

Ronald Lu & Partners

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**District Open Space,  
Sport Center and  
Library**

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AVA Expert Evaluation

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## 1 Introduction

Ove Arup and Partners Hong Kong Limited (Arup) was commissioned by Ronald Lu & Partners to provide an expert evaluation on the proposed building master planning of the development sites for Tseung Kwan O (TKO), District Open Space, Sport Center and Library from air ventilation perspective. This consultancy study is based on the methodology of Air Ventilation Assessment as set out in Technical Circular No. 1/06 issued jointly by Housing, Planning and Lands Bureau and Environment, Transport and Works Bureau and its Annex A – Technical Guide for Air Ventilation Assessment for Development in Hong Kong.

## 2 Objective of the Study

The objective of this assignment is to assess the likely impact of the proposed building height and planning of the development sites within the study area on the pedestrian wind environment as compared to the existing condition.

## 3 Study Scope

The scope of work includes the tasks as follows.

- To identify any potential problem areas due to the proposed building heights;
- To provide recommendation on how the problems may be alleviated;
- To identify any key ventilation corridors to be preserved or reserved;
- To advise whether any more detailed study is required for focused areas and the scope of the detailed study required.

## 4 Study Area

### 4.1 Site Boundary

The study area is a vacant site which is located between Tiu Keng Leng MTR Station and Tseung Kwun O MTR Station. This Area is bounded by Choi Ming Street in the north, Po Shun Road in the east, Chui Ling Road in the south and King Ling Road in the west. This area is being developed and forms part of the existing built-up areas of Tseung Kwun O district. (Figure 1)

TKO is one the landfill formed areas in Hong Kong, the terrain here is generally flat and open in nature. The north-western and western parts of TKO is surrounded by Mau Wu Shan and Chiu Keng Wan Shan. The built-up area is mainly concentrated at the foothill. And the north of and north east of the site is Junk Bay.



Figure 1 The Study Area (source from Google Earth)

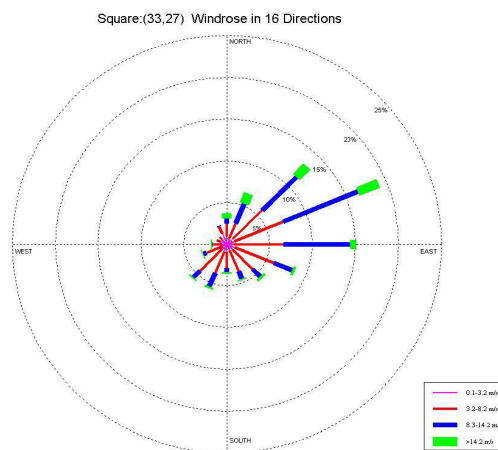
## 5 Wind Availability

The wind availability of the site is an essential item to investigate the wind performance of the development. Following the AVA guideline, site wind availability data ( $V_{\infty}$ ) is achieved by appropriate mathematical models (i.e. MM5 simulation).

### 5.1 Wind Data from MM5 Simulation Result

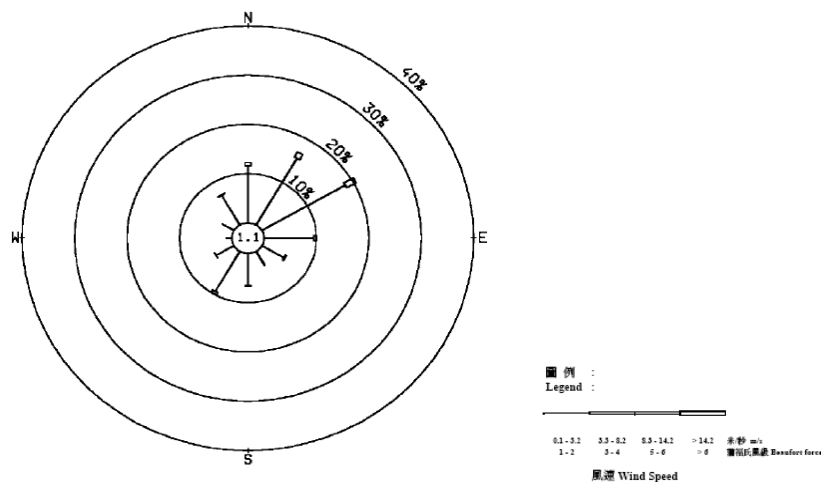
To facilitate AVA expert evaluation study, the wind data of MM5 simulation results at the height of 596 m above Tseung Kwun O Area from the website provided by Planning Department is utilised in this study. Also, the local wind condition measured by Hong Kong Observatory would be taken as a reference windrose for different seasons in this study.

As shown in Figure 2, it can be concluded that Eastern (E) and North-Eastern (NE) winds dominate the annual wind frequency. While in summer period, the winds are mainly coming from South-western (SW) directions. Similar to the annual wind frequency characteristic, Eastern (E) and North-Eastern winds dominate in non-summer period.



**Annual Wind Rose**

將軍澳 Tseung Kwan O

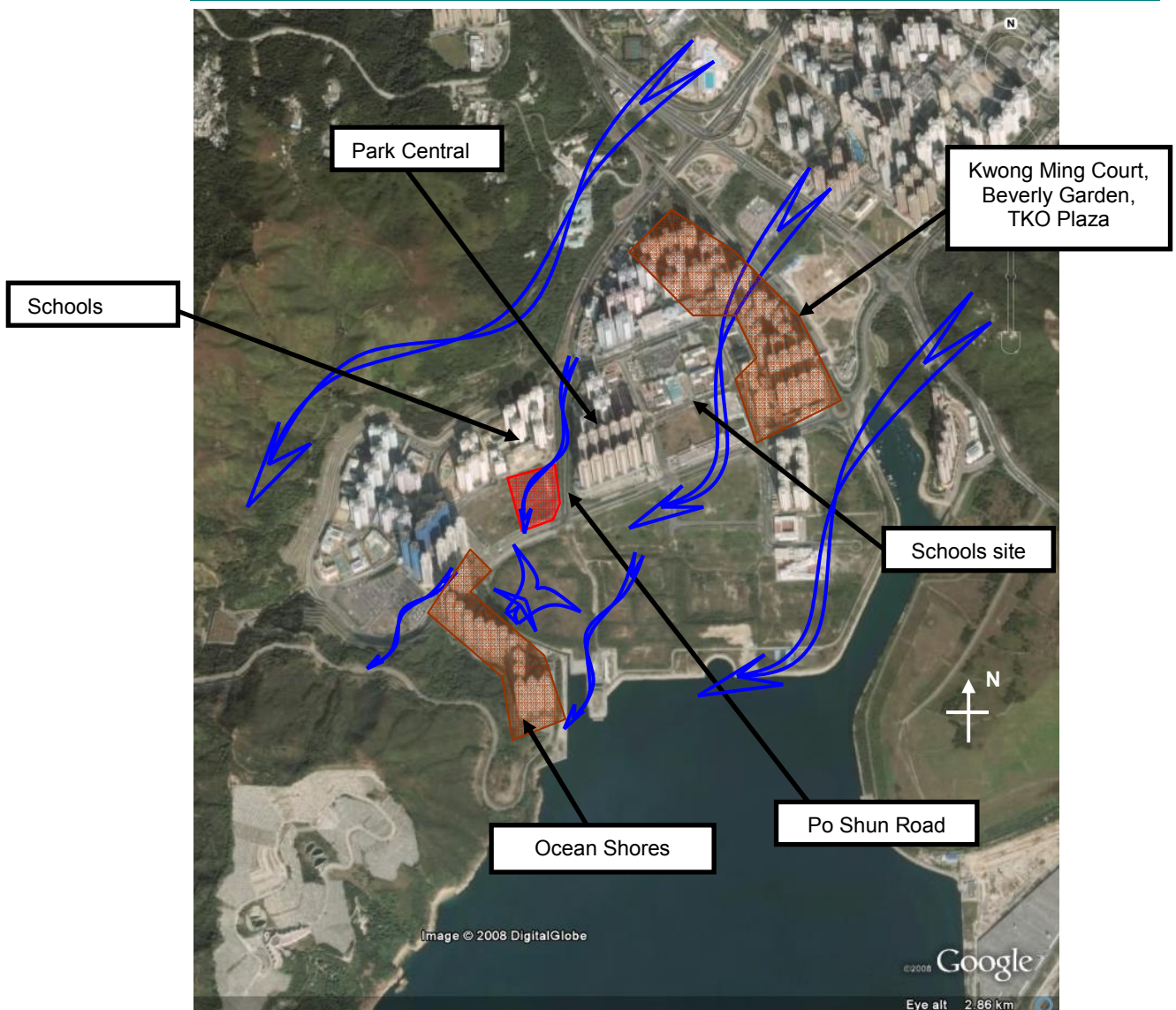


**Figure 2 Upper: Annual wind rose from MM5 data (ref. Plan D), Lower: : Annual wind rose from HKO data**



## 6 Expert Evaluation

### 6.1 Non - Summer Macroscopic Wind Condition - North-East wind

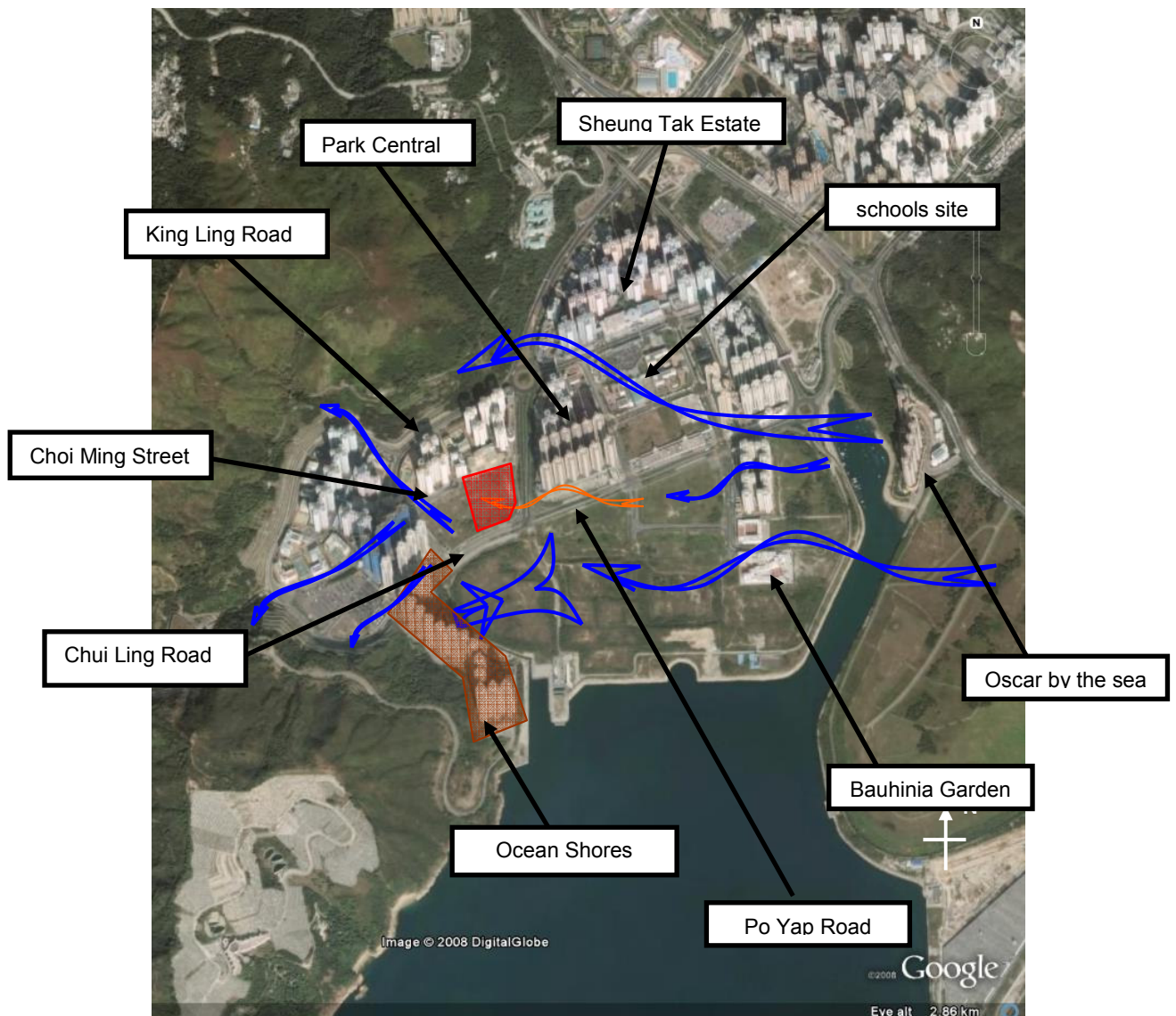


**Figure 3 Non - Summer Macroscopic Wind Condition- North-East wind**

- The Wall like obstruction formed by Kwong Ming Court, Beverly Garden and Tseung Kwun O Plaza blocked most of the north-east coming wind for the site.
- Although the wind is reattached to the low-level at the schools sites, the reattached wind is blocked by Park Central immediately.
- The north-east wind may be entrained from Po Shun Road under north-east wind condition. However, the wind magnitude may not be strong as the speed is already decelerated by the congested zone at north-east part of the study area.
- The wall-type building arrangement of Ocean shore and Metro Town may create a very strong down-washing effect. Since the area beneath is relatively open, those areas nearby, included the Study Area, may suffer from chaotic and strong turbulence wind.



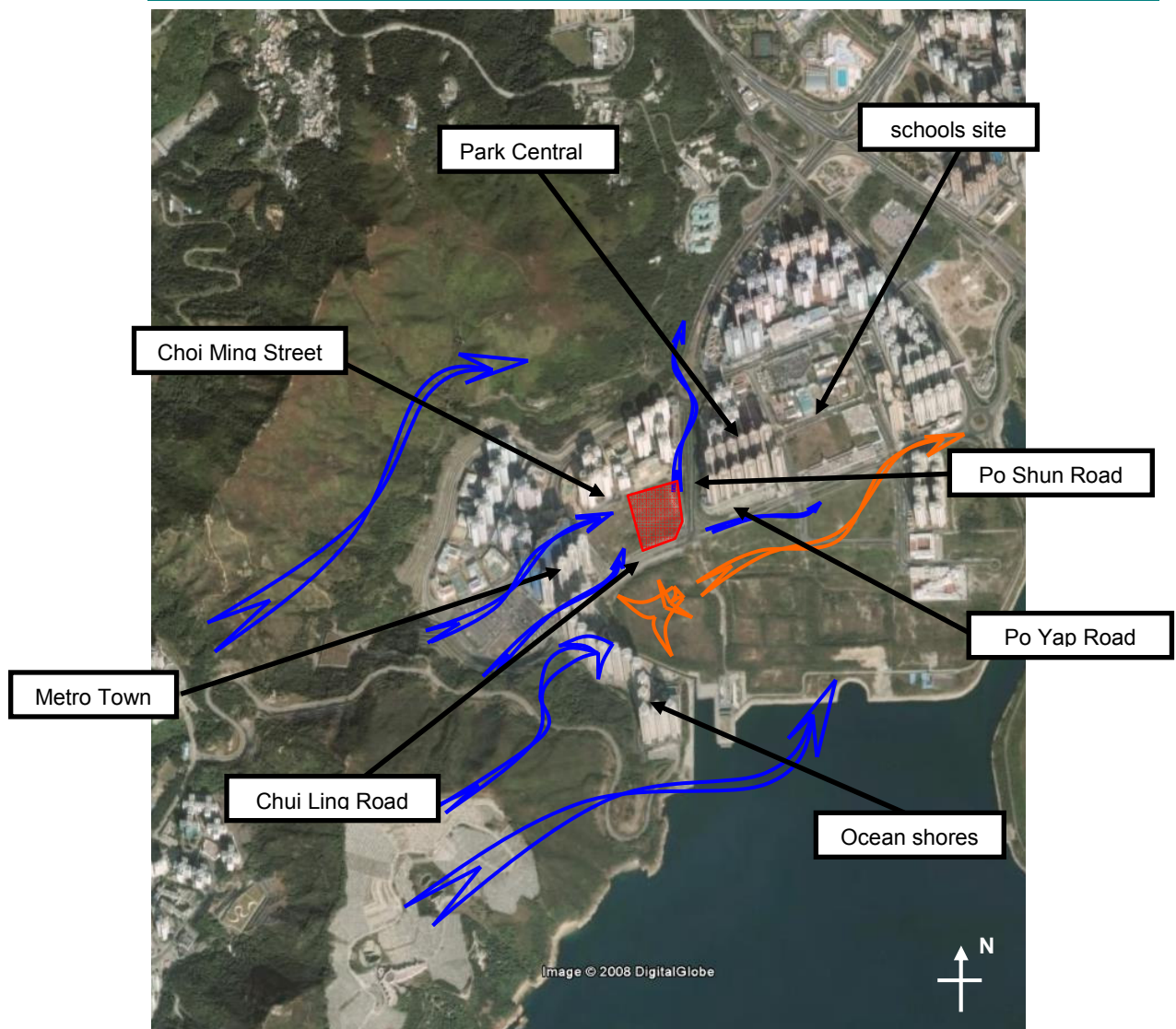
**6.2 Non - Summer Macroscopic Wind Condition - East wind**



**Figure 4 Non - Summer Macroscopic Wind Condition- East wind**

- The major wind entrance for eastern wind for TKO area is Po Yap Road. Wind is passing through the open area nearby the TKO MTR station and then divert by Park Central. And part of the wind may divert northward to the Sheung Tak Estate
- The east coming wind is blocked by Bauhinia Garden and reattached to low level. A portion of reattached wind (orange arrow) is blocked by the Park Central but some could reach the southern part of the site.
- The open space at the southern part of the study site allows an excellent wind penetration. Again, the wall type structure of Ocean Shores may generate a strong downdraft which may make wind environment becoming chaotic and windy.
- After passing through the study area, the wind may leave the site through Chui Ling Road, Choi Ming Street and King Ling Road.

### 6.3 Summer Macroscopic Wind Condition - South-west wind



**Figure 5 Summer Macroscopic Wind Condition- South-west wind**

- Most of the south-western wind coming to the study site is blocked by the Ocean Shore and Metro town.
- Since the incoming wind is blocked by the wall type structure, wind could only pass through the road underneath. It makes the Chui Ling Road and Choi Ming Street serve as the main wind entrance for the site during the summer wind conditions.
- The blocked wind passed over the wall-type buildings, and then reattached to low level at the open space area. The study area may turn into a wake zone as it may be located close to the reattachment point.
- As the study site may be located at the wind reattachment point, it may have a chance that the wind environment of the southern part is very turbulent.
- After reaching to the site, the east coming wind leaves the study site through Po Shun Road and Po Yap Road.



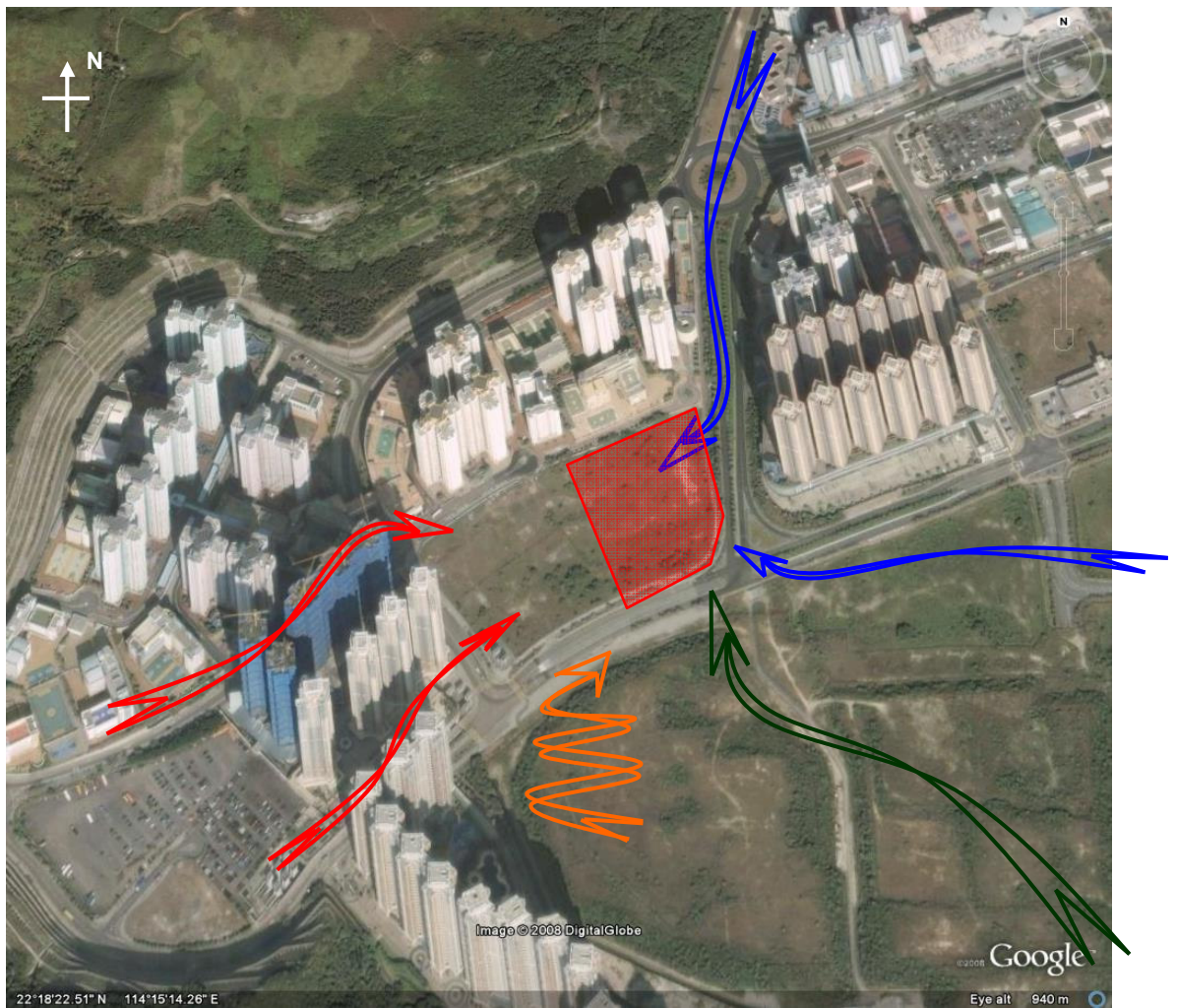
## 6.4 Onshore wind



**Figure 6 Onshore wind**

- Since the southern and south-eastern part of the study site is completely open, the sea breeze likely comes from the south-east due to thermal effect.
- Under the sea breeze condition, the incoming wind could reach the site directly without any obstruction and the southern part of the site would enjoy plenty of sea breeze.
- The sea breeze passing through the site leaves along Po Shun Road and King Ling Road.

### 6.5 Summary on Incoming Wind for Study Site



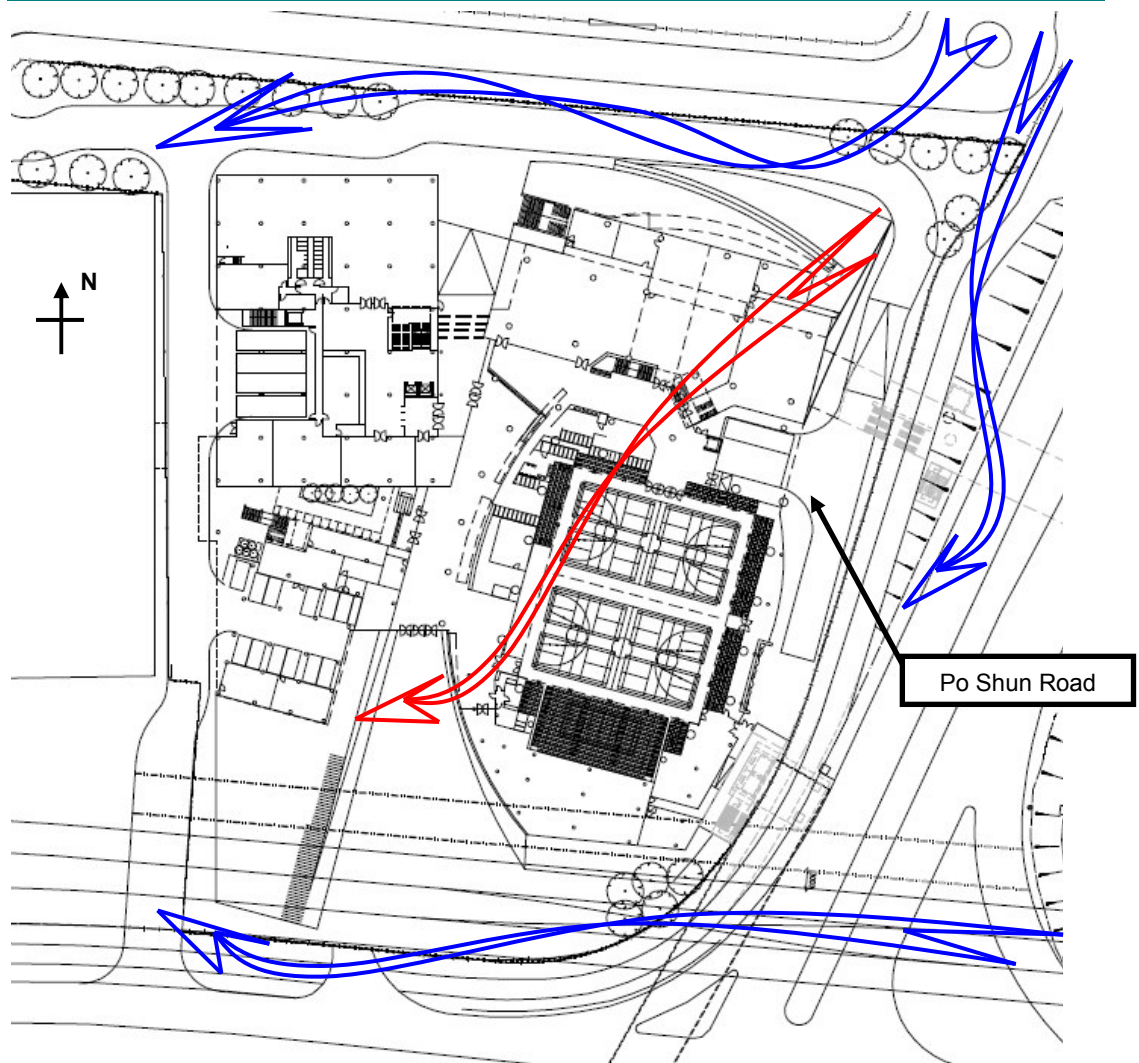
**Figure 7 Short Summary on Incoming Wind for Study Site**

The above figure shows the incoming wind prediction for the Study Site:

- Blue Arrow - Incoming wind during non-summer conditions. Wind is reaching the site from Po Shun Road and Po Yap Road.
- Red Arrow - Incoming wind during summer conditions. Wind is reaching the site from Choi Ming Street and Chui Ling Road
- Green Arrow - Incoming wind for sea breeze. Wind is reaching from the open space at the south-east of the site
- Orange Arrow - Turbulence wind generated by the downdraft effect, it may affect the south part of the site.



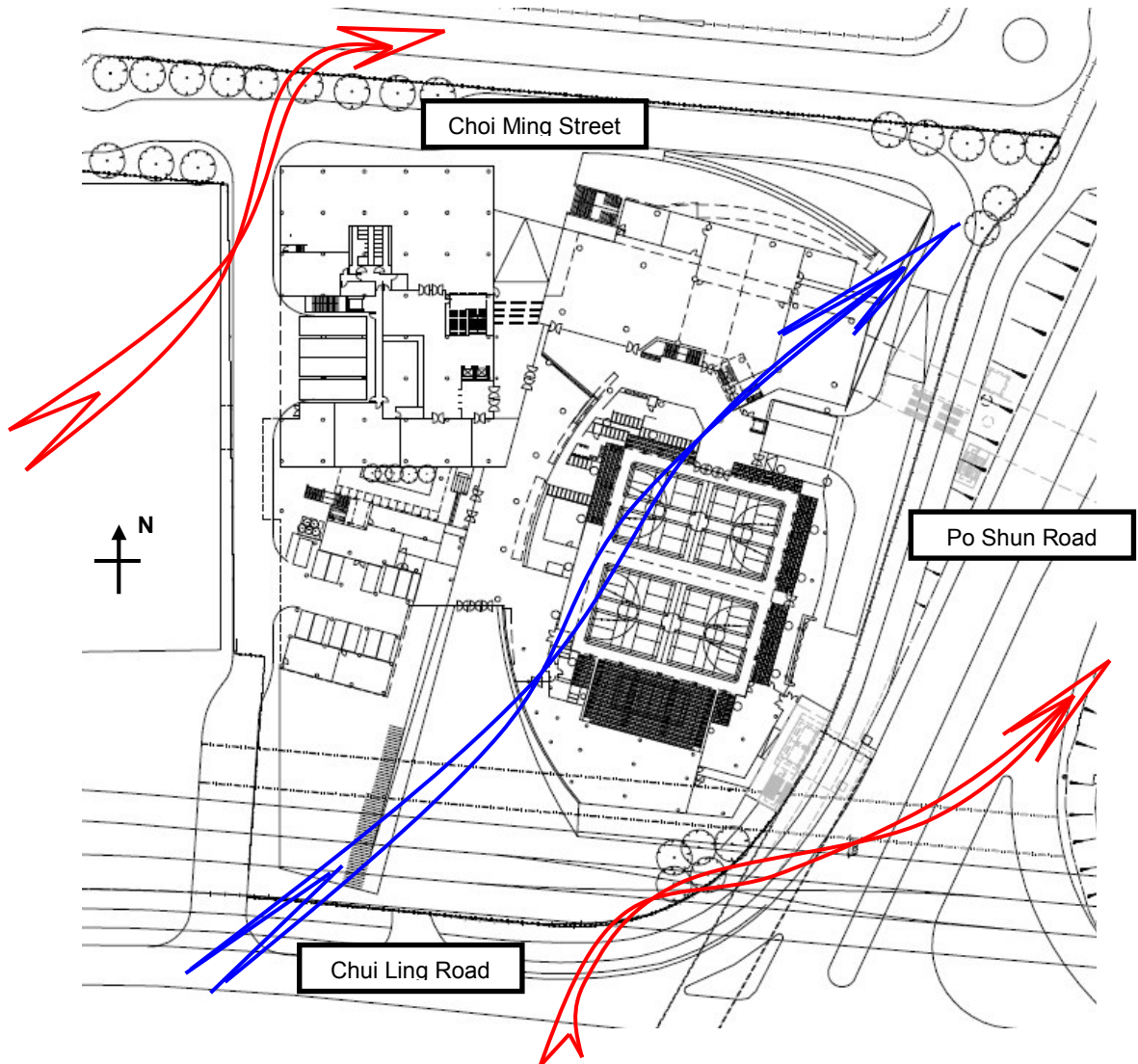
## 6.6 Site wise wind condition - Non-summer wind



**Figure 8 Site wise wind condition - Non-summer wind**

- The wind from the Po Shun Road is diverted by the sport centre. Part of the wind continues flowing along the Po Shun Road but part of it is brought to Choi Ming Street.
- Since the sport centre is a relatively low rise structure, wind could slip over the stadium (red arrow) and reattach to pedestrian level in a short distance.
- Most of the east coming wind from Po Yap Road could flow freely along the road without obstructed by study site.

## 6.7 Site wise wind condition - summer wind

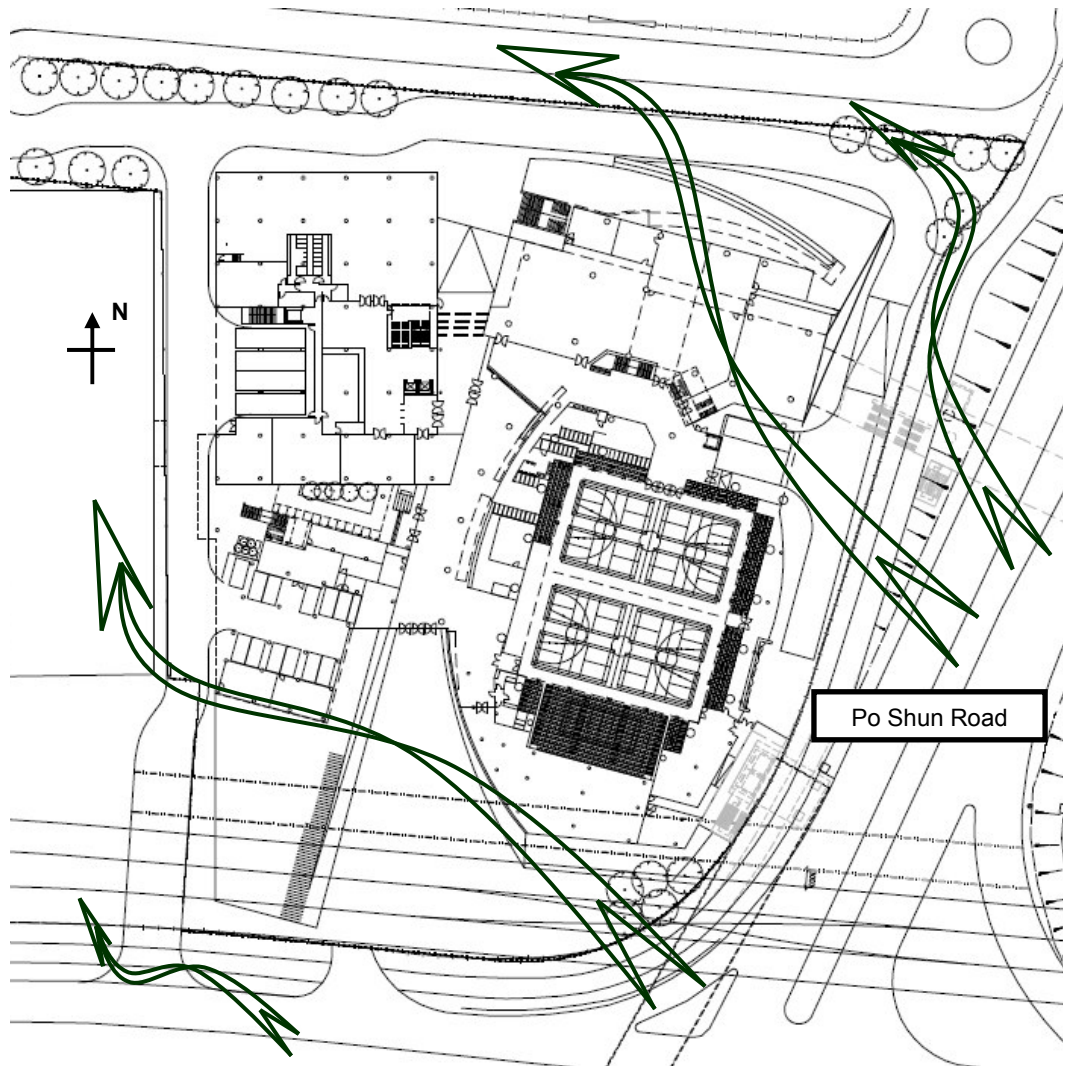


**Figure 9 Site wise wind condition - summer wind**

- Wind from Choi Ming Street will continue flowing along Choi Ming Street and being unaffected by the buildings in the proposed site.
- Wind from Chui Ling Road mainly splits into three parts.
  - Part of the incoming wind will slip over the stadium and reach Po Shun Road
  - Part of the wind will be diverted by the stadium at low-level and pass along Po Shun Road and Tong Tak Street.
  - Part of the wind will be rerouted by the library building and point northward, and then reach Choi Ming Court.



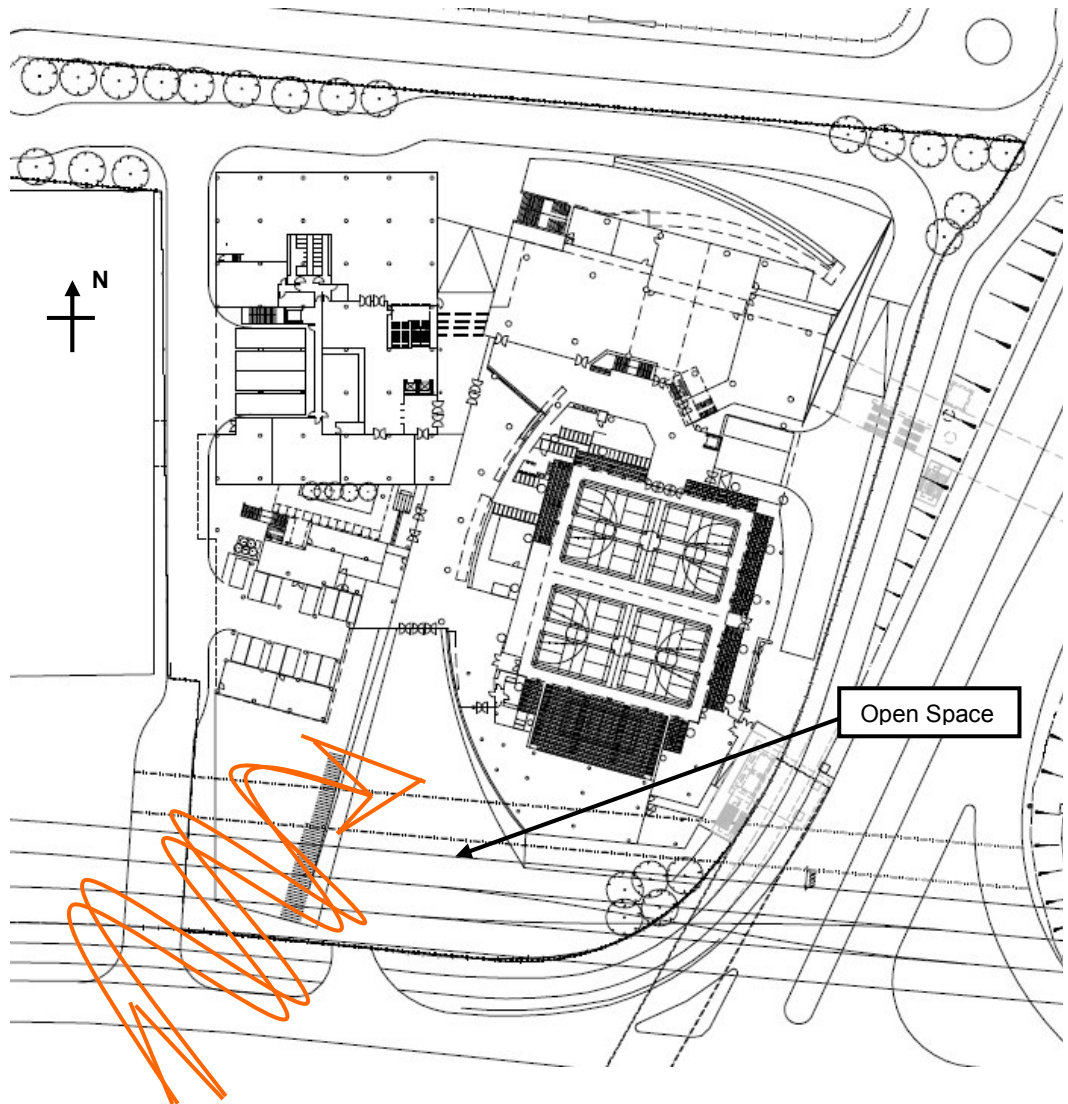
**6.8 Site wise wind condition - Sea Breeze**



**Figure 10 Site wise wind condition - Sea Breeze**

- At low-level, south-east sea breeze is diverted to Po Shun Road northerly and the open area adjacent to the Study Site easterly.
- At high-level, wind flows over the stadium and reaches Choi Ming Court.

**6.9 Site wise wind condition - Wind due to down washing**



**Figure 11 Site wise wind condition - Wind due to down washing**

- The down washed wind (See Figure 7) from Metro Town and Ocean Shores may affect the southern part of the site.
- Un-predictable/ Disordered wind may affect the open space next to the entrance area of the stadium.

## 6.10 Problematic area and mitigation measures

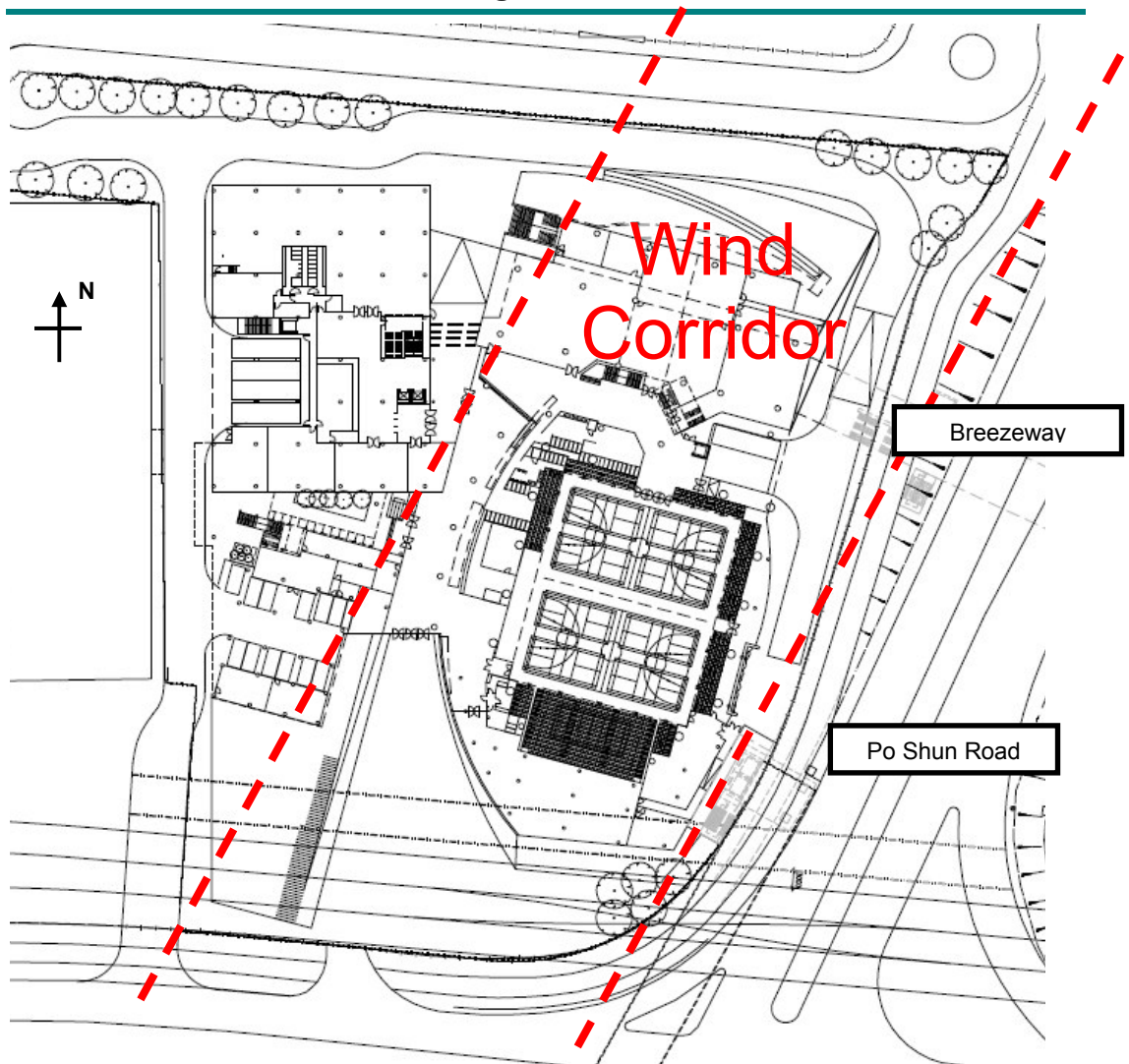


Figure 12 wind corridor

- Due to simple shape and relatively low-rise nature of the proposed buildings, there is no specific wind problem to the site and its surrounding areas on the proposed design in general. There is also little impact to the breezeway.
- Since the stadium is low rise in nature and is situated alongside Po Shun Road, this area may be served as a wind corridor for the site. It is recommended that the adjacent vacant sites may need be strategically planned to utilize the wind corridor currently provided.

### **6.11 Recommendation for further study**

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Aforementioned, the low-rise stadium may serve as the main ventilation corridor of the area. Comparing the captioned project with the surrounding high-rise clusters, those high-rise buildings have a relatively larger impact on the surrounding areas in terms of air ventilation performance. Therefore, the stadium may not have specific air ventilation problem to the site and its surrounding area. In this connection, no CFD or wind tunnel test AVA study is required based on the current design.

## **7 Conclusion**

This report provides the expert evaluation on the AVA of the District Open Space, Sport Center and Library for TKO area. It is a qualitative assessment of wind performance of the site layout plan. A preliminary assessment on site characteristic and wind availability is conducted. The expert evaluation indicates that there are four major routes of incoming wind for the site.

1. Incoming wind during non-summer condition. Wind is reaching the site from Po shun Road and Po Yap Road.
2. Incoming wind during summer condition. Wind is reaching the site from Choi Ming Street and Chui Ling Road
3. Incoming wind from sea breeze. Wind is reaching from the open space at the south-east of the site
4. Turbulence wind generated by the downdraft effect, it may affect the south part of the site.

Due to the simple shape and relatively low-rise nature of the proposed buildings, in general, the proposed design will have no or little specific wind problem to the site and its surrounding areas, and it will have little impact on the breezeway. No CFD or wind tunnel test AVA study is required based on the current design.