Risetall Ltd

Belmont Street Development, Camden

Environmental Noise Final Report

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Revision Schedule

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Executive Summary

Introduction

A development is proposed on Belmont Street, Camden comprising student accommodation and office space. This report covers the noise and vibration assessment and provides:

- an assessment of the site in terms of its suitability for residential accommodation;
- an assessment of the suitability of the building for commercial office space;
- noise limit specification for fixed plant associated with the development, and predicts noise levels from likely fixed plant at the nearest receptors; and
- details of noise mitigation measures where necessary.

Methodology

Noise measurements were taken at the east, west and south facades of the existing building, at Belmont Street, Camden.

The resulting data were compared against published standards and guidelines, including Planning Policy Guidance Note 24 (PPG24).

Measured noise levels were used to assess the suitability of the building façade to adequately attenuate noise for the proposed office space, in accordance with guidance from BS 8233.

An assessment of fixed plant according to the provisions of BS 4142 was undertaken based on a maximum level at the receptors set by the London Borough of Camden Council (LBC).

Findings

The majority of the site has been classified according to PPG24 as Noise Exposure Category (NEC) A during the daytime and NEC B during the night time, with the exception of the south façade which falls into NEC throughout the day. Thus the site falls into NEC B. This indicates that the site is likely to be suitable in for residential development in terms of noise levels, but account should be made for the noise levels in the façade design to ensure acceptable internal noise levels will be achieved.

Provision of suitable mitigation measures, the proposed student accommodation, should afford acceptable living conditions in terms of noise for future residents. Use of thermal double glazing and a means of ventilation providing a similar degree of sound attenuation, should result in internal noise levels within the student accommodation are expected to remain within acceptable levels for both daytime and night.

Within the office areas of the building, suitable mitigation to ensure acceptable internal noise levels should also take the form of thermal double glazing with a means of ventilation providing similar noise attenuation. For cellular offices the criteria will be achieved with open windows.

In accordance with BS 4142 and London Borough of Camden's local interpretation, attenuation to ventilation plant has been specified in order to ensure noise rating levels of 5 dB below the measured background noise levels will not be exceeded at the nearest noise sensitive receptors.

Provided the limits set in this report are not exceeded, plant noise will be unlikely to cause complaints, following the guidance in BS 4142, and plant noise levels will meet the limits agreed with the London Borough of Camden.

The impact of the proposed fixed plant on the new residential uses is not expected to increase daytime or night-time levels assuming practical remediation measures.

1 Introduction

1.1.1 A development is proposed at the site of an existing commercial building at 10A Belmont Street and an adjacent residential property at 10 Belmont Street, Camden, NW1 8HH. It is proposed to demolish both buildings and construct a new building to contain both student accommodation and new offices.

1.1.2 Scott Wilson have been commissioned by Risetall Ltd to undertake a noise assessment for the site in terms of its suitability for residential development, commercial office space and to assess the noise impact at the nearest receptors due to any proposed fixed plant.

1.1.3 Noise associated with the development may arise from the:

- biomass boiler and gas boilers;
- generator;
- air handling units; and
- ventilation/air conditioning systems for the Offices, Student Accommodation, boiler room, screen room and laundry room.

1.1.4 The existing office space is housed within a six-storey former factory building, whilst the residential property is a 3 storey terraced property.

1.1.5 Commercial office space will be at lower basement, upper basement and ground floor levels, with student accommodation from the first to the seventh floors. The proposal includes for 163 student rooms in total, the majority facing out onto Belmont Street, with others to the rear of the building overlooking the yard.

1.1.6 The existing yard to the rear of the building will become a service yard.

1.1.7 The aims of this report are to:

- determine the existing background noise levels in the area;
- assess the site in terms of its suitability for residential accommodation and commercial office space; and
- assess the noise impact at the nearest receptors due to any proposed fixed plant.

1.1.8 This report will:

- outline the appropriate noise criteria;
- describe the measurement methodology;
- report the findings of the noise survey;
- provide an assessment of the noise impacts at the site and
- provide advice on any noise mitigation necessary.

1.1.9 Details of noise terminology and theory relevant to this report are given in Appendix A.

2 Criteria

2.1 Planning Policy Guidance 24

2.1.1 Planning Policy Guidance PPG 24 'Planning and Noise'[1] was introduced by the Department of the Environment in 1994. Paragraph 1 on page 1 of PPG 24 indicates that it was issued to:

> *"…provide advice on how the planning system can be used to minimise the adverse impact of noise without placing unreasonable restrictions on development or adding unduly to the costs and administrative burdens of business … It outlines some of the main considerations which local planning authorities should take into account in drawing up development plan policies and when determining planning applications for development which will either generate noise or be exposed to existing noise sources."*

2.1.2 PPG 24 includes advice to local authorities in England on the use of their planning powers to minimise the adverse impact of noise when determining planning applications for new residential developments. It introduces the concept of noise exposure categories (NECs) for residential development, encourages their use and recommends appropriate levels for exposure to different sources of noise.

2.1.3 Paragraph 8 of PPG 24 states:

> *"This guidance introduces the concept of Noise Exposure Categories (NECs), ranging from A-D, to help local planning authorities in their consideration of applications for residential development near transport-related noise sources. Category A represents the circumstances in which noise is unlikely to be a determining factor, while Category D relates to the situation in which development should normally be refused. Categories B and C deal with situations where noise mitigation measures may make development acceptable."*

2.1.4 PPG 24 recommends adopting a 16-hour daytime period of 07.00-23.00 and an 8-hour night-time period of 23.00-07.00.

2.1.5 The recommended values for specifying NEC bands are tabulated in PPG 24 and repeated below in Table 2.1:

[1] Planning Policy Guidance: Planning and Noise PPG 24, September 1994. Department of the Environment

Table 2.1: Noise Exposure Categories				
Noise Levels Corresponding to the Noise Exposure Categories for New Dwellings $L_{Aeq,T}$ dB				
Noise Source	**Noise Exposure Category**			
	A	**B**	**C**	**D**
Road Traffic				
07:00 – 23:00	<55	55 - 63	63 - 72	>72
23:00 – 07:00	<45	45 - 57	57 - 66	>66
Rail Traffic				
07:00 – 23:00	<55	55 - 66	66 - 74	>74
23:00 – 07:00	<45	45 - 59	59 - 66	>66
Air Traffic				
07:00 – 23:00	<57	57 - 66	66 - 72	>72
23:00 – 07:00	<48	48 - 57	57 - 66	>66
Mixed Sources				
07:00 – 23:00	<55	55 - 63	63 – 72	>72
23:00 – 07:00	<45	45 - 57	57 – 66	>66

2.1.6 Having measured and assessed the day and night-time NEC rating of the site the recommended action specific to applications for planning permission are tabulated in PPG 24 and repeated below in Table 2.2.

Table 2.2: Noise Exposure Categories Descriptions	
NEC	Determination
A	Noise need not be considered as a determining factor in granting planning permission, although the noise level at the high end of the category should not be regarded as a desirable level.
B	Noise should be taken into account when determining planning applications and, where appropriate, conditions imposed to ensure an adequate level of protection against noise.
C	Planning permission should not normally be granted. Where it is considered that permission should be given, for example because there are no alternative quieter sites available, conditions should be imposed to ensure a commensurate level of protection against noise.
D	Planning permission should normally be refused.

2.1.7 For example, for an area of a site subject predominantly to road traffic noise an existing daytime noise level of less than 55 dB $L_{Aeq,16h}$ corresponds to Noise Exposure Category A. An existing night-time noise level of less than 45 dB $L_{Aeq,8h}$ corresponds to Noise Exposure Category A. No noise mitigation works would normally be required at a site falling entirely into NEC A for day and night-time purposes.

2.1.8 For areas falling into Noise Exposure Category B or C it is possible to address moderate or high levels of environmental noise for future residents by specifying noise reduction measures such as acoustic barriers to reduce noise levels to future gardens and facades, and acoustic ventilation and glazing to reduce internally transmitted noise.

2.1.9 In terms of night time noise levels (between 23.00 and 07.00), PPG24 also states that where individual noise events exceed 82 dB L_{Amax} (S time weighting), several times in any hour, this should be treated as being in NEC C, regardless of the $L_{Aeq,T}$ (except where the $L_{Aeq,T}$ already puts the site in NEC D).

2.2 BS 8233 Guidance

2.2.1 BS 8233[2] provides acoustic guidance on the recommended indoor ambient noise levels for various types of room when unoccupied, i.e. only noise ingress and noise from building services is considered. Recommended noise levels are quoted as having a design range of 'Good' to 'Reasonable'; the criteria which applies to this development are shown in Table 2.3

Table 2.3: Indoor Ambient Noise Levels in Spaces when they are Unoccuppied (BS 8233)

Criterion	Typical situations	Design range $L_{Aeq,T}$ dB	
		Good	Reasonable
Reasonable resting/sleeping conditions	Living rooms	30	40
	Bedrooms	30	35
Reasonable conditions for study and work requiring concentration	Cellular office	40	50
	Meeting room, executive office	35	40

2.3 BS 4142 Guidance

2.3.1 British Standard BS 4142[3] addresses, the impact of a new noise source or sources (including its acoustic characteristics), at the nearest noise-sensitive receptors, accounting for existing ambient noise levels.

2.3.2 The basis of the standard is a comparison between the background noise level in the vicinity of residential locations and the rating level of the noise source under consideration. The relevant parameters in this instance are as follows:

- Background Noise Level, $L_{A90,T}$ – defined in the Standard as "the 'A' weighted sound pressure level of the residual noise at the assessment position which is exceeded for 90 % of the given time interval, T, measured using time weighting F (fast)".
- Specific Noise Level $L_{Aeq,T}$ – the equivalent continuous 'A' weighted sound pressure level of the source in question over a given time interval.
- Rating Level $L_{Ar,T}$ – the specific noise level plus any adjustment made for the characteristic features of the noise.

2.3.3 BS 4142 attempts to account for acoustic characteristics present in a noise source such as a 'distinguishable, discrete, continuous note (whine, hiss, screech, hum etc.)' or 'distinct impulses (bangs, clicks, clatters or thumps)', by applying an additional +5 dB(A) weighting to the specific noise level of the source (i.e. a 5 dB(A) 'penalty') before its comparison with the ambient background noise level.

2.3.4 Therefore, for a new noise source, BS 4142 indicates that the ambient background noise level, L_{A90}, should be measured at a receptor and compared to the noise level from the source (the rating level).

[2] BS 8233: 1999 'Sound insulation and noise reduction for buildings – Code of practice', British Standards Institute
[3] BS 4142: 1997 'Method for Rating Industrial Noise in Mixed Residential and Industrial Areas', British Standards Institute

2.3.5 BS 4142 suggests that a rating level excess of up to 5 dB(A) above the ambient background noise level at the receptor is of 'marginal significance'. If the rating level due to the noise source exceeds the ambient background noise level by more than 10 dB(A) then the indication is that complaints would be 'likely'. If the rating level of the noise source is more than 10 dB(A) below the ambient background noise level, this is a 'positive indication that complaints are unlikely'.

2.4 London Borough of Camden

2.4.1 London Borough of Camden's (LBC) Unitary Development Plan includes a section on noise and vibration. Part of Appendix 1 of this document is reproduced in Table 2.3 below.

Table 2.3: Noise Levels from Plant and Machinery at Which Planning Permission will not be Granted

Noise description and location of measurement	Period	Time	Noise Level
Noise at 1 metre external to a sensitive facade	Day, evening and night	0000-2400	5 dB(A)<L_{A90}

2.4.2 Liaison with LBC[4] has identified that (with reference to BS 4142) a rating level 5 dB(A) below background would be considered acceptable during day, evening and night-time periods.

[4] Email and telephone correspondence between Robbie Pattison/Robert Colder (Scott Wilson Noise and Vibration Team) and LB Camden Planning Officer 23rd and 25th September 2008.

3 Noise Monitoring

3.1 Methodology

3.1.1 Unmanned long-term noise monitoring was undertaken on the east, west and south façades of the existing building between the 20th and the 27th May 2009. Additional manned monitoring was undertaken overnight from 23:00 on 21st until 05:00 on 22nd July 2009 on the roof of the building to ascertain the source of noise which occurred during most nights of the long-term monitoring – this is covered in greater detail in section 3.2.

3.1.2 Appendix B, Figure B1 illustrates the locations where ambient noise monitoring was undertaken.

3.1.3 Measurements were taken in accordance with the methodology contained in PPG24 and BS 4142 and, apart from Locations N1 and N4, conformed to the requirements of BS 7445: 1991[5]. Locations N1 and N4 were positioned 1m from the building façade and require the use of a correction factor to be used to obtain free-field levels.

3.1.4 Table 3.1 lists the noise monitoring locations and the nearest noise sensitive receptors which the data will be used to represent in the assessment.

Table 3.1: Ambient Noise Survey Details

Reference	Location	Details	Representative of Nearest Receptors
N1	Front of 10A Belmont Street	4th Floor 1 metre from façade	Front façade of the building and 8-10 Belmont Street
N2	Rear of 10 A Belmont Street	Ground Floor free-field	Rear of building below 4th storey (the height of surrounding buildings), 21 Belmont Street
N3	Rear/Side of 10A Belmont Street	3/4th Floor free-field	Rear and side of building above level of surrounding properties (above 4th storey) rear of properties on Chalk Farm Road
N4	Roof of 10A Belmont Street	Roof, 1 metre from facade	Front façade of the building

3.1.5 Photographs of the site and monitoring locations are shown in Appendix C.

3.1.6 The following instrumentation was employed during the noise survey:

- Norsonic 140 integrated sound level meter, serial no. 1403077 – Location N1;
- Brüel & Kjær (B&K) 2238 integrated sound level meter, serial no. 2562671 – Location N2;
- Brüel & Kjær (B&K) 2238 integrated sound level meter, serial no. 2201511 – Location N3;
- Norsonic 140 integrated sound level meter, serial no. 1403078 – Location N4; and
- Bruel & Kjaer (B&K) 4231 calibrator, serial no. 2217875 – All Locations.

3.1.7 The sound level meters (Locations N1 – N3) were set to measure various parameters, including the L_{Aeq}, L_{A90} and $L_{Amax(slow)}$ values, logging contiguous periods of 15 minutes. Measurements of L_{Aeq}, and L_{A90} were made at Location N4 in contiguous periods of 5 minutes. The calibration level of all equipment was checked before and after the monitoring periods – no significant changes (+/-0.1 dB) were noted.

[5] British Standard BS 7445: 1991 'Description and Measurement of Environmental Noise', British Standards Institution, 1991

3.1.8 Weather conditions throughout the monitoring periods were varied. Where weather conditions were outside the limits specified in BS 7445 the data have not been included in this assessment. Details of weather conditions are given in Table D1 in Appendix D.

3.1.9 The noise climate was dominated by road traffic, this including local traffic movements on Chalk Farm Road, Belmont Street and distant traffic noise from other surrounding roads. Other noise sources included train noise from the nearby rail line (visible from the roof), emergency services sirens and overhead aircraft.

3.2 PPG24 Monitoring Data

3.2.1 Long-term ambient monitoring results are shown in Table 3.2. At Location N1 and N4 3 dB has been subtracted from all measured data to convert the façade noise level to a free-field level. This allows the measured data to be assessed against the guidance given in PPG24.

Table 3.2: Summary of Long-Term Monitoring

Location Reference	Daytime $L_{Aeq,16hour}$ (dB)	Night-time $L_{Aeq,8hour}$ (dB)
N1	53	48[a]
N2	53	47
N3	56	52
N4	-	50[b]

a – noise data dominated by unknown night time source omitted (see paragraphs 3.2.4-3.2.6)
b – noise measurements taken from 23:00-05:00 21st-22nd July 2009

3.2.2 The figures for N1-N3 shown in Table 3.2 are obtained by logarithmically averaging the $L_{Aeq,15min}$ data for the daytime and night time, which gives $L_{Aeq,16hour}$ and $L_{Aeq,8hour}$ figures for each day. This data are then arithmetically averaged over the entire monitoring period. The data for N4 are the logarithmic average of the $L_{Aeq,5min}$ data for the time period 23:00-05:00.

3.2.3 The noise monitoring time histories for Locations N1 to N4 are shown in Appendix D.

3.2.4 At Location N1 it is clear from the noise monitoring time histories that there is a noise source present which is active every night, generally starting between 21:00-22:00 and continuing for up to ten hours. The source generated steady noise levels of approximately 60 dB L_{Aeq}, with frequency analysis showing that most of the noise was concentrated at the 50Hz $^1/_3$ octave band.

3.2.5 Manned monitoring was carried out on the roof of the building on the night of 21st-22nd July 2009 during which the 60 dB noise source was not observed (see data for Location N4 in Appendix D). Liaison with the local authority confirmed that they were unaware of any noise sources in the area that could generate the noise described in 3.2.4. It was suggested that it may be caused by generators related to railway maintenance. The local authority had not been made aware of any maintenance occurring during the monitoring period[6], however it is not unusual for such maintenance to take place without prior consultation.

3.2.6 It was agreed with the EHO that night time noise of this nature would be likely to generate complaints from existing residents in Belmont Street if it was due to any of the extract plant

[6] Telephone correspondence between Andrew Nash (Scott Wilson Noise and Vibration Team) and LB Camden Planning Officer 24th July 2009

associated with nearby restaurants, or if it was a regular occurrence. It was also suggested by the local authority that it could have been due to road maintenance. It was agreed with the EHO that the noise can be assumed as temporary, and is therefore omitted from the Location N1 data.

3.2.7 It should be noted that additional site visits were made on 8th and the 16th of June 2009 from 22:00-23:00 for the purpose of witnessing this noise. No noise with the characteristics described was audible on either occasion.

3.3 BS 4142 Monitoring Data

3.3.1 The nearest noise sensitive residential receptors are located on all sides of the proposed site, on Belmont Street and Chalk Farm Road; these are highlighted on Figure B1, Appendix B. The noise levels measured at N1, N2, N3 and N4 are considered representative of the nearest noise sensitive receptors and the L_{A90} data has been used to set noise limits on plant using the LBC guidance outlined in section 2.4.

3.3.2 Results from the noise measurements at the monitoring locations are given in Table 3.3.

Table 3.3: Measured L_{A90} Noise Levels at the Nearest Noise Sensitive Receptors

Location Reference	Period	L_{A90} (dB)[a]
N1	Day	47
	Night	45[b]
N2	Day	44
	Night	42
N3	Day	51
	Night	47
N4	Night	46[c]

a – the arithmetic average of $L_{A90,15min}$ measurements during the defined measurement period.
b – noise data dominated by unknown night time source omitted
c – noise measurements taken from 23:00-05:00 21st July 2009

3.3.3 The background levels measured at Location N4 are very similar to the levels measured at N1, therefore the assessment of plant noise will be made relative to the lower background level i.e. measured at Location N1 to provide a worst case assessment.

4 Impact Assessment

4.1 General

4.1.1 For the purpose of this report, the assessment chapter has been separated into two sections:

- measured ambient noise levels have been compared against criteria levels within PPG24; and
- noise limits at the nearest receptors to the proposed fixed plant have been specified in accordance with BS 4142 and LBC criteria.

4.2 PPG24

4.2.1 Table 4.1 details the PPG24 Noise Exposure Categories using the data measured at Locations N1, N2 and N3 (data at N1 has been converted to a free-field level).

Table 4.1: PPG24 Noise Exposure Categories

Location Reference	Daytime $L_{Aeq,T}$ (dB)	Corresponding NEC	Night-time $L_{Aeq,T}$ (dB)	Corresponding NEC
N1	53	A	48	B
N2	53	A	47	B
N3	56	B	52	B

4.2.2 Based on the long-term measurements at Locations N1 and N2, these areas of the site proposed for student accommodation have been classified within NEC A during the daytime and NEC B during the night-time period.

4.2.3 Based on the long-term measurement data at Location N3 this area of the site proposed for student accommodation has been classified as NEC B during both daytime and night-time periods.

4.2.4 $L_{Amax(slow)}$ values exceeding 82 dB were measured during the night-time period at Location N1 only. However, this only occurred occasionally during periods of high night time noise which have been omitted as discussed in 3.2.

4.2.5 It is understood from correspondence with LBC that they distinguish the time period between 19:00 and 23:00 as 'evening'. At Location N1, the measured $L_{Aeq,T}$ for this period was 52 dB, resulting in a corresponding NEC A. At Location N2 a level of 53 dB was measured in the evening period, corresponding to NEC A, and at Location N3 a level of 55 dB was measured, corresponding to NEC A/B.

4.2.6 PPG24 states that when a site falls within NEC A, "noise need not be considered as a determining factor in granting planning permission". Where any part of the site falls within NEC B or C, PPG 24 advises that mitigation measures will be necessary in order to ensure an adequate level of protection against noise for future inhabitants of the proposed residential properties

4.2.7 Therefore, some mitigation will be required to ensure an adequate level of protection against noise for future residents.

4.2.8 It is generally considered that for a typical facade the main path for noise to enter a building is through the windows[1].

4.2.9 With appropriate façade insulation i.e. thermal double glazing and ventilation, it is considered that a suitable level of noise protection can be attained providing an acceptable internal noise climate for future residents.

4.2.10 Indications of the typical attenuation provided by thermal double glazing are provided in PPG 24, Annex 6 which states that an outside to inside reduction of road traffic noise of 33 dB(A) can be achieved. Coupled with ventilation affording equivalent protection, internal levels within the student accommodation are expected to remain within acceptable levels for both daytime and night time periods, as shown in Table 4.2.

4.2.11 Open windows are likely to result in indoor ambient noise levels which exceed the BS 8233 'reasonable' criteria.

Table 4.2: Predicted Internal Noise Levels at the Monitoring Locations

Location	Recommended Maximum Internal Noise Level dB(A)	Measured Noise Level $L_{Aeq,T}$ dB	Calculated Façade Level $L_{Aeq,T}$ dB	Predicted Internal Noise Level dB(A)	
				Open window	Double Glazing
	BS 8233 'Reasonable' Criteria	A	B	C	E
			= A + 3	= B – 13	= B -33
Daytime					
N1	**40**	53	**56**	**43**	**23**
N2	**40**	53	**56**	**43**	**23**
N3	**40**	56	**59**	**46**	**26**
Night-time					
N1	**35**	48	**51**	**38**	**18**
N2	**35**	47	**50**	**37**	**17**
N3	**35**	52	**55**	**42**	**22**

4.3 BS 8233 Assessment

4.3.1 The BS 8233 indoor ambient noise 'reasonable' criteria is 40 dB $L_{Aeq,T}$ for meeting rooms and 50 dB $L_{Aeq,T}$ is for a cellular office. The daytime predictions from Table 4.2 show that with adequate glazing and assuming the building has ventilation affording equivalent protection, acceptable noise levels should be achieved inside the offices. For cellular offices the criteria will be achieved with open windows.

4.4 BS 4142 Assessment

4.4.1 Noise for the proposed development may arise from fixed plant associated with the:

- biomass boiler and gas boilers;
- generator;
- air handling units; and

- ventilation/air conditioning systems for the Offices, Student Accommodation, boiler room, screen room and laundry room.

4.4.2 Noise breakout from the biomass and gas boilers is expected to be negligible as they will be situated in the lower basement of the development. However, noise from the ventilation servicing the boiler room does need to be assessed.

4.4.3 Table 4.3 below gives the recommended maximum total noise level from all new plant at the closest selected sensitive receptors in order to meet the LBC assessment criterion.

Table 4.3: Recommended Noise Limits at External Measurement Locations (Free-Field)

Monitoring location	Details	Period	Measured Background Noise Level ($L_{A90,5min}$ dB)	Maximum $L_{Ar,T}$ for fixed plant (5 dB below background)*
		Day		
N1	Representative of the front of the development and the nearest receptors to the west on Belmont Street	Day	47	**44**
		Night	45	**43**
N2	Representative of the rear of the development and the nearest receptors to the north on Belmont Street	Day	44	**39**
		Night	42	**37**
N3	Representative of the rear/ southern side of development, and the nearest receptors on Chalk Farm Road	Day	51	**46**
		Night	47	**42**
* Rating Level (i.e. including any correction factor)				

4.4.4 An indicative assessment of the plant which is likely to be required for the building has been provided by a qualified mechanical services engineer[7]; full details, including description, location, operating times and required in-duct attenuation, are provided in Appendix E. Most attenuators have been specified in terms of 'minimum values' that must be achieved to meet LBC criteria. The proposed location of the plant and associated intakes and exhausts are shown in Appendix E Figure E1-E5.

4.4.5 It should be noted that the plant and attenuator details are indicative and may be subject to change. In the event of a change in type or layout of plant, LBC may require this BS 4142 assessment to be reviewed.

4.4.6 The following assumptions have been made in the prediction of noise levels in Table 4.3:

- 10 dB reduction in predicted noise at a receptor with no line of sight to the source;
- 5 dB reduction in predicted noise at a receptor which is in the same plane as the source, i.e. at 90 degrees, with no direct line of sight but no physical barrier;
- half of the student room extract fans could be on at any one time (applies to day and night);
- all predictions include the 5 dB 'penalty' for acoustic characteristics likely to attract attention as described in section 2.3.

4.4.7 Table 4.3 details the nearest noise sensitive receptors for which predictions have been undertaken (see Figure B1 of Appendix B for a diagram) and the noise sources are potentially significant. The results of the assessment show that the proposed plant and associated mitigation as detailed in Appendix E meets the LBC criteria at all of the nearest residential receptors used in the assessment.

[7] 'Belmont Street Camden Outline Design for Noise Assessment – Plant Schedule' Peter Mullarky (Scott Wilson M&E)

Table 4.3: Results of the BS 4142 Assessment

Receptor	Potential Significant Noise Sources	Minimum Distance to Receptor (m)	Direct Line of Sight	Maximum $L_{Ar,T}$ dB		Predicted $L_{Ar,T}$ dB		Difference	
				Day	Night	Day	Night	Day	Night
8 Belmont Street (rear)	L2 – AHU1 discharge louvre L3 – exhaust louvre for each student room L10 – Boiler Room intake L11 – Boiler Room exhaust	20 16 16 16	Yes Yes No No	44	43	**39**[a,b]	**36**	**-5**	**-7**
74-77 Chalk Farm Rd (1)	L2 – AHU1 discharge louvre L3 – exhaust louvre for each student room L10 – Boiler Room intake L11 – Boiler Room exhaust	52 23 30 40	No[c] No[c] No Yes	46	42	**37**	**34**	**-9**	**-8**
74-77 Chalk Farm Rd (2)	L2 – AHU1 discharge louvre L3 – exhaust louvre for each student room L10 – Boiler Room intake L11 – Boiler Room exhaust	38 13 17 27	Yes Yes No No	46	42	**38**	**37**	**-8**	**-5**
10 Belmont Street (front)	L1 – AHU1 intake louvre L2 – AHU1 discharge louvre L3 – exhaust louvre for each student room L10 – Boiler Room intake L11 – Boiler Room exhaust	6 11 11 35 25	No No No[c] No[c] No[c]	44	43	**37**	**34**	**-5**	**-9**
10 Belmont Street (rear)	L3– exhaust louvre for each student room L6 – Exhaust louvre for bike store L7 – Exhaust louvre for refuse store L8 – Exhaust louvre for core toilets L9 – toilet extract discharge louvre R1 – Social space condenser R2 – Screen room condenser	10 15 15 15 10 20 20	No No No No No No No	39	37	**33**	**26**	**-6**	**-11**
21 Belmont Street	L3– exhaust louvre for each student room L6 – Exhaust louvre for bike store L7 – Exhaust louvre for refuse store L8 – Exhaust louvre for core toilets L9 – toilet extract discharge louvre	20 6 6 6 10	Yes Yes Yes Yes Yes	39	37	**32**	**32**	**-7**	**-5**
72 Chalk Farm Rd	L3– exhaust louvre for each student room L10 – Boiler Room intake L11 – Boiler Room exhaust	25 28 41	No[c] No No	46	42	**29**	**28**	**-17**	**-14**

a – attenuation with distance calculated using Lp = Lw – 20log(r)-8 for all inlets/exhausts except L10 and L11
b – attenuation with distance for L10 and L11 calculated using Lp = Lw – 20log(r) – 5
c – source and receiver both in the same plane, i.e. no direct line of sight but no physical barrier

4.4.8 The generator in the rear yard is understood to be an emergency power generator for the fireman's lift and smoke extract in the event of a power cut during a fire. The generator would only operate in either an emergency situation or during a weekly test which would last approximately an hour. Correspondence with the EHO has confirmed that as the plant is emergency plant that does not generally operate it does not need to be considered in the total plant noise calculations and can be considered a separate item of plant, however it does still need to meet the LBC criteria at the nearest residences[8].

4.4.9 The nearest receptor to the generator G1 is 21 Belmont Street, which is 16m away. Noise breakout from the generator will be controlled to achieve 51 dB(A) at 1m. This should result in a Rating Level of 32 dB(A) at 16m, 5 dB below the night time $L_{A90,8hour}$ of 37 dB measured at Location N2.

4.4.10 The generator should only be tested during the daytime to minimise disturbance to neighbours.

[8] Email correspondence from Lee Casey to Andrew Nash 28/07/09

5 Conclusions

5.1.1 Scott Wilson were instructed by Risetall Ltd to undertake a noise assessment for a proposed development comprising student accommodation and office space at the site of an existing office building on Belmont Street, Camden. This report assesses the site in terms of its suitability for the proposed residential accommodation and commercial offices space, and specifies noise limits for fixed plant.

5.1.2 The area of the site proposed for student accommodation has been classified within NEC A during the day and NEC B during the night at locations N1 (eastern boundary) and N2 (western boundary). Location N3 (southern boundary) falls within NEC B during both daytime and night-time periods.

5.1.3 Some mitigation against road traffic noise will be required to ensure an adequate level of protection against noise for future residents. The use of thermal double glazing, together with suitable means of ventilation providing a similar degree of sound insulation should be sufficient to ensure acceptable internal noise levels within both the residential and commercial areas of the development.

5.1.4 Mitigation of ventilation plant has been specified in order to ensure that noise rating levels of 5 dB below the measured background noise levels will not be exceeded at the nearest noise sensitive receptors.

Appendix A: Noise Perception and Terminology

Between the quietest audible sound and the loudest tolerable sound there is a million to one ratio in sound pressure (measured in pascals, Pa). Because of this wide range a noise level scale based on logarithms is used in noise measurement called the decibel (dB) scale. Audibility of sound covers a range of approximately 0 to 140 dB.

The human ear system does not respond uniformly to sound across the detectable frequency range and consequently instrumentation used to measure noise is weighted to represent the performance of the ear. This is known as the 'A weighting' and annotated as dB (A). Table A1 below lists the sound pressure level in dB (A) for common situations.

Table A1: Sound Pressure Levels for a Range of Situations.

Typical Noise Levels dB(A)	Example
0	Threshold of hearing
30	Rural area at night, still air
40	Public library Refrigerator humming at 2m
50	Quiet office, no machinery Boiling kettle at 0.5m
60	Normal conversation
70	Telephone ringing at 2m Vacuum cleaner at 3m
80	General factory noise level
100	Pneumatic drill at 5m
120	Discotheque - 1m in front of loudspeaker
140	Threshold of pain

The noise level at a measurement point is rarely steady, even in rural areas, and varies over a range dependent upon the effects of local noise sources. Close to a busy road, the noise level may vary over a range of 5 dB(A), whereas in a suburban area this may increase up to 40 dB(A) and more due to the multitude of noise sources in such areas (cars, dogs, aircraft etc.) and their variable operation. Furthermore, the range of night-time noise levels will often be smaller and the levels significantly reduced compared to daytime levels.

The equivalent continuous A-weighted sound pressure level, L_{Aeq}, is the single number that represents the average sound energy measured over that period. The L_{Aeq} is the sound level of a notionally steady sound having the same energy as a fluctuating sound over a specified measurement period.

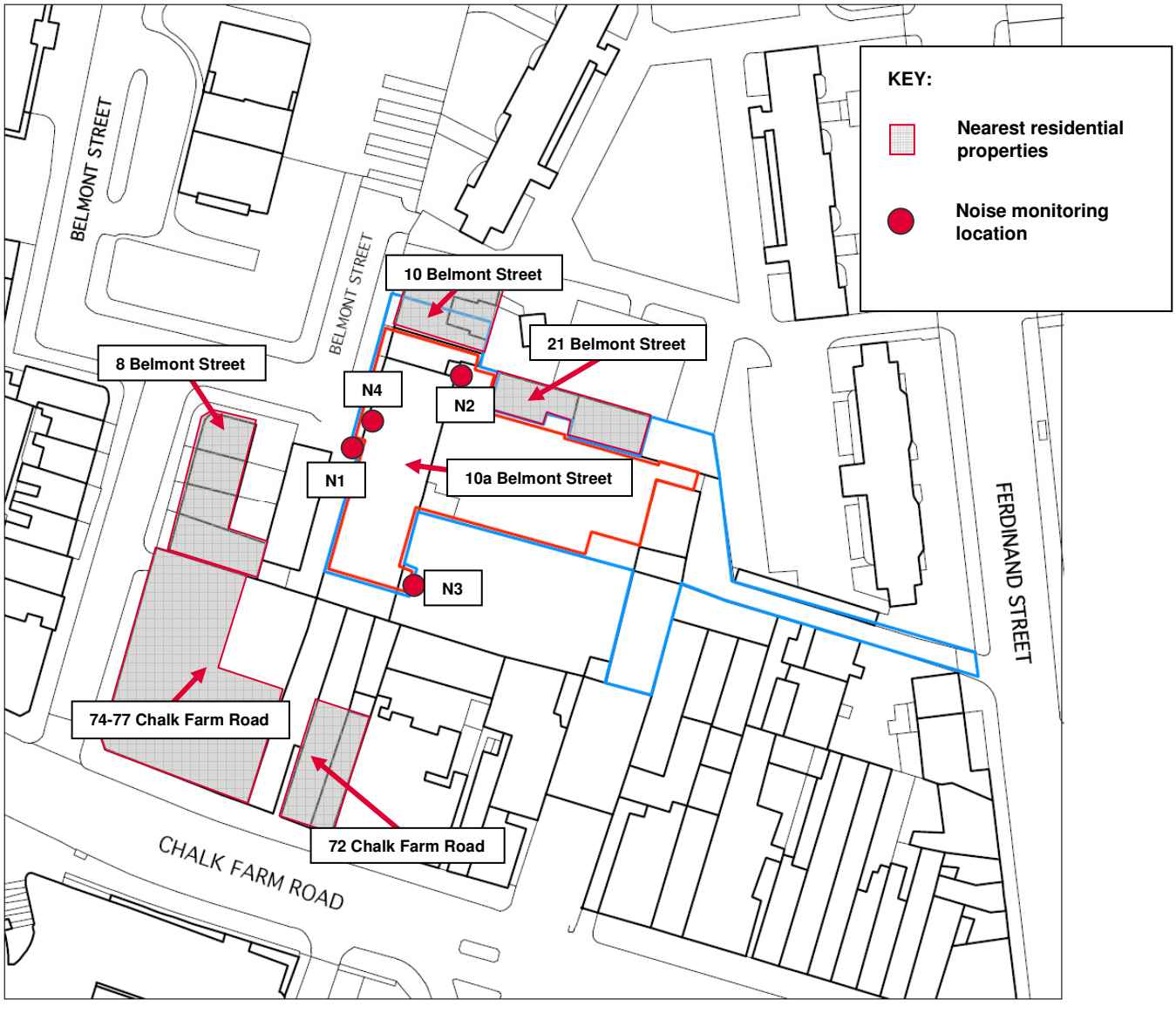
A parameter that is widely accepted as reflecting human perception of the ambient noise is the background noise level, L_{A90}. This is the noise level exceeded for 90% of the measurement period and generally reflects the noise level in the lulls between individual noise events. Over a 1-hour period the L_{A90} will be the noise level exceeded for 54 minutes.

Human subjects are generally only capable of noticing changes in steady levels of no less than 3 dB(A). It is generally accepted that a change of 10 dB(A) in an overall, steady noise level is perceived to the human ear as a doubling (or halving) of the noise level. (These findings do not necessarily apply to transient or non-steady noise sources such as changes in noise due to changes in road traffic flow, or intermittent noise sources).

The $L_{Amax,slow}$ measurement parameter is the maximum instantaneous sound pressure level attained during the measurement period (30 seconds, 5 minutes etc.), measured on the 'slow' response setting of the sound level meter. This is sometimes expressed as L_{Amax} or L_{max} dB(A). Even though sounds appear fairly steady to the human ear they are seldom if ever steady in level. To accommodate this factor, sound level meters (SLMs) are generally provided with at least two meter responses or exponential averaging circuits. Fast meter response has a time constant of $1/8^{th}$ of a second (125ms) and approximates the integration time of human hearing. The slow time response (time constant = 1 second) is intended to obtain an approximate average value of rapidly fluctuating levels from simple meter readings. This is used during the application of noise exposure categories, during night-time periods within PPG 24.

Appendix B: Site Plan and Noise Monitoring Locations

Figure B1: Proposed Site Plan and Noise Monitoring Locations



Appendix C: Site Photographs

Figure C1: View East Towards Location N1 (Location N1 circled)

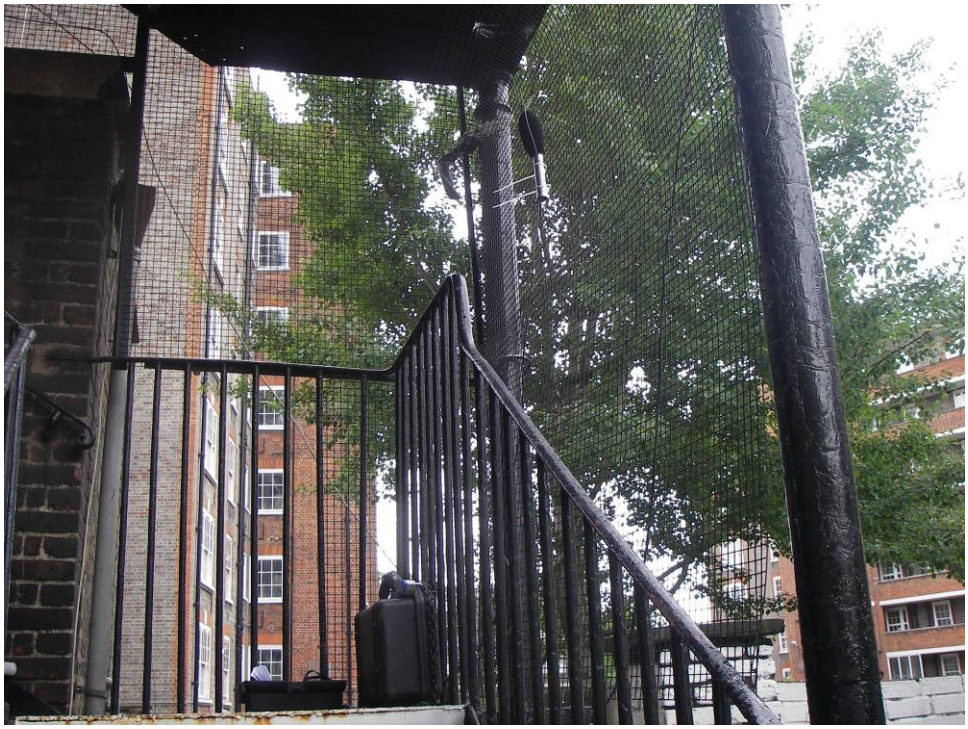


Figure C2: View North Towards Location N2

Figure C3: View South Towards Location N3 (circled)

Appendix D: Noise Monitoring

Instrumentation

The following instrumentation was employed during the noise survey:

- Norsonic 140 integrated sound level meter, serial no. 1403077 – Location N1;
- Brüel & Kjær (B&K) 2238 integrated sound level meter, serial no. 2562671 – Location N2;
- Brüel & Kjær (B&K) 2238 integrated sound level meter, serial no. 2201511 – Location N3;
- Norsonic 140 integrated sound level meter, serial no. 1403078 – Location N4; and
- Bruel & Kjaer (B&K) 4231 calibrator, serial no. 2217875 – All Locations.

Weather Conditions

Table D1 gives the weather conditions during the long-term noise monitoring. Information highlighted in **BOLD** exceed the limits given in BS 7445. Conditions have been sourced from the Met Office and www.wunderground.com for London.

Table D1: Weather Condions During Long-term Monitoring

Day	Period	Temperature ℃	Wind Direction	Average Wind Speed (m/s)	Conditions
Wednesday 21st May 2009	PM	12-19	SW	4.5	Partly cloudy
Thursday 21st May 2009	AM	9-17	S – W	3.5	Partly cloudy
	PM	11-19	W	**5.6**	Clear
Friday 22nd May 2009	AM	8-17	W	4.4	Clear
	PM	14-20	W	5.1	Partly cloudy
Saturday 23rd May 2009	AM	9-20	Variable	2.9	Clear
	PM	14-21	S	3.3	Clear
Sunday 24th May 2009	AM	10-21	Variable	2.1	Clear
	PM	16-25	Variable	2.7	Clear
Monday 25th May 2009	AM	12-19	E	3.2	Partly cloudy
	PM	18-23	Variable	2.8	Partly cloudy
Tuesday 26th May 2009	AM	12-18	N – W	4.1	**CLOUDY/RAIN**
	PM	11-17	W	**6.9**	Windy/ partly cloudy
Wednesday 27th May 2009	AM	9-12	S - W	5.4	**RAIN**

Noise Monitoring Time Histories

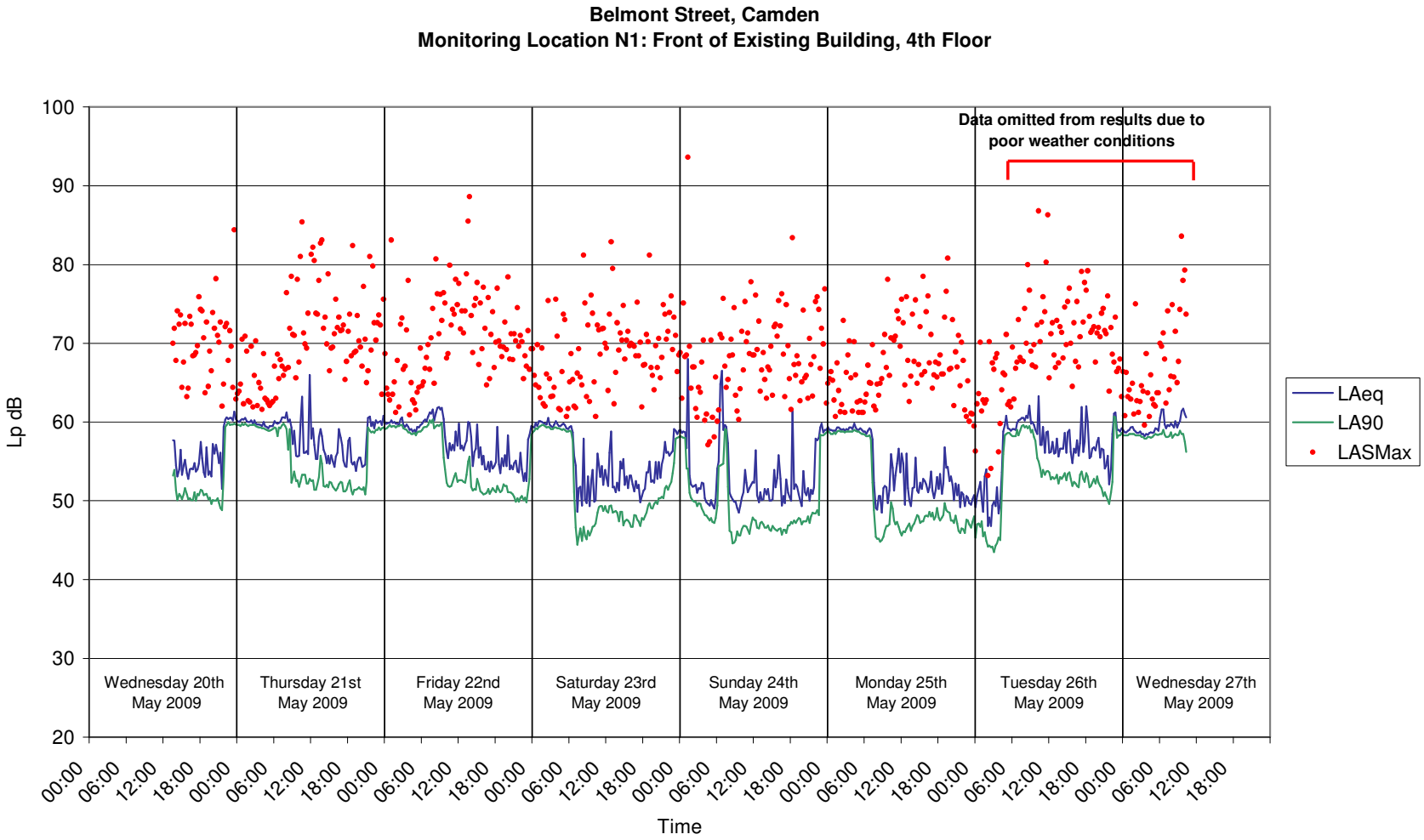


Figure D1: Noise Level Time History at Location N1

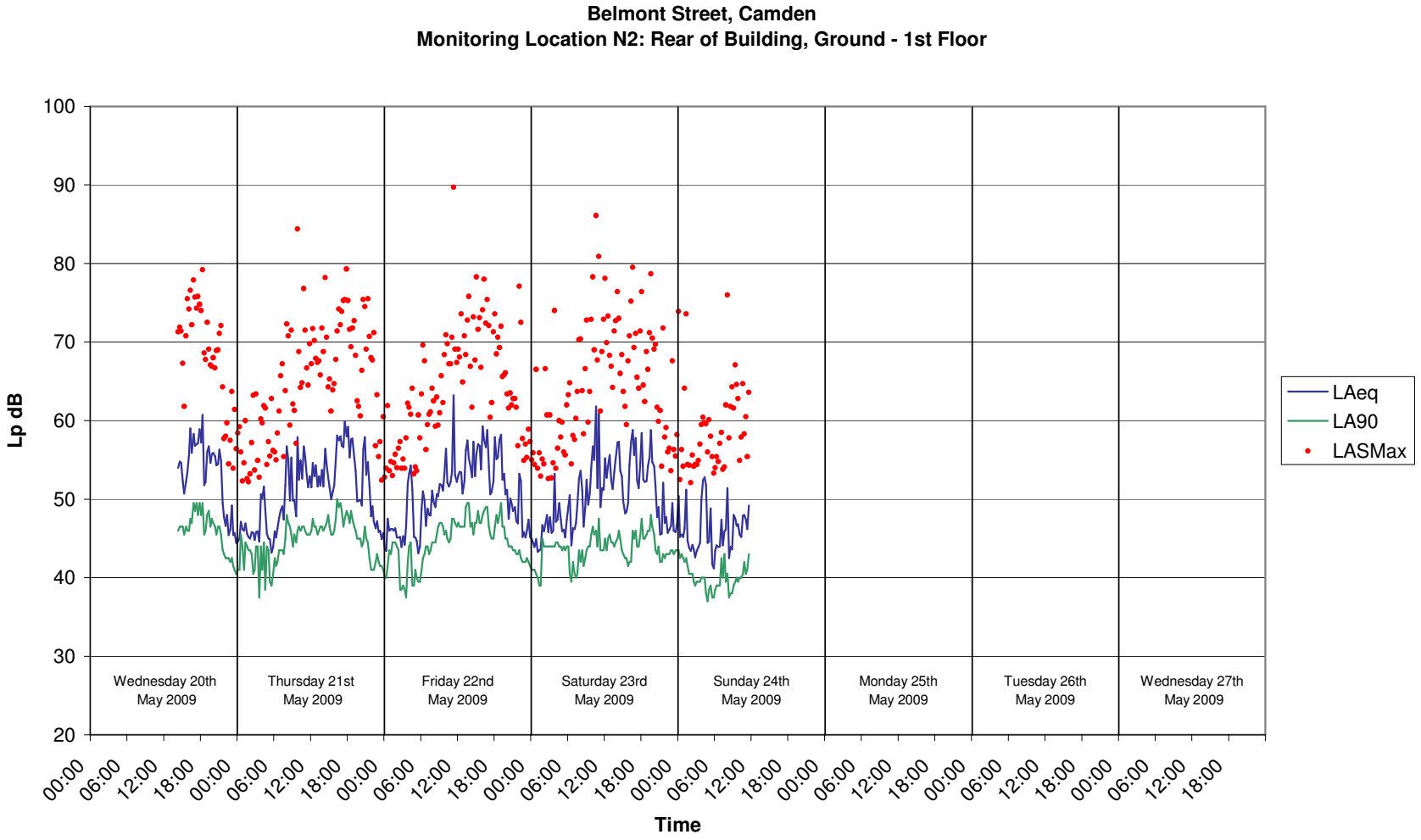


Figure D2: Noise Level Time History at Location N2

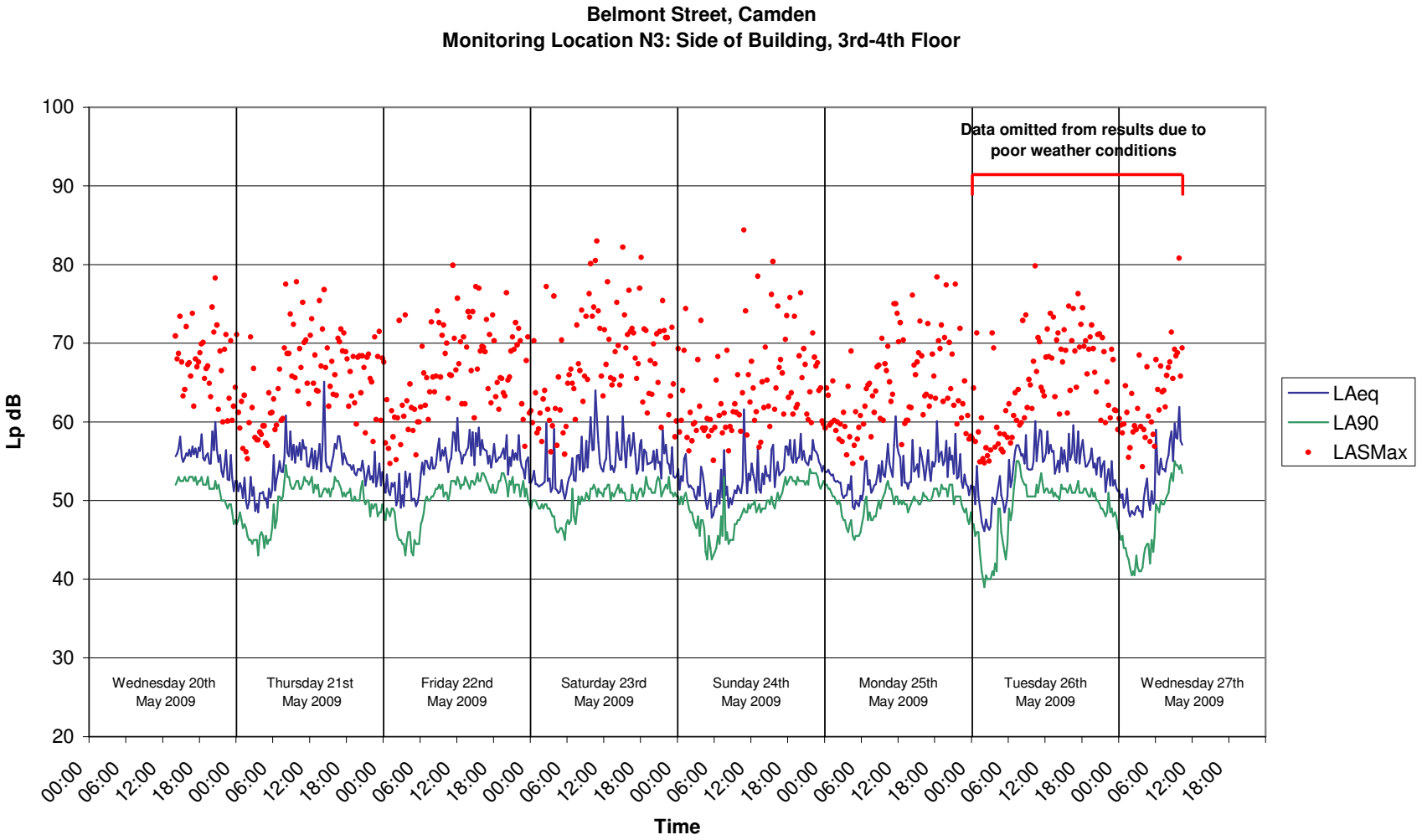


Figure D3: Noise Level Time History at Location N3

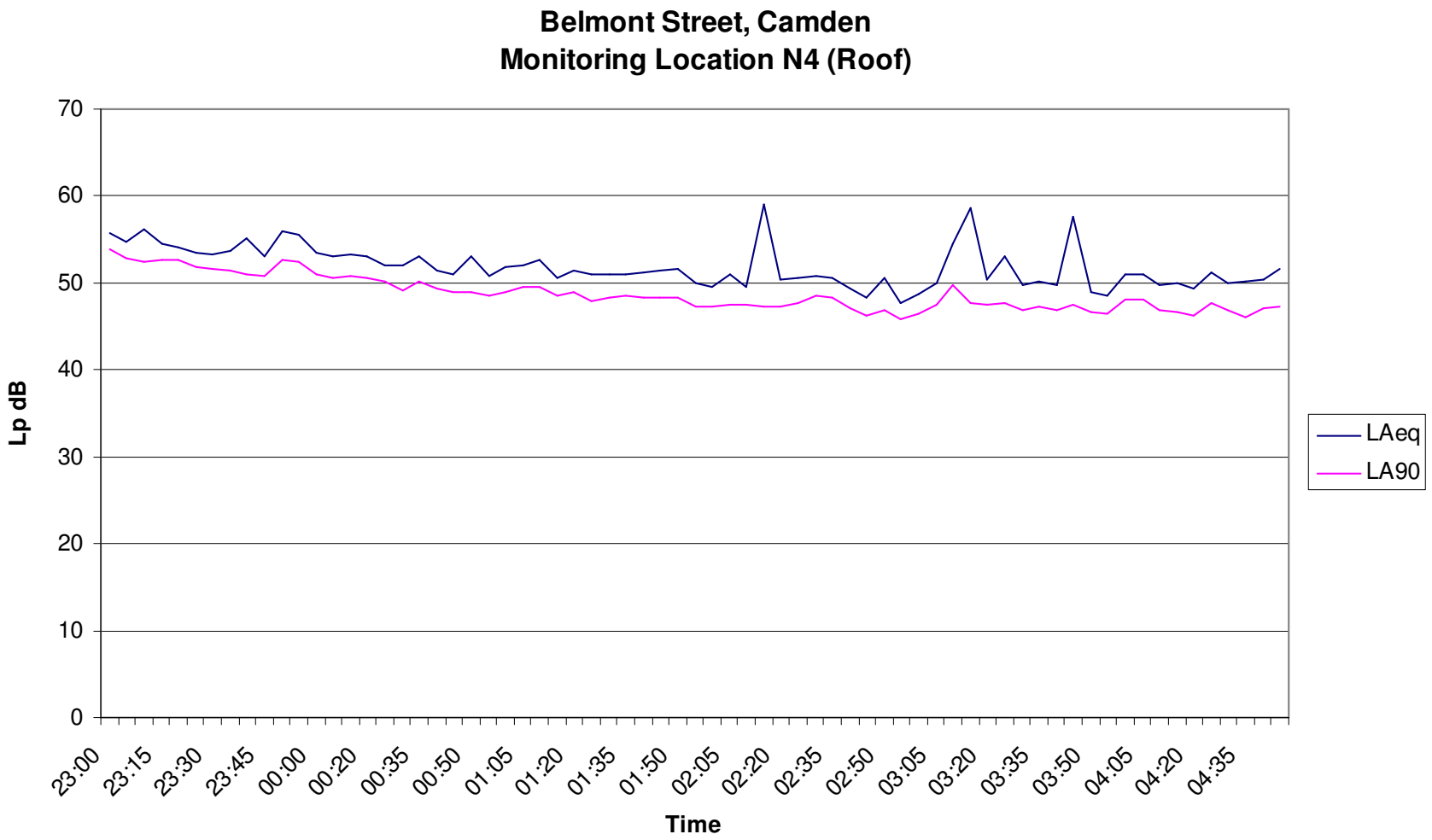


Figure D4: Noise Level Time History at Location N4

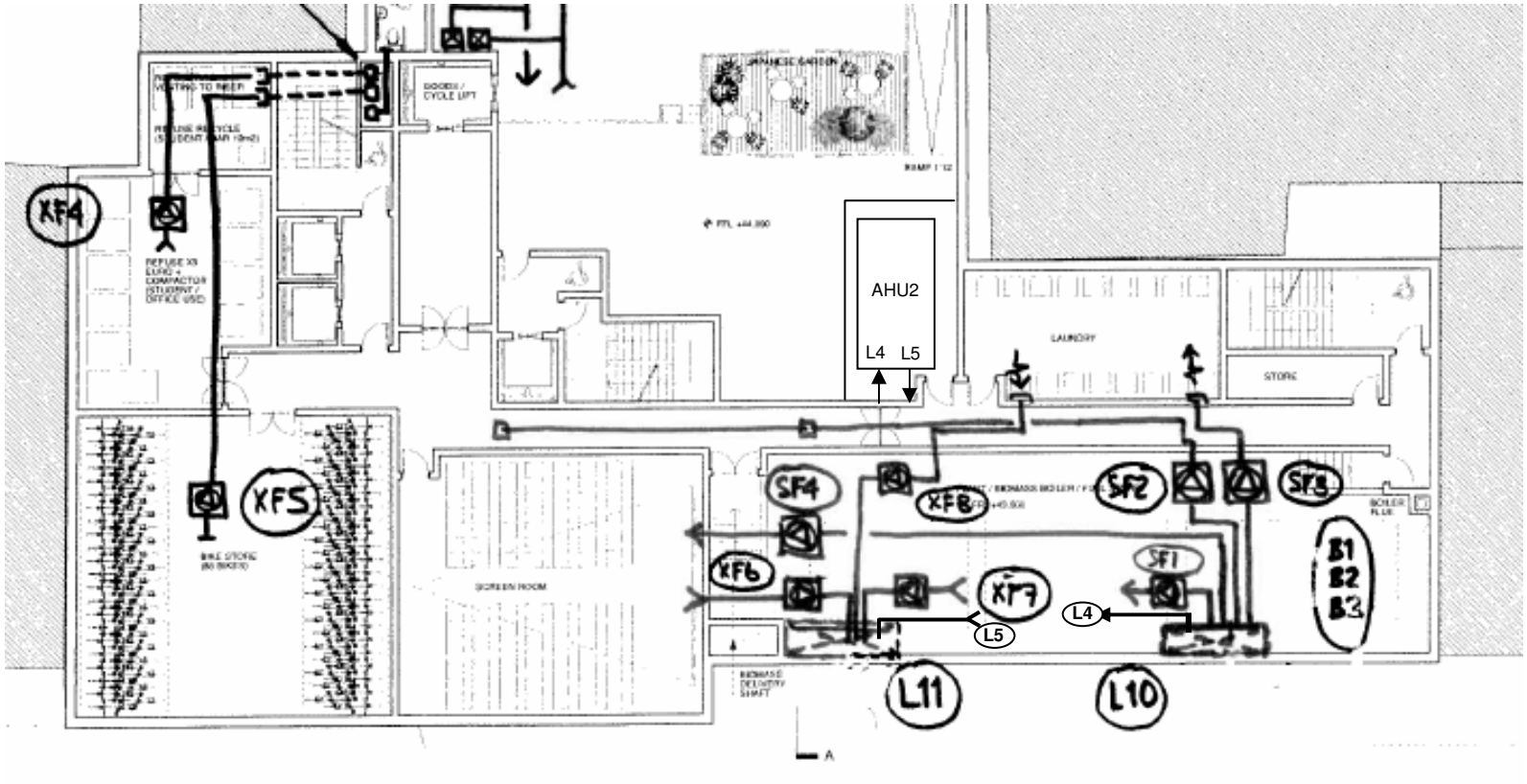
Appendix E: Mechanical Services

				plant details				In Duct Lw dB								In Duct Attenuation dB							
ref	serving	location	operating hours	make	model	Breakout noise (dBA @ 3m)		125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	silencer	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	Lw at outlet dB(A)
AHU1	social space AHU supply side	ceiling void level 7	09 - 23	Nu-Aire	Xboxer S6-XBH	39		79	76	67	62	59	50	40	CA40SP	-3	-7	-14	-18	-16	-11	-8	63
AHU1	social space AHU extract	ceiling void level 7	09 - 23					86	80	74	72	68	61	54	Minimum values	-10	-16	-20	-20	-18	-20	-10	62
L1	AHU1 intake louvre	façade level 7	09 - 23	-	-	-																	
L2	AHU1 discharge louvre	façade level 7	09 - 23	-	-	-																	
AHU2	employment space AHU supply side	Lower Basement	08 - 19	Nu-Aire	Boxer size 5	45		89	86	87	81	78	72	67	Minimum values	-14	-24	-34	-40	-40	-38	-28	60
L4/L10 part	AHU2 intake louvre	Boiler room discharge lightwell	08 - 19																				
SF1	Boiler room supply	Boiler room	24 hr	Nu-Aire	Axus 100DR-623	63		95	95	89	86	82	78	73	Minimum values	-20	-34	-42	-42	-38	-32	-26	60
L10 part	intake for boiler room	Boiler room discharge lightwell	24 hr	-	-	-																	
SF2	corridor supply	Boiler room	24 hr	Nu-Aire	AirMover 22	46		82	87	84	78	77	80	80	Minimum values	-14	-26	-29	-31	-34	-27	-24	60
L10 part	intake for corridor supply	Boiler room discharge lightwell	24 hr	-	-	-																	
SF3	Laundry	Boiler room	24 hr	Nu-Aire	AirMover 21	42		81	84	69	67	68	68	71	AM-SIL 1-S	-12	-16	-29	-35	-34	-27	-14	62
L10 part	intake for laundry supply	Boiler room discharge lightwell	24 hr	-	-	-																	
SF4	Screen room	Boiler room	09 - 23	Nu-Aire	AirMover 22	46		82	87	84	78	77	80	80	Minimum values	-15	-26	-29	-35	-34	-27	-24	60
L10 part	intake for screen room	Boiler room discharge lightwell	09 - 23	-	-	-																	
XF1	extract fan for each student room	above cooking area	24 hr	Nu-Aire	MEV-SVS 2	27		42	46	41	37	28	24	18	none								43
L3	exhaust louvre for each student room	façade within residential room	24 hr	-	-	-																	
XF2	employment toilet extract fan	GF ceiling void	24 hr	Nu-Aire	ES-OPUS DC40-M	29		65	52	45	41	36	24	25	Minimum values	-7	-10	-10	-10	-6	0	0	43
L9	toilet extract discharge louvre	GF rear wall to adjacent property	24 hr	-	-	-																	
XF3	Core toilet extract fan	toilet area ceiling void	24 hr	Nu-Aire	Quietscroll EST-4	30		61	61	45	37	31	30	24	Minimum values	-12	-17	-15	-8	-2	-2	0	39
L8	Exhaust louvre for core toilets	GF rear wall facing service yard	24 hr	-	-	-																	
XF4	Refuse store extract fan	refuse store ceiling void	24 hr	Nu-Aire	AirMover 21	42		81	80	70	71	71	70	68	Minimum values	-32	-38	-36	-44	-44	-42	-36	39
L7	Exhaust louvre for refuse store	GF rear wall facing service yard	24 hr	-	-	-																	
XF5	Bike store extract fan	Bike store ceiling void	24 hr	Nu-Aire	AirMover 22	46		83	82	82	82	82	81	82	Minimum values	-29	-39	-54	-58	-58	-54	-52	40
L6	Exhaust louvre for bike store	GF rear wall facing service yard	24 hr	-	-	-																	
AHU2	employment space AHU extract	Lower Basement	08-19	Nu-Aire	Boxer sixe 5	45		82	87	86	80	76	71	67	Minimum values	-12	-24	-28	-29	-30	-23	-20	60
L5/L11 part	AHU2 discharge louvre	Boiler room discharge lightwell	08-19	-	-	-																	
XF6	Screen Room extract	Boiler room	09 - 23	Nu-Aire	AirMover 22	46		83	82	82	82	82	81	82	Minimum values	-12	-20	-29	-35	-34	-30	-28	60
L11 part	Exhaust louvre for screen room	Boiler room discharge lightwell	09 - 23	-	-	-																	
XF7	Boiler room extract	Boiler room	24 hr	Nu-Aire	Axus 100DR-623	63		95	95	89	86	82	78	73	Minimum values	-24	-32	-34	-34	-34	-30	-24	60
L11 part	Exhaust louvre for boiler room vent	Boiler room discharge lightwell	24 hr	-	-	-																	
XF8	Laundry Extract	Boiler room	24 hr	Nu-Aire	AirMover 21	42		81	80	70	71	71	70	68	AM-SIL 1-S	-12	-16	-29	-35	-34	-27	-14	59
L11 part	Exhaust louvre for laundry extract	Boiler room discharge lightwell	24 hr	-	-	-																	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]																	
R1	social space condenser	level 7 stair roof	09 - 23	Mitsubishi	PUHZ-RP200YKA	59 dBA @ 1m																	
R2	screen room condenser	level 7 stair roof	09 - 23	Mitsubishi	PUHZ-RP200YKA	59 dBA @ 1m																	
B1	85 kW biomass boiler	basement -2 boiler room	24 hr			negligible																	
B2	200 kW gas boiler	basement -2 boiler room	24 hr			negligible																	
B3	200 kW gas boiler	basement -2 boiler room	24 hr			negligible																	

Table E1: Mechanical Services Plant Schedule

Note that L10 and L11 provide the intake and exhaust for a number of items of plant.

Mechanical Services Proposed Layouts



Belmont Street

Figure E1: Lower Basement Plan

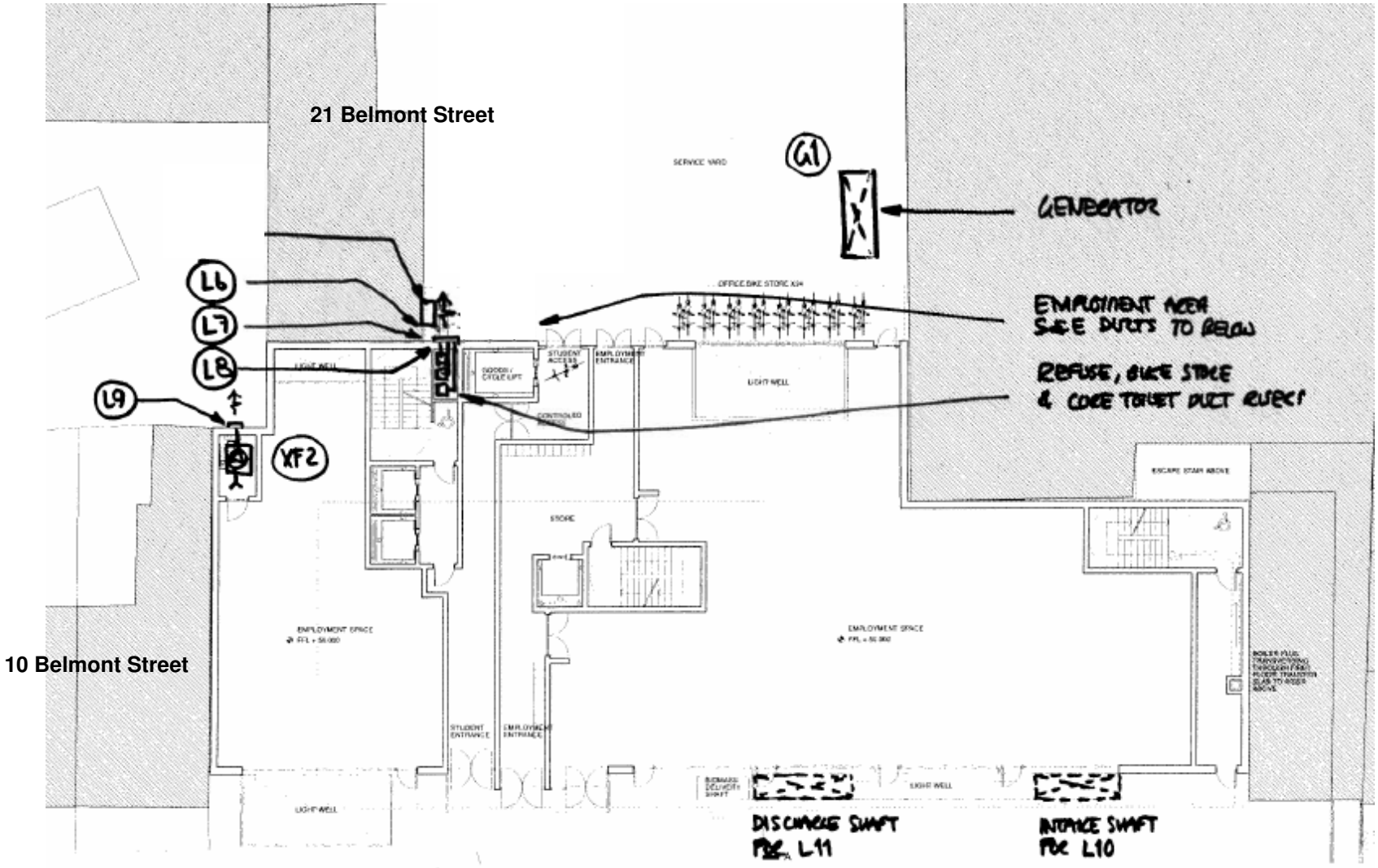


Figure E2: Ground Floor Plan

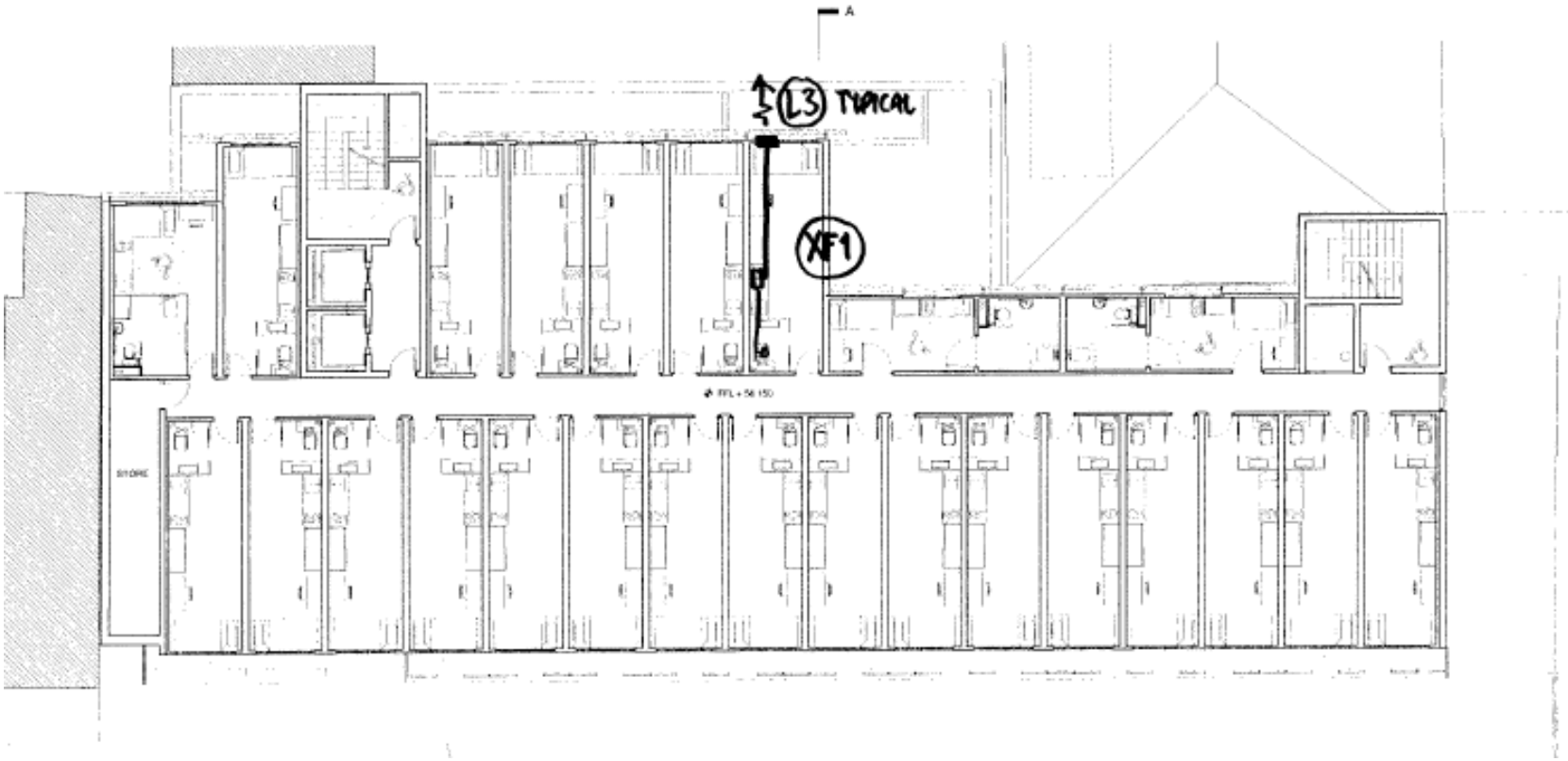


Figure E3: First to Sixth Floor Plan (extract fan XF1 and L3 will be provided for every student room)

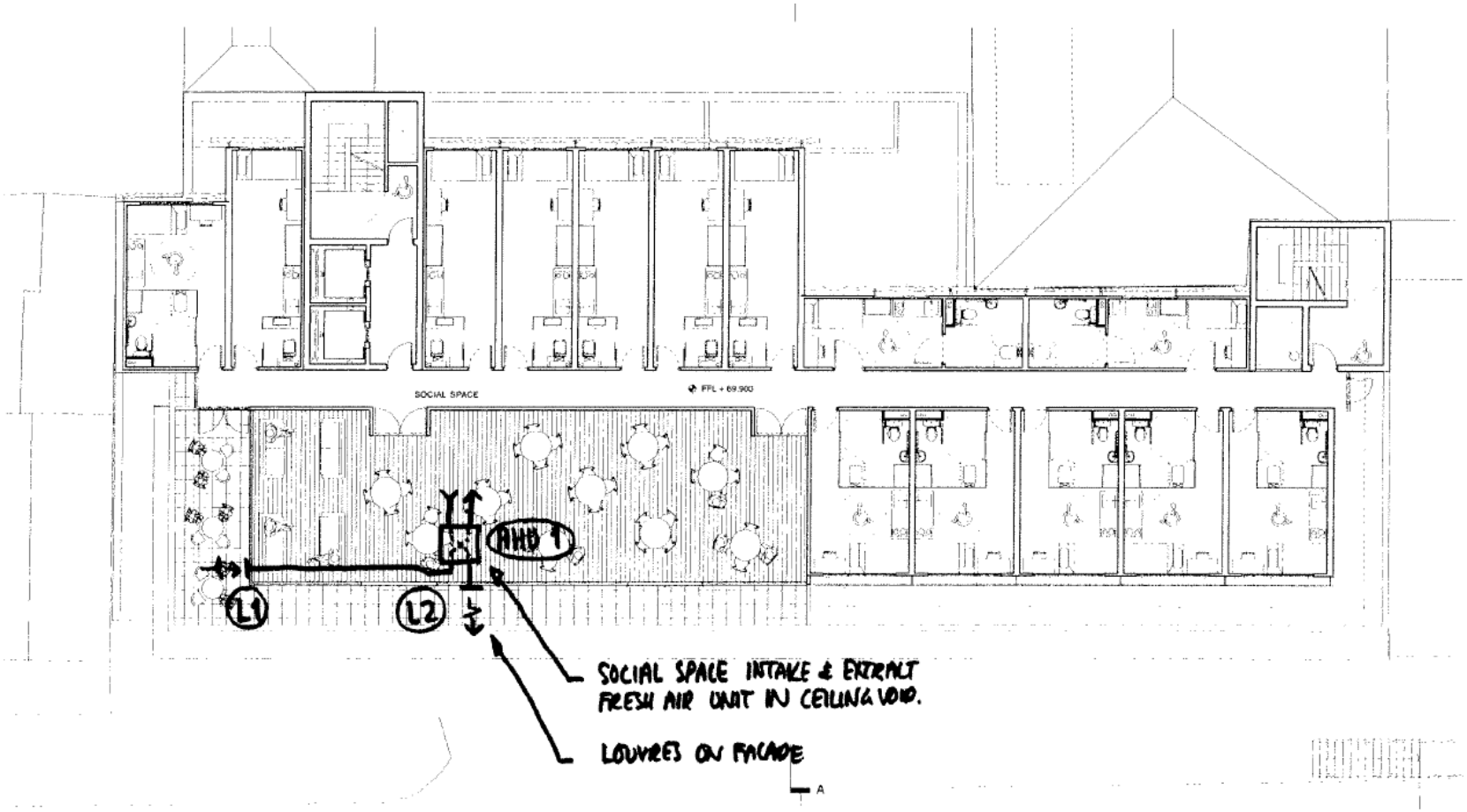


Figure E4: Seventh Floor Plan

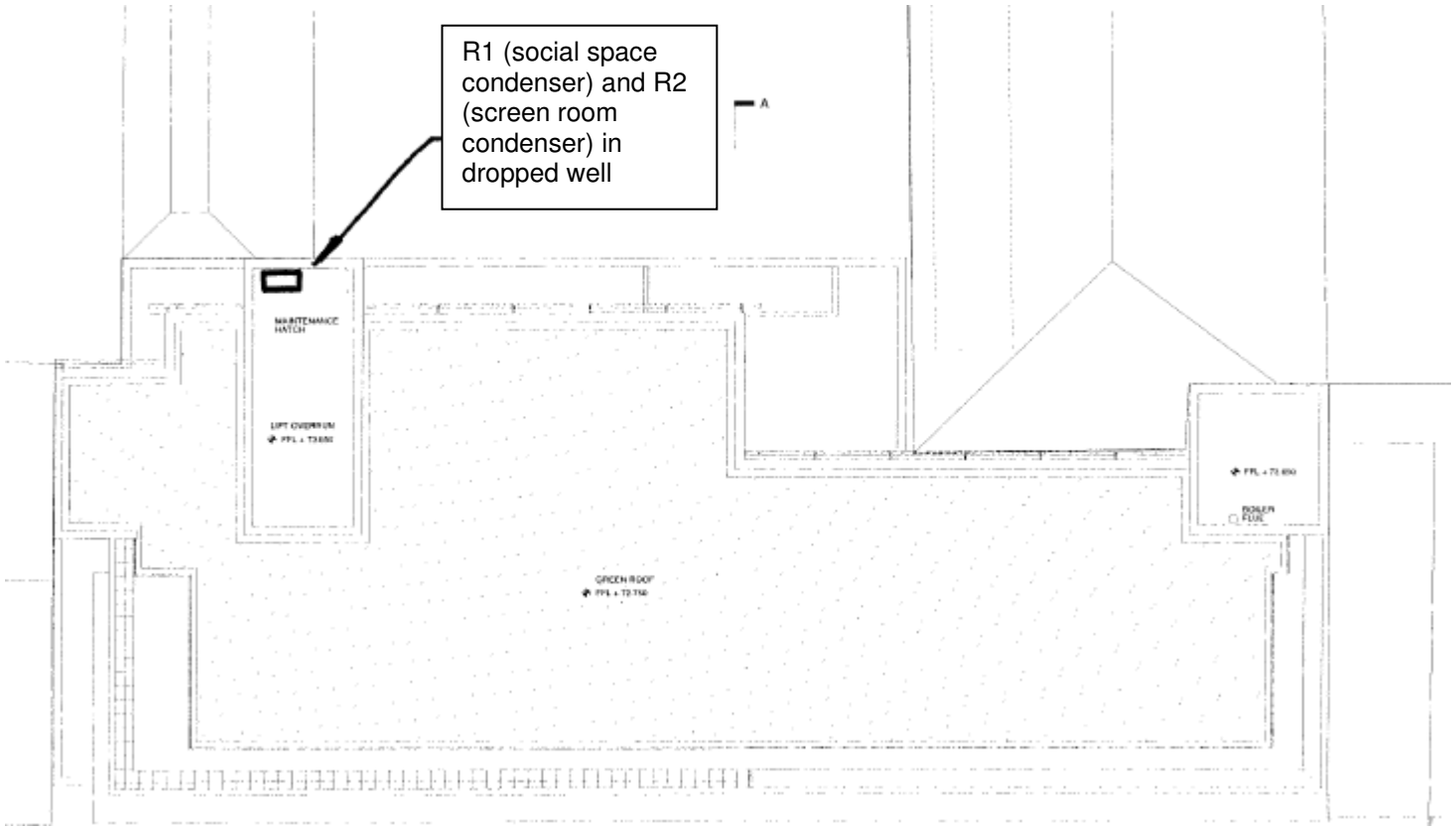


Figure E5: Roof Plan