2 September 2011

610.10230 Majors Bay MasterPlan Wind 20110902

Cox Richardson
Level 2, 204 Clarence Street
SYDNEY NSW 2000

Attention: Mr Michael Grave

Dear Michael

Majors Bay Development, Mortlake
Masterplan Stage - Environmental Impact: WIND
Updated Preliminary Assessment

Aust-Equity Pty Ltd is seeking approval to develop three sites totalling 2.75 ha on Majors Bay, Mortlake, in the Canada Bay Local Government Area. The proposal consolidates a number of ownership parcels in the precinct into three "sites" providing the opportunity to develop an integrated master plan with new connections and open space that can create a more cohesive public domain for the precinct than has been possible where smaller and more disparate sites have been developed.

The change in existing building height profile and consolidation of the development will alter the local wind environment in the area.

In December 2010, SLR Consulting prepared an initial qualitative assessment covering the likely wind impact of the development and the detailed analysis which might to follow, should the development gain Masterplan approval.

Since that time, some modest changes have been made to the Site 1 footprint configuration of the development. The enclosed is a revised (preliminary) assessment of the development. Given the modest nature of the changes involved, the outcomes of our assessment remain unchanged.

Please do not hesitate to call me on (02) 9427 8100 or (0421) 915 597 if you have any queries regarding the enclosed.

Yours sincerely

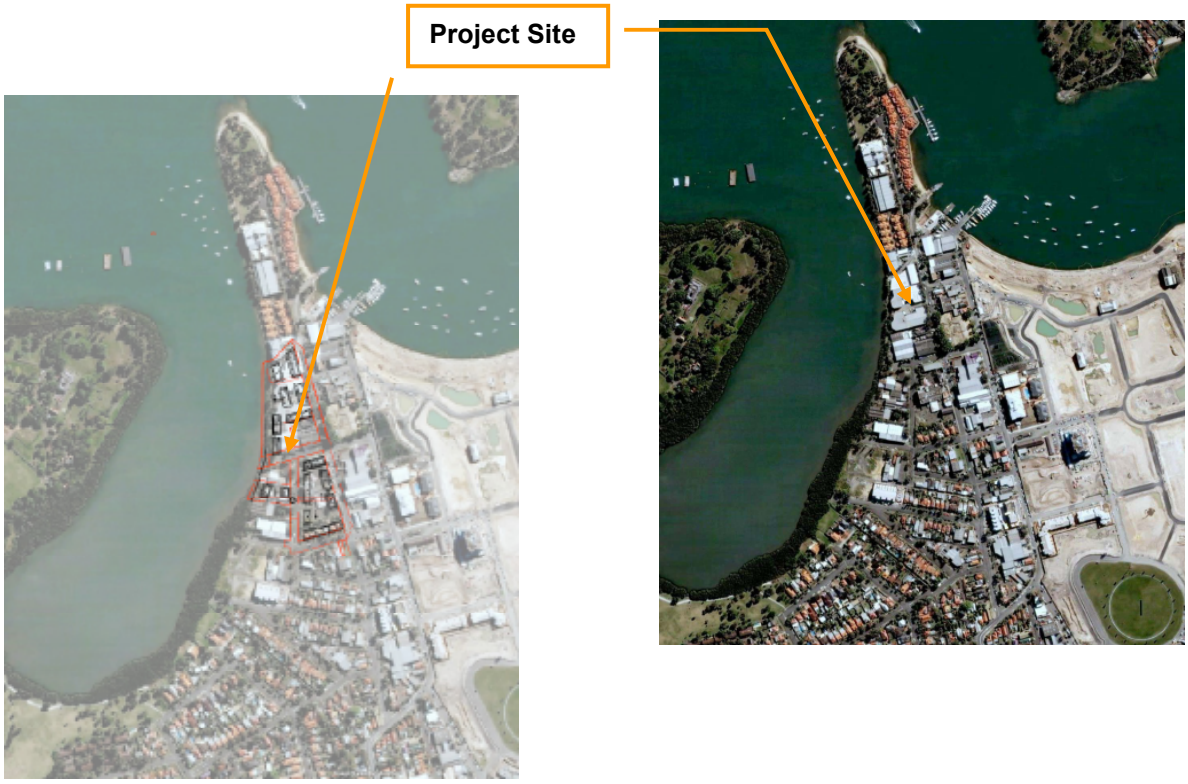
PETER GEORGIOU
Director
(Call at any time on 0421 915 597)

1 BACKGROUND

Aust-Equity Pty Ltd is seeking approval to develop three sites totalling 2.75 ha on Majors Bay, Mortlake, in the Canada Bay Local Government Area – refer aerial and images below. The proposal consolidates a number of ownership parcels in the precinct providing the opportunity to develop an integrated master plan with new connections and open space that can create a more cohesive public domain for the precinct than has been possible where smaller and more disparate sites have been developed.

The proposal would deliver a precinct that is in scale both with its immediate context, as well as the broader context of Majors Bay and Breakfast Point:

- Site 1 has a total site area of 10,483m² and is bounded by roadways on all sides. Hilly Street forms the site's eastern boundary, Northcote Street the northern boundary; Bennett Street the western boundary; and Edwin Street the southern boundary.
- Site 2 has a total site area of 2,911m² and is bounded by roadways, residential developments and Majors Bay foreshore. Bennett Street forms the sites eastern boundary, a neighbouring residential development the northern boundary, Majors Bay foreshore the western boundary and a neighbouring residential development the southern boundary.
- Site 3 has a total site area of 14,037m² and is bounded by roadways, residential developments and Majors Bay foreshore. Hilly Street forms the site's eastern boundary, a neighbouring residential development the northern boundary, Majors Bay foreshore the western boundary and Northcote Street the southern boundary.

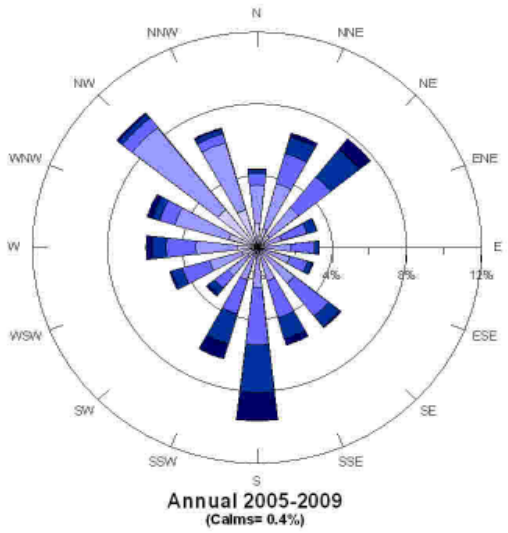


The following provides a Preliminary Wind Impact Assessment of the development and details further work to be carried out in subsequent stages of the development, assuming project approval is gained.

2 SYDNEY'S WIND CLIMATE

2.1 Seasonal Winds

The key characteristics of the Sydney Region Wind Climate are shown in the adjacent wind rose, taken from the Bureau of Meteorology met data at Sydney Airport.



The corresponding seasonal wind roses provided in **Attachment A** show that Sydney is affected by two primary wind seasons:

Summer winds occur mainly from the northeast, southeast / south.

- While northeast winds are the more common prevailing wind direction (occurring typically as offshore land-sea breezes), southeast / south winds generally provide the strongest gusts during summer.

Winter/Early spring winds occur mainly from the west and the south.

- West quadrant winds 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 will receives moderate shielding, especially close to the ground, from the northeast from existing mainly low-rise buildings.
- Shielding from the south and southeast will be greater provided by both low-rise and some mediu-rise blocks in this direction.
- The site is exposed to winds approaching the site from the west (over water).

3 DESCRIPTION OF THE PROPOSED DEVELOPMENT

3.1 Proposed Building Heights

In general, the massing of the revised configuration of the proposed development complies with requirements of the current and draft LEP and DCP, with several modest exceptions, as follows:

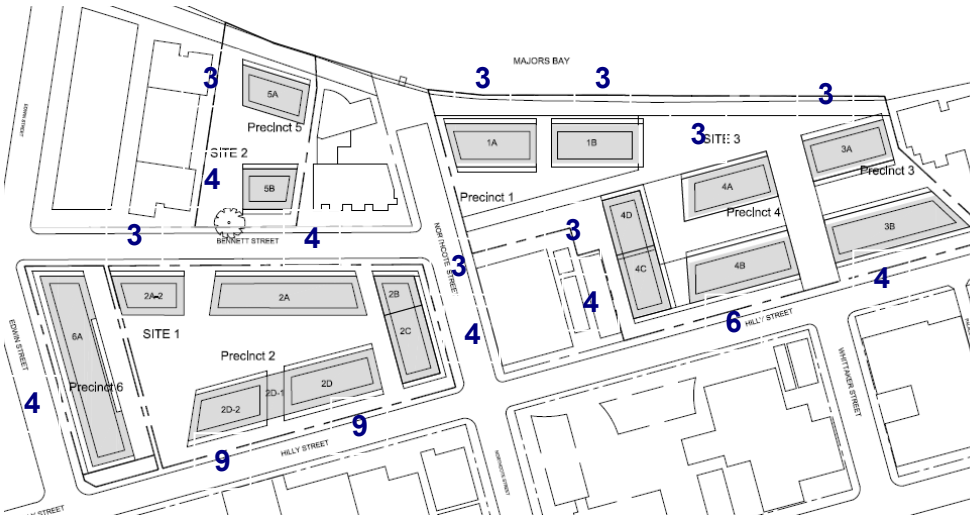
- The recently revised scheme still has three principal block sites refer (**Figure 1**), comprising a total of 17 individual buildings (previously 18 buildings)
- Most buildings are still either 3-storey (8 buildings) or 4-storey (6 buildings)
- Three slightly taller buildings are located along Hilly Street (away from the water's edge) ranging in height from 6 storeys to 9 storeys (there were previously four buildings in this height range).

A combination of publicly-accessible open space, private open space and new public domain dedications will provide connectivity and access to the foreshore – refer the revised landscaping plan in **Figure 1**.

Figure 1 Block Massing and Proposed Landscaping of the Revised Proposed Development

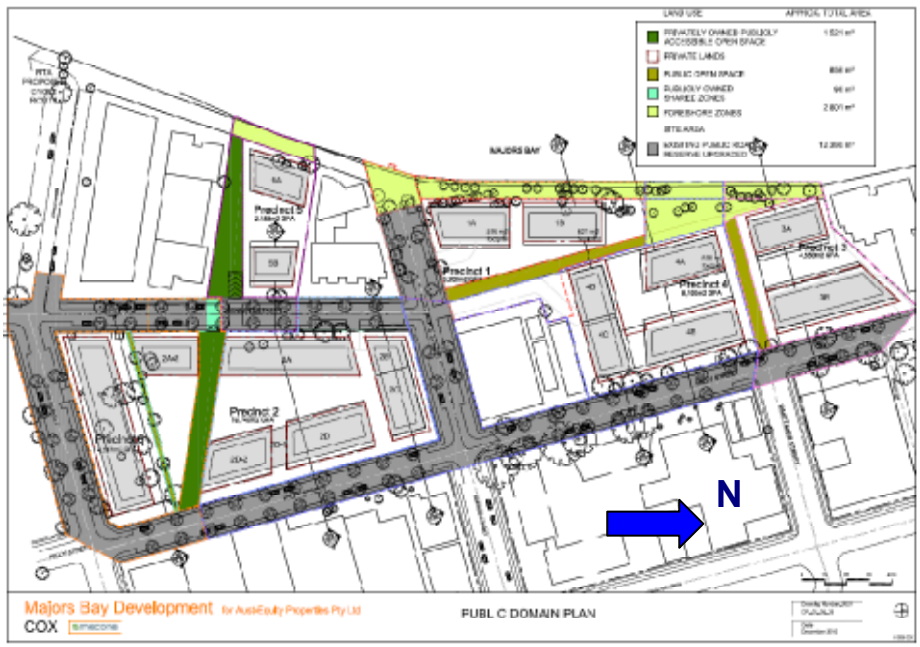
Floor Heights

September 2011



Proposed Landscaping

September 2011



4 INDICATIVE WIND IMPACTS

4.1 General Observations

The impact of wind flowing past buildings has well known general impacts at ground level – refer **Figure 2**:

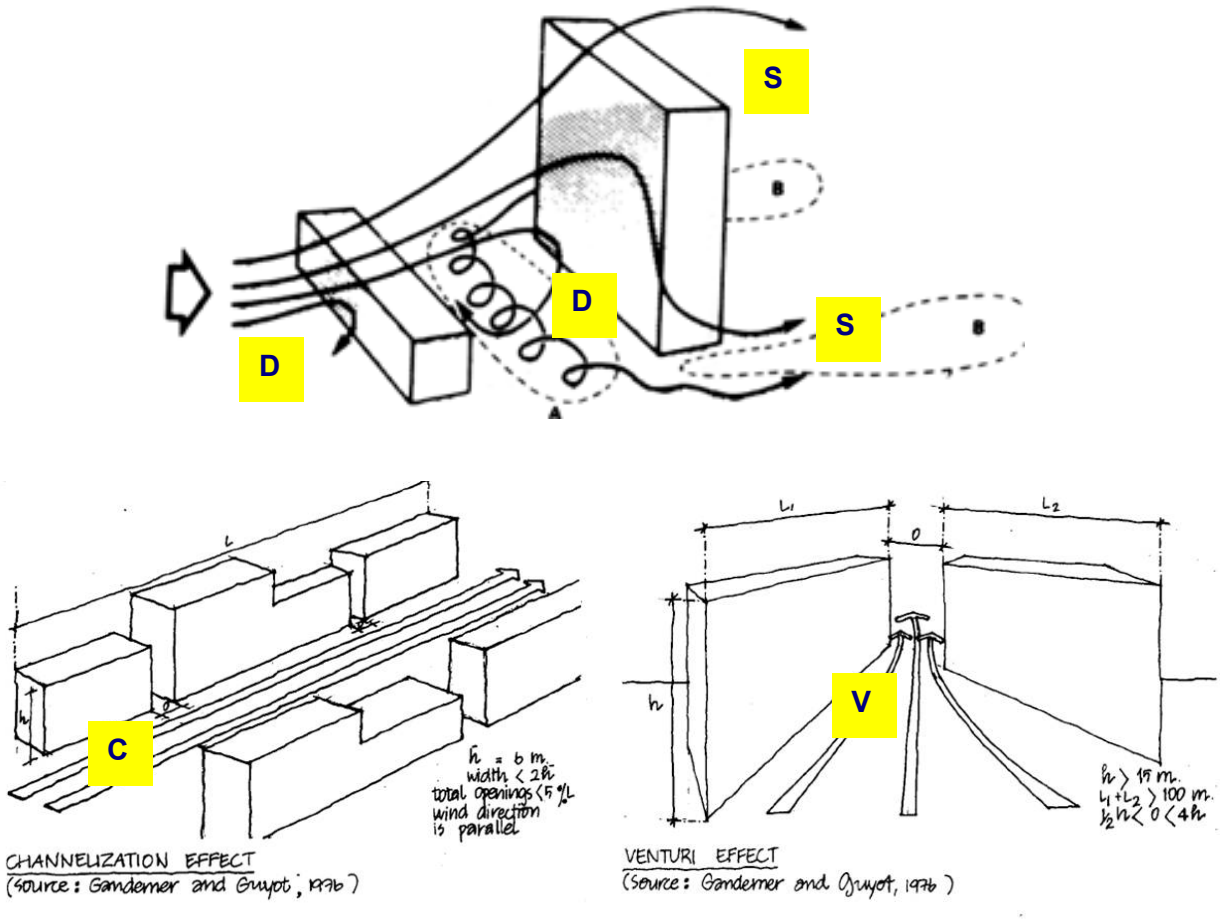
- Downwash winds **"D"** are the winds which impact on the windward face of a building and are then deflected downwards to ground level in a vertical direction
- Accelerating Shearflow winds **"S"** are the winds which accelerate past the building edges and roof as the flow speeds up moving around the building

In general, the taller the building, the more pronounced the impact on ground level winds.

The grouping of buildings can also have an impact on resulting pedestrian winds:

- 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

Figure 2 Windflow Patterns Past Regular Rectangular Shaped Buildings



4.2 Wind Comfort Criteria

The choice of suitable criteria for evaluating the acceptability of particular ground level conditions has been the subject of research carried out over the past few decades. The acceptability criteria that have been developed from this research and currently referenced by most Australian Local Government Development Control Plans 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

4.3 Indicative Impacts of the Proposed Development

The following characteristics of the revised (September 2011) development will influence its local wind impact:

1. The development's building heights remain modest and the resulting single building impacts (eg downwash winds, accelerated shearflow winds) will be correspondingly moderate.

2. In general, the gaps between buildings are significant in terms of building spacing to building height ratios and unlikely to result in canyoning winds of significance

3. Almost all thoroughfares are to be provided with substantial landscaping

4. Northeast winds (ie prevailing summer winds) and southerly (all-year round) winds will receive some sheltering, especially at lower levels, from upstream buildings.

5. Westerly winds are expected to have an impact on the wind environment within the open spaces on the western edge of the site along the Majors Bay foreshore.

It is expected that the maintenance of acceptable wind conditions throughout the development will involve a combination of the following "standard" wind mitigation options:

- Landscaping (already planned), combined in some cases with earth mounds (eg possibly in selected locations along the foreshore)
- Vertical windbreak elements, eg landscaping, porous and/or solid screens, etc
- Horizontal windbreak elements, eg canopies, awnings, pergolas, etc.

On the basis of the above, and with the benefit of a future Detailed Wind Analysis (refer **Section 5**) we are confident that winds throughout all public spaces within and around the development will be able to be maintained within the acceptability criteria outlined above.

5 FUTURE DETAILED WIND ANALYSIS

The development at this stage has been defined only in terms of overall massing (eg indicative building heights). Detailed design features of relevance to specific wind mitigation solutions, eg building entry points, public usage (eg outdoor eating areas, etc), have not yet been defined.

Project Commitment

Following Masterplan approval and the identification of wind sensitive areas, a more detailed wind analysis would be performed to define the precise location and extent of all the windbreak features to be incorporated into the building design.

Future Wind Analysis Technique

The detailed wind analysis would be undertaken using one of the following proven techniques:

- Qualitative (Expert Opinion) Wind Assessment
- Wind Tunnel Test – SAND SCOUR technique
- Wind Tunnel Test – DISCRETE SENSOR technique
- CFD Modelling (3-D Computer Simulation)

Some examples of the output from such studies have been reproduced on the following page.

Output of the Future Detailed Wind Analysis

The detailed wind analysis will involve the following steps:

- The study would take into account the known characteristics of mean and gust speeds on both an annual and seasonal basis associated with the local (eg Sydney) wind climate, ie taking into account the strength characteristics of prevailing Sydney wind directions on a seasonal basis.
- The study will identify all public spaces of interest, eg footpaths, building entry points, areas designated for quiescent type activities (eg outdoor eating areas).
- Potential adverse wind conditions would be identified and the likely wind intensities would be compared to standard acceptability criteria for pedestrian and occupant safety and comfort.
- Recommendations would then be made to reduce adverse wind effects, eg using landscaping, porous windbreaks, awnings and canopies, etc.
- These modifications would be developed in tandem with the Project Team (for viability, practicality, cost-effectiveness, aesthetic impact, etc).

Finally, recommendations would be made as to whether further detailed investigations involving wind tunnel modelling or CFD modelling might be required.

Figure 3 Wind Tunnel Sand Scour Examples (a) low wind scour, (b) high wind scour

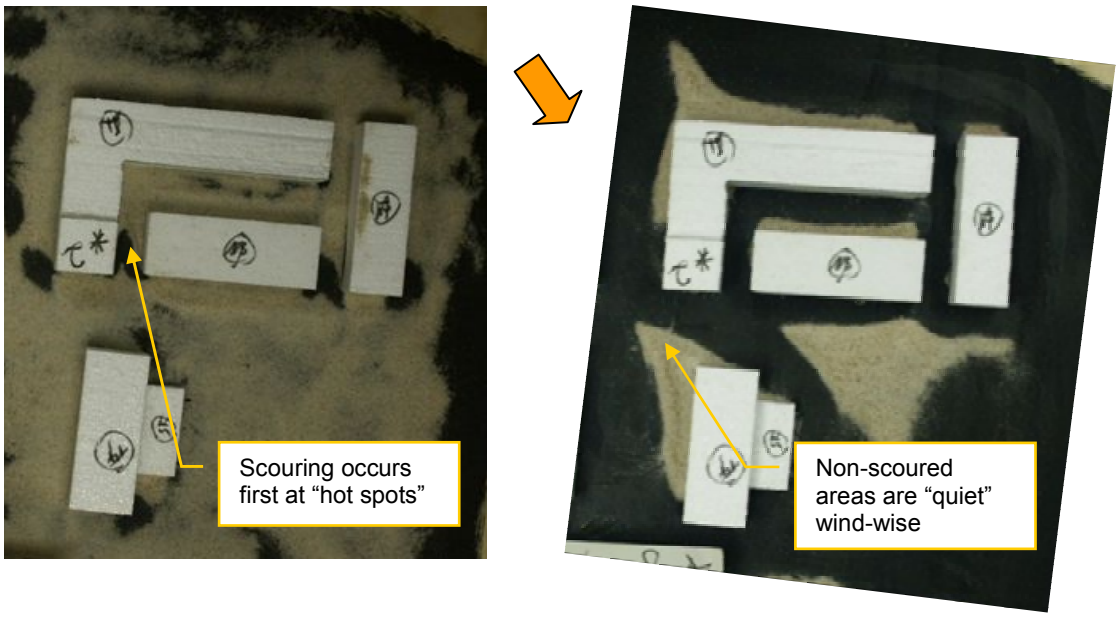
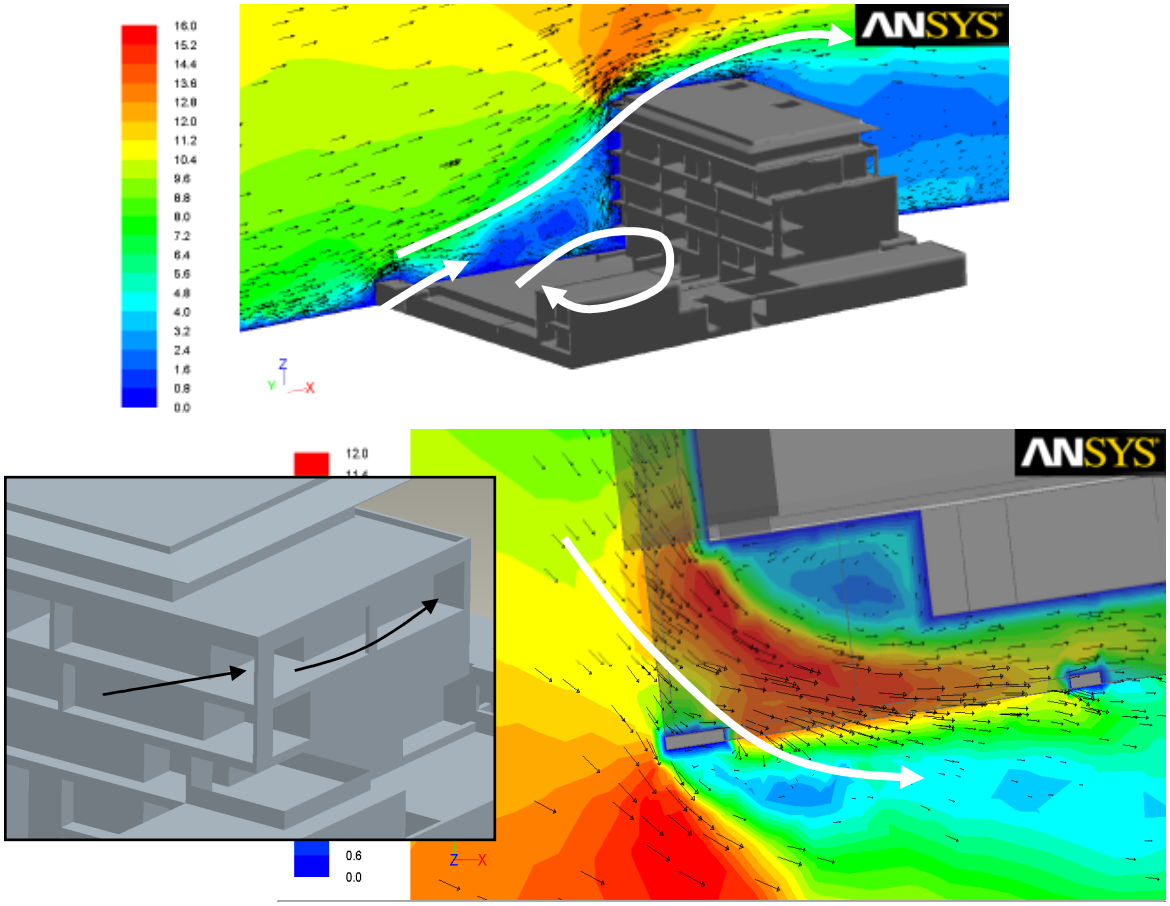


Figure 4 CFD Examples – Recent 4-Block Project



Sydney Airport – Seasonal Wind Roses