Blue Acoustics NS337

117 Station Road, Cradely Heath, Birmingham B64 6PL

Proposed partial rear demolition and change of use of existing warehouse premises into 9 No. self-contained flats

Planning Application : DC/20/64273

Prepared by :

Timothy Sherlock-Brown (M.I.O.A. MSc)

08.01.2021

On behalf of :

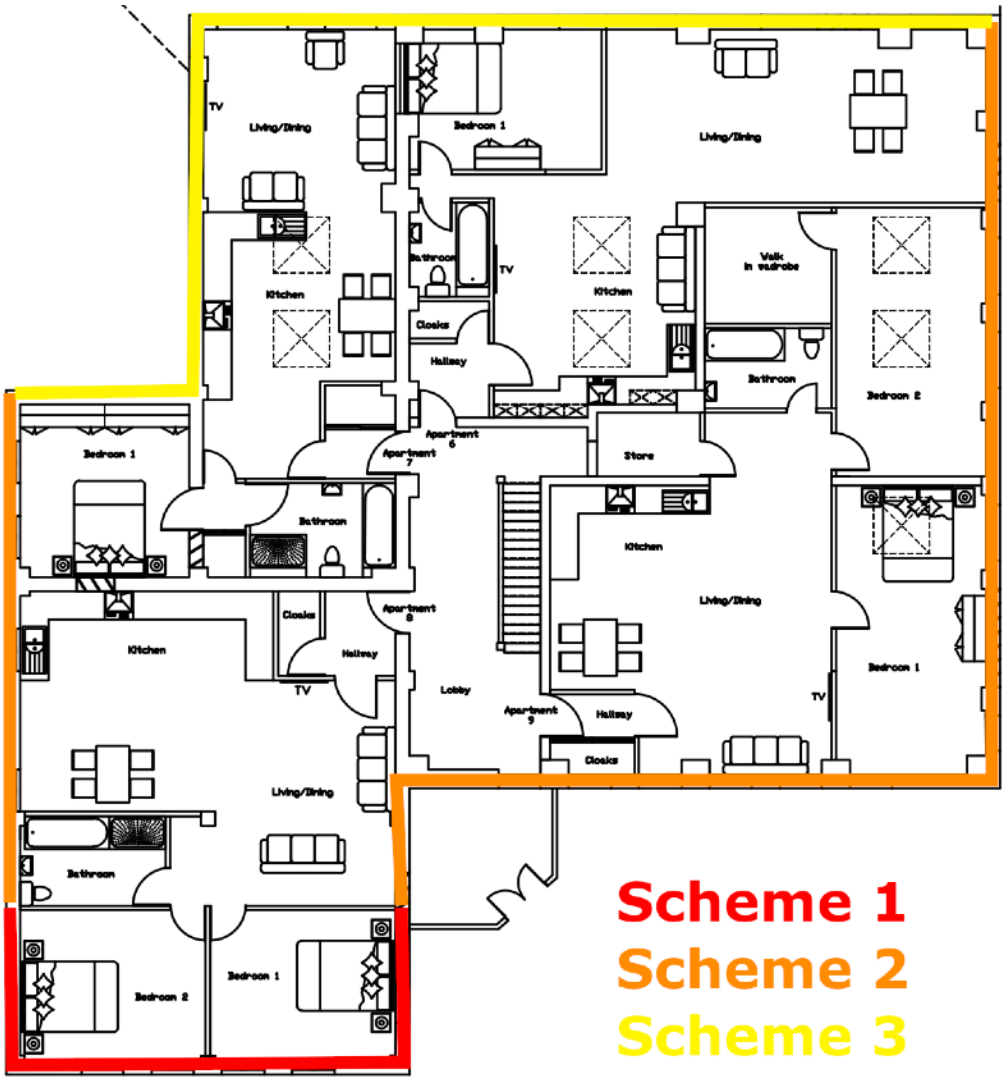
Mohammed Adeel

Blue Acoustics, Crossways, Meare Green Lane, Wrantage, Taunton TA3 6DB
01823 480 272 / 07811 595 363
tim@blueacoustics.co.uk

Contents

1 Executive Summary

The following image details the recommended insulation scheme positions, listed below. The design applies to both floors and must be strictly followed to achieve BS8233 internal noise levels.



Scheme	Recommended Treatment
1	Glazing : Pilkington Optiphon 10mm / 16mm Argon / 9.1mm Window Vents : Titon V75 + C75
2	Glazing : Generic 10mm / 16mm / 4mm Window Vents : Titon V75 + Standard Canopy
3	Glazing : Generic 4mm / 16mm / 4mm Window Vents : Titon Standard Vent + C25

Table 8 : Insulation scheme table

2 Covid 19 Statement

The following paragraph has been taken from the Association Of Noise Consultants and Institute Of Acoustics 'Joint Guidance on the Impact of COVID-19 on the Practicality and Reliability of Baseline Sound Level Surveying and the Provision of Sound & Noise Impact Assessments' - Version5.

https://www.ioa.org.uk/sites/default/files/joint_guidance_on_the_impact_of_covid.ioa_anc_v5.pdf

"Site surveys should take place unless they cannot be carried out in complete accordance with current Government requirements. Where they cannot, alternative methods of characterising baseline conditions may be used. These are set out below. Acoustics professionals are skilled in understanding how best to use those techniques so that the outcome is representative and the conclusions drawn are technically robust, so that clients and decision- makers can come to well-informed judgements."

The measurements within this report were taken during the 3rd national lockdown. Whilst schools were closed and much of the country were ordered to work from home, significant activity was witnessed between the hours of 06:00 - 09:00, after which traffic flow was witnessed to reduce when most workers were at their destination.. This activity was generated by staff who couldn't work from home, going to their place of work. This included contractors for all trade types, restaurant and cafe staff and factory operatives, to name a few. All bus and trains services were running relatively normally and all essential shops such as garages, cafes & restaurants, supermarkets and trade and DIY stores, were open as usual.

In the quest for representative data, and to ensure that (if anything) building insulation is over-prescribed, the following methodologies have been adopted :

1 Bedroom glazing is normally triggered by night time LAFMax events (WHO & BS8233), typically vehicle passes through the night. Whilst there may be less vehicle movements, the same principal applies and so this assessment methodology can be considered representative.

2 A +3dB correction will be applied to the LAeq,16 to compensate for up to 50% less traffic flow past the site by day.

3 Introduction

Blue Acoustics has been instructed to carried out a 24hr noise assessment in response to a planning condition for 117 Station Road, Cradely Heath, Birmingham B64 6PL.

The development is for the partial demolition and change of use of an existing warehouse building, to form 9no self contained flats.

Figure 1 : Existing building

Planning Condition 8 :

a) Prior to the commencement of development a comprehensive noise assessment shall be carried out over a 24-hour period and any noise mitigation measures be identified.

b) Details of any noise mitigation measures shall be submitted to and agreed by the local planning authority prior to development.

c) The agreed noise mitigation measures shall be implemented in full prior to development first being occupied.

The site was attended over the period 5th-6th January 20201, during which a number of attended and non-attended noise measurements were taken to establish noise levels around the site.

The noise data was used to carry out a ProPG assessment and provide an insulation scheme by ascertaining the minimum glazing and ventilation noise specifications throughout the building.

4 Guidance & References

Planning policies are set at both a national and local level. With respect to national policy, assessment of the suitability of a site for residential development was previously guided by Planning Policy Guidance Note 24 “Planning and noise” (PPG 24) , issued by the Department of the Environment in 1994. This document gave guidance to local authorities on the use of their planning powers to minimise the adverse impact of noise, using clearly defined prescriptive noise exposure categories.

On 28 March 2012, the Government published the National Planning Policy Framework (NPPF) and cancelled numerous planning guidance/policy documents including PPG 24.

With regard to noise, the NPPF (“the Framework”) does not provide specific policies or defined noise limits, but rather is intended to enable the planning system to support the Government’s aims and objectives with respect to sustainable development, and provides a general framework within which planning applications for development “must be determined in accordance with the [local] development plan”.

None of the current local or national planning policies preclude the proposed redevelopment of the site.

The National Planning Policy Framework does state that “the planning system should contribute to and enhance the natural and local environment by preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability”.

Additional national planning guidance is provided in the Government’s Noise Policy Statement for England2 (NPSE – “the Noise Policy”), to which the Framework makes specific reference as the main source of national guidance specifically on planning and noise.

The Noise Policy has a long term vision 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”. The vision is supported by three key aims intended to promote sustainable development with respect to noise so that “Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development: void significant adverse impacts on health and quality of life;”.

Health is defined by the World Health Organisation as “a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity, and recognises the enjoyment of the highest attainable standard of health as one of the fundamental rights of every human being” and the Noise Policy makes “a distinction between ‘quality of life’ which is a subjective measure that refers to people’s emotional, social and physical well being and ‘health’ which refers to physical and mental well being”.

However, the Noise Policy recognises that it is not currently possible to define a single objective noise level having specific effects on people, hence the emphasis on “promoting” improvements to

health and quality of life through effective management of noise, considered in the context of the wider environment and factors other than noise.

Assessment of noise arising from commercial uses is assessed in accordance with the guidance contained in BS 4142: 2014 Methods for rating and assessing industrial and commercial sound. Note that this standard refers to "sound" rather than "noise".

BS 4142 provides a method for determining the sound arising from an industrial or commercial site, defined as the site's 'specific' sound level (dB LAeq) to which is added a correction for tonal, impulsive or intermittent elements, to provide the site's 'rating' sound level (dB LAr,Tr). The rating sound level is then compared with the background (dB LA90 or 90th percentile) sound level as measured or calculated outside a building, usually a residential property.

The standard applies a 'penalty' to tonal, impulsive and intermittent sounds, as separate entities. The simplest method is a subjective assessment with a sliding scale of up to +6 dB for tonal sound, up to +9 dB for impulsive sound and +3 dB for intermittency. The objective methods provided only allow for the assessment of tonal sound.

The standard indicates significance of sound effects according to varying degrees of "adverse impact": a difference between the background sound and industrial ("rating" sound) of +10 dB "is likely to be an indication of a significant adverse impact, depending on the context" whilst "a difference of around +5dB is likely to be an indication of an adverse impact, depending on the context" and that " 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 Standard includes a specific requirement that assessments should take account of "context" in determining the significance of any predicted impact, which is critical in providing a reasoned and pragmatic assessment, avoiding rigid adherence to limit values at the exclusion of any other considerations. The standard also includes an element of correction for "uncertainty", the assessment of which is largely subjective.

Additional guidance on potentially acceptable noise levels for residential properties is provided in BS 8233: 2014 Guidance on sound insulation and noise reduction for buildings.

Unlike BS 4142 which merely assesses sound "outside a building", BS 8233 gives recommendations for external and internal noise levels for residential uses in order to protect residential amenity, derived from health-based research, as follows:

Living rooms during the day	35 dB LAeq,16hour
Dining rooms during the day	40 dB LAeq,16hour
Bedrooms during the day	35 dB LAeq,16hour
Bedrooms during the night	30 dB LAeq,8hour

In most standard modern properties, the walls and roof provide relatively high levels of sound insulation of greater than 40 dB; the weakest part of a building facade, with respect to noise, is generally the windows. Modern construction methods for new residential properties incorporate standard thermal double-glazing which, the standard suggests, will provide approximately 33 dB Rw of sound attenuation when closed. The standard does not specifically give sound attenuation values for partially open windows, although the worked example (G.1) at Annex G of the Standard indicates that a partially open window would provide 15 dB Rw of sound attenuation.

The standard does not provide guidance on maximum (LAmax) noise levels but the 1999 World Health Organisation (WHO) Guidelines for Community Noise suggest that maximum noise levels in bedrooms at night should not regularly exceed 45 dB LAmax.

With respect to noise affecting external areas i.e. gardens, BS 8233:2014 states that "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 LAeq,T, with an upper guideline value of 55 dB LAeq,T which would be acceptable in noisier environments".

Pro-PG was created to provide a consistent approach to noise assessments for new build residential developments exposed to predominantly airborne noise from transport sources, in line with current government guidance, the Noise Policy Statement of England (*NPSE 2010*) and the National Planning Policy Framework (*NPPF 2012, revised 2018*). The document encourages better acoustic design for new residential development and aims to protect people from the harmful effects of noise.
This industry professional guidance encourages planners, consultants and developers to consider noise issues at the start of planning with a two-stage approach.

Stage 1 is an initial noise risk assessment of the proposed development site and examines the existing noise levels at a site being considered for development and if mitigation is required. The level of risk is assessed from a (minimum) 24-hour measurement of a "worst case scenario" that records noise data from all dominant transport noise sources.

Industrial and commercial noise sources (when not dominant) can also be included in this assessment although separate BS4142:2014 assessments may still be required. In line with current government guidance, the Noise Policy Statement of England (*NPSE 2010*) and the National Planning Policy Framework (*NPPF 2012, revised 2018*).

Stage 2 is a full assessment of noise levels and the risk level associated with them to create a good acoustic design for the residential development which mitigates this risk and results in internal and external sound levels in line with BS8233:2014 and WHO guidance. ProPG guidance accepts that certain noise climates cannot be mitigated to these levels and recommends a relaxing of targets in these cases.

This should be assessed in the context of positive economic and social impacts as well as the build costs of a proposed residential development especially in cases of prohibitively high costing for some levels of mitigation.

5 Site Detail

5.1 General

The site is situated on Station Road in Cradely Heath, a built up suburb approximately 4km south of Dudley. Station Road is relatively busy road with a 30mph speed limit (not enforced). Vehicles accelerate past the site up a slight incline when travelling east from the Waterfall Lane junction. Waterfall Lane runs NE/SW approximately 30m to the west of the site.

There are bus stops on both sides of the road directly outside the building but are currently displaying 'Not in use' signage. Old Hill railway station is situated 60 to the south of the site, forming part of the Birmingham - Stourbridge line. The station has a large car park between the station building and Station Road.

Figure 2 : Location map

There are a number of businesses lining the opposite side of Station Road, notably Midland Tyre Centre, MTB Midlands and Paint 360.

Immediately to the east is a row of terraced houses and to the west is a parking area which extends 20m to a building currently being converted to residential use.

To the rear (north) of the site are a number of residential and commercial buildings, though nothing of note noise-wise.

To the north east is a large reclamation yard. The yard has a number of small buildings, one of which is currently used by Crossways Car Bodies. The yard is at a greatly elevated position with a 5' brick boundary wall which eliminates line of sight to the 1st floor windows.

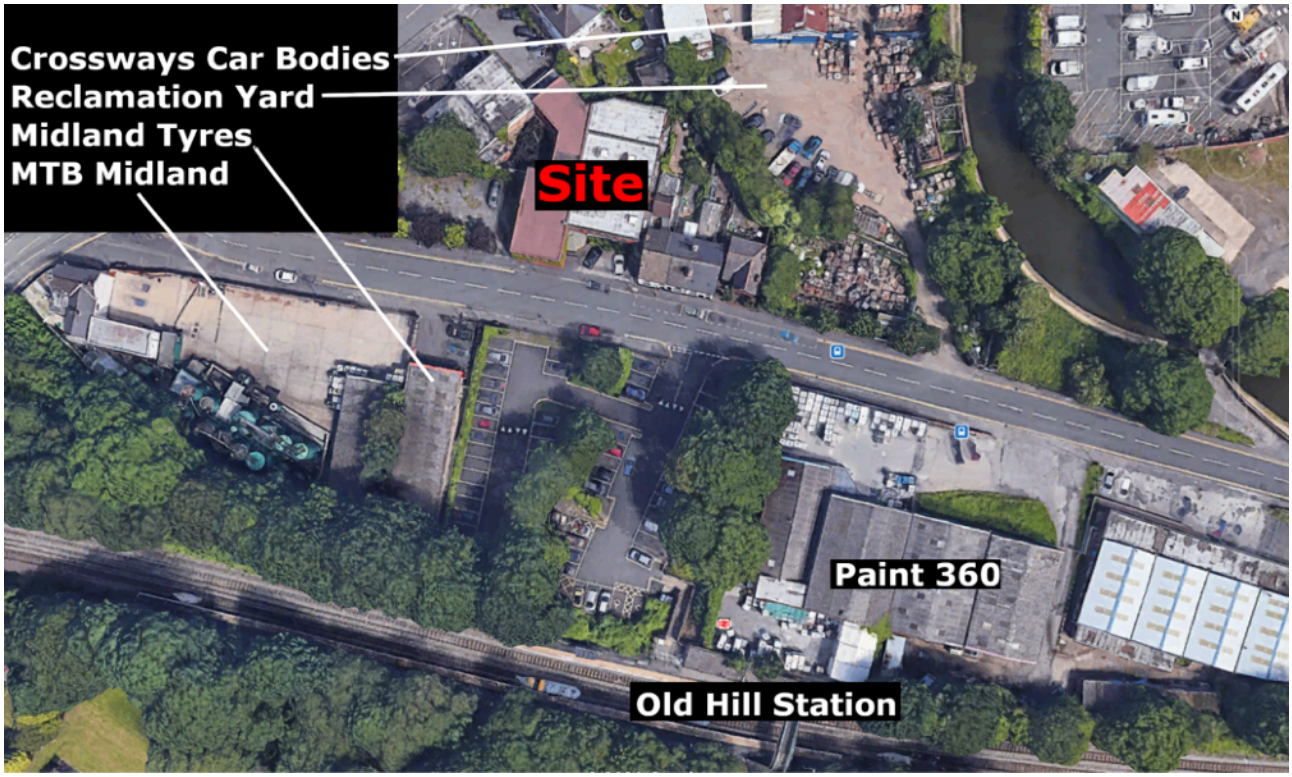


Figure 3: Aerial view of immediate area

Figure 4 : Location plan

5.2 Floor Plans

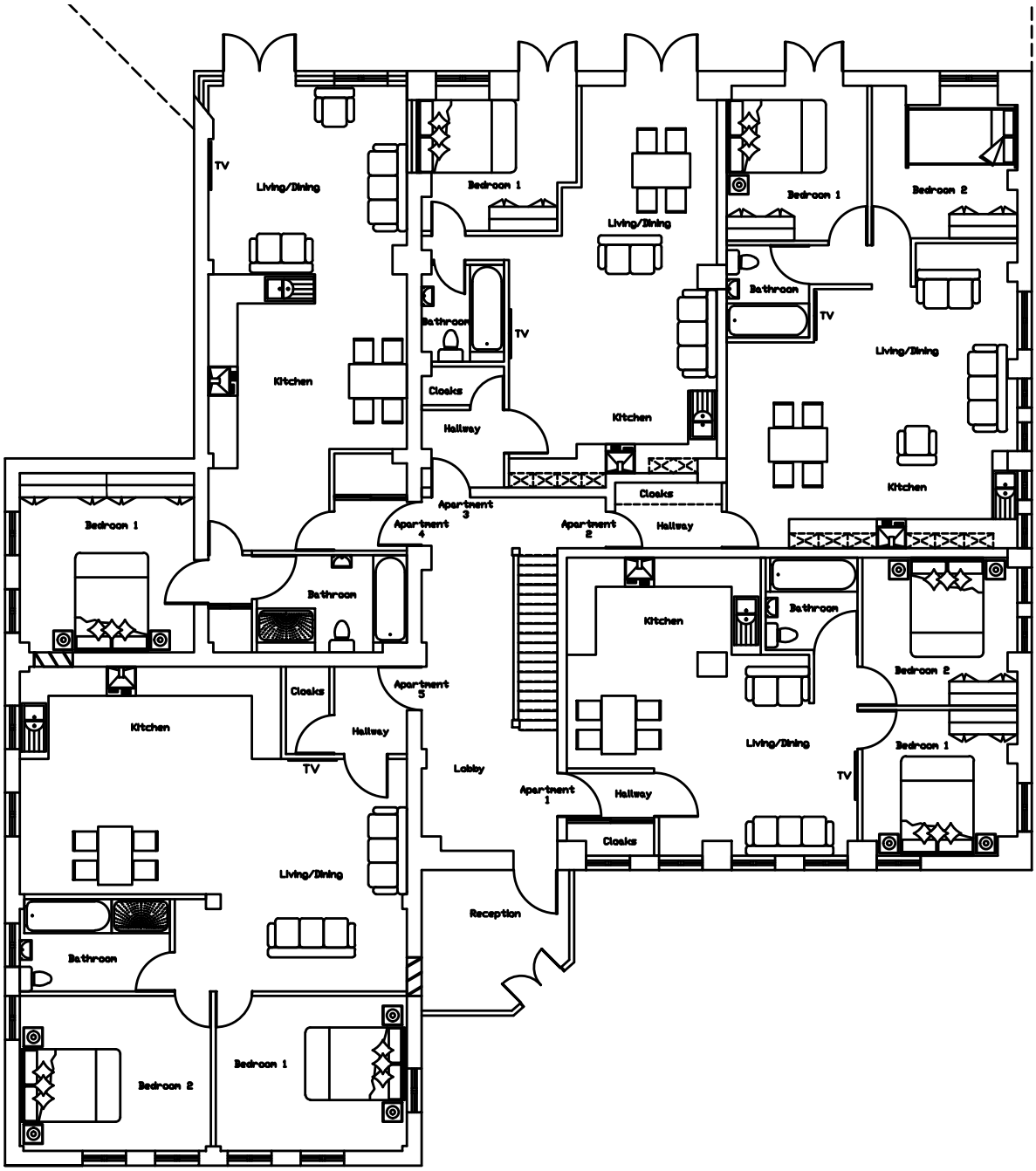


Figure 5 : Ground Floor Layout

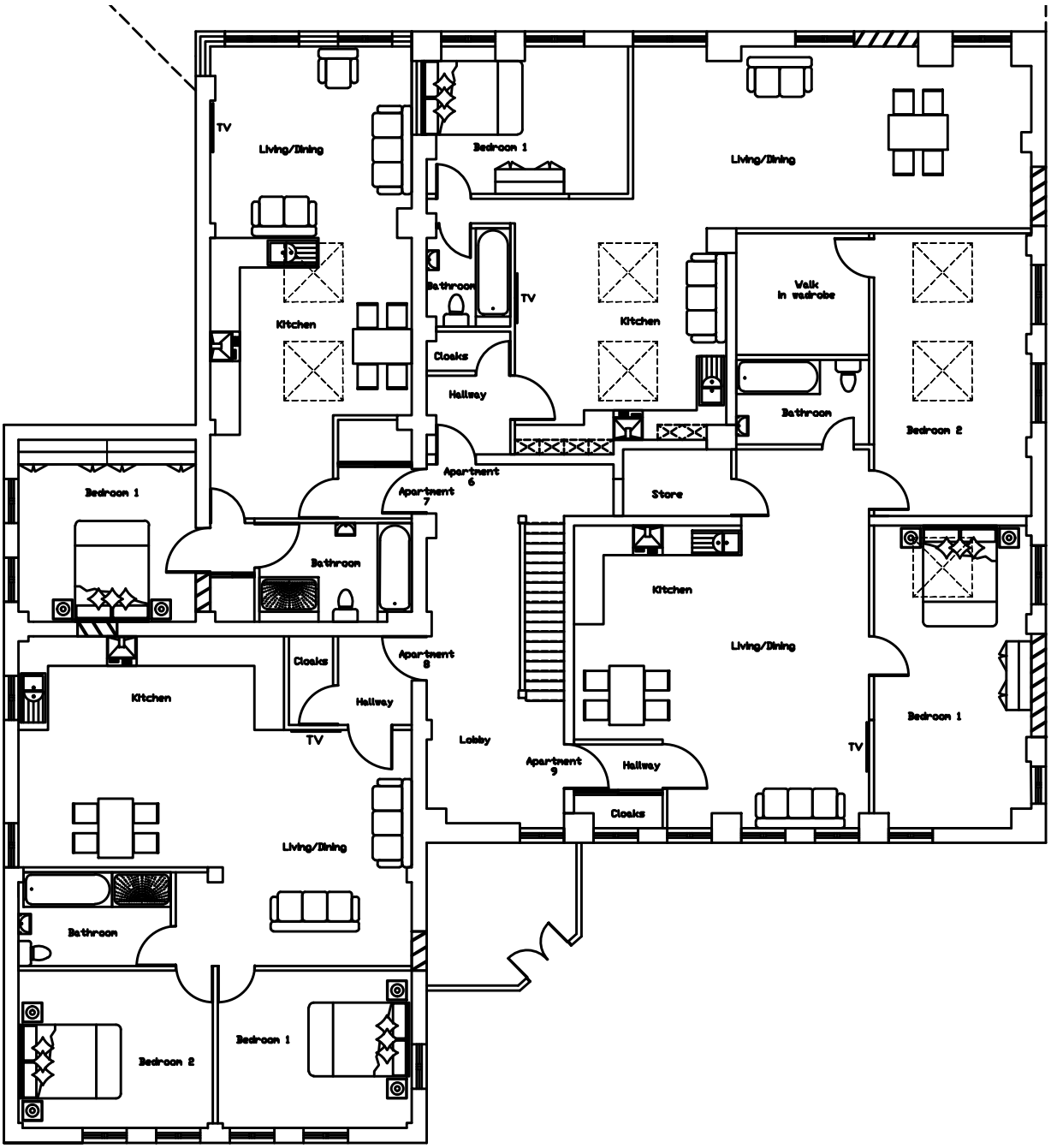


Figure 6 : 1st Floor layout

6 Measurement Details

6.1 Personnel & Equipment

All testing, calculation & evaluation was conducted by Timothy Sherlock-Brown M.I.O.A. of Blue Acoustics. Timothy is a Member of the Institute of Acoustics and possesses an MSc in Applied Acoustics.

Device	Serial Number	Calibration Date	Calibration Cert. No
Cirrus 171C Class 1 Meter (3)	G079832	17.11.2020	149029
Cirrus 821A Class 1 Meter (2)	B14212FE	13.03.2019	268930
Cirrus 515 Calibrator	80569	17.11.2020	149029

Table 2 : Measurement equipment table

Care was taken to eliminate external influence on the measurements by the application of a windshield, and with particular attention paid to wind speed when selecting measurement periods. Unless otherwise stated, meters were tripod mounted at a height of 1.2-1.5m at an angle of approximately 60 degrees.

Calibration was performed before and after each measurement or set of measurements with no notable drift. A drift of up to 0.5dB with a Class 1 meter is considered reasonable and is generally the cause of gradients in variables such as temperature, humidity and battery power.

6.2 Weather Conditions

Dry; Temp 0c to 3c; Windspeed 0-5m/s northerly; variable % cloud cover

6.3 Measurement Positions

The following measurement positions were adopted to establish noise levels around the site :

P1	Ground floor level with front facade, >3.5m from any reflecting surface. Chosen to establish day and night time noise levels at the front facade	
P2	Meter protruding 1m out of a 1st floor window at the rear facade. Chosen to establish 24hr noise levels at the rear facade	

Table 3 : Measurement position table

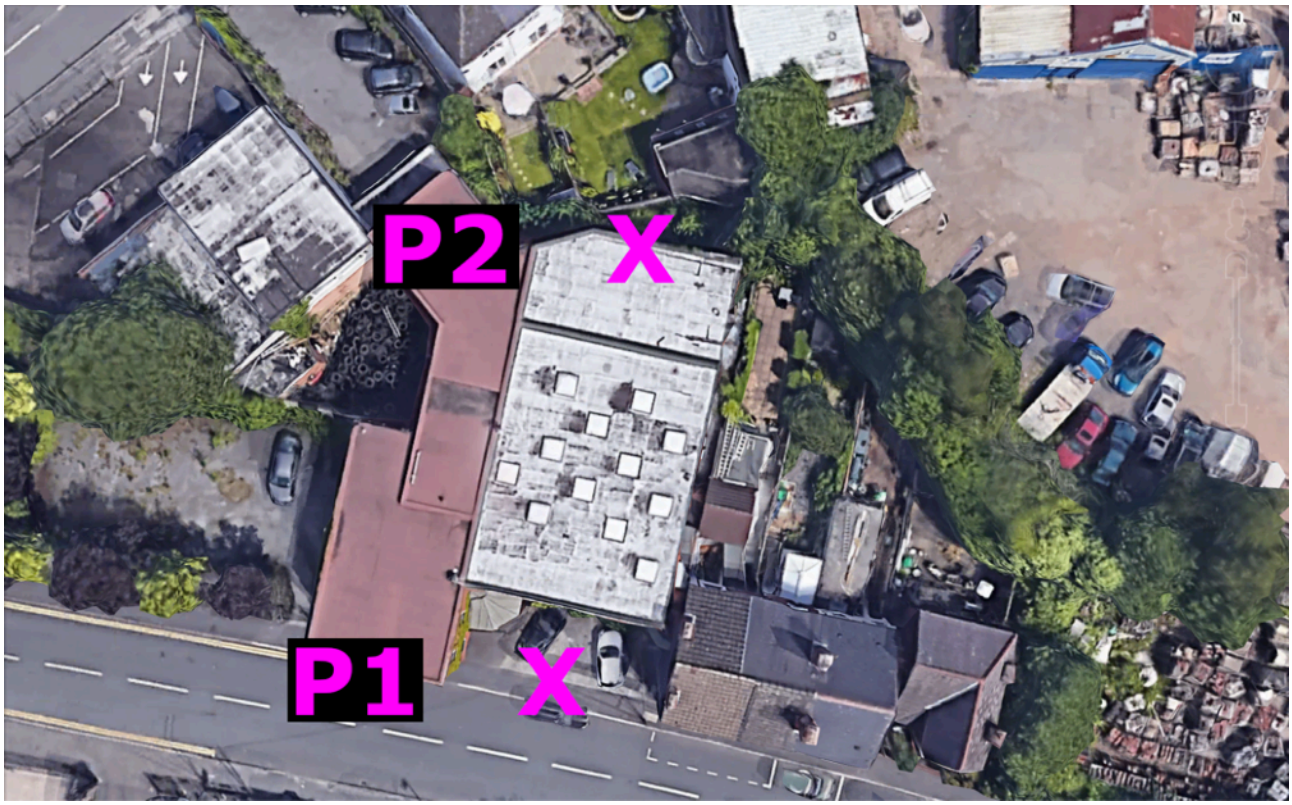


Figure 7 : Measurement Positions

7 Presentation of Measurement Results

The following table details the measurement data for all positions in BS8233 format. Corrections have been applied to reflect both facade proximity and Covid 19 conditions as per the Covid 19 Statement (section 2).

An attempt was made to attain a full 24hr noise measurement at the front facade from a 1st storey window. However, the meter was stolen in the night and so the following data has been extracted from attended monitoring carried out at position P1 by day and night. The night time period 06:30 - 07:00 was chosen to provide the maximum no of vehicle passes from early morning commuters, thus minimising error with respect to LAFMax events.

Significant construction noise was present through much of the day, both from within the building and another site nearby. As such, the LAeq,16hr for the rear facade has been taken from quieter periods in the absence of construction work in and around the site.

Position	Measurement	Period	Value
	LAeq,16hr	07:00 - 23:00	69 dB
P1	LAeq,8hr	23:00 - 07:00	64 dB
	LAFMax,5min (night)	23:00 - 07:00	80 dB
	LAeq,16hr	07:00 - 23:00	56 dB
P2	LAeq,8hr	23:00 - 07:00	46 dB
	LAFMax,5min (night)	23:00 - 07:00	70 dB

Table 4 :BS8233 format noise data

8 Noise Climate

The noise climate around the site is dominated by traffic noise with contributions from the railway line and nearby commerce which were all found to be open and running as usual.

MTB Midlands - caters for multiple lorry deliveries and extractions daily. Constant low level tone from MTB Midlands plant, audible 24/7 (hazardous waste cleaning). Lorries arrive at any time through the day and night to unload or be loaded with waste product. **Open 24/7**

Midland Tyres - regular vehicle movements witnessed as vehicles are bought into and out of the unit. Front shutters remain open all day. Compressed air impact gun is used to remove & re-fit tyres which takes place deep within the shop. Jet washing takes place on occasion in the front parking area. Open 09:00 - 18:00 (Mon-Fri) ; **Open 09:30 - 17:00 Sat**

Oldfields Reclamation Yard - stores bricks and tiles etc. It has occasional flat bed deliveries which requires occasional use of a fork lift, otherwise generally very quiet. There is a 5' solid brick wall along the boundary of the yard which eliminates line of sight to the 1st floor windows of the development. **Open 08:00 - 16:30 Mon - Sun**

Crossways Car Bodies - situated within the grounds of the reclamation yard and specialises in spray painting. It features a large spray booth with panel assembly area. The spray booth extract system generates a constant low level hum which is inaudible at the site. **Open 08:30 - 17:30 Mon-Fri.**

Passenger trains movements - small dmu passenger trains, mostly 4 carriages in length, just audible above traffic noise by day. Passenger trains approximate to 8 per hour with 4 stopping at station and 4 passing through. **Trains run from 06:13 to 23:30.**

Trains movements register approx 65dB at the front facade, less than vehicle movements.

Freight train movements - approximate to 1 per day or night according to a next door resident, though rarely audible as they move slowly past the station. This is corroborated by freight timetables which indicated 2 freight movements each day, generally in the evening.

9 BS8233:2014 Assessment

WHO 1999 Guidelines to Community Noise states: "For a good sleep, it is believed that indoor sound pressure levels should not exceed **approximately** 45 dB LAFmax **more than 10-15** times per night"

9.1 Position P1 - Front Facade

The night time LAFMax,5min of 83.3dB measured at 06:42 was a relatively isolated incident. As such, a more representative LAFMax of 80dB has been adopted for the purpose of BS8233 assessment, exceeded on 1 occasions through the measured night time period.

	Value	BS8233:2014 & WHO Inside Bedroom	Bedroom Glazing Rw + Ctr	Living Room Glazing (35dB Day resting)
LAeq,16hrs (Day)	69 dB	35 dB		**34 dB**
LAeq,8hrs (Night)	64 dB	30 dB	34 dB	
LAFMax,5min (Night)	80 dB	45 dB	**35 dB**	

Table 5 : BS8233:2014 assessment table (Position P1)

9.2 Position P2 - Rear Facade

The night time LAFMax,5min of 79.3dB measured at 23:20 was a relatively isolated incident. As such, a more representative LAFMax of 70dB has been adopted for the purpose of BS8233 assessment, exceeded on 4 occasions through the measured night time period.

	Value	BS8233:2014 & WHO Inside Bedroom	Bedroom Glazing Rw + Ctr	Living Room Glazing (35dB Day resting)
LAeq,16hrs (Day)	56 dB	35 dB		**21 dB**
LAeq,8hrs (Night)	46 dB	30 dB	16 dB	
LAFMax,5min (Night)	70 dB	45 dB	**25 dB**	

Table 6 : BS8233:2014 assessment table (Position P2)

9.3 Ventilation Assessment

BS8233:2014 states that "If relying on closed windows to meet the guide values, there needs to be an appropriate alternative ventilation that does not compromise the facade insulation or the resulting noise level"

The following table details the recommended glazing and ventilation insulation strategy. The upper noise levels for each position have been adopted to reflect the fact that rooms may be changed from bedroom to living room and vice versa, and thus protecting the future amenity of all residents. The required sound insulation criteria for the trickle vents have been increased by 6dB to provide adequate sound insulation for larger rooms with 4 window vents installed. Should more specific sound insulation values be required, this can be achieved through the following formula : Minimum Glazing + 10 log (N), where N = number of window vents.

Facade	Room Type	Minimum Glazing Rw + Ctr	Facade Ventilation (Open) Dn,e,w + Ctr	Recommended Treatment
Front (Road Side Rooms)	Living	34 dB	40 dB	Glazing : Pilkington Optiphon 10mm / 16mm Argon / 9.1mm Window Vents : Titon V75 + C75
	Bedrooms	35 dB	41 dB	
Front (Recessed) & Sides	Living	31 dB	37 dB	Glazing : Generic 10mm / 16mm / 4mm Window Vents : Titon V75 + Standard Canopy
	Bedrooms	32 dB	38 dB	
Rear & East Side	Living	21 dB	22 dB	Glazing : Generic 4mm / 16mm / 4mm Window Vents : Titon Standard Vent + C25
	Bedrooms	25 dB	31 dB	

Table 7 : Glazing & ventilation specification table

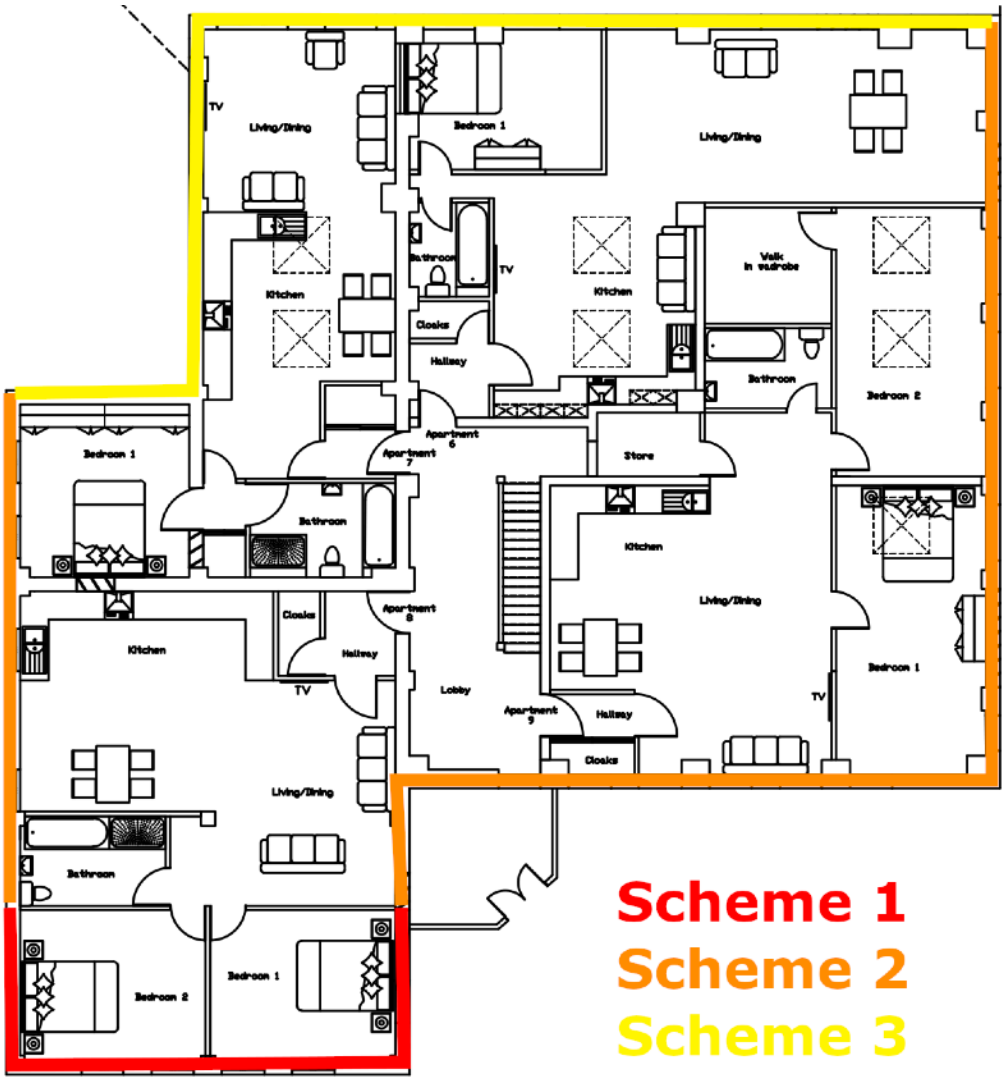
9.4 External Amenity Noise

BS8233:2014 states that "the acoustic environment of external amenity areas that are an intrinsic part of the overall design should always be assessed and noise levels should ideally not be above the range 50 – 55 dB $L_{Aeq,16hr}$"

The measured noise levels to the rear of the site indicate an LAeq,16 of approximately 56dB at 1st floor level which has direct line of sight to traffic flow along Watery Lane. As such, daytime noise levels within the ground floor amenity area are expected to register well below this level with the introduction of boundary fencing which would result in a difference of -10dB or more.

10 Insulation Scheme

The following image details the recommended insulation scheme positions, listed below. The design applies to both floors and must be strictly followed to achieve BS8233 internal noise levels.



Scheme	Recommended Treatment
1	Glazing : Pilkington Optiphon 10mm / 16mm Argon / 9.1mm Window Vents : Titon V75 + C75
2	Glazing : Generic 10mm / 16mm / 4mm Window Vents : Titon V75 + Standard Canopy
3	Glazing : Generic 4mm / 16mm / 4mm Window Vents : Titon Standard Vent + C25

Table 8 : Insulation scheme table

11 Conclusions

The front of the site is exposed to significant traffic noise, with additional noise (to a lesser extent) from railway movements and commercial activity.

Railway noise events register lower than vehicle movements at the site.

Noise levels at the rear of the site are significantly lower than noise levels at the front.

Rear amenity space noise levels are expected to fall well below WHO guidance levels of 50dB

BS8233 internal noise levels are not achievable with windows open, through good acoustic design. However, BS8233 internal noise levels are achievable through the installation of the glazing and acoustic window vents specified within this report.

12 Uncertainty

This report relies on ambient noise level measurements. Ambient noise at a given location can vary substantially from day to day with variations in road traffic and other sources, and propagation of noise can be strongly affected by weather and atmospheric conditions. We believe our assessment to be representative of typical conditions, but only very long-term noise monitoring could establish the range of variation in these conditions.

BS4142:2014 section 10.0 states that uncertainty in the calculation of sound levels during the assessment process can arise from both the measured values and calculation methods.

To ensure the accuracy of the assessment consideration has been taken for the level of uncertainty in the measured data and associated calculations in the proposed methodology used to undertake the assessment. Where the level of uncertainty could affect the conclusion, reasonably practicable steps have been taken to minimise the level of uncertainty. Where the level of uncertainty is excessive, additional measurements and site visits have been conducted to increase the confidence in the results. In all instances the following steps have been taken to address the uncertainty;

1 Measured Values; A detailed understanding of the source of noise under investigation has been conducted including consideration for the complexity, variability over time and location, the character and effect of the residual sound level in comparison with the source, the measurement location, quantity of measurements and distance/intervening ground conditions, measurement time interval and the range of times measurement were taken, the suitability of weather conditions, the level of rounding and the classification of the instrumentation used to conduct the assessment.

2 Calculation Methods; Consideration has been taken for the accuracy of the measured sound levels, the character of the sound emissions in question, the calculation method and the simplification of the real situation to “fit” the modelled situation. Recognised standards and validated methods and processes have been used to establish accurate values during the calculation process.

For the avoidance of doubt, the level of uncertainty will not be quantified. If appropriate consideration is taken for points 1 and 2 during the collection of data and analysis thereof, then the influence of uncertainty in the final result is at its lowest practical value.

13 Disclaimer

Blue Acoustics takes no responsibility for any physical implementation & strongly suggests the client seek structural advice before carrying out the proposed work. Recommendations in this report are for acoustics purposes only, and it is the responsibility of the Project Manager or Architect to ensure that all other requirements are met including (but not limited to) structure, fire and Building Controls.

The calculations within this report are based upon sourced and or calculated data. It should be understood that complex flanking transmission paths through the structure can lead to excess vibration transmission and that mitigation measures within the rooms may have to be 'tweaked' after construction. Also, build quality can greatly affect partition performance and Blue Acoustics takes no responsibility for the integrity of any physical work carried out.

The opinions and interpretations presented in this report represent our best technical interpretation of the data made available to us. However, due to uncertainty inherent in the estimation of all parameters, we cannot, and do not guarantee the accuracy or correctness of any interpretation and we shall not, except in the case of gross or wilful negligence on our part, be liable or responsible for any loss, cost, damages or expenses incurred or sustained by anyone resulting from any interpretation made by any of our officers, agents or employees. The findings and opinions expressed are relevant to the dates of the site works and should not be relied upon to represent conditions at substantially later dates. If additional information becomes available which may affect our comments, conclusions or recommendations, the author reserves the right to review the information, reassess any new potential concerns and modify our opinions accordingly.

Except for the provision of professional services on a fee basis, Blue Acoustics does not have a commercial arrangement with any person or company involved in the interests that are the subject of this report. Blue Acoustics cannot accept any liability for the correctness, applicability or validity for the information they have provided, or indeed for any consequential costs or losses in this regard. Our efforts have been made on a "best endeavours" basis and no responsibility or liability is warranted or accepted by Blue Acoustics.

Appendix 1 – Glossary of Terms

'A' weighting (dB(A)): A frequency dependent correction which weights sound to correlate with the sensitivity of the human ear to sounds of different frequencies.

dB(A): decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) broadly agree with people's assessment of loudness. A change of 3 dB(A) is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds roughly to halving or doubling the loudness of a sound. The background noise level in a living room may be about 30 dB(A); normal conversation about 60 dB(A) at 1 metre; heavy road traffic about 80 dB(A) at 10 metres; the level near a pneumatic drill about 100 dB(A).
Ambient Noise: A measure of the typical noise (excluding any unusual events) present at a site. This is usually described in terms of $L_{Aeq,T}$.

Anonymous noise: Noise that cannot be attributed to a single (specific source). For example noise from cars on a road would be considered anonymous whereas a noisy ventilation unit would not.

Attenuation: A reduction in the intensity of a sound signal.

Audible: Sound that can be heard or is perceptible by the human ear.

Background Noise: A measure of the underlying noise (excluding any unusual events) which is present at a site before a new noise source is introduced. This is usually described in terms of the L_{A90} level: the sound pressure level exceeded for 90% of the time.

C_{tr} Spectrum adaptation term: A correction added to a sound insulation quantity (such as R_W) to take account of a specific (traffic noise) spectra. See BS EN ISO 717-1:1997. For example the difference between internal and external traffic noise levels in dB(A) is calculated using $R_W + C_{tr}$ (equivalent to $R_{traffic}$)

Clearly audible: There is no acoustic definition for clearly audible and as such a noise source may be deemed to be clearly audible if it is both easily identifiable and deemed likely to adversely affect the amenity of residents of any (proposed) development.

$D_{ne,W}$ Weighted element normalized level difference: A single-number quantity which characterizes the airborne sound insulation of a small building element. See BS EN ISO 717-1: 1997

$D_{nT,W}$ Standardised level difference: A single-number quantity which characterizes the airborne sound insulation between rooms. See BS EN ISO 717-1: 1997

Decibel (dB): A unit used for many acoustic quantities to indicate the level of sound with respect to a reference level.

EPU: Environmental Protection Unit, a service within the Environmental Health section of the Regulatory Services Department of Birmingham City Council.

Façade measurement: Noise measurements made outside an external wall of a structure (usually 1 metre from the wall).

Free Field: 1. A free sound field is a field in a homogeneous, isotropic medium free from boundaries. In practice it is a field in which the effects of the boundaries are negligible over the region of interest. The actual pressure impinging on an object (e.g., a microphone) placed in an otherwise free sound field will differ from the pressure which would exist at the point with the object removed, unless the acoustic impedance of the object matches the acoustic impedance of the medium.
2. An environment in which there are no reflective surfaces within the frequency region of interest.
3. A region in which no significant reflections of sound occur.
4. [BS4142] suggests that free-field environmental noise measurements need to be made at least 3.5m from any reflecting structure.

Habitable room: A room used for sleeping or recreation / relaxation.

Hertz (Hz): unit of frequency, equal to one cycle per second. Frequency is related to the pitch of a sound.

Inaudible: Sound that cannot be heard or is imperceptible to the human ear.

Industrial-type noise sources: Noise sources that are industrial in character. For example noise from plant and machinery, materials handling operations, or manoeuvring of heavy vehicles.

Institute of Acoustics: A professional body representing persons at all levels working in the field of acoustics. http://www.ioa.org.uk/

$L_{A90,T}$: Sound pressure level exceeded for 90% of the measurement period "T" or 'background level'.

$L_{Aeq,T}$: Equivalent continuous sound pressure level measured over the time period "T"

L_{Amax}: The maximum RMS A weighted sound pressure level

Mixed Use: Premises or development which will include both residential and non-residential uses

Noise: Unwanted sound.

Noise with a specific character: Noise has a specific character if it contains features such as a distinguishable, descrete and continuous tone, is irregular enough to attract attention, or has strong low frequency content .

Noise Nuisance: A legal term used to describe noise at a level that is disturbing as perceived by a reasonable person. The meaning of nuisance is defined by precedent in common law.

Outdoor Amenity Area: An outdoor area adjacent to a residential building which is designed and intended primarily for the leisure and recreation of the occupants of the dwelling. This will include gardens, landscaped areas, balconies.

R, Sound reduction index: A quantity which characterizes the airborne sound insulation of a material or building element in a stated frequency band. See BS EN ISO 140-3:1995

R_W, Weighted sound reduction index: A single-number quantity which characterizes the airborne sound insulation of a material or building element measured in the laboratory. See BS EN ISO 717-1: 1997

Rating Level: The noise level of an industrial noise source which includes an adjustment for the character of the noise. Used in BS4142.

Residual Noise : The ambient noise remaining at a given position in a given situation when the specific noise level is suppressed to a degree such that it does not contribute to the ambient noise.

Sound insulation: A quantity which is used to characterize the reduction in sound pressure level across an element or partition. (See R, R_W, $D_{nT,W}$, $D_{ne,W}$, C_{tr})

Specific noise source : The noise source under investigation for assessing the likelihood of complaints.

Steady State Noise: Noise that gives fluctuations over a range of not more than 5 dB on a sound level meter set to frequency weighting A and time weighting S. [BS 4142:2014]

Structure borne noise: Noise that propagates through a structure, for example through a building.

Appendix 2 Glazing And Ventilation Examples

Titon Trickle Vents

Sound Attenuation level:

	Open	Closed
V75 + C75	Dn,e,w (C;Ctr) = 44 (-2;-3)dB	Dn,e,w (C;Ctr) = 55 (-1;-5)dB
V75 + C50	Dn,e,w (C;Ctr) = 42 (-1;-2)dB	Dn,e,w (C;Ctr) = 55 (-2;-5)dB
V75 + standard canopy	Dn,e,w (C;Ctr) = 40 (-1;-2)dB	Dn,e,w (C;Ctr) = 53 (-1;-4)dB
V50 + C25	Dn,e,w (C;Ctr) = 39 (-1;-2)dB	Dn,e,w (C;Ctr) = 55 (-2;-5)dB
V50 + standard canopy	Dn,e,w (C;Ctr) = 38 (-1;-2)dB	Dn,e,w (C;Ctr) = 55 (-2;-5)dB
V25 + C25	Dn,e,w (C;Ctr) = 36 (-0;-2)dB	Dn,e,w (C;Ctr) = 55 (-1;-5)dB
V25 + standard canopy	Dn,e,w (C;Ctr) = 35 (-0;-1)dB	Dn,e,w (C;Ctr) = 54 (-1;-4)dB
Standard vent + C25	Dn,e,w (C;Ctr) = 35 (-0;-1)dB	Dn,e,w (C;Ctr) = 55 (-1;-5)dB
Standard vent + standard SF canopy	Dn,e,w (C;Ctr) = 32 (-1;-0)dB	Dn,e,w (C;Ctr) = 52 (-2;-4)dB
Standard vent + C25	Dn,e,w (C;Ctr) = 35 (-1;-2)dB	Dn,e,w (C;Ctr) = 54 (-2;-6)dB

Pilkington Optiphon Data

Glass	Sound reduction index (dB)									
	Octaveband Centre Frequency (Hz)						$R_w(C;C_{tr})$	R_w	R_w+C	R_w+C_{tr}
	125	250	500	1000	2000	4000				
Single glazing										
6.8 mm Pilkington **Optiphon**™	26	27	31	36	40	39	36 (-1; -4)	36	35	32
8.8 mm Pilkington **Optiphon**™	24	28	34	38	37	43	37 (-1; -4)	37	36	33
9.1 mm Pilkington **Optiphon**™	26	29	34	38	38	43	37 (-1; -3)	37	36	34
12.8 mm Pilkington **Optiphon**™	30	32	37	39	41	51	39 (0; -2)	39	39	37
13.1 mm Pilkington **Optiphon**™	30	33	37	40	41	50	40 (0; -2)	40	40	38
Insulating glass units										
6 mm / 16 mm argon / 6.8 mm Pilkington **Optiphon**™	22	27	35	42	41	48	38 (-2; -5)	38	36	33
6 mm / 16 mm argon / 8.8 mm Pilkington **Optiphon**™	24	26	40	48	46	54	41 (-3; -7)	41	38	34
8 mm / 16 mm argon / 9.1 mm Pilkington **Optiphon**™	24	29	41	47	47	55	43 (-3; -7)	43	40	36
10 mm / 16 mm argon / 9.1 mm Pilkington **Optiphon**™	29	33	44	46	49	57	45 (-2; -5)	45	43	40
8.8 mm Pilkington **Optiphon**™ / 16 mm argon / 12.8 mm Pilkington **Optiphon**™	26	36	46	50	52	63	47 (-2; -7)	47	45	40
9.1 mm Pilkington **Optiphon**™ / 20 mm argon / 13.1 mm Pilkington **Optiphon**™	29	39	49	52	55	63	50 (-3; -8)	50	47	42

Measurements undertaken in accordance with BS EN ISO 10140 and R_w (C; C_{tr}) determined in accordance with BS EN ISO 717-1
For insulating glass units, there is little difference in the sound insulation for cavity widths in the range 6 to 16 mm
Pendulum body impact resistance to BS EN 12600 for all Pilkington **Optiphon**™ is Class 1 (B) 1
To achieve low U values in insulating glass units, Pilkington **Optiphon**™ can be combined with low emissivity glass from the Pilkington **K Glass**™ or Pilkington **Optitherm**™ ranges
To calculate performance data for Pilkington products, please use our Spectrum online calculator at www.pilkington.co.uk/spectrum
For glass combinations to achieve an R_w value higher than 50 dB, please contact us for more details

Appendix 3 Measurement Data

Night time noise data (Front Facade)

08/01/2021

Cirrus Research plc

Measurement Time History Report

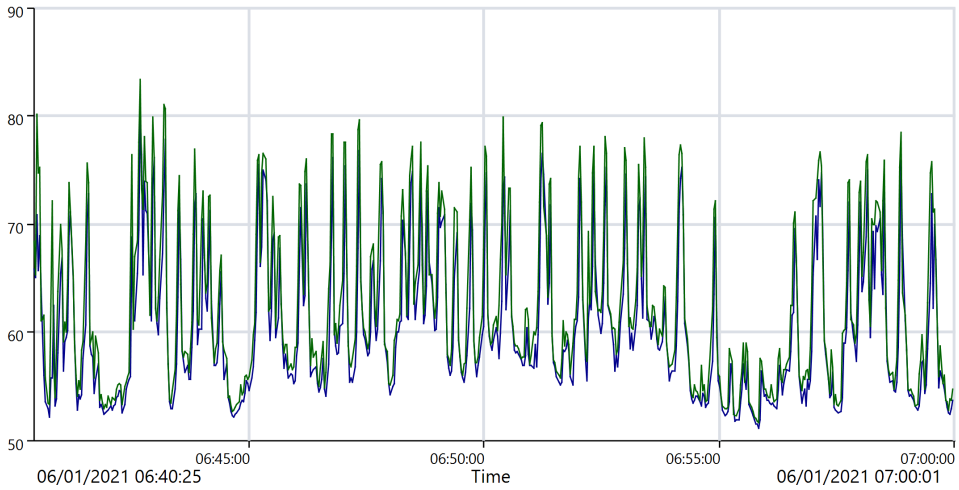
Name	117 Station Road, Cradely Heath - front facade / ground floor / night			
Time	06/01/2021 06:40:25	**Person**	**Place**	**Project**
Duration	00:19:36			117 Station Road,
Instrument	G079832, CR:171C			

Calibration

Before	06/01/2021 06:15	Offset	0.01 dB	**After**	06/01/2021 07:02	Offset	-0.36 dB

Period 06/01/2021 06:40:25 - 06/01/2021 07:00:01

Legend	LAeq	LAFMax
Value	66.1 dB	83.4 dB



These values have been recalculated due to the large number of samples displayed.

ReportId

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Day time noise data (Front Facade)

Date	Time	Run Time	Leq	Lmax
06/01/2021	11:00	00:14:59	68.20	83.60
06/01/2021	11:15	00:14:59	70.90	93.90
06/01/2021	11:30	00:14:59	66.90	80.30
06/01/2021	11:45	00:14:59	68.90	92.80
06/01/2021	12:00	00:11:59	66.70	80.00

Rear Facade (Long Term)

Date	Time	Run Time	Leq	Lmax
05/01/2021	11:30	00:07:01	61.00	77.40
05/01/2021	11:38	00:00:31	62.20	82.30
05/01/2021	11:41	00:14:59	61.50	86.70
05/01/2021	11:56	00:14:59	56.90	73.70
05/01/2021	12:11	00:14:59	57.70	69.30
05/01/2021	12:26	00:14:59	63.20	76.40
05/01/2021	12:41	00:14:59	56.90	76.30
05/01/2021	12:56	00:14:59	56.00	76.80
05/01/2021	13:11	00:14:59	61.80	76.60
05/01/2021	13:26	00:14:59	62.80	76.20
05/01/2021	13:41	00:14:59	64.70	92.10
05/01/2021	13:56	00:14:59	64.20	75.80
05/01/2021	14:11	00:14:59	56.00	69.90
05/01/2021	14:26	00:14:59	62.90	75.00
05/01/2021	14:41	00:14:59	56.50	79.00
05/01/2021	14:56	00:14:59	62.70	75.00
05/01/2021	15:11	00:14:59	62.40	76.30
05/01/2021	15:26	00:14:59	56.40	73.10
05/01/2021	15:41	00:14:59	62.80	81.50

Date	Time	Run Time	Leq	Lmax
05/01/2021	15:56	00:14:59	56.10	74.80
05/01/2021	16:11	00:14:59	56.40	70.20
05/01/2021	16:26	00:14:59	56.90	73.60
05/01/2021	16:41	00:14:59	68.30	89.90
05/01/2021	16:56	00:14:59	61.60	88.10
05/01/2021	17:11	00:14:59	55.50	68.20
05/01/2021	17:26	00:14:59	55.40	70.20
05/01/2021	17:41	00:14:59	56.10	70.00
05/01/2021	17:56	00:14:59	54.90	68.40
05/01/2021	18:11	00:14:59	55.50	77.60
05/01/2021	18:26	00:14:59	55.90	73.30
05/01/2021	18:41	00:14:59	54.30	68.60
05/01/2021	18:56	00:14:59	53.70	67.00
05/01/2021	19:11	00:14:59	54.20	68.50
05/01/2021	19:26	00:14:59	54.00	66.90
05/01/2021	19:41	00:14:59	56.30	71.80
05/01/2021	19:56	00:14:59	55.40	70.80
05/01/2021	20:11	00:14:59	52.30	67.40
05/01/2021	20:26	00:14:59	52.50	68.30
05/01/2021	20:41	00:14:59	52.30	72.20
05/01/2021	20:56	00:14:59	52.30	68.30
05/01/2021	21:11	00:14:59	50.80	67.20
05/01/2021	21:26	00:14:59	51.00	67.50
05/01/2021	21:41	00:14:59	51.00	67.10
05/01/2021	21:56	00:14:59	51.80	70.50
05/01/2021	22:11	00:14:59	50.40	67.10
05/01/2021	22:26	00:14:59	49.50	66.80
05/01/2021	22:41	00:14:59	48.60	66.00
05/01/2021	22:56	00:14:59	47.50	65.70

Date	Time	Run Time	Leq	Lmax
05/01/2021	23:11	00:14:59	52.40	79.30
05/01/2021	23:26	00:14:59	46.30	64.10
05/01/2021	23:41	00:14:59	45.90	62.40
05/01/2021	23:56	00:14:59	51.40	76.70
06/01/2021	00:11	00:14:59	47.80	72.30
06/01/2021	00:26	00:14:59	45.50	68.00
06/01/2021	00:41	00:14:59	43.10	61.00
06/01/2021	00:56	00:14:59	45.50	66.00
06/01/2021	01:11	00:14:59	43.00	62.50
06/01/2021	01:26	00:14:59	42.10	63.40
06/01/2021	01:41	00:14:59	45.80	62.40
06/01/2021	01:56	00:14:59	44.90	64.90
06/01/2021	02:11	00:14:59	42.60	62.90
06/01/2021	02:26	00:14:59	41.50	61.20
06/01/2021	02:41	00:14:59	40.70	61.90
06/01/2021	02:56	00:14:59	42.00	62.70
06/01/2021	03:11	00:14:59	45.00	65.20
06/01/2021	03:26	00:14:59	41.00	62.00
06/01/2021	03:41	00:14:59	43.00	63.60
06/01/2021	03:56	00:14:59	45.40	62.50
06/01/2021	04:11	00:14:59	45.80	63.30
06/01/2021	04:26	00:14:59	45.00	64.00
06/01/2021	04:41	00:14:59	46.60	64.30
06/01/2021	04:56	00:14:59	46.90	63.40
06/01/2021	05:11	00:14:59	49.20	65.00
06/01/2021	05:26	00:14:59	50.50	66.70
06/01/2021	05:41	00:14:59	52.80	66.90
06/01/2021	05:56	00:14:59	52.30	67.90
06/01/2021	06:11	00:14:59	53.50	65.90

Date	Time	Run Time	Leq	Lmax
06/01/2021	06:26	00:14:59	53.90	65.40
06/01/2021	06:41	00:14:59	54.20	66.80
06/01/2021	06:56	00:14:59	55.90	72.50
06/01/2021	07:11	00:14:59	55.50	66.60
06/01/2021	07:26	00:14:59	55.90	70.90
06/01/2021	07:41	00:14:59	55.50	65.20
06/01/2021	07:56	00:14:59	56.20	68.20
06/01/2021	08:11	00:14:59	56.40	67.20
06/01/2021	08:26	00:14:59	55.80	66.30
06/01/2021	08:41	00:14:59	56.30	69.70
06/01/2021	08:56	00:14:59	55.50	66.40
06/01/2021	09:11	00:14:59	55.80	78.20
06/01/2021	09:26	00:07:48	55.40	67.20