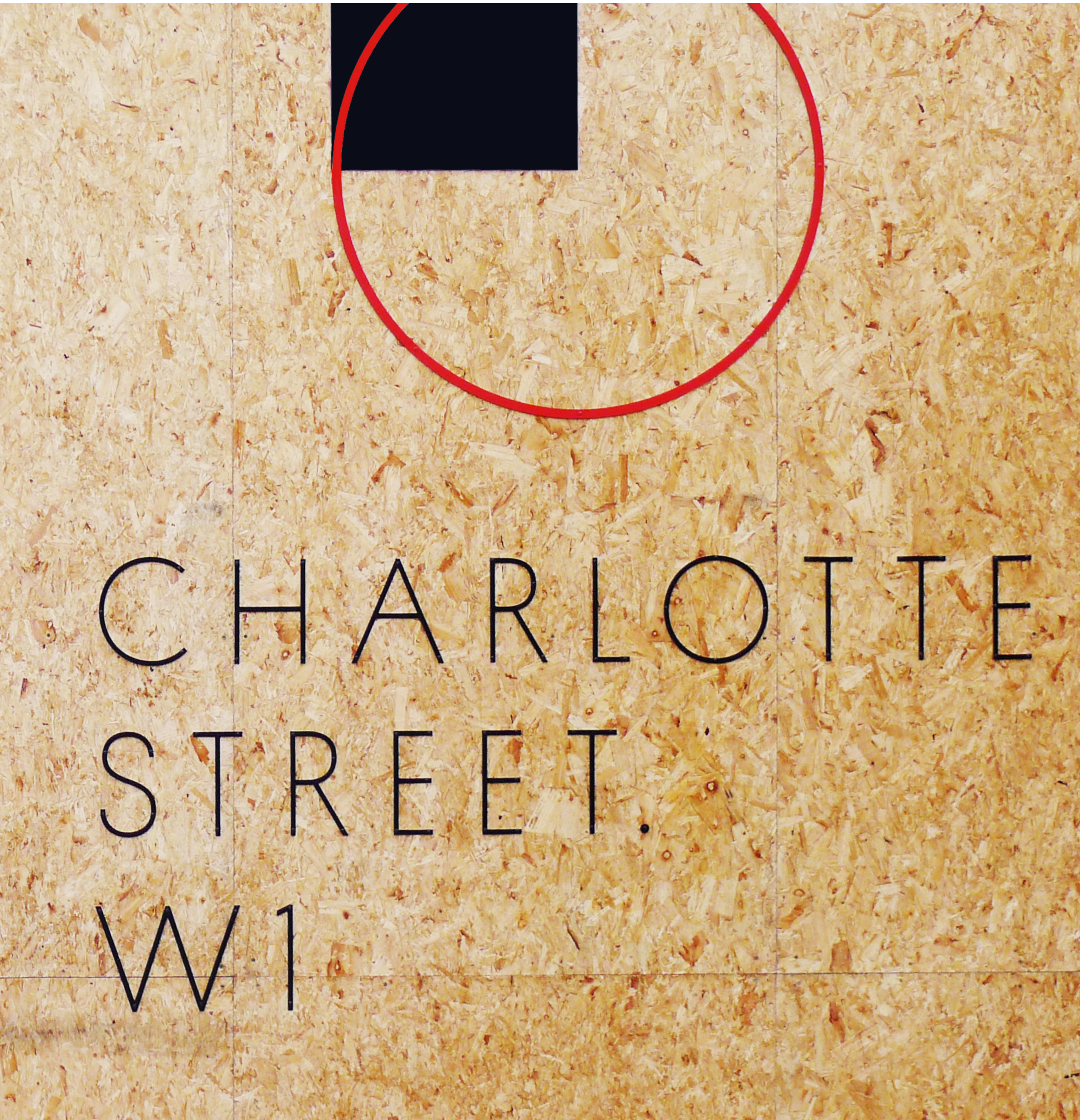
80 Charlotte Street & 65 Whitfield Street:

Minor Material Amendment – Noise Impact Addendum Assessment

Date
December 2015



clarke saunders | acoustics

specialist consultants

REPORT AS6171.151126.NIA1.1

80 CHARLOTTE STREET, LONDON

NOISE IMPACT ASSESSMENT (ADDENDUM)

Prepared: 30 November 2015

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List of Attachments

1.0 INTRODUCTION

The addendum assessment provides an update on acoustic matters given amendments proposed to the approved scheme at 80 Charlotte Street and 65 Whitfield Street (the Site). Planning permission for the full redevelopment of the Site was granted in March 2012 under application reference 2010/6873/P. The submission was accompanied by an Acoustic Statement (dated December 2010) which considered the prevailing noise climate at the Site and concluded that it would be suitable for residential development. The purpose of this addendum assessment is to update the environmental noise survey to ensure that any change to the prevailing noise climate, including the plant equipment proposed at the Site, is acceptable given design and noise criteria. The addendum assessment supports a minor material amendment application for additional demolition at the Site, which results in a number of design changes to the approved scheme.

Vibration levels were measured during the noise surveys and confirmed to have not altered since the previous survey. This assessment does not update the vibration or external building fabric elements of the approved December 2010 Acoustic Statement, as these elements are still current and acceptable.

2.0 SURVEY PROCEDURE & EQUIPMENT

A survey of the existing background noise levels was undertaken at sixth floor roof level of the existing building at the locations shown in site plan AS6171/SP1. Measurements of consecutive 5-minute L_{Aeq}, L_{Amax}, L_{A10} and L_{A90} sound pressure levels were taken between 09:55 hours on Thursday 19th and 10:40 hours on Monday 23rd November 2015.

These measurements will allow suitable noise criteria to be set for the new building services plant, dependent on hours of operation.

The following equipment was used during the course of the survey:

- 3 no. NTi data logging sound level meters type XL2;
- 1 no. Svantek data logging sound level meter type 958;
- Rion sound level calibrator type NC-74.

The calibration of the sound level meter was verified before and after use. No calibration drift was detected.

The weather during the survey had periods of dry weather with light winds, which made the conditions suitable for the measurement of environmental noise.

Measurements were made generally in accordance with ISO 1996-2:2007 *Acoustics - Description, measurement and assessment of environmental noise – Part 2: Determination of environmental noise levels*.

Please refer to Appendix A for details of the acoustic terminology used throughout this report.

3.0 RESULTS

Figures AS6171/TH1-TH18 show the L_{Aeq}, L_{Amax}, L_{A10} and L_{A90} sound pressure levels as time histories at the measurement position.

4.0 DISCUSSION

The background noise climate at the site is determined by roof-mounted plant on surrounding buildings and road traffic noise in the surrounding streets with occasional aircraft noise.

Measured minimum background noise levels are shown in Table 4.1 below.

Location	Monitoring period	Minimum $L_{A90, 5 mins}$
Chitty Street	07:00 - 23:00 hours	50 dB 10:30 - 10:35, 22/11/15
Charlotte Street		52 dB 07:00 - 07:05, 20/11/15
Howland Street		50 dB 07:00 - 07:05, 22/11/15
Whitfield Street		50 dB 20:35 - 20:40, 21/11/15
Chitty Street	23:00 - 07:00 hours	49 dB 3:40 - 3:45, 23/11/15
Charlotte Street		47 dB 3:00 - 3:05, 20/11/15
Howland Street		50 dB 5:40 - 5:45, 22/11/15
Whitfield Street		48 dB 05:45 - 5:50, 22/11/15

Table 4.1 - Minimum measured background noise levels **[dB ref. 20µPa]**

5.0 DESIGN CRITERIA

5.1 Local Authority Requirements

Condition 4 attached to the planning permission requires new plant to be 5dB below the background level. It states that:

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 (or any part of it) is in operation unless the plant/equipment hereby permitted 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), then the noise levels from that piece of plant/equipment at any sensitive façade shall be at least 10dB(A) below the L_{A90}, expressed in dB(A).

It is not expected that tonal noise will be generated by the proposed plant units and so the plant noise emissions criteria that should not be exceeded at the nearest noise sensitive receiver should be set to the proposed levels detailed in Table 5.1.

Location	Monitoring period	$L_{Aeq, T}$
Chitty Street	07:00 - 23:00 hours	45 dB
Charlotte Street		47 dB
Howland Street		45 dB
Whitfield Street		45 dB
Chitty Street	23:00 - 07:00 hours	44 dB
Charlotte Street		42 dB
Howland Street		45 dB
Whitfield Street		43 dB

Table 5.1 - Proposed design noise criteria at noise sensitive receivers **[dB ref. 20µPa]**

5.2 External Noise Emissions (Emergency Plant)

London Borough of Camden do not currently have a specific design criterion for noise in relation to emergency plant noise emissions.

It is proposed, therefore, to set the design noise criterion for emergency operational plant at the nearest noise sensitive receiver to 10dB above the background noise level, using the noise monitoring data, as shown in Table 5.2.

It should be noted that any standby (as opposed to 'emergency') plant, however, would need to achieve the plant noise emissions criteria detailed in Table 5.1.

Location	24 hour $L_{Aeq, T}$
Chitty Street	59 dB
Charlotte Street	57 dB
Howland Street	50 dB
Whitfield Street	58 dB

Table 5.2 Emergency plant noise criteria at nearest noise sensitive receivers **[dB ref. 20µPa]**

5.3 BS8233:2014 *Guidance on sound insulation and noise reduction for buildings*

The guidance in this document indicates suitable noise levels for various activities within residential and commercial buildings.

The relevant sections of this standard are shown in the following table:

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living Room	35 dB $L_{Aeq, 16 hour}$	-
Dining	Dining Room	40 dB $L_{Aeq, 16 hour}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq, 16 hour}$	30 dB $L_{Aeq, 8 hour}$
Work requiring concentration	Executive Office	35-40 dB $L_{Aeq, T}$	-
Work requiring concentration	Open Plan Office	45-50 dB $L_{Aeq, T}$	-

Table 5.3 - Excerpt from BS8233: 2014 **[dB ref. 20µPa]**

6.0 PREDICTED NOISE IMPACT

6.1 Proposed plant

The selected plant has been confirmed as:

- 3 no. AHUs
- 3 no. Climaventa TECS2/SL-CA 0522 Air cooled Chillers
- 1 no. Climaventa Air to water Heat Pump
- 1 no. Climaventa Air to water Heat Pump
- 1 no. Climaventa ERACS2-Q/SL-CA2022 Air to water Heat Pump
- 2 no. Residential Heat Pumps
- 2 no. Mitsubishi PURY-P400YJM-A VRF Heat Pump Condensers
- 4 no. Heat Pump Boiler
- 4 no. Enclosed Chilled Water Pumps
- 6 no. Enclosed Heat Pump Pumps
- 6 no. Enclosed Chiller Pumps
- 2 no. Nuaire WC extract fan
- 2 no. ETFE Pressurisation units
- 3 no. ETFE Inflation fans
- 2 x Colt Extract Fan (emergency)
- 1 x FG Wilson P800P1 Generator (emergency)

The approximate location of the plant to be installed is shown in site plan AS6171/SP1.

Noise levels generated by the plant to be installed are summarised in Appendix B.

6.2 Predicted noise levels

Assessments have been undertaken to the most affected receivers on each road facing all façades of the building.

Due to the complexity of the building interaction in this locale and the likelihood of noise both reflecting off and being screened by the proposed plant and surrounding buildings, 3D noise mapping was implemented to ensure the most accurate prediction of plant noise levels at the nearest noise sensitive receivers.

This process uses several different calculation protocols to derive accurate noise analysis predictions. Noise propagation and barrier attenuation are calculated in accordance with ISO 9613-1:1993 *Acoustics - Attenuation of sound during propagation outdoors - Part 1: Calculation of the absorption of sound by the atmosphere* and ISO 9613-2:1996 *Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation*.

The cumulative noise level at the nearest noise sensitive receiver has been assessed according to the guidelines set out in BS4142:1997 *Method for rating industrial noise affecting mixed residential and industrial areas* as guidance, using the noise data above.

Location	24-hour plant noise design criterion, $L_{Aeq, T}$	Predicted noise level, $L_{Aeq, T}$
Chitty Street	44 dB	36 dB
Charlotte Street	42 dB	41 dB
Howland Street	45 dB	39 dB
Whitfield Street	43 dB	43 dB

Table 6.1 – Operational plant noise levels at nearest noise sensitive receivers **[dB ref. 20µPa]**

The calculated noise levels at the receivers due to emergency plant are shown in Table 6.2.

Location	Emergency plant noise design criterion, $L_{Aeq, T}$	Predicted noise level, $L_{Aeq, T}$
Chitty Street	59 dB	31 dB
Charlotte Street	57 dB	45 dB
Howland Street	50 dB	34 dB
Whitfield Street	58 dB	33 dB

Table 6.2 - Emergency plant noise levels at nearest noise sensitive receivers **[dB ref. 20µPa]**

6.3 Comparison to BS8233:2014 Criteria

BS8233 assumes a loss of approximately 15dB for a partially open window. The external noise level shown in Table 6.1 would result in an internal noise levels that would meet the level shown in Table 5.3.

7.0 CONCLUSION

An environmental noise survey has been undertaken at 80 Charlotte Street, London by Clarke Saunders Associates between Thursday 19th and Monday 23rd November 2015.

Measurements have been made to establish the current background noise climate. This has enabled a 24-hour design criterion to be set for the control of plant noise emissions to noise sensitive properties, in accordance with requirements set in Condition 4 attached to the permission granted in March 2012.

Data for the plant now proposed have been used to predict the noise impact of the new plant on neighbouring residential properties.

Compliance with the noise emission design criterion has been demonstrated. No further mitigation measures are, therefore, required for external noise emissions.

Jamie Duncan MIOA

CLARKE SAUNDERS ASSOCIATES

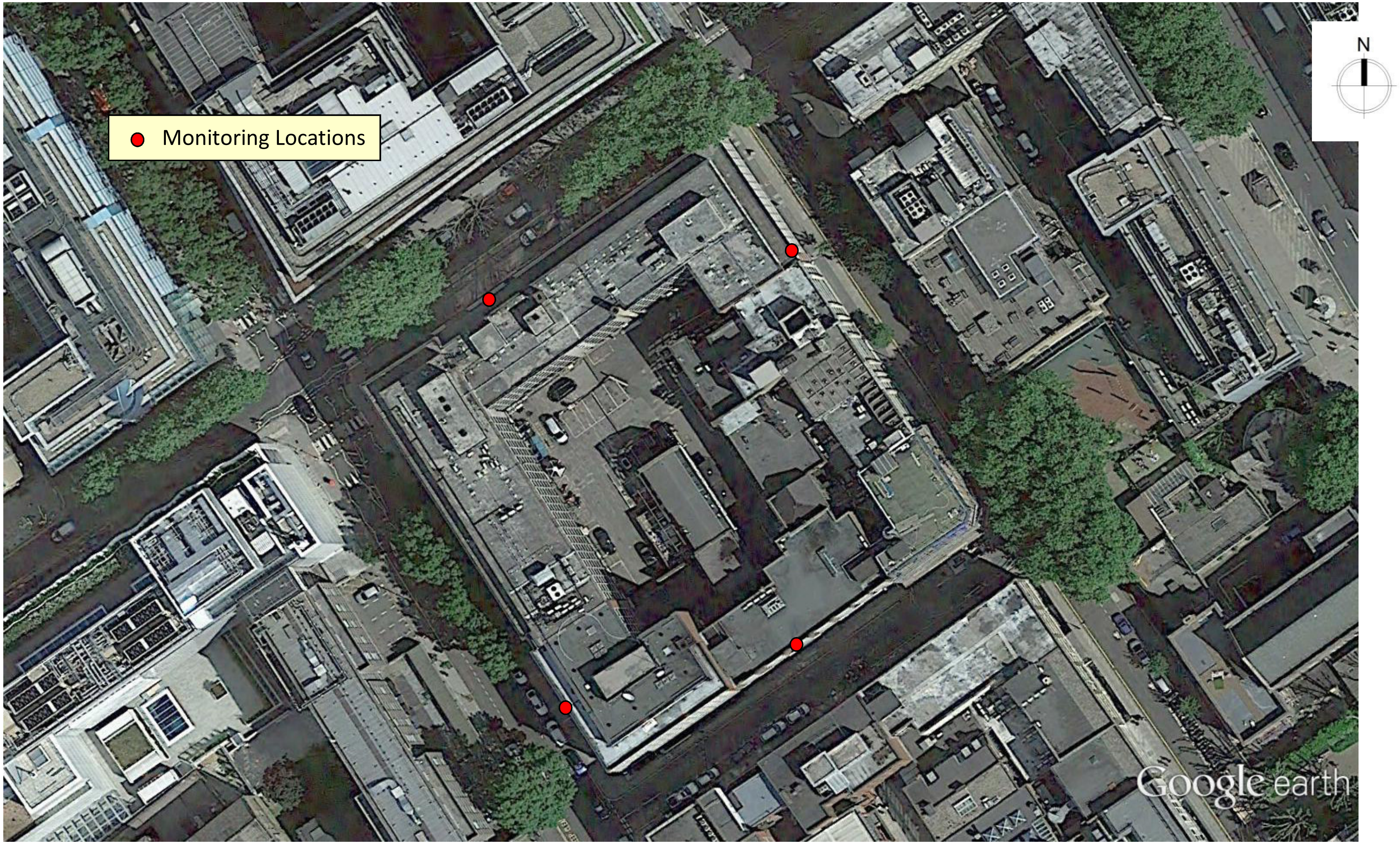
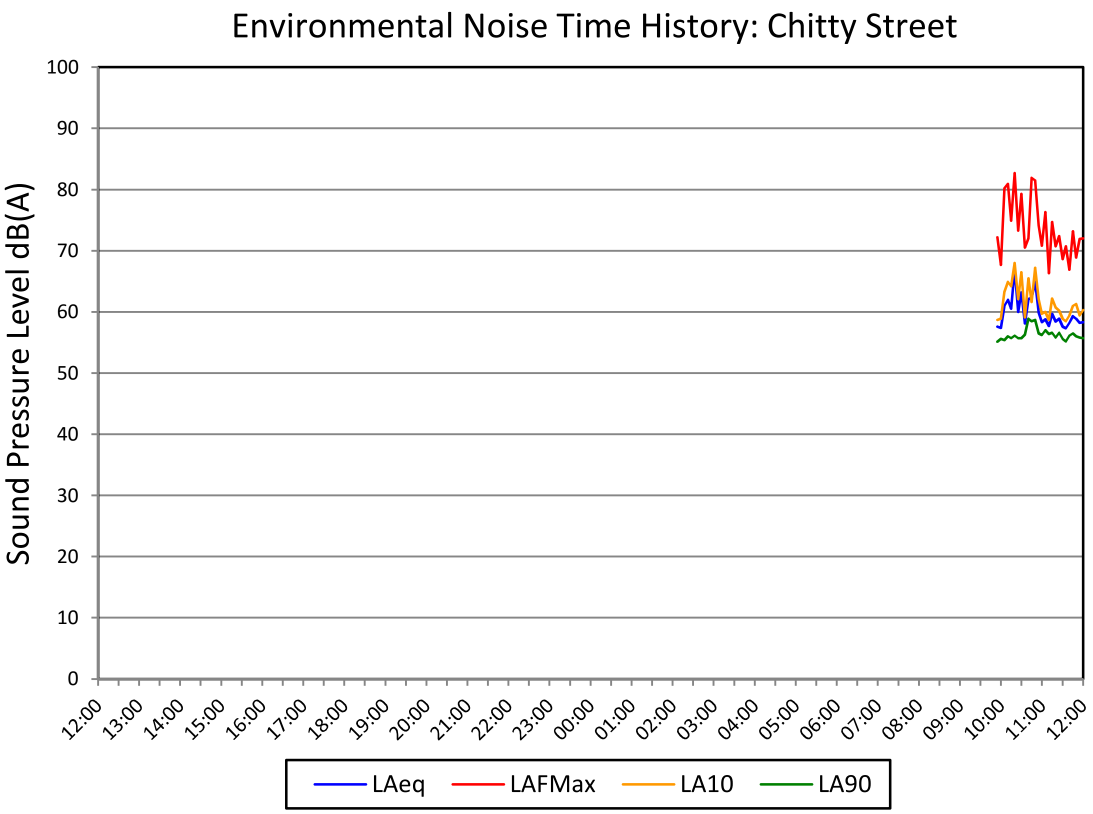


Figure AS6171/SP1

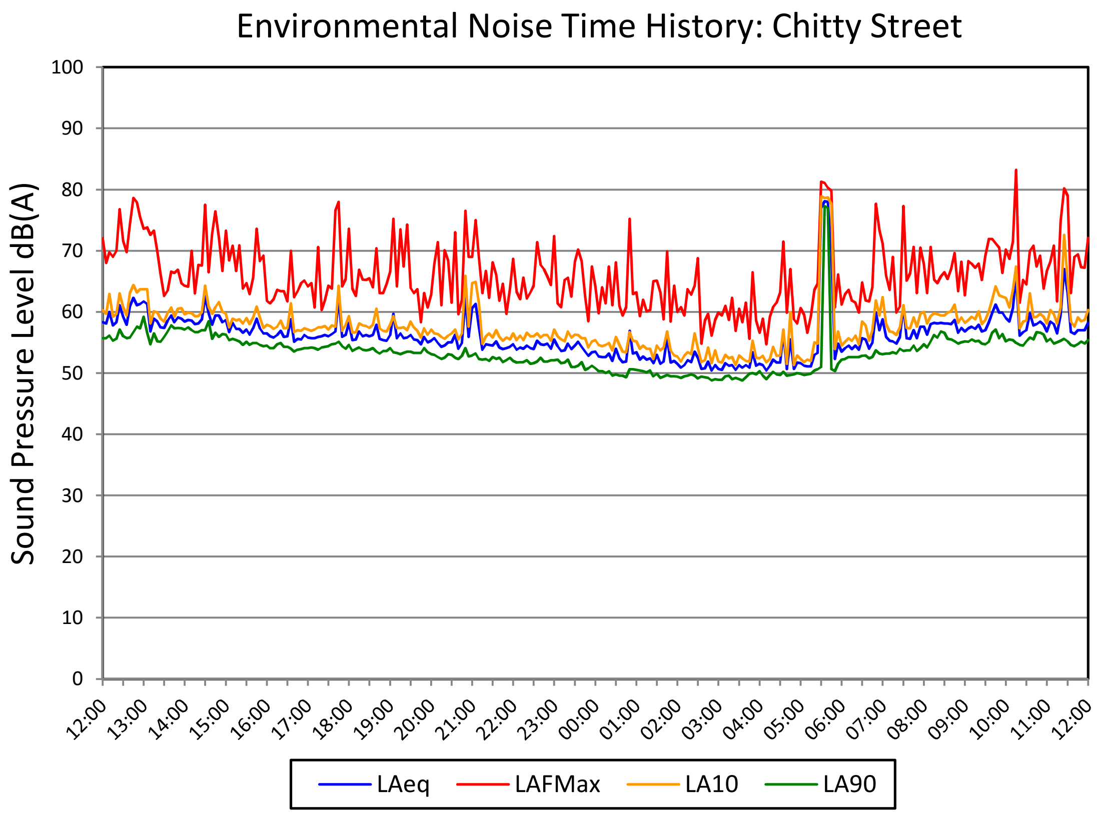
80 Charlotte Street, London



Wednesday 18 November to Thursday 19 November 2015

Figure AS6171/TH1

80 Charlotte Street, London

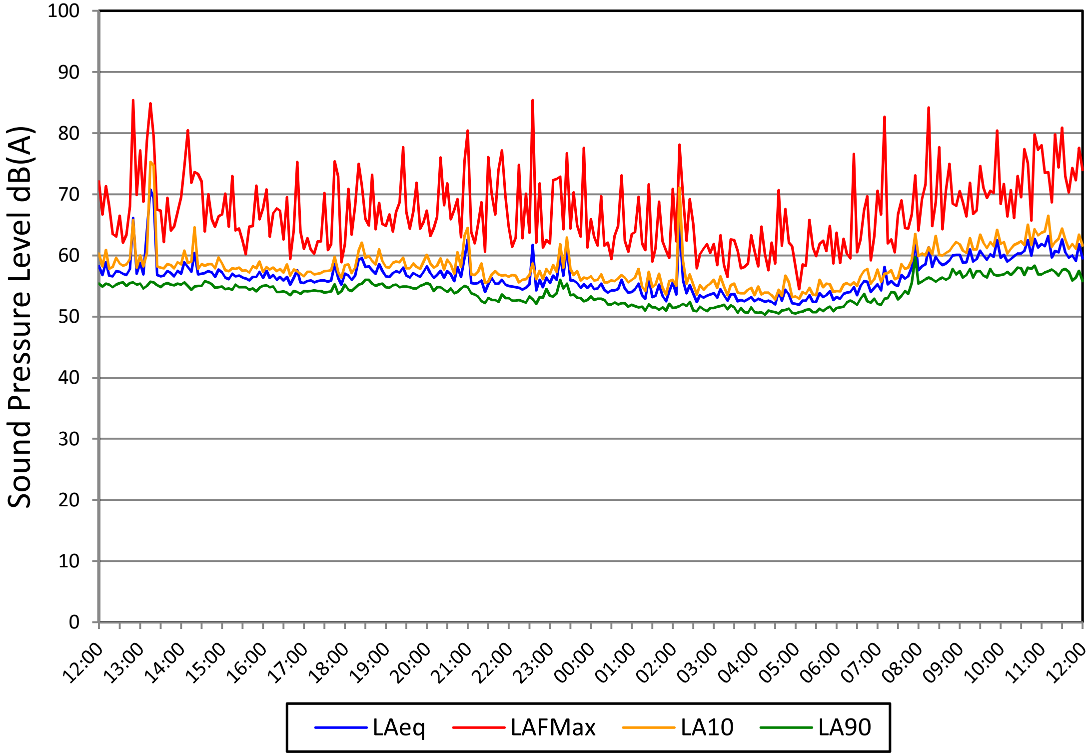


Thursday 19 November to Friday 20 November 2015

Figure AS6171/TH2

80 Charlotte Street, London

Environmental Noise Time History: Chitty Street

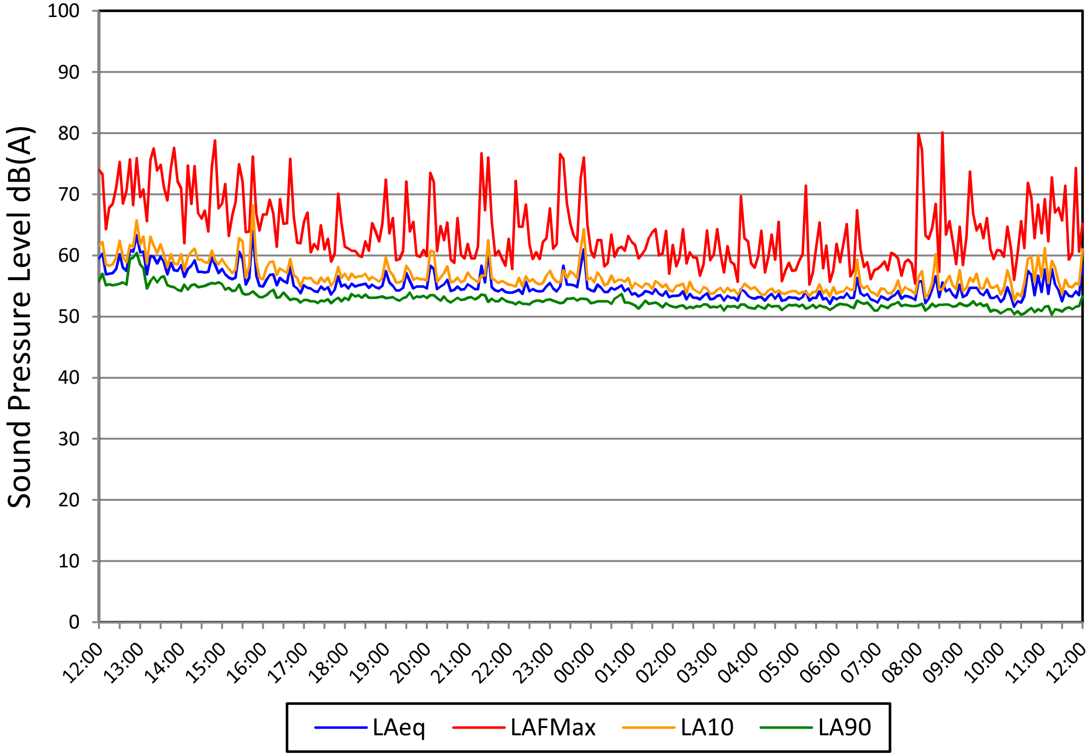


Friday 20 November to Saturday 21 November 2015

Figure AS6171/TH3

80 Charlotte Street, London

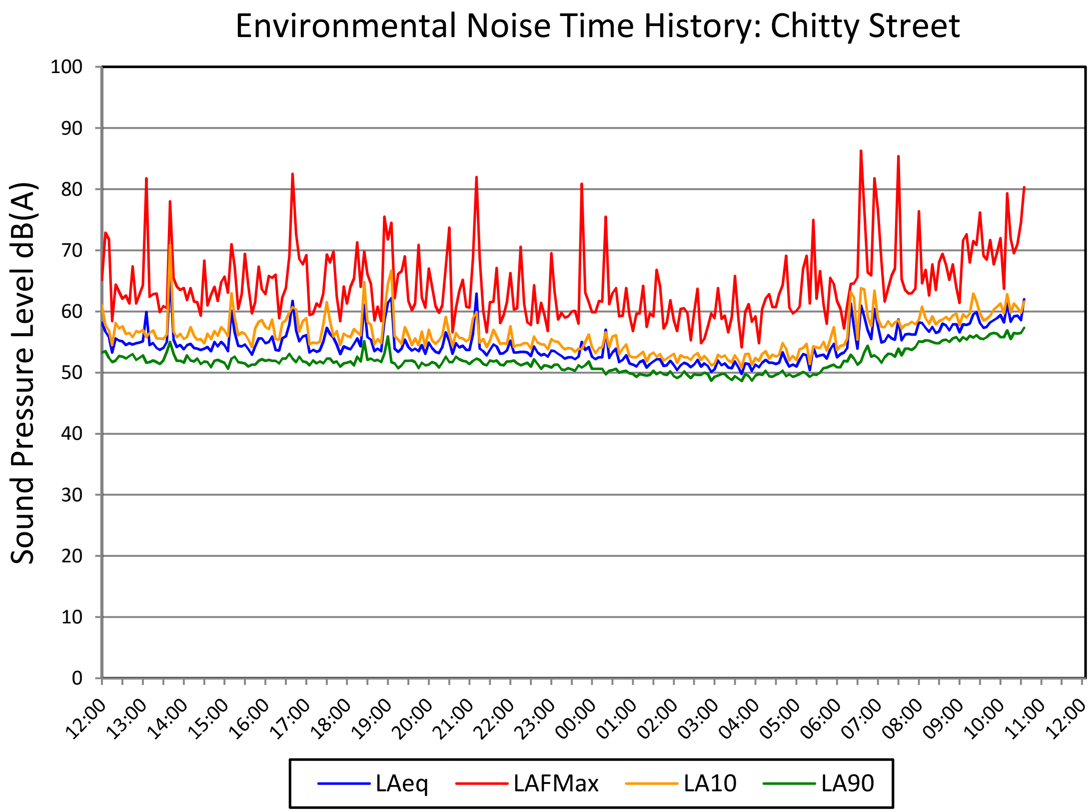
Environmental Noise Time History: Chitty Street



Saturday 21 November to Sunday 22 November 2015

Figure AS6171/TH4

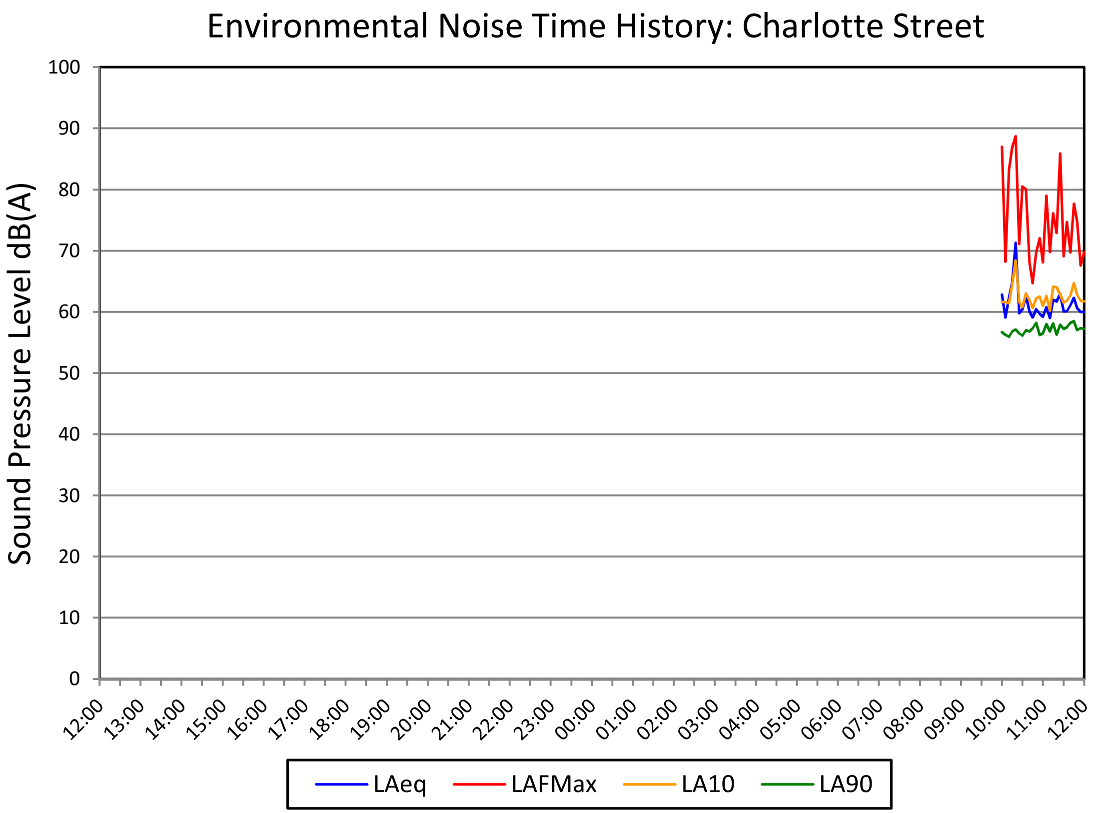
80 Charlotte Street, London



Sunday 22 November to Monday 23 November 2015

Figure AS6171/TH5

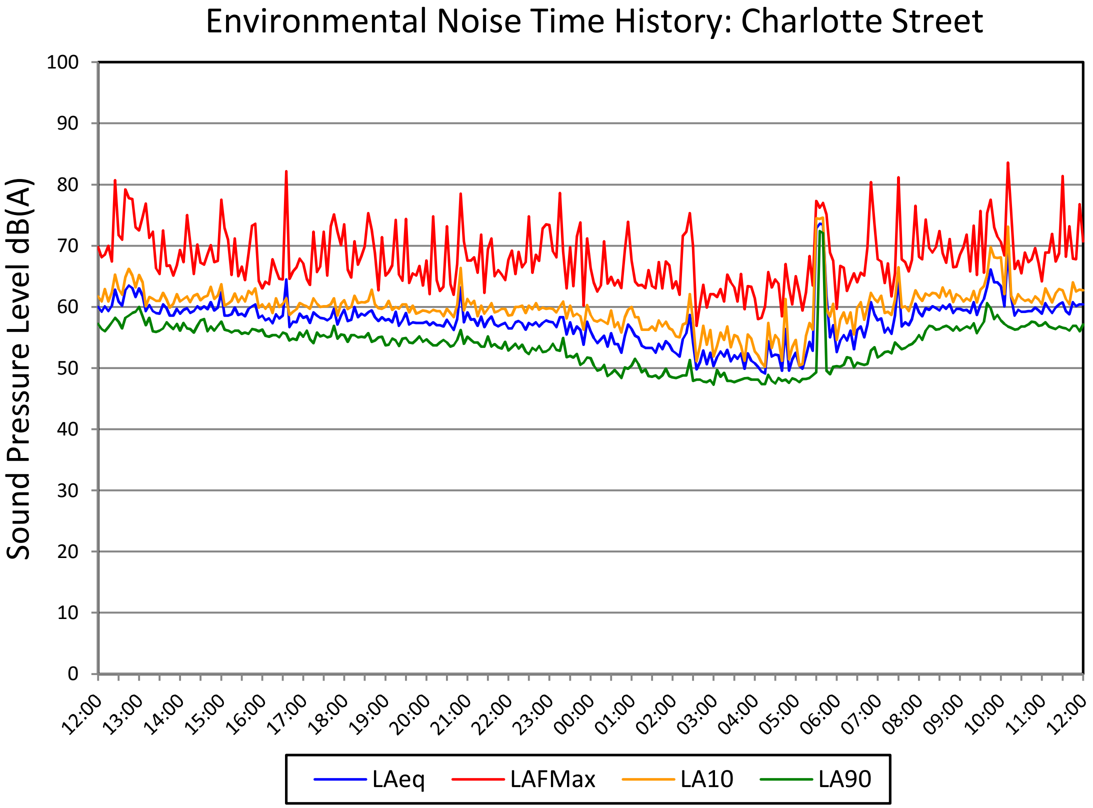
80 Charlotte Street, London



Wednesday 18 November to Thursday 19 November 2015

Figure AS6171/TH6

80 Charlotte Street, London



Thursday 19 November to Friday 20 November 2015

Figure AS6171/TH7

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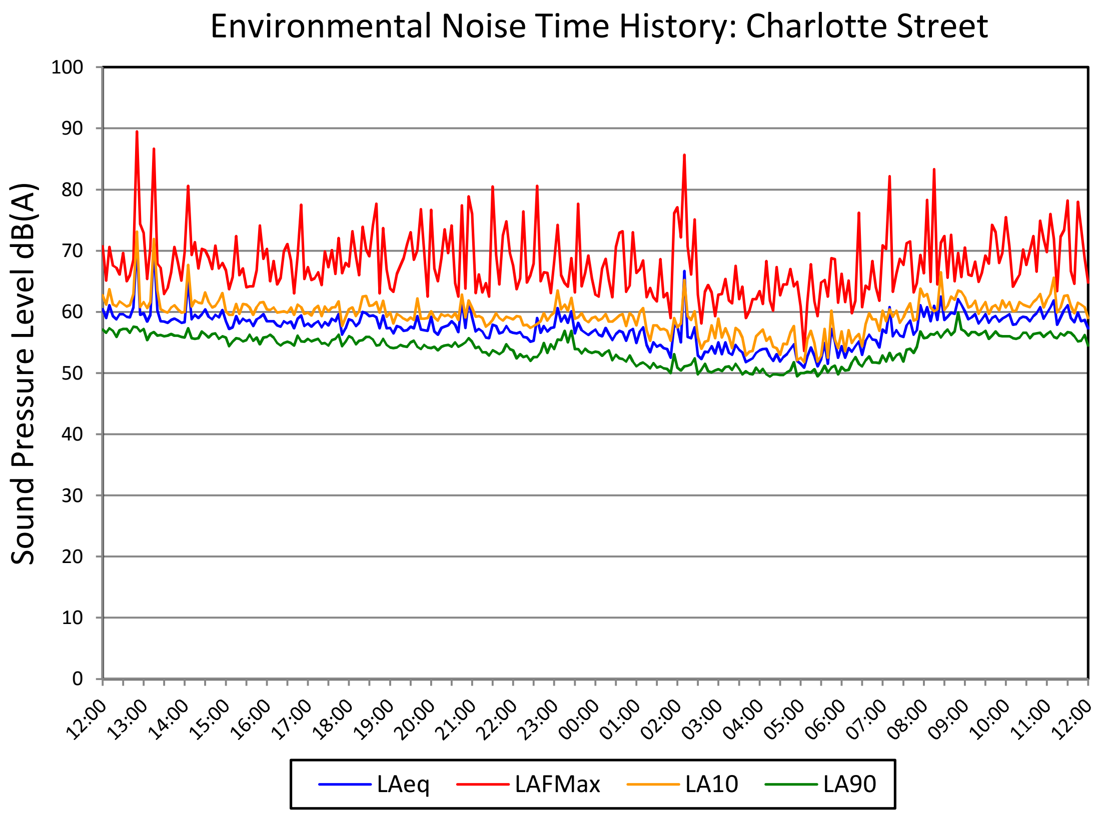
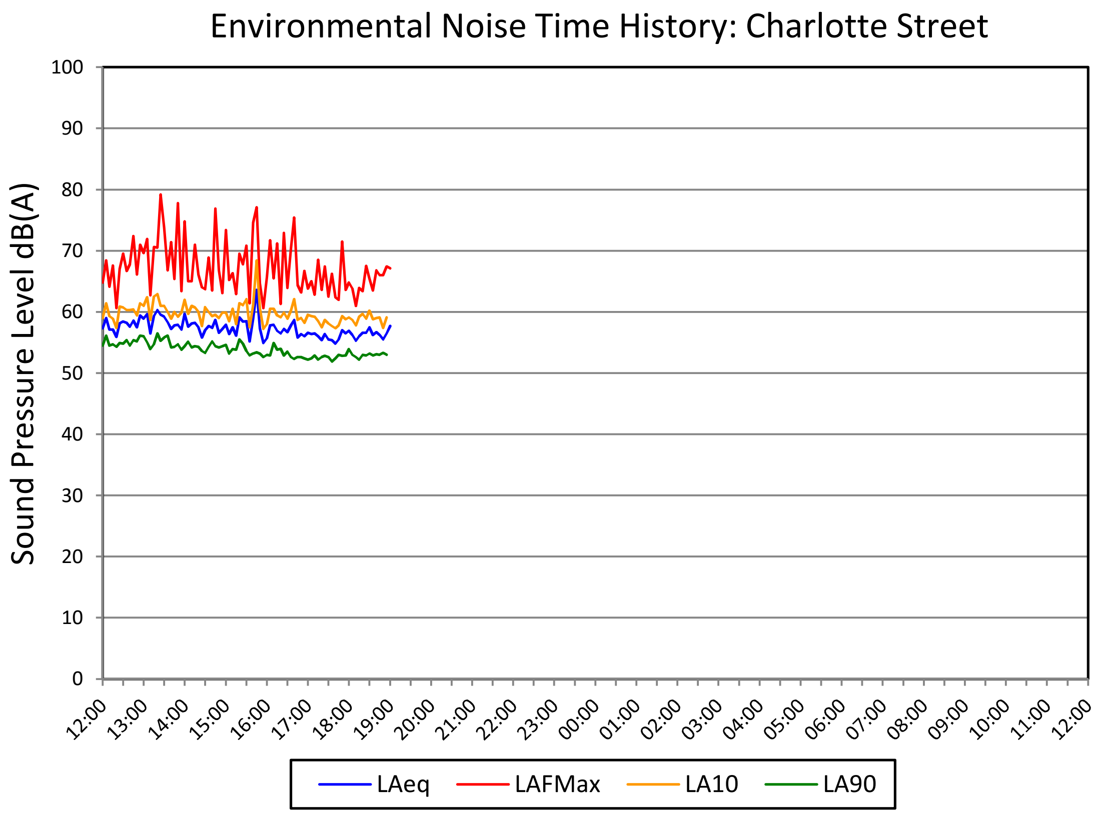


Friday 20 November to Saturday 21 November 2015

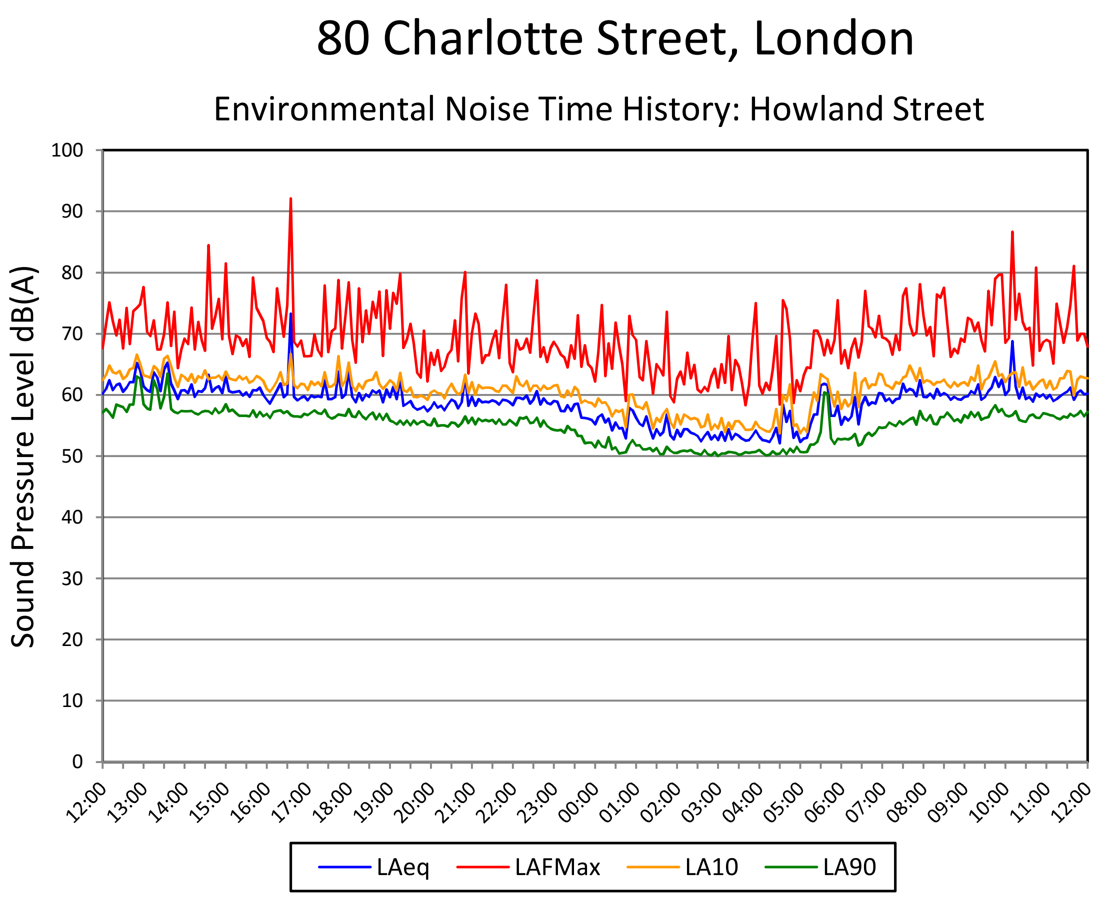
Figure AS6171/TH8

80 Charlotte Street, London



Saturday 21 November to Sunday 22 November 2015

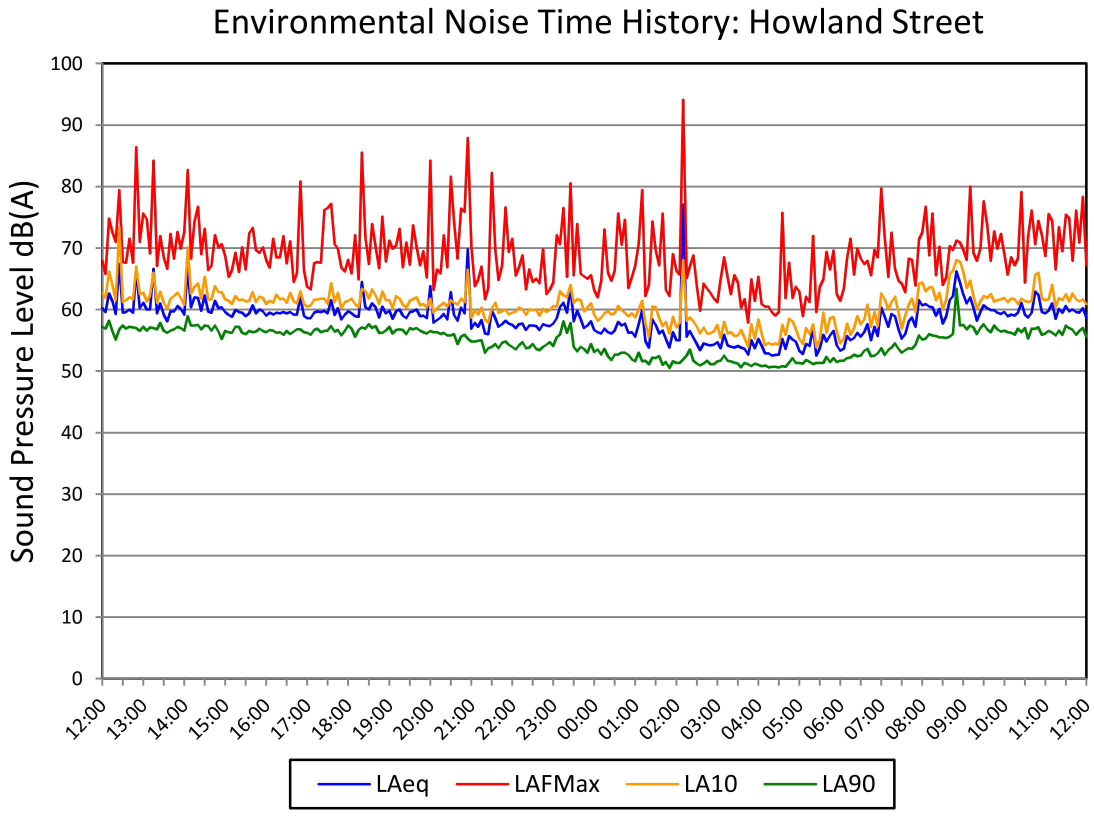
Figure AS6171/TH9



Thursday 19 November to Friday 20 November 2015

Figure AS6171/TH10

80 Charlotte Street, London

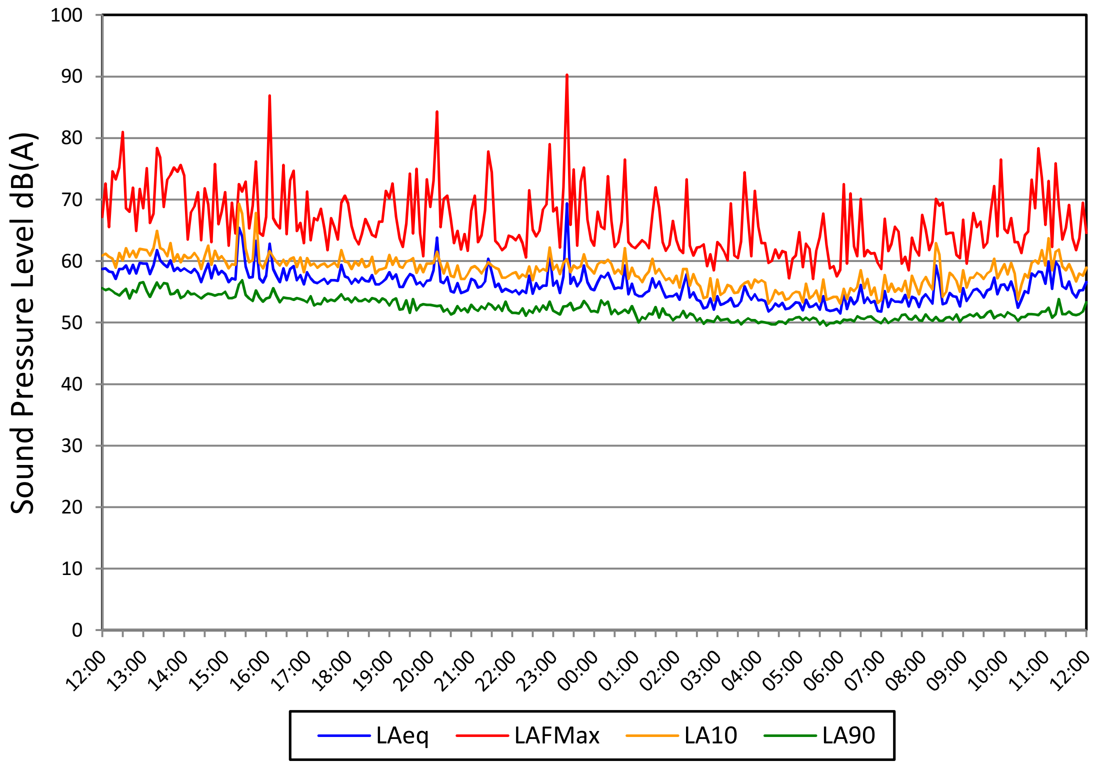


Friday 20 November to Saturday 21 November 2015

Figure AS6171/TH11

80 Charlotte Street, London

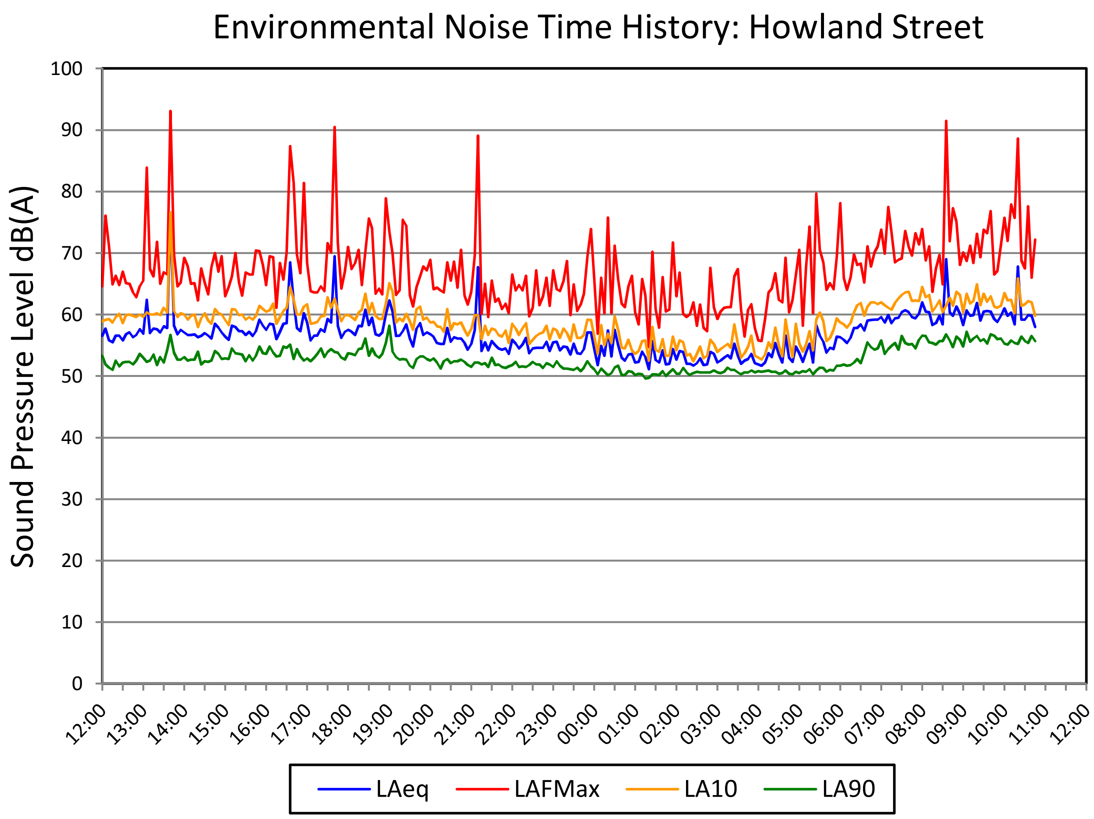
Environmental Noise Time History: Howland Street



Saturday 21 November to Sunday 22 November 2015

Figure AS6171/TH12

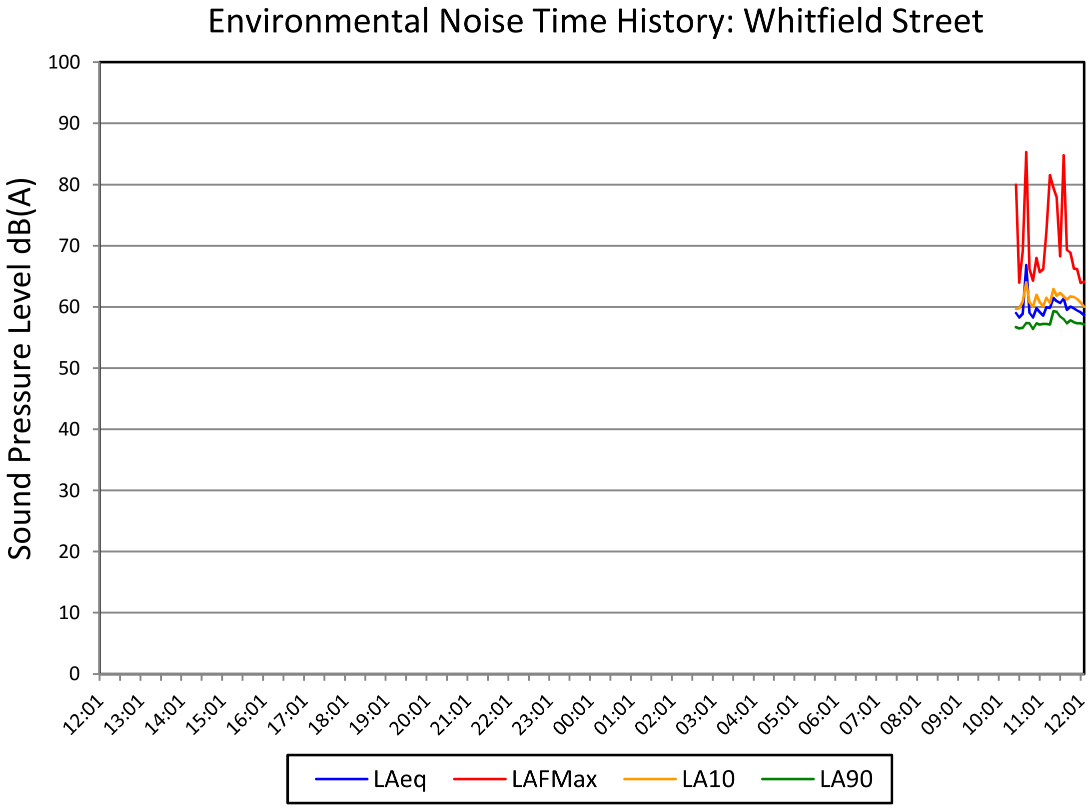
80 Charlotte Street, London



Sunday 22 November to Monday 23 November 2015

Figure AS6171/TH13

80 Charlotte Street, London

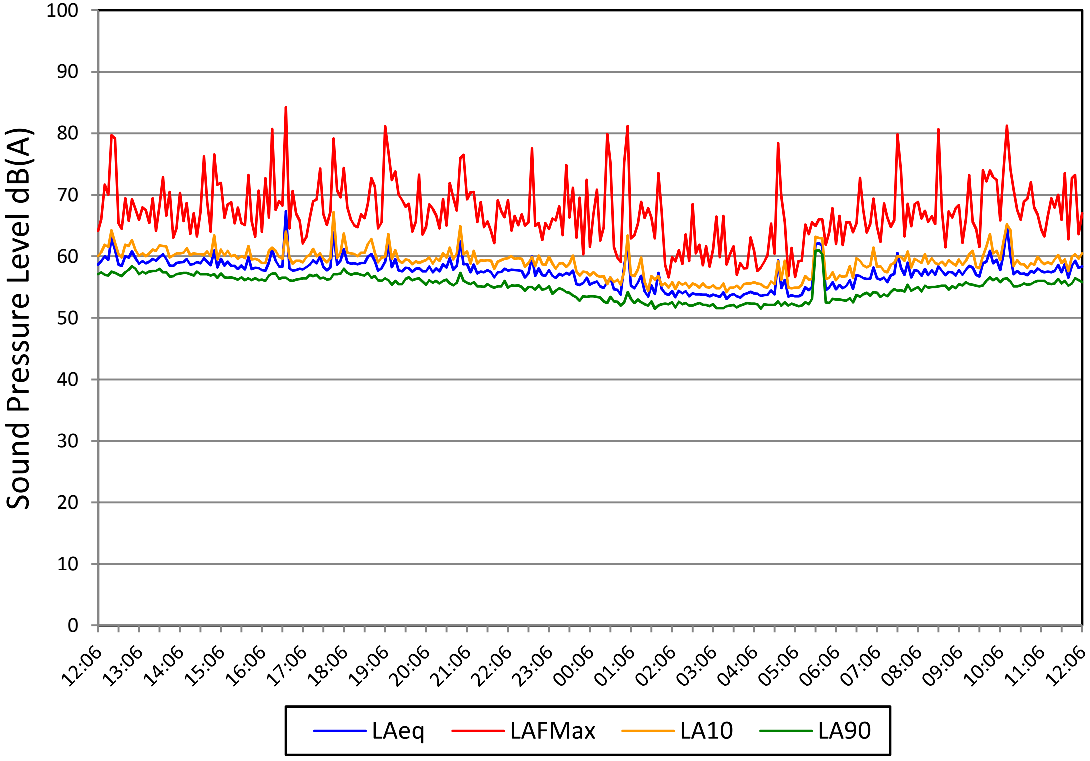


Wednesday 18 November to Thursday 19 November 2015

Figure AS6171/TH14

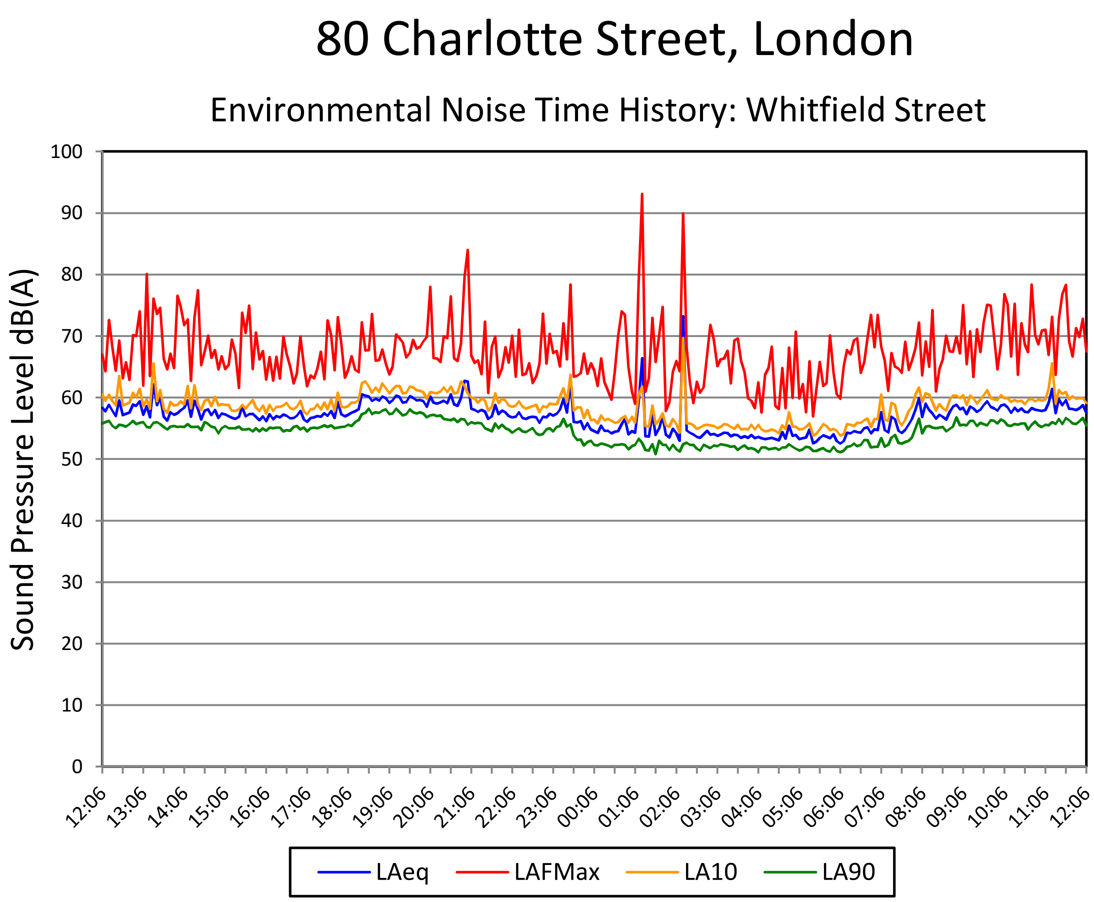
80 Charlotte Street, London

Environmental Noise Time History: Whitfield Street



Thursday 19 November to Friday 20 November 2015

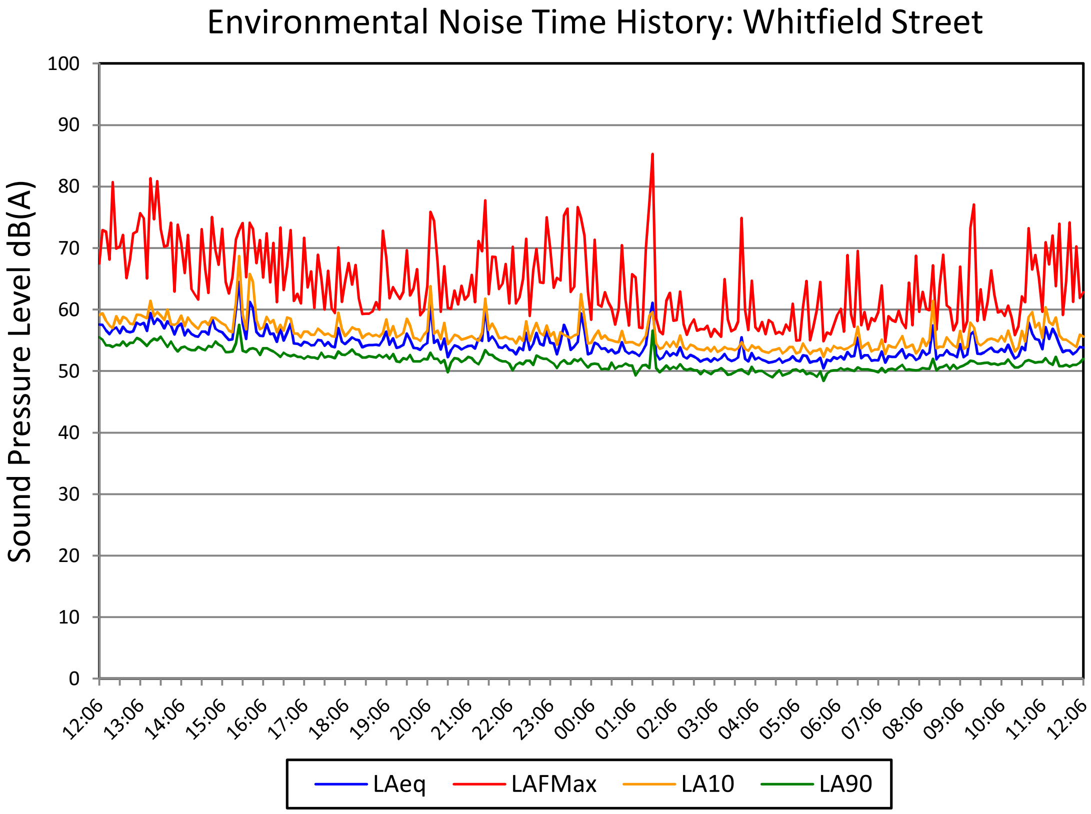
Figure AS6171/TH15



Friday 20 November to Saturday 21 November 2015

Figure AS6171/TH16

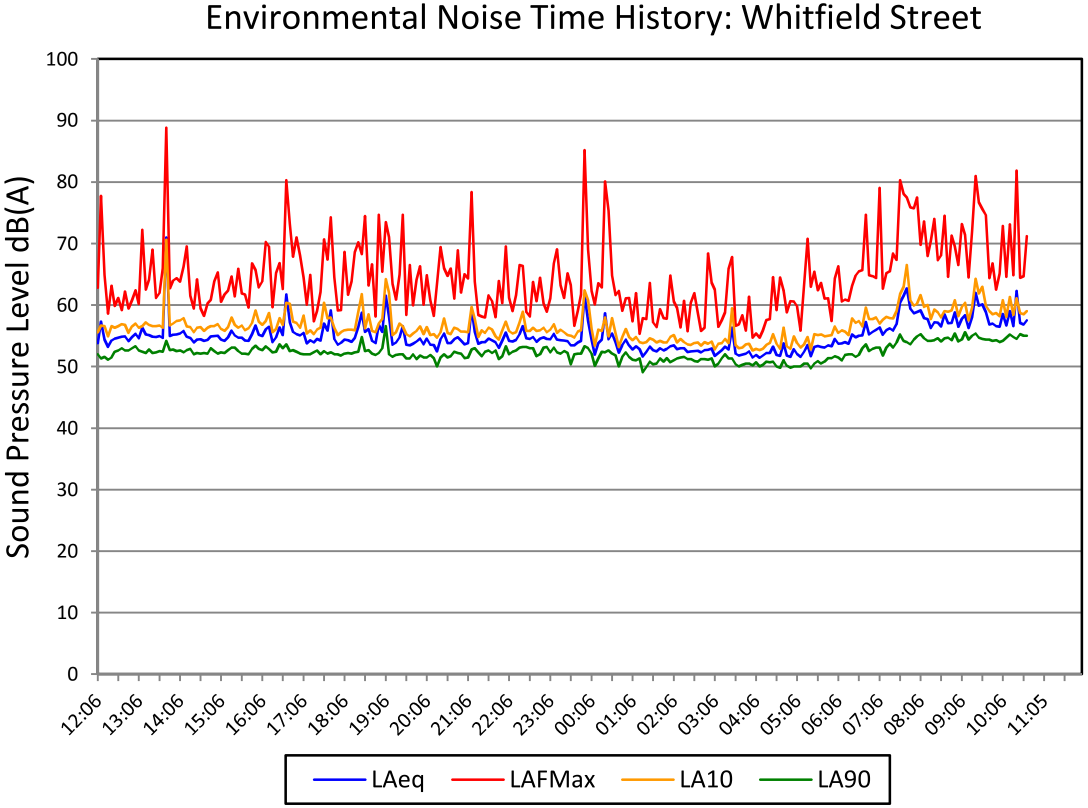
80 Charlotte Street, London



Saturday 21 November to Sunday 22 November 2015

Figure AS6171/TH17

80 Charlotte Street, London



Sunday 22 November to Monday 23 November 2015

Figure AS6171/TH18

APPENDIX A

ACOUSTIC TERMINOLOGY & HUMAN RESPONSE TO BROADBAND NOISE

1.1 Acoustic Terminology

The annoyance produced by noise is dependent upon many complex interrelated factors such as 'loudness', its frequency (or pitch) and any variations in its level. In order to have some objective measure of the annoyance, scales have been derived to allow for these subjective factors.

dB (A): The human ear is more susceptible to mid-frequency noise than the high and low frequencies. To take account of this when measuring noise, the 'A' weighting scale is used so that the measured noise corresponds roughly to the overall level of noise that is discerned by the average human. It is also possible to calculate the 'A' weighted noise level by applying certain corrections to an un-weighted spectrum. The measured or calculated 'A' weighted noise level is known as the dB(A) level.

L_{10} & L_{90}: If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The L_n indices are used for this purpose, and the term refers to the level exceeded for n% of the time, hence L_{10} is the level exceeded for 10% of the time and as such can be regarded as the `average maximum level'. Similarly, L_{90} is the average minimum level and is often used to describe the background noise.

It is common practice to use the L_{10} index to describe traffic noise, as being a high average, it takes into account the increased annoyance that results from the non-steady nature of traffic noise.

L_{eq}: The concept of L_{eq} (equivalent continuous sound level) has up to recently been primarily used in assessing noise in industry but seems now to be finding use in defining many other types of noise, such as aircraft noise, environmental noise and construction noise.

L_{eq} is defined as a notional steady sound level which, over a stated period of time, would contain the same amount of acoustical energy as the actual, fluctuating sound measured over that period (e.g. 8 hour, 1 hour, etc).

The use of digital technology in sound level meters now makes the measurement of L_{eq} very straightforward.

Because L_{eq} is effectively a summation of a number of noise events, it does not in itself limit the magnitude of any individual event, and this is frequently used in conjunction with an absolute noise limit.

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.

D The sound insulation performance of a construction is a function of the difference in noise level either side of the construction in the presence of a loud noise source in one of the pair of rooms under test. *D*, is therefore simply the *level difference* in decibels between the two rooms in different frequency bands.

D_w D_w is the *Weighted Level Difference* The level difference is determined as above, but weighted in accordance with the procedures laid down in BS EN ISO 717-1.

$D_{nT,w}$ $D_{nT,w}$ is the *Weighted Standardised Level Difference* as defined in BS EN ISO 717-1 and represents the *weighted level difference*, as described above, corrected for room reverberant characteristics.

C_{tr} C_{tr} is a spectrum adaptation term to be added to a single number quantity such as $D_{nT,w}$, to take account of characteristics of a particular sound.

$L'_{nT,w}$ $L'_{nT,w}$ is the *Weighted Standardised Impact Sound Pressure Level* as defined in BS EN ISO 717-2 and represents the level of sound pressure when measured within room where the floor above is under excitation from a calibrated tapping machine, corrected for the receive room reverberant characteristics.

APPENDIX A

ACOUSTIC TERMINOLOGY & HUMAN RESPONSE TO BROADBAND NOISE

1.2 Octave Band Frequencies

In order to determine the way in which the energy of sound is distributed across the frequency range, the International Standards Organisation have agreed on "preferred" bands of frequency for sound measurement and analysis. The widest and most commonly used band for frequency measurement and analysis is the Octave Band. In these bands, the upper frequency limit is twice the lower frequency limit, with the band being described by its "centre frequency" which is the average (geometric mean) of the upper and lower limits, eg. 250 Hz octave band runs from 176 Hz to 353 Hz. The most commonly used bands are:

Octave Band Centre Frequency Hz	63	125	250	500	1000	2000	4000	8000

1.3 Human Perception of Broadband Noise

Because of the logarithmic nature of the decibel scale, it should be borne in mind that noise levels in dB(A) do not have a simple linear relationship. For example, 100dB(A) is not twice as loud as 50 dB(A) sound level. It has been found experimentally that changes in the average level of fluctuating sound, such as traffic noise, need to be of the order of 3 dB(A) before becoming definitely perceptible to the human ear. Data from other experiments have indicated that a change in sound level of 10 dB(A) is perceived by the average listener as a doubling or halving of loudness. Using this information, a guide to the subjective interpretation of changes in traffic noise level can be given.

INTERPRETATION

Change in Sound Level dB(A)	Subjective Impression	Human Response
0 to 2	Imperceptible change in loudness	Marginal
3 to 5	Perceptible change in loudness	Noticeable
6 to 10	Up to a doubling or halving of loudness	Significant
11 to 15	More than a doubling or halving of loudness	Substantial
16 to 20	Up to a quadrupling or quartering of loudness	Substantial
21 or more	More than a quadrupling or quartering of loudness	Very Substantial

1.4 Earth Bunds and Barriers - Effective Screen Height

When considering the reduction in noise level of a source provided by a barrier, it is necessary to establish the "effective screen height". For example if a 3 metre high barrier exists between a noise source and a listener, with the barrier close to the listener, the listener will perceive the noise source is louder, if he climbs up a ladder (and is closer to the top of the barrier) than if he were standing at ground level. Equally if he sat on the ground the noise source would seem quieter than it was if he were standing. This may be explained by the fact that the "effective screen height" is changing with the three cases above, the greater the effective screen height, in general, the greater the reduction in noise level.

Where the noise sources are various roads, the attenuation provided by a fixed barrier at a specific property will be greater for roads close to the barrier than for roads further away.

3 no. Dalair AHUs

L_w	63	125	250	500	1000	2000	4000	8000	dB(A)
Supply	100	95	93	94	92	88	83	74	96.3
Extract	100	94	91	90	87	83	78	70	92
Attenuator	11	19	31	38	48	50	45	29	-

Table 1.1 - Source noise data for the Air Handling Units **[dB ref. 20µPa]**

3 no. Climaventa TECS2/SL-CA 0522 Air cooled Chillers

L_w	63	125	250	500	1000	2000	4000	8000	dB(A)
L_w	88	89	89	86	86	82	77	71	90

Table 1.2 - Source noise data for the Climaventa TECS2/SL-CA 0522 Air cooled Chillers **[dB ref. 20µPa]**

1 no. Climaventa FOCS-N/SL-CA2622 Air to water Heat Pump

L_w	63	125	250	500	1000	2000	4000	8000	dB(A)
L_w	84	83	87	89	90	78	67	59	92

Table 1.3 - Source noise data for the type Climaventa FOCS-N/SL-CA2622 Air to water Heat Pump **[dB ref. 20µPa]**

1 no. Climaventa FOCS-N/SL-CA2722 Air to water Heat Pump

L_w	63	125	250	500	1000	2000	4000	8000	dB(A)
L_w	84	83	87	89	90	78	67	59	92

Table 1.4 - Source noise data for the Climaventa FOCS-N/SL-CA2722 Air to water Heat Pump **[dB ref. 20µPa]**

1 no. Climaventa ERACS2-Q/SL-CA2022 Air to water Heat Pump

L_w	63	125	250	500	1000	2000	4000	8000	dB(A)
L_w	92	90	92	88	84	78	71	63	90

Table 1.5 - Source noise data for the Climaventa ERACS2-Q/SL-CA2022 Air to water Heat Pump **[dB ref. 20µPa]**

2 no. Mitsubishi PURY-P400YJM-A VRF Heat Pump Condensers

L_w	63	125	250	500	1000	2000	4000	8000	dB(A)
L_w	81	74	71	66	63	59	56	49	69.1

Table 1.6 - Source noise data for the Mitsubishi PURY-P400YJM-A VRF condensers **[dB ref. 20µPa]**

2 x Colt Extract Fan (emergency)

L_w	63	125	250	500	1000	2000	4000	8000	dB(A)
L_w	93	98	90	92	89	87	82	80	94.5

Table 1.7 - Source noise data for the Colt Extract Fan (emergency) **[dB ref. 20µPa]**

2 no. Nuaire WC extract fan

L_w	63	125	250	500	1000	2000	4000	8000	dB(A)
L_w	94	89	84	89	78	75	67	68	87.5

Table 1.8 - Source noise data for the Nuaire WC extract fan **[dB ref. 20µPa]**

	No. of units	L_w
Heat Pump Boiler (Mitsbusihi CAHV-P500YA-HPB)	4	67
Residential Heat Pumps	2	84
Enclosed Chilled Water Pumps	4	86
Enclosed Heat Pump Pumps	6	60
Enclosed Chiller Pumps	6	60
ETFE Pressurisation units	2	55
ETFE Inflation Fans	3	67
FG Wilson P800P1 Generator (emergency)	1	81

Table 1.9 - Source noise data for the assorted plant items **[dB ref. 20µPa]**

Appendix C

80 Charlotte Street & 65 Whitfield Street

Noise, Vibration and External Building Fabric Assessment

December 2010

DERWENT LONDON