



**Independent Acoustic
Consultancy Practice**

Noise Impact Assessment

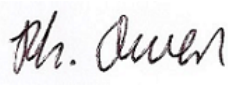
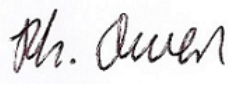
**External A/C Units
Cwmlllynfell**

5897/NIA1_Rev1

Noise Impact Assessment

Project:	External A/C Units
Site Address:	CKs Foodstores Cwmlllynfell SA9 2GH
HA Reference:	5897/NIA1_Rev1
Date:	20/10/2022
Client:	CK Supermarkets Ltd. c/o: Ateb Consult Ltd. 42 Gurnos Road Ystalyfera Swansea SA9 2HY
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ISSUE / REVISION

Rev	Date			
0	15 October 2021	Filename	21.5897_NIA	
		Description	First Issue	
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1	20 October 2022	Filename	22.5897_NIA_Rev1	
		Description	Rearrangement of AC units. Background sound survey undertaken.	
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1. INTRODUCTION

It is understood complaints have been received from nearby residents relating to new external air conditioning plant installed at CKs Foodstores, Cwmllynfell, Cwmllynfell, SA9 2GH.

Hunter Acoustics has been commissioned to carry out a noise impact assessment of the plant. This report details results of a background sound survey and sample measurements carried out at the site.

Acoustic terminology used in the report are explained in Appendix A.

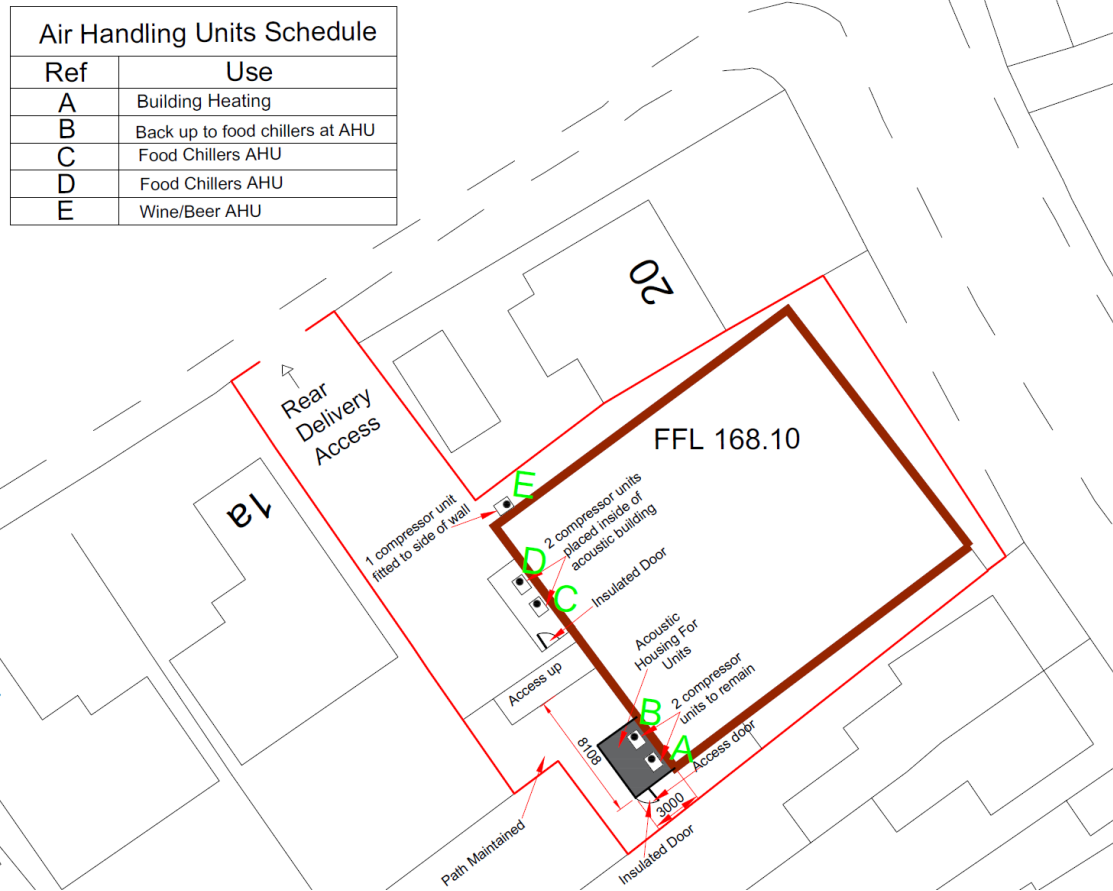
1.1 Revision 1

Since our original assessment was conducted in October 2021 (see Figure 1.1 below), the 2no pre-existing AC units (Kyung Dong 1PAL035M3) have been replaced with 1no new unit that is the same make and model as the additional 3no new AC units (J&E Hall JEHS-0350-B3-M-3).

The arrangement of the AC units has altered since our original assessment. The 5no AC units are now spread out across the south-western façade of the shop. Current proposals are for CK Supermarkets to screen the AC units with insulated panels – see Figure 1.2 below.

Figure 1.1 – Previous AC Unit Layout (2021)



Figure 1.2 – Current Layout

2. GUIDANCE

2.1 British Standard 4142:2014+A1:2019

British Standard 4142:2014+A1:2019 “Methods for rating and assessing industrial and commercial sound” 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.

As part of a subjective assessment 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.

2.1.1 BS 4142:2014+A1:2019 Section 11

Section 11 of BS 4142:2014+A1:2019 states;

“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.”

3. ENVIRONMENTAL NOISE SURVEY

Image in Figure 3.1 below shows a view from the rear of the shop premises of the current layout of the AC units. AC units 3&4 are located within an existing shed.

Figure 3.1 – Photo of A/C Units – Existing Scenario



3.1 Sound Sensitive Receivers (SSRs)

The most critical SSR is 1A Heol Daniel, located immediately west of the site compound. The property has a bedroom window overlooking the site compound, as indicated in Figure 3.2 below;

Figure 3.2 – View of nearest SSR – 1a Heol Daniel



3.2 Procedure

3.2.1 Source Sample Noise Measurements

Sample noise measurements were undertaken on Wednesday 4th August 2021 from 1120hrs to 1230hrs. Measurements were undertaken of the AC plant at source (at 1m distance) and at a position representative of the nearest SSR's first floor window (microphone on extended pole, elevated approximately 4.5m above local ground height).

Data including L_{Aeq} and background L_{A90} was logged over the monitoring period, along with continuous audio and 100ms data to allow for a detailed assessment in line with objective method under BS 4142:2014.

3.2.2 Background Sound Survey

Continuous noise monitoring was carried out from 1320hrs on Monday, 10 October 2022 to 1300hrs Tuesday, 11 October 2022 at position A.

Position A, as shown in Figure 3.3 below, was located on a rail in the centre of the plant compound to the rear of the shop premises. The ambient & background sound climate at this position was deemed representative of that at the nearest SSR (1A Heol Daniel).

Figure 3.3 – Position A Monitoring Location



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.

It was agreed with the Client that condenser plant would be turned off for a short period of time during the day and night to allow for measuring the background sound level, in line with BS 4142. It was not possible to switch the condenser plant off for longer periods of time as this would have affected food stocks within the shop.

3.3 Equipment

3.3.1 Source Sample Noise Measurements

The following equipment was used:

Table 3.1 – Sample Measurement Equipment List

Make	Description	Model	Serial Number	Last Calibrated	Certificate No.
NTi	Type 1 - Sound Level Meter	XL2-TA	A2A-13022-E0	20 August 2019	TCRT19/1649
	Preamplifier	MA220	6853	20 August 2019	TCRT19/1649
	Microphone capsule	MC230	A14127	20 August 2019	TCRT19/1649
Rion	Calibrator (94.03dB @ 984Hz)	NC-73	10355197	01 June 2021	UCRT20/1265

3.3.1 Background Sound Survey

The following equipment was used:

Table 3.2 – Continuous Monitoring Equipment List

Make	Description	Model	Serial Number	Last Calibrated	Certificate No.
NTi	Type 1 - Sound Level Meter	XL2-TA	A2A-19813-E0	04 November 2021	UK-21-096
	Preamplifier	MA220	10302	04 November 2021	UK-21-096
	Microphone Capsule	MC230A	A21824	04 November 2021	UK-21-096
Larson Davis	Calibrator (94.00dB / 114.03dB @ 1kHz)	CAL200	19047	15 August 2022	44788-19047-CAL200

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 Weather Conditions

3.4.1 Source Sample Noise Measurements

Weather conditions were generally calm, dry and sunny. An occasional easterly light breeze was measured with an anemometer (up to 3m/s wind speed).

3.4.2 Background Sound Survey

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 dry with an occasional breeze.

3.5 Results

3.5.1 Background Sound Survey

Time history graph in Figure B.3 of Appendix B shows L_{Amax} , L_{Aeq} and L_{A90} sound pressure levels measured at position A.

For the majority of the day, evening and night-time periods, at least one or more condenser unit within the plant compound was operational at one time. This is illustrated in the time history graph Figure B.3 of Appendix B where L_{A90} sound pressure levels are shown to drop when AC plant is not operational.

During the brief periods where none of the external condenser plant was operational, the ambient and background sound climate was controlled by distant road traffic. Based on these periods excluding condenser plant noise, the following L_{A90} background sound levels for the day, evening and night have been evaluated:

Table 3.3 – Measured Total Daytime, Evening and Night-time Background L_{A90} Results

Period	Position A
Daytime (0700-1900hrs) L_{A90} (dB)	37
Evening (1900-2300hrs) L_{A90} (dB)	29
Night-time (2300-0700hrs) L_{A90} (dB)	27

It is therefore proposed to use these background sound levels as a basis for undertaking the BS 4142:2014 noise impact assessments.

3.5.2 Source Sample Noise Measurements

The following measurements from our original assessment (report 21.5897_NIA dated 15/10/2021) are referenced below for use in the noise impact assessment.

Table 3.4 – Sample Measurement Results

Measurement	Description	Comment	$L_{Aeq,T}$ (dB)
1	Ambient Sound Climate with No Plant Operational	Controlled by distant road traffic.	31.3
2	A/C Unit 'J&E Hall JEHS-0350-B3-M-3' @ 1m	Taken in front of unit.	57.8

Third-octave band spectra for each measurement is shown in Table B.1 of Appendix B.

Throughout the sample measurement survey periods, A/C unit 1 (Panasonic U-140PZ2E8 Inverter) was not operational. It is therefore proposed to use manufacturer's sound data for the noise impact assessment. The manufacturer's data sheet can be found in Figure B.5 of Appendix B.

3.5.3 Time History Analysis of Plant

Based on continuous monitoring results, the highest measured condenser plant noise during the critical night-time period is indicated to be 47.2dB L_{Aeq} at Position A.

An objective tonality FFT assessment of AC unit noise at Position A indicates a +6dB penalty for 'highly perceptible' tonality. This assessment outcome is illustrated in Figure B.4 of Appendix B.

4. NOISE IMPACT ASSESSMENT

4.1 Current Scenario – No Additional Attenuation Measures

Based on source sample noise measurements and manufacturer's noise data (AC Unit 1), a 3D noise model has been generated predicting AC unit noise levels in their current locations, at the nearest SSRs.

Our analysis has used the proprietary Predictor (v2021.1) computer modelling software, in conjunction with procedures of ISO 9613.

The model has been generated with all 5no AC units operational 100% of the time (this is considered a worst-case scenario). Noise model input data can be viewed in Table B.2 of Appendix B - which is based on sample measurement data taken at 1m from the AC units.

Predicted levels at critical receiver locations are shown in Table 4.1 below;

Table 4.1 – Noise Map Predictions – Current Scenario

Sound Sensitive Receiver (SSR)	Level Above Ground	Predicted $L_{Aeq,T}$ (dB)
SSR1 (1A Heol Daniel)	1.2m	34
	4.5m	45
SSR2 (20 Gwilym Road)	1.2m	34
	4.5m	41

The noise map model in Figure C.1 of Appendix C shows the predicted noise contour plot across the surrounding area to critical SSRs at 4.5m above local ground height (critical first floor level).

Based on results of the noise model prediction, a BS 4142:2014+A1:2019 assessment has been undertaken to the most critical SSR (1A Heol Daniel), at first floor level; and can be viewed in Table B.3 of Appendix B. The assessment has been carried out with a +6dB penalty applied to the specific sound level for 'highly perceptible' tonality, based on BS 4142 (see Figure B.4).

At a +24dB rating over background sound level outcome, the result of the BS 4142 assessment outlines "a significant adverse impact depending on context". This is during a worst-case scenario of all AC units running at 100% duty.

4.2 Proposed Noise Attenuation Measures

Following discussions between Hunter Acoustics and the Client, a workable solution to reduce AC unit noise levels at SSRs has been sought.

Based on current levels, a significant reduction in plant noise emissions is required to reduce the noise impact to surrounding residences.

The following measures are deemed necessary:

- Relocate AC Unit 5 next to units 3&4 to mitigate noise level emissions to 20 Gwilym Road, located immediately north of the site.
- Encase all AC units in an enclosure(s). Minimum sound reduction values are detailed below.

4.2.1 Acoustic Enclosure

At this stage this is based on the entire enclosure wall being an acoustic louvre, with a solid roof structure.

The acoustic louvre sections shall be capable of meeting the minimum Sound Reduction Index (SRI) performance values:

Table 4.2 – Acoustic Enclosure Sound Reduction Index Figures

Element	Description	Sound Reduction Index dB R (BS EN ISO 10140-2:2010) @ Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Acoustic Enclosure	Based on IAC Acoustics 'Model R' Louvre Specification	5	7	11	12	13	14	12	9

Please note that the above specification is deemed acceptable as a minimum, based on manufacturer's published data. Acoustic enclosure suppliers should provide a detailed acoustic enclosure design to meet the above figures, and to ensure adequate airflow is provided.

The following list is not exhaustive but outlines a number of UK suppliers of acoustic louvres/enclosures:

Table 4.3 - Acoustic Enclosure Supplier List

Supplier	Website	Telephone
Allaway Acoustics	http://www.allawayacoustics.co.uk/	01992 550825
Ambient Acoustics Ltd	https://www.ambientacoustics.co.uk/	01934 712802
Caice	https://www.caice.co.uk/	0118 918 6470
Colt	https://www.coltinfo.co.uk/	02392 451111
Emtec	http://emtecproducts.co.uk/	020 8848 3031
IAC Acoustics	https://www.iacacoustics.global/	01962 873000
Wakefield Acoustics	https://www.wakefieldacoustics.co.uk/	0203 143 5800

4.2.2 Noise Model Predictions

Based on the proposed layout scenario with acoustic enclosure noise mitigation measures in place, a noise map model has been generated. Predicted levels at critical receiver locations are shown in Table 4.4 below;

Table 4.4 – Predictions of Proposed Scenario with Attenuation Measures

Sound Sensitive Receiver (SSR)	Level Above Ground	Predicted $L_{Aeq,T}$ (dB)	Predicted Sound Reduction Compared to Current Scenario (dB)
SSR1 (1A Heol Daniel)	1.2m	23	11
	4.5m	32	13
SSR2 (20 Gwilym Road)	1.2m	16	18
	4.5m	22	19

The noise map model in Figure C.2 of Appendix C shows the predicted noise contour plot across the surrounding area to critical SSRs at 4.5m above local ground height (critical first floor level).

Based on results of the noise model prediction, a BS 4142:2014+A1:2019 assessment has been undertaken to the most critical SSR (1A Heol Daniel) and can be viewed in Table B.4 of Appendix B.

A +2dB penalty for 'just perceptible' tonality has been applied to the specific sound level, rather than +6dB 'highly perceptible' tonality correction. This is in consideration of the significant sound reduction predicted between the current scenario and proposed.

A +7dB overall rating over background sound level outcome has resulted from the BS 4142 assessment. This is during a worst-case scenario of all AC units at 100% operation.

4.3 Discussion

Mitigated plant noise level of 32dB $L_{Aeq,15min}$ is shown to be 13dB lower than the current scenario and 19dB lower than the estimated worst-case absolute level outlined in our original assessment report (21.5897_NIA dated 15/10/2021). This can be considered best practical means and results in a significant reduction. The resultant plant noise level could be considered low.

The night-time background sound climate at the nearest Sound Sensitive Receivers (SSRs) without condenser plant operational could be considered low, at 27dB $L_{A90,15min}$.

Section 11 of BS 4142:2014+A1:2019 states: *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.*

It is therefore proposed to take into account the absolute noise levels in the context. As we are assessing at first floor (bedroom) level at night, the internal noise level is also more important to consider than the external noise level.

At 32dB $L_{Aeq,15min}$ externally at the SSR, allowing 15dB attenuation through a partially open window, internal noise levels would equate to 17dB $L_{Aeq,15min}$, falling well below the 'desirable' 30dB L_{Aeq} guidance value quoted in World Health Organisation (WHO) 'Guidelines for Community Noise, 1999' and British Standard 8233:2014 'Guidance on sound insulation and noise reduction for buildings'.

Therefore taking the above context into account the noise impact assessment can therefore be modified to *"less likely the specific sound source will have an adverse impact or a significant adverse impact"*

5. CONCLUSION

A noise impact assessment has been carried out in regards to the introduction of new condenser plant units installed to an existing plant compound at CKs Foodstores, Cwmllynfell, SA9 2GH.

A noise map model has been generated in order to assess current worst-case noise emissions from condenser plant. A noise impact assessment of the current scenario has been carried out in line with BS4142:2014+A1:2019 and indicates a “significant adverse impact, depending on the context”.

With the inclusion of an acoustic enclosure, absolute noise levels from all 5no condenser units at the nearest Sound Sensitive Receivers are indicated to fall by at least 13dB. A renewed BS4142 assessment describes this as “likely to be an indication of adverse impact, depending, on the context”.

Taking context of low plant noise levels and low background sound levels into account it is proposed to assess absolute noise levels. Assessing noise intrusion through a partially open window, internal plant noise levels are indicated to fall well below ‘desirable’ internal ambient noise criteria for habitable rooms, as quoted in WHO & BS 8233:2014 guidance.

Therefore taking the above context into account the noise impact assessment can therefore be modified to *“less likely the specific sound source will have an adverse impact or a significant adverse impact”*.

APPENDIX A - ACOUSTIC TERMINOLOGY

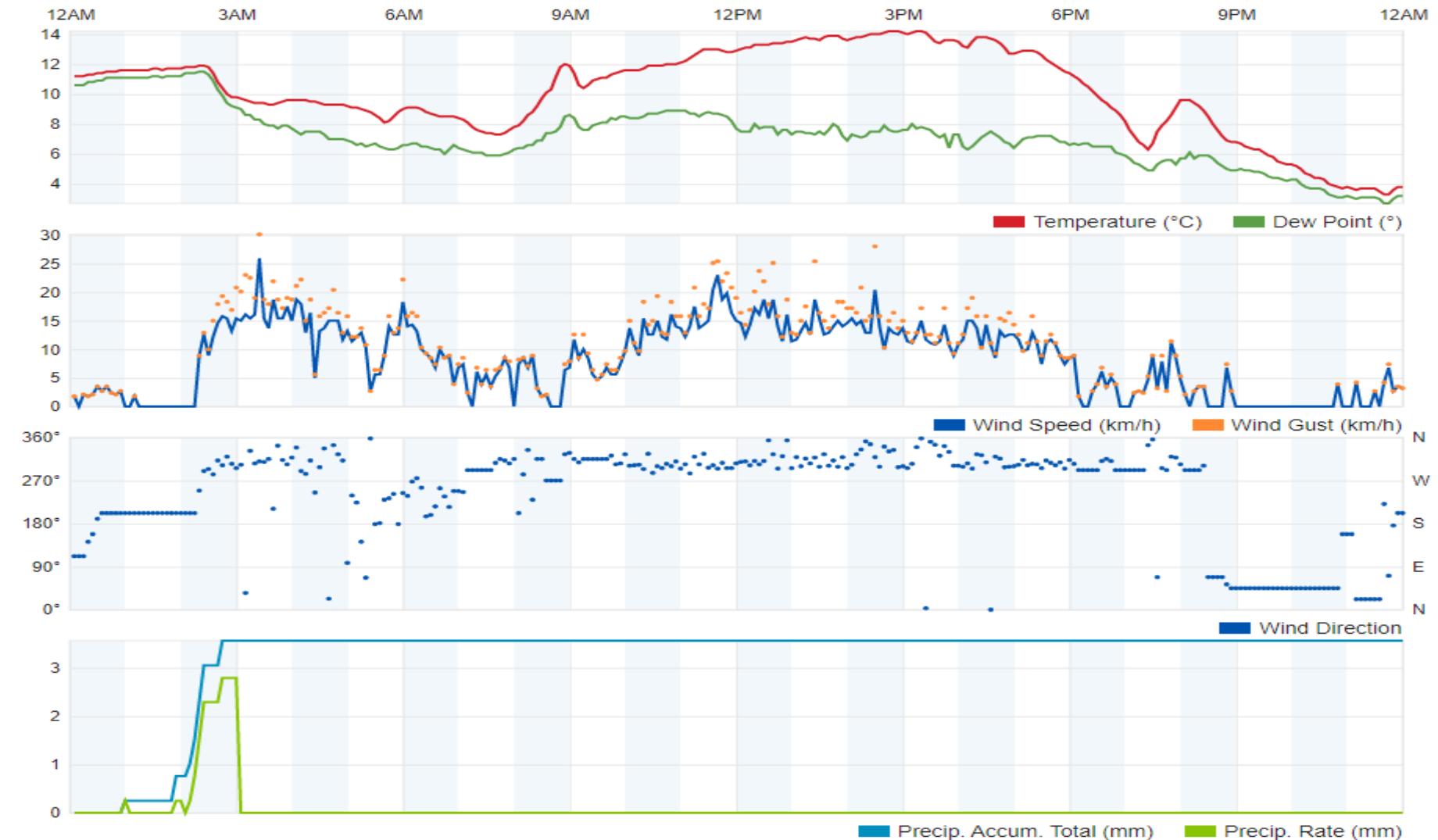
Human response to noise depends on a number of factors including loudness, frequency content and variations in level with time. Various frequency weightings and statistical indices have been developed in order to objectively quantify 'annoyance'.

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

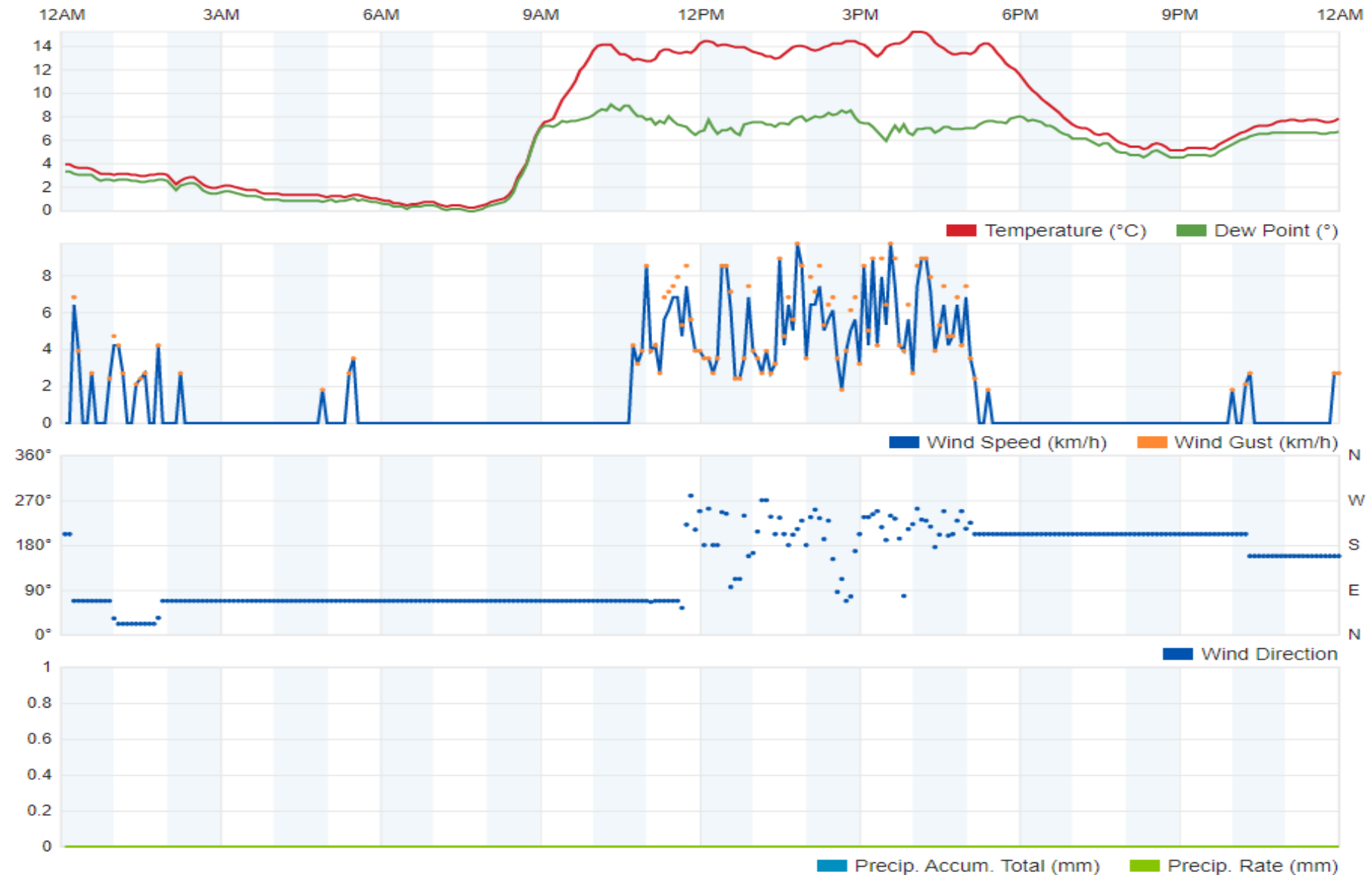
APPENDIX B - DIAGRAMS, GRAPHS AND TABLES

Figure B.1 – Approximate Weather History for Monday, 10 October 2022



Note: Taken from www.wunderground.com - weather station ISWANS50 located in Cwmllynfell [Elev 168m, 51.797° N, 3.812° W]

Figure B.2 – Approximate Weather History for Tuesday, 11 October 2022



Note: Taken from www.wunderground.com - weather station ISWANS50 located in Cwmllynfell [Elev 168m, 51.797° N, 3.812° W]

Figure B.3 – Time History at Position A

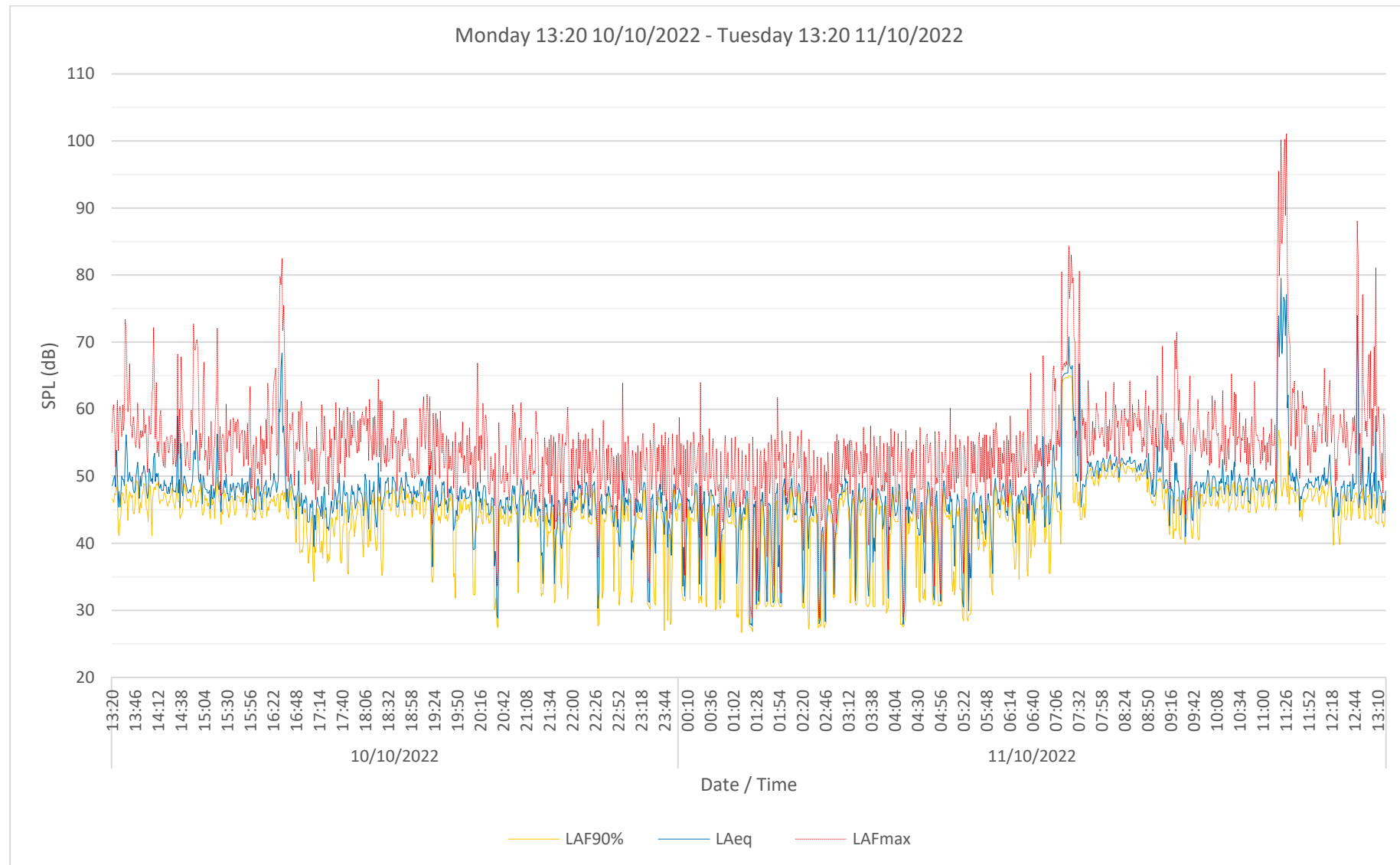


Table B.1 – Third-Octave Band Spectra

Measurement	Description	Comment	$L_{Aeq,T}$ (dB)	Third-Octave Band L_{eq} (dB)																							
				50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz	500 Hz	630 Hz	800 Hz	1 kHz	1.25 kHz	1.6 kHz	2 kHz	2.5 kHz	3.15 kHz	4 kHz	5 kHz	6.3 kHz	8 kHz	10 kHz
1	Background (No Plant Operational)	Controlled by distant road traffic.	31.3	42.6	37.6	39.4	36	31.6	32.3	26.9	26.4	26.1	24.6	24.6	21.4	21.7	20.6	18.9	17.6	16.1	14.7	14	12.8	12.9	11.8	11.8	11.8
2	J&E Hall JEHS-0350-B3-M-3 @ 1m	Taken in front of unit.	57.8	64.8	49.8	44	63.2	47	56.1	54.1	53.3	54.7	47.9	44.6	46.4	40.3	53	50.7	37.7	39.5	40	34.9	35.9	30.4	29	25.9	22.1

Table B.2 – Noise Model Input Data

Plant Item / Activity	L_w at Octave Band Centre Frequencies, Hz (dB)								L_{wA} (dB)
	63	125	250	500	1000	2000	4000	8000	
AC Unit 1	68	67	62	54	58	47	42	34	72.5
AC Unit 2 - 5	73	72	67	59	63	52	47	39	77.5

Figure B.4 – Narrow-band Tonality Analysis – AC Units @ Position A

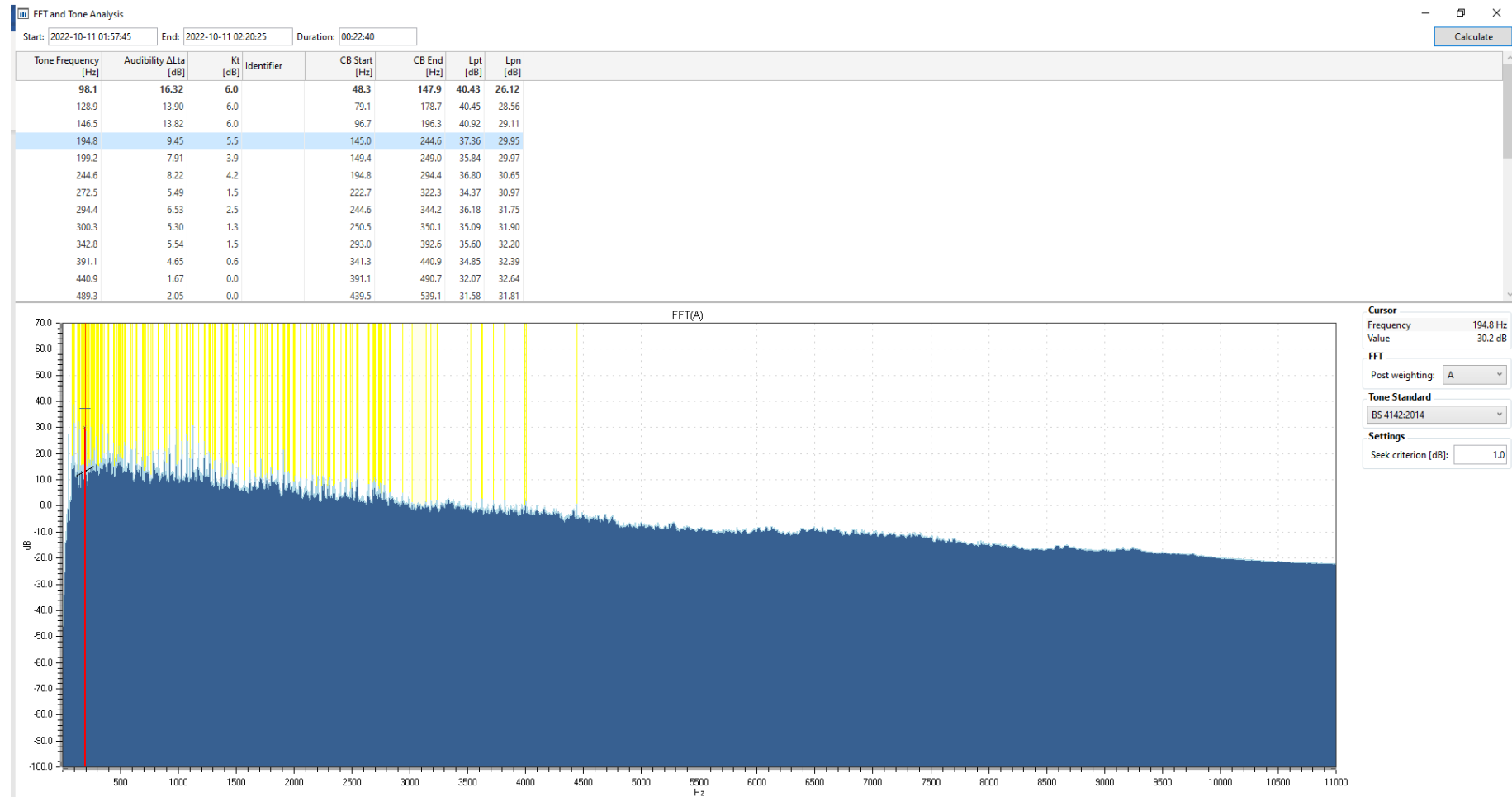


Figure B.5 – Panasonic Inverter Data Sheet

Panasonic

heating & cooling solutions

PACI Standard 4 Way 90x90 • R32		Three Phase
Kit		14.0 kW
Remote controller		KIT-140PU2Z8
Cooling capacity (Nominal)		CZ-RTCSB
Cooling capacity (Min)	kW	14,0
Cooling capacity (Max)	kW	3,3
EER (Nominal) (1)	W/W	15,0
EER (Min) (1)	W/W	3,23
EER (Max) (1)	W/W	5,32
SEER (2)	W/W	2,73
Pdesign (cooling)	kW	6,5
Input power cooling (Nominal)	kW	14,0
Annual energy consumption cooling (3)	kWh/a	4,34
Input power cooling (Min)	kW	—
Input power cooling (Max)	kW	0,62
Heating capacity (Nominal)	kW	5,50
Heating capacity (Min)	kW	14,0
Heating capacity (Max)	kW	3,4
COP (Nominal) (1)	W/W	16,0
COP (Min) (1)	W/W	4,18
COP (Max) (1)	W/W	3,33
SCOP (2)	W/W	5,48
Pdesign at -10°C	kW	3,9
Input power heating (Nominal)	kW	14,0
Input power heating (Min)	kW	3,35
Input power heating (Max)	kW	0,62
Annual energy consumption heating (3)	kWh/a	4,80
Indoor unit		—
Indoor air flow (Hi)	m³/min	S-140PU2E5B
Indoor air flow (Med)	m³/min	38,0
Indoor air flow (Lo)	m³/min	29,0
Moisture removal volume	L/h	20,0
Indoor sound pressure (Med) (4)	dB(A)	6,0
Indoor sound pressure (Lo) (4)	dB(A)	40
Indoor sound power (Hi)	dB(A)	34
Indoor sound power (Med)	dB(A)	62
Indoor sound power (Lo)	dB(A)	55
Indoor dimension (Height)	mm	49
Indoor dimension (Width)	mm	319
Indoor dimension (Depth)	mm	840
Panel dimension (Height)	mm	840
Panel dimension (Depth)	mm	33,5
Indoor net weight	kg	950
Panel net weight	kg	25
nanoe X Generator		5
Outdoor unit		Mark 1
Outdoor power source		U-140PZ2E8
Current in cooling (1p 220V / 3p 380)	V	380 - 400 - 415
Current in cooling (1p 230V / 3p 400)	A	6,85
Current in cooling (1p 240V / 3p 415)	A	6,50
Current in heating (1p 220V / 3p 380)	A	6,25
Current in heating (1p 230V / 3p 400)	A	5,25
Current in heating (1p 240V / 3p 415)	A	4,95
Outdoor air flow (Cool)	m³/min	4,80
Outdoor air flow (Heat)	m³/min	89
Outdoor sound pressure (Cool -Hi)	dB(A)	83
Outdoor sound pressure (Heat -Hi)	dB(A)	56
Outdoor sound power (Cool -Hi)	dB(A)	56
Outdoor sound power (Heat -Hi)	dB(A)	74
Outdoor dimension (Height)	mm	74
Outdoor dimension (Width)	mm	996
Outdoor dimension (Depth)	mm	980
Outdoor net weight	kg	370
Pipe diameter (Liquid)	Inch (mm)	94
Pipe diameter (Gas)	Inch (mm)	3/8 (9,52)
Pipe length range	m	5/8 (15,88)
Elevation difference (in/out) (5)	m	5 ~ 50
Pipe length for additional gas	m	30
Additional gas amount	g/m	30
Refrigerant (R32) / CO2 Eq.	kg / T	45
Operating range (Cool - Min)	°C	2,98 / 2,0115
Operating range (Cool - Max)	°C	-10
Operating range (Heat - Min)	°C	43
Operating range (Heat - Max)	°C	-15
	°C	24

Table B.3 – BS 4142:2014 Night-time Assessment at 1A Heol Daniel (Current Scenario – No Sound Additional Attenuation Measures)

Results		Relevant Clause	Commentary
Measured Levels of AC Plant	As detailed in section 3.5.2.	7.3.7	Source condenser plant noise levels are put in to noise modelling noise software and predicted to SSRs.
Residual sound level	N/A	7.3.2	N/A
Background sound level	$L_{A90,15min} = 27dB$	8.1.1 8.1.3 8.3	Background sound level measured at Position A.
Assessment made during the night-time so the reference time interval is 15-mins.		7.2	
Specific sound level.	$L_{Aeq,15min} = 45dB$	7.3.7	Calculated sum of plant sound levels predicted to the SSR – see Table 4.1.
Acoustic feature correction	Tonality = 6dB	9.3.3	Narrow-band analysis of monitoring at Pos A indicates audible tone at 194Hz – See Figure B.4.
Rating Level	$(45+6) = 51dB$		
Background sound level (night-time)	$L_{A90(2300-0700hrs)} = 27dB$	8.3	
Excess of rating over background sound level	$(51 - 27) dB = 24dB$	11	
Assessment indicates significant adverse impact likely, depending on context		11	At 24dB above background BS 4142:2014 advises: "likely to be an indication of a significant adverse impact, depending on the context."
Uncertainty of assessment		10	Uncertainty in noise measurements is considered low.

Table B.4 – BS 4142:2014 Night-time Assessment at 1A Heol Daniel (Proposed Scenario – With Noise Mitigation Measures)

Results		Relevant Clause	Commentary
Predicted Levels of AC Plant	As detailed in section 3.5.2.	7.3.7	Source condenser plant noise levels are put in to noise modelling noise software and predicted to SSRs.
Residual sound level	N/A	7.3.2	N/A
Background sound level	$L_{A90,15min} = 27\text{dB}$	8.1.1 8.1.3 8.3	Background sound level measured at Position A.
Assessment made during the night-time so the reference time interval is 15-mins.		7.2	
Specific sound level.	$L_{Aeq,15min} = 32\text{dB}$	7.3.7	Calculated sum of plant sound levels predicted to the SSR – see Table 4.4.
Acoustic feature correction	Tonality = 2dB	9.2	A 'just perceptible' penalty for tonality is applied. This is to account for the significant sound reduction compared to the current scenario.
Rating Level	$(32+2) = 34\text{dB}$		
Background sound level (night-time)	$L_{A90(2300-0700hrs)} = 27\text{dB}$	8.3	
Excess of rating over background sound level	$(34 - 27) \text{ dB} = 7\text{dB}$	11	
Assessment indicates likelihood of adverse impact, depending on context		11	Although the excess of rating over background sound level is indicated to be +7dB, it is concluded by professional judgement that, taking context into consideration, there is less likelihood of adverse impact.
Uncertainty of assessment		10	Uncertainty in noise measurements is considered low.

APPENDIX C - NOISE MAP MODELS

Figure C.1 – Current Scenario Noise Map (No Sound Attenuation Measures) $L_{Aeq,T}$ Contours at 4.5m Height (First Floor Level)

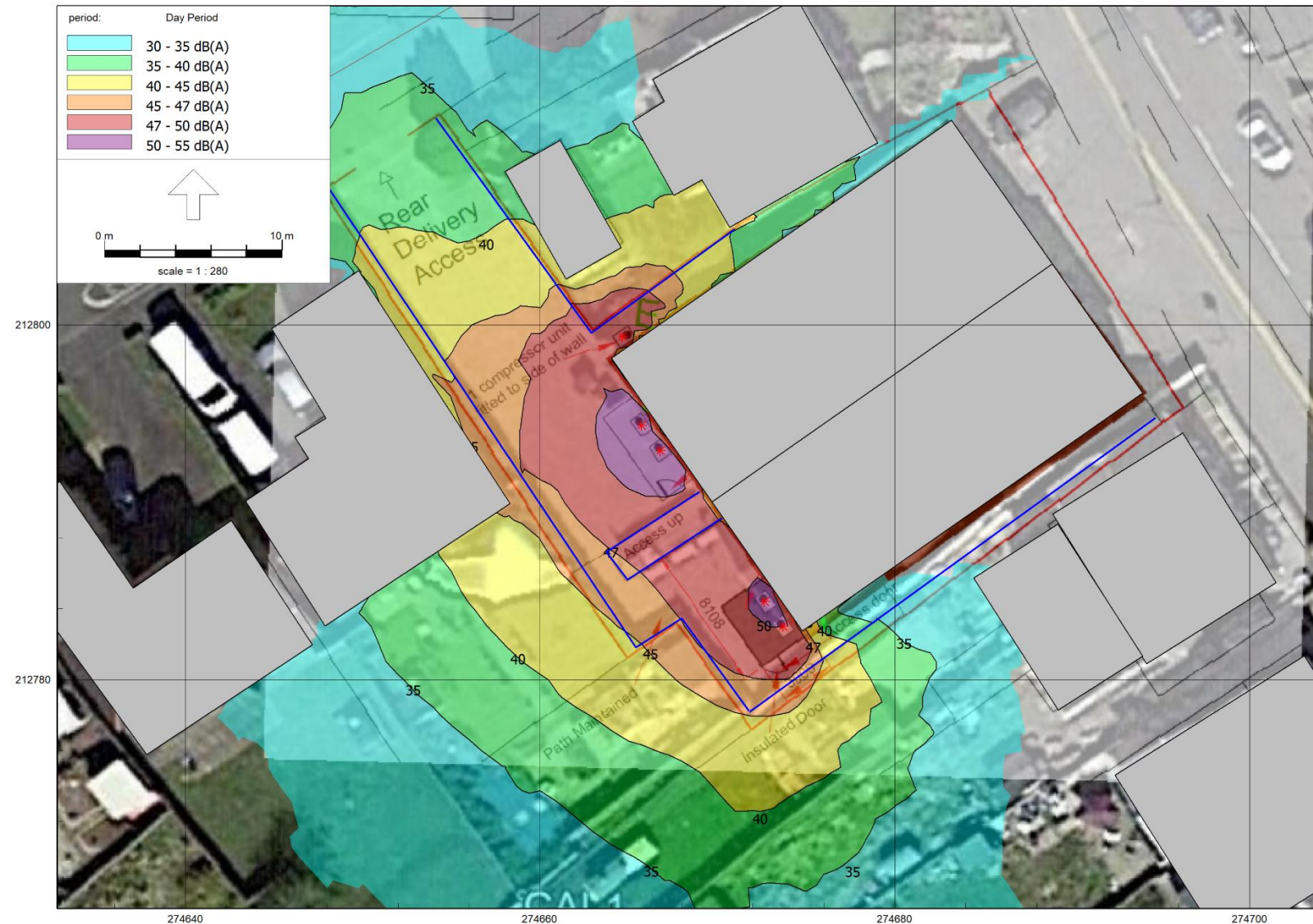


Figure C.2 – Proposed Scenario Noise Map (Enclosures Implemented) $L_{Aeq,T}$ Contours at 4.5m Height (First Floor Level)

