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NOISE | VIBRATION | AIR QUALITY

# BROWS FARM GOLF CENTRE

BROWS FARM GOLF CENTRE, BROWS FARM,
FARNHAM ROAD, LISS

## NOISE IMPACT ASSESSMENT

TECHNICAL REPORT: RFE-0538-23-01-02

DATE: NOVEMBER 2023

**PROJECT TITLE: BROWS FARM GOLF CENTRE, BROWS FARM, FARNHAM ROAD, LISS**

**REPORT REF: RFE-0538-23-01-02**

**DATE: NOVEMBER 2023**

| | Name | Position | Signature | Date |
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| For and on behalf of RF Environmental Ltd | | | | |

| DOCUMENT HISTORY | | |
|---|---|---|
| **Status** | **Description** | **Date** |
| 01 | Draft report for client comment | 29/11/2023 |
| 02 | Final report incorporating client comments | 30/11/2023 |



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# BROWS FARM GOLF CENTRE, BROWS FARM, FARNHAM ROAD, LISS
# NOISE IMPACT ASSESSMENT

## CONTENTS

# 1 INTRODUCTION

RF Environmental Ltd (RFE) has been commissioned, in November 2023, to undertake a noise impact assessment to support a planning application to The South Downs National Park Authority (SDNPA) for the proposed extension to the driving range at the Brows Farm Golf Centre located at Brows Farm, Farnham Road, Liss, GU33 6JG (hereafter referred to as 'the site').

The objective of this report is to assess the potential noise impact associated with the proposals.

The existing site and proposed development, including the expected sound generating activities are described in the following section of this report, whilst the legislation and criteria used for the assessment are included within Section 3. The sound survey is presented in Section 4. Details of the noise calculations and computer sound model of the development and the noise impact assessment are addressed in Sections 5 and 6, respectively. Finally, the conclusions of this study are summarised in Section 7. Figures and Tables are presented in Appendix A and B, respectively. A description of useful acoustic terms can be found in Appendix C.

The report has been produced by Jamie Pearson (MIOA) and reviewed by Richard Fenton (MIOA, MCIEH).

Jamie has over 12 years' experience in the production of noise impact assessments and has produced a significant number of noise assessments in consultancy roles.

Richard has produced a significant number of noise assessments in consultancy roles and reviewed them in local authority roles.

# 2 SITE DESCRIPTION AND PROPOSED DEVELOPMENT

## 2.1 Site Description

The site is located on the eastern side of Farnham Road, approximately 400m to the west of Liss town centre.

To the north of site is the Brows Farm Business park.

To the west of the site are residential dwellings and a care home, with Farnham Road beyond.

To the west and south-east of the site at the closest distance of c. 280m is the Liphook - Petersfield Bypass (A3).

Agricultural land is located to the east and south-east. Residential dwellings are located beyond.

To the south is the Brows Farm Golf Centre 9-hole practice golf course. A railway line and residential dwellings are located beyond.

The location of site is highlighted in Figure A1 of Appendix A.

## 2.2 Subjective Observations

Subjective observations undertaken on site indicate that the main sources of noise affecting the surrounding residential receptors is the continuous sound from distant road traffic on the A3, the intermittent sound from road traffic on Farnham Road, overhead commercial and light aircraft movements, occasional distant train movements and general neighbourhood sound such as mowing and dog barks. The sound of the striking of golf balls, from the existing driving range, could also be heard at all receptors, with the sound occurring in c. 10-15 seconds intervals.

## 2.3 Site Proposals

The site proposals comprise:

> Replacement of the existing 10 no. uncovered golf driving range bays and putting green with a covered two-tiered driving ranged with 16 no. bays (8 no. bays at ground floor and 8 no. bays at first floor). The resulting number of driving range bays including the proposed will be 31;
> Construction of a kitchen, dining and bar area; and
> Increased parking spaces from 66 no. to 72 no.

The proposed site plans are presented in Figures A2 to A8 of Appendix A.

<u>Sound Generating Activities</u>

The sound generating activities for the development are:

Sound from golf balls being struck within the expanded driving range;
Plant noise associated with the proposed kitchen; and
vehicle sound from increased car parking spaces

The existing opening hours of the driving range are as follows:

08:00hrs to 20:30hrs - Monday, Wednesday, Thursday, Friday, Saturday and Sunday; and
10:00hrs to 20:30hrs on Tuesday.

It is understood that the opening hours of the driving range will remain the same. However, the proposed kitchen and bar area will remain open until 22:00hrs on each day of the week.

# 3 ASSESSMENT CRITERIA

## 3.1 Noise Policy Statement for England (NPSE)

The Noise Policy Statement for England (March 2010)[1], sets out the long-term vision of Government noise policy.

The vision of the NPSE is to 'Promote good health and a good quality of life through the effective management and control of noise within the context of Government policy on sustainable development.' This vision is supported by three key aims:

avoid significant adverse impacts on health and quality of life;

mitigate and reduce to a minimum other adverse impacts on health and quality of life; and

where possible, contribute to the improvement of health and quality of life.

The NPSE should apply to all forms of noise including environmental noise, neighbour noise and neighbourhood noise but does not apply to noise in the workplace (occupational noise).

The NPSE had adopted the following concepts, to help consider whether noise is likely to have 'significant adverse' or 'adverse' effects on health and quality of life:

NOEL – No Observed Effect Level

This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to noise.

LOAEL – Lowest Observed Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected.

SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur.

However the NPSE goes on to state that:

'it is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times. It is acknowledged that further research is required to increase our understanding of what may constitute a significant adverse impact on health and quality of life from noise. However, not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available.'

[1] Department for Environment, Food and Rural Affairs (DEFRA). Noise Policy Statement for England (NPSE), 2010.

## 3.2 National Planning Policy Framework

The NPPF 2021[2], which refers to the "Explanatory Note in the NPSE", does not include specific noise criteria to be applied in planning decisions. It contains the following relevant guidance relating to noise and development:

"174. 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...

185. 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 quality of life; and

(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...

187. Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed.

188. The focus of planning policies and decisions should be on whether proposed development is an acceptable use of land, rather than the control of processes or emissions (where these are subject to separate pollution control regimes). Planning decisions should assume that these regimes will operate effectively. Equally, where a planning decision has been made on a particular development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities."

[2] Department of Communities and Local Government. National Planning Policy Framework, 2021

## 3.3 Planning Policy Guidance

Planning Practice Guidance (PPG) on noise was issued in March 2014 and updated in July 2019[3]. This web-based guidance advises local planning authorities that *"*Noise needs to be considered when new developments may create additional noise (including any anticipated changers to that environment from activities that are permitted but not yet commenced)…*"* It states that…

*"*noise can override other concerns, where justified, although it is important to look at noise in the context of the wider characteristics of a development proposal, its likely users and its surroundings, as these can have an important effect on whether noise is likely to pose a concern*"*

*"*…but neither the Noise Policy Statement for England nor the National Planning Policy Framework (which reflects the NPSE) expects noise to be considered in isolation, separately from the economic social and other environmental dimensions of proposed development.*"* (paragraph 002)

As regards planning decisions, the PPG advises that the decision taker *'*should take into account the acoustic environment, and in doing so consider the following:

whether or not a significant adverse effect is occurring or likely to occur;

whether or not an adverse effect is occurring or likely to occur; and

whether or not a good standard of amenity can be achieved.

*"*In line with the explanatory note of the noise policy statement for England, this would include identifying whether the overall effect of the noise exposure (including the impact during the construction phase wherever applicable) is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation.*"* (paragraph 003)

The PPG paragraph 004 refers to the NSPE 'observed effect level', while paragraph 005 sets out the noise exposure hierarchy which is based on the 'likely average response,' and gives example outcomes. The hierarchy table is presented in Table 3.1 below.

The hierarchy table provides guidance regarding how the concept of SOAELs and LOAELs, introduced through the NPSE, can be applied; and allows for informed subjective perceptions to be made in respect of the noticeability of noise in the context of potential effect levels. The PPG states that *"*Although the word *'*level*'* is used here, this does not mean that the effects can only be defined in terms of a single value of noise exposure. In some circumstances adverse effects are defined in terms of a combination of more that one factor such as noise exposure, the number of occurrences of the noise in a given time period, the duration of the noise and the time of the day the noise occurs*"*.

[3] Department for Communities and Local Government: Planning Practice Guidance – Noise paragraph 001 Ref. ID: 30-001-20140306. Revision date July 2019.

| Response | Examples of Outcomes | Increasing Effect Level | Action |
|---|---|---|---|
| | No Observed Effect Level | | |
| Not Present | No Effect | No Observed Adverse Effect | No specific measures required |
| | No Observed Adverse Effect Level | | |
| Present and not intrusive | Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in quality of life. | No Observed Adverse Effect | No specific measures required |
| | Lowest Observed Adverse Effect Level | | |
| Present and intrusive | Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life. | Observed Adverse Effect | Mitigate and reduce to a minimum |
| | Significant Observed Adverse Effect Level | | |
| Present of disruptive | The noise causes a material change in behaviour, attitude or other physiological response, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area. | Significant Observed Adverse Effect | Avoid |
| Present and very disruptive | Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory | Unacceptable Adverse Effect | Prevent |

TABLE 3.1: PPG NOISE EXPOSURE HEIRARCHY
(Source – Planning Practice Guidance)

## 3.4 IEMA Guidelines for Environmental Noise Impact Assessment

The Institute of Environmental Management & Assessment (IEMA) document Guidelines for Environmental Noise Impact Assessment[4] was published in 2014 and aims to define core methods and techniques within the noise impact assessment process. The document advises that a noise impact assessment requires:

an understanding of the existing noise climate;

the prediction of noise which might be generated; and

the assessment of the expected noise impact at the sensitive receptors.

[4] Institute of Environmental Management and Assessment (IEMA). Guidelines for Environmental Noise Impact Assessment. Version 1.2. 2014.

The principles of the guidelines are relevant to all types of project, regardless of size. The guidance does not provide specific assessment criteria but suggests that the methodology should follow national and local standards and be specific to the site and that the change in noise and the absolute noise level should both be considered in the determination of the significance of the effect.

The guidelines include descriptors for noise effects based on the change in sound level and sensitivity of the receptor. These are reproduced in Table 3.2 below.

| Effect Descriptor | Change in Sound Level |
|---|---|
| Very substantial | Greater than 10 dB $L_{Aeq}$ change in sound level perceived at a receptor of great sensitivity to noise |
| Substantial | Greater than 5 dB $L_{Aeq}$ change in sound level at a noise-sensitive receptor, or a 5 to 9.9 dB $L_{Aeq}$ change in sound level at a receptor of great sensitivity to noise |
| Moderate | A 3 to 4.9 dB $L_{Aeq}$ change in sound level at a sensitive or highly sensitive noise receptor, or a greater than 5 dB $L_{Aeq}$ change in sound level at a receptor of some sensitivity |
| Slight | A 3 to 4.9 dB $L_{Aeq}$ change in sound level at a receptor of some sensitivity |
| None / Not significant | Less than 2.9 dB $L_{Aeq}$ change in sound level and/or all receptors are of negligible sensitivity to noise or marginal to the zone of influence of the proposals |

TABLE 3.2: IEMA GUIDELINES EFFECT DESCRIPTORS

## 3.5 British Standard BS4142:2014+A1:2019.

Guidance on the rating and assessing of sound of an industrial and/or commercial nature is contained in British Standard (BS) 4142: 2014+A1:2019 'Methods for rating and assessing industrial and commercial sound'[5]

The standard states that:

This standard is applicable to the determination of the following levels at outdoor locations

a) rating levels for sources of sound of an industrial and/or commercial nature; and

b) ambient, background and residual sound levels

for the purposes of:

1. investigating complaints;

2. assessing sound from proposed, new, modified or additional source(s) of sound of an industrial nature and/or commercial nature; and

[5] British Standard BS4142:2014: Methods for rating and assessing industrial and commercial sound.

3. assessing sound at proposed new dwellings or premises used for residential purposes.

The determination of noise amounting to a nuisance is beyond the scope of this British Standard.

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.

Typically, the greater the difference between rating level and background noise level, the greater the magnitude of the impact:

a difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context;

a difference of around +5 dB is likely to be an indication of an adverse impact depending on context; and

the lower the rating level is relative to the measured background sound level, the less likely it is that the specific 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.

Certain acoustic features can increase the significance of the impact of a specific sound source. These features include tonality and impulsivity, as well as additional characteristics and intermittency of the sound.

Where appropriate, a rating penalty for sound based on a subjective assessment of its characteristics should be established. In other circumstances an objective appraisal of tonal and/or impulsive characteristics may be appropriate.

# 4 ENVIRONMENTAL SOUND SURVEY

## 4.1 Unattended Baseline Sound Survey

Unattended continuous sound monitoring of existing sound levels was undertaken at the site, at the monitoring location shown as LT1 on Figure A1 of Appendix A. The equipment used during the survey is presented in Table 4.1 below.

| Manufacturer | Model No. | Description | Serial No. | Calibration Due Date |
|---|---|---|---|---|
| Norsonic | NOR-140 | Sound Level Meter | 140326 | December 2024 |
| Norsonic | NOR-1251 | Calibrator | 34540 | April 2024 |

TABLE 4.1: SOUND MONITORING EQUIPMENT

The sound level meter was powered by dry cell batteries and stored inside a weatherproof security box.

Measurements were obtained using the 'F' time weighting and A-weighting frequency network. The equipment was calibrated before and after the survey to generate a calibration level of 114.0 dB at 1 kHz.

The unattended sound monitoring equipment was 1.8m above local ground level in free-field conditions. 15-minute measurements of $L_{Amax,F}$, $L_{Aeq,15min}$ and $L_{A90,15min}$ sound levels were obtained at this monitoring location between 11:45hrs Friday 10th November 2023 and 16:15hrs Thursday 16th November 2023.

The measurement location was chosen as it was considered representative of the closest residential receptor to the west of the site. A photograph of the monitoring equipment is displayed in Figure 4.1 below.

FIGURE 4.1: PHOTOGRAPH OF UNATTENDED MONITORING EQUIPMENT WITH CARE HOME BEYOND (R1)

## 4.2 Attended Receptor Sound Measurements

Supplementary short-term attended sound measurements were obtained on Friday 17th November 2023 between 12:55hrs and 14:50hrs at the monitoring location labelled as ST1 and ST2 on Figure A1 of Appendix A.

The equipment used for the attended measurements is as presented above in Table 4.2.

| Manufacturer | Model No. | Description | Serial No. | Calibration Due Date |
|---|---|---|---|---|
| Larson Davis | LxT | Sound Level Meter | 0006489 | May 2025 |

TABLE 4.2 SOUND MONITORING EQUIPMENT

Attended sound measurements were made in free-field conditions, with the sound level meter fitted with a windshield and mounted on a tri-pod to elevate the microphone 1.5 m above local ground.

The sound level meter was configured to measure A-weighted sound indices, which included $L_{Amax,F}$, $L_{Aeq,5min}$ and $L_{A90,5min}$ levels. Measurements were made over 15-minute periods.

The sound level meter was calibrated before and after the survey using the acoustic calibrator described above in Table 4.1.

The clocks on the unattended sound level meter and attended sound level meters were synchronised to enable simultaneous measurements.

## 4.3 Attended Source-term Sound Measurements

It was not possible to isolate the golf ball strikes from the existing ambient sound environment at the monitoring locations (LT1, ST1 and ST2). As such, sample source-term sound measurements of golf activity within the existing driving range were obtained between 14:58 hrs and 15:15 hrs on Friday 17th November 2023.

The sample sound measurements were undertaken using the equipment presented above in Table 4.2.

The sound measurements of the golf activity included the striking of golf balls within an existing single covered bay (bay 1), using a range of golf clubs (pitching wedge to driver) to replicate a typical scenario.

Measurements were obtained using the 'F' time weighting and A-weighting frequency network. The microphone was approximately 1.5 m above local ground, 2m from the driving range hitting mat, as shown below in Figure 4.2.

FIGURE 4.2: PHOTOGRAPH OF SOURCE-TERM ATTENDED MONITORING EQUIPMENT

The sound level meter was configured to measure A-weighted sound indices, which included 1-second measurements of $L_{Amax,F}$ and $L_{Aeq,T}$ levels.

## 4.4 Weather Conditions

Weather conditions during the site visits are presented below in Table 4.3.

| Site Visit | Date and Time | Noted Weather |
|---|---|---|
| Setup | 10/11/2023 11:30hrs | Damp due to earlier rain, $10^{O}$, 88% humidity, average windspeeds <0.5m/s |
| Collection/ Attended Monitoring | 17/11/2023 12:00hrs | Dry with 70% cloud cover, $12^{O}$, 83% humidity, average windspeeds <0.2m/s |

TABLE 4.3: WEATHER CONDITIONS DURING SITE VISITS

A history of the local weather conditions during the continuous survey period has been obtained from an internet source (www.wunderground.com).

Analysis of the data shows that during the survey period, the weather was unsettled with periods of rainfall. High windspeeds were also measured between Monday 13th and Wednesday 15th November 2023.

Analysis of the noise dataset indicates that noise levels may have been influenced by the rainfall and wind speeds on the following days:

- During the daytime periods on Monday 13th, Tuesday 14th and Wednesday 15th November 2023; and
- During the night-time periods on Sunday 12th, Monday 13th and Tuesday 14th November 2023.

As such, these periods have been removed from any further analysis.

A summary of the weather data obtained for the survey period is presented in Figure A9 of Appendix A.

## 4.5 Unattended Baseline Sound Survey Results

The results of the unattended sound measurement survey are presented graphically in Figure A10 of Appendix A, tabulated in Table B1 of Appendix B and summarised overleaf in Table 4.3.

| Date | Measured Free-field Sound Levels, dB | | | | | |
|---|---|---|---|---|---|---|
| | Daytime (07:00 - 23:00) | | | Night-time (23:00 - 07:00) | | |
| | $L_{Amax,F}$ | $L_{Aeq,16hr}$ | $L_{A90,16hr}$ | $L_{Amax,F}$ | $L_{Aeq,8hr}$ | $L_{A90,8hr}$ |
| Fri 10/11/23[1] | 62(54-81) | 50 | 46 | 54(49-67) | 43 | 37 |
| Sat 11/11/23 | 60(48-75) | 48 | 43 | 51(42-61) | 40 | 32 |
| Sun 12/11/23 | 61(55-76) | 49 | 45 | 60(52-69) | 52 | 46 |
| Mon 13/11/23 | 64(56-77) | 56 | 52 | 57(53-62) | 48 | 44 |
| Tue 14/11/23 | 63(57-80) | 55 | 51 | 57(52-64) | 48 | 40 |
| Wed 15/11/23 | 63(53-85) | 55 | 49 | 49(36-65) | 41 | 34 |
| Thu 16/11/23[2] | 63(56-76) | 51 | 46 | - | - | - |
| Average | 62(60-64) | 53 | 47 | 55(49-60) | 45 | 39 |
| Average (Excluding adverse weather) | 62(60-63) | 50 | 45 | 51(49-54) | 41 | 34 |

TABLE 4.4: SUMMARY OF UNATTENDED SOUND MEASUREMENTS AT LT1
Notes:
[1] incomplete daytime period due to equipment setup;
[2] incomplete daytime period due to depleted battery and;
[3] dark grey highlight indicates periods excluded due to potential influence from adverse weather.

The results of the unattended sound measurement show that with periods of adverse weather excluded, ambient day time $L_{Aeq,16hr}$ sound levels produced an arithmetic average of 50 dB $L_{Aeq,16hr}$. With the periods of adverse weather excluded, the night-time $L_{Aeq,8hr}$ sound levels produced an arithmetic average of 41 dB $L_{Aeq,\ 8hr}$.

During the daytime period, with periods of adverse weather excluded, an arithmetic average of the background sound levels produced a sound level of 45 dB $L_{A90,16hr}$. With periods of adverse weather excluded, the night-time $L_{A90,8hr}$ sound levels produced an arithmetic average of 34 dB $L_{A90,\ 8hr}$.

## 4.6 Attended Sound Survey Results

The results of the attended sound measurements obtained on Friday 17th November 2023 are summarised in Tables 4.5 to 4.10 below.

| Monitoring Location | Date | Start Time | Duration (mins) | Measured Free-field Noise Levels, dB | | | Observations |
|---|---|---|---|---|---|---|---|
| | | | | $L_{Amax, F}$ | $L_{Aeq,T}$ | $L_{A90,T}$ | |
| ST1 | 17/11/2023 | 12:55 | 5 | 57.4 | 51.1 | 48.4 | The A3 is main sound source and is continuous; other sources include birdsong, golf ball strikes approximately every 15 seconds, but unable to isolate from ambient; birdsong; aircraft in period 2 for 30 seconds. |
| | | 13:00 | 5 | 65.8 | 50.9 | 47.4 | |
| | | 13:05 | 5 | 59.9 | 52.0 | 50.1 | |
| | | Cumulative | | 65.8 | 51.4 | 48.6 | |

TABLE 4.5: SUMMARY OF ATTENDED SOUND MEASUREMENT RESULTS – FRIDAY 17TH NOVEMBER 2023

| Monitoring Location | Date | Start Time | Duration (mins) | Measured Free-field Noise Levels, dB | | | Observations |
|---|---|---|---|---|---|---|---|
| | | | | $L_{Amax, F}$ | $L_{Aeq,T}$ | $L_{A90,T}$ | |
| ST2 | 17/11/2023 | 13:15 | 5 | 58.0 | 53.1 | 51.2 | As per previous location; Aircraft overhead in second period; Distant train pass in third period. |
| | | 13:20 | 5 | 63.9 | 53.5 | 51.1 | |
| | | 13:25 | 5 | 57.5 | 52.7 | 51.1 | |
| | | Cumulative | | 63.9 | 53.1 | 51.1 | |

TABLE 4.6: SUMMARY OF ATTENDED SOUND MEASUREMENT RESULTS – FRIDAY 17TH NOVEMBER 2023

| Monitoring Location | Date | Start Time | Duration (mins) | Measured Free-field Noise Levels, dB | | | Observations |
|---|---|---|---|---|---|---|---|
| | | | | $L_{Amax, F}$ | $L_{Aeq,T}$ | $L_{A90,T}$ | |
| ST1 | 17/11/2023 | 13:35 | 5 | 67.8 | 53.2 | 50.1 | As previous; Light aircraft in first period, helicopter in third period increases background sound $L_{A90}$. |
| | | 13:40 | 5 | 60.9 | 54.1 | 51.6 | |
| | | 13:45 | 5 | 76.4 | 59.1 | 53.8 | |
| | | Cumulative | | 76.4 | 56.3 | 51.8 | |

TABLE 4.7: SUMMARY OF ATTENDED SOUND MEASUREMENT RESULTS – FRIDAY 17TH NOVEMBER 2023

| Monitoring Location | Date | Start Time | Duration (mins) | Measured Free-field Noise Levels, dB | | | Observations |
|---|---|---|---|---|---|---|---|
| | | | | $L_{Amax, F}$ | $L_{Aeq,T}$ | $L_{A90,T}$ | |
| ST2 | 17/11/2023 | 13:55 | 5 | 55.5 | 55.5 | 53.5 | As previous. Overhead light aircraft in third period. Mowing in distance increases $L_{A90}$. |
| | | 14:00 | 5 | 61.7 | 55.4 | 53.7 | |
| | | 14:05 | 5 | 65.1 | 55.5 | 53.7 | |
| | | Cumulative | | 65.1 | 55.5 | 53.6 | |

TABLE 4.8: SUMMARY OF ATTENDED SOUND MEASUREMENT RESULTS – FRIDAY 17TH NOVEMBER 2023

| Monitoring Location | Date | Start Time | Duration (mins) | Measured Free-field Noise Levels, dB | | | Observations |
|---|---|---|---|---|---|---|---|
| | | | | $L_{Amax, F}$ | $L_{Aeq,T}$ | $L_{A90,T}$ | |
| ST1 | 17/11/2023 | 14:15 | 5 | 97.7 | 73.2 | 54.2 | Dog barking close to meter continuous. |
| | | 14:20 | 5 | 79.2 | 62.1 | 54.5 | |
| | | 14:25 | 5 | 59.1 | 55.6 | 53.0 | |
| | | Cumulative | | 97.7 | 68.8 | 53.9 | |

TABLE 4.9: SUMMARY OF ATTENDED SOUND MEASUREMENT RESULTS – FRIDAY 17TH NOVEMBER 2023

| Monitoring Location | Date | Start Time | Duration (mins) | Measured Free-field Noise Levels, dB | | | Observations |
|---|---|---|---|---|---|---|---|
| | | | | $L_{Amax, F}$ | $L_{Aeq,T}$ | $L_{A90,T}$ | |
| ST2 | 17/11/2023 | 14:35 | 5 | 58.0 | 53.3 | 51.6 | As previous. Road traffic in distance dominates. |
| | | 14:40 | 5 | 64.3 | 52.4 | 49.7 | |
| | | 14:45 | 5 | 58.7 | 52.7 | 50.6 | |
| | | Cumulative | | 64.3 | 52.8 | 50.6 | |

TABLE 4.10: SUMMARY OF ATTENDED SOUND MEASUREMENT RESULTS – FRIDAY 17TH NOVEMBER 2023

## 4.7 Attended Sample Source-term Sound Survey Results

The results of the attended source-term sound measurements obtained on Friday 17th November 2023 are summarised overleaf in Table 4.11.

A histogram of the source-term noise measurements is displayed in Figure A11 of Appendix A.

| Measurement Distance from Source (m) | Date | Measurement Start Time (hh:mm) | Duration (Secs) | Measured Sound Levels, dB | | Isolated SPLs, dB $L_{Aeq,T}$ (a minus b)[1] |
|---|---|---|---|---|---|---|
| | | | | (a) Sound Source plus Residual SPL, dB | (b) Residual SPL, dB $L_{Aeq,T}$ | |
| 2 | 17/11/2023 | 10:49 | 1004 | 74.1 | 54.8 | 74.0 |

TABLE 4.11: SUMMARY OF ATTENDED SOURCE-TERM SOUND MEASUREMENTS

Note:

[1] Logarithmic subtraction; and

[2] Internal and external measurements were made in spaces where reflections may occur i.e. façade measurement conditions, at a height of approximately 1.5m above local ground. As the measurements are representative of the source in its environment i.e. partially enclosed, a façade to free-field correction has not been applied.

# 5 NOISE MODELLING AND CALCULATIONS

## 5.1 Sound Prediction Model

An acoustic model has been developed to predict the specific sound levels associated with the development driving range proposals at the closest noise sensitive receptors. The model of the proposed development and local area has been created using the SoundPlan Essential v5.1 software package.

This proprietary software implements the sound propagation calculations specified in ISO 9613-2[6] as follows:

$$L_{fT}(DW) = L_w + D_c - A$$

Where:

| | | |
|---|---|---|
| $L_{ft}(DW)$ | = | equivalent continuous downwind octave-band sound pressure level at a receiver location |
| $L_w$ | = | sound power level of the sound source |
| $D_c$ | = | directivity correction |
| A | = | attenuation that occurs during propagation from the point sound source to the receiver. $A = A_{div} + A_{atm} + A_{gr} + A_{bar} + A_{misc}$ |
| $A_{div}$ | = | attenuation due to geometrical divergence |
| $A_{atm}$ | = | attenuation due to atmospheric absorption |
| $A_{gr}$ | = | attenuation due to the ground effect |
| $A_{bar}$ | = | attenuation due to a barrier |
| $A_{misc}$ | = | attenuation due to miscellaneous other effects |

## 5.2 Nearest Noise Sensitive Receptors

The nearest noise sensitive receptors identified for this assessment and input into the noise model is displayed in Figure A12 of Appendix A and summarised below in Table 5.3.

| Receptor I.D. | Address | Description | Number of Floors |
|---|---|---|---|
| R1 | Blenheim Court Care Home | Residential | 3 |
| R2 | 107-111 The Rectory | Residential | 2 |
| R3 | 5 Balfour Drive | Residential | 1 |

TABLE 5.3: NEAREST NOISE SENSITIVE RECEPTORS

[6] International Standard ISO 9613-2: 1996: Acoustics – Attenuation of sound during propagation outdoors. Part 2: General method of calculation.

Assumptions

The following assumptions have been made for the sound modelling exercise:

The surrounding area included in the modelling exercise, such as buildings and other intervening structures, have been based on Ordinance Survey mapping and site plans, supplemented by on site observations;

Residential building heights have been based on the observed number of floors, with the assumption of 2.5 m in height per floor level. The highest calculated floor noise level has been used to provide a worse case assessment;

Calculation receptor positions are modelled in free-field locations at all occupied floor levels. The maximum calculated floor level has been assessed to provide a worse-case assessment;

The topography of the surrounding area has been modelled using a LIDAR Digital Terrain Model (DTM) data available online from Bluesky Mapshop;

Ground cover has been modelled as soft;

25 no. point sources have been added to the existing driving range area in the sound model, to represent the existing number of driving range bays (10 no. open aired bays and 15 no. covered bays), 0.5m above local ground. A calculation receptor has been positioned 2m from a single point source in the sound model and calibrated to the measured source-term SPL of 74 dB, as presented in Table 4.4. The resulting sound power level in the model for each source (25 in total) is 87 dB (A);

To account for the existing structure covering 15 no. bays, a 3m barrier has been positioned to the rear and sides of these bays within the model;

Following the calculation of the existing scenario, 2 no. point sources have been removed representing the open aired bays, and an additional 8 no. point sources have been modelled at a height of 3m to represent the proposed first floor or the proposed driving range extension. A 6m barrier has been positioned to the rear and sides of the proposed bays within the model to represent the driving range structure;

It is acknowledged that it is unlikely that all of the driving range bays (both existing and future), will be occupied at any one time, however, it is understood that there is no restrictions on the number of bays that can be used, and provides a worse-case scenario; and

A screenshot of the noise model is presented below in Figure 5.1.

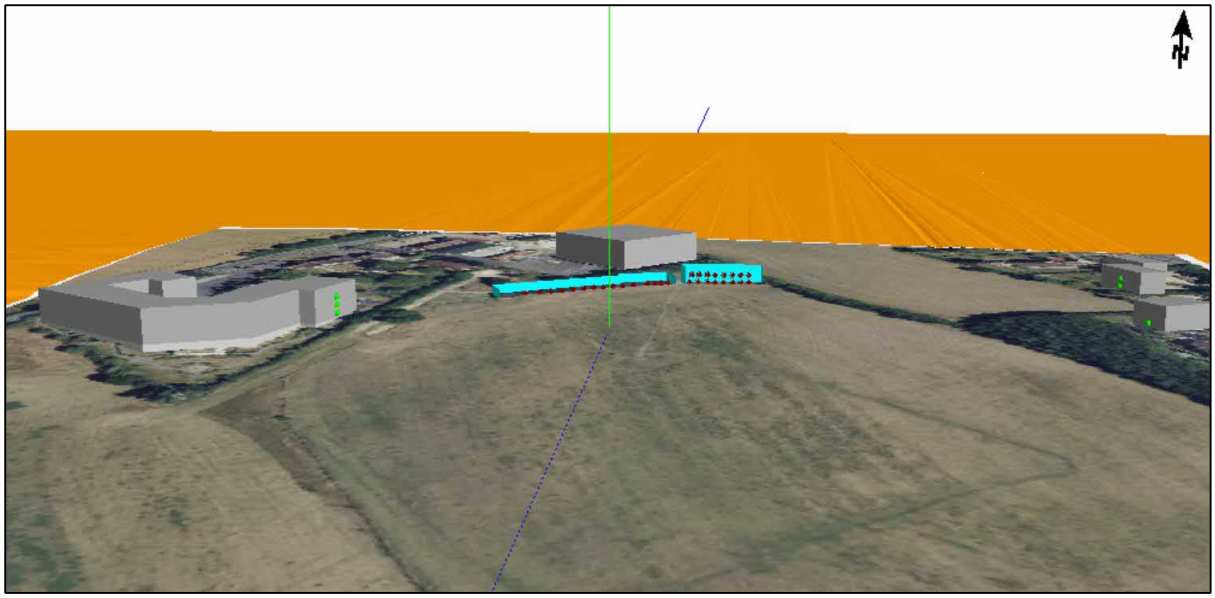

FIGURE 5.2: SCREENSHOT OF COMPUTER NOISE MODEL

# 6 NOISE IMPACT ASSESSMENT

## 6.1 Overview

The predicted receptor noise levels of the worst case existing and future golf striking noise calculated in the noise model was then used to assess the potential noise impact at the closest noise sensitive receptors. The estimated sound levels for the proposed increase in driving range bays have been compared to the sound levels calculated for the existing number of bays.

The specific details of any external fixed plant for use in the restaurant/bar are not yet known. As such, external plant rating noise limits have been derived, based on the existing background ($L_{A90,T}$) noise levels, to aid the final selection and design of any plant.

## 6.2 Assessment of the Noise Level Change from Golf Driving Range

To determine the noise level change due to the introduction of the additional golf driving range bays, the scenarios considered were as follows:

Scenario 1 – Existing Scenario: All existing bays are occupied. 15 no. covered and 10 no. uncovered (25 no. in total).

Scenario 2 – Proposed Scenario: Incorporating the replacement of 10no. uncovered bays and replacement with an additional 16 covered bays (31 in total).

The results of the modelling predictions, along with a calculated level difference, at the assessment receivers are presented in Table 5.2 below.

| Location | Calculated Golf Driving Range Sound Level, dB $L_{Aeq,T}$ | | Level Difference, dB (b minus a) |
|---|---|---|---|
| | Existing (a) | Proposed (b) | |
| R1 | 50.1 | 51.1 | 1.0 |
| R2 | 44.5 | 46.5 | 2.0 |
| R3 | 44.6 | 43.1 | -1.5 |

TABLE 5.2: NOISE LEVEL DIFFERENCE

## 6.3 Modelling Results Discussion

The results of the modelling at R1 and R2 shows an increase in golf sound levels of 1 dB and 2 dB, respectively.

A 3 dB change in noise level is considered the minimum increase to be subjectively noticeable by the average human ear. Based on the worst case assessment, and considering that the driving range already forms part of the existing acoustic sound environment, the risk of an adverse noise impact due to the increased number of driving range bays is low.

Furthermore, according to the IEMA guidelines, these change in noise levels are 'Not significant'.

At R3, a reduction in sound levels from the golf centre can be seen due to the screening provided by the proposed building structure.

## 6.4 Assessment of Fixed Plant

It is understood that a kitchen serving hot food will form part of the development proposals.

At this stage, specific details of a kitchen extraction system or other fixed plant is not known. Should a kitchen extraction system, or other items of fixed external plant form part of the proposals, there is potential for adverse noise impactwhen in operation. This will require consideration and will likely be subject to Local Authority requirements.

Based on experience in the production of fixed plant sound assessments in the jurisdiction of SDNPA, the preferred sound criterion would be to achieve 5 dB below the background sound level when assessed in accordance with BS 4142:2014+A1:2019.

At this stage it is not clear what the operating time of the external plant will be, but is likely to operate up to 22:00hrs, in line with the proposed opening hours. For the purposes of this assessment, background sound levels have been derived for the last hour (between 21:00 to 22:00hrs). When the operating hours of the plant become known, the background sound levels can be changed to ensure they are representative, if required.

Modal statistical analysis of the background $L_{A90,T}$ sound levels is presented in Figure A12 of Appendix A for the daytime period between 21:00hrs and 22:00hrs. This statistical analysis indicates that with periods of adverse weather removed, the most commonly occurring $L_{A90,15min}$ sound levels during this period is 42 dB.

Using the background sound level derived from the unattended noise survey, the following plant rating noise levels should be considered a maximum, when measured at the nearest noise sensitive receptors.

37dB $L_{Ar, Tr}$

Once the final specification has been determined, it is advised that the any fixed plant is assessed to ensure that it remains within the prescribed limits.

## 6.5 Car Movements

There are spaces for up to 66 vehicles within the existing site. The proposed allows for an additional 6 vehicles to a total of 72 vehicles, an increase of 9%.

A 9% increase in vehicle movements will result in a noise increase of less than 1dB.

To calculate the specific increase in noise resulting from a 9% increase in vehicle movements, the following equation can be used:

$$L_{increase} = 10*\log(N_2/N_1)$$

Where N1 is the existing percentage of vehicle movements (100%) and N2 is the projected percentage increase in vehicle movements (9%).

This will result in an increase in noise levels of 0.4dB.

As discussed, a 3 dB change in noise level is considered the minimum increase in noise levels to be subjectively noticeable by the average human ear. According to the IEMA Noise Guidelines[7], an ambient noise change of 2.9 dB $L_{Aeq,T}$ or less could be considered a 'negligible' effect.

Therefore, the risk of an adverse noise impact due to the increased number of vehicles is low.

## 6.6 Uncertainty

There are a variety of factors that inevitably limit the accuracy associated with all steps of any sound assessment, including measurement, calculation, or prediction. Factors include, but are not limited to:

- The inherent limitation of calculation/prediction methodology in Standards and guidance;
- Variability in meteorological conditions; and
- The accuracy of sound source input data of a calculation or sound model.

It is imperative to minimise the uncertainty to a level commensurate with the intention of the assessment objective. Measures taken in this assessment to minimise uncertainty are:

- Sound level measurements were undertaken in accordance with recognised Standards. Periods where the weather conditions may have influenced the measured noise levels has been discounted from analysis;
- Field calibration checks were undertaken prior and after measurements to record acceptable drift;
- The sound source data was taken from known measured source-term data obtained by RFE; and
- Recognised sound prediction calculations have been used to calculate sound levels at sensitive locations and any assumptions have been stated.

The aforementioned measures reduce uncertainty to a level considered not to have any significance to the outcome of the assessment.

[7] Institute of Environmental Management & Assessment. Guidelines for Environmental NIA.01/11/2014.

# 7 CONCLUSIONS

RF Environmental Ltd (RFE) was commissioned in November 2023 to undertake a noise impact assessment to support a planning application to The South Downs National Park Authority (SDNPA) for the proposed extension to the driving range at the Brows Farm Golf Centre located at Brows Farm, Farnham Road, Liss, GU33 6JG.

The existing sound environment has been established, which is considered representative of the development site, through unattended and attended sound monitoring.

Noise calculation and computer noise modelling of the proposed development and the expected sound sources listed below, has been undertaken to estimate sound levels at the closest noise sensitive receptors.

Sound from the increased users of the driving range; and
Sound from increased car movements.

A comparison between the sound from the existing driving range activity and sound due to increase in driving range bays shows a negligible increase in ambient sound, indicating the risk of adverse noise impact due to the proposals is low.

A negligible increase in sound levels due to an increase in car movements has also been calculated.

Fixed items of plant are expected at the development, however, the specific detail of any external fixed plant is not yet known. As such, external plant rating noise limits have been presented to aid the final selection and design of any plant, to ensure that any chosen plant can comply with the required noise limits prescribed within this report.

Once the final specification has been determined, it is advised that the any fixed plant is reassessed to ensure that it remains within the prescribed limits.

# APPENDIX A: FIGURES


FIGURE A1: SITE LOCATION PLAN

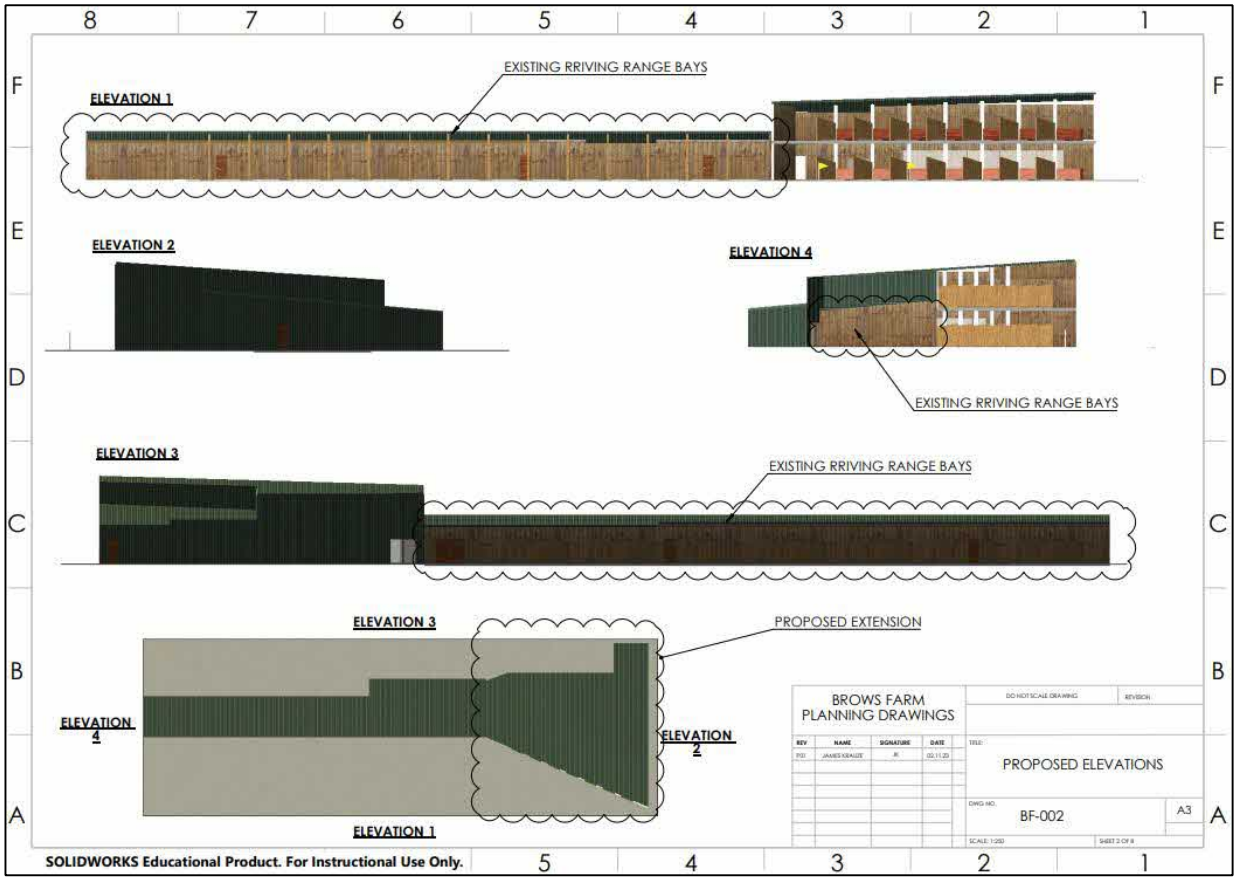

FIGURE A2: PROPOSED ELEVATIONS

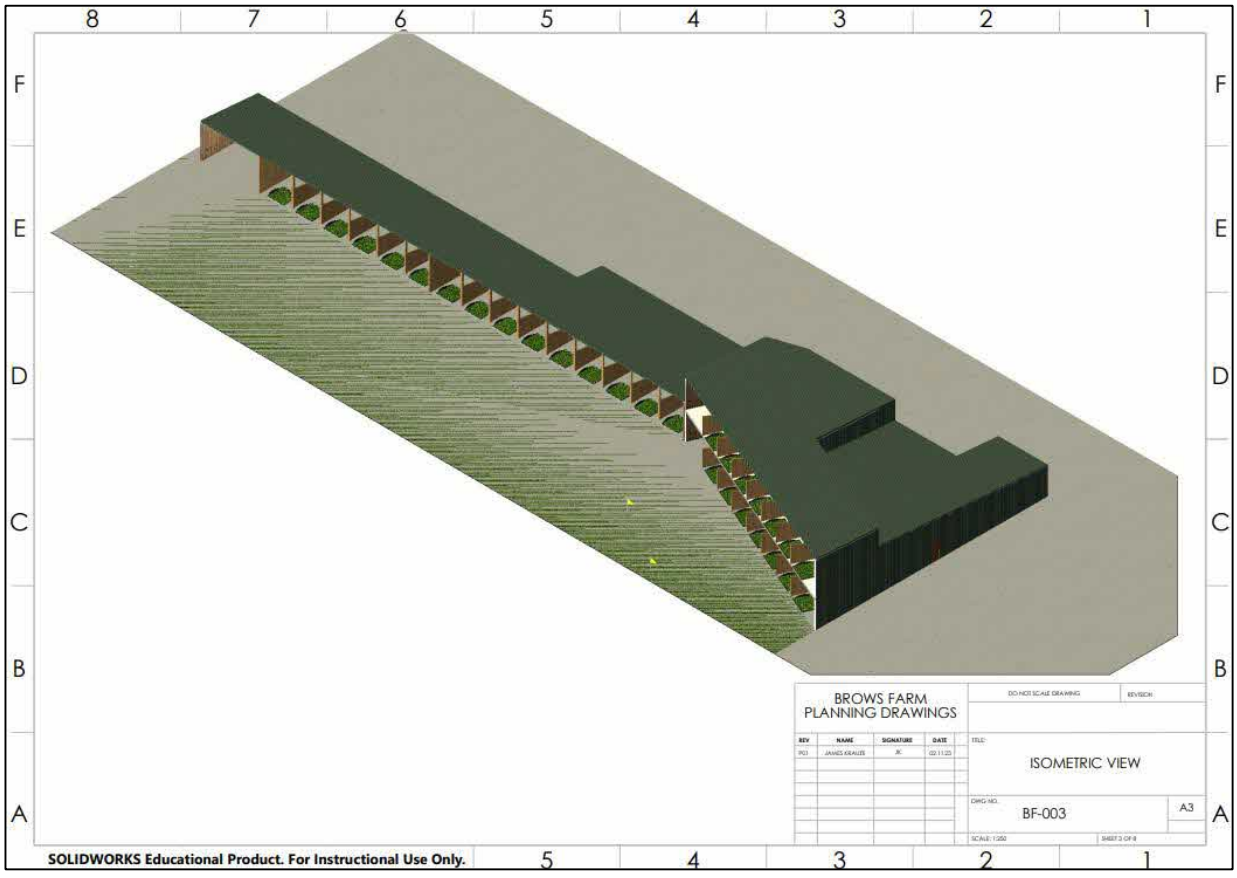

FIGURE A3: ISOMETRIC VIEW OF PROPOSALS

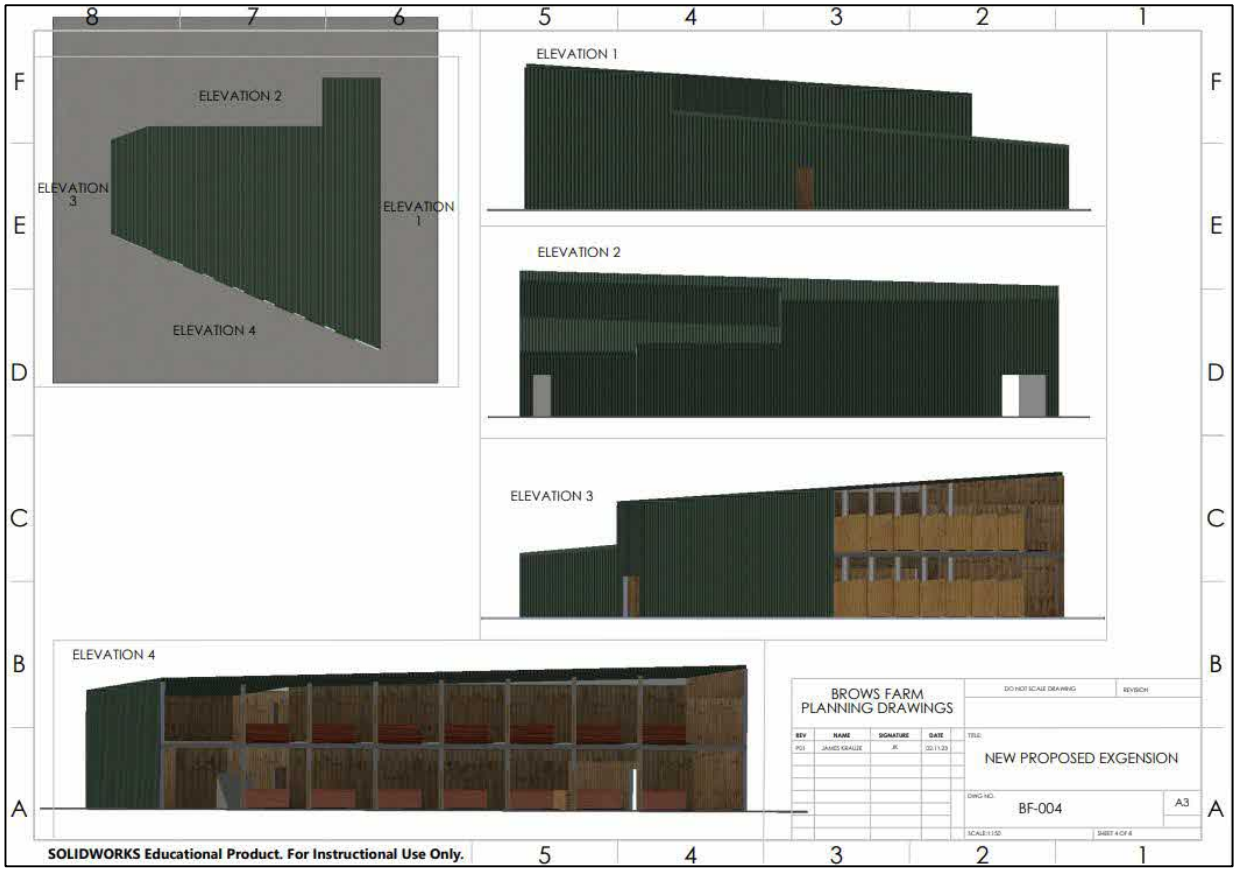


FIGURE A4: PROPOSED EXTENSION PLANS

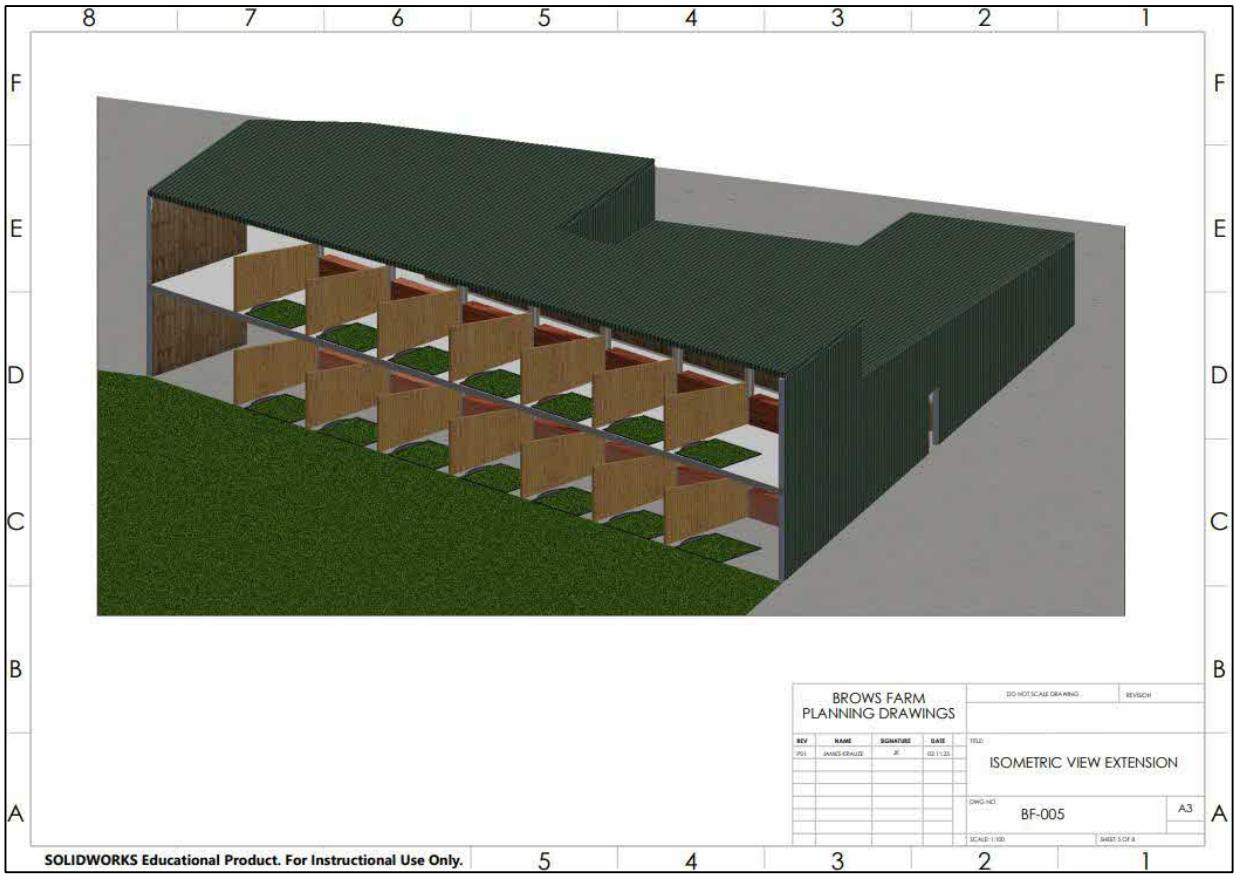


FIGURE A5: ISOMETRIC VIEW OF PROPOSALS

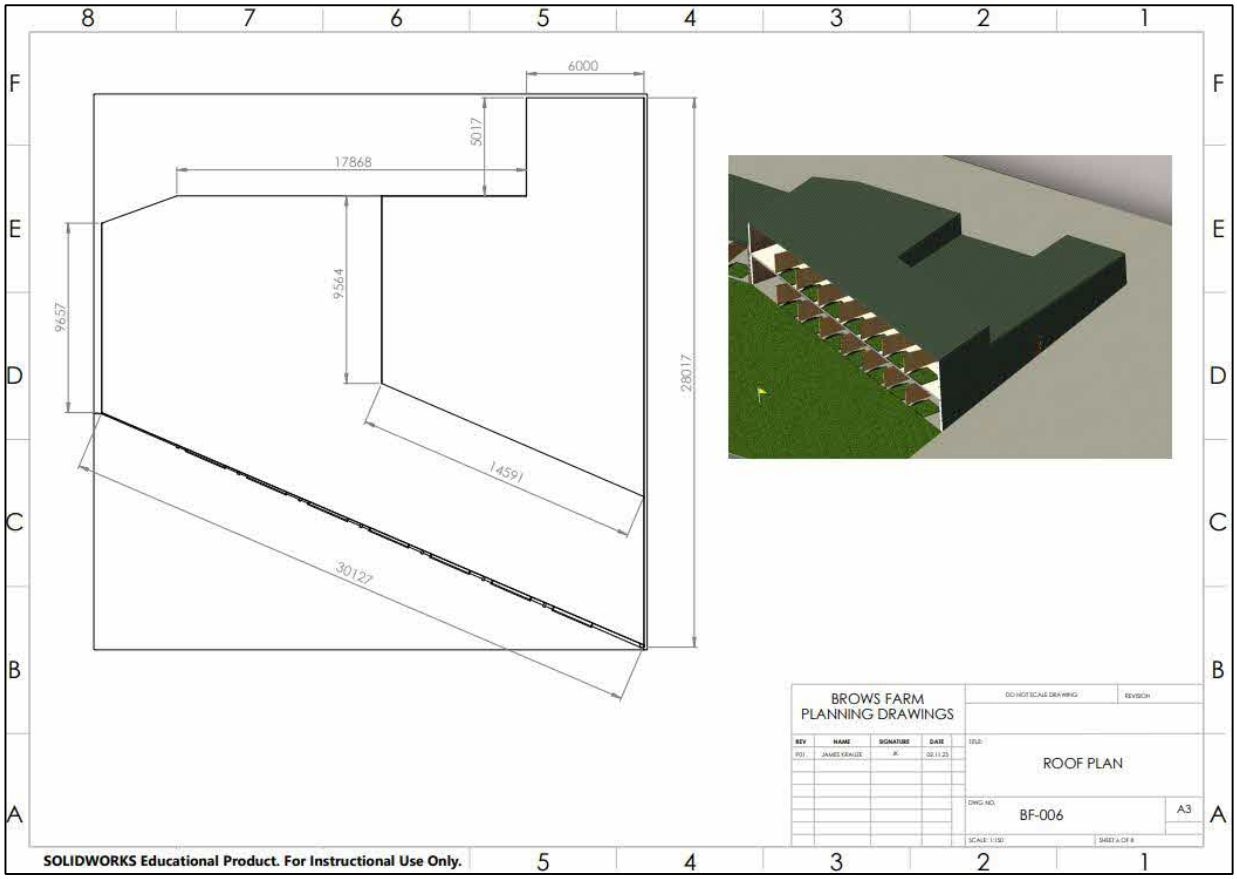


FIGURE A6: PROPOSED ROOF PLAN

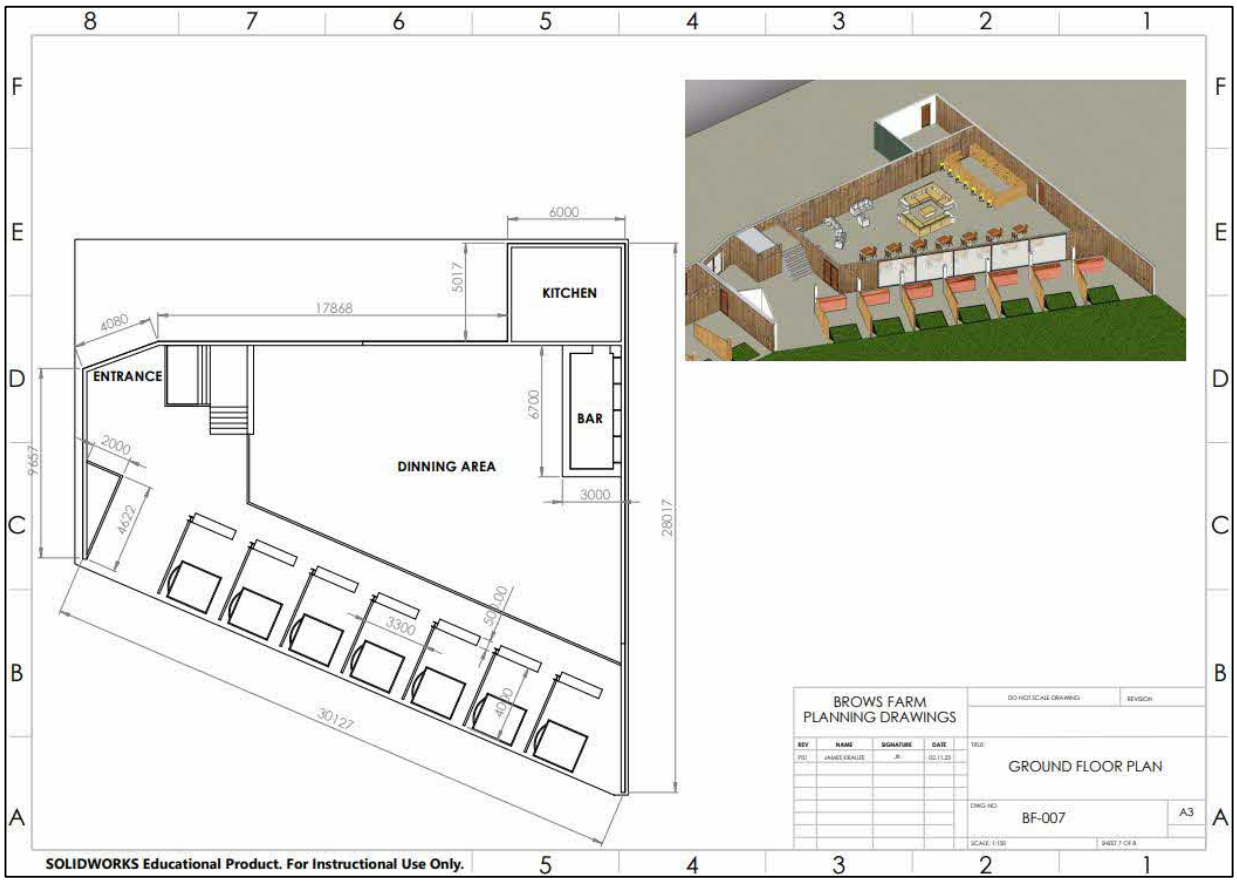


FIGURE A7: PROPOSED GROUND FLOOR PLAN

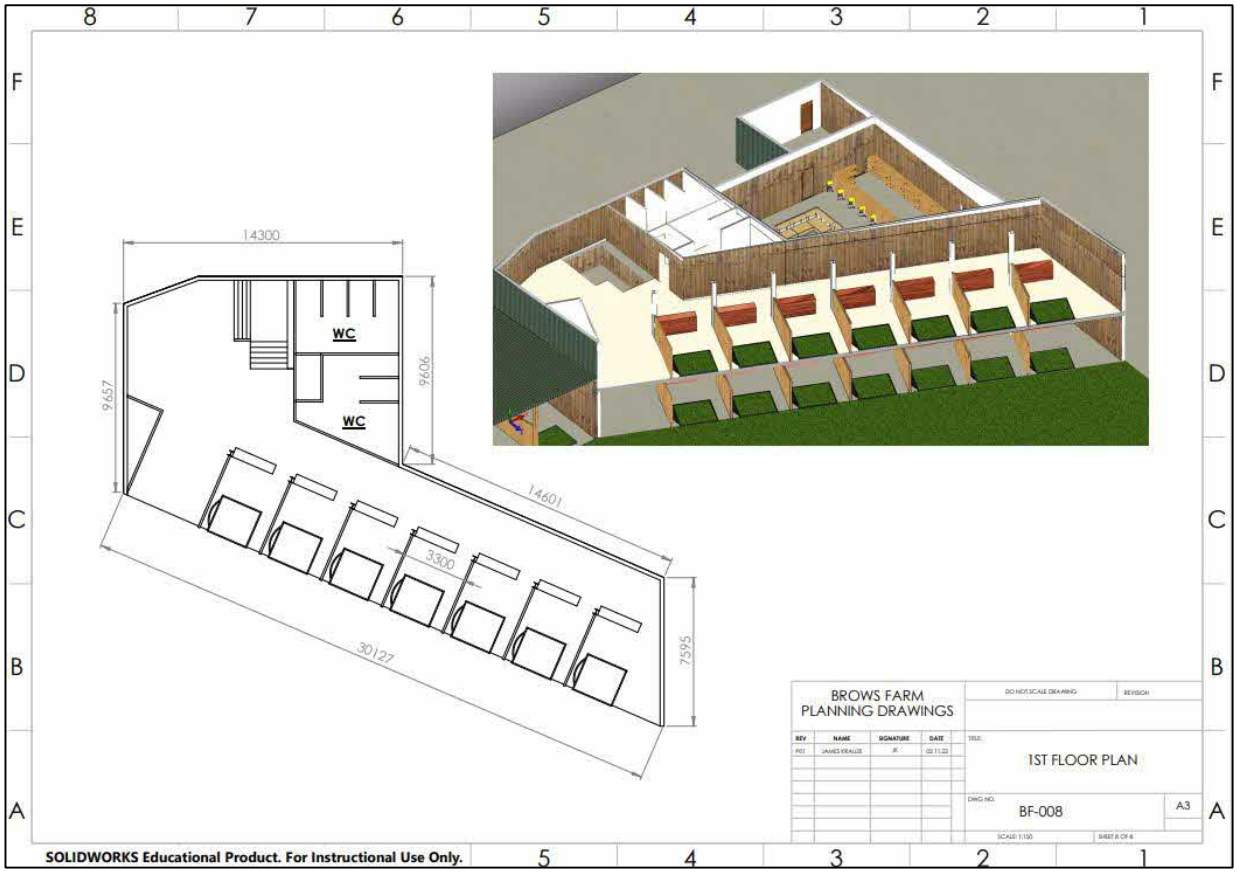


FIGURE A8: PROPOSED FIRST FLOOR PLAN

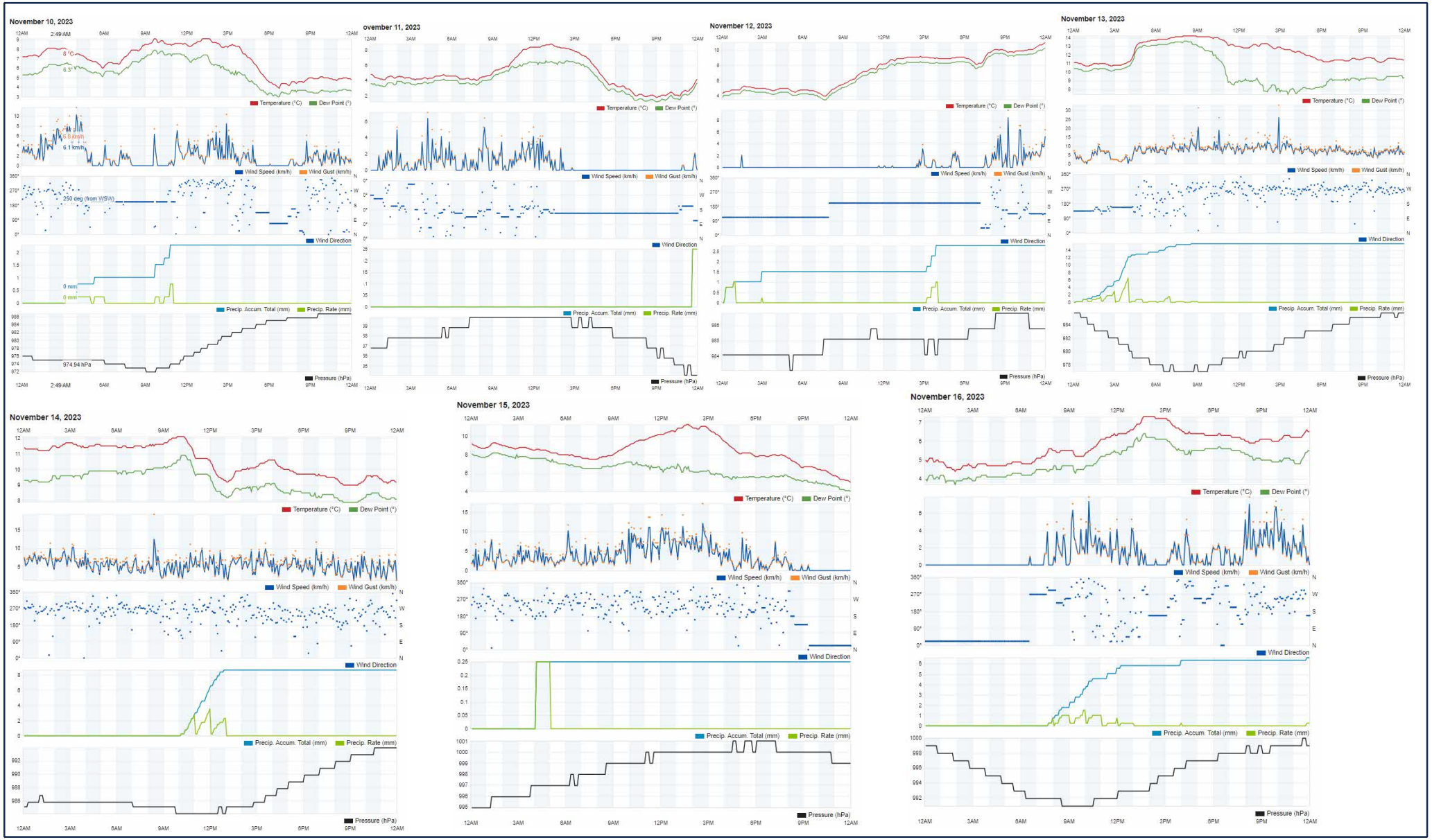


FIGURE A9: WEATHER DATA FOR UNATTENDED NOISE MONITORING PERIOD

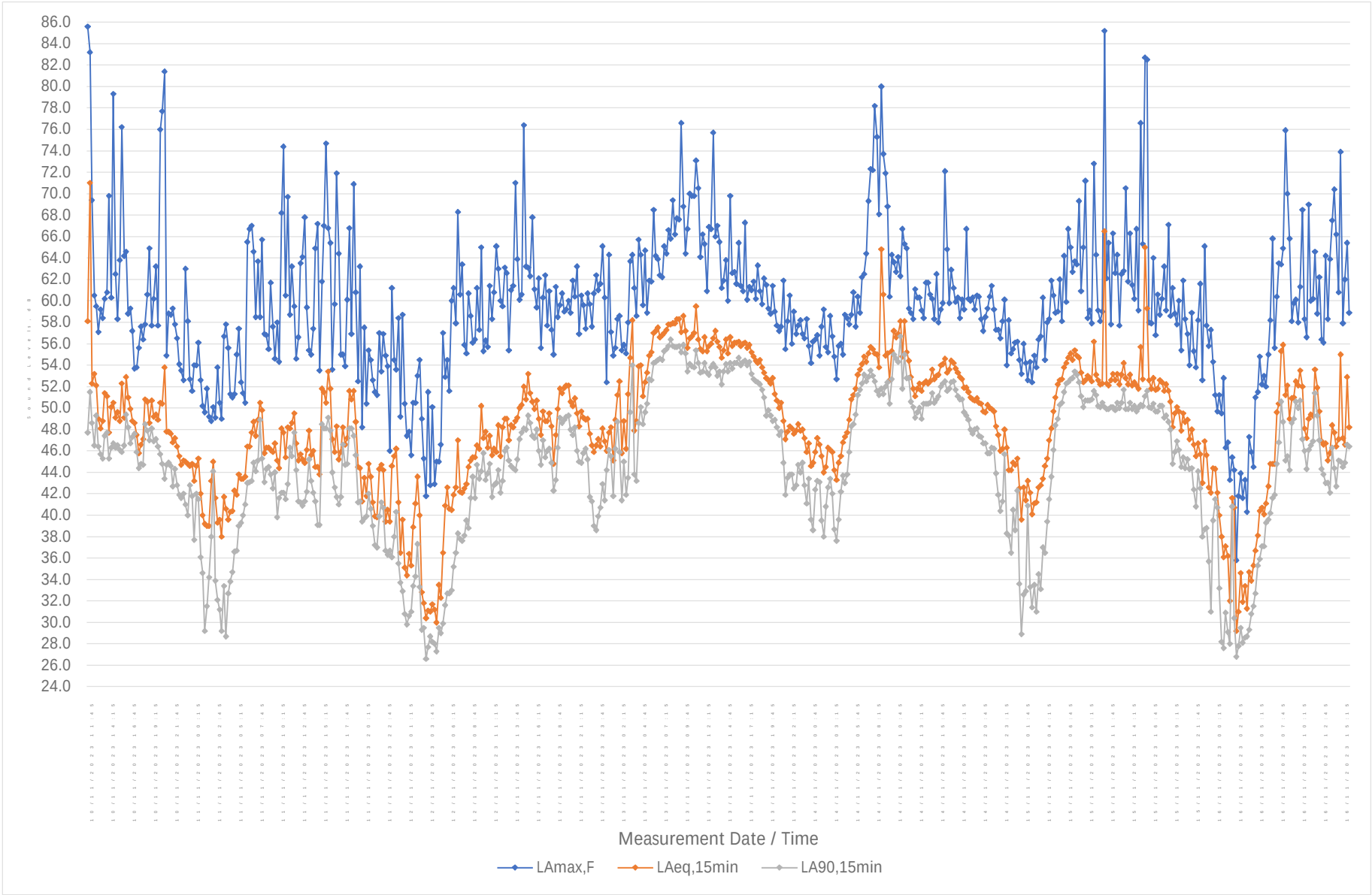


FIGURE A10: TIME HISTORY OF CONTINUOUS SOUND MONITORING DATA AT LT1

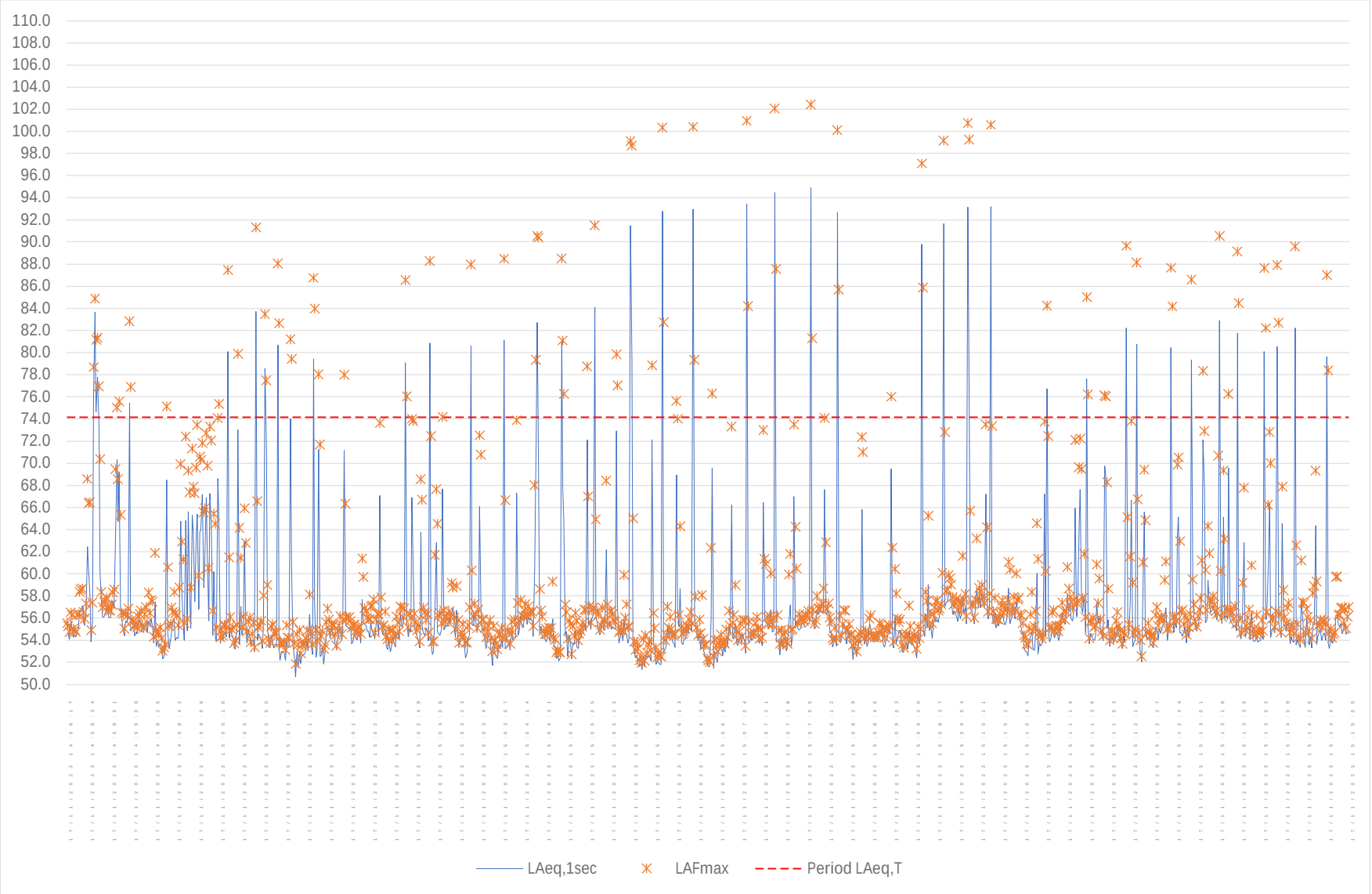


FIGURE A11: TIME HISTORY OF SOURCE-TERM SOUND MEASURMENTS


FIGURE A12: CALCULATION RECEPTOR POINTS

[redacted]

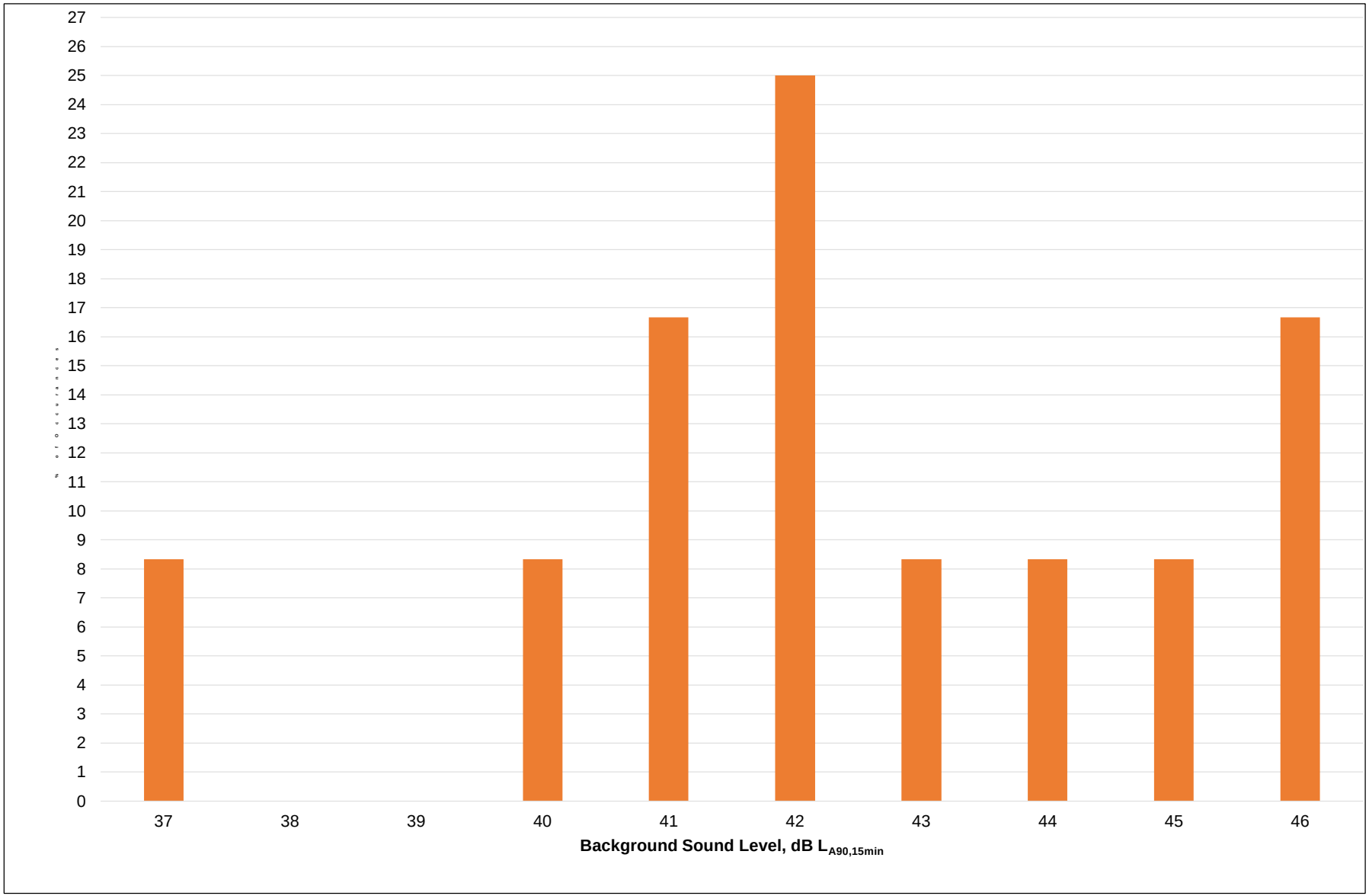


FIGURE A12: DERIVATION OF BACKGROUND SOUND LEVEL

# APPENDIX B: TABLES

| Date of Meas. | Start Time | Measured Sound Levels, dB | | |
|---|---|---|---|---|
| | | $L_{Amax,F}$ | $L_{Aeq,15min}$ | $L_{A90,15min}$ |
| Friday 10th November 2023 | 12:15 | 69.4 | 52.3 | 48.6 |
| | 12:30 | 60.5 | 53.2 | 46.5 |
| | 12:45 | 59.5 | 52.1 | 49.3 |
| | 13:00 | 57.1 | 49.0 | 46.4 |
| | 13:15 | 59.2 | 48.1 | 45.7 |
| | 13:30 | 58.4 | 48.8 | 45.3 |
| | 13:45 | 60.2 | 51.4 | 47.4 |
| | 14:00 | 60.8 | 51.1 | 47.7 |
| | 14:15 | 69.8 | 47.7 | 45.3 |
| | 14:30 | 60.3 | 50.1 | 46.3 |
| | 14:45 | 79.3 | 50.5 | 46.7 |
| | 15:00 | 62.5 | 49.1 | 46.3 |
| | 15:15 | 58.3 | 49.6 | 46.5 |
| | 15:30 | 63.8 | 48.8 | 46.1 |
| | 15:45 | 76.2 | 52.3 | 45.9 |
| | 16:00 | 64.2 | 49.1 | 46.5 |
| | 16:15 | 64.6 | 52.9 | 49.4 |
| | 16:30 | 58.8 | 51.0 | 48.2 |
| | 16:45 | 59.3 | 49.9 | 46.7 |
| | 17:00 | 57.2 | 48.8 | 47.3 |
| | 17:15 | 53.7 | 48.6 | 47.6 |
| | 17:30 | 53.8 | 47.5 | 45.9 |
| | 17:45 | 55.6 | 45.8 | 44.4 |
| | 18:00 | 57.6 | 46.6 | 44.8 |
| | 18:15 | 56.4 | 47.1 | 44.7 |
| | 18:30 | 57.8 | 50.8 | 48.5 |
| | 18:45 | 60.6 | 50.6 | 47.9 |
| | 19:00 | 64.9 | 48.6 | 47.0 |
| | 19:15 | 57.7 | 50.7 | 48.1 |
| | 19:30 | 60.2 | 49.2 | 46.9 |
| | 19:45 | 63.2 | 49.4 | 47.1 |
| | 20:00 | 57.7 | 48.9 | 46.4 |
| | 20:15 | 76.0 | 50.5 | 45.7 |
| | 20:30 | 77.7 | 50.4 | 44.8 |
| | 20:45 | 81.4 | 53.8 | 43.4 |
| | 21:00 | 54.9 | 47.8 | 44.7 |
| | 21:15 | 58.8 | 47.8 | 44.9 |
| | 21:30 | 58.7 | 47.6 | 44.6 |
| | 21:45 | 59.3 | 46.8 | 42.7 |
| | 22:00 | 57.8 | 47.2 | 44.3 |
| | 22:15 | 56.5 | 46.4 | 42.8 |
| | 22:30 | 54.1 | 45.5 | 41.9 |
| | 22:45 | 53.5 | 44.7 | 41.6 |
| | 23:00 | 52.6 | 45.1 | 42.0 |
| | 23:15 | 63.0 | 45.0 | 41.0 |

| | | | | |
|---|---|---|---|---|
| | 23:30 | 58.1 | 44.8 | 40.0 |
| | 23:45 | 52.7 | 44.6 | 42.8 |
| Saturday 11th | 00:00 | 51.6 | 44.8 | 41.8 |
| November 2023 | 00:15 | 54.0 | 43.2 | 37.7 |
| | 00:30 | 54.0 | 44.6 | 42.0 |
| | 00:45 | 56.1 | 45.3 | 41.5 |
| | 01:00 | 52.6 | 42.0 | 36.1 |
| | 01:15 | 50.2 | 40.0 | 34.6 |
| | 01:30 | 49.6 | 39.2 | 29.2 |
| | 01:45 | 51.8 | 39.0 | 31.5 |
| | 02:00 | 49.2 | 39.0 | 34.2 |
| | 02:15 | 48.8 | 43.2 | 38.0 |
| | 02:30 | 50.1 | 45.0 | 44.1 |
| | 02:45 | 49.1 | 41.6 | 33.9 |
| | 03:00 | 53.8 | 39.3 | 32.1 |
| | 03:15 | 50.5 | 39.6 | 31.2 |
| | 03:30 | 49.0 | 38.0 | 29.2 |
| | 03:45 | 56.7 | 41.7 | 33.4 |
| | 04:00 | 57.8 | 40.6 | 28.7 |
| | 04:15 | 55.6 | 39.6 | 32.7 |
| | 04:30 | 51.3 | 40.3 | 33.8 |
| | 04:45 | 51.0 | 40.4 | 34.7 |
| | 05:00 | 51.3 | 42.3 | 36.6 |
| | 05:15 | 55.0 | 41.9 | 36.7 |
| | 05:30 | 57.4 | 43.8 | 39.0 |
| | 05:45 | 52.4 | 43.4 | 39.3 |
| | 06:00 | 51.4 | 43.4 | 40.0 |
| | 06:15 | 50.5 | 43.6 | 41.0 |
| | 06:30 | 65.5 | 46.4 | 43.0 |
| | 06:45 | 66.7 | 46.4 | 43.1 |
| | 07:00 | 67.0 | 47.7 | 43.2 |
| | 07:15 | 64.6 | 48.7 | 44.9 |
| | 07:30 | 58.5 | 47.4 | 44.1 |
| | 07:45 | 63.7 | 48.9 | 45.1 |
| | 08:00 | 58.5 | 50.5 | 48.9 |
| | 08:15 | 65.7 | 49.8 | 45.3 |
| | 08:30 | 56.9 | 45.8 | 43.1 |
| | 08:45 | 56.8 | 46.3 | 44.3 |
| | 09:00 | 55.5 | 46.3 | 44.5 |
| | 09:15 | 61.7 | 46.1 | 43.8 |
| | 09:30 | 57.6 | 45.9 | 42.5 |
| | 09:45 | 54.6 | 46.7 | 44.0 |
| | 10:00 | 58.0 | 45.1 | 39.8 |
| | 10:15 | 54.3 | 44.4 | 41.6 |
| | 10:30 | 68.2 | 48.1 | 42.1 |
| | 10:45 | 74.4 | 47.7 | 42.1 |
| | 11:00 | 60.5 | 45.4 | 41.5 |
| | 11:15 | 69.7 | 48.2 | 42.9 |

| | | | | |
|---|---|---|---|---|
| | 11:30 | 58.7 | 48.1 | 46.3 |
| | 11:45 | 63.2 | 48.6 | 45.5 |
| | 12:00 | 59.5 | 49.5 | 47.7 |
| | 12:15 | 54.6 | 46.7 | 44.2 |
| | 12:30 | 56.6 | 45.1 | 41.3 |
| | 12:45 | 63.5 | 45.7 | 41.2 |
| | 13:00 | 64.1 | 45.2 | 40.9 |
| | 13:15 | 67.8 | 44.9 | 41.3 |
| | 13:30 | 59.4 | 46.1 | 42.2 |
| | 13:45 | 55.4 | 47.9 | 45.2 |
| | 14:00 | 55.0 | 45.6 | 43.2 |
| | 14:15 | 57.4 | 46.0 | 42.1 |
| | 14:30 | 64.9 | 44.5 | 41.3 |
| | 14:45 | 67.2 | 44.5 | 39.1 |
| | 15:00 | 53.5 | 43.8 | 39.1 |
| | 15:15 | 61.8 | 51.8 | 48.5 |
| | 15:30 | 67.0 | 51.5 | 48.1 |
| | 15:45 | 74.7 | 50.5 | 48.1 |
| | 16:00 | 66.8 | 53.4 | 49.1 |
| | 16:15 | 65.4 | 51.8 | 47.9 |
| | 16:30 | 53.6 | 47.1 | 44.0 |
| | 16:45 | 59.7 | 45.9 | 42.6 |
| | 17:00 | 71.9 | 48.3 | 41.7 |
| | 17:15 | 64.4 | 45.2 | 41.0 |
| | 17:30 | 55.0 | 45.9 | 41.7 |
| | 17:45 | 55.0 | 48.2 | 46.6 |
| | 18:00 | 53.9 | 46.6 | 44.7 |
| | 18:15 | 60.1 | 47.2 | 44.8 |
| | 18:30 | 66.8 | 51.6 | 48.1 |
| | 18:45 | 56.9 | 50.8 | 48.1 |
| | 19:00 | 70.9 | 51.6 | 47.4 |
| | 19:15 | 60.8 | 48.7 | 45.6 |
| | 19:30 | 52.5 | 44.5 | 41.2 |
| | 19:45 | 63.2 | 44.4 | 41.3 |
| | 20:00 | 48.2 | 41.3 | 39.4 |
| | 20:15 | 57.5 | 43.5 | 39.7 |
| | 20:30 | 50.4 | 41.8 | 39.9 |
| | 20:45 | 55.4 | 44.8 | 42.0 |
| | 21:00 | 54.5 | 43.6 | 40.6 |
| | 21:15 | 52.6 | 41.2 | 39.0 |
| | 21:30 | 51.5 | 39.9 | 37.2 |
| | 21:45 | 51.2 | 39.8 | 37.0 |
| | 22:00 | 57.0 | 44.3 | 39.9 |
| | 22:15 | 53.4 | 44.7 | 41.2 |
| | 22:30 | 56.9 | 44.2 | 40.7 |
| | 22:45 | 54.9 | 39.4 | 36.7 |
| | 23:00 | 53.9 | 40.5 | 36.3 |
| | 23:15 | 46.0 | 39.4 | 36.7 |

| | | | | |
|---|---|---|---|---|
| | 23:30 | 61.2 | 44.6 | 36.1 |
| | 23:45 | 54.5 | 45.5 | 38.0 |
| Sunday 12th | 00:00 | 53.6 | 46.2 | 40.3 |
| November 2023 | 00:15 | 58.4 | 41.2 | 35.5 |
| | 00:30 | 49.2 | 36.5 | 33.7 |
| | 00:45 | 58.7 | 39.6 | 32.9 |
| | 01:00 | 50.4 | 35.1 | 30.8 |
| | 01:15 | 47.4 | 34.4 | 29.8 |
| | 01:30 | 47.8 | 36.4 | 30.6 |
| | 01:45 | 45.6 | 35.3 | 31.0 |
| | 02:00 | 50.5 | 38.9 | 33.4 |
| | 02:15 | 50.5 | 41.1 | 34.3 |
| | 02:30 | 53.0 | 43.6 | 37.3 |
| | 02:45 | 54.5 | 40.0 | 33.3 |
| | 03:00 | 49.0 | 32.8 | 29.3 |
| | 03:15 | 45.3 | 31.8 | 29.5 |
| | 03:30 | 41.8 | 30.4 | 26.6 |
| | 03:45 | 51.5 | 31.1 | 27.7 |
| | 04:00 | 42.8 | 31.0 | 28.7 |
| | 04:15 | 50.1 | 31.7 | 28.2 |
| | 04:30 | 42.9 | 31.2 | 28.0 |
| | 04:45 | 45.0 | 30.0 | 27.3 |
| | 05:00 | 45.0 | 33.5 | 29.5 |
| | 05:15 | 46.6 | 32.3 | 29.0 |
| | 05:30 | 57.0 | 36.5 | 29.9 |
| | 05:45 | 52.9 | 40.9 | 31.6 |
| | 06:00 | 54.5 | 42.6 | 32.7 |
| | 06:15 | 51.6 | 40.6 | 32.7 |
| | 06:30 | 60.0 | 40.5 | 33.0 |
| | 06:45 | 61.2 | 41.9 | 35.2 |
| | 07:00 | 57.9 | 42.6 | 36.5 |
| | 07:15 | 68.3 | 47.0 | 38.3 |
| | 07:30 | 60.6 | 42.2 | 37.8 |
| | 07:45 | 63.4 | 42.1 | 37.6 |
| | 08:00 | 55.9 | 42.5 | 38.1 |
| | 08:15 | 55.1 | 42.9 | 39.5 |
| | 08:30 | 60.7 | 44.5 | 38.8 |
| | 08:45 | 58.6 | 45.1 | 41.6 |
| | 09:00 | 56.1 | 45.4 | 43.6 |
| | 09:15 | 56.4 | 45.4 | 41.6 |
| | 09:30 | 61.2 | 46.5 | 44.7 |
| | 09:45 | 57.3 | 46.2 | 43.4 |
| | 10:00 | 65.0 | 50.2 | 44.1 |
| | 10:15 | 55.3 | 47.2 | 45.8 |
| | 10:30 | 56.3 | 47.8 | 43.3 |
| | 10:45 | 55.7 | 46.3 | 43.9 |
| | 11:00 | 61.4 | 47.4 | 44.8 |
| | 11:15 | 58.3 | 45.6 | 41.7 |

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| | 11:30 | 60.8 | 46.2 | 42.8 |
| | 11:45 | 65.1 | 45.9 | 43.0 |
| | 12:00 | 63.0 | 48.4 | 44.2 |
| | 12:15 | 60.0 | 45.5 | 42.1 |
| | 12:30 | 59.5 | 48.2 | 43.2 |
| | 12:45 | 63.1 | 49.0 | 46.0 |
| | 13:00 | 62.6 | 49.0 | 46.3 |
| | 13:15 | 55.4 | 47.0 | 45.1 |
| | 13:30 | 61.0 | 48.4 | 44.6 |
| | 13:45 | 61.4 | 48.2 | 44.4 |
| | 14:00 | 71.0 | 48.8 | 44.2 |
| | 14:15 | 63.9 | 49.1 | 45.2 |
| | 14:30 | 60.1 | 50.0 | 47.1 |
| | 14:45 | 60.6 | 50.3 | 47.7 |
| | 15:00 | 76.4 | 52.0 | 48.1 |
| | 15:15 | 63.2 | 50.8 | 48.0 |
| | 15:30 | 63.1 | 53.2 | 49.3 |
| | 15:45 | 62.3 | 51.4 | 48.6 |
| | 16:00 | 67.8 | 50.6 | 47.4 |
| | 16:15 | 61.1 | 49.9 | 47.2 |
| | 16:30 | 59.4 | 50.7 | 48.0 |
| | 16:45 | 62.1 | 49.0 | 46.0 |
| | 17:00 | 55.6 | 47.5 | 44.7 |
| | 17:15 | 60.3 | 49.7 | 47.0 |
| | 17:30 | 62.4 | 48.8 | 45.4 |
| | 17:45 | 57.7 | 48.8 | 46.0 |
| | 18:00 | 60.9 | 49.5 | 46.2 |
| | 18:15 | 57.3 | 48.3 | 44.9 |
| | 18:30 | 55.0 | 44.8 | 42.3 |
| | 18:45 | 61.3 | 47.5 | 43.3 |
| | 19:00 | 58.5 | 49.9 | 46.3 |
| | 19:15 | 59.6 | 51.8 | 49.1 |
| | 19:30 | 60.7 | 51.4 | 48.6 |
| | 19:45 | 59.0 | 51.9 | 48.9 |
| | 20:00 | 59.2 | 52.1 | 49.2 |
| | 20:15 | 60.0 | 52.1 | 49.3 |
| | 20:30 | 58.9 | 50.6 | 48.0 |
| | 20:45 | 61.9 | 50.2 | 47.5 |
| | 21:00 | 60.4 | 50.9 | 48.2 |
| | 21:15 | 63.2 | 49.5 | 46.0 |
| | 21:30 | 56.9 | 48.3 | 45.0 |
| | 21:45 | 60.5 | 49.7 | 44.9 |
| | 22:00 | 59.6 | 49.1 | 45.8 |
| | 22:15 | 57.4 | 48.9 | 46.2 |
| | 22:30 | 60.7 | 49.0 | 45.2 |
| | 22:45 | 59.7 | 47.6 | 41.7 |
| | 23:00 | 57.6 | 46.5 | 41.3 |
| | 23:15 | 60.7 | 45.9 | 39.0 |

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| | 23:30 | 62.4 | 46.5 | 38.6 |
| | 23:45 | 61.0 | 47.1 | 39.9 |
| Monday 13th | 00:00 | 61.6 | 46.4 | 40.7 |
| November 2023 | 00:15 | 65.1 | 48.1 | 42.9 |
| | 00:30 | 60.3 | 46.9 | 41.4 |
| | 00:45 | 52.4 | 46.0 | 44.2 |
| | 01:00 | 64.3 | 47.7 | 46.1 |
| | 01:15 | 57.1 | 48.2 | 45.5 |
| | 01:30 | 54.9 | 45.1 | 41.8 |
| | 01:45 | 55.6 | 48.9 | 46.2 |
| | 02:00 | 58.3 | 51.2 | 48.7 |
| | 02:15 | 58.6 | 52.5 | 45.9 |
| | 02:30 | 55.4 | 45.8 | 41.4 |
| | 02:45 | 55.9 | 48.8 | 45.0 |
| | 03:00 | 55.1 | 46.2 | 41.9 |
| | 03:15 | 58.0 | 51.3 | 43.5 |
| | 03:30 | 63.7 | 54.7 | 49.6 |
| | 03:45 | 64.3 | 58.2 | 54.0 |
| | 04:00 | 61.2 | 47.9 | 43.8 |
| | 04:15 | 58.6 | 48.8 | 43.2 |
| | 04:30 | 65.7 | 53.9 | 48.6 |
| | 04:45 | 64.3 | 54.0 | 50.1 |
| | 05:00 | 59.6 | 51.1 | 48.5 |
| | 05:15 | 64.7 | 52.4 | 49.6 |
| | 05:30 | 58.9 | 53.3 | 50.4 |
| | 05:45 | 61.9 | 54.9 | 52.7 |
| | 06:00 | 61.8 | 55.2 | 52.6 |
| | 06:15 | 68.5 | 57.0 | 54.2 |
| | 06:30 | 64.2 | 57.2 | 54.3 |
| | 06:45 | 63.9 | 57.5 | 54.5 |
| | 07:00 | 62.4 | 56.6 | 54.6 |
| | 07:15 | 62.2 | 56.8 | 54.5 |
| | 07:30 | 65.1 | 57.0 | 55.3 |
| | 07:45 | 64.4 | 57.3 | 55.5 |
| | 08:00 | 66.6 | 57.8 | 55.8 |
| | 08:15 | 65.8 | 57.8 | 56.4 |
| | 08:30 | 69.4 | 57.9 | 55.8 |
| | 08:45 | 66.2 | 57.9 | 55.7 |
| | 09:00 | 67.7 | 58.3 | 55.7 |
| | 09:15 | 67.6 | 58.3 | 55.8 |
| | 09:30 | 76.6 | 57.1 | 55.2 |
| | 09:45 | 68.8 | 58.6 | 55.9 |
| | 10:00 | 64.4 | 57.2 | 55.1 |
| | 10:15 | 66.7 | 55.6 | 53.4 |
| | 10:30 | 70.0 | 56.5 | 54.1 |
| | 10:45 | 69.8 | 56.7 | 53.9 |
| | 11:00 | 69.8 | 57.0 | 53.8 |
| | 11:15 | 73.1 | 59.5 | 55.4 |

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|---|---|---|---|---|
| | 11:30 | 70.5 | 56.4 | 54.2 |
| | 11:45 | 64.1 | 55.5 | 53.3 |
| | 12:00 | 66.2 | 55.3 | 53.4 |
| | 12:15 | 65.3 | 56.6 | 54.2 |
| | 12:30 | 60.9 | 55.3 | 53.3 |
| | 12:45 | 66.9 | 55.8 | 53.1 |
| | 13:00 | 66.7 | 56.0 | 53.8 |
| | 13:15 | 75.7 | 56.5 | 54.1 |
| | 13:30 | 66.0 | 57.2 | 53.8 |
| | 13:45 | 67.0 | 56.2 | 53.0 |
| | 14:00 | 65.5 | 55.7 | 53.4 |
| | 14:15 | 61.2 | 54.7 | 52.2 |
| | 14:30 | 61.9 | 55.4 | 53.4 |
| | 14:45 | 63.8 | 56.4 | 54.1 |
| | 15:00 | 60.0 | 55.1 | 53.4 |
| | 15:15 | 69.8 | 56.6 | 54.2 |
| | 15:30 | 62.6 | 55.8 | 53.7 |
| | 15:45 | 62.7 | 56.1 | 54.2 |
| | 16:00 | 61.6 | 56.1 | 54.2 |
| | 16:15 | 65.4 | 56.2 | 54.7 |
| | 16:30 | 61.4 | 55.8 | 54.0 |
| | 16:45 | 60.9 | 56.0 | 54.3 |
| | 17:00 | 67.3 | 56.1 | 54.4 |
| | 17:15 | 60.1 | 55.6 | 54.0 |
| | 17:30 | 61.3 | 55.9 | 54.3 |
| | 17:45 | 61.0 | 55.2 | 53.2 |
| | 18:00 | 61.8 | 54.8 | 52.7 |
| | 18:15 | 60.2 | 54.4 | 52.5 |
| | 18:30 | 63.3 | 54.2 | 52.4 |
| | 18:45 | 60.9 | 54.5 | 52.2 |
| | 19:00 | 59.7 | 53.8 | 51.7 |
| | 19:15 | 62.1 | 53.3 | 51.0 |
| | 19:30 | 61.5 | 52.8 | 49.3 |
| | 19:45 | 59.3 | 52.6 | 49.8 |
| | 20:00 | 58.8 | 52.3 | 49.3 |
| | 20:15 | 61.4 | 52.8 | 48.8 |
| | 20:30 | 59.0 | 51.3 | 48.9 |
| | 20:45 | 57.7 | 50.7 | 48.2 |
| | 21:00 | 57.2 | 50.0 | 47.5 |
| | 21:15 | 57.6 | 50.5 | 47.8 |
| | 21:30 | 61.9 | 48.8 | 44.9 |
| | 21:45 | 55.5 | 47.1 | 41.9 |
| | 22:00 | 58.1 | 47.8 | 43.5 |
| | 22:15 | 60.5 | 48.3 | 43.8 |
| | 22:30 | 56.0 | 48.1 | 43.8 |
| | 22:45 | 59.0 | 47.6 | 42.5 |
| | 23:00 | 56.9 | 47.9 | 42.8 |
| | 23:15 | 57.7 | 48.5 | 44.7 |

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|---|---|---|---|---|
| | 23:30 | 58.2 | 47.9 | 44.0 |
| | 23:45 | 56.9 | 48.0 | 44.9 |
| Tuesday 14th | 00:00 | 56.5 | 47.2 | 42.8 |
| November 2023 | 00:15 | 58.3 | 45.9 | 41.1 |
| | 00:30 | 55.8 | 46.7 | 43.4 |
| | 00:45 | 54.2 | 44.6 | 39.6 |
| | 01:00 | 56.2 | 44.9 | 38.6 |
| | 01:15 | 56.4 | 45.9 | 42.4 |
| | 01:30 | 56.8 | 47.2 | 43.2 |
| | 01:45 | 54.9 | 46.6 | 43.1 |
| | 02:00 | 57.6 | 45.5 | 39.5 |
| | 02:15 | 59.2 | 44.0 | 38.0 |
| | 02:30 | 55.7 | 44.5 | 40.8 |
| | 02:45 | 55.2 | 46.3 | 42.6 |
| | 03:00 | 58.6 | 46.1 | 43.4 |
| | 03:15 | 56.7 | 45.9 | 42.0 |
| | 03:30 | 54.8 | 44.2 | 38.7 |
| | 03:45 | 52.7 | 43.3 | 37.6 |
| | 04:00 | 55.8 | 44.9 | 39.6 |
| | 04:15 | 56.0 | 45.5 | 42.2 |
| | 04:30 | 55.0 | 46.8 | 43.7 |
| | 04:45 | 58.7 | 47.3 | 43.0 |
| | 05:00 | 58.4 | 47.7 | 43.8 |
| | 05:15 | 57.8 | 48.9 | 45.9 |
| | 05:30 | 58.7 | 50.8 | 48.3 |
| | 05:45 | 60.8 | 51.2 | 48.5 |
| | 06:00 | 57.6 | 51.8 | 49.4 |
| | 06:15 | 60.4 | 53.1 | 51.2 |
| | 06:30 | 58.9 | 53.6 | 51.7 |
| | 06:45 | 62.2 | 54.1 | 52.3 |
| | 07:00 | 62.5 | 54.8 | 53.1 |
| | 07:15 | 64.4 | 54.3 | 52.5 |
| | 07:30 | 69.3 | 55.1 | 52.9 |
| | 07:45 | 72.3 | 55.7 | 53.5 |
| | 08:00 | 72.2 | 55.5 | 53.0 |
| | 08:15 | 78.2 | 55.1 | 52.5 |
| | 08:30 | 75.3 | 55.0 | 51.6 |
| | 08:45 | 68.1 | 53.8 | 51.2 |
| | 09:00 | 80.0 | 64.8 | 51.8 |
| | 09:15 | 73.7 | 60.6 | 51.3 |
| | 09:30 | 71.9 | 54.9 | 52.0 |
| | 09:45 | 68.8 | 55.1 | 52.4 |
| | 10:00 | 60.4 | 52.6 | 50.4 |
| | 10:15 | 64.3 | 55.3 | 52.7 |
| | 10:30 | 63.6 | 57.2 | 55.0 |
| | 10:45 | 62.7 | 56.6 | 54.6 |
| | 11:00 | 64.1 | 56.9 | 54.3 |
| | 11:15 | 62.3 | 58.1 | 56.7 |

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|---|---|---|---|---|
| | 11:30 | 66.7 | 54.8 | 51.8 |
| | 11:45 | 65.3 | 58.1 | 55.0 |
| | 12:00 | 64.9 | 55.2 | 52.8 |
| | 12:15 | 59.3 | 54.4 | 52.8 |
| | 12:30 | 58.9 | 52.9 | 50.6 |
| | 12:45 | 58.3 | 51.8 | 50.1 |
| | 13:00 | 61.1 | 51.1 | 49.1 |
| | 13:15 | 60.3 | 51.8 | 49.6 |
| | 13:30 | 60.3 | 52.3 | 50.0 |
| | 13:45 | 59.1 | 51.6 | 49.0 |
| | 14:00 | 58.4 | 52.3 | 50.4 |
| | 14:15 | 61.7 | 52.5 | 50.4 |
| | 14:30 | 61.7 | 52.3 | 50.4 |
| | 14:45 | 60.6 | 52.5 | 50.5 |
| | 15:00 | 60.2 | 53.6 | 51.4 |
| | 15:15 | 58.3 | 52.7 | 50.5 |
| | 15:30 | 62.5 | 53.0 | 50.8 |
| | 15:45 | 58.0 | 53.1 | 51.1 |
| | 16:00 | 59.2 | 54.0 | 52.0 |
| | 16:15 | 59.8 | 54.1 | 52.3 |
| | 16:30 | 72.1 | 54.6 | 52.5 |
| | 16:45 | 64.8 | 53.3 | 51.6 |
| | 17:00 | 59.8 | 53.6 | 51.8 |
| | 17:15 | 62.9 | 54.4 | 52.4 |
| | 17:30 | 61.2 | 54.2 | 52.5 |
| | 17:45 | 59.9 | 53.7 | 51.7 |
| | 18:00 | 60.3 | 53.3 | 51.1 |
| | 18:15 | 58.4 | 52.9 | 50.8 |
| | 18:30 | 60.1 | 52.7 | 50.8 |
| | 18:45 | 59.2 | 51.9 | 49.6 |
| | 19:00 | 66.7 | 51.9 | 49.3 |
| | 19:15 | 60.2 | 51.5 | 48.9 |
| | 19:30 | 60.0 | 51.0 | 48.0 |
| | 19:45 | 60.3 | 50.8 | 47.6 |
| | 20:00 | 59.2 | 50.7 | 48.0 |
| | 20:15 | 60.5 | 50.9 | 48.1 |
| | 20:30 | 60.4 | 50.5 | 47.4 |
| | 20:45 | 58.3 | 50.4 | 47.3 |
| | 21:00 | 57.2 | 49.7 | 46.7 |
| | 21:15 | 58.5 | 49.6 | 46.7 |
| | 21:30 | 59.3 | 50.3 | 45.8 |
| | 21:45 | 60.4 | 50.0 | 45.8 |
| | 22:00 | 61.4 | 49.9 | 46.3 |
| | 22:15 | 59.2 | 49.7 | 46.2 |
| | 22:30 | 57.3 | 48.3 | 43.9 |
| | 22:45 | 57.3 | 47.5 | 41.9 |
| | 23:00 | 56.5 | 46.0 | 40.4 |
| | 23:15 | 58.1 | 46.2 | 41.3 |

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| | 23:30 | 60.1 | 48.0 | 45.7 |
| | 23:45 | 54.0 | 46.3 | 38.3 |
| Wednesday 15th | 00:00 | 58.2 | 44.2 | 38.1 |
| November 2023 | 00:15 | 55.1 | 44.2 | 36.5 |
| | 00:30 | 55.5 | 44.9 | 40.5 |
| | 00:45 | 56.1 | 44.7 | 38.6 |
| | 01:00 | 56.2 | 45.3 | 42.3 |
| | 01:15 | 54.5 | 42.5 | 33.6 |
| | 01:30 | 53.2 | 39.6 | 28.9 |
| | 01:45 | 56.0 | 42.6 | 32.6 |
| | 02:00 | 54.2 | 41.4 | 32.9 |
| | 02:15 | 52.6 | 43.2 | 40.9 |
| | 02:30 | 54.3 | 42.1 | 33.3 |
| | 02:45 | 52.4 | 40.1 | 31.4 |
| | 03:00 | 54.9 | 41.1 | 33.5 |
| | 03:15 | 53.8 | 41.2 | 31.0 |
| | 03:30 | 56.4 | 42.6 | 34.5 |
| | 03:45 | 56.7 | 42.8 | 33.1 |
| | 04:00 | 60.3 | 43.4 | 37.0 |
| | 04:15 | 54.5 | 44.6 | 36.5 |
| | 04:30 | 58.0 | 45.3 | 39.4 |
| | 04:45 | 58.3 | 47.0 | 41.5 |
| | 05:00 | 61.9 | 48.1 | 43.6 |
| | 05:15 | 60.5 | 49.7 | 46.1 |
| | 05:30 | 58.9 | 51.0 | 48.4 |
| | 05:45 | 59.0 | 52.2 | 49.0 |
| | 06:00 | 62.0 | 52.6 | 50.3 |
| | 06:15 | 58.1 | 52.7 | 50.5 |
| | 06:30 | 64.2 | 53.8 | 51.5 |
| | 06:45 | 59.9 | 54.2 | 52.3 |
| | 07:00 | 66.7 | 54.7 | 52.4 |
| | 07:15 | 65.0 | 55.1 | 52.7 |
| | 07:30 | 62.7 | 54.5 | 52.8 |
| | 07:45 | 63.7 | 55.4 | 53.4 |
| | 08:00 | 63.4 | 54.9 | 53.1 |
| | 08:15 | 69.3 | 54.7 | 52.4 |
| | 08:30 | 60.9 | 53.3 | 51.1 |
| | 08:45 | 65.0 | 52.4 | 50.1 |
| | 09:00 | 71.2 | 52.6 | 50.7 |
| | 09:15 | 58.4 | 53.0 | 50.7 |
| | 09:30 | 59.1 | 52.8 | 50.7 |
| | 09:45 | 57.9 | 52.5 | 50.8 |
| | 10:00 | 72.8 | 56.2 | 51.6 |
| | 10:15 | 64.3 | 53.1 | 51.2 |
| | 10:30 | 59.1 | 52.6 | 50.2 |
| | 10:45 | 58.1 | 52.2 | 50.1 |
| | 11:00 | 59.0 | 52.3 | 50.5 |
| | 11:15 | 85.2 | 66.5 | 50.1 |

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|---|---|---|---|---|
| | 11:30 | 62.1 | 52.3 | 49.9 |
| | 11:45 | 65.4 | 52.1 | 49.9 |
| | 12:00 | 57.8 | 52.6 | 50.1 |
| | 12:15 | 66.3 | 53.2 | 50.1 |
| | 12:30 | 62.6 | 52.6 | 49.8 |
| | 12:45 | 64.3 | 53.2 | 50.5 |
| | 13:00 | 57.7 | 52.2 | 50.0 |
| | 13:15 | 62.5 | 53.1 | 50.5 |
| | 13:30 | 62.8 | 54.2 | 51.7 |
| | 13:45 | 70.5 | 52.8 | 49.9 |
| | 14:00 | 61.8 | 52.2 | 49.9 |
| | 14:15 | 66.3 | 53.1 | 50.5 |
| | 14:30 | 61.5 | 52.1 | 49.9 |
| | 14:45 | 60.2 | 52.4 | 50.2 |
| | 15:00 | 66.7 | 52.1 | 49.7 |
| | 15:15 | 59.1 | 51.8 | 50.0 |
| | 15:30 | 76.6 | 55.7 | 50.3 |
| | 15:45 | 65.3 | 52.7 | 50.2 |
| | 16:00 | 82.7 | 65.0 | 51.1 |
| | 16:15 | 82.5 | 59.3 | 51.6 |
| | 16:30 | 58.0 | 52.6 | 50.1 |
| | 16:45 | 57.9 | 51.8 | 50.0 |
| | 17:00 | 64.0 | 52.8 | 50.4 |
| | 17:15 | 56.8 | 51.7 | 49.7 |
| | 17:30 | 60.6 | 51.8 | 49.7 |
| | 17:45 | 58.7 | 52.6 | 50.2 |
| | 18:00 | 60.2 | 52.4 | 50.2 |
| | 18:15 | 63.2 | 51.6 | 49.1 |
| | 18:30 | 59.1 | 52.2 | 49.3 |
| | 18:45 | 67.1 | 51.6 | 48.7 |
| | 19:00 | 58.6 | 50.6 | 48.0 |
| | 19:15 | 61.2 | 48.2 | 44.8 |
| | 19:30 | 58.8 | 49.5 | 45.9 |
| | 19:45 | 57.8 | 50.1 | 46.9 |
| | 20:00 | 60.0 | 49.7 | 46.1 |
| | 20:15 | 55.4 | 47.9 | 44.5 |
| | 20:30 | 61.9 | 49.5 | 45.4 |
| | 20:45 | 58.3 | 48.7 | 44.4 |
| | 21:00 | 56.9 | 48.9 | 45.2 |
| | 21:15 | 54.0 | 47.1 | 44.3 |
| | 21:30 | 58.9 | 48.0 | 44.4 |
| | 21:45 | 55.3 | 46.6 | 42.4 |
| | 22:00 | 53.8 | 45.5 | 40.8 |
| | 22:15 | 58.2 | 46.7 | 44.1 |
| | 22:30 | 61.6 | 45.7 | 42.5 |
| | 22:45 | 52.6 | 43.0 | 38.0 |
| | 23:00 | 65.1 | 46.9 | 38.7 |
| | 23:15 | 57.7 | 45.6 | 38.8 |

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|---|---|---|---|---|
| | 23:30 | 55.8 | 42.6 | 35.7 |
| | 23:45 | 57.3 | 42.1 | 31.0 |
| Thursday 16th | 00:00 | 54.3 | 44.4 | 39.5 |
| November 2023 | 00:15 | 51.2 | 44.3 | 41.5 |
| | 00:30 | 49.7 | 42.1 | 40.7 |
| | 00:45 | 51.2 | 40.0 | 33.2 |
| | 01:00 | 49.5 | 38.0 | 28.2 |
| | 01:15 | 52.8 | 36.1 | 27.6 |
| | 01:30 | 46.3 | 37.1 | 30.9 |
| | 01:45 | 46.8 | 36.2 | 29.1 |
| | 02:00 | 43.3 | 32.0 | 28.0 |
| | 02:15 | 45.4 | 41.6 | 40.8 |
| | 02:30 | 44.2 | 40.7 | 30.4 |
| | 02:45 | 35.8 | 29.2 | 26.8 |
| | 03:00 | 41.8 | 31.0 | 27.8 |
| | 03:15 | 43.9 | 34.6 | 29.5 |
| | 03:30 | 41.6 | 31.9 | 28.1 |
| | 03:45 | 43.3 | 33.4 | 28.6 |
| | 04:00 | 40.3 | 31.3 | 28.7 |
| | 04:15 | 47.3 | 34.7 | 29.3 |
| | 04:30 | 45.9 | 33.9 | 30.8 |
| | 04:45 | 44.5 | 35.3 | 31.5 |
| | 05:00 | 51.0 | 36.7 | 32.7 |
| | 05:15 | 51.5 | 38.1 | 35.3 |
| | 05:30 | 54.8 | 40.4 | 35.9 |
| | 05:45 | 52.2 | 40.7 | 37.1 |
| | 06:00 | 53.0 | 40.1 | 37.1 |
| | 06:15 | 52.0 | 41.1 | 39.3 |
| | 06:30 | 55.0 | 42.7 | 39.6 |
| | 06:45 | 58.2 | 44.8 | 40.2 |
| | 07:00 | 65.8 | 44.8 | 41.6 |
| | 07:15 | 55.6 | 44.8 | 41.9 |
| | 07:30 | 60.4 | 49.6 | 44.8 |
| | 07:45 | 63.5 | 50.4 | 46.8 |
| | 08:00 | 63.4 | 55.3 | 50.6 |
| | 08:15 | 64.9 | 55.9 | 48.7 |
| | 08:30 | 75.9 | 51.2 | 45.1 |
| | 08:45 | 70.0 | 52.1 | 45.5 |
| | 09:00 | 65.8 | 49.0 | 44.2 |
| | 09:15 | 58.1 | 50.9 | 48.6 |
| | 09:30 | 59.8 | 51.0 | 49.0 |
| | 09:45 | 60.1 | 52.5 | 50.6 |
| | 10:00 | 58.0 | 52.1 | 50.0 |
| | 10:15 | 61.3 | 53.5 | 50.7 |
| | 10:30 | 68.5 | 52.0 | 47.1 |
| | 10:45 | 58.3 | 48.1 | 46.0 |
| | 11:00 | 56.6 | 47.2 | 44.3 |
| | 11:15 | 69.0 | 49.0 | 46.1 |

| | | | | |
|---|---|---|---|---|
| | 11:30 | 60.0 | 49.4 | 46.5 |
| | 11:45 | 60.2 | 49.3 | 46.9 |
| | 12:00 | 64.6 | 53.6 | 51.4 |
| | 12:15 | 58.8 | 51.9 | 49.3 |
| | 12:30 | 62.2 | 49.7 | 47.0 |
| | 12:45 | 56.4 | 46.9 | 44.3 |
| | 13:00 | 56.1 | 46.6 | 43.8 |
| | 13:15 | 64.2 | 46.7 | 43.0 |
| | 13:30 | 58.3 | 45.1 | 43.0 |
| | 13:45 | 63.9 | 45.8 | 42.1 |
| | 14:00 | 67.5 | 48.4 | 46.3 |
| | 14:15 | 70.4 | 47.7 | 44.4 |
| | 14:30 | 66.2 | 46.4 | 42.7 |
| | 14:45 | 60.8 | 47.1 | 45.1 |
| | 15:00 | 73.9 | 55.0 | 45.0 |
| | 15:15 | 57.9 | 47.2 | 44.5 |
| | 15:30 | 62.0 | 46.6 | 44.9 |
| | 15:45 | 65.4 | 52.9 | 46.6 |
| | 16:00 | 58.9 | 48.2 | 46.4 |

TABLE B1: UNATTENDED SOUND MONITORING DATA

# APPENDIX C: GLOSSARY

Noise

Noise is defined as unwanted sound. The range of audible sound is from 0 to 140 dB. The frequency response of the ear is usually taken to be around 18 Hz (number of oscillations per second) to 18000 Hz. The ear does not respond equally to different frequencies at the same level. It is more sensitive in the mid-frequency range than the lower and higher frequencies and because of this, the low and high frequency components of a sound are reduced in importance by applying a weighting (filtering) circuit to the noise measuring instrument. The weighting which is most widely used and which correlates best with subjective response to noise is the dBA weighting. This is an internationally accepted standard for noise measurements.

For variable sources, such as traffic, a difference of 3 dBA is just distinguishable. In addition, a doubling of traffic flow will increase the overall noise by 3 dBA. The 'loudness' of a noise is a purely subjective parameter, but it is generally accepted that an increase/ decrease of 10 dBA corresponds to a doubling/ halving in perceived loudness. Noise is measured on a logarithmic scale in decibels (dB) because of the ears' sensitivity to a wide range of pressure changes. The sound pressure level (SPL) of a signal is denoted by the symbol Lp and defined by the equation Lp = 10 log (p/po)2 where p is the root mean square pressure of the signal and po is the reference sound pressure (2 x 10-5 Pa).

An indication of the range of sound pressure levels commonly found in the environment is given below:

| Location | $L_{pAdB}(A)$ |
|---|---|
| Normal threshold of hearing | -10 to 20 |
| Music halls and theatres | 20 to 30 |
| Living rooms and offices | 30 to 50 |
| Inside motor vehicles | 50 to 70 |
| Industrial premises | 70 to 100 |
| Burglar alarms at 1 m | 100 to 110 |
| Jet aircraft on take-off | 110 to 130 |
| Threshold of pain | 130 to 140 |

External noise levels are rarely steady, but rise and fall according to activities within an area. In attempt to produce a figure that relates this variable noise level to subjective response, a number of noise indices have been developed. These include:

i) The $L_{Amax}$ noise level

This is the maximum noise level recorded over the measurement period.

ii) The $L_{Aeq}$ noise level

This is "equivalent continuous A-weighted sound pressure level, in decibels" and is defined in British Standard BS 7445 as the " value of the A-weighted sound pressure level of a continuous, steady sound that, within a specified time internal, T, has the same mean square sound pressure as a sound under consideration whose level varies with time".

It is a unit commonly used to describe construction noise and noise from industrial premises and is the most suitable unit for the description of other forms of environmental noise. In more straightforward terms, it is a measure of energy within the varying noise.

iii) The $L_{A10}$ noise level

This is the noise level that is exceeded for 10% of the measurement period and gives an indication of the noisier levels. It is a unit that has been used over many years for the measurement and assessment of road traffic noise.

iv) The $L_{A90}$ noise level

This is the noise level that is exceeded for 90% of the measurement period and gives an indication of the noise level during the quieter periods. It is often referred to as the background noise level and is used in the assessment of disturbance from industrial noise.

Community response to environmental noise sources is dependent on both acoustic and non-acoustic factors. The acoustic factors include absolute noise level, changes or exceedances of background and ambient levels as well as the characteristics, time, duration and frequency of noise.