

NOISE IMPACT ASSESSMENT

FORMER TACK LEA WORKS, ROCHDALE

REPORT REFERENCE NO. J003941-5711-JP-01

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This report has been prepared based upon a scope of works and associated resources agreed between the client and Philip Dunbavin Acoustics Ltd (PDA). This report has been prepared with all reasonable skill, care and diligence and has been based upon the interpretation of data collected. This has been accepted in good faith as being accurate and valid at the time of the collection. This report has been based solely on the specific design assumptions and criteria stated herein.



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1.0 SUMMARY

At the request of Aster Planning LLP, PDA Ltd has conducted an assessment of the ambient noise climate for the proposed residential scheme at the Former Tack Lea Works, Rochdale.

Noise levels at the site are dominated by road traffic noise from Bury and Rochdale Old Road which runs along the southern boundary of the proposed site.

Mitigation is proposed to the building envelopes to ensure that internal noise levels within habitable areas are suitable for resting and sleeping and are in accordance with the requirements of the NPPF and BS 8233:2014 “Guidance on sound insulation and noise reduction for buildings”. Noise mitigation advice for the proposed residential facades is given in **Section 7.0** of this report in the form of treatment to the glazing and ventilation.



2.0 BRIEF FOR CONSULTANCY

PDA Ltd was engaged to carry out the following:

A. Noise Survey

We will travel to site at  and carry out an ambient noise survey to assess the level of noise incident upon the proposed development. The measurement will include for noise from the adjacent Bury and Rochdale Old Road, and other local noise sources.

We would propose to undertake manned measurements between the hours of 22:00 – 01:00 hours and 06:00 – 10:00 hours representative of daytime and night time hours at the site. Alternatively, if a secure location can be provided within the existing site, unmanned measurements with audio recordings over a full night time may be possible.

We will carry out all noise surveys in accordance with the provisions of BS7445 “Description and Measurement of Environmental Noise”. The measurements made will include both dBA and octave band noise levels including L_{eq} , L_{max} and L_{90} parameters. During the survey duration, we will require unrestricted access to the site.

B. Survey Processing and Report

The results of the noise survey will be assessed in line with the requirements of the National Planning Policy Framework (NPPF). We will carry out basic calculations, based on available room data/drawings, to predict internal noise levels within the development to compare with good practice guidance criteria, e.g., BS8233:2014, and develop specifications for the building facades, glazing and ventilation elements.

We will produce a report detailing all survey procedure, measurements and results suitable for submission to the Local Authority in support of your planning application. We will suggest a scheme of sound insulation works (typically windows and ventilation openings) to ensure suitable internal noise levels within the development.

3.0 SITE DESCRIPTION

The proposed site is currently unused and was formerly the Tack Lea Works site on Bury and Rochdale Old Road. It is proposed to develop 27 no. houses and 6 no. apartments at the site.

4.0 ASSESSMENT CRITERIA

4.1 National Planning Policy Framework

National Planning Policy is guided by the National Planning Policy Framework (NPPF) updated in July 2021. With regard to Noise the Framework states the following;

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

- *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.*

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:

- *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;*
- *identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.*

The terms 'significant adverse impact' and 'adverse impact' are defined in the explanatory notes of the 'Noise Policy Statement for England (NPSE)' which states;

There are two established concepts from toxicology that are currently being applied to noise impacts, for example, by the World Health Organisation. 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.

The notes also offer an explanation of the term 'adverse impacts' as follows;

... refers to the situation where the impact lies somewhere between LOAEL and SOAEL. It requires that all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development (paragraph 1.8). This does not mean that such adverse effects cannot occur.

Although no specific noise limits for LOAEL and SOAEL have been defined, in 2014 and updated in July 2019 the UK Government published a planning practice guidance document for noise which indicates where these limits fall with relation to the perception of noise. A summary is reproduced in Section 4.2



below. It is considered that guidance from other acoustic standards may be employed to determine suitable levels within the overall principal of the National Planning Policy Framework.

The National Planning Policy Framework also states:

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.

The focus of planning policies and decisions should be on whether proposed development is an acceptable use of land, rather than the control of processes or emissions (where these are subject to separate pollution control regimes). Planning decisions should assume that these regimes will operate effectively. Equally, where a planning decision has been made on a particular development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities.

4.2 Planning Practice Guidance – Noise

In March 2014 (updated July 2019) the UK Government published further guidance on the assessment of noise for planning purposes in the form of the on-line publication, Planning Practice Guidance on noise (<http://www.gov.uk/guidance/noise--2>). This document offers further guidance on the typical levels which constitute the NOEL, LOAEL and SOAEL. The relevant section is reproduced in the table below;

Table 1. Planning Practice noise level guidance

Response	Examples of Outcomes	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, attitude or other physiological response. 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, attitude or other physiological response, 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 small actual or 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, attitude or other physiological response, 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
Present and very disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

It is notable from the above planning guidance that development should not normally be permitted above Significant Observed Adverse Effect Levels, and should aim to minimise Other Adverse Effect Levels (below SOAEL but above LOAEL). However, it is clear that noise is permitted to approach and/or exceed the Lowest Observed Adverse Effect Level, providing that noise is mitigated and reduced to a minimum.

4.3 BS8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings

BS8233 proposes acceptable noise levels for new residences. The guidance within BS8233 has been revised and updated in 2014 to take into account the most recent research and expert opinion on suitable noise levels for new developments.

With regard to residential development BS8233 gives the following criteria;

Table 2. BS8233:2014 indoor ambient noise levels for dwellings

Activity	Location	Design range $L_{Aeq,T}$	
		Daytime (07:00 - 23:00)	Night-time (23:00 – 07:00)
Resting	Living rooms	35	-
Dining	Dining room / area	40	-
Sleeping (daytime resting)	Bedroom	35	30

The above criteria apply to steady external noise sources, such as road traffic. Where specific noise events are likely to occur during the night time BS8233:2014 gives the following guidance:

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 $L_{Amax,F}$, depending on the character and number of events per night. Sporadic noise events could require separate values.

WHO guidelines for Community Noise indicates that exceedances of 45 dB L_{Amax} for single sound events should be limited to no more than 10 – 15 times per night, when measured with a 'fast' time weighting.

With regard to external areas of residential developments BS8233:2014 states the following;

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.

4.4 Building Regulations Approved Document O

Approved Document O of the Building Regulations was published in December 2021 and updated in February 2022 and hence contains the latest guidance with regard to overheating in dwellings. With relation to the conflict between noise and overheating the document states:

Noise

- 3.2 In locations where external noise may be an issue (for example, where the local planning authority considered external noise to be an issue at the planning stage), the overheating mitigation strategy should take account of the likelihood that windows will be closed during sleeping hours (11pm to 7am).
- 3.3 Windows are likely to be closed during sleeping hours if noise within bedrooms exceeds the following limits.
 - a. 40dB $L_{Aeq,T}$ averaged over 8 hours (between 11pm and 7am).
 - b. 55dB L_{AFmax} more than 10 times a night (between 11pm and 7am).

5.0 SURVEY DETAILS

5.1 Survey Times & Personnel

An unattended noise survey was carried out between 12:15 hours on 01/08/2022 and 10:55 hours on 02/08/2022. The survey was set up by Jack Perry BEng (Hons) of PDA Ltd.

5.2 Equipment

The survey was conducted using an NTi XL2 sound level meter (Position 1 - serial no. A2A-15820-E0) and a Rion NL52 sound level meter (Position 2 - serial no. 810315). Both the XL2 and NL52 are Class 1 sound level meters in accordance with EC 61572-1:2002.

Both microphones were fitted with all-weather windshields throughout the duration of the survey and mounted on a tripod at 1.5m height above ground. Both sound level meters were field calibrated before and after the survey during which time no significant deviation from the calibrated level was observed. Calibration certificates for both sound level meters are retained on file and are available upon request.

All measurements were taken at least 3.5m from building façades/structures within open space, and can therefore be assumed to be free-field measurements. All measurements were undertaken with a fast time-weighting and broadband statistics were measured throughout; in addition the NTi XL2 measured octave band spectra.

5.3 Weather

Throughout the survey the weather was largely dry with some rain showers. Temperatures ranged from 17°C - 23°C and average wind speeds varied from 2m/s – 5m/s. The weather was considered conducive to undertaking noise measurements.

5.4 Measurement Locations

A noise level survey was undertaken in the vicinity of the site to determine the existing noise climate. The measurement positions were approximately at the nearest proposed façade position to Bury and Rochdale Old Road and a secondary position to the rear of the site away from the road.

The site layout and measurement positions are shown in **Figure 1** below.



Figure 1. Site layout and measurement positions.

5.5 Subjective Noise Sources

Subjectively, the noise climate in vicinity of the site was dominated by road traffic noise from the adjacent Bury and Rochdale Old Road. The road traffic included cars, HGVs, buses and motorbikes.

Additional intermittent noise sources contributing at the measurement position included bird song (i.e. dawn chorus). The noise levels at the western end of the site (as per Position 2) are lower due to the embankment between the site and the road which provides shielding of the road.

5.6 Measured Survey Results

Table 3 below shows a summary of the measured noise levels from the survey.

Table 3. Measured ambient noise levels - August 2022

Position	Period	L _{Aeq} [dB]	Octave Band L _{Aeq} (Hz) [dB]								L _{Amax} [dB]*
			63	125	250	500	1k	2k	4k	8k	
1	Day	62	63	58	55	55	59	55	52	49	-
	Night	56	56	50	46	47	57	49	47	45	76
2	Day	53	-	-	-	-	-	-	-	-	-
	Night	48	-	-	-	-	-	-	-	-	63

* There were 2 no. high noise events at 89 and 86 dB(A) L_{max} at Position 1 and 73 and 72 dB(A) L_{max} at Position 2 respectively, due to emergency services sirens. Values above represent the highest typical L_{Amax} level.

Note – There are no octave band levels for Position 2 as this measurement position was used as a reference for the noise level difference at the rear of the site away from the road.

6.0 NOISE PROPAGATION MODELLING

6.1 Calculation Procedure

In order to assess the noise levels incident on the façades of the proposed development, the measured noise levels shown in **Table 3** have been used in a SoundPLAN noise propagation model. SoundPLAN software uses the method of ISO 9613 “Acoustics – attenuation of sound during propagation outdoors – general method of calculation” and takes into account geometric spreading, ground effects, air attenuation, barrier attenuation and reflections.

The worst case calculated façade noise levels for each façade have been used in the building envelope assessment to specify building envelope elements.

6.2 Calculation Results

The daytime (07:00 – 23:00 hours) and night time (23:00 – 07:00 hours) results from the noise propagation model are shown in **Figure 2** & **Figure 3** below.

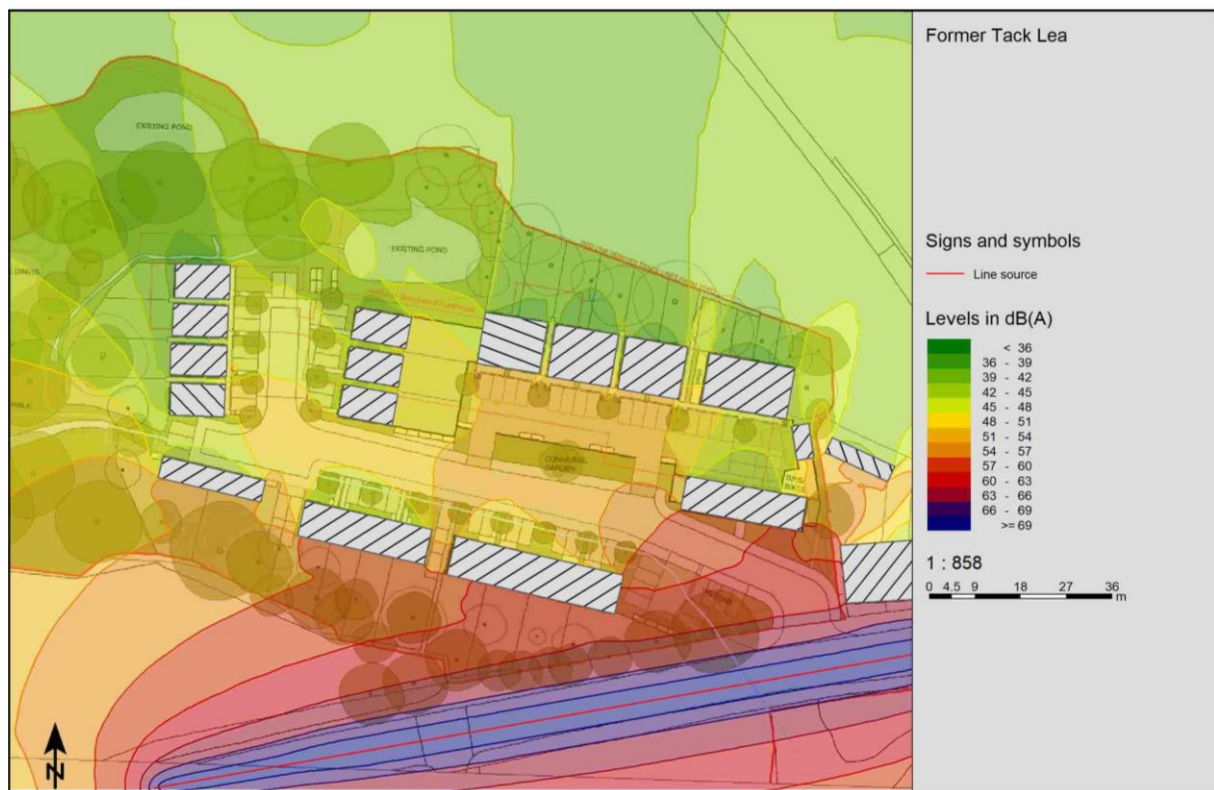


Figure 2. Daytime calculated noise levels.

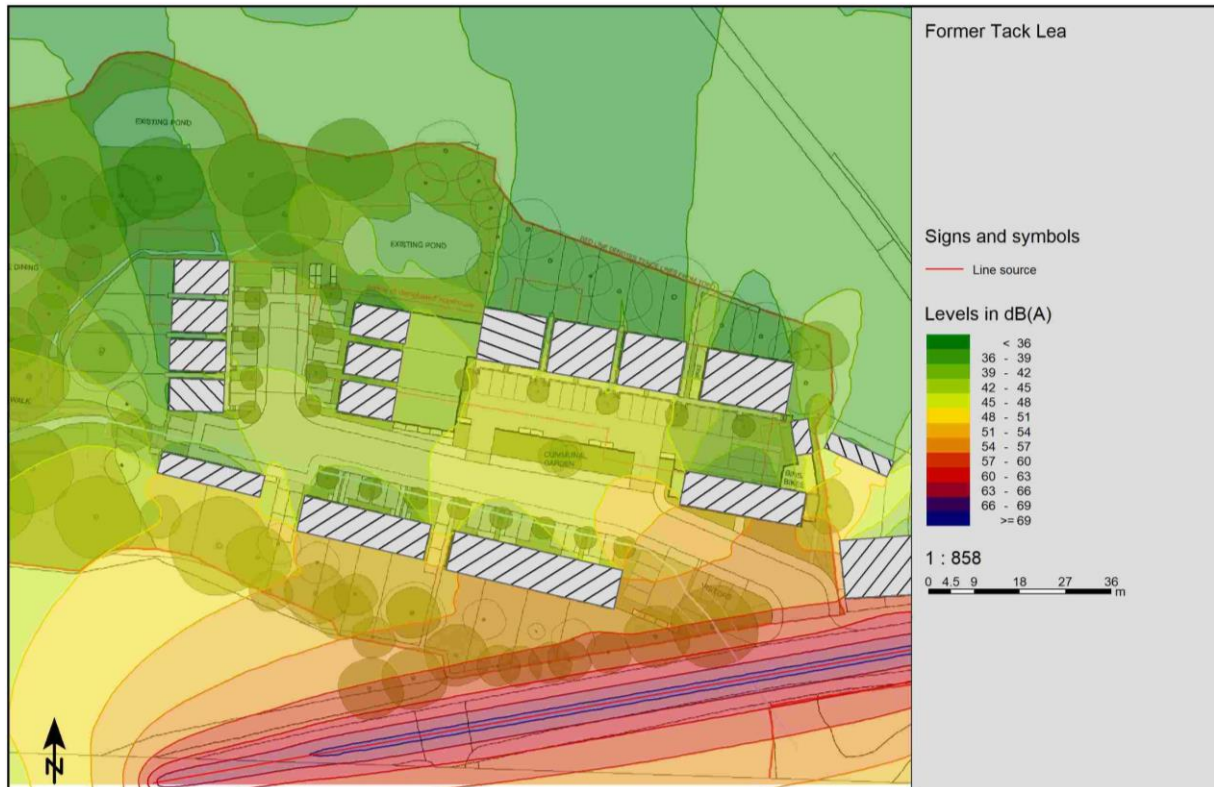


Figure 3. Night time calculated noise levels.

6.3 Discussion

The Soundplan noise model has been used to determine the $L_{Aeq,16\text{hour}}$ daytime and $L_{Aeq,8\text{hour}}$ night time and L_{Amax} noise levels incident upon the façades of the proposed buildings. It is PDA's experience that developments with the measured noise levels above are suitable for residential development provided that adequate acoustic attenuation is provided to habitable areas.

Considering the acoustic weak points of a building façade, typically the glazing and ventilation elements, calculations have been undertaken to determine potential internal noise levels. These levels are compared with the criteria detailed in Table 2, derived from the British Standard guidance in Section 4.3.

7.0 NOISE INGRESS CALCULATIONS & MITIGATION

7.1 Building Envelope Elements

Noise ingress calculations are based on typical room dimensions for habitable spaces within residential dwellings. The following construction elements have been used to model the external building envelope.

7.1.1 Walls

The exact wall construction has not been confirmed, for the purposes of this assessment it is assumed that the proposed facades will be typical cavity wall construction rated at least 51 dB R_w laboratory sound insulation. The final selected construction should be checked by PDA to ensure that the break-in to habitable rooms is not compromised.

7.1.2 Glazing

As the glazing is the acoustically weak area of the façade, the noise level incident on the façade will determine the type of glazing specified.

7.2 Design Assumptions

Assessment and specification of the acoustic performance of the building envelope and suitable glazing and ventilation has been undertaken based on achieving internal ambient acoustic conditions specified in **Section 4.3** above.

Information on the sound insulation properties for specific element details have been obtained from manufacturer test data.

For the purposes of the noise ingress calculations, typical room dimensions for habitable spaces within residential dwellings have been used.

7.2.1 Room Dimensions & Volumes

The typical room dimensions and volumes used in the assessment are shown in **Table 4** below.

Table 4. Typical room dimensions.

Room	External Wall Area m ² (excluding window)	Window Area m ²	Room Volume m ³
Bedroom	5.7	1.8	25
Living Room/Kitchen	5.1	7.4	50

7.3 Calculated Noise Levels

Noise ingress through the proposed building façade has been calculated in octave frequency bands using the detailed method of BS8233:2014, taking into account the octave band sound reduction of the façade elements, façade element areas, room volumes and reverberation times in the finished rooms. For the purposes of calculation, the finished room reverberation time has been assumed to be 0.5 seconds in all frequency bands in habitable rooms. The calculated octave band internal noise levels have then been used to determine the overall A-weighted noise level in the habitable rooms which have been compared to the criteria of **Section 4.3**. Glazing and ventilation specifications have been selected to ensure that the criteria of **Section 4.3** are achieved within the proposed dwellings.

Table 5. Glazing & ventilator schedule for habitable rooms.

Dwelling façade	Room	Minimum Glazing Rating R_w dB	Minimum combined Ventilator Rating $D_{n,e,w}$ dB	Internal Noise Level Target $L_{Aeq,T}$ dB Day/Night	Calculated Internal Noise Level $L_{Aeq,T}$ dB Day/Night ¹	Internal Noise Level target L_{Amax} dB Night	Calculated Internal Noise Level L_{Amax} dB Night ^{1,2}
Facing Road (red in Figure 4)	Living/Kitchen	31	38	35/-	32/-	-	-
	Bedroom	35	38	35/30	31/24	45	45
Screened from road	Living/Kitchen	31	31	35/-	30/-	-	-
	Bedroom	31	31	35/30	31/25	45	42

Notes

1 Calculated noise levels assuming closed windows and allowing for an inlet vent of specification detailed.

2 Calculated L_{Amax} noise level typically not exceeded more than 10 times per night as per WHO Guidance.



Figure 4. Site Layout and proposed mitigation.

7.4 Glazing

Table 6 below gives the required glazing sound insulation performance in octave frequency bands, together with typical glazing products which achieve the required sound insulation. Any alternative products should meet the given sound insulation performance in each octave frequency band to ensure that the internal noise levels specified in **Table 5** are achieved.

All sound insulation values quoted above must be achieved by the overall **combination of frame and glazing**, and not just by the glazing alone. The frame should not reduce the performance of the system overall. Glazing framing systems must be fully sealed with any small gaps (<10mm nominal) around the perimeter to be stuffed with dense mineral wool to full frame depth and sealed both sides with acoustic non-setting mastic, with additional weathering protection to be applied additionally externally to this. No gaps should be left unsealed.

Table 6. Required glazing performance (minimum).

R_w	Typical example (mm glass / mm cavity / mm glass)	Frequency band [Hz]						
		63	125	250	500	1000	2000	4000
31	4/12/4mm	20	24	20	25	35	38	35
35	6/12/8mm	23	23	23	30	38	36	43

7.5 Ventilation

Ventilation indicated in **Table 7** will be required as an alternative to open windows in order to achieve the design criterion. Our calculations have allowed for one of the specified vent types in each habitable room. The acoustic specification relates to the combined performance of all ventilation elements. Where two or more ventilators are required to meet the ventilation requirement, the acoustic performance for a single ventilator must be selected so that the combined performance is as stated in the table below, e.g. for 2 no. ventilators, the acoustic performance of each will need to be $D_{n,e,w}$ 38 dB to meet a combined $D_{n,e,w}$ 41 dB specification. Requirements should be checked with the manufacturer.

Table 7 gives the required acoustic performance of the specified vents in octave frequency bands, together with typical products which achieve the required sound insulation. Any alternative vent should achieve the same performance or greater in each octave band.

Table 7. Required ventilator performance (minimum).

$D_{n,e,w}$	Typical example vent	Frequency band [Hz]						
		63	125	250	500	1000	2000	4000
31	Simon Framevent	32	36	33	33	31	29	31
38	Simon Acoustic EHAS	36	40	36	34	35	44	40

Please note that the specification of vents is in terms of acoustic performance only. It should be checked by others that the ventilation requirements of the Building Regulations are also met.

As an alternative to façade vents, a mechanical ventilation system could be used. Bear in mind that with any fan-assisted ventilation systems it should be ensured that the fan itself does not exceed the noise criteria as specified in **Section 4.3**.

7.6 Purge Ventilation and summer cooling

The sound insulation of the façade relies on the windows remaining closed with ventilation provided by means of the attenuated vents specified in Section **Error! Reference source not found.** above. During times when windows are open internal noise levels are likely to exceed the criteria of Section 4.3.

With regard to purge ventilation BS 8223:2014 states:

“The Building Regulations’ supporting documents on ventilation recommend that habitable rooms in dwellings have background ventilation. Where openable windows cannot be relied upon for this ventilation, trickle ventilators can be used and sound attenuating types are available. However, windows may remain openable for rapid or purge ventilation, or at the occupant’s choice.”

BS8233:2014 further states:

“if partially open windows were relied upon for background ventilation, the insulation would be reduced to approximately 15 dB, resulting in the target levels being exceeded. However, windows may still be openable for rapid or purge ventilation, or occupant’s choice’.

Approved Document O of the Building Regulations was published in December 2021 and updated in February 2022 and hence contains the latest guidance with regard to overheating in dwellings. With relation to the conflict between noise and overheating the document states:

Noise

- 3.2 In locations where external noise may be an issue (for example, where the local planning authority considered external noise to be an issue at the planning stage), the overheating mitigation strategy should take account of the likelihood that windows will be closed during sleeping hours (11pm to 7am).
- 3.3 Windows are likely to be closed during sleeping hours if noise within bedrooms exceeds the following limits.
- 40dB $L_{Aeq,T}$ averaged over 8 hours (between 11pm and 7am).
 - 55dB L_{AFmax} more than 10 times a night (between 11pm and 7am).

BS8233:2014 suggests, *‘if partially open windows were relied upon for background ventilation, the insulation would be reduced to approximately 15 dB’.*

Therefore where the sound insulation at the façade exceeds approximately 55 dB $L_{Aeq,T}$ averaged over 8 hours during the night time, or 70 dB L_{AFmax} , more than 10 times a night during the night time, ADO would suggest that open windows are unlikely to be a practical form of mitigation.

For the proposed residential dwellings, the noise modelling would suggest that either of the above values would be exceeded for the façades marked red in Figure 4. Therefore, Building Regulations ADO would suggest that where a room is expected to overheat, for the above identified façades, alternative means of ventilation to standard opening windows may be required, e.g. acoustic ventilators/louvres or staggered opening sound paths or mechanical ventilation. The proposed form of mitigation must not compromise the sound insulation provided by the glazing/passive ventilators proposed to meet the criteria in Section 7.3.

7.7 External Areas

With regard to external areas of residential developments BS8233:2014 states the following;

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.

It is noted that the measured noise level at Position 2 was 53 dB L_{Aeq} during the daytime, which indicates that at the rear of the site or where the road is screened, the good practice guidance noise values may be achieved.

For the gardens that front the road, an acoustic barrier fence may be used to screen the gardens. The typical specification of a barrier fence is that it may be made from any suitable material (e.g. brick wall or timber fence) with a minimum mass per unit area of 15kg/m². The fence should be imperforate e.g. close boarded timber, and have no gaps at the base or between adjoining panels. The fence should be tall enough to effectively block line of sight between receivers and the surrounding noise sources, i.e. typically 2m in height.

8.0 CONCLUSION



At the request of **Asteer Planning LLP**, PDA Ltd has conducted an assessment of the ambient noise climate for the proposed residential scheme at the Former Tack Lea Works, Rochdale.

Noise levels at the site are dominated by road traffic noise from Bury and Rochdale Old Road which runs along the southern boundary of the proposed site.

Mitigation is proposed to the building envelopes to ensure that internal noise levels within habitable areas are suitable for resting and sleeping and are in accordance with the requirements of the NPPF and BS 8233:2014 "Guidance on sound insulation and noise reduction for buildings". Noise mitigation advice for the proposed residential facades is given in **Section 7.0** of this report in the form of treatment to the glazing and ventilation.

APPENDIX A – NOTES FOR QUALITY CONTROL

1. Blockwork

All blockwork is to be mortared to an almost fair faced standard both horizontally and vertically. Only perfect blocks may be used with no pitting or cracks. The blockwork must seal effectively to the underside of the soffit.

Where blockwork walls form a cavity wall, care should be taken to avoid rubble and snots from bridging the cavity. This is especially important where one or more of the leaves is floating.

2. Plasterboard

All plasterboard joints are to be butted tight. The rule of thumb is that the joint should be tight enough over its entire length to prevent a normal business card from being inserted. Multiple layers should be fitted with staggered joints.

Base details and deflection heads are to be as per the British Gypsum White Book unless otherwise stated, and copious amounts of mastic to be used when fitting to the walls, floor and ceiling respectively.

3. Mineral Fibre

Mineral fibre slabs are to be butted tightly together and to boundary structures, to form a homogeneous layer.

4. Windows

All window frames are to be a good tight fit into the building structure with any gaps to be filled both internally and externally with a non-setting mastic in addition to the usual weather proofing seal to the exterior. Any gaps between the frame and building that are greater than 5 mm are to be packed with a dense mineral fibre prior to mastic sealing.

5. Electrical Sockets

Electrical sockets must not be fitted back to back and removed areas of blockwork and plasterboard should be kept to an absolute minimum.

6. Water Pipes

All water pipes (and any other pipework) are to be resiliently mounted to avoid "water hammer". This is particularly important for plasterboard walls.

7. Penetrations

Penetrations are to be dealt with as described in this report. Details for specific services penetrations may be supplied upon request.

8. Approved Samples and Inspections

Samples of each individual acoustic element should be provided for inspection at the beginning of its installation. Once approved, the Clerk of Works must ensure that the same level of quality continues throughout construction.

APPENDIX B – DEFINITION OF ACOUSTIC TERMS

The decibel

This is the basic unit of noise, denoted dB.

A Weighting

This is a weighting process which simulates the human ear's different sensitivity at different frequencies. A weighting can be shown two typical ways, 50 dB(A) L_{eq} or 50 dB L_{Aeq} . Both mean the same thing. (See below for a definition of L_{eq}). The dB(A) level can be regarded as the overall level perceived by human beings.

L_{eq} and $L_{eq(s)}$

This is the equivalent continuous noise level which contains the same acoustic energy as the actual time-varying sound. In other words it is a kind of average noise level. It is denoted dB L_{eq} or, for A-weighted figures dB(A) L_{eq} or dB L_{Aeq} . It can also be expressed in terms of frequency analysis (see later). $L_{eq(s)}$ is the sample L_{eq} level.

L_n

This is the level exceeded for n% of the time. It is denoted dB L_n or, for A-weighted figures dB(A) L_n or dB L_{An} . It can be expressed in terms of frequency analysis (see later). L_{90} is the level exceeded for 90% of the time and is a measure of the lowest level typically reached. L_{10} is the level exceeded for 10% of the time and is the highest level typically reached. L_{50} is the level exceeded for 50% of the time and, mathematically, it is the median.

L_{max}

This is the maximum level reached during a measurement period. The "time constant", or the ability of the equipment to respond to impulses is usually expressed along with it, e.g. "Fast", "Slow", etc. It is denoted dB L_{max} or, for A-weighted figures dB(A) L_{max} , dB L_{Amax} , etc. It can also be expressed in terms of frequency analysis.

Frequency Analysis

Whereas dB(A) gives a very useful overall figure, it has its limitations in that it cannot be used to model or predict the effect of noise control and mitigation as this nearly always has radically different performance at different frequencies.

Frequency analysis expresses an overall noise level at each frequency or band of frequencies in the audible range. Octave band analysis divides the audible range into 10 bands from 31.5 Hz to 16 kHz and the noise level in each band can be expressed in any form e.g. L_{eq} , L_{90} , L_{max} etc. One third octave band analysis uses 30 bands.

Narrow band analysis takes the process to resolutions of less than 1 Hz. This is useful for identifying the existence of tones (whines, hums, etc.) and in pin-pointing the sources.



APPENDIX C – MEASURED NOISE LEVELS

