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Virtus Saunderton
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1 Introduction

1.1.1 Temple Group has been appointed by Bryden Wood to provide noise and vibration support during Stage 2 and 3 of the design for a new data centre campus at the Former Molins Site, Haw Lane, Saunderton, Buckinghamshire. The Proposed Development will comprise of four separate data centre buildings, electricity sub-station, vehicle access, approximately 150 car parking spaces, landscaping, security fencing, and gates.

1.1.2 The assessment included within this report is based on the final completed construction of the site (i.e. all four data centre buildings). The phased construction of each data centre building has not been considered, as the final completed site would provide the worst-case acoustic conditions. It should be noted that the electricity sub-station is being designed by a separate utility services provider and is therefore not covered by this report.

1.1.3 This report covers the assessment of external plant noise emission from the data centre key items (generators and chillers) at the nearest noise sensitive receptors, provides acoustic performance specification for internal office uses and an assessment of vibration exposure at the site.

1.1.4 External attended and unattended noise measurements have been completed at and around the site to characterise the typical background noise levels over the daytime and night-time periods at locations representative of nearby sensitive receptors. Attended vibration measurements have been completed to determine the impact from local transportation sources at the Proposed Development.

1.1.5 The measured background noise levels have been used to set plant noise limits in accordance with the local authority requirements. Plant noise from the chillers and generators has been modelled and predicted at the nearest noise sensitive receptors to site and compared against the noise limits.

1.1.6 It should be noted that the acoustic modelling included within this report is based on specific plant manufacturers and plant selections available at the time of writing the report (RIBA Stage 3 design). The final plant selections, manufacturers, and arrangements may be subject to change for the final detailed design and construction stages. However, any future alternative plant / arrangement will be selected to meet the overall performance outlined within this report.

1.1.7 Details of the assessment methodology used, together with the results of the survey undertaken and the subsequent conclusions and recommendations drawn are presented in this report.

1.1.8 A glossary of acoustic terms and their meanings has been included in **Appendix A - Acoustic Glossary**.

2 Standards and Guidance

2.1 Technical Standards and Guidance

British Standard 7445 – Description and measurement of environmental noise

2.1.1 British Standard 7445 Part 1 (BS 7455-1:2003)[1] defines the basic quantities to be used for the description of noise in community environments and describes basic procedures for the determination of these quantities.

2.1.2 The methods and procedures described in this British Standard are intended to be applicable to sounds from all sources, individually and in combination, which contribute to the total noise at a site.

2.1.3 British Standard 7445 Part 2 (BS 7455-2:1991)[2] describes methods for the acquisition of data which provide descriptors that enable:

- a description of the environmental noise in a specified area of land to be made in a uniform way;
- the compatibility of any land use activity or projected activity to be assessed with respect to existing or predicted noise; and
- Using the data as a basis, authorities may establish a system for selecting the appropriate land use, as far as levels of noise are concerned, for a specified area, or the sources of noise - existing or planned - which are acceptable with respect to land use, existing or planned.

British Standard 4142 – Methods for rating and assessing industrial and commercial sound

2.1.4 British Standard 4142:2014+A1:2019[3] (BS 4142) describes methods for rating and assessing sound of an industrial and/or commercial nature. The method uses outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident. The method is suitable for the purpose of assessing sound at proposed new dwellings or premises used for residential purposes.

2.1.5 The method of assessment requires that the existing external background noise level, L_{A90}, be subtracted from the predicted specific sound level plus any adjustment for the characteristic features of the sound.

2.1.6 Certain acoustic features can increase the significance of impact over that expected from a basic comparison between the specific sound level and the background sound

[1] British Standards Institute (BSI), (2003): 'BS 7445 – Description and Measurement of Environmental Noise. Part 1: Guide to Quantities and Procedures'. BSI, London.
[2] British Standards Institute (BSI), (1991): 'BS 7445 – Description and Measurement of Environmental Noise. Part 2: Guide to the Acquisition of Data Pertinent to Land Use'. BSI, London.
[3] British Standards Institution (June 2019), British Standard 4142:2014+A1:2019 'Methods for rating and assessing industrial and commercial sound'

level. Where such features are present at the assessment location, an acoustic character correction is required. The corrected specific sound level is the Rating Level.

2.1.7 BS 4142 contains several methods for the determination of tones and their corresponding penalties. For sound ranging from not tonal to prominently tonal, the Joint Nordic Method gives a correction of between 0 dB and +6 dB for tonality. Subjectively, this can be converted to a penalty of 2 dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible and 6 dB where it is highly perceptible.

2.1.8 A correction of up to +9 dB can be applied for sound that is highly impulsive, considering both the rapidity of the change in sound level and the overall change in sound level. Subjectively, this can be converted to a penalty of 3 dB for impulsivity which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible, and 9 dB where it is highly perceptible.

2.1.9 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 3 dB can be applied.

2.1.10 BS 4142 states that typically the greater the difference between the Rating Level and the background noise level, the greater the magnitude of the impact:

- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
- A difference of around +5 dB is likely to be an indication of an adverse impact, depending on 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 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.

2.1.11 The consideration of context is of particular importance when assessing the effect of an existing noise source on proposed noise-sensitive dwellings. In its scope definition, BS 4142 states that it is *“not intended to be applied to the derivation of indoor sound levels arising from sound levels outside, or the assessment of indoor sound levels”*. As part of the assessment of effect, BS 4142 discusses the need to consider all pertinent factors which may modify the initial assessment. In this regard it states:

“*The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions, such as:*

- *facade insulation treatment;*
- *ventilation and/or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation; and*
- *acoustic screening*.”

2.1.12 Therefore, when considering effects on residents inside their property, such as the potential for sleep disturbance, BS 4142 suggests that the guidance in BS 8233 (see above) is more applicable.

British Standard 6472

2.1.13 British Standard 6472-1: 2008 'Guide to Evaluation of Human Exposure to Vibration in Buildings Part 1: Vibration Sources other than Blasting'[4] presents recommended frequency weighted vibration spectra (for continuous vibration) and vibration dose values (VDV) (for intermittent vibration) above which adverse comment is likely to occur in residential properties. **Table 1** shows vibration dose value ranges which might result in various probabilities of adverse comment within residential buildings.

Table 1 Vibration dosed value ranges which might result in various probabilities of adverse comment within residential buildings

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 16hr day	0.2 to 0.4	0.4 to 0.8	0.8 to 1.6
Residential buildings 8hr night	0.1 to 0.2	0.2 to 0.4	0.4 to 0.8

2.1.14 NOTE For offices and workshops, multiplying factors of 2 and 4 respectively should be applied to the above vibration dose value ranges for a 16-hour day.

British Standard 8233 - Guidance on sound insulation and noise reduction for buildings

2.1.15 British Standard 8233:2014[5] (BS 8233) 'Guidance on Sound Insulation and Noise Reduction for Buildings' provides criteria for the assessment of internal noise levels for various uses including dwellings and commercial properties. The standard suggests suitable internal noise levels within different types of space with examples for offices and dwellings shown in **Table 2** and **Table 3**.

Table 2 BS 8233 Guideline indoor noise levels for offices

Objective/Activity	Location	Design Range $L_{Aeq,\,T}$ dB
Typical noise levels for acoustic privacy in shared spaced	Open Plan office	45-50
Study and work requiring concentration	Executive office	35-40

2.1.16

[4] British Standards Institution (June 2008), British Standard 6472-1: 2008 'Guide to Evaluation of Human Exposure to Vibration in Buildings Part 1: Vibration Sources other than Blasting'

[5] British Standards Institute (BSI), (2014). 'BS 8233 – Guidance on sound insulation and noise reduction for buildings. BSI, London.

Table 3 BS 8233 Guideline indoor noise levels for dwellings

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living Room	35 dB $L_{Aeq, 16hour}$	-
Dining	Dining room/area	40 dB $L_{Aeq, 16hour}$	-
Sleeping	Bedroom	35 dB $L_{Aeq, 16hour}$	30 dB $L_{Aeq, 8hour}$

British Council for Offices (BCO) – Guide to specification

2.1.17 The BCO Guide to specification[6] provides design and specification guidance on how to develop workplaces. It covers a range of topics including envelope, structural engineering, building services, finishes, fit out and acoustics. It states:

2.1.18 *"The acoustic environment in offices affects wellbeing, concentration, communication and productivity. Excessive noise can cause disturbance and discomfort and, when background levels are too low, unwanted noise causes greater distraction. Acoustic privacy is important, whether in an open plan environment, across partitioning or in cellular space. Good acoustic design is an essential ingredient of the well-designed office."*

2.2 Planning Conditions

2.2.1 Planning permission (08/05740/FULEA) for the site was approved in 2008 subject to several planning conditions, conditions 10 and 11 relate to noise and have been summarised below:

2.2.2 *"10. Prior to construction above ground within each phase approved pursuant to Conditions 3, a scheme shall be submitted to and approved in writing by the Local Planning Authority which specified the provisions to be made for the control of noise emanating from the development within the phase. The target levels for the plant would be that the rating level (as defined in BS 4142) be at least 5 dB below the background noise level (excluding the 'stand-by' generator plant) currently existing at agreed sensitive locations specified within the Environmental Statement[7] accompanying planning permission 08/05740/FULEA. As such in the event of tonal emissions, a 5 dB penalty shall apply therefore making the specific level at least 10 dB below the minimum background (LA90) level. Thereafter, no use within a phase approved pursuant to Condition 3 shall commence until the approved noise control scheme within the phase has been fully implemented and a validation report has been submitted to and approved in writing by the Local Planning Authority to demonstrate that the scheme is achieving the requisite performance. The implemented and validated measures within the noise control scheme shall be retained and maintained thereafter in accordance with the approved details.*

2.2.3 *Reason: To protect the occupants of nearby residential properties from noise disturbance*

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[6] British Council for Office (2019). Guide to Specification

[7] King Sturge LLP on behalf of e-shelter (UK) and Molins PLC (March 2008). Environmental Statement, Molins Site, Haw Lane, Saunderton.

2.2.4 *11. The generator plant shall be used for emergency purposes only, which is deemed as to be when the electricity supply to the development has failed, and at no other times except for testing and maintenance. The noise emitted by the generator plant shall not exceed existing background noise levels currently existing at agreed sensitive locations specified within the Environmental Statement[7].*

2.2.5 *Reason: In order to protect neighbouring occupiers from noise disturbance"*

2.3 Initial Consultation

2.3.1 On 28th of June 2024, Norbert Skopinski, a Principal Consultant at Temple contacted Buckinghamshire Environmental Health team (environmentalhealth@buckinghamshire.gov.uk) via email. The correspondence summarised the proposed methodology for undertaking the noise survey and subsequent assessment. On the 4th of July 2024, a response was received from Stuart Goodbun (Stuart.Goodbun@buckinghamshire.gov.uk) confirming that the approach was reasonable.

2.4 Further Consultation

2.4.1 It was noted by Temple that there were inconsistencies within the written acoustic conditions (presented in **Section 2.2**) that required clarification. It also appeared that the conditions, which were first written in 2008, were based on the 2008 Environmental Statement where background noise levels were derived from a single 15-minute measurement during each period of the day, evening and night (which would typically be deemed insufficient). The conditions also referenced guidance that has since been superseded. In addition to this, during the initial consultation with Stuart Goodburn, an example of a typical external plant noise condition proposed by Buckinghamshire Council (BC) was provided which had different criteria to those currently enforced on the site.

2.4.2 Due to the above, further consultation with BC was undertaken to clarify the ambiguities noted by Temple in the conditions. Norbert Skopinski contacted Stuart Goodburn via email on the 30th September 2024 to raise the relating queries. Following a call on the 1st October 2024, an email response was received from Stuart Goodburn on the same day stating his agreement with the derived typical background noise levels at the site, and confirmation that the conditioned noise limit requirements should be updated to match the latest BC criteria (limits of typical background + 3 dB). This correspondence is presented in **Appendix B – Consultation**.

3 The Site and its Surrounding

3.1.1 The Proposed Development is located at the Former Molins site, Haw Lane, Saunderton, Buckinghamshire. Access is provided directly from Haw Lane which runs along the northern boundary of the site. The A4010 Wycombe Road and Chiltern railway lines into Saunderton Station are located approximately 200m and 100m east of the site boundary respectively. The remaining surroundings of the site are predominantly agricultural land with a small number of residential properties.

3.1.2 The nearest noise sensitive receptors to the Proposed Development are as follows:

- Residential property on Haw Lane, located adjacent to the site boundary (R1)
- Residential property on Haw Lane, located adjacent to the site boundary (R2)
- Residential property on Haw Lane, located approximately 20m northeast from the site boundary (R3)
- Residential properties on Saunderton Vale, located approximately 200m southeast from the site boundary (R4)
- Dean Valley Studios (film) on Deanfield, located approximately 250m southwest from the site boundary (R5)
- Residential property on Deanfield, located approximately 325m southwest from the site boundary (R6)
- Residential properties off Haw Lane, located approximately 380m west of the site boundary (R7)

3.1.3 The main noise sources incident upon the Proposed Development that control the noise climate are:

- Haw Lane
- The A4010 Wycombe Road
- Railway lines north of Saunderton Station

3.1.4 **Figure 1** shows the site boundary and receptors.

3.2 Proposed Development

3.2.1 The Proposed Development will comprise of four separate data centre buildings referred to as London 15, 16, 17 and 18. London 15-17 will be two storey buildings while London 18 will have three storeys. There are two existing office buildings on the northern boundary of the site which will be retained and refurbished as part of the Proposed Development. An on-site electricity substation is also currently being built along with vehicle access, approximately 150 car parking spaces and security fences/gates to support the data centres and office buildings.

3.3 Proposed Plant

3.3.1 The proposal is to house plant on external gantries on the west and east sides of each data centre building. At this stage only the largest plant items have been modelled which includes the chillers and generators. The chillers are proposed to run 24/7 while the generators will only run during emergencies and for maintenance. The number and type of plant proposed is presented below:

London 15 (L15)

- 7 x Cat 3516E HPD Diesel Generators – Located on the ground floor gantries
- 7 x Airedale TurboChill 'V' 1601 kW Chillers – Located on the first-floor gantries

London 16 (L16)

- 16 x Cat 3516E HPD Diesel Generators – Located on the ground floor gantries
- 16 x Airedale TurboChill 'V' 1653 kW Chillers – Located on the first-floor gantries

London 17 (L17)

- 12 x Cat 3516E HPD Diesel Generators – Located on the ground floor gantries
- 12 x Airedale TurboChill 'V' 1569 kW Chillers – Located on the first-floor gantries

London 18 (L18)

- 22 x Cat 3516E HPD Diesel Generators – Located on the ground and first floor gantries
- 22 x Airedale TurboChill 'V' 1601 kW Chillers – Located on the second-floor gantries

3.3.2 Plant Specification sheet data can be found in **Appendix C – Data Sheets**, the data from which has been summarised below in **Table 4**. Layouts of the proposed plant can be seen in **Appendix D - Site Layout**.

3.3.3 Noise data for the generator presented in **Table 4** includes an attenuated container, inlet and outlet/exhaust.

Table 4 Plant noise levels (Manufacturer/Supplier Data)

Plant item/model	Location	Mode	Octave Band Centre Frequency Hz (dB)								Data Type
			63	125	250	500	1000	2000	4000	8000	
Airedale TurboChill 'V' 1601 kW Chiller	L15 & L18	Day (34.3 °C)	89	95	92	91	89	85	85	86	Sound Power Level
		Night (24.5 °C)	89	94	91	90	89	84	85	85	
Airedale TurboChill 'V' 1653 kW Chiller	L16	Day (34.3 °C)	89	95	92	91	90	85	86	86	
		Night (24.5 °C)	89	95	92	91	89	85	85	86	
Airedale TurboChill 'V' 1569 kW Chiller	L17	Day (34.3 °C)	89	95	92	91	89	85	85	85	
		Night (24.5 °C)	89	94	91	90	89	84	84	84	
Cat 3516E Generator - Body	L15, L16, L17 and L18	n/a	83	71	64	49	35	26	20	40	Unweighted sound pressure level at 1m from container/inlet/outlet
Cat 3516E Generator – Inlet			86	76	64	40	29	20	30	47	
Cat 3516E Generator – Discharge duct (including exhaust)			88	78	64	49	45	45	36	43	

3.3.4 Single figure directional sound power level data was also supplied for the chiller units (which can be seen in **Appendix C – Data Sheets**). Octave band directional data has been derived by scaling the octave band total sound power levels (seen in **Table 4**) to the single figure values. This is presented in **Table 5.**

Table 5 Derived directional octave band chiller sound power levels for model input

Plant item/model	Location	Mode	Side	Octave Band Centre Frequency Hz (dB)							
				63	125	250	500	1000	2000	4000	8000
Airedale TurboChill 'V' 1601 kW Chiller	L15 & L18	Day (34.3 °C)	Long	85	91	88	87	85	81	81	82
			Short	78	84	81	80	78	74	74	75
		Night (24.5 °C)	Long	85	90	87	86	85	80	81	81
			Short	78	83	80	79	78	73	74	74
Airedale TurboChill 'V' 1653 kW Chiller	L16	Day (34.3 °C)	Long	85	91	88	87	86	81	82	82
			Short	78	84	81	80	79	74	75	75
		Night (24.5 °C)	Long	85	91	88	87	85	81	81	82
			Short	78	84	81	80	78	74	74	75
Airedale TurboChill 'V' 1569 kW Chiller	L17	Day (34.3 °C)	Long	85	91	88	87	85	81	81	81
			Short	78	84	81	80	78	74	74	74
		Night (24.5 °C)	Long	85	90	87	86	85	80	80	80
			Short	78	83	80	79	78	73	73	73

3.3.5 Sound pressure level data supplied for the generator unit has been converted to sound power levels, it is assumed that the measurements were made over soft (absorptive) ground as this is worst case. The calculated generator sound power levels are presented in **Table 6**.

Table 6 Derived generator sound power levels for model input

Plant item/model	Octave Band Centre Frequency Sound Powe Level Hz (dB)							
	63	125	250	500	1000	2000	4000	8000
Cat 3516E Generator - Body	103	90	84	69	55	46	40	59
Cat 3516E Generator – Inlet	97	87	75	51	40	31	41	58
Cat 3516E Generator – Discharge duct (including exhaust)	99	89	75	60	56	56	47	54

4 Measurement Methodology

4.1 Unattended Noise Monitoring

4.1.1 An unattended environmental noise survey was carried out at the Proposed Development between Wednesday the 10th July and Wednesday the 17th July 2024 to obtain full daytime and night-time baseline noise levels during weekdays and at a weekend. The environmental noise survey was undertaken in accordance with BS 7445: Part 2.

4.1.2 The unattended sound level meter's microphone at each position was positioned at a height of 1.2m above the ground level, and further than 3m away from any reflective surface and therefore are considered to have measured free-field levels. The microphones were fitted with a windshield and appropriate corrections applied.

4.1.3 The sound level meters were set to log continuously over 15-minute periods measuring octave band and A -weighted parameters.

4.1.4 The unattended measurement positions are shown in **Figure 1**. Photos of each measurement position can be seen in **Appendix E – Survey Photos**.

4.2 Attended Noise Monitoring

4.2.1 An attended noise survey was carried out at two further locations on Wednesday the 10th July 2024 to further assess the noise conditions across the site and at the residential receptors along Saunderton Vale road.

4.2.2 At each location the sound level meter was mounted on a tripod at a height of approximately 1.2m above local ground level. The microphone was considered to have measured free-field levels.

4.2.3 The meter was set to log in 15-minute periods measuring octave band and A-weighted L_{eq}, L_{Fmax}, L_{10} and L_{90} parameters. Measurements were synchronised with the unattended monitors to determine the relationship between the noise levels at each location.

4.2.4 No unusual acoustic events occurred during measurements, and the data is considered to provide a fair representation of the typical acoustic environment at the relevant measurement locations.

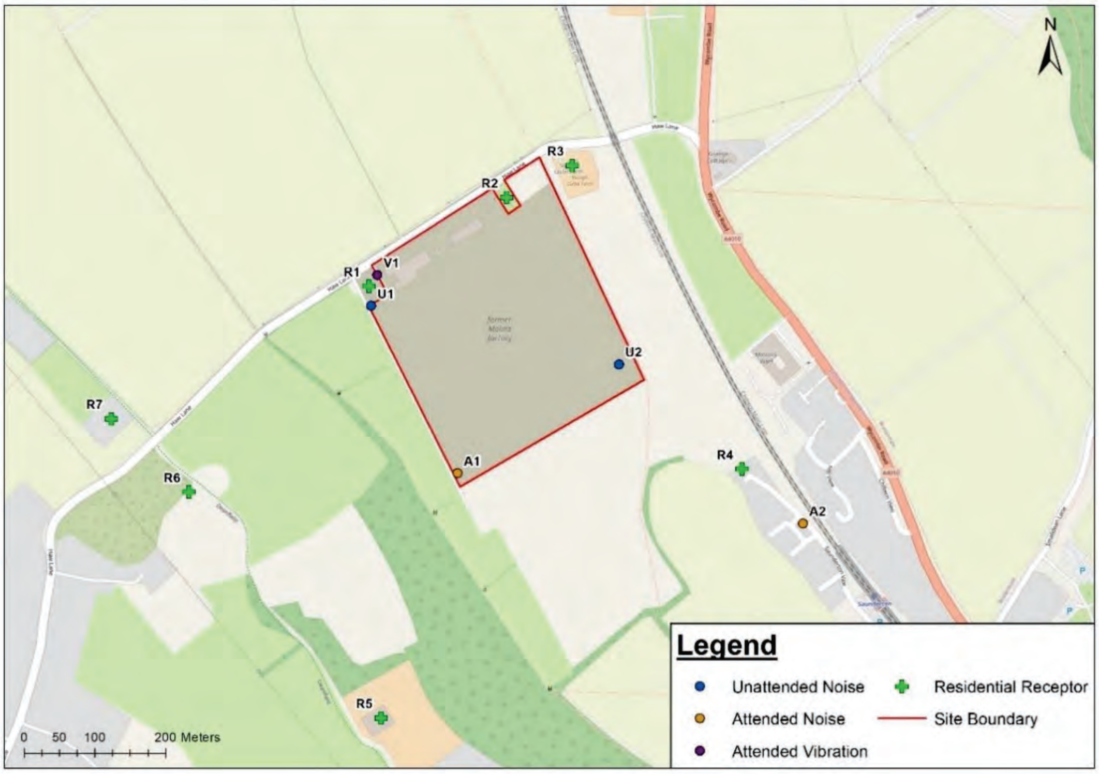
4.3 Attended Vibration Monitoring

4.3.1 An attended vibration survey was carried out at a location approximately 16m away from Haw Lane in the northeast corner of the site. The location (V1) was in line with the northern façade of the 'Ballroom' building. The survey was carried out on 17th July 2024 to determine the vibration levels due to road traffic on Haw Lane.

4.3.2 Vibration measurements were carried out using a vibration monitor and a triaxial accelerometer. Vibrations Dose Value (VDV) measurements were taken in all three axes (X,Y,Z) with the X-axis perpendicular to Haw Lane, Y-axis parallel to Haw Lane and Z as the vertical axis. The accelerometer was mounted on a DIN plate which was levelled and placed on a flat concrete surface within the site boundary.

4.3.3 The attended measurement positions are shown in **Figure 1** below. Photos of each measurement positions are presented in **Appendix E – Survey Photos**.

Figure 1 Survey measurement locations



4.4 Equipment

4.4.1 The equipment used is detailed in **Table 7** below. The sound level meters were field checked for calibration before and after their respective measurement periods and no significant variation in level was observed. The equipment is subject to manufacturer's certificates of periodic verification within one year for the field calibrator and two year's for sound level and vibration meters. Copies of these certificates are available upon request.

Table 7 Survey equipment

Manufacturer	Item	Type	Serial Number	Calibration Due Date
RION	Sound Level Meter	NA-28	01260205	29/01/2026
RION	Sound Level Meter	NL-52	00510141	19/09/2025
RION	Sound Level Meter	NL-52	00410086	19/09/2025
RION	Calibrator	NC-74	35094451	08/11/2024
SVANTEK	Vibration Monitor	SV-106A	46325	10/10/2023

4.5 Meteorological Conditions

4.5.1 Meteorological conditions during the survey have been observed based on data captured at the weather station at (Bledlow Ridge - IBUCKING19)[8]. Periods of excessive wind speeds (greater than 5m/s) and precipitation have been reviewed. The meteorological data for the surveying period can be seen in **Figure 19** in **Appendix F – Weather Data.** A period between 18:44 and 22:44 on Thursday the 15th of July was excluded due to precipitation.

[8] https://www.wunderground.com/dashboard/pws/IBUCKING19

5 Noise Survey Results

5.1 Survey Observations

5.1.1 During the visit to site, observations regarding perceptible noise and vibration sources influencing the baseline were noted by the surveyor at each measurement location, a summary of which is presented below.

Noise Survey

Unattended Location 1 (U1) – Northwest corner of the site

5.1.2 During the survey set up and take-down, the noise climate consisted of birds in the surrounding vegetation and trees blowing in the wind. The trains were dominant when present. Distant construction works of the substation to the east of the monitoring location could be heard during quieter moments of the survey.

Unattended Location 2 (U2) – Southeast corner of the site

5.1.3 During the survey set up and take-down, the noise climate consisted of road traffic noise from the A4010 (Wycombe Road). The trains were loud and dominant when present due to the close proximity of the tracks. Distant construction works of the substation to the north of the monitoring location could be heard during quieter moments of the survey.

Attended Location 1 (A1) – Southwest corner of the site

5.1.4 During the survey, the noise climate consisted of people shouting from the south and cars occasionally driving along the track that is located along the western edge of the Proposed Site. Distant construction works of the substation to the east of the monitoring location could be heard during quieter moments of the survey.

Attended Location 2 (A2) – Saunderton Vale

5.1.5 During the survey, the noise climate was made up of trees moving in the wind and birds in the surrounding vegetation. Train noise was dominant when present and was the loudest at this location compared to any of the other monitoring locations. Road traffic noise could be heard in the distance from A4010 (Wycombe Road) and cars were also observed occasionally driving along Saunderton Vale Road.

5.2 Unattended Noise Measurement Results

5.2.1 A summary of the results of the daytime and night-time continuous noise measurements at the unattended locations are presented in **Table 8**. Graphs showing the time history of the measured results for the unattended monitoring locations is given in **Appendix G - Unattended Measurement Data**.

5.2.2 The daytime/night-time $L_{Aeq, T}$ has been calculated for each day, and the typical $L_{Aeq, T}$ is the arithmetic average of all the daytime/night-time values. The typical L_{AF90} (background sound level) has been calculated by undertaking a statistical analysis of how often the levels occur during the daytime/night-time period in accordance with methods presented in BS 4142.

5.2.3 The daytime results have been based on the weekend only to remove any influence from the ongoing substation construction works on the measured noise levels.

Table 8 Unattended noise survey results

Parameter	Period	U1 (dB)	U2 (dB)
Typical $L_{Aeq,T}$	Daytime	46	46
	Night-time	42	42
Typical L_{AF90}	Daytime	35	35
	Night-time	31	27
Lowest L_{AF90}	Daytime	27	29
	Night-time	18	18

5.2.4 Full unattended measurement data along with the $L_{A90,\,15mins}$ statistical analysis is presented in **Appendix G - Unattended Measurement Data** and **Appendix H – LA90, 15mins Statistical Analysis**.

5.3 Attended Noise Results

5.3.1 Presented in **Table 9** are the results of the attended noise monitoring. The attended measurements were synchronised with the corresponding unattended locations (U1 for A1 and U2 for A2) to determine the relationship between the background noise levels at each location (as they are influenced by the same sources). The simultaneous results from the unattended monitors have therefore been presented alongside the attended noise measurements to calculate the difference between the L_{A90}.

Table 9 Attended noise survey results

Date/Time	Location	$L_{Aeq,15min}$ (dB)	$L_{A90,15min}$ (dB)	Average difference between attended and corresponding unattended location $L_{A90,15min}$ (dB)
10/07/2024 12:00	A1	47	38	-1
10/07/2024 13:30		43	38	
10/07/2024 14:00		44	40	
10/07/2024 12:00	U1	48	38	
10/07/2024 13:30		45	38	
10/07/2024 14:00		46	42	
10/07/2024 12:30	A2	57	40	1
10/07/2024 13:00		60	39	
10/07/2024 14:30		60	41	
10/07/2024 12:30	U2	43	38	
10/07/2024 13:00		44	37	
10/07/2024 14:30		48	40	

5.4 Noise Baseline Allocation

5.4.1 Baseline noise levels measured at U1 are considered representative of receptors at R1, R2 and R3 due to its proximity to Haw Lane.

5.4.2 Full daytime and night-time baseline noise levels at A1 and A2 have been derived based on the simultaneous measurement data at these locations and their corresponding unattended locations shown in **Figure 1**. This measurement exercise demonstrated that $L_{A90,\ 15mins}$ levels at A1 were typically 1 dB lower than those at U1 during the daytime, and those at A2 were typically 1 dB higher than those at U2 during the daytime. As these locations are exposed to the same noise sources during the daytime and night-time, we can assume the relationships between the night-time noise levels would be the same.

5.4.3 The baseline noise levels at A1 with corrections for the additional distance (and any screening from ground heights) have been allocated to receptors at R5, R6 and R7. The additional corrections for distance and screening were calculated in CadnaA.

5.4.4 The baseline noise levels at A2 are considered representative of receptors at R4.

5.4.5 The derived daytime and night-time noise limits have also considered noise generated by the substation based on information provided in 'Molins Site Substation sound emission assessment' (Doc ref: 285580-00/AAVT/R01) Arup report dated 26th October 2022. The report recommends that the substation should achieve a rating level of 25 dB$L_{Ar,Tr}$ to avoid in combination effects with the data centre. When assuming a rating level of 25 dB$L_{Ar,Tr}$ from the substation plant, the night-time noise limits from the data centre would need to be reduced by 1 dB to not exceed BC requirements. This reduction has only been applied to the nearest receptors (R1, R2 and R3) as it is assumed that the rating level at further receptors would be at least 1 dB lower due to additional distance attenuation. The daytime noise limits would be unaffected.

5.4.6 A summary of baseline allocations is presented in **Table 10.**

Table 10 Baseline allocation summary

Receptor	Representative Survey Location	Additional Corrections Applied	Typical L_{AF90} Daytime (07:00-23:00)	Typical L_{AF90} Night-time (23:00-07:00)	Daytime Noise Limit at 1m from Receptor	Night-time Noise Limit at 1m from Receptor
R1	U1	No	35	31	38	33
R2	U1	No	35	31	38	33
R3	U1	No	35	31	38	33
R4	A2	No	36	28	39	31
R5	A1	Yes (-4)	30	26	33	29
R6	A1	Yes (-4)	30	26	33	29
R7	A1	Yes (-5)	26	25	29	28

5.5 Attended Vibration Results

5.5.1 Results from the daytime attended vibration survey are presented in **Table 11**. This summarises the VDV levels from the one-hour daytime measurement.

Table 11 Attended vibration survey results

Date/Time	X-axis 1 hr VDV $m/s^{1.75}$	Y-axis 1 hr VDV $m/s^{1.75}$	Z-axis 1 hr VDV $m/s^{1.75}$
17/07/2024 10:15 – 11:15	0.1	0.1	0.1

6 Noise Modelling Methodology

6.1 Software Used

6.1.1 Outdoor sound propagation predictions have been undertaken in 3D environmental noise modelling software CadnaA 2021 MR 1 (64Bit) (build: 183.5110).

6.2 General Model Settings

6.2.1 The following settings have been applied in the CadnaA model in accordance with 'Acoustic Modelling Design Guide' or have been specified by or agreed with Bryden Wood:

- Calculation standard set to ISO 9613;
- Max error set to 1 dB;
- Buildings within the site boundary have been set to 90% reflective (0.1 absorption coefficient);
- Ground absorption has been set to 0 and 1 G (Ground Factor) within and outside the site boundary respectively; and
- Maximum order of reflections set to 'third'.

6.3 Modelling Approach

6.3.1 The location, shape, size, and noise emission data (where applicable) of all elements within the site boundary have been based on information provided to Temple via Bryden Wood. Topography data outside the site boundary has been sourced by Temple.

Buildings

6.3.2 The Proposed Development buildings have been imported into the CadnaA model directly from the .dwg files provided. The substation has however, not been included at this stage as building sections were not available. Buildings outside the site boundary have been sourced from Open Street Map[9].

Ground Contours

6.3.3 Ground contours outside of the site boundary have been sourced from the Environment Agency National Lidar Programme[10]. The contours have been simplified in the model to 1m in both the horizontal and vertical planes.

Non-Solid Objects

6.3.4 Perforated materials such as the gantry floors (which support the plant) and walls, have not been included in the model as they are likely to provide negligible screening.

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[9] https://www.openstreetmap.org/#map=6/54.910/-3.432
[10] https://www.data.gov.uk/dataset/f0db0249-f17b-4036-9e65-309148c97ce4/national-lidar-programme

Source Types

6.3.5 Noise sources have been modelled as either a single point source, a single vertical area source, or as multiple vertical area sources. They have been assigned based on the following rationale:

- Point sources have been used to model plant items that are likely to have negligible directionality, where no directionality data has been provided, or where noise levels for individual components (e.g. inlet/outlet) have not been provided and therefore noise has been assumed to radiate from the centre of the unit.
- Area sources have been used to model horizontal and vertical duct/fan openings or plant items with multiple components facing different directions/located separately.
- Multiple vertical area sources have been used to model plant items with large radiating surfaces and have directionality data for these surfaces.

Mitigation

6.3.6 Acoustic attenuation packs have been specified for all chiller units, the reduction has been applied in CadnaA as an insertion loss and is presented in **Appendix C – Data Sheets/Information**.

Barriers

6.3.7 It is understood that the north side of the first floor gantry chiller entrainment enclosures on L15 and L17 will be enhanced such that they meet the following specifications:

- Constructed from a solid material i.e. have no gaps that air can pass through
- Have a minimum surface density of 12 kg/m^2

6.3.8 These sections of the chiller entrainment enclosures have therefore been modelled as solid barriers up until the doors which have been assumed to be open.

6.3.9 It would also be recommended that the internal facing side is lined with an absorptive finish to avoid reflections (to approximately meet Class C absorption requirements defined by BS EN ISO 11654: 1997).

6.4 Acoustic Scenarios

6.4.1 Five operational scenarios have been modelled and assessed within this report:

- Standard daytime operation;
- Standard night-time operation;
- Emergency daytime operation;
- Emergency night-time operation; and
- Daytime generator maintenance

6.5 Assumptions

Noise Sources

Chillers

6.5.1 The manufacturer's data sheet for the chiller units contained single figure directional sound power levels in addition to the overall octave band sound power level of the whole unit. To obtain the octave band directional sound power levels, the overall sound power level spectrum was shifted so that it was equal to the single figure values for each direction when summed logarithmically. This equated to a -11 and -4 dB correction in each octave band for the shorter and longer sides respectively.

6.5.2 No data was available for the upwards directionality of the chiller units. Noise emitted from the top surface has therefore been assumed to be two times the acoustic energy as one of the long sides i.e. +3 dB.

Generators

6.5.3 Octave band sound pressure levels measured at 1m were provided for the generator body, inlet and outlet (including exhaust). The sound power levels have been derived from the sound pressure levels assuming the measurements were made on soft (absorptive) ground.

6.5.4 The generator supplier has recommended at least a ±3 dB contingency to allow for any breakout from penetrations into the generator container, however, no corrections have been applied at this stage.

Acoustic Features

Impulsivity

6.5.5 Temple was not provided with information that the proposed plant will have impulsive sound features, but experience of similar equipment indicates that this is unlikely to be the case.

Intermittency

6.5.6 The chillers are proposed to run continuously and generators during maintenance and emergencies only, as such, no correction is required.

Tonality

6.5.7 1/3rd octave band data is not available for the plant, therefore, no tonal corrections have been applied.

7 Assessment

7.1 Data Centre External Plant Noise Assessment

7.1.1 The total data centre plant noise levels have been calculated for each assessment scenarios at 1m from the façade of the nearest noise sensitive receptors.

Standard Operation

7.1.2 The standard operation scenario for both daytime and night-time includes only the chiller units running. The results for these scenarios are presented in **Table 12** and **Table 13**.

Table 12 Standard daytime operation plant noise assessment

Receptor	Daytime Noise Limit dBA	Plant Rating Level dBA	Daytime Exceedance dBA
R1	38	34	-4
R2	38	33	-5
R3	38	32	-6
R4	39	31	-8
R5	33	14	-19
R6	33	20	-13
R7	29	23	-6

Table 13 Standard night-time operation plant noise assessment

Receptor	Night-time Noise Limit dBA	Plant Rating Level dBA	Night-time Exceedance dBA
R1	33	33	0
R2	33	33	-1
R3	33	32	-2
R4	31	30	-1
R5	29	14	-16
R6	29	20	-9
R7	28	22	-6

Daytime Generator Maintenance

7.1.3 During monthly maintenance, the generators will be tested in turn. When tested, each generator will operate for up to 15 minutes. Maintenance testing will only occur during daytime hours.

7.1.4 The results of the assessment of the maintenance scenario are presented in **Table 20.** The results show generator noise levels during maintenance are predicted to be below the local authority noise limit at all receptors.

7.1.5 The predicted specific sound level presented is for the 'worst-case' individual generator (i.e. with the greatest predicted sound level at the given receptor). The specific sound level is therefore for a single generator only, though up to four generators may operate within the reference time period of one hour (for daytime assessment). It is assumed that the combined noise level of the three subsequent generators to be tested within the one-hour period would be sufficiently low so the noise limit would not be exceeded. This can be achieved through planned sequencing of the generator testing; there are also a sufficient number of generators which lead to sufficiently low noise levels at the receptors. Hence, the specific sound level presented from the 'worst-case' individual generator is effectively the worst-case specific sound level over the full hour. The majority of the maintenance activity is expected to lead to substantially lower noise levels as generators are further away or more screened than the worst-case individual generator.

7.1.6 The reference time interval for the daytime is one hour and therefore an on-time correction has been applied to the specific sound level from the worst case individual generator in accordance with BS 4142. An intermittency correction has also been applied as switching on and off the generators during maintenance may be readily distinctive against the acoustic environment.

7.1.7 It should be noted that if the four generators which are predicted to lead to the highest noise levels at an individual receptor (rather than a combination of the loudest and three much quieter generators as described above) were tested sequentially within one hour a minor exceedance of the local authority limits may be experienced at the closest receptor (R1), but not at other receptors. As described above, this exceedance can be avoided through the sequencing of testing. However, a minor exceedance of the local authority limits is still expected to be a low impact in accordance with BS 4142 when considering the local context such as the frequency of testing (once a month), time of day (daytime testing only), the absolute level is still relatively low (below ambient daytime noise levels) and that this would only be for 1 hour when this specific combination of four generators are tested.

7.1.8 The standard monthly testing (15 minute test) would take place for 11 out of 12 months a year. An annual test will take place in the 12th month where each generator will be tested in turn for up to 120 minutes. In this case a 1 dB exceedance of the local authority limits at the closest receptor (R1) would be experienced during testing of the worst case generator (closest to R1) but would still be expected to be a low impact when considering the local context: frequency of testing, time of day and the absolute level. All other generators and receptors would be within the noise limits during this testing scenario.

Table 14 Maintenance plant noise assessment (15 minute testing)

Receptor	Worst Case Generator Specific Sound Level, dBA	On-time Correction, dBA	Intermittency Correction, dBA	Generator Rating Level, dBA	Chiller Rating Level, dBA	Total Rating Level, dBA	Daytime Noise Limit, dBA	Daytime Exceedance, dBA
R1	37	-6	3	34	34	37	38	-1
R2	29	-6	3	26	33	34	38	-4
R3	29	-6	3	26	32	33	38	-5
R4	23	-6	3	20	31	31	39	-8
R5	10	-6	3	7	14	15	33	-18
R6	14	-6	3	11	20	21	33	-12
R7	13	-6	3	10	23	23	29	-6

Emergency Operation

7.1.9 The emergency operation scenario for both daytime and night-time includes all chiller and generator units running. The results for these scenarios are presented in **Table 15** and **Table 16**.

Table 15 Emergency daytime operation plant noise assessment

Receptor	Daytime Noise Limit dBA	Plant Rating Level dBA	Daytime Exceedance dBA
R1	38	43	5
R2	38	40	2
R3	38	39	1
R4	39	35	-4
R5	33	24	-9
R6	33	28	-5
R7	29	28	-1

Table 16 Emergency night-time operation plant noise assessment

Receptor	Night-time Noise Limit dBA	Plant Rating Level dBA	Night-time Exceedance dBA
R1	33	43	10
R2	33	40	7
R3	33	39	6
R4	31	35	4
R5	29	24	-5
R6	29	28	-1
R7	28	28	0

7.1.10 Over the last three years of audited records, Virtus have installed a total of 139 generators across their nine sites. During this time, they have experienced a total of 116 hours of emergency unplanned generator use. This occurred across two of their sites out of the nine (where a total of 39 generators were in use for a combined total hours of 116.5 hours). Note: comparing this total emergency use over the operational period of their sites, the percentage of time in emergency operation equates to 0.06% of the total operational period (116.5 hours emergency operation out of normal operating 26,280 hours) and therefore it is considered an exceptionally rare event.

7.1.11 As per section **2.4 Further Consultation**, the existing noise condition for the site is not up to date with the requirements of BC. A proposed re-wording of the condition based on the consultation is to be submitted to BC for approval. Due to the rare likelihood of the emergency scenario, the proposed rewording will also exclude the emergency scenario from the condition. It should be noted that this approach has not yet been agreed with BC at the time of writing this report.

Theoretical Boundary Barriers

7.1.12 An additional assessment has been calculated for the emergency operational scenarios that includes theoretical barriers on the property boundary lines of the data centre with the nearest noise sensitive receptors (R1, R2, R3 and R4), and are shown by orange lines in **Figure 2**. The barriers are not included within the proposed design as they are unfeasible and may have significant impact on planning / resident's views and daylight, but have been included to show the theoretical reduction from screening at these locations. The barriers are set at a relative height of 5 m above the local ground level at each location. The results are presented in **Table 17** and **Table 18**.

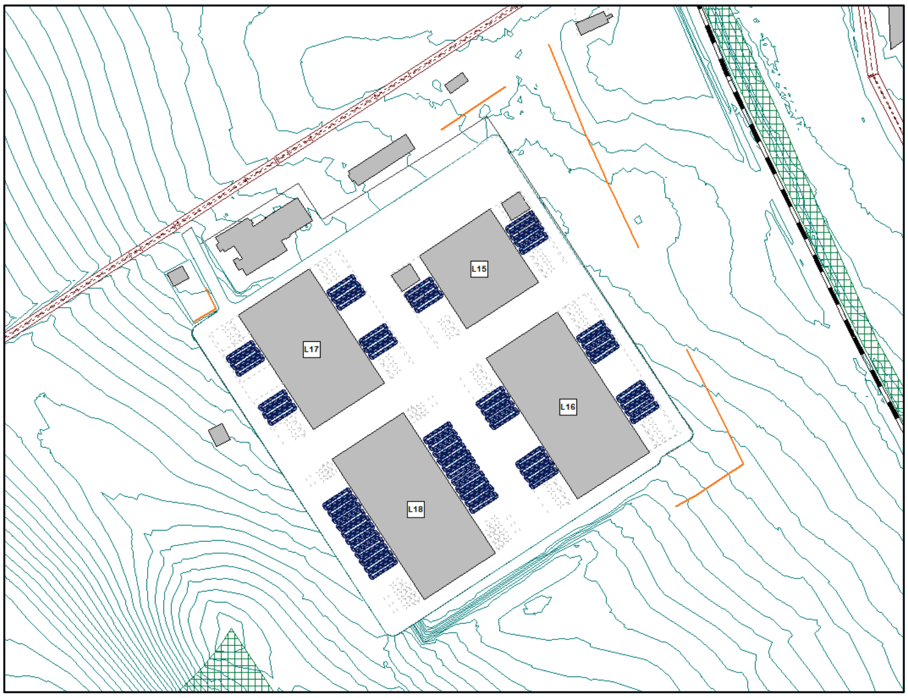
Table 17 Emergency daytime operation plant noise assessment (including 5 m boundary barriers)

Receptor	Daytime Noise Limit dBA	Plant Rating Level dBA	Daytime Exceedance dBA
R1	38	40	2
R2	38	39	1
R3	38	36	-2
R4	39	34	-5
R5	33	24	-9
R6	33	28	-5
R7	29	28	-1

Table 18 Emergency night-time operation plant noise assessment (including 5 m boundary barriers)

Receptor	Night-time Noise Limit dBA	Plant Rating Level dBA	Night-time Exceedance dBA
R1	33	40	7
R2	33	39	6
R3	33	36	3
R4	31	34	3
R5	29	24	-5
R6	29	28	-1
R7	28	28	0

Figure 2 Boundary noise barrier locations (shown by orange lines)



7.1.13 The predicted noise levels with the theoretical 5 m boundary barriers shows reductions of 3 dB at R1 and R3, and 1 dB at R2 and R4. The attenuation achieved is not significant (especially when considered the extent of the barriers) and does not allow for noise limits to be met at all receptors (only R3). Using boundary barriers is not considered an effective method of reducing noise levels on this site. For reference, an acoustic barrier that completely removes the line of site of site between the noise source and receiver would typically be expected to provide approximately 10 dB of attenuation. However, due the topography of the site and height/layout of plant items, it would be difficult to effectively screen plant noise without much larger barriers, which may have greater visual impacts for the receptors.

7.1.14 It should be noted that the above assessments assume no correction for tonality, impulsivity, other distinctive acoustic character. Consequently, all sources should be controlled so that these issues are not present at noise sensitive locations or else corrections will need to be applied.

7.1.15 As information relating to the plant that will be installed as part of the office refurbishments and smaller plant items supporting the data centres is not currently available, these have not been allowed for within this assessment but should be accounted for cumulative with the above assessed plant form the data centre.

7.2 Office External Plant Noise Assessment

7.2.1 Details of the office plant are not currently available as the office designs will commence at a later stage of the design.

7.3 Office External Noise Ingress Assessment

7.3.1 The level of internal noise resulting from external noise ingress is dependent upon the external noise level, the volume and surface finishes of the internal space, and the sound insulation performance afforded by the building envelope. The latter is dependent upon the combined performance of the glazing, solid elements and any ventilation openings.

7.3.2 The BCO 2019 Guide to Specification indicates that the external noise ingress should not exceed the following noise levels shown in **Table 19** (when measured under Cat A standards including carpets).

Table 19 External noise ingress limit

Room Type	External Noise Ingress Limit
Open plan offices	NR40 (L_{eq})
Speculative offices	NR38 (L_{eq})
Cellular offices	NR35 (L_{eq})
Rain noise	<60 dB L_{Aeq} in heavy rainfall

7.3.3 **Table 20** below show the worst-case noise levels from the data centre chillers (daytime operation) at the 'Ballroom' building plus the ambient noise levels measured at U1.

Table 20 Data centre chiller noise level + existing ambient noise levels (octave band sound pressure level)

Receptor	Octave Band Centre Frequency Sound Pressure Level Hz (dB)							
	63	125	250	500	1000	2000	4000	8000
Ballroom building	57	55	49	44	41	37	37	35

7.3.4 The required reduction to achieve the BCO noise ingress limits based on noise levels for the data centre chillers (only) plus existing ambient noise levels is presented in **Table 21**.

Table 21 Required noise ingress reduction during standard daytime operation (chillers only) to achieve the BCO criteria

Use	Octave Band Centre Frequency Sound Level Difference (external to internal) Hz (dB)							
	63	125	250	500	1000	2000	4000	8000
Open plan offices	0	0	0	0	0	0	0	0
Speculative offices	0	0	0	0	0	0	2	2
Cellular offices	0	0	0	0	3	2	5	5

7.4 Vibration Assessment

7.4.1 Vibration measurements were undertaken for one hour in line with the northern façade of the 'Ballroom' building on site to obtain vibration exposure from passing traffic on Haw Lane. During the survey, there was no perceptible vibration felt by the surveyor on site.

7.4.2 The measured 1-hour VDV exposure at site on each axis has been scaled up to a full 16 day, the results of which are presented in **Table 22**.

Table 22 Daytime predicted VDV

Parameter	X-axis	Y-axis	Z-axis
VDV_{16hr} m/s$^{1.75}$	0.2	0.2	0.2

7.4.3 Based on the measured vibration levels on all three axes (X, Y and Z), there is a low probability of adverse comment according to the BS 6472 criteria.

7.5 Office Internal Sound Insulation and Acoustic Privacy Specifications

Introduction

7.5.1 The principal factors influencing sound transmission and, more importantly, aural privacy between two adjacent spaces are:

- The prevailing background noise levels;
- The level of speech effort; and
- The sound insulation performance of the partition and any other sound transmission paths between the two spaces.

7.5.2 As such, when selecting partitions, full account must be taken of the prevailing building services noise levels, activity noise levels and the noise tolerances of room, the partition construction and any other factors that will influence the sound insulation between the spaces. This level of detail will not be available until later design stages.

7.5.3 Internal walls, floors, ceilings and doors will need to adequately reduce sound transmission between two spaces.

7.5.4 The two principal acoustic performance requirements for floors are:

- The reduction of airborne sound from one floor to another (e.g. voices, domestic appliances, amplified sound or building services plant)
- The reduction in impact sound from one floor to another (e.g. footsteps)

7.5.5 The airborne sound insulation performance of the separating floors is primarily determined by the mass per unit area of the structural floor slab in combination with the floor finish build-up and suspended ceiling below. The impact sound insulation performance of the separating floors is primarily determined by mass and by the reduction through resilient elements such as soft floor finishes or resilient interlayers.

7.5.6 The sound insulation requirement for internal partitions within individual occupier office areas will depend on the desired degree of privacy and the levels of background masking noise.

7.5.7 The level of aural privacy, or reduction of noise heard from an adjacent space, can simply be defined as the addition of the background noise level in the 'listening' room and the sound insulation performance of the transmission paths of sound between the two rooms. Therefore, the higher the level of background noise in the listening room, the less sound that can be heard from adjacent spaces. Similarly, achieving a comparable standard of aural privacy where background noise levels are low requires the sound insulation performance of the partition and other transmission paths to be correspondingly higher.

7.5.8 As stated above, the sound insulation performance of a partition is only one element determining the overall room to room sound insulation performance between the two spaces. Other factors, such as the interface between the partition and the ceiling, detailing at junction with the external façade and other elements such as doors, infill panels and glazing, ductwork penetrations etc will all influence the overall sound insulation performance, as will the quality of detailing of partitions and ceiling at joints and margins.

Criteria

7.5.9 The BCO Guide to Specification provides guidance on the levels of acoustic privacy and partition construction required to achieve various levels of room separation.

7.5.10 The recommended sound insulation of separating walls between office demises are based on the criteria from the BCO Guide 2019. As such, the demise wall should achieve a minimum sound insulation performance of $D_{nT,w}$ 45 dB at shell and core, and $D_{nT,w}$ 48 dB with a Cat A fit out in place. It is assumed that any partitions which may be installed to separate demises within the office spaces would be part of the fit out.

7.5.11 The sound insulation between office floors has also been set in line with the criteria from the BCO Guide 2019. As such, separating floors should achieve a minimum airborne sound insulation performance of $D_{nT,w}$ 45 dB at shell and core, and $D_{nT,w}$ 48 dB with a Cat A fit out. Floors over office areas should achieve a weighted impact sound insulation performance of $L_{nT,w}$ 60 dB as a reasonable maximum.

7.6 Office Room Acoustics and Surface Finishes

Introduction

7.6.1 To provide a suitable acoustic environment that maximises speech intelligibility, reduces echoes, reflected noise and general noise build up, some areas will require the inclusion of additional acoustically absorbing internal surface finishes. This fact cannot be overlooked, even for the sake of aesthetics, if an acceptable working environment is to be achieved.

7.6.2 The reverberation time is often used as a guide in the design of internal environments and is a measure of the time it takes for a noise to decay within a space. The lower the reverberation time, the more acoustically 'dead' the space feels. Generally, the more important the requirements for good communication and listening conditions, the greater the need for acoustic absorption.

Criteria

7.6.3 The BCO guide to Specification states that "Typically, a Cat A fit out includes an acoustically absorbent suspended ceiling achieving Absorption Class A (ref. *BS EN ISO 1164:1997 Acoustics. Sound absorbers for use in buildings. Rating of sound absorption*)". Where an acoustically absorbent suspended ceiling is not provided there are a wide range of alternative options for providing acoustic absorption to the soffit.

7.6.4 While *BS 8233:2014 Guidance on sound insulation and noise reduction in buildings* does not provide specific guidance on reverberation time criteria, its predecessor *BS 8233: 1999 Sound insulation and noise reduction in buildings – code of practice* provides guidance on appropriate reverberation times for spaces used for speech. Guide values of reverberation time at 500 Hz in unoccupied rooms of differing volumes are shown in **Table 23** below.

Table 23 BS 8233 1999 Guide to reverberation time in unoccupied rooms for speech

Room Volume	Reverberation Time at 500 Hz
50 m^3	0.4 s
100 m^3	0.5 s
200 m^3	0.6 s
500 m^3	0.7 s
1000 m^3	0.9 s
2000 m^3	1.0 s

8 Conclusion

8.1.1 Temple Group has been appointed by Bryden Wood to provide noise and vibration support during Stage 2 and 3 of the design for a new data centre campus at the Former Molins Site, Haw Lane, Saunderton, Buckinghamshire.

8.1.2 Temple has undertaken an unattended and attended noise survey and calculations of the rating noise level of the proposed mechanical plant which has been compared against conditioned noise limits at the nearest noise sensitive receptors.

8.1.3 The assessment indicates that the predicted rating noise level of the mechanical plant will meet local authority plant noise requirements during standard daytime and night-time operation as well as during monthly generator maintenance and testing based on the current design. A 1 dB exceedance at R1 is predicted during the annual testing for up to 120 minutes when testing the closest generator to R1, however the impact of this is expected to be low given the frequency of testing, duration of the exceedance and time of day (daytime testing).

8.1.4 During emergency operation (full power outages), the predicted rating level will exceed local authority noise limits by up to 5 and 10 dB during the day and night-time respectively at the worst affected receptor (R1), smaller exceedances are also predicted at R2, R3, and R4. It should be noted that the emergency scenario is anticipated to be an exceptionally rare event.

8.1.5 It should be noted that the acoustic modelling included within this report is based on specific plant manufacturers and plant selections available at the time of writing the report (RIBA Stage 3 design). The final plant selections, manufacturers, and arrangements may be subject to change for the final detailed design and construction stages. However, any future alternative plant / arrangement will be selected to meet the overall performance outlined within this report.

8.1.6 Based on the measured vibration levels on all three axes (X, Y and Z), there is a low probability of adverse comment according to the BS 6472 criteria.

8.1.7 Noise from the data centre has also been predicted at the existing office buildings on site that are proposed to be refurbished. The worst-case noise levels from the chillers at the façade have been compared against the BCO criteria for external noise ingress. The subsequent building envelope required reduction in noise levels to achieve the BCO criteria has been presented.

8.1.8 Outline performance specifications for reverberation times and sound insulation performance between spaces have been provided for consideration and comment by the client and design team.

Appendix A - Acoustic Glossary

Noise/Sound

8.1.9 Noise and sound need to be carefully distinguished. Sound is a term used to describe wave-like variations in air pressure that occur at frequencies that can stimulate receptors in the inner ear and, if sufficiently powerful, be appreciated at a conscious level. Noise implies the presence of sound but also implies a response to sound: noise is often defined as unwanted sound.

Decibel, dB

8.1.10 The unit used to describe the magnitude of sound is the decibel (dB) and the quantity measured is the sound pressure level. The decibel scale is logarithmic, and it ascribes equal values to proportional changes in sound pressure, which is a characteristic of the ear. Use of a logarithmic scale has the added advantage that it compresses the very wide range of sound pressures to which the ear may typically be exposed to a more manageable range of numbers. The threshold of hearing occurs at approximately 0dB (which corresponds to a reference sound pressure of 20 μPa) and the threshold of pain is around 120dB.

Frequency, Hz

8.1.11 Frequency is the number of occurrences of a repeating event per unit second or Hertz (Hz). The human ear is sensitive to sound in the range 20 Hz to 20,000 Hz (20 kHz). For acoustic engineering purposes, the frequency range is usually divided up into octave bands, in which the upper limiting frequency for any band is twice the lower limiting frequency. The bands are described by their centre frequency value. In environmental acoustics the ranges typically used are from 63 Hz to 8 kHz.

A-weighting

8.1.12 The sensitivity of the ear is frequency dependent. Sound level meters are fitted with a weighting network which approximates to this response and allows sound levels to be expressed as an overall single figure value, in dB(A).

Rating level

8.1.13 Specific sound level plus any adjustment for the characteristic features of the sound.

Reference time interval

8.1.14 Specified interval over which the specific sound level is determined. This is 1 h during the day from 07:00 h to 23:00 h and a shorter period of 15 min at night from 23:00 h to 07:00 h.

Residual sound

8.1.15 Ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound.

Residual sound level ($L_{Aeq,T}$)

8.1.16 Equivalent continuous A-weighted sound pressure level of the residual sound at the assessment location over a given time interval, T.

Specific sound level

8.1.17 Equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval.

Specific sound source

8.1.18 Sound source being assessed.

Peak Particle Velocity (PPV)

8.1.19 The peak particle velocity is the highest velocity in any direction experienced by vibration body during its oscillation. It is measured in mm/s.

Vibration Dose Value (VDV)

8.1.20 The *Vibration Dose Value* is a measure of the total vibration experienced during a period. Its units are m/s1.75 and it is defined in BS6472:2008. The VDV is based on a fourth power relationship between exposure time and exposure level.

Appendix B – Consultation

Figure 3 Consultation with BC

From: Norbert Skopinski <norbert.skopinski@templegroup.co.uk>
Sent: Monday, September 30, 2024 3:46 PM
To: Stuart Goodbun <Stuart.Goodbun@buckinghamshire.gov.uk>
Cc: Environmental Health Mailbox <environmentalhealth@buckinghamshire.gov.uk>; David Walker <DWalker@brydenwood.co.uk>; Zurine Alonso <zalonso@brydenwood.co.uk>; edward.ledwidge@montagu-evans.co.uk; Nigel Burton <nigel.burton@templegroup.co.uk>; Richard Budesha <richard.budesha@templegroup.co.uk>
Subject: [EXTERNAL] RE: 24/01344/NOISE, recent query

[Please note this has been sent from an external source - treat with caution and do not open attachments / use links until you are sure this is a trusted communication see intranet/IT for advice.]

Hi Stuart,

Thank you for your recent feedback regarding the site survey methodology and the example noise condition for the plant or machinery to be installed and operated on the proposed sites.

I have few queries following a review of the noise conditions in S73 (2022) of the APPLICATION NO: 22/06872/VCDN, and the provided example, and I would welcome your thoughts.

The condition in S73 (2022) states that *"...the target levels for the plant would be that the rating level (as defined in BS4142) be at least 5dB below the background noise level (excluding the "stand-by" generator plant) currently existing at agreed sensitive locations specified within the Environment Statement accompanying planning permission 08/05740/FULEA. As such in the event of tonal emissions, a 5dB penalty shall apply therefore making the specific level at least 10dB below the minimum background (LA90) level..."*

The use of 'background' and 'minimum background' is inconsistent within the condition. It appears to only mention 'minimum background' when discussing tonal elements. For reference, BS 4142:2014+A1:2019 states *"the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods."*

In addition, the plant's operational target levels should be at least 5dB below the background noise level at agreed sensitive locations, however your provided example allows for up to 3dB above the background noise level.

It would also be beneficial to understand if these conditions were set based on the ES findings, as the measured noise levels on site for ES purposes (undertaken by others) only measured a single 15-minute measurement per period (day/evening/night), resulting in much higher background levels when compared to our most recent long-term survey, which are as follows:

- U1 Typical L_{A90}: 35dB daytime and 31dB nighttime;
- U2 Typical L_{A90}: 35dB daytime and 27dB nighttime;
- U1 Lowest L_{A90}: 27dB daytime and 18dB nighttime, both only occurring less than 1% of the time;
- U2 Lowest L_{A90}: 29dB daytime and 18dB nighttime, both only occurring less than 2% of the time;

The U1 and U2 noise measurement positions are shown in Figure 1 and the L_{A90} statistical analysis is presented in Figures 2 to 5 in the pdf document attached.

For quiet areas, such as this site, BS 4142:2014+A1:2019 states *"Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant that the margin by which the rating level exceeds the background. This is especially true at night."* The Association of Noise Consultants (ANC) Guide to BS 4142:2014+A1:2019 provides context to this by stating:

"BS 4142 does not define 'low' in the context of background sound levels nor rating levels. The note to the Scope of the 1997 version of BS 4142 defined very low background sound levels as being less than about 30dB L_{A90}, and low rating levels as being less than about 35dB $L_{Ar,Tr}$."

The ANC Guide suggests that: *"...similar values would not be unreasonable in the context of BS 4142, but that the assessor should make a judgement and justify it where appropriate"*.
Planning Practice Guidance (Noise) defines the Lowest Observable Adverse Effect Level (LOAEL) as follows:

"Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life."
Based on the above, our view is that a rating level of 35dB $L_{Ar,Tr}$ would be an appropriate LOAEL for use in this case.

Regarding nighttime conditions, BS 8233:2014 Guidance on sound insulation and noise reduction for buildings and the World Health Organization (WHO) 'Guidelines for Community Noise' (1999) provide guidance levels for internal noise within dwellings of 30 dB $L_{Aeq,T}$ for good sleeping conditions at night. Based on an outside-to-inside level difference of approximately 9dB (from the ANC Guide to Demonstrating Compliance with the Noise Requirements of Approved Document O (July 2022) for a 'medium' risk location), an external noise level of 35dB would lead to an internal noise level of around 26dB which is below the guidance for good sleeping conditions at night.

Based on the above, our view is that an appropriate rating level for this development would be 35dB $L_{Ar,Tr}$ for all plant operating simultaneously including "stand-by" generator plant for both daytime and night-time conditions.

I would welcome your thoughts on the above approach and am happy to discuss the above over the phone / Teams call. Once agreed, we would be happy to help draft a revised planning condition if that would be of assistance.

Figure 4 Consultation with BC

From: Stuart Goodbun <Stuart.Goodbun@buckinghamshire.gov.uk>
Sent: 01 October 2024 13:57
To: Norbert Skopinski <norbert.skopinski@templegroup.co.uk>
Subject: RE: [EXTERNAL] RE: 24/01344/NOISE, recent query

Good afternoon, Nobert.

As per our conversation, there is variation in the original condition to the example I forwarded in our last correspondence. Due in part to changes at the council since becoming a unitary authority and updates to the BS4142 standard.

I would be content with the 35dB daytime and 31dB nighttime as represented in your "typical" levels for U1and U2.

I would express concerns in regard to the substation for the site and the low frequency load that this will generate.

In terms of discharge of condition, the newer standard and wording would be representative of requirements

I hope that this does assist

Kind regards

Stuart Goodbun BSc (Hons) MCIEH CEnvH AMIOA

Environmental Protection Officer
Transport and Regulatory Services
Buckinghamshire Council
Walton Street
Aylesbury
Buckinghamshire
HP20 1UA

Tel: 01494 421703

Appendix C – Data Sheets/Information

Figure 5 Airedale TurboChill 'V' L15 & L18 34.3 °C (Day) Chiller Data Sheet

SOUND DATA

Measurement of Sound

All sound data quoted has been measured in the third-octave band limited values, using a Real Time Analyser calibrated sound intensity meter in accordance with BS EN ISO9614 : 2009.
All Sound Power Levels quoted are calculated from measured sound intensity according to BS EN ISO9614 : 2009.
Sound Pressure Levels are calculated from sound power using the expanded parallelepiped method according to BS EN ISO11203 : 2009.
Resultant performance figures obtained from test will be proven to not differ from the claimed figures by more than the allowable deviations specified in table 7 of section VII of Eurovent RS 6/C/003-2016 (A-weighted sound power, +3dBA).
Acoustic data is representative of the unit running at the specified duty and conditions under steady state operation.

Directivity Indicator

The sound measurements quoted in the Global Chiller Sound Level Values table do not incorporate any directivity or denote any sound level heard at any given position surrounding the chiller, rather they represent the total sound levels radiating from the chiller in all directions in the horziontal plane from source.
Please Note: pump sound levels are not included.

Global Chiller Sound Level Values

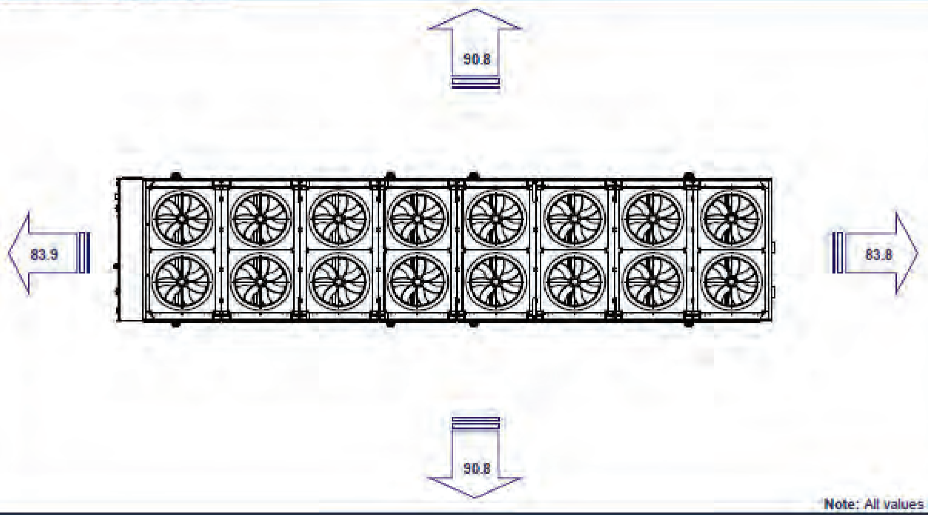
Frequency	Hz	63	125	250	500	1k	2k	4k	8k
Sound Power Level	[dB]	89.0	95.4	92.0	91.2	89.4	85.2	85.4	86.0
Sound Pressure Level @ 10m	[dB]	56.1	62.4	59.0	58.3	56.4	52.2	52.5	53.0
Sound Pressure Level @ 20m	[dB]	51.1	57.4	54.0	53.3	51.4	47.2	47.5	48.0
Sound Pressure Level @ attenuation package	[dB]	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC

		Total Sound Data (DX/FC)	
Sound Power Level	[dB(A)]	94.8	98.3
Sound Pressure Level @ 10m	[dB(A)]	61.8	65.3
Sound Pressure Level @ 20m	[dB(A)]	56.8	60.3
Sound Pressure Level @ attenuation package	[dB(A)]	TBC	TBC

Note:

Sound Power Levels calculated from measured sound intensity according to BS EN ISO9614 : 2009
Sound Pressure Levels calculated from sound power using the expanded parallelepiped method according to BS EN ISO11203 :2009
dBA is the overall noise level measured on the A scale
The Sound Pressure data quoted is only valid in free field conditions, where the unit is installed on a reflective base. If the equipment is placed adjacent to a reflective wall, values may vary from those stated, typically increasing by 3dB for each side added. All data excludes the sound emitted by the pump if selected.

Weighted Sound Power Level with Directivity



Note: All values in dB(A)

Figure 6 Airedale TurboChill 'V' L15 & L18 24.5 °C (Night) Chiller Data Sheet

SOUND DATA

Measurement of Sound

All sound data quoted has been measured in the third-octave band limited values, using a Real Time Analyser calibrated sound intensity meter in accordance with BS EN ISO9614 : 2009.
All Sound Power Levels quoted are calculated from measured sound intensity according to BS EN ISO9614 : 2009.
Sound Pressure Levels are calculated from sound power using the expanded parallelepiped method according to BS EN ISO11203 : 2009.
Resultant performance figures obtained from test will be proven to not differ from the claimed figures by more than the allowable deviations specified in table 7 of section VII of Eurovent RS 6/C/003-2016 (A-weighted sound power; +3dBA).
Acoustic data is representative of the unit running at the specified duty and conditions under steady state operation.

Directivity Indicator

The sound measurements quoted in the Global Chiller Sound Level Values table do not incorporate any directivity or denote any sound level heard at any given position surrounding the chiller, rather they represent the total sound levels radiating from the chiller in all directions in the horziontal plane from source.
Please Note: pump sound levels are not included.

Global Chiller Sound Level Values

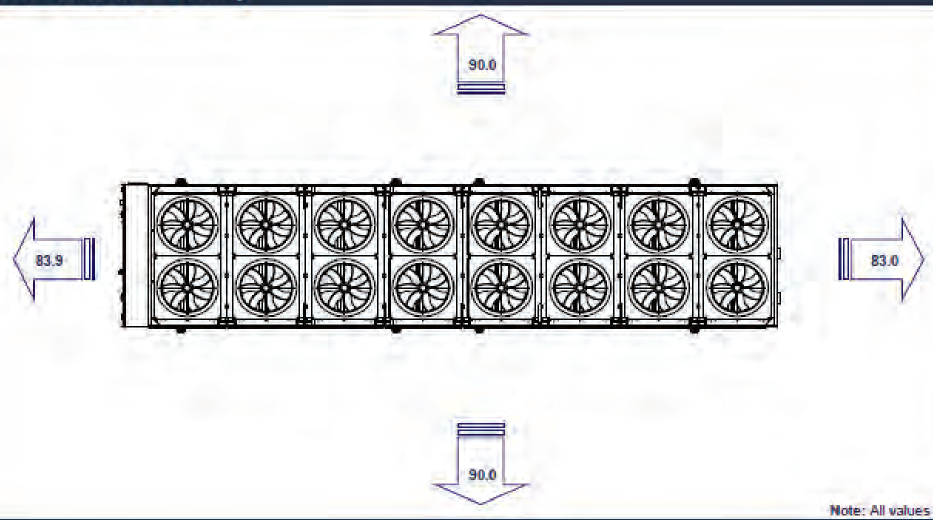
Frequency	Hz	63	125	250	500	1k	2k	4k	8k
Sound Power Level	[dB]	88.8	94.4	91.1	90.3	88.8	84.3	84.7	84.9
Sound Pressure Level @ 10m	[dB]	55.8	61.4	58.1	57.3	55.9	51.4	51.7	52.0
Sound Pressure Level @ 20m	[dB]	50.8	56.4	53.1	52.3	50.9	46.4	46.7	47.0
Sound Pressure Level @ attenuation package	[dB]	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC

		Total Sound Data (DX/FC)	
Sound Power Level	[dB(A)]	94.0	98.3
Sound Pressure Level @ 10m	[dB(A)]	61.0	65.3
Sound Pressure Level @ 20m	[dB(A)]	56.0	60.3
Sound Pressure Level @ attenuation package	[dB(A)]	TBC	TBC

Note:

Sound Power Levels calculated from measured sound intensity according to BS EN ISO9614 : 2009
Sound Pressure Levels calculated from sound power using the expanded parallelepiped method according to BS EN ISO11203 :2009
dBA is the overall noise level measured on the A scale
The Sound Pressure data quoted is only valid in free field conditions, where the unit is installed on a reflective base. If the equipment is placed adjacent to a reflective wall, values may vary from those stated, typically increasing by 3dB for each side added. All data excludes the sound emitted by the pump if selected.

Weighted Sound Power Level with Directivity



Note: All values in dB(A)

Figure 7 Airedale TurboChill 'V' L16 34.3 °C (Day) Chiller Data Sheet

SOUND DATA

Measurement of Sound

All sound data quoted has been measured in the third-octave band limited values, using a Real Time Analyser calibrated sound intensity meter in accordance with BS EN ISO9614 : 2009.
All Sound Power Levels quoted are calculated from measured sound intensity according to BS EN ISO9614 : 2009.
Sound Pressure Levels are calculated from sound power using the expanded parallelepiped method according to BS EN ISO11203 : 2009.
Resultant performance figures obtained from test will be proven to not differ from the claimed figures by more than the allowable deviations specified in table 7 of section VII of Eurovent RS 6/C/003-2016 (A-weighted sound power; +3dBA).
Acoustic data is representative of the unit running at the specified duty and conditions under steady state operation.

Directivity Indicator

The sound measurements quoted in the Global Chiller Sound Level Values table do not incorporate any directivity or denote any sound level heard at any given position surrounding the chiller, rather they represent the total sound levels radiating from the chiller in all directions in the horizontal plane from source.
Please Note: pump sound levels are not included.

Global Chiller Sound Level Values

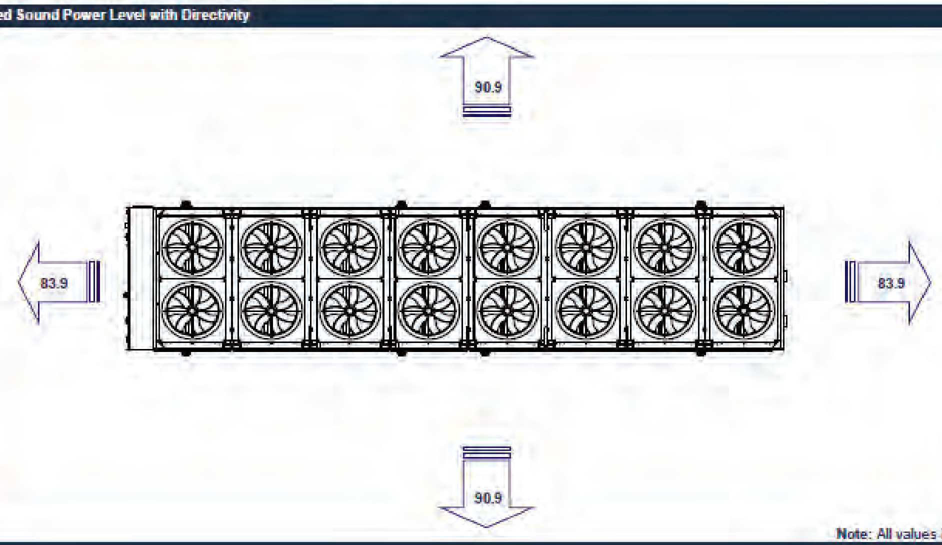
Frequency	Hz	63	125	250	500	1k	2k	4k	8k
Sound Power Level	[dB]	89.1	95.4	92.0	91.3	89.5	85.4	85.7	86.4
Sound Pressure Level @ 10m	[dB]	56.1	62.5	59.0	58.3	56.5	52.4	52.7	53.4
Sound Pressure Level @ 20m	[dB]	51.1	57.5	54.0	53.3	51.5	47.4	47.7	48.4
Sound Pressure Level @ attenuation package	[dB]	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC

		Total Sound Data (DX/FC)	
Sound Power Level	[dB(A)]	94.9	98.3
Sound Pressure Level @ 10m	[dB(A)]	61.9	65.3
Sound Pressure Level @ 20m	[dB(A)]	56.9	60.3
Sound Pressure Level @ attenuation package	[dB(A)]	TBC	TBC

Note:

Sound Power Levels calculated from measured sound intensity according to BS EN ISO9614 : 2009
Sound Pressure Levels calculated from sound power using the expanded parallelepiped method according to BS EN ISO11203 :2009
dBA is the overall noise level measured on the A scale
The Sound Pressure data quoted is only valid in free field conditions, where the unit is installed on a reflective base. If the equipment is placed adjacent to a reflective wall, values may vary from those stated, typically increasing by 3dB for each side added. All data excludes the sound emitted by the pump if selected.

Weighted Sound Power Level with Directivity



Note: All values in dB(A)

Figure 8 Airedale TurboChill 'V' L16 24.5 °C (Night) Chiller Data Sheet

SOUND DATA

Measurement of Sound

All sound data quoted has been measured in the third-octave band limited values, using a Real Time Analyser calibrated sound intensity meter in accordance with BS EN ISO9614 : 2009.
All Sound Power Levels quoted are calculated from measured sound intensity according to BS EN ISO9614 : 2009.
Sound Pressure Levels are calculated from sound power using the expanded parallelepiped method according to BS EN ISO11203 : 2009.
Resultant performance figures obtained from test will be proven to not differ from the claimed figures by more than the allowable deviations specified in table 7 of section VII of Eurovent RS 6/C/003-2016 (A-weighted sound power; +3dBA).
Acoustic data is representative of the unit running at the specified duty and conditions under steady state operation.

Directivity Indicator

The sound measurements quoted in the Global Chiller Sound Level Values table do not incorporate any directivity or denote any sound level heard at any given position surrounding the chiller, rather they represent the total sound levels radiating from the chiller in all directions in the horziontal plane from source.
Please Note: pump sound levels are not included.

Global Chiller Sound Level Values

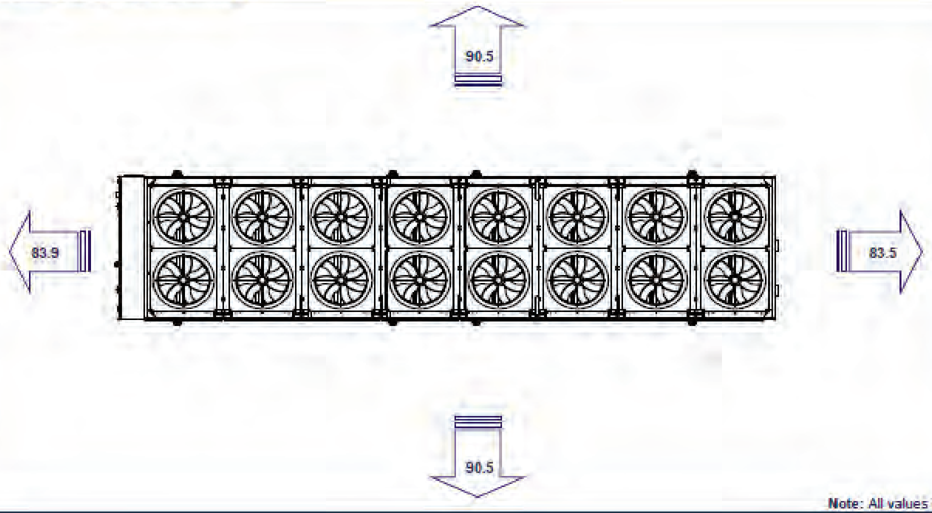
Frequency	Hz	63	125	250	500	1k	2k	4k	8k
Sound Power Level	[dB]	88.9	95.0	91.5	90.8	89.2	84.9	85.3	85.8
Sound Pressure Level @ 10m	[dB]	55.9	62.0	58.6	57.9	56.2	51.9	52.3	52.8
Sound Pressure Level @ 20m	[dB]	50.9	57.0	53.6	52.9	51.2	46.9	47.3	47.8
Sound Pressure Level @ attenuation package	[dB]	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC

		Total Sound Data (DX/FC)	
Sound Power Level	[dB(A)]	94.5	98.3
Sound Pressure Level @ 10m	[dB(A)]	61.5	65.3
Sound Pressure Level @ 20m	[dB(A)]	56.5	60.3
Sound Pressure Level @ attenuation package	[dB(A)]	TBC	TBC

Note:

Sound Power Levels calculated from measured sound intensity according to BS EN ISO9614 : 2009
Sound Pressure Levels calculated from sound power using the expanded parallelepiped method according to BS EN ISO11203 :2009
dBA is the overall noise level measured on the A scale
The Sound Pressure data quoted is only valid in free field conditions, where the unit is installed on a reflective base. If the equipment is placed adjacent to a reflective wall, values may vary from those stated, typically increasing by 3dB for each side added. All data excludes the sound emitted by the pump if selected.

Weighted Sound Power Level with Directivity



Note: All values in dB(A)

Figure 9 Airedale TurboChill 'V' L17 34.3 °C (Day) Chiller Data Sheet

SOUND DATA

Measurement of Sound

All sound data quoted has been measured in the third-octave band limited values, using a Real Time Analyser calibrated sound intensity meter in accordance with BS EN ISO9614 : 2009.
All Sound Power Levels quoted are calculated from measured sound intensity according to BS EN ISO9614 : 2009.
Sound Pressure Levels are calculated from sound power using the expanded parallelepiped method according to BS EN ISO11203 : 2009.
Resultant performance figures obtained from test will be proven to not differ from the claimed figures by more than the allowable deviations specified in table 7 of section VII of Eurovent RS 6/C/003-2016 (A-weighted sound power; +3dBA).
Acoustic data is representative of the unit running at the specified duty and conditions under steady state operation.

Directivity Indicator

The sound measurements quoted in the Global Chiller Sound Level Values table do not incorporate any directivity or denote any sound level heard at any given position surrounding the chiller, rather they represent the total sound levels radiating from the chiller in all directions in the horizontal plane from source.
Please Note: pump sound levels are not included.

Global Chiller Sound Level Values

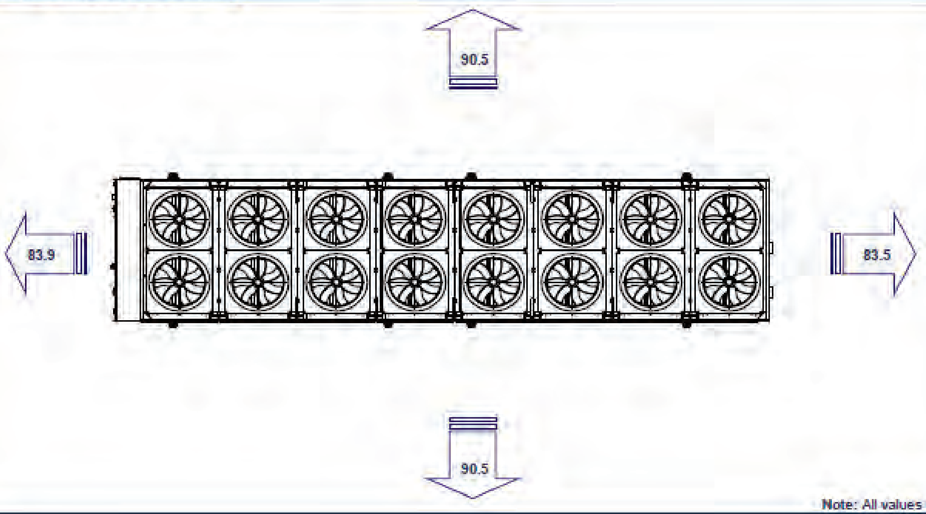
Frequency	Hz	63	125	250	500	1k	2k	4k	8k
Sound Power Level	[dB]	89.0	95.3	91.9	91.1	89.3	84.9	85.1	85.4
Sound Pressure Level @ 10m	[dB]	56.0	62.3	58.9	58.1	56.3	51.9	52.1	52.4
Sound Pressure Level @ 20m	[dB]	51.0	57.3	53.9	53.1	51.3	46.9	47.1	47.4
Sound Pressure Level @ attenuation package	[dB]	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC

		Total Sound Data (DX/FC)	
Sound Power Level	[dB(A)]	94.5	98.3
Sound Pressure Level @ 10m	[dB(A)]	61.6	65.3
Sound Pressure Level @ 20m	[dB(A)]	56.6	60.3
Sound Pressure Level @ attenuation package	[dB(A)]	TBC	TBC

Note:

Sound Power Levels calculated from measured sound intensity according to BS EN ISO9614 : 2009
Sound Pressure Levels calculated from sound power using the expanded parallelepiped method according to BS EN ISO11203 :2009
dBA is the overall noise level measured on the A scale
The Sound Pressure data quoted is only valid in free field conditions, where the unit is installed on a reflective base. If the equipment is placed adjacent to a reflective wall, values may vary from those stated, typically increasing by 3dB for each side added. All data excludes the sound emitted by the pump if selected.

Weighted Sound Power Level with Directivity



Note: All values in dB(A)

Figure 10 Airedale TurboChill 'V' L17 24.5 °C (Night) Chiller Data Sheet

SOUND DATA

Measurement of Sound

All sound data quoted has been measured in the third-octave band limited values, using a Real Time Analyser calibrated sound intensity meter in accordance with BS EN ISO9614 : 2009.
All Sound Power Levels quoted are calculated from measured sound intensity according to BS EN ISO9614 : 2009.
Sound Pressure Levels are calculated from sound power using the expanded parallelepiped method according to BS EN ISO11203 : 2009.
Resultant performance figures obtained from test will be proven to not differ from the claimed figures by more than the allowable deviations specified in table 7 of section VII of Eurovent RS 6/C/003-2018 (A-weighted sound power; +3dBA).
Acoustic data is representative of the unit running at the specified duty and conditions under steady state operation.

Directivity Indicator

The sound measurements quoted in the Global Chiller Sound Level Values table do not incorporate any directivity or denote any sound level heard at any given position surrounding the chiller, rather they represent the total sound levels radiating from the chiller in all directions in the horizontal plane from source.
Please Note: pump sound levels are not included.

Global Chiller Sound Level Values

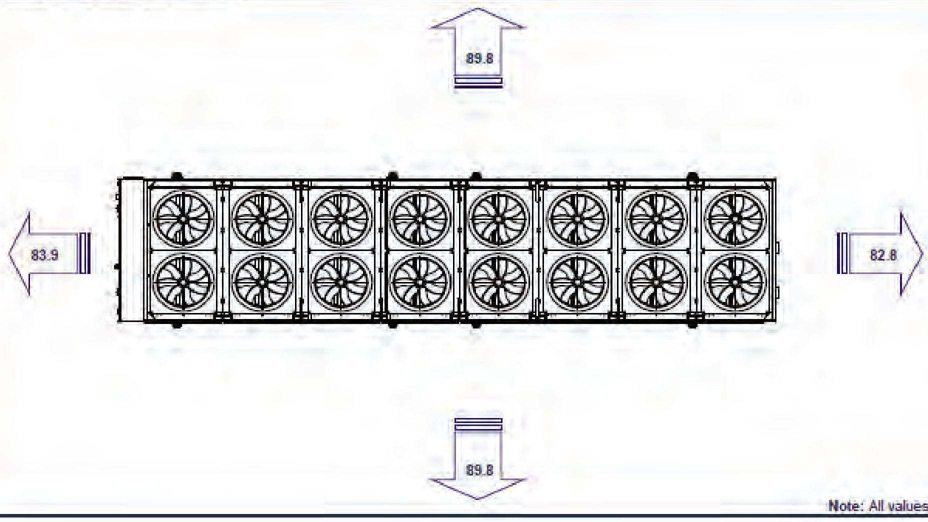
Frequency	Hz	63	125	250	500	1k	2k	4k	8k
Sound Power Level	[dB]	88.7	94.4	91.1	90.2	88.8	84.2	84.4	84.3
Sound Pressure Level @ 10m	[dB]	55.8	61.4	58.1	57.3	55.8	51.2	51.5	51.4
Sound Pressure Level @ 20m	[dB]	50.8	56.4	53.1	52.3	50.8	46.2	46.5	46.4
Sound Pressure Level @ attenuation package	[dB]	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC

		Total Sound Data (DX/FC)	
Sound Power Level	[dB(A)]	93.8	98.3
Sound Pressure Level @ 10m	[dB(A)]	60.8	65.3
Sound Pressure Level @ 20m	[dB(A)]	55.8	60.3
Sound Pressure Level @ attenuation package	[dB(A)]	TBC	TBC

Note:

Sound Power Levels calculated from measured sound intensity according to BS EN ISO9614 : 2009
Sound Pressure Levels calculated from sound power using the expanded parallelepiped method according to BS EN ISO11203 :2009
dBA is the overall noise level measured on the A scale
The Sound Pressure data quoted is only valid in free field conditions, where the unit is installed on a reflective base. If the equipment is placed adjacent to a reflective wall, values may vary from those stated, typically increasing by 3dB for each side added. All data excludes the sound emitted by the pump if selected.

Weighted Sound Power Level with Directivity



Note: All values in dB(A)

Figure 11 Cat 3516E HPD Diesel Generator (with attenuated container and inlet/outlets)

Oliver Miles <OMiles@brydenwood.co.uk>
To Richard Budesha
Cc David Walker; Nigel Burton; Norbert Skopinski

Reply | Reply All | Forward

Tue 07/01/2025 15:11

Hi Richard,

Please find a response from the generator manufacturer copied below:

I think there was a copy and paste issue with the noise data for the inlet, see revised table.

	63	125	250	500	1k	2k	4k	8k	dBA	Sound power	
Inlet (LpdB)	86.3	76.2	64.4	40.2	29.2	19.6	30.2	47.9	**64.0**	74.8	LwdBA
Discharge and exhaust	88.0	78.4	63.8	48.9	44.7	45.0	36.4	43.1	**65.8**	76.0	LwdBA
Container	83.1	70.8	64.2	49.4	35.4	26.4	20.1	39.8	**60.8**	79	LwdBA

The data above is calculated using CAT noise data and tested panel and attenuator data.

I would suggest that at least a ±3dB contingency is added into the above to allow for any breakout issues for the multiple penetrations into the container for various services and access.

I have a call with the manufacturer on Monday where I will ask for more details on the +/-3dB contingency, for now could we use these values until I have more clarity on the contingency.

On the chillers, if you don't hear from me by the end of the day please could you proceed with the assumption that the highest end directional value is applied to both ends.

Many thanks,

Ollie

Figure 12 AA303S Modified Chiller attenuation pack insertion loss

RE: [EXTERNAL] RE: 24/01344/NOISE, recent query

Oliver Miles <OMiles@brydenwood.co.uk>
To Richard Budesha
Cc David Walker; Zurine Alonso; Scott Sinfield; Norbert Skopinski; Nigel Burton; Michael Hope-Jones

AA303S Package isometric.pdf
64 KB

Hi Richard,

Thank you for your time yesterday on the call.

We have now received an acoustic pack selection from Allaway which we can feasibly fit. It will be the AA303S Modified which has been modified to take care of the 4kHz peak in the Lw spectrum and can provide 20dBA reduction.

The insertion losses are as follows:

Type	63	125	250	500	1k	2k	4k	8k
AA303S Modified IL	-3	-6	-12	-20	-26	-25	-23	-18

Appendix D - Site Layout

Figure 13 Site layout

Appendix E – Survey Photos

Figure 14 Survey Location U1 (northwest corner of the site) looking north

Figure 15 Survey Location U2 (southeast corner of the site) looking west

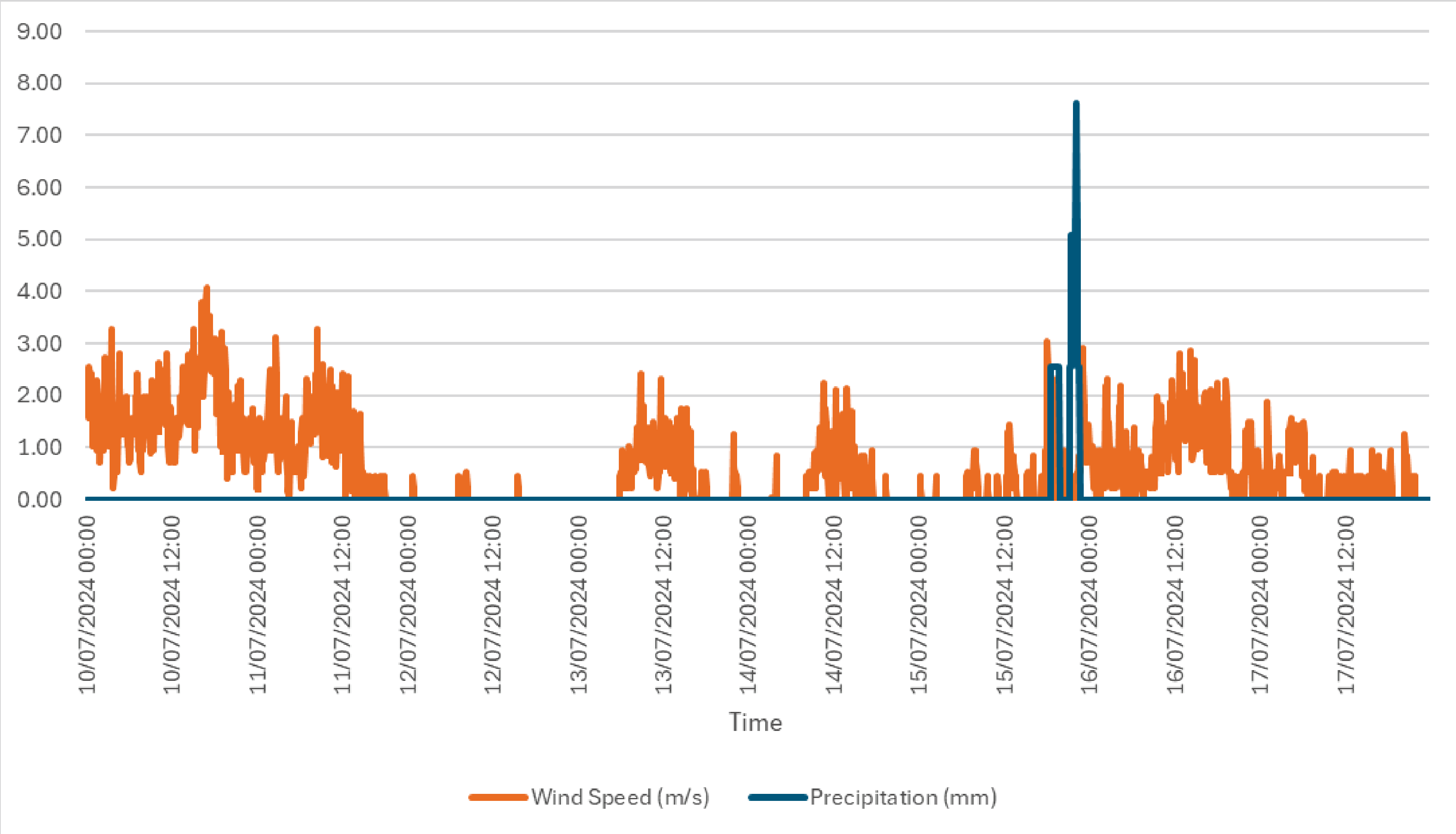
Figure 16 Survey Location A1 (southwest corner of the site) looking north

Figure 17 Survey Location A2 (Saunderton Vale) looking southeast

Figure 18 Survey Location V1 looking north

Appendix F – Weather Data

Figure 19 Weather Data for the duration of the unattended noise survey



Appendix G - Unattended Measurement Data

Figure 20 U1 Time History Data (no exclusions)

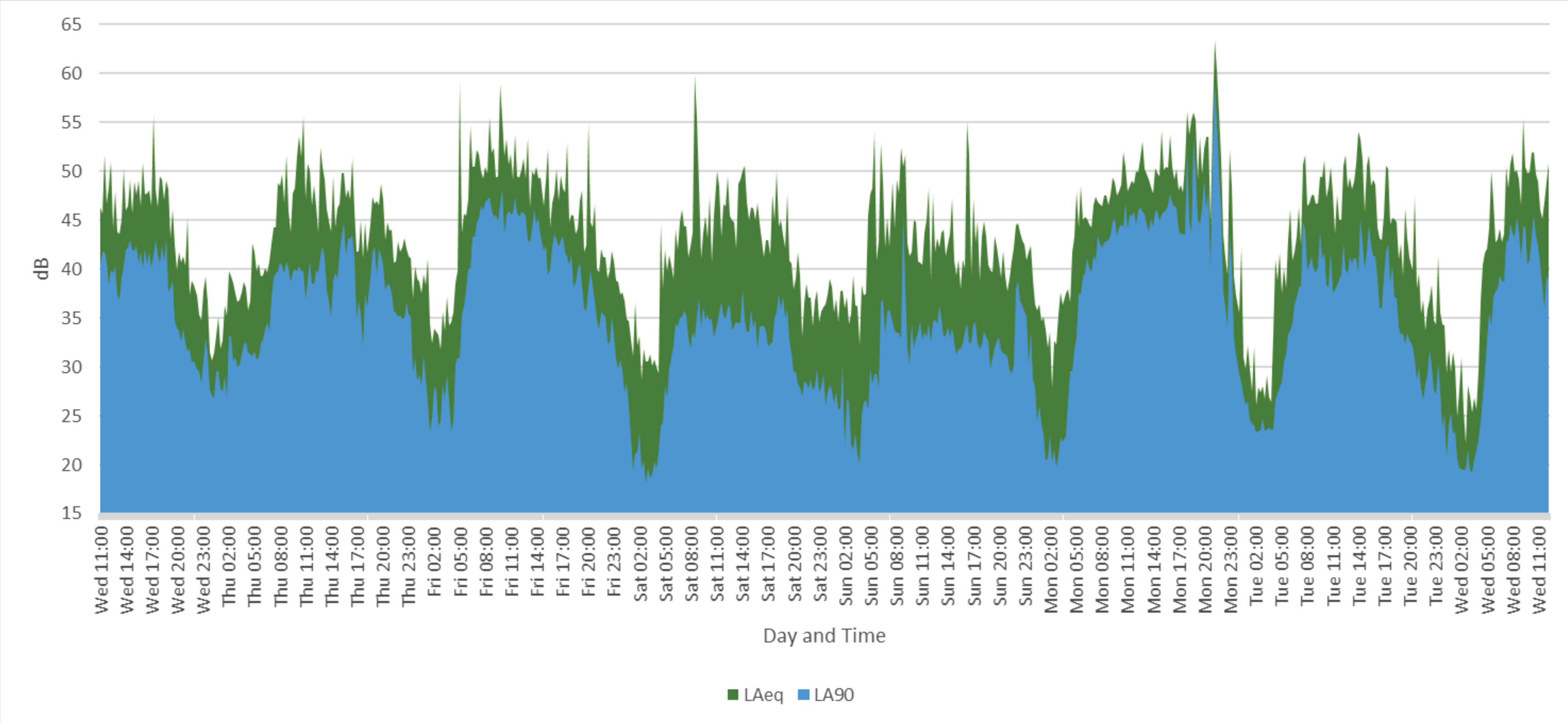
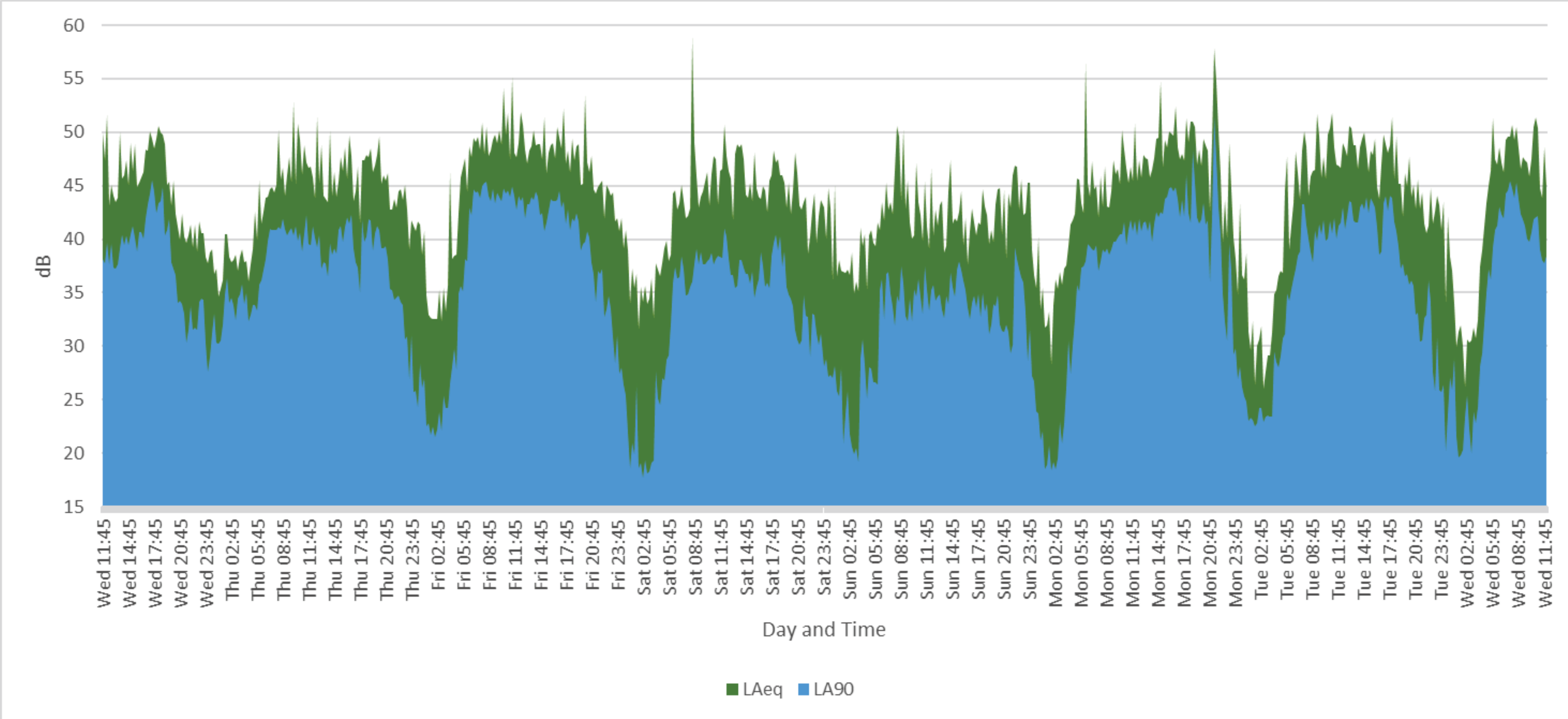


Figure 21 U2 Time History Data (no exclusions)



Appendix H – $L_{A90, 15mins}$ Statistical Analysis

Figure 22 U1 LA90 Daytime Statistical Analysis (with exclusions)

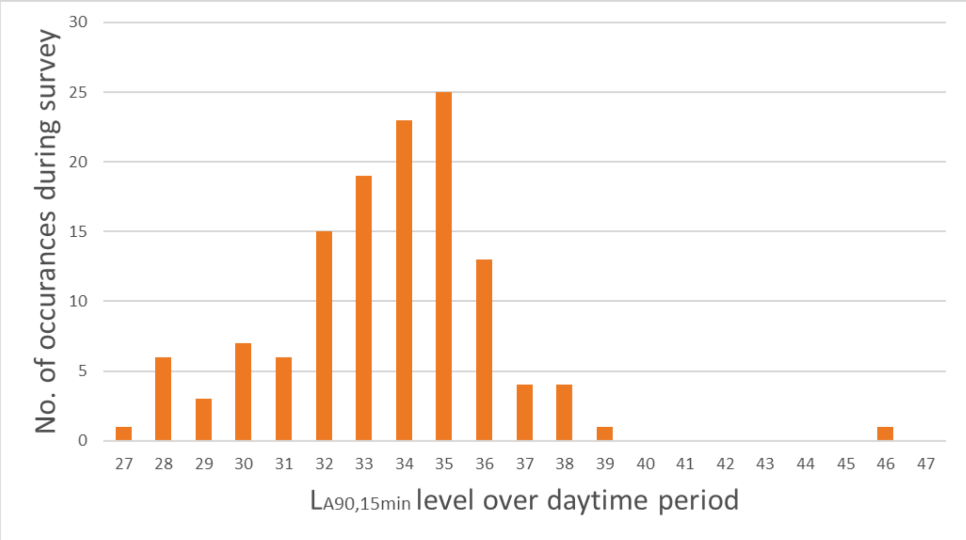


Figure 23 U1 LA90 Night-time Statistical Analysis (with exclusions)

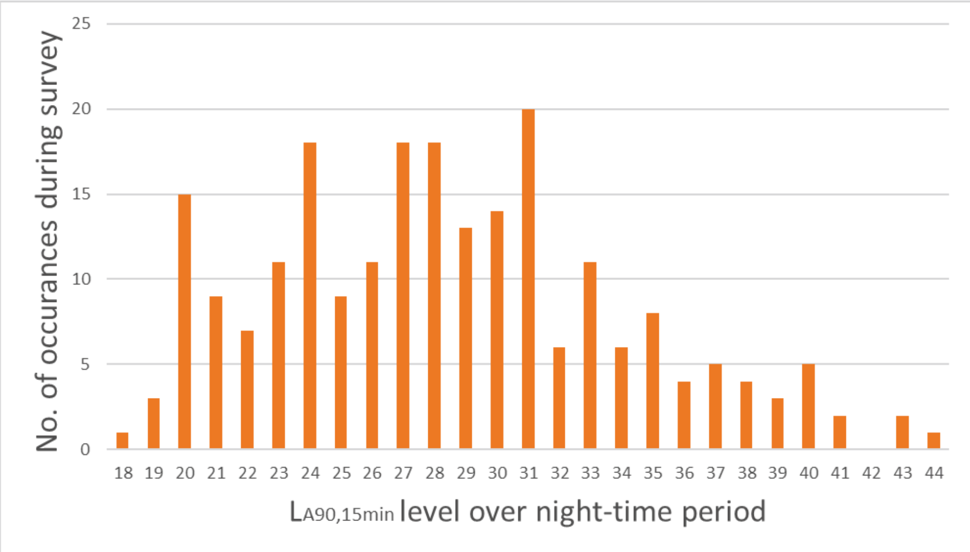
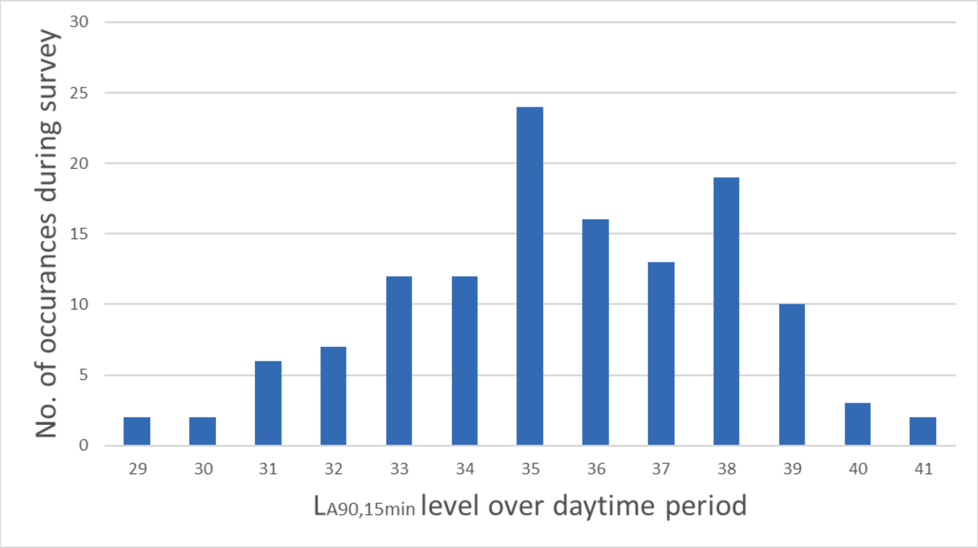
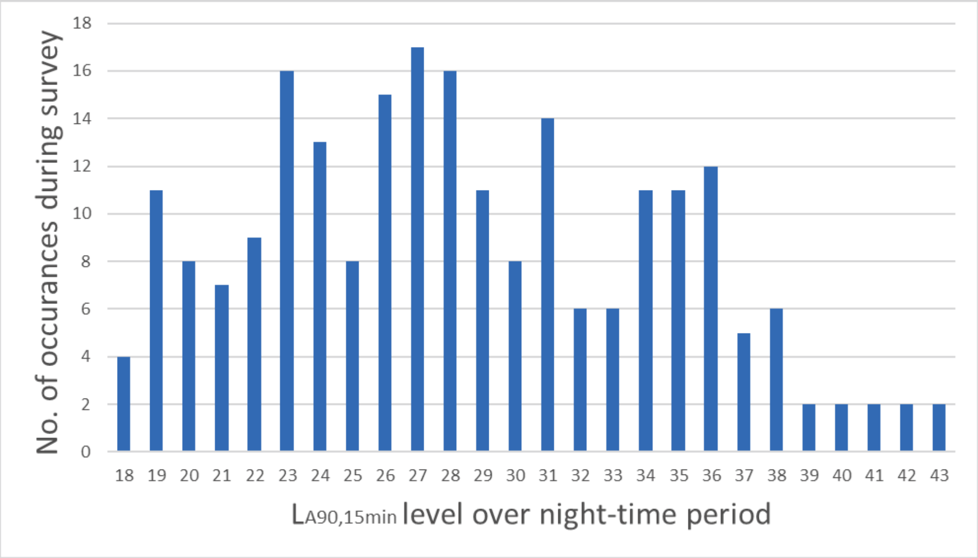


Figure 24 U2 LA90 Daytime Statistical Analysis (with exclusions)



90 Nighttime Statistical Analysis (with exclusions)



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