Cole Jarman

Barnes Primary School, Additional Classrooms

External Noise Intrusion

Report 20/0083/R1

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McBains

Beechwood Grove Park
Waltham Road
Maidenhead SL6 3LW

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External Noise Intrusion

1 Introduction

1.1 It is proposed to add additional classrooms and other facilities at Barnes Primary School, by converting the existing two storey Caretaker's House into teaching space.

1.2 The site is affected by noise from aircraft on their descent to land at London Heathrow Airport when operating on westerly conditions.

1.3 Cole Jarman have been instructed to undertake an environmental noise survey at the site and provide acoustic design advice for the scheme.

1.4 This report details the survey methodology and results, as well as preliminary guidance on external noise intrusion.

2 Site Description

2.1 The existing Caretaker's House is located to the northeast side of Cross Street, to the southwest of the adjacent KS2 part of the school site. The site is bounded to the northwest and southeast by residences on Westfields Avenue and Railway Side. The site location is outlined on the plan contained in section 0 of this report.

3 Acoustic Design Requirements

3.1 Internal Ambient Noise Levels

3.1.1 The proposed new school will be required to be fully compliant with Building Bulletin 93[1] (BB93) as it is a means of complying with Building Regulations requirements.

3.1.2 BB93 indicates the minimum required performance standards for teaching spaces within school buildings, in terms of noise ingress and other acoustic parameters. Section 1.1 is related to indoor ambient noise levels (IANLs).

3.1.3 The IANLs should exclude noise contributions from teaching activities within the school premises, including noise from staff, students and equipment within the building or in playgrounds. This is specifically set out in section 1.1.1 of BB93.

3.1.4 The IANL criteria for teaching spaces intended specifically for students with special hearing and communication needs are 30dB $L_{Aeq,30min}$ and 60dB $L_{A01,30min}$. There is some flexibility on these limits depending on ventilation strategy under some circumstances the limits can be relaxed.

[1] Acoustic design of schools: performance standards (February 2015)

3.2 Ventilation Design Requirements (BB93)

3.2.1 Table 2 of BB93 and its accompanying notes set out the following requirements in terms of IANLs for different ventilation methods.

- With normal condition ventilation provided mechanically, either via a fully mechanical or hybrid system, IANLs from the mechanical elements should not exceed those levels set out in BB93 Table 1;
- With normal condition ventilation provided naturally, or using a hybrid system, IANLs from total system noise should not exceed those levels set out in BB93 Table 1 by more than 5dB;
- With summertime[2] and intermittent boost[3] ventilation provided naturally, IANLs should not exceed 55dB $L_{Aeq,30min}$;
- Normal condition for a mechanical supply is typically equivalent to approximately 8l/s per person (additional carbon dioxide concentration requirements apply);
- Normal condition for a natural or hybrid supply is typically equivalent to approximately 5l/s per person (additional carbon dioxide concentration requirements apply);
- The +5dB criteria does not apply to teaching and learning spaces where the Table 1 level is 45dB or greater.

3.2.2 In addition to the above, noise from ventilators, actuators or dampers should not exceed 5dB above the resultant IANLs based on the points set out above.

3.2.3 Discrete noise events, such as aircraft flyovers, should not exceed 60dB $L_{A01,30min}$. As stated within BB93, this is achieved by default for spaces with IANLs up to 40dB $L_{Aeq,30min}$.

[2] Ventilation under local control of teacher to prevent overheating – allowable during the hottest 200 hrs of the year, typically equating to ~40 teaching hours per year. Not applicable to classrooms intended specifically for students with special hearing and communication needs, or to speech therapy rooms

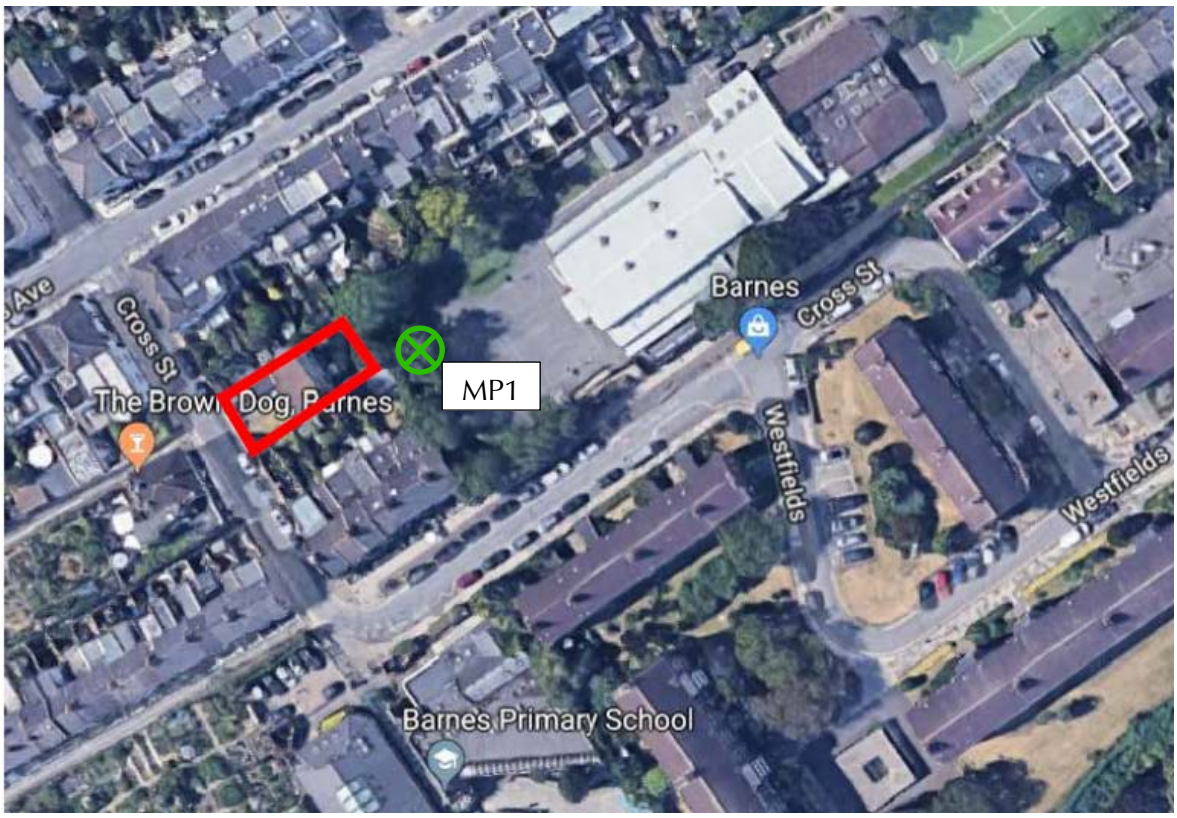
[3] Not applicable to classrooms intended specifically for students with special hearing and communication needs, or to speech therapy rooms

4 External Noise Levels

4.1 Site Noise Survey

4.1.1 An attended noise survey was undertaken at the site on 22nd July 2020.

4.1.2 Noise measurements were taken in the Key Stage 2 playground close to the boundary with the existing Caretakers House, indicated as MP1 on the plan below. The microphone was positioned at 1.5m above local ground in a free-field position.



Site plan indicating measurement position MP1

4.1.3 The most significant noise source affecting the site is aircraft on their final approach to London Heathrow Airport under westerly operations, where planes pass the site at an approximate height of 2,000 ft. Under easterly operations where planes take off towards London, they do not pass over the site, having turned long before, noise levels from aircraft will consequently be significantly lower. Westerly operations typically occur around 70% of the year due to the prevailing wind.

4.1.4 Usually, under westerly operation the airport changes the runway usage at 15:00 hours each day, so that landings take place in a westerly direction on one runway before 15:00 hours and on the other runway after 15:00 hours. The airport also usually switches the usage of the runways each week. This is all done to provide some respite to local residents.

4.1.5 At the time of the site noise survey however, the south runway was closed for repairs while flight volumes were reduced due to the impacts of Covid-19, meaning all flights were landing on the north runway. The site is located between the landing approach flight paths for the north and south runways. In plan it is approximately 450m to the north of the south runway landing approach flight path, and approximately 950m to the south of the north runway landing approach flight path. Additional sample noise measurements were therefore taken at an off-site proxy position on a public footpath near Barn Elms playing fields, approximately 450m from the operating north runway landing approach flight path in plan.

4.1.6 Measurements were made in the L_{Aeq}, L_{AE}, L_{Amax} and L_{A90} indices (see Glossary of Acoustic Terms for an explanation of the noise units used), using the equipment listed in table T1 below:

Item	Manufacturer	Type
Sound Level Analyser	Norsonic	118
Acoustic Calibrator	Norsonic	1251

T1 Equipment used during attended noise survey.

4.1.7 The microphone was fitted with a windshield and calibrated before and after the survey to ensure a consistent and acceptable level of accuracy was maintained throughout. No significant drift was observed.

4.1.8 Weather conditions during the survey period were warm and dry with very light cloud cover and little to no wind.

4.2 Results

4.2.1 The period results of the measurements are tabulated below:

Period	L_{Aeq}	L_{Amax}	L_{A90}
MP1 – on school site ~950m from operating north runway flight path			
1020-1030	49	68	34
1030-1045	51	68	36
1045-1100	46	63	35
1100-1115	50	69	35
MP2 – proxy position ~450m from operating north runway flight path			
1145-1200	55	73	40

T2 Period noise survey results

4.2.2 Noise levels of individual aircraft are tabulated below:

Time	Flight no.	L_{Amax}	L_{AE}
MP1 – on school site ~950m from operating north runway flight path			
1025	BA280	68	74
1028	EI158	62	72
1030	AC854	65	76
1038	BA2771	68	74
1041	A3600	68	74
1044	AZ202	66	75
1057	AI131	63	74
1106	BA393	69	75
MP2 – proxy position ~450m from operating north runway flight path			
1142	BA373	69	75
1153	QR8864	72	80
1156	CA787	73	81
1159	BA309	65	73

T3 Individual aircraft noise survey results

5 External Building Fabric

5.1 Representative Incident Noise Levels

5.1.1 At the time of the site noise survey, London Heathrow Airport was operating at a reduced capacity due to the effects of Covid-19. In addition to the overall reduced capacity, only the north runway was in use at the time of the survey.

5.1.2 Corrections have been applied to account for use of the closer south runway and a typical pre Covid-19 number of aircraft (21 planes in a 30-minute period), to give reasonable worst-case incident noise level of **58dB $L_{Aeq,30min}$**.

5.2 Room Geometry

5.2.1 The external noise intrusion calculations have been based on the room dimensions shown on the McBain's drawing no. LOND01-MCB-XX-ZZ-DR-A-SK03-S4-P1, duplicated in Appendix A.

5.2.2 Two 1.25m x 1.8m external windows are assumed per classroom. Ceiling height is assumed to be 2.7m.

5.3 Ventilation Strategy

5.3.1 As noted in section 3, internal ambient noise level criteria are dependent on ventilation strategy. The relevant criteria for an SEN Classroom are summarised in the table below:

Room	Ventilation Strategy	Upper Limit for Indoor Ambient Noise Level $L_{Aeq,30min}$ dB		
		Mechanical System Noise	Total Noise Level	Summertime Limits, dB(A)
SEN Classrooms	Mechanical	25	30	30
SEN Classrooms	Hybrid	30	35	35
SEN Classrooms	Passive	N/A	35	35

T4 Ventilation strategy and Internal Ambient Noise Levels.

5.3.2 It would be possible to utilise a hybrid or passive ventilation system, subject to ventilation openings achieving a minimum sound attenuation performance of **≥44dB $D_{n,e,w}$** when providing ventilation for normal teaching activities, assuming two openings per classroom.

5.3.3 Where a hybrid system is used, mechanical noise would need to be limited to an operating sound power level of **≤34dB L_w** when providing ventilation for normal teaching activities including during the summertime, assuming two units per classroom.

5.3.4 Where a mechanical system is used, mechanical noise would need to be attenuated in order to generate a room sound pressure level of **≤25dB $L_{Aeq,T}$** when providing ventilation for normal teaching activities including during the summertime.

5.4 External Building Fabric

5.4.1 To control external noise intrusion to within BB93 criteria the various elements of external building fabric will need to be designed to provide certain minimum sound insulation performances.

5.4.2 The external walls and roof will need to achieve a sound insulation performance of **≥47dB R'_w**. This performance would be readily achieved using cavity masonry external walls and a concrete roof. Lightweight façade and roof constructions can be considered subject to review of acoustic performance.

5.4.3 External glazing will need to achieve the sound insulation performances set out in the table below. The internal noise level criteria are dependent on the ventilation strategy, glazing requirements are therefore set out for each.

Room / Ventilation Strategy	Indicative glazing type	Minimum octave band SRI, Octave Band Centre Frequency (Hz) 125	250	500	1k	2k	4k
SEN Classroom Mechanical	10mm glass / 12mm air gap / 6mm glass (R_w37dB)	26	27	34	35	35	35
SEN Classroom Hybrid / Natural	6mm glass / 12mm air gap / 6mm glass (R_w32dB)	20	21	30	35	32	35

T5 Glazing acoustic performance requirements

6 Conclusions

6.1 It is proposed to add additional classrooms and other facilities at Barnes Primary School, by demolishing the existing two storey Caretaker's House and constructing a new block.

6.2 The site is affected by noise from aircraft on their descent to land at London Heathrow Airport when operating on westerly conditions. Cole Jarman have undertaken an environmental noise survey at the site to quantify the effects.

6.3 This report details the survey methodology and results, as well as guidance on external noise intrusion.

End of Section

Glossary of Acoustic Terms

L_{Aeq}:

The notional steady sound level (in dB) which over a stated period of time, would have the same A-weighted acoustic energy as the A-weighted fluctuating noise measurement over that period. Values are sometimes written using the alternative expression dB(A) L_{eq}.

L_{Amax}:

The maximum A-weighted sound pressure level recorded over the period stated. L_{Amax} is sometimes used in assessing environmental noise when occasional loud noises occur, which may have little effect on the L_{Aeq} noise level. Unless described otherwise, L_{Amax} is measured using the "fast" sound level meter response.

L_{A10} & L_{A90}:

If non-steady noise is to be described, it is necessary to know both its level and degree of fluctuation. The L_{An} indices are used for this purpose. The term refers to the A-weighted level (in dB) exceeded for n% of the time specified. L_{A10} is the level exceeded for 10% of the time and as such gives an indication of the upper limit of fluctuating noise. Similarly, L_{A90} gives an indication of the lower levels of fluctuating noise. It is often used to define the background noise.

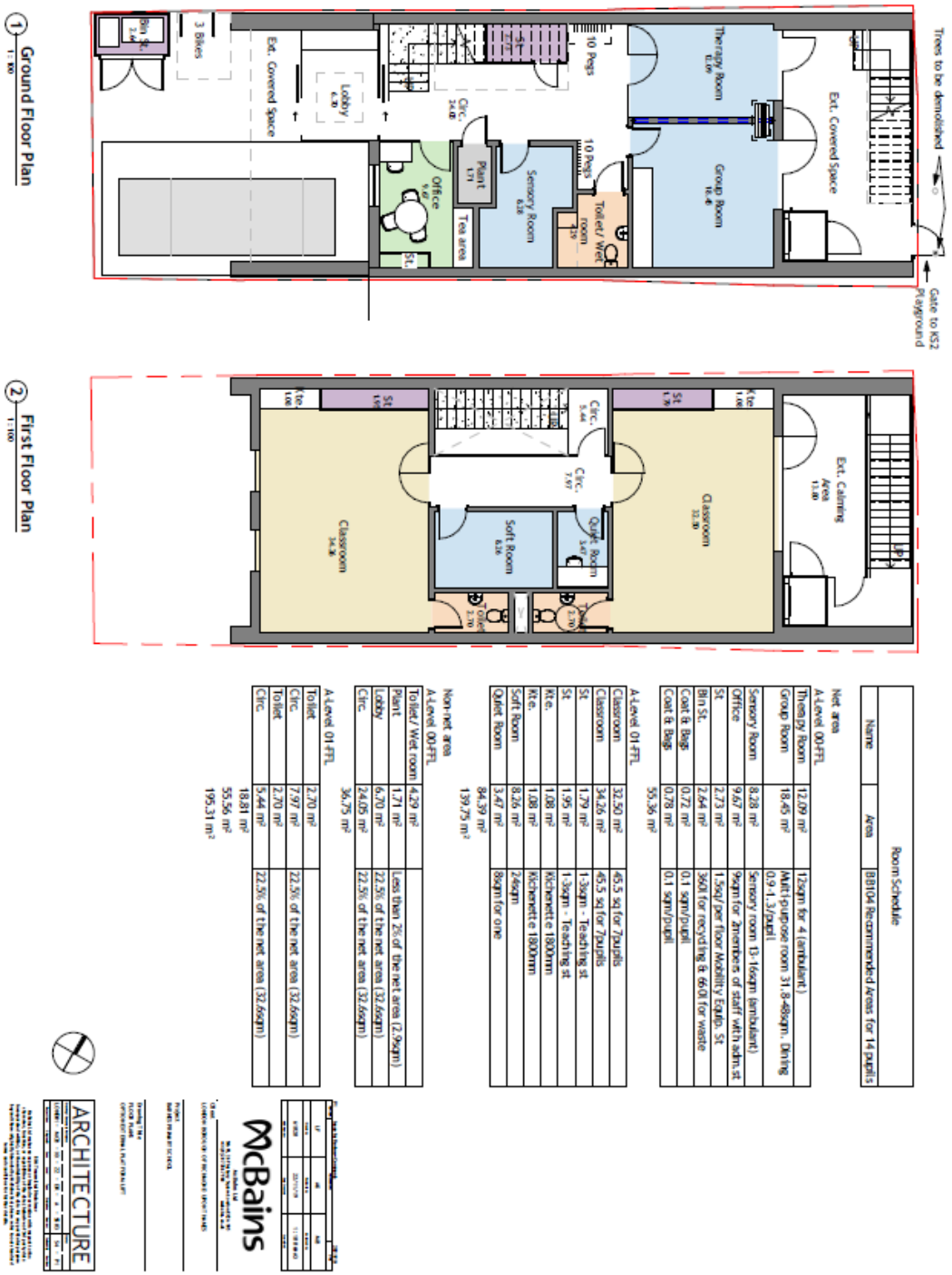
L_{A10} is commonly used to describe traffic noise. Values of dB L_{An} are sometimes written using the alternative expression dB(A) L_n.

L_{AX}, L_{AE} or SEL

The single event noise exposure level which, when maintained for 1 second, contains the same quantity of sound energy as the actual time varying level of one noise event. L_{AX} values for contributing noise sources can be considered as individual building blocks in the construction of a calculated value of L_{Aeq} for the total noise. The L_{AX} term can sometimes be referred to as Exposure Level (L_{AE}) or Single Event Level (SEL).

End of Section

Appendix A



End of Section

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