

**Term Consultancy for Expert Evaluation and Advisory Services on Air
Ventilation Assessment Services under Agreement No. PLNQ 35/2009**

**Expert Evaluation and Advisory Report for
Causeway Bay Area**

FINAL

September 2010



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EXECUTIVE SUMMARY

CO₂nnsulting was commissioned by the Planning Department of HKSARG under the Term Consultancy for Expert Evaluation on Air Ventilation Assessment Services to assess the air ventilation impacts of the building height restrictions incorporated in the draft Causeway Bay Outline Zoning Plan No. S/H6/14A and recommend mitigation measures to alleviate the impacts.

The methodology adopted here follows that for an expert evaluation in the “Technical Guide for Air Ventilation Assessment for Developments in Hong Kong” as well as those requirements in the Project Brief.

The wind data in Causeway Bay is obtained from the CLP Power Wind/Wave Tunnel Facility (WWTF) at The Hong Kong University of Science and Technology. The annual prevailing wind directions for the Project Area are: north-easterlies, easterlies and northerlies. The summer prevailing winds are: easterlies, south-south easterlies, and southwesterlies.

In Causeway Bay, the building height-to-street width ratio is high, as such that the majority of the buildings are very tall and the streets are comparatively narrow. Building height restriction may not be the most effective means to improve pedestrian level air ventilation. Control of the coverage and permeability of podia; provision of greenery and open space and gaps between buildings; setting back of building frontages to widen the streets and breezeways; and provision of non-building areas for air flow are measures considered.

Existing non-building areas either in the form of Open Space, or G/IC sites such as Victoria Park (outside the Project Area), South China Athletic Association (outside the Project Area), Causeway Bay Sports Ground, Moreton Terrace Temporary Playground, Hong Kong Stadium, So Kon Po Recreation Ground, Indian Recreation Club, are real gems to air ventilation to Causeway Bay. These regions are encouraged to be maintained to allow penetration of wind inland. All open space/ green areas and the GIC facilities provide useful “lungs” of air spaces in the Project Area. They should not be further developed with tall buildings or re-zoned for bulky developments. This would ensure that the existing useful air spaces “lungs” are kept intact.

The existing scenario does not present major problems to the air ventilation issue apart from the north-western region of Causeway Bay. Developments in the northwest area are tall

and densely built, and have negative impacts on the wind environment. Victoria Park, Sports Ground, Cannon Street, Paterson Street, Gloucester Road, Kingston Road, Great George Street, Sugar Street are the major breezeways to the northwest Causeway Bay and should not be obstructed. Hennessey Road and Yee Wo Street are the busiest major roads through Causeway Bay. The condition will improve if a non-building area aligning with Cannon Street is introduced to allow more sea breeze to reach Hennessey Road; a non-building area is introduced at 51 Paterson Street to align with Kingston Street; set-backs are introduced on both sides of Sugar Street and Great George Street to widen these two major breezeways. Having regard to the site details, it is recommended that two non-building areas be 15m wide, and Sugar Street and Great George Street be widened to 18m and 25m respectively.

The wide and tall (200mPD) committed development at the corner of Hennessey Road and Lee Garden Road, if without suitable mitigation measures, will reduce the south-southeast and southwest winds towards Hennessey Road and Lockhart Road. This committed development of 200mPD will create a large wake with stagnation. Various design options have already been studied in detail by another consultant to minimise the negative impact on the air ventilation. The current approved design has incorporated three ventilation windows to allow better permeability in surrounding areas albeit the benefit may not be mainly on the pedestrian level.

In the proposed plan, it is possible to have podiums which have 100% site coverage and up to three storeys. This will be a major air ventilation issue for the north-western region. The existing air ventilation in this commercial hub is already not ideal, this proposed change will worsen the existing air ventilation scenario significantly. The podium together with the increased building height from an average of 60mPD to 130mPD will have a significant adverse impact on the air ventilation. It is recommended to improve permeability by stipulating building setback requirements or recess on the lower floors, and by delineating non-building areas wherever possible. The maximum allowable building height of 130 mPD in the north-western region is high, and should be ideally reduced substantially to a maximum of 80mPD, with the road spacing ideally increased to 25m. This should be applied to Cannon Street and Paterson Street as far as possible. The introduction of building difference encourages wind to reach the pedestrian level. If a major reduction in

building height is considered impractical upon balancing of the development rights of the concerned lots, a moderate reduction should still be pursued.

The maximum building height along Hennessy Road and Yee Wo Street shall ideally not exceed 100mPD, with the road width of around 30m. The minor street regions are only about 12m wide, a maximum height of 130m will have severe adverse impact on the air ventilation.

The air ventilation in the streets around Kai Chiu Road, Lan Fong Road and Pak Sha Road will deteriorate, as these are sandwiched between the 200mPD committed development at Hennessy Road and Lee Garden Road Junction, as well as the 210mPD Manulife Plaza. Little can be done to improve the situation since the developments are already committed or constructed.

Potential redevelopment sites along Percival Street are two to six times taller than the existing developments (from 20-59m to 130m), and are likely to worsen the skimming flow with little air ventilation available at the street level. The maximum building height should ideally be reduced significantly, such that the problem of skimming flow across Lee Garden Road is not as severe. Set-backs are recommended on both sides of Lee Garden Road to minimise the skimming flow across Lee Garden Road.

Potential redevelopment sites along Leighton Road are two to five times taller than the existing developments (from 20-59m to 110m), which are likely to worsen the skimming flow at the street level. However, given that there is a vast open space offered by Victoria Park, the situation is better than otherwise.

It is recommended to step the height up from 85mPD to 115mPD to encourage some downwash to reach the narrow street level in the eastern region, in the Wun Sha Street residential cluster, Tai Hang.

The proposed building height profile for the centre region are similar to the heights of the existing developments. The impact on the surrounding wind regime will be minimal. The air ventilation with the proposed plan for the northern region will have no adverse impact on the northern area and those in the hinterland. There is no significant change in the southern region.

Moreover, response to the comments from the Planning Department, a number of additional improvement measures are suggested as follows:

- (1) Widen pavements to at least 3.5m by building set-backs fronting Lockhart Road, Jaffe Road, Cannon Street, Lan Fong Road, Jardine's Bazaar and Lee Garden Road due to the heavy pedestrian flows and poor air ventilation conditions.
- (2) Widen pavements at Haven Street and in the Wun Sha Street residential cluster to at least 2m wide in order to improve the pedestrian walking environment. This measure, if implemented, is useful for air ventilation.
- (3) The existing podia of Caroline Centre and Lee Gardens to be retained to maintain the existing air path in Yun Ping Road.
- (4) Encourage future developments to adopt suitable design measures to minimise any possible adverse impacts. These include greater permeability of podium, wider gaps between buildings, disposition and perforation of building towers to align with the prevailing wind directions, as appropriate.

1. INTRODUCTION

CO₂nnsulting was commissioned by the Planning Department of HKSARG under Category A Service of the Term Consultancies for Air Ventilation Assessment Services (AVAs). The objective is to assess the air ventilation impacts of the building height restrictions under the draft Outline Zoning Plan (OZP) and recommend mitigation measures to alleviate the impacts.

The main tasks are to provide the followings:

- Site inspection and analysis of the wind data and environment of the Project Area;
- A qualitative evaluation of the air ventilation impacts of the development as illustrated under the planned scenario as compared to the existing scenario;
- Recommendations of mitigation and improvement measures.

Figure 1 shows the Project Area. Figures 2 to 7 show photographs of the Project Area taken from Locations A to F in Figure 1 respectively. Figure 8 show various views of the Project Area. The methodology adopted here follows that for an expert evaluation in the “Technical Guide for Air Ventilation Assessment for Developments in Hong Kong” as well as those requirements in the Project Brief.

2. SITE INFORMATION

The Project Area covers the Causeway Bay area of Hong Kong Island, with an area of approximately 96.43 hectares (according to S/H6/14). See Figure 1. It is bounded by Gloucester Road in the north, Wun Sha Street and Tai Hang Road in the east, So Kon Po in the south and Hong Kong Stadium and Percival Street in the west. To its west is the residential development of Leighton Hill and to its east is the residential development of Lai Tak Tsuen.

For the purpose of expert evaluation, the total Project Area is dissected into the following regions, as shown in Figure 1 in this study report.

Sub areas within Causeway Bay	Location	Descriptions	Terrain
Northwest region	Bounded by east of Gloucester Road, north of Leighton Road, adjacent to Victoria Harbour	Majority commercial and residential (C/R) developments	Flat, 3.7 mPD to 8.5 mPD
North region	Bounded by Causeway Road, north of Tung Lo Wan Road	Sports ground, recreation clubs and Hong Kong Central Library	Flat, 4.3 mPD to 11.7 mPD
Centre region	Bounded by south of Leighton Road, east of Moreton Terrace and include Hong Kong Stadium	Public facilities such as schools, recreation clubs, library, and sports ground.	Flat, 5.5 mPD to 11 mPD
East region	Bounded by Tai Hang Road, south of Tung Lo Wan Road, and east of Lai Tak Tsuen	Mostly residential with some OU, GB and G/IC	Foothill, 22.3 mPD to 100 mPD
Southern region	Bounded by east of Tai Hang Road and south of Hong Kong Stadium	Green belt and open space	Hilly with So Kon Po (100mPD) and Tai Hang (100mPD)

Table 1 Characteristics of Sub-Regions within Project Area

Figure 8g shows the main road and street going through the centre of Causeway Bay, Yee Wo Street and Tai Hang Road. Yee Wo Street is surrounded by high-rise developments on both sides of the road which may worsen the local stagnant regions. In comparison, Tai Hang Road links the hillside in the eastern area to the centre with medium-rise developments and open space along the road, which assist the air ventilation.



Figure 2 View Towards the Northwest Region and North Region within the Project Area from Location A in Figure 1



Figure 3 View Towards the North Region within Project Area from Location B in Figure 1



Figure 4 View Towards the East, North and Centre Regions within Project Area from Location C in Figure 1



Figure 5 View Towards the East Region of Project Area from Location D in Figure 1



Figure 6 View Towards the Northwest and North regions within the Project Area from Location E in Figure 1

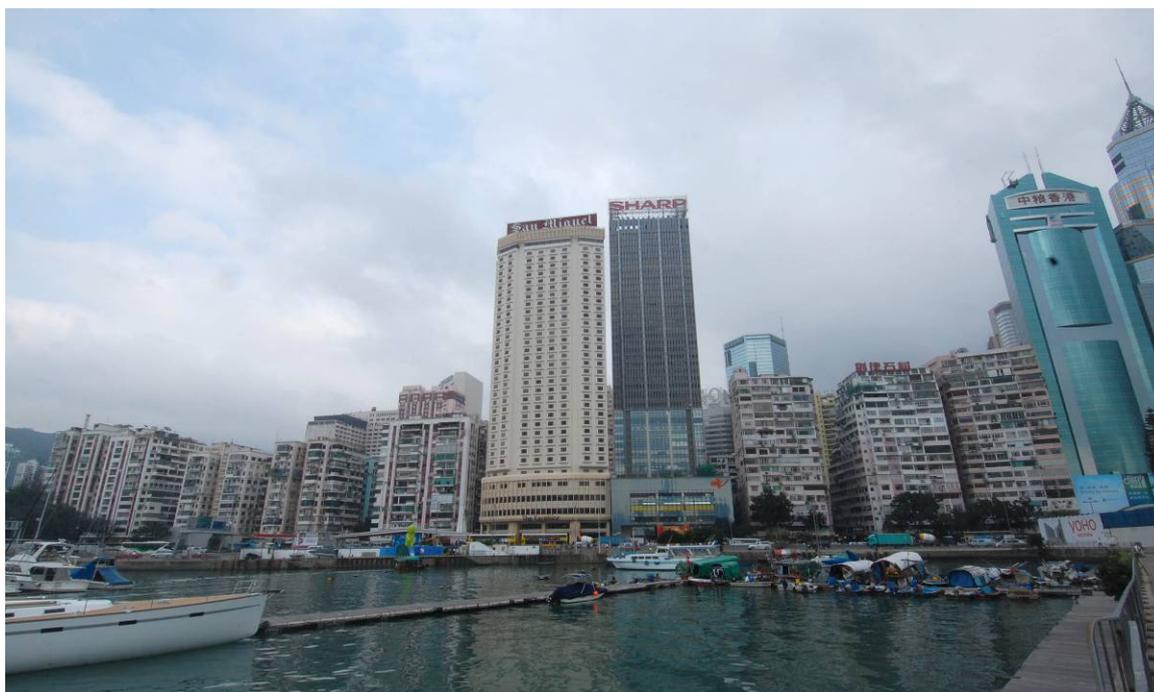


Figure 7 View Towards Northwest Region of Project Area from Location F in Figure 1



Figure 8 Views in the Causeway Bay Area



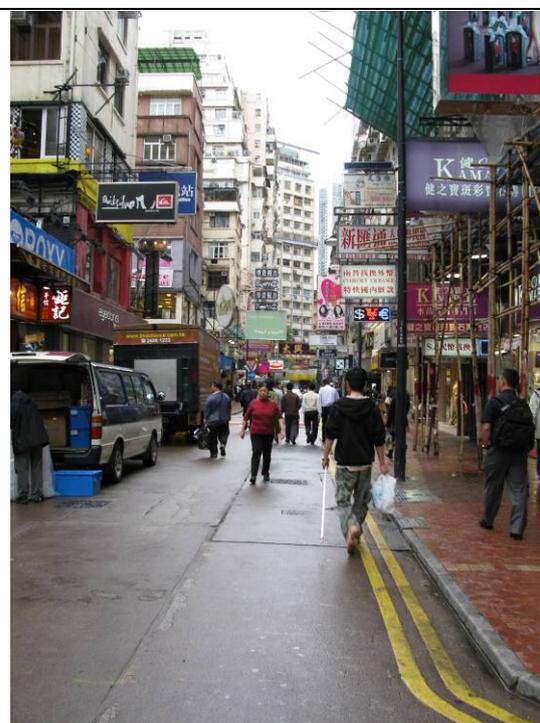
(e) Views of Lockhart Road Looking Westward (showing a mixture of low and high-rises)



(f) Views of Hennessy Road Looking Westward



(g) Views of Hennessy Road Looking Towards Yee Wo Street

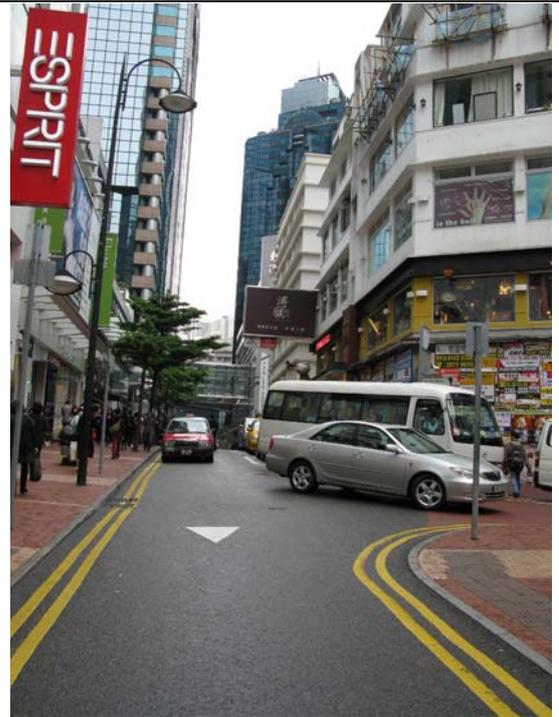


(h) Views of Lee Garden Road Looking Southward

Figure 8 Views in the Causeway Bay Area (continuous)



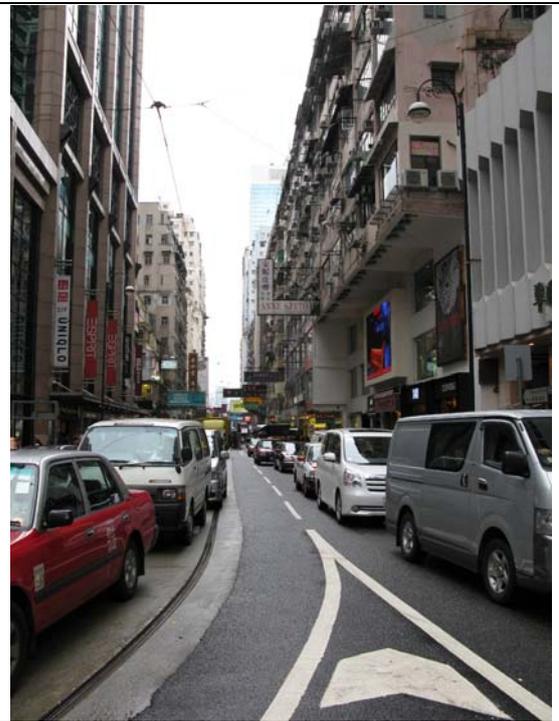
(i) Construction Site on Hennessy Road with 200 mPD (key obstruction to air ventilation)



(j) Views of Yun Ping Road Looking Southeastward



(k) Caroline Centre (obstruction to breeze)



(l) Percival Street Looking Northward

Figure 8 Views in the Causeway Bay Area (continuous)



(m) Po Wing Building (potential redevelopment site) Existing buildings show recess



(n) Views of Sharp Street East (outside boundary) Looking Westward - Narrow channels such as these are difficult to be ventilated.

Figure 8 Views in the Causeway Bay Area (continuous)

3. WIND ENVIRONMENT

The wind data refers to the experimental data conducted by the CLP Power Wind / Wave Tunnel Facility (WWTF) at The Hong Kong University of Science and Technology for the Causeway Bay Study Area. The WWTF is sufficient for this exercise, as this is a qualitative study requiring qualitative wind data, primarily prevailing wind directions.

The annual and summer wind data (at the centre of Causeway Bay junction of Hennessy Road and Great George Street) are shown in Figures 9 and 10 respectively. Furthermore, the wind data at heights of 50m, 100m, 200m and 500m were also analysed to identify the sensitivity of wind directions with variation in height for the location. These heights were chosen to verify the impact of developments on the wind regime. Typically the height of 500m gives an overall picture of the prevailing winds with less disturbance caused by the urban canopy, whilst the wind data at the height of 50m and 100m are subject to the variations in the urban canopy. The intermediate height of 200m usually gives a representative picture of the wind regime of the Project Area. Figures 9 and 10 compare the wind data at given heights for annual and summer winds respectively. The annual prevailing wind directions for the Project Area are: north-easterlies, northerlies and easterlies. The summer prevailing winds are: easterlies, south-south easterlies, and south-westerlies.

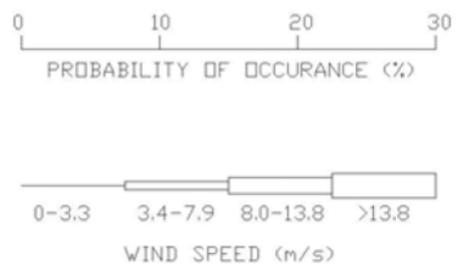
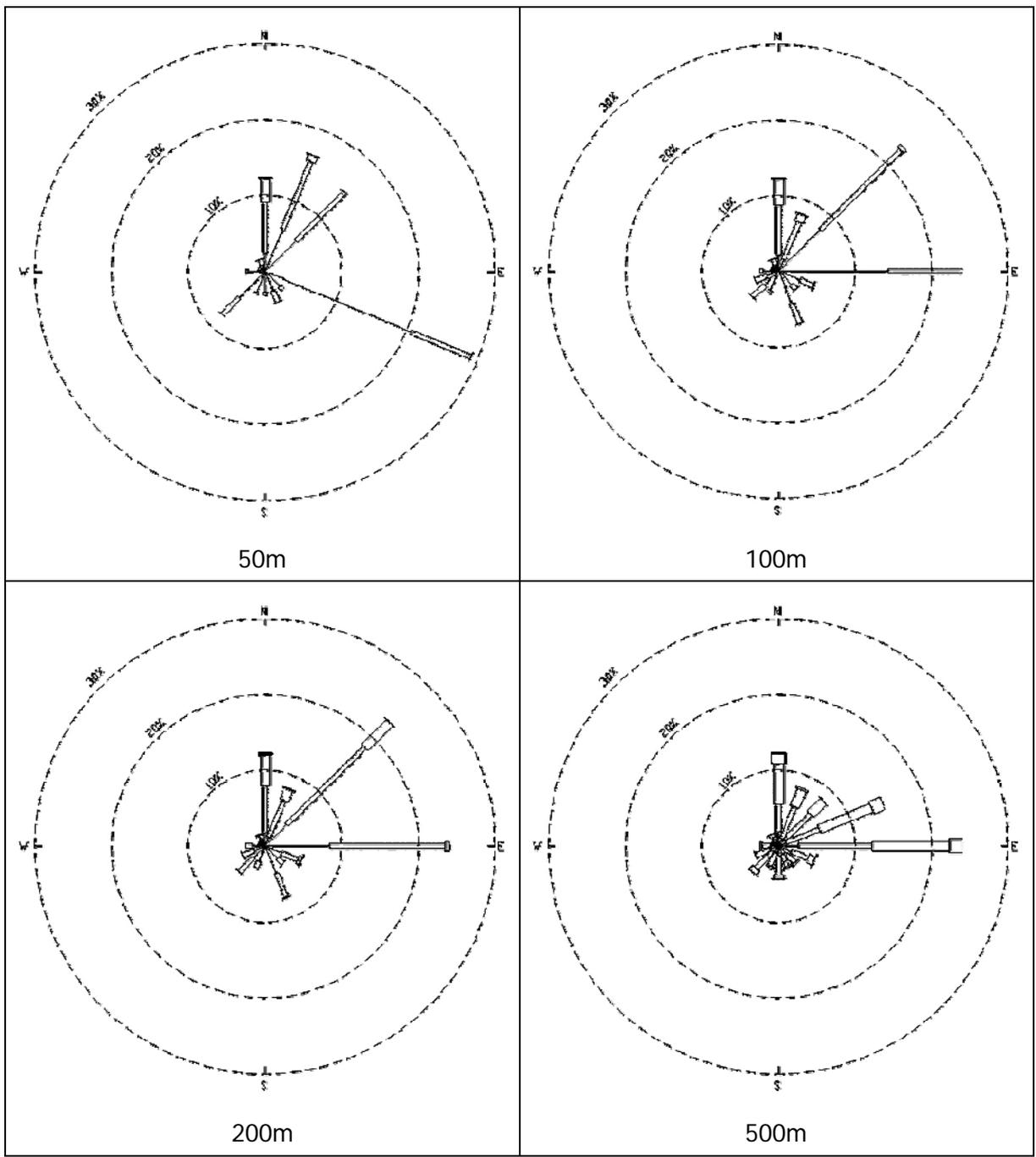


Figure 9 Wind Rose for Annual, non-typhoon winds for Causeway Bay

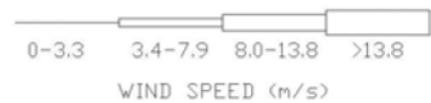
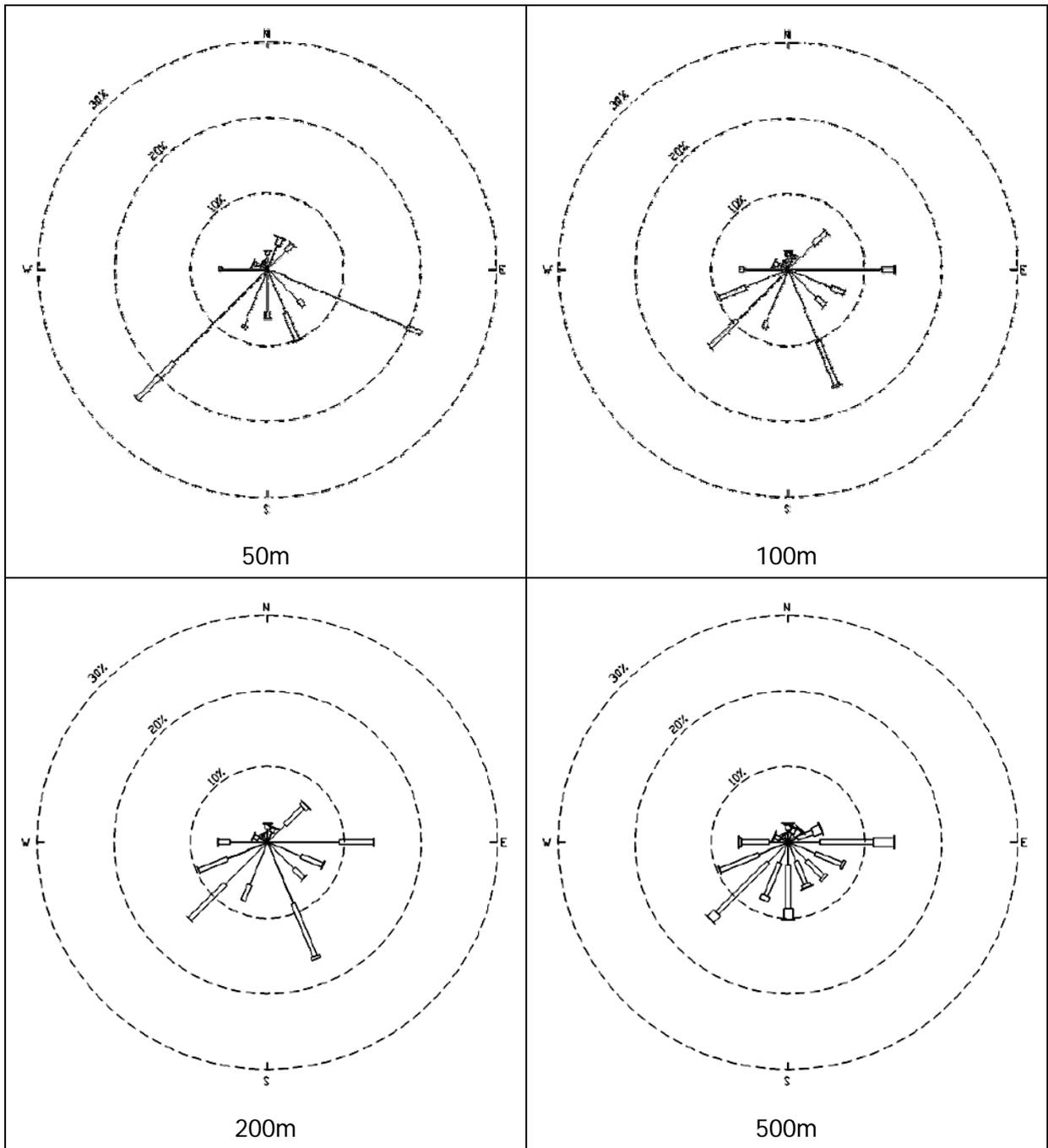


Figure 10 Wind Rose for Summer, non-typhoon winds for Causeway Bay

4. EXISTING SCENARIO

4.1 Topography

The following observations of the characteristics of the Project Area are noted:

- The terrain of Causeway Bay is flat mostly in the centre, northern, north-western regions, with some hills slopes in the eastern and southern regions (Tai Hang and So Kon Po). The north-western region is adjacent to Victoria Harbour and should enjoy some sea breeze.
- The northern region of the Project Area, just south of the Victoria Park and Sports Ground, consists mainly of open spaces.
- The densely populated area with the majority of the high-rise buildings above thirty storeys over 80mPD are concentrated in the north-western region, closest to the harbour. Some high-rise buildings above thirty storeys are scattered in the northern, central and eastern regions.
- The eastern region rests on a hill slope increasing from approximately 20mPD to 106mPD, and consists of mainly residential developments with some G/IC and OU and open space areas.
- The southern region consists primarily of green belt area, (Tai Hang and So Kon Po at a level of 50mPD to 100mPD), open spaces and G/IC areas such as the Hong Kong Stadium.

The wind flow in the Project Area is impacted not only by the disposition, massing, site coverage and height of buildings, but also the water mass nearby, and the surrounding hills. The proximity of water mass will bring cooler breeze. The land heats up more rapidly than the water, causing the air over the land to rise and be replaced by the cool air from over the water. Existing non-building areas either in the form of Open Space, or G/IC sites such as Victoria Park (outside the Project Area), South China Athletic Association (outside the Project Area), Causeway Bay Sports Ground, Moreton Terrace Temporary Playground, Hong Kong Stadium, So Kon Po Recreation Ground, Indian Recreation Club, are real gems to air ventilation to Causeway Bay. These regions are encouraged to be maintained to allow penetration of wind inland.

When the wind meets a hill, it creates a high-pressure zone of increased velocity on the windward side of the hill, and a low-pressure region on the leeward side of the hill. The velocity is increased as the wind sweeps around the sides and over the top of the hill as shown in Figure 11. As the sun warms the hills slopes, there exists a thermal gradient between the top of the hill and its base, the wind tends to flow upwards. By evening, the air cools and descends the hills and brings cooler wind to the base of the hills.

The green belt provided by Tai Hang and So Kon Po are a good example of this. Winds descend the faces of these green slopes bring coolth to the base of the hill.

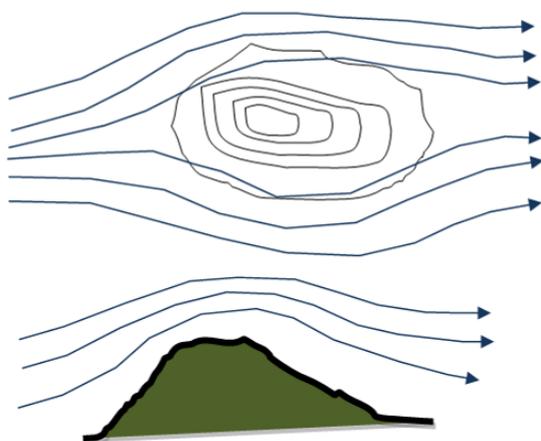


Figure 11 Influence of Terrain on Wind Flow

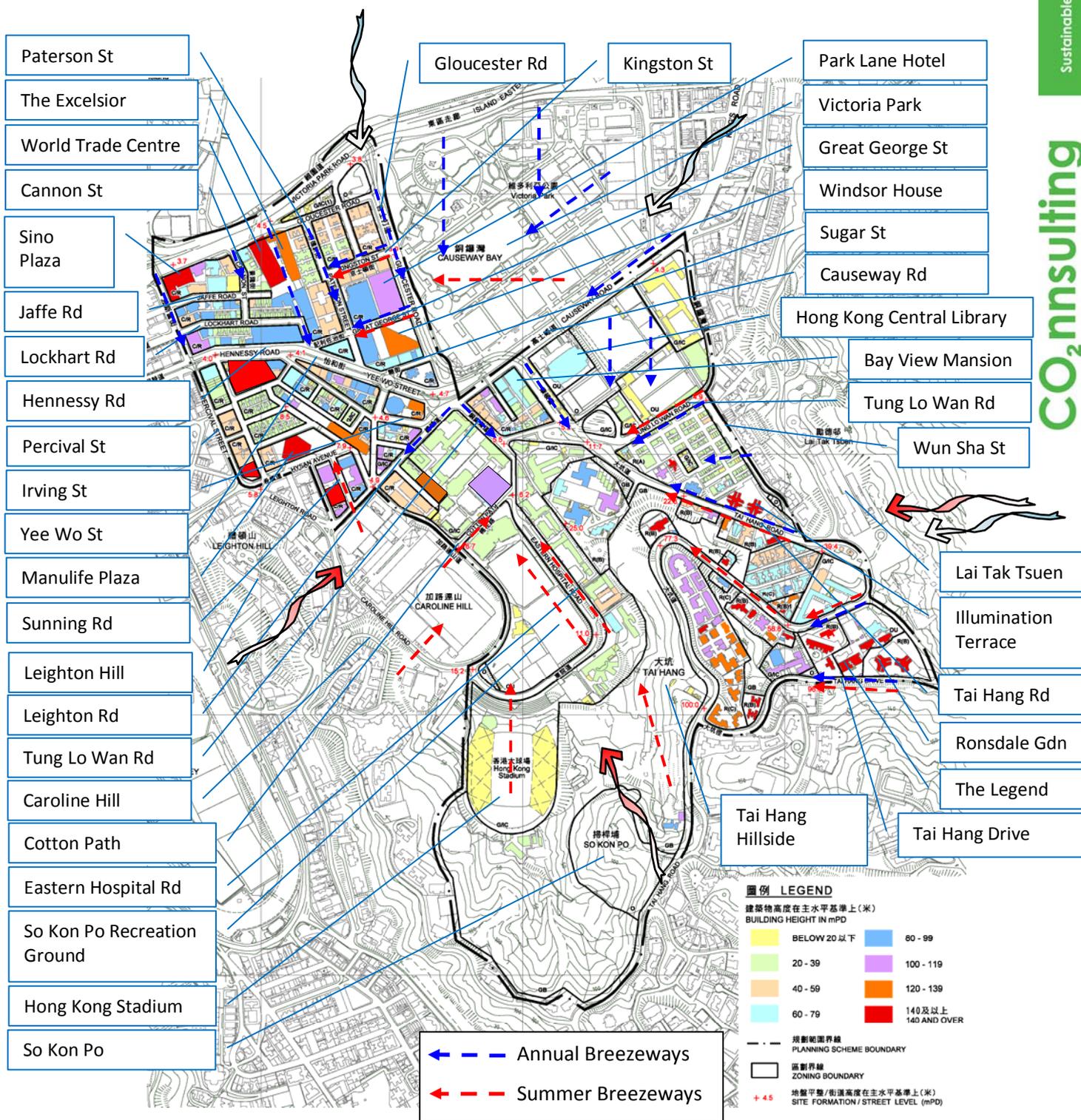


Figure 12 Existing Scenario showing Major Existing Breezeways

4.2 Existing Scenario in Summer

Section 3 has identified the summer prevailing wind directions as east, south-southeast and southwest. The information on the existing scenario, as provided by the Planning Department, presents the existing building profile including the approved and committed developments. It is used as a basis for appreciating the existing wind environment and understanding the effects of development restrictions. Figure 12 shows the prevailing winds for the existing scenario, the major breezeways are marked by arrows.

It is important to identify the most major breezeways along which measures such as setback/non-building area requirements may be imposed on OZP so as to improve their wind flows. The major breezeways towards the centre of Causeway Bay include:

East wind

- Tai Hang Road
- Kingston Street
- Great George Street
- Hennessy Road
- Sugar Street

South Southeast wind

- Hong Kong Stadium
- So Kon Po Hillside
- So Kon Po Recreational Ground

The eastern region of the Project Area, Tai Hang, is hilly. The majorities of the developments are ten storeys or below (up to 119 mPD), with some exceptions such as The Legend, Ronsdale Garden, Gardenview Heights and the committed development north of Dragon Garden over 30 storeys (around 200mPD and above). See Figure 13. These are situated on the hill slope, would enjoy descending wind breeze, and benefit from any transpiration cooling effect from the vegetated hillsides. Since these developments are concentrated in the east end of Tai Hang Drive, and the remaining of the eastern region is

occupied by ten storeys or below, the downhill wind can still flow over these obstacles. It is therefore important to maintain this area to low-rises.

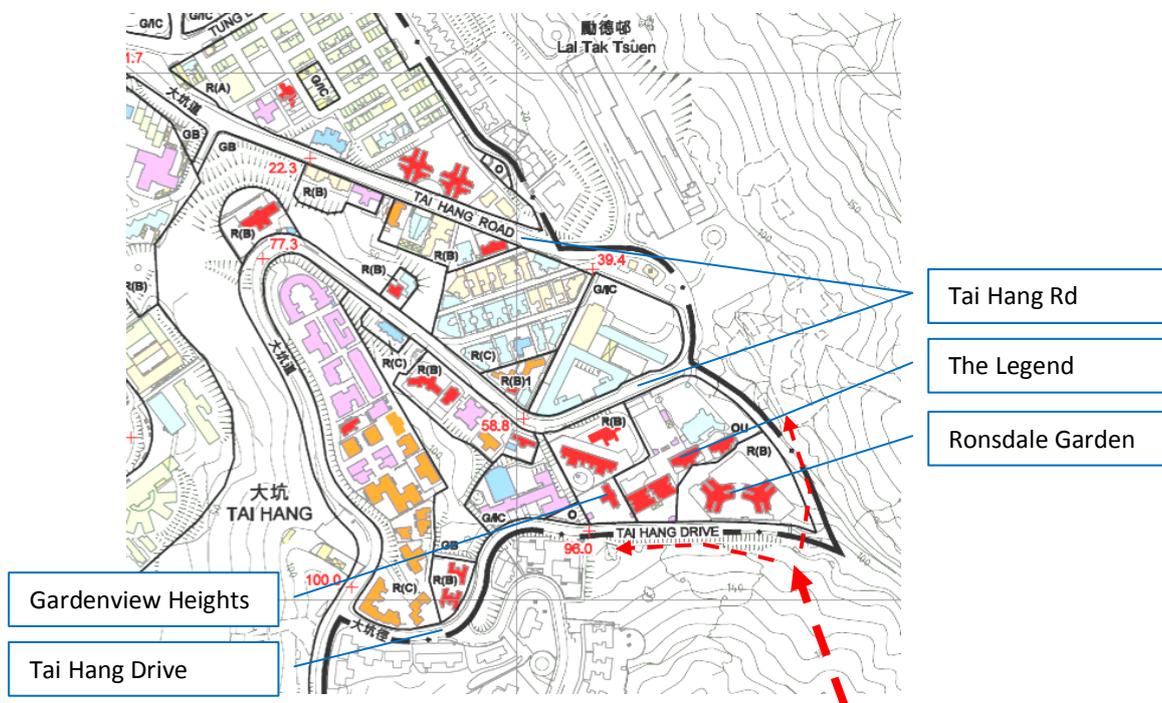


Figure 13 Existing Scenario in the Eastern Region of Causeway Bay

The northern region of the Project Area, just south of the Victoria Park and Sports Ground, consists mainly of open spaces, and is a key ventilation breezeway for sea breeze to penetrate into the G/IC site north of Tai Hang Road of the eastern region, as well as the centre region of Causeway Bay. These rare opportunities of Open Space and Recreational Sports Ground must be maintained as Causeway Bay suffers from poor air quality and will only worsen as the urban density increases.

The north-western region of the Project Area is adjacent to Victoria Harbour, and should enjoy some sea breeze. Gloucester Road, Kingston Road, Great George Street, Sugar Street are essential to ventilate the area. Paterson Street and Gloucester Road running north to south are key sea breeze corridors into the heart of Causeway Bay. Hennessey Road and Yee Wo Street are the busiest major roads through Causeway Bay. The condition will improve if a non-building area aligning with Cannon Street is introduced to allow more sea breeze to reach Hennessey Road as shown in Figure 14. An alternative or

additional measure though not as effective will be to make use of the existing path next to The Excelsior Hotel and improve the air penetration by straightening to ideally 10m, and increasing the vertical clearance to minimum 8m from ground level, as shown in Figure 14. The easterlies can reach the north-western area due to the openness of the Victoria Park and Sports Ground. Introduction of a non-building area of ideally 15m at 51 Peterson Street to align with Kingston Street, as shown in Figure 14, can further improve the air ventilation by creating a wind corridor to allow the easterlies to permeate. This commercial and retail hub is the most densely built area of Causeway Bay. The prevailing south-southeasterlies and southwesterlies struggle to permeate to Hennessey Road due to several high-rise buildings, and these are tabulated in table 2.

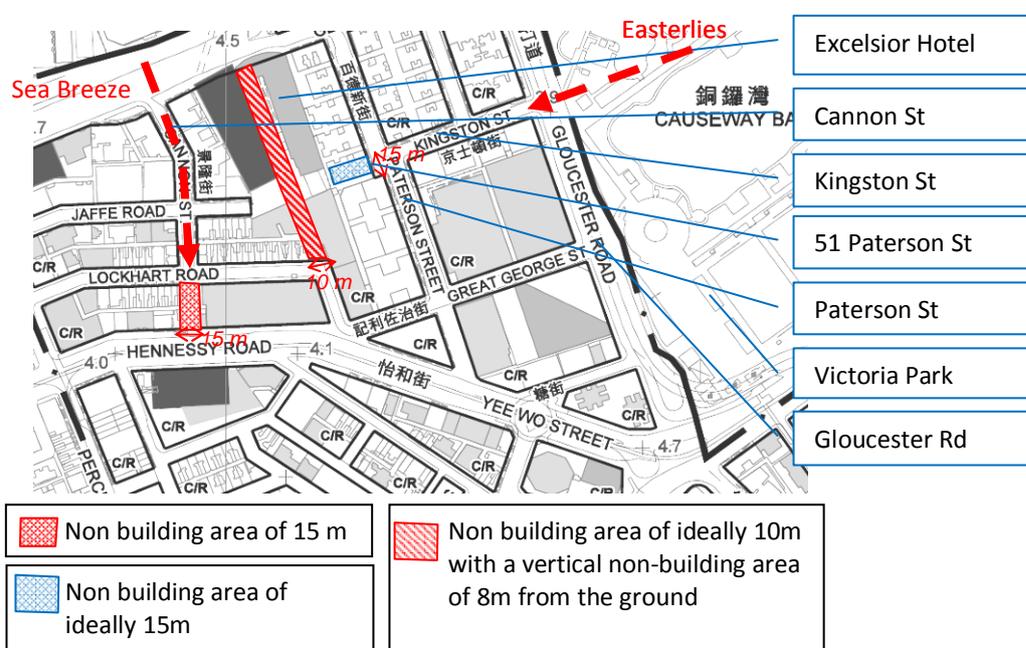


Figure 14 Non-building Areas

Buildings	Height (mPD)	Negative impact on wind direction
The Lee Gardens, Manulife Plaza	210	SSE and SW
Committed Development at the corner of Hennessy Road and Lee Garden Road	200	SSE and SW
Caroline Centre (Lee Garden Two)	125	SW

Table 2 Major Obstacles to Breeze

The wide and tall (200mPD), if without suitable mitigation measures, committed development at the corner of Hennessy Road and Lee Garden Road (Figure 8i) will reduce the south-southeast and southwest winds towards Hennessey Road and Lockhart Road. This committed development of 200mPD will create a large wake zone (a region with no or little air movement) with stagnation as far as 1km north of the development. Various design options have already been studied in detail by another consultant to minimise the negative impact on the air ventilation. The current approved design has incorporated three ventilation windows to allow better permeability in the surrounding areas albeit the benefit may not be mainly on the pedestrian level. The existing developments of Caroline Centre at 125mPD and Manulife Plaza at 210mPD, shown in Figure 15 create a large wake zone (a region with no or little air movement) to both of these developments. These wake zones have little air movement even when the summer wind is present.

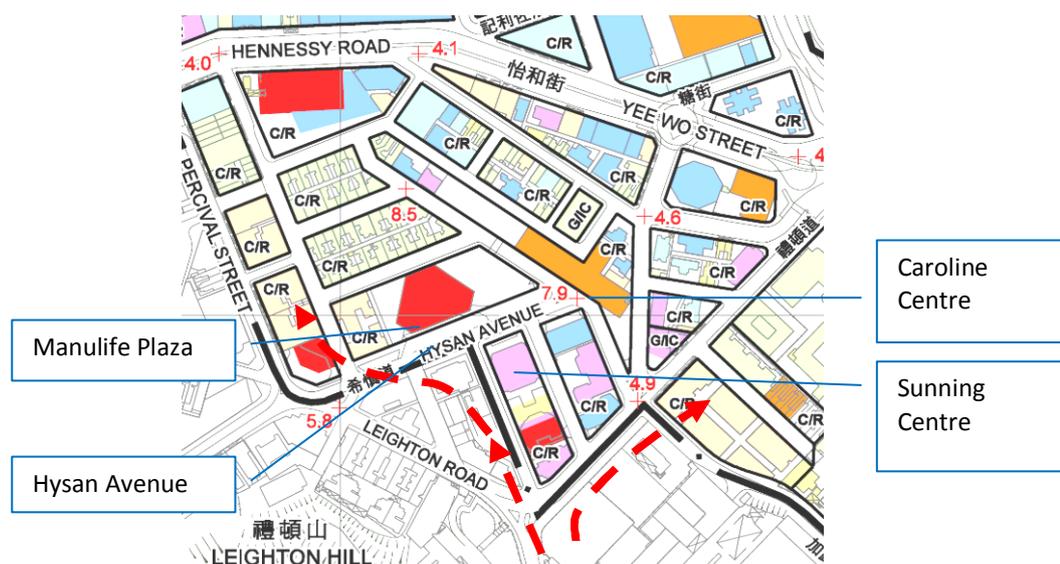


Figure 15 Existing Scenario around Manulife Plaza

The centre area of Causeway Bay is mainly G/IC (such as Hong Kong Stadium), OU (such as So Kon Po Sports Ground) and low-rise schools, colleges and hospital, as well as low-rise residential area. The majority of the developments are ten storeys or below (20mPD to 39mPD). This central area enjoys ample breeze coming from South China Athletic Association, So Kon Po and Tai Hang.

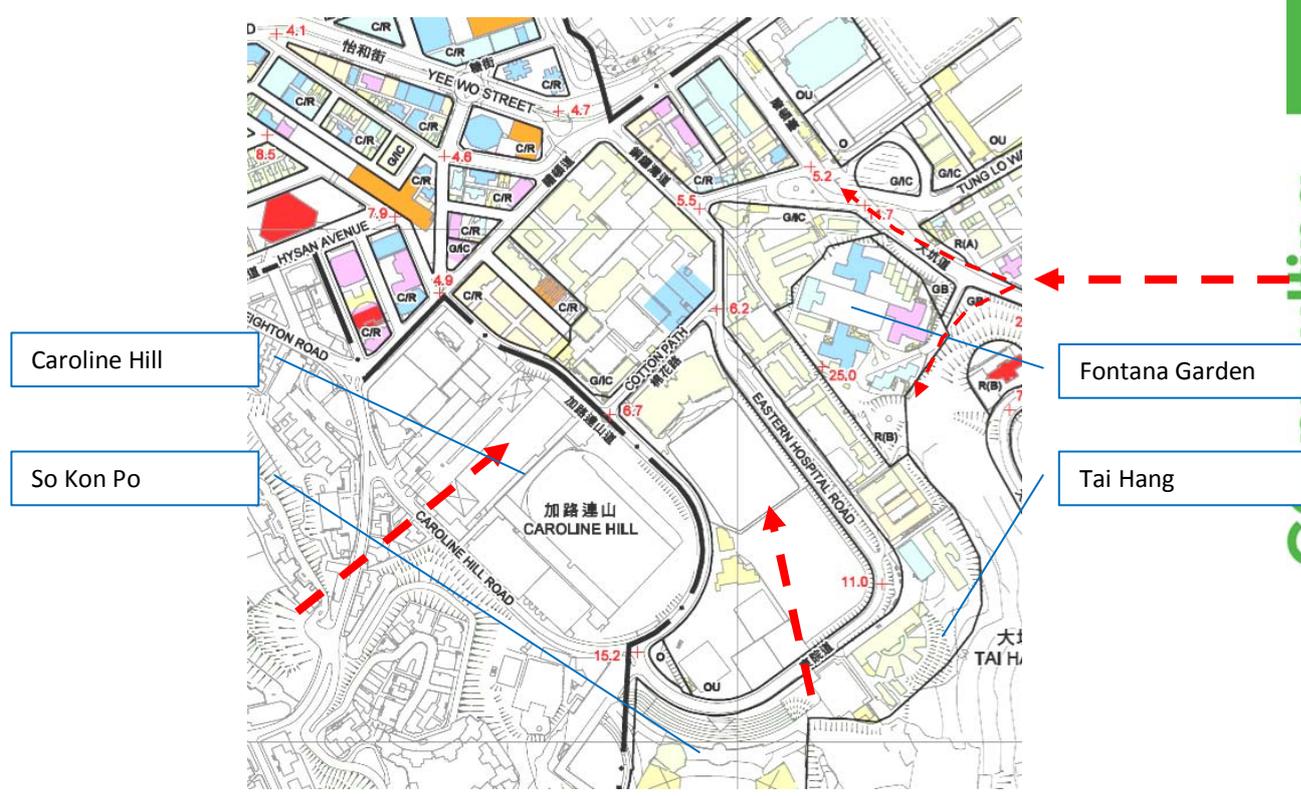


Figure 16 Existing Scenario in Centre Area of Causeway Bay

The southern area of Causeway Bay is mainly GB sites with Open Space. This elevated area surrounded by lush hills enjoys the descending wind cooled by the vegetation, as shown in Figure 17.

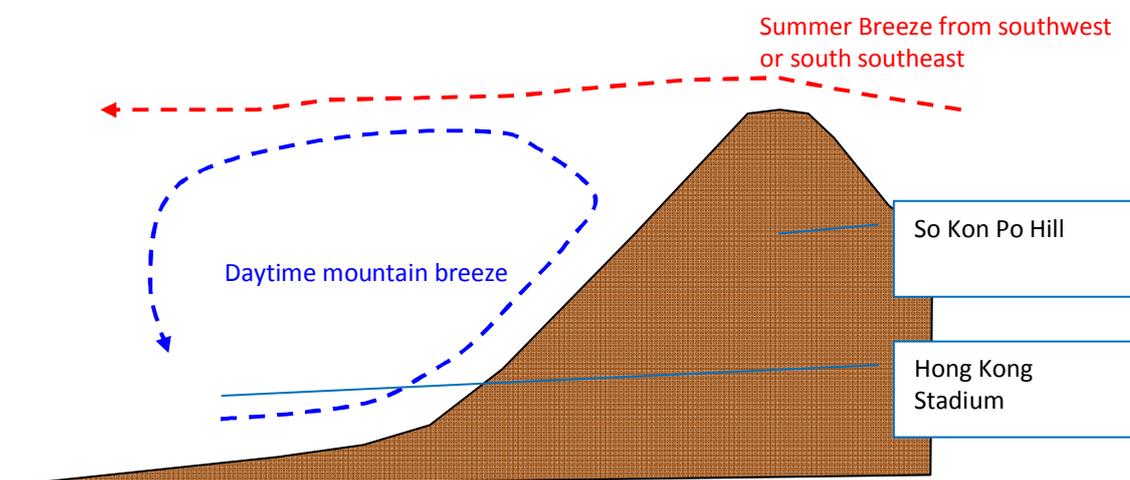


Figure 17 Existing Scenario in Southern Area of Causeway Bay

4.3 Existing Annual Scenario

Section 3 has identified the annual prevailing wind directions as north-easterlies, easterlies and northerlies. The annual breezeways include easterlies, north-easterlies and northerlies, as shown in Figure 12.

North wind

- Victoria Park
- Gloucester Road
- Paterson Street
- Cannon Street
- Percival Street
- Tung Lo Wan Road
- Causeway Bay Sports Ground

Northeast wind

- Victoria Park
- Causeway Road
- Tung Lo Wan Road

East wind

- Tung Lo Wan Road
- Tai Hang Road
- Tai Hang Drive
- Kingston Street
- Great George Street
- Sugar Street

The north-western region of the Project Area is adjacent to Victoria Harbour, and enjoys sea breeze via key breezeways such as Cannon Street, Paterson Street, Percival Street and Gloucester Road. The existing developments along Cannon Street and Paterson Street are mainly low-rises and mid-rises up to 20 storeys (20-60mPD). The width of Paterson Street together with the existing building height of below 60mPD do contribute to this favourable air ventilation scenario. However, the benefit may not reach Hennessy Road and Yee Wo Street due to the agglomeration and massing of World Trade Centre, The Excelsior Hotel, and East Point Centre. Victoria Park is a key ventilation corridor for Causeway Bay and must be maintained. The commercial hub benefits from the proximity of Victoria Park and Gloucester Road, Kingston Street, Great George Street and Sugar Street can channel these breezes into the hub. See Figure 18.

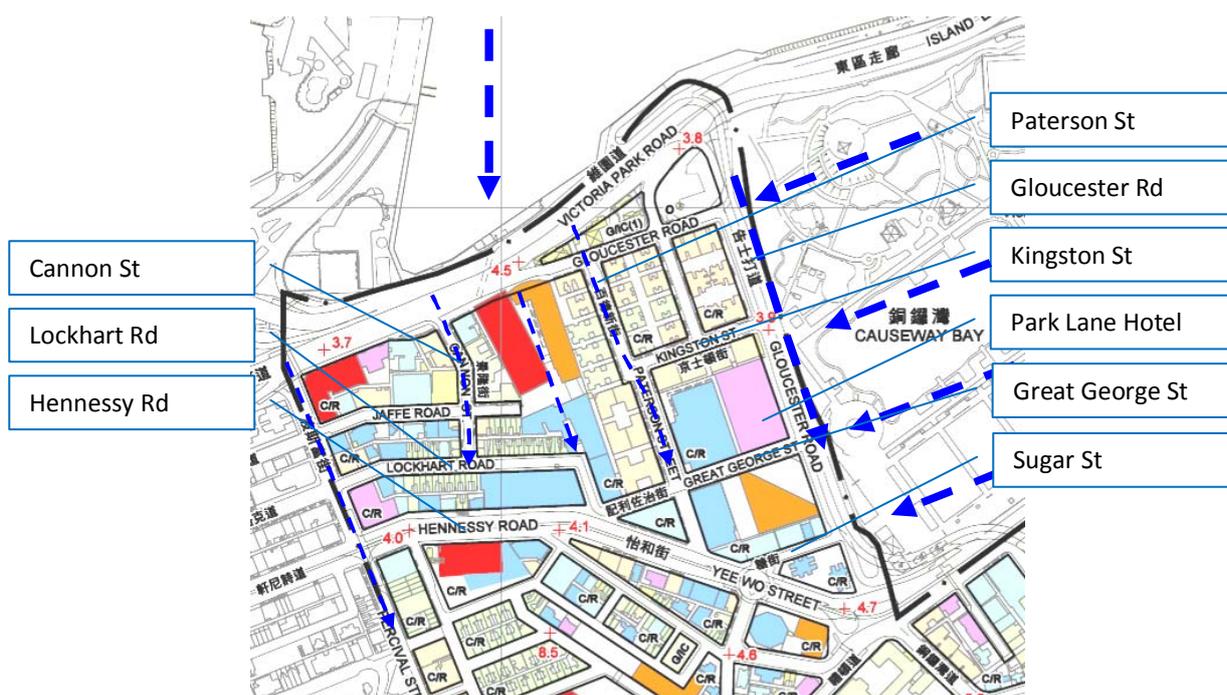


Figure 18 Existing Scenario for Northwest Region

The northern area of the Project Area is well served by annual prevailing winds due to the sparsely populated development and proximity to open spaces.

The centre area and the eastern area of Causeway Bay enjoy excellent breezes from the north due to the flat and open area of Victoria Park. Since the majority of the existing developments are not higher than ten storeys, (20-39mPD), north breeze can access the southern Causeway Bay without significant reduction.

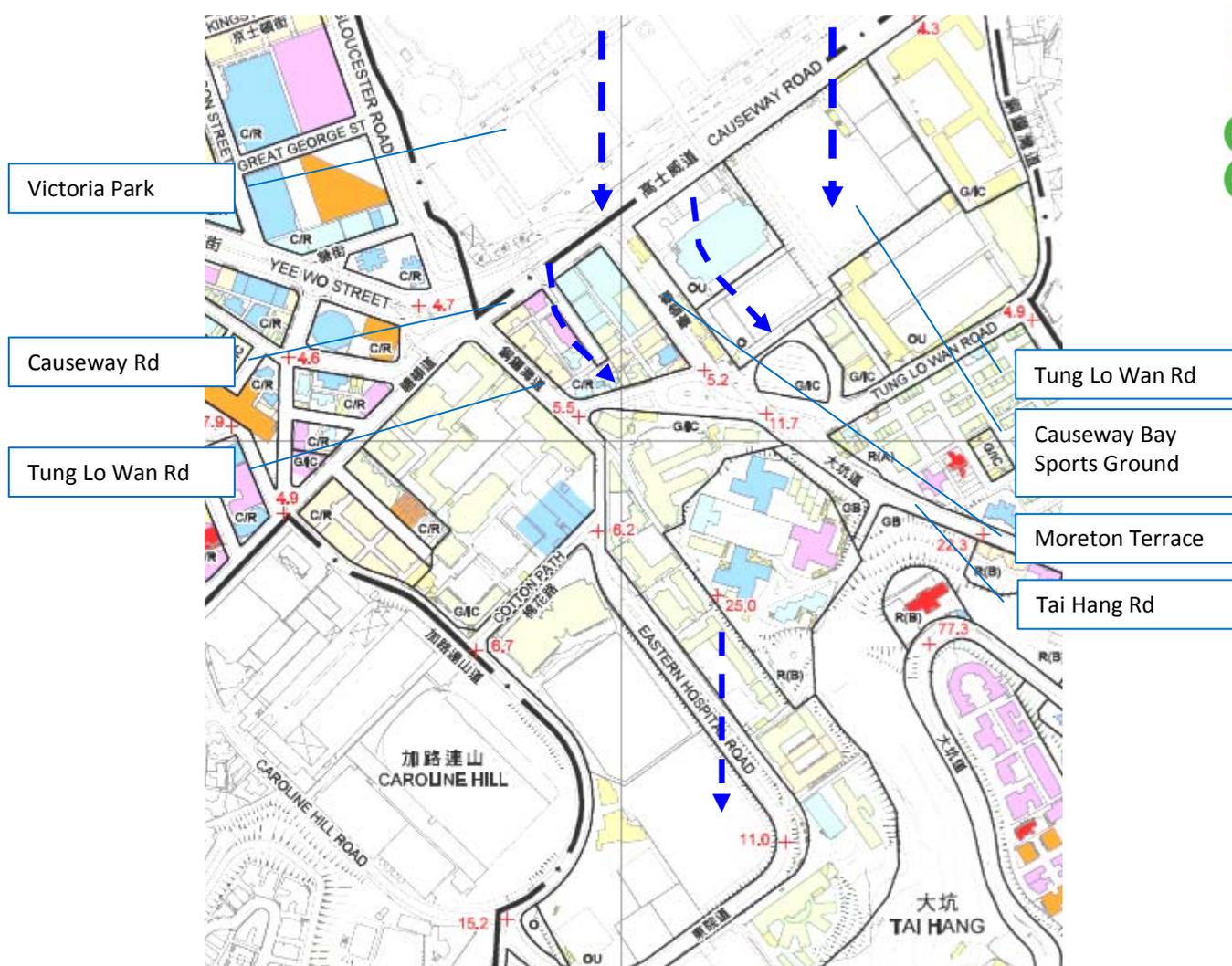


Figure 19 Existing Scenario in Centre Area and Eastern Area of Causeway Bay

The south region of the Project Area consists of developments mainly below ten storeys (30mPD), open areas and recreational ground, which produce minimal impedance the northerlies and north-westerlies.

5. INITIAL PLANNED SCENARIO

5.1 Observations

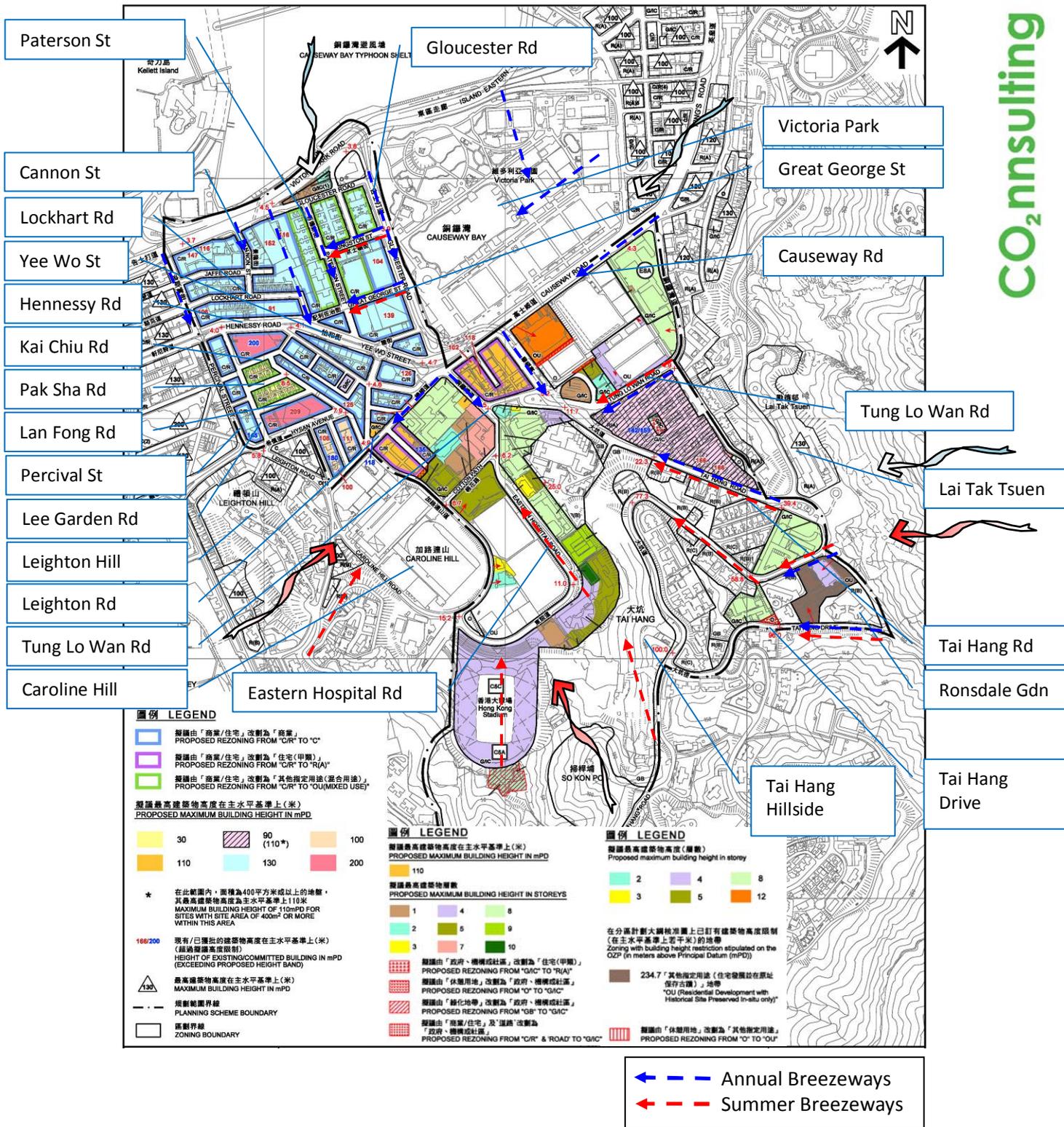


Figure 20 Building Blocks and Layout of Future Developments (Indicative)

5.2 Areas of Concern

Figure 20 shows the indicative redevelopment of some sites assuming redevelopment up to the proposed maximum development restrictions on the OZP, in addition to the existing and approved / committed ones. The design, disposition and height of new development shown in this figure are hypothetical.

(1) General

In the proposed plan, it is possible to have podiums which have 100% site coverage and up to three storeys. Figure 21 shows the potential redevelopments with podia. This will be a major air ventilation issue for the north-western region. The existing air ventilation in this commercial hub is already not ideal, this proposed change will worsen the existing air ventilation scenario significantly. The podium together with the increased building height from an average of 60mPD to 130mPD will have a significant adverse impact on the air ventilation.

It is recommended to provide set-back from the site boundary, or to recess the lower floors from these key wind corridors, or to align the podia edge with the building edge, to make the podia more permeable, by delineating non-building areas wherever possible, as shown in Figure 22. The maximum allowable building height of 130mPD in the north-western region is high, and should be ideally reduced substantially to a maximum of 80mPD, with the road spacing ideally increased to 25m. This should be applied to Cannon Street and Paterson Street as far as possible. The introduction of building difference encourages wind to reach the pedestrian level. See Figures 23 and 24. If a major reduction in building height is considered impractical upon balancing of the development rights of the concerned lots, a moderate reduction should still be pursued.

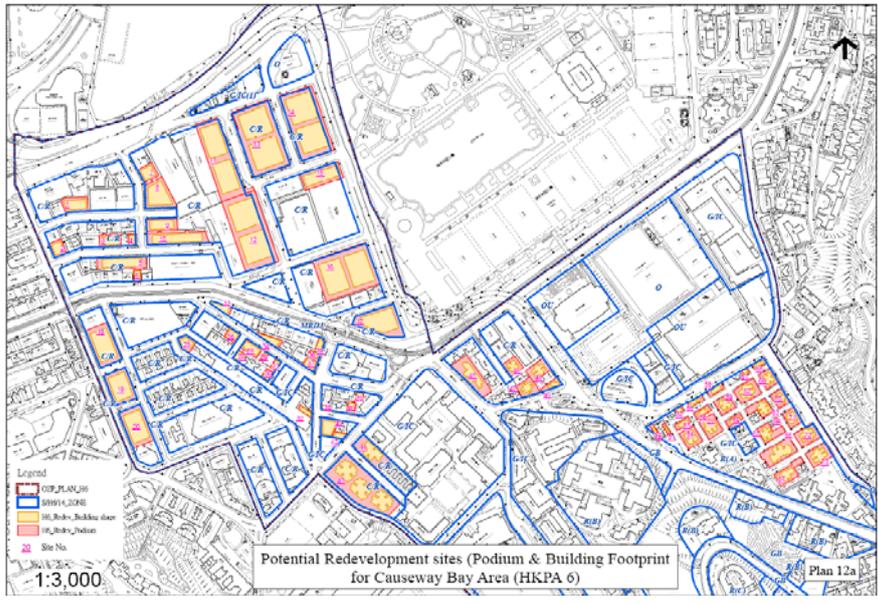


Figure 21 Potential Redevelopments

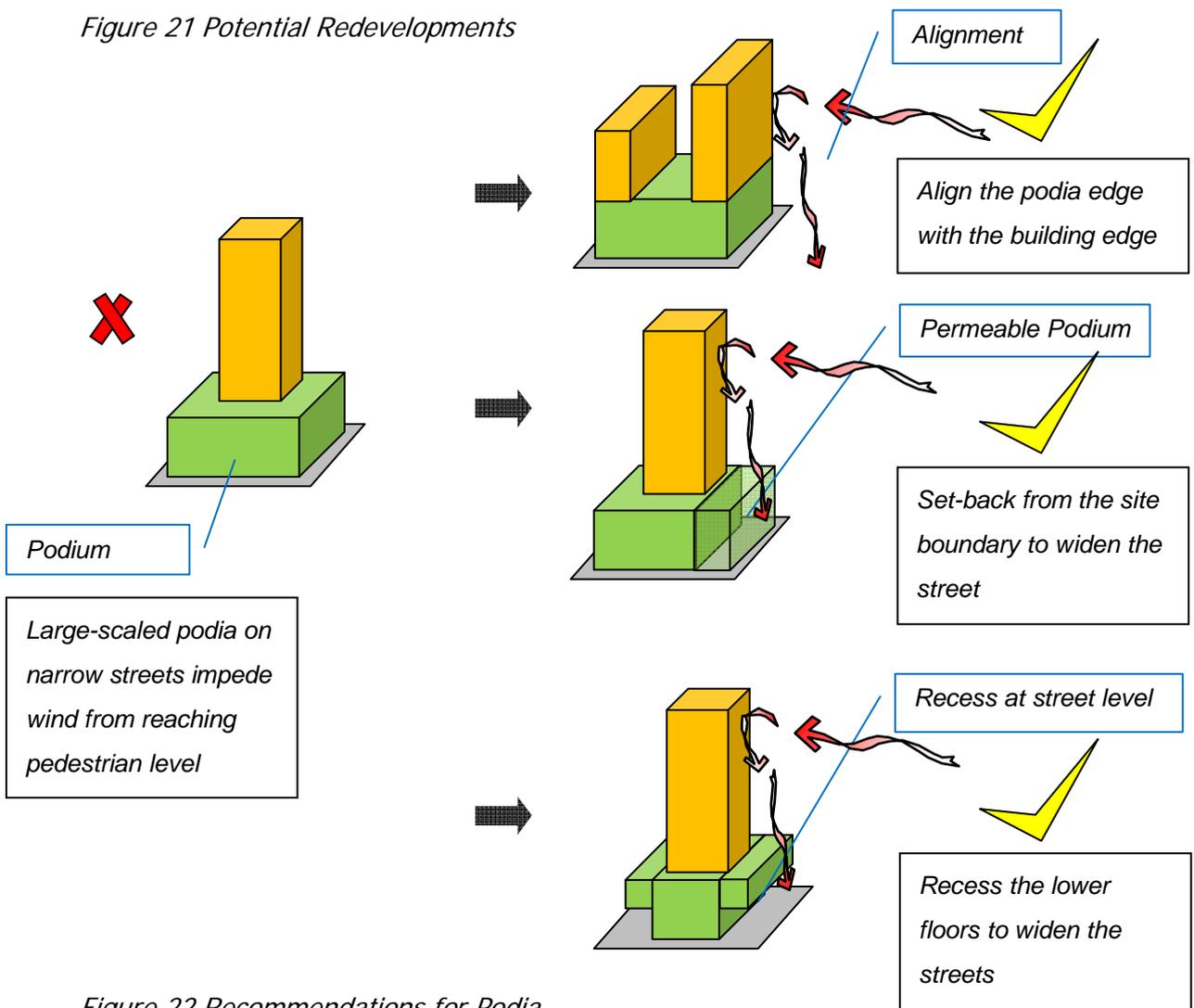
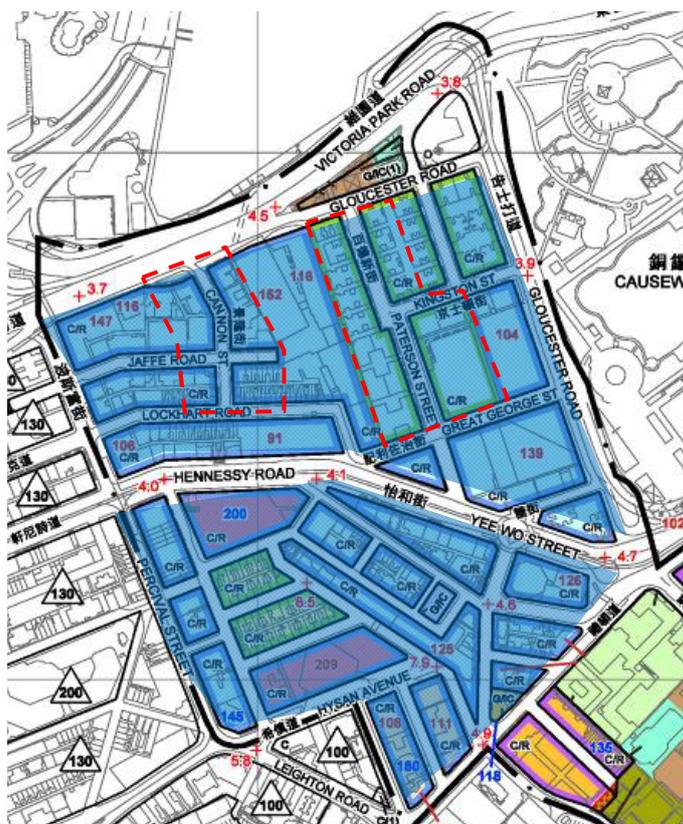


Figure 22 Recommendations for Podia



- Proposed building height has been increased to 130mPD.
- Recommend to create significant height reduction to 80mPD. If a major reduction in building height is considered impractical upon balancing of the development rights of the concerned lots, a moderate reduction should still be pursued.

Figure 23 Recommended Building Heights for Areas on Each Side of Cannon Street and Paterson Street - Introduction of Building Difference to Encourage Wind to Reach Pedestrian Level

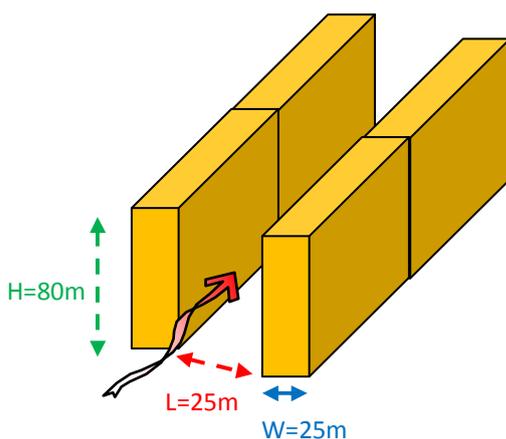


Figure 24 Recommended Maximum Building Height with Road Width for Paterson Street and Cannon Street

(2) Hennessy Road and Yee Wo Street

Ideally, the maximum building height along Hennessy Road and Yee Wo Street shall ideally not exceed 100mPD, with the road width of around 30m. See Figure 25. The minor street regions are only about 12 m wide, a maximum height of 130m will have severe adverse impact on the air ventilation. For example, a building height of greater than 60mPD will have a negative impact on air ventilation along Sunning Road which is only approximately 14m wide.

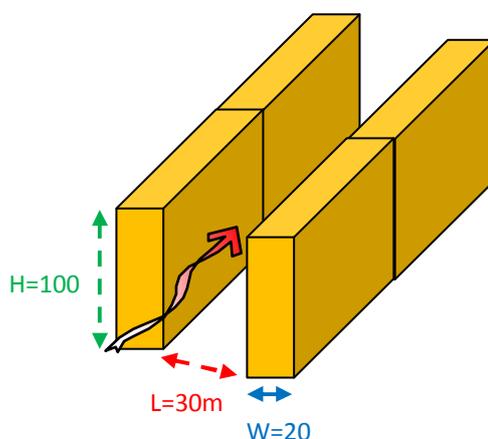


Figure 25 Recommended Maximum Building Height with Road Width for Yee Wo Street

In addition to the non-building areas and set-back suggested in Figure 14, set-backs are recommended for Great George Street and Sugar Street to improve the air ventilation in the densely populated area, as shown in Figure 26.



Figure 26 Recommended Set-Backs

Figure 27 shows the large scaled development with podia. The air ventilation in the streets around Kai Chiu Road, Lan Fong Road and Pak Sha Road will deteriorate, as these are sandwiched between the 200mPD committed development at Hennessy Road and Lee Garden Road Junction, as well as the 210mPD Manulife Plaza. Various design options have already been studied in detail by another consultant to minimise the negative impact on the air ventilation. The current approved design has incorporated three ventilation windows to allow better permeability in surrounding areas albeit the benefit may not be mainly on the pedestrian level.

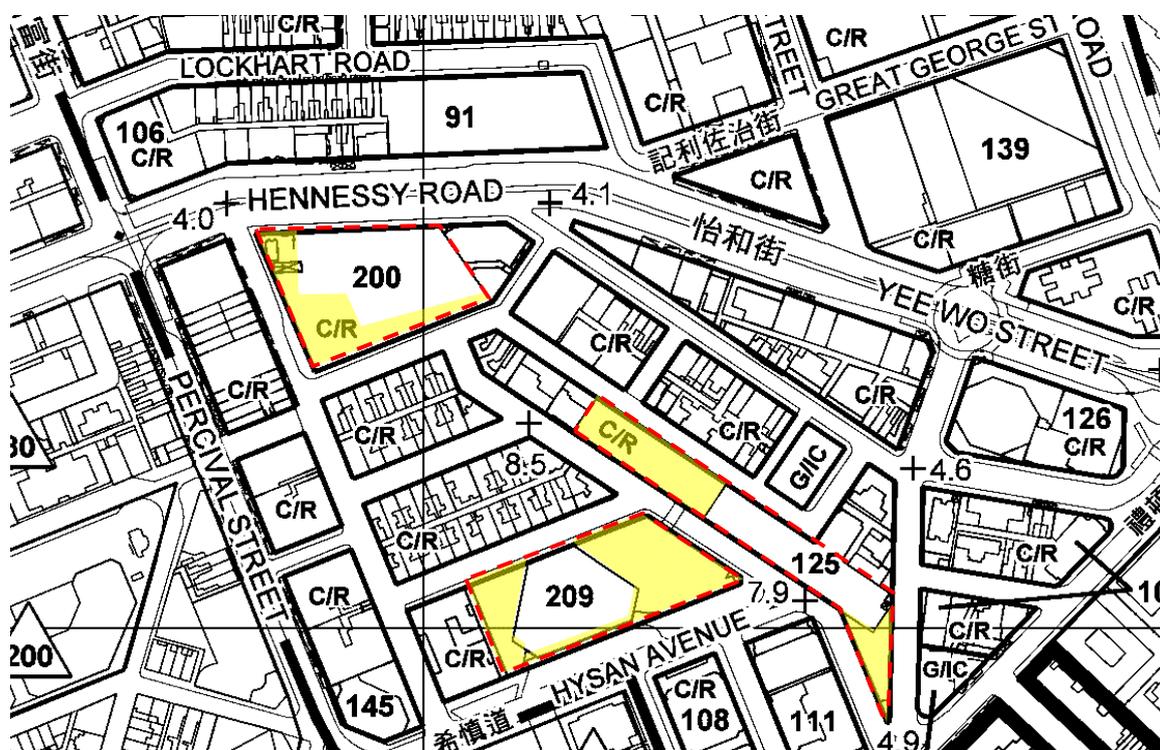


Figure 27 Large Scaled Development with Podia

These existing developments have podia, which prevent the wind to reach the pedestrian level. It is recommended to minimise the site coverage of the podia, and incorporate a set-back on the ground level. If podia are a must, then they should be designed with permeability, and the impact of the large structure should be assessed accordingly.

(3) Percival Street / Lee Garden Road

Potential redevelopment sites 18, 19 and 20 (Figure 28) along Percival Street are two to six times taller than the existing developments (from 20-59mPD to 130mPD), which are likely to worsen the skimming flow with little air ventilation available at the street level. The maximum building height should ideally be reduced significantly, such that the problem of skimming flow across Lee Garden Road is not as severe. Set-backs are recommended on both sides of Lee Garden Road as shown in Figure 28 to minimise the skimming flow across Lee Garden Road.

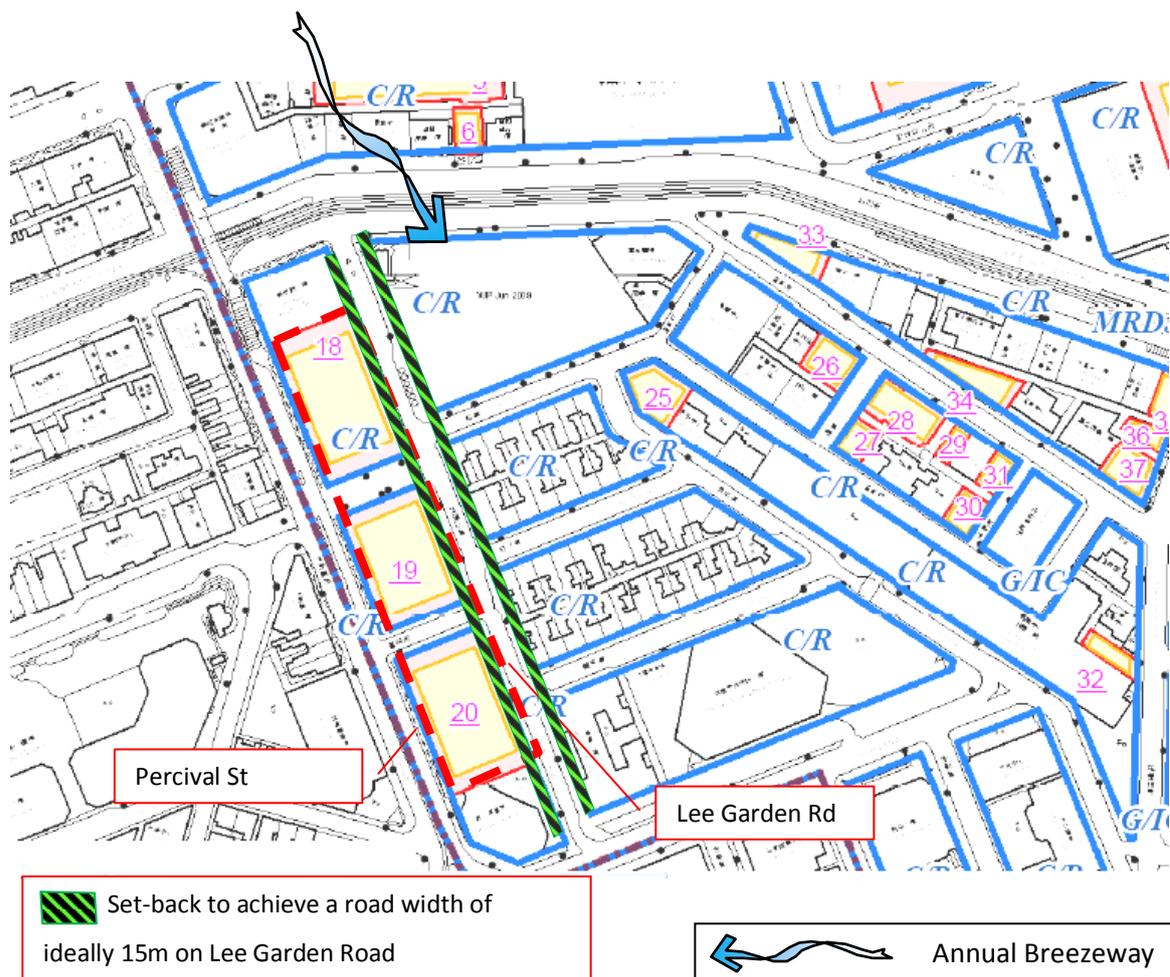


Figure 28 Recommendations for Potential Redevelopment Sites 18, 19 and 20 (denoted as red dashed line)

(4) Leighton Road

Potential redevelopment sites 43 and 44 (Figure 29) along Leighton Road are two to five times taller than the existing developments (from 20-59mPD to 110mPD), and are likely to deteriorate the air ventilation environment for the school area (denoted as green dashed line) between Leighton Road and Tung Lo Wan Road. However, given that there is a vast open space offered by Victoria Park, the situation is better than otherwise. Reduction in building height is still recommended for this residential cluster.

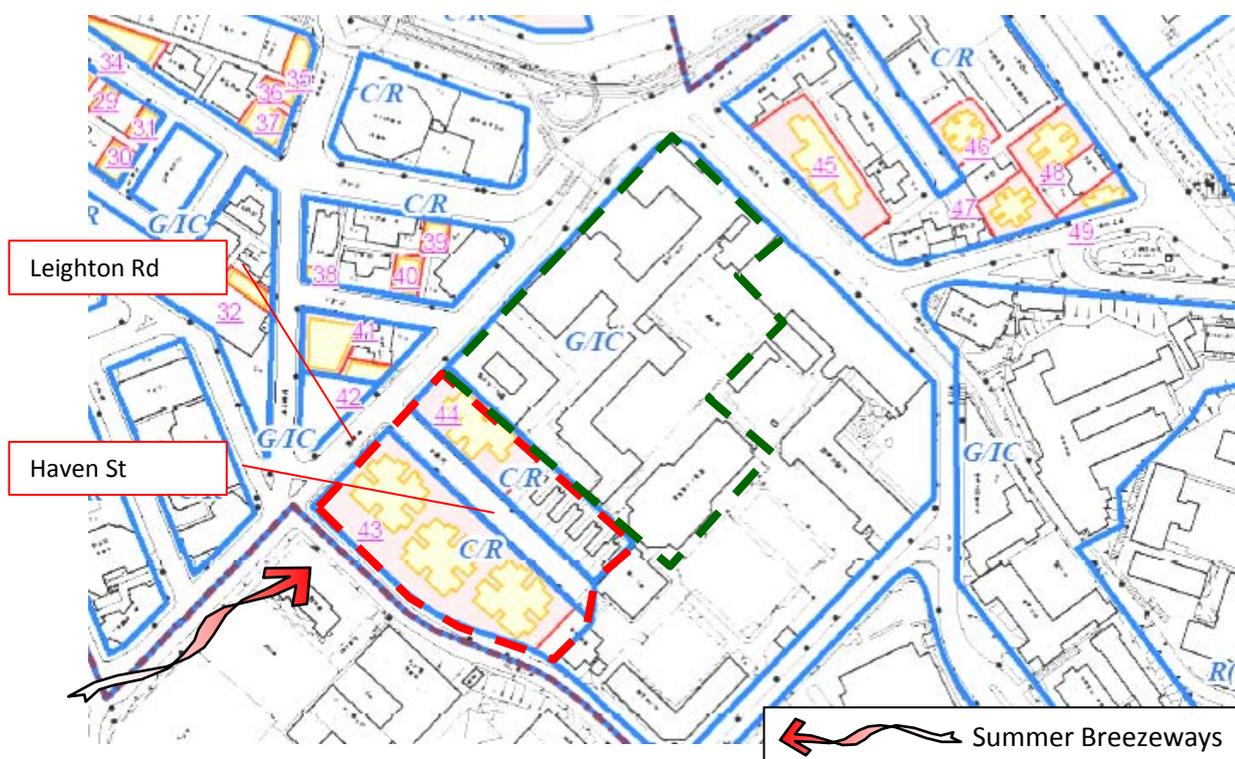


Figure 29 Potential Redevelopment Sites 43 and 44

(5) Centre Area

The proposed building height profile for the centre region are similar to the heights of the existing developments. The impact on the surrounding wind regime will be minimal. Except that it would be desirable to reduce the building height for Moreton Terrace to facilitate air ventilation. Figure 30 shows the existing and planned developments height in the centre region (bounded by red dashed line).

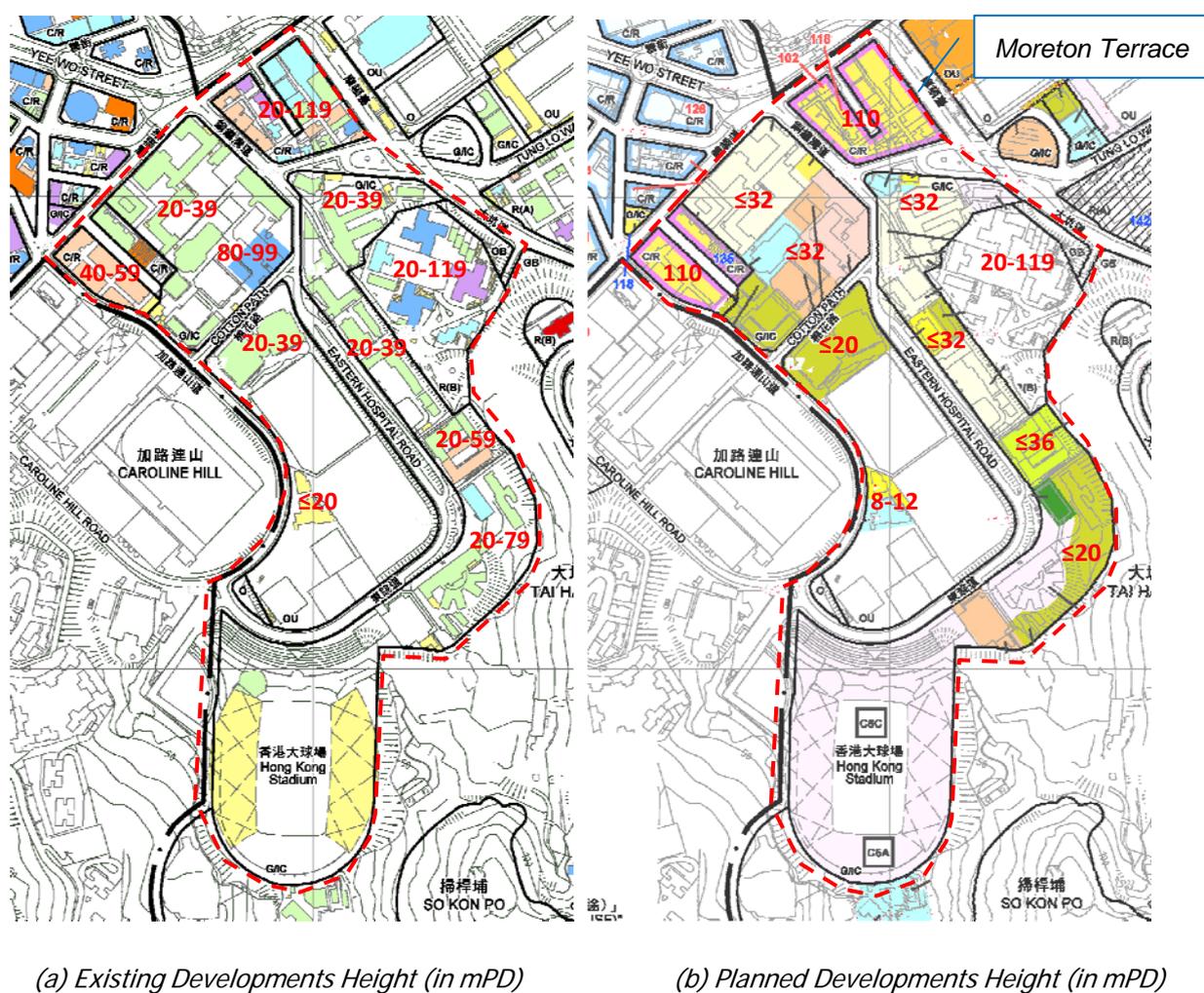


Figure 30 Comparison between Existing and Planned Developments in Centre Region

(6) The Northern Region

The proposed plan maintains the open space and G/IC developments which have a maximum building height of nine storeys. The air ventilation with the proposed plan in place will have no adverse impact on the northern area and those in the hinterland. See Figure 31.

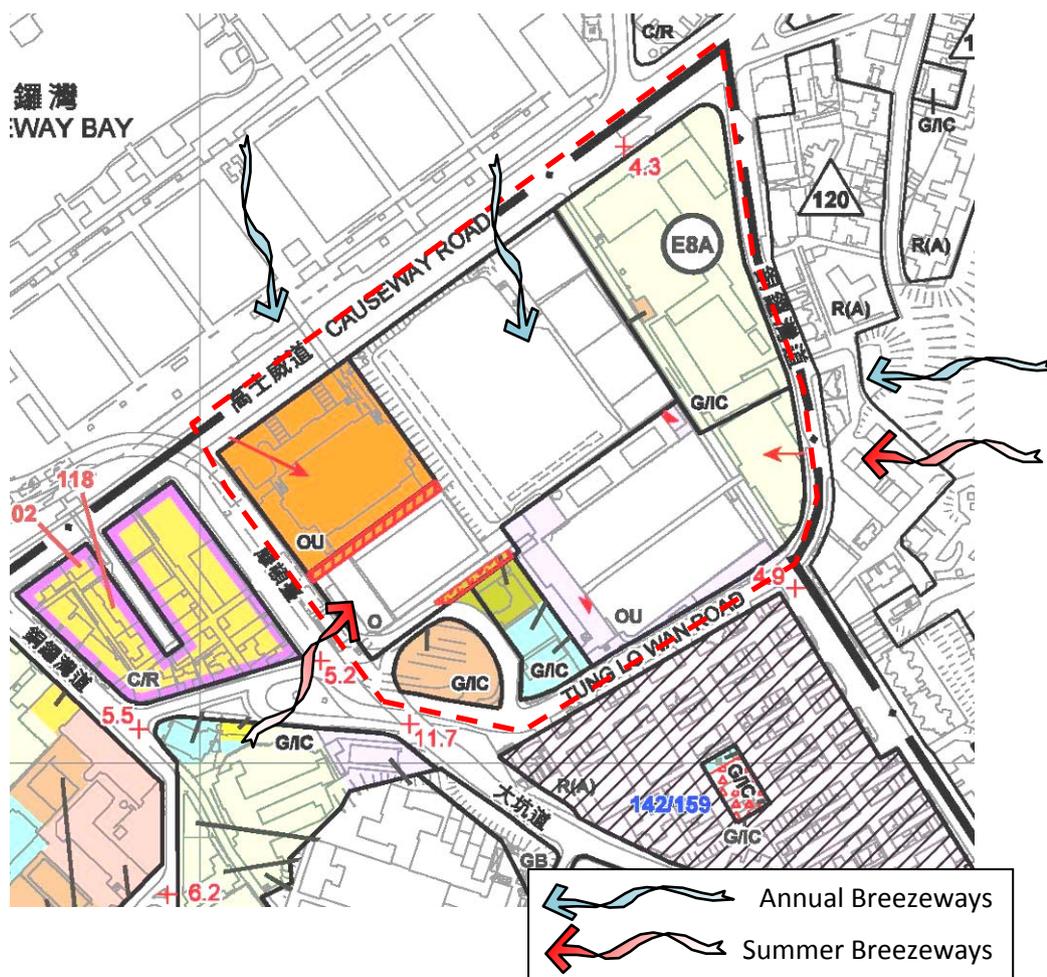


Figure 31 Wind Environment in the Northern Region

(7) Eastern Region

The key change in this region is the increase of maximum building height for the potential redevelopment of the residential area from 39mPD to 110 mPD as shown in Figure 32 (highlighted in yellow). This increase in building height will worsen the skimming flow situation significantly, such that the entire zone bound by Tai Hang Road and Tung Lo Wan Road will be severely affected. It is recommended to step the height up from 85mPD to 115mPD to encourage some downwash to reach the narrow street level, as shown in Figure 33.

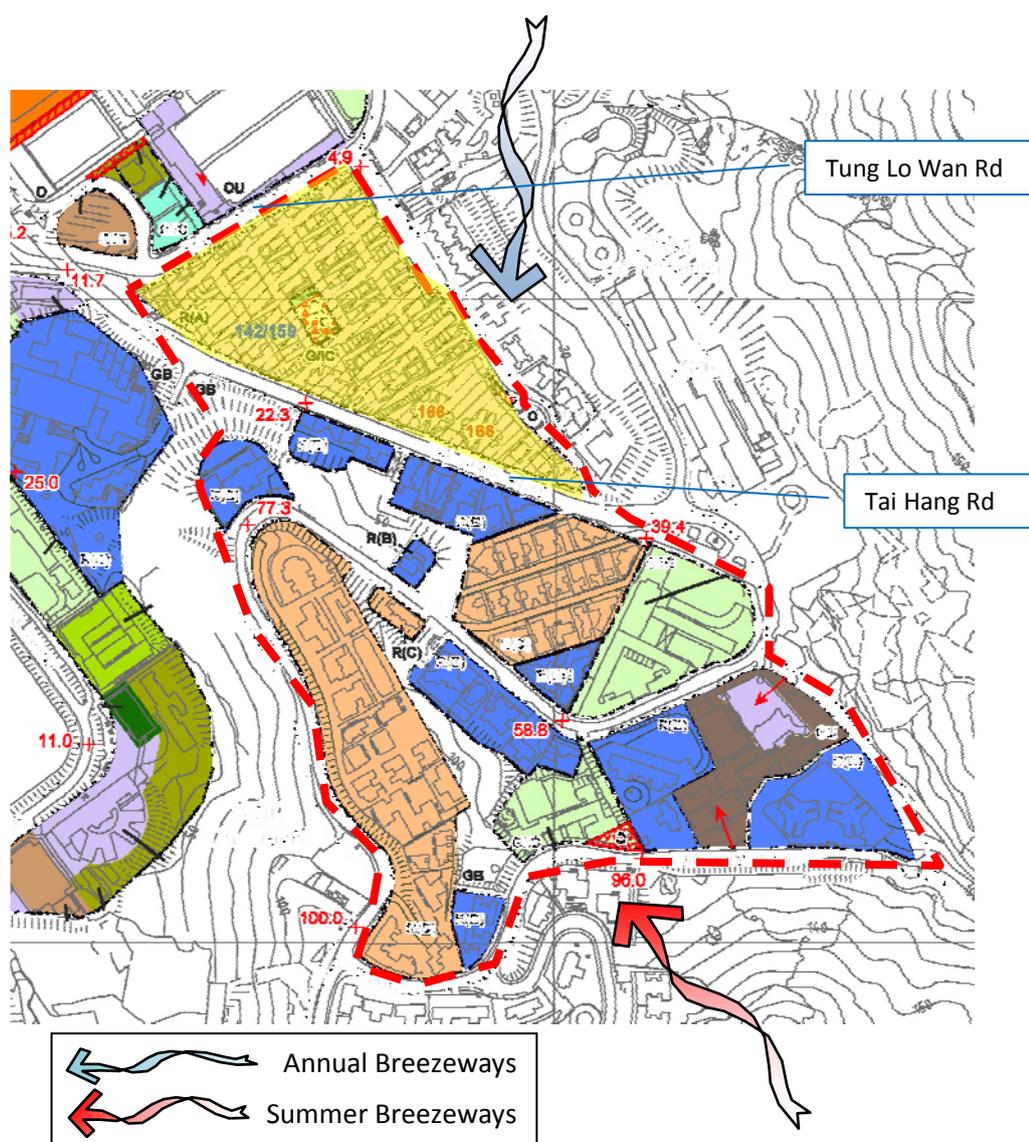


Figure 32 The East Region of the Project Area

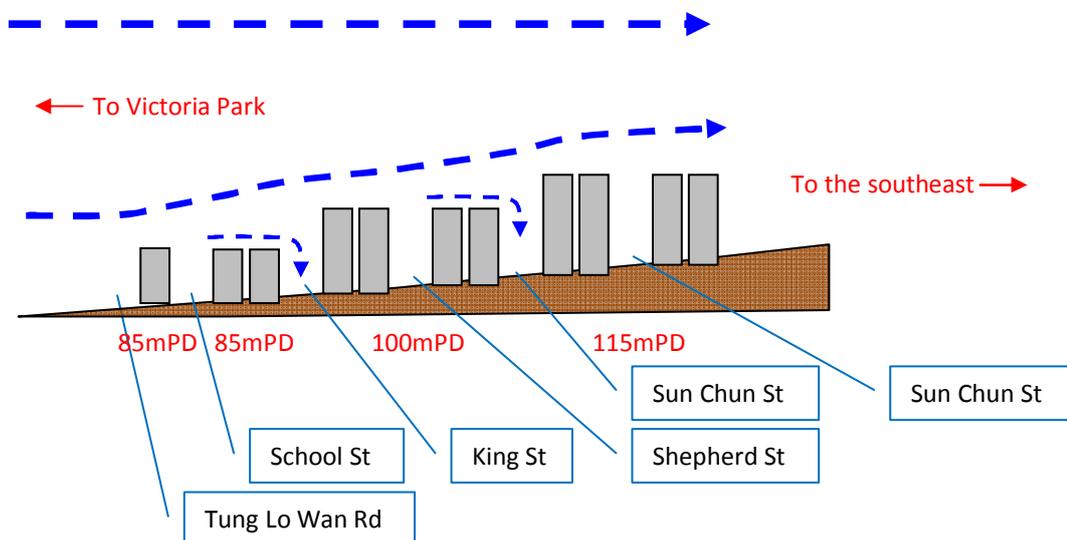


Figure 33 Recommended Building Heights for the Eastern Region of Causeway Bay

(8) Southern Region

There is no significant change between the existing and proposed plan in this region, and notable changes in the air ventilation is therefore not anticipated.

6. SUGGESTED IMPROVEMENT MEASURES

In Causeway Bay, the building height-to-street width ratio is high. As such, the majority of the buildings are very tall and the streets are comparatively narrow. Building height restriction would not be a sufficient means to improve pedestrian level air ventilation. Provision of greenery and open space; control of the coverage and permeability of podia; gaps between buildings; setting back of building frontages to widen the streets and breeze ways; and provision of non-building areas for air flow are measures considered. Apart from the need to review the proposed building height restrictions for the Northeast Region, the Wun Sha Street residential cluster, and the Haven Street residential cluster, the following specific improvement measures are recommended:

- (1) All open space / green areas and the G/IC facilities provide useful “lungs” of air space in the Project Area and should be maintained.
- (2) Non-building areas should be introduced to align with Cannon street and Kingston Street. The existing air corridor between World Trade Centre and The Excelsior Hotel could also be enhanced. These measures would benefit the Northeast Region.
- (3) Building set-backs should be introduced on both side of Great George Street, Sugar Street and Lee Garden Road.

Moreover, response to the comments from the Planning Department, a number of additional improvement measures are suggested as follows:

- (1) Widen pavements to at least 3.5m by building set-backs fronting Lockhart Road, Jaffe Road, Cannon Street, Lan Fong Road, Jardine’s Bazaar and Lee Garden Road due to the heavy pedestrian flows and poor air ventilation conditions.
- (2) Widen pavements at Haven Street and in the Wun Sha Street residential cluster to at least 2m wide in order to improve the pedestrian walking environment. This measure, if implemented, is useful for air ventilation.
- (3) The existing podia of Caroline Centre and Lee Gardens to be retained to maintain the existing air path in Yun Ping Road.

- (4) Encourage future developments to adopt suitable design measures to minimise any possible adverse impacts. These include greater permeability of podium, wider gap between buildings, disposition and perforation of building towers to align with the prevailing wind directions, as appropriate.

7. CONCLUSIONS

The maximum allowable building height of 130 mPD in the north-western region is high, and should be ideally reduced substantially to a maximum of 80mPD, with the road spacing ideally increased to 25m. Provision of set-back alone would not be sufficient to minimise the negative air ventilation impact. This should be applied to Cannon Street and Paterson Street. The introduction of building difference encourages wind to reach the pedestrian level. If a major reduction in building height is considered impractical upon balancing of the development rights of the concerned lots, a moderate reduction should still be pursued. It is recommended to step the height up from 85mPD to 115mPD to encourage some downwash to reach the narrow street level, in the eastern region, Tai Hang.

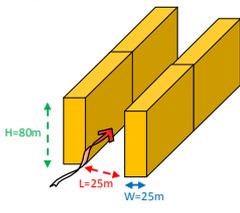
Figure 34 summarises the recommendations for the Project Area.

Control of building height alone would not be a sufficient means to improve air ventilation. This study only provides an overview of the existing wind environment and recommends broad measures to minimise negative impacts and where appropriate, improvement to the existing conditions.

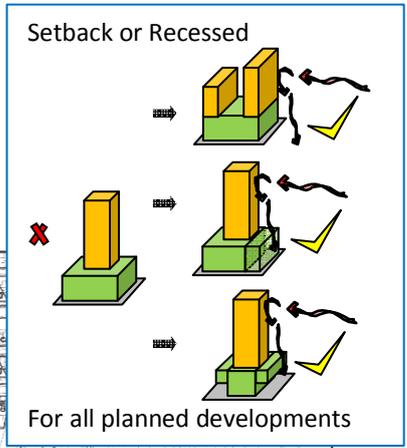
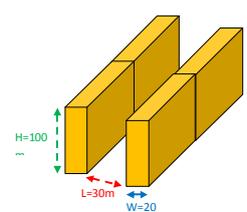
The Project Area is in a high building height-to-street width ratio which is caused by the tall buildings and comparatively narrow streets. Large-scale redevelopment may be possible and the planned maximum building height in the Initial Planned Scenario is more than twice the existing one in some sites of the Project Area. Non-building area and set-backs of streets have been recommended throughout the Project Area to prevent blockages of wind corridors caused by future large-scale and high-rise development. In general, no further study is required for the area if the recommendations made in this report are incorporated.

(1) Reduce building height substantially to a maximum of 80mPD on Cannon Street and Paterson Street.

(1) Increase road width to 25m for Cannon Street and Paterson Street.



(1) Maximum height
Hennessy Rd and Yee Wo St below 100mPD.



(1) Non-building area of ideally 15m at 51 Paterson Street to create a wind corridor for the easterlies to permeate.

(1) Non-building area of 15m along Hennessey Road.

If not feasible:
Non building area of ideally 10m with a vertical non-building area of 8m from the ground next to Excelsior Hotel to encourage wind to the heart of Causeway Bay

(1) Set-back to achieve road width of ideally 25m and 18m on Great George Street and Sugar Street respectively. To improve the air ventilation on Great George Street and Sugar Street.

(3) Height restriction
From 85mPD to 115mPD along Tai Hang Rd

(2) Maximum height
Maintain below 10 storeys

(1) Set-back to achieve a road width of ideally 15m on Lee Garden Road. To minimise the skimming flow across Lee Garden Road

(1) Minimise site coverage of podia, and incorporate a set-back on the ground level.

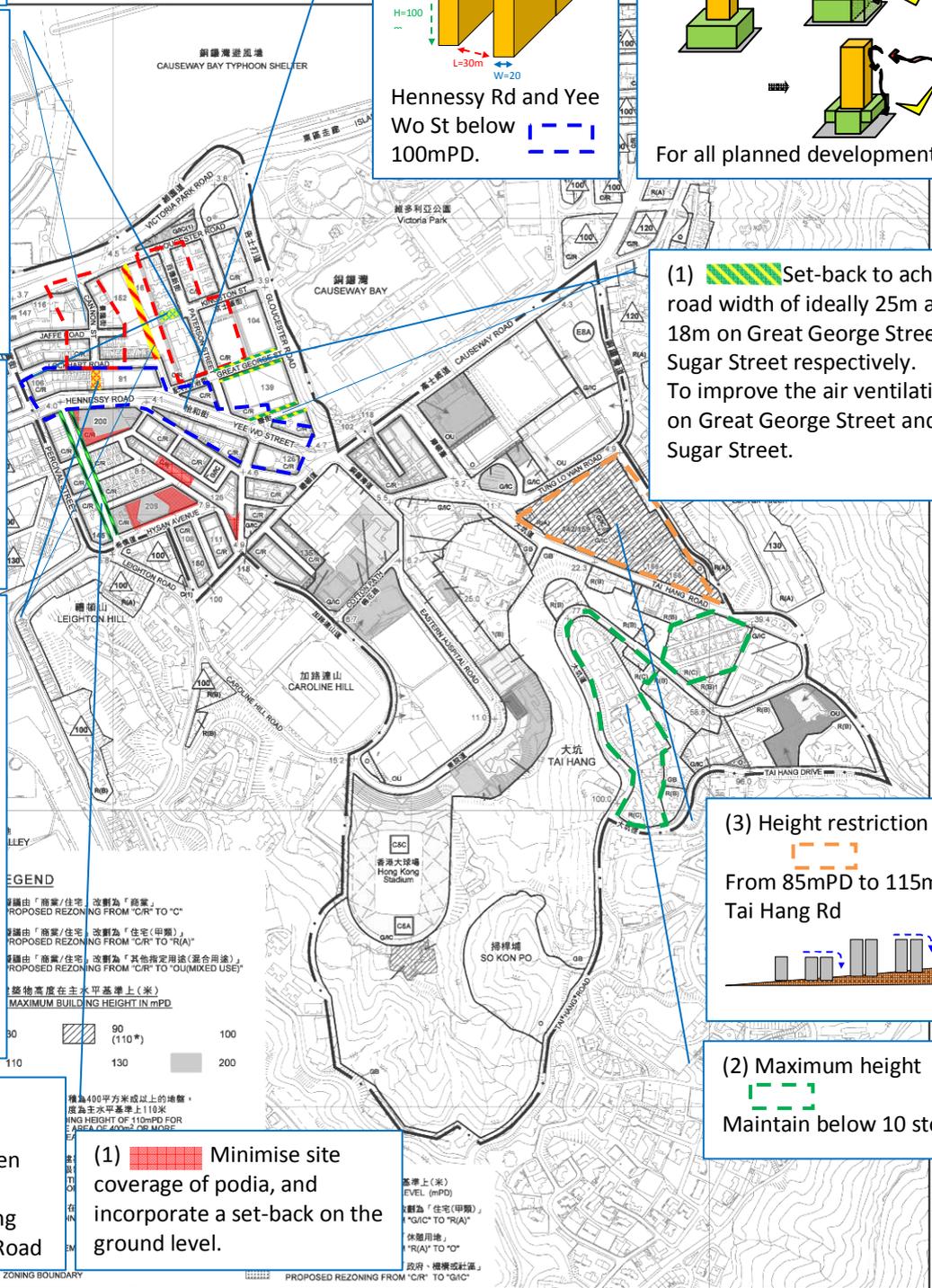


Figure 34 Summary of Recommendations to Minimise the Impact

8. OPTION STUDY ON REVISED SCENARIO

8.1 Observations

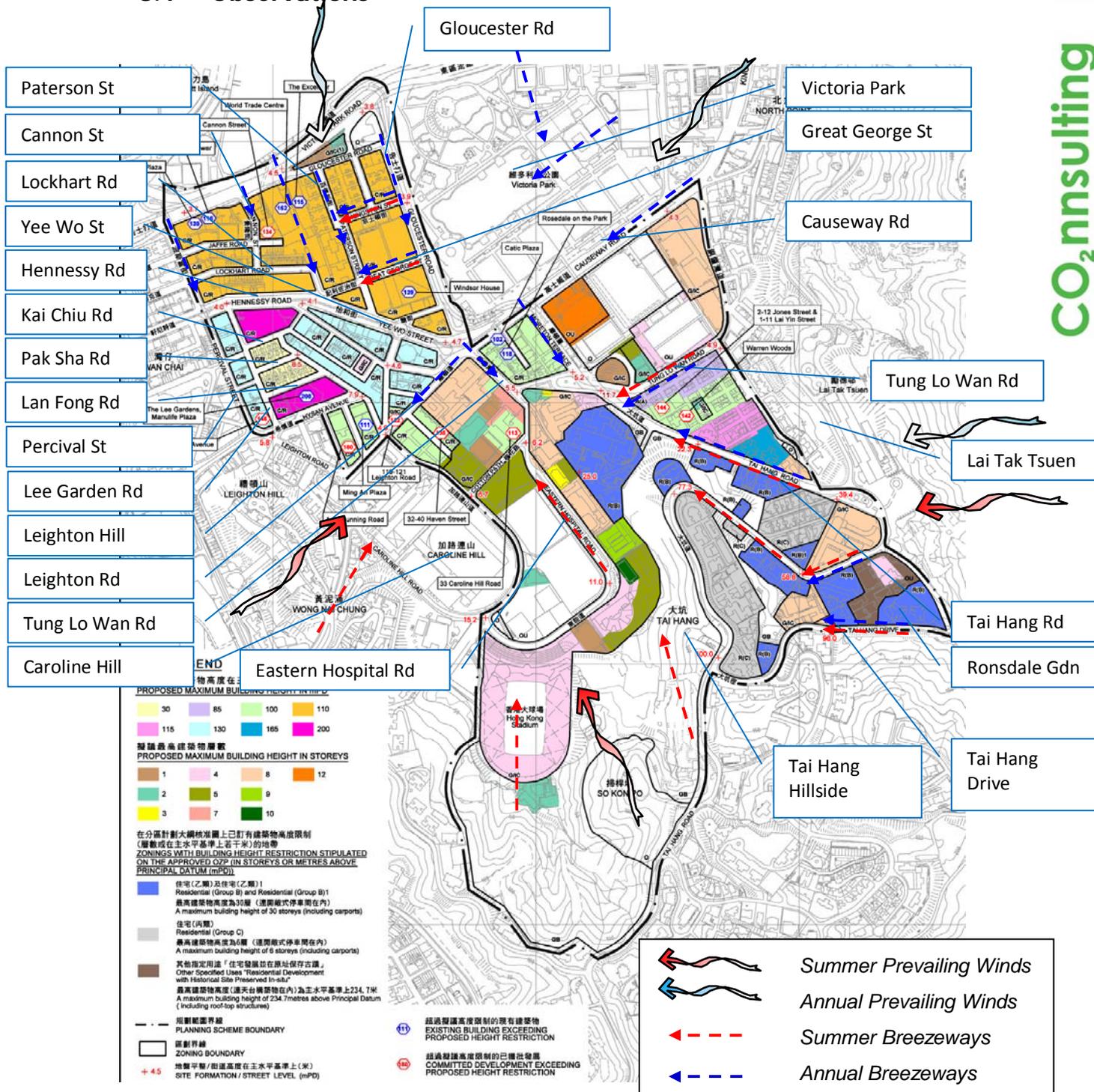


Figure 35 Existing and Proposed Building Height Restrictions in the Project Area

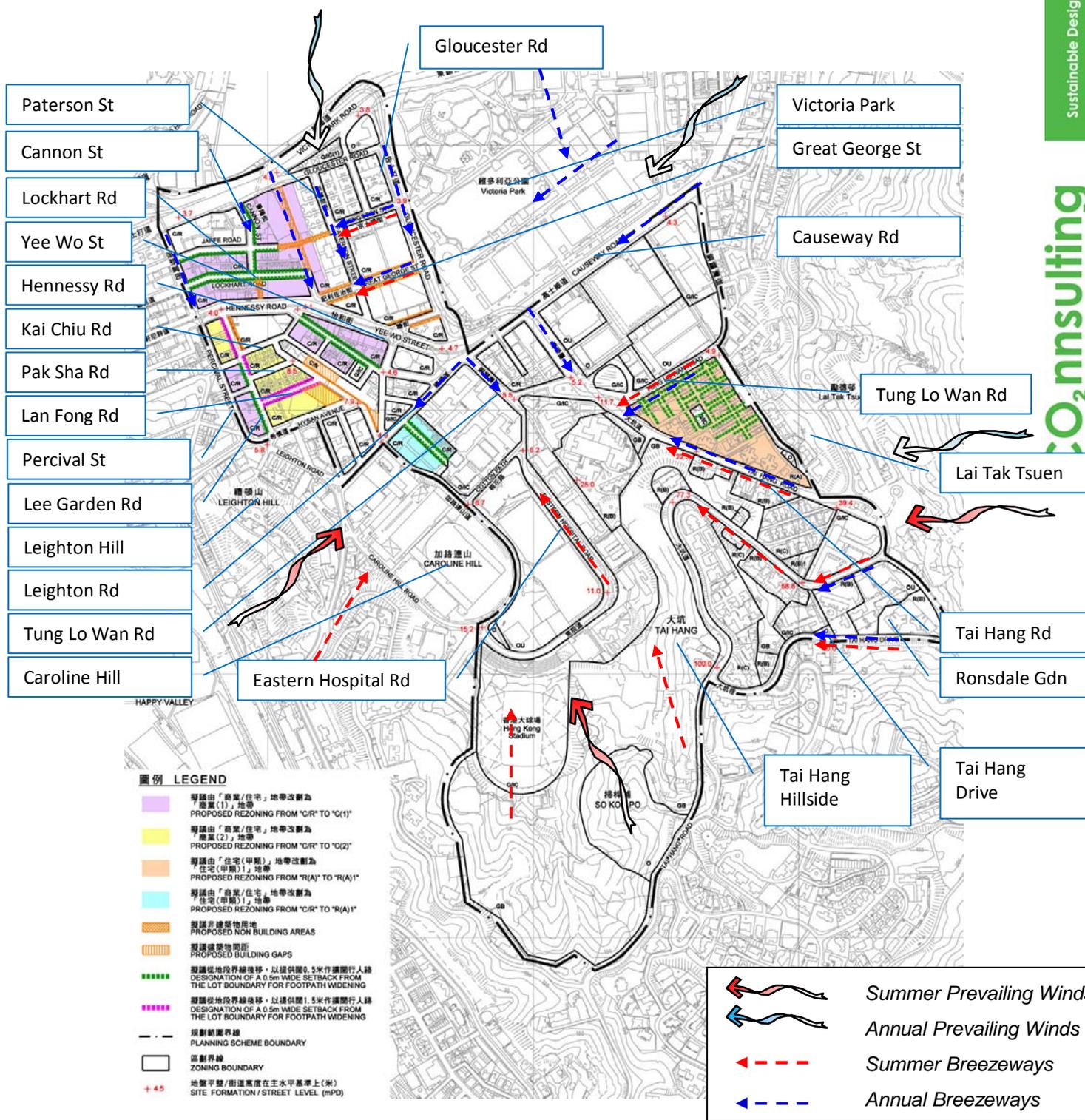


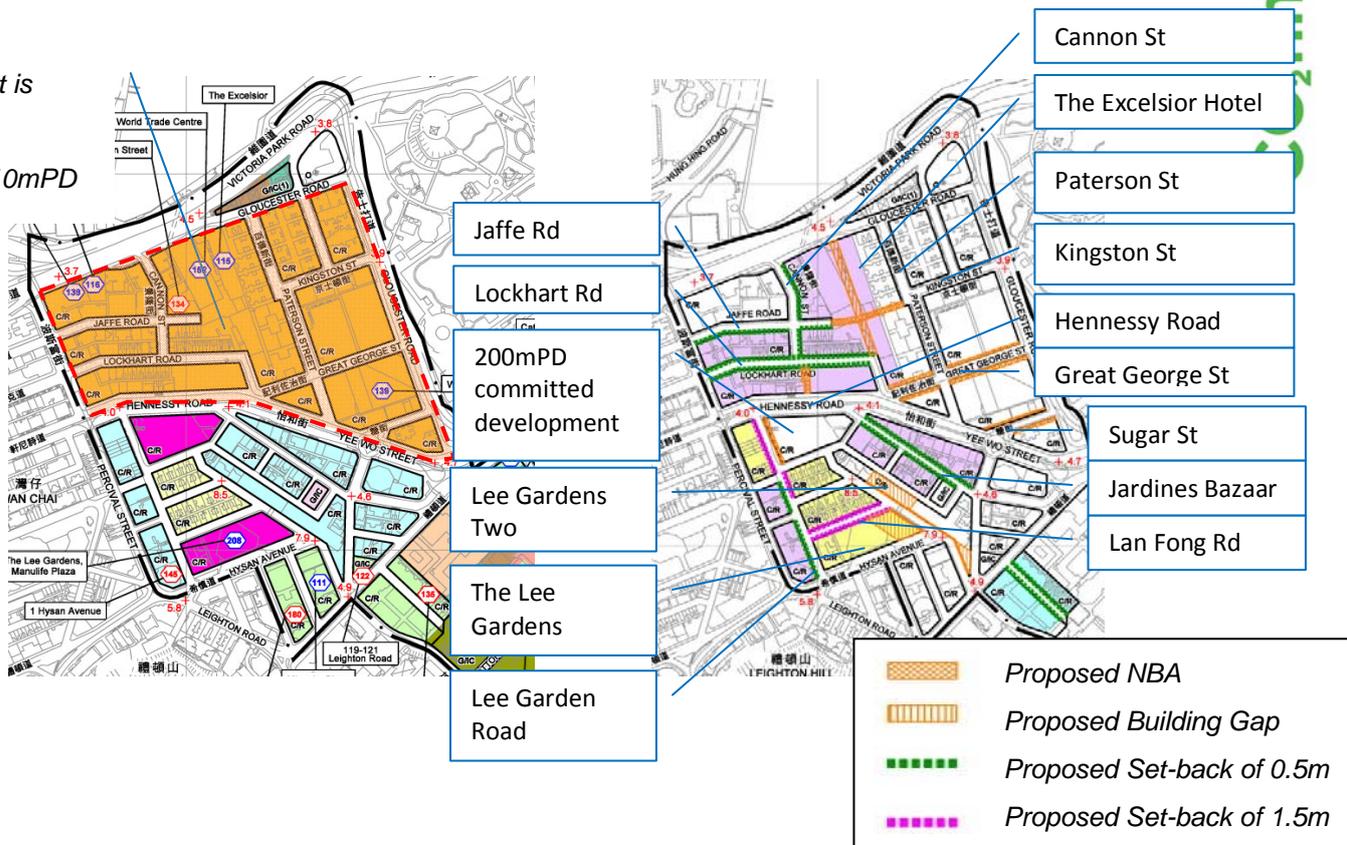
Figure 36 Proposed Non-Building Areas, Building Gaps and Set-backs in the Project Area

8.2 Areas of Concern

(1) Northwest Region

The variations in of the Northwest Region of the Option Study from the initial planned scenario are highlighted in Figure 37. The variations are summarised in the following paragraphs.

Building height is reduced from 130mPD to 110mPD



(a) Proposed Building Height Restrictions

(b) Proposed Non-Building Areas and Building Gaps

Figure 37 Northwest Region in Option Study

The maximum allowable building height of the area on the north of Hennessy Road and Yee Wo Street is decreased from 130mPD to 110mPD. The building heights in northwest Region is stepped up from 110mPD to 130mPD, the difference in building height helps to encourage downwash to reach the street level at Hennessy Road and Yee Wo Street.

A set-back of 0.5m is introduced on east side of Cannon Street, as shown in Figure 37b. While the non-building area is not sufficiently wide to mitigate the adverse air ventilation impact very effectively, it would bring some improvement.

The proposed building gap next to The Excelsior Hotel is 10m in width and in accordance with the recommendation, as shown in Figure 38. This would encourage some sea breeze to reach Hennessey Road

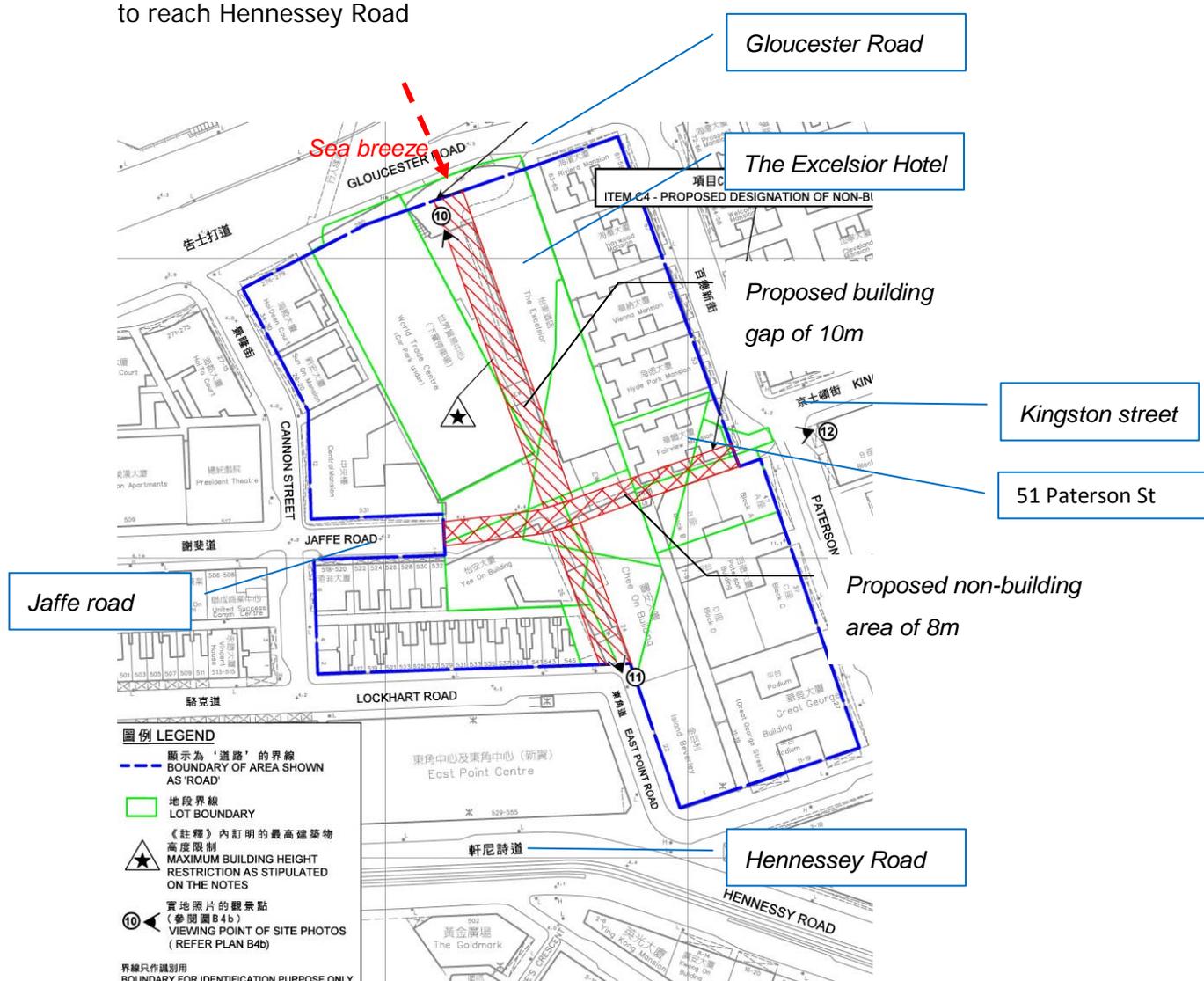


Figure 38 Proposed Building Gap next to The Excelsior Hotel and Proposed non-building area at 51 Paterson Street

A proposed non-building area at 51 Paterson Street connects Kingston Street and Jaffe Road as shown in Figure 38. The effectiveness of this non-building area would increase if its width is increased to ideally 15m to allow the easterlies to permeate as shown in Figure 39.

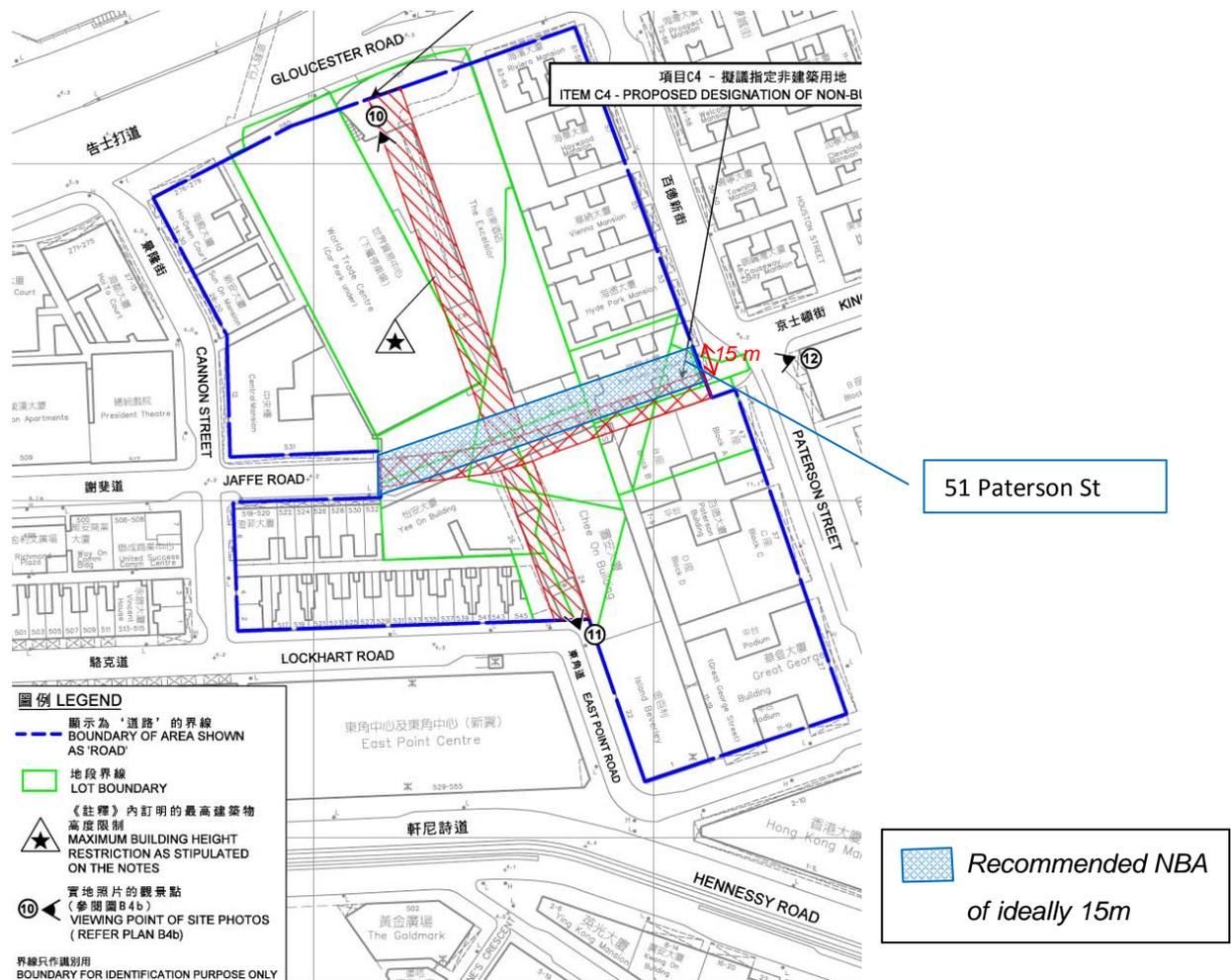


Figure 39 Recommended non-building area at 51 Paterson Street

Non-building areas are introduced on both sides of Great George Street and Sugar Street, as shown in Figure 40. These proposed non-building areas widen the former and the latter to 25m and 18m respectively. These mitigation measures are in line with the recommendations in Section 5.2.

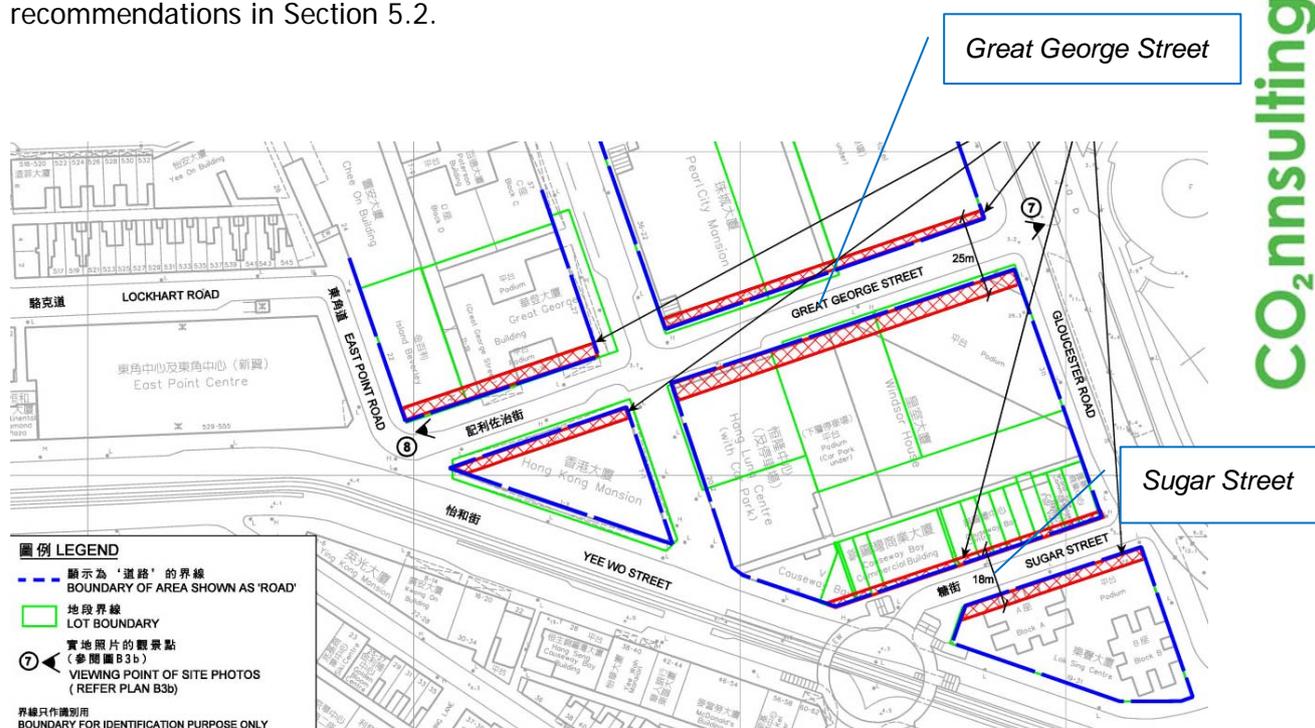


Figure 40 Proposed Non-building areas on Great George Street and Sugar Street

A non-building area is introduced on the north of Hennessy Road as shown in Figure 37b. This proposed non-building area is not in exact alignment with Cannon Road, and its effectiveness to bringing sea breeze to reach Hennessy Road would be somewhat reduced.

A non-building area is introduced to the 200mPD committed development at Hennessy Road and Lee Garden Road Junction as shown in Figure 41. This mitigation measure is in line with the recommendations in Section 5.2. This strategy coupled with permeable podia will help to ventilate the area. Furthermore, set-backs of 0.5m and 1.5m are introduced along Lee Garden Road as shown in Figure 37b. The combination of the non-building area and the set-back along Lee Garden Road will help to funnel northerlies through. The effectiveness of which would be improved if the overall road width is increased to ideally 19m.

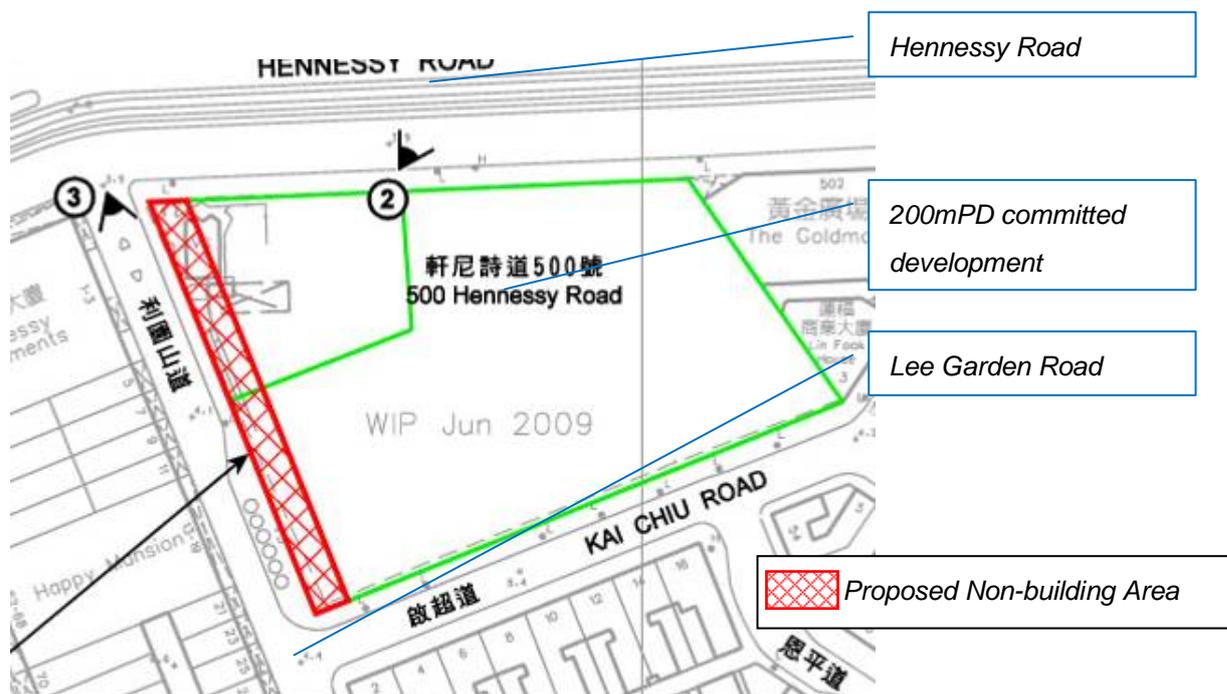


Figure 41 Proposed Non-building area on 200mPD Committed Development at Hennessy Road and Lee Garden Road Junction

Building gaps are introduced to The Lee Gardens, Lee Gardens Two and 119-121 Leighton Road as shown in Figure 42. These building gaps coupled with podia set-backs as shown in Figure 42, encourage wind movement in the vicinity of these large-scaled developments.

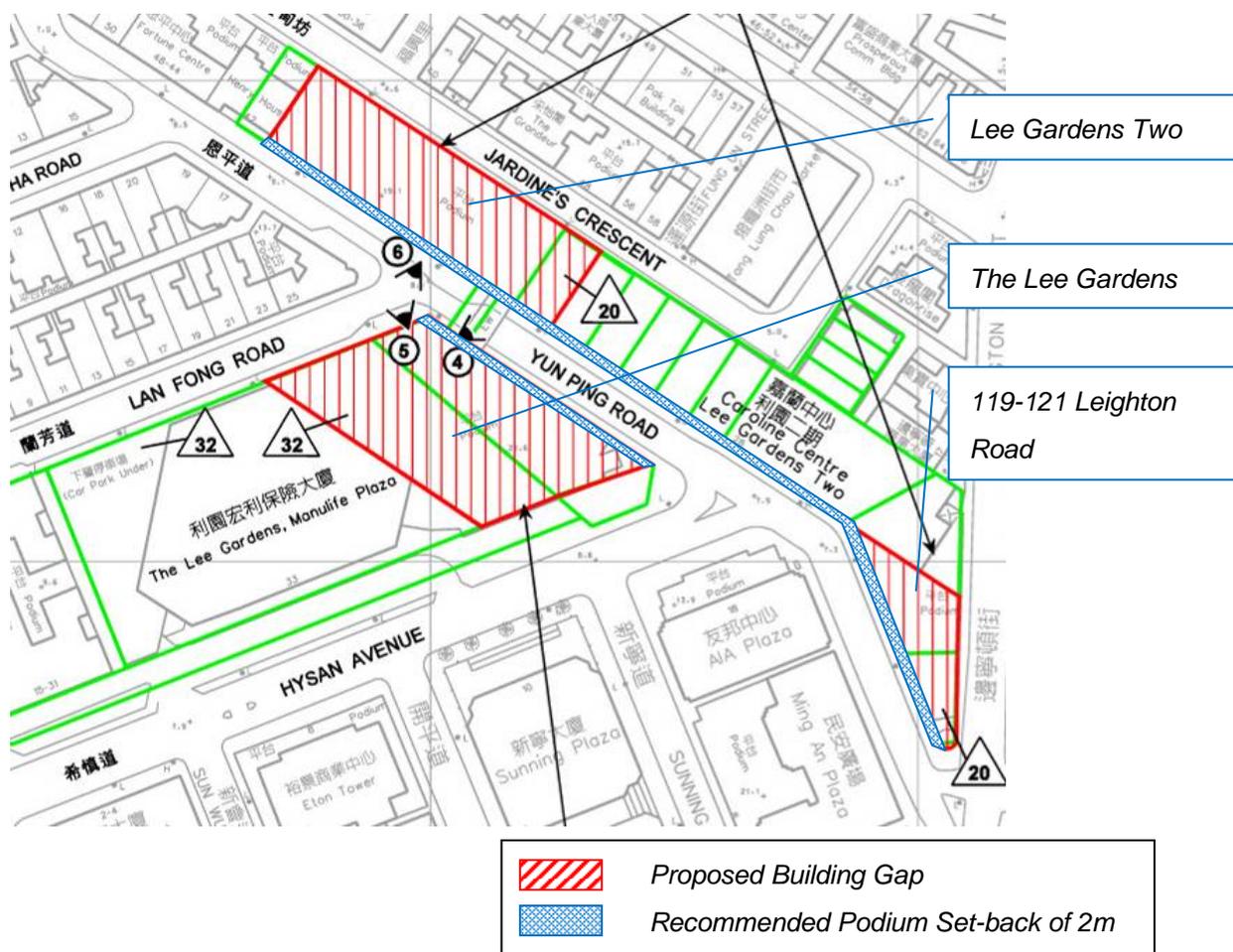
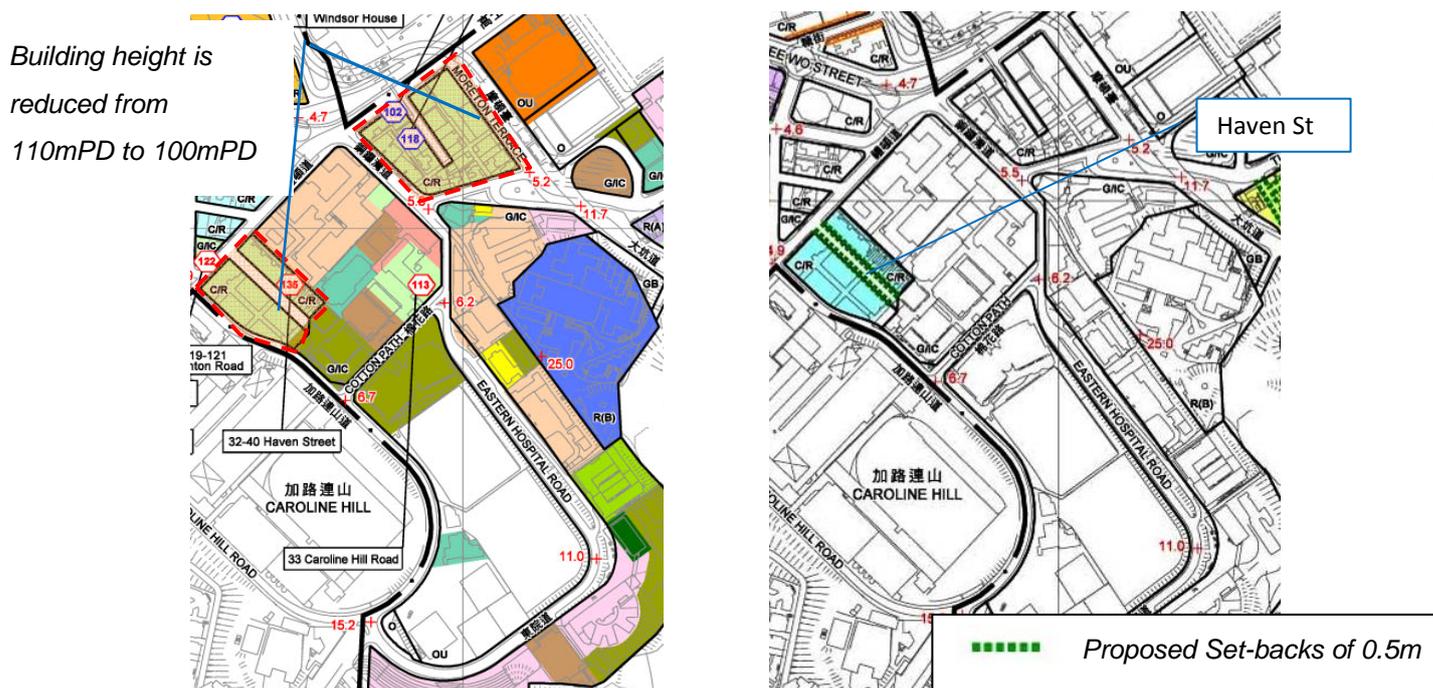


Figure 42 Proposed Building Gaps on The Lee Gardens, Lee Gardens Two and 119-121 Leighton Road with Recommended Podia Set-backs

Set-backs of 0.5m are introduced along Jaffe Road, Lockhart Road and Jardines Bazaar; and set-backs of 1.5m are introduced along Lan Fong Road, as shown in Figure 37b. The introduction of these non-building areas helps to further improve the air ventilation in the northwest region.

(2) Centre Region

The maximum building heights of the residential cluster along Leighton Road and the residential cluster between Tung Lo Wan Road and Moreton Terrace is decreased from 110mPD to 100mPD. Set-backs of 0.5m are introduced along the both sides of Haven Street. The building height reduction and introduction of non-building areas can help to facilitate the air ventilation. See Figure 43.



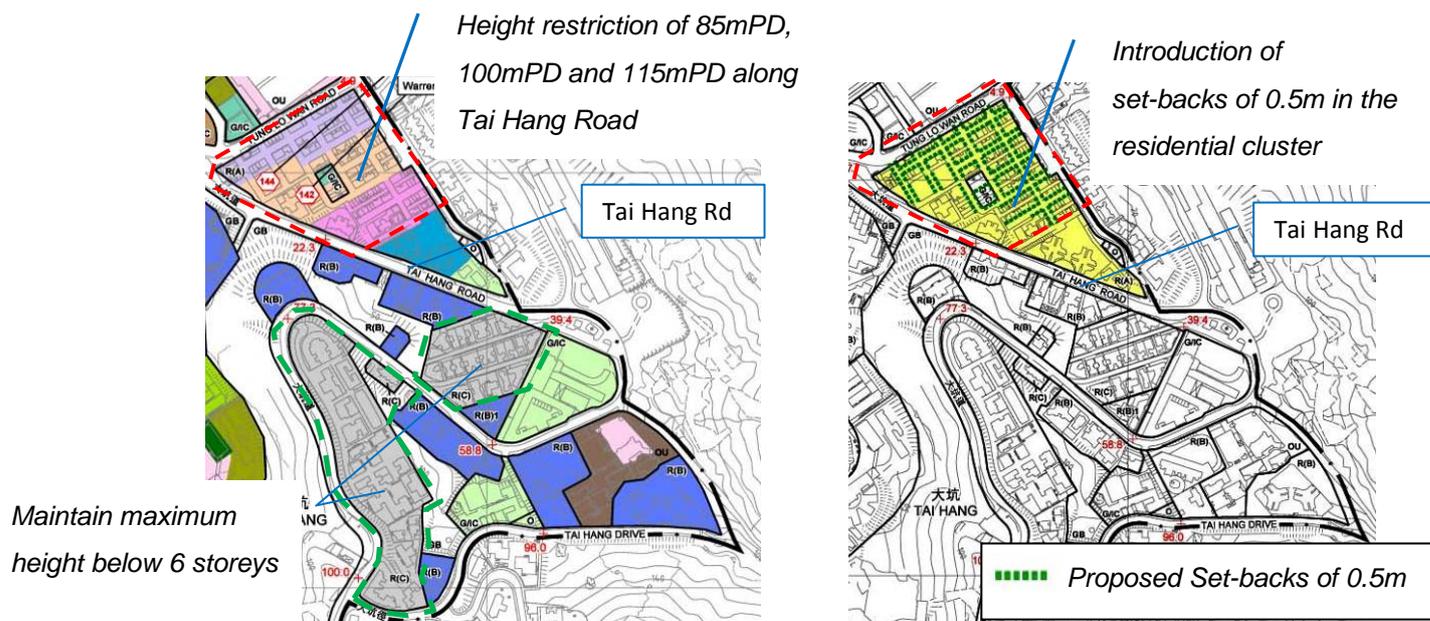
(a) Proposed Building Height Restrictions

(b) Proposed Non-Building Areas and Building Gaps

Figure 43 Centre Region in Option Study

(3) Eastern Region

Height restrictions from 85mPD to 100mPD to 115mPD are introduced to the residential cluster along Tai Hang Road, as shown in Figure 44a. Stepping the height up from 85mPD to 115mPD can encourage some downwash to reach the narrow street level. Set-backs of 0.5m are introduced to the residential cluster, this helps to further enhance the air ventilation. See Figure 44b.



(a) Proposed Building Height Restrictions

(b) Proposed Non-Building Areas and Building Gaps

Figure 44 Eastern Region in Option Study

The residential clusters “R(C)” zone as shown in Figure 44a (denoted as green dashed line) have already been restricted to maximum 6 storeys. This strategy introduces variation in height in the area and improves permeability.

To conclude, the majority of the recommendations mentioned in the Expert Evaluation and Advisory Final report has been integrated to the Option Study at the Revised Scenario. In general, the proposed building height reductions, non-building areas and building gaps in this Option Study help to mitigate the adverse air ventilation impact upon redevelopment, and improve the air ventilation.