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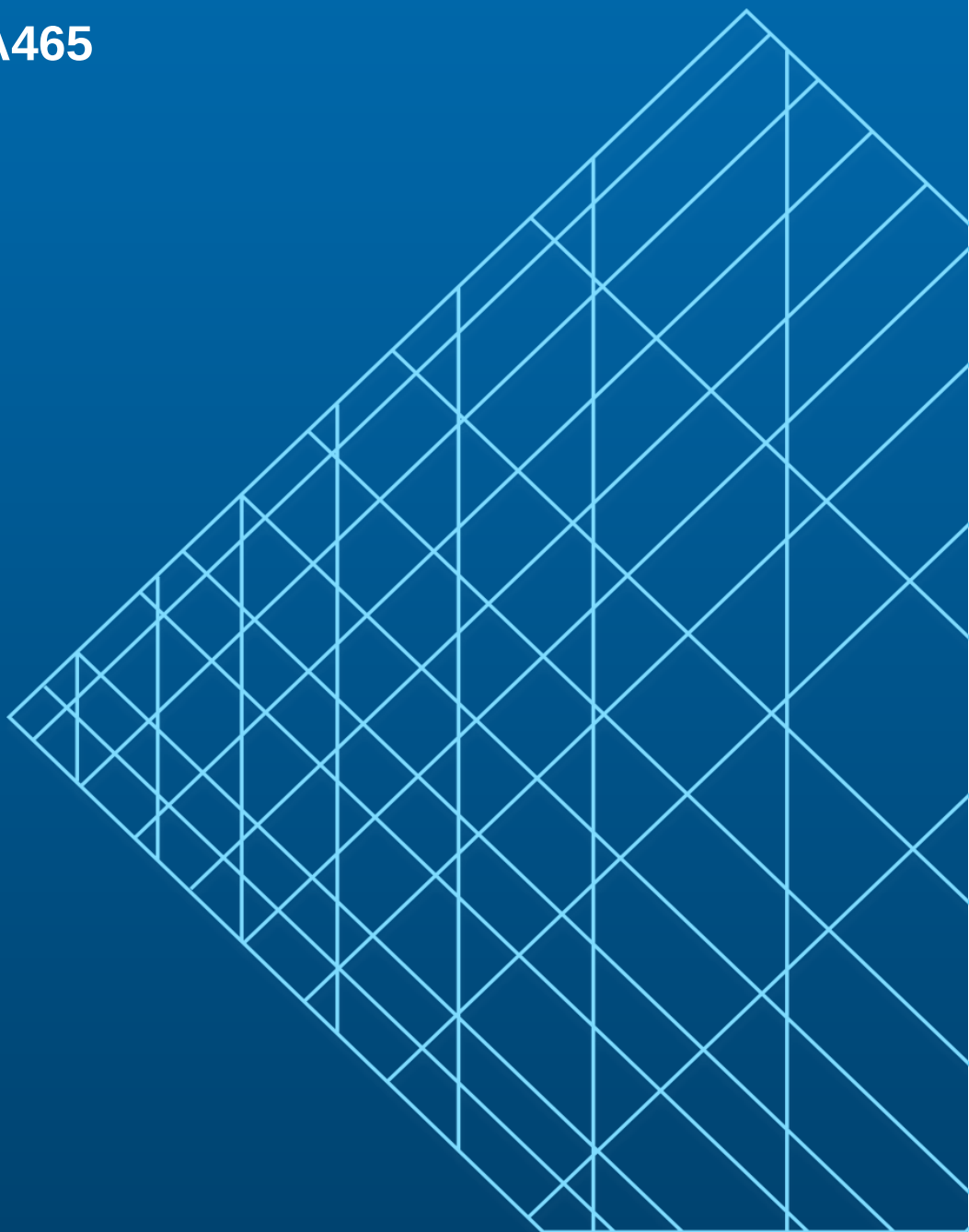
Independent Acoustic Consultancy Practice

# Environmental Noise and Vibration Assessment

## Land East of A465
## Abergavenny

6274/ENS1



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# Environmental Noise and Vibration Assessment

| | |
|---|---|
| **Project:** | **Land East of A465** |
| **Site Address:** | Abergavenny<br>NP7 |
| **HA Reference:** | 6274/ENS1 |
| **Date:** | 27/08/2021 |
| **Client:** | Monmouthshire Housing Association<br>Nant Y Pia House<br>Mamhilad Technology Park<br>Mamhilad<br>Monmouthshire<br>NP4 0JJ |
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# 1. INTRODUCTION

We understand a residential development is proposed at Land East of A465, Abergavenny, NP7.

The main noise sources affecting the site are road traffic on the A465 and trains commuting along the Welsh Marches Line.

This report has therefore been commissioned to assess existing ambient and background noise levels impinging on the site from local sources.

Survey results have been used for comparison with typical Local Authority Planning conditions and current planning guidance.

# 2. CRITERIA

## 2.1 Planning Policy Wales

The Welsh Government's Planning Policy Wales (Edition 11) dated February 2021, states the following;

*"6.7.20 Where sensitive developments need to be located close to existing transportation infrastructure for sustainable movement and access they should be designed, as far as practicable, to limit harmful substances and noise levels within and around those developments both now and in the future. This may include employing the principles of good acoustic design and the inclusion of active travel or travel management measures as part of development proposals. Such development, however, should preferably be located away from existing sources of significant noise, which may include aircraft noise or roads, particularly new roads or those with programmed route improvements."*

The document states *"For more information on the principles of good acoustic design, readers are referred to Professional Planning Guidance (ProPG) Supplementary Document 2, produced by the Association of Noise Consultants, the Institute of Acoustics and the Chartered Institute of Environmental Health (http://www.association-of-noise-consultants.co.uk/propg/). ProPG has been written principally to assist with the planning process in England, but the design principles put forward in Supplementary Document 2 may also be adopted in Wales.*

## 2.2 ProPG Supplementary Document 2

Professional Practice Guidance on Planning & Noise, New Residential Development 'Supplementary Document 2 – Good Acoustic Design' produced by the ANC, IOA and CIEH discusses the general principles of Good Acoustic Design, including the following hierarchy of noise management measures in descending order of preference;

*i) Maximising the spatial separation of noise source(s) and receptor(s).*
*ii) Investigating the necessity and feasibility of reducing existing noise levels and relocating existing noise sources.*
*iii) Using existing topography and existing structures (that are likely to last the expected life of the noise-sensitive scheme) to screen the proposed development site from significant sources of noise.*
*iv) Incorporating noise barriers as part of the scheme to screen the proposed development site from significant sources of noise.*
*v) Using the layout of the scheme to reduce noise propagation across the site.*
*vi) Using the orientation of the buildings to reduce the noise exposure of noise-sensitive rooms.*
*vii) Using the building envelope to mitigate noise to acceptable levels.*

*"It should be remembered that good acoustic design is a process that begins as soon as land is under consideration for development. The timeline for good acoustic design stretches from the conceptual design stage, through quality control during construction, and beyond to post construction performance testing.*

*Both internal and external spaces should be considered in the acoustic design process. Care should be taken to ensure that acoustic mitigation measures do not result in an otherwise unsatisfactory development. Good acoustic design must be regarded as an integrated part of the overall design process".*

## 2.3 Technical Advice Note (Wales) 11

Noise bands defining categories A-D of TAN 11 are set in terms of $L_{Aeq,16hr}$ daytime and $L_{Aeq,8hr}$ night time levels for road traffic noise and mixed sources, free field 1.2-1.5m above ground level as follows;

**Table 2.1 – TAN11 Noise Exposure Categories**

| Recommended noise exposure categories for new dwellings near existing noise sources (ref Table 2 of TAN 11 (Wales) October 1997) | | | | | |
|---|---|---|---|---|---|
| **Noise Source** | **Time** | **Noise Exposure Categories** | | | |
| | | **A** | **B** | **C** | **D** |
| Road Traffic | 07:00-23:00 | <55 | 55-63 | 63-72 | >72 |
| | 23:00-07:00 | <45 | 45-57 | 57-66 | >66 |
| Rail Traffic | 07:00-23:00 | <55 | 55-66 | 66-74 | >74 |
| | 23:00-07:00 | <45 | 45-59 | 59-66 | >66 |
| Air Traffic | 07:00-23:00 | <57 | 57-66 | 66-72 | >72 |
| | 23:00-07:00 | <48 | 48-57 | 57-66 | >66 |
| Mixed Sources(4) | 07:00-23:00 | <55 | 55-63 | 63-72 | >72 |
| | 23:00-07:00 | <45 | 45-57 | 57-66 | >66 |

*Note: In addition, sites where individual noise events regularly exceed 82dB(A) $L_{max}$(slow), several times in any night time hour should be treated as being in NEC C, unless the $L_{eq}$(8 hour) already puts the site in NEC D.*

*(4) Mixed sources: this refers to any combination of road, rail, air and industrial noise sources. The "mixed source" values are based on the lowest numerical values of the single source limits in the table. The "mixed source" NECs should only be used where no individual noise source is dominant.*

## 2.4 British Standard 8233:2014

British Standard 8233:2014 'Guidance on sound insulation and noise reduction for buildings' includes internal noise criteria of habitable rooms in residential dwellings, as shown below;

**Table 2.2 – BS 8233:2014 Internal Ambient Noise Criteria for Habitable Rooms**

| Location | Desired | | Reasonable * | |
|---|---|---|---|---|
| | 07:00 to 23:00 | 23:00 to 07:00 | 07:00 to 23:00 | 23:00 to 07:00 |
| Living room | 35 dB $L_{Aeq,16hr}$ | - | 40 dB $L_{Aeq,16hr}$ | - |
| Dining room/area | 40 dB $L_{Aeq,16hr}$ | - | 45 dB $L_{Aeq,16hr}$ | - |
| Bedroom | 35 dB $L_{Aeq,16hr}$ | 30 dB $L_{Aeq,8hr}$ | 40 dB $L_{Aeq,16hr}$ | 35 dB $L_{Aeq,8hr}$ |

* *NOTE 7 states "Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5dB and reasonable internal conditions still achieved.*

In addition BS 8233:2014 states: *"Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,F}$, depending on the character and number of events per night. Sporadic noise events could require separate values."*

Reference is therefore made to World Health Organisation (WHO) 'Guidelines for Community Noise, 1999' which states *"For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45dB $L_{Amax}$ more than 10-15 times per night (Vallet & Vernet 1991)".*

Section 7.7.3.2 of BS 8233:2014 entitled 'Design criteria for external noise' states;

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

The above criteria in BS 8233:2014 apply for sources without specific character, previously termed “anonymous noise”. BS 8233:2014 7.7.1 advises:

*“NOTE: Noise has a specific character if it contains features such as a distinguishable, discrete and continuous tone, is irregular enough to attract attention, or has strong low-frequency content, in which case lower noise limits might be appropriate.”*

# 3. ENVIRONMENTAL NOISE SURVEY

## 3.1 Procedures

### *3.1.1 Continuous Monitoring*

Continuous noise monitoring was carried out between 1215hrs on Thursday, 12 August 2021 to 1315hrs on Friday, 13 August 2021 at positions A-C.

Data including $L_{Amax}$, $L_{Aeq}$ and background $L_{A90}$ was logged at 1 minute intervals over the monitoring period, along with continuous audio and 100ms data to allow source identification and further detailed analysis of results if required.

**Figure 3.1 – Site Plan Showing Monitoring Locations**


Site plan in Figure 3.1 above shows the development site and continuous monitoring positions used, namely:

### Table 3.1 – Continuous Monitoring Location Details

| Position | Description |
|---|---|
| A | Located on fence line on the north western boundary approximately 10m back from the A465 with line of sight |
| B | Located on fence line on the western boundary approximately 140m back from the A465 and 180m back from Abergavenny train station with line of sight to road traffic |
| C | Located on tree on the south western boundary approximately 250m back from the A465 with line of sight |

*Note: All microphone positions approximately 1.5m above local ground level.*

## 3.2 Meteorological Conditions

Approximate weather conditions are shown in time history graphs in Figure B.1 and Figure B.2 of Appendix B.

To summarise, the weather conditions during the monitoring period were generally dry with an occasional breeze.

A rain shower occurred on 13th August between 0100 – 0210hrs.

## 3.3 Measurement Equipment

The following measurement equipment was used during the surveys:

### Table 3.2 – Noise Monitoring Equipment List

| Make | Description | Model | Serial Number | Last Calibrated | Certificate No. |
|---|---|---|---|---|---|
| NTi | Type 1 - Sound Level Meter | XL2-TA | A2A-08723-E0 | 30 October 2019 | FL-19-235 |
| | Preamplifier | MA220 | 1820 | 30 October 2019 | FL-19-235 |
| | Microphone | Capsule | 9381 | 30 October 2019 | FL-19-235 |
| NTi | Type 1 - Sound Level Meter | XL2-TA | A2A-14577-E0 | 22 June 2020 | TCRT20/1313 |
| | Preamplifier | MA220 | 7485 | 22 June 2020 | TCRT20/1313 |
| | Microphone | Capsule | A15594 | 22 June 2020 | TCRT20/1313 |
| Rion | Type 1 - Sound Level Meter | NL-32 | 1103396 | 03 June 2021 | UCRT19/1270 |
| | Preamplifier | NH-21 | 34335 | 03 June 2021 | UCRT19/1270 |
| | Microphone | UC-53A | 317921 | 03 June 2021 | UCRT19/1270 |
| Rion | Calibrator (94.03dB @ 984Hz) | NC-73 | 10355197 | 01 June 2021 | UCRT20/1265 |

Measurement systems were calibrated before and after the surveys and no variation occurred.

*Note: Copies of traceable calibration certificates for all equipment are available upon request.*

## 3.4 Results

### *3.4.1 Continuous Monitoring*

Time history graphs in Figure B.3, Figure B.4 and Figure B.5 of Appendix B show $L_{Amax}$, $L_{Aeq}$ and $L_{A90}$ sound pressure levels measured at positions A, B & C respectively.

The following $L_{Aeq,16hr}$ daytime (0700-2300hrs) and $L_{Aeq,8hr}$ night-time (2300-0700hrs) noise levels were measured;

**Table 3.3 – Summary of Daytime $L_{Aeq,16hr}$ and Night-time $L_{Aeq,8hr}$ Results**

| Period | Date | Position | | |
|---|---|---|---|---|
| | | A | B | C |
| Daytime $L_{Aeq,16hr}$ (dB) | 12-13/08/2021 | 74.7 | 59.8 | 53.5 |
| Night-time $L_{Aeq,8hr}$ (dB) | 12-13/08/2021 | 66.9 | 52.4 | 47.9 |

$L_{Amax,F}$ events over 82dB during the night-time period (2300-0700hrs) were regularly recorded measured at Position A due to vehicle pass-bys on the A465. $L_{Amax,F}$ events over 82dB were recorded at Positions B & C during the night-time period.

Daytime period is therefore assessed as critical (>5dB difference between daytime and night-time) at the majority of locations.

Graphs in Figure B.6 & Figure B.7 of Appendix B show statistical analysis of background sound levels measured at positions A & B respectively.

The following minimum consistent daytime and night-time background $L_{A90}$ sound levels have been determined;

**Table 3.4 – Minimum Consistent Daytime and Night-time Background $L_{A90}$ Results**

| Period | Position | |
|---|---|---|
| | A | B |
| Daytime (0700-2300hrs) $L_{A90}$ (dB) | 54 | 28 |
| Night-time (2300-0700hrs) $L_{A90}$ (dB) | 53 | 31 |

Road traffic noise controlled the ambient and background climate both daytime and night-time. Rail noise is not indicated to be significant.

# 4. NOISE MAP MODELLING

Three dimensional noise map modelling has been undertaken using the proprietary NoiseMap Five environmental noise mapping software package, which in turn uses calculation methods of Calculation of Road Traffic Noise (CRTN).

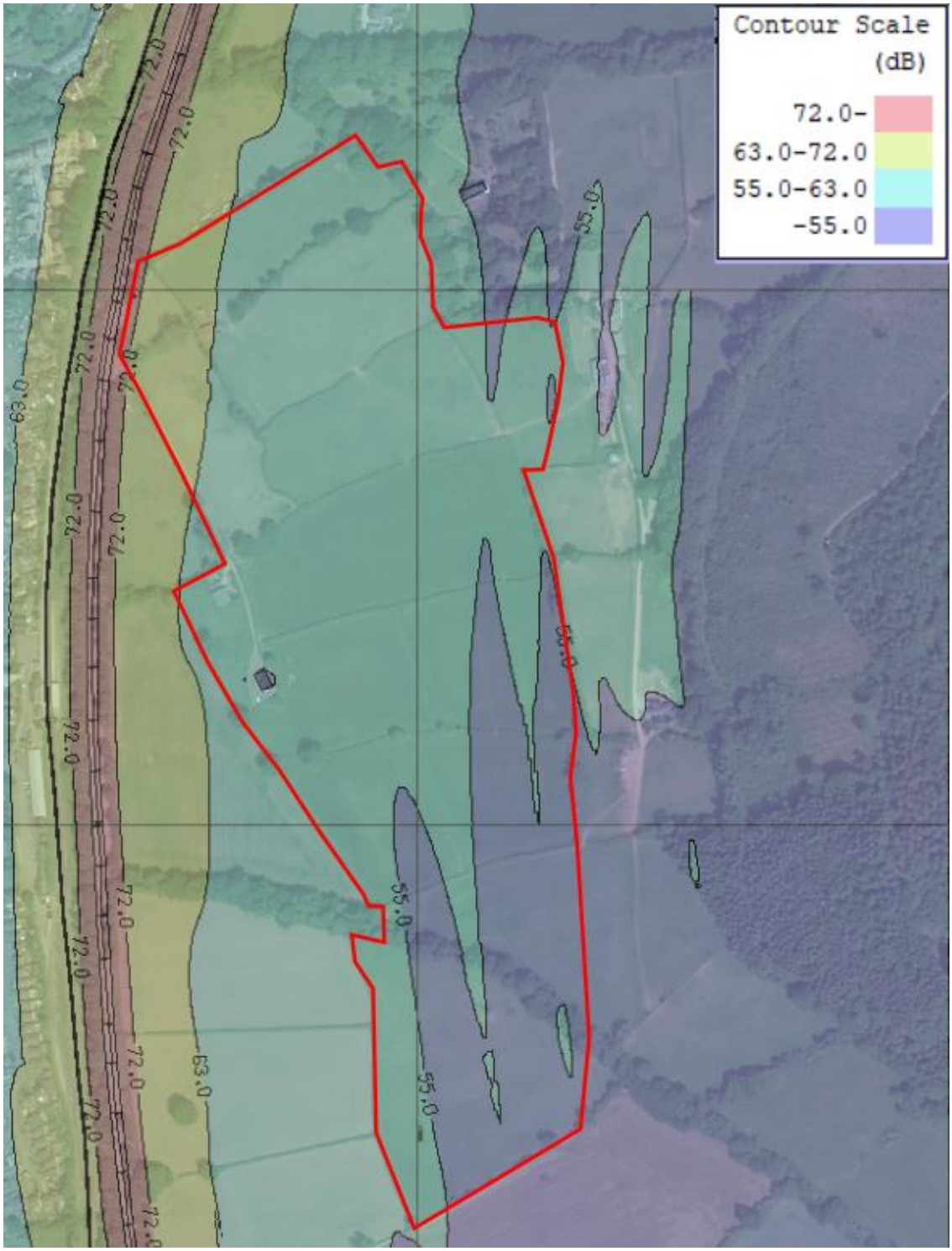
Models have been set up to predict daytime noise levels across the site from surrounding sources based on measured noise levels discussed in section 3.4 of this report.

The model takes into account distance and screening losses from existing and new structures, allowing garden noise levels to be assessed, as well as predicting noise levels at proposed residential facades.

## 4.1 Undeveloped Site

The noise map model in Figure 4.1 below shows predicted road traffic noise levels during the critical daytime period (0700-2300hrs) at 1.5m above local ground level across the undeveloped site.

**Figure 4.1 - Daytime Model (Undeveloped Site) $L_{Aeq,16hr}$ Contours at 1.5m Height**




The majority of the site is indicated to fall under NEC B of TAN11 with exception of the western boundary which falls under NEC C of TAN11 with a small proportion of the north eastern boundary falling under NEC D.

## 5. DISCUSSION

Noise levels across the undeveloped site are indicated to exceed 50dB $L_{Aeq,16hr}$ and 45dB $L_{Aeq,8hr}$ . ProPG stage 2 guidance advises: "*internal noise levels can be assessed with windows closed, however any façade openings used to provide whole dwelling ventilation (e.g. trickle ventilators) should be assessed in the "open" position and, in this scenario*". The majority of the site should be capable of meeting the 35dB $L_{Aeq,16hr}$ & 30dB $L_{Aeq,8hr}$ internal noise criteria quoted BS8233 and ProPG guidance with standard trickle ventilators in open position and windows closed. However, dwellings closest to the A465 are indicated to require some additional mitigation. Noise mitigation measures can be readily accommodated and it is therefore not considered to be a significant constraint to developing the site. At these locations good acoustic design principles are to be followed to minimise the potential noise impacts. These are likely to include:

- additional sound insulation measures, typically in the form of uprated acoustic glazing and mechanical ventilation, to control road noise and regular night-time $L_{Amax,F}$ levels intrusion to within BS8233 / ProPG guideline criteria.

- housing layout design so gardens or external amenity areas to houses in the western areas of the site are screened from the A465 by the houses. However, daytime noise levels are relatively high (≈70dB $L_{Aeq,16hr}$) in the north-western most part of the site and garden noise levels here may still exceed the 55dB $L_{Aeq,16hr}$ guideline value with screening in place. Reference should be made to Section 7.7.3.2 of BS 8233:2014 (see Section 2.4).

An updated noise map model and assessment of noise mitigation measures including requirements for external building fabric elements is to be carried out at the detailed design stage once the housing layout has been finalised.

# 6. CONCLUSION

An environmental noise assessment has been carried out for the proposed residential development at Land East of A465, Abergavenny, NP7.

Road traffic is indicated to control the ambient noise climate day and night.

A noise survey has been carried out across the site for 24 hours to assess daytime and night-time noise levels.

The noise survey indicates that daytime is the critical period (day/night difference > 5dB).

A noise map model has been generated to show noise propagation across the undeveloped site daytime.

## APPENDIX A - ACOUSTIC TERMINOLOGY

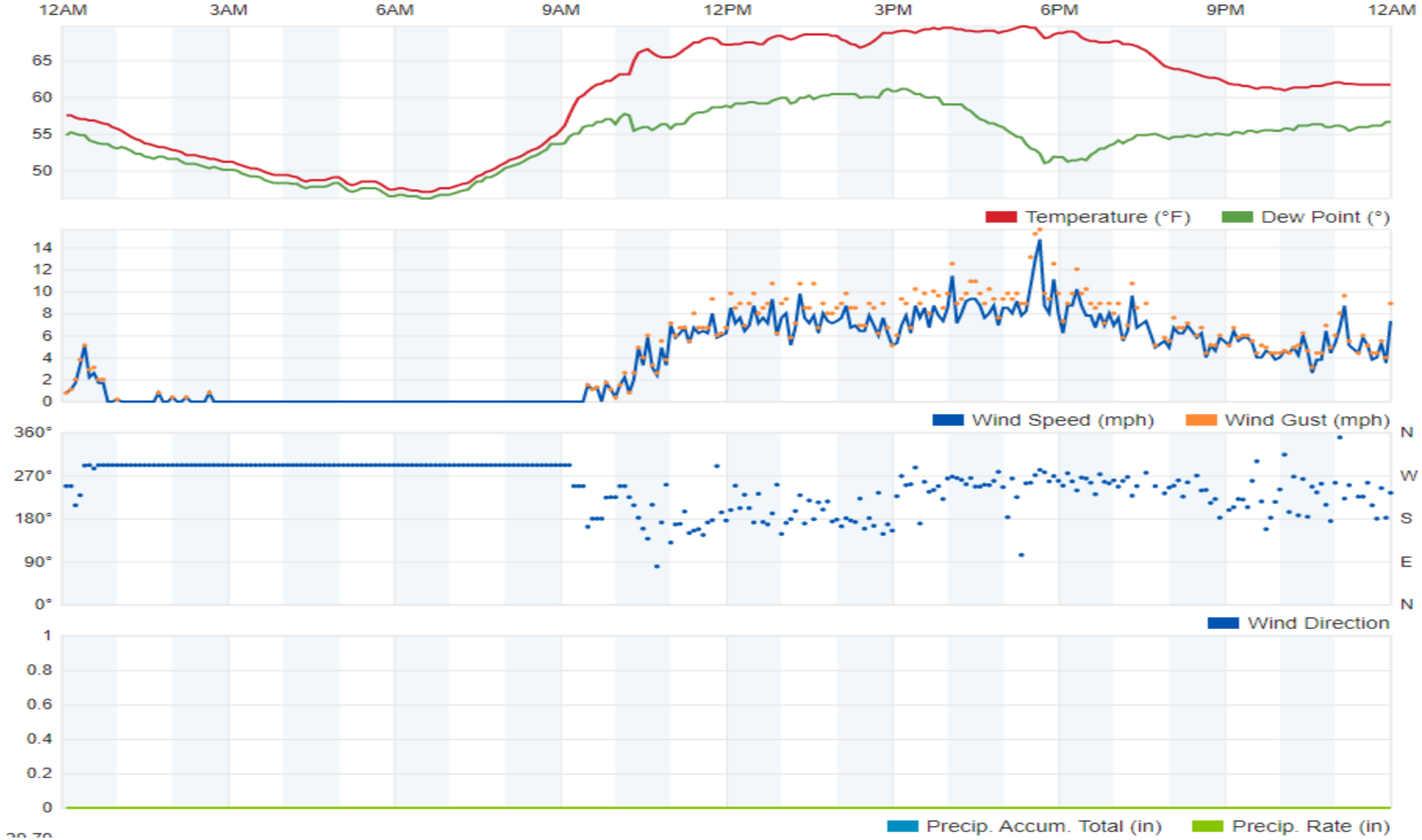
Human response to noise depends on a number of factors including loudness, frequency content and variations in level with time. Various frequency weightings and statistical indices have been developed in order to objectively quantify 'annoyance'.

The following units have been used in this report:

| | |
|---|---|
| dB(A) | The sound pressure level A-weighted to correspond with the frequency response of the human ear and therefore a persons' subjective response to frequency content. |
| $L_{eq}$ | The equivalent continuous sound level is a notional steady state level which over a quoted time period would have the same acoustic energy content as the actual fluctuating noise measured over that period. |
| $L_{max}$ | The highest instantaneous sound level recorded during the measurement period. |
| $L_{10}$ | The sound level which is exceeded for 10% of the measurement period. i.e. The level exceeded for 6 minutes of a 1 hour measurement - used as a measure of background noise. |
| $L_{90}$ | The sound level which is exceeded for 90% of the measurement period. i.e. The level exceeded for 54 minutes of a 1 hour measurement - used as a measure of background noise. |
| $L_{Ar,Tr}$ | The 'rating' level, as described in BS 4142:2014 – the specific noise plus any adjustment for the characteristic features of the noise. |
| SSR | Sound sensitive receiver |
| SEL | 'Sound Exposure Level', The dB(A) level which, if it lasted 1 second, would produce the same sound energy as the event in question (e.g. a train pass-by). |
| $VDV_{b/d,T}$ | Vibration Dose Value – the measure of the total vibration experienced over a specified period. It is weighted using $W_b$ and $W_d$ as appropriate, over a given time period, $T$. The VDV defines a relationship that yields a consistent assessment of continuous, intermittent, occasional and impulsive vibration and correlates well with subjective response. |

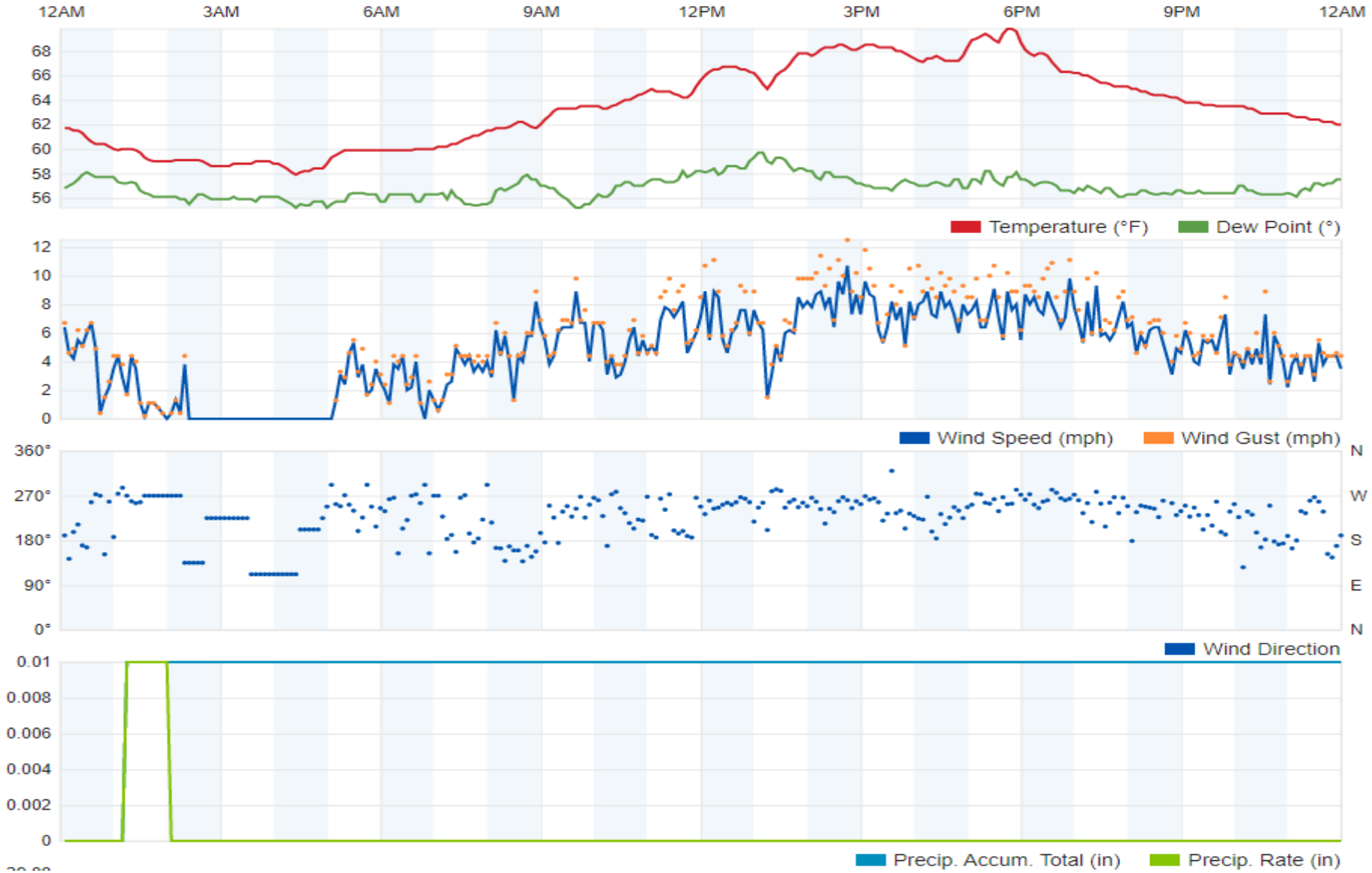
## APPENDIX B - DIAGRAMS, GRAPHS AND TABLES

### Figure B.1 – Approximate Weather History for Thursday, 12 August 2021



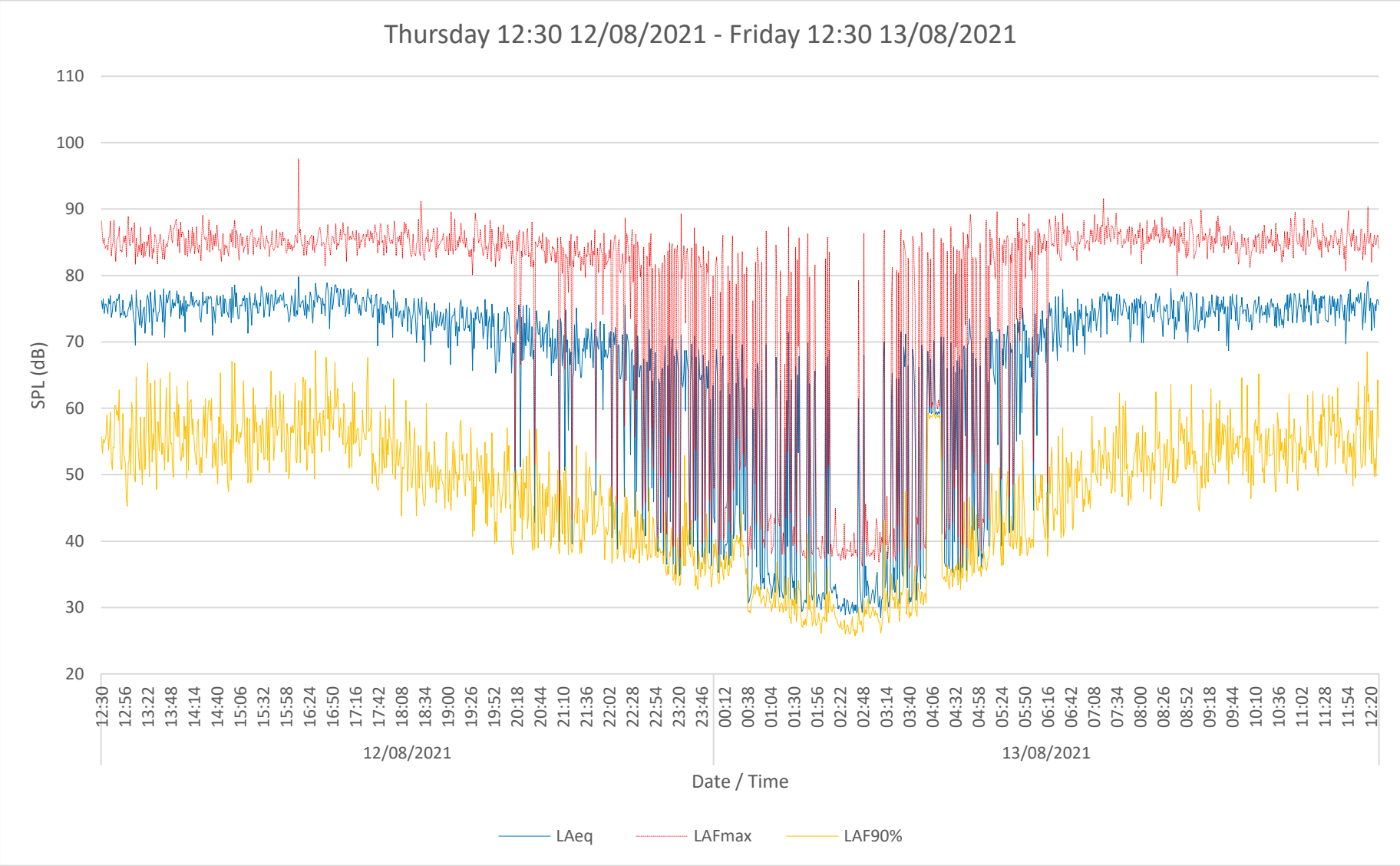

*Note: Taken from www.wunderground.com - weather station IABERG12 located in Abergavenny [Elev 299 ft, 51.83 °N, 3.01 °W]*

## Figure B.2 – Approximate Weather History for Friday, 13 August 2021

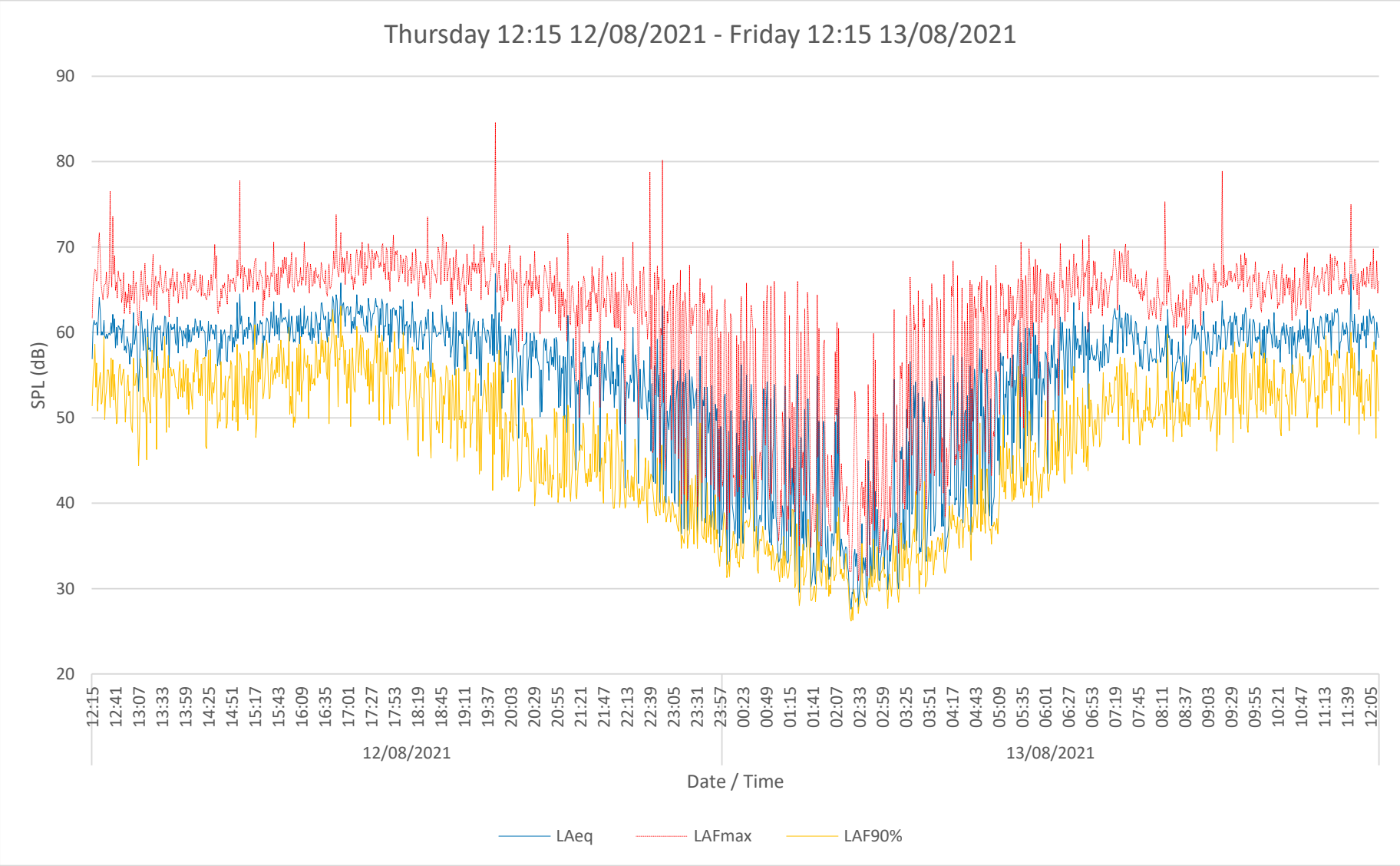



*Note: Taken from www.wunderground.com - weather station IABERG12 located in Abergavenny [Elev 299 ft, 51.83 °N, 3.01 °W]*

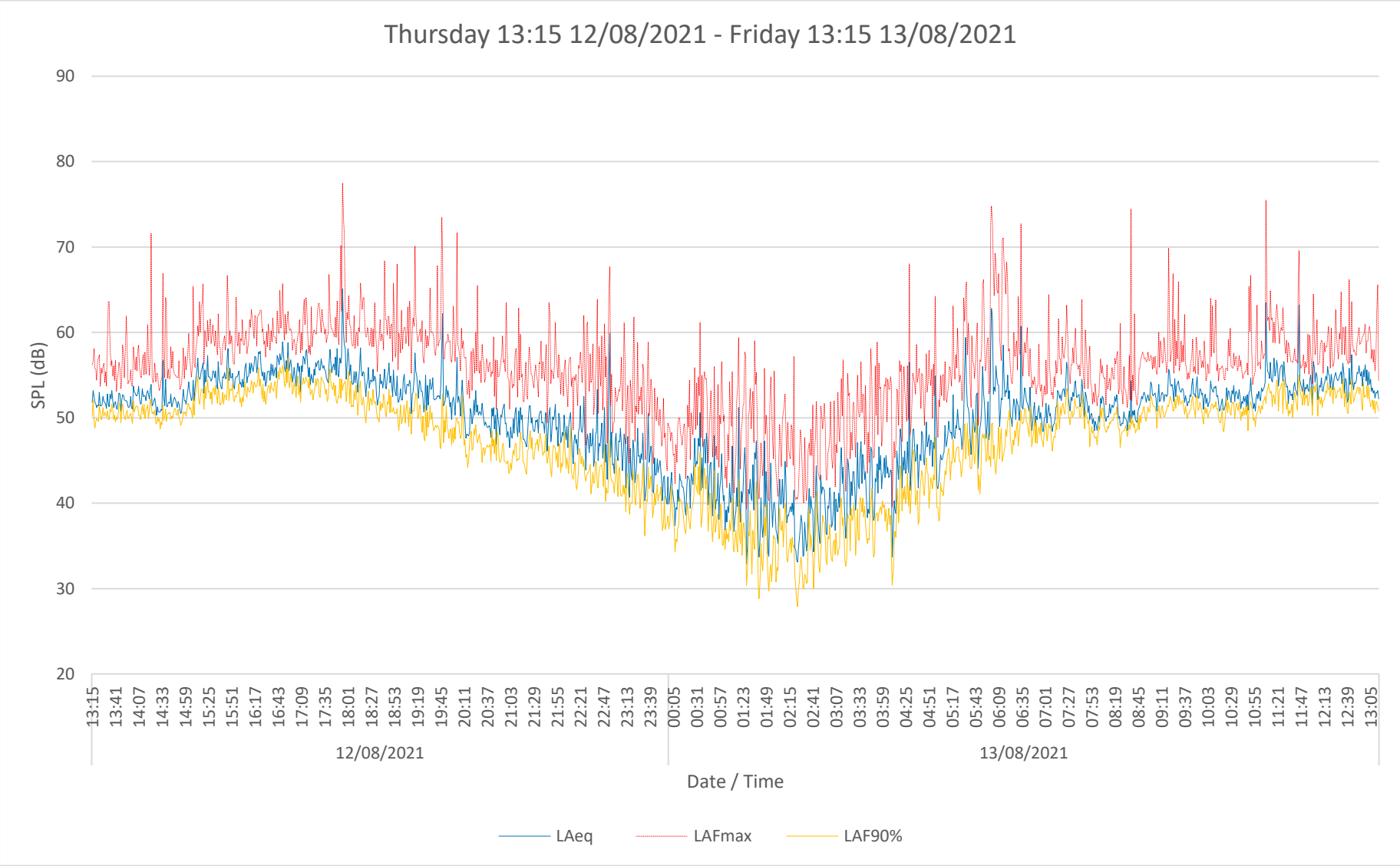
## Figure B.3 – Time History at Position A



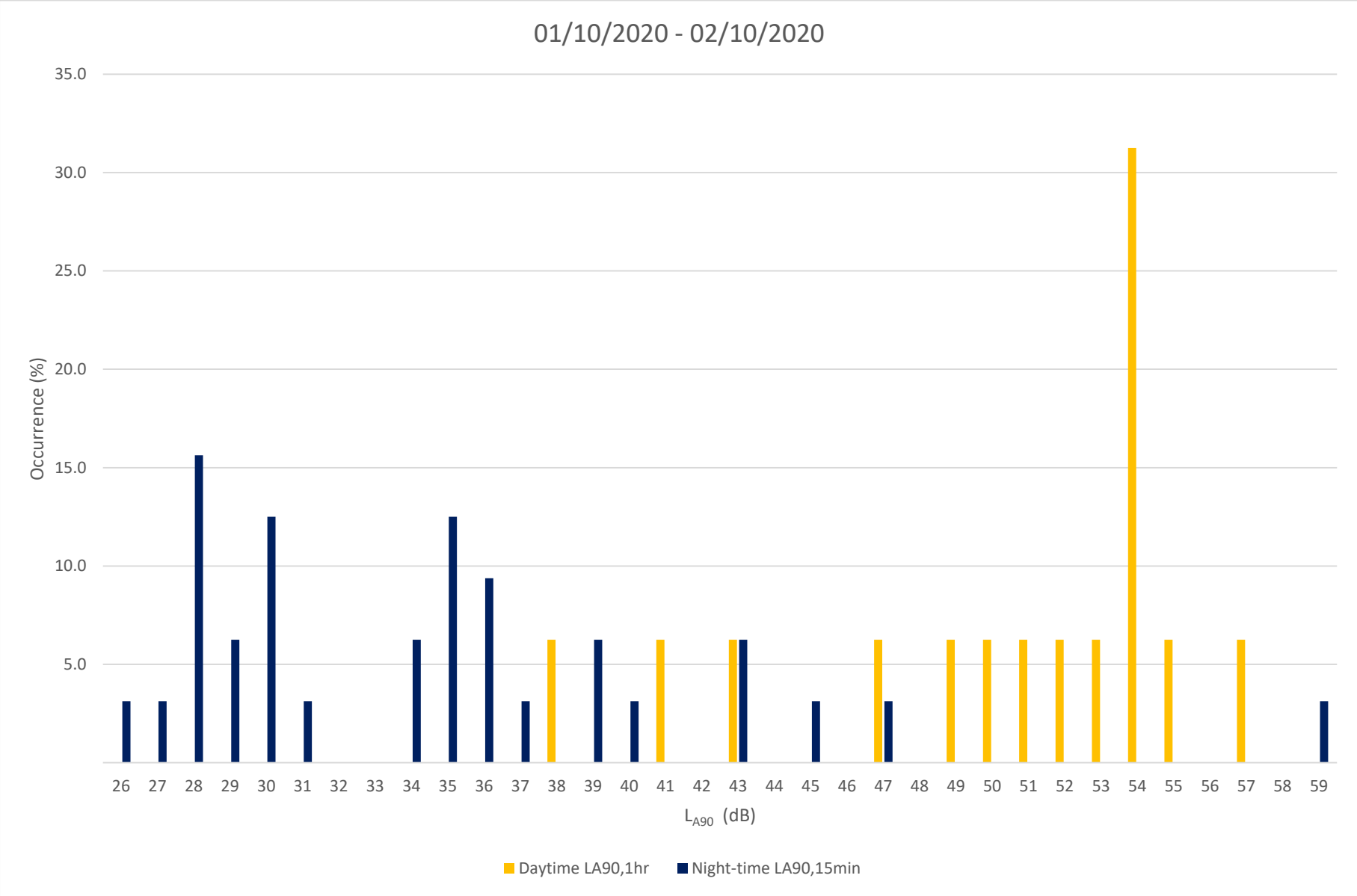
## Figure B.4 – Time History at Position B



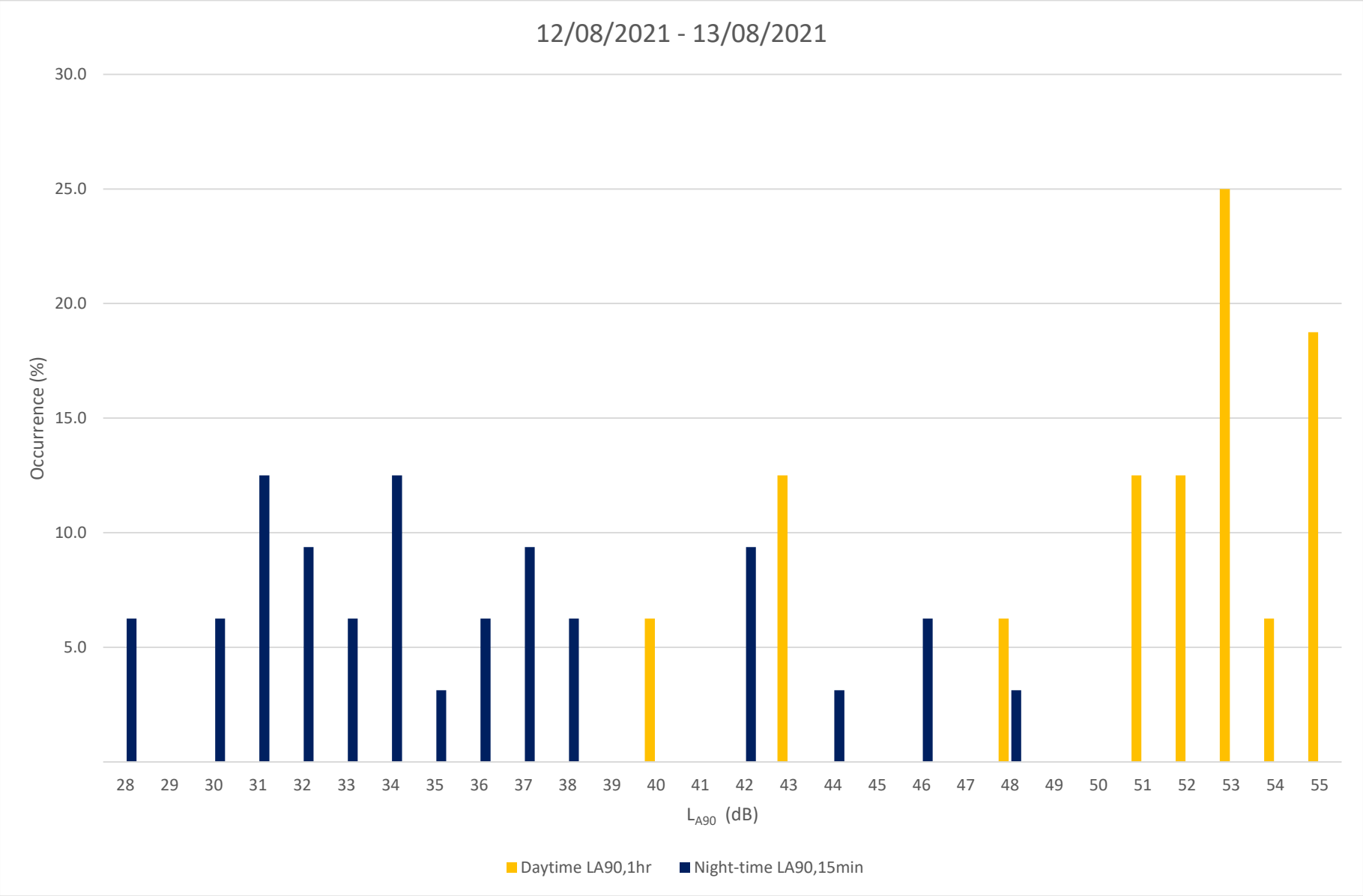
## Figure B.5 – Time History at Position C



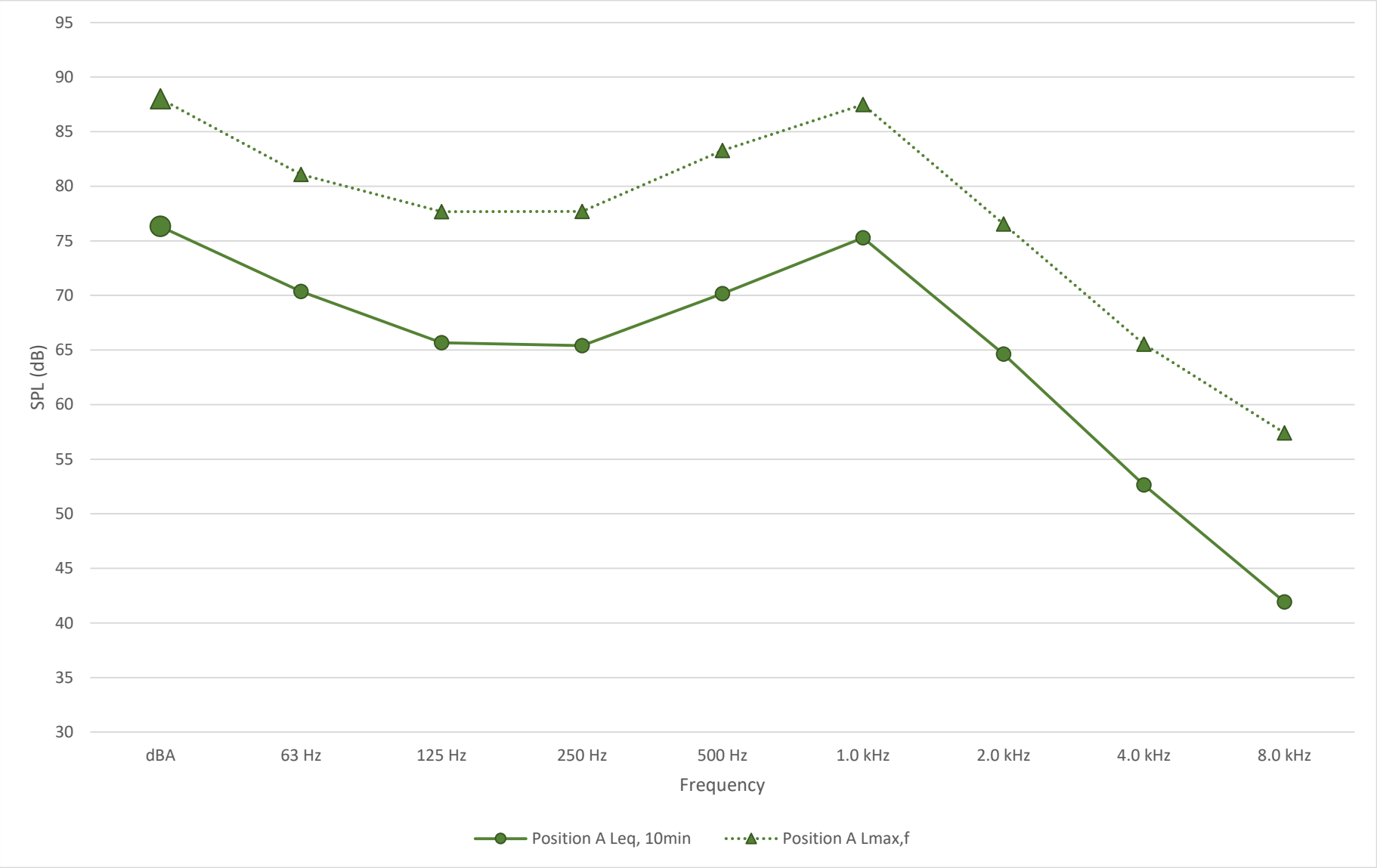
## Figure B.6 – Statistical Analysis of Background Sound Levels Measured at Position A



## Figure B.7 – Statistical Analysis of Background Sound Levels Measured at Position B



## Figure B.8 – $L_{eq}$ and $L_{max,F}$ Octave Band Spectra Measured at Position A (Thursday, 12 August 2021)



# APPENDIX C - NOISE MAP MODELS

**Figure C.1 – Daytime Noise Map (Undeveloped Site) $L_{Aeq,16hr}$ Contours at 1.5m Height**

**Figure C.2 – Night-time Noise Map (Undeveloped Site) $L_{Aeq,8hr}$ Contours at 1.5m Height**

**Figure C.3 – Daytime Noise Map (Developed Site) $L_{Aeq,16hr}$ Contours at 1.5m Height**

**Figure C.4 – Daytime Noise Map (Developed Site) $L_{Aeq,16hr}$ Contours at 4.5m Height**

**Figure C.5 – Night-time Noise Map (Developed Site) $L_{Aeq,8hr}$ Contours at 1.5m Height**

**Figure C.6 – Night-time Noise Map (Developed Site) $L_{Aeq,8hr}$ Contours at 4.5m Height**

# APPENDIX D - DRAWING LISTS

The following Company Name drawings and documents have been used in our assessment;

## Table D.1 – Drawing List

| Drawing Title | Drawing Number | Rev | Date |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |