

NOISE IMPACT ASSESSMENT

Client: - Abomnes Ltd

Project: - Pizza Sophia, 50 Tavistock Place

TABLE OF CONTENTS

Executive Summary

1. Introduction
2. Objectives
3. Site Description
4. Acoustic Criteria and Parameters
 - 4.1 London Borough of Camden Model Planning Condition
 - 4.2 Local Authority Pre-Application Advice
 - 4.3 BS4142:2014 “Methods for rating and assessing industrial and commercial sound”
 - 4.4 BS8233:2014 “Guidance on sound insulation and noise reduction for buildings”
5. Environmental Noise Survey
 - 5.1 Instrumentation
 - 5.2 Measurement Position
 - 5.3 Measurement Procedure
 - 5.4 Weather
 - 5.5 Site Noise Climate
6. Measurement Result Summary
7. Plant Noise Emission
 - 7.1 Plant Information & Operation
 - 7.2 Acoustic Mitigation Treatment
8. Vibration Isolation
9. Conclusions

Appendix

- A. Glossary of Terms
- B. Table of Environmental Monitoring Results
- C. Graph of Environmental Monitoring Results
- D. Location Plan: Site & Surrounding Area
- E. Location plan: Plant positions
- F. Plant Data Sheets
- G. Acoustic Calculations
- H. Sound Level Meter Calibration Certificate

EXECUTIVE SUMMARY

Qt Acoustics were appointed by Abomnes Ltd to review the acoustic impact of the air-conditioning and cold-room condensing unit plant located to the rear of the property at 50 Tavistock Place, London, WC1H 9RG.

This report demonstrates that the mechanical services plant and acoustic mitigation measures are in compliance with the relevant codes of good practice and local authority requirements.

Environmental noise monitoring of the site has been undertaken and representative noise levels have been recorded to allow assessment in accordance with local authority requirements and relevant codes of good practice. Noise level calculations have been performed to predict the noise rating level of the proposed mechanical services plant in relation to the local authority requirements for noise emission.

Relevant standards in the form of BS4142:2014, model planning conditions and pre-application advice from the London Borough of Camden (LBC) have been considered. A noise & vibration control package has been selected in order to provide sufficient mitigation of the mechanical services plant noise and so as to provide a low impact to neighbouring noise sensitive properties and comply with the local authority requirements.

1.0 Introduction

Retrospective planning permission is sought for mechanical services plant located on the ground floor rooftop of 50 Tavistock Place, London, WC1H 9RG and to serve the restaurant space at ground and basement level. The property is in a mixed use area comprising of residential and commercial properties.

Qt Acoustics have therefore been commissioned to undertake a detailed environmental noise assessment of the site in line with local authority requirements and codes of good practice.

2.0 Objectives

The objectives of this assessment are:

- To establish, by means of environmental noise monitoring, the existing noise climate of the site.
- To measure the existing L_{A90} (background noise level) at a location representative of the noise climate currently experienced at neighbouring noise sensitive properties.
- To propose suitable plant noise emission criteria based on relevant Standards and Local Authority Requirements.
- To perform predicted noise level calculations of the mechanical services plant incorporating any acoustic mitigation measures to provide a detailed assessment of the noise impact on neighbouring noise sensitive properties and specifically in relation to local authority requirements.

This report presents the results of the noise survey and the subsequent impact assessment of the mechanical services plant with any associated acoustic mitigation measures.

3.0 Site Description

The site is located at 50 Tavistock Place, King's Cross, London, WC1G 9RH and falls within the boundary of the London Borough of Camden. 50 Tavistock Place is used as a restaurant at basement and ground floor by Pizza Sophia the client and is within an area of mixed residential and commercial properties. The nearest noise sensitive residential property is:

- 50 Tavistock Place – 1st to 3rd Floor and located immediately above the restaurant

Tavistock Place is located around 400 metres south of Euston Road and St Pancras International Train Station.

Please see Appendix D for a map of the area.

The mechanical services equipment associated with this retrospective planning application is located at the rear façade of the property and fixed to the ground floor rear wall. The ground and basement floors extend nominally 4 metres rearward from the residential floors above.

The area to the rear of the property serves as an access route to the residential property located at 50 Tavistock Place and provides a service route for the commercial shops within the parade. The area to the rear is overlooked by commercial office space to the South and presumed additional residential properties at upper floors of neighbouring properties.

Adjacent properties are also used for class A3 purposes (restaurants and cafes). The area to the rear of 50 Tavistock Place contains numerous items of mechanical services plant in the form of air-conditioning condensing units, cold-room condensing units and kitchen ventilation units serving neighbouring commercial properties.

There is no external amenity space at the rear of the property.

Figure 3.1 & Figure 3.2: - Rear of 50 Tavistock Place. (2nd Image Courtesy of Google 2018)



4.0 Acoustic Criteria

Local authority requirements, planning conditions and appropriate British Standards are relevant in noise impact assessments. Criteria relating to noise emission from mechanical services plant is detailed below.

4.1 Local Authority Model Planning Conditions.

The London Borough of Camden Model Planning Condition has been advised as: -

Condition: The external noise level emitted from plant, machinery/ equipment will be lower than the lowest existing background noise level by at least 10dBA, or by 15dBA where the source is tonal, as assessed according to BS4142:2014 at the nearest and/or most affected noise sensitive premises.

Reason: To ensure that the amenity of occupiers of the development site/ surrounding premises is not adversely affected by noise from plant/mechanical installations/ equipment.

Anti- vibration mounts and silencing of machinery etc.

Condition: Measures shall ensure that [machinery, plant/ equipment] [extract/ ventilation system and ducting] are mounted with proprietary anti-vibration isolators and fan motors are vibration isolated from the casing and adequately silenced.

Reason: To ensure that the amenity of occupiers of the development site/ surrounding premises is not adversely affected by vibration."

4.2 Local Authority Pre Application advice.

Prior to application; guidance from the local authority Principal Environmental Health Officer: Peter Rodham has been sought due to the nature of the site and the lack of external amenity space and lack of space to accommodate further noise control measures. It is considered that night-time noise levels are of most concern at the site and the model planning condition should apply to any mechanical services noise generated between the hours of 2300-0700. As the site offers no external amenity space; for day-time noise levels it is considered that there is scope for a relaxation of the model planning condition. Day-time operation of mechanical services plant must adhere to the requirements of BS8233:2014 "Guidance on sound insulation and noise reduction for buildings" with regard to the internal noise levels in neighbouring residential properties and the noise rating level should not exceed the background noise level when assessed at 1 metre outside of noise sensitive premises windows and generally to provide a "low impact" in accordance with BS4142:2014.

4.3 BS4142:2014 "Methods for rating and assessing Industrial and commercial sound".

BS4142:2014 can be used to assess the likelihood of adverse impact as a result of a noise generating item. The standard provides guidance on how to:

- Assess the level of any adverse impact by identification of a "representative background noise level" for the period of plant operation and
- Methods to assess the "Rating Level" of the specific sound.

"The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level and specific sound source exceeds the background sound level and the context in which the sound occurs.

a) Typically the greater this difference, the greater the magnitude of impact.

b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.

c) A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context.

d) *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.*

And

"Rating Level

Certain acoustic features can increase the significance of impact over that expected from a basic comparison between the specific sound level and the background sound level."

The standard continues to suggest the following corrections to the specific sound level in order to obtain a "Rating Level": -

Table 4.2.1 Rating Level Correction from BS4142:2014

Characteristic	Range	Correction	Subjective Assessment
Tonality	0 to +6 dB		
		0 dB	Not Perceptible
		+ 2 dB	Just Perceptible
		+ 4 dB	Clearly Perceptible
		+ 6 dB	Highly Perceptible
Impulsivity	0 to +9 dB		
		0 dB	Not Perceptible
		+ 3 dB	Just Perceptible
		+ 6 dB	Clearly Perceptible
		+ 9 dB	Highly Perceptible
Other	0 or 3dB		
		+ 3 dB	Distinctive Characteristic Present
Intermittency	0 or 3dB		
		+ 3 dB	Readily Distinctive Intermittency

Note: - All are considered in relation to existing residual acoustic environment.

4.4 BS8233:2014 “Guidance on sound insulation and noise reduction for buildings”

BS8233:2014 suggests suitable noise levels for a range of activities and building usage and is intended to be used where noise sources are brought to existing noise-sensitive premises. The standard provides the following suggested noise levels inside a residential property.

Table 4.4.1 Suggested Internal Residential Noise Levels from BS4142:2014

Location/Activity	BS8233/WHO Limiting Sound Level	
	0700-2300 hours	2300-0700 hours
Bedroom (Sleeping/Day-time resting)	35 dB $L_{Aeq, 16 \text{ hour}}$	30 dB $L_{Aeq, 8 \text{ hour}}$
Living Area (Resting)	35 dB $L_{Aeq, 16 \text{ hour}}$	N/A
Dining Room (Dining)	40 dB $L_{Aeq, 16 \text{ hour}}$	N/A

The standard continues to suggest that a partially open window provides approximately 15 dB noise reduction from outside to inside and hence it can be determined that mechanical services noise outside of a noise sensitive window could be allowable up to 15 dB higher than stated in table 4.4.1 for the internal noise levels to be suitable for intended purpose. As such day-time & night-time mechanical services plant noise should not exceed 50 dB(A) & 45 dB(A) respectively when assessed at 1 meter outside of the window in order to achieve the suggested internal noise level criteria.

5.0 Environmental Noise Survey

5.1 Instrumentation

The environmental noise survey was undertaken using the following equipment:-

NTI Audio XL2 Serial No. A2A-08390-E Class 1 integrating and data logging sound level meter conforming to the relevant sections of BS EN 61672-1:2013

NTI Audio M2230 microphone monitoring assembly comprising of MA220 pre-amp - serial no. 1973 and microphone capsule serial number 9158 class 1 conforming to the relevant sections of BS EN 61672-1:2013.

Full calibration certificates are provided within Appendix H.

5.2 Measurement Position

Our survey concluded that the nearest noise sensitive property is located immediately above Pizza Sophia at 1st to 3rd Floors of 50 Tavistock Place and incorporates a window immediately adjacent to the ground floor flat roof located at the rear of Pizza Sophia. The noise monitoring instrumentation was located on the first floor flat roof and to the rear of Pizza Sophia and in close proximity to the neighbouring noise sensitive window.

Figure 5.2.1 – Position of Noise Monitoring and Nearest Residential Property.

NOTE: - SLM = Sound Level Meter, NSR1 = Noise Sensitive Receptor 1

Additional residential properties were identified in the area but are at a greater distance and/or benefit from being partially in the acoustic shadow of the building.

5.3 Measurement Procedure

The noise monitoring equipment was configured to monitor consecutive 15 minute samples of the site noise level over a period of nominally 4 ½ days. Measurements were logged concurrently for the ambient sound level ($L_{Aeq,15 \text{ min}}$), background Noise Level ($L_{A90,15 \text{ min}}$), $L_{A10,15 \text{ min}}$ (Often used as a traffic noise percentile) and the instantaneous maximum noise level ($L_{Amax,15 \text{ min}}$). The noise monitoring was an unattended test and as such the sound level meter was also configured to record a continuous audio sample of the entire test duration to assist with identification of any extraneous noise sources.

The microphone monitoring assembly was located at a height of 1.35 metres above the flat roof level and at a distance of nominally 3.5 metres from any neighbouring façade (in this instance that of the nearest noise sensitive property). The sound level meter manufacturer's windshield and bird spike assembly were used in order to minimise risk of external interference.

The environmental noise monitoring was performed from 11:30 hours on Friday 29th September 2017 to 19:15 hours on Tuesday 3rd October 2017. Mechanical services plant noise associated with Pizza Sophia was present during regular opening hours and typically between 10:30AM and 23:00 hours. Noise measurements influenced by the mechanical services plant during these periods have not be used for assessment for the residual noise level and periods before and immediately after plant shut-down have been used for assessment.

A field calibration check of the sound level meter and microphone monitoring assembly was undertaken before and after the noise measurement. No deviation was recorded and a microphone sensitivity of 34.9 mV/Pa maintained.

The procedure, measurements and interpretation were all undertaken in accordance with BS7445, parts 1&2. All provided sound pressure level measurements are referenced to 2×10^{-5} Pa.

5.4 Weather Conditions

The noise monitoring period was generally without precipitation and the ground surface was dry. The weather conditions were recorded both at the start and end of the noise monitoring period and indicated stable weather suitable for test purposes. The details are provided below:-

Test	Temperature	Wind Speed	Wind Direction	Cloud Cover
	°C	m/s		%
Start	18	1.0-4.1	W	25%
End	15	0.3-2.6	W	50%

Regional weather forecasts indicated that ambient temperatures dropped as low as 8 °C and with light precipitation for short durations of the test period. As such the prevailing weather conditions during the noise monitoring period are deemed to be suitable for the purpose of noise testing and would not result in excessive external interference to measurement.

5.5 Site Noise Climate

The area surrounding 50 Tavistock Place is mixed in usage with residential and commercial properties.

The main noise source within the area is traffic noise from surrounding roads. Whilst Tavistock Place is not a high traffic street the road network density within this area of London results in an underlying noise from vehicle movements.

Neighbouring commercial properties located predominantly to the rear of 50 Tavistock Place incorporate mechanical services plant and contribute to the noise climate in the area and in particular have a large influence, when operating, on the background noise level (L_{A90}).

Intermittent noise from over ground rail was detectable at the site from nearby main line rail track and stations with the nearest located at King's Cross St Pancras nominally 400 metres away.

Intermittent aircraft noise was identified and presumed from London City airport, other air traffic was also present in the form of helicopter movements across London.

6.0 Measurement Result Summary

A 103-hour unattended noise test was undertaken at the rear of 50 Tavistock Place at ground floor roof level and in close proximity to the nearest noise sensitive property facade. The full results are provided in graphical and numerical format within Appendix B – (NOTE Periods of mechanical services plant operation provided in Grey in Appendix B). A summary of the results is provided in table 6.1 & 6.2 below.

Table 6.1 Summary of Background Noise Levels – Day/Eve/Night

Time Period	Lowest Background Noise Level	Statistically Most Common Background Noise Level
	<i>L_{A90, 15min}</i>	<i>L_{A90, 15min}</i>
Day-Time (07:00-18:00 hrs)	41 dB	47 dB (0700-1030 hrs)
Evening (18:00-23:00 hrs)	41 dB	N/A (Plant Operating)
Night (23:00-07:00 hrs)	36 dB	38 dB

The mechanical services plant is to be operated during different time-periods subject to intended use and with air-conditioning equipment operating during restaurant opening hours and the cold-room condenser to operate 24/7 to maintain cold-room temperatures for the purposes of preservation of foodstuffs. As such the background noise levels have been additionally categorised for the periods of plant operation:-

Table 6.2 Summary of Background Noise Levels – Plant Operating Periods

Time Period	Lowest Background Noise Level	Statistically Most Common Background Noise Level
	<i>L_{A90, 15min}</i>	<i>L_{A90, 15min}</i>
Plant Group 1 (10:00-23:00 hrs)	41 dB	47 dB
Plant Group 2 = 24-hour so Night (23:00-07:00 hrs)	36 dB	38 dB

In order to comply with the requirements of the model planning condition of 10 dB below lowest measured background noise level the following limits should be applied to any noise generated by the proposed mechanical services when extrapolated to the nearest noise sensitive property:-

Table 6.3 – Plant Noise Limits – LBC Model Planning Condition

Time Period	Plant Noise Limits
	$L_{Aeq, 15min}$
Plant Group 1 (10:00-23:00 hrs)	31 dB *
Plant Group 2 = 24-hour so Night (23:00-07:00 hrs)	26 dB *

* In accordance with planning policy guidance detailed within section 4.1 – noise that is considered to be sufficiently tonal in nature at the receiver position should be **5 dB** quieter than detailed within table 6.3.

Table 6.4 – Plant Noise Limits – BS4142:2014 – Category “Low Adverse Impact”

Time Period	Plant Noise Limits
	$L_{Ar, 15min}$
Plant Group 1 (10:00-23:00 hrs)	47 dB *
Plant Group 2 = 24-hour so Night (23:00-07:00 hrs)	38 dB *

* Where L_{AR} is the specific Sound Source Rating Level with any corrections for the character of the noise as defined within Table 4.2.1

Table 6.5 – Plant Noise Limits – BS8233:2014

Time Period	Plant Noise Limits
	$L_{Aeq,}$
Plant Group 1 (10:00-23:00 hrs)	50 dB
Plant Group 2 = 24-hour so Night (23:00-07:00 hrs)	45 dB

Table 6.6 – Plant Noise Limits – Proposed

Time Period	Plant Noise Limits
	$L_{Aeq, 15min}$
Plant Group 1 (10:00-23:00 hrs)	41 dB *
Plant Group 2 = 24-hour so Night (23:00-07:00 hrs)	26 dB

* Where appropriate weightings are applied to the specific Sound Source Rating Level with any corrections for the character of the noise as defined within Table 4.2.1

Table 6.6 sets out the proposed limiting plant noise limits and following the pre-application advice sought from Peter Rodham of RBC with the relaxation of the day-time requirements in line with the site's lack of external amenity areas. As such the proposed limiting plant noise levels are substantially better than if assessed against BS4142:2014 or BS8233:2014 and will therefore provide a low adverse impact on neighbouring noise sensitive properties and provide internal noise levels fit for purpose.

7.0 Plant Noise Emission

The mechanical services plant subject to the retrospective planning application is to be reconfigured generally in accordance with the rear elevation drawing provided within Appendix E and is to incorporate acoustic mitigation treatment to reduce noise emission to neighbouring noise sensitive properties. This section summarises the plant, typical acoustic mitigation treatment that is to be installed and provides a noise impact assessment with reference to the proposed limiting noise levels as set out within table 6.6.

7.1 Plant Information and Operation

The plant is split into 2 categories subject to required operational hours. Where plant is to be restricted to certain hours the equipment is to be fitted with time clocks.

7.1.1 Plant Group 1 is to operate between the hours of 10:00 and 23:00 to provide comfort cooling/heating and comprises of the following equipment:-

- Item 1 – Daikin RZQSG71L3V1B External AC Condensing Unit – 51 dB(A) @ 1 metre ^{1,2}
- Item 2 – Panasonic U-50PE1E5 External AC Condensing Unit – 50 dB(A) @ 1 metre ^{1,2}

¹ The Manufacturer's published noise levels in octave bands are provided within Appendix F.

² The equipment noise level has also been site measured to confirm within tolerance of manufacturer's stated noise level.

7.1.2 Plant Group 2 is to operate 24-hours a day and seven days a week to provide essential coldroom cooling facilities and comprises of the following equipment:-

- Item 3 – Scandia EI050DGH/H-B External Coldroom Condensing Unit – 50 dB(A) @ 1 metre ^{1,3}

¹ The Manufacturer's published noise levels in octave bands are provided within Appendix F.

³ The equipment noise level has also been site measured to confirm within tolerance of manufacturer's stated noise level and spectral content.

7.2 Acoustic Mitigation Treatment

The mechanical services plant has been reviewed and noise level calculations performed to predict the acoustic impact on the neighbouring noise sensitive properties. In order to reduce the noise level of the plant an acoustic mitigation package has been developed and the following minimum standards for the acoustic mitigation package are to be incorporated: -

Plant Item 3 - Scandia EI050DGH/H-B. The equipment is to be housed in an acoustic enclosure incorporating attenuated inlet & discharge air paths. The enclosure is to provide the following minimum specification and attenuation:-

Plant Item 3	Octave Band Centre Frequency (Hz)								Global
Scandia EI050DGH/H-B	63	125	250	500	1000	2000	4000	8000	dB(A)
Minimum Attenuation of Acoustic Enclosure	4	7	14	25	30	30	25	18	15

Typical selection : - Bespoke Acoustic panel enclosure complete with attenuated inlet & outlet air path.

Enclosure dimensions - Nominally 1950mm W x 1200mm D x 2600mm H

7.3 Plant Noise Assessment

Plant noise levels with appropriate acoustic mitigation treatment, as detailed within section 7.2, and with plant located as per Appendix E have been calculated for the proposed periods of operation and extrapolated to outside the nearest noise sensitive property. The calculations have been performed with all plant operating at full speed simultaneously and as such represent a worst case scenario and one that is likely to be rarely experienced in practice. A full and detailed set of calculations are provided within Appendix G.

Our calculations indicate a predicted noise level of 36 dB(A) for Group 1 plant operating between the hours of 10:00 and 23:00 and 20 dB(A) for Group 2 plant items operating 24-hours a day 7 days a week.

7.3.1 BS4142:2014 Impact Assessment

The proposed plant is not considered to contain impulsive sounds. It is generally inverter speed controlled to slowly vary plant operating speeds in line with building requirements. As such it would not rapidly change speed so as to cause impulsive type sounds. The different items of plant will assist in providing diversification of any inherent plant noise tonality; the acoustic mitigation treatment has been selected so as to remove, where reasonably practicable, the tonality of plant item 3. The low level of the specific sound when extrapolated to noise sensitive properties in relation to the typical background noise level (of not less than 11 dB below typical background noise level) will provide a level of masking of any residual plant tonality. As such the proposed plant complete with acoustic mitigation is not considered to be tonal in nature in accordance with BS4142:2014. There may however be a level of intermittent operation of the proposed plant subject to controls systems implemented and as such a +3dB correction could be considered as worst case if assessed in accordance with BS4142:2014.

This would provide a rating level of between 8 dB and 15 dB below the typical background noise level recorded for the day and night time plant operating periods respectively and as such is significantly better than the "Low Impact" category as detailed within BS4142:2014. With this assessment the proposed conditions reached from pre-application discussion with LBC pose the most onerous target criteria.

7.3.2 Proposed Limiting Noise Criteria – Pre-Application

As detailed within section 7.3.1 the plant is not considered to be tonal in nature when compared to the pre-existing residual background noise level. Some items of plant are expected to operate intermittently and as such it is considered reasonable to apply a 3 dB Rating Level correction to the plant noise levels in line with BS4142:2014.

Our detailed calculations (provided within Appendix G) indicate that with the noise control treatment (as detailed within section 7.2) the following noise rating levels can be achieved for both group 1 & group 2 plant groups for the associated operating periods.

Table 7.3.2 – Plant Noise LBHF Planning Condition & Predicted Noise Levels

Time Period	Plant Noise Limits	Calculated Plant Noise
	$L_{Aeq, 15min}$	$L_{Aeq, 15min}$
Plant Group 1 (10:00-23:00 hrs)	41 dB	39 dB *
Plant Group 2 = 24-hour so Night (23:00-07:00 hrs)	26 dB	23 dB *

* Allows for + 3 dB Rating Level Correction due to Intermittent Operation.

As such this report clearly demonstrates compliance with the criteria and if assessed to BS4142:2014 would provide a low impact to noise sensitive properties.

8.0 Vibration Isolation

In order to isolate the mechanical services plant from the building structure and so as to prevent excessive levels of vibration being experienced by the adjoining residential properties; plant items 1&2 are to be mounted with proprietary rubber-in-shear type vibration isolators and so as to provide isolation efficiency greater than 80% at maximum operating speed. Item 3 is to be mounted inside an acoustic housing incorporating spring type vibration isolators and so as to provide not less than 90% isolation efficiency.

9.0 Conclusions

Qt acoustics have performed environmental noise monitoring at the site in order to establish representative background noise levels for the proposed plant operating periods. Relevant standards in the form of BS4142:2014, BS8233:2014 and model planning conditions from LBC have been considered and pre-application advice has been sought. A noise control package has been selected in order to provide sufficient mitigation of the proposed plant. This provides a low impact to neighbouring noise sensitive properties and complies with the requirements of LBC.

Appendix A. Glossary of Terms

Decibel (dB)

Adopted as the common unit of measurement in acoustics. The unit of the decibel is dimensionless and is used in acoustics for sound measurements to define the ratio between the measured pressure level and a reference pressure level – typically 2×10^{-5} N/m² or the threshold of hearing.

“A” Weighting

Arithmetic correction for different frequencies to closer represent the typical sensitivity of the human ear to sound. Suited to low level noises of around 40 phon (close to 40 dB(A)) and provides an simple single figure weighted indication of the perceived level of loudness by a human.

Noise Percentile Level - L_N

Statistical Analysis of the noise level where “N” can be from 0.1% to 99.9% and represents the noise level exceeded for “N” percent of the measurement time. Commonly used with “A-Weighting” as above and measured over a set period of time ‘t’ e.g. $L_{A99,15 \text{ min}}$ indicates the noise level exceeded for 99% of the measurement period of 15 minutes. See below for commonly used noise percentiles.

$L_{A90,t}$ or Background Noise Level

The A-Weighted noise level exceeded for 90% of the time ‘t’ and is referred to as the “background noise level” for BS4142 type noise assessments and quoted to the nearest whole dB.

$L_{A10,t}$

The A-Weighted noise level exceeded for 10% of the time ‘t’ and is referred to as the “traffic noise level”.

$L_{Aeq,t}$

The A-Weighted equivalent continuous sound pressure over the measurement period of time ‘t’ and is referred to as the “traffic noise level”.

$L_{Amax,t}$

The A-Weighted instantaneous maximum sound pressure that occurred during the measurement period of time ‘t’.

Assessment Position

Unless otherwise stated is a location 1 metre from the façade of the nearest noise sensitive property.

Specific Sound Source

The noise source being assessed within this report (typically the proposed mechanical services plant equipment).

Specific Sound Level

The equivalent continuous A-weighted sound pressure level of the residual sound at the assessment location over a given time interval.

Ambient Sound Level

Equivalent continuous A-Weighted sound pressure level of the totally encompassing sound in a given situation at a given time at the assessment location over a given time interval.

Rating Level, $L_{ar,Tr}$

The Specific Sound Level with any adjustment for characteristic features of the sound such as tonality or impulsivity.

Residual Sound

The ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound.

Appendix B. Table of Environmental Noise Monitoring Results

Date	Stop Time	LAeq	LAFmax	LAF10.0%	LAF90.0%
29/09/2017	11:45:00	60.1	79.3	59.3	53.2
29/09/2017	12:00:00	62.3	88	57.8	53.6
29/09/2017	12:15:00	61.3	85.1	57.5	53.7
29/09/2017	12:30:00	55.8	75.8	56.4	53.7
29/09/2017	11:45:00	59.9	80.2	59.1	53.8
29/09/2017	12:00:00	56.1	71.7	57.1	54.3
29/09/2017	12:15:00	56.2	74.2	57.3	53.9
29/09/2017	12:30:00	55.2	65.6	56.4	53.4
29/09/2017	12:45:00	55.9	75.2	56.9	53.9
29/09/2017	13:00:00	56.3	72.5	56.6	53.6
29/09/2017	13:15:00	55.1	75	56.1	53.4
29/09/2017	13:30:00	55.4	69.6	56.6	53.5
29/09/2017	13:45:00	55.9	74.2	56.9	54
29/09/2017	14:00:00	55	68.9	56.3	53.6
29/09/2017	14:15:00	55	70.3	56.2	53.2
29/09/2017	14:30:00	58.2	76.6	58.1	53.9
29/09/2017	14:45:00	55.7	76.3	56.5	53.4
29/09/2017	15:00:00	56.3	80.8	56	53.4
29/09/2017	15:15:00	55.5	73.8	56.2	53.7
29/09/2017	15:30:00	55.4	68.9	56.4	53.6
29/09/2017	15:45:00	55.7	67.5	56.7	53.5
29/09/2017	16:00:00	55.1	68.1	56.3	53.2
29/09/2017	16:15:00	55.9	83	56.5	53.1
29/09/2017	16:30:00	60.4	80.9	57.2	53.7
29/09/2017	16:45:00	55.2	70.9	56.6	53.4
29/09/2017	17:00:00	54.9	71.7	55.8	53.5
29/09/2017	17:15:00	58.7	76.5	57.2	53.7
29/09/2017	17:30:00	58.5	73.3	60.5	54
29/09/2017	17:45:00	58.2	74.7	59.5	54.7
29/09/2017	18:00:00	57.2	72.2	58.7	54.9

29/09/2017	18:15:00	56.9	70.5	58.5	54.5
29/09/2017	18:30:00	55.7	65.9	57.2	53.8
29/09/2017	18:45:00	56.1	70.2	57.7	54.1
29/09/2017	19:00:00	57.3	66.8	59	54.9
29/09/2017	19:15:00	57.6	68.2	59.3	55.2
29/09/2017	19:30:00	57.2	72.8	59	54.5
29/09/2017	19:45:00	55.5	67.5	56.5	54.2
29/09/2017	20:00:00	55	66.6	56.1	53.7
29/09/2017	20:15:00	54.7	62.6	55.5	53.6
29/09/2017	20:30:00	54.7	70.7	55.8	53.3
29/09/2017	20:45:00	55.3	70	56.1	53.4
29/09/2017	21:00:00	54.9	65.3	55.9	53.7
29/09/2017	21:15:00	55	66.7	56	53.7
29/09/2017	21:30:00	54.5	62.5	55.4	53.1
29/09/2017	21:45:00	54.7	69.8	55.7	53.1
29/09/2017	22:00:00	55.1	69.2	56.1	53.5
29/09/2017	22:15:00	55.6	73.2	57	53.4
29/09/2017	22:30:00	56.8	70.8	58.4	54.5
29/09/2017	22:45:00	55.9	73.3	57.1	53.6
29/09/2017	23:00:00	54.8	64.6	55.7	53.8
29/09/2017	23:15:00	54.5	70.1	55.6	53
29/09/2017	23:30:00	51.5	66.5	54.8	42.8
29/09/2017	23:45:00	48.3	59.2	50.7	41.1
30/09/2017	00:00:00	53.2	72.1	56.4	47.4
30/09/2017	00:15:00	48.6	64.4	50.7	42.1
30/09/2017	00:30:00	47.2	56.6	49.9	38
30/09/2017	00:45:00	47.3	61.9	50	38.3
30/09/2017	01:00:00	48.5	67.8	50.2	38.4
30/09/2017	01:15:00	46.8	56.8	49.5	37.9
30/09/2017	01:30:00	47.5	67.1	50.6	37.7
30/09/2017	01:45:00	46.5	57.9	49.3	37.9
30/09/2017	02:00:00	46.6	61.6	49.4	37.6
30/09/2017	02:15:00	52.3	63.5	54.1	39.5
30/09/2017	02:30:00	46.4	63	49.3	37.2

30/09/2017	02:45:00	46.4	58	49.5	37.5
30/09/2017	03:00:00	46.3	60.1	49.7	36.9
30/09/2017	03:15:00	46	56.5	49.5	36.5
30/09/2017	03:30:00	45.9	56	49.7	36.4
30/09/2017	03:45:00	46.3	54.1	49.7	39.5
30/09/2017	04:00:00	46.8	64.6	50	37.4
30/09/2017	04:15:00	46.4	64.7	49.8	37.1
30/09/2017	04:30:00	46.4	56.7	49.7	38.3
30/09/2017	04:45:00	46.5	60.5	49.7	37.9
30/09/2017	05:00:00	49.8	71.9	50.6	38.9
30/09/2017	05:15:00	47.1	71.9	49.7	38.1
30/09/2017	05:30:00	46.3	56.3	49.5	38.4
30/09/2017	05:45:00	46.6	60.7	49.9	38.6
30/09/2017	06:00:00	47	62.3	50	38.9
30/09/2017	06:15:00	47.1	59.8	49.9	39.9
30/09/2017	06:30:00	47.6	64.6	50.4	40.2
30/09/2017	06:45:00	48.2	67.9	50.9	41.1
30/09/2017	07:00:00	47.3	58.7	50.2	40.8
30/09/2017	07:15:00	51.6	69	51.7	43.2
30/09/2017	07:30:00	49	69.4	51.8	43.1
30/09/2017	07:45:00	55.8	77.2	53.1	42.6
30/09/2017	08:00:00	48.8	61.8	51.2	43.2
30/09/2017	08:15:00	51.5	66.7	52.7	44.6
30/09/2017	08:30:00	49.5	60	52.5	43.8
30/09/2017	08:45:00	49.3	63.7	51.8	44
30/09/2017	09:00:00	50.5	71.3	52.3	46.3
30/09/2017	09:15:00	51	71.5	52.6	46.4
30/09/2017	09:30:00	51.8	65	54.4	47
30/09/2017	09:45:00	55.6	71.6	58.2	46.2
30/09/2017	10:00:00	52.9	70.5	54.4	46.5
30/09/2017	10:15:00	51.3	73.8	52.6	47.6
30/09/2017	10:30:00	53.5	70.9	54.5	48.8

30/09/2017	10:45:00	56.4	76.5	56.8	48.1
30/09/2017	11:00:00	56.4	73.5	57.8	52.1
30/09/2017	11:15:00	56	72	57.1	53.6
30/09/2017	11:30:00	54.8	67.7	56	53.3
30/09/2017	11:45:00	55	67.1	56.2	53.6
30/09/2017	12:00:00	54.6	72	55.7	53
30/09/2017	12:15:00	54.8	67.2	56.2	52.9
30/09/2017	12:30:00	58.2	78.4	60.8	53.4
30/09/2017	12:45:00	54.9	72.2	55.6	53.1
30/09/2017	13:00:00	55.6	71	56	53.1
30/09/2017	13:15:00	54.4	65.1	55.3	53.3
30/09/2017	13:30:00	55.8	71.8	56	53.3
30/09/2017	13:45:00	54.4	65.3	55.6	53
30/09/2017	14:00:00	55.5	76.8	57	53.2
30/09/2017	14:15:00	55.3	68.4	56.5	53.5
30/09/2017	14:30:00	54.6	65.4	55.7	53
30/09/2017	14:45:00	54.5	71.7	55.4	53.1
30/09/2017	15:00:00	56.4	73.6	55.9	52.7
30/09/2017	15:15:00	55	64.7	56.4	52.8
30/09/2017	15:30:00	54.9	74	55.4	52.9
30/09/2017	15:45:00	54.5	65	55.6	52.9
30/09/2017	16:00:00	54.9	69.4	56.1	53.1
30/09/2017	16:15:00	54.9	67.5	56	53.2
30/09/2017	16:30:00	54.7	72.5	55.6	52.8
30/09/2017	16:45:00	55.3	69.5	56.5	53.7
30/09/2017	17:00:00	54.7	69.7	55.5	53.6
30/09/2017	17:15:00	54.8	74.2	55.7	53.6
30/09/2017	17:30:00	54.6	65.6	55.5	53.7
30/09/2017	17:45:00	55.9	69.4	57.1	53.9
30/09/2017	18:00:00	54.7	64	55.7	53.6
30/09/2017	18:15:00	55.4	75.2	55.9	54
30/09/2017	18:30:00	55	67.8	56	53.9

30/09/2017	18:45:00	54.8	67.6	55.8	53.8
30/09/2017	19:00:00	54.3	63	55.2	53.2
30/09/2017	19:15:00	54.8	62.2	56	53.2
30/09/2017	19:30:00	54.4	62.9	55.3	53.1
30/09/2017	19:45:00	54.9	68.1	55.9	53.5
30/09/2017	20:00:00	54.7	64.5	55.6	53.3
30/09/2017	20:15:00	54.5	67.7	55.5	53
30/09/2017	20:30:00	56	75.1	56	53.1
30/09/2017	20:45:00	65	83	62.7	53.6
30/09/2017	21:00:00	54.4	62.5	55.5	53.1
30/09/2017	21:15:00	54.6	69.5	55.5	53.1
30/09/2017	21:30:00	54.1	67	55.1	52.7
30/09/2017	21:45:00	54.1	66.6	55.1	52.7
30/09/2017	22:00:00	54.4	62.3	55.4	53.2
30/09/2017	22:15:00	54.8	66.8	55.7	53.7
30/09/2017	22:30:00	54.3	68.8	55.4	53
30/09/2017	22:45:00	54.4	66.1	55.5	52.9
30/09/2017	23:00:00	54.2	59.7	55.3	52.9
30/09/2017	23:15:00	51.4	63.2	54.8	43.6
30/09/2017	23:30:00	49.4	67.9	51.7	43.4
30/09/2017	23:45:00	48.8	61.8	51.1	42.9
01/10/2017	00:00:00	48.5	71.7	50.6	41.7
01/10/2017	00:15:00	49.3	71	51.5	41.4
01/10/2017	00:30:00	48.5	63.6	50.5	41.5
01/10/2017	00:45:00	47.1	57.7	50.1	40.3
01/10/2017	01:00:00	47.5	63.1	50.2	41.1
01/10/2017	01:15:00	49.9	75.6	50.9	42.4
01/10/2017	01:30:00	47.8	64	50.4	40.7
01/10/2017	01:45:00	47.1	60.9	49.8	40.5
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01/10/2017	02:15:00	47	59.2	49.3	39.9
01/10/2017	02:30:00	47.8	59.8	50.1	41

01/10/2017	02:45:00	47.1	65.3	49.3	39.9
01/10/2017	03:00:00	45.9	57.7	49.1	39.1
01/10/2017	03:15:00	46.1	57.6	49.2	39.5
01/10/2017	03:30:00	46.4	52.4	49.2	38.7
01/10/2017	03:45:00	47.3	55.6	50	40.3
01/10/2017	04:00:00	45.9	57.3	49	38.7
01/10/2017	04:15:00	46.4	65.1	49.3	38.7
01/10/2017	04:30:00	45.1	65.1	48.8	38.2
01/10/2017	04:45:00	46	53.8	49.4	38.5
01/10/2017	05:00:00	47.1	57.8	49.7	39.2
01/10/2017	05:15:00	46.3	58.6	49.1	37.8
01/10/2017	05:30:00	47.3	68.3	49.5	38.9
01/10/2017	05:45:00	45.1	54.4	49	37.6
01/10/2017	06:00:00	46	57.5	49.4	38.5
01/10/2017	06:15:00	46.5	73.7	49.1	38.9
01/10/2017	06:30:00	47.4	57.9	50.2	40
01/10/2017	06:45:00	55.6	75.1	50	40.8
01/10/2017	07:00:00	46.6	62.4	49.3	40.2
01/10/2017	07:15:00	47.1	58.5	49.4	41.9
01/10/2017	07:30:00	46.7	57.3	49.9	40.6
01/10/2017	07:45:00	56.1	77.6	53	40.9
01/10/2017	08:00:00	48.5	60.7	51.1	41.9
01/10/2017	08:15:00	49.8	73.7	51	43.1
01/10/2017	08:30:00	48.1	59.7	50.4	43.2
01/10/2017	08:45:00	49.4	69.9	51.5	42.8
01/10/2017	09:00:00	48.7	61.9	51	44.1
01/10/2017	09:15:00	49.3	71.4	51.4	43.4
01/10/2017	09:30:00	48.6	68.3	50.8	43.2
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01/10/2017	10:00:00	50	62.8	52.8	43.5
01/10/2017	10:15:00	50.6	70.5	52.5	45.1
01/10/2017	10:30:00	49	68	51.2	43.7

01/10/2017	10:45:00	54	63.5	55.1	52.6
01/10/2017	11:00:00	54.9	74.4	55.6	53
01/10/2017	11:15:00	54.2	72.6	55	52.8
01/10/2017	11:30:00	56.4	78.3	55.5	53
01/10/2017	11:45:00	54.5	65.2	55.4	53.5
01/10/2017	12:00:00	54.6	72.6	55.5	52.9
01/10/2017	12:15:00	54.5	69.1	55.4	52.9
01/10/2017	12:30:00	54.6	72.2	55.2	53
01/10/2017	12:45:00	56.1	74.4	57.3	53.6
01/10/2017	13:00:00	55.2	71.9	56.3	53
01/10/2017	13:15:00	54.3	75.5	55.2	51.6
01/10/2017	13:30:00	54.4	67.4	55.5	52.2
01/10/2017	13:45:00	54.2	68.9	55.3	52.3
01/10/2017	14:00:00	54.8	76.9	55.6	51.7
01/10/2017	14:15:00	57.3	76.1	59.3	52.4
01/10/2017	14:30:00	54.2	75.9	55.3	52
01/10/2017	14:45:00	54.2	70.3	55.4	51.8
01/10/2017	15:00:00	55.3	75.4	56.9	51.8
01/10/2017	15:15:00	54.3	68	55.4	52.2
01/10/2017	15:30:00	55	71.9	55.8	53.9
01/10/2017	15:45:00	54	69.9	55.2	51.9
01/10/2017	16:00:00	53.9	68.7	55	51.8
01/10/2017	16:15:00	53.9	71.3	55.3	51.7
01/10/2017	16:30:00	59.2	73.1	63.2	53.8
01/10/2017	16:45:00	56.8	67.2	58.8	53.6
01/10/2017	17:00:00	57.4	72	59.4	54.6
01/10/2017	17:15:00	56.4	73.1	58.2	54
01/10/2017	17:30:00	56.7	67.6	58.8	53.8
01/10/2017	17:45:00	56.8	66.6	58.7	54.6
01/10/2017	18:00:00	58	74.7	59.4	54.2
01/10/2017	18:15:00	57	71.7	58.9	54.5
01/10/2017	18:30:00	57.1	70.4	59.1	54.4

01/10/2017	18:45:00	56.7	67.9	58.5	54.4
01/10/2017	19:00:00	55.6	63.9	57.5	53
01/10/2017	19:15:00	56.6	71.7	58.2	54.4
01/10/2017	19:30:00	55.5	63.1	57.3	53.5
01/10/2017	19:45:00	55.4	69.7	57.2	52.5
01/10/2017	20:00:00	55.8	70.7	57.7	52.8
01/10/2017	20:15:00	56.5	74.5	58.4	53.1
01/10/2017	20:30:00	56.9	67	58.9	54
01/10/2017	20:45:00	56.4	69.2	58.5	53
01/10/2017	21:00:00	55.1	72.4	55.8	52.4
01/10/2017	21:15:00	55.7	78.2	56.1	52.4
01/10/2017	21:30:00	56	69.4	57.3	54.4
01/10/2017	21:45:00	55.3	66.7	55.9	54.4
01/10/2017	22:00:00	55.1	62.2	55.6	54.5
01/10/2017	22:15:00	53.1	66	54.9	48.9
01/10/2017	22:30:00	51.4	66.2	54.3	48.3
01/10/2017	22:45:00	50.4	63.1	51.6	48.5
01/10/2017	23:00:00	47.9	57.7	49.6	42.5
01/10/2017	23:15:00	48.6	66.1	50.1	41.4
01/10/2017	23:30:00	50.8	74.9	51.5	40.6
01/10/2017	23:45:00	48.1	65.9	50.7	40.9
02/10/2017	00:00:00	48.6	59.3	49.8	42.1
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02/10/2017	00:45:00	45.8	55	49	39.3
02/10/2017	01:00:00	47.1	53.4	49.4	39.4
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02/10/2017	01:45:00	45.7	52.8	49.6	39.2
02/10/2017	02:00:00	46.4	58.6	49.5	39.4
02/10/2017	02:15:00	48	65.1	50.1	40.1
02/10/2017	02:30:00	47.9	59.3	49.6	40.9

02/10/2017	02:45:00	45.5	53.8	49.2	39
02/10/2017	03:00:00	45.3	53.3	49.3	40
02/10/2017	03:15:00	46.5	55.6	49.2	39.1
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02/10/2017	04:00:00	45.5	57.9	49.8	39.1
02/10/2017	04:15:00	46.5	58.8	50.2	39.2
02/10/2017	04:30:00	47.3	57	49.6	40.5
02/10/2017	04:45:00	46.8	51.7	49.3	39.8
02/10/2017	05:00:00	46.2	62.3	49.2	40.3
02/10/2017	05:15:00	46	56.5	49.6	41.3
02/10/2017	05:30:00	48.6	57.7	50.5	42
02/10/2017	05:45:00	48.3	56.5	50.2	42.7
02/10/2017	06:00:00	48.6	66.3	51	42.1
02/10/2017	06:15:00	46.9	64.7	50.3	41.8
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02/10/2017	07:15:00	48.6	67.6	51.2	44.2
02/10/2017	07:30:00	51.1	72.7	52.1	45.3
02/10/2017	07:45:00	52.1	74	53.4	47
02/10/2017	08:00:00	53.3	69.8	53.9	47.1
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02/10/2017	08:45:00	52.8	67.8	54.4	47.2
02/10/2017	09:00:00	52.4	65.4	53.9	48
02/10/2017	09:15:00	59	83.4	54.5	47.8
02/10/2017	09:30:00	52.2	69.8	53.7	50.1
02/10/2017	09:45:00	53.8	70	57.1	50.1
02/10/2017	10:00:00	56.2	70.7	59.1	50
02/10/2017	10:15:00	56.1	73.1	56.8	53.2
02/10/2017	10:30:00	57.2	74.5	58.4	53.9

02/10/2017	10:45:00	56.3	70.3	57.8	53.9
02/10/2017	11:00:00	56	74.4	56.8	53.9
02/10/2017	11:15:00	62.1	80.5	65.6	55.4
02/10/2017	11:30:00	60.4	74.7	62.1	56.1
02/10/2017	11:45:00	59.4	72.2	62.8	54.6
02/10/2017	12:00:00	60.2	76.4	64.1	54.6
02/10/2017	12:15:00	55.6	72.9	57.1	53.3
02/10/2017	12:30:00	55.8	72	56.8	54.3
02/10/2017	12:45:00	57.5	75.1	61.8	53.7
02/10/2017	13:00:00	56.8	71.5	58.5	54.1
02/10/2017	13:15:00	61.2	69.9	64.5	55.6
02/10/2017	13:30:00	61.1	71	65.4	54.9
02/10/2017	13:45:00	56.4	73.7	57.1	54.9
02/10/2017	14:00:00	58.8	80.7	57.5	53.8
02/10/2017	14:15:00	57.3	75.8	58.9	54.5
02/10/2017	14:30:00	55.7	69.9	56.8	53.8
02/10/2017	14:45:00	57	67.9	60	54.2
02/10/2017	15:00:00	56.1	68.5	57.4	54.7
02/10/2017	15:15:00	55.9	74	56.8	53.8
02/10/2017	15:30:00	55.5	67.1	56.5	53.6
02/10/2017	15:45:00	60.5	78.2	61.3	54.2
02/10/2017	16:00:00	57.7	79.2	59.6	53.7
02/10/2017	16:15:00	56	66.7	58.2	53.3
02/10/2017	16:30:00	57.5	76.9	56.5	53.2
02/10/2017	16:45:00	57.3	79.2	57	53.2
02/10/2017	17:00:00	55.6	79.3	56.3	53
02/10/2017	17:15:00	56.4	73.3	56.7	54
02/10/2017	17:30:00	56.8	69.6	57.6	55.6
02/10/2017	17:45:00	57.3	73.5	57.4	55.1
02/10/2017	18:00:00	56.8	77.3	57.6	54.8
02/10/2017	18:15:00	56	71.9	56.7	54.7
02/10/2017	18:30:00	56.1	67.6	56.8	54.3

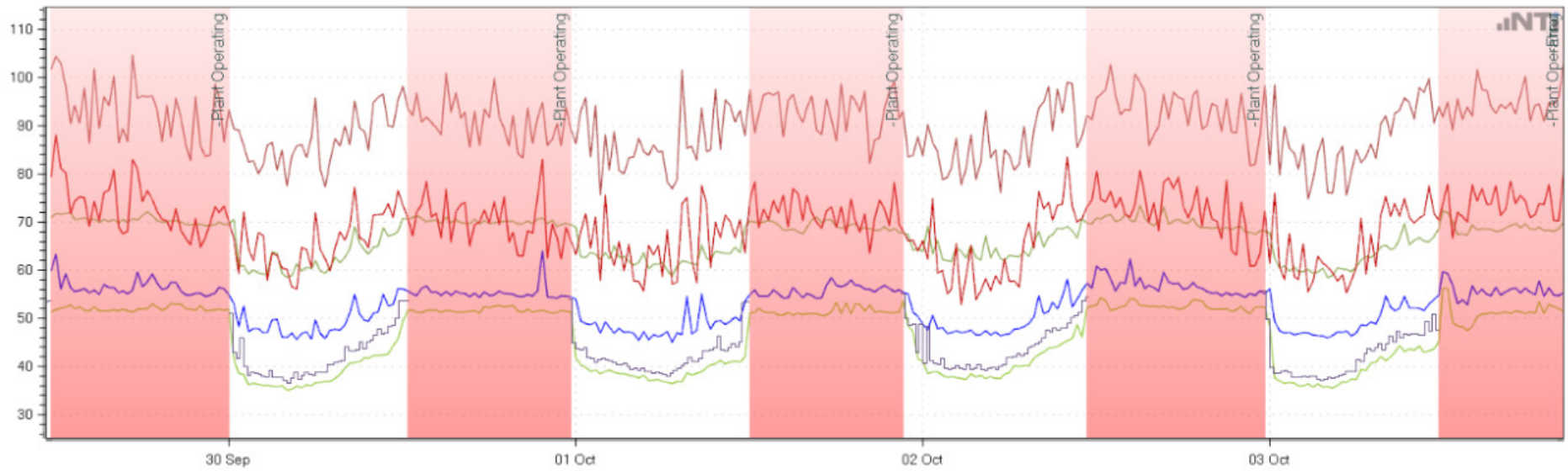
02/10/2017	18:45:00	55.4	75.1	56.7	53.2
02/10/2017	19:00:00	55.7	70.6	56.6	54.6
02/10/2017	19:15:00	55.1	70.1	56.4	52.9
02/10/2017	19:30:00	55	68.9	56	52.8
02/10/2017	19:45:00	54.3	66.3	55.5	52.8
02/10/2017	20:00:00	55.5	78.6	56.1	53.2
02/10/2017	20:15:00	55	63.6	55.9	53.3
02/10/2017	20:30:00	54.6	64.1	55.9	52.5
02/10/2017	20:45:00	54.9	63.1	55.8	52.9
02/10/2017	21:00:00	54.6	74.1	55.7	53.2
02/10/2017	21:15:00	54.6	65.8	55.7	52.7
02/10/2017	21:30:00	54.3	69.7	55.5	52.3
02/10/2017	21:45:00	55.3	60.8	56	54.6
02/10/2017	22:00:00	54.5	59.2	55.6	53.1
02/10/2017	22:15:00	55.3	61.7	56.2	53.5
02/10/2017	22:30:00	55.9	63.7	56.3	55.2
02/10/2017	22:45:00	54.8	72.2	56	53.2
02/10/2017	23:00:00	56.6	61.4	58.9	53.2
02/10/2017	23:15:00	52.6	76	58.6	40.9
02/10/2017	23:30:00	48.3	73.1	50.3	38.7
02/10/2017	23:45:00	48.2	59.2	50.7	38.4
03/10/2017	00:00:00	46.6	60.6	49.7	38.4
03/10/2017	00:15:00	46.2	58	49.8	38.6
03/10/2017	00:30:00	46.9	67.5	50	38
03/10/2017	00:45:00	47.4	58.6	50.1	38
03/10/2017	01:00:00	46.9	58	50	37.5
03/10/2017	01:15:00	47	65.4	49.8	37.8
03/10/2017	01:30:00	46.7	56.7	49.9	37.5
03/10/2017	01:45:00	45.4	55.5	49.9	37.5
03/10/2017	02:00:00	45.5	54.5	49.8	37.2
03/10/2017	02:15:00	46.4	57.6	50	37.6
03/10/2017	02:30:00	47.2	62.8	50.2	37.3

03/10/2017	02:45:00	47.3	61.4	50.2	36.9
03/10/2017	03:00:00	46.9	60.6	50	36.9
03/10/2017	03:15:00	46.8	56.7	50.4	37
03/10/2017	03:30:00	45.3	59.4	50.1	37.4
03/10/2017	03:45:00	45.1	54.8	49.9	37.2
03/10/2017	04:00:00	47	59	50.3	38.1
03/10/2017	04:15:00	47.2	55.1	50.3	38.1
03/10/2017	04:30:00	47.6	56	50.6	38.2
03/10/2017	04:45:00	46.7	57.8	50.2	38.9
03/10/2017	05:00:00	45.3	60.5	50.1	38.4
03/10/2017	05:15:00	48.3	70.8	50.5	41
03/10/2017	05:30:00	48.6	59.7	51.3	40.7
03/10/2017	05:45:00	49.2	59.1	51.6	42.3
03/10/2017	06:00:00	49.3	67.4	51.8	42.4
03/10/2017	06:15:00	48.5	64.5	51.6	42.4
03/10/2017	06:30:00	48.5	68.9	51.5	43.4
03/10/2017	06:45:00	51.4	71.4	52.9	44
03/10/2017	07:00:00	55.4	75.3	56	44.1
03/10/2017	07:15:00	50.6	67.1	52.8	43.4
03/10/2017	07:30:00	52.9	71.1	54.3	44.8
03/10/2017	07:45:00	51	73.9	53.1	44.6
03/10/2017	08:00:00	52.2	71.1	54.3	47.3
03/10/2017	08:15:00	55.4	74.9	54	46.8
03/10/2017	08:30:00	51.3	71.2	53.9	45.5
03/10/2017	08:45:00	51.9	70.9	55.5	46
03/10/2017	09:00:00	50.6	65	53	46
03/10/2017	09:15:00	52.5	69.7	55	47.1
03/10/2017	09:30:00	52.5	70.8	54.3	46.2
03/10/2017	09:45:00	52	71.4	54.4	47.2
03/10/2017	10:00:00	52.4	77.5	54.1	45.8
03/10/2017	10:15:00	53.6	71.8	54.8	47.1
03/10/2017	10:30:00	53.7	66.8	55.9	50.8

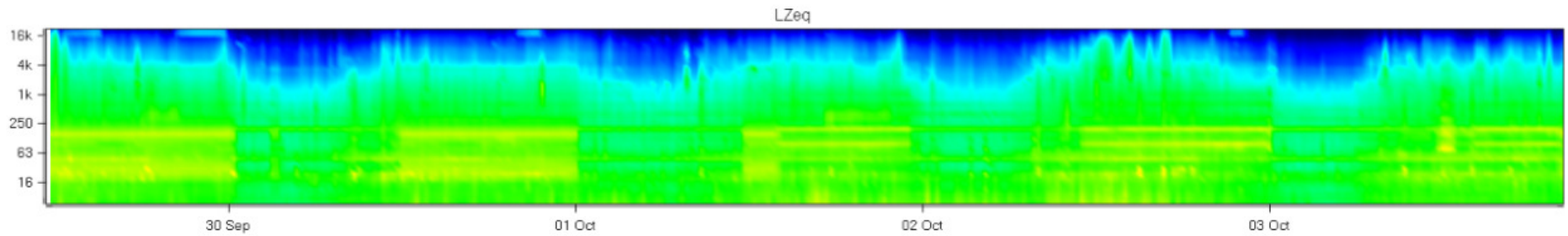
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03/10/2017	11:00:00	59.7	73.7	60.6	57.9
03/10/2017	11:15:00	59.4	70.8	60.6	57.5
03/10/2017	11:30:00	58.9	77.9	59.6	57.8
03/10/2017	11:45:00	56.7	66.6	58.9	51.6
03/10/2017	12:00:00	53.6	72	55.3	50.9
03/10/2017	12:15:00	52.5	67.3	53.9	50.3
03/10/2017	12:30:00	54.2	71.1	55.1	51.8
03/10/2017	12:45:00	52.7	70	54.4	49.6
03/10/2017	13:00:00	55.5	75.9	55.3	50.1
03/10/2017	13:15:00	56.3	77.7	56.4	51.1
03/10/2017	13:30:00	55.3	74.3	56.1	52.2
03/10/2017	13:45:00	56.3	76.9	57	52.2
03/10/2017	14:00:00	54.7	73.6	55.7	52.1
03/10/2017	14:15:00	54.6	73.7	56	52.3
03/10/2017	14:30:00	54.8	69.8	56	52.4
03/10/2017	14:45:00	57	77.5	56.2	52
03/10/2017	15:00:00	54.6	71.3	55.9	52.1
03/10/2017	15:15:00	55.1	69.8	56.4	52.5
03/10/2017	15:30:00	55.2	72.7	56.6	52.6
03/10/2017	15:45:00	55.2	78.4	56	52.2
03/10/2017	16:00:00	57	73.8	57.2	54.3
03/10/2017	16:15:00	55.8	71.3	57.7	52.8
03/10/2017	16:30:00	56.6	75.5	56.6	52.6
03/10/2017	16:45:00	54.9	74.3	56.1	52.4
03/10/2017	17:00:00	55.1	70.4	56.4	52.6
03/10/2017	17:15:00	55.7	71.5	56.7	53.1
03/10/2017	17:30:00	54.6	68.3	55.9	52.4
03/10/2017	17:45:00	56.5	73.6	56.2	54.2
03/10/2017	18:00:00	56.8	73.8	55.9	52.3
03/10/2017	18:15:00	55.2	73.8	55.7	54.1
03/10/2017	18:30:00	56.5	77.7	55.8	53.9

03/10/2017	18:45:00	54.9	70.3	55.5	53.7
03/10/2017	19:00:00	54.7	61	55.6	53.7
03/10/2017	19:15:00	55.2	80.6	55.5	53.3

Appendix C – Environmental Noise Monitoring Graphs



— LAeq_dt — LAFmax_dt — LAFmin_dt — LCPKmax_dt — LZeq_dt — L 90.0 %

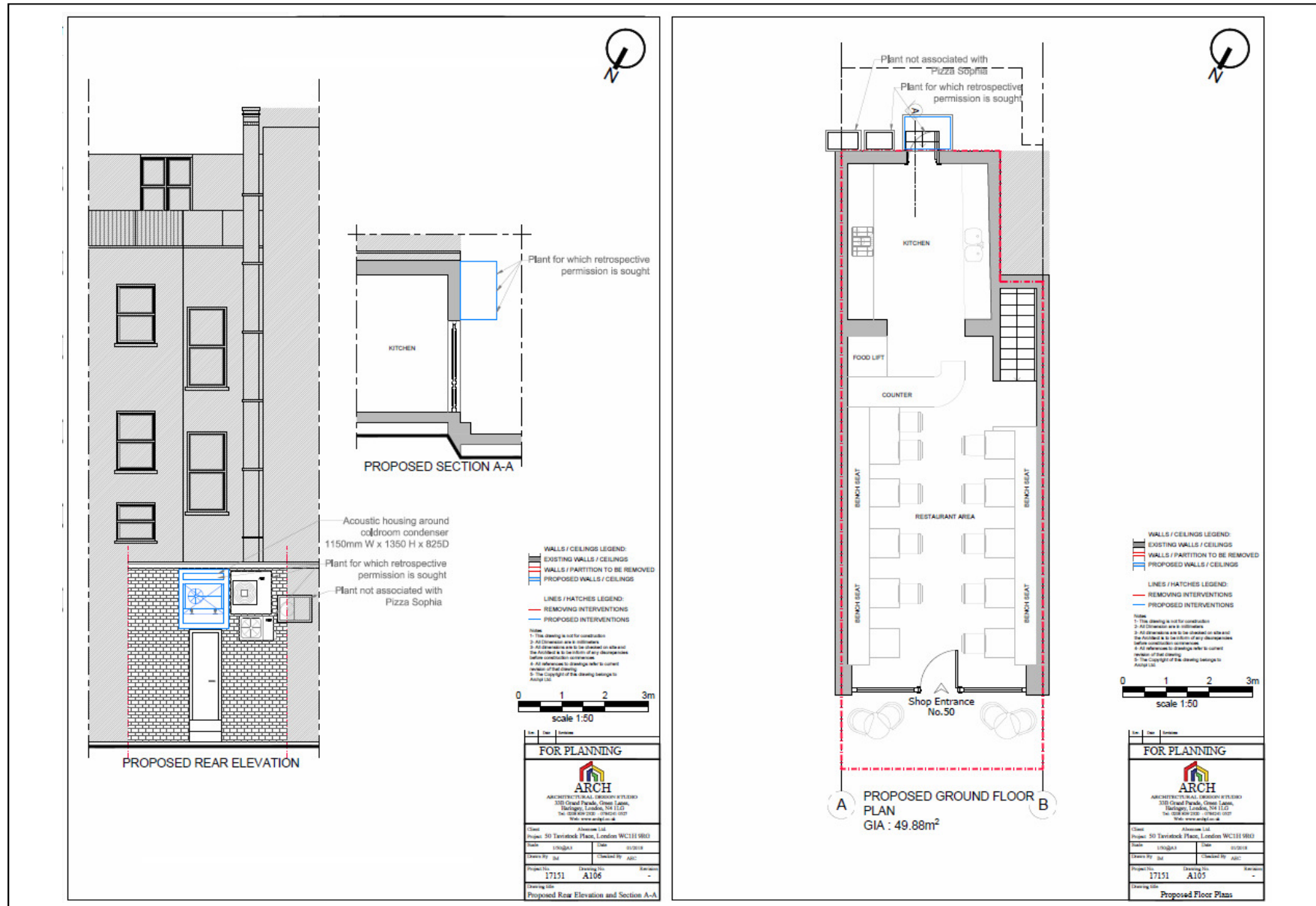


Appendix D – Location Plan – Site & Surrounding Area



Image courtesy of © Google 2018

Appendix E – Rear Elevation & Floor Plan – Proposed Incorporating Acoustic Mitigation & Plant

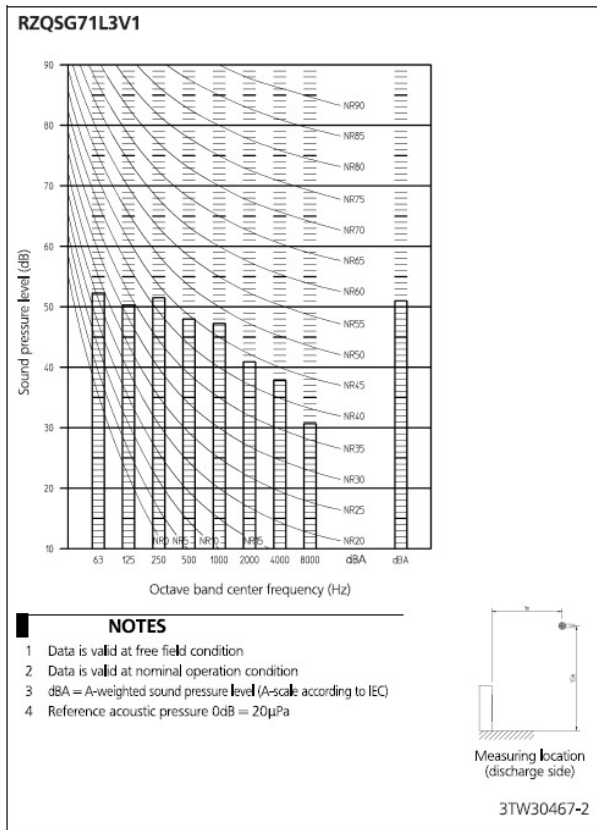


Appendix F – Plant Data Sheets

Item 1 – Daikin RZQSG71L3V1

11 Sound data

11 - 3 Sound Pressure Spectrum - Heating



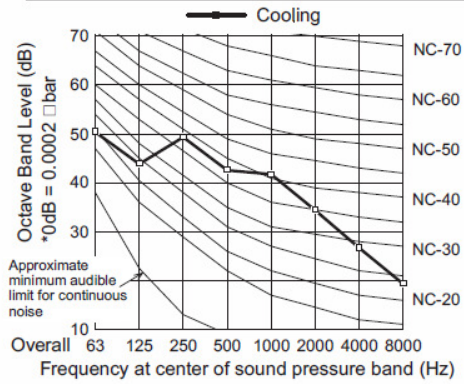
Appendix F – Plant Data Sheets

Item 2 – Panasonic U-50PE1E5

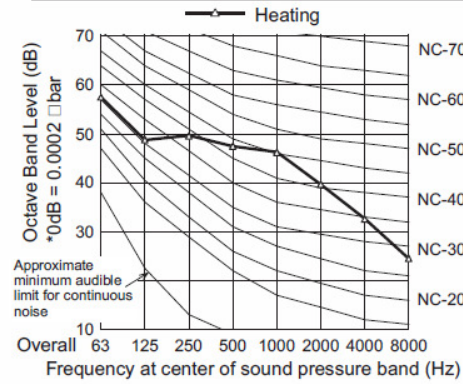
1-6. Noise Criterion Curves

(B) Outdoor Unit

MODEL : U-50PE1E5
 SOUND LEVEL : Cooling 46 dB(A)
 CONDITION : 1 m in front at height of 1.5 m
 SOURCE : 220-230-240V, 1 phase, 50Hz



MODEL : U-50PE1E5
 SOUND LEVEL : Heating 50 dB(A)
 CONDITION : 1 m in front at height of 1.5 m
 SOURCE : 220-230-240V, 1 phase, 50Hz



Appendix F – Plant Data Sheets

Essentec EI050DGH/H-B

ESSENTEC

Technical Data Serial : EI*****M/H-B:

Tab.2 REFRIGERATION SERIES (COLD ROOM TEMP. -10°C~10°C), R404A

DIMENSIONS	mm	850×320× 500
W×D×H		
Noise @1m	dB(A)	50
Noise @10m	dB(A)	36
Net Weight	Kg	50

Note: Sound data provided by manufacturer has been used as well as site measurement for noise prediction of system noise.

Appendix G – Acoustic Calculations – Day-time

Project: Pizza Sophia - 50 Tavistock Place
 Ref: QT1486
 Date: 22/02/2018
 Title: Day-time Condenser Calculation



Plant Item 1 - Daikin RZQG71L3V1B AC Condensing Unit					Octave Band Centre Frequency (Hz)								Global (dB)
Row Ref No.	Description	Option 1	R2	R1	63	125	250	500	1000	2000	4000	8000	
1	Manufacturer's Published Plant Octave Band SPL @ 1m dB ref 20 µPa				52.0	50.0	51.0	48.0	47.0	41.0	38.0	31.0	57.1
2	1 off units				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
3	Maximum Plant Noise SPL @1m dB Ref ref 20 µPa	1+2			52.0	50.0	51.0	48.0	47.0	41.0	38.0	31.0	
4	Distance correction to 1m from Noise Sensitive Receptor Façade	20 x LOG(R2/R1)	1	4.3	-12.7	-12.7	-12.7	-12.7	-12.7	-12.7	-12.7	-12.7	
5	Directivity Correction (+3 dB)				3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
6	SPL at Façade	3+4+5			42.3	40.3	41.3	38.3	37.3	31.3	28.3	21.3	47.5
7	dB(A) Correction				-26.0	-16.0	-9.0	-3.0	0.0	1.0	1.0	-1.0	
8	A-Weighted SPL at Façade	6+7			16.3	24.3	32.3	35.3	37.3	32.3	29.3	20.3	41.3
9	Attenuation - Natural Screening Effect of Building	Fresnel No. Calc	Path Diff =	0.05	-5	-6	-6	-8	-9	-12	-14	-17	
10	A-Weighted SPL at Façade	8+9			11.1	18.6	25.8	27.6	27.9	20.7	15.1	3.4	32.6

Plant Item 2 - Panasonic U-50PE1E5 AC Condensing Unit					Octave Band Centre Frequency (Hz)								Global (dB)
Row Ref No.	Description	Option 1	R2	R1	63	125	250	500	1000	2000	4000	8000	
11	Manufacturer's Published Plant Octave Band SPL @ 1m dB ref 20 µPa				57.0	49.0	50.0	47.0	46.0	39.0	32.0	24.0	58.9
12	1 off units				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
13	Maximum Plant Noise SPL @1m dB Ref ref 20 µPa	11+12			57.0	49.0	50.0	47.0	46.0	39.0	32.0	24.0	
14	Distance correction to 1m from Noise Sensitive Receptor Façade	20 x LOG(R2/R1)	1	9.5	-19.6	-19.6	-19.6	-19.6	-19.6	-19.6	-19.6	-19.6	
15	Directivity Correction (+3 dB)				3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
16	SPL at Façade	13+14+15			40.4	32.4	33.4	30.4	29.4	22.4	15.4	7.4	42.4
17	dB(A) Correction				-26.0	-16.0	-9.0	-3.0	0.0	1.0	1.0	-1.0	
18	A-Weighted SPL at Façade	16+17			14.4	16.4	24.4	27.4	29.4	23.4	16.4	6.4	33.1

Plant Item 3 - Scandia E1050DGH/H-B Coldroom Condenser					Octave Band Centre Frequency (Hz)								Global (dB)
Row Ref No.	Description	Option 1	R2	R1	63	125	250	500	1000	2000	4000	8000	
19	Site Measured Plant Octave Band SPL @ 1m dB ref 20 µPa				58.0	51.8	55.7	50.4	46.8	42.6	35.7	29.4	61.3
20	1 off units				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
21	Maximum Plant Noise SPL @1m dB Ref ref 20 µPa	19+20			58.0	51.8	55.7	50.4	46.8	42.6	35.7	29.4	
22	Distance correction to 1 metre from Noise Sensitive Receptor	20 x LOG(R2/R1)	1	4.3	-12.7	-12.7	-12.7	-12.7	-12.7	-12.7	-12.7	-12.7	
23	Directivity Correction (+3 dB)				3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
24	SPL at Façade	21+22+23			48.3	42.2	46.1	40.8	37.1	32.9	26.1	19.7	51.6
25	dB(A) Correction				-26.0	-16.0	-9.0	-3.0	0.0	1.0	1.0	-1.0	
26	A-Weighted SPL at Façade	24+25			22.3	26.2	37.1	37.8	37.1	33.9	27.1	18.7	43.0
27	Attenuation - Natural Screening Effect of Building	Fresnel No. Calc	Path Diff =	0.05	-5	-6	-6	-8	-9	-12	-14	-17	
28	A-Weighted SPL at Façade	26+27			17.0	20.4	30.6	30.1	27.6	22.2	12.9	1.7	34.9
29	Acoustic Enclosure Housing Attenuation				4.0	7.0	14.0	25.0	30.0	30.0	25.0	18.0	
30	A-Weighted SPL at Façade	28+29			13.0	13.4	16.6	5.1	1.0	-7.8	-12.1	-16.3	19.7

31	Cumulative SPL at Noise Sensitive Façade - dB(A) WITHOUT ATTENUATION	10+18+28			19.6	23.6	32.6	33.3	33.2	27.0	19.8	9.1	38.4
32	Cumulative SPL at Noise Sensitive Façade - dB(A) WITH ATTENUATION	10+18+30			17.8	21.4	28.5	30.6	31.7	25.3	18.8	8.2	36.0
33	Pre-Existing Day-time Lowest LA90, 15 min	A-Weighted			19.1	27.1	31.6	34.1	35.2	31.1	24.2	17.4	41

Appendix G – Acoustic Calculations – Night-time


Project: Pizza Sophia - 50 Tavistock Place
 Ref: QT11486
 Date: 22/02/2018
 Title: Night-time Condenser Calculation



Plant Item 3 - Scandia EI050DGH/H-B Coldroom Condenser					Octave Band Centre Frequency (Hz)								Global (dB)
Row Ref No.	Description	Option 1	R2	R1	63	125	250	500	1000	2000	4000	8000	
1	Site Measured Plant Octave Band SPL @ 1m dB ref 20 µPa				58.0	51.8	55.7	50.4	46.8	42.6	35.7	29.4	61.3
2	1 off units				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
3	Maximum Plant Noise SPL @1m dB Ref ref 20 µPa	1+2			58.0	51.8	55.7	50.4	46.8	42.6	35.7	29.4	
4	Distance correction to 1 metre from Noise Sensitive Receptor	20 x LOG(R2/R1)	1	4.3	-12.7	-12.7	-12.7	-12.7	-12.7	-12.7	-12.7	-12.7	
5	Directivity Correction (+3 dB - Site Measure)				3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
6	SPL at Facade	3+4+5			48.3	42.2	46.1	40.8	37.1	32.9	26.1	19.7	51.6
7	dB(A) Correction				-26.0	-16.0	-9.0	-3.0	0.0	1.0	1.0	-1.0	
8	A-Weighted SPL at Facade	6+7			22.3	26.2	37.1	37.8	37.1	33.9	27.1	18.7	43.0
9	Attenuation - Natural Screening Effect of Building	Fresnel No. Calc	Path Diff =	0.05	-5	-6	-6	-8	-9	-12	-14	-17	
10	A-Weighted SPL at Facade	8+9			17.0	20.4	30.6	30.1	27.6	22.2	12.9	1.7	34.9
11	Acoustic Enclosure Housing Attenuation				4.0	7.0	14.0	25.0	30.0	30.0	25.0	18.0	
12	A-Weighted SPL at Facade	10+11			13.0	13.4	16.6	5.1	-2.4	-7.8	-12.1	-16.3	19.6
13	Cumulative SPL at Noise Sensitive Façade - dB(A) WITHOUT ATTENUATION	10			17.0	20.4	30.6	30.1	27.6	22.2	12.9	1.7	34.9
14	Cumulative SPL at Noise Sensitive Façade - dB(A) WITH ATTENUATION	12			13.0	13.4	16.6	5.1	-2.4	-7.8	-12.1	-16.3	19.6
15	Pre-Existing Night-time Lowest LA90,15min	A-Weighted			16.2	23.8	28.3	29.6	30.2	26.3	19.9	15.8	36

Target Design = 41 dB(A) for 10:00 to 23:00 and 26 dB(A) for night Period
 Therefore Compliance with LBC requirements demonstrated

Appendix H – Sound Level Meter Calibration Certificates

CERTIFICATE OF CALIBRATION	
ISSUED BY AV CALIBRATION	
Date of issue	24 November 2016
Certificate N°	1611615
	AV Calibration
	2 Warren Court
	Chicksands, Shefford
	Bedfordshire SG17 5QB
	U.K.
Tel: +44 (0)1462 638600	
Fax: +44 (0)1462 638601	
Email: lab@avcalib.co.uk	
www.avcalibration.co.uk	
<small>Acoustics Noise and Vibration Ltd trading as AV Calibration</small>	
Page 1 of 3 Pages	
Signed 	
G. Parry	<input checked="" type="checkbox"/>
B. Baker	<input type="checkbox"/>
J. Harriman	<input type="checkbox"/>
CLIENT	Qt Acoustics Ltd
F.A.O.	J P Williams
ORDER No	-
Job No	TRAC16/11351/01
DATE OF RECEIPT	11 November 2016
PROCEDURE	AV Calibration Engineer's Handbook, section 25
IDENTIFICATION	Sound level meter NTi type XL2-TA serial No A2A-08390-E0 connected via an extension lead type ASD and preamplifier type MA220 serial No 1973 to a half-inch microphone type MC230 serial No 9158.
CALIBRATED ON	24 November 2016
PREVIOUS CALIBRATION	None known
<small>The measurements detailed herein are traceable to units of measurement realised at the National Physical Laboratory. This certificate may not be reproduced other than in full, except with the prior written approval of AV Calibration.</small>	