Noise Impact Assessment - Land North of Exeter Road, Topsham

ACT Acoustics Ltd.

Contents

1. Management Summary

Topsham Care Home Ltd. has commissioned ACT Acoustics to provide a noise impact assessment of road traffic noise for a new care home facility at Land North of Exeter Road, Topsham.

We have assessed the proposed development in accordance with the requirements of ProPG: Planning & Noise Professional Practice Guidance on Planning & Noise: New Residential Development (Institude of Acousics, May 2017). As part of the assessment, we;

- conducted a noise survey at the site to establish the existing road noise;
- modelled the noise propagtion around the facade of the proposed buildings; and
- determined the requirements for meeting the recommended internal noise levels described in BS 8233:2014.

Our findings show that the internal noise levels can be met in all cases. Further, for external areas, the majority of the site to the north of the development is below the 50 dB L_{Aeq} target value during both the day and the night.

For facades facing Exeter Road, an additional means of ventilation is required. This will ensure that future residents have an alternative to an open window during any noisy periods. Note that this requirement does **not** mean that windows cannot be openable, but that an alternative method should be provided.

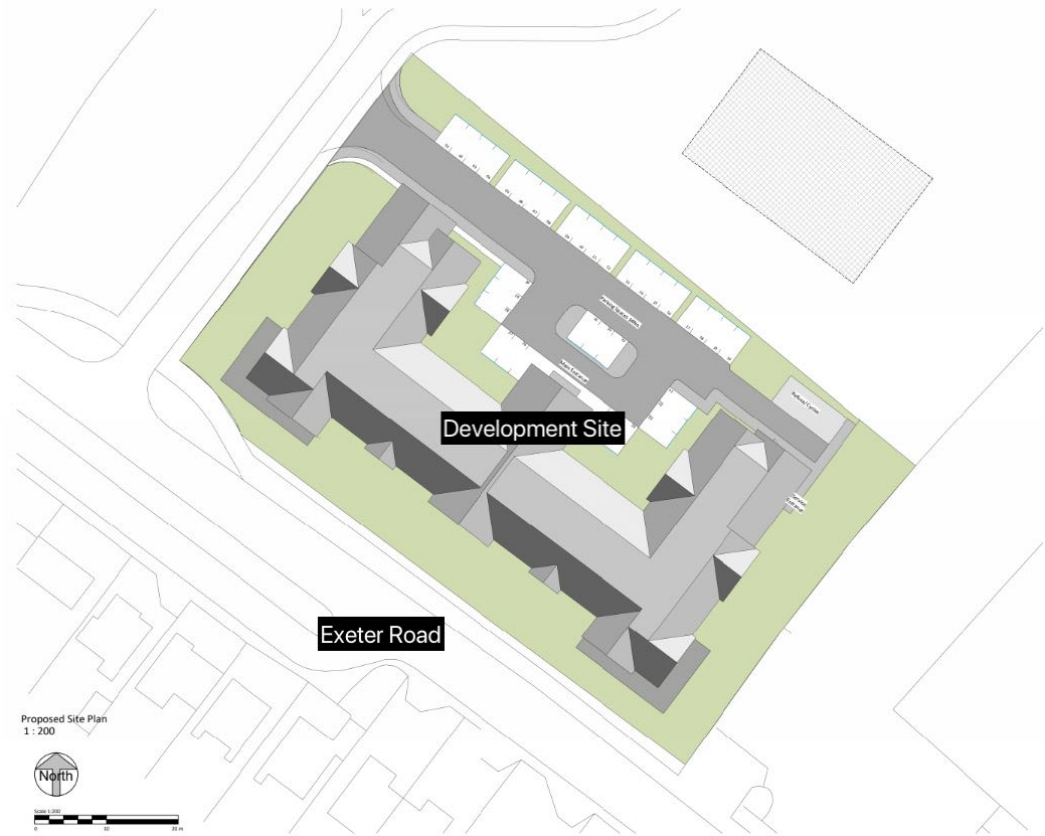
To achieve this, the minimum performance for glazing is 35 R_w. This can be achieved with 4-12-10 double glazing (which typically provides around 35 dB Rw or greater). Furthermore, a trickle vent with an element-weighted noise reduction of greater than 36 dB $D_{n,e}$ is required. Note that if more than one ventilator is required for sufficient airflow, higher performance ventilators will be required. We will be happy to advise as necessary.

Based on the above, we see no reason to refuse planning permission on noise grounds.

2. Project details

- Report reference: 200115-020
- Report for: Topsham Care Home Ltd.
- Site address: Land North of Exeter Road, Topsham
- Report version no:

The site is shown below:



Layout of the site

2.1. Assessment of noise sources

The principal source of noise affecting the site is road traffic on Exeter Road.

2.2. Receptor assessment

The nearest noise sensitive receptors are the units on the south facade. In our view, the flats have the same sensitivity to noise as residential dwellings, and will therefore be assessed as such.

3. Standards used in the assessment

3.1. BS 8223:2014 - Recommended internal noise levels for dwellings

BS 8233 recommends that the following internal noise levels are not exceeded:

Activity	Location	Daytime	Nighttime
Resting	Living room	35	-
Dining	Dingin room /area	40	-
Sleeping (daytime resting)	Bedroom	35	30

BS 8233 provides the following notes on the application of these criteria:

NOTE 1

[The above table] provides recommended levels for overall noise in the design of a building. These are the sum total of structure-borne and airborne noise sources. Groundborne noise is assessed separately and is not included as part of these targets, as human response to groundborne noise varies with many factors such as level, character, timing, occupant expectation and sensitivity.

NOTE 2

The levels shown in [the table above] are based on the existing guidelines issued by the WHO and assume normal diurnal fluctuations in external noise. In cases where local conditions do not follow a typical diurnal pattern, for example on a road serving a port with high levels of traffic at certain times of the night, an appropriate alternative period, e.g. 1 hour, may be used, but the level should be selected to ensure consistency with the levels recommended in Table 4.

NOTE 3

These levels are based on annual average data and do not have to be achieved in all circumstances. For example, it is normal to exclude occasional events, such as fireworks night or New Year's Eve.

NOTE 4

Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,F}$, depending on the character and number of events per night. Sporadic noise events could require separate values.

NOTE 5

If relying on closed windows to meet the guide values, there needs to be an appropriate alternative ventilation that does not compromise the facade insulation or the resulting noise level. If applicable, any room should have adequate ventilation (e.g. trickle ventilators should be open) during assessment.

NOTE 6

(This is a reference to the relevant building regulations)

NOTE 7

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

Outdoor amenity spaces

Regarding outdoor amenity areas, BS8233:2014 states that:

> *"the acoustic environment of external amenity areas that are an intrinsic part of the overall design should always be assessed and noise levels should ideally not be above the range 50 - 55 dB $L_{Aeq,16hr}$."*

Further;

> *"For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is also recognised that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, 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, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited"

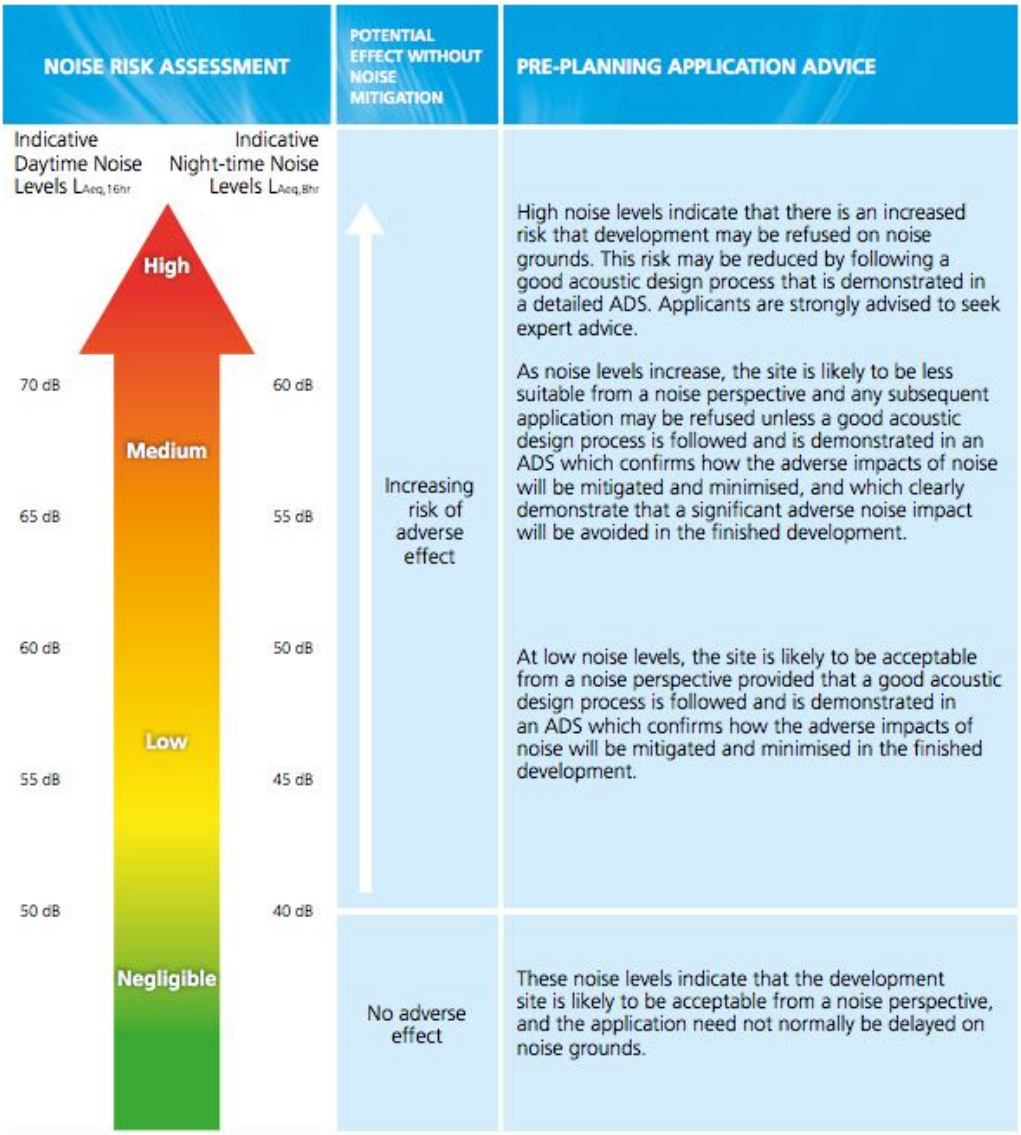
3.2. ProPG Assessment Method

The ProPG guidance details four elements for an acoustic assessment of sites proposed for residential development. It comprises two stages.

The first stage is an initial risk assessment of the site. This is followed by stage 2 which is formed of a four-element detailed assessment.

3.2.1. Stage 1

The first stage of the assessment is to assess the risk from the existing noise levels. The risk assessment classifies different areas of the site according their respective noise levels:



ProPG Risk assessment for noise levels

The noise risk assessment can be produced on the basis of either noise measurement or prediction and should:

> *"aim to describe noise levels over a typical worst case 24 hour day either now or in the foreseeable future".*

Our interpretation of the noise risk levels are shown below:

Risk level	**Day range (L_{Aeq})**	**Night range (L_{Aeq})**
Negligible	0 - 52.5	0 - 42.5
Low	52.6 - 62.5	42.6 - 52.5
Medium	62.6 - 72.5	52.6 - 62.5
High	72.6 - 62.6	-

3.2.2. Stage 2

Stage 2 provides a more detailed assessment of the noise.

Element 1: Good Acoustic Design Process

Regarding the application of a 'good acoustic design process', ProPG states the following:

> *"2.17 Following a good acoustic design process is an implicit part of achieving good design as required by Government planning and noise policy, set out in the NPSE and NPPF, and as outlined in Supplementary Document 1.*
>
> *2.18 It is imperative that acoustic design is considered at an early stage of the development control process.*
>
> *2.19 A good acoustic design process takes a multi-faceted and integrated approach to achieve optimal acoustic conditions, both internally (inside noise-sensitive parts of the building(s)) and externally (in spaces to be used for amenity purposes).*
>
> *2.20 Good acoustic design should avoid "unreasonable" acoustic conditions and prevent "unacceptable" acoustic conditions (these terms are defined in Element 2). Good acoustic design does not mean overdesign or gold plating of all new development but seeking to the optimum acoustic outcome for a particular site.*
>
> *2.21 Good acoustic design is not just compliance with recommended internal and external noise exposure standards. Good acoustic design should provide an integrated solution whereby the optimum acoustic outcome is achieved,*

without design compromises that will adversely affect living conditions and the quality of life of the inhabitants or other sustainable design objectives and requirements.

2.22 Using fixed unopenable glazing for sound insulation purposes is generally unsatisfactory and should be avoided; occupants generally prefer the ability to have control over the internal environment using openable windows, even if the acoustic conditions would be considered unsatisfactory when open. Solely relying on sound insulation of the building envelope to achieve acceptable acoustic conditions in new residential development, when other methods could reduce the need for this approach, is not regarded as good acoustic design. Any reliance upon building envelope insulation with closed windows should be justified in supporting documents."

Element 2: Internal noise level guidelines

The ProPG guidance suggests that the ideal internal noise levels are:

Activity	Location	Daytime	Nighttime
Resting	Living room	35	-
Dining	Dining room / area	40	-
Sleeping (daytime resting)	Bedroom	35	30

An open window typically provides around 10 - 15 dB of noise attenuation. The limits for allowing ventilation through an open window are therefore:

Activity	Location	Daytime	Nighttime
Resting	Living room	50	-
Dining	Dining room / area	55	-
Sleeping (daytime resting)	Bedroom	50	45

Element 3: External amenity noise assessment

It is recommended that outdoor noise levels in external amenity spaces (such as gardens and recreation areas) should be below the range 50 - 55 dB $L_{Aeq16hr}$. This is to ensure that future residents can enjoy outdoor areas.

Element 4: Assessment of other relevant issues

ProPG also recommends that any other relevant acoustic issues are considered as part of the detailed assessment.

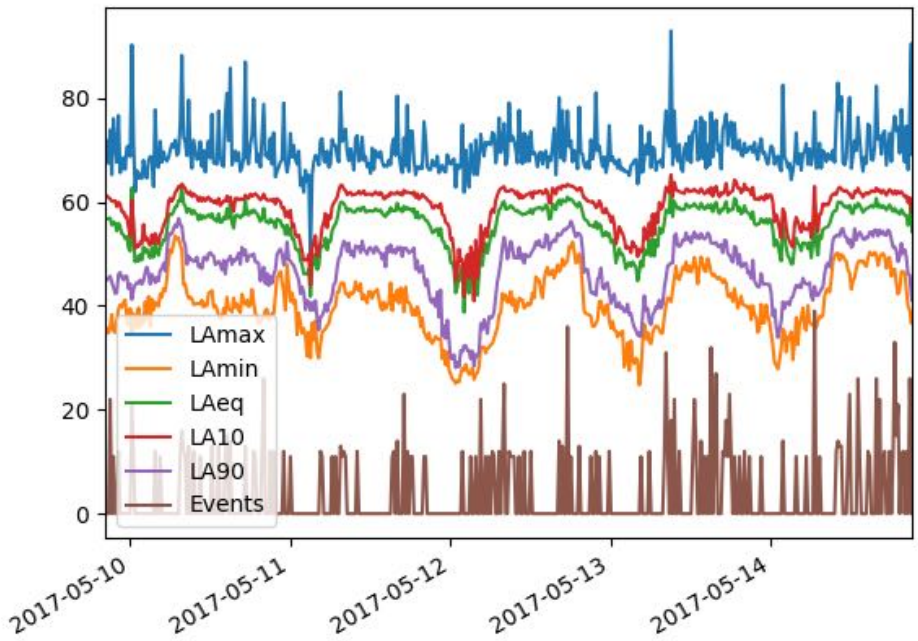
4. Survey summary

We measured the noise generated by Exeter Road at:

Key site locations

Location ID	Latitude	Longitude
BG1	50.68916	-3.47167

The noise survey was undertaken between Tuesday 09 May 2017 and Sunday 14 May 2017. The results of the data are shown in the following plots:



Time trace of survey data

The average day and nighttime noise levels were:

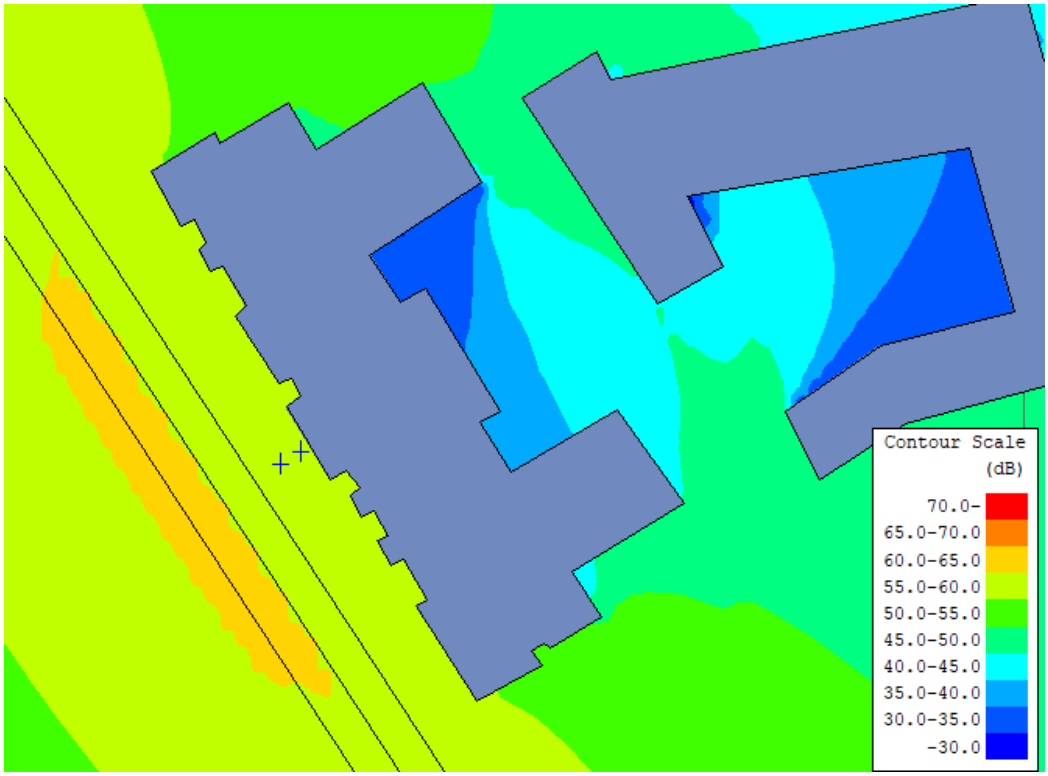
- Average daytime noise level: 58.2 dB LAeq,16hr
- Average nighttime noise level: 52.5 dB LAeq,8hr

This data was used to calibrate the noise model.

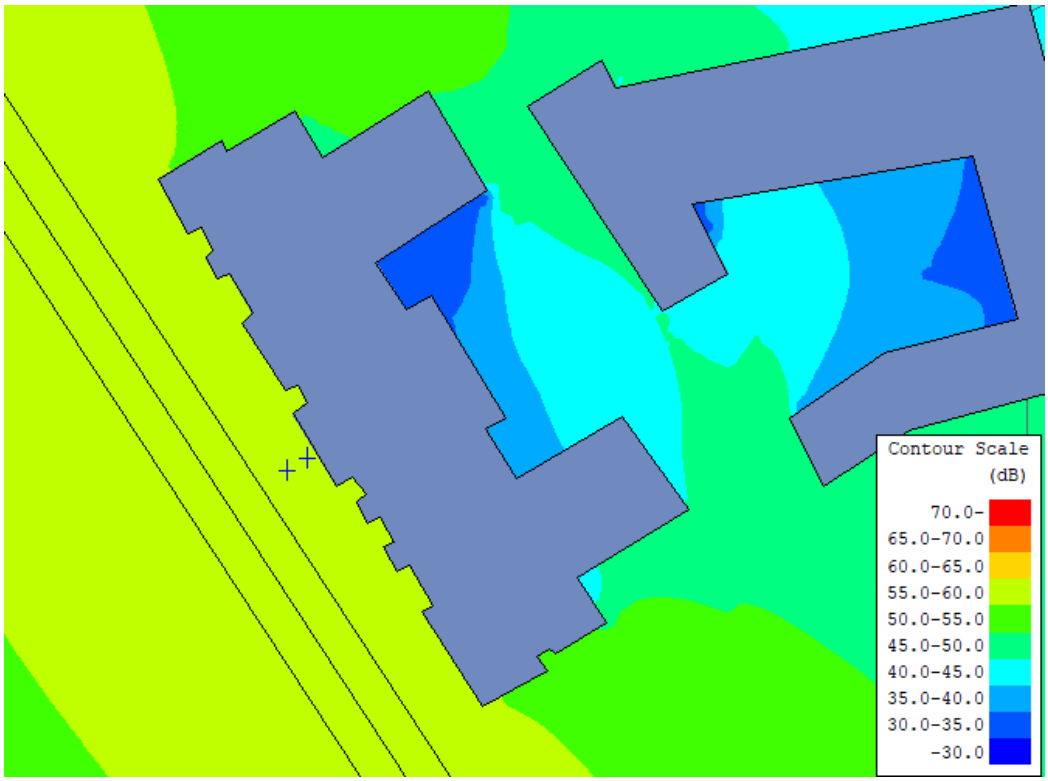
5. Noise Model

5.1. Results

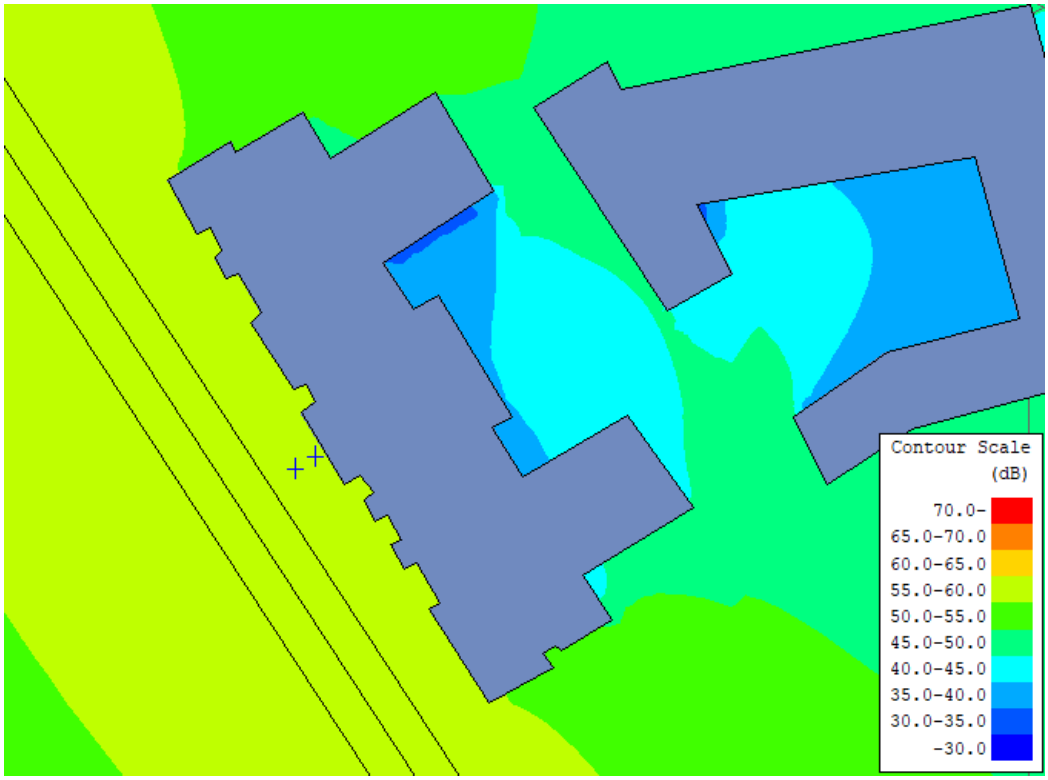
The following figures show the results of the average noise levels around the facade. The results are given for both day and nighttime periods on each floor. The results show that the majority of the site is low to negligible risk:



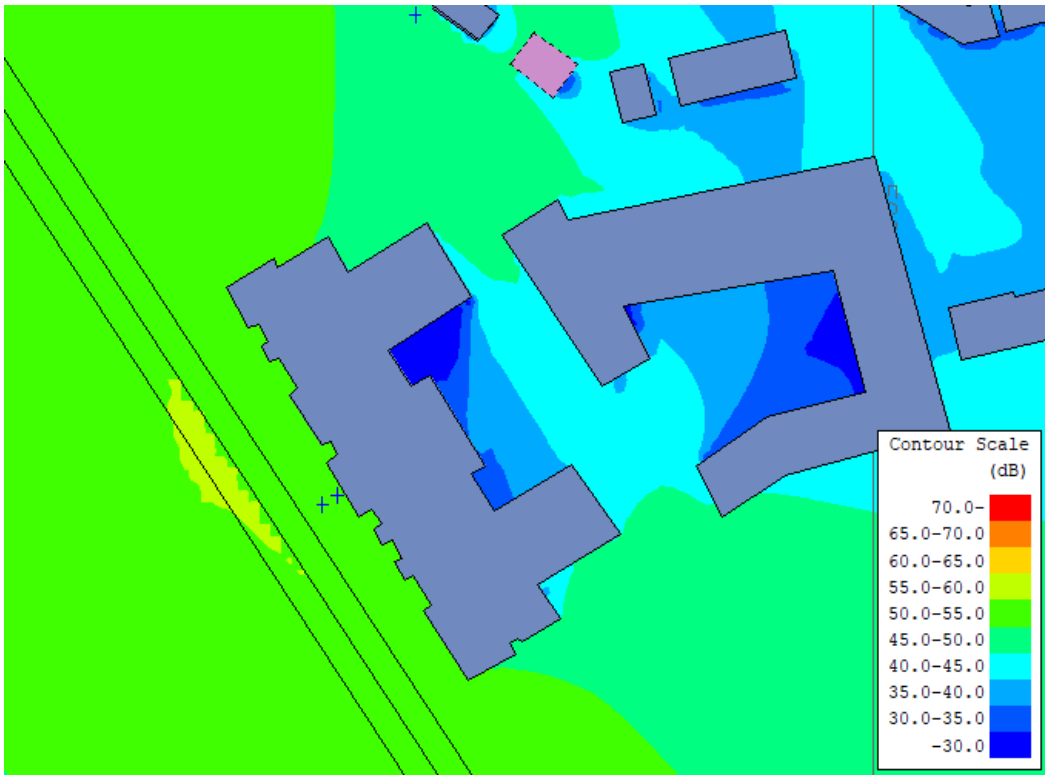
Ground floor day (figures in LAeq,16hr)



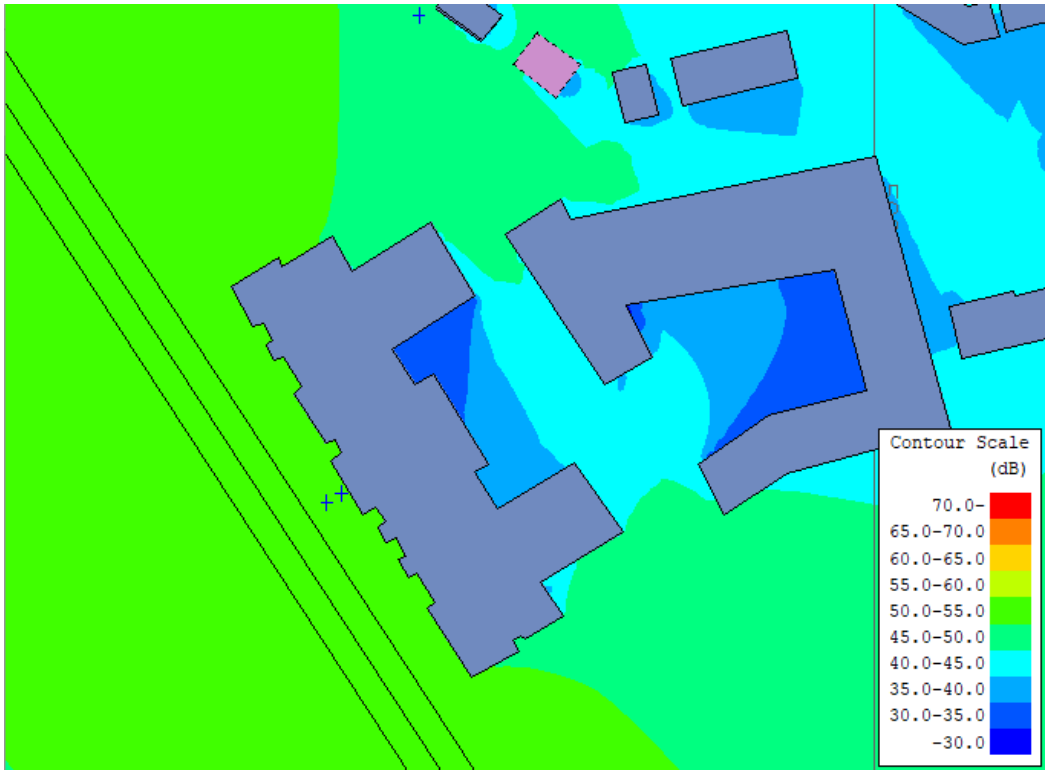
First floor day (figures in LAeq,16hr)



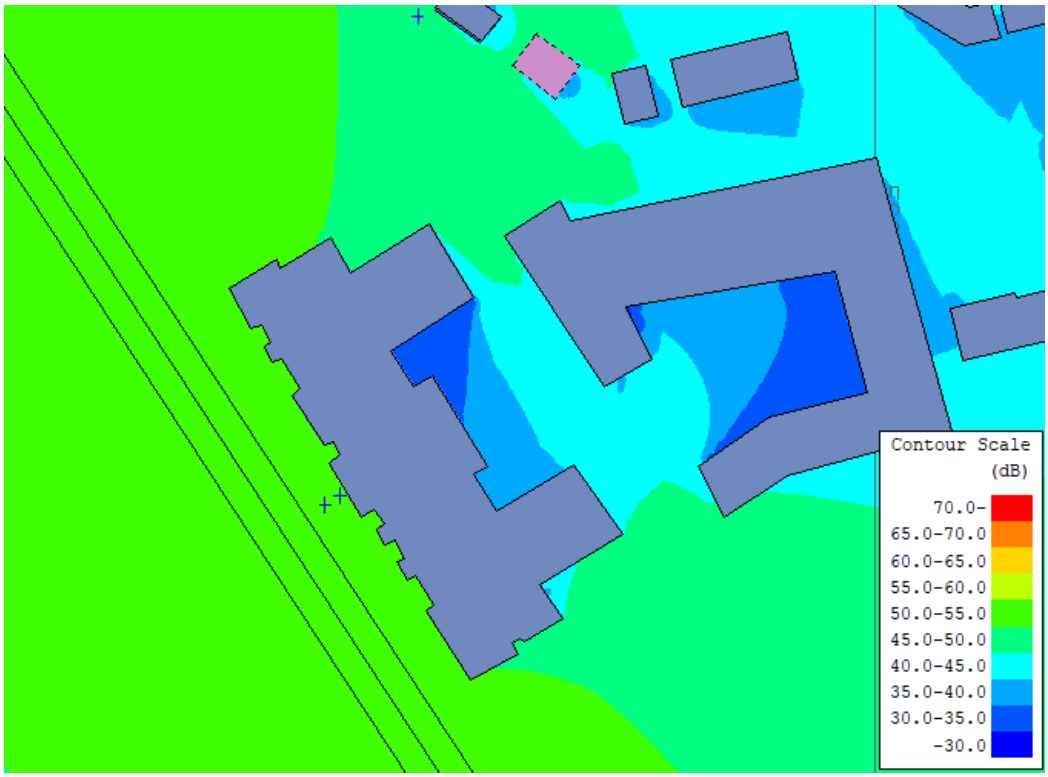
Second floor day (figures in LAeq,16hr)



Ground floor night (figures in LAeq,8hr)



First floor night (figures in LAeq,8hr)



Second floor night (figures in LAeq,8hr)

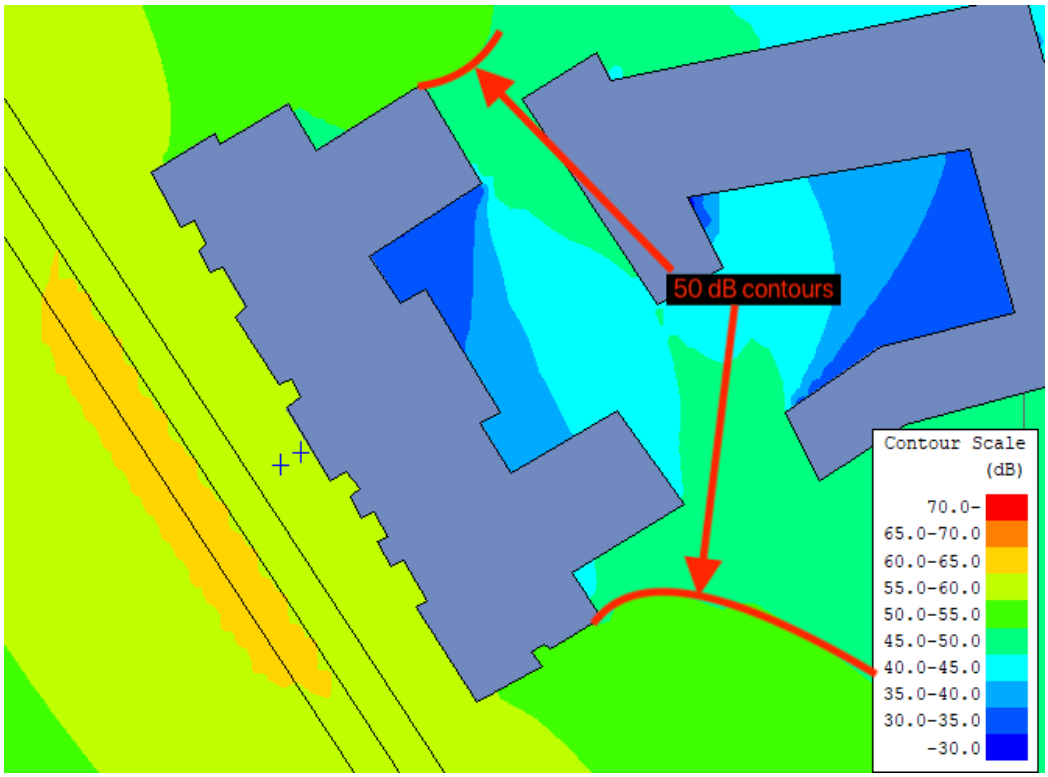
5.2. WHO Guidelines on community noise

The WHO Guidelines consider the effect of noise on outdoor spaces. Ideally, noise levels should be below 50 dB LAeq (Day) to avoid annoyance:

Environment	Health effects	LAeq
Outdoor spaces	Serious annoyance, daytime and evening	55
	Moderate annoyance, daytime and evening	50

Table 1: Limits for mimimising health effects for outdoor spaces (Adapted from the WHO Guidelines on Community Noise)

The 50 dB LAeq contour is shown in the daytime plot below:



50 dB contour

5.3. Average noise levels at facade

The noise model shows that difference between the noise levels at BG1 and the nearest facade is 1 dB Assuming that this is the case, the average noise level at the nearest facade are:

	Facade level (L_{Aeq})	**Internal level (open window) (L_{Aeq})**	**Required internal (L_{Aeq})**	**Difference (dB)**
Day	59.2	44.2	35	9.2
Night	53.5	38.5	30	8.5

Based on the average noise level, the composite noise reduction of the whole facade is required to be **23 dB R_w**

5.4. Peak events

The 10 noisiest LAmax during each night were:

	10th noisiest L_{Amax} (external)	**10th noisiest L_{Amax} (internal w/window)**

2017-05-10 05:00:00	70.7	60.7
2017-05-11 23:30:00	70.1	60.1
2017-05-12 05:30:00	72	62
2017-05-13 03:45:00	69.2	59.2
2017-05-14 04:15:00	70.3	60.3

The minimum additional noise attenuation (over an open window) for peak events is 17 dB. This equates to a required composite noise reduction of **32 dB R_w** for the whole facade.

5.5. Noise attenuation requirements on the noisiest facade

Since the internal noise limits cannot be met with an open window, an additional means of ventilation is required. This will ensure that future residents have an alternative to an open window during any noisy periods. Note that this requirements does **not** mean that windows cannot be openable, but that an alternative method should be provided.

The results indicate the following composite facade reductions are required:

- 23 dB Rw to protect against average noise levels; and
- 32 dB Rw to protect against peak nighttime noise.

If we assume that all units have 4-12-10 double glazing (which typically provides around 35 dB Rw of sound insulation) a trickle vent with and acoustic performance of 36 dB $D_{n,e}$ (measured according to BS EN ISO 10140) results in a total noise reduction of 33 dB Rw.

Suitable ventilators for meeting this requirement include:

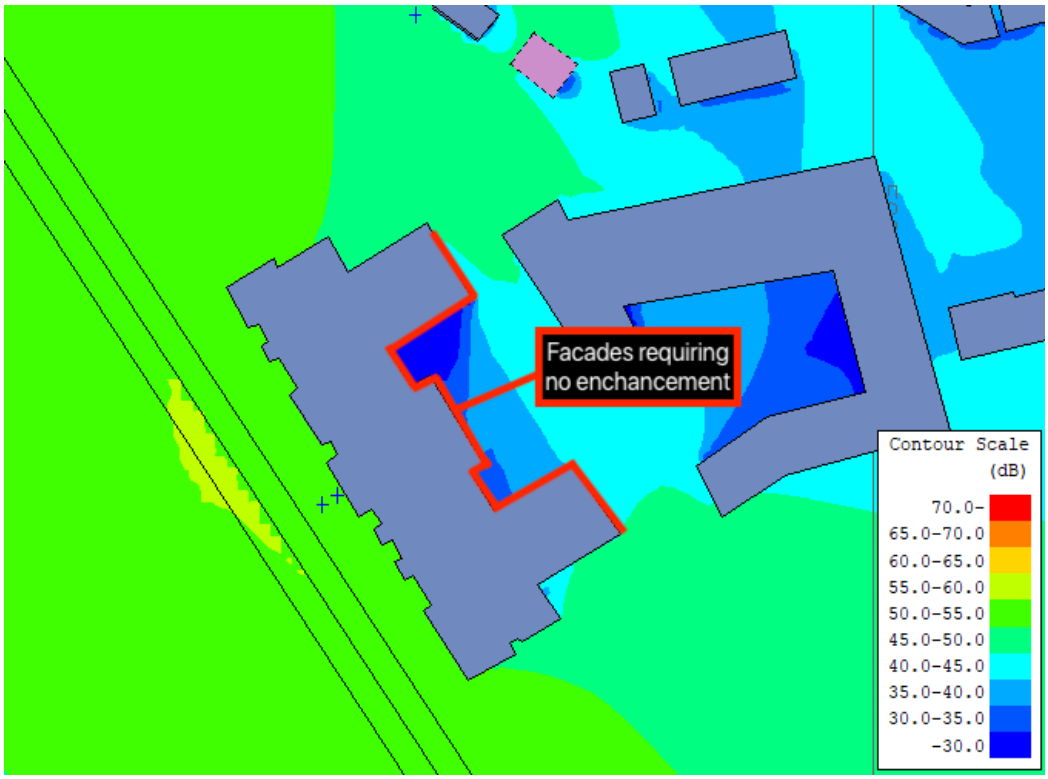
Model	Manufacturer	Type	Dne	Equivalent Free Area (mm^2)
125mm Acoustic High Rise Aircore, AAH5HM	Rytons	Passive	38.0	3248
TVALdB, 450/40	Passivent	Passive	40.0	4200
125mm Acoustic High Rise Aircore, AAC5	Rytons	Passive	41.0	3970

CAICE Acoustic Ventilator (2000 mm width x 400 mm depth)	CAICE	Passive	41.0	12224
Passivent 800/42	Passivent	Passive	42.0	4200
Passivent Fresh TLF-dB	Passivent	Passive	44.0	5000

In addition to the acoustic requirements, please ensure that each ventilator meets the minimum ventilation requirements for the space.

5.6. Noise attenuation for quieter facades

Facades where the average nighttime noise level is less than 45 dB $L_{Aeq,8hr}$ are unlikely to require additional treatment:



Facades not requiring enhanced ventilation

6. Conclusion

Our findings show that the internal noise levels can be met in all cases. Further, for external areas, the majority of the site to the north of the development is below the 50 dB L_{Aeq} target value during both the day and the night.

For facades facing Exeter Road, an additional means of ventilation is required. This will ensure that future residents have an alternative to an open window during any noisy periods. Note that this requirement does **not** mean that windows cannot be openable, but that an alternative method should be provided.

To achieve this, the minimum performance for glazing is 35 R_w. This can be achieved with 4-12-10 double glazing (which typically provides around 35 dB Rw or greater). Furthermore, a trickle vent with an element-weighted noise reduction of greater than 36 dB $D_{n,e}$ is required. Note that if more than one ventilator is required for sufficient airflow, higher performance ventilators will be required. We will be happy to advise as necessary.

Based on the above, we see no reason to refuse planning permission on noise grounds.

7. Appendix

7.1. Common definitions

Term	Meaning
SPL	Sound pressure level: A measure of the instantaneous noise level at a point in space
SWL	Sound power level: A measure of the total sound outputted in all directions by a noise source.
Q	Directivity: A measure of how directed the sound is. A Q of 1 would be equally dispersed in all directions. A Q of 2 would be directed in a half-sphere, and a Q of 4 would be a quarter sphere *etc*.
d	Distance in meters from the source

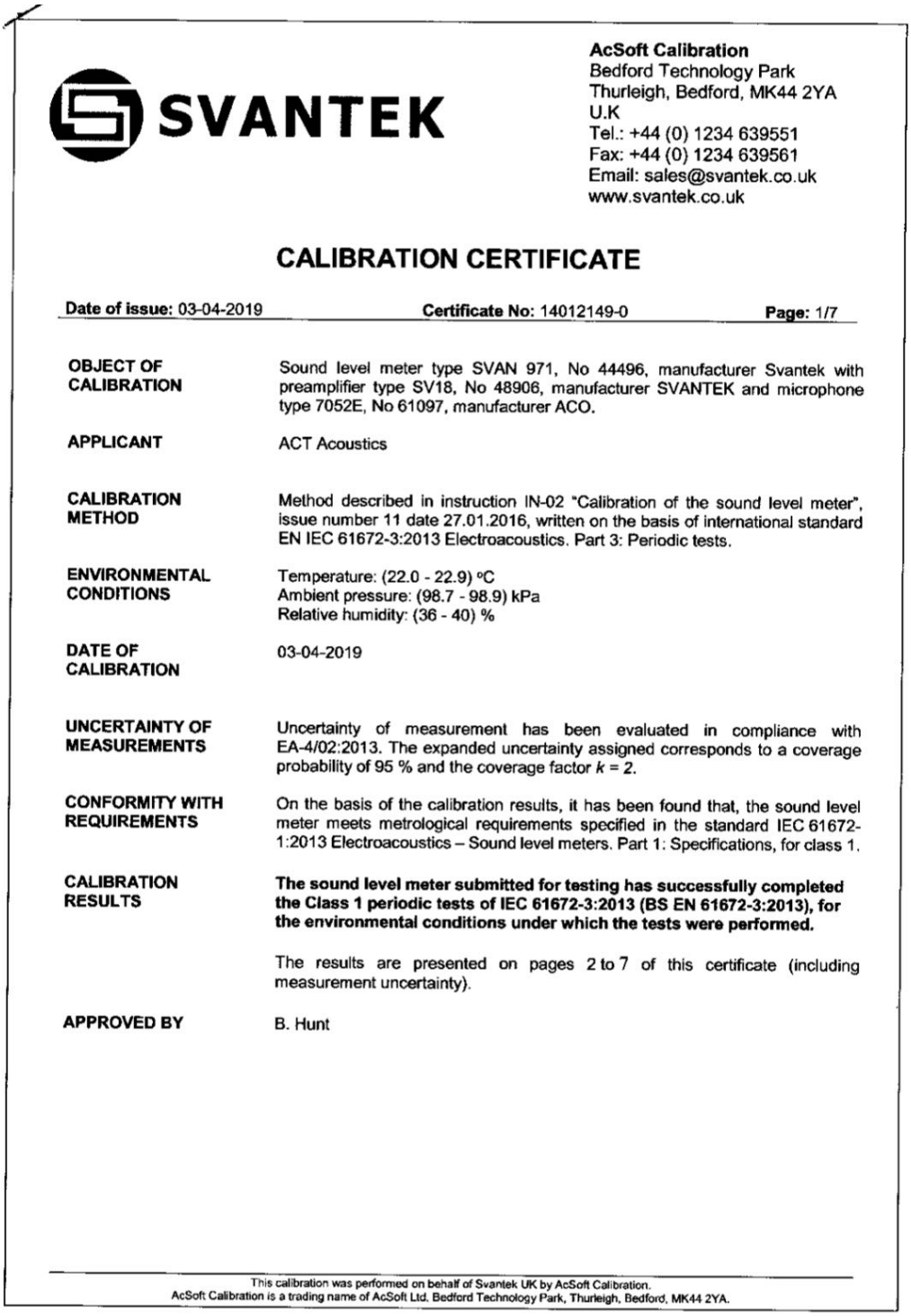
7.2. Typical noise levels

Lower (dB L_{Aeq})	Upper (dB L_{Aeq})	Example
0	10	Threshold of hearing
10	20	Broadcast studio
20	30	Bedroom at night
30	40	Library
40	50	Living room in urban area
50	60	Typical business office
60	70	Conversational speech
70	80	Average traffic on street corner
80	90	Inside bus
90	100	Lawn mower
100	110	Alarm clock at 1 m
110	120	Loud car horn at 1 m
120	130	Pneumatic drill at 1 m
130	140	Threshold of pain

Typical noise levels

7.3. SVAN 971 Calibration Certificate

Name	Component Type	Serial Number	Last Calibration
SV 18	Preamplifier	48906	2019-04-03
ACO 7052	Microphone	61097	2019-04-03



SVANTEK

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Bedford Technology Park
Thurleigh, Bedford, MK44 2YA
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Tel.: +44 (0) 1234 639551
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Email: sales@svantek.co.uk
www.svantek.co.uk

CALIBRATION CERTIFICATE

Date of issue: 03-04-2019 **Certificate No:** 14012149-0 **Page:** 1/7

OBJECT OF CALIBRATION	Sound level meter type SVAN 971, No 44496, manufacturer Svantek with preamplifier type SV18, No 48906, manufacturer SVANTEK and microphone type 7052E, No 61097, manufacturer ACO.
APPLICANT	ACT Acoustics
CALIBRATION METHOD	Method described in instruction IN-02 "Calibration of the sound level meter", issue number 11 date 27.01.2016, written on the basis of international standard EN IEC 61672-3:2013 Electroacoustics. Part 3: Periodic tests.
ENVIRONMENTAL CONDITIONS	Temperature: (22.0 - 22.9) °C Ambient pressure: (98.7 - 98.9) kPa Relative humidity: (36 - 40) %
DATE OF CALIBRATION	03-04-2019
UNCERTAINTY OF MEASUREMENTS	Uncertainty of measurement has been evaluated in compliance with EA-4/02:2013. The expanded uncertainty assigned corresponds to a coverage probability of 95 % and the coverage factor $k = 2$.
CONFORMITY WITH REQUIREMENTS	On the basis of the calibration results, it has been found that, the sound level meter meets metrological requirements specified in the standard IEC 61672-1:2013 Electroacoustics – Sound level meters. Part 1: Specifications, for class 1.
CALIBRATION RESULTS	**The sound level meter submitted for testing has successfully completed the Class 1 periodic tests of IEC 61672-3:2013 (BS EN 61672-3:2013), for the environmental conditions under which the tests were performed.** The results are presented on pages 2 to 7 of this certificate (including measurement uncertainty).
APPROVED BY	B. Hunt

This calibration was performed on behalf of Svantek UK by AcSoft Calibration.
AcSoft Calibration is a trading name of AcSoft Ltd. Bedford Technology Park, Thurleigh, Bedford, MK44 2YA.

SVAN 971 Calibration Certificate

8. Disclaimer

This report is confidential to the client. ACT Acoustics Ltd accepts no responsibility whatsoever to third parties to whom this report, or any part thereof, is made known, unless formally agreed by ACT Acoustics Ltd. Any such party relies upon the advice given in this report at their own risk.

All design advice given in this report should be checked with a suitably qualified structural engineer, fire safety engineer, building services engineer and your local building control officer. Suitably qualified consultants can be found at he Institution of Structural Engineers www.istructe.org/finding-a-structural-engineer) and the Chartered Institution of Building Services Engineers (www.cibse.org).

ACT Acoustics

ACT Acoustics Ltd. is registered as a company in England and Wales. No. 10569267. Registered company address 2, Ensign House, Parkway Court, Longbridge Road, Plymouth, PL6 8LR. VAT No.: 267852854.

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