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17 June 2020

**Western Gateway Block B – wind conditions**

Dear Mr. Dawson,

Further to recent correspondence, please find herein a brief summary relating to the ground plane wind conditions in and around the Western Gateway precinct.

## Background

The Western Gateway sub-precinct rezoning proposal was publicly exhibited by the State Government from 16 October 2019 to 27 November 2019. The rezoning proposal seeks to introduce a new land use and development control framework on land, identified as Block B, that is owned and controlled by Frasers Property Australia, and Dexus Funds Management Limited (the Consortium), via a long term lease.

In response to the public exhibition, a total of 94 submissions were received from individuals, community groups, local landowners, and government agencies. In addition, the Precinct Review Panel (PRP) which forms part of the established governance arrangements for the rezoning proposal, issued a letter and addendum to Transport for NSW (as lead proponent) identifying the key issues it considered required clarification and further justification.

A submission was received from the City of Sydney following the public exhibition process providing feedback in relation to wind. The Panel noted that wind impacts needs to be addressed at the rezoning stage through changes to the proposed building envelope.

The Consortium and its consultant team have considered the concerns raised by the City of Sydney and the Panel. This report responds to the wind related feedback and should be read in conjunction with the Consortium's complete suite of Response to Submissions documentation.

# Building Envelope Configurations and Scenarios

The Consortium has tested the proposed building envelope in multiple configurations to inform the Block B sub-precinct rezoning proposal. Throughout this process, the wind-tunnel testing has consistently concluded that the wind comfort criteria for pedestrian standing and walking, and pedestrian safety can be satisfied at all but two locations around Block B.

The two locations where wind conditions exceed the wind comfort and safety criteria are the south-west corner (Lee Street), and the north-east corner (building separation between Blocks A and B). The Consortium has proposed and investigated revised configurations

incorporating potential architectural strategies to ameliorate the wind conditions in these locations.

Details of the relevant configurations tested by the Consortium pre- and post-exhibition of the sub-precinct rezoning proposal are summarised in Table 1.

Table 1: Wind-tunnel testing envelope configurations

| Block B (Consortium's Site) | | Adjacent developments included in model | |
|---|---|---|---|
| Setback of west tower to Lee Street in metres | Separation distance between Blocks A and Block B in metres | Block A (Atlassian) | Future Over Station Development |
| Pre-Exhibition | | | |
| 0 | 13 | X | X |
| 0 | 13 | ✓ | X |
| Post-Exhibition | | | |
| 0 | 24 | X | X |
| 0 | 24 | ✓ | X |
| 3 | 30 | X | X |
| 3 | 30 | ✓ | X |
| 6 | 30 | X | X |
| 6 | 30 | ✓ | X |

The wind conditions have been assessed against the comfort and safety criteria of Lawson (1990) described in Table 2. These are the fundamentals for the wind criteria in the City of Sydney Draft Planning Strategy (2016).This approach is considered appropriate as it reflects the City's proposed controls, and importantly, recognises that there are few locations in Sydney that would meet wind controls in the current City of Sydney DCP (City of Sydney, 2012). No concern has been raised with Arup's assessment methodology.

Table 2: Pedestrian comfort criteria for various activities

| **Comfort (max. of mean or GEM wind speed exceeded 5% of the time)** | |
|---|---|
| <2 m/s | Dining |
| 2-4 m/s | Sitting |
| 4-6 m/s | Standing |
| 6-8 m/s | Walking |
| 8-10 m/s | Objective walking or cycling |
| >10 m/s | Uncomfortable |
| **Safety (max. of mean or GEM wind speed exceeded 0.022% of the time)** | |
| <15 m/s | General access |
| <20 m/s | Able-bodied people (less mobile or cyclists not expected) |

## Block B key findings – south-west corner

The wind-tunnel testing results conclude acceptable wind conditions for comfort and safety can be achieved through appropriate design and architectural interventions. Reconfiguration of the building envelope through increased building setbacks and separations alone would not be expected to sufficiently ameliorate the wind conditions.

The south-west corner currently experiences wind conditions exceeding the safety criterion, Figure 1. The introduction of a 6 m tower setback to the west tower from the Lee Street podium edge, as suggested by the PRP, exceeds both the comfort and safety criteria, Figure 2. From an aerodynamic perspective, a more effective solution to address the flow

mechanism causing the exceedances was to block the southern colonnade and wrap an awning around the south-west corner of the proposed building. The introduction of these design and architectural interventions improves the wind conditions around the south-west corner meeting the comfort and distress criteria, and maintains the existing wind conditions along Lee Street.

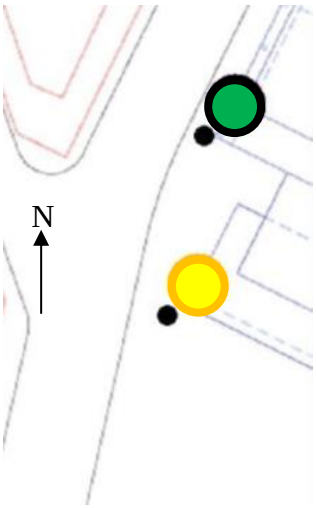


Figure 1: Existing conditions

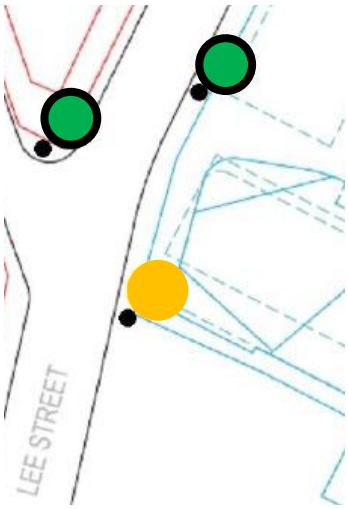


Figure 2: West tower setback of 6 m to Lee Street (Panel recommendation)

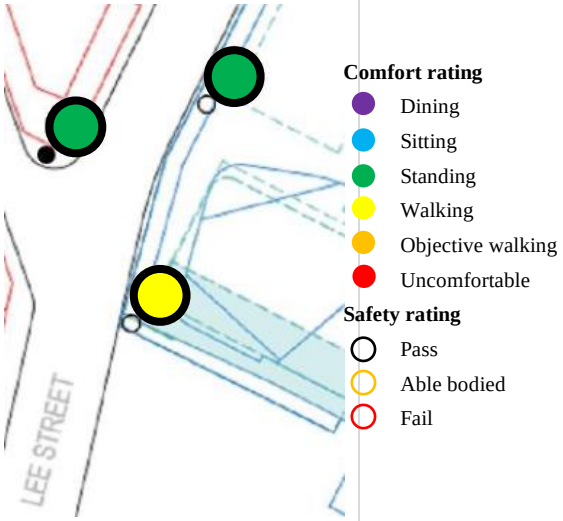


Figure 3: West tower setback of 6 m to Lee Street with architectural interventions

## Block B key findings – north-east corner

The proposed 30 m building separation between Blocks A and B by the PRP was insufficient to improve the wind conditions to meet the safety criterion, Figure 4. Combining the 30 m separation with the proposed terrace pavilion extending across the full width of the proposed separation improves the local wind conditions meeting both the comfort and safety criteria in this area for the intended use of the space, Figure 5. The introduction of an awning on the eastern façade further improves the local wind conditions in this location for intended use of the space.

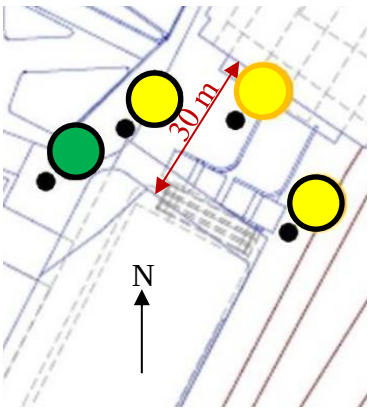


Figure 4: 30 m building separation between Blocks A and B

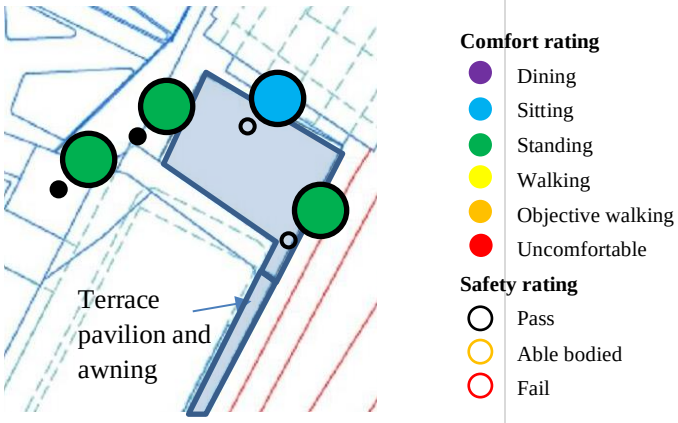


Figure 5: 30 m building separation between Blocks A and B with terrace pavilion and local amelioration

## Block B Design Competition

Since exhibition, the Consortium commenced an Architectural Design Competition for Block B. Ground plane wind conditions are an important design consideration for the Competition, and accordingly Arup was available to all competitors as a Technical Advisor. Arup has offered wind engineering guidance and input to the schemes by identifying potential design features that could be incorporated into the building forms to improve the ground plane wind conditions.

Arup has reviewed the designs from a wind perspective for each scheme, which will be presented to the Competition Jury in the coming weeks. The emerging results reaffirm that suitable wind comfort and safety criteria can be achieved throughout the Western Gateway sub-precinct.

## Western Gateway Cumulative Wind Conditions

A summary of the wind conditions in the existing and after development of Blocks A and B are presented in Figure 6 demonstrating the comfort conditions are classified between sitting and walking, and meet the safety conditions everywhere. Wind conditions would be further locally improved with the inclusion of detailed architectural and design interventions. Reliance on landscaping and temporary elements in the public domain is not required.

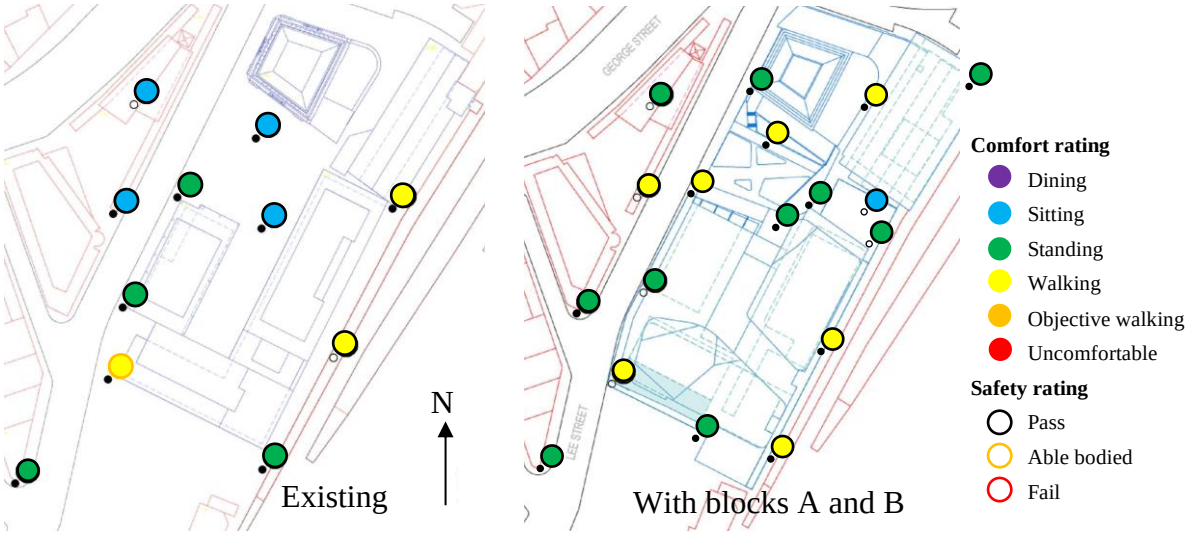


Figure 6: Summary of wind classification around precinct

The wind conditions in and around Block B will be governed by the final geometry of **all** large buildings in the Western Gateway sub-precincts and surrounds. An appropriate wind comfort criterion map has been developed in consideration of the intended purpose, function and uses of various spaces in and around Block B and is presented in Figure 7.


Figure 7: Appropriate wind comfort criterion map for the Block B precinct

## Conclusions

The additional wind-tunnel testing and analysis completed since public exhibition of the Western Gateway sub-precinct rezoning proposal does not support any further amendments to the Consortium's building envelope.

Acceptable wind conditions can be achieved at the Lee Street corner through architectural treatments, rather than increased building setbacks. Due to the flow mechanism, acceptable wind comfort and safety conditions cannot be achieved around the south-west corner through increased setbacks above the podium fronting Lee Street. Wind modelling demonstrates that the introduction of just a 6 m setback would worsen the existing poor wind conditions. Wind modelling indicates a more appropriate solution is the introduction of design strategies to address the wind flow mechanism causing issues, which improves the wind conditions along Lee Street.

The subsequent wind modelling has confirmed that the 30 m building separation between Blocks A and B improves the wind conditions , but to achieve acceptable wind comfort and safety conditions a terrace pavilion at RL 21 m between Block A and Block B is required. Wind conditions could be further improved with the provision of an awning along the east façade of Block B.

The terrace pavilion aligns with the future East-West pedestrian link proposed to connect the Western Gateway to the Over Station Development (OSD). Once the OSD is designed and completed, the East-West link would be appropriately modified to accommodate lifts, escalators and stairs to the OSD level at RL 30.

The cumulative impacts of the Block A and Block B developments have been assessed and can meet appropriate wind comfort and safety conditions for the intended use of the

spaces, without reliance on temporary structures to mitigate wind impacts. These positive results have informed the preparation of a wind comfort criterion map.

I hope this is of assistance, please do not hesitate to contact me on (02) 9320 9921, if you have any questions regarding any aspect of this report.

Yours sincerely,

Graeme Wood
Associate Principal

## References

Arup, (2019), 14-30 Lee Street, Haymarket Western Gateway sub-precinct Block B, Environmental wind report, dated 27 August 2019.

City of Sydney (2012), Development Control Plan.

City of Sydney (2016), Central Sydney Planning Strategy 2016-2036.

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