

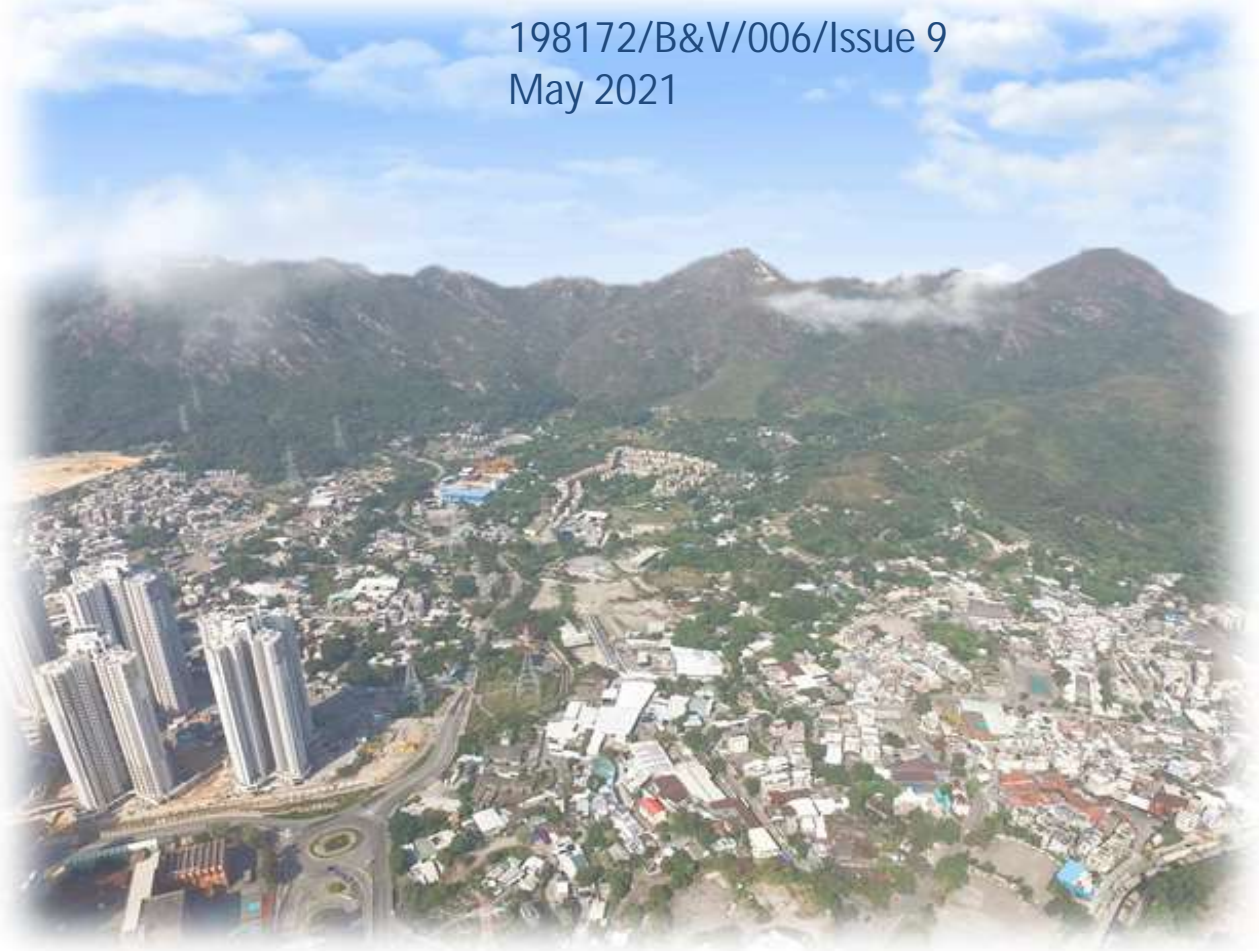
CONFIDENTIAL

Agreement No. CE 68/2017 (CE)

Site Formation and Infrastructural Works for
the Development at San Hing Road and Hong
Po Road, Tuen Mun - Feasibility Study

FINAL TECHNICAL REPORT
ON PRELIMINARY AIR
VENTILATION ASSESSMENT –
EXPERT EVALUATION

198172/B&V/006/Issue 9
May 2021



土木工程拓展署
Civil Engineering and
Development Department



BLACK & VEATCH

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Road and Hong Po Road, Tuen Mun–
Feasibility Study

Final Technical Report on Preliminary
Air Ventilation Assessment
– Expert Evaluation

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May 2021

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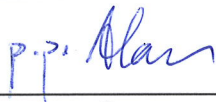

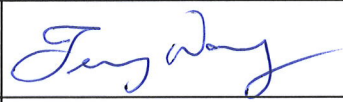

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	Name	Signature	Date
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1 INTRODUCTION

1.1 Background

- 1.1.1 Black & Veatch Hong Kong Limited (B&V) was commissioned by Civil Engineering and Development Department (CEDD) to examine the technical feasibility on developing housing development at San Hing Road and Hong Po Road, Tuen Mun.
- 1.1.2 To increase land supply to meet the demand of the public, the Government has identified the proposed sites at San Hing Road and Hong Po Road for public housing developments, which falls within an area zoned “Residential (Group E)” (“R(E)”) and “Green Belt” (“GB”) on the approved Lam Tei and Yick Yuen Outline Zoning Plan (OZP) No. S/TM-LTTY/10 and Residential (Group E) 1” (“R(E)1”), “GB” and “Village Type Development” (“V”) and an area shown as ‘Road’ on the approved Tuen Mun OZP No. S/TM/35.
- 1.1.3 The total site area under the Development will exceed 20 ha, therefore an Environmental Impact Assessment (EIA) is required in accordance with the Item 1 under Schedule 3 of the EIA Ordinance (Cap. 499), i.e. “Engineering feasibility study of urban development projects with a study area covering more than 20 ha or involving a total population of more than 100,000”. In this regard, the Feasibility Study with EIA Study are required to ascertain the parameters of the Development proposal.
- 1.1.4 As identified by the Government, the proposed development area at San Hing Road (SHR) and Hong Po Road (HPR) have the potential for public housing developments, but the development sites are subject to various development constraints including inadequate infrastructure. A holistic review is required to confirm the feasibility of amending the land use of the sites for the proposed developments. In order to support the subsequent rezoning exercise by the Government, the Assignment will examine the feasibility on developing public housing by conducting preliminary engineering and environmental assessments to formulate Infrastructure proposal, and to formulate the implementation strategies and programme for the Infrastructure to suit the Developments.
- 1.1.5 Subject to the findings and recommendation of the technical assessments, the proposed site formation and infrastructure works (the Project) to support the public housing developments at the Site comprise the followings:
- a) Site formation works;
 - b) Slope cutting and earth filling works as well as geotechnical works/structures;
 - c) Decontamination works;
 - d) Roadworks;
 - e) Sewerage infrastructural works;

- f) Drainage infrastructural works;
- g) Landscaping works;
- h) Environmental impact assessment under Environmental Impact Assessment Ordinance (EIAO);
- i) Environmental mitigation measures; and
- j) Other infrastructural works including water supply works.

1.1.6 Considering air ventilation aspect, a Preliminary Air Ventilation Assessment – Site Wind Availability Study (AVA – SWAS) and a Preliminary Air Ventilation Assessment – Expert Evaluation (AVA – EE) would be conducted for the Project to establish guiding principles in air ventilation terms and evaluate the proposed developments in accordance with the Technical Guide for AVA for Developments in Hong Kong (Annex A of HPLB and ETWB TC No.1/06). This report covered the AVA – EE for the Project. The Study Area is shown in **Figure 1-1**.

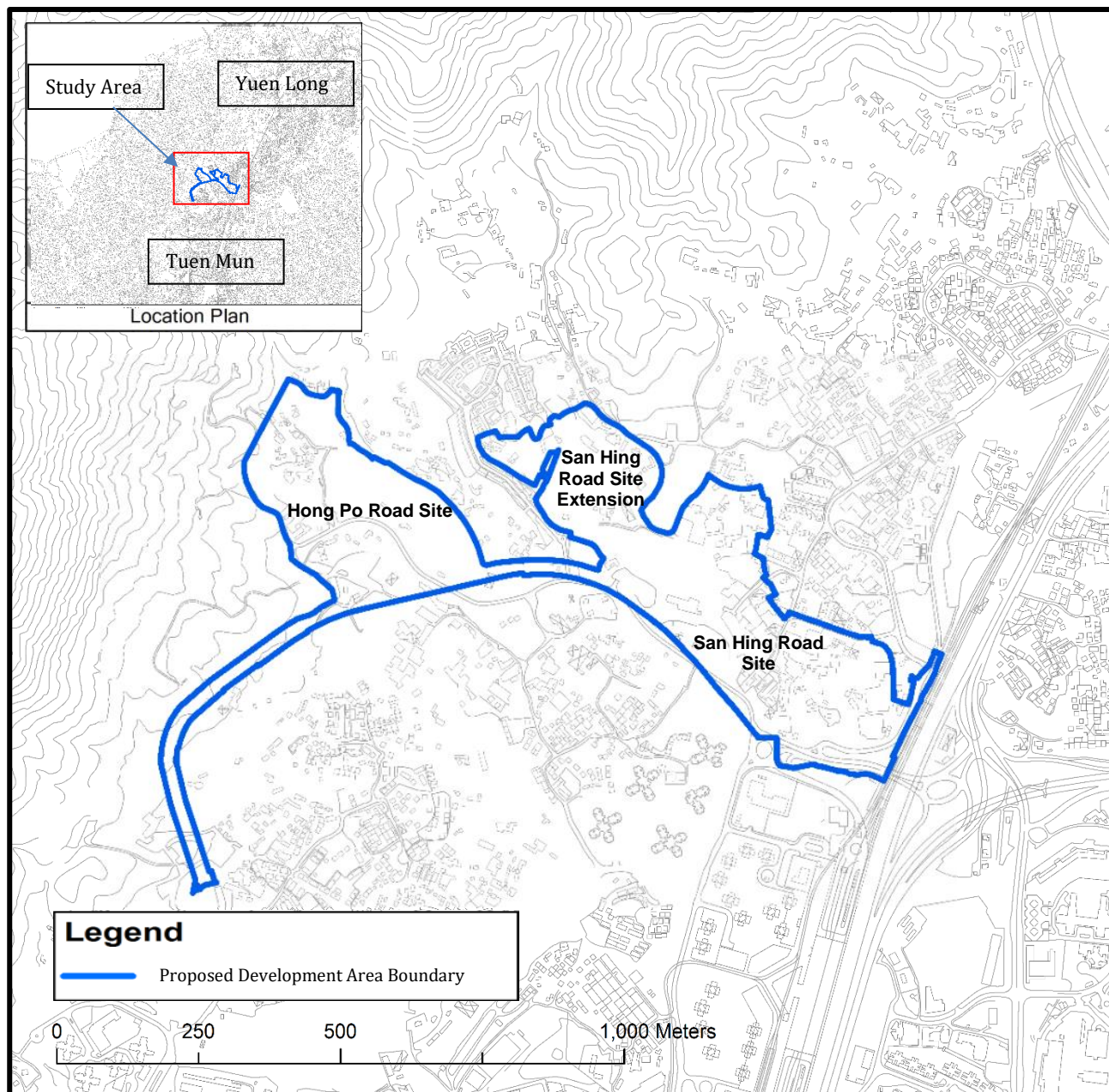


Figure 1-1 - Study Area of the AVA - EE

- 1.1.7 A summary of key information for the Air Ventilation Assessment (AVA) is summarised below:

Table 1.1 - Key Information of Air Ventilation Assessment (AVA)

Development Parameters	HPR Site	SHR Site Extension	SHR Site
Overall Plot Ratio (PR)	6.0(Domestic) 0.5(Non- Domestic)	6.0(Domestic) 0.5(Non- Domestic)	6.0(Domestic) 0.5(Non- Domestic)
Site Area	7.9ha	3.9ha	8.9ha
No. of Units	10,500	1,700	9,400
Max. Building Height (mPD)	about 150	about 150	about 150
No. of Domestic Storeys	43-44	43	32-46
School Provision	-	<ul style="list-style-type: none"> • Two 36-classroom primary Schools • One 30-classroom secondary school 	<ul style="list-style-type: none"> • Two 36-classroom primary schools
Completion Year	2033	2030	2031

1.2 Purpose of this Report

1.2.1 The purpose of this AVA - EE is to:

- (a) Include the site wind availability information:
 - i. Analyze relevant wind data as the approaching wind conditions to understand the wind environment of the Study Area;
 - ii. Analyze the effect of the surrounding topographical features on the wind environment of the Study Area;
 - iii. Analyze the effect of surrounding building morphology on wind environment of the Study Area; and
 - iv. Identify the existing major wind corridors and breezeways.
- (b) Examine the prima facie impact, merits or demerits of the development on the pedestrians wind environment in the vicinity of the Site.
- (c) Identify the order of the magnitude of any possible wind problem areas due to the Development.

- (d) Identify any mitigation and improvement measures with due regard to the relevant statutory plans, Building (Planning) Regulations, and Urban Design Guidelines in HKPSG.

1.3 Structure of this Report

1.3.1 The structure of this baseline review report is as follows:

- Section 1 introduces the project background and purpose of this report;
- Section 2 discusses the latest development proposed in the Site;
- Section 3 covers the site wind available study;
- Section 4 describes the existing site conditions of the Site;
- Section 5 covers an expert evaluation on air ventilation of the proposed developments in the Site; and
- Section 6 provides a summary to this report.

2 LATEST DEVELOPMENT PARAMETERS

2.1 Development Layout

- 2.1.1 The existing ground level of SHR Site, SHR Site Extension and HPR Site ranges from approximately +5.3 mPD to +14.8 mPD, +9 mPD to +16 mPD and +14 mPD to +40 mPD respectively. The site currently comprises slopes, open storages, workshops, low-rise village houses, agricultural area, factories, warehouses and temporary structures, graves, urns and permitted burial grounds.
- 2.1.2 The proposed site formation level of SHR Site, SHR Site Extension and HPR Site ranges from +6 mPD to +12.0 mPD, from + 9.8 mPD to +12.2 mPD and from +8 mPD to +21 mPD respectively.
- 2.1.3 A preliminary layout plan showing the proposed formation of the Site is presented in **Appendix A**. Since the proposed building height is tentative, maximum height of 150mPD is assumed in this assessment.

2.2 Non-Domestic GFAs and Schools

- 2.2.1 In addition to the development parameters as shown in Section 1.1.6, the following non-domestic Gross Floor Areas (GFAs) are proposed:

Table 2.1 - Non-Domestic GFAs

Development	Non-domestic GFAs (m²)	
HPR Site	Retail	8,000
	150-p Residential Care Home for Elderly (RCHE) + 30-p Day Care Unit (DCU)	4,406.6
	Integrated Children and Youth Services Centre (ICYSC)	1,388.2
	Neighborhood Elderly Centre (NEC)	1,333.2
	Two kindergartens	1,520
	Others*	21,160.5
SHR Site Extension	Retail	1,000
	One 30-classroom secondary school and two 36-classroom primary schools	21,000
	Others*	6,298
SHR Site	Retail	10,620
	100-p Child Care Centre (CCC)	1,166.0
	Neighbourhood Elderly Centre (NEC)	1,333.2
	60-p Special Child Care Centre (SCCC)	902.0
	OPRS Office Base	363.0
	Two 36-classroom primary schools	14,000
	Two kindergartens	1,000

	Others*	21,942.8
--	---------	----------

*allowed for provision of additional retail facilities or welfare facilities (to be reviewed in the detailed design stage)

Schools

- a) Kindergarten – There are two 6-classroom and two 9-classroom kindergartens at SHR Site and HPR Site respectively.
- b) Primary School – There are two 36-classroom primary schools in SHR Site and two 36-classroom primary schools at SHR Extension Site.
- c) Secondary School – There is a 30-classroom secondary school located at SHR Site Extension.

3 SITE WIND AVAILABILITY STUDY

3.1 Approaching Wind Conditions at the Study Area

Hong Kong Observatory

- 3.1.1 There are 41 wind stations currently operated by Hong Kong Observatory (HKO) in Hong Kong. The locations of the wind stations are illustrated in **Figure 3-1**. By analyzing the wind data recorded by those wind stations with appropriate methods, a general understanding of the wind environment in any districts of Hong Kong (especially near ground level) will be acquired.

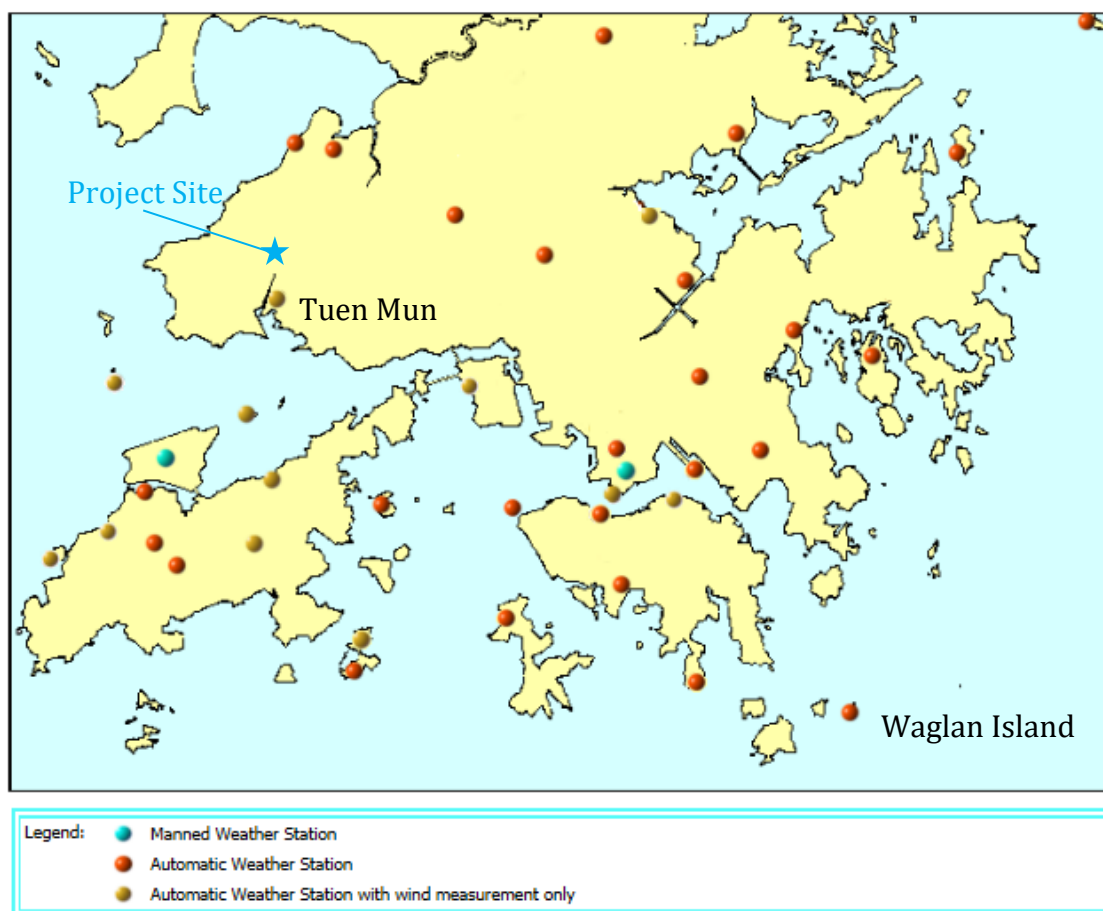


Figure 3-1 HKO's Wind Stations in Hong Kong

- 3.1.2 Amongst the wind stations of HKO, the station at Waglan Island (WL) is normally adopted by wind engineers as the reference station for measuring the wind approaching towards Hong Kong (the location is shown in **Figure 3-1**). It is because WL station is situated on top of a small island far off the south-east coast of Hong Kong and it is not obstructed by any surrounding buildings and topography in more or less all directions. In addition, the station has a very long measurement record. Therefore, the wind data measured at WL station are usually employed to estimate the site wind availability together with consideration for the adjacent topography surrounding the site.

- 3.1.3 As shown in the annual wind rose recorded at WL Station based on 1998-2007 data in **Figure 3-2**, it is observed that the annual prevailing wind directions (strongest wind directions) in Hong Kong are mainly in the range of directions of ENE – E, which are preliminary due to typhoons invading Hong Kong; and other strong wind directions are in the range of directions of N – NE and SW, which are preliminary due to monsoon in winter and summer respectively. (*wind data from 1998 to 2007 are currently the latest available 10-year data from HKO.)

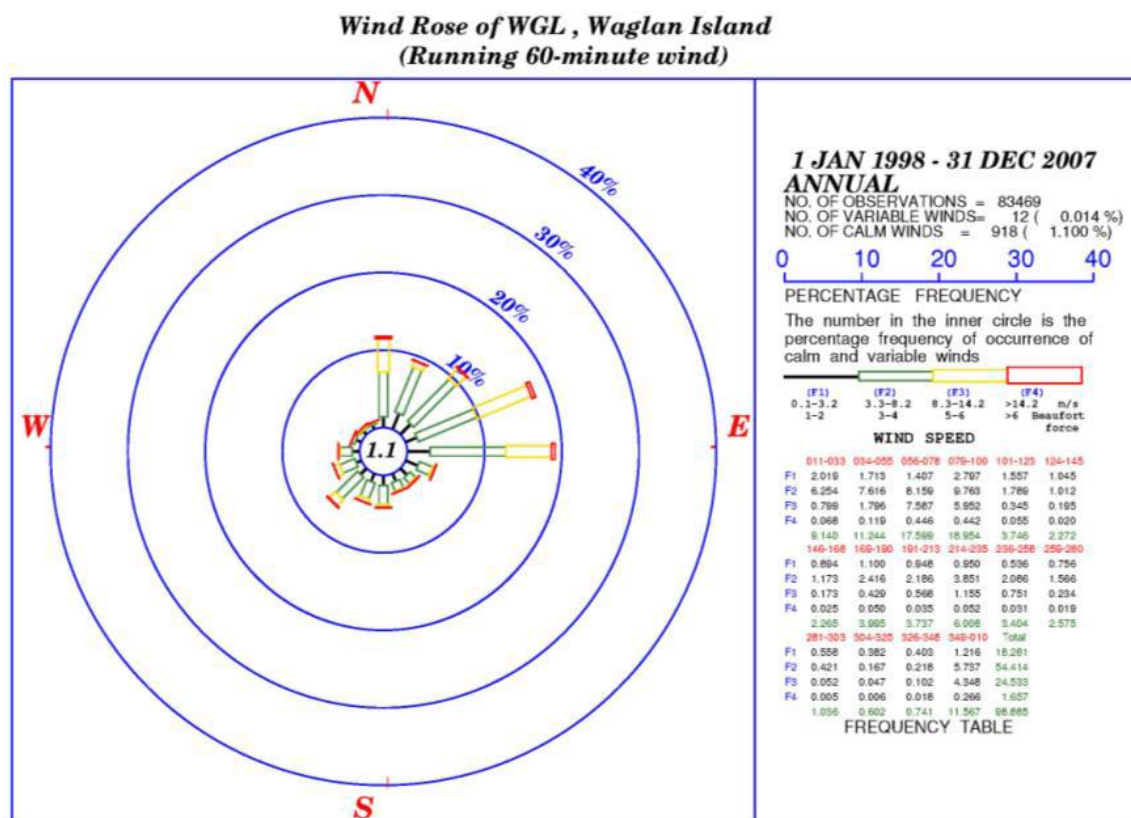


Figure 3-2 - Annual Wind Rose Recorded at WL Station (based on 1998 - 2007 data)

- 3.1.4 As shown in the monthly wind rose recorded at WL station based on 1998-2007 data (**Figure 3-3**), the annual prevailing wind comes from ENE and E, while the summer (June to August) prevailing wind comes from E, SW and WSW. For AVA in Hong Kong, the summer wind is relatively more important and beneficial for thermal comfort. Hence, based on wind data recorded at WL station, it is very important to plan our city, on the one hand, to capture the annual wind characteristics, and on the other hand, to maximize the penetration of the summer winds (mainly from the southwest) into the urban areas.

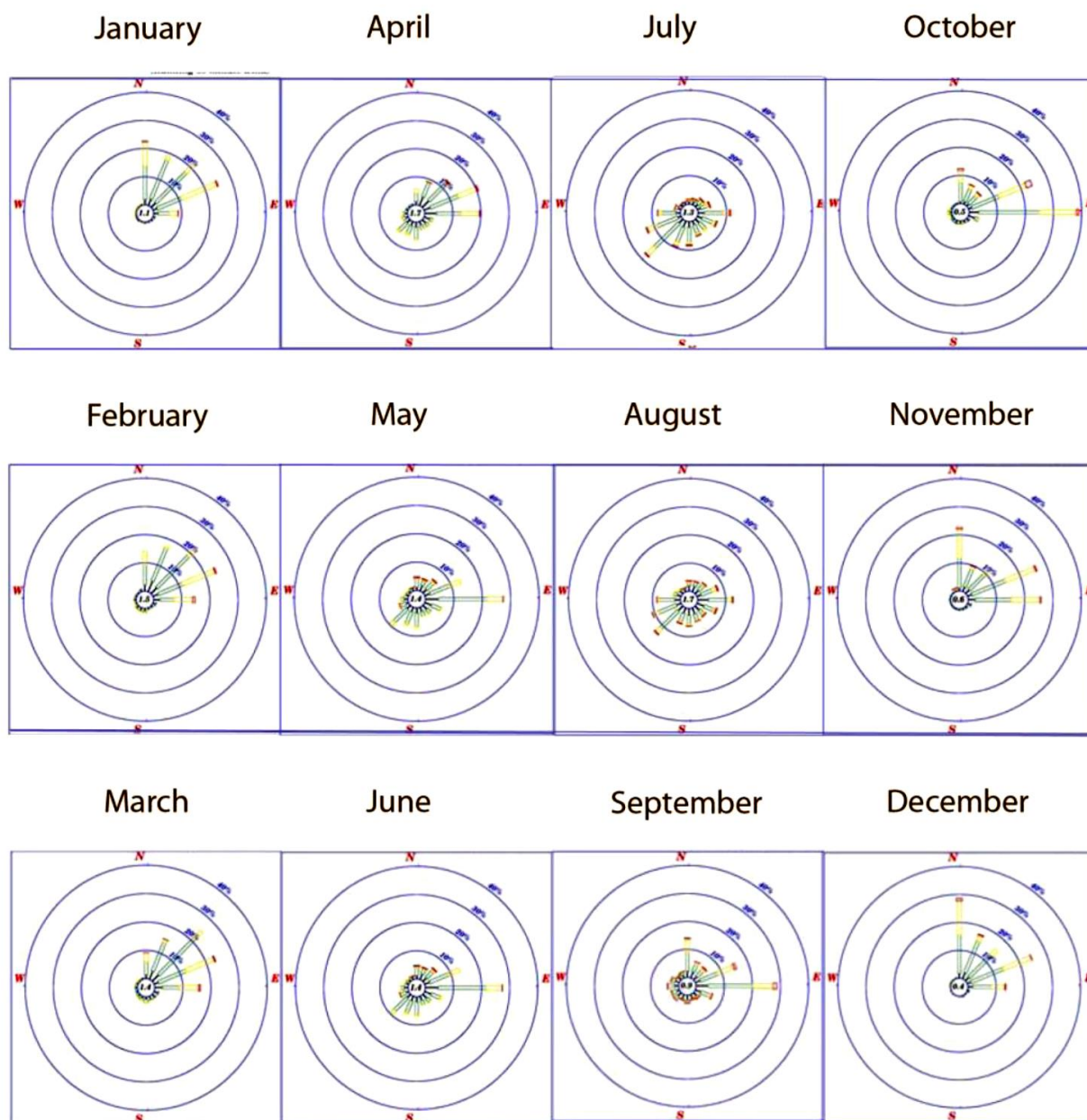
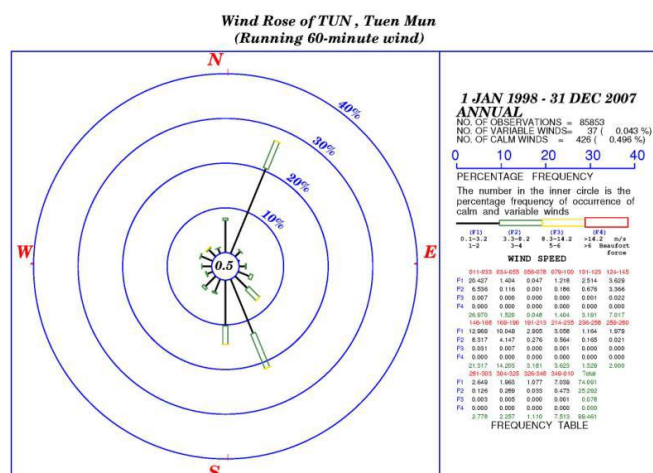


Figure 3-3 - Monthly Wind Rose Recorded at WL Station (based on 1998 - 2007 data)

- 3.1.5 In addition to the wind roses recorded at WL station, the wind roses recorded at Tuen Mun (TM) station (the location is shown in **Figure 3-1**, which is the wind station nearest to the study area) were also collected from HKO; and the annual wind rose, monthly wind roses and monthly wind roses are shown in **Figure 3-4** and **Figure 3-5** respectively. Unlike the wind roses recorded at WL station, the annual prevailing wind in Tuen Mun comes from NNE, SSE and S, while the summer prevailing wind in Tuen Mun comes from NNE, SSE and S. The difference will likely be due to the local topography at Tuen Mun area.



Simulated Wind Data

- 3.1.6 Besides of the wind roses recorded at WL and TM stations of HKO, a study of wind availability and characteristics for Hong Kong was conducted by the City University of Hong Kong. In the study, a meso-scale model Regional Atmospheric Modelling System (RAMS) was used to reproduce the site wind data including wind rose and wind profile. Simulated data at Grids X:038 Y:064, X:038 Y:065, X:039 Y:064, X:039 Y:065, X:040 Y:064 and X:040 Y:065 at the study area (**Figure 3-6**) were extracted at 200m, 300m and 500m above ground (**Figure 3-7 to Figure 3-12**). These locations were selected to representatively reflect the general wind patterns within the study area induced by topography. Prevailing wind directions of each location and level are summarized in **Table 2.1**.

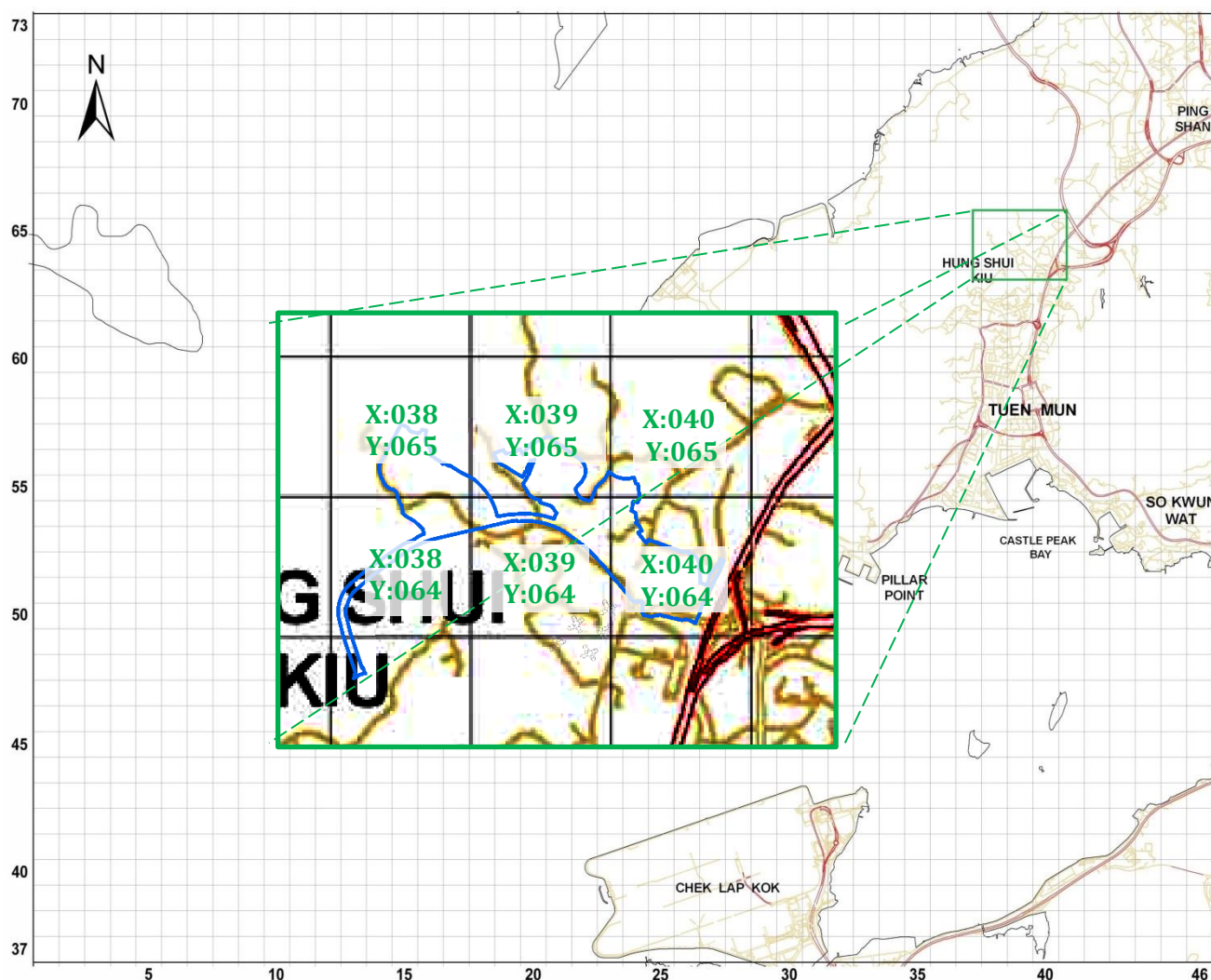


Figure 3-6 - Location Map of RAMS Model

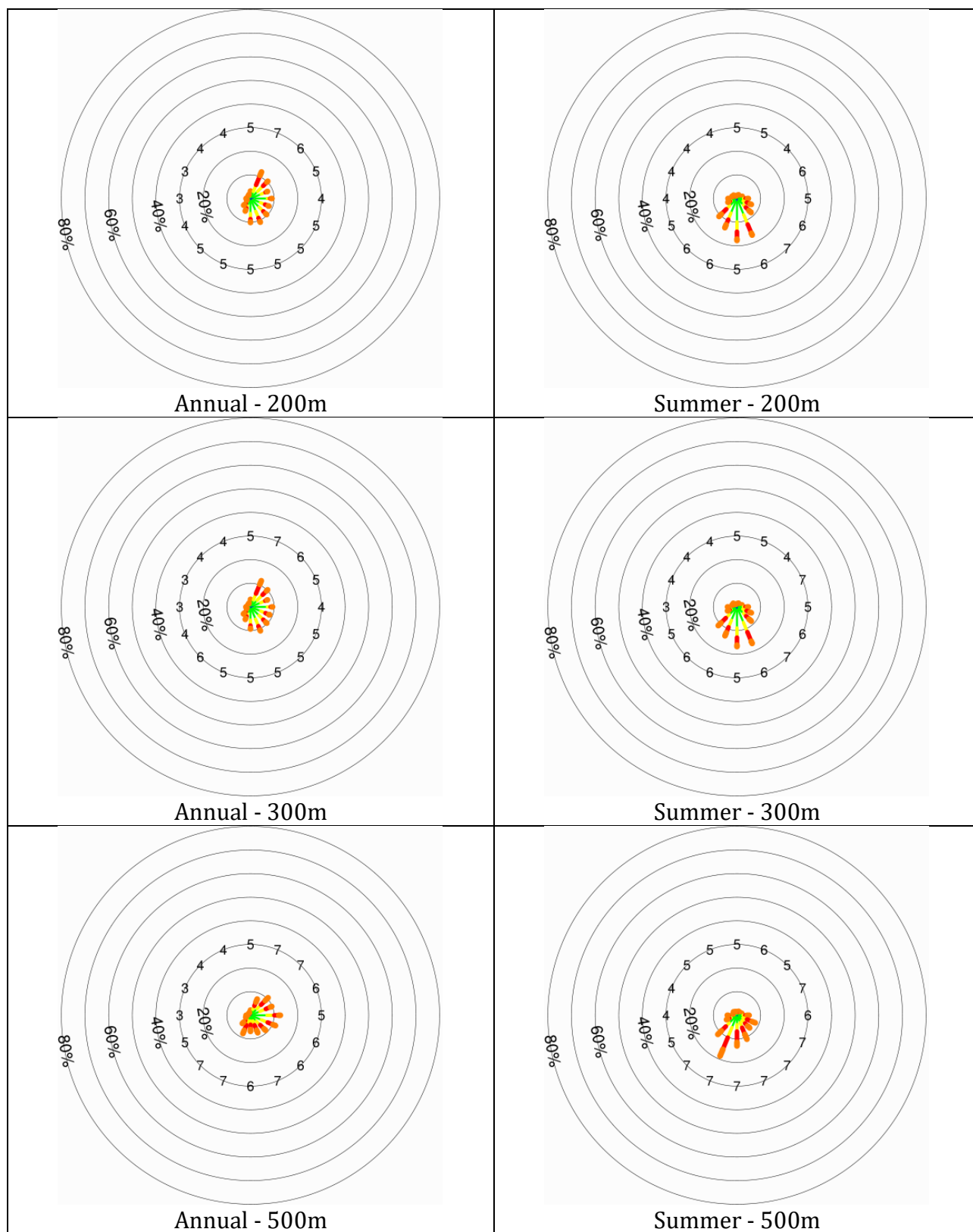


Figure 3-7 - Wind Roses at Grid X:038 Y:064

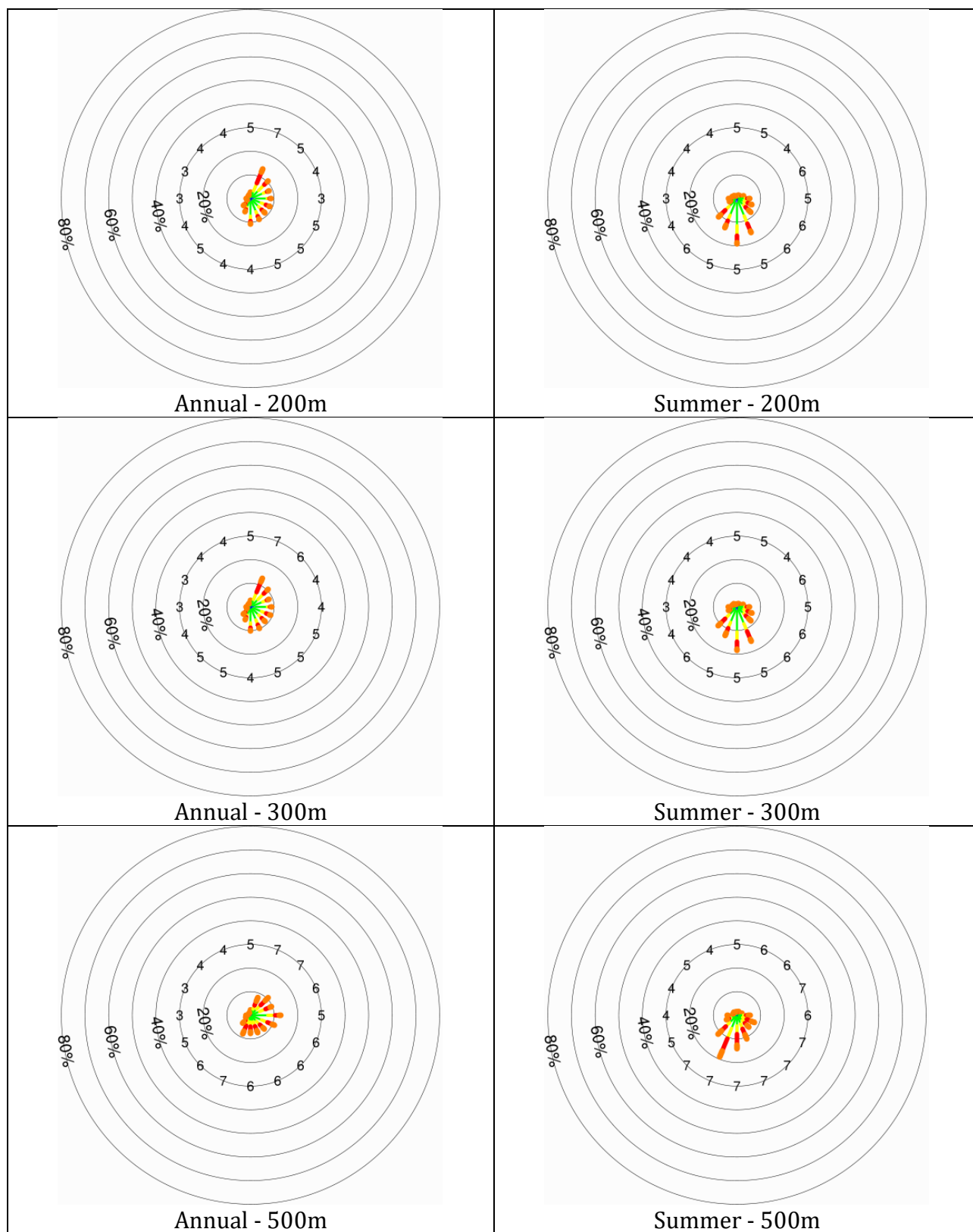


Figure 3-8 - Wind Roses at Grid X:039 Y:064

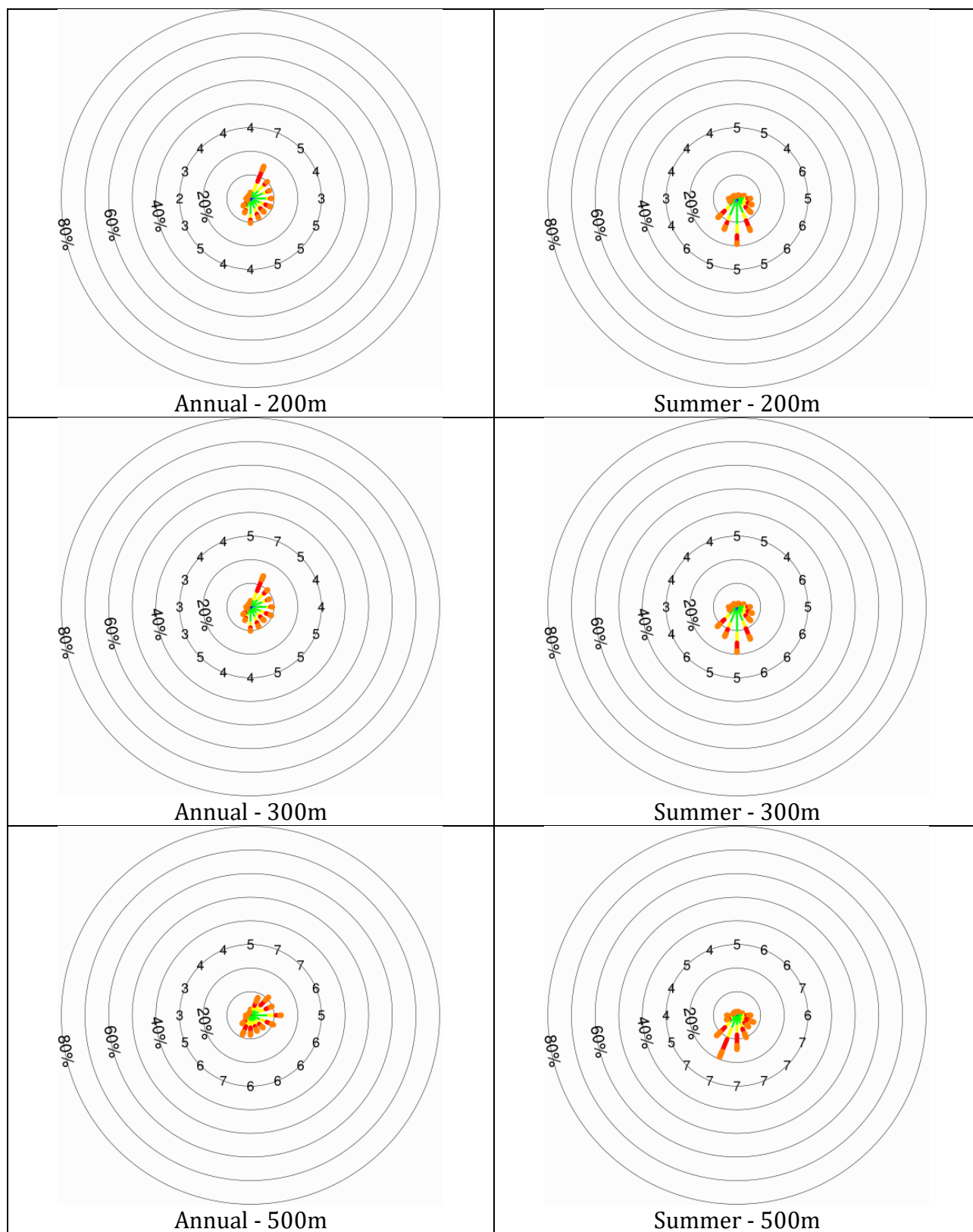


Figure 3-9 - Wind Roses at Grid X:040 Y:064

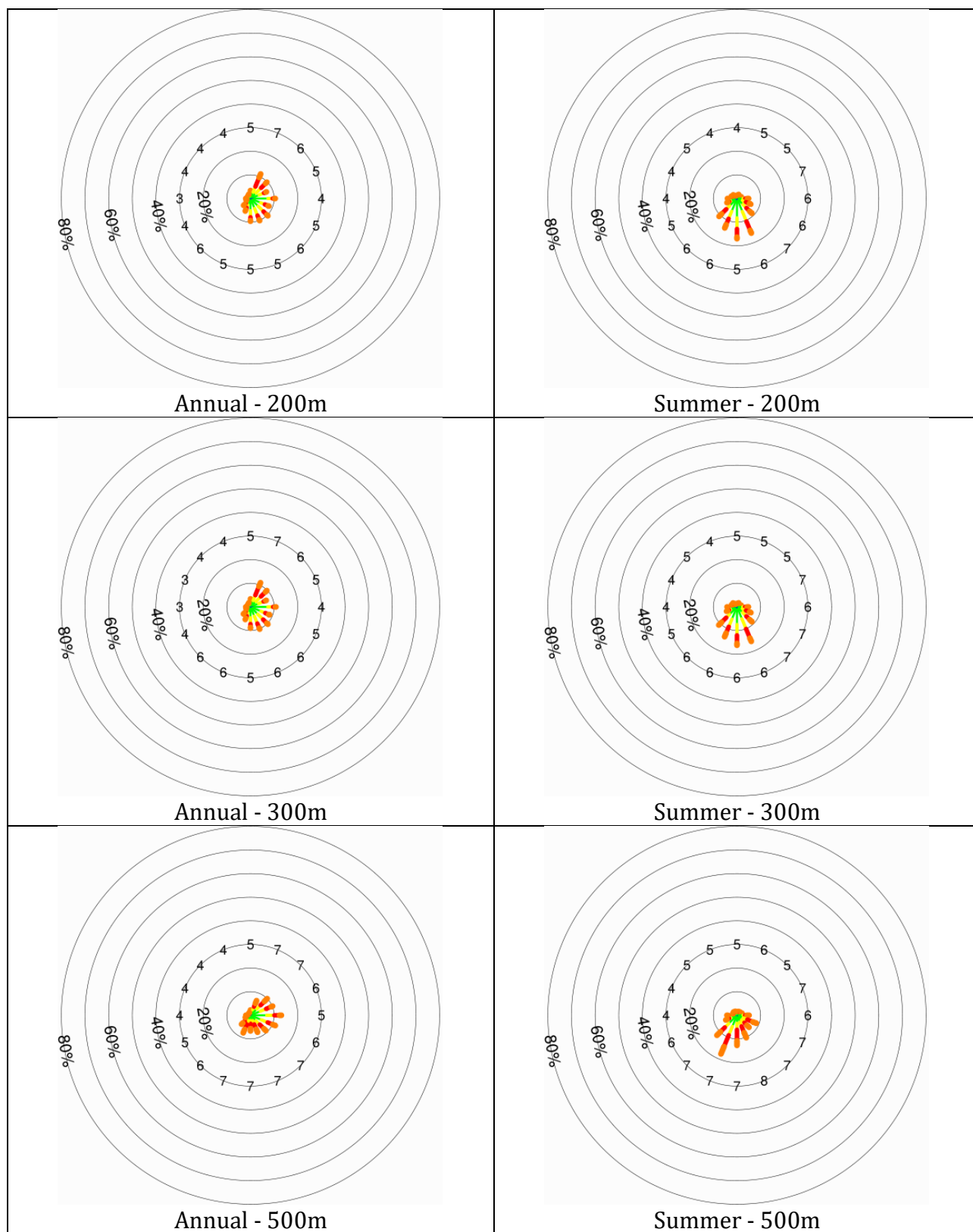


Figure 3-10 - Wind Roses at Grid X:038 Y:065

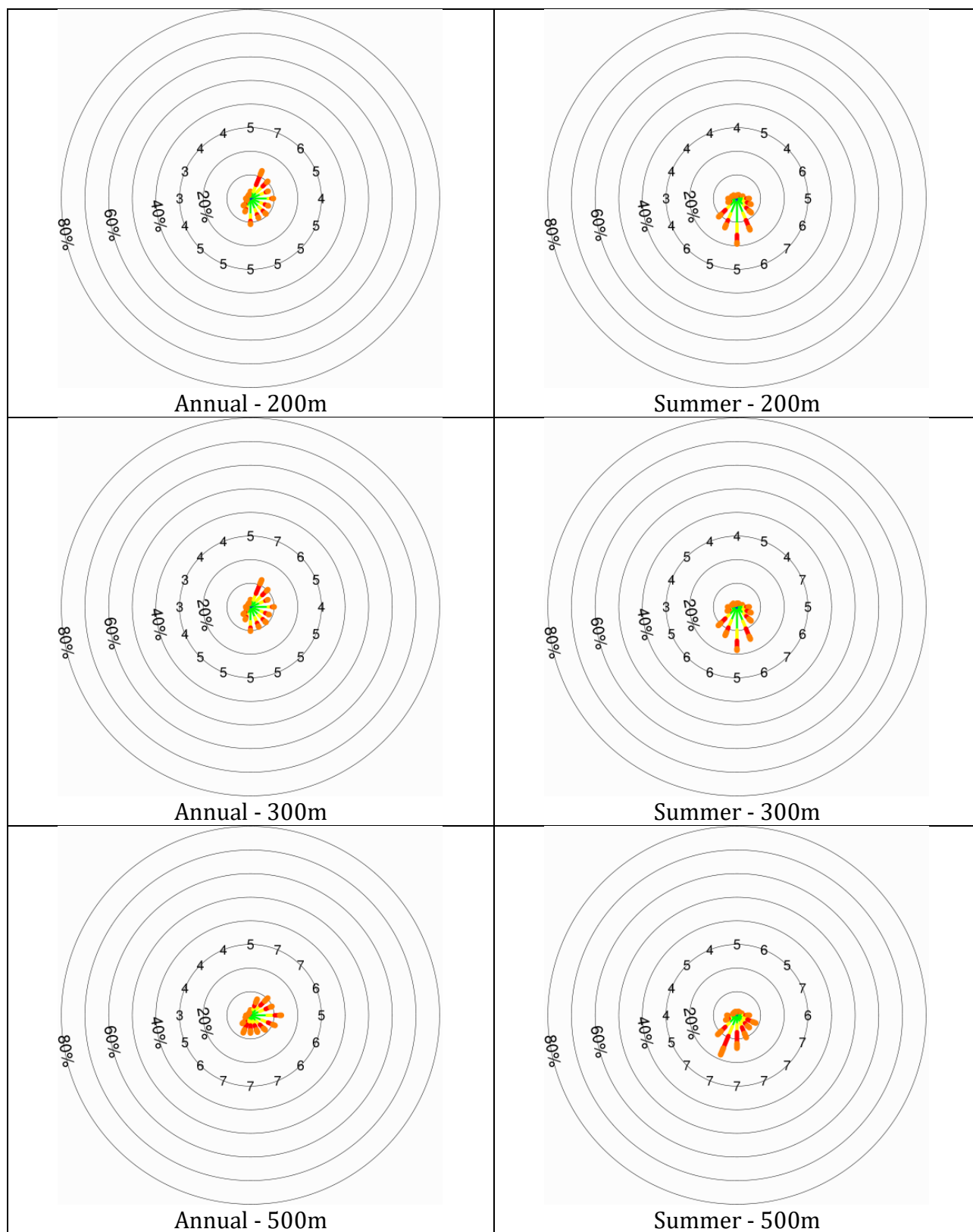


Figure 3-11 - Wind Roses at Grid X:039 Y:065

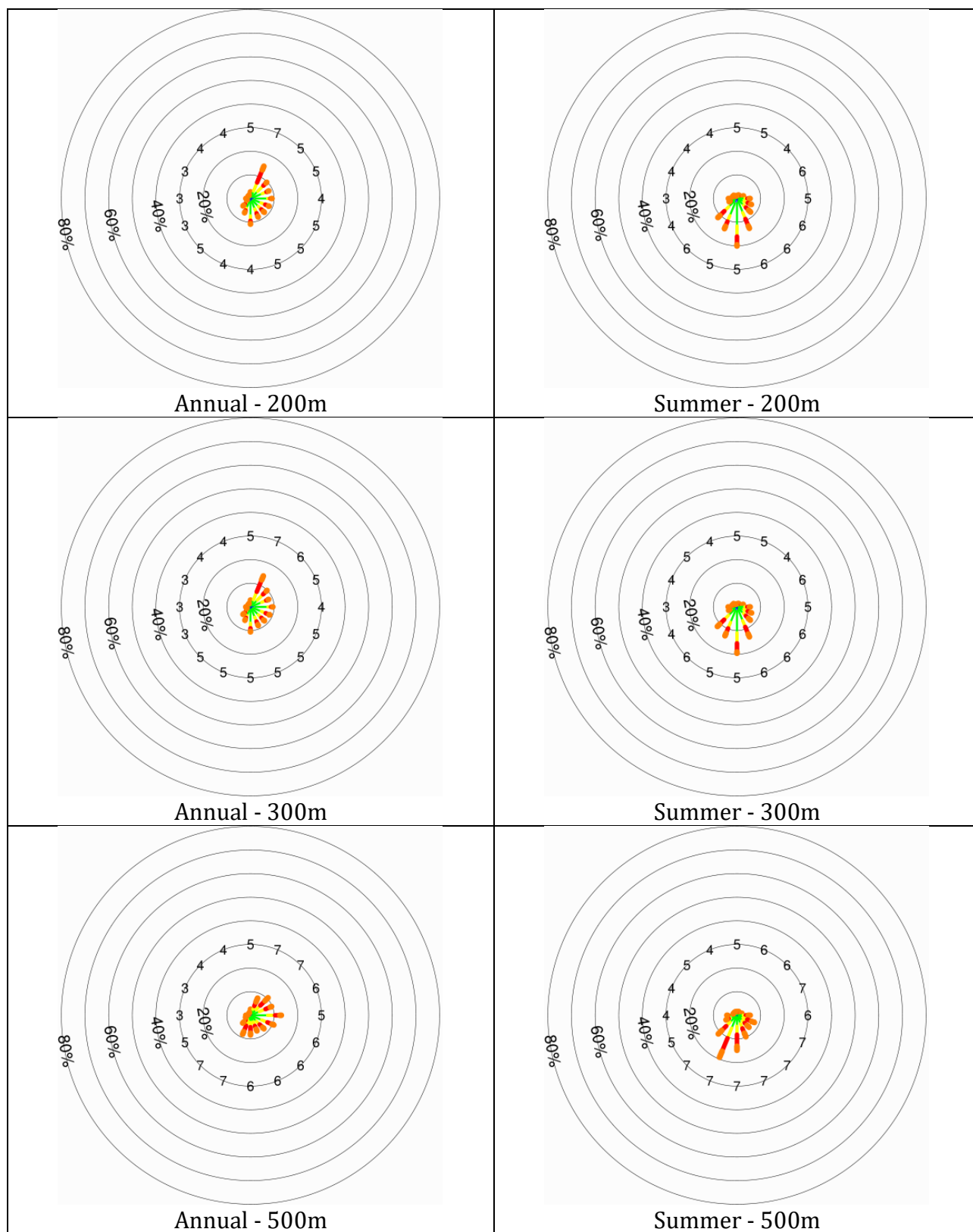


Figure 3-12 - Wind Roses at Grid X:040 Y:065

Wind Tunnel

- 3.1.7 Apart from the wind data recorded at WL and TM stations of HKO and the RAMS data simulated by City University of Hong Kong, relevant wind tunnel test data are also found in the “Experimental Site Wind Availability Study for Tuen Mun Area, Hong Kong” conducted by HKUST. Based on the experimental findings of the wind tunnel test, the wind characteristics in the test area shown in **Figure 3-13** which is located in the South of the Study Area of the present Study) have been acquired. It is found that the annual prevailing wind directions in the test area are mainly from E and NE (**Figure 3-14** to **Figure 3-17**); and the summer prevailing wind directions in the test area are mainly from the east, southeast and southwest (**Figure 3-18** to **Figure 3-21**).

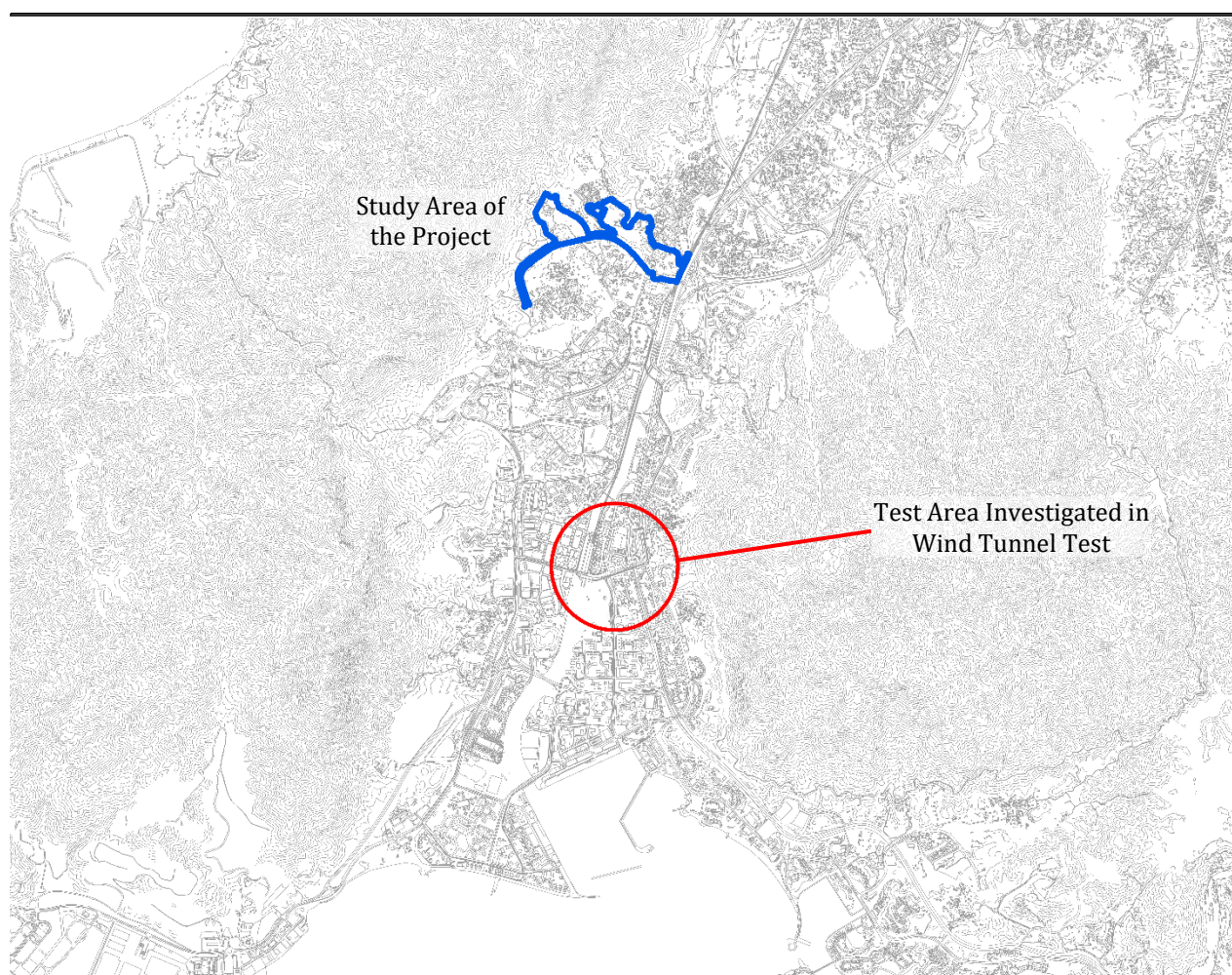


Figure 3-13 - Location of the Tuen Mun Study Area of Wind Tunnel Test

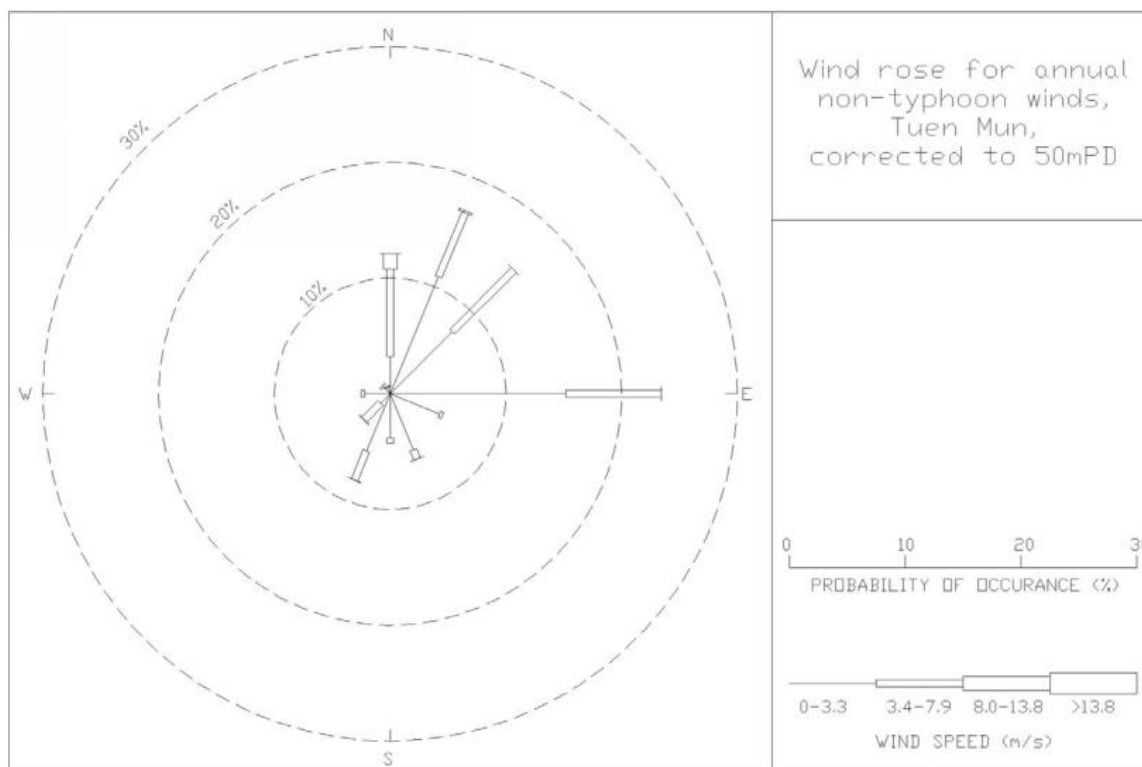


Figure 3-14 - Wind Rose for Annual Non-typhoon Winds at Test Area in Tuen Mun (corrected to 50mPD)

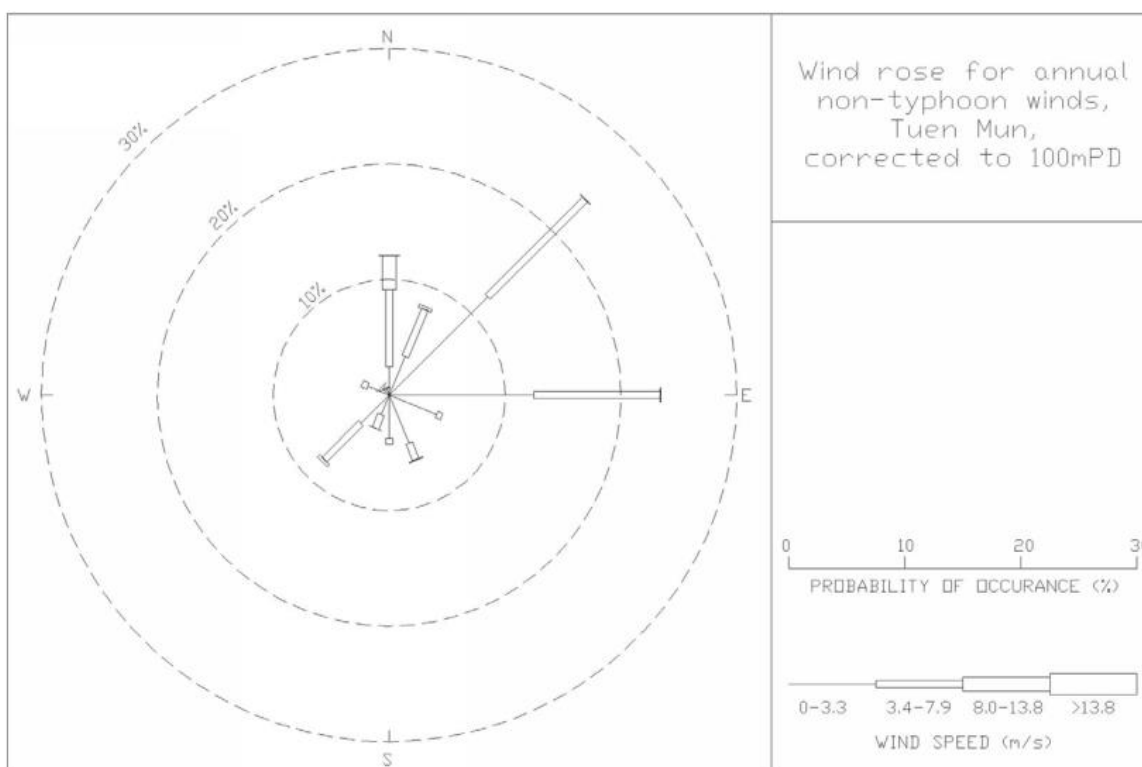


Figure 3-15 - Wind Rose for Annual Non-typhoon Winds at Test Area in Tuen Mun (corrected to 100mPD)

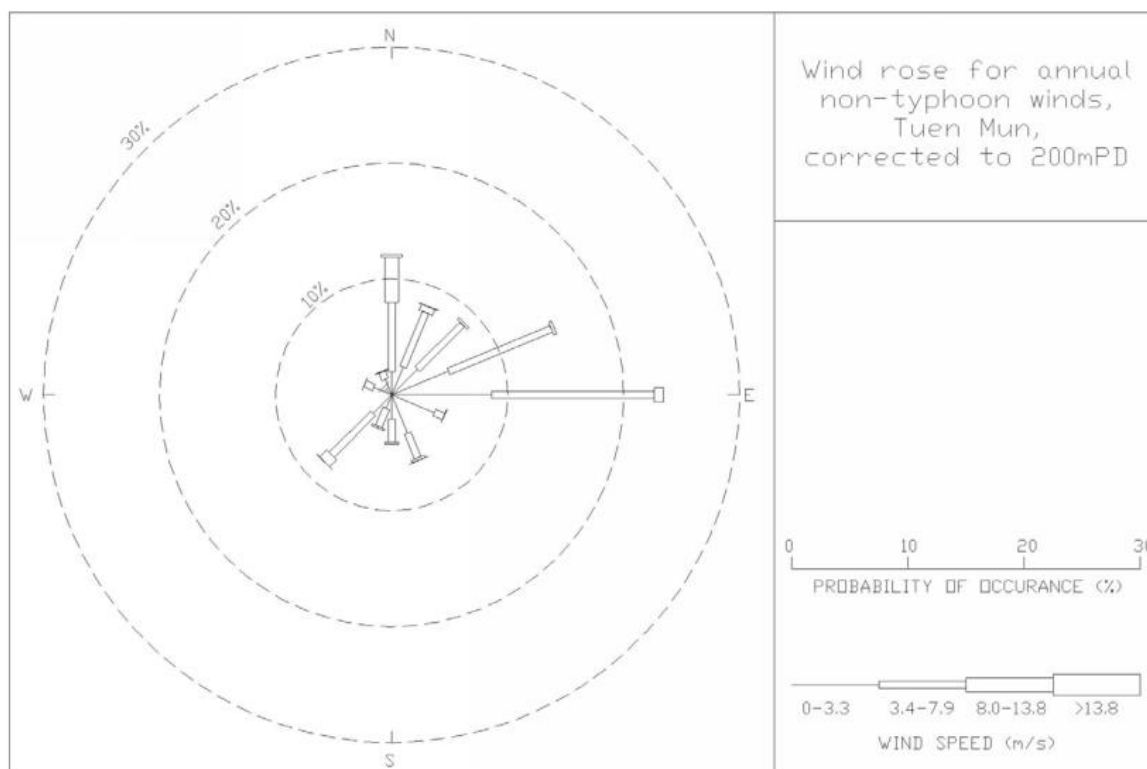


Figure 3-16 - Wind Rose for Annual Non-typhoon Winds at Test Area in Tuen Mun (corrected to 200mPD)

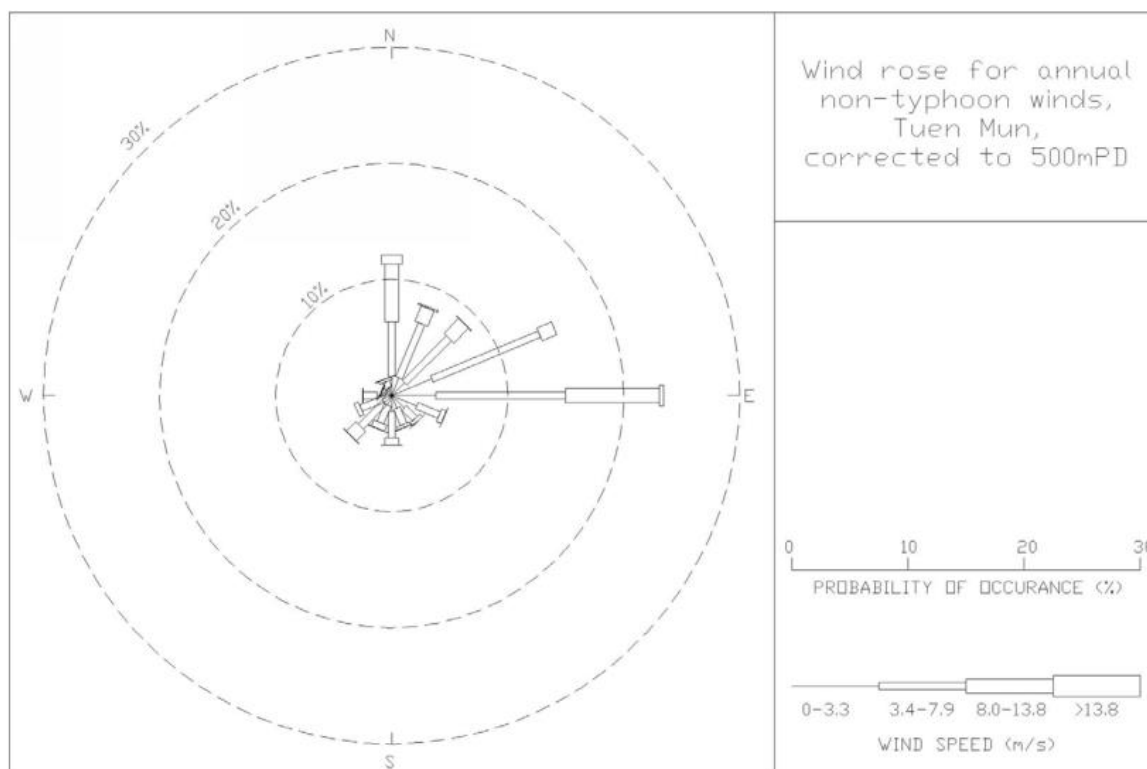


Figure 3-17 - Wind Rose for Annual Non-typhoon Winds at Test Area in Tuen Mun (corrected to 500mPD)

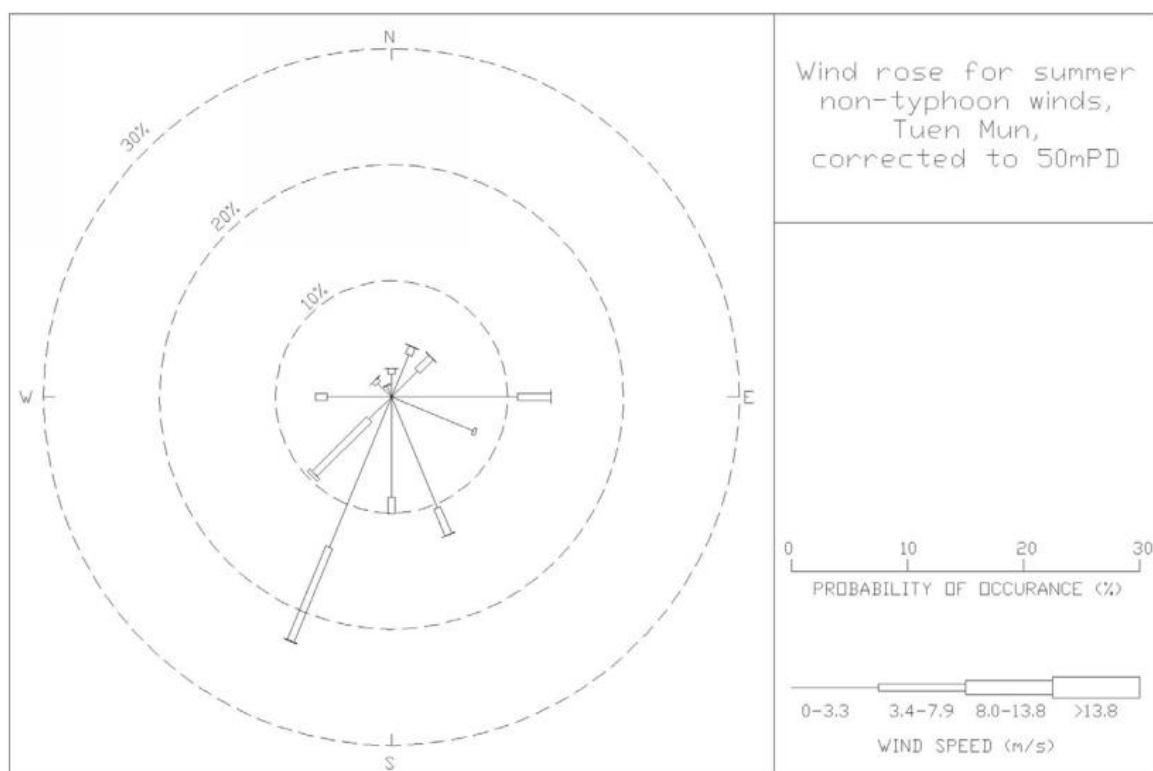


Figure 3-18 - Wind Rose for Summer Non-typhoon Winds at Test Area in Tuen Mun (corrected to 50mPD)

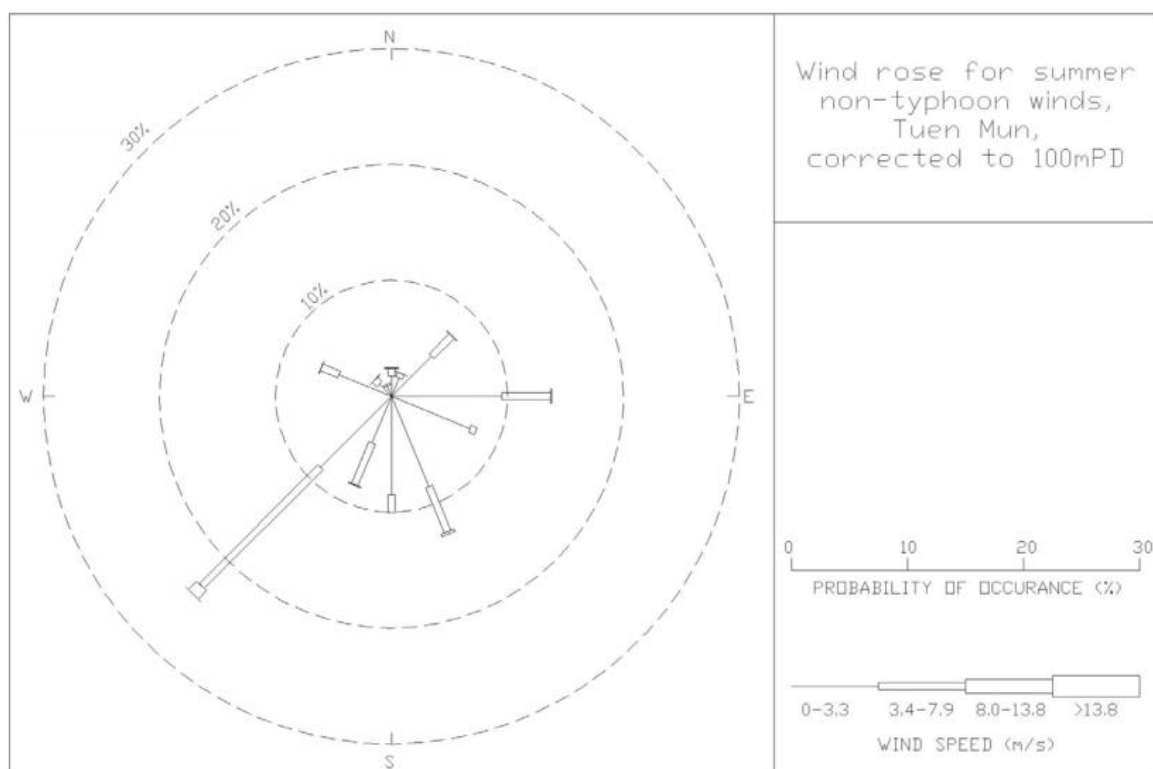


Figure 3-19 - Wind Rose for Summer Non-typhoon Winds at Test Area in Tuen Mun (corrected to 100mPD)

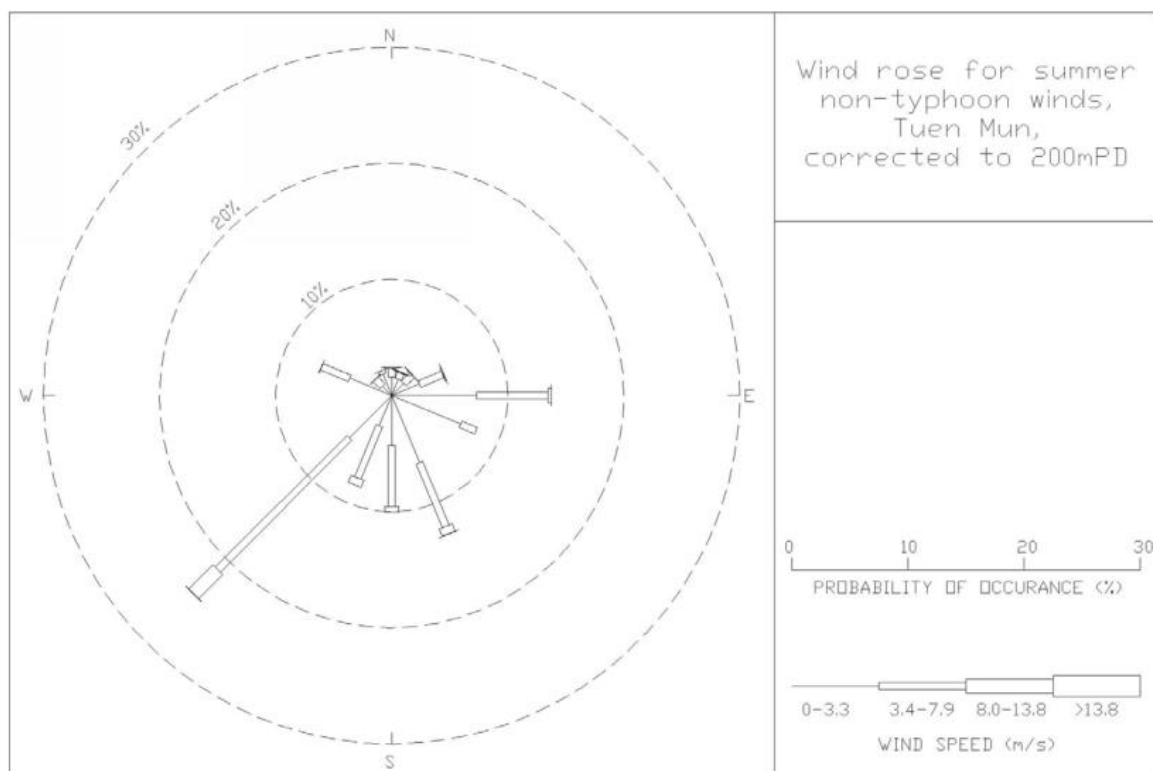


Figure 3-20 - Wind Rose for Summer Non-typhoon Winds at Test Area in Tuen Mun (corrected to 200mPD)

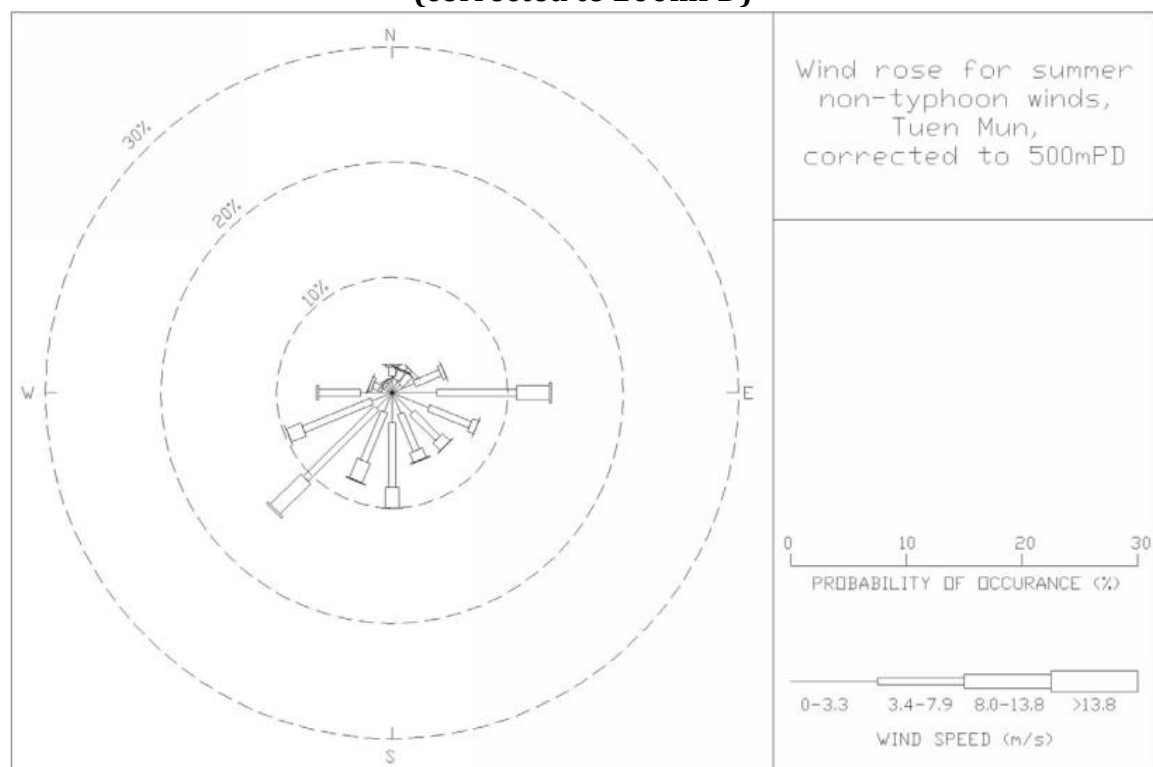


Figure 3-21 - Wind Rose for Summer Non-typhoon Winds at Test Area in Tuen Mun (corrected to 500mPD)

Table 3.1 – Summary of Prevailing Wind Directions

	Location	mPD*	Prevailing Wind	
			Annual	Summer
HKO Station	Tuen Mun Station (TM)	70m	NNE, SSE, S	NNE, SSE,S
RAMS simulation conducted by CityU	X:038 Y:064	200m	NNE, NE, SSE, S	SSE, S, SSW, SW
		300m	NNE, NE, SSE	SSE, S, SSW, SW
		500m	NE, E, ESE	SSE, S, SSW, SW
	X:039 Y:064	200m	NNE, NE, S	SSE, S, SSW, SW
		300m	NNE, NE, S	SSE, S, SSW, SW
		500m	NE, E, ESE	SSE, S, SSW, SW
	X:040 Y:064	200m	NNE, NE, S	SSE, S, SSW, SW
		300m	NNE, NE, S	SSE, S, SSW, SW
		500m	NE, E, ESE	SSE, S, SSW, SW
	X:038 Y:065	200m	NNE, E, SE, SSE	SSE, S, SSW, SW
		300m	NNE, E, SE, SSE	SSE, S, SSW, SW
		500m	NE, ENE, E, ESE	SSE, S, SSW, SW
	X:039 Y:065	200m	NNE, NE, S	SSE, S, SSW, SW
		300m	NNE, NE, S	SSE, S, SSW, SW
		500m	NE, E, ESE	SSE, S, SSW, SW
	X:040 Y:065	200m	NNE, NE, S	SSE, S, SSW, SW
		300m	NNE, NE, S	SSE, S, SSW, SW
		500m	NE, E, ESE	SSE, S, SSW, SW
Wind Tunnel Test conducted by HKUST		50m	N, NNE, NE, E	E, SSE, SSW
		100m	N, NE, E	E, SSE, S, SW
		200m	N, ENE, E	E, SSE, S, SW
		500m	N, ENE, E	E, S, SW

Note:

* Metres above Principal Datum at the measurement (HKO) /simulated (RAMS) /experimental (wind tunnel) height.

3.1.8 Since the HKO data and wind tunnel test result is not exactly site specific which have at least 2km from the Project site, and the simulated data at a lower level would experience more effect due to the topography. Therefore, the site specified RAMS at 200m is considered the most representative available wind data to determine the prevailing wind conditions.

3.1.9 In summary, refer to **Table 3.1**, the annual wind in the vicinity of the Study Area may mainly come from the directions NNE, NE, E, SE, SSE and S; while the summer wind in the vicinity of the Study Area may mainly come from SSE, S, SSW and SW (**Figure 3-22**).

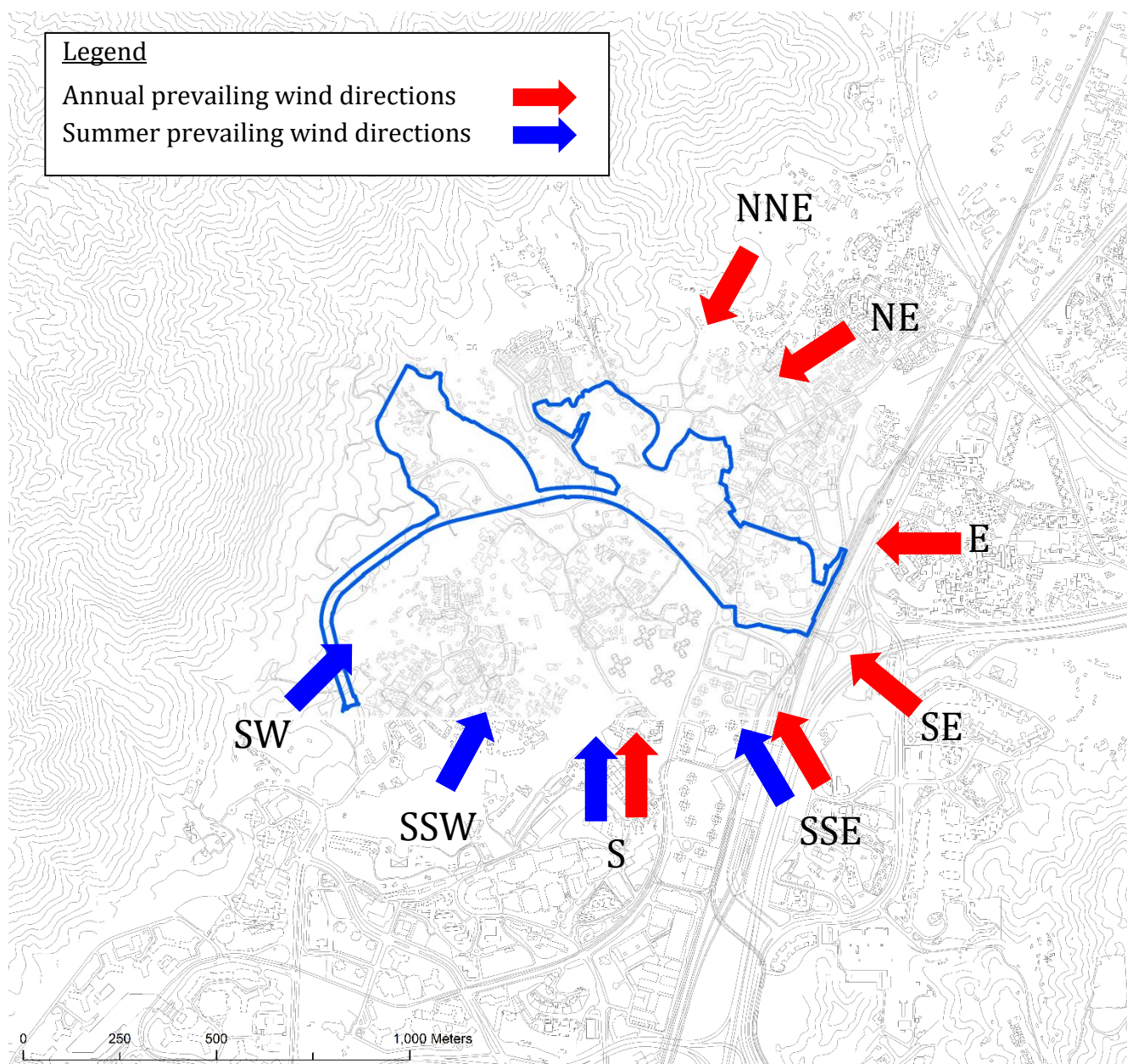


Figure 3-22 - Summary of Prevailing Wind Directions in the vicinity of Study Area

3.2 Effect of Surrounding Topography on Wind Environment of Study Area

- 3.2.1 As shown in **Figure 3-23**, the Study Area is located on a valley running more or less in the north-south direction. On the east are the mountains of the Tai Lam Country Park; and on the west are the Castle Peak and adjacent mountains.
- 3.2.2 A majority portion of strong winds from prevailing directions of NE to SW would pass through the Study Area as the wind directions are aligned with the direction of the valley (red arrows in **Figure 3-23**). However, part of the prevailing winds coming from SE, SSE and SW would be weakened by the shielding effects of the mountains of the Tai Lam Country Park and the Castle Peak (black arrows in **Figure 3-23**).
- 3.2.3 In contrast, magnifications in wind speed due to downhill air movement and valley wind is expected from some vegetative hill slopes and some valleys near the study area (some of possible directions NW, NNW and N are shown by green arrows in **Figure 3-23**).

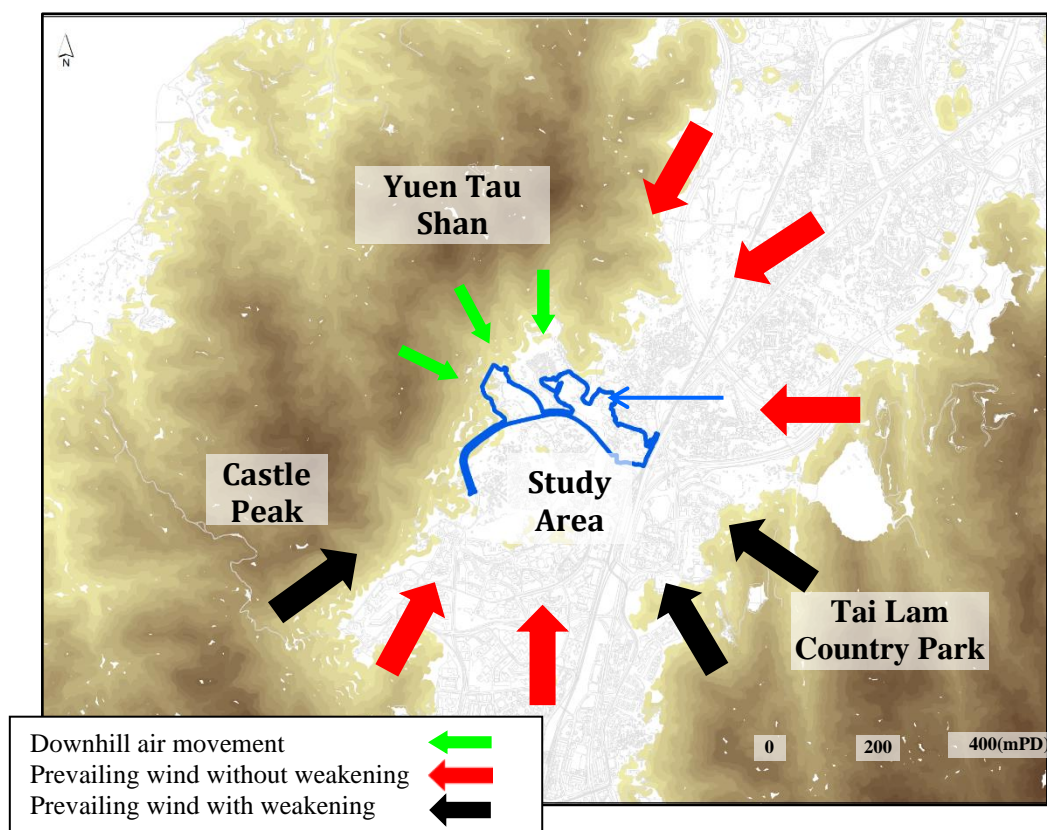


Figure 3-23 - Topographical Effect on Wind Environment of Study Area

3.3 Effect of Building Morphology on Wind Environment of Study Area

3.3.1 In the vicinity of the Site, Siu Hong Court and Yan Tin Estate are the only existing development with high-rise building blocks. Layouts of development in the northern part of Siu Hong Court and Yan Tin Estate are shown in **Figure 3-24**. Since both Siu Hong Court and Yan Tin Estate are situated to the south of the Site, they may have shielding effect in annual prevailing wind conditions. Similarly in summer, prevailing winds from S and SSE approaching the Site may be blocked by the existing blocks in Siu Hong Court and Yan Tin Estate.

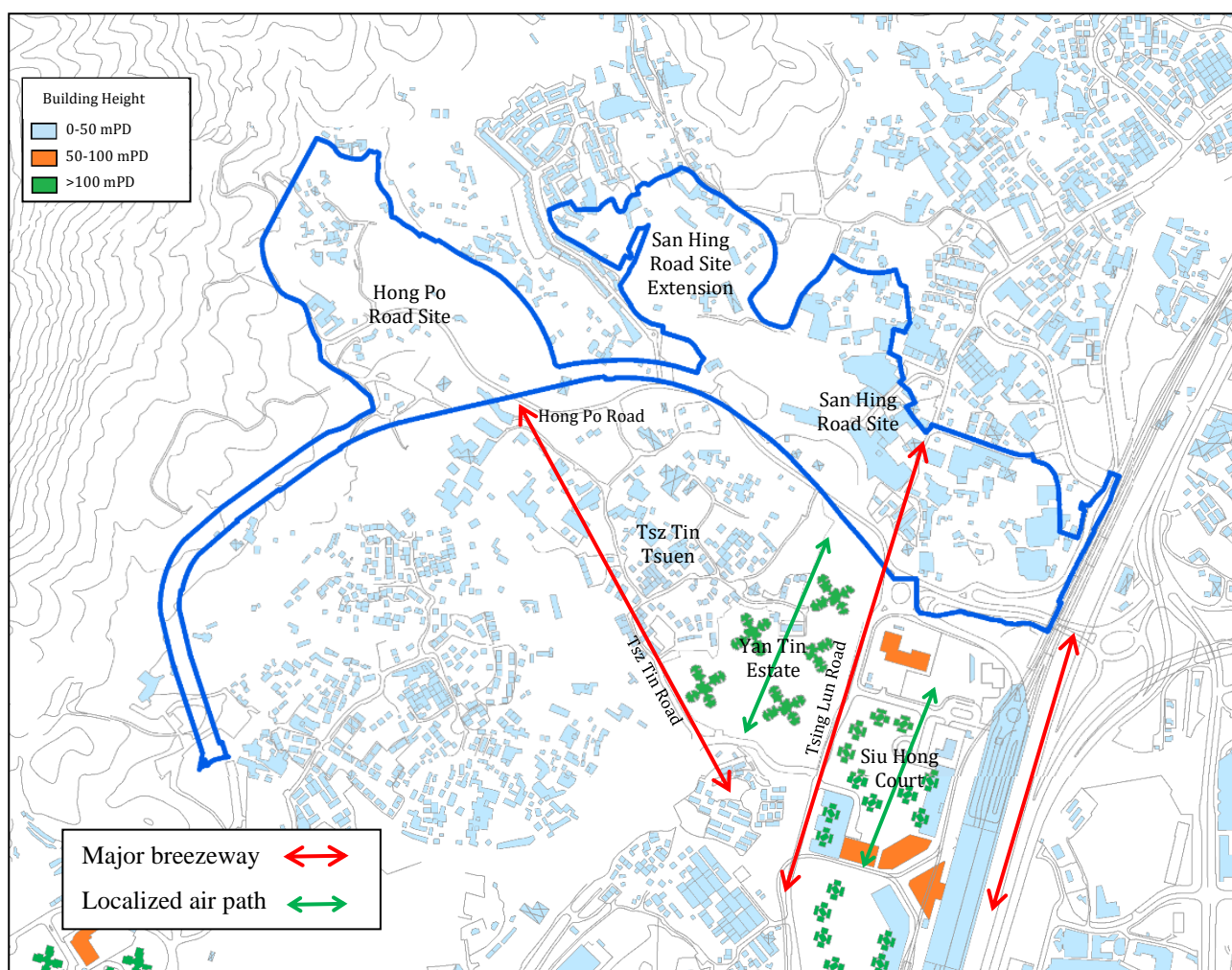


Figure 3-24 - Building Morphology Effect on Wind Environment of the Site

3.3.2 While Tsing Lun Road serves as a major breezeway and two localized air paths in N-S direction are available through Siu Hong Court and Yan Tin Estate, S wind approaching the Site will not be hindered in general. SSE wind to the east side of the Project area (San Hing Road Site and San Hing Road Site Extension) may be partially blocked by the existing clusters. However, the SSE wind can reach west side of the Project area (Ho Po Road Site) through Tsz Tin Road along Tsz Tin Tsuen.

- 3.3.3 Existing noise barriers (7.5m tall) are located along Tsing Lun Road and Tsz Tin Road. A noise enclosure (8m tall) is also installed at Tsing Lun Road. **Figure 3-25** shows the proposed Noise Barriers, location of existing noise barriers and noise enclosure in the vicinity of Study Area. Since the noise barriers and noise enclosure at Tsing Lun Road are aligned in north-south direction, they would block a portion of easterly wind entering Yan Tin Estate at pedestrian level and divert the wind to north and south direction. Since the noise barriers and noise enclosure are insubstantial (7.5m to 8m tall), the impacted area would be localized.
- 3.3.4 **Figure 3-26** shows the details of the proposed Noise Barriers. They are aligned along the realigned Hong Po Road, Ng Lau Road and internal road of San Hing Road Site in south-east and north-west direction. They would block a portion of southerly wind and south-westerly wind entering the San Hing Road Site and San Hing Road Site Extension. The incoming southerly wind and south-westerly wind will be diverted to east and west direction. Similar to the existing noise barriers, the noise barriers and noise enclosure are insubstantial (2.5m to 5.5m tall), the impacted area would be localized.

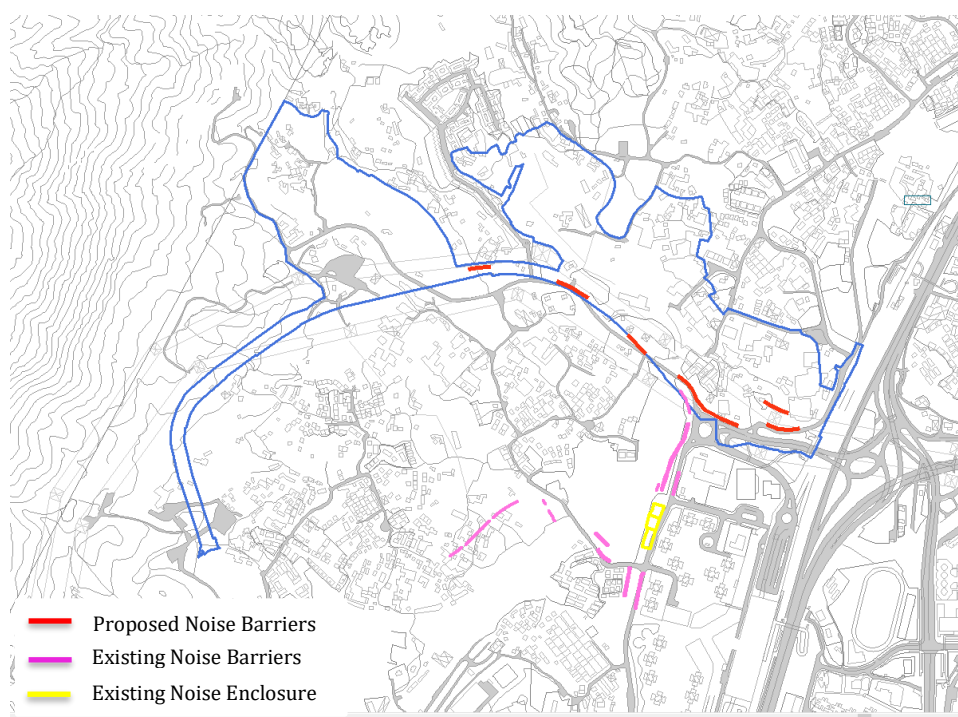


Figure 3-25 - Topographical Effect on Wind Environment of Study Area

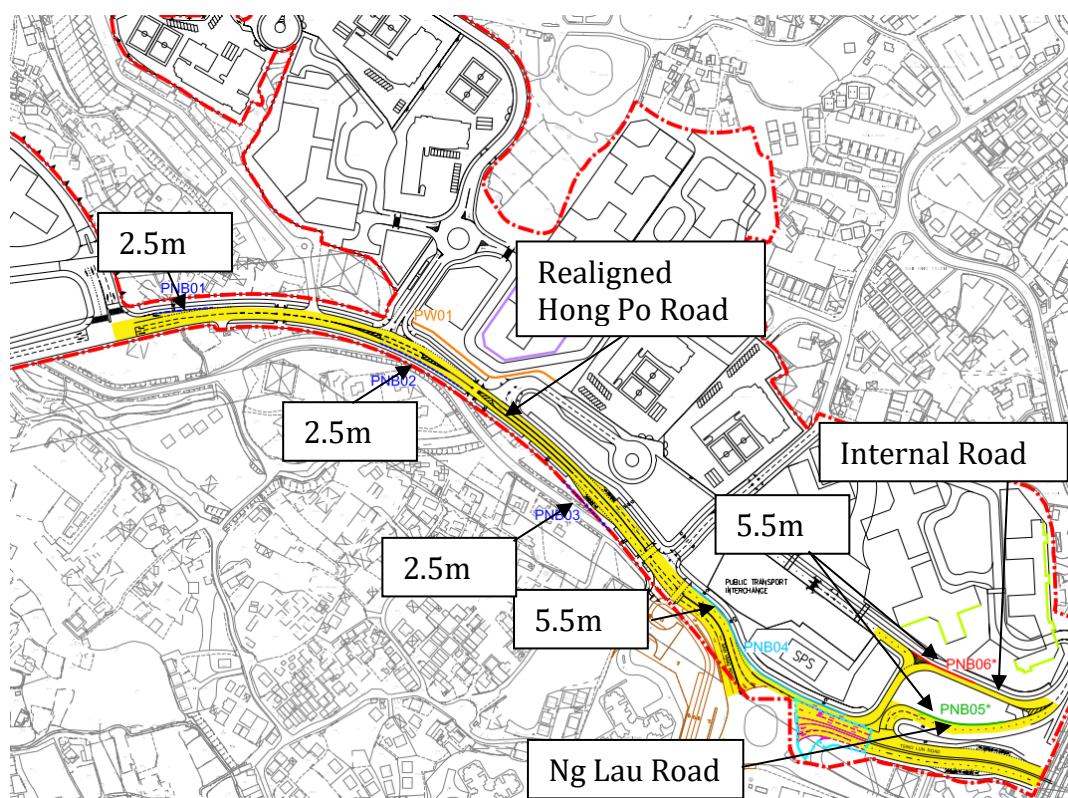


Figure 3-26 – Details of the proposed Noise Barriers of Study Area

3.3.5 Moreover, there are private developments in the vicinity of the Site which have been approved via Planning Permission. These existing and committed developments may affect the wind availability of the individual sites in existing conditions. The committed/ proposed private developments are either low-rise residential blocks of 4-storeys above ground or small houses of 3-storeys. However, the layout is yet confirmed and therefore not discussed in this Report.

3.4 Summary on Site Wind Availability Study

3.4.1 The relevant measured, simulated and experimental wind data were collected and reviewed (**Table 3.1**). It is concluded that the annual wind in the vicinity of the Study Area may mainly come from the directions NNE, NE, E, SSE, SE and S; while the summer wind in the vicinity of the Study Area may mainly come from SSE, S, SSW and SW.

3.4.2 The effect of surrounding topography on the wind environment of the Site is investigated. It is considered that a majority portion of strong winds from prevailing directions of NE to SW will pass through the Site as the wind directions are aligned with the direction of the valley running more or less in the north-south direction (red arrows in **Figure 3-23**). Part of the prevailing winds coming from SE, SSE and SW would be weakened by the shielding effects of the adjacent mountains (black arrows in **Figure 3-23**); while magnifications in wind speed due to downhill air movement and valley wind is expected from some vegetative hill slopes and some valleys near the Site (some of possible directions NW, NNW and N are shown by green arrows in **Figure 3-23**).

- 3.4.3 The effect of building morphology on the wind environment of the Site due to the committed developments in vicinity is investigated. The existing Siu Hong Court and Yan Tin Estate may obstruct SSE wind to the Site. Tsing Lun Road and Tsz Tin Road serve as breezeways which allow wind penetration to the Project Site.

4 EXISTING CONDITIONS

4.1 Existing Site Conditions

- 4.1.1 The Site is currently occupied by low-rise village houses (houses of 3 storeys or lower), farms, open storage sites, car park areas and landscape areas. There is a local access road to the existing development of Villa Pinada and Hong Po Road and Tsz Tin Tsuen Road leading to the Site. HPR Site is mainly occupied by open storage sites, while SHR Site Extension is mainly landscape areas. SHR Site comprises landscape areas and open storage sites with temporary structures (godowns). With large open areas and low rise structures only, there is no air ventilation problem in the vicinity of the Site in the present status.

4.2 Current Land Uses

- 4.2.1 By reviewing the latest approved Tuen Mun Outline Zoning Plan No. S/TM/35 and approved Lam Tei and Yick Yuen Outline Zoning Plan No. S/TM-LTYY/10, it is understood that the land uses of the Site are “Green Belt” (“GB”) and Residential (Group E)” (“R(E)”).
- 4.2.2 The Site is surrounded by “Green Belt” (“GB”), “Village Type Development” (“V”), “Conservation Area” (“CA”) and “Government, Institution or Community” (“G/IC”) zones as ‘air spaces’, except at the southeast side where there are sites zoned “Residential (Group A)” (“R(A)”) including Yan Tin Estate and Siu Hong Court. Hence, there is no major air ventilation problem in the vicinity of the Site in the present status but wind availability from SE and SSE will be slightly affected by the residential developments.
- 4.2.3 Downhill air movements from approximately NW, NNW and N direction of the Site are beneficial to air ventilation in the vicinity of the Site.

4.3 Prevailing wind Directions and Major Air Paths/Breezeways

- 4.3.1 Based on the analysis of the topography and the findings from the Site Wind Availability Study (SWAS) in Section 3, the prevailing wind directions of the Site are identified and illustrated in **Figure 3-23**. Downhill air movements (green arrows) are also shown in the figure. For the summary of prevailing wind directions in SWAS, **Table 3.1** and **Figure 3-22** refer. The major breezeways and localized air paths are indicated in **Figure 3-24**.
- 4.3.2 For the annual condition, the prevailing wind comes from directions including NNE, NE, E, SE, SSE and S (**Figure 4-1**). The northeast area of the Site is occupied by low rise building and structures only, the prevailing annual wind from NNE and NE can reach the Site with only minimal obstruction. HPR Site is located at the NNW of Tze Tin Tsuen and its west boundary adjoins the Tsing Shan Firing Range boundary. There is no development at its south west direction. As the current site area is mainly open storage, potential air ventilation problem due to HPR Site is not expected. On the other hand, SHR Extension Site is mainly green belt zone with vegetation and it will not cause potential ventilation problem to Po Tong Ha at its southwest side under

NNE and NE wind. Annual prevailing wind from north east direction can pass through the low-rise village area (Tsing Chuen Wai and Tuen Tsz Wai) and SHR Site to Tsing Lun Road. The existing developments does not facilitate annual prevailing wind from SE and SSE very well. SE, SSE and S wind are sheltered by Yan Tin Estate and Siu Hong Court before reaching Site and the further downstream area. Tze Tin Road and Ho Po Road and major breezeways under SE and SSE wind while Tsing Lun Road serve as major breezeway under S wind. Since the Site contains low rise building and structures only, Villa Pinada, which is located at the North west of the Site, only experiences minimal wind obstruction by the Site under SE and SSE and S wind.

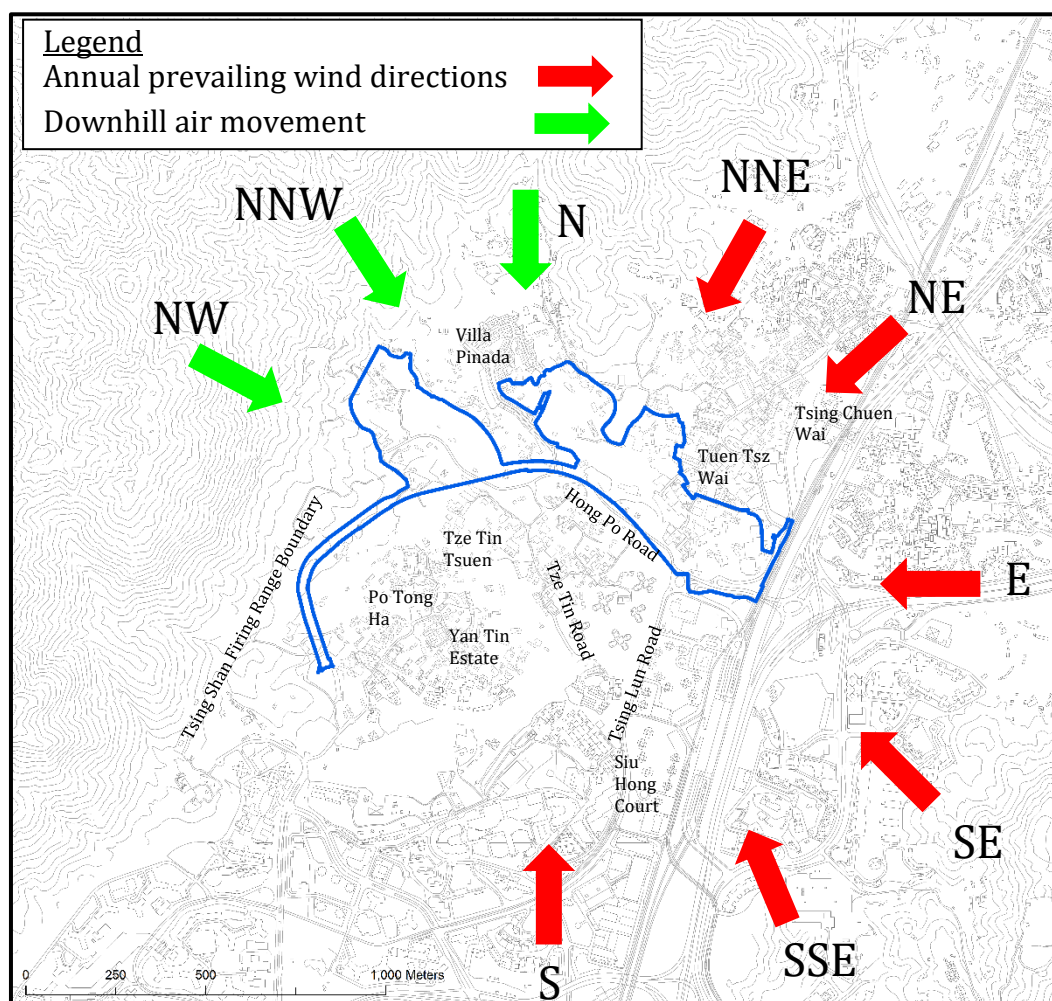


Figure 4-1 - Annual Prevailing Wind Direction of the Site

- 4.3.3 Considering the summer condition, the directions of the prevailing wind are between SSE and SW directions (**Figure 4-2**). The south west wind comes from open area of Po Tong Ha and reaches HPR Site and SHR Site Extension. Considering SHR Site, the SSW and SW wind are sheltered by Yan Tin Estate, Tsing Lun Road serves as major breezeway for the penetration of SSW and SW wind. Under the existing development scenario, wind obstruction by the Site under SSW and SW wind is minimal. Air ventilation to Villa Pinada and the village area of Tsing Chuen Wai, Tuen Tsz Wai and San Hang Tsuen at the north east of the Site are not affected.

- 4.3.4 Villa Pinada, which is located at the North west of the Site, only experiences minimal wind obstruction by the Site under SSE and S wind.

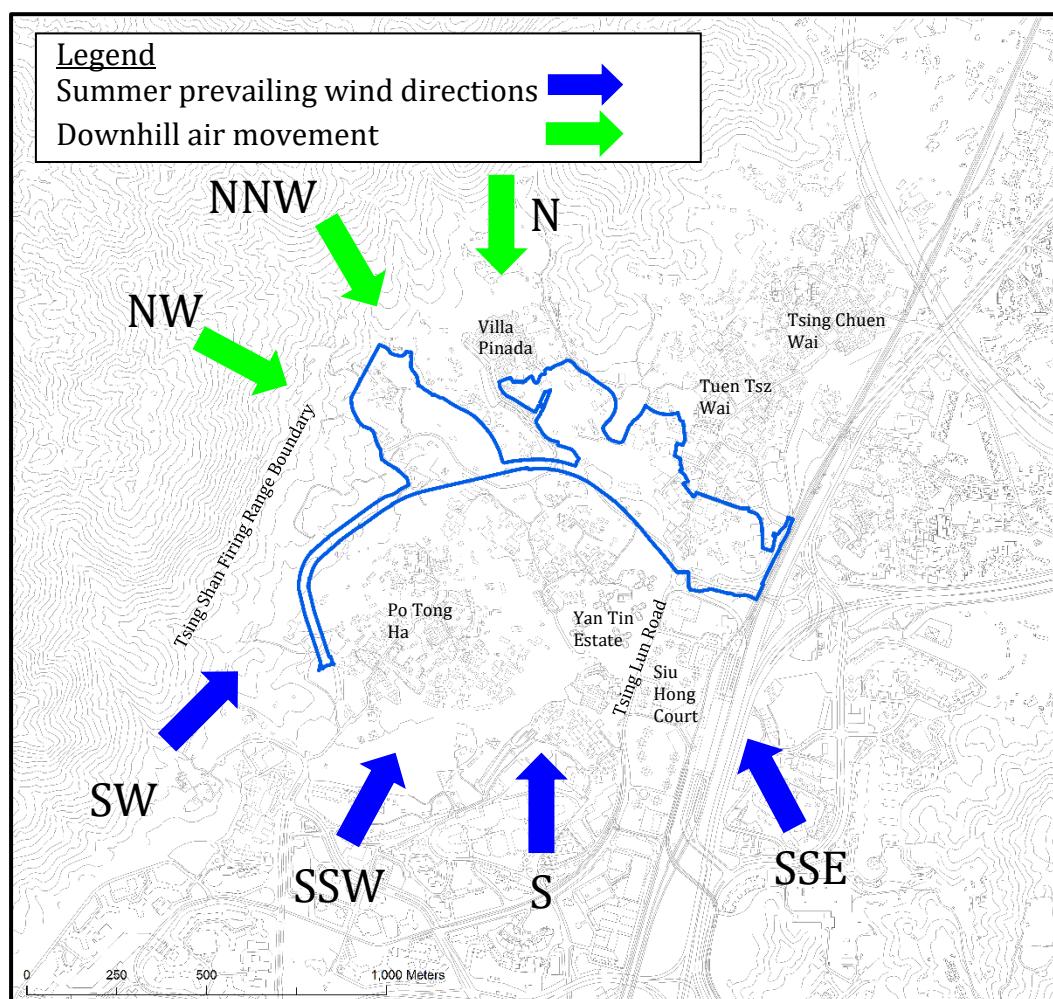


Figure 4-2 - Summer Prevailing Wind Direction of the Site

- 4.3.5 The downhill wind approaches the Site from the NW, NNW and N directions. It passes through HPR Site and SHR Site Extension to ventilate the southern open areas of the Site. Since the existing buildings in those two sites are mainly scattered low-rise village houses, the downhill wind can penetrate through the sites to reach SHR Site. Since SHR Site consist of low rise buildings and structures only, the downhill wind can further pass across SHR Site to the leeward areas with minimal obstruction.

4.4 Summary on Existing Conditions

- 4.4.1 By reviewing the existing site conditions, current land uses, ground coverage by buildings, prevailing wind directions and major air path/breezeway, it is concluded that the Site does not induce any major air ventilation problems in the present status.

5 EXPERT EVALUATION OF PROPOSED DEVELOPMENTS

5.1 General

- 5.1.1 The proposed development consists of 3 major sites, namely HPR Site, SHR Site Extension and SHR Site. The Project Boundary is shown in **Figure 1-1**. The air ventilation impact of the Development to adjacent areas is assessed based on the development layout in the Site, the existing conditions of adjacent areas, the far-field and near-field topography, the site wind availability, including the major breezeways, and future developments in the surrounding regions with the assumption that they will be built to their maximum plot ratios and building heights allowed.

5.2 Hong Po Road Site

- 5.2.1 The HPR site is situated at rural area in NNW of Tuen Mun, which is over 2km from Tuen Mun Centre. The general layout of the site is shown in **Appendix A**. The site is proposed to be re-zoned from “GB” to “R(A)” for development of public housing. The site area for public housing development use is about 7.9 hectares. The HPR site would be formed in ground levels from +8mPD to +21mPD, which is indicative and subject to detailed design. There will be 11 nos. of high-rise residential blocks in the site. The 3 blocks at the west would be seated on the platform. The overall design plot ratio for the public housing development area is 6.5 and the maximum proposed building height is about +150mPD. Along the northwest boundary adjacent to the Tsing Shan Firing Range, a 20m buffer zone is reserved for natural terrain mitigation measures. The detail development parameters are presented in **Table 5.1**.
- 5.2.2 Existing buildings in the vicinity of the HPR site only include scattered low-rise village houses, open storages, car workshops, warehouses, etc. The relatively large-scale development in the vicinity is Villa Pinada suited in the east of the Site but it is low-density development in “GB” zone. At present, the HPR site has open exposure to the prevailing winds and the major breezeways in both annual and summer conditions. The HPR site also has open exposure to the downhill air movement from the hills surrounding the Site in the NW, NNW and N directions.

Table 5.1 Development Parameters of HPR Site

Maximum building height	About 150mPD
Plot ratio	6.0(Domestic) 0.5(Non- Domestic)
Podium height	5m to 13m
Building blocks Block 1 Blocks 2 to 11 Welfare and Retail facilities at G/F of domestic blocks & podium	46 storeys 45 storeys

5.3 San Hing Road Site Extension

- 5.3.1 The site is situated at rural area in NNW of Tuen Mun and to the east of HPR Site. The general layout of the site is shown in **Appendix A**. The site is proposed to be re-zoned from “GB” to “R(A)” for development of public housing and schools. The site areas for school use and public housing development use are about 2.4 hectares and 1.5 hectares respectively. There will be 2 nos. of primary schools and a secondary school in the area and 2 nos. of high-rise residential blocks, retail facility and welfare facility on G/F of domestic blocks in the area for public housing development are used in the conceptual design. The overall design plot ratio for the public housing development area is 6.5 and the maximum proposed building height is about +150mPD. The detail development parameters are presented in **Table 5.2**.
- 5.3.2 Existing buildings in the vicinity of the site only include scattered low-rise village houses, open storages, car workshops, agricultural area, warehouses, etc. A relatively larger scale village type house development in the vicinity is Villa Pinada suited immediately to the north west of the Site. At present, the site has open exposure to the prevailing winds as well as the major breezeways in both annual and summer conditions. The site also has open exposure to the downhill air movement from the hills situated in approximately from NW, NNW and N directions.

Table 5.2 - Development Parameters of SHR Site Extension

Maximum building height	About +150mPD
Plot ratio	6.0(Domestic) 0.5(Non- Domestic)
Podium height	5.5m to 6.0m
Building blocks Blocks 1 to 2 30- classroom secondary school 2 nos. of 36-classroom primary schools Welfare and Retail facilities at G/F of domestic blocks	45 storeys 7 storeys* 7 storeys* -

*Standard design is assumed. Height is below 30m.

5.4 San Hing Road Site

- 5.4.1 SHR Site is situated to the SW of San Hing Tsuen and the NE of Tsz Tin Tsuen on the opposite side Hong Po Road. The general layout of the site is shown in **Appendix A**. The site is proposed to be re-zoned from “GB” and “R(E)” to “R(A)” for development of public housing and schools. The site areas for public housing development use and school use are 7.5 hectares and 1.4 hectares, respectively. There will be 2 nos. of primary schools and 9 nos. of high-rise residential blocks with welfare facilities on G/F in the area for public housing development use in the conceptual design. The overall design plot ratio for the public housing development area is 6.5 and the maximum proposed building height is about +150mPD. The detail development parameters are presented in **Table 5.3**.

- 5.4.2 Existing buildings in the vicinity of the site only include scattered low-rise village houses, open storages, car workshops, warehouses, etc. Tuen Tze Wai is suited immediately to the north east of the Site. At present, the prevailing winds from the south is sheltered by Yan Tin Estate and Siu Hong Court in both annual and summer conditions.

Table 5.3 - Development Parameters of SHR Site

Maximum building height	About +150mPD
Plot ratio	6.0(Domestic) 0.5(Non- Domestic)
Podium height	5.5m to 16.5m
Building blocks Block 1 Blocks 2 to 4, 7 to 9 Blocks 5 to 6 2 nos. of 30-classroom primary schools Welfare and retail facilities at G/F of domestic blocks	33 storeys 46 storeys 48 storeys 7 storeys* -

* Standard design is assumed. Height is below 30m.

5.5 Proposed Roads and Noise Barriers

- 5.5.1 Road L7 and the realigned Hong Po Road will be proposed to link Lam Tei Interchange and Ming Kum Road. The proposed Road L7 will provide an alternative route to the proposed development sites to diversify the traffic to different location so as to minimise the traffic impact to the surrounding road network. Proposed vertical noise barriers were provided along the realigned Hong Po Road and Existing noise barriers and noise enclosures are constructed along Tsing Lun Road as noise mitigation measures for the Site and Yan Tin Estate.
- 5.5.2 For the proposed noise barriers as shown in **Figure 3-26**, they are aligned along the realigned Hong Po Road, Ng Lau Road and internal road of San Hing Road Site in south-east and north-west direction. The noise barrier will have localized impact under the annual prevailing NNE, NE wind and summer prevailing SSW, SW wind. However, the wide gaps between the noise barrier sections provide continuity to some of the localised air paths and could reduce their impact. The noise barriers, especially the high ones, would also affect the wind availability at pedestrian level along the proposed realigned Hong Po Road.

5.6 San Hing Road Sewage Pumping Station (SHR SPS)

- 5.6.1 The proposed San Hing Road Sewage Pumping Station is located at the south the SHR Site and at the eastern of the proposed Road L7 (**Figure 5-3**). The proposed pumping

station is 32.5m x 18m on plan and its height is 7.5m with top level at 15.4mPD. Considering the height of the low-rise pumping station (equal to a 3-storey building) and the open area of PTI at its north and Tsing Lun Road Roundabout at its south, easterly approaching wind from Yuen Long Highway through the proposed Road L7 to the Site would not be obstructed.

5.7 Wind Performance

- 5.7.1 In this section, the conceptual site layout of the Site is described first. Features regarding air ventilation and localised air paths are covered. Direction analysis of the prevailing wind conditions are then provided.
- 5.7.2 In HPR Site, most of the building separations would be wider than 15m. The buildings would be aligned in SE to NW direction and localized air paths are identified within the proposed development along NE to SW direction as shown in **Figure 5-1**.

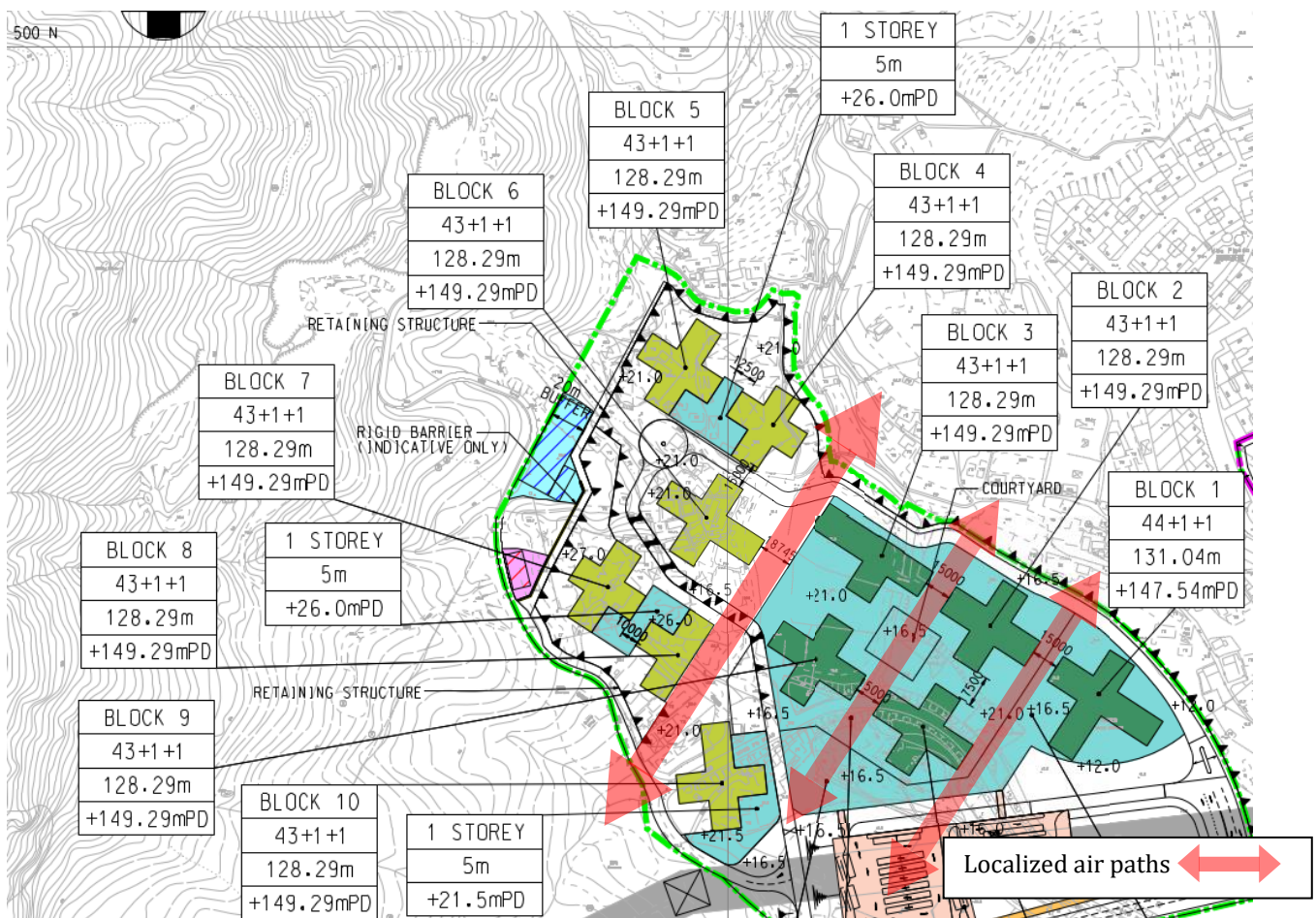


Figure 5-1 - Layout Plan for Hong Po Road Site

- 5.7.3 In SHR Site Extension, the building separation between the proposed residential buildings is narrow (about 5.5m). The separations between the proposed residential buildings and the school buildings would be more than 15m. Three localized air paths are identified in the proposed development as shown in **Figure 5-2**. The air paths would be at least 15m wide and the bending angle would be less than 15 degrees.

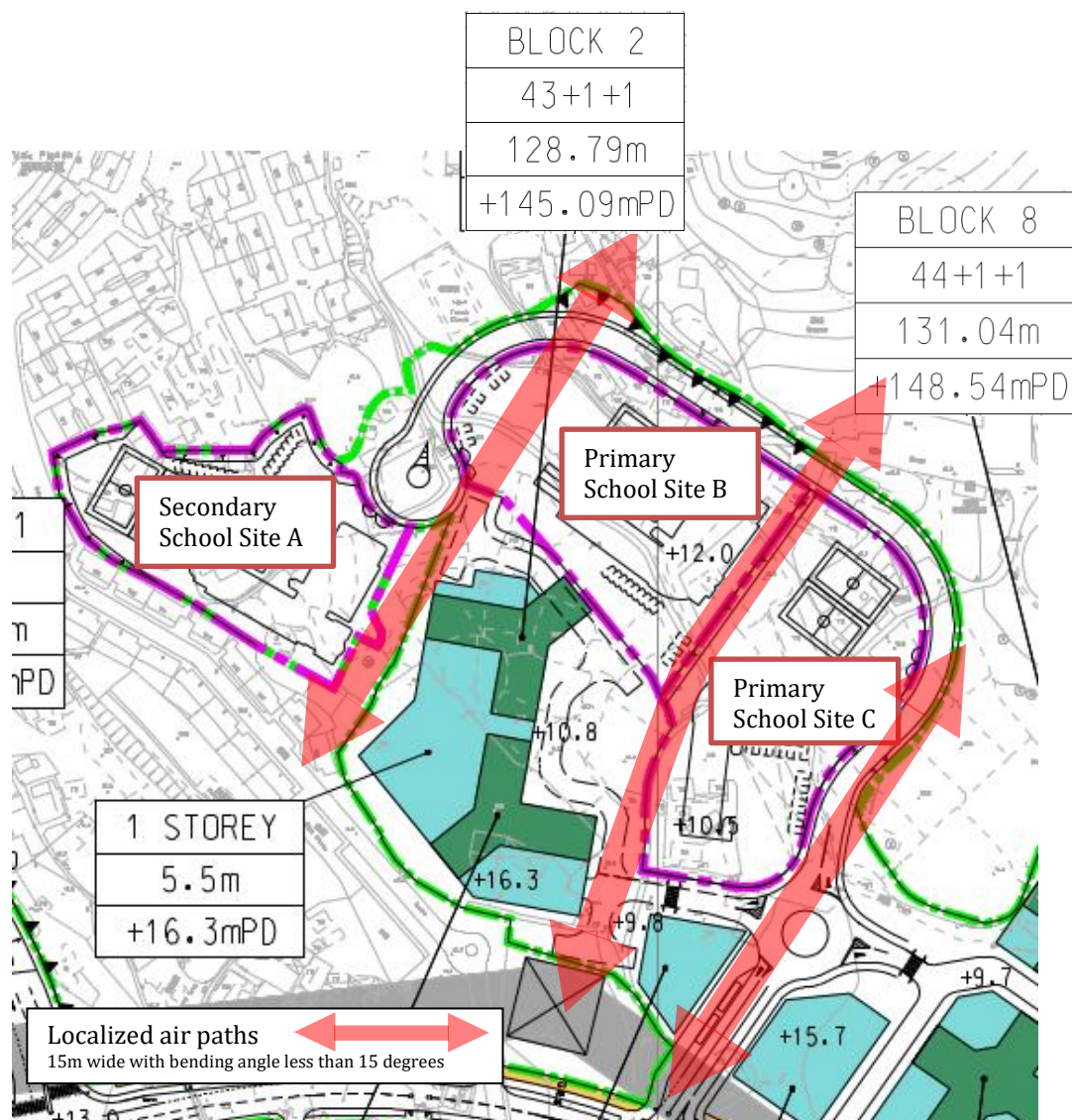


Figure 5-2 - Layout Plan for San Hing Road Site Extension

5.7.4 In SHR Site, the building separations would be all wider or equal to 15m. The building gaps are proposed along NE to SW direction and several localized air paths are identified in the proposed development as shown in **Figure 5-3**.

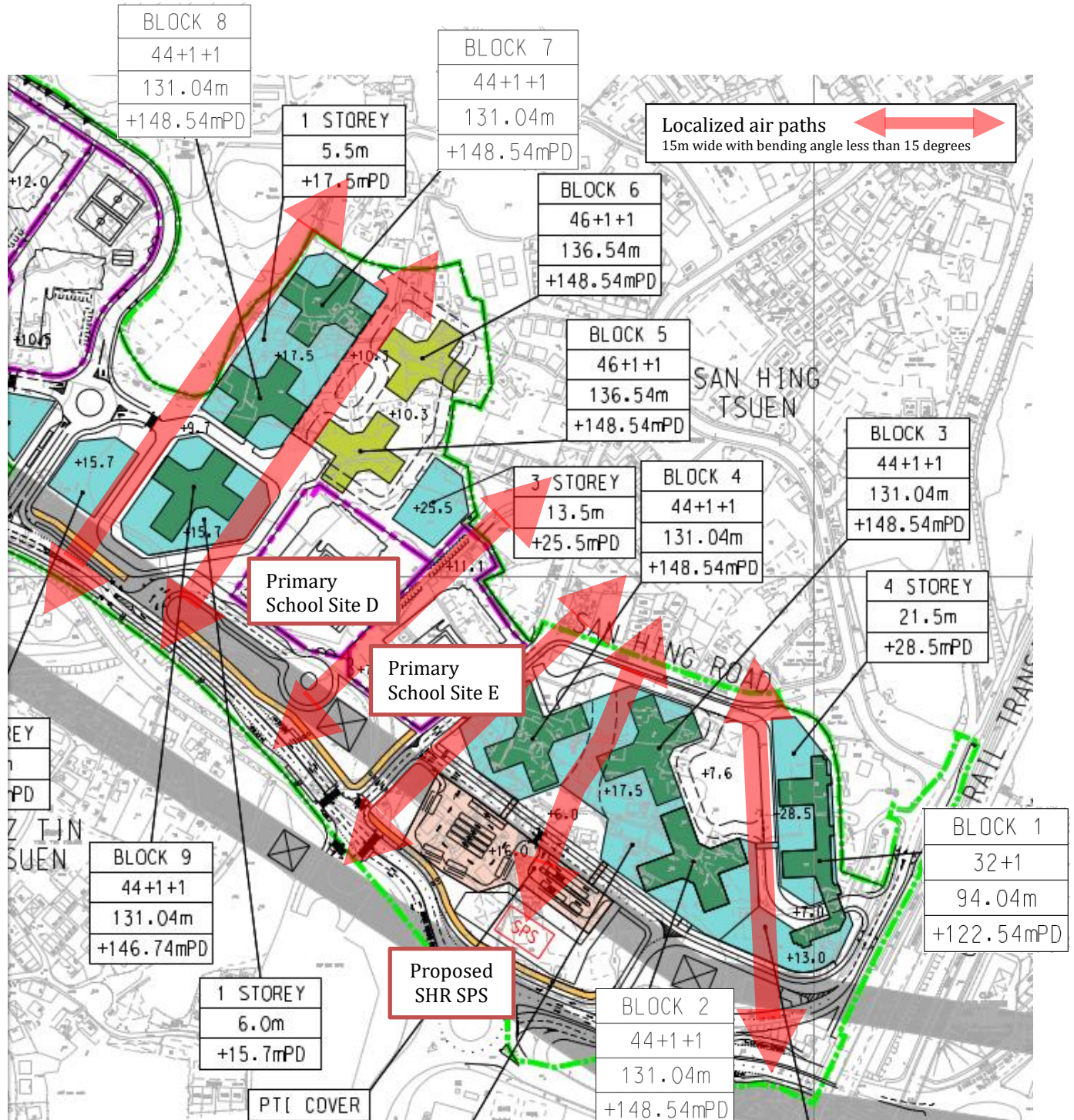


Figure 5-3 - Layout Plan for San Hing Road Site

- 5.7.5 For annual condition, prevailing wind comes from NNE, NE, E, SE, SSE and S directions as shown in **Appendix B**. For summer condition, prevailing wind comes from SSE, S, SSW and SW directions as shown in **Appendix B**. The site wind performance is described below.

5.8 Prevailing Wind in NNE Direction (Annual Wind)

- 5.8.1 The approaching wind comes from Tuen Tsz Wai and Villa Pinada without blockage (**Appendix B-1**).

Hong Po Road Site

- 5.8.2 The localised air paths as shown on **Figure 5-1** would be utilised. Wind penetration through the site would be good. Ventilation of the green belt area to the west of the site and the proposed Public Transport Interchanges (PTIs) would be affected. The western estate road and the open areas to the south of Blocks 10 and 11 would be affected also. The inner court of the site would be sheltered by Blocks 2 and 3. The area along the northeast side of the site including the eastern estate road would experience strong downwashed wind. Minor wind paths are predicted to penetrate into the Site through the building gaps between Blocks 1 and 2 and between Blocks 2 and 3. It is noticed that wind penetration through the minor wind path between Blocks 1 and 2 would be relatively weaker than that between Blocks 2 and 3 due to the obstruction by the extended podium structure between the building gaps.

San Hing Road Site Extension

- 5.8.3 The localised air paths as shown on **Figure 5-2** would be utilised. Wind penetration through the site would be good. Ventilation to the green belt area at downwind side, the southern end of the access road from the proposed Road L7 to Villa Pinada and part of the proposed Road L7 would be affected. Several blocks of Villa Pinada to the south of the proposed Secondary School Site A indicated in **Figure 5-2** would be affected by the Secondary School Site A. The proposed Primary School Sites B & C would affect ventilation to the lower floors of Blocks 1 and 2 within the Site. However, both Blocks 1 and 2 would convey the upper wind down to the pedestrian level and create a localised high wind speed area. The effect of the schools therefore would not be significant.

San Hing Road Site

- 5.8.4 Wind would be able to penetrate into the Site in several paths, the localized air paths as shown in **Figure 5-3** would be utilised. At pedestrian level, area near Blocks 1 to 4 is predicted to have better air ventilation performance as compared to Blocks 5 to 9 (including the proposed Primary School Sites D & E indicated in **Figure 5-3**) due to the shielding effect of Blocks 6 and 7 on Blocks 5, 8 and 9. A minor wind flow between Blocks 6 and 7 would allow the NNE wind to penetrate into the inner court of the Site and it is likely to help lower the impact due to the shielding effect. However, the potential minor wind flow would be obstructed by the podium of Block 9. On the other hand, the proposed Primary School Site E to the south east of Block 5 would not be affected by the high rise residential buildings. Although the predicted wind performance at Blocks 1 to 4 is satisfactory, the proposed high rise residential

buildings would shelter the incoming NNE towards the leeward proposed PTIs and the existing Yan Tin Estate. The wind performance at Yan Tin Estate would be lowered. The proposed building separations between Blocks 1 and 4 would help to lower the shielding effect induced by the buildings on the leeward sensitive areas.

5.9 Prevailing Wind in NE direction (Annual Wind)

- 5.9.1 Similar to NNE wind, the approaching wind comes from Tuen Tsz Wai and Villa Pinada without blockage (**Appendix B-2**).

Hong Po Road Site

- 5.9.2 The predicted wind performance is similar to the condition under NNE wind. The localised air paths as shown on **Figure 5-1** would be utilised. Wind penetration through the site would be good. Ventilation of the green belt area to the west of the site and the proposed PTIs would be affected. The western estate road and the open areas to the south of Blocks 10 and 11 would be affected also. The inner court of the site would be sheltered by Blocks 2 and 3. The area along the northeast side of the site including the eastern estate road would experience strong downwashed wind. Minor wind paths are predicted to penetrate into the Site through the building gaps between Blocks 1 and 2 and between Blocks 2 and 3. It is noticed that wind penetration through the minor wind path between Blocks 1 and 2 would be relatively weaker than that between Blocks 2 and 3 due to the obstruction by the extended podium structure between the building gaps.

San Hing Road Site Extension

- 5.9.3 The predicted wind performance is similar to the condition under NNE wind. The localised air paths as shown on **Figure 5-2** would be utilised. Wind penetration through the site would be good. Ventilation to the green belt area at downwind side, the southern end of the access road from the proposed Road L7 to Villa Pinada and part of the proposed Road L7 would be affected. Several blocks of Villa Pinada to the south of the proposed Secondary School Site A indicated in **Figure 5-2**, would be affected by the proposed Secondary School Site A. The proposed Primary School Sites B & C would affect ventilation to the lower floors of Blocks 1 and 2 within the Site. However, Blocks 1 and 2 would convey the upper wind down to the pedestrian level and create a localised high wind speed area. The effect of the schools therefore would not be significant.

San Hing Road Site

- 5.9.4 The predicted wind performance is similar to the condition under NNE wind. Wind would be able to penetrate into the Site in several paths, the localized air paths as shown in **Figure 5-3** would be utilised. At pedestrian level, area near Blocks 1 to 4 is predicted to have better air ventilation performance as compared to Blocks 5 to 9 (including the proposed Primary School Site D indicated in **Figure 5-3**) due to the shielding effect of Blocks 6 and 7 on Blocks 5, 8 and 9. A minor wind flow between Blocks 6 and 7 would allow the NE wind to penetrate into the inner court of the Site and it is likely to help lower the impact due to the shielding effect. However, the potential minor wind flow would be obstructed by the extended podium of Block 9.

On the other hand, the proposed Primary School Sites D and E indicated in **Figure 5-3** would not be affected by the high rise residential buildings. Although the predicted wind performance at Blocks 1 to 4 is satisfactory, the proposed high rise residential buildings would shelter the incoming NE wind towards the leeward proposed PTIs and the existing Yan Tin Estate. The wind performance at Yan Tin Estate would be lowered. The proposed building separations between Blocks 1 to 4 would help to lower the shielding effect induced by the buildings on the leeward sensitive areas.

5.10 Prevailing wind in E direction (Annual Wind)

5.10.1 The approaching wind comes from Lam Tei Interchange without significant blockage (Appendix B-3)

Hong Po Road Site

5.10.2 The predicted wind performance is not favorable under E wind. The localised air paths as shown on Figure 5-1 would not be utilised. Wind penetration through the site would not be good. Ventilation of the green belt area to the west of the site would be affected. The inner court of the site would be sheltered by the building blocks at the Site, the prevailing wind would pass around the Site. Only a potential minor wind flow is predicted to enter the site between Blocks 3 and 4. Moreover, the area along the east side of the site would experience strong downwashed wind.

San Hing Road Site Extension

5.10.3 Similar to Hong Po Road Site, the predicted wind performance is not favorable under E wind. The localised air paths as shown on Figure 5-2 would not be utilised. Wind penetration through the site would not be good, the prevailing wind would pass around the Site instead of penetrating into the Site. Several blocks of Villa Pinada to the west of the Site would be affected by the high-rise residential buildings. On the other hand, the high-rise residential buildings would convey the upper wind down to the pedestrian level and create a localised high wind speed area.

San Hing Road Site

5.10.4 Similar to the Hong Po Road Site and San Hing Road Site Extension, the predicted wind performance is not favorable under E wind. The localized air paths as shown in Figure 5-3 would not be utilised. Wind penetration through the site would not be good, the prevailing wind would pass around the Site instead of penetrating into the Site. The leeward area of the high-rise building would be sheltered, e.g the PTIs. Since Block 2 and Block 3 would be taller than Block 1 by at least 25 meters, Blocks 2 and 3 would convey the upper wind down to the pedestrian level and create a localised high wind speed area between Blocks 1, 2 and 3.

5.11 Prevailing Wind in SE direction (Annual Wind)

5.11.1 The approaching wind comes from Siu Hong Court, Yan Tin Estate and Tze Tin Tsuen (Appendix B-4). The approaching wind passing over Po Tong Ha towards HPR Site would be unobstructed. Yan Tin Estate has sheltering effect towards SHR Site under SE wind condition.

Hong Po Road Site

- 5.11.2 The layout of the site does not facilitate wind come from SE. The building cluster would obstruct wind towards the northwest side. The prevailing SE wind would be able to penetrate into the inner court through the minor wind paths on the 2 sides of Block 11. However, the green belt area and Tsing Shan Firing Range at the north west of the site would be affected and the eastern estate road would be slightly sheltered by the high rise residential buildings. The open areas south of Blocks 1, 10 and 11 would be subject to downwashed wind and induce a localised high wind speed area. The proposed b PTIs would be beneficial by the downwash wind.

San Hing Road Site Extension

- 5.11.3 SE wind is predicted to pass the site at both sides of the residential blocks. Ventilation to a small part of Villa Pinada would experience sheltering effect. Several blocks of Villa Pinada to the northwest of the Site would experience minimal ventilation impact induced by the high-rise residential buildings. Due to downwash wind, a localised high velocity area would form at the open area to the south of the residential blocks. The proposed Secondary School Sites A would induce minimal ventilation impact to Villa Pinada due to its low rise nature. Similarly, the proposed Primary School Sites B & C are predicted to induce minimal ventilation impact to its leeward area. The prevailing SE wind can penetrate into the site through the building gap between the residential block and the school at the east. Since the building gaps in the Site would not be aligned parallel to the prevailing SE wind, only potential minor wind paths are predicted.

San Hing Road Site

- 5.11.4 The predicted wind performance is not favorable under SE wind. The localized air paths as shown in **Figure 5-3** would not be utilised. Wind penetration through the site would not be good, the prevailing wind would pass around the Site instead of penetrating into the Site. The leeward area of the high-rise building would be sheltered, e.g the inner part of the Site. Since Block 2 and Block 3 would be taller than Block 1 by at least 25 meters, Blocks 2 and 3 would convey the upper wind down to the pedestrian level and create a localised high wind speed area between Blocks 1, 2 and 3.

5.12 Prevailing Wind in SSE direction (Annual and Summer Wind)

- 5.12.1 The approaching wind comes from Siu Hong Court, Yan Tin Estate and Tze Tin Tsuen (**Appendix B-5**). The approaching wind passing over Po Tong Ha towards HPR Site would be unobstructed. Yan Tin Estate has sheltering effect towards SHR Site under SSE wind condition.

Hong Po Road Site

- 5.12.2 The layout of the site does not facilitate wind come from SSE. The building cluster obstruct wind towards the northwest side. The prevailing SSE wind would be able to penetrate into the inner court through the minor wind paths on the 2 sides of Block 11. However, the green belt area and Tsing Shan Firing Range at the north west of the site would be affected and the eastern estate road would also be sheltered by the high

rise residential buildings. A localised high velocity area would be formed at the open area to the south of the residential blocks due to downwashed wind induced by Blocks 1, 10 and 11. The proposed PTIs would also be beneficial by the downwash wind.

San Hing Road Site Extension

- 5.12.3 SSE wind is predicted to pass the site at both sides of the residential blocks. Ventilation to a small part of Villa Pinada would experience sheltering effect. Several blocks of Villa Pinada to the northwest of the Site would experience minimal ventilation impact induced by the high-rise residential buildings. Due to downwash wind, a localised high velocity area would form at the open area to the south of the residential blocks. The proposed Secondary School Sites A would induce minimal ventilation impact to Villa Pinada due to its low rise nature. Similarly, the proposed Primary School Sites B & C are predicted to induce minimal ventilation impact to its leeward area. The prevailing SSE wind can penetrate into the site through the building gap between the residential block and the school at the east. Since the building gaps in the Site would not be aligned parallel to the prevailing SSE wind, only potential minor wind paths are predicted.

San Hing Road Site

- 5.12.4 At pedestrian level, area near Blocks 1 to 4 is predicted to have better air ventilation performance as compared to Blocks 5 to 9. The prevailing SSE wind is predicted to penetrate through Blocks 1 and 2 as well as Blocks 3 and 4. Downwash wind is expected at Blocks 1, 2 and 4 which help enhancing the pedestrian wind performance at the proposed PTIs. For Blocks 5 to 9 and the proposed Primary School Sites D & E, the approaching SSE wind would be weakened by the Yan Tin Estate and Siu Hong Court. Although Blocks 5 and 9 would be able to convey the upper wind down to pedestrian level, only localized area would be enhanced. Since the building gaps between the proposed Primary School Sites D & E as well as between Blocks 5 and 9 would not be aligned with SSE wind, wind flow between the aforementioned would be limited. On the other hand, area in the leeward side of Blocks 5 and 9 is expected to be sheltered and have low air ventilation performance under SSE wind.

5.13 Prevailing Wind in S direction (Annual and Summer Wind)

- 5.13.1 The approaching wind comes from Siu Hong Court, Yan Tin Estate, Tze Tin Tsuen and Po Tong Ha (**Appendix B-6**). Yan Tin Estate has sheltering effect towards SHR Site under S wind condition.

Hong Po Road Site

- 5.13.2 It is expected the wind can penetrate Blocks 1 and 2 through the wind corridor as shown in **Figure 5-1**. A minor wind path is predicted to form between Blocks 9 and 10. The S wind is predicted to penetrate into the inner part of the Site through the wind paths and leave the Site through the building gap between Blocks 3 and 4. Besides, the rest of the site would not facilitate the wind coming from S direction. The wind penetration pattern is similar to that in SSE wind but the extent of the potentially affected area and the downwashed wind experienced are different. The

green belt area west of Villa Pinada and Tsing Shan Firing Range north of the site would be affected. Wind availability to the eastern estate road and the north part of the western estate road would also be affected. A localised high velocity area would be formed at the open area to the south of the residential blocks due to downwashed wind induced by Blocks 1, 10 and 11. The proposed public transport interchange would also be beneficial by the downwash wind.

San Hing Road Site Extension

- 5.13.3 Southerly wind is predicted to penetrate through the site via the localised air paths as shown on **Figure 5-2** but not in the right orientation. Ventilation to the green belt area at downwind side, the proposed Primary School Sites B and the access road between the proposed Secondary School Site A & Primary School Site B. would be affected. The open area at the south of Block 2 would be subject to downwashed wind. Similar to SSE Wind, several blocks of Villa Pinada to the north of the proposed Secondary School Site A would be affected by the Secondary School Site A. The primary school Site B would affect the wind availability to the access road to the north of the primary school Site B. The primary school Site C at the east would affect ventilation to the open area at its leeward side.

San Hing Road Site

- 5.13.4 Similar to the predicted wind performance under SSE wind, area near Blocks 1 to 4 is predicted to have better air ventilation performance as compared to Blocks 5 to 9. The prevailing SSE wind is predicted to penetrate through Blocks 1 and 2 as well as Blocks 3 and 4. Downwash wind is expected at Blocks 1 to 4 which help enhancing the pedestrian wind performance at the proposed PTIs. For Blocks 5 to 9 and the proposed schools area, the approaching southerly wind would be weakened by Yan Tin Estate. A minor wind path is predicted to form between Blocks 5 & 6 and Blocks 7 & 8. Windward area at the south of Blocks 5 and 9 would experience downwashed wind. Another minor wind path is expected to form between the 2 proposed schools. On the other hand, area in the leeward side of Blocks 5 and 9 is expected to be sheltered and have low air ventilation performance under SSE wind.

5.14 Prevailing Wind in SSW direction (Summer Wind)

- 5.14.1 The approaching wind comes from Siu Hong Court, Yan Tin Estate, Tze Tin Tsun and Po Tong Ha (**Appendix B-7**). Yan Tin Estate has sheltering effect towards SHR Site under SSW wind condition.

Hong Po Road Site

- 5.14.2 The localised air paths as shown on **Figure 5-3** would be utilised. Wind penetration through the site would be good. Ventilation of green belt area north-east of the site and some part of Villa Pinada would be impacted by the high-rise residential building. The inner area between Blocks 4 to 8 and the inner area between Blocks 2, 3, 9 and 11 would also be affected. A minor wind path is predicted between Blocks 1 and 2, while the performance of this wind path is not efficient due to the extended podium structure. On the other hand, the open areas at the windward side of the residential

blocks (Blocks 1, 7 to 11) would be subject to strong downwashed wind.

San Hing Road Site Extension

- 5.14.3 Similar to HPR Site, the localised air paths as shown on **Figure 5-2** would be utilised. Wind penetration through the site would be good. Ventilation to the conservation area at the hillside, the proposed Primary School Site B indicated in **Figure 5-2** and its adjacent access road would be shielded by the residential blocks. The open area to the south of Block 1 would be subject to strong downwashed wind. The proposed Secondary School Site A would have slight impact to the wind availability to the access road in the northeast of the Secondary School Site A. The proposed Primary School Site C would affect ventilation to the open area at its north-east direction.

San Hing Road Site

- 5.14.4 For Blocks 1 to 4, the approaching wind would be sheltered by Yan Tin Estate. However, the localised air paths as shown on **Figure 5-3** would still be utilised. The leeward area including the open area north to each residential blocks, the whole San Hing Road and large part of San Hing Tsuen bounded by Ng Lau Road (further downwind area e.g. Hanison Garden and Wilhelmina Garden would unlikely to be affected), a small section of south end of Ng Lau Road and the open storage area at the north of the site would be affected. Windward areas to the south of Blocks 1 to 4 would experience downwashed wind which would benefit to the air ventilation performance at the proposed PTIs, while the leeward area (San Hing Tsuen) would be impacted by the sheltering effect of the proposed high rise buildings. For Blocks 5 to 9, the approaching wind can pass through the localised air paths as shown on **Figure 5-3**, the wind can pass through the site and reach the village area in the north of the site (i.e. far west of Tuen Tsz Wai). Downwashed wind induced by Blocks 1 and 2 can be alleviated by the retained amenity area. Besides, the proposed Primary School Sites D & E would only induce minimal ventilation impact at their leeward side.

5.15 Prevailing Wind in SW direction (Summer Wind)

- 5.15.1 The approaching wind comes from Siu Hong Court, Yan Tin Estate, Tze Tin Tsuen and Po Tong Ha (**Appendix B-8**). Yan Tin Estate has sheltering effect towards SHR Site under SW wind condition.

Hong Po Road Site

- 5.15.2 Similar to the wind condition under SSW wind, the localised air paths as shown on **Figure 5-1** would be utilised. Wind penetration through the site would be good. Ventilation of green belt area east of the site, some part of Villa Pinada would be affected. The inner area between Blocks 4 to 8 and the inner area between Blocks 2, 3, 9 and 11 would also be affected. A minor wind path is predicted between Blocks 1 and 2, while the performance of this wind path would not be efficient due to the extended podium structure. The open areas at the windward side of the residential blocks (Blocks 1, 7 to 11) would be subject to strong downwashed wind.

San Hing Road Site Extension

- 5.15.3 Similar to the predicted wind performance under SSW wind, the localised air paths as

shown on **Figure 5-2** would be utilised. Wind penetration through the site is predicted to be achieved by the potential minor wind flow between the high-rise residential building and the proposed Secondary School Site A. Ventilation to the conservation area at the hillside, the primary school at the north side and its adjacent access road would be shielded by the residential blocks. The open area to the south of Blocks 1 and 2 would be subject to strong downwashed wind. The proposed Secondary School Site A would affect the wind availability to the access road in the northeast of the Secondary School Site A. The proposed Primary School Site C would affect ventilation to the open area at its north-east direction.

San Hing Road Site

- 5.15.4 The wind condition is similar to that under SSW wind. For Blocks 1 to 4, the approaching wind would be sheltered by Yan Tin Estate. However, the localised air paths as shown on **Figure 5-3** would still be utilised. The leeward area including the open area north to each residential blocks, the whole San Hing Road and large part of San Hing Tsuen bounded by Ng Lau Road (further downwind area e.g. Hanison Garden and Wilhelmina Garden would unlikely to be affected), a small section of south end of Ng Lau Road and the open storage area at the north of the site would be affected. Windward areas to the south of Blocks 1 to 4 would experience downwashed wind which would benefit to the air ventilation performance at the proposed public transport interchange, while the leeward area (San Hing Tsuen) would be impacted by the sheltering effect of the proposed high rise buildings. For Blocks 5 to 9, the approaching wind can pass through the localised air paths as shown on **Figure 5-3**, the wind can pass through the site and reach the village area in the north of the site (i.e. far west of Tuen Tsz Wai). Downwashed wind induced by Blocks 1 and 2 can be alleviated by the retained amenity area. Besides, the proposed Primary School Sites D & E would only induce minimal ventilation impact at their leeward side.

5.16 Downhill wind

- 5.16.1 Downhill air movement from Yuen Tau Shan to the north west of the Site comes from NW, NNW and N directions as shown in **Figures 4-1** and **4-2**. The downhill wind blows through the hillside sites of HPR Site and SHR Site Extension with good air penetration. However, the downhill wind is expected to be sheltered by the proposed high rise residential buildings. Downhill wind would be less available in the development area and its vicinity.

5.17 Good Design Features

5.17.1 The good design features within each Sites are presented below.

Hong Po Road Site

5.17.2 Most of the building separation are at least 15m.

5.17.3 Localised wind corridors which facilitate prevailing winds coming from North-east and South-west directions:

- Between Blocks 1 and 2 which aligned in NE to SW direction
- Between Blocks 2 and 3 which aligned in NE to SW direction
- Between Blocks 8 and 9 which aligned in NE to SW direction

San Hing Road Site Extension

5.17.4 The building gaps are designed in NE to SW direction which facilitate the penetration of prevailing wind from north-east and south-west quadrant.

5.17.5 Localised wind corridors which facilitate prevailing winds coming from North-east and South-west directions:

- Between the residential blocks and the proposed Primary School Site C at the east which aligned in NE to SW direction
- Between the residential blocks and the proposed Secondary school Site A which aligned in NE to SW direction

San Hing Road Site

5.17.6 The building blocks (Blocks 5 to 9) are aligned in NE to SW direction which facilitate the penetration of prevailing wind from north-east and south-west quadrant.

5.17.7 Localised wind corridors which facilitate prevailing winds coming from North-east and South-west directions:

- Opening under the podium between Blocks 3 and 4 which allow wind penetration
- Between Blocks 6 and 7 which aligned in NE to SW direction
- Block 2 and Block 3 are taller than Block 1 by at least 25 meters to convey the upper wind down to the pedestrian level under prevailing E direction annual wind

5.17.8 Since the above good design features are based on the conceptual layout plan and the indicative layouts of the school sites, they are subject to detailed layout in the future.

5.18 Problematic Areas

5.18.1 Considering the predicted wind performance in prevailing wind directions, the following problematic areas are identified.

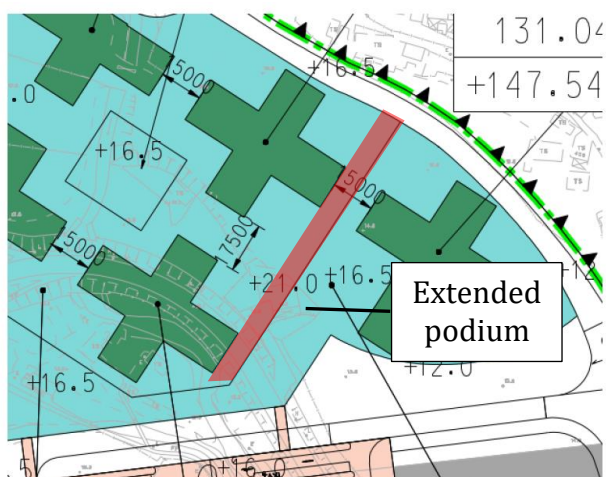
- (a) The leeward side of the inner site area within HPR Site under annual and summer wind conditions;

- (b) The extended podium to the south east of Blocks 2 and 11 of HPR Site is predicted to lower the performance of the potential wind path between Blocks 1 and 2;
- (c) The leeward side of the inner site area within SHR Site Blocks 5 to 9 under annual and summer wind conditions;
- (d) The extended podium to the south east of Block 9 is predicted to lower the performance of the potential wind path between Blocks 5 and 8 of SHR Site under NE to SW wind;
- (e) Villa Pinada, the largest development in the surrounding area, would be affected in summer prevailing wind conditions subject to SSE and S winds. Its access road from the proposed Road L7 and the houses along the access would also be affected in annual prevailing wind conditions;
- (f) Proposed Primary School Site B would be affected under summer wind conditions subject to SW and SSW winds;
- (g) Proposed Primary School Sites D & E would be affected under annual wind conditions (SE & SSE wind) and summer wind conditions (SSE wind);
- (h) San Hing Tsuen would be affected under summer wind conditions (SW, SSW and S);
- (i) Air ventilation to discrete sections of the proposed Road L7 may be affected in annual prevailing conditions subject to NNE and NE winds; and
- (j) The downhill wind from Yuen Tau Shan would be less available in the development area as compare to the existing conditions.

5.19 Recommended Mitigation Measures

- 5.19.1 It is recommended to maintain the building separation and localised wind corridors (mentioned in Section 5.17) as to facilitate the wind penetration. Moreover, the extended podium structures identified in 5.18.1 (b) and (d) are suggested to be removed to enhance the performance of the potential wind paths under different prevailing wind conditions. The detailed mitigation measures and the mitigated layout plan are shown in **Figure 5-4** and **Appendix C** respectively.
- 5.19.2 It is also recommended to maximize the building block separations in the detail design stage. Furthermore, quantitative study is suggested to quantify the air ventilation performance.
- 5.19.3 In addition, the following design principles to improve urban climate are specified for considerations at detailed design stage:

- (a) Building permeability (in accordance with APP-152 Sustainable Building Design Guidelines requirement);
- (b) Maintain podium free design as far as practicable;
- (c) Building setback (in accordance with APP-152 Sustainable Building Design Guidelines requirement);
- (d) Greenery target of 30% while 20% as a minimum;
- (e) Avoid continuous long facades; and
- (f) Reference could also be made to recommendations of design measures in the Hong Kong Planning Standards and Guidelines.



HPR Site, podium in the vicinity of Block 2 and 11



SHR Site, podium in the vicinity of Block 9

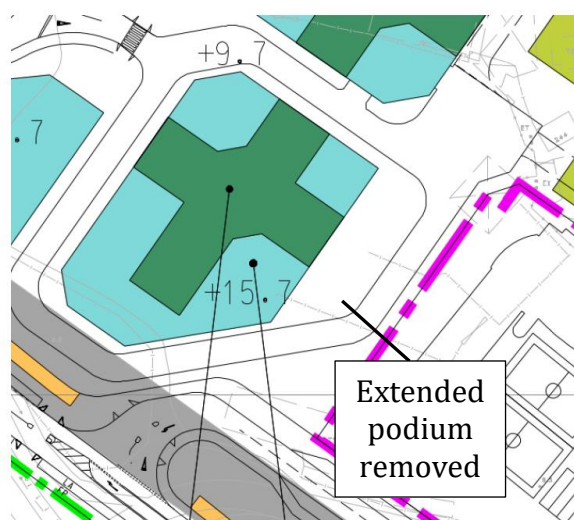
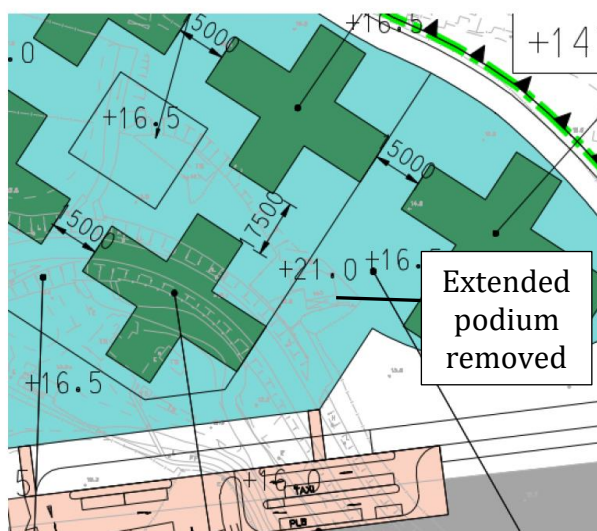


Figure 5-4 - Mitigation Measures

6 SUMMARY AND RECOMMENDATIONS FOR FURTHER STUDY

6.1 Summary

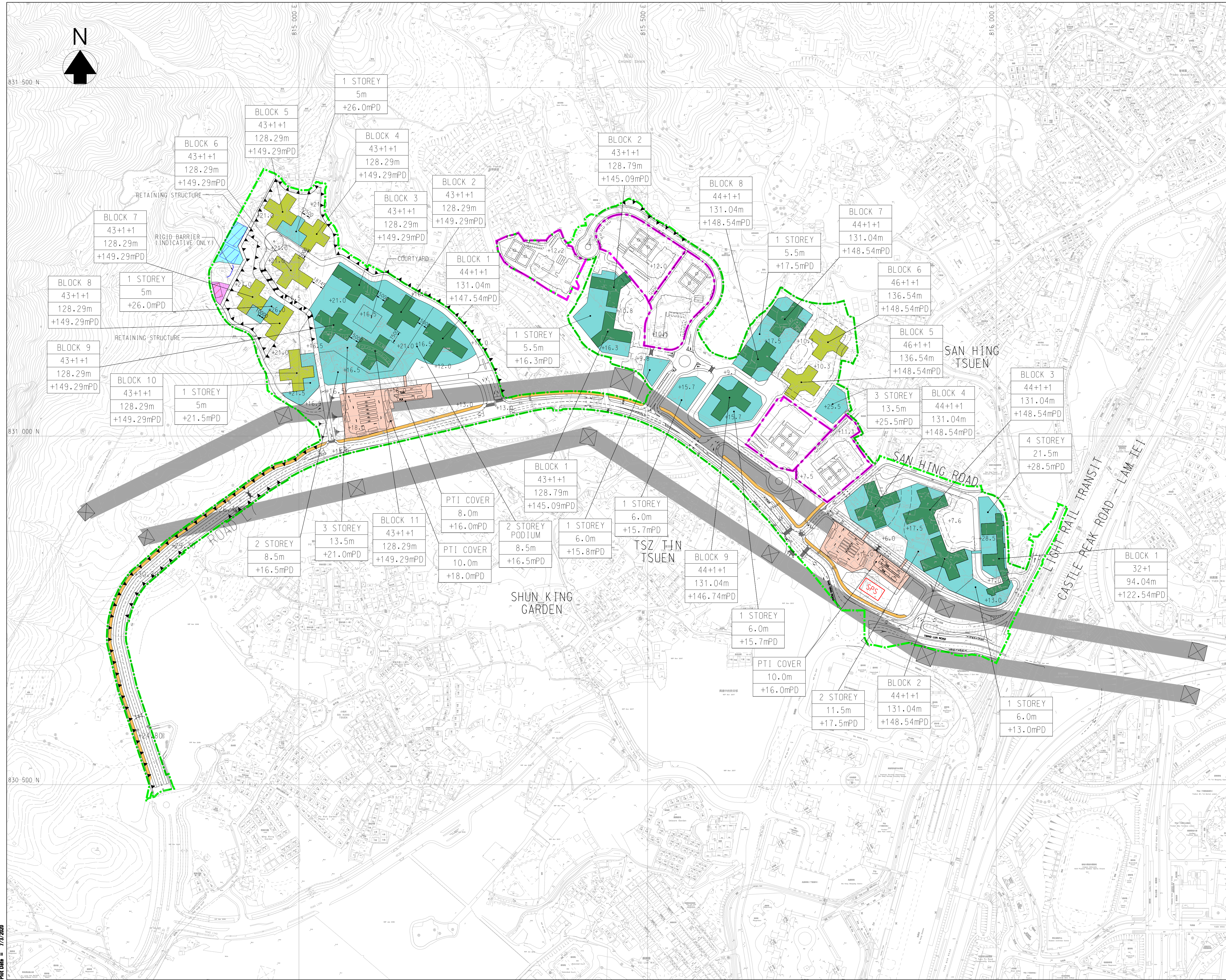
- 6.1.1 An expert evaluation for the Development covering Hong Po Road Site, San Hing Road Site Extension and San Hing Road Site has been conducted.
- 6.1.2 After reviewing the development layouts, the existing conditions of adjacent areas, the far-field and near-field topography, the site wind availability including the major breezeways, and future developments in the surrounding areas, it is considered that there would be some potential air ventilation impacts on the areas in the vicinity of the Site under annual (NNE, NE, E, SE, SSE, S) and summer (SSE, S, SSW, SW) prevailing wind conditions.
- 6.1.3 Air ventilation to the nearest large development Villa Pinada, San Hing Tsuen, Yan Tin Estate, the proposed schools within the Sites, San Tat Road and San Hing Road would be affected at different degrees subject to either annual or summer prevailing wind conditions in NE to SW wind directions.
- 6.1.4 Several mitigation measures should be considered in future designs and further study is recommended at detail design stage.

6.2 Recommendations for Further Study

- 6.2.1 This evaluation is qualitative assessment only. Further quantitative AVA is required at detailed design stage for design optimization, so as to assess the ability of wind penetration and to recommend design guidelines for future development from air ventilation perspective.
- 6.2.2 Initial Study (IS) by Computational Fluid Dynamics (CFD), is recommended to quantify the air ventilation performance. Should the proposed mitigation measures cannot be incorporated into the future design, the quantitative AVA is to prove that the future schemes perform no worse than those with the listed mitigation measures.
- 6.2.3 Mitigation measures, either planning measures e.g. provision of amenity area/greening zone or engineering measures e.g. installation of shelter/canopy to alleviate downwashed winds shall be investigated to address wind comfort at pedestrian level.
- 6.2.4 Despite of the above recommendations, the exact coverage of the future study will be determined at the Initial Study (IS) stage, taking into account the future development areas, phasing and other considerations.

END OF TEXT

Appendix A Preliminary Site Layout Plan



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LEGEND:

- PROPOSED DEVELOPMENT AREA BOUNDARY
- POTENTIAL SCHOOL SITE
- RESIDENTIAL USE
- RETAIL/SOCIAL FACILITIES / CARPARK
- RESIDENTIAL USE ON TOP OF RETAIL/SOCIAL FACILITIES / CARPARK
- PROPOSED PUBLIC TRANSPORT INTERCHANGE (PTI)
- CYCLE TRACK
- EXISTING CLP Pylon AND 400kV OVERHEAD LINES
- PERMANENT HONG PO ROAD (HRP FW S/R) FRESH WATER SERVICE RESERVOIR
- PERMANENT HONG PO ROAD (HRP SW S/R) SALT WATER SERVICE RESERVOIR
- PROPOSED FRESH WATER TANK (INDICATIVE ONLY)
- PROPOSED SALT WATER TANK (INDICATIVE ONLY)
- NO. OF DOMESTIC STOREYS (EXCLUDE PODIUM / LOBBY) + REFUGE FLOOR + REFUGE FLOOR BUILDING HEIGHT (METERS) mPD OF BUILDING (METERS)
- PROPOSED FORMATION LEVEL (INDICATIVE ONLY)
- PROPOSED RETAINED STRUCTURE
- PROPOSED SLOPE
- PROPOSED SEWAGE PUMPING STATION
- RIGID BARRIER

Revision	Date	Description	Initial
Initial	Designed	Checked	Drawn
Initial	JL1	YKL	SZ
Date	11/19	11/19	11/19
Approved			

Project title
AGREEMENT NO. CE68/2017 (CE)
SITE FORMATION AND
INFRASTRUCTURAL WORKS FOR THE
DEVELOPMENT AT SAN HING ROAD
AND HONG PO ROAD, TUEN MUN -
FEASIBILITY STUDY

Drawing title
PRELIMINARY SITE LAYOUT PLAN

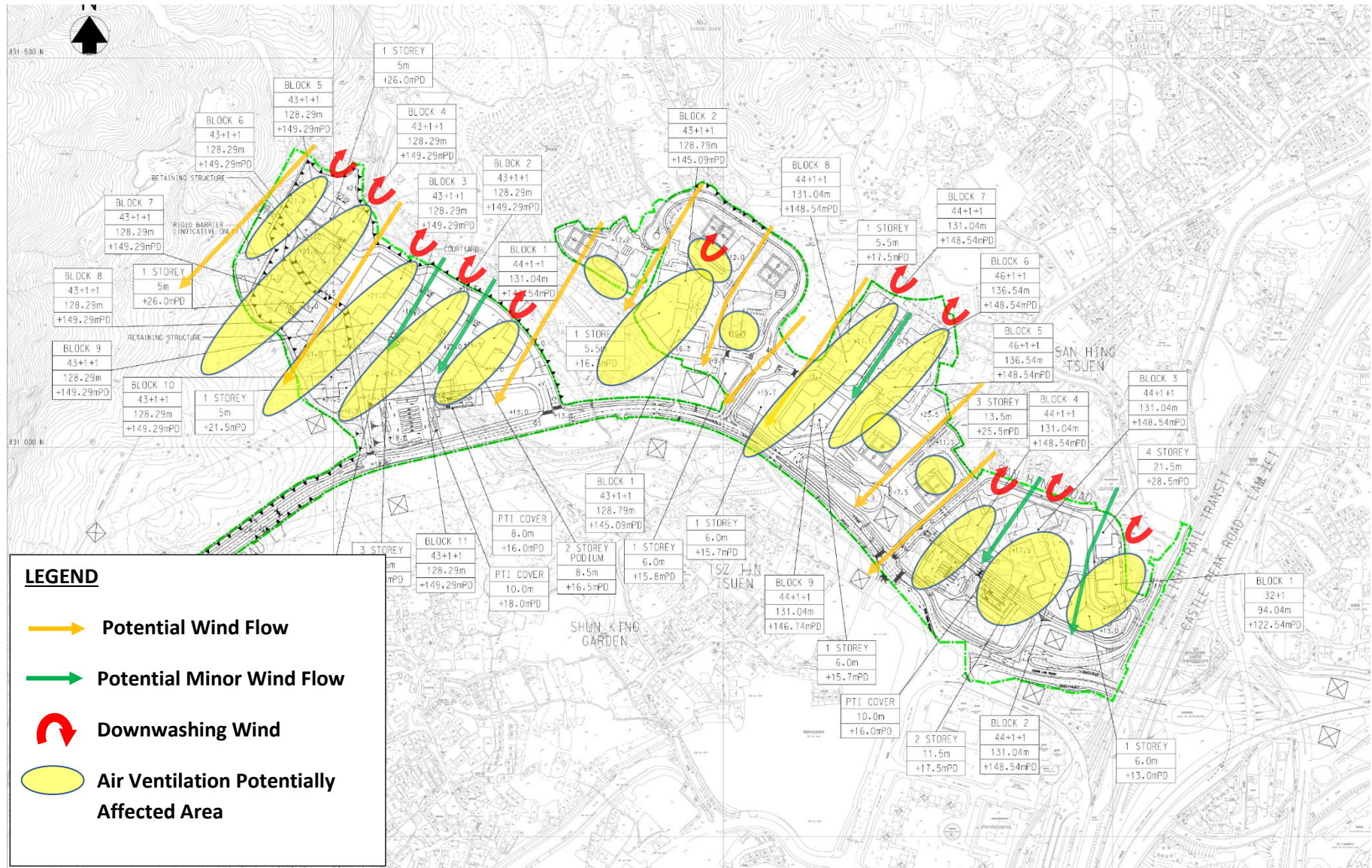
Drawing No.	Scale
198172/B&V/GEN/010-a	1 : 2500 (A1) 1 : 5000 (A3)

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

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Appendix B Annual and Summer Wind Conditions

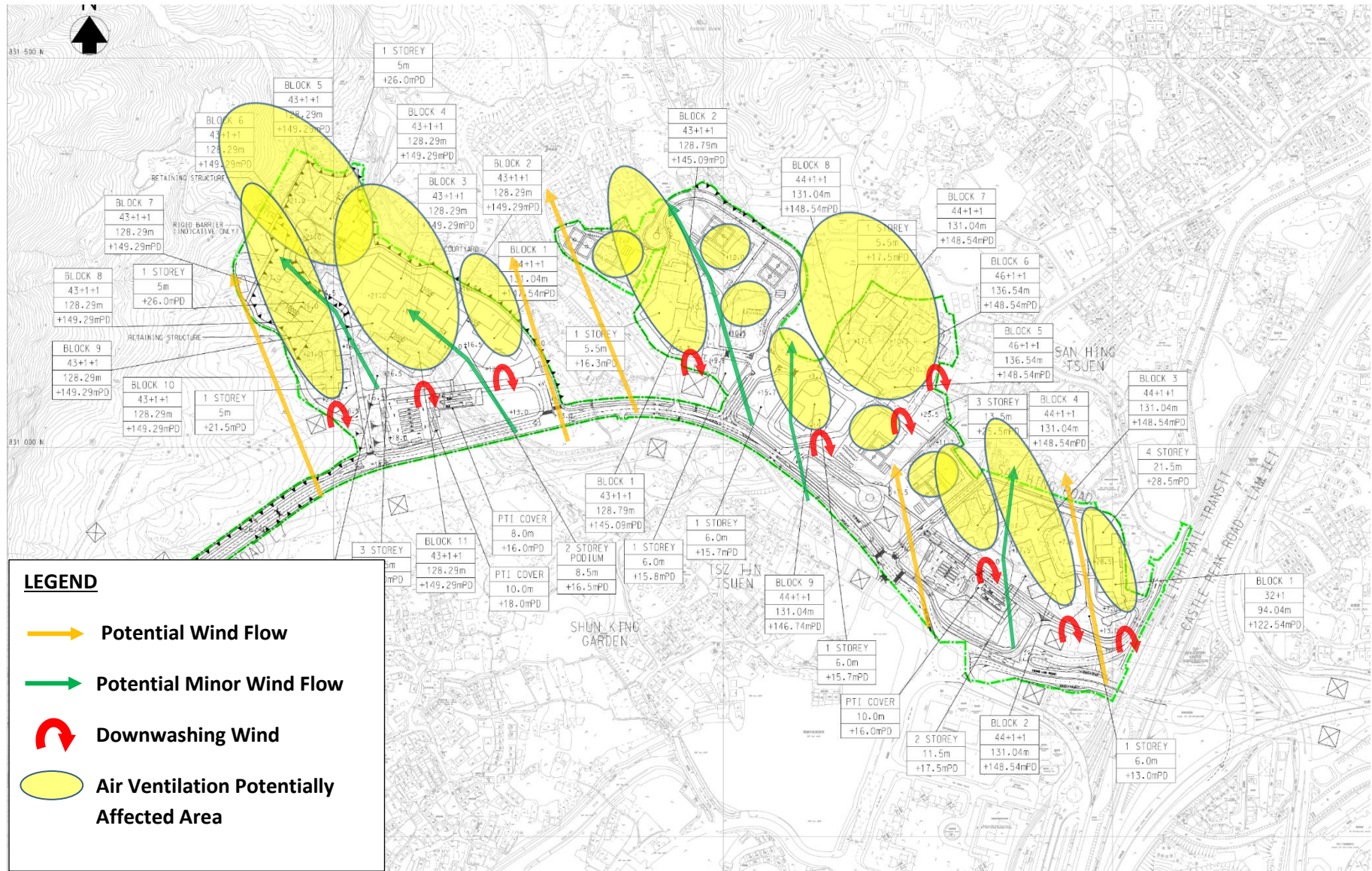




Appendix B-2 - Prevailing Wind in NE direction (Annual Wind)

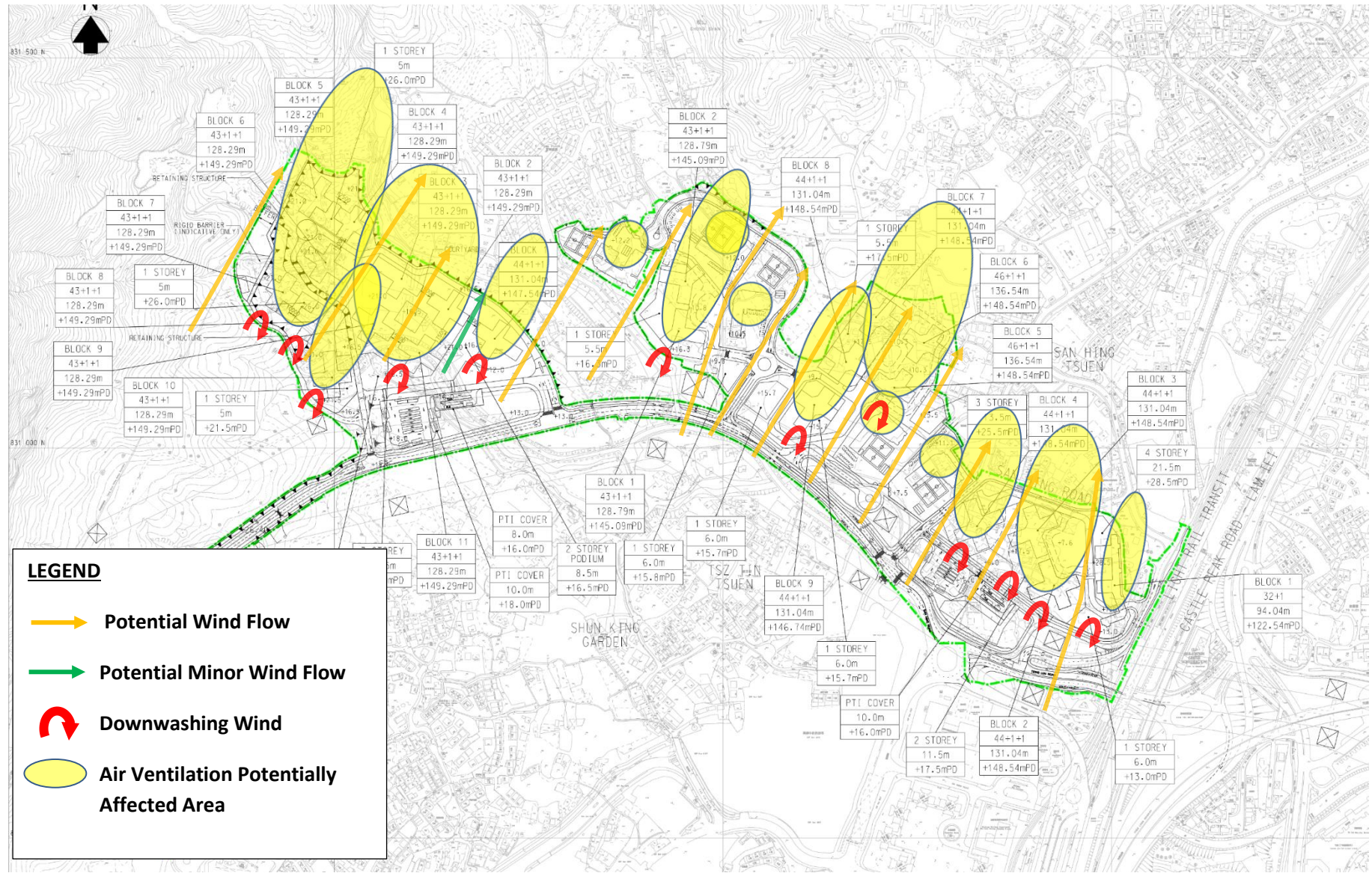




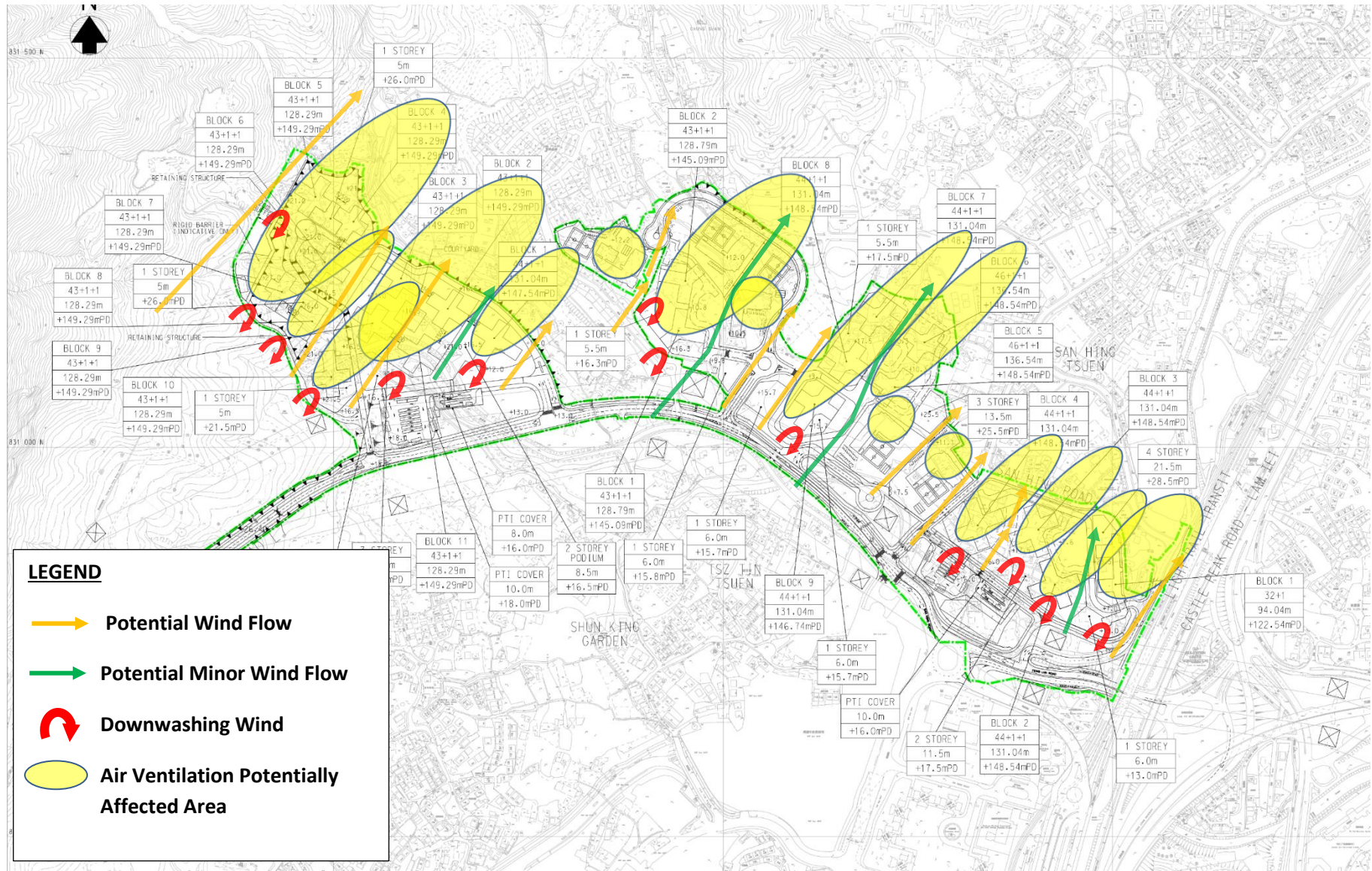


Appendix B-5 - Prevailing Wind in SSE direction (Annual and Summer Wind)



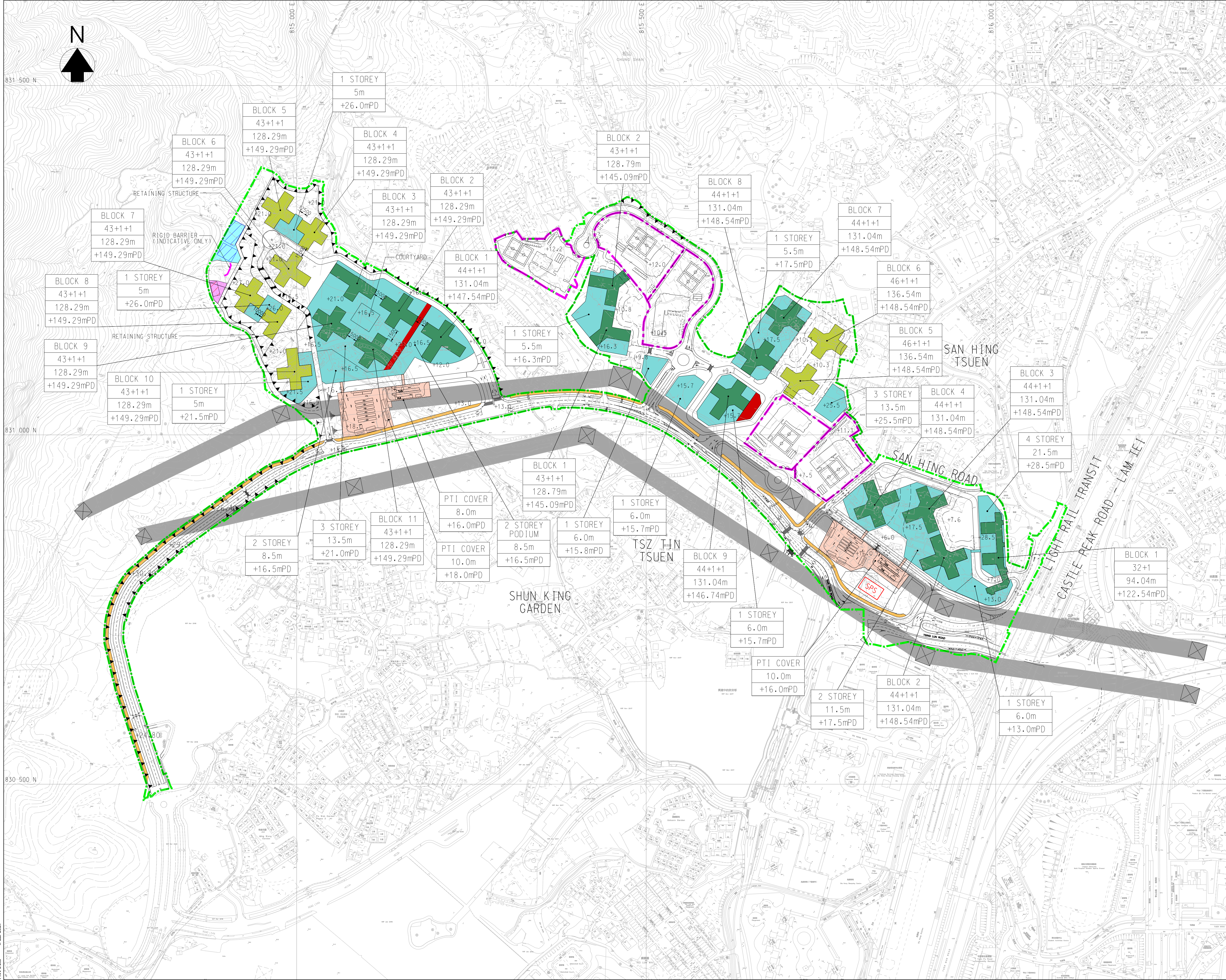


Appendix B-7 - Prevailing Wind in SSW direction (Summer Wind)



Appendix B-8 - Prevailing Wind in SW direction (Summer Wind)

Appendix C Mitigated Site Layout Plan



- LEGEND:
- PROPOSED DEVELOPMENT AREA BOUNDARY
 - POTENTIAL SCHOOL SITE
 - RESIDENTIAL USE
 - RETAIL/SOCIAL FACILITIES / CARPARK
 - RESIDENTIAL USE ON TOP OF RETAIL/SOCIAL FACILITIES / CARPARK
 - PROPOSED PUBLIC TRANSPORT INTERCHANGE (PTI)
 - CT CYCLE TRACK
 - EXISTING CLP PYLON AND 400KV OVERHEAD LINES
 - PERMANENT HONG PO ROAD (HRP FW S/R) FRESH WATER SERVICE RESERVOIR
 - PERMANENT HONG PO ROAD (HRP SW S/R) SALT WATER SERVICE RESERVOIR
 - PROPOSED FRESH WATER TANK (INDICATIVE ONLY)
 - PROPOSED SALT WATER TANK (INDICATIVE ONLY)
 - PROPOSED MITIGATION MEASURES (REMOVED EXTENDED PODIUM)
 - NO. OF DOMESTIC STOREYS (EXCLUDE PODIUM / LOBBY) + REFUGE FLOOR + REFUGE FLOOR BUILDING HEIGHT (METERS)
 - mPD OF BUILDING (METERS)
 - PROPOSED FORMATION LEVEL (INDICATIVE ONLY)
 - PROPOSED RETAINED STRUCTURE
 - PROPOSED SLOPE
 - PROPOSED SEWAGE PUMPING STATION
 - RIGID BARRIER

Revision	Date	Description	Initial
Initial	Designed	Checked	Drawn
Initial	YJL	YKL	SZ
Date	11/19	11/19	11/19
Approved			

Project title

AGREEMENT NO. CE68/2017 (CE)
SITE FORMATION AND
INFRASTRUCTURAL WORKS FOR THE
DEVELOPMENT AT SAN HING ROAD
AND HONG PO ROAD, TUEN MUN -
FEASIBILITY STUDY

Drawing title

MITIGATED SITE LAYOUT PLAN

Drawing No.	Scale
198172/B&V/GEN/010-c	1 : 2500 (A1) 1 : 5000 (A3)

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

BLACK & VEATCH HONG KONG LIMITED
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Plot Date = 1/22/2021

CAD Filename = Y:\Daily Work\20210118C\198172-B&V-GEN-010-c.dgn