South West Hertfordshire Secondary Schools
Site A

Noise Review

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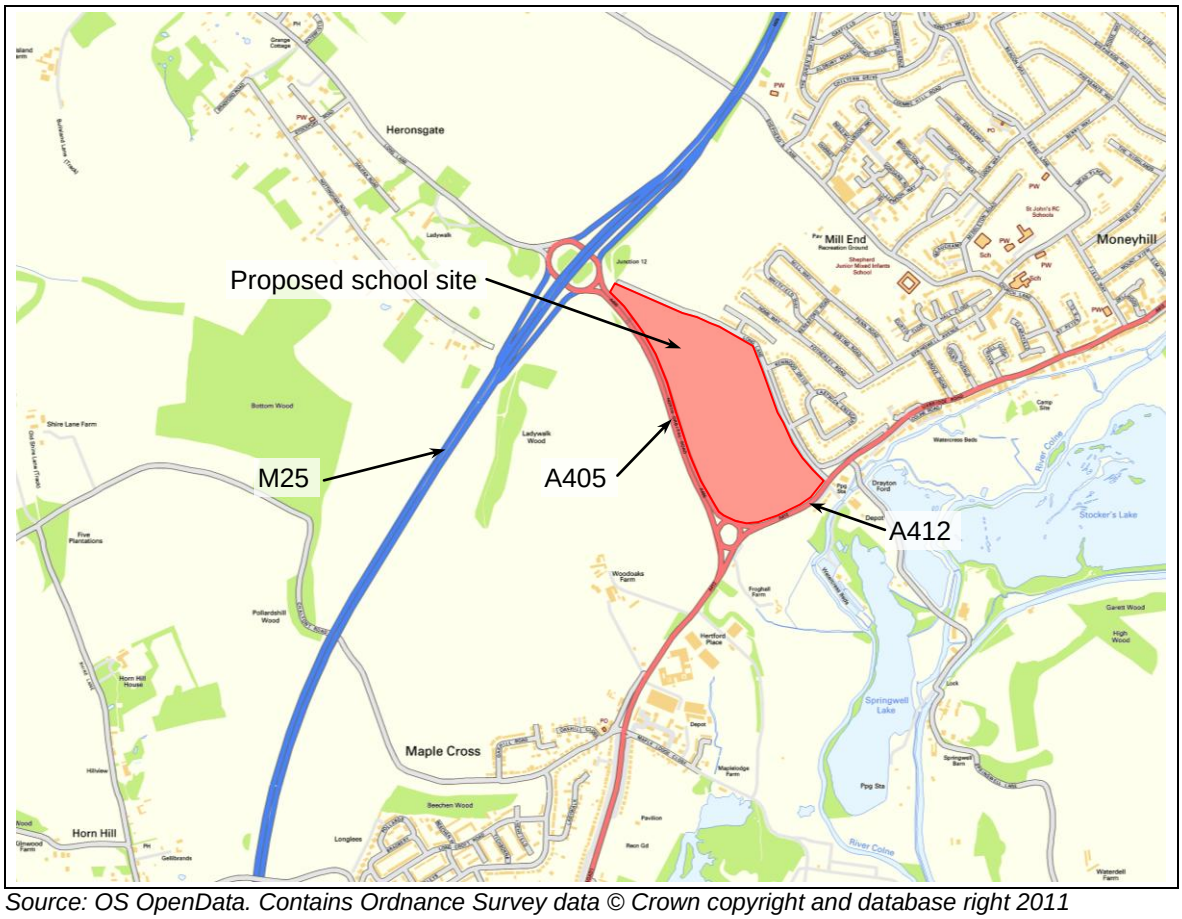
1 Introduction

General

1.1 JMP Consultants Ltd has been commissioned by Hertfordshire County Council to undertake a Noise Review and comparison of the noise environment at four potential secondary school sites (Site A, Site B, Site C and Site D), to support the LDF preparation process.

1.2 This report focuses on Site A, which is located on land east of A405, and north of the A412. The north-western corner of the site is adjacent to M25 junction 17. The site location is shown in Figure 1.1.

Figure 1.1 Site location



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Scope of the Noise Review

1.3 In order to establish the noise environment around the school site this Noise Review will present the findings of a period of noise monitoring undertaken within and around the proposed school site.

1.4 An Executive Summary document containing an appraisal of the noise environment at all four potential sites has been produce separately.

Report Structure

1.5 Following this introductory section, the structure of the this report is as follows:

- **Section 2** defines the noise and planning context of the proposed development and the local area.
- **Section 3** describes the methodology applied to the assessment, specifically the requirements of BB93 *Acoustic Design of Schools a Design Guide*.
- **Section 4** presents the assessment findings and summarises the results.
- **Section 5** presents the construction impacts of the proposed development.
- **Section 6** presents the conclusions of the study.

2 Noise Context

General

2.1 This section of the report outlines the noise context of the proposed development, particularly with regard to relevant guidance documents. Sound levels and the health impact of noise are also discussed.

The Health Impact of Noise

2.2 Long-term exposure to noise (unwanted sound) has been shown to have a negative impact on human health and general wellbeing. The World Health Organisation (WHO) estimates that one in three Europeans is adversely affected by traffic noise. The detrimental effects of traffic noise include the following (source: WHO, 2008).

- Pain and hearing fatigue;
- Hearing impairment including tinnitus;
- Annoyance;
- Interferences with social behaviour (aggressiveness, protest and helplessness);
- Interference with speech communication;
- Sleep disturbance and all its consequences on a long and short term basis;
- Cardiovascular effects;
- Hormonal responses (stress hormones) and their possible consequences on human metabolism (nutrition) and immune system; and
- Poor performance at work and school.

2.3 As a consequence of the health implications of exposure to noise, it is often considered necessary to determine the existing transport-related noise level at a location of a proposed school development. This planning requirement is principally addressed by Building Bulletin 93 (BB93) *Acoustic Design of Schools - A Design Guide*. With regard to acceptable internal noise levels, BS8233 *Sound Insulation and Noise Reduction for Buildings* and the World Health Organisation have recommended limits for school buildings.

Relevant Guidance

BB93 Acoustic Design of Schools – A Design Guide

2.4 BB93 provides regulatory framework for the acoustic design of schools. At the feasibility stage of the planning and design process BB93 recommends that a noise survey is undertaken to establish the suitability of a site for a school development. This Noise Review presents the findings of a noise survey undertaken to do this. Table 2.1 below shows the recommended external noise levels within a playground and at the boundary of a proposed school building.

Table 2.1 Recommended BB93 noise levels

Criterion	Ideal	Limit
The boundary of external premises used for formal and informal teaching	60dB(A) $L_{Aeq\ 30min}$	
Noise level in an unoccupied playing fields	50dB(A) $L_{Aeq\ 30min}$	55dB(A) $L_{Aeq\ 30min}$
Area used for outdoor teaching activities	At least one area should be below 50dB(A) $L_{Aeq\ 30min}$	

Source: BB93

BS8223:1999 Sound Insulation and Noise Reduction for Buildings

2.5 BS8223, Table 5 recommends internal noise levels for new or refurbished buildings. These internal noise limits are primarily intended to apply to new or refurbished buildings and not for the assessment of changes in the external noise environment. Table 2.2 below shows the internal noise levels recommended in BS8223.

Table 2.2 BS8223:1999 Recommended noise levels

Criterion	Typical situations	Design range L_{AeqT} dB(A)	
		Good	Reasonable
Reasonable listening conditions	Classroom	35	40
Reasonable conditions for study and work requiring concentration	Library	40	50

Source: BS8233

2.6 In order to convert a monitored noise level to an internal noise level, in accordance with BS8233, it is assumed that:

- An open window will provide a decibel reduction of 13dB(A).
- A closed double glazed window (specification 6-12-6) will reduce external noise levels by 34dB(A).
- A closed secondary glazed window (specification 4-200-4) will reduce external noise levels by 43dB(A).

World Health Organisation Guidelines for Community Noise

2.7 *Guidelines for Community Noise*, published by the World Health Organisation in 1999, states that, in order to prevent speech interference, the internal background noise level within a classroom should not exceed 35dB(A) L_{Aeq} during a teaching session. In outdoor playground areas noise from external sources should not exceed 55dB(A) L_{Aeq}. Table 2.3 shows the noise levels recommended in this document.

Table 2.3 World Health Organisation recommended noise levels

Specific environment	L_{Aeq} dB(A)	Time base (hours)
School classrooms	35	During Class
School playground outdoor	55	During Play

Source: Guidelines for Community Noise, World Health Organisation (1999)

3 Methodology

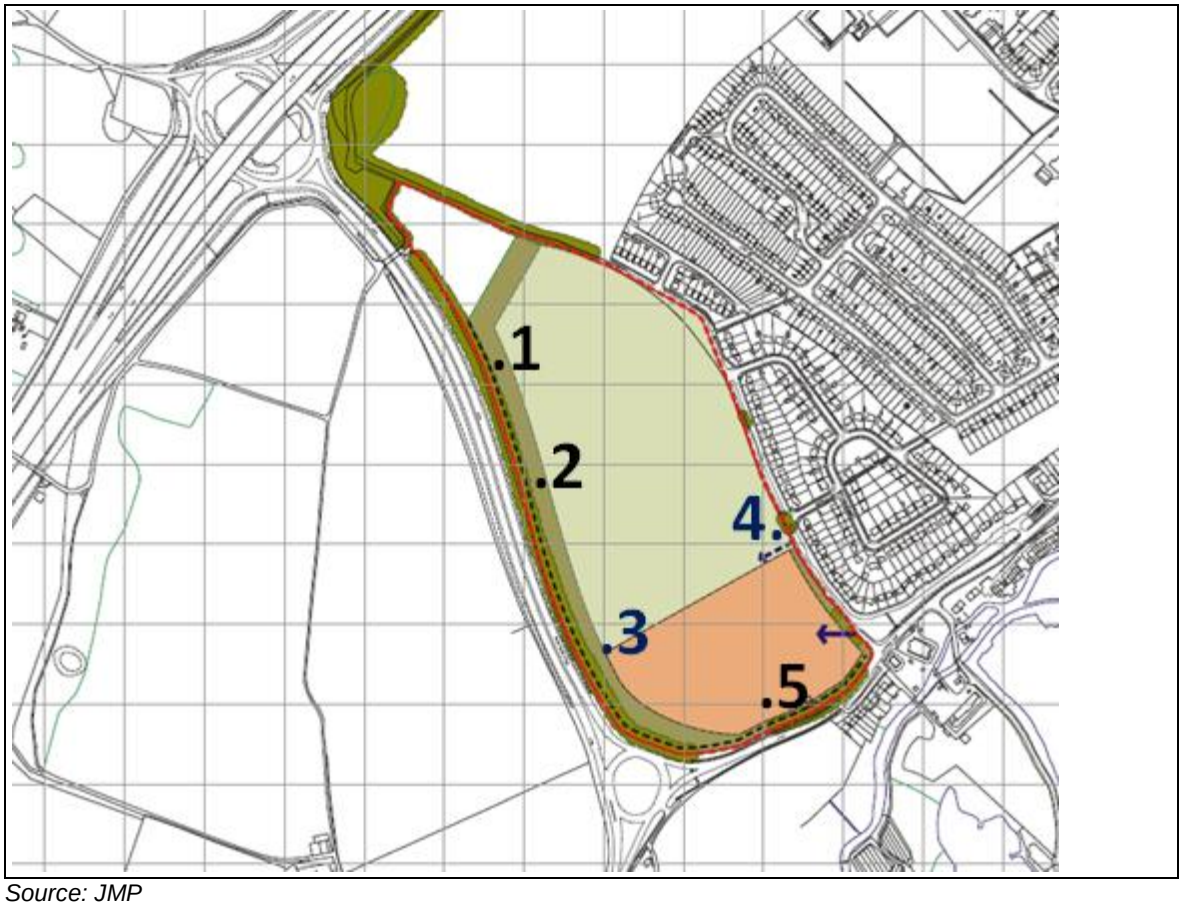
Noise Monitoring

3.1 To determine the noise levels at the site, it was necessary to conduct a period of on-site noise monitoring. The on-site noise monitoring was conducted by a JMP staff member who has attained the Institute of Acoustics (IOA) *Certificate of Competence in Environmental Noise Measurement*.

3.2 At this feasibility stage, noise was monitored for a limited period at the locations indicated in Figure 3.1 below. The monitoring locations were selected due to their proximity to nearby traffic noise sources and the proposed locations of playgrounds and school buildings.

3.3 The monitoring was undertaken during typical school hours (including a peak traffic period) on Wednesday 13th July 2011 between 08:30 and 12:12. At each specified point noise was measured for periods of 15 minutes at various times throughout the monitoring period. During the monitoring period weather conditions were dry and warm with low wind speeds.

Figure 3.1 Monitoring locations



Source: JMP

Noise Meters

3.4 Noise was monitored using a Norsonic 140 integrated sound level meter and a Casella 440 integrated sound level meter. All measurements were A-weighted and recorded using a fast time response. The noise meter was set at a height of 1.5m above the ground.

3.5 The Norsonic noise meter was calibrated using a Norsonic calibrator at the beginning and end of each monitoring period. The Casella noise meter was calibrated using a CEL-284/2 calibrator at the beginning and end of each monitoring period. No significant deviations were observed. Calibration certificates can be provided upon request.

4 Results

Noise Environment

4.1 Measured external noise levels at the monitoring locations are shown below in Table 4.1.

Table 4.1 Noise levels at the monitoring locations

Location / distance from dominant noise source(s)	Time		$L_{Aeq\ 15min}$ dB(A)*	Observed noise sources
	Start	Stop		
1 250m from the M25 28m from A405	09.35	09.50	56.6	Noise from the M25 was dominant.
	10.43	10.58	55.1	
	11.39	11.54	58.7	
	Arithmetic Average		**56.8**	
2 370m from the M25 20 m from A405	11.03	11.18	55.7	Noise from the M25 was dominant. Noise from the A405 was also clearly audible and therefore contributed to the noise reading.
	-	-	-	
	-	-	-	
	Arithmetic Average		**55.7**	
3 15m from A405	09.00	09.15	62.5	Noise from the A405 was dominant. The M25 was also audible and therefore contributed to the noise reading.
	10.18	10.32	61.9	
	11.57	12.12	60.8	
	Arithmetic Average		**61.7**	
4 50m from A412	10.51	11.06	51.4	Noise from the A412 was dominant. The M25 was not audible. Plane noise was also heard intermittently.
	11.34	11.49	51.6	
	-	-	-	
	Arithmetic Average		**51.5**	
5 10m from A412	8.30	8.45	67.4	Noise from the A412 was dominant. Noise from the A405 was also audible. The M25 was not audible. Plane noise was also heard intermittently.
	10.00	10.15	67.6	
	11.13	11.28	64.3	
	Arithmetic Average		**66.4**	

** The ambient noise level during the monitoring period was consistent. Therefore the 15 minute measurements are considered representative of a 30 minute period.*

Analysis

Playground Area – The Ideal Noise Limit

4.2 The noise levels measured at the locations indicated in Figure 3.1 exceed the ideal limit of 50dB(A) $L_{Aeq30min}$ recommended by BB93 for an area used for outdoor teaching. This ideal noise limit must be met at at least one outdoor teaching location.

4.3 It should be noted that the monitoring positions were located on the boundary of the site close to road traffic noise sources. With increasing distance from the site boundary, noise levels will decrease and the ideal limit may be met.

4.4 From the data collected, the quietest part of the site was identified as being in the area surrounding monitoring position 4, which is located towards the eastern site boundary. Noise levels were monitored at a location set back 50m from the A412, which is the dominant noise source at this point. Traffic on Long Lane adjacent to monitoring position 4 was intermittent and did not contribute significantly to the L_{Aeq} noise level.

4.5 Using a line source distance attenuation calculation, it can be inferred that at a distance of 71m from the A412, the lower noise limit level of 50dB(A) $L_{Aeq30min}$ can be achieved, ensuring that at at least one part of the site the Ideal Noise Limit can be met. Calculations can be seen in **Appendix A**. However, this may only be true at a location close to the eastern boundary; at the western boundary, the A405 is a significant source of noise.

Playground Area - The Upper Noise Limit

4.6 The noise levels measured at locations 1, 2, 3, and 5 do not meet the upper limit of 55dB(A) $L_{Aeq30min}$ as recommended by BB93 for an unoccupied playground, playing field, or other outdoor area. The noise levels measured at location 4 do meet the upper noise limit.

4.7 In order for the upper limit noise level to be met at the southern, western, and northern boundaries of the site, it will be necessary to offset any playground, playing field, or other outdoor area away from the road network. Using the line source distance attenuation calculation, the offset distances presented in Table 4.2 are required in order for a noise level of 55dB(A) $L_{Aeq30min}$ to be achieved. The calculations can be seen in **Appendix A**.

Table 4.2 Offset distances required

Boundary	Monitoring location	Dominant noise source	Offset distance from dominant noise source required
Northern	1	M25	379m
Western	3	A405	70m
Southern	5	A412	138m

Note: The offset distance for location 2 is covered by the offsets for locations 1 and 3; therefore it has not been specified.

4.8 An alternative to using distance to achieve acceptable noise levels at the southern boundary of the site would be to use a noise barrier. In accordance with BB93, a noise barrier can reduce noise levels from traffic by up to 10dB(A). It is understood that an earthworks bund would be the preferable form of barrier in terms of visual impact and biodiversity. Preliminary calculations indicate that a 3.0m high barrier will be sufficient to provide the necessary noise level reduction.

4.9 A noise barrier may be less suitable on the western boundary of the site, especially towards the northern boundary, as the A405 becomes progressively elevated above the site, thus limiting the effectiveness of any noise barrier placed within the development site.

School Building Areas

4.10 The noise levels measured at Locations 1 (northern boundary), 2 (north-western boundary), and 4 (eastern boundary) meet the required upper permitted noise level presented in BB93 at the boundary of a proposed school building.

4.11 The noise levels at Locations 3 (south western boundary) and 5 (southern boundary) are in excess of the upper $L_{Aeq30min}$ noise level presented in BB93 for the location of a proposed school building. At these locations, road traffic using the A405 and A412 were considered to be the dominant noise sources.

4.12 Using a line source distance attenuation calculation, it can be inferred that 23m from the A412 on the south western boundary, and 44m from the A412 on the southern boundary, the upper noise limit of 60dB(A) $L_{Aeq30min}$ can be achieved. The calculations can be seen in **Appendix A**.

4.13 Alternatively, in order to ensure that acceptable noise levels are achieved at the boundary of the site, a noise barrier may be included on the southern and south western boundaries in the vicinity of locations 5 and 3. In accordance with BB93 a noise barrier, as described above, could reduce noise levels from traffic by up to 10dB(A).

5 Construction Impacts

General

5.1 In terms of construction, the main noise impacts that are required to be considered are the generation of noise arising from construction plant. For this site, the sensitive receptors are located on Long Lane.

Recommended Measures

5.2 To minimise the impact of construction noise it is recommended that the following measures are implemented:

- Noise-generating plant should be placed as far as possible from sensitive receptors.
- Where possible, fixed plant/facilities should be powered by shore-supply rather than by generators.
- Construction plant and equipment should be:
  - Maintained to ensure optimum performance.
  - Fitted with appropriate silencers, mufflers or acoustic screens.
  - Operated in a manner that will reduce noise emissions.
- Vehicles and plant should be switched off, or throttled down to a minimum, when not in use.
- Nearby residents should be shielded from noise by temporary noise hoardings located along the perimeter of the work site.
- Where practical, mulching-breaking equipment should be used in preference to percussion-breaking machines.
- The (general) permitted hours of site operation are limited to:
  - Monday to Friday 0:800 hrs to 18:00 hrs.
  - Saturday 08:00hrs to 13:00 hrs.
  - No working on Sunday or Bank Holidays.

6 Conclusions

6.1 The measured noise levels taken at the boundary of the site exceeded the ideal noise limit as prescribed by BB93 for an area to be used for outdoor teaching. However, calculations have shown that at a distance of 71m away from the A412, in the vicinity of the eastern boundary, the ideal limit can be achieved.

6.2 The measured noise levels taken at the boundary of the site, with the exception of location 4 (eastern boundary), exceeded the upper noise limit as prescribed by BB93 for an area used for outdoor teaching. However, calculations have shown that at the distances listed below from the surrounding road network, the upper limit can be achieved on the site.

- Location 1: 379m from the M25
- Location 3: 138m from the A412
- Location 5: 70m from the A405

6.3 The measured noise levels on the northern, north-western and eastern boundaries of the site meet the required upper permitted noise level presented in BB93 at the boundary of a proposed school building. Calculations have shown that at a 44m away from the A412 on the southern boundary and at 23m from the A405 on the south western boundary; this upper limit can be achieved.

6.4 Alternatively, in order to ensure that acceptable noise levels are achieved at the boundary of the site, a noise barrier may be included on the southern and south western boundaries in the vicinity of locations 5 and 3. In accordance with BB93, a noise barrier could reduce noise levels from traffic by up to 10dB(A). The noise barrier is likely to take the form of an earthworks bund. Preliminary calculations indicate that a height of 3.0m will be sufficient to achieve the require noise level reductions.

6.5 The preliminary findings described in this report indicate that, with appropriate mitigation measures in place, noise issues will not preclude the development of a new secondary school on this site. A full Noise Assessment will be required to support any future planning application made for the site. This will provide details the noise mitigation measures, such as the dimensions of any noises barriers, required for the site to be developed.

Appendix A

Calculations

Line Source Distance Calculations

Distance Corrected Noise Level =10 LOG_{10} (R/r)

where *R* = Distance from the road to the point the measurement was taken

where *r* = Distance from the road to the point where the measurement is to be corrected to

Playground Area – The Ideal Noise Limit

In order to meet the required noise level of $L_{Aeq\ 30\ mins}$ 50dB(A) the following offset distances will be required.

Table A.1 Playground Area – Ideal Noise Limit

Boundary	Monitoring location	Dominant noise source	Calculation	Offset distance required
Eastern	4	50m from A412	10 LOG_{10} (50/71) = -1.5 51.5 – 1.5 = 50dB(A)	70m from A412

Playground Area – The Upper Noise Limit

In order to meet the required noise level of $L_{Aeq\ 30\ mins}$ 55dB(A) the following offset distances will be required.

Table A.2 Playground Area – Upper Noise Limit

Boundary	Monitoring location	Dominant noise source	Calculation	Offset distance required
Northern	1	250m from M25	10 LOG_{10} (250/379) = -1.8 56.8 – 1.8 = 55dB(A)	379m from M25
Western	3	15m from A405	10 LOG_{10} (15/70) = -6.7 61.7 – 6.7 = 55dB(A)	70m from A405
Southern	5	10m from A412	10 LOG_{10} (10/138) = -11.4 66.4 – 11.4 = 55dB(A)	138m from A412

School Buildings – The Upper Noise Limit

In order to meet the required noise level of $L_{Aeq\ 30\ mins}$ 60dB(A) the following offset distances will be required.

Table A.3 School Building – Upper Noise Limit

Boundary	Monitoring location	Dominant noise source	Calculation	Offset distance required
Western	3	15m from A405	10 LOG_{10} (15/23) = -1.85 61.7– 1.85 = 59.85dB(A)	23m from A405
Southern	5	10m from A412	10 LOG_{10} (10/44) = -6.4 66.4– 6.4 = 60dB(A)	44m from A412