

101 Princess Street Manchester, M1 6DD

Mechanical Services Plant Noise Impact Assessment

Report ref.

RK3309/20141/Rev 0

Issued to

Jones Lang LaSalle

Prepared by

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1. INTRODUCTION

Jones Lang LaSalle are seeking planning permission to install new plant equipment relating to a fifth floor fitout at 101 Princess Street in Manchester. The new plant equipment is proposed to be located externally at roof level next to existing units, which is located opposite noise sensitive receptors. Accordingly, a noise impact assessment is required.

Spectrum Acoustic Consultants have been instructed by Jones Lang LaSalle to carry out a Noise Impact Assessment to support the application. This report is submitted with the intention of providing sufficient information to both inform and satisfy the requirements of the Local Planning Authority.

2. SITE DESCRIPTION & PROPOSALS

The site is located at 101 Princess Street, Manchester, M1 6DD. The seven storey high commercial building comprises of a night-club at basement level, with offices above. Princess Street bounds the site to the west and has a number of commercial properties located along it. Silver Street bounds the site to the north and has a seven storey high hotel building directly opposite (Townhouse Hotel Manchester). Abingdon Street bounds the site to the east and has a large ten storey high hotel building opposite (Hotel Brooklyn). To the south is Major Street which has a number of commercial buildings located on it, along with a car park. An existing site location plan is included in Appendix A.

As part of a new fitout to the fifth floor, proposals involve installing an additional new Daikin air conditioning condenser unit. The offices are used during the daytime only i.e. typically 08:00 to 18:00, Monday to Friday. Scheme proposals are included in Appendix B.

Note, in May 2021, Spectrum prepared a noise impact assessment report (reference RK3198/20141/Rev 0) in connection with removing some of the old Mitsubishi air conditioning condenser units which were located on the fifth floor roof. Those units were replaced by two new Daikin condenser units, to provide air conditioning to the third and forth floors of the building.

3. NOISE CRITERIA

3.1 BS 4142:2014 METHODS FOR RATING AND ASSESSING INDUSTRIAL AND COMMERCIAL SOUND

The noise impact assessment relating to mechanical plant will be carried out in accordance with the procedures set out in BS 4142:2014 *Methods for rating and assessing industrial and commercial sound*. The principle of BS 4142 is to determine an initial estimate of impact of industrial/commercial sound on nearby residents by comparing the Rating Level (sound level from the industrial/commercial source, with a correction applied for any acoustic features that characterise the sound) with the Background Sound Level (L_{A90} as measured in absence of the industrial/commercial source).

Generally, the greater the difference by which the Rating Level exceeds the Background Sound Level, the greater the magnitude of impact. BS 4142 states that *'a difference of around +10 dB or more is likely to be an indication of a significant adverse impact [...]. A difference of around +5 dB is likely to be an indication of an 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.'*



However, BS 4142 also advises that *'when making assessments and arriving at decisions [...] it is essential to place the sound in context'* so in each case, the context in which the sound is placed must be considered and the initial estimate of impact should be modified accordingly.

For example it advises *'Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night.'*

It also indicates that impacts estimated during *'the middle of the night can be distinctly different (and potentially of lesser importance) compared to the start or end of the night-time period for sleep purposes.'*

3.2 MANCHESTER CITY COUNCIL'S PLANNING & NOISE TECHNICAL GUIDANCE - NOISE AND VIBRATION FROM FIXED PLANT / EQUIPMENT

Noise from fixed plant, equipment or machinery can be very annoying and disruptive to people living nearby particularly where that item involved emits a noise with impulsive or tonal characteristics.

Many of the noise complaints Environmental Health receive about noise from plant, equipment and machinery specifically concern the character of the noise emitted. Any noise assessment needs to consider not only the overall level of noise emitted but also its particular characteristics. The noise assessment should be based on BS 4142:2014 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.

Past experience has shown that this criterion can be readily achieved. Where available, product specification data for new items should be submitted with the acoustic report. Consultants should be using these to compare with data from the noise survey, and propose mitigation where the levels are above those specified in the criterion. Where this information is not available a consultant may choose to measure the noise levels generated by the equipment in question where the equipment has already been installed elsewhere (and in accordance with the guidance in BS 4142).

Where fixed plant, equipment or machinery is attached to a building the vibration caused by it can pass through the building structure and cause structure borne noise elsewhere in the building. Where it is to be installed in or on a building containing a noise sensitive use structure borne noise should be considered in the noise assessment and adequate control measures should be proposed. An example of where this would be required is where there is a proposal to install fixed plant or equipment on the roof of a residential apartment block.



4. BACKGROUND NOISE MEASUREMENT SURVEY

To inform the noise impact assessment, measurements of existing background noise levels were previously carried out during a noise survey conducted at the site from Friday 14 to Monday 17 May 2021. The noise data is still considered to be representative. Consequently, for the purposes of this assessment, it will be used again.

Weather conditions during the survey were generally mild and dry, with low wind speeds, presenting good conditions for noise measurement purposes.

Logger noise measurements were carried out on the roof of the building in accordance with BS 4142:2014. The monitoring location is considered representative of the nearest noise sensitive receptor location to the proposed plant equipment (Townhouse Hotel Manchester). Note, existing plant items located on the roof were not operating during the survey.

Measurements consisted of continuous 15 minute periods. The microphone was mounted on a pole at 2m above ground. The location of the microphone is shown on the existing site location plan included in Appendix A.

The following instrumentation was used during the survey.

- Bruel & Kjaer Type 2250 Sound Level Meter s/n 3027959
- Bruel & Kjaer Type 4189 Microphone s/n 3196073
- Bruel & Kjaer Type 4231 Acoustic Calibrator s/n 2688672

Before and after the survey, the sound level meter was field-calibrated in accordance with the manufacturer's guidelines, and no significant drift was observed. The meter, microphone and field calibrator are laboratory calibrated biennially in accordance with UKAS procedures or to traceable National Standards.

Measurements made were of the following parameters:

- Maximum Noise Level – defined as the maximum (L_{Amax} the maximum noise level)
- Residual Noise Level – defined as the Energy Average Level of a period, in the absence of noise from the proposed development (L_{Aeq})
- Background Noise Level – defined as level exceeded for 90% of a period, in the absence of the noise from the proposed development (L_{A90})

The measured noise profile at the noise monitoring location is shown in the following chart.

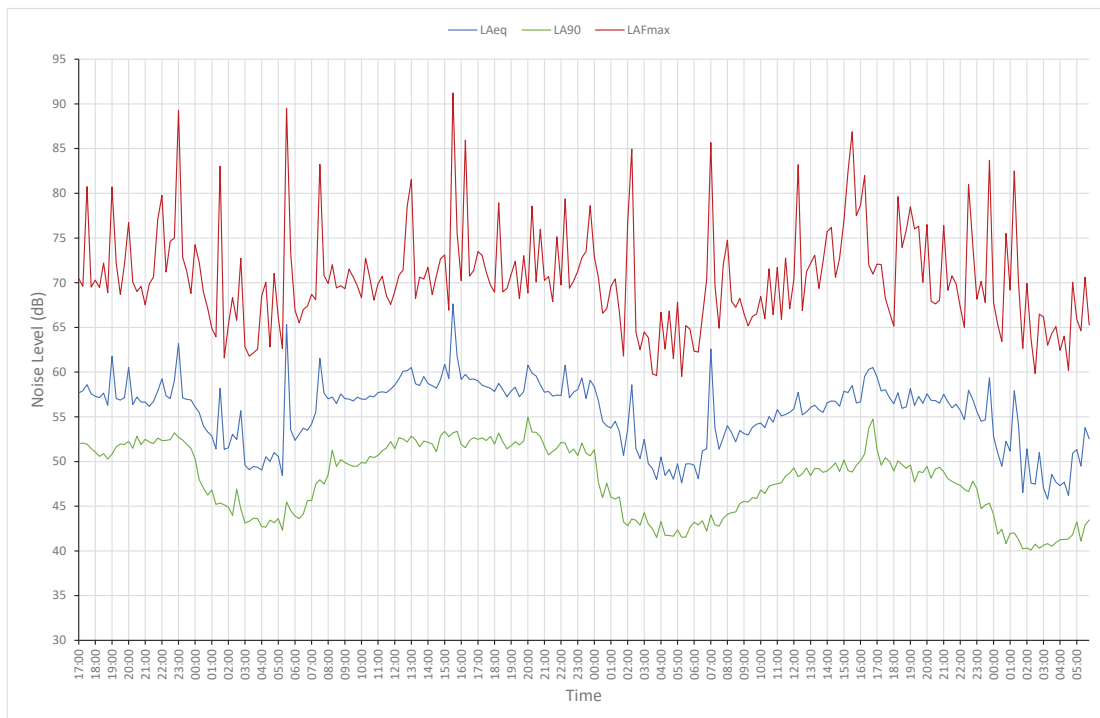


Chart 1: Ambient noise profile – Friday 14 to Monday 17 May 2021

When determining the representative background $L_{A90,T}$ level for the relevant period, BS 4142¹ guidance states “a representative level ought to account for the range in background levels and ought not automatically to be assumed to be either the minimum or modal value.” With this in mind, statistical analysis has been used to determine the typical background $L_{A90,T}$ noise level. This analysis derives the Mode, Mean and Mean -1 standard deviation values. Once these three values have been established, a judgement is made as to which value is considered representative. In this instance, the modal value is regarded as being representative.

Table 1 shows the representative background noise level measured during the daytime period when the plant items would be operating. Note, the equipment would only operate on weekdays. Consequently, the representative background level has been determined from the daytime measurements on the Friday and Saturday only.

Measurement Location	Period	Background Noise Level
Opposite Townhouse Hotel Manchester	07:00 – 20:00	$L_{A90,1hour}$ 52 dB

Table 1: Summary of the representative background noise level measured during the sensitive daytime period

As shown in Table 1, the representative background noise level at the nearest noise sensitive receptors to the proposed mechanical plant is $L_{A90,1hour}$ 52dB during the daytime when the new equipment would be operating. This reflects a typical steady noise profile controlled by traffic movements and other nearby mechanical plant in the area.

¹ BS 4142:2014 Methods for rating and assessing industrial and commercial sound



5. ASSESSMENT OF NOISE IMPACT

5.1 PROJECTED NOISE FROM MECHANICAL PLANT

The proposed new mechanical services plant item would be located close to the existing units on the roof of the building. The noise output (sound power level) generated by the unit is set out in Table 2 below.

Plant Item	No. of	Overall Sound Power Level dB(A)
Daikin REYQ18U Condenser Unit	x1	86

Table 2: Sound power levels of the existing and proposed external mechanical plant

Predictions of how the noise from the mechanical plant source propagates to sensitive community receptors has been determined by noise modelling using proprietary software (Predictor²) which meets the requirement of ISO 9613 Part 2:1996³. The noise model takes account of the following in its calculations procedures:

- Source sound power level (for point, line and area sources)
- Reflection from nearby structures and source directivity
- Distance from noise source (geometric spreading)
- Atmospheric absorption
- Acoustic screening of intervening structures and topography
- Ground absorption
- Ground effects (which includes the height of ground relative to the noise source)

Detailed noise calculations, providing information on the total specific noise level at each receptor are computed. To illustrate the scheme, a diagram showing the location of mechanical plant noise source, superimposed on a 3D view of the site, is included in Appendix C.

Note, the condenser unit operates on thermostatic, speed and timer controls according to heat loads and occupation rates, so it would not be operating 100% of the time. Whilst a typical on-time for this type of equipment might only 20-35%, a conservative and therefore more robust assessment assumes a 50% on-time for a typical worst-case scenario.

Predicted specific noise levels from the proposed new plant item at the nearest sensitive receptor location for the daytime operating scenario are provided in Table 3 below.

Receptor	L_{Aeq} dB(A)	L_{Aeq} Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
R1. Townhouse Hotel Manchester	41	25	29	33	38	34	27	22	14

Table 3: Predicted specific noise contribution from the proposed new mechanical services plant at the nearest sensitive receptor location.

As indicated in Table 3, predicted overall noise levels at the nearest sensitive receptor location from the proposed new mechanical services plant would be L_{Aeq} 41dB.

² Bruel and Kjaer – Predictor V7 Environmental Noise Calculation Software Package, Type 7810

³ ISO 9613-2:1996 "Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation to determine Noise Levels"

5.2 MECHANICAL PLANT NOISE IMPACT ASSESSMENT

Table 4 shows a BS 4142 assessment covering the mechanical plant noise impact during the daytime. The proposed new plant item does not emit any distinct tones or impulses. Furthermore, as there has been existing plant operating in the vicinity of the nearest sensitive receptor for many years, the proposals would result in no change in the character of the noise currently experienced. Therefore, no acoustic feature correction has been included in the rating level.

Residential Position	Rating Level (dB)	Background L_{A90} (dB)	Assessment Level (dB) (Background excess)
R1. Townhouse Hotel Manchester	41	52	-11

Table 4: Predicted rating level from the proposed new mechanical plant at the nearest sensitive receptor location, compared with the representative daytime (07:00-20:00) background $L_{A90,1hour}$ level

During the daytime, the study predicts that at the nearest sensitive receptor location, the mechanical plant rating level would be 11dB lower than the background noise level. The difference between the rating level and background level is such that any uncertainty would have no significance on the outcome of the assessment. Furthermore, the nearest sensitive receptor is a hotel where guests stay for short periods of time. The times when guests typically stay at the hotel are usually outside of the hours of operation of the plant equipment. Therefore, when considering these contextual elements, the sensitivity of the receptor is less than that of a typical dwelling.

In view of the above, noise emitted from the plant equipment during the daytime would meet the requirements of Manchester City Council's Planning and Noise Technical Guidance. In line with BS 4142:2014 guidance, mechanical services plant would have a very low noise impact.

6. CONCLUSIONS

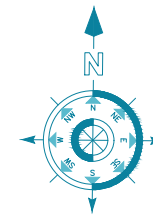
A noise assessment has been completed to consider the potential impact of noise produced by proposed new mechanical services plant relating to a new fifth floor fitout at 101 Princess Street in Manchester.

A background noise measurement survey was previously conducted in May 2021 at a location representative of the most sensitive receptor position to the plant. The noise data is still considered to be representative. Predictions of noise from the proposed new mechanical plant have been completed, utilising a proprietary software package.

Noise limits for mechanical services plant have been established, based on the previously measured background noise levels, Manchester City Council's Planning and Noise Technical Guidance, as well as taking account of BS 4142:2014+A1:2019 *Methods for rating and assessing industrial and commercial sound*. Predictions have indicated that the overall noise levels from the equipment would meet noise limit objectives and consequently have a low impact.

APPENDIX A

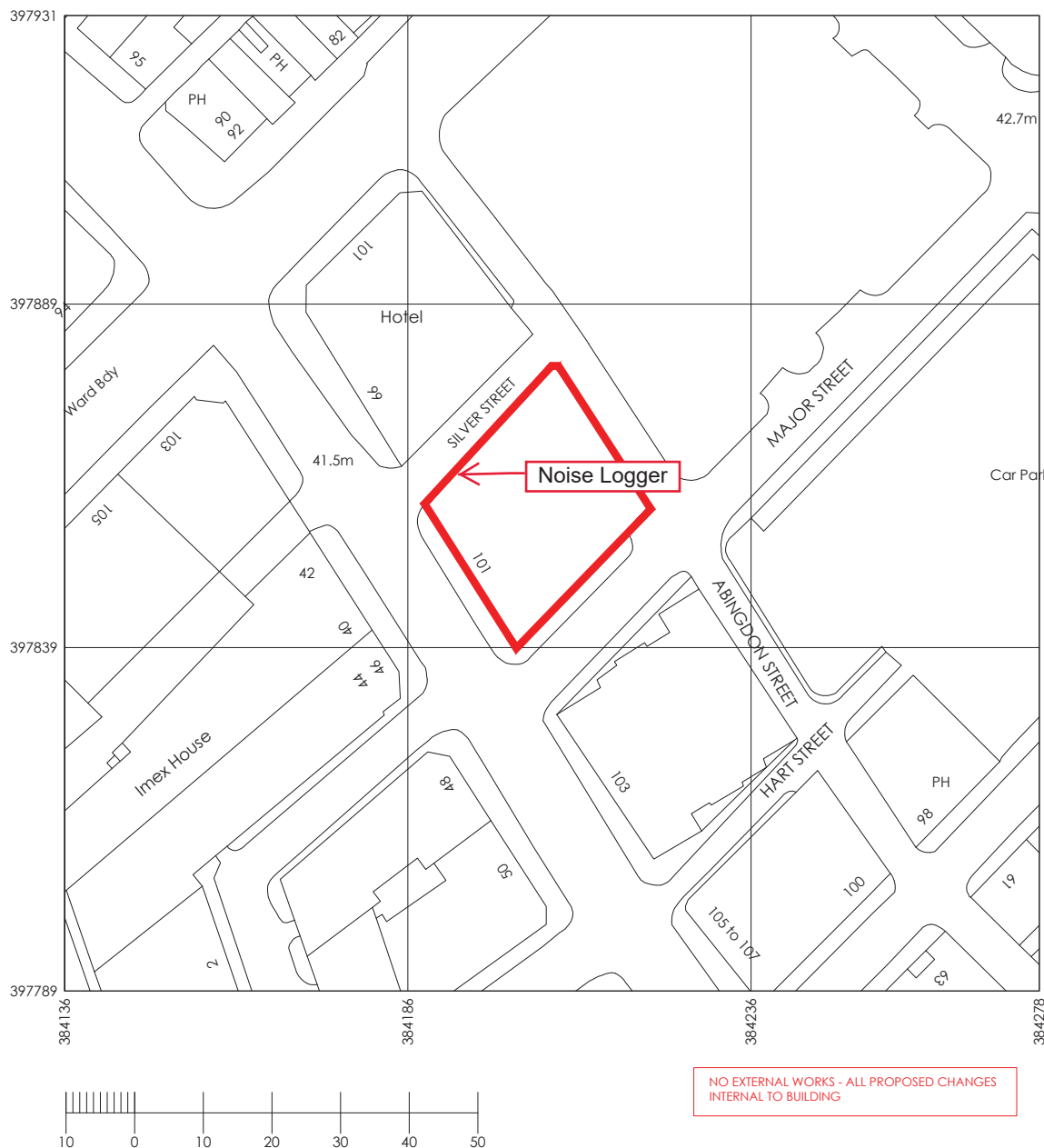
Existing Site Location Plan



Rev	Date	Description	Initials
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FOR CONSTRUCTION

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Project:	CAT A + REFURBISHMENT
Address:	101 PRINCESS ST MANCHESTER
Drawing Title:	3RD FLOOR EXISTING & PROPOSED SITE PLAN
Date:	04.03.2021
Project Number:	1213
Scale:	1:500@A2
Drawn by:	FLC
Drawing Number:	1213-03-LP02



101 PRINCESS ST - MANCHESTER

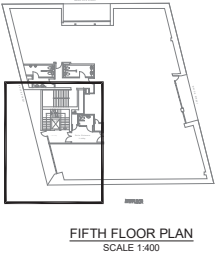
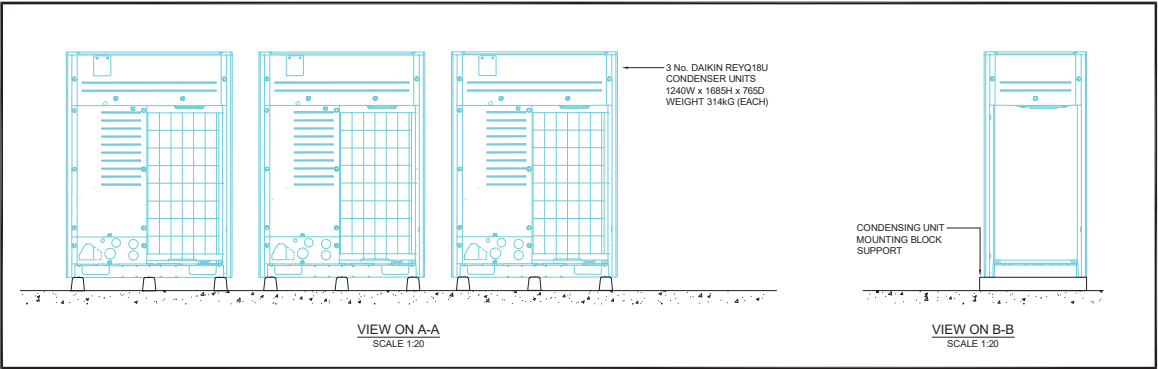
SITE PLAN 1:500

bluesky Design
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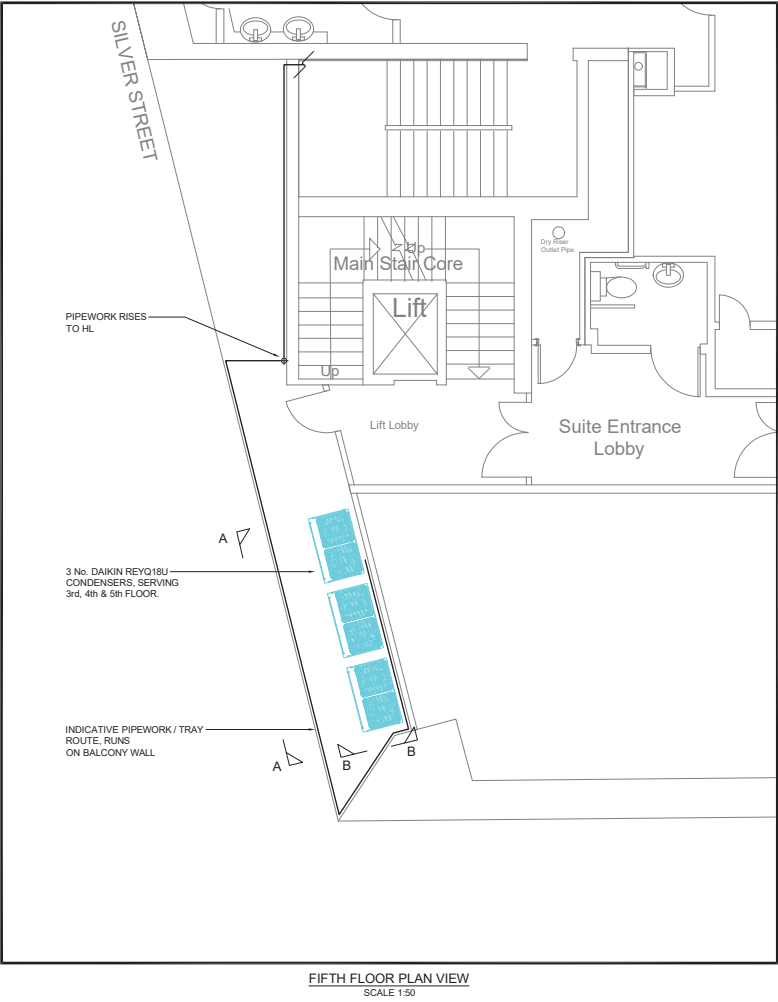
APPENDIX B

Scheme Proposals



SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION	
IN ADDITION TO THE HAZARDOUSNESS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAIL ON THIS DRAWING, NOTE THE FOLLOWING:	
CONSTRUCTION	
MAINTENANCE/CLEANING	
DECOMMISSIONING/DEMOLITION	
IT IS ASSUMED THAT ALL WORK WILL BE COMPLETED BY COMPETENT CONTRACTORS/ENGINEERS, USING APPROPRIATE, TO AN APPROVED SERVICE/STANDARD	

- NOTES
- PIPEWORK TRAY ROUTE / SIZE, INDICATIVE ONLY.

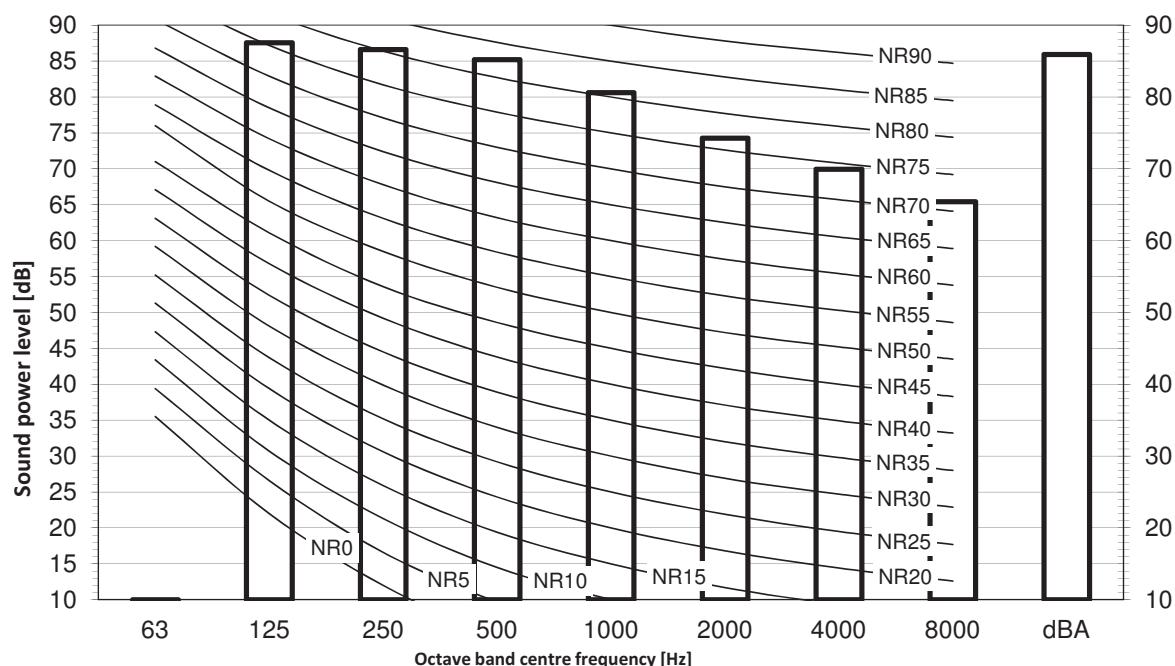


P0	18-11-21	FOR INFORMATION	LO
REV	DATE	DESCRIPTION	BY
 EVORA EDGE EVORA EDGE Ltd, The Pump House, Cotton Hill, Shrewsbury, SY1 2DP (T) 01743 341903 (W) www.evoraedge.com (E) cad@evoraedge.com Twitter @evoraedgetd Linked In www.linkedin.com/company/evora-edge-limited/			
CLIENT AberdeenStandard Investments			
PROJECT 101 PRINCESS STREET			
TITLE FIFTH FLOOR PROPOSED EXTERNAL CONDENSER LAYOUT			
DATE	18-11-2021	DRAWN BY LO	CHECKED JG
SCALE	1:50	PAPER A1	DRAWING No: 1989-EDGE-10-05-DR-M-0102
STATUS INFORMATION			REVISION P0

11 Sound data

11 - 1 Sound Power Spectrum

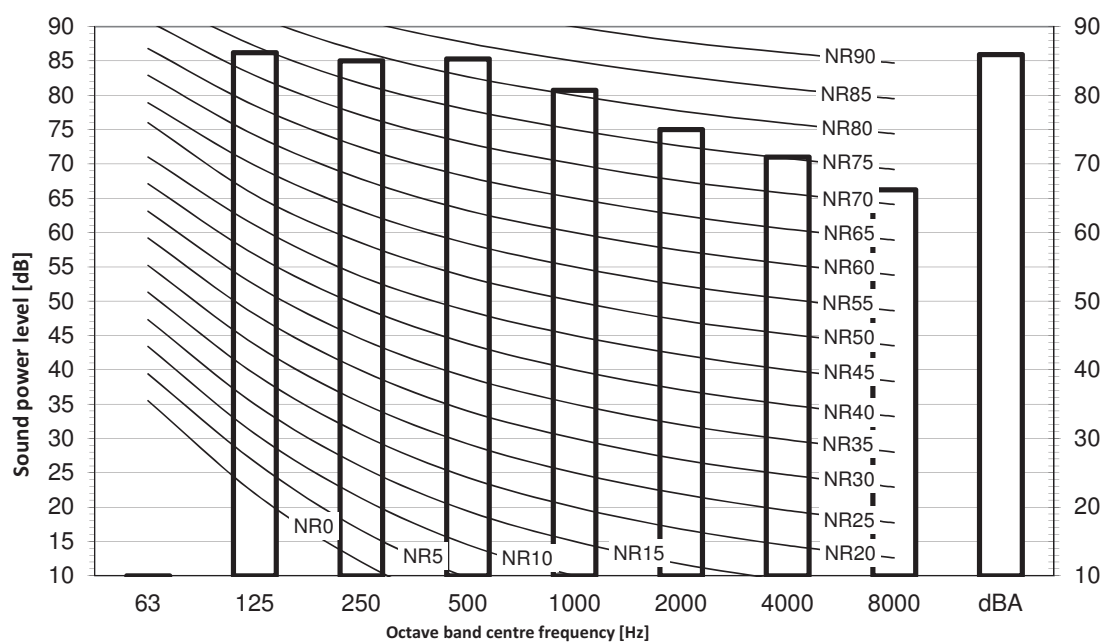
REYQ16T



- Notes :
1. dBA = A-weighted sound power level (A scale according to IEC).
 2. Reference acoustic intensity $0\text{dB} = 10^{-10}\text{W/m}^2$.
 3. Measured according to ISO 3744

3D079911B

REYQ18T



- Notes :
1. dBA = A-weighted sound power level (A scale according to IEC).
 2. Reference acoustic intensity $0\text{dB} = 10^{-10}\text{W/m}^2$.
 3. Measured according to ISO 3744

3D079912B

APPENDIX C

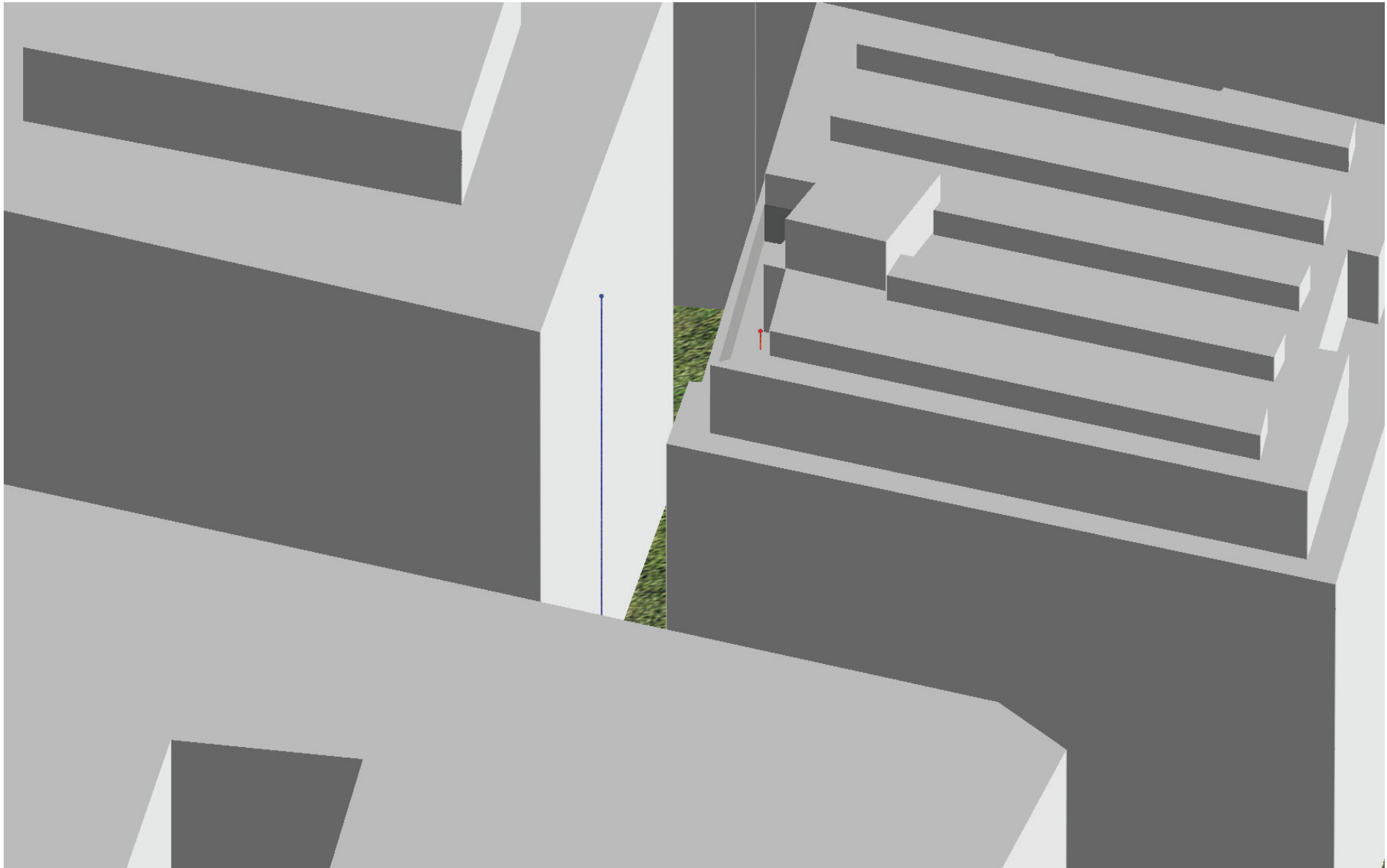
Noise Prediction Model

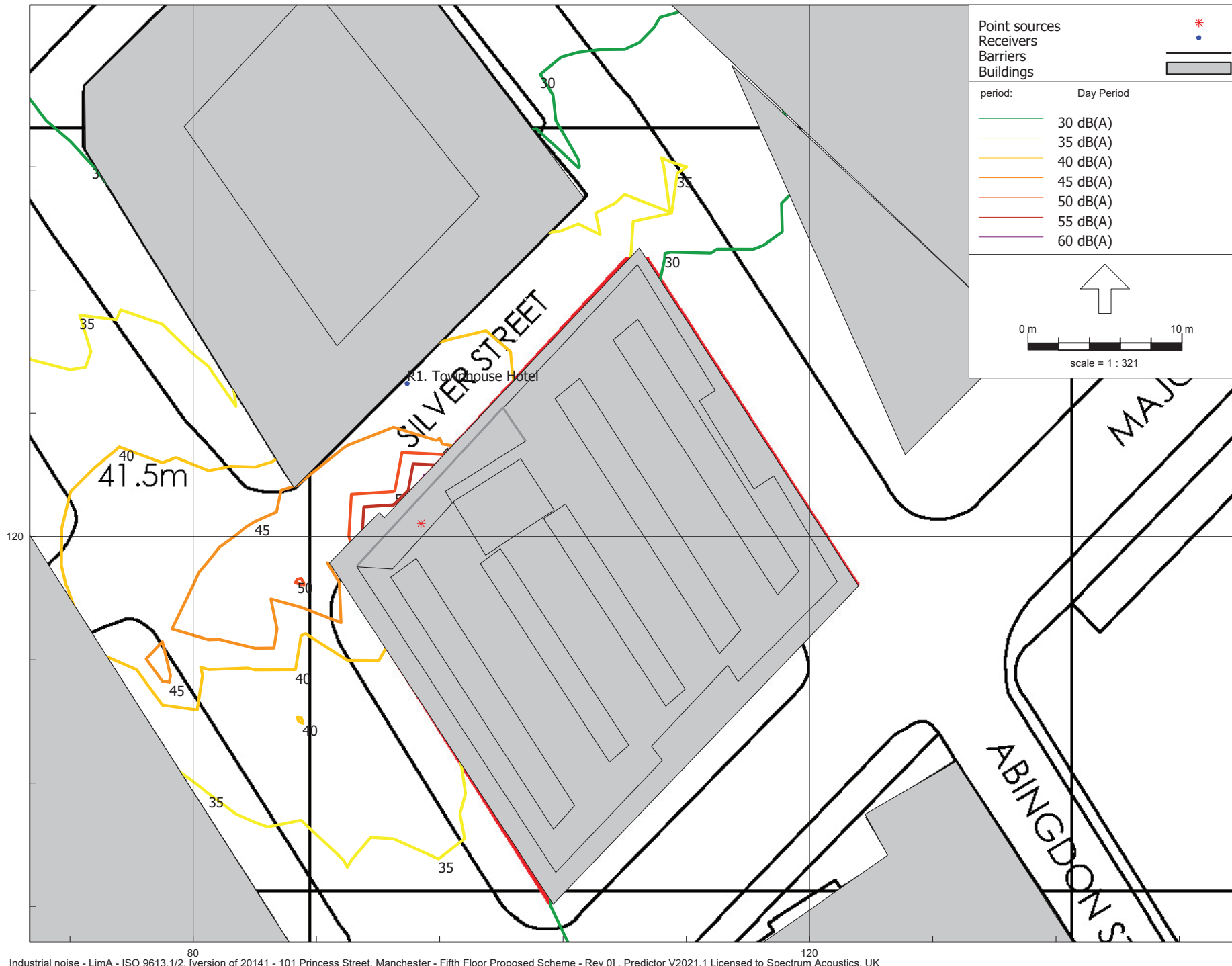
Equipment List Sound Power Levels



Revision	Date	Comment

[illegible]





101 Princess Street, Manchester

Predicted Plant Noise Levels

Report: Table of Results
Model: Fifth Floor Proposed Scheme - Rev 0
LAeq per octave: total results for receivers
Group: (main group)
Group Reduction: No

Name		Day								
Receiver	Description	Total	63	125	250	500	1000	2000	4000	8000
_A	R1. Townhouse Hotel	41	25	29	33	38	34	27	22	14

All shown dB values are A-weighted

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