AECOM

Planning Department

Agreement No. PLNQ A1-1/AVA 2018

Category A1 – Term Consultancy for Expert Evaluation on Air Ventilation Assessments

For an Instructed Project for Kennedy Town and Mount Davis Planning Area

Air Ventilation Assessment – Expert Evaluation Final Report

December 2020

Table of Contents

Page

1 INTRODUCTION AND BACKGROUND

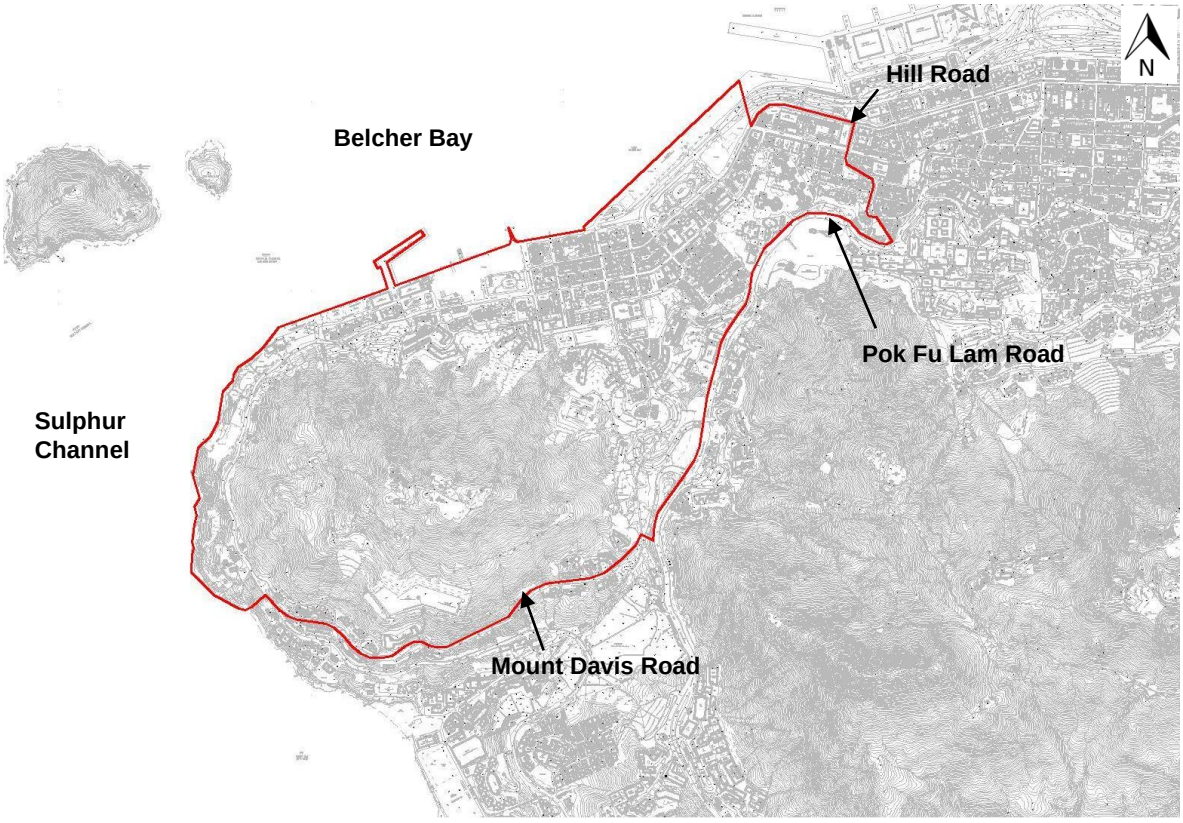
1.1 An Air Ventilation Assessment (Expert Evaluation) (AVA EE) on the Kennedy Town & Mount Davis area was conducted in 2011 ("Term Consultancy (PLNQ 35/2009)" ("AVA EE 2011" hereafter)). The recommendations of the AVA EE 2011 formed an important basis to the formulation of the draft Kennedy Town & Mount Davis Outline Zoning Plan (OZP) No. S/H1/18, which incorporated building height restrictions (BHRs) and building gaps (BGs). In 2013, an AVA EE on the western part of Kennedy Town was also undertaken in support of the "Land Use Review on the Western Part of Kennedy Town" ("Term Consultancy (PLNQ 35/2009)" ("AVA EE 2013" hereafter)). Its recommendations including the BHRs and non-building area (NBA) and BG requirements are incorporated in the draft OZP No. S/H1/20 (the current OZP) and its Explanatory Statement (ES) respectively.

1.2 In 2012, two judicial review (JR) applications were filed by the Incorporated Owners of 6 & 10 Mount Davis Road and the Trustees of the Church of England in the Diocese of Victoria, Hong Kong (i.e. the owner of 2 Mount Davis Road) against the Town Planning Board (TPB)'s decision on 25.11.2011 for not to propose amendment to the OZP No. S/H1/18 to meet the representation submitted by the Real Estate Developers Association of Hong Kong (REDA), which generally opposed all amendments incorporated in the OZP in respect of the imposition of building height (BH) and BG restrictions. The Incorporated Owners of 6 & 10 Mount Davis Road and the owner of 2 Mount Davis Road were also the commenters who submitted comments during the publication of representations in respect of the OZP No. S/H1/18 in 2011. Their comments supported the REDA's representation and objected to the rezoning of the two sites on Mount Davis Road from "R(B)" to "R(C)2" with imposition of the maximum plot ratio (PR) of 0.75, site coverage (SC) of 25% and BH of 3 storeys.

1.3 On 19.3.2020, the Court quashed the TPB's decision and directed the TPB to reconsider the relevant representation and comments thereon. Pursuant to the Court's ruling, the Planning Department (PlanD) has revisited the REDA's representation and the comments. A review on the development restrictions of the OZP taking into account the requirements of Sustainable Building Design Guidelines (SBDG) is therefore conducted.

1.4 In 2020, AECOM has been commissioned by PlanD to conduct an AVA EE for Kennedy Town and Mount Davis Area ("the Project Area" hereafter). The study aims to review the existing wind environment of the Project Area and its vicinity and the wind environment under the planned scenario of the current OZP No. S/H1/20, including the NBA and BG requirements stipulated on both the OZP and its ES (i.e. Baseline Scenario); qualitatively assess the air ventilation performance under the Initial Scenario with revised BHRs taking account of the SBDG and the Court's judgment. The report is prepared according to the "Technical Guide for Air Ventilation Assessment for Developments in Hong Kong" (Annex A of HPLB and ETWB TC No. 1/06).

1.5 The Project Area is about 172 hectares. It is located at the north-western corner of Hong Kong Island and bounded by the Belcher Bay and Sulphur Channel to its north and west; Hill Road and Pok Fu Lam Road delineate the eastern boundary; whilst Mount Davis Road forms its southern boundary. The location of the Project Area is illustrated in **Figure 1.1**.



Project Area Boundary

Figure 1.1 **The Location of Kennedy Town and Mount Davis Area**

1.6 The report is divided into following contents:

- Section 2 – Identification of Wind Availability
- Section 3 – Existing Site Environment and Air Ventilation Measures on the Current OZP and Its ES
- Section 4 – Review on the Existing Wind Environment and Air Ventilation Measures on the Current OZP and Its ES
- Section 5 – Evaluation of the Initial Scenario
- Section 6 – Recommendations on Air Ventilation Measures
- Section 7 – Conclusion

2 IDENTIFICATION OF WIND AVAILABILITY

2.1 Identification of the annual and summer prevailing wind is essential in determining the wind condition and air ventilation performance at the Project Area.

2.2 Wind data collected from the weather stations operated by Hong Kong Observatory (HKO) could be referenced in determining wind availability at site. The nearest HKO weather station to the Project Area is the Green Island Weather Station, which is located approximately 700m from the northwestern Project Area Boundary. The weather station is located at a height of 88m AMSL. The relative location of this weather station and the Project Area are shown in **Figure 2.1**, while annual wind roses of Green Island Weather Station between 2015 and 2019 are presented in **Figure 2.2**.

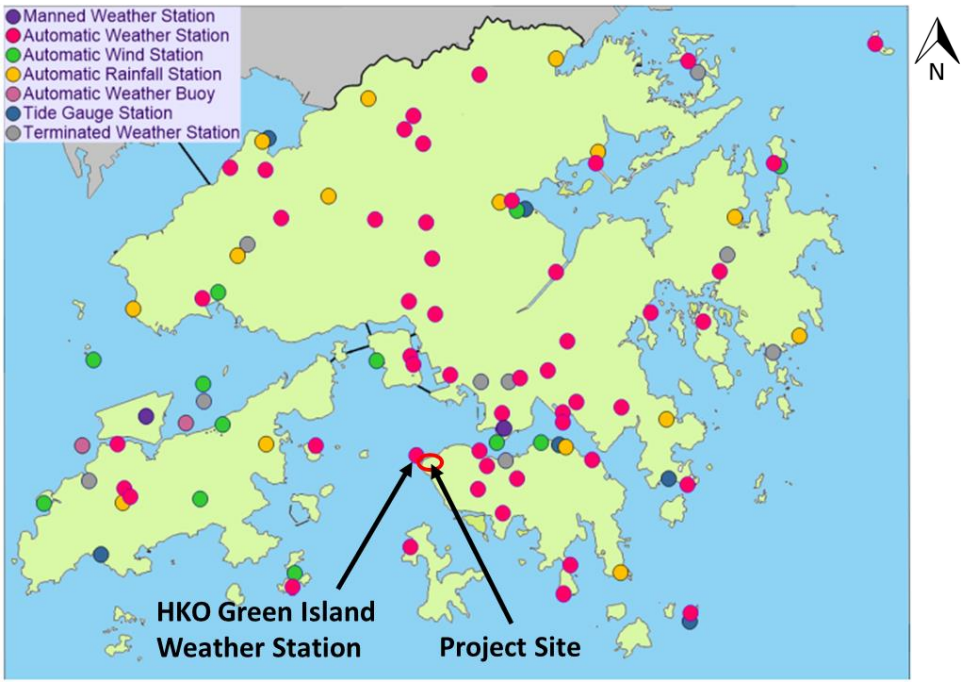
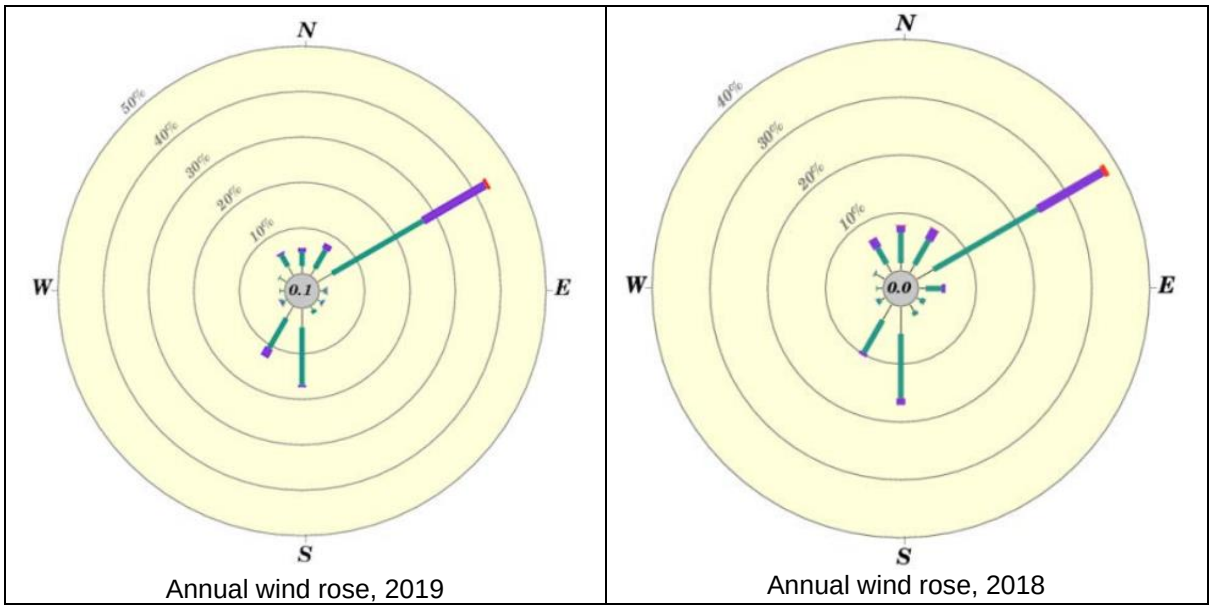
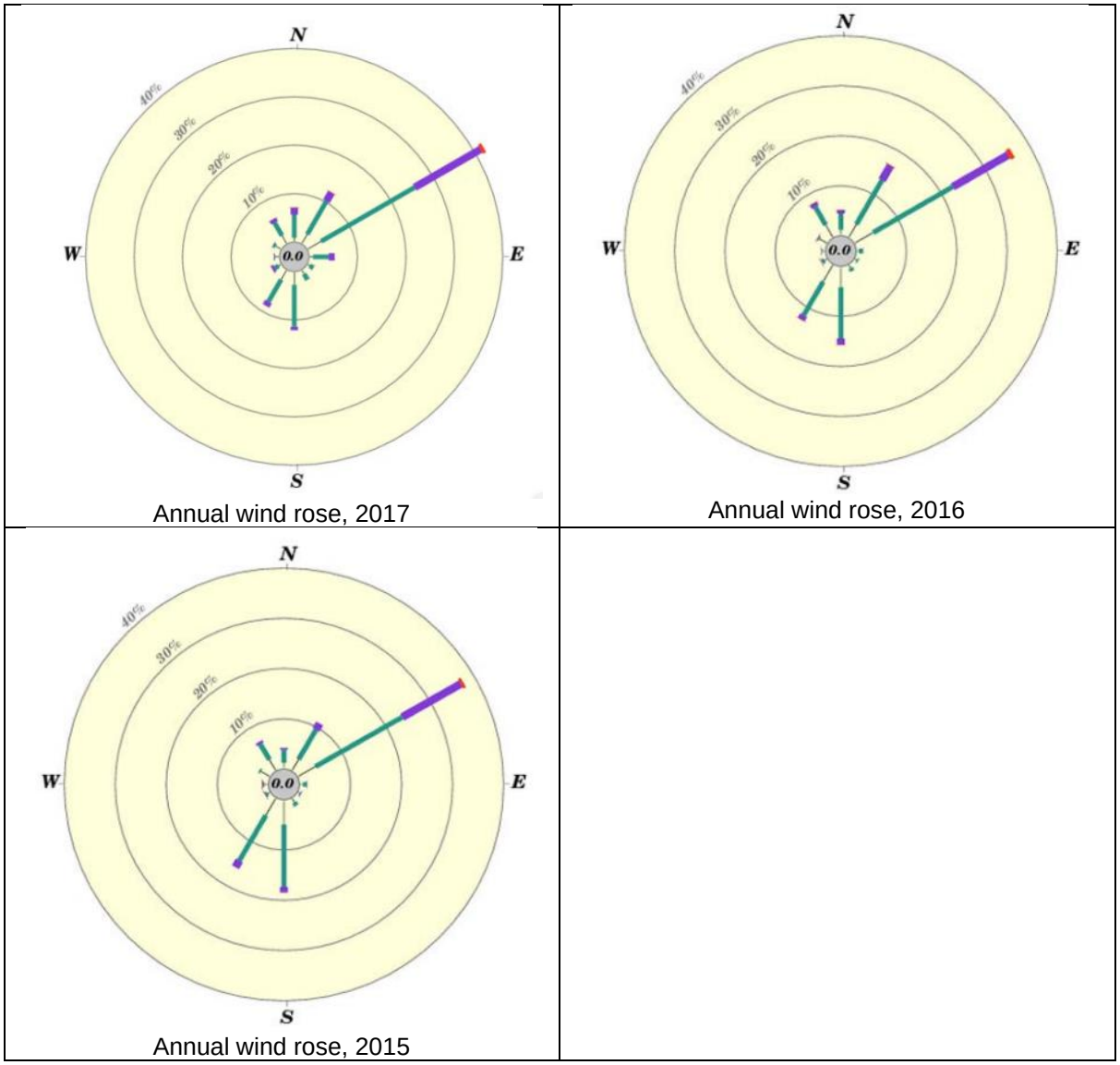


Figure 2.1 Locations of the HKO Weather Stations



Annual wind rose, 2019 | Annual wind rose, 2018



Annual wind rose, 2017

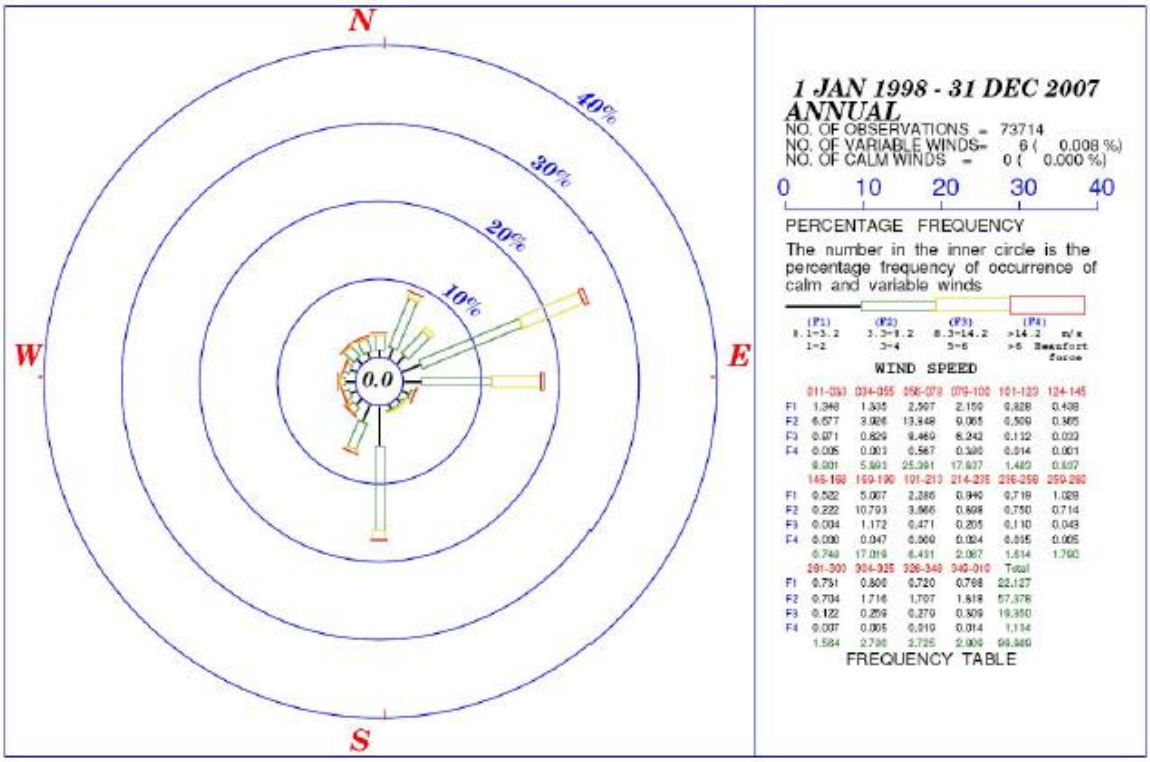
Annual wind rose, 2016

Annual wind rose, 2015

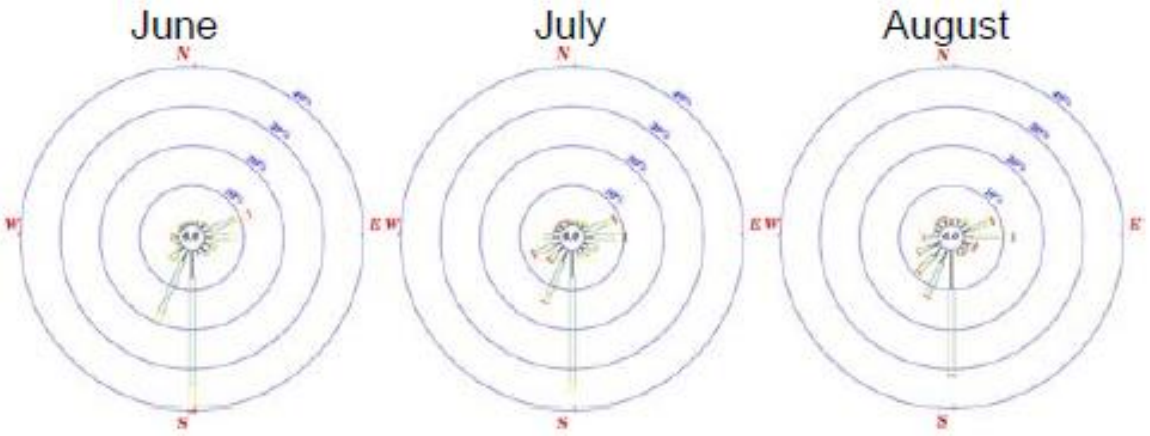
Figure 2.2 Annual wind roses of Green Island Weather Station between 2015 and 2019

2.3 Based on the annual wind roses obtained from the recent five years, it can be identified that the annual prevailing wind near the Project Area mainly comes from ENE, NNE, S and SSW directions.

2.4 The AVA EE 2013 also adopted wind data of the Green Island Weather Station as reference for wind availability determination, in which wind roses based on the wind data collected from 1998 to 2007 at Green Island Weather Station were considered: The annual wind mainly comes from ENE, E and S directions, while E, S and SSW wind contribute the most to the prevailing wind during summer months. These wind roses are shown in **Figure 2.3** below.



(a) Averaged Annual Wind Rose (1998 - 2007) from Green Island Weather Station



(b) Averaged Wind Roses (1998 - 2007) in summer months (Green Island Weather Station)

Figure 2.3 Averaged wind roses (1998 - 2007) from HKO Green Island Weather Station

2.5 In addition to the wind data collected by HKO, simulation via meteorology model could also provide robust data for the determination of wind availability near the Project Area. The wind data simulated via RAMS model released by PlanD could be served as references for wind availability of Hong Kong. The Project Area covers 10 grids of this model: Grid (069,032), Grid (070,032), Grid (069,033), Grid (070,033), Grid (071,033), Grid (069,034), Grid (070,034), Grid (071,034), Grid (071,035), Grid (072,035), as illustrated in **Figure 2.4**.

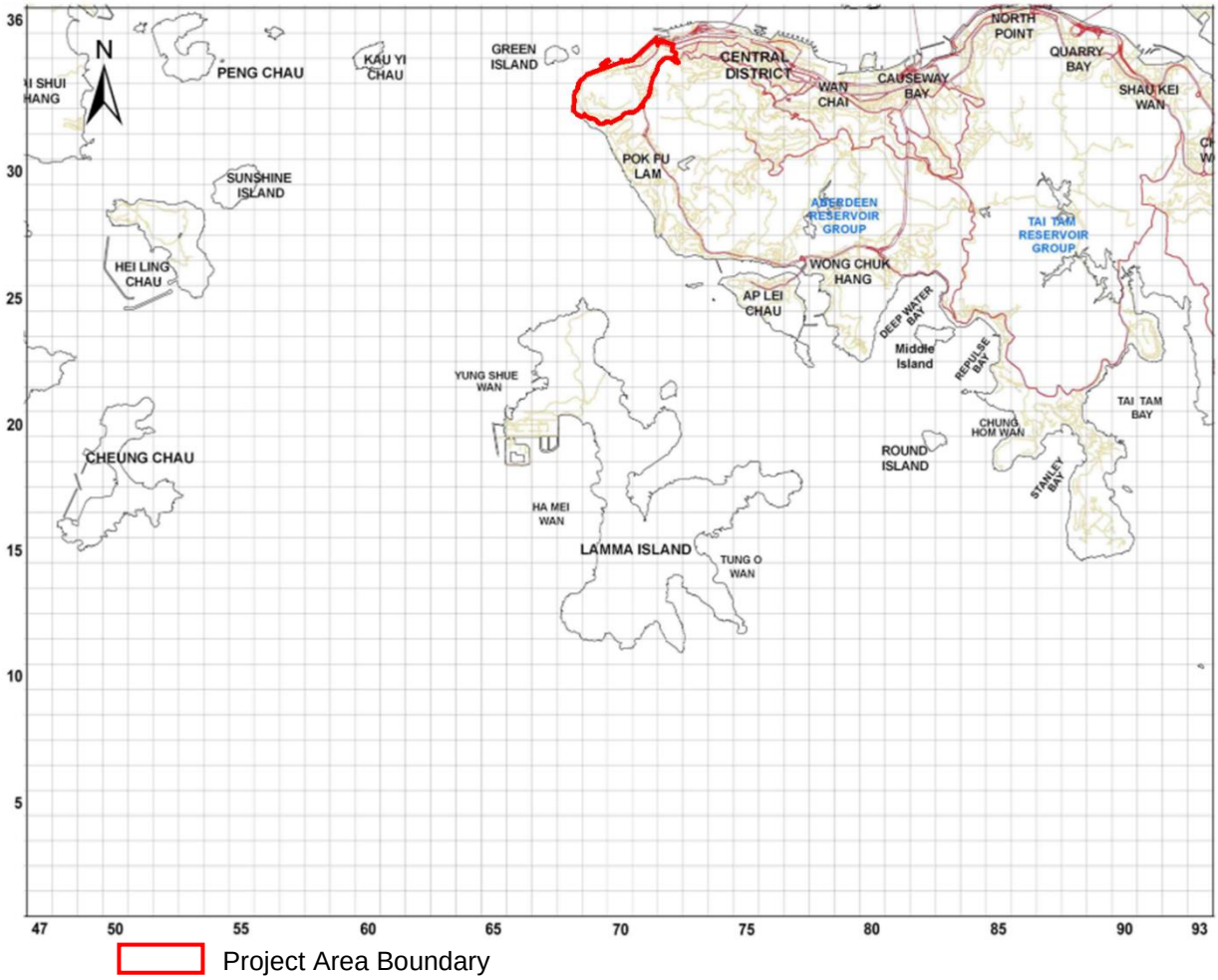
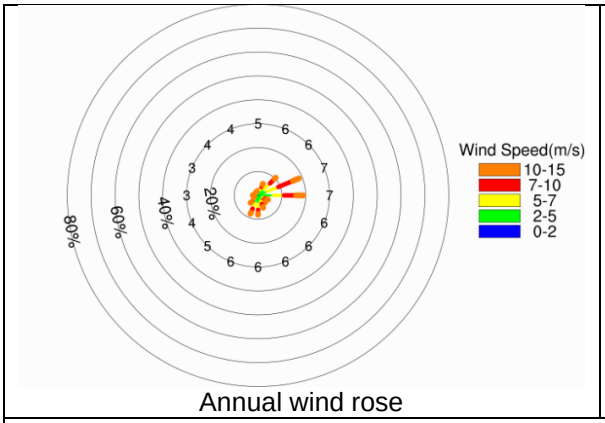
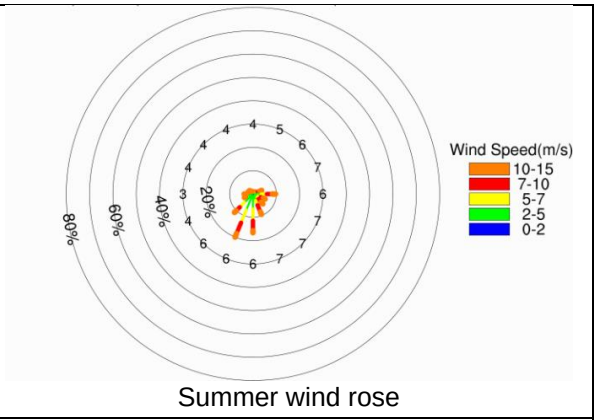


Figure 2.4 Illustration of location for wind data extraction at Project Area

2.6 Considering wind roses of the 10 grids, the prevailing wind from NE, ENE and E would generally dominate the wind availability over a whole year, while in summer, the prevailing wind mostly originate from the southerly quadrant, including S, SSW and SW. In the northern region of the Project Area, easterly wind would induce a greater influence during summer periods. Representative wind roses are extracted and illustrated in **Figure 2.5**.

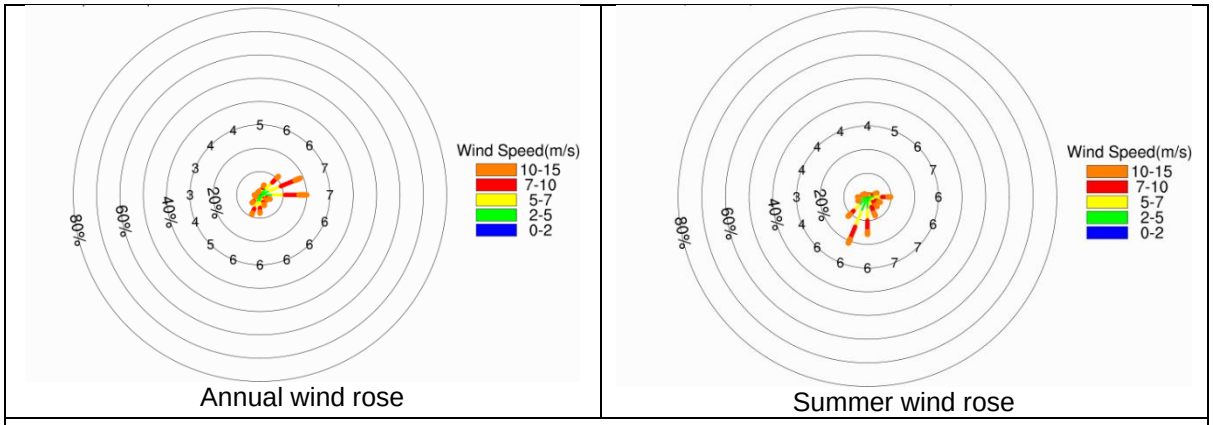


Annual wind rose



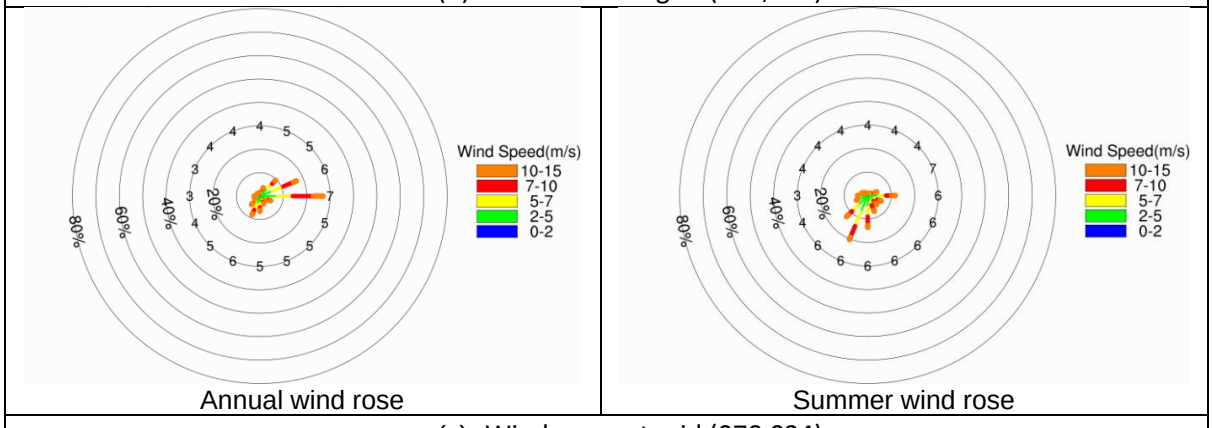
Summer wind rose

(a) Wind roses at grid (069,033)



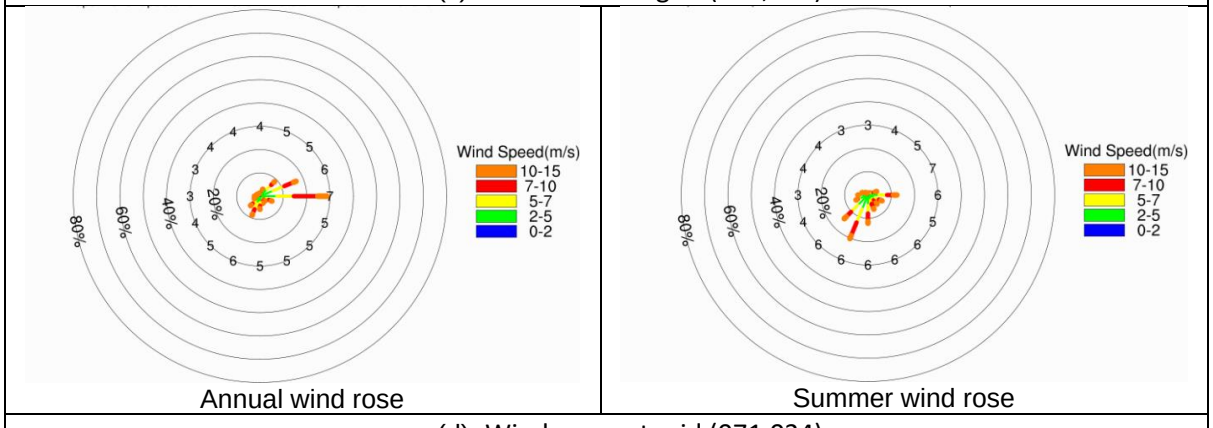
Annual wind rose | Summer wind rose

(b) Wind roses at grid (070,033)



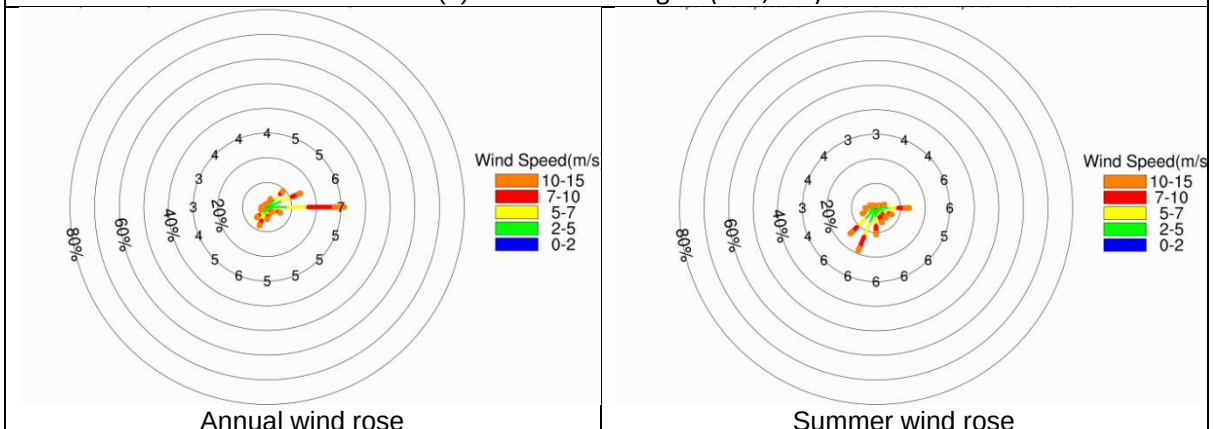
Annual wind rose | Summer wind rose

(c) Wind roses at grid (070,034)



Annual wind rose | Summer wind rose

(d) Wind roses at grid (071,034)

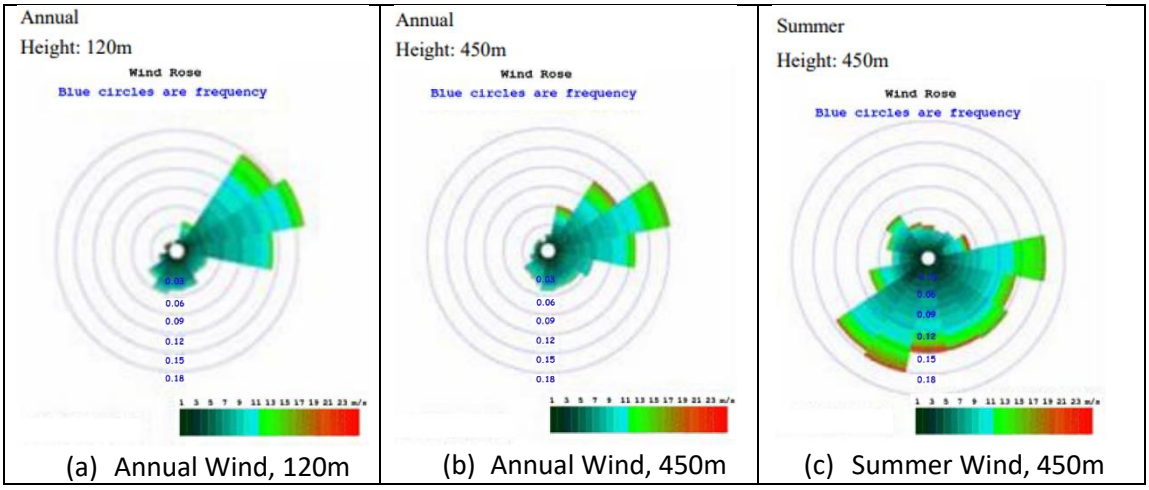


Annual wind rose | Summer wind rose

(e) Wind roses at grid (071,035)

Figure 2.5 Wind roses extracted from PlanD RAMS model (200mPD)

2.7 In addition to the simulation data released from PlanD, the Hong Kong University of Science and Technology (HKUST) also obtains a set of wind data simulated via MM5 model. This set of wind data is documented in the AVA EE 2011. The annual and summer wind roses as simulated by MM5 model are presented in **Figure 2.6**, where the annual wind from E, ENE, and NE directions and summer wind from E, S, SE, SSW and SW directions have been identified.



(a) Annual Wind, 120m (b) Annual Wind, 450m (c) Summer Wind, 450m

Figure 2.6 Wind roses based on MM5 simulation
(Extracted from "Previous EE for Kennedy Town and Mount Davis" (AVA EE 2011))

2.8 The AVA EE 2013 also adopted MM5 model wind data extracted from 3 locations for reference of wind availability. The locations of wind data extraction are shown in **Figure 2.7** while the annual and summer wind roses are shown in **Figures 2.8, 2.9** and **2.10**.

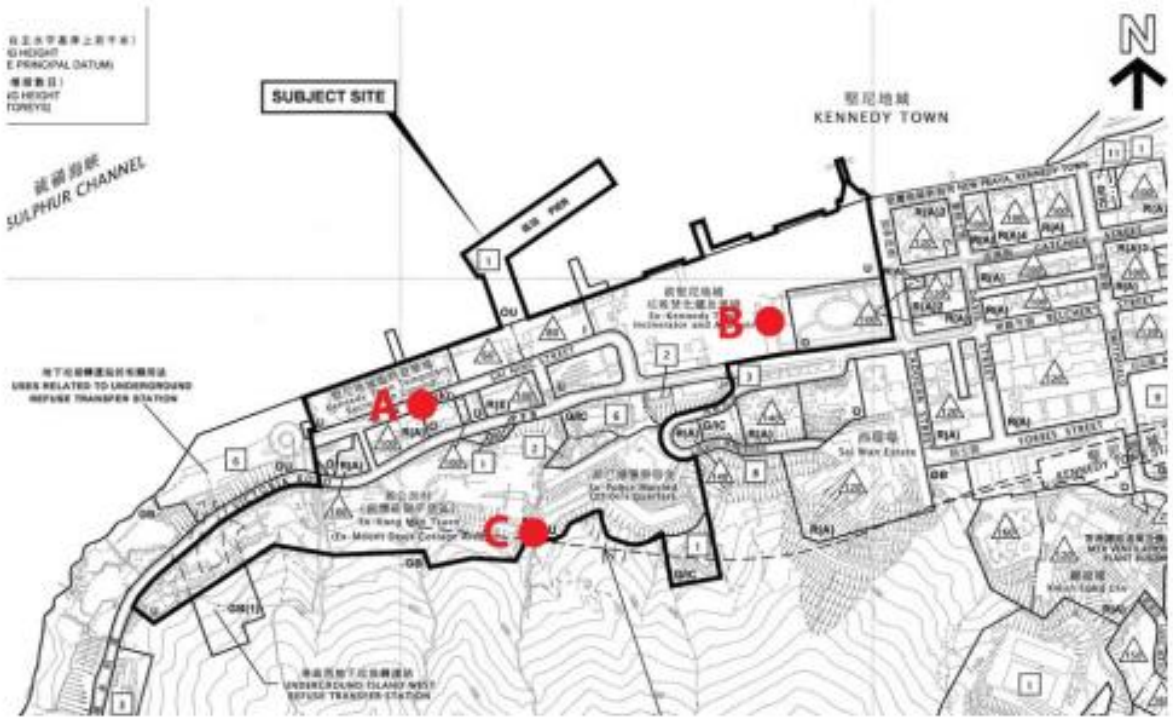
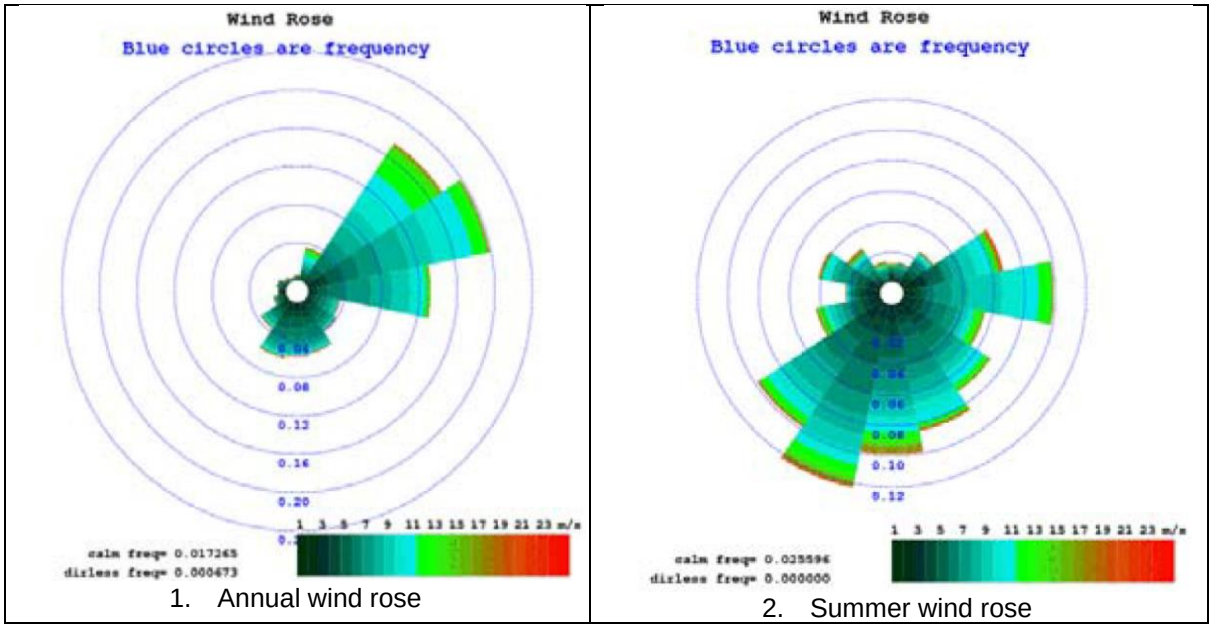
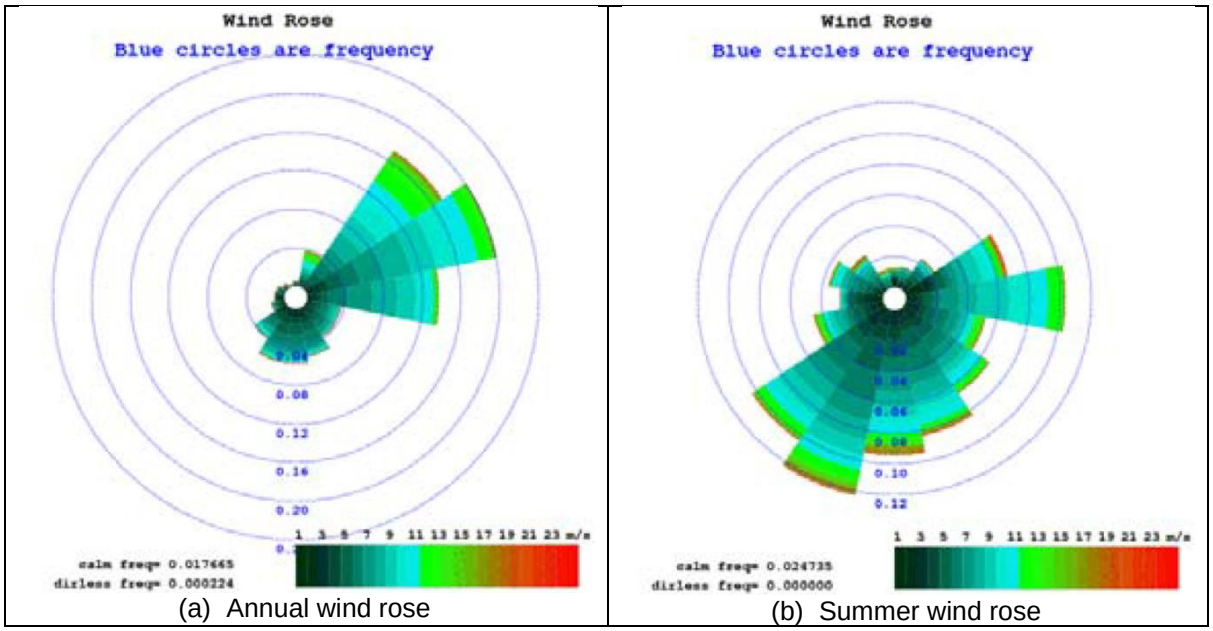


Figure 2.7 Locations of extraction for MM5 wind data (A, B and C)
(Figure extracted from "AVA EE 2013")



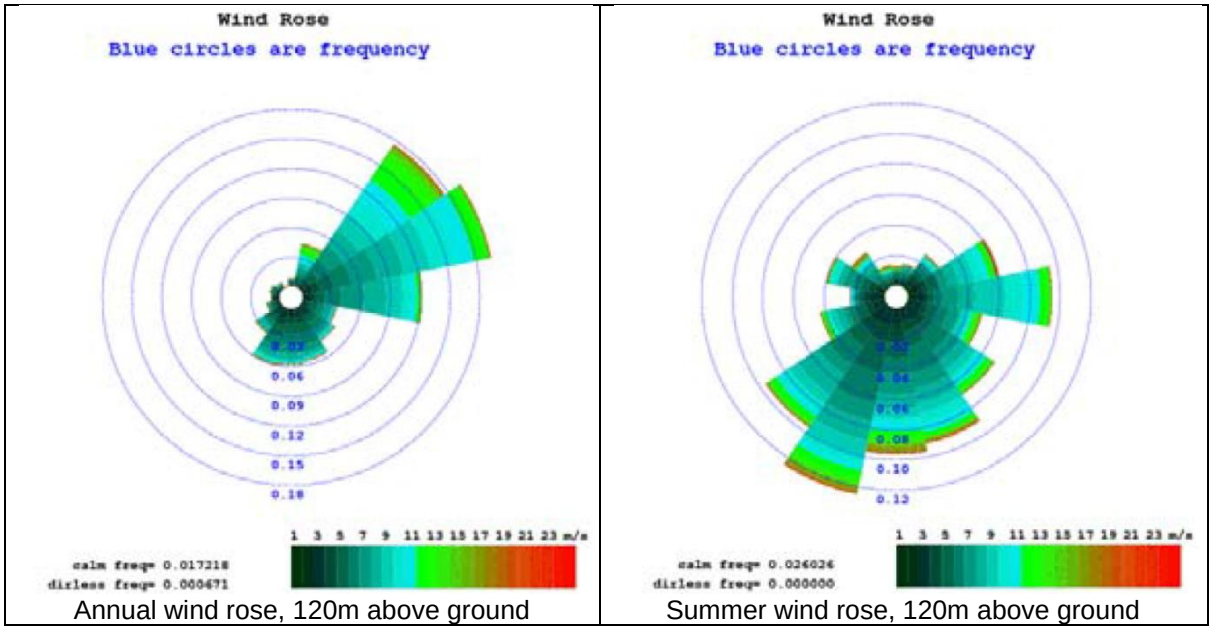
1. Annual wind rose
2. Summer wind rose

Figure 2.8 Annual and summer wind roses at A at 120m above the ground
(Figure extracted from "AVA EE 2013")



(a) Annual wind rose
(b) Summer wind rose

Figure 2.9 Annual and summer wind roses at B at 120m above the ground
(Figure extracted from "AVA EE 2013")



Annual wind rose, 120m above ground | Summer wind rose, 120m above ground

Figure 2.10 Annual and summer wind roses at C at 120m above the ground
(Figure extracted from "AVA EE 2013")

2.9 Based on the MM5 wind roses shown in the AVA EE 2013, the annual prevailing wind mainly comes from E, ENE and NE directions, while the prevailing wind during the summer season mainly comes from E, SE, S, SSW and SW directions.

2.10 The prevailing winds considered in this current study are summarized in **Table 2.1** and illustrated in **Figure 2.11**, which adequately cover the range of prevailing wind predicted by various sources (i.e. HKO, PlanD RAMS model and HKUST MM5 model). In short, the annual prevailing wind mainly comes from NNE, NE, ENE, E, S and SSW directions. The summer prevailing wind generally originated from the east direction and southerly quadrant including SE, S, SSW and SW.

Table 2.1 Summary of Prevailing Wind Directions

	Annual	Summer
HKO Green Island Weather Station (1998-2007)	ENE, E, S	E, S, SSW
HKO Green Island Weather Station (2015-2019)	NNE, ENE, S, SSW	-
PlanD RAMS model	NE, ENE, E	E, S, SSW, SW
HKUST MM5 data in Previous EE for Kennedy Town and Mount Davis (AVA EE 2011)	NE, ENE, E	E, SE, S, SSW, SW
HKUST MM5 data in EE for West Kennedy Town (AVA EE 2013)	NE, ENE, E	E, SE, S, SSW, SW
Summary	**NNE, NE, ENE, E, S, SSW**	**E, SE, S, SSW, SW**

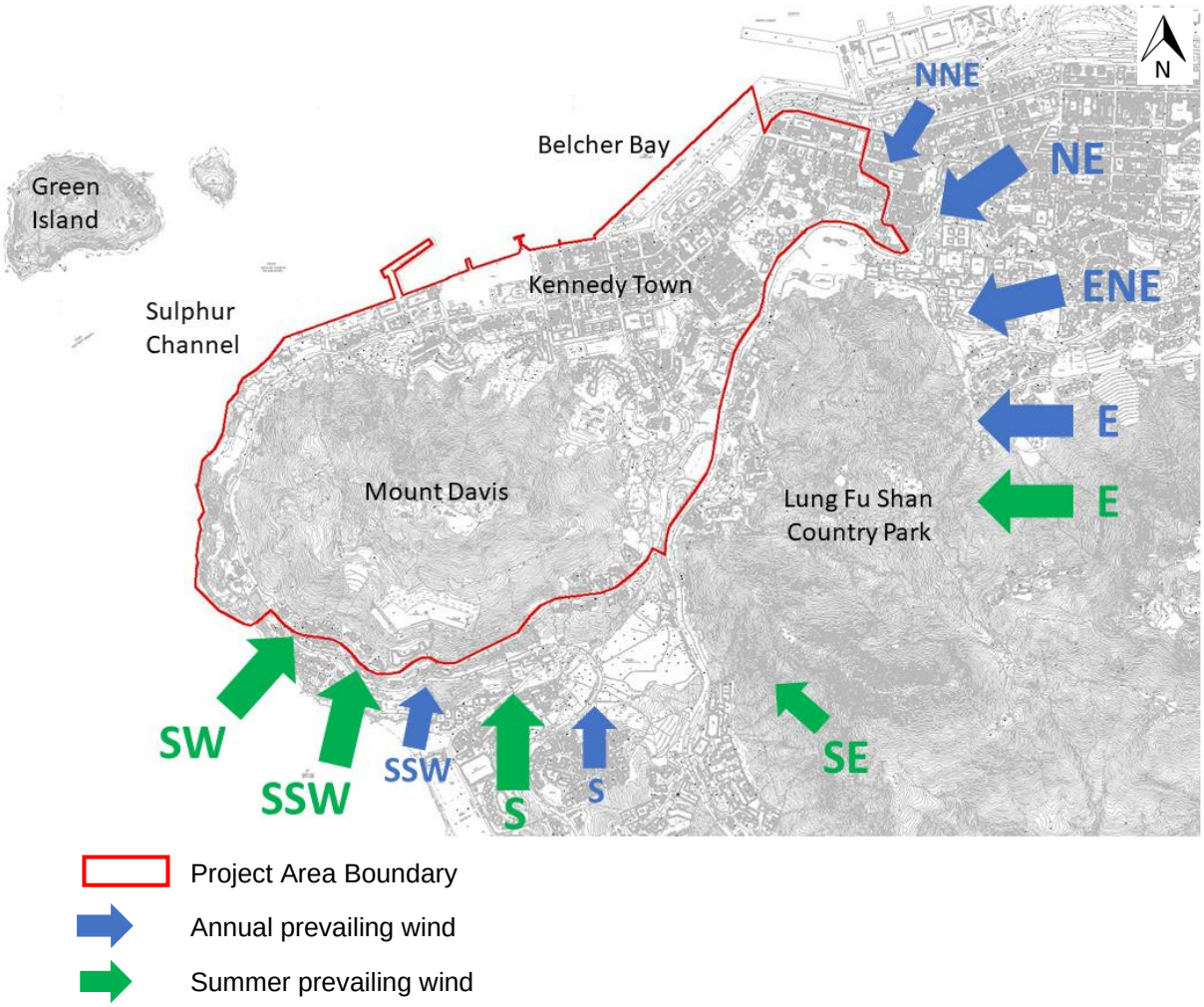


Figure 2.11 Illustration of annual and summer prevailing wind at the Project Area

3 EXISTING SITE ENVIRONMENT AND AIR VENTILATION MEASURES ON THE CURRENT OZP AND ITS ES

Local Topography

3.1 The Project Area is on the northwestern part of Hong Kong Island, fronting the Belcher Bay and Sulphur Channel to the north and west, as well as the Sandy Bay to the southwest. The terrain features in the Project Area generally rises from the northwest towards southeast. The region near the waterfront adjacent to Belcher Bay / Sulphur Channel has a level in terms of meters above principle datum (mPD) of less than 4mPD, while the highest point is the mountain peak of Mount Davis with nearly 300mPD in height and it is located at the southern portion of the Project Area.

3.2 Mountainous terrain also exists to the southeast of the Project Area, i.e. the Lung Fu Shan Country Park – Mount High West, which has a terrain height of over 300mPD (Pinewood Battery) at approximately 500m away from Pok Fu Lam Road, and 400mPD (High West Viewing Point) around 800m away from southeast site boundary. This topographical feature implies that the air flow driven under the prevailing winds from the southern and south-eastern directions (i.e. S, SE and E) would likely to be moderated by the high-rise hilly terrains of Lung Fu Shan Country Park areas before flowing towards the Project Area. Moreover, the southwestern quadrant winds (i.e. SSW, SW) would be weakened by the terrain of Mount Davis before reaching the Kennedy Town area.

3.3 The terrain heights of Mount Davis and Lung Fu Shan / Mount High West form a valley in between. The valley is aligning roughly in the south-north direction near Pok Fu Lam Road. The terrain where the valley locates is around 100mPD in height and is sandwiched by the high grounds of Mount Davis (300mPD) to its west and Mount High West (400mPD) to its east. Hence, the prevailing winds from the southerly and south westerly directions could potentially be channeled into this valley ("valley corridor" from hereafter) and flow towards the urban areas within the Project Area located downhill.

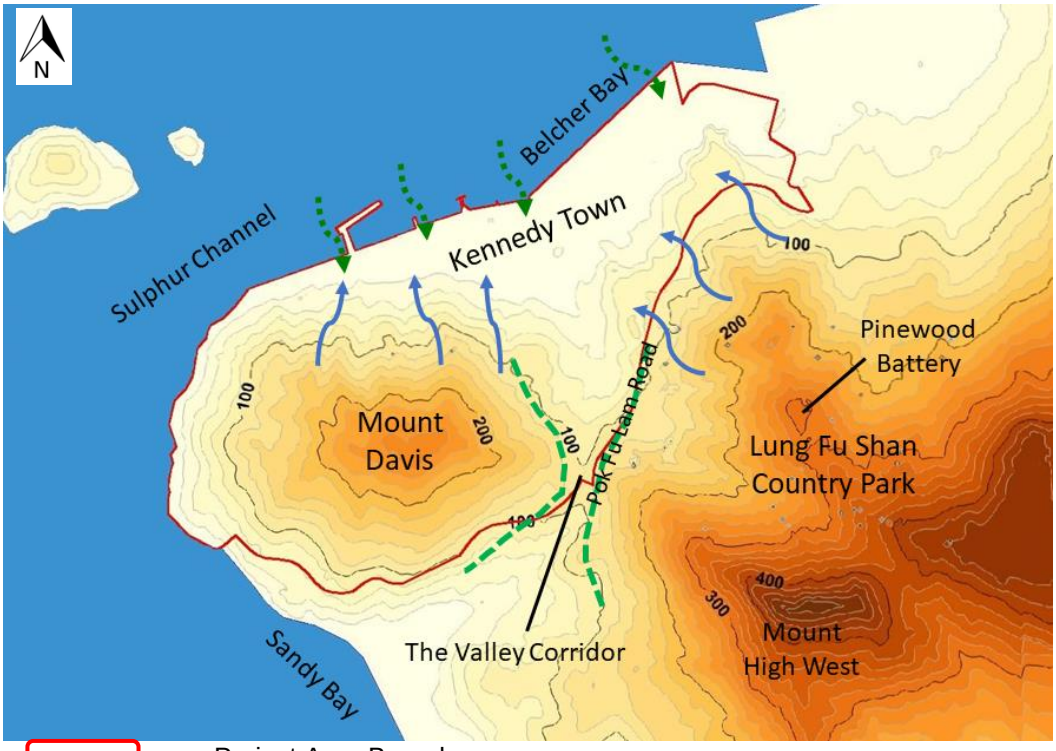


Figure 3.1 Digital elevation map for Kennedy Town and Mount Davis

3.4 In addition to the influence on the annual / summer prevailing wind, the high-rise terrain of Mount Davis and Lung Fu Shan would also induce "katabatic effect" (downhill air movement due to thermal mechanics). The downhill air movement at the northern hillslope of the Mount Davis and north-western hillslope of Lung Fu Shan would be more beneficial to the urban areas of Kennedy Town, reaching the urban area from S and SE directions respectively. Furthermore, sea breeze at the shoreline of Kennedy Town is anticipated, enhancing air movement into the Project Area from the north. A digital terrain elevation map for the Project Area with illustrations of downhill air movements and sea breeze, is shown in **Figure 3.1**.

Land Uses and Urban Morphology

3.5 The land uses of the Project Area are shown on the OZP as illustrated in **Figure 3.2** below.

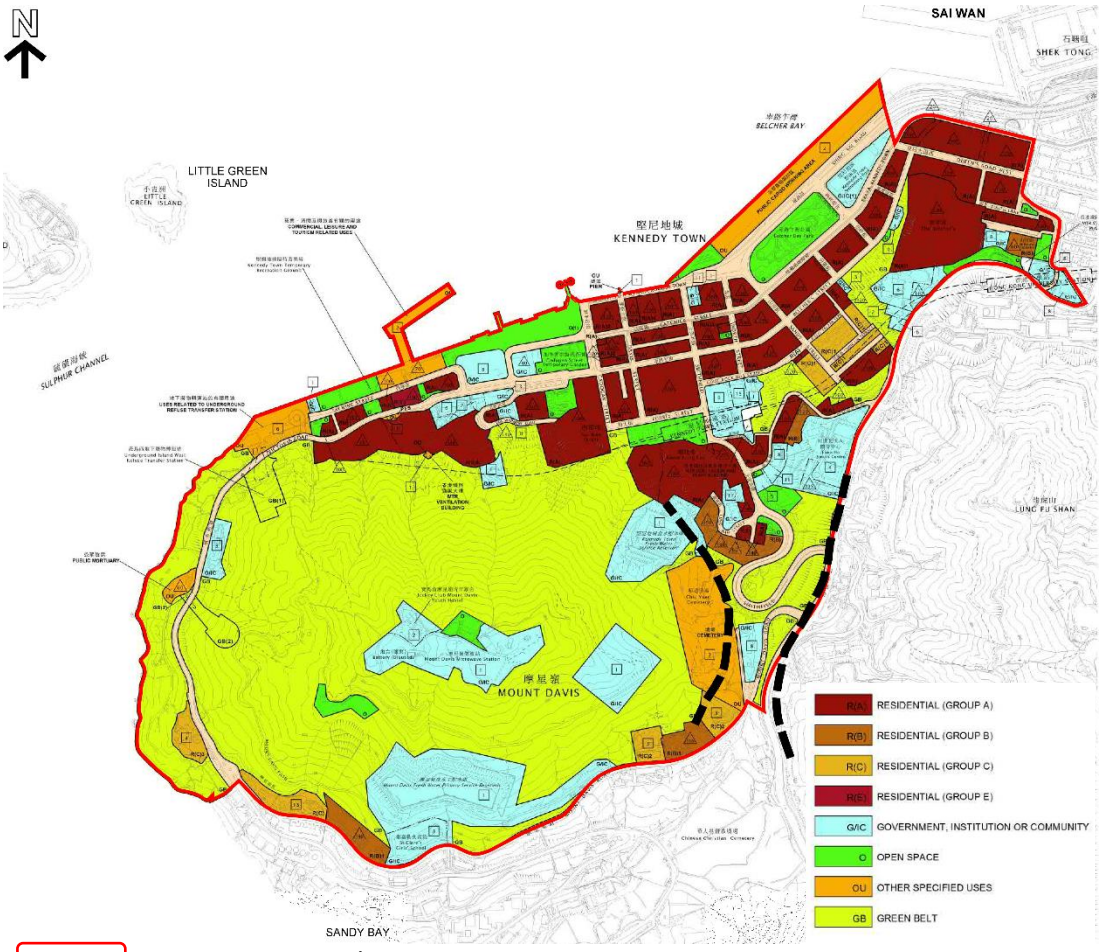
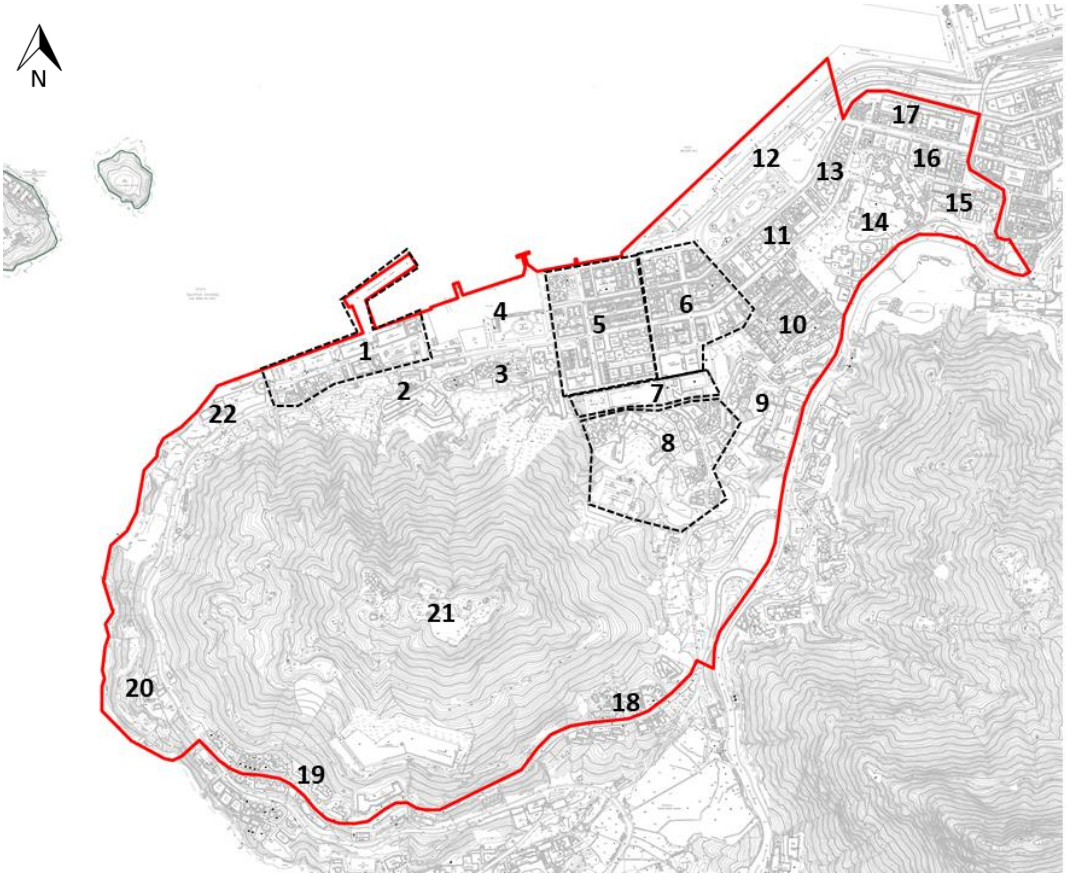


Figure 3.2 The OZP No. S/H1/20

3.6 The southwestern portion of the Project Area is known as Mount Davis which mainly zoned "Green Belt" ("GB") with some areas zoned "Residential (Group B)" ("R(B)"), "Residential (Group C)" ("R(C)"), "Government, Institute or Community" ("G/IC"), "Open Space" ("O") and "Other Specified Uses" ("OU") on the OZP. The northern portion of the Project Area is the urban area of Kennedy Town, extending along the shoreline. Majority of this region is zoned "R(A)" with some areas zoned "O", "G/IC" and "OU". A valley corridor is identified at the southeastern portion of the Project Area as shown in **Figure 3.2**, the area comprises sites which zoned "R(A)", "R(B)", "GB", "G/IC" and "O".

3.7 To sum up, low-rise and low density residential and GIC developments are scattered along the eastern, southern and western portion of the Mount Davis foothill. Higher density residential developments are located to the north and northeast of Mount Davis. The major buildings / clusters of developments within the Project Area are shown in **Figure 3.3** below, while the BHRs under the current OZP is shown in **Figure 3.4.**



1. Kennedy Town Temporary Recreation Ground, Serene Court, China Merchants Wharf and Godown, Yiuga Factory Building and Kennedy Town Bus Terminus Sitting-out Area	2. Bayanihan Kennedy Town Centre, Buddhish To Chi Fat She and Ka Wai Man Road public housing site (currently vacant)
3. Kennedy Town Jockey Club Clinic, SKH Lui Ming Choi Memorial Primary School, Cayman Rise, Sai Wan Estate, Ka Wai Man Road Garden and Centenary Mansion	4. Cadogan Street Temporary Garden, Sai See Street Refuse Collection Point and the future waterfront park (currently vacant)
5. The Merton, Catchick Street Garden, Manhattan Heights, Hau Wo Court, Full Harvest Building, Kam Tong Building, Kennedy Mansion, Luen Hong / Luen Yau / Luen On / Luen Gay / Luen Hing Apartments, Smithfield Court, Concord Hotel and On Fat Building	6. New Fortune House, Wah Po Building, Kelley Court, Harbour View Garden, Hang Fai Building, La Maison Du Nord, Markfield Building, Imperial Kennedy, Man Kwong Court, Belcher Hill, Smithfield Municipal Services Building, Kennedy Town Community Complex
7. Forbes Street Temporary Playground, MTR Kennedy Town Station and Smithfield Sitting-out Area	8. Kwun Lung Lau, Smithfield Terrace, The HKU Jockey Club Student Village 3, Pokfield Garden, Our Lady of The Rosary Church St. Charles School, Smithfield Garden and Kennedy Town Service Reservoir Playground
9. University Heights, The HKU Jockey Club Student Village 2, Flora Ho Sports Centre and HKU St. John's College	10. Axeford Villa, Hoi Lee Building, Academic Terrace, Greenview Court, Ching Lin Terrace Residence, Ying Ga Garden, HK (Western) Swaton Baptist Church, Hee Wong Terrace and Po Wah House
11. Kennedy Town Centre, Jade Court, Pearl Court, Hoi Tao Building and Belcher Street Sitting-out Area	12. Belcher Bay Park and Kennedy Town Swimming Pool

13. Belcher Court, Yick Fung Garden, Sunglow Building and Chester Court	14. The Belcher's (The Westwood), The HKU Jockey Club Student Village 1, Ricci Hall and Pokfulam Station Building
15. Nam Wah Mansion, Sik On House, SKH St. Peter's Primary School and Hillview Garden	16. Kam Ling Court, Hotel Jen Hong Kong, Pak Hoo Mansion, Sun King House and Hon Bong Building
17. Harbour One, Hong Kong Industrial Building, Kwun Yick Building, Yip Cheong Building, Dragonfair Garden and Mei Sun Lau	18. Mount Davis Village, Four Winds, On Lee, Greenery Garden, Mount Davis Garden and Greenvale
19. St. Clare's Girls' School, Cape Mansions, Villas Sorrento and Felix Villas	20. The Hong Kong Jockey Club University of Chicago Academic Complex
21. Jockey Club Mt. Davis Youth Hostel, Police Radio Station and Mount Davis Playground	22. Environmental Protection Department Environmental Infrastructure Division Island West Transfer Station (EPD Transfer Station)

Figure 3.3 Major developments in the Project Area

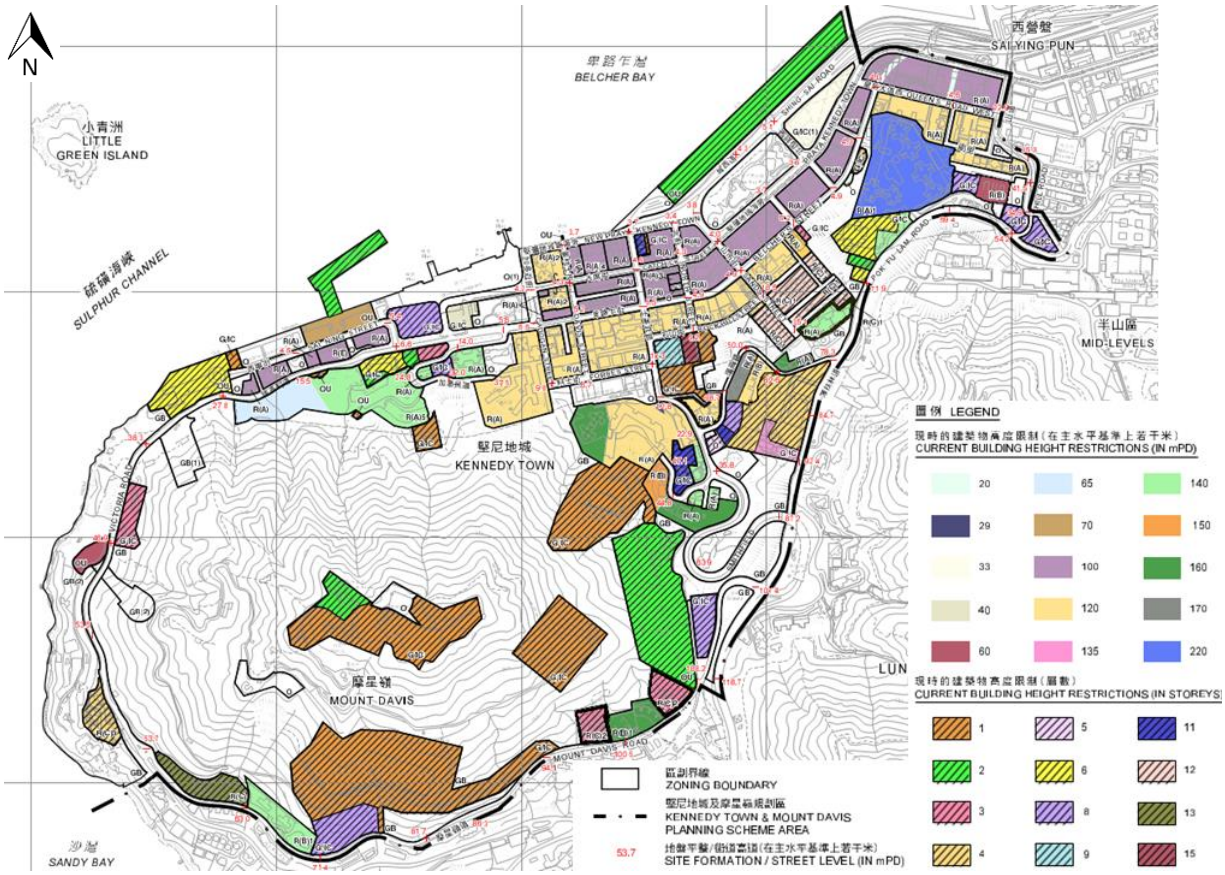


Figure 3.4 BHRs under the current OZP No. S/H1/20

3.8 The BH of existing developments within the Project Area range from around 20mPD to over 160mPD with the highest buildings being The Belcher's (The Westwood) (220mPD), followed by Manhattan Heights (171mPD), Belcher's Hill (167mPD) and The Merton (165mPD).

3.9 Another important feature of the development morphologies within the urban development areas of the Project Area is that the buildings are densely packed together, especially in the northeastern and central portions, where Kennedy Town is located. This feature inhibits the flow and penetration of the prevailing wind near ground level in the aforementioned region and the wind magnitude is anticipated to be relatively lower as compared to those areas located at the hillslopes of Mount Davis, near the shoreline and western region of Kennedy Town (i.e. the region adjacent to the north hillslope of Mount Davis).

3.10 Open areas such as parks, sitting-out areas, vacant sites and hillslopes appear near the urban morphologies. These regions include Belcher Bay Park, Belcher Street Sitting-out Area and the

vegetated hillslopes to the southwest of The Belcher's (The Westwood), Hoi Tao Building and HK (Western) Swaton Baptist Church), Smithfield Sitting-out Area and adjacent hillslope, Forbes Street Temporary Playground, Kai Wai Man Road Garden, Cadogan Street Temporary Garden and its adjacent vacant site (i.e. the future waterfront park which zoned "Open Space (1)" on the OZP). These open areas would become wind entrance points allowing the prevailing winds to infiltrate into the highly dense Kennedy Town, or serve as ventilation "breathing areas" among the densely packed buildings, allowing spaces for air flow to reach the pedestrian level after flowing over the buildings.

The Air Ventilation Measures on the Current OZP and Its ES

3.11 The previous AVA studies of the Kennedy Town (i.e. AVA EE 2011 and AVA EE 2013) have proposed several measures in enhancing the air ventilation performance of Kennedy Town. The measures have been stipulated on either the OZP or its ES. An overview of the measures proposed in previous AVA studies are illustrated in **Figure 3.5**.

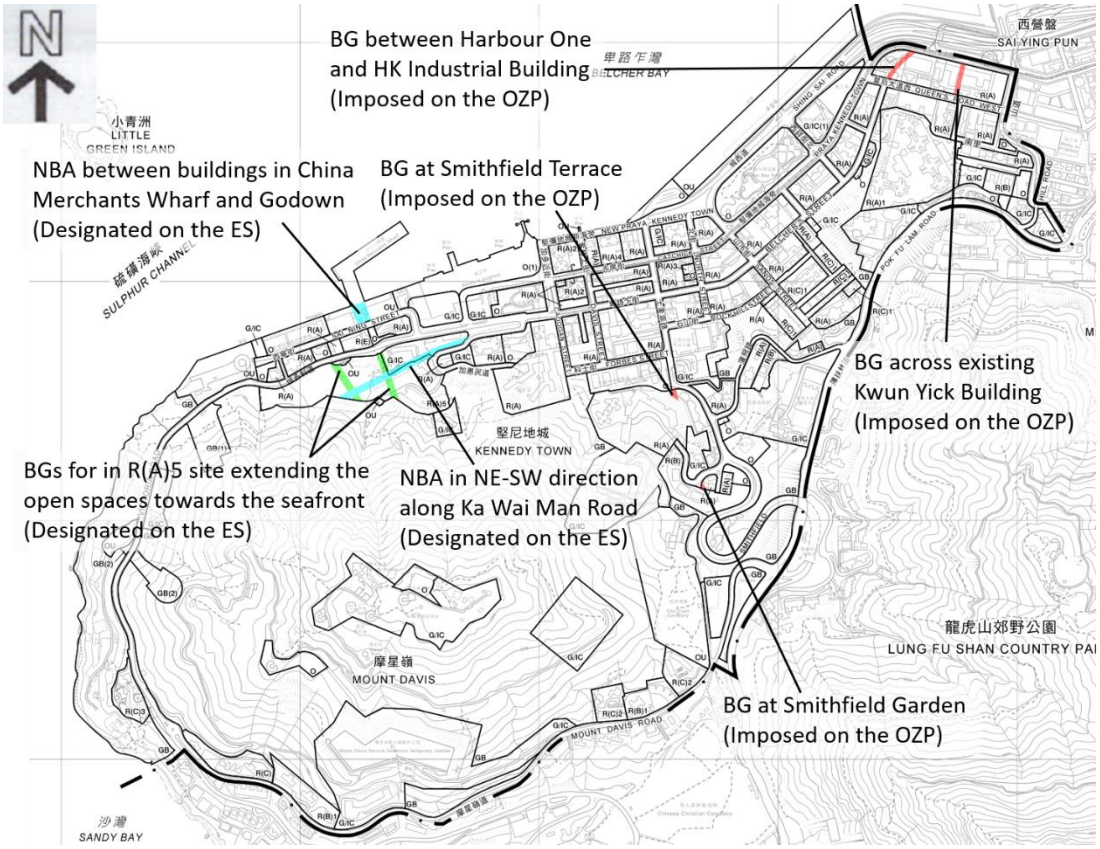


Figure 3.5 Illustration of measures imposed on the OZP and its ES as recommended in the previous AVA studies

3.12 The measures which imposed on the OZP as recommended in the AVA EE 2011:

- A BG at "R(A)" site, located between Harbour One and HK Industrial Building, linking up Queen's Road West and Connaught Road West;
- A BG at "R(A)" site, located across Kwun Yick Building near Woo Hop Street;
- A of BG at "R(A)" site of Smithfield Terrace, fronting Forbes Street Temporary Playground; and
- A BG at "R(A)" site of Smithfield Garden, adjacent to Lung Wah Street and fronting the HKU Jockey Club Student Village 3.

The measures which designated on the ES as recommended in the AVA EE 2013:

- A NBA at the "OU" site of the China Merchant Wharf;
- A NBA at the "R(A)5" site on Ka Wai Man Road for future public housing development; and
- Two BGs in line with Sai Ning Street Garden and Kennedy Town Bus Terminus at the "R(A)5" site on Ka Wai Man Road for future public housing development.

3.13 The effectiveness of these mitigation measures will be discussed in **Section 4** below.

4 REVIEW ON THE EXISTING WIND ENVIRONMENT AND AIR VENTILATION FEATURES ON THE CURRENT OZP AND ITS ES

4.1 Based on the identification of topographical features and the urban morphologies within the Project Area, a portion of the annual / summer prevailing wind (i.e. E, SE, S, SSW and SW) would be moderated by the hilly terrain of Mount Davis and Lung Fu Shan, while the high-density urban morphologies would limit the wind flow at pedestrian level within the built region of Kennedy Town. Owing to the high-density nature of the developments in the urban region of the Project Area, the discussion based on BH / BHR alone may not be sufficient in understanding the air ventilation performance in the urban region as pointed out in the AVA EE 2013. Thus, the identification of the breezeways and air paths at/near ground level is essential to support the analysis of the wind environment within the region and detailed discussion with illustrations (**Figures 4.1 to 4.6**) are provided in the sections below.

Under NNE prevailing wind and sea breeze

The localized air paths

4.2 Several streets and roads form localized air paths to carry the air flow driven by the prevailing winds and sea breeze into the urban fabric. At the eastern portion of the Project Area, the NNE wind may be channeled into Hill Road as well as the eastern BG through the blocks between Queen's Road West and Connaught Road West from the north and flow into Woo Hop Street, while Sai Cheung Street, Holland Street and Sands Street would allow the sea breeze coming from Public Cargo Working Area and Belcher Bay Park to penetrate the built areas near Yick Fung Garden and Pearl Court.

4.3 The north-south aligned air paths in the middle portion of the Kennedy Town would also facilitate sea breeze into the inland urban areas. These local air paths networks are composed by Cadogan Street, Davis Street, Smithfield and North Street, and such features enable the air sea breeze/NNE prevailing wind to infiltrate the high-rise development clusters in Kennedy Town to reach the inland areas.

4.4 The NNE wind would enter the western portion of Project Area via the vacant site (i.e. the future waterfront park) to the north of Cadogan Street Temporary Garden, which would skim over Ka Wai Man Road Garden to the south. Meanwhile, NNE wind would also penetrate the NBA imposed in the "OU" site of China Merchant Wharf and flow through the eastern BG at the "R(A)5" site of the proposed public housing site at Ka Wai Man Road. Furthermore, a portion of air flow driven by NNE prevailing wind would also enter the urban region via Kennedy Town Temporary Recreation Ground, from where the wind would travel further towards Victoria Road via Public Open Space and Sai Ning Street Garden – western BG of the proposed public housing site at Ka Wai Man Road. Major local breezeways and air paths under NNE prevailing wind and sea breeze are illustrated in **Figure 4.1**.

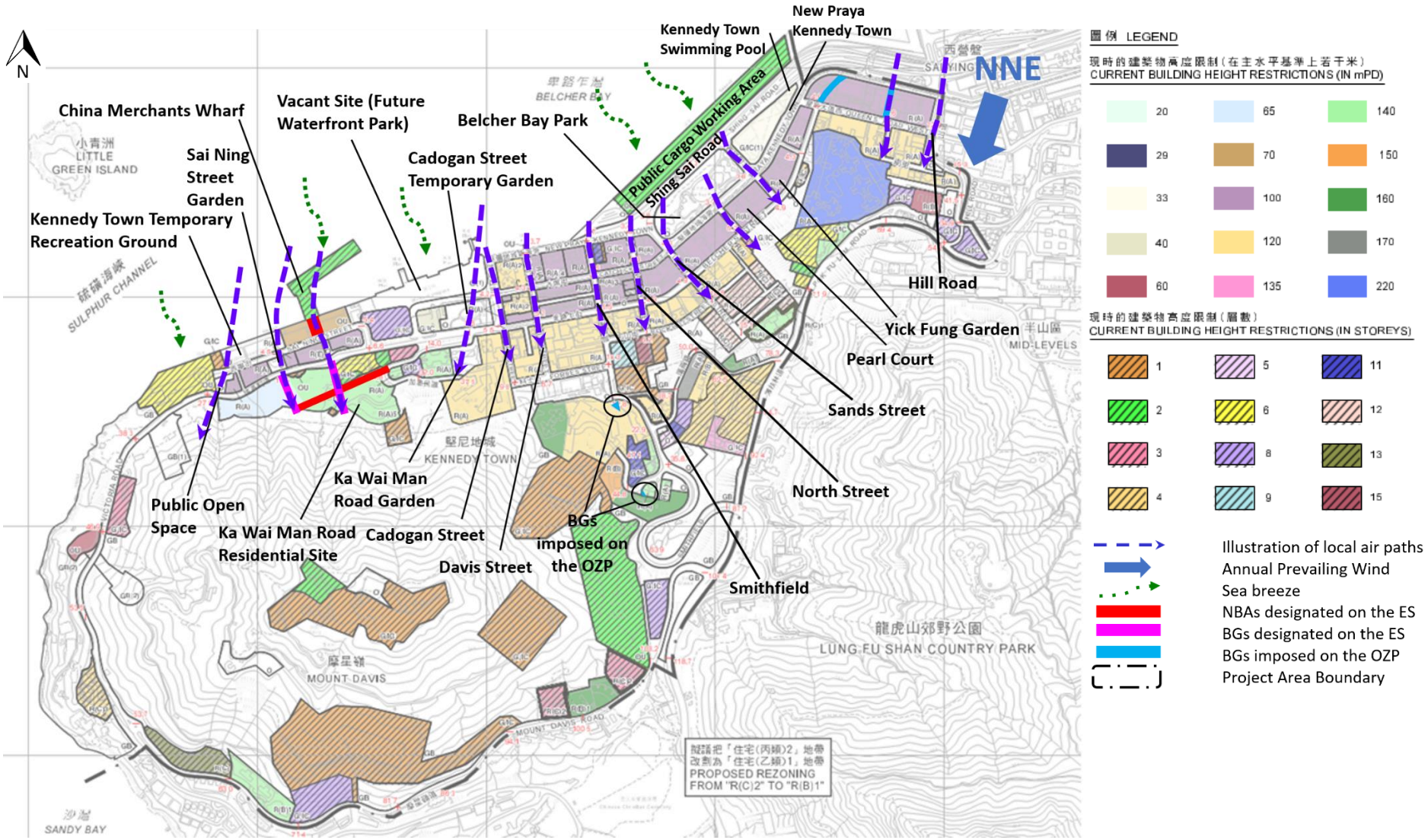


Figure 4.1 Major breezeways and air paths under NNE prevailing wind and sea breeze

Under NE and ENE prevailing wind

The major breezeways

4.5 Owing to the blockage by the high-density buildings to the east of the Project Area (i.e. the Sai Ying Pun region to the east of Hill Road), ENE and NE wind would generally approach the Project Area from Shing Sai Road and the sea. These wind would sweep through the relatively open area at the northeastern portion of the Project Area (i.e. the Public Cargo Working Area, Belcher Bay Park and Shing Sai Road, as well as New Praya Kennedy Town) and reach the area near New Fortune House or be channeled into Catchick Street.

4.6 Another portion of the NE wind would enter the Project Area via the vacant site (the future waterfront park) and Cadogan Street Temporary Garden. This stream of wind would flow across Victoria Road and enter Ka Wai Man Road, eventually penetrate the NBA proposed within the "R(A)5" site on Ka Wai Man Road, maintaining the air ventilation performance at this future residential site.

4.7 The prevailing wind would also flow over Kennedy Town Temporary Recreation Ground and Public Open Space to reach the open area of northwest hillslope of Mount Davis (near the Victoria Road) and facilitate the air ventilation performance in vicinity of the road.

The localized air paths

4.8 In addition to the major breezeways, several relatively narrower streets / roads and interlinked open areas / areas with low-BHR also form air paths to aid in carrying the air flow driven by the prevailing wind. Among the air paths, two are identified to elongate the breezeways to carry the air flow deeper into the urban area. The first one is at Catchick Street, which facilitates the air flow from New Praya Kennedy Town to penetrate the built region and reach Cadogan Street Temporary Garden. The second one is Victoria Road at the western portion of Kennedy Town, which would carry the wind travelled via Cadogan Street Temporary Garden and flow further west into the urban area.

4.9 Apart from the above two localized air paths, the air flow would also penetrate the building blocks via the two BGs recommended in the AVA EE 2011, the eastern BG would elongate the Woo Hop Street. The western BG would allow air flow to reach the Belcher's Street and be carried by this street to flow into the urban area of the eastern and central parts of Kennedy Town, as well as the hillslope area near Ricci Hall. Furthermore, the wind from the hillslope region near University Heights would also flow over the MTR Kennedy Town Station and sweep through Forbes Street Temporary Playground to the west, thus facilitates the air ventilation performance of the region near the station and the playground. Illustration of the flow of NE and ENE prevailing wind can be referred to **Figure 4.2**.

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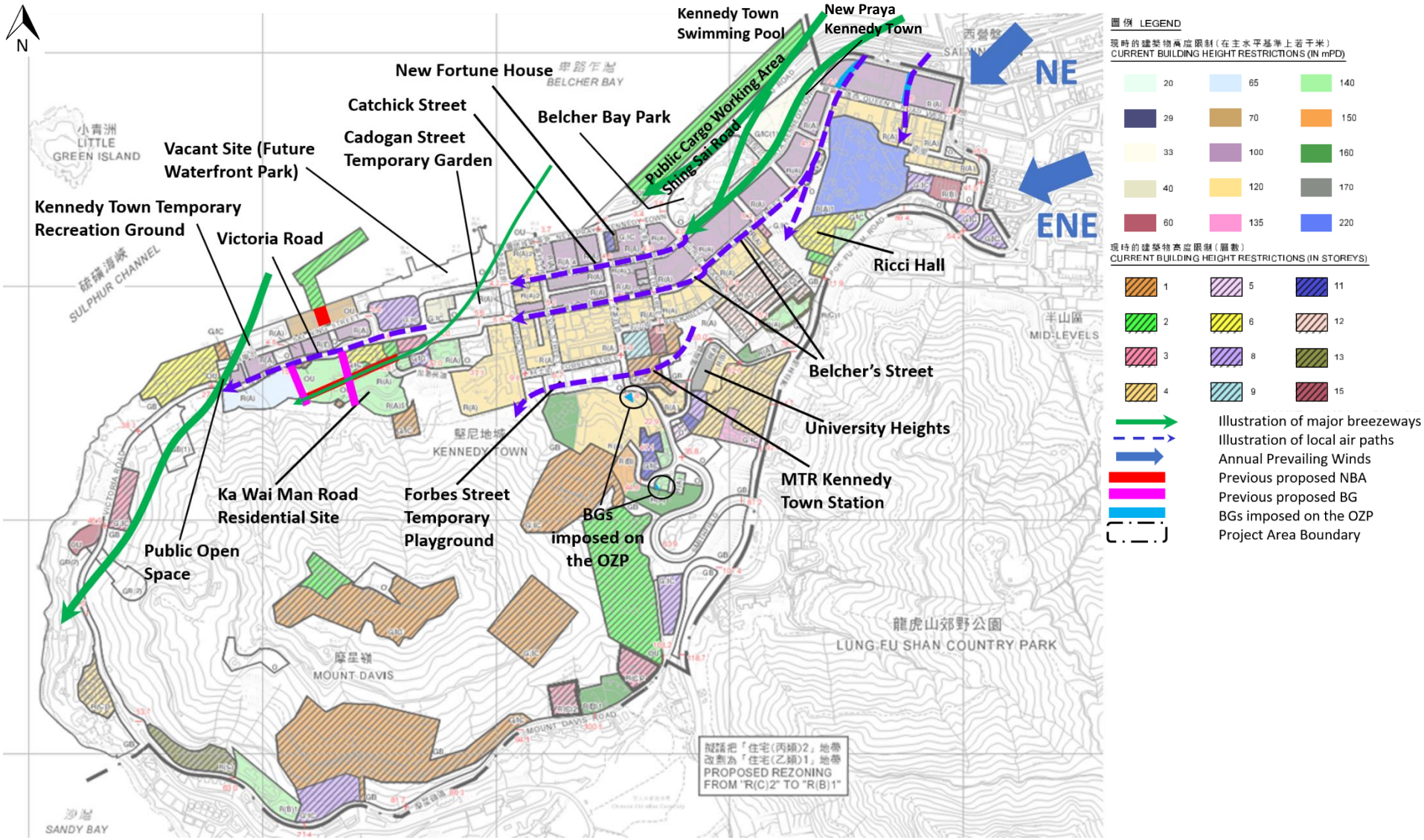


Figure 4.2 Major paths of air flow under NE, ENE wind

Under E prevailing wind and downhill air movement

The major breezeways

4.10 Easterly winds would be moderated and limited before entering the Project Area as the regions to the east and southeast of the Area are the high-density urban area of Sai Ying Pun and hill terrains of Lung Fu Shan respectively. Such external condition would lead to the fact that the wind entering the Project Area be relatively "weak" in terms of efficiency under the easterly prevailing wind. Nevertheless, the presence of a few breezeways would still enable such weakened air flows to infiltrate into the pedestrian frequent access areas.

4.11 Under the easterly wind, the air flow approaching the north of the Project Area would be flowing along Connaught Road West and reach the Public Cargo Working Area near the sea. This breezeway would be responsible for the air ventilation performance at the northern side of the Project Area.

4.12 Another portion of easterly wind would skim around the northern hillslope of Lung Fu Shan (near the south side of HKU Campus) and reach Pok Fu Lam Road, where the wind would enter the Project Area via the gap between Pokfulam Station Building and Academic Terrace. This portion of wind would skim over the relatively low-profiled building groups (Hee Wong Terrace) and reach the region around MTR Kennedy Town Station, eventually enter Forbes Street Temporary Playground. Major wind breezeways under E prevailing wind and downhill airflow are illustrated in **Figure 4.3**.

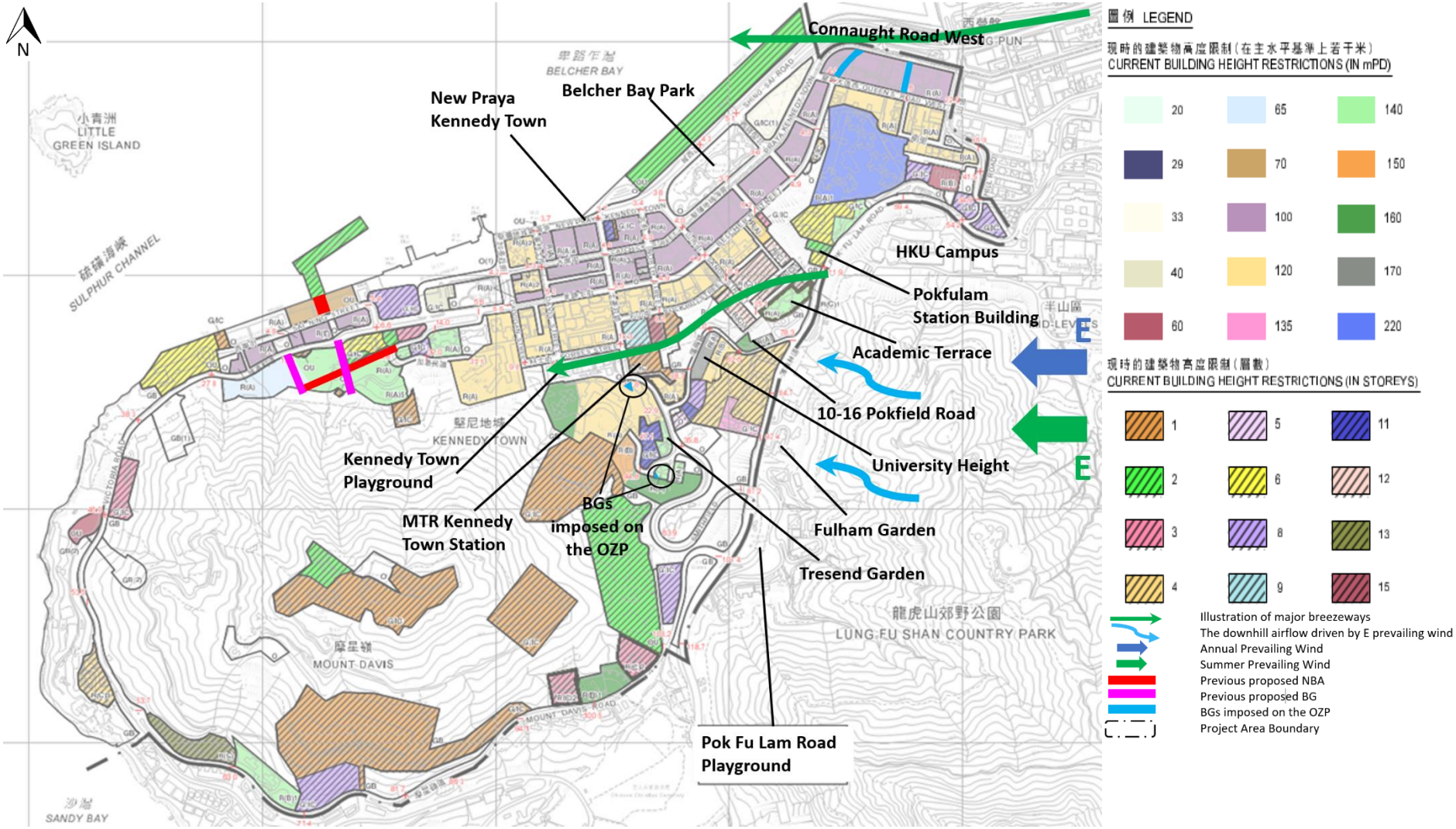


Figure 4.3 Major paths of air flow under E wind

Under SE prevailing wind and downhill air movement

Major breezeways

4.13 The south-easterly wind would also reach the area near Pok Fu Lam Road Playground. A portion of these air flows would travel from Emerald Garden towards the area near Tresend Garden and Smithfield. Meanwhile, the winds flow across Pok Fu Lam Road Playground would skim the low-profiled "G/IC" and "OU" sites (with BHRs of around 1-2 stories) to the southwest of the HKU Jockey Club Student Village 3 flowing towards Kwun Lung Lau and eventually reaching Forbes Street Temporary Playground and Sai Wan Estate to facilitate the air ventilation of the area.

The localised air paths

4.14 Several air paths are aligned with and elongate the wind breezeways that would further promote the air flow travelling into the urban regions. The westernmost local air paths are those created by the BGs to be implemented in the "R(A)5" site at Ka Wai Man Road for proposed public housing development. This portion of winds would then flow via the NBA in the "OU" site of China Merchants Wharf and Kennedy Town Temporary Recreation Ground. Furthermore, Cadogan Street elongates the breezeway near Kwun Lung Lau as mentioned above, allowing the wind flow to penetrate the high-rise urban area and reach the shoreline. Smithfield and Forbes Street Temporary Playground also form a local air path, elongating the breezeway of Emerald Garden – Tresend Garden and facilitate the wind environment in the vicinity region.

4.15 Similar to the easterly wind, the SE prevailing wind would be weakened after skimming over Lung Fu Shan. The prevailing wind flow along with the downhill wind would approach the Project Area via the hillslope across Pok Fu Lam Road. At the region near the HKU campus, the downhill air flow would flow into the stripe of corridor near HK (Western) Swaton Baptist Church and channeled into Hollands Street to reach Belcher Bay Park. Meanwhile, the wind flow would also approach the region to the south of Academic Terrace, in which the wind would be channeled separately by Academic Terrace and be carried towards the shoreline by Sands Street and Holland Street, facilitating the air ventilation in the vicinity region. Furthermore, Sai Cheung Street would also serve as a local air path, transporting the air flow driven by the SE prevailing wind to flow from the hillslope near The Belcher's (The Westwood) towards the seafront region. The above-mentioned air flows are illustrated in **Figure 4.4**.

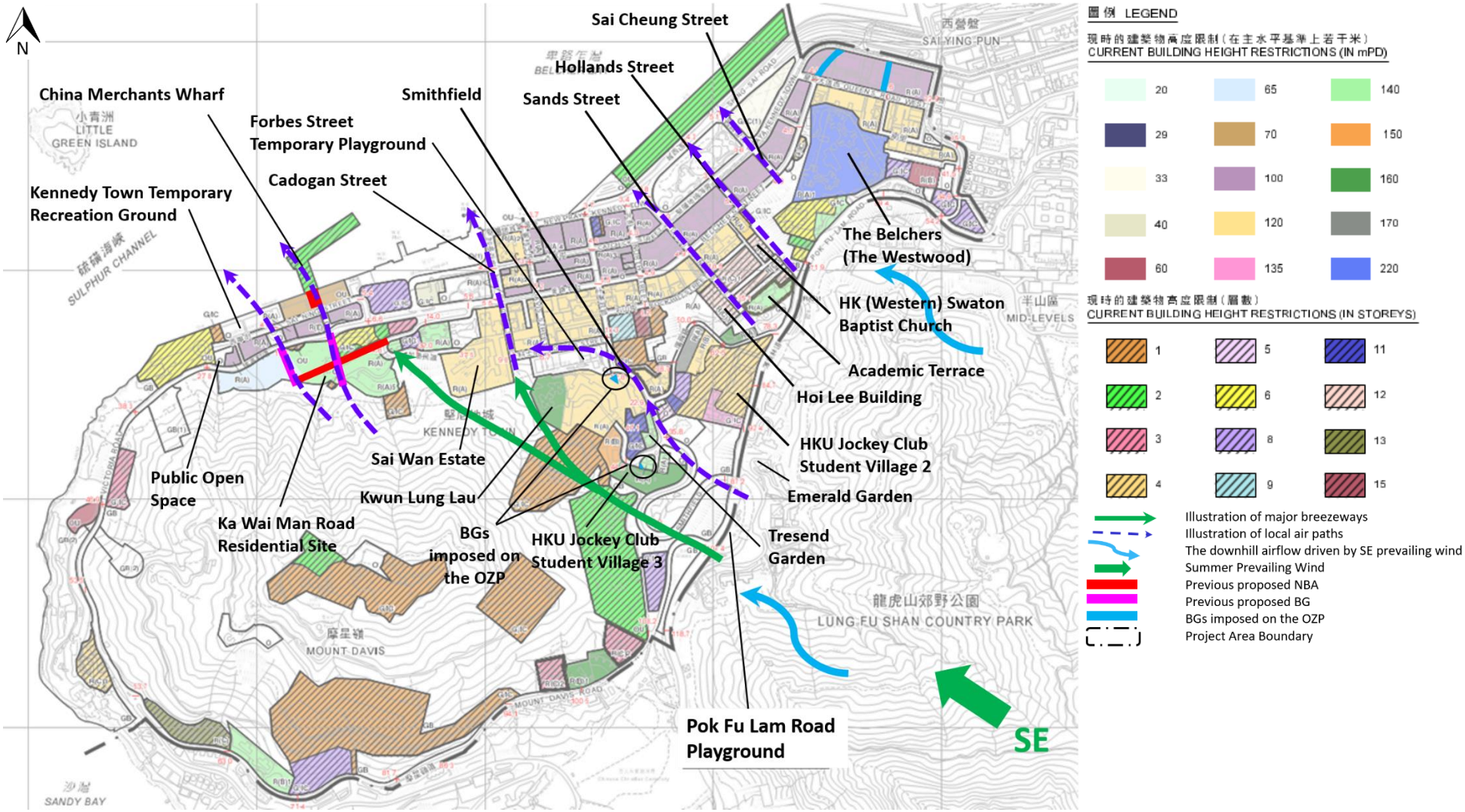


Figure 4.4 Major paths of air flow under SE wind

Under S and SSW prevailing winds and downhill air movement

Major breezeways

4.16 Under the SSW and S winds, a portion of the prevailing wind would approach Victoria Road to the west of Mount Davis and reach the westernmost region of Kennedy Town (i.e. the area near EPD Transfer Station). In addition, downhill wind from Mount Davis would approach the western portion of Kennedy Town, and part of this wind would penetrate the Public Open Space and flow over Kennedy Town Temporary Recreation Ground, before reaching the sea.

4.17 Majority of the air flows driven by SSW wind approaching the urban region of the Project Area would be channeled into the valley corridor near Greenery Garden. A portion of these SSW winds would flow along Pok Fu Lam Road and reach Ricci Hall and HKU campus.

4.18 The S prevailing wind would also enter the valley corridor via the western side of Greenery Garden and would flow along the hillslope to the southwest of HKU Jockey Club Student Village 3 and skim towards Kwun Lung Lau and eventually reaching Sai Wan Estate as well as the western portion of Forbes Street Temporary Playground.

The localized air paths

4.19 Apart from the major breezeways which introduce the prevailing wind and mountain wind into the urban region, several streets also facilitate the penetration of the prevailing wind through the region. Such air paths include Cadogan Street, which elongates the breezeway near Kwun Lung Lau, allowing the air flow from the south to penetrate the high-rise building clusters near the shoreline. Another important air path is at Smithfield, which links up the relatively opened area near HKU Jockey Club Student Village 3 and directs the air flow to flow across the urban region at central portion of Kennedy Town to reach the sea.

4.20 In addition to the above air paths, Davis Street also facilitates the air flow from Forbes Street Temporary Playground to penetrate the urban region of Kennedy Town towards the seaside. It is also noticed that the BGs at "R(A)5" site on Ka Wai Man Road would carry the air flow skimming down the hillslope of Mount Davis through the planned residential area under the south quadrant wind, and flow towards the shoreline via the NBA on the "OU" site of China Merchants Wharf as well as Kennedy Town Temporary Recreation Ground. **Figure 4.5** illustrates the flow of S/SSW prevailing wind.

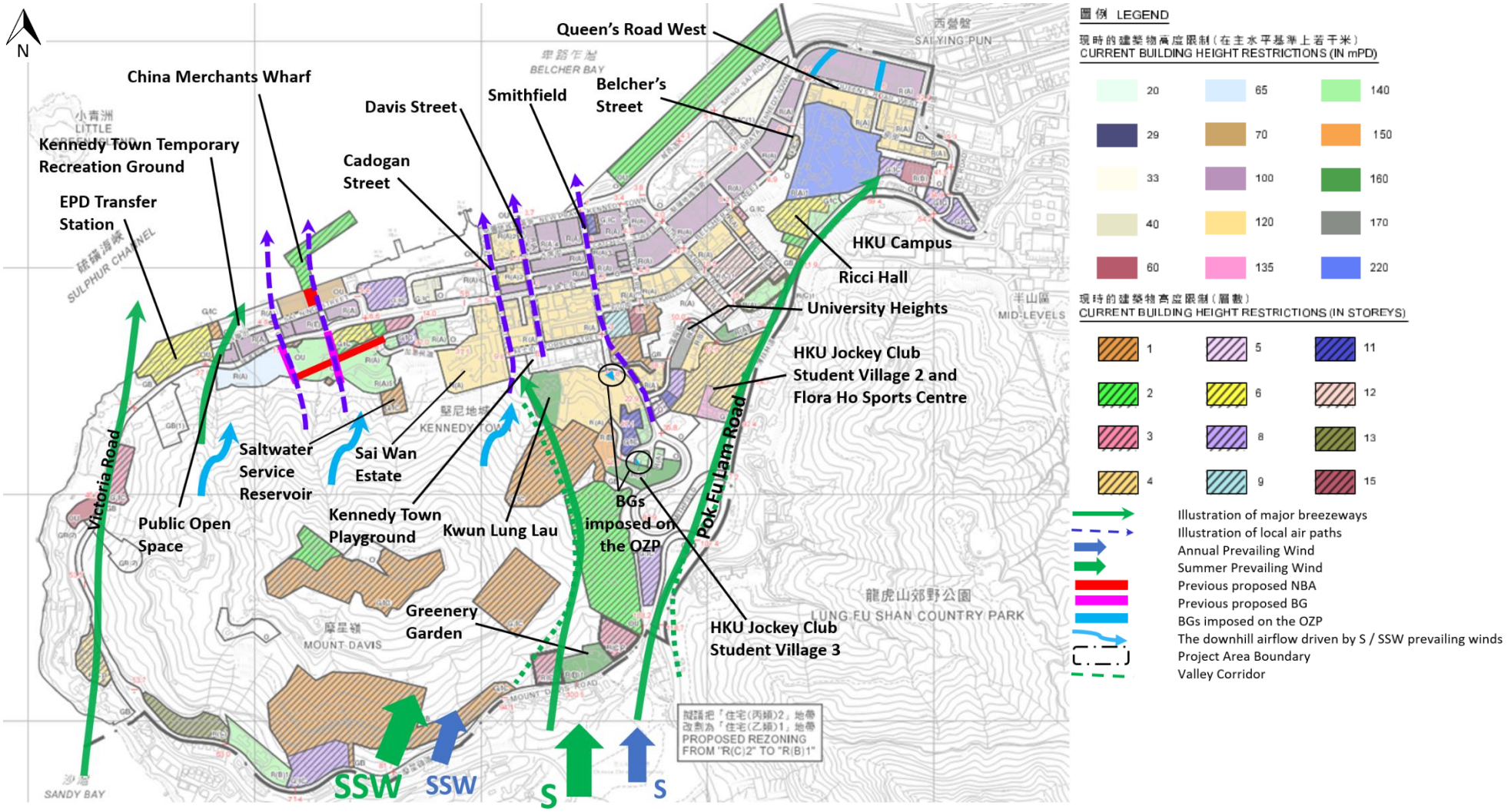


Figure 4.5 Major paths of air flow under S and SSW wind

Under SW prevailing wind and downhill wind

Major breezeways

4.21 A portion of the SW prevailing wind would enter the Project Area at Victoria Road to the northwest of Mount Davis and reach the westernmost region of Kennedy Town (i.e. the area near EPD Transfer Station), which would then reach and skim over the Kennedy Town Temporary Recreation Ground and flow towards the area north to the south of the "OU" site of China Merchant's Godown and Wharf.

4.22 In addition to the southwest wind approaching the northwest side of Mount Davis, a portion of air flow would also be channeled into the valley corridor near Greenery Garden similar to that under the SSW wind. This portion of SW wind would flow along Pok Fu Lam Road and eventually reaching the HKU campus.

The localized air paths

4.23 In addition to the major breezeways identified above, several streets / roads and open spaces would also serve as local air paths within the urban area and contribute in sustaining the wind environment. The westernmost of these air paths is at Victoria Road to the east of the EPD Transfer Station, which directs the air flow entering the urban area from the west to flow towards Cadogan Street Temporary Garden to the northeast. This air path would be further elongated by Belcher's Street and Catchick Street, allowing the air flow to reach Belcher Bay Park and the region near The Belcher's (The Westwood), facilitating the wind environment along the route.

4.24 Furthermore, the air flow driven by SW prevailing wind and downhill wind from Mount Davis would also be channeled into the NBA proposed by the AVA EE 2013 in the proposed public housing site at Ka Wai Man Road and flow into Ka Wai Man Road to the northeast, eventually joining the air path of Victoria Road mentioned above. In addition, the downhill wind could also be channeled into Forbes Street Temporary Playground and flow towards MTR Kennedy Town Station and Davis Street, therefore increasing the wind availability at the central region of Kennedy Town.

4.25 The air flow driven by SW wind from the open space east to Kennedy Town MTR Station would skim over the low-profiled buildings of Hee Wong Terrace and flow into the open area between The Belcher's (Westwood) and Belcher's Street. Major breezeways and local air paths and their corresponding flows are illustrated in **Figure 4.6.**

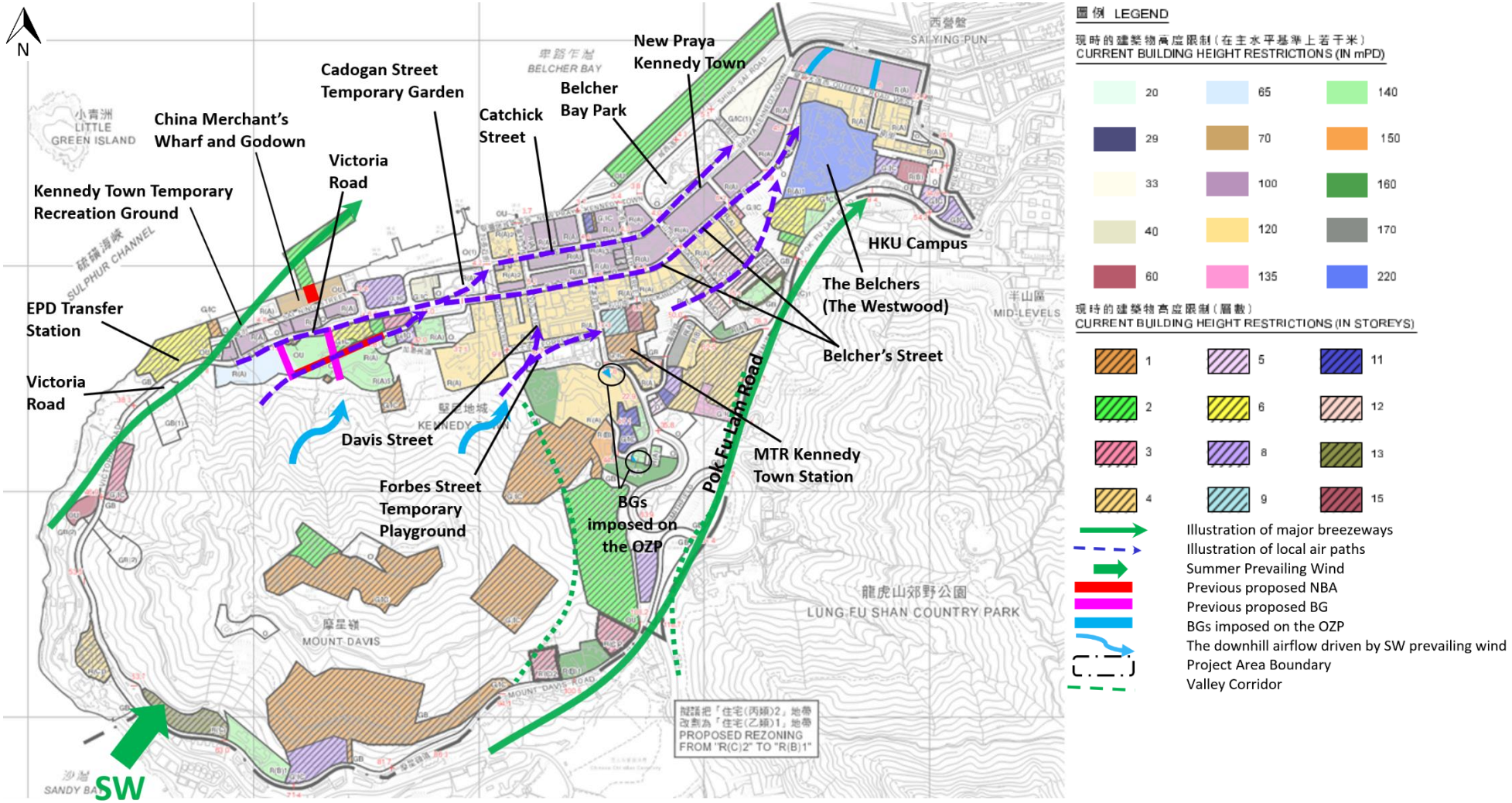


Figure 4.6 Major paths of air flow under SW wind

5 EVALUATION OF THE INITIAL SCENARIO

5.1 To follow up on the Court's rulings, PlanD has undertaken a further review on the development restrictions, including BHRs and NBA and BG requirements on the current OZP and its ES taking into account the latest requirements of SBDG. The review has come up with the Initial Scenario, in which BHRs for some "R(A)" and "R(B)" sites are proposed to be relaxed on the OZP to make allowance for future redevelopments to comply with the SBDG; and two sites at Mount Davis Road are proposed to be rezoned from "R(C)2" to "R(B)1" with the relaxation of the BH and PR restrictions on the OZP.

5.2 This section evaluates the potential impacts arising from the Initial Scenario, focusing on the amendments made to the Baseline Scenario as elaborated in **Section 4**. The following principles and considerations have been taken into account in assessing the Initial Scenario and recommending essential air ventilation measures for incorporation at the OZP level.

SBDG and Chapter 11 of the Hong Kong Planning Standards and Guidelines (HKPSG) relevant to the Project Area

5.3 The SBDG is an administrative means to promote sustainable building design by granting gross floor area (GFA) concessions with a view to contributing to a better built environment. In air ventilation perspective, SBDG aims to enhance building permeability in avoiding screen wall effect and to promote air movements amongst developments to enhance better dispersion and air mixing. Building setback is one of the requirements under SBDG which can improve the wind environment at pedestrian level. According to the SBDG, buildings fronting a street of less than 15m wide should be set back so that no part of the building up to a level of 15m above the street level should be within 7.5m from the centerline of the street. The potential improvement on air ventilation caused by sites adopting building setback could be quite significant for those streets which are currently less than 15m wide.

5.4 Building separation increases permeability within the urban built environment to mitigate heat island effects arising from the undesirable screening effect of long buildings. Incorporating building porosity into building design promotes air movements amongst developments and enhances the diffusion and mixing of air. Permeability in the low zone is particularly important for improving air ventilation at pedestrian level.

5.5 According to the SBDG, building sites that are (a) 20,000m^2 or above, or (b) less than 20,000m^2 and proposed with buildings having a continuous projected façade length (Lp) of 60m or above, should comply with the building separation requirements. The maximum permissible Lp for such building sites should not exceed five times the mean width of street canyon (U). A minimum permeability (P) of 20% is required for each plane in each assessment zone. Figures extracted from the SBDG on building permissible are included in **Appendix**.

5.6 Several principles for planning have been listed out in the Chapter 11 of the HKPSG and one of the most important principles is the alignments of breezeways and / or air paths in prevailing wind directions, accompanied by perpendicular insertion of air paths (see **Figure 5.1**). This would promote wind penetration through urbanized areas. Breezeways could be achieved by connecting major roads, open spaces, amenity areas, NBAs, building setbacks and low-rise building corridors.

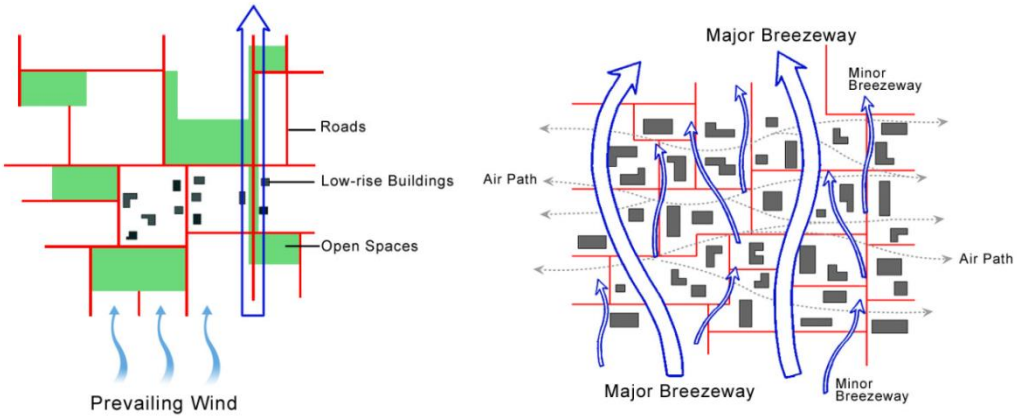


Figure 5.1 Linkage of roads / open space / low-rise buildings to form paths of air flow

5.7 Orientations of streets (see **Figure 5.2**) are also important for maximize the infiltration of prevailing winds into grid-patterned streets. The orientation of arrays of main streets/wide main avenues should best stay parallel to the prevailing wind directions, or with less than 30 degrees, being acceptable. Long street grid facing incoming winds should be avoided in order to minimize wind stagnant zones. Widening of streets/ building setbacks are also considered as a merit design feature.

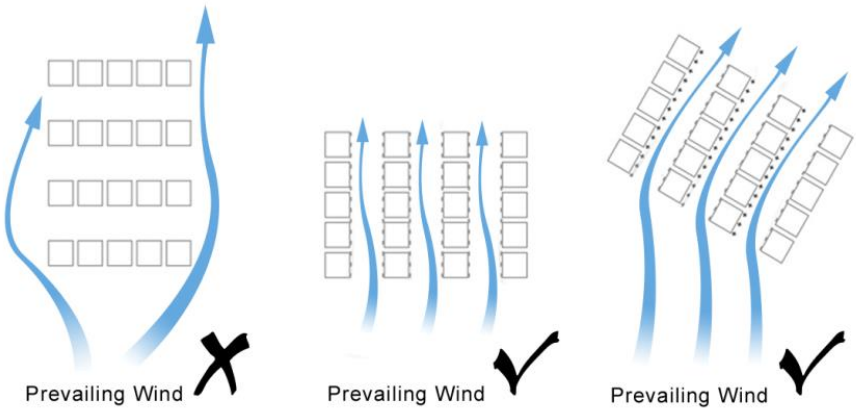


Figure 5.2 Illustration of orientation of streets

5.8 As the Project Area is located adjacent to the seafront, careful consideration should be taken for the function of waterfront sites, in which long continuous building groups perpendicular to wind directions are not encouraged. Corridors facilitating movement of sea / land breezes and prevailing winds flowing over the sea should be retained (see **Figure 5.3**).

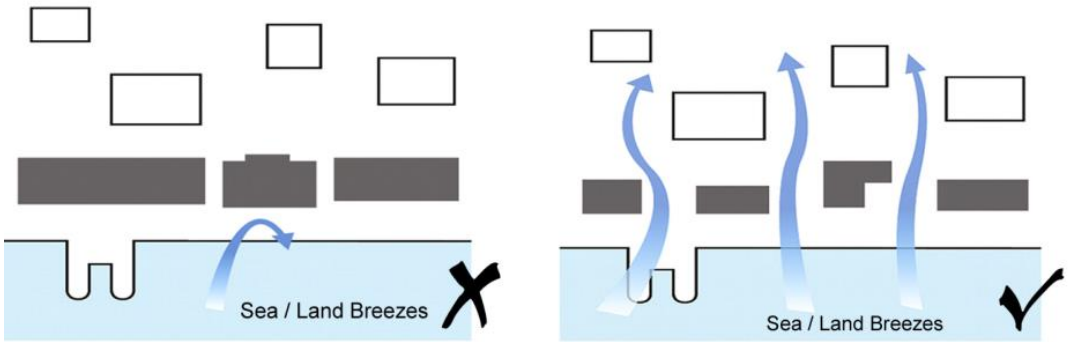


Figure 5.3 Illustration principles for waterfront sites

5.9 Further to the ground level permeability related measures, height variation for buildings (see **Figure 5.4**) also has its role in facilitating the wind flows in urban district, especially in the form of height decreases towards the direction where prevailing wind originates, as this feature instigates the wind flowing in vertical directions throughout the district. With low-rise buildings and open spaces widely disperse around the site, the effect would be intensified.

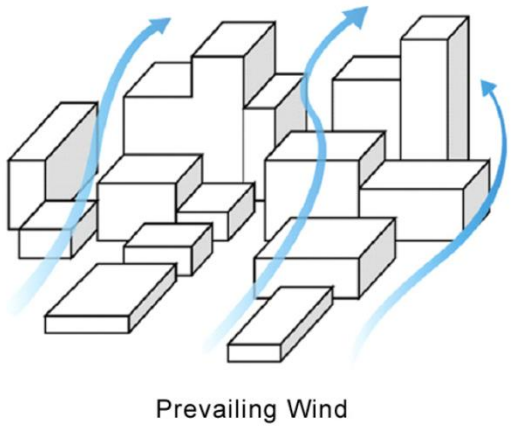


Figure 5.4 Illustration of wind flow over buildings with good BH profile

5.10 However, relying solely on SBDG would not be sufficient to ensure good air ventilation at the district level as concerned building design measures are drawn up for and confined to developments on the basis of each individual site. Building permeability can be provided at low, middle and high zones involving detailed building design matters. These measures, in a diversified manner, may not take into account the need of the wider area and benefits would be localized only. Therefore, incorporation of NBAs and BGs at strategic locations at the OZP level should still be a mean to maintain or create connected air paths for good wind penetration at district level. An appropriate mix use of strategies with planning measures (e.g. NBAs and BGs) at district level as well as design measures (e.g. SBDG's recommendations) at building/site level should be adopted.

Comparison of the Initial Scenario and Baseline Scenario

5.11 Under the Initial Scenario, the following amendments to the BH and PR restrictions of some sites in the Baseline Scenario are proposed (see **Figure 5.5**):

Sites with Proposed Amendments		Current Zoning	Proposed Zoning	Current Development Restrictions on the OZP (Baseline Scenario)	Proposed Development Restrictions on the OZP (Initial Scenario)
A	Pokfield Road Site	"R(A)"	No change	BH: 120mPD	BH: 130mPD
B	Academic Terrace	"R(A)"	No change	BH: 140mPD	BH: 160mPD
C	Hillview Garden	"R(B)"	No change	BH: 60mPD	BH: 120mPD
D	HKU Pokfield Road Residences	"R(B)"	No change	BH: 120mPD	BH: 150mPD
E	2 and 6-10 Mount Davis Road	"R(C)2"	"R(B)1"	PR: 0.75 SC: 25% BH: 3 storeys	PR: 3 SC: N/A* BH: 160mPD

Note: The PR and SC of Sites A to D and the SC* of Site E will be determined under the Building (Planning) Regulations of the Buildings Ordinance (BO).

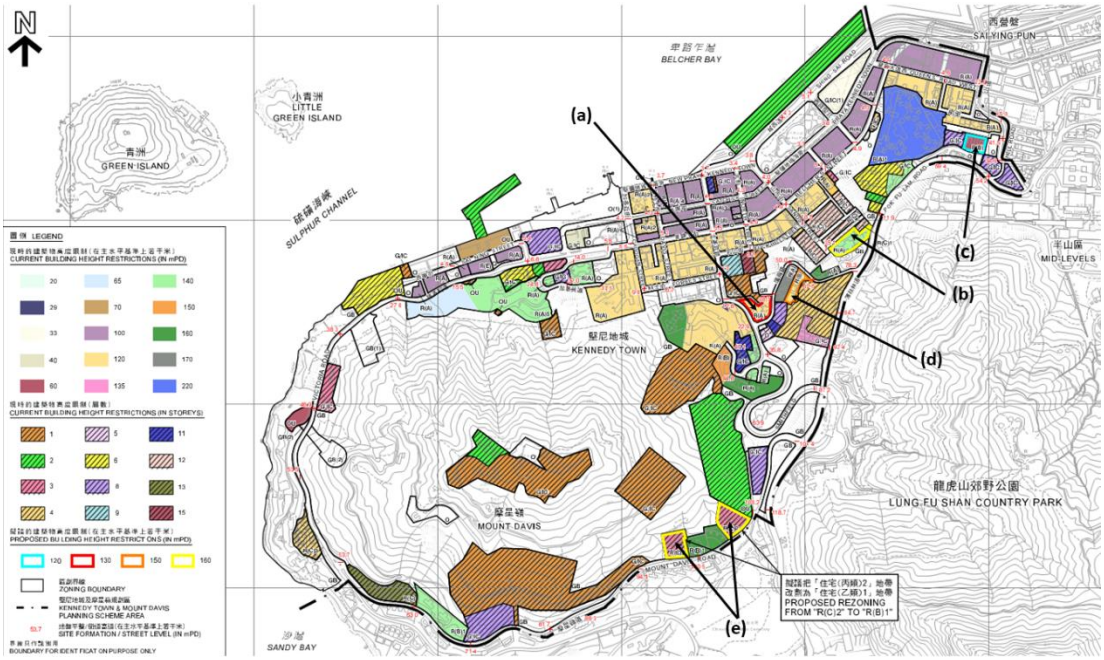


Figure 5.5 The Initial Scenario

5.12 It is generally understood that a building with higher profile would likely induce a larger wind shadow region to the downstream region. However, as raised in the AVA EE 2013, it may not be sufficient to solely rely on the change of BHR to determine the air ventilation performance due to the high-density feature in urban region. In addition, evaluation of the breezeways and air paths being incorporated in the district along with their effectiveness, and other merit features such as gaps between buildings and permeable elements near ground level would provide a more robust analysis of the air ventilation performance of the planning proposal.

5.13 Since the detailed building layout for future redevelopment has not been determined at early planning stage, the extent of implications of SBDG on the building profile could only be estimated in general terms by adopting typical assumptions (i.e. the Initial Scenario). Thus, the evaluation would be conducted in a conservative approach (i.e. assuming all sites will adopt the maximum permissible development parameters, which include the maximum PR and SC permitted under the BO and the proposed BHRs on the OZP). Detailed evaluation of the potential air ventilation impact induced by the amendments stated in Initial Scenario are as follows:

Site A: Pokfield Road Site

5.14 Site A is bounded by Smithfield and Pokfield Road from the west, east and south and fronting the MTR Kennedy Town Station to the north. Since the site is fronting Smithfield and Pokfield Road, which are narrow streets with a width of less than 7.5m from the centerline, building setback requirement under the SBDG is required if the site is to be redeveloped in future (see **Figure 5.6**). The achievable PR in the Initial Scenario is comparable as the Baseline Scenario under the BO with a reduction of non-domestic SC from 100% to 65% and the domestic SC remains unchanged at 40%. To accommodate the permissible development intensity under the BO for future redevelopment in complying with the SBDG, the BHR for Site A is proposed to be relaxed from 120mPD to 130mPD on the OZP.

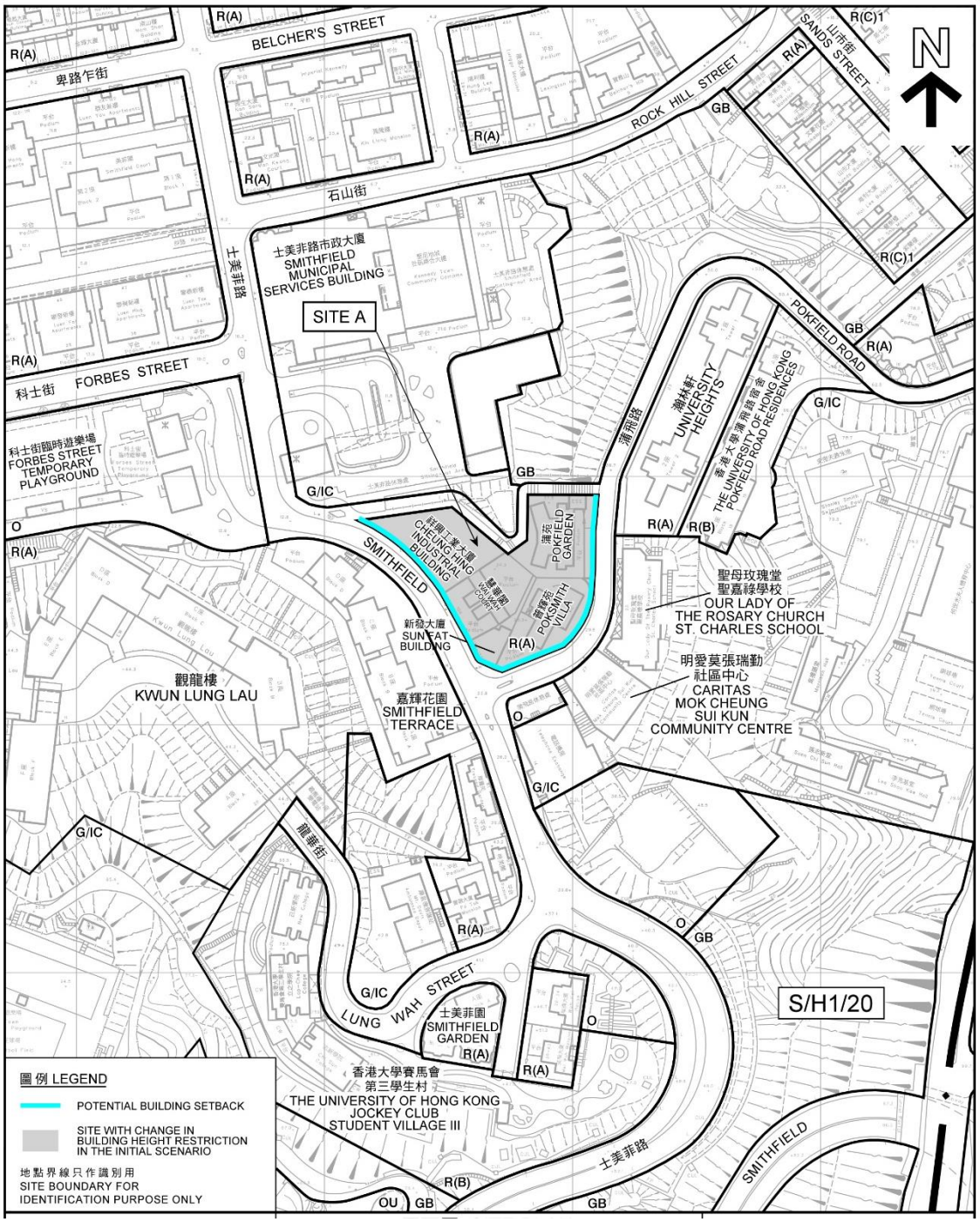
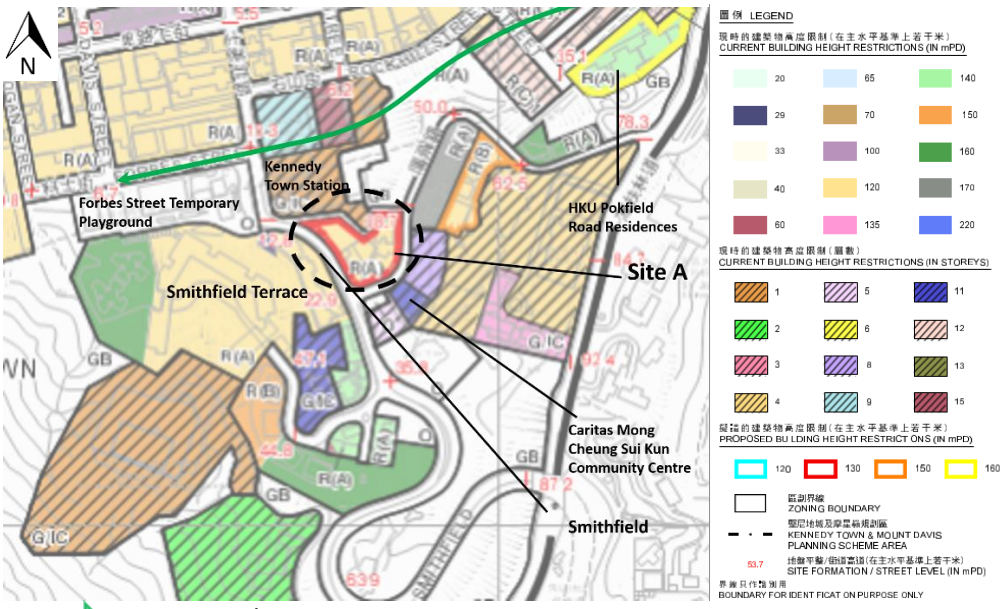


Figure 5.6 Potential Building Setback requirement under SBDG of Site A

NE / ENE/ E wind

5.15 Comparing to the existing BHR of Site A, this change in Initial Scenario would raise the wind blockage against Smithfield Terrace under NE / ENE wind. However, since the buildings in Site A could potentially have a smaller podium as described in Paragraph 5.14 above, the low-level permeability would allow the prevailing wind to penetrate through the site and alleviate the potential impact at the pedestrian level. In addition, the NE / ENE/ E wind can still flow along the air path of MTR Kennedy Town Station – Forbes Street Temporary Playground, allowing air flow to facilitate the wind environment between Smithfield Terrace and Forbes Street (see **Figure 5.7**).

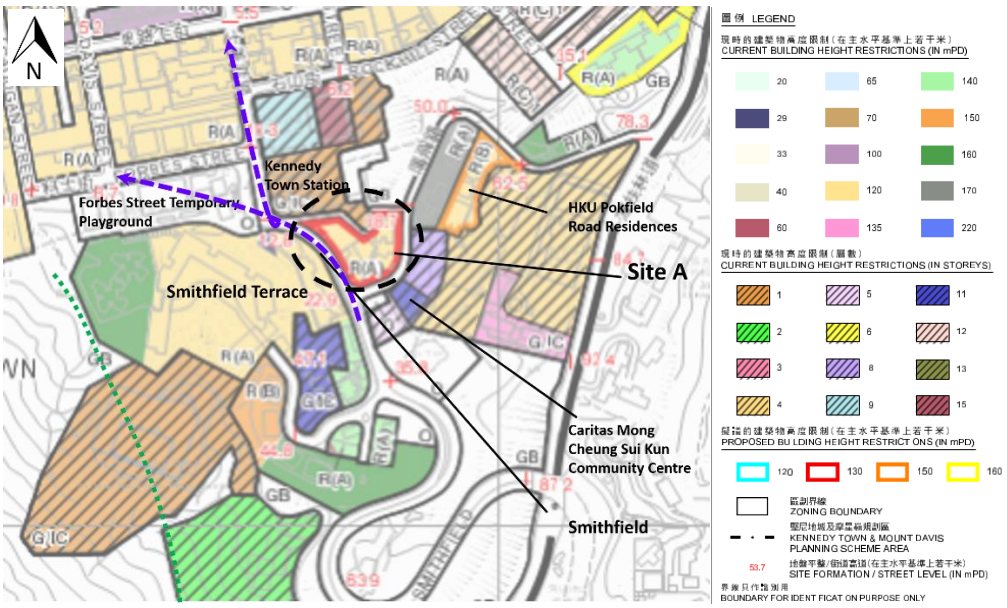


Wind Breezeway
Indication of location of Site A

Figure 5.7 The potential wind feature near Site A under Initial Scenario (E wind)

SE/ S / SSW wind

5.16 The SE/S/SSW prevailing wind mainly travels along the valley corridor and Smithfield. As the BHR of Site A will be relaxed, potential impact would be induced at the area near MTR Kennedy Town Station. As discussed and seen in **Figure 5.8**, the adoption of the SBDG would introduce building setback along Smithfield which allows more prevailing wind entering Forbes Street Temporary Playground and MTR Kennedy Town Station. The potential impact would be alleviated. The amendment of BHR on Site A would increase the BH difference to its surrounding sites (i.e. Caritas Mong Cheung Sui Kun Community Centre, etc.), forming a more evident variation of BH profiles in the region. Such feature would likely induce a stronger localized vertical air movement, bringing more upper level wind to the pedestrian level.



Local air paths
Valley Corridor
Indication of location of Site A

Figure 5.8 The potential wind feature near Site A under the Initial Scenario (SE/ S/ SSW wind)

Site B: Academic Terrace

5.17 Site B is aligned roughly along NE-SW direction at Pok Fu Lam Road. To comply with the SBDG requirements, it is assumed that the SC for non-domestic podium be reduced from 100% to 65% while the domestic SC be remained unchanged at 33.33% under the Initial Scenario. The achievable PR in the Initial Scenario is comparable as the Baseline Scenario under the BO. To accommodate the permissible development intensity under the BO for future redevelopment in complying with the SBDG requirements, the BHR of Site B is proposed to be relaxed from 140mPD to 160mPD on the OZP.

E wind

5.18 The relaxed BHR for Site B in the Initial Scenario may introduce more localized impact on the area near Hoi Lee Building and Sands Street under the easterly wind than the Baseline Scenario. However, assuming that the reduction in SC for non-domestic portion upon future redevelopment, more permeable elements are expected at the low zone of the future redevelopment. Thus, the potential impact of Site B under the Initial Scenario would not be significant under E wind condition. The potential wind feature near the Site B under E Wind can be referred to **Figure 5.9**.

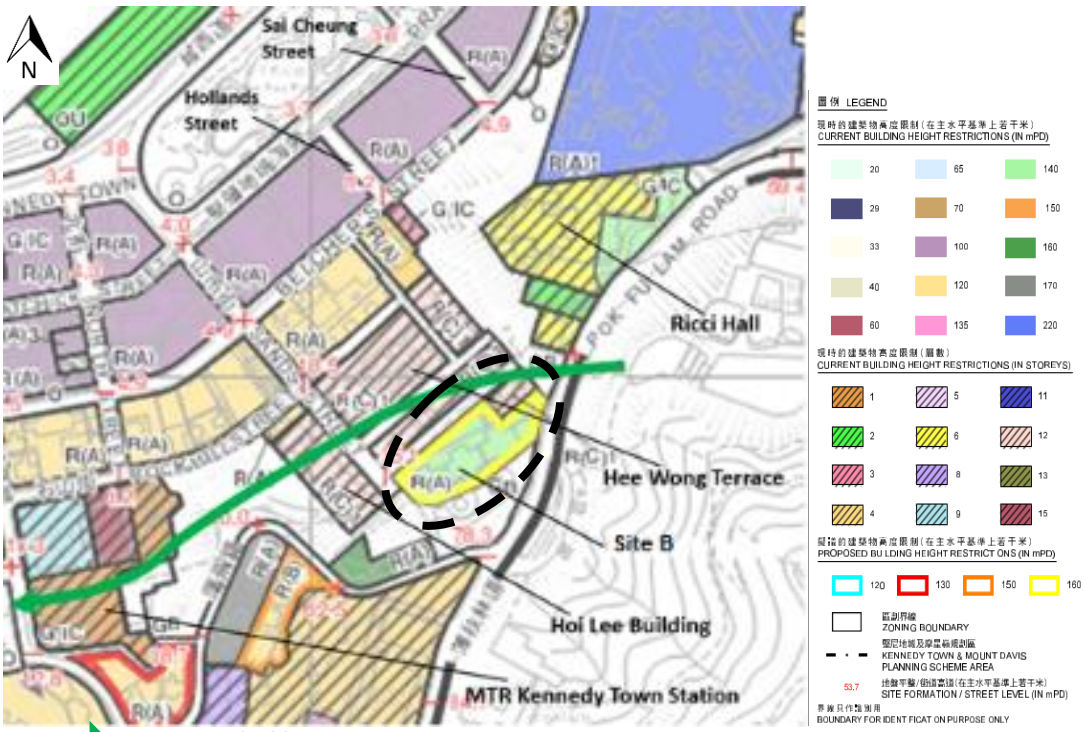


Figure 5.9 The potential wind feature near Site B under E Wind

SE wind

5.19 The alignment of Site B is perpendicular to the SE prevailing wind and would cast wind shadow at the area near Hee Wong Terrace. The reduced SC of non-domestic portion under the Initial Scenario would help facilitate the SE wind to penetrate through the site at low zone level and alleviate the potential impact induced by the increased in BH. Significant impact arising from the Initial Scenario is not anticipated when compared with the Baseline Scenario. **Figure 5.10** shows the potential wind feature near the Site B in the Initial Scenario under SE wind.

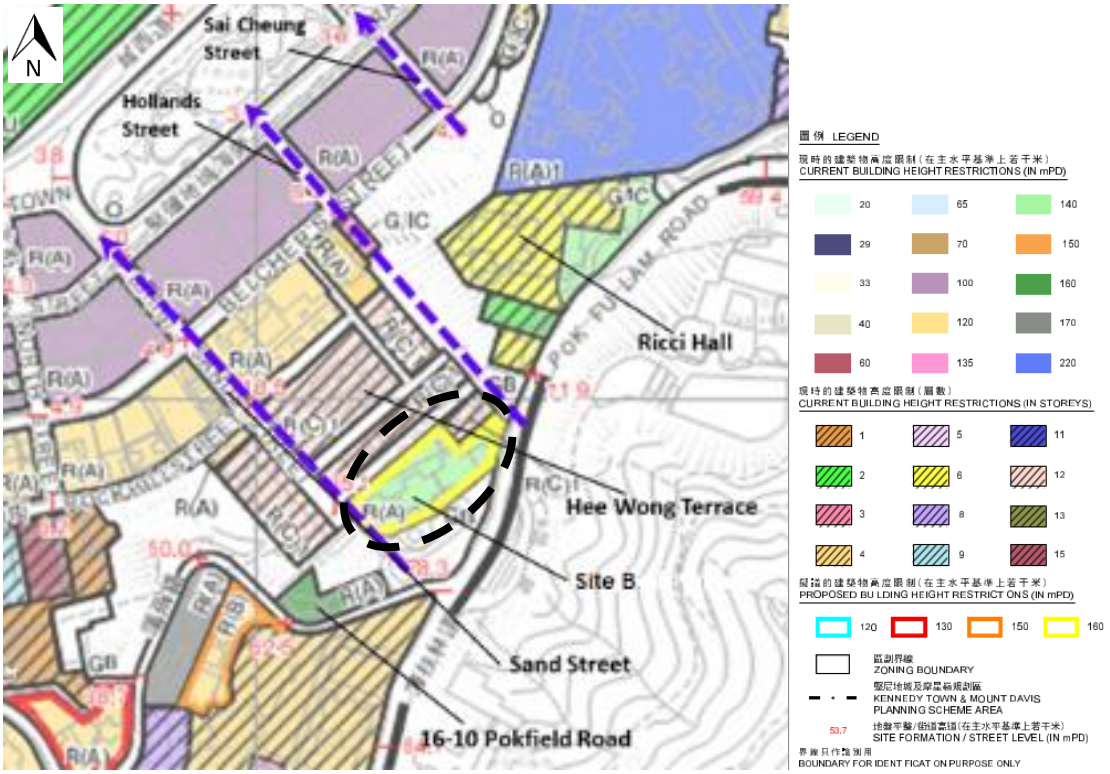
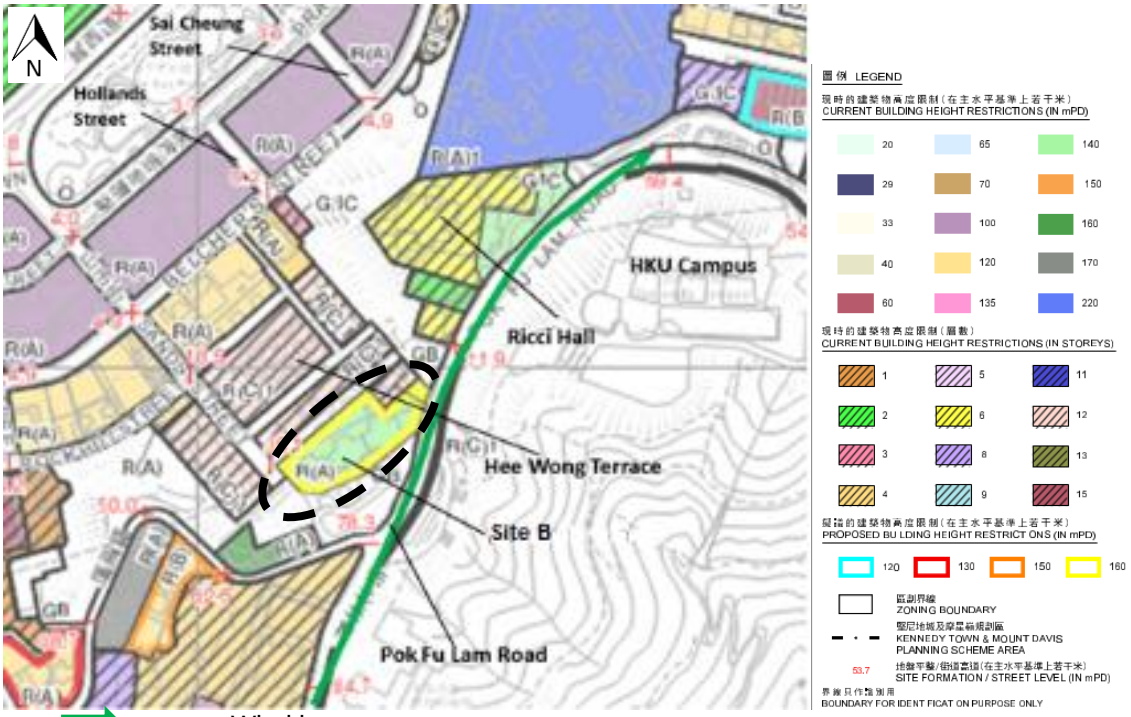


Figure 5.10 **The potential wind feature near Site B under Initial Scenario under SE wind**

S/SSW/SW wind

5.20 Under the S and SW wind directions, the prevailing wind near Site B mainly flows along Po Fu Lam Road (see **Figure 5.11**). Potential air ventilation impact would be induced to the region near Hee Wong Terrace and To Li Garden under the Initial Scenario with taller BHR when compared with Baseline Scenario. As mentioned above, the reduction in SC at the low zone would help alleviate the potential impact to the downstream areas. Moreover, the potential impact under these wind directions would be less significant than SE wind considering the site alignment.



Wind breezeway
Indication of location of Site B

Figure 5.11 The potential wind feature near Site B under Initial Scenario under S / SSW and SW wind directions

Under other prevailing wind directions (NNE/ NE / ENE)

5.21 Under the NE wind condition, the wind shadow of Site B would mainly cast onto the "GB" zone where the access road is situated, no significant impact is therefore anticipated. The potential impact would be further alleviated due to the reduction of SC at low zone as aforementioned.

Site C: Hillview Garden

5.22 Site C is located in the northeast sector of Kennedy Town, fronting the MTR HKU Station to its south and abutting Hill Road to its north, which is a narrow street with a width of less than 7.5m from the centerline. Building setback would be required under the SBDG (**Figure 5.12**). The maximum achievable PR would be increased from about 4.2 to 8, while the SC would be reduced from 42% to 33.33% under the BO (i.e. Initial Scenario). In order to accommodate the permissible development intensity for future redevelopment under the BO in complying with the SBDG, Site C is proposed to be relaxed from 60mPD to 120mPD on the OZP.

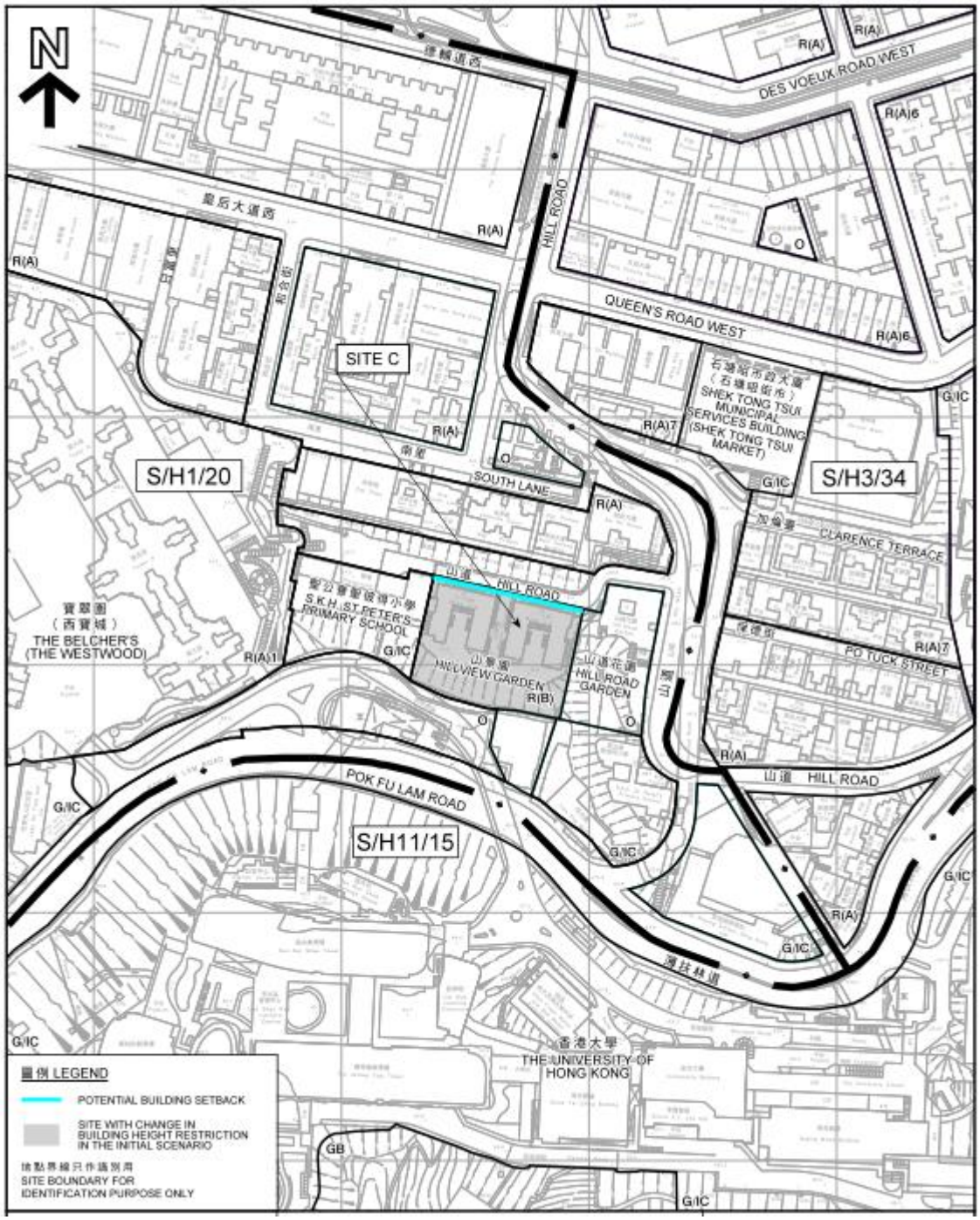


Figure 5.12 – Potential setback requirement under SBDG of Site C

5.23 In addition to the maximum permissible development parameters of Site C, the surrounding morphologies would also affect the wind environment near Site C. There are two pieces of open spaces (i.e. Hill Road Garden and the area near MTR HKU Station) located adjacent to Site C, which provide "ventilation breathing spaces" near the site, thereby enhancing the local wind environment.

NNE / NE / ENE / E wind

5.24 There is no identified air path near the site under North-Easterly and Easterly wind. The surrounding buildings are mainly dominated by some high-rise "R(A)" and "R(A)1" zones with BHRs of 120mPD and 220mPD respectively. The increase in BH and PR under the Initial Scenario would introduce some adverse air ventilation impacts on the S.H.K St. Peter's Primary

School and the open space near MTR HKU Station when compared with the Baseline Scenario. However, as the SC of Site C under Initial Scenario would be reduced, it could help alleviate the potential air ventilation impact. The aforementioned setback requirement under SBDG could also help the Easterly prevailing wind to reach the area near S.K.H. St. Peter's Primary School.

SE wind

5.25 Under SE wind condition, a portion of the SE prevailing wind would enter Site C from the HKU campus. The increase in BH and PR in the Initial Scenario would induce potential adverse air ventilation impact mainly to Hill Road near Site C and the S.K.H. St. Peter's Primary School. The further downstream pedestrian wind environment is already dominated by the buildings between Hill Road and South Lane. The setback requirement from Hill Road under SBDG for Site C would help avoid the deep canyon created between the site and Jadeview Court/ Nam Cheong Building. The lower SC under the Initial Scenario would help the prevailing wind infiltrating to the downstream area.

S / SSW / SW wind

5.26 Under S/SSW/SW wind directions, the prevailing wind would enter Site C from the identified air path (Pok Fu Lam Road) and the open space near the MTR HKU Station (**Figure 5.13**). Potential adverse air ventilation impact would be induced to Hill Road and Hill Road Garden under the Initial Scenario when compared with the Baseline Scenario. The building setback from Hill Street under SBDG and the lower SC would help alleviate the potential impact. The increase in BHR would also help to introduce some downwash wind to the pedestrian level and enhance the pedestrian wind environment near the open space at MTR HKU station. The downwash wind may then enter the area near Hill Road Garden and S.K.H. St. Peter's Primary School.

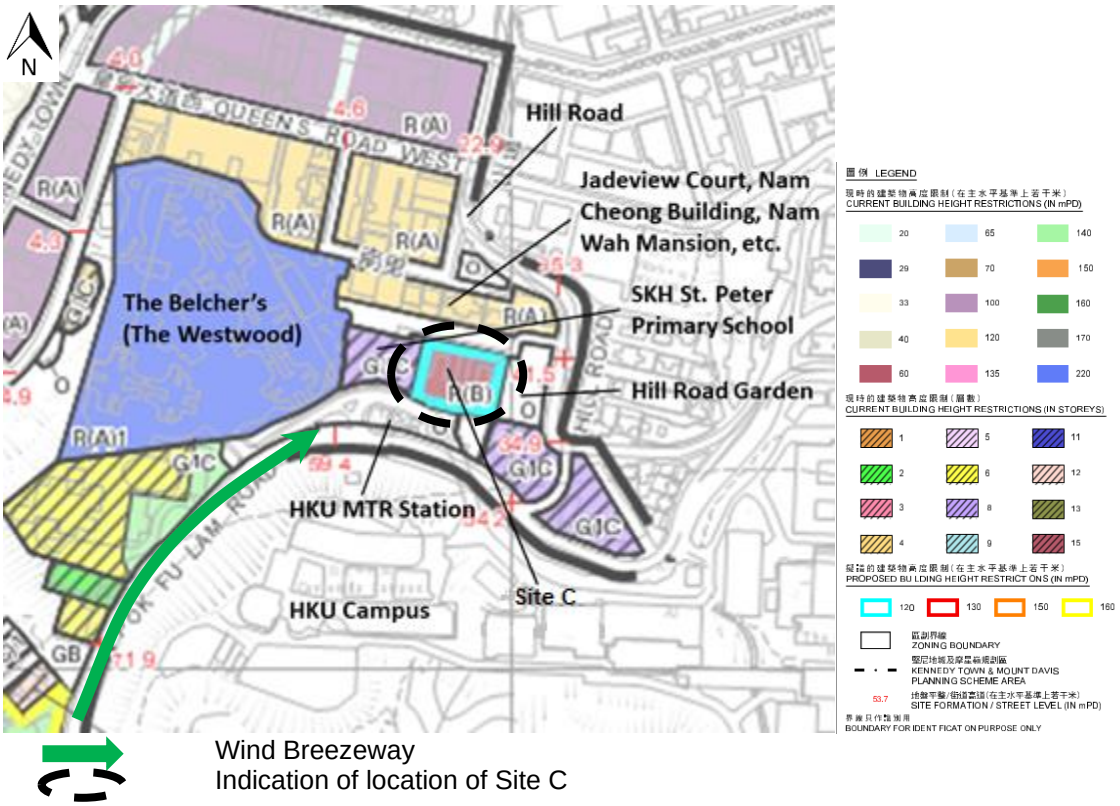


Figure 5.13 **The potential wind flow near Site C under Initial Scenario under S / SSW/SW wind directions**

Site D: The HKU Pokfield Residences

5.27 Site D is located to the immediate east of University Heights and abutting Pokfield Road to its north. Since Pokfield Road is a narrow street with a width of less than 7.5m from the centreline, potential building setback would be required under the SBDG (see **Figure 5.14**). The maximum achievable PR would be increased from about 6.7 to 8, while the SC would be remained at 33.33% under the BO. In order to accommodate the permissible development intensity for future redevelopment in complying with the SBDG, Site D is proposed to be relaxed from 120mPD to 150mPD on the OZP.

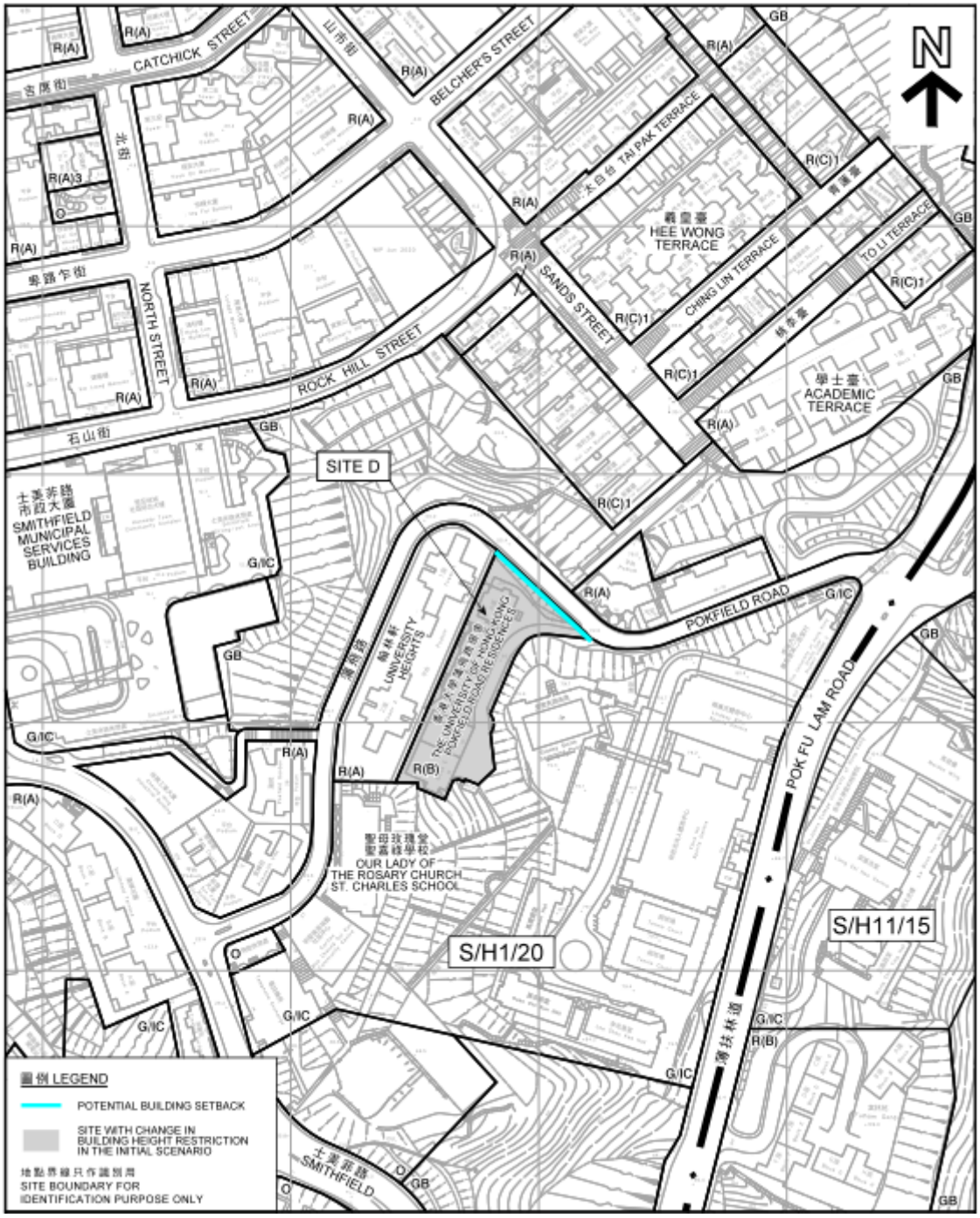


Figure 5.14 Potential Setback requirement under SBDG of Site D

NNE/NE/ENE

5.28 There is no identified air path near Site D. The alignment of the Site is mainly in NE-SW direction. The potential wake zone created by the development at Site D would be mainly at the GIC sites at its south-western area.

5.29 The increase in BH and PR under the Initial Scenario would introduce certain air ventilation impact on the downstream "G/IC" zone when compared with the Baseline Scenario. Even though the SC of Site D remains unchanged under both Scenarios, the relatively low SC of 33.3% with no podium and mild increase in PR would not cause significant impact on the surrounding pedestrian wind environment.

SE/E

5.30 Owing to the alignment and position of Site D, the relaxation of BHR on the OZP and the resultant increase in PR would potentially induce blockage against the E and SE winds approaching University Heights located to its immediate downstream. The potential building setback under SBDG along Pokfield Road would slightly help the prevailing wind to flow along Pokfield Road and slightly alleviate the potential impact generated by the Initial Scenario.

5.31 In addition, the relaxed BHR for Site D would increase the BH difference between the developments in Site D and those in the GIC site where Flora Ho Sports Centre situated to the east, thus the vertical air movement in the western portion of Flora Ho Sports Centre would be enhanced, and potentially facilitate the local wind environment at the pedestrian level.

S/SSW/SW

5.32 Under these wind directions, potential adverse impact due to the increase in BH and PR would not be significant as the potentially affected area would mainly be the "GB" zone at the downstream region.

Sites E: The two Sites at 2 and 6-10 Mount Davis Road

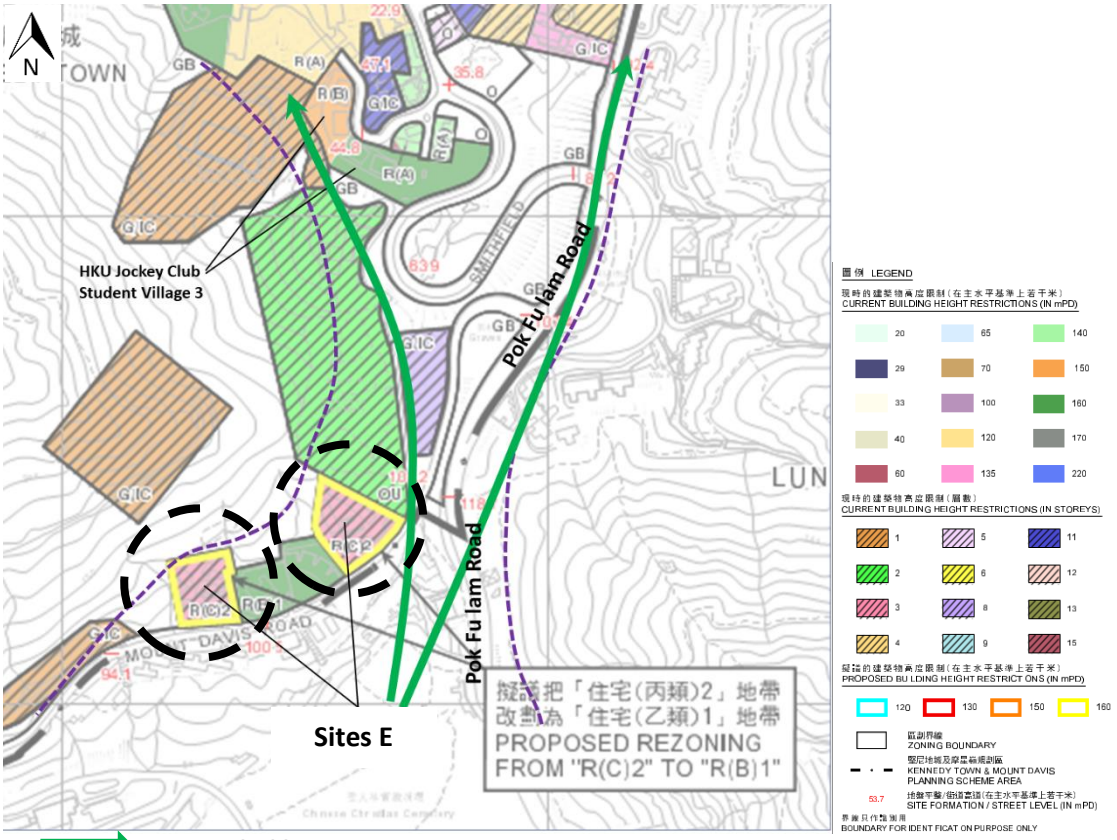
5.33 Sites E at Mount Davis Road (see **Figure 5.15**) are located at the southern portion of the Project Area and in the valley between Lung Fu Shan Country Park and Mount Davis. It is proposed to rezone the two sites from "R(C)2" with maximum PR of 0.75, SC of 25% and BH of 3 storeys to "R(B)1" with PR of 3 and BH of 160mPD (i.e. absolute BH of about 60m). The SC of the Initial Scenario will be complied with the BO (i.e. 33.33%).

NNE/ENE/NE/E

5.34 It is noticed that the increase in PR and BH of Sites E would induce some potential impact on the immediate downstream area, i.e. the residential developments to the south of Site E across Mount Davis Road and the "R(B)1" zone sandwiched between Sites E. Given that Sites E have relatively small site areas, and the surrounding regions are being relatively open, it would allow the winds from northeastern quadrant and eastern quadrants to skim around the future developments and reach the downstream area.

SE/ S / SSW and SW

5.35 Sites E are located at the southern end of the "valley corridor", which is identified as an important breezeway under the S/SSW as well as SW prevailing wind. Given the frontal areas of the two sites are relatively small, and the SC of each site is only 33.3%, air flows driven by the southerly and southwesterly winds could still be channeled into the "valley corridor" from the region near Pok Fu Lam Road. Moreover, the downstream area of the sites under these prevailing wind directions are some areas with no pedestrian, thus, no significant air ventilation impact is anticipated.



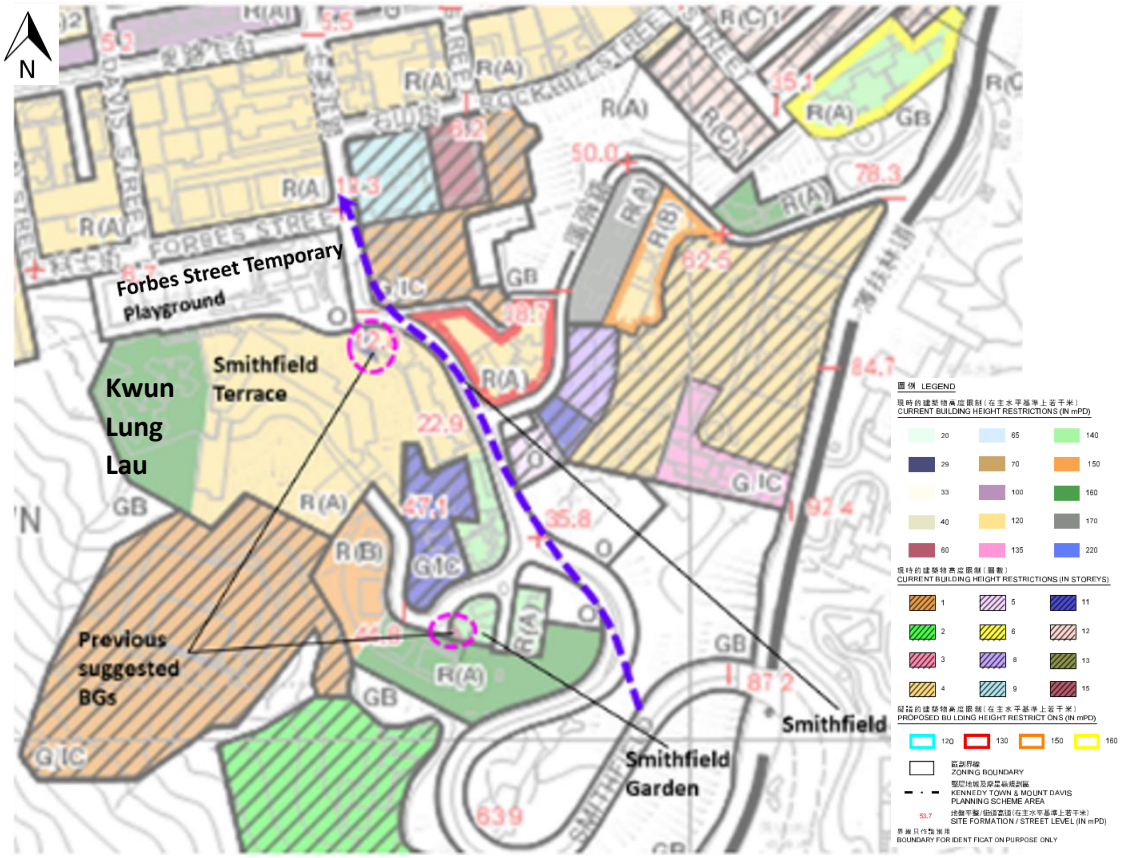
Wind breezeways
Illustration of "valley corridor"
Indication of location of Sites E

Figure 5.15 **The potential wind feature near Sites E under S/SSW and SW wind directions**

Review on the measures from the previous AVA EEs on OZP

5.36 As mentioned in Section 3, certain measures for enhancing air ventilation such as NBAs and BGs have been imposed for some sites within the Project Area on the OZP and its ES according to the previous AVA studies (i.e. AVA EE 2011 and AVA EE 2013). An overview of the measures has been illustrated in **Figure 3.5** above.

5.37 It is acknowledged that the incorporation of NBAs and BGs at strategic locations at the OZP level could potentially maintain or create connected air paths for good wind penetration at district level. It is worthwhile to review these measures, in order to evaluate their efficiency in promoting air ventilation performance on a district level. Detailed discussions about each of the measures are provided in subsequent paragraphs.



Local air path under S/SSW and SE winds
Indication of locations of the BGs on the OZP

Figure 5.16 Illustration of the two BGs at Smithfield Terrace / Kwun Lung Lau and Smithfield Garden

5.38 Two small pieces of BGs are imposed on the OZP as recommended in the AVA EE 2011 (**Figure 5.16**), which attempt to facilitate the air flow along the axis of Smithfield near MTR Kennedy Town Station – hillslope between Smithfield Terrace and Kwun Lung Lau – Lung Wah Street – open space to the south of Smithfield Garden. However, the effectiveness of these two small pieces of BGs may be localized and much dependent on the building morphologies within the nearby "R(A)" site of Kwun Lung Lau and "G/IC" site. Considering the incorporation of SBDG, the section of Smithfield near Site A would be slightly widened, which originally is the bottleneck of the identified air path under S/SE/SSW. This facilitates the prevailing wind from Lung Fu Shan "valley corridor" into Forbes Street Temporary Playground and urban area of Kennedy Town to the north. Therefore, it is considered that the two BGs could be removed.

5.39 Two strips of BGs at the "R(A)" zone between Des Voeux Road West and Queen's Road West are imposed on the OZP as recommended in the AVA EE 2011. Based on the review of wind environment under the existing OZP elaborated in **Section 4** above, these BGs form parts of the local air paths. It is worth to note that the incorporation of these BGs would "break up" the long continues façade of the developments sheltering NE / NNE wind, and directs the air movement under NNE / NE wind to be channeled into Belcher Street and Woo Hop Street (see **Figure 5.17**), implying that these two BGs are essential to the effectiveness of the whole air paths. This cannot be achieved by solely relying on SDBG should the site be redeveloped in future. Thus, these two BGs should be maintained to facilitate regional wind environment under ENE and NE wind directions for the area.

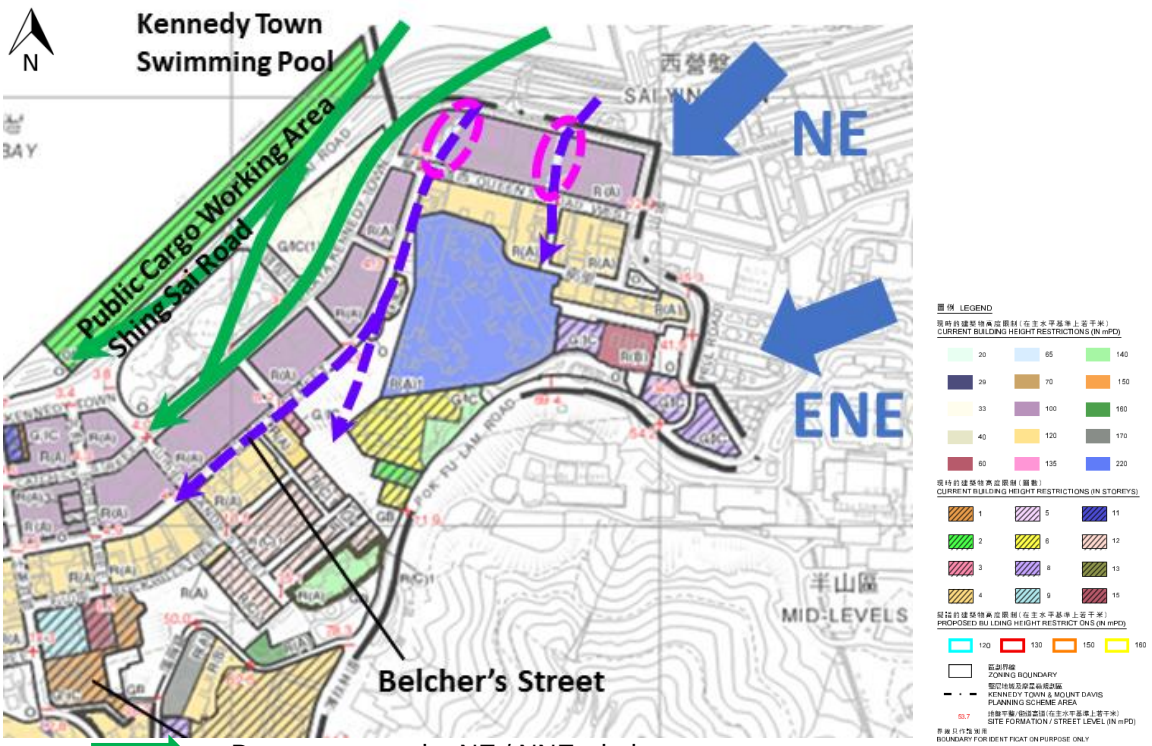


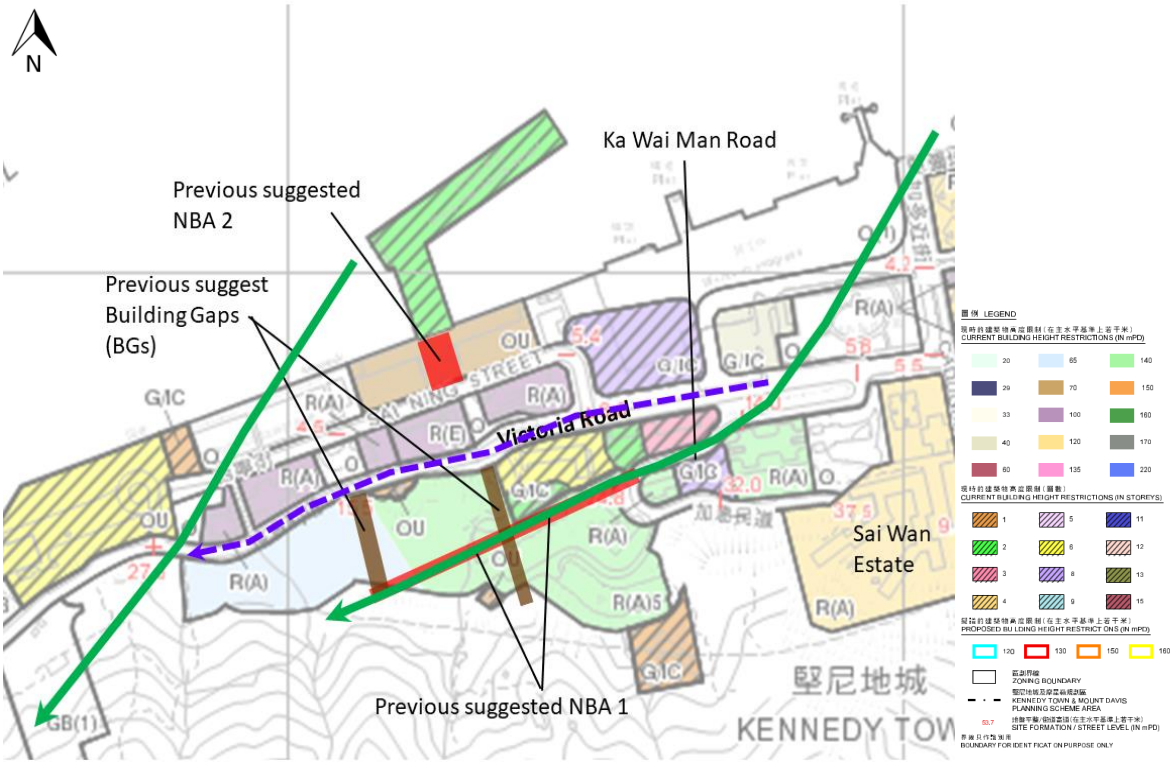
Figure 5.17 **Illustration of the influence of the two BGs at the "R(A)" zone between Des Voeux Road West and Queens Road West**

5.40 Two strips of BGs (**Figure 5.18**) are designated on the ES of the OZP as recommended in the AVA EE 2013 to guide the proposed public housing development at "R(A)5" zone on Ka Wai Man Road. As discussed in **Section 4**, these two BGs penetrate through the relatively long façade of the "R(A)5" site and elongate the air paths in the western part of Kennedy Town under NNE, SE, S and SSW prevailing wind. Thus, this measure is considered effective and necessary in facilitating the air flow in the region of the urban area of western part of Kennedy Town and should be maintained.

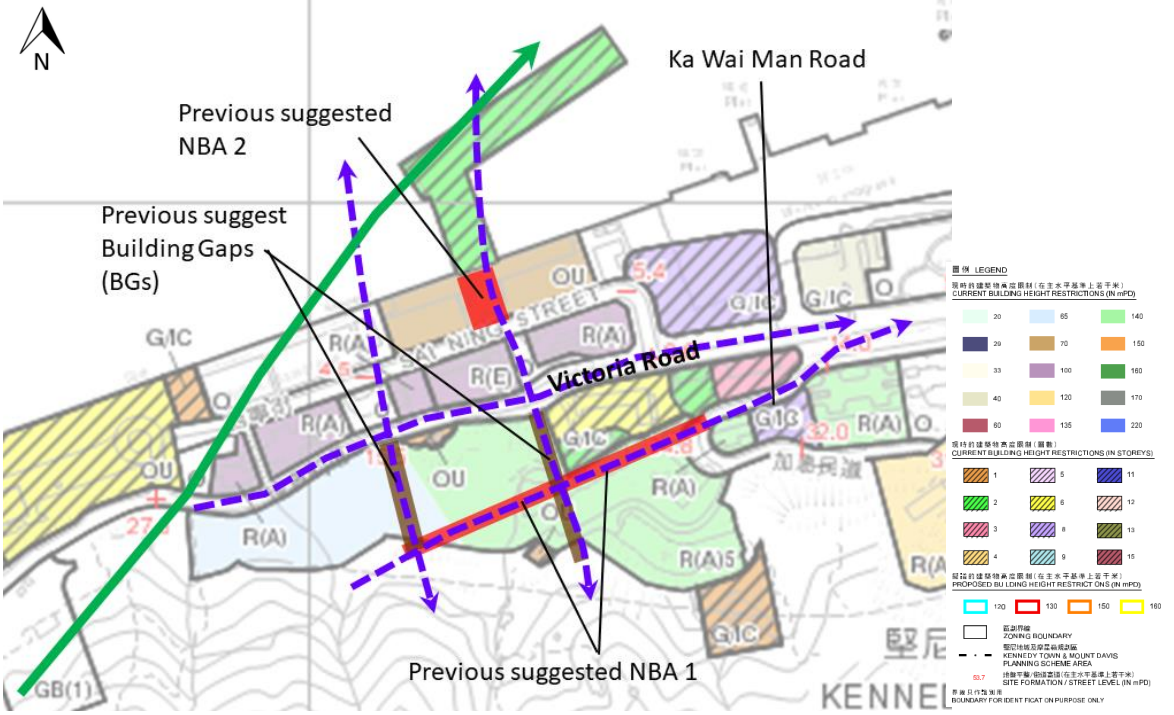
5.41 NBA 1 at the "R(A)5" site on Kai Wan Man Road has also been designated on the ES to guide the proposed public housing development (**Figure 5.18**). As discussed in **Section 4**, under south-westerly wind, this NBA elongates the air path of Ka Wai Man Road and would result in an enhancement of the wind environment of within this "R(A)5" site, the "G/IC" site of Bayanihan Kennedy Town Centre and "R(A)" site of Mount Davis 33. While under the NE /ENE winds, this NBA would also allow the air flow from Ka Wai Man Road to penetrate the "R(A)5" site and maintain the local air ventilation performance. Hence, this NBA is considered effective in facilitating regional wind environment and should be maintained. As it is a public housing site and any development would be guided by a Planning Brief which would set out the development parameters and special design requirements, the retention of the NBA/BG requirements in the ES is in line with the recommendations of the AVA EE 2013. A quantitative AVA will need to be conducted for the public housing development at detailed design stage to demonstrate that the future proposal would maintain/enhance the air ventilation performance in the surrounding area. Retention of the NBA/BG in the ES instead of stipulating on the OZP allows flexibility to further optimize the layout design for a better local air ventilation.

5.42 Another piece of NBA at the "OU" site (NBA 2) is also designated on the ES of the OZP to guide the future redevelopment of China Merchant Wharf and Godown. The discussions in **Section 4** have shown that this NBA is part of an air path located in the western part of Kennedy Town, allowing NNE wind and sea breeze from the north to infiltrate into the urbanized region near Victoria Road and flow into one of the BGs implemented in "R(A)5" site at Ka Wai Man Road. As a result, the air ventilation performance in the local area would be facilitated and this NBA is

considered effective and recommended to be retained. Redevelopment of this "OU" site would require planning permission from the TPB. Hence, the NBA requirement would be safeguarded by the planning mechanism. Retention of the NBA in the ES is to guide the future redevelopment of the site.



(a) Under NE / ENE wind



(b) Under NNE, SE, S / SSW and SW wind

Wind Breezeways
Local air paths

Figure 5.18 Illustration of measures on the ES in the western part of Kennedy Town

5.43 In general, development/redevelopment sites within the Project Area should take the following measures adopted in SBDG into design consideration:

- Maintaining building permeability of at least 20% to 33.3% with reference to PNAP APP-152[1] by provision of building separation
- Minimize the podium bulk with ground coverage of no more than 65% where feasible
- Provision of building setback with reference to PNAP APP-152
- Avoid long continuous facades
- Incorporate greening measure with a target of not less than 30% for sites larger than 1 ha, and not less than 20% for sites below 1 ha, preferably through tree planting at grade
- Refer to the recommendations of design measures in the Hong Kong Planning Standards and Guidelines

[1] https://www.bd.gov.hk/english/documents/pnap/APP/APP152.pdf

6 CONCLUSION

6.1 The Project Area is located at the northwest portion of Hong Kong Island, bounded by open sea of Belcher Bay / Sulphur Channel, Hill Road, Pok Fu Lam Road and Mount Davis Road. According to the measurement data from HKO, simulation result from MM5 and RAMS, the annual prevailing winds at the Project Area are constituted by NNE, NE, ENE, E, S, SSW winds, while summer prevailing winds are E, SE, S, SSW, SW directions.

6.2 It is understood that in high-density urban areas, solely relying on BHR may not be sufficient in determining the air ventilation performance. NBAs and BGs are some important features from district planning point of view.

6.3 For Sites A and B, with similar PRs under the Baseline Scenario and Initial Scenario as well as lower non-domestic SC at the lower zone, potential impact induced by the relaxation of BHRs of the sites to the surrounding pedestrian wind environment would not be significant. Moreover, the adoption of SBDG would introduce building setback along Smithfield at Site A which would further alleviate the potential impact of the relaxation of BH.

6.4 For Site C, while the increase in PR and BH under the Initial Scenario would induce some potential adverse air ventilation impacts, the reduction in SC with no podium and potential building setback from Hill Road under SBDG could help alleviate the potential impact on the surrounding pedestrian wind environment.

6.5 For Site D, while the SC would remain unchanged under the Initial Scenario, the future redevelopment of the site with relatively low SC with no podium and mild increase in PR would not cause significant impact on the surrounding pedestrian wind environment. Moreover, the potential setback along Pokfield Road under SBDG would slightly help alleviate its potential impact.

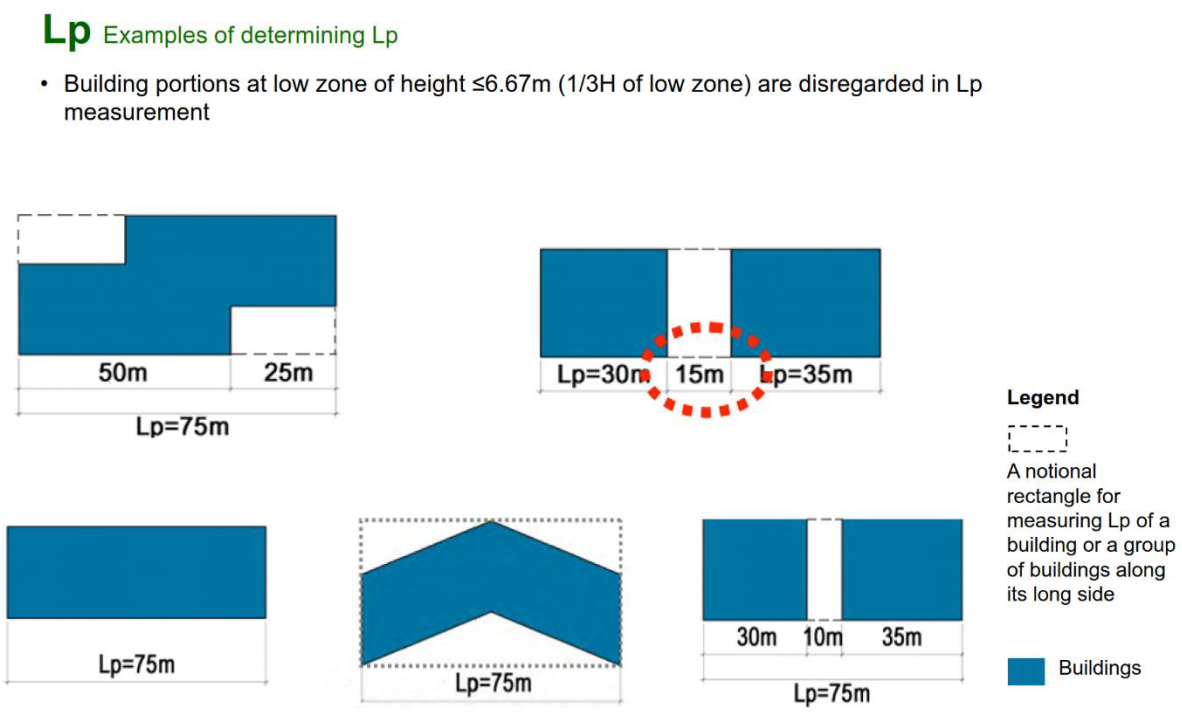
6.6 For Sites E, considering the relatively small site areas and the surrounding regions being relatively open, the rezoning of the sites from “R(C)2” to “R(B)1” with relaxation of PR, SC and BH would not induce significant impact on the surrounding pedestrian wind environment.

6.7 In addition, the planning measures of NBAs and BGs stipulated in the OZP and its ES in accordance with the recommendations from the previous AVA studies have been reviewed. Among these measures, the two small BGs imposed on the “R(A)” sites at Smithfield Terrace and Smithfield Garden could be removed as Smithfield would be slightly widened with the incorporation of SBDG upon redevelopment of Site A which could help enhance the local wind environment.

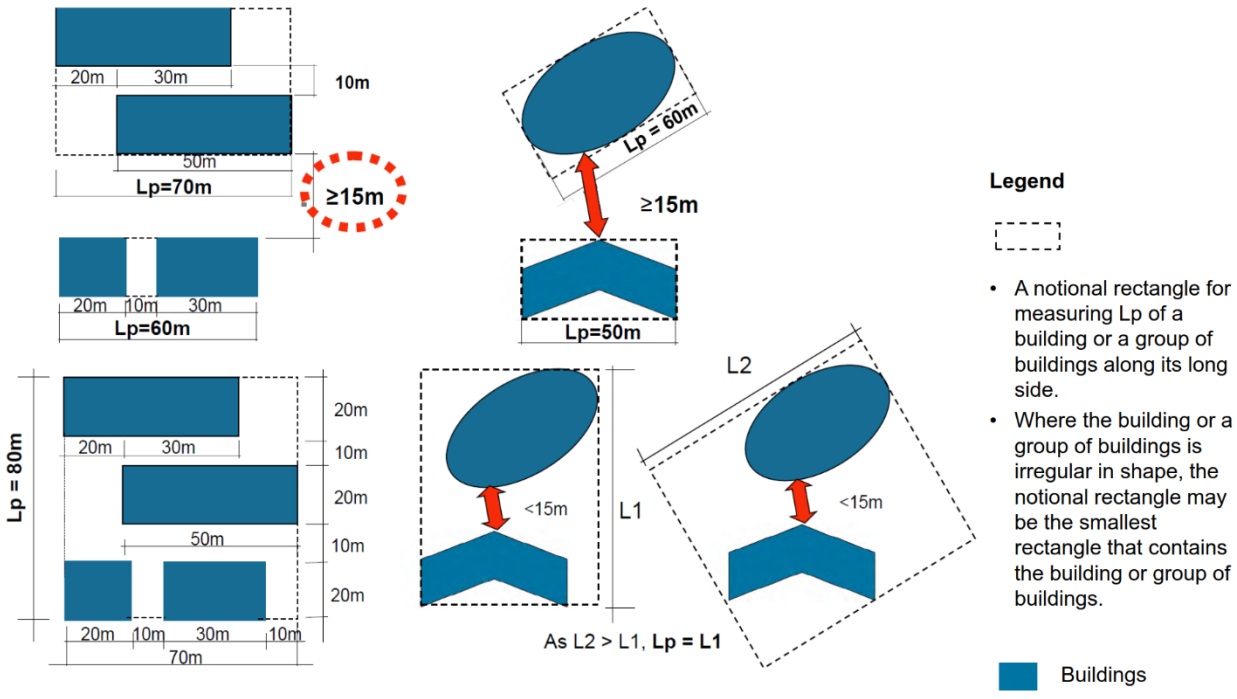
6.8 Others measures as imposed on the OZP and designated on the ES are considered as useful features from district planning point of view and should be maintained.

APPENDIX

Diagrams on Maximum Permissible (Extracted from Sustainable Building Design Guideline)



Diagrammatic Plans of Buildings

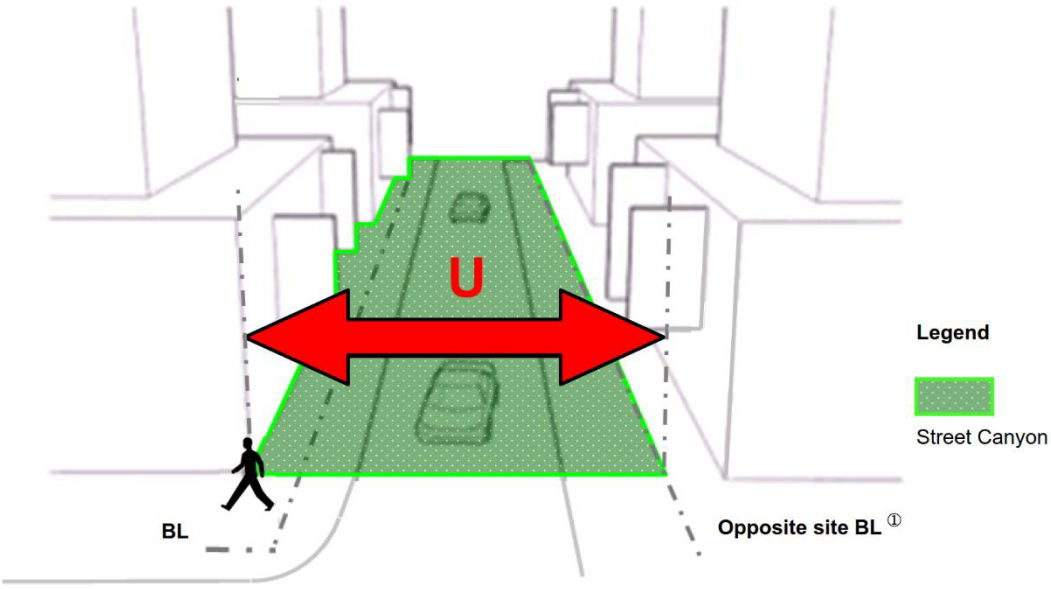


Diagrammatic Plans of Buildings

Diagrams on Maximum Permissible (Extracted from Sustainable Building Design Guideline)

Showing U

- Street canyon shall be vertically unobstructed. Minor projecting features, such as signboard, a covered footbridge and open sided features (balconies, utility platforms, covered walkways, trellises, etc.) may be disregarded.



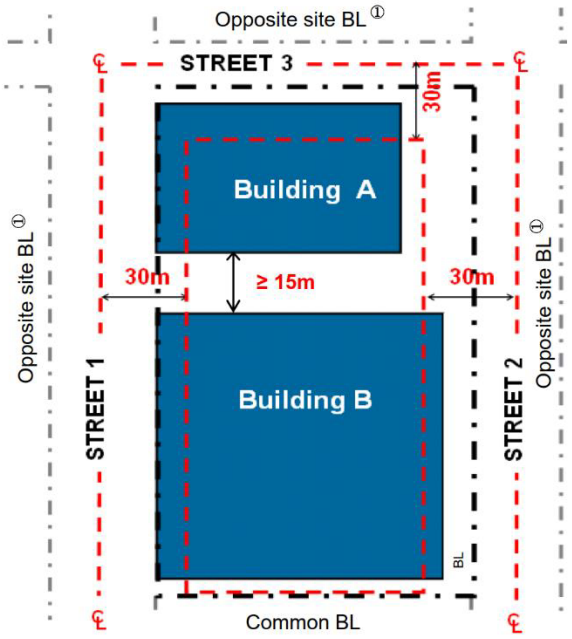
Perspective Showing Width of Street Canyon

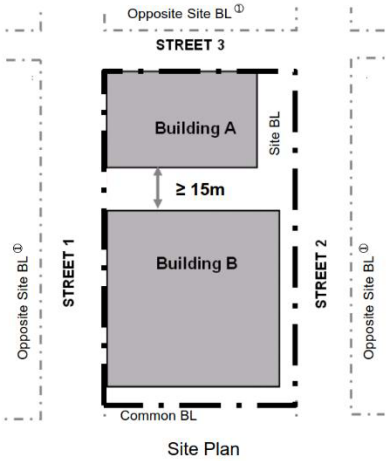
① Opposite side of the street if no opposite site

Adjoining Street Canyons

Buildings subject to control on Lp

- Buildings/groups of buildings wholly or partly **within 30m** from the centreline of an adjoining street.





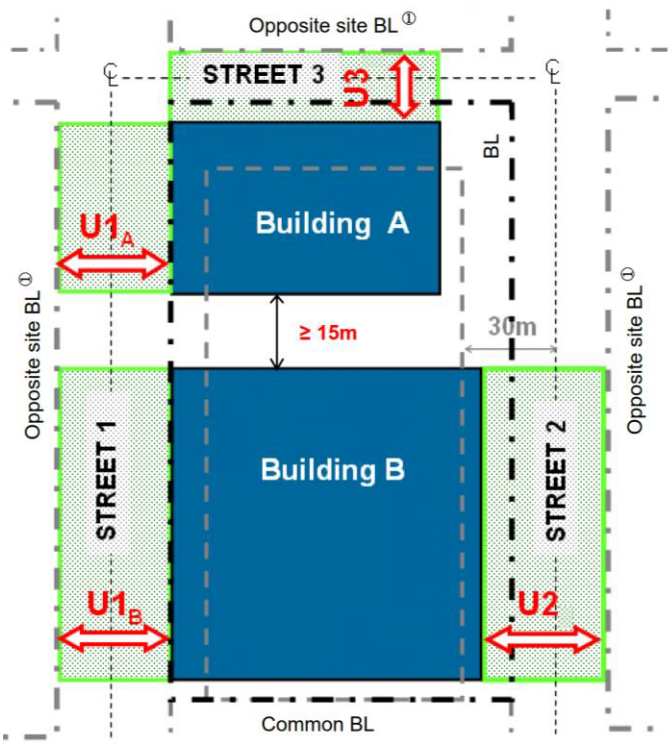
Site Plan

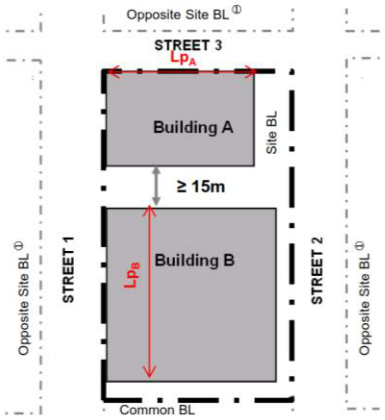
Diagrammatic Plans

① Opposite side of the street if no opposite site.

Diagrams on Maximum Permissible (Extracted from Sustainable Building Design Guideline)

U & Max. Permissible Lp





Site Plan

Max. Lp = 5 x U

- If a building abuts two or more streets, use the least U.
- **Building A**

  When $U3 < U1_A$, max. $Lp_A = 5 \times U3$
- **Building B**

  When $U1_B < U2$, max $Lp_B = 5 \times U1_B$

① Opposite side of the street if no opposite site.

Diagrammatic Plans

U & Max. Permissible Lp

Building A

- When width of the adjoining street canyon varies, Lp is determined by the smallest U.
- When $U_{A1} < U_{A2}$, max. $Lp_A = 5 \times U_{A1}$

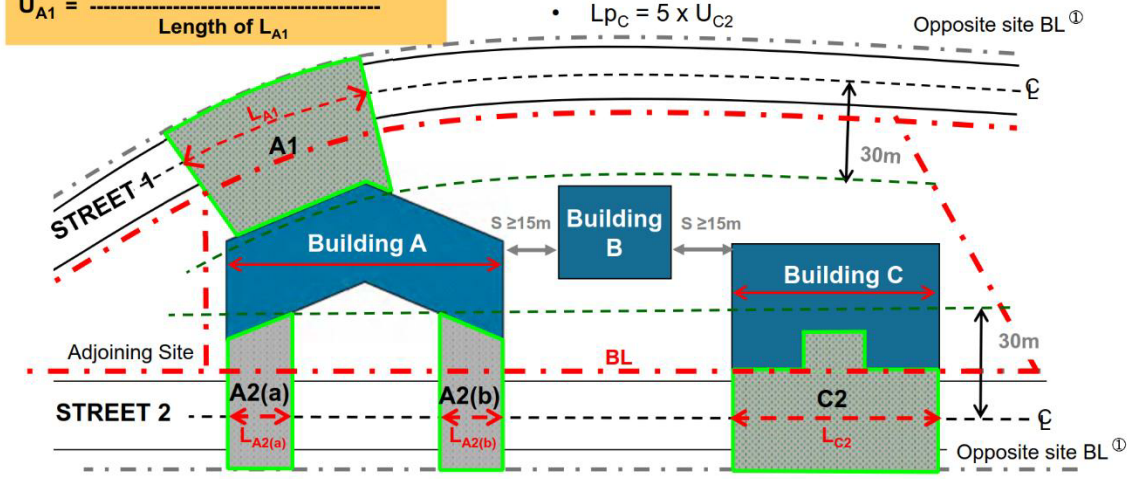
$$U_{A1} = \frac{\text{A1 (area of street canyon)}}{\text{Length of } L_{A1}}$$

Building B

- No part of the building is closer than 30m to the street centrelines. Building B is not subject to Design Requirement (1).

Building C

- Lp is determined by the U at Street 2:
- $Lp_C = 5 \times U_{C2}$



$$U_{A2} = \frac{\text{A2(a) + A2(b) (total areas of street canyon)}}{\text{Length of } L_{A2(a)} \text{ \& } L_{A2(b)}}$$

$$U_{C2} = \frac{\text{C2 (area of street canyon)}}{\text{Length of } L_{C2}}$$

① Opposite side of the street if no opposite site.

Diagrammatic Plan