# Attachment 2

UPDATED AIR VENTILATION ASSESSMENT - EXPERT EVALUATION

Issue No. : Issue 3
Issue Date : September 2025
Project No. : 819.5357



**AIR VENTILATION ASSESSMENT - EXPERT EVALUATION** 

**FOR** 

**PROPOSED MINOR RELAXATION OF NON-BUILDING AREA RESTRICTION FOR PROPOSED FOOTBRIDGE CONNECTIONS** AT MA SIK ROAD, FANLING, **NEW TERRITORIES** 

Prepared by

Allied Environmental Consultants Limited

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# **Document Verification**



**Project Title** Project No. Proposed Minor Relaxation 819.5357 of Non-Building Area

**Restriction for Proposed** Footbridge Connections at Ma Sik Road, Fanling, New

**Territories** 

**Document Title** Air ventilation Assessment - EXPERT EVALUATION

Issue No.	Issue Date	Description	Prepared by	Checked by	Approved by
Issue 1	July 2025	1st Submission	Toby Lam	Joanne Ng	Grace Kwok
Issue 2	August 2025	2nd Submission	Various	Joanne Ng	Grace Kwok
Issue 3	September 2025	3rd Submission	Toby Lam	Joanne Ng	Grace Kwok

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#### Project No. 819.5357

Air ventilation Assessment - EXPERT EVALUATION for Proposed Minor Relaxation of Non-Building Area Restriction for Proposed Footbridge Connections at Ma Sik Road, Fanling, New Territories

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# 1. Executive Summary

- 1.1.1. An Air Ventilation Assessment Expert Evaluation (AVA-EE) study was conducted for the Proposed Minor Relaxation of Non-Building Area Restriction for Proposed Footbridge Connections at Ma Sik Road to provide qualitative evaluation of wind performance under baseline scenario and that with the Proposed Footbridge Connections.
- 1.1.2. The Proposed Footbridge Connections consist of 2 sets of an open-sided covered walkway and single-storey weather-proof footbridge, which are erected that leaving a clearance of around 3.4m to 4.5m from the ground. Also, both sides of the open-sided walkway will be equipped with a 1100mm high non-perforated protective barrier, leaving a 3.4m full perforation at the top.
- 1.1.3. As evaluated in the AVA-EE, with the provision of abovementioned design features, no significant adverse impact to the wind environment in the surrounding area associated with the Proposed Footbridge Connections is anticipated.

## 2. Introduction

2.1.1. This Air Ventilation Assessment – Expert Evaluation is prepared and submitted in support of the Minor Relaxation of the Non-Building Area ("NBA") to enable two footbridge connections, each consisting of a weather-proof footbridge at 1/F and an open-sided covered walkway at 3/F (hereafter refer to as the "Proposed Footbridge Connections") at Ma Sik Road, Fanling, New Territories (hereafter refer to as the "Application Site").

# 3. Objectives

3.1.1. The main objective of the study is to evaluate potential air ventilation impacts associated with the Proposed Footbridge Connections on pedestrian wind environment within and in the vicinity of the Application Site using the methodology framework as set out by relevant government standard, guidelines and technical circulars.

# 4. Site Description

4.1.1. The Application Site is at the tail-end of the four designated NBA sites in Planning Areas 13 and 14, and is currently zoned "Residential (Group A) 1" ("R(A)1") on the Approved Fanling North Outline Zoning Plan ("OZP") No. S/FLN/4. The surrounding areas are mainly zoned "Residential (Group A) 1" ("R(A)1"), "Residential (Group A) 3" ("R(A)3"), "Residential (Group B)" ("R(B)"), "Residential (Group A) 12" ("R(A)12") and "Other Specified Uses (Amenity Area)" ("OU(A)"). A site location plan with surrounding environment is shown in *Figure 4-1*.

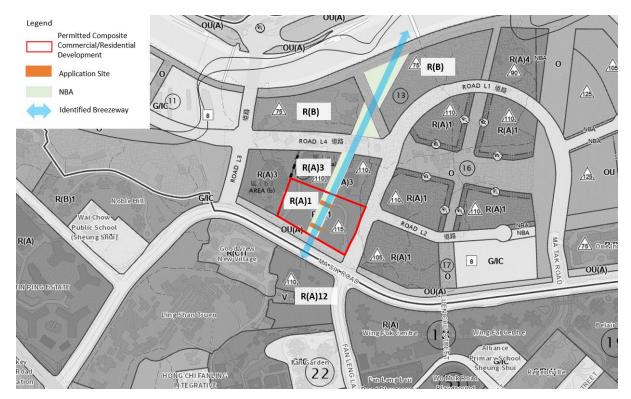


Figure 4-1 Application Site Location

# 5. Methodology

- 5.1.1. The methodology framework of this study is set out in the Technical Circular No. 1/06 and its Annex A Technical Guide for Air Ventilation Assessment for Development in Hong Kong. The Technical Circular is jointly issued by Housing, Planning and Lands Bureau (HPLB) and Environment, Transport and Work Bureau (ETWB) in July 2006 (Technical Guide).
- 5.1.2. The scope of this study shall cover the following:
  - To identify any major wind corridors which should be preserved or reserved;
  - To identify any potentially affected areas due to the Proposed Footbridge Connections design including the layout and deposition;
  - To identify design features of the Proposed Footbridge Connections; and
  - To provide recommendations for alleviating the potential air ventilation impact identified.

# 6. Assessment Methodology

#### 6.1. WIND AVAILABILITY DATA

Hong Kong Observatory

- 6.1.1. The Hong Kong Observatory records the metrological data in Hong Kong. Among all the weather stations in Hong Kong, wind data from Ta Kwu Ling station shall be used for the discussion on overall wind environment in the region.
- 6.1.2. According to the wind availability data from Ta Kwu Ling Station from 1986 2024, the annual wind rose revealed winds flowing from the east and southeast quadrant (i.e. E, ESE) throughout the year. The wind data from July to September is adopted as the summer prevailing wind, where predominant summer winds are flowing from the southeast quadrant (i.e. E, ESE). The wind rose during annual and summer conditions are shown in *Figure 6-1* and *Figure 6-2*.

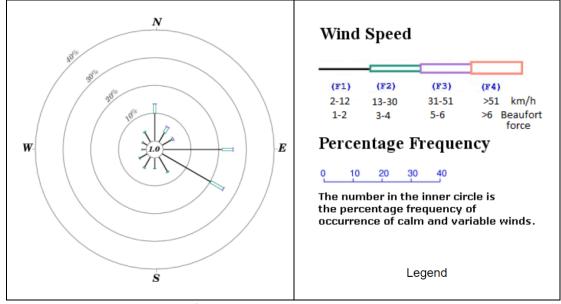


Figure 6-1 Annual Wind Rose for Tai Po, 1986 - 2024

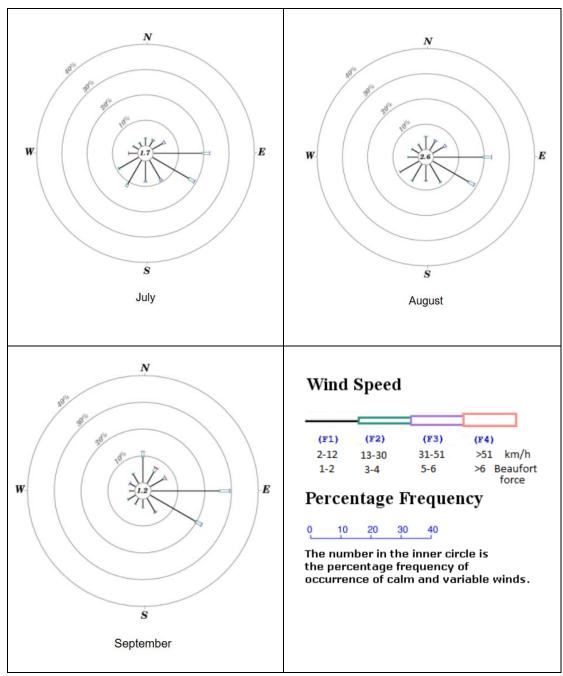


Figure 6-2 Summer Wind Rose for Tai Po, 1986 - 2024

#### Regional Atmospheric Modelling System (RAMS)

6.1.3. Wind availability to the Application Site is evaluated with reference to the "Consultancy Study on Establishment of Simulated Site Wind Availability Data for Air Ventilation Assessments in Hong Kong" simulated by the meso-scale model of Regional Atmospheric Modelling System (RAMS) Version 6.0 at the horizontal resolution of 0.5km \* 0.5km.

6.1.4. The Application Site is located within grid (073,083) in Fanling. Wind availability data at 200m was adopted in this assessment. According to PlanD's simulated data, wind roses, wind direction and wind probability data are provided in *Figure 6-3* and *Table 6-1*.

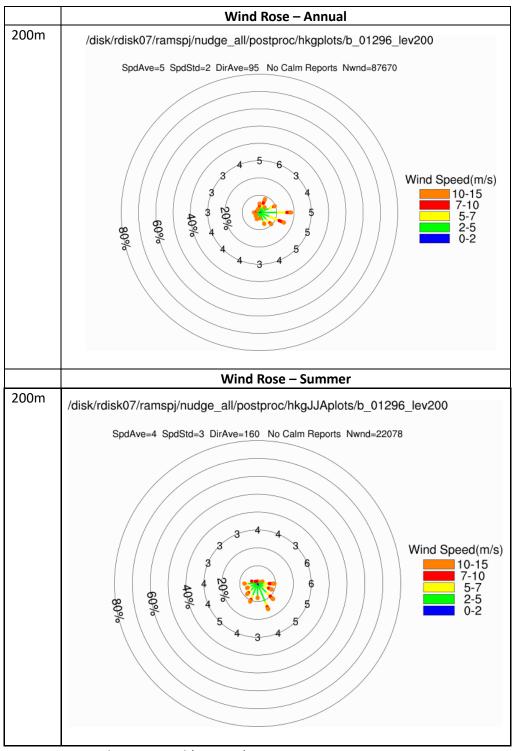


Figure 6-3 Wind Rose at Grid (073,083)

Table 6-1 Wind Probability at 200m (Grid 073,083)

Wind Direction	Annual Probability	Summer Probability
N	5%	1%
NNE	8%	1%
NE	4%	1%
ENE	10%	3%
E	18%	10%
ESE	15%	9%
SE	10%	12%
SSE	7%	16%
S	3%	8%
SSW	4%	11%
SW	3%	8%
WSW	2%	6%
W	3%	7%
WNW	2%	4%
NW	2%	2%
NNW	2%	1%

- 6.1.5. According to RAMS wind data, annual prevailing winds are the incoming winds flowing from the east and southeast quadrant while summer prevailing winds are flowing southwest and southeast quadrant.
- 6.1.6. *Table 6-2* summarises the identified prevailing wind conditions in Fanling area. Ta Kwu Ling Station is located inside the Ta Kwu Ling Farm at the northern part of the New Territories which is far away from the Application Site. For a comprehensive discussion on air ventilation performance of the Application Site and the wind environment at pedestrian level, prevailing winds from RAMS data are therefore adopted for air ventilation assessment.

Table 6-2 Wind Data Summary

Sources	Annual Wind	Summer Wind
Hong Kong Observatory (Tai Po station from 1986)	E, ESE	E, ESE
RAMS data (Grid 073,083)	ENE, E, ESE, SE	E, SE, SSE, SSW

# 7. Project Description

- 7.1.1. The Proposed Footbridge Connections, consisting of 2 sets of an open-sided covered walkway and single-storey weather-proof footbridge, is proposed to enhance the circulation of the Permitted Composite Commercial/Residential Development. No Commercial use is proposed within the Proposed Footbridge Connections.
- 7.1.2. The weather-proof footbridges would have a dimension of about 21.5 m (length) x 5 m (width) x 4.9 m (height), which will link up the retail uses of the two separated podium portions of the Development at 1/F. The top level of the weather-proof footbridge is merely about 20.95mPD with an overall height of 4.9m, while there is no enclosure to the 2/F to minimize the structural mass and enhance wind permeability. There Glass façade design will be adopted for the weather-proof footbridges to maximise the visual permeability on the NBA. A clearance of around 3.4m to 4.5m from the Ground is provided.
- 7.1.3. At 3/F, an open-sided covered walkway, with a dimension of about 21.5 m (length) x 3.5m (width) is proposed to connect the landscape areas and recreational facilities at 3/F for residents' enjoyment. Both sides of the walkway will be equipped with a 1100mm high non-perforated protective barrier, leaving a 3.4m full perforation at the top. Planters will be provided along the open-sided covered walkway to enhance the visual amenity of the Proposed Footbridge Connections.

#### 7.2. Surrounding Environment

**Urban Morphology** 

7.2.1. The Application Site is mainly surrounded by high-rise residential buildings (approx. 80-135 mPD). The surrounding environment is shown in *Table 7-1* and *Figure 7-1*.

Table 7-1 Building Heights of Major Development in the Surroundings

Surrounding Buildings	Building Heights (mPD)
Good View New Village	~24.4
Ling Shan Tsuen	~20.8
Fan Garden	~106
Wing Fok Centre	~91.4
Permitted Composite Commercial/Residential Development	~144
Proposed Private Housing	~80-132
Proposed Public Housing	~97.5-135
Proposed School	Max. 8-storey

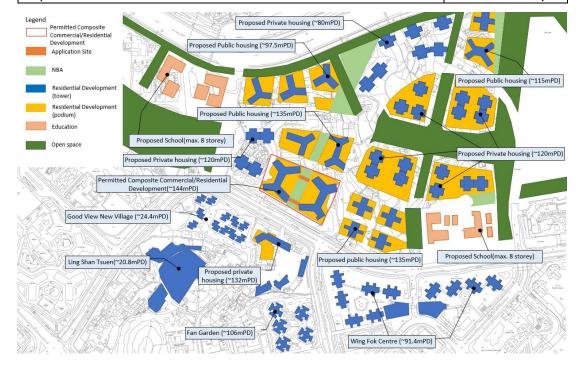


Figure 7-1 Surrounding environment

- 7.2.2. Road network facilitates wind penetration to the Application Site and the surrounding areas. The location of Proposed Footbridge Connections is at Residential (Group A) ("R(A)")1 site as shown in *Figure 4-1*. There are four NBAs aligned in NE to SW direction are designated within "R(A)1", "R(A)3" and "R(B)" sites in Planning Areas 13 and 14 to divert wind to penetrate through these sites to the Fanling area. Based on the Approved OZP, it is identified that the four NBAs are serving as a breezeway to enhance penetration of wind which is aligned approximately in northeast and southwest directions. These unobstructed breezeways allow the prevailing winds to penetrate into the built environment of the Area as well as the downstream Fanling/Sheung Shui area.
- 7.2.3. Further to the south-west of the Proposed Footbridge Connections, there is a high-rise proposed private Housing (~132mPD) located at site R(A)12. Therefore, prevailing ENE wind penetrate through the four NBAs and likely to collide at the high-rise building in site R(A)12, leading to a downwash effect at Ma Sik Road. On the other hand, only incoming wind at high level could skim over the high-rise building at southwest and the wind flowing through the gap between proposed private housing (~132mPD) and Good View New Village reach the Application Site. Open space is situated to the east and west of the Application Site, as illustrated in *Figure 7-1*, with high-rise buildings surrounding the Application site.

#### **Topography**

7.2.4. The Application Site is located on relatively flat area of about 12.5mPD that shares similar topography to its immediate area. Hilly topographies are found lying to the north of the Application Site with increasing topological heights further away from the Application Site. The hilly terrain act as a shelter to the annual ENE prevailing winds, and reduce the magnitude of this wind.

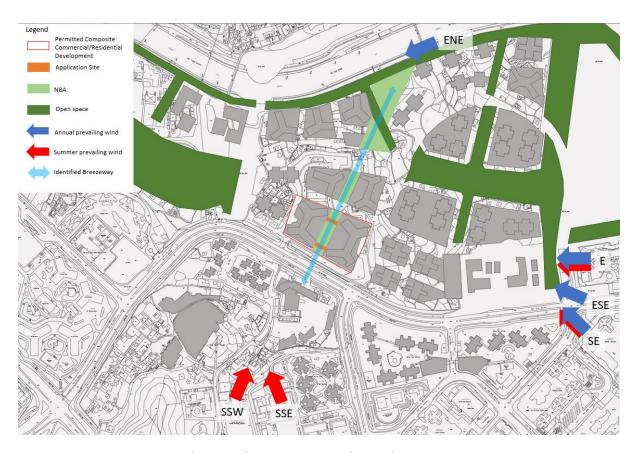


Figure 7-1 Prevailing Wind Environment in the Study Area

# 8. Baseline Scheme and Scheme with Proposed Footbridge Connections

#### 8.1. Design Parameters

- 8.1.1. The Application Site is at the tail-end of the four designated NBA sites in Planning Areas 13 and 14, where is currently zoned R(A)1 on the Approved Fanling North OZP No. S/FLN/4. The existing condition of the NBA is incorporated in Baseline Scheme (i.e. without the footbridge and with the planned development) and is compared with the Scheme with Proposed Footbridge Connections in the discussion of this report.
- 8.1.2. The major design parameters of Proposed Footbridge Connections are summarized in *Table 8-1.* Layout plans and section drawing are shown in *Appendix A.* Comparison between Baseline Scheme (Reference to Approved Scheme for Permitted Composite Commercial/ Residential Development under Planning Application No. A/FLN/32' (i.e. BH of 144.14mPD)) and the Scheme with Proposed Footbridge Connections are made to evaluate any impacts on the overall air ventilation performance in its surrounding area.

Table 8-1 Major design parameters of Scheme with Proposed Footbridge Connections

Parameter	Proposed Footbridge Connections
Site Area (m²)	Approx. <mark>215</mark> m²
Gross Floor Area (m²)	Not more than 215m <sup>2</sup>
Site Coverage (SC) (%) - Podium - Residential Tower	<ul><li>Not more than 63.99% [1]</li><li>Not more than 37.5%</li></ul>
Dimensions of the Proposed Footbridge Connections (length, width, height)	
<ul><li>1-storey Weather- Proof Footbridge</li><li>Open-Sided Covered Walkway</li></ul>	21.5 m (L) x <mark>5</mark> m (W) x <mark>4.9</mark> m (H) 21.5 m (L) x <mark>3.5</mark> m (W)

#### Note:

[1]: An additional SC of 1.49% to account for the Proposed Footbridge Connections to the Approved SC of 62.5% for the Podium of the Approved Development under TPB No. A/FLN/32. For height of building not exceeding 15m, the maximum SC allowable under the Building (Planning) Regulations shall be 100%.

#### 8.2. Design Features of Proposed Footbridge Connections

#### Clearance at pedestrian level

8.2.1. The Proposed Footbridge Connections are erected that leaving a clearance of around 3.4m to 4.5m from the ground as shown in *Figure 8-1*. This design is to maintain the wind corridor to the prevailing wind at ground level and beneficial to the downwind areas. It is anticipated that the incoming wind at low-level could penetrate through the Proposed Footbridge Connections and high-level wind will not be obstructed by the Proposed Footbridge Connections. It is anticipated the wind environment at pedestrian level would not be significantly affected.

#### Weather-proof Footbridge with an open-sided covered walkway

8.2.2. The structures of the Proposed Footbridge Connections are only minimal – its SC is merely not more than 1.49 % to the SC of 63.99% for the Podium of the Approved Development under TPB No. A/FLN/32. A wake zone would be created on the immediate leeward side of the Proposed Footbridge Connections. However, since the top level of the weather-proof footbridge is merely about 20.95mPD with an overall height of 4.9m as shown in *Figure 8-1*, it is expected that the adverse impact on downwind areas will be reduced due to its minimal obstruction. In addition, both sides of the open-sided covered walkway will be equipped with a 1100mm high non-perforated protective barrier, leaving a 3.4m full perforation at the top, it poses minimal obstruction to the incoming wind and would not induce significant obstruction to the downwind areas.

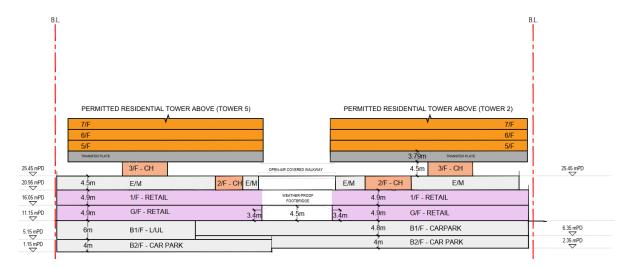


Figure 8-1 Section of the Proposed Footbridge Connections

# 9. Expert Evaluation

**ENE wind (Annual Prevailing Wind)** 

- 9.1.1. Under annual prevailing wind condition, incoming ENE wind would flow along the NBAs at the north and reach the Application Site as shown in *Figure 9-1*.
- 9.1.2. Under the Baseline Scheme, ENE wind could penetrate through the Application Site and reach the downwind area of proposed private housing (~132mPD) across Ma Sik Road. The prevailing wind would collide at the high-rise proposed private housing development and thus lead to a downwash effect at Ma Sik Road.
- 9.1.3. Under the Scheme with Proposed Footbridge Connections, part of the prevailing ENE wind at low-level would collide at the Proposed footbridge and a wake zone would be created on the immediate leeward side of the Proposed Footbridge Connections. However, since the Proposed Footbridge Connections are erected that leaving a clearance of around 3.4m to 4.5m from the ground and the top level of the weather-proof footbridge is merely about 20.95mPD with an overall height of 4.9m, it is expected that the adverse impact on downwind areas will be minimal due to the relatively small structure of Proposed Footbridge Connections. It is anticipated that the incoming wind at low-level could penetrate through and will not significantly affect the wind environment at pedestrian level. In addition, there would be no obstruction in the NBA at high-level and the high-level prevailing ENE wind could flow freely through the Application Site to downwind areas.
- 9.1.4. In addition, both sides of the open-sided walkway above the weather-proof footbridge will be equipped with a 1100mm high non-perforated protective barrier, leaving a 3.4m full perforation at the top, which poses minimal obstruction to the incoming wind and would not induce significant obstruction to the downwind areas. Similar to the scenario of the Baseline Scheme, the prevailing wind would collide at the high-rise proposed private housing development and thus lead to a downwash effect at Ma Sik Road.
- 9.1.5. Therefore, significant adverse impact from the Proposed Footbridge Connections to the wind performance at the downwind area is not anticipated.

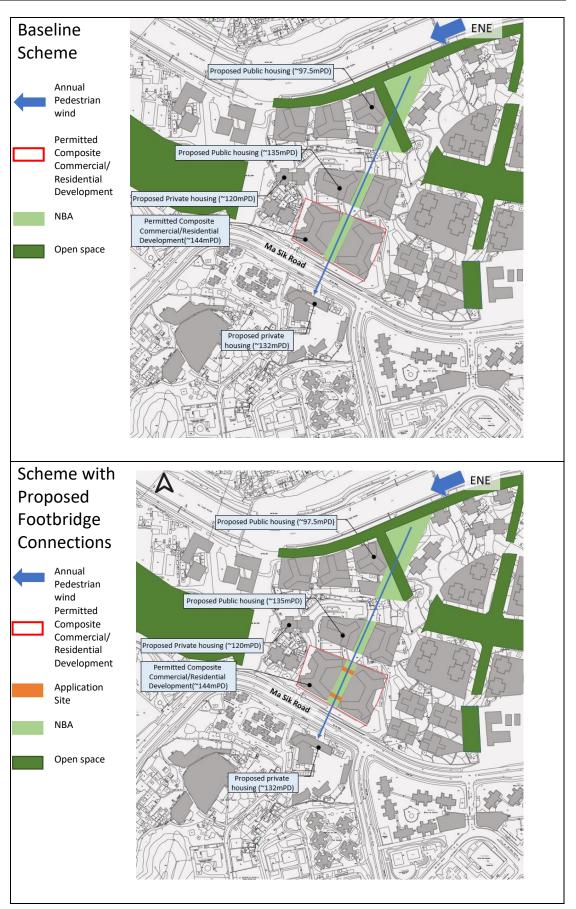


Figure 9-1 Annual Prevailing Wind (ENE Wind)

E and SE wind (Annual and Summer Prevailing Wind) and ESE (Annual Prevailing Wind)

- 9.1.6. Incoming E and SE wind under annual and summer wind condition and ESE wind under annual condition from open space and Road L2 would flow through the Application Site as shown in *Figure 9-2*.
- 9.1.7. Under the Baseline Scheme, the high-rise buildings located at the east of the Application Site (i.e. the Permitted Composite Commercial/Residential Development and the proposed private/public housing developments, etc.) with about 120-144mPD which block the prevailing E and ESE wind from reaching the Application Site. Most of the prevailing wind would be diverted and flow through the Road L2 and Ma Sik Road and reach the downwind areas of Application Site (i.e. open space). Eventually, cross winds in N-S direction would flow across the site through the NBA.
- 9.1.8. Under the Scheme with Proposed Footbridge Connections, similar to the baseline scheme, the prevailing wind would reach the Application Site through the two air paths, i.e. Road L2 and Ma Sik Road. Given that the Proposed Footbridge Connections are erected that leaving a clearance of around 3.4m to 4.5m from the ground, where the low-level cross winds could flow through. Hence, it is anticipated that the ventilation impact induced by the provision of Proposed Footbridge Connections is minimal.
- 9.1.9. Therefore, it is anticipated that the provision of Proposed Footbridge Connections would not cause significant ventilation impact under E, SE and ESE wind.

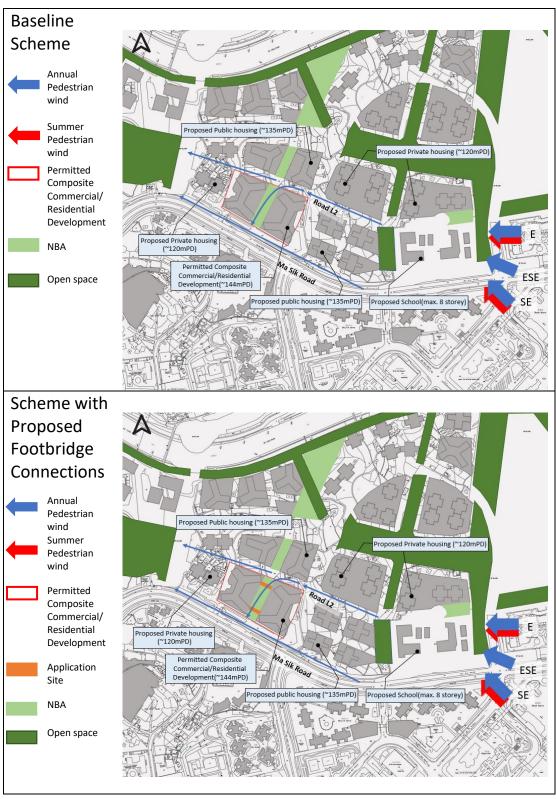


Figure 9-2 Annual Prevailing Wind (E, ESE and SE Wind)

SSW and SSE wind (Summer Prevailing Wind)

- 9.1.10. Under summer prevailing wind conditions, SSW and SSE wind would flow from the directions at the high-rise buildings (i.e. proposed private housing with 132mPD) located at the immediate southwest and reach the Application Site as shown in *Figure 9-3*.
- 9.1.11. Under the Baseline Scheme, the high-rise buildings at the immediate southwest of Application Site reduces the wind penetration to Application Site by generating wake zone at Application Site as shown in *Figure 9-3*. The Application Site is predominantly shielded by these high-rise buildings. Only incoming wind at high level could skim over the high-rise building at southwest and the wind flowing through the gap between proposed private housing (~132mPD) and Good View New Village reach the Application Site.
- 9.1.12. Similarly, under the Scheme with Proposed Footbridge Connections, due to the existing obstruction to the incoming SSW and SSE wind at the high-rise buildings at the immediate southwest of Application Site, only incoming wind at high level could skim over the high-rise building at southwest and the wind flowing through the gap between proposed private housing (~132mPD) and Good View New Village reach the Application Site. In this connection, it is anticipated that the Weather-proof Footbridge topping at around 20.95mPD with an overall height of 4.9m would have minimal obstruction to the high-level wind. In addition, both sides of the open-sided walkway on the above will be equipped with a 1100mm high non-perforated protective barrier, leaving a 3.4m full perforation at the top, which poses minimal obstruction to the incoming high-level wind and would not induce significant obstruction to the downwind areas.
- 9.1.13. Nevertheless, the Proposed Footbridge Connections are erected leaving a clearance of around 3.4m to 4.5m from the ground, it is expected that the prevailing wind could penetrate through the clearance at the pedestrian level.
- 9.1.14. Hence, the adverse impact on downwind areas of Application Site will be minimal due to the relatively small structure of Proposed Footbridge Connections.

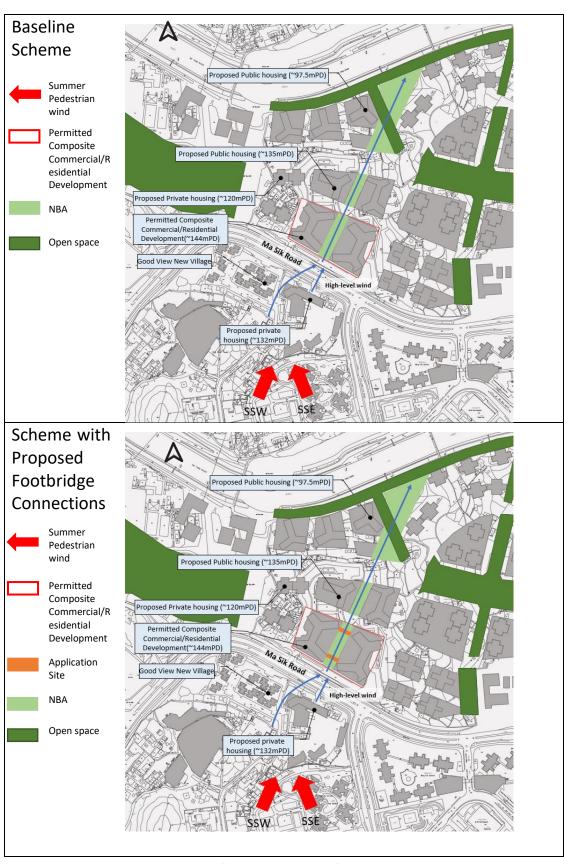
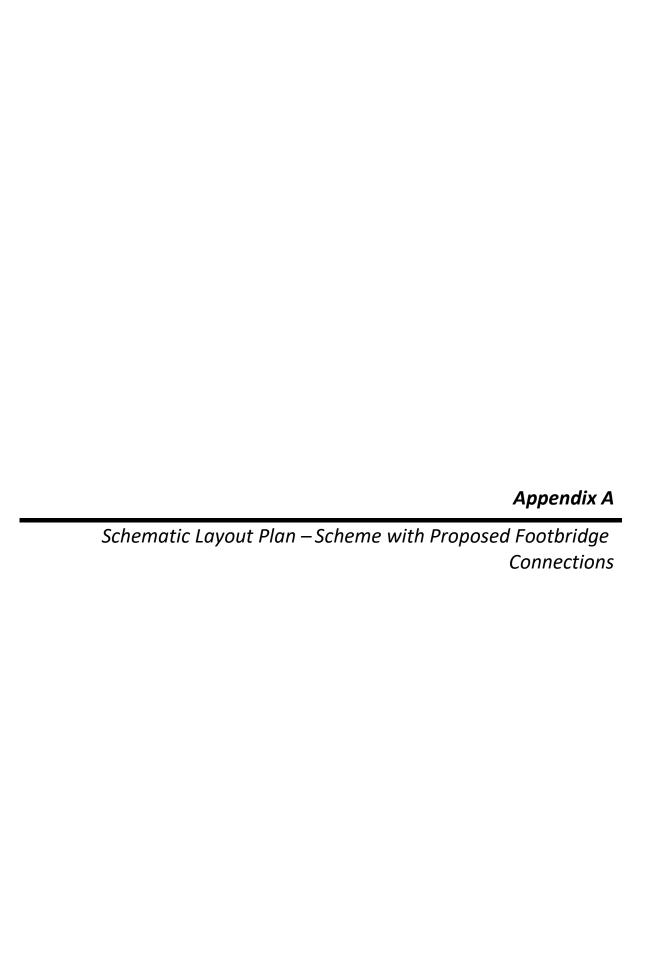


Figure 9-3 Summer Prevailing Wind (SSW and SSE Wind)

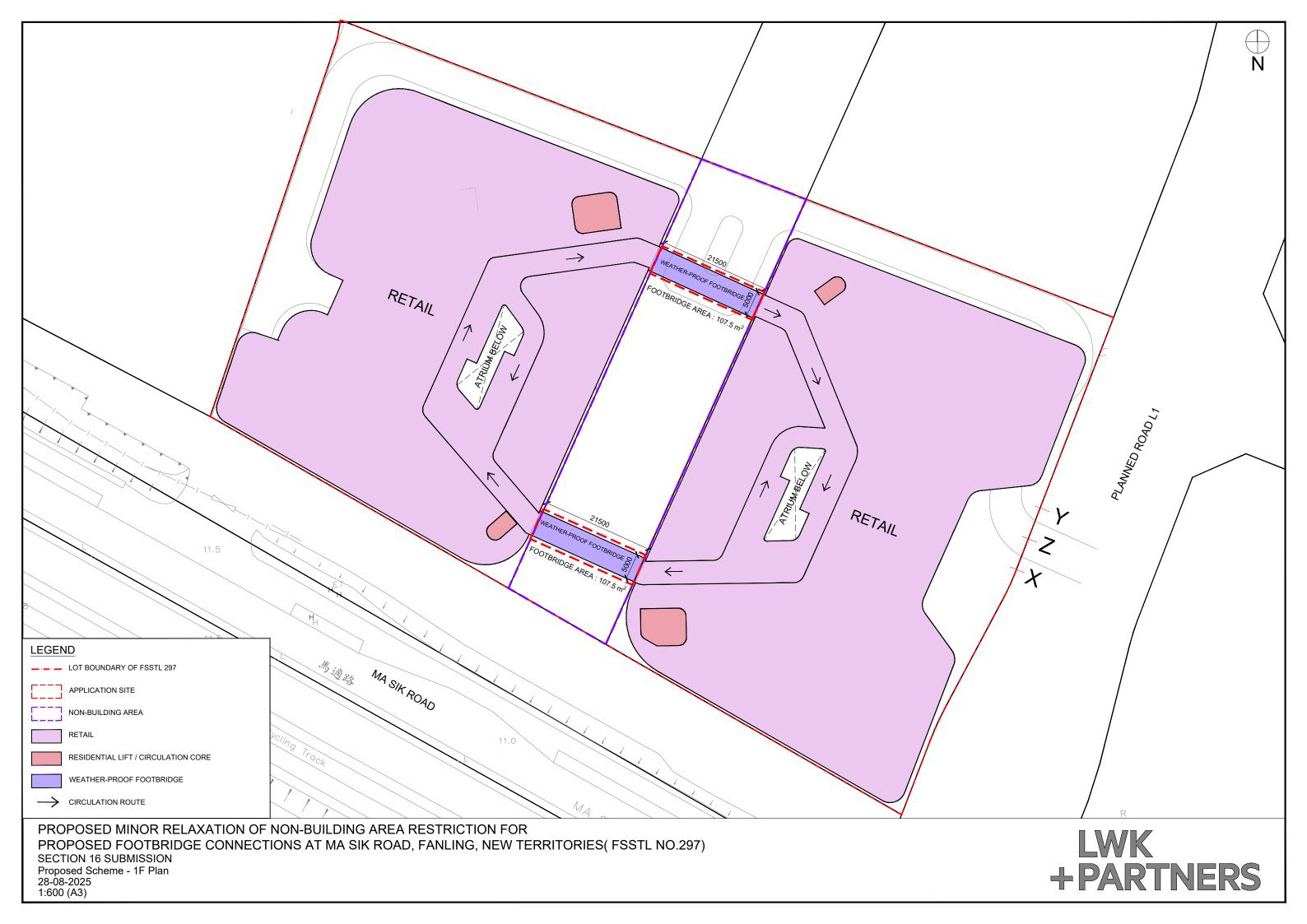
## 10. Conclusions

- 10.1.1. An AVA-EE study was conducted for the Proposed Minor Relaxation of Non-Building Area Restriction for Proposed Footbridge Connections at Ma Sik Road to provide qualitative evaluation of wind performance under Baseline Scheme and that with the Proposed Footbridge Connections.
- 10.1.2. Under Annual condition, most annual prevailing winds (E, ESE, SE wind) flow along Road L2 and Ma Sik Road and some cross winds in N-S direction would flow from Road L2 across the Application Site through the NBA. On the other hand, the third prevailing ENE wind could penetrate the Application Site through the NBA and reach the downwind areas. In general, it is expected that the adverse impact on downwind areas will be minimal due to the relatively small structure of Proposed Footbridge Connections comparing to baseline scheme. Also, it is anticipated that the incoming wind at low level could penetrate through the Proposed Footbridge Connections and will not be significantly affect the wind environment at pedestrian level.
- 10.1.3. Under Summer condition, the high-rise buildings at the immediate southwest of Application Site reduces the wind penetration from incoming SSW and SSE wind to Application Site by generating wake zone at Application Site under baseline scheme. Under the Scheme with Proposed Footbridge Connections, only incoming wind at high level could skim over the high-rise building at southwest and the wind flowing through the gap between proposed private housing (~132mPD) and Good View New Village reach the Application Site reach the Application Site. In this connection, it is anticipated that the relatively small Proposed Weather-proof Footbridge Connections would have minimal obstruction to the high-level wind.
- 10.1.4. To reduce any ventilation impact, the Proposed Footbridge Connections are erected that leaving a clearance of around 3.4m to 4.5m from the ground. Since the top level of the weather-proof footbridge is merely about 20.95mPD with an overall height of 4.9m, it is expected that the adverse impact on downwind areas will be minimal due to the relatively small structure of Proposed Footbridge Connections. It is anticipated that the incoming wind at low-level could penetrate through and will not be significantly affect the wind environment at pedestrian level. In addition, there would be no obstruction in the NBA at high-level and the high-level prevailing wind could flow freely through the Application Site.

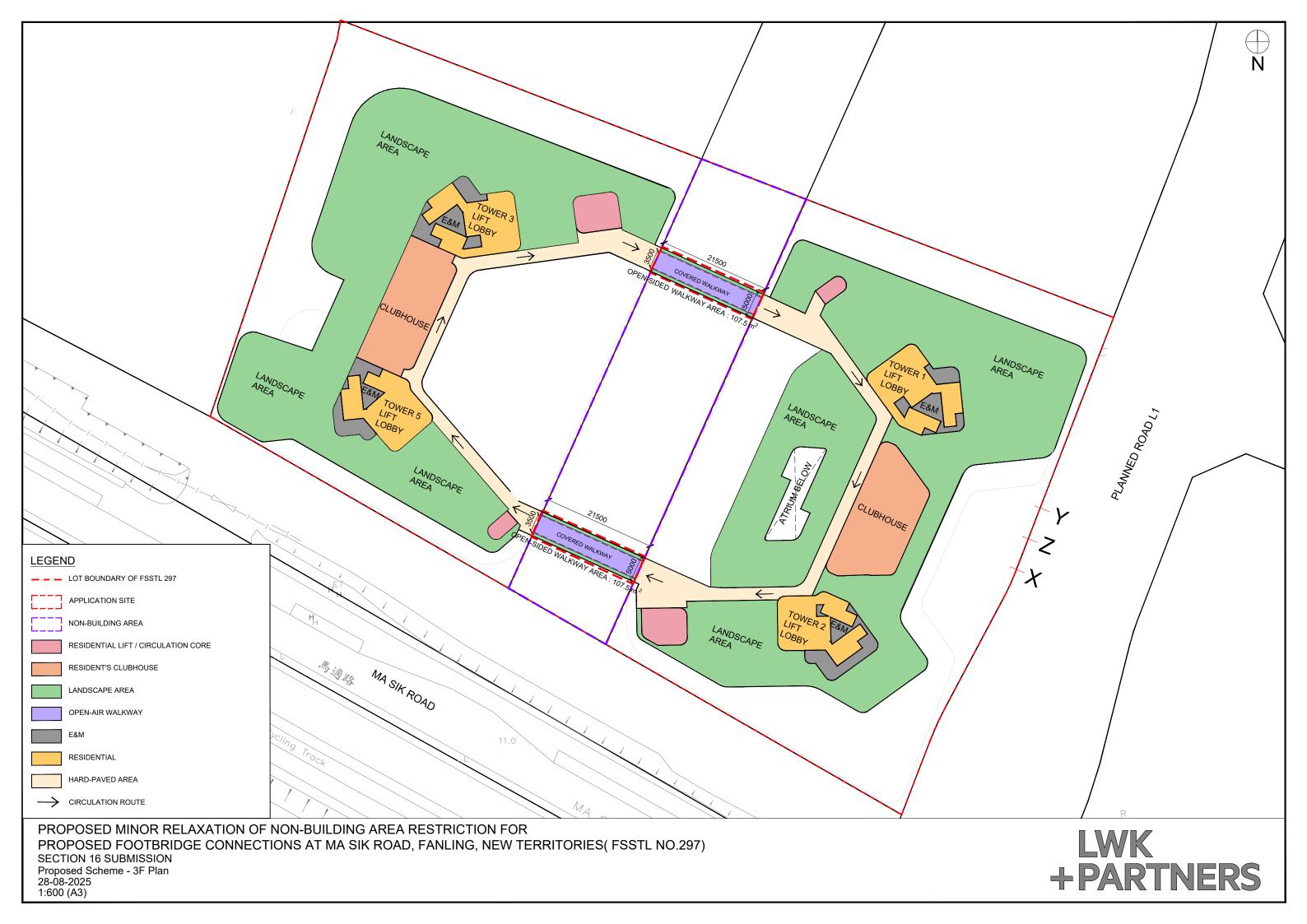
10.1.5. As evaluated in the AVA-EE, with the provision of abovementioned design features, it is anticipated that there will be no significant adverse impact to the wind environment in the surrounding area associated with the Proposed Footbridge Connections.

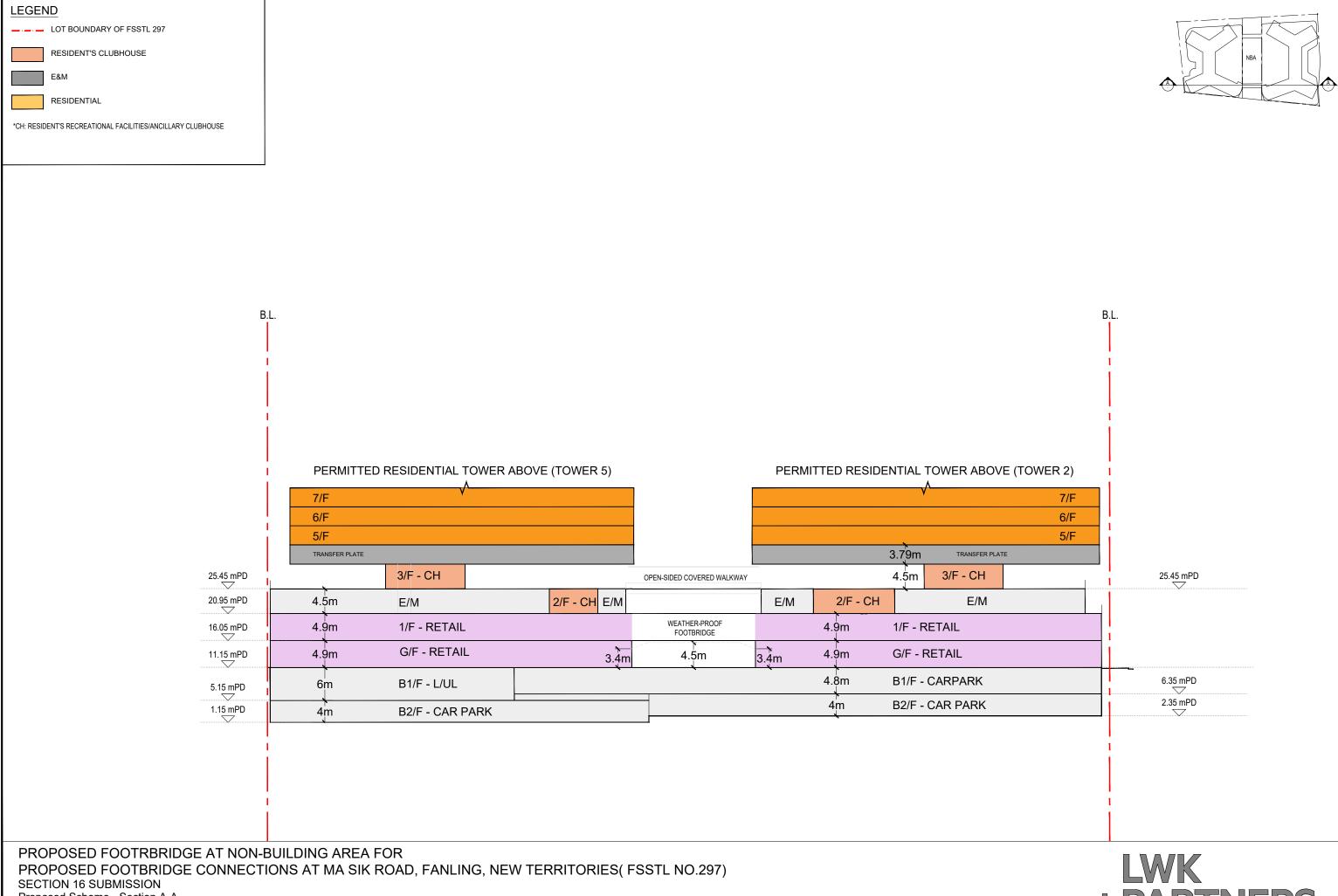












Proposed Scheme - Section A-A 28-08-2025 1:600 (A3)

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