

Technical Memorandum

To: Daniel Whitney (16 Real Estate)

From: Mike Potts (Echo Acoustics)

CC:

Date: 12 August 2022

Re: Federal Café, Circle Square, Manchester – kitchen extraction system noise assessment

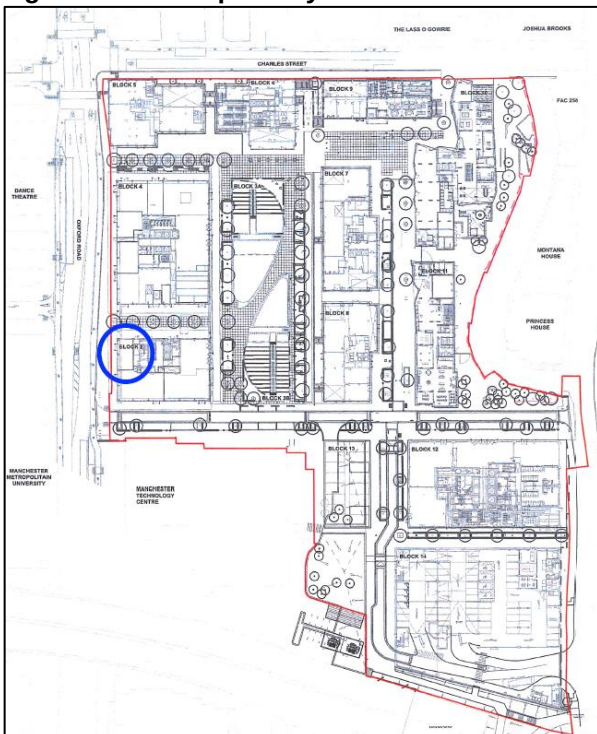
Introduction:

The following provides the findings of a desk-based assessment of sound, as it affects nearby noise sensitive (residential) receptors, arising from the proposed installation of a kitchen extraction system for the Federal Café, Circle Square, Manchester.

The café forms part of a recently completed development on the site of the former BBC buildings on Oxford Road, Manchester.

The wider development, presented in Figure 1, includes commercial uses in the units immediately adjacent Oxford Road with residential units behind; the café is highlighted with a blue circle in Figure 1.

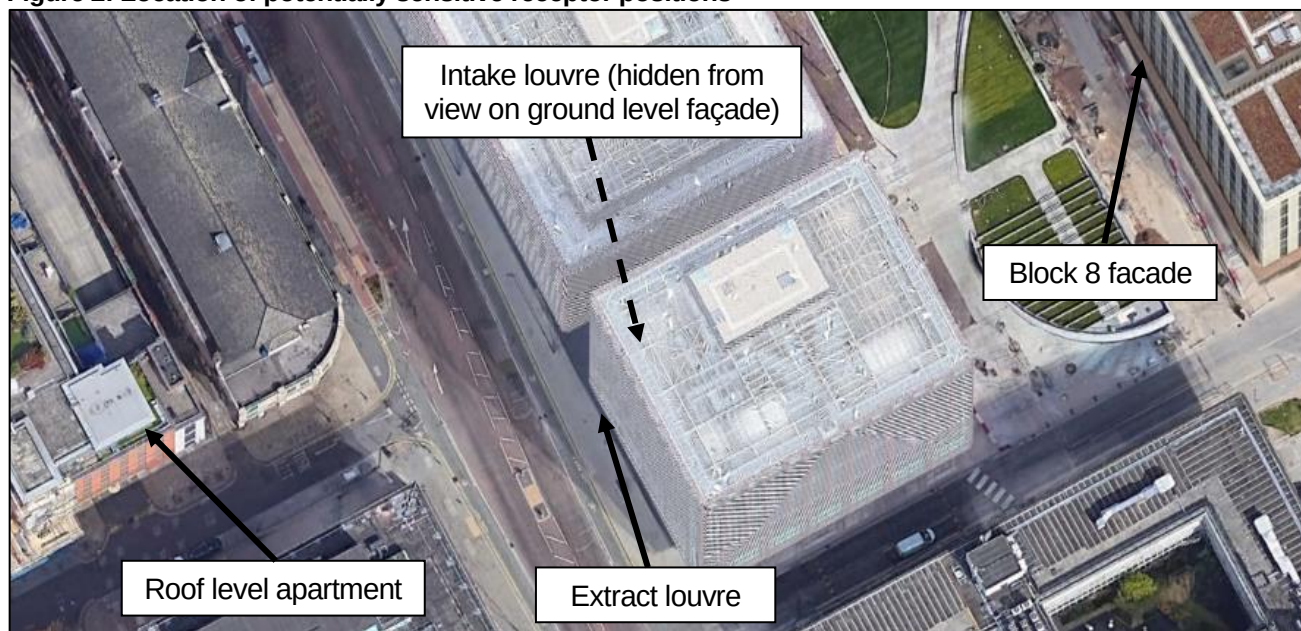
Figure 1: Circle Square layout and Federal Cafe location



The café's ventilation system will include an intake louvre at first floor level on the building's northern façade, overlooking a pedestrian walkway between Oxford Road and the Circle Square development area to the rear, and an extract louvre at first floor level on the building's western (front) façade overlooking Oxford Road.

With respect to potentially noise sensitive receptors, the uses above the café are commercial/office use and are not considered particularly sensitive in this setting. The closest residential uses are the western façade of Block 8, approximately 70 metres to the east of the intake louvre, and a 7th/8th floor roof level apartment at the top of buildings on Chester Street with a roof garden, approximately 56 metres from the extract louvre and 60 metres from the intake louvre. These are identified in Figure 2.

Figure 2: Location of potentially sensitive receptor positions



Assessment methodology

The assessment of potential impact makes reference to British Standard (BS) 4142: 2014 + A1 *Methods for Rating and Assessing Industrial and Commercial Sound* and Manchester City Council's guidance document (last updated in June 2022) "*Technical Guidance: Planning and noise*"¹ which states:

'The noise assessment should be based on BS 4142, and any application for fixed plant, equipment or machinery must demonstrate that:

'Externally mounted ancillary plant, equipment and servicing shall be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level of 5dB (L_{Aeq}) below the typical background (L_{A90}) level at the nearest noise sensitive location'.

By designing the sound pressure level of any plant items to generate a noise impact of at least 5dB below the existing background level, any plant noise impact should be of a negligible level which should not give rise to complaints from users or occupiers of existing noise-sensitive usages".

BS 4142 provides a method for determining the sound arising from an industrial or commercial site, defined as the site's 'specific' sound level ($dB L_{Aeq}$) to which is added a correction for tonal, impulsive or intermittent elements, to provide the site's 'rating' sound level ($dB L_{Ar,Tr}$). The rating sound level is then compared with the 'background' sound level ($dB L_{A90}$ or 90th percentile) as measured or calculated outside a building, usually a residential property or other noise sensitive receptor.

The standard applies a 'penalty' to tonal, impulsive and intermittent sounds, as separate entities. The simplest method is a subjective assessment with a sliding scale of up to +6 dB for tonal sound, up to +9 dB for impulsive sound and +3 dB for intermittency. The objective methods provided only allow for the assessment of tonal sound.

The standard indicates significance of sound effects according to varying degrees of "adverse impact": a difference between the 'background' level and the commercial/industrial 'rating' level of +10 dB "is likely to be an indication of a significant adverse impact, depending on the context" whilst "a difference of around +5dB is likely to be an indication of an adverse impact, depending on the context" and that "the lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context". In this instance, the City Council's technical Guidance clearly defines an 'acceptable' level as being a rating sound level 5 dB below the background sound level.

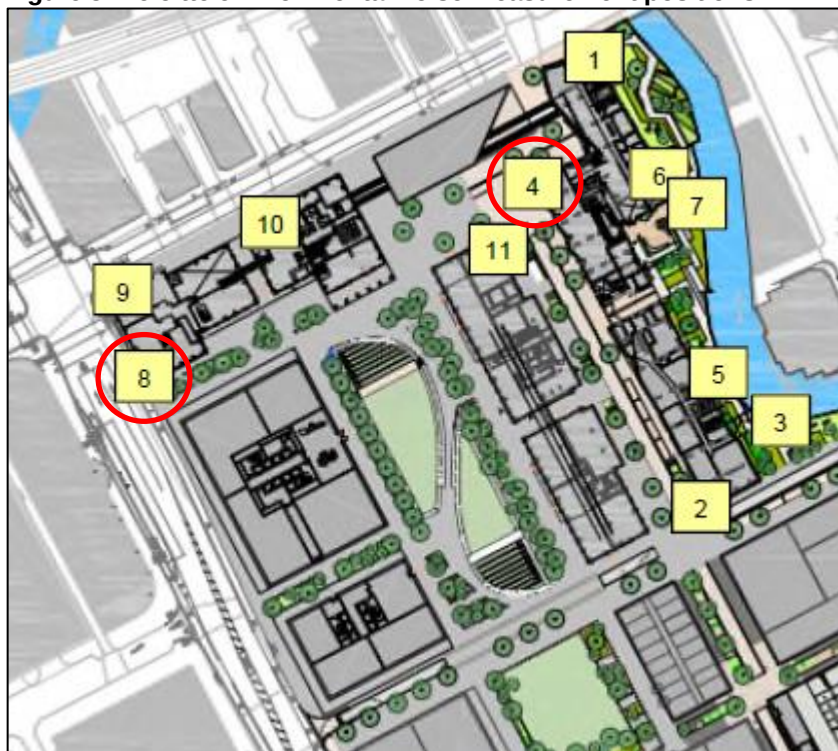
The Standard includes a specific requirement that assessments should take account of "context" in determining the significance of any predicted impact, which is critical in providing a reasoned and pragmatic assessment, avoiding rigid adherence to limit values at the exclusion of any other considerations

With respect to 'background' (dB LA90) sound levels, reference was made to the report prepared by Deloitte in January 2016² as part of the Environmental Impact Assessment for Phase 1B of the development, and which provides measured sound levels at the Circle Square development site.

Assessment

The background (dB LA90) data used for this assessment were the levels recorded by Deloitte for measurement positions 4 and 8, as indicated in Figure 3 (derived from Figure 3.2 of the Deloitte report¹), taken to be representative of background sound levels at Block 8 and the roof terrace apartment, respectively.

Figure 3: Deloitte environmental noise measurement positions



² Deloitte (2016) *Phase 1B Circle Square (Former BBC Site) Oxford Road, Manchester: Noise Impact*

The values recorded, presented in Table 3.8 of the report¹, were:

- Position 4: 55 to 56 dB L_{A90} during the day time (lower value **55 dB L_{A90}** used in this assessment) and 55 to 59 dB L_{A90} at night (median value **57 dB L_{A90}** used in this assessment).
- Position 8: 62 to 66 dB L_{A90} during the day time (median value **64 dB L_{A90}** used in this assessment) and 60 to 69 dB L_{A90} at night (median value **65 dB L_{A90}** used in this assessment).

Consequently, the Council's required levels, set at 5 dB below background, would be:

- Position 4 (Block 8): **50 dB L_{A90}** during the daytime and **52 dB L_{A90}** at night.
- Position 8 (roof terrace): **59 dB L_{A90}** during the day time and **61 dB L_{A90}** at night.

Data regarding the proposed extraction system plant equipment were provided by the client.

Kitchen extract fan

The proposed extract unit is a Systemair MUB/T-S 062 500D4 backwards curved centrifugal fan. It is assumed that the extract fan will run continuously over a given period (e.g. 15 minutes).

Table 1 provides a calculation summary for the proposed extract fan, taking into consideration the outlet sound power spectrum, the system's natural attenuation (duct attenuation and end reflection loss) and distance separation to the nearest receptor.

The extract termination is estimated to be approximately 56 metres from the roof top terrace on Chester Street but has no line of sight of the façade of Block 8 which is to the rear of the building within which the café is located. A direct line-of-sight from the roof top dwelling to the extract louvre is assumed (i.e. no acoustic screening between source and receptor).

Table 1: Kitchen extract fan sound pressure level at the roof top apartment (dB)

	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1000	2000	4000	8000
Kitchen extract fan L_w	77	91	86	84	81	78	74	68
Silencer insertion loss	-4	-7	-12	-20	-25	-23	-15	-11
Ductwork attenuation (3 m)	-3	-2	-1	-1	-1	-1	-1	-1
End reflection loss	-8	-4	-1	0	0	0	0	0
Directivity factor	+3	+3	+3	+3	+3	+3	+3	+3
A-weighting correction	-26	-16	-9	-3	0	+1	+1	-1
Spherical radiation @56m	-46	-46	-46	-46	-46	-46	-46	-46
Resulting L_{Aeq}	-3	26	32	37	37	35	31	23
Specific sound level $L_{Aeq,T} = 42$ dB								

The plant specification data indicate that the extract fan will not generate any tonal sound such that the specific sound level presented in Table 1 can be taken to be the rating sound level (dB $L_{Ar, 15min}$).

It was considered unnecessary to assess case-radiated sound pressure levels from the fan enclosure to the external environment since the extract fan will be located internally within the ceiling void.

The assessment shows, therefore, that **the predicted rating sound level of the extract fan will be significantly below both the background sound level and the Council's requirement of 5dB below background at the roof top apartment on Chester Street.**

Air supply fan

The proposed air supply unit is a Systemair AW450 axial fan. It is assumed that the fan will run continuously over a given period (e.g. 15 minutes).

Table 2 provides a calculation summary for the supply fan, taking into consideration the outlet sound power spectrum, the system's natural attenuation (duct attenuation and end reflection loss) and distance separation to the nearest receptors. The assessment assumes no acoustic screening.

Table 2: Air supply fan sound pressure level at the nearest receptors (dB)

	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1000	2000	4000	8000
Air supply fan L_w	75	68	64	63	63	59	57	52
Silencer insertion loss	-4	-7	-12	-20	-25	-23	-15	-11
Ductwork attenuation (1 m)	-1	-1	0	0	0	0	0	0
End reflection loss	-8	-4	-1	0	0	0	0	0
Directivity factor	+6	+6	+6	+6	+6	+6	+6	+6
A-weighting correction	-26	-16	-9	-3	0	+1	+1	-1
Spherical radiation @ 56m	-46	-46	-46	-46	-46	-46	-46	-46
Resulting L_{Aeq}	0	7	14	20	23	20	18	11
Specific sound level $L_{Aeq,T} = 27$ dB								
Spherical radiation @60m	-47	-47	-47	-47	-47	-47	-47	-47
Resulting L_{Aeq}	-1	6	13	19	22	19	17	10
Specific sound level $L_{Aeq,T} = 26$ dB								
Spherical radiation @70m	-48	-48	-48	-48	-48	-48	-48	-48
Resulting L_{Aeq}	-2	5	12	18	21	18	16	9
Specific sound level $L_{Aeq,T} = 25$ dB								

The plant specification data indicate that the air supply fan will not generate any tonal sound such that the specific sound levels presented in Table 2 can be taken to be the rating sound levels (dB $L_{Ar, 15min}$).

The assessment shows, therefore, that **the predicted rating sound level of the air supply fan will be significantly below both the background sound level and the Council's requirement of 5dB below background at all assessed receptors.**

Cumulative plant sound level

The roof terrace apartment will, potentially, have a line of sight to both the extract and air supply plant equipment and may, therefore, be subject to the sound arising from both concurrently; the combined the specific sound level of the equipment from both sets of equipment was calculated to be **42 dB $L_{Ar,15min}$** .

This is significantly both the background sound level and the Council's requirement of 5dB below background at this receptor.

Conclusion

The assessment of sound arising from the operation of the air supply and kitchen extract louvres at Federal café, indicates that the rating sound level (dB $L_{A,T}$) of the equipment will be significantly below both the background sound level (dB L_{A90}) and the Council's requirement of 5dB below background sound levels.

The assessment concludes, therefore, that will be no adverse impact on noise sensitive receptors in the area of the Circle Square development and that noise, therefore, need not be a reason for refusal of planning permission.