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NOISE ASSESSMENT

PROPOSED DEVELOPMENT OF 8 FLATS ON LAND AT THE SURGERY, STATION ROAD, KNEBWORTH

AT DESIGN (WELWYN) LTD

MARCH 2018



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Status	Prepared By	Date
1.0	L Jephson BEng (Hons) MIOA	23/3/18

This report has been prepared using all reasonable skill and care within the resources and brief agreed with the client.
LF Acoustics Ltd accept no responsibility for matters outside the terms of the brief or for use of this report, wholly or in part, by third parties.

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1. Introduction

LF Acoustics Ltd have been appointed by AT Design (Welwyn) Ltd, acting on behalf of A E Bullock Ltd to carry out a noise assessment for a proposed residential development on land at The Surgery, Station Road, Knebworth.

It is proposed to demolish the existing surgery building and construct a new development comprising 8 flats on the site.

Planning Permission for the Proposed Development has been granted, subject to conditions (Application Ref. 15/02299/1). Condition 5 relates to noise and is reproduced below for reference:

5. **Prior to the commencement of the development the developer shall carry out a noise assessment in accordance with relevant guidance and standards. A scheme for sound insulation and noise control measures shall be submitted for the Council's written approval. The approved scheme shall be implemented in accordance with the approved details in order to achieve the following "good" internal noise targets:**
Bedrooms (23.00 to 07.00hrs) 30 dB LAeq(16hour) and 45 dB LAmax(f)
Living rooms (07.00 to 23.00hrs) 30 dB LAeq(8hour).
Once implemented, the scheme of measures shall be maintained in accordance with the approved details.

This report provides an assessment of the noise levels within the Proposed Development, making recommendations for additional noise mitigation measures, as necessary, to ensure the limits specified within the above condition are met.

The following section of this report provides a description of the principal standards and guidelines referred to within this report. Section 3 provides a brief description of the site and surrounding noise sources. Section 4 provides a description of the measurement exercise carried out and a summary of the results. Section 5 calculates the noise levels within the proposed development and assesses the measured noise levels against the adopted criteria, with additional noise mitigation measures discussed to ensure a good standard of noise was achieved internally. Finally, Section 6 gives a summary of the main findings of the assessment.

2. Standards and Guidelines

A description of the noise and vibration units referred to in this report is given in Appendix A.

2.1. National Planning Policy Framework

The National Planning Policy Framework (NPPF) was published in 2012 [1]. The aim of the Framework is to move the decision making process to a local level and to promote new development, with the presumption in favour of sustainable development.

Local planning authorities are required to develop local policies, and with regards noise, planning policies and decisions should aim to:

- Avoid noise from giving rise to significant adverse impacts on health and quality of life from new development;
- Mitigate and reduce to a minimum other adverse impacts on heath and quality of life arising from noise from new development, including through the use of conditions; and
- Recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established.

2.2. British Standard BS 8233

BS 8233 [2] recommends design aims for noise levels to be achieved in new buildings and is the most appropriate guidance in defining applicable noise levels within the proposed development. The Standard was updated in 2014 to better reflect the requirements of the NPPF in terms of impact classifications and achieving the recommended guidance values, seeks to ensure that the occupants would not be subject to any significant adverse impacts, to ensure compliance with the requirements of the NPPF.

For residential properties, the guidance recommends the following design aims for the daytime (07:00 – 23:00) and night-time (23:00 – 07:00) periods:

- 35 dB $L_{Aeq,16\ hour}$ within living rooms and bedrooms during the daytime period;
- 40 dB $L_{Aeq,16\ hour}$ within dining areas / rooms during the daytime period;
- 30 dB $L_{Aeq,8\ hour}$ within bedrooms at night; and
- 50 – 55 dB L_{Aeq} within gardens and patios during the daytime.

With regards internal noise levels, the Standard advises:

"Where development is considered necessary or desirable, external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved."

Where the above limits require windows to be closed to maintain the standard of noise, there needs to be appropriate alternative ventilation provided that does not compromise the façade insulation or resulting noise level.

For outdoor amenity spaces, it is recognised in the Standard that these guideline values may not be achievable in all circumstances. Where development might be desirable, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, the development should be designed to achieve the lowest practicable levels, but should not be prohibited. Given that there is a need for the development, it is considered in this situation, that this relaxation could be applied, providing the lowest practicable levels have been achieved.

2.3. World Health Organisation Guidelines

The WHO guidance [3] provides guidance of a similar nature to BS8233, although the emphasis is more on health effects associated with noise. The document recommends internal and external noise levels to provide an acoustic environment conducive to un-interrupted speech and sleep. The WHO guidance is summarised below for information purposes.

- It will be important to consider the maximum noise levels and number of noisy events.
- Satisfactory protection should be provided to avoid sleep disturbance, annoyance and speech communication interference.
- Recommended internal noise levels in bedrooms are given as 30 dB $L_{Aeq,T}$ for continuous noise and 45 dB $L_{Amax,F}$ for single events, during the night-time period.

3. Site Description

The site is located on the corner of Station Road and the B197 within the centre of Knebworth.

The site is presently occupied by The Surgery, which is due to relocate elsewhere in the town shortly. The existing building will be demolished to enable the new development comprising 8 flats to be constructed.

Whilst remaining a similar distance from the B197, the new building will be located closer to Station Road, in line with the existing properties along the road. The positions of the existing and proposed buildings are indicated on Figure 1.

A 3 storey building will be constructed, comprising 3 flats on the ground and first floors and a further 2 flats on the second floor.

The internal layout of the flats has sought to minimise the number of bedrooms facing directly onto the two roads, by positioning lounges and kitchens closest to the roads, where possible. The proposed internal layouts are indicated on Figures 2 – 4.

Road traffic travelling along the B197 was identified to be the main source of noise within the site, with regular vehicle movements throughout the day and night-time periods.

Station Road was observed to be less busy and principally carrying local traffic (mainly cars), to the residential areas to the west.

The East Coast Main Line runs approximately 150 metres to the west of the site and is mainly screened from the Proposed Development by existing residential properties located closer to the railway. Whilst trains passing were audible within the site, the train movements had minimal influence on ambient (L_{Aeq}) noise levels and no influence on maximum noise levels ($L_{Amax,F}$), which were principally influenced by the passing road traffic.

4. Noise Monitoring

4.1. Introduction

In order to ascertain the existing noise levels on the site, a noise monitoring exercise was carried out between Monday 5th and Friday 9th March 2018.

The measurement exercise principally comprised an unattended noise survey located adjacent to the B197, supplemented with attended sample noise measurements taken at positions along Station Road.

Weather conditions during the survey were generally good, with generally dry conditions and light winds throughout the survey period. These conditions were considered suitable for undertaking an assessment of the road traffic noise levels.

Rion NL-52 Class 1 Sound Level Meters was used for the survey, which was calibrated before and after the exercise using a Rion NC-74 Class 1 Acoustic Calibrator. The sound level measured on the instruments with the calibrator applied read 94.0 dB(A) on both occasions.

The instruments were configured to monitor noise levels over contiguous 5 minute periods for the duration of the survey, which enabled maximum noise levels associated with particular events to be identified and to allow a comparison with the attended noise measurements to be made. The short duration also enabled a comparison between the unattended and attended noise measurements to be made.

4.2. Unattended Noise Survey

The unattended noise monitoring equipment was positioned along the side balcony of the current building. The microphone was set at a height of 4 metres above the ground level, strapped to the railings in a freefield position. There was an unobstructed view onto the carriageway of the B1997 from the monitoring position. From this position, there was also a narrow view onto the railway line to the west.

The monitoring location is indicated on Figure 1.

Noise levels monitored at this position were principally influenced by road traffic passing on the B197, with maximum noise levels generally attributable to passing HGVs.

The results of the survey have been summarised and tabulated into hourly periods for reporting purposes using the Rion AS-60 Data Management Software and are presented in Appendix B, with a graphical presentation of the 5 minute monitoring results also contained within the appendix.

The noise levels have been analysed to provide the overall day and night-time levels, as indicated in Table 4.1.

Day	Period L_{Aeq} Noise Level [dB]	
	Daytime (07:00 – 23:00)	**Night-time (23:00 – 07:00)**
Monday 5th March 2018	67.2*	59.9
Tuesday 6th March 2018	66.7	59.8
Wednesday 7th March 2018	67.7	61.1
Thursday 8th March 2018	68.1	59.8
Average	**68**	**60**

Notes * Daytime Period includes levels measured between Monday 11:00 – 23:00 hours and Friday 07:00 – 11:00 hours

Table 4.1 Period Noise Levels Monitored Adjacent to B197

Maximum noise levels were observed to be principally associated with passing HGV traffic during the daytime period. Overnight, traffic volumes reduced and maximum noise levels were observed to be typically between 70 – 75 dB $L_{Amax,F}$ associated with passing cars, with an occasional HGV passing generating higher levels, as indicated within the figures in Appendix B.

4.3. Attended Noise Monitoring

Attended noise measurements were obtained at two positions during the morning of Monday 5th March 2018. One instrument was positioned at the site boundary on the corner of Station Road and the B197 (located along the boundary, as there were cars parked within the car park) and a second along the boundary adjacent to the neighbouring property along Station Road. The monitoring locations are indicated on Figure 1.

Measurements were obtained over a period of 1 hour, concurrent with the unattended noise survey. At each position, the microphone was set freefield and at a height of 1.5 metres above the ground.

Noise levels at each position were observed to be principally attributable to traffic travelling along the B197. There were regular movements along Station Road with the traffic passing mainly cars and slowing for the roundabout.

The results of the surveys are presented in Appendix C, which also contains an evaluation with the unattended survey results to determine the period noise levels at these locations, as follows.

Location	Period L_{Aeq} Noise Level [dB]	
	Daytime (07:00 – 23:00)	**Night-time (23:00 – 07:00)**
Site Boundary Corner of Station Road and B197	68	61
In Line with Neighbouring Property Along Station Road	61	53

Table 4.2 Period Noise Levels Obtained from Monitoring Along Station Road

Noise levels along Station Road were observed to be lower than along the B197 façade, due to the lower volumes of traffic. Maximum noise levels were also observed to be lower, with maximum noise levels along Station Road not exceeding 75 dB $L_{Amax,F}$ at a position representative of the proposed façade.

5. Calculations and Assessment

5.1. Proposed Building Construction

The building would be of a standard brick construction, which would typically provide around a 50 dB R_W sound reduction. It is proposed to use clay tiles for the roof, again with a standard construction with insulation and plasterboard on the inner face, which would provide a sound reduction in excess of 40 dB R_W. The weak parts of the construction acoustically are therefore likely to be the glazing and ventilation.

Within the standard construction for the property, it is proposed to use typical 4-16-4 or 4-20-4 thermal double glazing, with above window slot ventilators with an indirect air path, to provide background ventilation in the rooms. This configuration typically provides a sound reduction of around 32 dB R_W and has been assumed as the base configuration for this assessment.

5.2. Facades Facing onto B197

Noise levels were observed to be highest along the B197 facades, due to the higher volumes of traffic.

The proposed internal layout has sought to minimise bedroom windows along this façade, although it would still necessary to locate one bedroom within the second floor, with a window facing onto the road, as indicated on Figure 4. As indicated on Figures 2 – 4 the windows facing onto the B197 would mainly be the lounge windows.

Calculations of the internal noise levels within the rooms facing onto the B197 have been made, based upon the standard construction defined above. The calculation details are provided in Appendix D. The calculations indicate internal noise levels of 42 dB $L_{Aeq,\ 16\ hour}$ daytime and 35 dB $L_{Aeq,\ 8\ hour}$ night-time, which are in excess of the limits specified within Condition 5 and within BS 8233 as representing a good standard of noise.

To ensure a good standard of noise is achieved within the lounges and bedrooms facing onto the B197 with regards to the requirements of BS 8233, it is recommended that the specification for the glazing and ventilation for windows facing onto the road be upgraded. At this stage, a glazing supplier has not been appointed and this assessment has therefore been based upon generic glazing and ventilation available commercially, to determine the requirements for these windows.

For the lounges, glazing such as Saint Gobain SGG 6/16/6.8 Stadip Silence, with acoustic passive window vents (an example would be ones provided by Munster Joinery or Velfac, assumed open), would provide a noticeable increase in the sound insulation of the building façade. The performance specification utilised for the glazing and vents is provided in Appendix D, along with the calculations.

The enhanced glazing / ventilation would provide a noticeable reduction in noise levels within the lounges, seeking to reduce noise levels internally by 36 dB(A) to 32 dB $L_{Aeq,\ 16\ hour}$ during the daytime periods and thus achieving a good standard of noise with regards the requirements of BS 8233.

Within bedrooms, the same mitigation would reduce night-time noise levels to 25 dB $L_{Aeq,\ 8\ hour}$, again achieving a good standard of noise. With regard maximum noise levels, the mitigation would seek to ensure that maximum noise levels remained generally of the order of 73 dB $L_{Amax,F}$ or lower internally and not normally exceeding a level of 45 dB $L_{Amax,F}$, thus meeting the requirements of Condition 5.

5.3. Facades Facing onto Station Road

Noise levels along these facades of the development were observed to be generally lower than along the B197 façade, as traffic volumes were lower, with the majority of the vehicles travelling very slowly as they approached the roundabout.

The monitoring carried out at positions representative of the Station Road facades indicated levels of 61 dB $L_{Aeq,\ 16\ hour}$ and 53 dB $L_{Aeq,\ 8\ hour}$, 7 dB(A) lower than the B197 facades.

Calculations of the internal noise levels based upon the use of standard thermal double glazing and trickle vents would indicate that the daytime noise levels within lounges facing onto the road would marginally exceed a good standard of noise, with noise levels within the bedrooms just achieving the standard.

To ensure a good standard of noise is achieved within the lounges and bedrooms facing onto Station Road, it is recommended that the enhanced glazing / ventilation specified for the B197 facades are also used within these facades.

The details of the calculations provided in Appendix D, indicate that noise levels within the lounges facing onto Station Road would be of the order of 28 dB $L_{Aeq,\ 16\ hour}$ daytime, with noise levels within bedrooms anticipated to be below 25 dB $L_{Aeq,\ 8\ hour}$ overnight, thus ensuring a good standard of noise was achieved internally.

The mitigation measures provided for the bedrooms with windows along this façade would also ensure that a level of 45 dB $L_{Amax,F}$ was not normally exceeded overnight, thus complying with the requirements of the planning condition.

6. Summary

LF Acoustics Ltd have were appointed by AT Design (Welwyn) Ltd, acting on behalf of A E Bullock Ltd to carry out a noise assessment for a proposed residential development on land at The Surgery, Station Road, Knebworth.

It is proposed to demolish the existing surgery building and construct a new development comprising 8 flats on the site.

Planning Permission for the Proposed Development has been granted, subject to conditions (Application Ref. 15/02299/1). Condition 5 of the planning permission seeks to ensure a good standard of noise is achieved within the flats.

A noise monitoring exercise has been undertaken to establish the noise environment within the Proposed Development, comprising an unattended noise survey, supplemented with periods of attended noise measurements.

The results of noise monitoring have been utilised as the basis of the calculation and assessment of internal noise levels within the Proposed Development.

The assessment concluded that the provision of standard thermal double glazing and trickle vents within the B197 and Station Road facades would not be sufficient to achieve a good standard of noise internally.

Recommendations have been made to utilise glazing with a higher acoustic performance, such as SGG 6/16/6.8SS (which provides a sound reduction of 33 dB R_{W+CTR}) and the provision of acoustically treated passive vents within the windows of lounges and bedrooms which face onto the two roads.

With the provision of appropriate mitigation, a good standard of noise would be achieved internally with regards to the requirements of BS 8233:2014 and thus meet the requirements of Condition 5 of the planning permission.

References

1. Department for Communities and Local Government. National Planning Policy Framework. March 2012.

2. British Standards Institute. Guidance on Sound Insulation and Noise Reduction for Buildings. BS 8233. 2014.

3. World Health Organisation. Guidelines for Community Noise. Geneva. 2000.

Figures

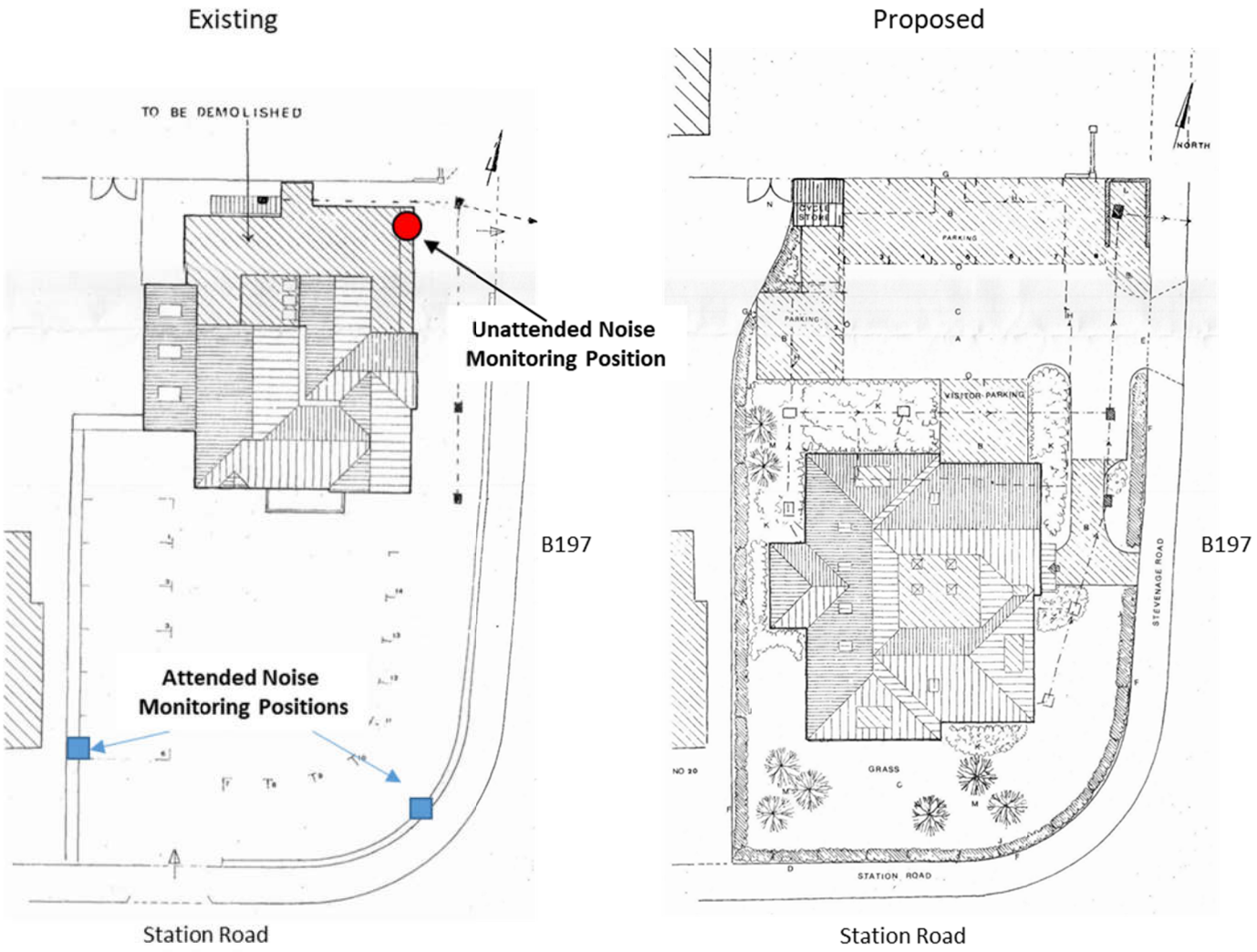

Figure 1:
Site Plan and Noise Monitoring Locations

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Figure 2:
Proposed Internal Layout
Ground Floor



Ground Floor Plan

Figure 3:
Proposed Internal Layout
First Floor

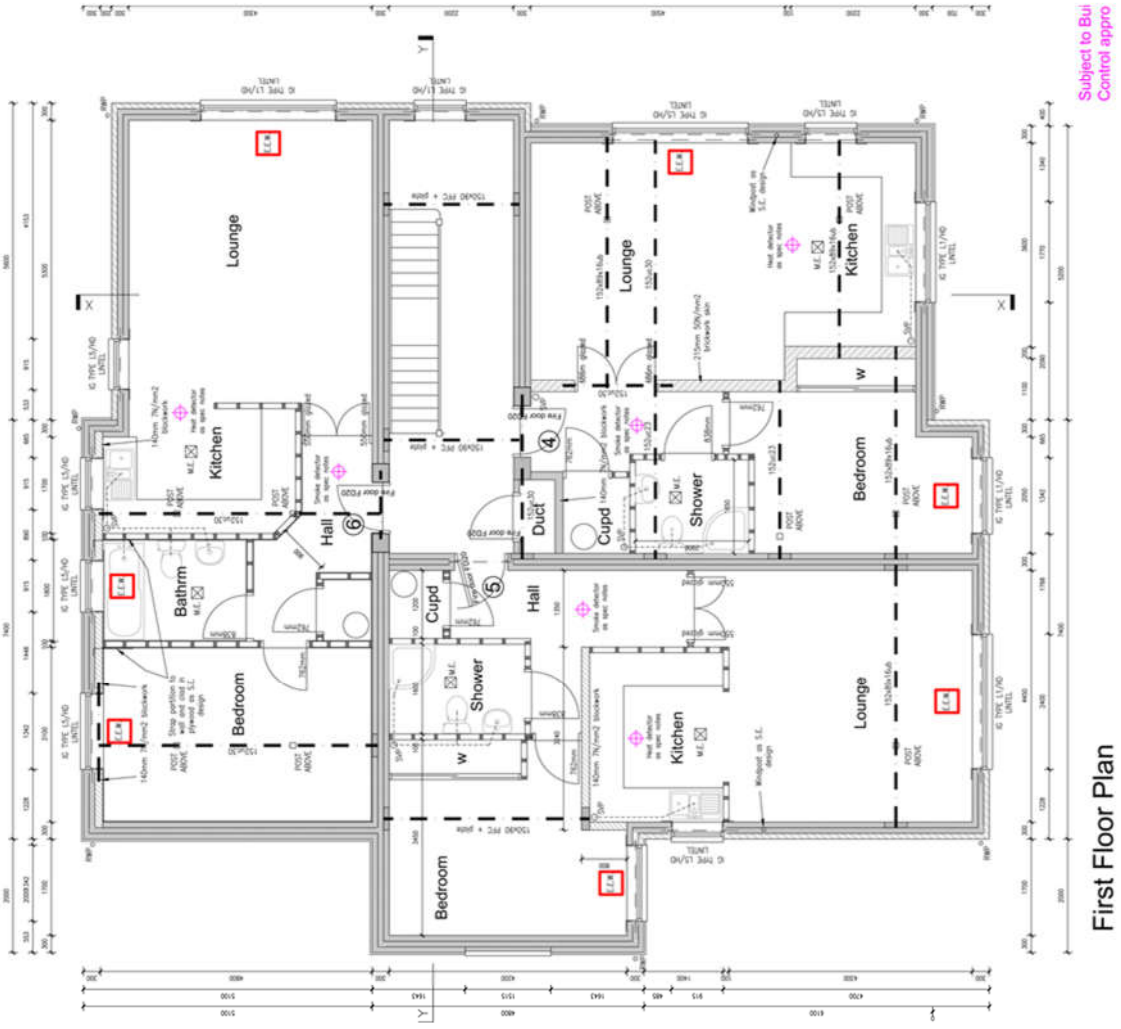
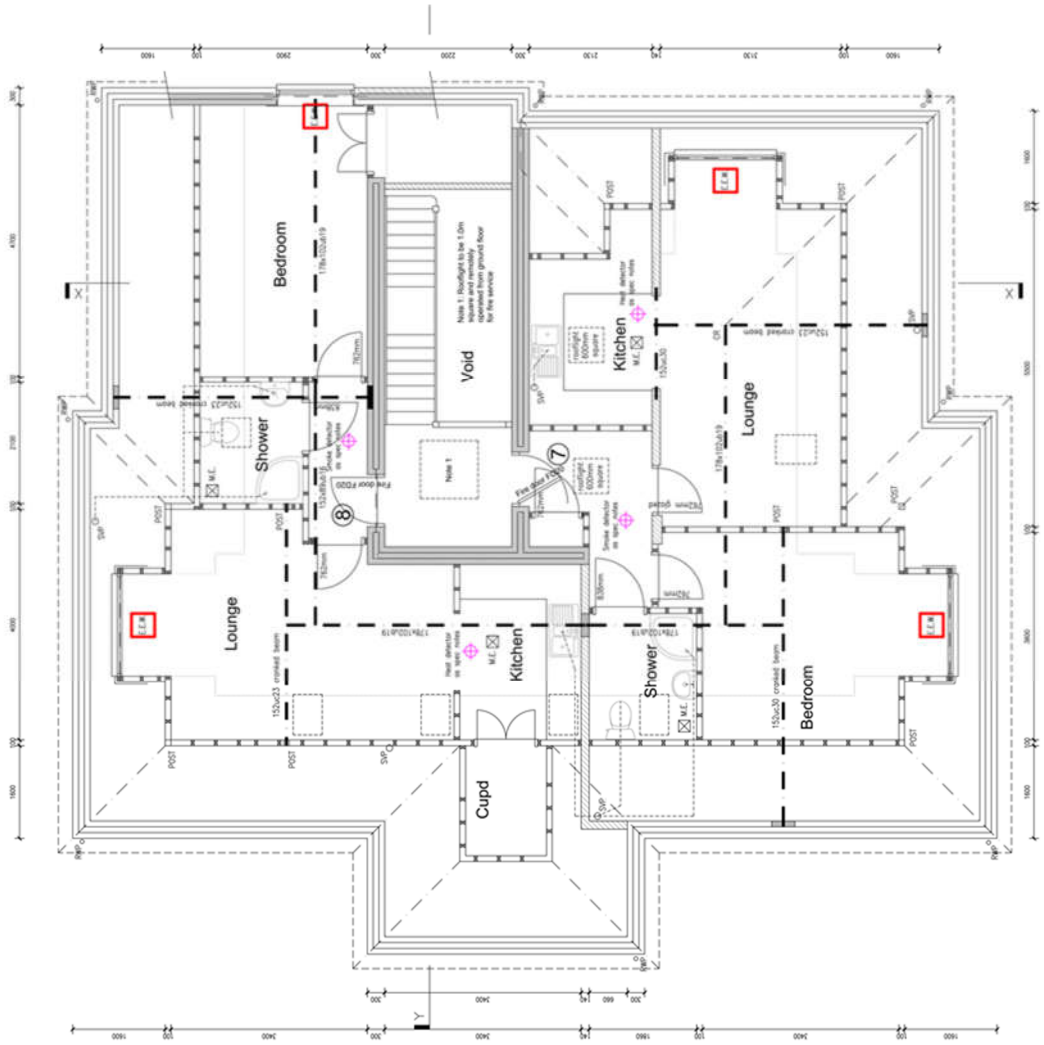


Figure 4:
Proposed Internal Layout
Second Floor



Appendix A
Noise Units

Decibels (dB)

Noise can be defined as unwanted sound. Sound in air can be considered as the propagation of energy through the air in the form of oscillatory changes in pressure. The size of the pressure changes in acoustic waves is quantified on a logarithmic decibel (dB) scale firstly because the range of audible sound pressures is very great, and secondly because the loudness function of the human auditory system is approximately logarithmic.

The dynamic range of the auditory system is generally taken to be 0 dB to 140 dB. Generally, the addition of noise from two sources producing the same sound pressure level will lead to an increase in sound pressure level of 3 dB. A 3 dB noise change is generally considered to be just noticeable, a 5 dB change is generally considered to be clearly discernible and a 10 dB change is generally accepted as leading to the subjective impression of a doubling or halving of loudness.

A-Weighting

The bandwidth of the frequency response of the ear is usually taken to be from about 18 Hz to 18,000 Hz. The auditory system is not equally sensitive throughout this frequency range. This is taken into account when making acoustic measurements by the use of A-weighting, a filter circuit which has a frequency response similar to the human auditory system. All the measurement results referred to in this report are A-weighted.

Units Used to Describe Time-Varying Noise Sources (L_{Aeq}, L_{A10}, L_{A90} and L_{Amax})

Instantaneous A-weighted sound pressure level is not generally considered as an adequate indicator of subjective response to noise because levels of noise usually vary with time.

For many types of noise the Equivalent Continuous A-Weighted Sound Pressure Level ($L_{Aeq,T}$) is used as the basis of determining community response. The $L_{Aeq,T}$ is defined as the A-weighted sound pressure level of the steady sound which contains the same acoustic energy as the noise being assessed over a specific time period, T.

The L_{A10} is the noise level exceeded for 10% of the measurement period. It has been used in the UK for the assessment of road traffic noise.

The L_{A90} is the noise level exceeded for 90% of the measurement period. It is generally used to quantify the background noise level, the underlying level of noise, which is present even during the quieter parts of the measurement period.

The L_{Amax} is the maximum value that the A-weighted sound pressure level reaches during a measurement period. $L_{Amax\,F}$, or Fast, is averaged over 0.125 of a second and $L_{Amax\,S}$, or Slow, is averaged over 1 second.

Appendix B
Unattended Noise Monitoring Results

Proposed Residential Development, Station Road, Knebworth
Results of Noise Measurements Carried Out Between
5 - 9 March 2017

Equipment Used: Rion NL-52 Class 1 Sound Level Meter (Serial No. 00610177)
Location: First Floor Terrace Facing onto B197
All Levels; Fast, Freefield, Mic Height 4 metres.

Date	Start Period	Measured Noise Levels [dB]			
		L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
Monday	11:00	65.8	79.6	69.2	56.3
05/03/2018	12:00	66.1	91.2	69.0	56.8
	13:00	67.6	97.8	69.3	55.1
	14:00	66.2	90.6	69.3	56.4
	15:00	67.3	89.1	69.6	57.6
	16:00	69.0	89.1	71.7	61.4
	17:00	69.9	86.8	72.8	62.4
	18:00	68.8	85.5	71.8	60.7
	19:00	67.0	85.0	70.2	56.7
	20:00	65.0	79.3	68.9	51.3
	21:00	63.8	79.3	68.4	45.6
	22:00	62.3	77.2	66.7	43.2
	23:00	59.1	75.5	61.8	39.8
Tuesday	0:00	55.8	80.6	51.5	37.3
06/03/2018	1:00	55.6	81.9	48.7	35.9
	2:00	54.1	82.7	46.2	35.7
	3:00	56.7	86.3	48.2	36.3
	4:00	53.6	75.7	51.8	39.4
	5:00	61.1	76.6	64.4	46.7
	6:00	66.1	85.3	69.4	54.8
	7:00	67.3	87.6	69.7	60.6
	8:00	66.8	90.5	69.9	58.9
	9:00	66.5	85.3	69.7	57.5
	10:00	66.0	86.6	69.3	55.7
	11:00	66.2	88.7	69.4	55.5
	12:00	69.6	99.9	69.0	55.2
	13:00	65.5	80.6	69.1	54.3
	14:00	67.2	94.5	68.9	55.7
	15:00	66.0	83.9	69.3	56.7
	16:00	69.5	96.0	70.6	58.9
	17:00	67.9	82.9	70.9	60.4
	18:00	67.4	86.4	70.5	58.4
	19:00	65.4	89.7	69.0	53.4
	20:00	65.0	89.7	68.5	49.8
	21:00	62.2	82.7	66.5	46.7
	22:00	60.6	76.3	64.8	45.1
	23:00	58.3	82.4	60.8	41.0
Wednesday	0:00	53.6	73.8	49.5	34.0
07/03/2018	1:00	55.2	81.9	49.4	36.8
	2:00	54.2	80.9	48.2	35.4
	3:00	56.5	85.8	47.1	33.9
	4:00	54.6	75.1	53.1	41.3
	5:00	60.1	78.6	62.8	47.3
	6:00	66.5	82.1	69.8	56.0
	7:00	67.7	88.8	70.4	61.2
	8:00	68.1	84.4	71.4	60.6

Proposed Residential Development, Station Road, Knebworth
Results of Noise Measurements Carried Out Between
5 - 9 March 2017

Equipment Used: Rion NL-52 Class 1 Sound Level Meter (Serial No. 00610177)
Location: First Floor Terrace Facing onto B197
All Levels; Fast, Freefield, Mic Height 4 metres.

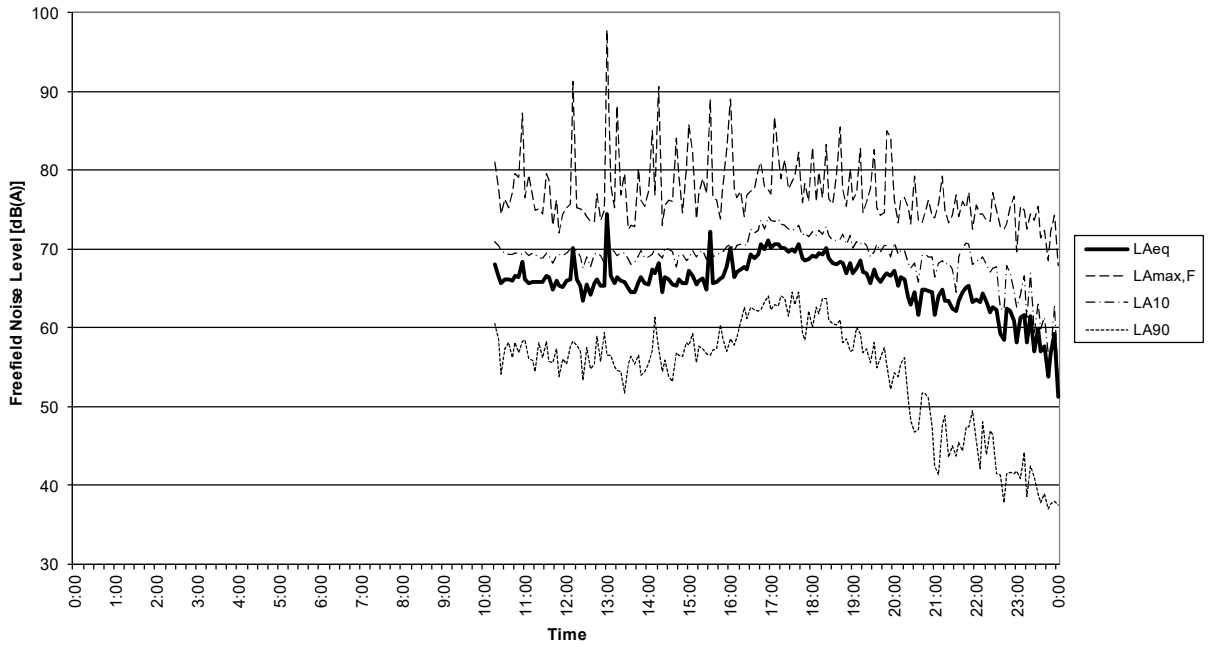
Date	Start Period	Measured Noise Levels [dB]			
		L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
Wednesday	9:00	67.3	83.0	70.6	58.0
07/03/2018	10:00	67.1	92.3	70.2	56.5
	11:00	65.9	83.2	69.3	56.5
	12:00	65.4	88.4	68.8	55.9
	13:00	66.7	82.5	69.9	56.7
	14:00	67.5	92.2	70.6	57.4
	15:00	70.5	102.3	69.9	58.4
	16:00	67.8	87.3	70.6	60.4
	17:00	73.0	106.2	71.0	61.2
	18:00	67.8	91.7	70.3	59.4
	19:00	66.3	91.1	69.1	55.1
	20:00	64.3	88.0	67.8	51.4
	21:00	63.4	89.9	67.0	49.1
	22:00	61.4	75.7	65.8	48.4
	23:00	59.5	76.4	63.4	45.4
Thursday	0:00	56.3	76.0	55.8	41.6
08/03/2018	1:00	55.4	81.5	52.0	39.7
	2:00	53.7	81.9	45.3	35.2
	3:00	56.8	84.6	51.0	37.5
	4:00	58.4	79.7	57.2	39.9
	5:00	62.9	85.7	66.5	48.0
	6:00	67.2	80.5	70.6	56.6
	7:00	68.3	89.0	70.9	61.4
	8:00	67.7	89.3	70.5	60.1
	9:00	67.2	89.9	70.2	58.5
	10:00	66.2	83.4	69.6	57.5
	11:00	66.9	81.9	70.2	59.1
	12:00	66.8	80.8	70.0	58.9
	13:00	66.5	83.9	69.7	57.2
	14:00	67.7	92.9	69.8	57.0
	15:00	71.0	103.7	69.6	58.0
	16:00	67.3	79.1	70.3	60.3
	17:00	70.6	101.7	71.0	60.7
	18:00	67.1	90.2	70.0	59.0
	19:00	66.0	87.9	69.3	55.9
	20:00	64.4	87.7	68.2	52.3
	21:00	63.6	84.9	67.6	50.3
	22:00	72.5	108.3	65.5	47.1
	23:00	59.0	75.9	63.0	45.2
Friday	0:00	56.9	76.8	58.1	42.1
09/03/2018	1:00	56.1	78.8	54.9	41.6
	2:00	54.6	76.8	51.2	40.3
	3:00	55.4	81.7	52.1	42.0
	4:00	55.3	77.4	55.0	43.5
	5:00	60.6	79.0	64.2	49.2
	6:00	65.9	81.3	69.4	56.1

Proposed Residential Development, Station Road, Knebworth
Results of Noise Measurements Carried Out Between
5 - 9 March 2017

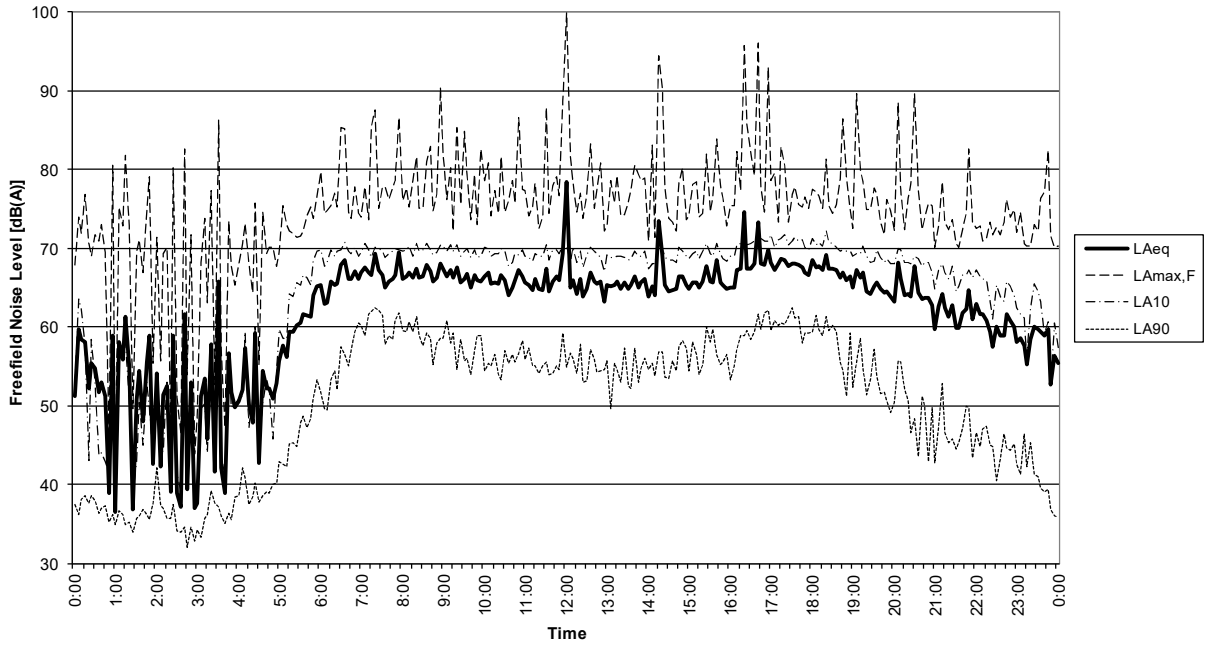
Equipment Used: Rion NL-52 Class 1 Sound Level Meter (Serial No. 00610177)
Location: First Floor Terrace Facing onto B197
All Levels; Fast, Freefield, Mic Height 4 metres.

Date	Start Period	Measured Noise Levels [dB]			
		L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
Friday	7:00	67.6	91.0	70.3	59.0
09/03/2018	8:00	69.3	97.8	70.4	57.5
	9:00	67.2	85.7	70.2	57.9
	10:00	66.4	82.4	69.7	56.9
	11:00	66.2	86.5	69.4	55.2

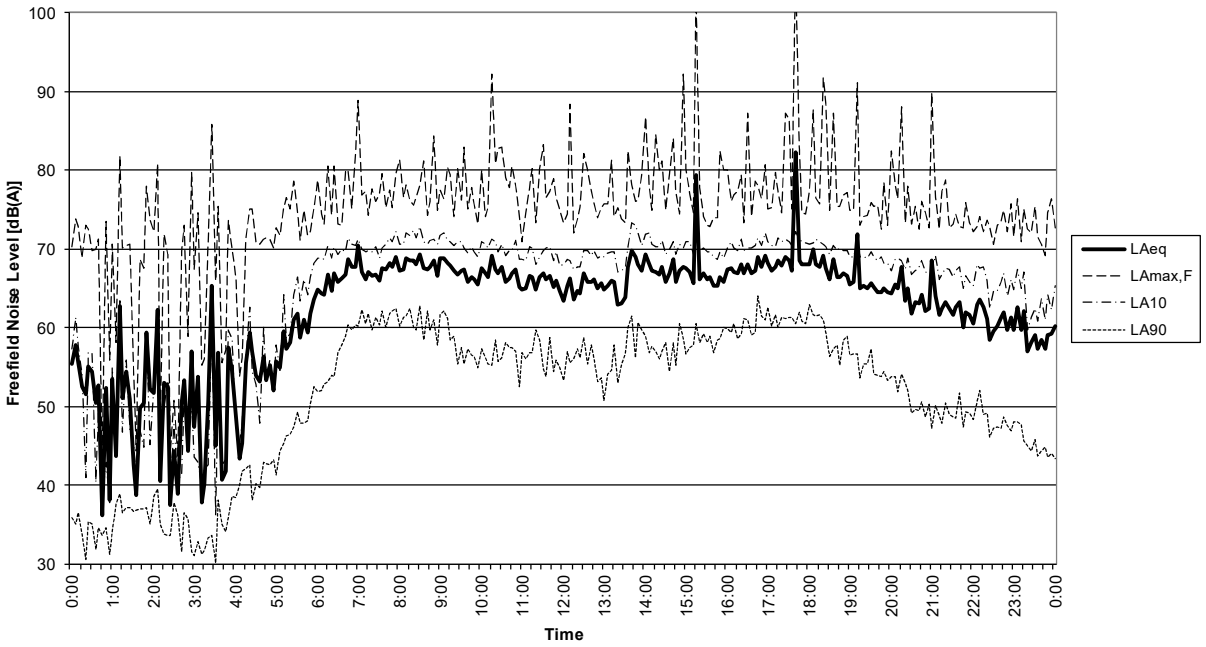
Monday 5 March 2018



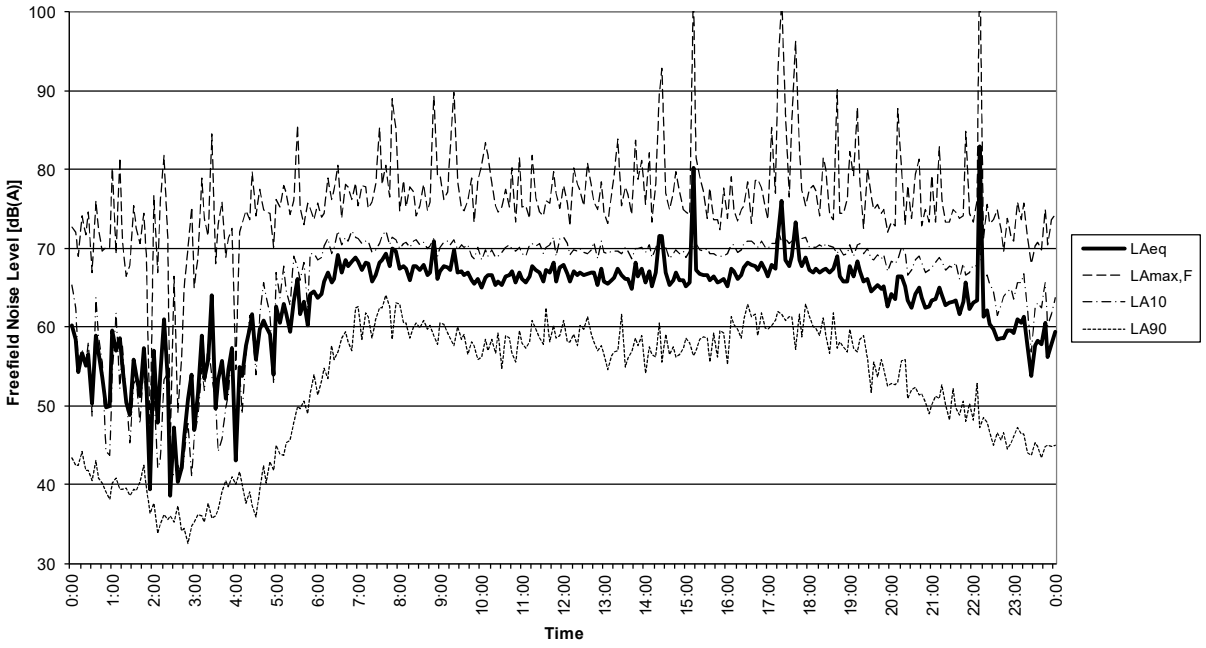
Tuesday 6 March 2018



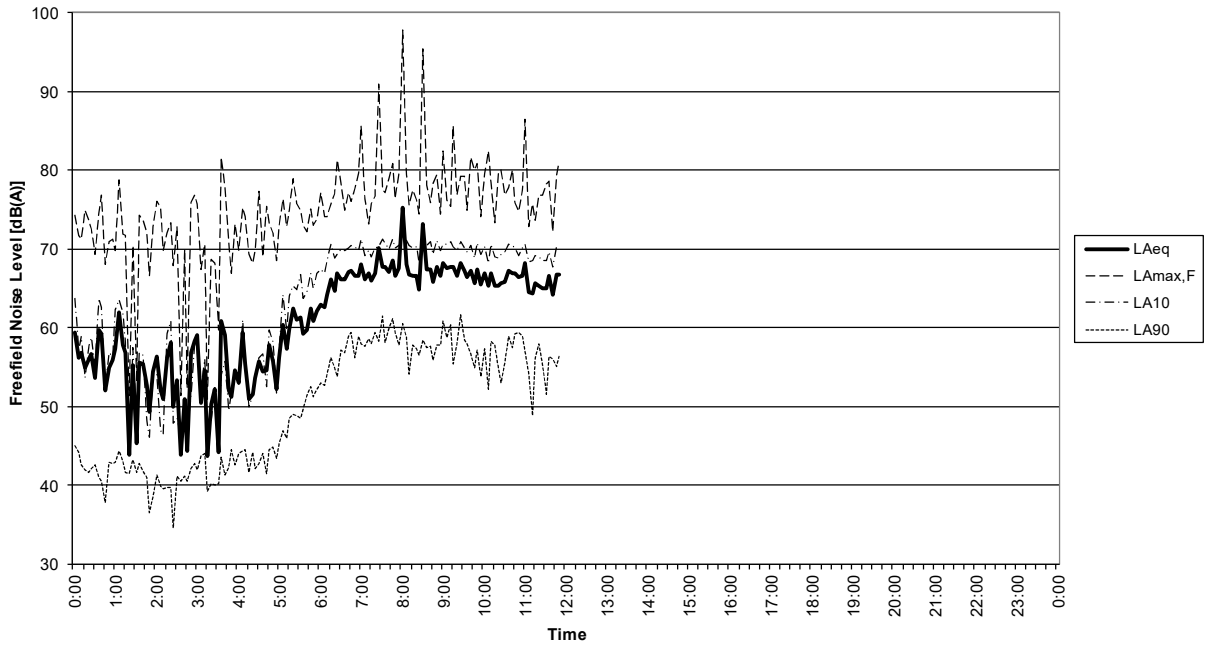
Wednesday 7 March 2018



Thursday 8 March 2018



Friday 9 March 2018



Appendix C
Attended Noise Monitoring Results

Proposed Residential Development, Station Road, Knebworth
Results of Attended Noise Measurements made on 5 March 2018

Equipment Used: Rion NL-52 Class 1 Sound Level Analysers, Calibrated with Rion NC-74 Class 1 Acoustic Calibrator

		FREEFIELD Sample Measurement Results				FREEFIELD Unattended Measurement Results				Difference			
Location	Start **Time**	L_{Aeq}	$L_{Amax,F}$	L_{A10}	L_{A90}	L_{Aeq}	$L_{Amax,F}$	L_{A10}	L_{A90}	L_{Aeq}	L_{A90}		
S1	10:20	67.3	83.6	71.2	57.7	66.7	77.9	70.4	58.6	0.6	-0.9		
On Corner of B198 / Station Road	10:25	66.2	76.4	70.4	57.7	65.7	74.4	69.8	54.1	0.5	3.6		
2m from Kerb	10:30	67.2	82.2	70.4	57.9	66.1	76.4	69.5	57.3	1.1	0.6		
	10:35	66.6	78.5	70.1	58.8	66.2	75.3	69.3	58.2	0.4	0.6		
	10:40	66.9	81.0	70.3	58.2	66.0	77.2	69.3	56.3	0.9	1.9		
	10:45	67.8	79.9	71.6	60.4	66.6	79.6	69.5	58.2	1.2	2.2		
	10:50	68.3	85.4	70.6	58.3	66.5	79.1	69.5	56.9	1.8	1.4		
	10:55	67.4	87.8	71.1	56.9	68.4	87.3	69.3	58.3	-1.0	-1.4		
	11:00	66.3	76.8	69.4	60.5	66.2	76.5	69.6	58.4	0.1	2.1		
	11:05	66.1	77.2	69.8	57.9	65.7	79.5	69.2	56.1	0.4	1.8		
	11:10	66.4	77.2	70.0	57.8	65.9	76.7	69.5	55.9	0.5	1.9	L_{Aeq} Day	L_{Aeq} Night
	11:15	66.4	76.5	69.4	57.4	65.8	75.0	69.3	54.5	0.6	2.9		
								Average Difference =		**0.6**	**1.4**	68.5	61.1
S2	10:20	59.7	74.9	62.3	52.7	66.7	77.9	70.4	58.6	-7.0	-5.9		
In Line With Existing Dwellings	10:25	59.6	69.2	62.8	52.5	65.7	74.4	69.8	54.1	-6.1	-1.6		
Station Road	10:30	59.3	69.5	62.5	53.6	66.1	76.4	69.5	57.3	-6.8	-3.7		
	10:35	58.7	68.1	61.5	53.5	66.2	75.3	69.3	58.2	-7.5	-4.7		
	10:40	60.8	74.4	63.8	53.3	66.0	77.2	69.3	56.3	-5.2	-3.0		
	10:45	58.7	67.9	61.5	54.1	66.6	79.6	69.5	58.2	-7.9	-4.1		
	10:50	58.3	70.5	61.1	52.3	66.5	79.1	69.5	56.9	-8.2	-4.6		
	10:55	57.8	73.9	60.2	51.5	68.4	87.3	69.3	58.3	-10.6	-6.8		
	11:00	58.7	72.9	60.8	54.0	66.2	76.5	69.6	58.4	-7.5	-4.4		
	11:05	59.8	73.2	61.5	52.7	65.7	79.5	69.2	56.1	-5.9	-3.4		
	11:10	60.5	71.0	63.0	53.4	65.9	76.7	69.5	55.9	-5.4	-2.5		
	11:15	60.2	72.1	62.4	52.8	65.8	75.0	69.3	54.5	-5.6	-1.7		
								Average Difference =		**-7.0**	**-3.9**	60.9	53.5

LFAcoustics consulting engineers

Appendix D
Calculation Details

SGG STADIP® & STADIP SILENCE® RANGE

Configuration of Unit*	Frequency						Rw (C;Ctr)	Rw	Ra	Ra,tr
	125	250	500	1000	2000	4000				
6mm / 15mm / 8.8mm	24	27	39	44	36	46	37 (-3;-6)	37	34	31
8mm / 16mm / 8.8mm	27	26	38	41	35	49	35 (-2;-6)	35	31	29
8mm / 15mm / 10.8mm	27	30	41	41	37	50	39 (-2;-5)	39	37	34
10mm / 16mm / 8.8mm	27	32	42	43	37	51	38 (-1;-4)	38	37	34
10mm / 12mm / 10.8mm	28	35	43	47	44	55	43 (-2;-6)	43	41	37
10mm / 16mm / 12.8mm	23	36	43	37	41	53	40 (-2;-6)	40	38	34
6mm / 16mm / 8.8mm SS	21	27	39	50	45	50	39 (-2;-6)	39	37	33
6mm / 12mm / 9.5mm SS	24	27	37	42	36	45	37 (-3;-6)	37	34	31
8mm / 16mm /10.8mm SS	26	31	42	44	42	55	42 (-3;-7)	42	39	35
8mm / 20mm / 12.8mm SS	24	34	44	49	43	58	44 (-2;-7)	44	42	37
10mm / 15mm /8.8mm SS	23	35	42	48	47	55	44 (-3;-7)	44	41	37
10mm / 16mm / 12.4mm SS	26	39	44	46	45	60	44 (-2;-5)	44	42	39
12mm / 15mm / 8.8mm SS	28	35	43	48	49	56	45 (-2;-6)	45	43	39
12mm /20mm / 12.8mm SS	34	40	48	47	48	63	48 (-1;-4)	48	47	44
10.8mm SS / 24mm / 14.8mm SS	34	43	51	54	57	72	53 (-2;-7)	53	51	46

*SS denotes use of SGG STADIP SILENCE acoustic laminate interlayer.
All acoustic performances are tested and certified in accordance with CE marking. Acoustic test reports can be requested through Saint-Gobain Glass.

Proposed Residential Development, Station Road, Knebworth
Calculation of Internal Noise Levels

Position : Facades Facing onto B197

Prepared By: LPJ - 9/3/18 **STANDARD GLAZING & VENTS**

Sf	Facade Area (inc Window)	10
Swi	Window Area	3
Sew	Sf-Swi	7
Srr	Area of Ceiling	12
S	Sf+Srr	22
A0	Ref Absorption Area	12

			Overall A-Wtd	1/3 Octave Band Leq 125	250	500	1000	2000	
Source Level	$L_{eq\ Freefield}$	A	**68**	64	62	61	65	62	Equivalent Freefield Daytime Level
Window Vent	Dn,e			34	33	33	27	32	Titon XS13 5000 EA Vent + GS22 Grill - OPEN
		B		0.00022	0.00027	0.00027	0.00109	0.00034	(Standard trickle vent)
Glazing	Rwi			18	17	32	37	40	Standard Glazing 4-16-4 (Munster)
		C		0.00216	0.00272	0.00009	0.00003	0.00001	
Wall	Rew			41	45	45	54	58	
		D		2.527E-05	1.006E-05	1.006E-05	1.267E-06	5.043E-07	
Ceiling	Rrr			30	42	50	54	54	
		E		0.0005455	3.442E-05	5.455E-06	2.171E-06	2.171E-06	
	10Log (B+C+D+E)			-25.303111	-25.173172	-34.260488	-29.511811	-34.4313	
	A (Furnished)			11	14	16	16	15	
	10*log (S/A)			3.0103	1.9629465	1.383027	1.383027	1.6633142	
	Leq,2			44.8	41.5	31.4	40.3	31.9	
	A-Weighting			-16.0	-9.0	-3.0	0.0	1.0	
	LAeq,2			28.8	32.5	28.4	40.3	32.9	

	Day	Night
LAeq, Internal	**42**	**35**
Reduction	**-26**	

Proposed Residential Development, Station Road, Knebworth
Calculation of Internal Noise Levels

Position : Facades Facing onto B197

Prepared By: LPJ - 9/3/18 **STANDARD GLAZING & VENTS**

Sf	Facade Area (inc Window)	10
Swi	Window Area	3
Sew	Sf-Swi	7
Srr	Area of Ceiling	12
S	Sf+Srr	22
A0	Ref Absorption Area	12

			Overall A-Wtd	1/3 Octave Band Lmax 125	250	500	1000	2000	
Source Level	$L_{max\ Freefield}$	A	**75**	76	76	70	72	68	Typical Maximum Level Freefield
Window Vent	Dn,e			34	33	33	27	32	Titon XS13 5000 EA Vent + GS22 Grill - OPEN
		B		0.00022	0.00027	0.00027	0.00109	0.00034	(Standard trickle vent)
Glazing	Rwi			18	17	32	37	40	Standard Glazing 4-16-4 (Munster)
		C		0.00216	0.00272	0.00009	0.00003	0.00001	
Wall	Rew			41	45	45	54	58	
		D		2.527E-05	1.006E-05	1.006E-05	1.267E-06	5.043E-07	
Ceiling	Rrr			30	42	50	54	54	
		E		0.0005455	3.442E-05	5.455E-06	2.171E-06	2.171E-06	
	10Log (B+C+D+E)			-25.303111	-25.173172	-34.260488	-29.511811	-34.4313	
	A (Furnished)			11	14	16	16	15	
	10*log (S/A)			3.0103	1.9629465	1.383027	1.383027	1.6633142	
	Lmax,2			57.2	55.5	40.4	46.7	38.4	
	A-Weighting			-16.0	-9.0	-3.0	0.0	1.0	
	LAmax,2			41.2	46.5	37.4	46.7	39.4	

	Night
LAmax, Internal	**51**
Reduction	**-25**

Proposed Residential Development, Station Road, Knebworth
Calculation of Internal Noise Levels

Position : Facades Facing onto B197

Prepared By: LPJ - 9/3/18 **ENHANCED GLAZING & ACOUSTIC PASSIVE VENTS**

Sf	Facade Area (inc Window)	10
Swi	Window Area	3
Sew	Sf-Swi	7
Srr	Area of Ceiling	12
S	Sf+Srr	22
A0	Ref Absorption Area	12

			Overall A-Wtd	1/3 Octave Band Leq 125	250	500	1000	2000	
Source Level	$L_{eq\ Freefield}$	A	**68**	64	62	61	65	62	Equivalent Freefield Daytime Level
Window Vent	Dn,e			42	42	39	39	48	Acoustic Passive Vent
		B		0.00003	0.00003	0.00007	0.00007	0.00001	(Munster - Open)
Glazing	Rwi			23	25	36	46	49	SGG 6/16/6.8SS
		C		0.00068	0.00043	0.00003	0.00000	0.00000	33dB RW+CTR
Wall	Rew			41	45	45	54	58	
		D		2.527E-05	1.006E-05	1.006E-05	1.267E-06	5.043E-07	
Ceiling	Rrr			30	42	50	54	54	
		E		0.0005455	3.442E-05	5.455E-06	2.171E-06	2.171E-06	
	10Log (B+C+D+E)			-28.898881	-32.923335	-39.26509	-41.218681	-48.848101	
	A (Furnished)			11	14	16	16	15	
	10*log (S/A)			3.0103	1.9629465	1.383027	1.383027	1.6633142	
	Leq,2			41.2	33.8	26.4	28.6	17.5	
	A-Weighting			-16.0	-9.0	-3.0	0.0	1.0	
	LAeq,2			25.2	24.8	23.4	28.6	18.5	

	Day	Night
LAeq, Internal	**32**	**25**
Reduction	**-36**	

Proposed Residential Development, Station Road, Knebworth
Calculation of Internal Noise Levels

Position : Facades Facing onto B197

Prepared By: LPJ - 9/3/18 **ENHANCED GLAZING & ACOUSTIC PASSIVE VENTS**

Sf	Facade Area (inc Window)	10
Swi	Window Area	3
Sew	Sf-Swi	7
Srr	Area of Ceiling	12
S	Sf+Srr	22
A0	Ref Absorption Area	12

			Overall A-Wtd	1/3 Octave Band Lmax 125	250	500	1000	2000	
Source Level	$L_{max\ Freefield}$	A	**75**	76	76	70	72	68	Typical Maximum Level Freefield
Window Vent	Dn,e			42	42	39	39	48	Acoustic Passive Vent
		B		0.00003	0.00003	0.00007	0.00007	0.00001	(Munster - Open)
Glazing	Rwi			23	25	36	46	49	SGG 6/16/6.8SS
		C		0.00068	0.00043	0.00003	0.00000	0.00000	33dB RW+CTR
Wall	Rew			41	45	45	54	58	
		D		2.527E-05	1.006E-05	1.006E-05	1.267E-06	5.043E-07	
Ceiling	Rrr			30	42	50	54	54	
		E		0.0005455	3.442E-05	5.455E-06	2.171E-06	2.171E-06	
	10Log (B+C+D+E)			-28.898881	-32.923335	-39.26509	-41.218681	-48.848101	
	A (Furnished)			11	14	16	16	15	
	10*log (S/A)			3.0103	1.9629465	1.383027	1.383027	1.6633142	
	Lmax,2			53.6	47.8	35.4	35.0	23.9	
	A-Weighting			-16.0	-9.0	-3.0	0.0	1.0	
	LAmax,2			37.6	38.8	32.4	35.0	24.9	

	Night
LAmax, Internal	**43**
Reduction	**-33**

Proposed Residential Development, Station Road, Knebworth
Calculation of Internal Noise Levels

Position : Facades Facing onto Station Road

Prepared By: LPJ - 9/3/18 **STANDARD GLAZING & VENTS**

Sf	Facade Area (inc Window)	10
Swi	Window Area	3
Sew	Sf-Swi	7
Srr	Area of Ceiling	12
S	Sf+Srr	22
A0	Ref Absorption Area	12

			Overall A-Wtd	1/3 Octave Band Leq 125	250	500	1000	2000	
Source Level	$L_{eq\ Freefield}$	A	**61**	64	58	56	57	55	Equivalent Freefield Daytime Level
Window Vent	Dn,e			34	33	33	27	32	Titon XS13 5000 EA Vent + GS22 Grill - OPEN
		B		0.00022	0.00027	0.00027	0.00109	0.00034	(Standard trickle vent)
Glazing	Rwi			18	17	32	37	40	Standard Glazing 4-16-4 (Munster)
		C		0.00216	0.00272	0.00009	0.00003	0.00001	
Wall	Rew			41	45	45	54	58	
		D		2.527E-05	1.006E-05	1.006E-05	1.267E-06	5.043E-07	
Ceiling	Rrr			30	42	50	54	54	
		E		0.0005455	3.442E-05	5.455E-06	2.171E-06	2.171E-06	
	10Log (B+C+D+E)			-25.303111	-25.173172	-34.260488	-29.511811	-34.4313	
	A (Furnished)			11	14	16	16	15	
	10*log (S/A)			3.0103	1.9629465	1.383027	1.383027	1.6633142	
	Leq,2			44.6	37.5	26.2	32.2	25.0	
	A-Weighting			-16.0	-9.0	-3.0	0.0	1.0	
	LAeq,2			28.6	28.5	23.2	32.2	26.0	

	Day	Night
LAeq, Internal	**36**	**28**
Reduction	**-25**	

Proposed Residential Development, Station Road, Knebworth
Calculation of Internal Noise Levels

Position : Facades Facing onto B197

Prepared By: LPJ - 9/3/18 **ENHANCED GLAZING & ACOUSTIC PASSIVE VENTS**

Sf	Facade Area (inc Window)	10
Swi	Window Area	3
Sew	Sf-Swi	7
Srr	Area of Ceiling	12
S	Sf+Srr	22
A0	Ref Absorption Area	12

			Overall A-Wtd	1/3 Octave Band Leq 125	250	500	1000	2000	
Source Level	$L_{eq\ Freefield}$	A	**61**	64	58	56	57	55	Equivalent Freefield Daytime Level
Window Vent	Dn,e			42	42	39	39	48	Acoustic Passive Vent
		B		0.00003	0.00003	0.00007	0.00007	0.00001	(Munster - Open)
Glazing	Rwi			23	25	36	46	49	SGG 6/16/6.8SS
		C		0.00068	0.00043	0.00003	0.00000	0.00000	33dB RW+CTR
Wall	Rew			41	45	45	54	58	
		D		2.527E-05	1.006E-05	1.006E-05	1.267E-06	5.043E-07	
Ceiling	Rrr			30	42	50	54	54	
		E		0.0005455	3.442E-05	5.455E-06	2.171E-06	2.171E-06	
	10Log (B+C+D+E)			-28.898881	-32.923335	-39.26509	-41.218681	-48.848101	
	A (Furnished)			11	14	16	16	15	
	10*log (S/A)			3.0103	1.9629465	1.383027	1.383027	1.6633142	
	Leq,2			41.0	29.7	21.2	20.5	10.6	
	A-Weighting			-16.0	-9.0	-3.0	0.0	1.0	
	LAeq,2			25.0	20.7	18.2	20.5	11.6	

	Day	Night
LAeq, Internal	**28**	**21**
Reduction	**-33**	