



1/8/2022

Ros Luxford
Willis Bond
Level 2, 5 Cable St
P.O Box 24137
Wellington

Ref: 5-29P92.00

Dear Ros

Subject: Wind Tunnel Study – 110 Jervois Quay (Revised Design)

The letter describes the results of a wind tunnel study to investigate the effects of a revised design for the 110 Jervois Quay (Michael Fowler Centre carpark) development on pedestrian level wind conditions. This letter should be read in conjunction with WSP Research Report 21-529P92.00, which describes the method and procedures used for this wind tunnel study.

Background

In December 2021 WSP Research and Innovation conducted a pedestrian wind tunnel study of the proposed 110 Jervois Quay development (WSP Research Report 21-529P92.00).

Testing showed that, taken overall, the original development design caused a relatively small change in the local pedestrian wind environment, but did cause a significant redistribution of wind flows in the surrounding area. Gust speed increases were identified primarily around the western end of the building, while most of the reductions occurred around the eastern end of the building.

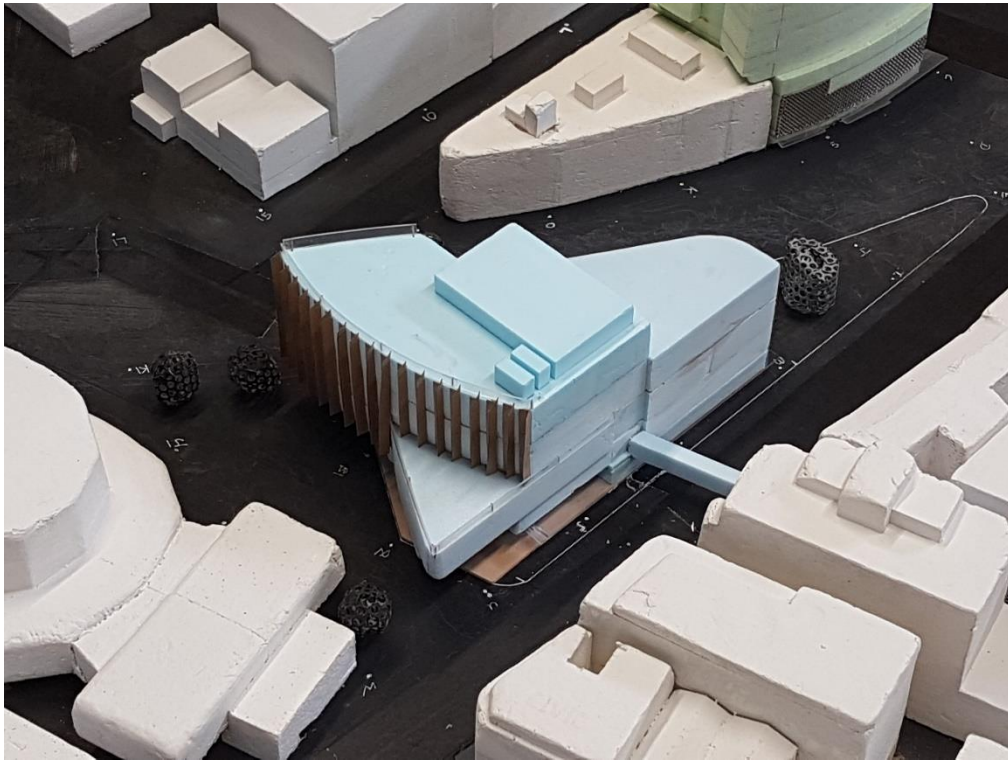
In the subsequent period, the development design has been revised, for reasons other than wind. Accordingly, it was considered appropriate to investigate the effects of the revised design on wind conditions. Given the similarities between the original design and the revised design, wind tunnel testing of the revised design was limited to those locations and wind directions identified in the earlier wind tunnel study as causing significant increases in the gust speeds, or a deterioration in the local wind amenity.

Wind Tunnel Study - Revised Design

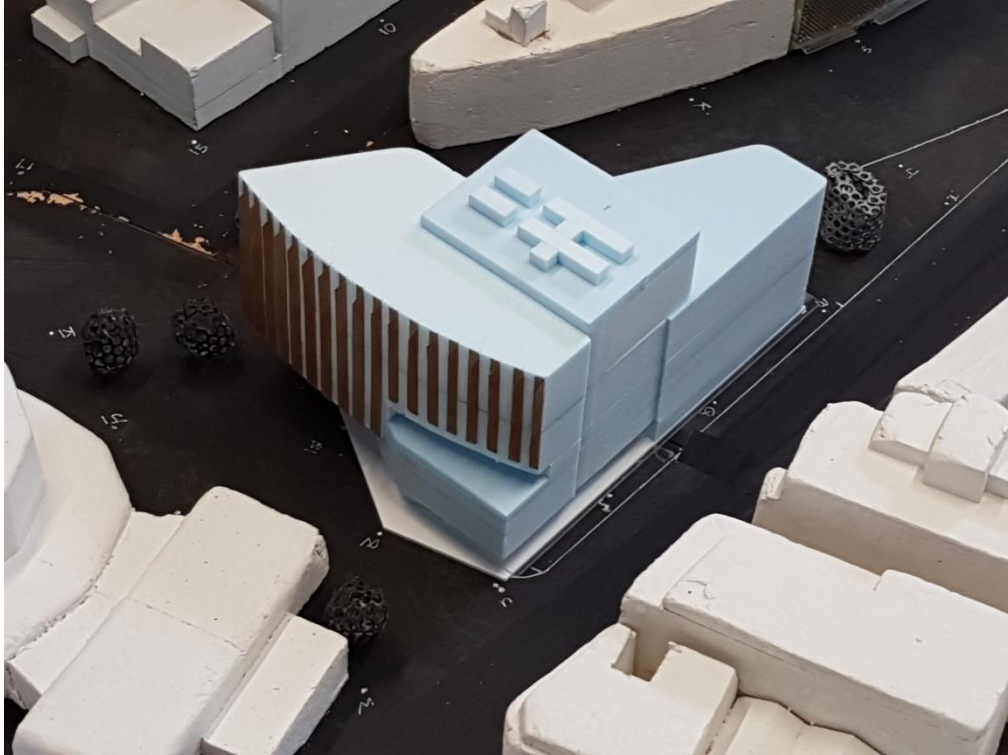
A model of the revised development design was constructed at our Wellington wind tunnel model scale of 1:264. Figure 1 compares the original design with the revised design. The most significant changes can be seen around the west end of the building (closest to the Michael Fowler Centre), where the projecting wing has been reduced in size, and the curve in the façade above has been flattened slightly.

WSP
Petone
33 The Esplanade
Petone
Lower Hutt 5012
New Zealand

+64 4 587 0600
wsp.com/nz



(a) original design



(b) revised design

Figure 1: Wind tunnel models of (a) original design and (b) revised design

Wind speed measurements were carried out at the locations shown in yellow in Figure 2, for those wind directions identified in the 2021 wind report as having increased the maximum gust

speed significantly. Figure 2 also shows, in white, the other measurement locations used in the earlier wind tunnel study.



Figure 2: Wind speed measurement locations (for revised design (yellow), for original design (yellow and white))

Measured Gust Speeds

Tables 1 and 2 list the measured gust speeds for (1) the existing situation, (2) the original design, and (3) the revised design, for northerly wind directions and southerly wind directions respectively. Table 3 compares the maximum gust speeds from any of the eight wind directions for the three configurations.

Table 1: Comparison of Calculated Gust Speeds, V_c (m/s) – Northerly winds

Notes: E = with existing situation, OD = with Original design, RD = Revised Design
 = calculated gust speed > 20m/s Safety Criteria, - = not measured

Location	320°			340°			360°			020°		
	E	OD	RD	E	OD	RD	E	OD	RD	E	OD	RD
K	14	13	10	17	16	19	15	15	16	8	11	11
O	13	14	13	15	16	17	14	16	15	6	11	11
P	12	16	13	18	20	14	14	17	18	12	12	10
R	9	11	11	13	15	13	12	15	17	10	13	12
U	9	18	15	13	21	17	12	21	20	10	16	15
W	8	15	14	11	17	11	12	15	15	7	8	8
Z	10	11	9	10	14	17	15	17	18	14	13	13
A1	8	17	14	10	19	10	10	12	11	8	11	10
C1	12	22	18	14	20	14	14	13	12	11	11	10
J1	12	17	14	14	15	12	16	15	13	15	15	13
K1	12	16	12	15	18	14	15	15	14	13	12	11

Table 2: Comparison of Calculated Gust Speeds, V_c (m/s) – Southerly winds

Notes: E = with existing situation, OD = with Original design, RD = Revised Design
 = calculated gust speed > 20m/s Safety Criteria, - = not measured

Location	150°			170°			190°			210°		
	E	OD	RD	E	OD	RD	E	OD	RD	E	OD	RD
K	10	13	10	12	14	-	16	15	-	20	19	-
O	9	11	-	14	15	-	18	17	-	23	22	-
P	7	10	9	10	10	-	9	9	-	11	12	-
R	4	5	-	7	7	-	9	5	-	12	8	-
U	6	3	-	7	11	11	9	8	-	10	9	-
W	9	7	-	9	10	-	12	11	-	14	13	-
Z	6	10	7	8	6	-	8	10	8	10	12	8
A1	8	4	8	8	8	-	6	7	-	8	7	-
C1	10	5	-	17	17	-	18	17	-	18	18	-
J1	10	11	-	10	8	-	11	11	-	12	12	-
K1	12	6	10	14	14	-	13	13	-	13	13	-

Table 3: Maximum Calculated Gust Speeds, V_c (m/s) – any direction

Notes: E = with existing situation, OD = with Original design, RD = Revised Design
 = calculated gust speed > 20m/s Safety Criteria, - = not measured

Location	E	OD	RD
K	20	19	19
O	23	22	17
P	18	20	18
R	13	15	16
U	13	21	20
W	14	17	15
Z	15	17	18
A1	10	19	14
C1	18	22	18
J1	16	17	14
K1	15	18	14

The results show that, in terms of the calculated gust speeds, the revised design performs mostly better than the original design, including at those locations where the original design increased the maximum speed above the 20m/s Safety Criteria. The revised design should also largely retain the gust speed reductions identified at other locations with the original design, because of the similarities of design, bulk and form that are retained in the revised design.

Frequency of Occurrence

Tables 4 lists the number of days per year that the District Plan Cumulative Effect mean wind speed of 2.5m/s will be equalled or exceeded, summed over the eight wind directions. Note that, in this context, a day is defined as a cumulative duration of 24 hours, which may be spread over several calendar days and different wind directions.

Table 4: Days per year Cumulative Effect Criteria (2.5m/s) Are Equalled or Exceeded.

Notes: E = with existing situation, OD = with Original design, RD = Revised Design
 Δ = change from the existing situation.
 = increase in time of occurrence > 20days.
 = decrease in time of occurrence > 20days.

Location	E	OD	RD	Δ OD	Δ RD
K	113	147	150	34	37
O	90	141	144	51	54
P	39	88	66	49	27
R	17	106	104	89	87
U	3	157	154	154	151
W	4	33	29	29	24
Z	30	83	95	52	64
A1	0	47	39	47	39
C1	116	124	114	8	-2
J1	98	88	81	-10	-17
K1	134	117	102	-17	-32



The results show that the revised design performs slightly better than the original design at those locations identified as causing a deterioration in the local wind amenity. The revised design should also largely retain the amenity improvements identified at other locations with the original design, because of the similarities of design, bulk and form that are retained in the revised design.

Concluding Comment

The wind tunnel study of the revised design for the 110 Jervois Quay development showed that it generally performed better than the original design that was tested. It reduced, or eliminated, some of the gust speed increases identified with the original design, including all of those locations where the original design increased the gust speeds over the 20m/s District Plan Safety Criteria.

If there are any questions regarding the wind tunnel testing or the results, please do not hesitate to call me (021 243 9386).

Regards

A handwritten signature in black ink, appearing to read 'Neil Jamieson'. The signature is fluid and cursive, with a long horizontal stroke at the end.

Neil Jamieson
Research Leader - Wind Engineering