1A Highgate Road
London

ENVIRONMENTAL NOISE SURVEY &
EXTERNAL BUILDING FABRIC REPORT
REPORT 19369/EBF1

For :

Jacques Samuel Pianos
142 Edgware Road
London
W2 2DZ

29 November 2013

HANN TUCKER ASSOCIATES
Consultants in Acoustics
Noise and Vibration

Head Office
Duke House
1-2 Duke Street
WOKING
Surrey GU21 5BA

Tel : 01483 770595
Fax : 01483 729565

Northern Office
First Floor
346 Deansgate
MANCHESTER
M3 4LY

Tel : 0161 832 7041
Fax : 0161 832 8075

E-mail : enquiries@hanntucker.co.uk
www.hanntucker.co.uk

REPORT 19369/EBF1

CONTENTS

Page

1.0 INTRODUCTION

1A Highgate Road is proposed to undergo redevelopment as a mixed use residential and commercial premises. Hann Tucker Associates have been appointed to undertake an environmental noise survey to establish the existing noise levels around the site in order to assess compliance with the Local authority's requirements and to prepare preliminary external building fabric specifications.

This report presents the survey methodology and findings. The survey data has been used as the basis for various acoustic design and assessment purposes.

2.0 OBJECTIVES

To establish, by means of detailed 48 hour daytime and night-time fully automated environmental noise monitoring, the existing A-weighted (dBA) L_{10}, L_{90}, L_{eq} and L_{max} environmental noise levels at selected accessible street level positions.

To establish, by means of detailed 2 hour night-time fully manned environmental noise monitoring, the existing A-weighted (dBA) and octave band L_{10}, L_{90}, L_{eq} and L_{max} environmental noise levels at selected accessible street level positions around the site.

Based on the results of the noise survey, and with reference to the requirements of the Local Authority, to recommend suitable internal noise criteria.

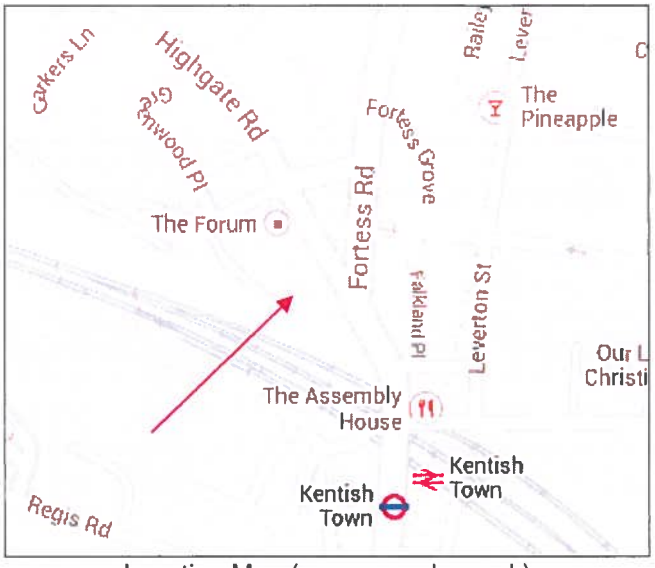
Based on the results of the noise survey, to specify the typical worst case incident noise levels for each façade of the proposed development. These incident noise levels may subsequently be used to carry out detailed calculations in order to determine the acoustic performance requirements of the external building fabric.

These objectives are as set out in our letter dated 24 October 2013.

3.0 SITE DESCRIPTION

3.1 Location

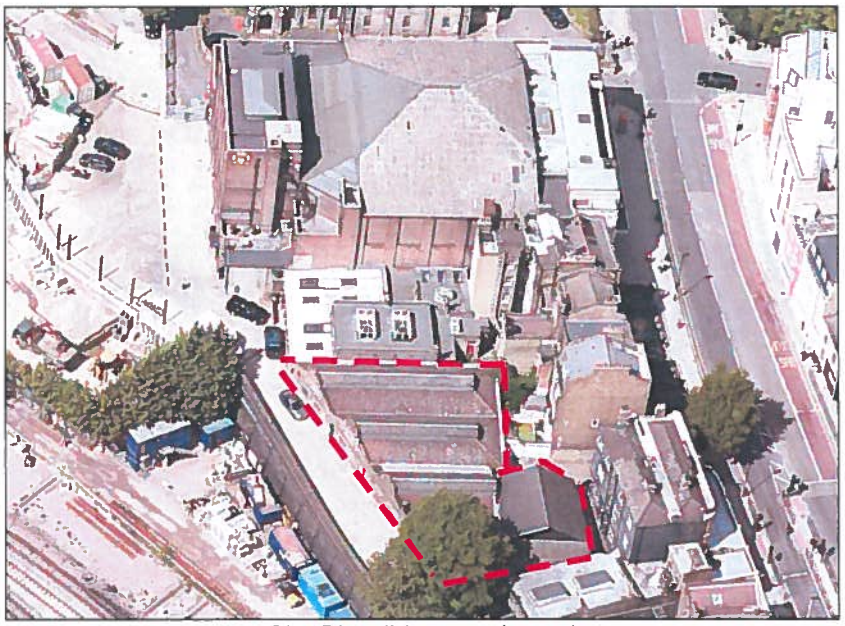
The site is located at 1A Highgate Road, London NW5 1JY and falls within Camden Borough Council's jurisdiction. See Location Map below.



Location Map (maps.google.co.uk)

3.2 Description

The site is situated away from Highgate Road behind existing mixed use premises. The site is bound by rail lines to the south and mixed use premises in all other directions. The HMV Forum is approximately 30m to the north of site. The dominant source of noise was judged to be the railway at the rear of the property. See Site Plan below.



Site Plan (bing.com/maps)

4.0 ACOUSTIC TERMINOLOGY

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

5.0 METHODOLOGY

5.1 Unmanned Survey

5.1.1 Procedure

Fully automated environmental noise monitoring was undertaken from approximately 07:00 hours on 6 November 2013 to 08:00 hours on 8 November 2013.

Due to the nature of the survey, i.e. unmanned, it is not possible to accurately comment on the weather conditions throughout the entire survey period. However at the beginning and end of the survey period the wind conditions were calm. The sky was generally overcast. We understand that generally throughout the survey period the weather conditions were similar to this.

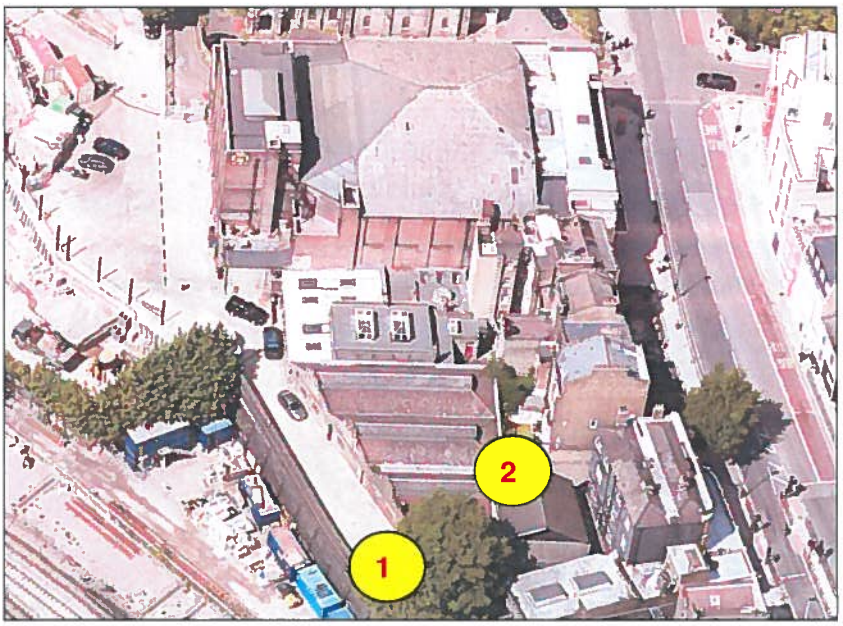
Measurements were taken continuously of the A-weighted (dBA) L_{10}, L_{90}, L_{eq} and L_{max} sound pressure levels over 15 and 5 minute periods.

5.1.2 Measurement Positions

The noise level measurements were undertaken at 2No. Positions around the development site. The measurement positions are described in the table below.

Position No	Description
1	The sound level meter was attached to a tree at the rear of the site overlooking the railway, approximately 1.5m from the ground.
2	The sound level meter was attached to a grille at the front of the property, approximately 8m from Highgate Road, 1m from the façade and 1.5m from the ground.

Positions 1 and 2 were selected in order to establish the existing road and rail traffic noise at the site and are shown on the plan below.



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

5.1.3 Instrumentation

The instrumentation used during the survey is presented in the Table below:

Description	Manufacturer	Type	Serial Number	Latest Verification
Position 1 Type 1 Data Logging Sound Level Meter	Larson Davis	824	3838	LD calibration on 19/11/2012
Position 2 Type 1 Data Logging Sound Level Meter	Larson Davis	824	3824	LD calibration on 16/10/2012
Type 1 Calibrator	Larson Davis	CAL200	3082	LD calibration on 21/03/2013

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 Larson Davis windshield.

5.2 Manned Survey

5.2.1 Procedure

Fully manned environmental noise monitoring was undertaken from approximately 20:30 hours to 22:30 hours on 17 November 2013.

During the survey period the wind conditions were calm. The sky was generally overcast. There was light rainfall during the survey. Road traffic was not judged to be a dominant source of noise.

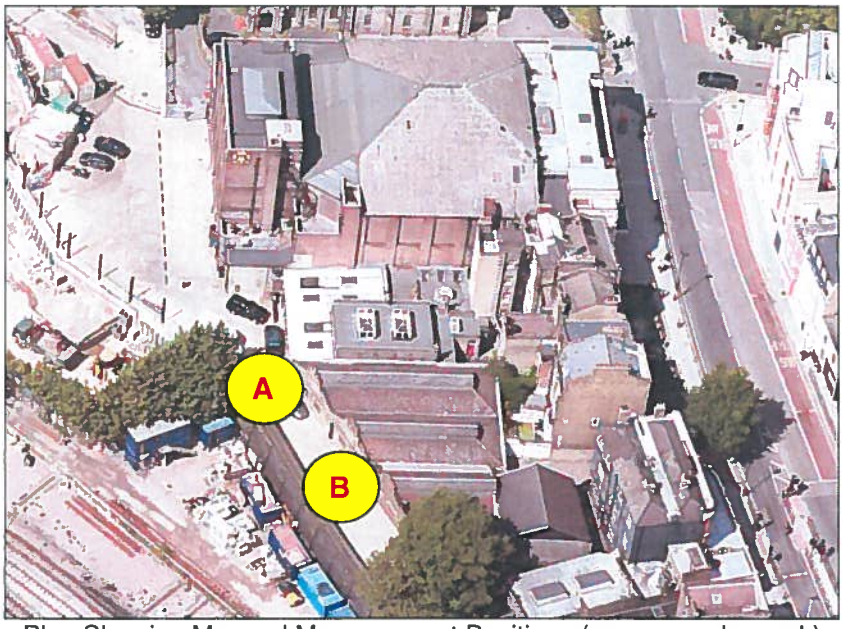
Measurements were taken of the A-weighted (dBA) and octave band L_{10}, L_{90}, L_{eq} and L_{max} sound pressure levels over periods of not less than 5 minutes. Atypical noises were excluded as far as reasonably possible. The noise levels measured are therefore assumed to be representative of the noise climate during the hour in which the measurements were taken

5.2.2 Measurement Positions

The noise level measurements were undertaken at 2No. Positions around the development site. The measurement positions are described in the table below.

Position	Description
A	The measurements were taken at the rear of the property, at the site boundary closest to the HMV Forum music venue. The microphone was attached to a tripod approximately 1.5m from the ground in free field.
B	The measurements were taken at the rear of the property, at the site boundary but further from the HMV Forum music venue. The microphone was attached to a tripod approximately 1.5m from the ground in free field.

These positions were selected to measure the potential worse case noise impact from the operation of the HMV Forum and are shown on the plan below.



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

5.2.3 Instrumentation

The instrumentation used during the manned survey is presented in the Table below:

Description	Manufacturer	Type	Serial Number	Latest Verification
Type 1 Precision Sound Level Meter	Brüel and Kjær	2260	2114994	Salford Uni calibration on 08/02/2013
Type 1 Calibrator	Brüel and Kjær	4231	2095100	Salford Uni Calibration on 01/02/2013

The sound level meter was mounted on a tripod and was fitted with a Brüel and Kjær microphone windshield.

The sound level meter was calibrated prior to and on completion of the survey. No significant change was found to have occurred (no more than 0.1 dB).

6.0 RESULTS

6.1 Results of Unmanned survey

The results have been plotted on Time History Graphs 19369/TH1 to 19369/TH4 enclosed presenting the 15 and 5 minute A-weighted (dBA) L_{10}, L_{90}, L_{eq} and L_{max} levels at each measurement position throughout the duration of the survey.

6.1.1 Daytime, Evening and Night-Time L_{Aeq} Noise Levels

The following table summarises the 12-hour Daytime (07:00 – 19:00 hours), 4-hour Evening (19:00 – 23:00 hours) and 8-hour Night-Time (23:00 – 07:00 hours) L_{Aeq} noise levels at each position over the measurement period.

Position	Period	L_{Aeq} Sound Levels (dBA)		
		Day	Evening	Night
1	06/11/2013 – 07/11/2013	66	66	61
	07/11/2013 – 08/11/2013	66	66	60
2	06/11/2013 – 07/11/2013	61	61	55
	07/11/2013 – 08/11/2013	62	61	59

The above levels have been corrected for façade reflections.

6.1.2 Lowest Measured L_{Aeq} Noise Levels

The following table summarises the lowest measured $L_{Aeq(15min)}$ noise levels at each position over the measurement period.

Position	Period	$L_{Aeq(15min)}$ Sound Levels (dBA)		
		Day	Evening	Night
1	06/11/2013 – 07/11/2013	64	61	61
	07/11/2013 – 08/11/2013	47	47	46
2	06/11/2013 – 07/11/2013	58	58	54
	07/11/2013 – 08/11/2013	58	60	53

The above levels have been corrected for façade reflections.

6.2 Results of Manned survey

The fully manned survey measurements A-weighted (dBA) L_{90}, L_{eq} and L_{max} sound levels are recorded below.

Position	Time	Sound Levels dBA		
		L_{90}	L_{eq}	L_{max}
A	21:21	51	54	56
	21:57	50	55	72
	22:02	50	54	70
B	21:27	41	49	70
	21:51	57	50	69

7.0 DISCUSSION OF NOISE CLIMATE

7.1 Unmanned Survey

Due to the nature of the survey, i.e. unmanned, it is not possible to accurately describe the dominant noise sources, or specific noise events throughout the entire survey period. However at the beginning and end of the survey period the dominant noise sources were noted to be rail noise at the rear of the site and road traffic on Highgate Road to the front of site.

7.2 Manned Survey

During the manned survey, the dominant sources of noise were noted to be music breakout from the HMV Forum, crew members unloading equipment at the rear of the venue, items of building services plant and occasional train pass-bys (approximately every 5-10 minutes).

The survey was undertaken on Sunday 17 November, while a heavy metal band were performing at the HMV Forum and the survey is considered a measurement of the worst-case likely noise levels at the site.

8.0 EXTERNAL NOISE LEVELS

8.1 Criteria

Camden borough Council's policies regarding the acceptability of sites adjoining railways and road and places of entertainment is contained in their Unitary Development Plan.

8.1.1 Road and Rail Noise

Table A in Appendix 1 of the Unitary Development Plan presents noise levels at residential sites adjoining railways and road at which planning permission will not be granted. See below.

Noise levels on residential sites adjoining railways and road at which planning permission will not be granted.

Noise description and location of measurement	Period	Time	Sites adjoining railways	Sites adjoining roads
Noise at 1 metre external to a sensitive façade	Day	07:00 – 19:00	74 dB $L_{Aeq,}$12h	72 dB $L_{Aeq,}$12h
Noise at 1 metre external to a sensitive façade	Evening	19:00 – 23:00	74 dB $L_{Aeq,}$4h	72 dB $L_{Aeq,}$4h
Noise at 1 metre external to a sensitive façade	Night	23:00 – 07:00	66 dB $L_{Aeq,}$8h	66 dB $L_{Aeq,}$8h

8.1.2 Noise from Places of Entertainment

Table D in Appendix 1 of the Unitary Development Plan presents noise levels at residential sites adjoining places of entertainment at which planning permission will not be granted. See below.

Noise levels from places of entertainment on adjoining residential sites at which planning permission will not be granted.

Noise description and location of measurement	Period	Time	Sites adjoining places of entertainment
Noise at 1 metre external to a sensitive façade	Day and evening	07:00 – 23:00	$L_{Aeq,}$5m shall not increase by more than 5dB*
Noise at 1 metre external to a sensitive façade	Night	23:00 – 07:00	$L_{Aeq,}$5m shall not increase by more than 3dB*
Noise inside any living room of any noise sensitive premises, with the windows open or closed	Night	23:00 – 07:00	$L_{Aeq,}$5m (in the 63Hz Octave band measured using the "fast" time constant) should show no increase in dB*
* As compared to the same measure, from the same position, and over a comparable period, with no entertainment taking place.			

8.2 Discussion of Results

8.2.1 Road and Rail Noise

It can be seen by referring to the table in Section 6.1.1 that the measured Day, Evening and Night-time L_{Aeq} noise levels are not in exceedance of Camden Borough Council's criteria relating to rail noise described in Section 8.1.1.

8.2.2 Noise from Places of Entertainment

Our calculations indicate that the worst-case $L_{Aeq(5min)}$ manned measurement of 55dBA would be approximately 50dBA at 1m from the nearest proposed window, taking into account distance and screening losses provided by the proposed structures.

This would indicate that the noise levels would be increased by approximately 5dB from the lowest measured L_{Aeq} noise levels measured during the unmanned survey at the rear of the property (46dBA) and therefore exceed the requirements of the local authority.

However, we would note that the HMV Forum is not in operation every night, and noise levels are dependent on the performers (heavy metal acts are assumed to perform at higher levels than folk acts). We would also note that, subjectively, train noise dominated music break-out during train pass-bys and therefore, a glazing specification to adequately protect dwellings against train noise should provide sufficient protection from venue noise break-out.

9.0 INCIDENT NOISE LEVELS

The following table presents the typical worst case incident noise levels for each façade (with suitable corrections made for façade reflections). The data may be used in subsequent analysis to establish sound performance specifications for each of the external building fabric elements.

Position	Description	L_{eq} Sound Pressure Level (dB) @ Octave Band Centre Frequency (Hz)								dBA
		63	125	250	500	1k	2k	4k	8k	
Rear	Typically high night-time L_{max} (23:00 – 07:00)	74	72	71	79	80	69	59	54	82
Front	Typical Daytime L_{eq} (07:00 – 23:00)	74	68	59	58	56	54	47	38	61

The above levels have been corrected for façade reflections.

10.0 EXTERNAL BUILDING FABRIC

10.1 Architectural Assumptions

10.1.1 Room Finishes

In our calculations we have assumed bedrooms and living areas will have typical furnishings including beds, sofas, chairs, carpets etc.

10.1.2 Drawings

Our calculations have been based on the following drawings provided by Green Architecutre.

L001	L004
L002	L005
L003	L006

10.2 Criteria

There are no criteria in current Building Regulations concerning external noise intrusion. We also understand the Planning Authority have not imposed any noise criteria for external noise intrusion in residential or commercial properties. Therefore, there are no statutory requirements for controlling external noise intrusion on this project. We would be please to advise on the external building fabric of the commercial units at the detailed design stage.

Various reference documents including BS 8233: 1999 edition and WHO Community Noise Guidelines present acoustic criteria for residential premises, as outlined below. These guidelines are entirely discretional.

BS 8233: 1999 "Sound insulation and noise reduction for buildings"

British Standard 8233: 1999 "Sound insulation and noise reduction for buildings" recommends design criteria for internal ambient noise levels for dwellings providing a reasonable or good level of protection from external noise. It states that reasonable resting and sleeping conditions in living rooms and bedrooms can be achieved by the following target $L_{Aeq,T}$ internal noise levels:

Room Type	Design Range $L_{Aeq,T}$	
	Good	Reasonable
Living Rooms	30 dB	40 dB
Bedrooms	30 dB	35 dB

The Standard also states *"For a reasonable standard in bedrooms at night, individual noise events (measure with F time-weighting) should not normally exceed 45dB L_{Amax}".*

World Health Organisation (WHO)

The World Health Organisation document on "Guidelines for Community Noise" states the following guideline values for community noise in specific environments.

Specific Environment	Critical Health Effect(s)	L_{Aeq}	$L_{Amax,fast}$
Dwelling, indoors	Speech intelligibility and moderate annoyance, daytime and evening	35dB	-
Inside Bedrooms	Sleep disturbance, night-time	30dB	45dB

The document also states *"For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45dBA L_{Amax} more than 10-15 times per night, (Vallet & Varnet 1991)."*

The above levels are however the subject of much controversy, as indicated by one of the feature articles in the January/February 2003 edition of the Institute of Acoustics' publication.

In our opinion the above criteria for bedrooms should thus be regarded as preferred, rather than mandatory maxima to be achieved in all cases.

Summary

On the basis of the above we propose the following internal acoustic design criteria which the levels of road and rail traffic noise intrusion should not exceed.

Room Type	Period	Criterion
Living Areas	Daytime (07:00-23:00 hours)	40dB $L_{Aeq,16hr}$
Bedrooms	Night Time (23:00-07:00 hours)	35dB $L_{Aeq,8hr}$

The above levels correspond to "reasonable" as defined in BS 8233. If these criteria are adopted as minimum standards for worst affected dwellings, the typical levels in typical houses will approach, and in many cases exceed, "good" as defined in BS 8233.

Note: If the worst case was designed to "good" this would lead to "over design" for other dwellings – which could be undesirable for various reasons (including cost and acoustic privacy between dwellings).

In addition it is proposed that L_{Amax} noise levels in bedrooms should not regularly exceed approximately 45dBA more than several times per hour between 23:00 and 07:00 hours.

10.3 Specification for Glazing

The composite acoustic performance required of any portion of the building envelope will depend on its location relative to the principal noise sources

around the site and the nature of the spaces behind it (noise criteria, size, room finishes etc.).

The levels of noise incident upon each façade of the building are different. Consequently, each façade therefore has its own unique sound insulation requirement. In our experience, however, it is not appropriate to prepare numerous performance specifications. In this instance, for the sake of simplicity, we have prepared a specification with 2No. different performance levels, each of which corresponds to appropriate notional glazing configurations.

Where structural glass or non-vision spandrel panels are proposed, they should provide sound reduction performance at least equal to that required of the glazing in order to maintain the acoustic integrity of the building envelope.

In order to comply with Building Regulations (Part F), it is necessary to provide background trickle ventilation to habitable rooms (living rooms and bedrooms). Where trickle ventilators do not form an integral part of the cladding they should comply with the Acoustic Specification for Trickle Ventilators which details the recommended minimum octave band element normalised level differences. In all cases, it is essential that ventilators are tested in accordance with BS EN ISO 10140-2:2010. Where ventilators form an integral part of the cladding system the ventilators shall be tested in conjunction with the cladding system.

10.4 Construction Guidance for Glazing and Ventilators

It is essential that prospective cladding system suppliers can demonstrate compliance with the acoustic performance detailed in our specification rather than simply offering a generic glazing configuration. However, we would suggest that the following configurations could typically be expected to provide the required levels of noise insulation.

Type	Façade/Zone	Example Glazing Configuration	Type of Trickle Vent
A	Facades with line of sight to trains	10/16/6.4	Acoustic
B	Facades not facing railway	6/16/6	Standard

N.B. The above guidance is given on the understanding that 4/16/4 is the minimum required for non-acoustic reasons. Please advise if this is not the case.

Please see attached our Specification for Glazing to Residential Facades.

In order to avoid weakness at junctions between cladding and party walls/floors we recommend;

a) All party walls abut 2No. separate mullions
All party floors abut 2No. separate transoms

b) The cladding shall incorporate suitable elements on partitioning lines against which partitions can be sealed. The complete system shall be tested for flanking transmission at a junction with party walls (between

adjoining rooms at the same floor abutting cladding) and with floor slabs (between adjoining floors abutting cladding). The system shall provide a weighted normalised flanking level difference of at least 50dB $D_{nF,w}$ +Ctr when tested in a laboratory in general accordance with BS BS EN ISO 10848-2:2006 and rated in accordance with BS EN ISO 717-1:1997. Junctions with floor slabs shall be tested in the absence of raised floors and suspended ceilings. N.B. To adequately control flanking transmission it is recommended that all party walls should be sealed to 2No. separate mullions and all party floors should be sealed to 2No. separate transoms.

11.0 CONCLUSIONS

A detailed 2 hour daytime fully manned environmental noise survey has been undertaken in order to establish the currently prevailing street level environmental noise climate around the site.

A detailed 48 hour daytime and night-time fully automated environmental noise survey has been undertaken in order to establish the currently prevailing street level environmental noise climate around the site.

Internal noise criteria have been recommended based on the results of the noise survey and with reference to the requirements of the Local Authority.

Typical worst case incident noise levels for each façade of the proposed development have been specified based on the results on the noise survey data.

A detailed acoustic analysis has been undertaken to assess the sound insulation requirements of the various external building fabric elements.

This has enabled a sound reduction performance specification for the glazing to be prepared, along with advice to be given on types of constructions we would typically expect to provide the required acoustic performance.

Where glazing systems are implemented which comply with our acoustic specifications for glazing and trickle ventilation, the proposed development should meet the required standards.

pp

Prepared by
Tony Trup
Assistant Consultant
HANN TUCKER ASSOCIATES

Checked by
Andrew Fermer
Senior Associate
HANN TUCKER ASSOCIATES

Appendix A

The acoustic terms used in this report are as follows:

dB : Decibel - Used as a measurement of sound pressure level. It is the logarithmic ratio of the noise being assessed to a standard reference level.

dBA : 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 dBA level.

Because of being a logarithmic scale noise 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_{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 Ln 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. 1 hour).

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

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.

HT : 19369 **29/11/2013**

1A HIGHGATE ROAD

ACOUSTIC SPECIFICATION FOR GLAZING TO RESIDENTIAL FACADES

SOUND REDUCTION PERFORMANCE

The complete glazing system, including frames shall achieve the following minimum sound reduction indices when tested in accordance with BS EN ISO 10140-2:2010.

Type	Façade/Zone	Minimum Sound Reduction Index (dB) @ Octave Band Centre Frequency (Hz)					
		125	250	500	1k	2k	4k
A	Facades with line of sight to trains	26	28	34	39	40	47
B	Facades not facing railway	23	19	23	32	35	38

TEST DATA

Fully detailed test reports from independent acoustic test authorities shall be supplied. All test reports shall be in English or, a full English translation.

Test data should include the $^1/_3$ octave band results from 100Hz to 3150Hz inclusive, together with the corresponding octave band results from 125Hz to 4000Hz inclusive.

The test report shall be provided for test samples which are representation of the complete system for the relevant facades - including frames, joints, seals, spandrel panels and opening lights and trickle vents (as appropriate). The samples proposed should be approved by Hann Tucker Associates.

HT : 19369 **29/11/2013**

1A HIGHGATE ROAD

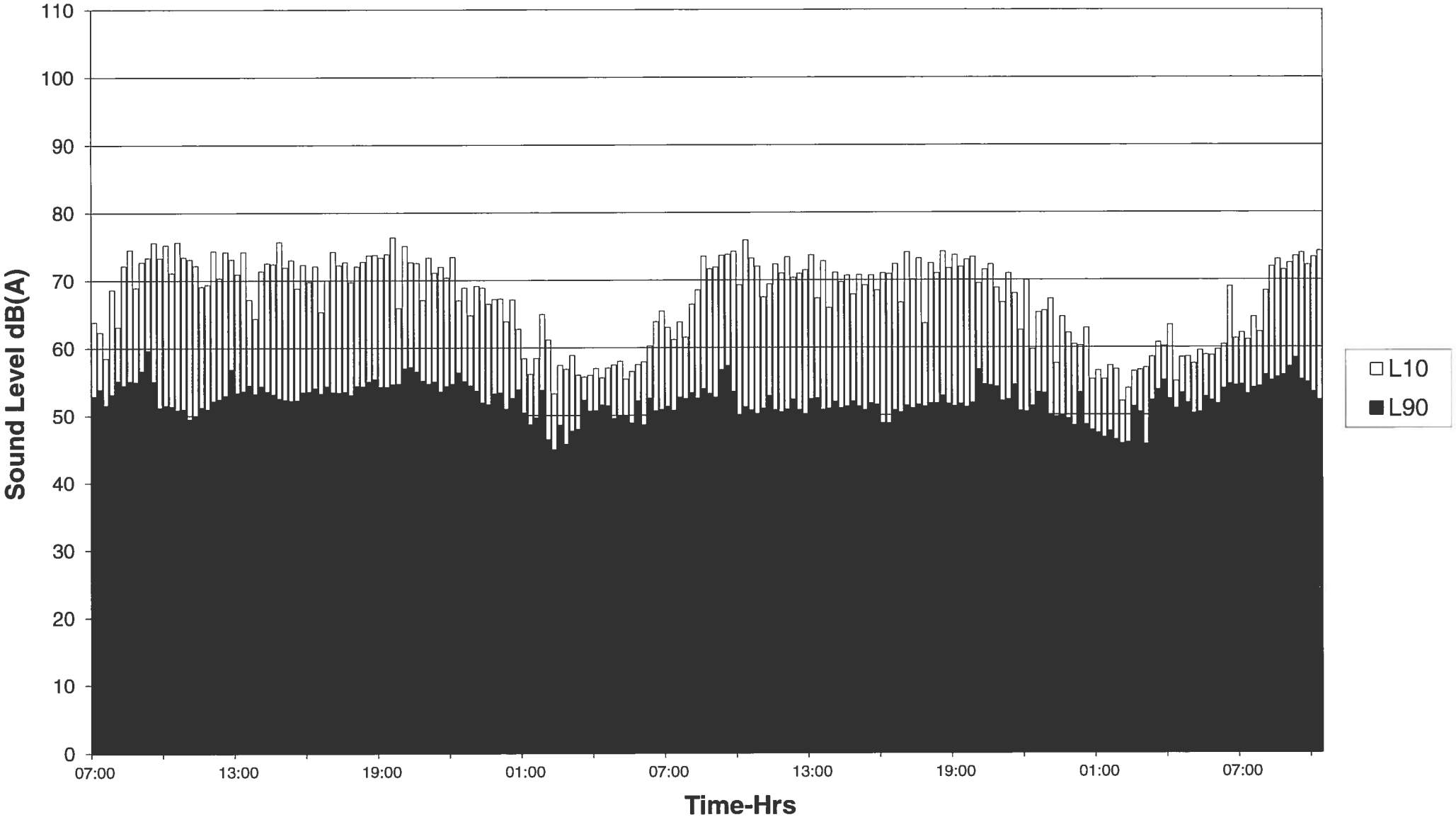
ACOUSTIC SPECIFICATION FOR TRICKLE VENTILATORS

SOUND INSULATION: Ventilators shall be tested in accordance with BS EN 15010140-2:2010. This will involve testing in 1/3 octaves from at least 100Hz to 2500Hz inclusive. These results, together with suitably converted octave band results from 125Hz to 2000Hz shall be provided for a ventilator unit which is representative of the proposed ventilator for the relevant façade. The samples proposed should be approved by Hann Tucker Associates.

The following element normalised level differences shall be achieved:

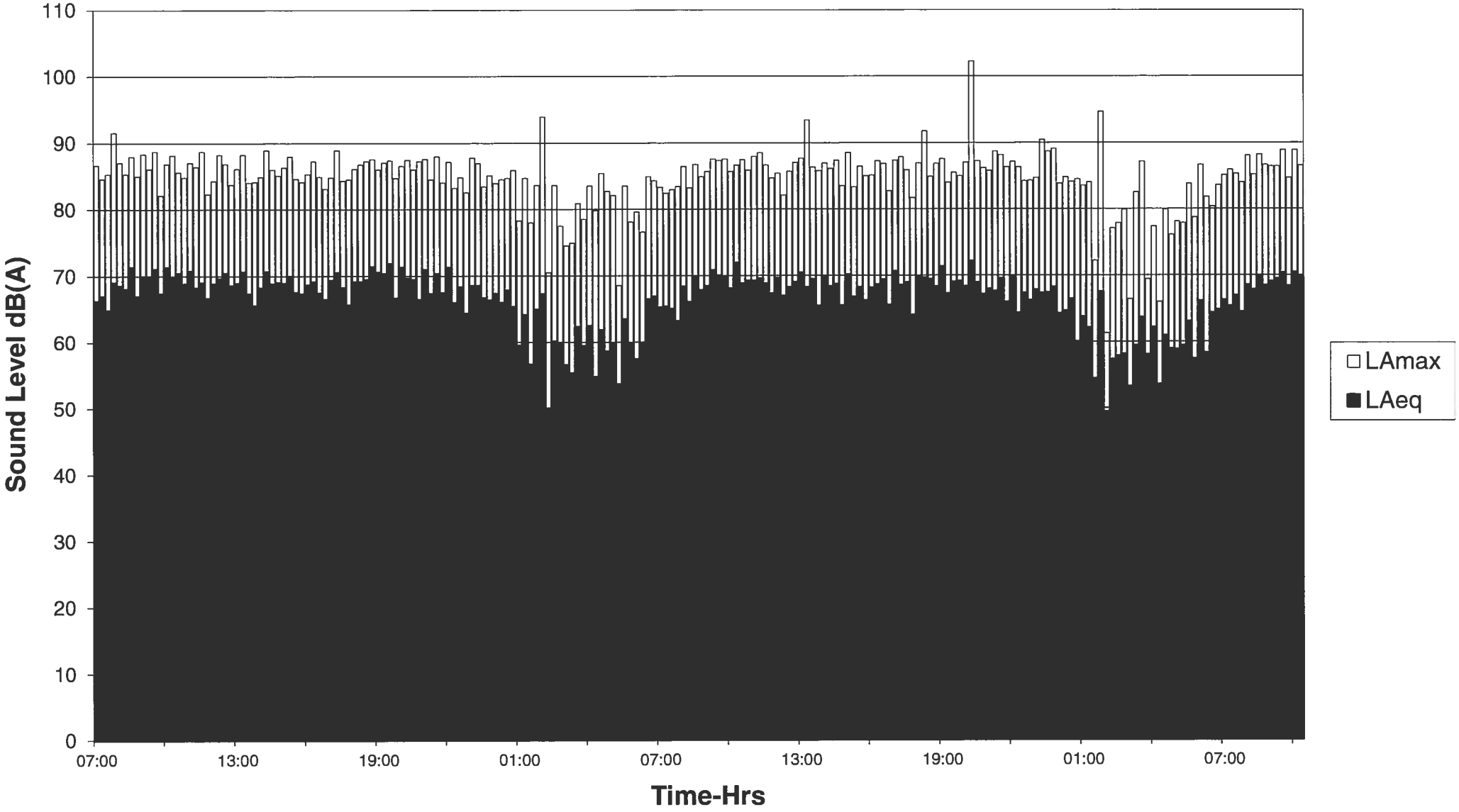
		$D_{n,e}$ Values (dB) Open Areas Corrected to 8000mm^2 at Octave Band Centre Frequency (Hz)				
Type	Façade/Zone	125	250	500	1k	2k
A	Facades with line of sight to trains	31	35	40	39	31
B	Facades not facing railway	31	36	31	38	28

1A Highgate Road
Position 1
L_{A10} and L_{A90} Noise Levels
Wednesday 06/11/2013 - Friday 08/11/2013



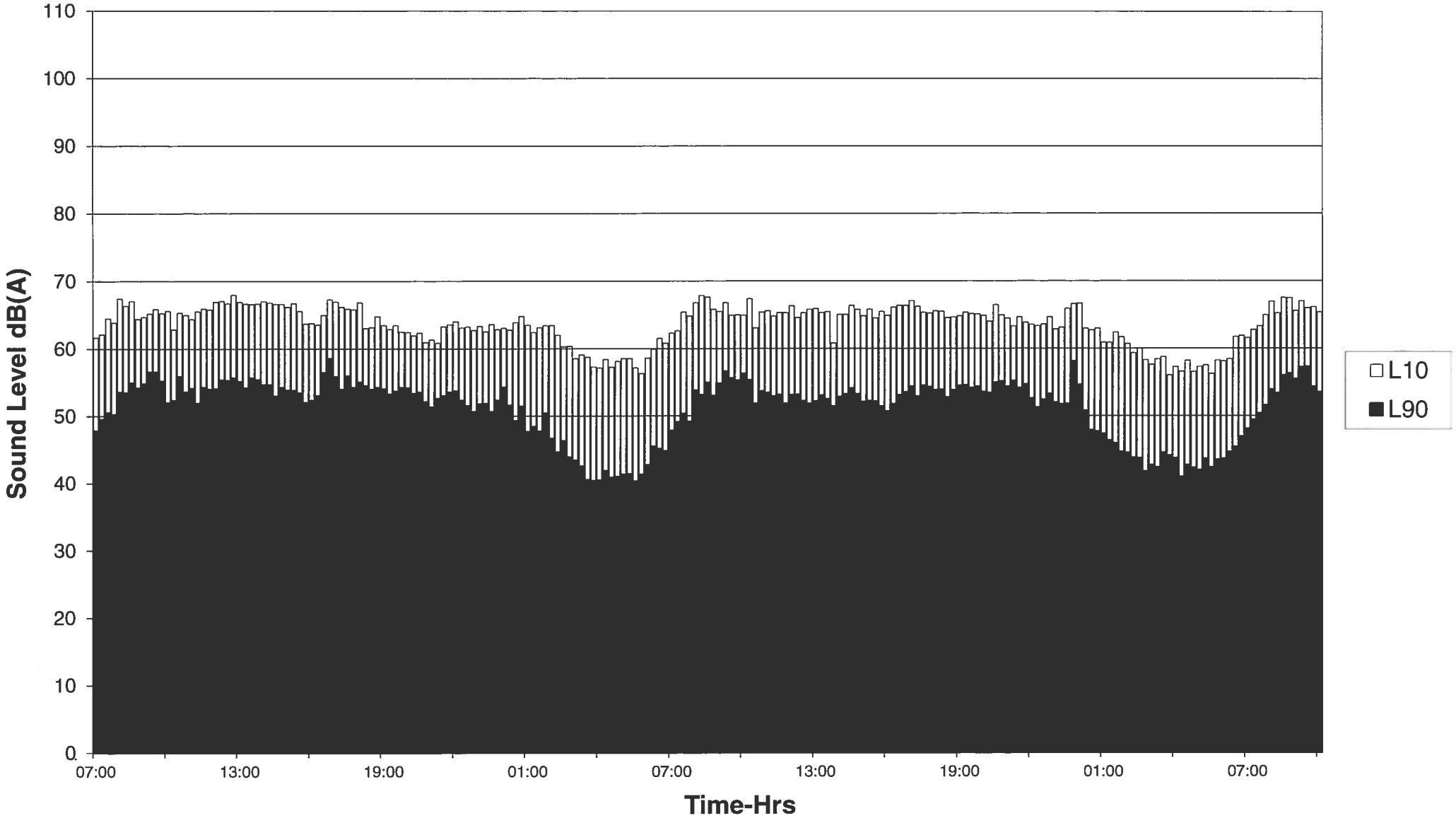
Time History Graph 19369/TH1

1A Highgate Road
Position 1
L_{Aeq} and L_{Amax} Noise Levels
Wednesday 06/11/2013 - Friday 08/11/2013



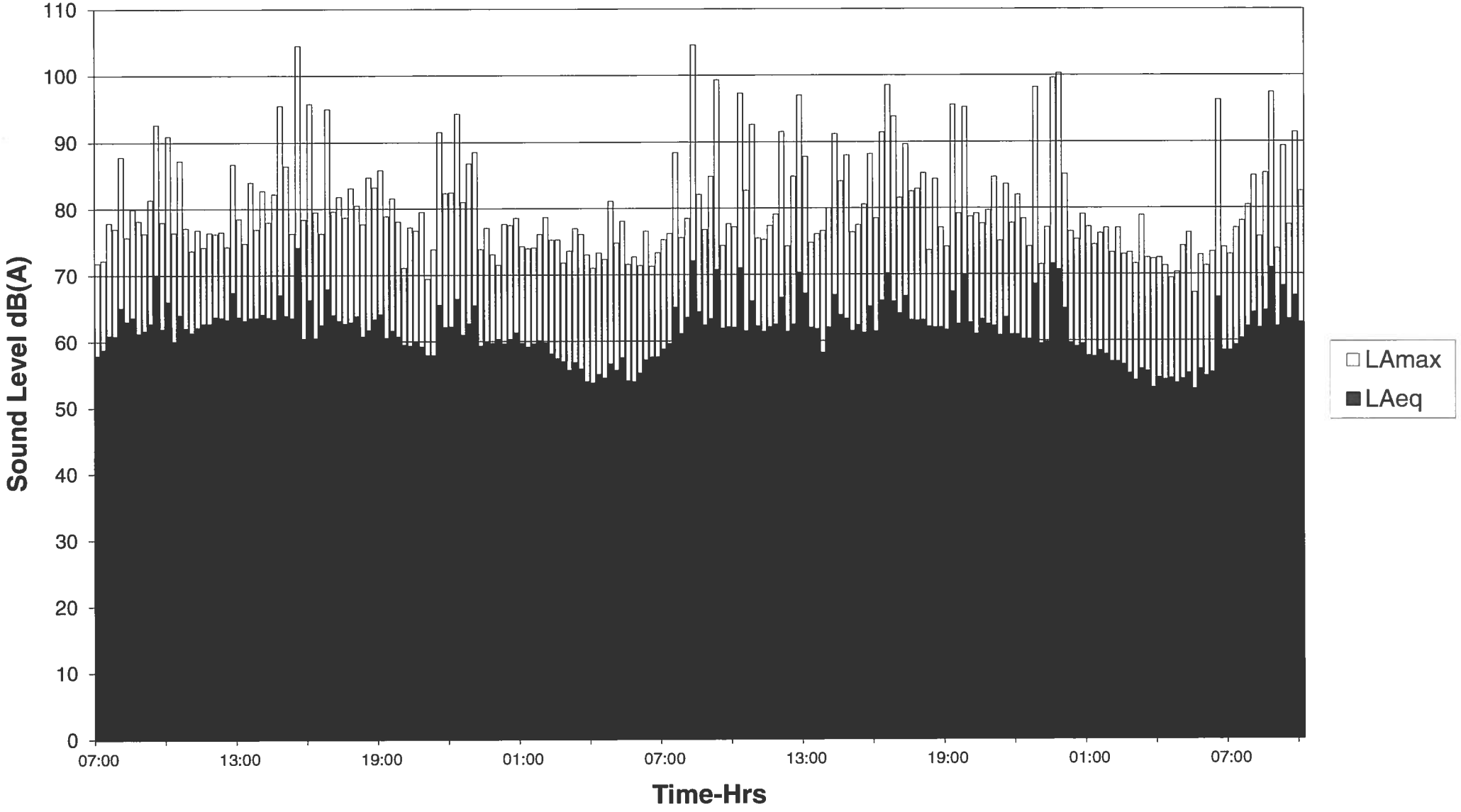
Time History Graph 19369/TH2

1A Highgate Road
Position 2
L_{A10} and L_{A90} Noise Levels
Wednesday 06/11/2013 - Friday 08/11/2013



Time History Graph 19369/TH3

1A Highgate Road
Position 2
L_{Aeq} and L_{Amax} Noise Levels
Wednesday 06/11/2013 - Friday 08/11/2013



Time History Graph 19369/TH4