Five Guys

156 West End Lane
London
NW6 1SD

Plant Noise Impact Assessment

On behalf of

chapman ventilation

Project Reference: 90960 | Revision: 04 | Date: 12th August 2022
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Document Information

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For and on behalf of Noise Solutions Ltd				

Revision	Date	Description	Prepared	Reviewed/ Approved
1	30/1/2024	Include client comments	ACM	NAC
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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 Five Guys restaurant located at the new development site at 156 West End Lane. West Hampstead, London, NW6 1SD.

1.2. This report forms part of the submission to discharge Condition 39 'A3 Odour Mitigation' of planning permission dated 21st February 2024 (ref: 2023/1716/P).

1.3. Condition 39 states: *" Prior to commencement of any A3 use on site, details of odour mitigation and ventilation systems including an accompanying acoustic report with details of any necessary acoustic isolation and sound attenuation measures shall be submitted to and approved in writing by the Local Planning Authority. All odour and acoustic mitigation measures shall be implemented in accordance with the details thus approved and shall thereafter be retained and maintained in accordance with the manufacturers' recommendations".*

1.4. The cumulative plant noise level has been predicted at the nearest noise-sensitive receptors and assessed against the requirements of The London Borough of Camden.

1.5. 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 commercial (A3) unit is located within the ground floor of the west building, facing West End Lane.

2.2. The proposed ventilation system comprises a supply Air Handling Unit (AHU1) and three smaller ancillary duct fans (EF2, EF3 and EF4), which are located within the commercial unit, terminating within the loading bay to the rear of the unit. Three air conditioning units (CU1, CU2, CU3) and a condenser unit (CC1) will be located at high level within the loading bay; and one kitchen extract fan (EF1) will be located on the roof of the west building.

2.3. An odour mitigation system is located within the unit and comprises two ESP units (ESP1 and ESP2), two UV-C units (UV1 and UV2) and four MFU units (MFU1, MFU2, MFU3, MFU4). It is understood that minimal noise will be generated by the odour mitigation system and, therefore, no assessment of noise emissions is required.

2.4. Manufacturer noise data for the proposed ventilation systems are detailed within **Appendix E** of this report. Full details of the ventilation systems and odour mitigation systems are detailed in

the accompanying Equipment Schedule and the Odour Mitigation Report prepared by Purified Air.

2.5. The catering condenser will run at all times. All other plant will run between 07.00 hours and 01:00 hours.

3.0 Nearest noise sensitive receptors

3.1. The area surrounding the site is mixed residential and commercial in nature. The nearest noise sensitive receptor has been identified as a residence to the north on Lymington Road (Receptor R1) approximately 27m from the plant.

3.2. **Appendix B** contains an aerial photograph showing the site and surrounding area, including the locations of the receptor identified above.

4.0 Plant noise emission criteria

4.1. Planning permission dated 21st February 2024 (ref: 2023/1716/P) included the discharge of Condition 38 'Plant Noise Assessment'. A Noise Impact Assessment produced by Ian Sharland Limited[1] was submitted in support of the discharge of the condition and Table 5.1 of the report details the plant noise egress limits for all mechanical plant. The proposed limits at 1m from the Lymington Road residential windows are:

Table 1 Proposed plant noise emissions level limits at noise sensitive residential receptor (Lymington Road).

Period	Cumulative plant noise level at Lymington Road residence, dB(A)
Daytime (07.00 – 23.00 hours)	37
Night-time (23.00 – 07.00 hours)	29

4.2. It is understood that these plant noise limits have been set in order that the London Borough of Camden's requirements are achieved, with plant noise levels being at least 5dB below the existing background sound level at the nearest noise-sensitive receptor.

5.0 Plant noise assessment

5.1. The cumulative plant noise level at the closest noise sensitive receptor has been predicted. The assessment has taken into consideration distance attenuation and directivity corrections as well

[1] Report M4758 23rd December 2021 for Astir Living Ltd

as screening due to the building envelope at receptor R1. Predictions are inclusive of the losses due to the following (plant locations in **Appendix E**):

Table 2 Attenuation (dBA) for inclusive mitigation.

Mitigation	Attenuation (dBA)
Acoustic enclosure or screen around CU1, CU2 and CU3	-10
Acoustic enclosure or screen around CC1	-10

5.2. Predictions are also inclusive of the losses due to atmospheric-side attenuators with the following acoustic performance:

Table 3 Insertion losses(dB) for attenuators at octave band centre frequencies (Hz)

Attenuator	Octave band centre frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Supply (AHU1) - atmospheric	7	15	31	45	45	45	45	41
Kitchen Extract (EF1) - atmospheric	10	20	36	40	40	36	31	26
General Extract (EF2) – atmospheric	2	4	6	16	26	19	17	13
WC Extract (EF3) - atmospheric	2	2	4	15	26	19	19	13
Refuse Extract (EF4) - atmospheric	2	2	4	18	30	27	22	14

5.3. It should be noted that the proposed plant, with the exception of the catering condensing unit, will operate between 07.00 and 01.00 hours only and is not anticipated to exhibit any tonal or impulsive characteristics provided it is well maintained. All proposed external plant will be inverter driven and, therefore, will gently ramp up and down depending on the demands on the various systems.

5.4. Table 4, below, summarises the results of the assessment at the nearest receptor. All other receptors benefit from increased distance/screening to the plant. The full set of calculations can be found in **Appendix D**. The predictions have been based on the proposed plant operating simultaneously at full capacity between 07.00 and 01.00 hours and the catering condensing unit operating at all times throughout day and night.

Table 4 Assessment of predicted noise levels at nearest receptors

Receptor	Period	Predicted rating level at receptor, LAeq (dB)	Proposed design criterion (dB)	Difference (dB)
R1	Daytime hours (07.00 – 23.00 hours)	29	37	-8
	Night-time (23.00 – 01.00 hours)	29*	29	0
	Night-time (01.00 – 07.00 hours)	15	29	-14

**The rating level above is representative of all plant items operating at night between 23.00 – 01.00 hours. It must be noted that only refrigeration will operate between 01.00 and 07.00 hours.*

5.5. The above assessment demonstrates that noise from the proposed plant will result in noise levels at or below the proposed limits and should therefore be acceptable to the London Borough of Camden.

6.0 Summary

6.1. Noise Solutions Ltd (NSL) has been commissioned by Chapman Ventilation to provide a Noise Impact Assessment for new plant serving a Five Guys restaurant located at the new development site at 156 West End Lane West Hampstead, London, NW6 1SD.

6.2. The cumulative plant noise level has been predicted at the nearest noise-sensitive receptors and assessed against the plant noise limits set out in the 2021 Ian Sharland report. When attenuated as described in this report, plant noise levels will comply with the approved limits and should therefore be acceptable to the London Borough of Camden.

6.3. The following mitigation measures are required;

- Acoustic enclosure or screen around CU1, CU2 and CU3 providing an overall loss of 10dBA to the nearest noise sensitive receptors.
- Acoustic enclosure or screen around CC1 providing an overall loss of 10dBA to the nearest noise sensitive receptors.
- Atmospheric-side attenuators as per the specification provided in Table 3.

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 Site and surrounding area

Appendix C Equipment Manufacturer's Noise Data

Reference	Make / Model	No. units	Notes	Sound levels, dB, at octave band frequencies (Hz)								
				63	125	250	500	1K	2K	4K	8K	L_{Aeq} (dB)
AHU1	Systemair/MUB 100 630EC Multibox-20	1	Inlet L_w	84	87	83	83	80	77	74	67	**85**
			Casing L_w	63	69	55	50	49	47	40	31	
EF1	FläktWoods/CVEQ - 036	1	Discharge L_w	80	96	91	87	84	80	77	74	**90**
			Casing L_w	63	79	65	49	45	50	45	35	
EF2	Systemair/Prio 250 EC	1	Discharge L_w	66	71	63	68	70	68	58	47	**74**
			Casing L_w	36	42	43	52	55	50	35	22	
EF3	Systemair/Prio 200 EC	1	Discharge L_w	70	71	60	71	70	68	61	59	**74**
			Casing L_w	42	40	39	54	59	56	45	35	
EF4	Systemair/K 100 XL	1	Discharge L_w	83	81	71	67	67	58	49	40	**71**
			Casing L_w	57	31	37	50	45	42	37	26	
CU1/CU2	Toshiba/RAV-GM1401 ATP-E	2	L_p at 1m									57 at 1 m
CU3	Toshiba/RAV-GM1101 ATP-E	1	L_p at 1m									57 at 1 m
CC1	Typical	1	L_p at 10m									35 at 10 m

Appendix D Predicted Noise Levels Calculation

AHU1 – Systemair/MUB 100 630EC Multibox

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	84	87	83	83	80	77	74	67	**85**
System losses					-5	-3	-2	-3	-3	-3	-3	-3	
Atmospheric side attenuator				I.L.	-7	-15	-31	-45	-45	-45	-45	-41	
Sound power level leaving terminal					**72**	**69**	**50**	**35**	**32**	**29**	**26**	**23**	**54**
Receptor R1	V angle	H angle											
Directivity correction		90	2000 x 1000 (0,90)		1	1	1	-4	-7	-7	-7	-7	
Distance correction	33	m		33 m	-38	-38	-38	-38	-38	-38	-38	-38	
Screening correction	Screened:		δ=	-33	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	
Surface corrections etc													
Resultant at Receptor R1				L_p	**35**	**32**	**13**	**-7**	**-13**	**-16**	**-19**	**-22**	**17**

EF1 - FläktWoods/CVEQ - 036

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	96	91	87	84	80	77	74	**90**
System losses					-9	-4	-1	0	0	0	0	0	
Atmospheric side attenuator				I.L.	-10	-20	-36	-40	-40	-36	-31	-26	
Sound power level leaving terminal					**61**	**72**	**54**	**47**	**44**	**44**	**46**	**48**	**58**
Receptor R1	V angle	H angle											
Directivity correction	90	0	600 x 600 (90,0)		0	0	0	0	-4	-7	-7	-7	
Distance correction	40	m		40 m	-40	-40	-40	-40	-40	-40	-40	-40	
Screening correction	Screened:		δ=	-40	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	
Surface corrections etc													
Resultant at Receptor R1				**L_p**	**21**	**32**	**14**	**7**	**0**	**-3**	**-1**	**1**	**17**

EF2 - Systemair/Prio 250EC

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	66	71	63	68	70	68	58	47	**74**
System losses					-14	-10	-6	-3	-3	-6	-9	-9	
Atmospheric side attenuator				I.L.	-2	-4	-6	-16	-26	-19	-17	-13	
Sound power level leaving terminal					**50**	**57**	**51**	**49**	**41**	**43**	**32**	**25**	**50**
Receptor R1	V angle	H angle											
Directivity correction	0	0	250 x 250 (0,0)		1	2	3	4	5	6	6	6	
Distance correction	25	m		25 m	-36	-36	-36	-36	-36	-36	-36	-36	
Screening correction	Screened:		δ=	-25	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	
Surface corrections etc													
Resultant at Receptor R1				**L_p**	**15**	**23**	**18**	**17**	**10**	**13**	**2**	**-5**	**19**

EF3 - Systemair/Prio 200EC

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	70	71	60	71	70	68	61	59	**74**
System losses				-15	-11	-6	-4	-3	-6	-9	-9	
Atmospheric side attenuator			I.L.	-2	-2	-4	-15	-26	-19	-19	-13	
Sound power level leaving terminal				**53**	**58**	**50**	**52**	**41**	**43**	**33**	**37**	**52**
Receptor R1	V angle	H angle										
Directivity correction		200 x 200 (0,0)		1	2	3	4	5	6	6	6	
Distance correction	25	m	25 m	-36	-36	-36	-36	-36	-36	-36	-36	
Screening correction	Screened:	δ=	-25	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	
Surface corrections etc												
Resultant at Receptor R1			L_p	**18**	**24**	**17**	**20**	**10**	**13**	**3**	**7**	**20**

EF4 - Systemair/K 100 XL

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	83	81	71	67	67	58	49	40	**71**
System losses				-20	-15	-12	-7	-7	-8	-11	-11	
Atmospheric side attenuator			I.L.	-2	-2	-4	-18	-30	-27	-22	-14	
Sound power level leaving terminal				**61**	**64**	**55**	**42**	**30**	**23**	**16**	**15**	**51**
Receptor R1	V angle	H angle										
Directivity correction		100 x 100 (0,0)		1	2	3	4	5	6	6	6	
Distance correction	25	m	25 m	-36	-36	-36	-36	-36	-36	-36	-36	
Screening correction	Screened:	δ=	-25	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	
Surface corrections etc												
Resultant at Receptor R1			**L_p**	**26**	**30**	**22**	**10**	**-1**	**-7**	**-14**	**-15**	**17**

Condensers R1

Unit	Make / Model	LpA	at / m	m	dB	Directivity	Screening	Attenuation	Result
CU 1	Toshiba/RAV-GM1401	57	1	28	-29	0	0	-10	18
CU 2	Toshiba/RAV-GM1401	57	1	29	-29	0	0	-10	18
CU 3	Toshiba/RAV-GM1101	57	1	30	-30	0	0	-10	17
CC 1	Catering Condenser	35	10	31	-10	0	0	-10	15

EF1 Casing

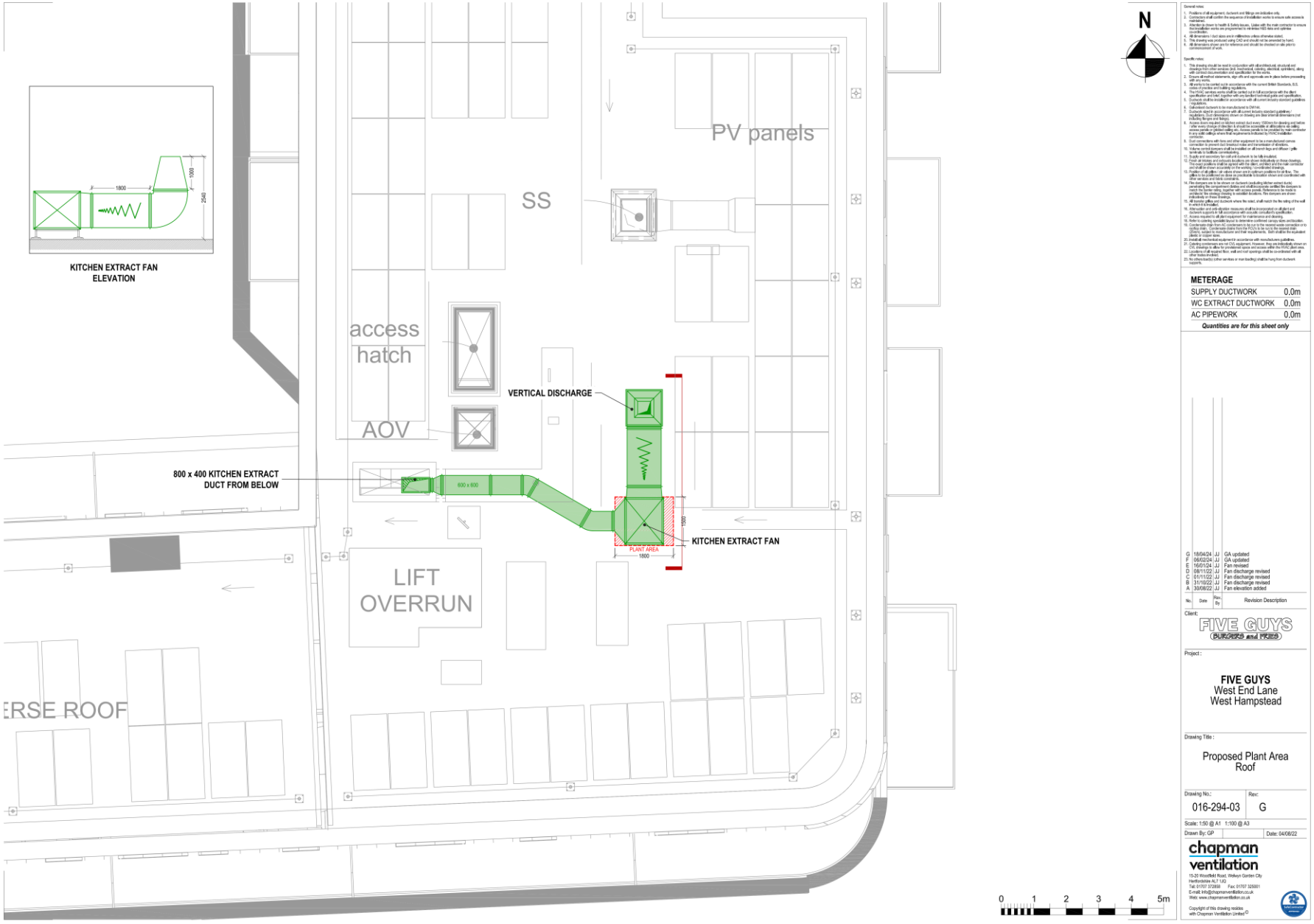
			Sound level (dB) at octave band centre frequencies (Hz)								
			63	125	250	500	1k	2k	4k	8k	
Source noise level (unattenuated)	Sound Power Level		63	79	65	49	45	50	45	35	**64**
Casing Lagging / Enclosure		I.L.	0	0	0	0	0	0	0	0	
Attenuated source noise level			**63**	**79**	**65**	**49**	**45**	**50**	**45**	**35**	**64**
Receptor R1											
Distance correction	40 m	40 m	-40	-40	-40	-40	-40	-40	-40	-40	
Screening correction	Screened: δ=	-40	0	**0**	**0**	**0**	**0**	**0**	**0**	**0**	
Acoustic Panels											
Resultant at Receptor R1		L_p	**23**	**39**	**25**	**9**	**5**	**10**	**5**	**-5**	**24**

Cumulative plant noise levels at Receptor

	Receptor R1 dB(A)
AHU1 Inlet	17
EF1 Exhaust	17
EF1 Casing	24
EF2 Exhaust	19
EF3 Exhaust	20
EF4 Exhaust	17
CU 1	18
CU 2	18
CU 3	17
CC 1	15
Combined plant L_p (Day) All plant running	**29**
Combined plant L_p (23.00-01.00) All plant running	**29**
Combined plant L_p (01.00-07.00) CCU 1 Only running	**15**

Appendix E Unit Layout


ACCESS DOOR IN KITCHEN EXTRACT DUCT FOR CLEANING
EQUIPMENT OVER 25KG CANOPIES, ALL SQUARE / RECTANGULAR DUCTWORK & +Ø250 SPIRAL LENGTHS ASSUMED TO BE OVER 25KG
SWITCH ROOM
15.1 m²
SUBSTATION
21.7 m²
3 No. AC condenser units at high level
Catering condenser unit (by others) 400x150 AC Pipework
SLAB
AD
400x800
Supply intake (2000x1000)
Extract discharge (650x300)
REFUSE STORE
GULLY 300X300mm
RWP
SVP
KP
RE
600x600 Kitchen extract from below
800x600 Kitchen extract to above
UP
LV
SLV
BCW
BHW
BT
METERAGE
SUPPLY DUCTWORK 0.0m
WC EXTRACT DUCTWORK 0.0m
AC PIPEWORK 0.0m
Quantities are for this sheet only
E 21/02/24 JJ GA & extract ducts updated.
D 03/01/24 JJ Kitchen extract repositioned.
C 28/04/23 JJ Supply intake shown.
B 27/09/22 JJ Kitchen extract duct updated.
A 09/06/22 JJ GA updated.
FIVE GUYS BURGERS and FRIES
156 West End Lane
West Hampstead
London
Proposed Roof HVAC Layout
016-294-02
E
chapman ventilation


KITCHEN EXTRACT FAN
ELEVATION
1800
1000
2540
PV panels
SS
access
hatch
AOV
VERTICAL DISCHARGE
800 x 400 KITCHEN EXTRACT
DUCT FROM BELOW
600 x 600
PLANT AREA
1800
1000
KITCHEN EXTRACT FAN
LIFT
OVERRUN
ERSE ROOF
N
0 1 2 3 4 5m
METERAGE
SUPPLY DUCTWORK 0,0m
WC EXTRACT DUCTWORK 0,0m
AC PIPEWORK 0,0m
Quantities are for this sheet only
G 18/04/24 JJ GA updated
F 06/02/24 JJ GA updated
E 16/01/24 JJ Fan revised
D 08/11/22 JJ Fan discharge revised
C 01/11/22 JJ Fan discharge revised
B 31/10/22 JJ Fan discharge revised
A 30/08/22 JJ Fan elevation added
No. Date Rev By Revision Description
Client:
FIVE GUYS
BURGERS and FRIES
Project :
FIVE GUYS
West End Lane
West Hampstead
Drawing Title :
Proposed Plant Area
Roof
Drawing No.: 016-294-03
Rev: G
Scale: 1:50 @ A1 1:100 @ A3
Drawn By: GP
Date: 04/08/22
chapman
ventilation