Hemlington North, Middlesbrough

Noise impact assessment

6910.1

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Revision A

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1 Contents

2 Summary

2.1 This report has been prepared in support of an Outline Planning Application for a residential development at Hemlington North, Middlesbrough.

2.2 The potential significant noise sources for assessment are:

- Road traffic on Stainton Way to the north of the site, and the B1365 to the east of the site;
- Activity associated with The Gables Inn to the south east of the site;

2.3 Noise levels affecting the proposed development site have been measured and the risks and potential impact upon the future development assessed following current guidance. No significant noise from the Gables Inn was identified during the measurement period, such that road traffic was the only source of significance.

2.4 A suitable methodology for the noise assessments has been discussed with the Local Environmental Health Officer (EHO).

2.5 Potential noise mitigation options are outlined in Section 6.11 to reduce noise impact on external amenity areas; the wider planning objectives should be considered when determining feasible screening strategies.

2.6 Calculations have also been carried out to determine the potential noise impact on the internal noise levels, and an example façade sound insulation strategy has been outlined which shows noise levels may be suitably mitigated to achieve Local Authority internal noise level requirements. The specifications should be reviewed, following the detailed design of site layouts.

2.7 Based on the assessed sound sources identified and the details described in this report, the site is considered to be suitable for residential development.

3 Introduction

3.1 The purpose of this report is to evaluate the potential noise risks and assess the suitability of the site for a residential development in support of an outline Planning Application.

3.2 A residential development described as Hemlington North development site, has been proposed on land to the south of Stainton Way, Middlesbrough.

3.3 The site location is shown in Figure 1.

3.4 Apex Acoustics has been appointed to carry out a noise survey and assessment in support of an outline Planning Application.

3.5 The potential noise sources considered in this report are indicated in Figure 1.

3.6 This assessment is based on planning guidance, an assessment methodology discussed with the local Environmental Health Officer and measurements of the surrounding noise sources.

Figure 1: Site location outlined in red with measurement positions indicated by blue markers

4 Guidance and acceptable levels

4.1 NPPF and NPSE

4.2 The National Planning Policy Framework (NPPF, 2018), Reference 1, sets out the Government's planning policies for England and how these should be applied. It provides a framework within which locally-prepared plans for housing and other development can be produced.

4.3 The Noise Policy Statement for England (NPSE) set out the long-term vision of Government noise policy, "Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development", Reference 2.

4.4 The aims and further details of the NPPF and NPSE are discussed in Appendix 1.

4.5 BS8233 and WHO

4.6 Table 4 of BS 8233, Reference 3, defines guideline upper limits for internal ambient noise levels in dwellings for steady external noise sources, as shown in Table 1.

Activity	Location	Guideline upper limit, $L_{Aeq,T}$ / dB	
		07:00 to 23:00	23:00 to 07:00
Resting	Living rooms	35	-
Dining	Dining room/area	40	-
Sleeping (daytime resting)	Bedroom	35	30

Table 1: Guideline indoor ambient noise levels defined in BS 8233

4.7 Note 4 to Table 4 of BS 8233 states:

"Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or LAmax, F, depending on the character and number of events per night. Sporadic noise events could require separate values."

4.8 However, due to the quite low activity of the road, cars are considered as individual events. As such, maximum levels are considered in this assessment. Therefore, the World Health Organisation (WHO), Reference 4 guidance on sleep disturbance is considered appropriate, as discussed in Appendix 2.

4.9 Section 3.4 of the WHO guidelines states:

"For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 dB LAmax more than 10 – 15 times per night."

4.10 The above guidance is adopted to assess the impact on internal levels within proposed bedrooms during the night time period, 23:00 to 07:00 hours.

4.11 **Internal and external noise level criteria**

4.12 Suitable criteria for this development have been agreed with the Local Environmental Health Department for internal ambient noise levels and are consistent with the values given in BS 8233, as presented in Table 2.

Situation	Upper limits / dB	
	$L_{Aeq,T}$	L_{AFmax}
Living rooms and Bedrooms, daytime	35	-
Bedrooms, night time	30	45

Table 2: Agreed Local authority internal noise level requirements

4.13 Noise level criteria for external amenity space has been discussed with the Local Authority and ideally should not exceed 50dB $L_{Aeq,16hr}$ through the daytime.

4.14 **Entertainment noise**

4.15 The Local Authority have proposed that the indoor ambient noise levels should not exceed NR20 and 45 dB L_{AFmax} more than 10 times per night as a result of noise from live music and entertainment. Therefore, any measured entertainment noise associated with the Gables Inn will be assessed in this way.

4.16 **Traffic projection**

4.17 A 15-year projection of traffic flow can be calculated using the guidance in chart 16a: *Traffic Forecast Table for Light Vehicles*, of the Calculation of Road Traffic Noise (CRTN), Reference 5.

4.18 The most current data for a 15-year increase in traffic flow with accordance to CRTN is between the years 1995 and-2010, predicting in a 22% increase. This equates to an increased noise level of <1 dB. Therefore, a prudent 1 dB increase can be applied to the noise levels before any consideration of noise impact.

5 Noise sources and measurements

5.1 **Equipment**

5.2 The equipment used is listed in Table 3.

Equipment	Model	Serial no.
Sound Level Meter	NTi XL2	A2A-04045-D2
Calibrator	Larson Davis CAL 200	11705
Sound Level Meter	NTi XL2	A2A-09646-E0
Calibrator	Larson Davis CAL 200	12572
Sound Level Meter	NTi XL2	A2A-14205-E0
Calibrator	Larson Davis CAL 200	15308

Table 3: Equipment used

5.3 Both meters and calibrators have current calibration certificates traceable to national standards.

5.4 **Measurements**

5.5 Measurements were made with the microphone located at 1.5 m above ground level, away from other reflecting surfaces, such that they are considered to be free field.

5.6 *Daytime*

5.7 Daytime measurements were made from 10:30 hrs on 27th June 2018 at position A, indicated by the northernmost marker in Figure 1.

5.8 During the day time, the temperature was around 28 °C; the wind speed measured around 0.2 m/s.

5.9 *Evening and Night time*

5.10 Measurements were made on the 6th July 2018 between 23:03 and 23:36 hrs at position A, and between 22:29 and 23:30 hrs at position B, indicated by the southernmost marker in Figure 1.

5.11 During the night time, the temperature was around 19 °C; the wind speed measured around 0.2 m/s.

5.12 **Results**

5.13 The most significant noise source affecting the proposed development during both day and night was from road traffic on Stainton Way.

5.14 Other noise sources included road traffic on B1365.

5.15 No noise associated with The Gables Inn was audible at either measurement position.

5.16 **Daytime noise levels**

5.17 The calculation method of the overall daytime noise level, $L_{Aeq,16hr}$ and night-time noise level, $L_{Aeq,8hr}$, from the measured data is described in Appendix 1, in accordance with CRTN.

5.18 The measured values of the L_{A10} for three consecutive hours are shown in Table 4.

Position	Time Period	Measured noise level, L_{A10} / dB
A	First hour	65
	Second hour	65
	Third hour	66

Table 4: Measured L_{A10} over three consecutive hours

5.19 The calculation of the daytime $L_{Aeq,16hr}$ noise level is shown in Table 5.

Position	Parameter	Level / dB
A	Arithmetic mean $L_{A10,3hr}$	65
	$L_{A10,18hr}$	64
	$L_{Aeq,16\ hr}$	62

Table 5: Calculation $L_{A10,18hr}$ from measured L_{A10}

5.20 **Evening and night time noise levels**

5.21 The measured evening, $L_{Aeq,\ T}$ and night-time $L_{Aeq,\ T}$ noise levels are shown in Table 6.

Position	Period	Level / dB
A	23:03 – 23:36 (night)	54
B	22:29 – 23:00 (evening)	48
	23:00 – 23:30 (night)	47

Table 6: Evening and night-time measurements

5.22 Night time measurements were made over the first portion of the night time period, immediately after 23:00 hrs, after which noise levels generally fall as the night time period progresses.

5.23 The measured level in the first portion of the night time period is taken to be representative of the whole 8-hour night time period; this is generally considered to be a prudent assumption as noise levels usually drop off after midnight before rising again at around 06:00 hours.

5.24 The predicted 15-year traffic flow increase are shown in Table 7.

Parameter	$L_{Aeq,\ T}$ / dB	$L_{Aeq,\ T}$ with additional predicted 15-year traffic flow increase/ dB
Daytime, $L_{Aeq,16hr}$	62	63
Night time, $L_{Aeq,8hr}$	54	55

Table 7: Calculated daytime and night time noise level for position A

5.25 **Maximum night time noise levels**

5.26 The maximum noise level, L_{AFmax} presented in Table 8 is the highest measured at position A during the night time period.

Period	L_{AFmax} / dB
Night time	68

Table 8: Highest maximum noise level from position A during the night time period

6 Internal and external noise levels

6.1 At the measurement position, the noise levels are considered representative of the noise impact upon the site boundary when the development is complete. Such that the calculated daytime $L_{Aeq,16hr}$ noise levels and the measured night time $L_{Aeq,T}$ and L_{AFmax} levels have been used in an example façade sound insulation calculation to determine site suitability.

6.2 **Internal noise levels**

6.3 For a prudent assessment, the potential noise impact on internal levels are considered without the additional benefit of the noise screening as the strategy would not be developed in detail until a later stage.

6.4 Therefore, the worst-case calculated noise levels, with the additional 1 dB adjustment for traffic projection are used, as shown in Table 9.

Parameter	Noise external noise levels, dB
Daytime $L_{Aeq,16hr}$	63
Night time $L_{Aeq,8hr}$	55
Night-time L_{AFmax}	68

Table 9: Worst case noise levels used in the example façade calculations

6.5 The calculation method for façade sound insulation is in accordance with BS 8233 and the principles of BS EN 12354-3, Reference 7, as described in Appendix 3 and detailed in the Apex Method, Reference 8. Calculation methods are discussed further in Appendix 4.

6.6 A summary of the example internal noise level calculations is shown in Table 10.

Parameter	Calculated internal noise levels / dB		Full calculation
	$L_{Aeq,T}$	L_{AFmax}	
Daytime	32	-	Table 12
Night time	23	38	

Table 10: Calculated internal noise levels

6.7 The glazing specification and ventilation strategy used in the example calculations is shown in Table 11.

Glazing	Vents	Ventilation Strategy
6 – 16 – 6.8 mm Double glazing with acoustic laminate	1 x RW Simon Acoustic TTF Slimline	AD-F system 3: continuous mechanical extract (MEV)

Table 11: Example glazing specification and ventilation strategy

6.8 The example calculations above have been done to indicate that internal noise level criteria can be achieved for the proposed development.

6.9 Houses located further away from the sound sources would likely have a less onerous acoustic specification.

6.10 When plans and layouts are finalised, the glazing and ventilation specification proposed in this report should be re-assessed for feasibility.

6.11 **External noise levels**

6.12 Measured noise levels show that the Local Authority external noise limit of 50 dB $L_{Aeq,\ 16\ hr}$ would not be achieved across the majority of the site, and noise mitigation should be considered to reduce potential impacts on external amenity spaces.

6.13 It has been calculated that ≥ 5 m screening is required along the northern, eastern and western boundaries of the site to reduce the noise impact on outdoor amenity space to satisfy the requirements of the Local Authority. This is unlikely to be a practicable solution, considering wider planning objectives.

6.14 On the basis of a typical 1.8 m high screen, the noise levels could be reduced to around 56 dB(A) for gardens located along the site boundaries.

6.15 Screening could be close-board fencing, brick walls or any combination of these. To be effective in practice, the barrier should have no cracks or gaps, be continuous to the ground, and have a surface density ≥ 10 kg/m^2.

6.16 Site layout should be considered to situate external amenity areas such that they face the centre of the site away from the road traffic noise sources. In this case, the dwellings themselves would act as barriers to noise; this may reduce the impact to below the Local Authority required levels.

6.17 Dwellings located around the boundary of the site would also act as barriers to noise impacting upon any dwellings located towards the centre of the site.

6.18 ProPG: Planning & Noise guidance, Reference 6, indicates:

"The acoustic environment of external amenity areas that are an intrinsic part of the overall design should always be assessed and noise levels should ideally not be above the range 50-55 dB $L_{Aeq, 16 hr}$.

These guideline values may not be achievable in all circumstances where development might be desirable. In such a situation, development should be designed to achieve the lowest practicable noise level in these external amenity spaces."

6.19 The mitigation options discussed in this section are considered to provide the lowest practicable noise levels, therefore where 50 dB $L_{Aeq, 16 hr}$ is not achievable after consideration of these measures, a higher noise limit might be acceptable subject to Local Environmental Health requirements.

7 Conclusion

7.1 Noise levels affecting the proposed development have been measured and the highest noise impact calculated.

7.2 Potential noise mitigation options are outlined in Section 6.11 to reduce noise impact on external amenity areas; the wider planning objectives should be considered when determining feasible screening strategies.

7.3 Calculations have also been carried out to determine the potential noise impact on internal noise levels, and an example façade sound insulation strategy has been outlined which shows noise levels may be suitably mitigated to achieve Local Authority internal noise level requirements. The specifications should be reviewed, following the detailed design of site layouts.

7.4 Based on the assessed sound sources identified and the details in this report, it is considered that the site is suitable for residential development with regards to noise.

8 References

1 National Planning Policy Framework, Ministry of Housing, Communities & Local Government, July 2018.

2 Noise Policy Statement for England, Department for Environment, Food and Rural Affairs, March 2010.

3 BS 8233: 2014, Guidance on sound insulation and noise reduction for buildings.

4 Guidelines for Community Noise, Edited by Birgitta Bergland, Thomas Lindvall, Dietrich H Schwela, World Health Organisation, 1999.

5 Calculation of Road Traffic Noise, Department of Transport, 1988.

6 Association of Noise Consultants (ANC), Institute of Acoustics (IOA) and Chartered Institute of Environmental Health (CIEH), "ProPG: Planning & Noise - New Residential Development," May 2017.

7 BS EN 12354-3:2000, Building Acoustics – Estimation of acoustic performance of buildings from the performance of elements – Part 3: Airborne sound insulation against outdoor sound.

8 Practical Acoustic Design – the Apex Method, Proceedings of the Institute of Acoustics Vol 36 Pt 3 2014. Full paper and Poster presentation at Institute of Acoustics Conference 2014, available to download from www.apexacoustics.co.uk

9 Appendix 1: Current policy and guidance

9.1 **National Planning Policy Framework (NPPF)**

9.2 The National Planning Policy Framework (NPPF, 2018) sets out the Government's planning policies for England and how these should be applied. It provides a framework within which locally-prepared plans for housing and other development can be produced. In respect of noise, Paragraph 170, 180 and 182 of the NPPF states the following:

9.3 Paragraph 170:

9.4 "e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution…"

9.5 Paragraph 180:

9.6 "Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;

b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; … "

9.7 Paragraph 182:

9.8 "Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed."

9.9 **Noise Policy Statement for England (NPSE)**

9.10 The Noise Policy Statement for England states three policy aims as follows:

"Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- avoid significant adverse impacts on health and quality of life;
- mitigate and minimise adverse impacts on health and quality of life; and
- where possible, contribute to the improvement of health and quality of life."

9.11 The NPSE defines adverse noise impact as follows:

- No Observed Effect Level (NOEL)
  This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.
- Lowest Observed Adverse Effect Level (LOAEL)
  This is the level above which adverse effects on health and quality of life can be detected.
- Significant Observed Adverse Effect Level (SOAEL)
  This is the level above which significant adverse effects on health and quality of life occur

9.12 The first two aims of the NPSE require that no significant adverse impact should occur and that, where a noise level which falls between a level which represents the lowest observable adverse effect and a level which represents a significant observed adverse effect, then according to the explanatory notes in the statement:

"… all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life whilst also taking into consideration the guiding principles of sustainable development. This does not mean that such effects cannot occur."

9.13 It is considered that meeting the internal ambient noise level limits given in BS 8233, which are in line with those given by the World Health Organisation, Reference 4, adequately achieve the first and second aims of the NPSE.

10 Appendix 2: WHO Community Noise Guideline values

10.1 Section 4.2.3 of WHO Community Noise Guideline Values discusses how electrophysiological and behavioural methods have demonstrated that both continuous and intermittent noise indoors lead to sleep disturbance.

10.2 The more intense the background noise, the more disturbing is its effect on sleep. Measurable effects on sleep start at background noise levels of about 30 dB L_{Aeq}. Physiological effects include changes in the pattern of sleep stages, especially a reduction in the proportion of REM sleep.

10.3 Subjective effects have also been identified, such as difficulty in falling asleep, perceived sleep quality, and adverse after-effects such as headache and tiredness. Sensitive groups mainly include elderly persons, shift workers and persons with physical or mental disorders.

10.4 Where noise is continuous, the equivalent sound pressure level should not exceed 30 dB(A) indoors, if negative effects on sleep are to be avoided. When the noise is composed of a large proportion of low-frequency sounds a still lower guideline value is recommended, because low frequency noise (e.g. from ventilation systems) can disturb rest and sleep even at low sound pressure levels. It should be noted that the adverse effect of noise partly depends on the nature of the source.

10.5 If the noise is not continuous, L_{Amax} or SEL are used to indicate the probability of noise induced awakenings. Effects have been observed at individual L_{Amax} exposures of 45 dB or less. Consequently, it is important to limit the number of noise events with a L_{Amax} exceeding 45 dB. Therefore, the guidelines should be based on a combination of values of 30 dB $L_{Aeq,8h}$ and 45 dB L_{Amax}. However, Section 3.4 of the WHO guidelines note that for a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 dB L_{Amax} more than 10–15 times per night (Vallet & Vernet 1991).

10.6 To protect sensitive persons, a still lower guideline value would be preferred when the background level is low. Sleep disturbance from intermittent noise events increases with the maximum noise level. Even if the total equivalent noise level is fairly low, a small number of noise events with a high maximum sound pressure level will affect sleep.

10.7 Therefore, to avoid sleep disturbance, guidelines for community noise should be expressed in terms of equivalent sound pressure levels, as well as L_{Amax} / SEL and the number of noise events. Measures reducing disturbance during the first part of the night are believed to be the most effective for reducing problems in falling asleep.

11 Appendix 3: Calculation of daytime and night-time levels

11.1 **Calculation of $L_{A10,\ 18hr}$ using CRTN shortened measurement procedure**

11.2 The shortened measurement procedure outlined in CRTN, paragraph 43 can be used to calculate the $L_{A10,18hr}$ from measurements of the L_{A10} made over any 3 consecutive hours between 10:00 and 17:00. The measured values are shown in Table 4.

11.3 For the shortened measurement procedure, the arithmetic mean of the three noise levels shown is taken and the $L_{A10,18hr}$ calculated from the $L_{A10,3hr}$ as shown in the equation below:

$$L_{A10,18hr} = L_{A10,3hr} - 1\ dB$$

11.4 **Calculation of $L_{Aeq,\ 16hr}$ from the $L_{A10,\ 18hr}$**

11.5 BS 8233 states that for road traffic noise the $L_{Aeq,16hr}$ can be calculated from the $L_{A10,18hr}$ as shown in the equation below:

$$L_{Aeq,16hr} = L_{A10,18hr} - 2\ dB$$

12 Appendix 4: Calculation of façade noise ingress

12.1 The noise level in a room due to sound penetrating a façade element may be calculated according to BS EN 12354-3 and BS 8233 from:

$$L_2 = L_{1,in} - R + 10 \times Log\left(\frac{S}{V}\right) + 10 \times Log(T) + 11$$ Equation 1.

Where:

- L_2 = noise level in room due to sound through façade portion of area S and mean sound reduction index R, dB
- L_1, in = external free-field noise level at the position of the façade, dB.
- R = sound reduction index of portion, dB
- S = area of façade portion, m^2.
- V = room volume, m^3
- T = reverberation time, s.

12.2 For small façade components, such as ventilators, the noise level in a room may be calculated according to the same standards as above from:

$$L_2 = L_{1,in} - D_{n,e} - 10 \times Log(V) + 10 \times Log(T) + 21$$ Equation 2.

Where:

- $D_{n,e}$ = element-normalised sound level difference of the ventilator.

Other components have the same meaning as above.

12.3 The sound reduction of the masonry portion of the facade is much higher than that of the glazing and ventilation provision. Therefore, noise penetration through the masonry is disregarded as insignificant compared to noise penetration through the glazing and ventilation provision.

12.4 Since construction details are currently unavailable for the proposed development, as a worst-case example, the bedroom is assumed to have a window area of 2 m^2 and a volume of 20 m^3.

12.5 The noise penetration through the vents and the glazing is calculated as above and then combined in each frequency band to give an overall internal level from the external sources by these routes. Calculations are carried out in five octave bands as indicated in BS 8233.

Example	
Volume, V / m^3	20
Window area, S / m^2	2
Reverberation Time, T / s	0.5
Number of vents feasible	1

Daytime $L_{Aeq,\ 16\ hr}$ (dB)	**dB(A)**	**125 Hz**	**250 Hz**	**500 Hz**	**1 kHz**	**2 kHz**
External free-field noise, L_{1in}	**62**	46	51	55	60	54
Glazing: 6/16/6.8 mm, R		22	27	35	42	41
Equation 1, L_2(a)	**26**	22	22	18	16	11
Vent: Acoustic TTF Slimline, $D_{n,e}$		42	40	38	36	40
Equation 2, L_2(b)	**30**	9	16	22	29	19
Total noise through all elements, L_2	**32**					
Night-time $L_{Aeq,\ 8\ hr}$ (dB)	**dB(A)**	**125 Hz**	**250 Hz**	**500 Hz**	**1 kHz**	**2 kHz**
External free-field noise, L_{1in}	**54**	36	39	45	51	47
Glazing: 6/16/6.8 mm, R		22	27	35	42	41
Equation 1, L_2(a)	**16**	12	10	8	7	4
Vent: Acoustic TTF Slimline, $D_{n,e}$		42	40	38	36	40
Equation 2, L_2(b)	**22**	-1	4	12	21	12
Total noise through all elements, L_2	**23**					
Night-time L_{AFmax} (dB)	**dB(A)**	**125 Hz**	**250 Hz**	**500 Hz**	**1 kHz**	**2 kHz**
External free-field noise, L_{1in}	**68**	48	54	60	67	59
Glazing: 6/16/6.8 mm, R		22	27	35	42	41
Equation 1, L_2(a)	**30**	24	25	23	23	16
Vent: Acoustic TTF Slimline, $D_{n,e}$		42	40	38	36	40
Equation 2, L_2(b)	**37**	10	19	27	36	24
Total noise through all elements, L_2	**38**					

Table 12: Example internal noise level calculation for a bedroom with noise impact from all sources