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# REPORT No. E1049

# CLIENT:- NORTON MAYFIELD LTD.


***FIG 1 – View on the North West façade of site*. (Courtesy Google Maps)**

**Issue Date:**
**Site at:** **61-63 Holmes Road, London NW5 3AN**
**Produced by:** **Site Sound Ltd.**

| Rev. | Draft | Issue | Date | Notes | By:- |
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Measured and Produced for Issue by Dave Ball M.I.O.A.,

**Acoustic Consultant.**

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## SUMMARY

Site Sound Ltd. has completed an environmental noise survey and impact assessment with respect to the proposed development of new build residential dwellings at 61-63, Holmes Road, London, NW5 3AN

The development is to comprise the demolition of an existing 2 storey building and the erection of a 5 storey building comprising commercial spaces to the basement and ground floors with a further 8 dwelling flats to 4 floors above.

The noise survey and subsequent impact assessment are to discharge a planning condition imposed by the London Borough of Camden; in order to protect and preserve the amenity of future residents with respect to area existing environmental ambient noise levels; the planning condition has limited internal noise levels as below:-

*'Living Rooms 35dBLAeq 16hrs 07.00 to 23.00 hours (Day time)*

*Bedrooms 30dBLAeq 8hrs 23.00 to 07.00 hours ' (Night time)*

The largely unattended noise survey has sampled the existing area ambient noise levels over a suitable 24hr monitoring period representative of typical acoustic conditions at the development exposed façade.

Any necessary remedial measures to mitigate noise break in at the proposed residential dwellings are advised within this report.

The noise survey and impact assessment have resulted in the following comments and conclusions:-

**1.0.** Existing environmental ambient noise levels over a 24hr continuous monitoring sampling period have been measured as

$L_{Aeq,16hr}$ day time ambient = 66dB(A)

$L_{Aeq,8hr}$ night time ambient = 54dB(A)

**2.0.** Impact assessments have been completed at the North West and North East front bedroom and living room glazed facades of the proposed development.

**3.0.** Based on the 24hr sampled existing environmental ambient noise levels then the internal noise level limits will not be met if bedroom and living room windows are open.

**4.0.** With windows closed a front glazed façade sound insulation design target of minimum in situ noise reduction of 31dB(A) and 29dB(A) have been determined for living rooms and bedrooms respectively in order to meet the internal noise level limits.

**5.0.** The in-situ noise reduction requirements typically equate to single figure composite façade weighted sound reduction index of Rw = 34dB(A) at bedrooms and RW36dB(A) at living rooms.

**6.0.** Such noise reductions are not onerous and specifications/comments have been made with regard to the building shell construction at external walls, roof, glazing and entrance door areas.

**7.0.** In the main conventional construction s are specified utilising masonry/kingspan external wall system, tiled concrete or steel roof system and sealed unit double glazing of minimum glass and air gap dimensions.

**8.0.** A special section is included with respect to ventilation and acoustic ventilation units; these must be included on the basis that the external noise levels prohibit the opening of windows.

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**9.0.** Based on the 24hr sampled existing environmental noise levels and providing the advice here in is followed with respect to external shell construction details, glazing selections and ventilation requirements then Site Sound see no reason why the Camden Borough Council internal noise level limits should not be met.

Please note that this report is produced to form a basis on which the local authority can make a decision with respect to their acoustic specifications as laid down in relevant planning conditions.

Final decisions on any matters here in rest with Camden Borough Council environmental and planning officers.

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## Contents



### Attachments:-

Tables 2 and 3 (Best viewed over computer)

### Client drawings

1214-PL-099 [PL Basement] - Plans: Basement Floor Proposed
1214-PL-100B [PL Ground] - Plans: Ground Floor Proposed
1214-PL-101A [PL 1st+2nd+3rd] - Plans: First, Second & Third Floors Proposed
1214-PL-102A [PL 4th Floor] - Plans: Fourth Floor Proposed
1214-a-600A - Construction types

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# 1.0 Introduction

Site Sound Ltd. has been commissioned by Norton Mayfield to complete an environmental noise survey and impact assessment with respect to the proposed development of new build residential dwellings at 61-63, Holmes Road, London, NW5 3AN

The development is to comprise the demolition of an existing 2 storey building and the erection of a 5 storey building comprising commercial spaces to the basement and ground floors with a further 8 dwelling flats to 4 floors above.

The noise survey and subsequent impact assessment are to discharge a planning condition imposed on the planning application by the London Borough of Camden in order to protect and preserve the amenity of future residents with respect to area environmental ambient noise levels.

The noise survey and impact assessment will study the existing acoustic environment by sampling the existing area ambient noise levels over a suitable 24hr monitoring period representative of typical acoustic conditions at the development exposed façade.

The noise survey will be unattended and so any detailed notes with respect to contributing ambient noise sources are not feasible. However where possible such observations will be noted and commented upon based on short term attendance at the beginning of the survey period.

The implication to residents and advice on any necessary remedial measures to mitigate noise break in at the residential dwellings will be based on limiting criteria as specified by the London Borough of Camden in the planning condition.

These limiting criteria are as below:-

*'Living Rooms 35dBLAeq 16hrs 07.00 to 23.00 hours*

*Bedrooms 30dBLAeq 8hrs 23.00 to 07.00 hours '*

It is noted that these criteria are taken directly from the following national/international standards and guidance documents:-

- BS8233:1999: 'Sound Insulation and Noise Reduction for Buildings - Code of Practice'
- World |Health Organisation (WHO) Guidelines on community noise:Geneva1999

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# 2.0. Survey Details

## 2.1. Date/Time of Survey:-

The 24hr continuous noise monitoring was completed over the period 16:00hrs Thursday 8th November to 16:00hrs Friday 9th November 2012

Some additional supporting measurements were completed on the Friday just after the continuous monitoring.

## 2.2. Location:-

Existing premises at 61-63, Holmes Road, London NW5 3AN

## 2.3. Survey carried out by:-

Mr. Dave Ball M.I.O.A. – Acoustic Consultant

## 2.4. Survey Attended by:-

Dave Ball, the consultant, was in attendance to take notes and make initial observations for approximately 1hr at the start and end of the noise survey. Otherwise 24hr monitoring was un-attended.

## 2.5. Site description:-

The site lies in an inner city location in the London Borough of Camden.

It is on the edge of a small commercial area to its North with some residential areas at extended distances to the East, south and west directions.

The existing 2 storey flat roofed building is at a corner location with a commercial joinery/carpentry workshop to the ground floors of 61 and 63 with 1st floor studio type flats above.

Whilst the actual site is not on a main trunk road i.e. it is a side road of the main A400 Kentish Town Road, it does never the less get relatively busy with traffic during rush hour periods.

A railway line runs across the North of site at about 205m but is shielded from site to some extent by intervening buildings; there are no major London Airports in the immediate vicinity.

The existing site main road side exposed glazed facades are North Easterly and North westerly facing front facades, to the rear South Easterly and South Westerly facades are blocked by neighbouring buildings and are not glazed.

Fig 1 at the cover page and Figs 2 to 3 illustrate the existing site.

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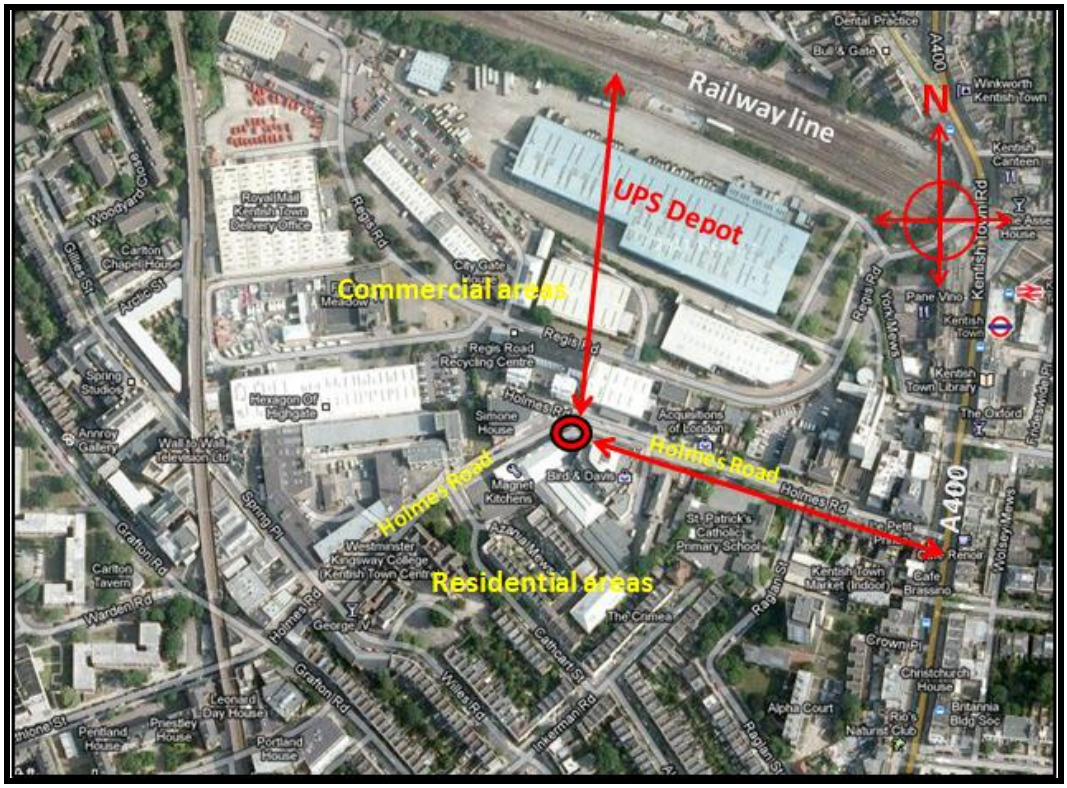


*FIG 2 – Aerial view of site showing surrounding features (Courtesy Google Maps).*


*FIG 3 – Close up aerial view showing immediate surround. (Courtesy Google Maps)*

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## 2.6. Proposed Dwellings:-

The proposed new build development is for commercial spaces to ground floor and basement with a further 4 floors above each containing 2 off dwelling flats.

The proposed layout of the completed development is as attached client drawings:-

1214-PL-099 [PL Basement] - Plans: Basement Floor Proposed
1214-PL-100B [PL Ground] - Plans: Ground Floor Proposed
1214-PL-101A [PL 1st+2nd+3rd] - Plans: First, Second & Third Floors Proposed
1214-PL-102A [PL 4th Floor] - Plans: Fourth Floor Proposed
In common with the existing building only the North Easterly and North Westerly main road side exposed facades are to be glazed; South Easterly and South Westerly facades remaining 'blocked' by neighbouring buildings and not glazed.

## 2.7. Noise sources.

The main continuous ambient noise source appeared to be immediately passing traffic and passing traffic at the nearby A400. At such sites there is often the constant drone of more distant traffic, especially at night when local traffic subsides.

Although not heard during the short site attendance it may be that the a railway line running across the North of site at 205m also contributes at times to the area ambient noise sources. The occasional overhead air craft was heard but is not considered a major contributor to ambient noise level.

Existing offices to the rear of the building were noted to have external air conditioning condenser units; however these were never audible in the region of the noise monitoring station. Considering the planned layout of the proposed redevelopment then these 1$^{st}$ floor mounted units are not considered as a potential noise problem.

An extract duct from the neighbouring Magnet Kitchen outlet was audible at times, it operated intermittently and was only noted as audible at the end of the 24hr monitoring when retrieving the noise monitoring equipment.

The 24hr monitoring will be a typical sample of area ambient noise levels, comprising the noise sources above to a greater lesser or negligible degree, advise here in will be designed to protect the amenity of future residents from this whole mix as proves necessary.

Contributions to any $L_{AF,(max)}$ noise level as may be incidental within the environmental background noise are likely to be from single events such as car / train horns or police / ambulance sirens although in the absence of such then public activities such as shouting or slamming car doors can be responsible.

## 2.8. Instrumentation

Noise measurements were obtained using precision grade Type 1 instrumentation i.e. a Norsonic 140 Sound level Meter IEC61672-1, class 1, measuring exponential time weighted, integrating average levels and sound exposure levels. 1/1 octave band and 1/3 octave band filters are installed and comply with IEC 61260 class 1. Refer to Table 1 below:-

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| Item | Description | Manufacturer | Serial No. |
|---|---|---|---|
| Nor-140 | Type 1 - SLM/Analyser | Norsonic | 1402918 |
| Nor-1225 | Microphone | Norsonic | 91729 |
| Nor-1206 | Pre-amplifier | Norsonic | 12207 |
| Nor-1251 | Sound Level Calibrator | Norsonic | 31233 |
| GRAS 41AL | Environmental Microphone (90° incidence) | GRAS | 4236 |

**Table 1 Calibrated Instrumentation (UKAS laboratory equivalent standard)**

## 2.9. Noise Measurements

The 24hr continuous monitoring was completed at a single measurement position representative of the North East and North West glazed facades of the proposed development.

This single measurement position was at the flat roof of the existing building and was the best available in terms of representing ambient noise levels at these facades and offering a secure location.

Extending a microphone boom to 1m outside the existing windows was impractical as the flats were occupied and there would have been a serious risk of contamination from internal noise by the residents.

The GRAS environmental microphone was tripod mounted at 1.4m above the flat roof and at its front edge, this represents closer to a free field measurement and when considering 1m from façade positions a +3dB correction will be applied to the measured results.

The 24hr survey was a series of 15minute repeated measurement periods (T) enabling calculation of 16hr day time ambient from 64 measurement events and 8hr night time ambient from 32 measurement events.

Figs 4 and 5 illustrate.

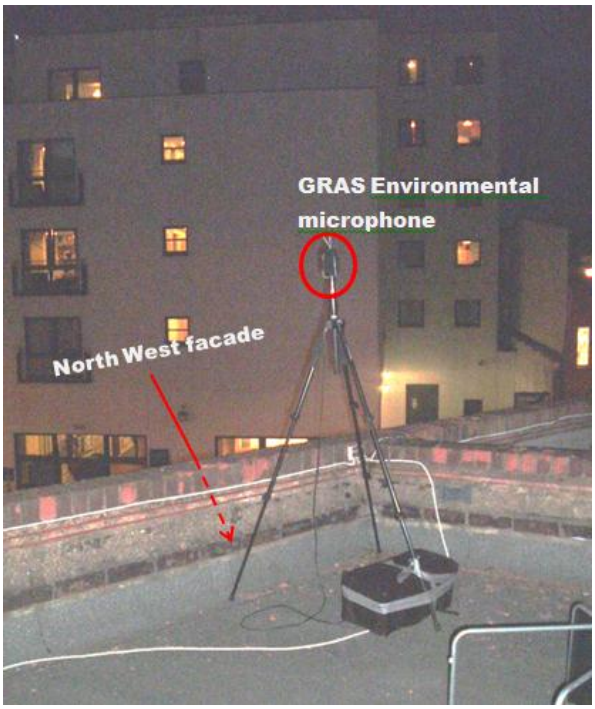


***FIG 4 – Microphone position at flat roof of No. 63 for 24hr monitoring of environmental noise levels***

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***FIG 5 – Street view of microphone position for 24hr monitoring.***

The NOR140 measures 'global' all pass parameters and 1/3rd octave band parameters in real time, their use as descriptors is dependant on the type of environmental noise impact assessment.

Required measurements are selected at computer download to results tables and in this case the parameters applicable to the environmental ambient noise measurements are $L_{Aeq}T$, $L_{AFmax},T$, and $L_{feq},T$ 1/3rd Octave and octave where T is the repeated measurement period of 15mins.

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# 3.0. Results

## 3.1. Measured Results (Note that all measurements are sound pressure level = Lp /dB re $2x10^{-5}$Pa)

Measured 24hr results are presented at attached Tables 2 and 3 these are a set of environmental noise measurement results for all pass and 1/3rd octave measurements giving pertinent measurement data and any calculated results for completion of the relevant analysis and impact assessments.

Note that these results are free field levels and relevant to front NW and NE glazed facades.

In accordance with British and International standards on environmental noise impact assessments 07.00 to 23.00Hrs represents day time periods and 23.00 to 07.00Hrs represents night time periods.

To assign a single number value for day or night time equivalent continuous noise level ($L_{eq,T}$ ,T=16 Hrs day time or 8Hrs night time) at the monitoring position the logarithmic averages of the 15 minute $L_{eq}$ results ($L_{Aeq}$ or $L_{feq}$) are taken over the relevant day or night time period.

Logarithmic average is given by:- $$Leq = 10\log_{10}\left[\frac{1}{N}\sum_{i=1}^{N}10^{L_i/10}\right] \quad \text{..... (1)}$$

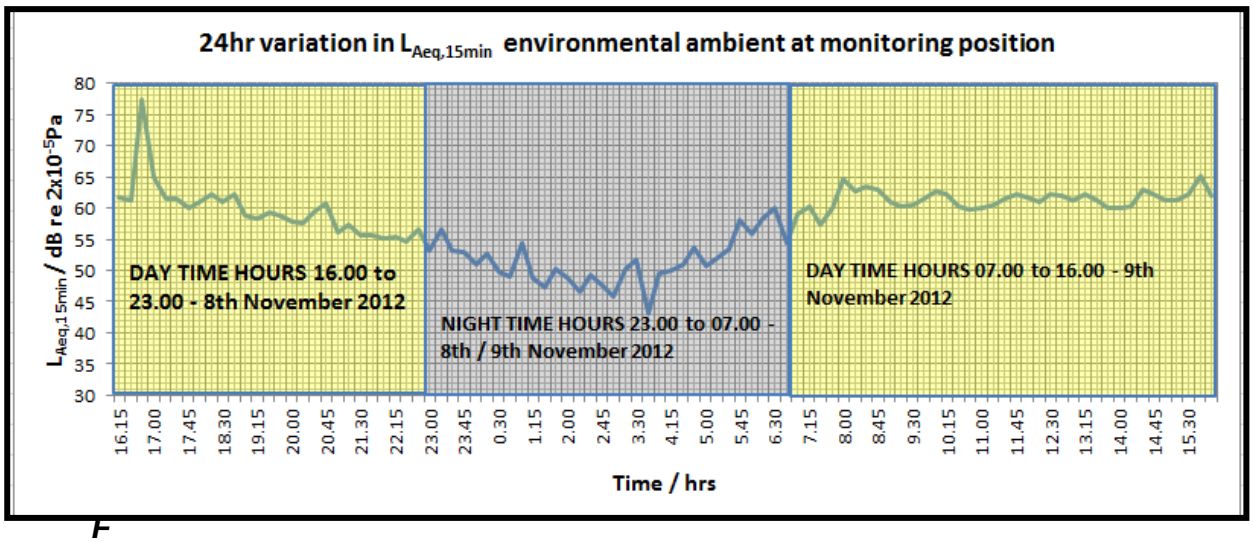
$L_i$ = The sound level =- $L_{Aeq,15min}$ or $L_{Feq,15min}$ in this case. N = No. of data points/results, = 64 day time and = 32 night time

To examine $L_{AF(MAX)}$ it is sufficient to take the highest recorded over day or night time periods

**a) 24Hr Noise Monitoring All Pass Results.**

Table 2 indicates the measured All Pass results for day and night time at the 24hr monitoring position.

All pass $L_{Aeq,16hr}$ day time ambient noise level = 66dB(A)
All pass $L_{Aeq,8hr}$ night time ambient noise level = 54dB(A)
Fig 6 illustrates the variation in all pass measured result over the monitoring period at the monitoring position. The peak near the start was due to a very loud siren from a passing fire engine.




***F***

***FIG 6 – Variation in environmental ambient noise level over a 24hr monitoring period***

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**b) 24hr Noise Monitoring Spectral results.**

Table 3 indicates the measured spectral results as 1/3rd Octave band levels for the day and night time at the 24hr monitoring position.

The spectral results (Fig 7) serve to support, or otherwise, the notes on contributing noise sources.

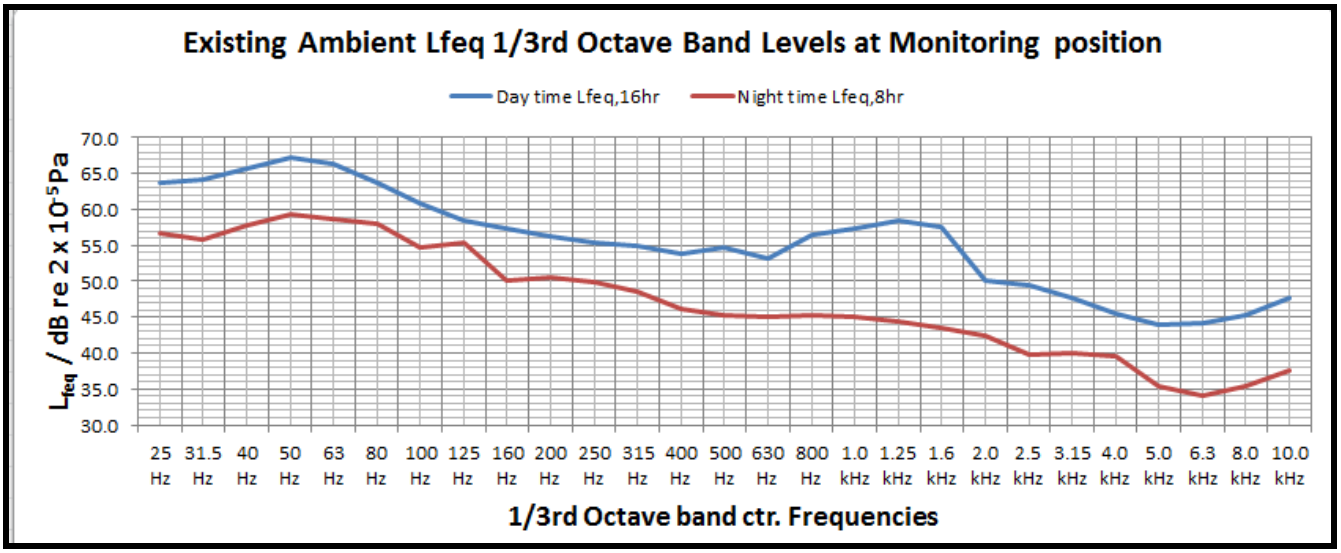


**FIG 7 – Environmental ambient 1/3rd octave band levels - at monitoring position.**

The measured spectral results indicate typical shapes for slow moving road traffic noise, i.e. low frequency levels due to road rumble and engine noise but with an absence of significant higher frequency peaks that would usually be attributed to aerodynamic noise, particularly from fast moving road traffic.

It is thought that the higher frequency peaks at the day time results are most likely due to excessive siren noise re passing fire engines or police cars, previous experience of background noise level measurements in London areas has indicated frequent occurrences of ambulance / fire / or police vehicle sirens.

There was at least one observed incident of a loud fire engine, siren on passing and then moments later returning, this was during the first hour of the monitored noise survey and probably accounts for the $L_{Aeq,15min}$ peak at Fig 6.

c) Weather readings

The limited weather readings were as Table 4 below, there was no rain overnight and weather conditions were not considered detrimental to noise measurements.

| Time | Temperature/ºC | RH/% | Wind speed/m per sec | |
|---|---|---|---|---|
| | | | Avg | Max |
| Start period, 116:0hrs 8/11/2012 | 14.8 | 67 | 0 | 4.4 |
| End period, 16:00hrs 9/11/2012 | 11.3 | 8.0 | 0.5 | 0.9 |

***TABLE 4 – Results of weather readings***

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### 3.2. Calculated Results

The measured results are free field levels and must be corrected to levels at 1m from receiver façade by +3dB – furthermore when we consider 1st to 4th floors then the receivers are at different distances from the centre of Holmes Road, assuming that road traffic noise at Holmes Road is the major contributor to environmental ambient noise levels then we can correct measured results with respect to receivers at 1st to 4th floors.

These calculations are completed at Table 2 and considering the minimal corrections for distance it is logical that we can assign a mean figure (logarithmic mean) to these calculated results which we can then assign as the relevant day or night time existing environmental noise levels for the development NW and NE facades as Table 5 below.

Note that $L_{AF,(max)}$ is based upon a single event and the highest measured is relevant rather than any mean, furthermore without knowing its exact origin it is not possible to apply corrections for distance and only façade corrections are applied.

| | Day time | | Night time | |
|---|---|---|---|---|
| Location | 07.00to 23.00hrs | | 23.00 to 07.00hrs | |
| | $L_{Aeq(16hrs)}$ | $L_{Amax(15min)}$ | $L_{Aeq(8hrs)}$ | $L_{Amax(15min)}$ |
| 1m from North Western and North Eastern facades, 1ST floor and above | 66 | 101 | 54 | 87 |

***TABLE 5 –Summary of 24hr environmental noise level results.***

## 4.0. Impact Assessment.

### 4.1. Local Authority Assessment criteria

We are advised that Camden Borough Council have specified acoustic criteria as below:-

*'The planning condition relating to the acoustics, is as follows:*

*The development hereby permitted shall not be occupied until a scheme for protecting the proposed dwellings from noise from external sources has been submitted to, and approved in writing by, the local planning authority. The scheme shall include sound insulation and attenuated ventilation to ensure that noise from external sources shall not exceed the following levels:*

*Living Rooms 35dBLAeq 16hrs 07.00 to 23.00 hours*

*Bedrooms 30dBLAeq 8hrs 23.00 to 07.00 hours '*

These criteria are taken directly from WHO/BS8233:1999 guidelines for community and internal noise levels.

It is noted that the local authority criteria do not make reference to night time LAF(max) internal limits at bedrooms neither do they refer to external amenity and ambient noise level limits at external spaces such as balconies- such limits do not therefore form part of this impact assessment. They may indeed be impractical for such a development at such a location.

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## 4.2. Impact assessment – Windows open

The proposed new build development has bedrooms and living rooms to the exposed North East and North West glazed facades- these are the critical facades with respect to exposure to ambient noise levels as determined from the 24hr monitoring noise survey.

We have to consider that under normal circumstances residents will have the choice to open windows for rapid ventilation purposes.

Open windows will seriously limit the sound insulation of the external facades. It is normally accepted that the in-situ noise reduction across an open window is in the region of 12 to 15dB(A), in the writer's experience this is closer to 12dB(A)

Using a figure of 12dB(A) in situ noise reduction across an open window we can now complete a worse case impact assessment with respect to break in noise level at these front façade windows. This is completed at Table 6 below:-

| 07:00 to 23:00hrs DAY TIME ASSESSMENT (16hr LAeq) | | | | | |
|---|---|---|---|---|---|
| Location | LAeq,16hr 1m o/side façade, bedroom or living room | Internal LAeq,16hr, bedroom or living room | Criteria, living room | Additional noise reduction required/dB(A) | Total noise reduction required across façade/dB(A) |
| All floors | 66 | 54 | 35 | 19 | 31 |
| 23:00 to 07:00hrs NIGHT TIME ASSESSMENT (8hr LAeq) | | | | | |
| Location | LAeq,8hr 1m o/side façade, bedroom or living room | Internal LAeq,8hr, bedroom or living room | Criteria, bedroom | Additional noise reduction required/dB(A) | Total noise reduction required across façade/dB(A) |
| All floors | 54 | 42 | 30 | 12 | 24 |

***TABLE 6 – Assessment of break in noise levels to bedrooms and living rooms due to measured day and night time environmental ambient noise levels – windows open***

From Table 6 .above it is obvious that opening windows is not an option if the local authority criteria for internal noise levels are to be met.

Hence we must now consider mitigation measures which include eliminating the option to open windows by offering an alternative means of ventilation.

Mitigation measures will now be discussed.

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# 5.0. Mitigation Measures

## 5.1. Noise Reduction requirements re. Environmental Ambient Noise Levels

The total noise reduction required across the proposed new building front facades is the 12dB(A) taken across an open window plus the additional requirement.

The requirement equates to a total in-situ noise reduction of minimum 31dB(A) day time and 29dB(A) night time across the front façade at living rooms and bedrooms respectively.

For road traffic noise spectra, the likely main contributor to ambient noise levels, the in-situ noise reduction is considered to be equivalent to the façade Rw figure less 5dB (A).

The Rw rating of a façade construction element is its laboratory measured single figure weighted sound reduction index and is the reference figure normally quoted when considering the sound insulation properties of façade elements of construction.

In this case to meet the local authority criteria we require the composite façade constructions to have an Rw of minimum 34dB night time (bedrooms) and 36dB day time (living rooms)

Whilst such requirements prohibit the opening of windows it can be said that they are not particularly onerous.

## 5.2. Noise Reduction Methods

Re BS 8233:1999, paragraph 5.5.1. the following general approach is recommended in examining noise reduction methods:

a) By quietening or removing the source of noise.
b) By attenuating the sound on its path to the receiver
c) By obstructing the sound path between source and receiver
d) By improving the sound insulation of the building envelope.

Commenting on the above:-

a) This is not feasible when considering environmental noise due to transport infrastructures; we cannot negate the use of existing road or rail links. It is a feasible when considering the noise from The Royal Hotel plant items.

b) Often refers to re-locating developments further back from the noise source to achieve further attenuation through air and ground absorption but in the main through dissipation as the sound waves spread out over greater distances from the source. Obviously not a practical consideration in this case.

c) This typically refers to the use of acoustic barriers which can be useful depending on source and receiver locations, only really practicable for external living areas and ground floor facades unless we are able to accommodate acoustic barriers of an extensive height. Not practicable in this situation..

d) In this case we shall be considering the sound insulation afforded by the proposed building shells WITH THE WINDOWS CLOSED when considering the required reduction to environmental noise levels.

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## 5.3. Noise Reduction to Internal living spaces- Façade constructions.

We must consider now the implications of the required noise reduction at section 5.1.above and how these relate to the sound insulation of the proposed building shell.

Note that noise reduction must be considered across all facade elements; these facade elements include the external wall, (1st to 4th floor bedrooms and living rooms), roof (4th floor) and glazing (all floors).

Doors should also be included where they lead directly to habitable rooms .

Other possible considerations relate to the arrangement of living and sleeping areas and other aspects of building arrangement in more serious situations.

From 5.1.we have design targets of Rw 29 (night time re bedrooms) and Rw 36dB (day time re living rooms)

In the interests of affording good protection of amenity to potential residents then the design target will be taken as Rw 36dB where facades are common to both bedroom and living rooms at front glazed facades; such a figure is readily achievable using modern construction materials.

We will initially examine the proposed construction details for the new build, the client advises as follows:-

- **External walls – As detailed at attached client drawing No. 1214-A-600A –Construction types.**

  A number of different wall types are detailed. All should easily achieve Rw 36dB or more.

  Attention to detail is important during constructions, especially at timber or mineral board clad systems where it must be ensured that No gap in constructions occur or that any gaps are sealed with acoustic flexible mastic.. It is important that coupling between any external lining and internal lining boards at such external walls is minimised or excluded all together.

  Where proprietary acoustic insulation systems, such as Kingspan, are used then be sure to adhere to supplier/manufacturer's installation instructions. Where single thickness 100mm block work construction (Wall W4) are.to be utilised at external walls, with Kingspan insulation system, then we would advise a minimum density of 180Kg/m2.

  Wall W6 is a construction we have no experience of and gives some cause for concern. If this is an external wall at a bedroom or living room then we would suggest that the internal side cavity is at least 75mm and is filled with minimum 75mm mineral wool slab of 45KG/m3 density.

  There should be NO penetrations through external walls. Where service penetrations are absolutely necessary then ideally make them to none habitable rooms and ensure any gaps around are sealed with acoustic mastic.

  Pipe penetrations into habitable rooms will need to be acoustically insulated. Box in with 2 layers of heavy plasterboard and 35Kg/m3 mineral wool.

- **Glazing – No details advised by client**

  The external walls are likely to offer substantial sound insulation well above the design target, this means that we can relax slightly the design target for windows.

  As the windows will be the weakest areas acoustically, and in view of the fact that some front room external facades at bedrooms appear quite small (meaning windows are likely to form a relatively large area then they will be specified as the minimum Rw requirements, i.e. Rw34 for bedrooms and Rw36dB for living rooms

  From 'Pilkington Insulight'range we have sealed unit double glazing of 10/12/4 that is rated as Rw 34dB and such glazing would be suitable for bedrooms at the front façade.

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For windows at living rooms then the window systems would have to be Rw36dB and the Pilckington Insulight 10/12/6.4pvb would have to be chosen.

We note that living room balcony doors are fully glazed areas hinged access doors which would have to meet an Rw36dB design target.

This could prove difficult with the door.

Whilst the Pilkington 10/12/6.4pvb glass should still be used the difficulty here would be achieving an effective seal at the door closures. We suggest that specialist noise control companies, such as Hodgson and Hodgson or IAC are consulted over such requirements. (See list of suppliers at Appendix C )

Glazing can be sourced from alternative manufacturer's suppliers providing that the Rw specifications are met – note that window frames should be heavy duty, timber frames should be minimum 25Kg/m2.

Manufacturers and suppliers should be able to quote window performance ratings including framework.

- **Roof – No details advised by client**

  At the 4$^{th}$ floor flats then the roof becomes an important consideration as it forms a façade of the top floor flats.

  Conventional tiles on a felt pitched roof with a 10mm plasterboard ceiling below have a typically quoted Rw figure of 34dB, adding a 100mm layer mineral wool quilt will increase this to above the desired Rw36dB.

  A solid concrete flat roof system will typically achieve Rw52dB, easily meeting the design target.

  A flat timber joist roof with asphalt on boarding, 12mm plasterboard ceiling below with 100mm mineral wool quilt thermal type insulation would rate at Rw 45dB.

  If steel roof systems are to be employed then we suggest that Kingspan are consulted as they have a range of acoustically insulated roof system to meet the design target of Rw36dB.

  Precautions with respect to penetrations at the roof level are as noted for external walls.

- **Entrance doors**

  Entrance to the dwellings from street level is too a large corridor and stairwell prior to entering the flats, a standard well sealing exterior door will suffice as it is not connecting directly to any dwelling.

All things considered then the required sound insulation for the building facades is not particularly onerous and should be achieved by the use of relatively conventional building materials.

## 5.4. Ventilation

With respect to ventilation it is normally the case that passive ventilation is achieved by opening windows; in this respect windows are often the weakest area acoustically in any facade.

We have shown at 5.1. that opening windows is not an option if the local authority internal noise level criteria are to be met and so alternative means of rapid ventilation have to be included in the building design..

The building regulations on ventilation (Approved Document F, 2006) recommend that habitable rooms in dwellings have background ventilation.

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Trickle ventilators, through the window or through the wall, can provide this. However acoustic type window/wall ventilators must be chosen.

These types of ventilators are very small in area and their acoustic performance is rated as a Dnew or weighted level difference across a typical wall with the vent installed.

It is recommended that a Dnew of minimum 29dB (bedrooms) and 31dB (living rooms) is selected, these are readily available from companies such as CAICE,Passivent etc.. (See Appendix C)

It must be noted that wall/window acoustic ventilators supply background ventilation only but will not substitute for rapid ventilation/cooling requirements and thus do not negate the need to open windows under certain conditions.

Having said this it is believed that CAICE do now supply window cassette systems that do satisfy rapid ventilation requirements. This should be investigated.

However if this is not the case then to satisfy rapid ventilation requirements will necessitate the installation of either through the wall or full house ducted ventilation schemes.

Mechanical and passive stack systems are available for full house ducted ventilation.

It is not within the scope of this report to discuss the technical merits of ventilation schemes, such schemes will have to conform to all aspects of Approved Document F (2006) and cope with requirements such as combustion air flow in the event of fuel burning appliances and gas regulations with respect to any gas burning appliances.

However from an acoustics point of view the following pre-cautions are important when considering any ducted or through the wall ventilation systems:-

a) Any fan driven system must not introduce intrusive mechanical noise levels to habitable rooms, the limits applied to internal noise levels at Table 6 and 7 still apply. Any fan noise should be limited to NR25 so as not to exceed 32dB(A) at habitable rooms, this will ensure a reasonable 35dB(A) maximum at such rooms.
b) Any mechanical ventilation system must not allow flanking transmission of external traffic noise entering via any atmospheric duct system and ‘short circuiting’ the sound insulation provided by the building elements
c) Through the wall fan assisted ventilators must have a noise reduction across them equivalent to the building elements, in this case a minimum 33dB(A) level difference from external to internal.
d) Full house ducted systems may require in duct silencers to limit mechanical and flanking noise radiation along duct systems, additionally duct systems may require acoustic lagging at strategic areas where breakout from duct walls may occur to habitable rooms.
e) The structural borne transfer of noise from mechanical systems should be guarded against; typically any fan system should be well isolated from its surround foundations or support structure via resilient or specifically selected anti vibration materials/mounts and flexible duct connectors.

Suppliers, (e.g.Passivent – see Appendix C ) of through the wall and full house ducted systems should be able to advise on the above re their specific products. Note that as an alternative to mechanical systems companies now offer passive ventilation systems that apparently can meet building regulation requirements; if selecting such systems then the main concern will be centred around prevention of any flanking paths as commente3d upon in b) and d) above.

Appendix C offers a list of suggested suppliers with respect to most of the recommendations made under sections 5.5 to 5.7. of this report

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### 5.5. Building Design

In addition to the mitigation measures outlined above attention should also be paid to building arrangement as part of any mitigation measures. Where possible the following guidelines should be adhered to:-

- Avoid placing living rooms and bedrooms in the facade facing adjacent roads
- Place kitchen, utility, bathrooms and corridors in the facade facing adjacent roads
- Avoid entrance doors in the facade facing adjacent roads
- Avoid or at least minimise window areas in the facade facing adjacent roads.
- Place outbuildings and garages between the facade and adjacent roads
- Place car parking between the facade and adjacent roads
- Avoid placing gardens or recreational facilities between the facade and adjacent roads

The comments/advice above is given in the interests of offering a complete service, it is realised in this case that the building design is complete and that some of the features above may be impossible to incorporate given the location and arrangement of the proposed development.

**NOTE that all recommendations for mitigating noise are given in good faith based on substantial experience of acoustic installations; however no guarantees can be given or implied with respect to final results as these are heavily dependent on quality of and selection of materials and installation workmanship.**
**Neither does Site Sound Ltd. (Dave Ball Acoustic Services) endorse or have any connection with specific products and/or supply companies that may be mentioned in this report.**

## 6.0. Closing comments and conclusions.

Site Sound Ltd. has completed an environmental noise survey and impact assessment with respect to the proposed development of new build residential dwellings at 61-63, Holmes Road, London, NW5 3AN

The development is to comprise the demolition of an existing 2 storey building and the erection of a 5 storey building comprising commercial spaces to the basement and ground floors with a further 8 dwelling flats to 4 floors above.

The noise survey and subsequent impact assessment are to discharge a planning condition imposed by the London Borough of Camden; in order to protect and preserve the amenity of future residents with respect to area existing environmental ambient noise levels; the planning condition has limited internal noise levels as below:-

*'Living Rooms 35dBLAeq 16hrs 07.00 to 23.00 hours (Day time)*

*Bedrooms 30dBLAeq 8hrs 23.00 to 07.00 hours ' (Night time)*

The largely unattended noise survey has sampled the existing area ambient noise levels over a suitable 24hr monitoring period representative of typical acoustic conditions at the development exposed façade.

Any necessary remedial measures to mitigate noise break in at the proposed residential dwellings are advised within this report.

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The noise survey and impact assessment have resulted in the following comments and conclusions:-

6.1 Existing environmental ambient noise levels over a 24hr continuous monitoring sampling period have been measured as

` LAeq,16hr day time ambient = 66dB(A)

LAeq,8hr night time ambient = 54dB(A)

6.2. Impact assessments have been completed at the North West and North East front bedroom living room glazed facades of the proposed development.

6.3. Based on the 24hr sampled existing environmental ambient noise levels then the internal noise level limits will not be met if bedroom and living room windows are open.

6.4. With windows closed a front glazed façade sound insulation design target of minimum in situ noise reduction of 31dB(A) and 29dB(A) have been determined for living rooms and bedrooms respectively in order to meet the internal noise level limits.

6.5. The in-situ noise reduction requirements typically equate to single figure composite façade weighted sound reduction index of Rw = 34dB(A) at bedrooms and RW36dB(A) at living rooms.

6.6. Such noise reductions are not onerous and specifications/comments have been made with regard to the building shell construction at external walls, roof, glazing and entrance door areas.

6.7. In the main conventional construction s are specified utilising masonry/kingspan external wall system, tiled concrete or steel roof system and sealed unit double glazing of minimum glass and air gap dimensions.

6.8. A special section is included with respect to ventilation and acoustic ventilation units, these must be included on the basis that the external noise levels prohibit the opening of windows.

6.9. Based on the 24hr sampled existing environmental noise levels and providing the advice here in is followed with respect to external shell construction details, glazing selections and ventilation requirements then Site Sound see no reason why the Camden Borough Council internal noise level limits should not be met.

Please note that this report is produced to form a basis on which the local authority can make a decision with respect to their acoustic specifications as laid down in relevant planning conditions.

Final decisions on any matters here in rest with Camden Borough Council environmental and planning officers.

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# APPENDICES

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# Appendix A Standards and Guidance

## A.1. British Standard 8233:1999 (Sound Insulation and Noise Reduction for Buildings. Code of Practise)

When rooms within a property are considered then guidance on suitable internal noise levels can be found in BS 8233: 1999. 'Guidance values for a range of ambient noise levels within residential properties' as shown in Table A1 below.

| Citation | Typical Situation | Design Range dB $L_{Aeq,t}$ | |
|---|---|---|---|
| | | Good | Reasonable |
| Reasonable resting/ sleeping conditions | Living rooms | 30 | 40 |
| | Bedrooms | 30 | 35 |
| For a reasonable standard in bedrooms at night, individual noise events(measured with F time weighting) should not normally exceed 45dB $L_{AMAX}$ | | | |

**TABLE A3 - Internal ambient noise levels for bedrooms and living rooms**

In a review of health effects based noise assessment methods undertaken for the DETR it is noted that:

' *We know from the most recent national survey of noise exposure carried out in England and Wales (Sargent 93) that around 56% of the population are exposed to daytime noise levels exceeding 55 $L_{Aeq}$ and that around 65% are exposed to night-time noise levels exceeding 45 $L_{Aeq}$ (as measured outside the house in each case). The value of 45 $L_{Aeq}$ night-time outdoors is equivalent to the 1995 WHO guideline value of 30 $L_{Aeq}$ night-time indoors allowing 15 dB attenuation from outdoors to indoors for a partially open window"*

## A.2. World Health Organization (WHO) Guidelines for Community Noise. Geneva. 1999

To evaluate outdoor noise the World Health Organisation, WHO[1] stipulates that to protect the majority of the people from being seriously annoyed during the day time, the sound pressure levels on balconies, terraces and outdoor living areas should not exceed 55dB $L_{Aeq}$ for steady continuous noise. At night, sound pressure levels at the outside facades of living spaces should not exceed 45 db $L_{Aeq}$, to allow people to sleep with a bedroom window open.

[1] World Health Organization. Guidelines for Community Noise. Geneva. 1999

[2] BS4142:1997. Method for Rating Industrial Noise Affecting Mixed Residential and Industrial areas.

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| Specific environment | Critical Health effect(s) | $L_{Aeq}$ (dB) | Time base hrs | $L_{Amax,(fast)}$ |
|---|---|---|---|---|
| **Outdoor living area** | Serious annoyance, daytime and evening<br>Moderate annoyance, daytime and evening | 55<br>50 | 16<br>16 | -<br>- |
| **Dwelling, indoors** | Speech intelligibility and moderate annoyance, daytime and evening | 35 | 16 | |
| **Inside bedrooms** | Sleep disturbance, night-time | 30 | 8 | 45 |
| **Outside bedrooms** | Sleep disturbance, window open (outdoor values) | 45 | 8 | 60 |

**Table A4----WHO Guidelines for community noise, Geneva 1999**

Sound ordinances which define acceptable noise level criteria are there to create and maintain a relaxing environment to live in, the main purpose of this is that levels must be kept low enough to avoid complains from the community. In general, the expected amount of community complaints rise in response with the function of noise levels, if the noise level goes up, the volume of complaints will increase.

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# Appendix B Brief Glossary of Terms

**Lw:-** Sound power level re 2 x 10 -12 Watts
**Lp :-** Sound Pressure level re 2 x 10 $^{-5}$ Pascals
**dB:-** Abbreviation for decibel – a scale used in sound measurement. It is equivalent to 10 times the logarithm (to base 10) of the ratio of a given sound pressure to a reference pressure.
**dB(A):** A value used for "A-weighted" sound pressure levels. "A" frequency weighting is an adjustment to sound-level to approximate the response of the human ear.
**$L_{A90}$. :** The A-weighted sound pressure level that is exceeded for 90% of the time over which a given sound is measured. This is considered to represent the background noise for the purposes of BS4142:1997
**$L_{A10}$. :** The A-weighted sound pressure level that is exceeded for 10% of the time over which a given sound is measured.
**$L_{Aeq}$ : (equivalent continuous noise level).** The level of noise equivalent to the energy average of noise levels occurring over a defined measurement period.
**$L_{Amax}$. :** The A-weighted sound pressure level that represents the maximum noise level measured over the time that a given sound is measured.
**Receiver:** The person or point at which the noise level is heard or measured.
**Ambient Noise. Level:** The all-encompassing noise within a given environment. It is the composite of sounds from many sources, both near and far. Including any specific noise source This is described using the **$L_{Aeq}$** descriptor for the purposes of BS4142:1997
**Residual Noise Level:** The A-weighted equivalent sound pressure level remaining at a given position in a given situation when the specific noise source is suppressed to a degree such that it does not contribute to the ambient noise. This is described using the **$L_{Aeq}$** descriptor for the purposes of BS4142:1997
**Specific Noise Source**: Specific plant or equipment giving rise to receiver specific noise levels at 1m from a sensitive facade
**Specific Noise Level $L_{Aeq(Tr)}$ :** The A-weighted equivalent sound pressure level that represents the noise level of a specific noise source at 1m from the nearest sensitive facade for Tr reference time period as defined in BS4142 where Tr = 1 hour daytime and Tr=5 mins night time. It is a logarithmic subtraction of ambient noise minus residual noise. This is described using the **$L_{Aeq}$** descriptor for the purposes of BS4142:1997.
**Background noise level:** The underlying A weighted sound pressure level of noise present in the ambient noise, excluding the Specific noise source under investigation
This is described using the **$L_{A90}$** descriptor for the purposes of BS4142
**Rating Level:** Specific Noise level adjusted for tonal, intermittent or impulsive characteristics as required for BS4142:1997.
**Assessment Level:** As defined in Bs4142:18997, an arithmetic subtraction of Rating Level – Background level.
**Community annoyance:** Includes noise annoyance due to: - characteristics of the noise (e.g. sound pressure level, tonality, impulsiveness, low-frequency content), - characteristics of the environment (e.g. very quiet suburban, suburban, urban, near industry), - miscellaneous circumstances (e.g. noise avoidance possibilities, cognitive noise, unpleasant associations), - human activity being interrupted (e.g. sleep, communicating, reading, working, listening to radio/TV, recreation).
**Habitable rooms:** Residential rooms where rest full conditions are required for sleep or relaxation
**Sleep disturbance.** Awakenings and disturbance to sleep stages.
**Tonality.** Noise containing a prominent frequency and characterised by a definite pitch. Often defined as being 5dB or more above neighbouring octave or 1/3$^{rd}$ octaves

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# Appendix C – Manufacturers and Suppliers of Acoustic Products

| COMPANY | PRODUCT | WEB SITE | E-MAIL | TEL. | LOCATION |
|---|---|---|---|---|---|
| Karma acoustic solutions | Range of building acoustics products including acoustic ventilators | www.karma-acoustics.co.uk | Technical services@karmaacoustics.co.uk | Not available- contact via web site | Nationwide stockists |
| CAICE Acoustic Air movement | High performance through the wall/window acoustic ventilators and fan silencers. | www.caice.co.uk | sales@caice.co.uk | 0844 847 5370 | Winnersh, Berkshire |
| Greenwood Air management | Acoustic trickle vents and other ventilation products | www.greenwood.co.uk | info@greenwood.co.uk | 01903 777137 | |
| Passivent | Large range of acoustic through the wall or through the window vents. PSV and MEV whole house systems | www.passivent.com | info@passivent.com | 0161 905 5700 | Sale, Cheshire |
| Rytons | Range of through the wall acoustic ventilators. | www.vents.co.uk | lit@rytons.com | 01536 511874 | Kettering |
| Renson fabrications | Acoustic trickle vents | www.renson.eu | info@rensonuk.net | 01622 754123 | Belgium with UK representatives |
| Noise seal ltd. | Custom designed acoustic glazing systems/acoustic doors | www.noiseseal.com | info@noiseseal.com | 01664 482929 | Melton Mowbray |
| Environ Technologies Ltd. | Custom designed and standard acoustic enclosures | www.environ.co.uk | On-line enquiry form | 0870 383 3344 | Cambourne, Cambridgeshire |
| H&H Group | Duct lagging, silencers, acoustic door sets in steel or timber. | www.acoustic.co.uk/H&H | info@hodgsongroup.co.uk | 01664 821810 | Melton Mowbray |
| Pilkington Group | Optithon laminated acoustic glass and other glazing systems | www.pilkington.co.uk | pilkington@respond.uk.com | 01744 692000 | St. Helens + other locations |
| St. Gobain Glass UK Ltd. | ssg Stadip laminated acoustic glass | www.saint-gobain-glass.com | glassinfo.uk@saint-gobain-glass.com | 01977 666100 | Eggborough |

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