

One Pukeahu Park

Assessment of the March 2023 proposal



BUILDING ENVIRONMENTAL PERFORMANCE SIMULATION

April 5, 2023

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Documents Seen

- 0 - AAL_SiteMassingUpdate.pdf
- 8 - Wind_Wraights-WSP-WakaKotahi.pdf
- ADVISOR COMMENT - TRAFFIC - rfi.doc
- aee-appendix-10---heritage-peer-review.pdf
- aee-appendix-11---cultural-effects-assessment.pdf
- aee-appendix-12a--wind-mitigation-study-consented-scheme.pdf
- aee-appendix-12b--wind-mitigation-scheme-amended-scheme.pdf
- aee-appendix-12---wind-report.pdf
- aee-appendix-13a---sun-study-addendum.pdf
- aee-appendix-13---sun-studies.pdf
- aee-appendix-14---acoustical-design-report.pdf
- aee-appendix-15---transportation-assessment-report.pdf
- aee-appendix-16---cpted-assessment.pdf
- aee-appendix-17---contaminated-land-status-letter.pdf
- aee-appendix-18---structural-effects-and-construction-methodology.pdf
- aee-appendix-19---civil-engineering-services-report.pdf
- aee-appendix-1---architectural-design-statement.pdf
- aee-appendix-20---draft-construction-managment-plan.pdf
- aee-appendix-21---conset-conditions-for-sr-500876.pdf
- aee-appendix-2---landscape-design-statement-and-plans.pdf
- aee-appendix-3---consent-scope-diagrams.pdf
- aee-appendix-4---district-plan-objectives-and-policies-assessment.pdf
- aee-appendix-5---district-plan-audit.pdf
- aee-appendix-6---record-of-pre-application-consultation.pdf
- aee-appendix-7---urban-design-assessment.pdf
- aee-appendix-8---townscape-views.pdf
- aee-appendix-9---heritage-assessment.pdf
- Annexure_1___Heritage_Advisor_Assessment.pdf
- Annexure_2___Urban_Design_Advisor_Assessment.pdf
- application-drawings.pdf

- assessment-of-environmental-effects-ae-report.pdf
- Combined submissions - 1-23 Tasman Street - 528330 (1).pdf
- Combined submissions - 1-23 Tasman Street - 528330.pdf
- cover-letter-rc-application--123-tasman-street.pdf
- FINAL DECISION S104 - SR 500876 One Tasman.docx
- FINAL S95 DECISION - SR 500876 One Tasman.docx
- One Tasman - additional matters.eml
- Re_ Direct Referral for One Tasman 2023 - SR 528330.eml
- resource-consent-application-form-121-tasman-street.pdf
- WCC Tree Pits - Std Details FOR CONST 5-10-18.pdf
- PLUS Files from previous applications:
- Wind_Additionaltesting(WSP).pdf
- Wind – Canopy Details.pdf

Brief

To comment on the aerodynamic design of the latest Resource Consent application in the context of the already consented design.

Summary

The many and various versions of the wind tunnel test are difficult to relate to a comparison of the impact of the proposed scheme, vis-à-vis the consented scheme. However, there are several simple observations that can be made: the wind tunnel tests demonstrate this is a very exposed site compared to other sites around the city. It experiences high winds at present, and the wind flow is not complicated by adjacent large scale buildings. On a strict interpretation of the intent of the District Plan, any intervention of tall buildings on the site ought to be referenced to the WCC Design Guide. This does not seem to have been the case. The most obvious evidence of this lack of reference to the Design Guide is the placement of the taller buildings in the development closer to the street than would be considered advisable.

What are proposed, in the consented development, and in the proposed taller development, are off-site amelioration measures comprised of large trees. On review of the documentation provided, there remain questions about their scale, placement, underplanting and on-going maintenance for the lifetime of the building. In addition, the evidence from the wind tunnel tests submitted that these off-site measures whose detailed planning and placement were to be negotiated as part of the post-planning-consent developed design were barely sufficient for the consented design. There does not seem to be any evidence that they could cope with the increased height of the proposed design.

In summary, more design work seems necessary to resolve the impact of the proposed design on the local pedestrian environment:

- a) The proposed extra height of the buildings will make the areas of concern from the consented building worse. The form, scale and placement of the buildings seems to take no cognizance of the added risk, and the earlier proposed off-site amelioration measures are apparently proposed as sufficient to deal with the added risk due to the increased height on this exposed site. What is proposed seems insufficient to deal with the demonstrated impact.
- b) The area under the canopy to the south of the Northern tower building is apparently subject to increased horizontal wind flows that were queried in previous design iterations and remain unresolved by the addition of tall trees with no supplemental wind-hardy underplanting, that will survive the minimal maintenance that the City can afford to provide to deal with the wind effects of the proposed building in future years.
- c) The West side of Tasman Street is made significantly worse with the proposed taller buildings, and no solution is proposed for this worsening; with the lower, consented, buildings this was not so much of an issue. If the solution were to propose off-site amelioration, it seems likely that building a wall along the edge of the footpath is the only way of dealing with this issue as the problem seems likely to be as a result of backwash off the West and North faces of the proposed taller buildings.
- d) The scale of the trees proposed as off-site amelioration on the Northeast corner of the site, and further along Old Buckle Street towards the Basin Reserve is unclear in my reading of the reports available to me. The question is I suspect whether the trees were modelled in the wind tunnel as 5m diameter, or 5m radius.
- e) The off-site amelioration planting scheme proposed for the Northeast corner of the development does not seem to recognize the direction from which the problem wind accelerations arise. It is important that the scale of the planting, the necessity for underplanting and the question of the long-term viability of planting as a wind shelter solution to be maintained by the Wellington City Council is resolved.

The Wind Environment

In my assessment of an earlier proposal for this site I noted:

“The location of the site on the ridge of Mount Cook, Wellington, with few buildings nearby seemed a likely source of the high wind speeds recorded in the wind tunnel test of the existing wind conditions. Therefore, in order to better understand the actual windiness of this site, the wind speeds characteristic of the wind in three other locations about the city were analysed from wind tunnel test reports for other sites. For this report, the text version of that analysis has been converted to the following table indicating the general windiness of the average wind speeds experienced on site:

Pre-development windiness of the site (average hours above tolerable threshold speed)			
1 Pukeahu	104 Dixon St	61 Molesworth St	2-12 Aitken St
Mt Cook	Centre of mid-rise CBD	Another ridge in Wellington - Thorndon	
<i>The threshold of tolerable wind for sitting outside for a long period of time is 9km/hr (2.5m/s in the District Plan).</i>			
Average of 48 points	Average of 31 points	Average of 71 points	
3500 hours (~146 ‘days’)	1041 hours (~43 ‘days’)	2000 hours (~80 ‘days’)	

I went on to note: *“Overall then, Tasman Street wind is far higher than the Thorndon wind, and both a significantly more windy than in amongst the tall buildings in the centre of the CBD. However, a remarkable feature of this comparison is that the above picture of the much higher average current wind speeds in Tasman Street, is not representative of the gustiness of the wind.*

Pre-development number of points where the safety criterion is exceeded			
1 Pukeahu	104 Dixon St	61 Molesworth St	2-12 Aitken St
Mt Cook	Centre of mid-rise CBD	Another ridge in Wellington - Thorndon	
<i>Number of points exceeding the threshold of safety which is a gust of 72km/hr (20m/s in the District Plan).</i>			
Total points: 48	Total points: 31	Total points: 37	Total points: 34
1 (2%) exceeds criterion 24 (50%) equal/exceed criterion	0 exceed safety criterion	12 (32%) exceed criterion 16 (43%) equal/exceed criterion	3 (9%) exceed criterion 8 (24%) equal/exceed criterion

“The conclusion is that [the existing] wind in Tasman Street is [characteristic of a site that is] much more exposed, but far less turbulent or less gusty [than any of these other sites] because there is little local disturbance to the flow by surrounding buildings; however it is clear that Tasman street does still [currently] experience very high winds as half the 48 measurement points experience gusts equal to the WCC safety criterion.”

On any site like this we are returning to the situation in 1920-1930s Wellington where the intrusion of the initially 6 and then 8 storey Hope Gibbons building created a location in the city that was notoriously dangerous for the next 60 years.

The risk, therefore is that any medium scale building near the footpaths, like the Hope Gibbons building will likely reproduce the safety and windiness issues formerly experienced at the Hope Gibbons corner, unless care is taken in the design. The current wind environment does not suffer from this issue because the tall parts of the buildings on site are well set back from pedestrian thoroughfares thus ensuring what wind effects occur on site remain on the roofs of the lower buildings along the footpath edges.



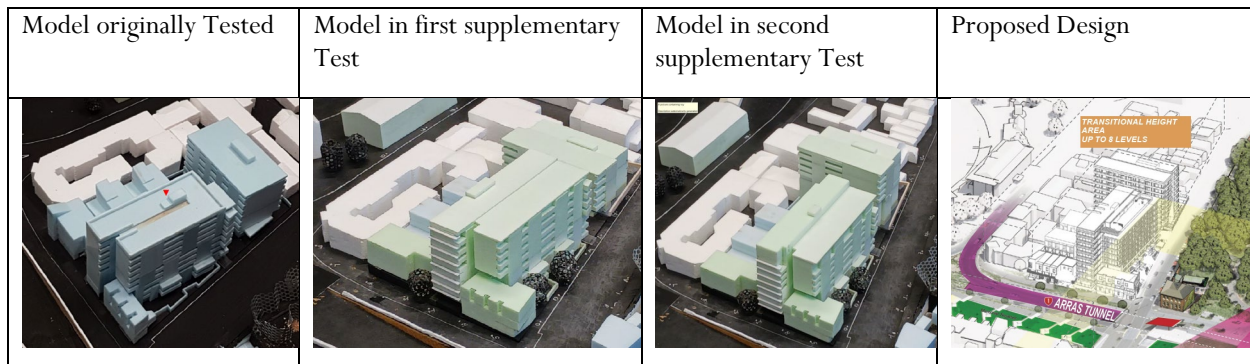
Since the 1980s the Wellington City Council has provided a design guide that provides good practice advice for building scale and form to reduce pedestrian level wind accelerations due to building design. It is the intention of this guide and of the Wind Rules in the District Plan that new buildings avoid creating further dangerous situations, and to avoid general worsening of the wind. This is to be achieved primarily through building design, with off-site amelioration such as trees and wind breaks providing the opportunity for fine tuning.

The Wind Report

Several wind tunnel tests were available with this application. Typically, in situations where a previously consented building is re-submitted with design changes, the wind report examines the impact of the design changes. For this proposal, three different wind assessments were submitted and a fourth was used as reference.

- 1) The most comprehensive wind report is the original 2021 wind tunnel test for a building of similar scale in terms of height, but in a slightly different plan configuration has been submitted (aee-appendix-12---wind-report.pdf).
- 2) The first supplemental report, produced in March 2022, but not apparently part of the current resource consent submission, examined further off-site mitigation options. (Wind_Additionaltesting(WSP).pdf) including: a) Dense evergreen planting in a 5m high strip, approximately 60m long, along the north side of Old Buckle Street. b) A 2.5m high 35% porous screen approximately 60m long, along the north side of Old Buckle Street. c) A 2.5m high solid screen approximately 60m long, along the north side of Old Buckle Street. d) A 1.5m high solid upstand around the outside perimeter of the large canopy added to the southern building, as Option 2 above.
- 3) This was recently (January 2023) supplemented by a report examining the wind impact of the consented building (aee-appendix-12a--wind-mitigation-study-consented-scheme.pdf) where the buildings on the site are much lower than originally tested. The building on the Northwest corner of the site is 8 storeys, and the building on the Southwest corner is 5 storeys in height. This report also notes: *“These wind mitigation features included (1) the large canopy described above (2) a 1.5m high upstand around the outside perimeter of this canopy, (3) two evergreen trees, 5m high, located along the Tasman Street frontage of the northern apartment block, and (4) Large evergreen trees, 5m high, extending in a row along the east side of Tasman Street, from the southwest corner of the site to opposite the centre of the Seventh Day Adventist Church at 27 Tasman Street.”*
- 4) The third submitted wind report is a further supplement examining the wind impact of a development that maintains *“...the original height of the northern apartment building at 9 to 10 levels and the southern apartment building at 9 levels.”* This development includes the following wind mitigation features: *(1) the large canopy ... [on the southern apartment building] (2) a 1.5m high upstand around the outside perimeter of this canopy, (3) two*

evergreen trees, 5m high, located along the Tasman Street frontage of the northern apartment block, and (4) Large evergreen trees, 5m high, extending in a row along the east side of Tasman Street, from the southwest corner of the site to opposite the centre of the Seventh Day Adventist Church at 27 Tasman Street.



On a site as exposed to the wind as this one, the simple, single building guidance in the Wellington City Design Guide is highly relevant as there is no added complication of large neighbouring buildings altering the wind flows. The design guidance highlights the issue that taller buildings are more of a problem than shorter buildings. The guide suggests a range of design approaches that involve significant changes in bulk and form to ensure that mitigation of the effects of a building on the wind at pedestrian level happens on-site. At its simplest the guidance can be interpreted as suggesting that to minimise the impact of this group of buildings on the neighbouring pedestrian areas, then the taller buildings should be placed further from the street. Swapping the low rise strip of buildings (Pukeahu Terrace Houses) with the taller apartment block (Northern Apartments) would have ensured that most of the the worst effects of the proposal's height and form would be experienced on-site. There, they would be an issue for the residents, but not for the city. However, the design proposals in this project are not about form. They are mostly about relatively small mitigation changes to the building through attached canopies, and a significant number of off-site measures such as trees and screens. Technically, even the canopies are off-site as they project over public space.

The one on-site design feature that is likely to be reducing the pedestrian wind effects of the development is the low rise building on the Northwest corner of the site; it is highly likely that the Northerly wind downdraft off the tall apartments behind will be dissipated on the roof of this low rise building.

Table 1 reports the relevant heights of the proposed building in the consented and proposed designs.

Table 1: Building Details

Building	Building Name	Consented Height (m)	Proposed Height (m)
A	Northern Apartments	29.3 (at parapet)	36m
B	Pukeahu Terrace Houses		12.1m
C	Buckle Street Terrace Houses		12.3m
D	Courtyard Terrace Houses		13.1m
E	Southern Apartments	19.5 (at parapet)	33m

I understand that, under the Operative District Plan, the maximum heights on the site are 18.6m (with a small sliver on the southern lot at 10.2m). These are in contrast to the maximum height of 28.5m in the proposed District Plan. Having worked on the proposed plan, it is also my understanding that the environmental effects of a proposed building will always have to meet the required wind performance criteria that the submitted wind reports examine.

The Effect of the Proposed Building(s)

In reality, this assessment of the building that is now proposed cannot be compared to the aerodynamics of the “Consented Design” as that design was approved with an expectation that:

- 1) The consented buildings had adjusted the bulk of the design to be significantly shorter than in the original wind tunnel test which had identified the neighbourhood worsening of the wind;
- 2) The consent had been awarded *conditional on further design work to improve the proposed off-site amelioration measures*;
- 3) The provisionally consented off-site amelioration measures were in response to the lower bulk of the consented buildings, not to the original wind tunnel test.

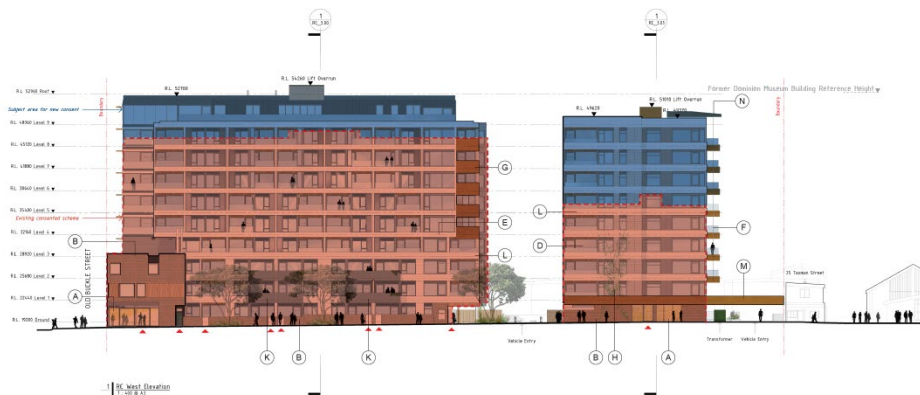


FIGURE 1 WEST ELEVATION OF THE PROPOSED DESIGN SHOWING SCALE OF CONSENTED BUILDING AS BRICK RED AND OF PROPOSED BUILDING AS BLUE (FROM AEE-APPENDIX-3---CONSENT-SCOPE-DIAGRAMS,PDF)

In the 2021 Assessment of Environmental Effects the following summary was made of the first wind tunnel test:

“Wind effects on public space - a wind assessment has been prepared as part of the Application by WSP. The assessment concludes that wind issues arising from the proposal can be adequately addressed through a combination of a design changes (which have been incorporated into the proposal) and the installation of a canopy along the Tasman Street frontage of Building E. The wind report notes that that the proposal does produce an improvement in the amenity around the north/west corner of the site, including over a sizeable area of Pukeahu National War Memorial Park.”

In January 2023, WSP produced a letter report that addressed the following issues:

The testing of design changes showed that the negative effects of the original design of the development could be partially mitigated. An aggregation of a number of design changes (Option 1) produced some significant improvements over the original design. The inclusion of a large canopy on the southern apartment building (Option 2) offered additional mitigation of some of the wind effects identified in Tasman Street. Both design changes (Options 1 and 2) were included in the development design submitted for resource consent. (aee-appendix-12a--wind-mitigation-study-consented-scheme.pdf)

Wind amelioration Option 1 from the Initial Wind Tunnel Tests comprised the following set of measures:

- North tower block shifted 2m South and 0.4m east.
- North tower block level 9 setback back west façade (i.e. one floor reduction in height)
- North West Corner townhouses extended further south along Tasman St
- Large trees included along Tasman St in front of Northern Apartments.
- South tower block shifted south approx. 7m (site to south has also been acquired)
- South tower block increased by 1 level
- South tower block footprint adjusted – steps on the south corners
- Proposed planting in the gap between North and South tower blocks
- Proposed planting in the space between the southern boundary and South tower block.

Option 2 comprised the design changes listed in Option 1, with the inclusion of a large canopy. This canopy extends from the northwest corner of the South tower block to the southern site boundary, 0.3m from the Tasman Street kerb and also extends along part of the southern façade of the South tower block.”

(aee-appendix-12---wind-report.pdf)

This January 2023 report used the lessons learned from the supplementary wind tunnel test letter report from March 2022 report (Wind_Additionaltesting(WSP).pdf) The design changes that were tested for the 2022 letter report comprise the following options:

- Dense evergreen planting in a 5m high strip, approximately 60m long, along the north side of Old Buckle Street.
- A 2.5m high 35% porous screen approximately 60m long, along the north side of Old Buckle Street.
- A 2.5m high solid screen approximately 60m long, along the north side of Old Buckle Street.
- A 1.5m high solid upstand around the outside perimeter of the large canopy added to the southern building, as Option 2 above (see Figure 1 below).



FIGURE 2 1.5M UPSTAND ON THE CANOPY AROUND THE SOUTHERN BUILDING (FROM DECEMBER 2021 ATHFIELD ARCHITECTS ILLUSTRATION IN WIND – CANOPY DETAILS.PDF)

The questions that remain to be considered in light of this latest application are much the same as those posed in the last advice provided to WCC in September 2022. Off-site wind mitigation measures were proposed for the positions listed as options a through h in Figure 3:

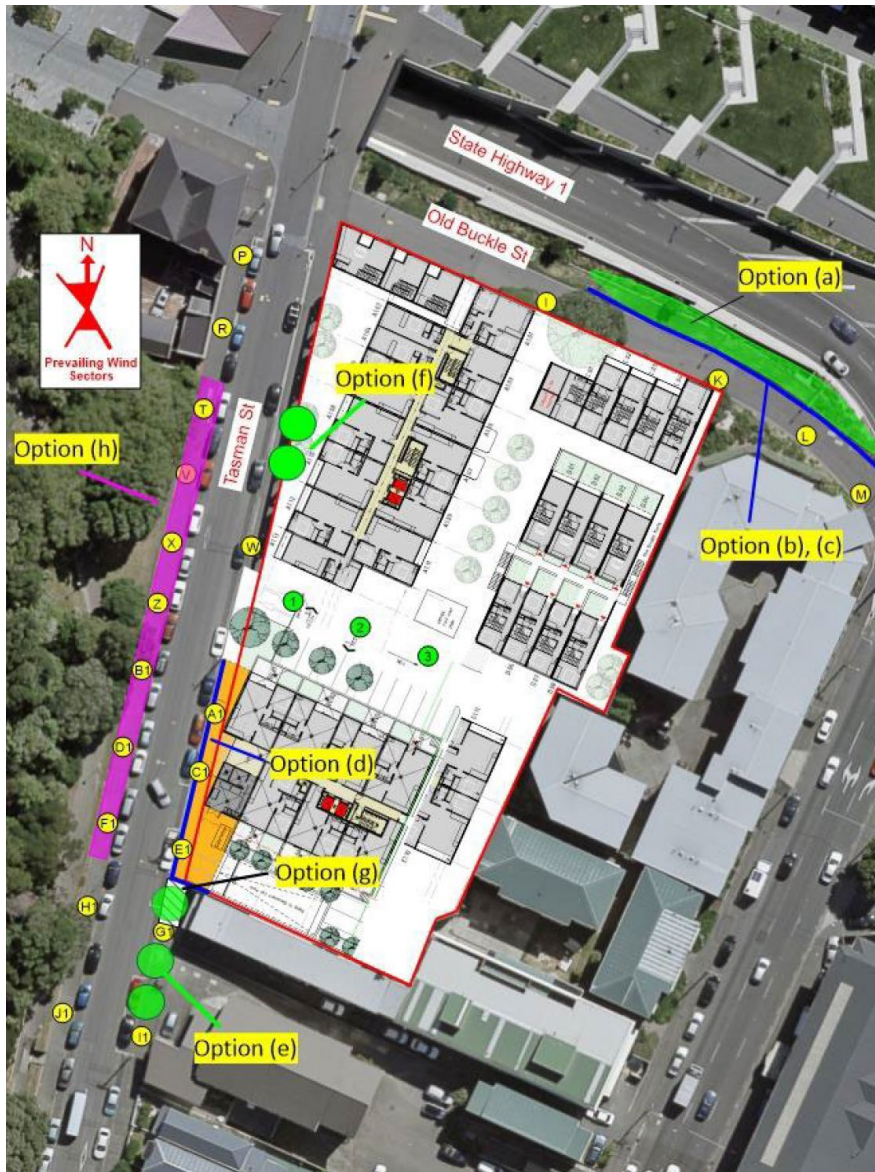


FIGURE 3 OFF-SITE WIND MITIGATION OPTIONS CONTAINED IN WSP REPORT: WIND_ADDITIONALTESTING(WSP).PDF

It must also be remembered that the wind shelter “devices” tested in the wind tunnel are of the shape shown in Figure 4, not the shape wind hardy trees adopt in reality (Figure 5) in urban areas. As noted in the September 2022 advice, trees of the shape shown in Figure 5 would need significant underplanting to provide pedestrian level shelter.

Buckle Street / Tasman Street intersection – wind tunnel test on left – existing situation on right

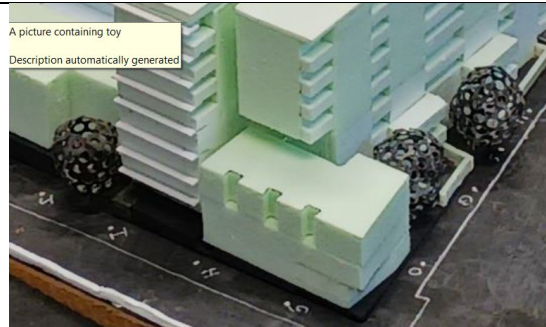


FIGURE 4 WIND TUNNEL TEST 'TREES'



FIGURE 5 EXISTING TREES ON OLD BUCKLE ST

Options d, e, g and h (see Figure 3) – amelioration around the Southern building

The proposed canopy (Figure 2) on the Southern building, as documented in the September review of the design proposal, has a small benefit in terms of safety under the canopy and near the building. I would note that However, as noted then: “*The other wind tunnel tests show the canopy would be far more effective here if, in addition to extending horizontally, it could be combined with vertical porous screens and trees.*” I cannot see evidence of these trees in the design now proposed, even though for a building of the scale now proposed, the earlier wind tunnel tests showed they were essential. In this context, the other issue that was highlighted in the September advice was that the models of trees used had to guard against horizontal flows – that is they needed to be the equivalent of a dense and tall (95m) hedge, not a canopy tree. Of interest again, it is the Northerlies whipping around the Southwest corner of the building that are the major issue from the Wind Tunnel Test results.

The wind tunnel tests of the original building heights, which are much closer to the scale of the heights proposed showed that the wind along the West side of Tasman was made significantly worse by the then proposed design. To gain an understanding of the effect of the Amended March 2023 design compared to the Consented, much shorter, design, the data we have is in Figure 6 and Figure 7. The increased height of the *Amended* design makes the West side of Tasman Street worse from a wind point of view by comparison of the *Consented* design. While each wind direction can be compared, the easiest summary can be derived from comparing the right hand column in each figure: the Maximum wind gust which the analysts are using as an approximation of the annual maximum gust speed the city requires be reported for safety analyses. 5 of the 9 measurement points reported have a lower wind speed measurement that is bigger than the measurement precision typically reported by WSP: 1m/s. For example, they report that 20 and 19m/s are so close that they are indistinguishable given the limits of their measurement precision. On this basis, the only differences between the consented smaller building and the amended, taller design now proposed are lead to the conclusion that the smaller building provides a positive benefit. The benefit is positive for these wind gusts even by comparison with the existing situation.

Location	320 Deg			340 Deg			360 Deg			170 Deg			190 Deg			210 Deg			Max Exg	Max Sub	Max Con
	Exg	Sub	Con	Exg	Sub	Con	Exg	Sub	Con	Exg	Sub	Con	Exg	Sub	Con	Exg	Sub	Con			
V	12	16	-	14	18	-	14	17	-	17	21	14	18	20	15	15	18	13	18	21	15
W	17	21	14	20	20	16	18	21	14	14	16	-	18	15	-	16	15	-	20	21	16
X	12	16	-	13	18	-	13	17	-	16	20	16	16	21	16	15	19	14	16	21	16
Z	12	17	-	14	18	-	13	15	-	16	21	15	16	21	17	14	20	15	16	21	17
A1	6	19	17	10	18	19	12	16	16	15	10	15	21	10	18	18	9	18	21	19	19
C1	8	20	15	12	20	18	13	18	16	17	19	8	19	20	11	18	18	9	19	20	18
E1	6	19	14	13	19	20	13	16	17	16	11	-	19	15	-	18	12	-	19	19	20
G1	8	21	13	13	19	16	14	18	15	15	13	-	17	16	-	16	13	-	17	21	16
I1	4	22	8	7	22	12	11	22	9	14	11	-	16	16	-	16	16	-	16	22	12

FIGURE 6 COMPARISON OF THE CONSENTED (CON) SCHEME WIND SPEEDS WITH THE EXISTING (EXG) WIND SPEEDS (AEE-APPENDIX-12A--WIND-MITIGATION-STUDY-CONSENTED-SCHEME.PDF)

Location	320 Deg			340 Deg			360 Deg			170 Deg			190 Deg			210 Deg			Max Exg	Max Sub	Max Amn
	Exg	Sub	Amn	Exg	Sub	Amn	Exg	Sub	Amn	Exg	Sub	Amn	Exg	Sub	Amn	Exg	Sub	Amn			
V	12	16	-	14	18	-	14	17	-	17	21	18	18	20	18	15	18	15	18	21	18
W	17	21	13	20	20	15	18	21	15	14	16	-	18	15	-	16	15	-	20	21	15
X	12	16	-	13	18	-	13	17	-	16	20	19	16	21	18	15	19	16	16	21	19
Z	12	17	-	14	18	-	13	15	-	16	21	20	16	21	20	14	20	16	16	21	20
A1	6	19	17	10	18	18	12	16	16	15	10	11	21	10	11	18	9	8	21	19	18
C1	8	20	15	12	20	17	13	18	16	17	19	8	19	20	9	18	18	9	19	20	17
E1	6	19	18	13	19	20	13	16	18	16	11	-	19	15	-	18	12	-	19	19	20
G1	8	21	16	13	19	17	14	18	19	15	13	-	17	16	-	16	13	-	17	21	19
I1	4	22	14	7	22	16	11	22	16	14	11	-	16	16	-	16	16	-	16	22	16

FIGURE 7 COMPARISON OF THE AMENDED (AMN) DESIGN WIND SPEEDS TO THE EXISTING (EXG) DESIGN FROM REPORT SUBMITTED WITH THIS RESOURCE CONSENT APPLICATION (AEE-APPENDIX-12B—WIND-MITIGATION-SCHEME-AMENDED-SCHEME.PDF)

The only possible conclusion from the data presented is that:

- The canopy on the South building is beneficial;
- Some form of wind screen needs to be associated with the canopy to effect the best result close to the building;
- The consented shorter building causes far less of a problem on the opposite side of Tasman Street from the development than does the now proposed building;
- It is worth noting that the on-site wind speed reported in the original wind tunnel test – point 1 in that report (Figure 8) - which is outside the purview of the city, because it is within the development and thus not on public land, would likely be far improved with the shorter consented building.

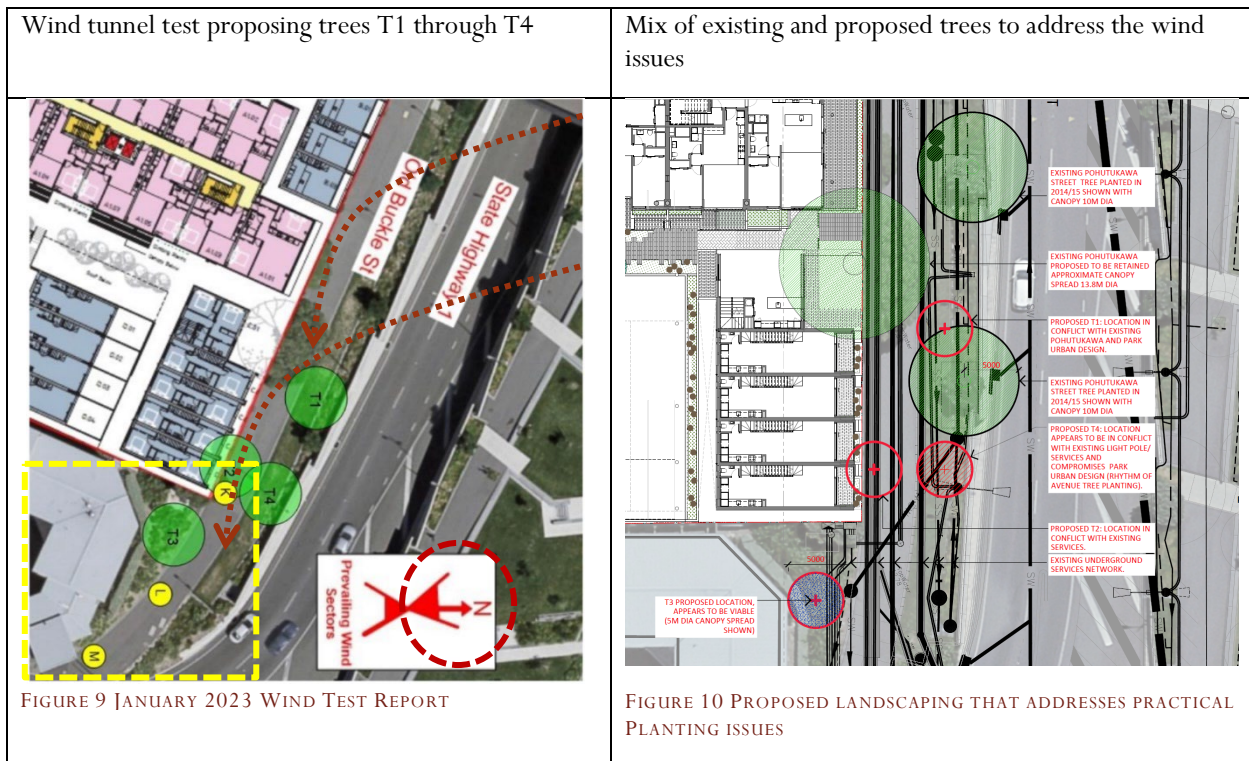


FIGURE 8 POINT 1 IN THE ORIGINAL WIND TUNNEL TEST

Options a,b and c (see Figure 3) – amelioration adjacent to Northwest of site

Figure 9 shows what I understand is the latest version of off-site mitigation proposed to address the wind accelerations on this Northwest corner of the site. Figure 10 shows the proposed plan to deliver the wind-tunnel tested trees and address the practical issues of sub-surface services and so on. The dashed arrows in Figure 9 show the wind that causes the problems – it is blowing from the North. However, the issue is not sheltering the footpath from the prevailing wind, but sheltering from the accelerations on the footpath created by the proposed buildings redirecting the wind.

Again, from the data in Figure 11 and Figure 12 the wind tunnel report data informs us that the consented lower height building is consistently better than the building now proposed. The area is already very windy. Backwash off the proposed buildings makes the situation worse. The taller building has a greater effect than the consented design.



Location	320 Deg			340 Deg			360 Deg			170 Deg			190 Deg			210 Deg			Max Exg	Max Sub	Max Con
	Exg	Sub	Con	Exg	Sub	Con	Exg	Sub	Con	Exg	Sub	Con	Exg	Sub	Con	Exg	Sub	Con			
K	16	19	18	20	22	21	16	22	20	15	20	-	13	19	-	13	12	-	20	22	21
L	16	19	18	19	22	21	16	20	19	17	19	-	13	17	-	9	14	-	19	22	21
M	18	20	18	21	23	23	21	24	20	12	16	-	17	14	-	8	12	-	21	24	23

FIGURE 11 COMPARISON OF THE CONSENTED (CON) SCHEME WIND SPEEDS WITH THE EXISTING (EXG) WIND SPEEDS (AEE-APPENDIX-12A--WIND-MITIGATION-STUDY-CONSENTED-SCHEME.PDF)

Location	320 Deg			340 Deg			360 Deg			170 Deg			190 Deg			210 Deg			Max Exg	Max Sub	Max Amn
	Exg	Sub	Amn	Exg	Sub	Amn	Exg	Sub	Amn	Exg	Sub	Amn	Exg	Sub	Amn	Exg	Sub	Amn			
K	16	19	17	20	22	22	16	22	19	15	20	-	13	19	-	13	12	-	20	22	22
L	16	19	18	19	22	23	16	20	19	17	19	-	13	17	-	9	14	-	19	22	23
M	18	20	19	21	23	24	21	24	20	12	16	-	17	14	-	8	12	-	21	24	24

FIGURE 12 COMPARISON OF THE AMENDED (AMN) DESIGN WIND SPEEDS TO THE EXISTING (EXG) DESIGN FROM REPORT SUBMITTED WITH THIS RESOURCE CONSENT APPLICATION (AEE-APPENDIX-12B—WIND-MITIGATION-SCHEME-AMENDED-SCHEME.PDF)

Note: green shaded trees from wind tunnel test report are shown as much bigger than Wraight Associates report (8 - Wind_Wraights-WSP-WakaKotahi.pdf) has drawn from Wind Tunnel Test

Illustration from WSP wind tunnel test *ae-appendix-12a--wind-mitigation-study-consented-scheme.pdf* of the scale models of trees – these appear to be closer to 5m in radius, not 5m in diameter? Note also the shape

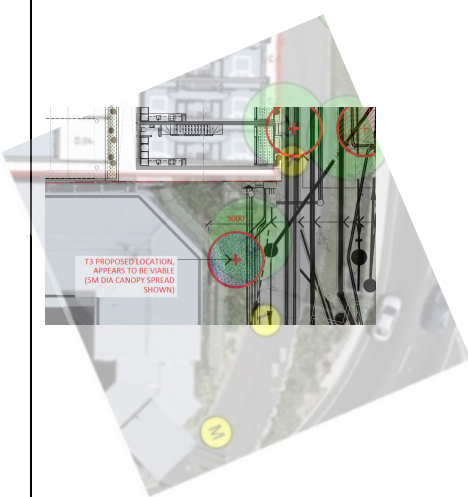


FIGURE 13 PLAN OF WIND TUNNEL TREES MADE TRANSPARENT TO OVERLAY ON WRAIGHT ASSOCIATES' PLANTING PLAN

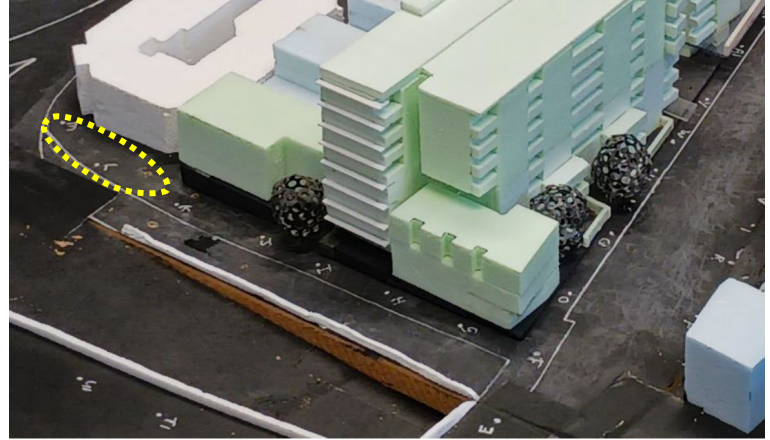


Figure 2: View of the wind tunnel model - consented scheme.

FIGURE 14 IMAGE OF 'CONSENTED' BUILDING FROM WIND TUNNEL TEST SHOWING SCALE AND SHAPE OF 'TREES' TESTED (CIRCLED AREA IS AREA TESTED.

Figure 13 and Figure 14 are provided to explore the practicality of the off-site measures proposed for the footpath at the Northeast corner of the site. Reading the data in Figure 11 and Figure 12, the following issues should be noted:

- 1) The initial wind tunnel test demonstrated that the wind in Southerlies will be made much worse than they are currently, but the amelioration studies focused only on the effect of off-site wind shelter during Northerlies, where backwash off the proposed buildings is the issue.
- 2) Examining the summary right hand column in each figure, it is clear that at each measurement point the annual gust speed is higher for the now-proposed, taller development. While the numbers individually are within the reading error within the WSP wind tunnel, the fact that all three are higher for the taller building is evidence of the worsening of the wind due to the extra height.

Interpretation of the difference between 21m/s (76km/hr) annual gust speed and 24m/s (86km/hr) when the safety criterion is 20m/s (72km/hr) may seem trivial. However, it needs to be recognized that the highest speed is a 30% increase in force on the pedestrian over the lowest value. Also, given the safety criterion is an annual gust of 20m/s, a reported 24m/ annual maximum gust means that there will be many more times per year that the lower wind speed of the actual safety limit will be exceeded.

Action

In summary, more design work seems necessary to resolve the impact of the proposed design on the local pedestrian environment:

- f) The proposed extra height of the buildings will make the areas of concern from the consented building worse. The form, scale and placement of the buildings seems to take no cognizance of the added risk, and the earlier proposed off-site amelioration measures are apparently proposed as sufficient to deal with the added risk due to the increased height on this exposed site. What is proposed seems insufficient to deal with the demonstrated impact.
- g) The area under the canopy to the south of the Northern tower building is apparently subject to increased horizontal wind flows that were queried in previous design iterations and remain unresolved by the addition of tall trees with no supplemental wind-hardy underplanting, that will survive the minimal maintenance that the City can afford to provide to deal with the wind effects of the proposed building in future years.
- h) The West side of Tasman Street is made significantly worse with the proposed taller buildings, and no solution is proposed for this worsening; with the lower, consented, buildings this was not so much of an issue. If the solution were to propose off-site amelioration, it seems likely that building a wall along the edge of the footpath is the only way of dealing with this issue as the problem seems likely to be as a result of backwash off the West and North faces of the proposed taller buildings.
- i) The scale of the trees proposed as off-site amelioration on the Northeast corner of the site, and further along Old Buckle Street towards the Basin Reserve is unclear in my reading of the reports available to me. The question is I suspect whether the trees were modelled in the wind tunnel as 5m diameter, or 5m radius.
- j) The off-site amelioration planting scheme proposed for the Northeast corner of the development does not seem to recognize the direction from which the problem wind accelerations arise. It is important that the scale of the planting, the necessity for underplanting and the question of the long-term viability of planting as a wind shelter solution to be maintained by the Wellington City Council is resolved.

Appendix

References

Time Spent on Report to date

Analysis of the reports – roughly 25 hours