Our ref: NIA/7748/18/7575/v6/Wormald Street Liversedge

16th March 2018

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Dear Sirs,

NOISE IMPACT ASSESSMENT FOR PROPOSED RESIDENTIAL DEVELOPMENT LAND AT WORMALD STREET, LIVERSEDGE, WF15 6BD

1.00 INTRODUCTION

1.01 Environmental Noise Solutions Limited has been commissioned by Arborline Pension Scheme to carry out a noise impact assessment for a proposed residential development (a detached dwelling house and a pair of semi detached dwelling houses) at land at Wormald Street, Liversedge, WF15 6BD (hereafter referred to as the application site).

1.02 The objectives of the noise impact assessment were to:

- Determine the ambient noise climate at the application site
- Assess the potential impact of the ambient noise climate on the proposed residential development with reference to pertinent guidelines
- Provide recommendations with respect to sound attenuation works, as necessary.

1.03 This report details the methodology and results of the assessment and provides recommendations with respect to sound attenuation works for the building envelope (fenestration and ventilation). It has been prepared to accompany an application for full planning permission to be submitted to Kirklees Council.

1.04 This report has been prepared for the Arborline Pension Scheme for the sole purpose described above and no extended duty of care to any third party is implied or offered. Third parties making reference to the report should consult the Arborline Pension Scheme (applicant), JR Planning (applicant's agent) and ENS as to the extent to which the findings may be appropriate for their use.

1.05 A glossary of acoustic terms used in the main body of the text is contained in Appendix 1.

2.00 APPLICATION SITE SETTING AND PROPOSED RESIDENTIAL DEVELOPMENT

2.01 The application site is located in a mixed use residential and commercial setting to the south / east of Liversedge town centre. Roughly rectangular in shape is bound by (see Appendix 2):

- Existing residential dwellings to the north
- Existing residential dwellings to the south (note: the main yard of Craven Timber Limited is circa 40 metres further south)
- Wormald Street to the east (open land opposite side of road)
- 4 commercial units to the west (equally close to the existing residential dwellings which neighbour the application site)

2.02 Full planning permission is sought for the erection of a detached dwelling house and a pair of semi detached dwelling houses (see Appendix 3).

Continued from page 1

3.00 NOISE SURVEY

3.01 In order to establish the ambient and background noise levels at the application site, a noise survey was undertaken on Tuesday 2nd January 2018.

3.02 For the purpose of the assessment, the following noise monitoring positions (see Appendix 2) were adopted in a free field environment at a height of 4.0 metres above ground level.

- MP1 was located at the northern corner of the site at 2 metres from the road kerb (furthest from the timber yard)
- MP2 was located at the southern corner of the site at 2 metres from the road kerb (nearest the timber yard)

3.03 Noise measurements were undertaken using a Bruel & Kjaer 2250 Type 1 integrating sound level meter. The measurement system calibration was verified immediately before the commencement of the measurement sessions and again at the end, using a Bruel & Kjaer Type 4231 calibrator. No drift in calibration level was noted. Measurements consisted of A–weighted broadband parameters, together with linear one third octave band L_{eq} levels. The following table contains a summary of the noise measurement data rounded to the nearest decibel.

Table 3.1 – Noise Measurement Data

Position	Date	Time	$L_{Aeq,T}$ (dB)	$L_{A90,T}$ (dB)	$L_{A10,T}$ (dB)	$L_{A1,T}$ (dB)	Comment
MP1	02/01/18	0845-0905	62	49	65	75	Wormald Street traffic dominates
		1002-1102	62	52	65	73	
		1141-1200	62	55	65	73	
		2300-2316	56	45	58	68	Wormald Street traffic (sporadic) Up to 75 dB L_{AFMax}
		2316-2347	56	44	59	65	
		2349-0022	53	43	56	62	
Daytime ambient noise level circa 62 dB $L_{Aeq\ (day)}$ Night time ambient noise level circa 56 dB $L_{Aeq\ (night)}$							
MP2	02/01/18	0906-0932	62	48	65	75	Wormald Street traffic dominates
		1103-1138	62	53	65	76	Timber yard audible not measurable
Comparable to MP1 (timber yard audible but not measurable, traffic dominates)							

3.04 The ambient noise climate at the application site is dominated by road traffic noise. Noise from the nearby timber merchants was audible but not measurable.

3.05 In terms of context, it is noteworthy that there are existing residential dwellings in similar or closer proximity to the surrounding commercial uses than the application site.

Continued from page 2

4.00 NATIONAL PLANNING POLICY FRAMEWORK (NPPF) PLANNING PRACTICE GUIDELINES ON NOISE AND OTHER RELEVANT GUIDANCE

4.01 In terms of noise impact assessment criteria, Paragraph 123 of the NPPF states that planning policies and decisions should aim to '*avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development'*.

4.02 Planning Practice Guidance specifically dealing with noise was uploaded to the Government's Planning Portal in March 2014 as an accompaniment to the NPPF. The guidance states '*… consideration should also be given to whether adverse internal effects can be completely removed by closing windows and, in the case of new residential development, if the proposed mitigation relies on windows being kept closed most of the time. In both cases a suitable alternative means of ventilation is likely to be necessary. Further information on ventilation can be found in the Building Regulations*'.

4.03 The ventilation requirements for dwellings (and other buildings) are covered under the Building Regulations and set out within Approved Document F 'Ventilation' (ADF), which requires that '*there shall be adequate means of ventilation provided for people in the building*.' The document states:

Ventilation is simply the removal of 'stale' indoor air from a building and its replacement with 'fresh' outside air. Ventilation is required for one or more of the following purposes:

a) Provision of outside air for breathing;
b) Dilution and removal of airborne pollutants, including odours;
c) Control of excess humidity (arising from water vapour in the indoor air);
d) Provision of air for fuel-burning appliances (covered under Part J of the Building Regulations)

Ventilation may also provide a means to control thermal comfort but this is not controlled under the Building Regulations. Part L addresses minimising energy use due to the effects of solar gain in summer.

4.04 Section 5 of ADF provides details of four template 'Systems' which comply with the above strategy. These are summarised in the following table.

Table 4.1 – ADF Template Systems

Ventilation System	Provision with ADF system / purpose		
	Whole Dwelling Ventilation	**Extract Ventilation**	**Purge Ventilation**
System 1: Background ventilators and intermittent extract fans	Background ventilators (Trickle vents)	Intermittent extract fans	Typically provided by opening windows
System 2: Passive Stack ("natural")	Background ventilators (Trickle vents) and passive stack ventilation	Continuous via passive stack	Typically provided by opening windows
System 3: Continuous mechanical extract (MEV)	Continuous mechanical extract – minimum low rate Trickle vents provide inlet air*	Continuous mechanical extract – minimum high rate Trickle vents provide inlet air	Typically provided by opening windows
System 4: Continuous mechanical supply and extract with heat recovery (MVHR)	Continuous mechanical supply and extract – minimum low rate	Continuous mechanical supply and extract – minimum high rate	Typically provided by opening windows

*Where the designed air permeability is leakier than (>) 5 $m^3/(h.m^2)$ at 50 Pa, background ventilators are not necessary

4.05 It is therefore evident that trickle ventilators providing whole dwelling ventilation represent an alternative means of ventilation under Building Regulations ADF. It should also be noted that depending upon the ventilation strategy and the air permeability of the building envelope (there would be a higher degree of natural air leakage expected in a existing building than a new building), trickle ventilators may not be required.

4.06 In areas with higher ambient noise levels, enhanced glazing and/or acoustically treated trickle ventilators may be appropriate. Furthermore, some developers prefer mechanical ventilation to acoustically treated trickle ventilators although this is not mandatory under Building Regulations or the National Planning Policy Guidance on Noise.

4.07 Whilst overheating is a growing concern, there are no specific requirements relating to overheating in the Building Regulations. Both ADF and Approved Document L (ADL) of the Building Regulations briefly mention overheating but do not provide details on what constitutes overheating (Part L addresses minimising energy use due to the effects of solar gain in summer).

4.08 Whilst purge ventilation may also be used to improve thermal comfort, it is not controlled under Building Regulations because (purge ventilation or for that matter whole dwelling ventilation or extract ventilation) is not exclusively linked to thermal comfort.

4.09 Indeed, (new build and converted) dwellings in the UK are relatively well insulated under Building Regulations ADL. Insulation acts as a barrier to heat loss and heat gain. This makes a dwelling warmer in winter and cooler in summer. In a warm summer, the temperature outside a well insulated dwelling is likely to be higher than that inside the dwelling. In this instance, opening a window would simply let warm air in, thus raising the internal ambient temperature.

4.10 Furthermore, occupant behaviour greatly influences the degree of thermal comfort. For example, minimise heat gains by switching off unneeded lights and appliances when not in use, keeping windows and curtains closed during the hottest parts of the day (and open at other times to cool down the home, especially at night).

4.11 ProPG Planning and Noise: New Residential Development (published in May 2017 by the Association of Noise Consultants, Institute of Acoustics and the Chartered Institute of Environmental Health) confirms the position as follows:

The internal target noise levels can only be practically achieved with windows closed, which may be the case in urban areas and at sites adjacent to transportation noise sources, special care must be taken to design the accommodation so that it provides good standards of acoustics, ventilation and thermal comfort without unduly compromising other aspects of the living environment.

In such circumstances, internal noise levels can be assessed with windows closed but with any façade openings used to provide 'whole dwelling ventilation' in accordance with Building Regulations Approved Document F (e.g. trickle ventilators in the open position).

It should also be noted that the internal noise level guidelines are not applicable under 'purge ventilation' conditions as defined by Building Regulations Approved Document F, as this should only occur occasionally (e.g. to remove odour from painting and decorating or from burnt food).

4.12 In the absence of a formal assessment framework for thermal comfort (which is in essence avoiding overheating), the proposed residential development is primarily assessed against the requirements of relevant guidance documents in respect of ventilation.

4.13 British Standard 8233:2014 'Guidance on Sound Insulation and Noise Reduction for Buildings' (BS 8233) sets indoor ambient noise levels from residential dwellings (see table below).

Table 4.1 – Indoor Ambient Noise Levels in Dwellings (BS 8233)

Location	Good Internal Ambient Noise Levels		Reasonable Internal Ambient Noise Levels	
Dining Room	40 dB $L_{Aeq\ (0700–2300)}$	n/a	45 dB $L_{Aeq\ (0700–2300)}$	n/a
Living Room	35 dB $L_{Aeq\ (0700–2300)}$	n/a	40 dB $L_{Aeq\ (0700–2300)}$	n/a
Bedroom	35 dB $L_{Aeq\ (0700–2300)}$	30 dB $L_{Aeq\ (2300–0700)}$	40 dB $L_{Aeq\ (0700–2300)}$	35 dB $L_{Aeq\ (2300–0700)}$

4.14 Note 4 to the above table 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 L_{AFMax} depending on the character and number of events per night. Sporadic noise events could require separate values'.* It is therefore evident that the night time maxima guideline values set out in BS 8233 relate to discrete, individual noise events such as aircraft and passing trains and not road traffic noise. Notwithstanding this, consideration of maximum noise levels does not have a significant impact on the glazing and ventilation specification as the reduction required for the control of night time maxima is comparable to that required for the control of the daytime ambient noise level.

4.15 Note 5 to the above table states '*If relying on closed windows to meet the guide values, there needs to be appropriate alternative ventilation that does not compromise the façade insulation or the resulting noise level. If applicable, any room should have adequate ventilation (e.g. trickle ventilators should be open) during assessment*'.

4.16 It is evident that BS 8233 also considers that adequate ventilation is provided by trickle ventilators in an open position. This is consistent with Building Regulations and the National Planning Policy Framework Planning Practice Guidance on Noise and ProPG.

4.17 On the basis of the above, the following internal ambient noise levels (with windows closed and trickle vents open) and represent good resting and sleeping conditions are considered appropriate for the proposed residential development:

- ≤ 35 dB $L_{Aeq\ (0700\text{-}2300)}$ in living rooms and bedrooms during the day
- ≤ 30 dB $L_{Aeq\ (2300\text{-}0700)}$ in bedrooms during the night
- 45 dB $L_{AFMax\ (2300\text{-}0700)}$ not normally exceeded in bedrooms during the night

4.18 With respect to external amenity, BS 8233 states … '*For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited*.'

4.19 ProPG guidance with respect to external areas (gardens) is consistent with the position adopted in BS 8233:2014.

Continued from page 5

5.00 SCHEME OF SOUND ATTENUATION

5.01 The ambient noise levels at the application site are as follows:

- 62 dB $L_{Aeq\ (0700–2300)}$
- 56 dB $L_{Aeq\ (2300–0700)}$
- 45 dB $L_{AFMax\ (2300–0700)}$

5.02 In order to calculate the sound insulation requirements of the façade, the Building Research Establishment (BRE) building envelope insulation calculation spreadsheet was used (see Appendix 4 for calculation spreadsheets). This spreadsheet is based on the calculation methodology advocated in BS 8233. The spreadsheet allows input of external noise levels, room dimensions and reverberation time together with parameters for the various elements of the building envelope and calculates the internal noise level in terms of the external noise level metric (L_{Aeq} in this case).

5.03 A scheme of sound insulation for the application site is summarised in the table below:

Table 5.1 – Scheme of Sound Insulation Works

Location	Noise Level	Internal Criteria	Glazing and Ventilation
Habitable Rooms Overlooking Wormald Street	62 dB $L_{Aeq\ (0700–2300)}$ 56 dB $L_{Aeq\ (2300–0700)}$ 75 dB $L_{AFMax\ (2300–0700)}$	< 35 dB $L_{Aeq\ (0700–2300)}$ < 30 dB $L_{Aeq\ (2300–0700)}$ < 45 dB $L_{AFMax\ (2300–0700)}$	Standard double glazing rated at ≥ 30 dB R_w i.e. 4/20/4 with acoustic trickle vents rated at ≥ 42 dB D_{new} per 5000 mm²**
Habitable Rooms Screened from Wormald Street*	47 dB $L_{Aeq\ (0700–2300)}$ 41 dB $L_{Aeq\ (2300–0700)}$ 60 dB $L_{AFMax\ (2300–0700)}$	< 35 dB $L_{Aeq\ (0700–2300)}$ < 30 dB $L_{Aeq\ (2300–0700)}$ < 45 dB $L_{AFMax\ (2300–0700)}$	Standard double glazing rated at ≥ 30 dB R_w i.e. 4/20/4 with standard trickle vents rated at ≥ 30 dB D_{new} per 5000 mm²

* Based on measurements of existing buildings, a circa 15 decibels reduction is common at the rear façade wholly screened from the noise source (road) by the dwelling itself

** Such as Greenwood EAW5000.AC2 (note: not applicable to 2nd floor as rooms span full depth of dwelling)

5.04 The gardens are located to the (rear) west of the application site and will be significantly screened by the dwellings themselves. Notwithstanding this, however, in order to protect garden amenity the provision of an 1800 mm high solid timber fence should be provided as shown in Appendix 2. The solid timber fence (or wall or wall with solid timber infill panels) should have a mass per unit area of ≥ 10 kg/m^2, be sealed to the ground and be fitted with cover strips to prevent gaps forming over time.

5.05 British Standard 5228:2009-1 'Noise Control on Construction and Open Sites' (BS 5228) states '*In the absence of spectral data, as a working approximation, if there is a barrier or other topographic feature between the source and the receiving position, assume an approximate attenuation of 5 dB when the top of the plant is just visible to the receiver over the noise barrier, and of 10 dB when the noise screen completely hides the sources from the receiver*.'

5.06 The proposed site layout allied to the provision of an 1800 mm high solid timber fence (or wall or wall with solid timber infill panels) as shown in Appendix 3 will significantly reduce daytime ambient noise levels in these gardens to as low a level as practicable and well below 55 dB $L_{Aeq\ (0700–2300)}$ when considering screening, distance attenuation and reduced angle of view.

6.00 CONCLUSIONS

6.01 A noise impact assessment has been undertaken for a proposed residential development at land at Wormald Street, Liversedge. The principal noise source across the site was road traffic, albeit at moderate levels. A scheme of sound attenuation works has been developed to protect the proposed residential development from the ambient noise climate.

Continued from page 6

I trust the foregoing is sufficient for your needs. Should you have any queries regarding the above, please do not hesitate to contact me.

Yours sincerely,

Richard Whitaker
AMIOA, Diploma in Acoustics and Noise Control, BSc (Hons)
Environmental Noise Solutions Limited

cc File

Appendix 1
Glossary of Acoustic Terms

Sound Pressure Level (L_p)

The basic unit of sound measurement is the sound pressure level. As the pressures to which the human ear responds can range from 20 µPa to 200 Pa, a linear measurement of sound levels would involve many orders of magnitude. Consequently, the pressures are converted to a logarithmic scale and expressed in decibels (dB) as follows:

$$L_p = 20 \log_{10}(p/p_0)$$

Where L_p = sound pressure level in dB; p = rms sound pressure in Pa; and p_0 = reference sound pressure (20 µPa).

A-weighting Network

A frequency filtering system in a sound level meter, which approximates under defined conditions the frequency response of the human ear. The A-weighted sound pressure level, expressed in dB(A), has been shown to correlate well with subjective response to noise.

Equivalent continuous A-weighted sound pressure level, $L_{Aeq, T}$

The value of the A-weighted sound pressure level in decibels of continuous steady sound that within a specified time interval, T, has the same mean-square sound pressure as a sound that varies with time. $L_{Aeq, 16h}$ (07:00 to 23:00 hours) and $L_{Aeq, 8h}$ (23:00 to 07:00 hours) are used to qualify daytime and night time noise levels.

$L_{A10, T}$

The A-weighted sound pressure level in decibels exceeded for 10% of the measurement period, T. $L_{A10, 18h}$ is the arithmetic mean of the 18 hourly values from 06:00 to 24:00 hours.

$L_{A90, T}$

The A-weighted sound pressure level of the residual noise in decibels exceeded 90% of a given time interval, T. L_{A90} is typically taken as representative of background noise.

$L_{AF\ max}$

The maximum A-weighted noise level recorded during the measurement period. The subscript 'F' denotes fast time weighting, slow time weighting 'S' is also used.

Sound Exposure Level (SEL or L_{AE})

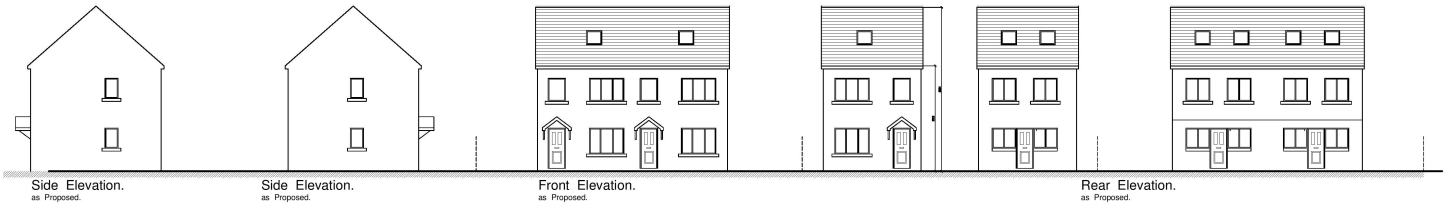
The energy produced by a discrete noise event averaged over one second, no matter how long the event actually took. This allows for comparison between different noise events which occur over different lengths of time.

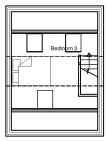
Weighted Sound Reduction Index (R_W)

Single number quantity which characterises the airborne sound insulation properties of a material or building element over a defined range of frequencies (R_W is used to characterise the insulation of a material or product that has been measured in a laboratory).

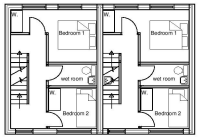
Appendix 2
Site Location and Noise Monitoring Positions

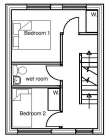
Appendix 3
Proposed Site Layout
(note: brown line indicates proposed 1800 mm solid fence and can include a solid gate to allow access into garden)



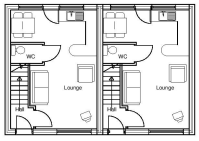


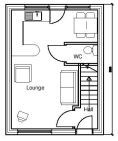
Attic Floor Plan
as Proposed.



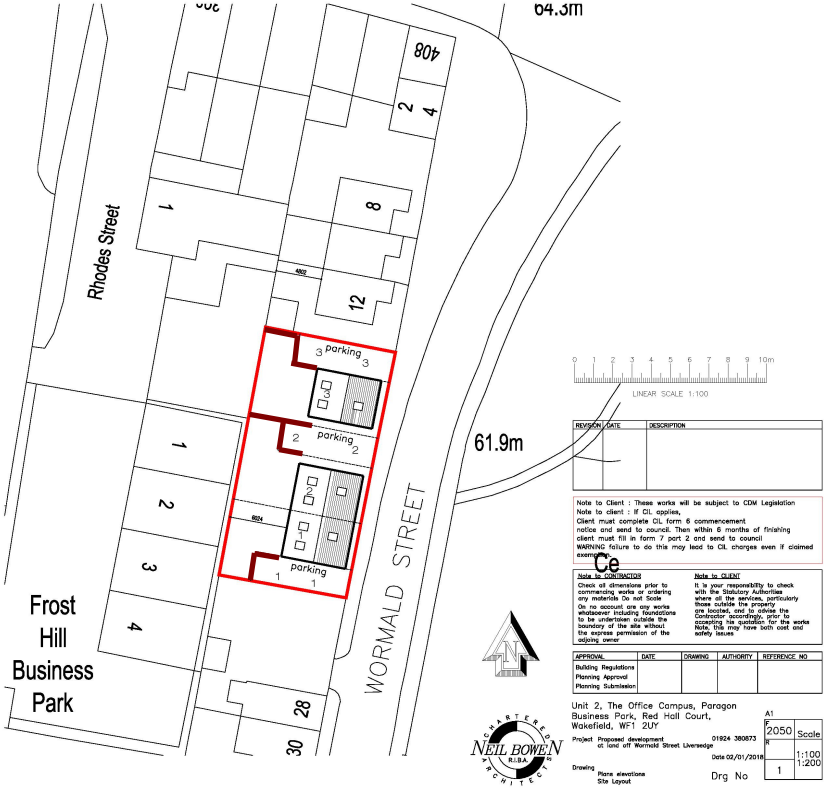


First Floor Plan
as Proposed.





Ground Floor Plan
as Proposed.



Appendix 4
BRE Building Envelope Sound Insulation Model

31 dB(A) reduction (62–31 = 31 dB) to road traffic noise