
Karim Rashid

Installation of 3 AC Units at 4 Bramley Close, Waterloooville

Noise Impact Assessment Report

Report No: 246/Rep 1/Rev 0/Nov 2022



Dr H S Sagoo – Acoustics, Noise & Vibration Consultants
PhD, BSc (1st Hons), CEng, MIOA, MIMechE

FINAL REPORT

REPORT NO: **246/Rep 1/Rev 0/NOV 2022**

SUBMITTED TO: **4 BRAMLEY CLOSE
WATERLOOVILLE
HAMPSHIRE PO7 7SU**

ATTENTION: **MR KARIM RASHID**



PREPARED & SUBMITTED BY:

**Dr H S SAGOO – Acoustics, Noise &
Vibration Consultants
'Havenwood'
110 Hiltingbury Road
Chandlers Ford
Hampshire SO53 5NT
02380 251239 0772 052 9702**

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SUMMARY

A resident has installed three air conditioning units at his house apparently without planning consent. As a result, the local authority has requested an assessment of the noise impact.

The planning agent approached Dr H S Sagoo – an experienced independent Noise and Vibration Consultant – to undertake the noise survey and prepare the requisite noise assessment.

Bramley Close in Waterloooville is located about 600m northeast of the town centre, less than 200m east of London Road A3 and about 1km west of the A3(M). Both of these roads are busy with road traffic day and night. The main source of ambient noise affecting Bramley Close is predominantly road traffic on trunk roads A3 and A3(M).

4 Bramley Close has recently installed three A/C units; one on its west façade facing house no 3 and two are installed on the east façade above the single storey garage facing house no 5. See Photos. The nearest residential dwellings to the new units are the neighbours, i.e. nos. 3 and 5 and the houses opposite, no. 24 and house no. 3 Brooklyn Close.

A noise survey was undertaken on Sunday night, 9th October 2022. The weather was dry with clear sky with a light wind of no particular direction.

Sound meters were set up as follows: one was installed on a tripod at a height of approx. 2.5 m above ground in the passageway between house nos. 3 and 4. The A/C unit is about 2.5 m above ground and fixed to the west wall of house no. 4. One was installed on a tripod about 1.6m above the roof of the single storey garage. This was about 5m away from the A/C units, this being roughly equivalent to distance of the neighbours nearest front window, except that this window is screened by the protruding corner of the building. A third meter was installed on a tripod about 2.5m above ground thus clearing the garden boundary fence on the footpath opposite the road from house No 4.

During the night-time noise survey and particularly when monitoring background noise, noise of distant road traffic was audible. No local sources of noise close to house no. 4 were noticed. Subjectively, when the A/C units were switched on, the units appeared to be extremely quiet; there were no impulsive clicks at fan start-up or stopping. There was a faint and only slightly noticeable hum close to the unit between houses 3 and 4. Whilst standing on the driveway, there was no clear evidence that the units were operating.

The assessment above shows that the rating noise level of the A/C units for the side window at house no. 3 is +11 dB and at this level, in accordance with BS4142 'it is likely to be an indication that a significant adverse impact'. It can be argued that this window is not for a habitable room, hence, the likelihood of complaints would be low. Consequently, it is recommended that no noise mitigation measures are required. However, to maintain good relations with the neighbours, it would be prudent to install a sheet metal canopy with acoustic absorption lining to be fitted over A/C unit 1 between house nos. 3 and 4,

At the front windows of house nos. 3 and 5 the assessment, in accordance with BS4142, is about -1 and +3 dB and it is 'less likely it is that there will be an adverse impact'. The soundscape is such that noise of distant cars is audible, hence, complaints are unlikely. Therefore, no mitigation is recommended.

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1. INTRODUCTION

A resident has installed three air conditioning units at his house without planning consent. As a result, the local authority has requested an assessment of the noise impact.

The planning agent approached Dr H S Sagoo – an experienced independent Noise and Vibration Consultant – to undertake the noise survey and prepare the requisite noise assessment.

The purpose of this report is to describe the site, the nearest residential areas, brief details of the proposal and outline the assessment methodology including the findings of the noise survey, assessment of the noise impact in accordance with the appropriate national guidance, and finally, recommend noise mitigation measures as necessary.

2. DESCRIPTION OF THE SITE

Bramley Close in Waterloooville is located about 600m northeast of the town centre, less than 200m east of London Road A3 and about 1km west of the A3(M). Both of these roads are busy with road traffic every day and night. See Figure 1.

Bramley Close appears to be a quiet residential street with detached houses. 4 Bramley Close has recently installed three A/C units; one on its west façade facing house no 3 and two are installed on the east façade above the single storey garage facing house no 5. See Photos. The nearest residential dwellings to the new units are the neighbours, i.e. nos. 3 and 5 Bramley Close and the houses opposite, no. 24 and house no. 3 Brooklyn Close.

House no. 3 has a small window, likely to be along the stairs or landing, on their east façade facing no. 4. There are no other windows on this façade. There are windows on the front and rear aspect of this house, and these are set back about 1m from the edge of the east façade.

House no. 5 has no windows on their west façade facing house no. 4. There are windows on the front and rear aspects which are about 0.5m from the edge and it is noted this edge sticks out about 200mm ahead of the windows; this arrangement is same for back as well as the front; hence, these windows are screened by this protruding edge.

The main source of ambient noise affecting Bramley Close is predominantly road traffic on trunk roads A3 and A3(M).

3. DEVELOPMENT PROPOSAL

Three A/C units have already been installed and all are the same make and model: Mitsubishi Electric room air conditioner, model MUZ-EF35VG.

It is understood that the units are not on a timer for their operation, so, it has to be assumed that these A/C units could be operated anytime day or night on demand.

4. NOISE ASSESSMENT CRITERIA

British Standard 4142¹ gives guidance on measurement and assessment of industrial and commercial sound on nearby residents and to determine whether this is likely to give rise to complaints.

In essence, the noise level and the character of noise caused by the specific source, called the rating noise level, is determined and rated against the measured ambient background level during the period of operation. The greater this difference the greater is the magnitude of the impact, as given in the table below. This standard states the reference time interval is 1 hour during the day, 07:00 to 23:00 hrs, and 15 minute during the night.

Difference in dB	Comment
+10 dB or more	Likely to be an indication that a significant adverse impact, depending on the context;
+5 dB	Could be an indication that a significant adverse impact, depending on the context;
The lower the rating level is relative to the measured background level	The less likely it is that there will be an adverse impact.

Table 1 BS 4142 Assessment Criteria

Acoustic Features

This standard allows a correction of up to 6 dB that can be added for source noises with a *“tone, whine, hiss, screech, hum, roar or other distinctive feature”*. In addition, a correction of up to 9 dB can be added for *“distinct impulses”* such as *“bangs, clicks, clatters or thumps”*.

Local authority requirements

The usual requirement is for the rating noise level not to exceed the lowest measured background noise level at the times of the operation to avoid the onset of noise complaints. As the operation could be anytime, the ambient noise climate over the weekend is usually lower and hence considered onerous. Therefore, night-time ambient background noise levels are used in this assessment.

5. METHODOLOGY

The A/C units do not have a timer for defined on and off times, hence, these are assumed to be operational at any time. As a result, therefore, the noise impact that could be caused by these units is greatest when the ambient noise levels are at their lowest. The latter is usually taken as the night-time period between approximately 02:00 and 03:30 hours.

¹ British Standard 4142:2014 'Method for rating and assessing industrial and commercial sound'.

To ascertain the noise impact, each A/C unit shall be operated separately and all three collectively to determine the noise impact. Each unit to be operated at maximum output and speed and given short time to settle down after switching on.

The noise measuring equipment shall be set to record with a fine resolution to capture the rapid changes in the sound levels and to include third-octave frequency bands.

6. INSTRUMENTATION

Noise measurements were taken using three 01dB Solo Type 1 integrating sound level meters (serial nos. 60354, 11649 and 10485) each fitted with a ½ inch microphone. These were set-up to record the frequency spectra of the ambient noise and were calibrated using a 01dB Calibrator (serial no. 130366) in accordance with the manufacturer's instructions before and after the measurements, and no drift in calibration level was observed. Noise levels were measured at 1-second intervals.

All measurements were free-field except the one between houses no. 3 and 4, and measurements were conducted in accordance with the guidelines given in BS7445² and BS4142.

7. NOISE MEASUREMENTS

The noise survey was undertaken on Sunday night, 9th October 2022. The weather was dry with clear sky with a light wind of no particular direction and approximately 0.5 m/s with gusts up to 1.1 m/s.

Sound meters were set up as follows:

- One meter was installed on a tripod at a height of approx. 2.5 m above ground in the passageway between house nos. 3 and 4. The A/C unit in this passageway was about 2.5 m above ground and fixed to the west wall of house no. 4. This measurement included façade reflection. See Photo 2.
- A meter was installed on a tripod about 1.6m above the roof of the single storey garage on the eastern façade of no. 4. This was about 5m away from the A/C units, this being roughly equivalent to the distance of the neighbour's nearest front window, except that this window is screened by the protruding corner of the building. See Photo 3.
- On meter was installed on a tripod about 2.5m above ground level on the footpath opposite the road from house No 4. The microphone was clear of the garden boundary fence. See Photo 4.

Measurements include the equivalent continuous noise level L_{Aeq} , the background noise level L_{A90} , the maximum level L_{Amax} and L_{A10} together with third octave frequency spectra. Explanation of acoustical terminology is given in Appendix 1.

² BS7445:2003, 'Description and measurement of environmental noise; a guide to quantities and procedures', BSI.

8. NOISE MEASUREMENT RESULTS

Observations

Time	Events during night of Sunday 9 th October 2022
02:38:58	Only A/C unit 1 between house nos. 3 and 4 switched on. Didn't hear the unit operating when standing on the driveway at front. The unit is just audible when standing underneath it; there is a slight rumble or mains hum but no tones. Distant cars are audible.
02:48:10	Unit 1 switched off
02:49:50	Only A/C unit 2 on garage roof switched on. Didn't hear the unit operating when standing in front of the garage. Distant road traffic audible. Also noticed a noisy motor bike.
02:54:20	Unit 2 switched off Climbed on to the garage roof.
02:57:00	Only A/C unit 3 on garage roof switched on. The unit started with no impulsive clicks. Distant cars audible. 02:58:22-50 particularly noisy lorry or a car.
03:01:40	Unit 3 switched off.
03:06:00	All units switched on. Distant cars audible. 03:08:33 car audible.
03:14:20	All units switched off.
03:18:06	Road traffic audible

Table 2 Site observations

Ambient noise levels

The potential for the greatest noise impact is during night-time when the ambient noise levels are lowest. The night-time survey results are given tabulated in Appendix 3 and summarised in the table below. Complete time histories are shown in Figure 4.

Period start	Measurement between nos. 3 and 4				Measurement on garage roof				Measurement on path opposite no. 4			
	Leq	Lmax	L90	L10	Leq	Lmax	L90	L10	Leq	Lmax	L90	L10
Background noise level												
10/10/2022 02:00	36.6	49.4	29.9	39	38.7	51.1	32	41.4	34.7	45.6	29.4	37.3
10/10/2022 02:15	35.3	43.5	30.2	38.2	37.6	47.7	32.3	40.2	33.6	43.4	29.4	36.2
With A/C unit 1 between nos. 3 and 4 operating												
10/10/2022 02:39-02:48	38.5	55.4	34.6	40.5	38.8	48.3	32.4	41.4	33.9	43.7	28.4	36.4
With A/C unit 2 on garage roof operating												
10/10/2022 02:50-02:54	38.6	49.6	33.4	41.1	40.3	47	35.4	43.3	35.1	41	31.4	37.8
With A/C unit 3 on garage roof operating												
10/10/2022 02:57-03:01	34.4	39.4	31.9	36.4	37.9	45.3	34.6	39.3	32.1	36.9	29.8	33.8
With all A/C units operating												
10/10/2022 03:06-03:17	35.9	44.8	33.2	37.6	38	47.9	33.6	40.7	31.6	39	27.3	34.2

All noise levels are in dB(A)

Table 3 Ambient noise levels and noise of A/C units

(It appears that A/C unit between house nos. 3 and 4 may have been left ON when only unit 2 over the garage was supposed to be operational but switched off when only unit 3 was operation.)

9. CALCULATION OF NOISE AT NEAREST DWELLINGS

Subjective perception

During the night-time noise survey and when monitoring background noise, noise of distant road traffic was audible. No local sources of noise close to house no. 4 were noticed.

When the A/C units were switched on, the units appeared to be extremely quiet; there were no noticeable impulsive clicks at fan start-up or stopping. There was a faint and only slightly noticeable hum close to the unit between houses 3 and 4. There was no clear evidence whilst standing on the driveway that the units on the garage roof were operating except that the fans were seen rotating after going on to the roof.

Objective assessment

Measurements show that the background noise levels, L_{A90} , in the area are generally about 30 dB but around 32 dB on the garage roof. The latter may be due to some fan or something else operating close to the monitoring point on the garage roof.

Noise measurements taken at the path opposite house no.4 show that there is hardly any noise impact caused by operation of the A/C units because the difference in the noise levels is within 2 dB of the background noise levels. This difference would not be noticeable particularly given the soundscape of this area where distant traffic is audible.

There may be potential noise impact at the neighbouring houses, and this is assessed below.

Source noise level

With A/C unit 1 between house nos. 3 and 4 in operation, the noise level monitored nearby increases to about 38.5 dB L_{Aeq} . This overall level includes background level of about 36 dB L_{Aeq} ; so, the source specific noise component is about 35.0 dB. In the same way, the noise component of A/C unit 2 at monitoring location 2 is about 36.5 dB L_{Aeq} .

Consideration of distance attenuation

Noise is attenuated by distance at rate of 6 dB for doubling in distance, known as the inverse square law. This doesn't apply in this case as the windows are located at short distance.

Consideration of barrier effect

The side window at house no. 3 is directly in view of the A/C unit on the west façade of no. 4. So there is no barrier effect.

As for those windows on the front and rear facades of the neighbouring houses, these are screened by the edge of the buildings. In accordance with guidance in CRTN³, a barrier effect of -5 dB applies simply when the line of sight between the receptor and the source is blocked. Based on the procedures in CRTN, the barrier effect of the building

³ Calculation of Road Traffic Noise, DoE Welsh Office 1988.

corner is calculated as approx. -12 dB for house no. 3 and -8 dB for house no. 5. The noise source is taken as the centre of the A/C unit(s) and the receiver as 1m in front of the centre of the nearest window.

	Barrier correction of corner of building dB
Window on side at house no. 3	- 0
Window at front at house no. 3	- 11.7
Window at front of house no.5	- 7.59

Table 4 Barrier corrections

Acoustic character correction

In accordance with BS4142, an acoustic character correction should be added if the specific noise was considered to be tonal or impulsive. A tone is considered to exist where the value of one third-Octave is more than about 10 dB above the adjacent ones.

Figure 4 show the frequency spectra in third Octaves for each measurement location for when each A/C units is operating. For A/C unit 1 between houses nos. 3 and 4, the figure shows two peaks; one at 40 Hz and one at 80 Hz, and their values are just less than 10 dB above the sidebands. On the garage roof, for A/C unit 2 appears to have the same characteristics albeit about 7 dB. There's no such characteristic for Unit 3. As a result, a 6 dB correction would apply. As mentioned previously, there were no impulsive clicks on start-up of the A/C units,

	Specific noise level dB L_{Aeq}	Character correction dB	Barrier correction dB	Rating noise level dB	Background noise level dB L_{A90}	BS4142 assessment
Between nos. 3 + 4	35	+ 6	0	41	30	+ 11
Window on front no. 3	35	+ 6	- 12	29	30	- 1
Window on front no. 5	36.5	+ 6	- 8	34.5	32	+ 3

Table 5 Derivation of the rating noise level

10. ASSESSMENT OF NOISE IMPACT AND MITIGATION MEASURES

The assessment above shows that the rating noise level of the A/C units for the side window at house no. 3 is +11 dB, and at this level, in accordance with BS4142 'it is likely to be an indication that a significant adverse impact'. However, it's highly unlikely that this side window leads to a bedroom or a habitable room. The external pipework on the house no. 3's east wall, see Photo 2, suggests that this window could be a bathroom window. Acoustically, even if this window is open, the window will have a sound reduction of approx. 15 dB, which would render this rating level below the internal background noise level; thus the noise of the A/C unit would not be noticeable, particularly in the soundscape of this area where noise of distant road traffic is clearly audible.

At the front windows of house nos. 3 and 5 the assessment, in accordance with BS4142, is at the level where it is 'less likely it is that there will be an adverse impact'. In the context of this area where noise of distant road traffic is clearly audible, the likelihood of noise complaints is low.

It is found that there is no adverse noise impact, and the likelihood of complaints is low. Consequently, it is recommended that no noise mitigation measures are required.

Recommendations for good neighbourhood

To maintain good relations with the neighbours, it would be prudent to install acoustic enclosure as follows; a sheet metal canopy with acoustic absorption lining to be fitted over A/C unit 1 between house nos. 3 and 4.

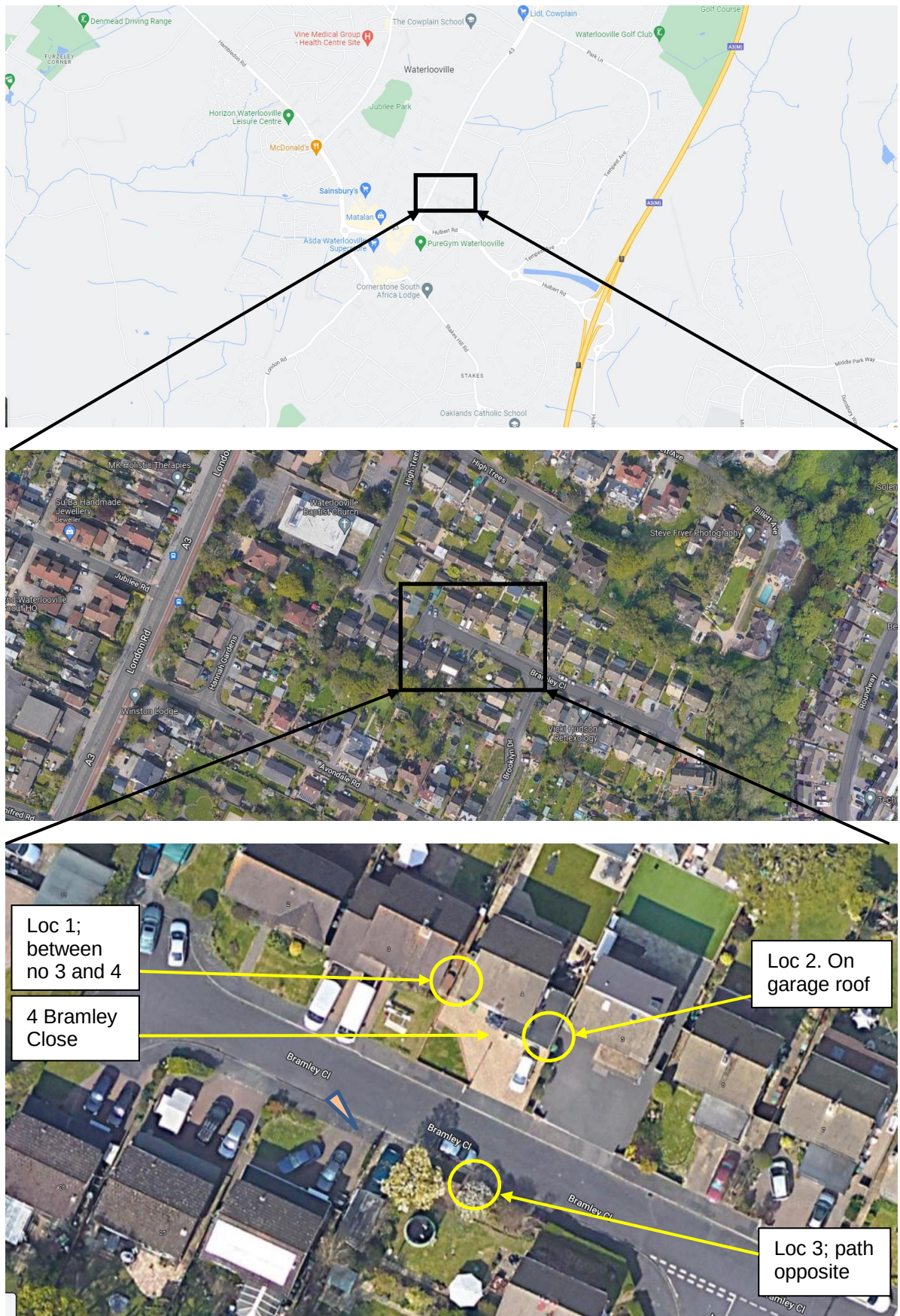
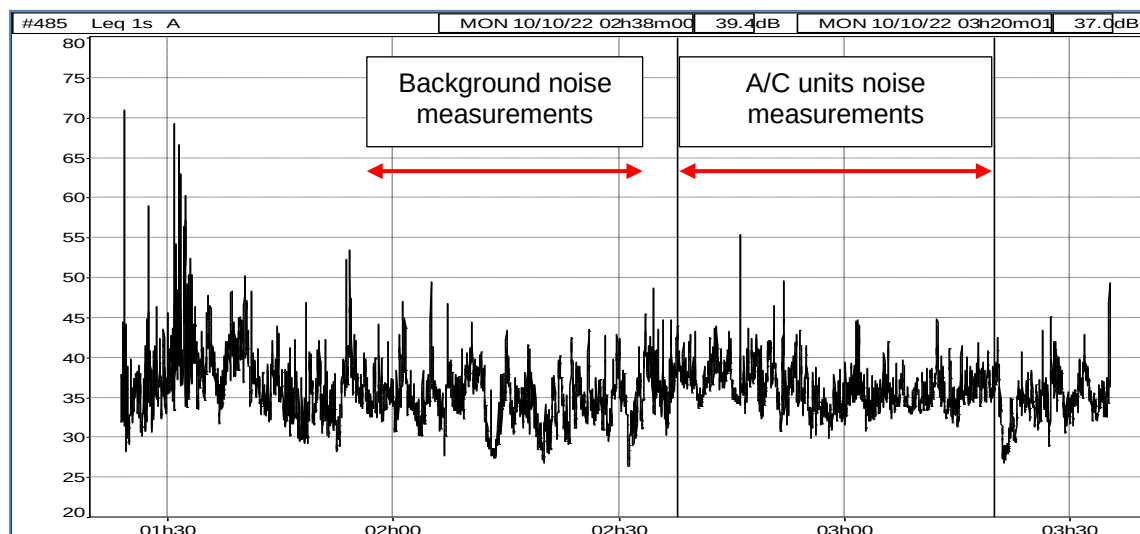
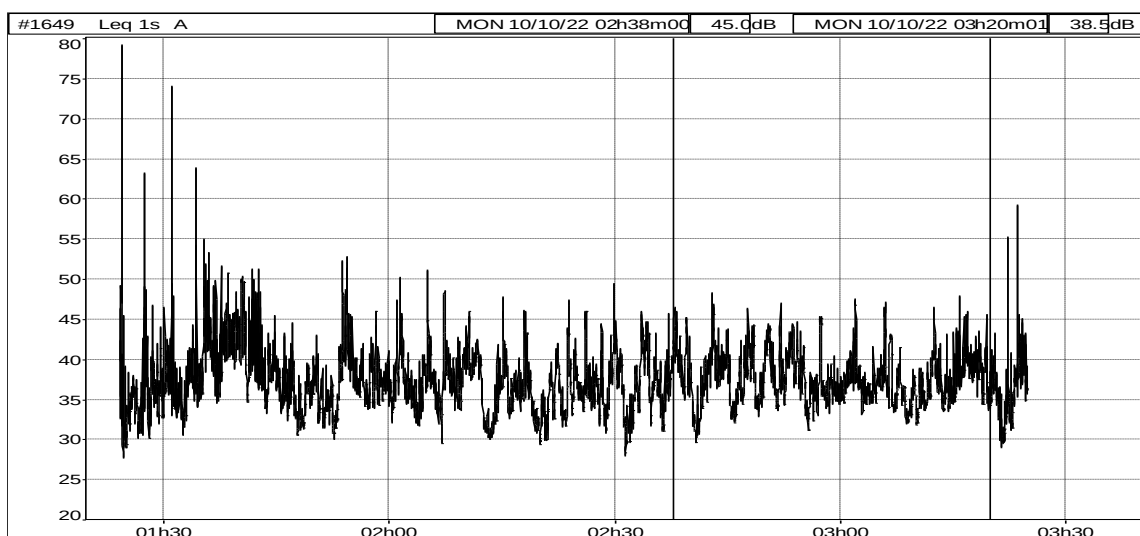


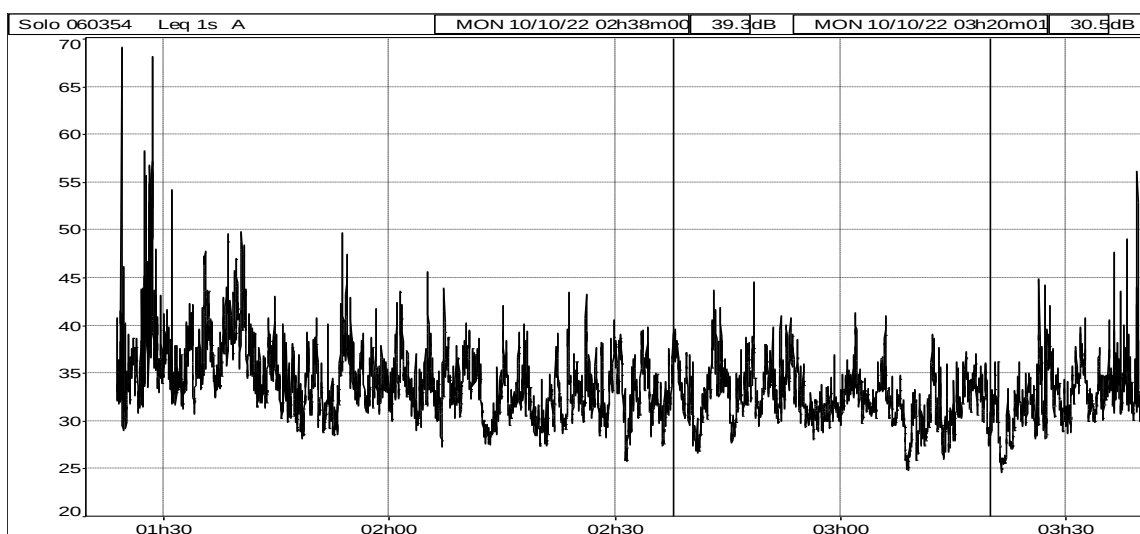
FIGURE 1 Map of Site with noise measurement locations



At measurement location 1 – between house nos. 3 and 4



At measurement location 2 – on garage roof



At short term location 3 – on path opposite

FIGURE 2 Measurement Time Histories – ambient noise

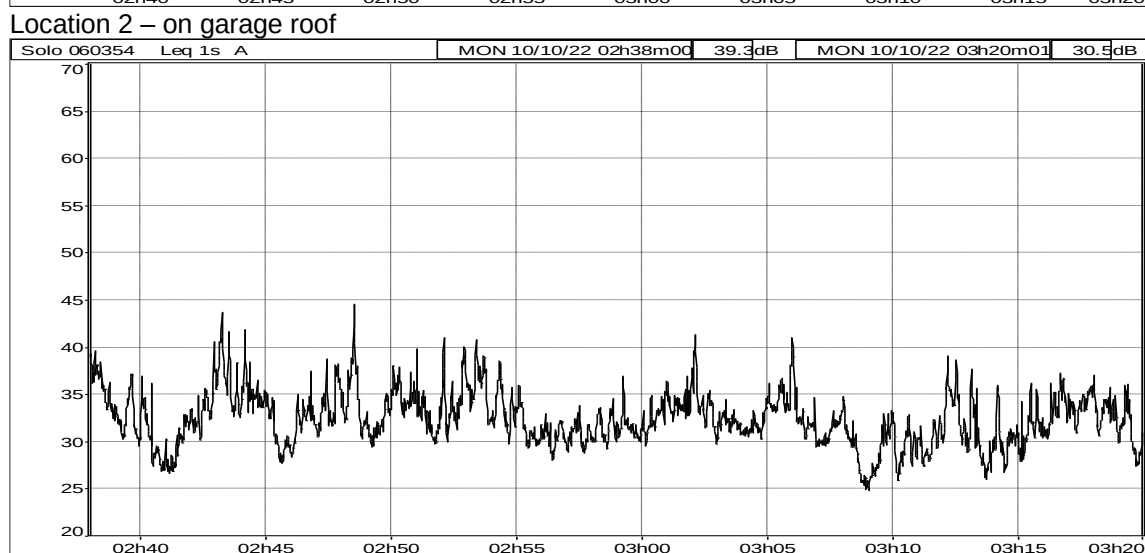
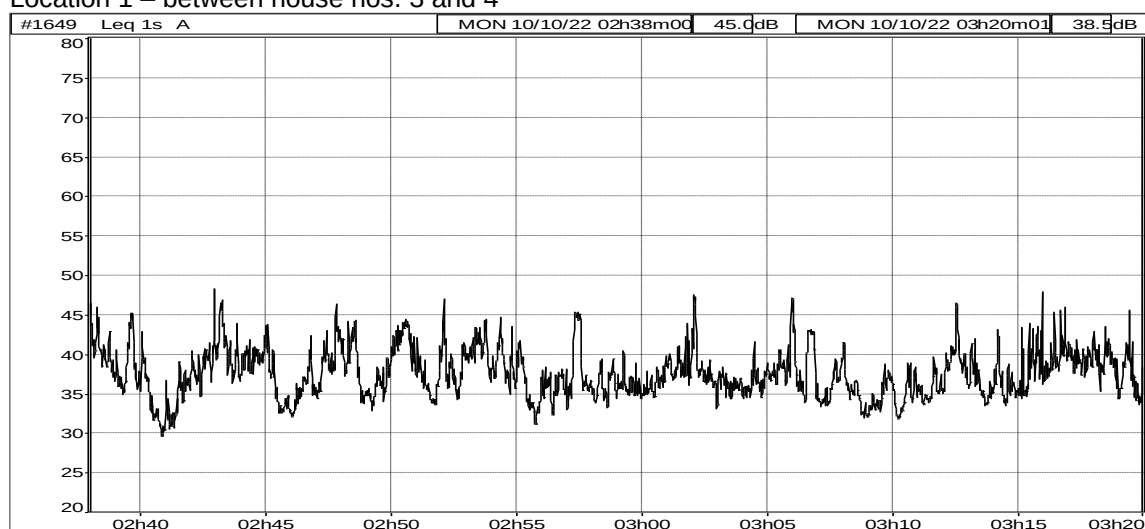
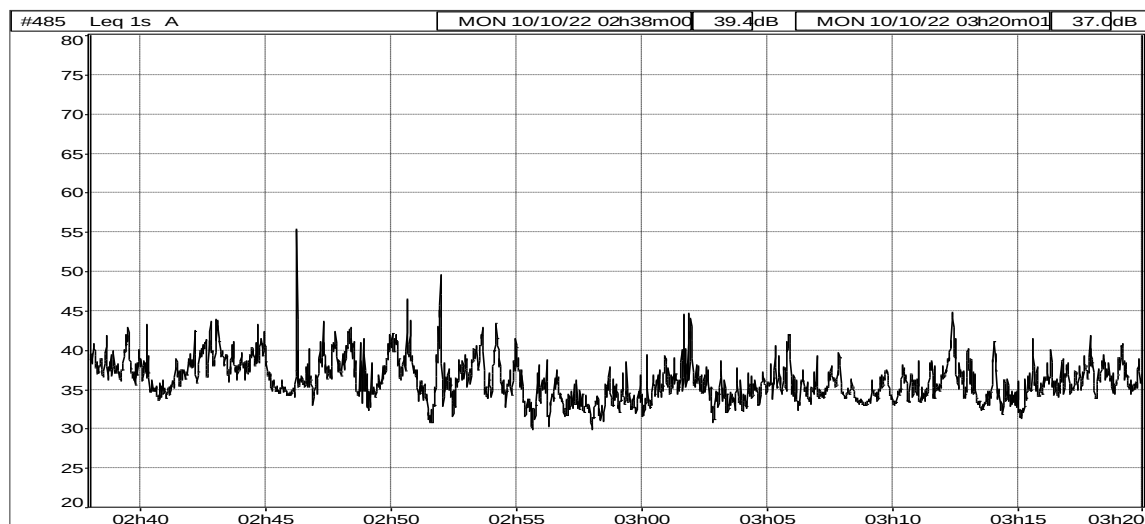
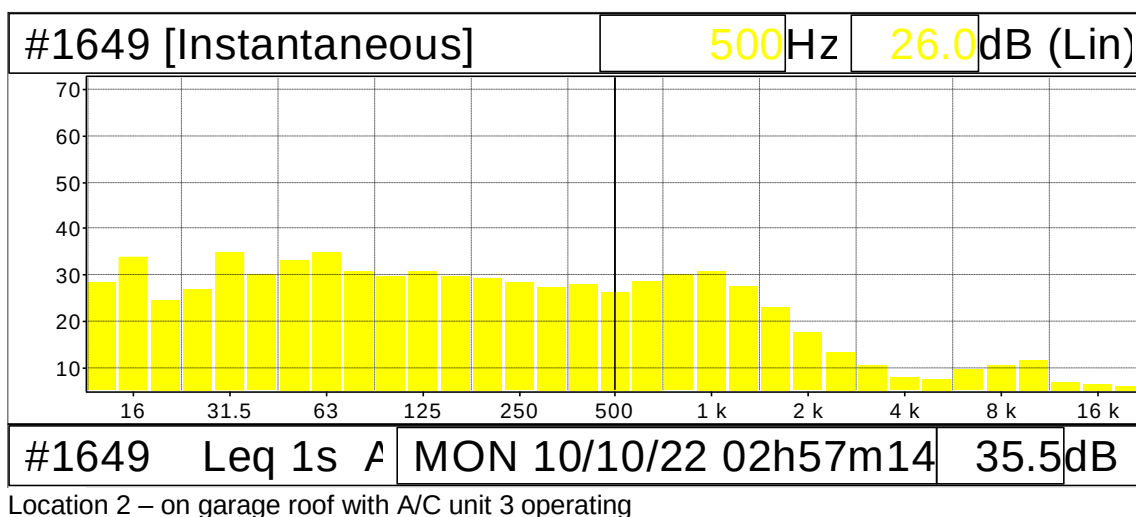
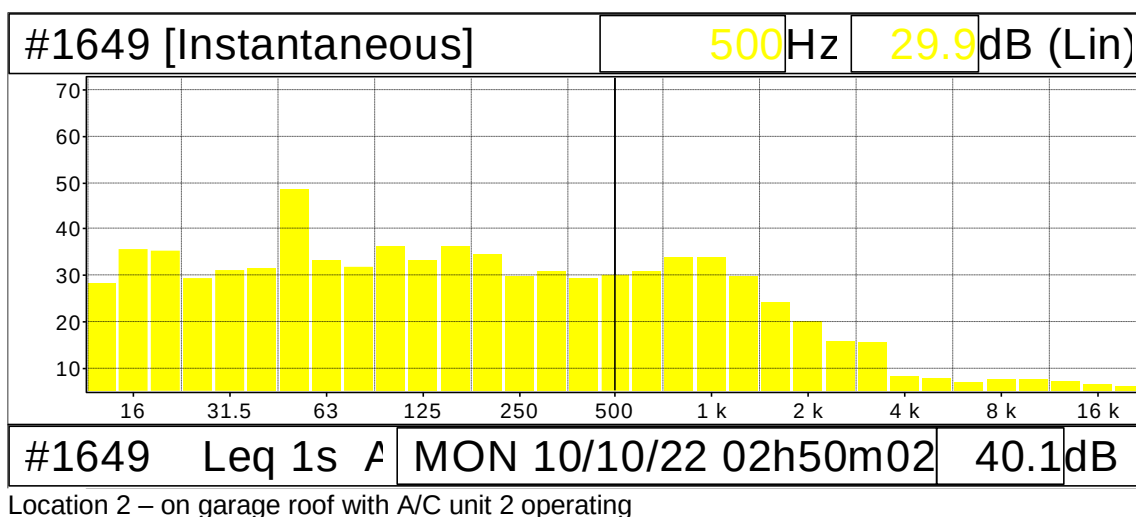
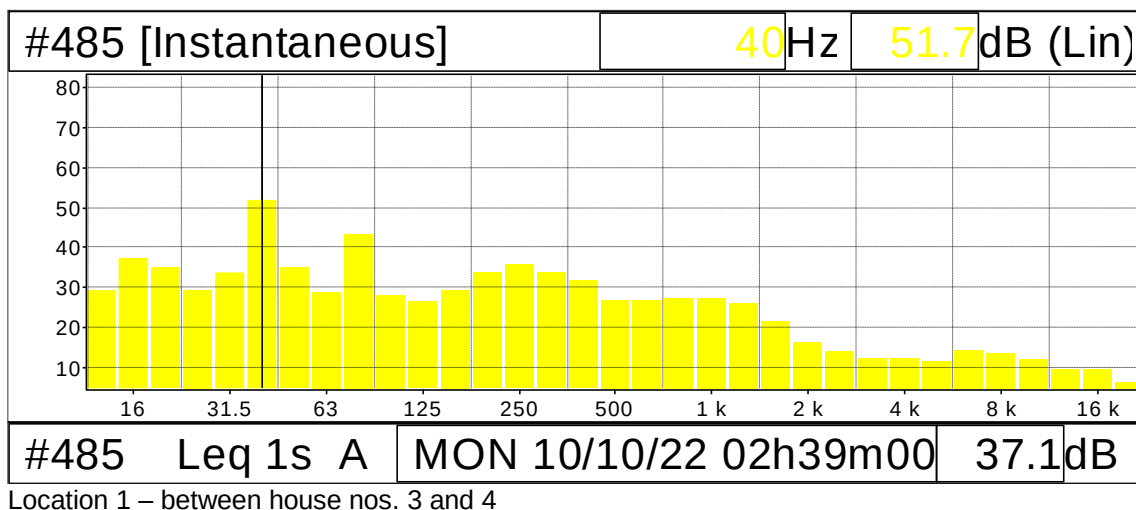


Figure 3 Time history during A/C units noise measurements



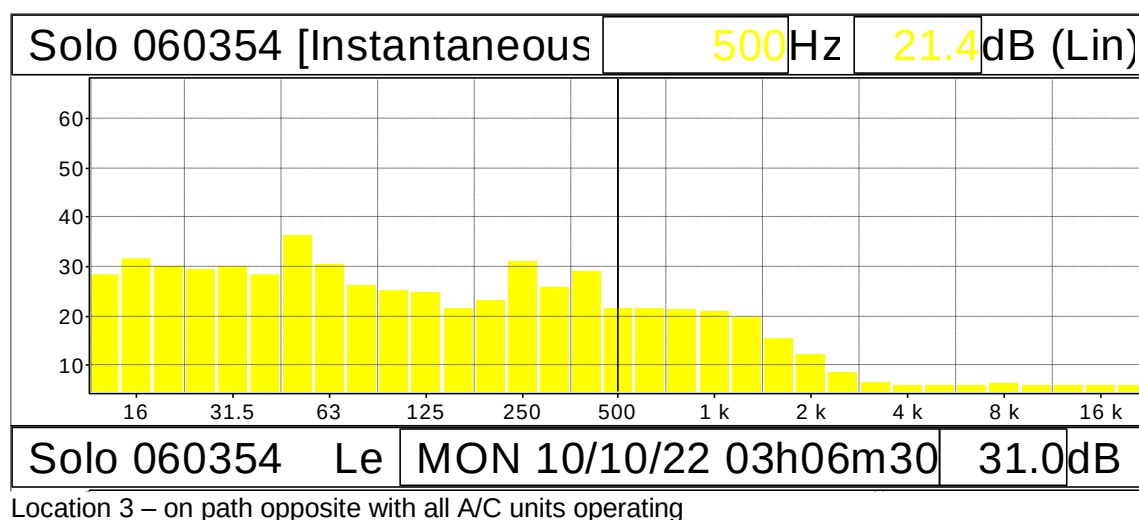
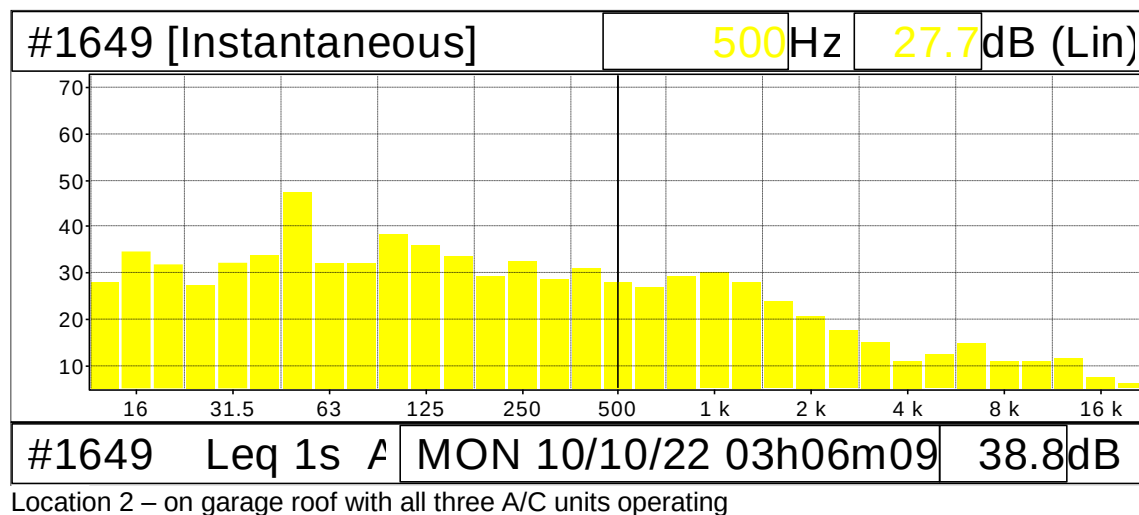


Figure 4 Frequency spectra of A/C units noise measurements

Appendix 1 Acoustic Terminology

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Perception of sound. Sound is a rapid fluctuation in air pressure. The human ear can hear sensations of sound when the fluctuations occur between 20 times a second and 20,000 times a second. This is called the frequency of the sound and is measured in Hertz (Hz). The loudness of the sound depends on the amplitude of fluctuation in the air pressure. The ear has an approximately logarithmic response to the loudness of sound: for example, every doubling or halving in sound pressure gives an apparently equal step increase or decrease. In measuring environmental noise, sound pressure levels are therefore usually quoted in terms of a logarithmic unit known as a decibel (dB). Typically, the quietest sound that can be heard (the threshold of hearing) is 0 dB and the sound becomes painful at 120 dB. The sensitivity and frequency range of the ear varies somewhat from person to person and deteriorates with age and exposure to loud sounds

“A” Weighting. The human ear is not equally sensitive to sounds of different frequencies (i.e. pitch): it tends to be more sensitive in the frequency range of the human voice than at higher or lower frequencies. When measuring sound, compensation for these effects can be made by applying a frequency weighting, usually the so-called “A” weighting, although other weightings are sometimes used for special purposes. To signify that the “A” weighting has been applied, the symbol of dB(A) is often used. However, current practice tends to prefer the weighting letter to be included in the name of the measurement index, e.g. dB(A) L_{eq} and dB L_{Aeq} both refer to the “A” weighting equivalent continuous sound level in decibels.

L_{AeqT} is a unit that also takes into account fluctuations in sound pressure levels. This unit takes into account both steady and impulsive noises and is defined as the steady, continuous sound pressure level which contains the same energy as the actual, fluctuating sound pressure level. It is necessary to state the time period over which the sound is measured, e.g. $L_{Aeq,(12\text{-hour})}$, typical in the case of daytime working and 5-minute for night-time.

L_{A90} is the level of A-weighted sound exceeded for 90% of the measurement period. It is generally used as a measure of the background noise in environment noise standards.

L_{A10} is the level of A-weighted sound exceeded for 10% of the measurement period. It is generally used as a measure of road traffic noise.

Appendix 2

Site Photographs



Photo 1 4 Bramley Close, two A/C units are visible above the garage



Photo 2 Measurement location 1; between house nos. 3 and 4



Photo 3 Measurement location 2; on garage roof



Photo 4 Measurement location 3 – on path opposite

Appendix 3 Noise measurement results

Results for 15 minutes periods during night-time

Table A3.1	Measurement location 1 – between house nos. 3 and 4
Table A3.2	Measurement location 2 – on garage roof
Table A3.3	Measurement location 3 – on path opposite

Source noise measurements

Table A3.4	Measurements with A/C units operating
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Start Time	LAeq	LAmax	LA90	LA10	Octave Band Frequency Hz										
					16	31.5	63	125	250	500	1k	2k	4k	8k	16k
10/10/2022															
01:15	46.1	70.9	31.2	39.4	39.6	40.0	40.3	34.8	35.6	39.5	38.9	39.6	40.8	32.4	23.5
01:30	46.2	69.3	34.4	44.3	52.8	59.4	53.1	51.3	48.1	43.1	38.8	38.9	31.4	29.9	19.3
01:45	37.3	53.4	31	39	40.9	37.5	39.3	37.0	38.0	33.4	34.7	26.3	17.2	16.6	11.9
02:00	36.6	49.4	29.9	39	41.1	39.1	37.2	35.7	34.5	32.9	34.7	24.8	11.6	11.2	10.2
02:15	35.3	43.5	30.2	38.2	41.4	38.2	36.2	34.2	34.1	31.6	33.2	23.1	11.6	11.3	10.2
02:30	38	48.7	32.7	40.7	42.2	47.9	39.7	36.3	36.8	34.6	35.5	26.5	21.6	19.6	14.1
02:45	37.4	55.4	32.5	40.1	44.8	43.9	39.1	35.0	36.6	34.1	34.9	25.8	20.5	20.2	12.4
03:00	36	44.8	33.1	38	41.6	49.2	40.2	37.8	36.7	33.2	32.7	23.8	18.3	16.2	12.8
03:15	35.8	45	30.5	38.1	43.1	43.2	37.2	34.2	34.6	33.4	33.1	23.7	17.7	15.3	11.2
03:30	36.2	49.3	32.7	38	40.4	39.0	36.7	34.9	36.2	32.8	33.3	25.6	21.1	20.5	13.7

All noise levels are in dB

Table A3.1 Measurement location 1 – between house nos. 3 and 4

Start Time	L _{Aeq}	L _{Amax}	L _{A90}	L _{A10}	Octave Band Frequency Hz										
					16	31.5	63	125	250	500	1k	2k	4k	8k	16k
10/10/2022															
01:15	54	79.1	31	40.3	40.7	41.0	42.0	38.6	35.6	42.9	44.9	47.9	49.6	39.9	28.7
01:30	46.8	74	34.7	45.3	52.5	49.5	45.6	41.6	39.0	38.3	40.3	42.9	35.6	32.3	22.3
01:45	38.8	52.8	32.7	40.6	36.3	35.6	39.9	37.4	37.3	35.1	36.6	26.6	14.6	12.5	10.8
02:00	38.7	51.1	32	41.4	36.2	36.1	37.5	36.8	35.6	35.0	36.7	26.9	13.5	11.6	10.5
02:15	37.6	47.7	32.3	40.2	37.3	35.9	37.1	36.8	34.9	34.0	35.4	25.5	12.8	12.4	10.6
02:30	39.1	49.4	32.1	42.2	37.9	36.8	37.6	36.2	35.2	35.2	37.2	26.8	13.5	11.9	10.6
02:45	38.8	47	33.8	42	40.4	37.4	43.4	38.6	35.6	35.9	36.5	26.6	16.7	14.4	11.3
03:00	37.8	47.5	33.8	40	36.7	39.7	42.7	39.7	36.4	34.6	35.1	26.1	16.7	14.5	12.1
03:15	39.6	59.2	32.2	41.3	45.0	42.0	40.6	38.8	37.0	36.6	35.7	30.1	28.3	24.4	15.9

All noise levels are in dB

Table A3.2 Measurement location 2 – on garage roof

Start Time	L _{Aeq}	L _{Amax}	L _{A90}	L _{A10}	Octave Band Frequency Hz										
					16	31.5	63	125	250	500	1k	2k	4k	8k	16k
10/10/2022															
01:15	48.1	69.1	31.9	43.8	44.6	43.3	43.6	47.2	45.8	43.3	39.4	41.9	40.1	38.6	27.4
01:30	39	54.2	32.9	41.6	39.9	37.1	39.4	34.6	36.3	35.3	36.6	28.2	17.5	16.4	12.1
01:45	35.3	49.7	30.2	37.7	36.1	35.3	39.3	32.7	35.4	31.8	32.5	23.5	14.6	13.8	11.6
02:00	34.7	45.6	29.4	37.3	35.8	35.7	37.0	31.4	33.3	31.5	32.2	23.1	11.4	10.8	10.4
02:15	33.6	43.4	29.4	36.2	36.2	35.6	36.5	31.3	32.7	30.9	30.8	21.5	11.2	11.5	10.4
02:30	34.4	43.7	28.7	37.4	36.0	35.3	36.7	32.2	32.6	30.9	32.1	22.3	11.9	10.9	10.4
02:45	33.6	44.5	29.8	36.3	38.9	35.0	36.5	30.6	31.6	30.7	31.2	21.2	11.0	10.7	10.4
03:00	32.4	41.3	27.7	34.8	35.7	34.9	36.4	31.2	32.4	30.1	29.3	19.9	11.4	11.1	10.5
03:15	32.9	44.8	27.8	35.3	36.6	35.2	35.8	31.7	30.8	30.8	29.8	20.4	16.0	12.7	10.6
03:30	35.7	56.1	30.6	36.6	36.7	35.7	37.7	33.2	32.9	31.4	32.1	28.1	22.4	20.9	14.0

All noise levels are in dB

Table A3.3 Measurement location 3 – on path opposite

	L _{Aeq}	L _{Amax}	L _{A90}	L _{A10}	Octave Band Frequency Hz										
					16	31.5	63	125	250	500	1k	2k	4k	8k	16k
10/10/2022															
A/C unit 1 only															
between 3+4	38.5	55.4	34.6	40.5	44.4	50.9	41.7	36.4	38.3	35.1	35.5	27.7	23.3	22.2	14.7
on garage roof	38.8	48.3	32.4	41.4	40.1	37.9	37.1	34.9	34.0	34.5	37.1	26.9	13.3	11.7	10.6
on path opposite	33.9	43.7	28.4	36.4	39.1	35.2	35.3	30.2	31.0	30.1	31.8	22.1	12.2	10.7	10.4
A/C unit 2 only															
between 3+4	38.6	49.6	33.4	41.1	44.7	40.4	39.6	34.6	35.0	35.2	36.9	25.7	19.2	16.3	10.8
on garage roof	40.3	47	35.4	43.3	40.1	37.8	47.3	38.9	37.2	37.4	38.1	27.6	16.8	13.2	11.4
on path opposite	35.1	41	31.4	37.8	37.9	35.5	37.7	31.3	32.5	32.2	32.8	22.3	10.8	10.6	10.4
A/C unit 3 only															
between 3+4	34.4	39.4	31.9	36.4	40.6	38.7	35.7	33.5	34.2	31.5	31.9	21.7	14.0	14.8	11.1
on garage roof	37.9	45.3	34.6	39.3	36.1	36.1	41.6	41.0	36.5	35.8	34.6	26.2	17.6	17.1	12.0
on path opposite	32.1	36.9	29.8	33.8	34.3	33.4	35.5	30.5	32.4	30.1	28.7	19.1	10.6	10.7	10.4
All A/C units															
between 3+4	35.9	44.8	33.2	37.6	42.3	50.9	41.2	36.2	36.4	33.6	32.4	23.9	19.3	16.7	13.4
on garage roof	38	47.9	33.6	40.7	42.0	43.0	44.1	40.2	36.1	34.5	34.9	27.9	23.5	18.6	13.6
on path opposite	31.6	39	27.3	34.2	36.4	36.1	36.3	29.8	30.9	29.4	28.5	18.9	11.9	11.1	10.5

All noise levels are in dB

Table A3.4 Measurements with A/C units operating