Independent Acoustic Consultancy Practice

Environmental Noise and Vibration Assessment

Hoover Site
Merthyr Tydfil

7479/ENS1

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Environmental Noise and Vibration Assessment

Project:	**Hoover Site**
Site Address:	Pentrebach Merthyr Tydfil CF48 4TU
HA Reference:	7479/ENS1
Date:	20/11/2024
Client:	Walters Land Ltd Hirwaun House Hirwaun Ind Est Aberdare CF44 9UL
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1. INTRODUCTION

We understand a residential development is proposed on land at the Hoover Site in Pentrebach, Merthyr Tydfil, CF48 4TU.

The Client has requested a noise and vibration impact assessment is submitted to accompany the planning application.

This report has therefore been commissioned to assess existing ambient and background noise and vibration 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.

Note: The site is currently still being used as a distribution warehouse with numerous HGV movements in and out of the site day and night. All efforts have been made where practical to do so to remove these on-site contributions from the results of our survey.

2. CRITERIA

2.1 Planning Policy Wales

The Welsh Government's Planning Policy Wales (Edition 12) dated February 2024, 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.”

2.5 Building Regulations Part O 2022 Edition - For use in Wales

Requirement O1 of Part O in Wales applies when a new residential building is erected and states,

“(1) Reasonable provision must be made to –

a) limit unwanted solar gains in summer;
b) provide an adequate means to remove heat from the indoor environment.

(2) In meeting the obligations in sub-paragraph(1) –

a) ***account must be taken of the safety of any occupant, and their reasonable enjoyment of the building; and***
b) mechanical cooling may only be used where insufficient heat is capable of being removed from the indoor environment without it.

Under the heading *“Intention”*, it states that requirement O1(2)(a) is met if the building’s overheating mitigation strategy takes account of all the following:

a. Noise at night
b. Pollution
c. Security
d. Protection from falling
e. Protection from entrapment

Noise at night is covered in paragraphs 2.2 to 2.4 as follows:

“2.2 High levels of external noise could limit the use of cross-ventilation to mitigate the risk of summer overheating. External noise is a material consideration considered when applying for Planning permission and mitigating measures may be required in the design in order to obtain Planning permission and controlled through a condition imposed on the consent. In exceptional cases, this could include non-openable windows. More commonly, windows will be openable in order to enable natural ventilation to occur at less sensitive times of day, when there is lower noise, when people are not present in the room, or when they are present but not engaged in noise-sensitive activities. But those windows may need to be kept closed at times to maintain acceptable indoor acoustic conditions, for example when people are using the rooms for sleep or

office work. A noise issue may be identified at the Planning stage but rely on occupants to close windows at noise-sensitive times rather than prevent them from ever opening them, and in those cases overheating strategies should assume windows will be closed during noise-sensitive periods even if they are not fixed closed.

2.3 When the removing excess heat as part of the overheating strategy, noise levels in bedrooms should be kept to a minimum during the sleeping hours of 23:00 – 07:00. Building control bodies may accept as evidence that this requirement is satisfied:

a. documentation to demonstrate that the local planning authority did not consider external noise to be an issue at the site at the planning stage or;

b. if the local planning authority did consider external noise to be an issue that should be controlled through a condition at planning stage, then documentation to demonstrate that the proposals for heat removal (during the sleeping hours of 23.00 – 07.00) are accommodated within or do not conflict with documentation provided to the local planning authority to satisfy any related planning permission condition(s). (For example any expectation that windows on one or more façade, or in certain rooms, will need to be kept closed during noise-sensitive periods.)

2.4 Where active measures (e.g. mechanical system) are used for removing excess heat within the overheating strategy, the noise generated by these measures, particularly within bedrooms and living rooms should be considered. Noise generated by ventilation/cooling systems (which may travel through ducts) and noise from the fan unit may disturb the occupants of the building and so discourage their use. Therefore, the designer should consider minimising noise by careful design and the specification of quieter products. Further guidance on mechanical ventilation systems can be found in Approved Document F.

There are no further criteria or guidance on internal noise levels within Building Regulations Part O in Wales and therefore guidance is sought from the Acoustics, Ventilation and Overheating Residential Design Guide (AVO Guide): 2020 prepared by the Association of Noise Consultants (ANC) and the Institute of Acoustics (IOA).

2.6 AVO Guide: 2020

The Acoustics, Ventilation and Overheating – Residential Design Guide (AVO Guide) 2020 aims to assist designers to adopt an integrated approach to the acoustic design of residential dwellings within the context of ventilation and thermal comfort requirements.

The following Internal Ambient Noise Levels are quoted for guidance in AVOG.

Figure 2.1 Guidance for Level 2 assessment of noise from transport noise sources relating to overheating condition

Internal ambient noise level [Note 2]			Examples of Outcomes [Note 5]	
$L_{Aeq,T}$ [Note 3] during 07:00 – 23:00 [Note 6]	$L_{Aeq,8h}$ during 23:00 – 07:00	Individual noise events during 23:00 – 07:00 [Note 4]		
> 50 dB	> 42 dB	Normally exceeds 65 dB $L_{AF,max}$	Noise causes a material change in behaviour e.g. having to keep windows closed most of the time	Avoiding certain activities during periods of intrusion. 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.
			Increasing likelihood of impact on reliable speech communication during the day or sleep disturbance at night	At higher noise levels, more significant behavioural change is expected and may only be considered suitable if occurring for limited periods. As noise levels increase, small behaviour changes are expected e.g. turning up the volume on the television; speaking a little more loudly; having to close windows for certain activities, for example ones which require a high level of concentration. Potential for some reported sleep disturbance. Affects the acoustic environment inside the dwelling such that there is a perceived change in quality of life. At lower noise levels, limited behavioural change is expected unless conditions are prevalent for most of the time. [Note 8]
≤ 35 dB	≤ 30 dB	Do not normally exceed $L_{AF,max}$ 45 dB more than 10 times a night	Noise can be heard, but does not cause any change in behaviour	Noise can be heard, but does not cause any change in behaviour, attitude, or other physiological response[Note 9]. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.

2.7 British Standard 4142:2014+A1:2019

British Standard 4142:2014+A1:2019 “Methods for rating and assessing industrial and commercial sound”, provides current guidance for the assessment of industrial noise affecting residential receivers.

This standard describes a rating method comparing L_{Aeq} noise levels from the industrial source with pre-existing background L_{A90} levels at the residential receiver. It advises at a difference (industrial noise - background) of:

- +10dB or higher, likely to be an indication of a significant adverse impact, depending on the context.

- A difference of + 5dB, likely to be an indication of an adverse impact, depending on the context.

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

A sliding scale of penalties can be applied to industrial/commercial sound levels which have acoustically distinguishing characteristics, including tonality, impulsivity and intermittency.

Tonality – A penalty of 2dB for a tone which is just perceptible at the noise receptor, 4dB where it is clearly perceptible, and 6dB where it is highly perceptible.

Impulsivity – A penalty of 3dB for impulsivity which is just perceptible at the noise receptor, 6dB where it clearly perceptible, and 9dB where it is highly perceptible.

Other sound characteristics – Where the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3dB can be applied

Intermittency – If intermittency is readily distinctive against the residual acoustic environment, a penalty of 3dB can be applied.

BS 4142:2014 states under section 11;

"Where the initial estimate of the impact needs to be modified due to the context, take all pertinent factors into consideration, including the following.

1) *The absolute level of sound. For a given difference between the rating level and the background sound level, the magnitude of the overall impact might be greater for an acoustic environment where the residual sound level is high than for an acoustic environment where the residual sound level is low.*

Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night.

Where residual sound levels are very high, the residual sound might itself result in adverse impacts or significant adverse impacts, and the margin by which the rating level exceeds the background might simply be an indication of the extent to which the specific sound source is likely to make those impacts worse."

2.8 British Standard 6472-1:2008

British Standard 6472-1:2008 "Guide to Evaluation of Human Exposure to Vibration in Buildings" gives guidance figures for vibration dose value (VDV) ranges which might result in various probabilities of adverse comment within residential buildings, as shown below;

Table 2.3 – BS 6472-1:2008 VDV Guidance Ranges

Place and Time	Low Probability of Adverse Comment $m/s^{1.75}$	Adverse Comment Possible $m/s^{1.75}$	Adverse Comment Probable $m/s^{1.75}$
Residential buildings 16 h day	0.2 to 0.4	0.4 to 0.8	0.8 to 1.6
Residential buildings 8 h day	0.1 to 0.2	0.2 to 0.4	0.4 to 0.8

In our experience, Local Planning Authorities typically request that dwellings are designed and constructed so as to ensure that vibration dose values do not exceed $0.4m/s^{1.75}$ 0700-2300hrs daytime, and $0.26m/s^{1.75}$ 2300-0700hrs night-time, as calculated in accordance with BS 6472-1:2008 [1Hz to 80Hz].

3. ENVIRONMENTAL NOISE SURVEY

3.1 Procedures

3.1.1 Continuous Monitoring

Continuous noise monitoring was carried out from 1300hrs on Wednesday, 09 October 2024 to 1500hrs on Monday, 14 October 2024 at positions A-D.

Note: There was a power fail on the sound level meter at Position B after a few hours and therefore further continuous noise monitoring was carried out from 1400hrs on Tuesday, 22 October 2024 to 1500hrs on Thursday, 24 October 2024 at Positions B and E (the opportunity was taken to place an additional monitor near Pentrebach train station during the repeat survey).

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.

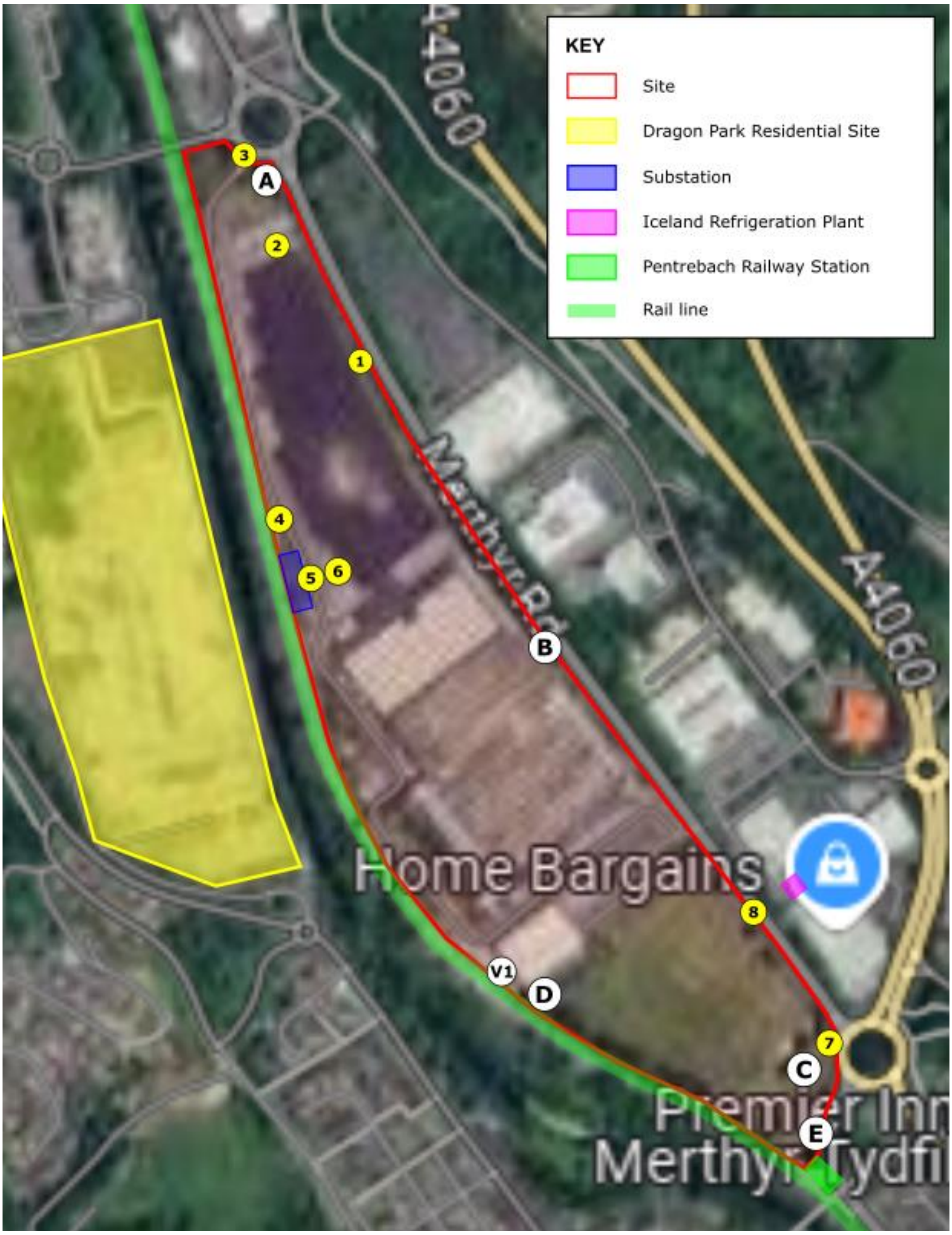
Site plan in Figure 3.1 below shows the development site and continuous monitoring positions used, namely:

Table 3.1 – Continuous Monitoring Location Details

Position	Description
A	Located on tripod at the northern corner of the site approximately 8m from roundabout.
B	Located on lamppost approximately 10m from A4054 Merthyr Road with full line of sight to road. Microphone approximately 2m above local site level.
C	Located on flagpole at the rear of Cricket Club approximately 30m from Pentrebach roundabout.
D	On palisade fence approximately 8m from rail line, approximately 2.2m above local site level.
E	Located on tripod at the southern corner of the site approximately 12m from Pentrebach train station.

Note: All microphone positions approximately 1.5m above local ground level unless stated otherwise above.

Figure 3.1 – Site Plan Showing Monitoring Locations



3.1.2 Sample Measurements

Additional sample measurements were taken on Monday, 14 October 2024 (and during the night-time on Tuesday 22 October 2023 at Position 8).

Parameters recorded include L_{max} and L_{eq} levels including 1/3 octave band spectra.

Site plan in Figure 3.1 shows the sample measurement positions used, namely:

Table 3.2 – Sample Measurement Location Details

Position	Description
1	Road traffic sample of Merthyr Road. Road slightly elevated above site at this location. Monitored approx. 9m back from road.
2	Road traffic sample of Merthyr Road. Road elevated above site at this location. Monitored approx. 20m back from site retaining wall, approx. 28m to Merthyr Road.
3	Road traffic sample at northern gates to roundabout, approx. 12m to roundabout road
4	On western site boundary approx.7m from rail line.
5	Approx. 10m from sub-station transformers
6	Approx. 24m from sub-station transformers
7	Approx. 6m back from Merthyr Road near roundabout
8	Approx. 42m from Iceland plant at night. Just outside site boundary.

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 to Figure B.5 of Appendix B.

To summarise, the weather conditions during the monitoring period were generally dry with exception of light rain showers on 10/10/2024, 12/10/2024, during the early hours between 0100-0800hrs on 14/10/2024 and again between 0600-0800hrs on the 23/10/2024.

Wind speeds were generally below 5m/s (11mph).

3.3 Measurement Equipment

The following measurement equipment was used during the surveys:

Table 3.3 – Noise Monitoring Equipment List

Make	Description	Model	Serial Number	Last Calibrated	Certificate No.
NTi	Type 1 - Sound Level Meter	XL2-TA	A2A-08723-E0	27 October 2023	UK-23-127
	Preamplifier	MA220	1820	27 October 2023	UK-23-127
	Filters	XL2-TA	A2A-08723-E0	27 October 2023	UK-23-127
	Microphone Capsule	MC230	9381	27 October 2023	UK-23-127
NTi	Type 1 - Sound Level Meter	XL2-TA	A2A-10021-E0	15 August 2023	UK-23-094
	Preamplifier	MA220	5435	15 August 2023	UK-23-094
	Microphone Capsule	MC230	8547	15 August 2023	UK-23-094
NTi	Type 1 - Sound Level Meter	XL2-TA	A2A-13022-E0	21 November 2023	UK-23-093
	Preamplifier	MA220	13634	21 November 2023	UK-23-093
	Microphone Capsule	MC230	A14127	21 November 2023	UK-23-093
NTi	Type 1 - Sound Level Meter	XL2-TA	A2A-14577-E0	21 June 2024	UK-24-065
	Preamplifier	MA220	7485	21 June 2024	UK-24-065
	Microphone Capsule	MC230	A15594	21 June 2024	UK-24-065
NTi	Type 1 - Sound Level Meter	XL2-TA	A2A-19813-E0	27 October 2023	UK-23-128
	Preamplifier	MA220	10302	27 October 2023	UK-23-128
	Microphone Capsule	MC230A	A21824	27 October 2023	UK-23-128
Larson Davis	Calibrator (94.00dB / 114.03dB @ 1kHz)	CAL200	19047	14 August 2024	48532
Leica	Laser measure	DISTO D510	1081540163	14 May 2018	1081540163

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.6, Figure B.7, Figure B.8, Figure B.9 and Figure B.10 of Appendix B show L_{Amax}, L_{Aeq} and L_{A90} sound pressure levels measured at positions A, B, C, D & E respectively.

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

Table 3.4 – Summary of Daytime $L_{Aeq,16hr}$ and Night-time $L_{Aeq,8hr}$ Results

Period	Date	Position				
		A	B	C	D	E
Daytime $L_{Aeq,10hr}$ (dB)	09/10/2024	55	-	59	57	-
Night-time $L_{Aeq,8hr}$ (dB)	09/10/2024	49	-	54	53	-
Daytime $L_{Aeq,16hr}$ (dB)	10/10/2024	55	-	60	56	-
Night-time $L_{Aeq,8hr}$ (dB)	10/10/2024	48	-	52	53	-
Daytime $L_{Aeq,16hr}$ (dB)	11/10/2024	55	-	59	56	-
Night-time $L_{Aeq,8hr}$ (dB)	11/10/2024	48	-	53	51	-
Daytime $L_{Aeq,16hr}$ (dB)	12/10/2024	55	-	60	57	-
Night-time $L_{Aeq,8hr}$ (dB)	12/10/2024	47	-	51	47	-
Daytime $L_{Aeq,16hr}$ (dB)	13/10/2024	53	-	57	54	-
Night-time $L_{Aeq,8hr}$ (dB)	13/10/2024	*52**	-	*58**	*54**	-
Daytime $L_{Aeq,8hr}$ (dB)	14/10/2024	57	-	63	57	-
Daytime $L_{Aeq,9hr}$ (dB)	22/10/2024	-	63	-	-	58
Night-time $L_{Aeq,8hr}$ (dB)	22/10/2024	-	56	-	-	54
Daytime $L_{Aeq,16hr}$ (dB)	23/10/2024	-	64	-	-	59
Night-time $L_{Aeq,8hr}$ (dB)	23/10/2024	-	57	-	-	53
Daytime $L_{Aeq,8hr}$ (dB)	24/10/2024	-	64	-	-	60

** Noise levels elevated by rainfall and therefore discounted from assessment.*

Daytime period is therefore assessed as critical (>5dB difference between daytime and night-time at majority continuous monitoring positions).

The following number of $L_{Amax,F}$ events over 82dB were measured during the night-time periods (2300-0700hrs):

- Pos A 2no events on night of 10/10/2024, 1no event on night of 11/10/2024
- Pos B 5no events on night of 23/10/2024
- Pos C None
- Pos D 6no events on nights of 09 & 10/10/2024, 5no events on nights of 11 & 13/10/2024 and 2no events on night of 12/10/2024 (Sat into Sun)
- Pos E None

Positions A, B, C & E were controlled by road traffic noise from the surrounding road networks. Position D was controlled by railway noise.

10th highest $L_{Amax,F}$ events measured at each location during the night-time are set out below:

Table 3.5 – 10th Highest $L_{Amax,F}$ Events Measured During Night-time Period

Position	10th Highest $L_{Amax,F}$ Events (dB)
A	70
B	78
C	68
D	68*
E	68

** Typical train pass-bys at Position D (of which there were less than 10) were typically in the range 80-85dB $L_{Amax,F}$.*

Train brake squeal and engine revving from trains arriving and departing at Pentrebach train station were also noted at Position E.

L_{eq} and $L_{Amax,F}$ octave band spectra for typical train events at Positions D and E are included in Figure B.12 of Appendix B.

3.4.2 Sample Measurements

Results of sample measurements are shown in Table 3.6 below.

Table 3.6 – Sample Measurement Results

Pos	Description	Time (hh:mm)	Duration (mm:ss)	L_{Aeq} (dB)	$L_{Amax,F}$ (dB)	L_{A90} (dB)
1	Merthyr Road at approx. 9m	14:22	09:08	62	79	52
2	Merthyr Road at North of site, approx. 28m	14:36	07:24	55	63	51
3	North roundabout at gates	14:48	10:00	59	70	54
4	Train pass-by at 7m	15:08	00:16	75	85	-
4	General (no trains)	15:14	04:02	47	50	46
X	Approx. 30m north of sub-station transformers	15:18	00:10	47	47	-
5	Approx. 10m from sub-station transformers	15:21	00:27	53	54	-
6	Approx. 24m from sub-station transformers	15:22	00:12	47	47	-
X	3-4m back from sub-station transformer 1	15:26	00:16	55	57	-
X	3-4m back from sub-station transformer 2	15:28	00:12	57	58	-
7	Merthyr Road near southern roundabout, approx. 8m	15:59	10:00	65	75	61
8	Approx. 42m from Iceland plant at night. Just outside site boundary.	23:32	00:30	45	47	44

L_{eq} and $L_{Amax,F}$ octave band spectra for road traffic noise from Merthyr Road at Positions 1, 3 and 7 are included in Figure B.11 of Appendix B.

L_{eq} third-octave band spectra for sub-station transformer measurements are included in Figure B.13 of Appendix B.

L_{eq} octave band spectra for night-time Iceland plant are included in Figure B.14 of Appendix B.

4. RAIL VIBRATION SURVEY

4.1 Procedure

Continuous vibration monitoring was carried out from 1300hrs on Wednesday, 09 October 2024 to 1500hrs on Monday, 14 October 2024.

Vibration levels were monitored in three orthogonal axes:

- Radial (horizontal, perpendicular to line of tracks)
- Tangential (horizontal, parallel to line of tracks)
- Vertical

Consecutive 1-minute 1/3-octave RMS acceleration spectra (a_{rms}) were recorded as well as hourly VDVs.

Site plan in Figure 3.1 shows the development site and vibration monitoring position used, namely:

Table 4.1 – Vibration Monitoring Location Details

Position	Description
V1	Located on concrete pad at base of palisade fence on western site boundary approximately 7m from the nearest rail line.

4.2 Equipment Used

The following measurement equipment was used during the surveys:

Table 4.2 – Vibration Monitoring Equipment List

Make	Description	Model	Serial Number	Last Calibrated	Certificate No.
Svantek	Vibration Terminal	SV803	142457	02 July 2024	1509104-1

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

4.3 Results

Table B.1 to Table B.5 of Appendix B show hourly vibration dose value (VDV) results for continuous vibration monitoring at position V1 for each day of monitoring.

Total daytime (0700-2300hrs) and night-time (2300-0700hrs) VDV results are summarised in the table below:

Table 4.3 – Summary of Continuous Vibration Monitoring Results at Position V1

Axis	Monitoring Day in October 2024				
	9th	10th	11th	12th	13th
Radial Totals					
VDV_d Day: 0700-2300hrs ($m/s^{1.75}$)	0.010	0.011	0.011	0.011	0.009
VDV_d Night: 2300-0700hrs ($m/s^{1.75}$)	0.010	0.009	0.008	0.006	0.011
Tangential Totals					
VDV_d Day: 0700-2300hrs ($m/s^{1.75}$)	0.006	0.006	0.007	0.007	0.006
VDV_d Night: 2300-0700hrs ($m/s^{1.75}$)	0.006	0.005	0.004	0.003	0.006
Vertical Totals					
VDV_b Day: 0700-2300hrs ($m/s^{1.75}$)	0.045	0.046	0.050	0.049	0.042
VDV_b Night: 2300-0700hrs ($m/s^{1.75}$)	0.042	0.040	0.031	0.025	0.039

Vibration dose values do not therefore exceed $0.4m/s^{1.75}$ 0700-2300hrs daytime, and $0.26m/s^{1.75}$ 2300-0700hrs night-time, as calculated in accordance with BS 6472-1:2008 [1Hz to 80Hz].

5. INDUSTRIAL NOISE CONTRIBUTIONS

5.1 Transformer Noise

Noise from the transformers on the western site boundary was clearly audible and highly tonal (refer to third octave band spectra graph in Figure B.13 of Appendix B)Appendix B

If the transformers are to remain, then good acoustic design is required to ensure any residential dwellings in close proximity to these are suitably protected.

At this stage, we would advise:

- Distance between the transformers and potential dwellings should be maximised
- Potential acoustic screening of the noise sources by means of a suitably designed acoustic barrier or enclosure
- Potential uprated glazing and ventilation to new dwellings to control noise intrusion

This should be reviewed by a suitably qualified acoustician at detailed design stage.

5.2 Iceland Plant Noise

Noise from Iceland plant is barely audible over the road traffic noise at the closest site boundary during the daytime but is audible during lulls in traffic.

At night, with levels around 45dB L_{Aeq} and the plant clearly audible and tonal (refer to Figure B.14 in Appendix B), it is advised that mitigation measures likely to be required to control road traffic noise intrusion would be suitable to control noise intrusion from the Iceland plant also.

Again, this should be reviewed by a suitably qualified acoustician at detailed design stage.

6. NOISE MAP MODELLING

Three-dimensional noise map modelling has been undertaken using environmental noise mapping software package, which in turn uses calculation methods of Calculation of Road Traffic Noise (CRTN) and ISO 9613-2.

Models have been set up to predict daytime and night-time 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, with the buildings currently on the site removed.

The noise map models in Appendix C show predicted combined road, rail and industrial noise levels during the daytime period (0700-2300hrs) and night-time periods at 1.5m and 4.5m above local ground level across the undeveloped site (existing buildings removed).

Noise models indicate during the daytime, the majority of the site is falls under NEC A of TAN11 with exception of boundaries in close proximity to Merthyr Road and the rail line which fall under NEC B of TAN11 (refer to Figure C.1). At night, the site falls mainly under NEC B of TAN11 (refer to Figure C.3).

7. DISCUSSION

7.1 Road & Rail Noise

For levels falling under NEC B, TAN11 advises:

“Noise should be taken into account when determining planning applications and, where appropriate, conditions imposed to ensure an adequate level of protection.”

We would therefore advise the site is suitable for residential development and that a suitably worded condition could be included on any forthcoming consent to control noise intrusion to habitable rooms and to private external amenity areas (gardens).

For NEC B sites, developers should take into account ‘Good Acoustic Design’ principles in line with Welsh Government planning policy (see Sections 2.1 and 2.2) when designing residential housing layouts.

7.2 Industrial Noise Sources

Survey work has identified noise from transformers on the western boundary and noise from fixed services plant on the Iceland store at the eastern boundary.

A comprehensive BS 4142:2014+A1:2019 assessment should be undertaken at detailed design stage by a Suitably Qualified Acoustician and any noise mitigation measures to reduce adverse impact determined.

8. CONCLUSION

An environmental noise and vibration assessment has been carried out for the proposed residential development at Hoover Site, Pentrebach, Merthyr Tydfil, County, CF48 4TU.

Road traffic is indicated to control the ambient noise climate day and night across the site, with rail traffic controlling at the western boundary.

Noise and vibration surveys have been carried out across the site. Additional sample measurements were undertaken to aid calibration of a noise map model.

Noise map models have been generated to show noise propagation across the undeveloped site.

The site is indicated to fall mainly under NEC B of TAN 11. TAN 11 therefore advises:

"Noise should be taken into account when determining planning applications and, where appropriate, conditions imposed to ensure an adequate level of protection."

We would therefore advise the site is suitable for residential development and that a suitably worded condition could be included on any forthcoming consent to control noise intrusion to habitable rooms and to private external amenity areas (gardens).

Survey work has identified noise from transformers on the western boundary and noise from fixed services plant on the Iceland store at the eastern boundary.

A comprehensive BS 4142:2014+A1:2019 assessment should be undertaken at detailed design stage by a Suitably Qualified Acoustician and any noise mitigation measures to reduce adverse impact determined.

APPENDIX A - ACOUSTIC TERMINOLOGY

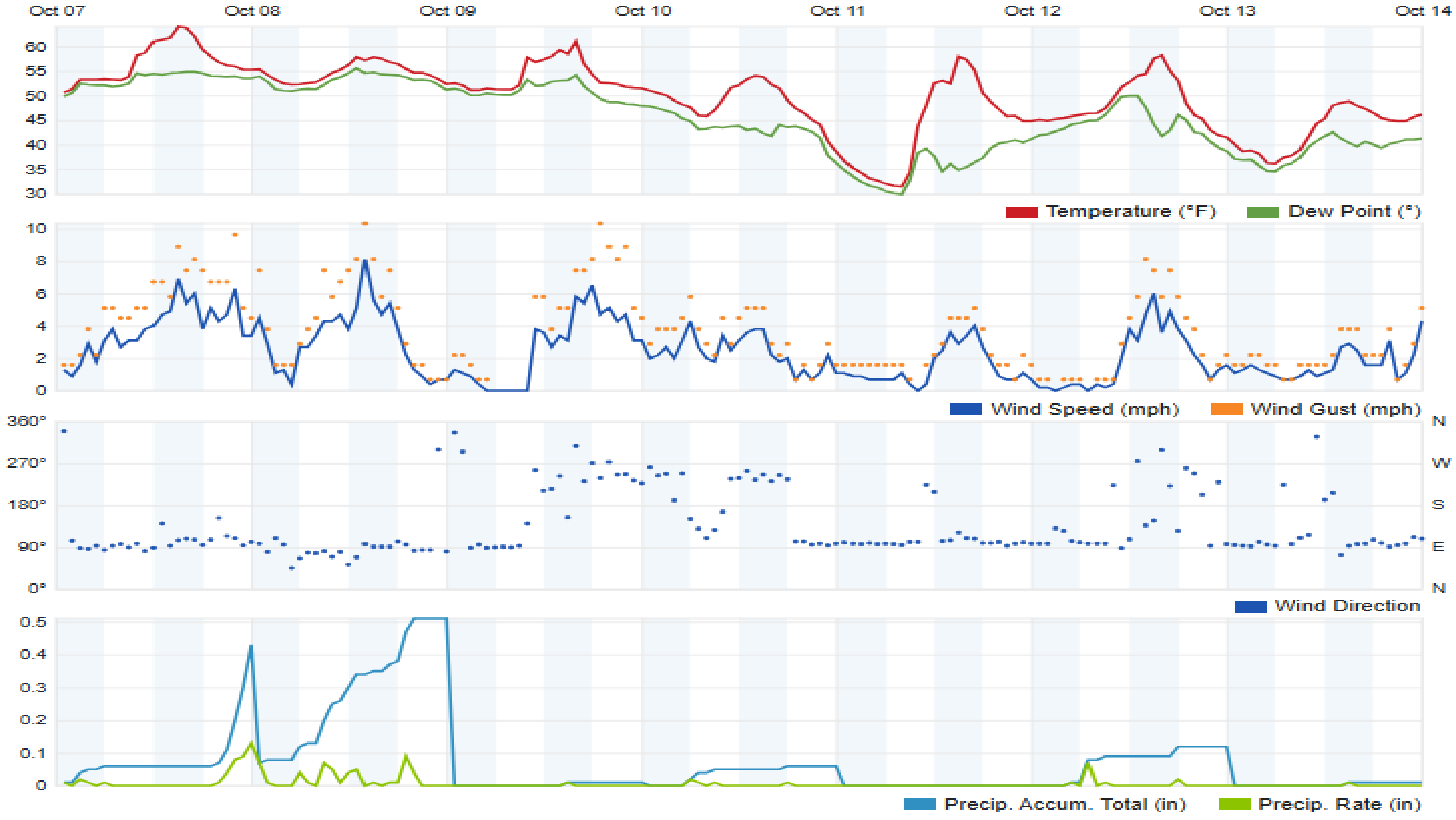
Human response to noise depends on a number of factors including loudness, frequency content and variations in level with time. Various frequency weightings and statistical indices have been developed in order to objectively quantify 'annoyance'.

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.
$L_{Ar,Tr}$	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
$VDV_{b/d,T}$	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.

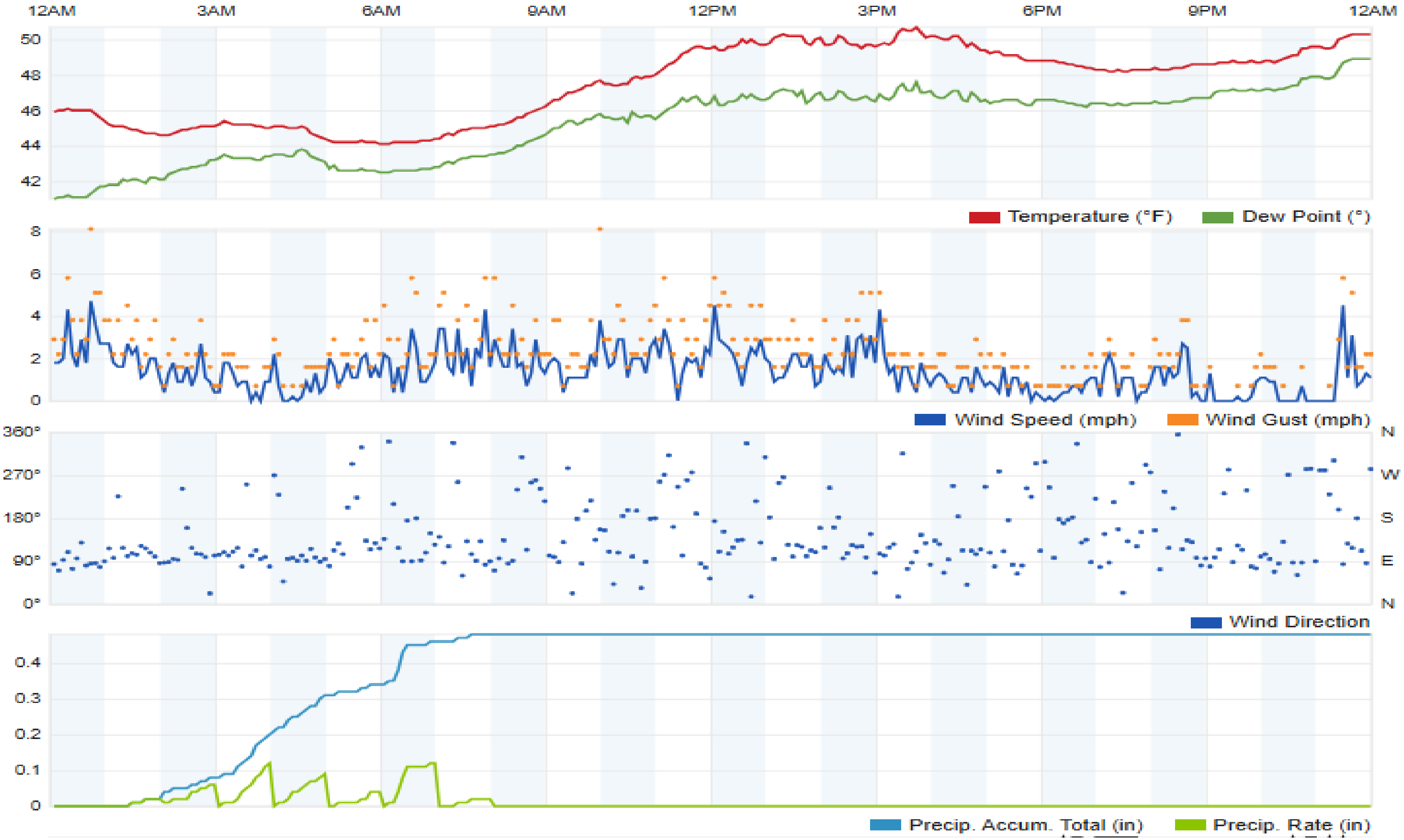
APPENDIX B - DIAGRAMS, GRAPHS AND TABLES

Figure B.1 – Approximate Weather History for Wednesday, 09 October 2024 to Sunday, 13 October 2024



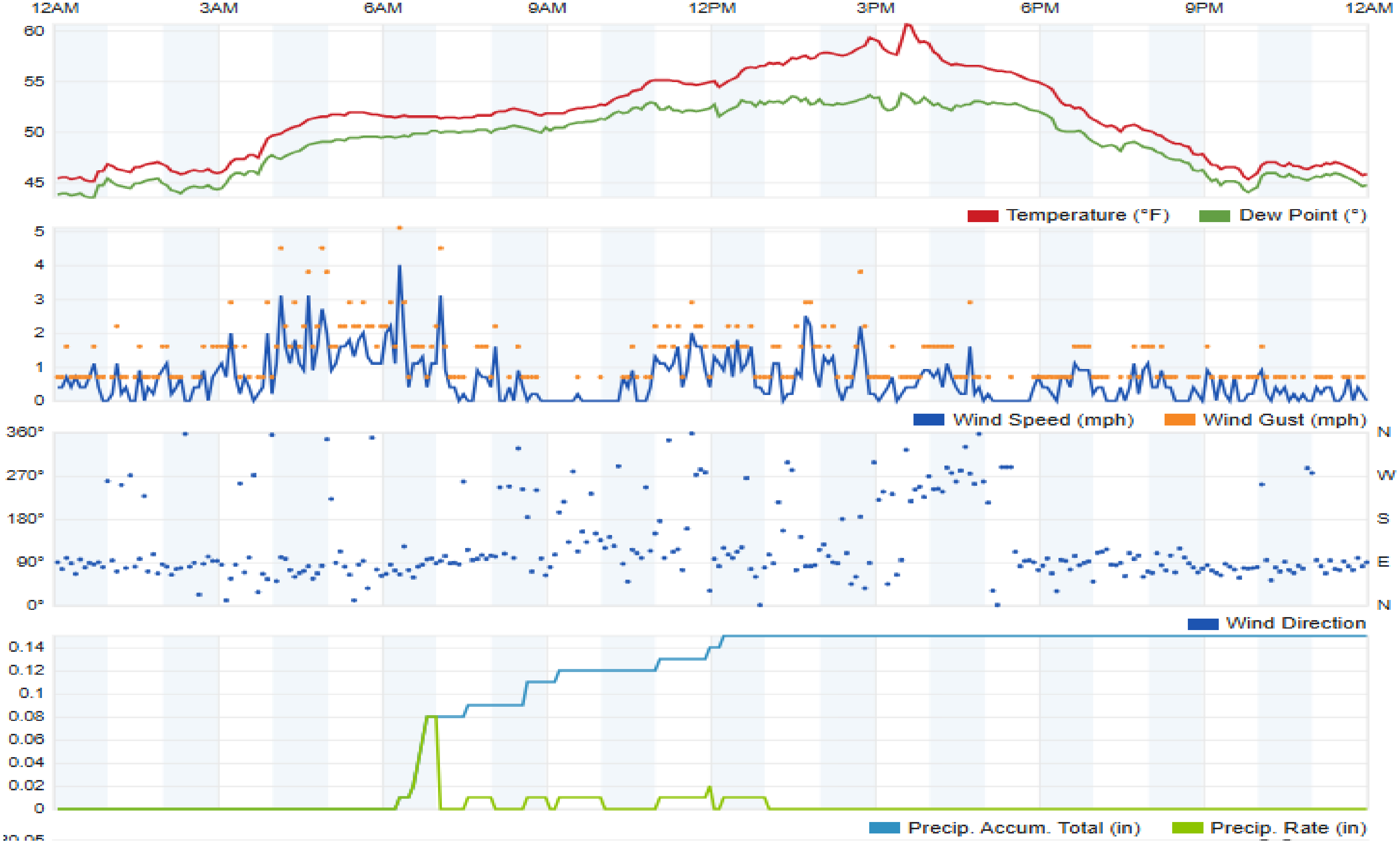
Note: Taken from www.wunderground.com - weather station IMERTH5 located in Merthyr Tydfil [Elev 237 51.752° N, 3.368° W]

Figure B.2 – Approximate Weather History for Monday, 14 October 2024



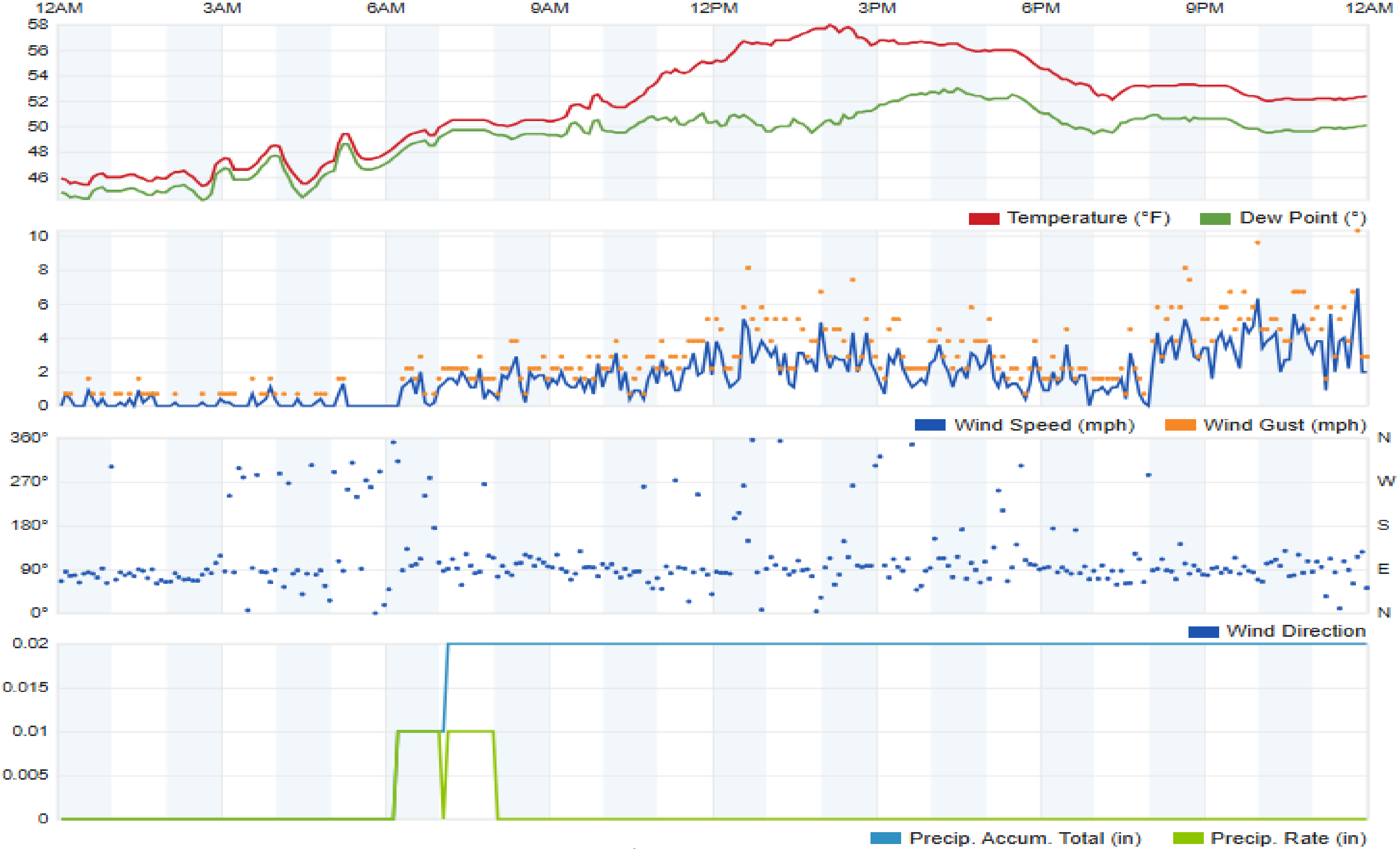
Note: Taken from www.wunderground.com - weather station IMERTH5 located in Merthyr Tydfil [Elev 237 51.752° N, 3.368° W]

Figure B.3 – Approximate Weather History for Tuesday, 22 October 2024



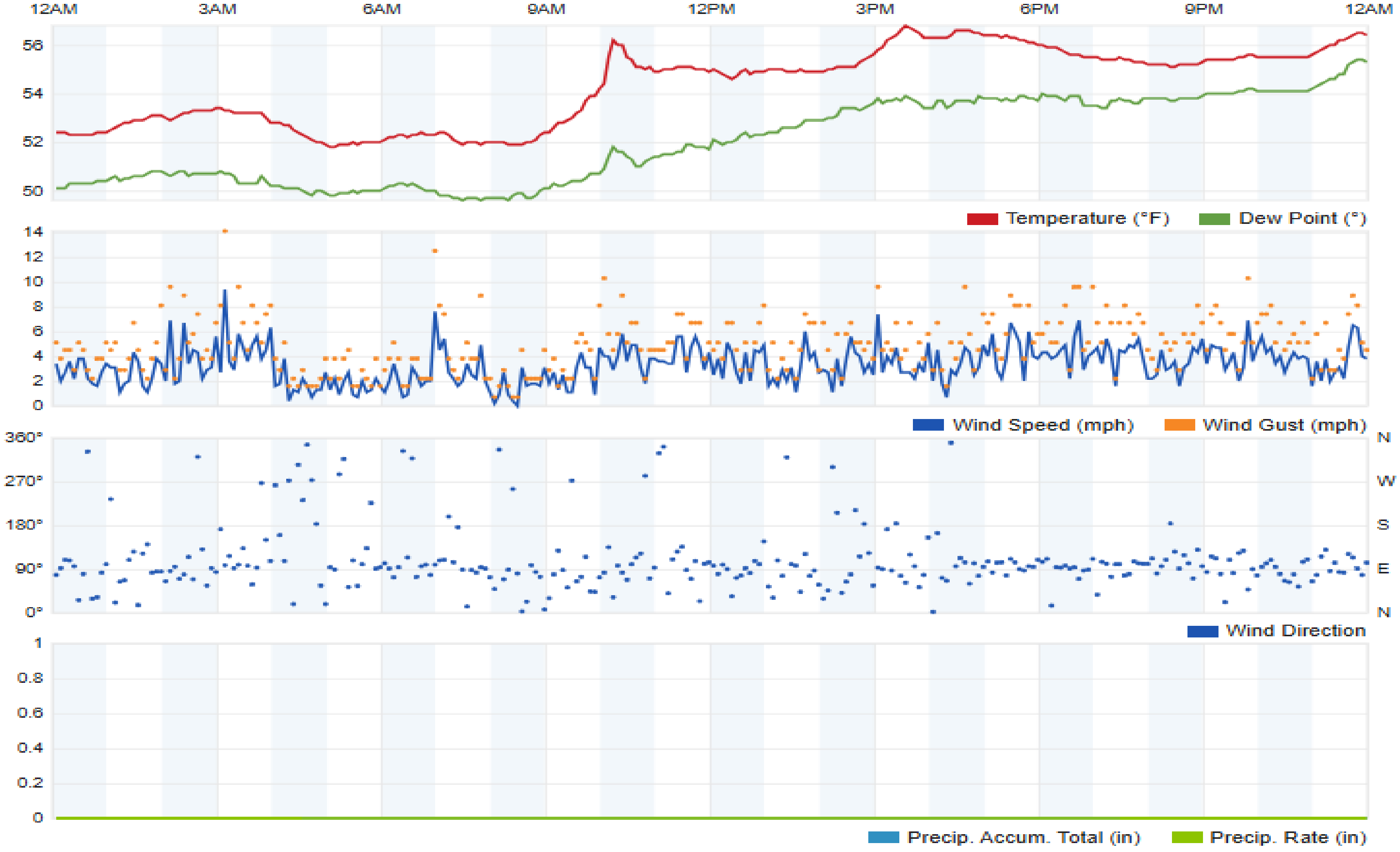
Note: Taken from www.wunderground.com - weather station IMERTH5 located in Merthyr Tydfil [Elev 237 51.752° N, 3.368° W]

Figure B.4 – Approximate Weather History for Wednesday, 23 October 2024



Note: Taken from www.wunderground.com - weather station IMERTH5 located in Merthyr Tydfil [Elev 237 51.752° N, 3.368° W]

Figure B.5 – Approximate Weather History for Thursday, 24 October 2024



Note: Taken from www.wunderground.com - weather station IMERTH5 located in Merthyr Tydfil [Elev 237 51.752° N, 3.368° W]

Figure B.6 – Time History at Position A (Wednesday, 09 October 2024 to Monday, 14 October 2024)

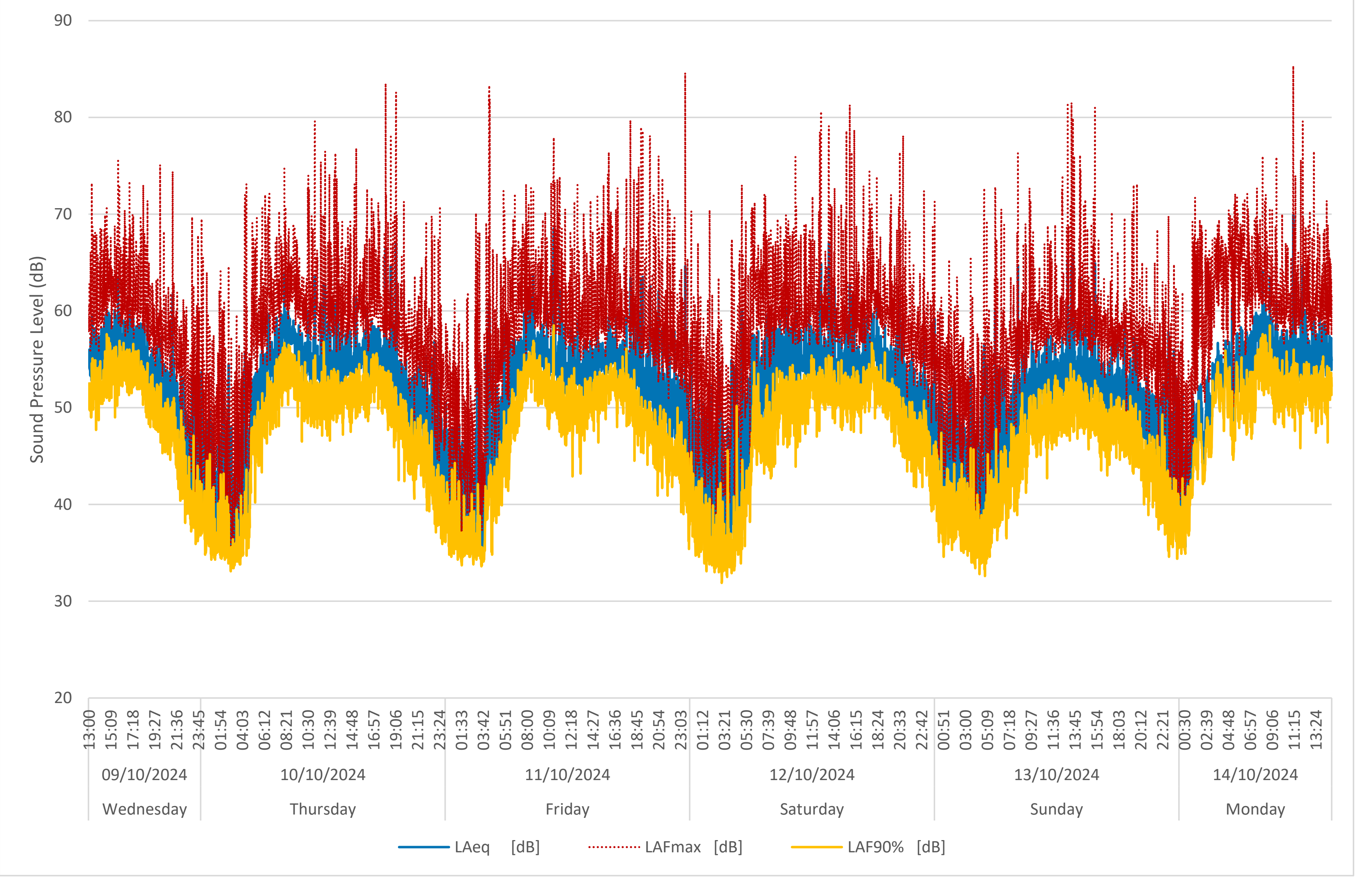


Figure B.7 – Time History at Position B (Tuesday, 22 October 2024 to Thursday, 24 October 2024)

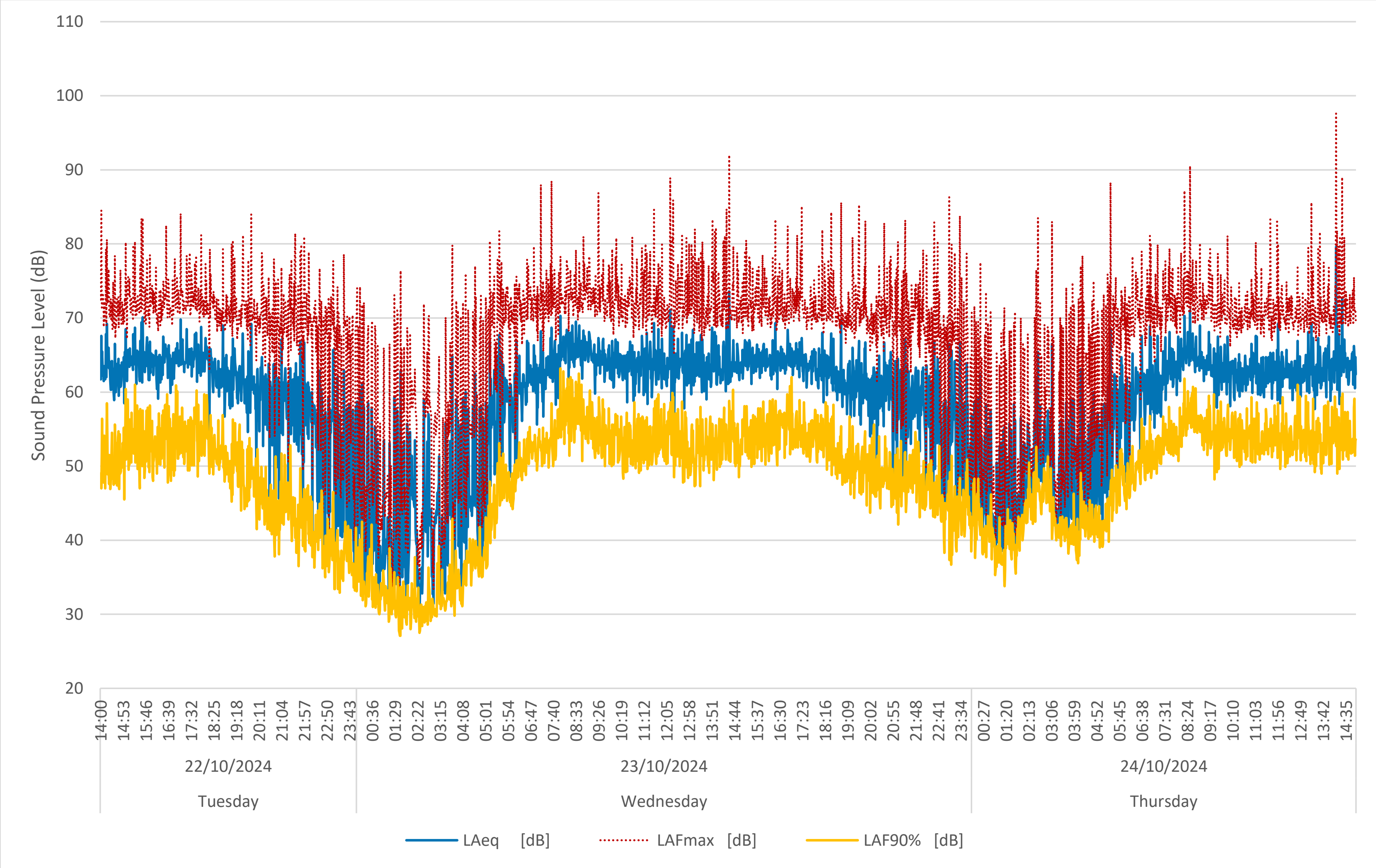


Figure B.8 – Time History at Position C (Wednesday, 09 October 2024 to Monday, 14 October 2024)

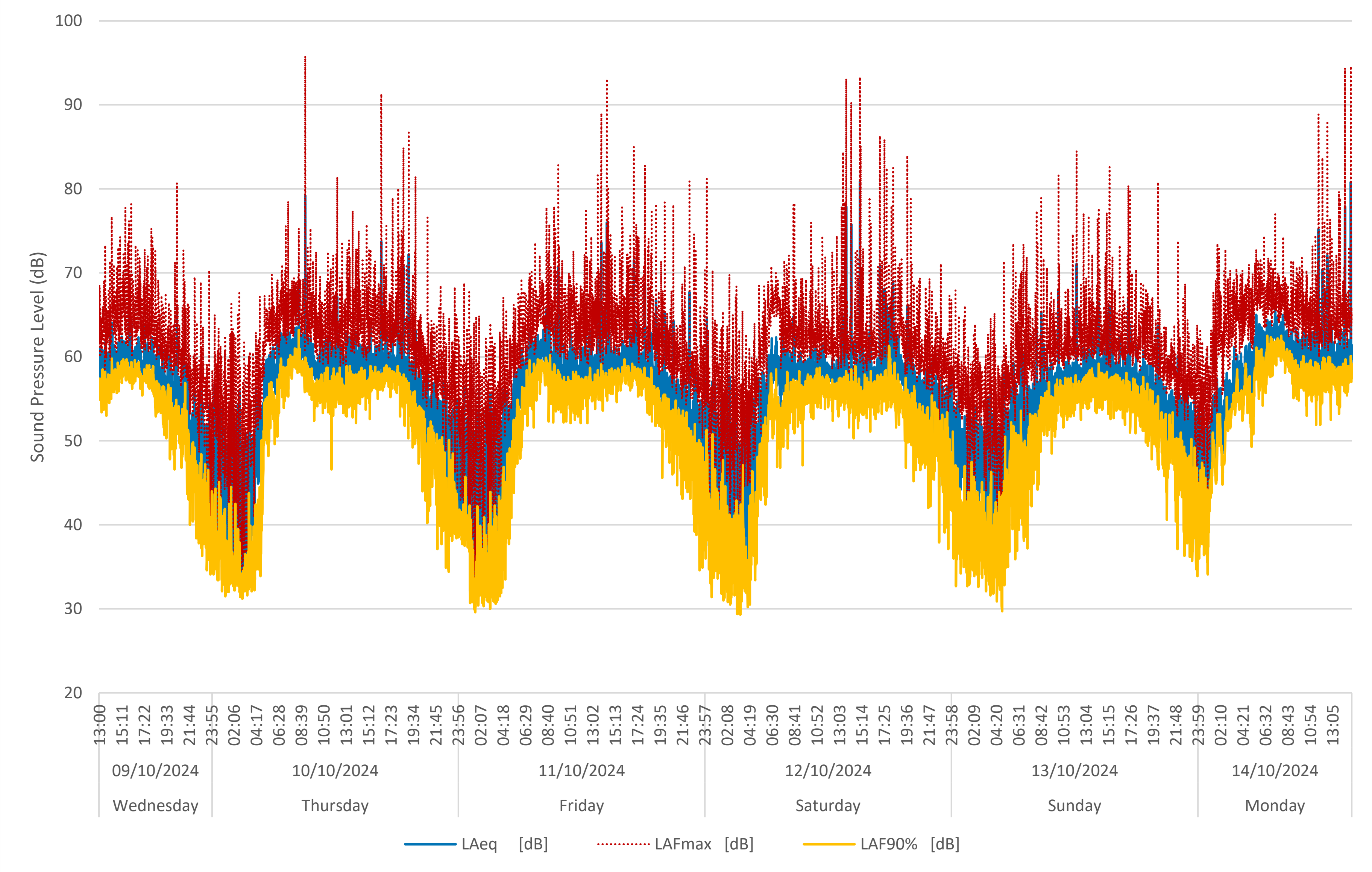


Figure B.9 – Time History at Position D (Wednesday, 09 October 2024 to Monday, 14 October 2024)

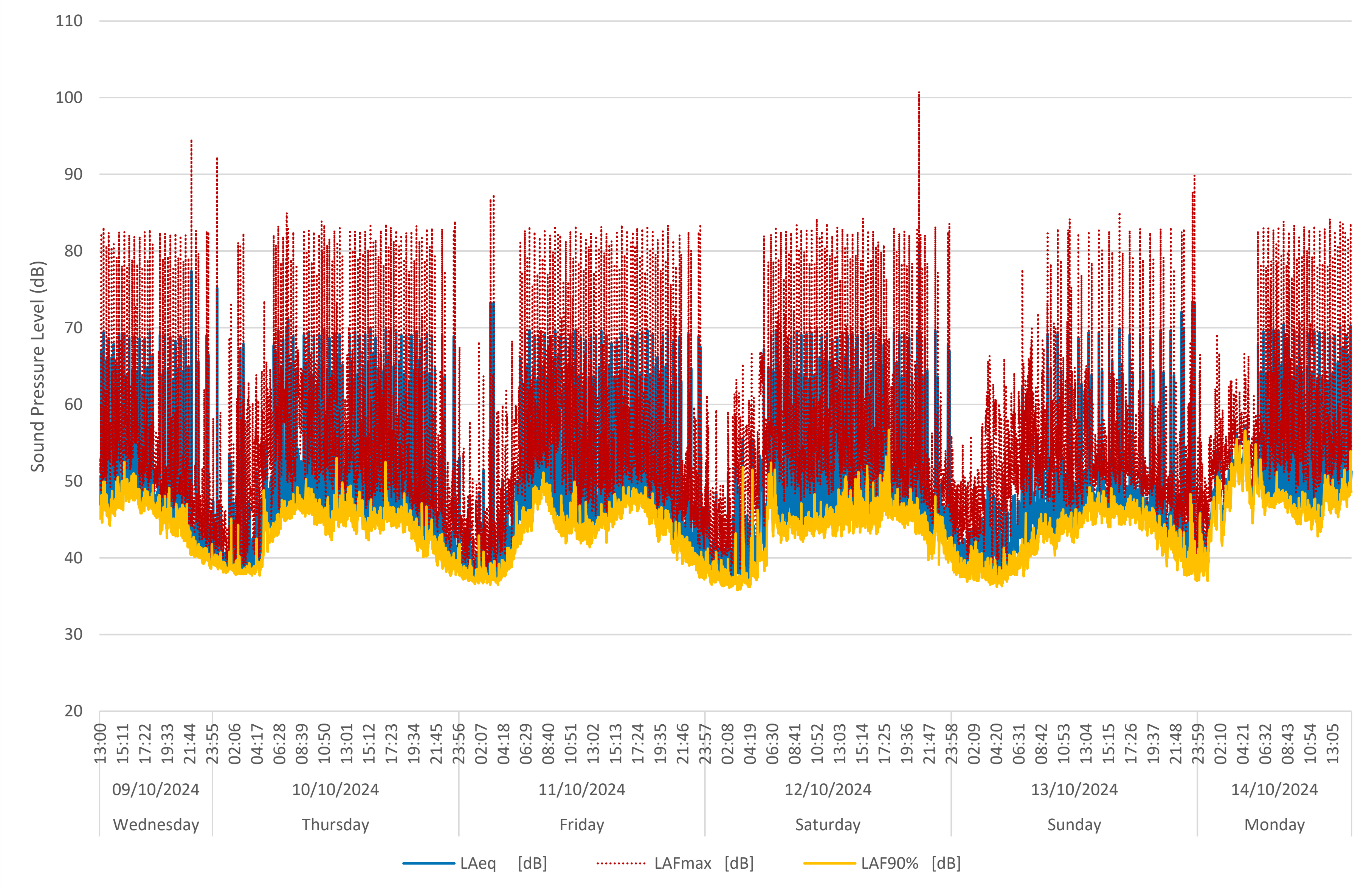


Figure B.10 – Time History at Position E (Tuesday, 22 October 2024 to Thursday, 24 October 2024)

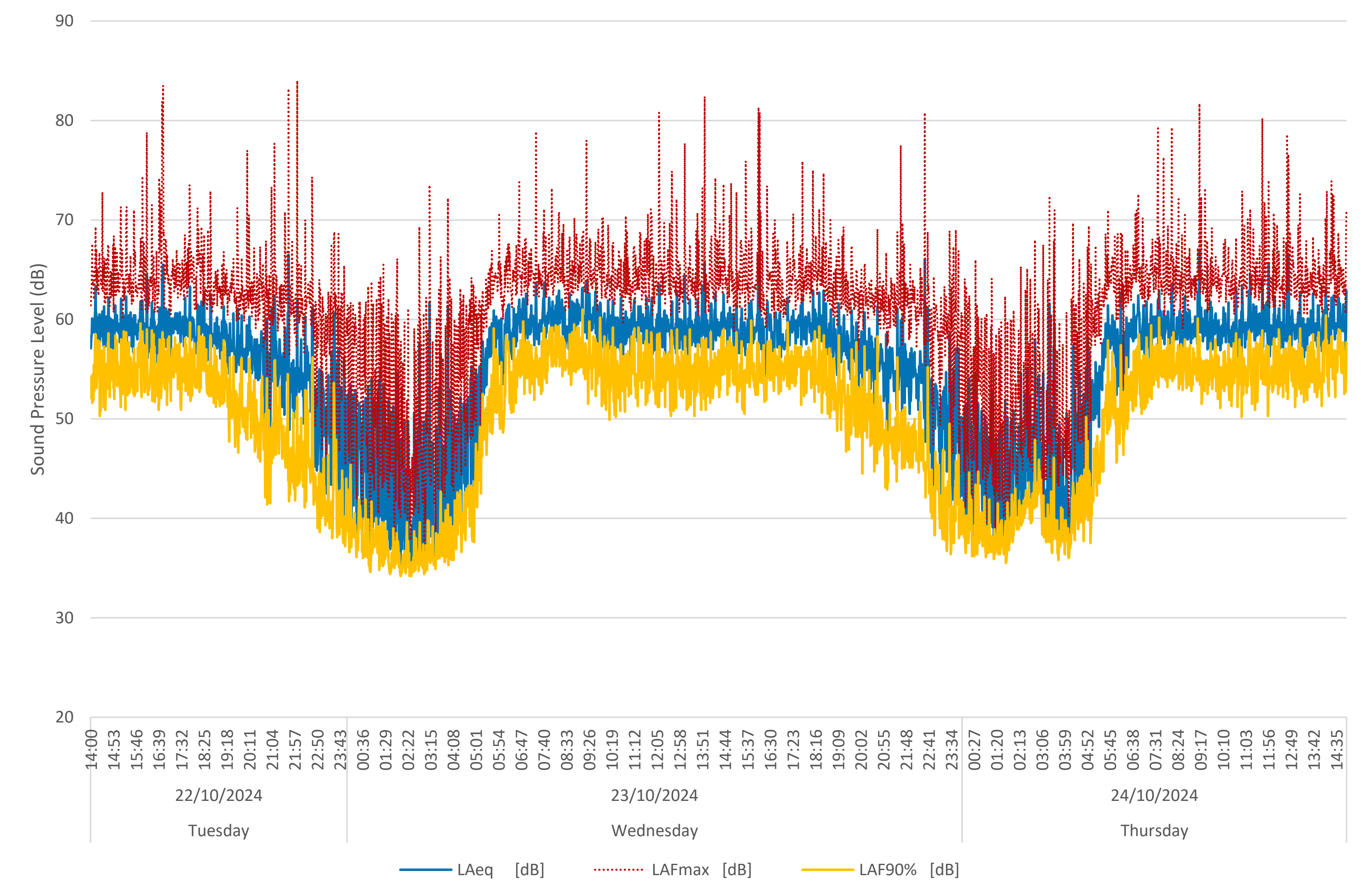


Figure B.11 – L_{eq} and $L_{max,F}$ Octave Band Spectra for Merthyr Road Measured at Positions 1, 3 & 7 (Monday, 14 October 2024)

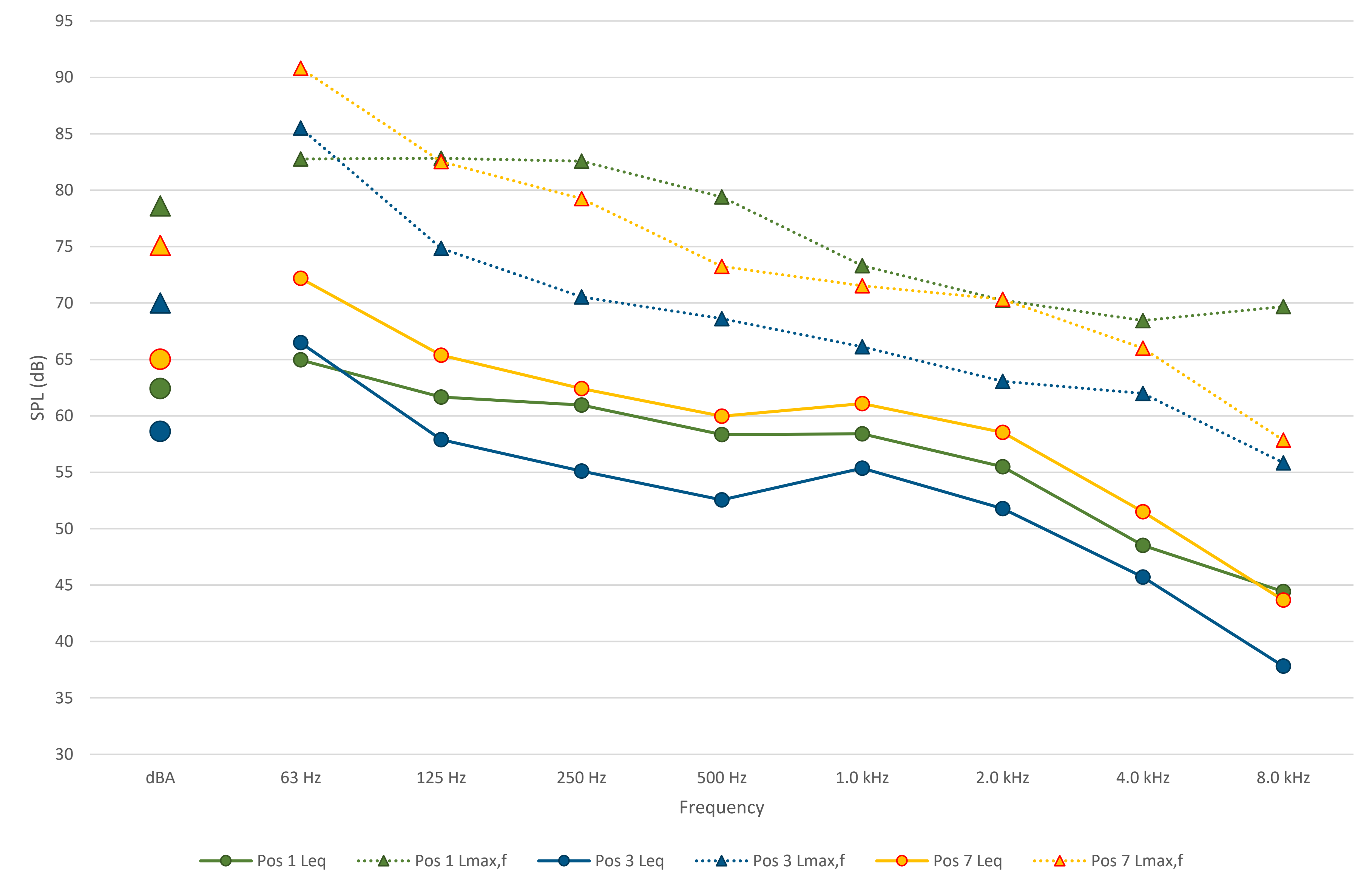


Figure B.12 – L_{eq} and $L_{max,F}$ Octave Band Spectra for Train Events Measured at Positions D & E

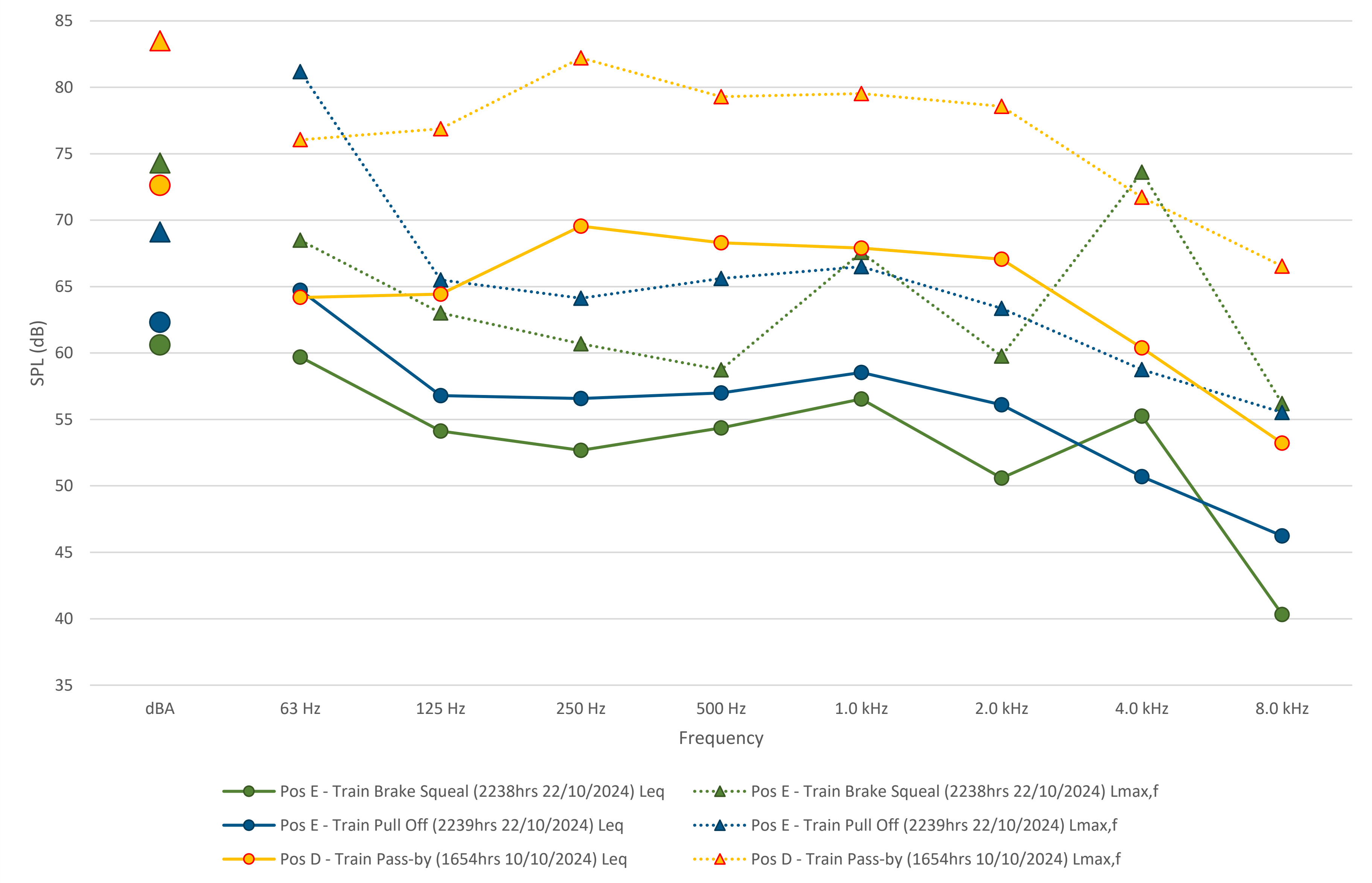


Figure B.13 – L_{eq} Third Octave Band Spectra for Sub-Station Transformers (Monday, 14 October 2024)

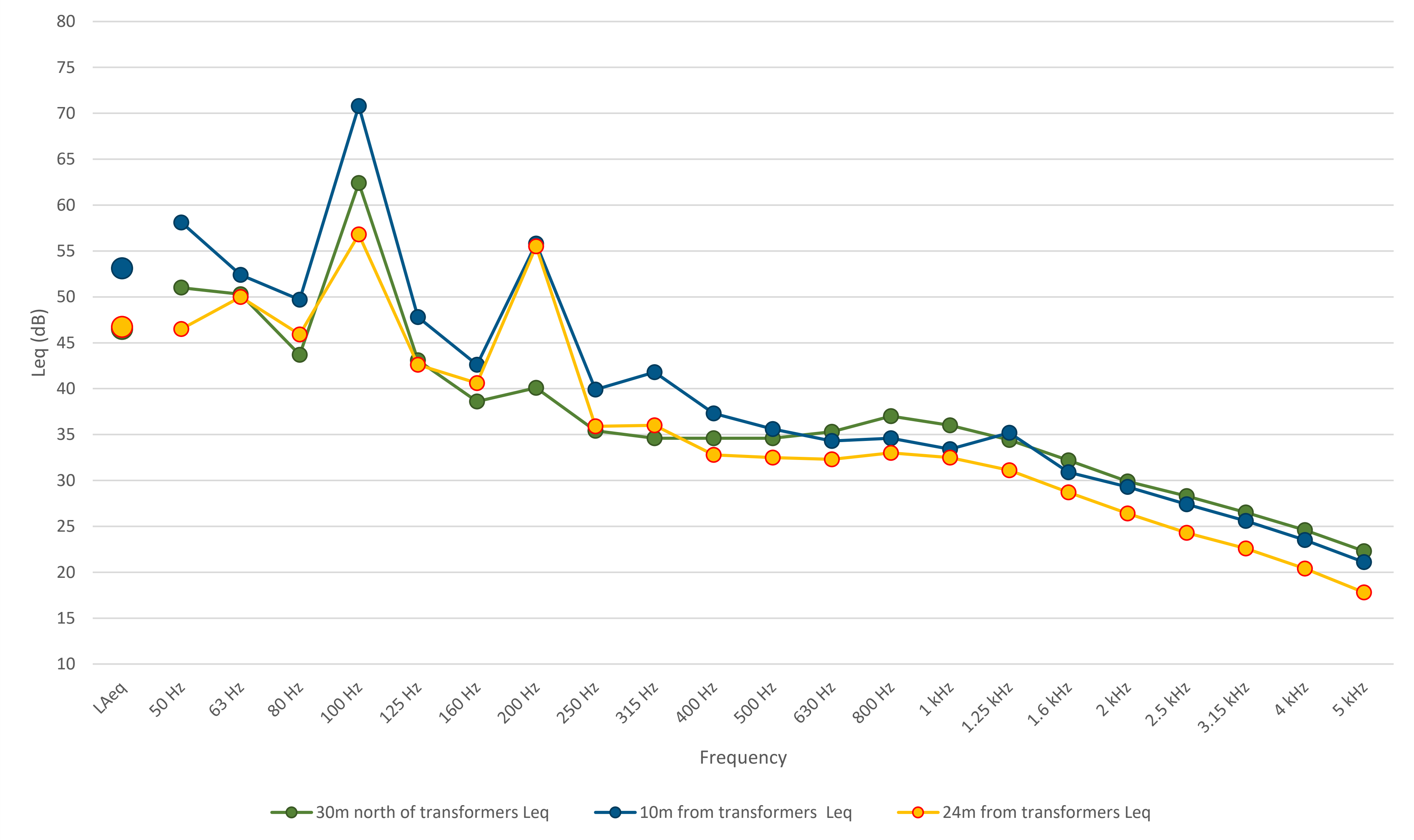


Figure B.14 – L_{eq} Third Octave Band Spectra for Iceland Plant (Tuesday, 22 October 2024)

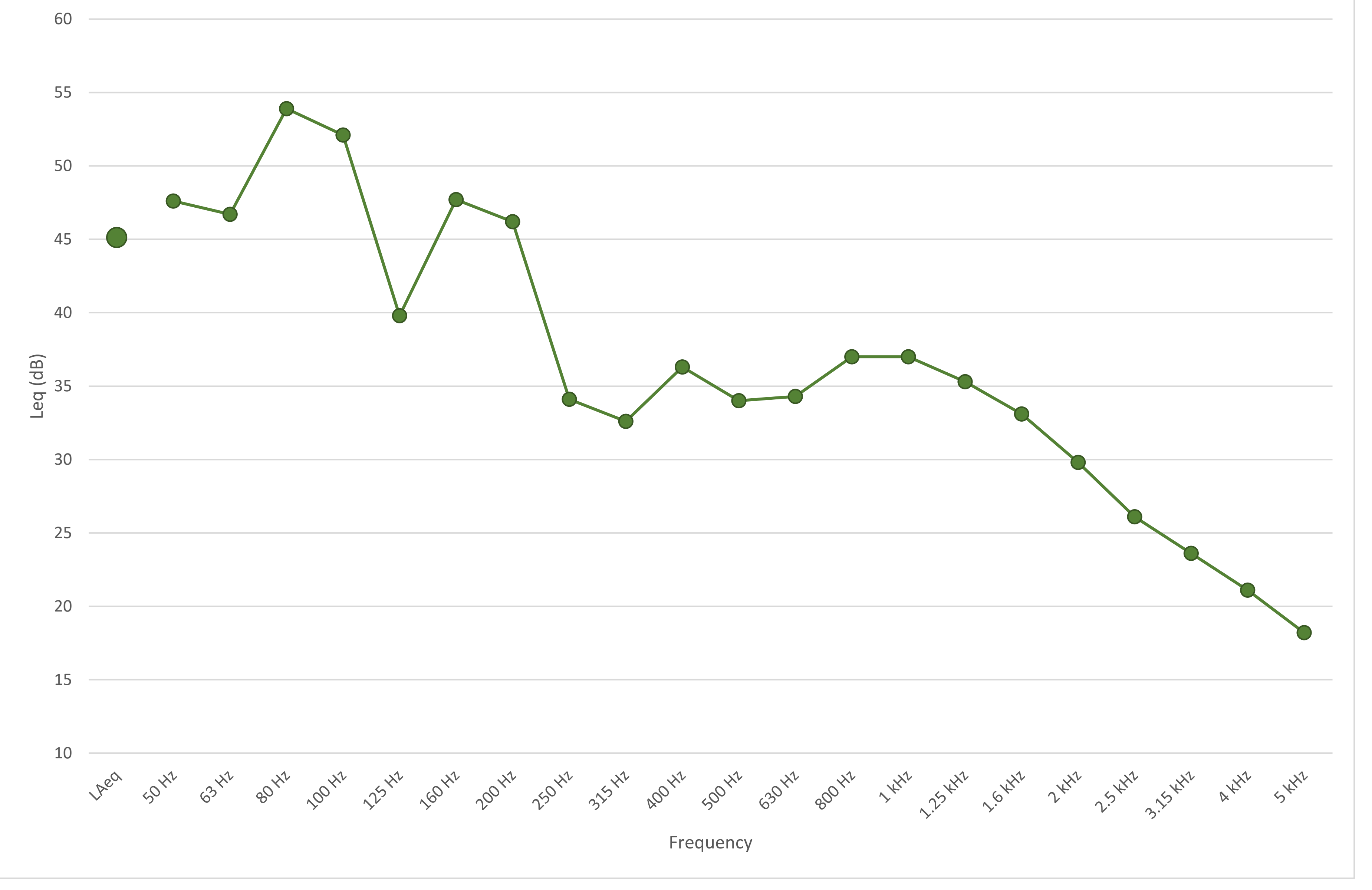


Table B.1 - Vibration Dose Values (VDVs) at Position V1 (Wednesday, 09 October 2024)

Date	Start	Channel	Weighting	VDV, $ms^{-1.75}$	Date	Start	Channel	Weighting	VDV, $ms^{-1.75}$
09/10/2024	13:00	Radial	W_d	5.68E-03	10/10/2024	01:00	Radial	W_d	5.45E-04
		Tangential	W_d	2.84E-03			Tangential	W_d	5.45E-04
		Vertical	W_b	2.26E-02			Vertical	W_b	4.76E-03
09/10/2024	14:00	Radial	W_d	5.40E-03	10/10/2024	02:00	Radial	W_d	6.28E-03
		Tangential	W_d	2.84E-03			Tangential	W_d	4.00E-03
		Vertical	W_b	1.92E-02			Vertical	W_b	2.81E-02
09/10/2024	15:00	Radial	W_d	5.68E-03	10/10/2024	03:00	Radial	W_d	9.00E-03
		Tangential	W_d	3.37E-03			Tangential	W_d	5.00E-03
		Vertical	W_b	2.60E-02			Vertical	W_b	3.40E-02
09/10/2024	16:00	Radial	W_d	5.91E-03	10/10/2024	04:00	Radial	W_d	8.98E-04
		Tangential	W_d	3.73E-03			Tangential	W_d	5.95E-04
		Vertical	W_b	2.47E-02			Vertical	W_b	5.45E-03
09/10/2024	17:00	Radial	W_d	5.40E-03	10/10/2024	05:00	Radial	W_d	4.00E-03
		Tangential	W_d	3.73E-03			Tangential	W_d	3.00E-03
		Vertical	W_b	2.21E-02			Vertical	W_b	2.30E-02
09/10/2024	18:00	Radial	W_d	4.76E-03	10/10/2024	06:00	Radial	W_d	4.73E-03
		Tangential	W_d	3.14E-03			Tangential	W_d	3.37E-03
		Vertical	W_b	2.22E-02			Vertical	W_b	2.10E-02
09/10/2024	19:00	Radial	W_d	4.73E-03	10/10/2024	07:00	Radial	W_d	4.73E-03
		Tangential	W_d	3.73E-03			Tangential	W_d	2.83E-03
		Vertical	W_b	2.49E-02			Vertical	W_b	2.19E-02
09/10/2024	20:00	Radial	W_d	5.10E-03	10/10/2024	08:00	Radial	W_d	3.65E-03
		Tangential	W_d	3.37E-03			Tangential	W_d	2.06E-03
		Vertical	W_b	2.31E-02			Vertical	W_b	1.88E-02
09/10/2024	21:00	Radial	W_d	5.57E-03	10/10/2024	09:00	Radial	W_d	4.73E-03
		Tangential	W_d	2.64E-03			Tangential	W_d	2.83E-03
		Vertical	W_b	2.01E-02			Vertical	W_b	2.31E-02
09/10/2024	22:00	Radial	W_d	5.15E-03	10/10/2024	10:00	Radial	W_d	5.91E-03
		Tangential	W_d	3.14E-03			Tangential	W_d	3.73E-03
		Vertical	W_b	2.02E-02			Vertical	W_b	2.52E-02
09/10/2024	23:00	Radial	W_d	5.45E-03	10/10/2024	11:00	Radial	W_d	5.10E-03
		Tangential	W_d	4.28E-03			Tangential	W_d	3.37E-03
		Vertical	W_b	2.91E-02			Vertical	W_b	2.18E-02
10/10/2024	00:00	Radial	W_d	7.49E-04	10/10/2024	12:00	Radial	W_d	0.00E+00
		Tangential	W_d	6.89E-04			Tangential	W_d	0.00E+00
		Vertical	W_b	4.25E-03			Vertical	W_b	0.00E+00
Radial Totals					VDV_d (Day: 0700-2300hrs)			0.010	$ms^{-1.75}$
					VDV_d (Night: 2300-0700hrs)			0.010	$ms^{-1.75}$
Tangential Totals					VDV_d (Day: 0700-2300hrs)			0.006	$ms^{-1.75}$
					VDV_d (Night: 2300-0700hrs)			0.006	$ms^{-1.75}$
Vertical Totals					VDV_b (Day: 0700-2300hrs)			0.045	$ms^{-1.75}$
					VDV_b (Night: 2300-0700hrs)			0.042	$ms^{-1.75}$

Table B.2 - Vibration Dose Values (VDVs) at Position V1 (Thursday, 10 October 2024)

Date	Start	Channel	Weighting	VDV, $ms^{-1.75}$	Date	Start	Channel	Weighting	VDV, $ms^{-1.75}$
10/10/2024	07:00	Radial	W_d	4.73E-03	10/10/2024	19:00	Radial	W_d	5.10E-03
		Tangential	W_d	2.83E-03			Tangential	W_d	3.73E-03
		Vertical	W_b	2.19E-02			Vertical	W_b	2.46E-02
10/10/2024	08:00	Radial	W_d	3.65E-03	10/10/2024	20:00	Radial	W_d	5.91E-03
		Tangential	W_d	2.06E-03			Tangential	W_d	3.74E-03
		Vertical	W_b	1.88E-02			Vertical	W_b	2.48E-02
10/10/2024	09:00	Radial	W_d	4.73E-03	10/10/2024	21:00	Radial	W_d	5.30E-03
		Tangential	W_d	2.83E-03			Tangential	W_d	2.63E-03
		Vertical	W_b	2.31E-02			Vertical	W_b	2.05E-02
10/10/2024	10:00	Radial	W_d	5.91E-03	10/10/2024	22:00	Radial	W_d	4.29E-03
		Tangential	W_d	3.73E-03			Tangential	W_d	2.38E-03
		Vertical	W_b	2.52E-02			Vertical	W_b	1.99E-02
10/10/2024	11:00	Radial	W_d	5.10E-03	10/10/2024	23:00	Radial	W_d	6.02E-03
		Tangential	W_d	3.37E-03			Tangential	W_d	3.14E-03
		Vertical	W_b	2.18E-02			Vertical	W_b	2.74E-02
10/10/2024	12:00	Radial	W_d	6.04E-03	11/10/2024	00:00	Radial	W_d	1.08E-03
		Tangential	W_d	3.27E-03			Tangential	W_d	7.32E-04
		Vertical	W_b	2.22E-02			Vertical	W_b	6.04E-03
10/10/2024	13:00	Radial	W_d	6.36E-03	11/10/2024	01:00	Radial	W_d	3.01E-04
		Tangential	W_d	3.26E-03			Tangential	W_d	4.01E-04
		Vertical	W_b	2.30E-02			Vertical	W_b	2.01E-03
10/10/2024	14:00	Radial	W_d	6.75E-03	11/10/2024	02:00	Radial	W_d	9.87E-04
		Tangential	W_d	3.37E-03			Tangential	W_d	6.52E-04
		Vertical	W_b	2.43E-02			Vertical	W_b	6.23E-03
10/10/2024	15:00	Radial	W_d	6.89E-03	11/10/2024	03:00	Radial	W_d	8.11E-03
		Tangential	W_d	3.73E-03			Tangential	W_d	4.80E-03
		Vertical	W_b	2.45E-02			Vertical	W_b	3.41E-02
10/10/2024	16:00	Radial	W_d	6.91E-03	11/10/2024	04:00	Radial	W_d	1.14E-03
		Tangential	W_d	2.99E-03			Tangential	W_d	7.52E-04
		Vertical	W_b	2.35E-02			Vertical	W_b	5.52E-03
10/10/2024	17:00	Radial	W_d	5.40E-03	11/10/2024	05:00	Radial	W_d	4.87E-04
		Tangential	W_d	3.37E-03			Tangential	W_d	5.62E-04
		Vertical	W_b	2.60E-02			Vertical	W_b	3.28E-03
10/10/2024	18:00	Radial	W_d	4.73E-03	11/10/2024	06:00	Radial	W_d	5.24E-03
		Tangential	W_d	2.83E-03			Tangential	W_d	3.47E-03
		Vertical	W_b	2.29E-02			Vertical	W_b	2.80E-02
Radial Totals					VDV_d (Day : 0700-2300hrs)			0.011	$ms^{-1.75}$
					VDV_d (Night : 2300-0700hrs)			0.009	$ms^{-1.75}$
Tangential Totals					VDV_d (Day : 0700-2300hrs)			0.006	$ms^{-1.75}$
					VDV_d (Night : 2300-0700hrs)			0.005	$ms^{-1.75}$
Vertical Totals					VDV_b (Day : 0700-2300hrs)			0.046	$ms^{-1.75}$
					VDV_b (Night : 2300-0700hrs)			0.040	$ms^{-1.75}$

Table B.3 - Vibration Dose Values (VDVs) at Position V1 (Friday, 11 October 2024)

Date	Start	Channel	Weighting	VDV, $ms^{-1.75}$	Date	Start	Channel	Weighting	VDV, $ms^{-1.75}$
11/10/2024	07:00	Radial	W_d	4.56E-03	11/10/2024	19:00	Radial	W_d	5.24E-03
		Tangential	W_d	2.83E-03			Tangential	W_d	3.81E-03
		Vertical	W_b	2.44E-02			Vertical	W_b	2.51E-02
11/10/2024	08:00	Radial	W_d	4.91E-03	11/10/2024	20:00	Radial	W_d	4.73E-03
		Tangential	W_d	3.74E-03			Tangential	W_d	3.37E-03
		Vertical	W_b	2.50E-02			Vertical	W_b	2.70E-02
11/10/2024	09:00	Radial	W_d	5.91E-03	11/10/2024	21:00	Radial	W_d	4.52E-03
		Tangential	W_d	3.73E-03			Tangential	W_d	3.26E-03
		Vertical	W_b	2.61E-02			Vertical	W_b	2.28E-02
11/10/2024	10:00	Radial	W_d	5.10E-03	11/10/2024	22:00	Radial	W_d	4.29E-03
		Tangential	W_d	3.74E-03			Tangential	W_d	3.14E-03
		Vertical	W_b	2.46E-02			Vertical	W_b	2.22E-02
11/10/2024	11:00	Radial	W_d	5.40E-03	11/10/2024	23:00	Radial	W_d	6.28E-03
		Tangential	W_d	3.73E-03			Tangential	W_d	3.57E-03
		Vertical	W_b	2.64E-02			Vertical	W_b	2.56E-02
11/10/2024	12:00	Radial	W_d	4.73E-03	12/10/2024	00:00	Radial	W_d	8.32E-04
		Tangential	W_d	3.73E-03			Tangential	W_d	4.76E-04
		Vertical	W_b	2.67E-02			Vertical	W_b	4.76E-03
11/10/2024	13:00	Radial	W_d	5.68E-03	12/10/2024	01:00	Radial	W_d	5.16E-04
		Tangential	W_d	3.37E-03			Tangential	W_d	4.29E-04
		Vertical	W_b	2.38E-02			Vertical	W_b	3.14E-03
11/10/2024	14:00	Radial	W_d	6.37E-03	12/10/2024	02:00	Radial	W_d	9.21E-04
		Tangential	W_d	3.38E-03			Tangential	W_d	6.09E-04
		Vertical	W_b	2.28E-02			Vertical	W_b	4.06E-03
11/10/2024	15:00	Radial	W_d	5.40E-03	12/10/2024	03:00	Radial	W_d	3.01E-04
		Tangential	W_d	2.65E-03			Tangential	W_d	5.00E-04
		Vertical	W_b	2.48E-02			Vertical	W_b	2.00E-03
11/10/2024	16:00	Radial	W_d	6.39E-03	12/10/2024	04:00	Radial	W_d	1.06E-04
		Tangential	W_d	3.74E-03			Tangential	W_d	9.20E-05
		Vertical	W_b	2.51E-02			Vertical	W_b	5.63E-04
11/10/2024	17:00	Radial	W_d	4.73E-03	12/10/2024	05:00	Radial	W_d	5.00E-03
		Tangential	W_d	3.73E-03			Tangential	W_d	3.00E-03
		Vertical	W_b	2.34E-02			Vertical	W_b	2.30E-02
11/10/2024	18:00	Radial	W_d	5.10E-03	12/10/2024	06:00	Radial	W_d	5.68E-03
		Tangential	W_d	4.01E-03			Tangential	W_d	2.83E-03
		Vertical	W_b	2.46E-02			Vertical	W_b	2.23E-02
Radial Totals					VDV_d (Day : 0700-2300hrs)			0.011	$ms^{-1.75}$
					VDV_d (Night : 2300-0700hrs)			0.008	$ms^{-1.75}$
Tangential Totals					VDV_d (Day : 0700-2300hrs)			0.007	$ms^{-1.75}$
					VDV_d (Night : 2300-0700hrs)			0.004	$ms^{-1.75}$
Vertical Totals					VDV_b (Day : 0700-2300hrs)			0.050	$ms^{-1.75}$
					VDV_b (Night : 2300-0700hrs)			0.031	$ms^{-1.75}$

Table B.4 - Vibration Dose Values (VDVs) at Position V1 (Saturday, 12 October 2024)

Date	Start	Channel	Weighting	VDV, $ms^{-1.75}$	Date	Start	Channel	Weighting	VDV, $ms^{-1.75}$
12/10/2024	07:00	Radial	W_d	4.25E-03	12/10/2024	19:00	Radial	W_d	4.56E-03
		Tangential	W_d	2.83E-03			Tangential	W_d	3.37E-03
		Vertical	W_b	2.16E-02			Vertical	W_b	2.36E-02
12/10/2024	08:00	Radial	W_d	5.91E-03	12/10/2024	20:00	Radial	W_d	4.56E-03
		Tangential	W_d	2.83E-03			Tangential	W_d	3.27E-03
		Vertical	W_b	2.34E-02			Vertical	W_b	2.09E-02
12/10/2024	09:00	Radial	W_d	5.68E-03	12/10/2024	21:00	Radial	W_d	4.91E-03
		Tangential	W_d	3.37E-03			Tangential	W_d	2.84E-03
		Vertical	W_b	2.43E-02			Vertical	W_b	2.35E-02
12/10/2024	10:00	Radial	W_d	6.11E-03	12/10/2024	22:00	Radial	W_d	3.57E-03
		Tangential	W_d	5.50E-03			Tangential	W_d	2.38E-03
		Vertical	W_b	3.26E-02			Vertical	W_b	1.88E-02
12/10/2024	11:00	Radial	W_d	6.13E-03	12/10/2024	23:00	Radial	W_d	6.02E-03
		Tangential	W_d	4.18E-03			Tangential	W_d	3.14E-03
		Vertical	W_b	2.63E-02			Vertical	W_b	2.54E-02
12/10/2024	12:00	Radial	W_d	5.91E-03	13/10/2024	00:00	Radial	W_d	6.04E-05
		Tangential	W_d	3.73E-03			Tangential	W_d	4.73E-05
		Vertical	W_b	2.56E-02			Vertical	W_b	2.38E-04
12/10/2024	13:00	Radial	W_d	5.40E-03	13/10/2024	01:00	Radial	W_d	7.52E-05
		Tangential	W_d	3.73E-03			Tangential	W_d	7.86E-05
		Vertical	W_b	2.60E-02			Vertical	W_b	4.28E-04
12/10/2024	14:00	Radial	W_d	5.91E-03	13/10/2024	02:00	Radial	W_d	5.23E-05
		Tangential	W_d	2.83E-03			Tangential	W_d	4.82E-05
		Vertical	W_b	2.14E-02			Vertical	W_b	1.91E-04
12/10/2024	15:00	Radial	W_d	5.10E-03	13/10/2024	03:00	Radial	W_d	5.53E-05
		Tangential	W_d	3.37E-03			Tangential	W_d	5.37E-05
		Vertical	W_b	2.22E-02			Vertical	W_b	2.37E-04
12/10/2024	16:00	Radial	W_d	6.89E-03	13/10/2024	04:00	Radial	W_d	6.85E-05
		Tangential	W_d	3.73E-03			Tangential	W_d	7.03E-05
		Vertical	W_b	2.43E-02			Vertical	W_b	3.64E-04
12/10/2024	17:00	Radial	W_d	4.66E-03	13/10/2024	05:00	Radial	W_d	5.92E-05
		Tangential	W_d	3.26E-03			Tangential	W_d	5.44E-05
		Vertical	W_b	2.06E-02			Vertical	W_b	2.04E-04
12/10/2024	18:00	Radial	W_d	5.30E-03	13/10/2024	06:00	Radial	W_d	9.00E-04
		Tangential	W_d	2.63E-03			Tangential	W_d	1.15E-04
		Vertical	W_b	2.31E-02			Vertical	W_b	4.30E-04
Radial Totals					VDV_d (Day : 0700-2300hrs)			0.011	$ms^{-1.75}$
					VDV_d (Night : 2300-0700hrs)			0.006	$ms^{-1.75}$
Tangential Totals					VDV_d (Day : 0700-2300hrs)			0.007	$ms^{-1.75}$
					VDV_d (Night : 2300-0700hrs)			0.003	$ms^{-1.75}$
Vertical Totals					VDV_b (Day : 0700-2300hrs)			0.049	$ms^{-1.75}$
					VDV_b (Night : 2300-0700hrs)			0.025	$ms^{-1.75}$

Table B.5 - Vibration Dose Values (VDVs) at Position V1 (Sunday, 13 October 2024)

Date	Start	Channel	Weighting	VDV, $ms^{-1.75}$	Date	Start	Channel	Weighting	VDV, $ms^{-1.75}$
13/10/2024	07:00	Radial	W_d	4.07E-04	13/10/2024	19:00	Radial	W_d	5.15E-03
		Tangential	W_d	4.34E-04			Tangential	W_d	3.14E-03
		Vertical	W_b	3.14E-03			Vertical	W_b	1.95E-02
13/10/2024	08:00	Radial	W_d	7.98E-05	13/10/2024	20:00	Radial	W_d	4.76E-03
		Tangential	W_d	8.35E-05			Tangential	W_d	3.14E-03
		Vertical	W_b	3.52E-04			Vertical	W_b	2.15E-02
13/10/2024	09:00	Radial	W_d	4.28E-03	13/10/2024	21:00	Radial	W_d	2.38E-03
		Tangential	W_d	2.38E-03			Tangential	W_d	3.14E-03
		Vertical	W_b	2.02E-02			Vertical	W_b	2.03E-02
13/10/2024	10:00	Radial	W_d	3.95E-03	13/10/2024	22:00	Radial	W_d	7.18E-03
		Tangential	W_d	2.63E-03			Tangential	W_d	4.28E-03
		Vertical	W_b	2.10E-02			Vertical	W_b	3.04E-02
13/10/2024	11:00	Radial	W_d	3.14E-03	13/10/2024	23:00	Radial	W_d	1.06E-02
		Tangential	W_d	2.03E-03			Tangential	W_d	5.45E-03
		Vertical	W_b	1.84E-02			Vertical	W_b	3.66E-02
13/10/2024	12:00	Radial	W_d	4.33E-03	14/10/2024	00:00	Radial	W_d	5.61E-04
		Tangential	W_d	2.63E-03			Tangential	W_d	5.00E-04
		Vertical	W_b	1.91E-02			Vertical	W_b	4.00E-03
13/10/2024	13:00	Radial	W_d	4.28E-03	14/10/2024	01:00	Radial	W_d	5.51E-04
		Tangential	W_d	2.38E-03			Tangential	W_d	6.28E-04
		Vertical	W_b	1.91E-02			Vertical	W_b	4.29E-03
13/10/2024	14:00	Radial	W_d	3.65E-03	14/10/2024	02:00	Radial	W_d	3.59E-04
		Tangential	W_d	2.63E-03			Tangential	W_d	4.29E-04
		Vertical	W_b	2.19E-02			Vertical	W_b	3.14E-03
13/10/2024	15:00	Radial	W_d	5.47E-03	14/10/2024	03:00	Radial	W_d	2.00E-03
		Tangential	W_d	3.26E-03			Tangential	W_d	2.01E-04
		Vertical	W_b	2.37E-02			Vertical	W_b	2.33E-04
13/10/2024	16:00	Radial	W_d	4.76E-03	14/10/2024	04:00	Radial	W_d	4.30E-04
		Tangential	W_d	3.14E-03			Tangential	W_d	1.00E-04
		Vertical	W_b	2.10E-02			Vertical	W_b	3.34E-04
13/10/2024	17:00	Radial	W_d	4.28E-03	14/10/2024	05:00	Radial	W_d	4.00E-03
		Tangential	W_d	2.38E-03			Tangential	W_d	2.00E-03
		Vertical	W_b	2.03E-02			Vertical	W_b	2.10E-02
13/10/2024	18:00	Radial	W_d	3.57E-03	14/10/2024	06:00	Radial	W_d	4.73E-03
		Tangential	W_d	2.38E-03			Tangential	W_d	3.37E-03
		Vertical	W_b	2.03E-02			Vertical	W_b	2.20E-02
Radial Totals					VDV_d (Day : 0700-2300hrs)			0.009	$ms^{-1.75}$
					VDV_d (Night : 2300-0700hrs)			0.011	$ms^{-1.75}$
Tangential Totals					VDV_d (Day : 0700-2300hrs)			0.006	$ms^{-1.75}$
					VDV_d (Night : 2300-0700hrs)			0.006	$ms^{-1.75}$
Vertical Totals					VDV_b (Day : 0700-2300hrs)			0.042	$ms^{-1.75}$
					VDV_b (Night : 2300-0700hrs)			0.039	$ms^{-1.75}$

APPENDIX C - NOISE MAP MODELS

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

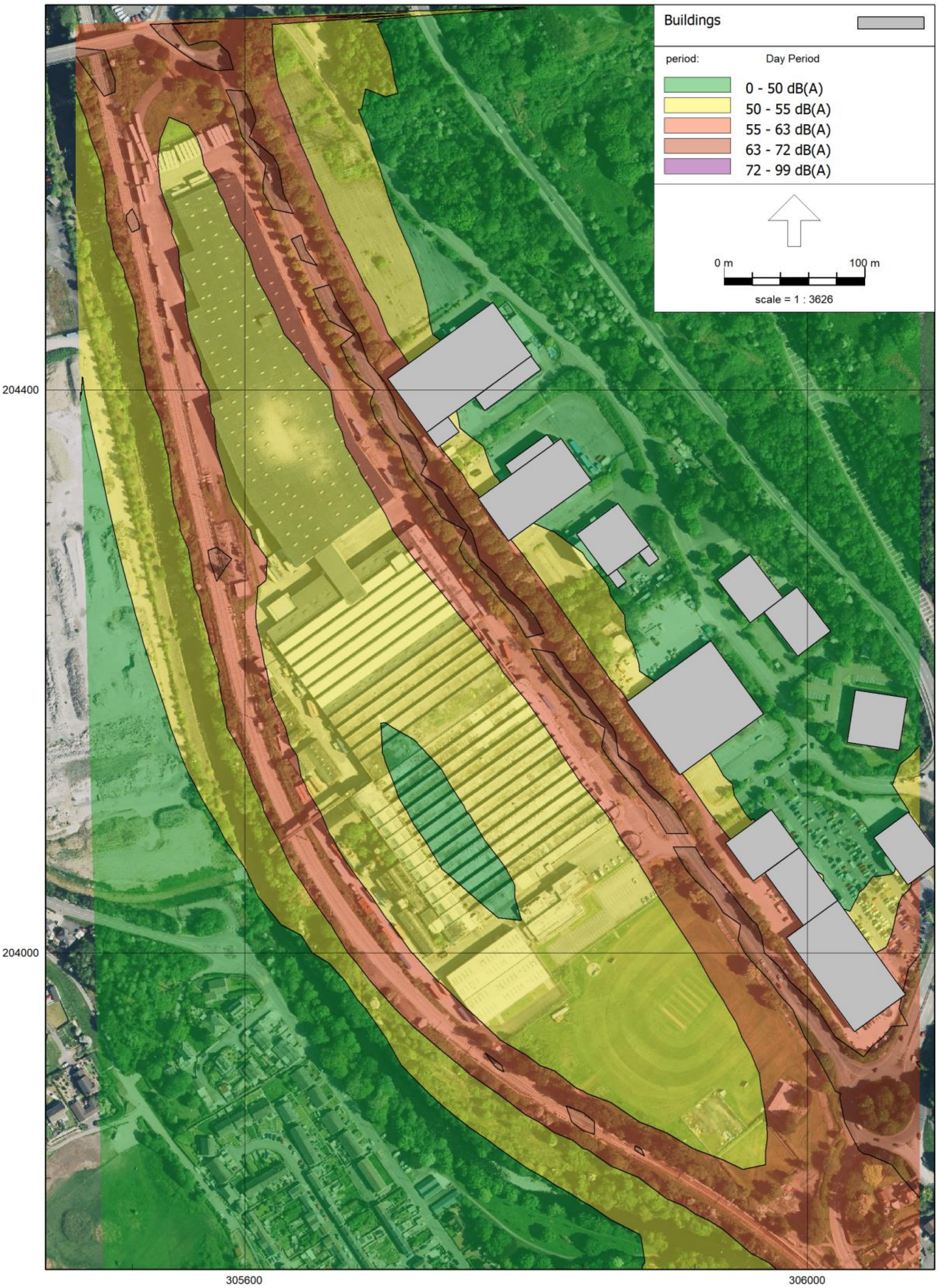


Figure C.2 – Daytime Noise Map (Undeveloped Site) $L_{Aeq,16hr}$ Contours at 4.5m Height

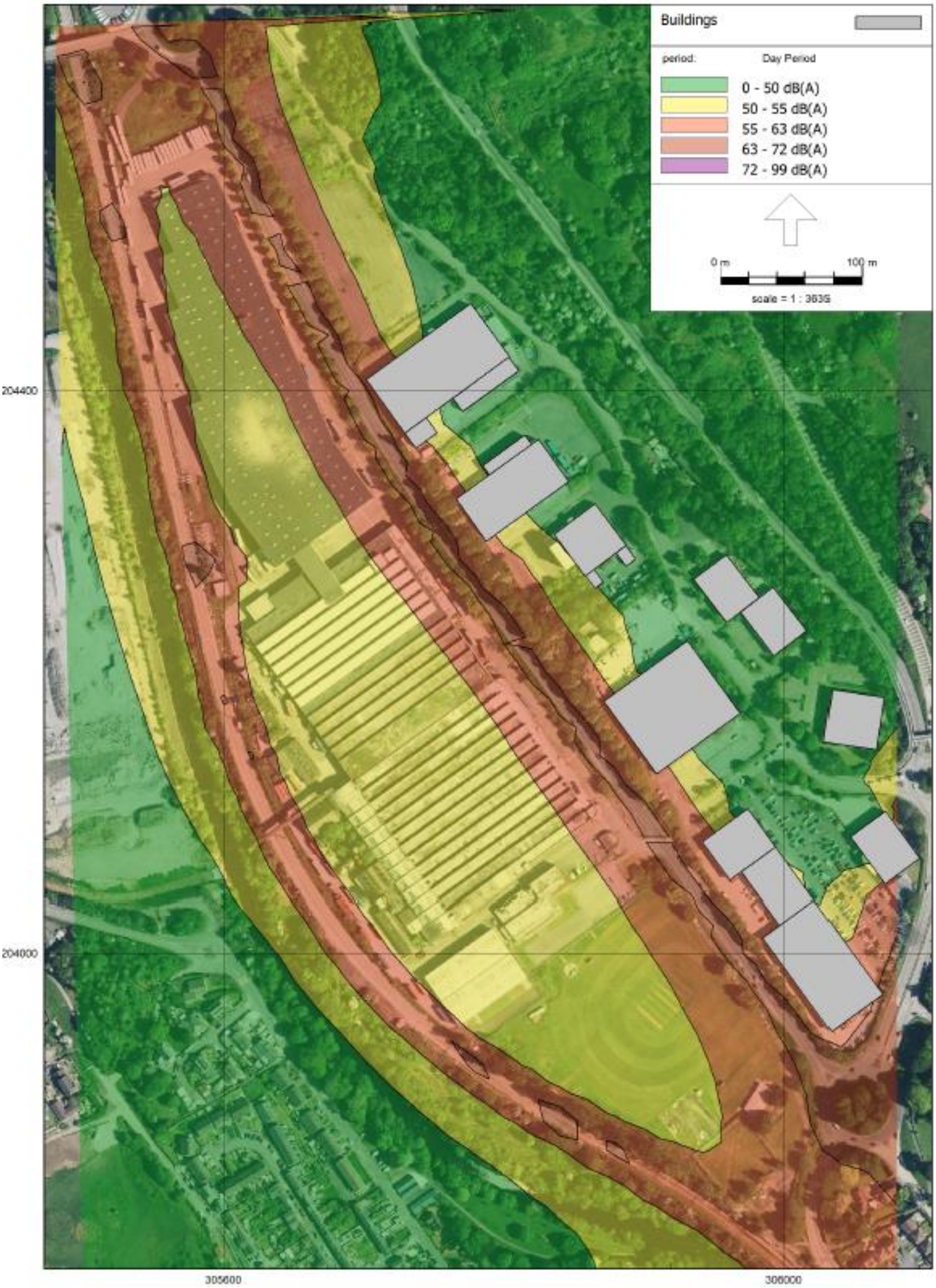


Figure C.3 – Night-time Noise Map (Undeveloped Site) $L_{Aeq,8hr}$ Contours at 1.5m Height

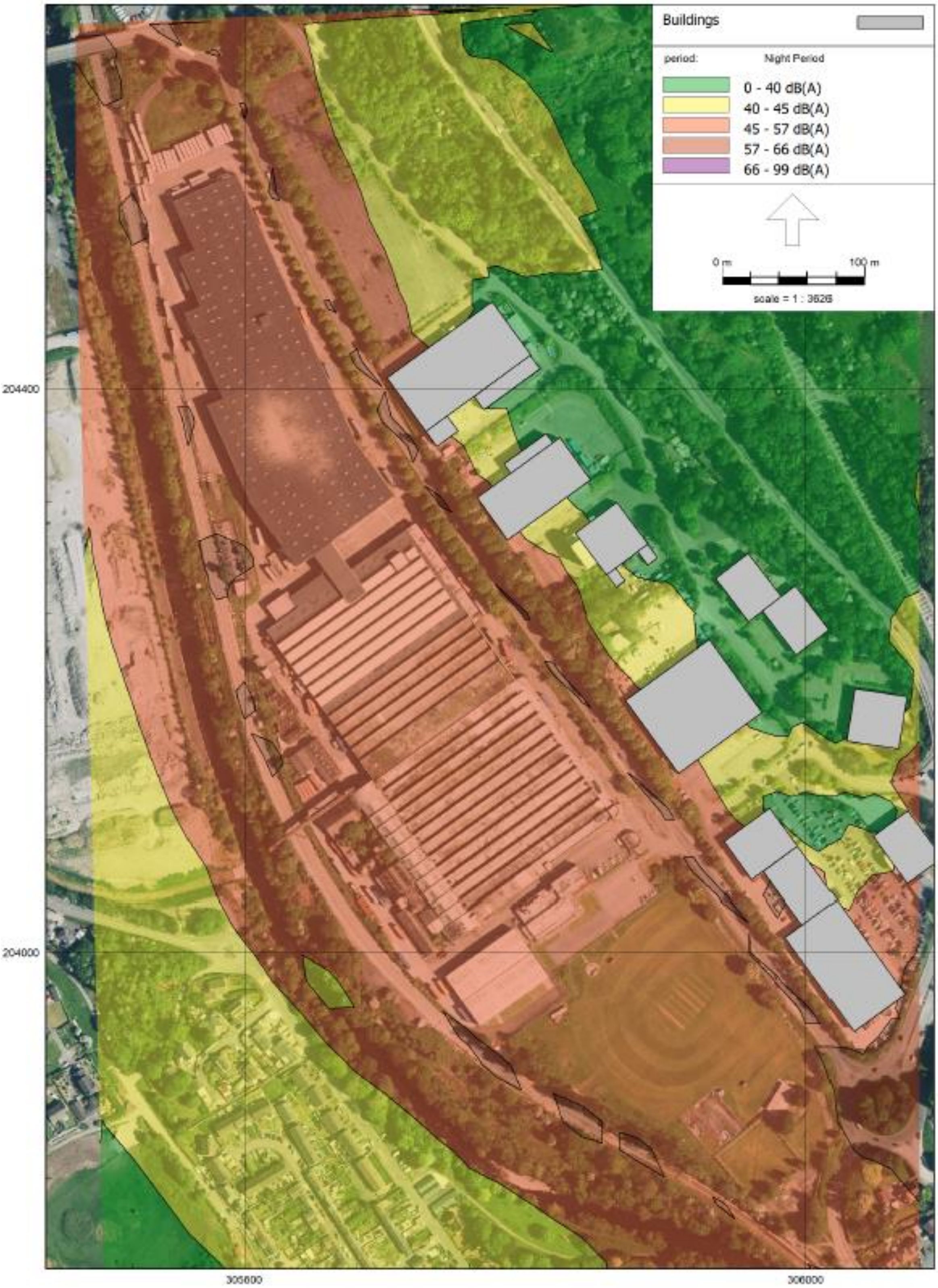


Figure C.4 – Night-time Noise Map (Undeveloped Site) $L_{Aeq,8hr}$ Contours at 4.5m Height