



Purbrook Park School

Air Handling Unit Noise Assessment

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15188

Report R03

Client: W Stirland Ltd

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Introduction

dBx Acoustics Ltd was commissioned by W Stirland to review the proposed externally-mounted building services plant for the new classroom block extension Purbrook Park School, Waterloooville.

In order to fully review the proposals, the following steps have been undertaken;

- Derivation of sound pressure level of noise from all combined plant equipment at nearest noise sensitive receptors
- Review of Local Authority requirements with regard to noise control
- Derivation of noise emission criteria for the plant with reference to the 2014 noise survey at the site.
- BS4142 assessment.

The nearest noise sensitive receptors referred to above are two residential dwellings, identified in Figure 1 on page 3 of this report.

dBx Acoustics Ltd has made every effort to assess all information provided during the course of this investigation; however, no guarantees or warranties can be made as to the accuracy or validity of information provided by third parties.

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A glossary of acoustic terminology is presented in Appendix A.

Overview of Proposed Plant

The proposed plant equipment will consist of 3 roof-mounted air handling units, and a 4th ground level AHU, all serving the kitchen, dining hall and food technology classrooms inside the school.

Below is figure showing the locations of the proposed plant:

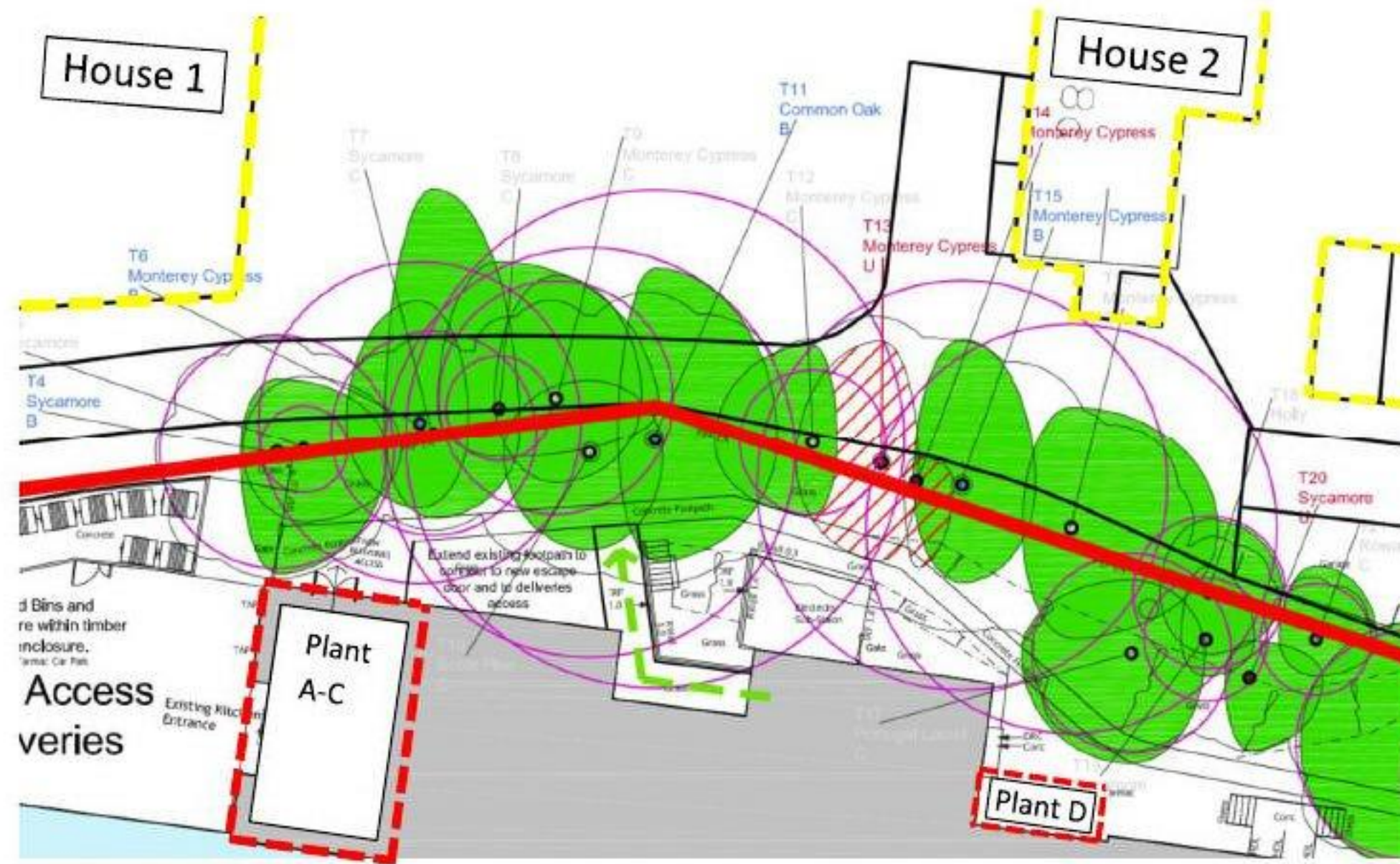


Figure 1: Location of Plant

Assessment Criteria

BS 4142:2014 Methods for Rating and Assessing Industrial and Commercial Sound

This standard provides a methodology for rating and assessing sound of an industrial or commercial nature, including sound from industrial and manufacturing processes, fixed plant installations, loading and unloading of goods, and sound from mobile plant.

The standard can be used both to assess sound from proposed new industrial and commercial sources, and sound from these sources affecting proposed new dwellings, as well as to investigate complaints. It does not, however, determine whether noise amounts to a nuisance.

The standard leads to derivation of a 'rating level' for the industrial sound which is weighted for acoustically significant characteristics including tonality, impulsivity and intermittency. This is compared against the background noise level in the absence of the specific noise (the noise source arising from the industrial/commercial use), the difference between the two being used to give an indication of impact.

Typically, the greater the difference, 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 noise source will have an adverse impact or 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.

It should be noted that not all adverse impacts will lead to complaints, and not every complaint is proof of an adverse impact.

The planning noise survey (refer to report dated 10 September 2014) identified a measured background noise level (L_{A90}) at the site boundary adjacent to the closest noise sensitive receptors (see Figure 1 above) of 34 dB $L_{A90,1\text{hour}}$ during the daytime period. Noise at this location was affected by existing plant at the School as well as activity from the existing kitchen and the school buildings. This location is considered representative of the residential receptors.

Given the context of this site as an existing school with plant operational, some of which may be removed as part of the works, it is considered appropriate for this scheme to design the new plant such that the BS 4142 rating sound level does not exceed the measured daytime background sound level at the residential receptors. Therefore the rating noise level should not exceed 34 dB L_{Aeq} in any 1-hour period during the daytime.

Local Authority Requirements

In granting planning permission reference APP/15/00576, Havant Borough Council stipulate (Condition 2) that:

'No externally visible or audible plant, equipment, machinery or structures required for ventilation or filtration purposes shall be installed at the premises until and unless details of the external appearance and acoustic performance of the same have been submitted to and approved in writing by the Local Planning Authority.'

Predicted Plant Noise Emission Levels

Manufacturers' Data

The table below shows the Manufacturers' quoted octave band sound power for the atmospheric air inlet and exhaust

		Octave Band Centre Frequency, Hz							
		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
Plant A (Swegon ProUnit)	Inlet	75	72	69	59	50	48	43	44
	Exhaust	85	81	78	78	79	77	73	70
Plant B (Nuaire ESBHS-E Fresh Air Intake and Heater)	Exhaust	94	89	83	82	75	71	66	62
Plant C (Nuaire)	Exhaust	82	85	83	83	75	76	76	62
Plant D (Swegon)	Inlet	77	74	67	66	55	53	47	46
	Exhaust	84	80	77	77	78	76	72	69

Table 1: Fan Sound Power Levels, dB re 10⁻¹² W

The information on the proposed attenuation (to be supplied by Allaway Acoustics) does not include the proposed installed insertion loss of the attenuators. Based on the information available from Allaway, we have assumed the following minimum installed insertion loss for each attenuator.

	Octave Band Centre Frequency, Hz							
	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
Installed Insertion Loss, dB	4	9	11	14	22	23	22	16

Table 2: Assumed Installed Attenuator Insertion Loss

Allaway Acoustics will be required to confirm that these minimum performances are achieved.

Methodology

From these sound power levels the total sound pressure level at the two nearest residential dwellings is calculated with corrections for:

- Duct losses*
- Bend losses*
- End correction*
- Grille Directivity/Angle from source
- Distance attenuation
- Attenuator insertion loss

*Related to dimensions of duct work

The table below shows the predicted sound pressure level at each residential receptor with these attenuators in place:

Residence	Predicted Sound Pressure Level (L _p)
House 1	33dB
House 2	34dB

Table 3: Predicted Sound Pressure with Installed Insertion Loss

BS 4142 Assessment

The following tables present a BS 4142 assessment for noise impact at each of the two residential receptors.

Results		Relevant Clause	Commentary
Background sound level	L _{A90} 34 dBA	8.3	Measured background sound level
Predicted sound pressure level	33 dBA	7.3.3	Predicted level at façade of Receptor 1 with plant in operation.
Assessment made during the daytime period so reference period is 1h		7.2	
Acoustic feature correction	+0 dB	9.2	No acoustic features are anticipated. The noise is not atypical for the site.
Rating level	33 dB	9.2	
Background sound level	34 dB L _{Aeq,30min}	8	
Excess of rating over background sound level	-1dB	11	
The assessment indicates that the rating level does not exceed the background noise level and therefore no significant impact is expected		11	
Uncertainty of the measurement	Not significant	10	The uncertainty of the measurement is unlikely to affect the outcome of the assessment

Table 4: BS 4142 Assessment - Receptor 1

Results		Relevant Clause	Commentary
Background sound level	L _{A90} 34 dBA	8.3	Measured background sound level
Predicted sound pressure level	34dBA	7.3.3	Predicted level at façade of residence with plant in operation.
Assessment made during the daytime period so reference period is 1h		7.2	
Acoustic feature correction	+0 dB	9.2	No acoustic features are anticipated. The noise is not atypical for the site.
Rating level	34 dB	9.2	
Background sound level	34 dB L _{Aeq,30min}	8	
Excess of rating over background sound level	0 dB	11	
The assessment indicates that the rating level does not exceed the background noise level and therefore no significant impact is expected		11	
Uncertainty of the measurement	Not significant	10	The uncertainty of the measurement is unlikely to affect the outcome of the assessment

Discussion

Based on the manufacturers' noise data, the plant layout, and the anticipated attenuation, it is demonstrated that the BS 4142 rating level when the proposed plant is in operation will not exceed the existing daytime background noise level. Therefore no significant impact from this plant is anticipated.

Conclusion

dBx Acoustics has been commissioned by W Stirland to carry out a noise impact assessment for proposed external plant equipment for the extension of Purbrook Park School as part of the planning submission to Havant Borough Council.

Based on the manufacturers' noise data, the plant layout, and the anticipated attenuation, it is demonstrated that the BS 4142 rating level when the proposed plant is in operation will not exceed the existing daytime background noise level. Therefore no significant impact from this plant is anticipated.

Appendix A - Glossary of Acoustic Terminology

Decibel, dB	A unit of level derived from the logarithm of the ratio between the value of a quantity and a reference value. For sound pressure level (L_p) the reference quantity is $2 \times 10^{-5} \text{ N/m}^2$. The sound pressure level existing when microphone measured pressure is $2 \times 10^{-5} \text{ N/m}^2$ is 0 dB, the threshold of hearing.
L	Instantaneous value of Sound Pressure Level (L_p) or Sound Power Level (L_w).
Frequency	Number of cycles per second, measured in hertz (Hz), related to sound pitch.
A weighting	Arithmetic corrections applied to values of L_p according to frequency. When logarithmically summed for all frequencies, the resulting single "A weighted value" becomes comparable with other such values from which a comparative loudness judgement can be made, then, without knowledge of frequency content of the source.
$L_{eq,T}$	Equivalent continuous level of sound pressure which, if it actually existed for the integration time period T of the measurement, would possess the same energy as the constantly varying values of L_p actually measured.
$L_{Aeq,T}$	Equivalent continuous level of A weighted sound pressure which, if it actually existed for the integration time period, T, of the measurement would possess the same energy as the constantly varying values of L_p actually measured.
$L_{n,T}$	L_p which was exceeded for n% of time, T.
$L_{An,T}$	Level in dBA which was exceeded for n% of time, T.
$L_{max,T}$	The instantaneous maximum sound pressure level which occurred during time, T.
$L_{Amax,T}$	The instantaneous maximum A weighted sound pressure level which occurred during time, T.