

1232 Hope Street Prescot

Industrial Noise Impact Assessment Report

30962/NIA1

16 October 2023

For:
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Document Control

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Contents	Page
1.0 Introduction	1
2.0 Objectives	1
3.0 Acoustic Terminology	1
4.0 Site Description	2
5.0 Proposed Development	3
6.0 Planning Policies, Standards & Guidance	5
7.0 Baseline Noise Survey	6
8.0 Industrial Noise Impacts	9
9.0 Incident Noise Levels	11
10.0 Achieving Internal Noise Levels	12
11.0 External Amenity Area	15
12.0 Conclusions	15

Attachments

Appendix A – Acoustic Terminology

Appendix B – Relevant Planning Policies and Guidance



1.0 Introduction

Hann Tucker Associates Limited (Hann Tucker) has been commissioned by Norman Harrison to undertake a noise assessment for a site in Prescot, Merseyside.

The site, which is located on Hope Street, is being considered for residential development. The proposals are for the demolition of existing industrial buildings and the erection of 6No interlinked 2-storey terraced houses with associated car parking and landscaped garden spaces.

The site is subject to road noise from Eaton Street as well as industrial noise from Prescot Car Centre.

Baseline noise conditions have been established by means of a detailed noise survey, presented herein. The findings have subsequently been used to assess the suitability of the site for residential use. Measures required to mitigate noise impacts for the proposed development (when operational) have been discussed in context with relevant national & local planning policies, design standards and good practice guides.

2.0 Objectives

To visit site to survey prevailing baseline daytime noise levels as well as operational (workshop) activity noise levels from the existing car garage capturing L_{Amax} , L_{Aeq} and L_{A90} noise levels, using fully computerised noise monitoring equipment.

To assess the noise emissions from the proposed MOT Centre, based upon data with which we measure from the existing facility, and comment upon the acceptability and potential impact on the proposed scheme.

To discuss noise mitigation and acoustic design solutions to achieve acceptable noise levels in residential areas.

3.0 Acoustic Terminology

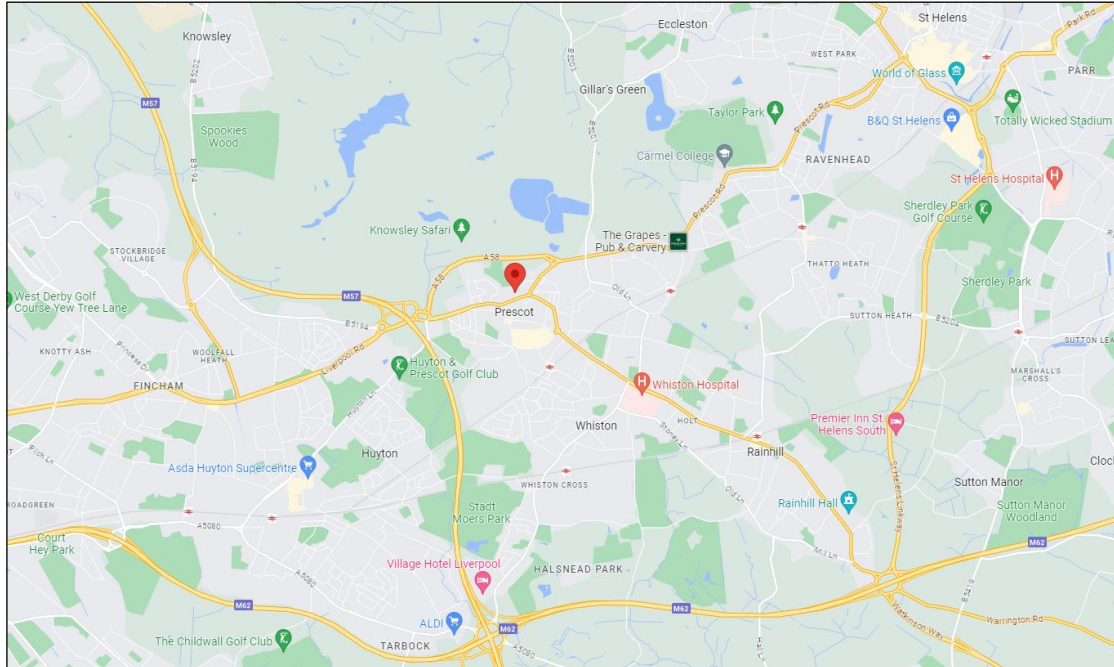
For an explanation of the acoustic terminology used in this report please refer to Appendix A enclosed.



4.0 Site Description

4.1 Location

The site is located off Hope Street in Prescot. The location is shown below.



Location Map (Map data © 2023)

The site falls within the jurisdiction of Knowsley Metropolitan Borough Council.

4.2 Description

The proposed site is primarily surrounded by residential premises. To the immediate south-west of the site is the Prescot Car Centre, approximately 15m away. To the east is an existing row of 2-storey terraced houses, and existing 3-storey terraced houses to the south.

The site is located off Hope Street, which is perpendicular to Eaton Street to the north and High Street (A57) to the south. To the north of the site, along Eaton Street, approximately 35m away lies a Private Day Nursery and Prescot Cables Football Club; 100m north there is a Children's play area. At the south end of Hope Street (65m from the proposed site) is the Hope & Anchor Pub.



Site Plan (Imagery ©2023 Airbus, Bluesky, Infoterra Ltd & COWI A/S, Getmapping plc, Infoterra Ltd & Bluesky, Maxar Technologies, The GeoInformation Group, Map data ©2023)

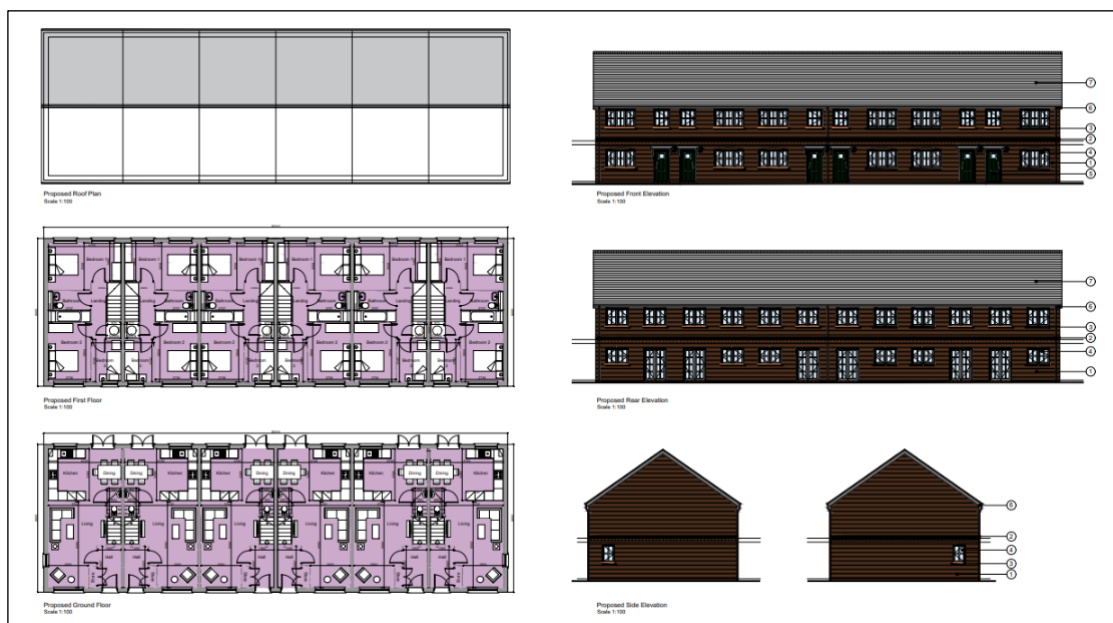
5.0 Proposed Development

The proposal for the development includes 6No. 2-storey terraced houses each with a garden and associated parking spaces to the south of the site. The proposed site plan can be seen overleaf.



Proposed Site Plan (Keith Davidson Partnership)

The front rear and side elevations can be seen in the Plan below.



Plan showing Project Proposals (Keith Davidson Partnership)



6.0 Planning Policies, Standards & Guidance

6.1 Policies & Guides

In order to provide a suitable assessment a number of national planning policies have been considered, including:

- The National Planning Policy Framework (NPPF), 2021
- The Noise Policy Statement for England (NPSE), 2010
- Planning Practice Guidance – Noise (PPGN), 2019

The above documents highlight the importance of considering the potential noise effects on any new residential development and provide a qualitative approach to assessment. However, each of the above does not provide any quantitative guidance. As such, all quantitative guidance used to form a noise impact assessment is taken from various other standards, guidance, and Local Authority requirements as summarised below:

- World Health Organisation: 2018
- British Standard BS8233: 2014
- ProPG : Planning & Noise: 2017
- Building Regulations Approved Document O: 2021
- British Standard 4142:2014 + A1:2019

Detailed information for relevant planning policies / guidance can be found within Appendix B.

6.2 Specific Local Authority Criteria

The local authority has been contacted and Helen Bradshawe (Environmental Protection Officer) has confirmed our methodology to be acceptable with the addition of an assessment of the L_{AFmax} values.

The requested assessment of L_{AFmax} is open to interpretation and we expect could relate to an assessment considering BS 8233:2014 and/or WHO guidance. These require an assessment of maximum noise levels during the night-time, however, the car MOT garage being assessed does not operate during such time. Notwithstanding, we have still considered the L_{AFmax} values in this report and have quantified the resultant internal levels in the proposed development for completeness (ie assuming night time operation). It should also be noted that BS 4142:2014 includes the application of penalties for attention catching features (ie impulsivity). If present, and applied, we would expect this to also provide consideration toward 'maximum noise events'.



7.0 Baseline Noise Survey

7.1 Procedure

Before completing the final survey, an initial visit was made to site by one of our engineers. However, due to the nature of the work being carried out by the workers in the current site and the fact the MOT garage was unusually quiet, we were unable to take any measurements as is the data would be confounded. Therefore, it was agreed with the client that we would return to site when the current unit was quieter, and the MOT garage was representatively operational.

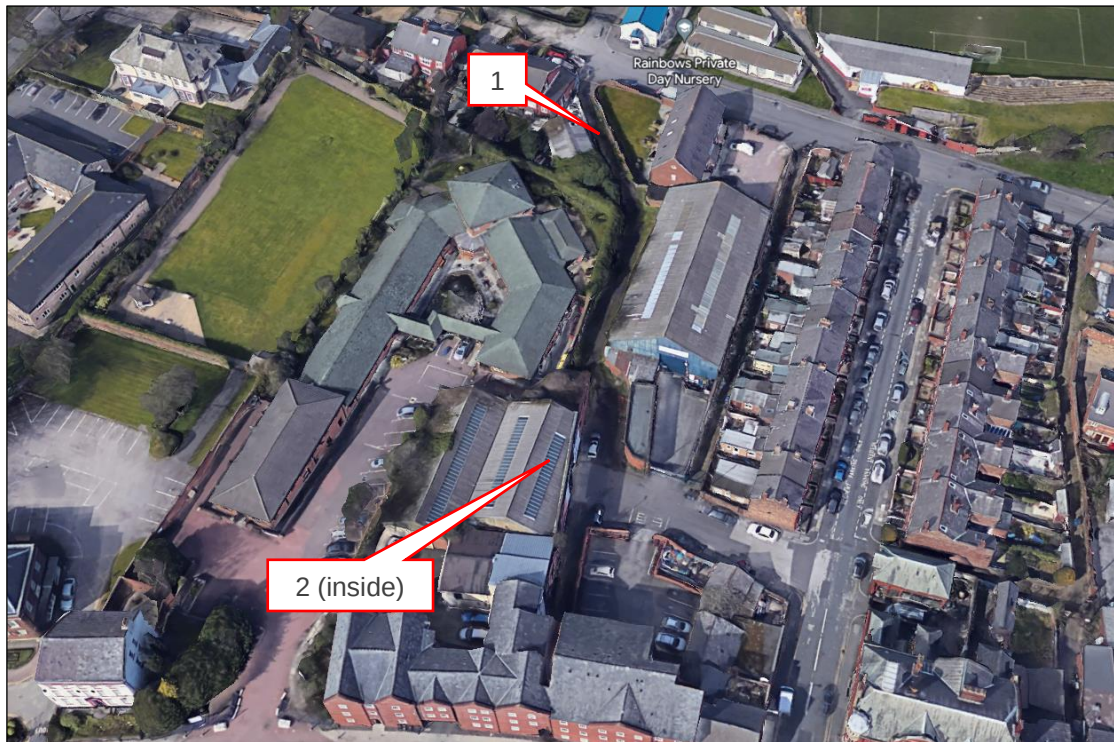
Fully automated environmental noise monitoring was undertaken by Will Robertson BSc (Hons) from approximately 10:00-12:00 hours on Wednesday 04 October 2023. Attended measurements were taken continuously of the A-weighted (dBA) L_{90} , L_{eq} , and L_{max} sound pressure levels over discrete 1 and 60-minute periods.

7.2 Measurement Positions

The noise level measurements were undertaken at 2No positions as described in the table below.

Position	Type	Description
1	Unattended	To the northwest corner of the site approx. 30m away. Approx. 8m from the nearside edge of Eaton Street. Microphone in free-field conditions approx. 2 m above ground.
2	Attended	Inside the MOT garage approx. 22m from the southwest nearside edge of the proposed site and 40m from Hope Street. Microphone in free-field conditions approx. 1.5m above ground (placed on tripod).

The positions are shown on the plan overleaf.



Plan Showing Measurement Positions (Google Earth ©2023)

It should be noted that measurement Position 2 was undertaken inside the MOT Garage, as opposed to measuring at the perimeter of the proposed site. This was decided upon arrival at the site because of the noise levels being generated from the current site (that is being removed) were too high to give an accurate assessment of the MOT Garage, independent of its surroundings. In the current site, it was noted that sanding and pressure washing of the vehicles inside, were the predominant sources of noise at the perimeter of the site.

7.3 Weather Conditions

During the attended survey on Wednesday 04 October 2023, the weather was generally overcast and dry with no periods of rainfall and calm wind conditions. The temperature was approximately 15°C during the measurement period.



7.4 Instrumentation

The instrumentation used during the survey is presented in the table below:

Position	Description	Manufacturer	Type	Serial Number	Calibration
1	Type 1 Data Logging Sound Level Meter	Larson Davis	LxT	5104	Calibration on 30/05/2023
2	Type 1 Data Logging Sound Level Meter	Larson Davis	LxT	4568	Calibration on 30/05/2023
Both	Type 1 Calibrator	Larson Davis	CAL200	3083	Calibration on 27/03/2023

Each sound level meter, including the extension cable, was calibrated prior to and on completion of the surveys. No significant changes were found to have occurred (no more than 0.08 dB).

Each sound level meter was located in an environmental case with the microphone connected to the sound level meter via an extension cable. Each microphone was fitted with a windshield.

7.5 Results

A summary of the results, as used to inform subsequent assessments against current guidelines, is presented in the table below. The L_{A90} values presented are the 'representative' levels determined through statistical analysis of the 60-minute readings.

The following table summarises noise levels recorded at each of the measurement positions.

Position	Period	Sound Pressure Level (dB)		
		$L_{Aeq,T}$	$L_{A90,T}$	$L_{Amax,T}$
1	10:00-11:00	48	45	69
	11:00-12:00	49	45	71
2	10:00-11:00	68	43	85
	11:00-12:00	57	45	89



7.6 Discussion of Noise Climate

At the beginning and end of the survey period the noise climate at the proposed closest façade to the garage was noted to be dominated by road traffic noise from High Street and operations inside the current MOT garage. At the unattended position, occasional cars would park or turn at the end of Eaton Street, and during the second measurement hour the current site became noticeably louder at the unattended position, with sanding of vehicles occurring inside the building.

8.0 Industrial Noise Impacts

8.1 Overview

This section considers the potential noise impact of the existing adjacent commercial premises and associated activities on proposed residential receptors. The assessment follows methodology set out within BS 4142:2014.

Our assessment has been carried out inside the current MOT garage, and therefore some corrections for distance and noise breakout have been applied to the measured data. We have corrected the data so that it represents 1 m from the worst affected window of the proposed development. The correction process can be seen below.

Description	Noise Egress Calculation
Reverberant Internal Noise Level (dBA)	68
Surface Area Correction (dB)	+18 (70m ²)
Distance Loss Correction (dB)	-28 (To 25m)
Constants (dB)	-14
Expected noise level at Nearest Sensitive Receptor (dBA)	44

The MOT garage is in operation between the hours of 08:00-17:00 hours on weekdays and is closed on weekends. When on site, the garage owner also suggested that sometime in the near future he will aim to work from Monday to Thursday, with the garage closed on Fridays.



8.2 BS 4142 Assessment

Based on the measured data and observations made on site, the table below provides an initial BS4142:2014 assessment. It should be noted that we have not corrected for the residual noise level as we measured the noise levels at the source, and therefore do not consider the levels measured to have been adversely affected by any extraneous measurements.

Results		Relevant Clause	Commentary
Specific sound level at receptor	$L_{Aeq,1hour} = 44 \text{ dB}$	7.3.8 7.3.9 7.3.10	Highest measured 1 hour period from measurement within the MOT
Acoustic feature correction	+ 9 dB	9.2	The noise inside the MOT garage was impulsive in nature, and when conducting site walkaround was still perceptible.
Rating level	53 dB	9.2	Calculated by adding acoustic feature corrections to the specific sound level.
Background sound level	$L_{A90,1hour} = 45 \text{ dB}$	8.1.1 8.1.3 8.3	Typical background sound level measured at the proposed development site during a typical weekday.
Excess of rating over background sound level	8 dB	11	
Assessment indicates likelihood of an adverse impact to residents without noise mitigation measures.		11	The excess of the rating level over the background level is high, mitigation measures must therefore be assessed further to ensure good internal acoustic conditions.
Uncertainty of the assessment	Low	10	The background sound level is based on repeatable measurements made over the duration of 2No hours. The measurements of industrial noise remained consistent throughout measurement period and were measured near the source.

The above indicates a likelihood of an adverse impact to proposed residents without noise mitigation measures, however, the context of the site must be considered to enable a full assessment.

Where the initial estimate of the impact needs to be modified due to the context, BS 4142:2014 states that all pertinent factors should be taken into consideration, including the following:

- The sensitivity of the receptor and whether dwellings will already incorporate design measures that secure good internal acoustic conditions.



Clearly, therefore, an initial estimate of an adverse impact does not imply that development may not be permitted, provided that proposed dwellings can incorporate design measures (ie enhanced façade elements) that secure good internal acoustic conditions.

The wider context of the site should also be considered as MOT garages are often situated within mixed residential areas similar to that of the proposed development, where there are also numerous other existing and established residential properties.

In light of the above, we recommend that appropriate mitigation measures are incorporated into the design of proposed dwellings to control noise from the proposed facilities to a suitable level.

9.0 Incident Noise Levels

Using the survey data, we have predicted the incident noise levels upon each elevation of the proposed development.



Incident Noise Level Markups (Map data ©2023)



The associated mark-ups outline the free-field incident noise levels across the development. For purposes of any subsequent assessment, these zones are considered to be the “Façade Zones”. An additional 5 dB penalty has been deducted from the other façades as a screening loss from the front of the MOT garage.

Façade zone	Calculated Specific Incident noise levels	
	Daytime $L_{Aeq,1h}$ (dB)	Daytime Highest $L_{AFmax,1min}$ (dB)
Red	44	65
Blue	39	60

10.0 Achieving Internal Noise Levels

There are 3No ventilation conditions applicable to proposed residential dwellings. These are Background Ventilation as described in Approved Document F (Part F) and Purge Ventilation (outdoor and smells). Overheating conditions are also relevant, but the scope of this is outside the scope of this Report.

Based on the prevailing noise climate at the site, open windows as a means of background ventilation could be deemed suitable in the blue façade across the development, but not the red zones as detailed in Section 9.0. As we are considering industrial noise, an internal noise criteria 5 dB below the standard criteria is suggested. The general consensus appears to be that open windows provide a 10-15 dB level drop from outside to inside, meaning that the red zones will reach a worst-case $L_{Aeq,1h}$ of 34 dB, which is 4 dB above the suggested criteria of 30 dB in BS 8233. As such we suggest an alternative means of ventilation for red zone façades.

10.1 Purge Ventilation

It should be noted that the internal noise level guidelines are generally not applicable under “*purge ventilation*” conditions as defined by Part F, as this should only occur occasionally (e.g. to remove odour from painting and decorating or from burnt food).

As such, acoustic conditions are generally not a concern during purge ventilation.

10.2 Background Ventilation Condition

10.2.1 Criteria

With reference to the acoustic standards and guidelines as reviewed in Appendix B, the external noise intrusion levels from environmental sources should be controlled so as to not exceed the following criteria.



Activity	Location	Desirable Internal Ambient Criteria	
		07:00 – 23:00	23:00 – 07:00
Resting	Living Rooms	35 dB $L_{Aeq,16hour}$	-
Dining	Dining Room/Area	40 dB $L_{Aeq,16hour}$	-
Sleeping (Daytime Resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$ 45 dB L_{Amax}

Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target noise levels may be relaxed (subject to the requirements of any planning conditions) by up to 5 dB and reasonable internal conditions still achieved.

10.2.2 Outline Specifications

Based on the prevailing noise climate at the site, open windows as a means of background ventilation would be suitable on all blue zone façades across the development, but not for the red zones.

Allowance should be made to provide appropriate sound insulation solutions as required including, where necessary, suitably specified glazing and attenuated ventilators/mechanical ventilation systems. Preliminary calculations have been carried out to determine the likely façade sound insulation performance requirements for each façade. Calculation methods follow those outlined in BS 8233:2014 Section G.2 and are based on the following:

- Conventional brick/block cavity external wall
- Typical room volume as per latest drawings
- Typical window area as per latest drawings
- Reverberation time of 0.5 seconds.

From the results of the assessment, the following minimum preliminary acoustic performance specifications are recommended. These are intended for planning use only, and detailed design stage octave band acoustic specifications will need to be developed for tender.

Façade Element	Preliminary Minimum Sound Reduction Specification	Example Configuration (For Guidance Only)
Window	27 dB $R_w + C_{tr}$	- 6 / 16 / 6 mm conventional double glazing
Ventilator	33 dB $D_{ne,w} + C_{tr}$	- 1 x 2,500 mm ² standard trickle vent per habitable room with MEV



The predicted specific internal noise levels of each façade zone with the application of the above façade specifications can be seen in the table below.

Zone	Predicted Internal Noise Level in Bedroom (dBA)	Predicted Internal Noise Level in Living Room (dBA)
Red	23	21
Blue	18	16

With windows shut, maximum noise levels would also be predicted to be 35 dB L_{AFmax} within bedrooms. Notwithstanding, the car garage does not operate during the night-time so as noted in Section 6.2 this is presented for completeness.

10.2.3 Example Glazing Configurations

Example glazing configurations commensurate with achieving the sound insulation specifications noted in Section 10.2.2 are given below.

Glazing Specification, $R_w + C_{tr}$ (dB)	Example Configuration
27	double glazed system e.g 6/16/6 mm.

10.2.4 Example Ventilation Solutions

Example ventilation solutions commensurate with achieving the elemental sound insulation performances noted in Section 10.2.2 are discussed below.

Ventilator Specification, $D_{new} + C_{tr}$ (dB)	Example Configuration
33	1 x 2,500mm ² standard hit-miss trickle vent per habitable room, or a mechanically assisted supply & extract solution (e.g. local MVHR).

The preliminary performance specifications included above are based on the provision of either full MVHR for rooms or 1no. ventilator only per habitable room as required. If additional numbers of ventilators are required to achieve the ventilation rates, the performance requirement for the individual ventilators will need to increase.

The table below provides guidance on the increase in performance specification required for additional numbers of ventilators.



Number of Ventilators	Performance Increase on Ventilator Specifications Stated Above
1	+0 dB
2	+3 dB
3	+5 dB
4	+6 dB

It should be noted that we believe that the south facing ground floor living room window should be fixed shut, and not relied on for any overheating relief, as the internal noise level criterion may be exceeded.

11.0 External Amenity Area

Noise levels in external amenity areas should ideally not be above the range of 50 to 55 dB $L_{Aeq,16hr}$, as suggested to be targeted as a limit in BS8233:2014. The assessment of this proposed development suggests that the noise levels are under the ideal range and should therefore be suitable for an external amenity area in regard to noise.

12.0 Conclusions

A detailed environmental noise survey has been undertaken in order to establish the currently prevailing noise climate around the site due to a nearby car MOT garage.

The noise impact associated with the operation of the car MOT garage upon the proposed dwellings has been assessed in the context of national and local planning policies.

Appropriate target internal noise levels have been proposed. These are achievable using conventional mitigation measures.

Preliminary acoustic performance specifications for the external building fabric elements have been recommended such that appropriate internal noise levels should be achieved. These are intended for planning use only, and detailed design stage octave band acoustic specifications will need to be developed for tender.

The assessment shows the site, subject to appropriate mitigation measures, is suitable for residential development in terms of noise.

Appendix A

Acoustic Terminology

The acoustic terms used in this report are defined as follows:

dB Decibel - Used as a measurement of sound level. Decibels are not an absolute unit of measurement but an expression of ratio between two quantities expressed in logarithmic form. The relationships between Decibel levels do not work in the same way that non-logarithmic (linear) numbers work (e.g. $30\text{dB} + 30\text{dB} = 33\text{dB}$, not 60dB).

dBA The human ear is more susceptible to mid-frequency noise than the high and low frequencies. The 'A'-weighting scale approximates this response and allows sound levels to be expressed as an overall single figure value in dBA. The _A subscript is applied to an acoustical parameter to indicate the stated noise level is A-weighted

It should be noted that levels in dBA do not have a linear relationship to each other; for similar noises, a change in noise level of 10dBA represents a doubling or halving of subjective loudness. A change of 3dBA is just perceptible.

L_{90,T} L₉₀ is the noise level exceeded for 90% of the period *T* (i.e. the quietest 10% of the measurement) and is often used to describe the background noise level.

L_{eq,T} L_{eq,T} is the equivalent continuous sound pressure level. It is an average of the total sound energy measured over a specified time period, *T*.

L_{max} L_{max} is the maximum sound pressure level recorded over the period stated. L_{max} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the L_{eq} noise level.

L_p Sound Pressure Level (SPL) is the sound pressure relative to a standard reference pressure of 2×10^{-5} Pa. This level varies for a given source according to a number of factors (including but not limited to: distance from the source; positioning; screening and meteorological effects).

L_w Sound Power Level (SWL) is the total amount of sound energy inherent in a particular sound source, independent of its environment. It is a logarithmic measure of the sound power in comparison to a specified reference level (usually 10^{-12} W).

Appendix B

Planning Policies, Standards & Guidance

B.1 Noise Policy Statement for England

The Noise Policy Statement for England (NPSE) was published in March 2010 (i.e. before the NPPF). The NPSE is the overarching statement of noise policy for England and applies to all forms of noise other than occupational noise, setting out the long term vision of Government noise policy which is to:

“Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development.”

That vision is supported by the following NPSE noise policy aims which are reflected in three of the four aims of planning policies and decisions in paragraph 123 of the NPPF (see paragraph 8.2 (b) below):

“Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- *avoid significant adverse impacts on health and quality of life;*
- *mitigate and minimise adverse impacts on health and quality of life; and*
- *where possible, contribute to the improvement of health and quality of life.”*

The Explanatory Note to the NPSE has three concepts for the assessment of noise in this country:

NOEL – No Observed Effect Level

This is the level below which no effect can be detected and below which there is no detectable effect on health and quality of life due to noise.

LOAEL – Lowest Observable Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected.

SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur.

None of these three levels are defined numerically and for the SOAEL the NPSE makes it clear that the noise level is likely to vary depending upon the noise source, the receptor and the time of day/day of the week, etc. The need for more research to investigate what may represent an SOAEL for noise is acknowledged in the NPSE and the NPSE asserts that not stating specific SOAEL levels provides policy flexibility in the period until there is further evidence and guidance.

The NPSE concludes by explaining in a little more detail how the LOAEL and SOAEL relate to the three NPSE noise policy aims listed above. It starts with the aim of avoiding significant adverse effects on health and quality of life, then addresses the situation where the noise impact falls between the LOAEL and the SOAEL when *“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.”* The final aim envisages pro-active management of noise to improve health and quality of life, again taking into account the guiding principles of sustainable development which include the need to minimise travel distance between housing and employment uses in an area.

B.2 National Planning Policy Framework (NPPF)

The following paragraphs are from the NPPF (published July 2021):

185. Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

- a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;
- b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

187. Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or ‘agent of change’) should be required to provide suitable mitigation before the development has been completed.”

Paragraph 185 also references the Noise Policy Statement for England (NPSE). This document does not refer to specific noise levels but instead sets out three aims:

- “Avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.
- Mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.
- Where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.”

B.3 Planning Practice Guidance on Noise

Planning Practice Guidance (PPG) under the NPPF has been published by the Government as a web based resource at <http://planningguidance.planningportal.gov.uk/blog/guidance/>. This includes specific guidance on Noise although, like the NPPF and NPSE the PPG does not provide any quantitative advice. It seeks to illustrate a range of effect levels in terms of examples of outcomes as set out in the following table:

Perception	Examples of Outcomes	Increasing effect level	Action
Not noticeable	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	

Perception	Examples of Outcomes	Increasing effect level	Action
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; 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.	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; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable hard, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

B.4 World Health Organisation

The current Environmental Noise Guidelines 2018 for the European Region (ENG) supersede the Guidelines for Community Noise from 1999 (CNG). Nevertheless, the ENG recommends that all CNG indoor guideline values and any values not covered by the current guidelines (such as industrial noise and shopping areas) remain valid.

A summary of the guidance from the ENG and CNG is shown in the table below.

Source	CNG guideline indoors all sources	ENG guideline outdoors noise from specific source only
Road traffic noise	35 L _{Aeq} , 16h	53 dB L _{den}
	30 L _{Aeq} , 8h	45 dB L _{night}
Railway noise	35 L _{Aeq} , 16h	54 dB L _{den}
	30 L _{Aeq} , 8h	44 dB L _{night}
Aircraft noise	35 L _{Aeq} , 16h	45 dB L _{den}
	30 L _{Aeq} , 8h	40 dB L _{night}

With regard to single-event noise indicators, Section 2.2.2 of the WHO Environmental Noise Guidelines 2018 state:

“In many situations, average noise levels like the L_{den} or L_{night} indicators may not be the best to

explain a particular noise effect. Single-event noise indicators – such as the maximum sound pressure level ($L_{A,max}$) and its frequency distribution – are warranted in specific situations, such as in the context of night-time railway or aircraft noise events that can clearly elicit awakenings and other physiological reactions that are mostly determined by $L_{A,max}$. Nevertheless, the assessment of the relationship between different types of single-event noise indicators and long-term health outcomes at the population level remains tentative. The guidelines therefore make no recommendations for single-event noise indicators.”

B.5 British Standard BS8233: 2014

British Standard 8233: 2014 “Guidance on sound insulation and noise reduction for buildings” provides guidance for the control of noise in and around buildings.

Internal Areas

BS8233:2014 Section 7.7.2 titled “Internal ambient noise levels for dwellings” states:

“In general for steady external noise sources, it is desirable that internal ambient noise levels do not exceed the following guideline values:

Activity	Location	Desirable Internal Ambient Criteria	
		07:00 – 23:00	23:00 to 07:00
Resting	Living Rooms	35 dB $L_{Aeq,16hour}$	-
Dining	Dining Room/Area	40 dB $L_{Aeq,16hour}$	-
Sleeping (Daytime Resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

Note 1 The above table provides recommended levels for overall noise in the design of a building. These are the sum total of structure-borne and airborne noise sources. Groundborne noise is assessed separately and is not included as part of these targets, as human response to groundborne noise varies with many factors such as level, character, timing, occupant expectation and sensitivity.

Note 2 The levels shown in the above table are based on the existing guidelines issued by the WHO and assume normal diurnal fluctuations in external noise. In cases where local conditions do not follow a typical diurnal pattern, for example on a road serving a port with high levels of traffic at certain times of the night, an appropriate alternative period, e.g. 1 hour, may be used, but the level should be selected to ensure consistency with the levels recommended in the above table.

Note 3 These levels are based on annual average data and do not have to be achieved in all circumstances. For example, it is normal to exclude occasional events, such as fireworks night or New Year’s Eve.

Note 4 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.

Note 5 If relying on closed windows to meet the guide values, there needs to be an appropriate alternative ventilation that does not compromise the façade insulation or the resulting noise level.

If applicable, any room should have adequate ventilation (e.g. trickle ventilators should be open) during assessment.

Note 6 Attention is drawn to the Building Regulations.

Note 7 Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved.”

External Amenity Areas

BS8233:2014 Section 7.7.3.2 titled “Design criteria for external noise” states:

“For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}^{-1}$, 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.

Other locations, such as balconies, roof gardens and terraces, are also important in residential buildings where normal external amenity space might be limited or not available, i.e. in flats, apartment blocks, etc. In these locations, specification of noise limits is not necessarily appropriate. Small balconies may be included for uses such as drying washing or growing pot plants, and noise limits should not be necessary for these uses. However, the general guidance on noise in amenity space is still appropriate for larger balconies, roof gardens, and terraces, which might be intended to be used for relaxation. In high-noise areas consideration should be given to protecting these areas by screening or building design to achieve the lowest practicable levels. Achieving levels of 55dB $L_{Aeq,T}$ or less might not be possible at the outer edge of these areas, but should be achievable in some areas of the space.”

B.6 ProPG : Planning & Noise : 2017

The primary goal of the ProPG is to assist the delivery of sustainable development by promoting good health and well-being through the effective management of noise. It seeks to do that through encouraging a good acoustic design process in and around proposed new residential development having regard to national policy on planning and noise. It is applicable to noise

from existing transport sources (noting that good professional practice should have regard to any reasonably foreseeable changes in existing and/or new sources of noise). The recommended approach is also considered suitable where some industrial or commercial noise contributes to the acoustic environment provided that is “not dominant”.

This ProPG advocates a systematic, proportionate, risk based, 2-stage, approach. The approach encourages early consideration of noise issues, facilitates straightforward accelerated decision making for lower risk sites, and assists proper consideration of noise issues where the acoustic environment is challenging.

The two sequential stages of the overall approach are:

- Stage 1 – an initial noise risk assessment of the proposed development site; and
- Stage 2 – a systematic consideration of four key elements.

The four key elements to be undertaken in parallel during Stage 2 of the recommended approach are:

- Element 1 – demonstrating a “Good Acoustic Design Process”;
- Element 2 – observing internal “Noise Level Guidelines”;
- Element 3 – undertaking an “External Amenity Area Noise Assessment”; and
- Element 4 – consideration of “Other Relevant Issues”.

The ProPG considers suitable guidance on internal noise levels found in “BS8233:2014: Guidance on sound insulation and noise reduction for buildings”. Table 4 in Section 7.7.2 of the standard suggests that “in general, for steady external noise sources, it is desirable that the internal ambient noise level does not exceed the guideline values”. The standard states (Section 7.7.1) that “occupants are usually more tolerant of noise without a specific character” and only noise without such character is considered in Table 4 of the standard.

Activity	Location	07:00 – 23:00 Hours	23:00 – 07:00 Hours
Resting	Living Room	35dB $L_{Aeq,16hr}$	-
Dining	Dining Room / Area	40dB $L_{Aeq,16hr}$	-
Sleeping (daytime resting)	Bedroom	35dB $L_{Aeq,16hr}$	30dB $L_{Aeq,16hr}$ 45dB $L_{Amax,F}$

NOTE 1 the Table provides recommended internal L_{Aeq} target levels for overall noise in the design of a building. These are the sum total of structure-borne and airborne noise sources.

Ground-borne noise is assessed separately and is not included as part of these targets, as human response to ground-borne noise varies with many factors such as level, character, timing, occupant expectation and sensitivity.

NOTE 2 The internal L_{Aeq} target levels shown in the Table are based on the existing guidelines issued by the WHO and assume normal diurnal fluctuations in external noise. In cases where local conditions do not follow a typical diurnal pattern, for example on a road serving a port with high levels of traffic at certain times of the night, an appropriate alternative period, e.g. 1 hour, may be used, but the level should be selected to ensure consistency with the L_{Aeq} target levels recommended in the Table.

NOTE 3 These internal L_{Aeq} target levels are based on annual average data and do not have to be achieved in all circumstances. For example, it is normal to exclude occasional events, such as fireworks night or New Year's Eve.

NOTE 4 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. In most circumstances in noise-sensitive rooms at night (e.g. bedrooms) good acoustic design can be used so that individual noise events do not normally exceed 45dB $L_{Amax,F}$ more than 10 times a night. However, where it is not reasonably practicable to achieve this guideline then the judgement of acceptability will depend not only on the maximum noise levels but also on factors such as the source, number, distribution, predictability and regularity of noise events (see Appendix A).

NOTE 5 Designing the site layout and the dwellings so that the internal target levels can be achieved with open windows in as many properties as possible demonstrates good acoustic design. Where it is not possible to meet internal target levels with windows open, internal noise levels can be assessed with windows closed, however any façade openings used to provide whole dwelling ventilation (e.g. trickle ventilators) should be assessed in the "open" position and, in this scenario, the internal L_{Aeq} target levels should not normally be exceeded, subject to the further advice in Note 7.

NOTE 6 Attention is drawn to the requirements of the Building Regulations.

NOTE 7 Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal L_{Aeq} target levels may be relaxed by up to 5dB and reasonable internal conditions still achieved. The more often internal L_{Aeq} levels start to exceed the internal L_{Aeq} target levels by more than 5dB, the more that most people are likely to regard them as "unreasonable". Where such exceedances are predicted, applicants should be

required to show how the relevant number of rooms affected has been kept to a minimum. Once internal L_{Aeq} levels exceed the target levels by more than 10dB, they are likely to be regarded as “unacceptable” by most people, particularly if such levels occur more than occasionally. Every effort should be made to avoid relevant rooms experiencing “unacceptable” noise levels at all and where such levels are likely to occur frequently, the development should be prevented in its proposed form (See Section 3.D).

B.7 Building Regulations Approved Document O

Building Regulations Approved Document O relates to setting standards for overheating in new residential buildings. It aims to protect the health and welfare of occupants of the building by reducing the occurrence of high indoor temperatures.

Requirement O1 of Approved Document O is met by designing and constructing the building to achieve both of the following:

- a. Limiting unwanted solar gains in summer.
- b. Providing an adequate means of removing excess heat from the indoor environment.

Sections 3.2 to 3.4 of this document relate to noise and state the following:

“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).

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).

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).*

B.8 British Standard 4142:2014 + A1:2019

When setting plant noise emission criteria reference is commonly made to BS 4142:2014 *“Methods for rating and assessing industrial and commercial sound”*.

The procedure contained in BS 4142:2014 provides an assessment of the likely effects of sound on people when comparing the specific noise levels from the source with representative background noise levels. Where the noise contains “a tone, impulse or other characteristic” then various corrections can be added to the specific (source) noise level to obtain the “rating level”.

BS 4142 states that: *“The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs”. An estimation of the impact of the specific noise can be obtained by the difference of the rating noise level and the background noise level and considering the following:*

- *“Typically, the greater this difference, the greater the magnitude of the impact.”*
- *“A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context.”*
- *“A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context.”*
- *“The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.”*

The determination of the “rating level” and the “background level” are both open to interpretation, depending on the context.

In summary it is not possible to set plant noise emission criteria purely on the basis of BS 4142:2014+A1:2019. It is reasonable to infer from the above, however, that a difference of around -5dB corresponds to “No Observed Effect Level” as defined in the Noise Policy Statement for England. It is also reasonable to infer from the above that if the plant noise rating level does not exceed the existing background noise level outside any noise sensitive residential window, then the plant noise is of “low impact”.