Noise Impact Assessment

Site: 579-581 Barlow Moor Road
Reference: 51-389-R1-1
Date: November 24

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EXECUTIVE SUMMARY

Site Address	579-581 Barlow Moor Road, Manchester M21 8AE
National Grid Reference	E 387083, N 406174
Proposed Development	Erection of single-storey front, side and rear extensions; and change of use of first and second floors to create 2 no.1 bed self-contained apartments and 3 no. 2 bedroom apartments (Class C3) together with the installation of bike and bin stores and associated elevational alterations.
Background	E3P were commissioned to undertake a Noise Impact Assessment in order to provide sufficient information in order to accompany a planning application.
Surveys Completed	E3P have completed a full weekday and weekend ambient sound survey out of existing first floor windows, one overlooking Barlow Moor Road and one overlooking Silverwood Avenue, in order to quantify levels of noise associated with road traffic and other sound sources upon existing facades.
Assessments Completed	Based on the proposed usage of the scheme, E3P have undertaken an assessment of internal noise levels due to external sound sources, in accordance with BS 8233.
Mitigation Recommendations	The assessment has recommended appropriate mitigation measures in order to control internal noise levels allowing for higher specification glazing and advice on façade insulation.
Conclusion and Discussion	This assessment has shown that, with mitigation measures in place, no adverse impact is predicted day or night at proposed receptors.

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1. INTRODUCTION

1.1. BACKGROUND

E3P were commissioned by Milan Properties to undertake a Noise Impact Assessment for the erection of single-storey front, side and rear extensions; and change of use of first and second floors to create 2 no.1 bed self-contained apartments and 3 no. 2 bedroom apartments (Class C3) together with the installation of bike and bin stores and associated elevational alterations at 579-581 Barlow Moor Road in Manchester, to be referred to hereafter as 'the site'.

This assessment looks to determine the key noise sources that have potential to impact upon the noise sensitive development and to assess their impact, if any, upon proposed receptors and to specify mitigation measures, where required.

1.2. REPORT OBJECTIVES

The objectives of this report are as follows.

- Establish and measure the existing sound levels across the site, day and night.
- Consider the potential sources of sound impacting the site and to measure source sound levels of all applicable sources.
- Assess internal and external noise levels associated with road traffic and other sources in accordance with criteria given in BS 8233.
- Provide advice on mitigation measures, where required.

Specifically, this report is to be used to discharge condition 7a of the planning permission (140033/FO/2024), the full condition is included which includes part b in relation to a verification report which will be undertaken upon completion of the development:

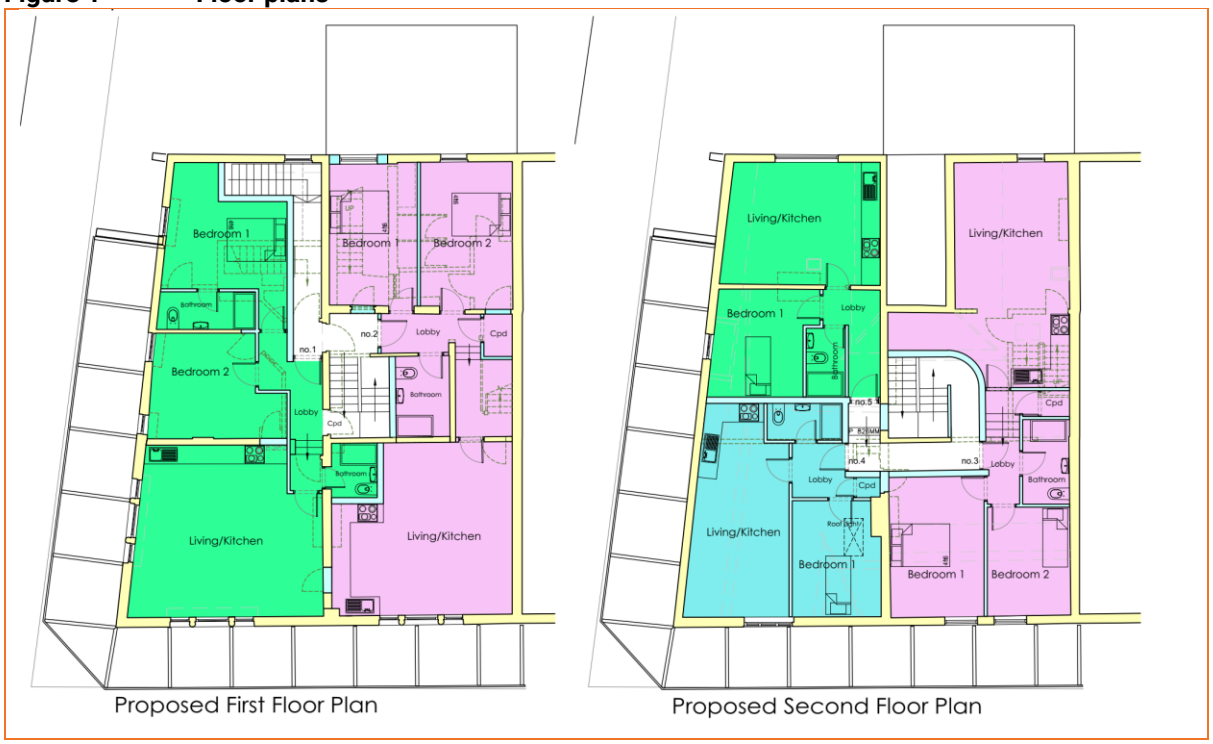
> *7) a) Notwithstanding details submitted, prior to the apartments hereby approved being occupied, a scheme for acoustically insulating the proposed residential accommodation against noise from Barlow Moor Road and nearby commercial uses shall be submitted to and approved in writing by the City Council as Local Planning Authority. The potential for overheating shall also be assessed and the noise insulation scheme should take this into account. The approved noise insulation and ventilation scheme shall be completed before any of the approved flats are occupied.*
>
> *b) Prior to first occupation of the residential units, a verification report shall be required to validate that the work undertaken throughout the development conforms to the recommendations and requirements in the approved acoustic consultant's report. The report shall also undertake post completion testing to confirm that the internal noise criteria have been met. Any instances of non-conformity with the recommendations in the report shall be detailed along with any measures required to ensure compliance with the internal noise criteria.*
>
> *Reason - In order to safeguard the amenity of existing and future occupiers of nearby residential accommodation, pursuant to saved policy DC26 of the Unitary Development Plan for the City of Manchester and policies SP1, H1 and DM1 of the Manchester Core Strategy.*

1.3. PROPOSED DEVELOPMENT

The development site is to be extended front, side and rear at ground floor level with a change of use of first and second floors to create 2 no.1 bed self-contained apartments and 3 no. 2 bedroom apartments (Class C3) together with the installation of bike and bin stores and associated elevational alterations.

The proposed floor plans are indicated in Figure 1.

Figure 1 Floor plans



2. ASSESSMENT METHODOLOGY

2.1. NATIONAL PLANNING POLICY FRAMEWORK

To prevent unacceptable risks from pollution, planning policies and decisions should ensure that new development is appropriate for its location. The effects (including cumulative effects) of pollution on health, the natural environment or general amenity, and the potential sensitivity of the area or proposed development to adverse effects from pollution, should be considered.

The national planning policy framework states that planning policies and decisions should aim to:

- Avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development.
- Mitigate and reduce to a minimum, other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions.
- Recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established.
- Identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

2.2. NATIONAL PLANNING PRACTICE GUIDANCE

Noise needs to be considered when new developments may create additional noise and when new developments would be sensitive to the prevailing acoustic environment. When preparing local or neighbourhood plans, or taking decisions about new development, there may also be opportunities to consider improvements to the acoustic environment.

Local planning authorities' plan-making and decision-making should take account of the acoustic environment and in doing so consider:

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

In line with the explanatory note of the NPSE, this would include identifying whether the overall effect of the noise exposure (including the impact during the construction phase, where applicable) is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation.

The "observed effect levels" are as follows:

- Significant observed adverse effect level: This is the level of noise exposure above which significant adverse effects on health and quality of life occur.
- Lowest observed adverse effect level: This is the level of noise exposure above which adverse effects on health and quality of life can be detected.
- No observed effect level: This is the level of noise exposure below which no effect at all on health or quality of life can be detected.

Table 1 summarises the noise exposure hierarchy, based on the likely average response.

Table 1 Noise Exposure Hierarchy

Perception	Examples of outcomes	Increasing effect level	Action
Not Applicable	No effect	No observed effect	No specific measures required.
Noticeable 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			
Noticeable 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, or having to close windows for some of the time because of the noise where there is no alternative ventilation. 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			
Noticeable and Disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion, having to keep windows closed most of the time because of the noise where there is no alternative ventilation. 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 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 (auditory and non-auditory).	Unacceptable adverse effect	Prevent

The subjective nature of noise means that there is not a simple relationship between noise levels and the impact on those affected. This will depend on how various factors combine in any situation. These factors include the following:

- The source and absolute level of the noise together with the time of day it occurs. Some types and level of noise will cause a greater adverse effect at night than if they occurred during the day. The adverse effect can also be greater simply because there is less background noise at night.

- For non-continuous sources of noise, the number of noise events, and the frequency and pattern of occurrence of the noise can be important.

- The spectral content of the noise and the general character of the noise. The local topology and topography should also be considered along with the existing and, where appropriate, the planned character of the area.

More specific factors to consider when relevant:

- Where applicable, the cumulative impacts of more than one source should be considered along with the extent to which the source of noise is intermittent and of limited duration.

- Consideration should also be given to whether adverse internal effects can be completely removed by closing windows and, in the case of new residential development, if the proposed mitigation relies on windows being kept closed most of the time. In both cases, a suitable alternative means of ventilation is likely to be necessary.

- If external amenity spaces are an intrinsic part of the overall design, then the acoustic environment of those spaces should be considered so that they can be enjoyed as intended.

2.3. BUILDING REGULATIONS: APPROVED DOCUMENT F – VOLUME 1: DWELLINGS (JUNE 2022)

Approved document F Volume 1: Dwellings (ADF) provides guidance set by the Department for Levelling Up, Housing and Communities, that relates to means of ventilation within dwellings. The ventilation strategy specified within the ADF are as follows.

> *1.9 The ventilation strategy in this approved document relies on a combination of all of the following.*
>
> *a. Extract ventilation from rooms where water vapour or pollutants are likely to be released (e.g. bathrooms and kitchens), to minimise their spread to the rest of the building. Ventilation fans may be either intermittent operation or continuous operation.*
>
> *b. Whole dwelling ventilation to provide fresh air to the building and to dilute, disperse and remove water vapour and pollutants not removed by extract ventilation.*
>
> *c. Purge ventilation to remove high concentrations of pollutants and water vapour. Purge ventilation is used intermittently and required only for pollutants produced by occasional activities (e.g. fumes from painting).*
>
> *1.10 Ventilation may be delivered through natural ventilation, mechanical ventilation or a combination of both.*
>
> *1.11 The ventilation systems in this approved document are examples of systems that comply with Part F of the Building Regulations. Other ventilation systems may be acceptable if they can be shown to meet an equal level of performance.*

Within the ADF there are three system specific ventilation systems that can be utilised to provide sufficient ventilation. These methods are as follow.

> *1.Natural ventilation with background ventilators and intermittent extract fans (guidance suitable only for less airtight dwellings) - Ventilation provided by thermal, wind or diffusion effects through doors, windows or other intentional openings without the use of mechanically driven equipment. For the purposes of this approved document, natural ventilation refers to a ventilation strategy using background ventilators and intermittent extract ventilation.*
>
> *2.Continuous mechanical extract ventilation - Mechanically driven ventilation that continuously extracts indoor air and discharges it to the outside.*
>
> *3. Mechanical ventilation with heat recovery - A mechanically driven ventilation system that both continuously supplies outdoor air to the inside of the dwelling and continuously extracts indoor air and discharges it to the outside. For the purposes of this approved document, the guidance for mechanical ventilation with heat recovery applies to centralised or decentralised supply and extract systems, with or without heat recovery.*

2.4. BUILDING REGULATIONS: APPROVED DOCUMENT O – OVERHEATING (JUNE 2022)

Approved document O - Overheating (ADO) provides guidance set by the Department for Levelling Up, Housing and Communities, that relates to the mitigation of overheating. In relation to noise the ADO provides the following guidance.

> *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 LAeq,T, averaged over 8 hours (between 11pm and 7am).*
> *b. 55dB LAFmax, more than 10 times a night (between 11pm and 7am).*
>
> *3.4 Where in-situ noise measurements are used as evidence that these limits are not exceeded, measurements should be taken in accordance with the Association of Noise Consultants'*
>
> *Measurement of Sound Levels in Buildings with the overheating mitigation strategy in use.*
>
> *NOTE: Guidance on reducing the passage of external noise into buildings can be found in the National Model Design Code: Part 2 – Guidance Notes (MHCLG, 2021) and the Association of Noise Consultants' Acoustics, Ventilation and Overheating: Residential Design Guide (2020)*

2.5. BRITISH STANDARD BS 8233:2014+A1:2019 – GUIDANCE ON SOUND INSULATION AND NOISE REDUCTION FOR BUILDINGS

The scope of this standard is the provision of recommendations for the control of noise in and around buildings including residential dwellings. It suggests appropriate criteria and limits for different situations, which are primarily intended to guide the design of new buildings or refurbished buildings undergoing a change of use, rather than to assess the effect of changes in the external noise climate.

The standard suggests suitable internal noise levels within different types of buildings, including residential dwellings, as shown in Table 2.

Table 2 BS 8233:2014 Recommended Internal Noise Levels

Criterion	Typical situation	Design criterion, $L_{Aeq,T}$ (dB)
Suitable resting and sleeping conditions	Living Room	35
	Bedroom	30

BS 8233 goes on to recommend noise levels for gardens:

> *It is desirable that the external noise level does not exceed 50 dB LAeq,T, with an upper guideline value of 55 dB LAeq,T which would be acceptable in noisier environments. However, it is also recognised 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 might be warranted.*

BS 8233 goes on to say:

> *In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces but should not be prohibited.*

3. SURVEY RESULTS

E3P undertook a weekday and weekend surveys in order to establish noise levels at the front of the building overlooking Barlow Moor Road and to the side overlooking Silverwood Avenue where road traffic and night-time economy sources exist. The microphone was located out of a first floor window. The surveys were conducted in the following locations:

Figure 2 Noise Measurement Positions

3.1. UNATTENDED AMBIENT SOUND SURVEY – BARLOW MOOR ROAD

E3P have conducted an unattended ambient sound measurements on the eastern elevation overlooking Barlow Moor Road out of a first-floor window. The survey was carried out over the following time periods:

- 12:00 Wednesday 6th November to 13:00 Tuesday 12th November 2024.

The following position was used:

- Noise Measurement Position 1 (NMP1): Located out of a first-floor window, in façade conditions, overlooking Barlow Moor Road. The microphone was located 1 m from the facade. The sound climate was dominated by road traffic sound.

A summary of the measured sound pressure levels is presented in Table 3.

Table 3 Measured Ambient Sound Pressure Levels – NMP1

Date	Period	Measured ambient sound levels, façade, $L_{Aeq,T}$ (dB)	10th highest maximum noise level, $L_{AMax,fast}$ (dB)
Wednesday 6th November	Daytime	65.9	-
	Night-time	59.4	78.5
Thursday 7th November	Daytime	65.6	-
	Night-time	61.6	79.9
Friday 8th November	Daytime	66.0	-
	Night-time	62.0	82.0
Saturday 9th November	Daytime	65.0	-
	Night-time	60.4	78.4
Sunday 10th November	Daytime	66.5	-
	Night-time	60.6	79.5
Monday 11th November	Daytime	66.2	-
	Night-time	60.4	79.5

The worst-case measured 16-hour day and 8-hour night-time noise levels are noted to be 67 and 62 dB respectively. These can then be corrected to free field resulting in daytime noise levels of 64 dB and night-time noise levels of 59 dB.

These levels correspond to first floor levels. To inform a worst case assessment, these are also applied to second floor windows.

The worst-case 10th highest 1-minute maximum noise level from the night-time period is noted to be 82.0 dB, corrected to 79 dB $L_{Amax,fast}$.

3.2. UNATTENDED AMBIENT SOUND SURVEY – SILVERWOOD AVENUE

E3P have conducted an unattended ambient sound measurements on the southern elevation overlooking Silverwood Avenue and Rudy's Pizza out of a first-floor window. The survey was carried out over the following time periods:

- 12:00 Wednesday 6th November to 13:00 Tuesday 12th November 2024.

The following position was used:

- Noise Measurement Position 2 (NMP2): Located out of a first-floor window, in façade conditions, overlooking Silverwood Avenue. The microphone was located 1 m from the facade. The sound climate was dominated by road traffic sound and patron noise.

A summary of the measured sound pressure levels is presented in Table 4.

Table 4 Measured Ambient Sound Pressure Levels – NMP2

Date	Period	Measured ambient sound levels, façade, $L_{Aeq,T}$ (dB)	10th highest maximum noise level, $L_{AMax,fast}$ (dB)
Wednesday 6th November	Daytime	57.0	-
	Night-time	49.0	57.5
Thursday 7th November	Daytime	56.8	-
	Night-time	51.6	59.4
Friday 8th November	Daytime	56.9	-
	Night-time	50.9	57.8
Saturday 9th November	Daytime	56.6	-
	Night-time	49.0	57.1
Sunday 10th November	Daytime	58.1	-
	Night-time	50.1	57.7
Monday 11th November	Daytime	58.7	-
	Night-time	49.4	58.0

The worst-case measured 16-hour day and 8-hour night-time noise levels are noted to be 59 and 52 dB respectively. These can then be corrected to free field resulting in daytime noise levels of 56 dB and night-time noise levels of 49 dB.

These levels correspond to first floor levels. To inform a worst-case assessment, these are also applied to second floor windows.

The worst-case 10th highest 1-minute maximum noise level from the night-time period is noted to be 59.4 dB, corrected to 56 dB $L_{Amax,fast}$.

The equipment outlined in Table 5 was used for the noise survey.

Table 5 Noise Measurement Equipment and Calibration Dates

Measurement position	Equipment description	Manufacturer & type number	Serial number	Calibration due date
NMP1	Sound Level Meter	Cirrus Optimus Green	G303884	19th September 2025
	Pre-amplifier	MV:200F	12731F	
	Microphone	MK:224	215899D	
	Calibrator	Cirrus CR515	99403	
NMP2	Sound Level Meter	01dB Fusion	14226	7th December 2025
	Pre-amplifier	01dB Pre22	2135072	
	Microphone	GRAS 40CD	470570	
	Calibrator	Cirrus CR515	99204	8th August 2025

The sound level meters were field calibrated before and after measurements with no significant drift witnessed.

4. NOISE IMPACT ASSESSMENT

4.1. INTERNAL NOISE LEVELS WITHIN NOISE SENSITIVE ROOMS

The required internal noise levels to be achieved within the habitable rooms of the apartments have been based on the guidance presented in BS8233:2014 (BS8233) *'Guidance on sound insulation and noise reduction for buildings'* and The Association of Noise Consultants (ANC) document Professional Practice Guidance (ProPG) on Planning and Noise '*New Residential Development*' (2017).

BS8233 and ProPG suggest that daytime and night-time noise levels should be controlled to no greater than those presented in Table 2 with consideration to maximum noise level limits of 45 dB $L_{Amax,fast}$ in bedrooms at night.

The limits will be applied to all sound sources measured at NMP1 and NMP2, including pedestrian noise.

It is assumed that a Part F appropriate ventilation system will be installed in the residential dwellings to provide necessary ventilation. Purge ventilation can be provided via an openable window.

For external to internal noise assessments, E3P have assumed standard glazing would be installed/retained which achieves at least 25 dB $R_w + C_{t,r}$. This allows external limits of 60 dB during the day and 55 dB during the night for standard glazing to be sufficient. A maximum limit of 70 dB is applicable for $L_{Amax,fast}$.

Where existing glazing is to be retained, confirmation on their sound reduction is required with the units resealed and maintained to appropriate standards.

In order to inform the assessment, the following noise levels are predicted at each elevation with measured first floor levels assumed at second floor:

Table 6 External Ambient and Maximum Noise Levels at proposed apartments

Floor	Elevation	Assessment period	Predicted noise level (dB)	Higher specification glazing required?
First and Second	East	Day	**64**	**Yes**
		Night	**59**	
		Night (Maximum)	**79**	
	South	Day	56	No
		Night	49	
		Night (Maximum)	56	

Based on the measured noise levels, it is found that all east facing habitable room windows would require higher specification or secondary glazing in order to achieve acceptable internal noise levels.

This is discussed in Section 5.0.

Noise levels on southern and western elevations are sufficiently low.

With regards to potential for overheating, both facades would experience an exceedance of the Part O requirements and, as such, an overheating assessment is recommended. The assessment should assume that east and south facing windows would need to remain closed at night.

5. MITIGATION

5.1. FAÇADE INSULATION AND VENTILATION REQUIREMENTS

The previous assessments determined that certain noise sensitive rooms would require higher specification glazing due to the predicted noise levels. It was found that all south and west facing rooms would experience sufficiently low levels of noise to not warrant any mitigation measures.

As such, Table 8 outlines the requirements:

Table 7 Glazing Specification Requirements

Floor	Elevation	Room	Minimum required reduction of glazing $R_w + C_{t,r}$ (dB)	Example higher specification glazing (glass / air space / glass) (mm)	Example secondary glazing
First and second	East	Lounge and bedrooms	**29 (34 dB R_w)**	**6 mm glass / 16 mm air space / 4 mm glass**	6 mm float with mastic seal, 50 mm cavity and 4 mm secondary glass

In terms of ventilation, in order to not downgrade the performance of the external envelope, a through-the-wall vent or through window ventilator with a sound insulation performance of at least 34 dB $D_{n,e,w}$ + $C_{t,r}$ should be installed.

An appropriate locking method of secondary glazing should be installed so that a suitable acoustic seal is achieved.

All background ventilation sound insulation requirements have been based on the use of a single ventilator per room. If more than one unit is required, such as may be required to satisfy Building Control requirements, the performance of each unit may need to be increased.

Windows should remain openable for purge ventilation and at the discretion of the occupants.

The assessment found that internal noise levels, when windows are opened to mitigate overheating, would exceed the Part O requirements on south and east elevations. As such, a Part O overheating assessment is recommended for the apartment based on this assumption.

6. CONCLUSIONS AND DISCUSSION

This assessment looked to determine the key noise sources impacting upon the development site and to assess their impact, if any, upon the noise sensitive use and to recommend mitigation measures, where necessary.

Based on the proposed usage and the layout of the scheme, E3P have undertaken an assessment of internal noise levels within noise sensitive rooms due to external sound sources, in accordance with BS 8233.

Higher specification or secondary glazing is required for eastern elevations.

The assessment has shown that, with mitigation measures in place, no adverse impact is predicted at the receptors.

END OF REPORT

APPENDIX I
LIMITATIONS

GENERAL

1. This report and any associated works (together comprising the "Services") were compiled and carried out by E3P for the client (as present in Section 1) under the E3P "Terms of Business" or with those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed and outlined in the body of the report.

2. Unless explicitly agreed otherwise, in writing, this report has been prepared under E3P Standard Terms and Business as included within our proposal to the Client.

3. Project-specific appointment documents may be agreed upon at our discretion and a charge may be levied for both the time to review and finalise appointment documents and also for associated changes to the appointment terms. E3P reserves the right to amend the fee should any changes to the appointment terms create an increased risk to E3P.

4. The report needs to be considered in light of the proposal and associated limitations of scope. The report needs to be read in full and isolated sections cannot be used without full reference to other elements of the report and any previous works referenced within the report.

NOISE AND VIBRATION IMPACT ASSESSMENTS

5. Where a noise or vibration survey is required to inform an assessment, E3P will endeavour to ensure that all noise and vibration measurements taken are robust, representative and reliable in order to inform an accurate assessment.

6. Where mitigation measures are specified in this report, it should be noted that these measures are relative to a specific sound or vibration source, both in terms of the measured sound pressure and vibration level and the character of the sound source. Where either the sound pressure level or the character of the sound varies following completion of the sound survey, E3P cannot be held responsible for any subsequent variations in the proposed mitigation performance.

7. The works undertaken to prepare this report comprised a study of available and easily documented information from a variety of sources (including the Client), together with (where appropriate) a brief walkover inspection of the Site and correspondence with relevant authorities and other interested parties. Due to the short timescales associated with these projects' responses may not have been received from all parties. E3P cannot be held responsible for any disclosures that are provided post-production of our report and will not automatically update our report.

8. The opinions given in this report have been dictated by the finite data on which they are based and are relevant only for the purpose for which the report was commissioned. The information reviewed should not be considered exhaustive and has been accepted in good faith as providing true and representative data pertaining to site conditions. Should additional information become available which may affect the opinions expressed in this report, E3P reserves the right to review such information and, if warranted, to modify the opinions accordingly.

9. E3P does not warrant work/data undertaken/provided by others.

APPENDIX II
GLOSSARY

NOISE

Noise is defined as unwanted sound. Human ears are able to respond to sound in the frequency range 20 Hz (deep bass) to 20,000 Hz (high treble) and over the audible range of 0 dB (the threshold of perception) to 140 dB (the threshold of pain). The ear does not respond equally to different frequencies of the same magnitude but is more responsive to mid-frequencies than to lower or higher frequencies. To quantify noise in a manner that approximates the response of the human ear, a weighting mechanism is used. This reduces the importance of lower and higher frequencies, in a similar manner to the human ear.

Furthermore, the perception of noise may be determined by a number of other factors, which may not necessarily be acoustic. In general, the impact of noise depends upon its level, the margin by which it exceeds the background level, its character and its variation over a given period of time. In some cases, the time of day and other acoustic features such as tonality or impulsiveness may be important, as may the disposition of the affected individual. Any assessment of noise should give due consideration to all of these factors when assessing the significance of a noise source. The most widely used weighting mechanism that best corresponds to the response of the human ear is the “A”-weighting scale. This is widely used for environmental noise measurement, and the levels are denoted as dB(A) or LAeq, LA90 etc., according to the parameter being measured.

The decibel scale is logarithmic rather than linear, and hence a 3 dB increase in sound level represents a doubling of the sound energy present. Judgement of sound is subjective but, as a general guide, a 10 dB(A) increase can be taken to represent a doubling of loudness, whilst an increase in the order of 3 dB(A) is generally regarded as the minimum difference needed to perceive a change under normal listening conditions. An indication of the range of sound levels commonly found in the environment is given in the following table.

Table 8 Typical Sound Pressure Levels

SOUND PRESSURE LEVEL	LOCATION/EXAMPLE
0	Threshold of hearing
20-30	Quiet bedroom at night
30-40	Living room during the day
40-50	Typical office
50-60	Inside a car
60-70	Typical high street
70-90	Inside a factory
100-110	Burglar alarm at 1 m away
110-130	Jet aircraft on take off
140	Threshold of pain

ACOUSTIC TERMINOLOGY

Table 9 Terminology

DESCRIPTOR	EXPLANATION
dB (decibel)	The scale on which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure (2E-05 Pa).
dB(A)	A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e. "A" weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.
LAeq, T	LAeq is defined as the notional steady sound level which, over a stated period of time (T), would contain the same amount of acoustical energy as the A-weighted fluctuating sound measured over that period.
LAmax	LAmax is the maximum A-weighted sound pressure level recorded over the period stated. LAmax is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the overall Leq noise level but will still affect the noise environment. Unless described otherwise, it is measured using the "fast" sound level meter response.
L10 and L90	If a non-steady noise is to be described, it is necessary to know both its level and the degree of fluctuation. The Ln indices are used for this purpose, and the term refers to the level exceeded for n% of the time. Hence L10 is the level exceeded for 10% of the time and as such can be regarded as the "average maximum level". Similarly, L90 is the "average minimum level" and is often used to describe the background noise. It is common practice to use the L10 index to describe traffic noise.
Free-field Level	A sound field determined at a point away from reflective surfaces other than the ground with no significant contributions due to sound from other reflective surfaces. Generally, as measured outside and away from buildings.
Fast	A time weighting used in the root-mean-square section of a sound level meter with a 125-millisecond time constant.
Slow	A time weighting used in the root-mean-square section of a sound level meter with a 1000-millisecond time constant.
dB (decibel)	The scale on which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure (2E-05 Pa).
dB(A)	A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e. "A" weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.

APPENDIX III
MEASURED SOUND PRESSURE LEVELS

Table 10 Measured Sound Pressure Levels – NMP1

Measurement start time	Measured ambient sound level, $L_{Aeq,1hr}$ (dB)	Measured background sound level, $L_{A90,1hr}$ (dB)	Measured maximum noise level, $L_{Amax,fast}$ (dB)
06/11/2024 11:21	67.8	57.1	90.5
06/11/2024 12:00	66.2	55.7	90.9
06/11/2024 13:00	65.5	56.8	84.3
06/11/2024 14:00	65.2	56.1	83.5
06/11/2024 15:00	65.5	55.2	84.4
06/11/2024 16:00	67.8	55.8	97.0
06/11/2024 17:00	64.7	55.1	83.0
06/11/2024 18:00	64.6	56.1	84.8
06/11/2024 19:00	64.6	56.4	89.3
06/11/2024 20:00	64.1	55.4	85.7
06/11/2024 21:00	63.8	54.1	85.8
06/11/2024 22:00	67.8	54.1	99.9
06/11/2024 23:00	61.9	52.0	78.5
07/11/2024 00:00	61.5	51.0	81.9
07/11/2024 01:00	62.8	43.8	91.7
07/11/2024 02:00	53.8	34.0	76.9
07/11/2024 03:00	52.6	33.2	71.8
07/11/2024 04:00	54.6	34.1	81.7
07/11/2024 05:00	56.8	34.6	84.6
07/11/2024 06:00	59.3	39.5	84.9
07/11/2024 07:00	64.1	47.5	92.1
07/11/2024 08:00	66.2	54.7	86.6
07/11/2024 09:00	66.5	56.5	85.1
07/11/2024 10:00	66.7	56.2	90.9
07/11/2024 11:00	66.5	56.2	87.4
07/11/2024 12:00	66.7	56.9	93.3
07/11/2024 13:00	66.1	56.4	87.4
07/11/2024 14:00	66.4	57.0	89.2
07/11/2024 15:00	66.6	57.9	89.2
07/11/2024 16:00	65.1	56.8	82.4
07/11/2024 17:00	65.1	56.1	85.8
07/11/2024 18:00	64.0	56.0	81.2
07/11/2024 19:00	64.7	56.6	82.8
07/11/2024 20:00	65.7	57.1	89.3
07/11/2024 21:00	63.6	55.2	82.6
07/11/2024 22:00	64.2	54.6	89.2
07/11/2024 23:00	64.9	56.0	80.8
08/11/2024 00:00	62.7	52.7	82.4
08/11/2024 01:00	59.6	46.4	80.5
08/11/2024 02:00	65.8	36.8	95.3
08/11/2024 03:00	53.2	34.4	77.1
08/11/2024 04:00	52.6	34.2	70.5
08/11/2024 05:00	57.5	35.1	78.5
08/11/2024 06:00	59.7	42.0	82.1
08/11/2024 07:00	65.3	50.1	88.4
08/11/2024 08:00	66.6	54.1	90.3
08/11/2024 09:00	67.0	58.2	88.3
08/11/2024 10:00	68.8	59.4	98.8
08/11/2024 11:00	67.0	57.5	87.6

Measurement start time	Measured ambient sound level, $L_{Aeq,1hr}$ (dB)	Measured background sound level, $L_{A90,1hr}$ (dB)	Measured maximum noise level, $L_{Amax,fast}$ (dB)
08/11/2024 12:00	66.7	55.9	94.1
08/11/2024 13:00	65.6	55.8	87.4
08/11/2024 14:00	65.6	56.4	86.8
08/11/2024 15:00	65.0	56.1	88.3
08/11/2024 16:00	65.1	56.8	82.7
08/11/2024 17:00	65.9	57.5	87.6
08/11/2024 18:00	64.7	57.1	84.4
08/11/2024 19:00	64.3	57.4	83.5
08/11/2024 20:00	66.2	57.4	90.6
08/11/2024 21:00	64.8	56.5	91.2
08/11/2024 22:00	64.1	55.3	87.0
08/11/2024 23:00	63.3	55.1	86.8
09/11/2024 00:00	64.9	54.3	93.5
09/11/2024 01:00	62.0	53.2	84.3
09/11/2024 02:00	66.1	46.8	98.1
09/11/2024 03:00	57.0	39.4	76.4
09/11/2024 04:00	55.7	36.5	75.7
09/11/2024 05:00	56.5	34.3	77.3
09/11/2024 06:00	57.0	37.5	74.9
09/11/2024 07:00	59.3	40.3	78.3
09/11/2024 08:00	64.0	48.4	85.3
09/11/2024 09:00	64.0	50.4	83.5
09/11/2024 10:00	64.3	53.3	85.1
09/11/2024 11:00	64.6	55.4	84.4
09/11/2024 12:00	65.6	55.9	83.6
09/11/2024 13:00	64.4	55.0	81.4
09/11/2024 14:00	66.2	56.7	90.7
09/11/2024 15:00	65.2	56.7	87.3
09/11/2024 16:00	66.9	57.1	96.3
09/11/2024 17:00	65.5	56.9	89.0
09/11/2024 18:00	65.2	56.6	83.6
09/11/2024 19:00	64.9	57.4	91.0
09/11/2024 20:00	65.2	57.1	90.5
09/11/2024 21:00	66.3	56.5	90.9
09/11/2024 22:00	65.3	56.5	95.6
09/11/2024 23:00	63.7	55.6	88.2
10/11/2024 00:00	62.8	54.3	82.6
10/11/2024 01:00	61.3	52.7	77.5
10/11/2024 02:00	60.0	47.1	80.4
10/11/2024 03:00	57.9	42.4	72.7
10/11/2024 04:00	58.3	40.8	81.9
10/11/2024 05:00	56.0	38.5	77.6
10/11/2024 06:00	57.6	37.6	85.0
10/11/2024 07:00	58.0	40.2	77.8
10/11/2024 08:00	58.5	44.1	74.8
10/11/2024 09:00	60.8	48.9	79.7
10/11/2024 10:00	63.3	51.7	79.7
10/11/2024 11:00	64.3	53.6	87.6
10/11/2024 12:00	64.5	55.3	92.4
10/11/2024 13:00	65.9	56.3	86.5

Measurement start time	Measured ambient sound level, $L_{Aeq,1hr}$ (dB)	Measured background sound level, $L_{A90,1hr}$ (dB)	Measured maximum noise level, $L_{Amax,fast}$ (dB)
10/11/2024 14:00	64.7	56.0	85.7
10/11/2024 15:00	66.8	57.6	78.8
10/11/2024 16:00	67.5	57.9	87.3
10/11/2024 17:00	73.6	58.4	103.4
10/11/2024 18:00	66.6	58.7	87.0
10/11/2024 19:00	66.9	58.2	86.5
10/11/2024 20:00	65.4	56.7	83.2
10/11/2024 21:00	65.6	56.7	86.2
10/11/2024 22:00	66.0	55.4	92.9
10/11/2024 23:00	64.2	53.5	88.0
11/11/2024 00:00	62.4	51.0	88.2
11/11/2024 01:00	59.3	45.0	77.1
11/11/2024 02:00	56.9	36.9	82.4
11/11/2024 03:00	53.8	36.1	76.2
11/11/2024 04:00	56.2	36.2	73.3
11/11/2024 05:00	61.2	38.1	89.9
11/11/2024 06:00	61.8	44.3	85.1
11/11/2024 07:00	64.6	49.8	79.3
11/11/2024 08:00	67.5	56.9	88.8
11/11/2024 09:00	67.5	58.3	87.3
11/11/2024 10:00	69.5	60.2	100.3
11/11/2024 11:00	66.3	55.7	86.5
11/11/2024 12:00	66.3	57.1	82.3
11/11/2024 13:00	66.0	57.4	85.0
11/11/2024 14:00	66.2	56.2	90.8
11/11/2024 15:00	65.6	56.9	83.4
11/11/2024 16:00	65.4	57.3	86.0
11/11/2024 17:00	66.3	58.0	88.9
11/11/2024 18:00	66.2	58.0	88.8
11/11/2024 19:00	64.8	57.2	87.5
11/11/2024 20:00	65.1	56.5	89.3
11/11/2024 21:00	63.8	55.3	80.9
11/11/2024 22:00	63.6	53.1	84.9
11/11/2024 23:00	65.6	51.4	90.5
12/11/2024 00:00	62.9	48.3	92.1
12/11/2024 01:00	57.9	42.8	76.6
12/11/2024 02:00	55.8	39.3	76.2
12/11/2024 03:00	53.0	38.4	74.7
12/11/2024 04:00	55.2	37.8	79.9
12/11/2024 05:00	59.1	38.7	90.8
12/11/2024 06:00	59.4	42.0	81.4
12/11/2024 07:00	64.8	50.1	92.1
12/11/2024 08:00	66.9	56.6	91.0
12/11/2024 09:00	67.6	58.4	85.8
12/11/2024 10:00	66.2	56.5	83.0
12/11/2024 11:00	66.1	56.4	85.7
12/11/2024 12:00	66.1	56.5	83.8

Table 11 Measured Sound Pressure Levels – NMP2

Measurement start time	Measured ambient sound level, $L_{Aeq,1hr}$ (dB)	Measured background sound level, $L_{A90,1hr}$ (dB)	Measured maximum noise level, $L_{Amax,fast}$ (dB)
06/11/2024 11:00	45.8	39.0	70.3
06/11/2024 12:00	44.2	39.2	65.6
06/11/2024 13:00	44.7	39.2	62.7
06/11/2024 14:00	43.5	38.5	56.0
06/11/2024 15:00	45.3	38.9	67.1
06/11/2024 16:00	53.1	38.5	85.1
06/11/2024 17:00	43.6	39.3	58.7
06/11/2024 18:00	45.0	39.6	71.0
06/11/2024 19:00	43.9	39.9	62.5
06/11/2024 20:00	43.2	39.1	58.1
06/11/2024 21:00	44.9	38.4	70.8
06/11/2024 22:00	41.3	37.3	54.8
06/11/2024 23:00	41.5	37.1	58.6
07/11/2024 00:00	41.0	36.8	64.4
07/11/2024 01:00	38.1	36.7	53.9
07/11/2024 02:00	38.0	36.7	51.9
07/11/2024 03:00	38.3	36.7	56.4
07/11/2024 04:00	39.0	36.8	59.0
07/11/2024 05:00	39.9	36.8	55.4
07/11/2024 06:00	41.9	37.0	62.9
07/11/2024 07:00	44.2	37.9	65.2
07/11/2024 08:00	44.3	38.5	59.9
07/11/2024 09:00	46.7	38.6	69.0
07/11/2024 10:00	44.4	38.7	63.0
07/11/2024 11:00	45.1	39.1	61.6
07/11/2024 12:00	44.5	38.7	64.0
07/11/2024 13:00	44.9	38.9	65.2
07/11/2024 14:00	48.0	40.1	70.6
07/11/2024 15:00	44.4	38.9	66.8
07/11/2024 16:00	43.5	39.0	63.1
07/11/2024 17:00	44.6	39.4	68.4
07/11/2024 18:00	43.5	39.6	62.1
07/11/2024 19:00	44.3	39.9	60.7
07/11/2024 20:00	43.6	39.6	62.3
07/11/2024 21:00	43.1	38.9	60.7
07/11/2024 22:00	43.6	38.5	60.6
07/11/2024 23:00	43.1	38.4	57.6
08/11/2024 00:00	40.1	37.0	59.1
08/11/2024 01:00	40.4	36.8	63.3
08/11/2024 02:00	37.8	36.8	54.5
08/11/2024 03:00	37.8	36.8	50.0
08/11/2024 04:00	39.6	36.8	55.0
08/11/2024 05:00	41.0	36.8	57.7
08/11/2024 06:00	48.5	37.2	65.7
08/11/2024 07:00	45.1	37.6	60.9
08/11/2024 08:00	46.1	39.0	62.1
08/11/2024 09:00	45.9	39.6	71.1
08/11/2024 10:00	44.6	38.9	63.7
08/11/2024 11:00	48.6	38.3	78.5

Measurement start time	Measured ambient sound level, $L_{Aeq,1hr}$ (dB)	Measured background sound level, $L_{A90,1hr}$ (dB)	Measured maximum noise level, $L_{Amax,fast}$ (dB)
08/11/2024 12:00	43.5	38.7	59.5
08/11/2024 13:00	44.2	38.8	66.7
08/11/2024 14:00	45.0	39.4	66.7
08/11/2024 15:00	43.7	38.6	58.1
08/11/2024 16:00	44.2	39.5	60.6
08/11/2024 17:00	43.5	39.5	59.0
08/11/2024 18:00	43.8	40.2	59.0
08/11/2024 19:00	44.7	41.0	59.9
08/11/2024 20:00	44.2	40.3	64.0
08/11/2024 21:00	44.0	39.8	61.1
08/11/2024 22:00	43.9	39.5	65.5
08/11/2024 23:00	43.5	38.0	64.0
09/11/2024 00:00	41.4	37.2	59.2
09/11/2024 01:00	46.8	36.8	78.5
09/11/2024 02:00	38.8	36.7	54.5
09/11/2024 03:00	38.3	36.6	50.5
09/11/2024 04:00	38.6	36.6	52.5
09/11/2024 05:00	38.8	36.6	53.7
09/11/2024 06:00	39.7	36.7	55.7
09/11/2024 07:00	43.1	36.9	62.2
09/11/2024 08:00	44.1	38.3	63.1
09/11/2024 09:00	43.8	39.5	60.1
09/11/2024 10:00	44.0	40.0	57.0
09/11/2024 11:00	43.7	38.3	59.8
09/11/2024 12:00	43.1	38.2	58.8
09/11/2024 13:00	46.2	39.6	71.8
09/11/2024 14:00	44.2	40.2	60.3
09/11/2024 15:00	45.2	39.9	71.8
09/11/2024 16:00	43.6	39.2	61.8
09/11/2024 17:00	45.2	40.4	74.2
09/11/2024 18:00	45.2	41.2	66.2
09/11/2024 19:00	45.4	41.1	69.5
09/11/2024 20:00	45.8	40.7	65.9
09/11/2024 21:00	44.8	40.9	63.5
09/11/2024 22:00	43.3	39.5	66.2
09/11/2024 23:00	42.2	37.6	56.6
10/11/2024 00:00	40.8	37.0	56.4
10/11/2024 01:00	39.8	36.8	54.2
10/11/2024 02:00	39.4	36.7	51.5
10/11/2024 03:00	39.6	36.7	61.1
10/11/2024 04:00	38.4	36.7	51.4
10/11/2024 05:00	39.3	36.7	62.1
10/11/2024 06:00	39.4	36.7	54.5
10/11/2024 07:00	39.6	36.9	51.7
10/11/2024 08:00	42.4	37.3	55.3
10/11/2024 09:00	42.6	37.5	57.9
10/11/2024 10:00	42.8	37.7	60.3
10/11/2024 11:00	43.1	38.1	57.7
10/11/2024 12:00	43.4	38.7	63.5
10/11/2024 13:00	44.0	38.9	61.6

Measurement start time	Measured ambient sound level, $L_{Aeq,1hr}$ (dB)	Measured background sound level, $L_{A90,1hr}$ (dB)	Measured maximum noise level, $L_{Amax,fast}$ (dB)
10/11/2024 14:00	45.7	40.0	60.5
10/11/2024 15:00	46.9	40.6	69.6
10/11/2024 16:00	53.6	40.2	84.1
10/11/2024 17:00	45.5	40.8	68.7
10/11/2024 18:00	46.2	40.8	61.8
10/11/2024 19:00	46.1	40.0	65.9
10/11/2024 20:00	45.1	39.7	63.2
10/11/2024 21:00	45.1	38.7	70.6
10/11/2024 22:00	43.5	37.9	58.0
10/11/2024 23:00	42.5	37.2	56.0
11/11/2024 00:00	40.4	36.9	54.2
11/11/2024 01:00	39.0	36.7	54.1
11/11/2024 02:00	38.0	36.7	54.1
11/11/2024 03:00	38.8	36.7	52.1
11/11/2024 04:00	41.0	36.7	64.3
11/11/2024 05:00	42.4	36.8	63.9
11/11/2024 06:00	43.3	37.2	57.6
11/11/2024 07:00	50.4	38.4	72.3
11/11/2024 08:00	46.3	39.4	64.0
11/11/2024 09:00	45.6	39.6	62.1
11/11/2024 10:00	45.8	38.9	64.8
11/11/2024 11:00	53.0	38.8	83.8
11/11/2024 12:00	45.2	39.5	69.9
11/11/2024 13:00	44.7	38.7	65.7
11/11/2024 14:00	45.2	40.0	69.2
11/11/2024 15:00	44.6	39.1	64.4
11/11/2024 16:00	44.7	39.5	65.5
11/11/2024 17:00	46.1	39.8	69.5
11/11/2024 18:00	43.8	39.3	60.5
11/11/2024 19:00	43.9	39.5	59.3
11/11/2024 20:00	44.5	38.8	70.2
11/11/2024 21:00	43.2	37.5	64.2
11/11/2024 22:00	43.3	37.2	64.1
11/11/2024 23:00	42.0	36.9	65.6
12/11/2024 00:00	39.4	36.7	54.0
12/11/2024 01:00	38.8	36.6	54.0
12/11/2024 02:00	37.8	36.6	52.8
12/11/2024 03:00	38.4	36.5	58.9
12/11/2024 04:00	40.6	36.6	68.9
12/11/2024 05:00	39.8	36.7	56.7
12/11/2024 06:00	43.3	37.1	59.0
12/11/2024 07:00	45.8	38.7	62.0
12/11/2024 08:00	46.3	39.3	68.2
12/11/2024 09:00	45.2	39.3	62.5
12/11/2024 10:00	45.1	38.5	59.3
12/11/2024 11:00	44.7	38.8	59.2
12/11/2024 12:00	46.5	39.3	66.6