WINDTECH

PEDESTRIAN WIND ENVIRONMENT STATEMENT

MELROSE PARK HIGH SCHOOL, MELROSE PARK

WJ017-01F02(REV2)- WS REPORT

JANUARY 14, 2025

Prepared for:

NSW Department of Education

105 Phillip Street, Parramatta, NSW, 2150

AT THE LEADING EDGE

WINDTECH CONSULTANTS
www.windtechconsult.com
reception@windtechglobal.com

Sydney | Singapore | London | Melbourne | Mumbai | New York | Hong Kong | Dubai | Miami | Toronto

DOCUMENT CONTROL

Date	Revision History	Issued Revision	Prepared By (initials)	Instructed By (initials)	Reviewed & Authorised by (initials)
November 7, 2024	Initial.	0	BY	MM	MLO
November 27, 2024	Updated report structure	1	BY	MM	MLO
January 14, 2025	Update to latest drawings and preamble text	2	MLO	MM	GC

EXECUTIVE SUMMARY

This report presents an opinion on the likely impact of the Melrose Park High School, located in Melrose Park, on the local wind environment at the critical outdoor areas within and around the subject site. The effect of wind activity has been examined for the three predominant wind directions for the region, namely the north-easterly, south to south-easterly, and westerly winds. The analysis of the wind effects relating to the proposed development have been carried out in the context of the local wind climate, building morphology and land topography.

The conclusions of this report are drawn from our extensive experience in this field and are based on an examination of the latest architectural drawings. No wind tunnel testing has been undertaken for the subject development, and hence this report addresses only the general wind effects and any localised effects that are identifiable by visual inspection of the architectural drawings provided (received 28 October 2024). Any recommendations in this report are made only in-principle and are based on our extensive experience in the study of wind environment effects.

The results of this assessment indicate that the development has incorporated several design features and wind mitigating strategies and is expected to be suitable for the intended use for the majority of the outdoor trafficable areas. However, there are some areas that are likely to be exposed to stronger winds. It is expected that the wind effects identified in the report can be ameliorated with the consideration of the following mitigation measures into the design of the development:

- Ground level areas (Stage 1 and 2):
    - Retention of the proposed trees, ensuring they are of densely foliating evergreen variety.
    - Inclusion of additional densely foliating evergreen trees in between Blocks A and B, and along the eastern aspect of Block D (Stage 2 only).
- Level 1 - 4 External Walkway (Stage 1 and 2)
    - Inclusion of at least 1.3m high balustrades ensuring they are 30% porous.
- Level 5 Terrace (Stage 2)

  Option A:
    - Inclusion of at least 1.5m high balustrades ensuring they are 30% porous.
    - Inclusion of planter boxes, ensuring they contain plants of a densely foliating evergreen variety and reach a combined height of at least 1.5m.

  Option B:
    - Inclusion of at least 1.8m high balustrades ensuring they are 30% porous.

With the inclusion of the abovementioned recommendations in the final design, it is expected that wind conditions for the various trafficable outdoor areas within and around the development will be suitable for their intended uses, and that the wind speeds will satisfy the applicable criteria for pedestrian comfort and safety.

CONTENTS

1 INTRODUCTION

This desktop pedestrian wind comfort assessment report has been prepared by Windtech Consultants on behalf of the Department of Education (DoE) to assess the potential environmental impacts that could arise from the construction and use of the new Melrose Park High School project (the Activity) at 37 Hope Street, Melrose Park. This report supports the assessment of the proposed Activity under Part 5 of the Environmental Planning and Assessment Act 1979. The Activity is proposed by the DoE to meet the growth in educational demand in the Melrose Park precinct.

This report has been prepared to present an opinion on the likely impact of the proposed design on the local wind environment affecting pedestrians within the critical outdoor areas within and around the subject development is presented in this report. The analysis of wind effects relating to the proposed development has been carried out in the context of the predominant wind directions for the region, building morphology of the development and nearby buildings, and local land topography. The conclusions of this report are drawn from our extensive experience in the field of wind engineering and studies of wind environment effects. No wind tunnel testing has been undertaken for this assessment. Hence this report addresses only the general wind effects and any localised effects that are identifiable by visual inspection, and any recommendations in this report are made only in-principle.

A list of the architectural drawings referenced for this assessment is provided in the table below in Table 1.

Table 1: List of Architectural Drawings Referenced
(used for the determination of results of this assessment)

Drawing No. and Title	Rev	Date
GENERAL ARRANGEMENT PLAN - STAGE 1	T1	15/11/2024
GENERAL ARRANGEMENT PLAN - STAGE 2 (FOR INFORMATION)	T1	15/11/2024
OVERALL GROUND FLOOR PLAN (STAGE 1)	16	19/12/2024
OVERALL GROUND FLOOR PLAN (STAGE 2)	16	19/12/2024
OVERALL LEVEL 1 PLAN (STAGE 1)	15	19/12/2024
OVERALL LEVEL 1 PLAN (STAGE 2)	15	19/12/2024
OVERALL LEVEL 2 PLAN (STAGE 1)	15	19/12/2024
OVERALL LEVEL 2 PLAN (STAGE 2)	15	19/12/2024
OVERALL LEVEL 3 PLAN (STAGE 1)	15	19/12/2024
OVERALL LEVEL 3 PLAN (STAGE 2)	15	19/12/2024
OVERALL LEVEL 4 PLAN (STAGE 1)	16	19/12/2024
OVERALL LEVEL 4 PLAN (STAGE 2)	16	19/12/2024
OVERALL LEVEL 5 PLAN (STAGE 1)	15	19/12/2024
OVERALL LEVEL 5 PLAN (STAGE 2)	15	19/12/2024
OVERALL ROOF PLAN (STAGE 1)	15	19/12/2024
OVERALL ROOF PLAN (STAGE 2)	14	19/12/2024

Drawing No. and Title	Rev	Date
SITE PLAN (STAGE 1)	15	19/12/2024
SITE PLAN (STAGE 2)	15	19/12/2024
SITE ELEVATIONS SHEET 1	9	19/12/2024
SITE ELEVATIONS SHEET 2	10	19/12/2024

The proposed activity involves the construction and use of a new high school in two stages for approximately 1,000 students.

Stage 1 of the proposed activity includes the following:

- Site preparation works.
- Construction of Block A – a six-storey (with additional roof/plant level) school building in the south-western portion of the site containing staff rooms and General Learning Spaces (GLS).
- Construction of Block B – a one storey (double height) hall, gymnasium, canteen and covered outdoor learning area (COLA) building in the south-eastern portion of the site.
- Construction of Block C – a single storey plant and storage building at the north-eastern portion of the site.
- Associated landscaping.
- Construction of on-site car parking.
- Provision and augmentation of services infrastructure.
- Associated public domain infrastructure works to support the school, including (but not limited to):
    - Provision of kiss and drop facilities along Wharf Road and widening of the Wharf Road footpath.
    - Raised pedestrian crossings on Wharf Road and Hope Street.

Stage 2 of the proposed activity includes the following:

- Construction of Block D – a five-storey (with additional roof/plant level) school building in the north-western portion of the site containing staff rooms and GLS:
- Additional open play spaces within the terrace areas of Block D.
- Minor layout amendments to Block A.

The Review of Environmental Factors prepared by Ethos Urban provides a full description of the proposed works.

For reference, the following REF requirement is addressed in this report:

Table 2 A REF Requirement

Item	REF Requirement	Relevant Section of Report
1	Desktop Pedestrian Wind Comfort Assessment	Section 5 – Results, Discussion and Mitigation Measures

2 DESCRIPTION OF DEVELOPMENT AND SURROUNDINGS

The site is located at 37 Hope Street, Melrose Park within the Parramatta LGA. The school covers an approximate area of 9,500m^2 and is generally rectangular in shape. The site is currently cleared and vacant. The site is located approximately 8km east of the Parramatta CBD. The site is bounded by Wharf Road to the east, Hope Street to the south, and construction plots to the west, for proposed 24-storey and 8-storey buildings, and north, for a proposed communal playing field. The buildings surrounding the subject development are predominately low-rise residential and commercial buildings, with a few mid-rise apartment buildings to the north, golf course to the east and the Parramatta River to the south.

A survey of the land topography indicates a hill towards the north-west, however, there are no major elevation changes in the area immediately surrounding the site. An aerial image of the subject site and the local surroundings is shown in Figure 1, with the frequency and magnitude of the prevailing winds is superimposed for each wind direction.

The existing site consists of an empty construction plot. The proposed development is 6 storeys high.

The critical outdoor trafficable areas associated with the proposed development, which are the focus of this assessment with regards to wind effects, are listed as follows:

- Ground Level areas and pedestrian footpath (Stage 1).
- Ground Level areas and pedestrian footpath (Stage 2).
- Level 1 - 4 External Walkway (Stage 1 and Stage 2).
- Level 5 Terrace (Stage 2).

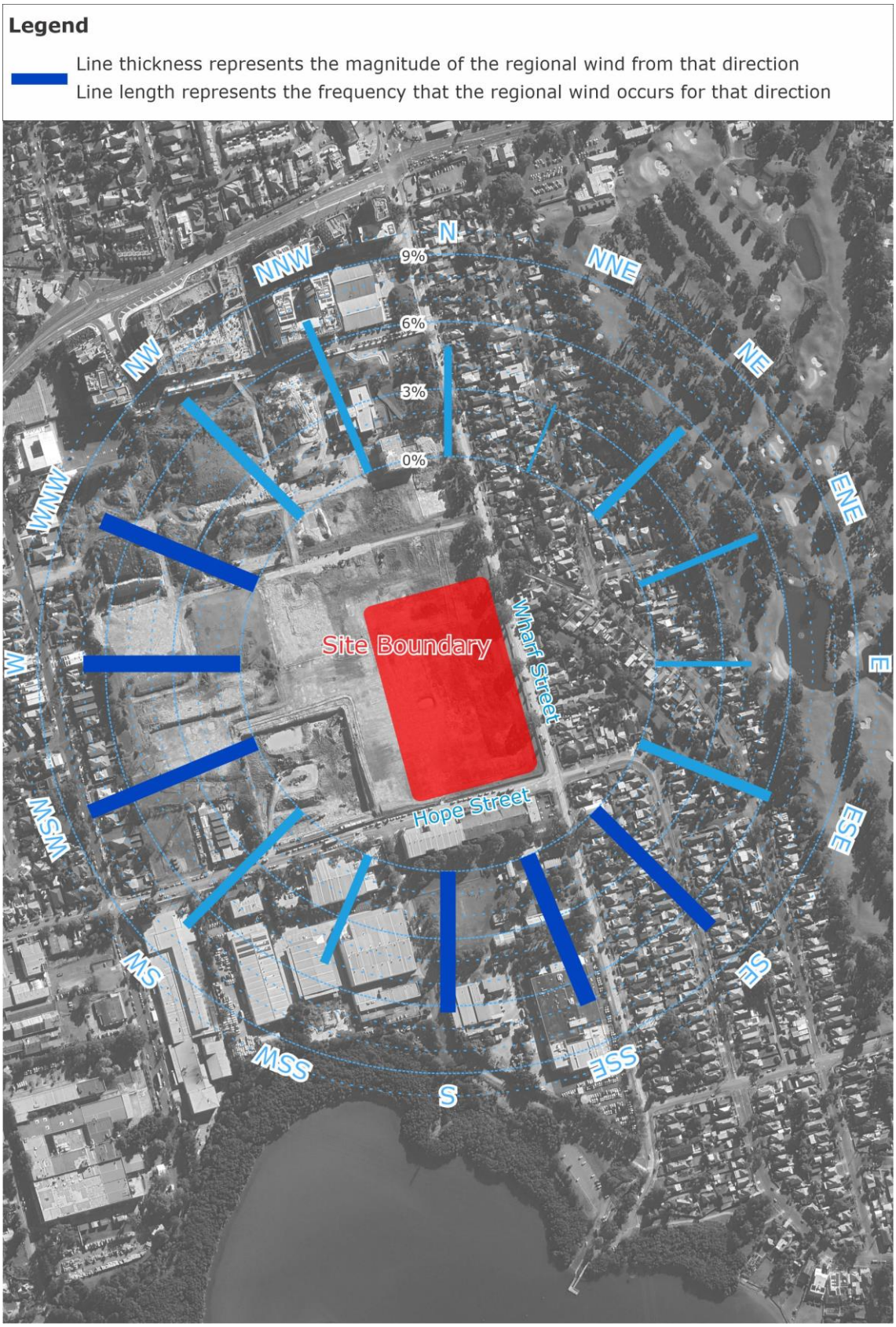

Figure 1: Aerial Image of the Site Location and Prevailing Wind Directions

3 REGIONAL WIND

The Melrose Park region is governed by three principal wind directions that can potentially affect the subject development. These winds prevail from the north-east, south to south-easterly, and west. These wind directions were determined from an analysis undertaken by Windtech Consultants of recorded directional wind speeds obtained from the meteorological station located at Bankstown Airport by the Bureau of Meteorology (recorded from 1993 to 2016). The data has been corrected to represent winds over standard open terrain at a height of 10m above ground level. The results of this analysis are presented in Figure 2 in the form of a directional plot of the annual and 5% exceedance mean winds for the region. The frequency of occurrence of these winds is also shown in Figure 2.

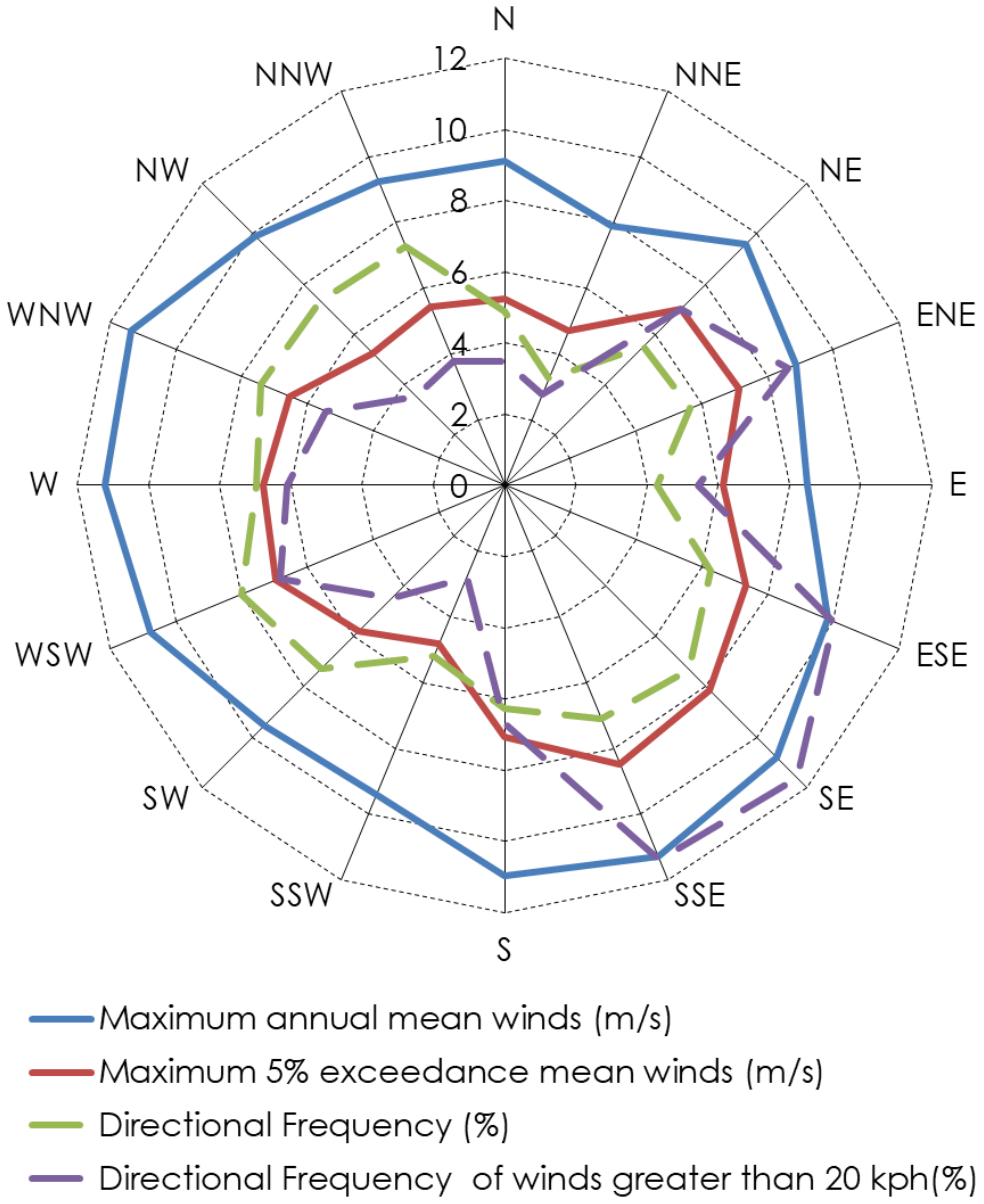

Figure 2: Directional Annual and 5% Exceedance Hourly Mean Wind Speeds (referenced to 10m height in standard open terrain), and Frequencies of Occurrence, for the Melrose Park Region

4 WIND EFFECTS ON PEOPLE

The acceptability of wind in any area is dependent upon its use. For example, people walking, or window-shopping will tolerate higher wind speeds than those seated at an outdoor restaurant. Various other researchers, such as A.G. Davenport, T.V. Lawson, W.H. Melbourne, and A.D. Penwarden, have published criteria for pedestrian comfort for pedestrians in outdoor spaces for various types of activities. Some Councils and Local Government Authorities have adopted elements of some of these into their planning control requirements.

For example, A.D. Penwarden (1973) developed a modified version of the Beaufort scale which describes the effects of various wind intensities on people. Table 3 presents the modified Beaufort scale. Note that the effects listed in this table refers to wind conditions occurring frequently over the averaging time (a probability of occurrence exceeding 5%). Higher ranges of wind speeds can be tolerated for rarer events.

Table 3: Summary of Wind Effects on People (A.D. Penwarden, 1973)

Type of Winds	Beaufort Number	Mean Wind Speed (m/s)	Effects
Calm	0	Less than 0.3	Negligible.
Calm, light air	1	0.3 – 1.6	No noticeable wind.
Light breeze	2	1.6 – 3.4	Wind felt on face.
Gentle breeze	3	3.4 – 5.5	Hair is disturbed, clothing flaps, newspapers difficult to read.
Moderate breeze	4	5.5 – 8.0	Raises dust, dry soil and loose paper, hair disarranged.
Fresh breeze	5	8.0 – 10.8	Force of wind felt on body, danger of stumbling
Strong breeze	6	10.8 – 13.9	Umbrellas used with difficulty, hair blown straight, difficult to walk steadily, wind noise on ears unpleasant.
Near gale	7	13.9 – 17.2	Inconvenience felt when walking.
Gale	8	17.2 – 20.8	Generally impedes progress, difficulty balancing in gusts.
Strong gale	9	Greater than 20.8	People blown over.

It should be noted that wind speeds affecting this particular development can only be accurately quantified with a wind tunnel study. This assessment addresses only the general wind effects and any localised effects that are identifiable by visual inspection and the acceptability of the conditions for outdoor areas are determined based on their intended use. Any recommendations in this report are made only in-principle and are based on our extensive experience in the study of wind environment effects.

5 RESULTS AND DISCUSSION AND MITIGATION MEASURES

The expected wind conditions affecting the development are discussed in the following sub-sections of this report for the various outdoor areas within and around the subject development. The interaction between the wind and the building morphology in the area is considered and important features taken into account including the distances between the surrounding buildings and the proposed building form, as well as the surrounding landform. Note that only the potentially critical wind effects are discussed in this report. A glossary of the different wind effects described in this report included in Appendix A.

For this assessment, the wind speed criteria for pedestrian comfort that are considered are listed as follows:

- Walking Criterion (8m/s with a 5% probability of exceedance)
  for general circulation and pedestrian thoroughfares, e.g. footpaths, private balconies/terraces, through-site links etc.

- Standing (Short Exposure) Criterion (6m/s with a 5% probability of exceedance)
  for stationary activities generally less than an hour, e.g. waiting areas, communal terraces, main entries, café seating etc.

- Sitting (Long Exposure) (4m/s with a 5% probability of exceedance)
  for stationary activities longer than an hour, e.g. outdoor cinemas, outdoor fine dining etc.

Note that the above wind comfort levels are derived from the Lawson (1975) criteria. Although this assessment is qualitative in nature, the abovementioned criteria for pedestrian comfort are considered when assessing the wind environment impacts. However, all areas are also assessed with consideration to a pedestrian safety criterion of 23m/s for the annual maximum gust.

5.1 Ground Level Areas (Stage 1)

The pedestrian footpath along Wharf Road is primarily exposed to the north-easterly and south to south-easterly prevailing winds. Due to the building setback of Block B, it is unlikely that the development will have any additional effect on pedestrian footpath along Wharf Road.

The pedestrian footpath along Hope Street is exposed to the westerly and south to south-easterly prevailing winds. The southerly to south-easterly prevailing winds are likely to downwash along the southern façade of both Blocks A and B, while the westerly prevailing winds have the potential to side stream along the façade of these buildings. It is recommended that the proposed trees are to be retained in the final design and that they are of foliating evergreen variety.

The pedestrian footpath along the future road to the west of the site is exposed to the westerly prevailing winds. The prevailing wind is likely to downwash off Block A, impacting the wind comfort of the area. It is recommended that the proposed trees along the future road are retained in the final design.

The open area between Blocks A and B are exposed to the north-easterly and south to south-easterly prevailing winds. The prevailing winds have the potential to funnel between Blocks A and B and adversely affect the area. The prevailing winds also has the potential to downwash along Block A's eastern façade, further impacting the wind comfort of the area. It is recommended that additional trees are included in this area to ameliorate the adverse wind effect.

The northern area of the development, including the basketball and the Car Park, are exposed to the north-easterly and the westerly prevailing winds. The north-easterly winds are likely to flow over the low-rise residential housing and impact the area directly. The westerly winds are also likely to impact the area with limited amount of shielding from adjacent buildings. It is recommended that the proposed tree planting to be retained.

With the inclusion of the above-mentioned treatments, the Stage 1 Ground Level Areas are expected to suitable for its intended purpose. These mitigation measures are also shown in Figure 3:

<u>Mitigation Measures (Ground Level Areas - Stage 1):</u>

- Retention of the proposed trees, ensuring they are of densely foliating evergreen variety.
- Inclusion of additional densely foliating evergreen trees in between Blocks A and B.

5.2 Ground Level Area (Stage 2)

With the inclusion of Block D, the building provides additional shielding effects to the north-eastern areas of the school, however adverse wind conditions are expected towards the north-western aspect of the development.

The basketball court is exposed to the north-easterly prevailing winds. The winds are likely to directly impact the area and create adverse wind condition for the area. It also has the potential to downwash off Block D and impact the walkway between the entrance and the basketball court. The existing trees along Wharf road are expected to ameliorate the impact of the north easterly winds. To further mitigate the potential impact of downwash off of Block D, it is recommended to include additional trees along the eastern aspect of Block D.

The pedestrian footpath along the future road to the west of the site is exposed to the westerly prevailing winds. The prevailing wind is likely to downwash off Block D, impacting the wind comfort of the area. It is recommended that the proposed trees along the future road are retained in the final design.

The centre of the school is primarily exposed to the north-easterly, south to south-easterly and westerly prevailing winds. With the inclusion of Block D, the westerly winds are likely to funnel between Blocks A and C, impacting the area directly. The south to south-easterly prevailing winds has the potential to side stream along Block A and funnel between Block A and D, further impacting the area. The north-easterly side of the development remains exposed to the north-easterly prevailing winds, allowing the prevailing winds to create adverse wind conditions. It is recommended that the proposed trees are retained in the final design, ensuring that they are of a densely foliating and evergreen variety.

With the inclusion of the above-mentioned treatments, the Stage 2 Ground Level Areas are expected to suitable for its intended purpose. These mitigation measures are also shown in Figure 4:

Mitigation Measures (Ground Level Areas - Stage 2):

- Retention of the proposed trees, ensuring they are of densely foliating evergreen variety.
- Inclusion of additional densely foliating evergreen trees in between Blocks A and B, and along the eastern aspect of Block D.

5.3 Level 1 - 4 External Walkway (Stage 1 and 2)

The level 1 - 4 external walkway, including the level 2 terrace, is primarily exposed to the south to south-easterly, westerly and north-easterly prevailing winds. Both the south to south-easterly and north easterly prevailing winds are likely to side stream along Block A (Stage 1 and 2) and Block D (Stage 2) affecting the walkway area, creating adverse wind conditions. For Stage 2 of development, the westerly winds have the potential to funnel between Blocks A and D, impacting the open area along the walkway. It is expected that the porous feature hanging on the western side of the walkway and the 30% porous 1.3m high balustrade will provide enough shielding to ameliorate the adverse wind condition in this area.

With the inclusion of the above-mentioned treatments, the Level 1-4 External Walkways are expected to suitable for its intended purpose. These mitigation measures are also shown in Figure 5 and Figure 6:

Mitigation Measures (Level 1 – 4 External Walkway – Stage 1 and 2)

- Inclusion of at least 1.3m high balustrades ensuring they are 30% porous.

5.4 Level 5 Terrace (Stage 2)

The Level 5 Terrace, located on the roof of Block D, is exposed to the north-easterly, westerly and south to south-easterly prevailing winds. The north-easterly and westerly winds are likely to impact the area directly with no shielding surrounding the development. The south-to-south-easterly winds have the potential to side stream along Block A and corner accelerate into the terrace area.

Two different treatment options, Option A and Option B have been provided. For option A treatments, it is recommended to include at least 1.5m high balustrades ensuring they are 30% porous surrounding the terrace and include planter boxes along the middle of the terrace to ameliorate the impact of side streaming and corner acceleration on the Terrace. The planter boxes are recommended to contain plants of a densely foliating evergreen variety and reach a combined height of at least 1.5m high in total. For Option B treatments, it is recommended to include at least 1.8m high balustrade surrounding the terrace, ensuring they are 30% porous.

With the inclusion of either Option A or B treatments the Level 5 Terrace is expected to suitable for its intended purpose. These mitigation measures are also shown n in Figure 7 and Figure 8:

Mitigation Measures (Level 5 Terrace – Stage 2):

Option A:

- Inclusion of at least 1.5m high balustrades ensuring they are 30% porous.
- Inclusion of planter boxes, ensuring they contain plants of a densely foliating evergreen variety and reach a combined height of at least 1.5m.

Option B:

- Inclusion of at least 1.8m high balustrades ensuring they are 30% porous.

5.5 Concluding Remarks

Subject to implementing the recommendations/mitigation measures set out in Section 5 of this report, the conclusion of this assessment is that the proposed Activity is not likely to significantly affect the environment in relation to pedestrian wind comfort matters.

The wind conditions occurring within and around the proposed school development can be quantified via a wind tunnel test undertaken at a more details design stage if required, which can also assist with the optimisation of the size and extent of the treatments required.

Figure 3: Recommended Treatment for the Ground Level (Stage 1)

Figure 4: Recommended Treatment for Ground Floor (Stage 2)

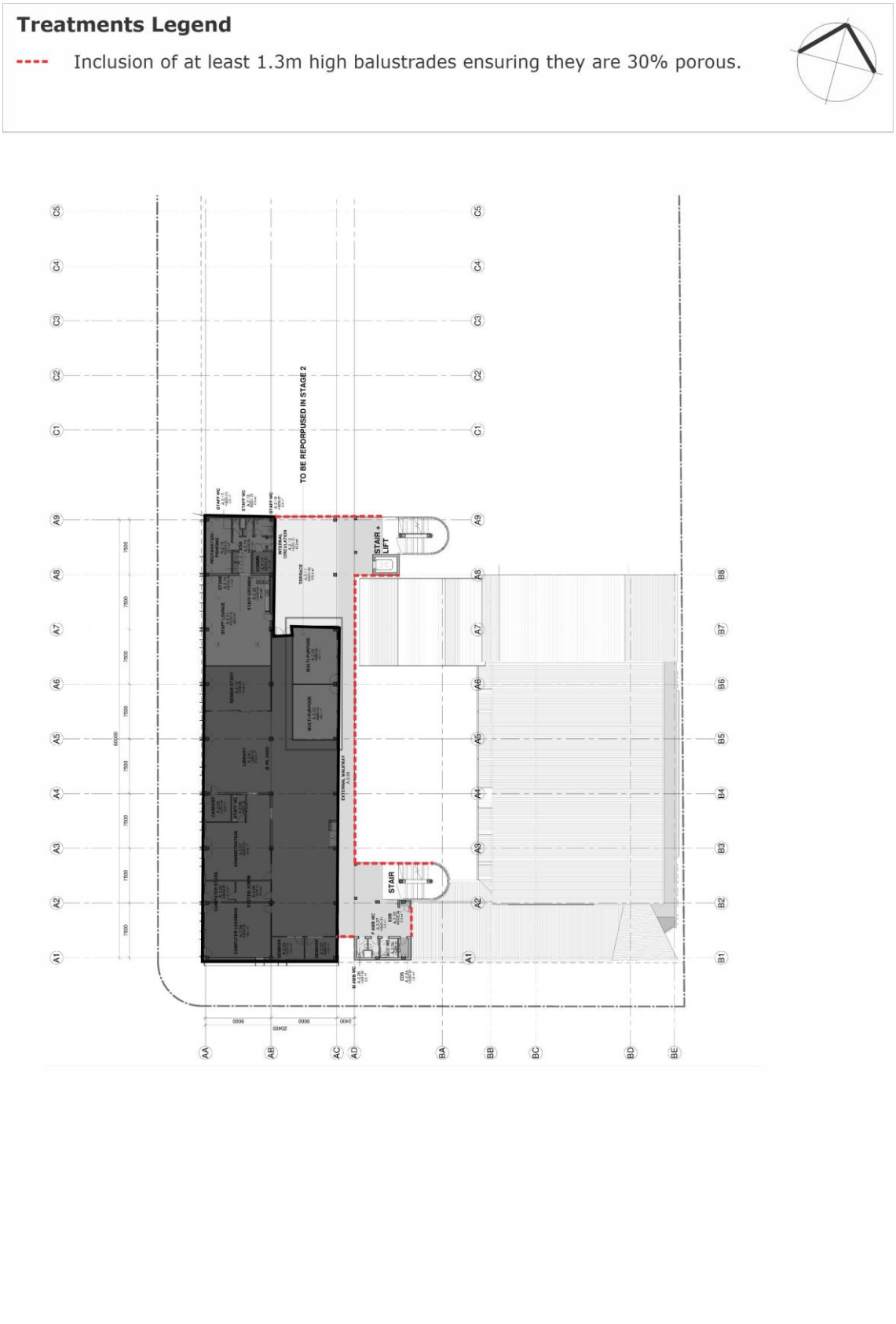

Figure 5: Recommended Treatment for Level 1-4 External Walkway (Stage 1)
(Level 2 Shown)

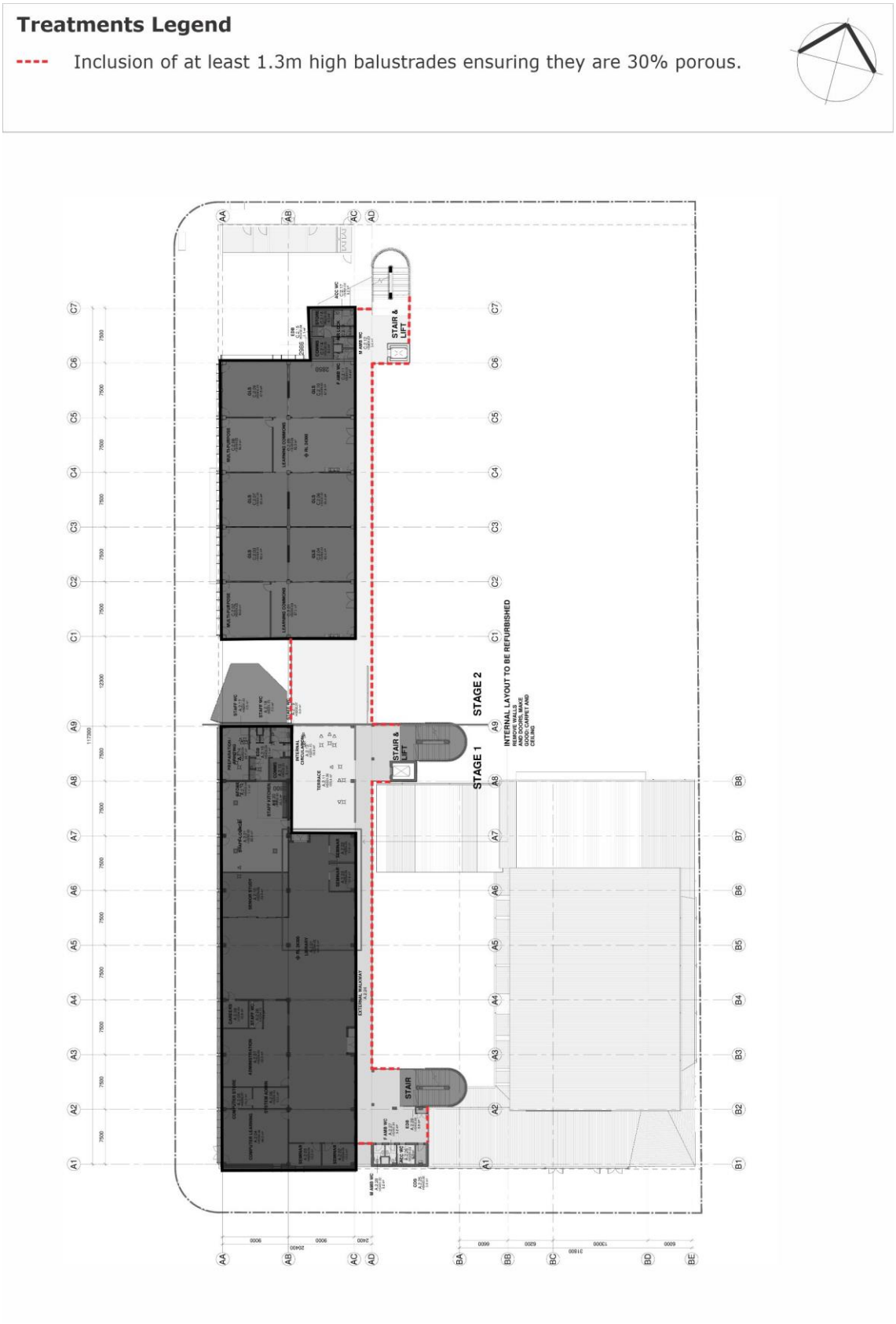

Figure 6: Recommended Treatment for Level 1-4 External Walkway (Stage 2)
(Level 2 Show)

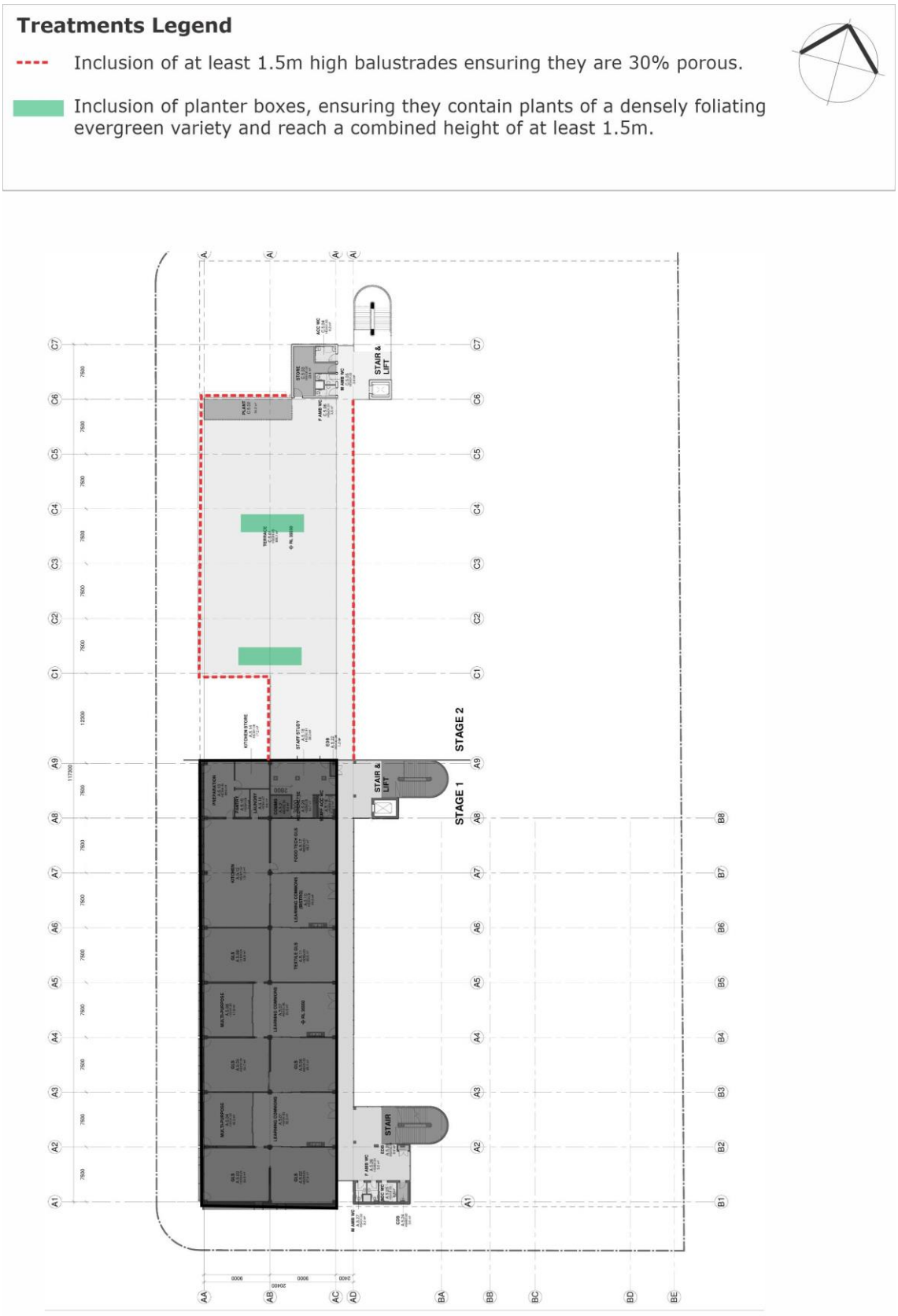

Figure 7: Recommended Treatment for the Level 5 Terrace (Option A)

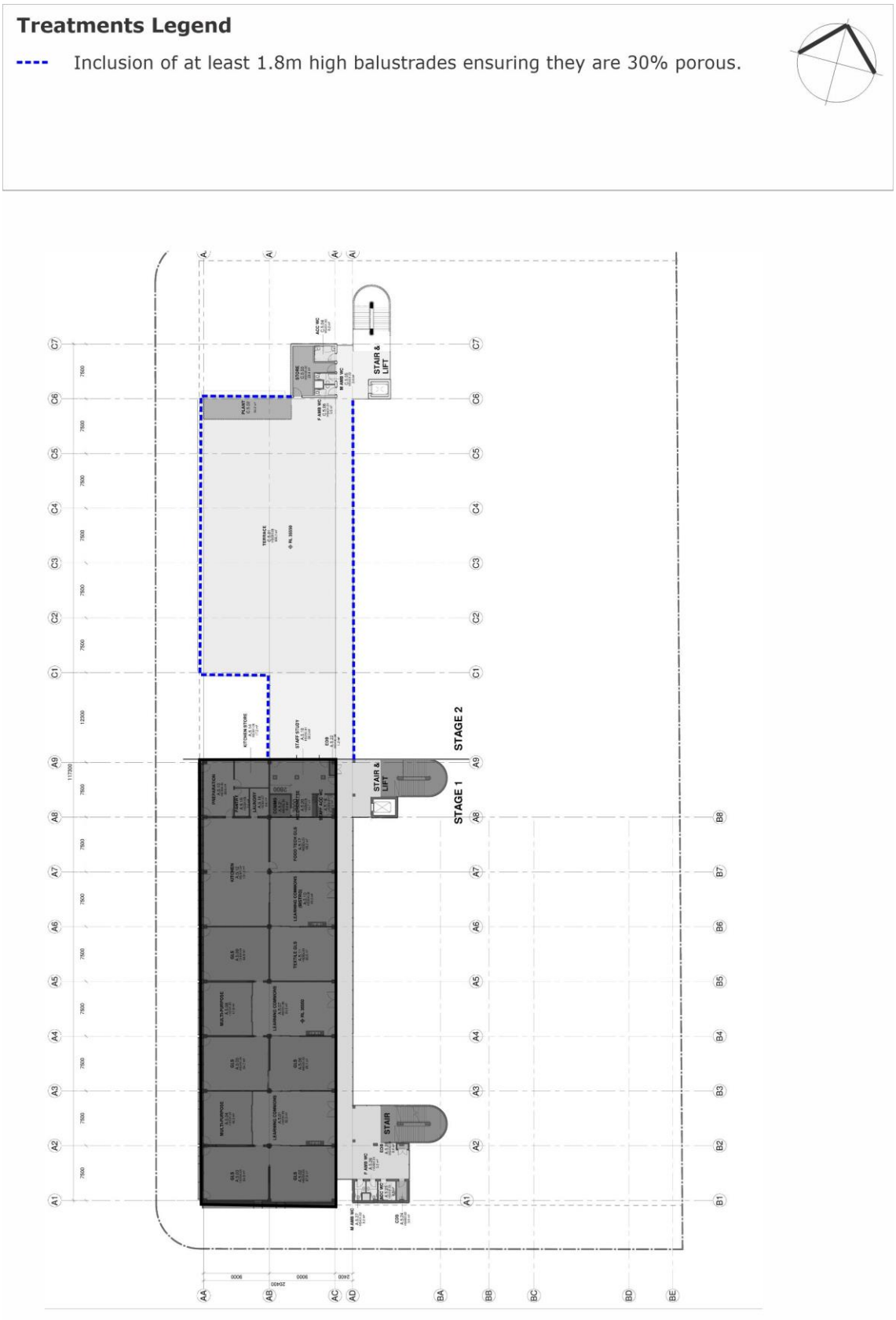

Figure 8: Recommended Treatment for the Level 5 Terrace (Option B)

6 REFERENCES

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APPENDIX A WIND EFFECTS GLOSSARY

A.1 Downwash and Upwash Effects

The downwash wind effect occurs when wind is deflected down the windward face of a building, causing accelerated winds at pedestrian level. This can lead to other adverse effects as corner acceleration as the wind attempts to flow around the building, as seen in Figure A.1.

This can also lead to recirculating flow in the presence of a shorter upstream building, causing local ground level winds to move back into the prevailing wind.

The upwash effect occurs near upper level edge of a building form as the wind flows over the top of the building. This has the potential to cause acceleration of winds near the leading edge, as well as potentially reattaching onto the roof area. This effect causes wind issues particularly near the leading edges of tall building and on the rooftop areas if there is sufficient depth along the wind direction. Upwash is more apparent in taller towers and podia.

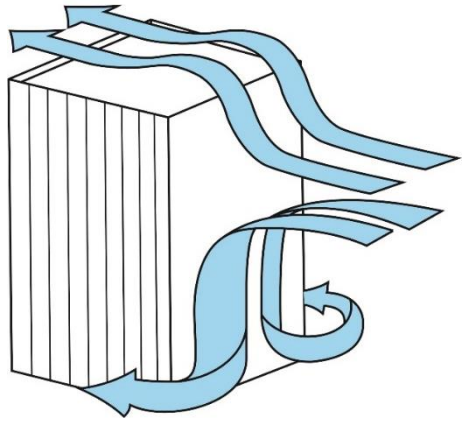

Figure A.1: Downwash Leading to Corner Wind Effect, and Upwash Effects

A.2 Funnelling/Venturi Effect

Funnelling occurs when the wind interacts with two or more buildings which are located adjacent to each other, which results in a bottleneck, as shown in Figure A.2. This causes the wind to be accelerated through the gap between the buildings, resulting in adverse wind conditions and pedestrian discomfort within the constricted space. Funnelling effects are common along pedestrian links and thoroughfares generally located between neighbouring buildings that have moderate gaps between them.

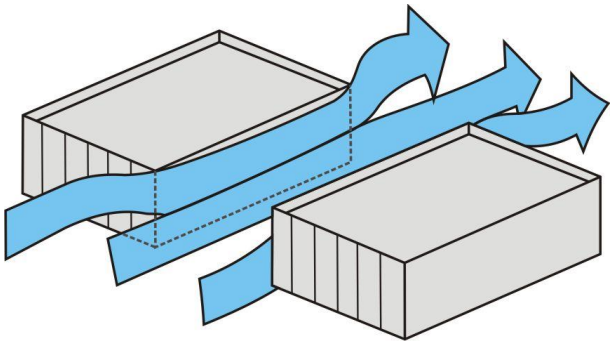

Figure A.2: Funnelling/Venturi Wind Effect

A.3 Gap Effect

The gap effect occurs in small openings in the façade that are open to wind on opposite faces, as seen in Figure A.3. This can involve a combination of funnelling and downwash effects. Presenting a small gap in the façade on the windward aspect as the easiest means through which the wind can flow through can result in wind acceleration through this gap. The pressure difference between the windward façade and the leeward façade also tends to exacerbate the wind flow through this gap.

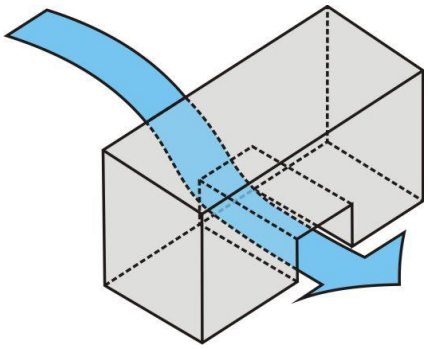

Figure A.3: Gap Wind Effect

A.4 Sidestream and Corner Effects

The sidestream effect is due to a gradual accumulation of wind shearing along the building façade that eventuates in an acceleration corner effect. The flow is parallel to the façade and can be exacerbated by downwash effects as well, or due to corner effect winds reattaching on the façade.

This is shown in Figure A.4. The corner refers to the acceleration of wind at the exterior vertical edge of a building, caused by the interaction of a large building massing with the incident wind, with the flow at the corner being accelerated due to high pressure differentials sets up between the windward façade and the orthogonal aspects. It can be further exacerbated by downwash effects that build up as the flow shears down the façade.

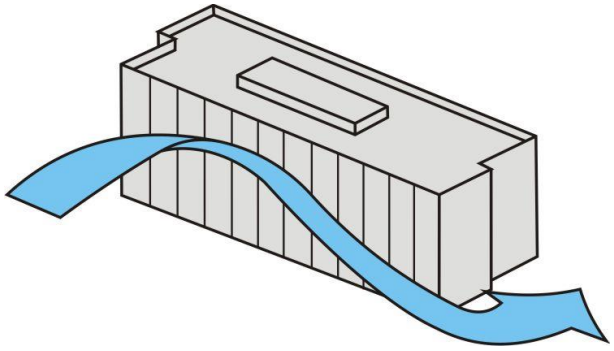

Figure A.4: Sidestream and Corner Wind Effect

A.5 Stagnation

Stagnation in a region refers to an area where the wind velocity is significantly reduced due to the effect of the flow being impeded by the bluff body. For a particular prevailing wind direction, this is typically located near the middle of the windward face of the building form or over a short distance in front of the windward face of a screen or fence. Concave building shapes tend to create an area of stagnation within the cavity, and wind speeds are generally low in these areas.