



TILBURY DOUGLAS

SANDILANDS PRIMARY SCHOOL

**NOISE IMPACT ASSESSMENT FOR PLANNING
PURPOSES**

27 March 2023

AEC REPORT: P4807/R1/NRS

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CONTENTS

	Page
1.0 INTRODUCTION	3
2.0 SITE DESCRIPTION	4
3.0 NOISE CLIMATE	5
4.0 BASIS OF ASSESSMENT	6
5.0 ASSESSMENT	11
6.0 SUMMARY & CONCLUSIONS	15
 APPENDIX A – Acoustic Terminology in Brief	 16
Appendix B – Noise Break-out Calculations	18

DOCUMENT STATUS

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Revision	Date	Document Details	Author	Checked By
-	27 March 2023	Original	NRS	AGB

1.0 INTRODUCTION

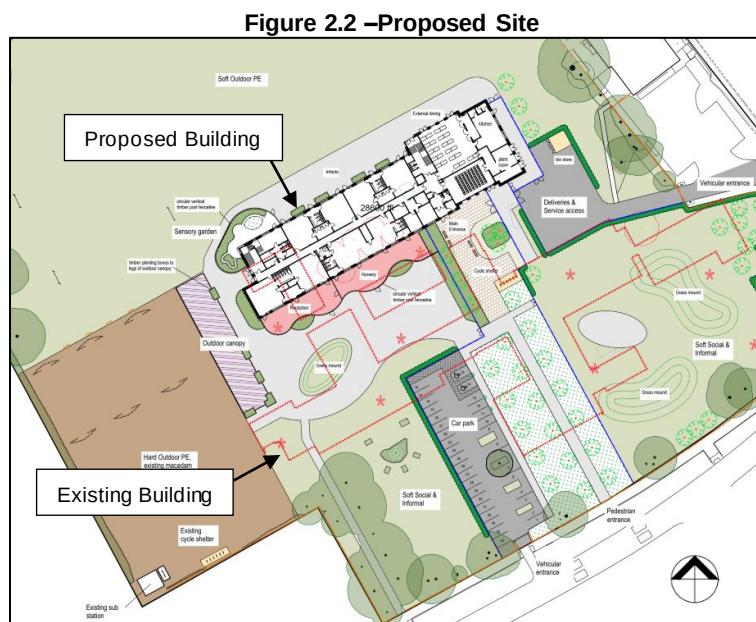
- 1.1 Acoustic & Engineering Consultants Limited (AEC) has been instructed by Tilbury Douglas to undertake a noise impact assessment for planning purposes for the proposed new Sandilands Primary School building, Manchester.
- 1.2 As part of the development, the existing and currently operational school buildings will be demolished.
- 1.3 This report presents details of the noise survey undertaken by others and an assessment considering noise break-out from activities within the school and atmospheric mechanical plant noise with reference to relevant standards and local authority guidance.
- 1.4 Although not forming part of the planning process, an outline assessment of anticipated internal noise levels is also presented.
- 1.5 Any assessment must consider that there is a school currently operating on the site and there are no reasons to expect any additional noise impact compared to the current situation.
- 1.6 Acoustic terminology used throughout this report is discussed in brief in Appendix A.

2.0 SITE DESCRIPTION

- 2.1 The site is bound by Wendover Road to the south, woodland to the north and residential properties to the east (Yattendon Avenue) and west (New Forest Road) as indicated on Figure 2.1, below.



- 2.2 The existing building to be demolished (red dotted line) and the proposed building is as identified in Figure 2.2, below.



- 2.3 The nearest noise sensitive receptors to the site will be residences on Yattendon Avenue to the north-east of the site.

3.0 NOISE CLIMATE

- 3.1 External noise levels were measured by 1st Horizon (1stH) as reported in their Noise Assessment report SL01-R02 dated 10 June 2021. Full details of the noise survey and results are presented in the 1stH report and are not therefore included in this report. However, a brief summary is presented below.
- 3.2 An attended noise level survey was undertaken approximately between 0900h and 1130h on Thursday 27 May 2021 at two locations as identified in Figure 3.1 below, which has been directly copied from the 1stH report.

Figure 3.1 – Noise Measurement Locations



- 3.3 Measurements were undertaken during a period when there was no national lockdown in place with regard to Covid-19 restrictions. In addition, the DEFRA noise map data for the site has been reviewed and the modelled noise levels are approximately in line with the worst-case noise levels measured by 1stH. As such, it is considered that the measured data is relevant.
- 3.4 Based on the reported noise levels, the anticipated free-field noise levels affecting all elevations of the new building are 49dBL_{Aeq,30mins} and 62dBL_{A01, 30mins}.
- 3.5 The 1stH report states that the measured noise levels were due to distant road traffic and birdsong.
- 3.6 During the measurement period, the typical daytime background noise level in the area was 39dBL_{A90,T} which represents a relatively low background noise level for the daytime period.

4.0 BASIS OF ASSESSMENT

National Planning Policy Framework

4.1 Current national planning policies are set out in the National Planning Policy Framework (NPPF) published by the Department for Communities and Local Government, dated March 2012, and revised in updated in July 2021. This document provides a framework for local planning authorities and decision makers when drawing up plans for housing and other development.

4.2 The planning policies which relate specifically to noise, are presented in paragraphs 174, 185 and 187 which are reproduced below:

“174. Planning policies and decisions should contribute to and enhance the natural and local environment by:

- (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 or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans.*

185. 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.*

187. 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.”

- 4.3 Further to the above, the Governments ‘*Planning Practice Guidance*’ (PPG) published on 6 March 2014 and updated on 22 July 2019 states:

‘Noise needs to be considered when development may create additional noise, or would be sensitive to the prevailing acoustic environment (including any anticipated changes to that environment from activities that are permitted but not yet commenced). When preparing plans, or taking decisions about new development, there may also be opportunities to make improvements to the acoustic environment. Good acoustic design needs to be considered early in the planning process to ensure that the most appropriate and cost-effective solutions are identified from the outset.’

- 4.4 In addition, the guidance indicates that, whilst noise can override other planning concerns, it is important to look at noise in the context of the wider characteristics of a development proposal, its likely users, and its surroundings, as these can have an important effect as to whether or not noise is likely to pose a concern.

- 4.5 When considering the acoustic environment in relation to plan-making and decision making, the PPG states that Local Authorities should consider:

- whether or not a significant adverse effect is occurring or is likely to occur;
- whether or not an adverse effect is occurring or likely to occur; and
- whether or not a good standard of amenity can be achieved.

- 4.6 The terms ‘*significant adverse*’ and ‘*adverse*’ above are referenced in the Noise Policy Statement for England (NPSE), published by Department for Environment, Food and Rural Affairs (DEFRA) dated March 2010. One of the main aims of this policy is also to avoid significant adverse effects on health and quality of life.

- 4.7 With respect to the two terms above, the explanatory note for the NPSE introduces two concepts from toxicology that are currently being applied to noise impacts, for example, by the World Health Organisation (WHO). They are:

- *“NOEL – No Observed Effect Level - 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.*
- *LOAEL – Lowest Observed Adverse Effect Level - This is the level above which adverse effects on health and quality of life can be detected.*

Extending these concepts for the purpose of this NPSE leads to the concept of a significant observed adverse effect level.

- *SOAEL – Significant Observed Adverse Effect Level - This is the level above which significant adverse effects on health and quality of life occur.”*

- 4.8 National Planning Practice Guidance (NPPG), an online resource, brings together the aims of the NPPG and NPSE and tries to indicate how can it be established if noise is likely to be a concern. To assist with this, the guidance presents a noise exposure hierarchy table which is reproduced as Table 4.1 below.

Table 4.1 – National Planning Policy Guidance - Noise

Response	Examples of Outcome	Increasing Effect Level	Action
No Observed Effect Level			
Not Present	No Effect	No Observed Effect	No specific measures required
No Observed Adverse Effect Level			
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level			
Present and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g., turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Present and disruptive	The noise causes a material change in behaviour and/or attitude, e.g., avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g., regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g., auditory and non-auditory	Unacceptable Adverse Effect	Prevent

Noise Break-in (BB93)

- 4.9 Although not a planning issue, noise break-in has been considered at this early stage and is included in the report for completeness. The aim will be to achieve the internal noise limits laid out in the Department for Education and Education Funding Agency's Building Bulletin 93 '*Acoustic design of schools – performance standards*' (Feb 2015) (BB93).

Atmospheric Plant Noise (BS 4142)

- 4.10 To assess potential atmospheric plant noise associated with the building consideration has been given to BS 4142:2014+A1:2019 '*Methods for rating and assessing industrial and commercial sound*' (BS4142). This standard describes methods for rating and assessing industrial and commercial sound by comparing the specific sound level, that is directly attributable to the industrial/commercial sound, to the prevailing background sound level ($dB_{LA90, T}$) over relevant periods that the activities occur.
- 4.11 It is necessary to determine the specific sound level from the industrial/commercial activities over a period of one hour during the daytime and/or 15 minutes during the night-time periods. Daytime is normally considered to be over the period 0700 to 2300 hours and night-time 2300 to 0700 hours.
- 4.12 Section 9 of BS4142 identifies that certain acoustic features can increase the significance of the impact over that expected from a basic comparison between the specific sound level and the background sound level. Where present at the assessment location, such features are taken into account by adding a correction to the specific sound level to obtain the noise rating level. A correction should be applied if one or more of the following features occur, or are expected to be present for new or modified sound sources.

Character	Correction
Tonality	0 to 6dB
Impulsivity	Up to 9dB
Other (neither tonal or impulsive but distinctive)	3dB
Intermittency	3dB

- 4.13 The significance of the potential impact is indicated by subtracting the background sound level from the noise rating level. Typically, the greater this difference, the greater the magnitude of the impact as described below.

Difference	Impact
+10dB or greater	Likely indication of significant adverse impact depending on the context
≈ +5dB	Likely to be an indication of an adverse impact, depending on the context.
0dB	indication of the specific sound source having a low 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 sound source will have an adverse impact or a significant adverse impact.

- 4.14 Furthermore, BS4142 states that the context of the noise will affect the overall significance of adverse impacts.

- 4.15 In addition, Manchester City Council's(MCC) '*Planning and Noise Technical Guidance*' (PNTG) – October 2022 states that:

“Externally mounted ancillary plant, equipment and servicing shall be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level of 5dB (L_{Aeq}) below the typical background (L_{A90}) level at the nearest noise sensitive location”

- 4.16 Based on the above, and a typical measured daytime background noise level of 39dB $L_{A90,15min}$, the rating level from all plant items combined would need to be limited to 34dB(A) at the residential properties.

Noise Break-out

- 4.17 It is understood that there might be music classes conducted in the Main Hall whose frequency is currently unknown.

- 4.18 MCC's PNTG states the following in terms of entertainment noise:

“Entertainment noise ($L_{Aeq,5min}$) should be controlled to 5dB below the typical background noise level (L_{A90}) in each octave band at the nearest noise sensitive location”

- 4.19 Noise from music classes are not strictly entertainment noise, but it is considered appropriate for music noise to be controlled to no greater than the prevailing background noise minus 5dB in each octave band frequency.

5.0 ASSESSMENT

Noise Break-in

External Noise

- 5.1 As identified above, with reference to the survey data, the anticipated free-field ambient noise level affecting all elevations of the new building is 49dBL_{Aeq,30mins}.

Ventilation

- 5.2 The proposals are for a natural / hybrid ventilation solution. BB93 states that when using natural ventilation methods, appropriate indoor ambient noise levels (IANL)s can be achieved when external noise levels do not exceed those presented in Table 5.1 below.

Table 5.1 – Maximum Acceptable External Noise Level to Allow for Natural Ventilation Provision

Space	IANL, dBL _{Aeq,30mins}	External Free-field Limit, dBL _{Aeq, 30min}	
		Single Side Ventilated Space	Cross, or Roof Ventilated Space
SEN teaching space	30	46	50
Classroom / Small Group Room / SEN Therapy / Main Hall / Studio	35	51	55
Library / Office / Staff Room / Interview Room / Food Bay / Staff (Prep and Social)	40	56	60
Corridors / Entrance / Circulation Space not used for learning	45	61	65
Kitchen / Toilets / Hygiene	50	66	70

- 5.3 Considering the above, if natural (or hybrid) ventilation incorporating cross or roof ventilation is used, all spaces including SEN teaching spaces can be ventilated via opening windows and BB93 requirements should be complied with.
- 5.4 The above demonstrates that external noise levels affecting the building will not be significant. This element is still being finalised and will be agreed with stakeholders as part of the detailed design.

Windows

- 5.5 Calculations demonstrate that glazing that provides a sound insulation performance of 29dBR_w and 25dBR_w+C_{tr} would appropriately control external to internal noise levels. This level of acoustic performance can be achieved using any standard of double thermal glazing.

Atmospheric Plant Noise

- 5.6 External plant will be located on the first-floor concrete roof to the north-east of the proposed building as identified on Figures 5.1 and 5.2 below.

Figure 5.1 – Plant Location and Items

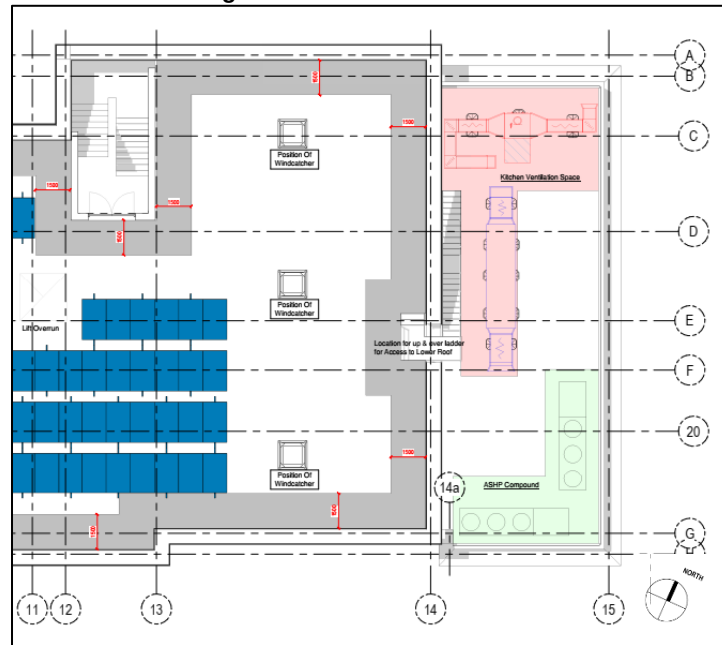


Figure 5.2 – Roof Top Plant Layout



- 5.7 The plant is located approximately 67m to the nearest residential property on Yattendon Avenue.

5.8 The following items will be located on the rooftop:

- 1 No. Air Handling Unit (AHU) (model currently unknown) with appropriate attenuation;
- 1 No. Kitchen Extract (model currently unknown) with appropriate attenuation;
- 1 No. Kitchen Supply (model currently unknown) with appropriate attenuation;
- 2 No. Lochinvar Air Source Heat Pumps (ASHP) model LAHP-1454HTS.

5.9 Based on AEC's extensive experience, a reasonable noise limit for an attenuated AHU and attenuated kitchen extract and supply would be a level of 65dB(A) at 1m (45dB(A) at 10m). Using this data and manufacturer's provided plant noise data for the ASHPs, anticipated plant noise levels at the nearest residential receptor window are presented in Table 5.2 below.

Table 5.2 – Total Plant Noise Levels at the Nearest Receptor Window

Item (No of Units)	Noise Level @10m per Item	Total Noise Level @10m*	Increased distance attenuation (10m to 67m)	Reduction due to Acoustic screening (via roof edge)	Resultant Noise level @ Residential
AHU (x1)	45dB(A)	45dB(A)*	-17dB	-6dB	22dB(A)
Extract Fan (x1)	45dB(A)	45dB(A)*	-17dB	-6dB	22dB(A)
Supply Fan (x1)	45dB(A)	45dB(A)*	-17dB	-6dB	22dB(A)
ASHPs (x2)	56dB(A)	59dB(A)*	-17dB	-6dB	36dB(A)
TOTAL COMBINED PLANT NOISE LEVEL					37dB(A)

* (Based on total number of units – see left hand column and the bullet points above)

5.10 Based on the above, the combined plant noise level is calculated to be below the prevailing daytime background noise level of 39dBL_{A90,T}, but above the required limit of 34dB(A).

5.11 However, in the context that there is already a school operating on the site, based on BS4142 guidance it is concluded that the predicted plant noise level represents a low adverse impact and should therefore be considered acceptable.

5.12 If the above is not acceptable to MCC, an acoustic screen would need to be provided around the air source heat pumps or quieter units selected. The acoustic screen can be in the form of any solid screen with a mass per unit area of approximately 10kg/m².

Noise Break-out

- 5.13 In terms of music noise break-out, the Main Hall, where music classes are proposed to take place, is located on the northern façade of the building, approximately 70m from the nearest residential window.
- 5.14 With reference to the Institute of Acoustics proceedings (Volume 27, Part 2) for the Spring Conference 2005, noise levels due to drums would create the highest potential noise levels in a school. These would be no greater than $100\text{dBL}_{\text{Aeq}}$ in each octave band centre frequency.
- 5.15 However, the above noise levels relate to drums played loudly in a small practice room. Considering the size of the Main Hall (floor area of 150m^2) noise levels of no greater than $88\text{dBL}_{\text{Aeq}}$ in each octave band centre frequency would be more appropriate.
- 5.16 Using this data, noise break-out calculations have been undertaken based on windows to the Main Hall being closed and following elements:
- Glazing – 29dBR_w ($25\text{dBR}_w + C_{tr}$);
 - Lightweight roof – at least 27dBR_w ;
 - External wall – approximately 60dBR_w ;
 - Windcatcher – at least $26\text{dBD}_{n,e,w}$.
- 5.17 An example calculation is provided in Appendix B and based on an equivalent calculation undertaken for each element, noise break-out from drums being played in the Main Hall would be around $32\text{dBL}_{\text{Aeq,T}}$ external to the residences, which is 7dB below the prevailing background noise levels of $39\text{dBL}_{\text{A90,T}}$.
- 5.18 In addition, the calculated level is also 5dB below the prevailing background noise level in each of the octave band frequency.
- 5.19 Therefore, provided that windows remain closed and that the sound insulation performance of the various external envelope elements achieve the above values, when drums are played or other loud amplified music is played in the Hall, there would be a low or no adverse impact from music noise break-out and this would be acceptable.
- 5.20 It should be noted that the sound insulation performances for the roof and walls are based on the currently proposed constructions and a wall with a lower sound insulation performance would also appropriately control noise break-out.

6.0 SUMMARY & CONCLUSIONS

- 6.1 AEC has undertaken a noise impact assessment for planning purposes in relation to the proposed new Sandilands Primary School building, Manchester.
- 6.2 Based on the noise data measured by others, the worst-case noise levels affecting the school building would be some 49dB_{L_{Aeq}, 30mins}. Furthermore, daytime background noise levels affecting the nearest residential properties would typically be around 39dB_{L_{A90}, 15min}.
- 6.3 An initial assessment has been undertaken in relation to achieving appropriate internal noise levels within the building, in line with the requirements of BB93. If natural (or hybrid) ventilation incorporating cross or roof ventilation is used, all spaces including SEN teaching spaces can be ventilated via opening windows and BB93 requirements should be complied with.
- 6.4 An assessment of noise due to the rooftop mechanical plant items has been undertaken which has demonstrated that plant noise affecting the nearest residential properties on Yattendon Avenue would be below the prevailing background noise level, but above the required limit of 34dB(A).
- 6.5 However, considering the context of the site, i.e. there is an existing school on site, the predicted plant noise levels are considered to represent a low impact and should therefore be considered acceptable.
- 6.6 If the above is not acceptable to MCC, quieter ASHP's would need to be selected or a solid screen ($\geq 10\text{kg/m}^2$) would need to be installed around these units.
- 6.7 With regard to noise break-out from the Main Hall, even with drums playing in this room, provided that windows remain closed based on the currently proposed external wall and roof constructions and a moderate sound insulation performance provided by the windcatchers and glazing (defined above), noise due to drums would be more than 5dB below the prevailing background noise levels. As such, potential music noise from within the building would have a low adverse impact.
- 6.8 Based on the above, noise should not be considered a determining factor in relation to the planning permission being sought.

APPENDIX A – Acoustic Terminology in Brief

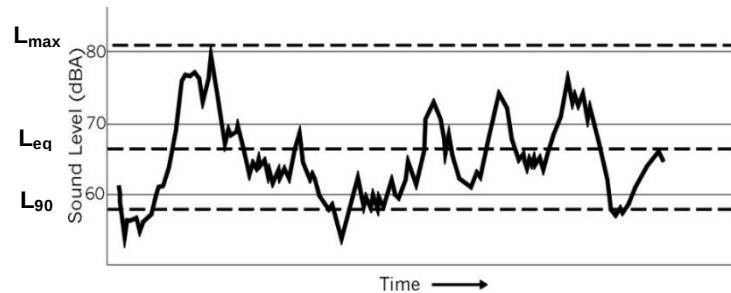
General

Sound is produced by mechanical vibration of a surface, which sets up rapid pressure fluctuations in the surrounding air. The rate at which the pressure fluctuations occur determines the pitch or *frequency* of the sound. The frequency is expressed in Hertz (Hz), that is, cycles per second. The human ear is sensitive to sounds from about 20 Hertz to 20,000 Hertz. Although sound can be of one discrete frequency - a 'pure tone' - most noise is made up of many different frequencies.

The human ear is more sensitive to some frequencies than others, and modern instruments can measure sound in the same subjective way. This is the basis of the A-weighted sound pressure level *dBA*, normally used to assess the effect of noise on people. The dBA weighting emphasizes or reduces the importance of certain frequencies within the audible range

Sound / Noise Units

The figure below shows an example of sound level varying with time. Because of this variation over time the same period of noise can be described by several different levels. The most common of these are described below.



Commonly Used Descriptors for Sound / Noise

$L_{Amax,F/S}$	The maximum (A-weighted) sound level measured during a given time. 'Fast' or 'Slow' meter response should be cited.
$L_{Aeq,T}$	The equivalent continuous (A-weighted) sound level. It may be thought of as the "average" sound level over a given time, T. It is used for assessing noise from various sources: industrial and commercial premises, construction sites, railways and other intermittent noises. It can be considered as the "ambient" noise level.
$L_{A90,T}$	The (A-weighted) sound level exceeded for 90% of a measurement period. It is the value often used to describe the "background" noise.
$L_{A1,T}$	The (A-weighted) sound level exceeded for 1% of a measurement period. It is the value generally used to indicate a 'typical' maximum noise level.
Free-field Level	This refers to the sound level measured outside, away from reflecting surfaces.

Other Common Acoustics Descriptors

R_w	Single number rating used to describe the <u>laboratory</u> airborne sound insulation properties of a material or building element over a range of frequencies, typically 100-3150Hz.
R'_w	Apparent sound reduction index - Single number rating used to describe the sound reduction index of an on-site construction over a range of frequencies, typically 100-3150Hz.
C_{tr}	A road traffic spectrum adaptation term which is used to describe the low frequency sound insulation performance of building elements.
Ambient Sound Level, L_{Aeq, T}	Equivalent continuous A-weighted sound pressure level of the totally encompassing sound in a given situation at a given time, usually from many sources near and far, at the assessment location over a given time interval, T.
Background Sound Level, L_{A90}	A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, measured using time weighting, F, and quoted to the nearest whole number of decibels.
Rating Level, L_{Ar, Tr}	Specific sound level plus any adjustment for the characteristic features of the sound
Residual Sound, L_{Aeq, T}	Ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound.
Specific Sound Level, L_{Aeq, Tr}	Equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, <i>t</i> .

Appendix B – Noise Break-out Calculations

	Contract No: P4807		Date: 09-Mar						
	Client: Tilbury Douglas								
	Project: Sandilands		Consultant: NRS						
NOISE BREAK OUT TO OUTSIDE									
Noise Source	Music noise								
	Corrections to obtain L_p at element ? (eg distance/directivity)								
Building & Element	Window								
Area (S)	25 m ²	Width(a)=	7 m	Height(b)= 4 m					
Position Directivity (Q)	4	(=4 for a wall, 2 for a roof)							
Additional Directivity									
Receiver	Residential								
Distance (R) from element	70 m								
Propagation Corrections									
Barrier	0								
Façade	0								
Calculation									
Frequency, Hz	63	125	250	500	1k	2k	4k	8k	dBA
Internal Level, dB	88	88	88	88	88	88	88	82	94
Internal Corrections, dB	0	0	0	0	0	0	0	0	
Corrected Internal Level, Lin, dB	88	88	88	88	88	88	88	82	94
SRI of Element, dB	16	21	17	25	35	37	31	31	29dBRw 4/16/4
Additional Directivity, dB									
Propagation Corrections									
Barrier, dB	-5	-5	-5	-5	-5	-5	-5	-5	
Façade, dB	-3	-3	-3	-3	-3	-3	-3	-3	
Level (1) at Receiver	30	25	29	21	11	9	15	9	24
Level (2) at Receiver	28	23	27	19	9	7	13	7	22
Criterion	51	43	38	36	34	31	24	19	39 Measured B
Shortfall (1)	-21	-18	-9	-15	-23	-22	-9	-10	
Shortfall (2)	-23	-20	-11	-17	-25	-24	-11	-12	
Calculation Method	(1)	$L_p = L_{in} - R - 6 + 10\log(S) - 20\log(R) - 11 + 10\log(Q)$							
	(2)	$L_p = L_{in} - R - 6 + 10\log(ab/(pi^2 \cdot R^2)) + 10\log(Q/2)$							