

NOISE IMPACT ASSESSMENT REPORT

PROPOSED RESTAURANT, 86 CROSS STREET, MANCHESTER, M2 4LA

REPORT REFERENCE NO. J004941-7851-JW-01

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This report has been prepared based upon a scope of works and associated resources agreed between the client and Philip Dunbavin Acoustics Ltd (PDA). This report has been prepared with all reasonable skill, care and diligence and has been based upon the interpretation of data collected. This has been accepted in good faith as being accurate and valid at the time of the collection. This report has been based solely on the specific design assumptions and criteria stated herein.



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APPENDIX A – DEFINITION OF ACOUSTIC TERMS



1.0 SUMMARY

At the request of Individual Restaurants an assessment of the external and internal noise egress from the proposed restaurant at 86 Cross Street, in Manchester has been undertaken.

The proposed scheme consists of a refurbishment of the existing ground and basement floor of 86 Cross Street into a proposed pizza restaurant. The first to third floor currently comprises residential apartments.

This report has been prepared to meet the requirements of Planning Conditions 9 and 11 of planning permission 117966/FO/2017.

A baseline noise survey was undertaken at the site. The noise level survey is considered representative of the background noise levels at the nearby receivers during day and night-time during the periods in which the plant is expected to operate. Noise level limits are proposed in line with the Planning Conditions and MCC standard criteria.

It is proposed to install mechanical services plant for the proposed restaurant to the rear façade of the development along Four Yards. An assessment of the noise breakout from the proposed units has been undertaken and compared with the existing measured background noise levels and Planning Conditions. Based upon manufacturer's noise level data and proposed architectural and mechanical services drawings, a 3-dimensional noise model has been created using Soundplan noise modelling software. An assessment has been carried out in accordance with BS4142:2014 with respect to the closest noise sensitive receivers, considered to be the apartments on the first to third floor of the building.

The calculated noise levels with the proposed plant selections is likely to be 18 dBA above the existing background at the worst-case nearby receiver for the evening / night-time periods. Therefore the current calculations would suggest that the requirements of Planning Condition 11 of the planning permission 117966/FO/2017, has not been achieved. However, recommendations for mitigation has been provided in Section 6.5 to achieve the planning condition.

An assessment has been undertaken for the proposed restaurant use at ground floor level which suggests that noise egress would be at least 10dB below the typical L_{A90} in each octave band at the façade of the nearest noise sensitive receiver. In addition, an assessment of internal transfer through the separating floor between the ground floor proposed restaurant and first floor apartments has been carried out. Our assessment has indicated that internal noise levels are likely to be significantly below 47 dB and 41 dB in the 63 Hz and 125 Hz octave bands, respectively. Therefore the calculations would suggest that the requirements of Planning Condition 9 of the planning permission 117966/FO/2017, are achieved.

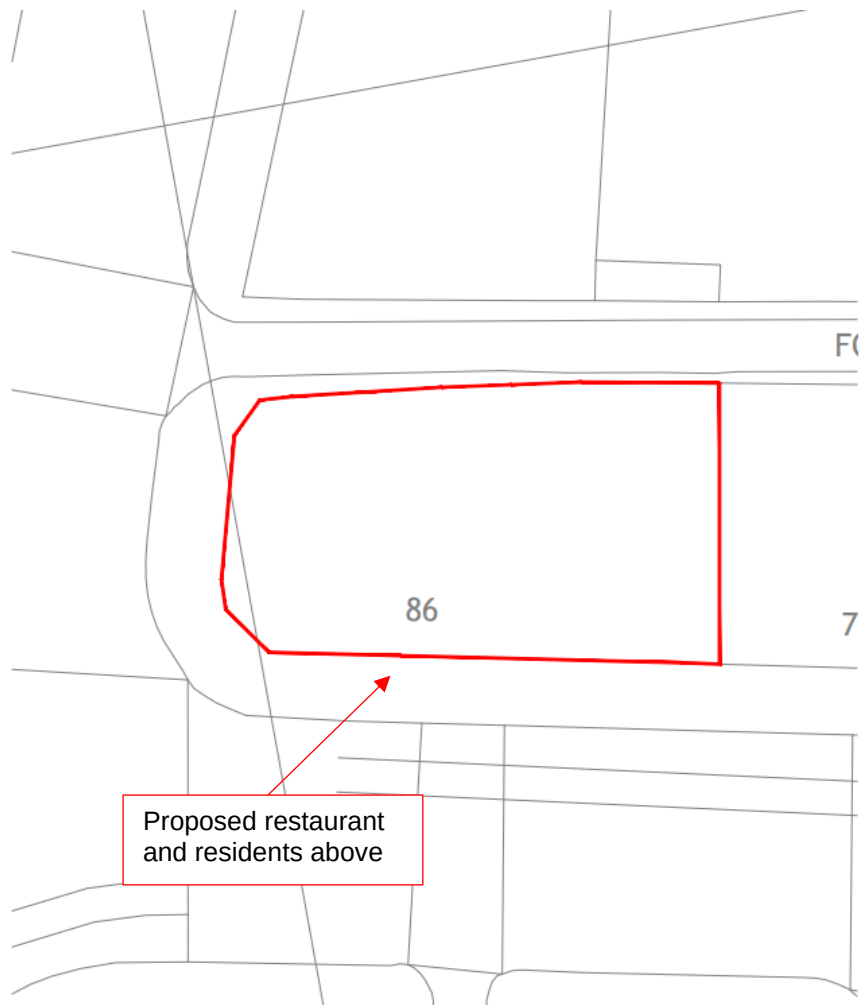
2.0 INTRODUCTION

The proposals are to convert the ground and basement floor of existing grade II listed building at 86 Cross Street, Manchester into a restaurant premises. It is understood that the proposed opening hours will be between 11:00 hours to 23:00 hours Monday to Thursday, 10.00 hours to 00:00 hours Friday to Saturday and 10:00 hours to 23:00 hours on Sunday.

The nearest residential receivers are identified as being apartments directly above the proposed restaurant on the first, second and third floor.

A site plan showing the location of the site and the surrounding local area including the closest residential receivers is shown in Figure 1 below.

Figure 1. Proposed Site Location with Nearest Residential Receivers



3.0 NOISE ASSESSMENT CRITERIA

3.1 Planning Conditions

The scheme has planning permission 117966/FO/2017 for which Planning Conditions 9 & 11 states:

9) The premises shall be acoustically insulated and treated to limit the break-out of noise in accordance with a noise study of the premises and a scheme of acoustic treatment that has been submitted to and approved in writing by the City Council as local planning authority. The scheme shall be implemented in full before the use commences, and shall only allow background music to be played in the bars and restaurant areas.

Where entertainment noise is proposed the LAeq (entertainment noise) shall be controlled to 10dB below the LA90 (without entertainment noise) in each octave band at the facade of the nearest noise sensitive location, and internal noise levels at structurally adjoined residential properties in the 63Hz and 125Hz octave frequency bands shall be controlled so as not to exceed (in habitable rooms) 47dB and 41dB, respectively.

Reason - To safeguard the amenities of the occupiers of the building and occupiers of nearby properties, pursuant to policies SP1 and DM1 of the Core Strategy

11) 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 (LAeq) below the typical background (LA90) level at the nearest noise sensitive location.

The scheme shall be submitted to and approved in writing by the City Council as local planning authority in order to secure a reduction in the level of noise emanating from the site.

Reason - To minimise the impact of the development and to prevent a general increase in pre-existing background noise levels around the site, pursuant to policies SP1 and DM1 of the Core Strategy.

3.2 BS 4142:2014 + A1:2019

The effect of industrial noise on the nearest noise sensitive residences will be assessed in accordance with BS4142:2014+A1:2019 – 'Methods for rating and assessing industrial and commercial sound'.

The standard describes a method of determining the level of sound of a commercial nature, together with procedures for assessing the impact of such a sound outside nearby noise sensitive areas.

The standard may be thought of as a procedure for comparing the sound from commercial sources with background sound levels in the absence of the commercial sound and determining the likely impact of the sound on noise sensitive residences.

In accordance with BS 4142 the background sound level is the typical A-weighted sound pressure level at the assessment position that is exceeded for 90% of a given time interval (L_{A90}). The specific sound level is the equivalent continuous (L_{Aeq}) sound pressure level at the assessment position produced by the commercial source over a given time interval.

Certain acoustic features can increase the impact over that expected from a simple comparison between the specific sound level and the background level. Where such features are present, these are taken into account by adding corrections to the specific sound level.

This correction is applied based on whether the following features occur, or are expected to be present. The correction values can either be determined subjectively, or by various objective measurement procedures.

- The sound contains a distinguishable, discrete, continuous tone (whine, hiss, screech, hum, etc.). 0 – 6 dB penalty
- The sound contains distinct impulses (bangs, clicks, clatters, or thumps). 0 – 9 dB penalty.
- The sound is irregular enough to attract attention. 0 – 3 dB penalty.
- Where the specific sound features characteristics that are neither tonal nor impulsive, nor intermittent, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied.

From the addition of the above penalties where appropriate the rating level is established, this being the value that is compared with the background noise. Note that corrections for impulsivity and tonality may be added arithmetically where both are present and likely to affect perception within the same reference period. However, if any single feature is dominant to the exclusion of the others then it might be appropriate to apply a reduced or even zero correction for the minor characteristics.

According to BS 4142 an initial estimate of the impact is given based on the rating level value as follows:

- a rating level 10 dB(A) or more above the background is an indication of significant adverse impact, depending on the context.
- a rating level 5 dB(A) above the background is an indication of an adverse impact, depending on the context.
- where the rating level does not exceed the background level, this is an indication of the specific sound source having a low impact, depending on the context.

BS4142 indicates that the noise source should be evaluated over the appropriate time interval which is as follows:

- 1h during the day (07:00 – 23:00)
- 15 min during the night (23:00 – 07:00)

The above initial assessment may then be modified depending on the context, to take into account;

- The absolute level of the sound.
- The character and level of the residual sound compared to the character and level of the specific sound.
- The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions, such as:
 1. Façade insulation treatment
 2. Ventilation and / or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation; and
 3. Acoustic screening

4.0 BACKGROUND NOISE SURVEY DETAILS

4.1 Survey Times and Dates

The ambient noise measurements were conducted between 22:07 hours to 00:14 hours on Thursday 9th May 2024 and 11:02 hours and 11:59 hours on Monday 20th May, with all measurements being made and attended by Mr Jamie Wilson of PDA Ltd. The measurement periods were selected to capture the quietest daytime/evening and night-time periods that the proposed restaurant associated plant may be expected to operate.

4.2 Equipment Used

Throughout the survey measurements were undertaken a Rion NA28 sound level meter. The meter is a precision grade Class 1 sound level meter (as per BS EN 61672-1: 2002) for which current calibration certificates are held. The meter was set to A-Weighted and fast response. The meter was calibrated directly before any measurement took place and immediately afterwards and no significant drift was observed.

4.3 Weather

During the course of the survey the weather conditions were as follows:

Table 1. Summary of weather conditions

Date	Range of Temperature (°C)	Rainfall	Average Wind Speed (mph)	Wind Direction
Thursday 9 th May	15 – 16	No	2 – 3	NE
Monday 20 th May	14 – 15	No	2 – 3	Variable

4.4 Measurement Positions & Procedure

Measurements were undertaken at two positions at the site. The locations were deemed representative of the closest residential locations to the site. A range of statistical noise indicators was measured, including L_{Aeq} and L_{A90} . Measurements were setup to log every 5 - minutes.

The measurement locations are highlighted within the following figure:

Figure 2. Measurement Location



5.0 MEASURED RESULTS

A summary of the noise level measurements is given below. The levels presented in the tables have been rounded to the nearest decibel. The L_{Aeq} levels are the logarithmic average of all the measured noise levels. The L_{A90} levels have been shown as a minimum to maximum range. We have also presented the typical background level derived from a statistical analysis of the range of background levels measured. Graphs of the full measured data may be found in Appendix B.

Table 2. Summary of environmental noise measurements – Daytime

Date	Measurement Location	Time Period	$L_{Aeq,T}$ (dB)	Range of Background Noise level L_{A90} , (dB)	Typical Background Noise level L_{A90} , (dB)
Monday 20 th May	MP1	11:02 – 11:25	70	64	64
Monday 20 th May	MP2	11:28 – 11:59	65	58 – 66	61

Table 3. Summary of environmental noise measurements – Evening / night time

Date	Measurement Location	Time Period	$L_{Aeq,T}$ (dB)	Range of Background Noise level L_{A90} , (dB)	Typical Background Noise level L_{A90} , (dB)
Thursday 9 th May	MP1	22:07 – 22:54	69	57 – 60	59
Thursday 9 th May	MP2	22:59 – 00:14	63	49 – 56	50

5.1 Description of Background Noise

Intermittent traffic noise on Cross Street, John Dalton Street and surrounding local roads was the main noise source at this location. Distant plant noise was audible throughout the survey period. People talking and occasional shouting was also observed.

5.2 Proposed Noise Assessment Criteria, Plant Noise

Based upon the planning condition and MCC guidance criteria, this would therefore equate to the design targets in the following table during daytime and night-time periods when measured outside the window of the nearest noise sensitive or residential premises. It should be noted that proposed plant equipment is situated along the Four Yards façade and therefore plant noise emissions will be assessed to measurements carried out at Measurement Position 2 (MP2) only.

Table 4. External plant noise limits at the façade of the closest residential receivers

Period	Measurement Location	Noise Level L_{Aeq} dB Limit at Receiver Window (Four Yards)
Day	MP2	54
Evening / Night-time	MP2	45

6.0 EXTERNAL PLANT ASSESSMENT

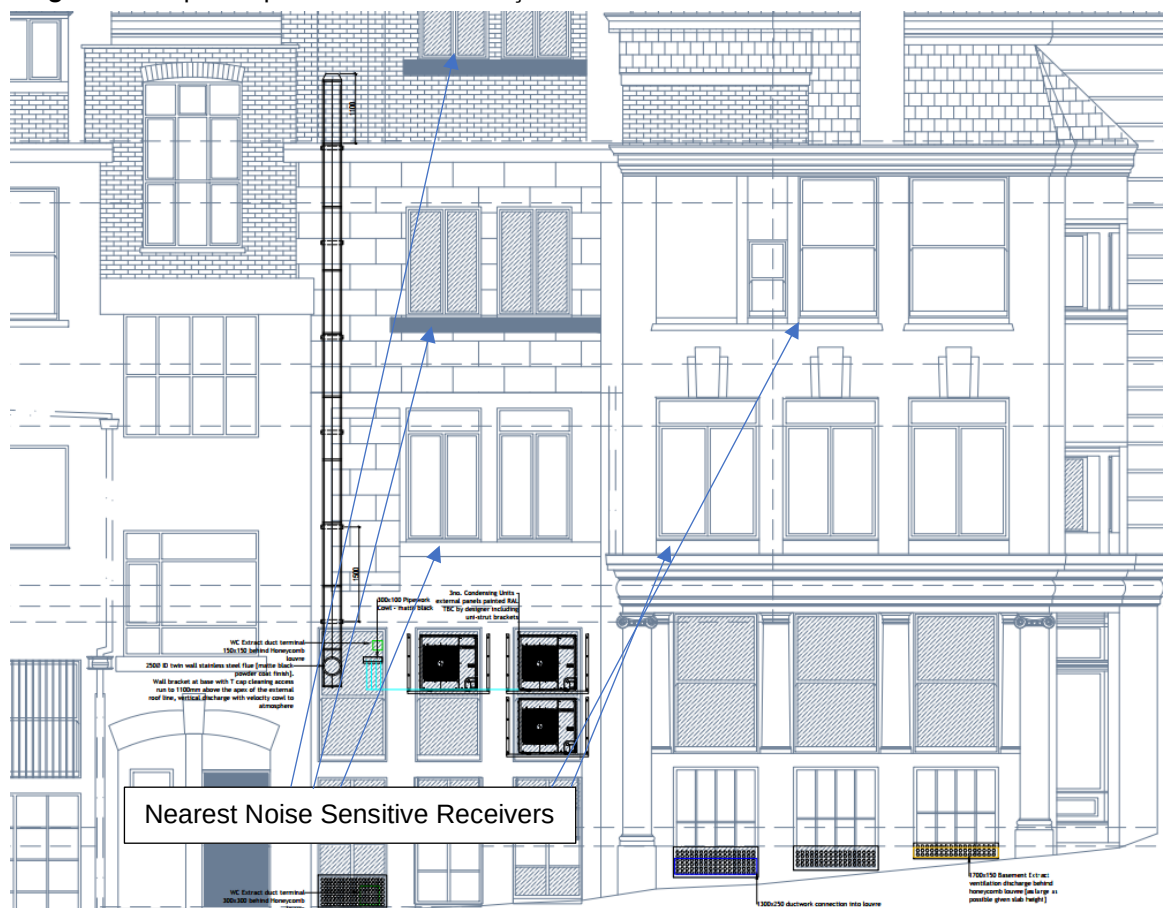
6.1 Proposed Plant

It is understood that the proposed plant for the development is as follows:

- 3 no. Toshiba RAV-GM1401ATP-E AC condenser units located externally, 2no. approximately 3.8m above ground level and 1no. approximately 2.8m above ground level.
- 1 no. Danfoss OP-MPYM014MP condenser unit located externally approximately 3.8m above ground level
- 1 no. Flueboost FB800 kitchen extract unit located at third floor level approximately 13.1m above ground level.
- 1 no. Systemair Prio 355 EC extract fan unit located approximately 0.3m above ground level discharge via a louver
- 1 no. Systemair Prio 315 EC supply fan unit located approximately 0.3m above ground level discharging via a louver
- 1 no. Systemair Prio Silent XP 150EC EC extract fan unit located approximately 0.2m above ground level discharging via a louver

The locations of the plant on the Four Yards façade is taken from Lifestyle Environmental Ltd Proposed Rear Elevation drawing SP2402425/01a dated February 2024 with an extract below.

Figure 3. Proposed plant services rear façade and nearest receivers



6.2 Manufactures Noise Level Data

The following section provides manufactures noise level data for proposed plant. We have been informed that the plant will operate during opening times only, and therefore equipment will be assessed up to 00:00 hours during the night-time period.

6.2.1 AC Condenser Units

Manufacturer's noise level data would suggest that the Toshiba RAV-GM1401ATP-E AC condenser units have a sound power level emission of 74dB(A) on the heating mode operation. Manufacturer's noise level data gives the noise level spectrum in sound pressure levels only. We have therefore adjusted the frequency spectra taken from the sound pressure level measurements to give the following sound power spectra.

Table 5. Toshiba RAV-GM1401ATP-E AC condenser unit noise level data

Element	Sound Power Level dB, Octave Band Centre Frequency Hz								dBA
	63	125	250	500	1k	2k	4k	8k	
Toshiba RAV-GM1401ATP-E Sound Power Level L_w	76	77	73	72	68	65	57	55	74

6.2.2 Cold Room Condenser Unit

Manufacturer's noise level data would suggest that the Danfoss OP-MPYM014MP condenser unit has a sound power level emission of 62dB(A). Manufacturer's noise level data gives the noise level spectrum in sound power levels and is shown in Table 6 below.

Table 6. Danfoss OP-MPYM014MP condenser unit noise level data

Element	Sound Power Level dB, Octave Band Centre Frequency Hz								dBA
	63	125	250	500	1k	2k	4k	8k	
Danfoss OP-MPYM014MP Sound Power Level L_w	68	69	63	60	56	53	47	42	62

6.2.3 Kitchen Extract

Manufacturer's noise level data would suggest that the Flueboost 800 kitchen extract unit has a sound power level emission of 79dB(A) from the discharge side operating at "high speed". Manufacturer's noise level data gives the noise level spectrum in sound power levels. The sound power levels are summarised in Table 7 below, note that additional losses have been taken for bends and duct run lengths as per standard CIBSE acoustic attenuation data, where appropriate.

Table 7. Flueboost 800 kitchen extract discharge noise level data

Element	Sound Power Level dB, Octave Band Centre Frequency Hz								dBA
	63	125	250	500	1k	2k	4k	8k	
Flueboost 800 Discharge (High Speed) Sound Power Level L_w	75	66	71	68	65	64	66	62	73

6.2.4 Basement Extract System

Manufacturer's noise level data would suggest that the Systemair Prio 355 EC basement extract fan has a sound power level emission of 79dB(A) from the outlet side. Manufacturer's noise level data gives the noise level spectrum in sound power levels and is shown in Table 8 below.

Table 8. Systemair Prio 355 EC extract fan noise level data

Element	Sound Power Level dB, Octave Band Centre Frequency Hz								dBA
	63	125	250	500	1k	2k	4k	8k	
Systemair Prio 355 (Outlet) Sound Power Level L_w	81	90	80	76	73	67	60	51	79

6.2.5 Basement Supply System

Manufacturer's noise level data would suggest that the Systemair Prio 315 EC basement supply fan has a sound power level emission of 72dB(A) from the outlet side. Manufacturer's noise level data gives the noise level spectrum in sound power levels and is shown in Table 9 below.

Table 9. Systemair Prio 315 EC supply fan noise level data

Element	Sound Power Level dB, Octave Band Centre Frequency Hz								dBA
	63	125	250	500	1k	2k	4k	8k	
Systemair Prio 315 (Outlet) Sound Power Level L_w	78	74	72	69	67	62	55	47	72

6.2.6 WC Extract System

Manufacturer's noise level data would suggest that the Systemair Prio Silent XP 150EC WC extract fan has a sound power level emission of 45dB(A) from the outlet side. Manufacturer's noise level data gives the noise level spectrum in sound power levels and is shown in Table 10 below.

Table 10. Systemair Prio Silent XP 150EC WC extract fan noise level data

Element	Sound Power Level dB, Octave Band Centre Frequency Hz								dBA
	63	125	250	500	1k	2k	4k	8k	
Systemair Prio Silent XP 150EC (Outlet) Sound Power Level L_w	41	47	45	43	41	33	21	20	45

6.3 Noise Modelling

A 3-dimensional noise model has been created using Soundplan noise modelling software. The model is based upon the Edifice Ltd General Arrangement Plans and Elevation Drawings, Lifestyle Environmental Ltd proposed rear elevation and HVAC proposals drawing and satellite images.

The software uses the method of ISO 9613 'Acoustics – attenuation of sound during propagation outdoors – general method of calculation' and takes into account geometric spreading, ground effects, air attenuation, barrier attenuation and reflections. A ground absorption coefficient of 0 has been used representative of hard surfaces (hardstanding, roads, etc.) which would likely provide a worst-case assessment.

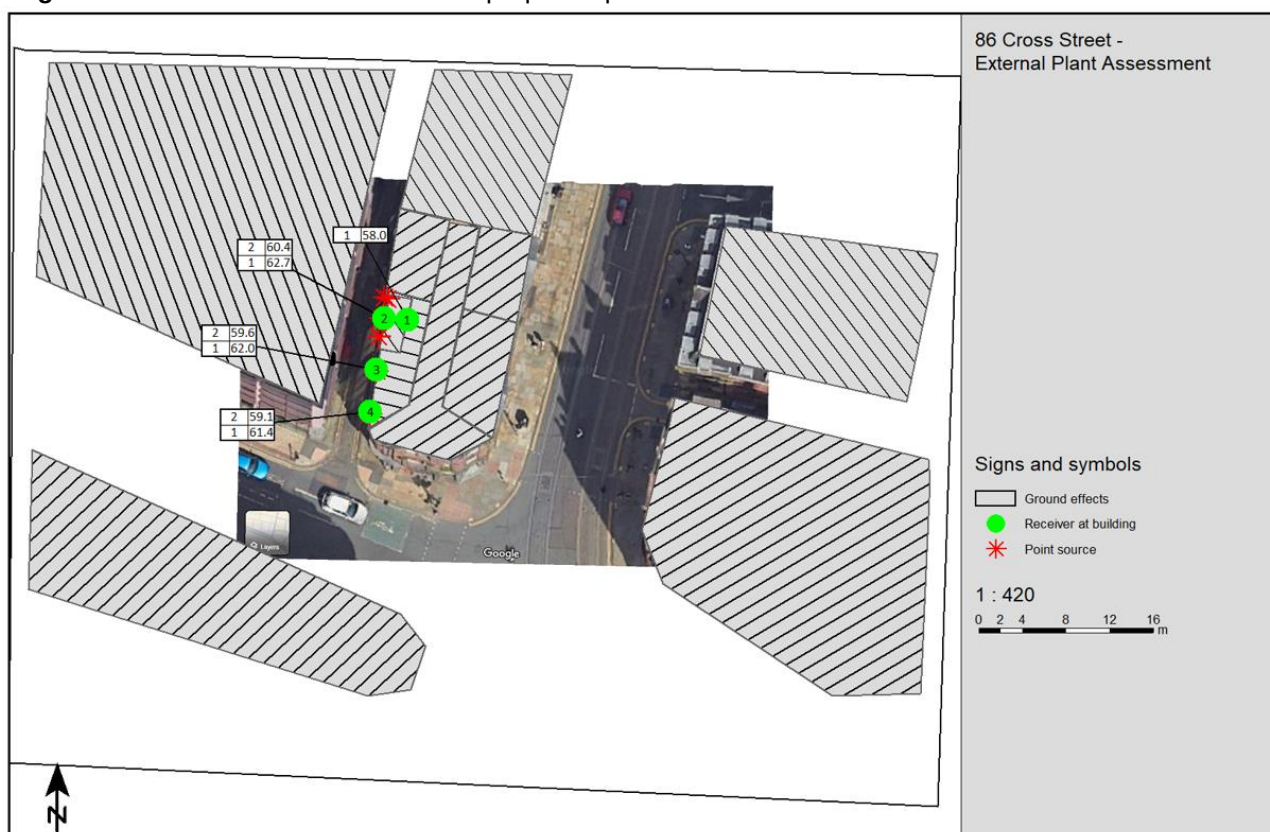
Note that no character corrections have been added within the assessment, as most modern plant units, etc. do not display tonality. In addition, where plant noise emission is made up of contributions from a number of different sources as is the case here, items with individual tonality or other characteristics even if they do exist will be masked by the other plant contributions.

The Calculations would suggest the following highest noise levels calculated at the closest noise sensitive receivers. For other receivers further away a lower noise level would be experienced due to greater distance attenuation provided.

Table 11. Calculated noise levels at the closest receivers

<i>Location</i>	<i>Calculated noise level dBA</i>
T02 Bedroom 2 (shown as Receiver 1 on Figure 4 below)	58.0
F03 Bedroom 2 (shown as Receiver 2 on Figure 4 below)	62.7
F03 Bedroom 1 (shown as Receiver 3 on Figure 4 below)	62.0
F03 Lounge (shown as Receiver 4 on Figure 4 below)	61.4

Figure 4. Noise level breakout from the proposed plant



6.4 BS4142 Assessment – Residential Receivers

An assessment has been carried out in accordance with condition 11 as shown in Section 3.1 with respect to the closest residential receivers. This assessment has been carried out to the highest calculated noise levels as appropriate.

F03 Bedroom 2 (shown as Receiver 2 on Figure 4 above)

Calculated noise level at façade L_{Aeq}	63 dB
Background Noise Level Limit (night-time) $L_{A90} - 5dB (50 - 5)$	45 dB
Acoustic Character Correction	0 dB
Rating Level (BS4142:2014) $(65 + 0)$	63 dB
Excess of Rating Level over the MCP noise limit $(63 - 45)$	+18 dB

Based on the results it can be seen that the worst-case predicted noise level is shown to be 18 dB above the background sound level and therefore has not complied with criteria shown in Section 3.1, condition 11.

6.5 Mitigation

Our assessment has indicated that the noise emissions from all plant equipment operating simultaneously is predicted to be up to 18 dB above the MCP noise limit as stipulated by Planning Condition 11.

We note that the Local Authority have require that the rating noise level associated with the external plant items is controlled to be at least 5 dB below background. Therefore we would recommend that mitigation to all plant equipment:

3no. AC Condenser units – Toshiba RAV-GM1401ATP-E

Each of the 3no. Toshiba RAV-GM1401ATP-E condenser unit noise emissions should be reduced by 20 dBA. This may be achieved by installing an acoustic enclosure to each condenser unit. Enclosures are available from manufactures such as IAC, Caice or Allaway Acoustics who will be able to provide an enclosure rated to achieve the required reductions. In addition, alternative units may be selected. The maximum sound power level should be 54 dBA for each unit or below.

1no. Cold Condenser Unit – Toshiba RAV-GM1401ATP-E

The 1no. Danfoss OP-MPYM014MP condenser unit noise emissions should be reduced by 8 dBA. This may be achieved by installing an acoustic enclosure to each condenser unit. Enclosures are available from manufactures such as IAC, Caice or Allaway Acoustics who will be able to provide an enclosure rated to achieve the required reductions. In addition, alternative units may be selected. The maximum sound power level should be 54 dBA or below.

1no. Systemair Prio 355 EC Basement Extract Fan

The Systemair Prio 355 EC basement extract fan outlet noise emissions should be reduced by 16 dBA. This may be achieved by installing an attenuator to the outlet duct. Attenuators are available from manufactures such as IAC, Caice or Allaway Acoustics who will be able to provide an attenuator rated to achieve the required reductions. An example attenuator is provided in Table 12 below:

Table 12. Example attenuator for Systemair Prio 355 Basement Extract Fan

Description	Minimum Insertion Loss (dB), Octave Band Centre Frequency Hz						
	63	125	250	500	1k	2k	4k
IACS 6MS Model (1800mm)	6	11	20	38	46	39	25

1no. Systemair Prio 315 EC Basement Supply Fan

The Systemair Prio 315 EC basement supply fan outlet noise emissions should be reduced by 15 dBA. This may be achieved by installing an attenuator to the outlet duct. Attenuators are available from manufactures such as IAC, Caice or Allaway Acoustics who will be able to provide an enclosure rated to achieve the required reductions. An example attenuator is provided in Table 13 below:

Table 13. Example attenuator for Systemair Prio 315 Basement Supply Fan

Description	Minimum Insertion Loss (dB), Octave Band Centre Frequency Hz						
	63	125	250	500	1k	2k	4k
IACS 5MS Model (1500mm)	5	10	18	35	43	32	21

1no. Flueboost 800 Kitchen Extract

The Flueboost 800 kitchen extract fan discharge noise emissions should be reduced by approximately 14 dBA. This may be achieved by installing an attenuator to the discharge duct. Attenuators are available from manufactures such as IAC, Caice or Allaway Acoustics who will be able to provide an enclosure rated to achieve the required reductions. An example attenuator is provided in Table 14 below:

Table 14. Example attenuator for Flueboost 800 Kitchen Extract

Description	Minimum Insertion Loss (dB), Octave Band Centre Frequency Hz						
	63	125	250	500	1k	2k	4k
IACS 3MS Model (900mm)	3	5	11	18	23	22	17

7.0 EXTERNAL BREAKOUT ASSESSMENT

It is understood the premises is to be a pizza restaurant with light customer noise and recorded background music.

7.1 Noise Within the Restaurant

It is assumed that the construction of the external façade of the proposed ground floor use comprises existing solid 300mm brick walls with the windows being a single pane of 6mm glazing with hardwood timber frames, the door being hardwood timber with a single pane of 6mm glazing.

7.1.1 Internal Noise Level

We have taken noise levels measured in a similar sized restaurant with background music playing from the PDA database.

Table 15. Typical Internal Reverberant Noise Levels

Element	Sound Pressure Level dBA, Octave Band Centre Frequency Hz								dBA
	63	125	250	500	1k	2k	4k	8k	
Restaurant with background music	37	53	58	70	72	70	65	55	76

7.1.2 Façade Sound Insulation Assessment

Based on the construction of the proposed restaurant and using the proposed façade and window dimensions the expected sound insulation performance, proportional areas, and subsequent composite sound insulation performance of the façade elements is as follows with data taken from standard manufacturers' data.

Table 16. Restaurant Front Façade Facing Cross Street – Composite Sound Insulation Performance

Cladding Element	Proportion of Area %	Sound Reduction Index Octave Band Centre Frequencies (Hz) dB							
		63	125	250	500	1k	2k	4k	8k
Existing Brick Wall	48	29	35	41	49	58	67	75	75
Standard Glazing Windows	52	15	19	23	28	32	30	35	35
Composite Sound Insulation	100	18	19	23	28	32	30	35	35

Table 17. Restaurant Façade Facing John Dalton Street – Composite Sound Insulation Performance

Cladding Element	Proportion of Area %	Sound Reduction Index Octave Band Centre Frequencies (Hz) dB							
		63	125	250	500	1k	2k	4k	8k
Existing Brick Wall	55	29	35	41	49	58	67	75	75
Standard Glazing Windows	36	15	19	23	28	32	30	35	35
Glazed Door	9	18	20	19	29	38	36	45	45
Composite Sound Insulation	100	19	21	23	30	34	32	37	38

Table 18. Restaurant Rear Façade Facing Four Yards Street – Composite Sound Insulation Performance

Cladding Element	Proportion of Area %	Sound Reduction Index Octave Band Centre Frequencies (Hz) dB							
		63	125	250	500	1k	2k	4k	8k
Existing Brick Wall	76	29	35	41	49	58	67	75	75
Standard Glazing Windows	24	15	19	23	28	32	30	35	35
Composite Sound Insulation	100	21	24	28	33	37	35	40	40

7.1.3 Façade Sound Insulation Assessment

Based on the predicted internal noise levels within the proposed restaurant use the façade noise break-out per metre squared (i.e. sound intensity) has been used for input into the noise model as follows:

Table 19. Façade Noise Break out

Element	Sound Power Level dB/m ² , Octave Band Centre Frequency Hz								dBA SWL/m ²
	63	125	250	500	1k	2k	4k	8k	
Cross Street Façade	39	44	38	39	34	33	23	15	40
John Dalton Street Façade	38	42	37	37	31	30	20	13	38
Four Yards Façade	36	39	33	34	29	27	18	10	35

7.2 Noise Within the Restaurant Proposed Noise Criteria – Noise Sensitive Receivers

The closest residential receivers are considered to be the adjacent residential apartments directly above the proposed restaurant (see Figure 1,3 above).

Based on the Planning Condition 9 in Section 3.1, it is suggested that noise break-out from entertainment noise be controlled so that it is 10dB below the L_{A90} in each octave band at the façade of the nearest noise sensitive receiver.

A summary of the representative background noise levels measured in the day and night -time periods are shown in Table 2 & 3 above. 1/1 octave bands were also measured.

7.3 Calculation Assumptions

Utilising the noise data detailed above we have calculated the noise egress to the nearest residential properties. Our calculations have been undertaken utilising the following methodology:

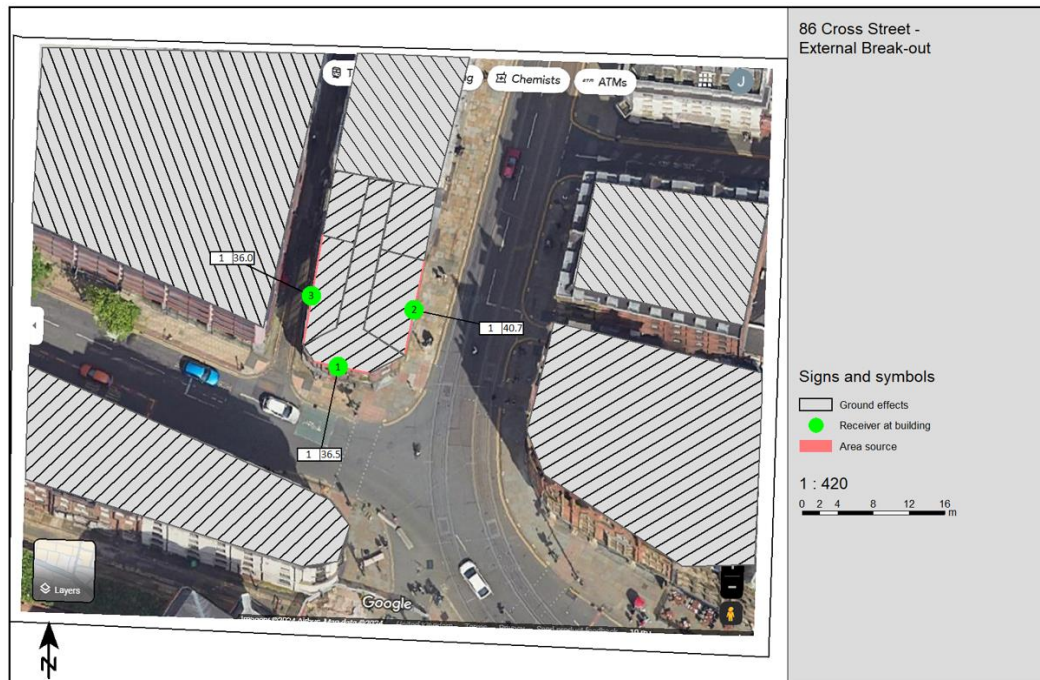
- Noise propagation to the nearest residential properties have been undertaken in accordance with the guidance contained within ISO 9613-2:1996. All calculations have been undertaken utilising Soundplan commercial noise prediction software.
- A ground absorption coefficient of 0 has been used representative of the intervening ground which is hard ground (i.e. roads, footpaths and hardstanding).
- Within the noise model, the facades of the proposed restaurant use are modelled as area sources.
- Floor levels for the receivers are measured based on elevation drawings

7.4 Calculation Results

The façade sound power levels per m² (applied over source area) from Table 16 have been included in a Soundplan noise propagation model to determine the noise impact from the operations of the proposed restaurants upon the nearby residential receivers.

The worst-case noise level incident upon this receivers is calculated at 41dB L_{Aeq} along Cross Street and 36dB L_{Aeq} Four Yards .

Figure 5. Noise level breakout from the proposed restaurant use



7.5 Assessment Against Background

Utilising the results of the noise predictions we have compared the predicted noise egress with the background noise levels measured for the nearest noise sensitive receivers. For the purposes of our assessment we have assessed the proposed restaurant use to evening / night-time use (between 22:00 hours - 00:00 hours) and therefore the evening / night-time typical background sound levels at measurement position 1 & 2 have been adopted within our calculations. The assessment provides results for the noise impact at residential facades along Cross Street and Four Yards. The results of our assessment are provided below

Table 20. Results for Noise Break Out of Restaurant use at NSR along Cross Street

Description	Sound Pressure Level dB, Octave Band Centre Frequency Hz								dBA
	63	125	250	500	1k	2k	4k	8k	
Predicted Specific Noise Level at NSR L_{Aeq} dB	39.6	44.8	38.2	39.7	34.3	33.1	23.3	15.4	41
Typical Background Noise Level L_{A90} dB	59.1	59.8	58.5	56.4	53.4	48.2	40.1	31.1	59
Excess of Source over Background, dB	-19.5	-15.0	-20.3	-16.7	-19.1	-15.1	-16.8	-15.7	-18

Table 21. Results for Noise Break Out of Restaurant use at NSR along Four Yards

Description	Sound Pressure Level dB, Octave Band Centre Frequency Hz								dBA
	63	125	250	500	1k	2k	4k	8k	
Predicted Specific Noise Level at NSR L_{Aeq} dB	37.1	40.3	33.6	35	29.5	28.2	18.4	10.3	36
Typical Background Noise Level L_{A90} dB	53.0	52.6	50.5	47.2	44.7	39.8	31.7	23.4	50
Excess of Source over Background, dB	-15.9	-12.3	-16.9	-12.2	-15.2	-11.6	-13.3	-13.1	-14

7.6 Discussion

The assessment undertaken above suggests that noise egress from the proposed restaurant use would be at least 10dB below the typical L_{A90} in each octave band at the façade of the nearest noise sensitive receivers and we would therefore consider that the noise emissions from the proposed restaurant use will have a low impact on the surrounding nearest residential receivers, and additional receivers that are further away would experience lesser impacts.

Therefore the calculations would suggest that the requirements of Planning Condition 9 of the planning permission 117966/FO/2017, are achieved.

8.0 ASSESSMENT OF INTERNAL SOUND TRANSFER

We have undertaken an assessment to determine the likely noise impact associated with the operation of the restaurant to the adjacent apartments at first floor level. In order to determine the airborne sound insulation of the existing separating floor, we have modelled the existing floor construction utilising INSUL sound insulation prediction software and BASTIAN.

8.1 Noise Within the Restaurant Proposed Noise Criteria – Noise Sensitive Receivers

Based on the Planning Condition 9 in Section 3.1, it is suggested that internal noise levels at structurally adjoined residential properties in the 63Hz and 125Hz octave frequency bands should be controlled so as not to exceed (in habitable rooms) 47dB and 41dB, respectively.

8.2 Existing Floor Construction

We are informed that the existing floor comprises a circa 300mm concrete slab with a layer of lathe and plaster below. The flanking walls are assumed to be circa 300mm brick.

8.3 Sound Insulation of Separating Floor Modelling

Access to the residential apartments was not available during our visit and as such, we have modelled the existing floor construction utilising INSUL sound insulation prediction software and BASTIAN. It is reasonably assumed that the floor construction is consistent throughout the building. The modelled results in terms of D_{nT} and $D_{nT,w} + C_{tr}$ are presented in the Table below:

Table 22. Modelled Sound Insulation Performance of Existing Separating Floor

Description	Standardised Level Difference (D_{nT} dB) at Octave Band Centre Frequency (Hz)							$D_{nT,w} + C_{tr}$
	63	125	250	500	1000	2000	4000	
Floor	41	40	45	53	60	65	71	51

It can be seen from the modelled results in Table 19 that the sound insulation of the separating floor achieve the requirements the Building Regulations Approved Document E 2003 (≥ 43 dB $D_{nT,w} + C_{tr}$) however, ultimately the required sound insulation performance will be dictated by the source level in the restaurant as discussed Section 7.1.1.

8.4 Internal Noise Assessment

Based on the modelled sound insulation performance of the separating floor in Section 8.3 and the measured restaurant noise levels in Section 7.1.1, we have undertaken a calculation to predict the likely noise levels within the adjacent apartments;

$$L_p \text{ Apartment} = L_p \text{ Restaurant} - D_{nT}$$

Where:

$L_p \text{ Apartment}$ = Measured reverberant sound pressure level in restaurant

$L_p \text{ restaurant}$ = Predicted sound pressure level in apartment

D_{nT} = Measured sound insulation performance of separating partition

The results are presented in the Table below:

Table 23. Predicted internal noise level within apartments due to restaurant

Description	Sound Pressure Level (dB), Octave Band Centre Frequency Hz							dB(A)
	63	125	250	500	1k	2k	4k	
Predicted internal noise level in typical first floor apartment	22	29	21	20	12	3	-7	20
Manchester Council noise limit criteria	47	41						
Comparison with MCC criteria	-25	-12						

8.5 Discussion of Results

With regards to the first-floor apartments, our assessment has indicated that internal noise levels are likely to be significantly below 47 dB and 41 dB in the 63 Hz and 125 Hz octave bands, respectively.

Therefore the calculations would suggest that the requirements of Planning Condition 9 of the planning permission 117966/FO/2017, are be achieved.

9.0 CONCLUSION

At the request of Individual Restaurants an assessment of the external and internal noise egress from the proposed restaurant at 86 Cross Street, in Manchester has been undertaken.

The proposed scheme consists of a refurbishment of the existing ground and basement floor of 86 Cross Street into a proposed pizza restaurant. The first to third floor currently comprises residential apartments.

This report has been prepared to meet the requirements of Planning Conditions 9 and 11 of planning permission 117966/FO/2017.

A baseline noise survey was undertaken at the site. The noise level survey is considered representative of the background noise levels at the nearby receivers during day and night-time during the periods in which the plant is expected to operate. Noise level limits are proposed in line with the Planning Conditions and MCC standard criteria.

It is proposed to install mechanical services plant for the proposed restaurant to the rear façade of the development along Four Yards. An assessment of the noise breakout from the proposed units has been undertaken and compared with the existing measured background noise levels and Planning Conditions. Based upon manufacturer's noise level data and proposed architectural and mechanical services drawings, a 3-dimensional noise model has been created using Soundplan noise modelling software. An assessment has been carried out in accordance with BS4142:2014 with respect to the closest noise sensitive receivers, considered to be the apartments on the first to third floor of the building.

The calculated noise levels with the proposed plant selections is likely to be 18 dBA above the existing background at the worst-case nearby receiver for the evening / night-time periods. Therefore the current calculations would suggest that the requirements of Planning Condition 11 of the planning permission 117966/FO/2017, has not been achieved. However, recommendations for mitigation has been provided in Section 6.5 to achieve the planning condition.

An assessment has been undertaken for the proposed restaurant use at ground floor level which suggests that noise egress would be at least 10dB below the typical L_{A90} in each octave band at the façade of the nearest noise sensitive receiver. In addition, an assessment of internal transfer through the separating floor between the ground floor proposed restaurant and first floor apartments has been carried out. Our assessment has indicated that internal noise levels are likely to be significantly below 47 dB and 41 dB in the 63 Hz and 125 Hz octave bands, respectively. Therefore the calculations would suggest that the requirements of Planning Condition 9 of the planning permission 117966/FO/2017, are achieved.

APPENDIX A – DEFINITION OF ACOUSTIC TERMS

The decibel

This is the basic unit of noise, denoted dB.

A Weighting

This is a weighting process which simulates the human ear's different sensitivity at different frequencies. A weighting can be shown two typical ways, 50 dB(A) L_{eq} or 50 dB L_{Aeq} . Both mean the same thing. (See below for a definition of L_{eq}). The dB(A) level can be regarded as the overall level perceived by human beings.

L_{eq} and $L_{eq(s)}$

This is the equivalent continuous noise level which contains the same acoustic energy as the actual time-varying sound. In other words it is a kind of average noise level. It is denoted dB L_{eq} or, for A-weighted figures dB(A) L_{eq} or dB L_{Aeq} . It can also be expressed in terms of frequency analysis (see later). $L_{eq(s)}$ is the sample L_{eq} level.

L_n

This is the level exceeded for n% of the time. It is denoted dB L_n or, for A-weighted figures dB(A) L_n or dB L_{An} . It can be expressed in terms of frequency analysis (see later). L_{90} is the level exceeded for 90% of the time and is a measure of the lowest level typically reached. L_{10} is the level exceeded for 10% of the time and is the highest level typically reached. L_{50} is the level exceeded for 50% of the time and, mathematically, it is the median.

L_{max}

This is the maximum level reached during a measurement period. The "time constant", or the ability of the equipment to respond to impulses is usually expressed along with it, e.g. "Fast", "Slow", etc. It is denoted dB L_{max} or, for A-weighted figures dB(A) L_{max} , dB L_{Amax} , etc. It can also be expressed in terms of frequency analysis.

Frequency Analysis

Whereas dB(A) gives a very useful overall figure, it has its limitations in that it cannot be used to model or predict the effect of noise control and mitigation as this nearly always has radically different performance at different frequencies.

Frequency analysis expresses an overall noise level at each frequency or band of frequencies in the audible range. Octave band analysis divides the audible range into 10 bands from 31.5 Hz to 16 kHz and the noise level in each band can be expressed in any form e.g. L_{eq} , L_{90} , L_{max} etc. One third octave band analysis uses 30 bands.

Narrow band analysis takes the process to resolutions of less than 1 Hz. This is useful for identifying the existence of tones (whines, hums, etc.) and in pin-pointing the sources.