39-49 Neal Street
London

Environmental Noise Survey and Plant Noise Assessment Report

24230/PNA1 Rev4

03 October 2017

For:
Shaftesbury Covent Garden Ltd
c/o Fresson & Tee
1 Sandwich Street
London
WC1H 9PF

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Hann Tucker Associates

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Document Control

Rev	Date	Comment	Prepared by	Authorised by
0	21/04/2017	-	Giovanni De Rienzo Consultant BSc(Hons), AMIOA	Gareth Evans Associate BSc(Hons), MIOA
1	09/05/2017	Assessment now includes plant enclosure and 2 additional units	Giovanni De Rienzo Consultant BSc(Hons), AMIOA	Gareth Evans Associate BSc(Hons), MIOA
2	27/09/2017	Removed AHU from calculations following email request from QuinnRoss	Giovanni De Rienzo Consultant BSc(Hons), AMIOA	Gareth Evans Associate BSc(Hons), MIOA
3	28/09/2017	Updated Assessment	Giovanni De Rienzo Consultant BSc(Hons), AMIOA	Gareth Evans Associate BSc(Hons), MIOA
4	03/10/2017	Adjustments following comments from Rolfe Judd		
			Giovanni De Rienzo Consultant BSc(Hons), AMIOA	Gareth Evans Associate BSc(Hons), MIOA

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Attachments

1.0 Introduction

New items of plant are proposed to serve 39-49 Neal Street, London, as part of an office refurbishment.

Hann Tucker Associates have therefore been instructed to undertake an environmental noise survey and plant noise assessment to determine the impact of the new plant items on nearby noise sensitive premises in line with Local Authority requirements.

2.0 Objectives

To establish the existing noise levels by means of fully automated noise monitoring over a period of approximately 24 hours at up to 2No. secure and accessible positions.

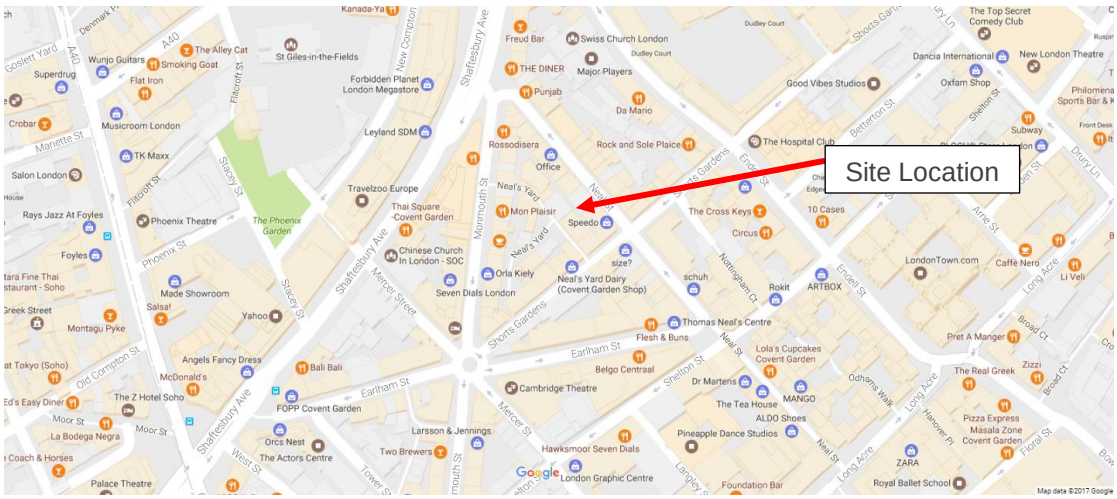
To assess the noise emissions from the proposed plant, based upon data with which we are provided, and comment upon the acceptability.

To advise on noise control measures, if required, with reference to the requirements of the Local Authority.

3.0 Site Description

3.1 Location

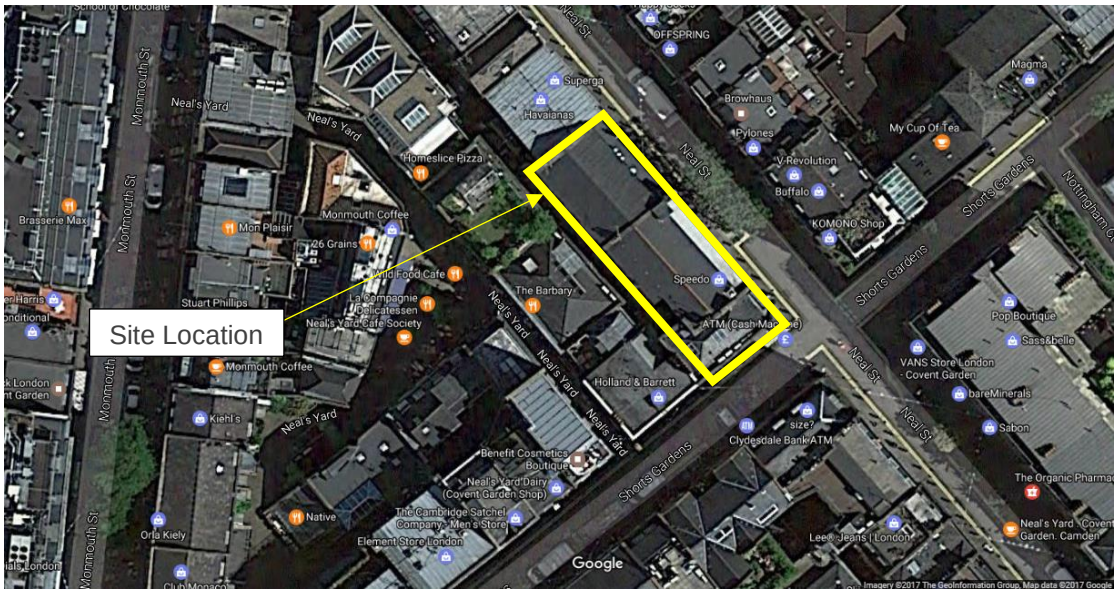
The site is located at 39-49 Neal Street, and falls within the jurisdiction of London Borough of Camden. The location is shown in the Location Map below.



Location Map (maps.google.co.uk)

3.2 Description

39-49 Neal Street is a basement, ground plus 3 storey building located in London Borough of Camden. The surrounding area is predominantly made up residential, office, and retail units. The site is shown in the Site Plan below.



Site Plan (maps.google.co.uk)

4.0 Acoustic Terminology

For an explanation of the acoustic terminology used in this report please refer to Appendix A enclosed.

5.0 Survey Methodology

The survey was undertaken by G. De Rienzo BSc(Hons) AMIOA.

5.1 Procedure

Fully automated environmental noise monitoring was undertaken from approximately 10:00 hours on 04 April 2017, to 10:00 hours on 05 April 2017.

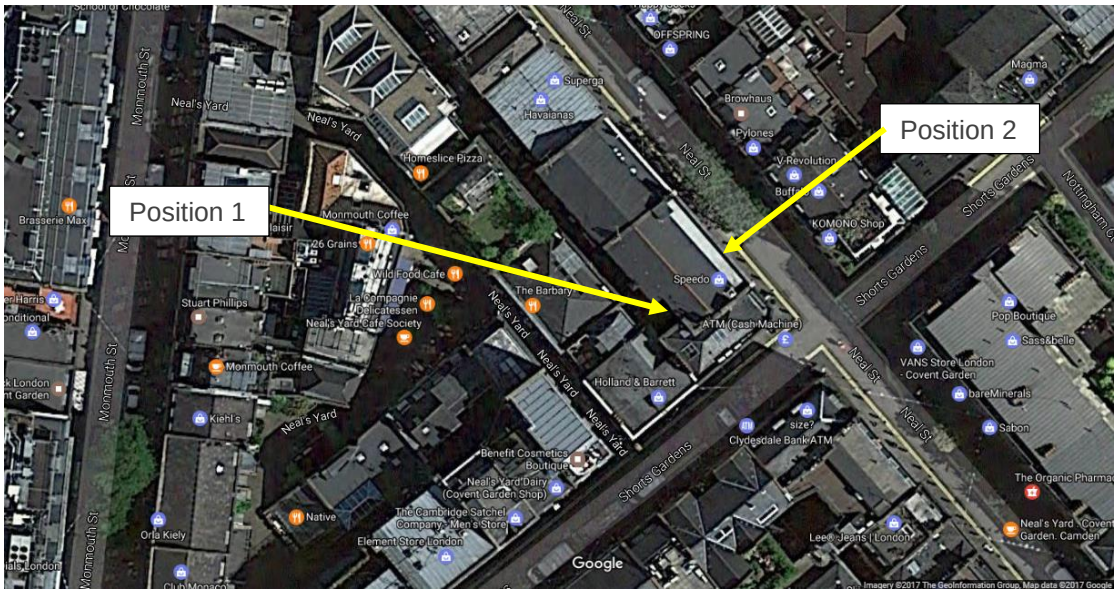
During the periods we were on site the wind conditions were calm. The sky was generally clear. We understand that generally throughout the survey period the weather conditions were similar to this. These conditions are considered suitable for obtaining representative measurement results.

Measurements were taken continuously of the A-weighted (dBA) L_{90}, L_{eq} and L_{max} sound pressure levels over 15 minute periods.

5.2 Measurement Positions

The noise level measurements were undertaken at 2No. positions as described in the table below.

Position No.	Description
1	The microphone was located at the rear of 39 Neal Street at third floor level overlooking the lightwell and residential properties. The microphone was placed outside the third floor window approximately 1.5m from the façade.
2	The microphone was located at the front of 39 Neal Street at third floor level overlooking Neal Street. The microphone was placed outside the third floor window approximately 1.5m from the façade.



Plan Showing Measurement Positions (maps.google.co.uk)

5.3 Instrumentation

The instrumentation used during the survey is presented in the table below.

Description	Manufacturer	Type	Serial Number	Calibration
Position 1 Type 1 Data Logging Sound Level Meter	Larson Davis	824	3443	Calibration on 10/03/2017
Position 1 Type 1 ½" Condenser Microphone	PCB	377A02	107842	Calibration on 10/03/2017
Position 2 Type 1 Data Logging Sound Level Meter	Larson Davis	824	3444	Calibration on 11/07/2016
Position 2 Type 1 ½" Condenser Microphone	PCB	377B02	122885	Calibration on 11/07/2016
Type 1 Calibrator	Larson Davis	CAL200	3082	LD calibration on 09/06/2016

Each sound level meter, including the extension cable, was calibrated prior to and on completion of the surveys. No significant changes were found to have occurred (no more than 0.1 dB).

Each sound level meter was located in an environmental case with the microphone connected to the sound level meter via an extension cable.

Each microphone was fitted with a windshield.

6.0 Results

The results have been plotted on Time History Graphs 24230/TH1.1 and 24230/TH1.2 enclosed, presenting the 15 minute A-weighted (dBA) L_{90}, L_{eq} and L_{max} noise levels at each measurement position throughout the duration of the survey.

The lowest $L_{A90\ (15\ min)}$ measurements recorded during the survey are presented in the table below:

Position	Lowest Measured $L_{A90(15min)}$ Background Noise Level (dB re 2 x 10^{-5} Pa)		
	Daytime (07:00 – 23:00) Hours	Night-Time (23:00 – 07:00) Hours	24 Hours
1	47 dBA	44 dBA	44 dBA
2	49 dBA	44 dBA	44 dBA

7.0 Discussion of Noise Climate

During the periods we were on site the dominant noise sources were noted to be distant road traffic at the front of the building and existing plant at the rear of the building.

8.0 Plant Noise Emission Criteria

8.1 Local Authority Criteria

39-49 Neal Street falls within the London Borough of Camden. Following an email dated 27th March 2015 we understand the London Borough of Camden's advice relating to noise emissions from new plant is as follows:

"Noise levels at a point 1 metre external to sensitive facades shall be at least 5dB(A) less than the existing background measurement (L_{A90}), expressed in dB(A) when all plant/equipment are in operation. Where it is anticipated that any plant/equipment will have a noise that has a distinguishable, discrete continuous note (whine, hiss, screech, hum) and/or if there are distinct impulses (bangs, clicks, clatters, thumps) special attention should be given to reducing the noise levels from that piece of plant/equipment at any sensitive façade to at least 10dB(A) below the L_{A90}, expressed in dB(A)".

In order to meet the above advice, noise emissions from the proposed plant should not exceed a level of 5dB below the lowest measured $L_{A90(15min)}$. Therefore, based on the results of the noise survey and the advice above, we would recommend the following plant noise emission levels should be achieved with all plant running simultaneously at 1m external to the nearest noise sensitive façade.

Location	Plant Noise Emission Criteria (dBA re:$2x10^{-5}$Pa)		
	Daytime (07:00 – 23:00 hours)	Night Time (23:00 – 07:00 hours)	24 Hours
Noise sensitive facades to the rear of 39-49 Neal Street	42 dBA	39 dBA	39 dBA
Noise sensitive facades to the front of 39-49 Neal Street	44 dBA	39 dBA	39 dBA

The above criteria are to be achieved with all plant operating simultaneously.

If plant contains tonal or impulsive characteristics the external design criteria should be reduced by 5dBA.

It should be noted that the above are subject to the final approval of the Local Authority.

8.2 Definition of Tonal Plant

Annex C of BS 4142 provides the following objective methodology for identifying a distinctive tone in a noise source:

"For a prominent, discrete tone to be identified as present, the time-averaged sound pressure level in the one-third-octave band of interest is required to exceed the time-averaged sound pressure levels of both adjacent one-third-octave bands by some constant level difference.

The level differences between adjacent one-third-octave bands that identify a tone are:

• 15 dB in the low-frequency one-third-octave bands (25 Hz to 125 Hz);

• 8 dB in the middle-frequency one-third-octave bands (160 Hz to 400 Hz);

and

• 5 dB in the high-frequency one-third-octave bands (500 Hz to 10 000 Hz)."

9.0 Plant Noise Impact Assessment

We understand the proposed plant comprises the following items.

Plant Description	Location	Qty	Plant Make	Model Number
Split Cooling Condenser Units Serving Levels 1 to 4 Offices IT	Roof of 39 Neal Street	4	Samsung	AC052FCADEH/EU
VRF Heat Recovery AC Condensing Units Serving Levels 1 to 4 Offices	Roof of 39 Neal Street	4	Samsung	AM100JXVHGR/EU
VRF Units for Retail	Roof of 39 Neal Street	2	Samsung	AM100KXMDGH/EU

9.1 Plant Noise Data

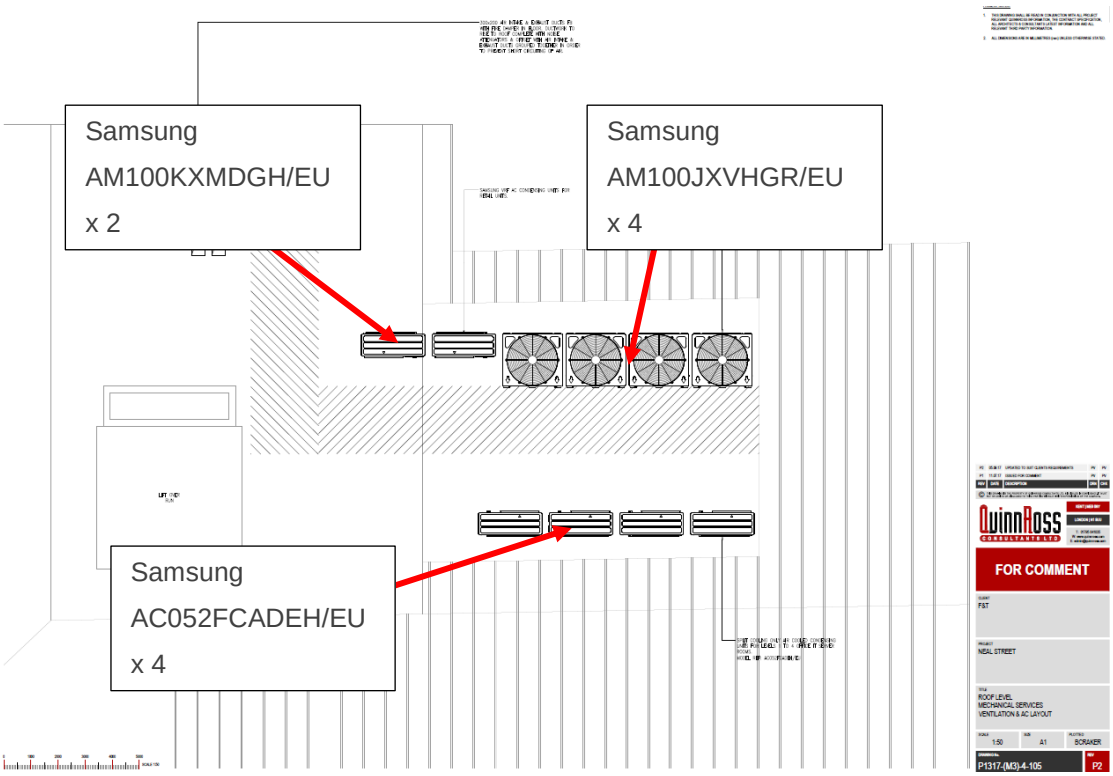
We understand the manufacturer's noise data for the equipment to be as follows:

Plant Description	Sound Pressure Level (dB re $2x10^{-5}$ Pa) at 1 metre at Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
Samsung AC052FCADEH/EU	46.0	49.5	49.0	46.0	42.5	38.0	35.0	28.5	48.0
Samsung AM100JXVHGR/EU	72.5	62.0	60.0	57.5	48.5	45.0	39.5	32.5	58.0
Samsung AM100KXMDGH/EU	63.0	64.5	58.0	54.5	52.5	49.0	47.0	37.5	58.0

9.2 Location of Plant and Nearest Noise Sensitive Windows

9.2.1 Plant Location

The plant is proposed to be located on the roof of 39 Neal Street within a 2 metre high plant enclosure surrounding the entire plant area. The drawing below provided by Quinn Ross Consultants shows the plant location on the roof.



Drawing provided by Quinn Ross Consultants

9.2.2 Nearest Noise Sensitive Window Locations

On 26 June 2016 London Borough of Camden sent us an email confirming the following windows should be considered noise sensitive, *"housing, schools, hospitals, offices, workshops"*.

The nearest noise sensitive windows are therefore the office windows located inside the rear lightwell of 39-49 Neal Street. There is existing plant operational in this area.

See image below.

Plan showing plant and window location (maps.google.co.uk)

9.3 Mitigation Measures

9.3.1 Plant Enclosure

The plant is proposed to be located behind a 2 metre high imperforate plant screen as shown below. Please find enclosed our acoustic specification for the proposed plant screen.

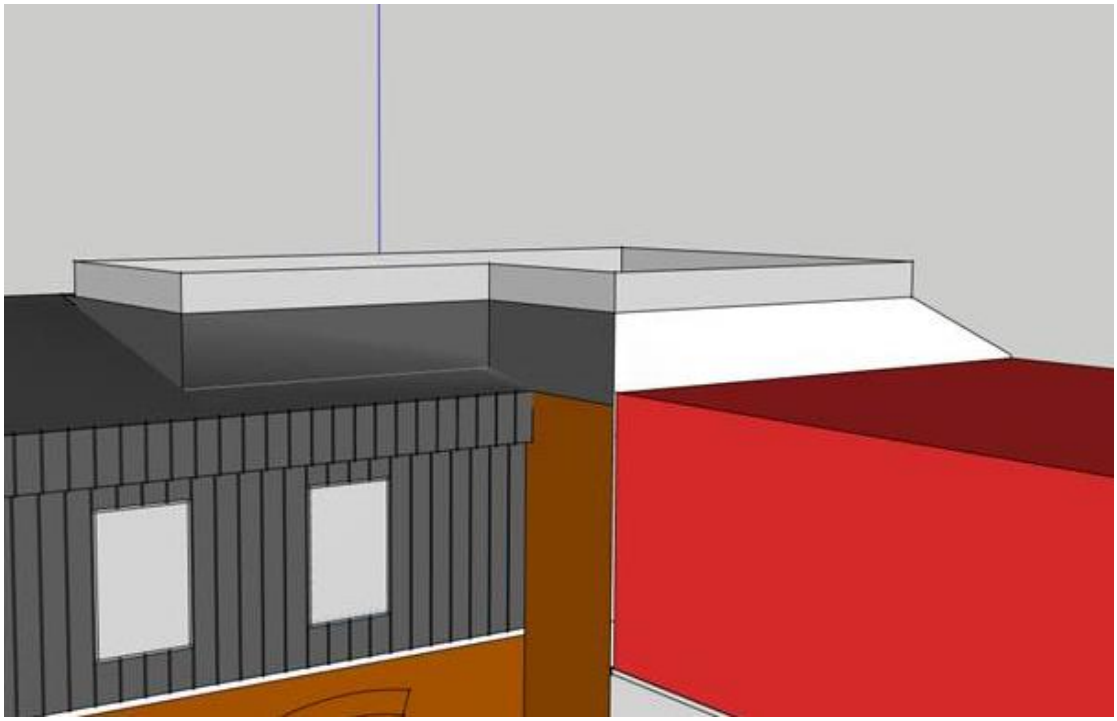


Image provided by Quinn Ross Consultants

9.4 Plant Noise Impact Assessment

We understand that some units will be operational during daytime hours only, and other will be operational during night-time. The following table shows which units will be operational at which times.

Plant Make	Model Number	Operational
Samsung	AC052FCADEH/EU	Daytime & Night-time
Samsung	AM100KXMDGH/EU	Daytime Only
Samsung	AM100JXVHGR/EU	Daytime Only

The following tables summarise our calculations of atmospheric noise emissions from the proposed plant items to the nearest noise sensitive window.

	Sound Pressure Level (dB re $2x10^{-5}$ Pa) at Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
Samsung AC052FCADEH/EU	46.0	49.5	49.0	46.0	42.5	38.0	35.0	28.5	48.0
Cumulative noise level of 4No. Units	52.0	55.5	55.0	52.0	48.5	44.0	41.0	34.5	54.0
Distance Correction at 7m	-14.0	-14.0	-14.0	-14.0	-14.0	-14.0	-14.0	-14.0	
Barrier Correction (Plant Screen)	-8.5	-10.5	-13.0	-15.5	-18.5	-20.0	-20.0	-20.0	
Calculated Noise Level at Receptor	29.5	31.0	28.0	22.5	16.0	10.0	7.0	0.5	24.0

	Sound Pressure Level (dB re 2x10^{-5} Pa) at Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
Samsung AM100JXVHGR/EU	72.5	62.0	60.0	57.5	48.5	45.0	39.5	32.5	58.0
Cumulative noise level of 4No. Units	78.5	68.0	66.0	63.5	54.5	51.0	45.5	38.5	64.0
Distance Correction at 7m	-14.0	-14.0	-14.0	-14.0	-14.0	-14.0	-14.0	-14.0	
Barrier Correction (Plant Screen)	-8.5	-10.5	-13.0	-15.5	-18.5	-20.0	-20.0	-20.0	
Calculated Noise Level at Receptor	56.0	43.5	39.0	34.0	22.0	17.0	11.5	4.5	36.0

	Sound Pressure Level (dB re 2x10^{-5} Pa) at Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
Samsung AM100KXMDGH/EU	63.0	64.5	58.0	54.5	52.5	49.0	47.0	37.5	58.0
Cumulative noise level of 2No. Units	66.0	67.5	61.0	57.5	55.5	52.0	50.0	40.5	61.0
Distance Correction at 7m	-14.0	-14.0	-14.0	-14.0	-14.0	-14.0	-14.0	-14.0	
Barrier Correction (Plant Screen)	-8.5	-10.5	-13.0	-15.5	-18.5	-20.0	-20.0	-20.0	
Calculated Noise Level at Receptor	43.5	43.0	34.0	28.0	23.0	18.0	16.0	6.5	32.0

Total Daytime Noise Level

	Sound Pressure Level (dB re 2x10^{-5} Pa) at Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
4 x Samsung AC052FCADEH/EU at Receptor	29.5	31.0	28.0	22.5	16.0	10.0	7.0	0.5	24.0
4 x Samsung AM100JXVHGR/EU at Receptor	56.0	43.5	39.0	34.0	22.0	17.0	11.5	4.5	36.0
2 x Samsung AM100KXMDGH/EU At Receptor	43.5	43.0	34.0	28.0	23.0	18.0	16.0	6.5	32.0
Façade Effect	+3	+3	+3	+3	+3	+3	+3	+3	
Total Cumulative Noise Level of all Plant at Receptor	59.0	49.5	43.5	38.0	29.0	24.0	20.5	12.0	40.5

Our calculations indicate that the proposed plant, with the specified mitigation measures, should be capable of achieving the requirements of the Local Authority outlined in Section 8.0.

Total Night-time Noise Level

	Sound Pressure Level (dB re 2x10^{-5} Pa) at Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
4 x Samsung AC052FCADEH/EU at Receptor	29.5	31.0	28.0	22.5	16.0	10.0	7.0	0.5	24.0
Façade Effect	+3	+3	+3	+3	+3	+3	+3	+3	
Total Cumulative Noise Level of all Plant at Receptor	**32.5**	**34.0**	**31.0**	**25.5**	**19.0**	**13.0**	**10.0**	**3.5**	**27.0**

Our calculations indicate that the proposed plant, with the specified mitigation measures should be capable of achieving the requirements of the Local Authority outlined in Section 8.0.

10.0 Conclusions

An environmental noise survey has been undertaken in order to establish the currently prevailing noise levels.

Plant noise emission criteria have been recommended based on the results of the noise survey and with reference to the Local Authority's requirements.

An assessment has been carried out to determine the plant noise emissions at the nearest noise sensitive window.

The assessment indicates that the proposed plant, in line with the specified mitigation measures, should be capable of achieving the proposed environmental noise criteria at the nearest noise sensitive window.

Appendix A

The acoustic terms used in this report are defined as follows:

dB — Decibel - Used as a measurement of sound level. Decibels are not an absolute unit of measurement but an expression of ratio between two quantities expressed in logarithmic form. The relationships between Decibel levels do not work in the same way that non-logarithmic (linear) numbers work (e.g. 30dB + 30dB = 33dB, not 60dB).

dBA — The human ear is more susceptible to mid-frequency noise than the high and low frequencies. The 'A'-weighting scale approximates this response and allows sound levels to be expressed as an overall single figure value in dBA. The $_A$ subscript is applied to an acoustical parameter to indicate the stated noise level is A-weighted

It should be noted that levels in dBA do not have a linear relationship to each other; for similar noises, a change in noise level of 10dBA represents a doubling or halving of subjective loudness. A change of 3dBA is just perceptible.

$L_{90,T}$ — L_{90} is the noise level exceeded for 90% of the period *T* (i.e. the quietest 10% of the measurement) and is often used to describe the background noise level.

$L_{eq,T}$ — $L_{eq,T}$ is the equivalent continuous sound pressure level. It is an average of the total sound energy measured over a specified time period, *T*.

L_{max} — L_{max} is the maximum sound pressure level recorded over the period stated. L_{max} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the L_{eq} noise level.

Sound Pressure Level (L_p) is the sound pressure relative to a standard reference pressure of 2×10^{-5} Pa. This level varies for a given source according to a number of factors (including but not limited to: distance from the source; positioning; screening and meteorological effects).

Sound Power Level (SWL or L_w) is the total amount of sound energy inherent in a particular sound source, independent of its environment. It is a logarithmic measure of the sound power in comparison to a specified reference level (usually 10^{-12} W).

HT: 24230 **3 October 2017**

39 – 49 Neal Street, London

Acoustic Specification for

Acoustic Screen

Acoustic screening shall extend:

- continuously around all sides of the plant area.
- from the roof up to a minimum height of 2000mm above roof level.

The screen shall be imperforate (solid) and have a minimum mass per unit area of at least 10kg/m^2. This could be achieved using two or more layers of a wide range of materials including, for example, plywood or equivalent sheeting board to a suitable thickness required to achieve the mass per unit area. All junctions should be staggered.

Doors, access panels and service penetrations shall be treated so as to maintain the acoustic performance of the assembled screen.

All junctions between the screen and adjacent structures shall be made good and sealed with a heavy grout and/or dense non-hardening mastic.

The complete structure shall be wind and weather resistant to standards agreed with the Client.

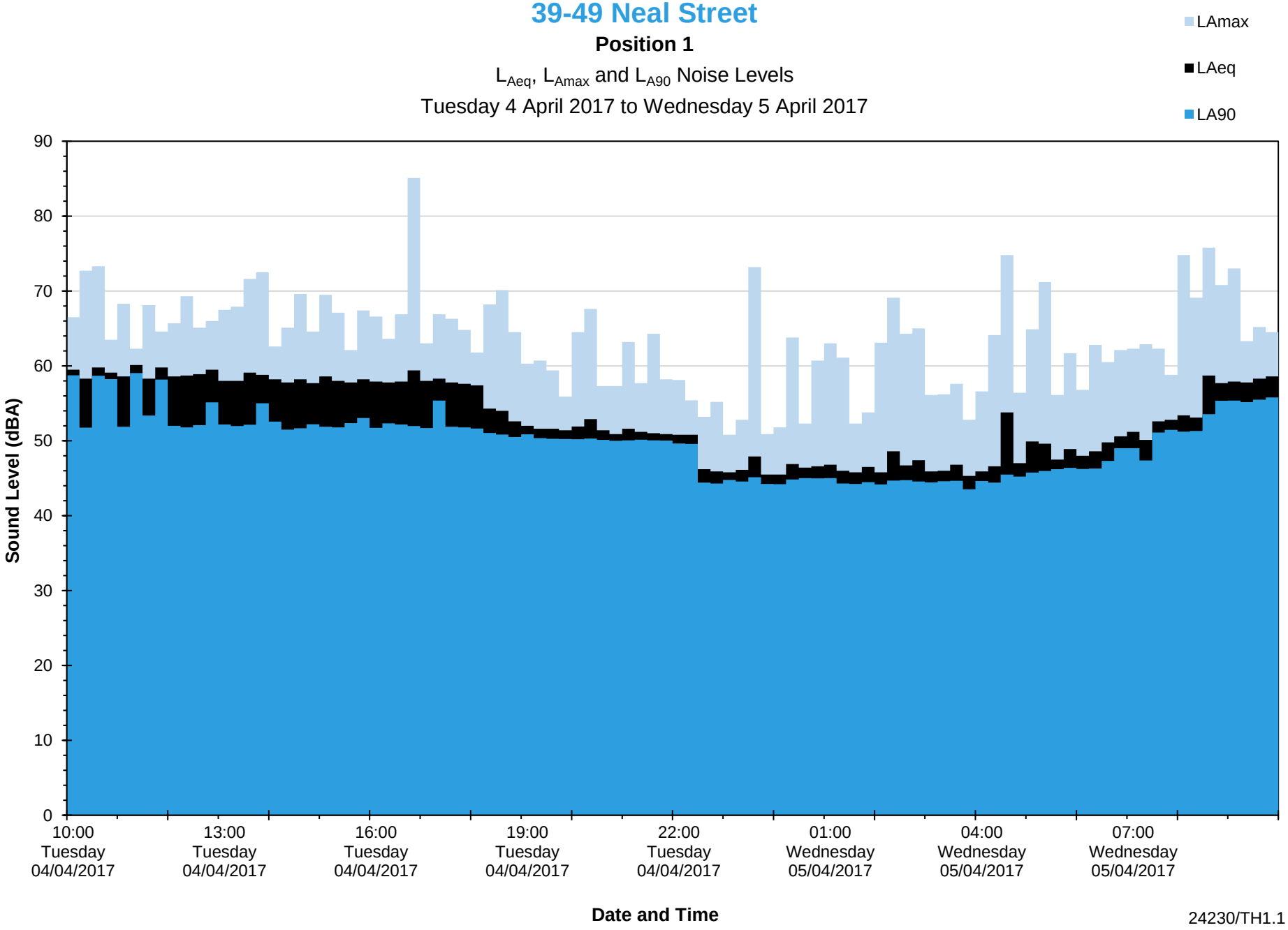
The exact design of the screen will be agreed with and approved by Hann Tucker Associates.

39-49 Neal Street

Position 1

L_{Aeq}, L_{Amax} and L_{A90} Noise Levels

Tuesday 4 April 2017 to Wednesday 5 April 2017



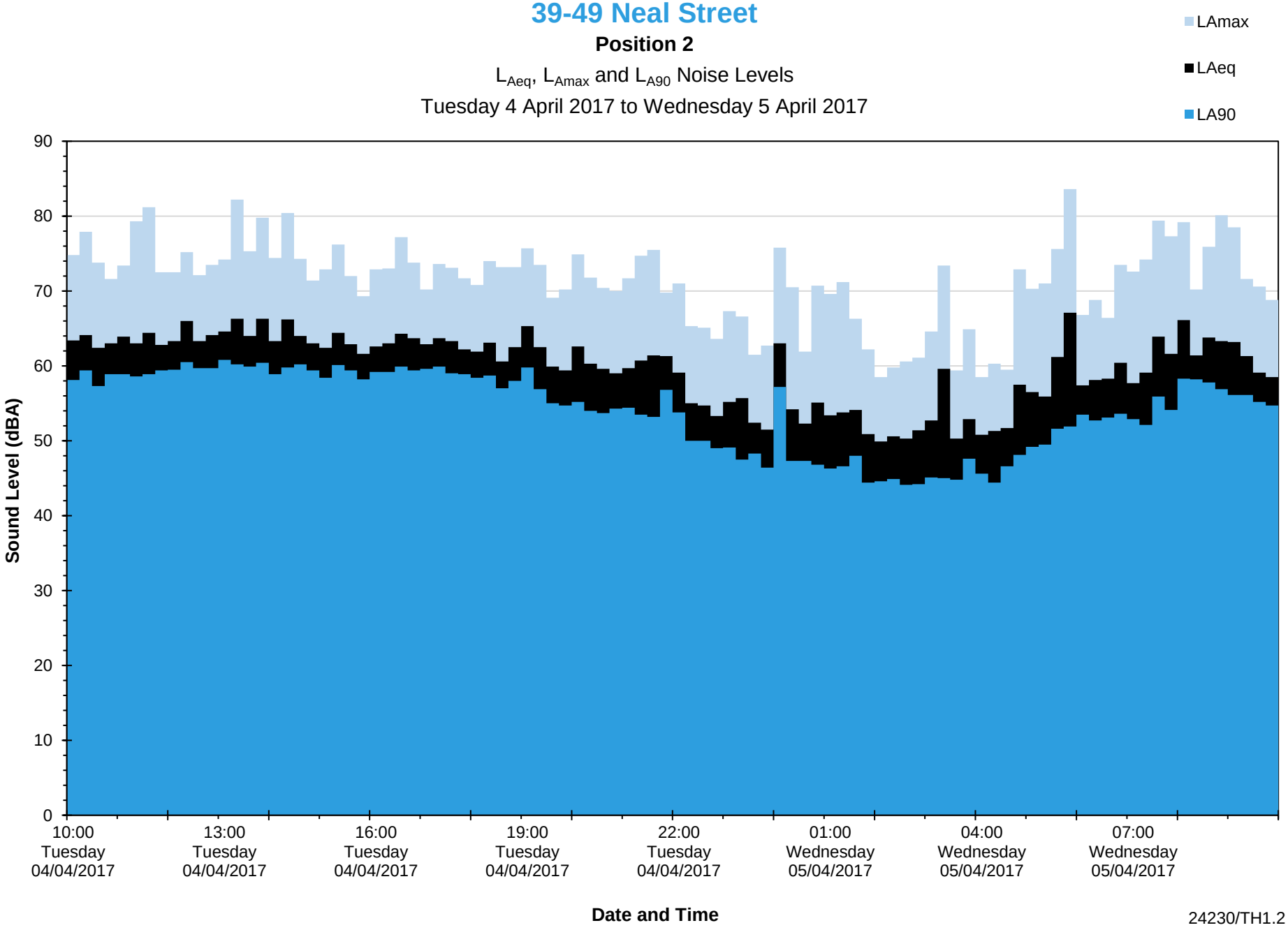
24230/TH1.1

39-49 Neal Street

Position 2

L_{Aeq}, L_{Amax} and L_{A90} Noise Levels

Tuesday 4 April 2017 to Wednesday 5 April 2017



24230/TH1.2