HEGGIES

REPORT 10-5947-R4

Revision 0

Dwyers-Oxford Site Re-Development - Concept Design 31 Crown Street, Wollongong Wind Impact Assessment

PREPARED FOR

Belmorgan Property Development Pty Ltd
Suite 2, Level 2
67-71 King Street
WARRAWONG NSW 2502

10 OCTOBER 2007

HEGGIES PTY LTD
ABN 29 001 584 612

Incorporating New Environment Graeme E. Harding & Associates Eric Taylor Acoustics

Dwyers-Oxford Site Re-Development - Concept Design
31 Crown Street, Wollongong
Wind Impact Assessment

PREPARED BY:

Heggies Pty Ltd
2 Lincoln Street Lane Cove NSW 2066 Australia
(PO Box 176 Lane Cove NSW 1595 Australia)
Telephone 61 2 9427 8100 Facsimile 61 2 9427 8200
Email sydney@heggies.com Web www.heggies.com

DOCUMENT CONTROL

Reference	Status	Date	Prepared	Checked	Authorised
10-5947-R4	Revision 0	10 October 2007	Peter Georgiou	Peter Georgiou	Peter Georgiou

EXECUTIVE SUMMARY

Heggies Pty Ltd (Heggies) has been engaged by Belmorgan Property Development Pty Ltd to re-examine the wind impact of the proposed Concept Plan (Option 1) Re-Development involving both the Dwyers Site (bounded by Crown, Corrimal and Burelli Streets and lying on the east side of Corrimal Street) and the Oxford Site (bounded by Crown, Corrimal and Burelli Streets and lying on the west side of Corrimal Street) located within the Wollongong CBD precinct.

The project site (refer **Figure 1**) is located in the eastern half of the central Wollongong CBD area and is surrounded by a mix of mainly low- to medium-rise retail and residential developments. The eastern half of the site (Dwyers Site) has previously received development approval.

The wind assessment of the proposed Dwyers-Oxford Site Re-Development, Wollongong CBD, has revealed the following impact considerations.

Considerable shielding exists directly adjacent to the site at low levels for southwesterly winds by buildings in the CBD area including the Wollongong Council Chambers on the opposite side of Burelli Street. Some additional shielding is provided to the west and south, however mid to upper levels of the development site are exposed to most of the prevailing Wollongong wind conditions of importance.

It is likely therefore that wind conditions on surrounding footpaths are currently generally below the 16 m/sec *"walking comfort"* criterion with exceedances occurring on a relatively infrequent basis, largely from the southeast and southwest.

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

- Footpath locations on Burelli Street at the entry point to the Dwyers Site Hotel Lobby.
- Dwyers Site Podium areas at the southeast and southwest corners of the Hotel block.
- Oxford Site Podium areas in between the Office and Residential blocks.
- Oxford Site Residential block balconies facing west and southwest.

Landscaping and other windbreak treatments (eg awnings) already included in the proposed re-development will assist in the preservation of wind amenity both at ground level surrounding the site and upper levels of the development.

It is noted that the specific configuration of wind treatments, eg density, height and layout of landscaping, extent of awnings, etc, would be developed during the detailed design phase of the project and could be assisted (in a quantitative manner) by the use of model-scale wind tunnel testing or Computational Fluid Dynamics (CFD) 3-D modelling to accurately identify all affected areas and to develop cost-effective treatments to ameliorate adverse wind conditions.

On the basis of the above, it is predicted that ground levels wind speeds along all surrounding public footpaths will either remain at their present levels or remain below the standard 16 m/sec walking comfort criterion level with the addition of the proposed redevelopment.

TABLE OF CONTENTS

1 INTRODUCTION

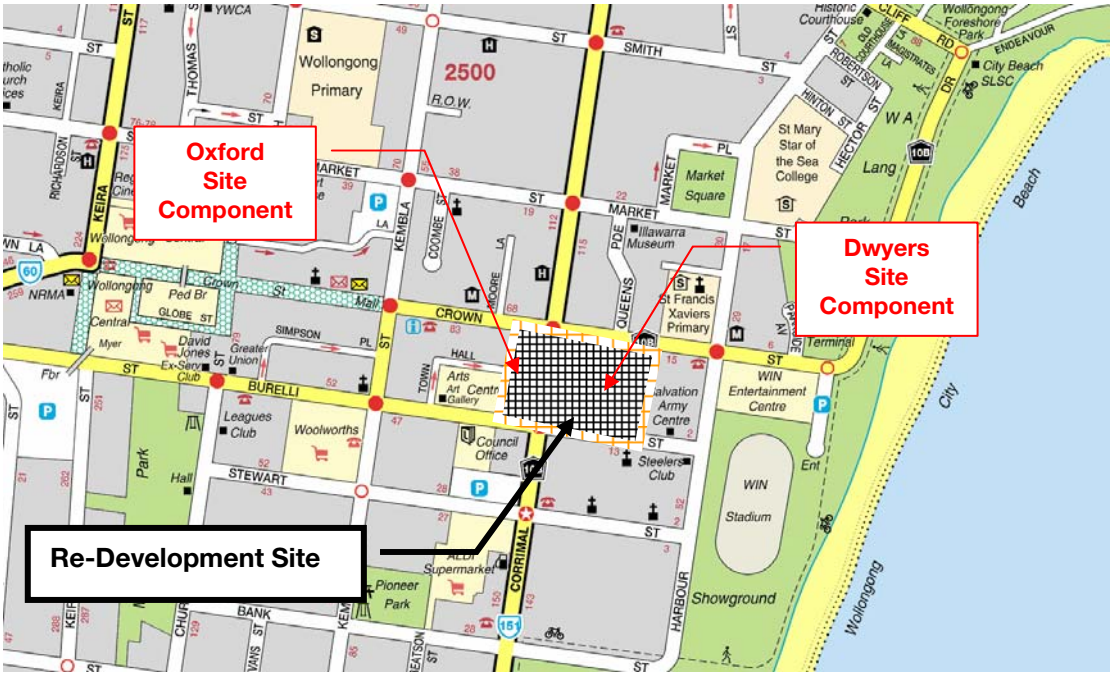
Heggies Pty Ltd (Heggies) has been engaged by Belmorgan Property Development Pty Ltd to re-examine the wind impact of the proposed Concept Plan (Option 1) Re-Development involving both the Dwyers and Oxford Sites located within the Wollongong CBD precinct.

1.1 Development Site

The integrated site consists of the Dwyers Site (bounded by Crown, Corrimal and Burelli Streets and lying on the east side of Corrimal Street) and the Oxford Site (bounded by Crown, Corrimal and Burelli Streets and lying on the west side of Corrimal Street).

The project site (refer **Figure 1**) is located in the eastern half of the central Wollongong CBD area and is surrounded by a mix of mainly low- to medium-rise retail and residential developments. The eastern half of the site (Dwyers Site) has previously received development approval.

Figure 1 Site Location Map for the Dwyers-Oxford Site Re-Development

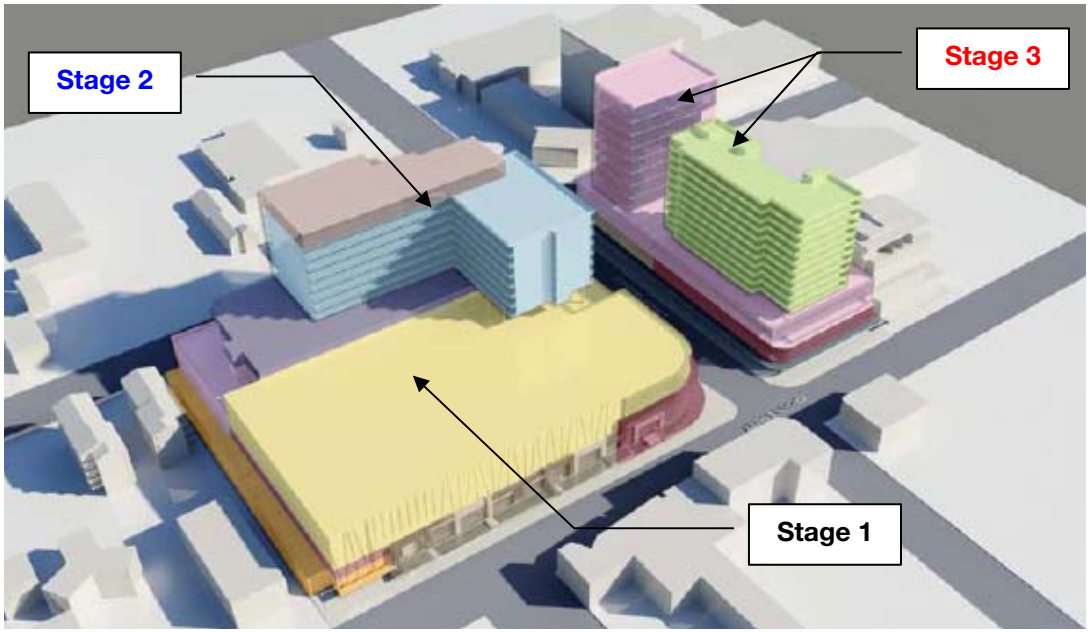


1.2 Development Description

Based upon architectural drawings supplied by DBI Design (March-July 2007), the proposed redevelopment of the Dwyers and Oxford Sites (refer **Figure 2**) will comprise the following stages:

- **Stage1 – Dwyers Site**
  - Basement carparking Levels B1 - B4.
  - Podium retail and commercial Levels 1 – 4.
- **Stage 2 – Dwyers Site**
  - Hotel Levels 5 - 12 plus Restaurant Level 13.
- **Stage 3 – Oxford Site**
  - Basement carparking Levels B1 - B4.
  - Podium Office Levels 1 – 3.
  - Office Tower Levels 4 - 11.
  - Residential Building Levels 4 - 14.

Figure 2 Dwyers-Oxford Site Re-Development Stages Illustration



2 WIND CHARACTERISTICS AFFECTING THE SITE

2.1 Synoptic Wind Climate

Detailed information of the Wollongong Wind Climate can be found in wind rose data available from various local meteorological weather stations. The climatological year is summarised by "wind seasons" which can be understood by reference to **Figure 3** and **Figure 4**.

- "Summer" winds:
  - Prevailing summer winds occur from the northeast (diurnal sea breezes) which strengthen during the day and provide some of the strongest winds throughout the year, typically in December and January.
  - Summer winds also occur from the southeast, particularly in early summer.
  - Northeast and southeast winds are strongest close to the coast.
  - In summer, there is also a prevailing offshore southwesterly wind which occurs only in the mornings and tends to be generally mild.
- "Winter / Early Spring" winds:
  - The months of winter and early spring are dominated by winds from the southwest, which also provide the strongest winds during this period. These winds occur regionally as westerly winds which manifest themselves locally as southwest winds due to the influence of the topographic orientation of the Illawarra Range to the west.
  - Winds tend to become more westerly towards the end of winter and the onset of spring.

2.2 Local Wind Environment Influences

Close to the ground, the "regional" wind patterns described above are affected by the local terrain and topography. The site is surrounded by low- to medium-rise residential and commercial buildings with the Pacific Ocean coast located only several blocks to the east and the high topography of the Illawarra Range further to the west.

- Winds from the northeast clockwise around to the southeast (ie onshore breezes) will impact on the re-development with shielding provided to the site only be the few low-rise residential and commercial buildings located between the site and the nearby coastline. It is noted however that these directions do not line up with the main street axes (running approximately north-south).
- Although winds from the west to southwest produce the strongest winds in the Wollongong region, these winds are lower than might be expected near the ground due to the influence of the steep rise in topography to the west of the Wollongong CBD area. Considerable shielding also exists directly adjacent to the site at low levels by buildings in the CBD area including the Wollongong Council Chambers on the other side of Burelli Street. West winds at ground level will tend to channel along both Crown Street and Burelli Street towards the east.
- Southerly winds occur with similar intensity to southeast winds and some shielding exists immediately to the south of the site from the Wollongong Council Chambers on the opposite side of Burelli Street. This direction coincides with the main alignment of Corrimal Street.

Figure 3 Wollongong Frequency Histogram Plots for 9.00 am and 3.00 pm – ALL Winds (regardless of strength)

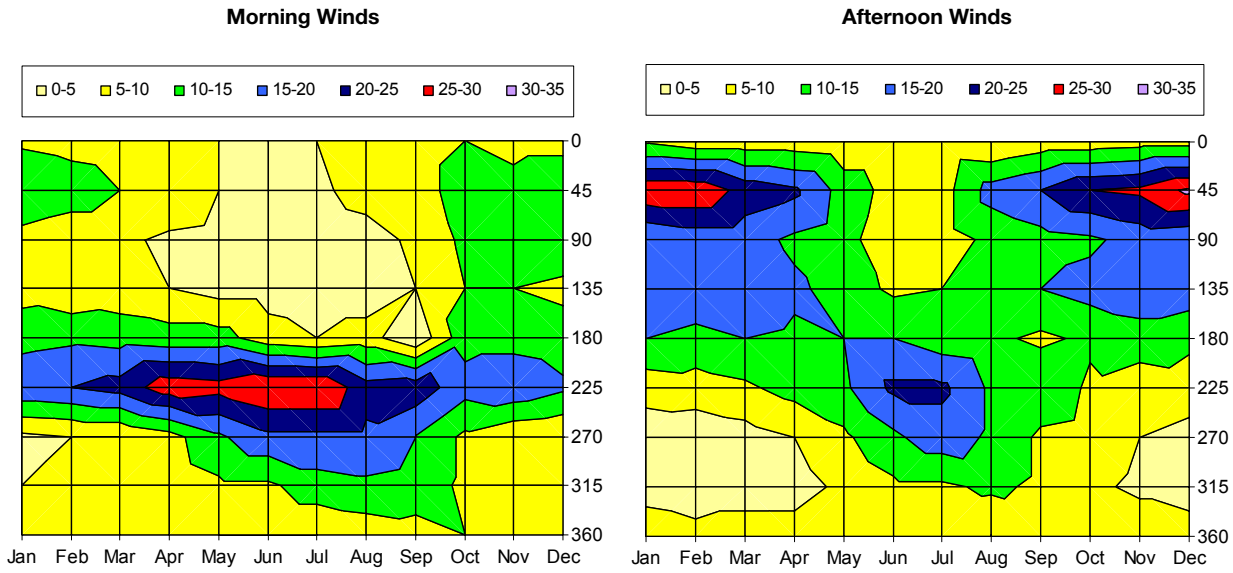
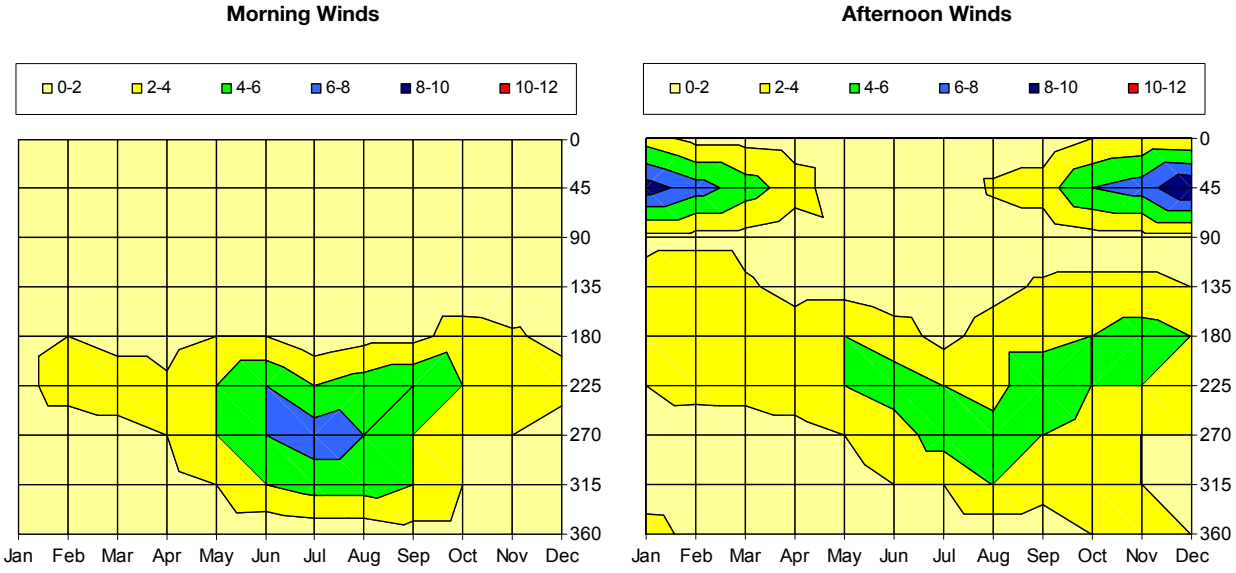


Figure 4 Wollongong Frequency Histogram Plots for 9.00 am and 3.00 pm – Winds greater than 20 km/hour



The above plots indicate the probability of occurrence (on a month-by-month basis) of winds arising from different wind directions: 0° corresponds to winds from the north, 90° easterly winds, 180° southerly winds, 270° westerly winds and 360° north winds.

3 PEDESTRIAN WIND ACCEPTABILITY CRITERIA

Standard Council Based 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 in use by Sydney City Council and other Councils within NSW are summarised in **Table 1**.

Table 1 Standard Council 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

Councils' primary objectives relating to wind impact 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 not exacerbate existing adverse wind conditions and should wherever feasible and reasonable ameliorate such conditions.

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 criteria given above may be acceptable for small areas under investigation provided the general site satisfies the relevant criteria.

4 WIND IMPACT OF THE PROPOSED RE-DEVELOPMENT

4.1 Existing Wind Environment at the Site

On the basis of the regional/seasonal wind variations and local shielding effects discussed in **Section 2** of this report, existing wind conditions at the Dwyers-Oxford Re-Development Site are likely to exhibit the following characteristics:

- *Existing* wind conditions on footpaths surrounding the site for ambient northeast and southeast winds will generally be below the 16 m/sec *"Walking Comfort"* criterion with exceedances occurring on a relatively infrequent basis.
- *Existing* wind conditions on footpaths surrounding the site for ambient westerly and southwesterly winds may be approaching the 16 m/sec *"Walking Comfort"* criterion with exceedances occurring on a relatively infrequent basis.
- Taking note of the mainly north-south Corrimal Street alignment, *existing* wind conditions on footpaths surrounding the site for ambient southerly winds may be approaching the 16 m/sec *"Walking Comfort"* criterion with exceedances occurring on a relatively infrequent basis.

4.2 Future Winds – Predicted Windflow Patterns for Prevailing Wind Directions

The following sections analyse the expected impacts of the proposed re-development for prevailing wind conditions affecting the local Wollongong area.

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.

The predictions made herein and the practicality and efficacy of wind mitigation measures thereby recommended could be further refined where necessary through accurate model scale wind tunnel testing or CFD (Computational Fluid Dynamic) simulation.

Wind Action 1 – Northeast Windflow (refer Figure 5)

With the proposed re-development on the site, northeast winds will experience the following actions:

- Generally northeast winds will provide beneficial cooling to the development.
- Northeast winds at ground level will be deflected by the re-development's Dwyers Site Podium along Crown Street towards the west and along the eastern facade towards the south.
- Regarding the Dwyers Site, northeast winds at upper levels will accelerate around the edges of the Hotel component moving towards the southwest in a horizontal direction. Northeast winds at upper levels will also be concentrated within the internal recessed area of the Hotel block at Podium level.
- Regarding the Oxford Site, northeast winds at upper levels will accelerate around the edges of the Office and Residential components, moving towards the southwest in a horizontal direction. There is some potential for channelling of northeast winds at upper levels between the Oxford Site Office and Residential components, once again moving towards the southwest.

Figure 5 Wind Action 1 – Northeast Windflow

Wind Conditions on Surrounding Public Spaces:

With respect to the ground level wind condition on Crown Street, it is noted this façade has a continuous Level 1 awning running along the Crown and Corrimal Street facades of the development. This is supplemented by 6 m to 8 m height mature trees along Crown Street in front of the development. Given the generally mild nature of northeast winds throughout the year and the alignment of surrounding streets, the awning and landscaping should ensure that Crown Street footpath winds are kept *below* the standard 16 m/sec walking comfort criteria.

Blockage from upstream buildings (northeast corner of Corrimal and Crown Streets) will ensure that footpath winds along Corrimal Street are kept *below* the standard 16 m/sec walking comfort criteria.

With respect to upper level winds, the Dwyer and Oxford Site Podiums will act to deflect these so that their impact close to ground will occur away from the footpaths immediately surrounding the site, eg footpaths close to the corner of Corrimal Street and Burelli Street. Once again, winds on surrounding footpaths downstream of the site should remain *below* the standard 16 m/sec walking comfort criteria.

Wind Conditions Within the Development Itself:

It is expected that winds at the following internal development locations may experience occasional instances of elevated intensity, ie with the potential to exceed the 16 m/sec walking comfort criteria.

- Internal (recessed) northeast-facing corner of the Dwyer's Site Hotel block at Podium level.
- Oxford Site Podium area located in between the south side Office block and north side Residential block.
- Upper-level Oxford Site Residential block balconies with a northeast exposure.

Consideration should be given to providing Podium level areas to be used by building occupants with mitigation for the expected occasional instances of higher winds. This is especially the case for areas which will also be subject to accelerating winds from other prevailing wind directions, eg the Oxford Site Podium area identified above will also experience similar of not higher winds for westerly wind conditions.

It is noted that milder northeast winds generally provide a beneficial cooling effect during summer. Mitigation options for northeast winds should therefore be biased towards "porous" or "impermanent" solutions which would lessen the impact of infrequent stronger winds but still take advantage of the cooling benefit during other periods.

- Retractable canopies, awnings, fabric umbrellas are examples of windbreak features which have these qualities.

Wind Action 2 – Southeasterly Windflow (refer Figure 6)

With the proposed re-development on the site, southeast winds will experience the following actions:

- Southeast winds at ground level will be deflected by the re-development's Dwyers Site Podium along Burelli Street towards the west and, to a much lesser extent, along its eastern facade towards the north. Southeast winds will also be deflected off the Oxford Site Podium and Office block towards the west along Burelli Street.
- Regarding the Dwyers Site and upper level windflow, southeast winds will accelerate around the edges of the Hotel block moving towards the northwest in a horizontal direction.
- Regarding the Oxford Site and upper level windflow, southeast winds will accelerate around the Office and Residential blocks, also moving towards the northwest in a horizontal direction. There is some potential for channelling of southeast winds at upper levels between the Oxford Site Office and Residential blocks.

Figure 6 Wind Action 2 – Southeasterly Windflow

Wind Conditions on Surrounding Public Spaces:

Although the eastern half of the Dwyer's Site Hotel block only has a modest set back from Burelli Street, the building orientation is not perpendicular to the windflow and the western half of the Hotel block has a set-back which increases significantly towards the corner of Burelli and Corrimal Streets. In addition, Burelli Street will be provided with a line of 6 m to 8 m height mature trees and a continuous line of awnings along the Burelli Street facade of the Dwyer's Site Podium.

The potential for downwash and other accelerated winds to impact on the footpath below in excess of the 16 m/sec walking comfort criterion is therefore low. Similar magnitude windflow conditions are expected to occur along Burelli Street for winds deflected off the southern façade of the Oxford Site Podium and Office block.

To assist in maintaining even lower wind speeds at the Lobby entry point for the Dwyers Site, we recommend the addition of planting along the outer kerb island at the perimeter of the vehicle drop-off area for the Hotel. Planting along Burelli Street close to the Burelli and Corrimal Street corner would also assist in maintaining low wind speeds at the southwest entry point into the retail areas of the Dwyers Site.

Winds accelerating at upper level around the Dwyer's Site Hotel block and Oxford Site Office and Residential blocks will be deflected horizontally by the Podium, limiting the impact of these winds away from ground level. Footpaths downstream of the site (eg Crown Street) will be generally shielded as a result and experience *lower wind speeds* than at the present time and likely well below the 16 m/sec walking comfort criterion.

Wind Conditions Within the Development Itself:

It is expected that winds at the following internal development locations may experience occasional instances of elevated intensity, ie with the potential to exceed the 16 m/sec walking comfort criteria.

- Dwyers Site Podium level overlooking the Burelli and Corrimal Street intersection (ie at the southwest corner of the Dwyer's Site Hotel block).
- Dwyers Site Podium level overlooking Burelli Street intersection at the southeast corner of the Hotel block).
- Oxford Site Podium area lying in between the south side Office block and north side Residential block.

Consideration should be given to providing these areas with mitigation for the expected occasional instances of higher winds if they are to be used as public access spaces.

In the case of the Dwyers Site Podium areas noted above, the winds of interest will be primarily horizontal. Accordingly, windbreak options considered for these locations should be vertical in nature, eg parapet walls or planter box wall along the perimeter of the Podium area.

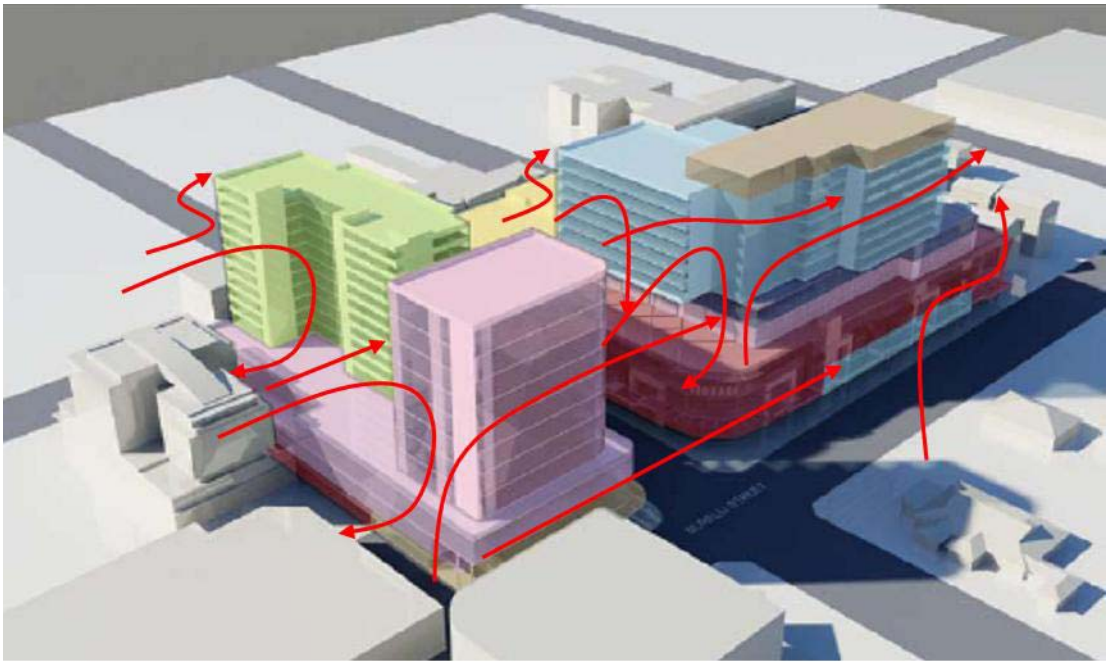
In the case of the Oxford Site Podium area between the Office and Residential blocks, the winds of interest will have both a horizontal and vertical component. Accordingly, windbreak options considered for this location should be horizontal in nature, eg awnings, canopies, umbrellas, louvred awnings, trellises, etc.

Wind Action 3 – Southwest and West Windflow (refer Figure 7)

With the proposed re-development on the site, prevailing southwest and less frequent west winds will experience the following actions:

- Southwest and westerly winds at ground level will receive shielding at ground level from existing upstream developments immediately adjacent to the site. This is especially the case for southwest winds at the Corrimal and Burelli Street intersection which will be shielded by the Council's Chamber Office building immediately upstream.
- Less frequent westerly winds at ground level will continue to channel along both Crown Street and Burelli Street towards the east.
- At upper level, west to southwest winds will be deflected downwards (as "downwash") off the western facades of the Oxford Site Office and Residential blocks. These winds will also move around the edges and over the roofs of these buildings towards the east and northeast.
- At upper level, westerly winds channelling between the Office and Residential blocks of the Oxford Site and southwest winds accelerating around the southern façade of the Office block have the potential to impact on the Dwyers Site Podium area overlooking the Corrimal-Burelli Street intersection (ie southwest corner of Dwyers Site Hotel block).
- Southwest winds alos have the potential to impact on the Dwyers Site Podium area at the southeastg corner of the Hotel block.

Figure 7 Wind Action 3 – West and Southwest Windflow



Wind Conditions on Surrounding Public Spaces:

With respect to wind conditions at ground level, the two conditions of interest are southwest winds and the channelling of westerly winds along both Burelli and Crown Streets.

In the case of southwest winds, significant upstream shielding is provided to the site at ground level. The southern facades of the Oxford Site Office block and Dwyers Site Hotel block are both set back from their respective Podiums such that residual downwash flow will be intercepted by each Podium before reaching ground level. Furthermore, footpath awnings line the base of the Podium facades providing a final barrier to downwash and/or accelerated flows. Accordingly, it is likely that footpath winds will be kept *below* the 16 m/sec walking comfort criterion.

In the case of the much more infrequent occurrence of channelling westerly winds along Crown Street and Burelli Street, the following is noted:

- the degree of building massing involved in both the Oxford and Dwyer Site Podiums is modest.
- All three major blocks on the site (Oxford Office and Residential and Dwyers Hotel) are set-back from both Crown and Burelli Streets.
- Planned trees along both Crown Street and Burelli Street along the development's north and south perimeters respectively as well as continuous awnings will assist in dispersing and dissipating wrestler winds.

Accordingly, it is likely that westerly wind channelling footpath winds will *remain close* to their present levels with the proposed re-development.

All of the upper level wind conditions identified for westerly winds, including for example downwash windflow off the Oxford Site Office and Residential blocks, will impact on the two Podium areas of the development itself and not impact on surrounding ground level wind conditions, except to produce general shielding for areas downstream of the site.

Wind Conditions Within the Development Itself:

It is expected that winds at the following internal development locations may experience occasional instances of elevated intensity, ie with the potential to exceed the 16 m/sec walking comfort criteria.

- Oxford Site Podium area lying in between the south side Office block and north side Residential block.
- Dwyers Site Podium level overlooking the Burelli and Corrimal Street intersection (ie at the southwest corner of the Hotel block).
- Dwyers Site Podium level overlooking Burelli Street intersection at the southeast corner of the Hotel block).

Consideration should be given to providing these areas with mitigation for the expected occasional instances of higher winds if they are to be used as public access spaces.

In the case of the Dwyers Site Podium area at the southeast corner of the Hotel block, the winds of interest will be primarily horizontal. Accordingly, windbreak options considered for this location should be vertical, eg perimeter parapet or planter box walls.

In the case of the Dwyers Site Podium area overlooking the Burelli and Corrimal Street intersection and the Oxford Site Podium between the Office and Residential blocks, the winds of interest will be both horizontal and vertical in nature. Accordingly, windbreak options considered for these locations should be a combination of vertical windbreaks, eg perimeter parapet or planter box walls, plus horizontal, eg canopies, awnings, etc.

Finally, it is expected that upper level balconies of the Oxford Site Residential block will experience high winds from the southwest. If it is intended to use these balconies throughout the year, consideration should be given to providing such areas with mitigation for the expected and relatively frequent instances of higher winds.

In considering the above windflow conditions, it should be noted that west and southwest winds occur primarily outside of summer months. If such spaces are intended primarily for summer use only, mitigation options can be more "porous" in nature, eg louvred screens, planting. Mitigation would also be targeted at primary summer windflow directions. If the use of such areas is intended to extend throughout most of the year, appropriate mitigation options should be less "porous", ie solid perimeter walls (which could involve glazing to enable views and solar intrusion) and solid canopies and awnings.

4.3 Relevance of Wind Speed Criteria to Balcony Wind Comfort

In relation to the wind comfort criteria noted in Section 3 of this report and balcony wind conditions (especially at upper levels of the Oxford Site Residential block), we note that, in general, a person's reaction to wind will be dependent on several factors, including the temperature and humidity, the activity being undertaken, their age and fitness, level of dress and familiarity with existing conditions. The latter point is important. Historically, the research studies associated with the development of current wind comfort and safety criteria involved a range of test subjects (different ages, heights, weight, etc) walking from a "no wind" situation to a "full wind" situation and then being prone to "knock-over". These research studies recognised that, in relation to the potential for wind knock-over, the crucial parameter is a sudden change in wind speed as would be encountered in walking around the corner of a building from the protected leeward side to the exposed windward side.

Such conditions are unlikely to exist in relation to occupants of the proposed Residential block. Higher wind speed occurrences would be accompanied by wind noise and possibly even rain. It seems extremely unlikely that a resident could be taken completely unawares walking out onto a balcony during the passage of a peak windstorm event affecting Wollongong. Nor would it be likely that occupants of the proposed Residential block would expect to use their balconies during such peak windstorm events, especially during winter months.

The use of partial screening options, eg sliding louvred screens, to increase the usage of the wind-prone balcony areas is therefore a reasonable option which also provides residents with a means by which associated energy efficiency benefits can be realised.

Finally, and in relation to the observations made above regarding sudden changes in wind conditions being the critical ingredient in generating adverse wind conditions. In lieu of providing some form of wind mitigation to exposed balcony spaces (eg wind screens, louvres, etc), consideration could be given instead to providing balconies with some form of "*windicator*", ie a feature such as a potted plant, etc, which would give ample warning to residents of the development of any uncomfortable wind conditions present on wind-prone balconies.

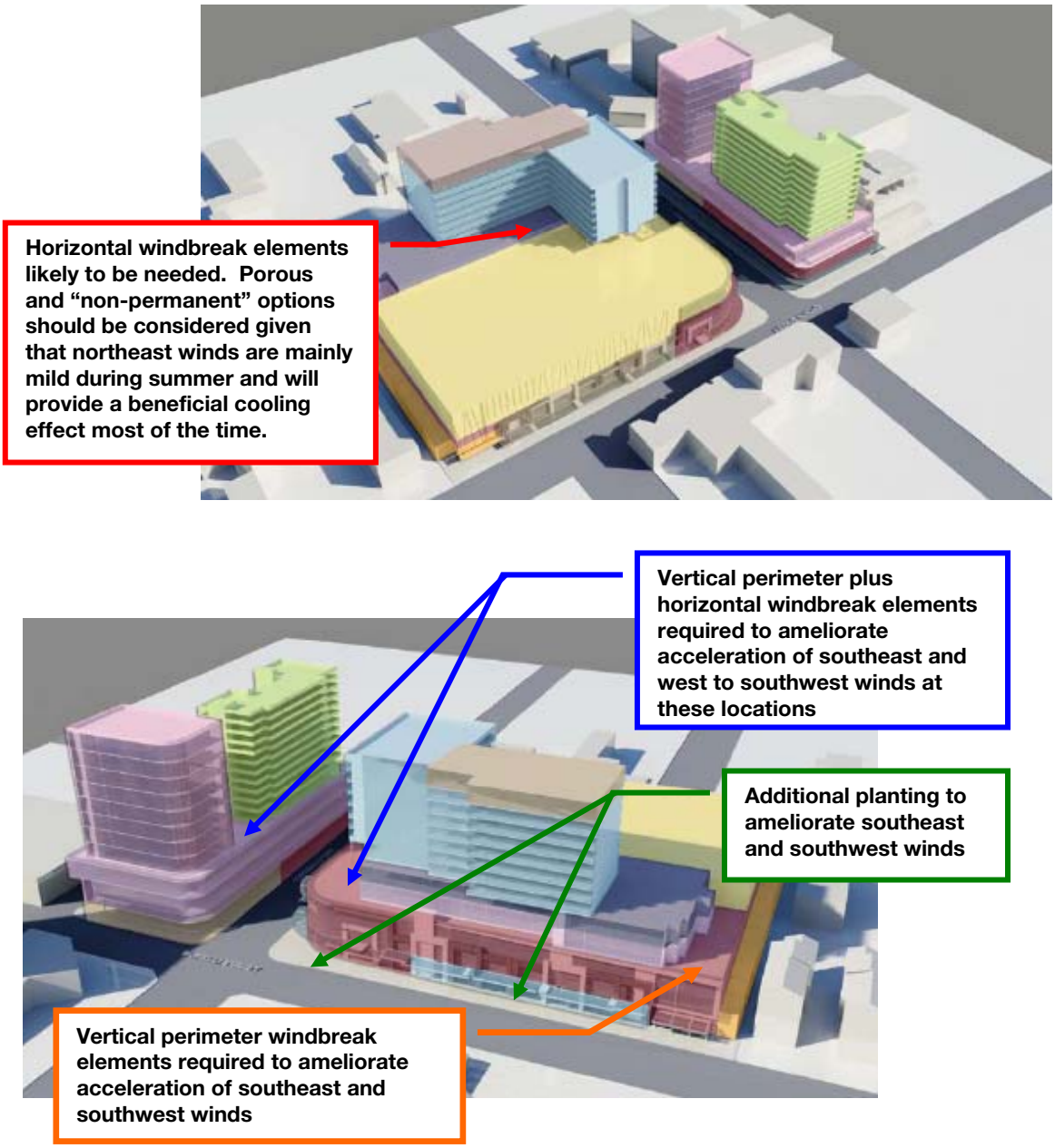
4.4 Summary of Recommended Windbreak Treatments

Figure 8 provides a graphical summary of the recommended measures to ameliorate undesirable wind impacts for the re-development. In general, only areas within the development site itself have the potential to experience elevated wind conditions.

Amelioration measures will mitigate adverse wind flow in these areas so that the resulting wind environment complies with standard Council Wind Acceptability guidelines.

We note that the landscaping plan accompanying the Concept Design submission for the project includes all of the recommended wind amelioration measures identified in **Figure 8**.

Figure 8 Recommended Wind Amelioration Measures



5 SUMMARY AND STATEMENT OF COMMITMENTS

5.1 Summary

The wind assessment of the proposed Dwyers-Oxford Site Re-Development, Wollongong CBD, has revealed the following impact considerations.

Considerable shielding exists directly adjacent to the site at low levels for southwesterly winds by buildings in the CBD area including the Wollongong Council Chambers on the opposite side of Burelli Street. Some additional shielding is provided to the west and south, however mid to upper levels of the development site are exposed to most of the prevailing Wollongong wind conditions of importance. It is likely that wind conditions on surrounding footpaths are currently generally below the 16 m/sec *"walking comfort"* criterion with exceedances occurring on a relatively infrequent basis.

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

- Footpath locations on Burelli Street at the entry point to the Dwyers Site Hotel Lobby.
- Dwyers Site Podium areas at the southeast and southwest corners of the Hotel block.
- Oxford Site Podium areas in between the Office and Residential blocks.
- Oxford Site Residential block balconies facing west and southwest.

Landscaping and other windbreak treatments already included in the proposed redevelopment will assist in the preservation of wind amenity both at ground level surrounding the site and upper levels of the development.

On the basis of the above, it is predicted that ground levels wind speeds along all surrounding public footpaths will either remain at their present levels or remain below the standard 16 m/sec walking comfort criterion level with the addition of the proposed redevelopment.

5.2 Statement of Commitments

It is intended that the areas of interest in relation to wind environment identified in this report and the windbreak features which will assist in their amelioration will continue to be reviewed through the detailed design phase of the development to ensure appropriate implementation.

The actual configuration of wind treatments, eg density, height and layout of landscaping, extend of awnings, etc, would be developed during the detailed design phase of the project prior to the Construction Certificate application for the project. This phase could be assisted (in a quantitative manner) by the use of model-scale wind tunnel testing or Computational Fluid Dynamics (CFD) 3-D modelling to accurately identify all affected areas and to develop cost-effective treatments to ameliorate any confirmed adverse wind conditions.