



FUSION STUDENTS

DEANS GATE SOUTH

WIND MICROCLIMATE REBUTTAL PROOF OF EVIDENCE

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1 INTRODUCTION

- 1.1 This rebuttal proof of evidence has been prepared to respond to points raised within the wind microclimate evidence of the Council (proof of evidence of Mr Alex Turpitt, AT)
- 1.2 I confirm that, insofar as the facts stated in my evidence and rebuttal are within my own knowledge, I have made clear what they are, and I believe them to be true; and that the opinions I have expressed represent my true and complete professional opinion irrespective of by whom I am instructed.

2 CHANGE OF SCOPE

- 2.1 The proof of evidence provided by AT is a significant departure from any of the justifications for refusal of the proposed scheme on wind grounds to date. It is focussed entirely on the methodology employed in the assessment. This is the first time the methodology has been called into question at any point in the process from scoping through to the committee and the statement of case.
- 2.2 Previously the key point of contention was the feasibility of the mitigation proposed, an issue not considered at any point in the proof by AT, or any of the other proofs provided by Manchester City Council (MCC).
- 2.3 The issues raised in the proof were not mentioned at any point during my dialogue with AT prior to its receipt.
- 2.4 This would appear unreasonable as the nature of wind modelling is such that new results cannot be presented within the restrictions of the appeal timetable. Nonetheless I will demonstrate below that the assessment presented is robust and closely adheres to current best practice guidance, most notably '*Wind Microclimate Guidelines for Developments in the City of London, RWDI, August 2019*' hereafter referred to as 'the Guidance'.

3 BUILDING DESIGN

- 3.1 At paragraph 5.4 AT suggests that the design of the building is likely to result in significant downdraughts. This has not been borne out in the modelling results which suggest low level accelerations and canyoning are the key drivers of higher wind speeds. In addition, AT states that the sharp south western corner is likely to promote

acceleration of lower level winds. This is true, however the results of the modelling indicate that the conditions created do not exceed the comfort or safety criteria in almost all cases. Where a very slight exceedance of the comfort criteria has been identified this will be mitigated by the proposed planting.

- 3.2 Paragraph 5.4 also suggests that not having modelled the conditions without the committed schemes in place, particularly Great Jackson Street Plot E, will have resulted in the windspeeds being overstated. The converse is also true in that these schemes may also channel winds and exacerbate any issues. In the case of Great Jackson Street, the development will likely exacerbate the funnelling of winds on the A56, something which has been recognised in our reporting. The committed schemes are in a constant state of flux, further schemes have come forward since this modelling and others are now substantially progressed, such as Crown Street Phase 2, which itself is likely to provide some shelter. Given the above, modelling the development without the committed schemes in place would also have provided potentially inaccurate results and the modelling presented was and is the best representation of the most likely wind scenario at the time of drafting.

4 WIND MICROCLIMATE PROPERTIES

- 4.1 In paragraphs 7.4 and 7.5 AT correctly describes one of the accepted methodologies for calculating the wind microclimate properties and also correctly identifies that this methodology has not been applied in this case. The methodology adopted for this assessment utilised the second approved method, highlighted in the note at the top of page 23 of the guidance. This states *'...alternatively, you may choose to calculate the wind speed x exceeded for 5% and 0.022% of the time. In this case please note that the wind speed should be calculated for a total probability across all wind angles, and not for individual angles. This would likely require a "goal seek" or "solver"-type method, depending on how and in what programming language the calculation is implemented.'*
- 4.2 The safety analysis has been carried in exact accordance with the methodology described above and as such the concerns raised by AT do not apply. The conditions are as reported. An offer to meet and take AT through the modelling process was extended during the production stage of the evidence. Had this been accepted or the concerns raised earlier this misunderstanding could have been avoided.

- 4.3 With regard to the comfort assessment, individual angles were assessed as there was a concern that calculating the total probabilities across all wind angles was under reporting potential issues in the prevailing wind direction in this instance. Using the methodology outlined above, the wind speed applied in the prevailing wind directions, using data for the winter period, would be 6.2 m/s. Using the annual data for each wind direction the wind speed was 6.6 m/s. Conversely northerly winds would also have been modelled at 6.2 m/s for comfort when the average wind speed recorded from that direction is just 2.24 m/s and the peak record over the 30 year dataset was just 7.44 m/s. This approach is given further credence due to the accuracy of the meteorological data employed in this assessment (See section 9 below). As such, the modelling provided is considered to be accurate and representative of actual conditions likely to be experienced on site.

5 SIGNIFICANCE CRITERIA

- 5.1 At Para 7.7 AT notes that he would expect all comfort exceedances to be mitigated. This is of course desirable where possible, but in cities outside of London, and particularly in the North and West of England where wind speeds are generally higher, this is not always practical. As such, the methodology and mitigation presented is considered a balanced approach in this setting.

6 GUSTS

- 6.1 At Paras 7.8 and 7.9 AT raises the issue of gusts, and in particular that the guidance prescribes that gust equivalent mean (GEM) wind speeds are taken into account. This is not the case. The guidance prescribes the use of GEM wind speeds for wind tunnel tests but not CFD. This is further clarified in Annex A, page 23, which states (with my emphasis), '*if both mean and gust-equivalent mean velocities have been measured (as in the methodology for wind tunnel testing, set out in the main document), then this process should be repeated for both sets of velocities*'.
- 6.2 As such the methodology presented is considered robust and to comply with current guidance. I do not consider that it under represents wind speeds likely to be experienced on site.

7 CUMULATIVE SITES

- 7.1 Paragraph 7.10 again raises the issue of cumulative sites which I have covered in my response at paragraph 3.2 above. I note that AT raises the fact that Crown Street development would provide shelter to the development. As raised above, Crown Street is now substantially progressed. This is demonstrated in the photograph below taken on the 14th March of this year.



Figure 7-1 - Crown Street Development Under Construction (14th March 2022)

8 EXISTING CONDITIONS

- 8.1 The revised ES chapter submitted as Appendix 1 to our proof of evidence, contrary to what is stated by AT in his proof, does include baseline conditions for all directions where the safety criteria are exceeded, and key directions where the comfort criteria are exceeded. As we are working to fixed thresholds, it is only in the areas where the criteria are exceeded that it becomes important to understand the baseline. Contrary to the proof provided by AT the data presented clearly demonstrates by how much the criteria are exceeded, and this is further elaborated on in my proof, where the exact increases in m/s are provided.

9 WIND DATA

- 9.1 At para 7.12 AT questions the validity of the wind data obtained for use in this assessment. He confirms that he has not looked into the dataset supplied and states that he '*cannot confirm if virtual met mast data is a suitable alternative to the process*'.
- 9.2 I contend that the virtual met mast (VMM) data provided by the met office is considerably more accurate than the process described by AT in paragraph 7.12, which was developed in the 1970's before climate science and computer modelling techniques existed in the same form as they do today. The VMM data aims to be as accurate as on-site wind measurements. The approach relies on data from Met Office regional-scale numerical weather prediction (NWP) models, to which downscaling corrections are applied to account for local complexity. These corrections include those which represent the effects of local topography, local surface roughness variations and near-coast effects.
- 9.3 Comparison with onsite data collection has shown that the variability is only 0.05 m/s on average making this a very powerful tool for this type of modelling. In London, where the Guidance originated, and where fixed reference data is supplied, the approach outlined by AT does have some merit as the reference data is fixed and this does allow projects to be easily compared, even if it is less accurate. In areas where this is not an advantage as fixed reference data is not supplied for local use, then the VMM data will always provide far more accurate results.
- 9.4 At para 7.13 it is suggested that the assessment is repeated. This would be unrealistic given that this is the first time the issue has been raised and the modelling is a lengthy

process. I would also contend that this is not required or appropriate for the reasons described above.

10 WINTER CONDITIONS

10.1.1 Paras 7.14 and 7.15 comment on the use of seasonal wind speeds. As per my response in paragraph 4.3 above, using the seasonal averages for this assessment was over estimating issues in some wind directions and under reporting them for others. As such, by using the annual figures, per wind direction, and ensuring that we are utilising the best quality meteorological information available, we have been able to provide a much more accurate assessment. This models higher wind speeds in the prevailing wind directions than would be modelled under the alternative approach, but lower wind speeds where these conditions either rarely, or never occur.

11 DUAL CFD AND WIND TUNNEL

11.1 At paragraphs 27.16 to 7.18 of his proof AT recommends that wind tunnel testing should be carried out alongside CFD in this case. This would be gold plating the assessment in the extreme and would be the first application in Manchester to use both techniques as part of the application, despite being relatively modest in scale. To support this point, a summary of tall building applications in Manchester and the techniques used to model wind effects are given in the table below.

No.	Site	App ref	Scheme	Date approved	Consultant	Wind modelling method
1	Axis Tower	106490/FO/2014/C1	27 storey building	21/11/2014	BMT	Wind tunnel
2	2-4 Chester Road	113870/FO/2016	Part-11 part-20 storeys	05/04/2017	BMT	Wind tunnel
3	Crown Street, Phase 1	119806/FO/2018	21 and 51 storeys	04/07/2018	BMT	Wind tunnel
4	Crown Street, Phase 2	126668/FO/2020	2 x 52 storeys	03/08/2020	WSP	CFD
5	Plot F, Great Jackson Street	132199/FO/2021	2 x 51 storeys	At committee 17 th March 2022. Recommended for approval	WSP	CFD
6	34 Great Jackson Street	129273/FO/2021	2 x 56 storey buildings	Approved at committee 09/03/2021	Urban Microclimate	Wind tunnel
7	River Street	118683/FO/2017	Part 32, part 10 and part 5 storey building	12/03/2018	Urban Microclimate	Wind tunnel

8	Deansgate Square	111719/FO/2016/C1	4 buildings (37, 44, 50 and 64 storeys)	04/07/2016	BMT	Wind tunnel
9	10-12 Whitworth Street	111003/FO/2016/C1	35 storeys	11/04/2016	BMT	Wind tunnel
10	325 - 327 Deansgate	125804/FO/2019	22 storeys	26/06/2020	Wind assessment = BMT ES chapter = Architectural Aerodynamics	Wind tunnel
11	Former Bauer Millet Site	115871/FO/2017	40 storeys	27/07/2017	BMT	Wind tunnel
12	Trinity Islands	132429/FO/2021	4 buildings (39, 48, 55 and 60 storeys)	Approved at committee 17/02/2022	WSP	CFD
13	St Michaels	114664/FO/2016	Part 9, part 38 storeys	20/06/2018	WSP	CFD
14	One Regent	105611/FO/2014/C1	28 storeys	31/10/2014	BMT	Wind tunnel
15	Great Marlborough Street	121252/FO/2018	Part 55, part 11, part 4 storeys	23/07/2021	WSP	CFD
16	1-5 New Wakefield Street	117054/FO/2017	30 storeys	22/12/2017	WSP	CFD
17	Hotspur Press	120635/FO/2018	28 storeys	30/10/2020	Urban Microclimate	Wind tunnel
18	Speakers House	131314/FO/2021	17 storeys	21/01/2022	GIA	CFD
19	Land Bound By Back Turner Street	126638/FO/2020	Part 17, part 6 storeys	26/06/2020	BMT	None. Desk study only.
20	20-36 High Street	121375/FO/2018	22 storeys	02/10/2020	RWDI	Wind tunnel
21	One City Road	128002/FO/2020	11 storey and 14 storey	26/01/2021	ArcAero	CFD
22	Plot 9A First Street	121462/FO/2018	17 storeys	14/12/2018	Ramboll	CFD
23	Plot 9 First Street	132600/FO/2021	9 storeys	Under determination (included because A Turpitt authored report)	ArcAero	"Experience based desk study"
24	Plot 9 First Street	125833/FO/2019	11 storeys	15/04/2020	ArcAero	CFD
25	Plot 11, First Street	125573/FO/2019	4 buildings (10-45 storeys)	09/03/2021	Urban Microclimate	Wind tunnel

11.2 In paragraph 7.18 AT refers directly to the original Lawson criteria and the fact that these recommended that gusts are modelled. In 1990, when these criteria were

developed, computer based CFD modelling would not have been possible in the way that it is now and as such they are based on wind tunnel testing. The most up to date Guidelines, produced in 2019, recommend GEM wind speeds are only used for wind tunnel testing, not CFD. As such the assessment complies with the latest guidelines for CFD wind modelling.

12 WIND CONDITIONS UNDER REPORTED

- 12.1.1 Paragraphs 7.19 and 7.20 state that the wind conditions are likely to be, and will be windier, respectively. Regardless of which statement is considered, as detailed above, the methodology employed in the assessment is robust and is accurately reporting expected conditions at the site.
- 12.1.2 As a sense check it is worthwhile reviewing the wind microclimate chapters for similar developments surrounding this site. If the assessment is dramatically under reporting conditions, as stated by AT, then you would expect significant safety and comfort issues to have been identified during the modelling of these surrounding sites, contrary to the results presented in our alleged 'under reporting' assessment. This is not the case, if anything the results from the assessment indicate higher wind speeds than those modelled for the buildings directly adjacent.

13 CONCLUSIONS

- 13.1 The proof by AT raises significant questions regarding the methodology employed in the wind microclimate assessment. These claims either misinterpret the methodology that has been employed, or in themselves, deviate from the current best practice guidance. Where the study has deviated from the Guidance this is to ensure accuracy and robustness, particularly in relation to the potential to under report comfort conditions from the prevailing wind directions.
- 13.2 In summary:
- The methodology employs the second option in the Guidance to determine probability of exceedance and does not under report effects.
 - The use of gust equivalent mean (GEM) wind speeds are not recommended for CFD studies in the guidance.
 - The existing surroundings have already changed dramatically since the study was undertaken. Using the committed sites at the time is the best proxy for long term conditions at the site.

- Seasonal windspeeds were not used in favour of annual, directionally applied windspeeds due to the fact that they were underreporting potential issues in the prevailing wind directions.
- This is the first time the methodology used in the assessment has been questioned and the proof does not refer to the issues highlighted in the reason for refusal or statement of case by Manchester City Council.

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