

Hong Kong Housing Authority

**Proposed Public Housing Development at
Tuen Mun Area 54 Sites 3 & 4 (East)**

Air Ventilation Assessment – Expert Evaluation

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This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number --

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1 Introduction

1.1 Project Background

Ove Arup and Partners Hong Kong Ltd (Arup) was appointed by Hong Kong Housing Authority (HKHA) to carry out an Air Ventilation Assessment (AVA) for the Proposed Public Housing Development at Tuen Mun Area 54 Sites 3 & 4 (East) (the Development).

The objective of this study is to evaluate the ventilation performance of the Proposed Development using the methodology of Air Ventilation Assessment, in accordance with “Technical Circular No. 1/06 – Air Ventilation Assessments” (the Technical Circular) and Annex A to the Technical Circular “Technical Guide for Air Ventilation Assessment for Developments in Hong Kong” (the Technical Guide) jointly issued by the Housing, Planning and Lands Bureau and Environmental, Transport and Works Bureau on 19th July 2006¹. This report presents the findings for Stage 1 of the AVA – Expert Evaluation.

1.2 Study Objectives

An Air Ventilation Assessment (AVA) – Initial Study (IS) has been carried out and approved under a Section 16 planning application. As the project progress, some minor changes have been made to the scheme studied under Initial Study. Hence, this Expert Evaluation has been carried out to assess the air ventilation performance of the latest design scheme.

Expert Evaluation assesses the characteristics of wind availability of the site and evaluates the air ventilation performance with the Proposed Development in a qualitative way. The following tasks are conducted:

- Identification of site location and characteristics;
- Analysis of the wind condition;
- Identifies good design features;
- Identifies obvious problem areas and propose some mitigation measures, if any;
- Evaluation of the wind flow characteristics with the Proposed Development as compared with previously approved scheme.

¹ https://www.devb.gov.hk/filemanager/en/content_679/hplb-etwb-tc-01-06.pdf

2 Site Characteristics

2.1 Site Location and the Surrounding Area

The Development is located in Tuen Mun District (Area 54) and situated at a flat topology between Lau Fau Shan (~+360mPD) and Tai Lam Country Park (~+460mPD). Siu Hong Court is located to its east, indicative TM54-Sites 3&4(W) Development to its west, Castle Peak Hospital and Tuen Mun Hospital to its southwest and low-rise villages at the northwest of the Development. The planned high-rise development at Tuen Mun Area 54 Site 4A (South) at the northeast and Tuen Mun Area 54 Site 5 at the west of TM54-Sites 3&4(E) Development are also included in the model indicatively, as shown in Figure 1.

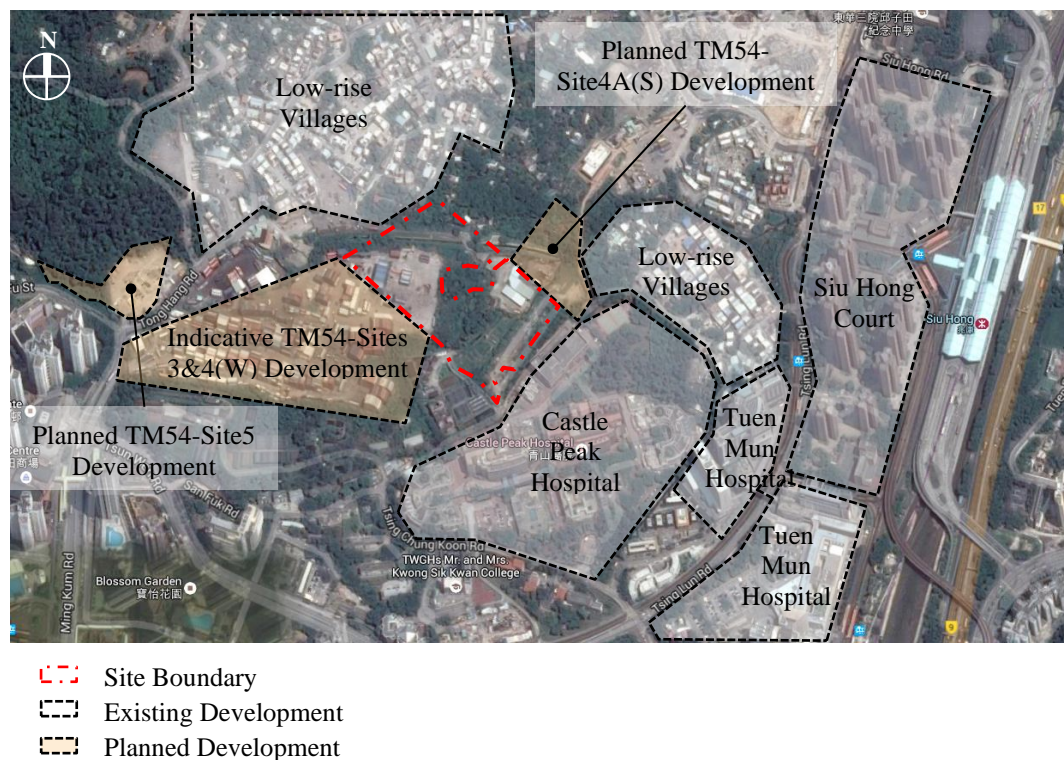


Figure 1 Site and the Surrounding Area of the Development

3 Site Wind Availability

3.1 Site Wind Availability Data

The site wind availability data for the study is obtained from Planning Department's website, which was simulated using the meso-scale numerical model Regional Atmospheric Modelling System (RAMS) ^[2]. The location of the Development falls within the location grid (x:038, y:063) in the RAMS database as indicated in Figure 2. The wind rose for annual condition is presented in Figure 3. The wind rose for summer condition is presented in Figure 4.

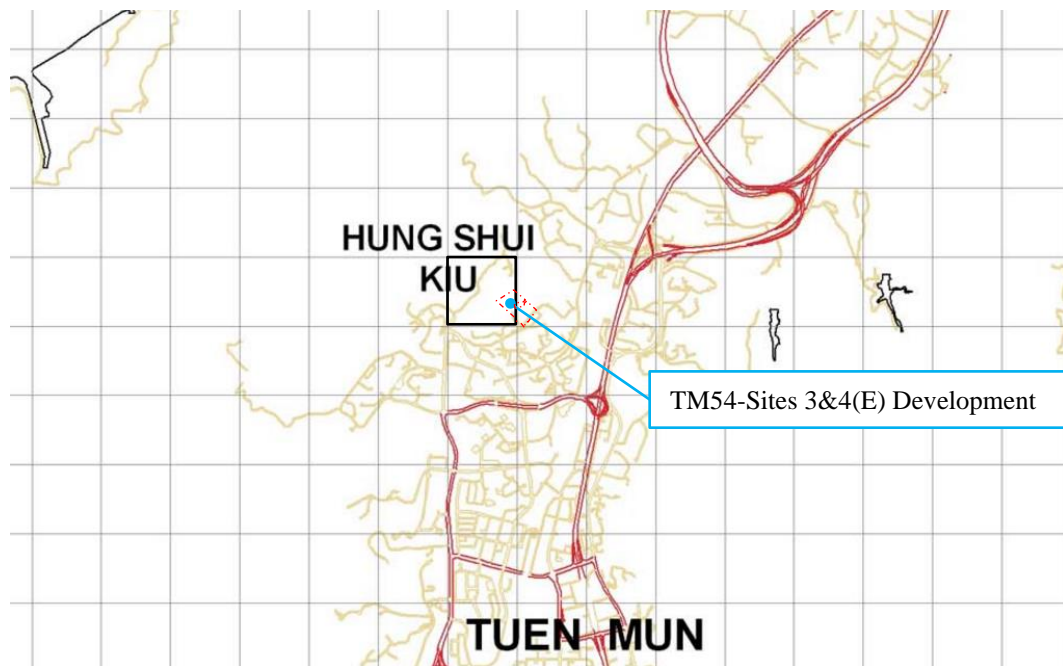


Figure 2 RAMS Grid and Location of the Developments

Figure 2 RAMS Grid and Location of the Developments

The wind rose for annual condition is presented in Figure 3, and the wind rose for summer condition is presented in Figure 4

As indicated by the wind roses, the annual prevailing wind directions are North-northeast (NNE) and South-southeast (SSE), and the summer prevailing wind directions are South (S) and South-southeast (SSE).

[2] http://www.pland.gov.hk/pland_en/p_study/comp_s/InceptionReport_webpage_11-12/final_report.pdf

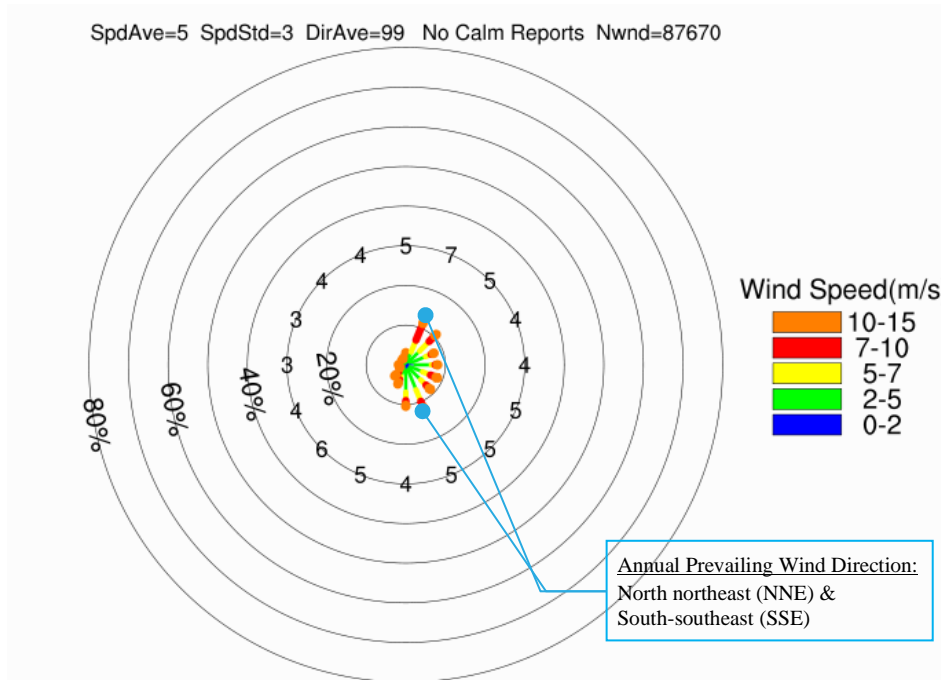


Figure 3 Wind Rose at 200mPD for Annual Condition (Grid x: 038, y: 063)

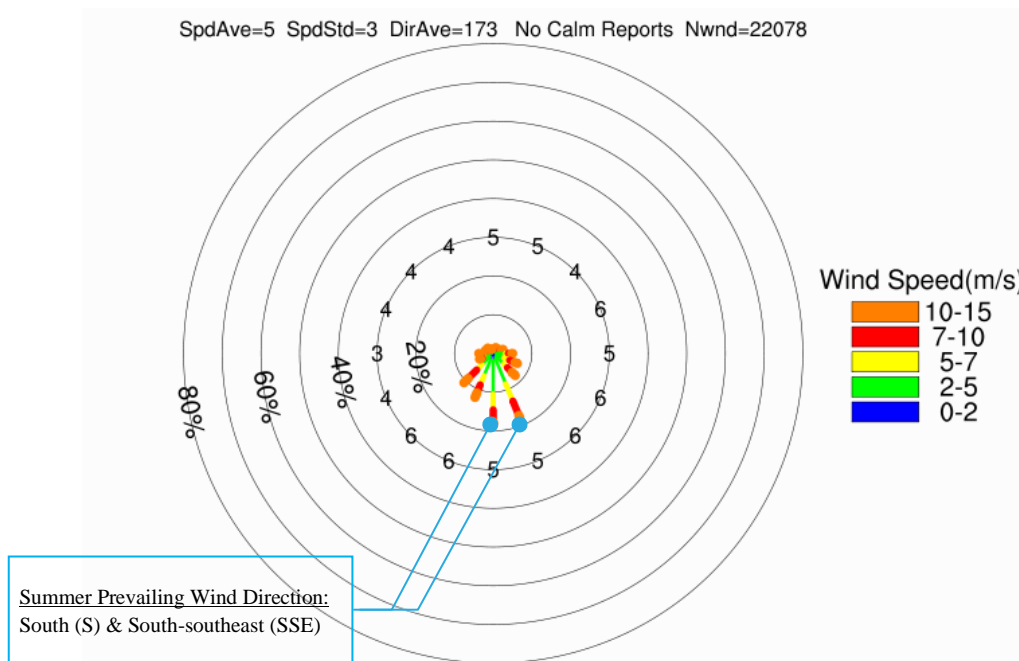


Figure 4 Wind Rose at 200mPD for Summer Condition (Grid x: 038, y: 063)

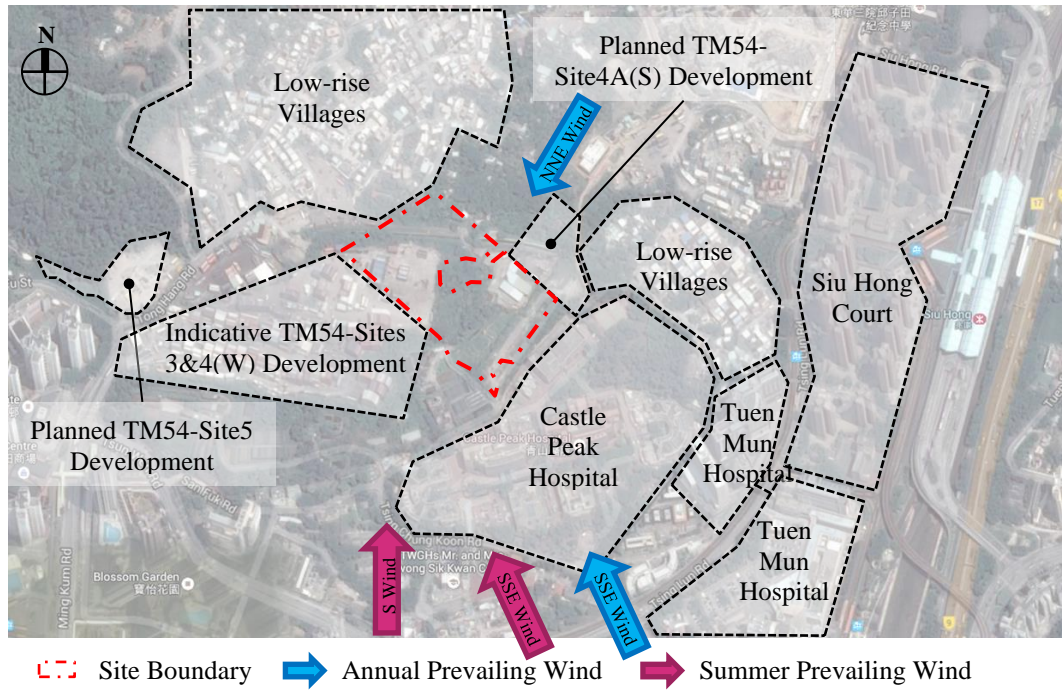


Figure 5 Prevailing Wind Directions at the Development

4 Studied Schemes

4.1 Baseline Scheme

The previously approved scheme was adopted as Baseline Scheme. The key development parameters of the Scheme is presented in Table 1.

Table 1 Development Parameters of Baseline Scheme

Development Parameter	Baseline Scheme
Plot Ratio (domestic portion)	6
Maximum Building Height	140mPD

The scheme consists of five domestic blocks with building height of about 125mPD to 132mPD. The site ground level is approximately 12.5mPD to 14.5mPD and there is a semi-sunken car park at the centre with the roof level of 16mPD. A 15m wide running NBA (at +16mPD) is also provided, as shown in Figure 6.

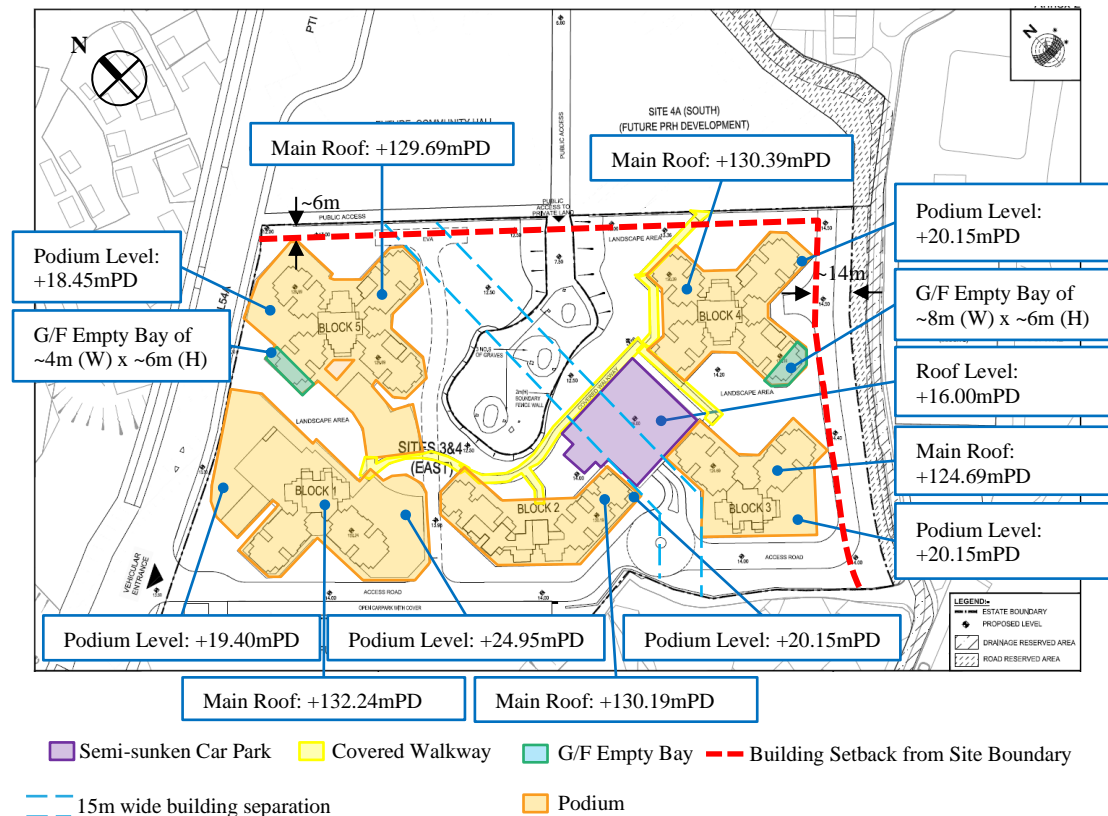


Figure 6 Master Layout Plan of Baseline Scheme

4.2 Proposed Scheme

Proposed Scheme is the latest design scheme. The key development parameters of which is presented in Table 2.

Table 2 Development Parameters of Proposed Scheme

Development Parameter	Proposed Scheme
Plot Ratio (domestic portion)	6
Maximum Building Height	140mPD

Similar planning parameter and building deposition as Baseline Scheme has been maintained. Due to the change in site boundary, the building setback to the north-eastern and south-eastern site boundaries are 4m and 10m respectively. In addition, apart from the 15m wide building separation, the podium coverage has been reduced between Block 1 and Block 5 to provide an additional 10m wide building separation at +16.33mPD, as indicated in Figure 7.

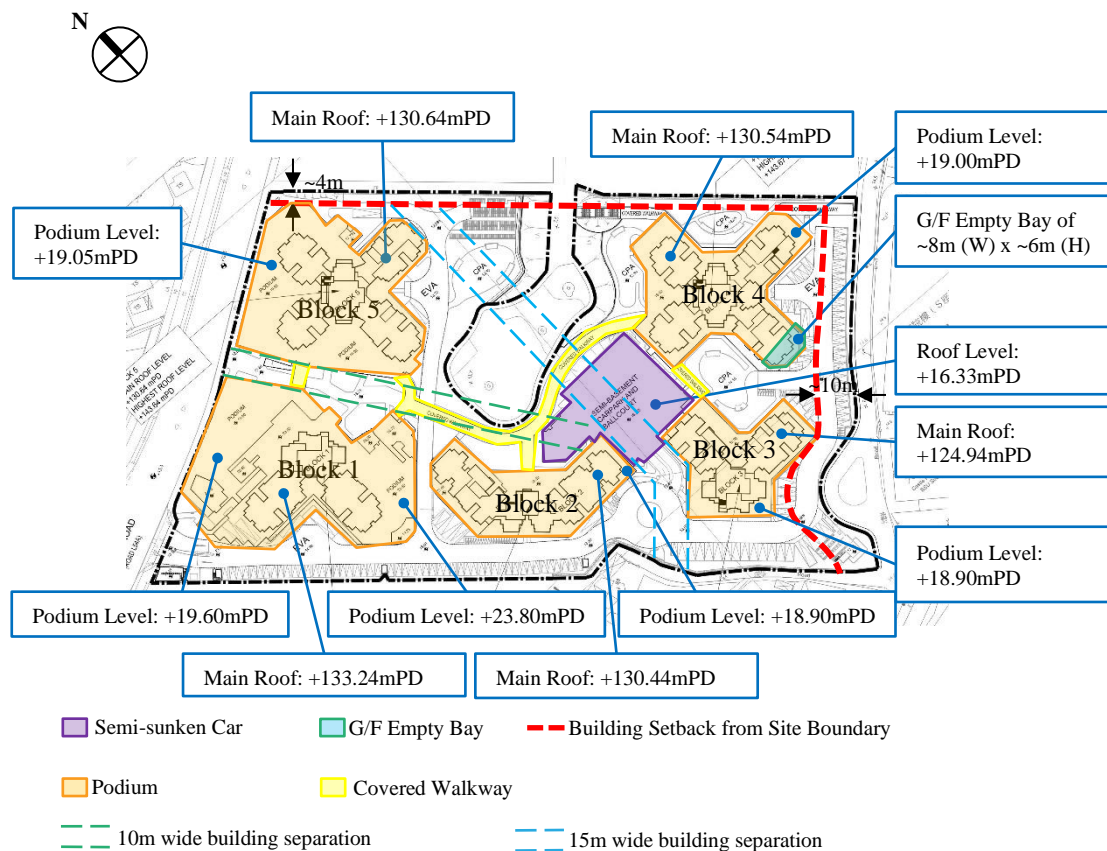


Figure 7 Master Layout Plan of Proposed Scheme

4.3 Qualitative Evaluation

4.3.1 NNE Wind

NNE wind is one of the prevailing winds under annual condition. With the similar building deposition, the ventilation performance would be similar under both schemes.

Under both schemes, as the planned TM54-Site4A(S) Development is located at the upwind position of the Development, it would induce wind blockage effect to the Development. Nevertheless, some of the NNE wind would be able to flow through the building separation between the future road between TM54-Sites 3&4 (W) and the low-rise village towers to reach the site (**Blue Arrow**). A portion of incoming NNE wind would be downwashed and diverted by the northern façade of the Planned TM54-Site4A(S) Development and Block 5 of proposed Development to enhance the wind environment at the adjacent areas (**Green Arrow**), such as the Low-rise Villages.

Another portion of NNE wind would be diverted by the Planned TM54-Site4A(S) and the proposed Development to travel along the south-eastern boundaries of the proposed Development (**Black Arrows**).

Although a wind shadow at the downwind area, such as the Indicative TM54-Sites 3&4(W) Development would be created, with the 15m wide building separation provided across the site, the wind would penetrate through and alleviate the wind shadow area in leeward side (**Purple Arrows**).

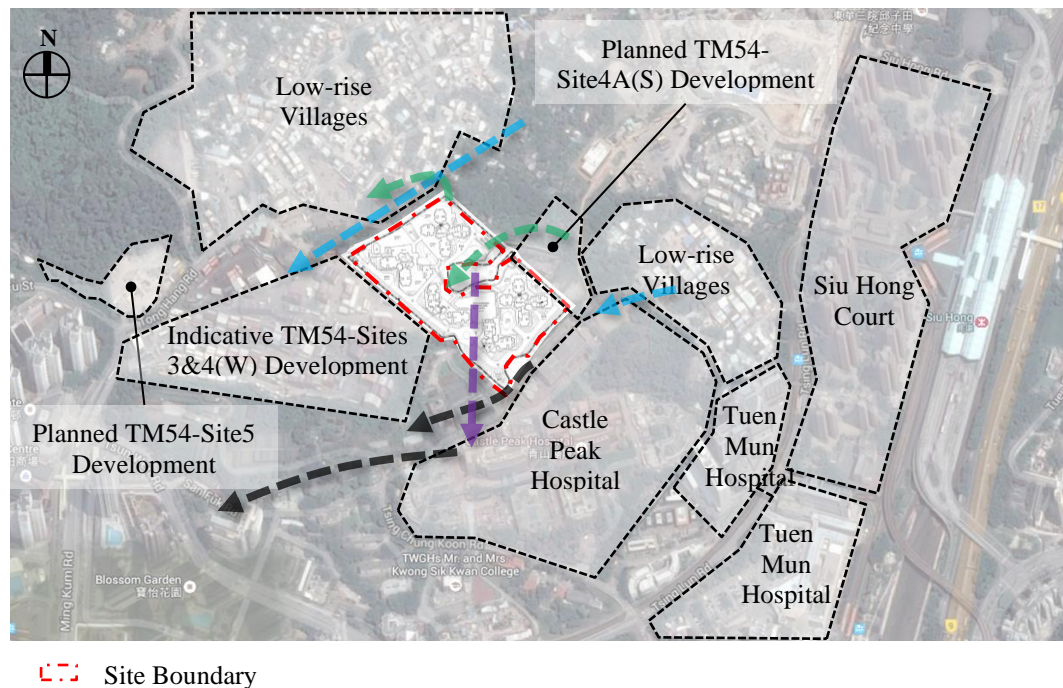


Figure 8 Wind Environment of Proposed Scheme under NNE Wind

4.4 S and SSE Wind

S wind is one of the prevailing winds under summer condition while SSE wind is the prevailing wind under both annual and summer condition. (**Blue Arrow**). With the similar building disposition, the ventilation performance would be similar under both schemes.

Under both schemes, the building frontage at Block 4 would capture more high-level wind and downwash towards the pedestrian level of Low-rise Village and Castle Peak Hospital. Moreover, the downwash wind induced by Block 4 would also travel through the building separation between Block 4 and the TM54-Site4A(S) Development towards the northwest direction. (**Purple Arrow**).

The building frontage area of Block 2 and 3 induces downwash effect to the pedestrian level and resulting more wind would travel towards the building separations between Blocks 2 & 3 and enhance the wind environment at the immediate surroundings, such as the Indicative TM54-Sites 3&4(W) Development. (**Black Arrow**)

The 15m wide building separation would allow S and SSE wind to penetrate through the site to its northern boundary (**Green Arrow**), enhancing the wind environment at the immediate surroundings such as the Low-rise Villages.

Under Proposed Scheme, the additional building separation of 10m and reduced podium between Block 1 and Block 5 would enhance the permeability at low zone and promote air movement. Some of the wind would travel through the building separation to ventilate the adjacent road and low-rise village,

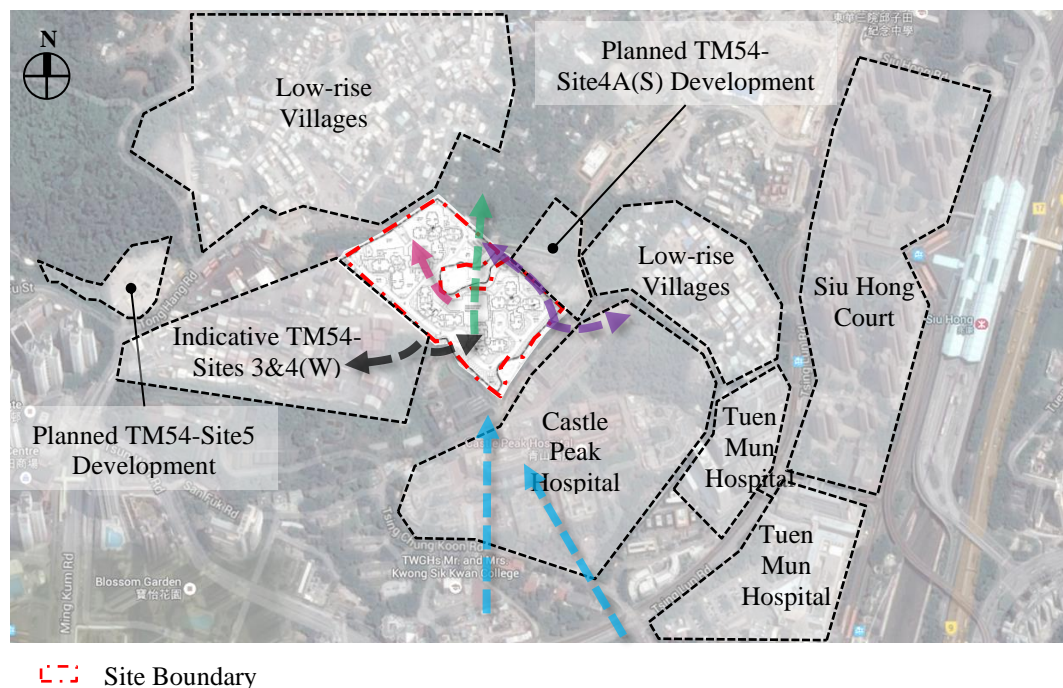


Figure 9 Wind Flow with the Proposed Development under S and SSE Wind

5 Conclusion

Ove Arup and Partners Hong Kong Ltd (Arup) was appointed by Hong Kong Housing Authority (HKHA) to carry out an Air Ventilation Assessment (AVA) for the Proposed Public Housing Development at Tuen Mun Area 54 Sites 3 & 4 (East). An AVA – IS has been carried out and approved under Section 16 planning application. This AVA Expert Evaluation was conducted to assess the latest changes in design.

RAMS wind data for the Development site is obtained from Planning Department's website and analysed. According to the analysis, the annual prevailing wind directions are North-Northeast (NNE) and South-southeast (SSE), and the summer prevailing wind directions are South (S) and South-southeast (SSE).

With the similar building layout under the Proposed Scheme and Baseline Scheme, the ventilation impact would be similar under both schemes. A local building separation of 15m above +16mPD has been maintained. Together with the reduced podium coverage between Block 1 and Block 5 to allow higher permeability at pedestrian level, the ventilation performance at some localized area within the site and near the adjacent road.