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Proposed Mixed Use Development

2-20 Parramatta Road & 11-13 Columbia Lane Homebush

Qualitative Wind Impact Assessment

Report Number 610.10150-R6

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PD Mayoh Architects Pty Ltd
60 Strathallen Avenue
Northbridge NSW 2063

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EXECUTIVE SUMMARY

SLR Consulting Pty Ltd (SLR) has been engaged by PD Mayoh Architects Pty Ltd (PD Mayoh) to assess the environmental impact of a proposed Mixed-Use Development located at 2-20 Parramatta Road and 11-13 Columbia Lane, Homebush, with respect to Environmental Wind Effects.

The proposed development site is bounded by Parramatta Road to the north, and the railway line on the east through to the south of the site. The area surrounding the development site comprises:

- The Bakehouse Quarter heritage precinct along George Street to the north of Parramatta Road.
- Proposed Part 3A Major Project Application for a 13 storey hotel/function development between the Bakehouse Quarter and the Parramatta road (north to the site)
- A group of 6-storey to 12-storey residential flat buildings to the immediate west of the development site
- Low-rise residential flat premises through to the south and further west.

The Proposed Columbia Precinct development consists of 7 residential towers (some connected) and 1 commercial tower on a series of typically 3-storey podiums (refer **Figure 2**). The concept design proposes a range of building heights, from the podiums to 21-storey residential buildings. There is an increase in building height from the north (facing Parramatta Road) towards the south. It is proposed to extend George Street towards the south so that it runs through the proposed development and to create public parks with pedestrian and bicycle links throughout the development site.

Prevailing Wind Directions of Interest

Prevailing Sydney wind directions of interest are from northeast, south to southeast and west. Their seasonal variation is described in **Section 2** of this report.

Existing Wind Environment

Existing street level wind conditions in the vicinity of the site are likely to range below the 16 m/sec *"walking comfort"* criterion for many prevailing wind directions given the varying degree of shielding afforded to the site by surrounding buildings – refer **Section 3** for explanation of the 16 m/sec criterion.

Future Wind Environment

In terms of the *future* wind environment with the proposed development, the following features of the development are noted as being of most significance:

- The site is shielded by numerous mid-rise buildings from the west and from the proposed development to be constructed north of the site and east.
- The proposed development features mid to high rise building on top of a series of 3-storey podiums with large footprints which will minimise the potential for street-level "downwash" winds to occur, ie winds which impact on any facades of the taller buildings and are then deflected back towards the ground.
- Pedestrian areas on the west and south side of the development are protected from adverse winds by a significant amount of landscaping.
- There is potential for adverse winds channelling along the proposed George Street extension and Columbia Lane and localised areas of accelerated flow and downwash on some of the development's own podium areas.

EXECUTIVE SUMMARY

Some areas have been identified as being potentially prone to winds close to or even exceeding the standard 16 m/sec walking comfort criterion. Additional amelioration measures (refer **Section 5.3**) have been recommended to mitigate windflow in these areas.

Accordingly, it has been predicted that ground levels wind speeds along all surrounding public footpaths and public access areas within the development itself will either remain at their present levels or decrease slightly with the addition of the proposed development and its wind mitigation treatments. Wind Mitigation treatments will be finalised during the DA Stage of the project

The above analysis has been made on the basis of our best engineering judgment and on the experience gained from model scale wind tunnel testing of a range of developments of similar magnitude to the currently proposed development. The analysis can be confirmed via model scale wind tunnel testing during the detailed design phase of the project.

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

1 INTRODUCTION

SLR Consulting Pty Ltd (SLR) has been engaged by PD Mayoh Architects Pty Ltd (PD Mayoh) to assess the environmental impact of a proposed Mixed-Use Development located at 2-20 Parramatta Road and 11-13 Columbia Lane, Homebush, with respect to Environmental Wind Effects.

1.1 Development Site

An aerial view of the site is shown in **Figure 1**. The proposed development site is bounded by Parramatta Road to the north, and the railway line on the east through to the south of the site. The area surrounding the development site comprises:

- The Bakehouse Quarter heritage precinct along George Street to the north of Parramatta Road.
- Proposed Part 3A Major Project Application for a 13 storey hotel/function development between the Bakehouse Quarter and the Parramatta road (north to the site)
- A group of 6-storey to 12-storey residential flat buildings to the immediate west of the development site and east across the northern rail link.
- Low-rise residential flat premises through to the south and further west.

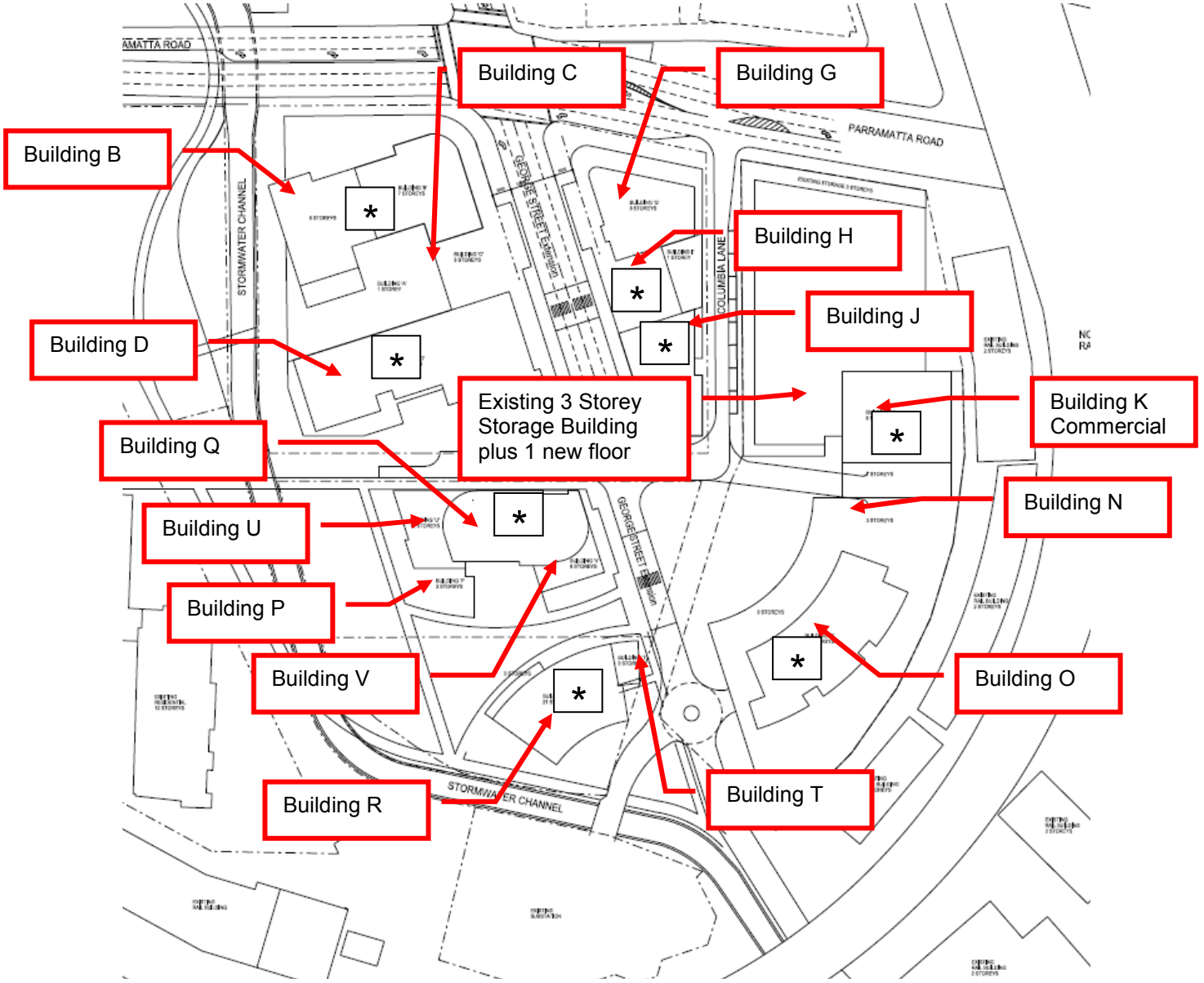
Figure 1 Aerial View of the Proposed Development Site

1.2 Proposed Development Description

The Proposed Columbia Precinct development consists of 7 residential towers (some connected) and 1 commercial tower on a series of typically 3-storey podiums (refer to **Figure 2**). The concept design proposes a range of building heights, from the podiums to 21-storey residential buildings. There is an increase in building height from the north (facing Parramatta Road) towards the south. It is proposed to extend George Street towards the south so that it runs through the proposed development and to create public parks with pedestrian and bicycle links throughout the development site. The proposed Columbia Precinct development comprises:

- 1-storey podium A on the northwest of the site with the following buildings above:
  - Building B – 6-7 storeys
  - Building C - 3 storeys
  - Building D - 8 storeys
- 1-storey podium I located between the proposed George Street extension and Columbia Lane, with the following buildings above:
  - Building G - 8 storeys
  - Building H - 3 storeys
  - Building J - 15 storeys
- 3-storey podium N on the east side of Columbia Lane, with the following buildings above:
  - Building K - 8 storeys
  - Building O - 21 storeys
- 3-storey podium P, with the following buildings above:
  - Building U - 12 storeys
  - Building Q - 16 storeys
  - Building V - 8 storeys
- 3-storey podium T with 21-storey Building R above it.

Figure 2 Proposed Development Concept Plan



2 SYDNEY'S WIND CLIMATE

The data of interest in this study are the annual extreme, mean hourly wind speeds and largest gusts experienced throughout the year, how these winds vary with azimuth, and the seasonal break-up of winds into the primary Sydney wind seasons.

2.1 Seasonal Winds

In relation to key characteristics of the Sydney Region Wind Climate (refer wind roses provided in **Appendix A**) relevant to the wind impact assessment of the proposed development, we note that Sydney is affected by two primary wind seasons:

- Summer winds occur mainly from the northeast, southeast and south.
  - While northeast winds are the more common prevailing wind direction (occurring typically as offshore land-sea breezes), southeast and south winds generally provide the strongest gusts during summer.
- Winter/Early spring winds occur mainly from the west and the south.
  - West quadrant winds (southwest to northwest) provide the strongest winds during winter and in fact for the whole year.

2.2 Wind Exposure at the Site – the "Local" Wind Environment

Close to the ground, the "regional" wind patterns described above are affected by the local terrain and topography.

- The development site receives varying shielding at lower levels from generally low rise developments surrounding the site.
- Localised shielding also occurs from nearby (and future proposed) medium-rise developments, eg to the west-southwest from the 12-storey residential buildings immediately adjacent the site, the 11-storey residential block to the east of the site located between Parramatta Road and Clarence Street, the proposed Part 3A hotel/function development, etc.

3 WIND ACCEPTABILITY CRITERIA

3.1 Standard Local Government Criteria

The choice of suitable criteria for evaluating the acceptability of particular ground level conditions has been the subject of relatively recent research. The acceptability criteria, that have been developed from this research and currently referenced by most Australian Local Government Development Control Plans, including those of Sydney City Council, have been summarised below in **Table 1**.

Table 1 Standard Local Government Wind Acceptability Criteria

Type of Criteria	Limiting Gust Wind Speed Occurring Once Per Year	Activity Concerned
Safety	24 m/s	Knockdown in Isolated Areas
	23 m/s	Knockdown in Public Access Areas
Comfort	**16 m/s**	**Comfortable Walking**
	13 m/s	Standing, Waiting, Window Shopping
	10 m/s	**Dining in Outdoor Restaurant**

The primary objectives relating to the above wind impact criteria are as follows:

- The general objective is for annual 3-second gust wind speeds to remain at or below the so-called 16 m/sec *"Walking Comfort"* criterion. Whilst this magnitude may appear somewhat arbitrary, its value represents a level of wind intensity which the majority of the population would find unacceptable for comfortable walking on a regular basis at any particular location.
- In many urban locations, either because of exposure to open water conditions or because of street "canyon" effects, etc, the 16 m/sec *"Walking Comfort"* level may already be currently exceeded. In such instances a new development should ideally not exacerbate existing adverse wind conditions and, wherever feasible and reasonable, ameliorate such conditions.

3.2 Application of Standard Council Wind Criteria

The criteria provided in **Table 1** should not be viewed as *"hard"* numbers as the limiting values were generally derived from subjective assessments of wind acceptability. Such assessments have been found to vary with the height, strength, age, etc, of the pedestrian concerned.

A further factor for consideration is the extent of windy conditions, and some relaxation of the above criteria may be acceptable for small areas under investigation provided the general site satisfies the relevant criteria.

Finally, it is noted that the limiting wind speed criteria in **Table 1** are based on the maximum wind gust occurring (on average) once per year. Winds at all other times, ie monthly winds, weekly winds, etc, would be of lesser magnitude. So for example, a location with a maximum annual gust of 10 m/sec would experience winds throughout the year of a generally very mild nature, conducive to stationary activities (seating, dining, etc).

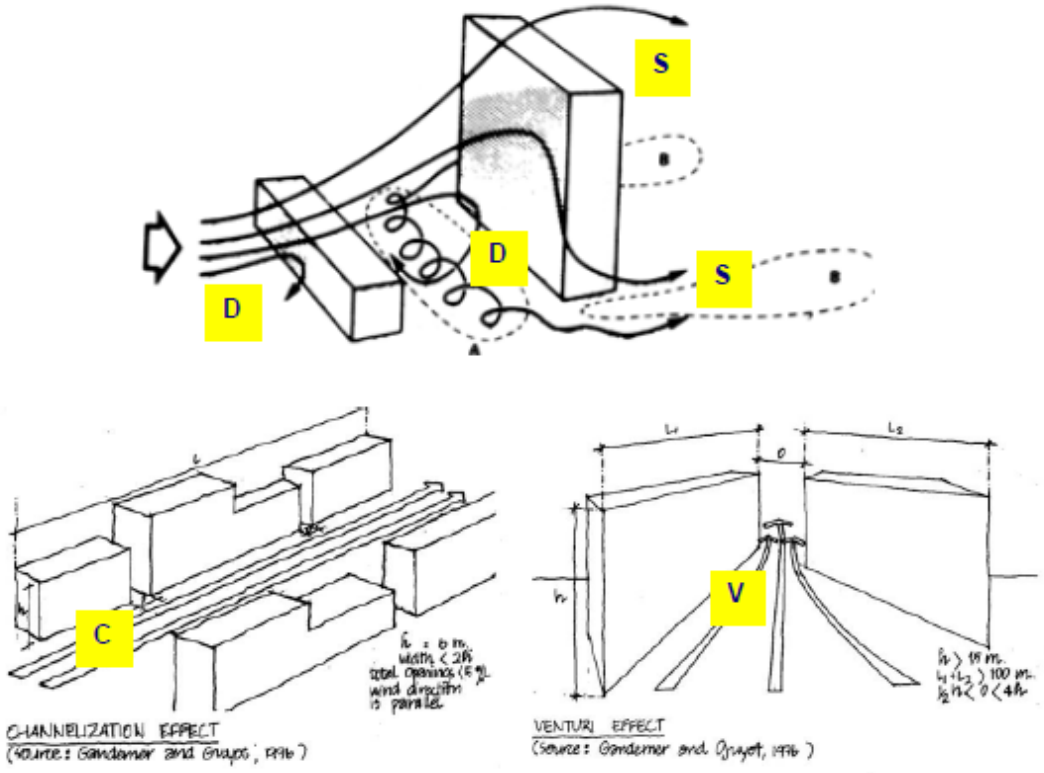
4 BUILDING-WIND INTERACTION – SOME GENERAL OBSERVATIONS

The impact of wind flowing past buildings has well known general impacts at ground level – refer **Figure 3**:

- Downwash winds “D” are the winds which impact on the windward face of a building and are then deflected downwards to ground level in a vertical direction
- Accelerating Shearflow winds “S” are the winds which experience an acceleration as they pass by the building edges and roof as the flow moves around and past the building

In general, the taller the building, the more pronounced the impact on ground level winds. Local building details can also influence winds in the immediate vicinity, eg building undercrofts are often associated with local acceleration of winds.

Figure 3 Windflow Patterns Past Regular Shaped Buildings



The grouping of buildings can also have an impact on resulting pedestrian winds – refer **Figure 4**:

- Canyon Effect winds “C” result when there are rows of parallel buildings (especially taller ones) where the gaps in between line up with prevailing wind directions
- Venturi Effect winds “V” result when windflow is forced to pass between two converging buildings or groups of buildings with a resulting increase in flow

5 WIND IMPACT OF THE PROPOSED DEVELOPMENT

5.1 Existing Winds – Wind Impact and Effects

Existing street level wind conditions in the vicinity of the site are likely to be either under or at the 16 m/sec *"walking comfort"* criterion for many prevailing wind directions given the varying degree of shielding afforded to the site by surrounding buildings.

Northeast Winds

Variable shielding is available to the northeast from mainly low rise residential premises as well as other developments further upstream. When the approved Masterplan buildings to the north of the site are completed, these will provide increased shielding to the proposed development. In addition, northeast winds are generally mild and the potential therefore for exceedance of the 16 m/sec criterion along the pedestrian pathways at the site is small, ie occurrences, if any, are likely to be very infrequent.

Southeast Quadrant (Southeast to South) Winds

The local alignment the nearby railway lines where they diverge north of Strathfield Railway Station creates the potential for channelling effects for southeast winds, partially offset by the low rise existing rail buildings to the southeast of the site.

West Quadrant (Northwest to Southwest) Winds

Westerly winds, which provide the highest winds affecting the Sydney region, have the potential to approach the 16 m/sec criterion at ground level for winds approaching the site from the west along Parramatta Road and the Inner West rail line. Winds at elevated heights will tend to be stronger.

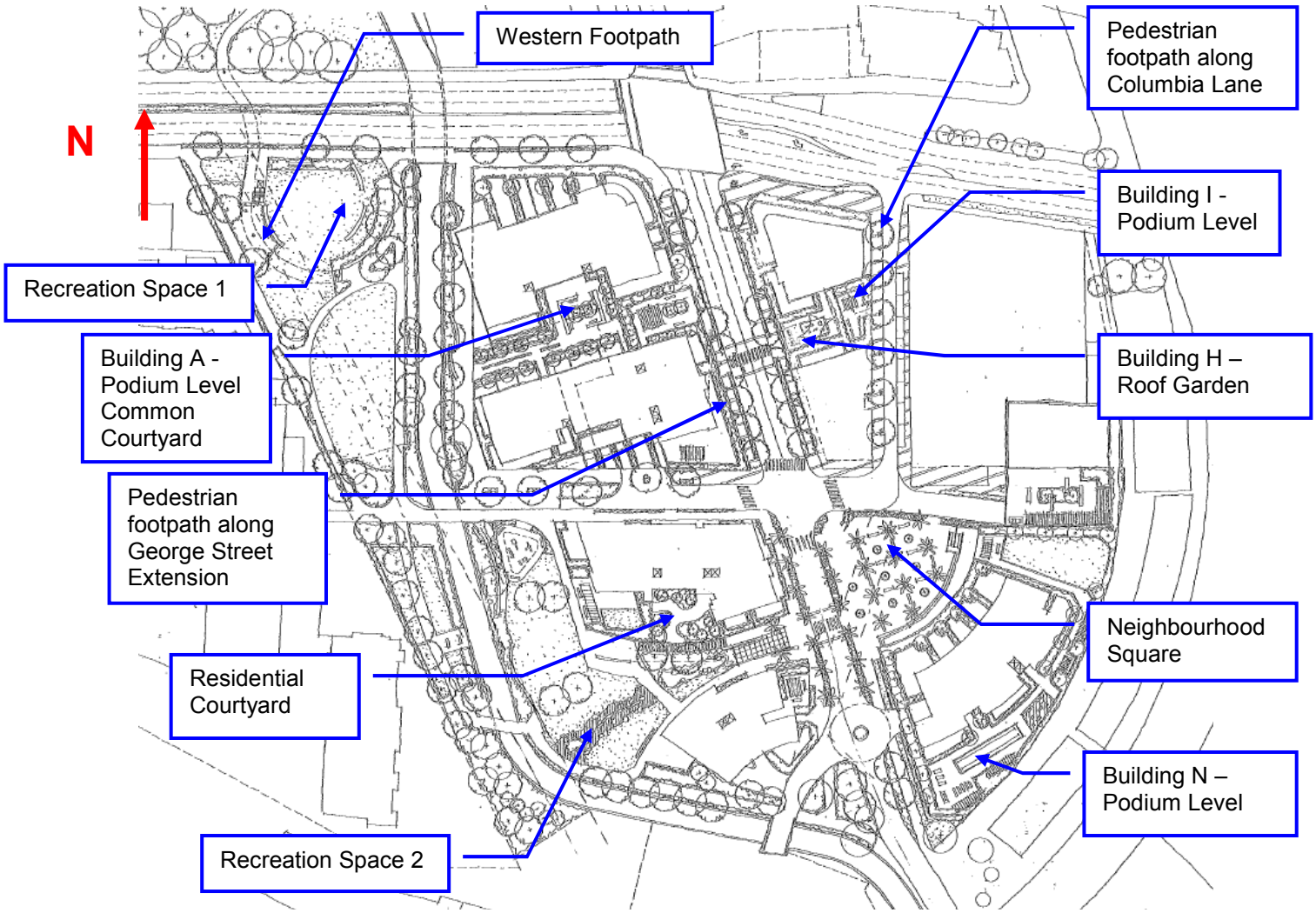
5.2 Future Winds - Predicted Windflow Patterns

The following sections analyse the expected impacts of the proposed development on the pedestrian wind environment in the adjacent streetscape.

The wind impact of the proposed development is described by examining the impact of prevailing wind conditions on all public access areas of interest within and external to the development. The large podium floors of Buildings A and N are considered as public access areas so as to provide wind mitigation recommendations in case they will be designed as recreational gardens etc.

The analysis is made on the basis of our best engineering judgement and on the experience gained from model scale wind tunnel testing of a range of developments of similar magnitude to the currently proposed development.

Figure 4 Concept Plan - Points of Interest Regards Public Access



Northeast Winds

Location	Wind Impact
Recreation Space 1	Potential impact here should be below or close to 16 m/sec, affected by: • Moderate shielding from the upstream buildings and existing trees north of Parramatta Road. • Landscaping already planned in the park.
Western footpath	Potential impact here should be below 16 m/sec, affected by: • Moderate shielding from the upstream buildings and existing trees north of Parramatta Road. • Shielding from the development itself • Landscaping already planned the footpath.
New Recreation Space 2	Potential impact here should be below 16 m/sec, affected by: • Shielding from the proposed development itself.
Neighbourhood Square	Potential impact here should be below 16 m/sec, affected by: • Shielding from the proposed development itself. • Wind acceleration over the Building I podium floor and flowing towards the Neighbourhood Square • Landscaping already planned throughout the Square
Pedestrian Footpath along Columbia Lane	Potential impact here should be close to 16 m/sec, affected by: • Shielding from the proposed development itself. • Wind acceleration over the Building L podium floor and flowing towards ground • Winds accelerating around Building K and impacting on Columbia footpath • Landscaping already planned along Columbia Lane
Pedestrian footpath along George Street Extension	Potential impact here should be below to close to 16 m/sec, affected by: • Shielding from the proposed development itself. • Localised impacts, eg downwash off Building O and Building N at the southern end • Landscaping already planned along George Street
Building A - Podium Level Common Courtyard	Potential impact here should be below 16 m/sec, affected by: • Shielding from the proposed development itself.
Building I - Podium Level	Potential impact here could be below 16 m/sec, affected by: • Downwash off Building G (upstream) and Building H. • Landscaping already planned • Provision of pergola
Building H –Roof Garden	Potential impact here could be below 16 m/sec, affected by: • Shielding from Building G. • Landscaping already planned
Building N - Podium Level	Potential impact here could be close to 16 m/sec, affected by: • Shielding from Building K • Winds impacting the northeast facing façades of and O and deflecting towards the ground (downwash)

5.2.1 South and Southeast Winds

Location	Wind Impact
Recreation Space 1	Potential impact here should be below or close to 16 m/sec, affected by: • Shielding from the existing residential flats. • Winds channelling along the stormwater channel, impacting on the park • Landscaping already planned in the park and upstream.
Western footpath	Potential impact here should be below or close to 16 m/sec, affected by: • Shielding from the existing residential flats and rail buildings. • Winds channelling along the rail line and along stormwater channel and the western footpath • Landscaping already planned along the footpath.
New Recreation Space 2	Potential impact here should be close to 16 m/sec, affected by: • Modest shielding from buildings upstream offset by accelerations around the development's own buildings (eg Building R) • Landscaping already planned in the park.
Neighbourhood Square	Potential impact here should be below or close to 16 m/sec, affected by: • Shielding from the proposed development itself. • Winds channelling along the rail line and along stormwater channel and through the George Street extension, impacting on the park • Landscaping already planned throughout the Square
Pedestrian Footpath along Columbia Lane	Potential impact here should be close to 16 m/sec, affected by: • Southerly winds channelling along Columbia lane • Landscaping already planned along Columbia Lane
Pedestrian footpath along George Street Extension	Potential impact here could be close to 16 m/sec, affected by: • Winds channelling in between the development's own buildings. • Landscaping already planned along George Street
Building A - Podium Level Common Courtyard	Potential impact here should be below 16 m/sec, affected by: • Shielding from the proposed development itself. • Wind acceleration around the northwest corner of Building D and impacting on the western side of the podium.
Building I - Podium Level	Potential impact here could be less than 16 m/sec, affected by: • Shielding from the proposed development itself
Building H –Roof Garden	Potential impact here could be below 16 m/sec, affected by: • Shielding from the proposed development itself. • Landscaping already planned
Building L - Podium Level	Potential impact here should be less than or close to 16 m/sec, affected by: • Lack of shielding from the south to southeast • Localised effects arising from both sheltering by and acceleration around Buildings O • Landscaping and horizontal pergolas already planned

5.2.2 Westerly Winds

Location	Wind Impact
Recreation Space 1	Potential impact here should be below 16 m/sec, affected by: • Shielding from the upstream flat buildings. • Landscaping already planned in the park, particularly on the west.
Western footpath	Potential impact here should be below 16 m/sec, affected by: • Shielding from the upstream residential buildings. • Landscaping already along the footpath, particularly on the west.
New Recreation Space 2	Potential impact here should be below 16 m/sec, affected by: • Shielding from the upstream flat buildings. • Landscaping already around the space, particularly on the west.
Neighbourhood Square	Potential impact here should be close to 16 m/sec, affected by: • Shielding from the proposed development itself. • Wind acceleration between building Q and R and between buildings D and Q and impacting on the Neighbourhood Square • Landscaping already planned throughout the Square
Pedestrian Footpath along Columbia Lane	Potential impact here should be below to 16 m/sec, affected by: • Shielding from the proposed development itself. • Landscaping already planned along Columbia Lane
Pedestrian footpath along George Street Extension	Potential impact here could be less than or close to 16 m/sec at localised areas affected by: • Shielding from the proposed development itself • Channelling between buildings (eg Buildings D/F and U/Q along Columbia Lane) • Landscaping already planned along George Street
Building A - Podium Level Common Courtyard	Potential impact here should be below 16 m/sec, affected by: • Shielding from the existing residential flats upstream. • Possible downwash impacting on the podium flor from winds impacting on the west facing façades of Buildings B, C and D and deflected towards the ground.
Building I - Podium Level	Potential impact here could be well below 16 m/sec, affected by: • Shielding from the proposed development itself
Building H –Roof Garden	Potential impact here could be below 16 m/sec, affected by: • Shielding from the proposed development itself. • Landscaping already planned
Building L - Podium Level	Potential impact here could be close to 16 m/sec, affected by: • Shielding from the development itself • Landscaping already planned • Winds impacting the north facing façade of Building O and deflecting towards the ground (downwash)

5.3 Wind Amelioration Recommendations

On the basis of the expected wind impacts outlined in **Section 4.2**, SLR consulting is of the opinion that the proposed landscape and wind break measures are sufficient to mitigate adverse winds conditions throughout the public access areas of the Columbia Precinct development.

Further windbreak measures will be finalised during the Development Application (DA) of the project.

SLR also recommends the following wind mitigation treatments:

- Denser landscaping close to the building edges to minimise wind acceleration around corners
- Large awning/canopies above building entry points and sitting areas adjacent to the proposed development to minimise downwash impact.

6 CONCLUSION

SLR Consulting Pty Ltd (SLR) has been engaged by PD Mayoh Architects Pty Ltd (PD Mayoh) to assess the environmental impact of a proposed Mixed-Use Development located at 2-20 Parramatta Road and 11-13 Columbia Lane, Homebush, with respect to Environmental Wind Effects.

Existing street level wind conditions in the vicinity of the site are likely to be either under or at the 16 m/sec *"walking comfort"* criterion for many prevailing wind directions given the varying degree of shielding afforded to the site by surrounding buildings.

Future Wind Environment

In terms of the *future* wind environment with the proposed development, the following features of the development are noted as being of most significance:

- The site is shielded by numerous mid-rise buildings from the west and from the proposed development to be constructed north to the site
- The proposed development features mid to high rise building on top of a series of 3-storey podiums with large footprints which will minimise the potential for street-level "downwash" winds to occur, ie winds which impact on any facades of the taller buildings and are then deflected back towards the ground.
- Pedestrian areas on the west and south side of the development are protected from adverse winds by a significant amount of landscaping.
- There is potential for adverse winds channelling along the proposed George Street extension and Columbia Lane and localised areas of accelerated flow and downwash on some of the development's own podium areas.

Accordingly, it has been predicted that ground levels wind speeds along all surrounding public footpaths and public access areas within the development itself will either remain at their present levels or decrease slightly with the addition of the proposed development and its wind mitigation treatments. Wind Mitigation treatments will be finalised during the DA Stage of the project

The above analysis has been made on the basis of our best engineering judgment and on the experience gained from model scale wind tunnel testing of a range of developments of similar magnitude to the currently proposed development. The analysis can be confirmed via model scale wind tunnel testing during the detailed design phase of the project.

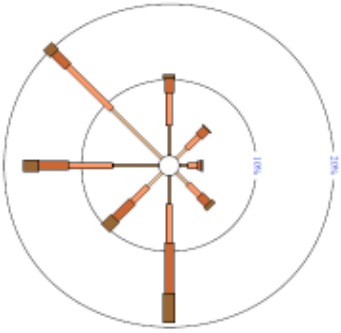
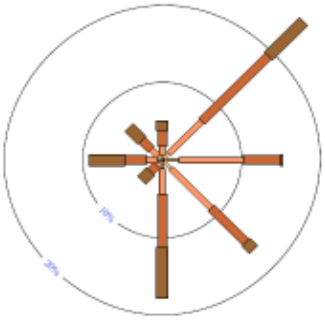
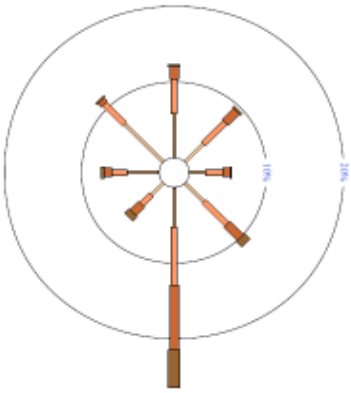
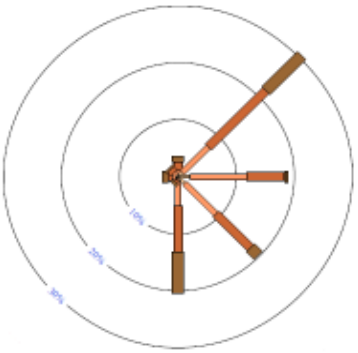
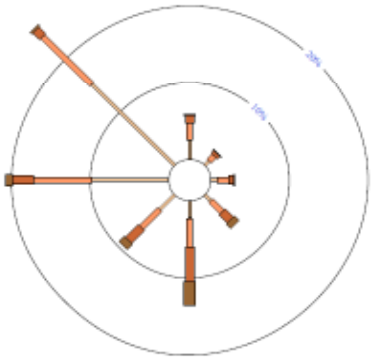
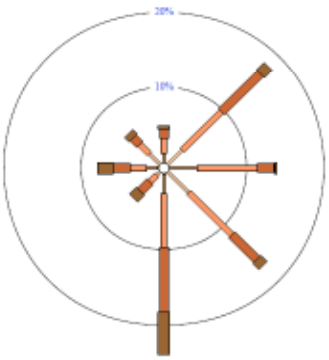
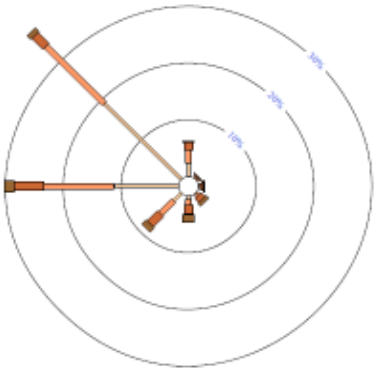
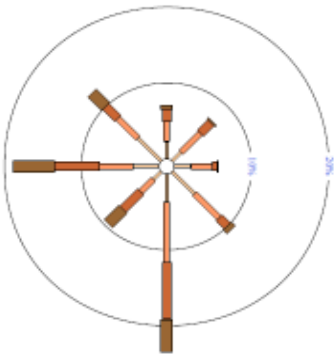
7 CLOSURE

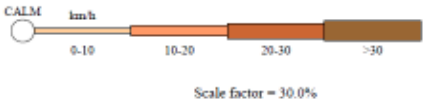
This report has been prepared by SLR Consulting Australia Pty Ltd with all reasonable skill, care and diligence, and taking account of the manpower and resources devoted to it by agreement with the client. Information reported herein is based on the interpretation of data collected and has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of PD Mayoh Architects Pty Ltd. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR.

SLR disclaims any responsibility to the client and others in respect of any matters outside the agreed scope of the work.

SYDNEY WIND ROSES

	Morning Winds	Afternoon Winds
Spring		
Summer		
Autumn		
Winter		



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