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

Agreement No. CE 35/2006 (CE)

Kai Tak Development Engineering Study cum Design and Construction of Advance Works – Investigation, Design and Construction

Air Ventilation Study for Kai Tak Development - Final Detail Air Ventilation Study Report

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AECOM

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February 2010

Reviewed: Peter Lee 4/2/10

Approved for Issue: Igor Ho 4/2/10

AECOM Asia Co. Ltd.

EXECUTIVE SUMMARY

Kai Tak Development will be developed as the "Heritage, Green, Sports and Tourism Hub of Hong Kong" and will house a total population of approximately 90,000 people. The proposed development will include areas for commercial and residential developments, a variety of Government, institution or community (GIC) facilities, a stadium complex, a cruise terminal and a tourism node, and a Metro Park.

A detailed air ventilation study was conducted for the Kai Tak Development by the CLP Power Wind/Wave Tunnel Facility (WWTF) at The Hong Kong University of Science and Technology (HKUST) under Agreement No. CE 35/2006(CE) Kai Tak Development Engineering Study cum Design and Construction of Advance Works – Investigation, Design and Construction. The study was conducted in accordance with the recommendations of Planning Department's Feasibility Study for Establishment of Air Ventilation Assessment System – Final Report (2005) and Technical Guide for Air Ventilation Assessment for Developments in Hong Kong (2006).

To facilitate the detailed air ventilation study, nine sub-districts have been designated: (1) Kai Tak City Centre at North Apron and North Apron East; (2) Sports Hub at North Apron West; (3) Metro Park at Runway North and around the Kai Tak Approach Channel; (4) Runway Precinct at Middle Runway; (5) Tourism and Leisure Hub at Runway South; (6) South Apron Corner; (7) Kwun Tong Waterfront; (8) Cha Kwo Ling Waterfront; and (9) To Kwa Wan Waterfront. The Kai Tak City Centre was also sub-divided into five zones, namely Zone A, Zone B, Zone C and Zone D and other area.

Site Environs and Wind Availability

The large mountains on Kowloon to the north and north-east of Kai Tak Development and nearby urban areas will have an obvious effect on winds from those directions. Although the mountains on Hong Kong Island are more distant, it is expected that they will also have a moderating effect on winds approaching Kai Tak from southerly directions. However, the narrow eastern entrance to Victoria Harbour and the form of the topography to the east of Kai Tak are likely to combine to modify winds approaching the area from the east to the south-east.

Due to the extent of Kai Tak Development, it is likely that the wind availability will vary over the site. In particular, areas in the Runway Precinct are significantly more exposed to east, south-easterly and southerly winds than areas in the vicinity of the North Apron. Existing buildings and other structures in close proximity to the North Apron will provide local significant shielding from winds at pedestrian level, particularly for east to south-easterly winds. Existing buildings along the eastern coastline of Kowloon Peninsula will also create some local shielding effects at the North Apron region during south to south-westerly winds that typically occur during the summer months.

Good Air Ventilation Design Features Incorporated into Kai Tak Development

An AVA study had previously been conducted under the *South East Kowloon Development Comprehensive Planning and Engineering – Stage 1 Planning Review*. A number of air ventilation improvement measures have then been incorporated into the Preliminary Outline Development Plan. These improvement measures include avoiding massive railway depot building fronting Prince Edward Road East to minimise blockage of wind flow to hinterland area; podium-free design to improve wind penetration; and grid neighbourhood design in south-eastern part of North Apron area with grid lots aligned to the prevailing wind direction to promote wind penetration. These measures have been incorporated in the Kai Tak Outline Zoning Plan approved in 2007.

Besides, major corridors within the Kai Tak Development site are aligned approximately south-east to north-west to maximise their potential to provide major air paths for the prevailing south-easterly winds. The Kai Tak Development also incorporates a number of major open spaces or open areas, including Kwun Tong Typhoon Shelter, Kai Tak Approach Channel, To Kwa Wan Typhoon Shelter, Sung Wong Toi Park, North Apron District Park, the Sports Hub at North Apron West and the Metro Park at Runway North. These areas serve as relatively unobstructed air paths for the Kai Tak Development, allowing the prevailing winds to penetrate into the built environment of the Kai Tak City Centre at North Apron and North Apron East and the South Apron Corner.

Furthermore, the open spaces in the North Apron District Park and the Sports Hub at North Apron West are connected with major existing air paths, such as the Shek Ku Lung Road Playground and the adjacent open spaces, Choi Hung Road and the Kai Tak Nullah. These open spaces are likely to allow the prevailing winds approaching from the south-east quadrant to penetrate into Tung Tau Estate and San Po Kong.

Detailed Wind Tunnel Tests

The wind tunnel tests were undertaken in accordance with the requirements stipulated in the Australasian Wind Engineering Society Quality Assurance Manual, AWES-QAM-1-2001 (2001) and the American Society of Civil Engineers Manual and Report on Engineering Practice No. 67 for Wind Tunnel Studies of Buildings and Structures (1999).

Two 1:800 scale wind tunnel models were fabricated to cover the Project Area of the proposed Kai Tak Development. Each proximity model included the surrounding areas within a diameter of 3.84 km, in which the topography was modelled at 4 m contour intervals, and all known existing and committed buildings and structures within the area.

The model of the Kai Tak Development Project Area was fabricated in accordance with the latest Recommended Outline Development Plan of Kai Tak Development. The building layouts for the individual lots within the Kai Tak Development Project Area and the Assessment Area were based on the latest information available at the time of model fabrication. For the public housing developments in Site 1A and Site 1B of Kai Tak Development, it is noted that the building layout and design have been fine-tuned to enhance the ventilation performance of the development.

Wind speeds were measured at 511 test points over the two models, for 16 wind directions ranging from 22.5° to 360° at increments of 22.5° using a multi-channel thermal anemometer. Directional wind velocity ratios were measured at each individual test point and subsequently combined with the site wind availability data to determine annual and summer overall wind velocity ratios for each test point and spatial average velocity ratios for each nominated zone and area in the Kai Tak Development Project Area and the Assessment Area.

Study Findings

Tourism and Leisure Hub, Runway Precinct and Metro Park

The proposed buildings at the Tourism and Leisure Hub at Runway South include a cruise terminal, tourism and commercial buildings with heights up to 100 mPD and a substantial park area. At the Middle Runway, commercial buildings with maximum heights of 45 and 55 mPD and elongated plan-forms have been proposed for the western side, while on the eastern side the proposed buildings are well spaced and range in height from 45 mPD at the southern end to 80 mPD at the northern end of the area. Runway North is currently proposed to be a Metro Park with open flat landscaping.

The relatively open exposure and low building density of the Runway Precinct will facilitate wind penetration to other nearby areas in the Kai Tak Development and it is unlikely to create significant wind effects in the Assessment Area. A relatively large potential air path has been included along the

Middle Runway that is likely to allow wind penetration for south-easterly winds to Runway North and beyond. The relatively wide spaces between buildings at the Middle Runway will also facilitate the penetration of winds from the south to south-west at the Kwun Tong Waterfront and South Apron Corner.

The wind tunnel test results indicate that pedestrian level wind speeds at Tourism and Leisure Hub at Runway South were relatively high due to its exposed location at the south-eastern end of the proposed development site. Some test points experienced localised sheltering effects for some wind directions. Nevertheless, Tourism and Leisure Hub at Runway South is evidently well placed to benefit from the prevailing south-east to south winds and south-west winds.

For Runway Precinct at Middle Runway, locations along the south-western edge were relatively exposed to winds ranging from the south-east to the west, with localised sheltering at some test point locations for north-east winds caused by adjacent proposed buildings. Overall wind velocity ratios at test points along the south-west to north-east aligned main road of the Middle Runway were around 20% lower overall than those at tests points on the south-western edge of the Middle Runway. Similarly, the more open exposure of test points along the north-eastern edge of the Middle Runway to winds from the east to the south-east allowed higher pedestrian level wind speeds for those directions.

South Apron Corner

Buildings proposed for the South Apron Corner have heights of up to 100 mPD and hence they are generally taller than those in the Kowloon Bay Assessment Area. These buildings may cause some localised areas of reduced wind flow and, depending on the approaching wind direction, they may also cause local accelerations of the wind speed. However, the spacing between the proposed buildings and the inclusion of Kowloon Bay Square at the southern end of this area will allow the prevailing south-easterly winds to penetrate into the South Apron and Kowloon Bay. The approximately north-east to south-west alignment of roads on the Middle Runway in combination with its open spaces and air paths will also help to maintain the availability of south-westerly winds that may reach the South Apron.

As shown by the wind tunnel test results, locations close to the waterfront areas of South Apron Corner had more open exposures to winds from the south-east to the south-west. The magnitudes of overall wind velocity ratios were generally lower at test points located close to the centre of South Apron Corner due to the presence of a bridge spanning the main road and at test points in relatively close proximity to the Kwun Tong Bypass. The alignment of the main road was generally effective in conveying south-easterly winds into the South Apron Corner.

North Apron East

The buildings proposed for North Apron East are widely spaced with heights ranging from 15 to 45 mPD. These buildings are unlikely to create significant adverse effects in the Kai Tak Development site and nearby Assessment Area. As reflected by the results of the wind tunnel tests, the most favourable pedestrian level wind conditions were measured in its northern parts where the overall building density is relatively low and locations close to the waterfront are able to benefit from winds from the south-east to south-west. Pedestrian level wind speeds were lower further away from the waterfront, with some localised sheltering effects from nearby buildings and flyovers.

Kai Tak City Centre at the North Apron

Kai Tak City Centre at the North Apron comprises proposed commercial and residential building groups. Buildings are also proposed for Comprehensive Development, Government, Institution or Community, and other specific uses. The heights of the proposed buildings generally range from 80 –

175 mPD, with its maximum building heights at the two "Comprehensive Development Areas" which will be developed into the twin towers along Kai Tak River.

Zone A-1: Buildings proposed for Zone A-1 have heights of 175, 150 and 125 mPD and as such they will be taller than the buildings in Zone A-2. A number of the buildings have elongated plan-forms and are oriented approximately perpendicular to the prevailing south-easterly wind direction which helps to capture and convey upper level winds down to the pedestrian level. Besides, the inclusion of buildings with various heights and shapes creates localised sheltered regions for some wind directions on their leeward sides while enhancing pedestrian level wind speeds at other locations.

Zone A-2: Buildings proposed for Zone A-2, located to the south of the Rhythm Garden estate have maximum heights of 100 mPD. These building have elongated plan-forms that are aligned approximately perpendicular to the prevailing south-easterly winds. These buildings had a significant influence on the local pedestrian level wind conditions in the area, causing localised accelerated wind speeds and reduced pedestrian level wind speeds to the north of those buildings, for a range of wind directions.

Zones B-1 & B-2: For Zone B-1, pedestrian level wind speeds are moderated by the extent and massing of buildings ranging from the south-east to the south-west of the area. For Zone B-2, pedestrian level wind speeds were moderated by the general sheltering effects caused by 120 mPD buildings in the north-east of Zone B-2 and 110 mPD and 100 mPD buildings to the south and west of Zone B-2. It is noted that site-level AVA studies have been undertaken for the public housing developments in Site 1A and Site 1B of Kai Tak Development within Zone B-1 and Zone B-2. The building layout and design of the public housing development have been fine-tuned to enhance the ventilation performance of the development.

Zone B-3: Buildings proposed for Zone B-3 have maximum heights of 100 – 110 mPD. The proposed pedestrian streets and roads form a street pattern that is approximately aligned with the prevailing south-easterly wind direction. However, pedestrian level winds in this area may be moderated slightly as the existing streets in Kowloon Bay are not aligned in the south-easterly wind direction. A 3m setback from pedestrian street within Zone B-3 is proposed subsequent to the detailed wind tunnel tests and has already been incorporated into the latest Recommended Outline Development Plan of Kai Tak Development. This building setback would increase the width of the north-west corridors across Zone B-3 and hence enhance the penetration of pedestrian winds into Zone B-3 and other areas immediate to its north-west.

Zone C: Zone C comprises proposed commercial and residential buildings with maximum heights of 30, 45, 60, 70, 85, 100 and 110 mPD. The "zig-zag" arrangement of proposed buildings along the south-east to north-west aligned non-building areas generally facilitated the penetration of pedestrian level winds. Towards the north-western boundary of Zone C, pedestrian level wind conditions were moderated by the larger massing of the nearby proposed buildings.

Zone D: The maximum heights of the proposed buildings in Zone D range from 100 – 110 mPD. The effectiveness of the north-west to south-east aligned non-building areas was variable. This is attributed to the variable sheltering effects at test points in Zone D caused by the relatively close spacing of the proposed buildings and their variable heights. Nevertheless, pedestrian level wind conditions in Zone D are relatively moderate. A 3m setback from pedestrian street within Zone D is proposed subsequent to the detailed wind tunnel tests and has already been incorporated into the latest Recommended Outline Development Plan of Kai Tak Development. This building setback would increase the width of the north-west corridors across Zone D and hence enhance the penetration of pedestrian winds into Zone D and other areas immediate to its north-west.

Other area: This area comprises mainly the Kai Tak River, the Station Square and Sung Wong Toi Park. Buildings proposed for this area have heights of 175mPD (the comprehensive development area to the west of the Kai Tak River) and 13mPD (the retail development at the Kai Tak Station). Prevailing wind are able to penetrate into this area through the north-west to south-east aligned Kai Tak River and Station Square. The strength of the pedestrian level wind speeds is likely to range from high to moderate.

North Apron West

The Sports Hub located at North Apron West comprises two proposed sports grounds and associated stadia with maximum heights of up to 55 mPD. The relatively large spacing between the two sports grounds and other proposed buildings on the North Apron is unlikely to create significant adverse effects on pedestrian level wind conditions. Due to the scale of the sports grounds and stadia, some localised shielding effects are likely for certain wind directions.

The wind tunnel test results indicate that the pedestrian level wind speeds towards the south were relatively high due to the better exposure of those areas to the prevailing winds and the enhancement caused by the proposed stadium for some wind directions. Towards the northern part of the Sports Hub, pedestrian level wind speeds were reduced due to the denser building developments and lower ground elevations.

Hinterland Area

For the hinterland area, pedestrian level wind conditions varied significantly. In the majority of the hinterland areas, such as Cha Kwo Ling, Kwun Tong and Ngau Tau Kok, Kowloon Bay, San Po Kong and To Kwa Wan and Ma Tau Kok, pedestrian level wind conditions are likely to be largely governed by the existing configurations of buildings and streets. The proposed Kai Tak Development may have some moderating effect on winds approaching in Tung Tau Estate and Kowloon City, however wind conditions inside those areas were dominated by the existing buildings and streets. Pedestrian level wind conditions in Ngau Chi Wan and Choi Hung, located to the north-east of the proposed Kai Tak Development, are likely to be significantly sheltered by the elongated rectangular plan-form buildings in Choi Hung Estate under most prevailing wind directions.

Overall Conclusion

This detailed air ventilation study serves as a district-level study to examine the performance of the planned improvement measures as well as to identify any local level effects.

In accordance with the findings of this detailed air ventilation study, the measured overall wind velocity ratios within Kai Tak Development are in general relatively higher than those measured in the surrounding hinterland area. The hinterland area is likely to be governed by the existing configuration of streets and buildings. Thus, the Kai Tak Development is not expected to have significant overall (i.e. district level) adverse effects on air ventilation conditions inside Kai Tak Development and the surrounding hinterland area.

Besides, taking into account development theme of sub-planning area and site characteristics, further building set-backs are proposed within the special design areas (i.e. Grid Neighbourhood and Runway Precinct) and along principal corridors/vistas (i.e. Kai Tak River and Runway Boulevard). The proposed building setbacks would further improve the performance of the planned air paths within Kai Tak Development and enhance the penetration of winds across Kai Tak City Centre at the North Apron.

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1.1 Project Background

A detailed air ventilation study was conducted by the CLP Power Wind/Wave Tunnel Facility (WWTF) at The Hong Kong University of Science and Technology (HKUST) as part of an air ventilation study under Agreement No. CE 35/2006(CE) Kai Tak Development Engineering Study cum Design and Construction of Advance Works – Investigation, Design and Construction. The detailed air ventilation study was conducted to assess likely pedestrian level wind conditions for the proposed Kai Tak Development.

Located at the site of the former Kai Tak Airport in the south-eastern part of Kowloon, the proposed Kai Tak Development will cover an area of about 328 hectares, as shown in Figure 1. The proposed Kai Tak Development comprises the apron and runway areas of the former Kai Tak Airport and existing waterfront areas at To Kwa Wan, Ma Tau Kok, Kowloon Bay, Kwun Tong, Cha Kwo Ling and the adjacent harbour areas.

The wind tunnel test techniques used for this study satisfied the requirements stipulated in the Australasian Wind Engineering Society Quality Assurance Manual, AWES-QAM-1-2001 (2001) and the American Society of Civil Engineers Manual and Report on Engineering Practice No. 67 for Wind Tunnel Studies of Buildings and Structures (1999). The study was also conducted in accordance with the relevant recommendations of Planning Department's Feasibility Study for Establishment of Air Ventilation Assessment System – Final Report (2005) and Technical Guide for Air Ventilation Assessment for Developments in Hong Kong (2006).

1.2 Details of the Proposed Kai Tak Development

Kai Tak will be developed as the "Heritage, Green, Sports and Tourism Hub of Hong Kong" and will house a total population of approximately 86,000 people. The proposed development will include areas for commercial and residential developments, a variety of Government, institution or community (GIC) facilities, a stadium complex, a cruise terminal and a tourism node, and a Metro Park. To facilitate the detailed study, nine sub-districts have been designated, as indicated in Figure 2: (1) Kai Tak City Centre at North Apron and North Apron East; (2) Sports Hub at North Apron West; (3) Metro Park at Runway North and around the Kai Tak Approach Channel; (4) Runway Precinct at Middle Runway; (5) Tourism and Leisure Hub at Runway South; (6) South Apron Corner; (7) Kwun Tong Waterfront; (8) Cha Kwo Ling Waterfront; and (9) To Kwa Wan Waterfront. The Kai Tak City Centre was also sub-divided into four zones, namely Zone A, Zone B, Zone C and Zone D as shown in Figure 3.

2 EXPERT EVALUATION

2.1 Site Wind Availability

The large mountains on Kowloon to the north and north-east of Kai Tak Development and nearby urban areas will have an obvious effect on winds from those directions. Although the mountains on Hong Kong Island are more distant, it is expected that they will also have a moderating effect on winds approaching Kai Tak from southerly directions. However, the narrow eastern entrance to Victoria Harbour and the form of the topography to the east of Kai Tak are likely to combine to modify winds approaching the area from the east to the south-east.

Due to the extent of the site, it is likely that the wind availability will vary over the site. In particular, areas in the Runway Precinct are significantly more exposed to east, south-easterly and southerly winds than areas in the vicinity of the North Apron. Existing buildings and other structures in close proximity to the North Apron will provide local significant shielding from winds at pedestrian level, particularly for east to south-easterly winds. Existing buildings along the eastern coastline of Kowloon Peninsula will also create some local shielding effects at the North Apron region during south to south-westerly winds that typically occur during the summer months.

An experimental study of site wind availability and characteristics was conducted for two Study Areas (see Figure 1) as part of the air ventilation study. A 1:2000 scale wind tunnel topography study was undertaken to determine the effects of the surrounding topography and urban environment on mean wind speeds and turbulence intensities above the Study Areas, designated as Study Areas A and B.

The topography study results were subsequently combined with a statistical model of the Kai Tak non-typhoon wind climate, based on wind speed measurements taken by Hong Kong Observatory above the roof of the former Kai Tak Airport Fire Station, to determine directional wind characteristics and availability for the Kai Tak Study Areas.

The statistical model of the non-typhoon wind climate developed for Kai Tak indicated that, at an elevation of 16 m above mean sea level, the prevailing non-typhoon winds at Kai Tak occur mainly from the south-east quadrant on an annual basis. During the summer months, the prevailing non-typhoon winds at Kai Tak occur mainly from the south-east and south-west quadrants.

Significant reductions in the magnitudes of mean wind speed were measured in the wind tunnel test for winds approaching from the north and north-east of the Study Areas. Those reductions were attributed to the mountains and buildings to the north and north-east of the Study Areas. Mountains on Hong Kong Island located across from Victoria Harbour in the south and south-westerly directions also reduced the wind speeds from those directions. The dense urban areas to the west of the Kai Tak development site also affected the wind environment for both Study Areas.

2.2 Exiting Pedestrian Level Wind Conditions

2.2.1 Cha Kwo Ling

Cha Kwo Ling is located to the east of the project site of the proposed Kai Tak Development. The area has relatively open exposures to prevailing south-easterly winds, although the topography within the area is likely to have some moderating effects. The Chao Kwo Ling area also has a relatively open exposure to south-westerly winds.

Only one group of buildings, namely Laguna City, is located in the Assessment Area in Cha Kwo Ling, as shown in Figure 4. The buildings in Laguna City are relatively closely spaced and have heights ranging approximately from 80 – 90 mPD which are arranged in a number of rows oriented approximately north-east to south-west, i.e. perpendicular to the prevailing

south-easterly winds. This alignment is likely to cause regions of localised stagnant wind in the leeward side of the buildings in Laguna City. However, the overall low building density in the Cha Kwo Ling area is likely to present alternative air paths for winds to penetrate deeper into other nearby urban areas.

2.2.2 Kwun Tong and Ngau Tau Kok

Kwun Tong and the adjacent Ngau Tau Kok region, indicated in Figure 5, are located to the east of the proposed Kai Tak Development, extending from a nullah at its southern end to an area adjacent to the South Apron Corner of the Kai Tak Development. Due to its waterfront location, Kwun Tong has a relatively open exposure to south to south-westerly winds. As Ngau Tau Kok is located further from the waterfront, south-westerly winds are likely to be moderated by the intermediate buildings in Kwun Tong. The presence of Laguna City and topography in the Cha Kwo Ling area to the south of Kwun Tong are likely to have a moderating effect on south-easterly winds in Kwun Tong. Similarly, the urban areas to the east of Kwun Tong are also likely to moderate easterly winds in both Kwun Tong and Ngau Tau Kok.

Streets in the Assessment Area in Kwun Tong are generally oriented parallel with the local coastline and hence approximately aligned with the annual prevailing winds approaching from the south-east. As shown in Figure 5, the south-east to north-west aligned Kwun Tong Road provides a wide potential air path in the Assessment Area by which prevailing south-easterly winds may be conveyed to Kwun Tong, Ngau Tau Kok and other nearby regions. Hung To Road, Wai Yip Street and Hoi Bun Road in Kwun Tong are also favourably aligned with the prevailing south-easterly wind direction and may also provide air paths into the area. The elevated road of the Kwun Tong Bypass is likely to induce localised sheltering effects on the nearby pedestrian level wind environment.

Kwun Tong comprises a mixture of residential, commercial and industrial buildings with various heights and building forms. Towards the southern end of the Kwun Tong area, the buildings enclosed by King Yip Street, Kwun Tong Road, Hung To Road and Tsun Yip Street are predominantly industrial buildings with heights of approximately 50 mPD that have extensive ground coverage and low permeability. The relatively uniform building heights are likely to create regions of low wind flow in this area.

A significant portion of buildings in other parts of the Kwun Tong Assessment Area also have heights of approximately 50 mPD, amongst which a number of newer and taller buildings are interspersed. Those taller buildings are mainly located along Kwun Tong Road and How Ming Street. Although they may impart localised effects on nearby pedestrian level wind conditions, the dispositions of the taller buildings are not likely to have a significant impact on the broader pedestrian level wind environment. Furthermore, they are likely able to convey the upper level winds down to the pedestrian level and enhance pedestrian level wind speeds in some areas.

A small area of the neighbouring Ngau Tau Kok region also falls inside the Assessment Area. Buildings in this area are of varying heights and forms and hence some localised sheltering effects are likely for winds from the south-west in particular. The south-east to north-west alignment of Ngau Tau Kok Road is likely to provide an air path into this area. Furthermore, the slightly higher ground elevation of this area is also likely to generally facilitate wind penetration.

2.2.3 Kowloon Bay

Kowloon Bay is located to the north-east of the North Apron East of the proposed Kai Tak Development, as shown in Figure 6. Due to the current lack of development on the North Apron East, the adjacent region of Kowloon Bay has relatively open exposures to winds from the south to south-west. Urban areas to the south-east, including Kwun Tong, are likely to have a moderating effect on the prevailing south-easterly winds.

In general, the north-south and east-west oriented grid pattern of streets in the Assessment Area in Kowloon Bay, including Wang Kong Road, Wang Chiu Road, Wai Yip Street, Wang Hoi Road, Kai Lok Road, Kai Cheung Road, Lam Hing Street, Sheung Yuet Road and Sheung Yee Road, are generally aligned with the prevailing wind directions, facilitating wind penetration into this area. The Kowloon Bay area also includes a number of open spaces for recreational use, including Kowloon Bay Sports Ground, Kowloon Bay Playground, the sitting out area between Sheung Yuet Road and Kai Cheung Road connected to Kowloon Bay Playground, and the area enclosed by Kwun Tong Road and Wang Chiu Road, that combine with the roads to form air paths into this area. Additional open spaces, including two car parks located at Kai Cheung Road and Wang Kwong Road, the car park located at Wang Chiu Road and Sheung Yuet Road, and the car park located at Lam Lee Street and Wang Tai Road also currently facilitate wind penetration.

Buildings in the Assessment Area in Kowloon Bay mainly comprise a mixture of industrial and commercial buildings. Those buildings generally have a rectangular cross-section and heights ranging from approximately 30 – 50 mPD. A number of recently constructed buildings located on the north side of Sheung Yee Road, with heights of approximately 160 – 170 mPD, are likely to have localised moderating effects on pedestrian level wind speeds. However, these buildings are not expected to have significant adverse effects on the overall air ventilation conditions in the Assessment Area in Kowloon Bay.

Located in the northern part of the Kowloon Bay area, adjacent to the North Apron of the Kai Tak Development site, the approximately 100 mPD residential buildings of Richland Gardens are likely to create localised areas of diminished wind flow within that estate. The nearby noise barrier on the Kwun Tong Bypass will also have localised effects on pedestrian level wind speeds.

2.2.4 Ngau Chi Wan and Choi Hung

Ngau Chi Wan and Choi Hung are located to the north of Kowloon Bay and to the east of the North Apron of the Kai Tak Development and shown in Figure 7. This area currently has relatively obstructed exposures to the prevailing winds, with significant topography such as Hammer Hill and Kowloon Peak to the east, closely spaced buildings and a number of elevated roadways. The relatively complicated arrangement and multiple alignments of the roads in this area are not likely to be beneficial to wind penetration.

Buildings inside the Ngau Chi Wan and Choi Hung Assessment Areas are located in Choi Hung Estate and Ping Shek Estate, the majority of which have heights in the range of approximately 60 – 80 mPD. Buildings in Choi Hung Estate generally have elongated rectangular plan-forms, a number of which are oriented approximately perpendicular to the prevailing wind directions and hence they are likely to cause areas of low wind flow in nearby areas. Buildings in Ping Shek Estate generally have square plan-forms and they are typically arranged in pairs perpendicular to the prevailing winds approaching from the south-east. Hence, it is expected that the buildings of Ping Shek Estate will also cause localized regions of low wind flow.

2.2.5 San Po Kong

San Po Kong is located to the north of the North Apron of the Kai Tak Development. The San Po Kong area is likely to receive some shelter from the surrounding topography and urban areas for east to north-easterly winds. To the south-east, the urban areas of Kowloon Bay and Kwun Tong will cause some moderation of south-easterly winds. The currently flat, open exposure of the North Apron of the Kai Tak Development facilitates south to south-westerly winds reaching San Po Kong.

As indicated in Figure 8, open spaces to the east and west of Rhythm Garden estate form major air paths for the Assessment Area in San Po Kong. These air paths are

oriented in an approximately north-south direction and connect to the existing empty project site of the proposed Kai Tak Development, allowing winds approaching from the corresponding directions to penetrate through the San Po Kong area into Diamond Hill.

The air path to the west of the Rhythm Garden estate is also connected to the Kai Tak East Playground, which is one of the major open spaces in the San Po Kong area. This further facilitates the penetration of south to south-easterly winds into this area. The predominantly south-east to north-west orientation of most streets in San Po Kong, such as Luk Hop Street, Pat Tat Street and Sam Chuk Street, will allow some penetration of east to south-easterly winds.

The building fabric in this area comprises a mixture of building heights and forms. Correspondingly, the pedestrian level wind environment is likely to include a mixture of areas of relatively low wind speed, due to the effects of street orientation, street width, building space and building size, moderate wind speeds due to the effects of the open spaces and air paths, to locally enhanced wind speeds due to the conveyance of upper level winds to pedestrian level by some of the larger tall buildings.

2.2.6 Tung Tau Estate at Wang Tau Hom

Tung Tau Estate is located to the north of the North Apron of the Kai Tak Development, as shown in Figure 9. The residential estate currently has a relatively open exposure to the prevailing south-easterly winds due to the undeveloped Kai Tak site and Shek Ku Lung Road Playground and the adjacent open spaces. Furthermore, the spacing, configuration and heights (ranging from approximately 20 – 30 mPD) of buildings in the area bounded by Prince Edward Road West, Lok Sin Road, Choi Hung Road and Tung Lei Road are not likely to prevent the prevailing winds from penetrating into the Assessment Area in Tung Tau Estate.

Buildings in Tung Tau Estate have heights ranging approximately 50 – 80 mPD. In general, these buildings are taller than other buildings located to the south of the estate and adjacent to the existing project site of the proposed Kai Tak Development. Moreover, these buildings have high length/width ratios and most of the buildings are oriented with the longer axis of the buildings aligned approximately in the east-west direction. The height differences and the building orientations are likely to allow the buildings in Tung Tau Estate to capture and convey some of the upper level winds down to pedestrian level, particularly for south-easterly directions.

2.2.7 Kowloon City

Kowloon City is located to the south-west of Tung Tau Estate and to the north-west of the North Apron as shown in Figure 10. Due to its proximity to the Kai Tak Development site, the area currently has relatively open exposures to east to south-easterly winds. Urban areas to the south and south-west of Kowloon City are likely to have a moderating effect on the strength of sustained wind speeds from those directions.

The majority of streets in the Kowloon City Assessment Area are arranged in a grid-like pattern oriented north-south and east-west. The penetration of easterly winds, likely to be moderated by the significant topography to the east of the Kai Tak Development site, are currently likely to be facilitated by the alignment of the three major east-west roads, i.e. Prince Edward Road West, Nga Tsin Wai Road and Carpenter Road. Due to the currently undeveloped Kai Tak site, south to south-easterly winds may be conveyed via the north-south aligned crossroads such as Sa Po Road, Kai Tak Road, Tak Ku Road, South Wall Road, Lung Kong Road, Nam Kok Road and Nga Tsin Long Road, although their misalignment will have a moderating effect on wind strength. The presence of the Kowloon Walled City Park will also facilitate the general penetration of winds into areas beyond Kowloon City.

Buildings in Kowloon City are predominantly closely spaced with relatively uniform heights ranging from approximately 20–30 mPD. This configuration of buildings is generally considered to be unfavourable for enhancing pedestrian level wind conditions.

2.2.8 To Kwa Wan and Ma Tau Kok

To Kwa Wan and Ma Tau Kok are located to the west of the Kai Tak Development site as shown in Figure 11. Due to their extensive waterfrontage, both areas have relatively open exposures to winds from the east to south-east. Urban areas to the south of To Kwa Wan and Ma Tau Kok are likely to have a moderating effect on southerly winds.

Roads in To Kwa Wan and Ma Tau Kok are predominantly aligned approximately north-east to south-west and south-east to north-west. Mok Cheong Street, Ma Tau Kok Road, San Shan Road and Lok Shan Road provide major air paths through which south-easterly winds may be conveyed through the To Kwa Wan area into the Ma Tau Kok area. Hoi Sham Park and the open spaces near Ma Tau Kok Public Pier, located at the waterfront of To Kwa Wan Typhoon Shelter, reserve a large open space for prevailing winds to penetrate into the To Kwa Wan and Ma Tau Kok areas through San Shan Road, San Ma Tau Street, Kwei Chow Street, Lok Shan Road, Chi Kiang Street and Ngan Hon Street.

The distance between the aforementioned streets and the closely spaced nature of the intermediate buildings, that generally have heights ranging from 30 – 50 mPD, is likely to cause some impedance to the overall penetration of south-easterly winds. Examples include the area bounded by Mok Cheong Street, Kowloon City Road, To Kwa Wan Road and Ma Tau Kok Road and the area bounded by To Kwa Wan Road, San Ma Tau Road, Chi Kiang Street and the waterfront of To Kwa Wan Typhoon Shelter. The small variation of building height does not facilitate the conveyance of upper level winds down to pedestrian level.

Two of the more recently developed residential estates in the area, Sky Tower and Grand Waterfront, are characterised by multiple closely spaced buildings that are arranged in a L-shape. This type of building arrangement is expected to create localised areas of relatively low wind speed on their leeward sides. However, as they are aligned approximately with the prevailing wind directions, they are not expected to have adverse effects on the overall pedestrian level wind environment in the area. These developments may also locally enhance pedestrian level wind speeds because they are significantly taller than the majority of the other buildings in To Kwa Wan and Ma Tau Kok.

2.2.9 Hung Hom

Hung Hom is located to the south of To Kwa Wan and west of the Kai Tak Development site as shown in Figure 12. It occupies a prominent location on Kowloon Peninsula with open exposures ranging from the east to the south-east. To the south to south-west, the extensive urban areas and far-field topography north of Hung Hom are likely to have a moderating effect on northerly winds.

A number of streets in the Hung Hom Assessment Area are oriented approximately east-west, extending westward from the waterfront, allowing the prevailing winds to penetrate into the urban areas of Hung Hom. These streets include Bailey Street, Hok Yuen Street, Dyer Ave, and Tak Hong Street. Tai Wan Shan Park, Hutchison Park, Fat Kwong Street Garden and Fat Kwong Street Playground are the major open spaces in the area. Tai Wan Shan Park, located at the waterfront of Victoria Harbour, and Dyer Ave through to Hutchison Park provides a major air path that will allow penetration of the prevailing east to south-easterly winds into the area.

Fat Kwong Street Garden and Fat Kwong Street Playground are located approximately 0.8 km from the waterfront to the west of the Hung Hom Gardens and Ka Wai Chuen estates

that comprise buildings with heights ranging approximately from 50 – 80 mPD. Therefore, winds approaching from the east to the south-east are likely to be moderated appreciably in this area.

Laguna Verde estate, located at the Hung Hom waterfront, comprises closely spaced buildings with heights ranging approximately 70 to 100 mPD, the tallest of which are generally located closest to the waterfront areas. These buildings are significantly taller than the majority of buildings in the Hung Hom Assessment Area and are expected to cause zones of relatively low or stagnant wind flow on the leeward side of the building group. This arrangement of buildings is also likely to create localised areas of accelerated wind flow for certain wind directions, particularly during periods of strong wind.

2.3 Characteristics of the Proposed Kai Tak Development and its Potential Air Ventilation Issues

2.3.1 Major potential air paths in the proposed Kai Tak Development site

Major corridors within the proposed Kai Tak Development site are aligned approximately south-east to north-west to maximise their potential to provide major air paths for the prevailing south-easterly winds. The proposed Kai Tak Development also incorporates a number of major open spaces, including Kwun Tong Typhoon Shelter, Kai Tak Approach Channel, To Kwa Wan Typhoon Shelter, Sung Wong Toi Park, North Apron District Park, the Sports Hub at North Apron West and the Metro Park at Runway North. These areas serve as relatively unobstructed air paths for the proposed Kai Tak Development, allowing the prevailing winds to penetrate into the built environment of the Kai Tak City Centre at North Apron and North Apron East and the South Apron Corner.

Furthermore, the open spaces in the North Apron District Park and the Sports Hub at North Apron West are connected with major existing air paths, such as the Shek Ku Lung Road Playground and the adjacent open spaces, Choi Hung Road and the Kai Tak Nullah. These open spaces are likely to allow the prevailing winds approaching from the south-east quadrant to penetrate into Tung Tau Estate and San Po Kong.

2.3.2 Tourism and Leisure Hub, Runway Precinct and Metro Park

The proposed buildings at the Tourism and Leisure Hub at Runway South include a cruise terminal, tourism and commercial buildings with heights up to 100 mPD and a substantial park area. At the Middle Runway, commercial buildings with maximum heights of 45 and 55 mPD and elongated plan-forms have been proposed for the western side, while on the eastern side the proposed buildings are well spaced and range in height from 45 mPD at the southern end to 80 mPD at the northern end of the area. Runway North is currently proposed to be a Metro Park with open flat landscaping.

The relatively open exposure and low building density of the Runway Precinct will facilitate wind penetration to other nearby areas in the Kai Tak Development and it is unlikely to create significant wind effects in the Assessment Area. A relatively large potential air path has been included along the Middle Runway that is likely to allow wind penetration for south-easterly winds to Runway North and beyond. The relatively wide spaces between buildings at the Middle Runway will also facilitate the penetration of winds from the south to south-west at the Kwun Tong Waterfront and South Apron Corner.

2.3.3 South Apron Corner

Buildings proposed for the South Apron Corner have heights of up to 100 mPD and hence they are generally taller than those in the Kowloon Bay Assessment Area. These buildings may cause some localised areas of reduced wind flow and, depending on the approaching wind direction, they may also cause local accelerations of the wind speed. However, the spacing between the proposed buildings and the inclusion of

Kowloon Bay Square at the southern end of this area will allow the prevailing south-easterly winds to penetrate into the South Apron and Kowloon Bay. The approximately north-east to south-west alignment of roads on the Middle Runway in combination with its open spaces and air paths will also help to maintain the availability of south-westerly winds that may reach the South Apron.

The majority of the hospital buildings (60 mPD) proposed for the South Apron have high length/width ratios that are aligned approximately with the prevailing south-easterly winds and hence provide a continuation of the potential air paths into the site. Those hospital buildings that are not aligned south-east to north-west may cause localised zones of lower wind flow on their leeward side.

In combination with the viaduct of the Kwun Tong Bypass, the proposed buildings on the South Apron may cause slight moderations in the strength of winds in Wang Chiu Road, Wang Mau Street and Wang Hoi Road in Kowloon Bay Assessment Area.

2.3.4 North Apron East

The buildings proposed for North Apron East are widely spaced with heights ranging from 15 to 45 mPD. These buildings are unlikely to create significant adverse effects in the Kai Tak Development site and nearby Assessment Area.

2.3.5 Kai Tak City Centre at the North Apron

Kai Tak City Centre at the North Apron comprises proposed commercial and residential building groups. Buildings are also proposed for Comprehensive Development, Government, Institution or Community, and other specific uses. The heights of the proposed buildings generally range from 70 – 120 mPD with its maximum building heights at the two “Comprehensive Development Area” which will be developed into the twin towers along Kai Tak River.

Zone A

Zone A comprises building groups with very different forms and characteristics. For example, buildings proposed for Zone A-1 have heights of 175, 150 and 125 mPD and as such they will be taller than the buildings in the adjacent areas. A number of the buildings have elongated plan-forms and are oriented approximately perpendicular to the prevailing south-easterly wind direction. These buildings may be able to capture and convey upper level winds down to the pedestrian level and they are also likely to induce localized stagnation zones on the leeward sides of the buildings.

Buildings proposed for Zone A-2, located to the south of the Rhythm Garden estate have maximum heights of 100 mPD. These building have elongated plan-forms that are aligned approximately perpendicular to the prevailing south-easterly winds. These buildings may have a moderating effect on the strength of winds penetrating the Rhythm Garden estate.

Zone B

Zone B mainly comprises proposed residential buildings with maximum heights ranging from 100 – 120 mPD. Relatively wide streets and spacings between buildings are likely to facilitate wind flow in and through this area.

The residential buildings proposed for Zone B-1 have maximum heights of 120 mPD. Although the spacings between these residential buildings are significantly larger than those of nearby existing developments, they are likely to have a moderating effect on winds penetrating into the Rhythm Garden estate. The nearby Richland Gardens estate and Kwun Tong Bypass are also likely to moderate south-easterly winds in this area.

However, as these building are generally taller than the buildings in the adjacent Assessment Area, upper level prevailing winds may be conveyed to pedestrian level creating localised areas of enhanced wind flow.

In Zone B-2, the close spacing between some of the proposed 120 mPD buildings is likely to impede wind flow into this area. This condition may be improved by reconsidering the alignment and spacing of several buildings in this area to better utilise the prevailing south-easterly winds.

The residential buildings proposed for Zone B-3 have maximum heights of 100 – 110 mPD, whereas the maximum building height for the G/IC sites within Zone B-3 are 15, 30 and 60mPD. The proposed pedestrian streets and roads form a street pattern that is approximately aligned with the prevailing south-easterly wind direction. However, pedestrian level winds in this area may be moderated slightly as the existing streets in Kowloon Bay are not aligned in the south-easterly wind direction.

Zone C

Zone C comprises proposed commercial and residential buildings with maximum heights of 30, 45, 60, 70, 85, 100 and 110 mPD. The buildings in the area are generally significantly taller than the buildings in the adjacent Kowloon City Assessment Area and hence they are likely to reduce the penetration of winds from the south-east to south. Furthermore, the combination of the proposed buildings in Zone B and Zone C and the misalignment of streets in Kowloon City and Zone C is likely to inhibit the penetration of easterly winds into the Kowloon City Assessment Area. Pedestrian level wind flow within Zone C will be facilitated by the south-easterly alignment of the proposed pedestrian streets and roads.

Zone D

Similar to the configuration of Zone B-3 to the east of the Kai Tak nullah, the proposed pedestrian streets and roads in Zone D are approximately aligned with the prevailing south-easterly winds. The maximum heights of the proposed buildings in Zone D ranged from 15 – 110 mPD, with majority in a maximum height of 100 – 110 mPD. For south-easterly winds, the adjacent North Apron District Park and Sports Hub will provide additional major air paths into and through the area. For easterly winds, the buildings in Zone D are likely to cause some localised shielding on the leeward sides of the proposed buildings.

Other area

This area comprises mainly the Kai Tak River, the Station Square and Sung Wong Toi Park. Buildings proposed for this area have heights of 175mPD (the comprehensive development area to the west of the Kai Tak River) and 13mPD (the retail development at the Kai Tak Station). Prevailing wind are able to penetrate into this area through the north-west to south-east aligned Kai Tak River and Station Square. The strength of the pedestrian level wind speeds is likely to range from high to moderate.

2.3.6 North Apron West

The Sports Hub located at North Apron West comprises two proposed stadiums and a sports arena with maximum building height of 55 mPD. The relatively large spacing between the two sports grounds and other proposed buildings on the North Apron is unlikely to create significant adverse effects on pedestrian level wind conditions. Due to the scale of the sports grounds and stadia, some localised shielding effects are likely for certain wind directions.

3 WIND TUNNEL MODELLING

3.1 Physical Model of the proposed Kai Tak Development

Two 1:800 scale wind tunnel models, designated as the Study Areas A and B, were fabricated to cover the Project Area of the proposed Kai Tak Development. The length scale of 1:800 for this district-level detailed air ventilation study was chosen in consultation with Planning Department to cover the full extent of the Kai Tak Development site and to include adequate detail in the model. Each proximity model included the surrounding areas within a diameter of 3.84 km, in which the topography was modelled at 4 m contour intervals, and all known existing and committed buildings and structures within the area.

The model of the Kai Tak Development Project Area was fabricated in accordance with the Recommended Outline Development Plan of Kai Tak Development. The building layouts for the individual lots within the Kai Tak Development Project Area and the Assessment Area were based on the latest information available at the time of model fabrication. For the public housing developments in Site 1A and Site 1B within Zones B-1 and B-2 respectively of Kai Tak Development, it is noted that the building layout and design have been modified subsequent to this detailed air ventilation study with an aims to enhance the ventilation performance of the development.

For the Kai Tak Development, a detailed air ventilation study had previously been conducted under the *South East Kowloon Development Comprehensive Planning and Engineering – Stage 1 Planning Review*. A number of air ventilation improvement measures have then been incorporated into the Recommended Outline Development Plan. These improvement measures include the incorporation of major wind corridors along the prevailing wind direction across the entire development; avoids massive railway depot building fronting Prince Edward Road East to minimise blockage of wind flow to hinterland area; podium-free design to improve wind penetration; and grid neighbourhood design in south-eastern part of North Apron area with grid lots aligned to the prevailing wind direction to promote wind penetration. This detailed air ventilation study serves as a district-level detailed air ventilation study to examine the performance of these improvement measures as well as to identify any local level effects.

Study Area A includes areas located on the south-eastern side of the proposed Kai Tak Development. It includes the Cha Kwo Ling Waterfront, Kwun Tong Waterfront, South Apron Corner, Tourism and Leisure Hub at Runway South, Runway Precinct at Middle Runway, part of the Metro Park at Runway North and part of the North Apron East. It also includes the Assessment Areas in Cha Kwo Ling, Kwun Tong, Ngau Tau Kok and Kowloon Bay. Various views of the Study Area A model in the low speed test section are shown in Figures 13 to 26 inclusive.

Study Area B includes areas located on the north-western side of the proposed Kai Tak Development. It includes the Kai Tak City Centre at North Apron, Sports Hub at North Apron West, To Kwa Wan Waterfront, part of the North Apron East and part of the Metro Park at Runway North. It also includes the Assessment Areas in Kowloon Bay, Ngau Chi Wan, Choi Hung, San Po Kong, Tung Tau Estate at Wang Tau Hom, Kowloon City, To Kwa Wan, Ma Tau Kok and Hung Hom. Various views of the Study Area B model in the low speed test section are shown in Figures 17 to 20 inclusive.

The Study Area A model was installed with a total of 151 test points and the Study Area B model was installed with a total of 360 test points, as shown in Figures 21 and 22 inclusive, to measure pedestrian level mean wind speeds in the proposed Kai Tak Development and the Assessment Areas. 284 test points, designated as test points P001 to P284, were installed in the Project Area of the proposed Kai Tak Development; 131 test points, designated as test points A285 to A415, were installed in the Assessment Area; 96 test points, designated as test points A416 to A511, were installed in Model Area.

3.2 Modelling the Natural Wind

In conducting wind tunnel model tests of structures on the surface of the Earth, it is necessary to adequately simulate the lowest layer of the atmosphere, known as the atmospheric boundary layer. It is within this layer that the surface of the Earth imparts drag forces on the moving air, generally resulting in mean wind speed increasing with height to a point where the effects of surface drag become negligible. In wind engineering, a convenient measure of the thickness of the atmospheric boundary layer is commonly referred to as the gradient height and its magnitude depends on the surrounding surface roughness over which the air must flow. Obstacles to air flow can vary from relatively large expanses of smooth, open water, to vegetation such as forests, built-up environments such as city centres, and large, rugged mountain ranges. The resulting gradient heights are typically in the range of several hundred metres to in excess of 1000 m.

A 1:2000 scale experimental Site Wind Availability Study has been undertaken to determine the effects of topography on local wind conditions and the site wind availability for the Study Areas A and B (see also Section 2.1 above). Due to the similarities between both mean wind speed and turbulence intensity profiles for certain wind directions, three representative approach profiles are considered to be adequate to represent the range of wind conditions affected by the local terrain for the full 360° azimuth for both the Study Areas A and B models. The approach conditions corresponding to each of the 16 wind directions tested for both Study Areas are presented in Table 1. Mean wind speed profiles, turbulence intensity profiles and the longitudinal velocity spectra for the approach conditions are presented in graphical form in Figures 23 to 28 inclusive.

For all 1:800 scale wind tunnel tests, reference wind speeds were measured at a height of 300 mPD. Wind speed scaling factors (F) were applied to relate the non-typhoon wind speed at 500 mPD above open terrain to wind speeds at the reference height, as shown in Equation (1).

$$V_{ref} = FV_{500,open} \qquad (1)$$

where:

F = wind speed scaling factor;

V_{ref} = the mean wind speed measured at the reference height (equivalent to 300 mPD in this 1:800 scale study); and

$V_{500,open}$ = directional non-typhoon mean wind speed at 500 mPD above open water terrain.

The wind speed scaling factors, F, are based on the matching of mean wind speeds between the 1:2000 scale topographical model and the 1:800 scale detailed model as shown in Equation (2), averaged over five heights equivalent to 25 mPD, 50 mPD, 75 mPD, 100 mPD and 150 mPD at prototype scale.

$$F = \left[\frac{V_z}{V_{500,open}}\right]_{1:2000} \left[\frac{V_{ref}}{V_z}\right]_{1:800} \qquad (2)$$

where:

V_z = mean wind speed measured at a height z (i.e. where z is equivalent to 25 mPD, 50 mPD, 75 mPD, 100 mPD and 150 mPD at prototype scale);

V_{ref} = wind speed measured at the reference height (z_{ref}) in the 1:800 scale tests, taken as 300 mPD for this study; and

$V_{500,open}$ = directional mean wind speed at 500 mPD above open water terrain.

The wind speed scaling factors presented in Table 2 for each of the 16 measured wind directions were determined as an average from the wind speeds measured in the 1:2000 and 1:800 scale tests at heights of 25 mPD, 50 mPD, 75 mPD, 100 mPD and 150 mPD.

4 EXPERIMENTAL AND ANALYSIS PROCEDURE

4.1 Wind Tunnel Testing

The detailed air ventilation study for the proposed Kai Tak Development was conducted in WWTF's low speed test section using two 1:800 scale models. Wind speed measurements were taken using a multi-channel thermal anemometer at a total of 511 measurement locations jointly selected by AECOM Asia Company Limited, Planning Department and WWTF, at 22.5º increments for the full 360º azimuth (i.e. 16 wind directions), where a wind direction of 0º or 360º corresponds to an incident wind approaching the proposed development site directly from the north, 90º corresponds to an incident wind approaching the proposed development site directly from the east, etc.

4.2 Wind Speed Measurements and Analysis Procedures

4.2.1 Determining Directional and Overall Wind Velocity Ratios

Wind speeds at each test point were measured using a multi-channel thermal anemometer whose signals were sampled using a dedicated computer for a period corresponding to approximately one hour at prototype scale. The mean wind speed measurements at each test point were subsequently related to the approaching upper level wind speed as a directional wind velocity ratio ($VR_{500,i,j}$).

Directional wind velocity ratios are defined as the ratio $V_{p,i,j}/V_{\infty}$, where $V_{p,i,j}$ is the mean wind speed at pedestrian level (i.e. measured at 2 m above ground at each test point in the 1:800 scale models) and V_{∞} is the mean wind speed at the top of the atmospheric boundary layer (taken as the mean wind speed at 500 mPD in this study, and denoted as $V_{500,i}$ in the following sections). Directional wind velocity ratios are used as an indicator of the wind characteristics at each of the test points.

Directional wind velocity ratios were determined at 22.5º intervals for the full 360º azimuth (i.e. 16 wind directions) for each test point. At a particular wind direction (i), the wind velocity ratio of the j-th test point is expressed in Equation (3).

$$VR_{500,i,j} = \frac{V_{p,i,j}}{V_{500,i}} \qquad (3)$$

The overall wind velocity ratio of the j-th test point ($VR_{w,j}$) is defined in Equation (4), which accounts for the probability of occurrence (p_i) of winds approaching the Study Areas from each of the 16 measured wind directions. The probabilities of occurrence (p_i) of the approach winds for the proposed Kai Tak Development Study Areas are presented in Table 3. Annual and summer wind roses for the proposed Kai Tak Development Study Areas, corrected to a height of 150 mPD, are presented in Figures 29 to 32 inclusive. Corresponding data are also presented in tabular form in Appendix A.

$$VR_{w,j} = \sum_{i=1}^{16} p_i \times VR_{500,i,j} \qquad (4)$$

4.2.2 Definition of Spatial Average Velocity Ratio

The spatial average velocity ratio (SAVR) for a particular zone, defined as the spatial average of the $VR_{w,j}$ of all test points that are relevant to that zone, is defined in Equation (5). In the current study, the SAVR is used as a representative and relative indicator of pedestrian level wind conditions within each relevant zone.

$$SAVR = \sum_{j=1}^{n} \frac{VR_{w,j}}{n} \qquad (5)$$

where n is the total number of test points relevant to the particular zone.

For test points that were located near the boundary of more than one zone, the measured overall wind velocity ratios of those test points were used in the calculations of SAVRs for each corresponding zone. For example, test point P106 was located near the boundary of Runway Precinct at Middle Runway and the Metro Park at Runway North. Therefore, the measured overall wind velocity ratios of test point P106 were used in the calculations of SAVRs for both the Runway Precinct at Middle Runway and the Metro Park at Runway North.

5 EXPERIMENTAL RESULTS AND DISCUSSION

5.1 Pedestrian Level Wind Conditions at Cha Kwo Ling Waterfront

5.1.1 Spatial Average Velocity Ratios (SAVR)

The annual and summer Spatial Average Velocity Ratios (SAVRs) for Cha Kwo Ling Waterfront are 0.14 and 0.17 respectively, as shown in Table 4.

5.1.2 Overall Wind Velocity Ratio Results

The test point locations, annual and summer overall wind velocity ratios for each individual test point for Cha Kwo Ling Waterfront are presented graphically in Figures 33 to 35 respectively, and in Table 5. The corresponding directional wind velocity ratios ($VR_{500i,j}$) are also presented in Table 5.

5.1.3 Air Ventilation Conditions at Cha Kwo Ling Waterfront

The highest annual and summer overall wind velocity ratios in Cha Kwo Ling Waterfront were measured at test point P001 (0.17_{annual} / 0.20_{summer}). The test point is located at the south-eastern side of the Cha Kwo Ling Waterfront.

The directional wind velocity ratios of test point P001 indicated that relatively high wind speeds were measured for winds approaching from 135° to 180°. This is attributed to the open exposure of this position to Lei Yue Mun and Victoria Harbour for winds approaching from south-east to south directions. Furthermore, there are no intermediate buildings between test point P001 and the waterfront to its south, which also contributes to the higher directional wind velocity ratios.

The lowest annual and summer overall wind velocity ratios in Cha Kwo Ling Waterfront were measured at test point P004 (0.12_{annual} / 0.13_{summer}). This test point is located at the northern part of the Cha Kwo Ling Waterfront. Several low-rise buildings with heights of approximately 15 mPD are located at the centre of the Cha Kwo Ling Waterfront and approximately to the south of test point P004. Those low rise buildings are generally closely spaced with building gaps of approximately 5 m to 10 m. The directional wind velocity ratios of test point P004 indicated that relatively low wind speeds were measured for winds approaching from southerly wind directions, which is attributed to the moderating effects of the low-rise buildings to the south of test point P004.

5.2 Pedestrian Level Wind Conditions at Kwun Tong Waterfront

5.2.1 Spatial Average Velocity Ratios (SAVR)

The annual and summer Spatial Average Velocity Ratios (SAVRs) for Kwun Tong Waterfront are 0.11 and 0.12 respectively, as shown in Table 4.

5.2.2 Overall Wind Velocity Ratio Results

The test point locations, annual and summer overall wind velocity ratios for each individual test point for Kwun Tong Waterfront are presented graphically in Figures 36 to 38 respectively, and in Table 6. The corresponding directional wind velocity ratios ($VR_{500i,j}$) are also presented in Table 6.

5.2.3 Air Ventilation Conditions at Kwun Tong Waterfront

The highest annual and summer overall wind velocity ratios in Kwun Tong Waterfront were measured at test point P009 (0.17_{annual} / 0.18_{summer}), which is located on the northern side of Kwun Tong Waterfront and to the south-west of a number of buildings with heights of approximately 100 mPD. The directional wind velocity ratios of test point P009 indicated that relatively high wind speeds were measured for most of the tested wind directions, and in particular for winds approaching from 135º to 225º inclusive due to the open exposure of test point P009 to winds approaching from southerly directions. Relatively high wind speeds were also measured for winds approaching from northerly directions, which is attributed to the accelerating effects of the building located approximately to the north-east of test point P009.

The lowest annual and summer overall wind velocity ratios in the Kwun Tong Waterfront were measured at test point P007 (0.09_{annual} / 0.09_{summer}). Relatively low overall wind velocity ratios were also measured at test points P005 (0.10_{annual} / 0.12_{summer}) and P006 (0.09_{annual} / 0.10_{summer}).

Test point P005 is located on the southern side of the Kwun Tong Waterfront in a public transport interchange, surrounded by a circular footbridge and flyovers that extend from a bridge connecting the Kwun Tong Waterfront and Runway South. A number of buildings are located from the north to the south of test point P005, including Mai Tak Industrial Building (50 mPD), Kwun Tong 233 (100 mPD), Lu Plaza (85 mPD) and Hoi Bun Industrial Building (50 mPD). The directional wind velocity ratios for test point P005 indicated that relatively low wind speeds were measured for winds approaching from 270° to 112.5° inclusive. For wind directions of 0° to 112.5° inclusive, the relatively low wind speeds are attributed to the moderating effects of the circular footbridge, flyovers and the nearby buildings from the north to the south of test point P005. The relatively low wind speeds measured for the north-west quadrant are attributed to the moderating effects of the pier of the bridge connecting the Kwun Tong Waterfront and Runway South.

Test point P006 is located to the north-east of Kwun Tong Vehicular Ferry Pier on the south-eastern side of the Kwun Tong Waterfront. Test point P007 is located on the waterfront and underneath the elevated Kwun Tong Bypass. The directional wind velocity ratios of test points P006 and P007 indicated that relatively low wind speeds were measured for most of the tested wind directions. This is attributed to the sheltering effects of closely spaced buildings with heights of approximately 50 mPD located from the north-west to south-east of those test points.

5.3 Pedestrian Level Wind Conditions at South Apron Corner

5.3.1 Spatial Average Velocity Ratios (SAVR)

The annual and summer Spatial Average Velocity Ratios (SAVRs) for the South Apron Corner are 0.17 and 0.19 respectively, as shown in Table 4.

5.3.2 Overall Wind Velocity Ratio Results

The test point locations, annual and summer overall wind velocity ratios for each individual test point for the South Apron Corner are presented graphically in Figures 39 to 41 respectively, and in Table 7. The corresponding directional wind velocity ratios ($VR_{500i,j}$) are also presented in Table 7.

5.3.3 Air Ventilation Conditions at South Apron Corner

The highest annual and summer overall wind velocity ratios in the South Apron Corner were measured at test point P025 (0.27_{annual} / 0.31_{summer}). Relatively high annual and summer overall wind velocity ratios were also measured at test points P014 (0.23_{annual} / 0.26_{summer}), P015 (0.21_{annual} / 0.23_{summer}), P016 (0.27_{annual} / 0.30_{summer}), P022 (0.20_{annual} / 0.23_{summer}), P035 (0.22_{annual} / 0.22_{summer}), P036 (0.22_{annual} / 0.24_{summer}) and P037 (0.21_{annual} / 0.24_{summer}).

Test point P025 is located on a road in the South Apron Corner that has a width of approximately 60 m and which is aligned approximately south-east to north-west. It is also located underneath a bridge with a height of approximately 6 m, connecting hospital buildings with heights of 60 mPD. The directional wind velocity ratios of test point P025 indicated that relatively high wind speeds were measured for winds approaching from 0º to 45º inclusive, 135º to 225º inclusive and 292.5º to 360º inclusive. It is believed the bridge directly above test point P025 caused local accelerations of south-easterly and north-westerly winds.

Test point P016 is located at the Kowloon Bay Square on the southern end of the South Apron Corner. The directional wind velocity ratios of the test point indicated that relatively high wind speeds were measured for wind approaching from 112.5º to 180º inclusive and 247.5º to 270º inclusive. Evidently, the high wind speeds measured for those wind directions are due to the penetration of winds through the adjacent Kwun Tong Typhoon Shelter. The two buildings with heights of 100 mPD are also likely to convey upper level winds down to pedestrian level for wind directions of 247.5º to 270º inclusive.

Test point P014 is located on a north-east to south-west aligned road with a width of approximately 30 m. A commercial building with a height of approximate 180 mPD is located to the north-west of test point P014 and six other commercial buildings with heights of 100 mPD are also located around the test point. The magnitudes of the directional wind velocity ratios for test point P014 were largest for winds approaching from 135º to 202.5º. The relatively high wind speeds measured for those wind directions is likely to be due to the combined effects of accelerated wind flow through the 15 m wide building gap between the two 100 mPD buildings located to the south and the influence of the 180 mPD building on pedestrian level wind speeds. Similarly, pedestrian level wind conditions at the nearby test point P015 are also likely to be affected by the 180 mPD building, as evidenced by the higher directional wind velocity ratios for winds approaching from 180º to 247.5º inclusive.

Test point P022 is located to the south of an L-shaped hospital building with a height of 60 mPD. The directional wind velocity ratios for test point P022 indicated that relatively high wind speeds were measured for winds approaching from 157.5º to 202.5º inclusive. For those directions, test point P022 is located in a region of accelerated wind flow that is attributed located to the south-east of test point P022. Those two buildings with heights of 100 mPD are also likely to be the main cause of relatively high wind speeds that were also measured for winds approaching from 292.5º to 315º inclusive.

Test point P035 is located towards the north-western side of the South Apron Corner on the approximately north-west to south-east aligned road passing through the South Apron Corner. The directional wind velocity ratios for test point P035 indicated that relatively high wind speeds were measured for winds approaching from 22.5º to 45º inclusive and 90º to 112.5º inclusive. For those wind directions, test point P035 is in the wake region of two 45 mPD buildings with rectangular plan-forms which are likely to cause locally accelerated pedestrian level wind flow at that location. Relatively high wind speeds were also measured for wind approaching from 225º to 270º inclusive which is attributed to the open exposure of test point P035 to winds from those directions.

Test points P036 and P037 are also located towards the north-western side of the South Apron Corner and close to the Kai Tak Approach Channel. The directional wind velocity ratios of test points P036 and P037 indicated that relatively high wind speeds were measured for winds approaching from 135º to 225º inclusive, which is attributed to the open exposure in those directions.

The lowest annual and summer overall wind velocity ratios in the South Apron Corner were measured at test point P026 (0.08_{annual} / 0.09_{summer}). Relatively low overall wind velocity ratios were also measured at test points P023 (0.13_{annual} / 0.12_{summer}), P029 (0.11_{annual} / 0.13_{summer}) and P030 (0.12_{annual} / 0.14_{summer}).

Test point P023 is located in a relatively sheltered position to the east of 60 mPD hospital buildings on the south-eastern side of the South Apron Corner, to the west of a proposed 45 mPD rectangular building, and to the south of New Kowloon Bay Vehicle Examination Centre and the Kwun Tong Bypass. The directional wind velocity ratios of test point P023 indicated that relatively low wind speeds were measured for winds approaching from 112.5º to 247.5º inclusive. These conditions are attributed to the proposed and existing buildings and elevated roadway.

Test point P026 is located directly underneath the elevated Kwun Tong Bypass, between the entrance and exit ramps that extend down from Kwun Tong Bypass to the adjacent ground level. The directional wind velocity ratios of test point P026 indicated that relatively low wind speeds were measured for most tested wind directions, and in particular for winds from 67.5º to 157.5º inclusive, due to the local sheltering effects of the elevated Kwun Tong Bypass.

Test points P029 and P030 are located in the middle of the South Apron Corner on the main south-east to north-west aligned road, that has a width of approximately 60 m, and to the north-west of a bridge with a height of approximately 6 m, that spans the main road and connects hospital buildings with heights of 60 mPD in the South Apron Corner. The directional wind velocity ratios of test points P029 and P030 indicated that relatively low wind speeds were measured for wind approaching from 112.5º to 157.5º inclusive. The main cause of the reduction in south-easterly winds is likely to be the bridge located to the south-east of those test points.

Pedestrian level mean wind speeds measured at test points located close to the waterfront areas of South Apron Corner (P012, P021, P027, P031, P033 and P036) displayed similar directional trends, with more open exposures to winds from the south-east to the south-west. The magnitudes of overall wind velocity ratios were generally lower at test points located close to the centre of South Apron Corner (P029 and P030) due to the presence of a bridge spanning the main road. However, the alignment of the main road was generally effective in conveying south-easterly winds into the South Apron Corner. Pedestrian level wind speeds were generally lowest at test points in relatively close proximity to the Kwun Tong Bypass.

5.4 Pedestrian Level Wind Conditions at North Apron East

5.4.1 Spatial Average Velocity Ratios (SAVR)

The annual and summer Spatial Average Velocity Ratios (SAVRs) for North Apron East are 0.17 and 0.18 respectively, as shown in Table 4.

5.4.2 Overall Wind Velocity Ratio Results

The test point locations, annual and summer overall wind velocity ratios for each individual test point for North Apron East are presented graphically in Figures 42 to 44 respectively, and in Table 8. The corresponding directional wind velocity ratios ($VR_{500i,j}$) are also presented in Table 8.

5.4.3 Air Ventilation Conditions at North Apron East

The highest annual and summer overall wind velocity ratios in North Apron East were measured at test point P057 (0.25 $_{annual}$ / 0.28 $_{summer}$). Relatively high annual and summer overall wind velocity ratios were also measured at test points P037 (0.21 $_{annual}$ / 0.24 $_{summer}$), P040 (0.23 $_{annual}$ / 0.22 $_{summer}$), P043 (0.20 $_{annual}$ / 0.23 $_{summer}$) and P232 (0.23 $_{annual}$ / 0.22 $_{summer}$).

Test point P057 is located on the north-western side of North Apron East, to the south of the 45 mPD Tunnel Ventilation Shaft and Administration Building and to the north and north-east of two 45 mPD buildings with rectangular plan-forms. The directional wind velocity ratios of test point P057 indicated that relatively high wind speeds were measured for winds approaching from 135º and 157.5º and from 202.5º to 270º inclusive. These conditions are attributed to the locally enhanced pedestrian level wind speeds for those wind directions caused by the nearby Tunnel Ventilation Shaft and Administration Building and the 45 mPD rectangular building to its south.

Test point P043 is located on the south-western side of North Apron East and close to the waterfront on the Kai Tak Approach Channel. The directional wind velocity ratios of test point P043 indicated that relatively high wind speeds were measured for winds approaching from 135º to 225º inclusive. Similar directional trends were also observed for test points P039 and test point P046 which are also located close to the waterfront in North Apron East. These pedestrian level wind conditions are due to the open exposure of the Kai Tak Approach Channel to winds from those directions.

Further from the waterfront, test point P040 is located on the south-eastern side of North Apron East underneath the elevated Kwun Tong Bypass and approximately to south-west of the 145 mPD Sing Tao building that comprises a tower with a rectangular plan-form and a podium with rounded corners. Enhanced directional wind velocity ratios at test point P040 for winds approaching from 45º to 112.5º inclusive and from 157.5º to 180º inclusive. As the height and bulk of the Sing Tao building are significantly greater than that of other nearby buildings, it is likely that it is mostly responsible for locally enhanced pedestrian level wind speeds.

Test point P232 (0.23 $_{annual}$ / 0.22 $_{summer}$) is located on the approximately 50 m wide, north-east to south-west aligned, road at the northern end of North Apron East. This area has a relatively low building density and hence relatively open exposures to the majority of wind directions. The generally higher directional wind velocity ratios of test point P232 for wind directions ranging from 22.5º to 247.5º inclusive are responsible for the relatively high overall wind velocity ratios measured at test point P232. Similar directional trends were also measured at test point P231.

The lowest annual overall wind velocity ratio in North Apron East was measured at test point P047 (0.10 $_{annual}$ / 0.11 $_{summer}$). The lowest summer overall wind velocity ratio in North Apron East was measured at test point P045 (0.11 $_{annual}$ / 0.10 $_{summer}$). Relatively low overall wind velocity ratios were also measured at test points P044 (0.13 $_{annual}$ / 0.14 $_{summer}$), P048 (0.12 $_{annual}$ / 0.14 $_{summer}$) and P052 (0.13 $_{annual}$ / 0.13 $_{summer}$).

Test point P047 is located to the west of the Hong Kong International Trade & Exhibition Centre that has large ground coverage and a height of 100 mPD and to the east of a flyover. The directional wind velocity ratios of test point P047 indicated that wind speeds measured for most of the tested wind directions were relatively low, which is mostly caused by the sheltering effects of the Hong Kong International Trade & Exhibition Centre and the flyover.

Test point P045 is located to the east of the Hong Kong International Trade & Exhibition Centre and underneath the elevated Kwun Tong Bypass, on the eastern side of the North Apron East. The directional wind velocity ratios of test point P045 indicated that relatively low wind speeds were measured for most wind directions, and in particular for winds from 135º to 360º inclusive. This is due to the sheltering effects of the Hong Kong International Trade & Exhibition Centre and underneath the elevated Kwun Tong Bypass.

Test point P044 is located on an approximately 35 m wide road on the northern side of North Apron East. The directional wind velocity ratios for test point P044 were relatively low for winds approaching from 90º to 180º inclusive. Those conditions are caused by localised sheltering effects from the adjacent flyover and the 45 mPD building located to the south of test point P044.

Test point P048, located on the approximately 35 m wide road linking North Apron East and North Apron West, experienced relatively low directional wind velocity ratios for winds approaching from 112.5º to 157.5º inclusive. This is attributed to the sheltering effects of the two 45 mPD rectangular buildings that are located to the south-east of test point P048.

Test point P052 is located to the east of the Electrical and Mechanical Services Department Headquarters building, which has a height of approximately 70 mPD. The directional wind velocity ratios of test point P052 indicated that relatively low wind speeds were measured for winds approaching from 90º to 135º inclusive, which is attributed to the sheltering effects of the Skyline Tower, Sino Industrial Plaza and HSBC Building Kowloon Bay. Test point P052 was also sheltered from winds from the north-west quadrant by the nearby Electrical and Mechanical Services Department Headquarters.

In general, the most favourable pedestrian level wind conditions were measured in the northern parts of the North Apron East where the overall building density is relatively low and locations close to the waterfront are able to benefit from winds from the south-east to south-west. Test points that were located further inland away from the waterfront experienced overall lower pedestrian level wind speeds, with some localised sheltering effects from nearby buildings and flyovers.

5.5 Pedestrian Level Wind Conditions at Tourism and Leisure Hub at Runway South

5.5.1 Spatial Average Velocity Ratios (SAVR)

The annual and summer Spatial Average Velocity Ratios (SAVRs) for the Tourism and Leisure Hub at Runway South are 0.21 and 0.23 respectively, as shown in Table 4.

5.5.2 Overall Wind Velocity Ratio Results

The test point locations, annual and summer overall wind velocity ratios for each individual test point for Tourism and Leisure Hub at Runway South are presented graphically in Figures 45 to 47 respectively, and in Table 9. The corresponding directional wind velocity ratios ($VR_{500i,j}$) are also presented in Table 9.

5.5.3 Air Ventilation Conditions at Tourism and Leisure Hub at Runway South

The highest annual and summer overall wind velocity ratios in Tourism and Leisure Hub at Runway South were measured at test point P069 (0.36_{annual} / 0.36_{summer}). Relatively high overall wind velocity ratios were also measured at test point P062 (0.26_{annual} / 0.28_{summer}).

Test point P062 is located in the heliport at the southern end of the runway. The directional wind velocity ratios of test point P062 indicated that relatively high wind speeds were measured for winds approaching from 22.5º to 112.5º inclusive and 247.5º to 360º inclusive. These conditions are attributed to the generally open exposure of the test point to winds from most directions.

Test point P069 is located to the north of the Commercial, Hotel and Entertainment Development that comprises a 200 mPD building and a 100 mPD building above a 20 mPD podium. The directional wind velocity ratios measured at test point P069 were relatively high for winds approaching from 22.5º to 157.5º inclusive and 247.5º to 360º inclusive. Pedestrian level wind speeds at this location are significantly increased by the 200 mPD building and by accelerated wind flow through the gap between the 100 mPD building and the 200 mPD building.

The lowest annual and summer overall velocity ratios in Tourism and Leisure Hub at Runway South were measured at test point P070 (0.13 $_{annual}$ / 0.15 $_{summer}$), which is located between the 35 mPD Cruise Terminal, with its elongated plan-form, and the two buildings with heights of 100 mPD and 200 mPD above a 20 mPD podium. It is also located to the north-west of a monorail station with rectangular plan-form. Directional wind velocity ratios of test point P070 indicated relatively low wind speeds for winds approaching from 67.5º to 135º inclusive, which is attributed to the sheltering effects caused by the 100 mPD and 200 mPD buildings the monorail station.

In general, pedestrian level wind conditions at Tourism and Leisure Hub at Runway South were relatively high due to its exposed location at the south-eastern end of the proposed development site. Some test points experienced localised sheltering effects for some wind directions. Nevertheless, Tourism and Leisure Hub at Runway South is evidently well placed to benefit from the prevailing south-east to south winds and south-west winds.

5.6 Pedestrian Level Wind Conditions at the Runway Precinct at Middle Runway

5.6.1 Spatial Average Velocity Ratios (SAVR)

The annual and summer Spatial Average Velocity Ratios (SAVRs) for the Runway Precinct at Middle Runway of the proposed Kai Tak Development are 0.19 and 0.21 respectively, as shown in Table 4.

5.6.2 Overall Wind Velocity Ratio Results

The test point locations, annual and summer overall wind velocity ratios for each individual test point at the Runway Precinct at Middle Runway are presented graphically in Figures 48 to 50 respectively, and in Table 10. The corresponding directional wind velocity ratios ($VR_{500i,j}$) are also presented in Table 10.

5.6.3 Air Ventilation Conditions at the Runway Precinct at Middle Runway

The highest annual and summer overall wind velocity ratio was measured at test point P085 (0.29 $_{annual}$ / 0.32 $_{summer}$). Test point P085 is located on the south-western side of the Runway Precinct at Middle Runway. The local widening of the runway adjacent to test point P085 allows the test point to be more exposed to the prevailing winds than other test points located along the south-western edge of the runway. Consequently, directional wind velocity ratios measured at test point P085 were relatively high for winds approaching from 112.5° to 337.5° inclusive.

The lowest annual overall wind velocity ratio was measured at test points P086 (0.13 $_{annual}$ / 0.16 $_{summer}$) and P097 (0.13 $_{annual}$ / 0.17 $_{summer}$), and the lowest summer overall wind velocity ratio was measured at test point P076 (0.15 $_{annual}$ / 0.14 $_{summer}$).

Test point P086 is located to the north of the monorail station in the Runway Precinct at Middle Runway. There are three major proposed buildings adjacent to test point P086 which affect pedestrian level wind conditions at this test point location: two buildings with heights of 65 mPD are located to the south-east and north-west of test point P086; a third building with a height of 45 mPD and a width of approximately 100 m is located to the south-west of test point P086. Due to the closely spaced surrounding buildings, test point P086 is sheltered for east to south-east wind directions, although some wind penetration was evident for winds approaching from approximately 157.5° to 247.5°. Similar pedestrian level wind conditions were measured for test point P097.

Test point P076 is located on an elevated road close to the north-eastern edge of the runway, with a number of buildings with heights ranging from 45 mPD to 55 mPD located to its south-west. The Cruise Terminal in Runway South is located approximately to the south-east of test point P076. Relatively low directional wind velocity ratios measured at test point P076 for winds approaching from 180° to 360° inclusive indicated that test point P076 was sheltered for those directions by the nearby buildings.

In general, test point locations located along the south-western edge of the Middle Runway were relatively exposed to winds ranging from the south-east to the west, with localised sheltering at some test point locations for north-east winds in particular, depending on their proximity to adjacent proposed buildings. Overall wind velocity ratios at test points along the south-west to north-east aligned main road of the Middle Runway were around 20% lower overall than those at tests points on the south-western edge of the Middle Runway. Similarly, the more open exposure of test points along the north-eastern edge of the Middle Runway to winds from the east to the south-east allowed higher pedestrian level wind speeds at those test points for those directions.

5.7 Pedestrian Level Wind Conditions at the Metro Park at Runway North

5.7.1 Spatial Average Velocity Ratios (SAVR)

The annual and summer Spatial Average Velocity Ratios (SAVRs) for the Metro Park at Runway North of the proposed Kai Tak Development are 0.23 and 0.24 respectively, as shown in Table 4.

5.7.2 Overall Wind Velocity Ratio Results

The test point locations, annual and summer overall wind velocity ratios for each individual test point at the Metro Park at Runway North of the proposed Kai Tak Development are presented graphically in Figures 51 to 53 respectively, and in Table 11. The corresponding directional wind velocity ratios ($VR_{500i,j}$) are also presented in Table 11.

5.7.3 Air Ventilation Conditions at the Metro Park at Runway North

Overall wind velocity ratios were generally relatively high for all test points within the Metro Park at Runway North due to the lack of buildings in that area. The highest annual and summer overall wind velocity ratios in the Metro Park at Runway North were measured at test point P111 (0.27_{annual} / 0.28_{summer}). Test point P111 is located at the south-west side of the Runway. Directional wind velocity ratios measured at test point P111 indicated that this location is relatively exposed for most tested wind directions, although there was some reduction for wind directions with extensive upstream fetches of urban terrain.

The lowest annual and summer overall wind velocity ratios in the Metro Park at Runway North were measured at test point P107 (0.19_{annual} / 0.18_{summer}). Test Point P107 is located at the south-eastern side of the Metro Park at Runway North and approximately on the boundary between Runway North and Middle Runway and in close proximity to an elevated road and a proposed building of height 20 mPD and width of 125 m to its south-west that had some effect on the magnitude of pedestrian level wind speeds. The directional wind velocity ratios measured at test point P107 were relatively low for winds approaching from directions of 135° to 157.5° inclusive, 202.5°, 247.5°, 270° and 337.5°.

5.8 Pedestrian Level Wind Conditions at the Sports Hub at North Apron West

5.8.1 Spatial Average Velocity Ratios (SAVR)

The annual and summer Spatial Average Velocity Ratios (SAVRs) for the Sports Hub at North Apron West of the proposed Kai Tak Development are 0.19 and 0.20 respectively, as shown in Table 4.

5.8.2 Overall Wind Velocity Ratio Results

The test point locations, annual and summer overall wind velocity ratios for each individual test point at the Sports Hub at North Apron West are presented graphically in Figures 54 to 56 respectively, and in Table 12. The corresponding directional wind velocity ratios ($VR_{500i,j}$) are also presented in Table 12.

5.8.3 Air Ventilation Conditions at the Sports Hub at North Apron West

The highest annual and summer overall wind velocity ratios in the Sports Hub at North Apron West were measured at test point P114 (0.30_{annual} / 0.31_{summer}). Due to the relatively large exposed areas towards the southern part of the Sports Hub at North Apron and the influence of the proposed main stadium on pedestrian level wind speeds, relatively high annual and summer overall wind velocity ratios were also measured at test points P112 (0.22_{annual} / 0.23_{summer}), P113 (0.21_{annual} / 0.23_{summer}), P115 (0.23_{annual} / 0.24_{summer}), P116 (0.24_{annual} / 0.24_{summer}), P117 (0.24_{annual} / 0.25_{summer}), P118 (0.23_{annual} / 0.24_{summer}) and P119 (0.28_{annual} / 0.29_{summer}).

It is evident from the directional wind velocity ratios for the aforementioned test points that the proposed main stadium caused both sheltering effects and enhanced wind speeds at pedestrian level, and that these effects varied with direction for these test points. The overall effect is that overall velocity ratios at these test points are relatively high.

The lowest annual and summer overall wind velocity ratios in the Sports Hub at North Apron West were measured at test point P122 (0.11_{annual} / 0.11_{summer}). Relatively low overall wind velocity ratios were also measured for test points P127 (0.12_{annual} / 0.12_{summer}) and P207 (0.12_{annual} / 0.13_{summer})

Test point P122 is located to the north of the monorail station in the Sports Hub at North Apron West. The directional wind velocity ratios for test point P122 indicated that relatively low wind speeds were measured for most wind directions. This is attributed to the sheltering effects of the 100 mPD buildings and 110 mPD buildings in Zone D of the Kai Tak City Centre at the North Apron to the east of test point P122, sheltering effects of the monorail station to the south of test point P122, and the effects of the higher ground elevation and monorail to the west of test point P122 moderating wind speeds for south-westerly to north-westerly winds.

Test point P127 is located to the south-east of a L-shaped 50 mPD building which is located towards the north-west of the Sports Hub at North Apron West. Relatively low directional wind velocity ratios were measured at this test point for winds approaching from 22.5° to 67.5° inclusive, 112.5° and 202.5° to 360° inclusive. Evidently, these conditions are caused by the sheltering effects of the L-shaped building and regions of low wind flow in close proximity to it.

A number of test points are also located around the perimeter of the Sports Hub at North Apron West. Among those test points, relatively low overall wind velocity ratios were measured at test point P207, which is located close to the northern boundary of North Apron West and Zone C of the Kai Tak City Centre at the North Apron. The relatively low directional wind velocity ratios that were measured at this test point for all tested wind directions are attributed to the combined effects of the buildings in Zone C of the Kai Tak City Centre to the north-west of test point P207, and the higher ground elevation of North Apron West to the south-east of test point P207.

In general, pedestrian level wind conditions in the southern parts of the Sports Hub at North Apron West were relatively high due to the better exposure of test points in those areas to the prevailing winds and the enhancement of those winds by the proposed stadium for some wind directions at some test point locations. Towards the northern part of Sports Hub at North Apron West, pedestrian level wind speeds were reduced due to the denser building developments and lower ground elevations.

5.9 Pedestrian Level Wind Conditions at To Kwa Wan Waterfront

5.9.1 Spatial Average Velocity Ratios (SAVR)

The annual and summer Spatial Average Velocity Ratios (SAVRs) for To Kwa Wan Waterfront of the proposed Kai Tak Development are 0.23 and 0.22 respectively, as shown in Table 4.

5.9.2 Overall Wind Velocity Ratio Results

The test point locations, annual and summer overall wind velocity ratios for each individual test point at the To Kwa Wan Waterfront are presented graphically in Figures 57 to 59 respectively, and in Table 13. The corresponding directional wind velocity ratios ($VR_{500i,j}$) are also presented in Table 13.

5.9.3 Air Ventilation Conditions at the To Kwa Wan Waterfront

The highest annual and summer overall wind velocity ratios in the To Kwa Wan Waterfront were measured at test point P133 (0.37 $_{annual}$ / 0.35 $_{summer}$). Test point P133 is located between the existing Grand Waterfront and the buildings of the proposed Kai Tak Development at To Kwa Wan Waterfront. The directional wind velocity ratios measured at test point P133 were generally high, but especially so for wind directions of 135° and 157.5°. Those high directional wind velocity ratios are indicative of significant wind speed enhancement and they are caused by a channelling effect between the Grand Waterfront and the adjacent proposed buildings. Similar conditions for wind directions of 135° and 157.5° were measured at test point P132, which is located at the south-eastern end of Ma Tau Kok Road.

The lowest annual and summer overall velocity ratios in the To Kwa Wan Waterfront were measured at P135 (0.13_{annual} / 0.12_{summer}). Test point P135 is located at the To Kwa Wan Vehicle Inspection Centre close to the waterfront and in close proximity to closely spaced residential buildings of Wyler Gardens to its north-west. Directional wind velocity ratios measured at test point P135 were particularly low for winds approaching from 202.5° to 360° inclusive which is attributed to the sheltering effects of those buildings.

In general, test point locations towards the northern end of To Kwa Wan have higher pedestrian level wind speeds due to the lower density of buildings in that area. Those wind speeds were significantly increased at two test point locations due to the accelerating effects of buildings in the Grand Waterfront and adjacent proposed buildings. In the southern part of To Kwa Wan, pedestrian level wind conditions are moderated by the density of the adjacent existing building groups.

5.10 Pedestrian Level Wind Conditions at Zone A-1 of the Kai Tak City Centre at the North Apron

5.10.1 Spatial Average Velocity Ratios (SAVR)

The annual and summer Spatial Average Velocity Ratios (SAVRs) for Zone A-1 of the Kai Tak City Centre at the North Apron are 0.17 and 0.18 respectively, as shown in Table 4.

5.10.2 Overall Wind Velocity Ratio Results

The test point locations, annual and summer overall wind velocity ratios for each individual test point for Zone A-1 of the Kai Tak City Centre at the North Apron are presented graphically in Figures 60 to 62 respectively, and in Table 14. The corresponding directional wind velocity ratios ($VR_{500i,j}$) are also presented in Table 14.

5.10.3 Air Ventilation Conditions at Zone A-1 of the Kai Tak City Centre at the North Apron

The highest annual and summer overall wind velocity ratios in Zone A-1 of the Kai Tak City Centre at the North Apron were measured at test points P138 (0.22 $_{annual}$ / 0.22 $_{summer}$), P141 (0.22 $_{annual}$ / 0.22 $_{summer}$) and P142 (0.20 $_{annual}$ / 0.23 $_{summer}$).

Test point P138 is located on the north-eastern side of Zone A-1. The directional 112.5° to 157.5° inclusive were relatively high. This is attributed to the accelerated wind flows due to the 80 mPD building located to its east and the group of three 150 mPD buildings to its south-west.

Test point P141 is located on the south-western side of Zone A-1. Relatively high directional wind velocity ratios were measured for winds approaching from 90° to 157.5° for test point P141. Those effects are attributed to the three 150 mPD buildings located to the north-east and the 175 mPD building located to the south of test point P141.

Test point P142 is located on an approximately north-east to south-west aligned road in Zone A-1 and it is also located on the north-eastern side of Zone A-1. The directional wind velocity ratios for test point P142 were relatively high wind for the prevailing wind directions of 135°, 157.5°, 247.5° and 270°. Those effects are likely to be due to the accelerated wind flow caused by the 80 mPD building, 125 mPD building and group of 150 mPD buildings located to its south.

The lowest annual and summer overall wind velocity ratios in Zone A-1 of the Kai Tak City Centre at the North Apron were measured at test points P146 (0.11_{annual} / 0.11_{summer}), P147 (0.12_{annual} / 0.11_{summer}). Relatively low overall wind velocity ratios were also measured at test point P139 (0.13_{annual} / 0.15_{summer}).

Test point P146 is located towards the south-western side of Zone A-1. Relatively low directional wind velocity ratios were measured for test point P146 at wind directions from 67.5° to 157.5° inclusive. The 175 mPD building located to the south-east of test point P146 provides shelter to that location for winds from those directions.

Test point P147 is located in the commercial area located at the northern end of Zone A-1. The location is sheltered by a 90 mPD building to its east, a 15 mPD building to its south, a 100 mPD building located to its west, and a row of commercial buildings in San Po Kong to its north, resulting in relatively low directional wind velocity ratios for most of the tested wind directions.

Test point P139 is located between a 125 mPD building and three 150 mPD buildings with curved plan-forms near the centre of Zone A-1. The directional wind velocity ratios of test point P139 were relatively low for winds approaching from 67.5° to 225° inclusive, highlighting the sheltering effects of the adjacent buildings. However, those buildings are also responsible for enhanced directional wind velocity ratios for wind directions from 247.5° to 292.5° inclusive.

In general, the relatively low development density in Zone A-1 of the Kai Tak City Centre at the North Apron generally facilitates the penetration of the prevailing winds into this area. The inclusion of buildings with various heights and shapes creates localised sheltered regions for some wind directions on their leeward sides while enhancing pedestrian level wind speeds at other locations.

5.11 Pedestrian Level Wind Conditions at Zone A-2 of the Kai Tak City Centre at the North Apron

5.11.1 Spatial Average Velocity Ratios (SAVR)

The annual and summer Spatial Average Velocity Ratios (SAVRs) for Zone A-2 of the Kai Tak City Centre at the North Apron are 0.16 and 0.16 respectively, as shown in Table 4.

5.11.2 Overall Wind Velocity Ratio Results

The test point locations, annual and summer overall wind velocity ratios for each individual test point for Zone A-2 of the Kai Tak City Centre at the North Apron are presented graphically in Figures 63 to 65 respectively, and in Table 15. The corresponding directional wind velocity ratios ($VR_{500i,j}$) are also presented in Table 15.

5.11.3 Air Ventilation Conditions at Zone A-2 of the Kai Tak City Centre at the North Apron

The highest annual overall wind velocity ratio in Zone A-2 of the Kai Tak City Centre at the North Apron were measured at test point P158 (0.22_{annual} / 0.19_{summer}). The highest summer overall wind velocity ratio in Zone A-2 of the Kai Tak City Centre at the North Apron were measured at test point P142 (0.20_{annual} / 0.23_{summer}).

Test point P158 is located between the four 100 mPD buildings with elongated plan-forms in Zone A-2. The directional wind velocity ratios for test point P158 were relatively high for winds approaching from 22.5° to 135° inclusive. Those conditions are attributed to the effects of the four 100 mPD buildings with elongated plan-form accelerating pedestrian level wind speeds for those directions.

Test point P142 is located on the boundary between Zone A-1 and Zone A-2. The directional wind velocity ratios for test point P142 were relatively high wind for the prevailing wind directions of 135°, 157.5°, 247.5° and 270°. Those effects are likely to be due to the accelerated wind flow caused by the 80 mPD building, 125 mPD building and group of 150 mPD buildings located to its south in Zone A-1.

The lowest annual and summer overall wind velocity ratios in Zone A-2 of the Kai Tak City Centre at the North Apron were measured at test points P144 (0.11_{annual} / 0.12_{summer}) and P162 (0.13_{annual} / 0.12_{summer}) respectively. Relatively low annual or summer overall wind velocity ratios in Zone A-2 of the Kai Tak City Centre at the North Apron were also measured at test points P157 (0.13_{annual} / 0.12_{summer}) and P161 (0.13_{annual} / 0.13_{summer}).

Test point P144 is located immediately to the west of the adjacent 90 mPD building with an "L-shaped" plan-form that shelters the location from winds approaching from 67.5° to 157.5° inclusive.

Test points P161 and P162 are located to the north-west of the four 100 mPD buildings with elongated plan-forms in Zone A-2. The directional wind velocity ratios of test points P161 and P162 indicated that winds approaching from 67.5° to 135° inclusive were reduced by the sheltering effects of the four 100 mPD buildings to their south-east. Relatively low directional wind velocity ratios were also measured for winds approaching from 202.5° to 292.5° for test point P162, that were caused by the sheltering effects of the nearby footbridge.

Test point P157 is located approximately to the north-east of the four 100 mPD buildings with elongated plan-form in Zone A-2. The corresponding directional wind velocity ratios for test point P157 indicated the largest reductions for winds approaching from 157.5° to 225°. Those conditions are attributed to the combined effects of the four adjacent 100 mPD buildings and the group of 120 mPD buildings located in Zone B-1 to the south.

In general, the four 100 mPD buildings with elongated plan-forms in Zone A-2 had a significant influence on the local pedestrian level wind conditions in the area. Accelerated wind flow at one test point location is attributable to the influence of those buildings. However, a number of test points located to the north of those buildings experienced reduced pedestrian level wind speeds for a range of wind directions.

5.12 Pedestrian Level Wind Conditions at Zone B-1 of the Kai Tak City Centre at the North Apron

5.12.1 Spatial Average Velocity Ratios (SAVR)

The annual and summer Spatial Average Velocity Ratios (SAVRs) for Zone B-1 of the Kai Tak City Centre at the North Apron are 0.16 and 0.15 respectively, as shown in Table 4.

5.12.2 Overall Wind Velocity Ratio Results

The test point locations, annual and summer overall wind velocity ratios for each individual test point for Zone B-1 of the Kai Tak City Centre at the North Apron are presented graphically in Figures 66 to 68 respectively, and in Table 16. The corresponding directional wind velocity ratios ($VR_{500i,j}$) are also presented in Table 16.

5.12.3 Air Ventilation Conditions at Zone B-1 of the Kai Tak City Centre at the North Apron

The highest annual and summer overall wind velocity ratios in Zone B-1 of the Kai Tak City Centre at the North Apron were measured at test point P163 (0.21_{annual} / 0.21_{summer}). A relatively high annual overall wind velocity ratio was also measured at test point P164 (0.20_{annual} / 0.17_{summer}). Test points P163 and P164 are both located at the south-eastern corner of Zone B-1.

The directional wind velocity ratios of test point P163 indicated relatively high wind speeds for wind directions ranging from 112.5° to 202.5° inclusive, indicating that pedestrian level wind conditions at that location were not significantly affected by the adjacent elevated roadway.

Test point P164 is located on the southern side of Zone B-1. Relatively high directional wind velocity ratios were measured for winds approaching from 315° to 135° inclusive, whereas directional wind velocity ratios for wind directions from 157.5° to 292.5° inclusive were significantly lower. Evidently, the 120 mPD buildings to the north and south of test point P164 create a complex pedestrian level wind environment that experiences both significant shielding and significant flow acceleration. Similar directional characteristics were also measured at test point P165.

The lowest annual and summer overall wind velocity ratios were measure at test points P169 (0.13_{annual} / 0.10_{summer}) and P172 (0.13_{annual} / 0.13_{summer}). Relatively low summer overall wind velocity ratios were also at test points P153 (0.14_{annual} / 0.13_{summer}), P166 (0.14_{annual} / 0.12_{summer}), P178 (0.14_{annual} / 0.12_{summer}) and P181 (0.15_{annual} / 0.13_{summer}).

Test point P169 is located on the approximately 20 m wide, east-west aligned building gap between the two 45 mPD buildings at the eastern side of Zone B-1. The directional wind velocity ratios of test point P169 were relatively low wind speeds for most of the tested wind directions, and in particular for winds from 112.5° to 270° inclusive. Evidently, the low wind speed ratios for those wind directions are caused by the sheltering effects of the two adjacent 45 mPD buildings. The higher directional wind velocity ratios measured for 67.5° and 90° are likely to be caused by channelling between the same building gap.

Test points P172 and P166 are located at the south-western corner of Zone B-1. The directional wind velocity ratios of test point P172 were relatively low for winds approaching from 0° to 135° inclusive. The directional wind velocity ratios for test point P166 were also relatively low for winds approaching from 90° to 135° inclusive. These characteristics are due to the locations of test points P166 and P172 relative to the 120 mPD buildings located in Zone B-1 and Zone B-2.

Test points P153, P178 and P181 are located on the northern side of Zone B-1. For test point P153, the relatively low directional wind velocity ratios for 112.5° to 247.5° inclusive are attributed to the moderating effects of the 45 mPD buildings and the 120 mPD buildings located approximately to the south of the test point location.

Test point P178 is located in an east-west aligned building gap, approximately 8 m wide, between two 45 mPD buildings. The directional wind velocity ratios measured for test point P178 were relatively low for most tested wind directions, and in particular for 157.5° to 337.5° inclusive, highlighting the shielding effects of the adjacent buildings.

Test point P181 is located at the north-eastern corner of Zone B-1. Relatively low directional wind velocity ratios were measured for test point P181 for directions ranging from 180° to 292.5° inclusive. This is attributed to the sheltering effects caused by the general extent of buildings located from the south to the south-west of the test point location. Similar directional characteristics were also observed for the nearby test point P177.

In general, pedestrian level wind speeds in Zone B-1 are moderated by the extent and massing of buildings ranging from the south-east to the south-west of the area. Having said that, it is noted that site-level AVA study has been undertaken for the public housing development in Site 1A of Kai Tak Development within Zone B-1. The building layout and design of the public housing development within Zone B-1 have been fine-tuned to enhance the ventilation performance of the development.

5.13 Pedestrian Level Wind Conditions at Zone B-2 of the Kai Tak City Centre at the North Apron

5.13.1 Spatial Average Velocity Ratios (SAVR)

The annual and summer Spatial Average Velocity Ratios (SAVRs) for Zone B-2 of the Kai Tak City Centre at the North Apron are 0.15 and 0.15 respectively, as shown in Table 4.

5.13.2 Overall Wind Velocity Ratio Results

The test point locations, annual and summer overall wind velocity ratios for each individual test point for Zone B-2 of the Kai Tak City Centre at the North Apron are presented graphically in Figures 69 to 71 respectively, and in Table 17. The corresponding directional wind velocity ratios ($VR_{500i,j}$) are also presented in Table 17.

5.13.3 Air Ventilation Conditions at Zone B-2 of the Kai Tak City Centre at the North Apron

The highest annual and summer overall wind velocity ratios in Zone B-2 of the Kai Tak City Centre at the North Apron were measured at test point P186 (0.29_{annual} / 0.27_{summer}). Test point P186 is located in the approximately 12 m wide building gap formed by the two 120 mPD buildings located at the south-eastern side of Zone B-2. The directional wind velocity ratios measured for test point P186 were relatively high for winds approaching from 90° to 135° inclusive. This is attributed to flow accelerating through the narrow gap between the adjacent buildings.

The lowest annual and summer overall wind velocity ratios were measured at test point P 191 (0.09_{annual} / 0.08_{summer}). Relatively low annual and summer overall wind velocity ratios were also measured at test points P185 (0.11_{annual} / 0.11_{summer}), P188 (0.09_{annual} / 0.11_{summer}), P189 (0.09_{annual} / 0.12_{summer}), P192 (0.11_{annual} / 0.13_{summer}), P193 (0.11_{annual} / 0.12_{summer}), P194 (0.10_{annual} / 0.11_{summer}), P196 (0.09_{annual} / 0.10_{summer}), P244 (0.11_{annual} / 0.10_{summer}) and P249 (0.13_{annual} / 0.14_{summer}).

Test points P188, P191, P192 and P194 are generally located between the 120 mPD buildings in Zone B-2. Test point P191 is approximately located at the centre of the 120 mPD building group in Zone B-2. These test points typical experienced low directional wind velocity ratios for winds approaching from 67.5° to 270°, although some local flow accelerations were measured for some wind directions. Similar effects were also measured for test point P196 located at the western side of Zone B-2, with relatively low directional wind velocity ratios being measured for winds approaching from 0° to 292.5°.

The two 45 mPD buildings located approximately to the south-west of test points P188 and P192 created less of an obstruction to south-westerly winds and a more significant height difference against the 120 mPD buildings. This is likely to allow some relatively weak penetration of south-westerly winds to these test points and nearby areas.

Test points P185 and P189 are located in the approximately 12 m wide building gaps between adjacent 45 mPD buildings located to the south of Zone B-2. Directional wind velocity ratios were relatively low for both test points for wind directions ranging from 292.5° to 135° inclusive. Evidently, these conditions are due to the sheltering effects of the adjacent 45 mPD buildings and the 120 mPD buildings located to the north of the test point locations. Pedestrian level wind conditions at test point P185 are also affected by the 100 mPD buildings in Zone B-3 located to its south-west.

Test point P193 is located to the north-west of the 45 mPD buildings located on the southern side of Zone B-2. Due to its location, the test point is sheltered by the 45 mPD buildings located to its south-east, the 80 mPD, the 100 mPD and 110 mPD buildings located to its south to west, resulting in relatively low overall wind velocity ratios.

Test point P244 is located to the south of the 45 mPD buildings located on the southern side of Zone B-2. The directional wind velocity ratios for the test point indicated that relatively low wind speeds were measured for winds approaching from 0° to 67.5° inclusive. This is attributed to the sheltering effects of the 45 mPD building located to the north-east of the test point location. Relatively low wind speeds were also measured for winds approaching from 135° to 247.5° inclusive due to the sheltering effects of the 110 mPD and 100 mPD buildings located from the south to the west of the test point.

Test point P249 is located on the western side of Zone B-2, approximately to the south of a 13 mPD building with elongated plan-form and approximately to the south-west of three 80 mPD buildings. Those buildings are the likely cause of relatively low directional wind velocity ratios for winds approaching from 0° to 90° inclusive. The group of 110 mPD and 100 mPD buildings to the south and south-west are the likely cause of relatively low directional wind velocity ratios for the south-west quadrant.

In general, pedestrian level wind speeds in Zone B-2 were moderated by the general sheltering effects caused by 120 mPD buildings in the north-east of Zone B-2 and 110 mPD and 100 mPD buildings to the south and west of Zone B-2. Having said that, it is noted that site-level AVA study has been undertaken for the public housing development in Site 1B of Kai Tak Development within Zone B-2. The building layout and design of the public housing development within Zone B-2 have been fine-tuned to enhance the ventilation performance of the development.

5.14 Pedestrian Level Wind Conditions at Zone B-3 of the Kai Tak City Centre at the North Apron

5.14.1 Spatial Average Velocity Ratios (SAVR)

The annual and summer Spatial Average Velocity Ratios (SAVRs) for Zone B-3 of the Kai Tak City Centre at the North Apron are 0.15 and 0.15 respectively, as shown in Table 4.

5.14.2 Overall Wind Velocity Ratio Results

The test point locations, annual and summer overall wind velocity ratios for each individual test point for Zone B-3 of the Kai Tak City Centre at the North Apron are presented graphically in Figures 72 to 74 respectively, and in Table 18. The corresponding directional wind velocity ratios ($VR_{500i,j}$) are also presented in Table 18.

5.14.3 Air Ventilation Conditions at Zone B-3 of the Kai Tak City Centre at the North Apron

The highest annual and summer overall wind velocity ratios in Zone B-3 of the Kai Tak City Centre at the North Apron were measured at test point P232 (0.23 annual / 0.22 summer). Relatively high annual and summer overall wind velocity ratios were also measured at test point P231 (0.21_{annual} / 0.20_{summer}). These test points are located on the approximately 50 m wide, north-east to south-west aligned road towards the south-east of Zone B-3. As indicated by the directional wind velocity ratios for these test points, the prevailing south-easterly to south-westerly winds are able to penetrate to these test point locations.

The lowest annual overall wind velocity ratio in Zone B-3 of the Kai Tak City Centre at the North Apron was measured at test point P247 (0.09 $_{annual}$ / 0.11 $_{summer}$). The lowest summer overall wind velocity ratios were measured at test point P241 (0.10 $_{annual}$ / 0.10 $_{summer}$). Relatively low overall wind velocity ratios were also measured at test points P235 (0.13 $_{annual}$ / 0.13 $_{summer}$) and P243 (0.12 $_{annual}$ / 0.12 $_{summer}$).

Test point P247 is located on the north-western side of Zone B-3. The directional wind velocity ratios of the test point indicated that low wind speeds were measured for winds approaching from 67.5° to 135° inclusive. This is due to the sheltering effects of the 110 mPD buildings and the 13 mPD buildings located to north-east and south-east of the test point, resulting in low overall wind velocity ratios.

Test point P235 is located on the non-building area on the south-eastern side of Zone B-3. The directional wind velocity ratios for test point P235 indicated that relatively low wind speeds were measured for winds approaching from 135° to 180° inclusive and 247.5° to 22.5° inclusive. These conditions are attributed to the sheltering effects caused by the two 30 mPD buildings located to the south-east of test point P235 and the 100 mPD building located to its north-west respectively.

Relatively low overall wind velocity ratios were also measured for test points P241 and P243 that are located on the approximately north-east to south-west aligned road in the centre of Zone B-3. The directional wind velocity ratios of these test points were relatively low for winds approaching from 247.5° to 135° inclusive due to the localised sheltering effects of the nearby 100 mPD and 13 mPD buildings.

Pedestrian level wind conditions at test points towards the south of Zone B-3 demonstrated that the prevailing south-easterly to south-westerly winds are able to penetrate into Zone B-3. However, overall wind velocity ratios at test locations among the 110 mPD and 100 mPD buildings in Zone B-3 were relatively moderate to low due to the sheltering effects of those buildings and the adjacent low-rise buildings.

5.15 Pedestrian Level Wind Conditions at Zone C of the Kai Tak City Centre at the North Apron

5.15.1 Spatial Average Velocity Ratios (SAVR)

The annual and summer Spatial Average Velocity Ratios (SAVRs) for Zone C of the Kai Tak City Centre at the North Apron are 0.18 and 0.19 respectively, as shown in Table 4.

5.15.2 Overall Wind Velocity Ratio Results

The test point locations, annual and summer overall wind velocity ratios for each individual test point at Zone C of the Kai Tak City Centre at the North Apron are presented graphically in Figures 75 to 77 respectively, and in Table 19. The corresponding directional wind velocity ratios ($VR_{500i,j}$) are also presented in Table 19.

5.15.3 Air Ventilation Conditions at Zone C of the Kai Tak City Centre at the North Apron

The highest annual and summer overall wind velocity ratios were measured at test point P208 (0.29 $_{annual}$ / 0.30 $_{summer}$).

Test points P203, P208, P217 and P225 are located along the widest street of Zone C, having a width of approximately 80 m, with the highest overall annual and summer wind velocity ratios measured at P208. Relatively high directional wind velocity ratios were measured at each test point for winds approaching from 90° to 180° inclusive and 247.5° to 315° inclusive, but with the largest directional wind velocity ratios measured at test points P208 and P217. The ensuing variation of overall wind velocity ratios along the street is likely to be caused by the locations of the test points relative to the alternating alignment of the buildings in this area.

The lowest annual overall velocity ratio was measured at P219 (0.11 $_{annual}$ / 0.12 $_{summer}$) and the lowest summer overall velocity ratio was measured at P214 (0.12 $_{annual}$ / 0.11 $_{summer}$).

Test point P214 is located on a south-east to north-west aligned non-building area, close to the north-west boundary of Zone C and in between two buildings that are spaced approximately 25 m apart. Test point P219 is located to the north-west of test point P214, on the north-west boundary of Zone C. Pedestrian level wind conditions at test points P214 and P219 are likely to be dominated by the effects of the buildings adjacent to test point P214.

In general, the "zig-zag" arrangement of proposed buildings along the south-east to north-west aligned non-building areas generally facilitated the penetration of pedestrian level winds into Zone C. Towards the north-western boundary of Zone C, pedestrian level wind conditions were moderated by the larger massing of the nearby proposed buildings.

5.16 Pedestrian Level Wind Conditions at Zone D of the Kai Tak City Centre at the North Apron

5.16.1 Spatial Average Velocity Ratios (SAVR)

The annual and summer Spatial Average Velocity Ratios (SAVRs) for Zone D of the Kai Tak City Centre at the North Apron are 0.16 and 0.17 respectively, as shown in Table 4.

5.16.2 Overall Wind Velocity Ratio Results

The test point locations, annual and summer overall wind velocity ratios for each individual test point for Zone D of the Kai Tak City Centre at the North Apron are presented graphically in Figures 78 to 80 respectively, and in Table 20. The corresponding directional wind velocity ratios ($VR_{500i,j}$) are also presented in Table 20.

5.16.3 Air Ventilation Conditions at Zone D of the Kai Tak City Centre at the North Apron

The highest annual and summer overall wind velocity ratios in Zone D of the Kai Tak City Centre at the North Apron were measured at test point P253 (0.19 $_{annual}$ / 0.20 $_{summer}$). Similar magnitudes of annual or summer overall wind velocity ratios were also measured at test points P251 (0.18 $_{annual}$ / 0.19 $_{summer}$), P252 (0.18 $_{annual}$ / 0.19 $_{summer}$), P255 (0.18 $_{annual}$ / 0.19 $_{summer}$), P257 (0.19 $_{annual}$ / 0.19 $_{summer}$), P258 (0.19 $_{annual}$ / 0.18 $_{summer}$), P263 (0.17 $_{annual}$ / 0.19 $_{summer}$) and P264 (0.16 $_{annual}$ / 0.19 $_{summer}$). The variation in directional wind velocity ratios for these test points demonstrates the localised effects of the adjacent buildings on pedestrian level wind conditions, which have a sheltering effect for some directions and which facilitate general wind penetration for other wind directions.

The lowest annual and summer overall wind velocity ratios in Zone D of the Kai Tak City Centre at the North Apron were measured at test point P260 (0.12 $_{annual}$ / 0.14 $_{summer}$). Relatively low overall wind velocity ratios were also measured at test points P250 (0.14 $_{annual}$ / 0.14 $_{summer}$) and P267 (0.13 $_{annual}$ / 0.14 $_{summer}$).

Test point P260 is located on the junction of the approximately north-east to south-west aligned road and the north-west to south-east aligned non-building area near the centre of Zone D. Relatively low directional wind velocity ratios were measured for winds approaching from 337.5° to 157.5° inclusive. This is attributed to the moderating effects of the relatively closely spaced 13 mPD, 110 mPD and 100 mPD buildings.

Test point P250 is located at the southern end of Zone D with a corresponding ground elevation of 4 mPD. It is also located approximately to the east of the 13 mPD platform of the Sports Hub at North Apron West. The lower ground elevation is likely to moderate winds approaching approximately from the south to the west, as indicated by the relatively low directional wind velocity ratios measured for winds approaching from 202.5° to 22.5°.

Test point P267 is located on the north-western side of Zone D. The directional wind velocity ratios for test point P267 were relatively low for winds from 112.5° to 157.5° inclusive. This is indicative of the general sheltering effects of the buildings located to the south-east of test point P267.

In general, the north-west to south-east aligned non-building areas were not uniformly effective in allowing the penetration of the prevailing south-easterly winds into Zone D. This is attributed to the variable sheltering effects at test points in Zone D caused by the relatively close spacing of the proposed buildings and their variable heights. Nevertheless, pedestrian level wind conditions in Zone D are relatively moderate.

5.17 Pedestrian Level Wind Conditions at other areas of the Kai Tak City Centre at the North Apron

5.17.1 Spatial Average Velocity Ratios (SAVR)

The annual and summer Spatial Average Velocity Ratios (SAVRs) for the other areas of the Kai Tak City Centre at the North Apron are 0.17 and 0.19 respectively, as shown in Table 4.

5.17.2 Overall Wind Velocity Ratio Results

The test point locations, annual and summer overall wind velocity ratios for each individual test point for the other areas of the Kai Tak City Centre at the North Apron are presented graphically in Figures 81 to 83 respectively, and in Table 21. The corresponding directional wind velocity ratios ($VR_{500i,j}$) are also presented in Table 21.

5.17.3 Air Ventilation Conditions at other areas of the Kai Tak City Centre at the North Apron

The highest annual and summer overall wind velocity ratios in the other areas of the Kai Tak City Centre at the North Apron were measured at test points P268 (0.26_{annual} / 0.27_{summer}), and P270 (0.25_{annual} / 0.26_{summer}) respectively. These test points are located in an open area in Sung Wong Toi Park. Due to their locations, relatively high wind speeds were measured for a number of wind directions, and in particular for winds approaching from 112.5° to 180°.

Test points P271, P273, P275 and P278 are located on the north-west to south-east aligned North Apron District Park in Kai Tak City Centre at the North Apron. The directional wind velocity ratios of these test points indicated that relatively high southerly wind speeds were measured at test point P271, which is located midway between Zone B-3 and Zone D. The measured southerly wind speeds decreased at test point P278, which is located further north-west. This is attributed to the moderating effects of the structures along both sides of the North Apron District Park.

Test points P215, P272, P273, P280 and P282 are located on the northern side of the north-east to south-west aligned Station Square. The directional wind velocity ratios of these test points indicated that relatively high wind speeds were generally measured for south-westerly directions. This is attributed to the relatively open exposure for those directions and the capacity of Station Square to act as a path for wind penetration into this area.

5.18 Pedestrian Level Wind Conditions for the Assessment Area

5.18.1 Cha Kwo Ling

Cha Kwo Ling is located to the east of the Kai Tak Project Area, with relatively open exposures to winds from the south-east to the south-west inclusive. Overall wind velocity ratios in the Cha Kwo Ling Assessment Area are relatively moderate to low.

The group of buildings that make up the residential estate of Laguna City have a dominant effect on the local wind conditions. A number of test points have relatively open exposures

to winds from the south-east to the south-west, as evidenced by the relatively high directional wind velocity ratios for those directions. Those test points are typically located in the more open areas of the Laguna City estate and include test point P285, A288 and A421. As expected for a development with closely spaced tall buildings of uniform height, pedestrian level wind conditions vary from significantly sheltered to experiencing accelerated wind flow, depending on wind direction and location relative to the buildings. However, the nearby areas of the proposed Kai Tak Development do not have a significant effect on pedestrian level wind conditions in the Cha Kwo Ling Assessment Area.

5.18.2 Kwun Tong and Ngau Tau Kok

Kwun Tong and the adjacent Ngau Tau Kok region are located to the east of the proposed Kai Tak Development, extending from a nullah at its southern end to an area adjacent to the South Apron Corner of the Kai Tak Development. The directional wind velocity ratios measured for south to south-westerly winds at test points adjacent to the Project Area, such as A293, A301 and A303, are relatively high, indicating the availability of winds from those directions in waterfront areas. Towards the southern end of the Kwun Tong Assessment Area, buildings on King Yip Street, Kwun Tong Road, Hung To Road and Tsun Yip Street are predominantly industrial buildings with uniform heights of approximately 50 mPD that have extensive ground coverage and low permeability. Those industrial buildings created regions of low wind flow in this area, evidenced by the low directional wind velocity ratios and overall wind velocity ratios for test points such as A304 and A305.

Similar pedestrian level wind conditions were measured at other test points in the Kwun Tong and Ngau Tau Kok Assessment Area due to the ground coverage and uniform heights of buildings in the area. The presence of an occasional taller building in the area created localised regions of enhanced pedestrian level wind flow for some wind directions, as measured at test point A432 for example.

The proposed Kai Tak Development did not have a significant impact on pedestrian level wind conditions in the Kwun Tong and Ngau Tau Kok Assessment Area.

5.18.3 Kowloon Bay

Kowloon Bay is located to the north-east of the North Apron East of the proposed Kai Tak Development, adjacent to the South Apron Corner and North Apron East. Buildings in the Kowloon Bay Assessment Area mainly comprise a mixture of industrial and commercial buildings with rectangular plan-forms and heights ranging from approximately 30 – 50 mPD.

In general, the wider streets in the north-south and east-west oriented grid pattern in the Kowloon Bay Assessment Area facilitate the penetration of north to north-easterly and south to south-westerly winds into the area. Further north in the Kowloon Bay Assessment Area, the Richland Gardens residential estate created localised areas of reduced wind flow. In general, the measured directional wind velocity ratios indicated that the proposed Kai Tak Development did not have a significant impact on pedestrian level wind conditions in the Kowloon Bay Assessment Area.

5.18.4 Ngau Chi Wan and Choi Hung

Ngau Chi Wan and Choi Hung are located to the north of Kowloon Bay and to the east of the North Apron of the Kai Tak Development. Directional wind velocity ratios measured at test points A469, A349, A350, A351 and A352 indicate that they are significantly sheltered by the elongated rectangular plan-form buildings in Choi Hung Estate. However, it is likely that the existing Richland Gardens Estate and the proposed developments in Zone B in the North Apron will also cause some disruption to winds approaching Choi Hung from the south-west quadrant, yet south-westerly wind is not a predominant wind in the area.

5.18.5 San Po Kong

San Po Kong is located to the north of the North Apron of the Kai Tak Development and to the north-west of the urban areas of Kowloon Bay and Kwun Tong. The San Po Kong Assessment Area includes open spaces to the east and west of the Rhythm Garden Estate and the Kai Tak East Playground. In contrast, a number of streets in the area, such as Ng Fong Street, Luk Hop Street and Pat Tat Street are relatively narrow and lined with closed spaced buildings.

It is evident from the directional wind velocity ratios for test points A353 and A354 that north-easterly winds and south-east to south winds are able to penetrate into the hinterland. It is likely that penetration of south-east to south winds is made possible via the relatively open areas associated with the Kwun Tong Bypass and Kwun Tong Road.

Pedestrian level wind conditions in narrow streets such as Ng Fong Street, Luk Hop Street and Pat Tat Street were relatively weak, as evidenced by the low overall wind velocity ratios measured at test points A470 to A478 inclusive. These conditions are mainly attributed to the local existing urban condition, with narrow streets and closely spaced buildings reducing pedestrian level wind speeds. This is further evidenced by relatively high directional wind velocity ratios measured for winds from the east to the west inclusive at test point A361, which is located in a relatively open location on Prince Edward Road East.

5.18.6 Wang Tau Hom

The Wang Tau Hom Assessment Area includes Tung Tau Estate, which is located to the north of the North Apron of the proposed Kai Tak Development, and Kowloon City, which is located to the south-west of Tung Tau Estate and to the north-west of the North Apron.

Buildings in Tung Tau Estate have heights ranging approximately 50 – 80 mPD. In general, these buildings are taller than other buildings located to the south of the estate and adjacent to the existing project site of the proposed Kai Tak Development. Test points A368, A370 and A372, located on Lok Sin Road to the south of Tung Tau Estate, were able to gain some benefit from south-easterly and westerly winds, although their overall wind velocity ratios were relatively moderate. Inside Tung Tau Estate, overall wind velocity ratios were also moderate at test points A479, A480 and A481, although directional wind velocity ratios measured at these test points for the south-west quadrant indicated that south-westerly breezes are likely to penetrate into this area via the Kowloon Walled City Park, which will be of particular benefit during the summer months.

Although the proposed Kai Tak Development may have some moderating effects on pedestrian level wind speeds in Tung Tau Estate, the buildings within Tung Tau Estate are likely to be the dominant influence on the local pedestrian level wind conditions.

The majority of streets in the Kowloon City Assessment Area are arranged in a grid-like pattern that is aligned north-south and east-west. A comparison between overall wind velocity ratios in Zone C of the North Apron and test points A375 to A386 inclusive in Kowloon City demonstrates that the magnitudes are comparable, but that pedestrian level winds are likely to be slightly moderated by the buildings in Kowloon City. Directional velocity ratios for 135° to 225° inclusive indicate that winds from those directions are likely to be able to penetrate through the proposed Kai Tak Development. However, the buildings in Kowloon City are likely to rapidly diminish the strength of those winds, resulting in reduced pedestrian level wind speeds in areas further to the north and the west of the proposed Kai Tak Development, as evidenced by the overall wind velocity ratios measured for test points A484 to A488 inclusive.

5.18.7 To Kwa Wan and Ma Tau Kok

To Kwa Wan and Ma Tau Kok are located to the west of the Kai Tak Development site. Due to their extensive water frontage, both areas have relatively open exposures to winds from the east to south-east. As a result, the directional wind velocity ratios of test points

A401, A402, A404, A407, A414 and 415 measured for east to south-east directions were relatively high, resulting in relatively high overall wind velocity ratios.

Relatively high overall wind velocity ratios were also measured at a number of test points which are attributed to the accelerating effects of tall buildings. These test points include: A391, A392, A393 and A395 located in close proximity to the Sky Tower; and A409 and A410 located to the north-west of a 115 mPD building.

Relatively low overall wind velocity ratios were measured at test points that are located further inland of the To Kwa Wan and Ma Tau Kok Assessment Areas. These conditions are attributed to the moderating effects of buildings in the To Kwa Wan and Ma Tau Kok Assessment Areas. The narrow streets in the To Kwa Wan and Ma Tau Kok Assessment Areas may also impede winds approaching from the waterfront.

5.19 Mean Wind Speed Results

The annual and summer mean wind speed results for each individual test point corresponding to a probability of exceedance of 50% are presented in Appendix B.

5.20 Further Recommendations on Building Setback

Taking into account development theme of sub-planning area and site characteristics, further building set-backs are proposed within the special design areas (i.e. Grid Neighbourhood and Runway Precinct) and along principal corridors/vistas (i.e. Kai Tak River and Runway Boulevard) subsequent to the detailed wind tunnel tests of this air ventilation study. These building setbacks have been incorporated into the latest Recommended Outline Development Plan (Version E) of Kai Tak Development.

The incorporated building set-back requirements are shown in Figures 84 and 85 and are summarised below:

- 3m setback from pedestrian street within development clusters unless otherwise specified;
- 5m setback along pedestrian street within Runway Precinct for wider separation between development sites due to long site frontage;
- 5m setback from the major urban design axis such as Kai Tak River and Runway Boulevard;
- 20m setback within each residential site in Grid Neighbourhood providing a continuous and uniform view corridor; and
- 42m setback within Tourism Node from the Cruise Terminal site to create a continued vista extended from Runway Boulevard to Runway Park. Of which, a strip of land with 6m in width along the southern edge of Site 4D2 is reserved for the emergency vehicular access to serve the Cruise Terminal.

The incorporated building setbacks would further improve the performance of the planned air paths within Kai Tak Development namely the one along Kai Tak River and Runway Boulevard. Besides, the setbacks in Grid Neighbourhood would enhance the penetration of winds across Kai Tak City Centre at the North Apron, and thus would help to improve the lower wind velocity ratios predicted at Zones B-1, B-2, B-3 and D discussed above.

6 CONCLUSIONS

A detailed air ventilation study was conducted by the CLP Power Wind/Wave Tunnel Facility (WWTF) at The Hong Kong University of Science and Technology (HKUST) as part of an air ventilation study under Agreement No. CE 35/2006(CE) Kai Tak Development Engineering Study cum Design and Construction of Advance Works – Investigation, Design and Construction.

The detailed air ventilation study was conducted in WWTF's low speed test section using two 1:800 scale models to cover the extent of the proposed Kai Tak Development. Wind speed measurements were taken using a multi-channel thermal anemometer at a total of 511 measurement locations for 16 wind directions ranging from 0º (north) to 337.5º at increments of 22.5º. Directional, annual and summer overall wind velocity ratios were determined by combining analytically the wind speed measurements and statistical models of the annual and summer non-typhoon wind climate at Kai Tak, that are based on measurements of non-typhoon winds taken by Hong Kong Observatory (HKO) above the roof of the former Kai Tak Airport Fire Station during the period of 1998 – 2009 inclusive.

The statistical model of non-typhoon wind climate developed for Kai Tak indicates that, at an elevation of 16 m above mean sea level, the annual prevailing non-typhoon winds at Kai Tak are mainly from the south-east quadrant. During the summer months, the prevailing non-typhoon winds at Kai Tak are mainly from the south-east and south-west quadrants.

The model of the Kai Tak Development Project Area was fabricated in accordance with the Recommended Outline Development Plan of Kai Tak Development. The building layouts for the individual lots within the Kai Tak Development Project Area and the Assessment Area were based on the latest information available at the time of model fabrication. For the public housing developments in Site 1A and Site 1B of Kai Tak Development, it is noted that the building layout and design have been fine-tuned to enhance the ventilation performance of the development.

For the Kai Tak Development, an AVA study had previously been conducted under the *South East Kowloon Development Comprehensive Planning and Engineering – Stage 1 Planning Review*. A number of air ventilation improvement measures have then been incorporated into the Recommended Outline Development Plan. These improvement measures include the incorporation of major wind corridors along the prevailing wind direction across the entire development; avoids massive railway depot building fronting Prince Edward Road East to minimise blockage of wind flow to hinterland area; podium-free design to improve wind penetration; and grid neighbourhood design in south-eastern part of North Apron area with grid lots aligned to the prevailing wind direction to promote wind penetration. This detailed air ventilation study serves as a district-level detailed air ventilation study to examine the performance of these improvement measures as well as to identify any local level effects.

For South Apron Corner, pedestrian level mean wind speeds measured at test points located close to the waterfront areas of South Apron Corner displayed similar directional trends, with more open exposures to winds from the south-east to the south-west. The magnitudes of overall wind velocity ratios were generally lower at test points located close to the centre of South Apron Corner due to the presence of a bridge spanning the main road. However, the alignment of the main road was generally effective in conveying south-easterly winds into the South Apron Corner. Pedestrian level wind speeds were generally lowest at test points in relatively close proximity to the Kwun Tong Bypass.

For North Apron East, the most favourable pedestrian level wind conditions were measured in the northern parts of the North Apron East where the overall building density is relatively low and locations close to the waterfront are able to benefit from winds from the south-east to south-west. Test points that were located further inland away from the waterfront experienced overall lower pedestrian level wind speeds, with some localised sheltering effects from nearby buildings and flyovers.

At Tourism and Leisure Hub at Runway South, pedestrian level wind speeds were relatively high due to its exposed location at the south-eastern end of the proposed development site. Some test points experienced localised sheltering effects for some wind directions. Nevertheless, Tourism and Leisure Hub at Runway South is evidently well placed to benefit from the prevailing south-east to south winds and south-west winds.

Test point locations along the south-western edge of the Middle Runway were relatively exposed to winds ranging from the south-east to the west, with localised sheltering at some test point locations for north-east winds in particular caused by adjacent proposed buildings. Overall wind velocity ratios at test points along the south-west to north-east aligned main road of the Middle Runway were around 20% lower overall than those at tests points on the south-western edge of the Middle Runway. Similarly, the more open exposure of test points along the north-eastern edge of the Middle Runway to winds from the east to the south-east allowed higher pedestrian level wind speeds at those test points for those directions.

Pedestrian level wind speeds in the southern parts of the Sports Hub at North Apron West were relatively high due to the better exposure of test points in those areas to the prevailing winds and the enhancement of those winds by the proposed stadium for some wind directions at some test point locations. Towards the northern part of Sports Hub at North Apron West, pedestrian level wind speeds were reduced due to the denser building developments and lower ground elevations.

Test point locations towards the northern end of To Kwa Wan have higher pedestrian level wind speeds due to the lower density of buildings in that area. Those wind speeds were significantly increased at two test point locations due to the accelerating effects of buildings in the Grand Waterfront and adjacent proposed buildings. In the southern part of To Kwa Wan, pedestrian level wind conditions are moderated by the density of the adjacent existing building groups.

The relatively low development density in Zone A-1 of the Kai Tak City Centre at the North Apron generally facilitates the penetration of the prevailing winds into this area. The inclusion of buildings with various heights and shapes creates localised sheltered regions for some wind directions on their leeward sides while enhancing pedestrian level wind speeds at other locations.

In Zone A-2, the four 100 mPD buildings with elongated plan-forms had a significant influence on the local pedestrian level wind conditions in the area. Accelerated wind flow at one test point location is attributable to the influence of those buildings. However, a number of test points located to the north of those buildings experienced reduced pedestrian level wind speeds for a range of wind directions.

Pedestrian level wind speeds in Zone B-1 are moderated by the extent and massing of buildings ranging from the south-east to the south-west of the area. Pedestrian level wind speeds in Zone B-2 were moderated by the general sheltering effects caused by 120 mPD buildings in the north-east of Zone B-2 and 110 mPD and 100 mPD buildings to the south and west of Zone B-2. It is noted that site-level AVA studies are being undertaking for the public housing developments in Site 1A and Site 1B of Kai Tak Development within Zone B-1 and Zone B-2. The building layout and design of the public housing development have been fine-tuned to enhance the ventilation performance of the development.

Pedestrian level wind conditions at test points towards the south of Zone B-3 demonstrated the prevailing south-easterly to south-westerly winds are able to penetrate into Zone B-3. However, overall wind velocity ratios at test locations among the 110 mPD and 100 mPD buildings in Zone B-3 were relatively moderate to low due to the sheltering effects of those buildings and the adjacent low-rise buildings. A 3m setback from pedestrian street within Zone B-3 is proposed subsequent to the detailed wind tunnel tests and has already been incorporated into the latest Recommended Outline Development Plan of Kai Tak Development. This building setback would increase the width of the north-west corridors

across Zone B-3 and hence enhance the penetration of pedestrian winds into Zone B-3 and other areas immediate to its north-west.

The “zig-zag” arrangement of proposed buildings along the south-east to north-west aligned non-building areas generally facilitated the penetration of pedestrian level winds into Zone C. Towards the north-western boundary of Zone C, pedestrian level wind conditions were moderated by the larger massing of the nearby proposed buildings.

For Zone D of the Kai Tak City Centre at the North Apron, the effectiveness of the north-west to south-east aligned non-building areas was variable. This is attributed to the variable sheltering effects at test points in Zone D caused by the relatively close spacing of the proposed buildings and their variable heights. Nevertheless, pedestrian level wind conditions in Zone D are relatively moderate. A 3m setback from pedestrian street within Zone D is proposed subsequent to the detailed wind tunnel tests and has already been incorporated into the latest Recommended Outline Development Plan of Kai Tak Development. This building setback would increase the width of the north-west corridors across Zone D and hence enhance the penetration of pedestrian winds into Zone D and other areas immediate to its north-west.

For other area in Kai Tak City Centre, prevailing winds were also able to penetrate into the Kai Tak City Centre at the North Apron, through the north-west to south-east aligned North Apron District Park and Station Square. However, the strength of the pedestrian level wind speeds is likely to be moderated at locations in closer proximity to the more heavily developed areas.

For the hinterland area, pedestrian level wind conditions varied significantly. In the majority of the hinterland areas, such as Cha Kwo Ling, Kwun Tong and Ngau Tau Kok, Kowloon Bay, San Po Kong and To Kwa Wan and Ma Tau Kok, pedestrian level wind conditions are likely to be largely governed by the existing configurations of buildings and streets. The proposed Kai Tak Development may have some moderating effect on winds approaching in Tung Tau Estate and Kowloon City, however wind conditions inside those areas were dominated by the existing buildings and streets. Pedestrian level wind conditions in Ngau Chi Wan and Choi Hung, located to the north-east of the proposed Kai Tak Development, are likely to be significantly sheltered by the elongated rectangular plan-form buildings in Choi Hung Estate under most prevailing wind directions.

In accordance with the findings of this detailed air ventilation study, the measured overall wind velocity ratios within Kai Tak Development are in general relatively higher than those measured in the surrounding hinterland area. The hinterland area is likely to be governed by the existing configuration of streets and buildings. Thus, the Kai Tak Development is not expected to have significant overall (i.e. district level) adverse effects on air ventilation conditions inside Kai Tak Development and the surrounding hinterland area.

Besides, taking into account development theme of sub-planning area and site characteristics, further building set-backs are proposed within the special design areas (i.e. Grid Neighbourhood and Runway Precinct) and along principal corridors/vistas (i.e. Kai Tak River and Runway Boulevard). The proposed building setbacks would further improve the performance of the planned air paths within Kai Tak Development and enhance the penetration of winds across Kai Tak City Centre at the North Apron.

7 REFERENCES

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Table 1: Directional approach wind conditions

Study Area A				Study Area B			
Wind Direction (°)	Approach Condition	Wind Direction (°)	Approach Condition	Wind Direction (°)	Approach Condition	Wind Direction (°)	Approach Condition
0	B	180	C	0	C	180	B
22.5	C	202.5	C	22.5	C	202.5	C
45	C	225	B	45	C	225	A
67.5	A	247.5	B	67.5	A	247.5	A
90	C	270	B	90	A	270	A
112.5	B	292.5	A	112.5	B	292.5	B
135	B	315	B	135	B	315	B
157.5	B	337.5	B	157.5	B	337.5	C

Table 2: Wind speed scaling factors

Study Area A				Study Area B			
Wind Direction (°)	Wind Speed Scaling Factor	Wind Direction (°)	Wind Speed Scaling Factor	Wind Direction (°)	Wind Speed Scaling Factor	Wind Direction (°)	Wind Speed Scaling Factor
0	0.76	180	0.65	0	0.63	180	0.72
22.5	0.48	202.5	0.53	22.5	0.68	202.5	0.51
45	0.57	225	0.85	45	0.68	225	0.75
67.5	0.61	247.5	0.75	67.5	0.69	247.5	0.73
90	0.50	270	0.62	90	0.77	270	0.78
112.5	0.73	292.5	0.75	112.5	0.69	292.5	0.71
135	0.98	315	0.85	135	0.88	315	0.84
157.5	0.85	337.5	0.86	157.5	0.86	337.5	0.48

Table 3: Probability of occurrence of directional winds for the proposed Kai Tak Development

Study Area A						Study Area B					
Wind Direction (°)	Annual Probability	Summer Probability	Wind Direction (°)	Annual Probability	Summer Probability	Wind Direction (°)	Annual Probability	Summer Probability	Wind Direction (°)	Annual Probability	Summer Probability
0	3.5%	0.8%	180	3.0%	6.9%	0	3.5%	0.8%	180	3.0%	6.9%
22.5	2.4%	0.3%	202.5	2.8%	7.6%	22.5	2.4%	0.3%	202.5	2.8%	7.6%
45	5.0%	0.6%	225	3.2%	7.2%	45	5.0%	0.6%	225	3.2%	7.2%
67.5	3.5%	0.8%	247.5	4.6%	12.7%	67.5	3.5%	0.8%	247.5	4.6%	12.7%
90	17.5%	8.3%	270	3.4%	8.4%	90	17.5%	8.3%	270	3.4%	8.4%
112.5	19.2%	11.4%	292.5	2.3%	4.0%	112.5	19.2%	11.4%	292.5	2.3%	4.0%
135	13.9%	19.0%	315	2.8%	1.7%	135	13.9%	19.0%	315	2.8%	1.7%
157.5	9.6%	8.9%	337.5	3.4%	1.4%	157.5	9.6%	8.9%	337.5	3.4%	1.4%

Table 4: Spatial Average Velocity Ratios (SAVRs) for the proposed Kai Tak Development

Zone	Annual SAVR	Summer SAVR	Zone	Annual SAVR	Summer SAVR
Cha Kwo Ling Waterfront	0.14	0.17	Zone C of the Kai Tak City Centre at the North Apron	0.18	0.19
Kwun Tong Waterfront	0.11	0.12	Zone A-1 of the Kai Tak City Centre at the North Apron	0.17	0.18
South Apron Corner	0.17	0.19	Zone A-2 of the Kai Tak City Centre at the North Apron	0.16	0.16
North Apron East	0.17	0.18	Zone B-1 of the Kai Tak City Centre at the North Apron	0.16	0.15
Tourism and Leisure Hub at Runway South	0.21	0.23	Zone B-2 of the Kai Tak City Centre at the North Apron	0.15	0.15
Runway Precinct at Middle Runway	0.19	0.21	Zone B-3 of the Kai Tak City Centre at the North Apron	0.15	0.15
Metro Park at Runway North	0.23	0.24	Zone D of the Kai Tak City Centre at the North Apron	0.16	0.17
Sport Hub at North Apron West	0.19	0.20	The Other Areas of the Kai Tak City Centre at the North Apron	0.17	0.19
To Kwa Wan Waterfront	0.23	0.22	Average of all Zones	0.17	0.18

Table 5: Directional, annual and summer overall wind velocity ratios measured at Cha Kwo Ling Waterfront

		Directional Wind Velocity Ratio ($VR_{500,i,j}$)																Annual Overall Wind Velocity Ratios	Summer Overall Wind Velocity Ratios
Test Point		0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5	Total	Total
P	001	0.09	0.07	0.09	0.08	0.11	0.16	0.33	0.26	0.19	0.14	0.17	0.18	0.13	0.19	0.12	0.11	0.17	0.20
P	002	0.07	0.08	0.10	0.09	0.13	0.14	0.23	0.15	0.15	0.16	0.30	0.25	0.13	0.12	0.11	0.09	0.15	0.18
P	003	0.07	0.07	0.10	0.07	0.09	0.13	0.21	0.14	0.16	0.15	0.26	0.23	0.09	0.11	0.10	0.09	0.14	0.16
P	004	0.13	0.10	0.15	0.11	0.08	0.09	0.20	0.10	0.11	0.13	0.20	0.13	0.11	0.15	0.08	0.09	0.12	0.13

Table 6: Directional, annual and summer overall wind velocity ratios measured at Kwun Tong Waterfront

		Directional Wind Velocity Ratio ($VR_{500,i,j}$)																Annual Overall Wind Velocity Ratios	Summer Overall Wind Velocity Ratios
Test Point		0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5	Total	Total
P	005	0.06	0.05	0.06	0.06	0.07	0.08	0.12	0.18	0.18	0.15	0.21	0.12	0.06	0.08	0.07	0.07	0.10	0.12
P	006	0.08	0.07	0.08	0.07	0.07	0.07	0.09	0.07	0.10	0.09	0.14	0.15	0.09	0.11	0.10	0.12	0.09	0.10
P	007	0.06	0.07	0.06	0.05	0.08	0.09	0.09	0.09	0.12	0.10	0.12	0.09	0.09	0.11	0.07	0.08	0.09	0.09
P	008	0.08	0.07	0.08	0.07	0.08	0.10	0.10	0.12	0.23	0.18	0.22	0.15	0.12	0.09	0.07	0.09	0.11	0.13
P	009	0.22	0.14	0.15	0.11	0.13	0.16	0.20	0.20	0.22	0.17	0.21	0.18	0.11	0.26	0.20	0.23	0.17	0.18

Table 7: Directional, annual and summer overall wind velocity ratios measured at South Apron Corner

		Directional Wind Velocity Ratio ($VR_{500,i,j}$)																Annual Overall Wind Velocity Ratios	Summer Overall Wind Velocity Ratios
Test Point		0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5	Total	Total
P	010	0.18	0.15	0.12	0.09	0.11	0.15	0.24	0.26	0.20	0.16	0.12	0.12	0.06	0.13	0.15	0.14	0.16	0.16
P	011	0.10	0.08	0.08	0.09	0.12	0.18	0.25	0.26	0.23	0.19	0.18	0.24	0.19	0.20	0.16	0.07	0.17	0.20
P	012	0.11	0.09	0.11	0.12	0.16	0.25	0.30	0.23	0.15	0.10	0.11	0.13	0.12	0.12	0.12	0.13	0.19	0.18
P	013	0.16	0.13	0.14	0.10	0.09	0.12	0.19	0.19	0.13	0.10	0.13	0.17	0.16	0.18	0.17	0.19	0.14	0.15
P	014	0.22	0.17	0.14	0.09	0.08	0.20	0.37	0.39	0.25	0.23	0.26	0.25	0.19	0.26	0.23	0.23	0.23	0.26
P	015	0.19	0.20	0.18	0.15	0.17	0.21	0.22	0.31	0.30	0.23	0.30	0.28	0.18	0.17	0.16	0.15	0.21	0.23
P	016	0.14	0.10	0.09	0.08	0.15	0.33	0.49	0.40	0.26	0.18	0.25	0.33	0.21	0.21	0.18	0.15	0.27	0.30
P	017	0.22	0.11	0.10	0.08	0.06	0.06	0.13	0.37	0.32	0.18	0.19	0.17	0.18	0.25	0.26	0.23	0.15	0.18
P	018	0.19	0.17	0.17	0.15	0.11	0.12	0.22	0.19	0.13	0.09	0.11	0.22	0.18	0.19	0.17	0.16	0.16	0.17
P	019	0.18	0.21	0.16	0.13	0.09	0.06	0.16	0.21	0.26	0.23	0.24	0.29	0.29	0.33	0.29	0.20	0.16	0.20
P	020	0.19	0.17	0.14	0.12	0.10	0.09	0.13	0.19	0.26	0.22	0.29	0.23	0.20	0.32	0.33	0.19	0.16	0.19
P	021	0.16	0.13	0.10	0.06	0.09	0.18	0.19	0.12	0.14	0.12	0.17	0.27	0.19	0.13	0.16	0.13	0.15	0.17
P	022	0.16	0.16	0.13	0.11	0.10	0.11	0.28	0.40	0.33	0.23	0.21	0.20	0.17	0.30	0.34	0.17	0.20	0.23
P	023	0.16	0.15	0.16	0.12	0.11	0.09	0.18	0.12	0.14	0.10	0.10	0.07	0.11	0.16	0.25	0.12	0.13	0.12
P	024	0.16	0.14	0.15	0.11	0.12	0.10	0.13	0.20	0.28	0.17	0.25	0.10	0.11	0.14	0.16	0.12	0.14	0.15
P	025	0.23	0.16	0.17	0.12	0.10	0.17	0.43	0.56	0.53	0.43	0.33	0.15	0.16	0.34	0.32	0.28	0.27	0.31
P	026	0.09	0.08	0.10	0.06	0.06	0.07	0.09	0.09	0.11	0.09	0.09	0.08	0.10	0.08	0.11	0.07	0.08	0.09
P	027	0.09	0.06	0.07	0.05	0.06	0.10	0.20	0.30	0.28	0.22	0.21	0.25	0.22	0.20	0.20	0.16	0.15	0.20
P	028	0.26	0.18	0.20	0.15	0.13	0.09	0.12	0.17	0.17	0.16	0.18	0.23	0.16	0.22	0.25	0.17	0.15	0.16
P	029	0.16	0.11	0.11	0.08	0.09	0.07	0.10	0.12	0.19	0.24	0.15	0.15	0.13	0.20	0.20	0.15	0.11	0.13
P	030	0.24	0.10	0.12	0.10	0.10	0.08	0.09	0.12	0.18	0.16	0.21	0.20	0.18	0.16	0.18	0.16	0.12	0.14
P	031	0.14	0.07	0.08	0.07	0.07	0.08	0.16	0.28	0.23	0.17	0.25	0.24	0.17	0.17	0.20	0.12	0.14	0.18
P	032	0.19	0.22	0.21	0.17	0.21	0.11	0.09	0.14	0.15	0.10	0.21	0.25	0.20	0.12	0.13	0.10	0.15	0.15
P	033	0.14	0.14	0.13	0.11	0.27	0.16	0.27	0.24	0.25	0.15	0.18	0.17	0.18	0.20	0.18	0.12	0.20	0.21
P	034	0.33	0.14	0.10	0.06	0.07	0.10	0.18	0.31	0.29	0.20	0.37	0.29	0.16	0.14	0.19	0.23	0.17	0.21
P	035	0.16	0.27	0.23	0.14	0.25	0.23	0.24	0.23	0.20	0.10	0.21	0.25	0.23	0.14	0.18	0.11	0.22	0.22
P	036	0.22	0.30	0.19	0.11	0.14	0.20	0.30	0.37	0.37	0.19	0.27	0.22	0.18	0.19	0.23	0.15	0.22	0.24

Table 7 (cont.): Directional, annual and summer overall wind velocity ratios measured at South Apron Corner

		Directional Wind Velocity Ratio ($VR_{500,i,j}$)																Annual Overall Wind Velocity Ratios	Summer Overall Wind Velocity Ratios
Test Point		0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5	Total	Total
P	037	0.15	0.18	0.22	0.16	0.16	0.16	0.29	0.33	0.33	0.17	0.28	0.25	0.23	0.15	0.18	0.12	0.21	0.24

Table 8: Directional, annual and summer overall wind velocity ratios measured at North Apron East

		Directional Wind Velocity Ratio ($VR_{500,i,j}$)																Annual Overall Wind Velocity Ratios	Summer Overall Wind Velocity Ratios
Test Point		0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5	Total	Total
P	037	0.15	0.18	0.22	0.16	0.16	0.16	0.29	0.33	0.33	0.17	0.28	0.25	0.23	0.15	0.18	0.12	0.21	0.24
P	038	0.14	0.15	0.14	0.09	0.12	0.18	0.21	0.28	0.25	0.13	0.15	0.19	0.24	0.15	0.19	0.12	0.18	0.19
P	039	0.11	0.16	0.12	0.14	0.11	0.11	0.25	0.27	0.23	0.13	0.17	0.18	0.16	0.10	0.14	0.08	0.16	0.18
P	040	0.09	0.17	0.24	0.28	0.28	0.22	0.23	0.33	0.24	0.09	0.14	0.22	0.30	0.11	0.23	0.09	0.23	0.22
P	041	0.13	0.18	0.18	0.14	0.19	0.20	0.21	0.29	0.25	0.15	0.16	0.21	0.24	0.15	0.18	0.11	0.20	0.21
P	042	0.18	0.24	0.23	0.16	0.15	0.11	0.14	0.20	0.19	0.26	0.29	0.24	0.21	0.14	0.13	0.11	0.16	0.18
P	043	0.12	0.15	0.18	0.12	0.14	0.13	0.32	0.37	0.24	0.18	0.22	0.22	0.24	0.14	0.19	0.12	0.20	0.23
P	044	0.12	0.14	0.16	0.13	0.12	0.11	0.15	0.16	0.11	0.14	0.15	0.15	0.18	0.12	0.15	0.10	0.13	0.14
P	045	0.07	0.12	0.14	0.10	0.14	0.14	0.08	0.10	0.08	0.07	0.10	0.08	0.09	0.06	0.07	0.05	0.11	0.10
P	046	0.19	0.26	0.26	0.16	0.11	0.08	0.26	0.35	0.28	0.26	0.30	0.19	0.17	0.13	0.16	0.12	0.19	0.21
P	047	0.08	0.10	0.11	0.09	0.11	0.06	0.15	0.16	0.12	0.09	0.10	0.10	0.10	0.08	0.10	0.06	0.10	0.11
P	048	0.09	0.15	0.17	0.14	0.13	0.07	0.09	0.11	0.13	0.23	0.27	0.21	0.20	0.08	0.07	0.06	0.12	0.14
P	049	0.14	0.16	0.16	0.13	0.15	0.09	0.20	0.21	0.14	0.13	0.19	0.24	0.26	0.13	0.14	0.11	0.16	0.18
P	050	0.11	0.11	0.10	0.08	0.12	0.16	0.14	0.21	0.17	0.18	0.20	0.14	0.11	0.11	0.12	0.08	0.14	0.15
P	051	0.15	0.13	0.14	0.10	0.14	0.09	0.17	0.24	0.19	0.19	0.21	0.16	0.14	0.12	0.16	0.11	0.15	0.16
P	052	0.13	0.14	0.16	0.12	0.12	0.10	0.13	0.23	0.13	0.11	0.11	0.11	0.12	0.12	0.10	0.08	0.13	0.13
P	053	0.12	0.16	0.16	0.15	0.14	0.13	0.13	0.18	0.10	0.11	0.16	0.17	0.16	0.14	0.16	0.08	0.14	0.14
P	054	0.20	0.22	0.27	0.19	0.16	0.11	0.19	0.16	0.19	0.18	0.24	0.21	0.12	0.10	0.12	0.13	0.17	0.17

Table 8 (cont.): Directional, annual and summer overall wind velocity ratios measured at North Apron East

		Directional Wind Velocity Ratio ($VR_{500,i,j}$)																Annual Overall Wind Velocity Ratios	Summer Overall Wind Velocity Ratios
Test Point		0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5	Total	Total
P	055	0.10	0.09	0.10	0.08	0.12	0.09	0.11	0.24	0.21	0.24	0.25	0.21	0.14	0.24	0.25	0.12	0.14	0.17
P	056	0.18	0.18	0.20	0.13	0.14	0.16	0.23	0.30	0.20	0.17	0.16	0.15	0.14	0.13	0.16	0.12	0.18	0.18
P	057	0.18	0.19	0.25	0.18	0.23	0.18	0.36	0.34	0.23	0.27	0.32	0.28	0.29	0.16	0.22	0.13	0.25	0.28
P	058	0.12	0.12	0.15	0.10	0.14	0.12	0.18	0.17	0.15	0.14	0.16	0.12	0.12	0.10	0.16	0.08	0.14	0.14
P	059	0.15	0.17	0.25	0.19	0.22	0.17	0.25	0.12	0.13	0.17	0.21	0.16	0.13	0.15	0.12	0.11	0.18	0.18
P	060	0.18	0.18	0.18	0.15	0.17	0.13	0.08	0.12	0.15	0.16	0.27	0.26	0.17	0.20	0.22	0.11	0.15	0.16
P	182	0.16	0.18	0.22	0.19	0.21	0.21	0.17	0.11	0.21	0.22	0.23	0.18	0.15	0.13	0.13	0.11	0.18	0.18
P	183	0.16	0.22	0.27	0.23	0.27	0.25	0.19	0.15	0.27	0.25	0.29	0.20	0.16	0.17	0.17	0.11	0.22	0.21
P	184	0.20	0.20	0.21	0.20	0.19	0.20	0.14	0.11	0.17	0.19	0.18	0.10	0.09	0.08	0.11	0.14	0.16	0.15
P	231	0.17	0.22	0.27	0.24	0.26	0.22	0.14	0.23	0.19	0.23	0.27	0.21	0.14	0.13	0.16	0.13	0.21	0.20
P	232	0.17	0.24	0.31	0.27	0.26	0.22	0.19	0.28	0.24	0.21	0.27	0.23	0.15	0.19	0.19	0.10	0.23	0.22
P	250	0.10	0.10	0.14	0.17	0.16	0.15	0.17	0.12	0.17	0.13	0.14	0.12	0.13	0.09	0.16	0.08	0.14	0.14
P	251	0.11	0.12	0.20	0.20	0.18	0.17	0.20	0.21	0.14	0.17	0.26	0.22	0.16	0.15	0.10	0.08	0.18	0.19

Table 9: Directional, annual and summer overall wind velocity ratios measured at Tourism and Leisure Hub at Runway South

		Directional Wind Velocity Ratio ($VR_{500,i,j}$)																Annual Overall Wind Velocity Ratios	Summer Overall Wind Velocity Ratios
Test Point		0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5	Total	Total
P	061	0.17	0.14	0.15	0.18	0.20	0.26	0.30	0.24	0.24	0.24	0.37	0.14	0.14	0.19	0.18	0.15	0.22	0.23
P	062	0.10	0.15	0.20	0.24	0.26	0.32	0.31	0.26	0.25	0.24	0.40	0.39	0.21	0.12	0.13	0.15	0.26	0.28
P	063	0.15	0.13	0.13	0.15	0.16	0.15	0.21	0.32	0.27	0.14	0.16	0.13	0.15	0.17	0.17	0.15	0.18	0.18
P	064	0.09	0.05	0.07	0.19	0.22	0.23	0.28	0.38	0.28	0.17	0.25	0.28	0.26	0.32	0.31	0.18	0.24	0.26
P	065	0.13	0.10	0.11	0.10	0.11	0.13	0.27	0.22	0.15	0.12	0.11	0.18	0.17	0.16	0.15	0.13	0.16	0.17
P	066	0.19	0.15	0.18	0.11	0.10	0.12	0.22	0.31	0.30	0.18	0.23	0.18	0.12	0.12	0.10	0.13	0.17	0.19
P	067	0.07	0.05	0.06	0.04	0.11	0.25	0.39	0.31	0.22	0.14	0.19	0.21	0.21	0.27	0.26	0.15	0.21	0.24
P	068	0.17	0.10	0.13	0.11	0.12	0.23	0.40	0.30	0.31	0.21	0.23	0.23	0.28	0.21	0.34	0.26	0.23	0.27
P	069	0.23	0.19	0.24	0.26	0.28	0.42	0.52	0.42	0.23	0.17	0.19	0.35	0.36	0.40	0.52	0.36	0.36	0.36
P	070	0.13	0.13	0.14	0.09	0.09	0.11	0.12	0.19	0.26	0.18	0.17	0.15	0.14	0.15	0.17	0.16	0.13	0.15
P	071	0.10	0.07	0.11	0.06	0.07	0.22	0.36	0.32	0.24	0.16	0.20	0.22	0.23	0.30	0.31	0.18	0.20	0.24
P	072	0.14	0.12	0.18	0.16	0.22	0.25	0.31	0.28	0.17	0.20	0.34	0.24	0.20	0.27	0.32	0.24	0.24	0.25
P	073	0.12	0.18	0.23	0.21	0.21	0.12	0.27	0.37	0.38	0.28	0.16	0.20	0.14	0.11	0.22	0.25	0.22	0.23
P	074	0.10	0.09	0.10	0.09	0.09	0.09	0.23	0.19	0.19	0.12	0.31	0.29	0.27	0.20	0.16	0.12	0.15	0.20

Table 10: Directional, annual and summer overall wind velocity ratios measured at Runway Precinct at Middle Runway

		Directional Wind Velocity Ratio ($VR_{500,i,j}$)																Annual Overall Wind Velocity Ratios	Summer Overall Wind Velocity Ratios
Test Point		0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5	Total	Total
P	073	0.12	0.18	0.23	0.21	0.21	0.12	0.27	0.37	0.38	0.28	0.16	0.20	0.14	0.11	0.22	0.25	0.22	0.23
P	074	0.10	0.09	0.10	0.09	0.09	0.09	0.23	0.19	0.19	0.12	0.31	0.29	0.27	0.20	0.16	0.12	0.15	0.20
P	075	0.12	0.19	0.22	0.15	0.15	0.10	0.19	0.16	0.17	0.10	0.14	0.16	0.13	0.10	0.10	0.14	0.15	0.15
P	076	0.09	0.15	0.19	0.17	0.20	0.16	0.18	0.16	0.11	0.09	0.18	0.11	0.06	0.06	0.09	0.13	0.15	0.14
P	077	0.15	0.22	0.24	0.18	0.17	0.14	0.24	0.28	0.16	0.17	0.27	0.22	0.22	0.22	0.16	0.21	0.20	0.21
P	078	0.13	0.13	0.21	0.16	0.15	0.15	0.27	0.15	0.20	0.17	0.18	0.15	0.16	0.20	0.22	0.17	0.18	0.18
P	079	0.14	0.11	0.12	0.10	0.12	0.13	0.21	0.19	0.22	0.25	0.37	0.17	0.27	0.11	0.13	0.28	0.17	0.20
P	080	0.12	0.10	0.12	0.11	0.12	0.11	0.20	0.24	0.27	0.25	0.37	0.17	0.11	0.08	0.08	0.21	0.16	0.19
P	081	0.11	0.10	0.12	0.10	0.14	0.18	0.37	0.33	0.26	0.21	0.28	0.27	0.25	0.30	0.29	0.16	0.22	0.26
P	082	0.20	0.10	0.14	0.15	0.20	0.22	0.22	0.13	0.15	0.14	0.41	0.24	0.21	0.19	0.27	0.38	0.21	0.22
P	083	0.13	0.12	0.18	0.15	0.15	0.12	0.17	0.27	0.34	0.30	0.45	0.41	0.30	0.16	0.12	0.11	0.19	0.25
P	084	0.17	0.12	0.19	0.18	0.19	0.14	0.23	0.14	0.27	0.23	0.39	0.22	0.10	0.14	0.13	0.28	0.19	0.20
P	085	0.19	0.13	0.16	0.14	0.17	0.26	0.44	0.41	0.35	0.25	0.33	0.31	0.29	0.36	0.43	0.31	0.29	0.32
P	086	0.10	0.10	0.14	0.12	0.12	0.10	0.09	0.16	0.25	0.27	0.33	0.17	0.10	0.13	0.08	0.13	0.13	0.16
P	087	0.11	0.08	0.11	0.09	0.12	0.20	0.36	0.34	0.24	0.13	0.14	0.17	0.20	0.25	0.33	0.19	0.21	0.23
P	088	0.14	0.11	0.12	0.10	0.16	0.21	0.28	0.22	0.24	0.17	0.22	0.18	0.12	0.15	0.15	0.17	0.19	0.20
P	089	0.15	0.09	0.12	0.10	0.14	0.11	0.16	0.19	0.24	0.23	0.48	0.36	0.22	0.15	0.11	0.26	0.17	0.22
P	090	0.12	0.09	0.11	0.09	0.13	0.18	0.32	0.31	0.24	0.14	0.18	0.21	0.22	0.27	0.36	0.19	0.20	0.23
P	091	0.16	0.09	0.11	0.11	0.20	0.23	0.29	0.21	0.18	0.13	0.12	0.10	0.09	0.15	0.29	0.29	0.20	0.19
P	092	0.12	0.08	0.09	0.08	0.11	0.13	0.12	0.21	0.26	0.14	0.18	0.14	0.10	0.15	0.18	0.20	0.14	0.15
P	093	0.12	0.08	0.10	0.07	0.10	0.15	0.27	0.27	0.20	0.12	0.12	0.12	0.14	0.21	0.33	0.22	0.17	0.18
P	094	0.15	0.13	0.21	0.21	0.30	0.33	0.26	0.19	0.25	0.18	0.35	0.24	0.20	0.21	0.24	0.21	0.26	0.25
P	095	0.17	0.10	0.10	0.09	0.11	0.10	0.15	0.15	0.25	0.32	0.48	0.26	0.14	0.16	0.19	0.31	0.16	0.20
P	096	0.10	0.08	0.11	0.09	0.11	0.16	0.32	0.32	0.27	0.17	0.19	0.20	0.20	0.25	0.37	0.27	0.20	0.23
P	097	0.13	0.10	0.10	0.08	0.10	0.10	0.12	0.14	0.17	0.15	0.25	0.23	0.24	0.25	0.27	0.12	0.13	0.17
P	098	0.15	0.11	0.12	0.09	0.11	0.17	0.37	0.38	0.31	0.17	0.16	0.16	0.19	0.28	0.36	0.35	0.22	0.24
P	099	0.16	0.08	0.09	0.08	0.14	0.22	0.21	0.19	0.16	0.14	0.19	0.24	0.18	0.19	0.32	0.29	0.19	0.20

Table10 (cont.): Directional, annual and summer overall wind velocity ratios measured at Runway Precinct at Middle Runway

		Directional Wind Velocity Ratio ($VR_{500,i,j}$)																Annual Overall Wind Velocity Ratios	Summer Overall Wind Velocity Ratios
Test Point		0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5	Total	Total
P	100	0.31	0.17	0.19	0.16	0.20	0.18	0.14	0.18	0.26	0.19	0.35	0.18	0.23	0.18	0.18	0.42	0.20	0.20
P	101	0.22	0.12	0.13	0.10	0.10	0.08	0.21	0.27	0.34	0.38	0.49	0.26	0.20	0.17	0.21	0.26	0.18	0.24
P	102	0.12	0.09	0.10	0.08	0.10	0.16	0.36	0.40	0.33	0.22	0.23	0.19	0.21	0.29	0.37	0.38	0.22	0.25
P	103	0.19	0.10	0.09	0.07	0.08	0.08	0.11	0.17	0.23	0.15	0.29	0.36	0.26	0.30	0.36	0.35	0.15	0.19
P	104	0.19	0.22	0.20	0.17	0.17	0.21	0.36	0.36	0.24	0.15	0.16	0.16	0.20	0.21	0.25	0.19	0.23	0.24
P	105	0.29	0.24	0.20	0.14	0.18	0.23	0.41	0.41	0.31	0.21	0.25	0.18	0.18	0.18	0.27	0.24	0.26	0.27
P	106	0.23	0.24	0.21	0.18	0.20	0.26	0.19	0.20	0.20	0.19	0.30	0.22	0.16	0.13	0.17	0.15	0.21	0.21
P	107	0.17	0.18	0.19	0.18	0.24	0.20	0.16	0.15	0.20	0.12	0.23	0.16	0.17	0.19	0.19	0.14	0.19	0.18

Table 11: Directional, annual and summer overall wind velocity ratios measured at Metro Park at Runway North

		Directional Wind Velocity Ratio ($VR_{500,i,j}$)																Annual Overall Wind Velocity Ratios	Summer Overall Wind Velocity Ratios
Test Point		0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5	Total	Total
P	105	0.29	0.24	0.20	0.14	0.18	0.23	0.41	0.41	0.31	0.21	0.25	0.18	0.18	0.18	0.27	0.24	0.26	0.27
P	106	0.23	0.24	0.21	0.18	0.20	0.26	0.19	0.20	0.20	0.19	0.30	0.22	0.16	0.13	0.17	0.15	0.21	0.21
P	107	0.17	0.18	0.19	0.18	0.24	0.20	0.16	0.15	0.20	0.12	0.23	0.16	0.17	0.19	0.19	0.14	0.19	0.18
P	108	0.22	0.24	0.18	0.14	0.19	0.12	0.31	0.35	0.31	0.22	0.25	0.20	0.20	0.16	0.23	0.19	0.22	0.24
P	109	0.20	0.25	0.20	0.15	0.30	0.22	0.25	0.23	0.19	0.12	0.24	0.23	0.19	0.16	0.20	0.16	0.23	0.22
P	110	0.24	0.26	0.21	0.14	0.25	0.16	0.37	0.39	0.33	0.25	0.25	0.23	0.23	0.16	0.23	0.19	0.25	0.27
P	111	0.26	0.24	0.25	0.15	0.28	0.18	0.39	0.41	0.33	0.26	0.30	0.23	0.19	0.17	0.22	0.19	0.27	0.28
P	112	0.23	0.20	0.20	0.19	0.18	0.19	0.33	0.33	0.32	0.22	0.19	0.18	0.15	0.17	0.20	0.15	0.22	0.23

Table 12: Directional, annual and summer overall wind velocity ratios measured at Sport Hub at North Apron West

		Directional Wind Velocity Ratio ($VR_{500,i,j}$)																Annual Overall Wind Velocity Ratios	Summer Overall Wind Velocity Ratios
Test Point		0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5	Total	Total
P	112	0.23	0.20	0.20	0.19	0.18	0.19	0.33	0.33	0.32	0.22	0.19	0.18	0.15	0.17	0.20	0.15	0.22	0.23
P	113	0.24	0.24	0.19	0.11	0.12	0.16	0.29	0.43	0.38	0.26	0.23	0.16	0.14	0.16	0.21	0.16	0.21	0.23
P	114	0.15	0.16	0.21	0.25	0.29	0.30	0.36	0.44	0.31	0.23	0.29	0.29	0.32	0.24	0.24	0.14	0.30	0.31
P	115	0.17	0.17	0.18	0.17	0.21	0.18	0.37	0.36	0.23	0.20	0.16	0.18	0.23	0.15	0.21	0.13	0.23	0.24
P	116	0.19	0.21	0.22	0.19	0.24	0.22	0.30	0.33	0.26	0.19	0.22	0.20	0.24	0.21	0.21	0.15	0.24	0.24
P	117	0.17	0.15	0.12	0.09	0.15	0.25	0.45	0.44	0.32	0.17	0.12	0.11	0.17	0.15	0.23	0.16	0.24	0.25
P	118	0.13	0.14	0.18	0.17	0.24	0.20	0.33	0.32	0.28	0.12	0.20	0.19	0.27	0.14	0.21	0.12	0.23	0.24
P	119	0.21	0.24	0.24	0.17	0.16	0.29	0.45	0.46	0.36	0.20	0.24	0.19	0.23	0.20	0.20	0.16	0.28	0.29
P	120	0.16	0.15	0.15	0.15	0.16	0.14	0.24	0.30	0.28	0.15	0.22	0.16	0.14	0.11	0.18	0.11	0.18	0.19
P	121	0.12	0.13	0.17	0.14	0.18	0.14	0.18	0.20	0.17	0.14	0.19	0.15	0.13	0.08	0.12	0.08	0.16	0.16
P	122	0.08	0.08	0.10	0.10	0.12	0.12	0.15	0.11	0.12	0.09	0.09	0.08	0.08	0.08	0.17	0.06	0.11	0.11
P	123	0.11	0.12	0.14	0.15	0.18	0.18	0.22	0.29	0.14	0.13	0.18	0.13	0.13	0.12	0.16	0.10	0.18	0.17
P	124	0.15	0.14	0.12	0.11	0.12	0.12	0.21	0.33	0.26	0.13	0.18	0.12	0.09	0.09	0.13	0.09	0.16	0.17
P	125	0.21	0.16	0.11	0.09	0.14	0.17	0.24	0.20	0.24	0.13	0.16	0.10	0.11	0.11	0.22	0.14	0.17	0.17
P	126	0.09	0.10	0.12	0.14	0.19	0.16	0.30	0.24	0.16	0.09	0.12	0.09	0.10	0.09	0.09	0.06	0.17	0.17
P	127	0.09	0.11	0.12	0.13	0.15	0.10	0.18	0.18	0.14	0.07	0.06	0.08	0.06	0.06	0.08	0.06	0.12	0.12
P	128	0.20	0.15	0.16	0.15	0.20	0.19	0.24	0.13	0.11	0.08	0.10	0.13	0.18	0.20	0.27	0.19	0.18	0.17
P	129	0.17	0.17	0.14	0.10	0.16	0.17	0.26	0.36	0.28	0.15	0.19	0.09	0.14	0.16	0.16	0.10	0.19	0.20
P	130	0.16	0.15	0.16	0.08	0.10	0.10	0.23	0.33	0.16	0.15	0.24	0.16	0.11	0.12	0.14	0.08	0.16	0.17
P	131	0.17	0.12	0.12	0.11	0.16	0.20	0.26	0.22	0.13	0.11	0.13	0.12	0.17	0.20	0.25	0.17	0.18	0.18
P	197	0.09	0.12	0.13	0.18	0.26	0.17	0.13	0.19	0.17	0.17	0.19	0.20	0.17	0.11	0.12	0.07	0.17	0.17
P	199	0.12	0.14	0.15	0.19	0.26	0.26	0.29	0.14	0.19	0.19	0.20	0.30	0.24	0.16	0.19	0.10	0.22	0.23
P	201	0.11	0.14	0.19	0.19	0.23	0.22	0.32	0.16	0.18	0.17	0.16	0.27	0.19	0.13	0.17	0.10	0.21	0.22
P	207	0.10	0.09	0.14	0.09	0.11	0.09	0.14	0.20	0.14	0.13	0.13	0.10	0.09	0.14	0.13	0.08	0.12	0.13
P	211	0.22	0.23	0.16	0.09	0.11	0.11	0.18	0.28	0.26	0.18	0.18	0.08	0.12	0.20	0.18	0.14	0.16	0.16
P	253	0.14	0.15	0.15	0.15	0.19	0.21	0.26	0.19	0.18	0.13	0.18	0.18	0.21	0.18	0.24	0.12	0.19	0.20
P	256	0.15	0.14	0.11	0.09	0.15	0.14	0.19	0.16	0.21	0.15	0.15	0.12	0.15	0.15	0.19	0.10	0.15	0.16

Table12 (cont.): Directional, annual and summer overall wind velocity ratios measured at Sport Hub at North Apron West

		Directional Wind Velocity Ratio ($VR_{500,i,j}$)																Annual Overall Wind Velocity Ratios	Summer Overall Wind Velocity Ratios
Test Point		0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5	Total	Total
P	263	0.18	0.16	0.12	0.13	0.16	0.12	0.23	0.25	0.29	0.19	0.21	0.13	0.12	0.19	0.25	0.13	0.17	0.19

Table 13: Directional, annual and summer overall wind velocity ratios measured at To Kwa Wan Waterfront

		Directional Wind Velocity Ratio ($VR_{500,i,j}$)																Annual Overall Wind Velocity Ratios	Summer Overall Wind Velocity Ratios
Test Point		0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5	Total	Total
P	132	0.29	0.30	0.24	0.15	0.24	0.36	0.55	0.44	0.39	0.22	0.20	0.16	0.20	0.21	0.26	0.26	0.33	0.32
P	133	0.34	0.34	0.22	0.22	0.30	0.37	0.62	0.60	0.39	0.18	0.13	0.11	0.23	0.28	0.36	0.29	0.37	0.35
P	134	0.15	0.21	0.25	0.20	0.30	0.27	0.28	0.22	0.20	0.15	0.24	0.18	0.14	0.10	0.12	0.12	0.23	0.22
P	135	0.10	0.13	0.15	0.14	0.15	0.11	0.15	0.19	0.17	0.08	0.07	0.07	0.08	0.08	0.08	0.07	0.13	0.12
P	136	0.09	0.11	0.13	0.13	0.22	0.15	0.19	0.17	0.11	0.09	0.09	0.10	0.08	0.10	0.10	0.06	0.15	0.14
P	137	0.12	0.16	0.19	0.17	0.24	0.21	0.25	0.17	0.07	0.08	0.10	0.10	0.09	0.11	0.11	0.08	0.18	0.16

Table 14: Directional, annual and summer overall wind velocity ratios measured at Zone A-1 of the Kai Tak City Centre at the North Apron

		Directional Wind Velocity Ratio ($VR_{500,i,j}$)																Annual Overall Wind Velocity Ratios	Summer Overall Wind Velocity Ratios
Test Point		0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5	Total	Total
P	138	0.19	0.19	0.18	0.08	0.17	0.24	0.38	0.40	0.19	0.12	0.14	0.12	0.14	0.09	0.15	0.14	0.22	0.22
P	139	0.14	0.14	0.16	0.07	0.11	0.12	0.12	0.14	0.08	0.08	0.15	0.23	0.25	0.25	0.12	0.10	0.13	0.15
P	140	0.16	0.13	0.12	0.06	0.15	0.16	0.26	0.25	0.10	0.11	0.16	0.21	0.27	0.23	0.12	0.12	0.18	0.19
P	141	0.20	0.12	0.13	0.13	0.23	0.24	0.31	0.30	0.13	0.12	0.14	0.18	0.22	0.17	0.14	0.14	0.22	0.22
P	142	0.10	0.15	0.18	0.09	0.10	0.14	0.37	0.40	0.18	0.13	0.16	0.22	0.29	0.20	0.12	0.08	0.20	0.23
P	143	0.21	0.22	0.26	0.12	0.08	0.11	0.14	0.18	0.17	0.18	0.21	0.23	0.26	0.22	0.13	0.15	0.15	0.17
P	145	0.31	0.24	0.27	0.10	0.11	0.15	0.23	0.28	0.22	0.20	0.22	0.20	0.21	0.15	0.16	0.20	0.19	0.20
P	146	0.21	0.19	0.18	0.05	0.08	0.08	0.10	0.10	0.14	0.11	0.12	0.12	0.12	0.11	0.15	0.10	0.11	0.11
P	147	0.08	0.10	0.14	0.08	0.09	0.12	0.15	0.18	0.09	0.07	0.08	0.09	0.13	0.10	0.09	0.07	0.12	0.11
P	148	0.11	0.14	0.20	0.11	0.14	0.14	0.18	0.26	0.12	0.12	0.15	0.17	0.24	0.10	0.11	0.08	0.16	0.16
P	149	0.22	0.19	0.19	0.09	0.11	0.16	0.28	0.38	0.17	0.16	0.19	0.18	0.23	0.16	0.28	0.12	0.20	0.21
P	150	0.13	0.16	0.24	0.14	0.17	0.09	0.29	0.34	0.16	0.14	0.14	0.12	0.17	0.13	0.15	0.11	0.18	0.18
P	151	0.15	0.14	0.17	0.11	0.15	0.12	0.25	0.36	0.19	0.18	0.18	0.16	0.20	0.16	0.23	0.10	0.18	0.20
P	152	0.19	0.14	0.17	0.14	0.14	0.10	0.16	0.28	0.17	0.16	0.20	0.16	0.22	0.15	0.15	0.09	0.16	0.17

Table 15: Directional, annual and summer overall wind velocity ratios measured at Zone A-2 of the Kai Tak City Centre at the North Apron

		Directional Wind Velocity Ratio ($VR_{500,i,j}$)																Annual Overall Wind Velocity Ratios	Summer Overall Wind Velocity Ratios
Test Point		0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5	Total	Total
P	142	0.10	0.15	0.18	0.09	0.10	0.14	0.37	0.40	0.18	0.13	0.16	0.22	0.29	0.20	0.12	0.08	0.20	0.23
P	144	0.09	0.11	0.15	0.09	0.08	0.07	0.09	0.14	0.15	0.12	0.16	0.17	0.18	0.13	0.11	0.09	0.11	0.12
P	150	0.13	0.16	0.24	0.14	0.17	0.09	0.29	0.34	0.16	0.14	0.14	0.12	0.17	0.13	0.15	0.11	0.18	0.18
P	153	0.19	0.22	0.20	0.10	0.17	0.14	0.14	0.10	0.07	0.08	0.12	0.12	0.20	0.15	0.15	0.14	0.14	0.13
P	154	0.25	0.35	0.33	0.23	0.22	0.13	0.13	0.15	0.17	0.19	0.23	0.20	0.28	0.19	0.19	0.15	0.19	0.18
P	155	0.19	0.22	0.21	0.13	0.17	0.17	0.16	0.09	0.09	0.16	0.21	0.16	0.19	0.17	0.15	0.13	0.16	0.16
P	156	0.19	0.20	0.19	0.09	0.11	0.13	0.12	0.15	0.13	0.12	0.15	0.13	0.16	0.13	0.18	0.18	0.14	0.13
P	157	0.14	0.19	0.19	0.11	0.12	0.14	0.13	0.09	0.07	0.09	0.10	0.12	0.21	0.12	0.13	0.10	0.13	0.12
P	158	0.17	0.27	0.27	0.19	0.30	0.27	0.24	0.14	0.10	0.09	0.09	0.15	0.28	0.17	0.16	0.15	0.22	0.19
P	159	0.14	0.19	0.19	0.15	0.27	0.23	0.19	0.14	0.12	0.11	0.13	0.12	0.22	0.16	0.15	0.17	0.19	0.17
P	160	0.18	0.24	0.27	0.16	0.25	0.21	0.18	0.09	0.09	0.09	0.13	0.16	0.16	0.19	0.18	0.17	0.19	0.16
P	161	0.15	0.21	0.22	0.10	0.09	0.07	0.12	0.12	0.13	0.14	0.19	0.14	0.15	0.20	0.21	0.18	0.13	0.13
P	162	0.13	0.25	0.19	0.10	0.14	0.10	0.11	0.16	0.11	0.08	0.10	0.12	0.13	0.14	0.15	0.12	0.13	0.12

Table 16: Directional, annual and summer overall wind velocity ratios measured at Zone B-1 of the Kai Tak City Centre at the North Apron

		Directional Wind Velocity Ratio ($VR_{500,i,j}$)																Annual Overall Wind Velocity Ratios	Summer Overall Wind Velocity Ratios
Test Point		0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5	Total	Total
P	153	0.19	0.22	0.20	0.10	0.17	0.14	0.14	0.10	0.07	0.08	0.12	0.12	0.20	0.15	0.15	0.14	0.14	0.13
P	154	0.25	0.35	0.33	0.23	0.22	0.13	0.13	0.15	0.17	0.19	0.23	0.20	0.28	0.19	0.19	0.15	0.19	0.18
P	163	0.22	0.22	0.17	0.15	0.16	0.27	0.30	0.24	0.26	0.23	0.19	0.13	0.09	0.07	0.14	0.11	0.21	0.21
P	164	0.39	0.41	0.31	0.29	0.18	0.19	0.24	0.16	0.09	0.09	0.18	0.14	0.14	0.10	0.26	0.18	0.20	0.17
P	165	0.27	0.31	0.30	0.29	0.19	0.13	0.12	0.11	0.07	0.12	0.21	0.15	0.14	0.10	0.24	0.20	0.17	0.14
P	166	0.23	0.30	0.24	0.21	0.15	0.09	0.10	0.16	0.11	0.09	0.13	0.13	0.12	0.08	0.13	0.11	0.14	0.12
P	167	0.19	0.19	0.19	0.16	0.27	0.17	0.16	0.08	0.07	0.07	0.13	0.12	0.13	0.10	0.23	0.17	0.17	0.14
P	168	0.17	0.21	0.15	0.14	0.15	0.18	0.24	0.21	0.21	0.17	0.16	0.14	0.12	0.07	0.09	0.10	0.17	0.17
P	169	0.15	0.15	0.17	0.24	0.24	0.11	0.10	0.07	0.05	0.06	0.07	0.07	0.09	0.08	0.09	0.07	0.13	0.10
P	170	0.21	0.28	0.20	0.17	0.28	0.18	0.22	0.10	0.06	0.07	0.12	0.14	0.14	0.11	0.17	0.11	0.18	0.16
P	171	0.14	0.19	0.18	0.12	0.16	0.13	0.18	0.10	0.06	0.09	0.19	0.19	0.19	0.09	0.09	0.07	0.14	0.14
P	172	0.15	0.17	0.15	0.12	0.13	0.12	0.12	0.13	0.11	0.14	0.16	0.15	0.15	0.10	0.11	0.09	0.13	0.13
P	173	0.12	0.20	0.22	0.19	0.35	0.14	0.14	0.09	0.08	0.12	0.15	0.14	0.13	0.08	0.09	0.07	0.17	0.14
P	174	0.17	0.25	0.18	0.13	0.23	0.18	0.25	0.13	0.07	0.13	0.23	0.19	0.18	0.07	0.08	0.07	0.18	0.18
P	175	0.27	0.37	0.25	0.13	0.22	0.17	0.23	0.12	0.05	0.06	0.11	0.12	0.12	0.07	0.10	0.08	0.17	0.15
P	176	0.08	0.13	0.24	0.26	0.29	0.15	0.15	0.08	0.10	0.09	0.16	0.15	0.15	0.08	0.09	0.07	0.16	0.14
P	177	0.22	0.23	0.15	0.13	0.22	0.17	0.22	0.17	0.14	0.12	0.08	0.07	0.07	0.07	0.11	0.12	0.17	0.15
P	178	0.13	0.15	0.13	0.13	0.24	0.16	0.13	0.11	0.07	0.07	0.08	0.08	0.13	0.06	0.06	0.06	0.14	0.12
P	179	0.24	0.30	0.21	0.14	0.19	0.17	0.17	0.10	0.06	0.12	0.19	0.15	0.13	0.09	0.08	0.09	0.16	0.14
P	180	0.23	0.33	0.31	0.30	0.27	0.17	0.11	0.08	0.07	0.13	0.22	0.19	0.11	0.08	0.08	0.09	0.17	0.14
P	181	0.21	0.22	0.15	0.15	0.17	0.17	0.22	0.15	0.09	0.06	0.07	0.07	0.07	0.08	0.13	0.15	0.15	0.13

Table 17: Directional, annual and summer overall wind velocity ratios measured at Zone B-2 of the Kai Tak City Centre at the North Apron

		Directional Wind Velocity Ratio ($VR_{500,i,j}$)																Annual Overall Wind Velocity Ratios	Summer Overall Wind Velocity Ratios
Test Point		0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5	Total	Total
P	163	0.22	0.22	0.17	0.15	0.16	0.27	0.30	0.24	0.26	0.23	0.19	0.13	0.09	0.07	0.14	0.11	0.21	0.21
P	164	0.39	0.41	0.31	0.29	0.18	0.19	0.24	0.16	0.09	0.09	0.18	0.14	0.14	0.10	0.26	0.18	0.20	0.17
P	165	0.27	0.31	0.30	0.29	0.19	0.13	0.12	0.11	0.07	0.12	0.21	0.15	0.14	0.10	0.24	0.20	0.17	0.14
P	166	0.23	0.30	0.24	0.21	0.15	0.09	0.10	0.16	0.11	0.09	0.13	0.13	0.12	0.08	0.13	0.11	0.14	0.12
P	182	0.16	0.18	0.22	0.19	0.21	0.21	0.17	0.11	0.21	0.22	0.23	0.18	0.15	0.13	0.13	0.11	0.18	0.18
P	183	0.16	0.22	0.27	0.23	0.27	0.25	0.19	0.15	0.27	0.25	0.29	0.20	0.16	0.17	0.17	0.11	0.22	0.21
P	184	0.20	0.20	0.21	0.20	0.19	0.20	0.14	0.11	0.17	0.19	0.18	0.10	0.09	0.08	0.11	0.14	0.16	0.15
P	185	0.10	0.10	0.08	0.06	0.10	0.10	0.11	0.22	0.11	0.11	0.09	0.09	0.10	0.07	0.14	0.08	0.11	0.11
P	186	0.17	0.14	0.14	0.18	0.41	0.42	0.40	0.19	0.18	0.17	0.19	0.21	0.20	0.12	0.13	0.11	0.29	0.27
P	187	0.16	0.14	0.09	0.09	0.15	0.17	0.16	0.27	0.27	0.16	0.17	0.16	0.17	0.13	0.20	0.12	0.17	0.18
P	188	0.08	0.16	0.08	0.04	0.07	0.08	0.07	0.15	0.17	0.12	0.16	0.14	0.08	0.06	0.11	0.07	0.09	0.11
P	189	0.08	0.08	0.07	0.05	0.05	0.07	0.05	0.17	0.22	0.18	0.18	0.18	0.11	0.06	0.05	0.06	0.09	0.12
P	190	0.22	0.24	0.26	0.23	0.19	0.22	0.23	0.14	0.11	0.12	0.17	0.16	0.13	0.10	0.15	0.13	0.19	0.17
P	191	0.12	0.23	0.15	0.10	0.07	0.09	0.07	0.08	0.08	0.07	0.09	0.09	0.08	0.07	0.11	0.10	0.09	0.08
P	192	0.06	0.09	0.11	0.07	0.06	0.09	0.08	0.23	0.24	0.19	0.21	0.17	0.09	0.06	0.10	0.07	0.11	0.13
P	193	0.10	0.12	0.11	0.08	0.07	0.08	0.13	0.15	0.11	0.13	0.14	0.13	0.16	0.11	0.10	0.09	0.11	0.12
P	194	0.10	0.09	0.09	0.09	0.07	0.09	0.10	0.15	0.07	0.12	0.16	0.13	0.09	0.08	0.15	0.12	0.10	0.11
P	195	0.29	0.30	0.19	0.19	0.11	0.13	0.14	0.17	0.19	0.19	0.16	0.18	0.15	0.10	0.25	0.17	0.16	0.16
P	196	0.11	0.10	0.12	0.10	0.07	0.07	0.08	0.11	0.07	0.09	0.11	0.13	0.11	0.09	0.17	0.14	0.09	0.10
P	237	0.09	0.12	0.21	0.16	0.26	0.24	0.14	0.16	0.15	0.12	0.13	0.10	0.12	0.09	0.08	0.11	0.18	0.15
P	240	0.12	0.12	0.13	0.11	0.21	0.20	0.17	0.30	0.23	0.21	0.15	0.13	0.14	0.10	0.11	0.13	0.18	0.18
P	244	0.10	0.11	0.08	0.05	0.14	0.16	0.11	0.11	0.07	0.06	0.07	0.08	0.14	0.08	0.06	0.09	0.11	0.10
P	249	0.11	0.14	0.10	0.07	0.09	0.15	0.15	0.22	0.14	0.09	0.10	0.12	0.19	0.14	0.12	0.09	0.13	0.14

Table 18: Directional, annual and summer overall wind velocity ratios measured at Zone B-3 of the Kai Tak City Centre at the North Apron

		Directional Wind Velocity Ratio ($VR_{500,i,j}$)																Annual Overall Wind Velocity Ratios	Summer Overall Wind Velocity Ratios
Test Point		0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5	Total	Total
P	231	0.17	0.22	0.27	0.24	0.26	0.22	0.14	0.23	0.19	0.23	0.27	0.21	0.14	0.13	0.16	0.13	0.21	0.20
P	232	0.17	0.24	0.31	0.27	0.26	0.22	0.19	0.28	0.24	0.21	0.27	0.23	0.15	0.19	0.19	0.10	0.23	0.22
P	233	0.09	0.10	0.11	0.11	0.17	0.15	0.12	0.18	0.20	0.23	0.26	0.12	0.11	0.12	0.13	0.07	0.15	0.15
P	234	0.08	0.12	0.17	0.15	0.18	0.16	0.16	0.21	0.18	0.17	0.18	0.10	0.07	0.07	0.09	0.05	0.15	0.15
P	235	0.09	0.09	0.11	0.12	0.17	0.13	0.13	0.16	0.13	0.15	0.13	0.09	0.10	0.08	0.09	0.07	0.13	0.13
P	236	0.10	0.10	0.11	0.10	0.15	0.13	0.11	0.24	0.27	0.24	0.25	0.11	0.12	0.07	0.10	0.08	0.14	0.16
P	237	0.09	0.12	0.21	0.16	0.26	0.24	0.14	0.16	0.15	0.12	0.13	0.10	0.12	0.09	0.08	0.11	0.18	0.15
P	238	0.13	0.13	0.12	0.12	0.18	0.16	0.15	0.33	0.23	0.20	0.12	0.12	0.17	0.16	0.16	0.10	0.17	0.17
P	239	0.12	0.14	0.12	0.14	0.18	0.15	0.13	0.34	0.20	0.16	0.12	0.11	0.16	0.12	0.09	0.09	0.16	0.16
P	240	0.12	0.12	0.13	0.11	0.21	0.20	0.17	0.30	0.23	0.21	0.15	0.13	0.14	0.10	0.11	0.13	0.18	0.18
P	241	0.09	0.09	0.09	0.08	0.09	0.08	0.09	0.14	0.13	0.11	0.14	0.10	0.11	0.10	0.10	0.07	0.10	0.10
P	242	0.18	0.16	0.13	0.11	0.18	0.16	0.11	0.20	0.13	0.10	0.14	0.11	0.14	0.11	0.11	0.13	0.15	0.14
P	243	0.10	0.11	0.11	0.10	0.12	0.10	0.09	0.25	0.13	0.09	0.12	0.08	0.13	0.10	0.08	0.08	0.12	0.12
P	244	0.10	0.11	0.08	0.05	0.14	0.16	0.11	0.11	0.07	0.06	0.07	0.08	0.14	0.08	0.06	0.09	0.11	0.10
P	245	0.20	0.16	0.12	0.07	0.11	0.11	0.15	0.31	0.26	0.19	0.18	0.15	0.23	0.21	0.17	0.15	0.16	0.18
P	246	0.15	0.15	0.14	0.12	0.17	0.16	0.15	0.28	0.15	0.12	0.12	0.11	0.24	0.19	0.12	0.12	0.17	0.16
P	247	0.11	0.11	0.11	0.06	0.06	0.06	0.08	0.13	0.13	0.10	0.13	0.15	0.19	0.14	0.16	0.09	0.09	0.11
P	248	0.15	0.15	0.15	0.10	0.12	0.11	0.12	0.21	0.12	0.10	0.14	0.19	0.25	0.19	0.19	0.13	0.14	0.15
P	249	0.11	0.14	0.10	0.07	0.09	0.15	0.15	0.22	0.14	0.09	0.10	0.12	0.19	0.14	0.12	0.09	0.13	0.14

Table 19: Directional, annual and summer overall wind velocity ratios measured at Zone C of the Kai Tak City Centre at the North Apron

		Directional Wind Velocity Ratio ($VR_{500,i,j}$)																Annual Overall Wind Velocity Ratios	Summer Overall Wind Velocity Ratios
Test Point		0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5	Total	Total
P	197	0.09	0.12	0.13	0.18	0.26	0.17	0.13	0.19	0.17	0.17	0.19	0.20	0.17	0.11	0.12	0.07	0.17	0.17
P	198	0.11	0.10	0.10	0.10	0.13	0.16	0.44	0.33	0.19	0.16	0.14	0.25	0.22	0.19	0.25	0.14	0.21	0.24
P	199	0.12	0.14	0.15	0.19	0.26	0.26	0.29	0.14	0.19	0.19	0.20	0.30	0.24	0.16	0.19	0.10	0.22	0.23
P	200	0.15	0.12	0.12	0.14	0.17	0.14	0.31	0.35	0.20	0.12	0.11	0.23	0.27	0.27	0.34	0.21	0.21	0.22
P	201	0.11	0.14	0.19	0.19	0.23	0.22	0.32	0.16	0.18	0.17	0.16	0.27	0.19	0.13	0.17	0.10	0.21	0.22
P	202	0.10	0.09	0.10	0.15	0.22	0.22	0.34	0.27	0.21	0.11	0.08	0.11	0.18	0.18	0.19	0.14	0.21	0.20
P	203	0.11	0.13	0.12	0.12	0.14	0.15	0.25	0.32	0.11	0.10	0.11	0.12	0.17	0.20	0.22	0.12	0.17	0.17
P	204	0.19	0.17	0.16	0.15	0.24	0.24	0.44	0.27	0.22	0.12	0.13	0.18	0.26	0.24	0.36	0.22	0.25	0.25
P	205	0.14	0.15	0.11	0.09	0.11	0.09	0.21	0.28	0.15	0.11	0.15	0.19	0.15	0.11	0.15	0.12	0.15	0.16
P	206	0.13	0.10	0.10	0.10	0.12	0.10	0.22	0.29	0.23	0.12	0.10	0.10	0.13	0.12	0.22	0.13	0.15	0.16
P	207	0.10	0.09	0.14	0.09	0.11	0.09	0.14	0.20	0.14	0.13	0.13	0.10	0.09	0.14	0.13	0.08	0.12	0.13
P	208	0.15	0.21	0.16	0.17	0.26	0.27	0.47	0.48	0.25	0.18	0.15	0.22	0.23	0.26	0.30	0.17	0.29	0.30
P	209	0.16	0.16	0.12	0.09	0.16	0.18	0.23	0.17	0.16	0.08	0.15	0.20	0.18	0.12	0.18	0.14	0.17	0.17
P	210	0.16	0.13	0.11	0.07	0.09	0.07	0.14	0.18	0.12	0.12	0.18	0.19	0.19	0.17	0.23	0.17	0.13	0.14
P	211	0.22	0.23	0.16	0.09	0.11	0.11	0.18	0.28	0.26	0.18	0.18	0.08	0.12	0.20	0.18	0.14	0.16	0.16
P	212	0.17	0.14	0.12	0.11	0.20	0.22	0.38	0.38	0.21	0.11	0.09	0.16	0.24	0.32	0.29	0.18	0.24	0.24
P	213	0.18	0.22	0.17	0.12	0.18	0.20	0.37	0.20	0.15	0.12	0.17	0.20	0.21	0.14	0.21	0.15	0.21	0.22
P	214	0.18	0.13	0.11	0.07	0.11	0.10	0.11	0.08	0.10	0.06	0.11	0.13	0.14	0.16	0.28	0.19	0.12	0.11
P	215	0.19	0.17	0.13	0.10	0.12	0.11	0.18	0.25	0.26	0.16	0.16	0.29	0.38	0.32	0.36	0.14	0.18	0.21
P	216	0.13	0.14	0.13	0.11	0.20	0.22	0.38	0.39	0.25	0.10	0.09	0.14	0.22	0.28	0.23	0.15	0.23	0.24
P	217	0.14	0.17	0.15	0.13	0.24	0.21	0.33	0.43	0.24	0.17	0.14	0.20	0.15	0.20	0.25	0.13	0.24	0.24
P	218	0.20	0.18	0.17	0.08	0.14	0.14	0.21	0.13	0.13	0.11	0.18	0.23	0.24	0.24	0.38	0.24	0.17	0.18
P	219	0.15	0.13	0.14	0.07	0.11	0.08	0.10	0.10	0.10	0.11	0.16	0.18	0.14	0.09	0.17	0.13	0.11	0.12
P	220	0.19	0.16	0.17	0.11	0.15	0.12	0.17	0.16	0.13	0.15	0.19	0.19	0.15	0.13	0.21	0.17	0.15	0.16
P	221	0.16	0.23	0.20	0.08	0.18	0.20	0.30	0.30	0.15	0.11	0.15	0.19	0.17	0.18	0.13	0.10	0.20	0.20
P	222	0.17	0.17	0.17	0.09	0.13	0.11	0.17	0.12	0.11	0.11	0.18	0.21	0.17	0.13	0.18	0.14	0.14	0.15
P	223	0.18	0.27	0.23	0.11	0.23	0.23	0.43	0.38	0.16	0.10	0.13	0.19	0.19	0.16	0.15	0.11	0.25	0.24

Table19 (cont.): Directional, annual and summer overall wind velocity ratios measured at Zone C of the Kai Tak City Centre at the North Apron

		Directional Wind Velocity Ratio ($VR_{500,i,j}$)																Annual Overall Wind Velocity Ratios	Summer Overall Wind Velocity Ratios
Test Point		0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5	Total	Total
P	224	0.16	0.20	0.21	0.07	0.11	0.11	0.18	0.18	0.13	0.12	0.16	0.18	0.28	0.34	0.25	0.17	0.16	0.17
P	225	0.11	0.09	0.12	0.07	0.18	0.13	0.19	0.34	0.20	0.11	0.11	0.13	0.11	0.10	0.14	0.09	0.16	0.16
P	226	0.13	0.13	0.13	0.09	0.21	0.16	0.29	0.22	0.12	0.08	0.11	0.18	0.14	0.13	0.15	0.09	0.18	0.18
P	227	0.17	0.21	0.19	0.08	0.10	0.12	0.22	0.20	0.11	0.11	0.18	0.24	0.35	0.35	0.26	0.20	0.17	0.19
P	228	0.19	0.17	0.18	0.08	0.10	0.10	0.15	0.15	0.12	0.14	0.23	0.26	0.24	0.30	0.25	0.16	0.15	0.17
P	229	0.15	0.19	0.20	0.10	0.17	0.16	0.25	0.15	0.08	0.08	0.10	0.13	0.25	0.19	0.35	0.18	0.18	0.17
P	230	0.17	0.21	0.24	0.09	0.10	0.11	0.21	0.15	0.11	0.12	0.21	0.24	0.25	0.28	0.23	0.13	0.16	0.18

Table 20: Directional, annual and summer overall wind velocity ratios measured at Zone D of the Kai Tak City Centre at the North Apron

		Directional Wind Velocity Ratio ($VR_{500,i,j}$)																Annual Overall Wind Velocity Ratios	Summer Overall Wind Velocity Ratios
Test Point		0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5	Total	Total
P	250	0.10	0.10	0.14	0.17	0.16	0.15	0.17	0.12	0.17	0.13	0.14	0.12	0.13	0.09	0.16	0.08	0.14	0.14
P	251	0.11	0.12	0.20	0.20	0.18	0.17	0.20	0.21	0.14	0.17	0.26	0.22	0.16	0.15	0.10	0.08	0.18	0.19
P	252	0.13	0.16	0.17	0.17	0.21	0.17	0.21	0.21	0.18	0.19	0.28	0.22	0.16	0.09	0.11	0.08	0.18	0.19
P	253	0.14	0.15	0.15	0.15	0.19	0.21	0.26	0.19	0.18	0.13	0.18	0.18	0.21	0.18	0.24	0.12	0.19	0.20
P	254	0.13	0.17	0.14	0.18	0.24	0.13	0.14	0.16	0.23	0.23	0.23	0.15	0.11	0.19	0.13	0.09	0.17	0.17
P	255	0.11	0.14	0.15	0.22	0.26	0.17	0.15	0.19	0.25	0.22	0.26	0.19	0.14	0.19	0.12	0.07	0.18	0.19
P	256	0.15	0.14	0.11	0.09	0.15	0.14	0.19	0.16	0.21	0.15	0.15	0.12	0.15	0.15	0.19	0.10	0.15	0.16
P	257	0.13	0.12	0.10	0.15	0.29	0.17	0.17	0.20	0.24	0.18	0.17	0.17	0.17	0.20	0.17	0.10	0.19	0.19
P	258	0.12	0.13	0.12	0.15	0.21	0.15	0.25	0.37	0.22	0.10	0.13	0.13	0.12	0.11	0.20	0.09	0.19	0.18
P	259	0.15	0.16	0.14	0.13	0.18	0.13	0.15	0.16	0.22	0.19	0.29	0.19	0.16	0.11	0.14	0.10	0.16	0.17
P	260	0.10	0.10	0.09	0.10	0.11	0.08	0.11	0.13	0.24	0.21	0.30	0.16	0.11	0.15	0.11	0.08	0.12	0.14
P	261	0.10	0.11	0.12	0.16	0.19	0.10	0.16	0.23	0.24	0.19	0.27	0.16	0.15	0.21	0.10	0.06	0.16	0.18
P	262	0.13	0.13	0.14	0.16	0.26	0.16	0.13	0.18	0.41	0.27	0.25	0.14	0.08	0.07	0.14	0.09	0.18	0.18
P	263	0.18	0.16	0.12	0.13	0.16	0.12	0.23	0.25	0.29	0.19	0.21	0.13	0.12	0.19	0.25	0.13	0.17	0.19
P	264	0.19	0.15	0.14	0.12	0.14	0.09	0.16	0.21	0.40	0.26	0.28	0.14	0.15	0.19	0.18	0.13	0.16	0.19
P	265	0.20	0.18	0.13	0.14	0.20	0.11	0.13	0.15	0.25	0.21	0.16	0.15	0.17	0.13	0.21	0.14	0.16	0.16
P	266	0.23	0.19	0.16	0.10	0.13	0.09	0.13	0.17	0.24	0.19	0.30	0.17	0.24	0.22	0.21	0.14	0.15	0.17
P	267	0.17	0.14	0.13	0.11	0.17	0.08	0.09	0.11	0.15	0.15	0.25	0.14	0.24	0.17	0.16	0.11	0.13	0.14

Table 21: Directional, annual and summer overall wind velocity ratios measured at the Other Areas of the Kai Tak City Centre at the North Apron

		Directional Wind Velocity Ratio ($VR_{500,i,j}$)																Annual Overall Wind Velocity Ratios	Summer Overall Wind Velocity Ratios
Test Point		0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5	Total	Total
P	198	0.11	0.10	0.10	0.10	0.13	0.16	0.44	0.33	0.19	0.16	0.14	0.25	0.22	0.19	0.25	0.14	0.21	0.24
P	206	0.13	0.10	0.10	0.10	0.12	0.10	0.22	0.29	0.23	0.12	0.10	0.10	0.13	0.12	0.22	0.13	0.15	0.16
P	215	0.19	0.17	0.13	0.10	0.12	0.11	0.18	0.25	0.26	0.16	0.16	0.29	0.38	0.32	0.36	0.14	0.18	0.21
P	226	0.13	0.13	0.13	0.09	0.21	0.16	0.29	0.22	0.12	0.08	0.11	0.18	0.14	0.13	0.15	0.09	0.18	0.18
P	229	0.15	0.19	0.20	0.10	0.17	0.16	0.25	0.15	0.08	0.08	0.10	0.13	0.25	0.19	0.35	0.18	0.18	0.17
P	247	0.11	0.11	0.11	0.06	0.06	0.06	0.08	0.13	0.13	0.10	0.13	0.15	0.19	0.14	0.16	0.09	0.09	0.11
P	248	0.15	0.15	0.15	0.10	0.12	0.11	0.12	0.21	0.12	0.10	0.14	0.19	0.25	0.19	0.19	0.13	0.14	0.15
P	266	0.23	0.19	0.16	0.10	0.13	0.09	0.13	0.17	0.24	0.19	0.30	0.17	0.24	0.22	0.21	0.14	0.15	0.17
P	267	0.17	0.14	0.13	0.11	0.17	0.08	0.09	0.11	0.15	0.15	0.25	0.14	0.24	0.17	0.16	0.11	0.13	0.14
P	268	0.21	0.21	0.20	0.16	0.21	0.27	0.41	0.32	0.27	0.19	0.17	0.23	0.23	0.25	0.30	0.18	0.26	0.27
P	269	0.12	0.14	0.16	0.16	0.20	0.25	0.33	0.19	0.14	0.16	0.11	0.15	0.17	0.22	0.21	0.13	0.21	0.21
P	270	0.15	0.13	0.15	0.20	0.21	0.27	0.42	0.40	0.29	0.12	0.16	0.15	0.18	0.18	0.22	0.14	0.25	0.26
P	271	0.14	0.13	0.12	0.16	0.28	0.18	0.23	0.42	0.27	0.18	0.14	0.13	0.19	0.18	0.23	0.11	0.22	0.22
P	272	0.27	0.26	0.18	0.10	0.10	0.10	0.20	0.20	0.30	0.21	0.22	0.16	0.28	0.24	0.22	0.15	0.17	0.19
P	273	0.18	0.12	0.12	0.09	0.16	0.12	0.15	0.29	0.15	0.16	0.26	0.11	0.25	0.23	0.26	0.12	0.17	0.18
P	274	0.13	0.14	0.14	0.11	0.17	0.14	0.24	0.26	0.34	0.20	0.17	0.14	0.13	0.11	0.21	0.12	0.18	0.19
P	275	0.20	0.15	0.14	0.13	0.21	0.19	0.25	0.32	0.27	0.14	0.13	0.13	0.19	0.20	0.21	0.13	0.21	0.20
P	276	0.16	0.14	0.14	0.08	0.15	0.14	0.16	0.20	0.14	0.09	0.11	0.17	0.21	0.21	0.20	0.10	0.15	0.16
P	277	0.11	0.12	0.13	0.09	0.21	0.18	0.29	0.30	0.26	0.14	0.14	0.19	0.22	0.15	0.21	0.11	0.20	0.21
P	278	0.13	0.15	0.16	0.07	0.10	0.11	0.11	0.17	0.14	0.12	0.16	0.17	0.24	0.16	0.15	0.09	0.13	0.14
P	279	0.11	0.11	0.13	0.07	0.08	0.09	0.08	0.19	0.12	0.10	0.14	0.17	0.22	0.17	0.08	0.09	0.11	0.13
P	280	0.23	0.22	0.20	0.12	0.15	0.13	0.19	0.16	0.08	0.13	0.26	0.32	0.42	0.33	0.18	0.13	0.18	0.21
P	281	0.20	0.24	0.20	0.12	0.11	0.12	0.23	0.30	0.14	0.10	0.14	0.24	0.26	0.15	0.14	0.14	0.17	0.19
P	282	0.18	0.19	0.15	0.07	0.11	0.11	0.24	0.23	0.10	0.11	0.20	0.23	0.14	0.10	0.12	0.13	0.15	0.17

Table 22: Directional, annual and summer overall wind velocity ratios measured at Assessment Areas of the Proposed Kai Tak Development

		Directional Wind Velocity Ratio (VR500,i,j)																Annual Overall Wind Velocity Ratios	Summer Overall Wind Velocity Ratios
Test Point		0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5	Total	Total
A	285	0.15	0.07	0.08	0.10	0.18	0.31	0.18	0.14	0.12	0.14	0.26	0.25	0.16	0.16	0.12	0.13	0.19	0.19
A	286	0.05	0.07	0.06	0.06	0.12	0.16	0.22	0.28	0.20	0.18	0.28	0.24	0.11	0.07	0.06	0.05	0.16	0.19
A	287	0.08	0.06	0.06	0.04	0.07	0.06	0.11	0.10	0.13	0.16	0.25	0.16	0.11	0.12	0.09	0.08	0.09	0.12
A	288	0.17	0.13	0.13	0.06	0.09	0.12	0.24	0.28	0.26	0.22	0.24	0.13	0.08	0.10	0.09	0.19	0.16	0.18
A	289	0.09	0.06	0.07	0.04	0.09	0.08	0.20	0.18	0.12	0.10	0.14	0.12	0.08	0.08	0.07	0.09	0.11	0.13
A	290	0.07	0.06	0.07	0.05	0.05	0.06	0.09	0.14	0.10	0.09	0.22	0.22	0.16	0.14	0.08	0.07	0.09	0.12
A	291	0.17	0.13	0.15	0.05	0.08	0.13	0.19	0.33	0.32	0.25	0.33	0.19	0.08	0.11	0.09	0.11	0.16	0.19
A	292	0.14	0.11	0.22	0.19	0.11	0.19	0.18	0.25	0.27	0.25	0.38	0.27	0.12	0.08	0.09	0.10	0.18	0.21
A	293	0.07	0.06	0.11	0.15	0.12	0.19	0.17	0.24	0.28	0.31	0.48	0.28	0.18	0.24	0.15	0.08	0.18	0.23
A	294	0.12	0.12	0.21	0.27	0.14	0.20	0.28	0.25	0.22	0.22	0.38	0.13	0.06	0.06	0.07	0.09	0.19	0.20
A	295	0.07	0.06	0.09	0.11	0.08	0.17	0.26	0.21	0.23	0.19	0.29	0.10	0.06	0.10	0.08	0.07	0.15	0.17
A	296	0.16	0.12	0.17	0.16	0.15	0.28	0.34	0.43	0.35	0.28	0.34	0.19	0.12	0.15	0.15	0.16	0.25	0.27
A	297	0.11	0.11	0.19	0.24	0.17	0.28	0.50	0.46	0.41	0.29	0.32	0.30	0.25	0.32	0.26	0.15	0.29	0.34
A	298	0.16	0.13	0.14	0.13	0.11	0.28	0.32	0.40	0.36	0.24	0.13	0.13	0.14	0.24	0.21	0.14	0.22	0.24
A	299	0.11	0.08	0.12	0.14	0.12	0.19	0.26	0.26	0.22	0.10	0.19	0.21	0.19	0.22	0.13	0.09	0.18	0.20
A	300	0.05	0.05	0.06	0.09	0.08	0.14	0.14	0.08	0.15	0.19	0.30	0.26	0.10	0.14	0.10	0.08	0.12	0.15
A	301	0.07	0.06	0.07	0.06	0.07	0.10	0.09	0.07	0.15	0.21	0.34	0.28	0.12	0.15	0.13	0.10	0.11	0.15
A	302	0.07	0.05	0.09	0.09	0.10	0.19	0.11	0.07	0.17	0.15	0.17	0.13	0.08	0.06	0.06	0.06	0.12	0.12
A	303	0.06	0.06	0.07	0.05	0.07	0.13	0.17	0.32	0.34	0.31	0.41	0.26	0.06	0.06	0.06	0.07	0.15	0.20
A	304	0.08	0.06	0.08	0.08	0.05	0.07	0.09	0.10	0.10	0.09	0.15	0.11	0.09	0.08	0.07	0.07	0.08	0.09
A	305	0.06	0.08	0.09	0.06	0.06	0.10	0.10	0.09	0.09	0.08	0.10	0.10	0.09	0.09	0.08	0.08	0.09	0.09
A	306	0.09	0.08	0.06	0.05	0.04	0.05	0.11	0.15	0.28	0.25	0.37	0.15	0.06	0.06	0.06	0.07	0.10	0.14
A	307	0.14	0.14	0.17	0.12	0.09	0.13	0.19	0.26	0.35	0.35	0.40	0.32	0.27	0.18	0.16	0.19	0.18	0.24
A	308	0.09	0.09	0.11	0.07	0.09	0.14	0.17	0.13	0.13	0.14	0.18	0.16	0.15	0.16	0.12	0.14	0.13	0.14
A	309	0.06	0.06	0.09	0.08	0.06	0.07	0.12	0.20	0.21	0.19	0.15	0.18	0.15	0.11	0.08	0.13	0.11	0.14
A	310	0.09	0.09	0.10	0.08	0.08	0.11	0.18	0.13	0.18	0.17	0.26	0.22	0.15	0.14	0.10	0.15	0.13	0.16
A	311	0.09	0.10	0.12	0.09	0.08	0.07	0.11	0.16	0.21	0.18	0.26	0.25	0.21	0.14	0.09	0.13	0.12	0.16

Table22 (cont.): Directional, annual and summer overall wind velocity ratios measured at Assessment Areas of the Proposed Kai Tak Development

		Directional Wind Velocity Ratio ($VR_{500,i,j}$)																Annual Overall Wind Velocity Ratios	Summer Overall Wind Velocity Ratios
Test Point		0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5	Total	Total
A	312	0.18	0.09	0.12	0.09	0.08	0.07	0.11	0.13	0.25	0.22	0.27	0.24	0.08	0.16	0.09	0.15	0.12	0.15
A	313	0.22	0.13	0.12	0.07	0.07	0.09	0.13	0.15	0.13	0.11	0.13	0.10	0.08	0.10	0.10	0.18	0.11	0.11
A	314	0.10	0.06	0.07	0.06	0.07	0.07	0.12	0.22	0.27	0.25	0.41	0.27	0.07	0.13	0.08	0.11	0.12	0.17
A	315	0.13	0.08	0.07	0.06	0.06	0.06	0.14	0.15	0.21	0.16	0.13	0.10	0.06	0.07	0.11	0.16	0.10	0.11
A	316	0.16	0.12	0.14	0.11	0.11	0.17	0.39	0.48	0.44	0.30	0.29	0.20	0.13	0.24	0.16	0.20	0.23	0.27
A	317	0.16	0.12	0.06	0.06	0.06	0.07	0.18	0.18	0.17	0.08	0.09	0.05	0.09	0.12	0.17	0.22	0.11	0.12
A	318	0.15	0.14	0.12	0.09	0.13	0.18	0.32	0.37	0.34	0.28	0.34	0.12	0.23	0.21	0.15	0.15	0.21	0.25
A	319	0.17	0.13	0.15	0.10	0.12	0.15	0.25	0.26	0.24	0.18	0.19	0.18	0.16	0.14	0.19	0.16	0.17	0.19
A	320	0.09	0.08	0.08	0.05	0.06	0.10	0.22	0.26	0.16	0.07	0.10	0.18	0.12	0.10	0.08	0.09	0.13	0.15
A	321	0.07	0.07	0.10	0.07	0.09	0.10	0.21	0.13	0.13	0.10	0.13	0.10	0.09	0.12	0.10	0.12	0.12	0.13
A	322	0.07	0.06	0.08	0.05	0.06	0.07	0.18	0.22	0.10	0.14	0.13	0.23	0.18	0.12	0.10	0.10	0.12	0.15
A	323	0.11	0.06	0.07	0.07	0.07	0.08	0.15	0.09	0.10	0.11	0.14	0.14	0.08	0.10	0.20	0.24	0.11	0.12
A	324	0.09	0.06	0.08	0.06	0.05	0.06	0.11	0.09	0.11	0.10	0.14	0.17	0.13	0.11	0.10	0.10	0.09	0.11
A	325	0.15	0.10	0.12	0.11	0.10	0.13	0.19	0.16	0.15	0.13	0.17	0.18	0.12	0.15	0.16	0.14	0.14	0.15
A	326	0.40	0.17	0.16	0.15	0.11	0.12	0.20	0.29	0.29	0.21	0.41	0.30	0.23	0.27	0.30	0.42	0.21	0.24
A	327	0.25	0.13	0.13	0.12	0.10	0.11	0.17	0.27	0.31	0.22	0.41	0.32	0.27	0.27	0.42	0.16	0.19	0.23
A	328	0.14	0.10	0.09	0.11	0.10	0.18	0.27	0.22	0.17	0.14	0.38	0.36	0.26	0.29	0.20	0.12	0.19	0.24
A	329	0.55	0.25	0.23	0.20	0.13	0.19	0.26	0.43	0.44	0.36	0.57	0.39	0.14	0.48	0.48	0.53	0.29	0.32
A	330	0.28	0.24	0.16	0.09	0.11	0.10	0.25	0.38	0.32	0.18	0.23	0.17	0.22	0.16	0.13	0.16	0.19	0.21
A	331	0.34	0.44	0.32	0.19	0.13	0.18	0.30	0.32	0.28	0.15	0.23	0.13	0.14	0.22	0.11	0.21	0.22	0.21
A	332	0.20	0.24	0.21	0.15	0.22	0.18	0.15	0.21	0.25	0.14	0.33	0.27	0.27	0.17	0.17	0.16	0.20	0.21
A	333	0.11	0.11	0.12	0.08	0.08	0.09	0.15	0.23	0.17	0.13	0.17	0.21	0.29	0.08	0.12	0.08	0.13	0.16
A	334	0.25	0.24	0.18	0.15	0.17	0.25	0.31	0.20	0.27	0.14	0.23	0.13	0.12	0.07	0.12	0.16	0.21	0.20
A	335	0.17	0.25	0.23	0.18	0.21	0.14	0.29	0.14	0.21	0.21	0.33	0.21	0.16	0.11	0.16	0.12	0.20	0.21
A	336	0.26	0.40	0.40	0.28	0.31	0.29	0.18	0.19	0.13	0.23	0.34	0.34	0.36	0.15	0.12	0.12	0.26	0.25
A	337	0.17	0.24	0.24	0.17	0.15	0.10	0.15	0.16	0.14	0.13	0.14	0.13	0.13	0.09	0.10	0.10	0.14	0.13
A	338	0.17	0.27	0.29	0.18	0.18	0.17	0.08	0.14	0.13	0.19	0.28	0.27	0.25	0.10	0.13	0.10	0.17	0.17

Table22 (cont.): Directional, annual and summer overall wind velocity ratios measured at Assessment Areas of the Proposed Kai Tak Development

		Directional Wind Velocity Ratio ($VR_{500,i,j}$)																Annual Overall Wind Velocity Ratios	Summer Overall Wind Velocity Ratios
Test Point		0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5	Total	Total
A	339	0.14	0.25	0.28	0.21	0.17	0.16	0.09	0.21	0.11	0.11	0.14	0.13	0.11	0.09	0.11	0.10	0.15	0.13
A	340	0.08	0.07	0.09	0.10	0.11	0.11	0.10	0.20	0.16	0.13	0.13	0.12	0.11	0.07	0.08	0.07	0.11	0.12
A	341	0.19	0.22	0.22	0.14	0.14	0.12	0.16	0.13	0.12	0.09	0.12	0.11	0.12	0.13	0.13	0.13	0.14	0.13
A	342	0.14	0.16	0.17	0.12	0.15	0.14	0.25	0.14	0.21	0.18	0.21	0.18	0.13	0.15	0.14	0.10	0.16	0.18
A	343	0.12	0.12	0.12	0.10	0.13	0.12	0.25	0.15	0.10	0.08	0.11	0.10	0.08	0.08	0.11	0.11	0.14	0.13
A	344	0.11	0.10	0.12	0.13	0.13	0.15	0.15	0.18	0.13	0.10	0.12	0.12	0.12	0.08	0.11	0.07	0.13	0.13
A	345	0.20	0.18	0.14	0.12	0.13	0.08	0.13	0.14	0.14	0.10	0.12	0.08	0.09	0.05	0.10	0.15	0.12	0.11
A	346	0.17	0.17	0.19	0.17	0.11	0.13	0.17	0.14	0.18	0.23	0.21	0.10	0.10	0.10	0.13	0.16	0.15	0.15
A	347	0.12	0.11	0.11	0.10	0.10	0.08	0.12	0.08	0.06	0.07	0.08	0.07	0.10	0.10	0.19	0.13	0.10	0.09
A	348	0.14	0.10	0.10	0.10	0.10	0.14	0.21	0.19	0.07	0.08	0.08	0.08	0.09	0.10	0.20	0.12	0.13	0.13
A	349	0.14	0.13	0.10	0.06	0.10	0.06	0.11	0.16	0.07	0.09	0.11	0.09	0.11	0.11	0.22	0.14	0.10	0.10
A	350	0.31	0.27	0.18	0.09	0.12	0.16	0.17	0.23	0.15	0.11	0.09	0.07	0.08	0.13	0.20	0.22	0.16	0.14
A	351	0.17	0.12	0.11	0.05	0.07	0.13	0.12	0.18	0.10	0.13	0.08	0.07	0.07	0.22	0.28	0.18	0.12	0.12
A	352	0.10	0.10	0.11	0.05	0.08	0.11	0.18	0.20	0.08	0.09	0.07	0.09	0.07	0.17	0.24	0.14	0.12	0.12
A	353	0.29	0.26	0.26	0.17	0.12	0.21	0.25	0.23	0.15	0.14	0.15	0.12	0.10	0.13	0.31	0.25	0.20	0.18
A	354	0.33	0.34	0.30	0.16	0.13	0.17	0.23	0.19	0.14	0.13	0.15	0.13	0.08	0.11	0.26	0.24	0.18	0.16
A	355	0.19	0.25	0.21	0.12	0.15	0.16	0.20	0.16	0.13	0.12	0.14	0.13	0.10	0.12	0.17	0.13	0.16	0.15
A	356	0.16	0.23	0.23	0.24	0.24	0.19	0.11	0.11	0.14	0.07	0.08	0.10	0.10	0.07	0.12	0.12	0.16	0.13
A	357	0.25	0.34	0.34	0.29	0.28	0.15	0.11	0.18	0.12	0.11	0.17	0.20	0.17	0.10	0.14	0.15	0.19	0.16
A	358	0.21	0.31	0.30	0.27	0.21	0.12	0.14	0.15	0.10	0.08	0.09	0.10	0.21	0.24	0.17	0.14	0.17	0.14
A	359	0.12	0.15	0.15	0.14	0.13	0.10	0.14	0.19	0.12	0.11	0.13	0.16	0.14	0.14	0.12	0.09	0.13	0.14
A	360	0.14	0.13	0.18	0.14	0.11	0.06	0.10	0.09	0.06	0.10	0.15	0.16	0.32	0.25	0.37	0.12	0.12	0.13
A	361	0.12	0.12	0.14	0.11	0.25	0.15	0.22	0.36	0.25	0.22	0.25	0.18	0.22	0.10	0.11	0.08	0.20	0.22
A	362	0.07	0.06	0.05	0.05	0.06	0.06	0.07	0.15	0.10	0.11	0.17	0.11	0.27	0.17	0.27	0.07	0.09	0.12
A	363	0.20	0.15	0.09	0.11	0.15	0.18	0.24	0.35	0.15	0.13	0.11	0.12	0.23	0.25	0.38	0.15	0.19	0.20
A	364	0.13	0.15	0.11	0.08	0.10	0.10	0.12	0.15	0.09	0.10	0.11	0.24	0.15	0.19	0.14	0.08	0.12	0.14
A	365	0.17	0.11	0.08	0.09	0.07	0.06	0.10	0.17	0.18	0.14	0.14	0.20	0.14	0.09	0.16	0.10	0.11	0.13

Table22 (cont.): Directional, annual and summer overall wind velocity ratios measured at Assessment Areas of the Proposed Kai Tak Development

		Directional Wind Velocity Ratio ($VR_{500,i,j}$)																Annual Overall Wind Velocity Ratios	Summer Overall Wind Velocity Ratios
Test Point		0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5	Total	Total
A	366	0.38	0.35	0.19	0.07	0.07	0.16	0.28	0.38	0.27	0.22	0.19	0.16	0.30	0.26	0.31	0.17	0.21	0.23
A	367	0.21	0.16	0.10	0.06	0.06	0.11	0.19	0.27	0.20	0.14	0.13	0.10	0.14	0.13	0.13	0.10	0.14	0.15
A	368	0.15	0.15	0.12	0.07	0.07	0.12	0.22	0.18	0.15	0.09	0.14	0.18	0.30	0.21	0.18	0.09	0.14	0.17
A	369	0.13	0.13	0.13	0.11	0.13	0.12	0.14	0.14	0.11	0.11	0.16	0.21	0.33	0.23	0.20	0.09	0.14	0.16
A	370	0.16	0.18	0.13	0.09	0.08	0.15	0.25	0.25	0.13	0.12	0.18	0.12	0.14	0.12	0.19	0.13	0.16	0.17
A	371	0.13	0.12	0.14	0.10	0.11	0.09	0.14	0.11	0.13	0.12	0.15	0.11	0.12	0.15	0.33	0.17	0.12	0.13
A	372	0.15	0.12	0.11	0.09	0.11	0.13	0.15	0.16	0.15	0.16	0.19	0.15	0.23	0.23	0.35	0.19	0.15	0.16
A	373	0.11	0.14	0.18	0.10	0.10	0.08	0.12	0.22	0.10	0.14	0.15	0.12	0.23	0.24	0.21	0.09	0.13	0.14
A	374	0.12	0.10	0.07	0.07	0.05	0.05	0.05	0.06	0.06	0.09	0.10	0.08	0.12	0.14	0.17	0.12	0.07	0.08
A	375	0.11	0.10	0.13	0.11	0.18	0.17	0.20	0.26	0.15	0.11	0.13	0.15	0.22	0.26	0.27	0.14	0.18	0.18
A	376	0.09	0.10	0.15	0.10	0.13	0.11	0.14	0.26	0.14	0.17	0.16	0.11	0.10	0.10	0.12	0.09	0.13	0.14
A	377	0.15	0.15	0.11	0.09	0.13	0.11	0.14	0.18	0.13	0.13	0.12	0.11	0.18	0.21	0.21	0.13	0.13	0.14
A	378	0.15	0.13	0.14	0.08	0.16	0.14	0.16	0.22	0.16	0.13	0.12	0.09	0.13	0.17	0.23	0.14	0.15	0.15
A	379	0.11	0.07	0.08	0.04	0.10	0.08	0.19	0.16	0.10	0.11	0.13	0.09	0.05	0.07	0.11	0.11	0.11	0.12
A	380	0.13	0.12	0.11	0.08	0.13	0.11	0.15	0.18	0.12	0.10	0.10	0.09	0.12	0.14	0.17	0.14	0.13	0.13
A	381	0.12	0.12	0.11	0.07	0.14	0.11	0.21	0.19	0.13	0.13	0.14	0.11	0.10	0.13	0.19	0.12	0.14	0.14
A	382	0.19	0.14	0.12	0.07	0.18	0.12	0.28	0.26	0.16	0.21	0.20	0.12	0.12	0.28	0.40	0.21	0.19	0.20
A	383	0.10	0.09	0.11	0.07	0.16	0.10	0.18	0.18	0.11	0.12	0.15	0.09	0.10	0.12	0.20	0.10	0.13	0.13
A	384	0.15	0.14	0.15	0.09	0.17	0.13	0.28	0.28	0.18	0.20	0.22	0.18	0.10	0.13	0.23	0.14	0.18	0.19
A	385	0.14	0.13	0.09	0.07	0.19	0.15	0.27	0.25	0.16	0.16	0.14	0.11	0.08	0.12	0.25	0.14	0.17	0.17
A	386	0.09	0.11	0.09	0.06	0.11	0.10	0.21	0.22	0.14	0.16	0.19	0.16	0.07	0.07	0.07	0.06	0.13	0.15
A	387	0.10	0.09	0.09	0.07	0.12	0.09	0.13	0.17	0.13	0.12	0.13	0.10	0.10	0.08	0.13	0.09	0.11	0.12
A	388	0.12	0.11	0.12	0.12	0.15	0.14	0.18	0.19	0.09	0.09	0.10	0.10	0.13	0.15	0.10	0.10	0.14	0.13
A	389	0.11	0.12	0.15	0.15	0.17	0.19	0.25	0.17	0.10	0.12	0.13	0.14	0.10	0.09	0.12	0.09	0.17	0.16
A	390	0.09	0.11	0.16	0.16	0.21	0.18	0.18	0.09	0.13	0.12	0.10	0.09	0.07	0.08	0.12	0.10	0.15	0.13
A	391	0.20	0.27	0.28	0.24	0.25	0.26	0.31	0.19	0.14	0.16	0.19	0.37	0.39	0.28	0.22	0.12	0.25	0.27
A	392	0.15	0.15	0.20	0.23	0.26	0.28	0.39	0.25	0.15	0.15	0.14	0.21	0.19	0.13	0.18	0.13	0.25	0.24

Table22 (cont.): Directional, annual and summer overall wind velocity ratios measured at Assessment Areas of the Proposed Kai Tak Development

		Directional Wind Velocity Ratio ($VR_{500,i,j}$)																Annual Overall Wind Velocity Ratios	Summer Overall Wind Velocity Ratios
Test Point		0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5	Total	Total
A	393	0.21	0.23	0.25	0.21	0.28	0.40	0.55	0.35	0.25	0.18	0.10	0.15	0.24	0.31	0.36	0.18	0.32	0.31
A	394	0.19	0.16	0.19	0.16	0.13	0.12	0.18	0.20	0.14	0.18	0.10	0.25	0.23	0.28	0.37	0.22	0.17	0.18
A	395	0.34	0.29	0.27	0.18	0.16	0.28	0.48	0.35	0.32	0.31	0.27	0.24	0.15	0.25	0.40	0.30	0.29	0.30
A	396	0.24	0.26	0.20	0.12	0.12	0.12	0.15	0.23	0.14	0.17	0.10	0.11	0.11	0.12	0.19	0.14	0.15	0.14
A	397	0.18	0.18	0.17	0.14	0.17	0.10	0.14	0.24	0.22	0.10	0.12	0.07	0.08	0.07	0.10	0.13	0.14	0.13
A	398	0.14	0.17	0.14	0.11	0.08	0.08	0.11	0.17	0.22	0.13	0.17	0.10	0.11	0.08	0.11	0.10	0.11	0.12
A	399	0.16	0.23	0.24	0.14	0.15	0.22	0.32	0.32	0.16	0.09	0.09	0.07	0.07	0.13	0.24	0.14	0.20	0.18
A	400	0.16	0.20	0.17	0.16	0.17	0.15	0.33	0.38	0.31	0.13	0.13	0.11	0.11	0.09	0.11	0.11	0.20	0.20
A	401	0.15	0.17	0.16	0.15	0.23	0.24	0.33	0.29	0.22	0.09	0.11	0.11	0.14	0.12	0.17	0.11	0.22	0.20
A	402	0.10	0.15	0.11	0.22	0.22	0.24	0.38	0.41	0.30	0.11	0.10	0.05	0.07	0.09	0.09	0.06	0.22	0.21
A	403	0.11	0.13	0.09	0.09	0.09	0.09	0.12	0.17	0.10	0.09	0.08	0.10	0.12	0.10	0.10	0.09	0.11	0.11
A	404	0.10	0.15	0.17	0.23	0.33	0.30	0.27	0.18	0.17	0.09	0.10	0.07	0.08	0.07	0.09	0.07	0.22	0.18
A	405	0.08	0.08	0.08	0.06	0.10	0.11	0.20	0.13	0.07	0.06	0.07	0.10	0.08	0.08	0.10	0.06	0.11	0.11
A	406	0.13	0.14	0.12	0.10	0.18	0.15	0.12	0.14	0.11	0.10	0.11	0.12	0.10	0.15	0.16	0.09	0.14	0.13
A	407	0.09	0.09	0.09	0.12	0.32	0.31	0.38	0.28	0.14	0.12	0.08	0.09	0.08	0.11	0.11	0.06	0.23	0.21
A	408	0.10	0.11	0.11	0.08	0.10	0.10	0.16	0.15	0.10	0.10	0.16	0.11	0.08	0.17	0.11	0.07	0.12	0.12
A	409	0.08	0.13	0.23	0.22	0.37	0.36	0.38	0.24	0.12	0.08	0.10	0.09	0.06	0.09	0.08	0.06	0.26	0.21
A	410	0.05	0.10	0.21	0.23	0.44	0.47	0.55	0.35	0.13	0.09	0.10	0.12	0.06	0.10	0.07	0.04	0.32	0.28
A	411	0.05	0.07	0.09	0.05	0.14	0.24	0.11	0.07	0.04	0.04	0.05	0.05	0.05	0.07	0.06	0.04	0.11	0.09
A	412	0.09	0.10	0.14	0.16	0.23	0.18	0.18	0.14	0.09	0.06	0.08	0.07	0.10	0.12	0.14	0.08	0.15	0.13
A	413	0.10	0.09	0.08	0.06	0.11	0.10	0.09	0.06	0.05	0.05	0.10	0.12	0.08	0.15	0.11	0.09	0.09	0.09
A	414	0.15	0.23	0.33	0.30	0.36	0.25	0.29	0.22	0.23	0.16	0.20	0.20	0.09	0.11	0.29	0.10	0.26	0.23
A	415	0.15	0.18	0.21	0.18	0.25	0.26	0.25	0.12	0.11	0.10	0.20	0.13	0.15	0.14	0.22	0.11	0.20	0.18

Table 23: Directional, annual and summer overall wind velocity ratios measured at Outside Assessment Areas of the Proposed Kai Tak Development

		Directional Wind Velocity Ratio (VR500,i,j)																Annual Overall Wind Velocity Ratios	Summer Overall Wind Velocity Ratios
Test Point		0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5	Total	Total
A	416	0.13	0.12	0.13	0.08	0.17	0.34	0.21	0.34	0.31	0.20	0.16	0.16	0.07	0.08	0.10	0.13	0.21	0.21
A	417	0.11	0.08	0.11	0.06	0.08	0.10	0.08	0.19	0.22	0.21	0.36	0.29	0.15	0.08	0.06	0.09	0.12	0.16
A	418	0.16	0.14	0.18	0.09	0.07	0.13	0.13	0.15	0.23	0.23	0.35	0.29	0.15	0.11	0.12	0.13	0.15	0.18
A	419	0.23	0.17	0.21	0.16	0.08	0.24	0.18	0.13	0.15	0.14	0.20	0.16	0.09	0.09	0.14	0.21	0.16	0.16
A	420	0.08	0.06	0.09	0.06	0.05	0.07	0.15	0.06	0.07	0.08	0.15	0.15	0.09	0.06	0.07	0.08	0.08	0.10
A	421	0.19	0.14	0.18	0.12	0.07	0.11	0.10	0.11	0.18	0.20	0.37	0.37	0.23	0.18	0.17	0.18	0.14	0.18
A	422	0.09	0.09	0.18	0.15	0.09	0.15	0.13	0.23	0.26	0.21	0.32	0.26	0.16	0.09	0.08	0.09	0.15	0.18
A	423	0.06	0.05	0.08	0.09	0.09	0.11	0.23	0.13	0.11	0.10	0.14	0.11	0.08	0.05	0.05	0.07	0.11	0.13
A	424	0.07	0.06	0.10	0.10	0.08	0.14	0.28	0.35	0.28	0.23	0.30	0.11	0.06	0.05	0.06	0.06	0.16	0.19
A	425	0.09	0.08	0.11	0.09	0.07	0.14	0.19	0.10	0.18	0.22	0.28	0.19	0.12	0.08	0.08	0.09	0.13	0.16
A	426	0.06	0.05	0.08	0.09	0.07	0.12	0.08	0.12	0.13	0.08	0.08	0.06	0.04	0.06	0.06	0.07	0.09	0.08
A	427	0.10	0.10	0.17	0.15	0.12	0.06	0.11	0.13	0.11	0.10	0.13	0.09	0.10	0.10	0.07	0.10	0.10	0.10
A	428	0.14	0.10	0.09	0.07	0.06	0.15	0.10	0.12	0.06	0.05	0.07	0.05	0.07	0.06	0.07	0.13	0.10	0.09
A	429	0.14	0.10	0.09	0.06	0.06	0.07	0.14	0.10	0.14	0.14	0.12	0.06	0.08	0.11	0.14	0.16	0.10	0.10
A	430	0.20	0.13	0.12	0.10	0.06	0.05	0.12	0.12	0.09	0.08	0.07	0.10	0.10	0.07	0.09	0.16	0.09	0.09
A	431	0.13	0.09	0.11	0.10	0.05	0.05	0.06	0.05	0.10	0.11	0.14	0.11	0.07	0.09	0.08	0.12	0.07	0.08
A	432	0.27	0.20	0.24	0.25	0.21	0.14	0.22	0.23	0.16	0.12	0.18	0.15	0.14	0.16	0.14	0.22	0.19	0.18
A	433	0.05	0.07	0.09	0.06	0.05	0.07	0.07	0.08	0.27	0.21	0.24	0.10	0.10	0.11	0.05	0.06	0.09	0.11
A	434	0.17	0.12	0.15	0.14	0.13	0.16	0.26	0.25	0.16	0.13	0.22	0.16	0.13	0.20	0.21	0.22	0.18	0.19
A	435	0.10	0.12	0.17	0.17	0.14	0.07	0.08	0.06	0.06	0.05	0.10	0.09	0.09	0.12	0.16	0.09	0.10	0.09
A	436	0.07	0.06	0.09	0.09	0.07	0.05	0.07	0.09	0.16	0.15	0.22	0.14	0.08	0.10	0.09	0.08	0.08	0.10
A	437	0.14	0.06	0.07	0.05	0.06	0.04	0.05	0.10	0.17	0.09	0.05	0.06	0.05	0.06	0.08	0.16	0.07	0.07
A	438	0.11	0.12	0.10	0.05	0.05	0.07	0.12	0.16	0.12	0.13	0.20	0.21	0.20	0.11	0.19	0.19	0.11	0.14
A	439	0.12	0.09	0.10	0.07	0.08	0.11	0.15	0.13	0.14	0.12	0.14	0.15	0.14	0.11	0.13	0.12	0.12	0.13
A	440	0.21	0.14	0.16	0.14	0.11	0.13	0.19	0.21	0.16	0.13	0.22	0.29	0.16	0.14	0.19	0.21	0.17	0.18
A	441	0.07	0.06	0.08	0.07	0.06	0.11	0.15	0.13	0.09	0.09	0.14	0.27	0.15	0.17	0.27	0.15	0.12	0.14

Table 23 (cont.): Directional, annual and summer overall wind velocity ratios measured at Outside Assessment Areas of the Proposed Kai Tak Development

		Directional Wind Velocity Ratio ($VR_{500,i,j}$)																Annual Overall Wind Velocity Ratios	Summer Overall Wind Velocity Ratios
Test Point		0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5	Total	Total
A	442	0.07	0.05	0.06	0.06	0.06	0.09	0.14	0.14	0.20	0.19	0.42	0.31	0.09	0.09	0.08	0.08	0.12	0.17
A	443	0.16	0.10	0.09	0.08	0.07	0.08	0.14	0.25	0.27	0.23	0.48	0.36	0.11	0.29	0.25	0.20	0.15	0.21
A	444	0.31	0.13	0.12	0.10	0.06	0.07	0.10	0.12	0.16	0.17	0.45	0.26	0.18	0.18	0.34	0.43	0.14	0.17
A	445	0.10	0.10	0.10	0.10	0.09	0.24	0.39	0.13	0.28	0.28	0.31	0.16	0.17	0.14	0.17	0.13	0.20	0.23
A	446	0.24	0.13	0.12	0.13	0.14	0.27	0.40	0.25	0.32	0.20	0.32	0.27	0.26	0.18	0.25	0.30	0.25	0.28
A	447	0.17	0.18	0.13	0.10	0.11	0.33	0.35	0.20	0.24	0.21	0.12	0.11	0.11	0.09	0.12	0.13	0.20	0.21
A	448	0.14	0.13	0.13	0.09	0.08	0.13	0.21	0.16	0.15	0.12	0.22	0.21	0.17	0.14	0.14	0.12	0.14	0.16
A	449	0.16	0.16	0.14	0.11	0.15	0.20	0.36	0.30	0.33	0.21	0.28	0.18	0.15	0.10	0.18	0.12	0.21	0.24
A	450	0.09	0.09	0.09	0.07	0.08	0.12	0.18	0.14	0.18	0.14	0.19	0.13	0.09	0.08	0.08	0.07	0.12	0.14
A	451	0.13	0.18	0.16	0.08	0.09	0.11	0.25	0.19	0.22	0.16	0.24	0.13	0.13	0.10	0.13	0.12	0.15	0.17
A	452	0.15	0.21	0.18	0.17	0.25	0.07	0.08	0.11	0.07	0.11	0.13	0.20	0.21	0.10	0.13	0.10	0.14	0.13
A	453	0.15	0.15	0.12	0.15	0.23	0.07	0.14	0.15	0.09	0.08	0.10	0.13	0.16	0.15	0.18	0.15	0.14	0.13
A	454	0.16	0.22	0.26	0.19	0.18	0.26	0.18	0.13	0.16	0.09	0.11	0.13	0.26	0.15	0.26	0.14	0.19	0.17
A	455	0.17	0.33	0.28	0.13	0.15	0.22	0.18	0.09	0.09	0.06	0.13	0.18	0.24	0.10	0.13	0.10	0.17	0.16
A	456	0.13	0.17	0.17	0.13	0.14	0.11	0.17	0.13	0.12	0.07	0.09	0.12	0.18	0.14	0.16	0.13	0.14	0.13
A	457	0.12	0.15	0.14	0.10	0.11	0.15	0.19	0.09	0.08	0.07	0.12	0.17	0.18	0.09	0.10	0.08	0.13	0.14
A	458	0.25	0.34	0.32	0.14	0.15	0.18	0.18	0.24	0.15	0.09	0.14	0.15	0.15	0.12	0.16	0.16	0.18	0.16
A	459	0.13	0.23	0.32	0.19	0.08	0.05	0.27	0.09	0.07	0.09	0.15	0.16	0.14	0.13	0.10	0.12	0.13	0.14
A	460	0.22	0.27	0.26	0.20	0.21	0.20	0.37	0.25	0.31	0.30	0.42	0.36	0.26	0.18	0.14	0.18	0.25	0.29
A	461	0.12	0.18	0.18	0.15	0.14	0.10	0.14	0.12	0.10	0.12	0.18	0.18	0.16	0.15	0.14	0.10	0.13	0.14
A	462	0.13	0.19	0.21	0.19	0.16	0.13	0.13	0.14	0.10	0.12	0.27	0.26	0.18	0.16	0.15	0.12	0.16	0.17
A	463	0.11	0.16	0.25	0.19	0.14	0.14	0.14	0.14	0.13	0.16	0.22	0.18	0.11	0.12	0.11	0.09	0.15	0.15
A	464	0.33	0.26	0.26	0.27	0.25	0.13	0.16	0.18	0.12	0.10	0.13	0.11	0.10	0.08	0.24	0.27	0.19	0.15
A	465	0.22	0.17	0.17	0.15	0.15	0.12	0.20	0.28	0.17	0.13	0.12	0.09	0.11	0.10	0.19	0.17	0.16	0.15
A	466	0.21	0.18	0.22	0.24	0.22	0.10	0.10	0.08	0.06	0.05	0.07	0.07	0.08	0.07	0.17	0.17	0.13	0.10
A	467	0.17	0.15	0.17	0.19	0.20	0.19	0.18	0.16	0.15	0.11	0.12	0.16	0.19	0.18	0.26	0.14	0.18	0.17

Table 23 (cont.): Directional, annual and summer overall wind velocity ratios measured at Outside Assessment Areas of the Proposed Kai Tak Development

		Directional Wind Velocity Ratio ($VR_{500,i,j}$)																Annual Overall Wind Velocity Ratios	Summer Overall Wind Velocity Ratios
Test Point		0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5	Total	Total
A	468	0.12	0.10	0.08	0.08	0.10	0.14	0.19	0.20	0.12	0.08	0.09	0.10	0.10	0.11	0.17	0.12	0.13	0.13
A	469	0.25	0.17	0.12	0.10	0.18	0.10	0.21	0.24	0.11	0.15	0.13	0.12	0.11	0.15	0.29	0.21	0.16	0.16
A	470	0.12	0.11	0.10	0.10	0.11	0.08	0.09	0.16	0.11	0.09	0.11	0.07	0.05	0.05	0.05	0.09	0.10	0.09
A	471	0.19	0.14	0.11	0.10	0.08	0.06	0.08	0.09	0.08	0.07	0.15	0.22	0.13	0.12	0.07	0.14	0.10	0.11
A	472	0.18	0.14	0.10	0.05	0.10	0.06	0.11	0.18	0.06	0.06	0.08	0.11	0.08	0.06	0.06	0.08	0.10	0.10
A	473	0.08	0.10	0.10	0.08	0.12	0.09	0.14	0.23	0.08	0.07	0.10	0.13	0.10	0.08	0.06	0.06	0.11	0.12
A	474	0.15	0.12	0.08	0.08	0.13	0.12	0.13	0.16	0.09	0.09	0.14	0.21	0.16	0.17	0.12	0.12	0.13	0.14
A	475	0.17	0.13	0.10	0.12	0.19	0.09	0.13	0.14	0.08	0.07	0.09	0.19	0.17	0.18	0.15	0.08	0.13	0.13
A	476	0.09	0.11	0.13	0.10	0.10	0.06	0.09	0.10	0.07	0.10	0.15	0.22	0.18	0.18	0.16	0.07	0.11	0.12
A	477	0.07	0.08	0.10	0.09	0.11	0.06	0.12	0.09	0.10	0.10	0.13	0.13	0.16	0.22	0.16	0.06	0.10	0.12
A	478	0.09	0.08	0.08	0.06	0.08	0.06	0.11	0.16	0.12	0.10	0.11	0.14	0.14	0.12	0.12	0.07	0.10	0.11
A	479	0.13	0.21	0.19	0.12	0.11	0.07	0.11	0.15	0.12	0.12	0.15	0.26	0.22	0.23	0.24	0.12	0.13	0.15
A	480	0.13	0.16	0.12	0.08	0.06	0.08	0.12	0.17	0.15	0.12	0.19	0.22	0.25	0.16	0.31	0.14	0.13	0.15
A	481	0.11	0.10	0.10	0.06	0.06	0.08	0.12	0.17	0.18	0.20	0.20	0.19	0.22	0.12	0.23	0.12	0.12	0.15
A	482	0.12	0.10	0.10	0.11	0.09	0.09	0.10	0.12	0.13	0.11	0.12	0.15	0.19	0.21	0.17	0.11	0.11	0.12
A	483	0.16	0.15	0.13	0.12	0.11	0.11	0.14	0.20	0.14	0.15	0.17	0.25	0.25	0.25	0.16	0.13	0.15	0.17
A	484	0.13	0.14	0.09	0.07	0.06	0.07	0.08	0.09	0.07	0.09	0.13	0.14	0.18	0.18	0.22	0.11	0.09	0.10
A	485	0.12	0.10	0.09	0.07	0.13	0.10	0.14	0.12	0.07	0.11	0.14	0.09	0.13	0.13	0.16	0.11	0.11	0.12
A	486	0.11	0.11	0.10	0.06	0.11	0.10	0.17	0.16	0.10	0.11	0.13	0.10	0.08	0.14	0.16	0.09	0.12	0.12
A	487	0.13	0.08	0.08	0.07	0.14	0.10	0.17	0.14	0.09	0.12	0.13	0.08	0.12	0.17	0.38	0.18	0.13	0.13
A	488	0.15	0.15	0.10	0.06	0.12	0.09	0.16	0.15	0.06	0.10	0.13	0.09	0.10	0.10	0.11	0.12	0.12	0.12
A	489	0.10	0.09	0.09	0.07	0.10	0.07	0.11	0.07	0.08	0.09	0.11	0.12	0.09	0.10	0.08	0.08	0.09	0.10
A	490	0.08	0.08	0.09	0.12	0.14	0.09	0.09	0.08	0.10	0.11	0.12	0.13	0.13	0.14	0.08	0.05	0.10	0.11
A	491	0.08	0.09	0.11	0.14	0.16	0.14	0.20	0.14	0.13	0.11	0.10	0.10	0.10	0.11	0.15	0.07	0.14	0.14
A	492	0.07	0.09	0.14	0.18	0.19	0.22	0.26	0.15	0.11	0.08	0.07	0.10	0.10	0.06	0.06	0.05	0.17	0.15
A	493	0.14	0.10	0.10	0.06	0.15	0.26	0.20	0.24	0.13	0.08	0.08	0.18	0.20	0.14	0.18	0.12	0.18	0.18

Table 23 (cont.): Directional, annual and summer overall wind velocity ratios measured at Outside Assessment Areas of the Proposed Kai Tak Development

		Directional Wind Velocity Ratio ($VR_{500,i,j}$)																Annual Overall Wind Velocity Ratios	Summer Overall Wind Velocity Ratios
Test Point		0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5	Total	Total
A	494	0.09	0.08	0.08	0.07	0.08	0.09	0.15	0.17	0.12	0.08	0.06	0.11	0.14	0.16	0.19	0.09	0.11	0.12
A	495	0.15	0.11	0.12	0.14	0.18	0.18	0.22	0.16	0.11	0.11	0.08	0.13	0.23	0.19	0.26	0.17	0.17	0.17
A	496	0.13	0.12	0.13	0.12	0.16	0.16	0.25	0.19	0.11	0.09	0.08	0.11	0.14	0.16	0.18	0.12	0.16	0.16
A	497	0.09	0.15	0.16	0.14	0.14	0.12	0.26	0.28	0.15	0.10	0.12	0.12	0.19	0.11	0.15	0.07	0.16	0.17
A	498	0.08	0.06	0.09	0.14	0.17	0.15	0.25	0.17	0.10	0.07	0.06	0.07	0.12	0.16	0.19	0.08	0.15	0.14
A	499	0.08	0.07	0.07	0.06	0.13	0.13	0.14	0.11	0.09	0.07	0.07	0.11	0.10	0.11	0.16	0.08	0.11	0.11
A	500	0.18	0.12	0.12	0.10	0.18	0.13	0.20	0.20	0.10	0.07	0.08	0.12	0.17	0.15	0.20	0.16	0.16	0.15
A	501	0.06	0.07	0.08	0.09	0.16	0.20	0.16	0.22	0.14	0.07	0.08	0.07	0.08	0.07	0.12	0.07	0.14	0.13
A	502	0.06	0.13	0.18	0.18	0.14	0.13	0.27	0.19	0.11	0.07	0.10	0.07	0.11	0.07	0.05	0.04	0.14	0.14
A	503	0.10	0.12	0.15	0.09	0.18	0.10	0.17	0.21	0.17	0.12	0.11	0.10	0.10	0.10	0.14	0.10	0.14	0.14
A	504	0.08	0.12	0.14	0.12	0.17	0.16	0.14	0.18	0.11	0.08	0.10	0.10	0.11	0.13	0.13	0.07	0.14	0.13
A	505	0.10	0.15	0.18	0.15	0.21	0.25	0.15	0.24	0.15	0.09	0.10	0.08	0.09	0.10	0.10	0.07	0.17	0.15
A	506	0.07	0.07	0.08	0.06	0.09	0.08	0.12	0.12	0.05	0.04	0.06	0.07	0.08	0.06	0.11	0.05	0.08	0.08
A	507	0.09	0.10	0.15	0.10	0.11	0.11	0.17	0.18	0.10	0.08	0.12	0.11	0.11	0.09	0.11	0.08	0.12	0.12
A	508	0.10	0.10	0.09	0.09	0.09	0.09	0.19	0.16	0.12	0.06	0.07	0.07	0.09	0.08	0.06	0.07	0.11	0.11
A	509	0.10	0.15	0.19	0.23	0.21	0.19	0.24	0.21	0.14	0.14	0.19	0.06	0.10	0.19	0.12	0.05	0.18	0.17
A	510	0.28	0.31	0.33	0.30	0.35	0.32	0.40	0.36	0.28	0.22	0.30	0.28	0.29	0.32	0.34	0.21	0.33	0.32
A	511	0.08	0.10	0.11	0.10	0.10	0.10	0.19	0.13	0.11	0.09	0.14	0.14	0.10	0.11	0.20	0.07	0.12	0.13

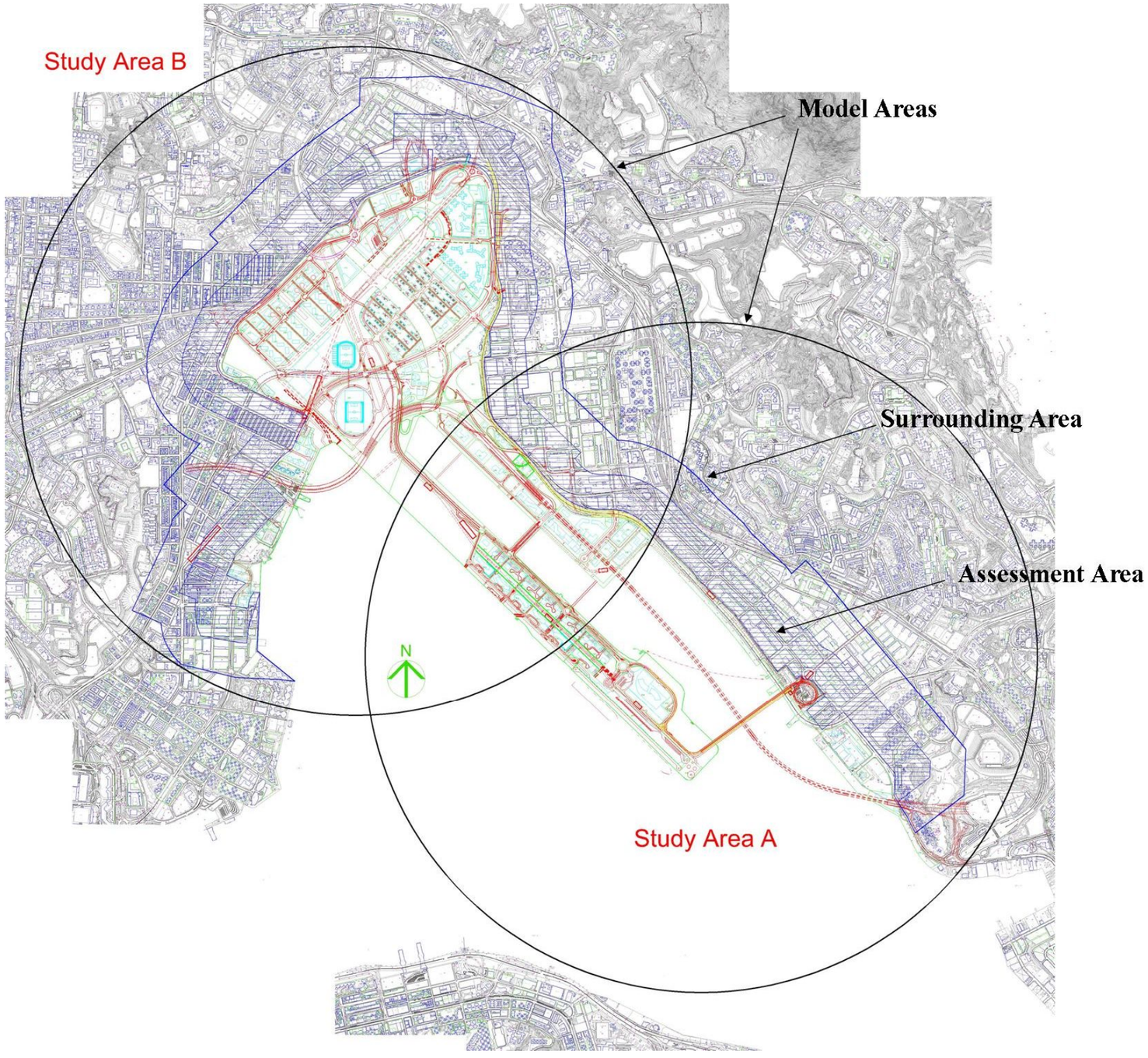

Figure 1: The proposed Kai Tak Development

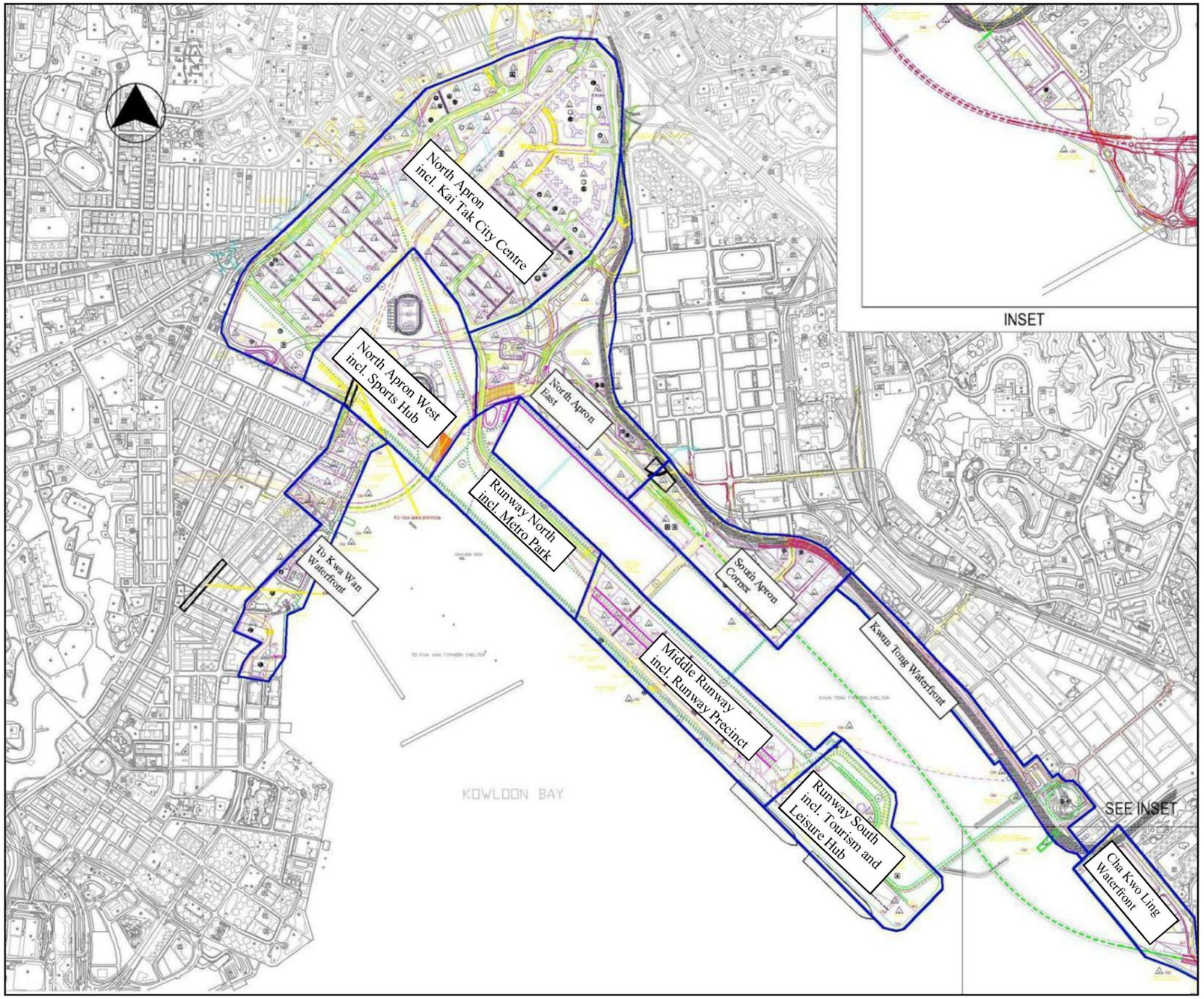

Figure 2: Zoning of the proposed Kai Tak Development

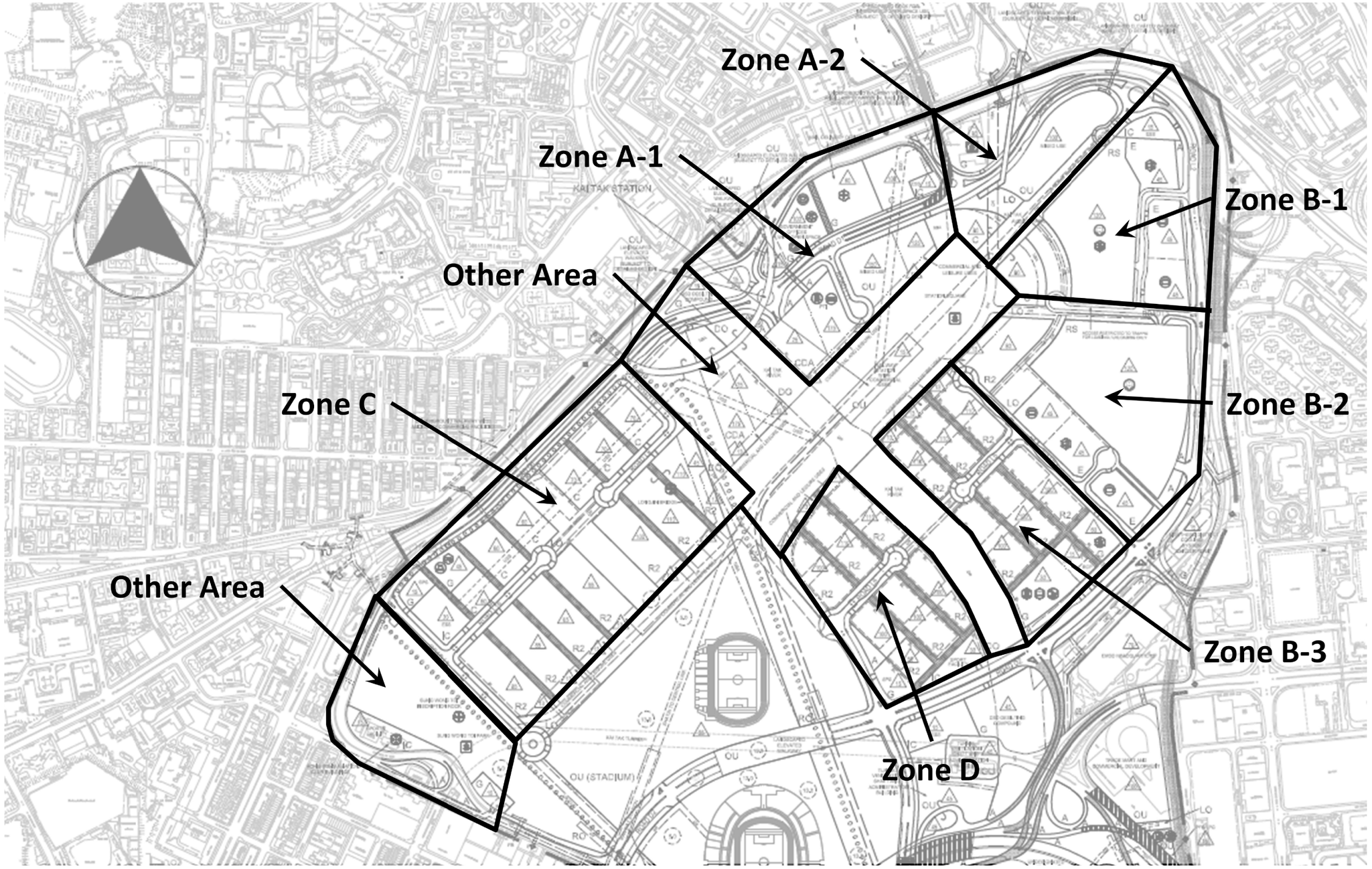

Figure 3: Kai Tak City Centre at the North Apron

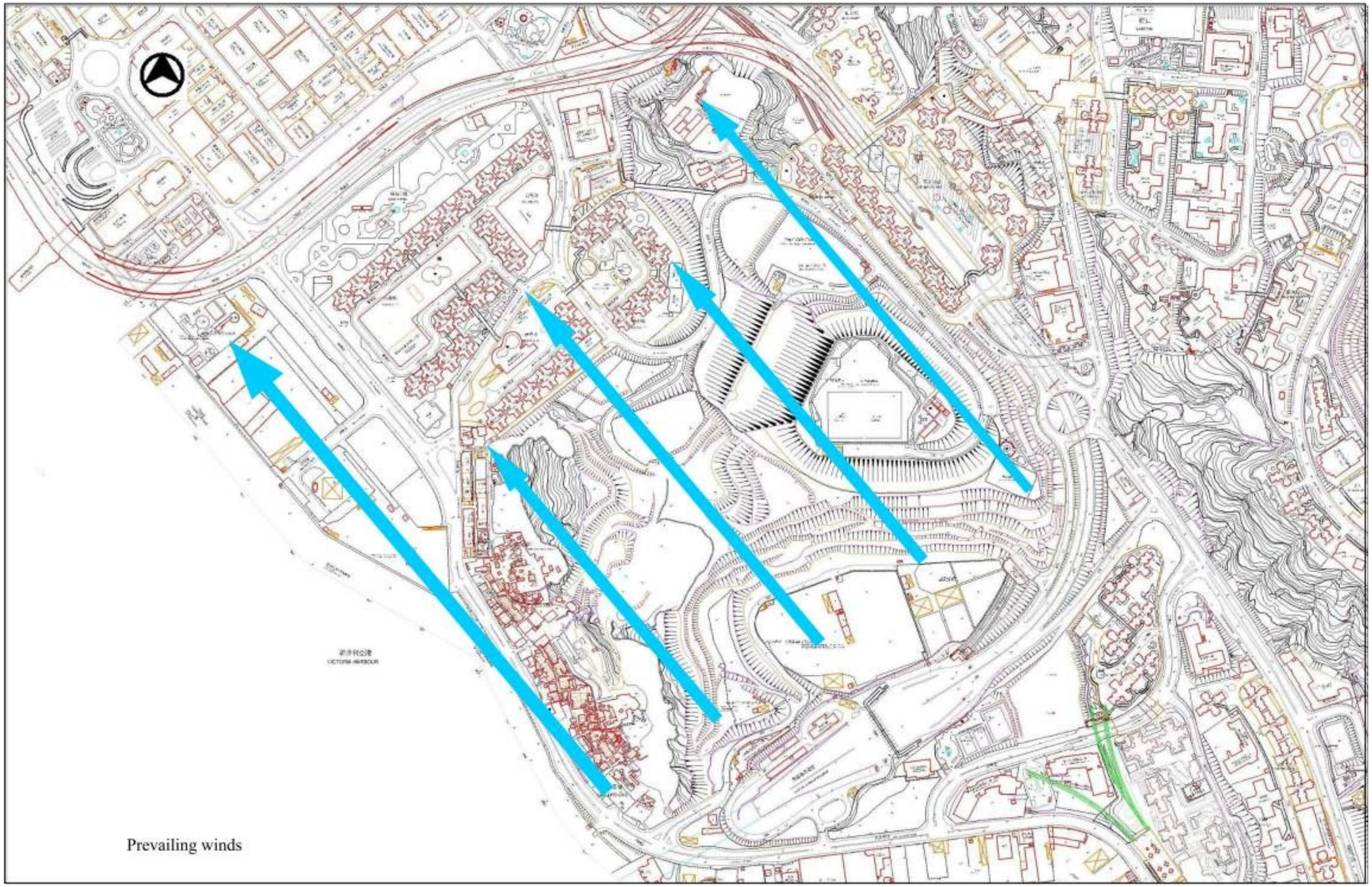

Figure 4: Wind Conditions in Cha Kwo Ling

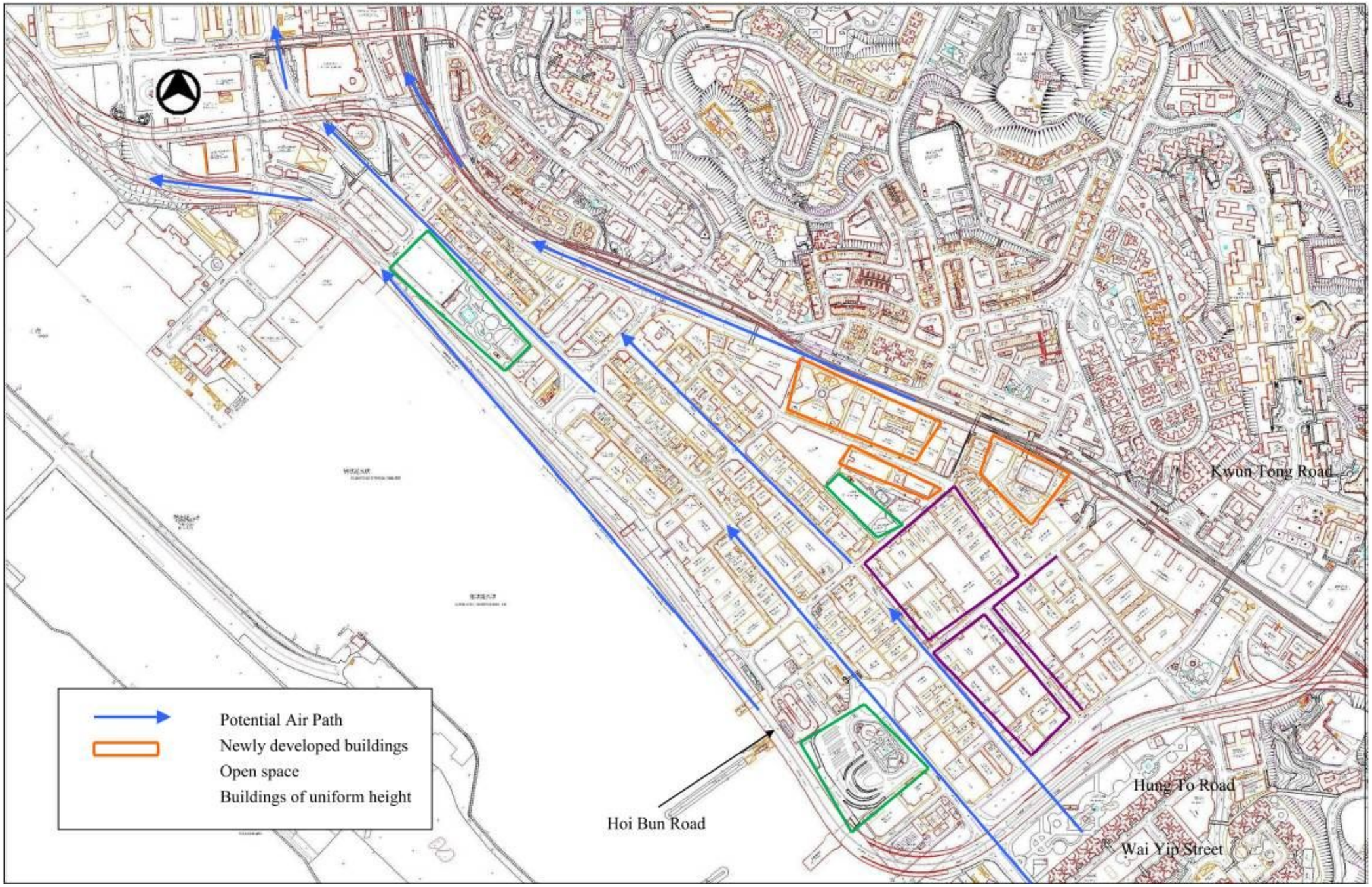

Figure 5: Wind Conditions in Kwun Tong and Ngau Tau Kok

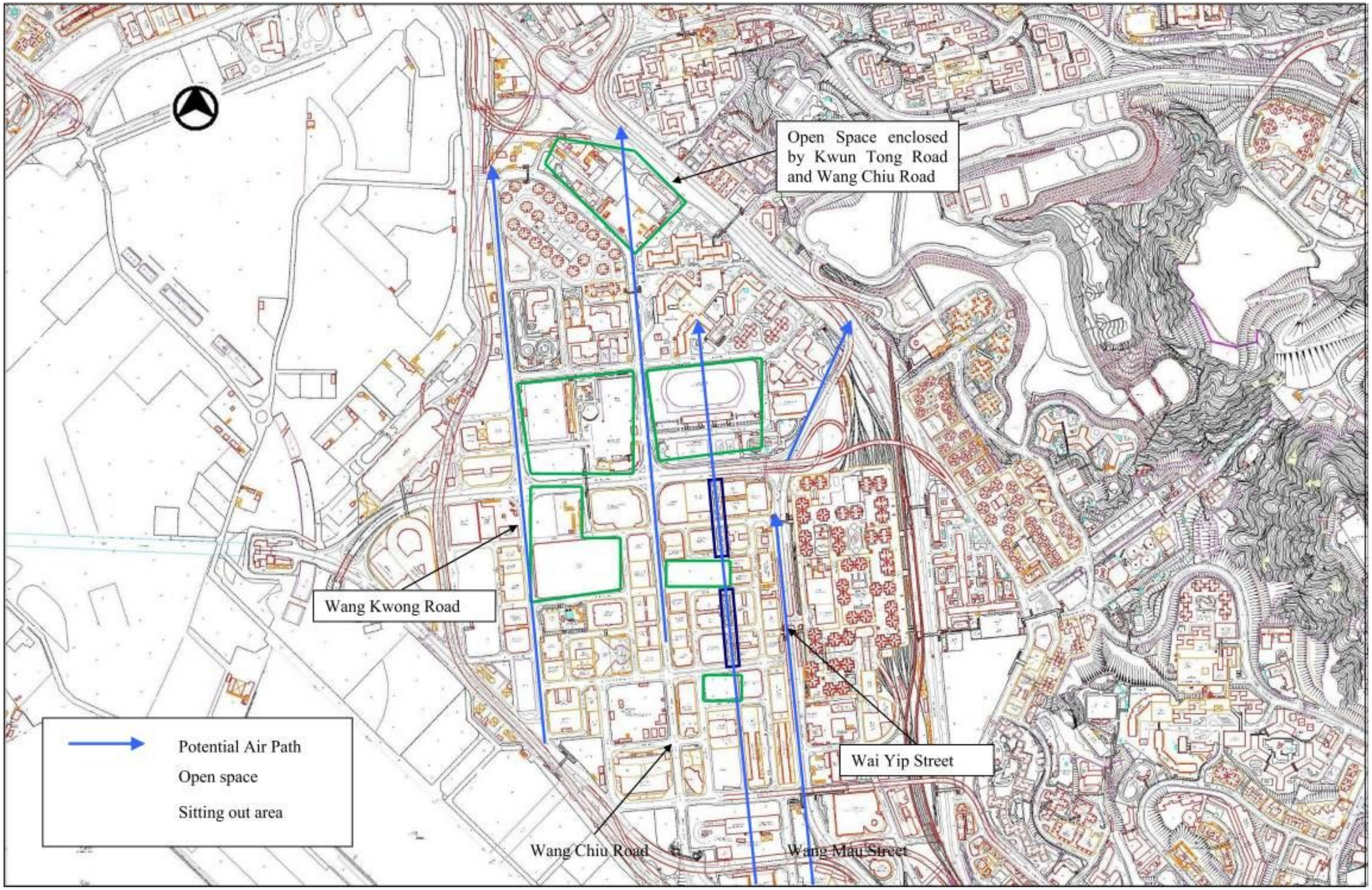

Figure 6: Wind Conditions in Kowloon Bay

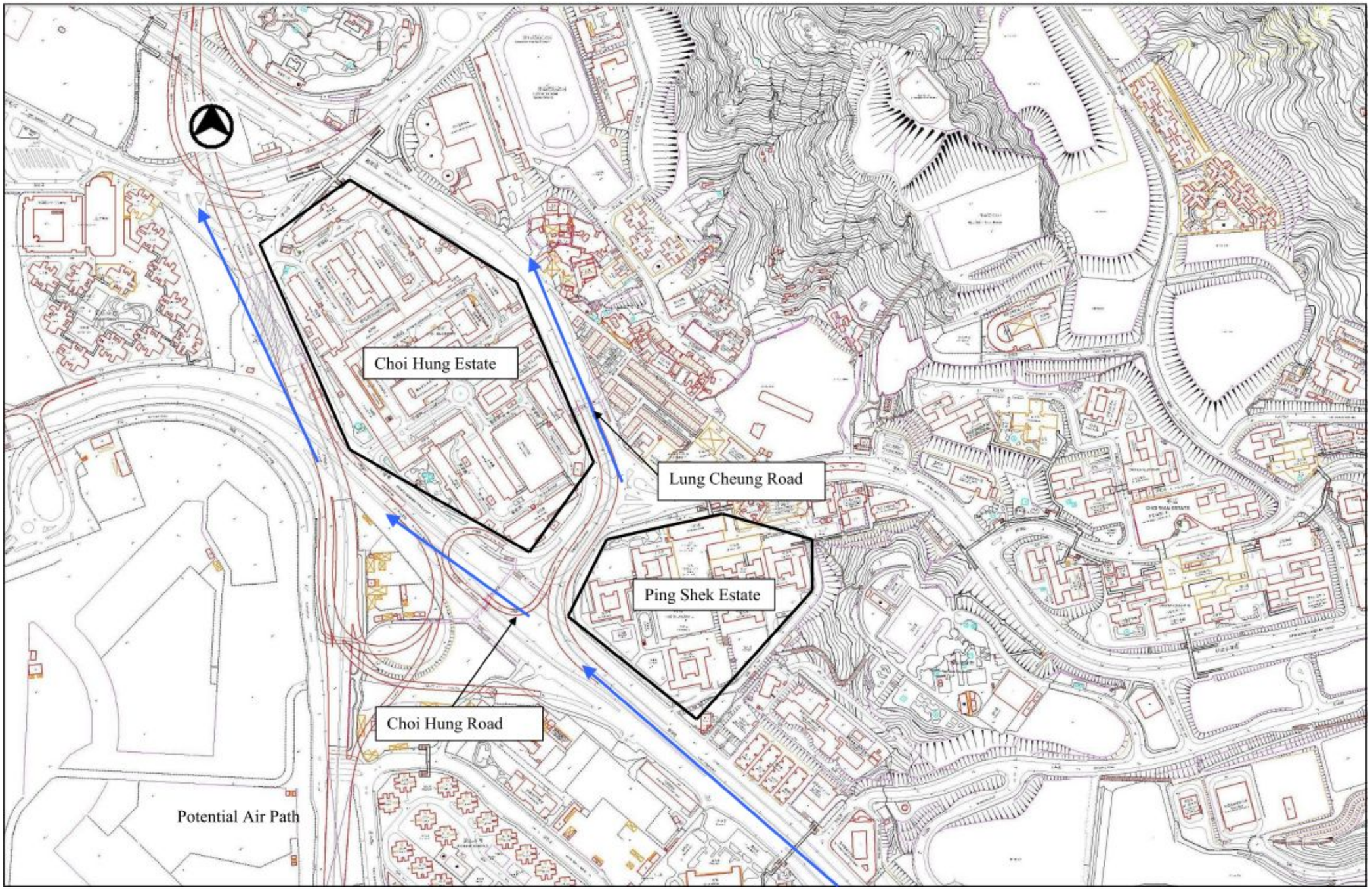

Figure 7: Wind Conditions in Ngau Chi Wan and Choi Hung

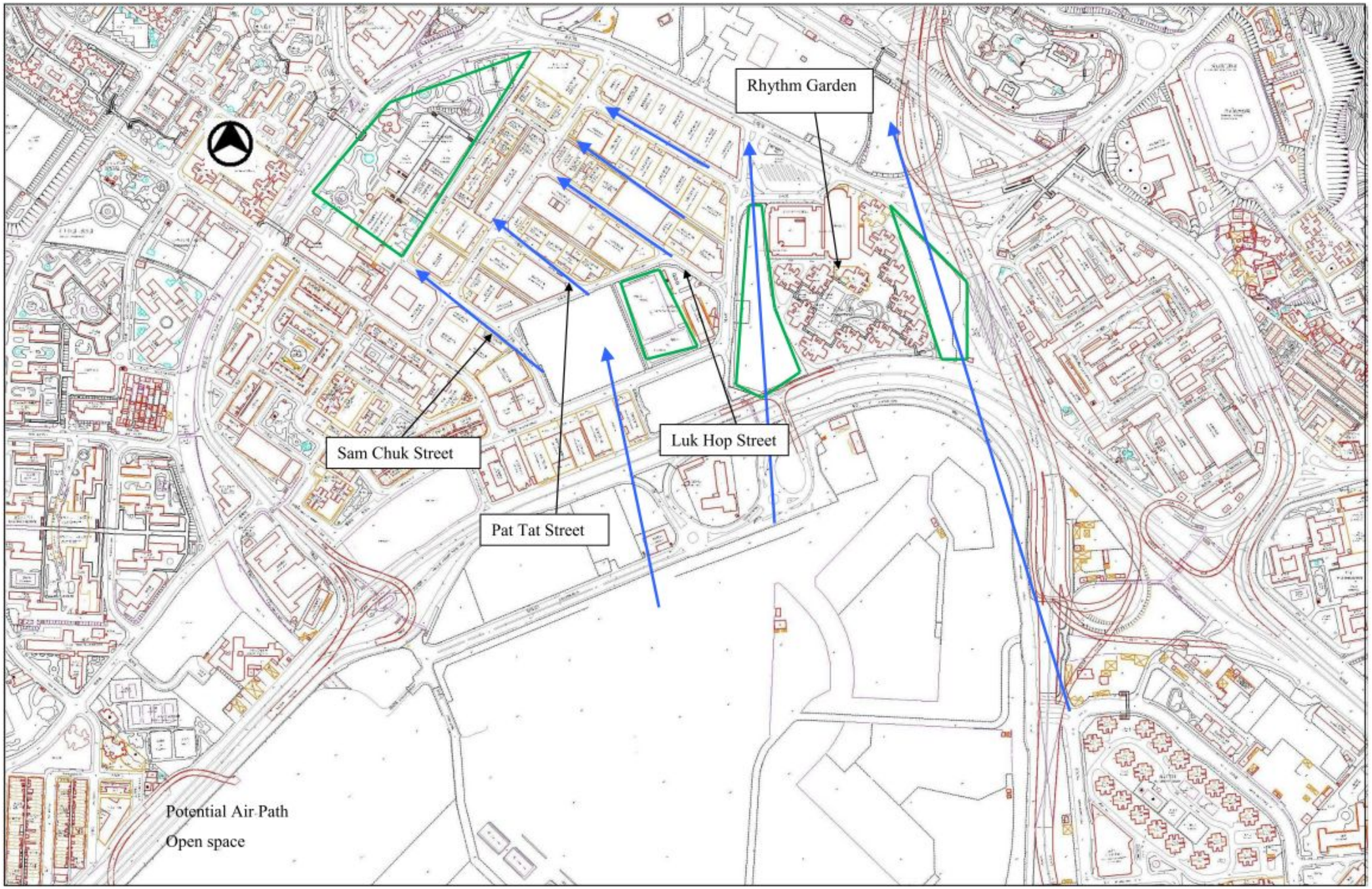

Figure 8: Wind Conditions in San Po Kong

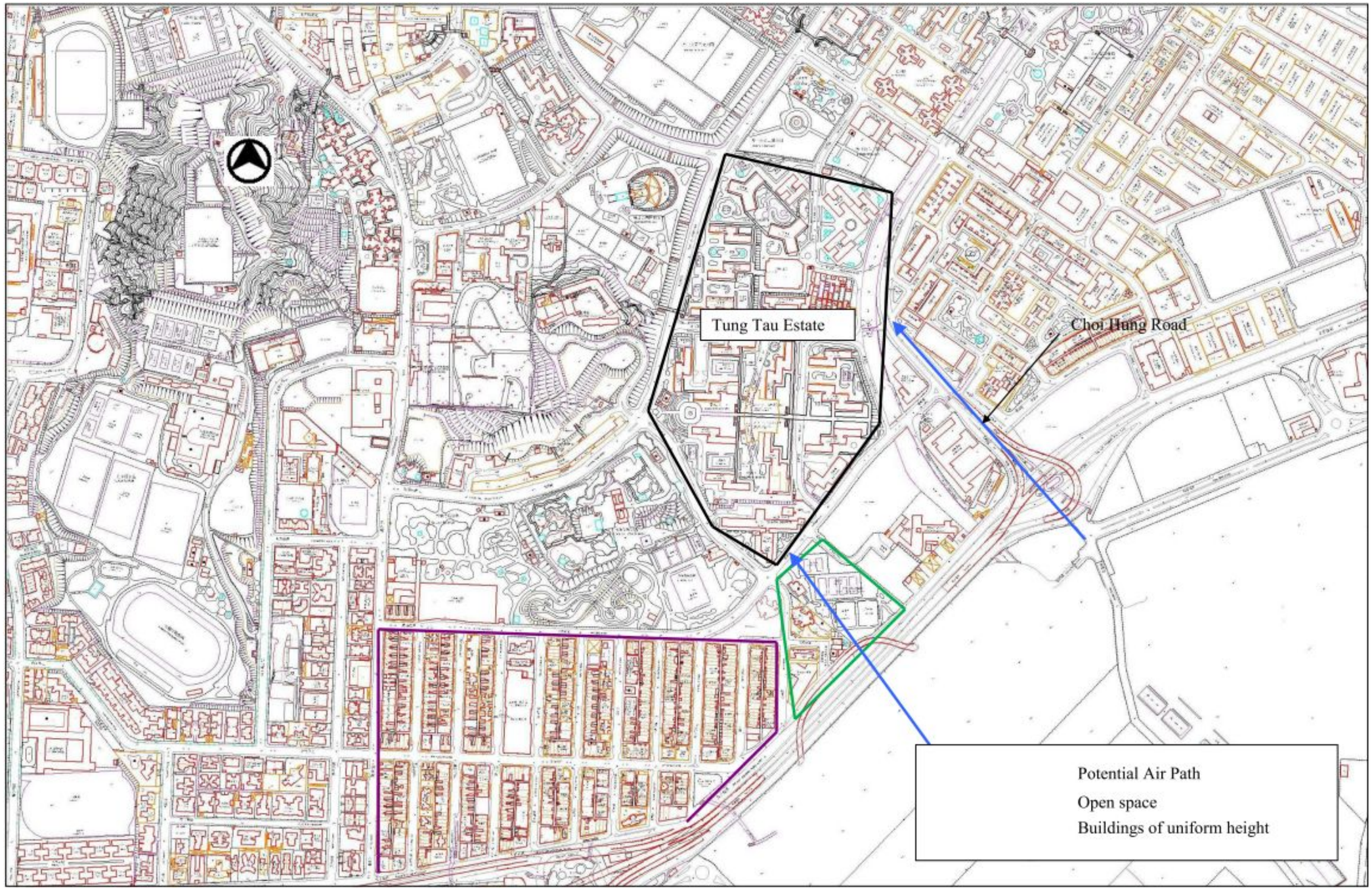

Figure 9: Wind Conditions in Wang Tau Hom

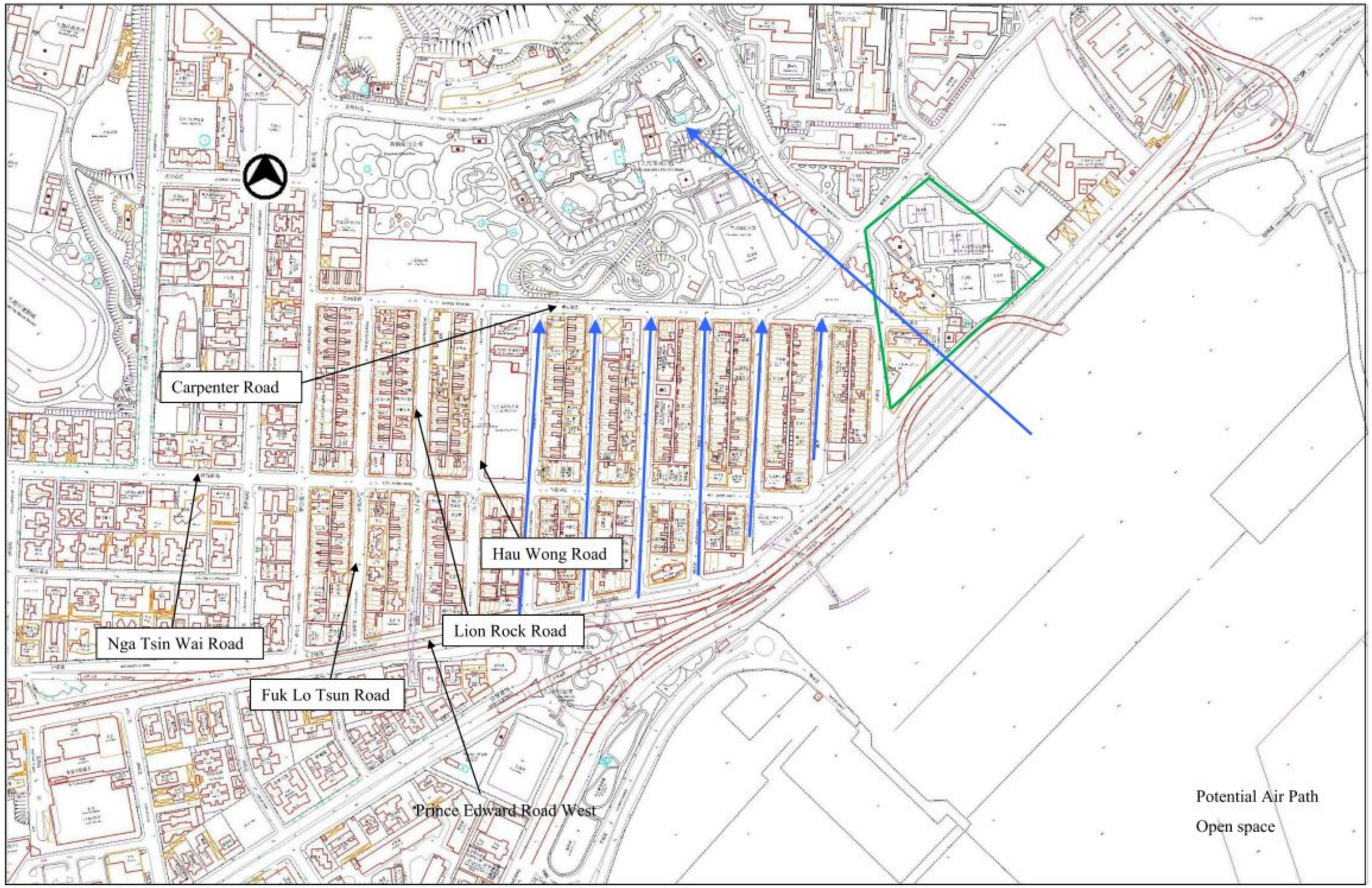

Figure 10: Wind Conditions in Kowloon City

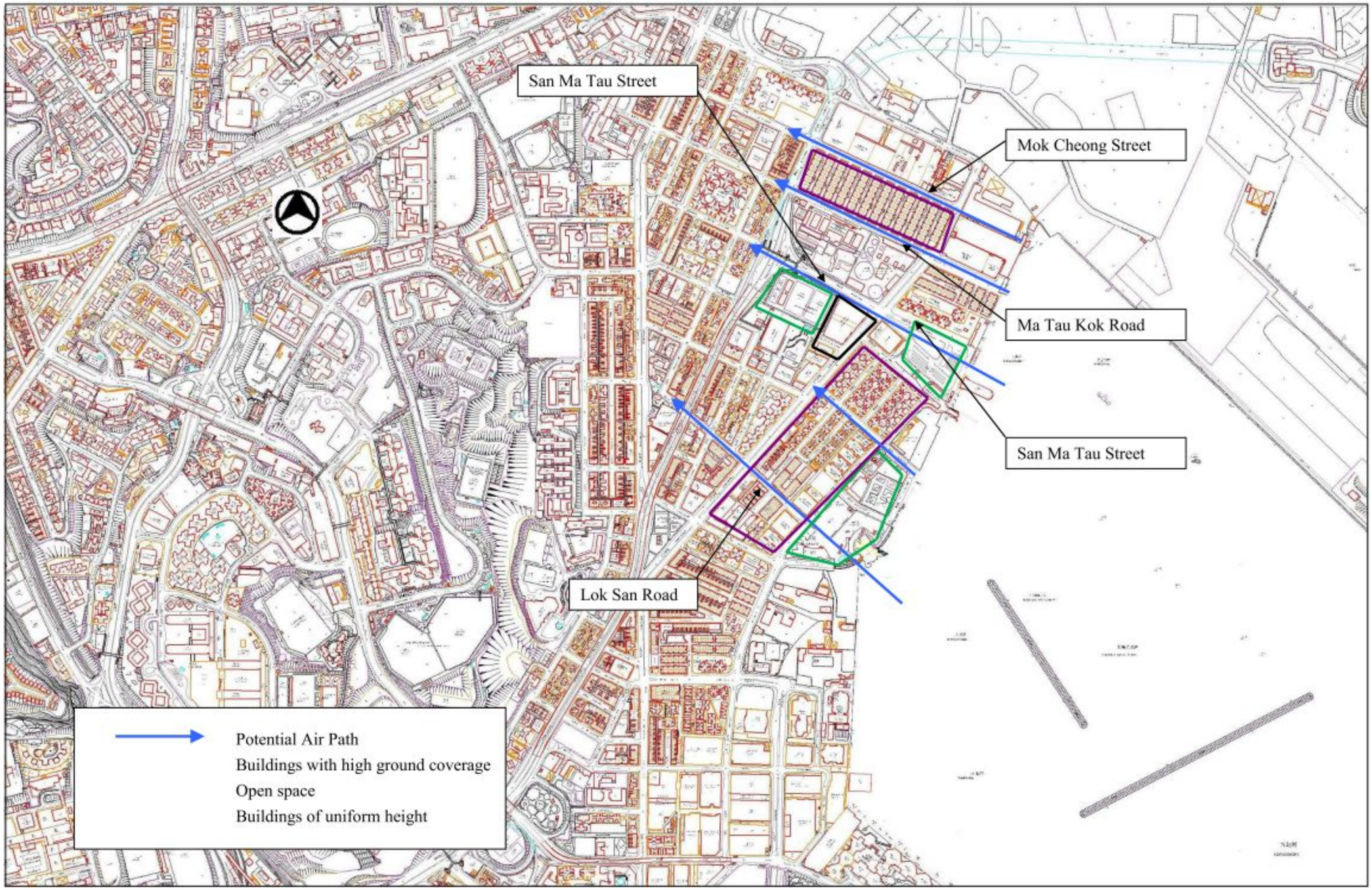

Figure 11: Wind Conditions in To Kwa Wan and Ma Tau Kok

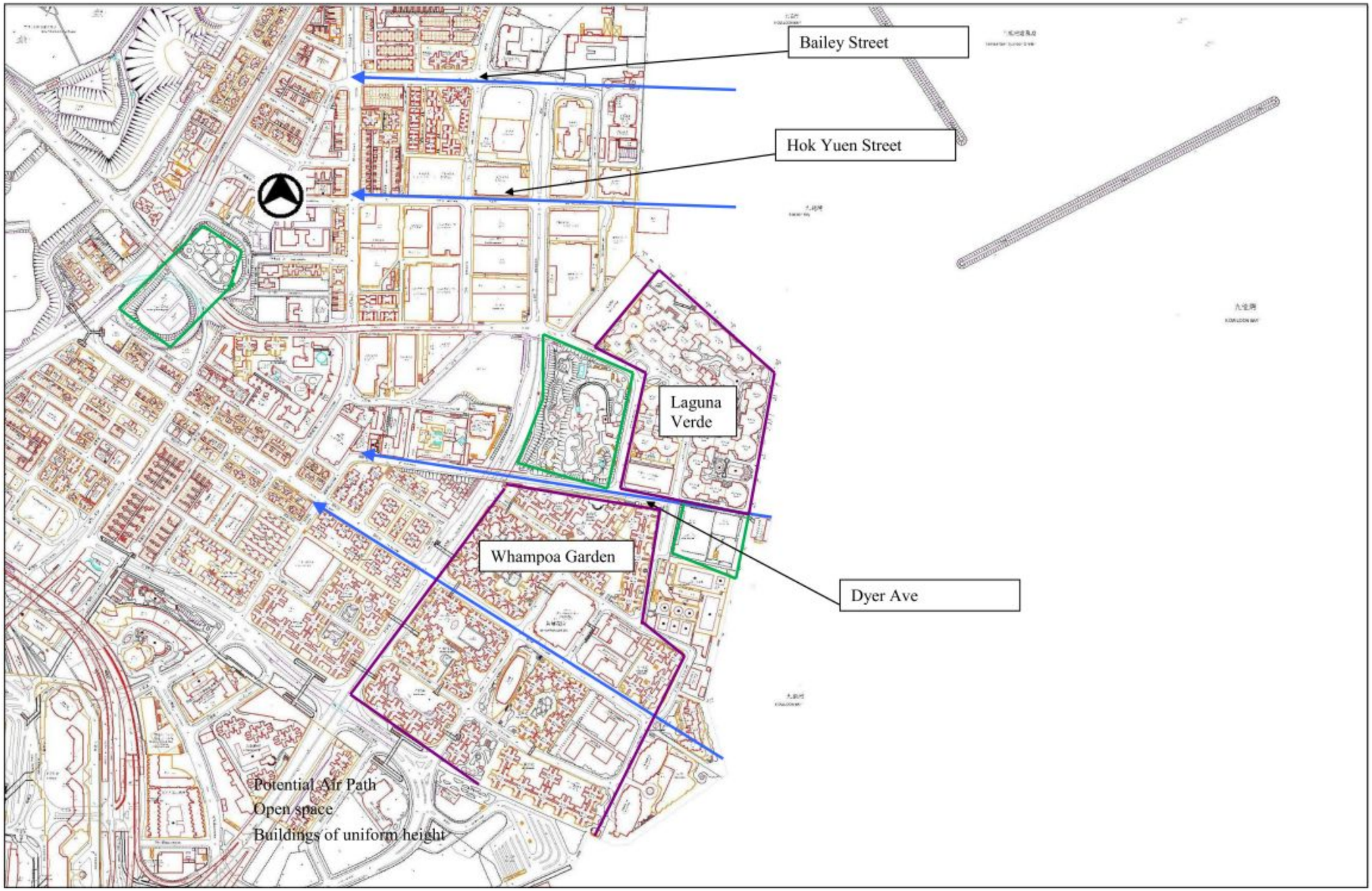

Figure 12: Wind Conditions in Hung Hom

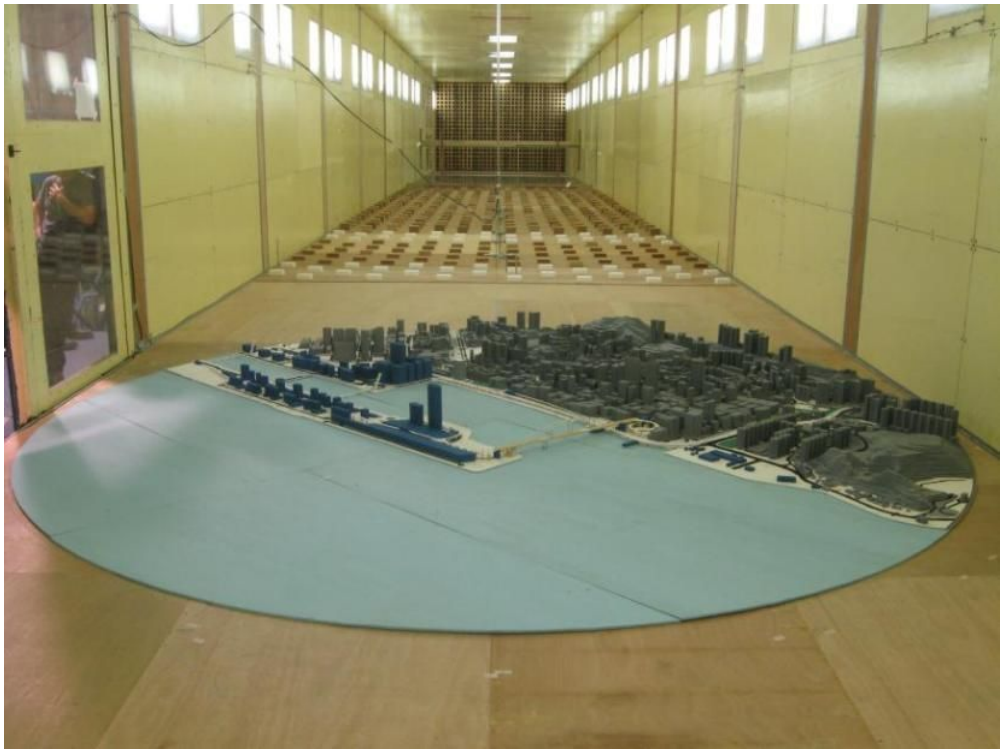

Figure 13: A 1:800 scale model of the proposed Kai Tak Development in the low speed test section, Study Area A, (north wind direction, 0°)

Figure 14: A 1:800 scale model of the proposed Kai Tak Development in the low speed test section, Study Area A, (east wind direction, 90°)

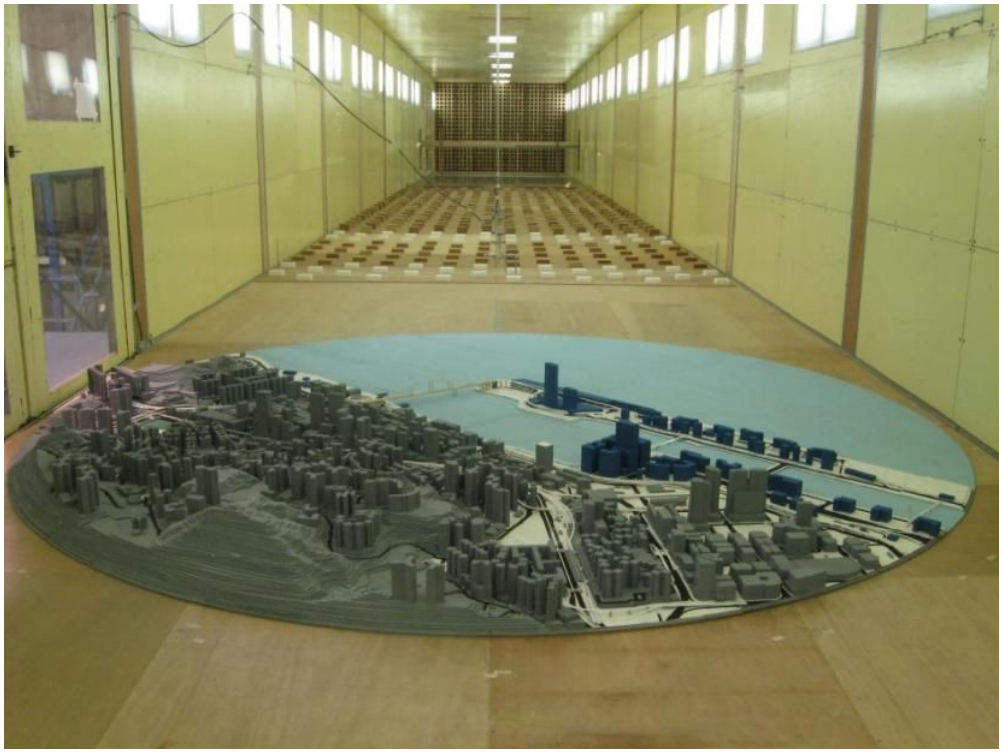

Figure 15: A 1:800 scale model of the proposed Kai Tak Development in the low speed test section, Study Area A, (south wind direction, 180°)

Figure 16: A 1:800 scale model of the proposed Kai Tak Development in the low speed test section, Study Area A, (west wind direction, 270°)

Figure 17: A 1:800 scale model of the proposed Kai Tak Development in the low speed test section, Study Area B, (north wind direction, 0°)

Figure 18: A 1:800 scale model of the proposed Kai Tak Development in the low speed test section, Study Area B, (east wind direction, 90°)

Figure 19: A 1:800 scale model of the proposed Kai Tak Development in the low speed test section, Study Area B, (south wind direction, 180°)

Figure 20: A 1:800 scale model of the proposed Kai Tak Development in the low speed test section, Study Area B, (west wind direction, 270°)

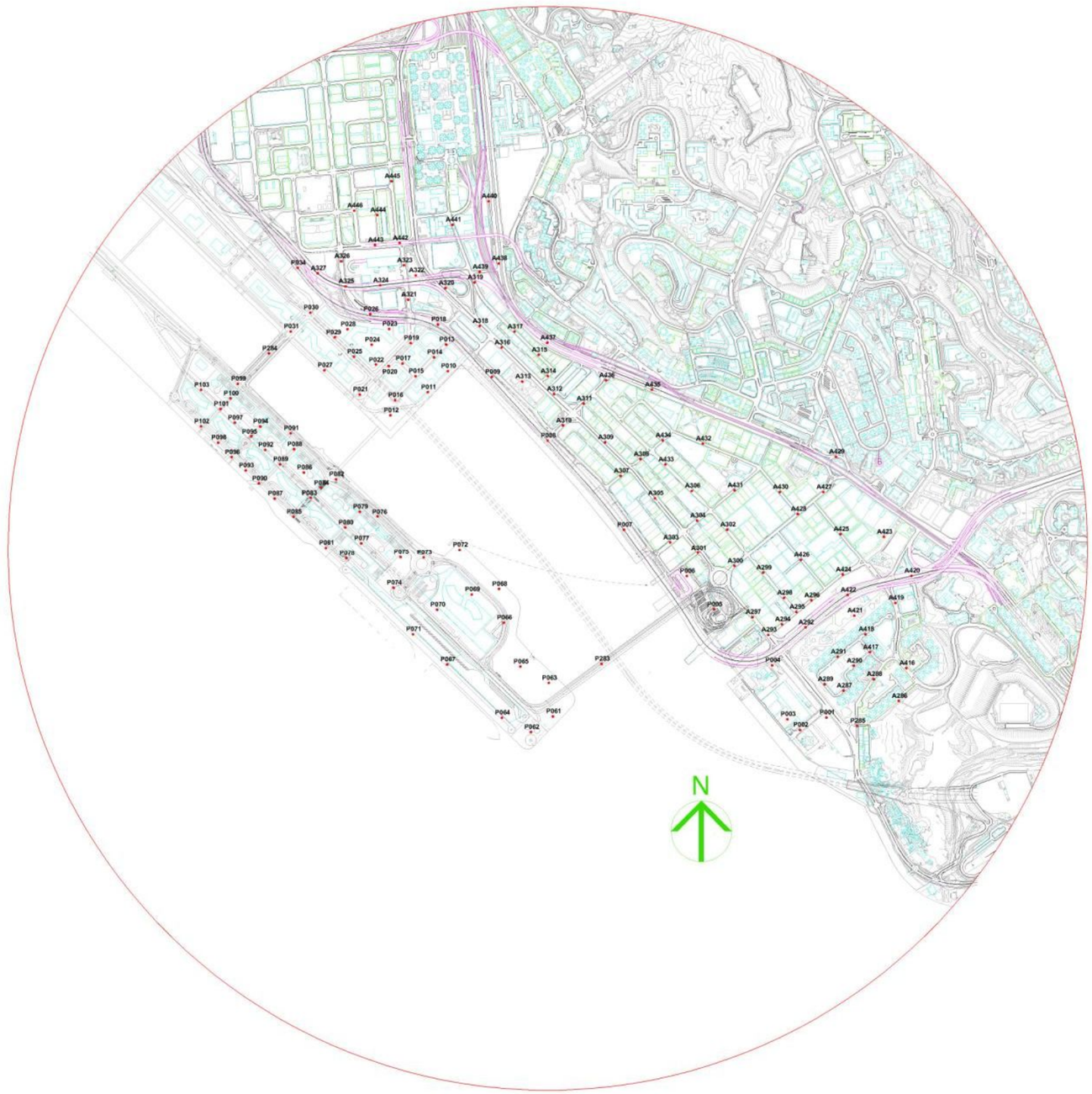

Figure 21: Test point locations on the Study Area A model

Figure 22: Test point locations on the Study Area B model

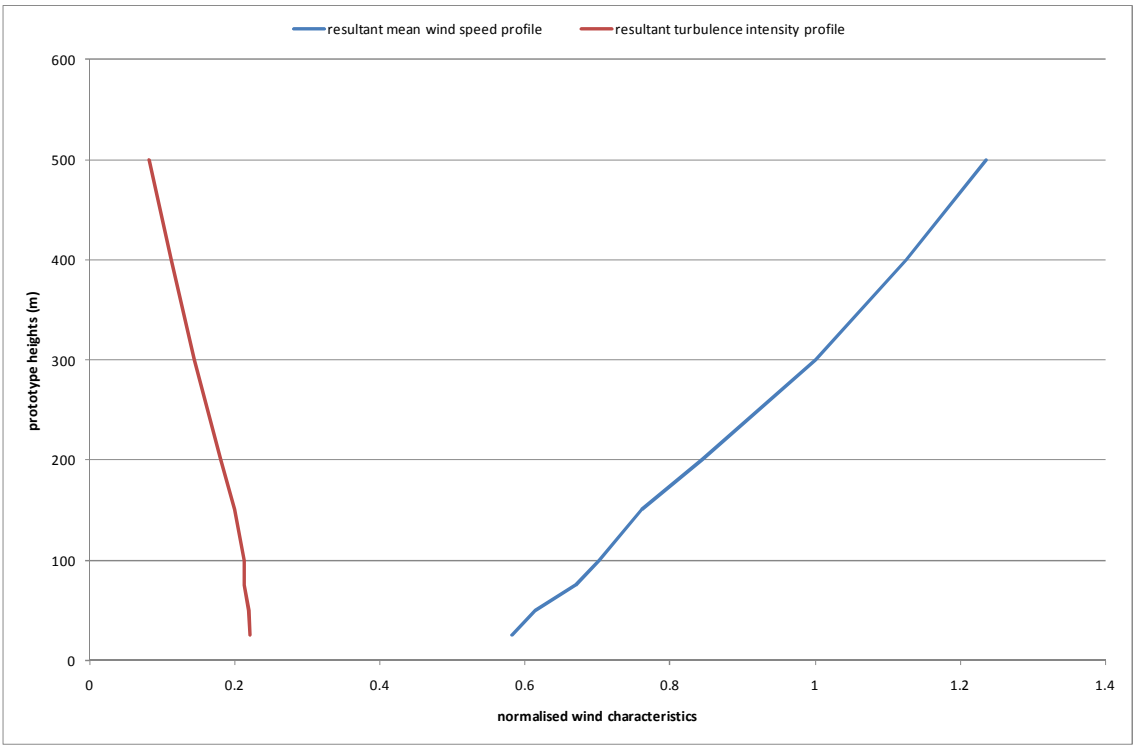

Figure 23: Mean wind speed and turbulence intensity profiles of 1:400 scale wind, approach condition A

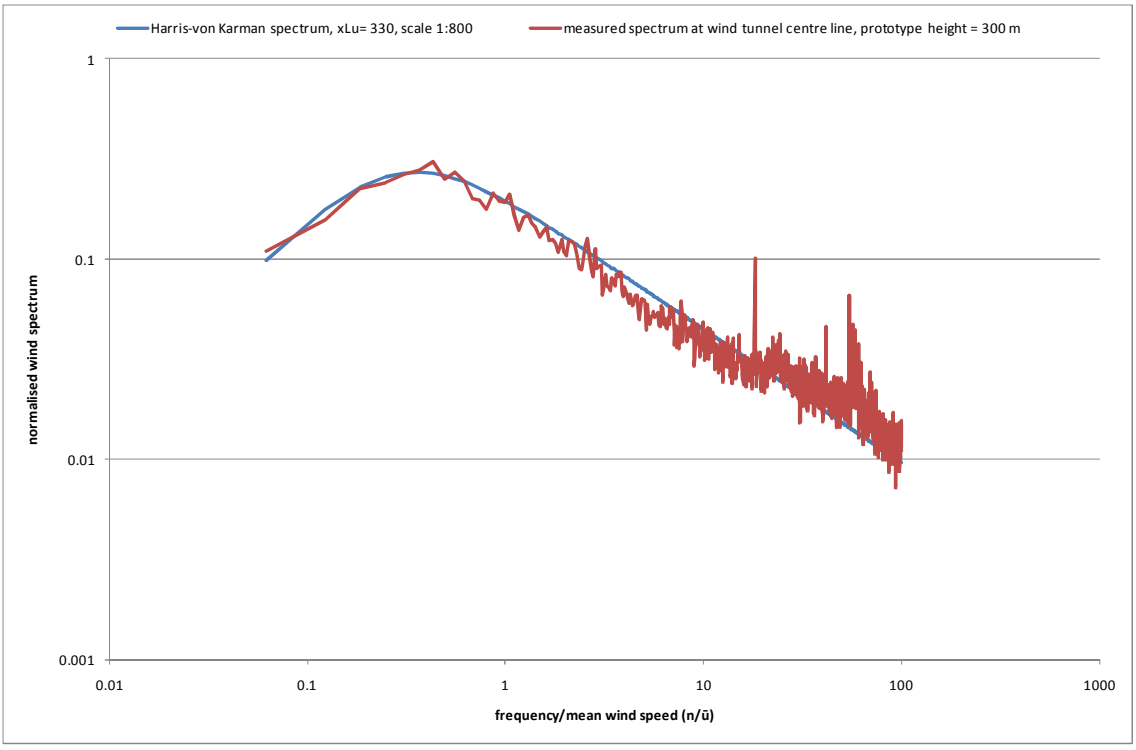

Figure 24: Longitudinal velocity spectrum of 1:400 scale wind, approach condition A

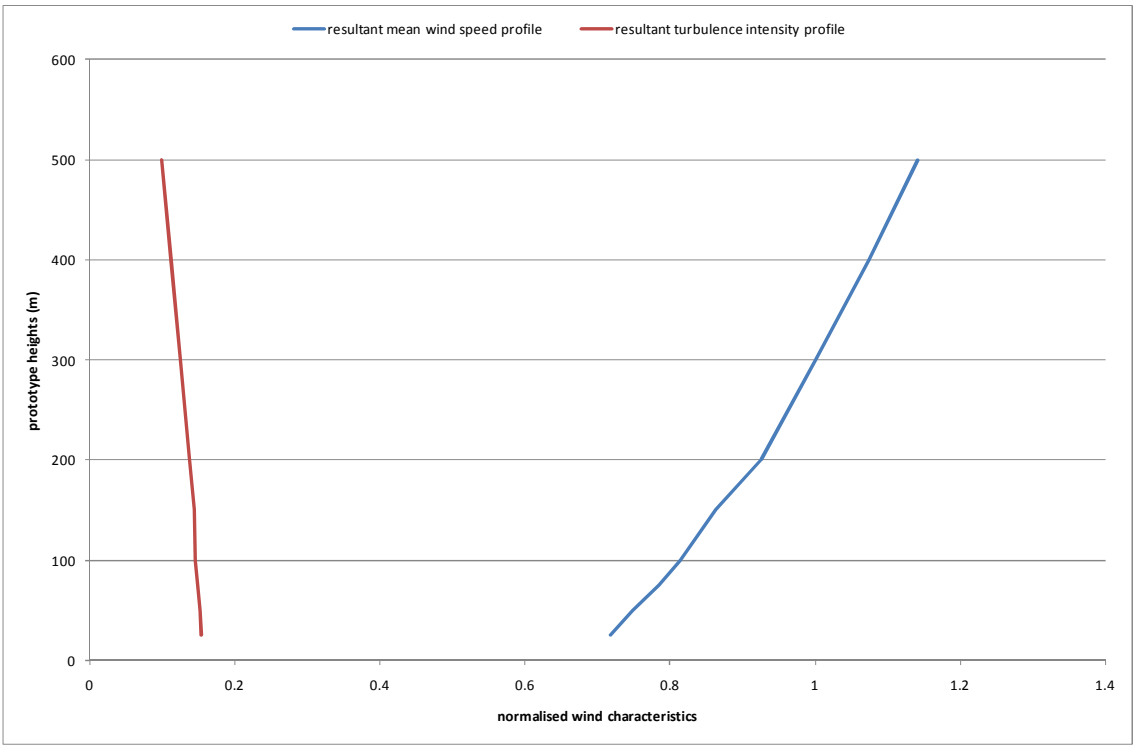

Figure 25: Mean wind speed and turbulence intensity profiles of 1:400 scale wind, approach condition B

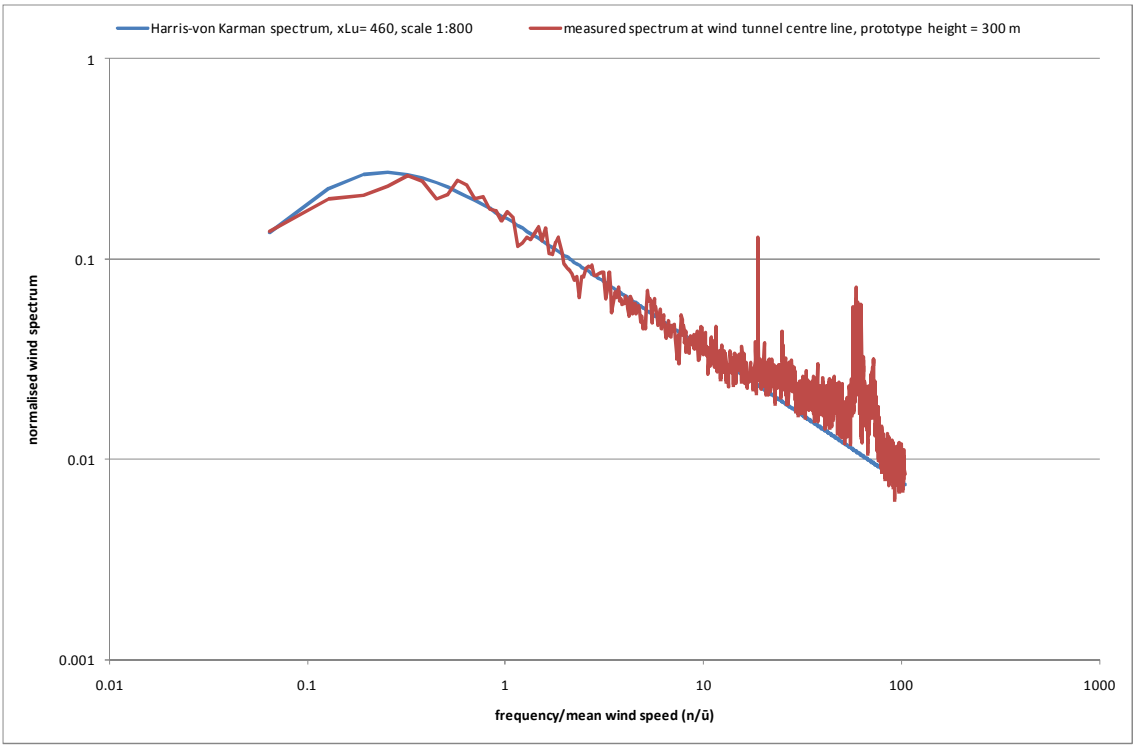

Figure 26: Longitudinal velocity spectrum of 1:400 scale wind, approach condition B

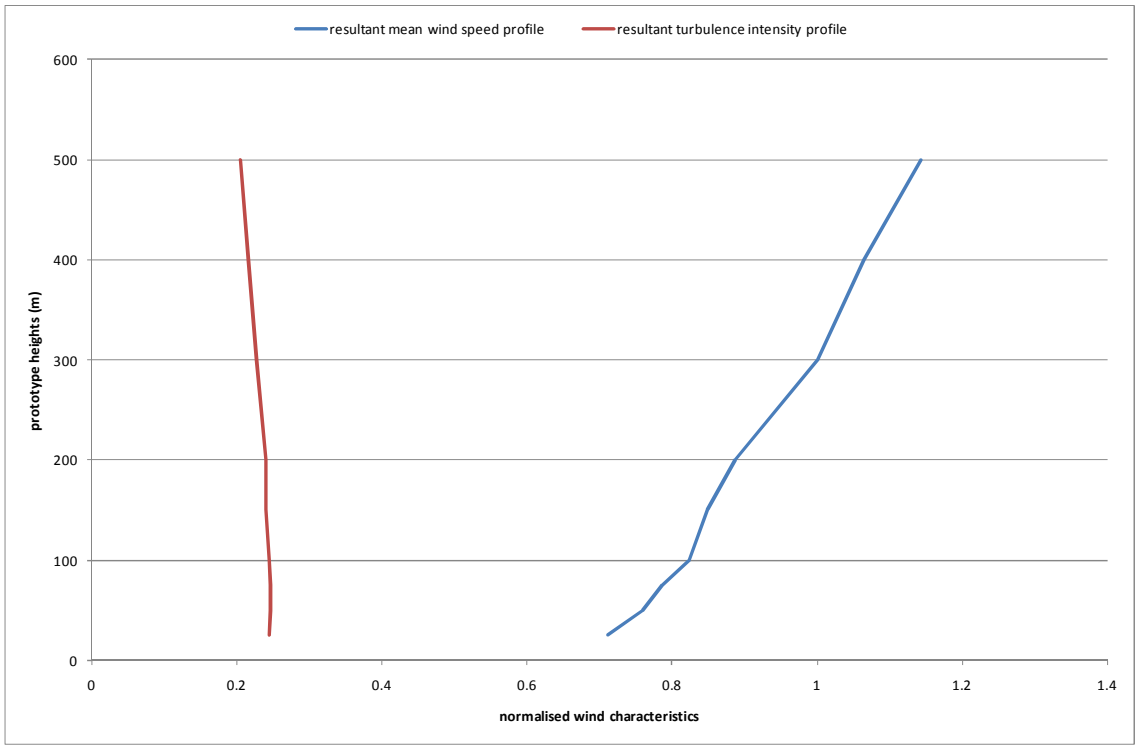

Figure 27: Mean wind speed and turbulence intensity profiles of 1:400 scale wind, approach condition C

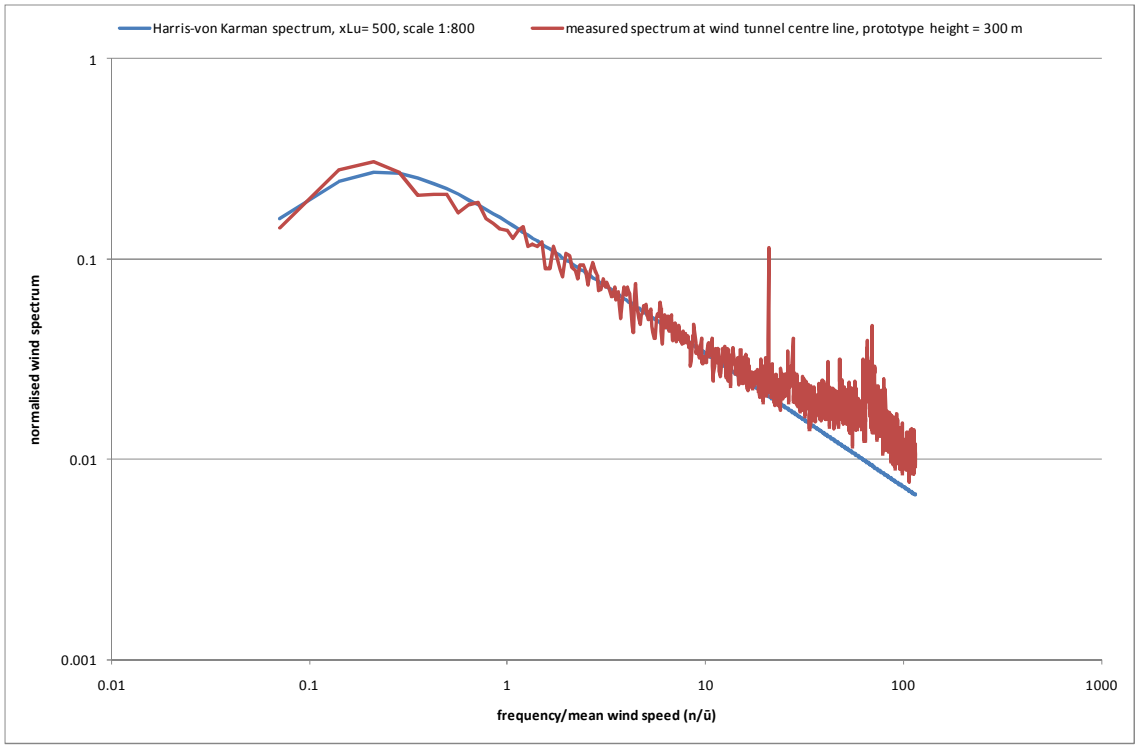

Figure 28: Longitudinal velocity spectrum of 1:400 scale wind, approach condition C

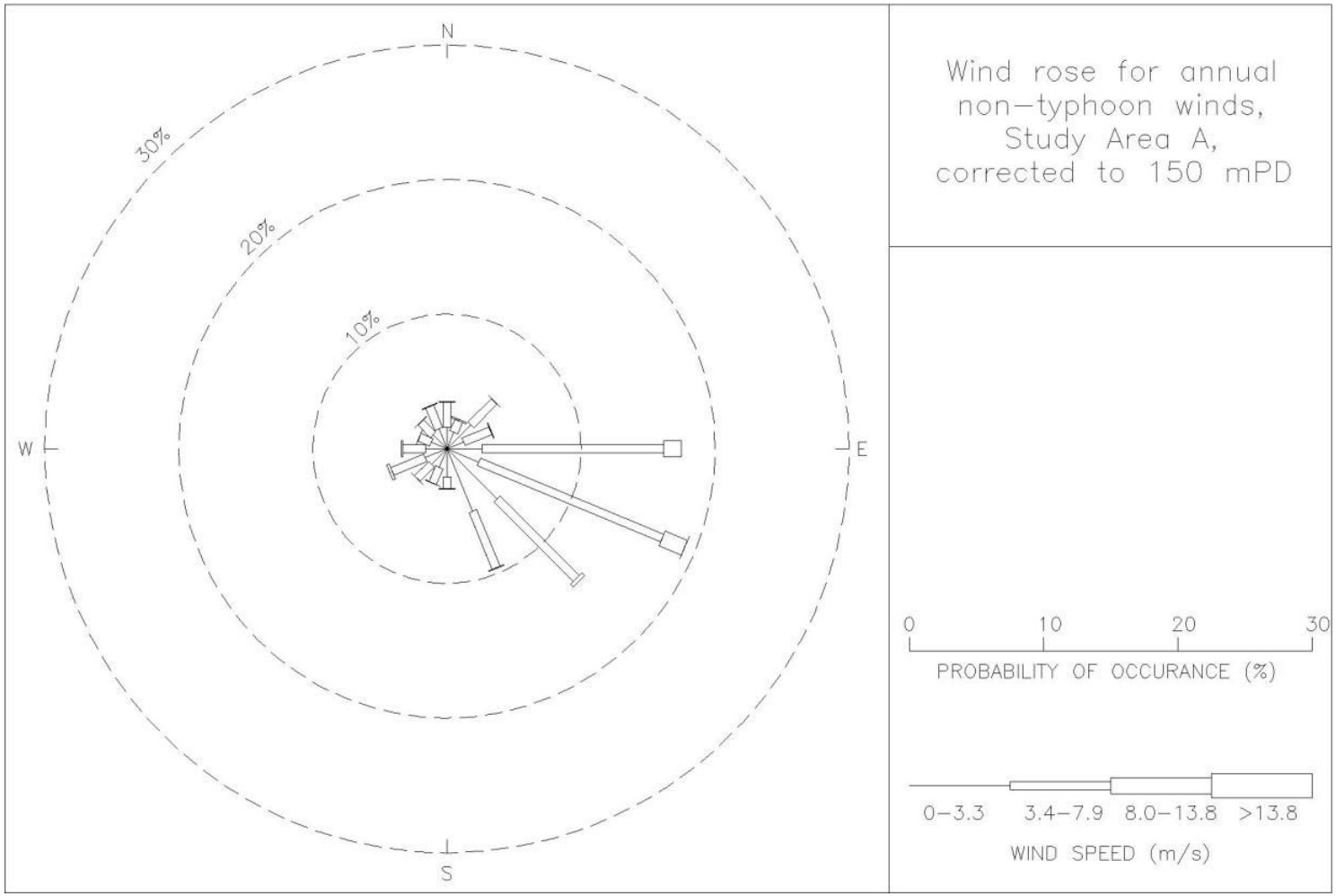

Figure 29: Wind rose for annual, non-typhoon winds for Kai Tak, corrected to 150 mPD at Study Area A, 1998 - 2009

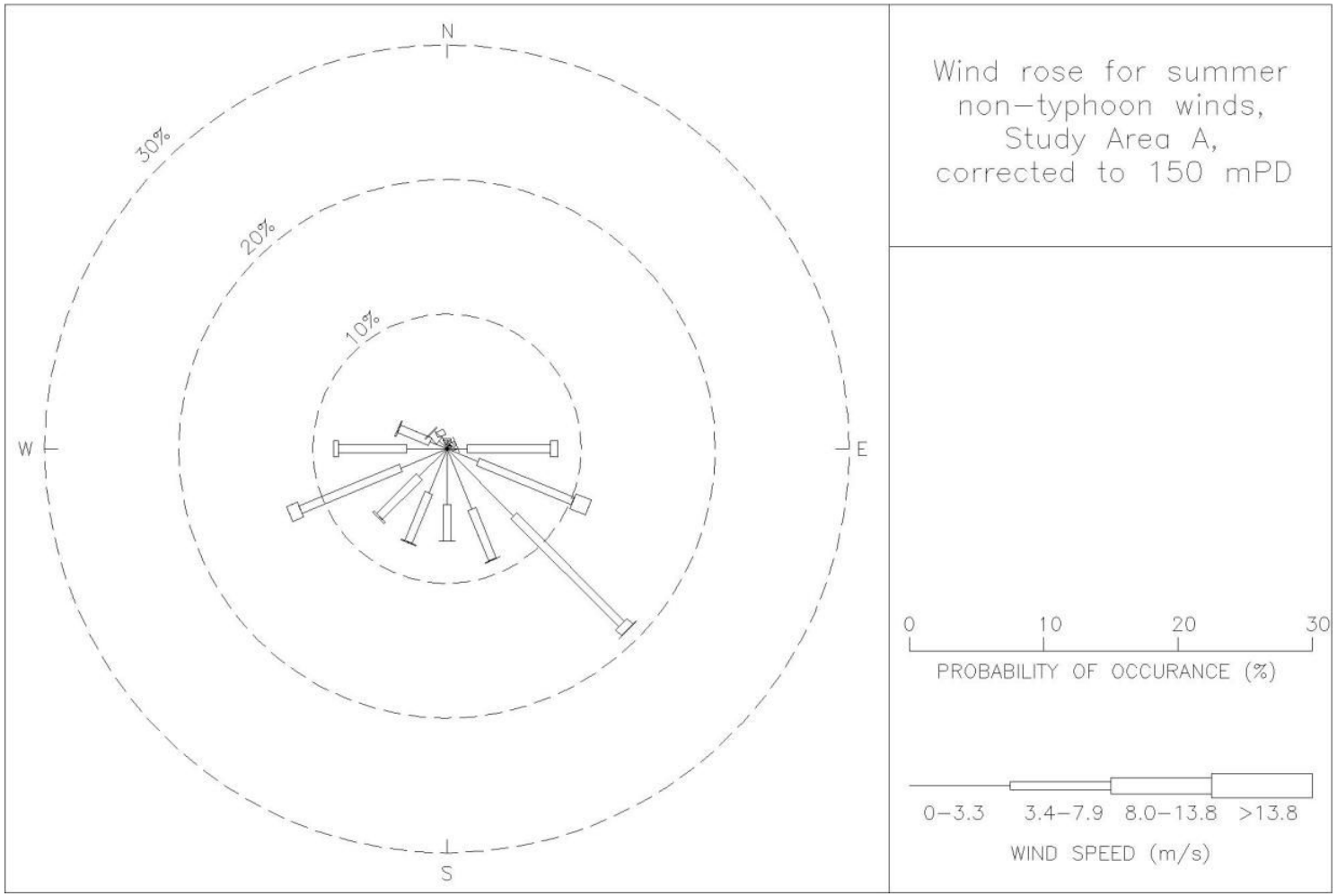

Figure 30: Wind rose for summer, non-typhoon winds for Kai Tak, corrected to 150 mPD at Study Area A, 1998 - 2009

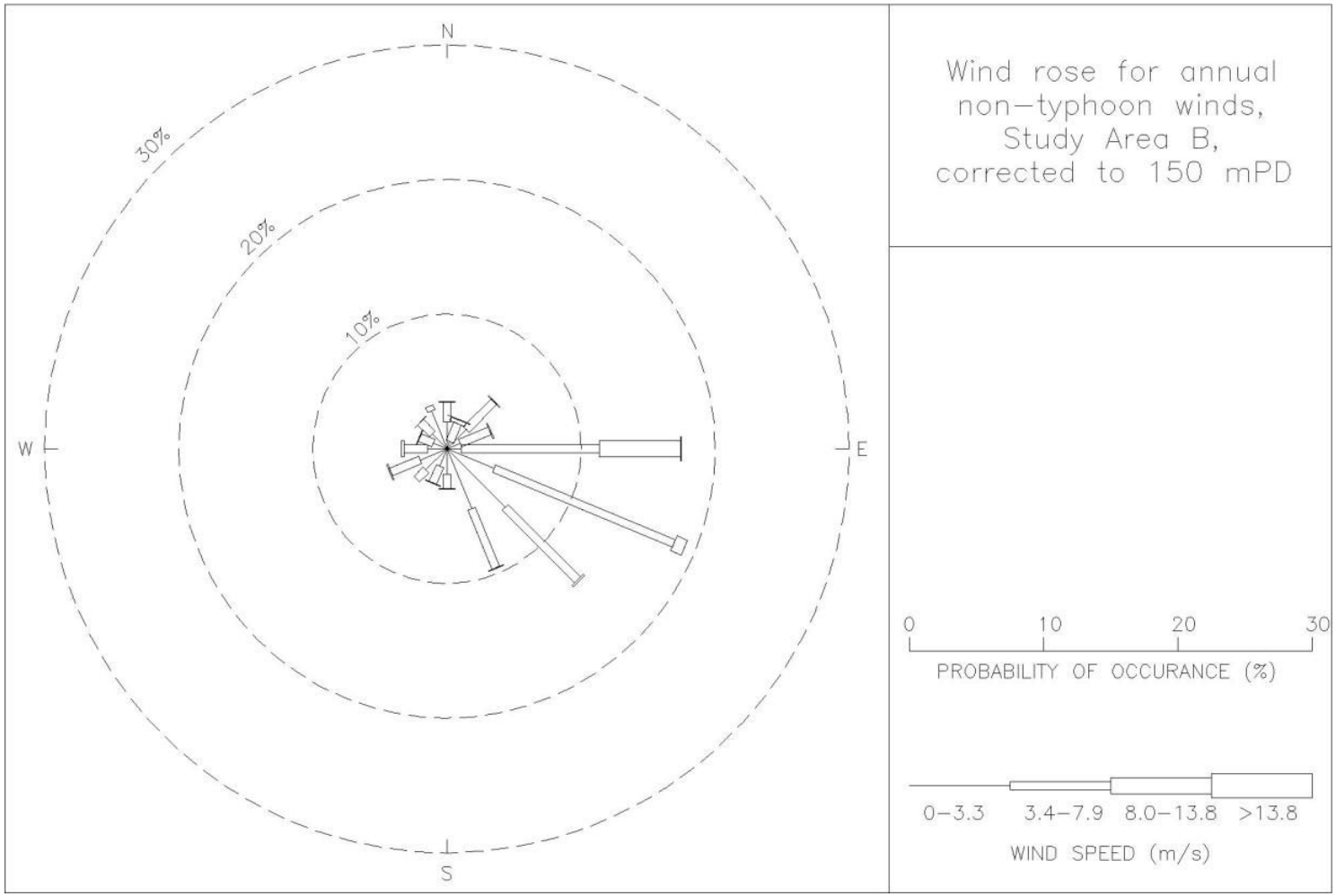

Figure 31: Wind rose for annual, non-typhoon winds for Kai Tak, corrected to 150 mPD at Study Area B, 1998 - 2009

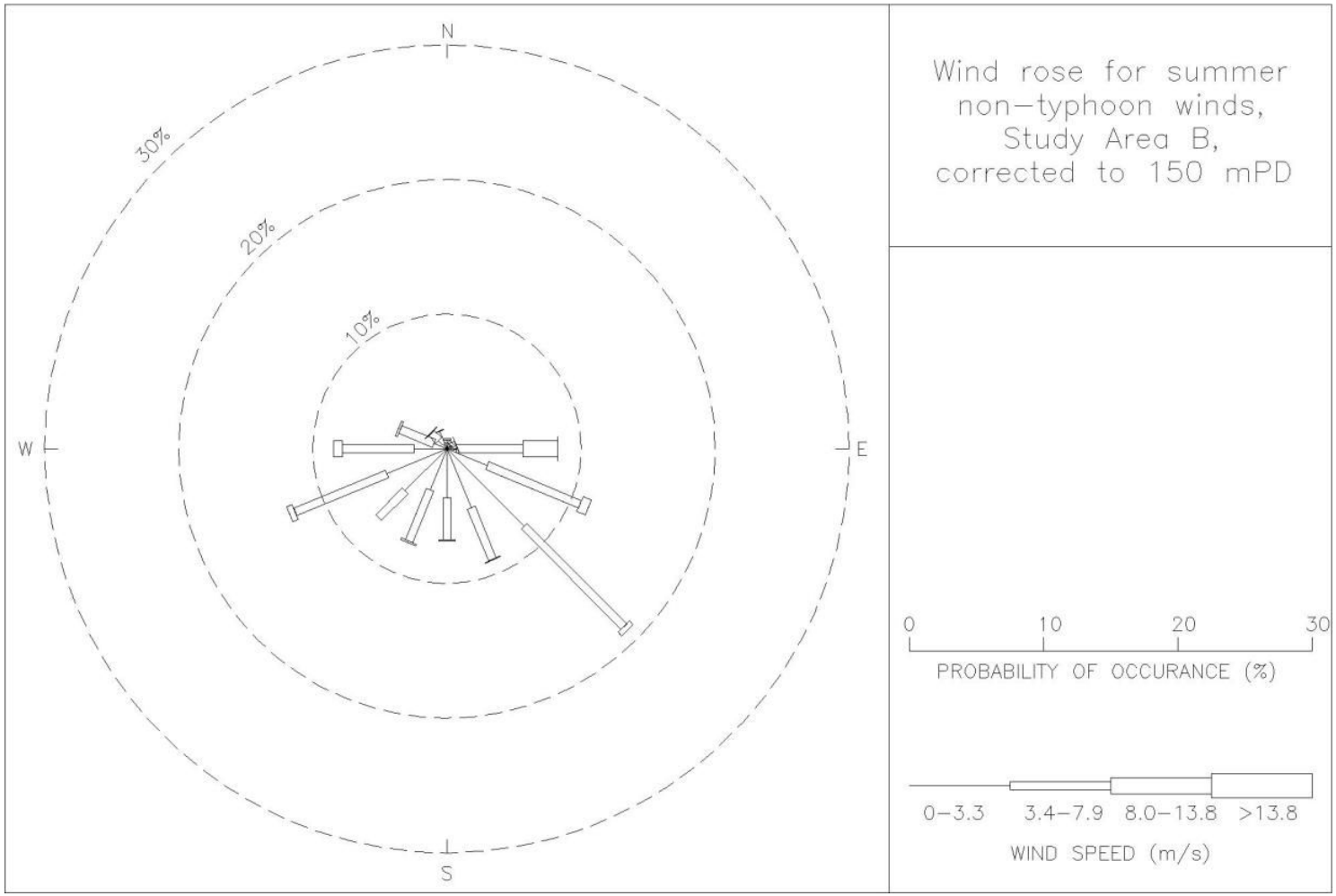

Figure 32: Wind rose for summer, non-typhoon winds for Kai Tak, corrected to 150 mPD at Study Area B, 1998 - 2009

Figure 33: Test point locations for Cha Kwo Ling Waterfront

Figure 34: Annual overall wind velocity ratios for Cha Kwo Ling Waterfront

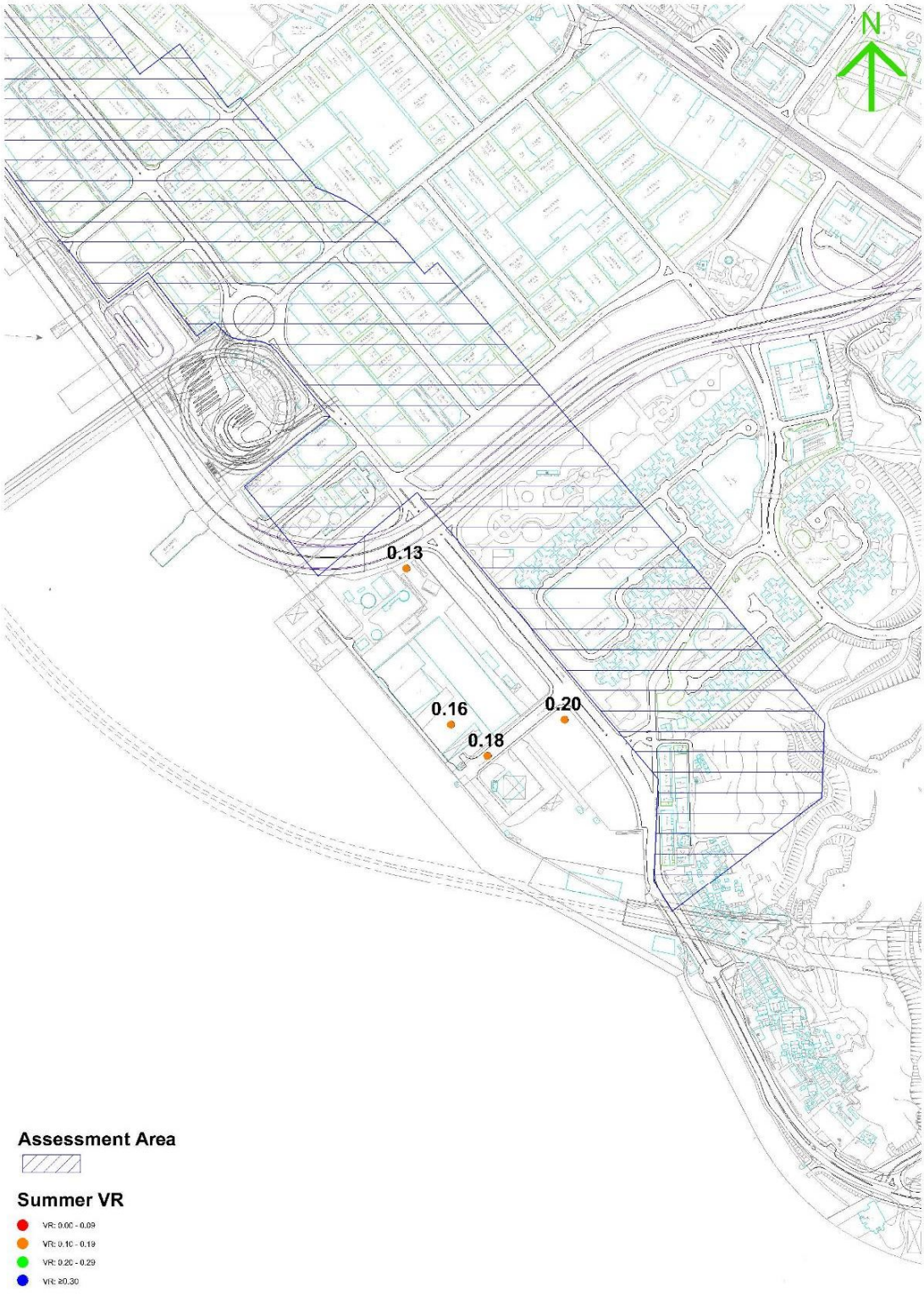

Figure 35: Summer overall wind velocity ratios for Cha Kwo Ling Waterfront

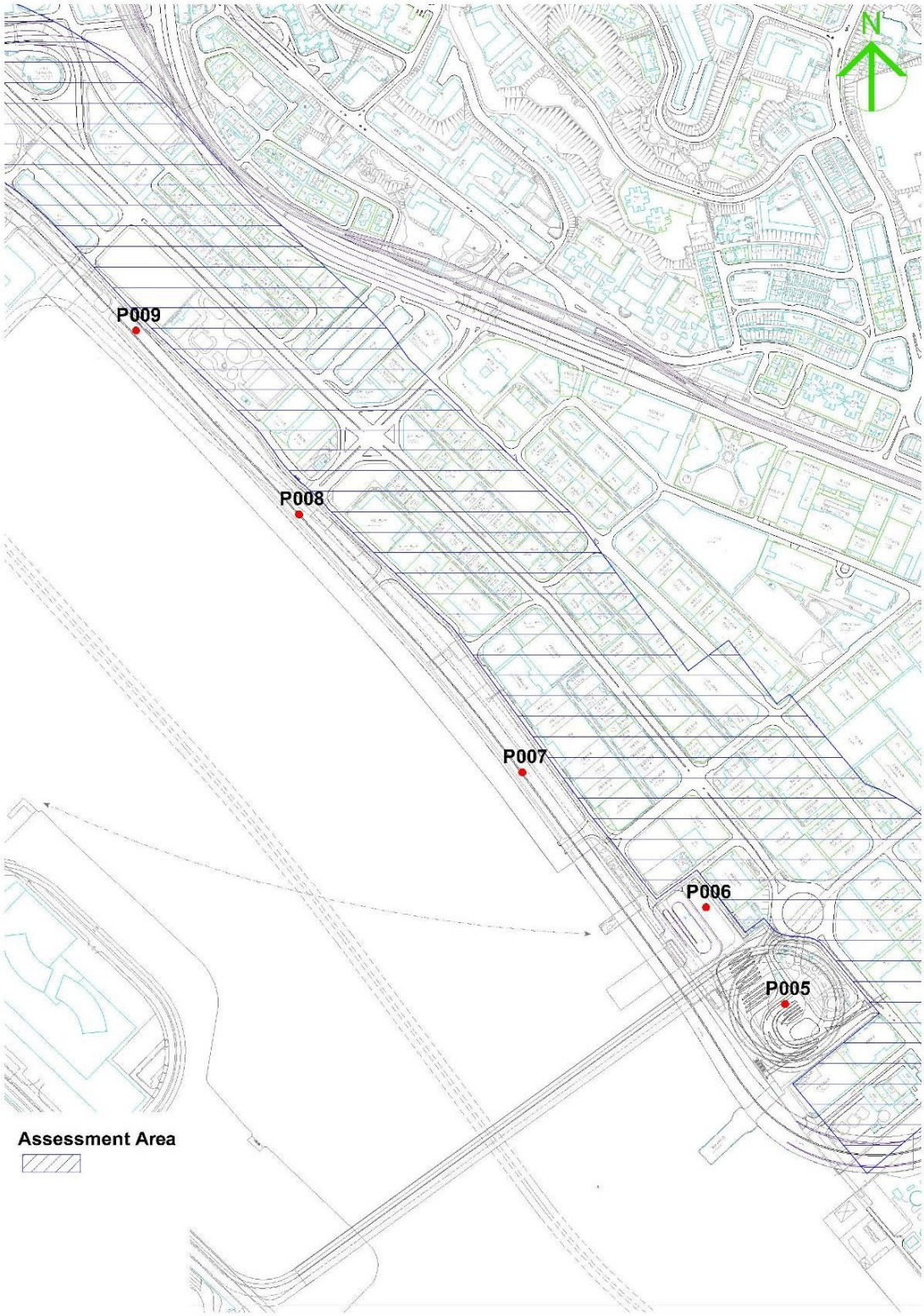

Figure 36: Test point locations for Kwun Tong Waterfront

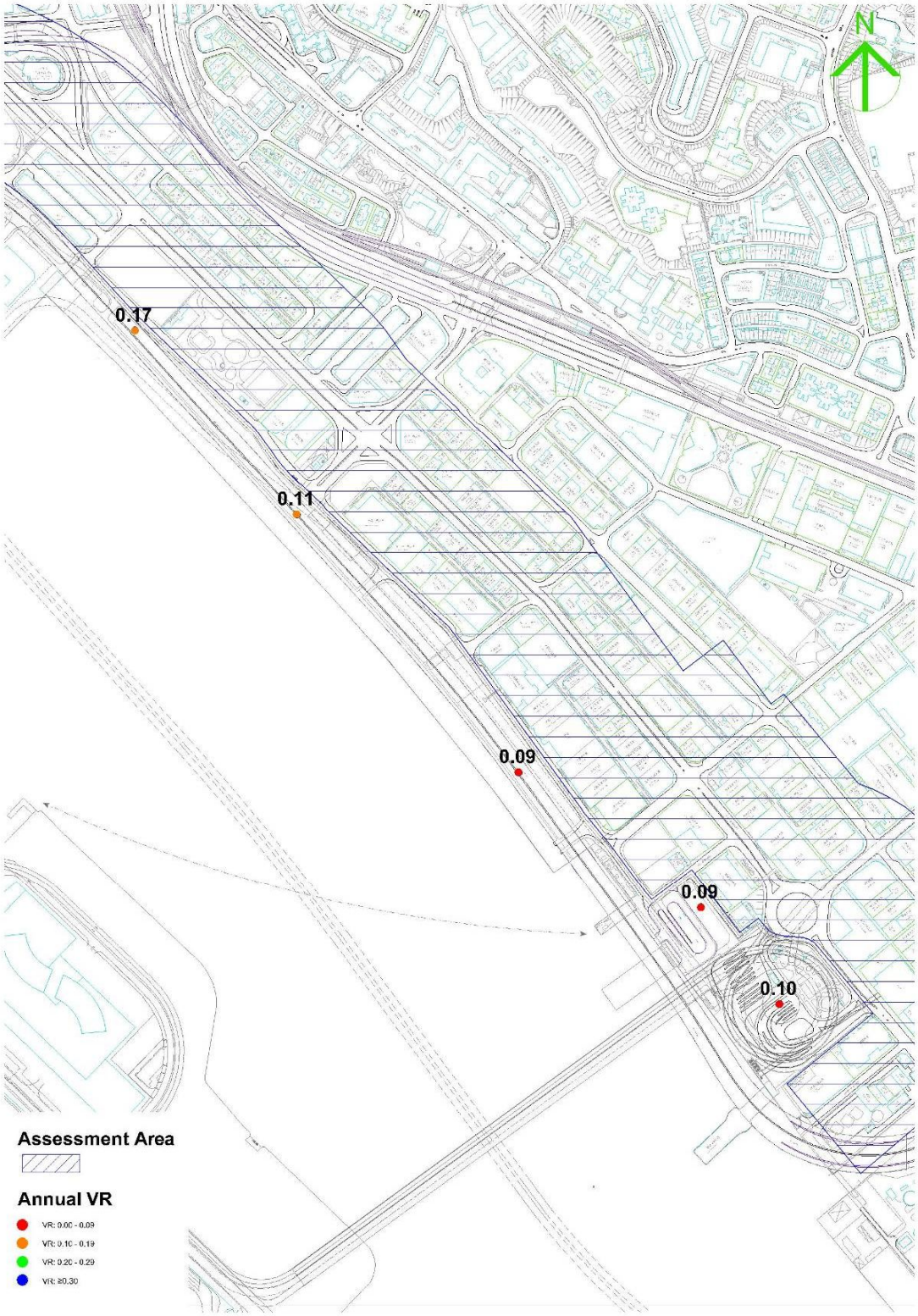

Figure 37: Annual overall wind velocity ratios for Kwun Tong Waterfront

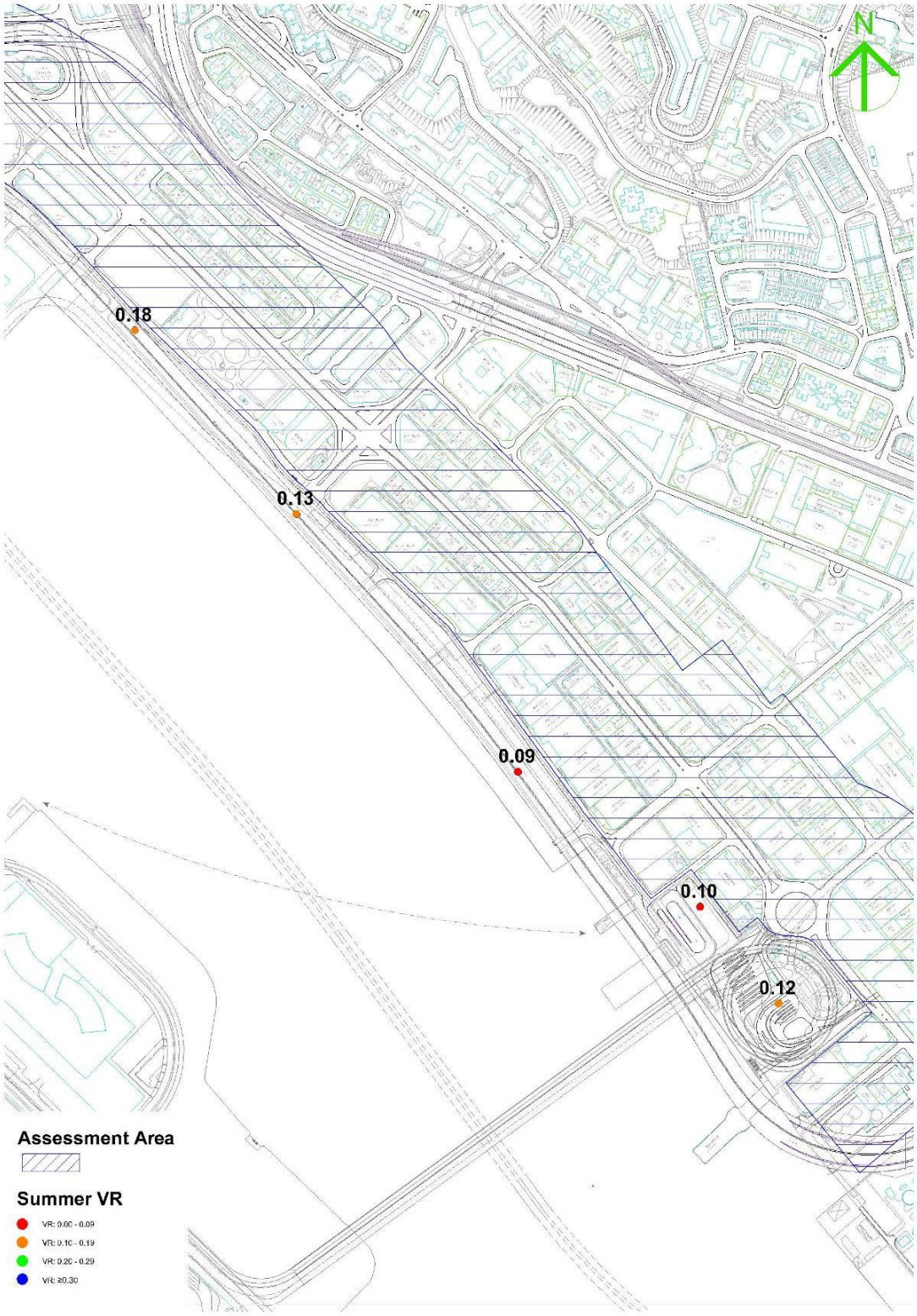

Figure 38: Summer overall wind velocity ratios for Kwun Tong Waterfront

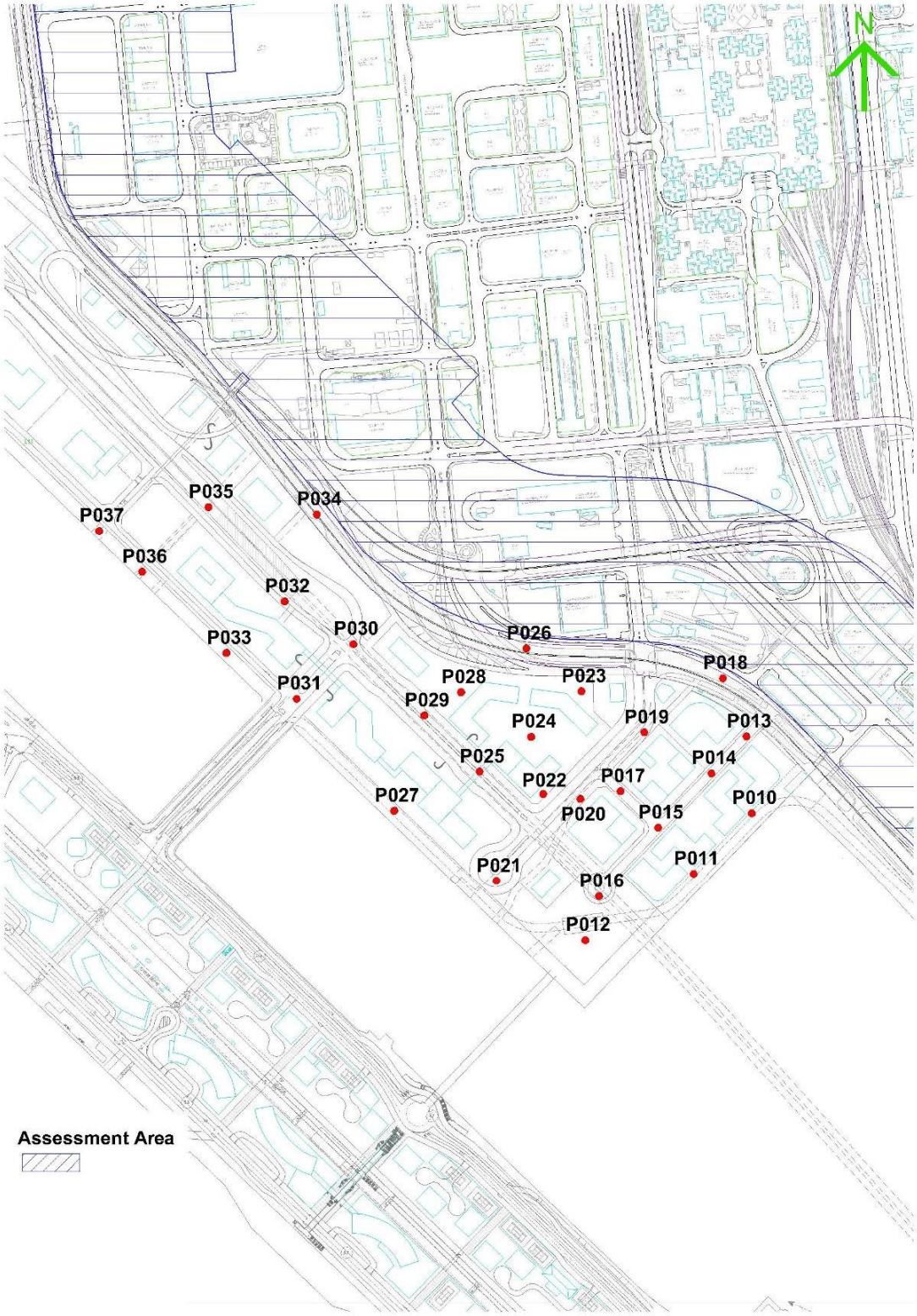

Figure 39: Test point locations for South Apron Corner

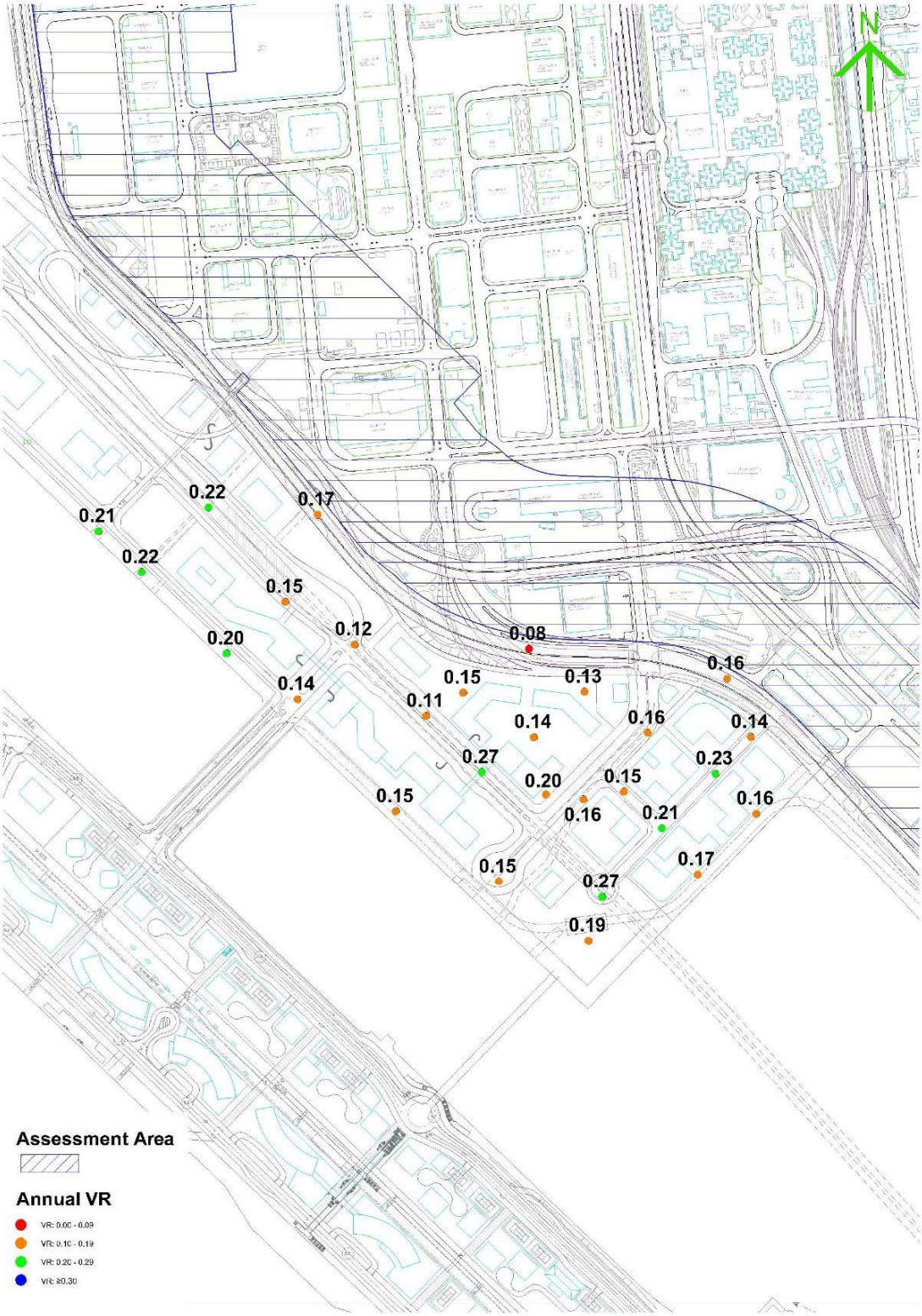

Figure 40: Annual overall wind velocity ratios for South Apron Corner

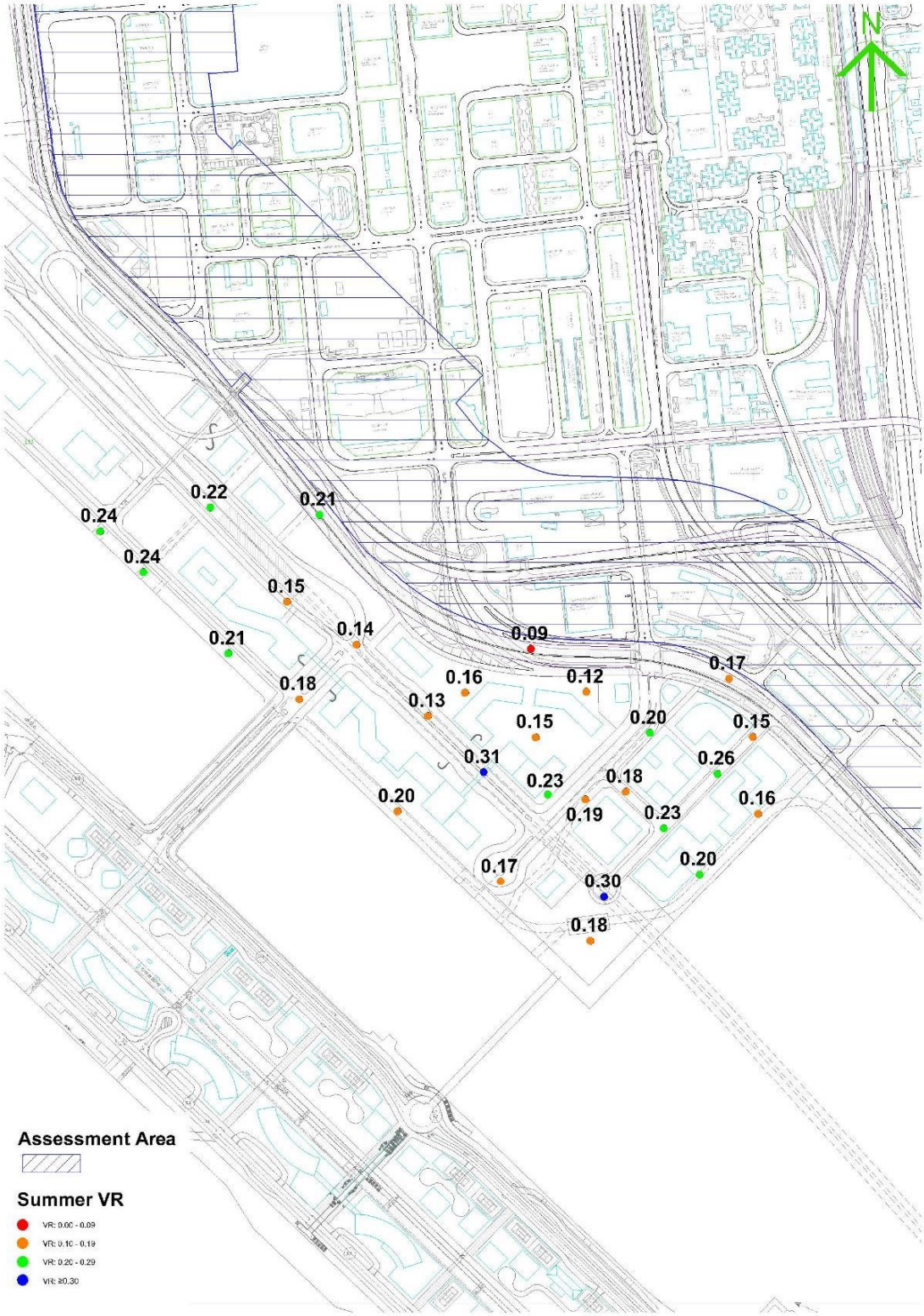

Figure 41: Summer overall wind velocity ratios for South Apron Corner

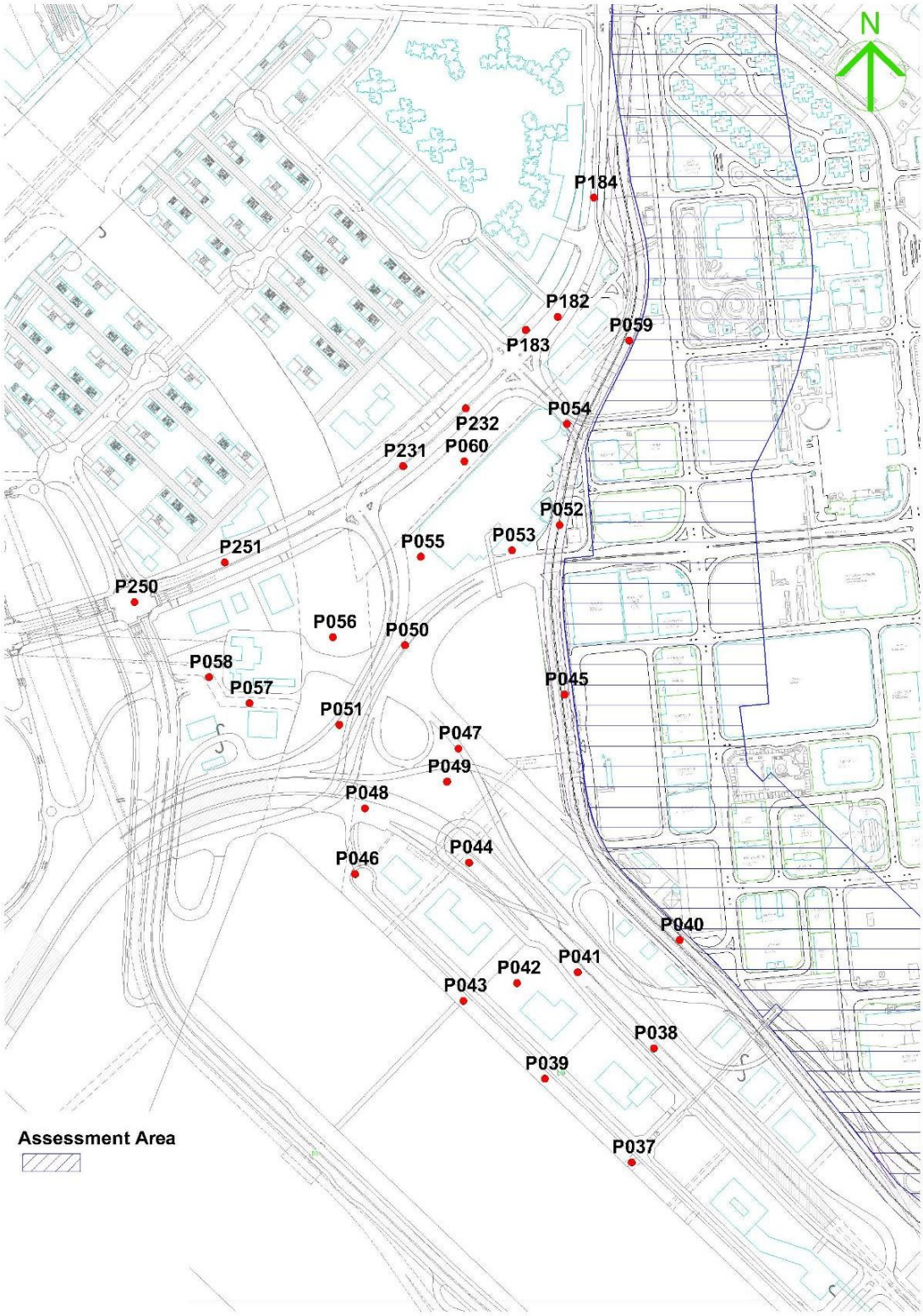

Figure 42: Test point locations for North Apron East

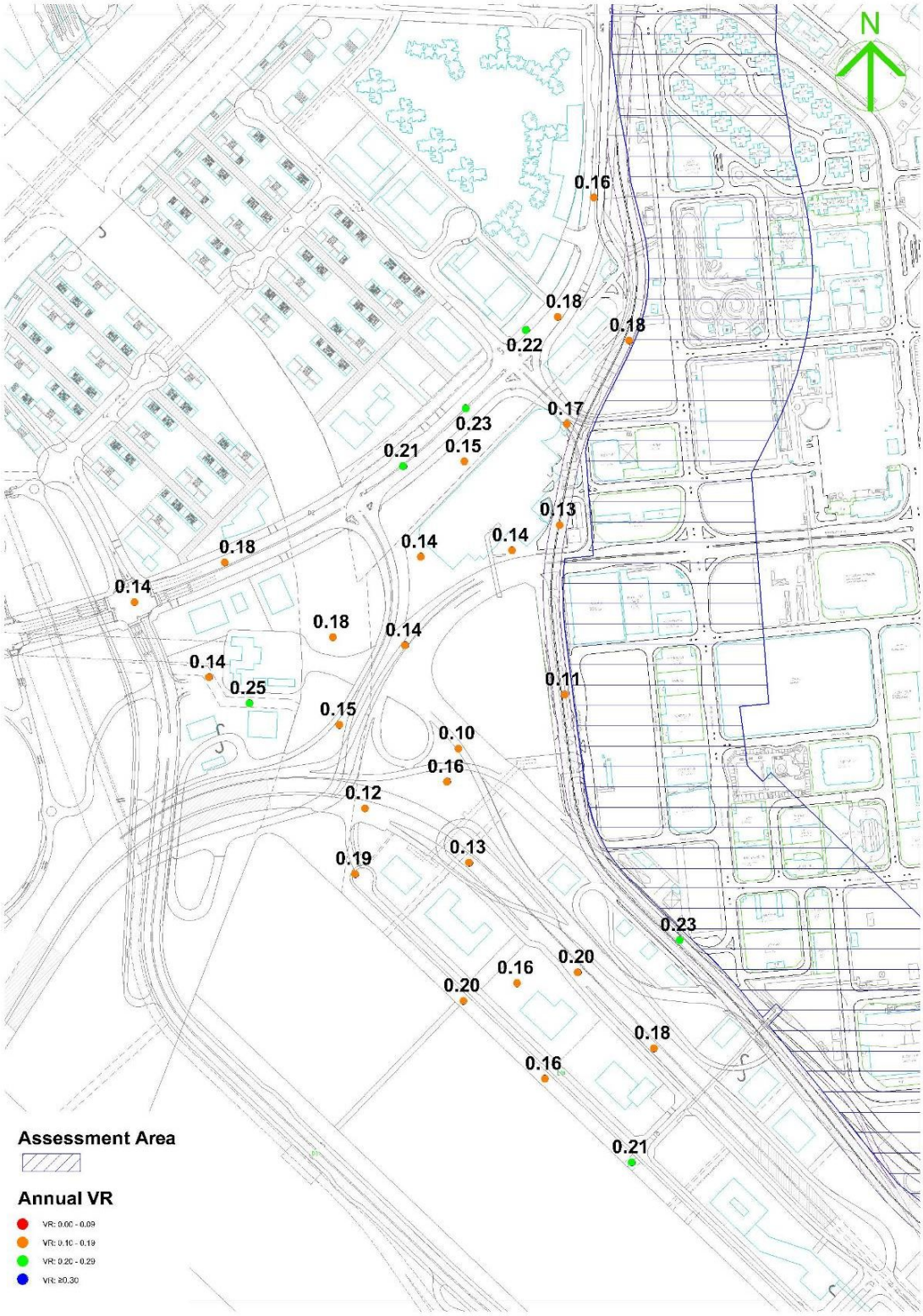

Figure 43: Annual overall wind velocity ratios for North Apron East

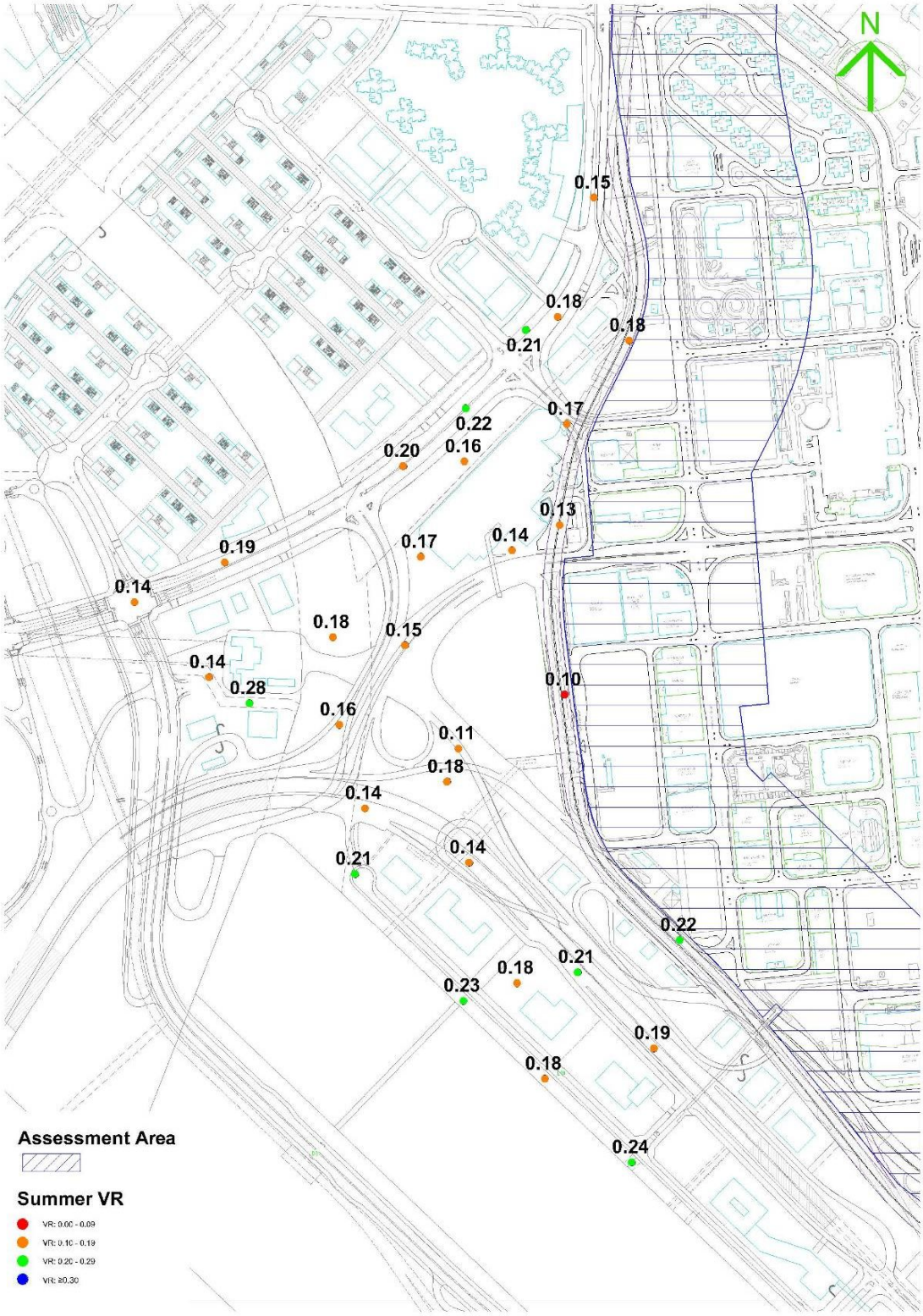

Figure 44: Summer overall wind velocity ratios for North Apron East

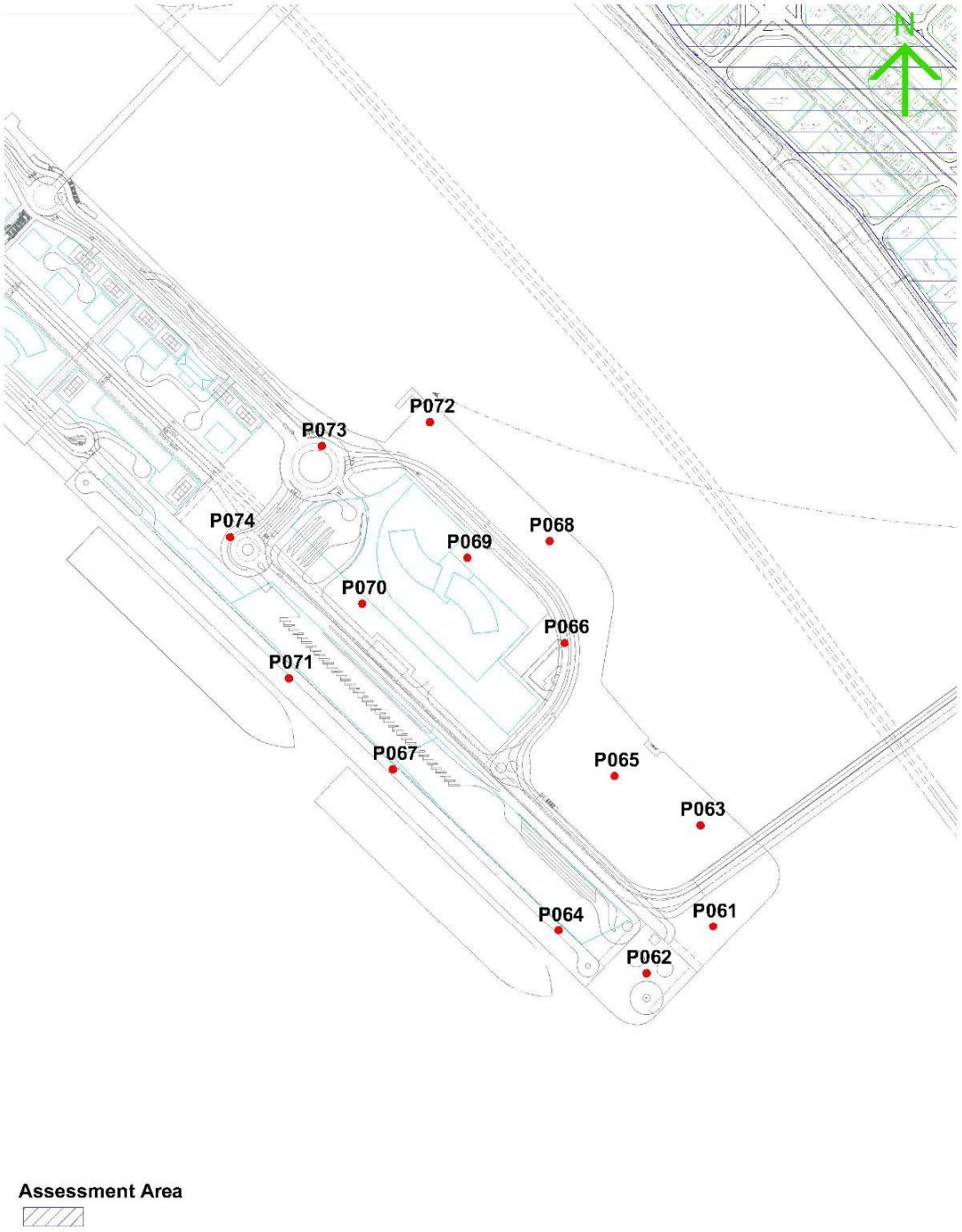

Figure 45: Test point locations for Tourism and Leisure Hub at Runway South

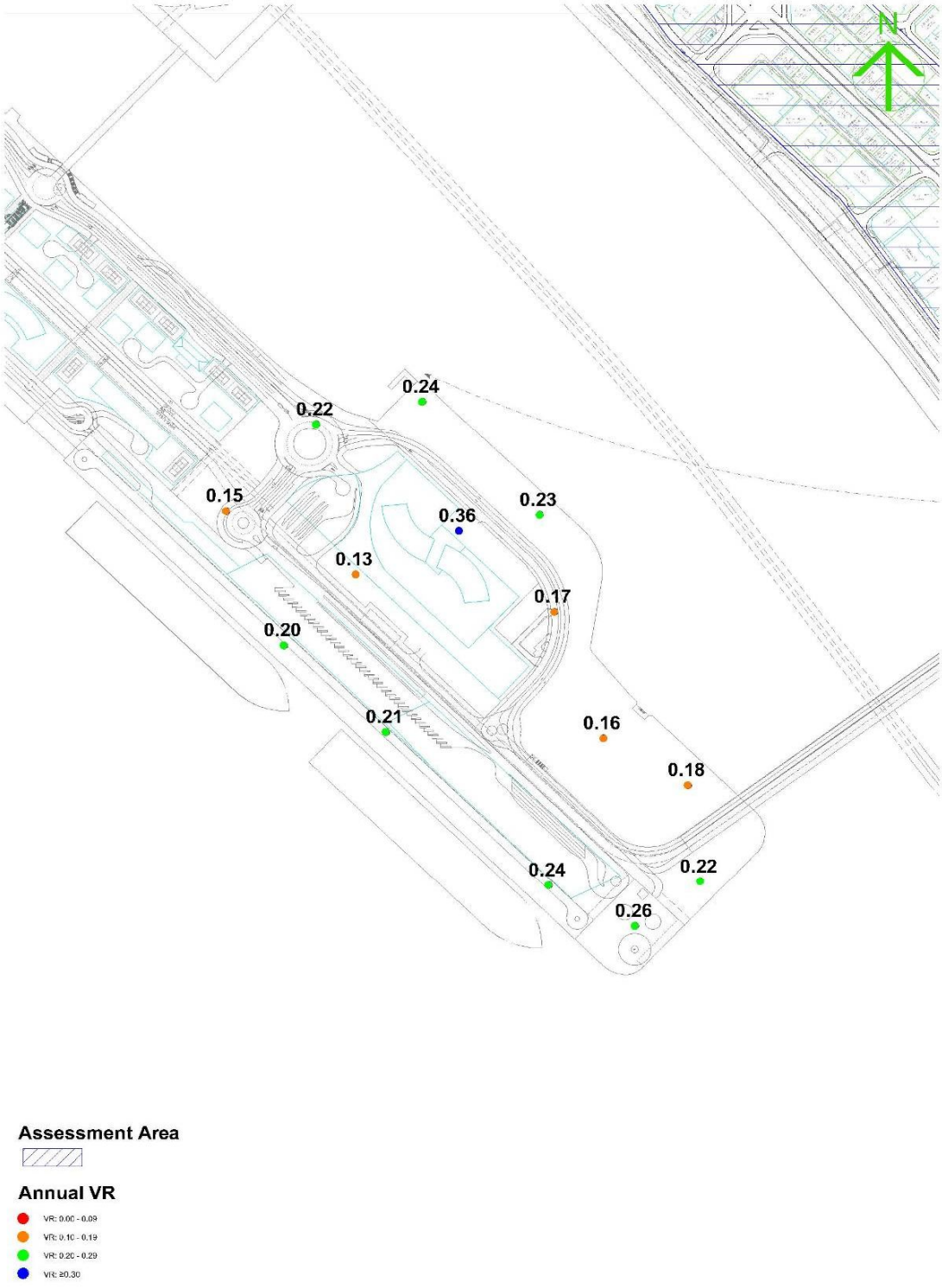

Figure 46: Annual overall wind velocity ratios for Tourism and Leisure Hub at Runway South

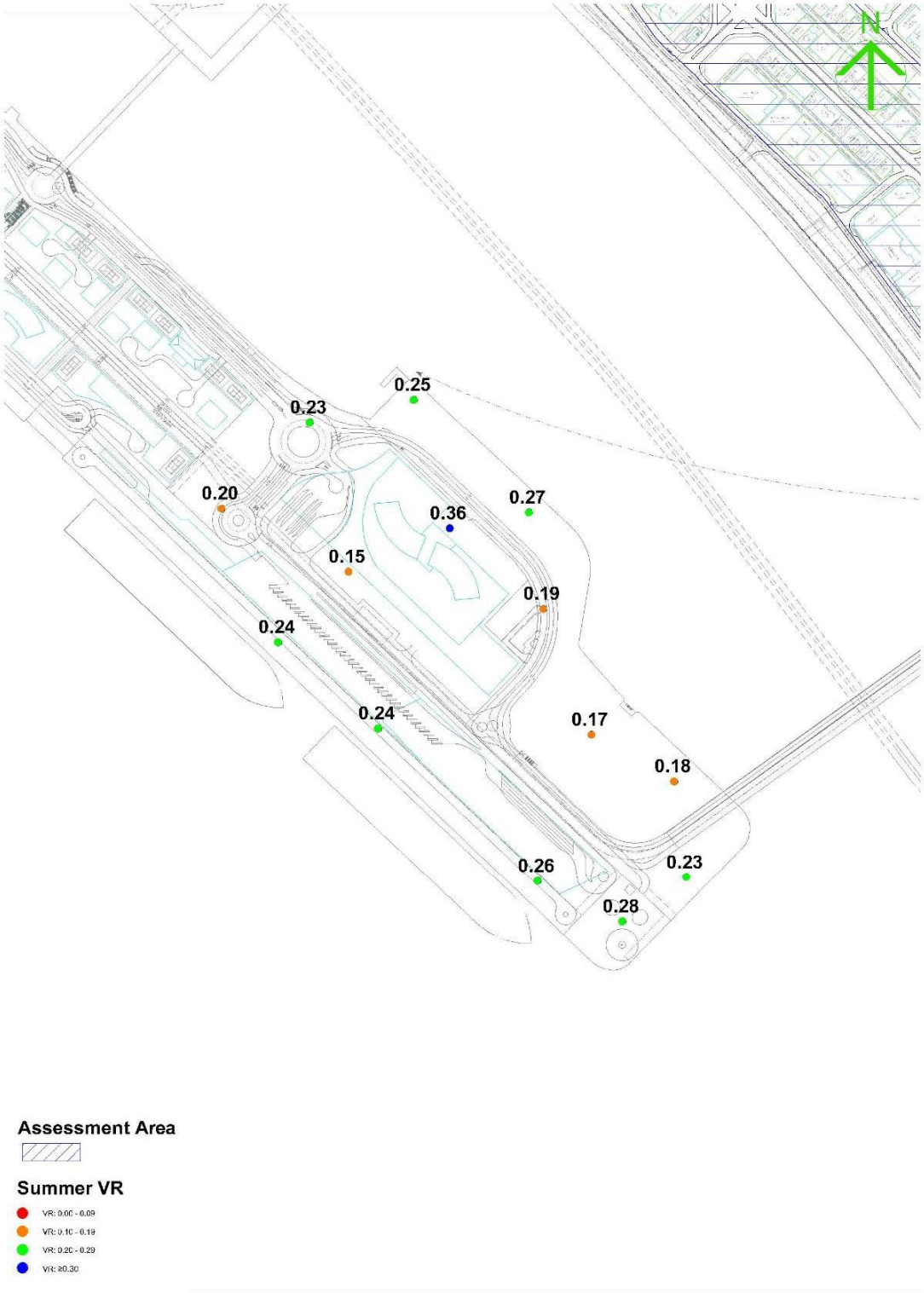

Figure 47: Summer overall wind velocity ratios for Tourism and Leisure Hub at Runway South

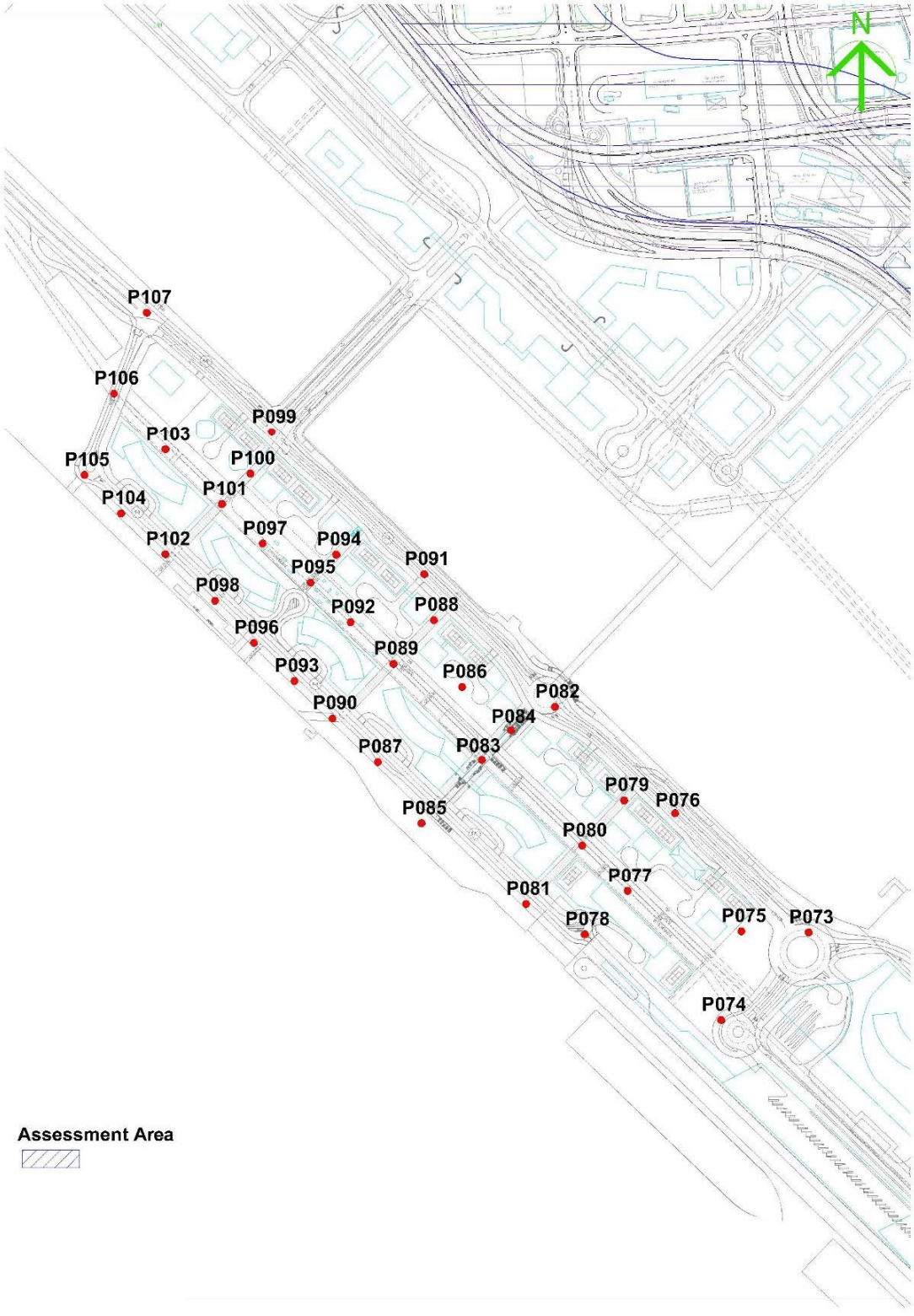

Figure 48: Test point locations for the Runway Precinct at Middle Runway

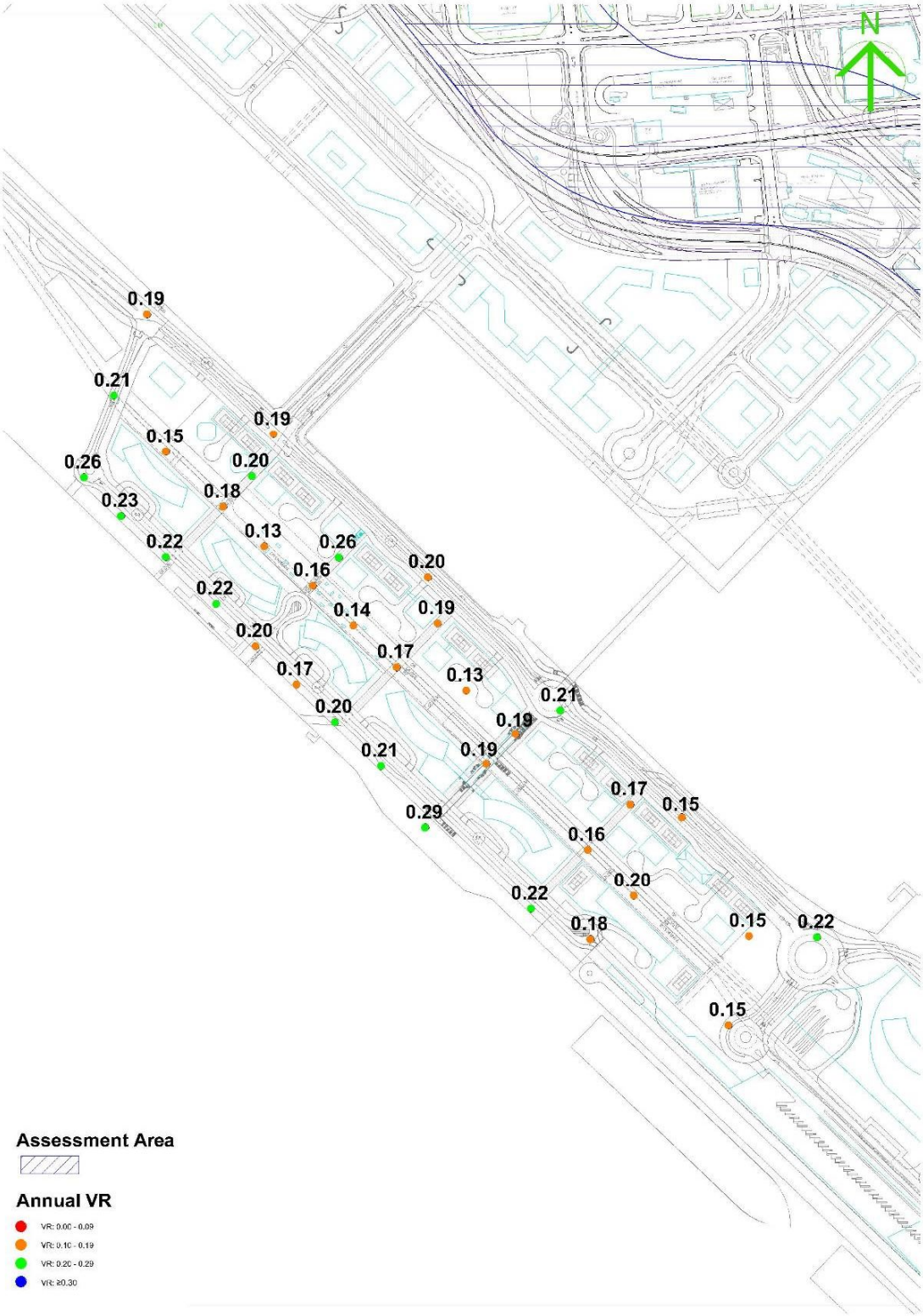

Figure 49: Annual overall wind velocity ratios for the Runway Precinct at Middle Runway

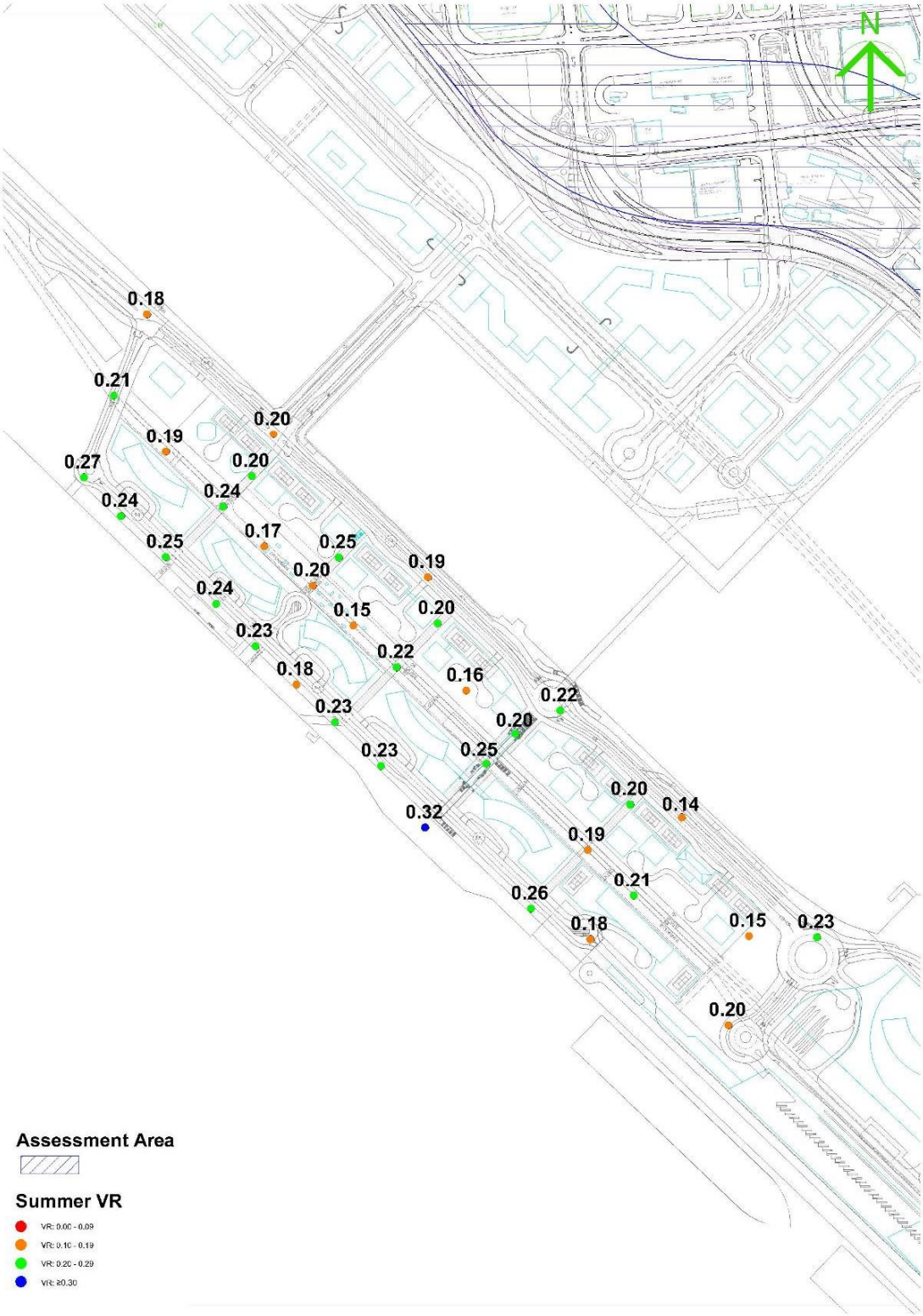

Figure 50: Summer overall wind velocity ratios for the Runway Precinct at Middle Runway

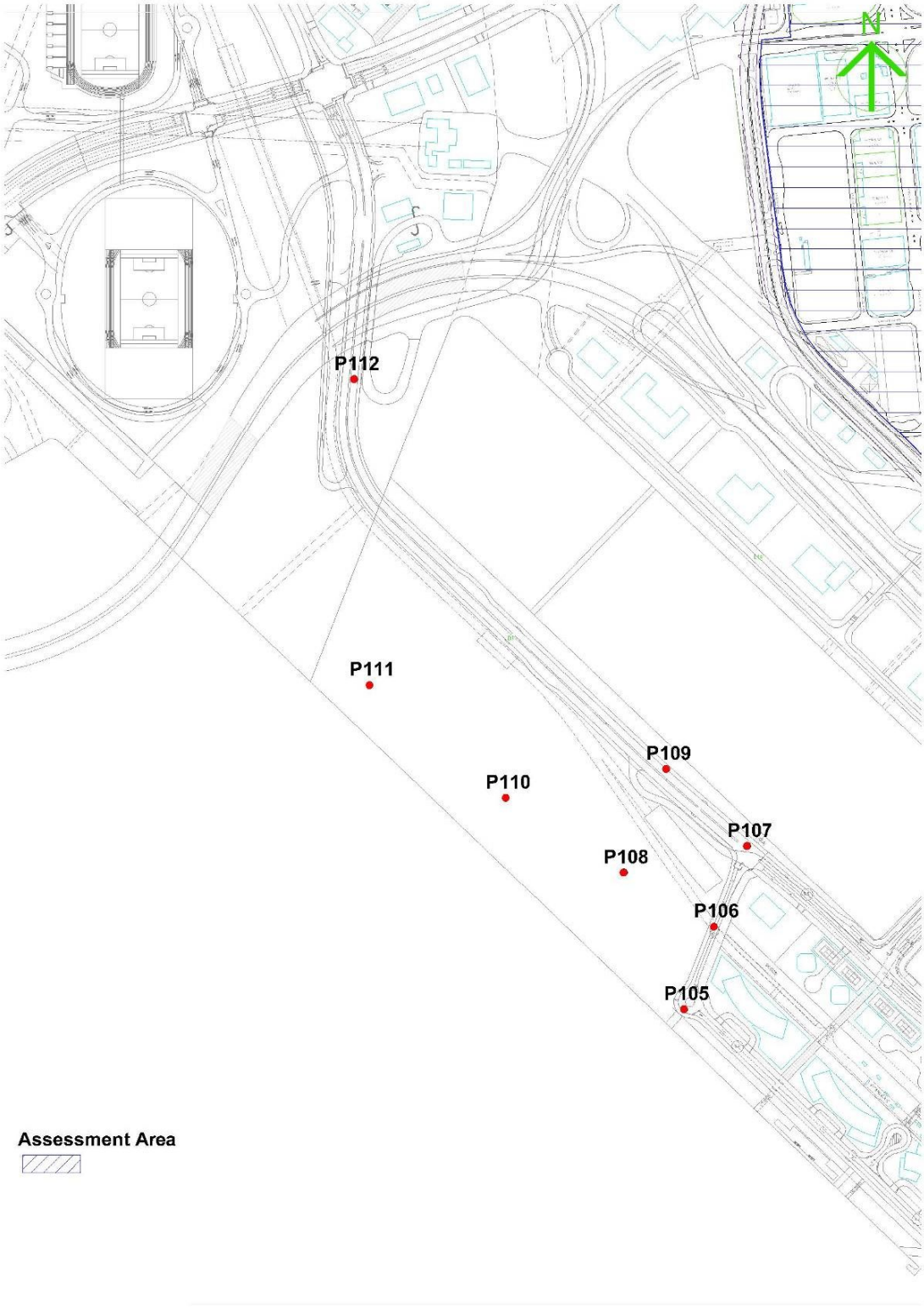

Figure 51: Test point locations for the Metro Park at Runway North

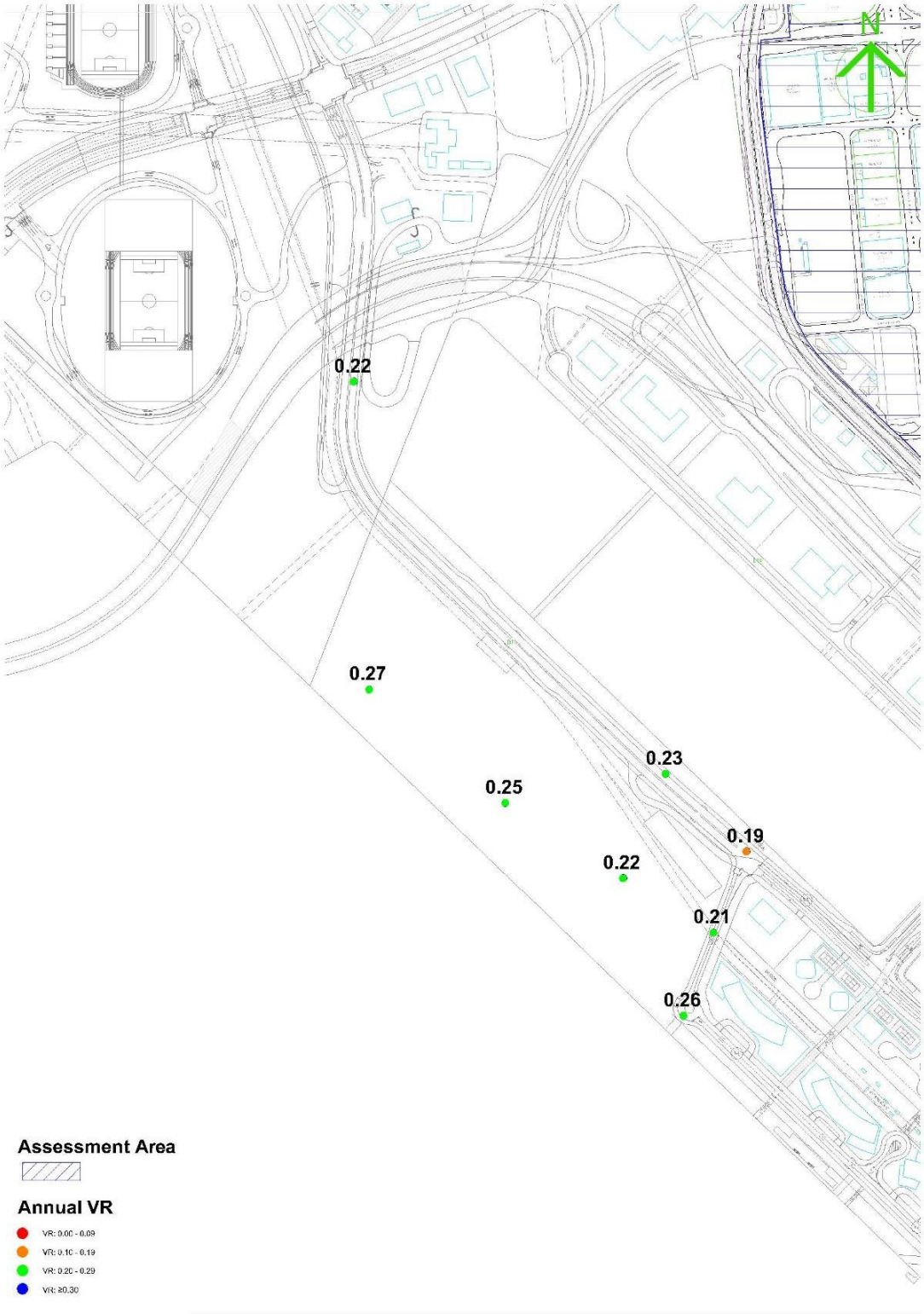

Figure 52: Annual overall wind velocity ratios for the Metro Park at Runway North

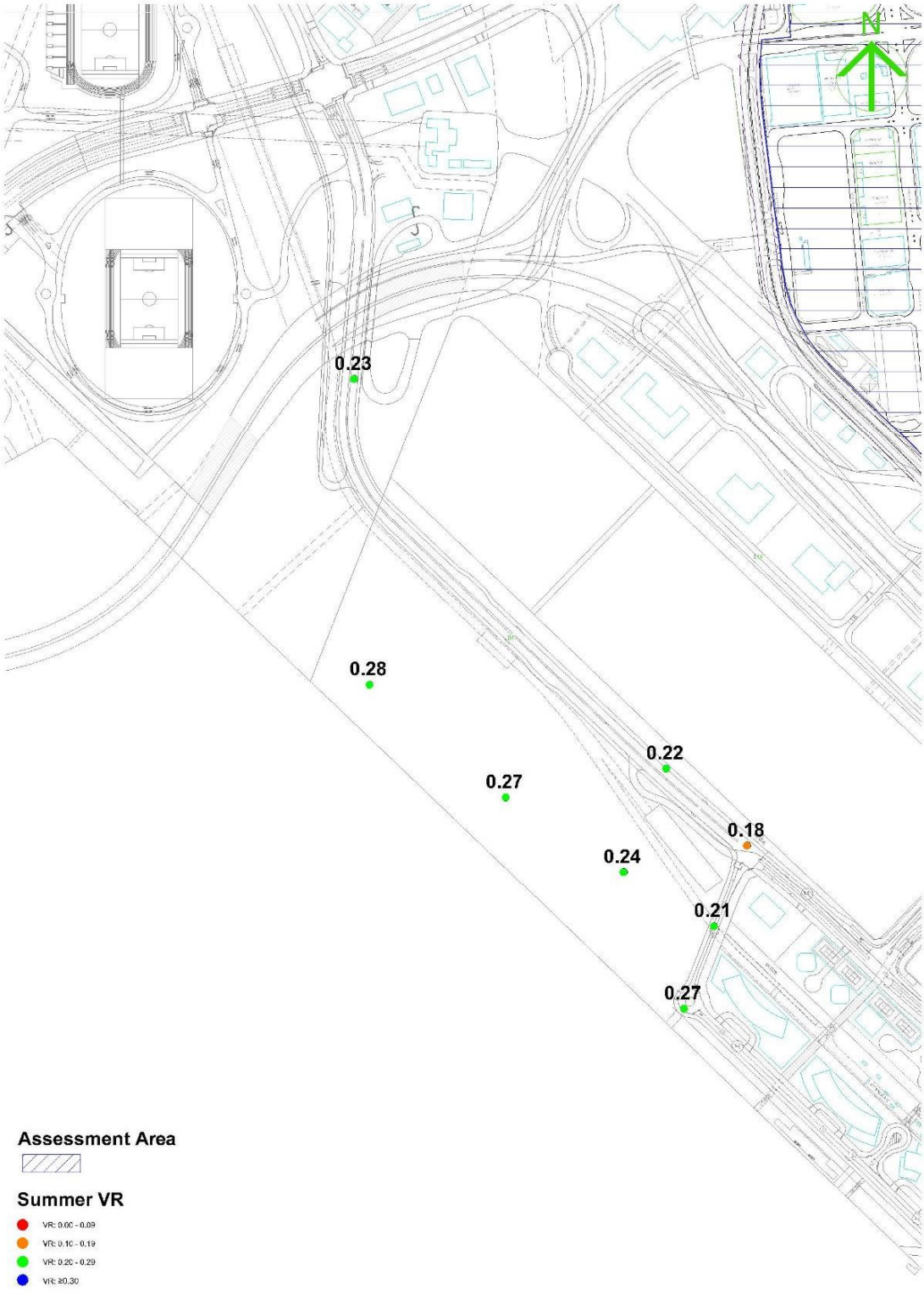

Figure 53: Summer overall wind velocity ratios for the Metro Park at Runway North

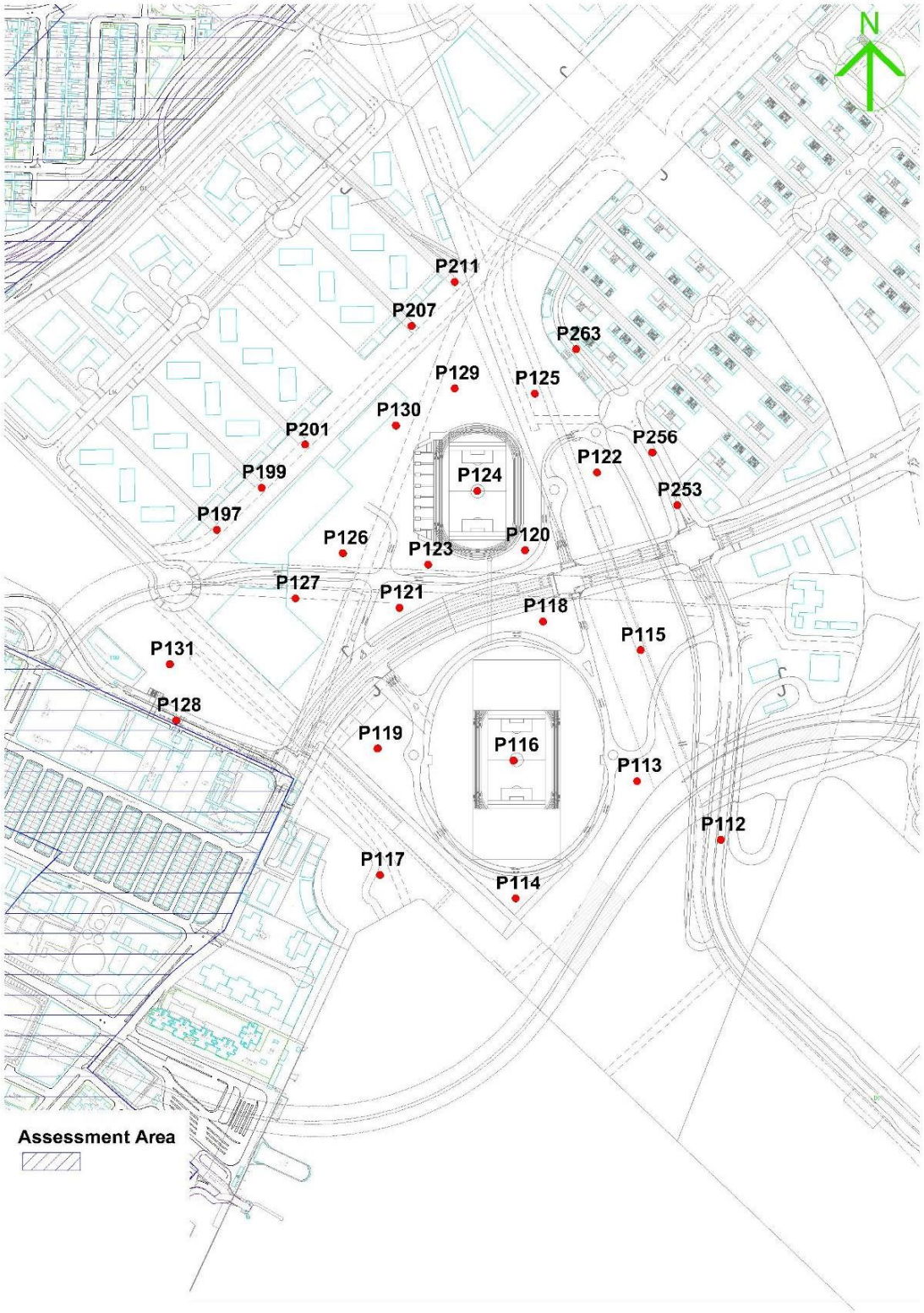

Figure 54: Test point locations for the Sports Hub at North Apron West

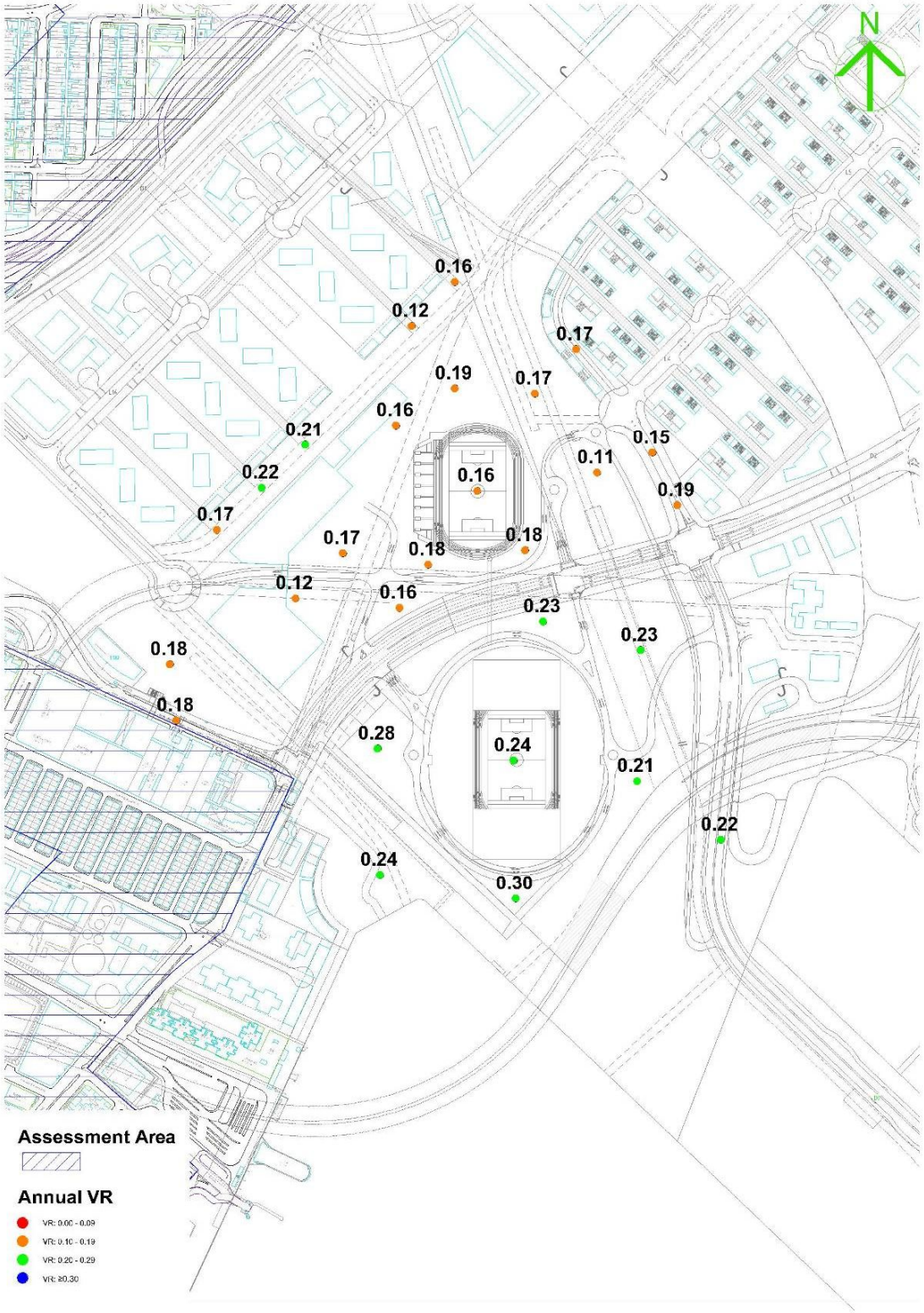

Figure 55: Annual overall wind velocity ratios for the Sports Hub at North Apron West

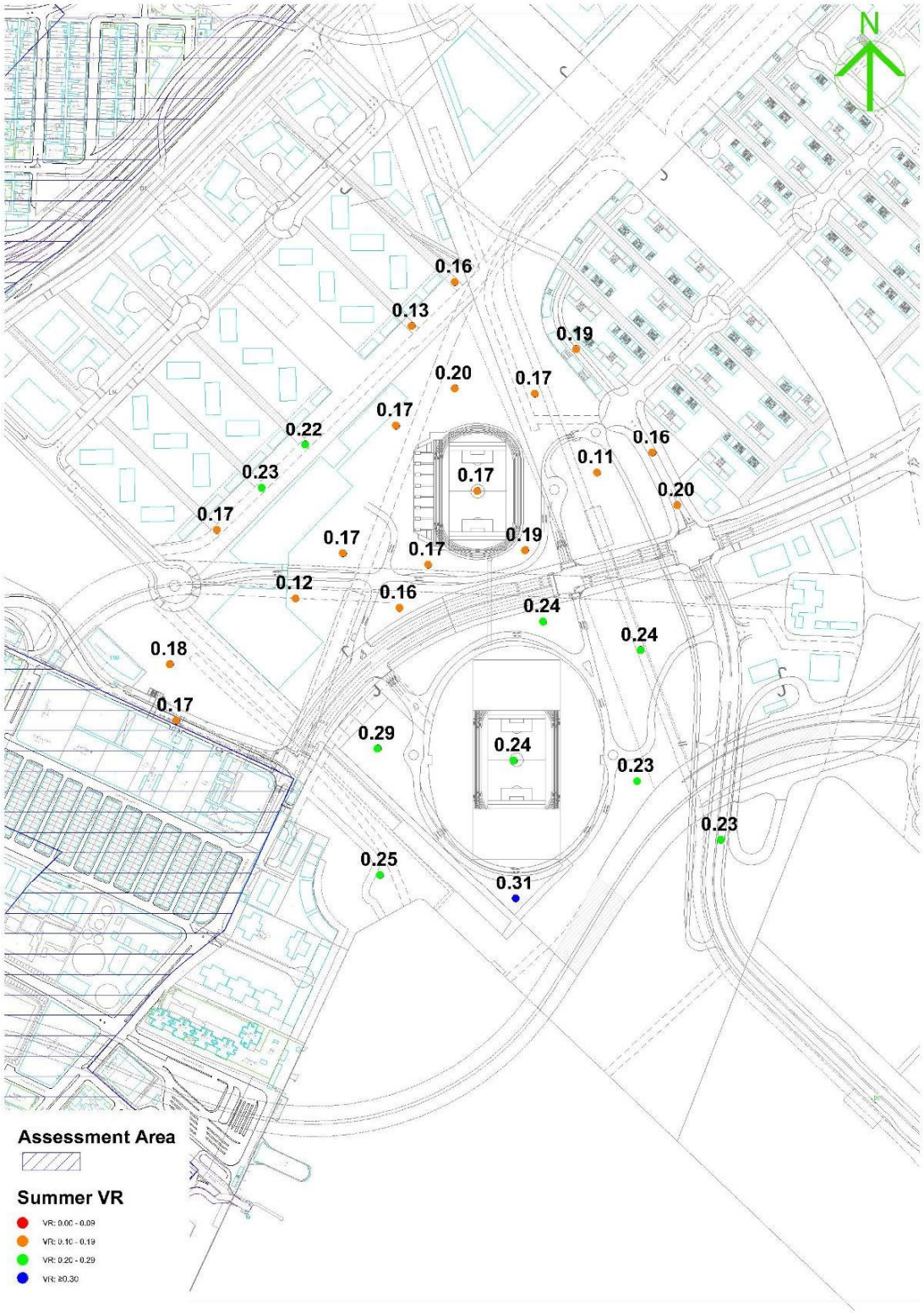

Figure 56: Summer overall wind velocity ratios for the Sports Hub at North Apron West

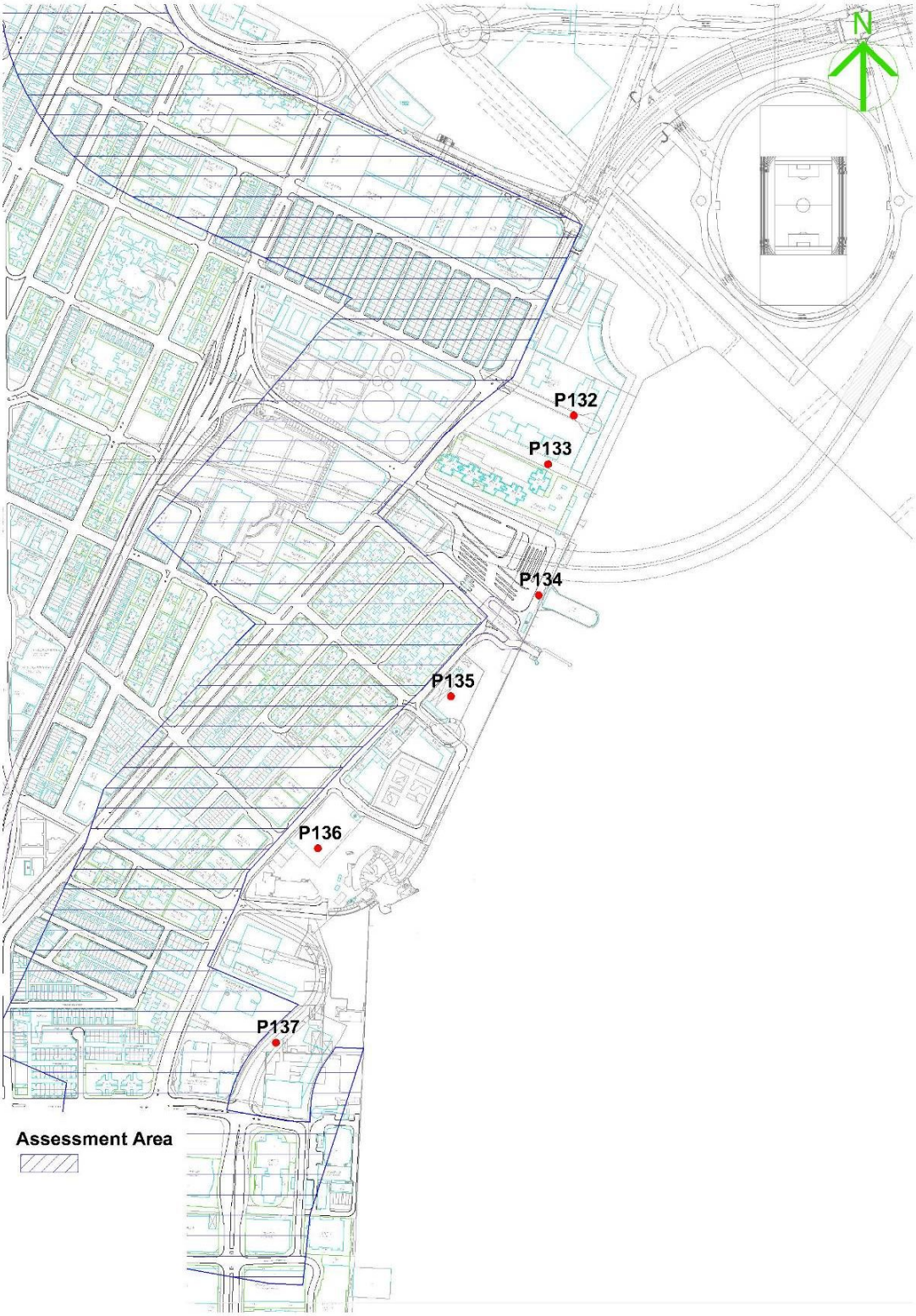

Figure 57: Test point locations for To Kwa Wan Waterfront

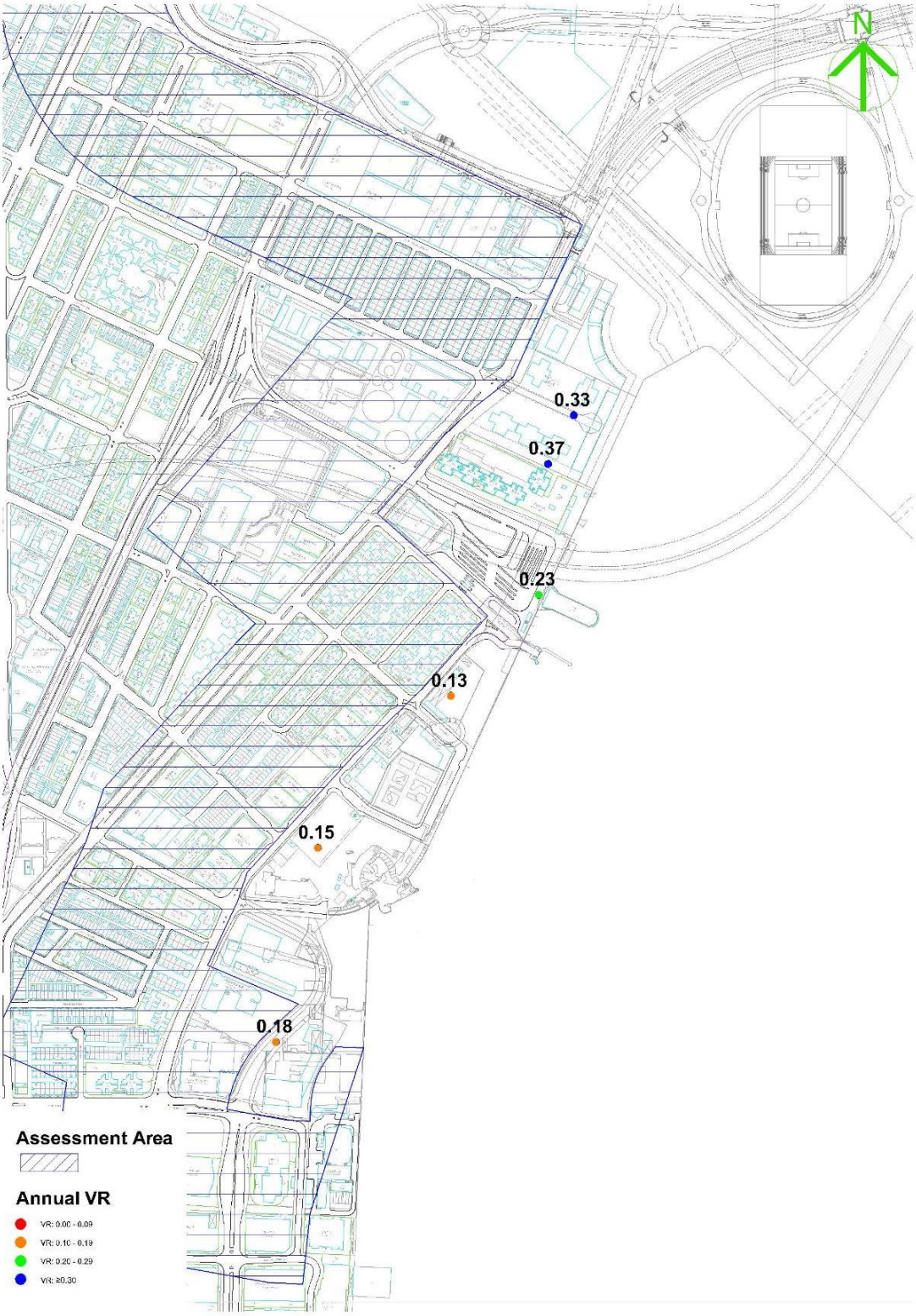

Figure 58: Annual overall wind velocity ratios for To Kwa Wan Waterfront

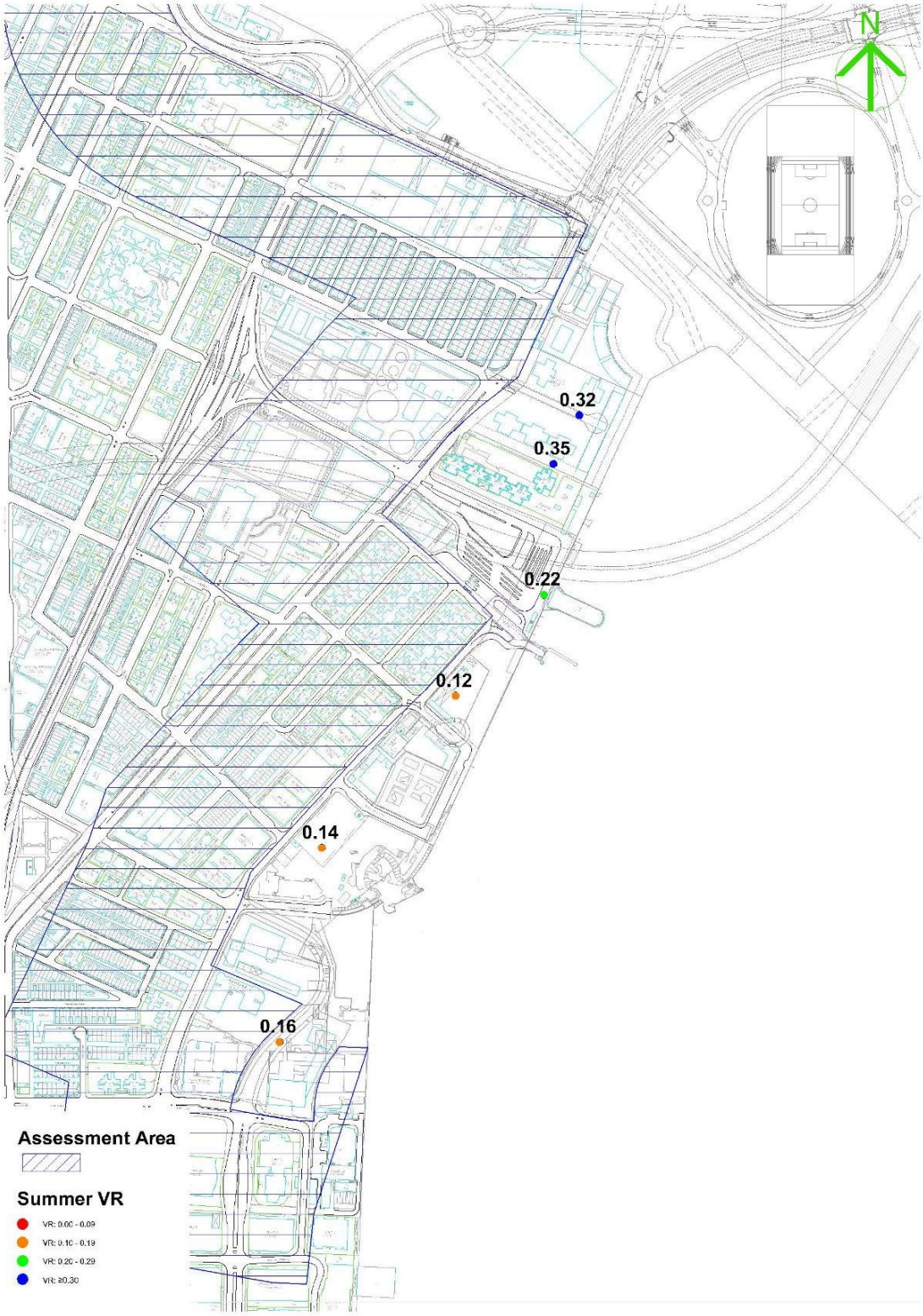

Figure 59: Summer overall wind velocity ratios for To Kwa Wan Waterfront

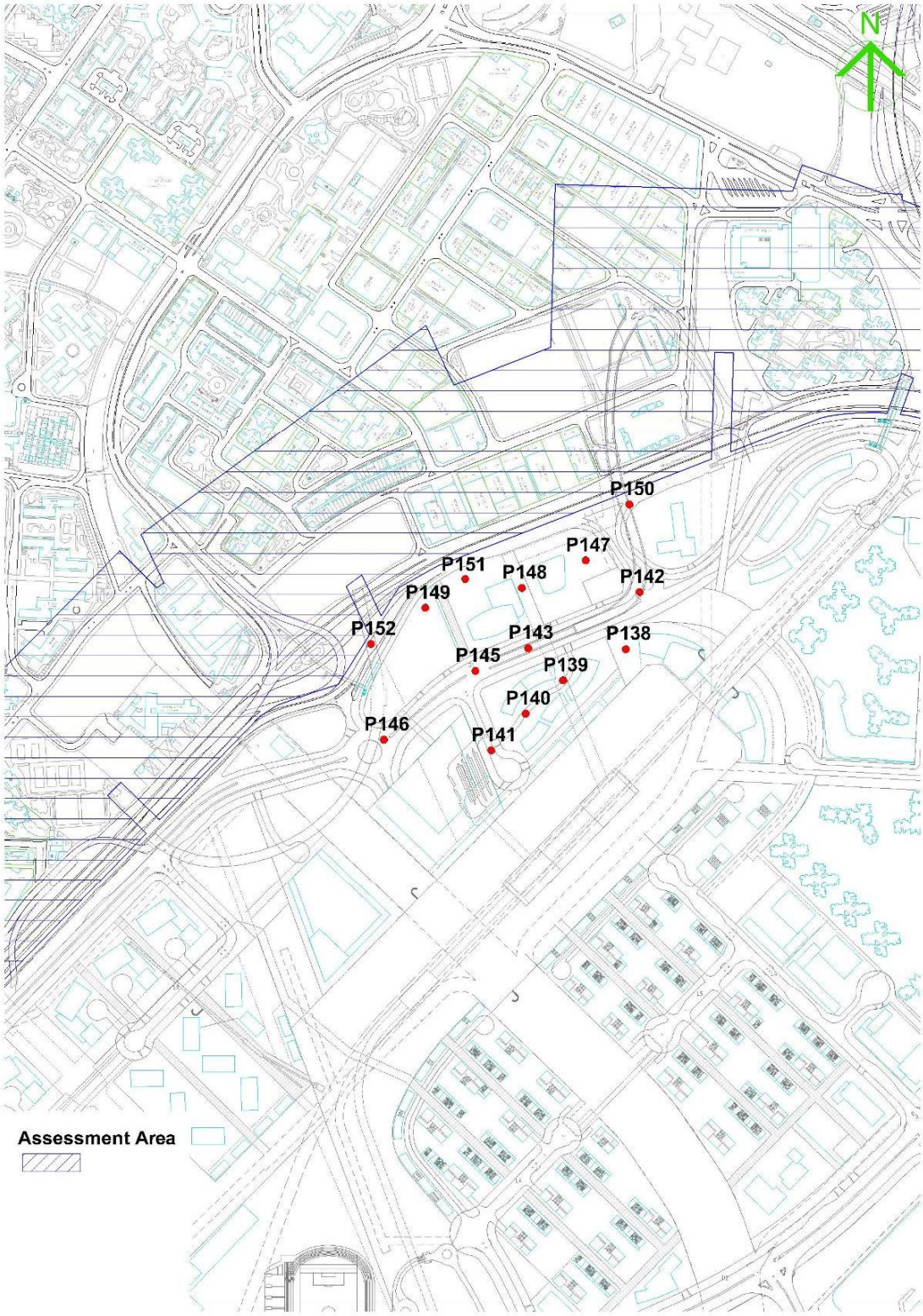

Figure 60: Test point locations for Zone A-1 of the Kai Tak City Centre at the North Apron

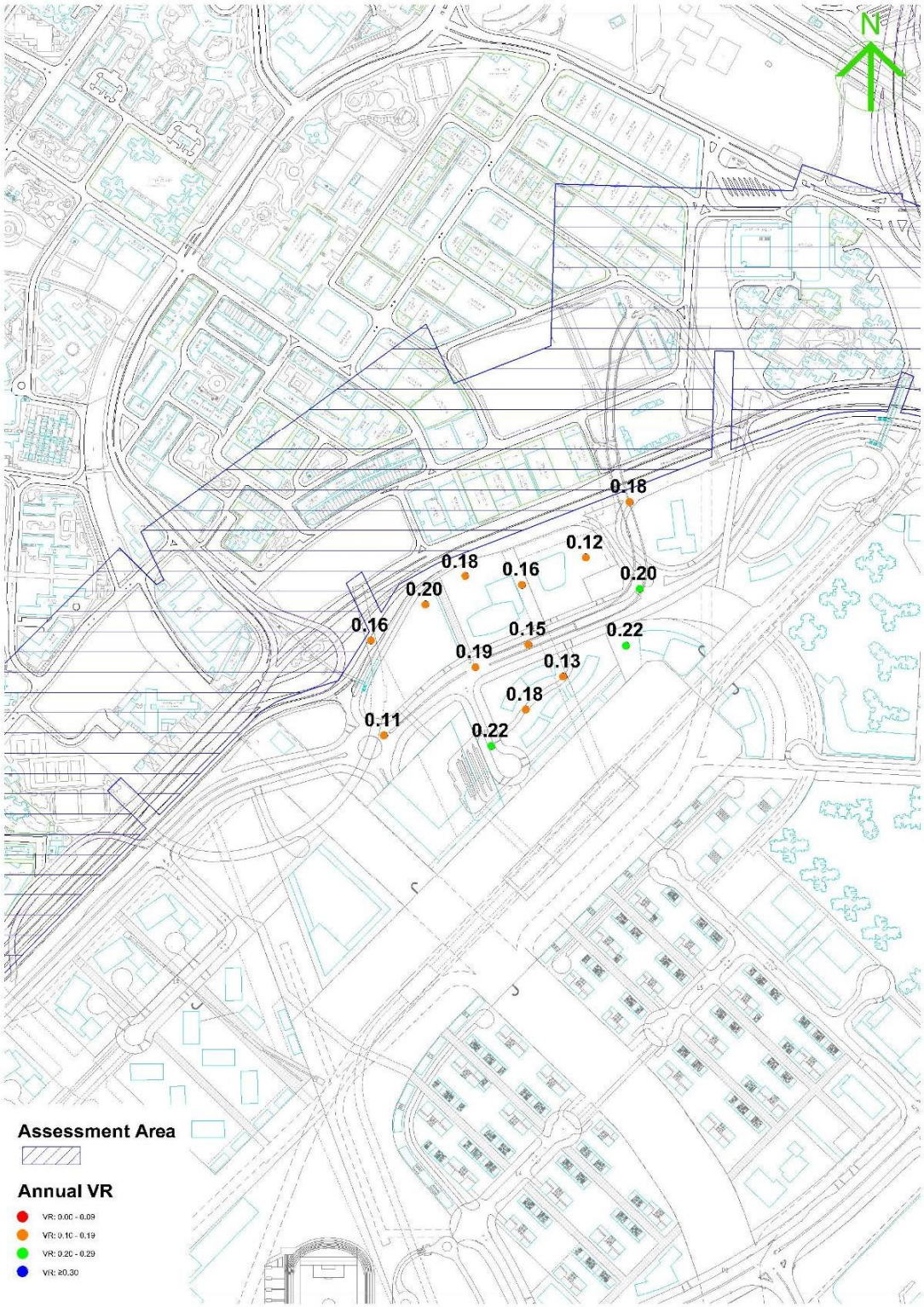

Figure 61: Annual overall wind velocity ratios for Zone A-1 of the Kai Tak City Centre at the North Apron

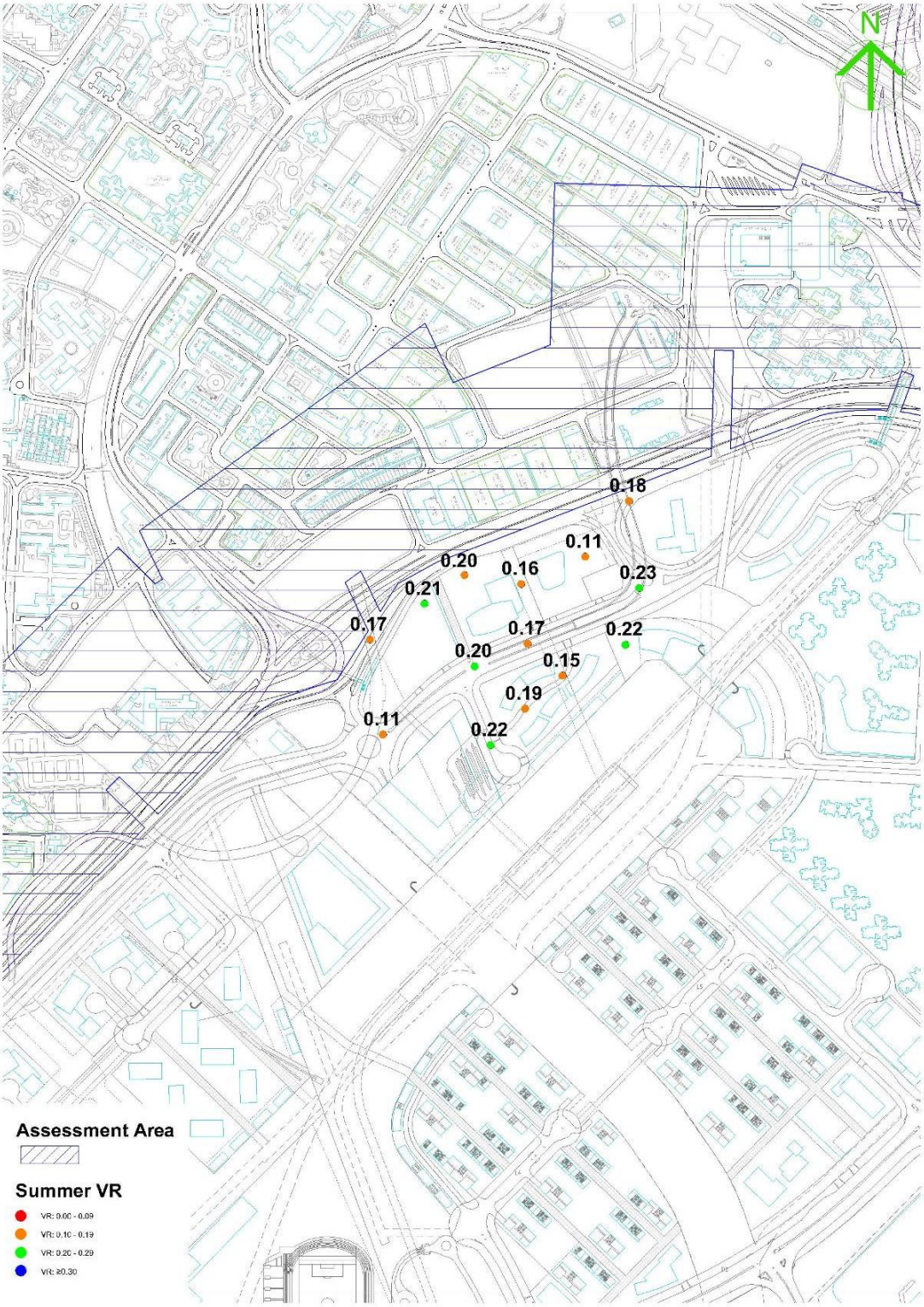

Figure 62: Summer overall wind velocity ratios for Zone A-1 of the Kai Tak City Centre at the North Apron

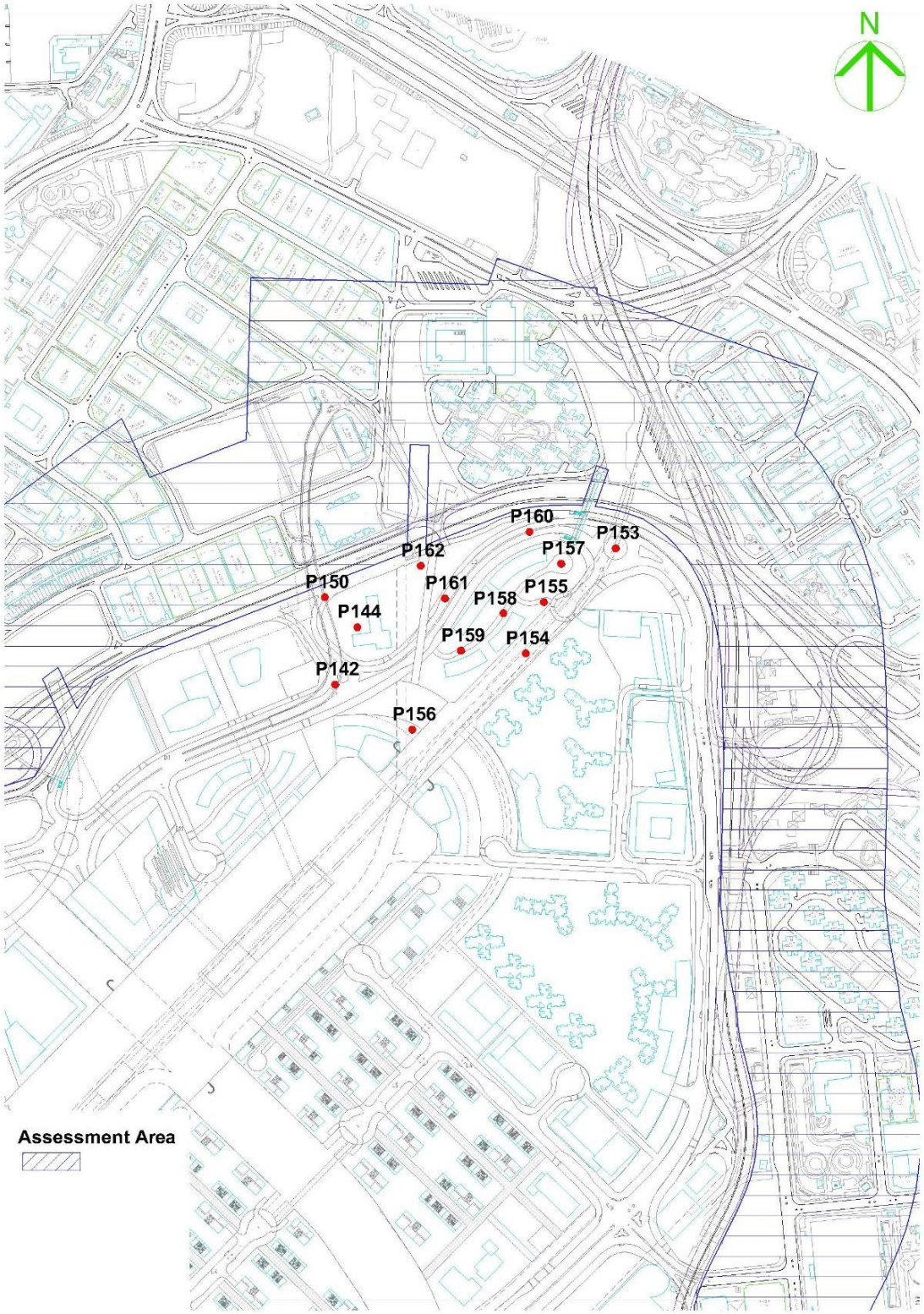

Figure 63: Test point locations for Zone A-2 of the Kai Tak City Centre at the North Apron

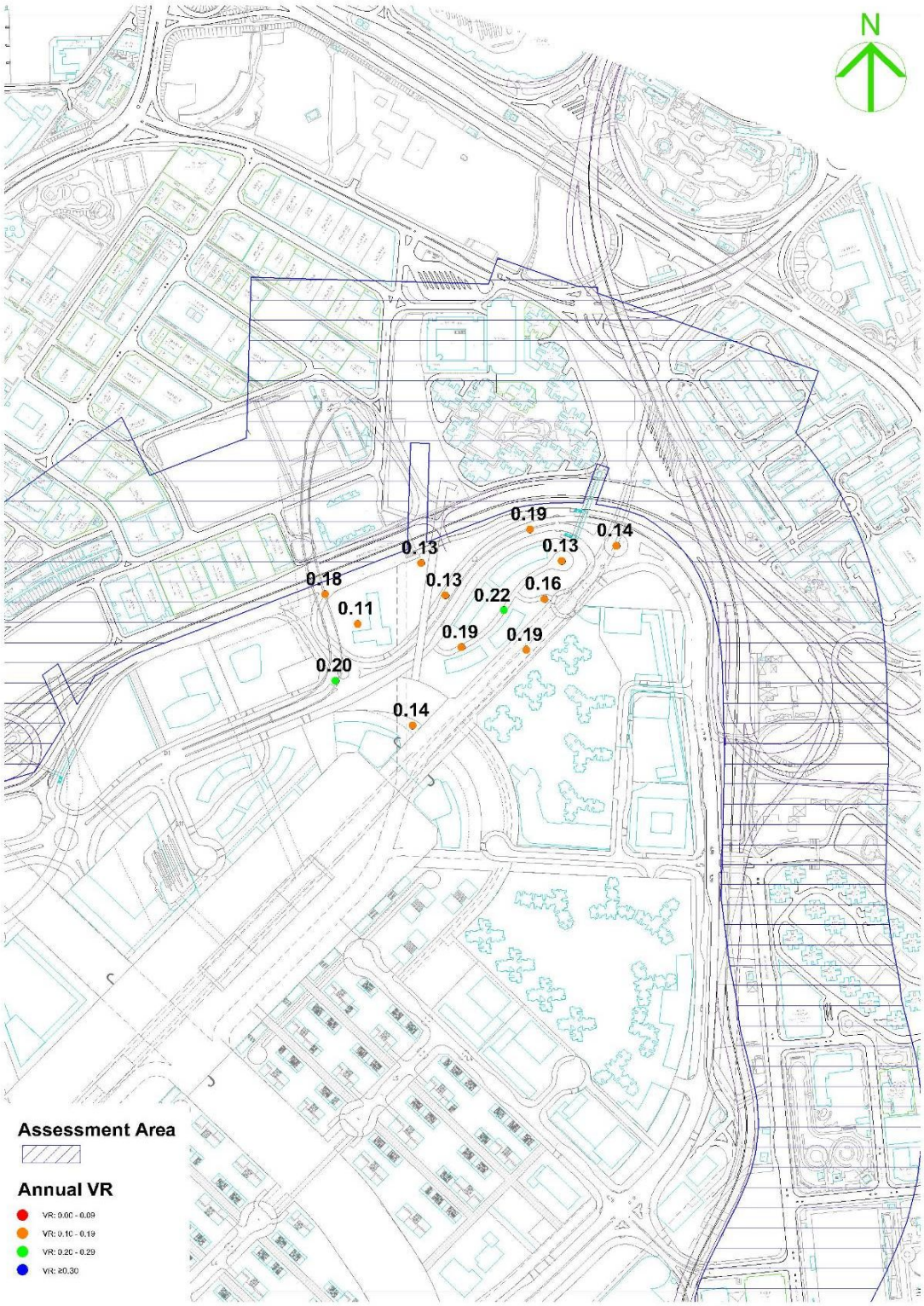

Figure 64: Annual overall wind velocity ratios for Zone A-2 of the Kai Tak City Centre at the North Apron

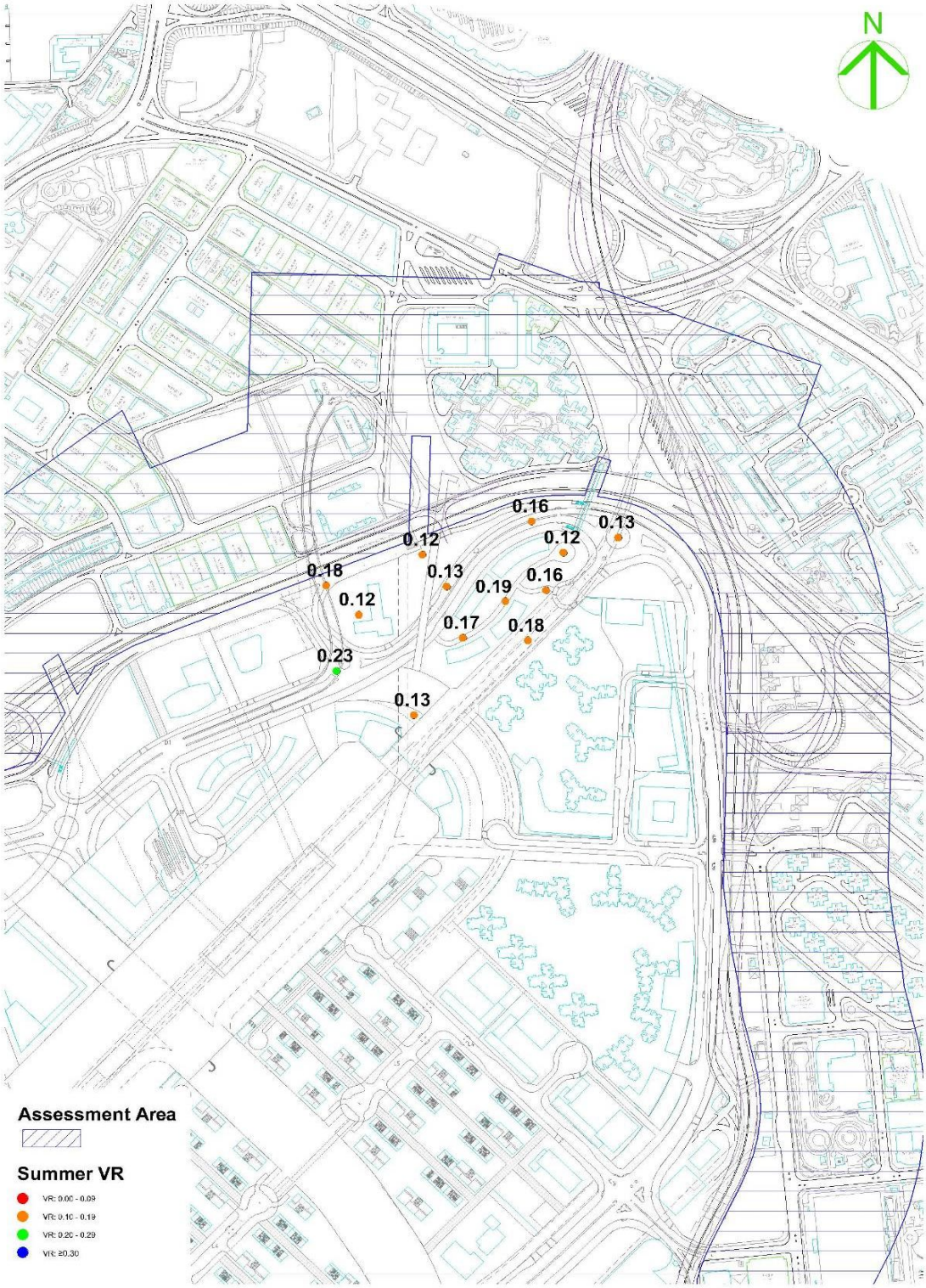

Figure 65: Summer overall wind velocity ratios for Zone A-2 of the Kai Tak City Centre at the North Apron

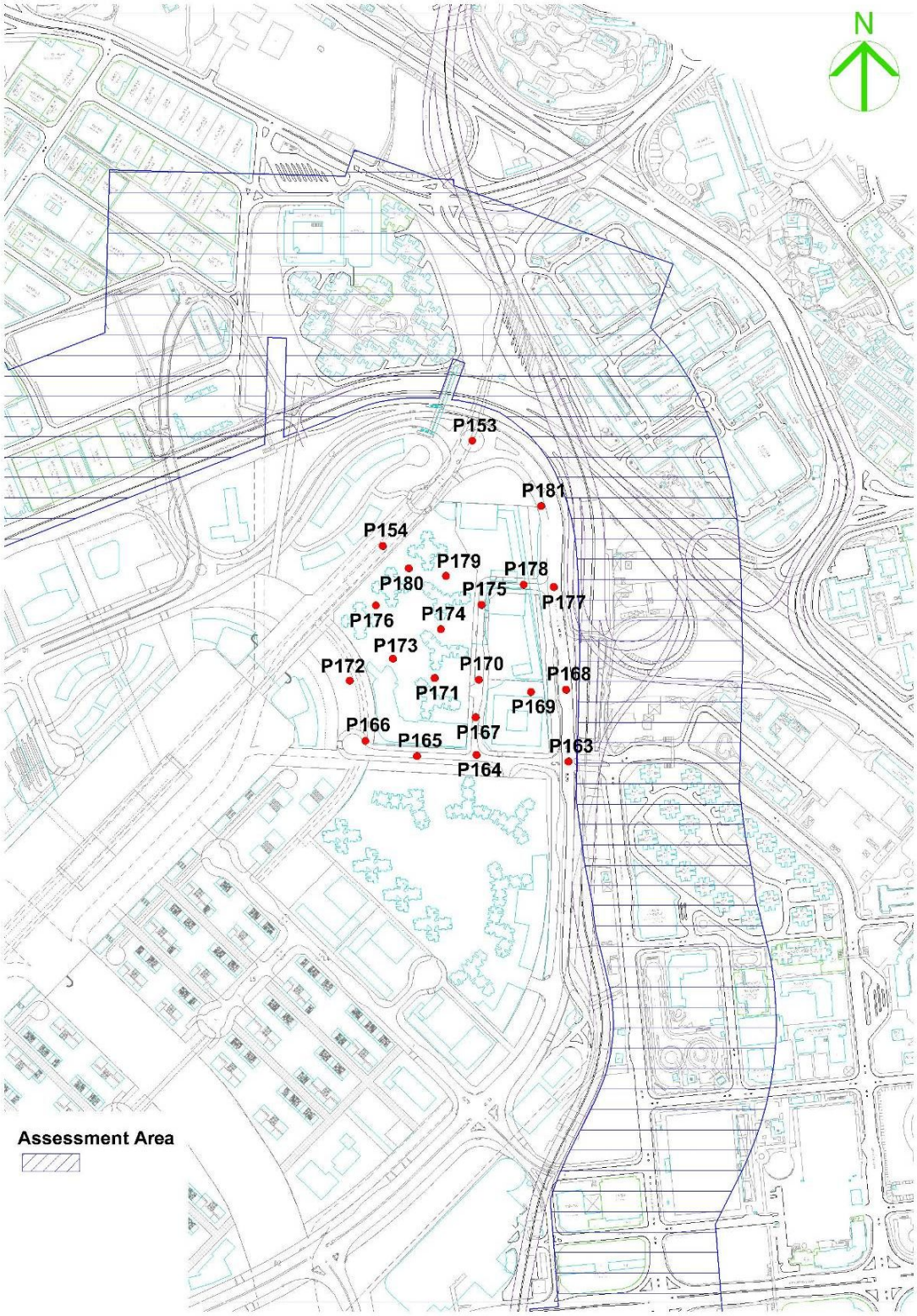

Figure 66: Test point locations for Zone B-1 of the Kai Tak City Centre at the North Apron

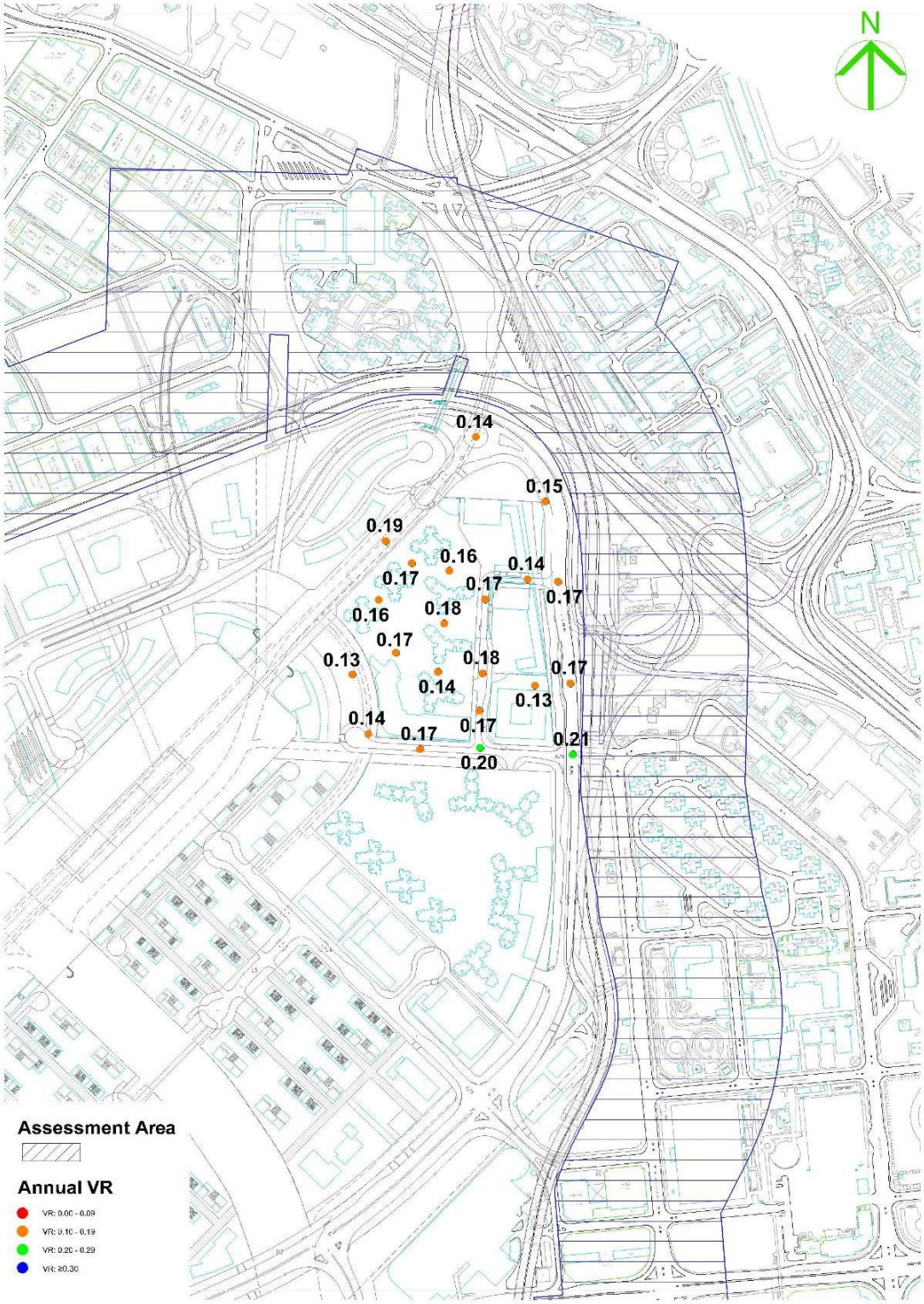

Figure 67: Annual overall wind velocity ratios for Zone B-1 of the Kai Tak City Centre at the North Apron

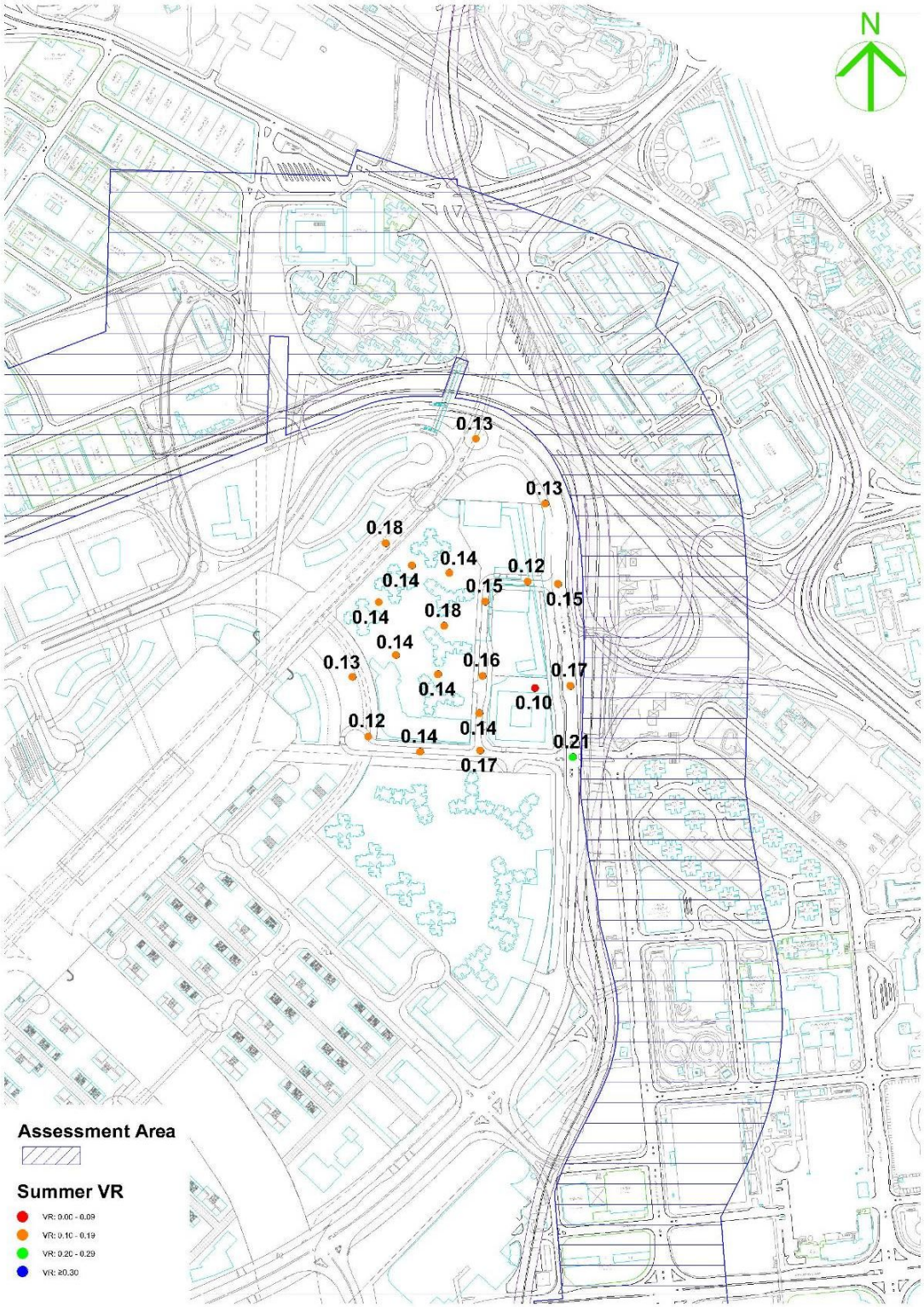

Figure 68: Summer overall wind velocity ratios for Zone B-1 of the Kai Tak City Centre at the North Apron

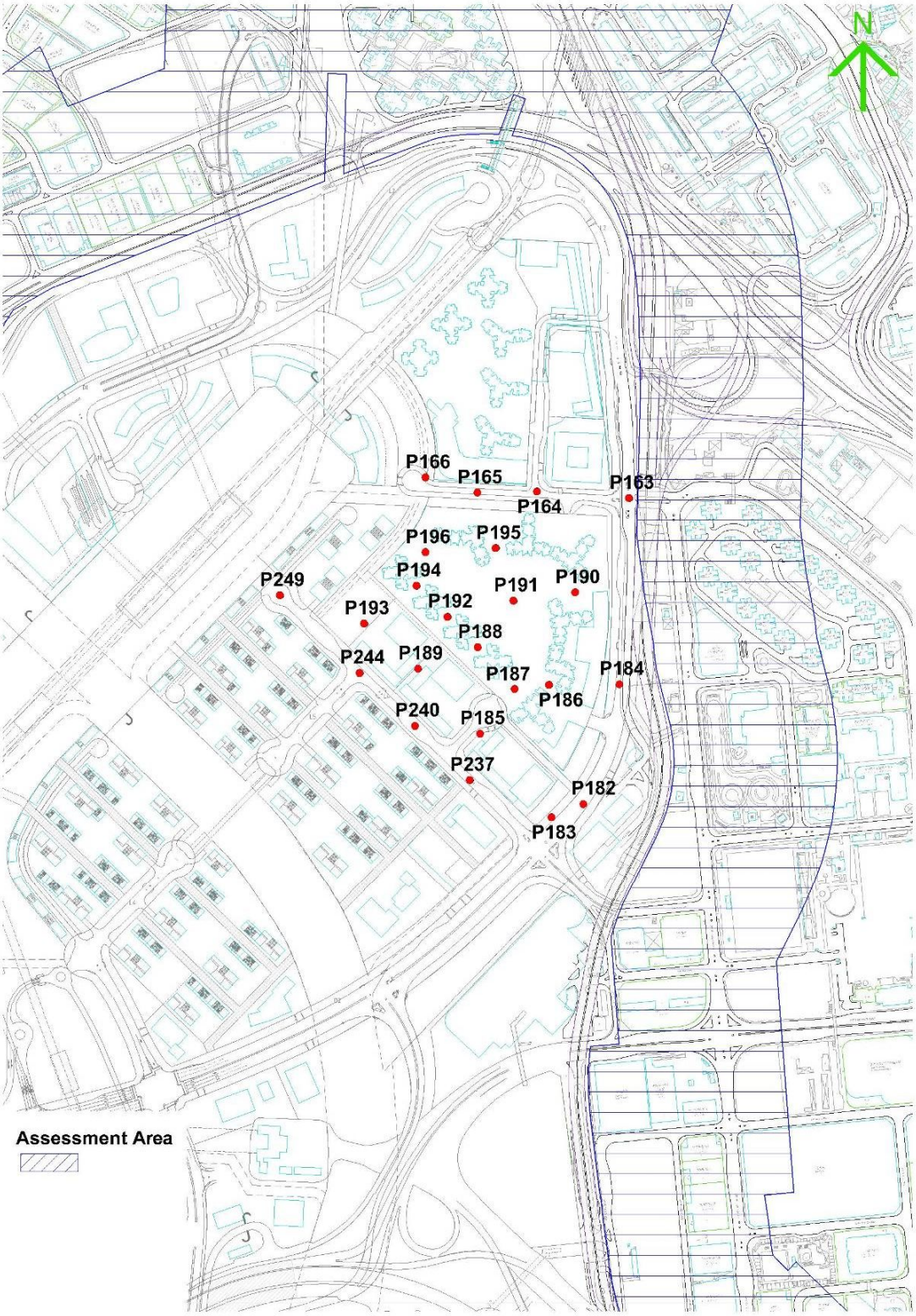

Figure 69: Test point locations for Zone B-2 of the Kai Tak City Centre at the North Apron

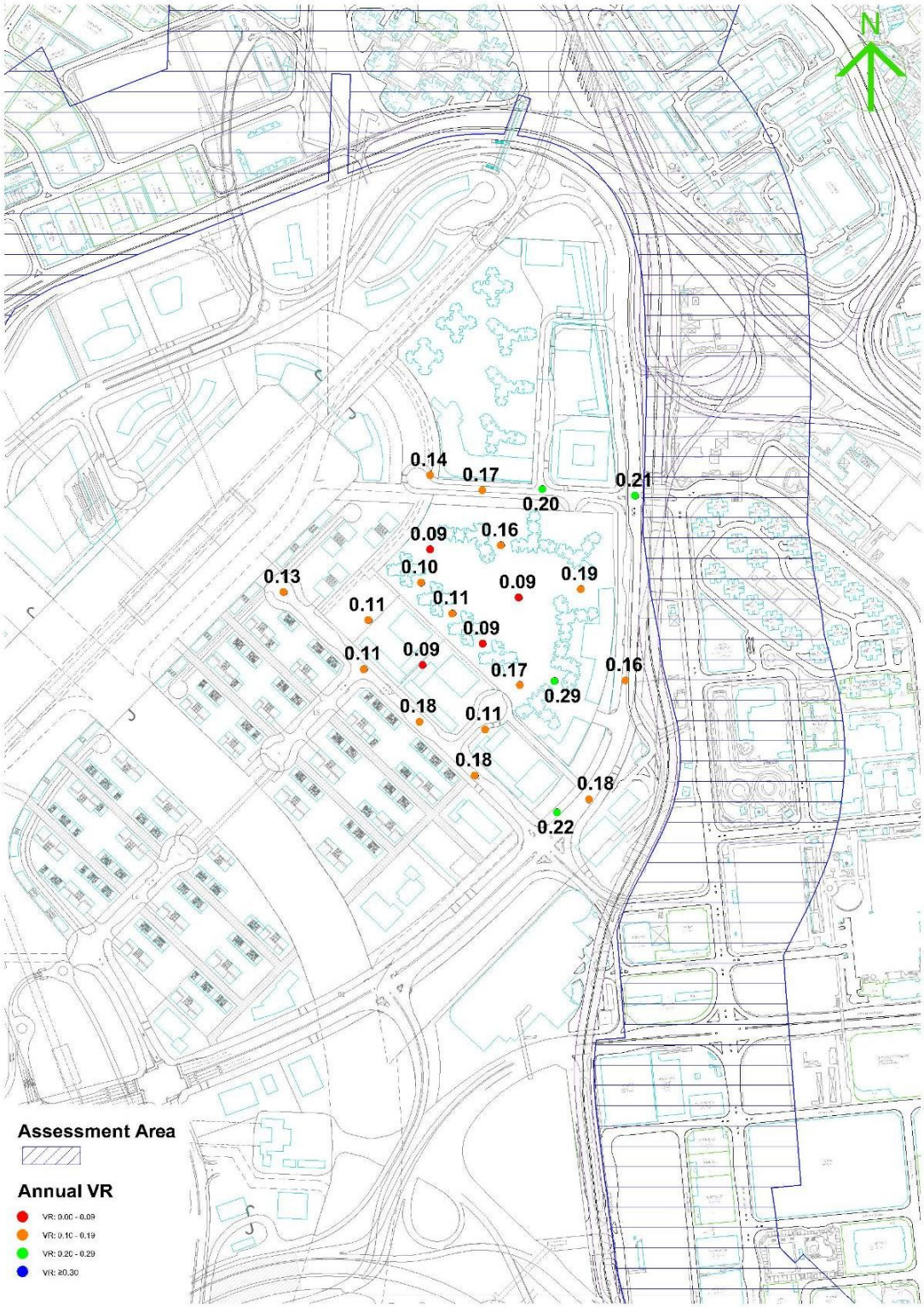

Figure 70: Annual overall wind velocity ratios for Zone B-2 of the Kai Tak City Centre at the North Apron

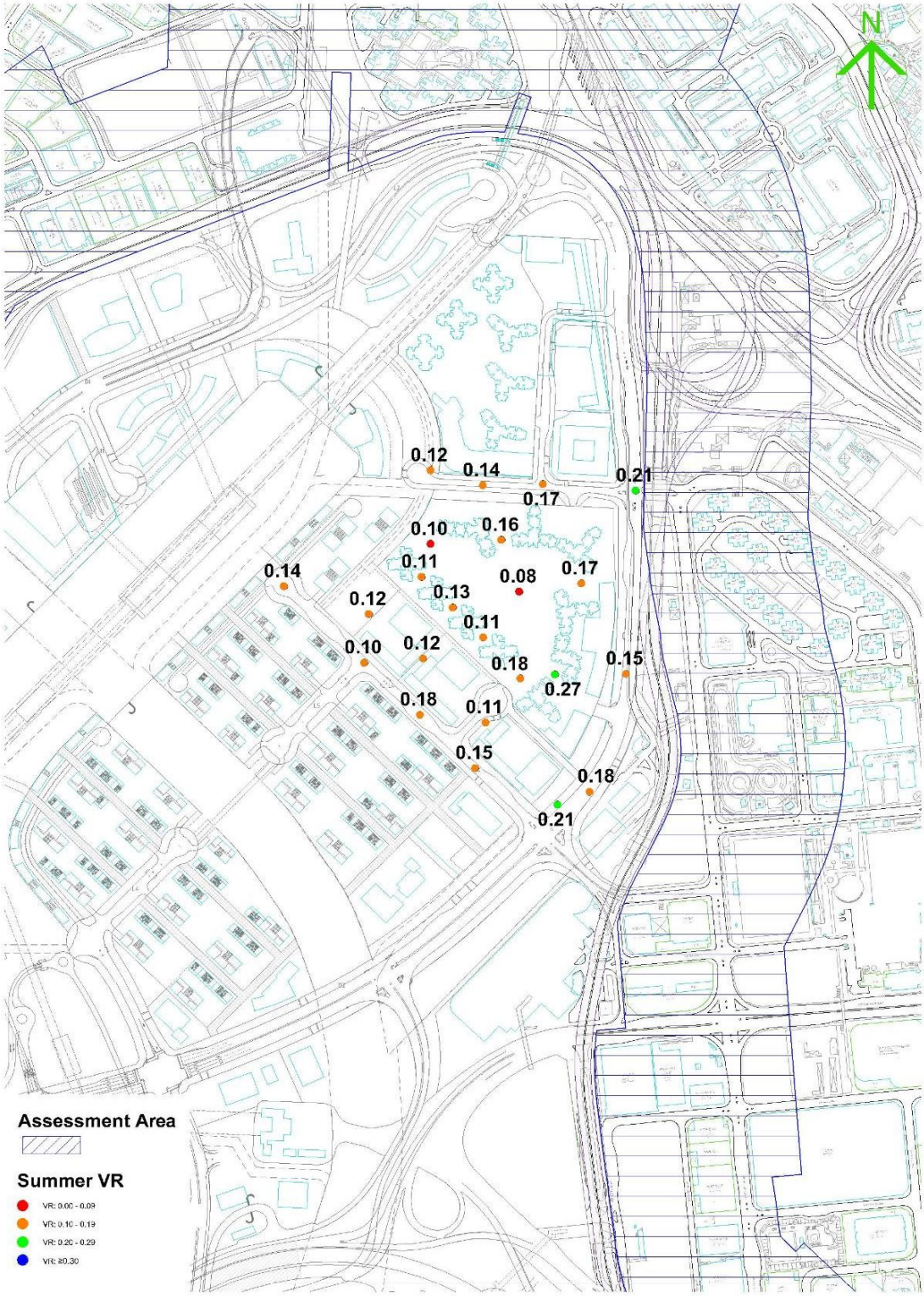

Figure 71: Summer overall wind velocity ratios for Zone B-2 of the Kai Tak City Centre at the North Apron

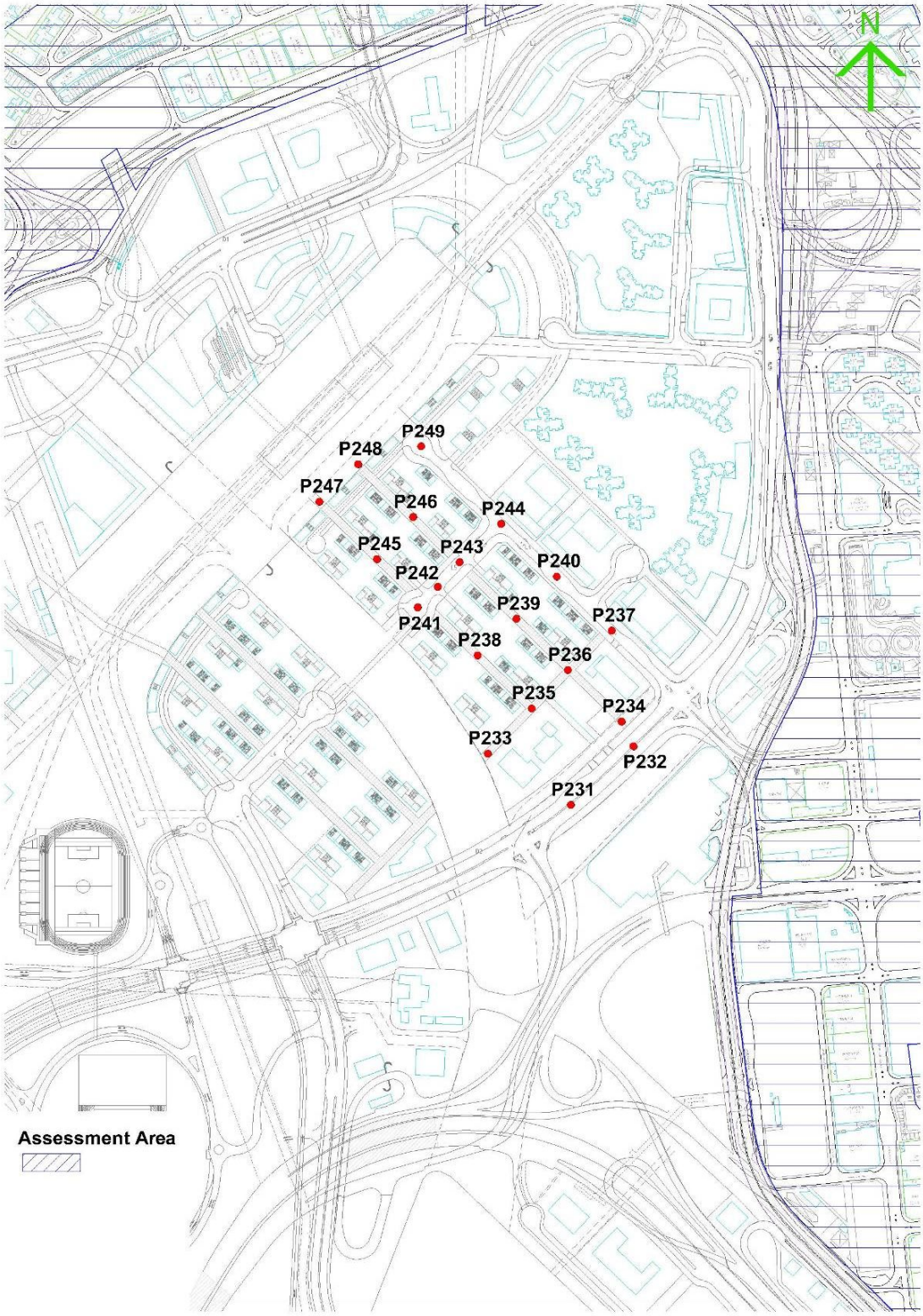

Figure 72: Test point locations for Zone B-3 of the Kai Tak City Centre at the North Apron

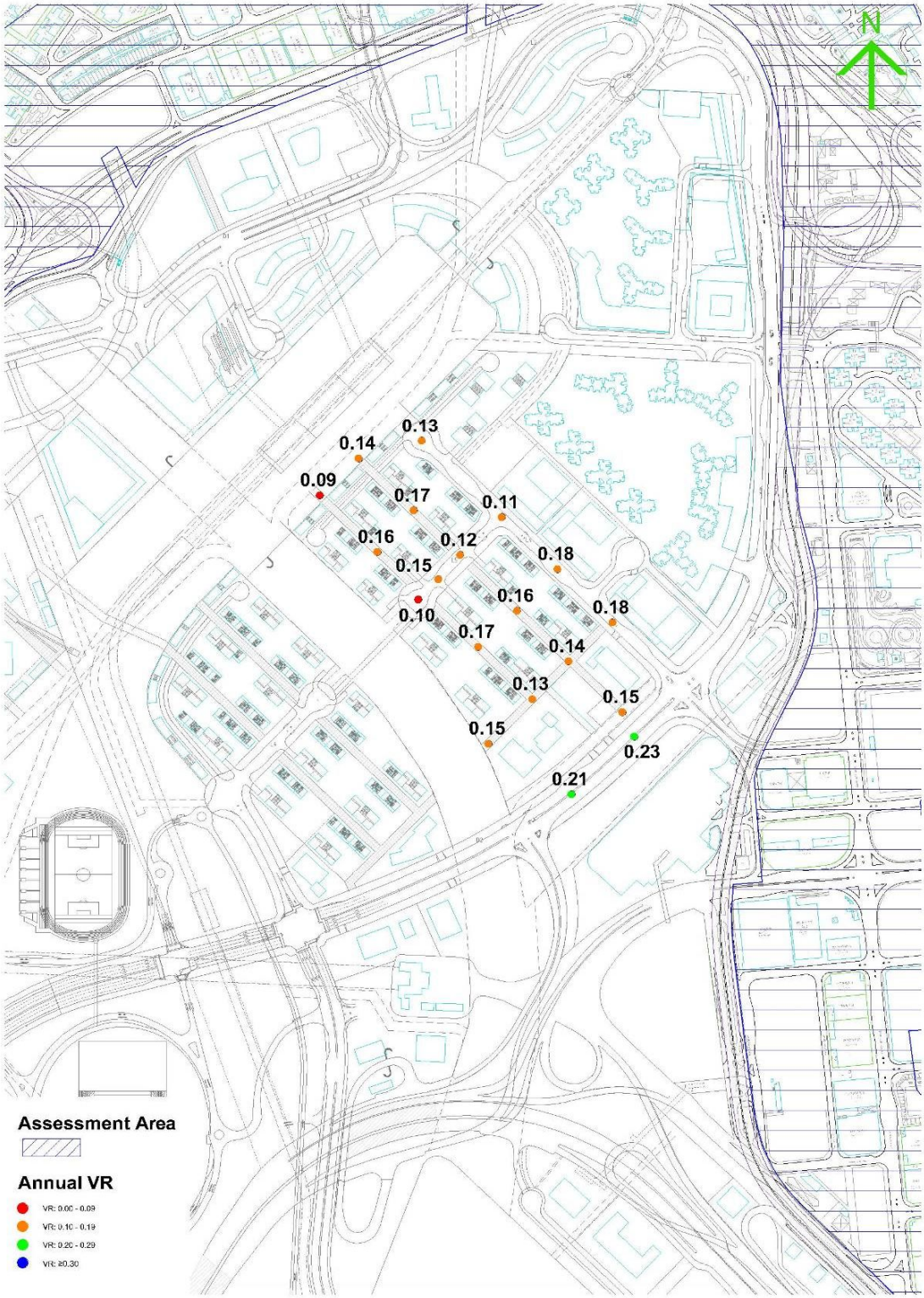

Figure 73: Annual overall wind velocity ratios for Zone B-3 of the Kai Tak City Centre at the North Apron

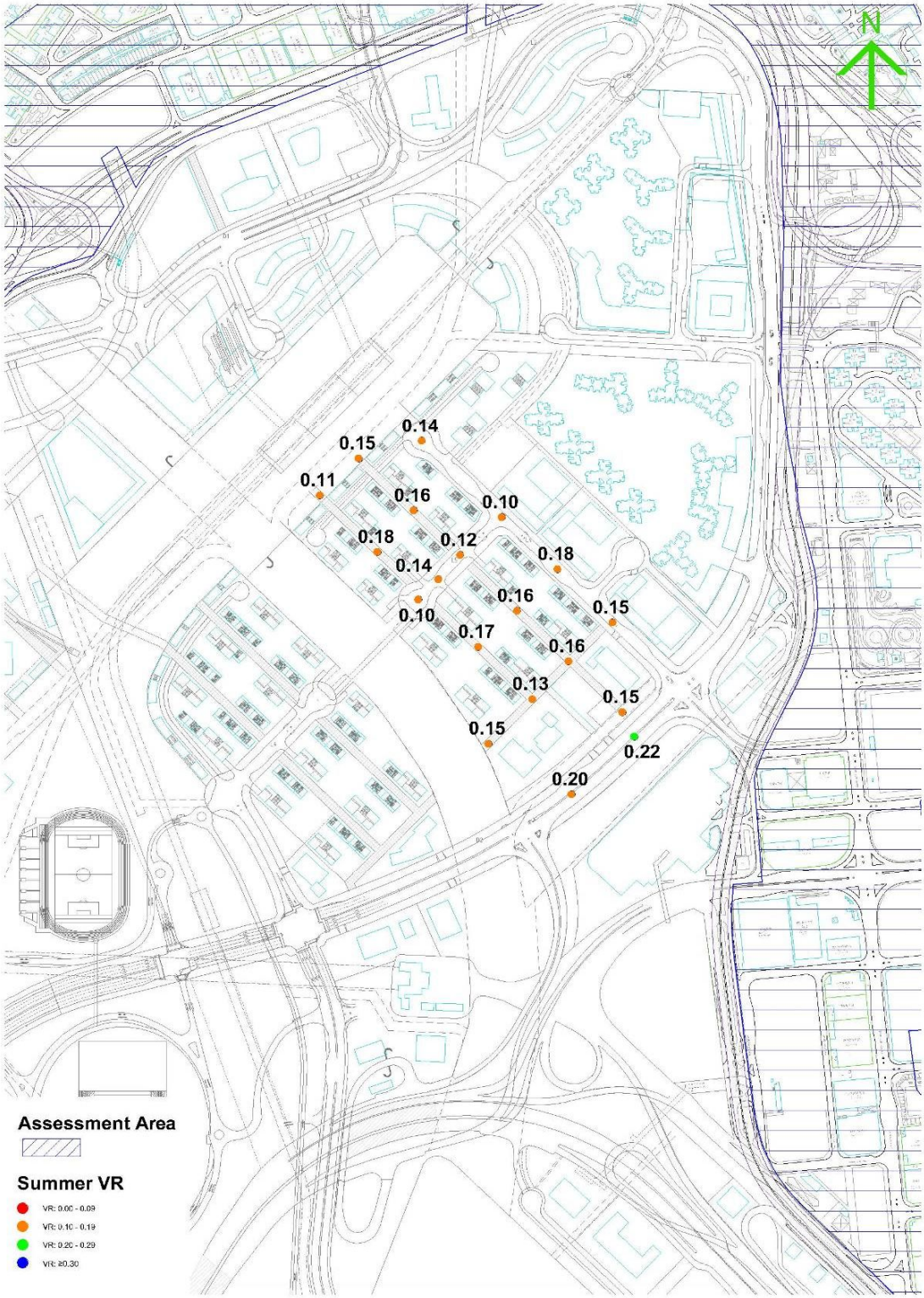

Figure 74: Summer overall wind velocity ratios for Zone B-3 of the Kai Tak City Centre at the North Apron

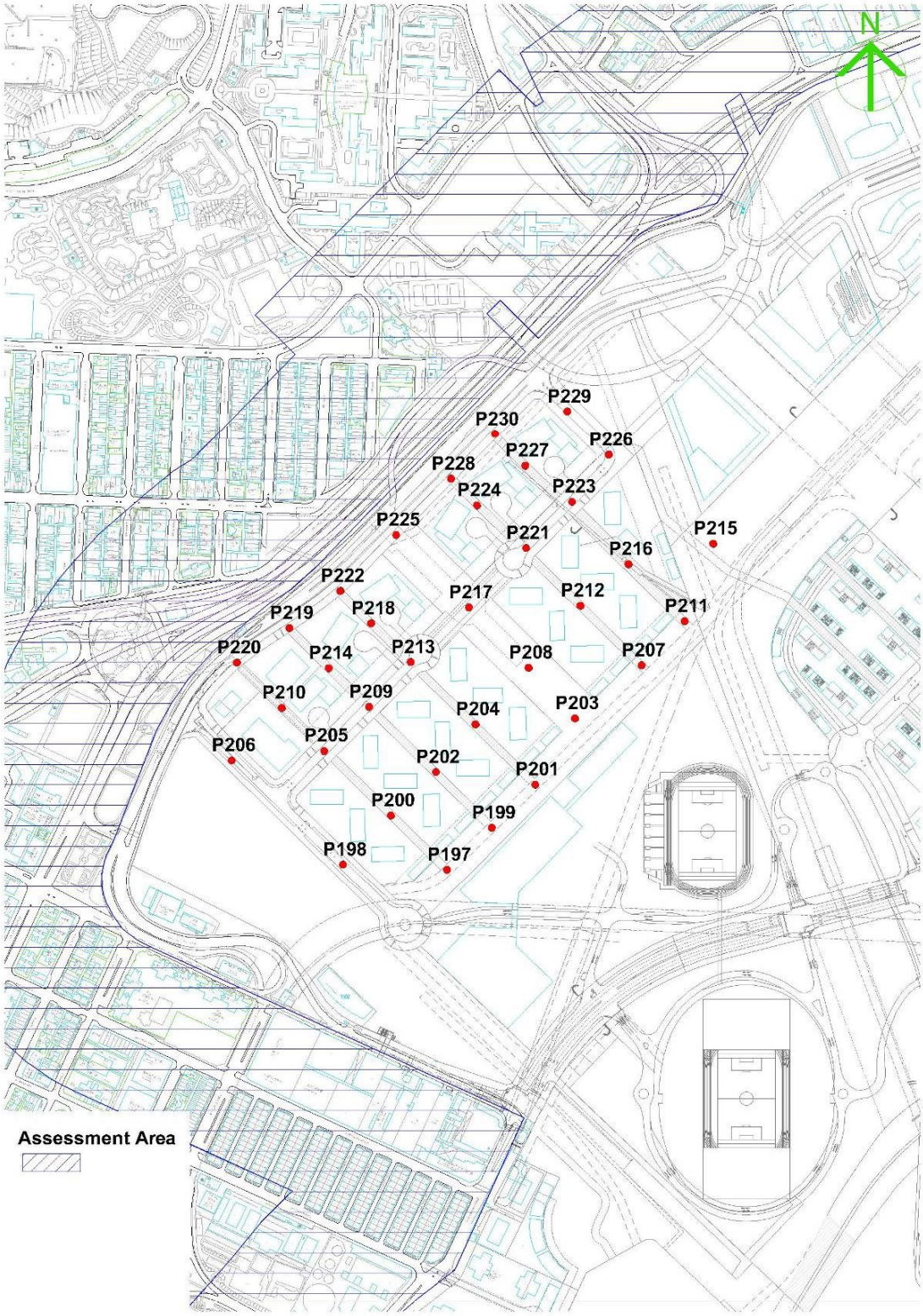

Figure 75: Test point locations for Zone C of the Kai Tak City Centre at the North Apron

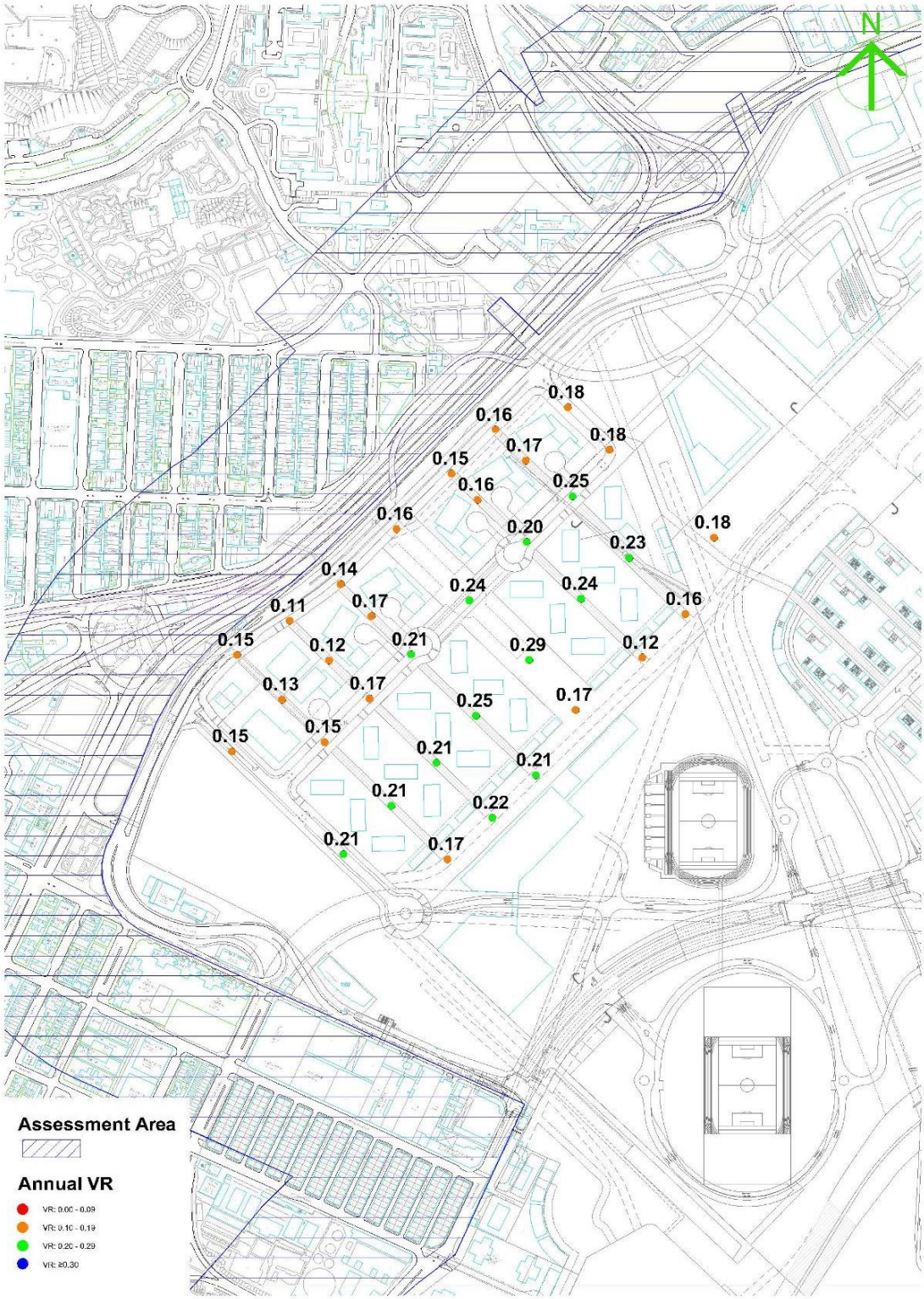

Figure 76: Annual overall wind velocity ratios for Zone C of the Kai Tak City Centre at the North Apron

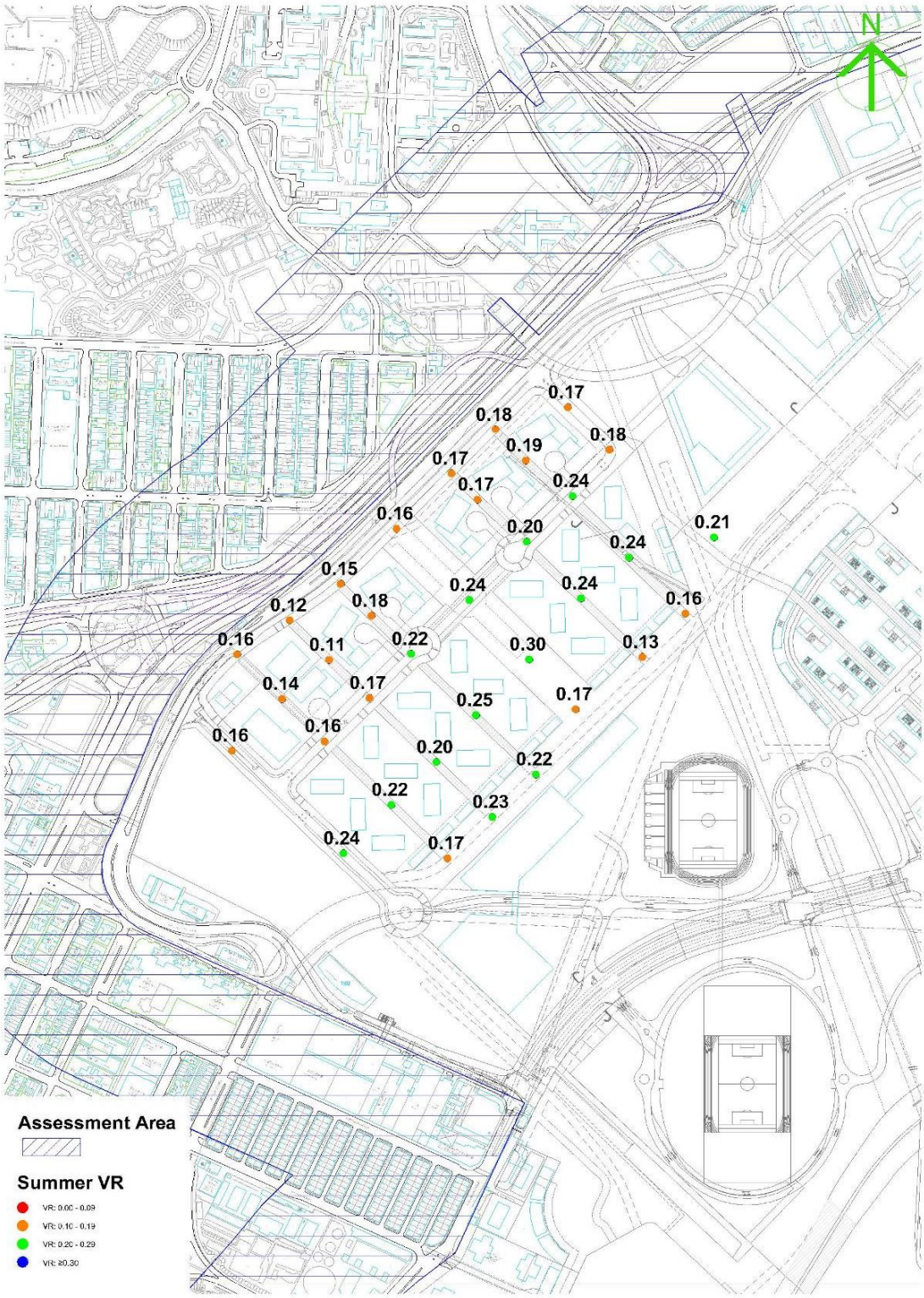

Figure 77: Summer overall wind velocity ratios for Zone C of the Kai Tak City Centre at the North Apron

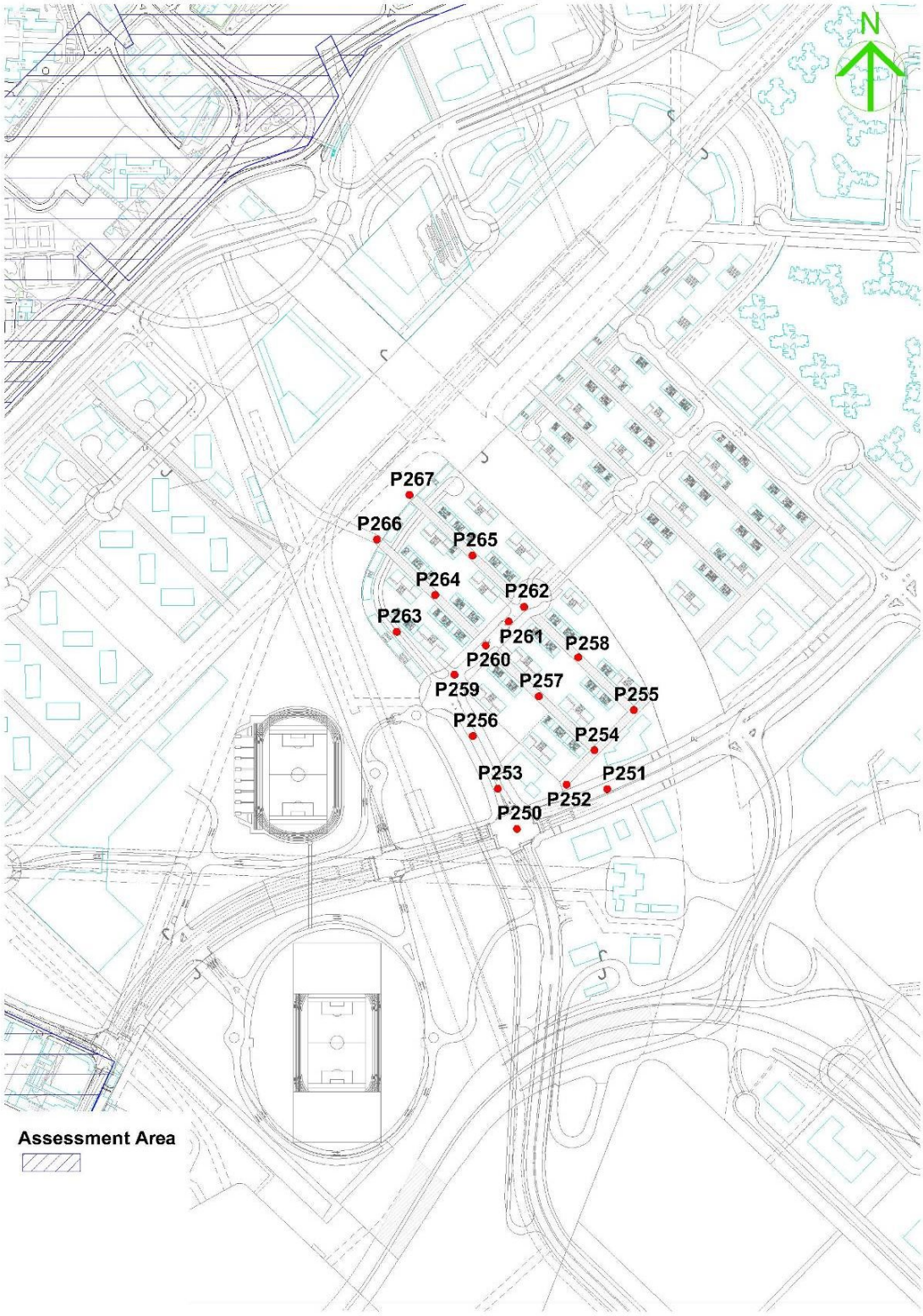

Figure 78: Test point locations for Zone D of the Kai Tak City Centre at the North Apron

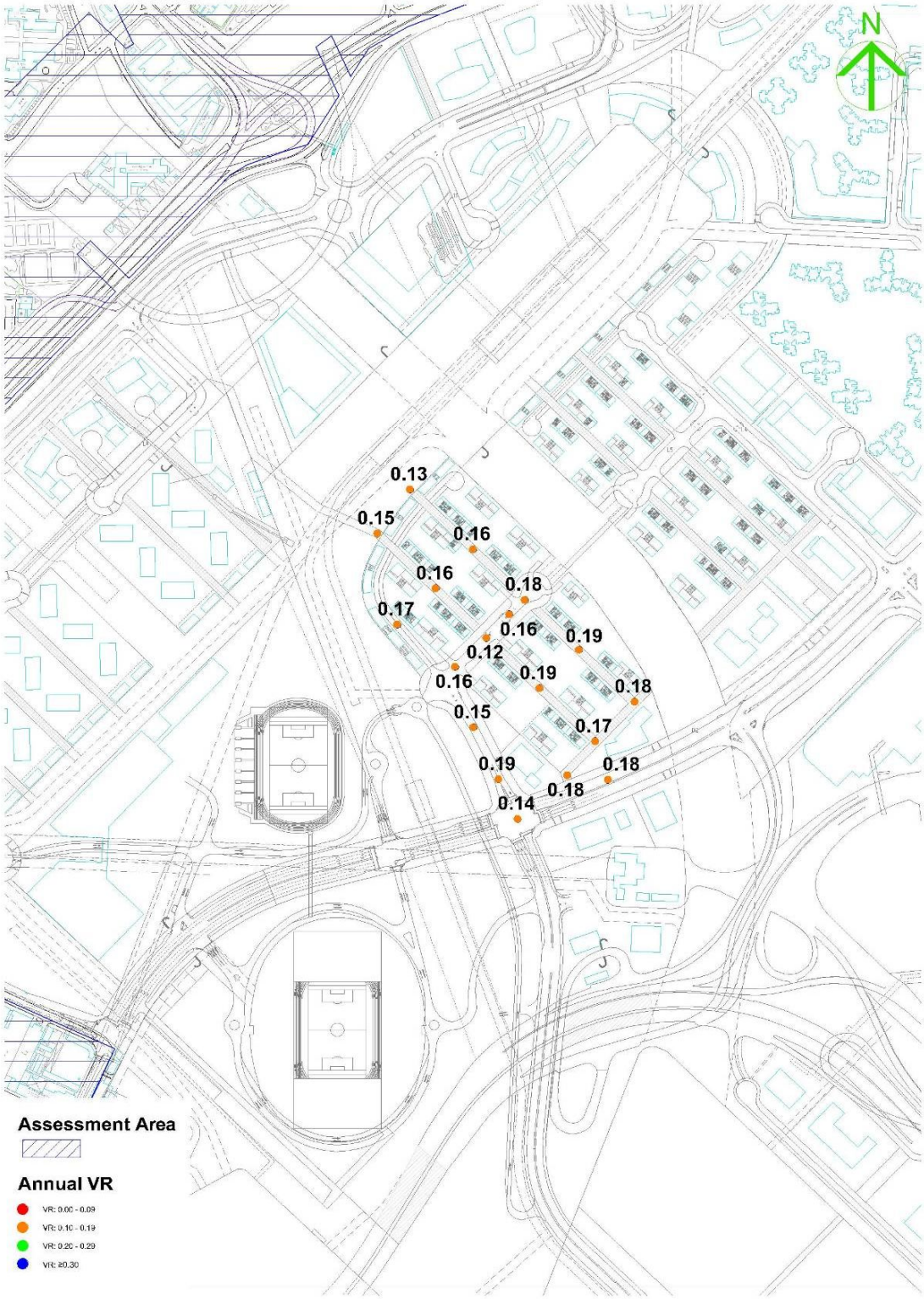

Figure 79: Annual overall wind velocity ratios for Zone D of the Kai Tak City Centre at the North Apron

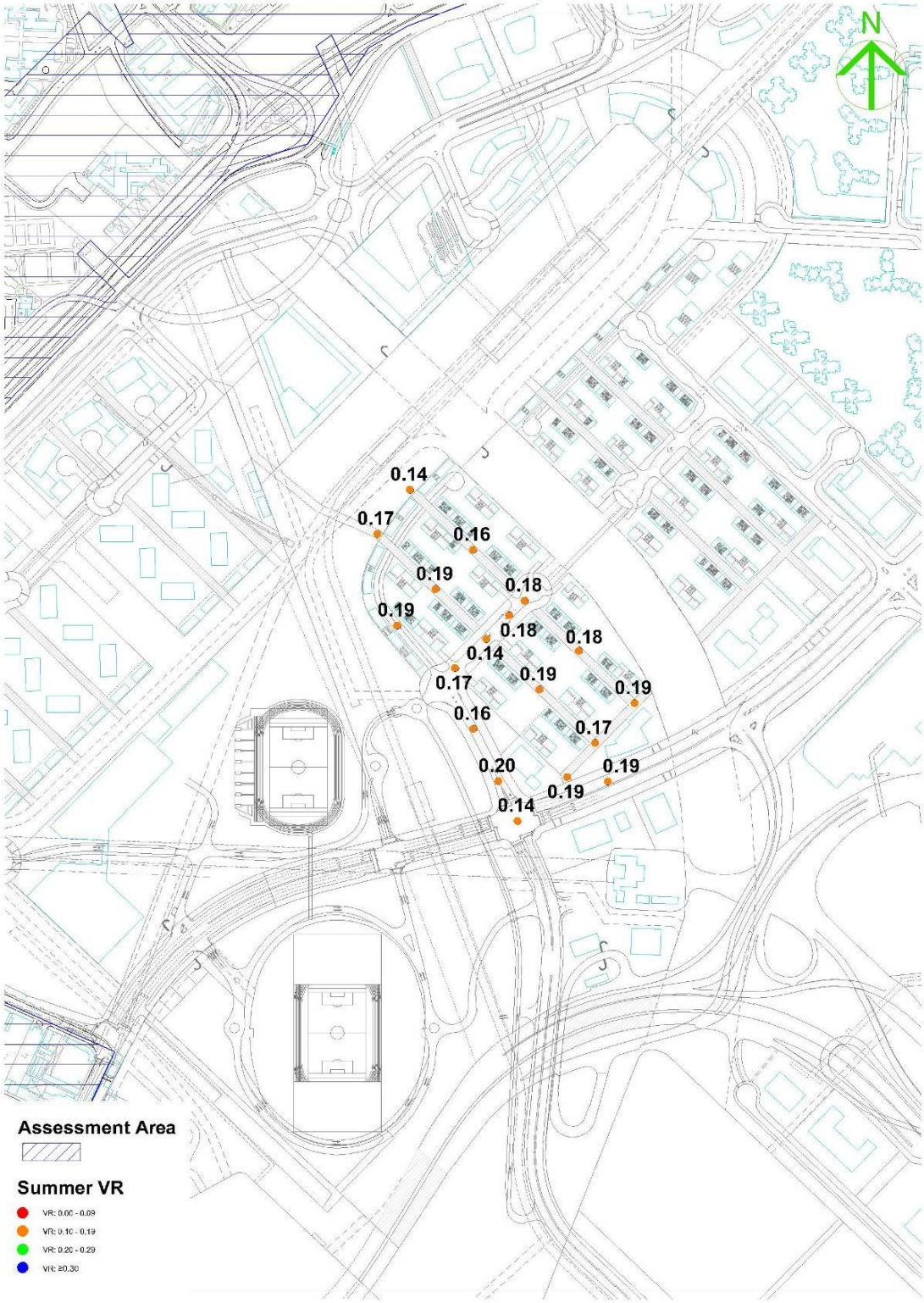

Figure 80: Summer overall wind velocity ratios for Zone D of the Kai Tak City Centre at the North Apron

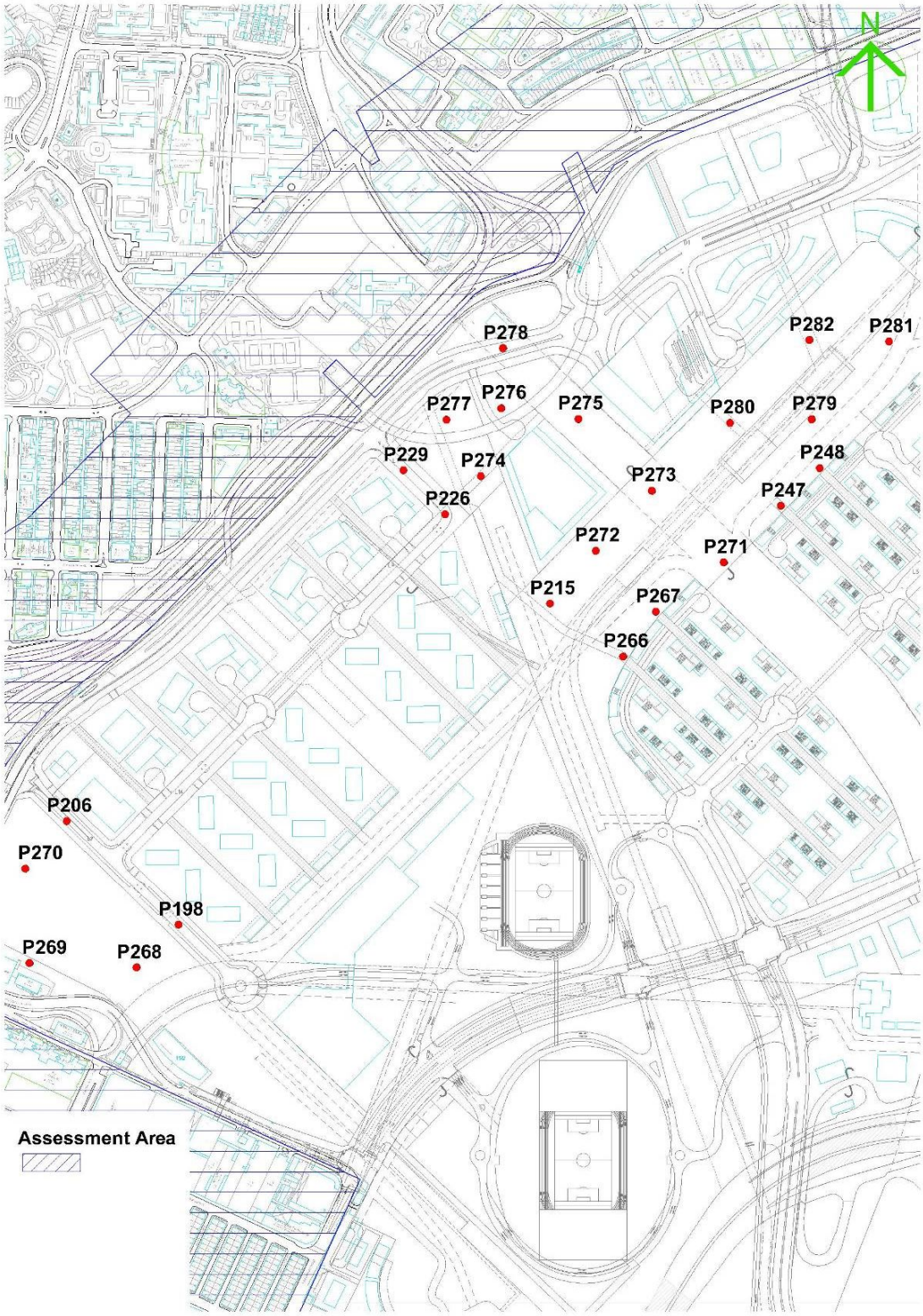

Figure 81: Test point locations for other areas of the Kai Tak City Centre at the North Apron

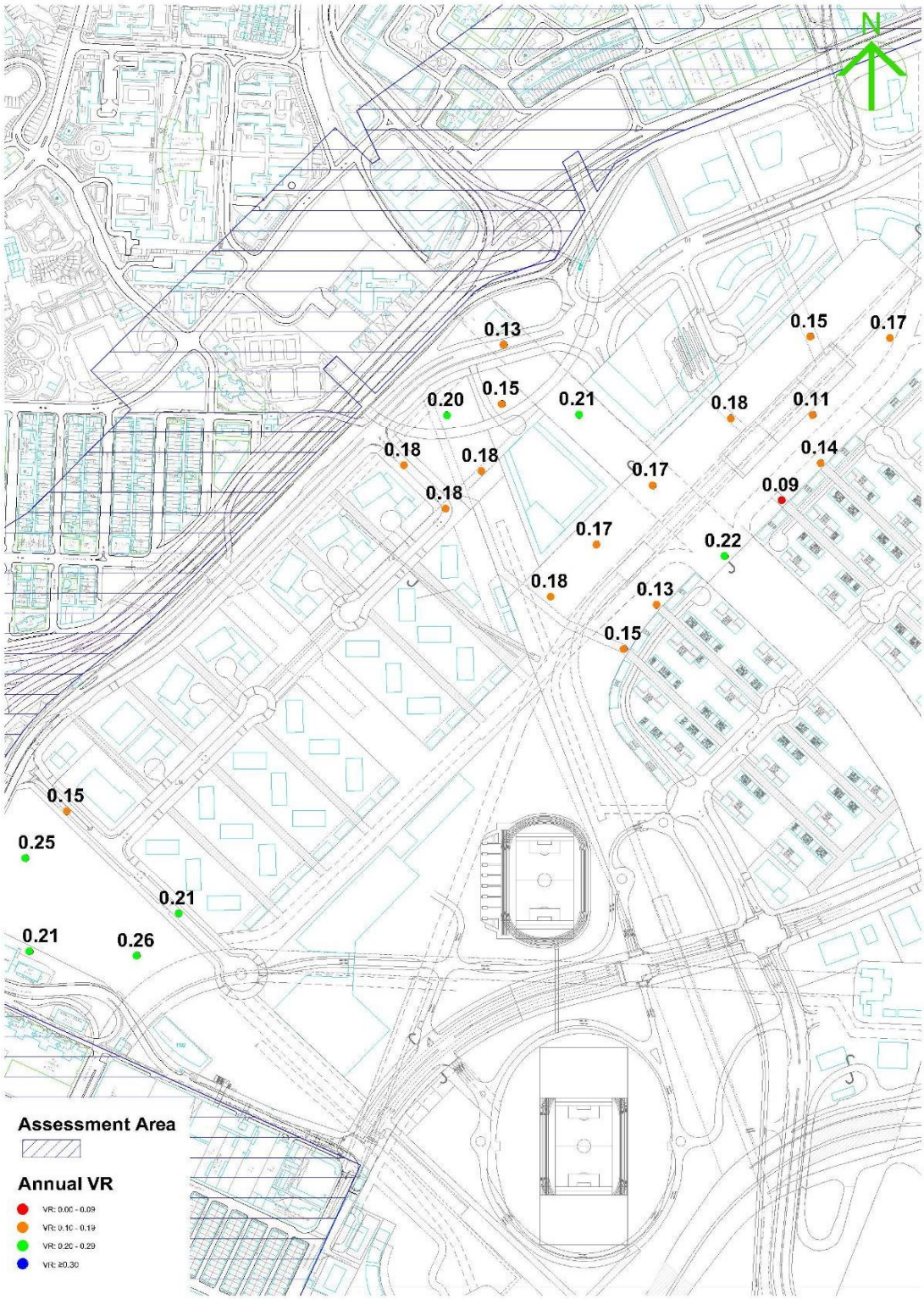

Figure 82: Annual overall wind velocity ratios for other areas of the Kai Tak City Centre at the North Apron

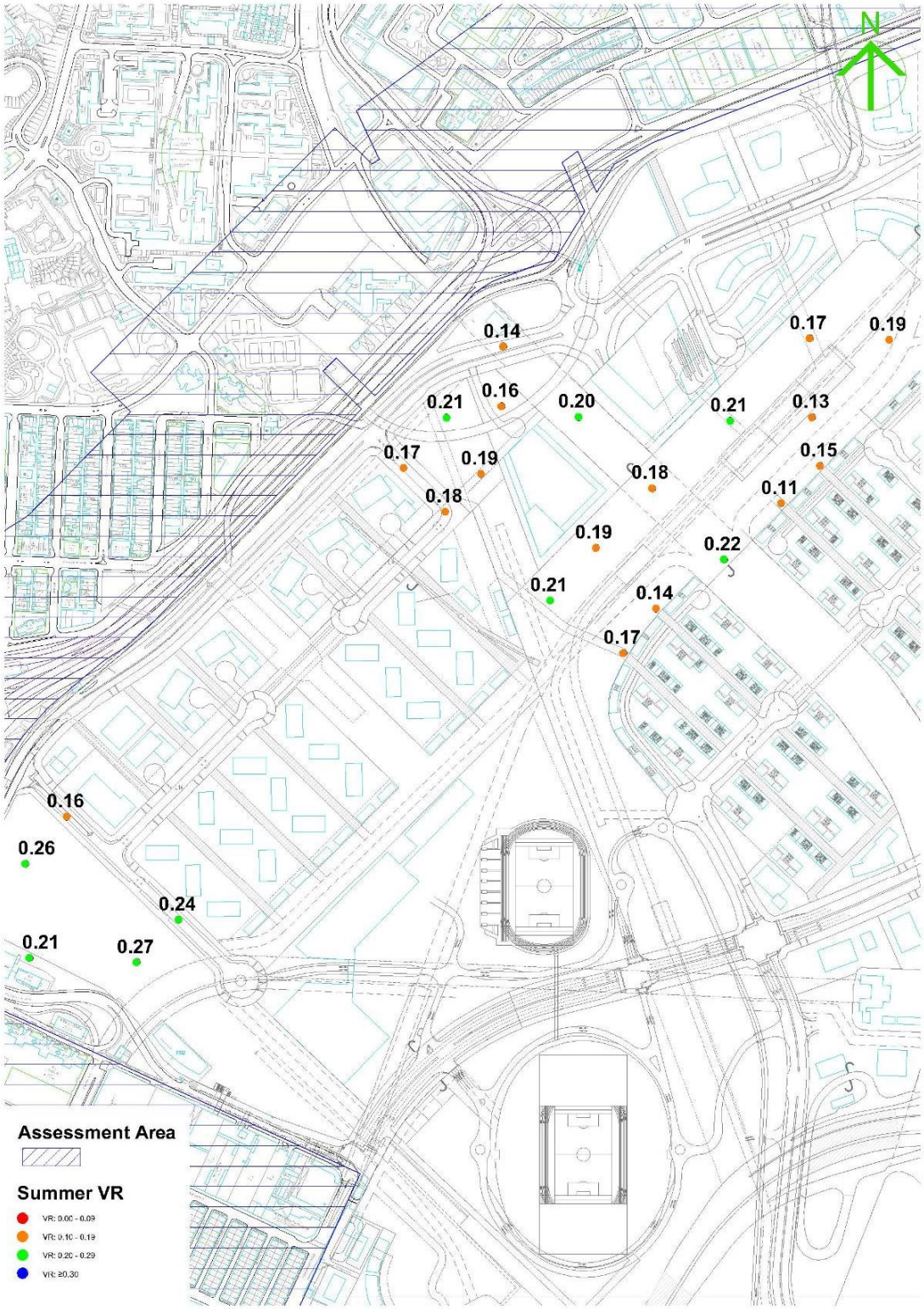

Figure 83: Summer overall wind velocity ratios for other areas of the Kai Tak City Centre at the North Apron

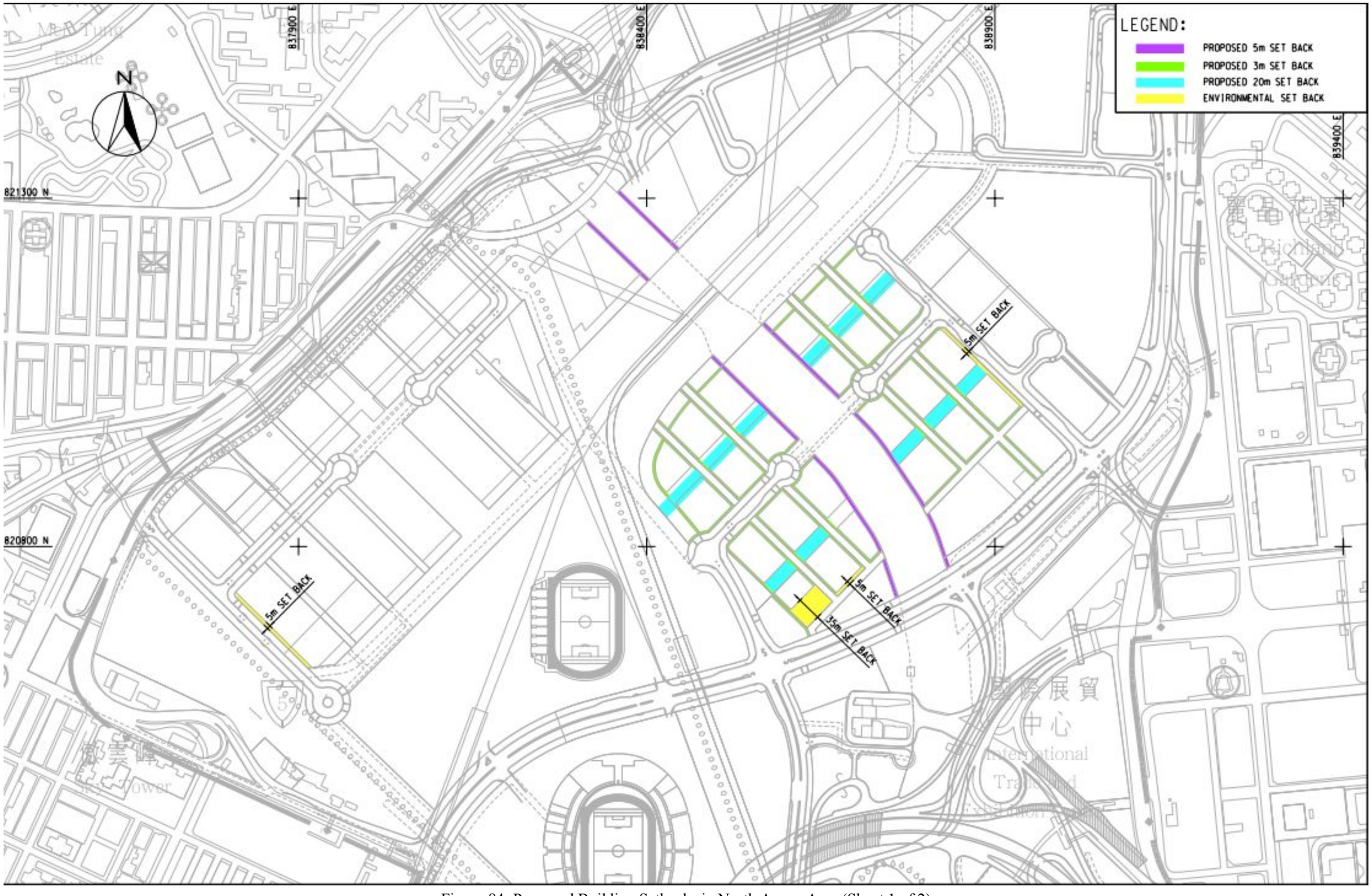

Figure 84: Proposed Building Setbacks in North Apron Area (Sheet 1 of 2)

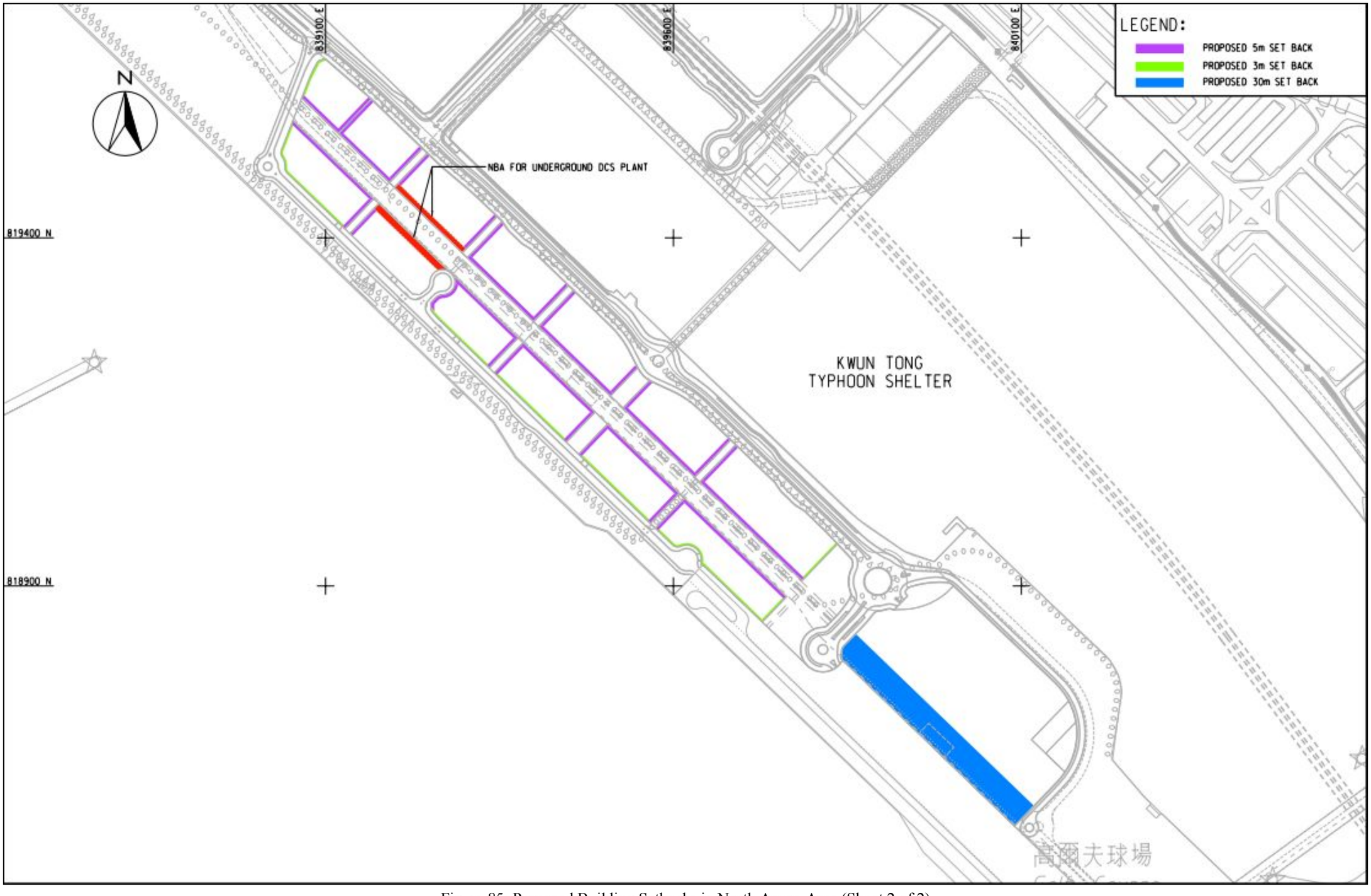

Figure 85: Proposed Building Setbacks in North Apron Area (Sheet 2 of 2)

APPENDIX A

TABULATED WIND ROSE DATA

Table A1: Wind rose data for annual non-typhoon winds at the proposed Kai Tak Development – Study Area A, corrected to 150 m

	Percentage Occurrence (%) for wind speed ranges:				
Wind Directions	< 3.3	3.3 < 7.9	7.9 < 13.8	> 13.8	Total
0.0°	1.6%	1.8%	0.1%	0.0%	3.5%
22.5°	1.3%	0.9%	0.1%	0.0%	2.4%
45.0°	2.5%	2.5%	0.0%	0.0%	5.0%
67.5°	1.3%	2.2%	0.1%	0.0%	3.5%
90.0°	2.6%	13.5%	1.3%	0.0%	17.5%
112.5°	2.6%	14.8%	1.8%	0.0%	19.2%
135.0°	5.3%	8.4%	0.3%	0.0%	13.9%
157.5°	5.0%	4.6%	0.1%	0.0%	9.6%
180.0°	2.1%	0.9%	0.0%	0.0%	3.0%
202.5°	1.5%	1.3%	0.0%	0.0%	2.8%
225.0°	1.6%	1.5%	0.0%	0.0%	3.2%
247.5°	1.8%	2.7%	0.2%	0.0%	4.6%
270.0°	1.6%	1.7%	0.1%	0.0%	3.4%
292.5°	1.3%	1.0%	0.0%	0.0%	2.3%
315.0°	1.5%	1.3%	0.1%	0.0%	2.8%
337.5°	1.6%	1.8%	0.1%	0.0%	3.4%

Table A2: Wind rose data for summer non-typhoon winds at the proposed Kai Tak Development – Study Area A, corrected to 150 m

	Percentage Occurrence (%) for wind speed ranges:				
Wind Directions	< 3.3	3.3 < 7.9	7.9 < 13.8	> 13.8	Total
0.0°	0.6%	0.2%	0.0%	0.0%	0.8%
22.5°	0.3%	0.1%	0.0%	0.0%	0.3%
45.0°	0.4%	0.2%	0.0%	0.0%	0.6%
67.5°	0.3%	0.4%	0.0%	0.0%	0.8%
90.0°	1.5%	6.2%	0.6%	0.0%	8.3%
112.5°	2.5%	7.7%	1.3%	0.0%	11.4%
135.0°	7.1%	11.4%	0.6%	0.0%	19.0%
157.5°	4.9%	4.0%	0.1%	0.0%	8.9%
180.0°	4.1%	2.7%	0.0%	0.0%	6.9%
202.5°	3.6%	3.9%	0.1%	0.0%	7.6%
225.0°	2.9%	4.2%	0.1%	0.0%	7.2%
247.5°	3.7%	8.1%	0.9%	0.0%	12.7%
270.0°	3.0%	5.1%	0.4%	0.0%	8.4%
292.5°	1.4%	2.5%	0.1%	0.0%	4.0%
315.0°	0.8%	0.8%	0.1%	0.0%	1.7%
337.5°	1.0%	0.4%	0.0%	0.0%	1.4%

Table A3: Wind rose data for annual non-typhoon winds at the proposed Kai Tak Development – Study Area B, corrected to 150 m

	Percentage Occurrence (%) for wind speed ranges:				
Wind Directions	< 3.3	3.3 < 7.9	7.9 < 13.8	> 13.8	Total
0.0°	2.0%	1.5%	0.0%	0.0%	3.5%
22.5°	0.6%	1.5%	0.3%	0.0%	2.4%
45.0°	2.0%	2.9%	0.0%	0.0%	5.0%
67.5°	1.1%	2.4%	0.1%	0.0%	3.5%
90.0°	1.1%	10.3%	6.1%	0.1%	17.5%
112.5°	3.8%	14.5%	0.9%	0.0%	19.2%
135.0°	6.2%	7.6%	0.1%	0.0%	13.9%
157.5°	4.8%	4.7%	0.1%	0.0%	9.6%
180.0°	1.9%	1.0%	0.1%	0.0%	3.0%
202.5°	1.4%	1.3%	0.0%	0.0%	2.8%
225.0°	2.2%	1.0%	0.0%	0.0%	3.2%
247.5°	2.2%	2.4%	0.1%	0.0%	4.6%
270.0°	1.4%	1.8%	0.2%	0.0%	3.4%
292.5°	1.1%	1.1%	0.1%	0.0%	2.3%
315.0°	1.6%	1.2%	0.0%	0.0%	2.8%
337.5°	3.0%	0.4%	0.0%	0.0%	3.4%

Table A4: Wind rose data for summer non-typhoon winds at the proposed Kai Tak Development – Study Area B, corrected to 150 m

	Percentage Occurrence (%) for wind speed ranges:				
Wind Directions	< 3.3	3.3 < 7.9	7.9 < 13.8	> 13.8	Total
0.0°	0.7%	0.1%	0.0%	0.0%	0.8%
22.5°	0.2%	0.1%	0.0%	0.0%	0.3%
45.0°	0.4%	0.2%	0.0%	0.0%	0.6%
67.5°	0.3%	0.4%	0.0%	0.0%	0.8%
90.0°	0.7%	5.0%	2.6%	0.0%	8.3%
112.5°	3.3%	7.5%	0.7%	0.0%	11.4%
135.0°	8.1%	10.5%	0.4%	0.0%	19.0%
157.5°	4.7%	4.2%	0.1%	0.0%	8.9%
180.0°	3.7%	3.1%	0.1%	0.0%	6.9%
202.5°	3.3%	4.1%	0.1%	0.0%	7.6%
225.0°	4.4%	2.8%	0.0%	0.0%	7.2%
247.5°	4.9%	7.4%	0.5%	0.0%	12.7%
270.0°	2.5%	5.3%	0.6%	0.0%	8.4%
292.5°	1.1%	2.7%	0.2%	0.0%	4.0%
315.0°	0.9%	0.8%	0.1%	0.0%	1.7%
337.5°	1.4%	0.0%	0.0%	0.0%	1.4%

APPENDIX B

DIRECTIONAL, ANNUAL OVERALL AND SUMMER OVERALL WIND VELOCITY RATIOS OF ALL TEST POINTS

Table B1: Annual and summer mean wind speeds corresponding to a probability of exceedance of 50%

Test Points		Annual mean wind speed	Summer mean wind speed	Test Points		Annual mean wind speed	Summer mean wind speed
P	001	1.08	1.15	P	040	1.47	1.25
P	002	0.99	1.10	P	041	1.30	1.24
P	003	0.87	0.97	P	042	1.02	1.04
P	004	0.78	0.81	P	043	1.19	1.30
P	005	0.60	0.66	P	044	0.88	0.85
P	006	0.57	0.60	P	045	0.67	0.53
P	007	0.56	0.59	P	046	1.07	1.17
P	008	0.69	0.76	P	047	0.63	0.63
P	009	1.14	1.10	P	048	0.66	0.71
P	010	1.02	0.93	P	049	0.95	1.01
P	011	1.13	1.26	P	050	0.91	0.90
P	012	1.19	1.02	P	051	0.89	0.94
P	013	0.92	0.91	P	052	0.81	0.74
P	014	1.31	1.49	P	053	0.93	0.85
P	015	1.41	1.43	P	054	1.02	0.98
P	016	1.66	1.76	P	055	0.81	0.93
P	017	0.74	0.89	P	056	1.16	1.07
P	018	1.03	0.99	P	057	1.56	1.64
P	019	0.92	1.10	P	058	0.90	0.86
P	020	0.93	1.05	P	059	1.19	1.06
P	021	0.95	1.00	P	060	0.99	0.94
P	022	1.11	1.28	P	061	1.46	1.37
P	023	0.83	0.72	P	062	1.77	1.75
P	024	0.88	0.84	P	063	1.14	1.06
P	025	1.43	1.58	P	064	1.56	1.61
P	026	0.54	0.54	P	065	1.00	1.03
P	027	0.82	1.10	P	066	1.05	1.09
P	028	0.93	0.93	P	067	1.31	1.41
P	029	0.71	0.75	P	068	1.46	1.58
P	030	0.74	0.81	P	069	2.38	2.15
P	031	0.68	0.84	P	070	0.85	0.87
P	032	0.91	0.83	P	071	1.14	1.36
P	033	1.19	1.19	P	072	1.60	1.56
P	034	0.91	1.09	P	073	1.29	1.25
P	035	1.42	1.27	P	074	0.90	1.12
P	036	1.42	1.43	P	075	0.93	0.88
P	037	1.34	1.40	P	076	1.00	0.77
P	038	1.14	1.14	P	077	1.29	1.28
P	039	0.97	1.02	P	078	1.17	1.12

Table B1 (cont.): Annual and summer mean wind speeds corresponding to a probability of exceedance of 50%

Test Points		Annual mean wind speed	Summer mean wind speed	Test Points		Annual mean wind speed	Summer mean wind speed
P	079	1.05	1.15	P	126	1.06	0.89
P	080	0.97	1.04	P	127	0.76	0.62
P	081	1.38	1.59	P	128	1.17	0.93
P	082	1.33	1.29	P	129	1.20	1.10
P	083	1.11	1.35	P	130	0.93	0.97
P	084	1.18	1.16	P	131	1.18	1.03
P	085	1.82	1.97	P	132	2.08	1.74
P	086	0.81	0.83	P	133	2.34	1.84
P	087	1.29	1.31	P	134	1.50	1.24
P	088	1.24	1.22	P	135	0.82	0.64
P	089	1.01	1.18	P	136	0.93	0.75
P	090	1.27	1.34	P	137	1.14	0.79
P	091	1.27	1.02	P	138	1.42	1.13
P	092	0.88	0.88	P	139	0.85	0.81
P	093	1.05	1.03	P	140	1.12	1.14
P	094	1.63	1.51	P	141	1.39	1.24
P	095	0.92	1.04	P	142	1.15	1.27
P	096	1.21	1.33	P	143	0.90	0.95
P	097	0.83	0.94	P	144	0.66	0.71
P	098	1.28	1.33	P	145	1.18	1.19
P	099	1.21	1.21	P	146	0.66	0.65
P	100	1.30	1.19	P	147	0.76	0.67
P	101	0.99	1.24	P	148	1.02	0.96
P	102	1.25	1.42	P	149	1.20	1.20
P	103	0.78	0.95	P	150	1.04	1.00
P	104	1.38	1.45	P	151	1.10	1.14
P	105	1.32	1.37	P	152	0.95	0.97
P	106	1.39	1.23	P	153	0.90	0.74
P	107	0.95	0.90	P	154	1.11	1.03
P	108	1.29	1.35	P	155	1.06	0.94
P	109	1.41	1.28	P	156	0.90	0.82
P	110	1.53	1.55	P	157	0.84	0.71
P	111	1.65	1.61	P	158	1.37	1.01
P	112	1.45	1.35	P	159	1.16	0.95
P	113	1.28	1.27	P	160	1.17	0.90
P	114	1.92	1.87	P	161	0.75	0.76
P	115	1.45	1.39	P	162	0.79	0.69
P	116	1.57	1.46	P	163	1.37	1.14
P	117	1.46	1.32	P	164	1.28	0.97
P	118	1.46	1.37	P	165	1.00	0.81
P	119	1.74	1.65	P	166	0.79	0.68
P	120	1.15	1.11	P	167	1.01	0.75
P	121	1.01	0.95	P	168	1.15	1.02
P	122	0.74	0.64	P	169	0.67	0.49
P	123	1.14	1.02	P	170	1.11	0.84
P	124	0.96	0.92	P	171	0.92	0.85
P	125	1.07	0.96	P	172	0.84	0.78

Table B1 (cont.): Annual and summer mean wind speeds corresponding to a probability of exceedance of 50%

Test Points		Annual mean wind speed	Summer mean wind speed	Test Points		Annual mean wind speed	Summer mean wind speed
P	173	0.91	0.77	P	220	0.99	0.96
P	174	1.19	1.06	P	221	1.32	1.18
P	175	1.08	0.78	P	222	0.89	0.89
P	176	0.93	0.79	P	223	1.59	1.32
P	177	1.06	0.75	P	224	0.98	0.98
P	178	0.81	0.60	P	225	0.95	0.89
P	179	1.04	0.85	P	226	1.10	1.00
P	180	1.02	0.75	P	227	1.02	1.04
P	181	1.02	0.67	P	228	0.89	0.94
P	182	1.20	1.07	P	229	1.13	0.94
P	183	1.40	1.24	P	230	0.97	1.02
P	184	1.05	0.80	P	231	1.36	1.13
P	185	0.68	0.63	P	232	1.49	1.31
P	186	1.62	1.42	P	233	0.90	0.86
P	187	1.06	1.04	P	234	0.98	0.81
P	188	0.58	0.59	P	235	0.81	0.71
P	189	0.49	0.57	P	236	0.88	0.84
P	190	1.27	0.99	P	237	1.04	0.80
P	191	0.58	0.49	P	238	1.06	0.97
P	192	0.65	0.69	P	239	0.99	0.88
P	193	0.67	0.71	P	240	1.11	1.00
P	194	0.66	0.64	P	241	0.62	0.62
P	195	1.01	0.93	P	242	0.93	0.77
P	196	0.60	0.57	P	243	0.72	0.64
P	197	1.04	1.00	P	244	0.67	0.57
P	198	1.24	1.37	P	245	0.93	0.99
P	199	1.42	1.39	P	246	1.04	0.92
P	200	1.25	1.28	P	247	0.56	0.60
P	201	1.38	1.30	P	248	0.90	0.87
P	202	1.31	1.14	P	249	0.86	0.82
P	203	1.06	0.96	P	250	0.94	0.85
P	204	1.60	1.43	P	251	1.18	1.14
P	205	0.88	0.92	P	252	1.21	1.17
P	206	0.88	0.86	P	253	1.27	1.20
P	207	0.76	0.73	P	254	0.97	0.94
P	208	1.81	1.68	P	255	1.12	1.09
P	209	1.10	1.03	P	256	0.97	0.95
P	210	0.76	0.83	P	257	1.10	1.09
P	211	0.96	0.91	P	258	1.12	1.00
P	212	1.48	1.36	P	259	0.98	0.99
P	213	1.35	1.25	P	260	0.70	0.78
P	214	0.74	0.67	P	261	0.94	1.01
P	215	1.03	1.14	P	262	1.03	0.92
P	216	1.43	1.30	P	263	1.06	1.06
P	217	1.45	1.36	P	264	0.93	1.00
P	218	1.09	1.06	P	265	0.94	0.92
P	219	0.69	0.69	P	266	0.91	0.97

Table B1 (cont.): Annual and summer mean wind speeds corresponding to a probability of exceedance of 50%

Test Points		Annual mean wind speed	Summer mean wind speed	Test Points		Annual mean wind speed	Summer mean wind speed
P	267	0.75	0.76	A	314	0.64	0.79
P	268	1.71	1.60	A	315	0.60	0.62
P	269	1.35	1.19	A	316	1.31	1.47
P	270	1.61	1.39	A	317	0.65	0.63
P	271	1.27	1.18	A	318	1.30	1.41
P	272	1.01	1.08	A	319	1.13	1.15
P	273	0.98	0.98	A	320	0.73	0.80
P	274	1.10	1.08	A	321	0.76	0.75
P	275	1.29	1.16	A	322	0.66	0.82
P	276	0.97	0.91	A	323	0.67	0.70
P	277	1.25	1.25	A	324	0.55	0.62
P	278	0.84	0.84	A	325	0.93	0.94
P	279	0.70	0.71	A	326	1.20	1.34
P	280	1.10	1.12	A	327	1.06	1.26
P	281	1.08	1.06	A	328	1.17	1.37
P	282	0.95	0.97	A	329	1.64	1.72
P	283	2.95	2.94	A	330	1.05	1.16
P	284	1.74	1.72	A	331	1.39	1.22
A	285	1.12	1.13	A	332	1.28	1.22
A	286	1.02	1.12	A	333	0.80	0.88
A	287	0.54	0.67	A	334	1.37	1.16
A	288	0.96	0.97	A	335	1.22	1.21
A	289	0.68	0.73	A	336	1.73	1.42
A	290	0.51	0.62	A	337	0.88	0.80
A	291	0.96	1.03	A	338	1.13	0.98
A	292	1.19	1.19	A	339	0.99	0.74
A	293	1.15	1.32	A	340	0.72	0.70
A	294	1.30	1.14	A	341	0.90	0.77
A	295	0.93	0.94	A	342	1.07	1.07
A	296	1.55	1.51	A	343	0.86	0.74
A	297	1.87	2.02	A	344	0.89	0.78
A	298	1.33	1.29	A	345	0.74	0.64
A	299	1.18	1.22	A	346	0.95	0.84
A	300	0.74	0.86	A	347	0.64	0.55
A	301	0.63	0.75	A	348	0.87	0.71
A	302	0.72	0.70	A	349	0.62	0.59
A	303	0.84	1.01	A	350	1.03	0.77
A	304	0.53	0.56	A	351	0.76	0.62
A	305	0.57	0.57	A	352	0.76	0.67
A	306	0.49	0.60	A	353	1.28	1.01
A	307	1.08	1.30	A	354	1.19	0.94
A	308	0.85	0.90	A	355	1.07	0.90
A	309	0.64	0.76	A	356	0.93	0.64
A	310	0.84	0.97	A	357	1.11	0.88
A	311	0.70	0.84	A	358	0.97	0.75
A	312	0.70	0.77	A	359	0.84	0.81
A	313	0.72	0.68	A	360	0.66	0.65

Table B1 (cont.): Annual and summer mean wind speeds corresponding to a probability of exceedance of 50%

Test Points		Annual mean wind speed	Summer mean wind speed	Test Points		Annual mean wind speed	Summer mean wind speed
A	361	1.19	1.23	A	408	0.75	0.72
A	362	0.52	0.60	A	409	1.58	0.86
A	363	1.22	1.10	A	410	1.95	1.06
A	364	0.76	0.76	A	411	0.56	0.41
A	365	0.64	0.70	A	412	0.93	0.68
A	366	1.13	1.22	A	413	0.58	0.52
A	367	0.78	0.81	A	414	1.58	1.25
A	368	0.84	0.91	A	415	1.28	1.02
A	369	0.91	0.90	A	416	1.27	1.12
A	370	0.97	0.95	A	417	0.73	0.84
A	371	0.79	0.75	A	418	0.89	0.96
A	372	0.95	0.97	A	419	1.03	0.91
A	373	0.78	0.78	A	420	0.53	0.58
A	374	0.44	0.42	A	421	0.82	0.89
A	375	1.12	1.04	A	422	0.98	1.05
A	376	0.84	0.80	A	423	0.74	0.75
A	377	0.86	0.80	A	424	0.96	1.01
A	378	0.97	0.85	A	425	0.82	0.92
A	379	0.67	0.65	A	426	0.55	0.47
A	380	0.83	0.74	A	427	0.63	0.62
A	381	0.88	0.84	A	428	0.60	0.47
A	382	1.11	1.08	A	429	0.61	0.60
A	383	0.82	0.77	A	430	0.58	0.55
A	384	1.11	1.11	A	431	0.46	0.46
A	385	1.06	0.95	A	432	1.23	1.06
A	386	0.81	0.84	A	433	0.51	0.57
A	387	0.70	0.69	A	434	1.18	1.14
A	388	0.91	0.78	A	435	0.58	0.50
A	389	1.08	0.91	A	436	0.50	0.57
A	390	0.92	0.71	A	437	0.39	0.37
A	391	1.68	1.54	A	438	0.64	0.75
A	392	1.61	1.36	A	439	0.77	0.80
A	393	2.08	1.69	A	440	1.08	1.09
A	394	1.09	1.06	A	441	0.74	0.80
A	395	1.83	1.72	A	442	0.64	0.80
A	396	0.95	0.81	A	443	0.78	0.97
A	397	0.84	0.69	A	444	0.71	0.81
A	398	0.69	0.68	A	445	1.14	1.30
A	399	1.33	0.89	A	446	1.58	1.68
A	400	1.23	1.05	A	447	1.18	1.05
A	401	1.37	1.07	A	448	0.90	0.97
A	402	1.45	0.98	A	449	1.35	1.36
A	403	0.69	0.64	A	450	0.76	0.80
A	404	1.27	0.80	A	451	0.93	0.96
A	405	0.70	0.62	A	452	0.68	0.65
A	406	0.86	0.74	A	453	0.76	0.70
A	407	1.35	0.93	A	454	1.21	0.93

Table B1 (cont.): Annual and summer mean wind speeds corresponding to a probability of exceedance of 50%

Test Points		Annual mean wind speed	Summer mean wind speed	Test Points		Annual mean wind speed	Summer mean wind speed
A	455	1.09	0.85	A	484	0.57	0.57
A	456	0.89	0.78	A	485	0.73	0.69
A	457	0.88	0.78	A	486	0.75	0.72
A	458	1.17	0.95	A	487	0.79	0.74
A	459	0.70	0.74	A	488	0.73	0.68
A	460	1.65	1.73	A	489	0.57	0.57
A	461	0.85	0.83	A	490	0.63	0.63
A	462	1.00	0.95	A	491	0.89	0.79
A	463	0.95	0.88	A	492	1.05	0.77
A	464	1.05	0.80	A	493	1.11	1.01
A	465	1.03	0.86	A	494	0.69	0.68
A	466	0.71	0.50	A	495	1.10	0.96
A	467	1.17	1.00	A	496	1.04	0.89
A	468	0.83	0.75	A	497	1.00	0.94
A	469	0.96	0.89	A	498	0.94	0.76
A	470	0.60	0.51	A	499	0.70	0.65
A	471	0.57	0.56	A	500	0.98	0.85
A	472	0.57	0.53	A	501	0.84	0.66
A	473	0.70	0.67	A	502	0.95	0.73
A	474	0.81	0.81	A	503	0.83	0.77
A	475	0.78	0.72	A	504	0.89	0.73
A	476	0.62	0.64	A	505	1.06	0.75
A	477	0.61	0.66	A	506	0.54	0.47
A	478	0.59	0.65	A	507	0.81	0.74
A	479	0.78	0.81	A	508	0.70	0.61
A	480	0.73	0.80	A	509	1.19	0.95
A	481	0.67	0.78	A	510	2.15	1.92
A	482	0.71	0.72	A	511	0.79	0.78
A	483	0.93	0.97				