NSL
Noise Solutions Ltd

Five Guys

144-146 High Street
Barnet
EN5 5XP

Plant Noise Impact Assessment

On behalf of

chapman ventilation

Project Reference: 92139 | Revision: 00 | Date: 13th March 2024

[redacted]

Document Information

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Project Reference	:	**92139**
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	Name	Qualifications	Initials	Date
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For and on behalf of Noise Solutions Ltd				

Revision	Date	Description	Prepared	Reviewed/ Approved

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Appendices

1.0 Introduction

1.1. Noise Solutions Ltd (NSL) has been commissioned by Chapman Ventilation to provide a Noise Impact Assessment for new plant serving a proposed Five Guys restaurant at 144-146 High Street in Barnet.

1.1. An environmental sound survey has been undertaken to establish the prevailing background sound pressure levels at a location representative of the sound levels outside the nearest noise sensitive receptors to the site.

1.1. The cumulative plant noise level has been predicted at the nearest noise-sensitive receptors and assessed against London Borough of Brent Council's typical emissions criteria.

1.1. A glossary of acoustic terminology is given in Appendix A. An in-depth glossary of acoustic terms can be viewed online at www.acoustic-glossary.co.uk.

2.0 Details of development proposals

2.1. The Five Guys restaurant is to occupy the ground floor of an existing retail premises at 144-146 High Street Barnet. The first floor of the building is occupied by residential premises, although these only extend across the front portion of the building.

2.1. New air conditioning (AC), refrigeration and ventilation plant is proposed to serve the restaurant. Three AC condensers and one refrigeration condenser are proposed to be wall mounted along the rear elevation. Absorptive acoustic wall lining is proposed to be fitted to the walls behind the units in order to minimise the effects of reflected sound on nearby receptors.

2.1. Five new ventilation fans are to be located internally with louvres proposed along the rear elevation. All systems are to be fitted with atmospheric-side attenuators internally.

2.1. All proposed plant and associated ductwork/pipework is to be fitted with suitably rated anti-vibration mounts/hangers.

2.1. All plant will run during the operational period 07.00 hours to 01.00 hours, with the exception of the catering condensing unit which will potentially run at any time to meet cooling demands.

2.1. Details of the proposed plant are provided in Appendix D. Proposed plant layout drawings are provided in Appendix F.

3.0 Nearest noise sensitive receptors

2.1. The area surrounding the site is mixed residential and commercial.

2.1. The most affected residential premises are new residential flats (Receptor R1) located to the north east of the plant area. The nearest windows are located around 24m away from the closest proposed plant item.

2.1. There are further residential properties to the south east (Receptor R2), west (Receptor R3) and east (Receptor R4). These premises benefit from significant additional screening and/or distance from the plant when compared to Receptor R1. Therefore, only Receptor R1 has been considered in this assessment.

2.1. Appendix B contains an aerial photograph showing the site and surrounding area, including the locations of the potential receptors identified above.

4.0 Existing noise climate

4.1. An environmental noise survey was undertaken to establish the typical background sound levels at a location representative of the noise climate outside the façades of the nearest noise sensitive receptors to the proposed plant area during the quietest times at which the plant will operate.

4.1. The results of the environmental sound survey are summarised in Table 1 below. The full set of measurement results and details of the survey methodology are presented in Appendix C.

Table 1 Summary of survey results

Measurement period	Range of recorded sound pressure levels (dB)			
	$L_{Aeq(15mins)}$	$L_{Amax(15mins)}$	$L_{A10(15mins)}$	$L_{A90(15mins)}$
Daytime hours (07.00 – 23.00 hours)*	40-56	51-77	41-54	38-40
Night-time hours (23.00 – 07.00 hours)*	38-41	44-57	39-43	37-38
Main plant operating hours (07.00 – 01.00 hours)*	38-56	44-77	39-54	37-40

**unfortunately there was a battery failure during the survey meaning noise levels were not captured for a full 24-hour period. In any case noise levels were monitored over a sufficient period to determine background noise levels during the main plant operating period.*

5.0 Plant noise design criteria

London Borough of Barnet

1.1. For new plant installations London Borough of Barnet typically requires:

> *The level of noise emitted from the (specify machinery) plant hereby approved shall be at least 5dB(A) below the background level, as measured from any point 1 metre outside the window of any room of a neighbouring residential property.*
>
> *If the noise emitted has a distinguishable, discrete continuous note (whine, hiss, screech, hum) and/or distinct impulse (bangs, clicks, clatters, thumps), then it shall be at least 10dB(A) below the background level, as measured from any point 1 metre outside the window of any room of a neighbouring residential property.*

Proposed criteria

1.1. The proposed plant is to be acoustically treated and is not anticipated to exhibit any tonal or impulsive characteristics at the receptor provided it is well maintained. All proposed external condensers will be inverter driven and, therefore, will gently ramp up and down depending on the demands on the various systems. As such, in accordance with Barnet Council's typical requirements, cumulative plant noise emissions must not exceed a level 5dBA below the prevailing background noise level.

1.1. In order to be robust, the noise emissions criteria for the main plant operating period (07.00 – 01.00 hours) have been based on the lowest recorded background noise level (i.e. 37dBA).

1.1. For the out-of-hours operating period when only the catering condenser will be switched on, it is suggested that the plant noise design criteria at the nearest residences should be capped at 30dBA. This proposed criterion is based on guidance found in Section 11 of BS 4142:2014 which states:

> *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.*

1.1. A plant noise level of 30dBA at the façade would result in an internal noise level of 15dBA, which is likely to be lower than self-generated noise internally (for example, from domestic refrigerators). This assumption is based on guidance found in BS 8233:2014, which states that approximately 15dB of insulation is provided by a partially open window.

1.1. The following plant noise limits are therefore proposed:

Table 2 Plant noise emissions limits at the receptor boundary

Receptor	Period	Cumulative plant rating level, dB(A)
Residential	All plant operating (07.00 – 01.00 hours)	32
	Refrigeration plant only (01.00 – 07.00 hours)	30

6.0 Plant noise assessment

2.1. The cumulative plant noise level at the most affected noise sensitive receptors has been predicted. The assessment has taken into consideration distance attenuation and directivity corrections. Predictions are inclusive of the following atmospheric-side attenuators fitted to the ventilation systems:

Table 3 Proposed atmospheric side attenuators to ventilation systems

Attenuator	Insertion losses dB, at octave band centre frequencies (Hz)							
	63	125	250	500	1k	2k	4k	8k
Kitchen supply (AHU1)	6	13	26	41	45	45	43	36
Kitchen extract (EF1)	10	20	36	40	40	36	31	26
General extract (EF2)	3	6	8	23	36	26	24	19
Toilet extract (EF3)	3	6	8	29	38	31	28	20
Refuse Extract (EF4)	3	6	8	32	41	34	31	22

2.1. For the external condenser units, the calculations consider that absorptive wall lining will be installed behind the plant to minimise the effects of reflected sound.

2.1. Table 4, below, summarises the results of the assessment at the most affected receptor. The full set of calculations can be found in Appendix E.

Table 4 Assessment of predicted noise levels at most affected receptor

Receptor	Period	Predicted rating level at receptor, $L_{Ar,Tr}$ (dB)	Proposed design criterion (dB)	Difference (dB)
R1	All plant operating (07.00 – 01.00 hours)	32	32	0
	Refrigeration plant only (01.00 – 07.00 hours)	26	30	-4

2.1. The above assessment demonstrates that noise from the proposed plant will result in noise levels below the proposed limits and should therefore be acceptable to the local authority.

Context and uncertainties

2.1. The impact should be considered within the context of the site and the surrounding acoustic environment. The following must, therefore, also be taken into consideration when determining the potential impact that may be experienced:

The assessment is undertaken at the most affected residential windows. The impact on all other nearby residential windows will be lower due to screening and distance attenuation.

Predictions are based on all plant operating simultaneously at maximum capacity. The plant will not always operate in this fashion and, therefore, the assessment is representative of the worst case.

2.1. Where possible uncertainty in the above assessments has been minimised by taking the following steps:

The meter and calibrator used have a traceable laboratory calibration and the meter was field calibrated before and after the measurements.

Uncertainty in the calculated impacts has been reduced by the use of a well-established calculation method.

7.0 Summary

2.1. Noise Solutions Ltd (NSL) has been commissioned by Chapman Ventilation to provide a Noise Impact Assessment for new plant serving a proposed Five Guys at 144-146 High Street, Barnet.

2.1. An environmental noise survey has been undertaken to establish the existing prevailing noise levels at a location representative of the noise climate outside the nearest noise sensitive receptors to the proposed plant area.

2.1. Cumulative plant noise emission levels for the proposed plant have been predicted at the nearest receptors inclusive of the following mitigation measures:

Suitable atmospheric-side attenuators fitted to all ventilation systems.

Suitable absorptive acoustic wall lining fitted to the building facades behind the external condenser units.

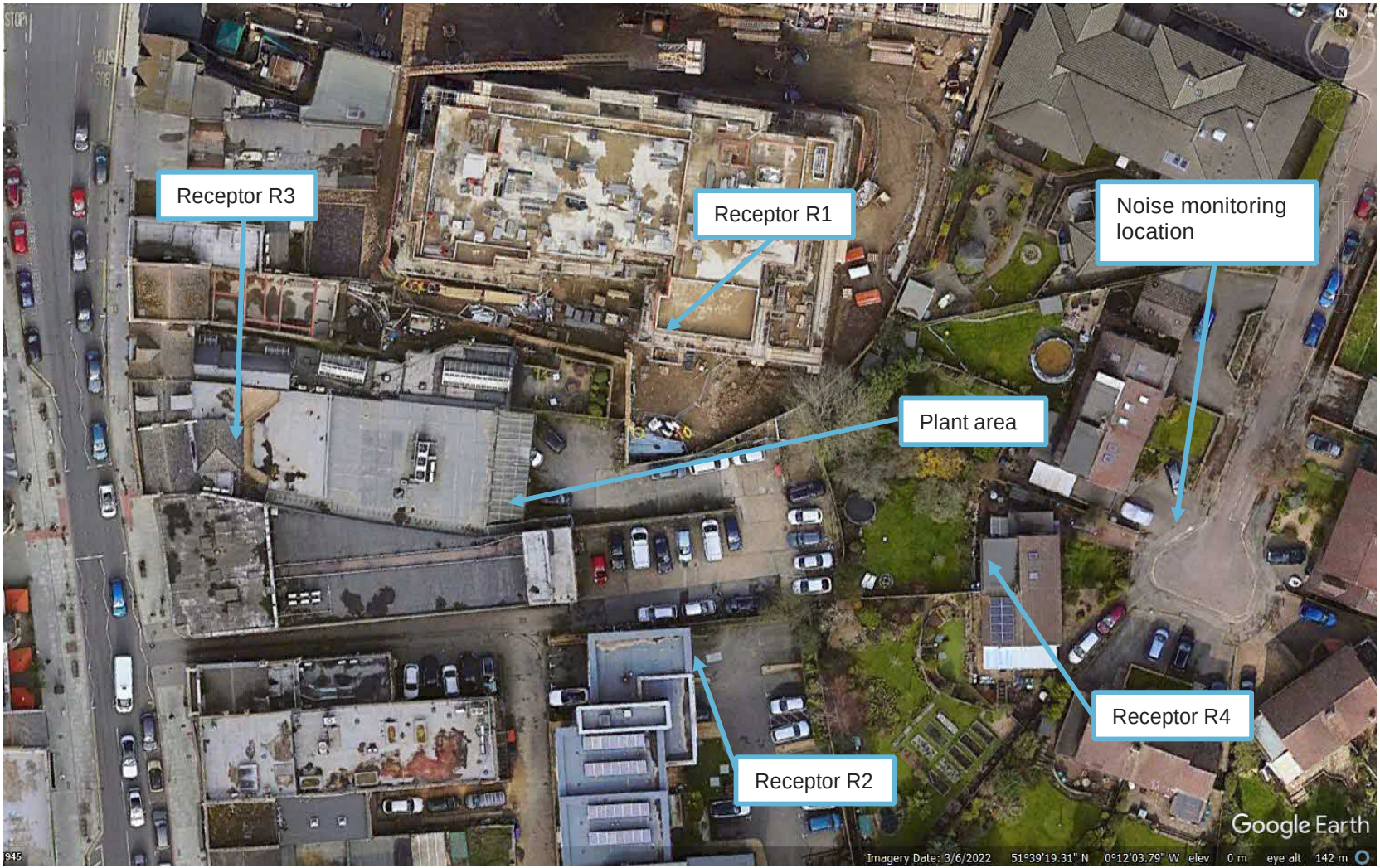
All plant and associated pipework/ductwork to be fitted with suitable anti-vibration mounts/hangers.

2.1. The assessment of predicted noise levels demonstrates compliance with Barnet Council's typical plant noise emissions criteria. Therefore, noise from the proposals should not be a reason for refusal of planning permission.

Appendix A Acoustic terminology

Parameter	Description
Ambient Noise Level	The totally encompassing sound in a given situation at a given time, usually composed of a sound from many sources both distant and near ($L_{Aeq,T}$).
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s1 and s2 is given by 20 $\log_{10}$ (s1/s2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20μPa. The threshold of normal hearing is in the region of 0 dB and 140 dB is the threshold of pain. A change of 1 dB is only perceptible under controlled conditions.
dB(A), L_{Ax}	Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) broadly agree with people's assessment of loudness. A change of 3 dB(A) is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds roughly to halving or doubling the loudness of a sound. The background noise in a living room may be about 30 dB(A); normal conversation about 60 dB(A) at 1 metre; heavy road traffic about 80 dB(A) at 10 metres; the level near a pneumatic drill about 100 dB(A).
Fast Time Weighting	Setting on sound level meter, denoted by a subscript F, that determines the speed at which the instrument responds to changes in the amplitude of any measured signal. The fast time weighting can lead to higher values than the slow time weighting when rapidly changing signals are measured. The average time constant for the fast response setting is 0.125 (1/8) seconds.
Free-field	Sound pressure level measured outside, far away from reflecting surfaces (except the ground), usually taken to mean at least 3.5 metres
Façade	Sound pressure level measured at a distance of 1 metre in front of a large sound reflecting object such as a building façade.
$L_{Aeq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level recorded during a noise event with a period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{10,T}$	A noise level index. The noise level exceeded for 10% of the time over the period T. L_{10} can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise. $L_{A10,18h}$ is the A –weighted arithmetic average of the 18 hourly $L_{A10,1h}$ values from 06:00-24:00.
$L_{90,T}$	A noise level index. The noise level that is exceeded for 90% of the measurement time interval, T. It gives an indication of the lower levels of fluctuating noise. It is often used to describe the background noise level and can be considered to be the "average minimum" noise level and is a term used to describe the level to which non-specific noise falls during quiet spells, when there is lull in passing traffic for example.

Appendix B Aerial photograph of site showing areas of interest



Appendix C Environmental sound survey

Details of environmental sound survey

C.1 Measurements of the existing background sound levels were undertaken between 12.15 hours on Tuesday 27th February and 01.15 hours on Wednesday 28th February 2024.

C.2 The sound level meter was programmed to record the A-weighted L_{eq}, L_{90}, L_{10} and L_{max} noise indices for consecutive fifteen-minute sample periods for the duration of the survey.

Measurement position

C.3 The representative measurement position was located on a lamp post on Clyde Close (location indicated on the site plan in Appendix B). This location is approximately representative of the levels of road traffic noise affecting residential premises to the rear of the site.

C.4 In accordance with BS 7445-2:1991 '*Description and measurement of environmental noise – Part 2: Guide to the acquisition of data pertinent to land use*', the measurements were undertaken under free-field conditions.

Equipment

C.5 Details of the equipment used during the survey are provided in the table below. The sound level meter was calibrated before and after the survey; no significant change (+/-0.2 dB) in the calibration level was noted.

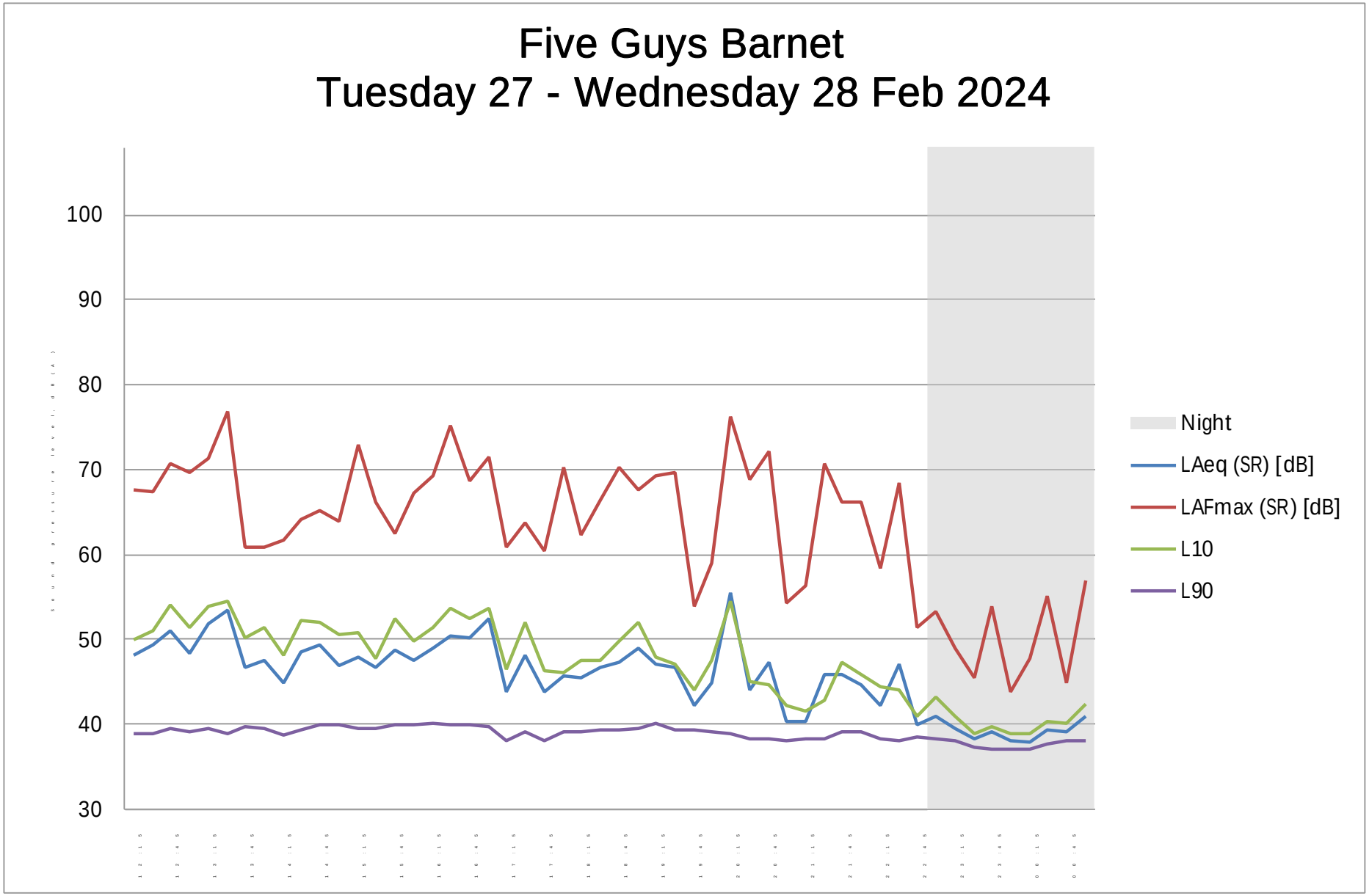
Description	Model / serial no.	Calibration date	Calibration certificate no.
Class 1 Sound level meter	Svantek 977/ 69747	01/08/2022	1503080-1
Condenser microphone	ACO Pacific 7052E / 70829		
Preamplifier	Svantek SV12L / 73687		
Calibrator	Svantek SV30A / 10843	30/10/2023	1506985-1

C.6 Weather conditions were determined both at the start and on completion of the survey. It is considered that the meteorological conditions were appropriate for environmental noise measurements. The table below presents the weather conditions recorded on site at the beginning and end of the survey.

<table>
<tr><th colspan="5">Weather Conditions</th></tr>
<tr><th>Measurement Location</th><th>Time/ Date</th><th>Description</th><th>Beginning of Survey</th><th>End of Survey</th></tr>
<tr><td>As indicated on Appendix B</td><td>12.15 27/2/24 – 12.00 28/2/24</td><td>Temperature (°C)</td><td>8</td><td>8</td></tr>
<tr><td rowspan="9">Cloud Cover
Symbol Scale in oktas (eighths)
0 Sky completely clear
1
2
3
4 Sky half cloudy
5
6
7
8 Sky completely cloudy
(9) Sky obstructed from view</td><td>Precipitation:</td><td>No</td><td>No</td></tr>
<tr><td>Cloud cover (oktas – see guide)</td><td>6</td><td>8</td></tr>
<tr><td>Presence of fog/snow/ice</td><td>No</td><td>No</td></tr>
<tr><td>Presence of damp roads/wet ground</td><td>Damp</td><td>Damp</td></tr>
<tr><td>Wind Speed (m/s)</td><td>1-2</td><td>2</td></tr>
<tr><td>Wind Direction</td><td>SW</td><td>SW</td></tr>
<tr><td>Conditions that may cause temperature inversion (i.e. calm nights with no cloud)</td><td>No</td><td>No</td></tr>
</table>

Results

C.7 The results of the survey are considered to be representative of the background sound pressure levels at the façade of the most affected noise sensitive receptor to the plant area during the quietest times at which the plant will operate. The noise climate at the measurement position during the installation and collection of the monitoring equipment was dominated by distant road traffic. The results of the survey are presented in a time history graph overleaf.


Five Guys Barnet
Tuesday 27 - Wednesday 28 Feb 2024
100
90
80
70
60
50
40
30
Night
LAeq (SR) [dB]
LAFmax (SR) [dB]
L10
L90

Appendix D Equipment Manufacturer's Noise Data

Reference	Make / Model	Notes	Sound levels, dB, at octave band frequencies (Hz)								
			63	125	250	500	1K	2K	4K	8K	L_{Aeq} (dB)
AHU1	Systemair/MUB 062 630EC	Inlet L_w	74	80	76	74	73	69	67	64	78
EF1	Fläktwoods/GME B 1-04-063-1670	Discharge L_w	80	82	91	91	89	85	87	83	94
EF2	Systemair/Prio250EC	Discharge L_w	62	69	65	65	65	63	58	49	69
EF3	Systemair/Prio150E C	Discharge L_w	64	64	60	62	53	49	41	30	61
EF4	Systemair/K 100 XL	Discharge L_w	71	68	62	57	52	48	36	26	59
CU1	Toshiba/RAV1401ATPE	L_p at 1m									53 at 1 m
CU2	Toshiba/RAV1401ATPE	L_p at 1m									53 at 1 m
CU3	Toshiba/RAV1101ATPE	L_p at 1m									54 at 1 m
CC1	Typical	L_p at 10m									35 at 10 m

Appendix E Predicted Noise Levels Calculation

AHU1 vent

Description	Notes.	Sound level (dB) at octave band centre frequencies (Hz)								dBA
		63	125	250	500	1k	2k	4k	8k	
Source noise level (unattenuated)	In-duct L_w	74	80	76	74	73	69	67	64	**78**
System losses		-6	-2	-1	-1	0	0	0	0	
Atmospheric side attenuator	I.L.	-6	-13	-26	-41	-45	-45	-43	-36	
Sound power level leaving terminal		**62**	**65**	**49**	**32**	**28**	**24**	**24**	**28**	**50**

Receptor R1	V angle	H angle									
Directivity correction	0	45	1500 x 800 (0,45)	2	3	3	4	4	4	4	4	
Distance correction	27	m	27 m	-37	-37	-37	-37	-37	-37	-37	-37	
Screening correction	Screened:		d=	-27	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	
Surface corrections etc				3	3	3	3	3	3	3	3	
Resultant at Receptor R1			L_p	**30**	**34**	**18**	**2**	**-2**	**-6**	**-6**	**-2**	**19**

EF1 vent

Description	Notes.	Sound level (dB) at octave band centre frequencies (Hz)								dBA
		63	125	250	500	1k	2k	4k	8k	
Source noise level (unattenuated)	In-duct L_w	80	82	91	91	89	85	87	83	**94**
System losses		-12	-7	-3	-3	-5	-7	-7	-7	
Atmospheric side attenuator	I.L.	-10	-20	-36	-40	-40	-36	-31	-26	
Sound power level leaving terminal		**58**	**55**	**52**	**48**	**44**	**42**	**49**	**50**	**55**

Receptor R1	V angle	H angle									
Directivity correction	0	45	600 x 600 (0,45)	1	2	2	3	3	4	4	4	
Distance correction	25	m	25 m	-36	-36	-36	-36	-36	-36	-36	-36	
Screening correction	Screened:		d=	-25	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	
Surface corrections etc				3	3	3	3	3	3	3	3	
Resultant at Receptor R1			L_p	**26**	**24**	**21**	**18**	**14**	**13**	**20**	**21**	**25**

EF2 vent

Description	Notes.	Sound level (dB) at octave band centre frequencies (Hz)								dBA
		63	125	250	500	1k	2k	4k	8k	
Source noise level (unattenuated)	In-duct L_w	62	69	65	65	65	63	58	49	**69**
System losses		-8	-3	-1	0	0	0	0	0	
Atmospheric side attenuator	I.L.	-3	-6	-8	-23	-36	-26	-24	-19	
Sound power level leaving terminal		**51**	**60**	**56**	**42**	**29**	**37**	**34**	**30**	**50**

Receptor R1	V angle	H angle									
Directivity correction	0	45	900 x 350 (0,45)	1	2	2	3	3	4	4	4	
Distance correction	24	m	24 m	-36	-36	-36	-36	-36	-36	-36	-36	
Screening correction	Screened:		-24	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	
Surface corrections etc				3	3	3	3	3	3	3	3	
Resultant at Receptor R1			L_p	**19**	**29**	**25**	**12**	**-1**	**8**	**5**	**1**	**19**

EF3 vent

Description	Notes.	Sound level (dB) at octave band centre frequencies (Hz)								dBA
		63	125	250	500	1k	2k	4k	8k	
Source noise level (unattenuated)	In-duct L_w	64	64	60	62	53	49	41	30	**61**
System losses		-9	-4	-2	-1	-2	-4	-6	-6	
Atmospheric side attenuator	I.L.	-3	-6	-8	-29	-38	-31	-28	-20	
Sound power level leaving terminal		**52**	**54**	**50**	**32**	**13**	**14**	**7**	**4**	**43**

Receptor R1	V angle	H angle									
Directivity correction	0	45	900 x 350 (0,45)	1	2	2	3	3	4	4	4	
Distance correction	24	m	24 m	-36	-36	-36	-36	-36	-36	-36	-36	
Screening correction	Screened:		-24	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	
Surface corrections etc				3	3	3	3	3	3	3	3	
Resultant at Receptor R1			L_p	**20**	**23**	**19**	**2**	**-17**	**-15**	**-22**	**-25**	**12**

EF4 vent

Description				Notes.	Sound level (dB) at octave band centre frequencies (Hz)								dBA
					63	125	250	500	1k	2k	4k	8k	
Source noise level (unattenuated)				In-duct L_w	71	68	62	57	52	48	36	26	**59**
System losses					-8	-3	-1	0	-1	-1	-1	-1	
Atmospheric side attenuator				I.L.	-3	-6	-8	-32	-41	-34	-31	-22	
Sound power level leaving terminal					**60**	**59**	**53**	**25**	**10**	**13**	**4**	**3**	**47**
Receptor R1	V angle	H angle											
Directivity correction	0	45	900 x 350 (0,45)		1	2	2	3	3	4	4	4	
Distance correction	24	m		24 m	-36	-36	-36	-36	-36	-36	-36	-36	
Screening correction	Screened:		d=	-24	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	
Surface corrections etc					3	3	3	3	3	3	3	3	
Resultant at Receptor R1				L_p	**28**	**28**	**22**	**-5**	**-20**	**-16**	**-25**	**-26**	**16**

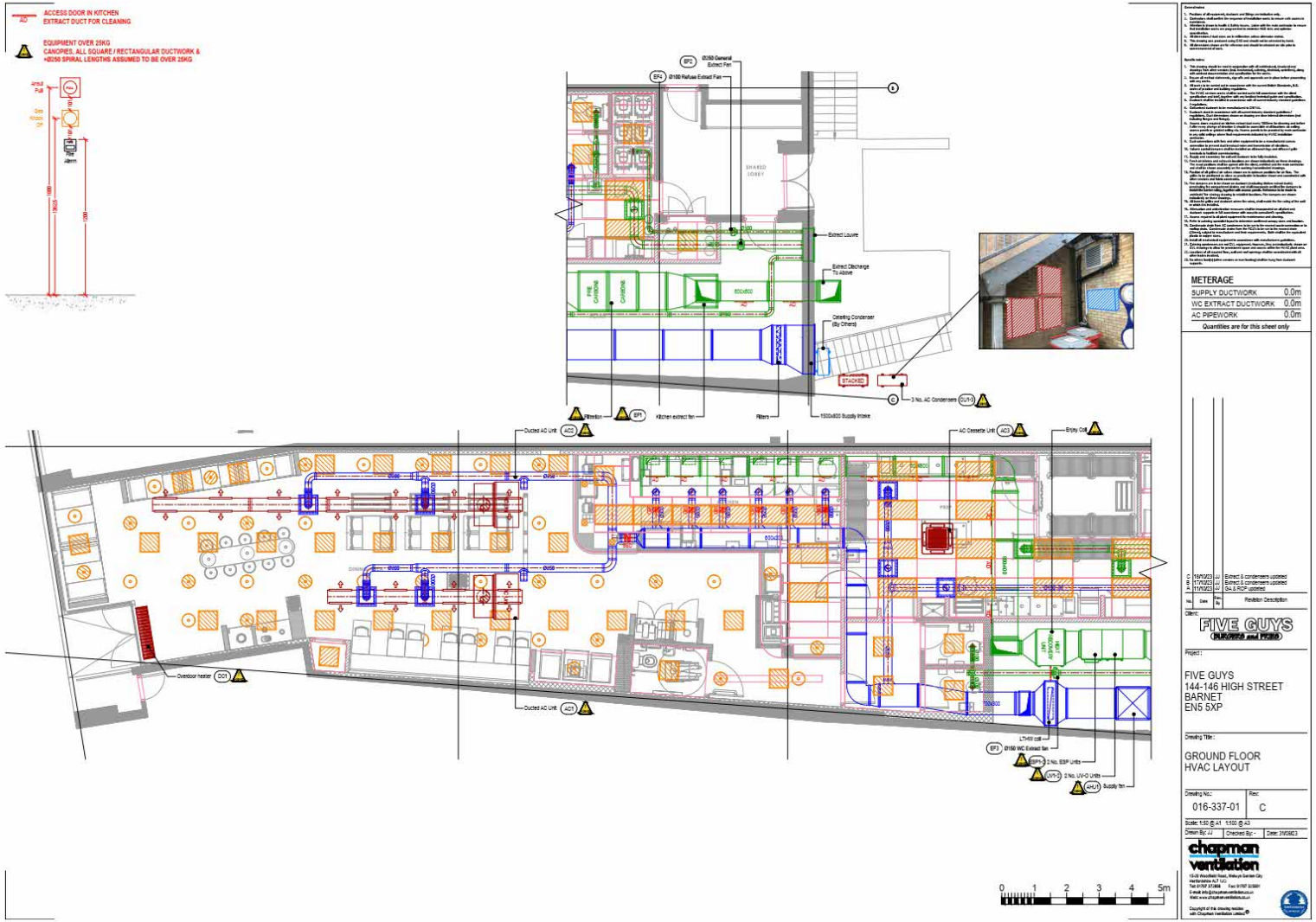
Condensers R1

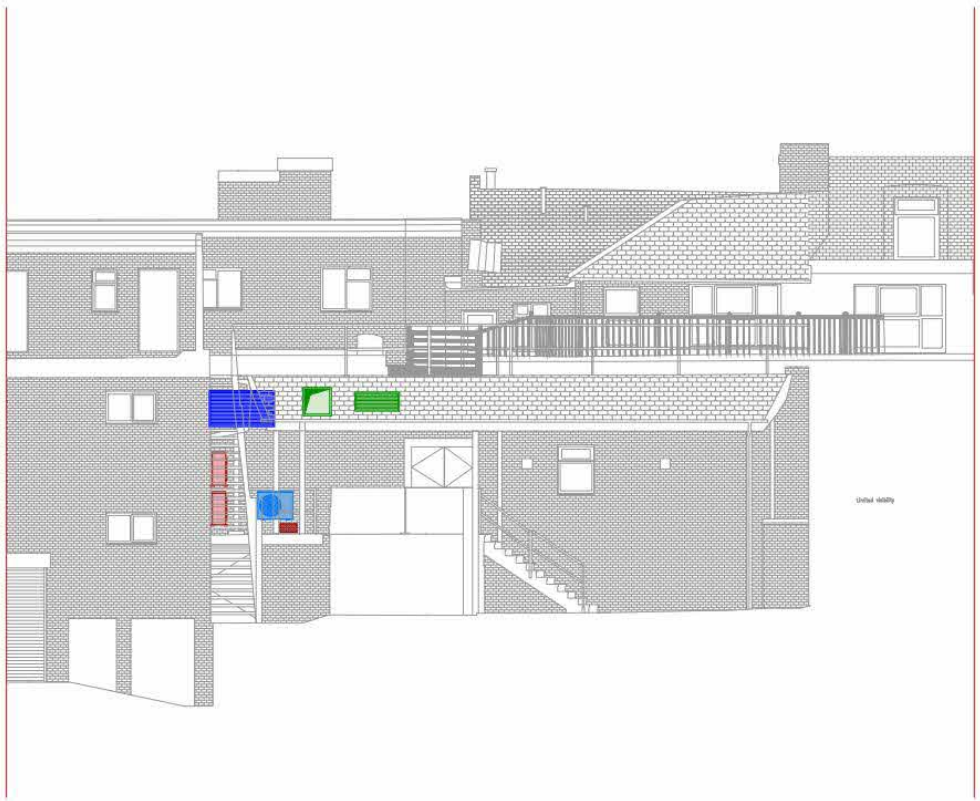
Unit	Make / Model	L_{pA}	at / m	m	dB	Directivity	Screening	Result
AC1	Toshiba/RAV GM1401ATP-E	53	1	27	-29	0		24
AC2	Toshiba/RAV GM1401ATP-E	53	1	27	-29	0		24
AC3	Toshiba/RAV GM1101ATP-E	54	1	27	-29	0		25
CC1	Typical	35	10	27	-9	0		26

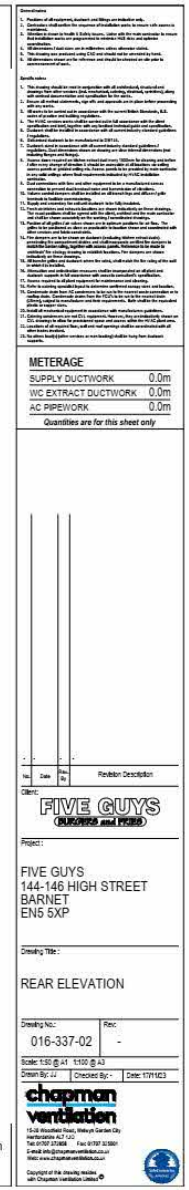
Cumulative plant noise levels at Receptor

Plant item	R1 dB(A)
Kitchen supply	19
Kitchen extract	25
General extract	19
Toilet extract	12
Refuse extract	16
CU1	24
CU2	24
CU3	25
CC1	26
Cumulative (07.00 – 01.00 hours)	**32**
Cumulative (01.00 – 07.00 hours)	**26**

Appendix F Restaurant Plant Layout







METERAGE

SUPPLY DUCTWORK	0.0m
WC EXTRACT DUCTWORK	0.0m
AC PIPEWORK	0.0m

Quantities are for this sheet only

No. | Date | Rev. By | Revision Description

Client:
FIVE GUYS

Project:
FIVE GUYS
144-146 HIGH STREET
BARNET
EN5 5XP

Drawing Title:
REAR ELEVATION

Drawing No.: 016-337-02 | Rev: -

Scale: 1:50 @ A1 1:100 @ A3
Drawn By: JJ | Checked By: - | Date: 17/11/23

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