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UNISON HQ

LONDON NW1

ACOUSTIC ASSESSMENT

EXTERNAL PLANT NOISE

PLANNING SUPPORT NARRATIVE

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1.0 Introduction

1.1 It is proposed to redevelop the site of the former Elizabeth Garrett Anderson Hospital, removing the majority of the existing buildings on the site, retaining and restoring only the fist generation listed buildings on the south west corner of Euston Road and Churchway, and to construct a new mixed use development comprising primarily office, residential and a small retail unit on Euston Road.

1.2 New air conditioning plant will be installed on the fifth floor roof of the proposed office development, comprising multiple condenser units and various air handling and extract air plant. This plant is overlooked by block C of the proposed residential element of the new development, this being the closest potential noise sensitive receiver.

1.3 As part of the submission to London Borough of Camden to obtain planning permission for the development, information will be required concerning the level of environmental noise associated with any external mechanical services plant and equipment. This report will therefore provide a review of all external plant noise levels, in the form of an assessment in relation to prevailing background noise levels and the current policy requirements of London Borough of Camden.

1.3 See figure 1 for site plan and figure 2 for proposed plant locations. A glossary of terms is included as figure 4.

2.0 Planning Conditions

2.1 Planning consents issued by London Borough of Camden generally include several conditions which relate to noise and vibration issues. At time of writing, the standard condition which is considered likely to apply to this development are as follows;

Noise levels at a point 1 m external to sensitive facades shall be at least 5 dBA less than the existing background measurement (L_{A90}) expressed in dBA 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 attenuation should be given to reducing the noise levels from that piece of plant/equipment at any sensitive façade to at least 10 dBA below the L_{A90}, expressed in dBA. The applicant is therefore required to undertake a full acoustic background noise assessment, the full details of which shall be submitted to the Council, in order that the design criteria for the acoustic enclosure of plant/equipment can be properly assessed.

For each of the octave band of centre frequencies 63Hz-8kHz inclusive, noise levels from ALL plant/equipment (measured in L_{Aeq}) when in operation shall at all times add not more than 1 decibel to the existing background nose level L_{A90}, expressed in dBA, in the same octave band as measured 1 metre external to sensitive facades.

3.0 Survey Details – Background Noise Levels

3.1 Aims

To assess the level of background noise in the vicinity of the site, in order to allow the setting of environmental noise criteria for external plant such that the requirements of the planning authority are achieved.

3.2 Instrumentation:

Larson Davis type 820 environmental noise level analyser, equipped with a Larson Davis type 2541 microphone and Larson Davis type 900B pre-amplifier. The instrument was powered by an external battery and stored in a weather proof case. The instrument was calibrated prior and subsequent to use with a Larson Davis type CA 250 calibrator – no calibration drift was recorded.

3.3 Location:

The noise monitor was located in the car park area to the rear (north) of the hospital site, adjacent Christopher Place.

3.4 Period:

Monitoring was continuous from approximately 15:00 on 3rd March 2006 until 09:30 on 7th March 2006. The monitor was set up to monitor noise levels continuously in fifteen-minute intervals.

3.5 Weather:

The prevailing weather conditions during all survey periods was dry and cold with little wind. The measured data is considered as an accurate representation of ambient and background noise levels.

3.6 Site Noise Characteristics:

Noise levels at the site are predominately dictated by road traffic in the local area. The dominant source is Euston road running to the south of the site, which carries high volumes of traffic during both the day and night. The west side of the site, facing Churchway, is also significantly affected by traffic noise on Euston Road. Churchway carries only small volumes of traffic during the day. The North and East sides of the site are screened by buildings; however traffic noise from the surrounding area is still the most significant source

3.7 Results:

The results of automated measurements are set out in figure 3.

3.8 Surveyor:

Paul Cockram BSc. MIOA

4.0 Plant Noise Criteria

4.1 Limiting noise level criteria for new plant will be considered here in two distinct periods, related to the probable operating periods of the plant; i.e. daytime (07:00 to 21:00) and night-time (21:00 to 07:00) hours.

4.3 A-weighted noise level assessment

4.3.1 The typical lowest value of background noise level ($L_{A90,15min}$) measured over the three assessment periods are shown in table 1;

Table 1 : Minimum background noise levels

Period	Minimum Background Noise Level
Daytime (07:00 to 21:00)	$L_{A90,15min}$ 47 dB
Night-time (21:00 to 07:00)	$L_{A90,15min}$ 42 dB

4.3.2 To comply with the likely planning requirements, the residual plant noise level must be at least 5 dB lower than these background noise levels, and the appropriate limits are therefore as shown in table 2:

Table 2 : Limiting plant noise level criteria – A-weighted noise levels

Period	Maximum Plant Noise Level
Daytime (07:00 to 21:00)	L_{Aeq} 42 dB
Night-time (21:00 to 07:00)	L_{Aeq} 37 dB

4.3.3 If the proposed plant is likely to emit any distinguishable, discrete continuous notes (whine, hiss, screech, hum), or possess any distinct impulses (bangs, clicks, clatters, thumps), then the values of L_{Aeq} shown above must be reduced by 5 dB.

4.4 Octave band noise level assessment

4.4.1 The representative octave band sound pressure levels associated with the overall noise levels from table 1 are shown in table 3;

Table 3 : Typical octave band background noise levels

Period	octave band centre frequency (Hz							
	63	125	250	500	1k	2k	4k	8k
	L_{90} sound pressure level, dB re $2x10^{-5}$ Pa							
07:00 – 21:00	56	53	48	45	42	37	31	27
21:00 – 07:00	51	48	43	40	37	32	26	22

4.4.2 To comply with the likely planning requirements, the spectra shown above must be increased by no more than 1 dB in any octave band by the new plant, assessed as the value of L_{eq}. In practice, this means that the value of L_{eq} per octave shall be at least 5 dB less than the value of L_{90}.

4.4.3 In order to achieve the requirements of London Borough of Camden, the residual plant noise level at 1 m from the nearest affected sensitive façade should be no more than that shown in table 4;

Table 4 : Limiting plant noise level targets – octave band noise levels

Period	octave band centre frequency (Hz							
	63	125	250	500	1k	2k	4k	8k
	L_{eq} sound pressure level, dB re $2x10^{-5}$ Pa							
07:00 – 21:00	51	48	43	40	37	32	26	22
21:00 – 07:00	46	46	38	35	32	27	21	17

5.0 Plant Noise Assessment

5.1 The proposed plant will be located in three separate areas of the 5th floor office roof, as indicated in figure 2, and as shown in detail in the architects and mechanical services drawings that accompany this planning application.

5.2 The nearest potentially affected noise sensitive façade is considered to be the 8th floor of the south façade of the proposed block C residential building, which overlooks the 5th floor office roof – see figure 2.

5.3 The proposed plant includes multiple condenser units, air handling units and extract fans spread out over the three plant areas shown in figure 2. Appendix 1 provides calculations for these various items of plant, and the following points are of note (with more detailed supporting information shown in appendix 1);

5.3.1 The distance between any plant item and the closest noise sensitive façade varies from 11 m to 34 m.

5.3.2 Plant selections from manufacturers ranges have been made by the building services consulting engineers, with noise levels published by the manufacturers for these selections as shown in appendix 1.

5.3.3 The calculations have been performed using recognised standard procedures and formulae for noise propagation outdoors.

5.3.4 The calculations include for effects of attenuation measures which have been designed to ensure the relevant criteria are achieved – these include an full acoustic enclosure to the condenser units (two groups of, as shown in the planning drawings), and in-duct attenuators to air handling units and fans as necessary.

5.3.5 Night-time operation noise levels will be lower, consequent upon reduced duty to the condenser units, and non-operation of kitchen plant.

5.4 The results of the calculations detailed in appendix 1, for all plant operating at full load, is summarised in table 5;

Table 5 : Predicted total plant noise level

	octave band centre frequency (Hz)								A
	63	125	250	500	1k	2k	4k	8k	
Lp receive - daytime	47	45	37	33	27	22	21	18	35
Lp receive – night-time	46	44	34	20	12	10	8	11	31

6.0 Comparison of Plant Noise to Criteria

6.1 A-weighted assessment

6.1.1 The first part of the likely planning condition requires the total plant noise level to be at least 5 dBA less than the prevailing background noise level (L_{A90}), or 10 dB less if the plant noise is tonal etc.

6.1.2 The comparative assessment of predicted plant noise in relation to the time related criteria from table 2 is shown in table 6;

Table 6 : Comparative assessment – A-weighted noise levels

	Period	
	07:00 – 21:00	21:00 – 07:00
Criteria (L_{Aeq})	41	37
Plant noise level (L_{Aeq})	36	31
DIFFERENCE	-5	-6

6.1.3 This comparative assessment demonstrates that the predicted A-weighted noise level of the proposed plant will comply with the planning criteria for daytime periods, however will exceed the criteria for night-time operation.

6.1.4 N.B. It is not considered that the plant will exhibit any distinguishable, discrete continuous note (whine, hiss, screech, hum) or distinct impulses (bangs, clicks, clatters, thumps) – as such, there is no need to apply a further 5 dBA penalty.

6.2 Octave band assessment

6.2.1 The second part of the likely planning condition will require the individual octave band plant noise levels to cause an increase in the background octave band noise levels of no more than 1 dB. In practice, this means that each individual octave band plant noise level must be at least 5 dB less than the prevailing background noise level.

6.2.2 A comparison of the predicted total plant noise levels with the target noise levels shown in table 4, for the three time periods, is shown in tables 7 and 8;

Table 7 : Comparison of predicted plant noise to criteria (daytime)

07:00 – 21:00	octave band centre frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Criteria	51	48	43	40	37	32	26	22
Predicted plant noise	47	45	37	33	27	22	21	18
DIFFERENCE	-4	-3	-6	-7	-10	-10	-5	-4

Table 8 : Comparison of predicted plant noise to criteria (night-time)

21:00 – 07:00	octave band centre frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Criteria	46	46	38	35	32	27	21	17
Predicted plant noise	46	44	34	20	12	10	8	11
DIFFERENCE	0	-2	-4	-5	-20	-17	-13	-6

6.3 The tables above demonstrate that the predicted octave band noise levels will comply with the planning noise criteria for daytime and night-time operation.

7.0 Mitigation Measures

7.1 The calculations detailed in appendix 1 include for the following items of plant noise control – these will be specified and schedule as part of the on-going design process;

7.1.1 The condenser units will be located within a high performance ventilated enclosure, utilising attenuated air inlet paths, and outlet attenuators per each individual unit.

7.1.2 Attenuators will be added to fan and AHU outlet/inlet air ducts, as necessary. Appropriate insertion losses are shown in appendix 1.

7.1.3 In addition to the in-duct attenuators noted, the block A3 kitchen AHU extract section will have an acoustically lined plenum between the fan discharge and the outlet attenuator.

7.2 Note that these measures reflect the current scheme design and plant selections, which are subject to change during the detail design process. The attenuation principles and ultimate noise level requirements set out in this report will, however, be maintained in any such design evolution.

8.0 Conclusion

8.1 A comparative assessment of likely plant noise has been performed, from calculations using measured noise levels, manufacturers noise source data, architects and mechanical services consultants drawings, and prudent calculation techniques. The assessment demonstrates that, with all plant operating simultaneously, the resulting noise level at the nearest noise sensitive facade is likely to achieve the limiting noise level criteria for both daytime and night-time operation.

8.2 It is therefore considered that, consequent upon the addition of noise mitigation measures as per section 7.0 of this report, the proposed plant will achieve the noise planning requirements of London Borough of Camden, for 24 hour operation.

Figure 1: Existing site plan (aerial photograph)

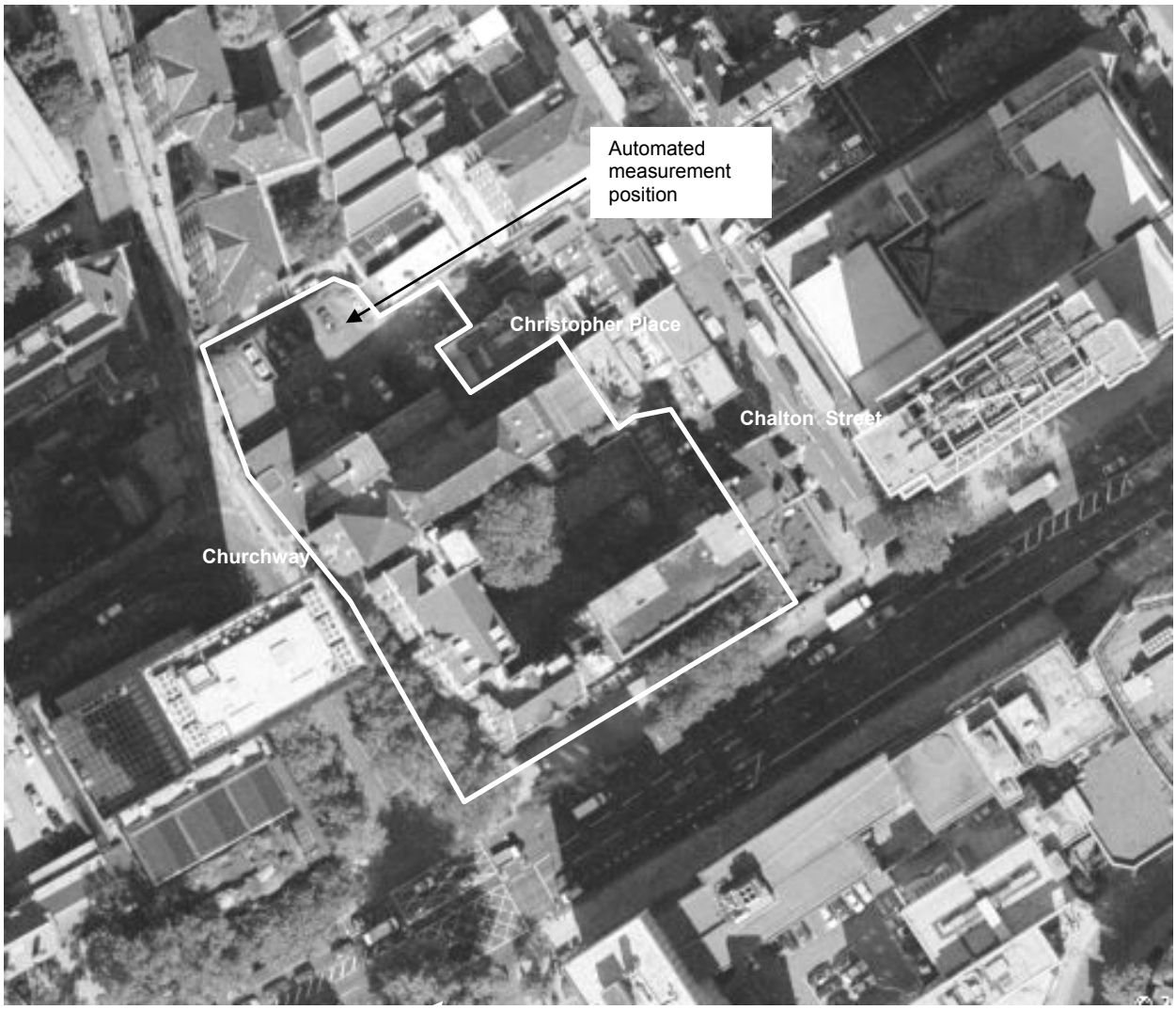

Figure 2: Proposed site plan

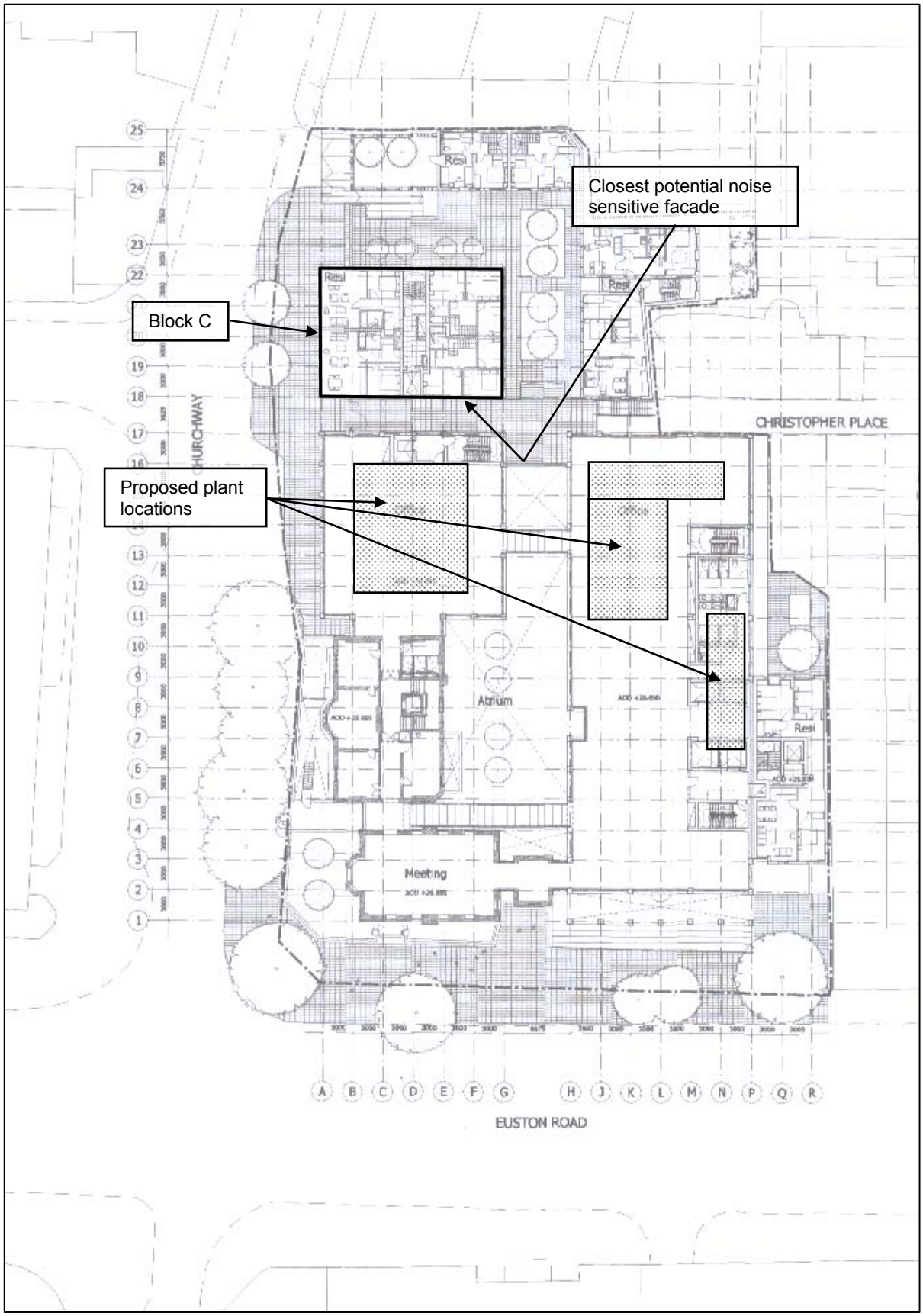

Figure 3: Survey Data

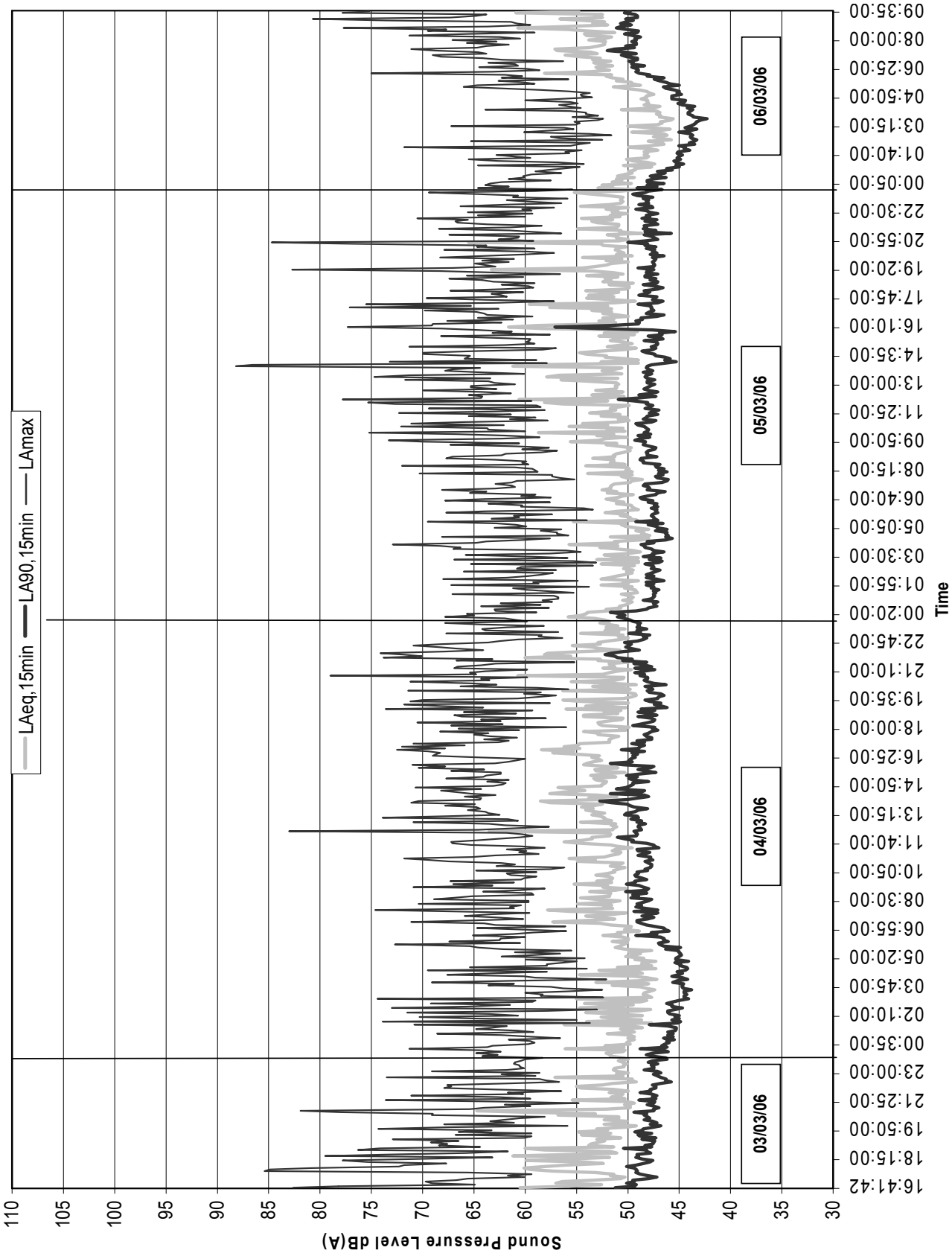

Figure 4 : Glossary of Terms

Decibel, dB	A unit of level derived from the logarithm of the ratio between the value of a quantity and a reference value. For sound pressure level (Lp) the reference quantity is $2x10^{-5}$ N/m^2. The sound pressure level existing when microphone measured pressure is $2x10^{-5}$ N/m^2 is 0 dB, the threshold of hearing.
L	Instantaneous value of Sound Pressure Level (Lp) or Sound Power Level (Lw).
Frequency	Number of cycles per second, measured in hertz (Hz), related to sound pitch.
A weighting	Arithmetic corrections applied to values of Lp according to frequency. When logarithmically summed for all frequencies, the resulting single "A weighted value" becomes comparable with other such values from which a comparative loudness judgement can be made, then, without knowledge of frequency content of the source.
$L_{eq,T}$	Equivalent continuous level of sound pressure which, if it actually existed for the integration time period T of the measurement, would possess the same energy as the constantly varying values of Lp actually measured.
$L_{Aeq,T}$	Equivalent continuous level of A weighted sound pressure which, if it actually existed for the integration time period, T, of the measurement would possess the same energy as the constantly varying values of Lp actually measured.
$L_{n,T}$	Lp which was exceeded for n% of time, T.
$L_{An,T}$	Level in dBA which was exceeded for n% of time, T.
$L_{max,T}$	The instantaneous maximum sound pressure level which occurred during time, T.
$L_{Amax,T}$	The instantaneous maximum A weighted sound pressure level which occurred during time, T.
Background Noise Level	The value of $L_{A90,T}$, ref. BS4142:1997.
Traffic Noise Level	The value of $L_{A10,T}$.
Specific Noise Level	The value of $L_{Aeq,T}$ at the assessment position produced by the specific noise source, ref. BS4142:1997.
Rating Level	The specific noise level, corrected to account for any characteristic features of the noise, by adding a 5 dBA penalty for any tonal, impulsive or irregular qualities, ref. BS4142:1997.
Specific Noise Source	The noise source under consideration when assessing the likelihood of complaint.
Assessment Position	Unless otherwise noted, is a point at 1m from the façade of the nearest affected sensitive property.

Appendix 1 : Calculations