Proposed air conditioning Condenser
at
Flat 6, 135 Haverstock Hill
Hampstead

Noise Assessment

Report prepared on behalf of:

Mr and Mrs Lee
Flat 6, 135 Haverstock Hill

Report prepared by:

Auracle Acoustics
5 Honeygate
Luton
LU2 7EP
tel: 01582 450896

Owen Clingan BSc (Hons) MIOA FRSA – 9 November 2018

Limit of liability

This report has been prepared in connection the site identified on the title page on behalf of and for the benefit of Mr and Mrs Lee only.

No responsibility to any other party is intended or implied.

Executive summary

It is proposed to install an external air conditioning condenser unit on the balcony of Flat 6, 135 Haverstock Hill, Hampstead to provide heating and cooling for the flat. The installation requires consent from the local planning authority, the London of Camden, and from the Landlord.

A noise impact assessment has therefore been undertaken on the basis of:

- a background noise monitoring exercise;
- a plant noise prediction exercise using noise data provided by the manufacturer of the condenser;
- relevant national guidance documents; and
- the noise standards adopted by the LB Camden.

The assessment has demonstrated that noise levels arising from the proposed condenser will be satisfactory when assessed using the criteria set out in BS4142: 2014 and BS8233: 2014 and those adopted by LB Camden. Additionally, due to the benign nature of the noise spectra arising from the proposed condenser, it is expected that noise from this source will be inaudible in the adjacent flats.

Accordingly, no mitigation will be required.

It should also be noted that with windows partially open at this location, worst-case maximum noise levels due to road traffic are predicted to be considerably in excess of 45 dB L_{Amax}, which is the recommended night-time limit for bedrooms. This means that it is probably unlikely that the windows of occupied bedroom will be open at night. This further reduces the likelihood that noise from the condenser will be audible in the flats adjoining Flat 6.

Contents

Chapter 1 - Introduction

It is proposed to install an external air conditioning condenser unit on the balcony of Flat 6, 135 Haverstock Hill, Hampstead to provide heating and cooling for the flat. The installation requires consent from the local planning authority, the London of Camden, and from the Landlord.

The location of the site is shown in Figure 1, while other illustrations relating to the proposed installation are shown in Figures 2A & 2B. Information relating to the proposed condenser is provided in Appendix A.

A noise impact assessment has therefore been undertaken on the basis of:

- a background noise monitoring exercise;
- a plant noise prediction exercise using noise data provided by the manufacturer of the condenser;
- relevant national guidance documents; and
- the noise standards adopted by the LB Camden.

The noise assessment is discussed below.

Chapter 2 – Noise assessment criteria

A glossary of acoustical terms is reproduced in Appendix B.

It is appropriate for this assessment to be undertaken using the guidance provided by LB Camden and:

- National Planning Policy Framework (NPPF) (Ref 1);
- Noise Policy Statement for England (NPSE) (Ref 2);
- BS4142: 2014 'Methods for rating and assessing industrial and commercial sound' (Ref 3); and
- BS8233: 2014 'Guidance on sound insulation and noise reduction for buildings' (Ref 4).

The content of these reference documents and the local planning authority's noise standards are discussed below.

2.1 National Planning Policy Framework

The current edition of the NPPF was published on 24th July 2018 and is considered to be a key part of the Government's reforms to make the planning system less complex and more accessible, to protect the environment and to promote sustainable growth. This edition of the document replaces the original version that was issued in 2012.

Paragraph 1 of the document states:

> "The National Planning Policy Framework sets out the Government's planning policies for England and how these should be applied. It provides a framework within which locally-prepared plans for housing and other development can be produced."

Paragraph 7 of the document states:

> "The purpose of the planning system is to contribute to the achievement of sustainable development. At a very high level, the objective of sustainable development can be summarised as meeting the needs of the present without compromising the ability of future generations to meet their own needs."

Three overarching objectives of the planning system are identified, an economic objective, a social objective and an environmental objective.

Paragraph 10 of the document states:

> "So that sustainable development is pursued in a positive way, at the heart of the Framework is a presumption in favour of sustainable development (paragraph 11)."

As is to be expected, much of the document deals with strategic planning issues such as delivering a sufficient supply of homes, building a strong, competitive economy and ensuring the vitality of town centres.

Specific references to noise are limited, but occur in:

- paragraph 170, which states:
  "Planning policies and decisions should contribute to and enhance the natural and local environment by:
  e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans";

- paragraph 180, which states:
  "Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:
  a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;
  b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason";

- paragraph 204, which states:
  "Planning policies should:
  g) when developing noise limits, recognise that some noisy short-term activities, which may otherwise be regarded as unacceptable, are unavoidable to facilitate minerals extraction"; and

- paragraph 205, which states:
  "When determining planning applications, great weight should be given to the benefits of mineral extraction, including to the economy65. In considering proposals for mineral extraction, minerals planning authorities should:
  c) ensure that any unavoidable noise, dust and particle emissions and any blasting vibrations are controlled, mitigated or removed at source, and establish appropriate noise limits for extraction in proximity to noise sensitive properties".

Additionally, the document refers to the Explanatory Note to the Noise Policy Statement for England.

2.2 Noise Policy Statement for England

The Noise Policy Statement for England was published by the Department for Environment, Food and Rural Affairs (Defra) in March 2010. The complete document includes the Policy Statement itself and an Explanatory Note.

Key concepts used in the MPSE are:

- NOEL or "no observed effect", meaning the level (of noise) below which no effect on health or quality of life can be detected;

- LOAEL or "lowest observed adverse effect", meaning the level (of noise) above which adverse effects on health and quality of life can be detected; and

- SOAEL or "significant observed adverse effect", meaning the level (of noise) above which significant adverse effects on health and quality of life can occur.

The first aim of the NPSE is to: "Avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of the policy on sustainable development".

The second aim of the NPSE is to: "Mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of the policy on sustainable development".

The third aim of the NPSE is to: "Where possible, contribute to the improvement of health and quality of life through the effective management of environmental, neighbour and neighbourhood noise within the context of the policy on sustainable development".

The second aim refers to the situation lies somewhere between LOAEL and SOAEL.

However, paragraph 2.3 of the Explanatory Note makes it clear that the approach to the minimisation of noise from environmental and related sources should be reasonable and balanced in stating:

- "2.3 Furthermore, the broad aim of noise management has been to separate noise sources from sensitive noise receivers and to "minimise" noise. Of course, taken in isolation and to a literal extreme, noise minimisation would mean no noise at all. In reality, although it has not always been stated, the aim has tended to be to minimise noise "as far as reasonably practical". This concept can be found in the Environmental Protection Act 1990, where, in some circumstances, there is a defence of "best practicable means" in summary statutory nuisance proceedings.

2.3 BS4142: 2014 'Methods for rating and assessing industrial and commercial sound'

Noise arising from permanent industrial or commercial sources is normally assessed using BS4142: 2014 'Methods for rating and assessing industrial and commercial sound'. This document was published on 31 October 2014 and supersedes the 1997 edition.

The assessment methodology set out in BS4142: 2014 is based on a comparison being made between the noise level due to the noise industrial or commercial noise source(s) concerned and the prevailing background sound level in the absence of the specific noise source(s) being considered. If necessary the measured or predicted L_{Aeq} for industrial noise source(s) concerned is initially corrected for percentage on-times and for significant tonal and / or impulsive components, yielding a 'rating level'.

Chapter 11 of the document, which sets out the assessment methodology, is prefaced with the following text:

> "The significance of sound of an industrial and / or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs. An effective assessment cannot be conducted without an understanding of the reason(s) for the assessment and the context in which the sound occurs / will occur. When making assessments and arriving at decisions, therefore, it is essential to place the sound in context."

The document then recommends the following initial assessment methodology:

"Obtain an initial estimate of the impact of the specific sound by subtracting the measured background sound level (see Clause 8) from the rating level (see Clause 9), and consider the following.

"NOTE 1 More than one assessment might be appropriate.

"a) Typically, the greater this difference, the greater the magnitude of the impact.

"b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.

"c) A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.

"d) The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

"NOTE 2 Adverse impacts include, but are not limited to, annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact."

In cases where the initial estimate of the impact should be modified due to the context the following procedure is recommended:

"1) The absolute level of sound. For a given difference between the rating level and the background sound level, the magnitude of the overall impact might be greater for an acoustic environment where the residual sound level is high than for an acoustic environment where the residual sound level is low.
Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night.
Where residual sound levels are very high, the residual sound might itself result in adverse impacts or significant adverse impacts, and the margin by which the rating level exceeds the background might simply be an indication of the extent to which the specific sound source is likely to make those impacts worse.

"2) The character and level of the residual sound compared to the character and level of the specific sound. Consider whether it would be beneficial to compare the frequency spectrum and temporal variation of the specific sound with that of the ambient or residual sound, to assess the degree to which the specific sound source is likely to be distinguishable and will represent an incongruous sound by comparison to the acoustic environment that would occur in the absence of the specific sound. Any sound parameters, sampling periods and averaging time periods used to undertake character comparisons should reflect the way in which sound of an industrial and / or commercial nature is likely to be perceived and how people react to it.

"NOTE 3 Consideration ought to be given to evidence on human response to sound and, in particular, industrial and / or commercial sound where it is available. A number of studies are listed in the "Effects on humans of industrial and commercial sound" portion of the "Further reading" list in the Bibliography.

3) The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal

and / or outdoor acoustic conditions, such as:
i) facade insulation treatment;
ii) ventilation and / or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation; and
iii) acoustic screening."

2.4 BS8233: 2014 'Guidance on sound insulation and noise reduction for buildings'

BS8233: 2014: 'Guidance on sound insulation and noise reduction for buildings' provides guidance on indoor ambient noise levels for dwellings which are applicable in this case and which are set out in Table 4 of the document. These are set out below.

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living room	35 dB $L_{Aeq,16h}$	-
Dining	Dining room / area	40 dB $L_{Aeq,16h}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16h}$	30 dB $L_{Aeq,16h}$

The 1999 edition of the document also included an internal maximum noise level standard for bedrooms at night, although this does not appear in the current version. In accordance with World Health Organisation (WHO) guidance (which is still current), it the 1999 edition recommended that an internal noise level of 45 dB L_{Amax} should be exceeded no more than approximately 10 to 15 times per night in bedrooms.

In respect of noise levels in garden areas BS8233: 2014 states:

> "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 recognized 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."

Paragraph 6.2.2 of the document also states that for moderate and heavy traffic flows a 16-hour L_{Aeq} noise level can be derived from an 18-hour L_{A10} level by subtracting 2 dB. This conversion factor was previously provided in Planning Policy Guidance note 24 'Planning and Noise' (PPG24).

2.5 Noise standards adopted by the London Borough of Camden

It has been assumed that the LB of Camden follows the national guidance discussed above. Additionally, LB Camden's Policy DP28 requires that:

- Plant noise at 1 metre external to a sensitive façade should not exceed a level 5 dB below the background L_{A90} noise level;
- Plant noise that has a distinguishable discrete continuous note (while, hiss, screech, hum) at 1 metre external to a sensitive façade should not exceed a level 10 dB below the background L_{A90} noise level;
- Plant noise that has distinct impulses (bangs, clicks, clatters, thumps) at 1 metre external to a sensitive façade should not exceed a level 10 dB below the background L_{A90} noise level; and
- Where the background noise level exceeds 60 dB L_{A90} at 1 metre external to a sensitive façade, the level of plant noise should not exceed 55 dB L_{Aeq}.

Chapter 3 – Background noise monitoring exercise and derivation of reference background noise levels

Background noise levels were monitored during the evening of Monday 22 and the early hours of Friday 23 October 2018 at the monitoring position identified in Figure 1. The microphone was positioned at a height of approximately 5.0 metres above local ground level, and results were logged between 22.00 and 04.00 hours.

Data was gathered in terms of dB L_{Aeq}, dB L_{A10}, dB L_{A90} and dB L_{Amax}. Calibrated Type 1 precision integrating monitoring equipment with an effective weather protection kit was used and all field calibration and battery checks were satisfactory. Weather conditions were generally good throughout the monitoring period, being dry with very little air movement. The results may therefore be taken to be fully representative.

When rounded to the nearest whole dB reference background noise levels were found to be:

- 50 dB $L_{A90,1h}$ between 22.00 and 23.00 hours; and
- 40 dB $L_{A90,15m}$ between 23.00 and 04.00 hours.

Full details of the background noise monitoring exercise and the results obtained are provided in Appendix C.

Chapter 4 – Noise levels at potentially affected sensitive locations

As discussed above, Information relating to the proposed condenser is provided in Appendix A, reference noise levels for the proposed condenser being:

- 52 dB(A) at a distance of 1.0 metre during the day; and
- 48 dB(A) at a distance of 1.0 metre at night.

The position of the proposed condenser is marked with an 'X' in Figure 2A, where it will be situated within the balcony, and is also shown in plan view in Figure 2B. The nearest potentially affected residential windows in different ownership are also identified in Figures 2A. Predicted noise levels at these windows are set out in Appendix D.

No tonality is evident in the noise spectra for the proposed condenser, and condensers of this kind do not normally generate significant tonal or impulsive components, so no correction has been added to the predicted noise levels.

From the predicted noise levels derived in Appendix D it can be seen that at the worst-case potentially affected window (Window B) the noise level due to the proposed condenser will be:

- 13.0 dB below background during the daytime period including the late evening; and
- 7.0 dB below background at night.

These external noise levels comfortably satisfy the requirements of LB Camden's Policy DP28, and will therefore be satisfactory.

When assessed using BS4142: 2014 this daytime situations is an indication that the specific sound source will have a low impact during the daytime period including the late evening, and at night, depending on the context. In this case, where the dominant noise source is road traffic, the context means that noise from the proposed condenser will not give rise to any significant impacts.

With the window partially open, internal noise levels at this worst-case location will be:

- 22.0 dB $L_{Aeq,1h}$ during the daytime period including the late evening; and
- 18.0 dB $L_{Aeq,15m}$ at night.

Both of these noise levels comfortably satisfy the internal noise level criteria set out in BS8233: 2014, so will be satisfactory. Additionally, due to the benign nature of the noise spectra arising from the proposed condenser, it is expected that noise from this source will be inaudible in the adjacent flats.

Chapter 5 – Conclusions

The assessment has demonstrated that noise levels arising from the proposed condenser will be satisfactory when assessed using the criteria set out in BS4142: 2014 and BS8233: 2014 and those adopted by LB Camden. Additionally, due to the benign nature of the noise spectra arising from the proposed condenser, it is expected that noise from this source will be inaudible in the adjacent flats.

Accordingly, no mitigation will be required.

It should also be noted that with windows partially open at this location, worst-case maximum noise levels due to road traffic are predicted to be considerably in excess of 45 dB L_{Amax}, which is the recommended night-time limit for bedrooms. This means that it is probably unlikely that the windows of occupied bedroom will be open at night. This further reduces the likelihood that noise from the condenser will be audible in the flats adjoining Flat 6.

References

1 National Planning Policy Framework; Ministry of Housing, Communities and Local Government; 2018

2 Noise Policy Statement for England; Department for Environment, Food and Rural Affairs; 2010

3 BS4142: 2014 ‘Methods for rating and assessing industrial and commercial sound’; BSI

4 BS8233: 2014 ‘Guidance on sound insulation and noise reduction for buildings’; BSI

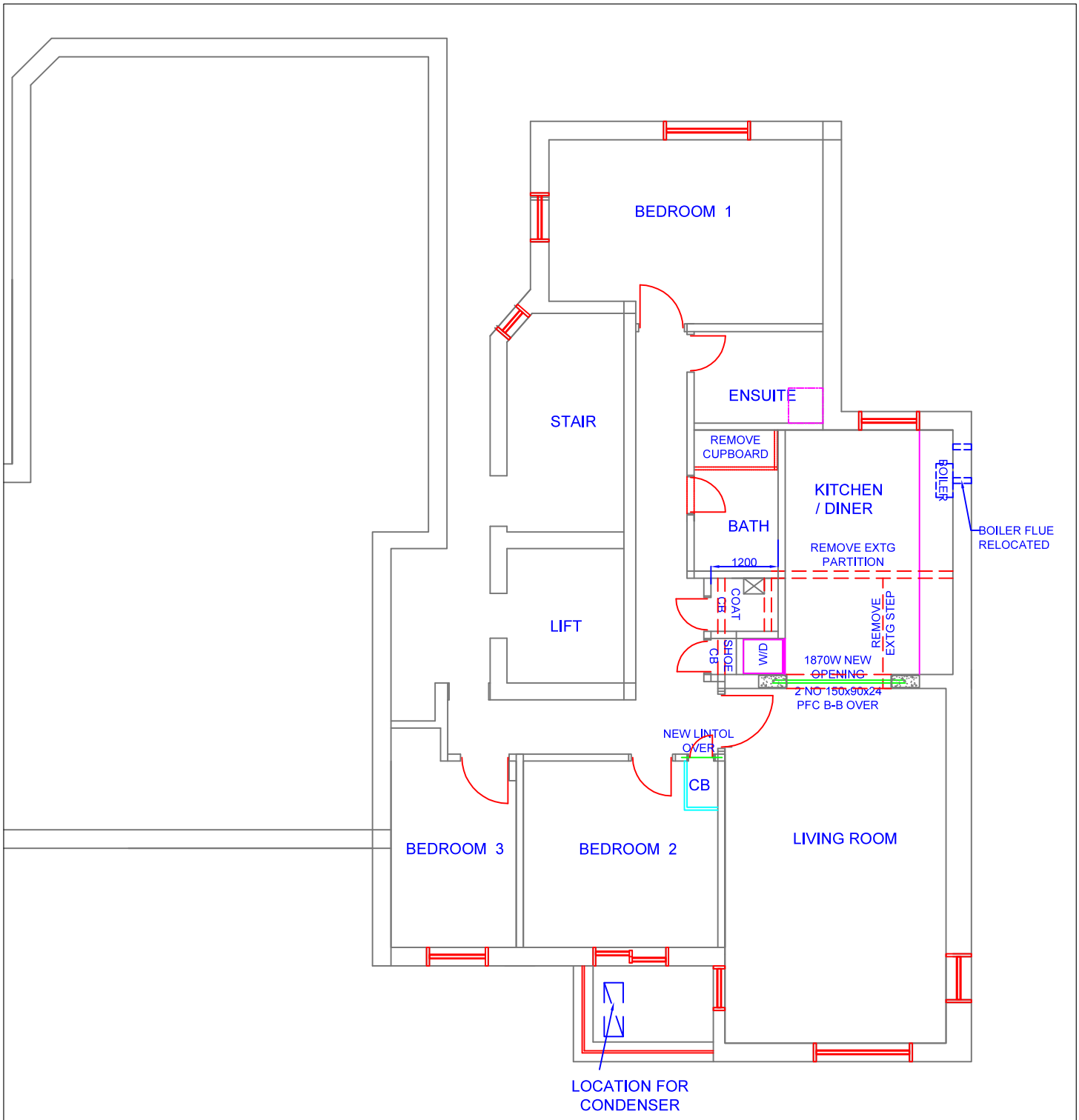
Figure 1

Site location plan

Figures 2A & 2B

Other illustrations


D
E
F
FLAT 6
X
A
B
C



FLAT 6
PROPOSED PLAN
CONDENSER
UNIT LOCATION

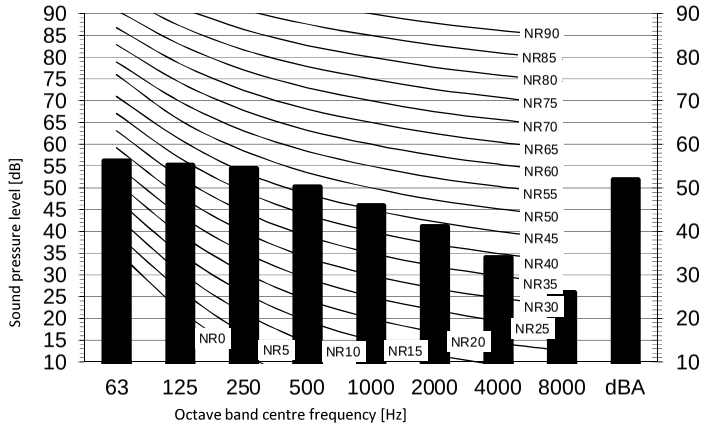
348 - SK11

Appendix A

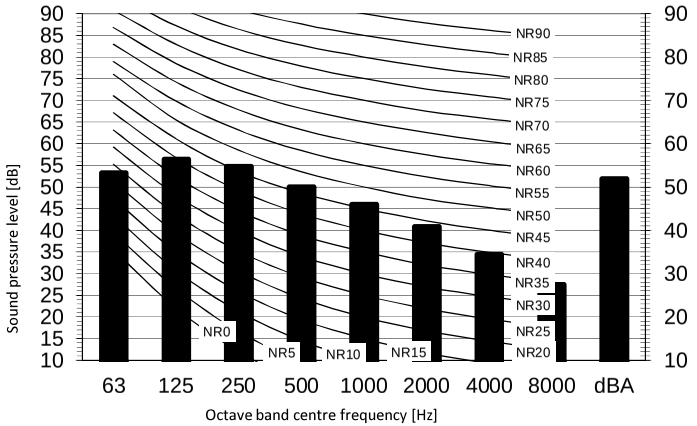
Proposed condenser

5MXM90N

Cooling mode



Heating mode



Legend

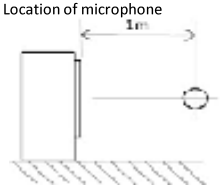
dBA = A-weighted sound pressure level (A scale according to IEC).

A Scale

High-tap

B

Location of microphone



Cooling Total dB

A	B
dBA	52

Heating Total dB

A	B
dBA	52

Notes

1. Operating conditions: power source 220-240 V/220 V 50/60 Hz; JIS standard
2. Background noise already taken into account.
3. Operating noise varies depending on operation and ambient conditions.
4. The operation noise measuring method is in accordance with JISC9612.
5. Measuring location: anechoic chamber
6. Editable data for this drawing are available in the GDE (E-BOM) system.
7. The values above are for connecting with the following indoor unit types: 1.5, 2.0, 2.5, 3.5, 4.2, 5.0, 6.0, 7.1 kW Class

3D106226

Owen Clingan

From: "londonnorthsales/UK/EUR/Daikin" <londonnorthsales@daikin.co.uk>
Date: 31 October 2018 10:41
To: "Owen Clingan" <owen.clingan@btinternet.com>
Subject: RE: Daikin 5MXM50N

Owen,

Yes, night set back is 4 dB quieter.

Kind Regards,

Kevin Rice
Application Engineer – London North Applications and Quotations Team
DAIKIN UK

Direct Tel: 0845 641 9315 | Direct Email: rice.k@daikin.co.uk
Office Tel: 0845 641 9360 | Office Email: londonnorthsales@daikin.co.uk
www.daikin.co.uk | www.twitter.com/daikinuk

Sales Orders and Deliveries:
Tel: 0845 641 9360 | Email: london.orders@daikin.co.uk

Information and Self Help Tools:
Product Information: www.my.daikin.co.uk | Web based quotation and order system: www.daikinetool.co.uk

---

From: Owen Clingan [mailto:owen.clingan@btinternet.com]
Sent: 31 October 2018 10:06
To: Kevin Rice <rice.k@daikin.co.uk>
Subject: Re: Daikin 5MXM50N

Hi Kevin,

I sent the e-mail message before I had read the PDF properly. I see now that both data sheets quote 52 dB(A) at 1 metre, so please accept my apologies.

I have been told by the proposed installer that this unit has a 'night mode' which is 4 dB quieter, ie 48 dB(A) at 1 metre. Is this the case?

Regards, Owen (office: 01582 450896, mobile: 07710 405060)

From: Owen Clingan
Sent: Wednesday, October 31, 2018 9:53 AM
To: Kevin Rice
Subject: Re: Daikin 5MXM50N

Many thanks for the information and the prompt response Kevin.

The noise level figures that you have just sent to me differ from those in the

I have been told by the proposed installer that this unit has a 'night mode' which is 4 dB quieter. Is this the case?

Regards, Owen (office: 01582 450896, mobile: 07710 405060)

From: Kevin Rice
Sent: Wednesday, October 31, 2018 9:36 AM
To: owen.clingan@btinternet.com
Subject: Daikin 5MXM50N

Owen,

Please see attached all the sound data we have for the above unit.

Kind Regards,

Kevin Rice
Application Engineer – London North Applications and Quotations Team
DAIKIN UK

Direct Tel: 0845 641 9315 | Direct Email: rice.k@daikin.co.uk
Office Tel: 0845 641 9360 | Office Email: londonnorthsales@daikin.co.uk
www.daikin.co.uk | www.twitter.com/daikinuk

Sales Orders and Deliveries:
Tel: 0845 641 9360 | Email: london.orders@daikin.co.uk

Information and Self Help Tools:
Product Information: www.my.daikin.co.uk | Web based quotation and order system: www.daikinetool.co.uk

Daikin Airconditioning UK Ltd
Tel: 0845 641 9000 | Fax: 0845 641 9009 |
Address: The Heights, Brooklands, Weybridge, KT13 0NY

www.daikin.co.uk

Appendix B

Glossary of acoustical terms

Glossary

Below are explanations of terms as they are used in the PPG; they are not definitions.

Decibel (dB): a unit of level derived from the logarithm of the ratio between the value of a quantity and a reference value. It is used to describe the level of many different quantities. For sound pressure level the reference quantity is 20 Pa, the threshold of normal hearing is in the region of 0 dB, and 140 dB is the threshold of pain. A change of 1 dB is only perceptible under controlled conditions.

dB(A): decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) broadly agree with people's assessment of loudness. A change of 3 dB(A) is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds roughly to halving or doubling the loudness of a sound. The background noise level in a living room may be about 30 dB(A); normal conversation about 60 dB(A) at 1 metre; heavy road traffic about 80 dB(A) at 10 metres; the level near a pneumatic drill about 100 dB(A).

Hertz (Hz): unit of frequency, equal to one cycle per second. Frequency is related to the pitch of a sound.

$L_{A10,T}$: the A weighted level of noise exceeded for 10% of the specified measurement period (T). It gives an indication of the upper limit of fluctuating noise such as that from road traffic. $L_{A10,18h}$ is the arithmetic average of the 18 hourly $L_{A10,1h}$ values from 06.00 to 24.00.

$L_{A90,T}$: the A weighted noise level exceeded for 90% of the specified measurement period (T). In BS 4142: 1990 it is used to define background noise level.

$L_{Aeq,T}$: the equivalent continuous sound level -the sound level of a notionally steady sound having the same energy as a fluctuating sound over a specified measurement period (T). $L_{Aeq,T}$ is used to describe many types of noise and can be measured directly with an integrating sound level meter. It is written as L_{eq} in connection with aircraft noise.

L_{Amax}: the highest A weighted noise level recorded during a noise event. The time weighting used (F or S) should be stated.

Additionally, the term *SPL* refers to the quantity Sound Pressure Level as discussed under *Decibel (dB)* above. This can be either a broad-band quantity including all octave-band figures or can refer to individual octave-bands for instance.

The above text is reproduced in full from PPG24

Appendix C

Background noise monitoring exercise

Results obtained at	Position in front of building facing Haverstock Hill, approximately 5.0 metres high			MPB
	Microphone positioned approximately	3.0	m from façade	
	Façade reflection(s) estimated to have added	1.0	dB to results obtained	
Results obtained on	Monday 22 October 2018			Day
NTi XL2-TA Kit B	Calibration at start	ok	Battery level at start	ok
Fast response	Calibration at end	ok	Battery level at end	ok

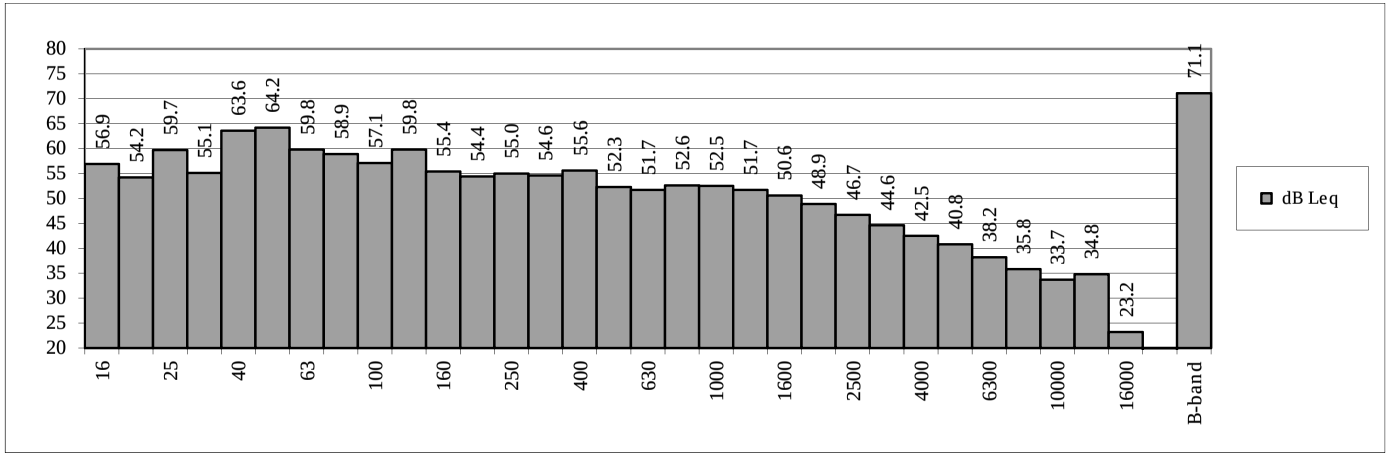
Sources: Dominant noise source is road traffic
No other significant noise sources
Weather: ~6 degrees C, dry, partial cloud, very little air movement
Road surfaces dry throughout monitoring period

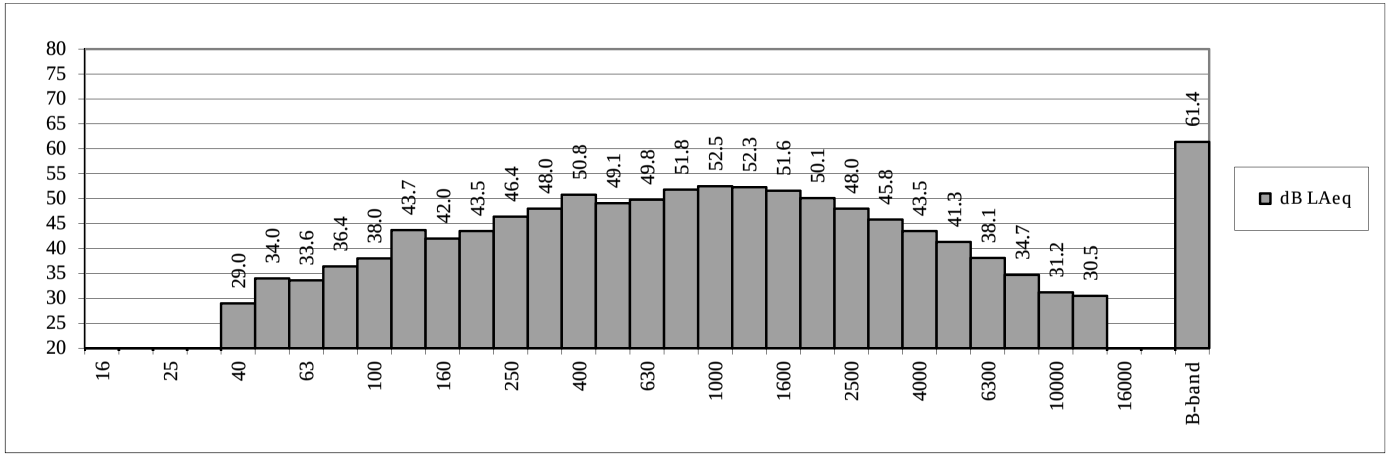
Start time	LAeq	LA10	LA90	LAmax	Notes
22:00:00	61.0	64.8	51.6	74.1	
22:15:00	61.3	65.4	50.6	76.0	
22:30:00	60.7	64.4	49.8	72.7	
22:45:00	62.3	64.0	50.9	87.6	
Overall:	61.3	64.6	50.8	87.6	including any façade reflections
Overall:	60.3	63.6	49.8	86.6	corrected for free-field conditions

Results obtained at: Position in front of building facing Haverstock Hill, approximately 5.0 metres high — MPB
Microphone positioned approximately 3.0 m from façade
Façade reflection(s) estimated to have added 1.0 dB to results obtained

Average spectra for: Monday 22 October 2018 — including any façade reflection(s) — Day

Centre Freq Hz	Averages dB Leq	Averages dB LAeq
16	56.9	0.2
20	54.2	3.7
25	59.7	15.0
31.5	55.1	15.7
40	63.6	29.0
50	64.2	34.0
63	59.8	33.6
80	58.9	36.4
100	57.1	38.0
125	59.8	43.7
160	55.4	42.0
200	54.4	43.5
250	55.0	46.4
315	54.6	48.0
400	55.6	50.8
500	52.3	49.1
630	51.7	49.8
800	52.6	51.8
1000	52.5	52.5
1250	51.7	52.3
1600	50.6	51.6
2000	48.9	50.1
2500	46.7	48.0
3150	44.6	45.8
4000	42.5	43.5
5000	40.8	41.3
6300	38.2	38.1
8000	35.8	34.7
10000	33.7	31.2
12500	34.8	30.5
16000	23.2	16.6
20000	14.4	5.1
B-band	71.1	61.4





Results obtained at	Position in front of building facing Haverstock Hill, approximately 5.0 metres high		MPB
	Microphone positioned approximately	3.0	m from façade
	Façade reflection(s) estimated to have added	1.0	dB to results obtained
Results obtained on	Monday 22 / Tuesday 23 October 2018		Night

NTi XL2-TA Kit B	Calibration at start	ok	Battery level at start	ok
Fast response	Calibration at end	ok	Battery level at end	ok

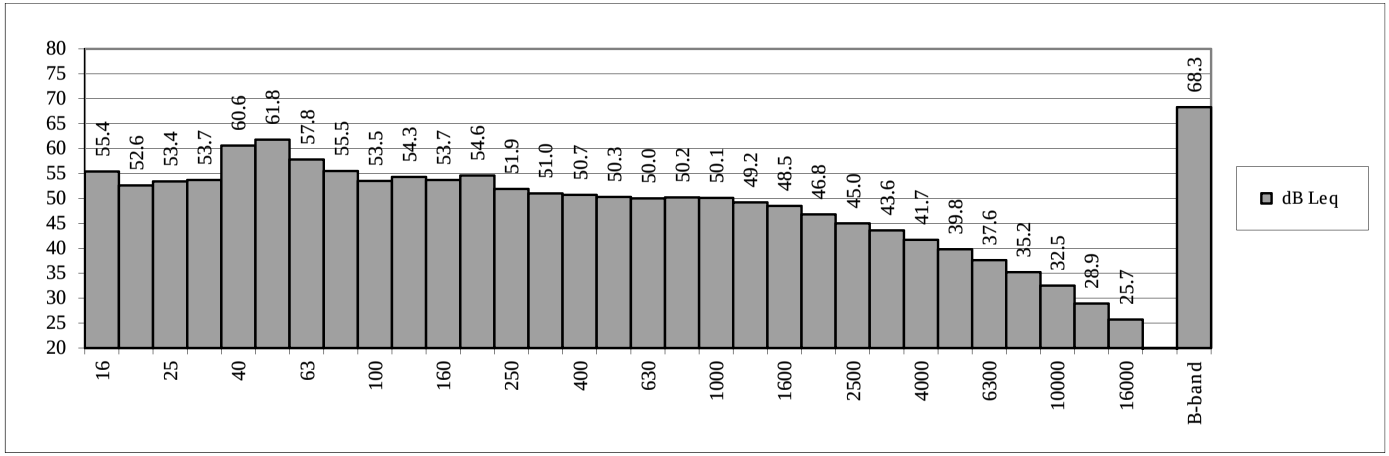
Sources: Dominant noise source is road traffic
No other significant noise sources
Weather: ~6 degrees C, dry, partial cloud, very little air movement
Road surfaces dry throughout monitoring period

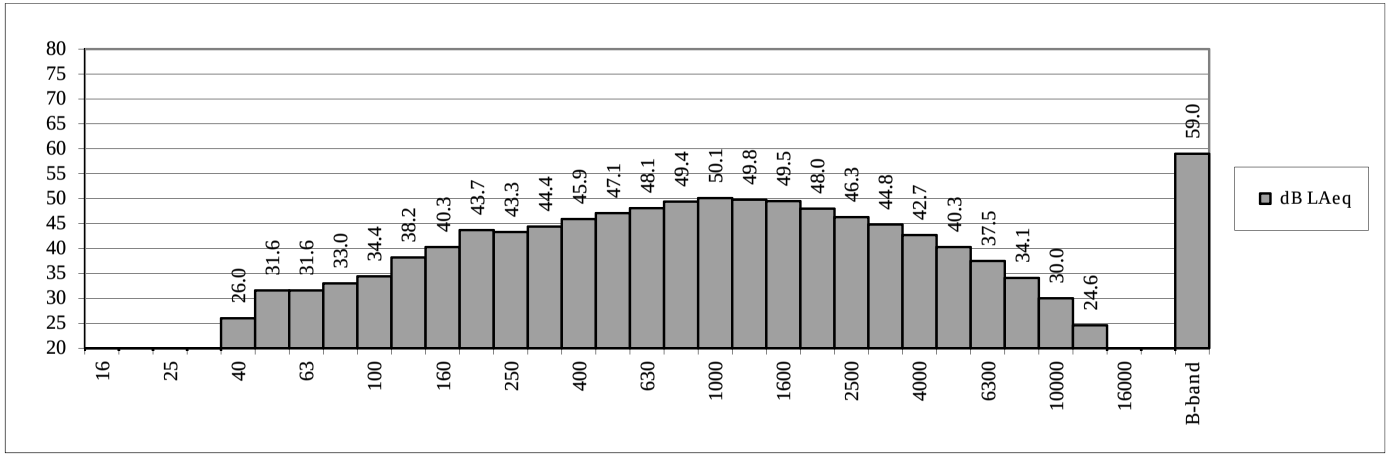
Start time	LAeq	LA10	LA90	LAmax	Notes
23:00:00	60.3	63.9	50.5	74.6	
23:15:00	60.1	64.4	46.0	72.9	
23:30:00	58.7	63.3	46.6	75.9	
23:45:00	59.8	63.9	47.0	74.4	
00:00:00	58.9	62.5	44.4	74.7	
00:15:00	56.5	61.6	41.9	71.0	
00:30:00	57.6	61.7	44.6	76.6	
00:45:00	56.3	61.0	43.9	69.2	
01:00:00	56.1	60.6	42.1	71.8	
01:15:00	61.8	59.2	42.7	90.3	
Overall:	59.0	62.7	44.1	90.3	including any façade reflections
Overall:	58.0	61.7	43.1	89.3	corrected for free-field conditions
Lowest:			41.9		including any façade reflections
Lowest:			40.9		corrected for free-field conditions

Results obtained at: Position in front of building facing Haverstock Hill, approximately 5.0 metres high — MPB
Microphone positioned approximately 3.0 m from façade
Façade reflection(s) estimated to have added 1.0 dB to results obtained

Average spectra for: Monday 22 / Tuesday 23 October 2018 — including any façade reflection(s) — Night

Centre Freq Hz	Averages dB Leq	Averages dB LAeq
16	55.4	-1.3
20	52.6	2.1
25	53.4	8.7
31.5	53.7	14.3
40	60.6	26.0
50	61.8	31.6
63	57.8	31.6
80	55.5	33.0
100	53.5	34.4
125	54.3	38.2
160	53.7	40.3
200	54.6	43.7
250	51.9	43.3
315	51.0	44.4
400	50.7	45.9
500	50.3	47.1
630	50.0	48.1
800	50.2	49.4
1000	50.1	50.1
1250	49.2	49.8
1600	48.5	49.5
2000	46.8	48.0
2500	45.0	46.3
3150	43.6	44.8
4000	41.7	42.7
5000	39.8	40.3
6300	37.6	37.5
8000	35.2	34.1
10000	32.5	30.0
12500	28.9	24.6
16000	25.7	19.1
20000	14.5	5.2
B-band	68.3	59.0





Results obtained at	Position in front of building facing Haverstock Hill, approximately 5.0 metres high			MPB
	Microphone positioned approximately	3.0	m from façade	
	Façade reflection(s) estimated to have added	1.0	dB to results obtained	
Results obtained on	Monday 22 / Tuesday 23 October 2018			Night
NTi XL2-TA Kit B	Calibration at start	ok	Battery level at start	ok
Fast response	Calibration at end	ok	Battery level at end	ok

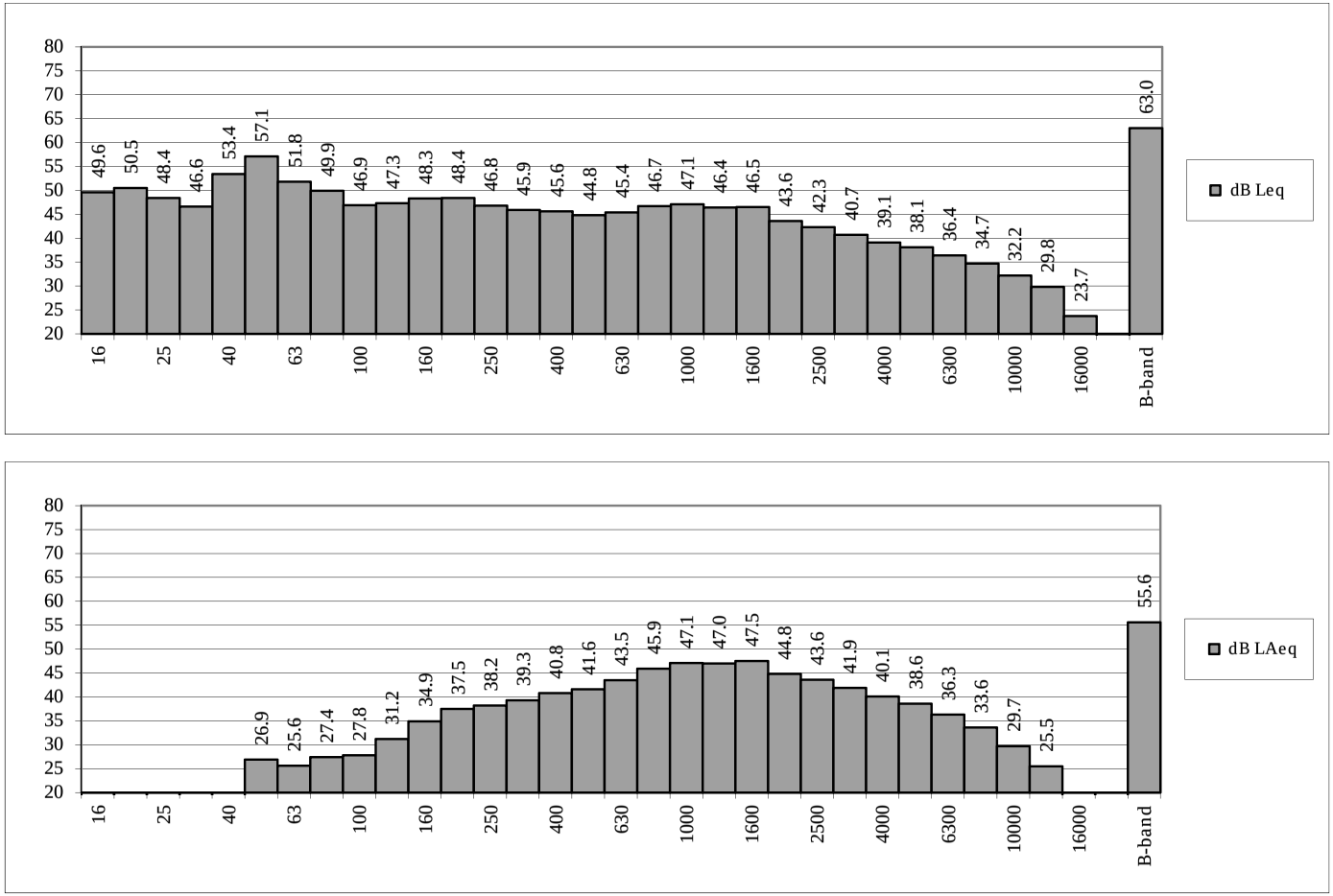
Sources: Dominant noise source is road traffic
No other significant noise sources
Weather: ~6 degrees C, dry, partial cloud, very little air movement
Road surfaces dry throughout monitoring period

Start time	LAeq	LA10	LA90	LAmax	Notes
01:30:00	55.1	59.0	39.7	71.7	
01:45:00	60.1	61.1	44.1	85.1	
02:00:00	53.2	56.0	42.4	71.8	
02:15:00	55.4	58.4	44.7	72.0	
02:30:00	54.5	58.0	44.2	68.6	
02:45:00	54.7	57.9	42.9	71.3	
03:00:00	52.8	55.6	44.2	68.4	
03:15:00	55.3	58.5	43.6	79.2	
03:30:00	55.8	57.1	40.0	77.5	
03:45:00	54.1	57.4	41.6	71.7	
Overall:	55.6	58.1	42.2	85.1	including any façade reflections
Overall:	54.6	57.1	41.2	84.1	corrected for free-field conditions
Lowest:			39.7		including any façade reflections
Lowest:			38.7		corrected for free-field conditions

Results obtained at: Position in front of building facing Haverstock Hill, approximately 5.0 metres high — MPB
Microphone positioned approximately 3.0 m from façade
Façade reflection(s) estimated to have added 1.0 dB to results obtained

Average spectra for: Monday 22 / Tuesday 23 October 2018 — including any façade reflection(s) — Night

Centre Freq Hz	Averages dB Leq	Averages dB LAeq
16	49.6	-7.1
20	50.5	0.0
25	48.4	3.7
31.5	46.6	7.2
40	53.4	18.8
50	57.1	26.9
63	51.8	25.6
80	49.9	27.4
100	46.9	27.8
125	47.3	31.2
160	48.3	34.9
200	48.4	37.5
250	46.8	38.2
315	45.9	39.3
400	45.6	40.8
500	44.8	41.6
630	45.4	43.5
800	46.7	45.9
1000	47.1	47.1
1250	46.4	47.0
1600	46.5	47.5
2000	43.6	44.8
2500	42.3	43.6
3150	40.7	41.9
4000	39.1	40.1
5000	38.1	38.6
6300	36.4	36.3
8000	34.7	33.6
10000	32.2	29.7
12500	29.8	25.5
16000	23.7	17.1
20000	15.2	5.9
B-band	63.0	55.6

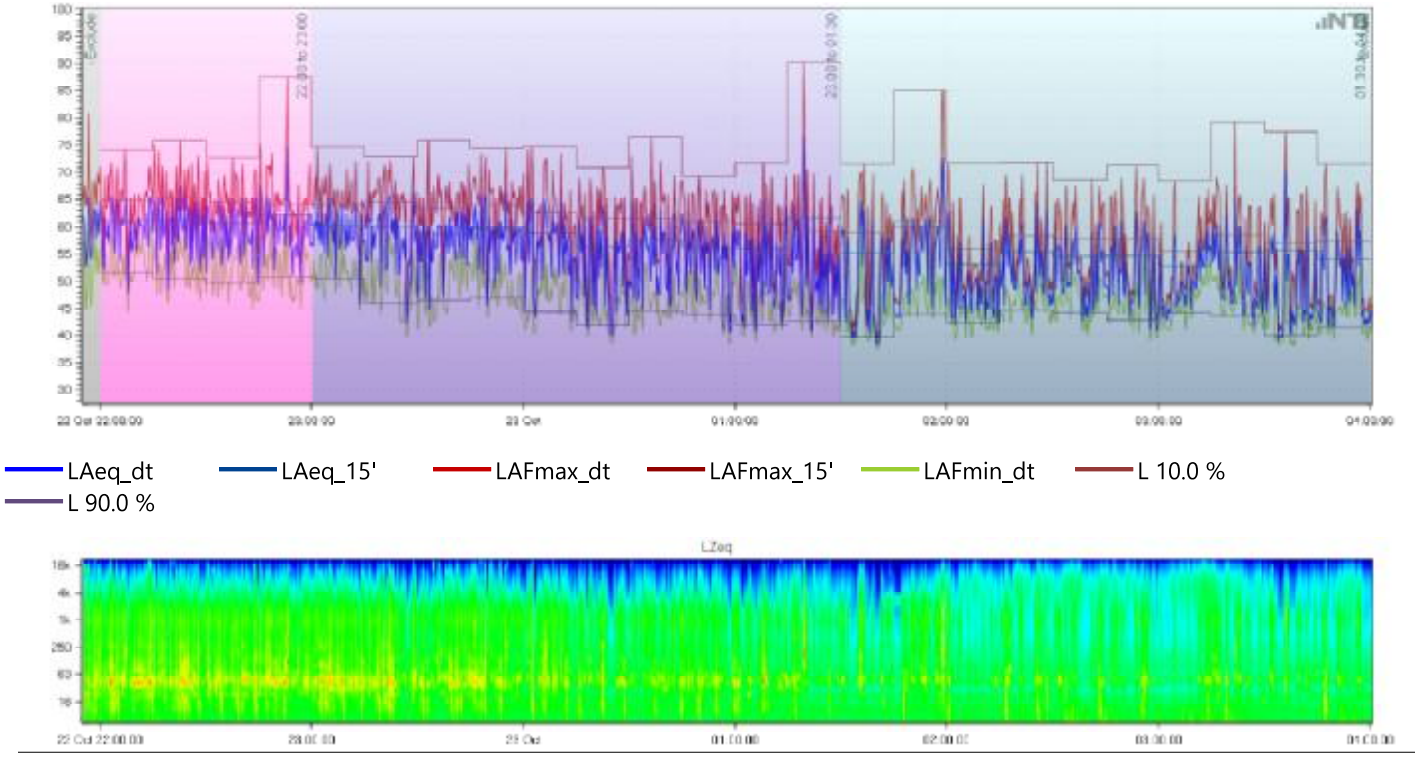


AURACLE
ACOUSTICS

Project Report

Start: 2018-10-22 21:55:00

End: 2018-10-23 04:00:40



Configuration

Device Info:	XL2, SNo. A2A-11063-E0, FW3.23
Mic Type:	NTi Audio M2230, SNo. 5819, User calibrated 2018-10-22 21:49, WP30(h)
Mic Sensitivity:	47.2 mV/Pa
Range:	0 - 100 dB
Ln based on:	LAeq_dt

AURACLE
ACOUSTICS

Results

Type	Start Date and Time	Duration	LAeq [dB]	LAFmax [dB]	L 10.0 % [dB]	L 90.0 % [dB]
Recorded		**06:05:40**	**58.6**	**90.3**		
-Exclude (2)		**00:05:40**	**60.9**	**81.0**	**64.8**	**45.0**
-Exclude	2018-10-22 21:55:00	00:05:00	61.5	81.0		
-Exclude	2018-10-23 04:00:00	00:00:40	44.3	45.7		
Project Result		**06:00:00**	**58.5**	**90.3**	**62.4**	**43.4**

Markers

Type	Start Date and Time	Duration	LAeq [dB]	LAFmax [dB]	L 10.0 % [dB]	L 90.0 % [dB]
22.00 to 23.00 (1)		**01:00:00**	**61.3**	**87.6**	**64.6**	**50.8**
22.00 to 23.00	2018-10-22 22:00:00	01:00:00	61.3	87.6		
23.00 to 01.30 (1)		**02:30:00**	**59.0**	**90.3**	**62.7**	**44.1**
23.00 to 01.30	2018-10-22 23:00:00	02:30:00	59.0	90.3		
01.30 to 04.00 (1)		**02:30:00**	**55.6**	**85.1**	**58.1**	**42.2**
01.30 to 04.00	2018-10-23 01:30:00	02:30:00	55.6	85.1		

Audit Intervals

Type	Start Date and Time	Duration	LAeq [dB]	LAFmax [dB]	L 10.0 % [dB]	L 90.0 % [dB]
15'	**2018-10-22 21:45:00**	**00:00:00**	**---**	**---**	**---**	**---**
15'	**2018-10-22 22:00:00**	**00:15:00**	**61.0**	**74.1**	**64.8**	**51.6**
15'	**2018-10-22 22:15:00**	**00:15:00**	**61.3**	**76.0**	**65.4**	**50.6**
15'	**2018-10-22 22:30:00**	**00:15:00**	**60.7**	**72.7**	**64.4**	**49.8**
15'	**2018-10-22 22:45:00**	**00:15:00**	**62.3**	**87.6**	**64.0**	**50.9**
15'	**2018-10-22 23:00:00**	**00:15:00**	**60.3**	**74.6**	**63.9**	**50.5**
15'	**2018-10-22 23:15:00**	**00:15:00**	**60.1**	**72.9**	**64.4**	**46.0**
15'	**2018-10-22 23:30:00**	**00:15:00**	**58.7**	**75.9**	**63.3**	**46.6**
15'	**2018-10-22 23:45:00**	**00:15:00**	**59.8**	**74.4**	**63.9**	**47.0**
15'	**2018-10-23 00:00:00**	**00:15:00**	**58.9**	**74.7**	**62.5**	**44.4**
15'	**2018-10-23 00:15:00**	**00:15:00**	**56.5**	**71.0**	**61.6**	**41.9**
15'	**2018-10-23 00:30:00**	**00:15:00**	**57.6**	**76.6**	**61.7**	**44.6**
15'	**2018-10-23 00:45:00**	**00:15:00**	**56.3**	**69.2**	**61.0**	**43.9**
15'	**2018-10-23 01:00:00**	**00:15:00**	**56.1**	**71.8**	**60.6**	**42.1**
15'	**2018-10-23 01:15:00**	**00:15:00**	**61.8**	**90.3**	**59.2**	**42.7**
15'	**2018-10-23 01:30:00**	**00:15:00**	**55.1**	**71.7**	**59.0**	**39.7**
15'	**2018-10-23 01:45:00**	**00:15:00**	**60.1**	**85.1**	**61.1**	**44.1**
15'	**2018-10-23 02:00:00**	**00:15:00**	**53.2**	**71.8**	**56.0**	**42.4**
15'	**2018-10-23 02:15:00**	**00:15:00**	**55.4**	**72.0**	**58.4**	**44.7**
15'	**2018-10-23 02:30:00**	**00:15:00**	**54.5**	**68.6**	**58.0**	**44.2**
15'	**2018-10-23 02:45:00**	**00:15:00**	**54.7**	**71.3**	**57.9**	**42.9**
15'	**2018-10-23 03:00:00**	**00:15:00**	**52.8**	**68.4**	**55.6**	**44.2**
15'	**2018-10-23 03:15:00**	**00:15:00**	**55.3**	**79.2**	**58.5**	**43.6**

15'	2018-10-23 03:30:00	00:15:00	55.8	77.5	57.1	40.0
15'	2018-10-23 03:45:00	00:15:00	54.1	71.7	57.4	41.6
15'	2018-10-23 04:00:00	00:00:00	---	---	---	---

Appendix D

Noise predictions

Sensitive Windows	Reference Noise Level dB(A)	Separation Distance m	Acoustic Screening dB	Noise Level at Window dB(A)	Background Noise Level dB LA90	Noise Level Minus Background dB	Internal Noise Level dB(A)
Floor Below - Day							
Window A	52.0	2.5	-10.0	34.0	50.0	-16.0	19.0
Window B	52.0	1.0	-15.0	37.0	50.0	-13.0	22.0
Window C	52.0	3.5	-10.0	31.1	50.0	-18.9	16.1
Floor Above - Day							
Window D	52.0	4.0	-10.0	30.0	50.0	-20.0	15.0
Window E	52.0	3.5	-10.0	31.1	50.0	-18.9	16.1
Window F	52.0	4.5	-10.0	28.9	50.0	-21.1	13.9
Floor Below - Night							
Window A	48.0	2.5	-10.0	30.0	40.0	-10.0	15.0
Window B	48.0	1.0	-15.0	33.0	40.0	-7.0	18.0
Window C	48.0	3.5	-10.0	27.1	40.0	-12.9	12.1
Floor Above - Night							
Window D	48.0	4.0	-10.0	26.0	40.0	-14.0	11.0
Window E	48.0	3.5	-10.0	27.1	40.0	-12.9	12.1
Window F	48.0	4.5	-10.0	24.9	40.0	-15.1	9.9