



THE EGERTON (PROPERTY) PARTNERSHIP LTD

23a CRIMSWORTH AVENUE, CHORLTON

NOISE ASSESSMENT FOR PLANNING PURPOSES

17 August 2021

AEC REPORT: P4380/R1/RDC

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1.0 INTRODUCTION

- 1.1 Acoustic & Engineering Consultants Limited (AEC) has been instructed by The Egerton (Property) Partnership Ltd to undertake a noise and vibration assessment in relation to the proposed residential development at 23a Crimsworth Avenue, Chorlton.
- 1.2 This report details the noise and vibration levels measured on the development site, presents the assessment criteria and discussed the implications on the site layout and building design, to achieve acceptable noise and vibration level limits as required by the Local Authority.
- 1.3 It should be noted that the development has been granted two pre-conditions relation to acoustics and vibration. These are discussed further in Section 4.
- 1.4 Acoustic terminology is discussed in brief in Appendix A.

2.0 BACKGROUND AND SITE DESCRIPTION

- 2.1 The proposed development will be comprised of a single dwelling which is to be located in the existing garden area of 23 Crimsworth Avenue. A site location plan is presented on the attached Figure 1.
- 2.2 The proposed development is surrounded by existing residential properties and their associated gardens to the north, east and south. Beyond the properties to the south is Manchester Road, which is one of the main roads through Chorlton.
- 2.3 The Metrolink tram tracks, serving both the South Manchester Line and the Airport Line forms the western site boundary. There is an existing 2m high, timber fence on the site boundary which is approximately 10m from the closest tram track. It is understood this will be retained as part of the works. On the opposite side of the tram line are allotments and other existing residential buildings.
- 2.4 Based on the Metrolink timetable, it is understood that during trams running past the proposed development operator between 0500 and 0100h, Monday to Sunday. During the daytime hours, there are around 280 trams that run at an average of around 18 an hour. During the night-time hours (excluding 0100 – 0500h), there are around 60 trams that run at an average of roughly 15 an hour.
- 2.5 The nearest elevation of the proposed development will be around from the western boundary by around 3m.
- 2.6 The proposed development will be a three-storey building with four bedrooms, including one in the roof loft space. Each façade will have windows, excluding the eastern one facing 23 Crimsworth Avenue.

3.0 NOISE & VIBRATION MEASUREMENTS

- 3.1 AEC has undertaken noise and vibration measurements around the proposed development site and these are discussed separately, below.

Noise Level Measurements

- 3.2 An attended noise level survey was undertaken by AEC between approximately 1310 and 1400h on Tuesday 29 June 2021. Measurements were undertaken at a single location around the development site identified as A on the attached Figure 1. These measurements were undertaken under free-field conditions.
- 3.3 An extended unattended noise level survey was also undertaken between 1500h on 29 Tuesday June 2021 and 0700h on Wednesday 30 June 2021, at a single location at 1m from the façade at first floor level, of 23 Crimsworth Avenue, directly overlooking the tram tracks to the west. This location is identified as L on Figure 1. Full logged data over 15-minute periods are held on file by AEC and is available on request.
- 3.4 All measurements were undertaken in general accordance with BS7445-1: 2003 '*Description and measurement of environmental noise. Guide to quantities and procedures*' and a full measurement procedure is presented in Appendix B.
- 3.5 Location A was chosen to measure noise levels associated with individual tram pass-bys at the proposed western boundary of the development. Due to the existing 2m high timber fence at this boundary, these measurements were conducted above the fence to remove any associated barrier attenuation.
- 3.6 During the attended noise survey, 11 individual tram pass-bys were measured. The tram pass-by typically lasted around 12s, with sound exposure levels (SEL) of around 98dB_{LAE}. Maximum noise levels of tram pass-bys ranged from 84 to 101dB_{L_{Amax, F}}. Full details of the SEL measurements are presented in Table B1 of Appendix B.
- 3.7 Location L was chosen to measure noise levels associated with tram pass-bys but also noise levels associated with other sources in the area. It should be noted that the measurements at Location L had full line of site of the tram tracks. A graph of the measured data is presented in Graph B1 of Appendix B.
- 3.8 Following a review of the audio recorded during the measurements it was observed that, in addition to the tram movements, the noise climate in the area was due to distant road traffic.
- 3.9 A summary of the ambient noise levels measured during the daytime (1500 – 2300h) and night-time (2300 – 0700h) periods, at Location L, is presented in Table 3.1, below. In addition, non-erroneous maximum noise level, such as sirens or loud birdsong, during the night-time is also presented.

Table 3.1 – Summary of Measured Façade External Noise Levels

Period	Noise levels, dB	
	$L_{Aeq, T}$	$L_{Amax, F}$
Daytime (1500 – 2300)	61	-
Night-time (2300 – 0700)	56	82

- 3.10 It should be noted that between 0100 and 0500h, when no trams operate on the two lines, the ambient and maximum noise levels reduced to $40\text{dB}L_{Aeq, 4h}$ and $56\text{dB}L_{Amax, F}$. This is due to the fact that no trams passed run between these times (apart from one at 0105 which is believed to be due to a minor delay). During these periods, noise levels were due to distant road traffic and birdsong.

Vibration Measurements

- 3.11 Vibration levels were measured by AEC between approximately 1310 and 1400h on Tuesday 29 June 2021. The transducers for the vibration monitoring system were installed at a location representative of the nearest part of the proposed property to the tram tracks (a worst-case), approximately 13m away from the nearest rail.
- 3.12 The measurements made were typical of the standard tram timetable with trams operating at typical service frequencies. The results are presented in Section 6.

4.0 BASIS OF ASSESSMENT

Noise

National Planning Policy Framework

- 4.1 The latest Planning Policies are included in the National Planning Policy Framework published by the Department for Communities and Local Government and dated March 2012 and revised in February 2019.
- 4.2 This planning policies which relate specifically to noise are presented in paragraphs 170, 180 and 182 which are reproduced below:

170. *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 noise.

180. *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:*

(5) 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.

182. *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*’ 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.

Local Authority Requirements

- 4.5 Manchester City Council has produced '*Planning & Noise – Technical Guidance*' (2015) (PNTG) in relation to their requirements for noise and vibration assessments to accompany planning applications.
- 4.6 Based on this guidance, the development has been granted two noise and vibration pre-conditions and these are as follows (Application number: 129882/FO/2021):

- a) *Before the development commences a scheme for acoustically insulating the proposed residential accommodation against noise from the Metrolink shall be submitted to and approved in writing by the City Council as local planning authority. There may be other actual or potential sources of noise which require consideration on or near the site, including any local commercial/industrial premises. The approved noise insulation scheme shall be completed before any of the dwelling units are occupied.*

Noise survey data must include measurements taken during a rush-hour period and night time to determine the appropriate sound insulation measures necessary. The following noise criteria will be required to be achieved:

- *Bedrooms (night time - 23.00 - 07.00) 30 dB LAeq (individual noise events shall not exceed 45 dB LAmax,F by more than 15 times)*
- *Living Rooms (daytime - 07.00 - 23.00) 35 dB LAeq*
- *Gardens and terraces (daytime) 55 dB LAeq*

Due to the proximity of the development to a Metrolink line it will be necessary for vibration criteria to apply which can be found in BS 6472: 2008 "Guide to evaluation of human exposure to vibration in buildings". Groundborne noise/re-radiated noise must/shall also be factored into the assessment and design.

- 4.7 In addition to the PNTG, these noise level limits are also based on guidance presented in BS 8233:2014 '*Guidance on sound insulation and noise reduction for buildings*' (BS8233) and the Association of Noise Consultants (ANC) document '*ProPG: Planning and Noise - New Residential Development*', 2017 (ProPG).
- 4.8 It should be noted that Paragraph A.11 of ProPG does state that "*It is generally accepted, however, that the smaller the number of the noise events, the higher the maximum levels that can be withstood without adverse effects on sleep (up to an upper limit, and providing the overarching noise level during the overall sleep period e.g. $L_{Aeq,T}$ does not exceed a suitable threshold)*".
- 4.9 Based on the advice presented in ProPG and due to the number of tram movements at night, it was had been agreed with Richard Knightley, an Environmental Health Officer at MCC, that maximum noise levels in bedrooms at night should be controlled to not exceed 50dB $L_{Amax,F}$, more than 15 times a night.

- 4.10 In addition to the above, ProPG assumes that the attenuation of free-field external noise levels to internal noise levels provided by a window partially open for ventilation is up to 15dB. Therefore, to ensure that whole dwelling (background) ventilation can be provided via a partially open window at the nearby properties, AEC would propose that the external noise levels outside habitable rooms should not exceed $50\text{dBL}_{\text{Aeq,T}}$ during the daytime, and $45\text{dBL}_{\text{Aeq,T}}$ and $65\text{dBL}_{\text{Amax,F}}$ at night.

Ventilation and Overheating

- 4.11 The ventilation specifications presented in BS8233 and ProPG are based on achieving the requirements of Approved Document F (ADF) 'Ventilation' (2010) of the Building Regulations only.
- 4.12 ADF requires that continuous whole dwelling ventilation is provided to limit the accumulation of moisture and other pollutants originating within a building. This is typically achieved either via a partially opened window, or by a whole building ventilation system through the provision of trickle ventilators or mechanical ventilators. ADF states that '*The ventilation provisions will not necessarily meet cooling needs*'.
- 4.13 In relation to purge ventilation, ProPG suggests that as this should only occur occasionally (e.g. to remove odour from painting and decorating or from burnt food), the internal desired noise levels are not generally applicable. Therefore, internal noise levels due to windows being opened for purge ventilation has not been discussed further.
- 4.14 AEC has not been presented with a thermal assessment for this development and we cannot provide a comment on whether the property could be adversely affected by excessive or prolonged internal high temperatures (overheating). Therefore, the indicative overheating assessment presented in this report is only based on the noise levels measured on-site and would only apply to the habitable rooms at risk of overheating which would be determined by others.
- 4.15 In order to provide guidance on the relationship between internal noise levels and the control of overheating in residential properties, the ANC issued '*Acoustic ventilation and Overheating – Residential Design Guide*' (AVO) in January 2020. It is important to note that this is a design guide only and not a statutory document and the Local Authority may have their own requirements.
- 4.16 AEC understands that there are no specific Local Authority requirements in relation to acceptable internal noise level limits in habitable rooms with windows open to aid with the control of overheating. Therefore, this indicative assessment is based on the guidance presented AVO.
- 4.17 Table 3.3 of AVO presents guidance for allowable noise from transportation sources whilst windows are open for the control of overheating. With reference to this document AEC would propose that windows can be utilised in the control of overheating provided that the resultant internal ambient noise levels are below approximately $50\text{dBL}_{\text{Aeq, 16h}}$ during the daytime, and $42\text{dBL}_{\text{Aeq, 8h}}$ and $65\text{dBL}_{\text{Amax,F}}$ during the night-time.
- 4.18 These internal noise levels are the upper end of the medium risk category for adverse effects. Where these internal noise levels would be exceeded, AVO states that "*noise causes a material change in behaviour (e.g. having to keep windows closed most of the*

time)". In this situation, AEC would suggest alternative means for the control of overheating are considered.

- 4.19 AVO states that where transportation is the main source of noise, *"it is assumed that a partially open window will provide an outside-to-inside level difference of 13dB and is considered representative of typical domestic rooms with simple façade openings of around 2% of the floor area"*.
- 4.20 Considering the above, it is considered acceptable to control summertime heating via opening windows where external free-field noise levels are no greater than those presented in the following Table 4.1. This is based on simple façade openings to around 2% of the floor area.

Table 4.1 – External Free-Field Noise Level Limits for the Control of Overheating via Openable Windows

Activity	Location	Noise Level Limit, dB		
		Daytime 0700 – 2300h	Night-Time 2300 – 0700h	
		L _{Aeq,16h}	L _{Aeq,8h}	L _{Amax,F}
Resting	Living Room	63	-	-
Dining	Dining Room/Area	63	-	-
Sleeping (daytime resting)	Bedroom	63	55	75

External Noise Level Limits

- 4.21 For traditional external areas that are used as an amenity space, such as gardens and patios, BS8223 states that it is desirable that ambient noise levels should be not exceed 50dBL_{Aeq, 16 hour} during the daytime, with an upper limit of 55dBL_{Aeq, 16h}.
- 4.22 World Health Organization document 'Guidelines for Community Noise ' (WHO) issued in 1999 also provides a limit of 55dBL_{Aeq, 16 h} to stop the majority of people from being "seriously annoyed most of the time". Furthermore, PNTG provides a limit for 50dBL_{Aeq,16h} to stop 'moderate annoyance', and an upper limit of 55dBL_{Aeq,16h} for 'serious annoyance'.
- 4.23 It should be noted though that BS8233 does state that this external noise level is only a 'desirable upper guideline value' and that 'it is recognized that these guideline values are not achievable in all circumstances' and that a development should not be prohibited if this limit is exceeded.

Vibration

- 4.24 The assessment of vibration on humans within buildings is presented in BS 6472-1:2008 '*Guide to evaluation of human exposure to vibration in buildings. Vibration sources other than blasting*' (BS6472). The assessment of vibration on buildings i.e. damage, is presented in BS 7385-2:1993 '*Evaluation and measurement for vibration in buildings – Part 2: Guide to damage levels from groundborne vibration*' (BS7385-2).
- 4.25 BS6472 uses acceleration in terms of a 'vibration dose value' (VDV), which is a measure of vibration exposure, weighted for human perception, over a specified time period, to determine human response to vibration within a building.
- 4.26 The VDV's at which various degrees of adverse comment may be expected in residential buildings are reproduced in Table 4.2, below.

Table 4.2 – Vibration Dose Values Relating to Various Degrees of Adverse Comment

Place and Time	Low probability of adverse comment	Adverse comment possible	Adverse comment probable
Residential buildings 16h day	0.2 to 0.4	0.4 to 0.8	0.8 to 1.6
Residential buildings 8h night	0.1 to 0.2	0.2 to 0.4	0.4 to 0.8

**Vibration dose values ($\text{m/s}^{1.75}$) above which
various degrees of adverse comment may be expected**

- 4.27 The levels at which vibration resulting from tram traffic could cause damage to a residential property are presented in BS7385-2. This guidance uses the Peak Particle Velocity (PPV) of an event to determine whether vibration could potentially cause cosmetic damage to a property.
- 4.28 Based on BS7385-2, the risk of cosmetic damage is considered minimal below 15mm/s PPV, unless the building condition, foundations and/or ground type make it more susceptible to vibration. In addition, it is understood that certain soils can start to become vulnerable at levels of 10mm/s to the potential for differential settlement of ground caused by vibrations.
- 4.29 Therefore, taking the above into account, it is considered that PPV levels below 10mm/s should be deemed acceptable in relation avoiding the potential for causing cosmetic damage to a new development.

Groundborne / Re-radiated Noise

- 4.30 Ground-borne vibration energy will enter the building structure and be re-radiated from walls, floors and ceilings as noise within the building. The re-radiated noise level is dependent on the sound absorption in the room, the size and shape of the room and the distribution of vibrational energy across the surfaces of the room.
- 4.31 There is no standard or criteria defining acceptable ground-borne noise levels. A commonly adopted ground-borne noise level limit inside bedrooms, due to train movements, is **35 to 40dB_LA_{max,s}**. Although this may not necessarily be inaudible, this maximum level would minimize the risk of annoyance and disturbance to sleep.

5.0 ASSESSMENT OF PROPOSED DEVELOPMENT

- 5.1 As highlighted in AEC's noise level survey, there are only two noise sources affecting the proposed development; tram noise and distant road traffic.
- 5.2 A review of the tram movements measured during the unattended noise survey, indicates that the number of trams were in line with the Metrolink timetable stated in Section 2.
- 5.3 A comparison between the noise levels measured at both locations; A and L, during a tram pass-by, indicates that there is a difference of around 11dB in relation to ambient levels (L_{Aeq}), and around 17dB in relation to maximum levels ($L_{Amax,F}$).
- 5.4 The external daytime and night-time ambient and maximum noise levels measured at Location L, taking into account the differences between measurement Location A and L, as well as distance attenuation and screening attenuation (provided by the existing 2m high fence), are presented in Table 5.1, below.
- 5.5 It should be noted that calculations indicate that the 2m high fence could provide up to 10dB of attenuation to the ground floor rooms. It would, however, provide no attenuation to the upper floor bedrooms.
- 5.6 The night-time maximum noise levels have been based on the spectrum data measured at Location A.
- 5.7 Based on the measurements, distant road traffic noise in the absence of any tram noise is around 10dB below. Therefore, it has not been discussed further.

Table 5.1 – Determined Daytime and Night-time Noise Levels

Elevation	Noise Levels, dB		
	Daytime, Ambient $L_{Aeq,16h}$	Night-time	
		Ambient, $L_{Aeq,8h}$	Maximum $L_{Amax,F}$
Western	≤ 60	≤ 65	≤ 98
Northern / Southern	≤ 57	≤ 63	≤ 95
Eastern	≤ 50	≤ 55	≤ 85

Internal Noise Levels with Whole Dwelling Ventilation

- 5.8 As identified in Section 4, the allowable external noise levels for habitable rooms to be ventilated via a partially opened windows is 50dB $L_{Aeq,16h}$ during the daytime, and 45dB $L_{Aeq,8h}$ and 65dB $L_{Amax,F}$ at night.
- 5.9 A comparison between these levels and the noise levels presented in Table 5.1, indicates that whole dwelling ventilation can only be provided via a partially open window to living room windows on the eastern facades. However, as there is no glazing on this façade,

this has not been discussed further. On all facades, an alternative system of ventilation will need to be installed. Mitigation measures are discussed in Section 6.

Control of Overheating

- 5.10 If it is determined by others that there is a need to control overheating within this development, based on the noise level limits presented in Table 4.1, and the determined external noise levels presented in Table 5.1, only ground floor living rooms can have windows open to provide comfort cooling for the control of overheating.
- 5.11 For upper floor night-time rooms, windows must be closed and a mechanical ventilation system (or equivalent) must be installed for the control of overheating.

Noise Levels within Gardens

- 5.12 Based on the measured external noise levels, ambient noise levels within the garden would be around 63dBL_{Aeq, 16h}, and therefore, exceed the proposed external noise level limit of 55dBL_{Aeq, 16h}.
- 5.13 However, as previously indicated, BS8233 states that this limit is only a '*desirable upper guideline value*' and that '*it is recognized that these guideline values are not achievable in all circumstances*' and that a development should not be prohibited if this limit is exceeded. It should also be noted that the proposed garden area is part of the existing garden to 23 Crimsworth Avenue and, therefore, this should be acceptable.

6.0 VIBRATION ASSESSMENT

- 6.1 Using the guidance in BS6472, the measured VDV values, and the expected number of trains on the line during the day and night periods, the full 16-hour day and 8-hour night-time VDV values have been calculated. Table 6.1, below, compares the highest calculated 16-hour daytime and 8-hour night-time VDV values against the guidance provided in BS6472:2008.

**Table 6.1 – Calculated 16-Hour Daytime and 8-Hour Night-time VDV Levels
Compared to BS 6472 Guidance**

VDV period	Worst Case VDV _z , m/s ^{1.75}	BS 6472 “Low probability of adverse comment”
Day (0700 – 2300)	0.17	0.2 to 0.4
Night (2300 – 0700)	0.12	0.1 to 0.2

z – vertical

- 6.2 Table 6.1 demonstrates that the highest measured 16-hour and 8-hour VDV levels are at or below the levels where there is a low probability of adverse comment.
- 6.3 Based on our measurements, the PPV measured was between 0.5 to 0.9mm/s. As this is below the proposed limit of 10mm/s, this should be acceptable.
- 6.4 N.B. Please notify AEC if the building foundation design requires piling or deep foundations into harder substrate / rock layers. This may introduce a different vibration transmission path and check measurements may be advised.

Groundborne / Re-radiated Noise

- 6.5 Based on the measured PPVs discussed above, and a typical crest factor of 4 for a tram pass-bys, and a conservative estimation of ground-borne noise levels inside the dwelling, re-radiated noise could reach levels of 38 – 43dB_{L_{Amax,s}}. This estimate is based on the calculation methodology provided in Federal Transport of America-FTA Guidelines and vibration transfer functions provided in the Transportation Noise Reference Book, 1987.
- 6.6 Based on this estimate, the suggested limit of 35-40dB_{L_{Amax,s}} could be marginally exceeded.
- 6.7 However, it is important to note that this method of prediction provides an over estimation of the ground-borne noise levels, and therefore, levels would likely be within the proposed limits. Therefore, this should be deemed acceptable.
- 6.8 There is potential for timber floors to amplify vibration levels (not estimated in this assessment). Therefore, the development should consider practical measures to stiffen any suspended timber floors by way of additional supports, noggings and minimal span distance.

7.0 MITIGATION MEASURES

- 7.1 As previously stated, based on the calculated external noise levels, on all facades where glazing is proposed, all windows to habitable rooms would need to be kept closed during both the daytime and night-time periods and alternative means of whole dwelling ventilation would need to be provided. It is understood this will be achieved via acoustic trickle vents.
- 7.2 The sound insulation performance of the glazing and acoustic trickle ventilator, necessary to meet the agreed internal noise level requirements, have been calculated based on the spectrum noise data measured on-site and the room and glazing sizes based on the drawings provided by the architect. The required sound insulation performances are presented in Table 6.1, below.
- 7.3 While the noise levels do reduce round the sides of the building (northern and southern) compared to the tram line elevation (eastern), most of the rooms within the property have glazing on two facades. Therefore, we would propose that the same glazing strategy is installed within all rooms, regardless of the façade. This is presented in Table 7.1, below, for daytime (living rooms etc.) and night-time (bedrooms) rooms.

Table 7.1 – Outline Requirements of Glazing and Ventilation to Achieve Internal Noise Levels in Habitable Rooms

Sound Insulation Performance			
Daytime		Night-Time	
Glazing	Ventilator	Glazing	Ventilator
32dBR _w / 28dBR _w + C _{tr}	33dBD _{ne,w}	46dBR _w / 37dBR _w + C _{tr}	46dBD _{ne,w}

- 7.4 Example glazing build-ups to achieve the required sound insulation performances are presented in Table 7.2, below. As the night-time sound insulation requirements are higher, this will only be achievable with a secondary glazed unit.

Table 7.2 – Example Glazing Constructions

Sound Insulation Performance	Glazing Type	Example Construction
46dBR _w / 37dBR _w + C _{tr}	Secondary	6mm Glass / 100mm Cavity / 4mm Glass
32dBR _w / 28dBR _w + C _{tr}	Double	6mm Glass / 6 – 16mm Cavity / 4mm Glass

- 7.5 Prior to any glazing being installed, octave band sound insulation performance data of the glazing build-ups and ventilators selected must be verified by AEC or others.
- 7.6 Windows can be openable for purge ventilation providing that they are effectively acoustically sealed when closed and it is important that any frames and seals do not downgrade the sound insulation performance of the glazing.
- 7.7 All ventilation requirements have been based on the use of a single vent per room. If more than one unit is required, such as may be required to satisfy Building Control requirements, the performance of each unit might need to increase.

- 7.8 As the vent for the night-rooms has a high sound insulation performance requirement, this may need to be achieved with a 'through-the-wall' vent, rather than a trickle vent. It should be noted, however, that this may not be required, where it is determined that a mechanical ventilation system is needed for control of overheating purposes.
- 7.9 With regard to the other façade elements (walls and roof), on all elevations, these should be constructed such that the on-site sound insulation performance (dB R'_w) is at least 60dB R'_w. This would require development at the design stage.
- 7.10 It should be noted that this is quite an onerous performance and may require a roof lining to the ceiling such as one involving a resilient bar system, and maybe a cavity masonry type construction to the walls. This will be discussed further.

8.0 SUMMARY AND CONCLUSIONS

- 8.1 Acoustic & Engineering Consultants Limited has been appointed by The Egerton (Property) Partnership Ltd to undertake a noise and vibration assessment of the proposed development located on land associated with 23 Crimsworth Avenue.
- 8.2 The development will be comprised of a single dwelling with an associated external amenity space. It will have the following address: 23a Crimsworth Avenue.
- 8.3 An attended noise level survey was undertaken by AEC on 29 June 2021 between approximately 1310 and 1400h. Measurements were undertaken at a single location around the development site identified as A on the attached Figure 1.
- 8.4 An extended unattended noise level survey was also undertaken between 1500h on 29 June 2021 and 0700h on 30 June 2021, at a single location at first floor level, 1m from the façade of 23 Crimsworth Avenue, directly overlooking the tram line to the west. This location is identified as L on Figure 1. Full logged data over 15-minute periods is held on file by AEC and is available on request.
- 8.5 During the daytime noise level survey, tram noise associated with the tramline to the east was the dominant noise source. This was also the case for the night-time survey, however between 0100 and 0500h, trams did halt and the noise climate was due to distant road traffic and birdsong.
- 8.6 Whilst on-site, a vibration survey was also undertaken. Further details of this survey, alongside the noise surveys presented above are discussed further in Section 3.
- 8.7 A basis of assessment for the development is presented in Section 4 for the noise and vibration sources.
- 8.8 Based on the noise level measurements, an assessment was carried out to determine the noise levels impacting each façade of the residential properties within the development.
- 8.9 These measured noise levels were determined in accordance with the Planning and Noise Technical Guidance. The resultant noise levels external to the different elevations consider screening, distance and barrier attenuation, where applicable, and the results are presented in Table 5.1 of Section 5.
- 8.10 Based on the calculated external noise levels presented in Table 5.1, it was determined that alternative means of ventilation (to opening windows) would need to be provided to all habitable rooms.
- 8.11 Based on this, mitigation measures for the development are proposed in Section 6. These mitigation measures are presented in the form of enhanced glazing and acoustic trickle vents, where stated.
- 8.12 With regard to noise levels within gardens, AEC has calculated that noise levels within all gardens would be 63dBL_{Aeq,16h}. Whilst this is above the requirements, AEC consider this to be acceptable and this is discussed further in Sections 5.10 to 5.12.

- 8.13 In relation to the vibration levels measured on-site, an assessment was carried out in accordance with BS 6472-1:2008 '*Guide to evaluation of human exposure to vibration in buildings. Vibration sources other than blasting*'. This is presented in Section 7.
- 8.14 This demonstrated that the highest measured 16-hour and 8-hour VDV levels are at or below the levels where there is a low probability of adverse comment.
- 8.15 Based on the mitigation measures in Section 7 being implemented correctly, external and internal noise levels would be controlled to suitable levels. As vibration levels are also sufficiently controlled, AEC can confirm that noise and vibration should not be considered a determining factor in relation to any planning permission being sought.

FIGURE 1 – Site Location Plan Identifying Monitoring Locations



Map data ©2021 Google United Kingdom

Manchester Road

APPENDIX A – Acoustic Terminology in Brief

Sound Description

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 sound is made up of many different frequencies.

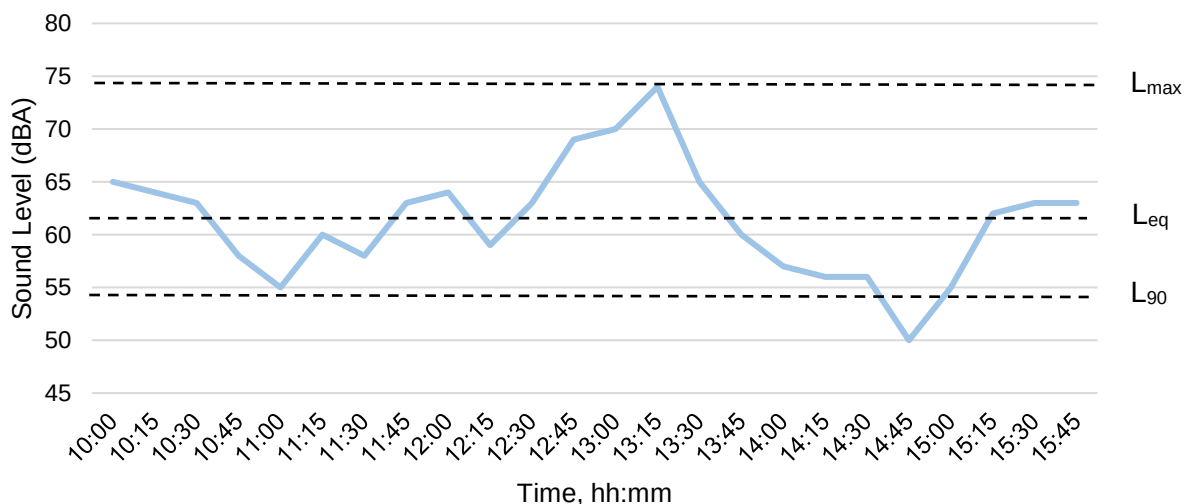
The human ear is more sensitive to some frequencies than others, and modern instruments can measure sound in the same subjective way. This is the basis of the A-weighted sound pressure level *dBA*, normally used to assess the effect of noise on people. The *dBA* weighting emphasises or reduces the importance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

Sound Units

In order to assess environmental noise, measurements are carried out by sampling over specific periods of time, such as fifteen minutes or one hour, the statistically determined results being used to quantify various aspects of the sound.

The figure below shows an example of sound level varying with time. Because of this time variation, the same period of sound can be described by several different levels. The most common of these are described below. It should be noted that in many instances in the main body of text, the unit will be preceded by a dB descriptor in the report e.g. $L_{Aeq,T}$ could be written $dBL_{Aeq,T}$.

Example of Sound Varying with Time



Unit Type	Acoustic Unit	Description
Standard Acoustic Units		
Ambient Sound Level	$L_{Aeq, T}$	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 and can be considered as the “ambient” noise level.
Percentile Level	L_{A10}	The (A-weighted) sound level exceeded for 10% of a measurement period. It is the value often used to describe traffic noise.
	L_{A90}	The (A-weighted) sound level exceeded for 90% of a measurement period. It is the value often used to describe background noise.
Maximum Sound level	L_{Amax}	The maximum (A-weighted) sound level measured during a given time. ‘Fast’ or ‘Slow’ meter response should be cited.
Additional Acoustic Units		
Sound Exposure Level (SEL)	L_{AE}	The sound exposure level is a notional noise level and describes the average L_{Aeq} noise level of an event over a given time period as if it occurred during a one second period. This allows the L_{Aeq} to be determined over a time period with a number of distinct events.
Free-field Level	-	This refers to the sound level measured outside, away from reflecting surfaces.
Façade Level	-	This refers to the sound level measured outside, at 1m from a hard-reflecting surface, typically 3dB greater than the free-field level.
Apparent sound reduction index	R'_w	Single number rating used to describe the sound reduction index of an on-site construction over a range of frequencies, typically 100-3150Hz.
Element normalized level difference	$D_{n,e,w}$	Single number rating used to describe the sound insulation performance of small elements.
Vibration Dose Value	-	Vibration Dose Value is a single number value and provides a convenient measure of the cumulative vibration received by a person during a measurement period. The measurement units are $m/s^{1.75}$.
Peak Particle Velocity	-	Peak particle velocity is the maximum velocity value of a vibration event during a measurement period. The measurement units are mm/s.

APPENDIX B – Noise Survey Details

Date & Time of Survey:	Unattended: Tuesday 29 June 2021, 1500h, to Wednesday 30 June 2021, 0700h.					
	Attended: Tuesday 29 June 2021, 1310 – 1400h.					
Personnel:	Ross Chamberlain (AEC).					
Equipment Used:	Unattended: Cirrus CR:171B Real Time Analyser (AEC Kit 3).					
	Attended: B&K 2260 Real Time Analyser (AEC Kit 2). Cirrus CR:171B Real Time Analyser (AEC Kit 5).					
Calibration:	The sound level analysers, which conforms to BS EN 61672-1: 2013 ' <i>Electroacoustics – Sound level meters - Part 1 Specifications</i> ' for Class 1 Type Z meters, was in calibration and check calibrated before and after the measurement periods using a Brüel & Kjær type 4231 (94dB) calibrator. There was no significant drift of calibration. Calibration certificates are available on request.					
Weather Conditions:	Unattended:					
	Date	Period	Wet/Dry	Temp°C	Wind Speed & Direction	Cloud Cover
	29/06/21	Day	Dry	16°C	Negligible	20%
	29/06/21 – 30/06/21	Night	Dry	14°C	Negligible	40%
	Attended:					
	Date	Period	Wet/Dry	Temp°C	Wind Speed & Direction	Cloud Cover
	29/06/21	Day	Dry	16°C	Negligible	20%
Measurement Locations:	Unattended: The microphone was connected via an extension cable and fixed at a location 1m from the façade of 23 Crimsworth Avenue at 1st floor level, identified as L on Figure 1.					
	Attended: Measurements were undertaken at a single location around the development site. Identified as A on Figure B1 and described below. A – On the edge of the existing site boundary. Microphone was held above the existing fence that forms the boundary and is located around 10m away from the tramline.					
Measurement Details:	Unattended: Measurements were logged continuously over 1s for post processing and assessment.					
	Attended: Measurements were undertaken over various periods in terms of L_{eq} , L_{10} , L_{90} , and L_{max} .					
Façade / Free-Field:	Unattended: Façade level					
	Attended: A - free-field					
	Full results for the attended measurements are given in Table B1. The measured daytime and night-time periods for the unattended survey is presented on Graphs B1.					
Measured Data:	Full octave band centre frequency data was obtained for all measurements.					

TABLE B1 – Measured Daytime Noise Levels

Sound Exposure Level, dBL _{AE}	Time, s
104	12
96	10
94	10
104	14
100	8
98	12
105	13
102	15
90	12
94	12
96	13

GRAPH B1 – Measured Night-Time Noise Levels
1500h on Tuesday 29 June 2021 to 0700h on Wednesday 30 June 2021,

