	0.02	0.06	0.05	0.05	0.06	0.07
O37	0.06	0.08	0.02	0.09	0.07	0.18	0.08	0.02	0.09	0.04	0.11	0.06	0.06	0.06	0.08
O38	0.08	0.13	0.18	0.10	0.07	0.13	0.07	0.08	0.12	0.05	0.07	0.04	0.13	0.12	0.08
O39	0.07	0.23	0.10	0.10	0.09	0.13	0.04	0.03	0.11	0.06	0.07	0.02	0.17	0.11	0.07
O40	0.07	0.16	0.13	0.11	0.04	0.03	0.22	0.17	0.06	0.05	0.21	0.14	0.10	0.11	0.11
O41	0.08	0.03	0.07	0.06	0.12	0.13	0.13	0.15	0.09	0.06	0.13	0.03	0.06	0.07	0.10
O42	0.06	0.04	0.05	0.03	0.01	0.14	0.15	0.16	0.06	0.02	0.10	0.01	0.04	0.05	0.07
O43	0.04	0.05	0.01	0.13	0.03	0.14	0.10	0.14	0.04	0.06	0.08	0.06	0.06	0.07	0.09
O44	0.07	0.16	0.14	0.03	0.04	0.13	0.11	0.11	0.06	0.05	0.05	0.05	0.08	0.08	0.07
O45	0.09	0.09	0.11	0.07	0.04	0.06	0.05	0.04	0.07	0.02	0.06	0.02	0.10	0.08	0.05
O46	0.03	0.04	0.04	0.10	0.07	0.14	0.17	0.18	0.10	0.07	0.08	0.09	0.07	0.07	0.11
O47	0.06	0.04	0.10	0.01	0.03	0.05	0.06	0.11	0.07	0.01	0.01	0.05	0.03	0.04	0.04
O48	0.03	0.08	0.07	0.08	0.03	0.11	0.05	0.04	0.05	0.01	0.11	0.08	0.04	0.06	0.06
O49	0.05	0.12	0.06	0.11	0.09	0.12	0.04	0.07	0.09	0.11	0.14	0.07	0.07	0.09	0.09
O50	0.05	0.19	0.11	0.16	0.18	0.14	0.04	0.02	0.13	0.18	0.04	0.04	0.02	0.12	0.11
O51	0.11	0.15	0.08	0.06	0.04	0.09	0.08	0.10	0.09	0.05	0.18	0.23	0.12	0.09	0.10
O52	0.15	0.18	0.09	0.11	0.07	0.02	0.03	0.02	0.05	0.04	0.03	0.08	0.14	0.11	0.05
O53	0.16	0.15	0.15	0.14	0.04	0.02	0.03	0.01	0.10	0.06	0.13	0.13	0.12	0.12	0.08
O54	0.11	0.11	0.09	0.13	0.11	0.08	0.07	0.05	0.06	0.06	0.05	0.03	0.07	0.10	0.07
O55	0.08	0.05	0.07	0.01	0.07	0.05	0.01	0.10	0.03	0.06	0.16	0.01	0.09	0.05	0.06
O56	0.06	0.06	0.09	0.03	0.02	0.03	0.12	0.15	0.03	0.02	0.17	0.09	0.05	0.05	0.07
O57	0.10	0.11	0.06	0.01	0.02	0.01	0.18	0.13	0.04	0.02	0.11	0.06	0.08	0.06	0.06
O58	0.10	0.02	0.05	0.07	0.07	0.08	0.08	0.02	0.05	0.10	0.09	0.11	0.06	0.06	0.07
O59	0.04	0.15	0.15	0.03	0.08	0.03	0.04	0.02	0.06	0.07	0.14	0.19	0.15	0.09	0.07
O60	0.12	0.14	0.04	0.13	0.10	0.05	0.03	0.03	0.04	0.04	0.10	0.17	0.18	0.11	0.08
O61	0.07	0.12	0.17	0.14	0.02	0.03	0.05	0.08	0.09	0.04	0.08	0.20	0.13	0.12	0.08
O62	0.03	0.10	0.19	0.09	0.06	0.05	0.08	0.08	0.10	0.09	0.12	0.09	0.11	0.10	0.09
O63	0.08	0.08	0.10	0.10	0.11	0.01	0.02	0.01	0.08	0.04	0.01	0.05	0.10	0.09	0.05
O64	0.07	0.09	0.11	0.08	0.11	0.01	0.03	0.02	0.03	0.06	0.06	0.04	0.07	0.08	0.05
O65	0.07	0.04	0.10	0.06	0.11	0.11	0.07	0.07	0.05	0.05	0.07	0.04	0.05	0.07	0.07
O66	0.08	0.04	0.05	0.03	0.14	0.16	0.04	0.03	0.07	0.10	0.08	0.07	0.02	0.05	0.08

	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	N	Annual Weighted	Summer Weighted
O67	0.12	0.06	0.05	0.04	0.08	0.03	0.06	0.07	0.05	0.05	0.11	0.10	0.10	0.06	0.07
O68	0.01	0.02	0.07	0.10	0.03	0.01	0.02	0.04	0.03	0.05	0.08	0.17	0.07	0.06	0.06
O69	0.01	0.09	0.14	0.07	0.04	0.01	0.04	0.05	0.03	0.10	0.09	0.16	0.10	0.08	0.07
O70	0.03	0.12	0.01	0.04	0.04	0.01	0.06	0.02	0.05	0.03	0.03	0.06	0.07	0.04	0.04
O71	0.07	0.15	0.10	0.12	0.01	0.07	0.02	0.03	0.02	0.02	0.01	0.01	0.07	0.09	0.04
O72	0.01	0.10	0.01	0.06	0.07	0.05	0.03	0.04	0.02	0.01	0.04	0.01	0.02	0.04	0.04
O73	0.01	0.02	0.04	0.01	0.01	0.12	0.03	0.02	0.02	0.03	0.01	0.04	0.05	0.02	0.03
O74	0.02	0.02	0.01	0.04	0.03	0.16	0.02	0.01	0.02	0.02	0.01	0.01	0.02	0.02	0.03
O75	0.07	0.08	0.07	0.10	0.02	0.05	0.07	0.08	0.01	0.05	0.07	0.04	0.11	0.08	0.06
O76	0.01	0.07	0.07	0.06	0.08	0.01	0.03	0.05	0.03	0.01	0.05	0.17	0.14	0.07	0.05
O77	0.03	0.04	0.09	0.02	0.03	0.03	0.06	0.07	0.04	0.04	0.07	0.13	0.13	0.05	0.05
O78	0.05	0.08	0.06	0.06	0.01	0.01	0.07	0.01	0.03	0.03	0.04	0.01	0.01	0.04	0.03
O79	0.05	0.09	0.04	0.03	0.01	0.09	0.01	0.06	0.01	0.03	0.05	0.04	0.01	0.04	0.04
O80	0.04	0.09	0.04	0.02	0.11	0.02	0.04	0.05	0.06	0.02	0.05	0.07	0.04	0.04	0.04
O81	0.03	0.04	0.02	0.14	0.03	0.15	0.01	0.07	0.02	0.05	0.10	0.03	0.03	0.06	0.07
O82	0.01	0.02	0.01	0.13	0.02	0.11	0.14	0.08	0.08	0.07	0.07	0.04	0.01	0.05	0.08
O83	0.20	0.33	0.21	0.30	0.11	0.05	0.05	0.07	0.06	0.04	0.02	0.01	0.12	0.21	0.09
O84	0.08	0.34	0.19	0.29	0.08	0.09	0.03	0.05	0.02	0.04	0.12	0.06	0.04	0.18	0.10
O85	0.11	0.14	0.13	0.18	0.13	0.13	0.05	0.07	0.01	0.07	0.03	0.07	0.08	0.13	0.09
O86	0.19	0.27	0.22	0.13	0.09	0.16	0.05	0.03	0.01	0.04	0.03	0.09	0.10	0.15	0.07
O87	0.15	0.18	0.14	0.24	0.08	0.17	0.03	0.01	0.03	0.05	0.05	0.08	0.06	0.15	0.09
O88	0.09	0.11	0.18	0.09	0.09	0.17	0.01	0.05	0.05	0.03	0.07	0.02	0.10	0.10	0.06
O89	0.08	0.07	0.16	0.04	0.05	0.09	0.02	0.06	0.02	0.05	0.05	0.03	0.10	0.08	0.05
O90	0.02	0.13	0.13	0.01	0.02	0.11	0.07	0.03	0.07	0.04	0.03	0.07	0.07	0.06	0.04
O91	0.06	0.05	0.01	0.03	0.03	0.07	0.03	0.05	0.04	0.03	0.04	0.06	0.02	0.03	0.04
O92	0.20	0.16	0.10	0.05	0.04	0.01	0.01	0.01	0.01	0.04	0.07	0.01	0.09	0.09	0.03
O93	0.16	0.13	0.07	0.05	0.02	0.03	0.02	0.02	0.02	0.06	0.01	0.03	0.05	0.07	0.03
O94	0.25	0.25	0.10	0.07	0.07	0.04	0.04	0.08	0.03	0.05	0.03	0.07	0.18	0.13	0.05
O95	0.22	0.24	0.10	0.08	0.08	0.06	0.05	0.04	0.04	0.05	0.04	0.04	0.17	0.12	0.06
O96	0.07	0.05	0.02	0.04	0.04	0.07	0.06	0.03	0.03	0.03	0.04	0.06	0.05	0.04	0.04
O97	0.05	0.10	0.06	0.07	0.12	0.05	0.05	0.05	0.06	0.04	0.07	0.08	0.06	0.07	0.06
O98	0.09	0.16	0.08	0.11	0.11	0.06	0.03	0.01	0.04	0.02	0.03	0.01	0.14	0.10	0.05
O99	0.11	0.08	0.07	0.15	0.08	0.03	0.04	0.02	0.05	0.02	0.04	0.04	0.09	0.10	0.06
O100	0.08	0.20	0.10	0.07	0.04	0.08	0.02	0.10	0.11	0.01	0.03	0.06	0.13	0.10	0.06
O101	0.07	0.03	0.01	0.05	0.07	0.07	0.07	0.08	0.08	0.12	0.11	0.05	0.08	0.05	0.08

	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	N	Annual Weighted	Summer Weighted
O102	0.11	0.03	0.01	0.02	0.04	0.07	0.01	0.03	0.09	0.07	0.05	0.05	0.01	0.03	0.05
O103	0.03	0.08	0.03	0.02	0.02	0.04	0.02	0.02	0.05	0.07	0.08	0.06	0.05	0.03	0.04
O104	0.05	0.06	0.02	0.03	0.07	0.10	0.06	0.01	0.07	0.06	0.10	0.04	0.07	0.04	0.06
O105	0.11	0.19	0.12	0.10	0.05	0.01	0.09	0.15	0.12	0.20	0.13	0.03	0.14	0.12	0.11
O106	0.10	0.21	0.13	0.12	0.05	0.09	0.05	0.13	0.11	0.20	0.14	0.07	0.14	0.13	0.12
O107	0.11	0.17	0.12	0.11	0.07	0.08	0.07	0.18	0.18	0.22	0.13	0.04	0.12	0.13	0.13
O108	0.12	0.21	0.10	0.06	0.05	0.04	0.11	0.17	0.18	0.21	0.17	0.07	0.13	0.11	0.13
O109	0.15	0.17	0.04	0.05	0.06	0.06	0.20	0.22	0.21	0.19	0.15	0.01	0.15	0.10	0.13
O110	0.16	0.14	0.04	0.19	0.10	0.13	0.26	0.16	0.21	0.21	0.14	0.07	0.15	0.14	0.17
O111	0.04	0.02	0.03	0.07	0.01	0.21	0.14	0.23	0.21	0.16	0.16	0.07	0.09	0.07	0.14
O112	0.02	0.05	0.03	0.02	0.06	0.23	0.16	0.21	0.09	0.08	0.17	0.09	0.11	0.05	0.11
O113	0.03	0.05	0.05	0.06	0.01	0.27	0.19	0.22	0.19	0.11	0.09	0.06	0.10	0.07	0.13
O114	0.01	0.07	0.05	0.09	0.05	0.27	0.20	0.21	0.17	0.08	0.06	0.04	0.08	0.07	0.12
O115	0.03	0.04	0.02	0.06	0.12	0.10	0.16	0.17	0.14	0.05	0.10	0.10	0.02	0.05	0.10
O116	0.07	0.10	0.18	0.23	0.25	0.12	0.10	0.02	0.05	0.04	0.10	0.05	0.08	0.15	0.11
O117	0.15	0.18	0.11	0.17	0.16	0.12	0.20	0.25	0.14	0.08	0.15	0.01	0.18	0.16	0.14
O118	0.11	0.18	0.12	0.22	0.22	0.14	0.18	0.20	0.11	0.06	0.07	0.03	0.19	0.17	0.14
O119	0.10	0.15	0.12	0.14	0.18	0.12	0.09	0.12	0.12	0.07	0.05	0.01	0.18	0.14	0.10
O120	0.08	0.14	0.18	0.22	0.23	0.16	0.12	0.10	0.11	0.08	0.07	0.01	0.17	0.17	0.13
O121	0.03	0.06	0.02	0.03	0.07	0.06	0.01	0.08	0.01	0.04	0.02	0.03	0.04	0.04	0.04
O122	0.16	0.22	0.26	0.29	0.23	0.19	0.20	0.25	0.22	0.22	0.15	0.09	0.14	0.23	0.21
O123	0.17	0.21	0.28	0.34	0.25	0.16	0.24	0.23	0.20	0.20	0.16	0.09	0.15	0.25	0.22
O124	0.16	0.18	0.17	0.28	0.21	0.13	0.26	0.27	0.25	0.26	0.20	0.08	0.15	0.21	0.23
O125	0.18	0.24	0.21	0.17	0.03	0.12	0.21	0.23	0.26	0.25	0.16	0.06	0.18	0.18	0.18
O126	0.19	0.25	0.23	0.21	0.03	0.14	0.23	0.21	0.22	0.22	0.12	0.04	0.20	0.21	0.17
O127	0.22	0.28	0.26	0.24	0.11	0.14	0.21	0.20	0.19	0.22	0.10	0.03	0.22	0.23	0.17
O128	0.18	0.29	0.14	0.17	0.05	0.03	0.06	0.04	0.03	0.01	0.02	0.02	0.20	0.16	0.05
O129	0.07	0.19	0.08	0.23	0.23	0.15	0.15	0.12	0.02	0.09	0.07	0.04	0.08	0.14	0.12
O130	0.09	0.22	0.04	0.25	0.16	0.15	0.10	0.13	0.12	0.10	0.06	0.06	0.14	0.16	0.13
O131	0.10	0.23	0.10	0.29	0.03	0.05	0.01	0.01	0.01	0.04	0.07	0.04	0.10	0.16	0.08
O132	0.15	0.25	0.15	0.35	0.05	0.09	0.05	0.06	0.03	0.03	0.07	0.03	0.09	0.19	0.10
O133	0.19	0.26	0.22	0.38	0.09	0.13	0.09	0.12	0.06	0.04	0.04	0.04	0.07	0.22	0.12
O134	0.03	0.08	0.09	0.06	0.02	0.11	0.10	0.05	0.10	0.04	0.06	0.04	0.11	0.07	0.06
O135	0.01	0.06	0.07	0.08	0.01	0.05	0.07	0.02	0.02	0.03	0.03	0.05	0.10	0.06	0.04
O136	0.07	0.05	0.15	0.14	0.04	0.06	0.04	0.04	0.05	0.05	0.04	0.06	0.13	0.11	0.06

	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	N	Annual Weighted	Summer Weighted
O137	0.17	0.11	0.24	0.23	0.04	0.04	0.03	0.03	0.08	0.03	0.01	0.09	0.13	0.16	0.07
O138	0.14	0.15	0.22	0.17	0.09	0.02	0.04	0.01	0.12	0.05	0.07	0.16	0.06	0.14	0.08
O139	0.05	0.08	0.07	0.05	0.05	0.04	0.04	0.03	0.07	0.04	0.08	0.09	0.05	0.05	0.05
O140	0.05	0.06	0.04	0.01	0.22	0.06	0.04	0.03	0.08	0.06	0.04	0.06	0.04	0.05	0.06
O141	0.02	0.06	0.03	0.06	0.22	0.01	0.02	0.03	0.09	0.04	0.08	0.08	0.08	0.06	0.07
O142	0.04	0.01	0.02	0.05	0.04	0.02	0.02	0.01	0.02	0.04	0.03	0.05	0.05	0.03	0.03
O143	0.07	0.20	0.10	0.14	0.07	0.11	0.06	0.03	0.06	0.04	0.04	0.04	0.06	0.10	0.07
O144	0.11	0.12	0.03	0.08	0.12	0.02	0.06	0.02	0.03	0.05	0.05	0.05	0.08	0.08	0.05
O145	0.03	0.12	0.08	0.07	0.02	0.05	0.03	0.02	0.03	0.05	0.07	0.08	0.03	0.06	0.05
O146	0.10	0.18	0.16	0.07	0.14	0.04	0.01	0.03	0.11	0.10	0.12	0.19	0.10	0.11	0.09
O147	0.09	0.11	0.17	0.09	0.09	0.01	0.01	0.06	0.11	0.12	0.13	0.18	0.08	0.11	0.09
O148	0.10	0.26	0.12	0.05	0.11	0.02	0.03	0.05	0.06	0.14	0.12	0.17	0.04	0.10	0.09
O149	0.15	0.26	0.30	0.23	0.02	0.04	0.02	0.07	0.06	0.06	0.03	0.17	0.11	0.19	0.09
O150	0.09	0.15	0.22	0.27	0.06	0.02	0.02	0.05	0.04	0.08	0.10	0.19	0.06	0.16	0.10
O151	0.12	0.08	0.08	0.08	0.00	0.01	0.02	0.04	0.05	0.01	0.04	0.02	0.06	0.07	0.03
O152	0.12	0.11	0.03	0.23	0.03	0.09	0.02	0.01	0.03	0.04	0.01	0.11	0.12	0.12	0.07
O153	0.11	0.11	0.04	0.28	0.06	0.13	0.02	0.06	0.07	0.01	0.02	0.08	0.02	0.12	0.09
O154	0.11	0.19	0.05	0.30	0.02	0.14	0.04	0.06	0.06	0.01	0.01	0.04	0.09	0.15	0.08
O155	0.15	0.28	0.11	0.46	0.04	0.21	0.10	0.05	0.02	0.04	0.03	0.07	0.20	0.24	0.13
O156	0.14	0.16	0.26	0.19	0.06	0.05	0.02	0.02	0.02	0.02	0.03	0.06	0.06	0.15	0.06
O157	0.10	0.03	0.07	0.18	0.06	0.04	0.05	0.04	0.09	0.05	0.07	0.17	0.03	0.09	0.08
O158	0.09	0.15	0.17	0.07	0.13	0.05	0.05	0.03	0.04	0.01	0.02	0.11	0.02	0.09	0.05
O159	0.12	0.16	0.04	0.04	0.05	0.04	0.05	0.01	0.07	0.02	0.03	0.08	0.05	0.06	0.04
O160	0.03	0.03	0.03	0.06	0.18	0.13	0.06	0.07	0.03	0.04	0.04	0.05	0.03	0.05	0.07
O161	0.08	0.10	0.04	0.05	0.06	0.06	0.02	0.02	0.07	0.05	0.03	0.03	0.03	0.05	0.04
O162	0.19	0.29	0.15	0.05	0.02	0.13	0.09	0.02	0.05	0.06	0.01	0.02	0.20	0.13	0.05
O163	0.03	0.01	0.03	0.06	0.04	0.07	0.06	0.03	0.10	0.05	0.05	0.02	0.08	0.05	0.05
O164	0.08	0.07	0.32	0.06	0.18	0.04	0.02	0.03	0.02	0.04	0.02	0.07	0.06	0.11	0.05
O165	0.07	0.11	0.21	0.22	0.14	0.06	0.07	0.04	0.04	0.03	0.02	0.03	0.08	0.15	0.08
O166	0.05	0.10	0.16	0.15	0.07	0.07	0.07	0.10	0.05	0.01	0.10	0.02	0.10	0.11	0.07
O167	0.03	0.11	0.08	0.12	0.07	0.06	0.05	0.08	0.04	0.01	0.11	0.05	0.09	0.09	0.07
O168	0.10	0.04	0.12	0.05	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.04	0.08	0.06	0.02
O169	0.04	0.04	0.03	0.03	0.04	0.04	0.04	0.07	0.03	0.03	0.02	0.16	0.05	0.04	0.05
O170	0.06	0.10	0.08	0.05	0.03	0.06	0.04	0.07	0.01	0.03	0.04	0.01	0.04	0.06	0.04
O171	0.11	0.05	0.03	0.02	0.10	0.07	0.02	0.10	0.04	0.09	0.05	0.13	0.05	0.05	0.07

	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	N	Annual Weighted	Summer Weighted
O172	0.16	0.16	0.17	0.05	0.06	0.07	0.04	0.10	0.04	0.06	0.08	0.19	0.14	0.11	0.07
O173	0.05	0.05	0.03	0.06	0.10	0.02	0.02	0.03	0.02	0.03	0.01	0.03	0.03	0.05	0.04

F2.2 Recommended Development Scheme

	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	N	Annual Weighted	Summer Weighted
O1	0.06	0.10	0.11	0.15	0.10	0.04	0.02	0.02	0.04	0.09	0.22	0.01	0.13	0.11	0.09
O2	0.06	0.08	0.07	0.05	0.04	0.01	0.03	0.05	0.01	0.11	0.22	0.06	0.07	0.06	0.07
O3	0.11	0.09	0.13	0.12	0.05	0.04	0.06	0.06	0.04	0.08	0.19	0.15	0.13	0.11	0.09
O4	0.13	0.06	0.07	0.21	0.11	0.10	0.03	0.06	0.06	0.04	0.15	0.06	0.07	0.12	0.10
O5	0.16	0.11	0.07	0.03	0.10	0.08	0.04	0.08	0.04	0.03	0.15	0.06	0.14	0.08	0.06
O6	0.02	0.02	0.03	0.03	0.11	0.11	0.06	0.12	0.04	0.02	0.13	0.04	0.06	0.04	0.07
O7	0.10	0.11	0.08	0.11	0.12	0.10	0.07	0.13	0.01	0.05	0.10	0.07	0.11	0.10	0.08
O8	0.23	0.25	0.17	0.02	0.02	0.08	0.06	0.09	0.03	0.02	0.10	0.06	0.20	0.12	0.05
O9	0.16	0.24	0.10	0.14	0.08	0.02	0.02	0.06	0.03	0.05	0.07	0.08	0.10	0.12	0.07
O10	0.12	0.27	0.04	0.05	0.05	0.14	0.02	0.01	0.01	0.04	0.02	0.04	0.10	0.08	0.04
O11	0.17	0.31	0.11	0.17	0.13	0.30	0.20	0.07	0.13	0.12	0.04	0.01	0.08	0.15	0.13
O12	0.06	0.13	0.04	0.09	0.08	0.08	0.03	0.04	0.04	0.08	0.09	0.10	0.03	0.07	0.07
O13	0.13	0.14	0.15	0.03	0.09	0.09	0.07	0.05	0.06	0.10	0.12	0.12	0.13	0.10	0.08
O14	0.06	0.12	0.21	0.19	0.03	0.06	0.07	0.05	0.06	0.11	0.18	0.12	0.12	0.14	0.10
O15	0.05	0.05	0.12	0.05	0.02	0.02	0.06	0.08	0.11	0.10	0.13	0.09	0.08	0.07	0.07
O16	0.08	0.07	0.05	0.07	0.05	0.02	0.06	0.04	0.09	0.07	0.08	0.06	0.07	0.06	0.06
O17	0.20	0.24	0.18	0.19	0.03	0.16	0.03	0.03	0.02	0.01	0.04	0.06	0.12	0.16	0.07
O18	0.08	0.09	0.07	0.12	0.12	0.08	0.01	0.06	0.07	0.04	0.09	0.06	0.04	0.08	0.07
O19	0.08	0.16	0.12	0.09	0.11	0.05	0.03	0.03	0.16	0.21	0.16	0.11	0.06	0.10	0.11
O20	0.05	0.15	0.18	0.16	0.07	0.04	0.02	0.06	0.01	0.02	0.03	0.02	0.08	0.12	0.05
O21	0.05	0.06	0.09	0.08	0.04	0.02	0.04	0.06	0.04	0.01	0.03	0.04	0.04	0.06	0.04
O22	0.05	0.10	0.10	0.15	0.01	0.03	0.02	0.04	0.02	0.03	0.07	0.04	0.04	0.09	0.06
O23	0.05	0.17	0.07	0.11	0.14	0.10	0.07	0.05	0.08	0.08	0.29	0.09	0.01	0.08	0.11
O24	0.07	0.05	0.05	0.05	0.05	0.07	0.06	0.05	0.09	0.13	0.24	0.05	0.09	0.06	0.09
O25	0.07	0.13	0.12	0.13	0.12	0.04	0.04	0.07	0.05	0.04	0.18	0.07	0.09	0.11	0.09
O26	0.08	0.16	0.12	0.13	0.03	0.02	0.02	0.06	0.01	0.04	0.13	0.04	0.09	0.10	0.06
O27	0.07	0.16	0.09	0.08	0.05	0.04	0.02	0.04	0.02	0.04	0.08	0.06	0.05	0.08	0.05
O28	0.11	0.26	0.17	0.23	0.21	0.15	0.06	0.03	0.10	0.29	0.10	0.12	0.09	0.18	0.16
O29	0.07	0.04	0.13	0.05	0.04	0.07	0.08	0.11	0.14	0.26	0.04	0.01	0.07	0.08	0.10

	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	N	Annual Weighted	Summer Weighted
O30	0.06	0.14	0.14	0.09	0.12	0.13	0.04	0.05	0.04	0.16	0.02	0.08	0.05	0.10	0.09
O31	0.04	0.09	0.09	0.08	0.04	0.13	0.03	0.03	0.05	0.10	0.03	0.10	0.07	0.07	0.07
O32	0.11	0.15	0.12	0.02	0.01	0.14	0.04	0.07	0.03	0.08	0.07	0.11	0.14	0.08	0.06
O33	0.16	0.22	0.15	0.15	0.10	0.05	0.04	0.11	0.09	0.09	0.24	0.03	0.16	0.15	0.11
O34	0.06	0.09	0.08	0.16	0.10	0.10	0.10	0.14	0.05	0.03	0.17	0.07	0.07	0.10	0.10
O35	0.06	0.07	0.11	0.08	0.11	0.11	0.16	0.07	0.03	0.04	0.08	0.04	0.04	0.08	0.08
O36	0.02	0.08	0.04	0.12	0.02	0.17	0.13	0.01	0.07	0.02	0.06	0.05	0.05	0.06	0.07
O37	0.06	0.08	0.02	0.09	0.07	0.18	0.08	0.02	0.09	0.04	0.11	0.06	0.06	0.06	0.08
O38	0.08	0.13	0.18	0.10	0.07	0.13	0.07	0.08	0.12	0.05	0.07	0.04	0.13	0.12	0.08
O39	0.07	0.23	0.10	0.10	0.09	0.13	0.04	0.03	0.11	0.06	0.07	0.02	0.17	0.11	0.07
O40	0.07	0.16	0.13	0.11	0.04	0.03	0.22	0.17	0.06	0.05	0.21	0.14	0.10	0.11	0.11
O41	0.08	0.03	0.07	0.06	0.12	0.13	0.13	0.15	0.09	0.06	0.13	0.03	0.06	0.07	0.10
O42	0.06	0.04	0.05	0.03	0.01	0.14	0.15	0.16	0.06	0.02	0.10	0.01	0.04	0.05	0.07
O43	0.04	0.05	0.01	0.13	0.03	0.14	0.10	0.14	0.04	0.06	0.08	0.06	0.06	0.07	0.09
O44	0.07	0.16	0.14	0.03	0.04	0.13	0.11	0.11	0.06	0.05	0.05	0.05	0.08	0.08	0.07
O45	0.09	0.09	0.11	0.07	0.04	0.06	0.05	0.04	0.07	0.02	0.06	0.02	0.10	0.08	0.05
O46	0.03	0.04	0.04	0.10	0.07	0.14	0.17	0.18	0.10	0.07	0.08	0.09	0.07	0.07	0.11
O47	0.06	0.04	0.10	0.01	0.03	0.05	0.06	0.11	0.07	0.01	0.01	0.05	0.03	0.04	0.04
O48	0.03	0.08	0.07	0.08	0.03	0.11	0.05	0.04	0.05	0.01	0.11	0.08	0.04	0.06	0.06
O49	0.05	0.12	0.06	0.11	0.09	0.12	0.04	0.07	0.09	0.11	0.14	0.07	0.07	0.09	0.09
O50	0.05	0.19	0.11	0.16	0.18	0.14	0.04	0.02	0.13	0.18	0.04	0.04	0.02	0.12	0.11
O51	0.11	0.15	0.08	0.06	0.04	0.09	0.08	0.10	0.09	0.05	0.18	0.23	0.12	0.09	0.10
O52	0.15	0.18	0.09	0.11	0.07	0.02	0.03	0.02	0.05	0.04	0.03	0.08	0.14	0.11	0.05
O53	0.16	0.15	0.15	0.14	0.04	0.02	0.03	0.01	0.10	0.06	0.13	0.13	0.12	0.12	0.08
O54	0.11	0.11	0.09	0.13	0.11	0.08	0.07	0.05	0.06	0.06	0.05	0.03	0.07	0.10	0.07
O55	0.08	0.05	0.07	0.01	0.07	0.05	0.01	0.10	0.03	0.06	0.16	0.01	0.09	0.05	0.06
O56	0.06	0.06	0.09	0.03	0.02	0.03	0.12	0.15	0.03	0.02	0.17	0.09	0.05	0.05	0.07
O57	0.10	0.11	0.06	0.01	0.02	0.01	0.18	0.13	0.04	0.02	0.11	0.06	0.08	0.06	0.06
O58	0.10	0.02	0.05	0.07	0.07	0.08	0.08	0.02	0.05	0.10	0.09	0.11	0.06	0.06	0.07
O59	0.04	0.15	0.15	0.03	0.08	0.03	0.04	0.02	0.06	0.07	0.14	0.19	0.15	0.09	0.07
O60	0.12	0.14	0.04	0.13	0.10	0.05	0.03	0.03	0.04	0.04	0.10	0.17	0.18	0.11	0.08
O61	0.07	0.12	0.17	0.14	0.02	0.03	0.05	0.08	0.09	0.04	0.08	0.20	0.13	0.12	0.08
O62	0.03	0.10	0.19	0.09	0.06	0.05	0.08	0.08	0.10	0.09	0.12	0.09	0.11	0.10	0.09
O63	0.08	0.08	0.10	0.10	0.11	0.01	0.02	0.01	0.08	0.04	0.01	0.05	0.10	0.09	0.05
O64	0.07	0.09	0.11	0.08	0.11	0.01	0.03	0.02	0.03	0.06	0.06	0.04	0.07	0.08	0.05

	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	N	Annual Weighted	Summer Weighted
O65	0.07	0.04	0.10	0.06	0.11	0.11	0.07	0.07	0.05	0.05	0.07	0.04	0.05	0.07	0.07
O66	0.08	0.04	0.05	0.03	0.14	0.16	0.04	0.03	0.07	0.10	0.08	0.07	0.02	0.05	0.08
O67	0.12	0.06	0.05	0.04	0.08	0.03	0.06	0.07	0.05	0.05	0.11	0.10	0.10	0.06	0.07
O68	0.01	0.02	0.07	0.10	0.03	0.01	0.02	0.04	0.03	0.05	0.08	0.17	0.07	0.06	0.06
O69	0.01	0.09	0.14	0.07	0.04	0.01	0.04	0.05	0.03	0.10	0.09	0.16	0.10	0.08	0.07
O70	0.03	0.12	0.01	0.04	0.04	0.01	0.06	0.02	0.05	0.03	0.03	0.06	0.07	0.04	0.04
O71	0.07	0.15	0.10	0.12	0.01	0.07	0.02	0.03	0.02	0.02	0.01	0.01	0.07	0.09	0.04
O72	0.01	0.10	0.01	0.06	0.07	0.05	0.03	0.04	0.02	0.01	0.04	0.01	0.02	0.04	0.04
O73	0.01	0.02	0.04	0.01	0.01	0.12	0.03	0.02	0.02	0.03	0.01	0.04	0.05	0.02	0.03
O74	0.02	0.02	0.01	0.04	0.03	0.16	0.02	0.01	0.02	0.02	0.01	0.01	0.02	0.02	0.03
O75	0.07	0.08	0.07	0.10	0.02	0.05	0.07	0.08	0.01	0.05	0.07	0.04	0.11	0.08	0.06
O76	0.01	0.07	0.07	0.06	0.08	0.01	0.03	0.05	0.03	0.01	0.05	0.17	0.14	0.07	0.05
O77	0.03	0.04	0.09	0.02	0.03	0.03	0.06	0.07	0.04	0.04	0.07	0.13	0.13	0.05	0.05
O78	0.05	0.08	0.06	0.06	0.01	0.01	0.07	0.01	0.03	0.03	0.04	0.01	0.01	0.04	0.03
O79	0.05	0.09	0.04	0.03	0.01	0.09	0.01	0.06	0.01	0.03	0.05	0.04	0.01	0.04	0.04
O80	0.04	0.09	0.04	0.02	0.11	0.02	0.04	0.05	0.06	0.02	0.05	0.07	0.04	0.04	0.04
O81	0.03	0.04	0.02	0.14	0.03	0.15	0.01	0.07	0.02	0.05	0.10	0.03	0.03	0.06	0.07
O82	0.01	0.02	0.01	0.13	0.02	0.11	0.14	0.08	0.08	0.07	0.07	0.04	0.01	0.05	0.08
O83	0.20	0.33	0.21	0.30	0.11	0.05	0.05	0.07	0.06	0.04	0.02	0.01	0.12	0.21	0.09
O84	0.08	0.34	0.19	0.29	0.08	0.09	0.03	0.05	0.02	0.04	0.12	0.06	0.04	0.18	0.10
O85	0.11	0.14	0.13	0.18	0.13	0.13	0.05	0.07	0.01	0.07	0.03	0.07	0.08	0.13	0.09
O86	0.19	0.27	0.22	0.13	0.09	0.16	0.05	0.03	0.01	0.04	0.03	0.09	0.10	0.15	0.07
O87	0.15	0.18	0.14	0.24	0.08	0.17	0.03	0.01	0.03	0.05	0.05	0.08	0.06	0.15	0.09
O88	0.09	0.11	0.18	0.09	0.09	0.17	0.01	0.05	0.05	0.03	0.07	0.02	0.10	0.10	0.06
O89	0.08	0.07	0.16	0.04	0.05	0.09	0.02	0.06	0.02	0.05	0.05	0.03	0.10	0.08	0.05
O90	0.02	0.13	0.13	0.01	0.02	0.11	0.07	0.03	0.07	0.04	0.03	0.07	0.07	0.06	0.04
O91	0.06	0.05	0.01	0.03	0.03	0.07	0.03	0.05	0.04	0.03	0.04	0.06	0.02	0.03	0.04
O92	0.20	0.16	0.10	0.05	0.04	0.01	0.01	0.01	0.01	0.04	0.07	0.01	0.09	0.09	0.03
O93	0.16	0.13	0.07	0.05	0.02	0.03	0.02	0.02	0.02	0.06	0.01	0.03	0.05	0.07	0.03
O94	0.25	0.25	0.10	0.07	0.07	0.04	0.04	0.08	0.03	0.05	0.03	0.07	0.18	0.13	0.05
O95	0.22	0.24	0.10	0.08	0.08	0.06	0.05	0.04	0.04	0.05	0.04	0.04	0.17	0.12	0.06
O96	0.07	0.05	0.02	0.04	0.04	0.07	0.06	0.03	0.03	0.03	0.04	0.06	0.05	0.04	0.04
O97	0.05	0.10	0.06	0.07	0.12	0.05	0.05	0.05	0.06	0.04	0.07	0.08	0.06	0.07	0.06
O98	0.09	0.16	0.08	0.11	0.11	0.06	0.03	0.01	0.04	0.02	0.03	0.01	0.14	0.10	0.05
O99	0.11	0.08	0.07	0.15	0.08	0.03	0.04	0.02	0.05	0.02	0.04	0.04	0.09	0.10	0.06

	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	N	Annual Weighted	Summer Weighted
O100	0.08	0.20	0.10	0.07	0.04	0.08	0.02	0.10	0.11	0.01	0.03	0.06	0.13	0.10	0.06
O101	0.07	0.03	0.01	0.05	0.07	0.07	0.07	0.08	0.08	0.12	0.11	0.05	0.08	0.05	0.08
O102	0.11	0.03	0.01	0.02	0.04	0.07	0.01	0.03	0.09	0.07	0.05	0.05	0.01	0.03	0.05
O103	0.03	0.08	0.03	0.02	0.02	0.04	0.02	0.02	0.05	0.07	0.08	0.06	0.05	0.03	0.04
O104	0.05	0.06	0.02	0.03	0.07	0.10	0.06	0.01	0.07	0.06	0.10	0.04	0.07	0.04	0.06
O105	0.11	0.19	0.12	0.10	0.05	0.01	0.09	0.15	0.12	0.20	0.13	0.03	0.14	0.12	0.11
O106	0.10	0.21	0.13	0.12	0.05	0.09	0.05	0.13	0.11	0.20	0.14	0.07	0.14	0.13	0.12
O107	0.11	0.17	0.12	0.11	0.07	0.08	0.07	0.18	0.18	0.22	0.13	0.04	0.12	0.13	0.13
O108	0.12	0.21	0.10	0.06	0.05	0.04	0.11	0.17	0.18	0.21	0.17	0.07	0.13	0.11	0.13
O109	0.15	0.17	0.04	0.05	0.06	0.06	0.20	0.22	0.21	0.19	0.15	0.01	0.15	0.10	0.13
O110	0.16	0.14	0.04	0.19	0.10	0.13	0.26	0.16	0.21	0.21	0.14	0.07	0.15	0.14	0.17
O111	0.04	0.02	0.03	0.07	0.01	0.21	0.14	0.23	0.21	0.16	0.16	0.07	0.09	0.07	0.14
O112	0.02	0.05	0.03	0.02	0.06	0.23	0.16	0.21	0.09	0.08	0.17	0.09	0.11	0.05	0.11
O113	0.03	0.05	0.05	0.06	0.01	0.27	0.19	0.22	0.19	0.11	0.09	0.06	0.10	0.07	0.13
O114	0.01	0.07	0.05	0.09	0.05	0.27	0.20	0.21	0.17	0.08	0.06	0.04	0.08	0.07	0.12
O115	0.03	0.04	0.02	0.06	0.12	0.10	0.16	0.17	0.14	0.05	0.10	0.10	0.02	0.05	0.10
O116	0.07	0.10	0.18	0.23	0.25	0.12	0.10	0.02	0.05	0.04	0.10	0.05	0.08	0.15	0.11
O117	0.15	0.18	0.11	0.17	0.16	0.12	0.20	0.25	0.14	0.08	0.15	0.01	0.18	0.16	0.14
O118	0.11	0.18	0.12	0.22	0.22	0.14	0.18	0.20	0.11	0.06	0.07	0.03	0.19	0.17	0.14
O119	0.10	0.15	0.12	0.14	0.18	0.12	0.09	0.12	0.12	0.07	0.05	0.01	0.18	0.14	0.10
O120	0.08	0.14	0.18	0.22	0.23	0.16	0.12	0.10	0.11	0.08	0.07	0.01	0.17	0.17	0.13
O121	0.03	0.06	0.02	0.03	0.07	0.06	0.01	0.08	0.01	0.04	0.02	0.03	0.04	0.04	0.04
O122	0.16	0.22	0.26	0.29	0.23	0.19	0.20	0.25	0.22	0.22	0.15	0.09	0.14	0.23	0.21
O123	0.17	0.21	0.28	0.34	0.25	0.16	0.24	0.23	0.20	0.20	0.16	0.09	0.15	0.25	0.22
O124	0.16	0.18	0.17	0.28	0.21	0.13	0.26	0.27	0.25	0.26	0.20	0.08	0.15	0.21	0.23
O125	0.18	0.24	0.21	0.17	0.03	0.12	0.21	0.23	0.26	0.25	0.16	0.06	0.18	0.18	0.18
O126	0.19	0.25	0.23	0.21	0.03	0.14	0.23	0.21	0.22	0.22	0.12	0.04	0.20	0.21	0.17
O127	0.22	0.28	0.26	0.24	0.11	0.14	0.21	0.20	0.19	0.22	0.10	0.03	0.22	0.23	0.17
O128	0.18	0.29	0.14	0.17	0.05	0.03	0.06	0.04	0.03	0.01	0.02	0.02	0.20	0.16	0.05
O129	0.07	0.19	0.08	0.23	0.23	0.15	0.15	0.12	0.02	0.09	0.07	0.04	0.08	0.14	0.12
O130	0.09	0.22	0.04	0.25	0.16	0.15	0.10	0.13	0.12	0.10	0.06	0.06	0.14	0.16	0.13
O131	0.10	0.23	0.10	0.29	0.03	0.05	0.01	0.01	0.01	0.04	0.07	0.04	0.10	0.16	0.08
O132	0.15	0.25	0.15	0.35	0.05	0.09	0.05	0.06	0.03	0.03	0.07	0.03	0.09	0.19	0.10
O133	0.19	0.26	0.22	0.38	0.09	0.13	0.09	0.12	0.06	0.04	0.04	0.04	0.07	0.22	0.12
O134	0.03	0.08	0.09	0.06	0.02	0.11	0.10	0.05	0.10	0.04	0.06	0.04	0.11	0.07	0.06

	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	N	Annual Weighted	Summer Weighted
O135	0.01	0.06	0.07	0.08	0.01	0.05	0.07	0.02	0.02	0.03	0.03	0.05	0.10	0.06	0.04
O136	0.07	0.05	0.15	0.14	0.04	0.06	0.04	0.04	0.05	0.05	0.04	0.06	0.13	0.11	0.06
O137	0.17	0.11	0.24	0.23	0.04	0.04	0.03	0.03	0.08	0.03	0.01	0.09	0.13	0.16	0.07
O138	0.14	0.15	0.22	0.17	0.09	0.02	0.04	0.01	0.12	0.05	0.07	0.16	0.06	0.14	0.08
O139	0.05	0.08	0.07	0.05	0.05	0.04	0.04	0.03	0.07	0.04	0.08	0.09	0.05	0.05	0.05
O140	0.05	0.06	0.04	0.01	0.22	0.06	0.04	0.03	0.08	0.06	0.04	0.06	0.04	0.05	0.06
O141	0.02	0.06	0.03	0.06	0.22	0.01	0.02	0.03	0.09	0.04	0.08	0.08	0.08	0.06	0.07
O142	0.04	0.01	0.02	0.05	0.04	0.02	0.02	0.01	0.02	0.04	0.03	0.05	0.05	0.03	0.03
O143	0.07	0.20	0.10	0.14	0.07	0.11	0.06	0.03	0.06	0.04	0.04	0.04	0.06	0.10	0.07
O144	0.11	0.12	0.03	0.08	0.12	0.02	0.06	0.02	0.03	0.05	0.05	0.05	0.08	0.08	0.05
O145	0.03	0.12	0.08	0.07	0.02	0.05	0.03	0.02	0.03	0.05	0.07	0.08	0.03	0.06	0.05
O146	0.10	0.18	0.16	0.07	0.14	0.04	0.01	0.03	0.11	0.10	0.12	0.19	0.10	0.11	0.09
O147	0.09	0.11	0.17	0.09	0.09	0.01	0.01	0.06	0.11	0.12	0.13	0.18	0.08	0.11	0.09
O148	0.10	0.26	0.12	0.05	0.11	0.02	0.03	0.05	0.06	0.14	0.12	0.17	0.04	0.10	0.09
O149	0.15	0.26	0.30	0.23	0.02	0.04	0.02	0.07	0.06	0.06	0.03	0.17	0.11	0.19	0.09
O150	0.09	0.15	0.22	0.27	0.06	0.02	0.02	0.05	0.04	0.08	0.10	0.19	0.06	0.16	0.10
O151	0.12	0.08	0.08	0.08	0.00	0.01	0.02	0.04	0.05	0.01	0.04	0.02	0.06	0.07	0.03
O152	0.12	0.11	0.03	0.23	0.03	0.09	0.02	0.01	0.03	0.04	0.01	0.11	0.12	0.12	0.07
O153	0.11	0.11	0.04	0.28	0.06	0.13	0.02	0.06	0.07	0.01	0.02	0.08	0.02	0.12	0.09
O154	0.11	0.19	0.05	0.30	0.02	0.14	0.04	0.06	0.06	0.01	0.01	0.04	0.09	0.15	0.08
O155	0.15	0.28	0.11	0.46	0.04	0.21	0.10	0.05	0.02	0.04	0.03	0.07	0.20	0.24	0.13
O156	0.14	0.16	0.26	0.19	0.06	0.05	0.02	0.02	0.02	0.02	0.03	0.06	0.06	0.15	0.06
O157	0.10	0.03	0.07	0.18	0.06	0.04	0.05	0.04	0.09	0.05	0.07	0.17	0.03	0.09	0.08
O158	0.09	0.15	0.17	0.07	0.13	0.05	0.05	0.03	0.04	0.01	0.02	0.11	0.02	0.09	0.05
O159	0.12	0.16	0.04	0.04	0.05	0.04	0.05	0.01	0.07	0.02	0.03	0.08	0.05	0.06	0.04
O160	0.03	0.03	0.03	0.06	0.18	0.13	0.06	0.07	0.03	0.04	0.04	0.05	0.03	0.05	0.07
O161	0.08	0.10	0.04	0.05	0.06	0.06	0.02	0.02	0.07	0.05	0.03	0.03	0.03	0.05	0.04
O162	0.19	0.29	0.15	0.05	0.02	0.13	0.09	0.02	0.05	0.06	0.01	0.02	0.20	0.13	0.05
O163	0.03	0.01	0.03	0.06	0.04	0.07	0.06	0.03	0.10	0.05	0.05	0.02	0.08	0.05	0.05
O164	0.08	0.07	0.32	0.06	0.18	0.04	0.02	0.03	0.02	0.04	0.02	0.07	0.06	0.11	0.05
O165	0.07	0.11	0.21	0.22	0.14	0.06	0.07	0.04	0.04	0.03	0.02	0.03	0.08	0.15	0.08
O166	0.05	0.10	0.16	0.15	0.07	0.07	0.07	0.10	0.05	0.01	0.10	0.02	0.10	0.11	0.07
O167	0.03	0.11	0.08	0.12	0.07	0.06	0.05	0.08	0.04	0.01	0.11	0.05	0.09	0.09	0.07
O168	0.10	0.04	0.12	0.05	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.04	0.08	0.06	0.02
O169	0.04	0.04	0.03	0.03	0.04	0.04	0.04	0.07	0.03	0.03	0.02	0.16	0.05	0.04	0.05

	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	N	Annual Weighted	Summer Weighted
O170	0.06	0.10	0.08	0.05	0.03	0.06	0.04	0.07	0.01	0.03	0.04	0.01	0.04	0.06	0.04
O171	0.11	0.05	0.03	0.02	0.10	0.07	0.02	0.10	0.04	0.09	0.05	0.13	0.05	0.05	0.07
O172	0.16	0.16	0.17	0.05	0.06	0.07	0.04	0.10	0.04	0.06	0.08	0.19	0.14	0.11	0.07
O173	0.05	0.05	0.03	0.06	0.10	0.02	0.02	0.03	0.02	0.03	0.01	0.03	0.03	0.05	0.04

F3 Special Test Points

F3.1 Existing Scheme

	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	N	Annual Weighted	Summer Weighted
S_O1	0.07	0.18	0.11	0.13	0.08	0.02	0.03	0.05	0.05	0.03	0.09	0.08	0.18	0.12	0.07
S_O2	0.05	0.19	0.12	0.08	0.10	0.03	0.04	0.05	0.07	0.04	0.08	0.08	0.19	0.11	0.06
S_O3	0.09	0.21	0.06	0.23	0.10	0.03	0.05	0.05	0.07	0.04	0.08	0.07	0.18	0.15	0.09
S_O4	0.19	0.36	0.27	0.31	0.15	0.07	0.03	0.06	0.04	0.06	0.12	0.08	0.10	0.23	0.11
S_O5	0.10	0.04	0.05	0.05	0.05	0.03	0.01	0.03	0.04	0.05	0.11	0.10	0.07	0.05	0.05
S1	0.07	0.09	0.10	0.03	0.01	0.06	0.07	0.07	0.03	0.08	0.10	0.26	0.02	0.05	0.07
S2	0.03	0.03	0.02	0.05	0.07	0.02	0.05	0.11	0.04	0.13	0.07	0.18	0.06	0.05	0.08
S3	0.07	0.03	0.03	0.07	0.17	0.04	0.04	0.04	0.08	0.08	0.08	0.21	0.06	0.06	0.09
S4	0.03	0.06	0.03	0.13	0.04	0.01	0.02	0.05	0.04	0.07	0.06	0.17	0.02	0.06	0.07
S5	0.06	0.03	0.04	0.04	0.06	0.02	0.03	0.11	0.05	0.12	0.09	0.21	0.08	0.06	0.08
S6	0.12	0.23	0.30	0.23	0.02	0.02	0.04	0.07	0.09	0.09	0.06	0.03	0.12	0.19	0.09
S7	0.14	0.21	0.29	0.27	0.04	0.12	0.03	0.12	0.16	0.09	0.08	0.01	0.15	0.21	0.12
S8	0.04	0.07	0.11	0.12	0.04	0.09	0.10	0.04	0.04	0.09	0.06	0.06	0.14	0.10	0.08
S9	0.03	0.14	0.13	0.04	0.01	0.06	0.08	0.07	0.12	0.10	0.05	0.09	0.05	0.07	0.07
S10	0.06	0.07	0.10	0.07	0.03	0.06	0.09	0.04	0.10	0.14	0.05	0.10	0.04	0.07	0.08
S11	0.01	0.09	0.09	0.04	0.03	0.04	0.06	0.05	0.09	0.10	0.05	0.11	0.04	0.06	0.06
S12	0.05	0.14	0.13	0.11	0.01	0.07	0.10	0.08	0.12	0.13	0.08	0.09	0.04	0.10	0.09
S13	0.04	0.06	0.13	0.06	0.02	0.06	0.10	0.08	0.13	0.15	0.11	0.10	0.06	0.07	0.09
S14	0.01	0.06	0.12	0.05	0.01	0.04	0.05	0.04	0.02	0.16	0.05	0.13	0.08	0.07	0.07
S15	0.04	0.06	0.21	0.06	0.01	0.06	0.11	0.14	0.17	0.16	0.13	0.10	0.10	0.10	0.11
S16	0.04	0.09	0.08	0.13	0.03	0.02	0.03	0.03	0.01	0.04	0.01	0.02	0.06	0.08	0.04
S17	0.05	0.17	0.15	0.16	0.03	0.06	0.08	0.05	0.10	0.10	0.06	0.08	0.07	0.12	0.08
S18	0.04	0.12	0.11	0.10	0.02	0.01	0.02	0.02	0.02	0.01	0.02	0.05	0.03	0.07	0.03
S19	0.07	0.10	0.09	0.09	0.04	0.04	0.05	0.04	0.04	0.04	0.06	0.03	0.03	0.07	0.05
S20	0.02	0.02	0.02	0.01	0.04	0.03	0.07	0.06	0.05	0.06	0.07	0.01	0.01	0.02	0.05

	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	N	Annual Weighted	Summer Weighted
S21	0.07	0.08	0.12	0.10	0.03	0.09	0.02	0.01	0.03	0.01	0.04	0.01	0.03	0.07	0.04
S22	0.03	0.03	0.08	0.02	0.01	0.01	0.02	0.02	0.02	0.01	0.03	0.01	0.03	0.03	0.02

F3.2 Recommended Development Scheme

	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	N	Annual Weighted	Summer Weighted
S_O1	0.07	0.18	0.11	0.13	0.08	0.02	0.03	0.05	0.05	0.03	0.09	0.08	0.18	0.12	0.07
S_O2	0.05	0.19	0.12	0.08	0.10	0.03	0.04	0.05	0.07	0.04	0.08	0.08	0.19	0.11	0.06
S_O3	0.09	0.21	0.06	0.23	0.10	0.03	0.05	0.05	0.07	0.04	0.08	0.07	0.18	0.15	0.09
S_O4	0.19	0.36	0.27	0.31	0.15	0.07	0.03	0.06	0.04	0.06	0.12	0.08	0.10	0.23	0.11
S_O5	0.10	0.04	0.05	0.05	0.05	0.03	0.01	0.03	0.04	0.05	0.11	0.10	0.07	0.05	0.05
S1	0.07	0.09	0.10	0.03	0.01	0.06	0.07	0.07	0.03	0.08	0.10	0.26	0.02	0.05	0.07
S2	0.03	0.03	0.02	0.05	0.07	0.02	0.05	0.11	0.04	0.13	0.07	0.18	0.06	0.05	0.08
S3	0.07	0.03	0.03	0.07	0.17	0.04	0.04	0.04	0.08	0.08	0.08	0.21	0.06	0.06	0.09
S4	0.03	0.06	0.03	0.13	0.04	0.01	0.02	0.05	0.04	0.07	0.06	0.17	0.02	0.06	0.07
S5	0.06	0.03	0.04	0.04	0.06	0.02	0.03	0.11	0.05	0.12	0.09	0.21	0.08	0.06	0.08
S6	0.12	0.23	0.30	0.23	0.02	0.02	0.04	0.07	0.09	0.09	0.06	0.03	0.12	0.19	0.09
S7	0.14	0.21	0.29	0.27	0.04	0.12	0.03	0.12	0.16	0.09	0.08	0.01	0.15	0.21	0.12
S8	0.04	0.07	0.11	0.12	0.04	0.09	0.10	0.04	0.04	0.09	0.06	0.06	0.14	0.10	0.08
S9	0.03	0.14	0.13	0.04	0.01	0.06	0.08	0.07	0.12	0.10	0.05	0.09	0.05	0.07	0.07
S10	0.06	0.07	0.10	0.07	0.03	0.06	0.09	0.04	0.10	0.14	0.05	0.10	0.04	0.07	0.08
S11	0.01	0.09	0.09	0.04	0.03	0.04	0.06	0.05	0.09	0.10	0.05	0.11	0.04	0.06	0.06
S12	0.05	0.14	0.13	0.11	0.01	0.07	0.10	0.08	0.12	0.13	0.08	0.09	0.04	0.10	0.09
S13	0.04	0.06	0.13	0.06	0.02	0.06	0.10	0.08	0.13	0.15	0.11	0.10	0.06	0.07	0.09
S14	0.01	0.06	0.12	0.05	0.01	0.04	0.05	0.04	0.02	0.16	0.05	0.13	0.08	0.07	0.07
S15	0.04	0.06	0.21	0.06	0.01	0.06	0.11	0.14	0.17	0.16	0.13	0.10	0.10	0.10	0.11
S16	0.04	0.09	0.08	0.13	0.03	0.02	0.03	0.03	0.01	0.04	0.01	0.02	0.06	0.08	0.04
S17	0.05	0.17	0.15	0.16	0.03	0.06	0.08	0.05	0.10	0.10	0.06	0.08	0.07	0.12	0.08
S18	0.04	0.12	0.11	0.10	0.02	0.01	0.02	0.02	0.02	0.01	0.02	0.05	0.03	0.07	0.03
S19	0.07	0.10	0.09	0.09	0.04	0.04	0.05	0.04	0.04	0.04	0.06	0.03	0.03	0.07	0.05
S20	0.02	0.02	0.02	0.01	0.04	0.03	0.07	0.06	0.05	0.06	0.07	0.01	0.01	0.02	0.05
S21	0.07	0.08	0.12	0.10	0.03	0.09	0.02	0.01	0.03	0.01	0.04	0.01	0.03	0.07	0.04
S22	0.03	0.03	0.08	0.02	0.01	0.01	0.02	0.02	0.02	0.01	0.03	0.01	0.03	0.03	0.02