



**TERM CONSULTANCY FOR
AIR VENTILATION ASSESSMENT SERVICES**

**Cat. A1– Term Consultancy for Expert Evaluation and Advisory
Services on Air Ventilation Assessment (PLNQ 37/2007)**

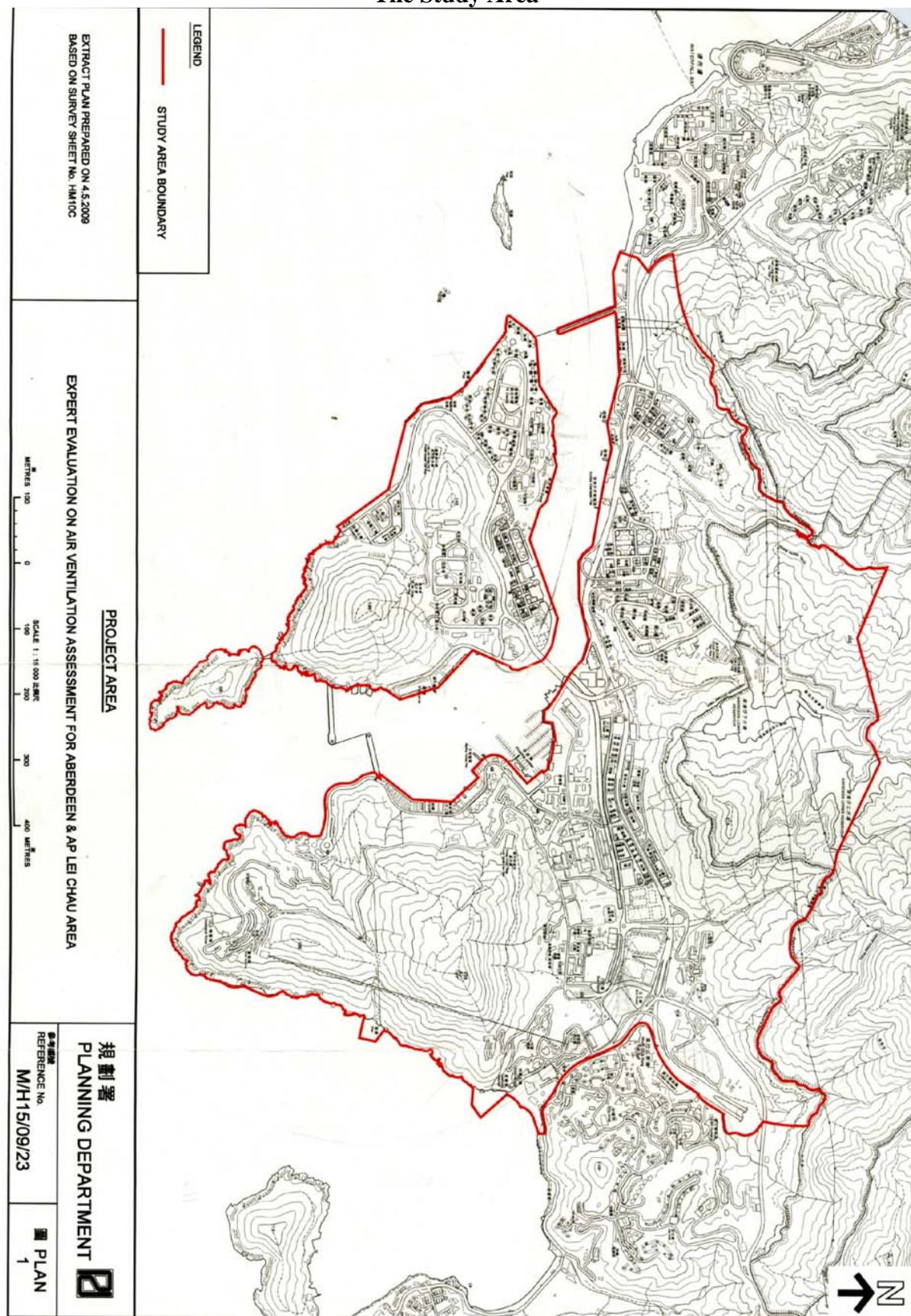
**Final Report
Aberdeen & Ap Lei Chau Area**

April 2010



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The Study Area



Expert Evaluation Report of Aberdeen & Ap Lei Chau Area

Executive summary

0.1 Wind Availability

(a) Based on the available wind data, one may conclude that the annual wind of the study area is mainly from the East and North-East. The directions of summer winds are ranging from the East, Southerly quarters, and the West. There is a strong east-west channeling at/near ground level due to the surrounding topography.

0.2 Topography

(a) For background wind coming from the northeast and southeast, the wind profiles and characteristics will be affected by hills. Turbulence and re-circulation of wind when it moves downhill towards the study area is expected. To fully understand the wind characteristics in the study, a detailed topographical study is required. With that study, a more precise wind profiles and turbulence intensity profiles can then be identified.

(b) In general, some of the northeast winds are shielded and made slow by the northern hills while some are diverted and channeled into the area along Heung Yip Road and the nullah. Thus, wind of the east-west direction parallel to Heung Yip Road/nullah is the most dominant wind directions to be respected for air ventilation.

0.3 Existing conditions

(a) The existing building heights in absolute terms range from low buildings (20mPD) to high buildings (170mPD). Most of the tall buildings are residential buildings.

(b) Based on land-use map, the study area has extensive green coverage, mainly on the slopes of the surrounding hills and the vegetated hills in Ocean Park. They are useful in terms of cool and fresh air production. The study area also has some open spaces as “air ventilation spaces”. They include Wong Chuk Hang Recreation Ground, Aberdeen Sports Ground and Ap Lei Chau Park. They are very useful to the Area in terms of air ventilation.

(c) On the whole, the Ground Coverage Ratio of the study area is “low” to “medium”. There are few clusters of high Ground Coverage Ratio in the Area. As they are not extensive, they should pose no major air ventilation problems. However, they should be contained with no further extension. The building volume density of the Area is also low to medium.

(d) The Aberdeen area along Wong Chuk Hang Road has tall buildings and street canyons with the height to street width ratio (H/W) of 2:1 to 4:1. Wong Chuk Hang Road is the main air path under east-west channeling winds. Winds from the southerly quarters will be blocked by buildings on the southern side of Wong Chuk Hang Road.

(e) The site of Ex-Wong Chuk Hang Estate is vacant now. Together with the GIC sites of low buildings along Heung Yip Road/nullah, they form a wide and important east-west air corridor. The nullah along Heung Yip Road extends from the waterfront to the open spaces of Ocean Park. It also provides a very useful east-west air ventilation space /path to the study area. It should be respected and carefully designed and enhanced with trees and landscaped areas along its banks. Covering it up or building extensive structures over or near it is not recommended.

(f) In addition to Wong Chuk Hang Road and Heung Yip Road/nullah, the main east-west air paths include Police School Road, Welfare Road, Ap Lei Chau Bridge Road and South Horizon Drive. The main north-south roads from the waterfront in Aberdeen are also useful air paths to capture the sea breezes.

0.4 The Existing Conditions with Committed Developments

(a) There are a number of committed projects and several planned projects along the main air paths of Wong Chuk Hang Road and Heung Yip Road. Tall buildings along Wong Chuk Hang Road will reduce the efficacy of the road serving as the main east-west air path.

(b) A major committed project on the western side of Ap Lei Chau Praya Road is currently under construction. As the site is isolated, the project will not adversely affect the existing surroundings in terms of air ventilation.

0.5 Expert Evaluation and Recommendations of the Initial Planned Scenario

(a) It must be stressed that given Hong Kong's tall building urban morphology and demand to develop, building height restriction (or minor changes of building heights) is not the most effective method for maintaining and/or improving air ventilation. Breezeways, air paths, open spaces, gaps between buildings and building permeability – especially at/near ground level, are more effective.

(b) For Housing Department's estates in the Area, viz, Shek Pai Wan Estate, Tin Wan Estate, Lei Tung Estate and Ap Lei Chau Estate, the respective site areas are larger than 2 ha in general. Therefore, AVA should be conducted upon their redevelopment. In particular, for Ap Lei Chau Estate, it is useful to have 2 air paths each of 15-20m wide to extend from Yi Nam Road and the Hong Kong Southern District Government Primary School respectively to the waterfront in the north. The air path should be as straight as possible to channel southerly winds and sea breezes. One of them should run through the bus terminus to facilitate a better air flow (indicative alignments shown on Figure 7.2). The AVA for Ap Lei Chau Estate upon redevelopment should ascertain the exact alignment and width of the air paths.

(c) For Yue Kwong Chuen of the Hong Kong Housing Society, although it is not located at the critical air path, its site area approaches 2 ha. It is highly recommended that AVA may be considered for its future redevelopment.

(d) The existing Tin Wan Shopping Centre and Tin Wan Estate Car Park building are low-rise developments, and are located in the middle part of the Tin Wan area sloping down from the northeast to the waterfront at the southwest. The cool katabatic wind of the valley (downhill hill movement) from the northeast to reach the areas at the southwest is especially important when the background wind is weak. That wind must be taken into consideration and respected upon redevelopment of the shopping centre and carpark building.

(e) The major east-west air path lies parallel to Heung Yip Road/nullah area extending to the Aberdeen West Typhoon Shelter. Future development along this air path should not disturb air ventilation potential and should be substantiated by AVA. In particular, the future development at the former Ex-Wong Chuk Hang Estate site must be carefully designed for air ventilation. Disposition of the towers should maintain the east-west air flow. Terraced podium design should be considered. Voids between towers and podium to allow porosity near ground level should also be considered.

(f) For the air ventilation of Old Main Street Aberdeen, it serves as a useful air path when wind comes from the south. However, the street canyon is perpendicular to prevailing wind from the east. As the ratio of the heights of buildings along the street to the width of that street is high, it may be difficult for the easterly to downwash from the top of the buildings to the street level. The street would therefore need to rely on the horse-shoe vortex effect for air ventilation, which channels the eastern wind from the streets on either side via the street junctions flowing to the inner part of Old Main Street Aberdeen. The street currently has a width ranging from about 6.5m to 7.5m. It is therefore beneficial to widen the street so as to enhance the penetration of the vortexes. Set-back of buildings for street widening is a desirable arrangement. In addition, measures including provision of greening and pedestrianisation to keep away vehicles may also be considered to reduce the need for air ventilation. However, taking into account the fact that the sites along this street are mainly small lots and the imposition of non-building area restriction to achieve the set-back will impose undue constraints on the future developments on these sites, a “second best” alternative of a 2m wide set-back above the podium is acceptable.

(g) Tang Fung Street is an important air path for Ka Wo Street and its surrounding areas providing beneficial air ventilation to the neighbourhood. It is therefore very important that it continue to function as the entrance to this important air path. There is a piece of private land adjoining the eastern end of the street. Hence, it is recommended that for the piece of private land, no building should obstruct or block the air path from the slope leading to Tang Fung Street. It should be designated as non building area. Due to practical considerations, a perforated podium not higher than 15m would be a compromise.

0.6 Further works

- (a) Based on the expert assessment, there should be no major air ventilation issue if the suggestions can be followed. Further study is not necessary.
- (b) There is no focus area of concern in the study area due to the generally medium-rise and medium volume density characteristics of the Area.

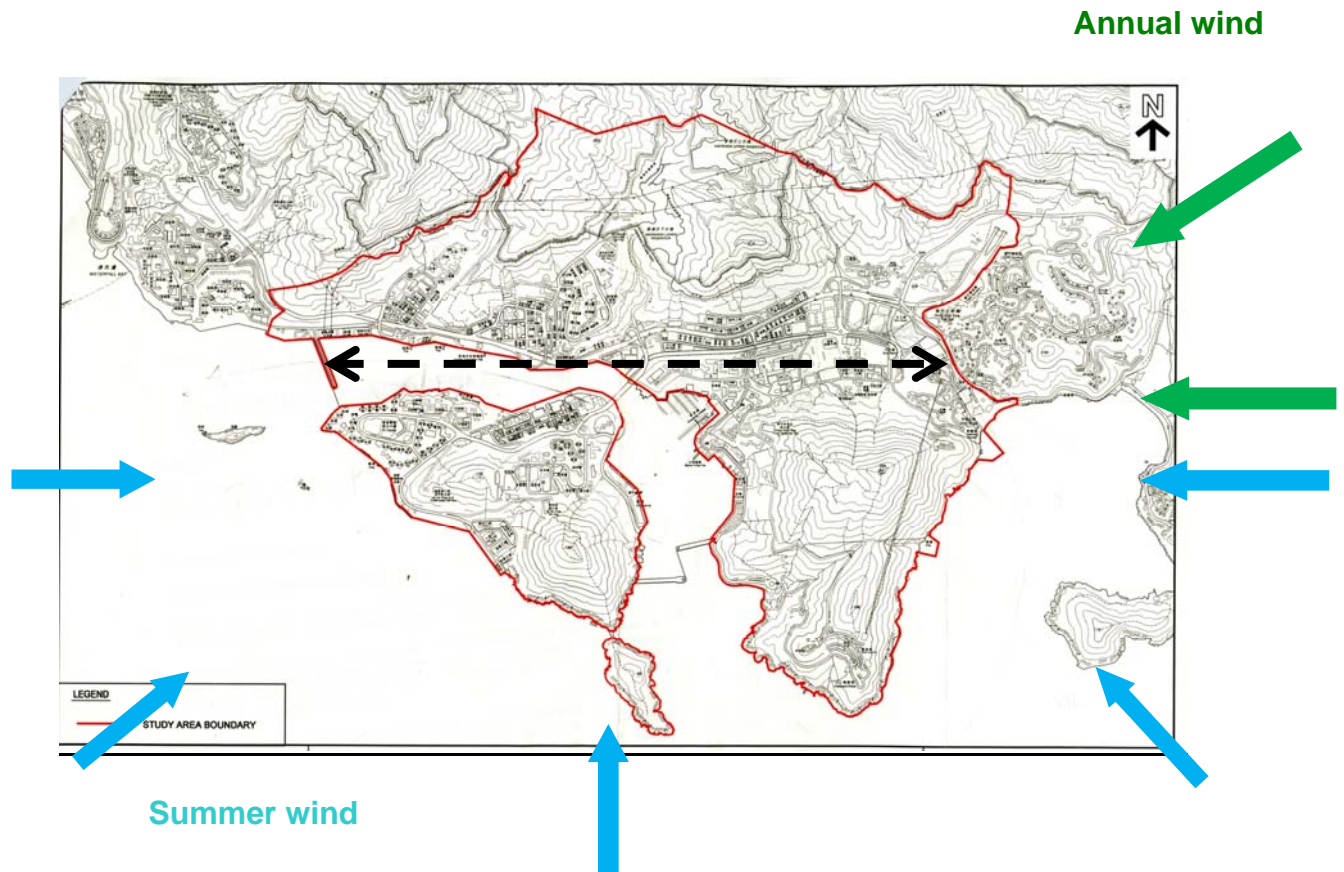


Figure 0.1 The wind in the study area

Expert Evaluation Report of Aberdeen & Ap Lei Chau Area

1.0 The Assignment

1.1 In order to provide better planning control on the building height upon development/redevelopment, the draft Aberdeen & Ap Lei Chau Outline Zoning Plan (OZP) No. S/H15/24 (the Plan) is being reviewed with a view to incorporating appropriate development restrictions in the Notes for various development zones of the OZP to guide future development/redevelopment. It is considered necessary to conduct an expert evaluation to assess the preliminary Air Ventilation impacts of the proposed building height restrictions.

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

- existing building height (in mPD & storeys) for Aberdeen & Ap Lei Chau Area
- existing building age profile
- proposed building height restrictions (in mPD) for Aberdeen & Ap Lei Chau Area
- committed projects and planned projects
- aerial photo of Aberdeen & Ap Lei Chau Area
- survey sheets covering Aberdeen & Ap Lei Chau Area

1.3 During the writing of the report, the consultant has working sessions with colleagues at Planning Department on 29th October 2009 and 19th March 2010. The consultant has studied the above mentioned materials, and has conducted site inspection on 24th November 2009.

2.0 Background

2.1 Planning Department's study: "Feasibility Study for Establishment of Air Ventilation Assessment System" 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 study summarizes 10 qualitative guidelines for planners and designers. For the preparation of OZPs, all the 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 study also suggests that Air Ventilation Assessment (AVA) be conducted at 3 stages: Expert Evaluation, Initial Studies, and Detailed Studies. The suggestion have been adopted and incorporated into HPLB and ETWB Technical Circular no. 1/06. 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 Area, as well as the surrounding areas.
- (c) Analyse the greenery/landscape characteristics of the Area, as well as the surrounding areas.
- (d) Analyse the land use and built form of the Area, as well as the surrounding areas.

Based on the analyses:

- (e) Estimate the characteristics of the input wind conditions of the Area.
- (f) Identify the wind paths and wind flow characteristics of the 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 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) Compare the prima facie impact, merits or demerits of the building height restrictions as proposed by Planning Department on Air Ventilation.
- (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 of the wind environment in Hong Kong (Figure 3.1). There are some 46 stations operated by HKO in Hong Kong. Together, they allow a very good general understanding of the wind environment especially close to ground level.



Figure 3.1 Some of the HKO stations in Hong Kong. This is a screen capture at 10:00 on 21 Oct 2009 from the HKO website. The arrows show the wind directions and speeds of the time.

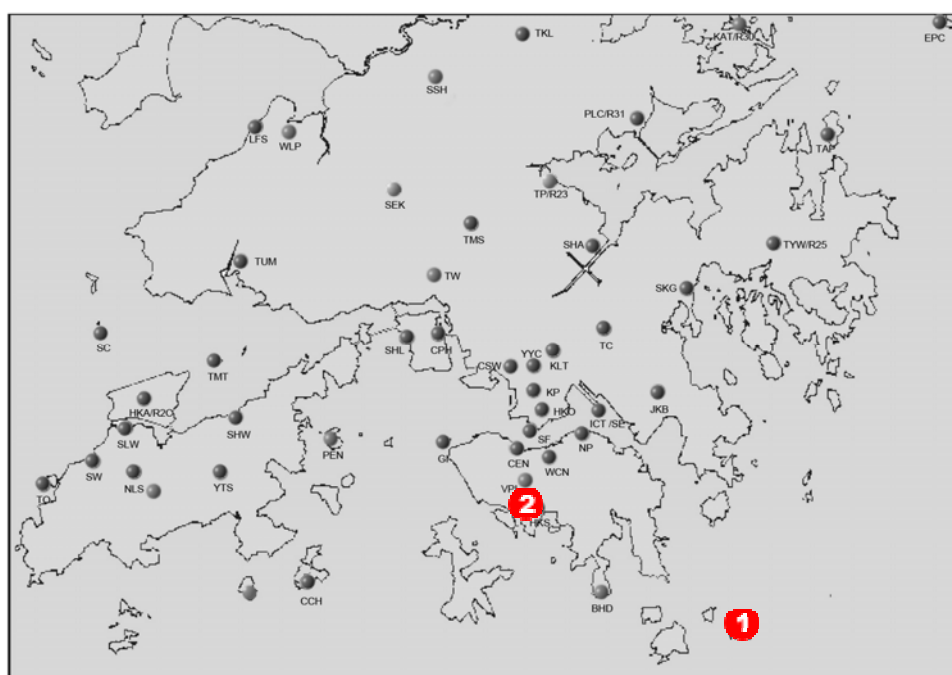


Figure 3.2 The HKO stations at 1: Waglan Island (WGL), 2: Wong Chuk Hang (HKS),

3.2 The HKO station at Waglan Island (WGL) is normally regarded by wind engineers as the reference station for wind related studies (Figure 3.3). The station has a very long measuring record, and it 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 Examining the annual wind rose of WGL, it is apparent that the annual prevailing wind in Hong Kong is from the East. There is also a major component of wind coming from the North-East; and there is a minor, but nonetheless observable component from the South-West. Around 70% of the time, WGL has weak to moderate wind (0.1m/s to 8.2 m/s).

3.4 For the study, it is useful to understand the wind environment seasonally or monthly (Figure 3.4 and 3.5). In the winter months of Hong Kong, the prevailing wind comes from the North-East. In the summer months, they come from the South-West. As far as AVA is concerned, in Hong Kong, the summer wind is very important and beneficial to 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 South-West) into the urban fabric.

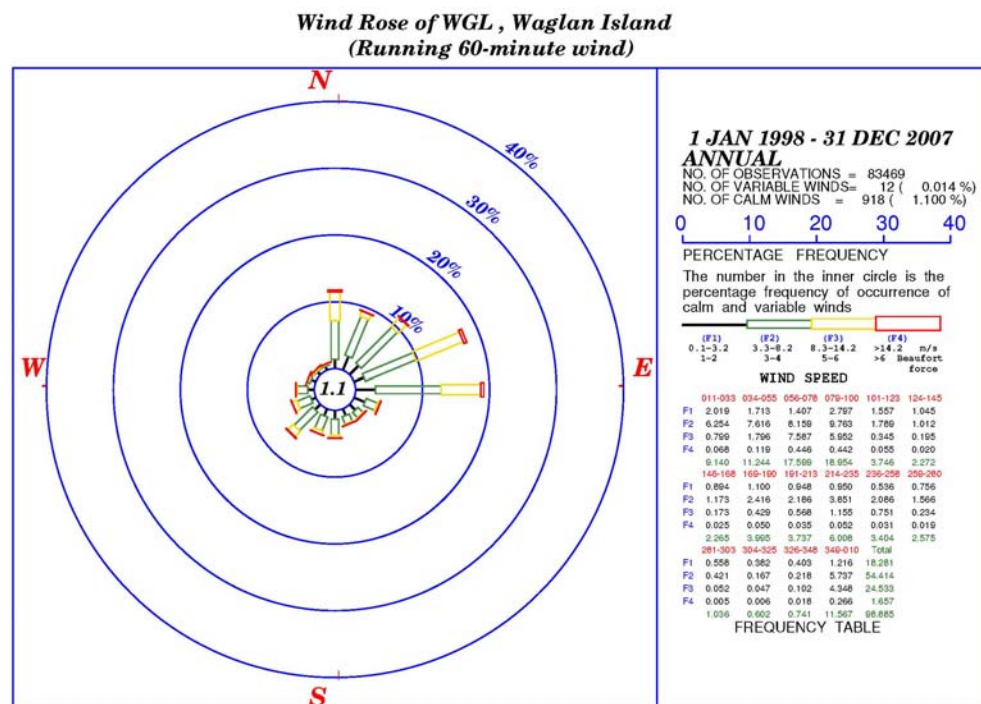


Figure 3.3 Wind rose of WGL 1998 – 2007 (annual) [Wind data in 1998 – 2007 are the latest available 10-year data from HKO to the consultant.]

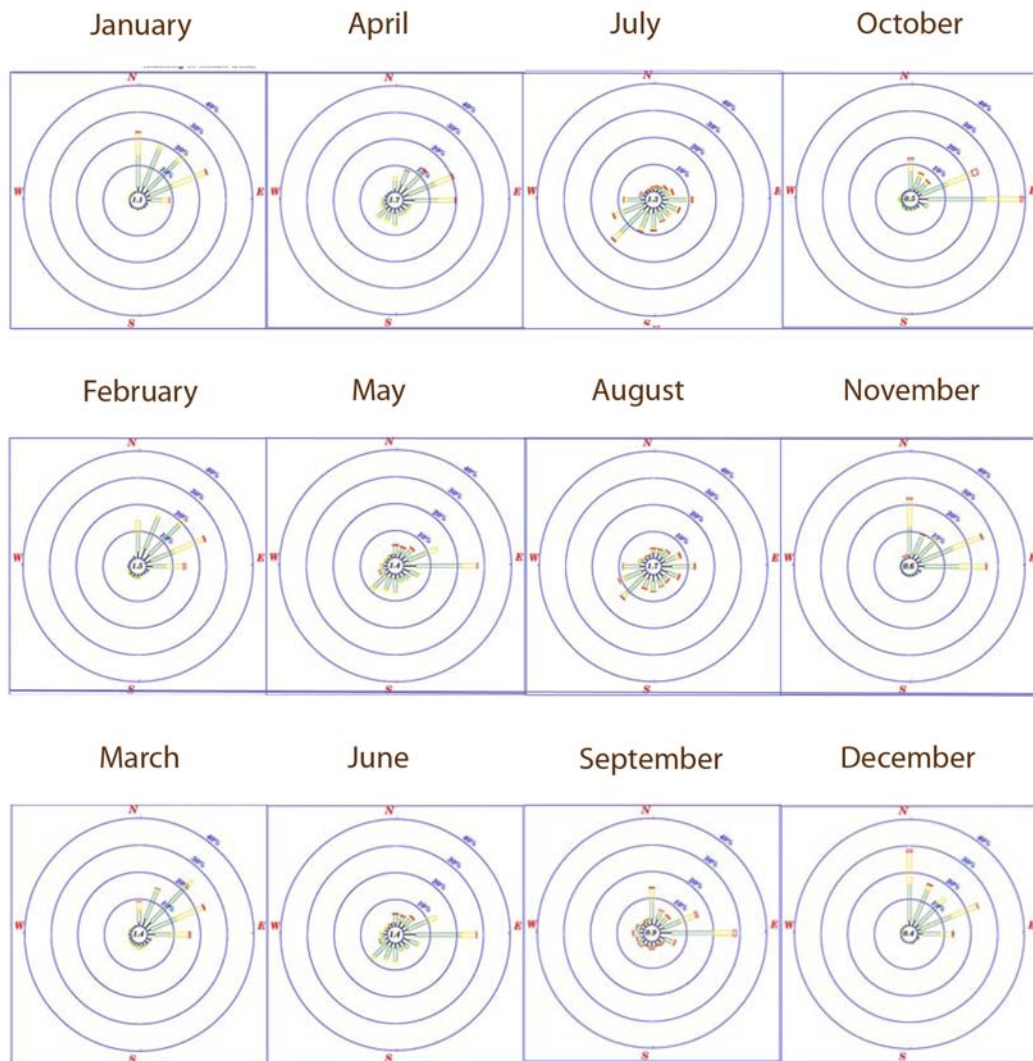


Figure 3.4 monthly wind roses of WGL 1998 – 2007

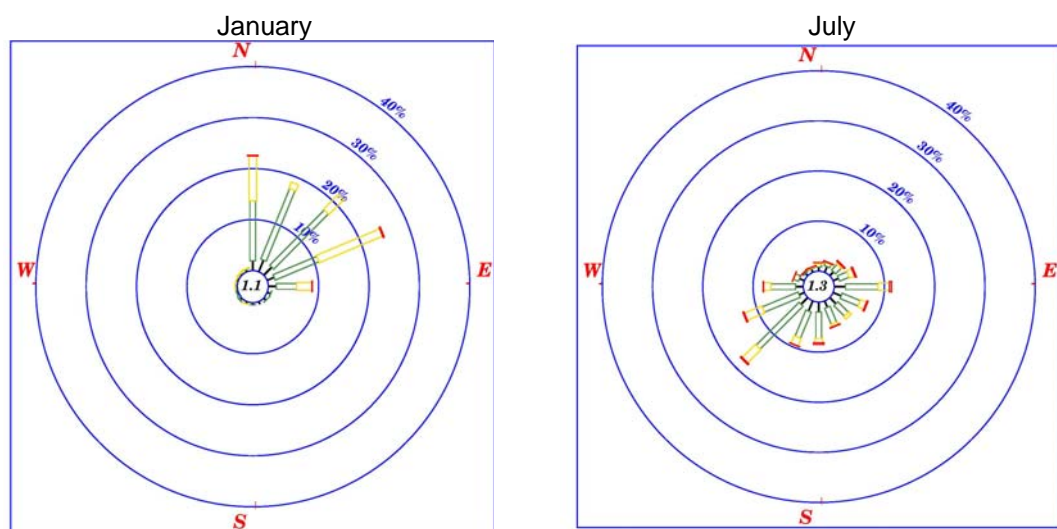


Figure 3.5 Wind roses of WGL 1998 – 2007 (Jan and July)

**Wind Rose of HKS, Wong Chuk Hang (Police Training School)
(Running 60-minute wind)**

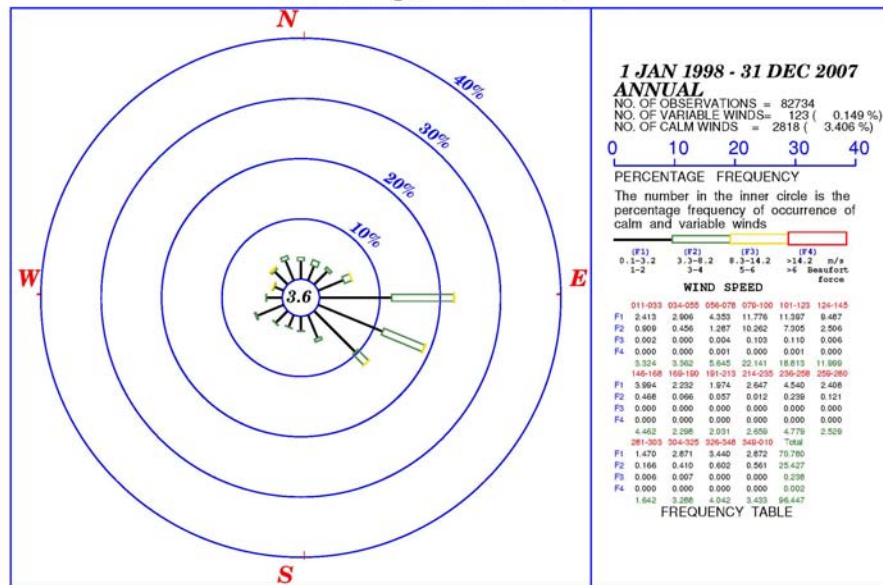


Figure 3.6 Wind rose of Wong Chuk Hang 1998-2007 (annual)

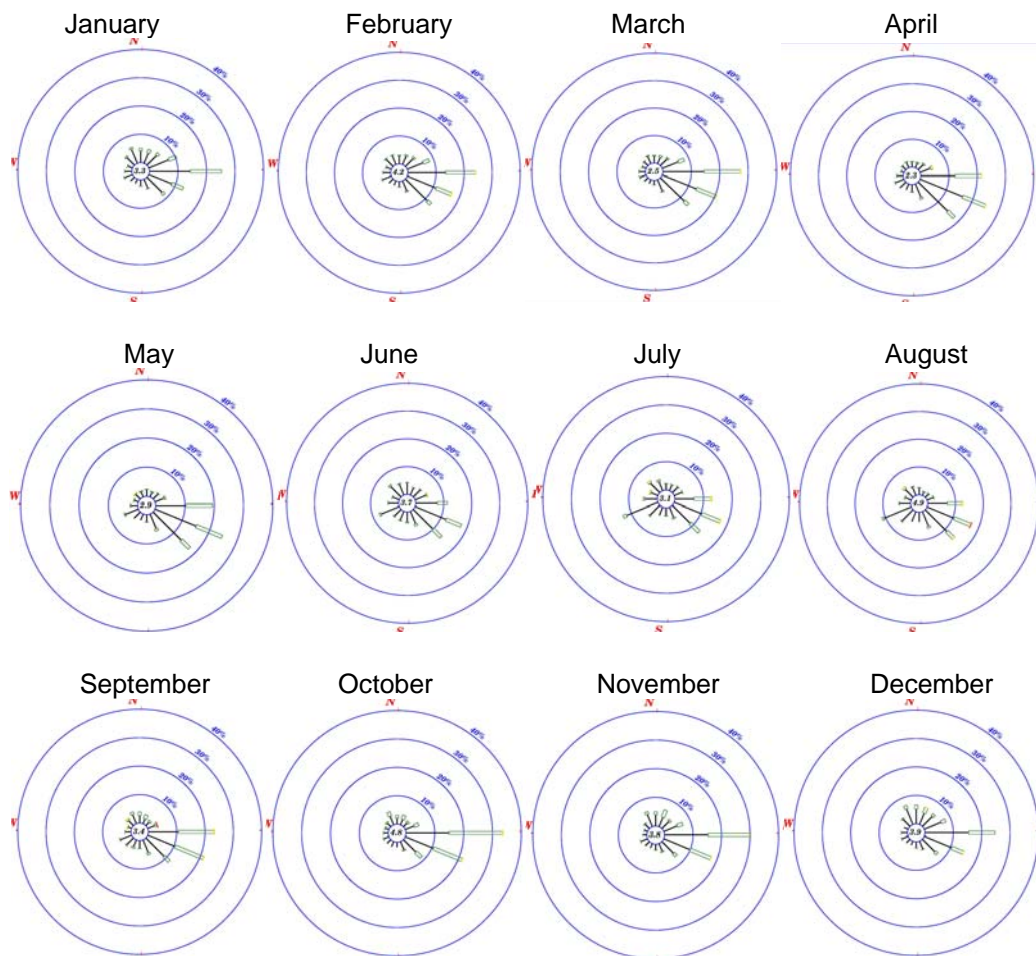


Figure 3.7 monthly wind roses of Wong Chuk Hang 1998 – 2007

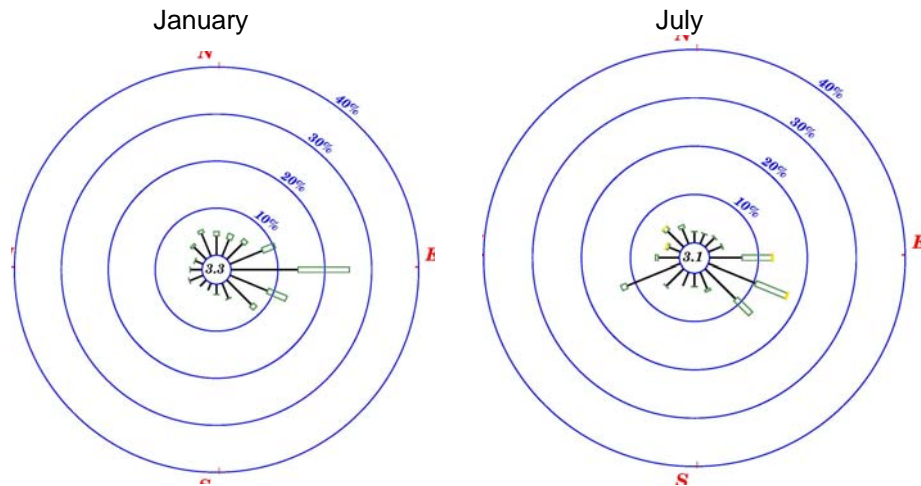


Figure 3.8 Wind roses of Wong Chuk Hang 1998 – 2007 (Jan and July)

3.5 The HKO station at the Hong Kong Police College in Wong Chuk Hang (HKS) is in the study area (Figure 3.6 to 3.8). Annually and in summer, strong east west channeling winds can be observed.

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 MM5. The data period cover the whole year of 2004. Based on this dataset, 3 locations of the Area are extracted at 60m, 120m and 450m above ground (Figures 3.9 to 3.15).

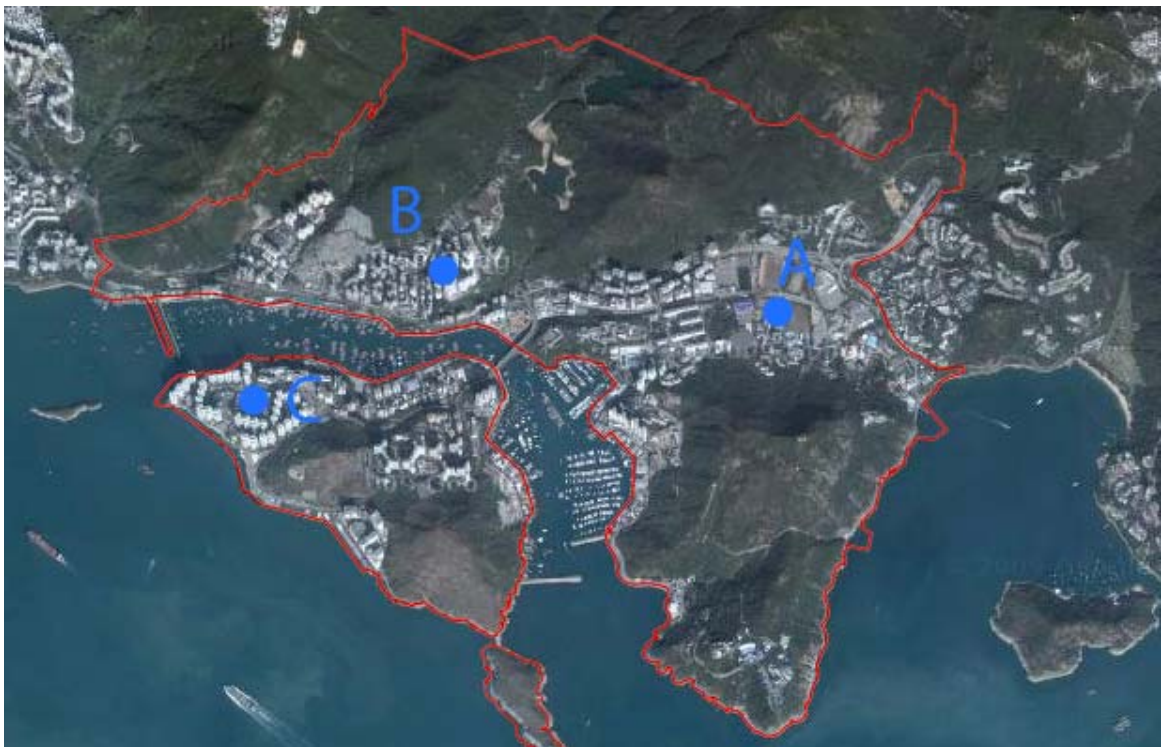


Figure 3.9 The 3 locations of MM5 extracted data

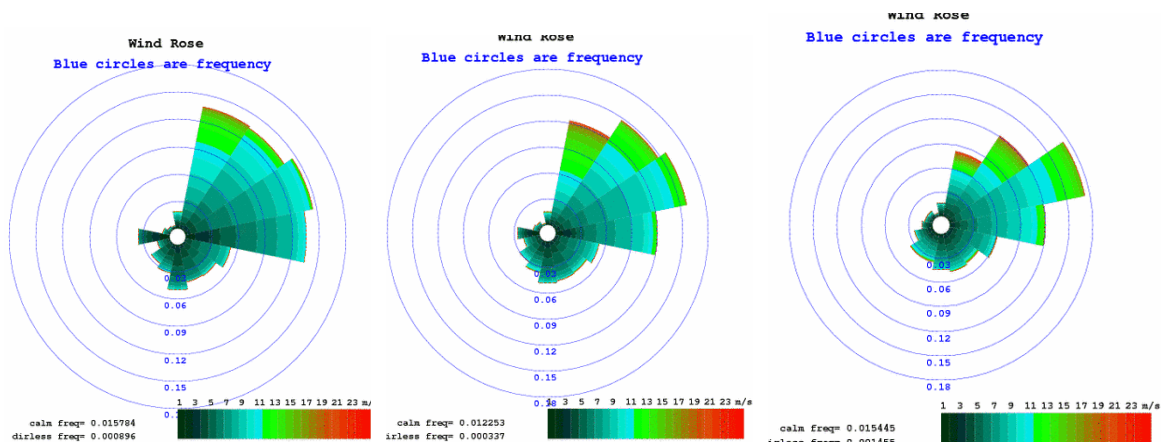


Figure 3.10 Wind roses (annual) at A (60m; 120m; 450m)

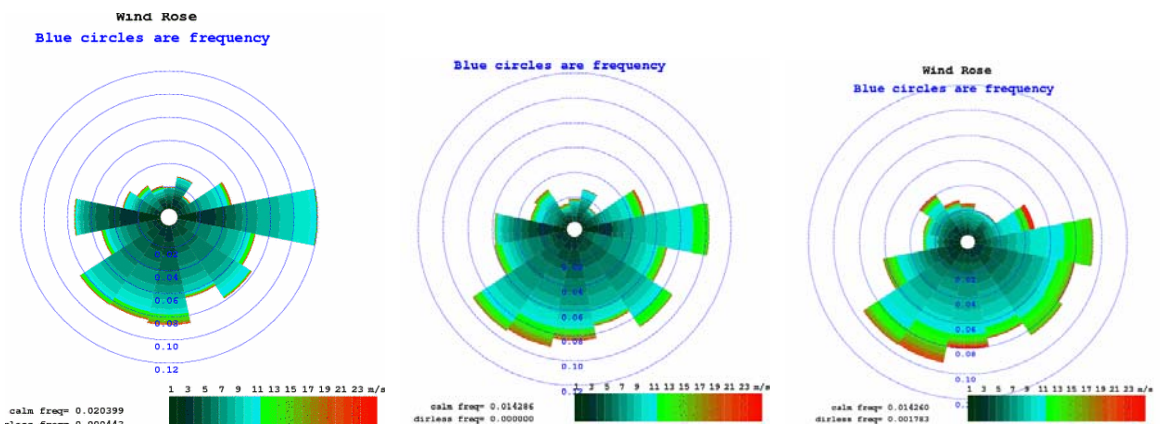


Figure 3.11 Wind roses (summer) at A (60m; 120m; 450m)

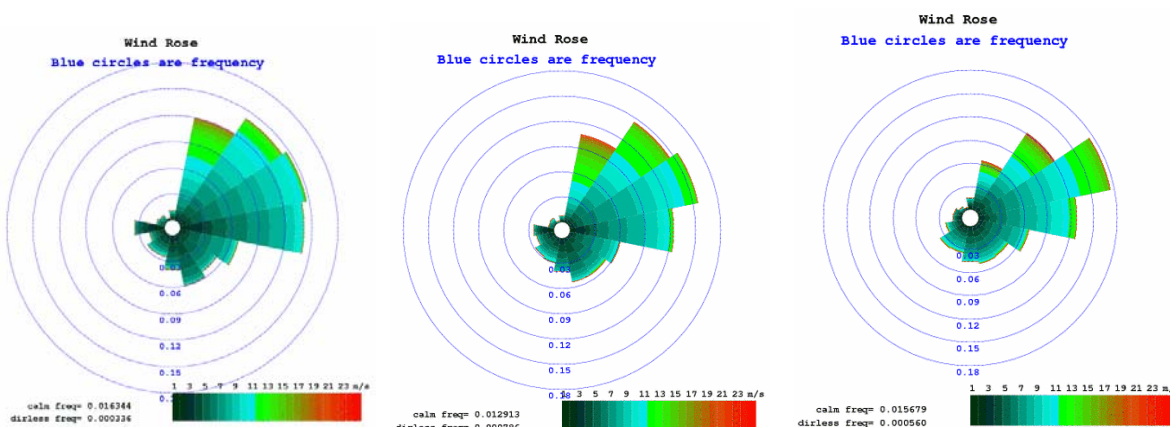


Figure 3.12 Wind roses (annual) at B (60m; 120m; 450m)

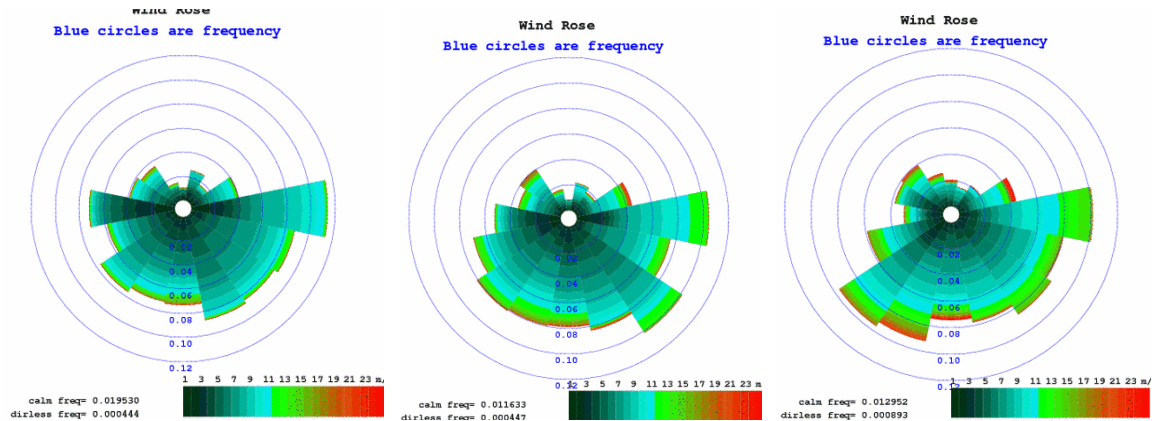


Figure 3.13 Wind roses (summer) at B (60m; 120m; 450m)

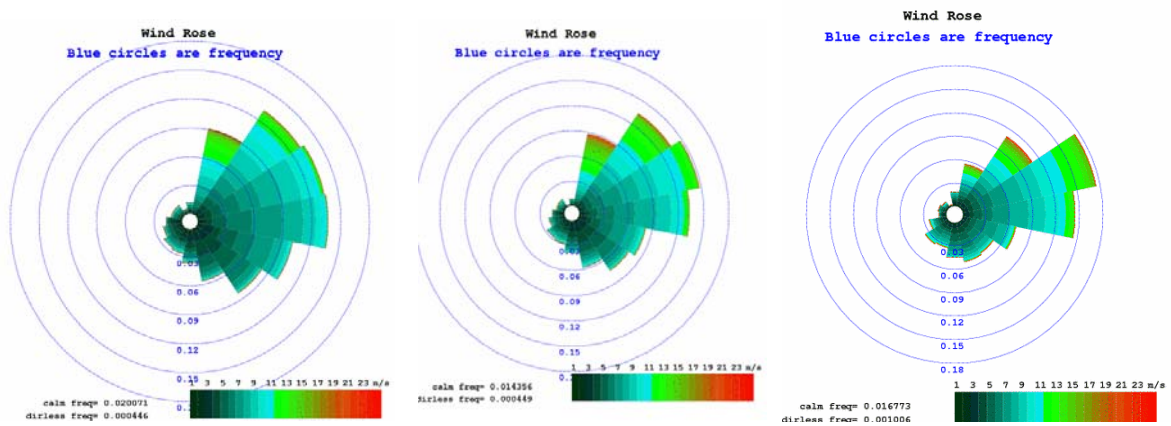


Figure 3.14 Wind roses (annual) at C (60m; 120m; 450m)

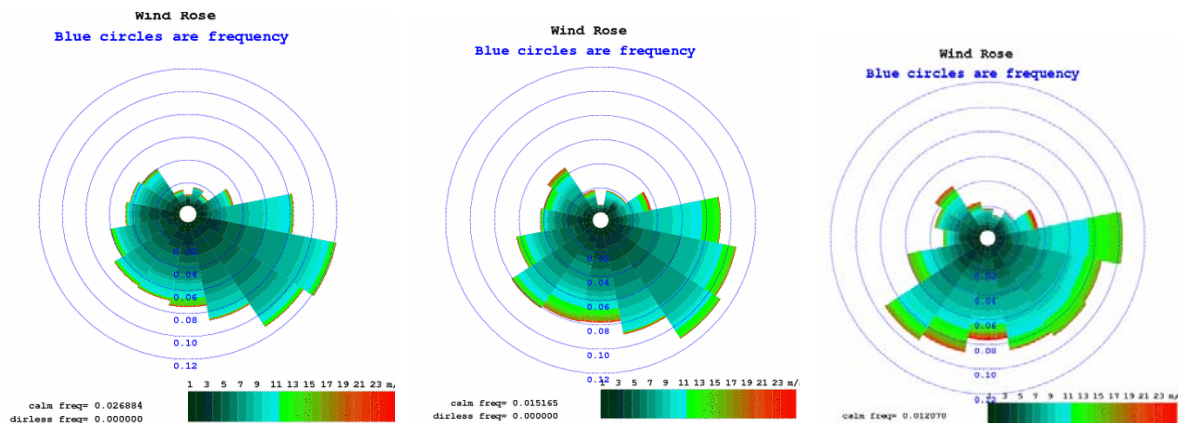


Figure 3.15 Wind roses (summer) at C (60m; 120m; 450m)

3.7 Using the simulated MM5 data, the annual and the summer prevailing wind directions of the study area and the surroundings can be evaluated as in Figure 3.16 and 3.17.

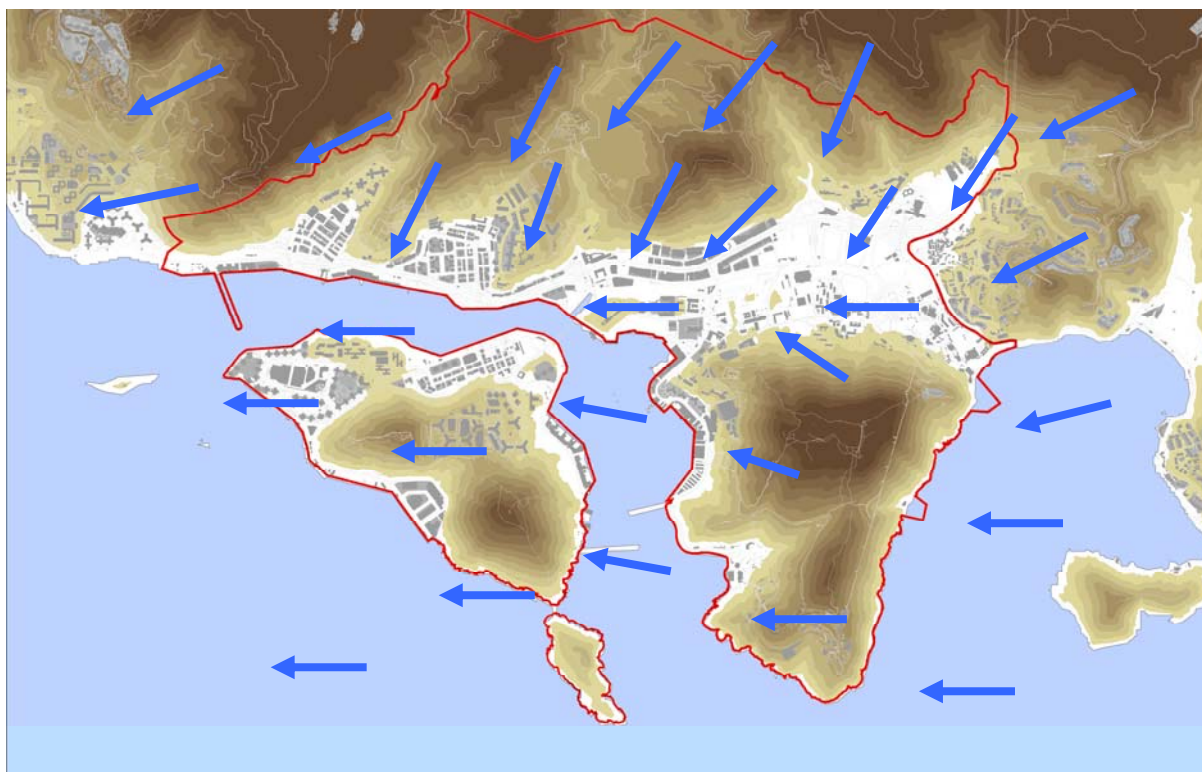


Figure 3.16 Prevailing wind directions at 60m (annual) of the based on MM5

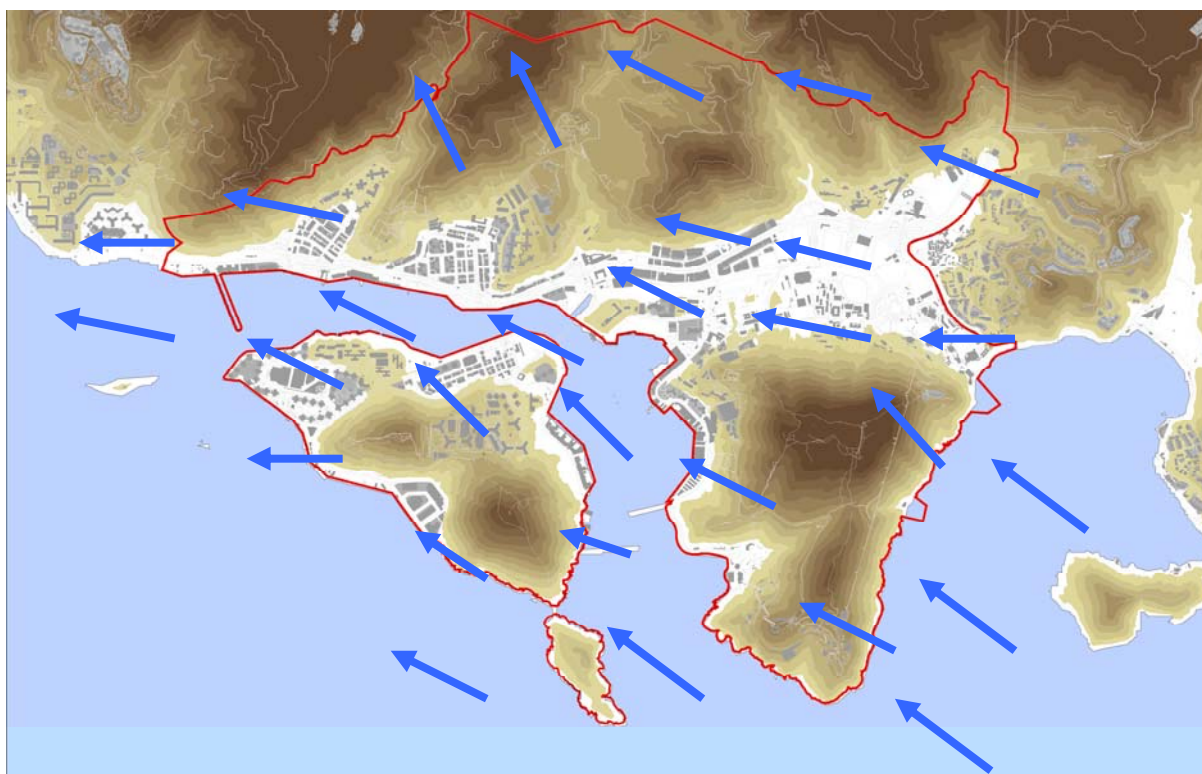


Figure 3.17 Prevailing wind directions at 60m (summer months Jun-Aug) based on MM5

3.8 Based on the MM5 simulated wind roses of the 3 locations extracted, one can evaluate that there are little differences among them (Table 1) in terms of the prevailing wind directions.

Table 1 Evaluated prevailing directions of the 4 locations

	Annual	Summer
A	E, NE	E, S, W, SW, SE
B	E, NE	E, S, W, SW, SE
C	E, NE	E, S, SW, SE

3.10 In summary, based on the available wind data, one may conclude that the annual wind of the study area is mainly from the East and North-East. The direction of summer wind is ranging from the East, Southerly quarters, and the West. There is a strong east-west channeling at/near ground level due to the surrounding topography.

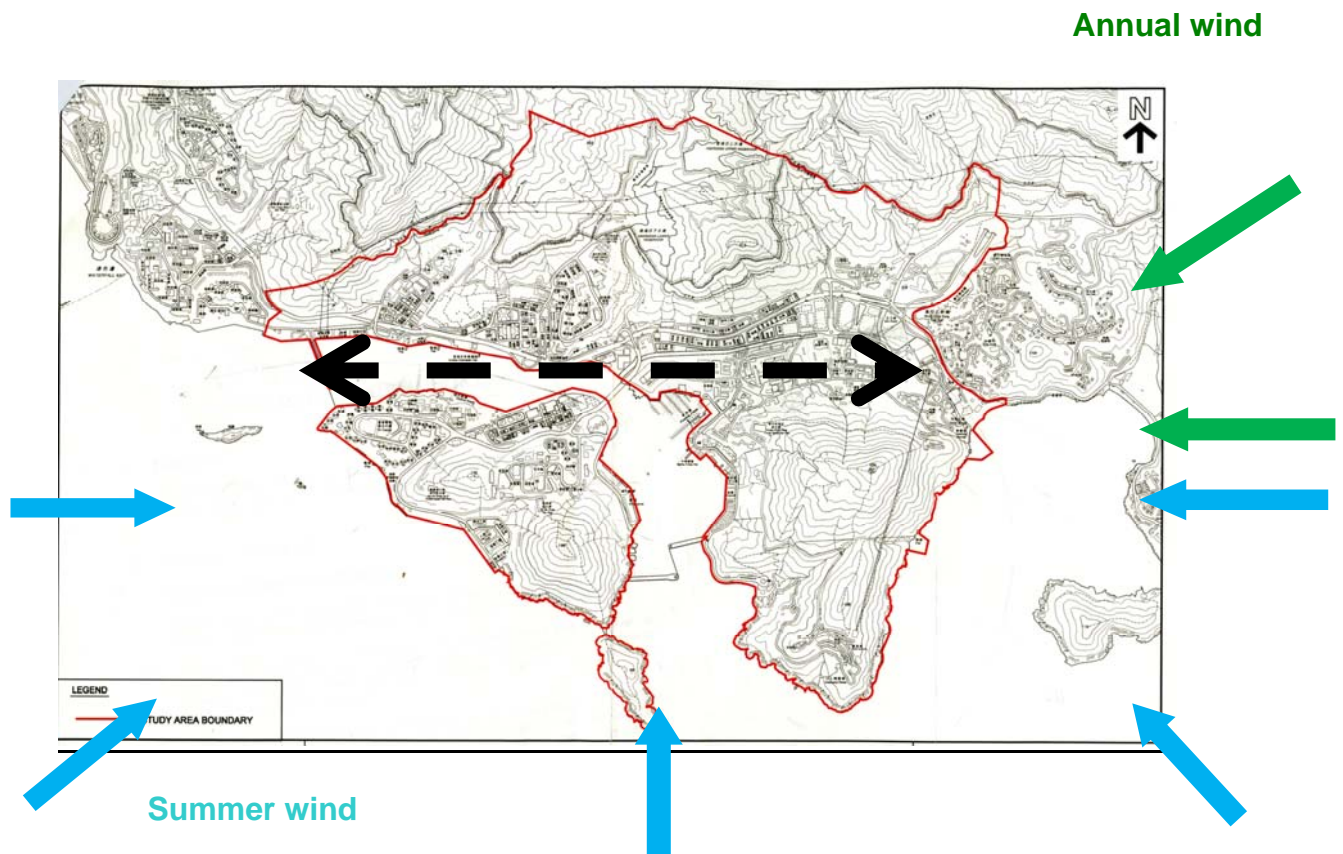


Figure 3.18 A summary of the winds of the Area

4.0 Topography, Land-Sea Breezes and the Urban Wind Environment

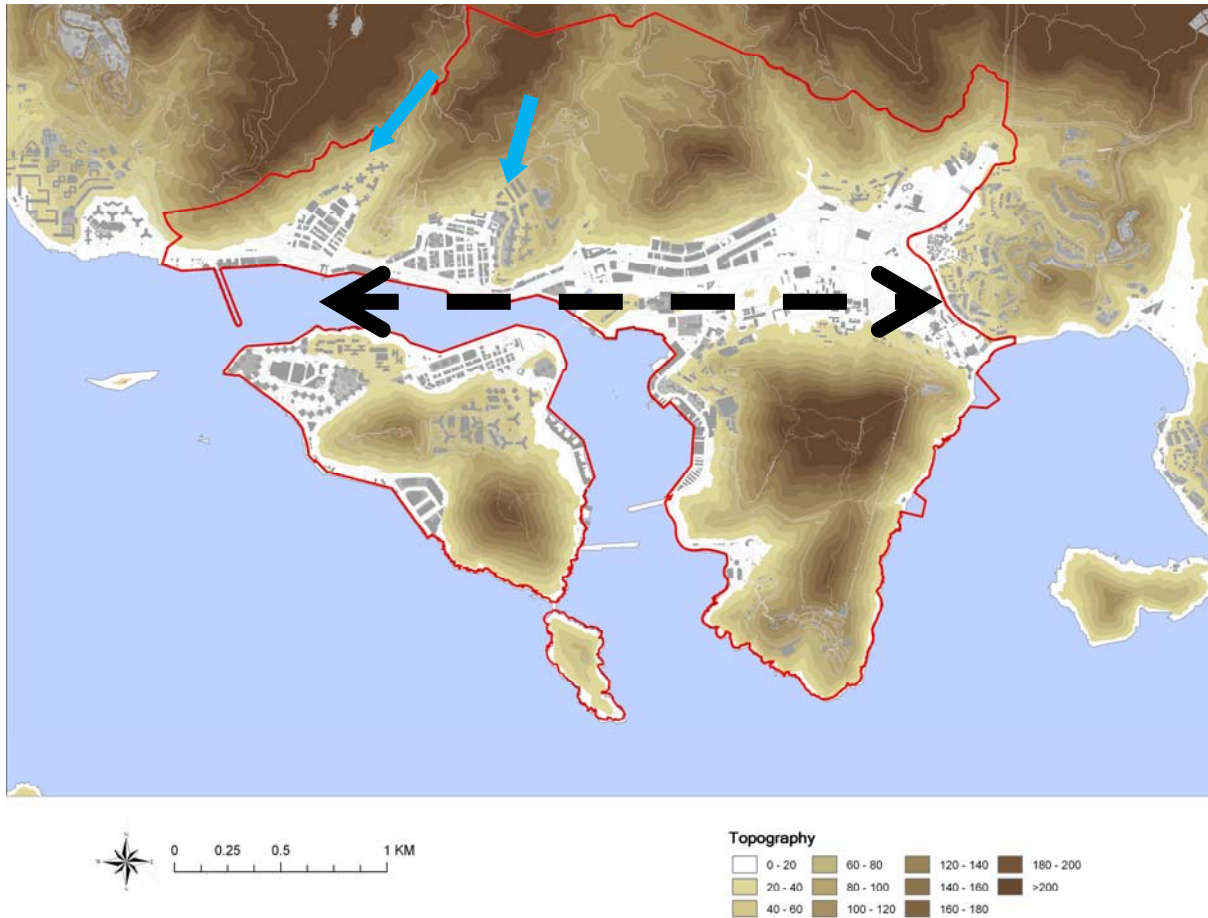


Figure 4.1 A digital elevation map of the Area (Blue arrows indicate valley wind systems; Black arrows indicate east-west winds)

4.1 The Area is at the south of Hong Kong Island. Surrounded by both hills and sea, it is influenced by topography (channeling) and sea breezes (from the southerly quarters). Please refer to Figure 4.1.

4.2 Wong Chuk Hang lies on the flat piece of land between the hill ranges of Aberdeen Country Park to the north and Nam Long Shan in the south. Aberdeen is on the waterfront between Aberdeen Country Park and Ap Lei Chau. Ap Lei Chau is an island, with hills in the middle and developments to the north.

4.3 For background wind coming from the northeast and southeast, the wind profiles and characteristics will be affected by hills. Turbulence and re-circulation of wind when it moves downhill towards the study area is expected (Figure 4.2).

4.4 In general, some of the northeast winds are shielded and made slow by the northern hills while some are diverted and channeled into the area along Heung Yip Road.

4.5 Minor katabatic (downhill) air movement can be expected from the vegetated hill slopes surrounding the study area.

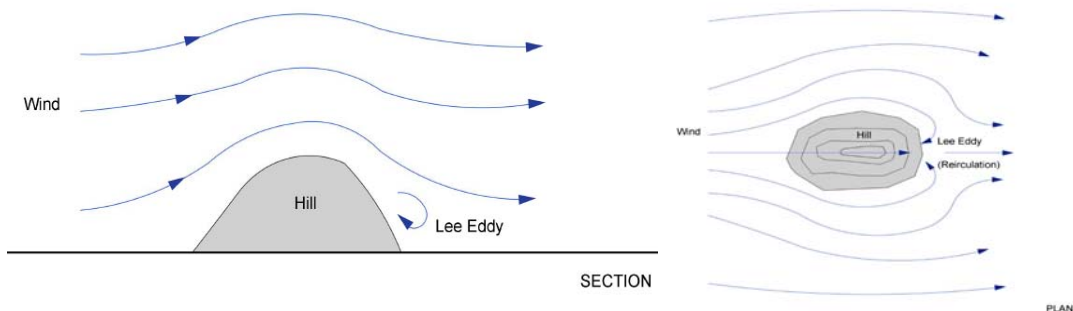


Figure 4.2 An example of wind flow across hills under moderate wind.

4.6 Two small valley wind systems as shown in Figure 4.1 blue arrows can be identified.

4.7 Some of the winds coming from the south over the hills to Wong Chuk Hang is shielded by Nam Long Shan.

4.8 Due to the channeling effects induced by Nam Long Shan and Aberdeen Country Park, wind of the east-west direction parallel to Heung Yip Road is the most dominant wind directions to be respected for air ventilation (black arrow in Figure 4.1). It is very important that this ventilation corridor be respected. Buildings and structures must not obstruct this main air corridor of the area.

5.0 The Existing Conditions

5.0.1 The existing building heights in absolute heights in terms of metres are shown in Figure 5.1, ranging from low buildings to tall buildings. Most tall buildings are residential buildings as briefly discussed below.

5.0.2 Existing GIC buildings around Heung Yip Road, especially on the southern side, are lower than 30m. Wong Chuk Hang Estate has been demolished, and the east-west channeling winds are unobstructed. As highlighted in para. 4.8 above, design care still need to be exercised to respect this main air corridor of the area.

5.0.3 The Wong Chuk Hang area along Wong Chuk Hang Road has tall buildings and street canyons with the height to street width ratio (H/W) of 2:1 to 4:1 (Figure 5.2 (*i.e.* Fig.7.6)). Wong Chuk Hang Road is the main air path under east-west channeling winds. Winds from the southerly quarters will be blocked by buildings on the southern side of Wong Chuk Hang Road.

5.0.4 Tall buildings of Broadview Court create some wind wakes to the schools behind it when winds come from the southwest and west.

5.0.5 High and closely-packed north-south orientated buildings of Shek Pai Wan Estate (120-130m in Figure 5.1) may form wind wake leewards, which is basically the “wind shadow” of the building with weaker and more turbulent winds. When winds come from the east, the areas around Tin Hau Temple may be affected as the winds will be blocked and weakened. Fortunately, winds from the southerly quarters can penetrate the areas via a number of north south orientated roads from the water front. The sea breezes are useful.

5.0.6 Tall buildings of Tin Kin House, Tin Wan Estate have obstructed the small valley wind systems into the built-up areas to its south.

5.0.7 Tall buildings of South Horizons (130mPD) are on its own peninsular and do not affect the surroundings beyond its boundaries.

5.0.8 Tall buildings of Lei Tung Estate do not affect its surroundings as they are surrounded by a landscaped green belt all around.

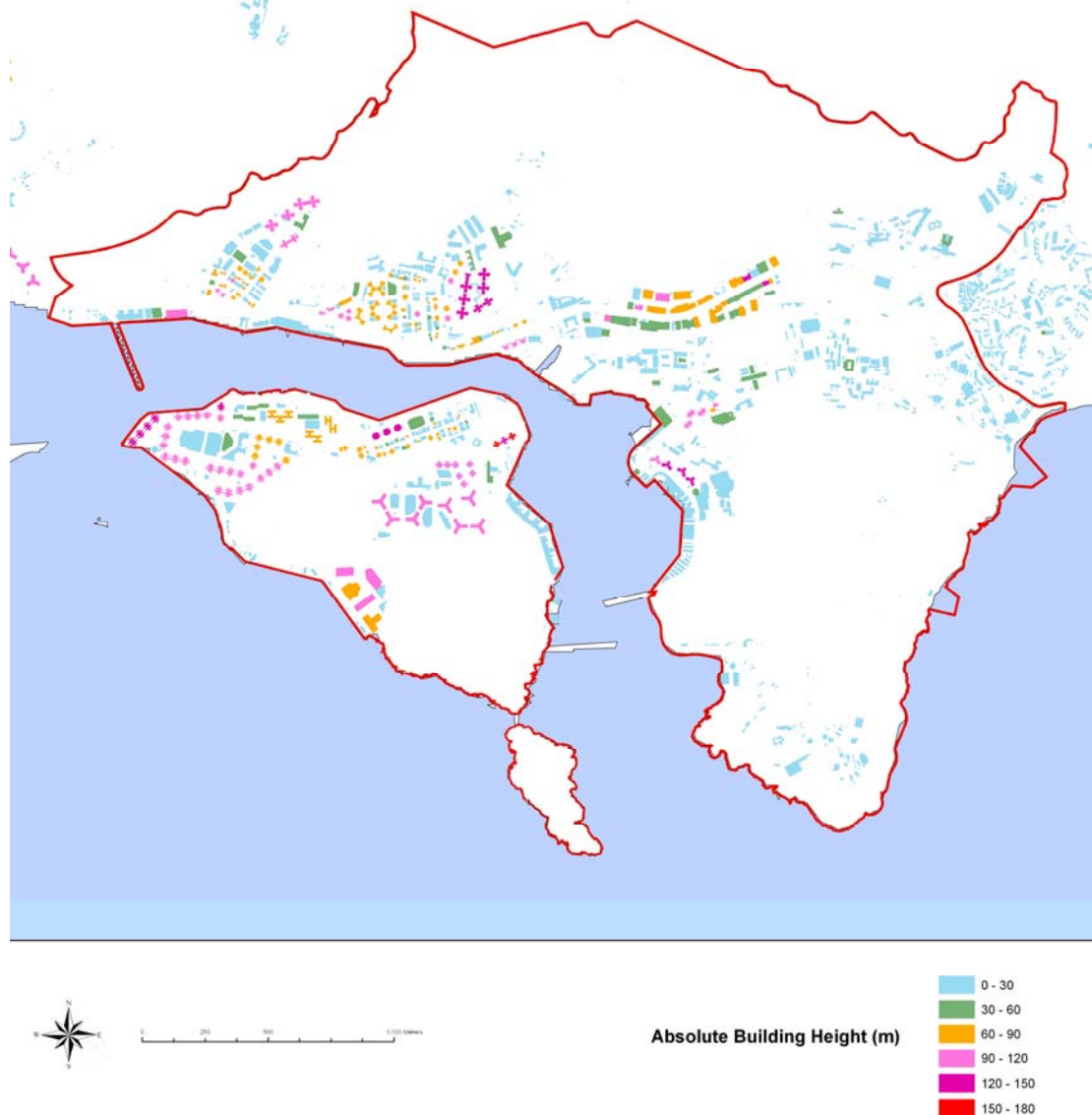


Figure 5.1 The existing building height profile of the study area in absolute height

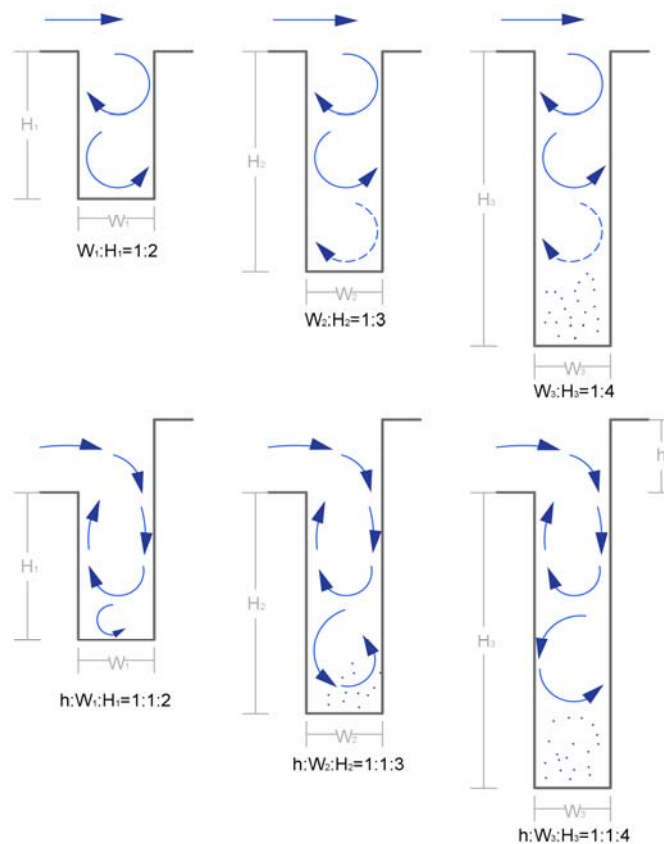


Figure 5.2 Wind regimes in canyons, and canyons with downwashes. Beyond a H/W ratio of 2:1, the ground level of canyons, even with the so call downwash effects, will have very weak eddies and air ventilation. [Reference: A. KOVAR-PANSKUS, P. LOUKA, J.-F. SINI, E. SAVORY, M. CZECH, A. ABDELQARI, P. G. MESTAYER and N. TOY, INFLUENCE OF GEOMETRY ON THE MEAN FLOW WITHIN URBAN STREET CANYONS – A COMPARISON OF WIND TUNNEL EXPERIMENTS AND NUMERICAL SIMULATIONS, *Water, Air, and Soil Pollution: Focus* 2: 365–380, 2002, Kluwer Academic Publishers.]

5.1 Greenery, Open Spaces and Landscaping

5.1.1 Based on land-use map, the study area has extensive green coverage (Figure 5.3), mainly on the slopes of the surrounding hills and the vegetated hills in Ocean Park. They are useful in terms of cool and fresh air production.

5.1.2 The study area also has some open spaces as “air ventilation spaces”. They include Wong Chuk Hang Recreation Ground, Aberdeen Sports Ground and Ap Lei Chau Park (Figure 5.3). They are very useful to the Area in terms of air ventilation.

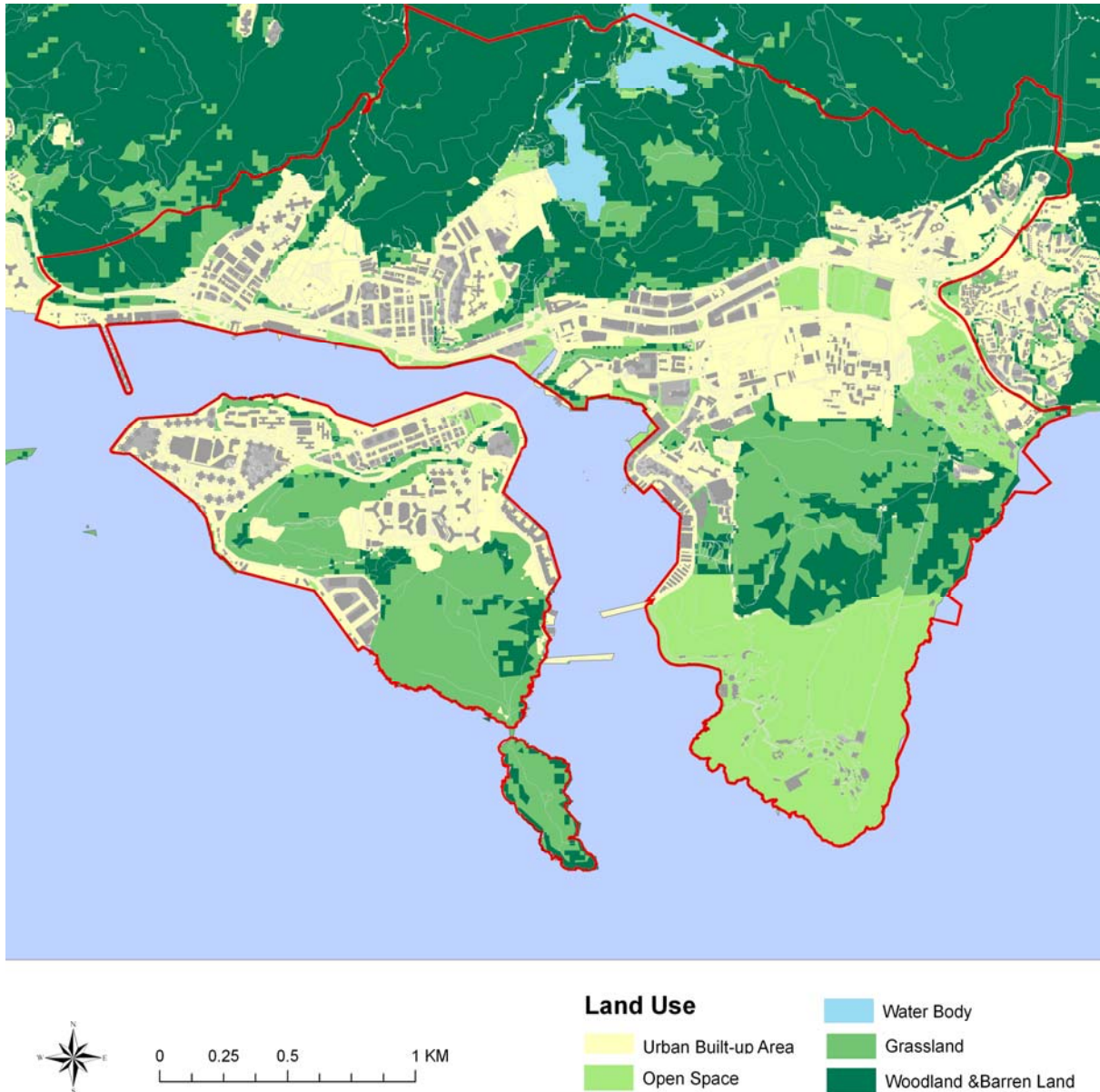


Figure 5.3 A greenery map of the Area based on land use data provided by Planning Department.

5.2 Land Use and Urban Morphology

5.2.1 Due to the fact that the greenery & open coverage of the Area is high; the corresponding Ground Coverage Ratio (GC Ratio) is low to medium.

5.2.2 Researchers at CUHK have earlier resolved a set of GC Ratio understanding of Hong Kong. High GC Ratio reduces urban porosity at the pedestrian level and thus reduces the potentials of air ventilation.

5.2.3 On the whole the GC Ratio of the study area is “low” to “medium” (Figure 5.4). A few clusters of high GC Ratio (red color) can be found around Wong Chuk Hang

Road (A in Figure 5.4), Aberdeen Main Road (B in Figure 5.4), South Horizon Drive (C in Figure 5.4) and along Shum Wan Road (D in Figure 5.4). Location A is a group of industrial buildings at the foot of the hill. Location B is at Aberdeen Centre and Shek Pai Wan Estate. Location C is the South Horizons developments. Location D is Broadview Court and the adjoining schools. Other single or small clusters of just 2 pixels of high GC Ratio are not a cause of concern in terms of ventilation problems. However, they should be contained with no further extension. High Building Volume Density pixels not in cluster are not included in the evaluation. Such area-based study should be conducted during the preparing of the OZPs.

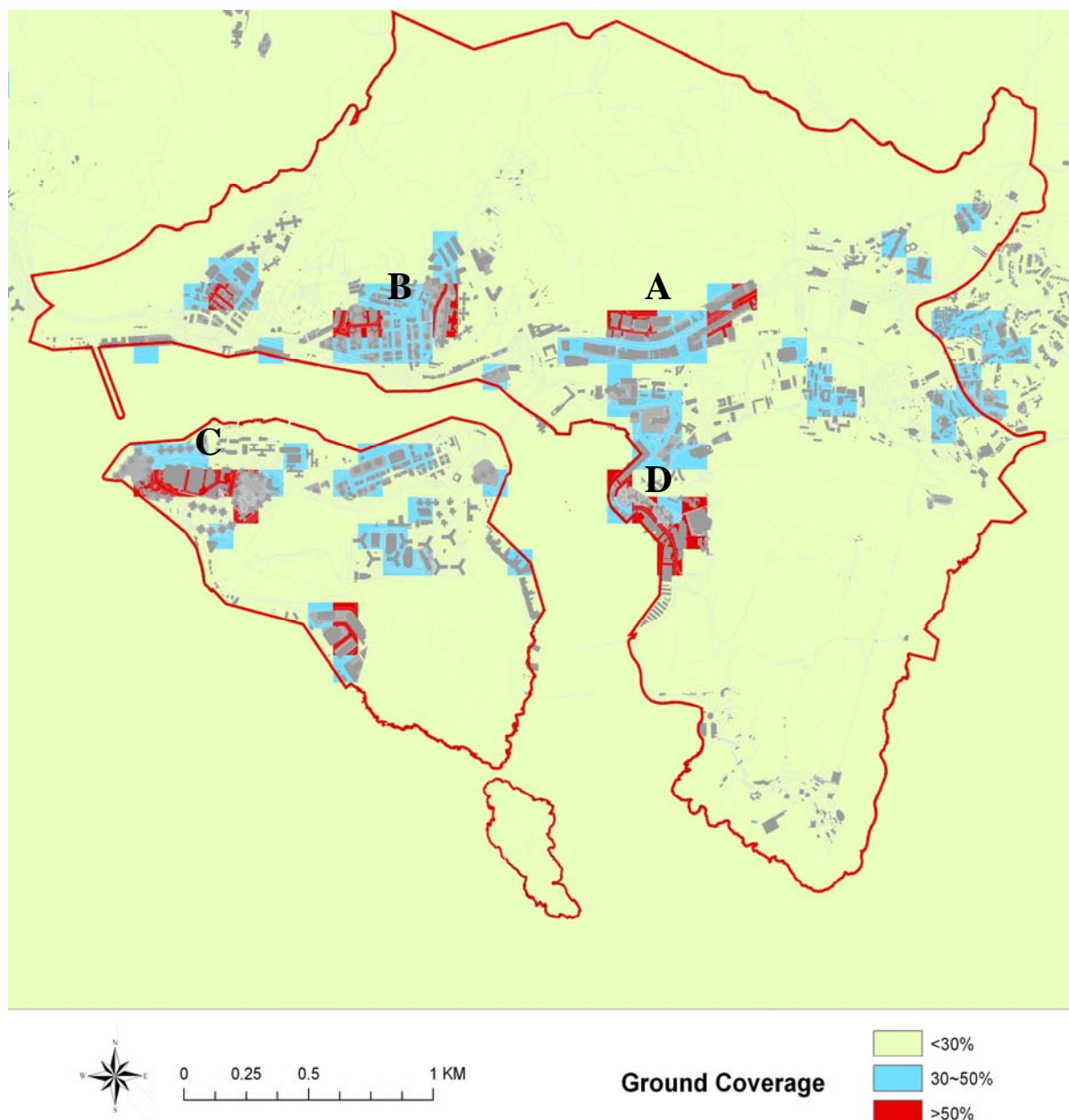


Figure 5.4 Ground Coverage Ratio map of the Area resolved to 100mx100m cell area (include roads, open spaces and ground area covered by buildings and podiums) [Ground Coverage Ratio (GC) is the ratio of total ground area (include roads and open spaces) and ground area covered by buildings and podiums in a 100m x 100m grid.]

5.2.4 Higher building volume increases the urban 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 in the summer months and the need for higher air ventilation to mitigate the negative thermal effects. Researchers at CUHK have earlier resolved a set of Building Volume Density (BVD) which is shown at Figure 5.5. On the whole the building volume density of the Area is low to medium.

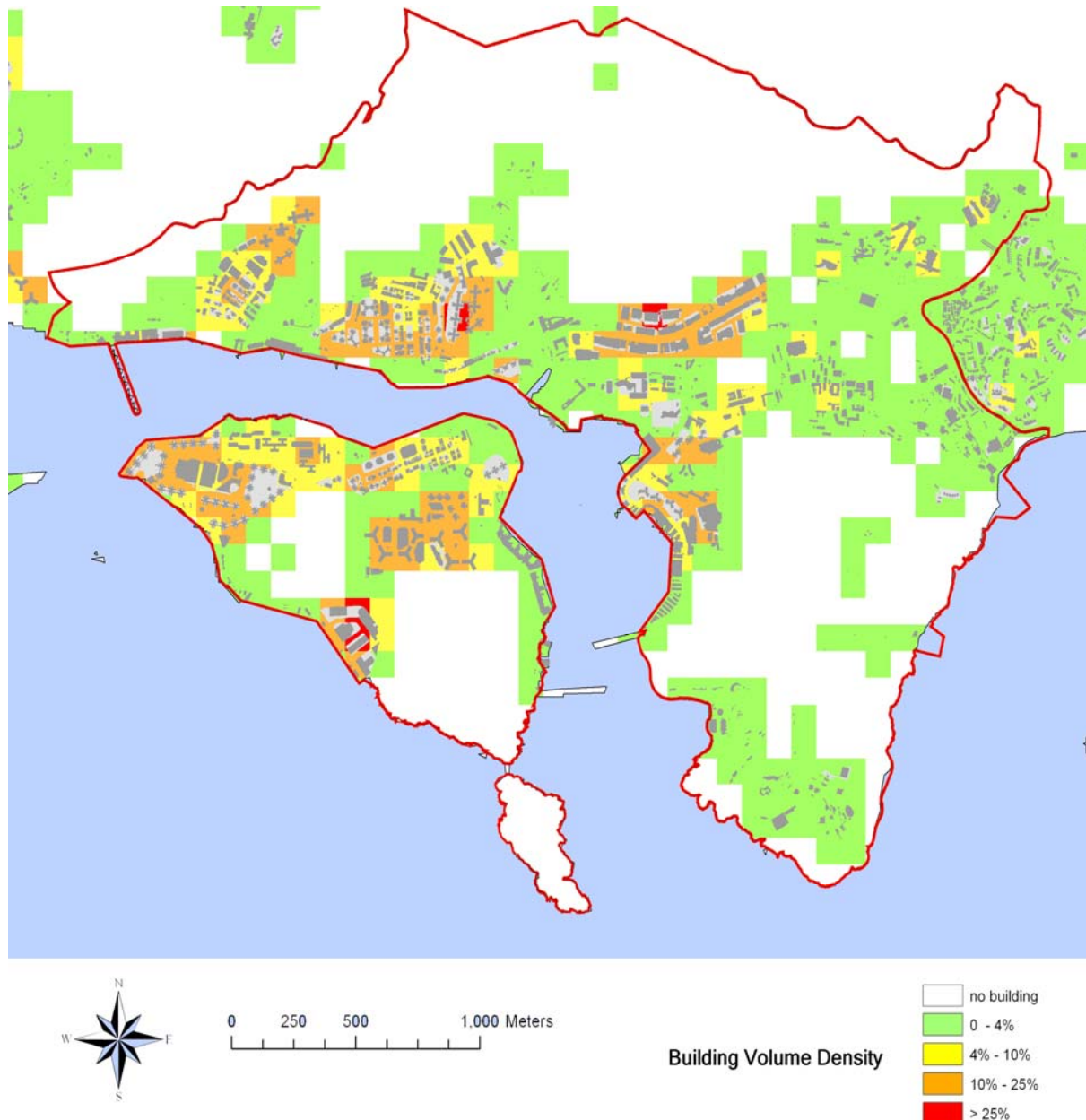


Figure 5.5 Building Volume Density map of the Area resolved to 100m x 100m grid. [For a site that occupies 100m x 100m, with a plot ratio of say 5, the building volume of the site will be about 150,000m³. Building Volume Density in % (BVD) is building volume in m³ of a 100m x 100m grid of land divided by a datum value of 1,200,000 m³]

5.3 Air Paths

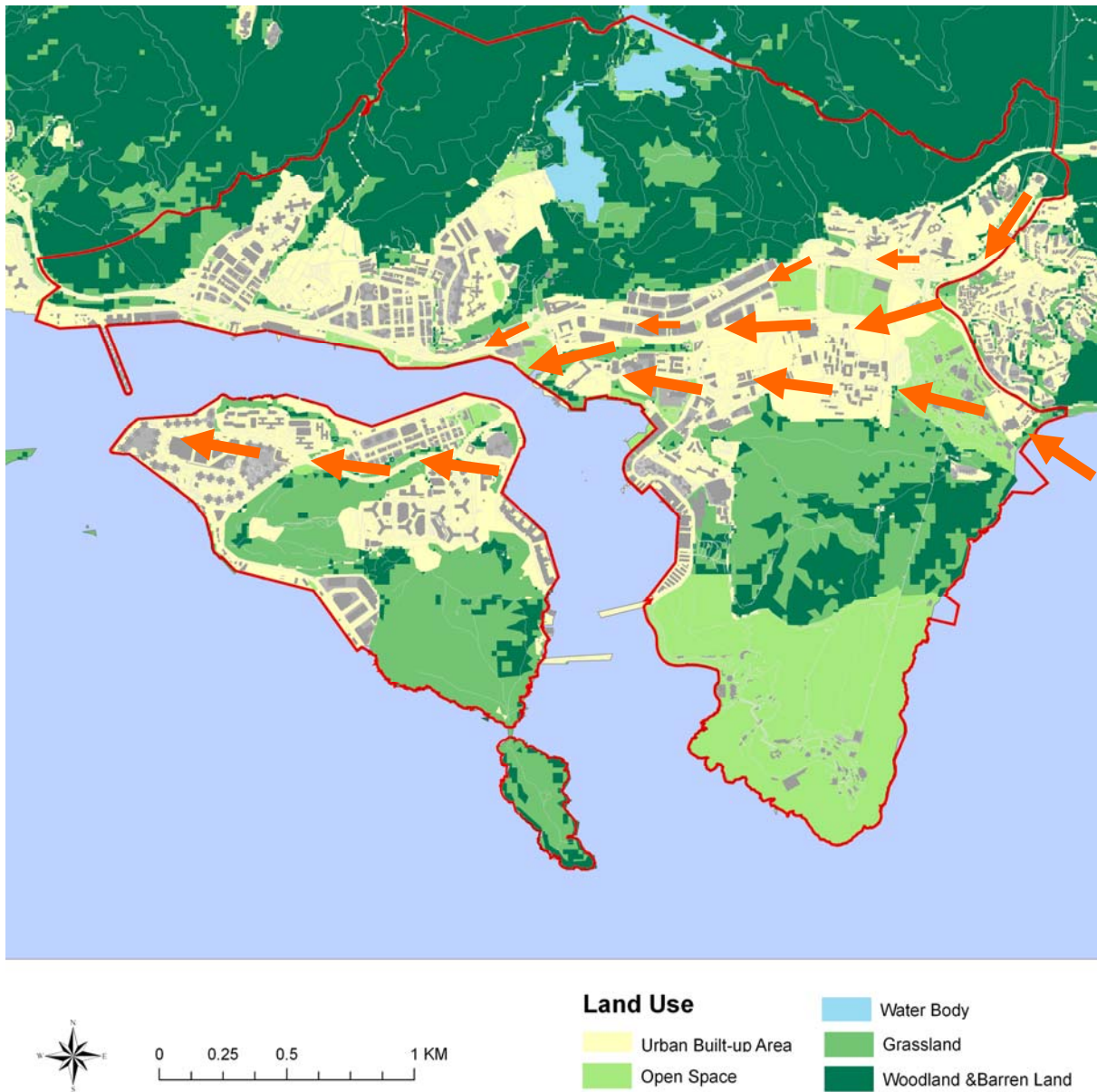


Figure 5.6 Air Paths of the Study Area

5.3.1 The flat land between Aberdeen Country Park and Nam Long Shan forms a channel in the east-west direction (Figure 5.6). In this area, the annual prevailing wind is east. The east-west direction is the most important winds to respect. Wong Chuk Hang Road and Heung Yip Road are important air paths. The site of Ex-Wong Chuk Hang Estate is vacant now. Together with the GIC sites of low buildings, they form a wide east-west air corridor.

5.3.2 The main east-west orientated roads in the study area are the main air paths. In addition to Wong Chuk Hang Road and Heung Yip Road, the main east-west air paths in the area include Police School Road and Welfare Road, Ap Lei Chau Bridge

Road and South Horizon Drive. The main north-south roads from the waterfront in Aberdeen are also useful air paths to capture sea breezes.



Figure 5.7 The nullah as an important east-west air ventilation space / path to the study area

5.3.3 The nullah along Heung Yip Road extends from the waterfront to the open spaces of Ocean Park (Figure 5.8). It provides a very useful east-west air ventilation space / path to the study area. It should be respected and enhanced with trees and landscaped areas along its banks. Covering it up or building extensive structures over or near it is not recommended.

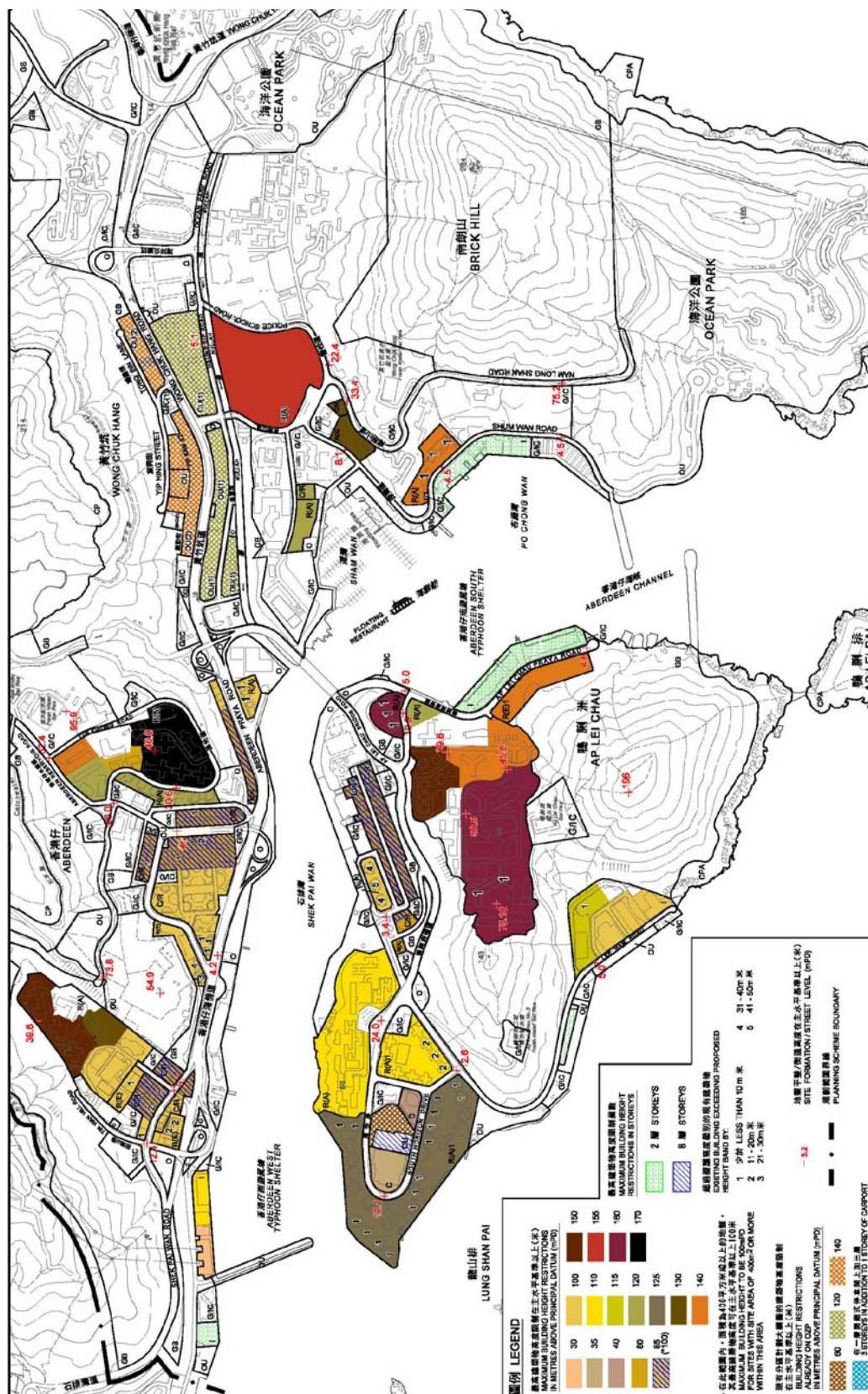
6.0 The Existing Conditions with Committed Projects

6.1 There are a number of committed projects and several unconfirmed planned projects along the main air paths of Wong Chuk Hang Road and Heung Yip Road. Among them, there would be a property development at the Ex-Wong Chuk Hang Estate site and the proposed buildings would probably be constructed on a podium accommodating the South Island Line's rail depot.

6.2 Tall buildings along Wong Chuk Hang Road will reduce the efficacy of the road serving as the main east-west air path.

6.3 A major committed project on the western side of Ap Lei Chau Praya Road is currently under construction. As the site is isolated; the project will not adversely affect the existing surroundings in terms of air ventilation.

7.0 Expert Evaluation and Recommendations of the Initial Planned Scenario



7.1 It must be stressed that given Hong Kong's tall building urban morphology, on the whole, building height restriction (or minor changes of building heights) is not the most effective method for maintaining and/or improving air ventilation. Breezeways, air paths, open spaces, gaps between buildings and building permeability – especially near ground level, are more effective.

7.2 Where stated, the proposed height restrictions, for example at South Horizons, largely follow building heights of existing buildings.

7.3 For Housing Department's estates in the Area, viz, Shek Pai Wan Estate, Tin Wan Estate, Lei Tung Estate and Ap Lei Chau Estate, the respective site areas are larger than 2 ha in general. Therefore, AVA should be conducted upon their redevelopment. In particular, for Ap Lei Chau Estate, it is useful to have 2 air paths each of 15-20m wide to extend from Yi Nam Road and the Hong Kong Southern District Government Primary School respectively to the waterfront in the north. The air path should be as straight as possible to channel southerly winds and sea breezes. One of them should run through the bus terminus to facilitate a better air flow (indicative alignments shown on Figure 7.2). The AVA for Ap Lei Chau Estate upon redevelopment should ascertain the exact alignment and width of the air paths.

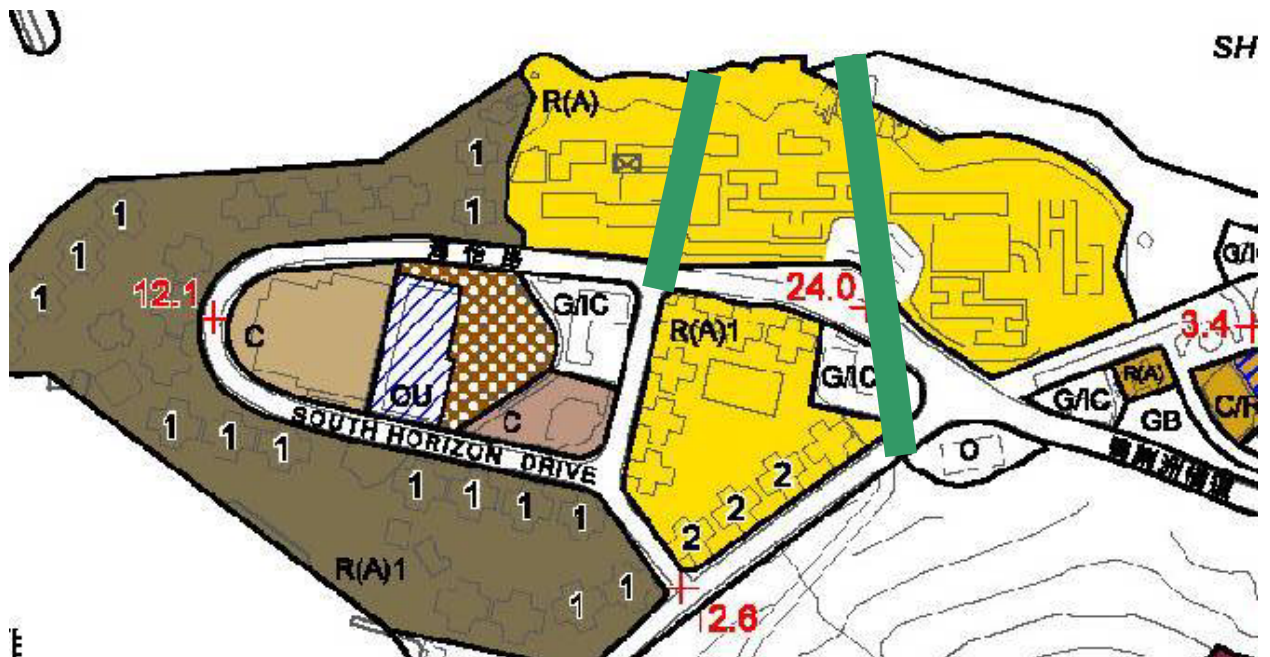


Figure 7.2 Suggested air paths in Ap Lei Chau Estate

7.4 For Yue Kwong Chuen of the Hong Kong Housing Society, although it is not located at the critical air path, its site area approaches 2 ha. It is highly recommended that AVA may be considered for its future redevelopment.

7.5 The existing Tin Wan Shopping Centre and Tin Wan Estate Car Park building are low-rise developments, and are located in the middle part of the Tin Wan area sloping down from the north east to the waterfront at the southwest. The cool katabatic wind of the valley (downhill hill movement) from the northeast to reach the

areas at the southwest is especially important when the background wind is weak. That wind must be taken into consideration and respected upon redevelopment of the shopping centre and the carpark building.

7.6 The major east-west air path lies parallel to Heung Yip Road/nullah area to the Aberdeen West Typhoon Shelter. Future development along this air path should not disturb air ventilation potential and should be substantiated by AVA.

7.7 In particular, the future development at the former Ex-Wong Chuk Hang Estate site falls within an important air corridor of the study area. It must be carefully designed for air ventilation. Disposition of the towers should maintain the east-west air flow and respect the east-west air path. It is recommended that east-west building gaps between towers across the site be specified. The total width of the building gaps is suggested to be 40% to 50% of the total width of the site (measured by the north-south dimension). Voids between towers and podium (as shown in Figure 7.3) to allow porosity near ground level should also be considered.

7.8 A terraced design at the podium edges, illustrated in Figure 7.3 as taken from the Hong Kong Planning Standards and Guidelines (HKPSG), is highly suggested to allow better air ventilation. Optimally, the terraces of Ex-Wong Chuk Hang Estate site should sustain an angle no more than 30 to 35 degrees (as shown in Figure 7.3).

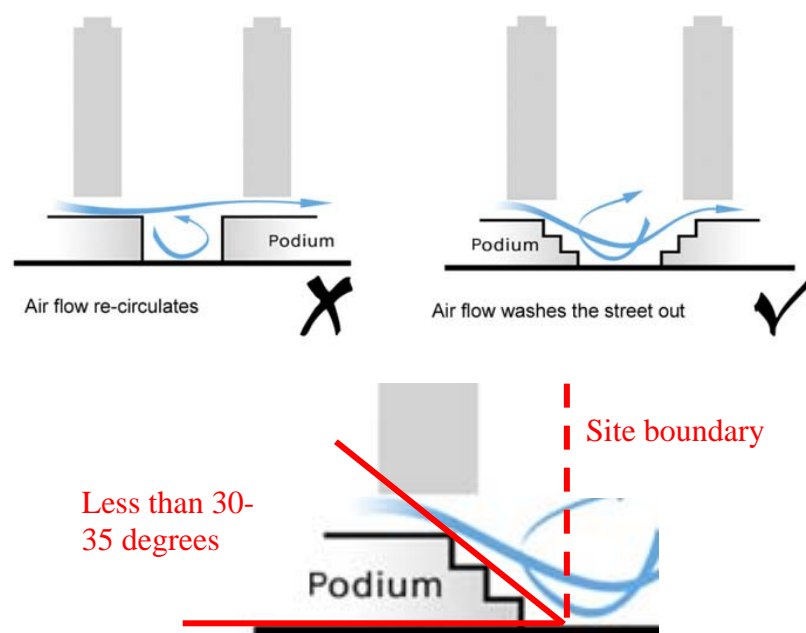


Figure 7.3 Terraced podium design to allow better air ventilation (source: HKPSG 11.3.3)

7.9 For Ex-Wong Chuk Hang Estate site, it is recommended that detailed AVA be conducted, the baseline (existing) be captured and noted, and performances of various options be evaluated. As having been mentioned earlier, the site is within the most important air corridor of the study area. It is very important not to over develop the site and try to achieve the best possible design for this site.

7.10 Ex-Wong Chuk Hang Estate site is next to the nullah. It is very important to design the interface so that this east-west air ventilation space / path is not compromised. Ideally, landscaped open spaces should be provided between the site and the nullah.

7.11 For the air ventilation of Old Main Street, Aberdeen (Figure 7.4), it serves as a useful air path when wind comes from the south. However, the street canyon is perpendicular to prevailing wind from the east. As the ratio of the heights of buildings along the street to the width of that street is high, it may be difficult for the easterly to downwash from the top of the buildings to the street level. The street would therefore need to rely on the horse-shoe vortex effect for air ventilation, which channels the eastern wind from the streets on either side via the street junctions flowing to the inner part of Old Main Street Aberdeen. The street currently has a width ranging from about 6.5m to 7.5m. It is therefore beneficial to widen the street so as to enhance the penetration of the vortices. Set-back of buildings for street widening is a desirable arrangement. In addition, measures including provision of greening and pedestrianization to keep away vehicles may also be considered to reduce the for air ventilation. However, taking into account of the facts that the sites along this street are mainly small lots and the imposition of non-building area restriction to achieve the set-back will impose undue constraints on the future developments on these sites, a “second best” alternative of a 2m wide set-back above the podium is acceptable.

7.12 Tang Fung Street is an important air path for Ka Wo Street and its surrounding areas providing beneficial air ventilation to the neighbourhood. It is therefore very important that it continue to function as the entrance to this important air path. The street is now free from building structures. There is a slope and an elevated platform at about 23mPD falling on Government land to the east of the street. However, at the eastern end of Tang Fung Street is a piece of private land on which buildings may be constructed. Hence, it is recommended that for this piece of private land, no building should obstruct or block the air path from the slope leading to Tang Fung Street. It should be designated as non building area. Exceptionally, due to practical considerations, a perforated podium not higher than 15m would be a compromise.



Figure 7.4 Old Main Street Aberdeen

8.0 Further works

- (a) Based on the expert assessment, there should be no major air ventilation issue if the suggestions can be followed. Further study is not necessary.
- (b) There is no focus area of concern in the study area due to the generally medium-rise and medium volume density characteristics of the Area.



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