

Report

Acoustic Assessment

Land South of Westwells Road, Corsham

Planning Stage

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1 Introduction

Sweco have been instructed by Ark Estates 4 Limited to assess the impact of noise associated with P6 Data Centre operations at Land South of Westwells Road, Corsham, to support a planning application.

A sound monitoring exercise has been carried out at the nearest noise-sensitive residential receptors in the area to determine the baseline conditions that are used as a basis for the assessment of plant noise impacts.

The assessment is based on noise emission data provided by the design team and mitigation measures designed in conjunction with the data center design engineers. The Assessment methodologies contained in British Standard 4142 and British Standard 8233 have been considered in the assessment.

This report presents the results of the baseline sound monitoring exercise carried out at three positions to determine the existing ambient sound climate at the nearest noise-sensitive receptors (NSRs) to the development. The Environmental Sound Survey was conducted by Sweco between Tuesday 2nd and Tuesday 9th May 2023. This sample is considered sufficient to provide details of representative and typical prevailing sound levels during the potential hours of operation.

The sound levels from the external and internal plant associated with the development have been predicted using the noise-modelling suite Cadna/A, which implements the ISO 9613 prediction methodology, and the resulting levels at the nearest noise-sensitive receptors have been compared to the baseline conditions, in accordance with the relevant UK standards.

Following a request by the Ecology consultants the report also includes an assessment of the potential noise impact on bats from the proposed development, at the boundary of the site.

This report contains references of a technical nature, a glossary of acoustic terminology has therefore been provided in Appendix A to assist in any interpretation.

Full tabulated and charted measurement results for the relevant periods are presented in Appendix C.

Noise maps in Appendix D graphically articulate the propagation of noise from the site to the surrounding area.

2 Assessment Methodology and Criteria

The assessment has been made in accordance with the following standards, the relevance of which is explained in the assessment text:

- ISO9613-1:1993 Acoustics – Attenuation of Sound During Propagation Outdoors – Part 1: Calculation of the Absorption of Sound by the Atmosphere;
- ISO9613-2:1996 Acoustics – Attenuation of Sound During Propagation Outdoors – Part 2: General Method of Calculation;
- BS4142:2014+A1:2019 Method for Rating and Assessing Industrial and Commercial Sound;
- BS8233:2014 Guidance on sound insulation and noise reduction for buildings.

Further details relating to the above standards are provided in Appendix B, as necessary.

3 Site and Development Description

The development is located at Land South of Westwells Road, Corsham , Wiltshire. The proposed P6 Data Centre site is bound by the rest of Spring Park Data Centre to the north, and Westwells Road to the northeast. To the east and south, the site is bound by Moor Green and open land respectively, with the Wadswick Green residential development further to the south. To the west the site is bound by woodland areas and open land, with some residential properties further west along Bradford Road.

The residential properties on Westwells Road to the north of the site and off Moor Green to the south of the site, will be the nearest and most exposed noise sensitive receptors.

3.1 Spring Park P6 Data Centre Facilities

The Data Centre P6 location is presented in the masterplan shown in Figure 1.



Figure 1: Site Masterplan Including P6 Location (red line)

The proposed site plan and elevations for the Data Centre P6 site and building are presented in Figures 2 – 7.

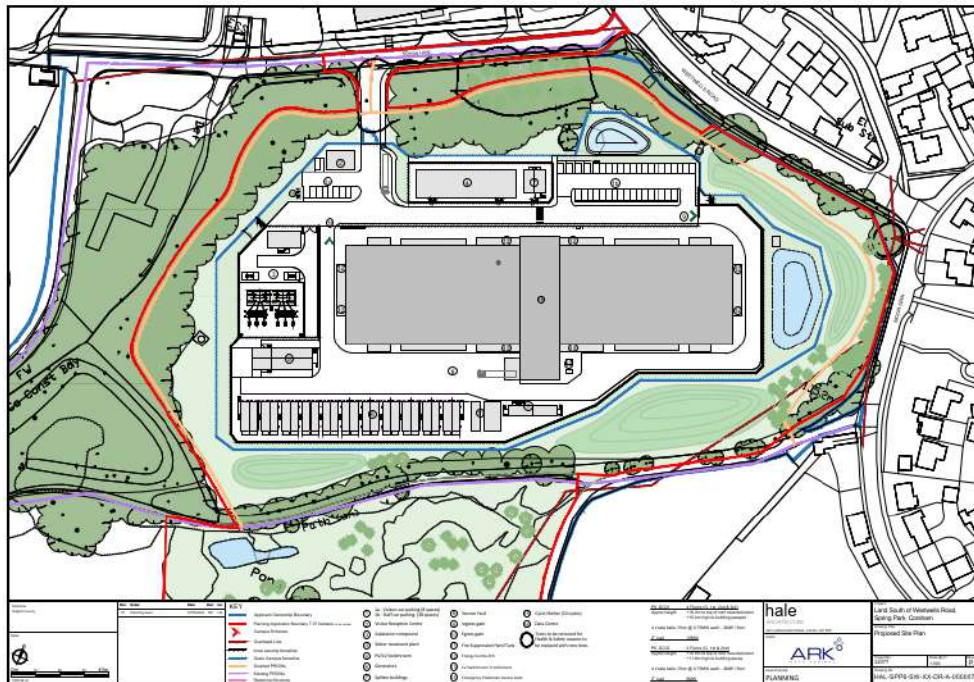


Figure 2: Proposed Site Plan

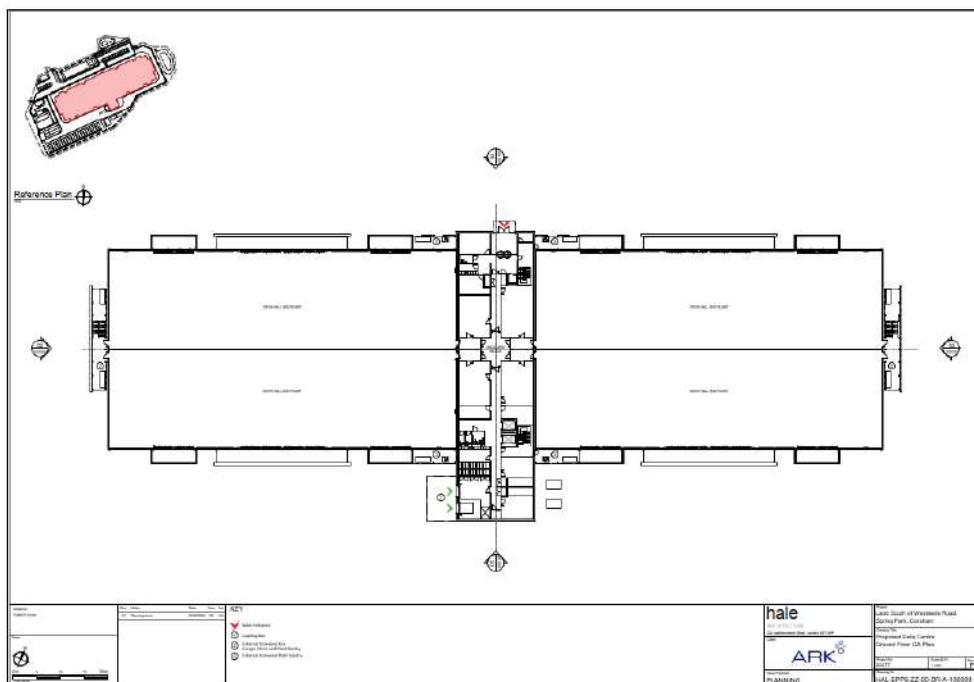


Figure 3: P6 Level 0 Layout

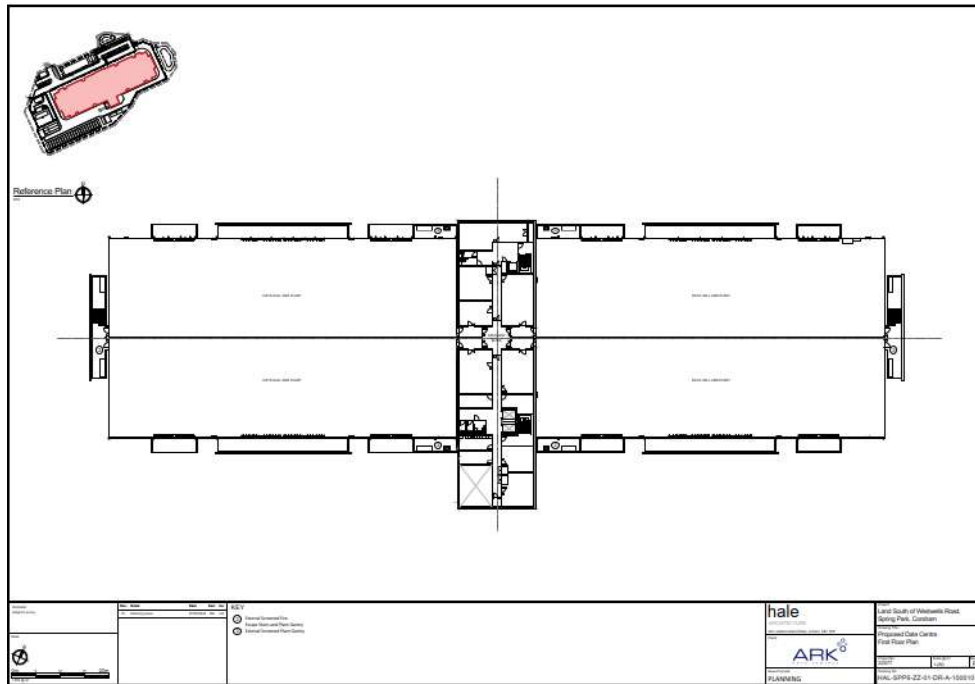


Figure 4: P6 Level 1 Layout (Level 2 plans are comparable)

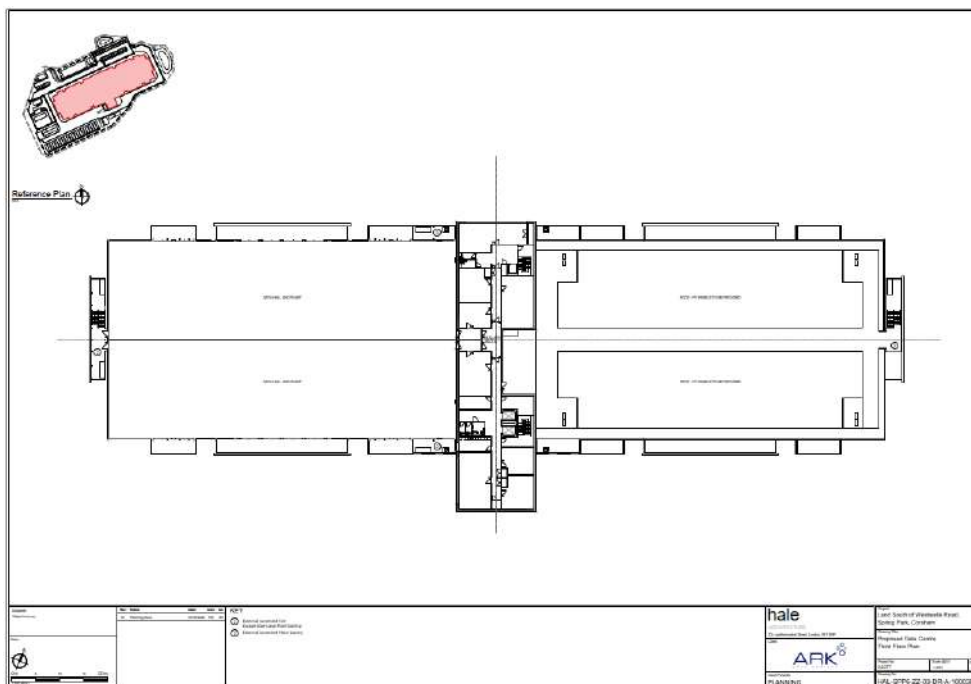


Figure 5: P6 Level 3 Layout

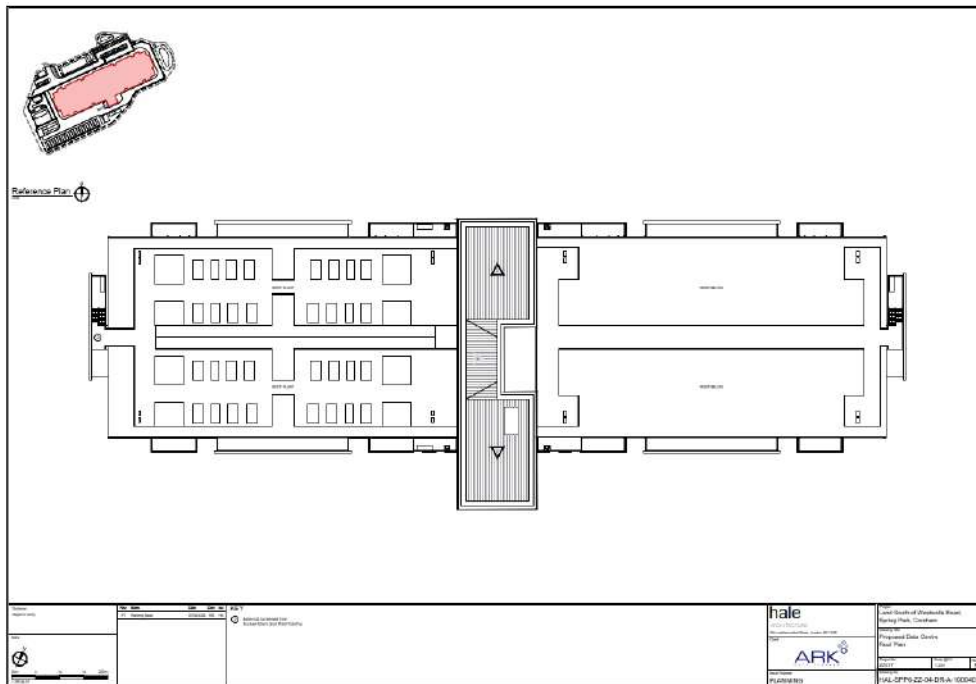


Figure 6: P6 Level 4 Layout

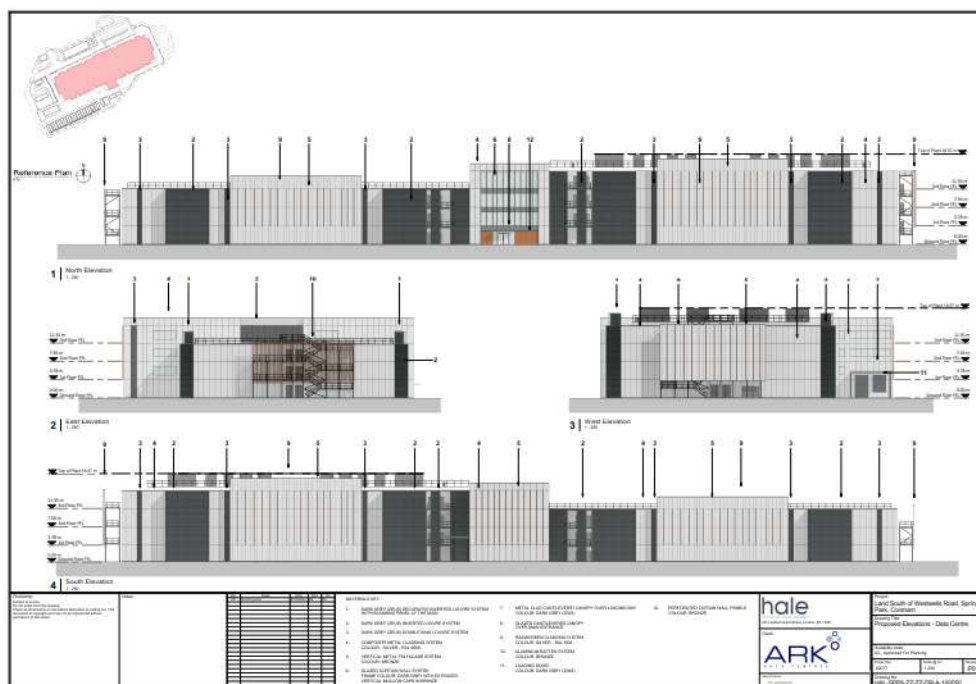


Figure 7: P6 Elevation Drawing

3.2 Site Operation

Under 'Normal Operation' conditions, the data suites located within the buildings are serviced by internal plant rooms, with associated ventilation inlet and outlet louvers at the sides of the buildings.

The external plant located on the roof of the west and east buildings, the roof of the ancillary building, and at ground level is associated with the ancillary building and the battery rooms. This plant has also been considered as part of the normal operation of the data centre, due to the proximity of the noise-sensitive residential receptors.

There is also a substation located to the west of the site that has been included in the assessment.

The external plant items associated with the P6 data suites and emergency services are for the provision of 'Emergency' data suite cooling and fire systems, to allow the data centre to continue operating and prevent the loss of any data in the event of primary (internal) cooling system failure or an event involving fire.

Based on the information provided by the operator, it is not possible to anticipate the likely duration or frequency of use of the emergency external plant, as this is dependent on extreme environmental conditions/emergency operations for the DX cooling units or chiller units on the roof. Emergency situations include a fire in the data centre, which would not be expected to impact all modules in the building simultaneously. They also include periods of extreme high external temperatures, which may be expected to impact all modules simultaneously, but are extremely unlikely to occur at night between 23:00hrs and 07:00 hrs. We understand that over the last 20 years of data centre operation, the worst-case emergency operating time was 22 hours in a given year, which would represent a 0.01% of the time. This provides an idea of the unlikelihood of these type of emergency events.

The backup power generators are proposed to allow the data centre to continue operating and prevent the loss of any data in the event of a grid power cut.

Emergency events are unlikely and are typically rectified very quickly, due to the enormous impact on the activity within the area affected. Therefore, the operation of the associated emergency plant is not considered part of the normal operation of the site and, as such, it has been excluded from this assessment in support of the planning application.

3.3 Nearest Noise-Sensitive Receptors (NNSRs)

The nearest and most affected noise-sensitive receptors have been identified as the properties off Westwells Road, to the north and the properties off Moor green to the south. The most affected receptors to the north are located at a distance of approximately 29 metres from the site boundary. The properties off Moor green to the south, are approximately 10 metres from the site boundary. There is also one isolated property approximately 360 metres to the west in the woodland area, and Wadswick Green retirement development to the southwest at approximately 170 metres. Other residential dwellings along Bradford Road to the west are at approximately 860 metres from the proposed site boundary. The NNSRs to the site are identified in Figure 8.



Figure 8: Nearest Noise-Sensitive Receptors (NNSRs)

4 Baseline Sound Conditions

4.1 Noise Survey Overview

The prevailing sound conditions at the location of the development site were determined by a detailed environmental noise survey, undertaken between Tuesday 2nd May and Tuesday 9th May 2023 at three monitoring positions.

All sound measurements were undertaken by a suitable qualified acoustician, certified as competent in environmental sound monitoring, and in accordance with the principles of BS 7445¹.

4.2 Survey Equipment and Methodology

All acoustic measurement equipment used during the sound survey conformed to Type 1 specification of BS 61672². A full inventory of this equipment is shown in Table 1 below.

Table 1: Inventory of Sound Measurement Equipment				
Item	Make & Model	Serial Number	Calibration Certificate Number	Date of Expiration of Calibration
Sound Level Meter	RION NL-52	00620900	TCRT23/1325	20 April 2025
Preamplifier	RION NH-25	31972		
Microphone	RION UC-59	03797		
Sound Level Meter	RION NL-52	00620957	TCRT23/1134	6 February 2025
Preamplifier	RION NH-25	20998		
Microphone	RION UC-59	03875		
Sound Level Meter	RION NL-52	01054199	TCRT21/1756	29 October 2023
Preamplifier	RION NH-25	54272		
Microphone	RION UC-59	08655		
Calibrator	RION NC-75	34212940	TCRT22/1291	11 May 2023

The sound measurement equipment used during the survey was calibrated at the start and end of the measurement period. The calibrator used had itself been calibrated by an accredited calibration laboratory within the twelve months preceding the measurements. No significant drift in calibration was found to have occurred on the

¹ British Standard 7445: 2003: Description and measurement of environmental noise. BSI

² British Standard 61672: 2013: Electroacoustics. Sound level meters. Part 1 Specifications. BSI.

sound level meters. Calibration certificates of the above equipment are available upon request.

$L_{Aeq,T}$, $L_{A90,T}$ and $L_{AF,max}$ acoustic parameters were recorded over sequential 15-minute periods.

Measurements were carried out at the following monitoring positions, as described in Table 2 and shown in



Figure 9. These positions were chosen following investigations on site and are considered to be representative of the existing ambient and background noise values as impinging upon the existing nearest dwellings to the site.

Table 2: Summary of Measured Noise Levels			
Measurement position	Period (T)	Equivalent continuous SPL $L_{Aeq,T}$ (dB)	Typical one percentile SPL $L_{A01,hour}$ (dB)
MP1	Located within private farmland to the south of Spring Park in close proximity to the nearest dwelling.	$\approx 1.5m$	Free-Field
MP2	Located approximately 5m from the edge of Westwells	$\approx 1.5m$	Free-Field

	Road at the mid-point between Rowan Lane and Moor Green.		
MP3	Located within the woodland approximately 20m from the edge of Bradford Road.	≈1.5m	Free-Field

MP1 is considered as being representative of both the private farm dwelling and the residential development of Wadwicks Green to the south-east.

MP2 is considered as being representative of typical sound conditions at all receptors to the east, off Westwells Road.

MP3 is considered as being representative of the typical sound conditions at the dwellings off Bradford Road.



Figure 9: Monitoring positions and approximate site boundary for Spring Park Ark P6 Data Centre

4.3 Weather Conditions

The survey period was selected following close monitoring of local weather conditions. Weather conditions were largely suitable for the noise measurement exercise, it being

generally dry with only light winds. The following periods have however been removed from the assessment due to unsuitable weather conditions:

- Rain was recorded between 05:00 – 17:00 on Saturday 6th May and between 17:00 – 00:00 on Monday 8th May.
- High winds were recorded between 16:00 – 19:00 on Wednesday 3rd May and between 16:00 – 19:00 Friday 5th May.

All microphones were fitted with a protective windshield and the appropriate correction applied on the Sound Level Meter.

4.4 Observations

Since the survey was largely unattended it is not possible to comment on the specific nature of the sound climate for the entire duration of the survey, however sound sources were noted during our time on site and are described below.

- MP1 – Largely unattended measurement of the sound climate representative of the nearest noise-sensitive receptor to the south of the site. The microphone was located under free-field conditions, at a height of 1.5 metres above local ground. The ambient noise climate at MP1 was controlled largely by distant traffic and local natural noises including birdsong and the local grazing of cattle. Other noise sources included occasional local vehicle movements, aircraft flyovers, and occasional animal noise including specifically Cockerels. No mechanical agricultural noise (i.e. farm equipment) was noted during the attended portions of the survey. It was identified in previous site attendances in 2019 that building services noise from the Spring Park commercial premises was audible at this location during night-time hours, however it is not possible to confirm if this is still the case in this latest survey.
- MP2 – Largely unattended measurement of the sound climate representative of the nearest noise-sensitive receptor to the east of the site. The microphone was located under free-field conditions, at a height of 1.5 metres above local ground. The ambient noise climate at MP2 was controlled largely by local traffic on Westwells Road and natural sounds in the vicinity including birdsong and wind-noise through the vegetation. Other contributions include helicopter and plane flyovers. Whilst not audible at the measurement location itself, steady-state ventilation noise was observed during the survey period along Rowan Lane to the north and as such may have contributed to the underlying background noise levels at MP2 – this is supported in the historic Sweco surveys and observations.
- MP3 – Largely unattended measurement of the sound climate representative of the nearest noise-sensitive receptor to the west of the site. The microphone was located under free-field conditions, at a height of 1.5 metres above local ground. The ambient noise climate at MP3 was controlled by local traffic on Bradford Road and natural sounds in the vicinity including birdsong and wind noise through the vegetation. Also, occasionally audible as a subtle low-frequency hum, determined as emanating from the MOD substation facilities to the east. This low-frequency hum was also observed in the historic survey and attendances.

4.5 Sound Survey Results

The results of the sound monitoring, in terms of the typical $L_{A90, \text{one hour}}$ daytime (07:00-23:00) and $L_{A90, 15 \text{ minutes}}$ night-time (23:00-07:00) are summarised in Table 3. In addition to the typical background sound levels, average ambient sound levels and typical maximum sound levels are presented to add context. Values have been rounded to the nearest whole number.

Aside from the periods of rain and high wind detailed above, the full survey period has been used in the determining of the typical background noise levels.

Full-tabulated and charted results of the sound measurements are presented in Appendix C. The statistical analysis for obtaining the typical background sound levels used in this assessment can also be found in Appendix C.

Table 3: Summary of Measured Noise Levels				
Measurement position	Period (T)	Equivalent continuous SPL $L_{Aeq,T}$ (dB)	Typical Maximum SPL L_{AFmax} (dB)	Typical background sound level $L_{A90,T}$ (dB)
MP1	Daytime (07:00 – 23:00)	50	72	36
	Night time (23:00 – 07:00)	45	68	28
MP2	Daytime (07:00 – 23:00)	59	84	41
	Night time (23:00 – 07:00)	56	79	26
MP3	Daytime (07:00 – 23:00)	61	79	43
	Night time (23:00 – 07:00)	54	75	31
The 'typical' background $L_{A90,T}$ presented is the modal peak in each time period for the full survey duration. Where the analysis presented multiple modal peaks for each time period, the lowest of these has been presented. The 'typical maximum' L_{AFmax} presented is the 90th percentile measurement result in each time period, i.e. the L_{AFmax} value that is exceeded for only 10% of the assessment period.				

5 Sound Predictions and Assessment

In order to assess the impact of sound from P6, it has been necessary to predict the likely specific sound level from the sources of sound associated with the development at the nearest noise-sensitive receptors. Predictions have been carried out in the noise-modelling suite Cadna/A, in accordance with the ISO 9613 prediction methodology.

In addition to the input data described below, the model considers the effects of topography, ground absorption, atmospheric absorption and acoustic reflections, as well as applying a light downwind correction to consider a typical worst-case downwind situation. In terms of ground absorption, the intervening ground between the sources and receivers has been modelled as acoustically hard, except where ground is covered by grass, trees or other vegetation, as advised on ISO 9613-2.

5.1 Operational Scenario

As advised by the operator and the plan designer the operational times of the plant will be as follows:

- Data suites located within the buildings are serviced by internal plant rooms, with associated ventilation inlet and outlet louvers at the sides of the buildings. These will operate continuously day and night.
- The ancillary buildings and external plant will operate continuously, except for the following elements:
 - AHUs Condensers will only operate during daytime periods (07:00 to 23:00).
 - VRV Condensers will only operate during daytime periods (07:00 to 23:00).
 - Ancillary areas ventilation systems (AHUs and MVHR) will operate day and night.
 - Electrical Plant Room Condensers (CRAC condensers are understood to operate day and night. For the night-time period operation, assuming a maximum temperature of 24C, the manufacturer has advised that the noise output will reduce by 13 dB.
 - MMR Condensers are understood to operate day and night. For the night-time period operation, when the temperature will be below 30C, the manufacturer has advised that the noise output will reduce by 5 dB.
 - Battery Rooms Condensers at Ground Floor are understood to operate day and night.
 - Battery room condensers on the roofs will operate day and night, only one of each pair (8no of 16no) will run at one time.
 - The water treatment room has been assumed to operate day and night, with only part of the plant operating simultaneously. The contribution from the breakout noise from this building is negligible, although it has been included in the assessment.
 - The substation transformers will operate continuously day and night.

5.2 Sound Data Assumptions

Noise emissions in this assessment are based on data provided by the design engineers of the development. The noise sources of the development are associated with a high IT load capacity of the modules, representing a worst-case scenario. Extensive mitigation measures have been included in the design, to reduce the noise impact where possible.

Ventilation louvres are associated with 'normal operation' of the data centre. Additionally, due to the close location of P6 to the residential receptors on Westwells Road and Moor Green, the external plant associated with the ancillary areas and the energy centre have also been included as part of the normal operation of the development.

Data provided by the MEP engineers and plant manufacturers have also been used for the assessment of the ancillary building and energy centre plant at P6.

5.2.1 Data Suite Ventilation

The sound power data for the ventilation inlets and outlets for P6 are based on the data provided by the MEP engineers.

A summary of the derived sound emission levels of the acoustic sources is presented in Table 4. This is based on the data provided for the inlet (at a distance of 3 metres) and the internal levels within the area behind the outlet louvres, which have been used in the current assessment for P6.

The reported sound power levels represent a 100% load scenario and have been derived based on the sound pressure level data provided for the inlets and the size of the outlet louvres. The calculated octave band data provided is A-weighted.

Table 4: Normal Operation Plant - Sound Power Levels, dBA									
Plant Type	Octave Band Centre Frequency, Hz								Global dBA
	63	125	250	500	1000	2000	4000	8000	
	Sound Power Level (dBA)								
Inlet Ventilation Louvres P6 East and West buildings	72	69	86	87	82	80	73	67	90
Outlet Ventilation Louvres P6 West Building (4 storeys)	82	77	93	93	88	86	79	73	98
Outlet Ventilation Louvres P6 East Building (3 storeys)	81	76	92	92	87	85	78	72	96

The MEP engineers have confirmed that the data hall ventilation noise levels for 80% IT load capacity will be 5 dB less than the full load noise levels presented above, and this has been applied to the assessment as the maximum IT load for a worst-case scenario.

5.2.1.1 Inlet Attenuation

Additional attenuation will be included in the inlet ventilation system for each module, in the form of a 2800mm attenuator, which is to be located outside of the building. The performance of the Inlet ventilation system attenuator is presented in Table 5.

Table 5: Inlet Ventilation Attenuator Performance Requirements									
System	Attenuation Type	Octave Band Centre Frequency, Hz dB							
		63	125	250	500	1000	2000	4000	8000
		Minimum Insertion Loss (dB)							
Inlet System	Acoustic Attenuator	7	22	31	48	57	51	34	21

5.2.1.2 Outlet Attenuation

For the outlet of each module, noise will be principally attenuated by using acoustic louvres mounted in the façade of the building, along with an enclosure around the acoustic louvres to create a 'chimney'. The chimney will be formed by absorptive acoustic panels to both minimise noise break out via the walls and provide Class A absorption in the interior of the chimney; and at the top d will include the provision of a 2500mx2800m attenuator at the grille to reduce further the noise emissions from the exhaust ventilation system.

The above mitigation measures have been designed by the engineering team to ensure the ventilation needs are achieved along with a high level of acoustic attenuation.

The acoustic performance of the acoustic louvres and the attenuators are presented in Table 6.

Table 6: Outlet Ventilation Acoustic Louvres and Attenuator Insertion Loss Performance Requirements									
System	Attenuation Type	Octave Band Centre Frequency, Hz dB							
		63	125	250	500	1000	2000	4000	8000
		Minimum Insertion Loss (dB)							
Outlet System	Acoustic Louvre	2	2	2	5	10	13	9	8
	Acoustic Attenuator	9	18	20	28	37	34	23	16

5.2.2 Ancillary Blocks and Energy Centre External Plant

5.2.2.1 Ancillary Block Roof and Plant Room Area

The MEP designers have provided noise data for the external plant to be installed on the plant room area at the top floor of the ancillary block, located in the middle of the building.

We understand that the external plant located in the ancillary block plant room and roof will comprise the following:

- 3 No AHUs (AHU SOUTH, AHU NORTH and AHU MMR & CORE)
- 2 No AHUs CONDENSER UNITS
- 1 No VRV Condenser Units

The noise emission data for the proposed plant is presented in Table 7.

Table 7: Normal Operation Plant – P6 Ancillary Block Top External Plant Noise Emission Data from Manufacturer										
Description		Octave Band Centre Frequency, Hz								dBA
		63	125	250	500	1000	2000	4000	8000	
		Sound Power level (dB)								
AHU NORTH	Breakout	64	62	59	41	38	39	34	34	52
	Return Outlet	76	71	86	79	76	76	74	69	83
AHU SOUTH	Supply Inlet	71	66	77	74	66	59	50	45	73
	Return Outlet	75	70	85	78	75	75	73	68	82
	Breakout	63	61	58	40	37	38	33	33	51
AHU MMR & CORE	Supply Inlet	62	63	69	66	60	53	45	38	66
	Breakout	59	58	45	34	35	37	31	29	45
AHU Condenser Type 1		69	69	68	64	61	56	51	44	66
AHU Condenser Type 2		91	82	81	79	78	72	66	61	82
VRV Condensers		81	79	75	73	68	66	67	59	75

To reduce the noise levels from the plant above, the AHUs will include attenuators. The acoustic performance of the noise mitigation included in the assessment are presented in Table 8.

Table 8: Attenuators Performance for AHUs									
Plant	Attenuation Type	Octave Band Centre Frequency, Hz dB							
		63	125	250	500	1000	2000	4000	8000
		Minimum Insertion Loss (dB)							
AHU SOUTH and AHU NORTH	Acoustic Attenuator	7	15	24	38	53	45	42	28
AHU MMR & CORE	Acoustic Attenuator	9	13	20	28	33	30	24	16

5.2.2.2 Ground Floor Plant

There will be external plant also at ground floor level to the east of the ancillary block. The external plant located by the ancillary block at ground floor will comprise the following:

- 4 No Electrical Plant Room Condensers (CRAC condensers)
- 4 No Battery Room Condensers

The MEP designers have provided noise data for the proposed plant. The data is presented in Table 9.

Table 9: Normal Operation Plant – P6 Ground Floor External Plant Noise Emission Data from Manufacturer									
Description	Octave Band Centre Frequency, Hz								dBA
	63	125	250	500	1000	2000	4000	8000	
	Sound Power level (dB)								
Electrical Plant Room (CRAC) Room Condensers*	71	59	59	60	58	58	53	50	64
Battery Room External Condensers	71	66	63	62	58	53	48	40	63

**CRAC condensers will run at lower levels at night and a reduction of 13 dB for the night-time operation has been applied, as advised by the plant designers assuming a maximum temperature of 23-24C.

The Battery Room External Condensers will be installed with a sound enclosure which will reduce the above noise emissions in 7 dB.

5.2.2.3 Roof Plant

External plant will be located on the roof of the western and the eastern buildings.

The external plant located in the western building roof will comprise the following:

- 24 No MMR CONDENSER UNITS

- 2 No Battery Room Condenser Units per module, with a total of 8 No Units, only one of each pair (4no of 8no) will run at one time.

The external plant located in the eastern building roof will comprise the following:

- 2 No Battery Room Condenser Units per module, with a total of 8 No Units, only one of each pair (4no of 8no) will run at one time.

The MEP designers have provided noise data for the proposed plant. The data is presented in Table 10.

Table 10: Normal Operation Plant –P6 Roof External Plant Noise Emission Data from Manufacturer									
Description	Octave Band Centre Frequency, Hz								dBA
	63	125	250	500	1000	2000	4000	8000	
	Sound Power level (dB)								
MMR Condensers*	47	47	54	56	57	56	53	43	62
Battery Rooms Condensers	71	70	68	70	58	56	51	52	45
*MMR noise levels are understood to be 5 dB lower at night, as the temperature will be below 30C.									

The Battery Room Condensers will be installed with a sound enclosure which will reduce the above noise emissions in 7 dB.

5.2.3 Substation Transformers

The proposals include a substation with two transformers located to the west of the P6 building. The design team was not able to provide manufacturer data for this plant, and the client suggested the existence of comparable plant operating within the existing site, that could be tested during normal operation.

The sound power data for the transformers included in the assessment have been derived based on sound pressure levels measured on site at a comparable substation within the existing Spring Park development, and a model validation.

Table 11: Normal Operation Plant –P6 Substation Transformers									
Description	Octave Band Centre Frequency, Hz								dBA
	63	125	250	500	1000	2000	4000	8000	
	Sound Power level (dB)								
Substation Transformers	76	83	73	68	66	60	52	37	72

5.3 Assessment of Normal Operating Conditions

The potential impact of sound from the normal operation of the P6 Data Centre site has been assessed in accordance with BS 4142:2014. This is based on a comparison between the predicted $L_{A,T,r}$ rating sound levels from the ventilation inlet and outlet louvers, the ancillary block and energy centre external plant, and substation transformers included in the normal operation regime for P6, with the typical measured $L_{A90,T}$ background sound levels at the nearest noise-sensitive receptors in the vicinity. Sound predictions have been carried out in the noise-modelling suite Cadna/A, in accordance with the ISO 9613 prediction methodology.

For the purposes of this assessment, it is assumed that all the internal plant for the ventilation of the data suites will operate simultaneously and continuously, except for the pressure relief dampers that are assumed to only operate when the gas suppression system is activated, which is in case of fire, and therefore not considered as part of the site operation. This is representative of a reasonable worst-case scenario for the normal operation, as explained in section 5.2 above, assuming maximum IT capacity.

In relation to the ancillary block services plant, it is assumed that all the external plant will operate simultaneously and continuously except for certain elements as advised by the designers and presented in Section 5.1 above.

All the mitigations presented in Section 5.2 above have been included in the predictions.

BS4142:2014 advises that when the noise contains a tonality, impulsivity, intermittency and other sound characteristics, then a correction depending on the grade of the aforementioned characteristics of the sound is added to the specific noise level to obtain the $L_{A,T,r}$ 'rating noise level'. A correction to include the consideration of a level of uncertainty in sound measurements, data and calculations can also be applied when necessary. It also advises that the assessment of the significance of sound needs to take into account the context in which the sound will occur. Based on the character of the proposed ventilation plant no penalties are considered necessary for intermittency, tonality or impulsivity of the sound arising from the development.

The prevailing background sound levels used within the assessment were measured over a 7-days period and in accordance with the principles of BS7445:2003. All acoustic measurement equipment used during the sound survey conformed to Type 1 Specification of British Standard 61672. This reduces the significance of the uncertainty in the measurements. The sound predictions were carried out using the noise-modelling suite Cadna/A, in accordance with the ISO 9613 prediction methodology. They are based on manufacturer data and a conservative approach has been followed.

The above approach effectively removes the significance of uncertainty, which has consequently, resulted in no uncertainty budgets being included within the assessment. Taking into account the context; the sound from the plant is not expected to alter the character of the prevailing acoustic environment.

Table 12 below presents the predicted sound rating levels at the most exposed NSRs and compares them against the prevailing background sound levels during the

daytime and night-time respectively. Receptors have been modelled at 4 metres high to represent the worst-case upper floor. Values have been rounded to the nearest whole number.

Table 12: Assessment of the Impacts on Residential Dwellings during Normal Operation					
Receptor	Period	Predicted Rating Sound Level $L_{A,r,Tr}$ (dB)	Typical Background Sound Level $L_{A90,T}$ (dB)	Excess of $L_{A,r,Tr}$ above $L_{A90,T}$ (dB)	Significance of Sound Impact (Depending on the context)
Detached Property (west)	Day	12	36	-24	No Adverse Impact
	Night	11	28	-17	No Adverse Impact
Wadwicks Green (south-west)	Day	18	36	-18	No Adverse Impact
	Night	17	28	-11	No Adverse Impact
Westwells Road (north)	Day	30	41	-11	No Adverse Impact
	Night	23	26	-3	Potential Low Adverse Impact
Moor Green (south)	Day	28	41	-13	No Adverse Impact
	Night	24	26	-2	Potential Low Adverse Impact
Bradford Road (west)	Day	10	43	-33	No Adverse Impact
	Night	10	31	-21	No Adverse Impact

During the daytime periods, the sound from the 'normal operation' of the proposed development considering the proposed mitigation measures will be well below the typical background at the nearest and most potentially exposed NSRs, which is an indication of No Adverse Impact.

During the night-time periods, when the background sound drops to very low levels (please refer to Table A1 in Appendix A for typical sound pressure levels for different environments to get some context), the sound from the 'normal operation' of the proposed development considering the mitigations above will be 3 and 2 dB below the typical background at the nearest and most potentially exposed NSRs, which is an indication of Potential Low Adverse Impact.

Sound maps showing the sound breakout contours at 1.5 metres above ground are presented in Appendix D, which graphically articulate the propagation of sound from the plant into the surrounding area.

The predicted levels at the closets and most exposed receptors are below the typical background levels measured during the baseline survey for the night-time period, which would indicate a low impact. This is especially significant when we review the low background levels measured, below 30 dBA.

It should be noted that due to the low background levels during the night at the closest receptors, measured during the baseline survey, the application of BS4142 should be put into context.

As stated in BS4142, *“where background sound levels and rating levels are low, absolute levels may be as, or more, relevant than the margin by which the rating level exceeds the background, especially at night”*.

In this case the absolute rating levels predicted for the night-time periods are of 23 and 24 dBA, which are objectively very low levels of noise. To provide some additional context on how these levels may affect the closest residential receptors assessed, an assessment based on BS8233:2014/World Health Organisation guidelines has been carried out to add context, due to the low background levels in the area during the night.

5.3.1 BS8233:2014/World Health Organisation Assessment

As stated in BS4142, *“where background sound levels and rating levels are low, absolute levels may be as, or more, relevant than the margin by which the rating level exceeds the background, especially at night”*.

In line with the stated in BS4142 about assessments in areas when background levels are low, as is the case specially for Westwells Road receptors to the north and Moor Green receptor to the south, an assessment has been undertaken to evaluate the predicted levels in the context of BS8233:2014 and WHO guidance.

Based on the guideline values presented in these guidance documents, the noise emissions from the proposed site operation should be controlled to ensure that the $L_{Aeq,T}$ value does not exceed 50 dB in the external areas, 35 dB internally during the day and 30 dB internally during the night, at the nearest noise-sensitive receptors.

It can be observed in **Error! Reference source not found.** Table 12 above that the noise levels from the site operation will be at least 20 dB below the 50 dB $L_{Aeq,T}$ value at the external amenity areas.

For the calculation of the indoor noise levels, background ventilation on existing NSRs provided via partially open windows should be considered, which will provide a noise reduction from outside to inside of approximately 15 dB, according to BS8233:2014 and WHO Guidelines.

Observing the levels in Table 12, it can be stated that noise intrusion considering mitigation included in the design will be at least 20 dB below the Indoor Ambient Noise Level (IANL) targets at the closest and most exposed receptors on Westwells Road and Moor Green.

The above demonstrates that the impact of the proposed site will be negligible in terms of BS8233 and WHO during normal operation.

5.4 Noise Impact Assessment – Bats

Following the Ecology consultants' request, the noise impact on the bats population around the site has been assessed. Discussions with the ecology team have informed that the site is sensitive for bats and that these species are sensitive for noise.

The ecology team informed that bats species are affected by much higher frequencies than humans, and therefore an assessment on the overall dBA levels will not be representative, as this is determined for human receptors mainly.

Following the discussion, the following approach was agreed as the best representative way to evaluate the likely impact on the bats. The assessment has been decided to compare the impact levels in dB produced by the data centre at different times (daytime and night-time) and the baseline dB levels measured during the survey, at the highest available frequency octave band of 8kHz. The assessment will compare unweighted values, as A-weighted curve is intended to adapt to human hearing.

It should be noted that the bats will be affected by frequencies at higher range than 8kHz, but the available noise data from manufacturers and modelling software does not allow the prediction of noise at higher frequencies. The assessment at 8 kHz will represent an absolute worst case, as most of the high frequency noise from the site is well attenuated by means of the mitigation measures, and the character of the noise from external plant and ventilation systems does not include very high frequency noise.

The assessment has been undertaken at five different positions as proposed by the ecology team and presented in the image below by yellow crosses; and at three different heights (4 metres; 6 metres and 10 metres above ground), deemed representative for bat receptors.

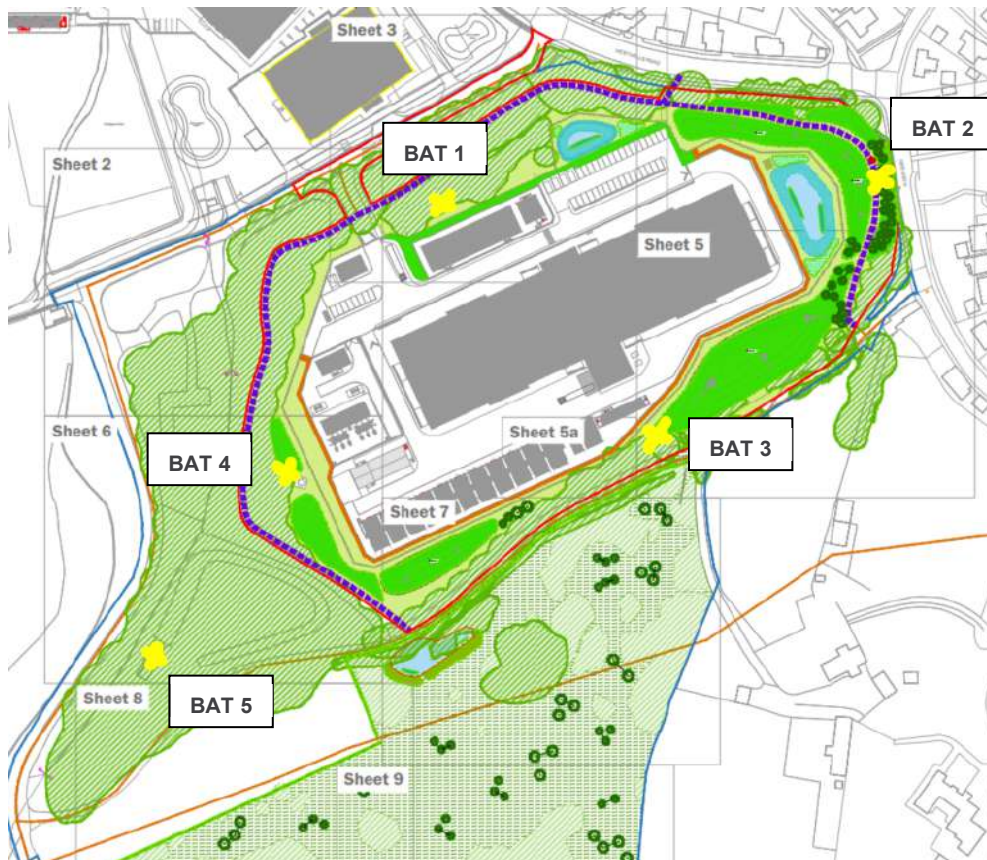


Figure 10: Proposed locations for Bat's noise assessment evaluation

In order to represent an absolute worst case, the assessment has been carried out against the minimum noise levels measured during the 7-days baseline survey for the two periods daytime and night-time. To add some context, the averaged level for the whole period has also been provided.

The baseline noise levels measured at MP1 (west of the proposed site) and MP2 (eastern boundary of the site) during the sound survey, for the 8kHz band, are presented in Table 13. The table presents the minimum level measured, the averaged level for the whole duration of the survey, and the level that is exceeded the 90% of the time.

Table 13: Summary of Measured Noise Levels at 8 kHz

Measurement position	Period (T)	Equivalent continuous SPL at 8kHz (dB)	Minimum SPL at 8kHz (dB)	SPL exceeded 90% of the time at 8kHz (dB)
MP1	Daytime (07:00 – 23:00)	42	14	25
	Night-time (23:00 – 07:00)	39	14	14

MP2	Daytime (07:00 – 23:00)	54	16	39
	Night-time (23:00 – 07:00)	54	15	19

The predicted noise levels at 8kHz octave band are presented in Table 14, along with the lowest level from the baseline sound survey for the same frequency for the nearest measurement position. The change in noise levels produced at the position, due to the site operation is also presented.

Table 14: Assessment of the Impacts on Bats during Normal Operation							
Receptor Position	Height	Noise Level from site operation at 8 kHz		Minimum SPL at 8kHz (dB)		Change in noise levels at 8KHz band (dB)	Comment
		Day (07:00 – 23:00)	Night (23:00 – 07:00)	Day (07:00 – 23:00)	Night (23:00 – 07:00)		
BAT1	4 m	0	0	16	15	0	There is no contribution from the site at high frequencies, there will be no noise impact on bats due to the operation of the site
	6 m	0	0	16	15	0	
	10 m	0	0	16	15	0	
BAT2	4 m	0	0	16	15	0	There is no contribution from the site at high frequencies, there will be no noise impact on bats due to the operation of the site
	6 m	0	0	16	15	0	
	10 m	0	0	16	15	0	
BAT3	4 m	16	5	16	15	+3 / 0	During the daytime, an increase of noise levels can be expected at high frequency in relation to the lowest levels measured during the survey. It should be noted that if the comparison is made with the levels measured more than 90% of the time, the increase of noise levels would be marginal. There is no change in noise levels due to the site contribution at high frequencies during the night-time. There will be no noise impact on bats due to
	6 m	16	5	16	15	+3 / 0	
	10 m	16	5	16	15	+3 / 0	

							the operation of the site for the night-time periods.
BAT4	4 m	0	0	14	14	0	There is no contribution from the site at high frequencies, there will be no noise impact on bats due to the operation of the site
	6 m	0	0	14	14	0	
	10 m	0	0	14	14	0	
BAT5	4 m	0	0	14	14	0	There is no contribution from the site at high frequencies, there will be no noise impact on bats due to the operation of the site
	6 m	0	0	14	14	0	
	10 m	0	0	14	14	0	

The assessment above has shown that in most of the areas close to the site boundaries, the noise from the site will have no contribution at frequencies in the 8 kHz band range and above, and therefore there will be no noise impact on bats in the area.

Just in the position close to the south site boundary, a low impact may happen for the daytime operation. However, it has been shown that when the baseline noise survey result used is not the absolute 15-minute minimum result, and we consider the baseline noise levels achieved more than 90% of the time, there will not be a perceptible change in the noise conditions in the area. The outcome of the assessment above, along with the fact that the assessment at 8 kHz is a worst case driven by technical limitations in the calculations, suggests that the bats in the area will not be affected by the noise from the proposed site.

6 Conclusion

Sweco have been instructed by Ark Estates 4 Limited to assess the impact of noise associated with P6 Data Centre operations at Land South of Westwells Road, Corsham, to support a planning application.

This report assesses the acoustic acceptability of the P6 Data Centre site, based on the results of a sound monitoring exercise carried out at the closest residential receptors in the area. Additionally, a comprehensive noise modelling exercise has been undertaken based on noise data provided by the design team and complemented where necessary by the mitigation measures included in the design and developed along with the data centre design engineers.

The intention of the assessment is to cover a worst-case scenario in terms of the data centre operation and IT load capacity, and the inclusion of extensive mitigation measures to reduce the noise impact from the proposed P6 Data Centre.

The 'Normal Operation' scenario assesses acoustic impact of plant which will normally be running, such as the breakout noise associated with ventilation inlet and outlet louvers at the building facades, the external roof and ground floor plant associated with the ancillary blocks and the energy centres, and the substation transformers.

The outcome of the assessment shows that the 'Normal Operations' are expected to have No Adverse Impact during the daytime and a potential Low Adverse noise impact at the nearest and most exposed noise-sensitive receptors on Westwells Road and Moor Green, when assessed in accordance with BS4142:2014. The plant operation is expected to be well below and below typical background levels in the area, when assuming the reductions and mitigation measures set out in section 5.2.

The mitigation measures included in the design are extensive and have demonstrated the low impact from the site operation even including high IT loads in all the Data Centre modules.

It should be noted that the background sound levels measured in the area during the baseline sound survey are very low at night-time, and therefore the impact should also be considered into the context and the applicability limitations of BS4142.

An assessment in line with BS8233/WHO has been undertaken and the levels in this guidance will be comfortably achieved.

An assessment on the noise impact on bats have been undertaken as requested and agreed with the Ecology team. The assessment is following a worst-case approach and suggests that the bats in the area will not be affected by the noise from the proposed site.

Appendix A – Glossary of Acoustic Terminology

Sound is the vibration of particles in a medium, such as air, which may be detected by the human ear. This sound is defined as noise when it is audible and unwanted or undesirable to a listener.

The vibration, or oscillation, of particles about an equilibrium position results in local pressure fluctuations from the normal pressure. These local pressure fluctuations are described as sound pressure, and the number of oscillations per second is described as the frequency.

The human ear responds to an incredibly large range of sound pressure, from 0.00002 Pa to 200 Pa, and the perceived loudness is proportional to the logarithm of the sound pressure squared. For this reason, sound is measured in terms of a logarithmic parameter, the sound pressure level, to approximate the response of the ear. Sound pressure levels are quantified in decibels (dB) relative to the threshold of hearing.

The human ear responds to a wide range of sound frequencies, from the lowest perceptible bass note, around 20 Hz, to the highest perceptible treble note, around 20,000 Hz. The ear does not respond equally to each frequency and is most sensitive to sound within the mid-frequency range of around 600 to 8000 Hz.

The response of the ear to each frequency also varies with the sound pressure level. For very loud sounds the difference in perceived loudness between each frequency is less pronounced than for low level sound.

Acousticians measure sound pressure levels using sound level meters, which incorporate a microphone.

A sound level meter approximates the response of the human ear to sound by using frequency filters. For typical environment sounds, the A-weighting filter is used to approximate the response of the ear at typical sound pressure levels. The sound pressure level, adjusted to approximate the response of the ear, is quantified in A-weighted decibels, dB(A) or dB L_{pA}.

In a typical environment, the A-weighted sound pressure level will vary with time. For this reason, acousticians use statistical measurement parameters to describe the sound environment. The most common measurement parameters are as follows:

- dB L_{Aeq,T}: Equivalent continuous A-weighted sound pressure level. This is the energy-average sound pressure level during a measurement period, T.
- dB L_{AFmax,T}: Maximum A-weighted sound pressure level. This is the maximum sound pressure level during a measurement period, T, and measured in a way that approximates the time-response of the ear.
- dB L_{A90,T}: 90th percentile A-weighted sound pressure level. This is the sound pressure level exceeded for 90% of the measurement period, T, commonly referred to as the background sound level.

Sound pressure levels in typical environments are presented in Table A1. Further definitions of acoustic parameters are presented in Table A2.

Table A1: Sound pressure levels within typical environments	
Sound Pressure Level, dB	Typical Environment or Description
0	Threshold of hearing
15 to 25	A recording studio
25 to 35	A hotel bedroom at night
35 to 45	An unoccupied office
45 to 55	Quiet residential street
55 to 65	Normal conversation, 1 m away TV programme, listener position
65 to 75	Raised voices, 1 m away Urban high street traffic
75 to 85	Busy motorway traffic, on hard shoulder Typical small plant room
85 to 95	High-speed hand-dryer, operator position Inside London underground (average)
95 to 105	Pneumatic hammer, operator position Concert orchestra
105 to 115	Typical nightclub Untreated generator plantroom
115 to 140	Aircraft take-off, close proximity Threshold of pain

Table A2: Definitions of Acoustic Terminology and Parameters	
Wording	Description
Ambient sound level	The total sound pressure level in a given position from all surrounding sources of noise, both near and far. Normally expressed as an equivalent continuous A-weighted sound pressure level, dB $L_{Aeq,T}$.
A-weighting	The process of weighting the observed sound pressure level at each frequency band, to approximate the sensitivity of the human ear to sounds of different frequencies. A-weighted sound pressure levels are expressed as dB(A) or dB L_{Ap} .
C_{tr}	Spectrum adaptation term No. 2 as defined in BS EN ISO 717-1. This term is a correction that applies to the weighted standardised level difference to account for how well a partition insulates against sound which has mainly low and medium frequency content (e.g. road traffic noise, amplified disco music).
Decibel	A logarithmic value quantifying the sound pressure at a specified position or sound power, relative to a reference sound pressure or sound power (20 μ Pa for sound pressure, 10-12 W for sound power).
Façade	A sound monitoring position is a "façade" position when it includes a strong reflection from an adjacent building or structure. This corresponds with a position that is between 1 and 2 metres away from a reflecting building or structure.
Free-field	A sound monitoring position is a "free-field" position when it is not affected by sound reflections from surrounding buildings and structures. This corresponds with a position at least 3.5 metres away from reflecting buildings or structures.
Frequency	The number of oscillations per second of a vibrating particle in a medium, measured in Hertz (Hz) or cycles per second.
Impact sound	Sound due to impacts on a floor, such as due to footfall, as observed in the room below the floor.
$L_{A10,18hr}$	The A-weighted sound pressure level exceeded during 10% of the 18-hour time interval between 06:00 and 24:00. This is the UK Road Traffic Noise Index, as defined in the Calculation of Road Traffic Noise (CRTN, HMSO, 1988).
$L_{A90,T}$	The A-weighted sound pressure level exceeded during 90% of the time interval, T. Typically used to quantify the background sound level at a specified position.
$L_{Aeq,T}$	The equivalent continuous A-weighted sound pressure level over a time interval, T. This is an energy-average sound pressure level over the specified time period.
$L_{AFmax,T}$	The maximum A-weight sound pressure level during a specified time interval, T. Measured with "fast" time-weighting (which approximates the time-response of the human ear).

Table A2: Definitions of Acoustic Terminology and Parameters	
Wording	Description
Noise	Unwanted or undesirable sounds observed by a listener.
Octave band	A frequency band used in acoustical measurements. An octave is a frequency interval between two sounds where the frequency of the lower sound is half the frequency of the upper sound. The human hearing range is divided into ten logarithmically equal frequency divisions called octave bands, with centre-band frequencies as follows: (16 Hz, 32 Hz,) 63 Hz, 125 Hz, 250 Hz, 500 Hz, 1000 Hz, 2000 Hz, 4000 Hz, 16000 Hz.
Rating level, L_{A,T_r}	The specific sound level plus a correction accounting for acoustic features such as impulses, tones, intermittent features, or any other characteristics that draw more attention to the sound source.
Residual sound level	The equivalent continuous A-weighted sound pressure level of the ambient sound remaining at a specified position when the specific sound source (the sound source being assessed) does not contribute to the ambient sound.
Reverberation	The reflection of sound from room surfaces, resulting in the prolongation or persistence of a sound in a room.
Reverberation time	Time, in seconds, required for the sound pressure level in a room to decrease by 60 dB after a sound source has stopped. Long reverberation times are present in large empty rooms with hard surfaces (e.g. a cathedral); short reverberation times are present in smaller rooms with soft furnishing (e.g. typical living room, a recording studio).
R_w	The weighted sound reduction index of an architectural element. A single-figure rating of the sound insulation provided by the architectural element in idealised conditions over a range of frequencies. Measured in a laboratory in accordance with BS EN ISO 140-3 (or BS EN ISO 10140-2), with single figure rating determined in accordance with BS EN ISO 717-1.
Sound	The vibration, or oscillation, of particles in a medium, such as air, which may be detected by the human ear.
Sound insulation	The ability of architectural elements or structures to reduce the transmission of sound, predominantly due to the reflection of sound incident on the element or structure. Typically measured as the difference in sound pressure levels between a “source” room containing a loudspeaker and an adjacent “receiving” room.
Sound power level	A logarithmic measurement that quantifies the total sound power of a source emitted in all directions relative to a reference sound power ($W_{ref} = 1 \text{ pW}$ or 10^{-12} W). Equal to $10 \log_{10} (W / W_{ref})$ and expressed in decibels.
Sound pressure level (SPL)	A logarithmic measurement that quantifies the sound pressure at a specified position relative to a reference sound pressure ($p_{ref} = 20 \text{ } \mu\text{Pa}$). Equal to $20 \log_{10} (p / p_{ref})$ and expressed in decibels.

Table A2: Definitions of Acoustic Terminology and Parameters	
Wording	Description
Specific sound level	The equivalent continuous A-weighted sound pressure level at a specified position due to the specific sound source (the sound source being assessed).
Third-octave band	A higher-resolution frequency band used in acoustical measurements. A third-octave band is equal to one of three logarithmically equal parts of the corresponding octave frequency band. The upper band edge frequency is equal to the lower band-edge frequency multiplied by $2^{1/3}$.

Appendix B – Guidance and Standards

British Standard 4142:2014 +A1:2019 Method for Rating and Assessing Industrial and Commercial Sound

BS4142 describes the method for assessing whether noise sources of an industrial, commercial or fixed nature are likely to cause adverse impact for people residing in the area.

New developments can often incorporate plant and processes that have the potential to generate noise, especially if operated at night-time when background noise levels are at their lowest.

BS 4142 sets out a method to assess whether noise from factories, industrial premises or fixed installations and sources of an industrial nature in commercial premises are likely to cause adverse impact at noise-sensitive receptors in the vicinity.

The procedure contained in BS 4142 for assessing the impact is to compare the measured or predicted noise level from the source in question, the $L_{Aeq,T}$ 'specific noise level', immediately outside the dwelling with the $L_{A90,T}$ background noise level.

Where the noise contains a tonality, impulsivity, intermittency and other sound characteristics, then a correction depending on the grade of the aforementioned characteristics of the sound is added to the specific noise level to obtain the $L_{Ar,Tr}$ 'rating noise level'. A correction to include the consideration of a level of uncertainty in noise measurements, data and calculations can also be applied when necessary.

BS 4142 states: *"The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs". An estimation of the impact of the specific noise can be obtained by the difference of the rating noise level and the background noise level and considering the following:*

Typically, the greater this difference, the greater the magnitude of the impact.

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

A difference of around +5dB 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 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."

For the daytime, the Assessment is carried out over a reference time period of one hour, but at night-time it is carried out over a 15 minute period. The periods associated with day or night, for the purposes of the Standard, are considered to be 07.00 to 23.00 and 23.00 to 07.00, respectively.

Based on the operational nature of the proposed development, both night-time and daytime periods have been considered.

British Standard 8233:2014

BS 8233:2014 draws on the results of research and experience to provide information on achieving internal acoustic environments appropriate to their functions. The guideline values provided are in terms of an average (L_{Aeq}) level.

The standard advises that, for steady external noise sources, it is desirable for internal ambient noise levels to not exceed the existing guidelines issued by the WHO, as detailed in Table B1 below.

Table B1: BS8233:2014 Indoor Ambient Noise Levels			
Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living Room	35 dB $L_{Aeq,16hours}$	-
Dining	Dining Room	40 dB $L_{Aeq,16hours}$	-
Sleeping	Bedroom	35 dB $L_{Aeq,16hours}$	30 dB $L_{Aeq,8hours}$

BS 8233:2014 goes on to suggest ‘where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved’.

In respect of external noise levels, the guidance in BS 8233:2014 suggests that “*it is desirable that the external noise level does not exceed 50dB $L_{Aeq,T}$, with an upper guideline value of 55dB $L_{Aeq,T}$ which would be acceptable in noisier environments*”. The standard also suggests that “*if partially open windows were relied upon for background ventilation, the insulation would be reduced to approximately 15 dB*’.

The guidance contained within BS 8233 is almost identical to that presented in the WHO guidelines. With respect to internal noise levels with windows open, the WHO guidelines state “...that the noise reduction from outside to inside with the window partly open is 15dB”.

Appendix C – Full Sound Measurements Results

Measurement Results

Tables present the measurement results obtained during the survey at the unattended measurement positions.

Table C1: Summary of Measured Noise Levels at MP1, Farm Field to South				
Survey Date	Period (T)	Equivalent continuous SPL L _{Aeq,T} (dB)	Typical maximum SPL L _{AFMax,15min} (dB)	Typical background sound level L _{A90,T} (dB)
02/05/2023	Daytime (12:00 – 23:00)	45	68	35
	Night-time (23:00 – 07:00)	47	70	28
03/05/2023 <i>Evening affected by wind</i>	Daytime (07:00 – 23:00)	46	71	37
	Night-time (23:00 – 07:00)	47	69	31
04/05/2023	Daytime (07:00 – 23:00)	54	71	39
	Night-time (23:00 – 07:00)	47	69	29
05/05/2023 <i>Evening affected by wind</i>	Daytime (07:00 – 23:00)	46	73	38
	Night-time (23:00 – 07:00)	46	72	28
06/05/2023 <i>Affected by Rain</i>	Daytime (07:00 – 23:00)	46	70	36
	Night-time (23:00 – 07:00)	44	64	26
07/05/2023	Daytime (07:00 – 23:00)	51	73	37
	Night-time (23:00 – 07:00)	45	68	28
08/05/2023 <i>Evening affected by Rain</i>	Daytime (07:00 – 23:00)	47	70	36
	Night-time (23:00 – 07:00)	45	67	26
09/05/2023	Daytime (07:00 – 12:00)	51	72	38
Full Survey Period	Daytime (07:00 – 23:00)	50	72	36
	Night-time (23:00 – 07:00)	45	68	28
<i>Typical Maximum SPL is the 90th percentile (i.e. exceeded only 10 of the time)</i> <i>Typical background noise level is the modal value in each time period. For the full survey duration, the analysis presented in figures below have been used to choose the typical background for the assessment.</i>				

Rain was recorded during the following periods, and the measured data removed in the period summary results: 06/05/2023 05:00 – 17:00 and 08/05/2023 17:00 – 00:00. High wind was recorded during the following periods, and the measured data removed in the summary results: 03/05/2023 16:00 – 19:00 and 05/05/2023 16:00 – 19:00.

Table C2: Summary of Measured Noise Levels at MP2 – Ex-MOD Site to East				
Survey Date	Period (T)	Equivalent continuous SPL L _{Aeq,T} (dB)	Typical maximum SPL L _{AFMax,15min} (dB)	Typical background sound level L _{A90,T} (dB)
02/05/2023	Daytime (12:00 – 23:00)	59	81	41
	Night-time (23:00 – 07:00)	58	80	26
03/05/2023 <i>Evening affected by wind</i>	Daytime (07:00 – 23:00)	60	84	41
	Night-time (23:00 – 07:00)	58	79	30
04/05/2023	Daytime (07:00 – 23:00)	60	83	41
	Night-time (23:00 – 07:00)	58	77	26
05/05/2023 <i>Evening affected by wind</i>	Daytime (07:00 – 23:00)	60	85	31
	Night-time (23:00 – 07:00)	57	82	25
06/05/2023 <i>Affected by Rain</i>	Daytime (07:00 – 23:00)	59	80	41
	Night-time (23:00 – 07:00)	56	80	27
07/05/2023	Daytime (07:00 – 23:00)	59	82	39
	Night-time (23:00 – 07:00)	58	78	26
08/05/2023 <i>Evening affected by Rain</i>	Daytime (07:00 – 23:00)	61	87	43
	Night-time (23:00 – 07:00)	57	79	30
09/05/2023	Daytime (07:00 – 12:00)	63	87	44
Full Survey Period	Daytime (07:00 – 23:00)	60	84	41
	Night-time (23:00 – 07:00)	57	79	26
<i>Typical Maximum SPL is the 90th percentile (i.e. exceeded only 10 of the time)</i> <i>Typical background noise level is the modal value in each time period. For the full survey duration, the analysis presented in figures below have been used to choose the typical background for the assessment.</i>				

Rain was recorded during the following periods, and the measured data removed in the period summary results: 06/05/2023 05:00 – 17:00 and 08/05/2023 17:00 – 00:00. High wind was recorded during the following periods, and the measured data removed in the summary results: 03/05/2023 16:00 – 19:00 and 05/05/2023 16:00 – 19:00.

Table C3: Summary of Measured Noise Levels at MP3 – Dwelling to West				
Survey Date	Period (T)	Equivalent continuous SPL L _{Aeq,T} (dB)	Typical maximum SPL L _{AFMax,15min} (dB)	Typical background sound level L _{A90,T} (dB)
02/05/2023	Daytime (12:00 – 23:00)	60	78	42
	Night-time (23:00 – 07:00)	54	77	31
03/05/2023 <i>Evening affected by wind</i>	Daytime (07:00 – 23:00)	61	79	42
	Night-time (23:00 – 07:00)	54	75	32
04/05/2023	Daytime (07:00 – 23:00)	61	77	43
	Night-time (23:00 – 07:00)	55	76	30
05/05/2023 <i>Evening affected by wind</i>	Daytime (07:00 – 23:00)	62	78	35
	Night-time (23:00 – 07:00)	52	75	30
06/05/2023 <i>Affected by Rain</i>	Daytime (07:00 – 23:00)	60	77	44
	Night-time (23:00 – 07:00)	52	75	28
07/05/2023	Daytime (07:00 – 23:00)	60	80	38
	Night-time (23:00 – 07:00)	51	74	31
08/05/2023 <i>Evening affected by Rain</i>	Daytime (07:00 – 23:00)	61	77	48
	Night-time (23:00 – 07:00)	55	75	29
09/05/2023	Daytime (07:00 – 12:00)	64	79	44
Full Survey Period	Daytime (07:00 – 23:00)	60	78	43
	Night-time (23:00 – 07:00)	53	75	31
<i>Typical Maximum SPL is the 90th percentile (i.e. exceeded only 10 of the time)</i> <i>Typical background noise level is the modal value in each time period. For the full survey duration, the analysis presented in figures below have been used to choose the typical background for the assessment.</i>				

Rain was recorded during the following periods, and the measured data removed in the period summary results: 06/05/2023 05:00 – 17:00 and 08/05/2023 17:00 – 00:00. High wind was recorded during the following periods, and the measured data removed in the summary results: 03/05/2023 16:00 – 19:00 and 05/05/2023 16:00 – 19:00.

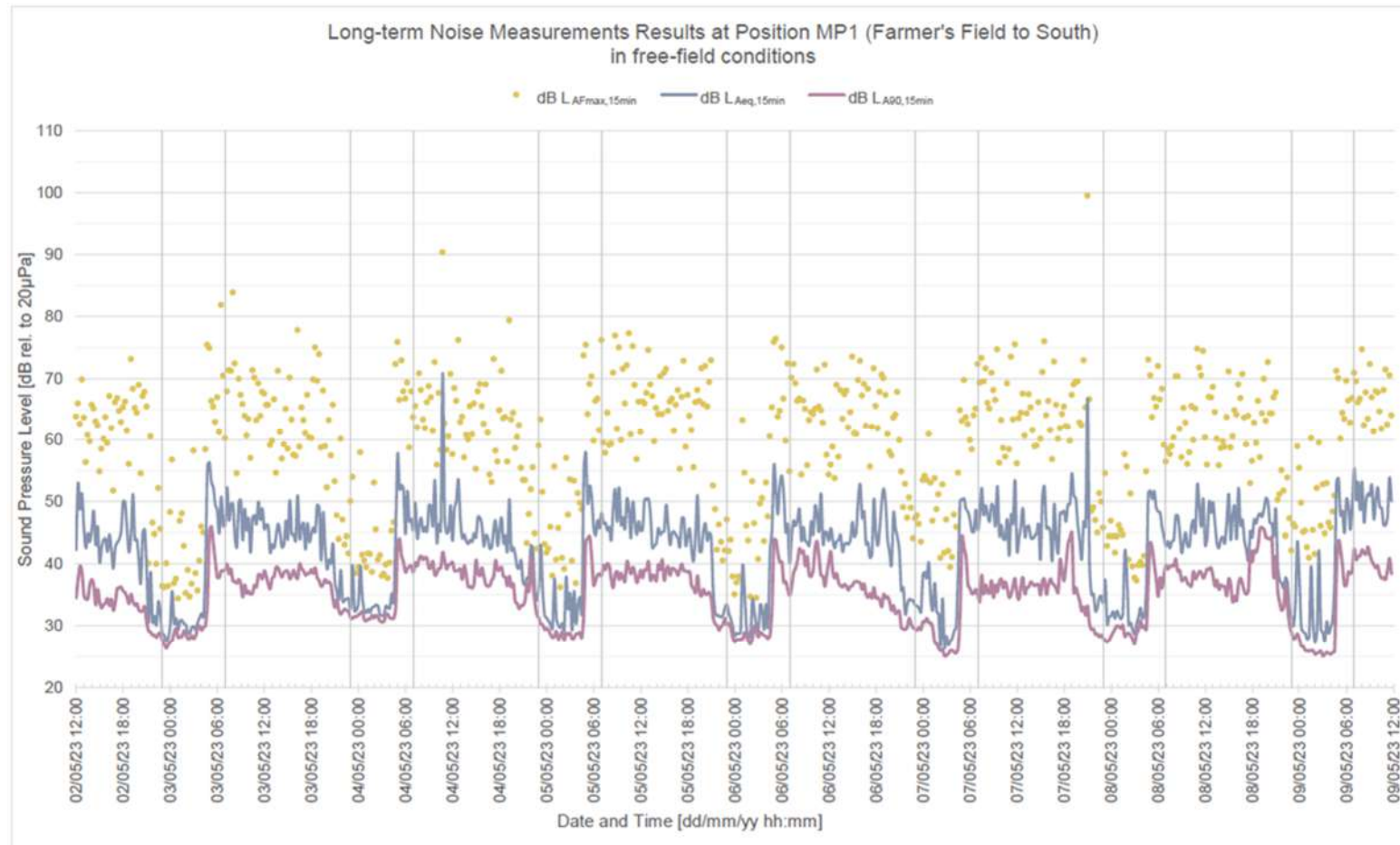


Figure C1: Monitoring Position 1 – Time History Graph

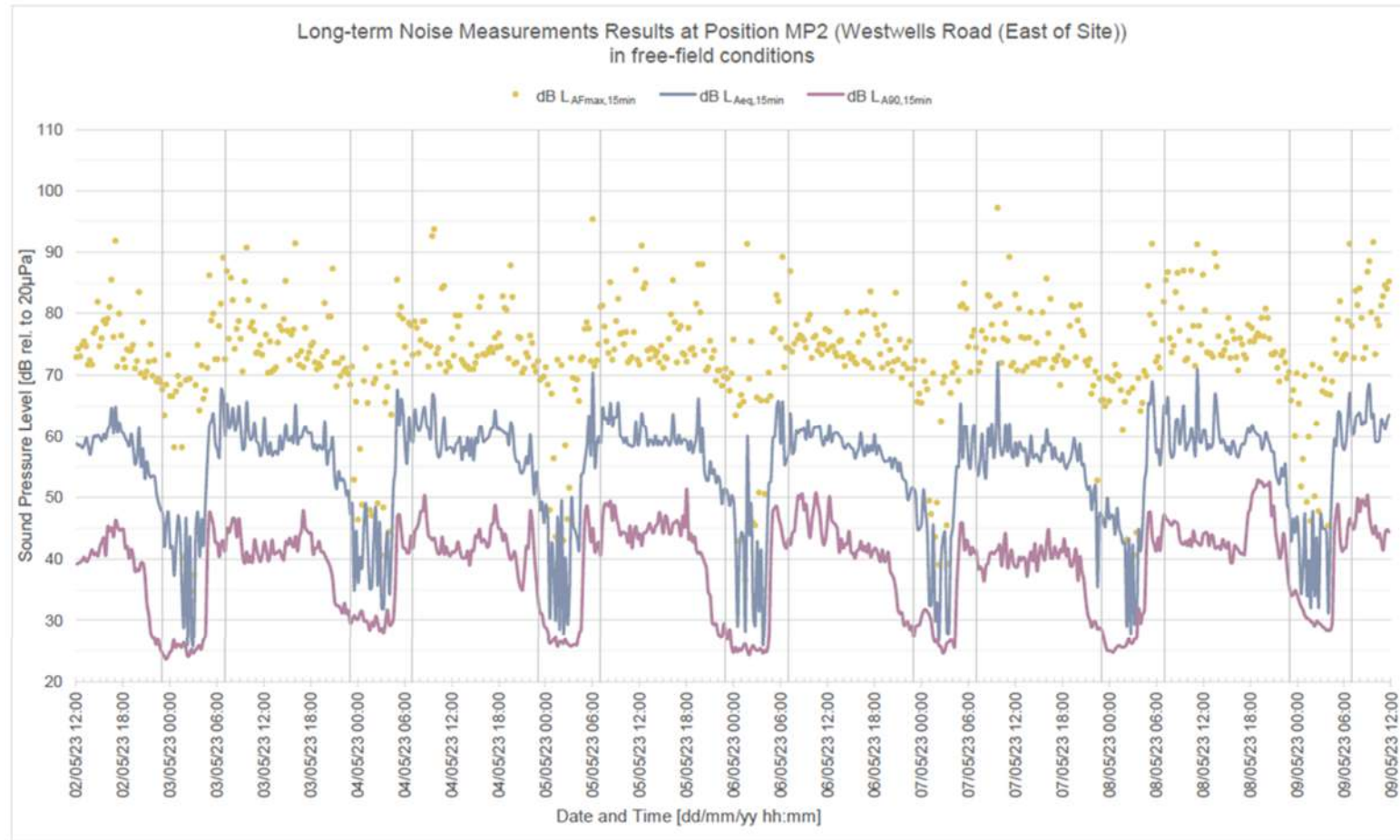


Figure C2: Monitoring Position 2 – Time History Graph

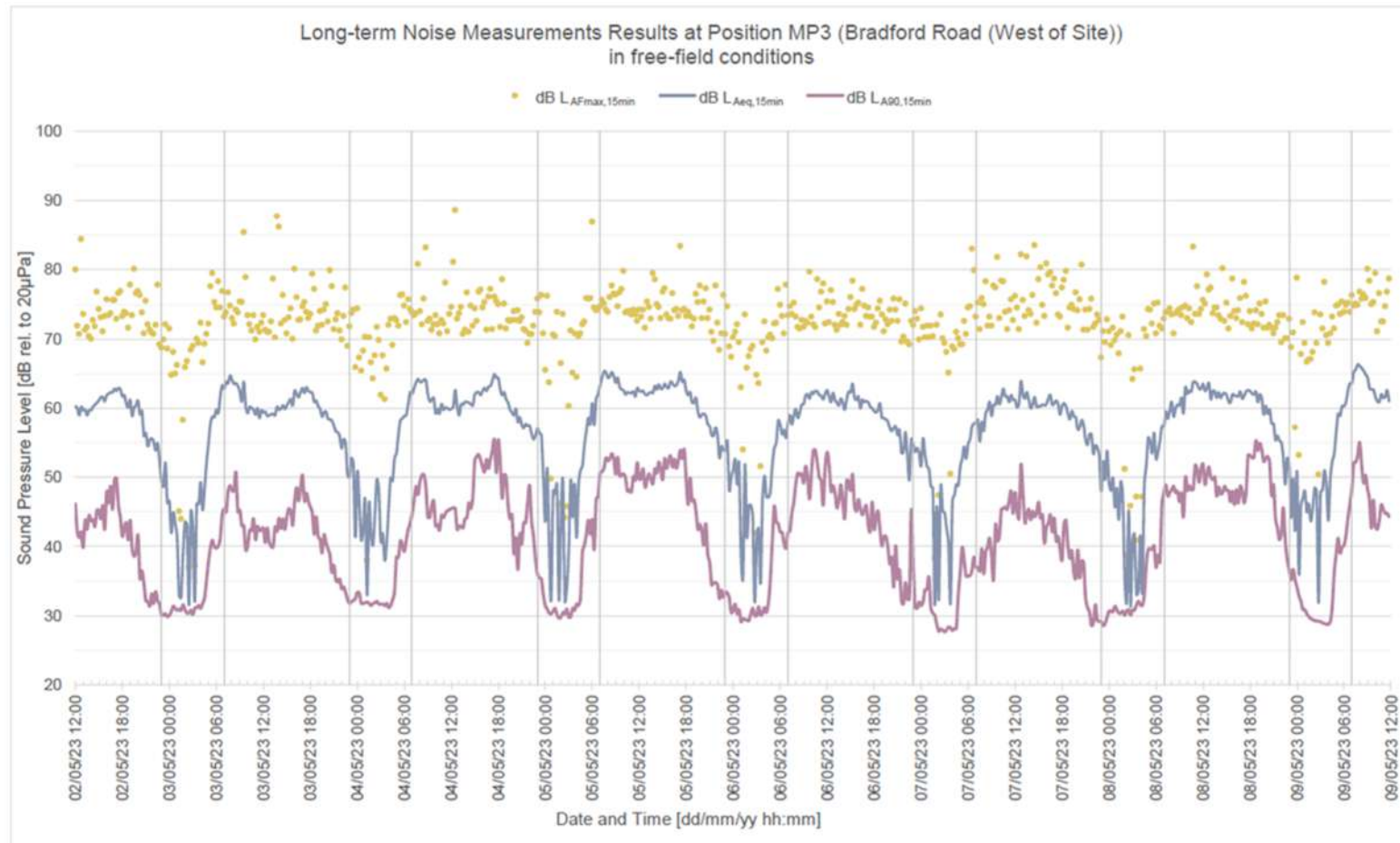


Figure C3: Monitoring Position 3 – Time History Graph

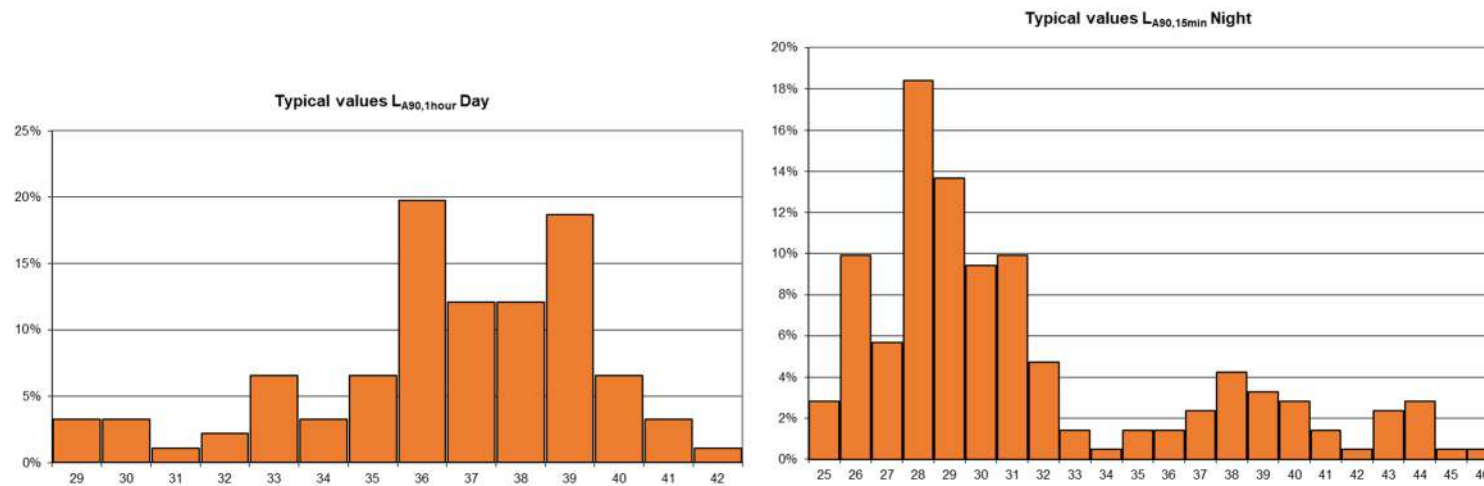


Figure C4: Daytime and Night-time L_{A90} Statistical Analysis –Position 1

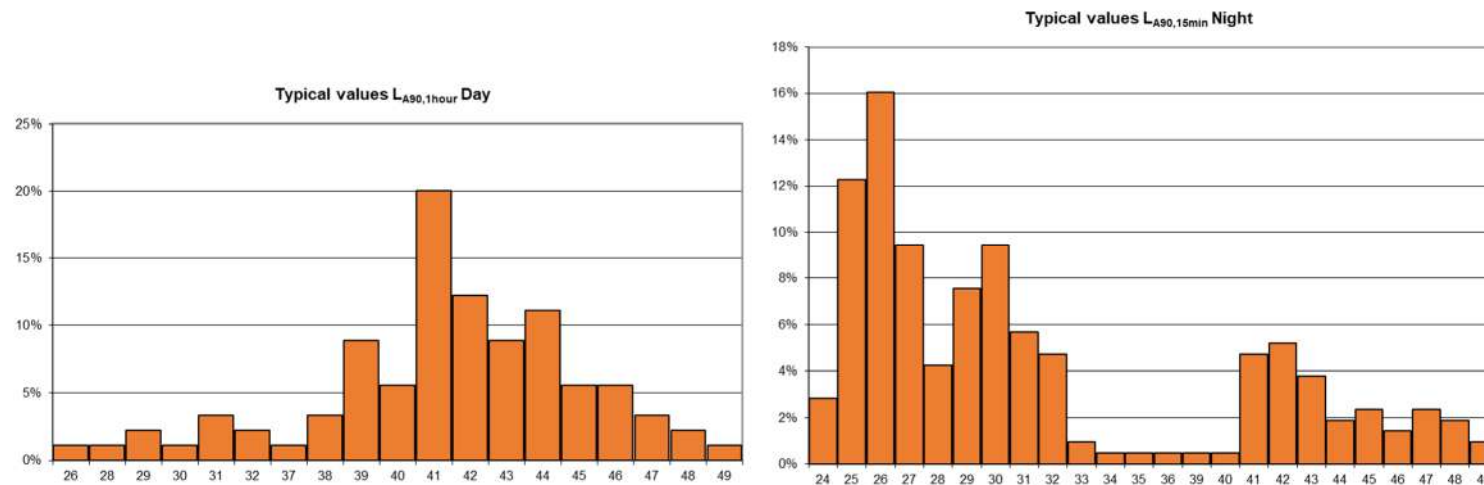


Figure C5: Daytime and Night-time L_{A90} Statistical Analysis –Position 2

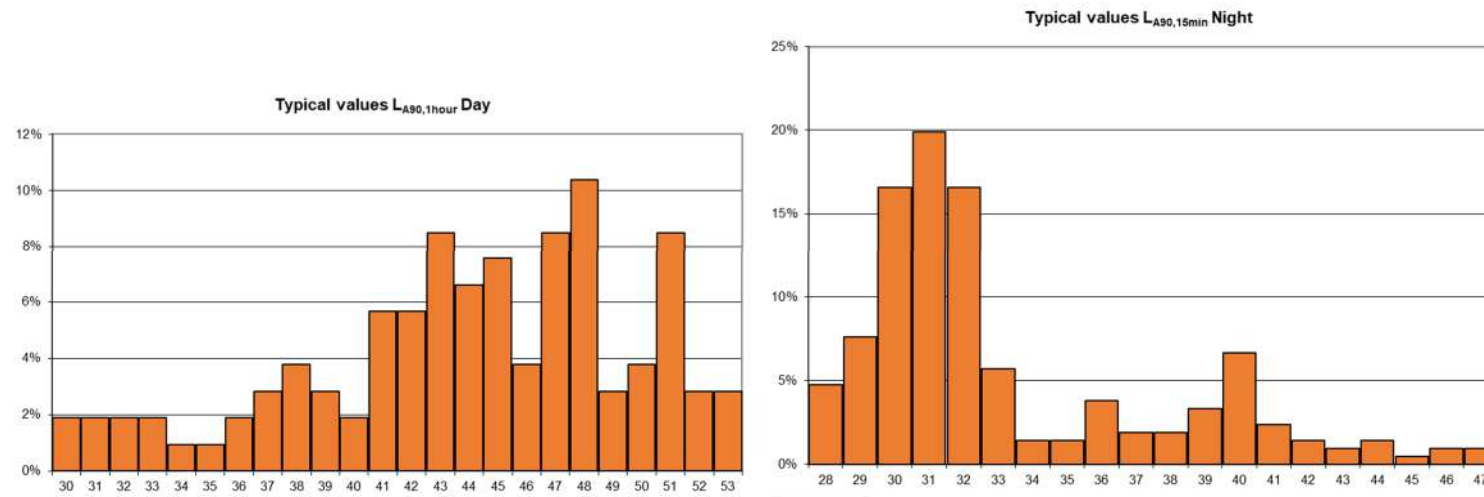


Figure C6: Daytime and Night-time L_{A90} Statistical Analysis –Position 3

Appendix D – Noise Maps

