CONSULTANCY STUDY FOR AIR VENTILATION ASSESSMENT SERVICES

Cat. A1– Term Consultancy for Expert Evaluation and Advisory Services on Air Ventilation Assessment (PLNQ 56/2012)

Final Report

Tuen Mun New Town

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by Professor Edward Ng
School of Architecture, CUHK, Shatin, NT, Hong Kong
T: 39436515 F: 26035267
E: edwardng@cuhk.edu.hk W: www.edwardng.com

The Study Area

Expert Evaluation Report
of Tuen Mun New Town

Executive summary

0.1 Wind Availability

(a) Annual wind in the study area mainly comes from the northeast, east and southeast. The summer wind mainly comes from the east and southerly quarters including southwest, south and southeast.

0.2 Existing Conditions

(a) Most buildings in the study area are lower than 85m while those buildings higher than 85m are mainly detached buildings with some gaps between building blocks that do not form “walls” obstructing air ventilation. The central part of the study area (near MTR Tuen Mun Station) is relatively densely built. This region will have weak ventilation. On the whole, severe air ventilation problems are not anticipated.

0.3 Expert Evaluation of the Proposed Amendments

(a) Due to Hong Kong‟s high-density urban morphology, it is not advisable to only rely on building height restriction or minor changes in building heights to maintain and/or improve air ventilation. For most areas, air ventilation can achieve better performance if more effective measures, such as breezeways, air paths, open spaces, gaps between buildings and building permeability especially near ground level, are also applied. In general, further developments in Tuen Mun New Town should be carefully designed to respect the key urban climatic characteristics such as breezeway, downhill air movement and sea breeze. “G/IC”, “O”, and “GB” zones in the approved Tuen Mun OZP No. S/TM/31 are recommended to be maintained in benefitting air ventilation of the study area.

(b) General mitigation measures will be recommended for all the sites, i.e. (i) encouragement to minimise the podia for enhancing air ventilation at pedestrian level based on Chapter 11 of the HKPSG; and (ii) the need to fulfil the requirement of

building separation in accordance with the Sustainable Building Design (SBD) Guidelines (APP-152) for better wind penetration throughout the subject sites.

Site A1

(c) Under prevailing winds, the developments on Site A1 may create wake areas on the leeward sides to affect the adjoining "R(A)" and "G/IC" site. In view of the relatively open exposure of Site A1 and subject to the minimisation of podium and the requirement of building separation in SBD Guidelines being respected, the proposed rezoning of Site A1 from "G/IC" to "R(A)24" is unlikely to impose significant impacts on the surrounding sites in air ventilation perspective.

Sites A2 and A5

(d) Under prevailing winds, the developments on Site A2 may have localised air ventilation impact on the surrounding areas. Subject to the minimisation of podium and the requirement of building separation in SBD Guidelines being respected, the proposed rezoning of Site A2 from "G/IC", "GB", and an area shown as „Road" to "R(A)25" is unlikely to impose significant impacts on the surrounding sites in air ventilation perspective.

(e) Site A5 is located north of Hing Fu Street in Area 54 and is proposed to be rezoned from "G/IC" to "GB" to reflect existing vegetated slopes at the site. The proposed rezoning will not impose any adverse air ventilation impact on the surroundings.

Site A3

(f) Site A3 is on the air path of downhill air movements. Under north-easterly prevailing wind, the developments on Site A3 are also likely to create wake areas on the leeward sides to affect the areas to the southwest (i.e. Leung King Estate). One 20m wide non-building area (NBA) is recommended along the southwestern edge of the site to facilitate the downhill air movements and serve as a "buffer zone" to alleviate the impact of wake areas to the southwest of the site. Subject to the incorporation of the NBA, together with the minimisation of podium and the requirement of building separation in SBD Guidelines being respected, the proposed

rezoning of Site A3 from "GIC" to "R(A)21" is unlikely to impose significant impacts on the surrounding sites in air ventilation perspective.

Site A4

(g) Site A4 covers a relatively small development site area creating relatively small wake areas. The open space to the south of the site and Shek Pai Tau Road to the north are also likely to serve as "buffer zones" reducing the impact of wake areas on the surrounding sites. Subject to the minimisation of podium and the requirement of building separation in SBD Guidelines being respected, the proposed rezoning of Site A4 from "G/IC" to "R(A)23" is unlikely to impose significant impacts on the surrounding sites in air ventilation perspective.

Site B1

(h) Under prevailing winds from the southwest, east and northeast, the developments on Site B1 may have localised air ventilation impact on the surrounding areas. One 15m wide NBA, which coincides with the existing footpath in the middle of the site and aligns with Hang Kwai Street, is recommended. Subject to the incorporation of the NBA, together with the minimisation of podium and the requirement of building separation in SBD Guidelines being respected, the proposed rezoning of Site B1 from "G/IC" to "R(A)22" is unlikely to impose significant impacts on the surrounding sites in air ventilation perspective.

Site B2

(i) When prevailing winds and downhill air movement come from the northeast and easterly quarters, the developments on Site B2 are likely to create wake areas on the leeward sides to affect the areas to the west and southwest. One 20m wide NBA perpendicular to Castle Peak Road – Castle Peak Bay is suggested for Site B2. In order to allow for design flexibility of the future development, the location of the 20m wide NBA could be determined during the detailed design stage. Subject to the incorporation of the NBA, together with the minimisation of podium and the requirement of building separation in SBD Guidelines being respected, the proposed rezoning of Site B2 from "G/IC" and "GB" to "R(A)22" is unlikely to impose significant impacts on the surrounding sites in air ventilation perspective.

Site C1

(j) When prevailing winds come from the northeast, east and southerly quarters, the developments on Site C1 are likely to create wake areas on the leeward sides of the site. Subject to the minimisation of podium and the requirement of building separation in SBD Guidelines being respected, the proposed rezoning of Site C1 from "R(B)8" to "R(B)2" is unlikely to impose significant impacts on the surrounding sites in air ventilation perspective.

Sites C2, C3, C11, C12 and C13

(k) Under prevailing winds from the northeast and southerly quadrant, Sites C2 and C3 are likely to create wake areas on the leeward side to affect the surrounding areas. Considering the large size of the sites in juxtaposition and the substantial building mass at a permissible plot ratio up to 4, future developments on Sites C2 and C3 are required to provide sufficient building separations and open space at grade to break up the long lot frontages for facilitating good wind penetration under the prevailing winds. It is recommended that NBA(s) of at least 15m wide, in a more or less north-south direction, should be provided for each site. NBA(s) of at least 15m wide along the west-southwest and east-northeast direction should also be provided across both Sites C2 and C3. In order to allow design flexibility of the future developments, it is recommended that quantitative AVAs should be conducted for each of Sites C2 and C3 at the detailed design stage to identify NBAs and other enhancement measures and to ascertain their effectiveness.

(l) Site C11 involves various small areas in Area 48 to be rezoned from "G/IC" to "GB". The proposed rezoning will not impose any adverse air ventilation impact on the surroundings.

(m) Site C12 is an area between Site C2 and Site C3 in Area 48 to be rezoned from "G/IC" to "Road". The proposed rezoning will not impose any adverse air ventilation impact on the surroundings.

(n) Site C13 is a "G/IC" zone in Area 48 and its maximum building height restriction is proposed to be changed from 8 storeys to 1 storey. The proposed change of building height restriction from 8 storeys to 1 storey will not impose any adverse air ventilation impact on the surroundings.

Sites C4, C5, C6, C7 and C8

(o) Sites C4, C5, C6, C7 and C8 lie in close proximity of each other in Tuen Mun Area 56. Under prevailing winds, the developments on these sites may create some air ventilation impact on the surrounding areas. In order to ameliorate the air ventilation issue with the consideration of breezeway connection through TMTL427, it is recommended that one 20m wide NBA each along the east-northeast and west-southwest direction for Site C7 and Site C4 be provided. For the remaining portion of Site C7 with lot frontage about 180m, it is also required to provide sufficient building separations in accordance with SBD Guidelines (APP-152) to facilitate better wind penetration from northeast quadrant to Site C8 and other downstream areas. In addition, one 20m wide NBA is proposed for Site C5 to allow for wind penetration to the north. Subject to the incorporation of NBAs together with the minimisation of podium and the requirement of building separation in SBD Guidelines being respected, the proposed rezoning of Sites C4, C5, C6, C7 and C8 is unlikely to impose significant impacts on the surrounding sites in air ventilation perspective.

Sites C9 and C10

(p) When prevailing winds come from southerly quarter, the proposed rezoning of Site C9 from “G/IC” and “O” to “R(B)” is likely to create wake areas on the leeward sides to affect the “G/IC” site (i.e. Chu Hai College of Higher Education) and the “R(B)” zone to the north. Considering that Site C9 occupies a significant waterfront location that is an important inlet of sea and land breezes and that its lot frontage exceeds 100m in length, an AVA should be conducted according to the HPLB and ETWB Joint Technical Circular No. 1/06. To avoid blockage of sea breezes, it is recommended that at least one 15m wide NBA be incorporated within Site C9 to align with the 32m wide building gap of Chu Hai College of Higher Education to facilitate wind penetration further inland. A quantitative AVA should be conducted at the detailed design stage to identify the NBAs and other enhancement measures and to ascertain their effectiveness.

(q) Site C10 is part of the public beach area in Area 48 and it is proposed to be rezoned from “G/IC” to “O” to reflect the existing use. The proposed rezoning will not impose any adverse air ventilation impact on the surroundings.

Site D1

(r) Site D1 is small in area. The proposed rezoning of Site D1 from "I" to "C(1)" is unlikely to have significant air ventilation impacts on the surrounding areas under the prevailing wind directions.

Site D2

(s) Site D2 is surrounded by "GB" zones. The proposed rezoning of Site D2 from "GB" to "REC" is unlikely to have significant air ventilation impacts on the surrounding areas.

Site E

(t) Site E is proposed to be rezoned from "Other Specified Uses" to "Undetermined" "(U"). As the use and development parameters of the site are yet to be confirmed, the air ventilation impact of the proposed amendment of Site E could not be determined at this stage.

Site F

(u) The rezoning of Site F is to reflect the completed housing project already on the site and it will have no impact on the current air ventilation conditions.

Site G

(v) The rezoning of Site G is to reflect an approval rezoning application for residential development. The redevelopment of this site in the future is also unlikely to have significant air ventilation impacts on the surrounding areas due to its low building height at maximum 3 storeys.

Other Potential Housing Site in Area 48 – Site 1

(w) When prevailing winds come from the east and southerly quarters, Site 1 is likely to create wake areas on the leeward side to affect the "G/IC" site to the north (mainly Chu Hai College of Higher Education). In order to address the potential air ventilation impact of future developments, more space at grade and permeability of

the building mass should be provided to allow for better wind penetration. In particular, development near the waterfront must but form a continuous barrier to sea breezes. Building must be arranged and positioned so that sufficient building gaps are left for air ventilation. Subject to the minimisation of podium and the requirements of building separation in SBD Guidelines being respected, the future development at Site 1 with a maximum building height at 70mPD is unlikely to impose significant impacts on the surrounding sites in air ventilation perspective.

Other Potential Housing Site in Area 55 – Site 2

(x) When prevailing winds come from the south and southwest, developments on Site 2 are likely to create wake areas on the leeward side to affect the areas in the southeast edge of Aegean Coast. More space at grade and permeability of the building mass should be provided to allow for better wind penetration. Subject to the minimisation of podium and the requirement of building separation in SBD Guidelines being respected, the future development at Site 2 at a maximum building height of 7 storeys is unlikely to impose significant impacts on the surrounding sites in air ventilation perspective.

Other Potential Housing Site in Area 16 – Site 3

(y) Under prevailing winds from the southwest, east and northeast, the developments on Site 3 may have localised air ventilation impact on the surrounding areas. One 15m wide NBA, in the middle of the site and aligns with Tuen Yee Street, is recommended to facilitate the penetration of easterly winds to the west of the site and westerly winds to Nerine Cove. Another 15m wide NBA is recommended along the southern site boundary of Site 3 to further facilitate the penetration of westerly winds into Nerine Cove. This NBA will also serve as a “buffer zone” to alleviate the impact caused by Site B1 under southerly winds. Subject to the incorporation of the NBAs, together with the minimisation of podium and the requirement of building separation in SBD Guidelines being respected, the future development at Site 3 is unlikely to impose significant impacts on the surrounding sites in air ventilation perspective. Otherwise, further AVA studies should be conducted to assess the air ventilation performance.

Other Potential Housing Site in Area 39 – Site 4

(z) When prevailing winds and downhill air movement come from the northeast and easterly quarters, the developments on Site 4 are likely to create wake areas on the leeward sides to affect the areas to the west and southwest. One 20m wide NBA perpendicular to Castle Peak Road – Castle Peak Bay is suggested for Site 4. In order to allow for design flexibility of the future development, the location of the 20m wide NBA could be determined during the detailed design stage. Subject to the incorporation of the NBA, together with the minimisation of podium and the requirement of building separation in SBD Guidelines being respected, the future development at Site 4 is unlikely to impose significant impacts on the surrounding sites in air ventilation perspective. Otherwise, further AVA studies should be conducted to assess the air ventilation performance.

0.4 Further Work

Given that both designated NBAs and requirement of building separation requirements would be fulfilled as recommended for individual sites, the study area would have no major air ventilation issues. If these requirements cannot be met, further quantitative AVA studies should be conducted to assess their air ventilation performance.

Sites C2 and C3 occupy a large area of about 5 hectares. Future developments on these sites would impose air ventilation impacts on the surrounding areas In order to allow for design flexibility for the future development, no NBAs are fixed for the sites although directional recommendations of these NBAs of at least 15m wide are included. It is therefore recommended that quantitative AVAs should be conducted in the detailed design stage to identify the NBAs and other enhancement measures and to ascertain their effectiveness.

Site C9 occupies a significant waterfront location that is an important inlet of sea breezes. It also has a long lot frontage exceeding 100m in length. In order to allow for design flexibility for the future development, no NBAs are fixed for this site although it is considered that an NBA of at least 15m wide should align with the proposed building gap in Chu Hai College of Higher Education. A quantitative AVA should be conducted for Site C9 in the detailed design stage to identify the NBAs and other enhancement measures and to ascertain their effectiveness.

Expert Evaluation Report
of Tuen Mun New Town

1.0 The Assignment

1.1 The land use of the approved Tuen Mun Outline Zoning Plan (OZP) No.S/TM/31 ("the Plan") has been reviewed. It is considered necessary to review the existing air ventilation assessment (AVA) for Tuen Mun Area (i.e. Term Consultancy for Expert Evaluation on Air Ventilation Assessment for Tuen Mun Area[1]) and conduct an updated Expert Evaluation to assess the preliminary air ventilation impacts of the new development proposals and the development restrictions to be imposed in guiding future developments/redevelopments.

1.2 This expert evaluation report is based on the materials given by Planning Department to the Consultant including:

Approved Tuen Mun Outline Zoning Plan (OZP) No.S/TM/31
Existing Building Height (in mPD, storey, and absolute height)
Proposed Building Height Restrictions (in mPD) for Approved Tuen Mun Outline Zoning Plan (OZP) No.S/TM/31
Proposed amendments to the approved Tuen Mun OZP No.S/TM/31
Term Consultancy for Expert Evaluation on Air Ventilation Assessment for Tuen Mun Area (March 2009)[1]
Experimental Site Wind Availability Study for Tuen Mun Area, Hong Kong (August 2009)[2]
Experimental Site Wind Availability Study for Tuen Mun East Area, Hong Kong (June 2008) [3]
Planning and Engineering Review of Potential Housing Sites in Tuen Mun East Area – Feasibility Study, Air Ventilation Assessment (2009)[4]

1.3 The consultant has studied the foregoing materials. During the preparation of the report, the consultant has visited the site and conducted working sessions with Planning Department.

2.0 Background

2.1 Planning Department's study: "Feasibility Study for Establishment of Air Ventilation Assessment System"[5] (Feasibility Study) has recommended that it is

important to allow adequate air ventilation through the built environment for pedestrian comfort.

2.2 Given Hong Kong‟s high density urban development, the study opines that: “more air ventilation, the better” is the useful design guideline.

2.3 The Feasibility Study summarises 10 qualitative guidelines for planners and designers. For the OZP level of consideration, breezeways/air paths, street grids and orientations, open spaces, non-building areas, waterfront sites, scales of podium, building heights, building dispositions, and greeneries are all important strategic considerations.

2.4 The Feasibility Study also suggests that Air Ventilation Assessment (AVA) be conducted in three stages: Expert Evaluation, Initial Studies, and Detailed Studies. The suggestion has been adopted and incorporated into Housing Planning and Lands Bureau (HPLB) and Environment, Transport and Works Bureau (ETWB) Technical Circular No. 1/06[6]. The key purposes of Expert Evaluation are to :

(a) Identify good design features.
(b) Identify obvious problem areas and propose some mitigation measures.
(c) Define “focuses” and methodologies of the Initial and/or Detailed studies.
(d) Determine if further study should be staged into Initial Study and Detailed Study, or Detailed Study alone.

2.5 To conduct the Expert Evaluation systematically and methodologically, it is necessary to undertake the following information analyses:

(a) Analyse relevant wind data as the input conditions to understand the wind environment of the Area.
(b) Analyse the topographical features of the study area, as well as the surrounding areas.
(c) Analyse the greenery/landscape characteristics of the study area, as well as the surrounding areas.
(d) Analyse the land use and built form of the study area, as well as the surrounding areas.

Based on the analyses:

(e) Estimate the characteristics of the input wind conditions of the study area.

(f) Identify the wind paths and wind flow characteristics of the study area through slopes, open spaces, streets, gaps and non-building areas between buildings, and low rise buildings; also identify stagnant/problem areas, if any.
(g) Estimate the need of wind for pedestrian comfort.

Based on the analyses of the EXISTING urban conditions:
(h) Evaluate the strategic role of the study area in air ventilation term.
(i) Identify problematic areas which warrant attention.
(j) Identify existing “good features” that needs to be kept or strengthened.

Based on an understanding of the EXISTING urban conditions:
(k) Evaluate and compare qualitatively the prima facie impact, merits or demerits of the different development restrictions as proposed by Planning Department on air ventilation aspect.
(l) Highlight problem areas, if any. Recommend improvements and mitigation measures if possible.
(m) Identify focus areas or issues that may need further studies. Recommend appropriate technical methodologies for the study if needed.

3.0 The Wind Environment

3.1 Hong Kong Observatory (HKO) stations provide useful and reliable data on the wind environment in Hong Kong (Figure 3.1). There are some 46 stations operated by HKO in Hong Kong. Together, these stations allow for a very good general understanding of the wind environment especially near ground level.

Figure 3.1 Some of the HKO stations in Hong Kong. This is a screen capture at 3pm on 17 July 2012 from the HKO website. The arrows show the wind directions and speeds at the given time.

Figure 3.2 The HKO stations at 1: Waglan Island (WGL), 2: Tuen Mun (TUN)

3.2 The HKO station at Waglan Island (WGL) is normally regarded by wind engineers as the reference station for wind related studies (Location 1 in Figure 3.2). The station has a very long measurement record, and is unaffected by Hong Kong‟s complex topography. Unfortunately, it is known not to be able to capture the thermally induced local wind circulation like sea breezes too well. Based on WGL wind data, studies are typically employed to estimate the site wind availability taking into account the topographical features around the site.

3.3 Based on the annual wind rose of WGL (Figure 3.3), it is apparent that the annual prevailing wind in Hong Kong is from the east. A major component of wind also comes from the northeast; and there is a minor, but nonetheless observable component from the southwest. WGL has weak to moderate wind (0.1m/s to 8.2 m/s) approximately 70% of the time.

3.4 For the study, seasonally or monthly wind environment should be understood (Figures 3.4 and 3.5). During winter, the prevailing wind comes from the northeast, whereas during summer, it comes from the southwest. As far as AVA is concerned, in Hong Kong, the summer wind is very important and beneficial for thermal comfort. Hence, based on WGL data, 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 fabric.

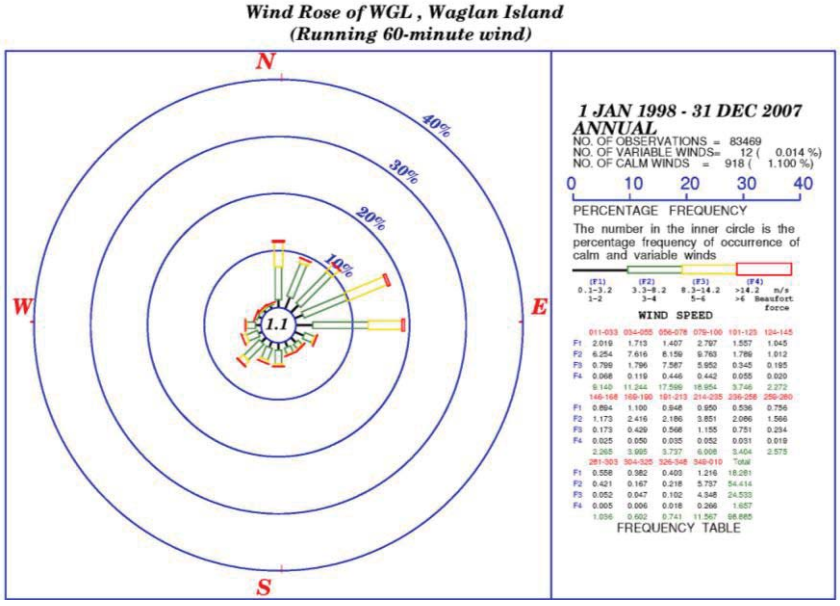

Figure 3.3 Wind rose of WGL from 1998 to 2007[1] (annual).

[1] Wind data from 1998 to 2007 are the latest available 10-year data from HKO to the consultant.

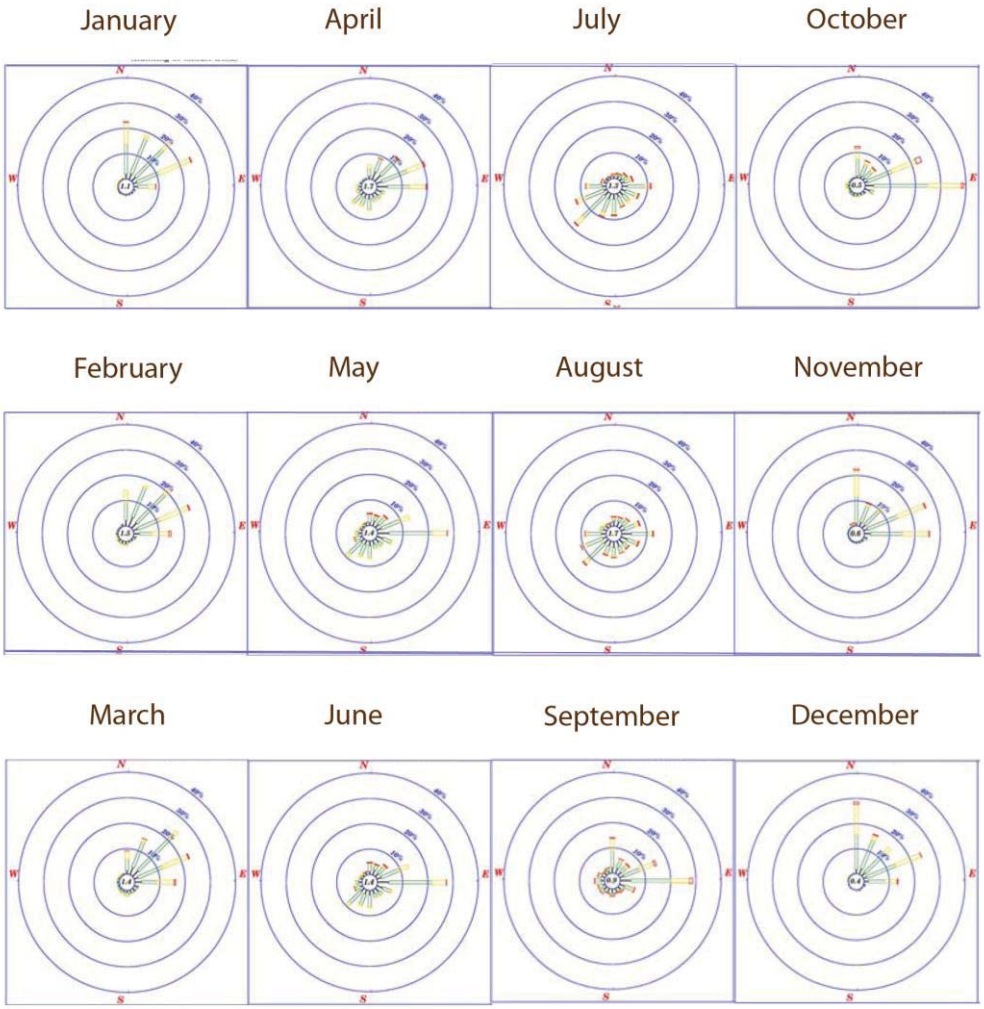

Figure 3.4 Monthly wind roses of WGL from 1998 to 2007.

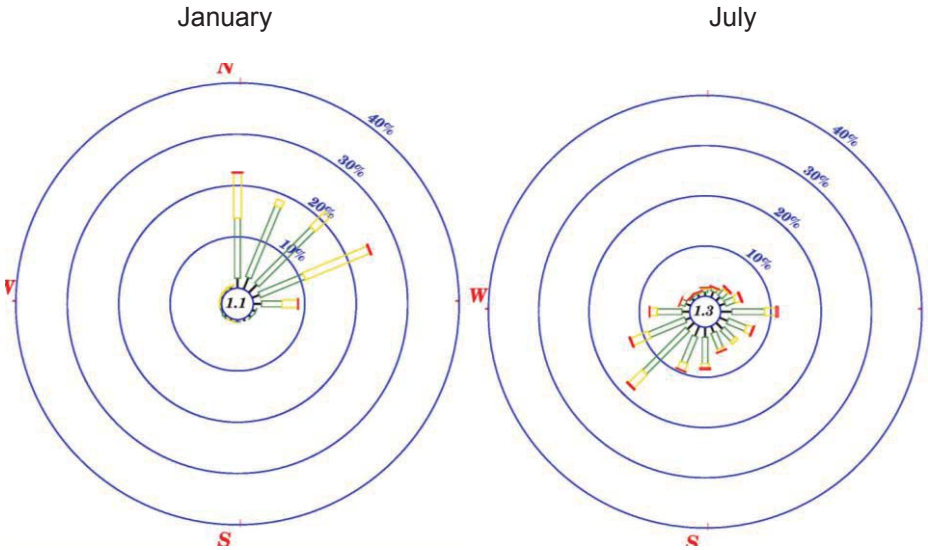

Figure 3.5 Wind roses of WGL from 1998 to 2007 (Jan and July).

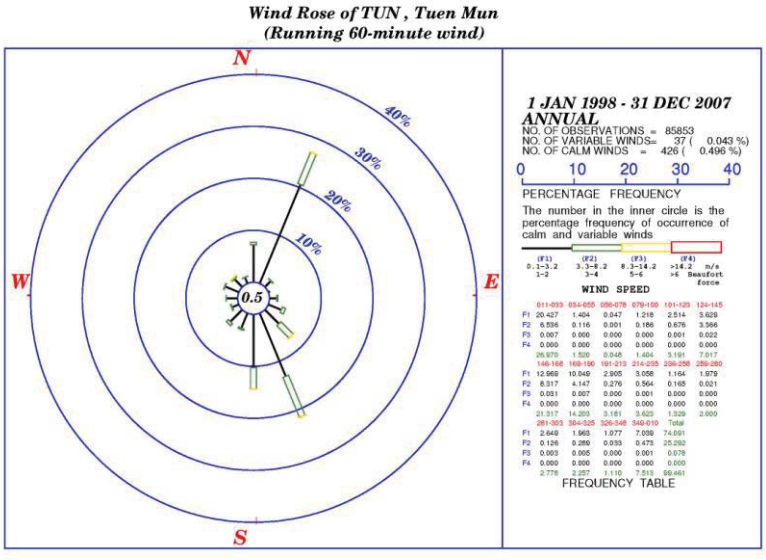

Figure 3.6 Wind rose of Tun, Tuen Mun from 1998 to 2007 (annual).

(Elevation of station: 63m above mean sea level)

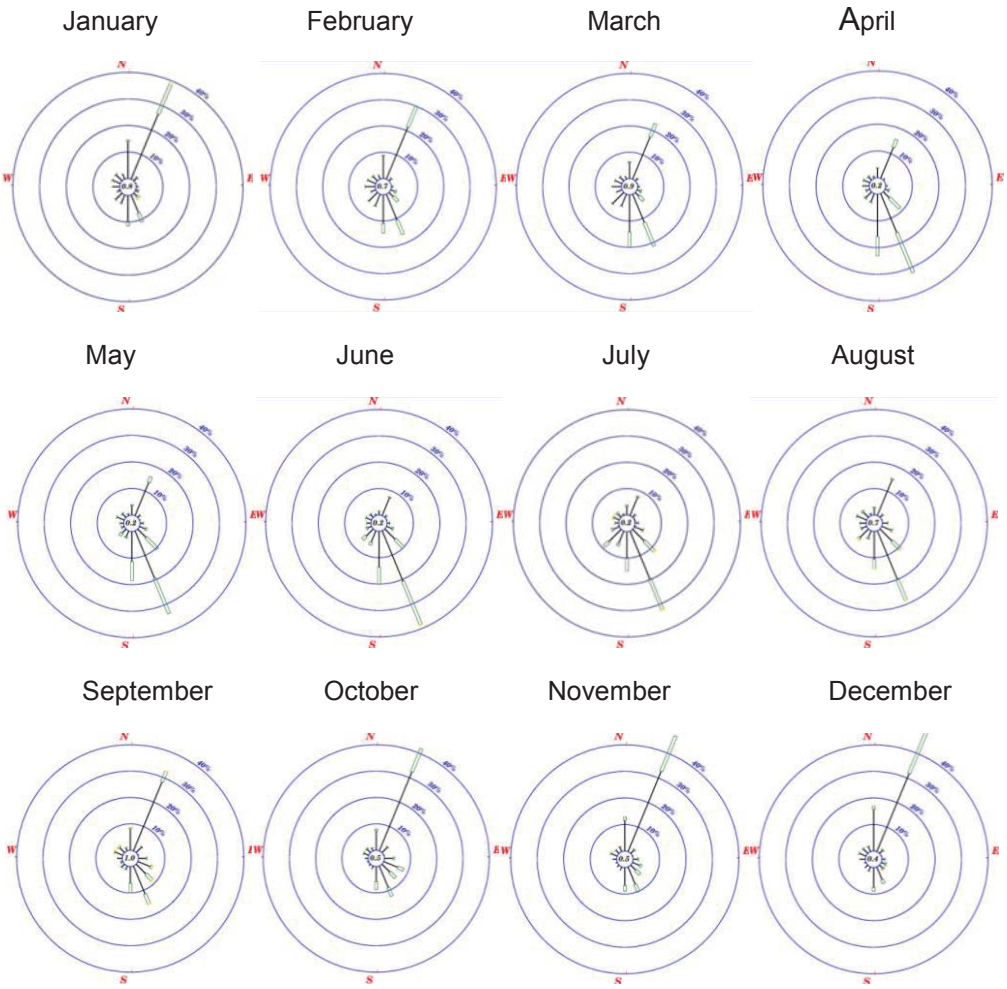

Figure 3.7 Monthly wind roses of Tun, Tuen Mun from 1998 to 2007.

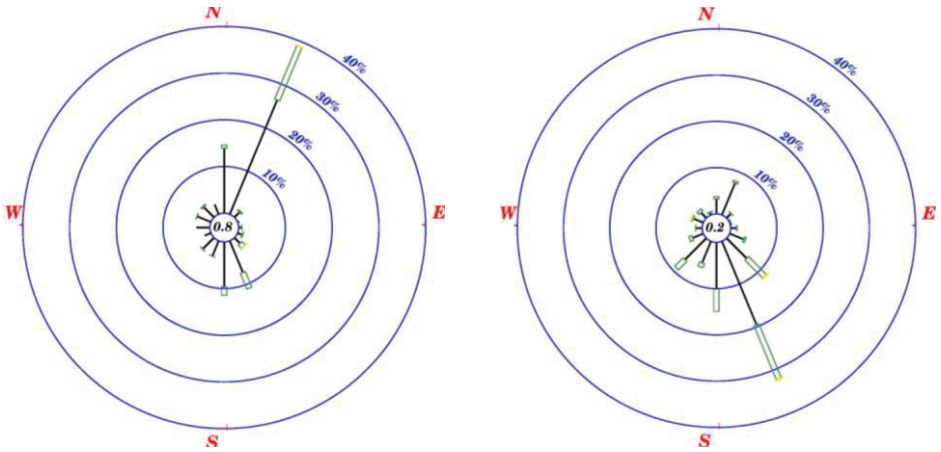

Figure 3.8 Wind roses of Tun, Tuen Mun from 1998 to 2007 (Jan and July).

Figure 3.9 The six locations of MM5 extracted data (A, B, C, D, E and F).

3.5 Apart from WGL, the wind data of Tuen Mun were also extracted from HKO for reference (Figures 3.6 to 3.8) as the nearest station for measuring wind environment for Tuen Mun New Town. It can be observed that the annual prevailing winds in Tuen Mun Station are mainly from the northeast and southeast. Summer prevailing winds are mainly from the southeast.

3.6 Researchers at Hong Kong University of Science and Technology (HKUST), Prof Alexis Lau and Prof Jimmy Fung, have simulated a set of wind data using Fifth-Generation Penn State/NCAR Mesoscale Model (MM5) over Hong Kong with 100m grid resolution. The wind data covered two years from 2004 to 2006[1]. Data from six locations within the study area were extracted at 60m, 120m and 450m above the ground (Figures 3.9 to 3.33). These six locations, according to the theories of MM5, 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 summarised in Table 1.1.

[1] Wind data from 2004 to 2006 simulated by MM5 are the latest available data from the Institute for the Environment (IENV), the Hong Kong University of Science and Technology (HKUST).

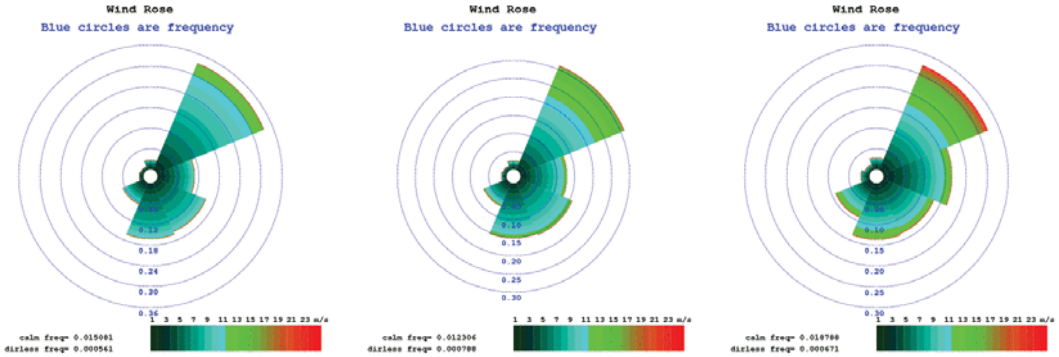

Figure 3.10 Annual Wind roses (2004 - 2006) at A (left: 60 m; middle: 120 m; right: 450 m).

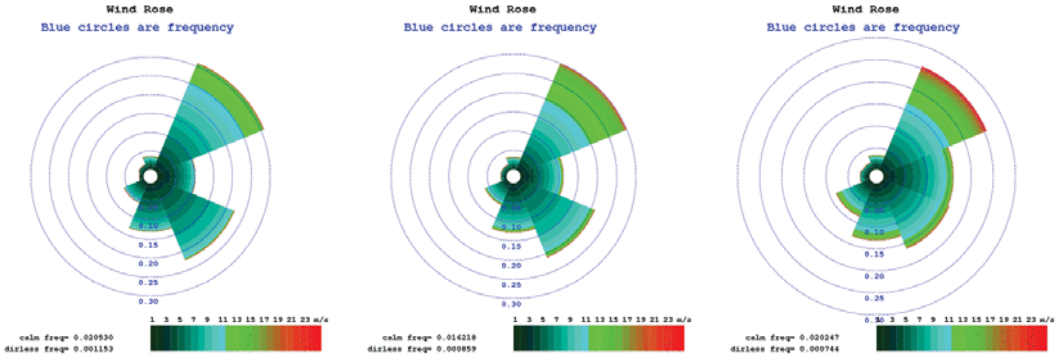

Figure 3.11 Annual Wind roses (2004 - 2006) at B (left: 60 m; middle: 120 m; right: 450 m).

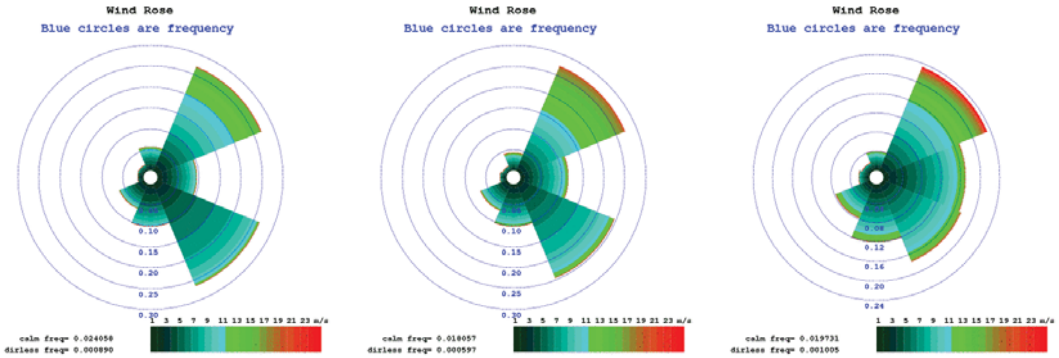

Figure 3.12 Annual Wind roses (2004 - 2006) at C (left: 60 m; middle: 120 m; right: 450 m).

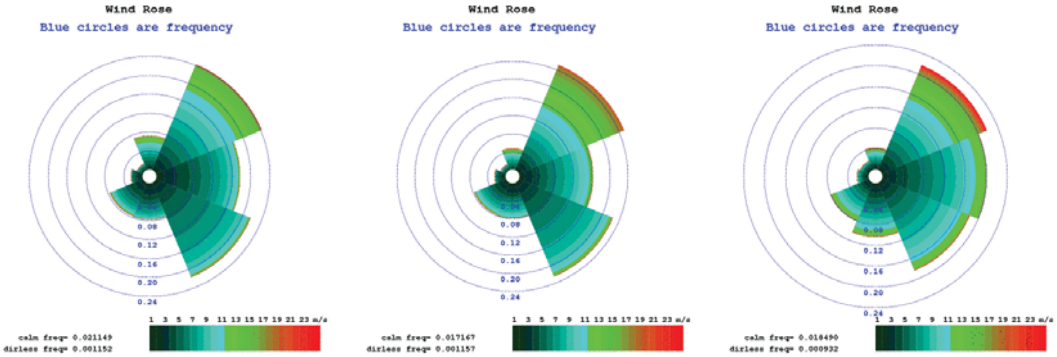

Figure 3.13 Annual Wind roses (2004 - 2006) at D (left: 60 m; middle: 120 m; right: 450 m).

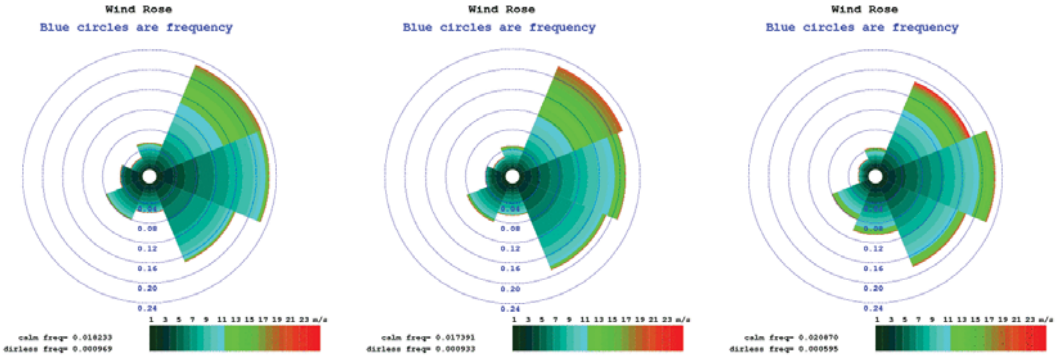

Figure 3.14 Annual Wind roses (2004 - 2006) at E (left: 60 m; middle: 120 m; right: 450 m).

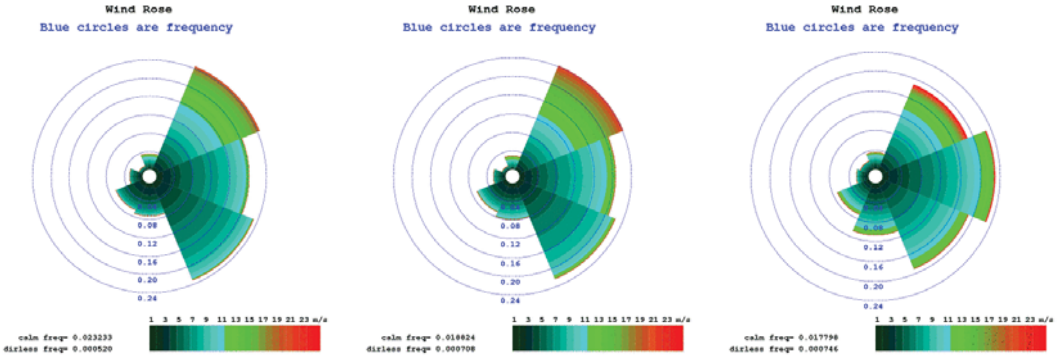

Figure 3.15 Annual Wind roses (2004 - 2006) at F (left: 60 m; middle: 120 m; right: 450 m).

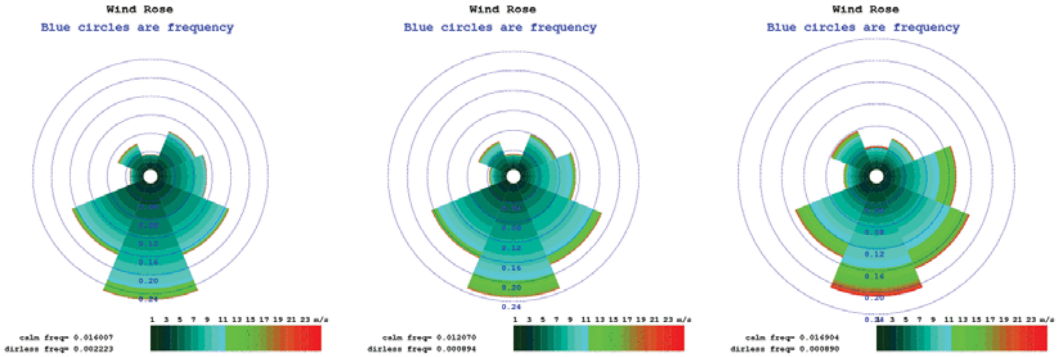

Figure 3.16 Summer Wind roses (2004) at A (left: 60 m; middle: 120 m; right: 450 m).

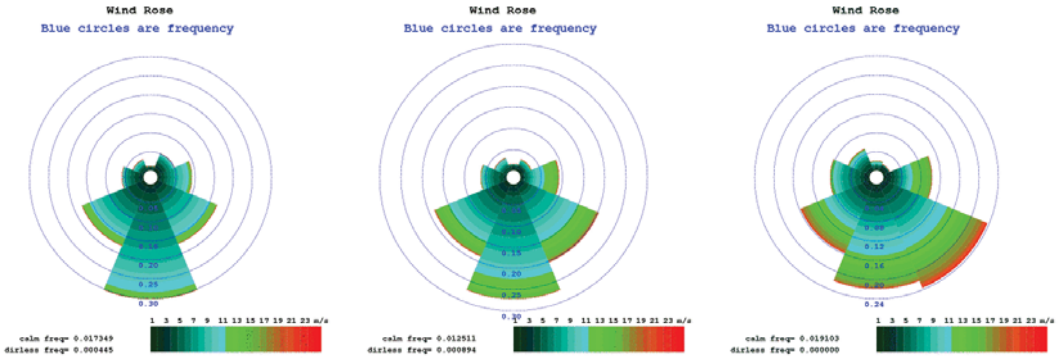

Figure 3.17 Summer Wind roses (2005) at A (left: 60 m; middle: 120 m; right: 450 m).

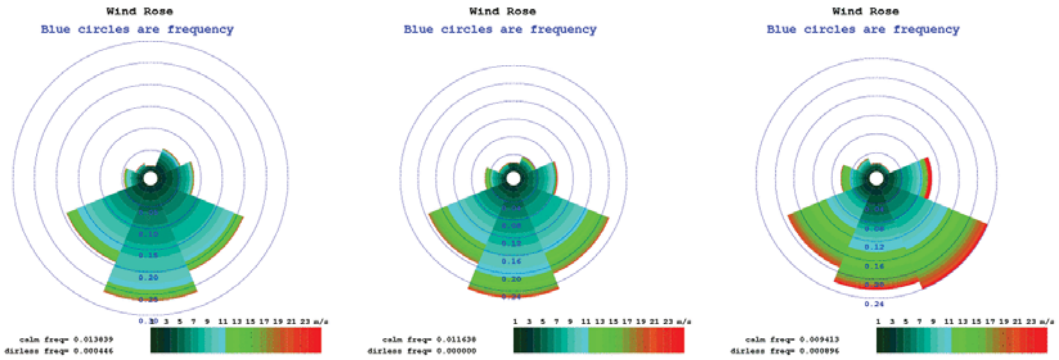

Figure 3.18 Summer Wind roses (2006) at A (left: 60 m; middle: 120 m; right: 450 m).

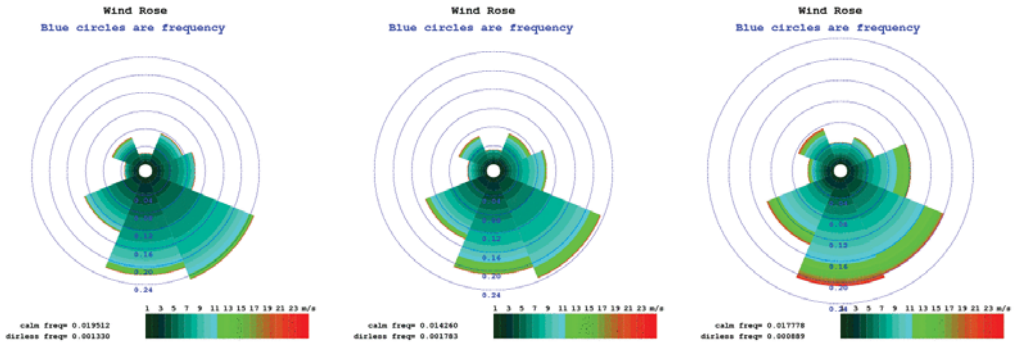

Figure 3.19 Summer Wind roses (2004) at B (left: 60 m; middle: 120 m; right: 450 m).

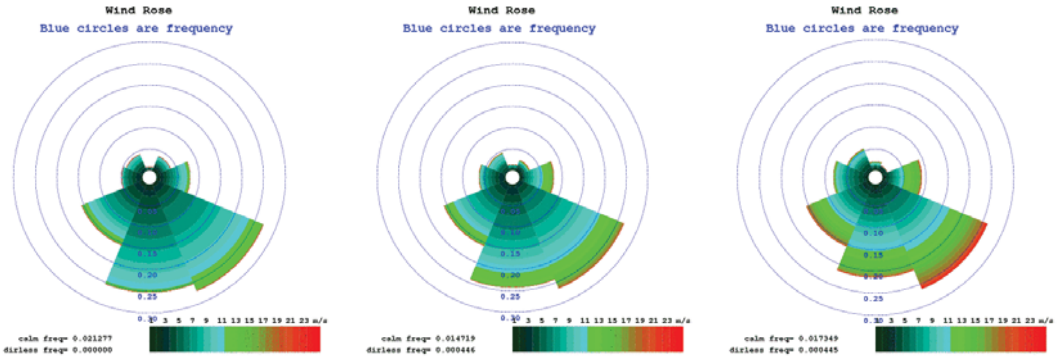

Figure 3.20 Summer Wind roses (2005) at B (left: 60 m; middle: 120 m; right: 450 m).

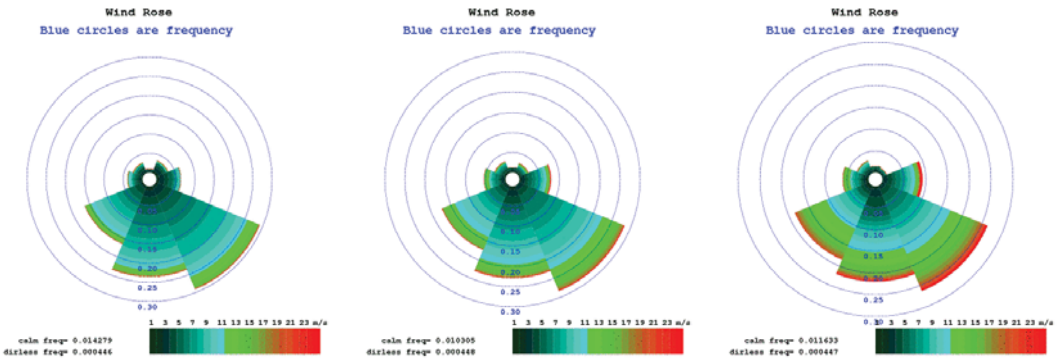

Figure 3.21 Summer Wind roses (2006) at B (left: 60 m; middle: 120 m; right: 450 m).

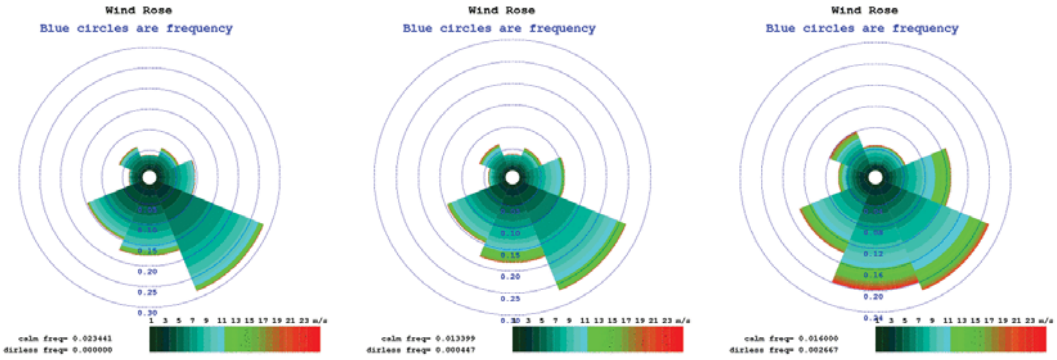

Figure 3.22 Summer Wind roses (2004) at C (left: 60 m; middle: 120 m; right: 450 m).

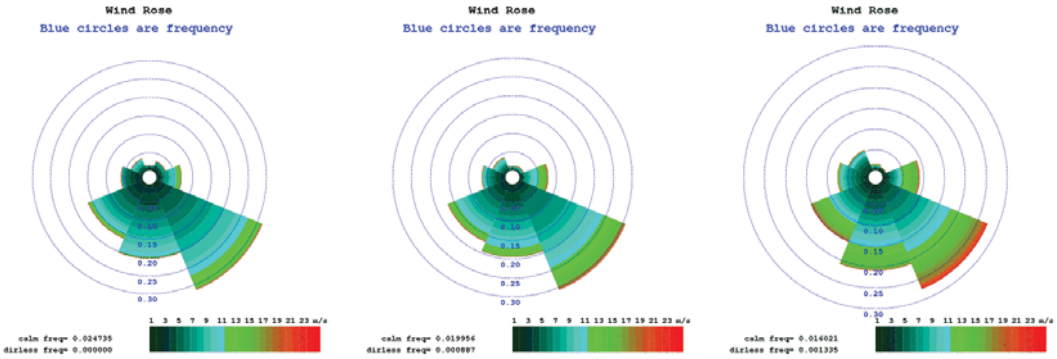

Figure 3.23 Summer Wind roses (2005) at C (left: 60 m; middle: 120 m; right: 450 m).

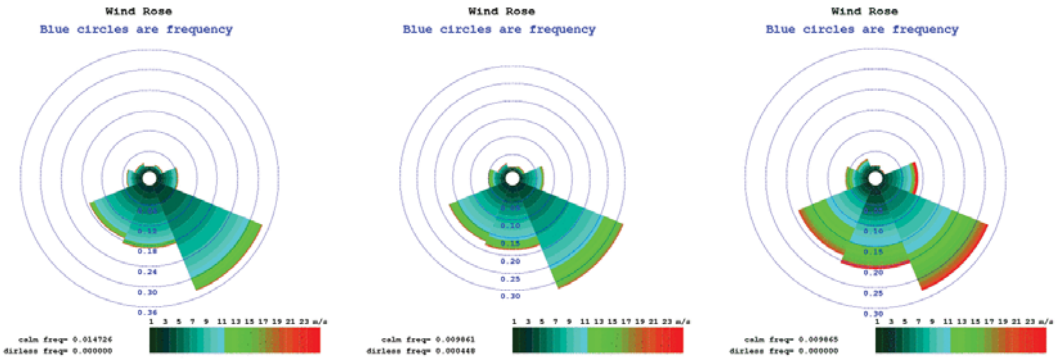

Figure 3.24 Summer Wind roses (2006) at C (left: 60 m; middle: 120 m; right: 450 m).

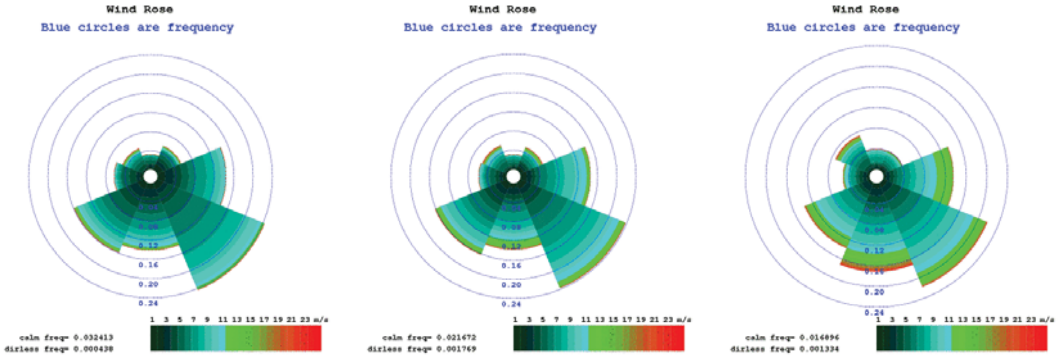

Figure 3.25 Summer Wind roses (2004) at D (left: 60 m; middle: 120 m; right: 450 m).

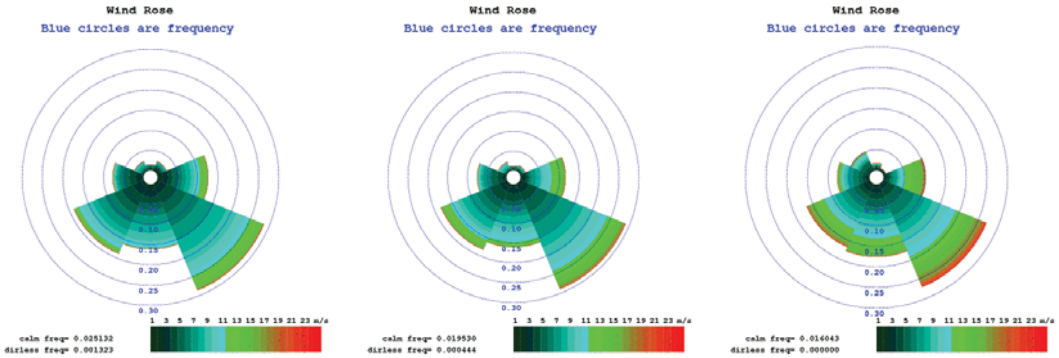

Figure 3.26 Summer Wind roses (2005) at D (left: 60 m; middle: 120 m; right: 450 m).

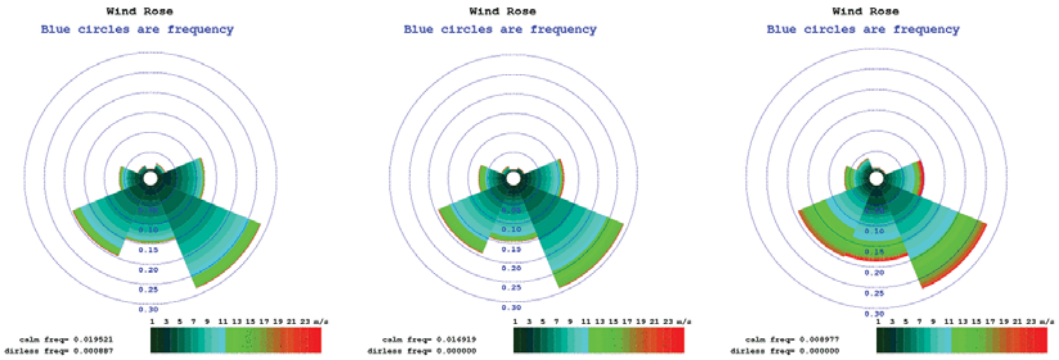

Figure 3.27 Summer Wind roses (2006) at D (left: 60 m; middle: 120 m; right: 450 m).

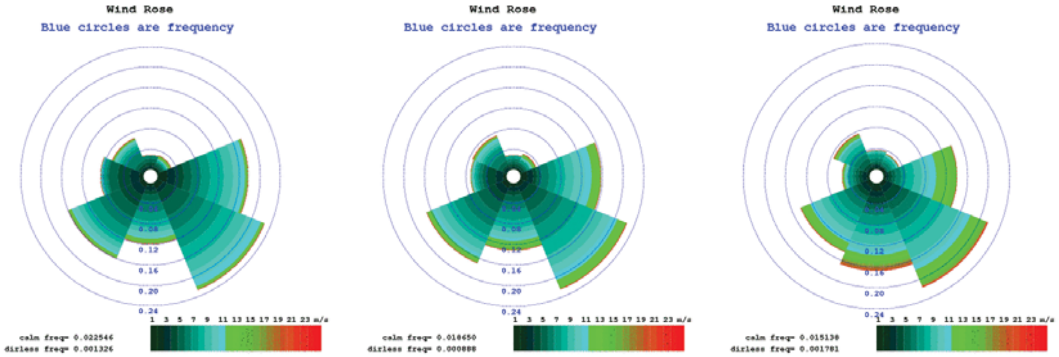

Figure 3.28 Summer Wind roses (2004) at E (left: 60 m; middle: 120 m; right: 450 m).

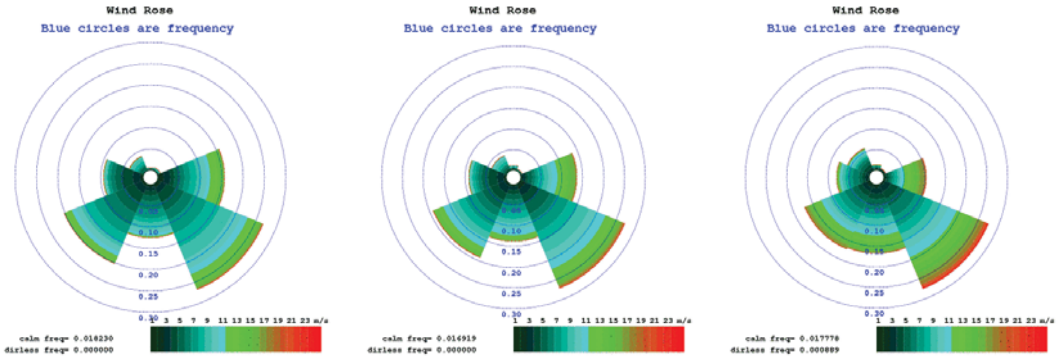

Figure 3.29 Summer Wind roses (2005) at E (left: 60 m; middle: 120 m; right: 450 m).

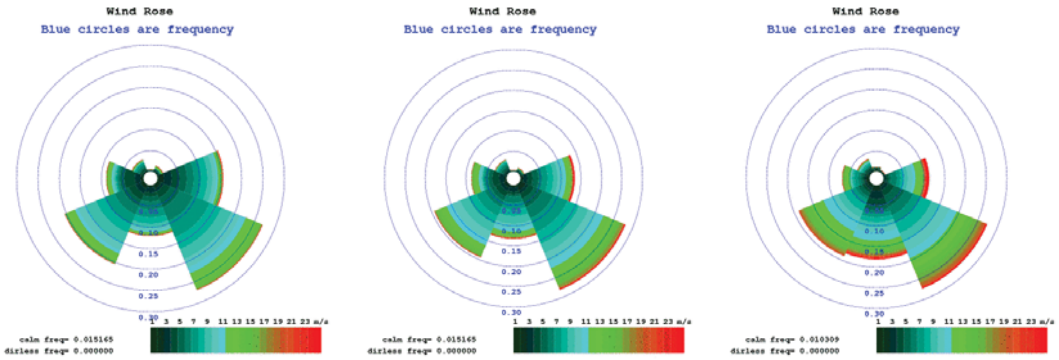

Figure 3.30 Summer Wind roses (2006) at E (left: 60 m; middle: 120 m; right: 450 m).

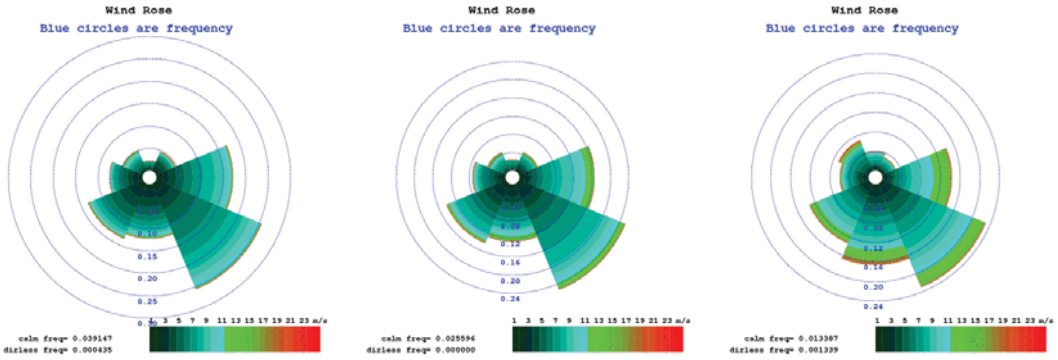

Figure 3.31 Summer Wind roses (2004) at F (left: 60 m; middle: 120 m; right: 450 m).

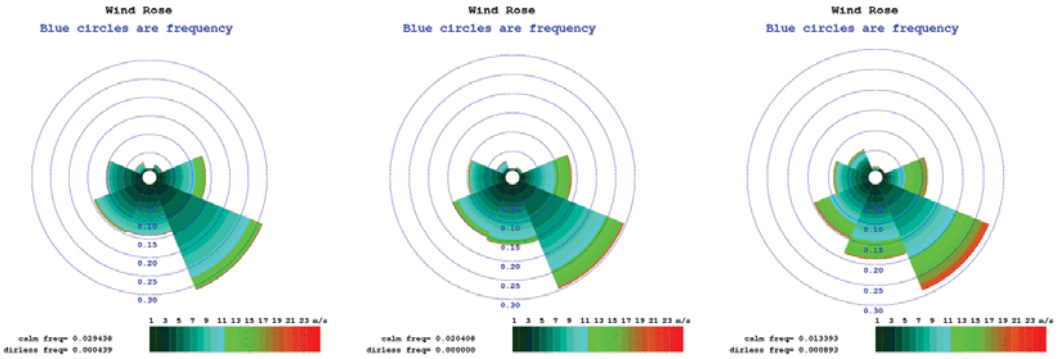

Figure 3.32 Summer Wind roses (2005) at F (left: 60 m; middle: 120 m; right: 450 m).

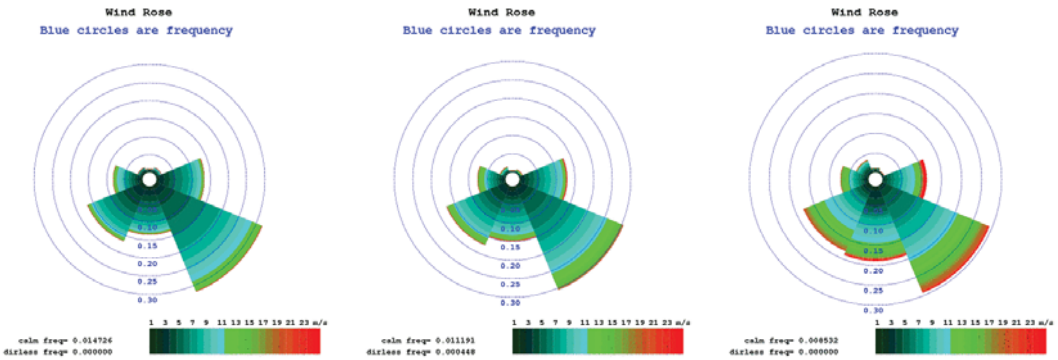

Figure 3.33 Summer Wind roses (2006) at F (left: 60 m; middle: 120 m; right: 450 m).

3.7 Referring to "Experimental Site Wind Availability Study for Tuen Mun Area, Hong Kong"[2] and "Experimental Site Wind Availability Study for Tuen Mun East Area, Hong Kong"[3], wind characteristics in Tuen Mun Area (Figure 3.34) and Tuen Mun East Area (Figure 3.43) have been analysed by wind tunnel experiments. The annual prevailing winds of the study location in Tuen Mun Area from the wind tunnel experiments are mainly from the east and northeast (Figures 3.35 to 3.38). The summer prevailing winds of the study location in Tuen Mun Area from the wind tunnel experiments are mainly from the east, southeast and southwest (Figures 3.39 to 3.42). The annual prevailing winds of Position 1 and 2 in Tuen Mun East Area from the wind tunnel experiments are mainly from the east (Figure 3.44 to Figure 3.47). No summer winds were provided in the wind tunnel experiments of Tuen Mun East Area[3].

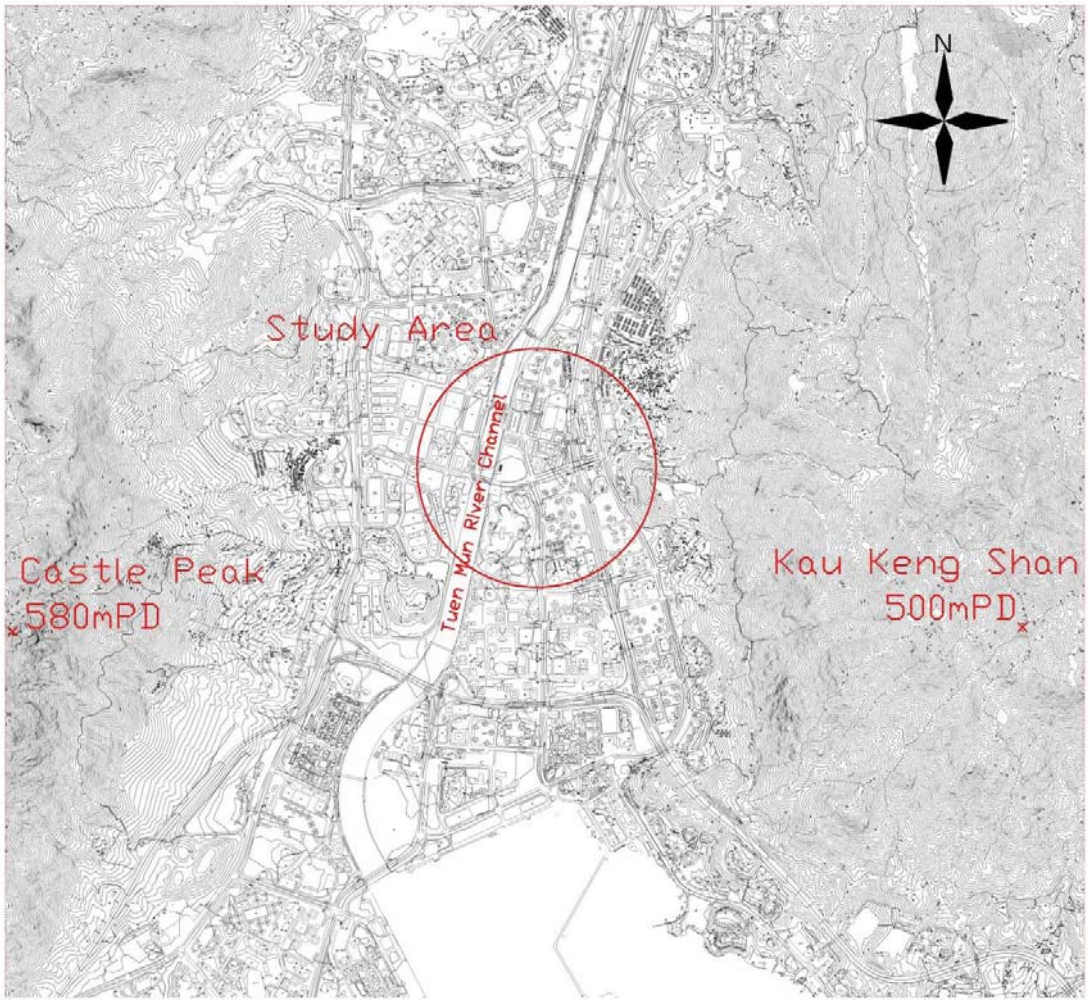

Figure 3.34 Location of the Tuen Mun Study Area for wind tunnel experiments.
(Source: Experimental Site Wind Availability Study for Tuen Mun Area, Hong Kong (August 2009) [2])

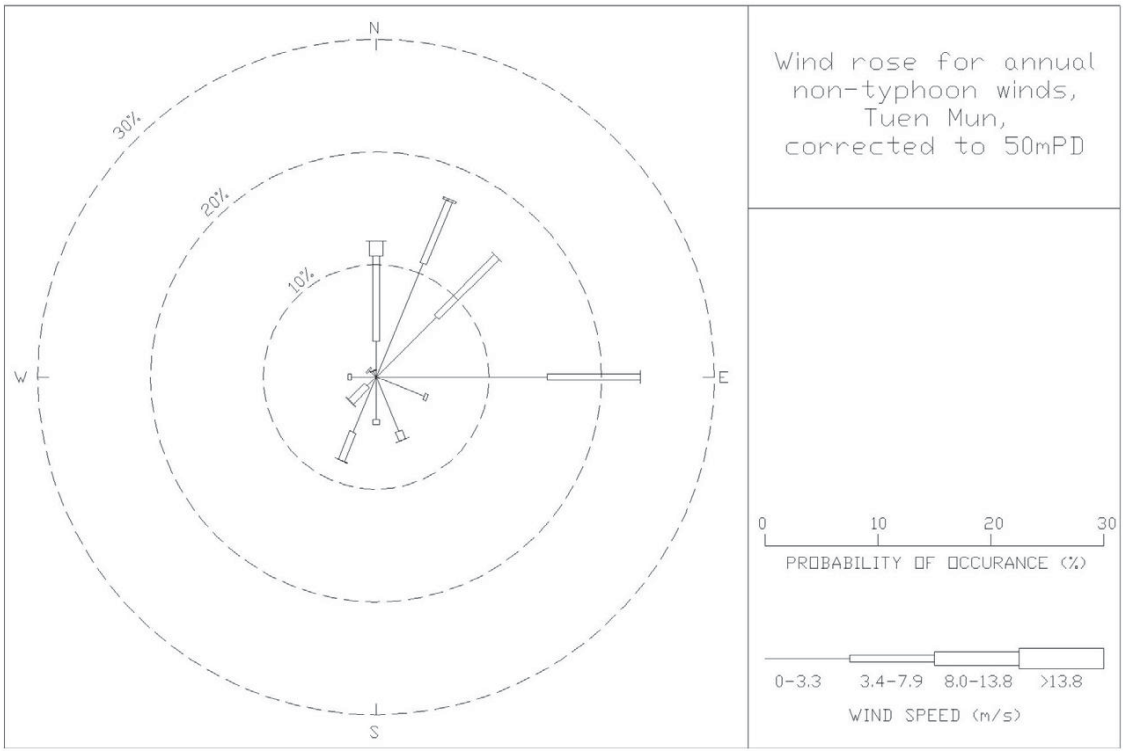

Figure 3.35 Wind rose for annual, non-typhoon winds for Tuen Mun, corrected to 50 mPD
(Source: Experimental Site Wind Availability Study for Tuen Mun Area, Hong Kong (August 2009) [2])

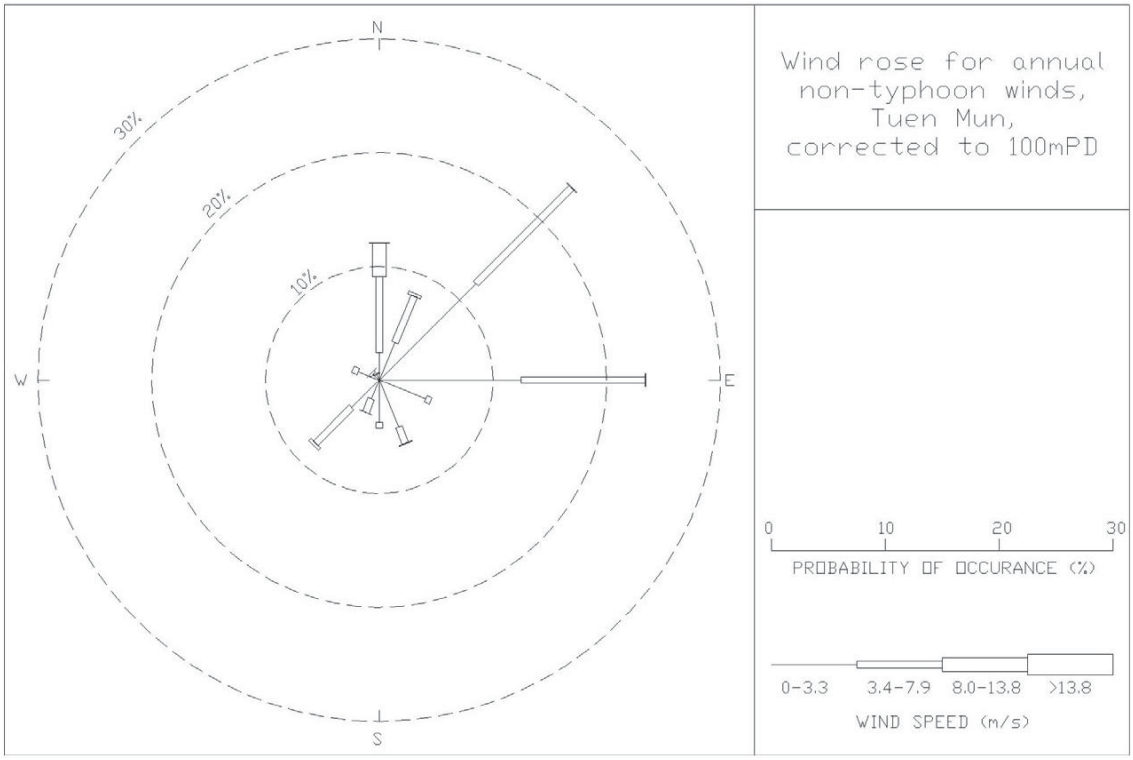

Figure 3.36 Wind rose for annual, non-typhoon winds for Tuen Mun, corrected to 100 mPD
(Source: Experimental Site Wind Availability Study for Tuen Mun Area, Hong Kong (August 2009) [2])

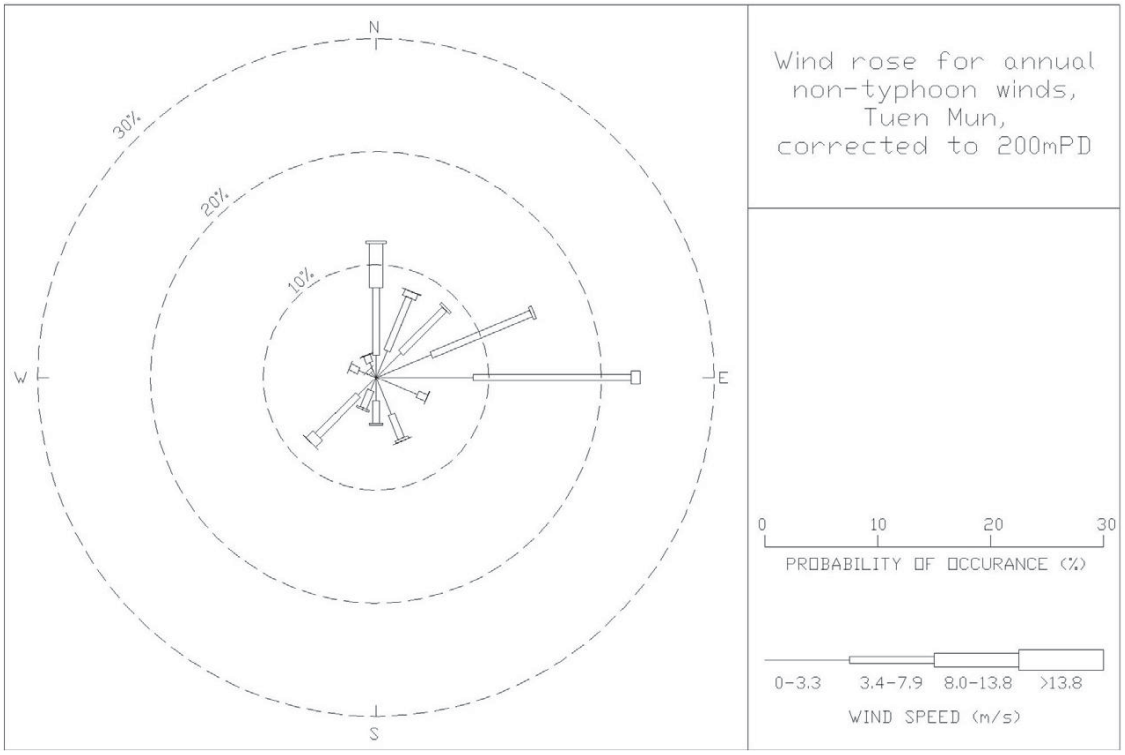

Figure 3.37 Wind rose for annual, non-typhoon winds for Tuen Mun, corrected to 200 mPD (Source: Experimental Site Wind Availability Study for Tuen Mun Area, Hong Kong (August 2009) [2])

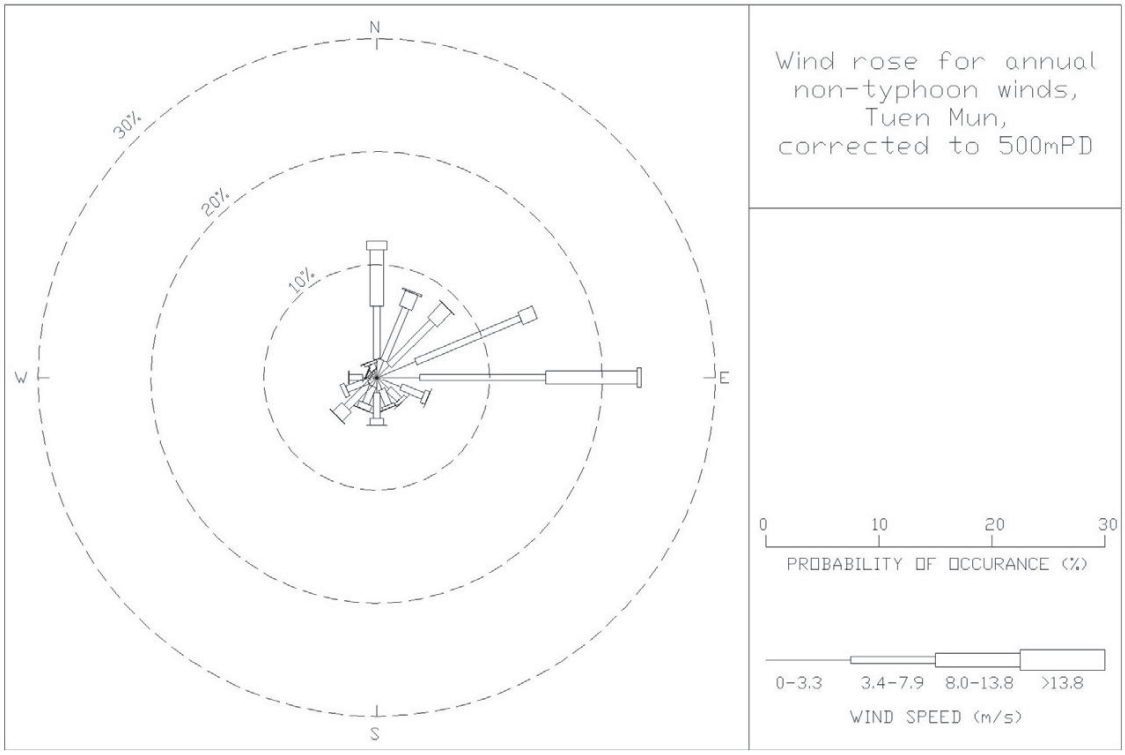

Figure 3.38 Wind rose for annual, non-typhoon winds for Tuen Mun, corrected to 500 mPD (Source: Experimental Site Wind Availability Study for Tuen Mun Area, Hong Kong (August 2009) [2])

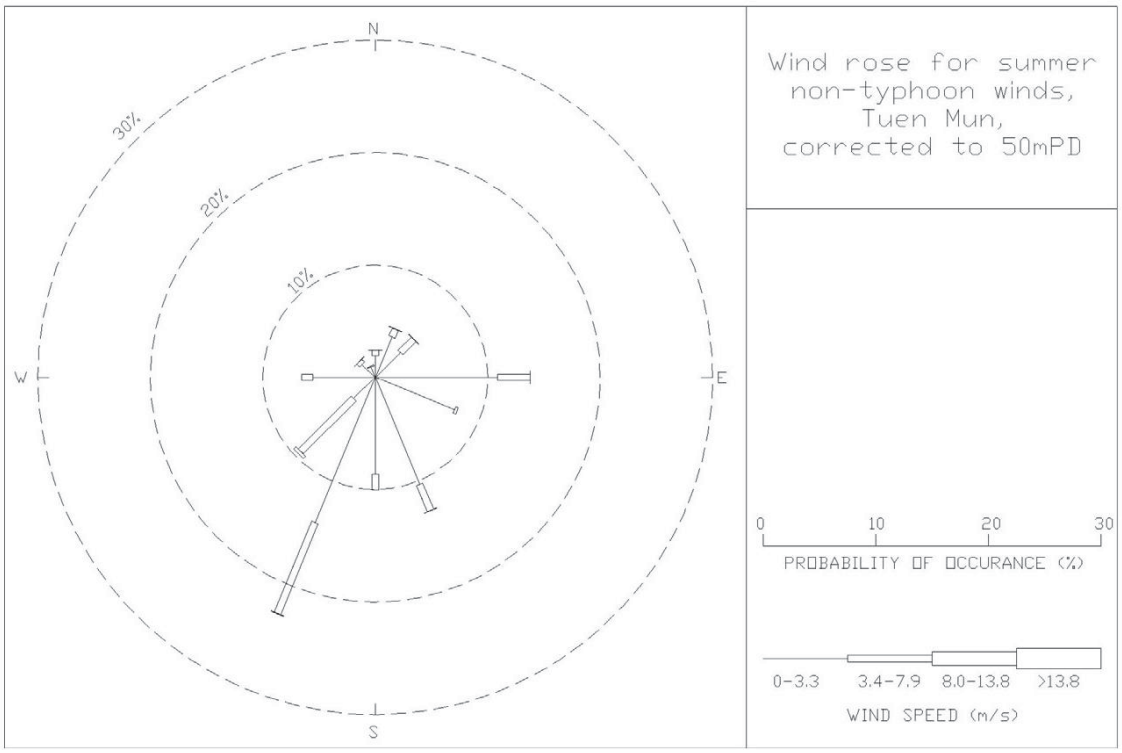

Figure 3.39 Wind rose for summer, non-typhoon winds for Tuen Mun, corrected to 50 mPD

(Source: Experimental Site Wind Availability Study for Tuen Mun Area, Hong Kong (August 2009) [2])

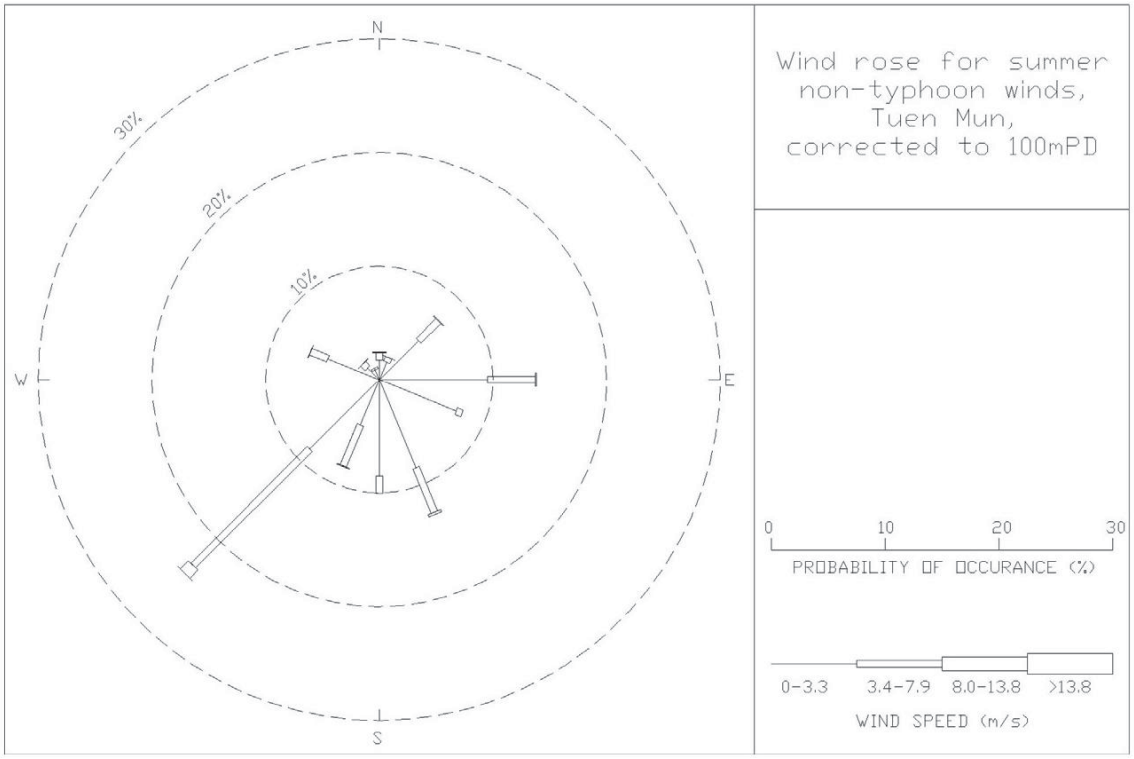

Figure 3.40 Wind rose for summer, non-typhoon winds for Tuen Mun, corrected to 100 mPD

(Source: Experimental Site Wind Availability Study for Tuen Mun Area, Hong Kong (August 2009) [2])

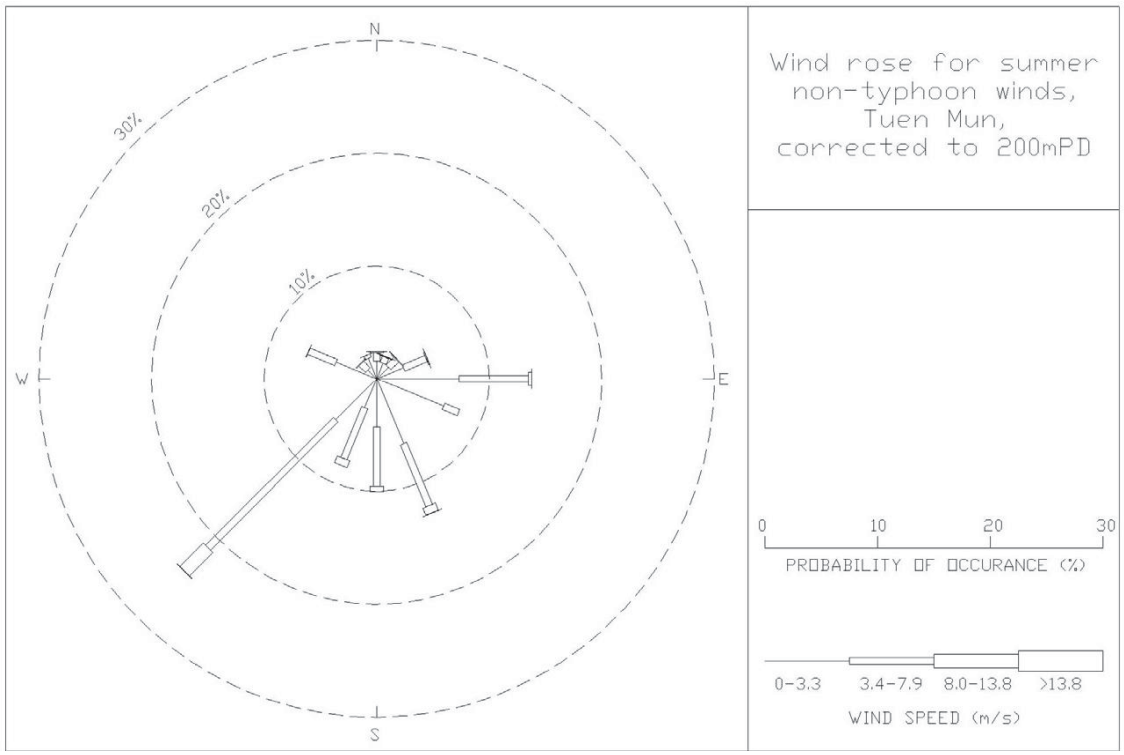

Figure 3.41 Wind rose for summer, non-typhoon winds for Tuen Mun, corrected to 200 mPD (Source: Experimental Site Wind Availability Study for Tuen Mun Area, Hong Kong (August 2009) [2])

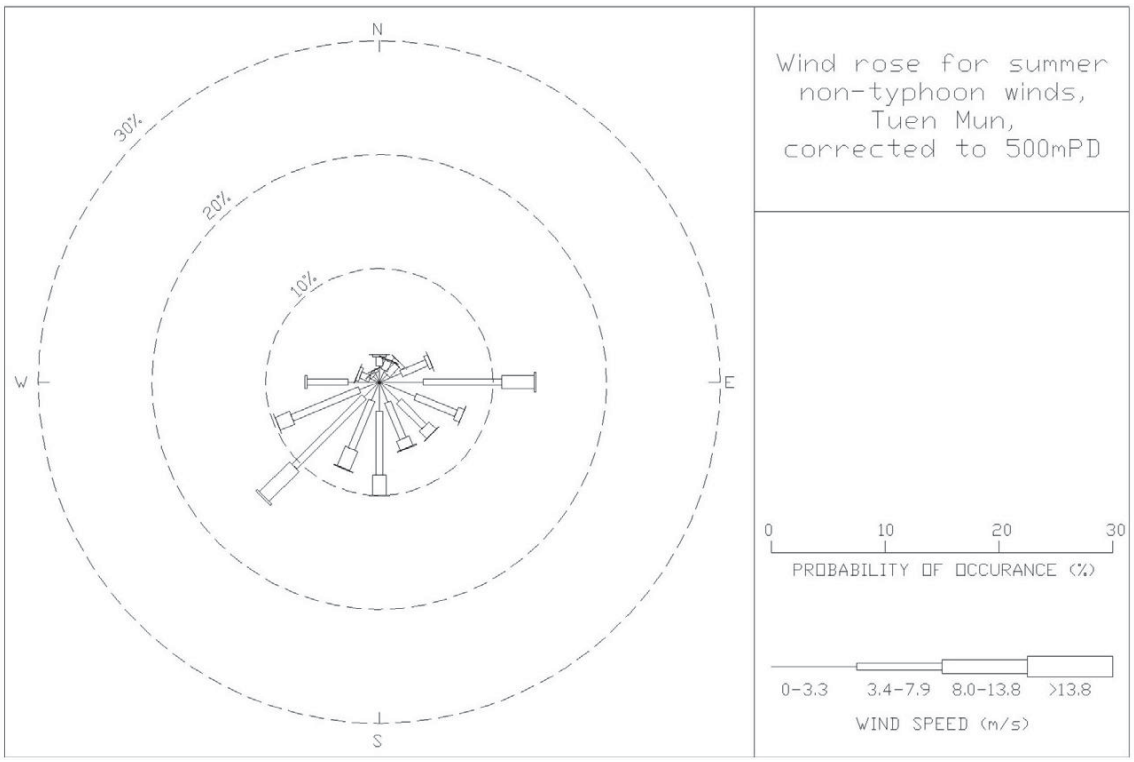

Figure 3.42 Wind rose for summer, non-typhoon winds for Tuen Mun, corrected to 500 mPD (Source: Experimental Site Wind Availability Study for Tuen Mun Area, Hong Kong (August 2009) [2])

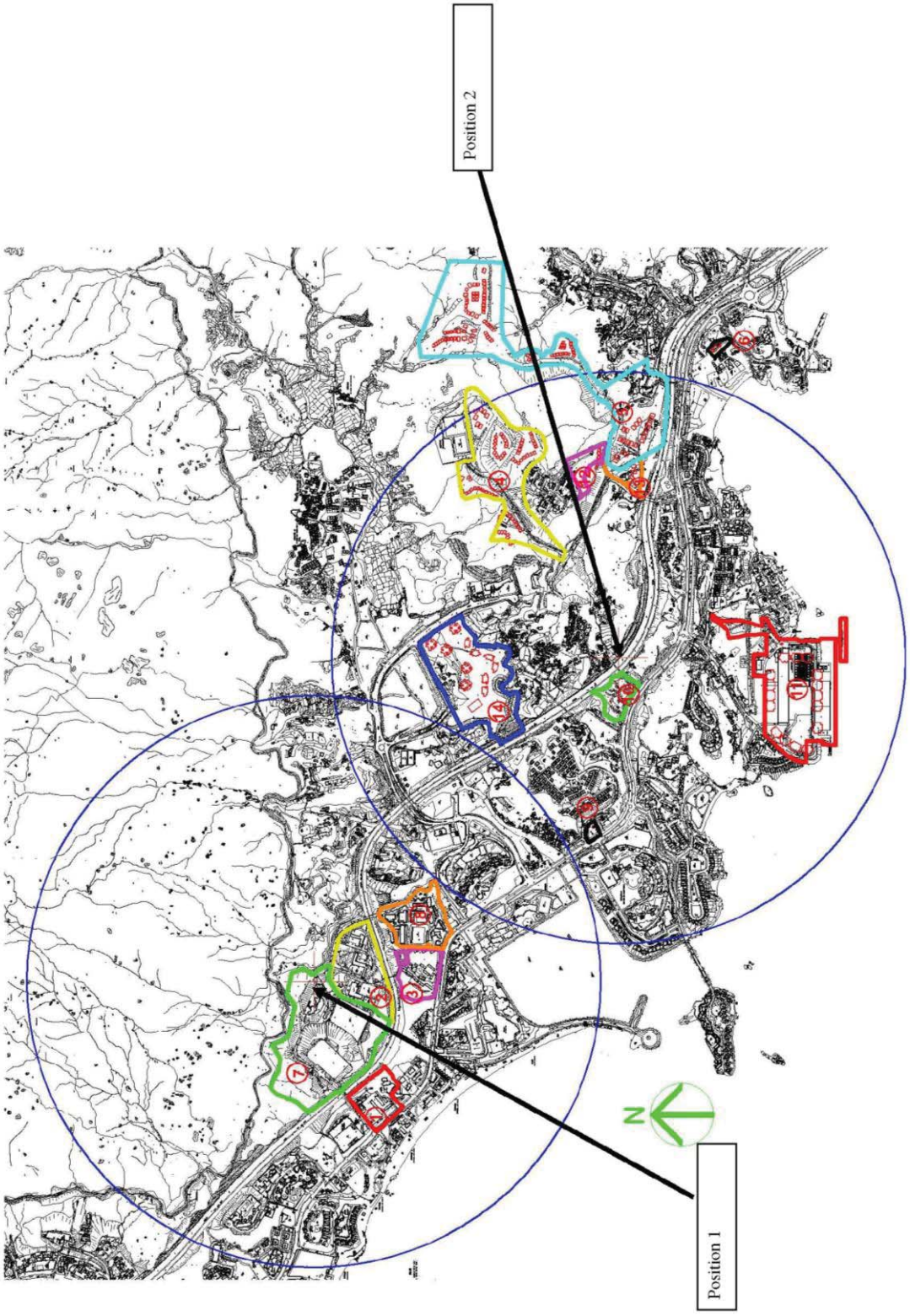

Figure 3.43 Two positions in Tuen Mun East Area for wind tunnel experiments. (Source: Experimental Site Wind Availability Study for Tuen Mun East Area, Hong Kong (June 2008)[3])

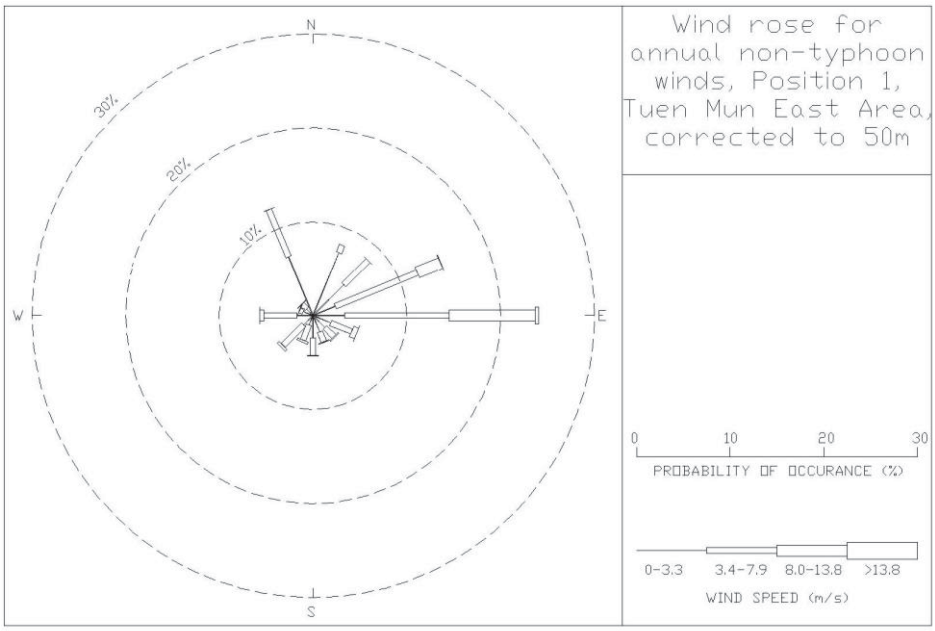

Figure 3.44 Wind rose for annual, non-typhoon winds for Position 1 of the Tuen Mun East Area, corrected to 50m.

(Source: Experimental Site Wind Availability Study for Tuen Mun East Area, Hong Kong (June 2008)[3])

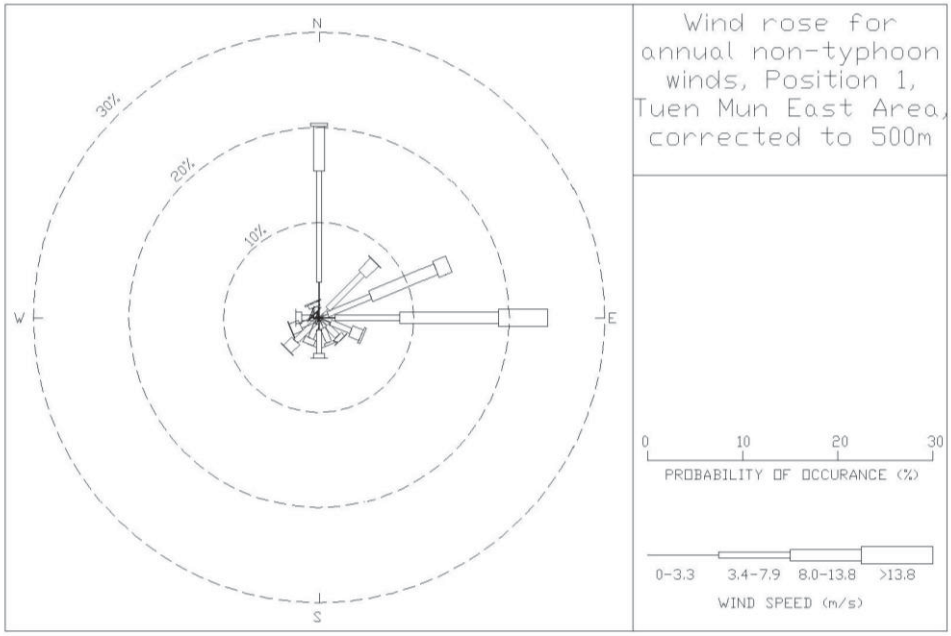

Figure 3.45 Wind rose for annual, non-typhoon winds for Position 1 of the Tuen Mun East Area, corrected to 500m.

(Source: Experimental Site Wind Availability Study for Tuen Mun East Area, Hong Kong (June 2008)[3])

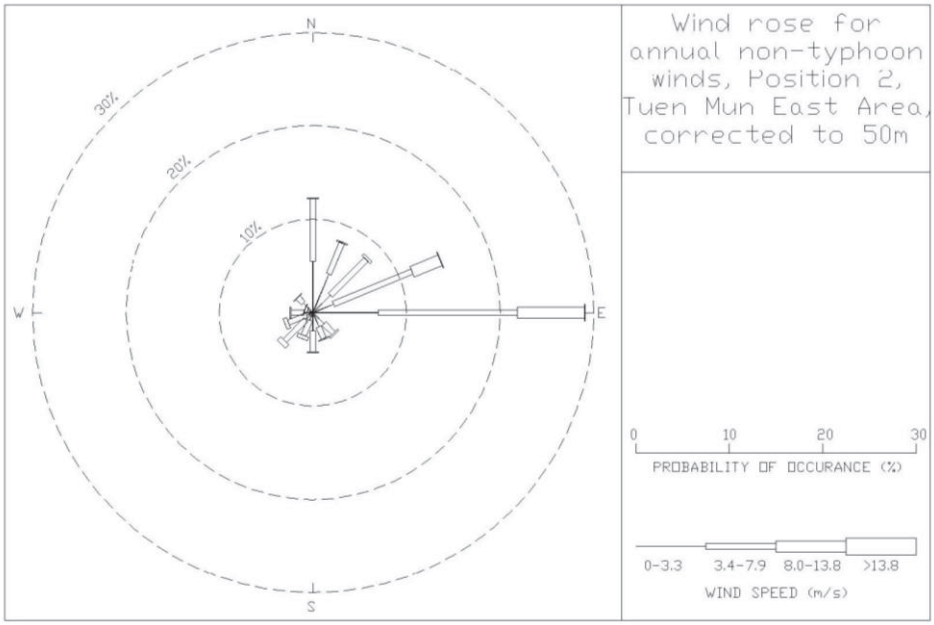

Figure 3.46 Wind rose for annual, non-typhoon winds for Position 2 of the Tuen Mun East Area, corrected to 50m.

(Source: Experimental Site Wind Availability Study for Tuen Mun East Area, Hong Kong (June 2008)[3])

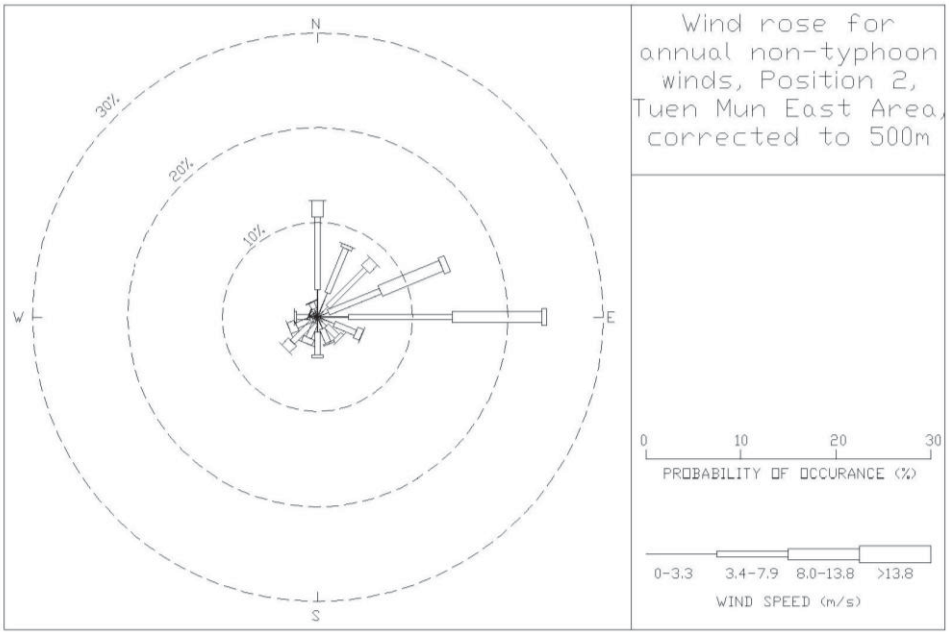

Figure 3.47 Wind rose for annual, non-typhoon winds for Position 2 of the Tuen Mun East Area, corrected to 500m.

(Source: Experimental Site Wind Availability Study for Tuen Mun East Area, Hong Kong (June 2008)[3])

3.8 In summary, based on the available wind data (Table 1.1), one may conclude that the annual wind of the Tuen Mun New Town area mainly comes from the northeast, east and southeast. The summer wind mainly comes from the east and southerly quarters including southwest, south and southeast (Figure 3.48).

Table 1.1 Summary of Prevailing Wind Directions

			Period	
			Annual	Summer
HKO station	Tuen Mun Station (Tun)		NE, SE	SE
MM5 Simulation	Location A	60m	NE	SE, S, SW
		120m	NE	SE, S, SW
		450m	NE, E	SE, S, SW
	Location B	60m	NE, SE	SE, S, SW
		120m	NE, SE	SE, S, SW
		450m	NE,E,SE	SE, S, SW
	Location C	60m	NE,E,SE	SE, S, SW
		120m	NE,E,SE	SE, S, SW
		450m	NE,E,SE	SE, S, SW
	Location D	60m	NE,E,SE	E, SE, S, SW
		120m	NE,E,SE	E, SE, S, SW
		450m	NE,E,SE	E, SE, S, SW
	Location E	60m	NE,E,SE	E, SE, S, SW
		120m	NE,E,SE	E, SE, S, SW
		450m	NE,E,SE	E, SE, S, SW
	Location F	60m	NE,E,SE	E, SE, S, SW
		120m	NE,E,SE	E, SE, S, SW
		450m	NE,E,SE	E, SE, S, SW
Wind tunnel experiments in Tuen Mun Area[2]		50m	NE, E	E, SE, SW
		100m	NE, E	E, SE, SW
		200m	E, ENE	E, SE, SW
		500m	E, ENE	E, SW
Wind tunnel experiments in Tuen Mun East Area[3]	Position 1	50m	E	N/A
		500m	N, E	N/A
	Position 2	50m	E	N/A
		500m	E	N/A

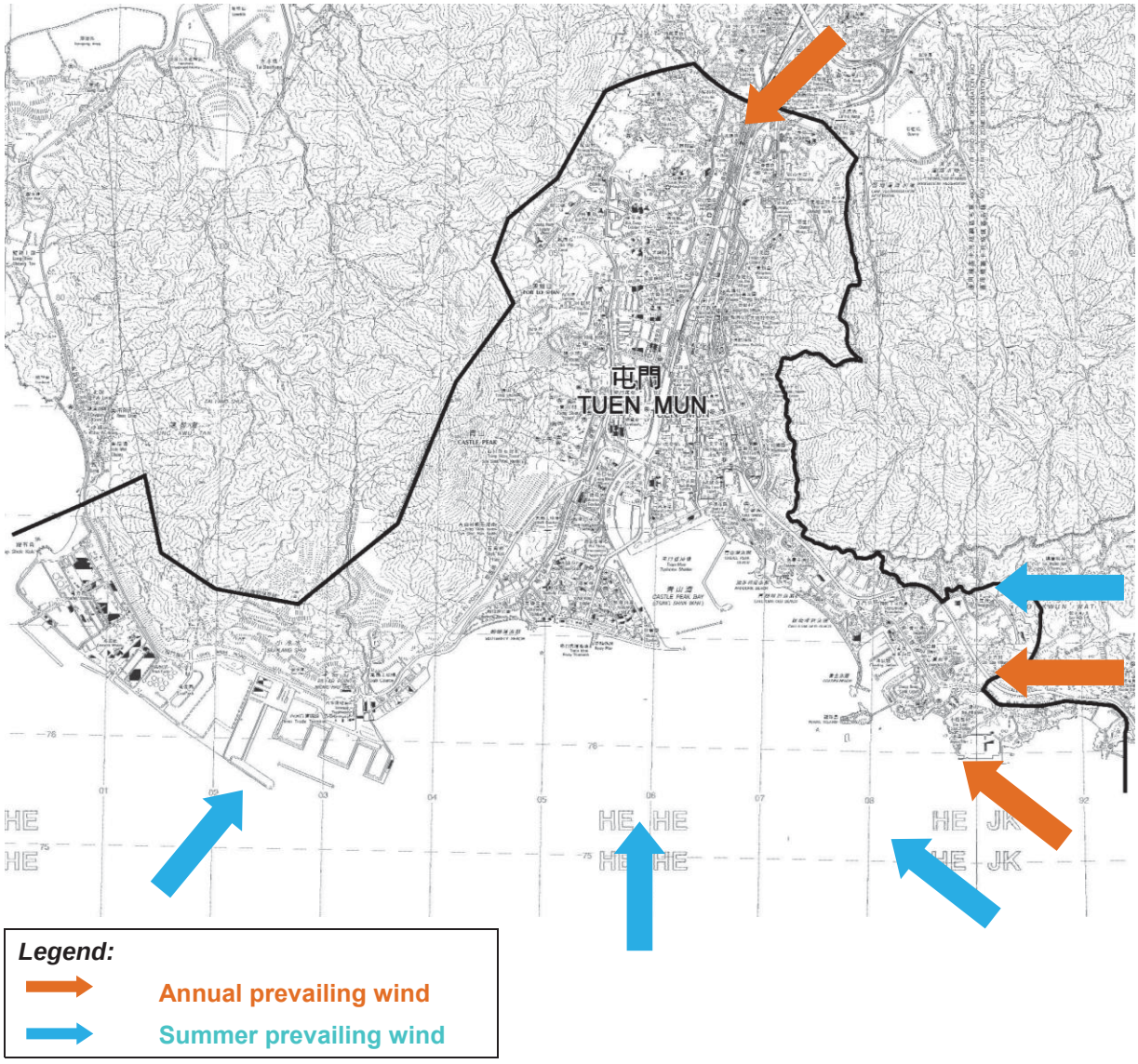

Figure 3.48 A summary of the prevailing winds in the study area.

4.0 Topography and the Wind Environment

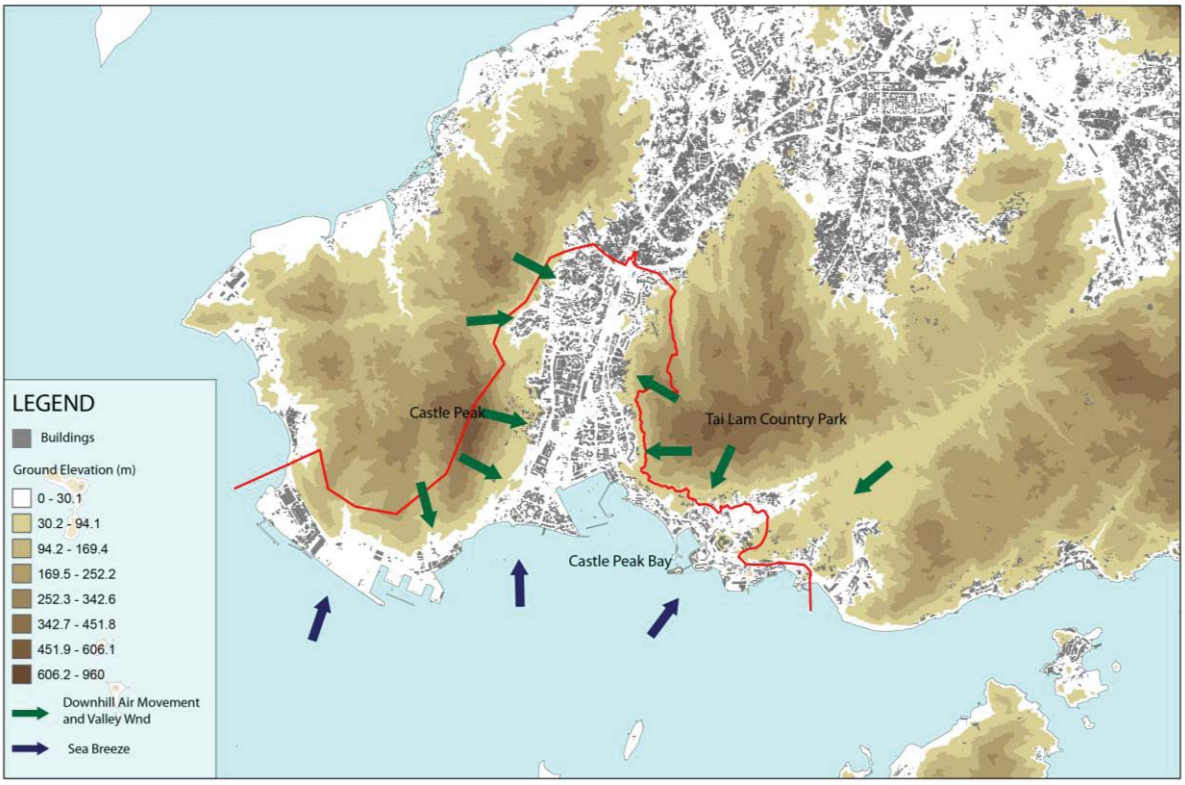

Figure 4.1 Topography and wind environment of the study area.

4.1 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 with the highest peak at about 500m. On the west is the Castle Peak mountain range. The southern part of the study area is open to the mouth of Tuen Mun River and Castle Peak Bay (Figure 4.1).

4.2 Majority of winds from the northeast and the southerly quarters can penetrate into the study area as the wind directions are aligned with the direction of the valley. The winds coming from the east and southeast can flow into the southern part of the study area but will be weakened to flow into the upper and middle parts of the study area by the shielding effects of the mountains of the Tai Lam Country Park.

4.3 Katabatic (downhill) air movement and valley wind can be expected from the vegetative hill slopes and some valleys surrounding the study area (indicative green arrows in Figure 4.1). The southern part of the study area can benefit from the sea breeze from the south (indicative blue arrows in Figure 4.1).

5.0 The Existing Conditions

5.0.1 The existing building heights are shown in Figures 5.1 to 5.3. Most buildings in the urban areas are lower than 85m while those buildings higher than 85m are mainly detached buildings with some gaps between building blocks that do not form "walls" obstructing air ventilation.

5.0.2 The central part of the study area (near MTR Tuen Mun Station) is relatively densely built. Buildings in this area have larger footprints. Therefore, this region will have weak ventilation.

5.1 "G/IC", "O" and "GB" sites

5.1.1 The study area has extensive "Government, Institution or Community" ("G/IC"), "Open Space" ("O"), and "Green Belt" ("GB") zones as „air spaces", which will contribute to the air ventilation (Figures 5.4 to 5.5). Furthermore, cooler air movements from the hills that are located in the east and west of the study area are beneficial for air ventilation in the study area.

5.2 Land use and Urban Morphology

5.2.1 High ground coverage reduces urban porosity at the pedestrian level, thus reducing the potentials of air ventilation. With reference to Section 5.1 above, the corresponding ground coverage is not high (<50%) because the greenery coverage of the study area is large (Figure 5.6). The isolated cells of high ground coverage (≥ 50%) in red in Figure 5.6 are normally not a cause of concern. In the study area, the central part of the study area (near MTR Tuen Mun Station) has some clusters of high ground coverage cells. Should building coverage increases in these areas in the future, mitigation measures, such as establishing and/or widening air paths through the area, are needed to improve/maintain the urban air ventilation performance.

5.2.2 High building volume increases the thermal capability and reduces urban Sky View Factor (SVF), which reduces long wave radiation back to the sky causing urban heat island. This creates higher thermal stress during the summer and a need for air ventilation to mitigate the negative thermal effects. Researchers at Chinese University of Hong Kong (CUHK) have resolved a set of understanding based on

Building Volume Ratio (BVR) and SVF for Hong Kong. A decrease of 0.15 average of SVF in a 100m radius neighbourhood may result in 1 °C temperature increase. As a whole, the BVR of the study area is low (<10%) to medium (<25%) (Figure 5.7). Building volume is currently not a problem as long as the areas with high BVR (≥ 25%) do not form connected clusters. It is recommended that mitigation measures, such as greening, should be considered if building volume should increase in the future in the high BVR areas.

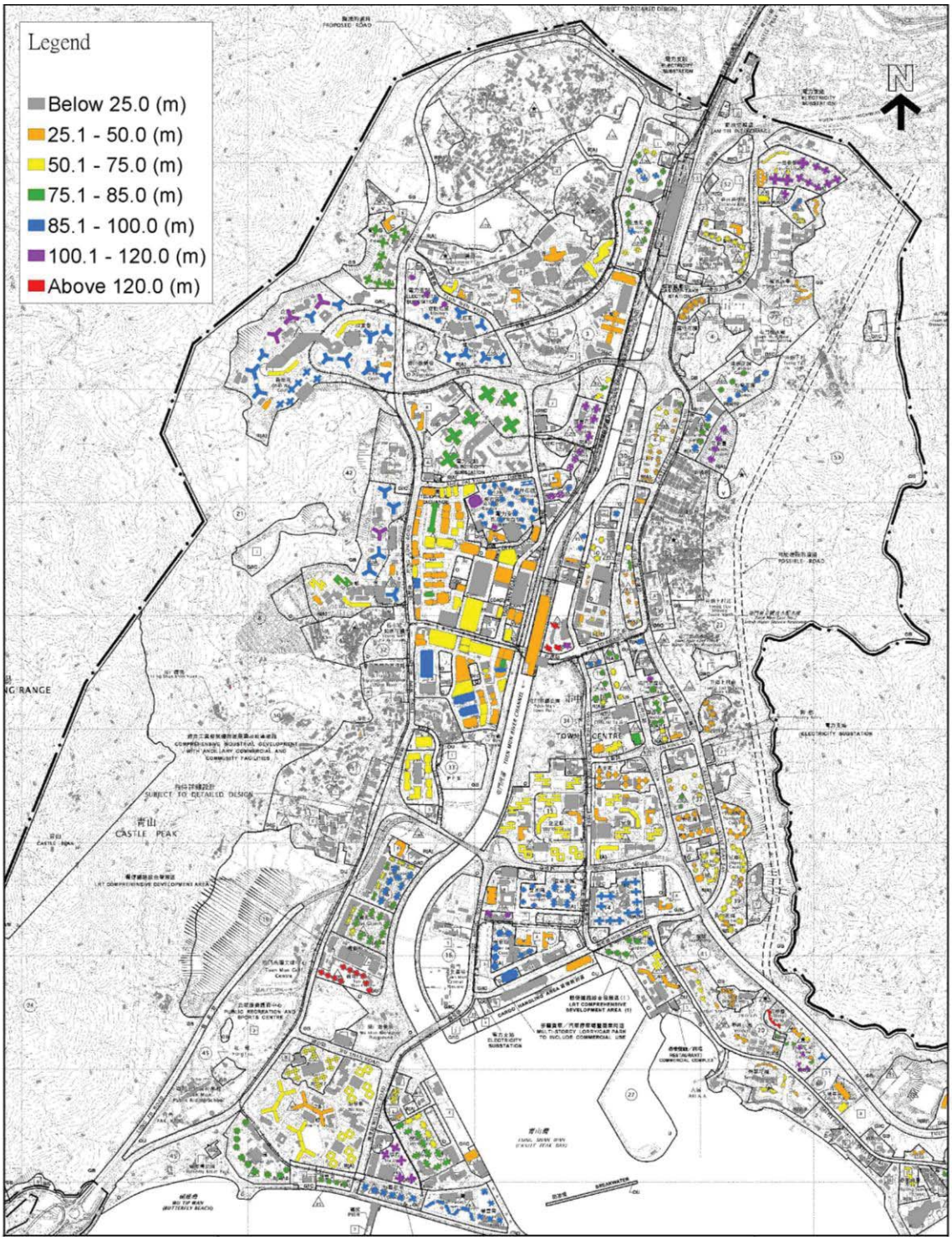

Figure 5.1 The existing building height profile of the study area in meters (Central Area).

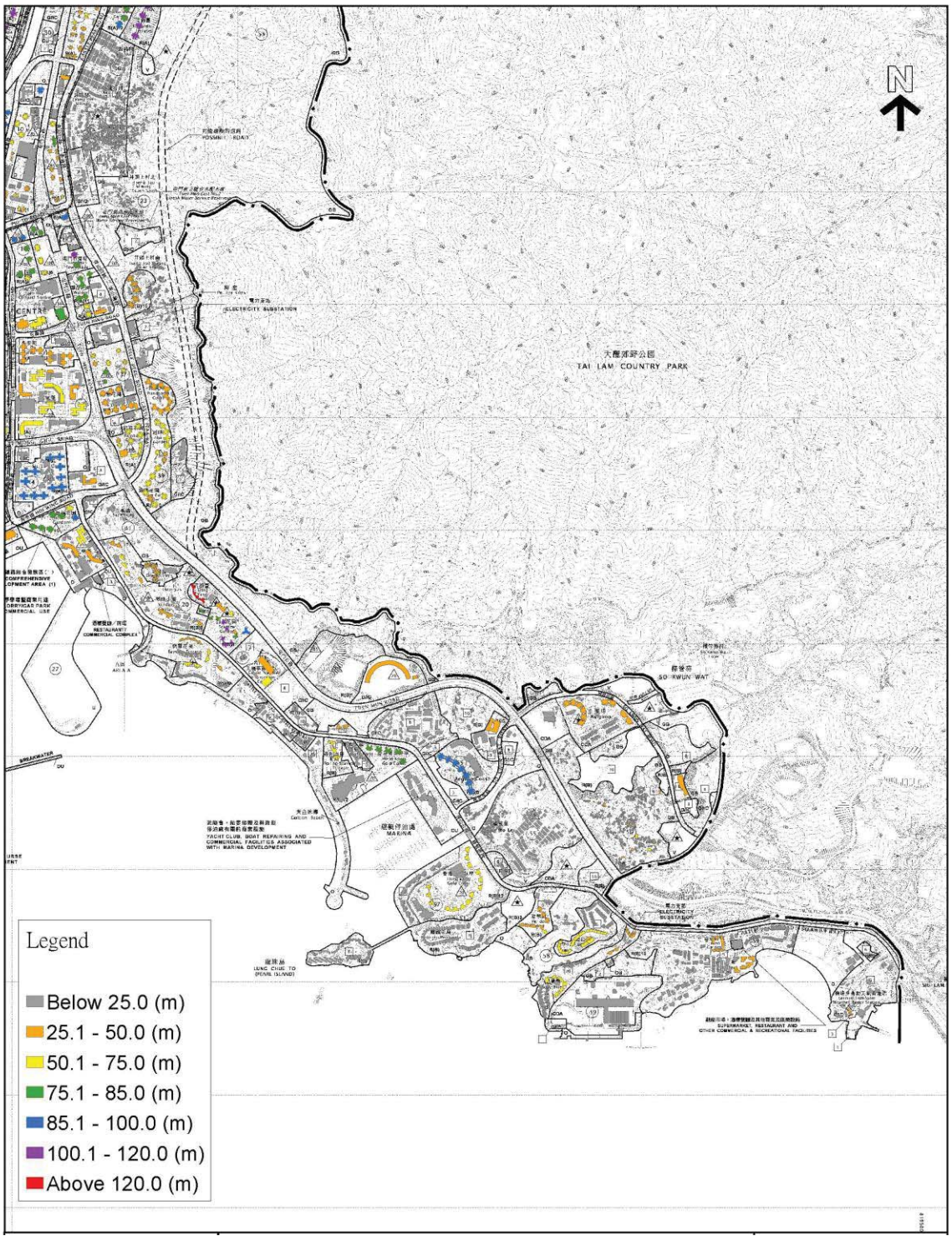

Figure 5.2 The existing building height profile of the study area in meters (East Area).

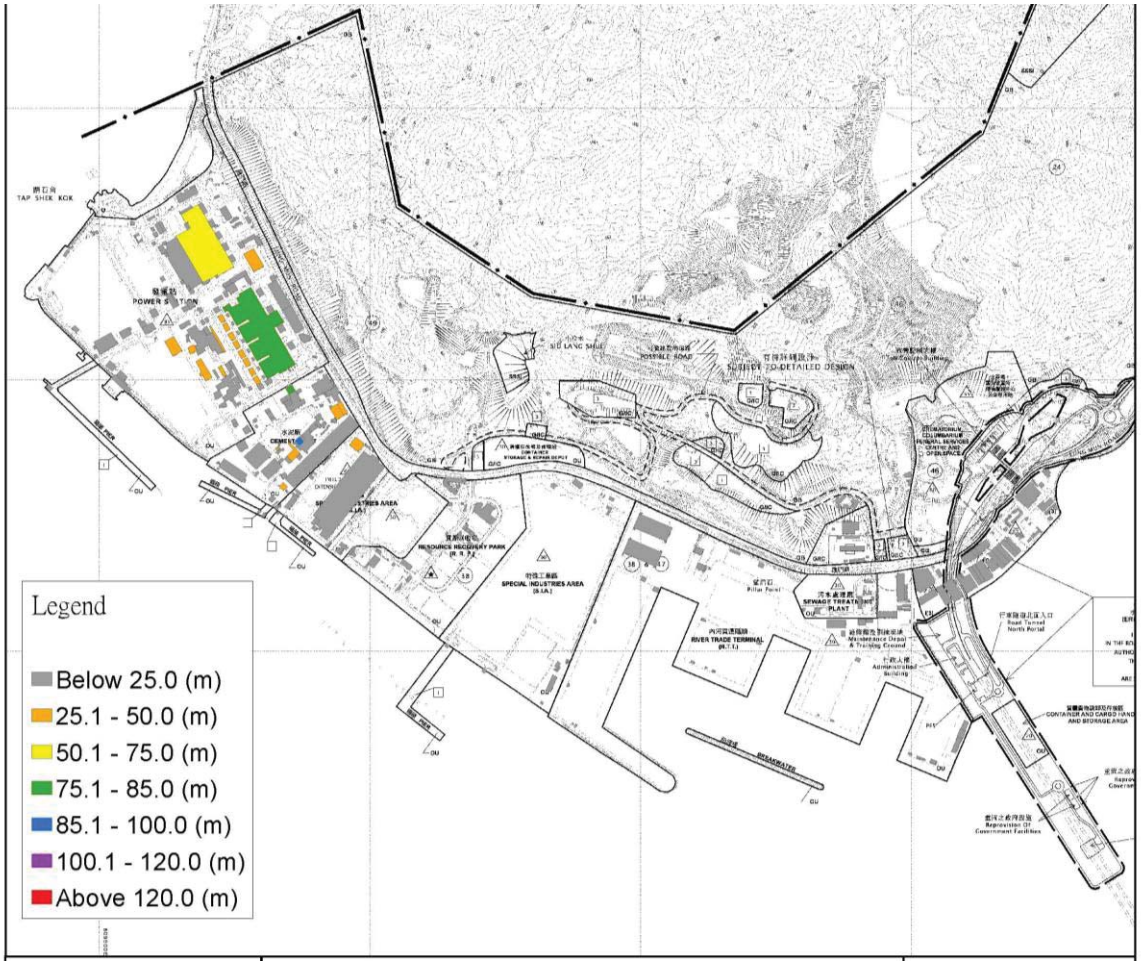

Figure 5.3 The existing building height profile of the study area in meters (West Area).

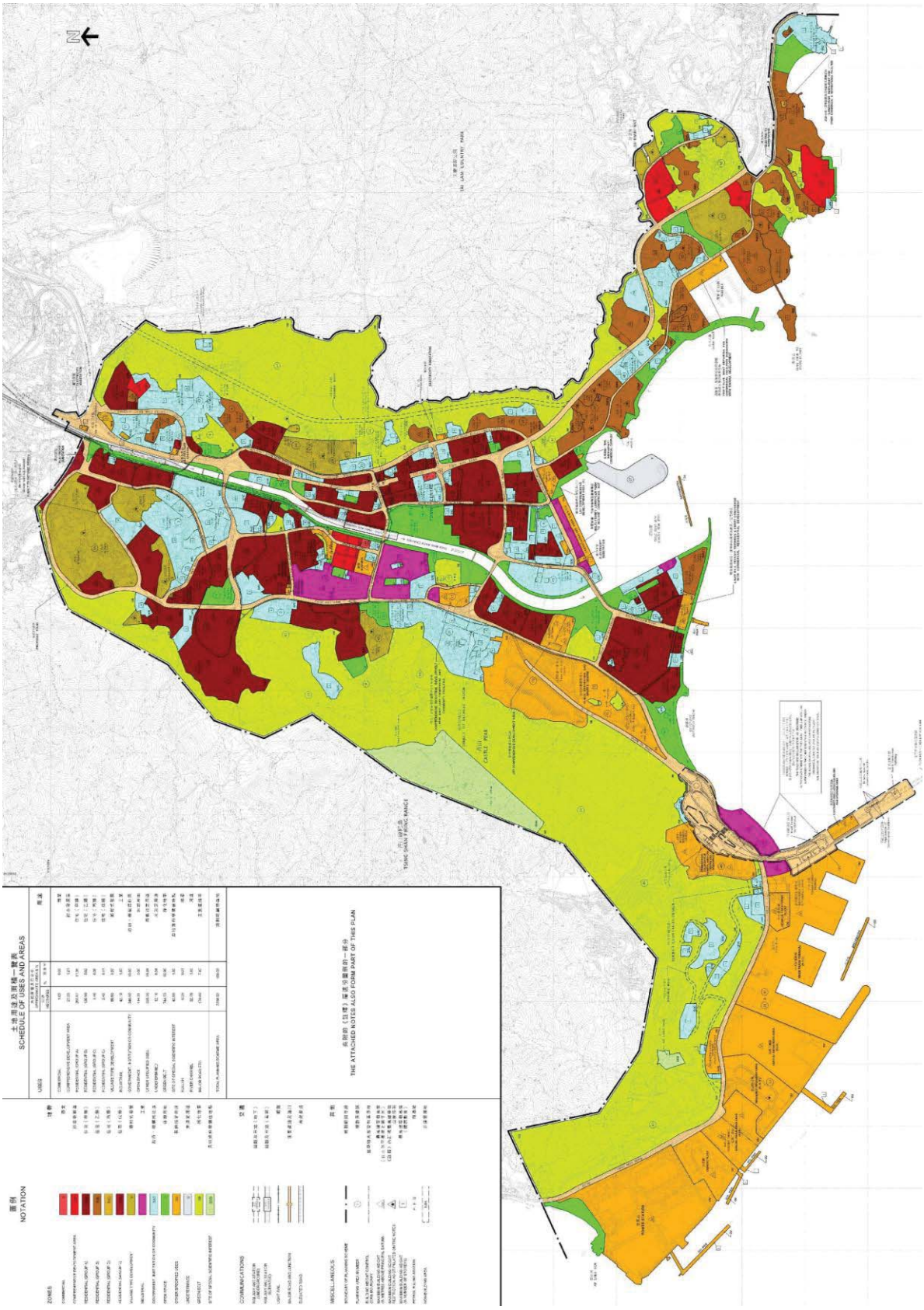

Figure 5.4 Land Use Pattern under current OZP.

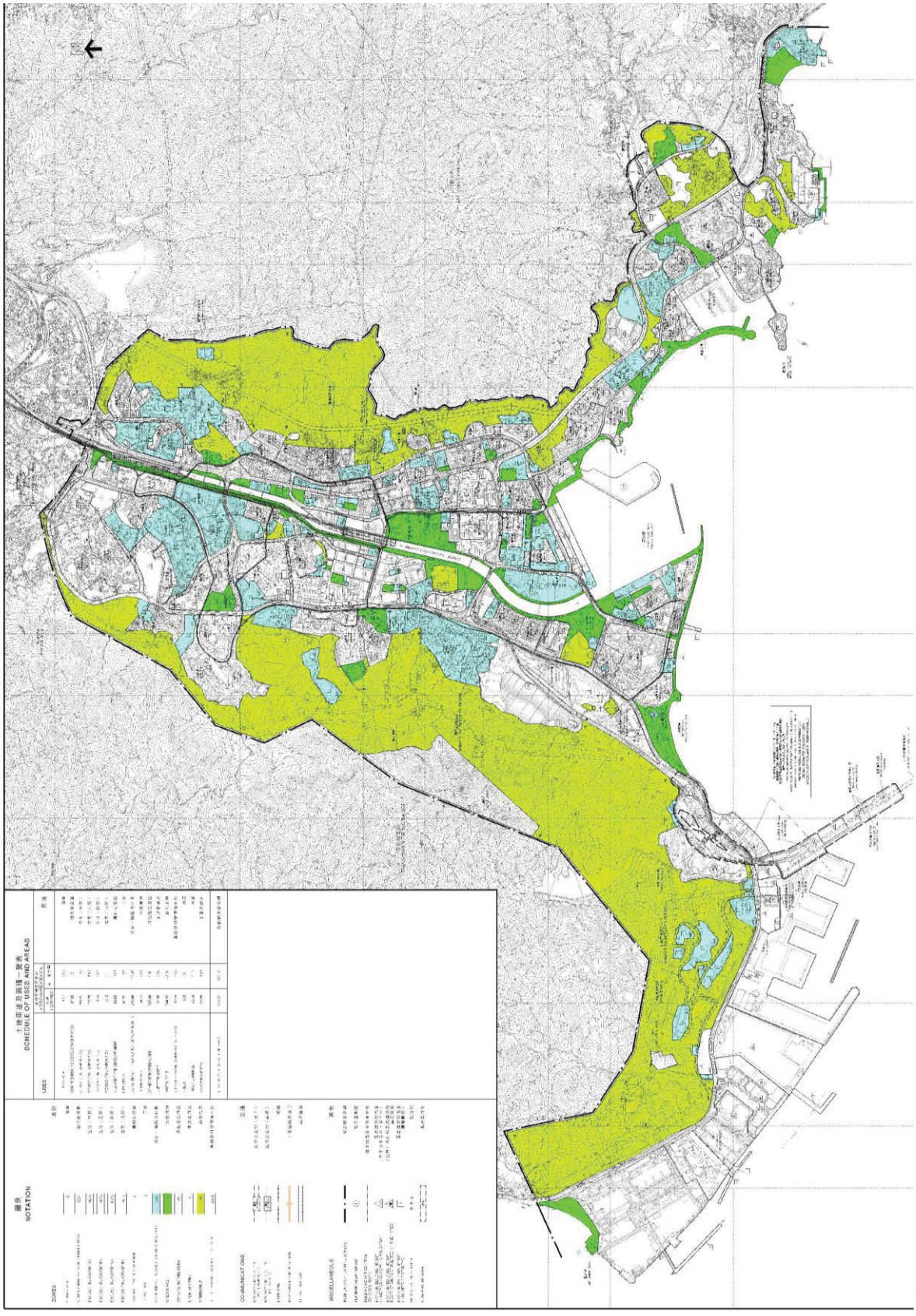

Figure 5.5 "GIC", "O" and "GB" sites of the study area under current OZP.

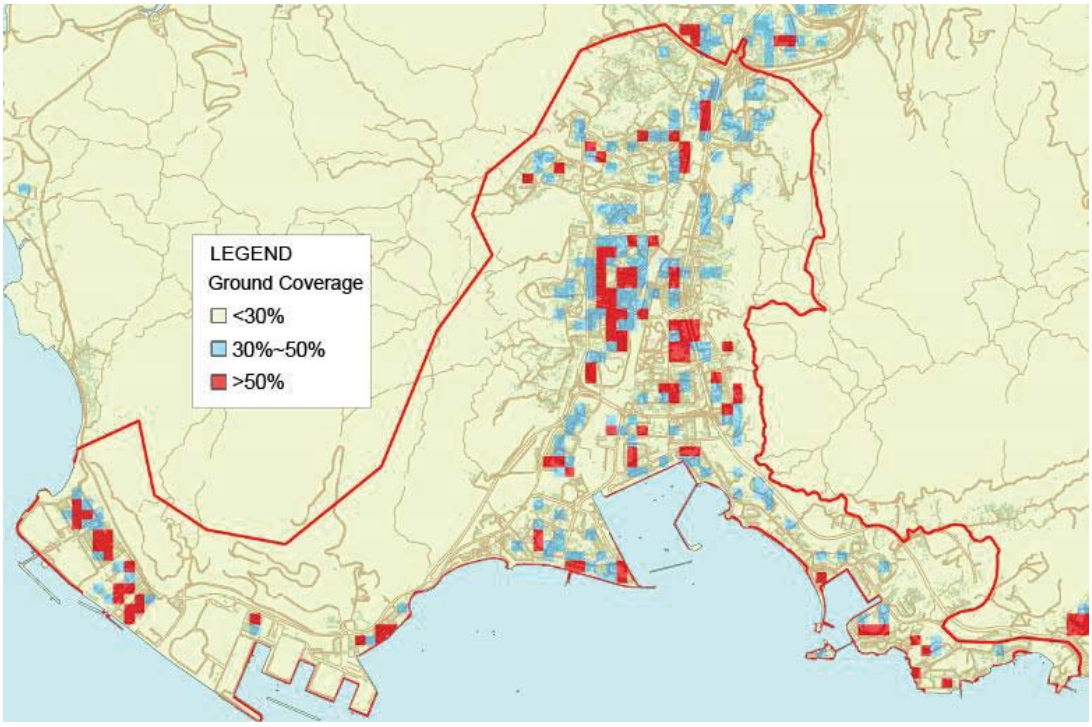

Figure 5.6 Ground Coverage Ratio map of the study area resolved to 100mx100m cell area (including roads, open spaces and ground area covered by buildings and podia).

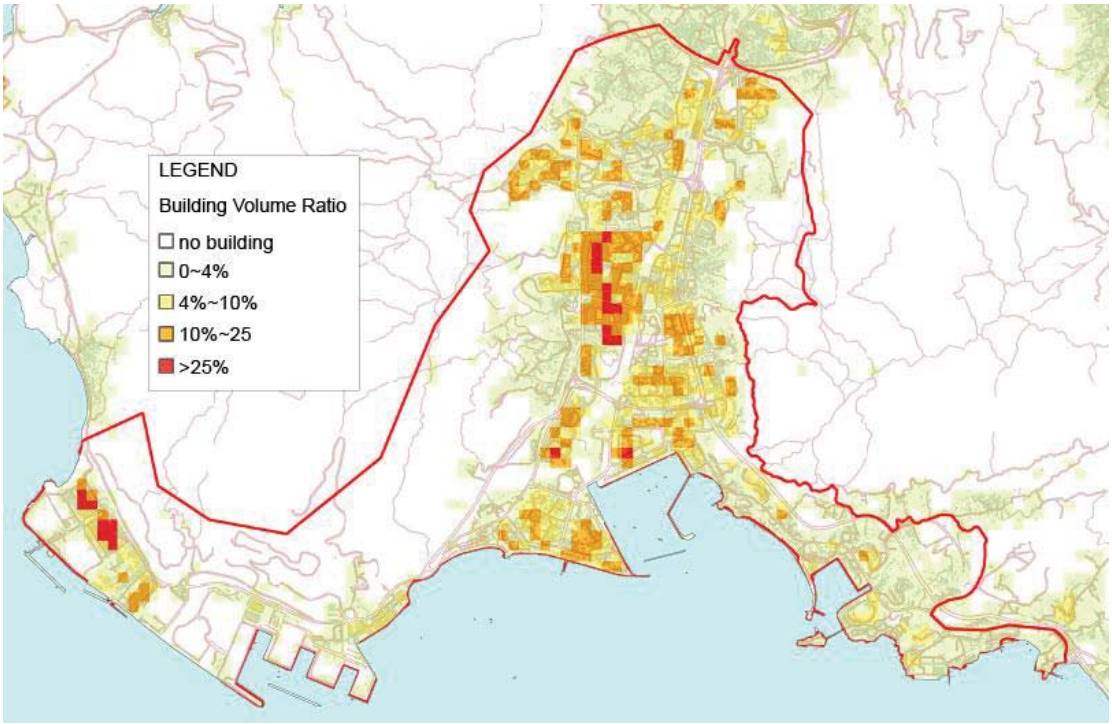

Figure 5.7 Building Volume Ratio map of the study area resolved to 100m x 100m cell. [Building Volume Ratio is the ratio between the cubic volume of buildings in a 100mx100m grid and the maximum building volume in Hong Kong – currently 1.2 million m^3.].

5.3 Air Paths

5.3.1 Based on the analysis of the prevailing winds, the topography and urban morphology and the findings from the previous studies in Tuen Mun area [2,3,1,4], the prevailing wind pattern of the study area can be summarised as follows (Figures 5.8 to 5.9).

5.3.2 For the Central Area of Tuen Mun New Town, Tuen Mun River Channel (TMRC) is the main breezeway of this area. Major roads such as Castle Peak Road, Tuen Mun Road, Tuen Mun Heung Sze Wui Road, Hing Kwai Street, Ming Kum Road, Tsing Wun Road, together with some "G/IC", "O", "GB" zones form major breezeways passing through this area. Figures 5.10 to 5.11 show the major breezeways in the Central Area of Tuen Mun New Town. Besides the major breezeways, most of the roads and streets in the Central Area of Tuen Mun New Town, although they extend in different directions, are connected to each other. The winds from east, northeast and southerly quarter can easily find ways to penetrate into this area. Referring to "Expert Evaluation on Air Ventilation Assessment for Tuen Mun Area" [1], air paths in the Central Area of Tuen Mun New Town can be analysed in different sub-zones: Northern Inner Core of Central Area, Central Inner Core of Central Area, and Southern Inner Core of Central Area. The major breezeways/air paths in different sub-zones are summarised in Table 5.1 and illustrated in Figures 5.12 to 5.17.

5.3.4 Tuen Mun East Area covers the strip of coastal land and lower hill slopes along the sea coast. Annual prevailing winds for this area are mostly from the northeast, east and southeast. Summer prevailing winds are mostly from the east and southerly quarters including southwest, south and southeast. This area is likely to benefit from the sea breeze from the south. The area is mainly a mix of low-rise and medium-rise buildings with some high-rise developments (Figure 5.2). On the whole, building developments in this area are in clusters which are relatively separated from each other. Due to this relatively scattered development pattern, no major breezeways/air paths flowing through this area can be identified. Prevailing winds can easily find ways to penetrate into this area. However, some high-rise developments in a long continuous layout, for example the Aegean Coast, Hong Kong Gold Coast and the Bayview Terrace, will create some air ventilation impact on the surrounding areas.

5.3.5 Tuen Mun West Area covers the strip of coastal land of Castle Peak. Annual prevailing winds for this area are mostly from the northeast, east and southeast. Summer prevailing winds are mostly from the east and southerly quarters including southwest, south and southeast. This area is likely to benefit from the sea breeze from the south. Buildings in area are mostly 10m to 25m industrial buildings. Prevailing winds can easily find ways to penetrate into this area.

Table 5.1 Major Breezeways / Air paths in different sub-zones of Central Area of Tuen Mun New Town

Sub-zones	**Major Breezeways / Air paths**
Northern Inner Core of Central Area	**N-S breezeways/air paths:** TMRC, Tuen Mun Road, Hing Kwai Street, Ming Kum Road, Castle Peak Road - Lingnan, Castle Peak Road - San Hui, Tsing Lun Road, Tsun Wen Road, Tsing Chung Koon Road, Tuen Mun Tang Siu Kin Sports Ground **E-W breezeways/air paths:** Tsing Tin Road, Shek Pai Tau Road **Air paths for downhill air movements:** Areas between Leung King Estate and Po Tin Estate
Central Inner Core of Central Area	**N-S breezeways/air paths:** TMRC, Tuen Mun Road, Ming Kum Road/Tsing Wun Road, Castle Peak Road - San Hui, Tsun Wen Road, , Tuen Mun Heung Sze Wui Road **E-W breezeways/air paths:** Pui To Road
Southern Inner Core of Central Area	**N-S breezeways/air paths:** TMRC, Tuen Mun Road, Castle Peak Road – Castle Peak Bay, Tsing Wun Road, Tuen Mun Heung Sze Wui Road, Wu King Road **E-W breezeways/air paths:** Wong Chu Road, Hoi Wing Road

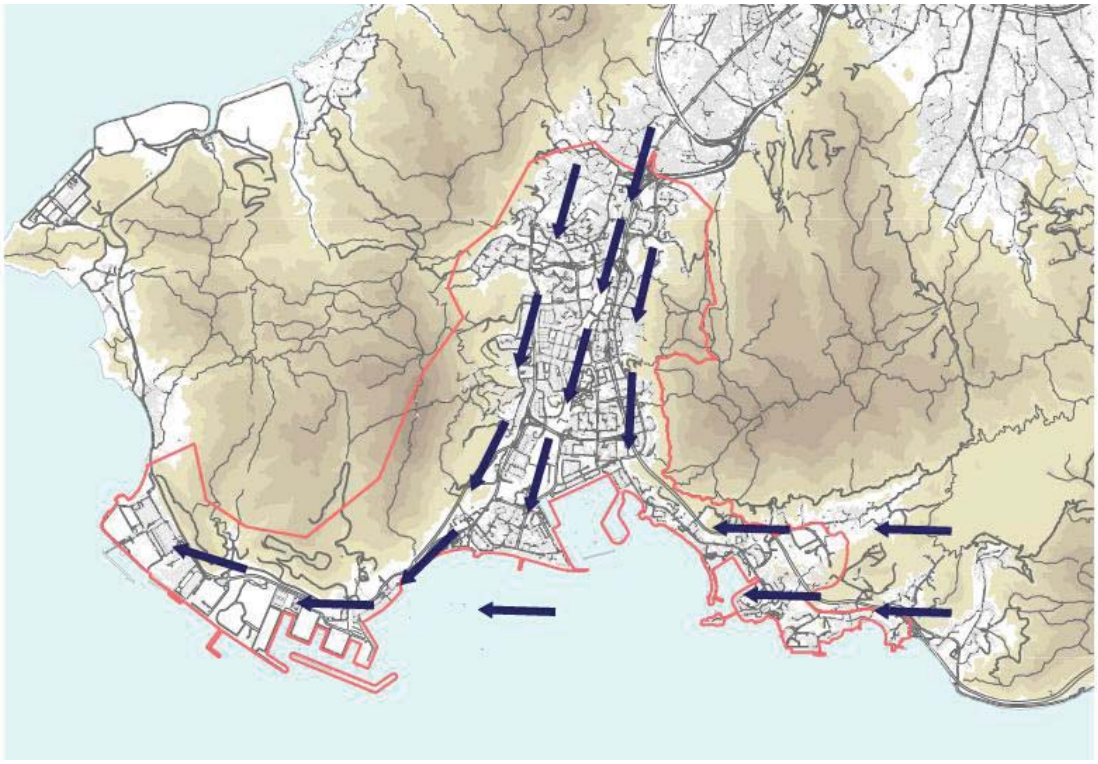

Figure 5.8 Annual prevailing wind pattern of the study area.

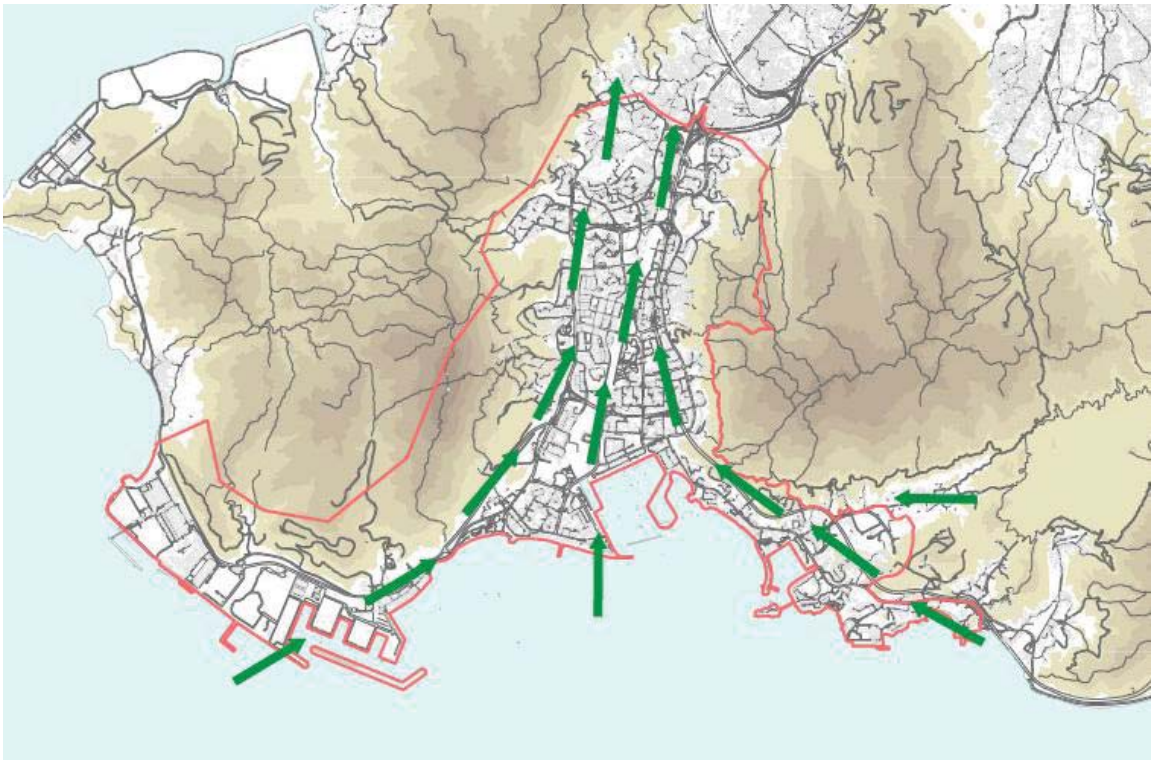

Figure 5.9 Summer prevailing wind pattern of the study area.

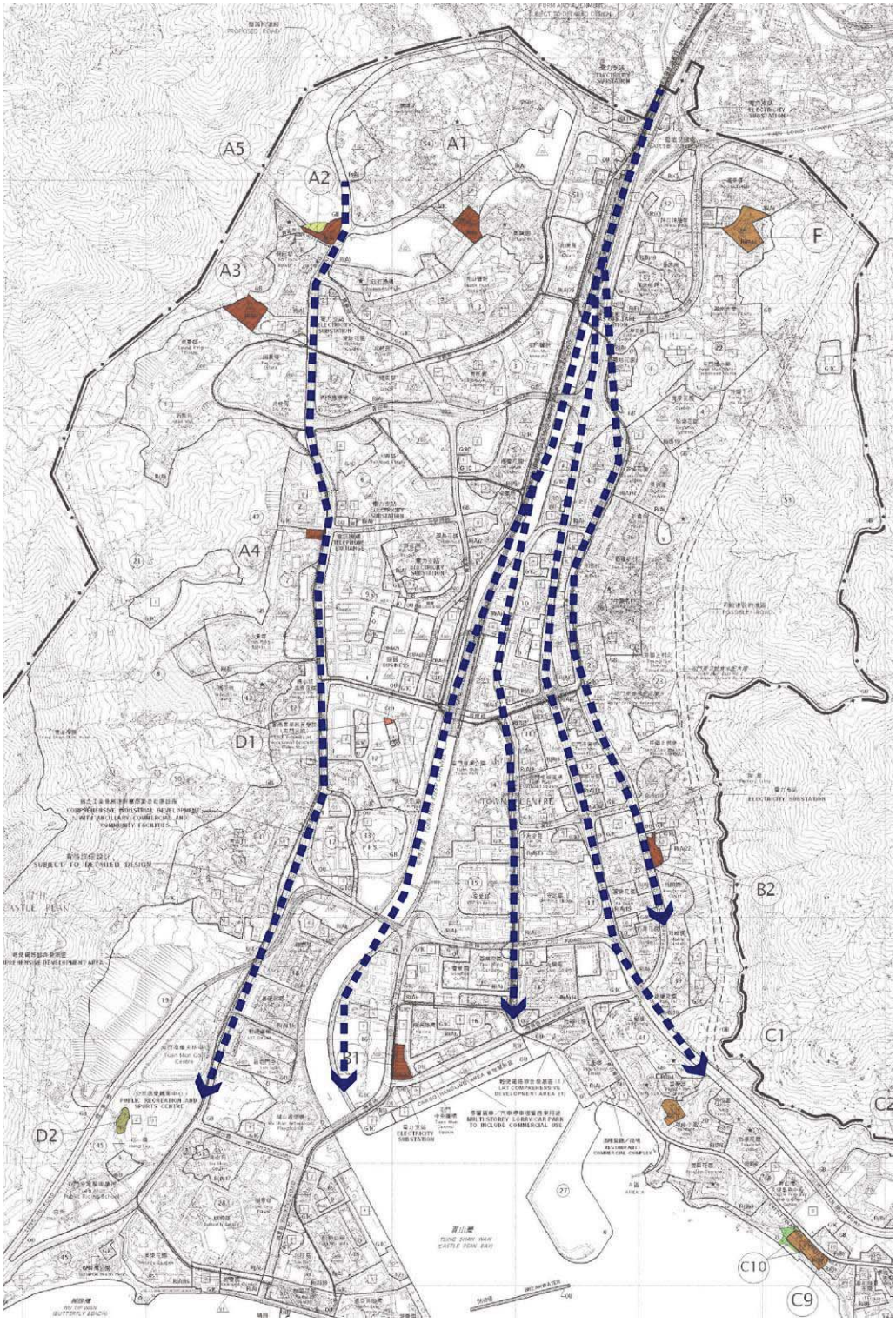

Figure 5.10 Major breezeways in the Central Area of Tuen Mun New Town (annual condition).

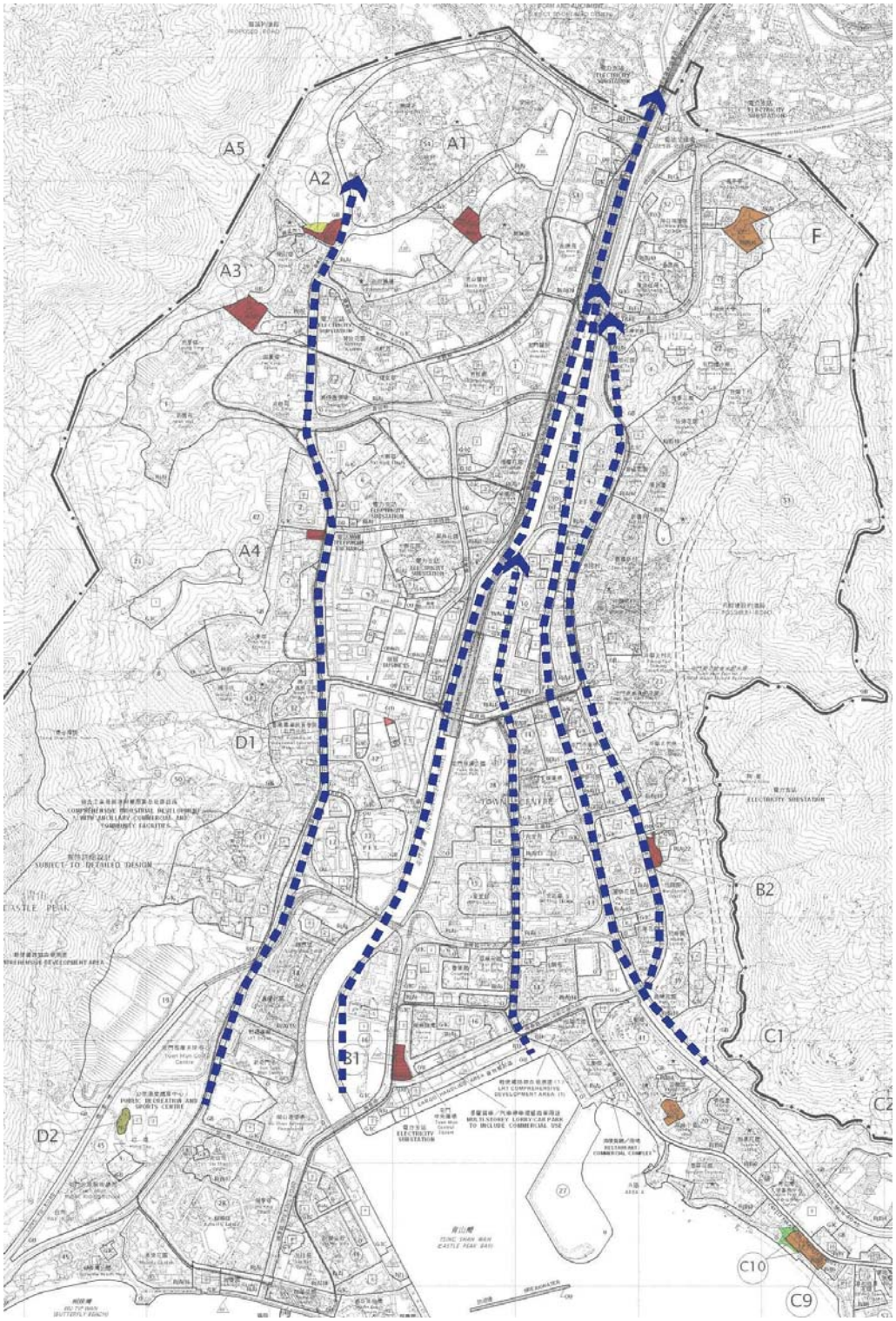

Figure 5.11 Major breezeways in the Central Area of Tuen Mun New Town (summer condition).

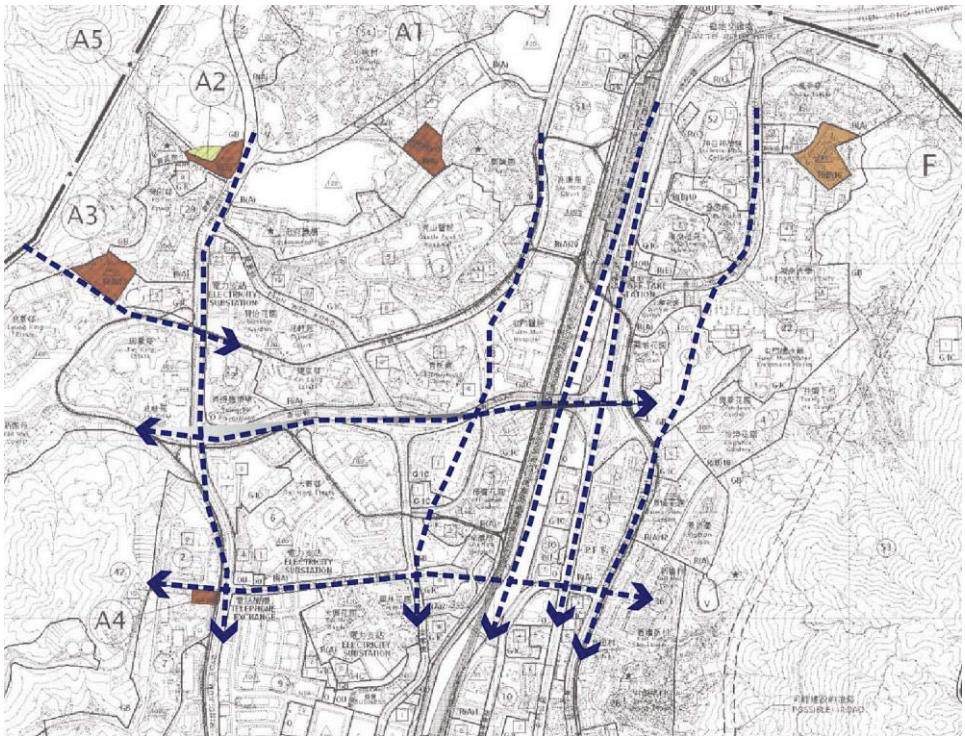

Figure 5.12 Major breezeways/air paths in the Northern Inner Core of Central Area of Tuen Mun New Town (annual condition).

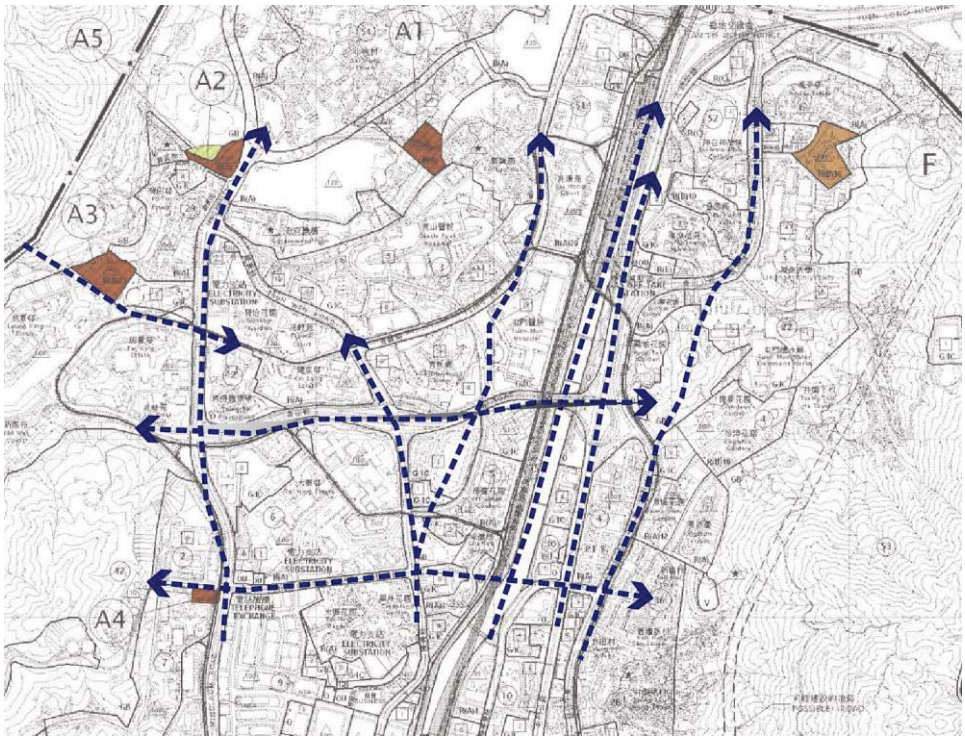

Figure 5.13 Major breezeways/air paths in the Northern Inner Core of Central Area of Tuen Mun New Town (summer condition).

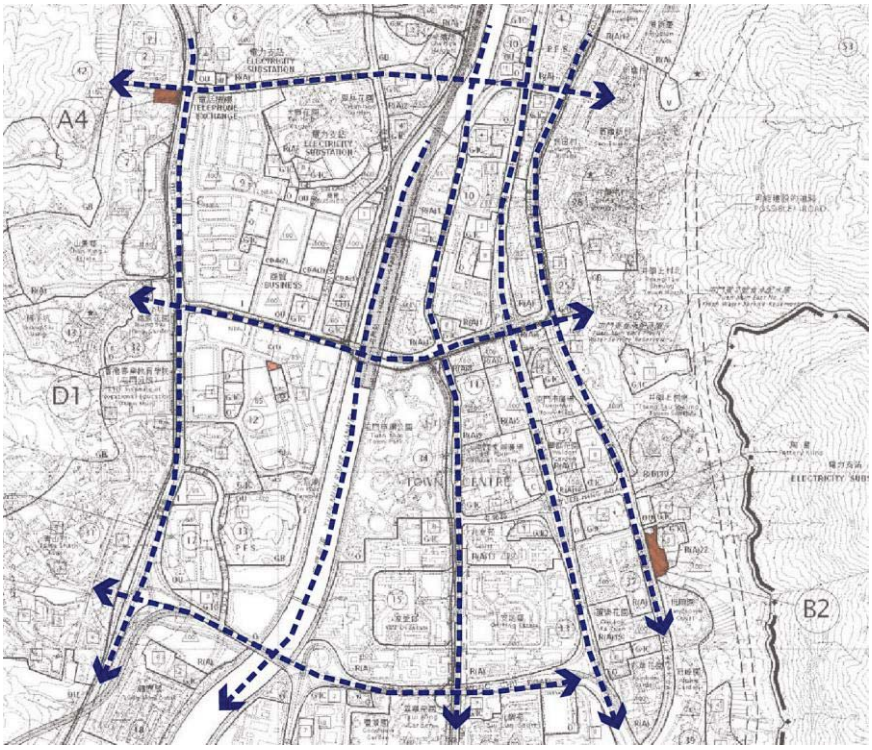

Figure 5.14 Major breezeways/air paths in the Central Inner Core of Central Area of Tuen Mun New Town (Annual condition).

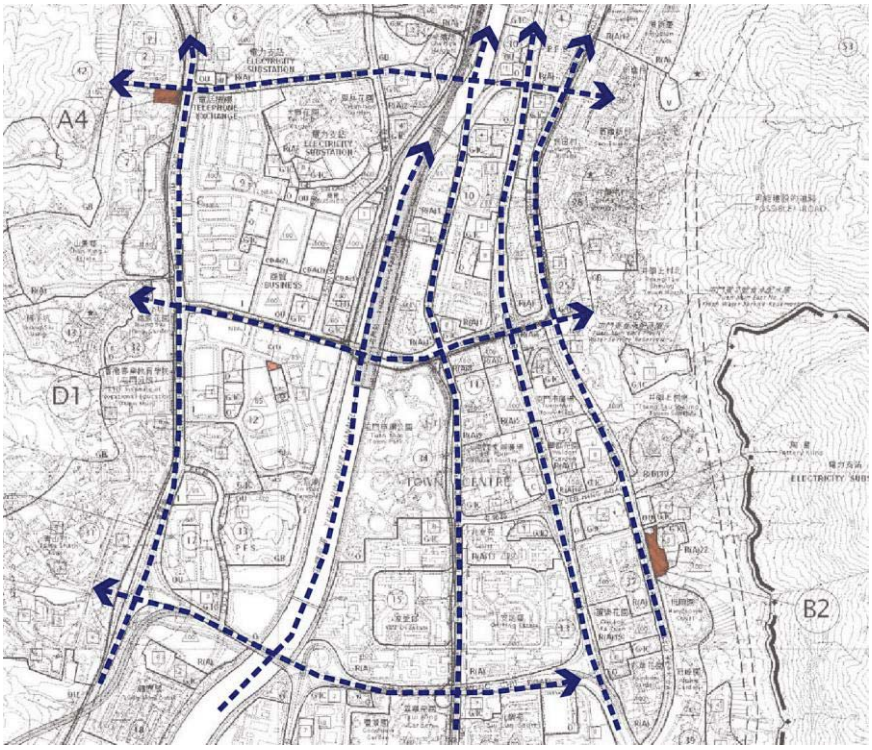

Figure 5.15 Major breezeways/air paths in the Central Inner Core of Central Area of Tuen Mun New Town (summer condition).

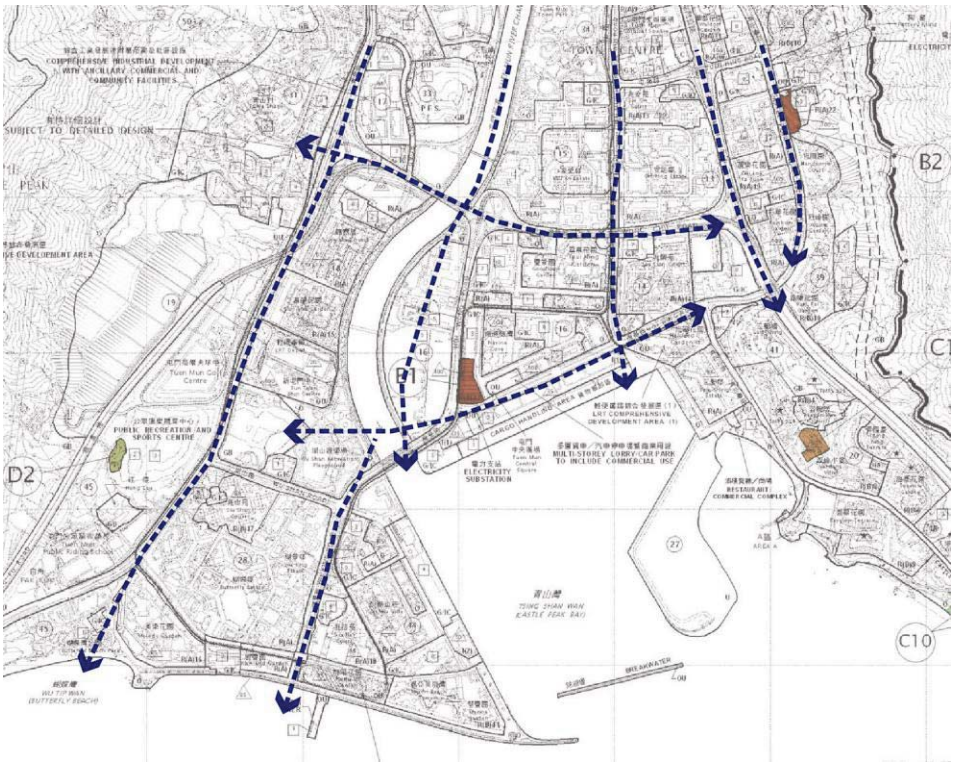

Figure 5.16 Major breezeways/air paths in the Southern Inner Core of Central Area of Tuen Mun New Town (annual condition).

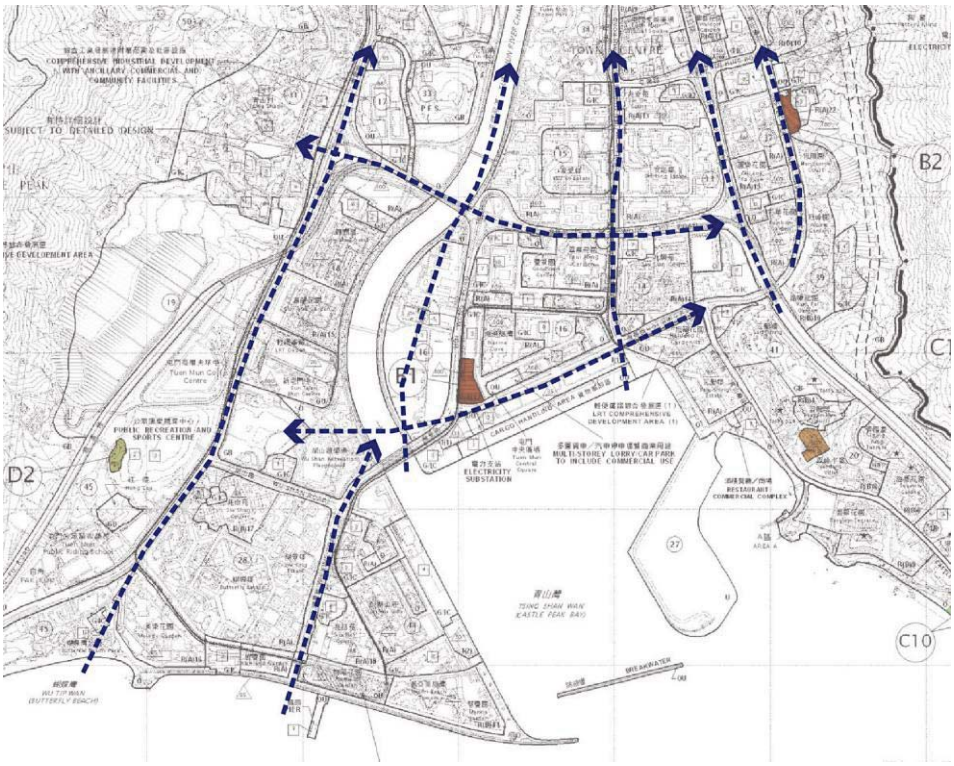

Figure 5.17 Major breezeways/air paths in the Southern Inner Core of Central Area of Tuen Mun New Town (summer condition).

6.0 Expert Evaluation of the Proposed Amendments

6.1 Proposed amendments to the approved Tuen Mun OZP No. S/TM/31 include 25 sites in the study area (Figure 6.1). Due to Hong Kong‟s high-density urban morphology, it is not advisable to only rely on building height restriction or minor changes in building heights to maintain and/or improve air ventilation. For most areas, air ventilation can achieve better performance if more effective measures, such as breezeways, air paths, open spaces, building gaps and building permeability especially near ground level, are also applied. In general, further developments in Tuen Mun New Town should be carefully designed to respect the key urban climatic characteristics such as breezeway, downhill air movement and sea breeze. “G/IC”, “O”, and “GB” zones in the approved Tuen Mun OZP No. S/TM/31 (Figure 6.2) are recommended to be maintained in benefitting air ventilation of the study area. The impact of the proposed amendments for each site on air ventilation will be assessed with the assumption that future developments would be built to their respective maximum plot ratio and building height allowed. The impact will also be evaluated based on existing circumstances including topography and greenery/landscape and future development of the surroundings as well as site wind availability.

6.2 General mitigation measures will be recommended for all the sites, i.e. (i) encouragement to minimise the podia for enhancing air ventilation at pedestrian level based on Chapter 11 of the HKPSG[7]; and (ii) the need to fulfil the requirement of building separation in accordance with the Sustainable Building Design (SBD) Guidelines (APP-152)[8] for better wind penetration throughout the subject sites. These measures intend to encourage more space to be provided at grade and higher building permeability. Other mitigation/enhancement measures and/or further study for each specific site would also be recommended where necessary.

<u>Site A1</u>

6.3 Site A1 is located at the west of Kei Lun Wai in Area 54 and is proposed to be rezoned from “G/IC” to “R(A)24” with a building height restriction of 120mPD. It covers a development site area of about 1 hectare (Figure 6.3).

6.4 Site A1 is located in a flat area away from the mountains and less likely to be affected by the terrains. Existing buildings in the areas around Site A1 are currently

low-rise, low-density developments ranging from 14mPD to 27mPD. At present, Site A1 has a relatively open exposure to winds from all directions.

6.5 Site A1 is not on the major breezeways of Tuen Mun New Town (Figures 5.12 to 5.13). However, the developments on Site A1 may have localised air ventilation impact on the surrounding areas. When prevailing winds come from the northeast, the developments on Site A1 are likely to create wake areas (low wind flow areas) on the leeward sides to affect the adjoining "R(A)" site to the southwest. When prevailing winds come from the southerly quarters, the developments on Site A1 are likely to create wake areas on the leeward sides of the site to affect the adjoining "G/IC" site to the north. To address the potential air ventilation impact of future developments, more space at grade and permeability of the building mass should be provided to allow for better wind penetration. In view of the relatively open exposure of Site A1 and subject to the minimisation of podium and the requirement of building separation in SBD Guidelines being respected, the proposed rezoning of Site A1 from "G/IC" to "R(A)24" is unlikely to impose significant impacts on the surrounding sites in air ventilation perspective.

Sites A2 and A5

6.6 Site A2 is located at the north of Hing Fu Street in Area 54 and is proposed to be rezoned from "G/IC", "GB", and an area shown as „Road" to "R(A)25" with a building height restriction of 120mPD (Figure 6.4). It covers a development site area of 0.75 hectare. Site A2 is near the area of downhill air movement coming from the northwest. It is recommended that the developments in this area should not form a barrier to the downhill air movements. Buildings must be arranged and positioned so that sufficient gaps between building blocks are reserved for air ventilation and urban permeability.

6.7 Existing buildings in the areas around Site A2 include Po Leung Kuk Horizon East Primary School (47.1mPD) and Po Tin Estate (maximum building height at 97mPD) to the southwest, and some village type developments (ranged from 27mPD to 37mPD) to the west. It is likely that south-westerly wind has already been sheltered by the surrounding buildings and the large mountains in Castle Peak. Site A2 has a relatively open exposure to the northeast, south and south-easterly winds. It is also likely to benefit from downhill air movement coming from the northwest.

6.8 Site A2 is not on the major breezeways of Tuen Mun New Town (Figures 5.12 to 5.13 and Figure 6.4). However, the developments on Site A2 may have localised air ventilation impact on the surrounding areas. When prevailing wind comes from the northeast, the developments on Site A2 are likely to create wake areas on the leeward sides to affect the areas to the southwest including Po Leung Kuk Horizon East Primary School and Po Tin Estate. They are also likely to affect the penetration of the westerly downhill air movements into the areas to the east of Site A2 (Figure 6.4). When prevailing wind comes from the east, the developments on Site A2 are likely to create wake areas on the existing village of Kwong Shan Tsuen in the downstream area. However, when prevailing winds come from the southerly quarters, the developments on Site A2 are unlikely to affect the surrounding areas as there are no sensitive receivers in the wake areas north of the site which is an area zoned "GB". To address the potential air ventilation impact, more space at grade and permeability of the building mass should be provided to allow for better wind penetration. Subject to the minimisation of podium and the requirement of building separation in SBD Guidelines being respected, the proposed rezoning of Site A2 from "G/IC", "GB", and an area shown as „Road" to "R(A)25" is unlikely to impose significant impacts on the surrounding sites in air ventilation perspective.

6.9 Site A5 is located north of Hing Fu Street in Area 54 and is proposed to be rezoned from "G/IC" to "GB" to reflect existing vegetated slopes at the site (Figure 6.4). The proposed rezoning will not impose any adverse air ventilation impact on the surroundings.

Site A3

6.10 Site A3 is at the northeast of Leung King Estate in Area 29 and is proposed to be rezoned from "GIC" to "R(A)21" with a building height restriction of 140mPD. It covers a development site area of 0.77 hectare (Figure 6.5). Site A3 is in the path of downhill air movement from the northwest. It is recommended that the developments in this site should not form a barrier to the downhill air movements which bring down wind from the slope into Tin King Road and streets adjacent to Venice Gardens. Buildings in Site A3 must be arranged and positioned so that sufficient gaps between building blocks are left for air ventilation and urban permeability.

6.11 Existing buildings in the areas around Site A3 include Leung King Estate (maximum building height at 118mPD) to the southwest, Tin King Estate (maximum

building height at 111mPD) to the south and Po Tin Estate (maximum building height at 100mPD) to the northeast. It is likely that south-westerly winds has already been sheltered by the surrounding buildings (i.e. Leung King Estate) and the large mountains of Castle Peak. The exposure of Site A3 to the south wind and north-easterly winds is also likely to be blocked by surrounding buildings (i.e. Tin King Estate and Po Tin Estate). The building height of Tuen Mun North West Swimming Pool to the southwest is low (i.e. around 33.6mPD)and therefore Site A3 has a relatively open exposure to the south-easterly winds. It is also likely to benefit from downhill air movement from the west (Figures 5.12 and 5.13).

6.12 Site A3 is not on the major breezeways of Tuen Mun New Town but it is on the air path of downhill air movements (Figures 5.12 to 5.13). The developments on Site A3 may have localised air ventilation impact on the surrounding areas. When prevailing wind comes from the northeast, the developments on Site A3 are likely to create wake areas on the leeward sides to affect the areas to the southwest (i.e. Leung King Estate). They are also likely to affect the penetration of the westerly downhill air movements into the areas to the east of Site A3. However, when prevailing winds come from southerly quarters, the developments on Site A3 are unlikely to affect the surrounding areas as there are no sensitive receivers in the wake areas north of the site which are “GB” zones and slopes. To facilitate the downhill air movements, one 20m wide non-building area (NBA) is recommended along the southwestern edge of the site (Figure 6.5). This NBA can also serve as a “buffer zone” to alleviate the impact of wake areas to the southwest of the site. More space at grade and permeability of the building mass should also be provided to allow for better wind penetration. Subject to the incorporation of the NBA, together with the minimisation of podium and the requirement of building separation in SBD Guidelines being respected, the proposed rezoning of Site A3 from “GIC” to “R(A)21” is unlikely to impose significant impacts on the surrounding sites in air ventilation perspective.

Site A4

6.13 Site A4 is located at the junction of Shek Pai Tau Road and Ming Kum Road in Area 2 and is to proposed to be rezoned from “G/IC” to “R(A)23” with a building height restriction of 110mPD (Figure 6.6). It covers a development site area of 0.23 hectare.

6.14 Existing buildings in the areas around Site A4 include Shan King Estate (maximum building height at 116mPD) to the southwest and south. It is likely that south-westerly wind has already been sheltered by the surrounding residential buildings and the large mountains of Castle Peak. The exposure of Site A4 to the southeast wind and north-easterly winds is likely to be affected by surrounding industrial and residential buildings ranging from 40mPD to 108mPD. Site A4 has a relatively open exposure to the southerly wind with open space adjacent to Ming Kam Road.

6.15 Site A4 is not on the major breezeways of Tuen Mun New Town (Figures 5.14 to 5.15 and Figure 6.6). It covers a relatively small development site area creating relatively small wake areas. The open space to the south of the site and Shek Pai Tau Road to the north are also likely to serve as "buffer zones" reducing the impact of wake areas on the surrounding sites. Subject to the minimisation of podium and the requirement of building separation in SBD Guidelines being respected, the proposed rezoning of Site A4 from "G/IC" to "R(A)23" is unlikely to impose significant impacts on the surrounding sites in air ventilation perspective.

Site B1

6.16 Site B1 is located at the junction of Hang Fu Street and Hoi Wing Road in Area 16 and is proposed to be rezoned from "G/IC" to "R(A)22" with a building height restriction of 100mPD (Figure 6.7). It covers a development site area of 0.47 hectare. Site B1 is near the area of a major breezeway (i.e. TMRC) of Tuen Mun New Town, which is an important inlet and outlet for annual and summer prevailing winds (Figures 5.10 and 5.11). Developments on this site must be arranged and positioned with sufficient gaps between building blocks for air ventilation and urban permeability.

6.17 Existing buildings in the areas around Site B1 include Nerine Cove (maximum building height at 114mPD) and Tuen Mun Central Square (114mPD) to the east and Oceania Heights (129mPD) to the north. The exposure of Site B1 to the southeast wind, easterly winds and north-easterly winds is likely to be affected by these surrounding buildings. Site B1 has a relatively open exposure to the south and south-westerly winds due to low-rise developments ranging from 6mPD to 28mPD in both directions.

6.18 When prevailing wind comes from the south, Site B1 is unlikely to have significant effects on the surrounding sites due to its relatively narrow lot frontal size of only about 60m. When prevailing winds come from the south-westerly direction, the proposed rezoning of Site B1 from "G/IC" to "R(A)22" is likely to create wake areas on its leeward side to affect Nerine Cove and block the penetration of south-westerly winds into Hang Kwai Street. When prevailing winds come from the east and northeast, the developments on Site B1 are likely to affect wind penetration into the areas to the west of the site. According to the qualitative guidelines on air ventilation in Chapter 11 of HKPSG[7], it is recommended that NBAs be designated at site level to subdivide large land parcels in avoiding wall-like developments. Site B1 has a lot frontage of 128m running in the north-south direction. It is desirable that the site be broken up so that long building façades would not be formed to block wind penetration. Considering both connectivity to the existing road network (Hang Kwai Street) as an air path and allowance of design flexibility due to site constraint, one 15m wide NBA, which coincides with the existing footpath in the middle of the site and aligns with Hang Kwai Street, is recommended (Figure 6.7). As mentioned in paragraph 6.16, Site B1 is near the area of breezeway (TMRC) of Tuen Mun New Town and hence developments on this site should be carefully designed. Subject to the incorporation of the NBA, together with the minimisation of podium and the requirement of building separation in SBD Guidelines being respected, the proposed rezoning of Site B1 from "G/IC" to "R(A)22" is unlikely to impose significant impacts on the surrounding sites in air ventilation perspective.

Site B2

6.19 Site B2 is located at the junction of Castle Peak Road – Castle Peak Bay and Hin Fat Lane in Area 39 and is proposed to be rezoned from "G/IC" and "GB" to "R(A)22" with a building height restriction of 100mPD (Figure 6.8) . It covers a development site area of 0.38 hectare. Site B2 is near the area of downhill air movement from the east-northeast. It is recommended that the developments in this site should not form a barrier to the downhill air movements.

6.20 Existing buildings in the areas around Site B2 include Man Bo Building, Come On Building and Kai Hei Land Building to the west, Handsome Court to the south. It is likely that south-westerly winds will already be sheltered by the surrounding buildings (e.g. Man Bo Building (85.7mPD) and Come On Building (78.1mPD). Site

B2 has a relatively open exposure to the northeast to southeast winds. It is likely to benefit from downhill air movement from the east.

6.21 Site B2 is not on the major breezeways of Tuen Mun New Town (Figure 5.14 to 5.15 and Figure 6.8). When prevailing wind comes from southerly quadrants, the proposed rezoning of Site B2 is unlikely to impose significant impacts on the leeward sides to affect the areas to the north as its lot frontage is small (about 45m in length). However, the developments on Site B2 may have localised air ventilation impact on the surrounding areas for other wind directions. When prevailing winds and downhill air movement come from the northeast and easterly quarters, the developments on Site B2 are likely to create wake areas on the leeward sides to affect the areas to the west and southwest including Come On Building, Kai Hei Land Building and Chi Lok Fa Yuen. One 20m wide NBA is suggested for the proposed rezoning of Site B2. Given that such NBA aims to facilitate the penetration of prevailing wind and downhill air movement from the east serving the areas to the west of Site B2 (Figure 6.8), it should run perpendicular to Castle Peak Road – Castle Peak Bay. Nevertheless, no fixed alignment is necessary at this planning stage as the site is relatively open to downhill wind along its northeast boundary. In order to allow for design flexibility of the future development, the location of the 20m wide NBA could be determined during the detailed design stage. Subject to the incorporation of the NBA, together with the minimisation of podium and the requirement of building separation in SBD Guidelines being respected, the proposed rezoning of Site B2 from “G/IC” and “GB” to “R(A)22” is unlikely to impose significant impacts on the surrounding sites in air ventilation perspective.

Site C1

6.22 Site C1 is located at Tsing Ha Lane in Area 20 and is proposed to be rezoned from “R(B)8” to “R(B)2” with a building height restriction of 80mPD. It covers a development site area of 0.61 hectare (Figure 6.9). Site C1 is near the waterfront. In particular, developments near the waterfront must not form a continuous barrier to the sea breezes. Buildings must be arranged and positioned so that sufficient gaps between building blocks are left for air ventilation and urban permeability.

6.23 Existing buildings in the areas around Site C1 include Castle Peak Bay Garden (19.6mPD) to the southwest, Verdant Villa (44.2mPD) to the south and Dragon Inn Court (66.4mPD) to the north. It is likely that the penetration of prevailing

south-westerly, southerly and south-easterly winds into Site C1 will be moderated by these surrounding buildings. Site C1 has a relatively open exposure to the northeast and east winds as there are no existing developments in these directions of the site.

6.24 When prevailing winds come from the northeast, east and southerly quarters, the developments on Site C1 are likely to create wake areas on the leeward sides of the site. More space at grade and permeability of the building mass should be provided to allow for better wind penetration. Subject to the minimisation of podium and the requirement of building separation in SBD Guidelines being respected, the proposed rezoning of Site C1 from "R(B)8" to "R(B)2" is unlikely to impose significant impacts on the surrounding sites in air ventilation perspective.

Sites C2, C3, C11, C12 and C13

6.25 Sites C2 and C3 relate to the proposal to rezone the former Perowone Barracks (near Kwun Tsing Road), Castle Peak Road – Castle Peak Bay in Area 48 from "G/IC" to "R(B)15" with building height restrictions of 70mPD (Site C2) and to "R(B)14" with building height restriction of 70mPD and 85mPD (Site C3) (Figure 6.10). Sites C2 and C3 cover development site areas of 2.18 hectares and 2.72 hectares respectively.

6.26 Existing buildings in the areas around Sites C2 and C3 include Hong Kong Gold Coast Phase 1 (76mPD) to the south, Aegean Coast (95mPD) to the southeast and Harrow International School Hong Kong (66mPD) to the north. Some low-rise village type developments (22mPD) lie to the east; to the west is a piece of vacant site currently zoned "GB". The exposure of the sites to south-westerly and southerly winds is likely to be sheltered by buildings in Hong Kong Gold Coast Phase 1. They have a relatively open exposure to the north-easterly, south-easterly and easterly winds.

6.27 When prevailing wind comes from the northeast, Sites C2 and C3 are likely to create wake areas on the leeward side to affect the areas to the southwest including Hong Kong Gold Coast Phase 1, Monte Cario Villas and Hong Kong Gold Coast Hotel. When prevailing wind comes from the east, developments on the sites are unlikely to have significant effects on the surrounding areas as the areas to the immediate west of the site has no sensitive receivers. When prevailing wind comes from the southerly quadrant, developments on Sites C2 and C3 are likely to create

wake areas on the leeward side to affect the areas to the north including Harrow International School and future residential developments in Tuen Mun Town Lot (TMTL) 423. Considering the large size of the sites in juxtaposition and the substantial building mass at a permissible plot ratio up to 4, careful design of the building layout and air corridors within the sites is essential to mitigate possible air ventilation impacts on the surrounding areas. Future developments on Sites C2 and C3 are required to provide sufficient building separations and open space at grade to break up the long lot frontages for facilitating good wind penetration under the prevailing winds. It is recommended that NBA(s) of at least 15m wide, in a more or less north-south direction, should be provided for each site. One NBA could align with the north-south internal road between Towers 3 and 4 of Hong Kong Gold Coast Phase 1; another to connect with an open space outside the southern boundary of the site and Castle Peak Road. Together with the proposed road between Sites C2 and C3, these NBAs should allow sufficient wind penetration for prevailing winds from northerly-southerly quarters. NBA(s) of at least 15m wide along the west-southwest and east-northeast direction should also be provided across both Sites C2 and C3. The corridors within the sites should be connected with each other to facilitate prevailing wind penetration through the whole area to serve the village type development to the east and other areas to the west further downstream. In order to allow design flexibility of the future developments, it is recommended that a quantitative AVA should be conducted for Sites C2 and C3 at the detailed design stage to identify NBAs and other enhancement measures and to ascertain their effectiveness.

6.28 Site C11 involves various small areas in Area 48 to be rezoned from “G/IC” to “GB” (Figure 6.10). The proposed rezoning will not impose any adverse air ventilation impact on the surroundings.

6.29 Site C12 is an area between Site C2 and Site C3 in Area 48 to be rezoned from “G/IC” to “Road” (Figure 6.10). The proposed rezoning will not impose any adverse air ventilation impact on the surroundings.

6.30 Site C13 is a “G/IC” zone in Area 48 and its maximum building height restriction is proposed to be changed from 8 storeys to 1 storey (Figure 6.10). The proposed change of building height restriction from 8 storeys to 1 storey will not impose any adverse air ventilation impact on the surroundings.

Sites C4, C5, C6, C7 and C8

6.31 Sites C4, C5, C6, C7 and C8 lie in close proximity of each other in Tuen Mun Area 56. Site C4 is located at Kwun Chui Road and is proposed to be rezoned from "R(B)" and "GB" to "R(B)2" with a building height restriction of 80mPD. It covers a development site area of 2.5 hectares (Figure 6.11).

6.32 Site C5 is located along the south side of Kwun Chui Road, opposite the existing development of Avignon (57mPD) near Site C4. It is proposed to be rezoned from "O" and "GB" to "R(B)2" with a building height restriction of 90mPD. It covers a development site area of 1.14 hectares (Figure 6.11).

6.33 Site C6 involves various small areas north of Mrs. Cheng Yam On Millennium School (8 storeys) about 57.5mPD to be rezoned from "O" to "GB" to reflect existing vegetated slopes (Figure 6.11). The proposed rezoning of Site C6 will not impose any adverse air ventilation impact on the area.

6.34 Site C7 is on So Kwun Wat Road north of Mrs. Cheng Yam On Millennium SchoolIt is proposed to be rezoned from "O", "R(B)" and "GB" to "R(B)15" with a building height restriction of 90mPD. It covers a development site area of 2.68 hectares (Figure 6.11).

6.35 Site C8 is located on So Kwun Wat Road opposite to Mrs. Cheng Yam On Millennium School and is proposed to be rezoned from "R(B)" and "GB" to "R(B)2" with a building height restriction of 90mPD (Figure 6.11). It covers a development site area of 0.65 hectare (Figure 6.11).

6.36 Existing buildings in the areas around Sites C4 and C5 include some low-rise buildings in Avignon to the northeast and north respectively. At present, both sites have a relatively open exposure to prevailing winds from all directions. However, Sites C4 and C5 lie to the west and north of TMTL427 which is zoned "R(B)" with a maximum plot ratio of 1.3 and building height restriction of 10 storeys. Future developments on TMTL 427 may have some air ventilation impact on Sites C4 and C5.

6.37 Existing buildings in the surrounding area of Site C7 only include Mrs Cheng Yam On Millennium School. At present, Site C7 has a relatively open exposure to prevailing winds from the northeastly and southerly quarters.

6.38 Existing buildings in the areas around Site C8 only include Mrs Cheng Yam On Millennium School to the southeast. At present, Site C8 has a relatively open exposure to prevailing winds from southerly quarters. For easterly wind, Site C8 is likely to be affected by the buildings of Mrs Cheng Yam On Millennium School and future developments on Site C7.

6.39 As mentioned, TMTL427 is in the midst of various sites in Area 56. With a permissible building height up to 10 storeys, it may impose wake areas on Sites C4, C5 and C7. Nonetheless, according to the land sales conditions, TMTL427 would be required to demonstrate a good building design/layout in terms of air ventilation impact via a separate AVA study that major prevailing winds from northeast, east and south-east quadrants could penetrate to the sites on its leeward sides.

6.40 Under northeast and east prevailing winds, Site C7, with maximum building height of 90mPD, is likely to affect its downstream areas including eastern part of TMTL427 and the northern part of Site C8. For Site C4 with maximum building height of 80mPD, it is likely to affect the adjoining area zoned “GB” and Tuen Mun Road. In order to ameliorate the above air ventilation issue with the consideration of breezeway connection through TMTL427, it is recommended that one 20m wide NBA each along the east-northeast and west-southwest direction for Site C7 and Site C4 be provided. For Site C7, the NBA should run along its northern site boundary to connect with the air path of TMTL427. For the remaining portion of Site C7 with lot frontage about 180m, it is also required to provide sufficient building separations in accordance with SBD Guidelines (APP-152) to facilitate better wind penetration from northeast quadrant to Site C8 and other downstream areas. For Site C4, the 20m wide NBA runs in the middle of the site. Under the northeast and east prevailing winds, future developments on Site C5 would not impose any impacts on its leeward side due to its relatively narrow lot frontage and that Kwun Chui Road should serve as the air path in these wind directions. Developments on Site C8 are unlikely to have significant effects on the surrounding areas as the areas to the west of the site is zoned “GB” with no sensitive receivers.

6.41 Under southeast and south winds, the proposed developments in Sites C4, C5 and TMTL 427 would likely block the incoming winds to reach the existing residential developments (e.g. Avignon). Given that TMTL 427 would demonstrate a good building design in terms of air ventilation aspect via a separate AVA study, one 20m wide NBA is proposed for Site C5 to allow for wind penetration to the north. Locations of proposed breezeways are shown in Figure 6.11.

6.42 In view of the potential cumulative impact of the proposed developments on Sites C4 to C8, more space at grade and permeability of the building mass should be provided to allow for better wind penetration. Subject to the incorporation of NBAs together with the minimisation of podium and the requirement of building separation in SBD Guidelines being respected, the proposed rezoning of Sites C4, C5, C6, C7 and C8 is unlikely to impose significant impacts on the surrounding sites in air ventilation perspective.

Sites C9 and C10

6.43 Site C9 is located at Castle Peak Road – Castle Peak Bay, Area 57 and is proposed to be rezoned from "G/IC" and "O" to "R(B)" with a building height restriction of 6 storeys (Figure 6.12). It covers a development site area of 0.86 hectare. Site C9 is elongated in shape, with a lot frontage of 184m running along the waterfront adjacent to the Cafeteria Old Beach. Developments along the waterfront must not form a continuous barrier to the sea breezes. Buildings must be arranged and positioned so that sufficient gaps between building blocks are left for air ventilation and urban permeability.

6.44 Existing buildings in the areas around Sites C9 include Chu Hai College of Higher Education under construction (51mPD to the north), and some low to medium-rise developments to the north and northeast ranging from 27.3mPD to 85mPD. Due to its close proximity to the coastline, Sites C9 currently have a relatively open exposure to the prevailing winds from the southerly quarter. To the further northeast and east of Sites C9, the existing developments including Perowne Heights and Harrow International School are far away and are unlikely to affect it under prevailing northeast and east winds.

6.45 When prevailing winds come from the east and northeast, the proposed rezoning of the site is unlikely to have significant effects on the surrounding areas as

the areas to the west of Site C9 are Castle Peak Bay. Although the Cafeteria Old Beach lies on the leeward side of the future development, the beach is mainly ventilated by the sea breezes coming from the southwest. Developments on Site C9 should not impose significant impact on the beach. When prevailing winds come from southerly quarter, the proposed rezoning of Site C9 from "G/IC" and "O" to "R(B)" is likely to create wake areas on the leeward sides to affect the "G/IC" site (i.e. Chu Hai College of Higher Education) and the "R(B)" zone to the north. Considering that Site C9 occupies a significant waterfront location that is an important inlet of sea and land breezes and that its lot frontage exceeds 100m in length, an AVA should be conducted according to the HPLB and ETWB Joint Technical Circular No. 1/06[6]. To avoid blockage of sea breezes, it is recommended that at least one 15m wide NBA be incorporated within Site C9 to align with the 32m wide building gap of Chu Hai College of Higher Education to facilitate wind penetration further inland (Figure 6.12). A quantitative AVA should be conducted at the detailed design stage to identify the NBAs and other enhancement measures and to ascertain their effectiveness.

6.46 Site C10 is part of the public beach area in Area 48 and it is proposed to be rezoned from "G/IC" to "O" to reflect the existing use. The proposed rezoning will not impose any adverse air ventilation impact on the surroundings.

Site D1

6.47 Site D1 is located at 2 San On Street in Area 12 and is proposed to be rezoned from "I" to "C(1)" with a building height restriction of 85mPD (Figure 6.13). It covers an area of about 0.07 hectare.

6.48 Site D1 is in the city centre surrounded by industrial buildings (ranged from 19.7 mPD to 52.3mPD). The exposure of Site D1 to prevailing winds from all directions is likely to be sheltered by surrounding buildings.

6.49 Site D1 is small in area. The proposed rezoning of Site D1 from "I" to "C(1)" is unlikely to have significant air ventilation impacts on the surrounding areas under the prevailing wind directions.

Site D2

6.50 Site D2 is located to the east of Lung Fu Road in Area 45 and is proposed to be rezoned from "GB" to "REC" with a building height restriction of 2 storeys (Figure 6.14). It covers an area of about 3.72 hectares.

6.51 Site D2 is surrounded by "GB" zones. The proposed rezoning of Site D2 is unlikely to have significant air ventilation impacts on the surrounding areas.

Site E

6.52 Site E is located at Siu Leng Shui in Area 46 and is proposed to be rezoned from "Other Specified Uses" to "Undetermined" "(U") (Figure 6.15). As the use and development parameters of the site are yet to be confirmed, the air ventilation impact of the proposed amendment of Site E could not be determined at this stage.

Site F

6.53 Site F is located at BeneVille on Tuen Kwai Road, Fu Tei in Area 52 and is proposed to be rezoned from "CDA" to "R(B)16"with a building height restriction of 106mPD (Figure 6.16). It covers an area of about 1.73 hectares. The rezoning of Site F is to reflect the completed housing project already on the site and it will have no impact on the current air ventilation conditions.

Site G

6.54 Site G is located at Lok Chui Street and is proposed to be rezoned to "R(B)19" with a maximum building height restriction of 3 storeys (Figure 6.17). The rezoning of Site G is to reflect an approved rezoning application on the site for a residential development of 3 storeys. The site is currently occupied by a 2-storey building. The redevelopment of this site in the future is also unlikely to impose significant air ventilation impacts on the surrounding areas due to its low building height.

Other Potential Housing Sites

6.55 In addition to the proposed amendments, four other sites with potential for housing development have also been assessed based on development parameters given by the Planning Department.

Site in Area 48 (Site 1)

6.56 This site (Site 1) is part of the Ex-Perowone Barracks at Castle Peak Road – Castle Peak Bay in Area 48. It is located near the waterfront, covering an area of 0.31 hectare. It is identified to have the potential for residential development with a building height restriction at 70mPD (Figure 6.18).

6.57 Existing buildings in the areas around Site 1 include some low-rise buildings (12mPD to 27mPD) to the south; and Chu Hai College of Higher Education under construction (51mPD) to the north. Due to its relatively close proximity to the coastline, with scattered low-rise buildings to the south, Site 1 currently has a relatively open exposure to the prevailing winds from the southerly quarter. However, Site C9 lies to the south of Site 1. Future developments on Site C9 as mentioned in this report may have some air ventilation impact on Site 1 when prevailing winds come from the southerly quarter. To the northeast and east of Site 1, the existing buildings including Perowne Heights and Harrow International School are far away and are unlikely to affect it under prevailing northeast and east winds.

6.58 When prevailing wind comes from the northeast, Site 1 is unlikely to have significant effects on the surrounding areas as its lot frontage perpendicular to the north-easterly wind is small (about 60m). When prevailing winds come from the east and southerly quarters, it is likely to create wake areas on the leeward side to affect the “G/IC” site to the north (mainly Chu Hai College of Higher Education). In order to address the potential air ventilation impact of future developments, more space at grade and permeability of the building mass should be provided to allow for better wind penetration. In particular, development near the waterfront must but form a continuous barrier to sea breezes. Building must be arranged and positioned so that sufficient building gaps are left for air ventilation. Subject to the minimisation of podium and the requirements of building separation in SBD Guidelines being respected, the future development at Site 1 with a maximum building height at

70mPD is unlikely to impose significant impacts on the surrounding sites in air ventilation perspective.

Site in Area 55 (Site 2)

6.59 This site (Site 2) is located at the junction of So Kwun Wat Road and Castle Peak Road – So Kwun Wat in Area 55. It covers an area of 1.22 hectares and is identified to have the potential for residential development with a building height restriction at 7 storeys (Figure 6.19).

6.60 Existing buildings in the areas around Site 2 include Aegean Coast to the northeast and Gold Coast Yacht and Country Club to the southwest. The exposure of Site 2 to north-easterly and easterly winds is likely to be affected by the buildings in Aegean Coast. It is likely that the penetration of prevailing south-westerly winds into Site 2 will be moderated by the buildings in Gold Coast Yacht and Country Club. On the other hand, it has relatively open exposures for southerly and south-easterly winds.

6.61 When prevailing winds come from the south and southwest, developments on Site 2 are likely to create wake areas on the leeward side to affect the areas in the southeast edge of Aegean Coast. More space at grade and permeability of the building mass should be provided to allow for better wind penetration. Subject to the minimisation of podium and the requirement of building separation in SBD Guidelines being respected, the future development at Site 2 at a maximum building height of 7 storeys is unlikely to impose significant impacts on the surrounding sites in air ventilation perspective.

Site in Area 16 (Site 3)

6.62 This site (Site 3) is located at the junction of Hang Fu Street and Hoi Wong Road in Area 16 (Figure 6.20). It is identified to have the potential for residential development.

6.63 Existing buildings in the areas around Site 3 include Nerine Cove (maximum building height at 114mPD) to the east and Oceania Heights (129mPD) to the north. The exposure of Site 3 to the southeast wind, easterly winds and north-easterly winds is likely to be affected by these surrounding buildings. Site 3 currently has a

relatively open exposure to the south and south-westerly winds as there are no existing developments in these directions of the site. However, Site B1 lies to the south of Site 3. Future developments on Site B1 as mentioned in this report may have some air ventilation impact on Site 3 when prevailing winds come from the southerly quarter.

6.64 When prevailing wind comes from the south, Site 3 is unlikely to have significant effects on the surrounding sites due to its relatively narrow lot frontal size of less than 60m. When prevailing winds come from the south-westerly direction, Site 3 is likely to create wake areas on its leeward side to affect Nerine Cove. When prevailing winds come from the east, the developments on Site 3 are likely to affect wind penetration into the areas to the west of the site. According to the qualitative guidelines on air ventilation in Chapter 11 of HKPSG[7], it is recommended that NBAs be designated at site level to subdivide large land parcels in avoiding wall-like developments. Site 3 has a lot frontage of 149m running in the north-south direction. It is desirable that the site be broken up so that long building façades would not be formed to block wind penetration. Considering the connectivity to the existing road network (Tuen Yee Street) as an air path, one 15m wide NBA in the middle of the site and aligns with Tuen Yee Street, is recommended to facilitate the penetration of easterly winds to the west of the site and westerly winds to Nerine Cove (Figure 6.20). In view of the potential cumulative impact together with the future development on Site B1, another 15m wide NBA is recommended along the southern site boundary of Site 3 to further facilitate the penetration of westerly winds into Nerine Cove. This NBA will also serve as a “buffer zone” to alleviate the impact caused by Site B1 under southerly winds (Figure 6.20). Site 3 is near the area of breezeway (TMRC) of Tuen Mun New Town and hence developments on this site should be carefully designed. Subject to the incorporation of the NBAs, together with the minimisation of podium and the requirement of building separation in SBD Guidelines being respected, the future development at Site 3 is unlikely to impose significant impacts on the surrounding sites in air ventilation perspective. Otherwise, further AVA studies should be conducted to assess the air ventilation performance.

Site in Area 39 (Site 4)

6.65 This site (Site 4) is located at the junction of Castle Peak Road – Castle Peak Bay and Hin Fat Lane in Area 39 (Figure 6.21). It is an enlarged site covering Site B2

as mentioned in this report and is identified to have the potential for residential development.

6.66 Existing buildings in the areas around Site 4 include Man Bo Building, Come On Building and Kai Hei Land Building to the west, Handsome Court to the south. It is likely that south-westerly winds will already be sheltered by the surrounding buildings (e.g. Man Bo Building (85.7mPD) and Come On Building (78.1mPD). Site 4 has a relatively open exposure to the northeast to southeast winds. It is likely to benefit from downhill air movement from the east.

6.67 Site 4 is not on the major breezeways of Tuen Mun New Town (Figure 5.14 to 5.15 and Figure 6.21). When prevailing wind comes from the southerly quadrants, Site 4 is unlikely to affect the surrounding areas as there are no sensitive receivers in the wake areas north of the site which are Tuen Mun Substation and an area zoned "GB". Villa Tiara lies on the downstream area under southerly winds, but Site 4 is unlikely to impose significant impacts on Villa Tiara as the distance between these two sites are over 100m. Southerly winds are still able to reach Villa Tiara through Castle Peak Road – Castle Peak Bay and open spaces around Tuen Mun Substation. However, the developments on Site 4 may have localised air ventilation impact on the surrounding areas for other wind directions. When prevailing winds and downhill air movement come from the northeast and easterly quarters, the developments on Site 4 are likely to create wake areas on the leeward sides to affect the areas to the west and southwest including Come On Building, Kai Hei Land Building and Chi Lok Fa Yuen. One 20m wide NBA is suggested for Site 4. Given that such NBA aims to facilitate the penetration of prevailing wind and downhill air movement from the east serving the areas to the west of Site 4 (Figure 6.21), it should run perpendicular to Castle Peak Road – Castle Peak Bay. Nevertheless, no fixed alignment is necessary at this planning stage as the site is relatively open to downhill wind along its northeast boundary. In order to allow for design flexibility of the future development, the location of the 20m wide NBA could be determined during the detailed design stage. Subject to the incorporation of the NBA, together with the minimisation of podium and the requirement of building separation in SBD Guidelines being respected, the future development at Site 4 is unlikely to impose significant impacts on the surrounding sites in air ventilation perspective. Otherwise, further AVA studies should be conducted to assess the air ventilation performance.

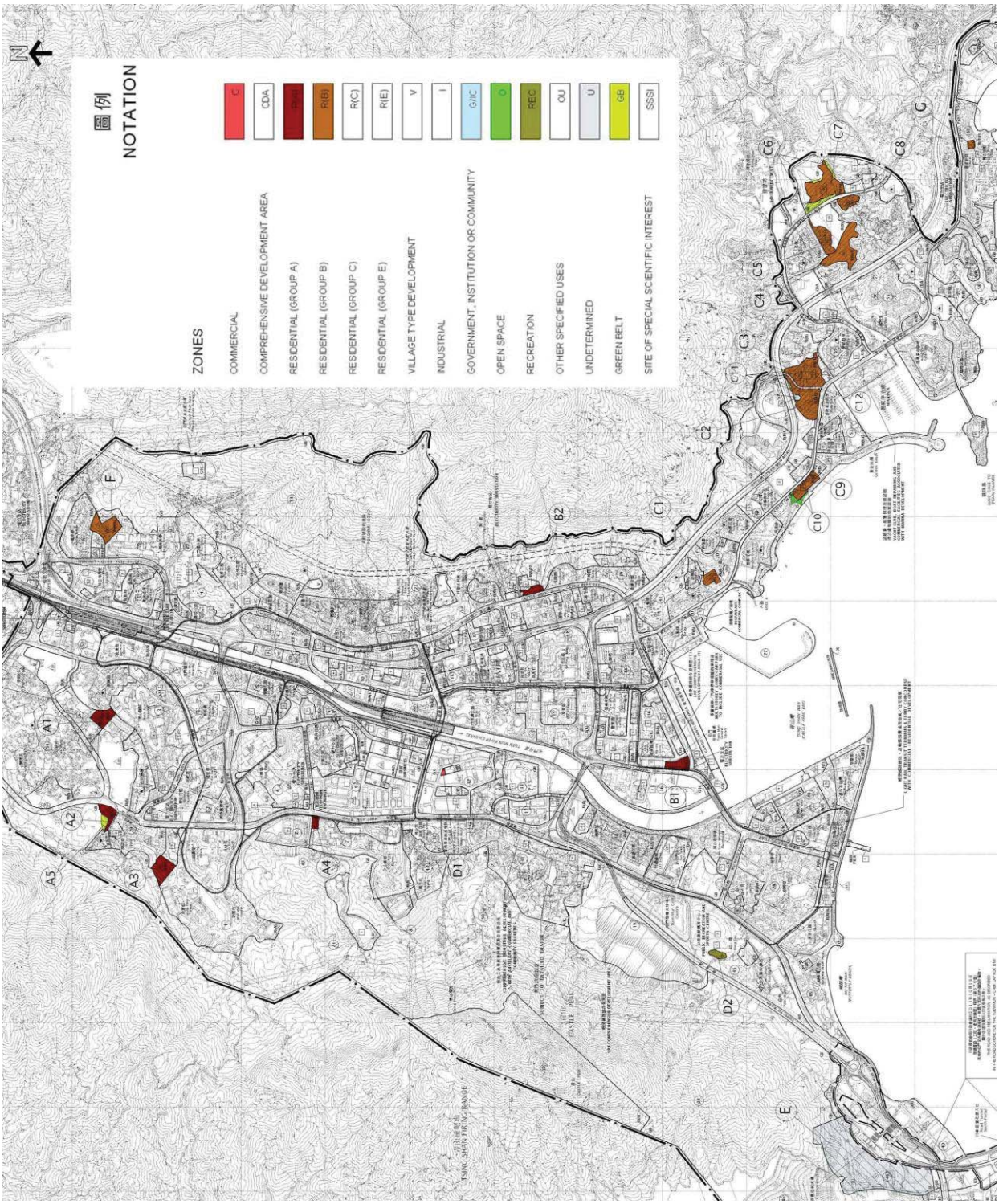

Figure 6.1 Locations of the proposed sites.

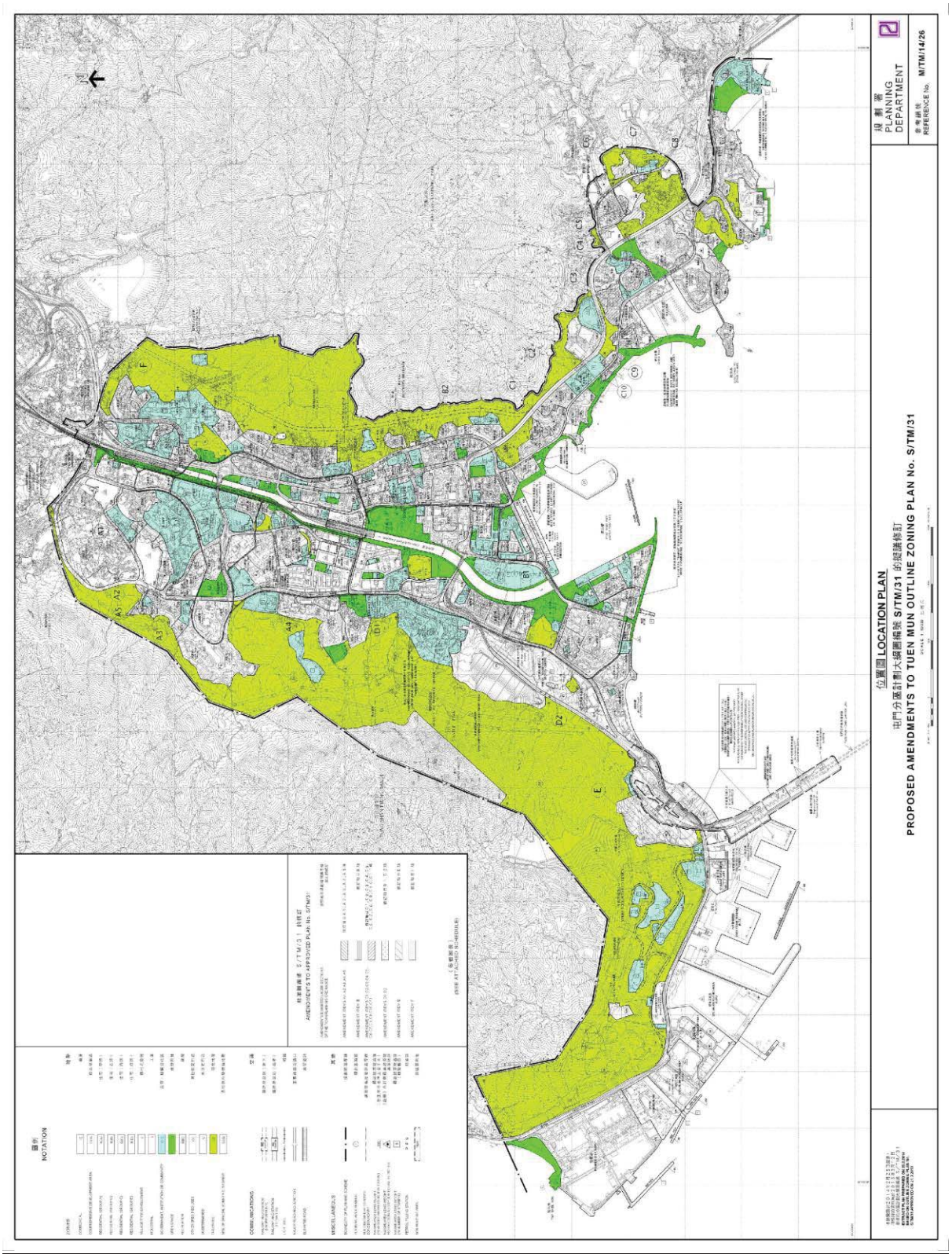

Figure 6.2 "G/IC", "O", and "GB" zones in the approved Tuen Mun OZP No. S/TM/31

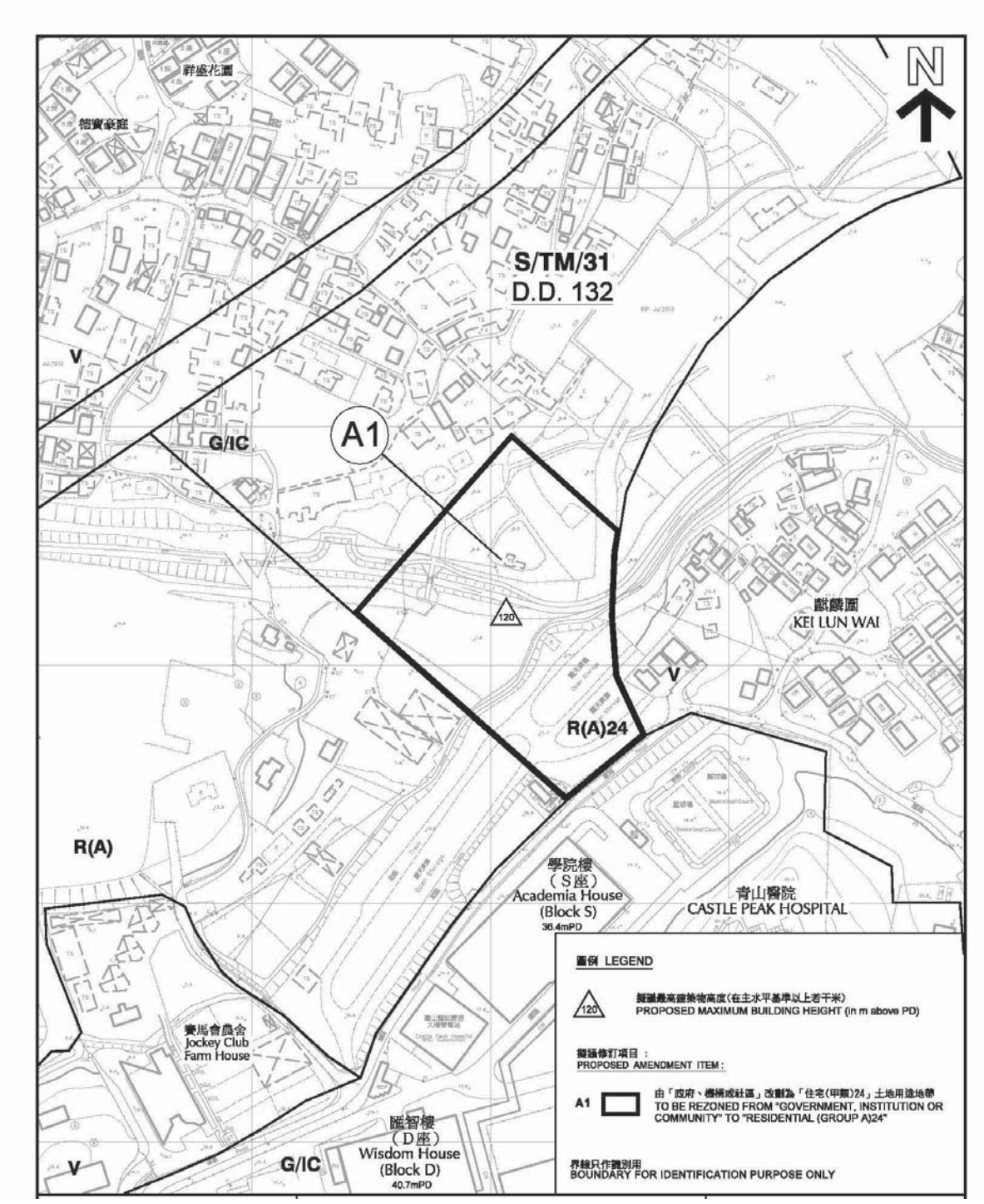

Figure 6.3 Site plan of Site A1

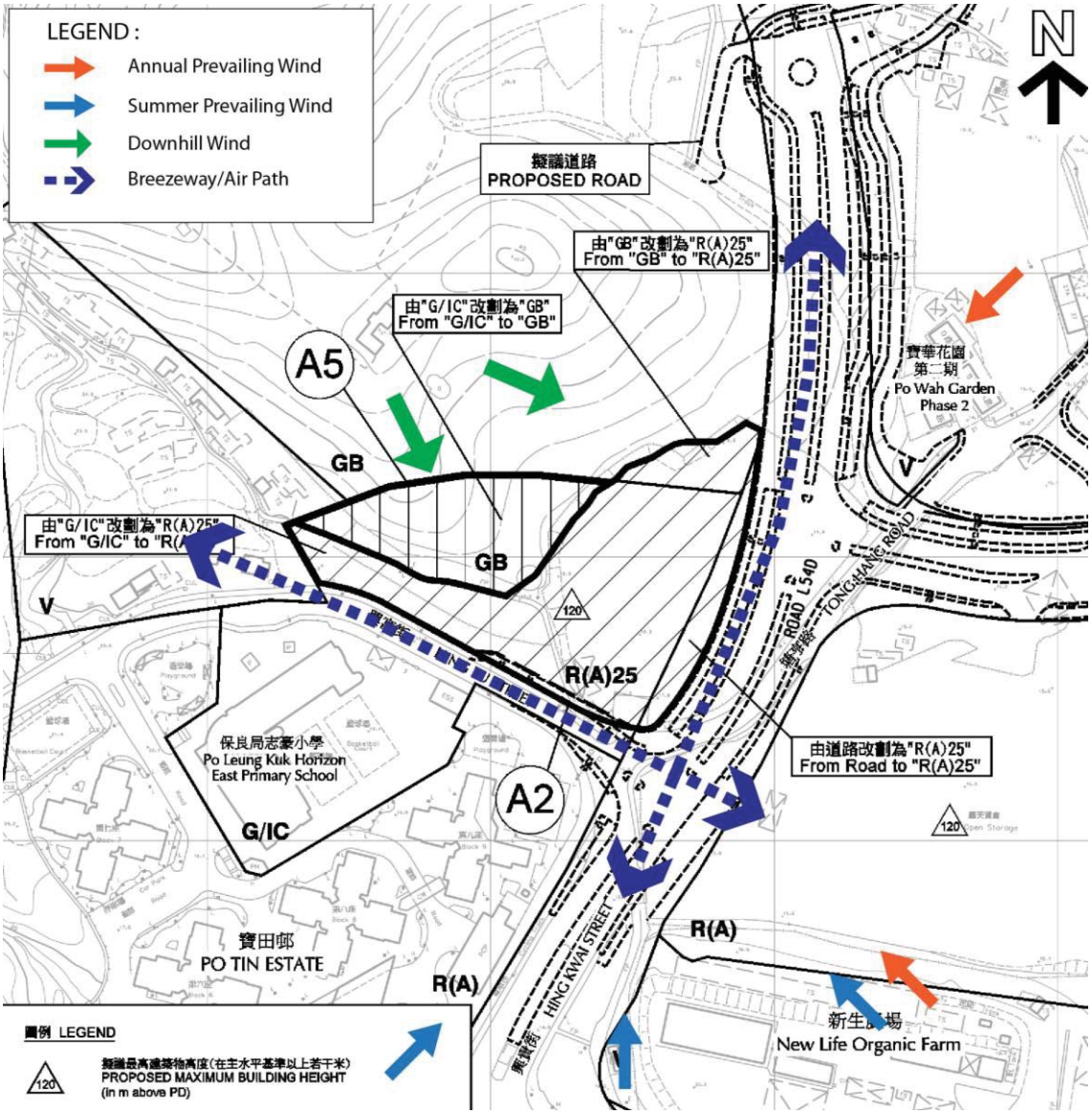

Figure 6.4 Site plan of Sites A2 and A5 and wind environment of their surroundings

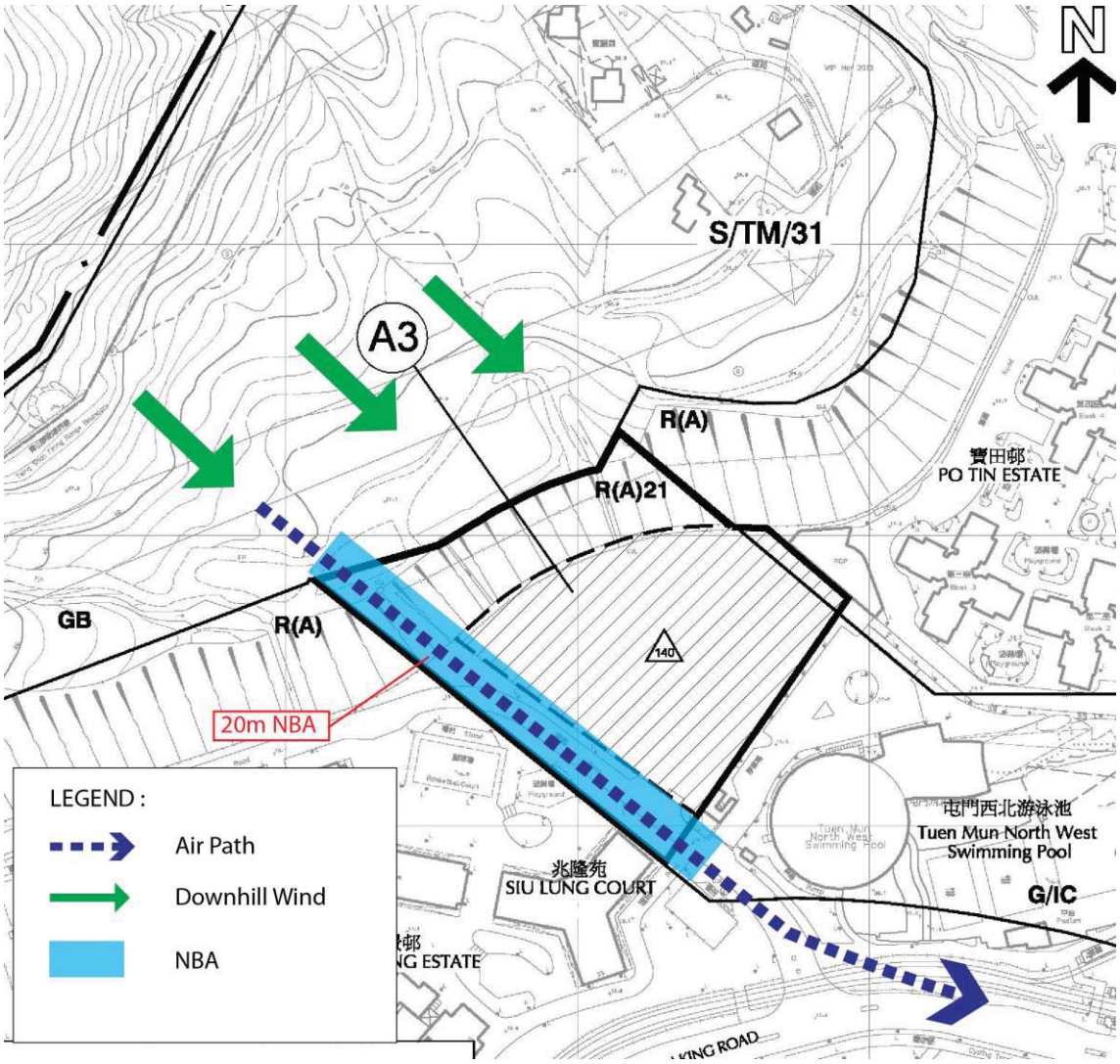

Figure 6.5 Site plan and the proposed NBA for Site A3

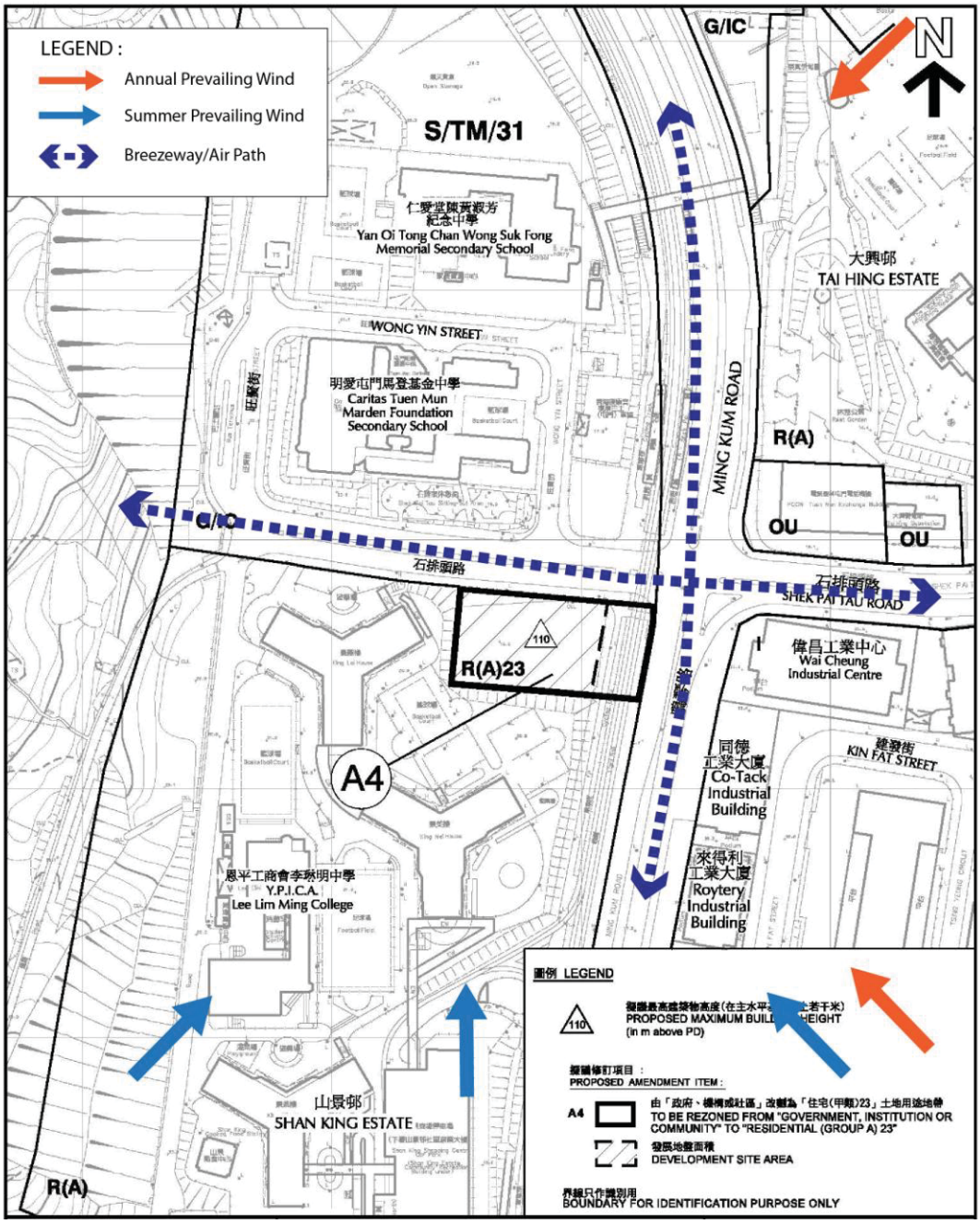

Figure 6.6 Site plan of Site A4 and wind environment of its surroundings

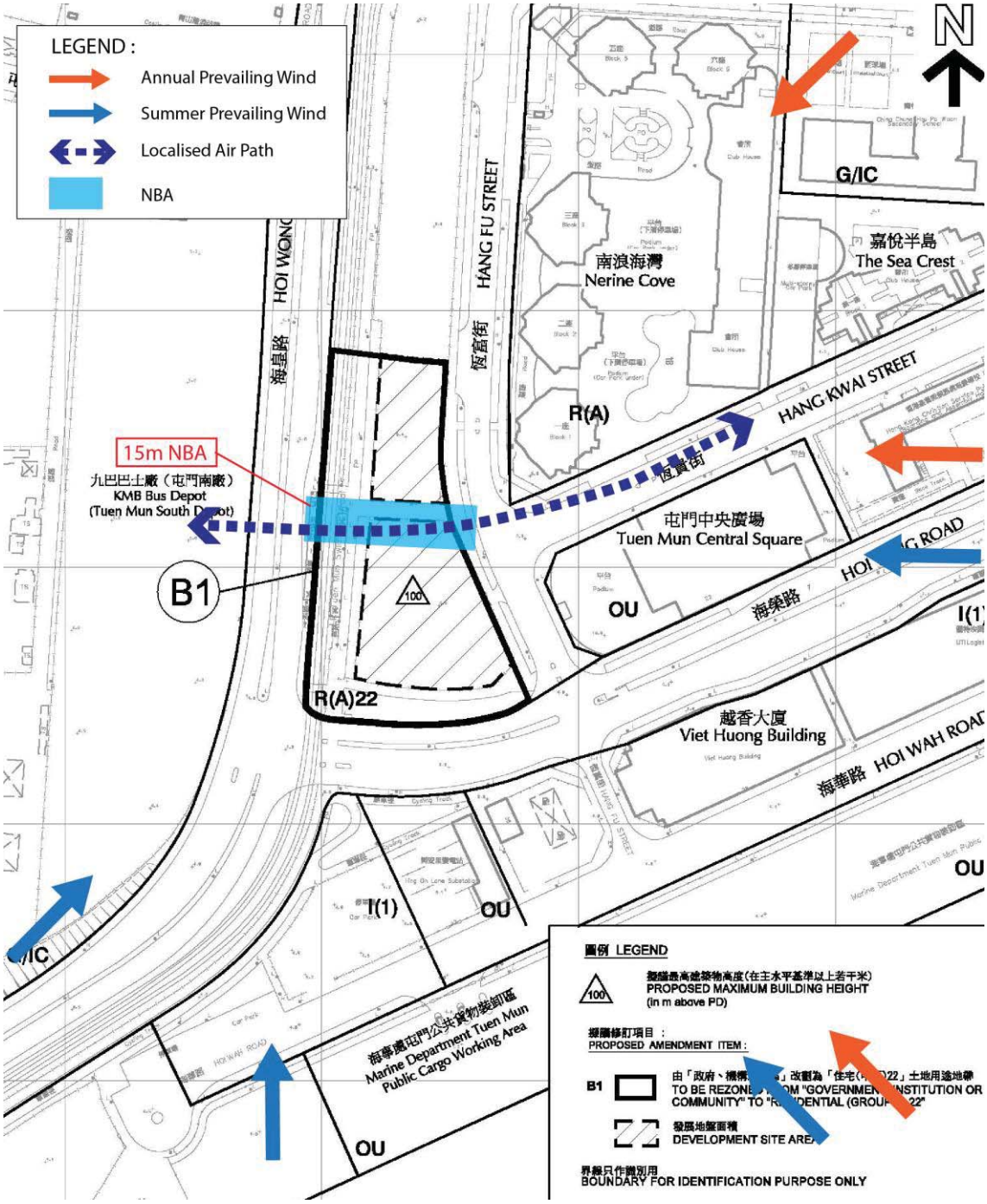

Figure 6.7 The proposed NBA for Site B1 and wind environment of its surroundings

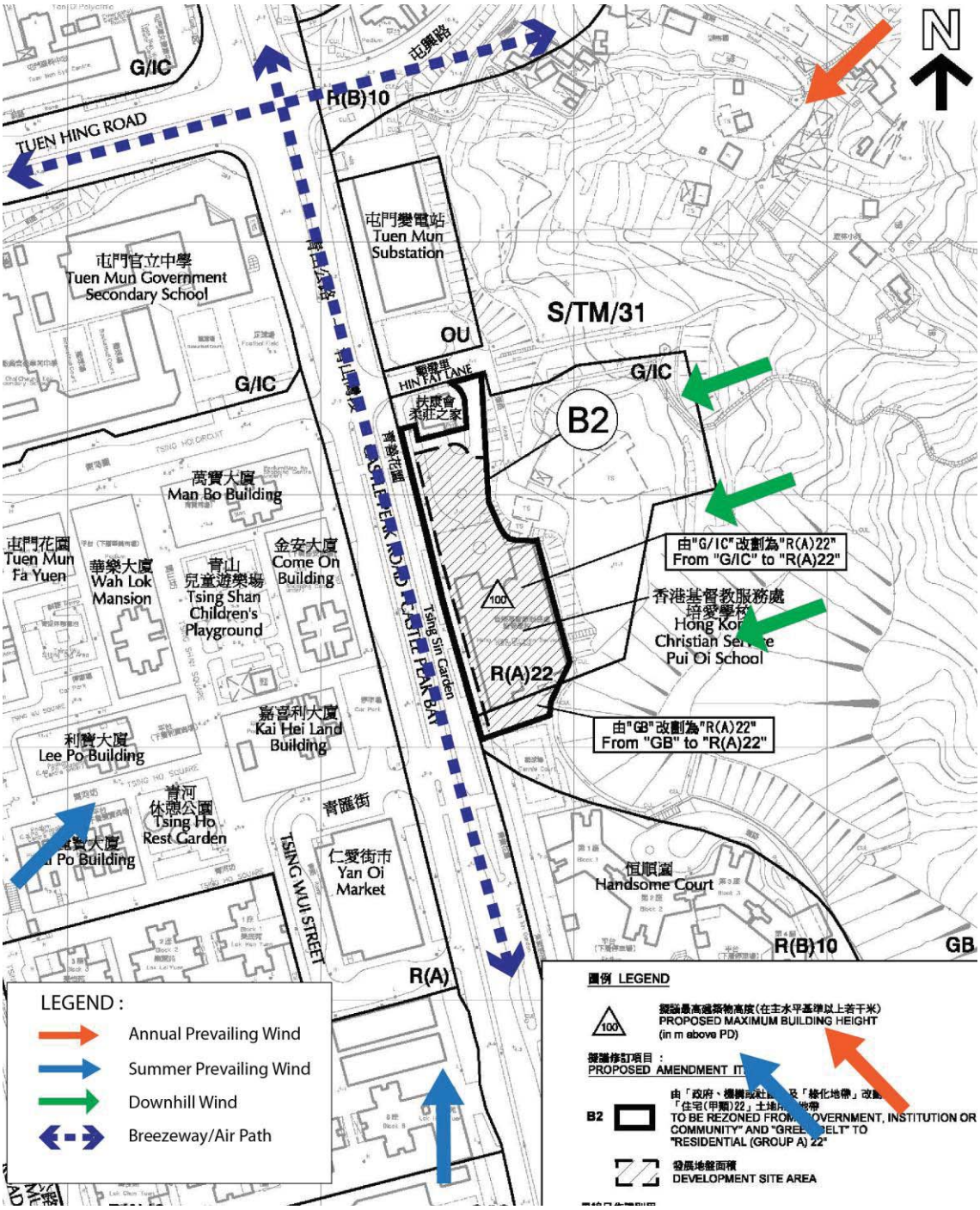

Figure 6.8 Site plan of Site B2 and wind environment of its surroundings

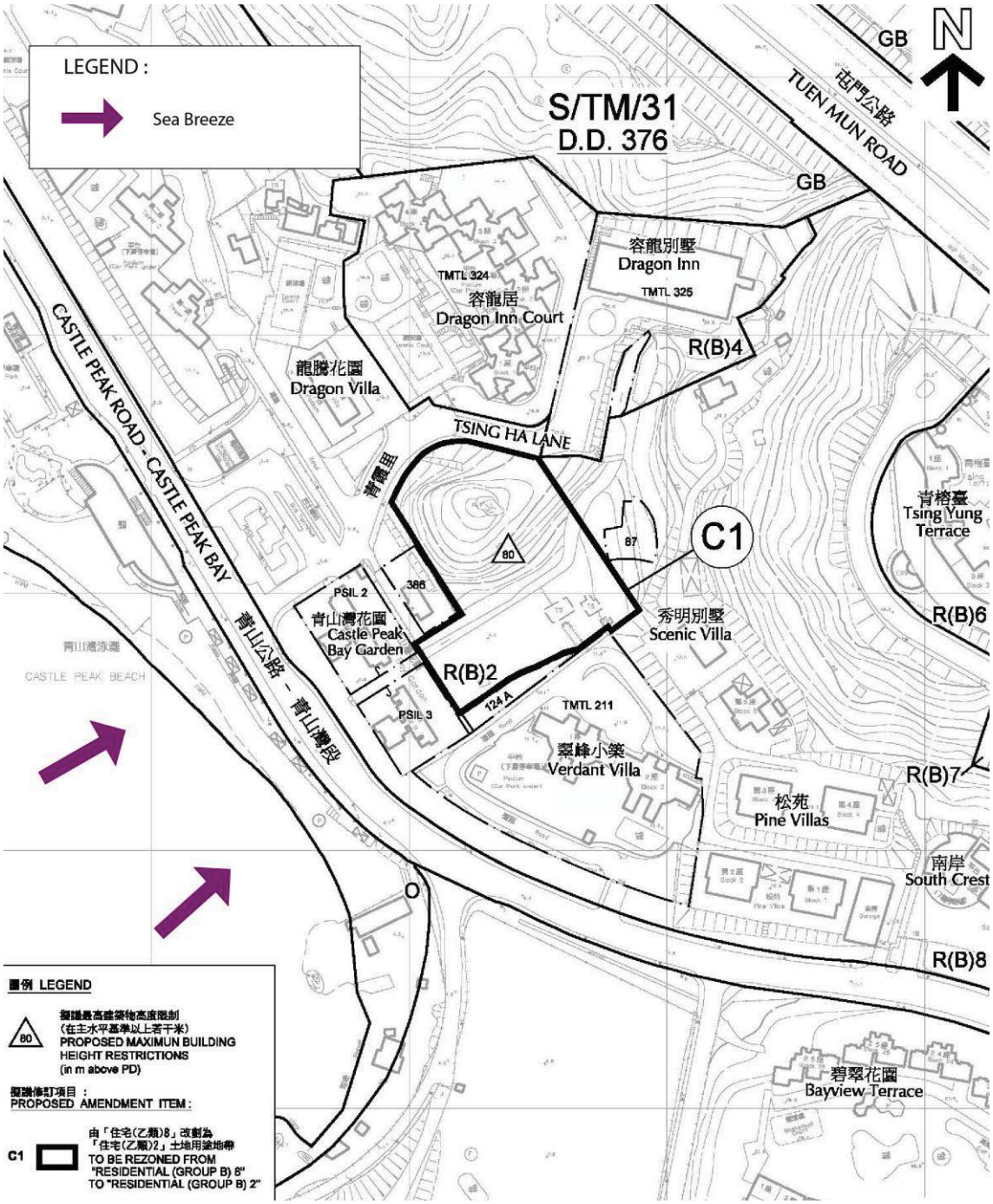

Figure 6.9 Site plan and sea breeze for Site C1

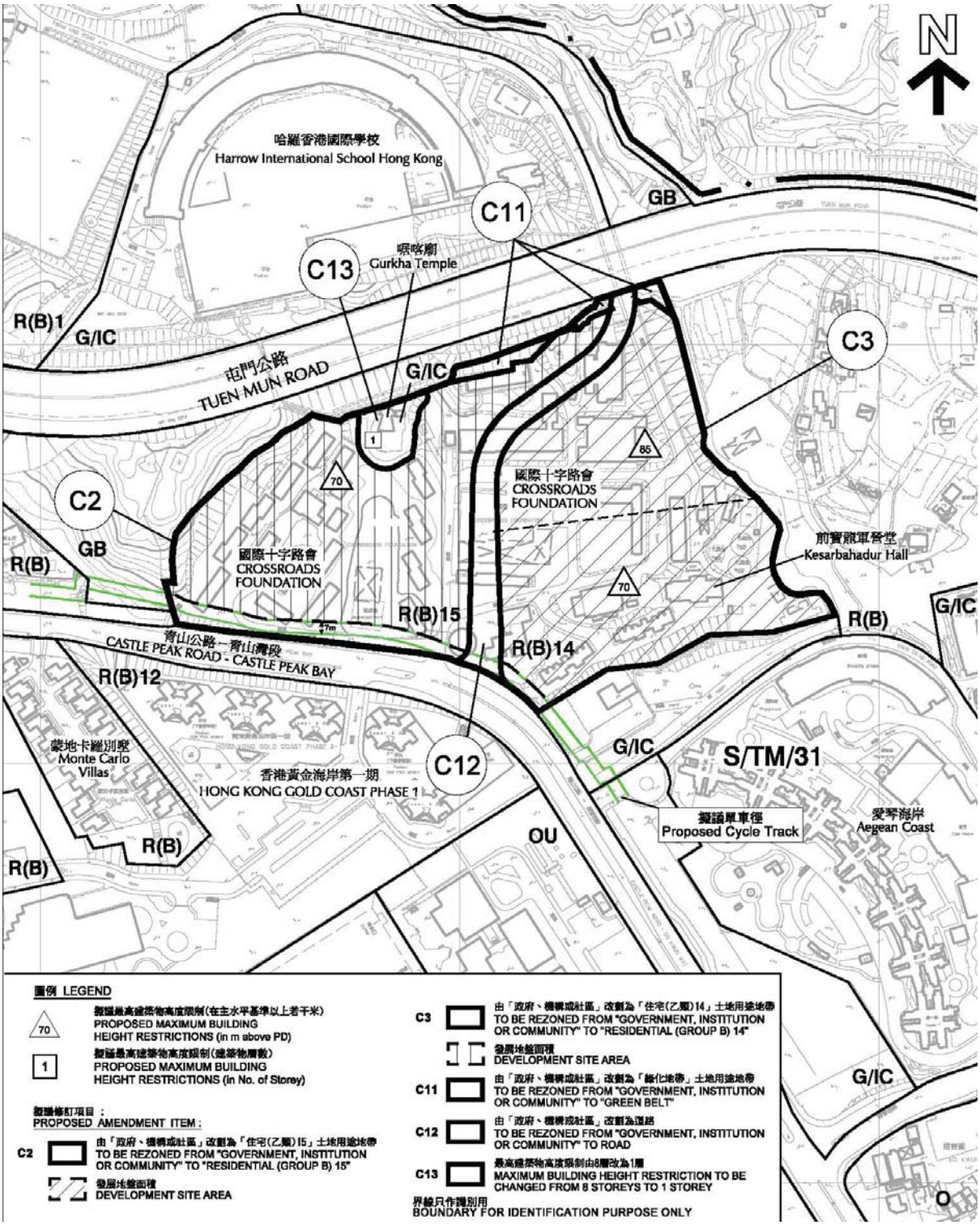

Figure 6.10 Site plan of Sites C2 , C3, C11, C12 and C13

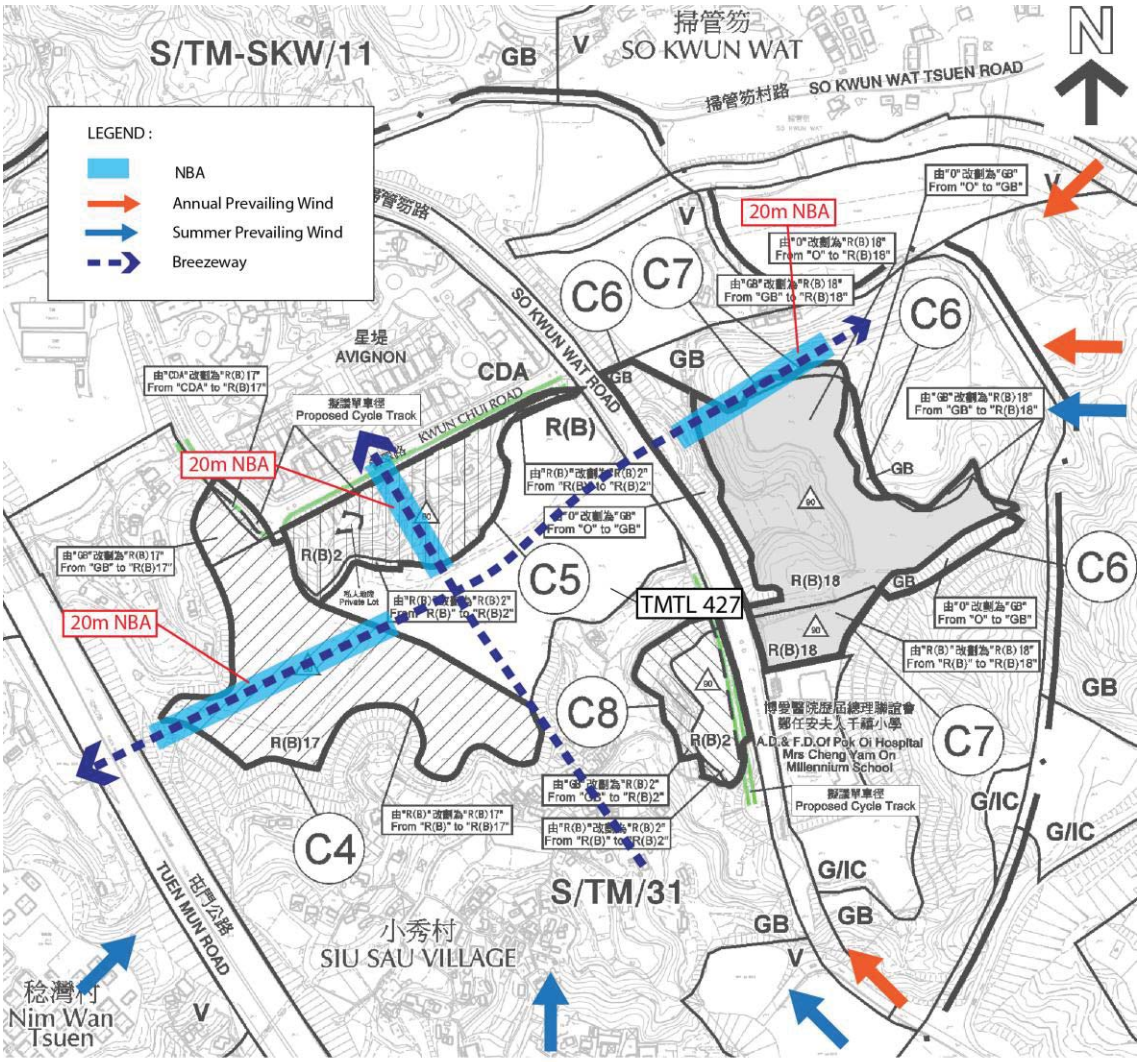

Figure 6.11 The proposed NBAs for Sites C4, C5, and C7 and wind environment of Sites C4, C5, C6, C7 and C8

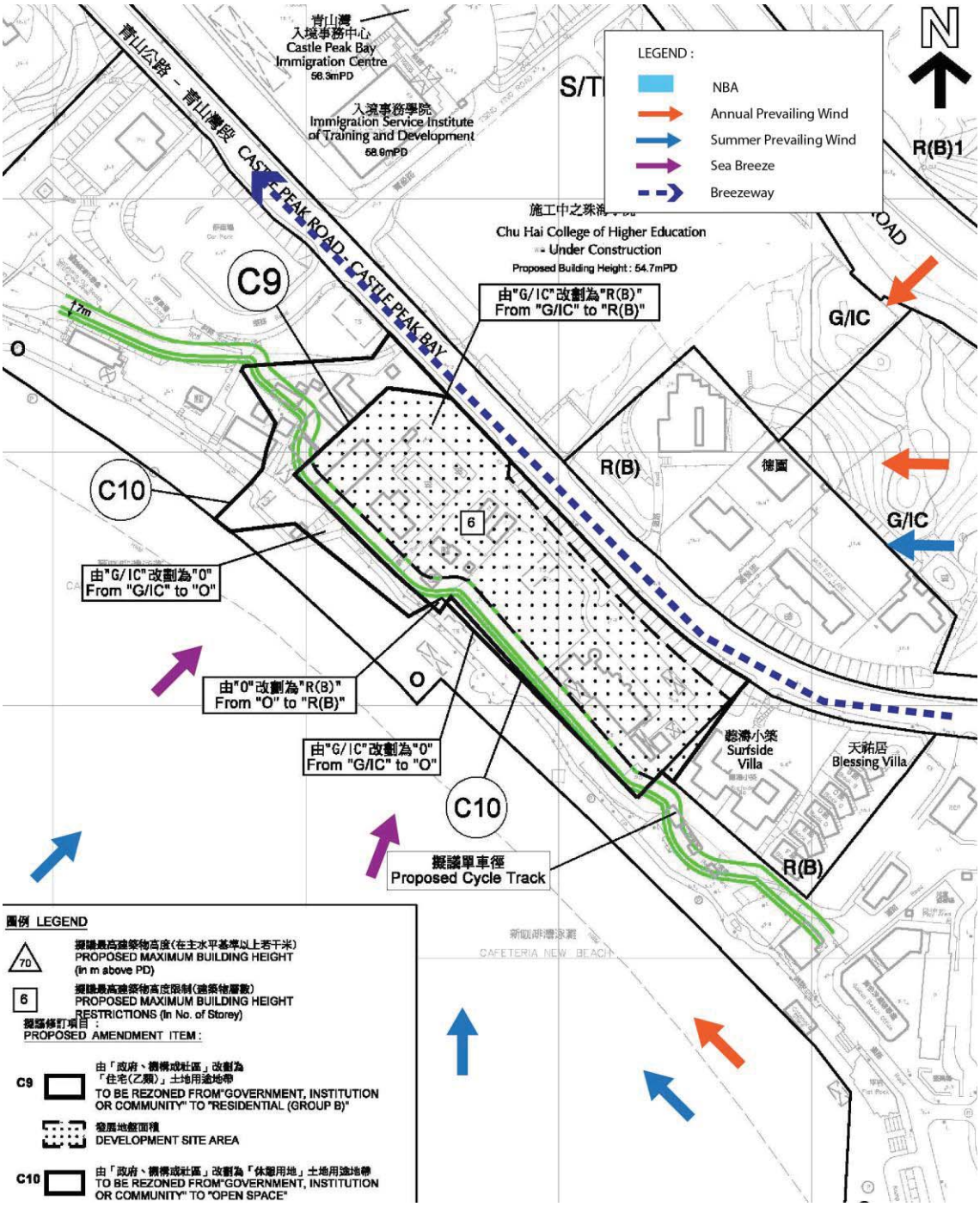

Figure 6.12 Site plan of Sites C9 and C10 and wind environment of their surroundings

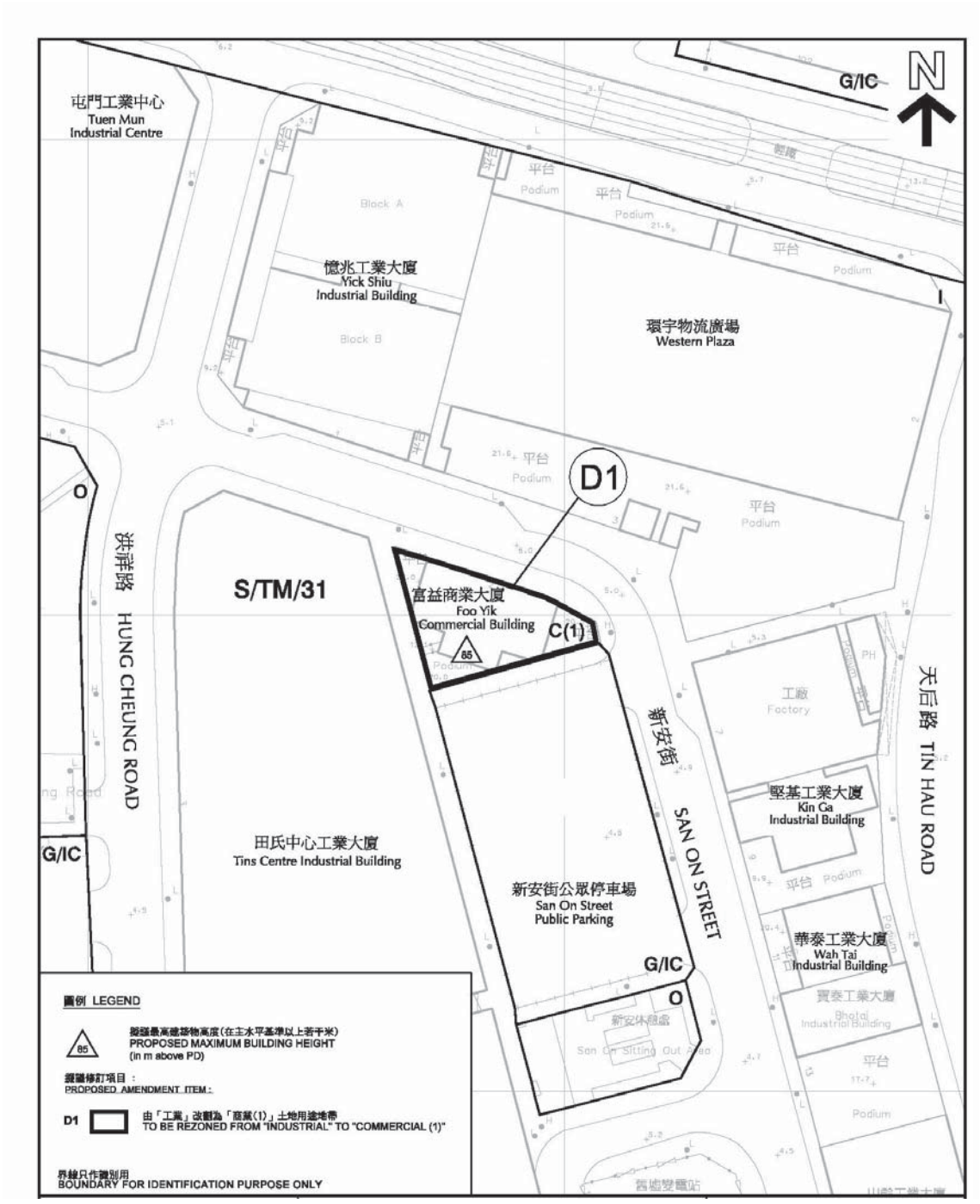

Figure 6.13 Site plan of Site D1

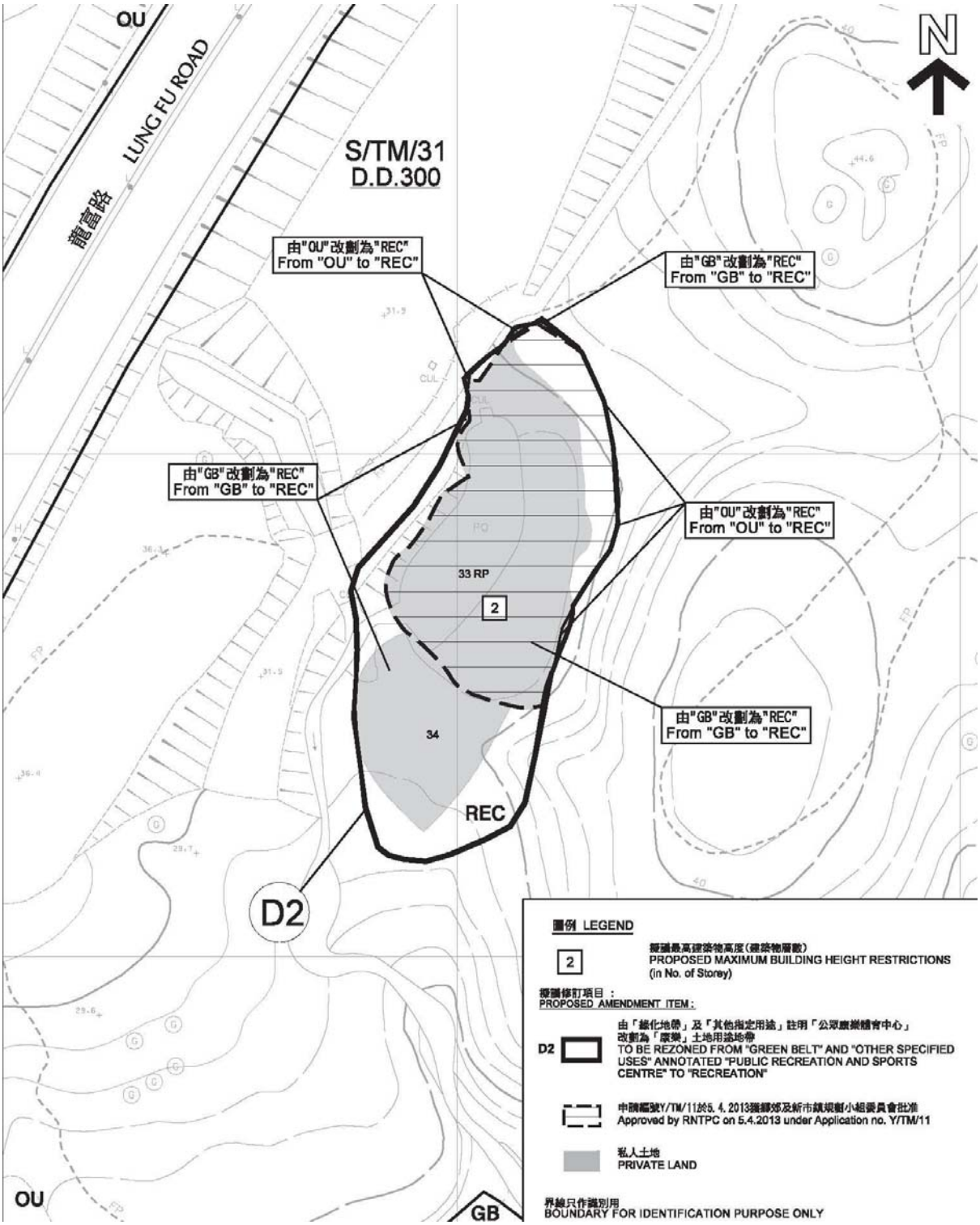

Figure 6.14 Site plan of Site D2

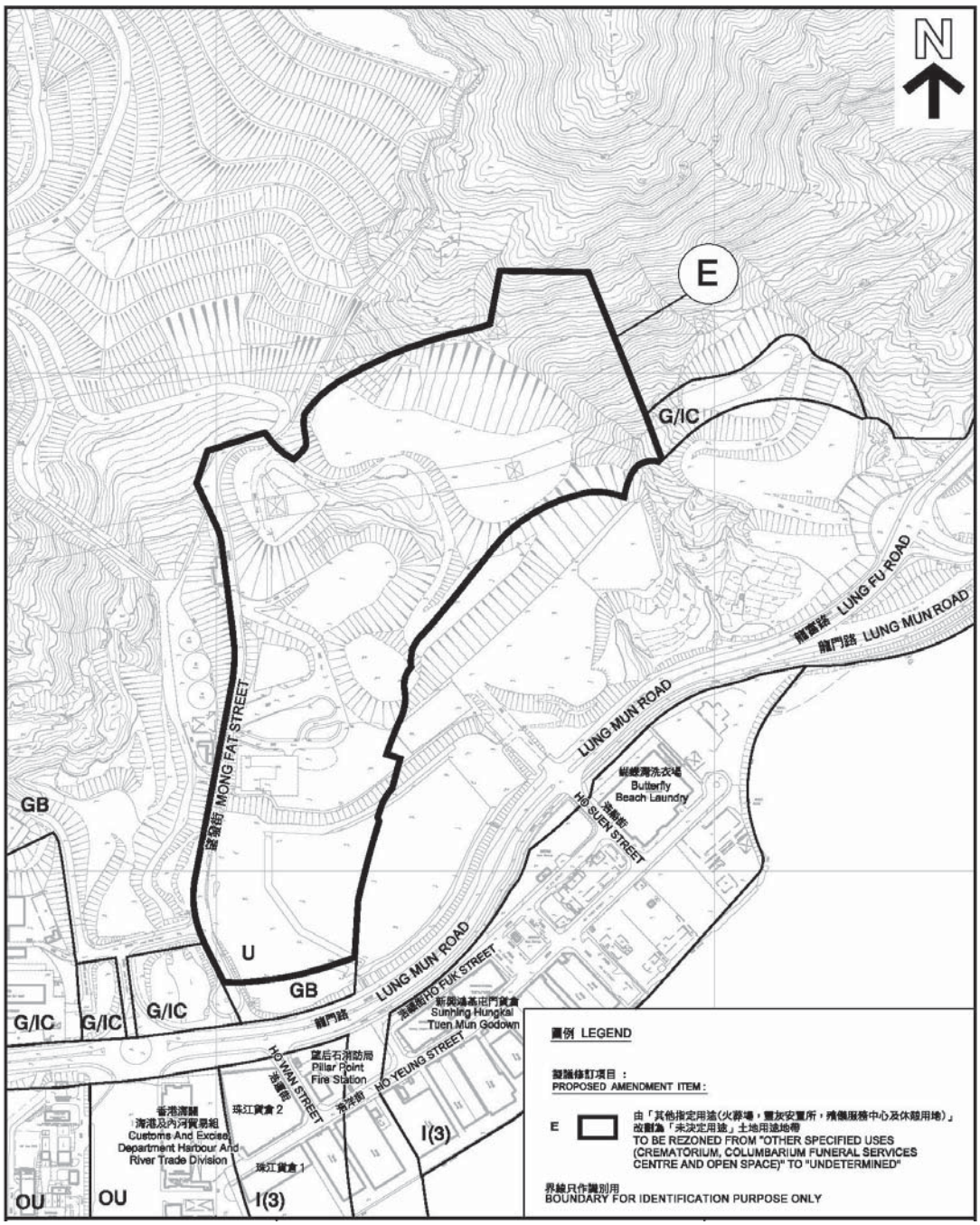

Figure 6.15 Site plan of Site E

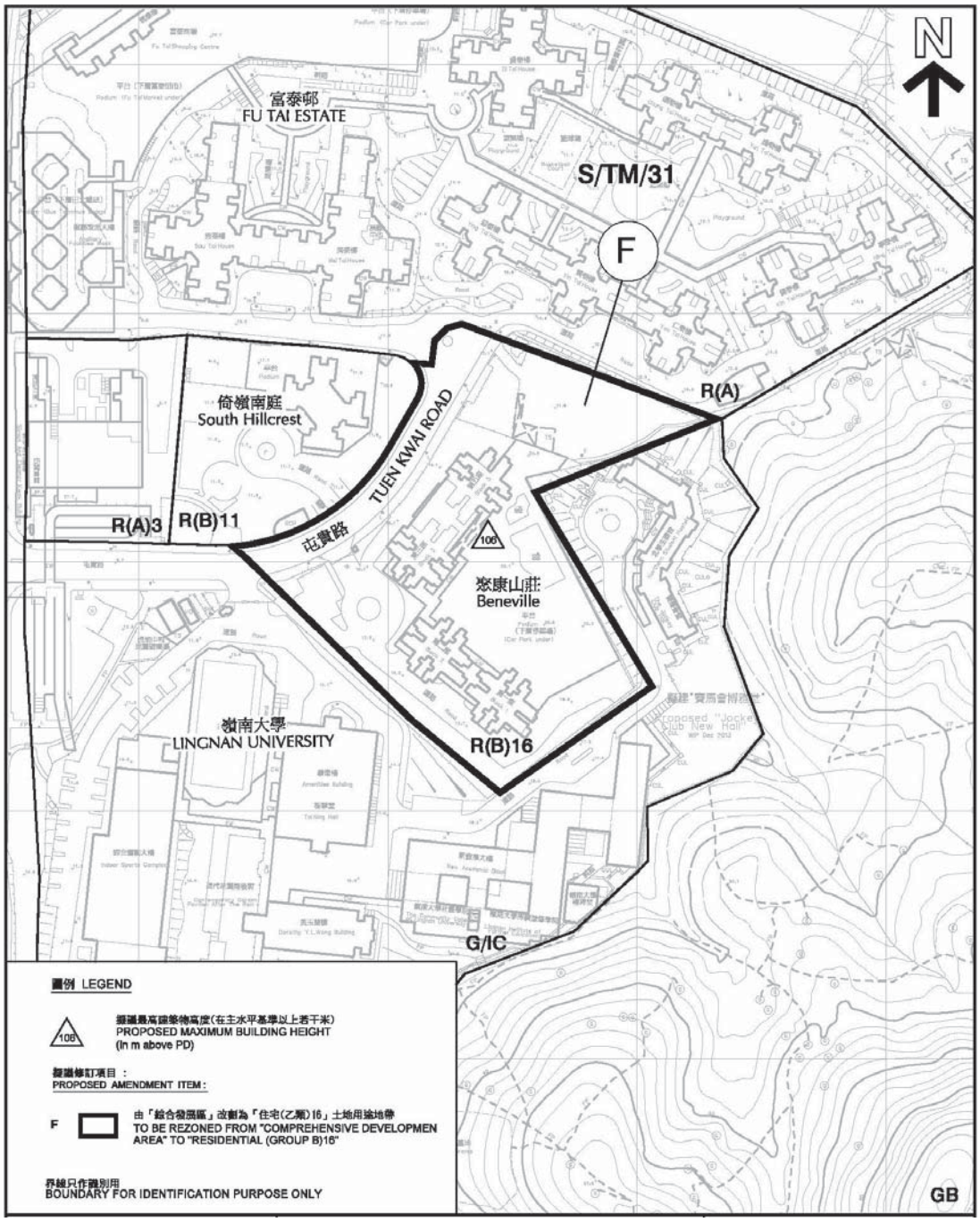

Figure 6.16 Site plan of Site F

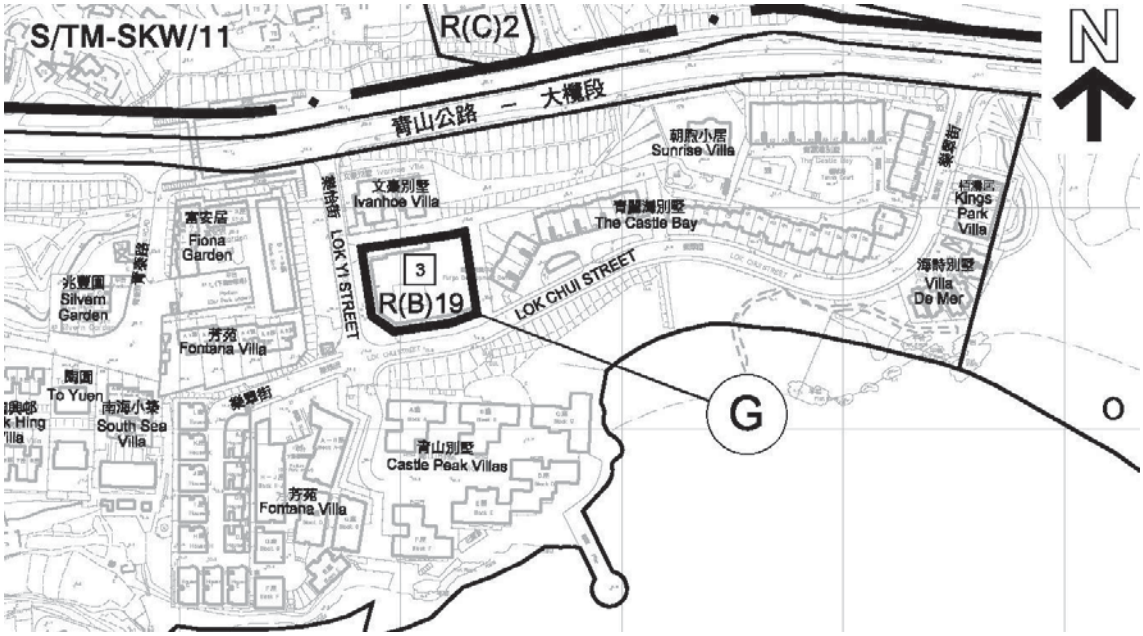

Figure 6.17 Site plan of Site G

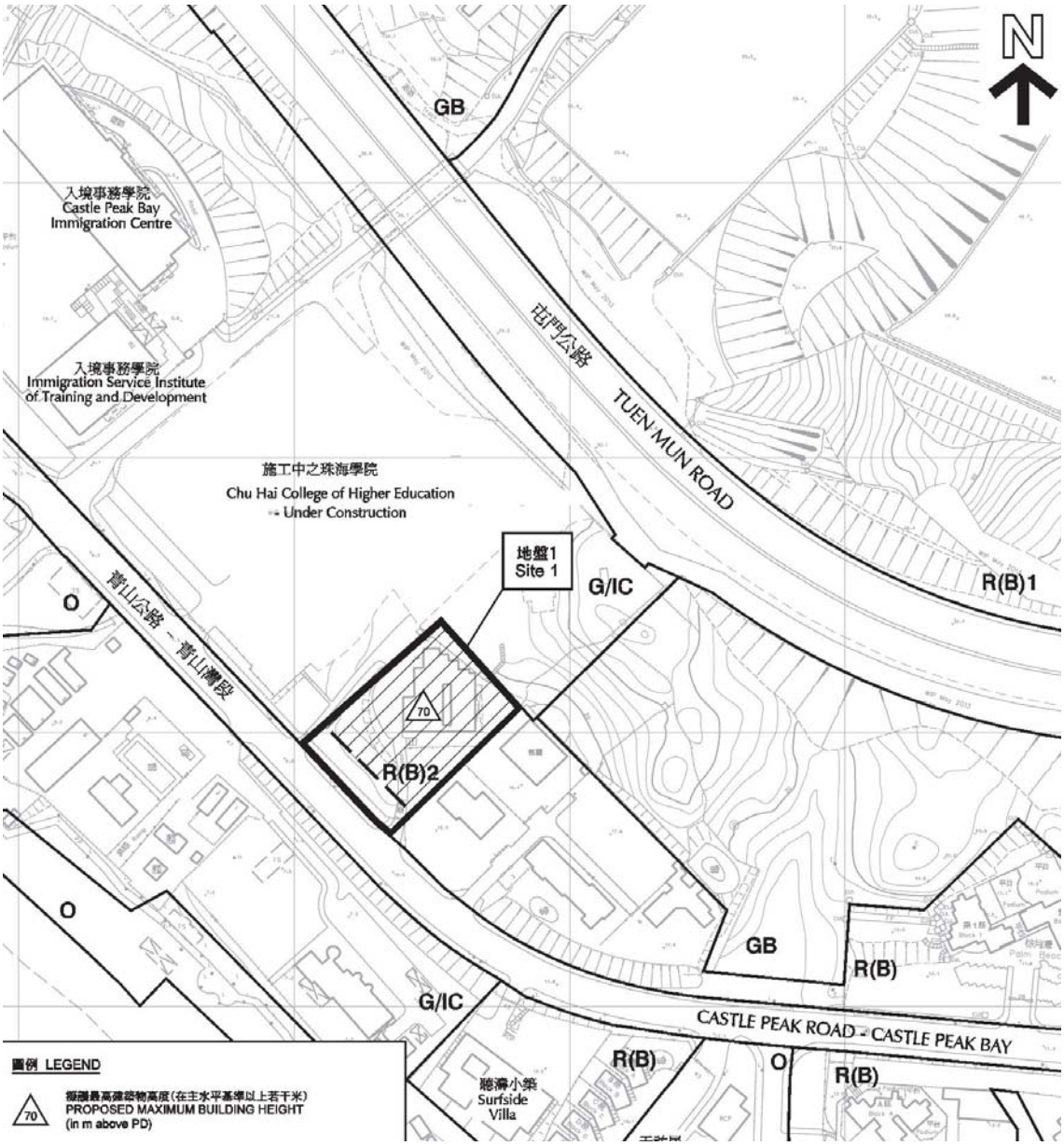

Figure 6.18 Site plan of Other Housing Site 1

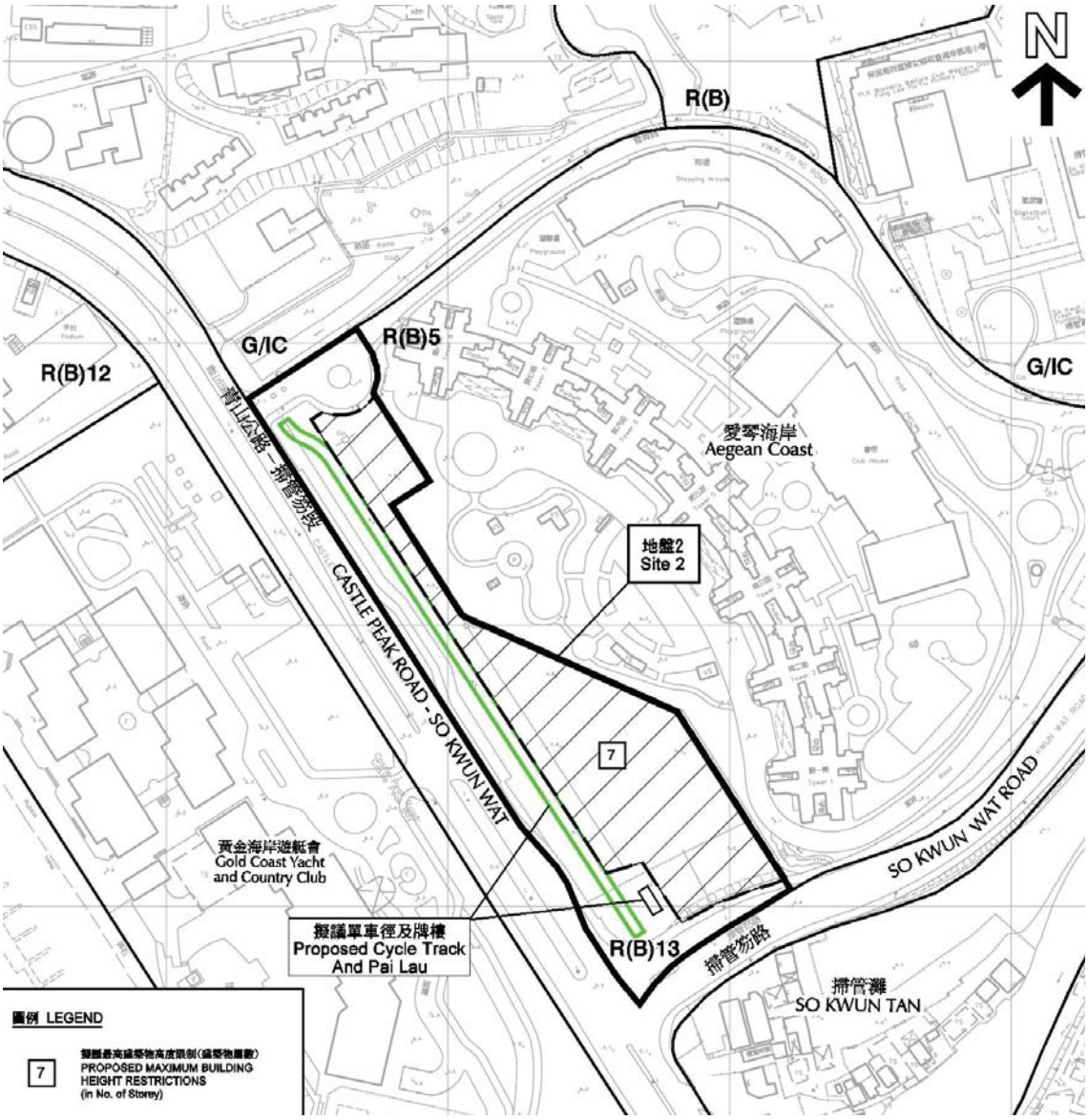

Figure 6.19 Site plan of Other Housing Site 2

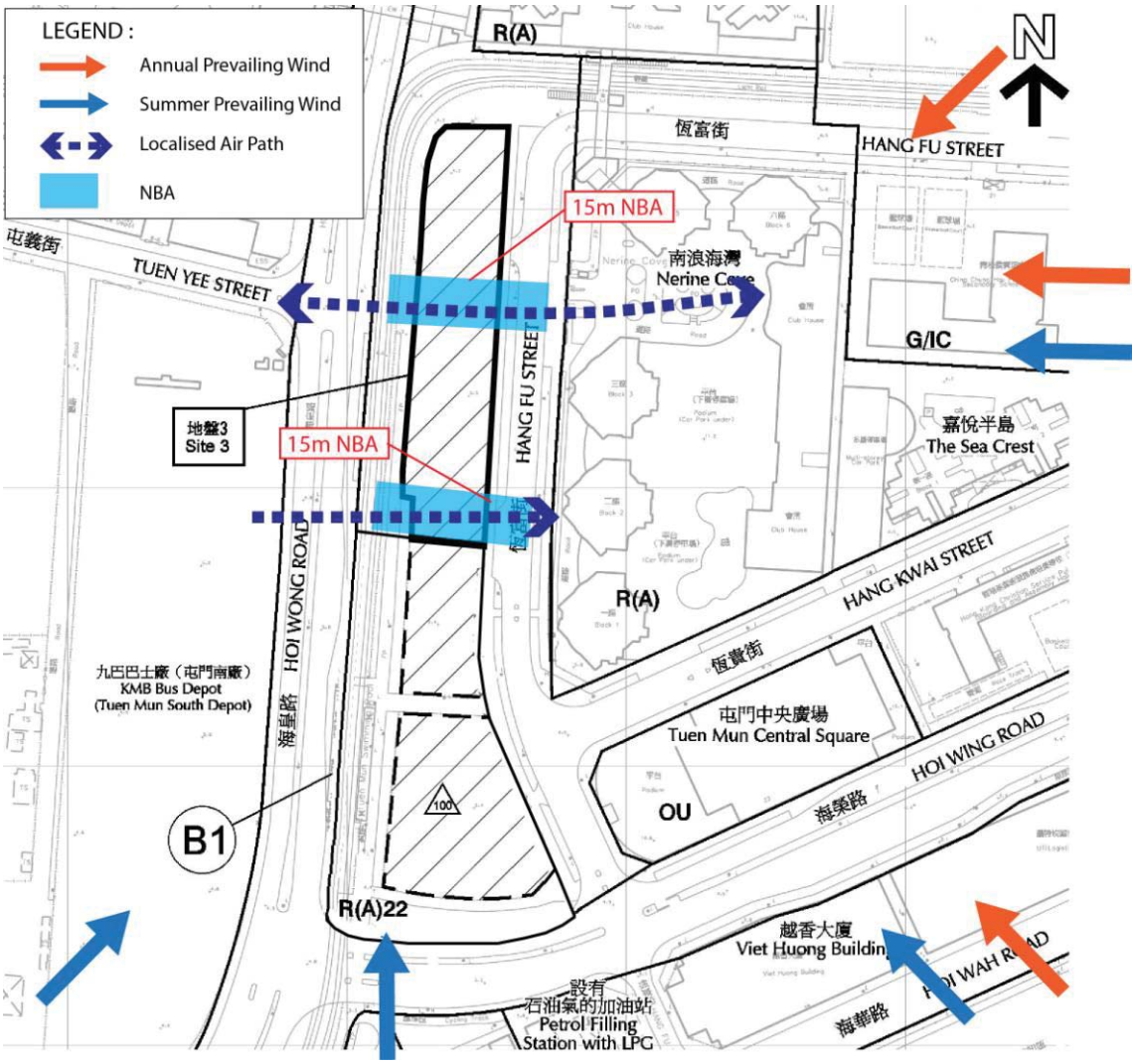

Figure 6.20 Site plan of Other Housing Site 3 and wind environment of its surroundings

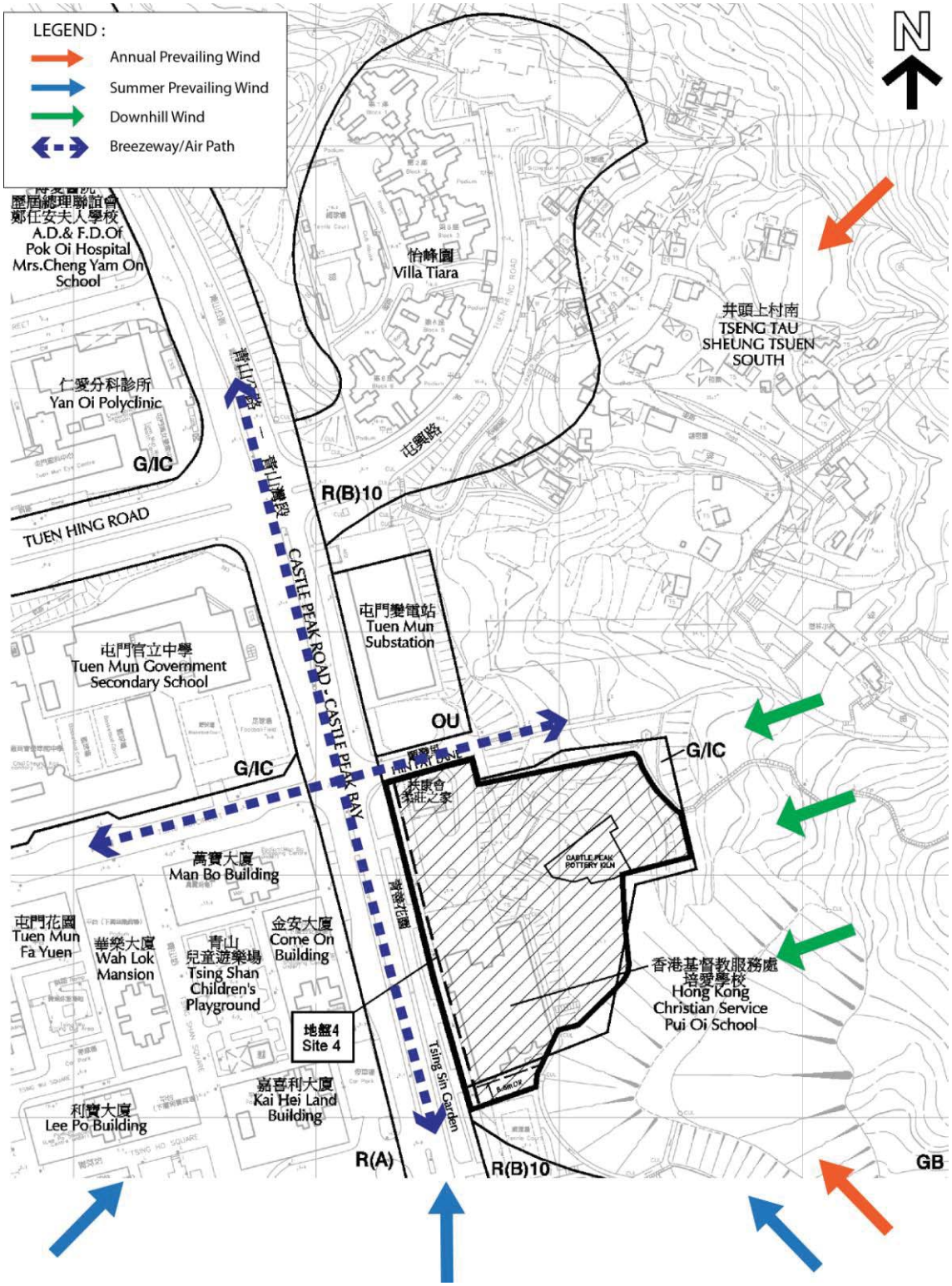

Figure 6.21 Site plan of Other Housing Site 4 and wind environment of its surroundings

7.0 Further Work

Given that both designated NBAs and requirement of building separation requirements would be fulfilled as recommended for individual sites, the study area would have no major air ventilation issues. If these requirements cannot be met, further quantitative AVA studies should be conducted to assess their air ventilation performance.

Sites C2 and C3 occupy a large area of about 5 hectares. Future developments on these sites would impose air ventilation impacts on the surrounding areas In order to allow for design flexibility for the future development, no NBAs are fixed for the sites although directional recommendations of these NBAs of at least 15m wide are included. It is therefore recommended that quantitative AVAs should be conducted in the detailed design stage to identify the NBAs and other enhancement measures and to ascertain their effectiveness.

Site C9 occupies a significant waterfront location that is an important inlet of sea breezes. It also has a long lot frontage exceeding 100m in length. In order to allow for design flexibility for the future development, no NBAs are fixed for this site although it is considered that an NBA of at least 15m wide should align with the proposed building gap in Chu Hai College of Higher Education. A quantitative AVA should be conducted for Site C9 in the detailed design stage to identify the NBAs and other enhancement measures and to ascertain their effectiveness.

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Prepared by

Date: 15 May 2014

Dr. Justin Ho

Endorsed by

Date: 15 May 2014

Professor Edward Ng

On behalf of technical experts in the term consultant term

School of Architecture, CUHK,
Shatin, NT, Hong Kong
T: 39436515 F: 26035267
E: edwardng@cuhk.edu.hk

Consultant team

	Expertise
Professor Edward Ng CUHK, Hong Kong	Coordinator, Architect, Environmental scientist, AVA methodology
Miss Betty Ho PlanArch Consultants Ltd.	Planner, Planning requirements and constraints
Professor Jimmy Chi-Hung Fung HKUST, Hong Kong	Mathematician, Mesoscale wind simulation, Climatic studies
Dr S C Kot (retired) HKUST, Hong Kong	Mechanical Engineer, Aerodynamicist, Computational Fluid Dynamics (CFD), Wind tunnel engineer
Professor Chao Ren CUHK, Hong Kong	Architect, Urban Climatologist
Dr Justin Ho CUHK, Hong Kong	Environmental scientist