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**WATERLOW PARK
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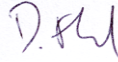
**PLANT NOISE
ASSESSMENT**

30 AUGUST 2024

3028-AF-00001-01

**AMERESCO
WATERLOW PARK CENTRE, LONDON N19 5JF
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REVIEW AND AUTHORISATION			
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Reviewed by Daniel Flood	Position Senior Consultant	Signature 	Date 30/08/2024

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1. INTRODUCTION

- 1.1.1 Ameresco has commissioned AF Acoustics Ltd. to undertake a plant noise assessment for the proposed installation of 2 No. Air Source Heat Pumps (ASHP) to be installed at the Waterlow Park Centre.

1.2 Brief and Scope

- 1.2.1 The brief is to undertake a plant noise assessment for the proposed plant to be installed at the Waterlow Park Centre, to calculate the atmospheric noise emissions at the nearest residential receptors, in accordance with the requirements of Camden Council. If the proposed plant exceeds the local authority criteria, recommendations will be provided such that this can be achieved.

2. SITE DESCRIPTION

2.1 Location

- 2.1.1 Waterlow Park Centre is located in the northeast of Waterlow Park close to Dartmouth Park Hill, within the administrative jurisdiction of Camden Council.
- 2.1.2 The area surrounding the park is predominantly residential in character.
- 2.1.3 The ASHP units are to be located at the rear of the Waterlow Park Centre.
- 2.1.4 The site layout is shown in Figure 2.1.
- 2.1.5 The noise profile at the measurement locations consisted mainly of noise from traffic on the surrounding road network.



FIGURE 2.1: LOCATION MAP

3. GUIDANCE

3.1 British Standard 4142:2014

3.1.1 BS 4142:2014 'Methods for rating and assessing industrial and commercial sound' describes methods for rating and assessing sound from "fixed installations which comprise mechanical and electrical plant and equipment", amongst other sources of noise.

3.1.2 The methodology contained within BS 4142:2014 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.

3.1.3 A summary of the approach set out within BS 4142:2014 is set out below:

- establish the specific sound level of the source(s);
- measure the representative background sound level, typically by measurement close to the receptor location;
- rate the specific sound level to account for any distinguishing characteristics;
- estimate the impact by subtracting the background sound level from the rating level; and
- consider the initial estimate of impact, in the context of the noise and its environment.

3.1.4 An initial estimate of the impact of the specific sound is obtained by subtracting the background sound level from the rating level. Using this approach, BS 4142 states:

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

3.1.5 Certain acoustic features can increase the significance of the impact over that expected from a basic comparison between specific sound level and the background sound level. These features include tonality and impulsivity, as well as additional characteristics and intermittency of the sound.

3.1.6 If appropriate, a subjective assessment of the plant features can be adopted. Where the plant noise contains tonal elements, the following corrections can be made depending on how perceptible the tone is at the noise receptor.

3.1.7 The specific sound level is rated to account for distinguishing characteristics by using the penalties below:

- 0 dB where the tone is not perceptible
- 2 dB where the tone is just perceptible
- 4 dB where the tone is clearly perceptible
- 6 dB where the tone is highly perceptible

3.1.8 Where the plant noise is impulsive, the following corrections can be made depending on how perceptible the impulsivity is at the noise receptor.

- 0 dB where the impulse is not perceptible
- 3 dB where the impulse is just perceptible
- 6 dB where the impulse is clearly perceptible
- 9 dB where the impulse is highly perceptible

3.1.9 For noise which is equally both impulsive and tonal, then both features can be taken into account by linearly summing the corrections for both characteristics.

3.1.10 If the plant has other distinctive characteristics, such as intermittency, then a 3 dB correction can be made.

3.1.11 If a subjective assessment is not appropriate then an objective assessment can be made. A noise source is deemed to be tonal if the time averaged sound pressure level in a one-third octave band exceeds the level in adjacent one-third octave bands by the level differences given below:

- 15 dB in the low frequency one-third octave bands (25 Hz to 125 Hz)
- 8 dB in the mid frequency one-third octave bands (160 Hz to 400 Hz)
- 5 dB in the high frequency one-third octave bands (500 Hz to 10000 Hz)

3.1.12 If an objective assessment identifies the plant noise to be tonal then a 6 dB correction must be made.

3.2 Local Authority Guidance – Camden Council - Policy A4 Noise and vibration

3.2.1 The Camden Local plan seeks to ensure that noise and vibration is controlled and managed. Noise and Vibration thresholds are provided, appended to the local plan documentation. The noise limits relating to industrial and commercial noise sources are reproduced below in Table 3.1.

3.2.2 The local plan states that planning permission will not be granted for A) development likely to generate unacceptable noise and vibration impacts or B) development sensitive to noise in locations which experience high levels of noise, unless appropriate attenuation measures can be provided and will not harm the continued operation of existing uses.

3.2.3 It is also stated that Camden will only grant permission for noise generating development, including any plant and machinery, if it can be operated without causing harm to amenity.

Existing Noise sensitive receptor	Assessment Location	Design Period	LOAEL (Green)	LOAEL to SOAEL (Amber)	SOAL (Red)
Dwellings	Garden used for main amenity (free field) and Outside living or dining or bedroom window (façade)	Day	'Rating level' 10dB below background	Rating level' between 9dB below and 5dB above background	'Rating level' greater than 5dB above background
Dwellings	Outside bedroom window (façade)	Night	Rating level' 10dB below background and no events exceeding 57 dB L_{Amax}	'Rating level' between 9dB below and 5dB above background or noise events between 57 dB and 88dB L_{Amax}	'Rating level' greater than 5dB above background and/or events exceeding 88 dB L_{Amax}

TABLE 3.1: CAMDEN LOCAL PLAN INDUSTRIAL AND COMMERCIAL NOISE THRESHOLDS

4. NOISE SURVEY AND MEASUREMENTS

4.1 Unattended Noise Survey

- 4.1.1 An unattended noise survey was undertaken by Adrian Finn of AF Acoustics. The duration of the survey was between 10:30 on Tuesday 13 August to 10:30 on Wednesday 14 August 2024.
- 4.1.2 The sound level meter was located at the rear of the Waterlow Park Centre. The sound level meter was mounted on a tripod at a height of 1.5m above ground level.
- 4.1.3 The measurement and plant locations are shown below in Figure 4.1.
- 4.1.4 Measurements were carried out in accordance with the requirements of BS 7445-2:1991 and ISO 1996-2:1987.
- 4.1.5 The sound level meter was calibrated both prior to and on completion of the survey, with no calibration drift observed. The microphones were fitted with windshields.



FIGURE 4.1: MEASUREMENT LOCATION

- 4.1.6 The equipment used is shown in Table 4.1.

Name	Serial Number	Last Calibrated
NTI Audio XL2-TA Class 1 Sound Level Meter	A2A-17402-E0	March 2024
NTI Audio MA220 Pre-amplifier	8850	March 2024
NTI Audio MC230A Microphone	A18347	March 2024
Larson Davis Calibrator	18295	January 2024

TABLE 4.1: MEASUREMENT EQUIPMENT

4.2 Measurement Weather Conditions

4.2.1 The weather during the measurements was mainly dry and clear. The temperature ranged from 14 to 22°C. Average wind speeds remained below 3 ms⁻¹. The weather is deemed to have caused no significant effect during the measurement period.

4.3 Results

4.3.1 The results of the continuous noise monitoring survey are presented in graphical form in Figure A1 of Appendix A and summarised in Table 4.2.

4.3.2 The period averaged L_{Aeq} noise levels are presented below. The L_{A90} background noise level has been derived considering the most commonly occurring 15 minute period, whilst the $L_{Amax,F}$ is the maximum noise level measured.

Time period	Measured Noise Levels (dB re 2.0 x 10 ⁻⁵ Pa)		
	$L_{Amax,F}$	$L_{Aeq,T}$	Typical $L_{A90,T}$
Daytime (07:00 – 23:00)	72	47	42
Nighttime (23:00 – 07:00)	70	41	27

TABLE 4.2: SUMMARY OF UNATTENDED NOISE MEASUREMENTS

5. PLANT NOISE ASSESSMENT

5.1 Noise Rating Limit

5.1.1 The table below presents the maximum noise rating level which must not be exceeded at the noise sensitive receptor.

Location	Measurement Period	Assessed Background Noise Level dB L_{A90}	Noise Rating Level Design Criteria	Plant Noise Rating Level Limit dB $L_{Ar,Tr}$
Residential bedroom windows of St Joseph's	24 hour	27	-10dB below the typical background noise level – at night	17

TABLE 5.1: TARGET BACKGROUND NOISE LEVEL

5.2 Plant Noise Levels

5.2.1 It is proposed to install one Daikin 2MXM40A2V1B9 ASHPs adjacent to the depot (Plant installation 1) and one Daikin RXYSCQ-5TV1 (Plant installation 2) near the Lux Building. The manufacturer's noise levels are stated below in Table 5.2.

Name	Plant	Parameter	Sound Level at Octave band Centre Frequency, dB							
			63	125	250	500	1000	2000	4000	8000
Plant installation 1	Daikin 2MXM40A2V1B9	L_p at 1m	53	53	49	47	43	37	33	27
Plant installation 2	Daikin RXYSCQ-5TV1	L_p at 1m	51	53	52	53	47	41	34	27

TABLE 5.2: PLANT NOISE LEVELS

5.3 Location of Nearest Sensitive Receptors

Receptor 1 – Residential bedroom windows of St Joseph's

The closest residential bedroom windows with the potential to be affected by noise from the plant installation, have been identified as belonging to St Joseph's, which is marked out in Figure 4.1. These are located at an approximate distance of 51m and 61m from plant locations 1 and 2 respectively. Both items of plant do not have a line of sight of the residential bedroom windows and a conservative path length difference of 20cm has been factored into the calculations.

5.4 Calculated Noise Levels

5.4.1 Table 5.3 provides a summary of the calculated plant noise levels at the nearest noise sensitive receptors. The calculation sheets are presented in Appendix B.

Location	Assessment Period	Target Plant Noise Rating Level dB $L_{Ar,Tr}$	Calculated Plant Noise Rating Level dB $L_{Ar,Tr}$
Residential bedroom windows of St Joseph's	24 hour	17	4

TABLE 5.3: PREDICTED NOISE LEVEL AT THE NEAREST RESIDENTIAL RECEPTOR

- 5.4.2 No correction factors have been added in accordance with BS4142:2014. There are no tones or other acoustic characteristics present from the proposed plant.
- 5.4.3 The results of the analysis indicate that the plant installation meets the proposed plant criteria. As per the semantics of BS4142:2014, the assessment indicates little likelihood of adverse impact.
- 5.4.4 The adoption of the above mitigation proposals is expected to see the plant noise levels achieve the requirements of Camden Council at the closest residential receptor, and should therefore be considered acceptable.

6. CONCLUSION

- 6.1.1 Ameresco commissioned AF Acoustics Ltd. to undertake a plant noise assessment for the proposed installation of 2 No. Air Source Heat Pumps (ASHP) are to be installed at the Waterlow Park Centre.
- 6.1.2 A noise survey was undertaken at the rear of Waterlow Park Centre in August 2024. The measurement position is considered representative of the noise levels affecting the nearest noise sensitive receptor. The representative noise levels measured at this location have been used to establish the prevailing environmental noise climate.
- 6.1.3 Plant noise emission criteria have been set at the nearest receptor based on the results of the noise survey and in conjunction with the national and local guidance.
- 6.1.4 Noise calculations based on the plant data have been undertaken to the nearest noise sensitive receptors.
- 6.1.5 The results of the assessment have been used to assess the impact of noise from the proposed plant at the nearest noise-sensitive receptors.
- 6.1.6 The assessment indicates that the atmospheric noise emissions from the proposed plant installation can achieve the requirements of the Camden London Borough Council and should therefore be considered acceptable.

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APPENDIX A: FIGURES

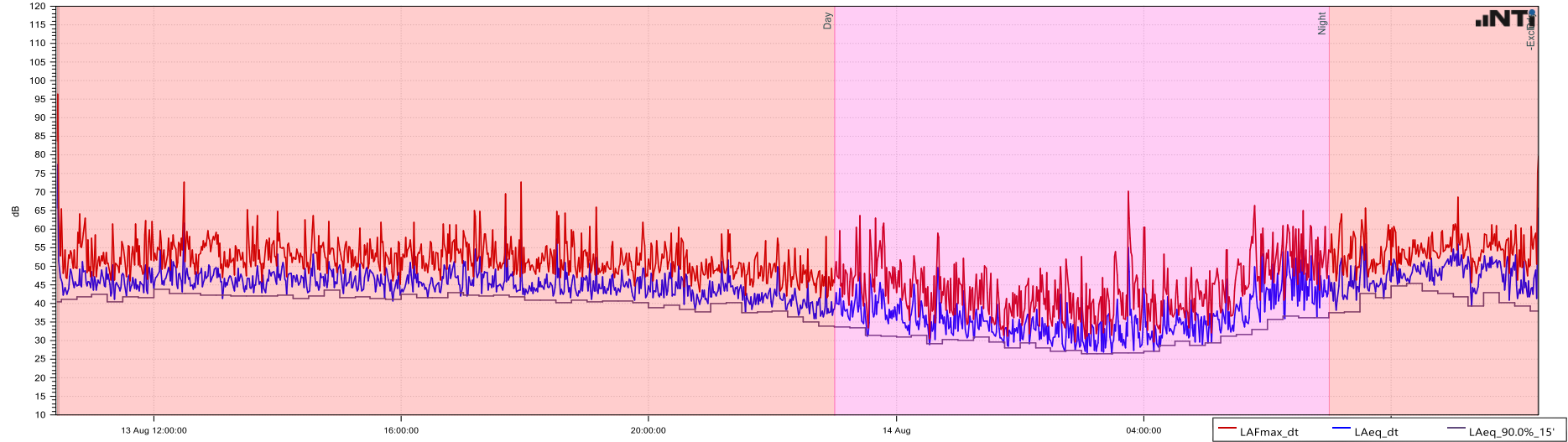


FIGURE A1: NOISE MEASUREMENT RESULTS – WATERLOW PARK CENTRE

APPENDIX B: TABLES



Job No.	Job Title				
3028	Waterlow Park Centre				
Date Created	By	Date Revised	Rev	Sheet	
30 Aug 2024	AF	30 Aug 2024	10	3	
Date Reviewed	By	Review Type	Review Status		
30 Aug 2024	AF	Self Check	No Comments		

Plant claculation to St Joseph's

Item / Description		Rating/Broadband/Input			Octave Band Centre Frequency, Hz								
		Rating	dB	dB(A)	31.5	63	125	250	500	1k	2k	4k	8k
Daikin 2MXM40A2V1B9	Depot Lp												
Ratio of Distances - Point Source		1.0 m	51.0 m		-34.2	-34.2	-34.2	-34.2	-34.2	-34.2	-34.2	-34.2	-34.2
Path length difference	20cm				-7.7	-9.4	-11.8	-14.7	-17.6	-20.6	-23.6	-26.7	
‡ Sum				0 (A)		11.2	10.4	3.0	-1.8	-8.8	-17.8	-24.8	-33.8
‡													
Daikin RXYSCQ-5TV1	lux building Lp												
Ratio of Distances - Point Source		1.0 m	62.0 m		-35.8	-35.8	-35.8	-35.8	-35.8	-35.8	-35.8	-35.8	-35.8
Path length difference	20cm				-7.7	-9.4	-11.8	-14.7	-17.6	-20.6	-23.6	-26.7	
Sum				2 (A)		7.5	7.7	4.3	2.5	-6.5	-15.5	-25.5	-35.5
= Logarithmic Sum				4 (A)		12.7	12.3	6.7	3.9	-4.5	-13.5	-22.1	-31.6

TABLE B1: CALCULATIONS TO THE NEAREST RESIDENTIAL RECEPTOR

APPENDIX C: TERMINOLOGY RELATING TO NOISE

Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level	The sound level is the sound pressure relative to a standard reference pressure of $20\mu\text{Pa}$ (20×10^{-6} Pascals) on a decibel scale.
Sound Power Level (L_w)	is the total amount of sound energy inherent in a particular sound source, independent of its environment. It is a logarithmic measure of the sound power in comparison to a specified reference level (usually 10^{-12} W).
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s_1 and s_2 is given by $20 \log_{10} (s_1 / s_2)$. The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is $20\mu\text{Pa}$.
A-weighting, dB(A)	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
$L_{Aeq,T}$	Equivalent continuous A-weighted sound pressure level. The value of the A-weighted sound pressure level of a continuous steady sound that, within a measurement time interval T, has the same A-weighted sound energy as the actual time-varying sound
$L_{90,T}$	L_{90} is the noise level exceeded for 90% of the period T (i.e. the quietest 10% of the measurement) and is often used to describe the background noise level.
$L_{max,T}$	A noise level index defined as the maximum noise level during the period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
Specific Noise	The noise source under investigation for assessing the likelihood of complaints.
Rating Level	The specific noise level plus any adjustment for the characteristic features of the noise.
Free field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m.
Façade	At a distance of 1m in front of a large sound reflecting object such as a building façade.

APPENDIX D: LIMITATIONS TO THE REPORT

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