



**Environmental Noise Assessment for a
residential development in High Street,
Donington**

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1 OBJECTIVES

- 1.1 To carry out a *noise assessment of a proposed residential development in High Street, Donington following guidance in Planning & Noise: Professional Practice Guidance on Planning & Noise: New Residential Development (ProPG – Reference 1).
- 1.2 To recommend solutions to any problems identified by the assessment.

2 CONCLUSIONS

- 2.1 The dominant noise across the site will be from road traffic on High Street and other local roads.
- 2.2 At times industrial noise will be dominant or significant:
 - The operations of fixed plant at George Barnsdale may cause a ¹*“significant adverse impact”* at the residential locations.
 - There is also the potential for disturbance from fixed plant at Jacks Fish Bar and Budgens supermarket, yard activities at the fire station and deliveries at Budgens.
- 2.3 Design recommendations are made in section 3 to mitigate the impact of these sources.
- 2.4 The ProPG initial site noise risk assessment for the site is between “Low” and “Medium” for both the daytime and night-time.
- 2.5 The overall impact on future residents is assessed as being no worse than “Observed Adverse Effect” using terminology from the National Planning Policy Guidance.

3 RECOMMENDATIONS

3.1 Acoustic fence

A 2 metre or higher acoustic fence should be constructed on the footprint marked as a red line in Drawing 3.1 shown below. Further details on the specification are given in Appendix 6.

*** See Appendix 1 for a Glossary of Terms**

¹ using terminology from British Standard BS 4142:2014
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3.2 Glazing, Ventilation, Overheating

3.2.1 South facing bedrooms (Façade A Marked blue in Drawing 3.1) -

For the ²bedrooms facing the High Street double glazing with compression seals of specification ³R_w 38(-5) dB or better should be installed with trickle or wall vents of specification D_{n,ew} (C_{tr}) 40(-2) or better.

Ventilation System 3 is recommended for ventilation. System 1 or 2 are feasible but may result in poor indoor air quality,

Opening windows on these facades is not recommended to control overheating and the design team should select an alternative strategy, such as ventilative cooling, if overheating is deemed to be a risk.

3.2.2 Living rooms and bedrooms exposed to industrial noise (Façade B - Marked green in Drawing 3.1)

Double glazing with compression seals of specification ⁴R_w (C_{tr}) 31(-6) dB or better should be installed with trickle or wall vents of specification D_{n,ew} (C_{tr}) ⁵34 (-1) or better. For the bedrooms and living rooms on these facades ambient noise levels are generally low however they may be exposed to industrial noise sources at George Barnsdale from the east and Budgens ventilation plant from the west. It is therefore necessary that residents should be able to achieve satisfactory ventilation if they decide to close their windows to protect against industrial noise sources.

Any ventilation system can be used provided the design team assume closed windows. It is therefore not recommended to control overheating via open windows and the design team should select an alternative strategy, such as ventilative cooling, if overheating is deemed to be a risk.

3.2.3 Other facades (Façade C in Drawing 3.1 – Marked yellow in Drawing 3.1)

Double glazing with compression seals of specification ⁶R_w (C_{tr}) 31(-6) dB or better is recommended. Noise levels will be acceptable with partially open windows. Overheating can be controlled by opening windows without causing excessive noise levels.

3.2.4 All facades

Any mechanical ventilation system chosen should comply with the requirements of (Reference 2) Document F for noise. Acoustic Associates can offer further advice at detailed design stage if required.

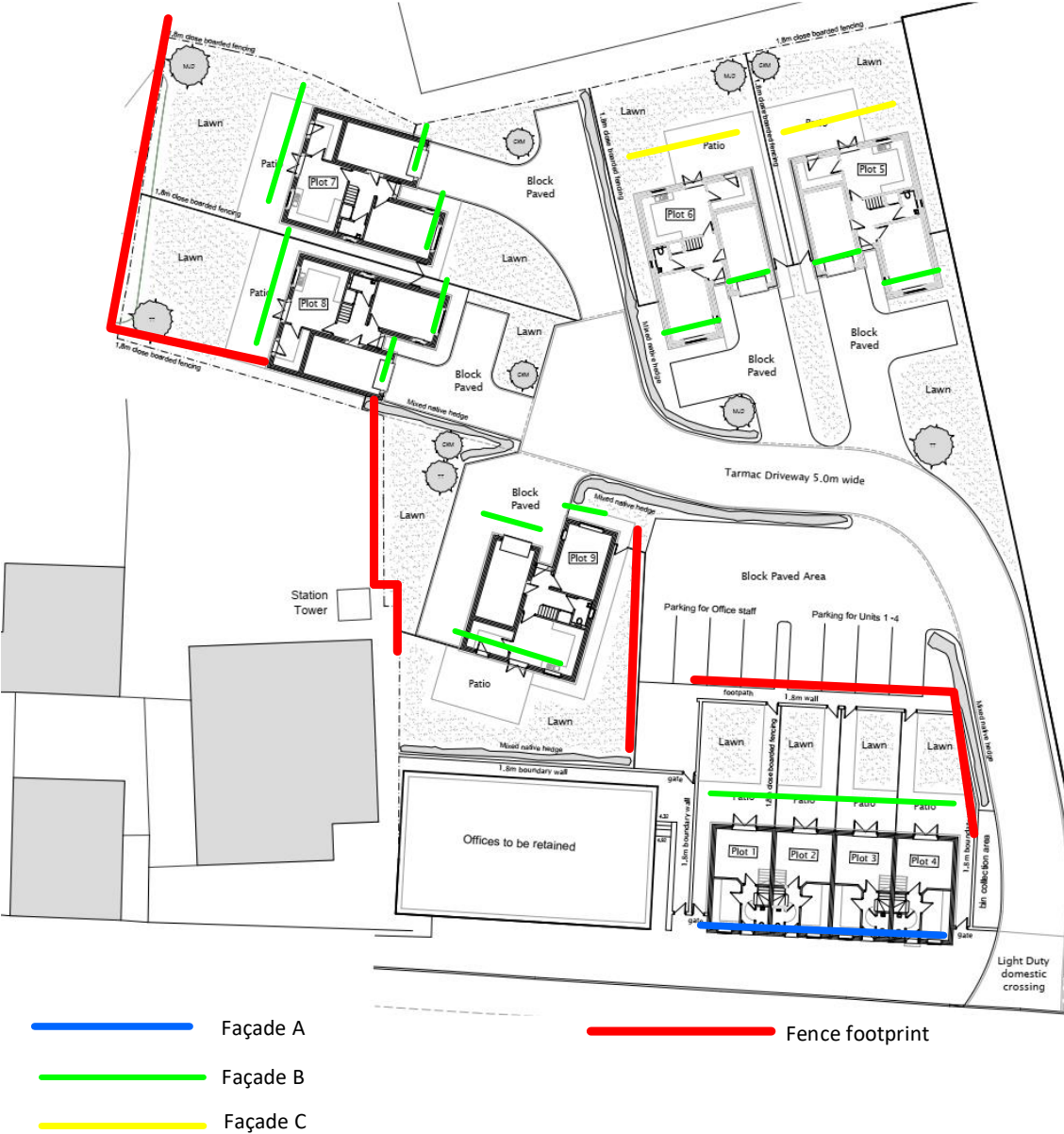
² There are no south-facing Living Rooms.

³ This can be achieved by glazing of spec 6/16/6.8 mm

⁴ This can be achieved by glazing of spec 4/16/4 mm

⁵ Standard hit and miss trickle vents

⁶ This can be achieved by glazing of spec 4/16/4 mm



Fo

Drawing 3.1 – Mitigation measures

4 **BACKGROUND**

Magnum Fabrications Ltd propose the residential redevelopment of a site in High Street, Donington. Under the proposal Magnum Fabrications existing production buildings will be demolished though their offices will be maintained at the south of the site. The residential development will be 4 new terraced houses on the High Street and 5 new detached houses accessed via a new cul-de-sac on the site. Drawing 4.1 shows the existing site bounded in red and Drawing 4.2 shows a plan of the proposed site.

Acoustic Associates (Peterborough) have been contracted to undertake the noise assessment for the site.



Drawing 4.1 – Site Location



Drawing 4.2 – Proposed site layout

5 POLICY, GUIDANCE AND STANDARDS

5.1 National Planning Policy Framework

The National Planning Policy Framework (Reference 3) states the following with respect to noise (para 180).

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

- 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 life⁶⁰;*
- 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.”*

The footnote 60 in section a) refers to the Noise Policy Statement for England (NPSE – Reference 4) in order to explain what it means by “adverse impact”.

5.2 Noise Policy Statement for England and National Planning Policy Guidance

The NPSE has stated that the impact of noise be classified according to an “effect level” (shown in column 3 below). The National Planning Policy Guidance (NPPG – Reference 5) has clarified what this effect level below means in terms of its perception by people at receptors and what action should be taken (columns 1 and 4 in Table 1 below).

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			
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. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g., avoiding certain activities during periods of intrusion; 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 harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

Table 1 - National Planning Policy Guidance noise exposure hierarchy**5.3 ProPG: Planning and Noise (Reference 1)**

This document was produced by noise professionals to offer them guidance on noise management within the planning system in England. It recommends a 2-stage approach to managing for noise:

5.3.1 ProPG: Stage 1 – Initial Site Noise Risk Assessment

5.3.1.1 The aim of this stage is to provide an indication of the likely risk of adverse effects due to noise from developing a site. Using measurement and/or prediction, indicative future noise levels on a site are estimated.

5.3.1.2 The following excerpt shows the potential effect associated with likely site noise levels for daytime and night-time.

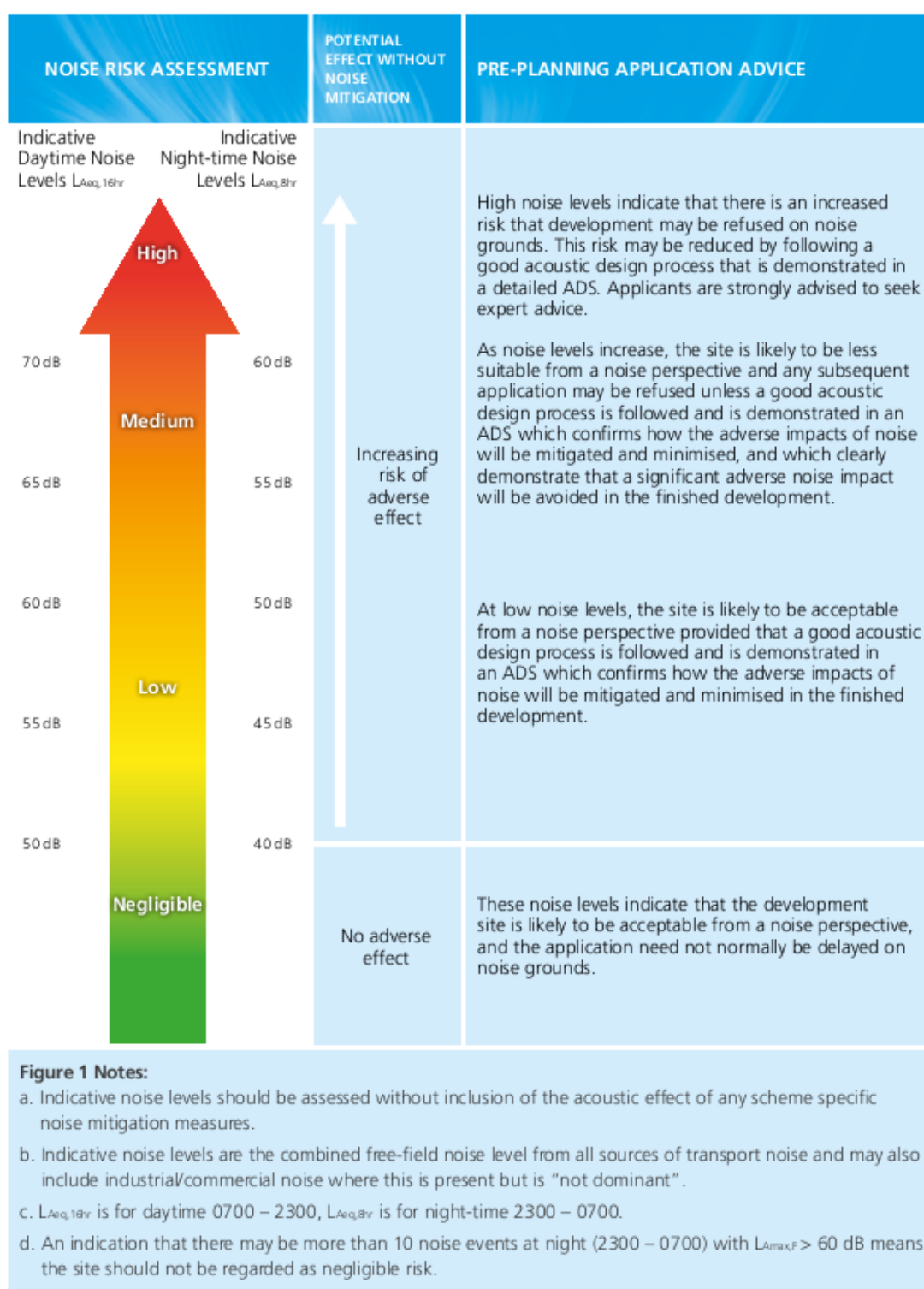


Figure 1. Stage 1– Initial Site Noise Risk Assessment

5.3.1.3 It must be noted that the initial assessment of noise risk is not the basis for the eventual recommendation of approval. Its aim is to give an early assessment of site suitability for residential development and the extent of the acoustic issues to be faced. The higher the risk the more important it is that good acoustic design is followed for the development.

5.3.2 ProPG: Stage 2 – Full Assessment

There are 4 stages to a full assessment, and these are briefly described below.

5.3.2.1 Element 1 - Good Acoustic Design Process

Provide an integrated solution whereby development avoids “unreasonable” and prevents “unacceptable” acoustic conditions. In particular the following should be considered: -

- Check the feasibility of relocating or reducing noise levels from relevant sources.
- Consider options for planning the site or building layout.
- Consider the orientation of proposed building(s).
- Select construction types and methods for meeting building performance requirements.
- Examine the effects of noise control measures on ventilation, fire regulation, health and safety, cost, CDM (construction, design and management) etc.
- Assess the viability of alternative solutions.
- Assess external amenity area noise.

5.3.2.2 Element 2 – Internal noise level Guidelines

Seek to achieve recommended noise levels inside noise sensitive rooms in new residential development. The following excerpt from the document shows the recommended internal noise levels that should ideally be achieved.

Activity	Location	Noise criteria	
		07:00 to 23:00	23:00 to 07:00
Resting	Living room	35 dB $L_{Aeq,16hour}$	-
Dining	Dining room / area	40 dB $L_{Aeq,16hour}$	-
Sleeping	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$ 45 dB $L_{Amax,F}$

Table 2 – ProPG Internal Noise Level Guidelines

Note 1: Figure 2 - Note 4 in ProPG states that in most circumstances the maximum noise level $L_{Amax,F}$ should not exceed 10 times per night.

Note 2: Section 2.3.3 of ProPG states the following with respect to the reduction of noise due to the building envelope *“the acoustic performance of the building envelope will be reduced in the event windows are opened for ventilation or cooling purposes, typically reducing the insulation to no more than 10 to 15 dB(A)”*.

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 5 dB 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 5 dB, 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 10 dB, they are highly 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

5.3.2.3 Element 3 – External Amenity Area Noise Assessment

The acoustic environment of external amenity areas that are an intrinsic part of the overall design assessment should always be assessed and noise levels should ideally not be above the range 50-55 dB $L_{Aeq,16hours}$. However the following follow-up advice should be noted

“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.”

5.3.2.4 Element 4 – Assessment of Other Relevant Issues

At this stage the following should be addressed:

- compliance with relevant national and local policy
- magnitude and extent of compliance with ProPG
- likely occupants of the development
- acoustic design v unintended adverse consequences
- acoustic design v wider planning objectives

5.4 Acoustics Ventilation and Overheating: Residential Design Guide (AVOG -Reference 6)

Acoustics design considerations for dwellings may impact on the ventilation and thermal comfort of the inhabitants e.g., closing windows to prevent noise ingress may mean that alternative means are needed to provide fresh air to inhabitants and to prevent overheating. The AVOG design guide details good practice to achieve satisfactory thermal and acoustic comfort for residents. It currently addresses noise from transport sources.

In summary an assessment for a dwelling will consist of the following:

- Based on the estimates of noise levels at the façades, advise on glazing specifications to achieve suitable internal noise levels;

- Advise the design team on the options for a ventilation strategy team (System 1,2,3 or 4 from Document F of the Building Regulations);
- Assess the effects of the ventilation strategy chosen and advise accordingly to prevent noise ingress. This advice could be on measures allowing natural (windows vents or open windows) or other methods such as mechanical ventilation;
- Assess the risk of overheating based on input from thermal modelling in a 2 stage assessment. Stage 1 determines whether open windows will suffice to mitigate against overheating. If so, there is no further assessment required for overheating as open windows will suffice;
- If a Stage 2 assessment is required, then, with input from the design team, advise on measures to achieve acceptable noise levels while preventing overheating. These could be measures to allow natural input (e.g., plenum windows) or physical measures such as cooling fans. If the latter, then noise emissions must be limited to avoid disturbance.

5.5 British Standard BS 4142:2014

5.5.1 BS 4142 (Reference 7) is a standard which describes a method for assessing whether the 'specific noise' from an industrial source is likely to give rise to complaints from residents of the adjacent dwellings. The 'specific noise' levels are determined outside dwellings. The specific noise level is determined for reference time periods of 1-hour for the daytime (7am to 11pm) and 15 minutes for the night-time. Tonal or impulsive characteristics of a noise are likely to increase the scope for complaints and this is taken into account by adding a value to the specific noise source level to obtain the 'rating level'. The value may be between 0 and 15 dB depending on objective and subjective measures detailed in the standard. The following table detail the values added for the subjective method.

Characteristics of noise	Noise at receptor	Value to add to specific noise level for rating level
Noise has tonal characteristics	Just perceptible	+2 dB
	Clearly perceptible	+4 dB
	Highly perceptible	+6 dB
Noise has impulsive characteristics	Just perceptible	+3 dB
	Clearly perceptible	+6 dB
	Highly perceptible	+9 dB
Other - characteristics that are neither tonal nor impulsive but are readily distinctive against the residual acoustic environment,	-	+ 3 dB
Intermittency	If intermittency is readily distinctive in the residual acoustic environment	+3 dB

Table 3 – BS 4142 – Corrections to noise to calculate rating level – subjective method

5.5.2 BS 4142 requires that the rating level of a noise is compared with the existing background noise ($L_{A90,T}$). Guidance given in the standard states the following regarding the difference between the rating Level and the background noise.

- A difference of 0 dB is indicative of a “*minor impact*”;
- A difference of +5 dB is indicative of an “*adverse impact*”;
- A difference of +10 dB is indicative of a “*significant adverse impact*” .

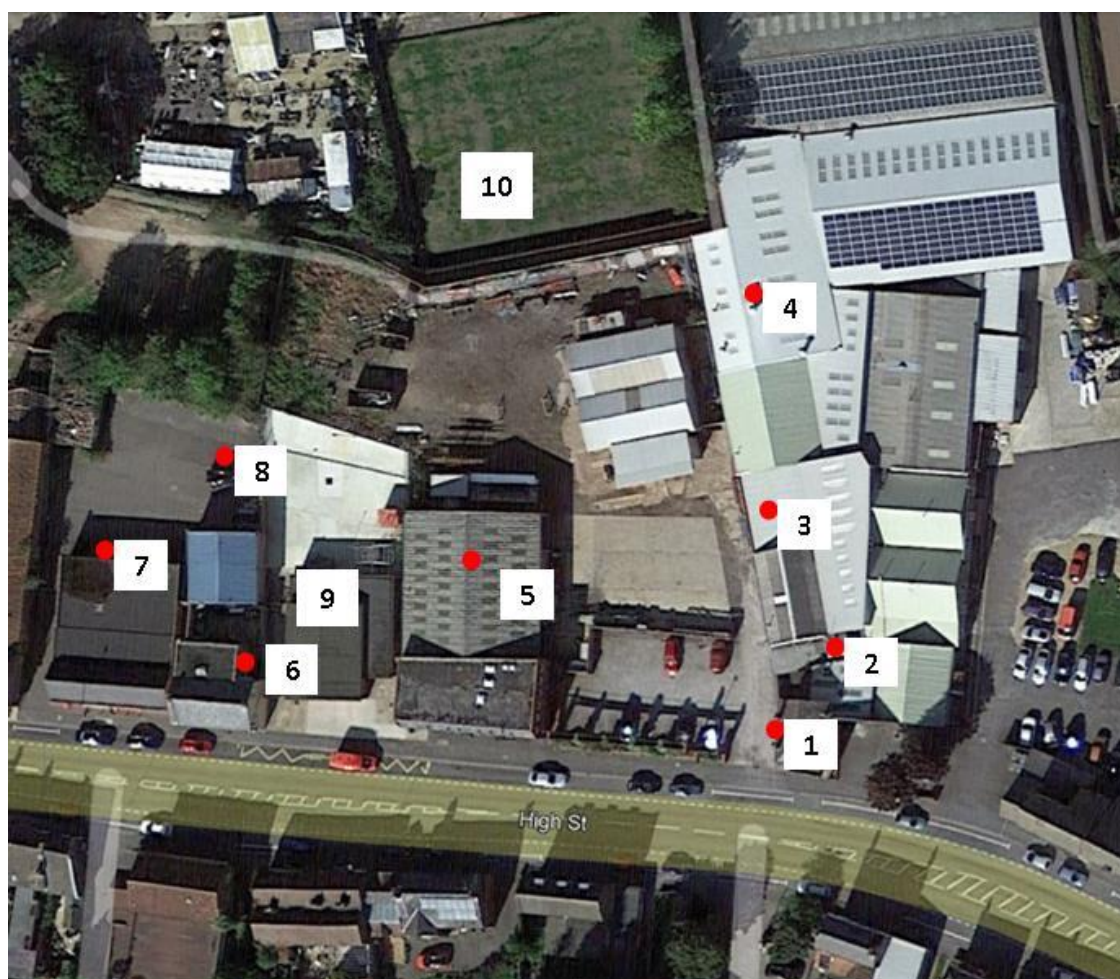
6 NOISE ASSESSMENT

6.1 Noise sources affecting the site

Based on inspection of and measurements taken on site, the following noise sources may potentially impact the proposed site.

- Noise from road traffic on High Street;
- Noise from George Barnsdale (items 1-4 in Diagram 6.1). This consists of fixed plant noise from roof sources and breakout through the building envelope. The western façade facing the site is complete and without gaps and all of the windows were double-glazed when the site was visited.
- Bugden's fixed plant (item 7) and yard activities (8). There are 9 inverters on the north-wall, and it is assumed that they may operate at their maximum in summer;
- An extractor chimney plant at Jacks Fish Bar (item 6).
- Magnum Fabrications (item 5) This will be demolished so is not an issue.

In addition, there is a fire station to the west of the site (item 9) which may create noise at some time. There is a bowling green to the north (item 10) and this is not considered to be an issue.



● = Noise Source Locations

- 1 — 2 x Inverters at George Barnsdale
- 2 — "Rumbling noise" source breaking out from inside George Barnsdale
- 3 — Extraction / machine running breaking out from George Barnsdale
- 4 — Roof Extraction at George Barnsdale
- 5 — Existing Magnum Fabrication Shop (to be demolished during redevelopment)
- 6 — Jacks Fish Bar chimney extractor
- 7 — 9 x Inverters at Budgens
- 8 — Delivery cages in Budgens shop yard
- 9 — Fire Station
- 10 — Bowling Green

Drawing 6.1 – Noise sources on site

6.2 Noise measurements

Long-term noise monitoring equipment was set up at Locations A and B on the site (Drawing 6.2). Location A was positioned next to the existing Magnum Fabrications building at a height of 3 metres above ground level and approximately 18 metres from the High Street. Location B was positioned at a height of 1.5m above ground level and adjacent to the Fire Station rear yard corner fence. Noise was continuously monitored throughout the period from 11:00 hours on Wednesday 6th October to 10:15 hours on Wednesday 13th October 2021. Short-term noise

monitoring equipment was also setup at Locations C – F at various times during attended daytime monitoring periods at heights of 1.5m above ground level. Appendix 2 gives details of the noise instrumentation used. The long-term noise monitoring results at Locations A & B are documented in Appendices 3 & 4. The short-term noise monitoring results are documented in Appendix 5.



Drawing 6.2 – Noise monitoring locations

6.3 Summary of long-term monitoring

6.3.1 The following table summarises the results of the long-term monitoring carried out on site.

Start Period	End of Period	Location A Noise level dB(A)				Location B Noise level dB(A)		
		Minimum background noise L_{A90}	Maximum background noise L_{A90}	Energy Average "Ambient" L_{Aeq}	*Overheating design case L_{Amax}	Minimum background noise L_{A90}	Maximum background noise L_{A90}	Energy Average "Ambient" L_{Aeq}
Wednesday - 11:00	Wednesday - 23:00	34.3	52.3	58.2	-	34.2	52.1	52.7
Wednesday - 23:00	Thursday - 07:00	28.1	45.7	51.6	71	28.3	43.2	41.4
Thursday - 07:00	Thursday - 23:00	33.6	60.5	61.4	-	36.3	58.7	57.8
Thursday - 23:00	Friday - 07:00	30.1	45.4	52.8	73	30.8	43.1	42.1
Friday - 07:00	Friday - 23:00	28.6	61.2	60.7	-	35.6	53.1	52.3
Friday - 23:00	Saturday - 07:00	24.6	38.5	49.8	70	26.8	43.5	40.6
Saturday - 07:00	Saturday - 23:00	27.9	47.3	57.4	-	32.3	45.6	50.7
Saturday - 23:00	Sunday - 07:00	27.0	34.0	49.3	70	32.0	38.5	40.1
Sunday - 07:00	Sunday - 23:00	29.8	46.0	56.6	-	32.6	44.7	47.0
Sunday - 23:00	Monday - 07:00	29.2	49.9	51.2	72	31.3	47.6	43.4
Monday - 07:00	Monday - 23:00	33.4	53.6	57.7	-	33.5	53.1	51.7
Monday - 23:00	Tuesday - 07:00	30.1	44.3	51.3	71	33.0	46.2	43.8
Tuesday - 07:00	Tuesday - 23:00	36.7	61.2	59.2	-	38.2	54.0	54.6
Tuesday - 23:00	Wednesday - 07:00	27.6	44.6	51.7	72	29.8	44.6	44.3
Wednesday - 07:00	Wednesday - 10:14	47.7	56.8	60.5	-	44.8	51.7	54.8
Daytime summary (07:00-23:00)		27.9	61.2	59.3	-	32.3	58.7	53.7
Night-time summary (23:00-07:00)		24.6	49.9	51.2	72	26.8	47.6	42.5

* The 10th highest $L_{Amax,1minute}$ recorded at night-time

Table 4 – Summary of unattended noise monitoring on site at Locations A and B

6.3.2 In addition to the above, the background noise levels were analysed to determine the “modal” background noise level at the site

- At Location A the modal background noise was L_{A90} **51 dB(A)** in the daytime and L_{A90} **30 dB(A)** at night-time;
- At Location B the modal background noise was L_{A90} **49 dB(A)** in the daytime and L_{A90} **36 dB(A)** at night-time;

These levels were used in the assessment of industrial noise

6.4 ProPG Assessment

Given the measurement results, the site is classified as between “*Low*” and “*Medium*” for those adjacent to the road and “*Low*” for most of the site in both daytime and night-time

This means that “*the site is likely to be acceptable from a noise perspective provided that a good acoustic design process is followed and is demonstrated in an acoustic design statement (ADS) which confirms how the adverse impacts of noise will be mitigated and minimised, and which clearly demonstrate that a significant adverse noise impact will be avoided in the finished development.*”

6.5 Industrial noise assessment (BS 4142)

6.5.1 George Barnsdale

The following table documents an assessment of industrial noise at the eastern side of the development.

Item	Daytime	Night-time	Comments
Specific noise level dB(A)	55	55	The measurements taken and documented in Appendix 5 at location D, E and F indicate that noise levels of $L_{Aeq,1hour}$ 55 dB(A) daytime (or $L_{Aeq,15minutes}$ 55 night-time) may occur at the eastern side of the proposed development due to fixed plant, vehicle movements and breakout from inside buildings.
Penalty	+10		Assumed to have clearly perceptible tonal and impulsive characteristics
Rating Noise level $L_{Ar,Tr}$ dB(A))	65	65	Specific noise level + penalty
Assumed background noise	49	36	See section 6.3
Excess over background dB	+16	+28	Rating Level – Background noise level
BS 4142 Assessment	“Significant adverse impact”		
Context	Continuous noise in mixed use residential/industrial area. It is a worst case assessment, and the site currently operates for a small portion of the night-time (06:30-07:00). The evidence of 3 visits to the site is that noise levels are generally lower for most of the day.		

Table 5 – BS 4142:2014 Assessment at nearest residential location of noise from George Barnsdale

As can be seen there is a potential for disturbance to residence from industrial noise so mitigation is recommended.

6.5.2 Other noise sources

The western site is adjacent to Budgens, Jacks Fish Bar and the Fire Station. The noise impact of sources has not been quantified however it is reasonable to assume the following .

- The fixed plant at Budgens includes 9 inverter units on a north facing wall and it is assumed that some of them will operate at night-time, particularly in the summer months; Typically, these will have a sound power of around L_w 75 dB(A). This will mean that noise levels at the new properties due to emissions from inverters could be over L_{Aeq} ⁷40 dB(A) if several inverters are running simultaneously.
- The chimney stack for Jacks Fish Bar includes an attenuator and there are already residents closer to it than those proposed for this development (south of High Street);
- There may be early morning deliveries at the rear of Budgens which cause disturbance;
- The noise from the Fire Station will be rare but also may occur at night-time.

Mitigation measures should be taken to minimise the risk of disturbance.

7 MITIGATION

7.1 **Amenity areas**

An acoustic fence should be constructed around the perimeters of properties where gardens are exposed to noise from the adjacent industrial sources. Details of its specification are given in section 3.

7.2 **Internal noise**

7.2.1 Introduction

Noise levels inside particular rooms were calculated in line with formulas shown in British Standard BS 8233:2014 section 6.7.2 (Reference 8) and design recommendations were made based on those results.

7.2.2 Houses facing High Street

The houses facing the road will be exposed to noise levels from road traffic on their southern facades. By comparing the results of short-term monitoring at Location C (the location of the new facades) with the results of the same period at Location A it is assumed that the noise levels next to the high Street are 4 dB higher. The following levels are assumed for this façade.

⁷ For 4 inverters at 25 metres = $75 - 20 \cdot \log(25) - 8 + 10 \cdot \log(5) = 41$
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- A daytime noise level of $L_{Aeq,16\text{hours}}$ **64 dB(A)**;
- A night-time noise level of $L_{Aeq,8\text{hours}}$ **56 dB(A)**;
- The 10th highest maximum noise level (the ventilation design case) is $L_{Amax,8\text{hours}}$ **77 dB(A)** and this value is generally exceeded by no more than 5 dB.

The recommendations given in section 3 of this report are based on these noise levels and the architect's layout drawings.

7.2.3 Other

For other parts of the site levels due to road traffic are significantly lower with levels likely to be under L_{Aq} 50 dB(A) in the daytime and under L_{Aeq} 45 dB(A) at night-time. However, it is assumed that rooms which face the industrial noise sources may at times be exposed to noise of a character which is likely to cause disturbance.

Recommendations given in section 3 of this report are based on these assumptions.

8 ACOUSTIC DESIGN

8.1 Stage 2 - Element 1 Good Acoustic Design

It is acknowledged that the layout is not optimized for acoustics however the shape of the plot means that it is quite difficult to do so. There are some acoustic benefits to the layout. The houses adjacent George Barnsdale do not have dwelling room windows on the façades facing east. The same is partially true of the layout to the west where the houses are exposed to sources at Budgens, the fish bar and the fire station.

The building envelope will be constructed to resist the ingress of noise.

8.2 Stage 2 - Element 2 Noise levels inside dwellings

Noise levels inside dwellings will be acceptable according to ProPG provided mitigation measures taken in section 3 are carried out.

8.3 Stage 2 - Element 3 - Noise levels in amenity areas

Noise levels over a 16 hour period will comply with the guidelines given in ProPG (less than $L_{Aeq,16h}$ 55 dB(A)). Additionally, an acoustic fence will be constructed around some amenity area to minimise disturbance from industrial sources and further reduce levels.

9 DISCUSSIONS

9.1 Uncertainties

The monitoring period was sufficiently long to estimate the ambient noise in the area.

There is uncertainty in the industrial emissions from George Barnsdale however the mitigation measures taken assume that the highest noise levels measured on this survey may occur on any part of this site.

There are therefore no uncertainties which could affect the conclusions or recommendations of this assessment.

9.2 Fence performance

It is acknowledged that the fence will have limited effect in reducing noise from the ventilation plant on the roof at George Barnsdale. However, the effect may still be significant. When the top of a fence is just in line of sight between a noise source and receiver a reduction of about 5 dB can be expected.

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7. *British Standard BS 4142:2014, Methods of rating and assessing industrial and commercial sound*; BSI, 2014.
8. *British Standard BS 8233, Guidance on sound insulation and noise reduction for buildings*; BSI, 2014.

Appendix 1 – Glossary of terms

Sound Pressure	The variation of ambient pressure that is detected by the ear as sound.
Noise	Unwanted sound
decibel (dB)	Ten times the logarithm of the square of the ratio of the Sound Pressure to a reference pressure (20 micro-Pascal's).
Sound Pressure Level (L_p)	The decibel version of the Sound Pressure.
A-Weighting	A frequency weighting which simulates the response of the ear. An A-Weighted Sound Pressure Level is denoted by L _{pA} and has units of dB(A)
L_{Aeq,T}	The value of the A-weighted sound pressure level, in decibels [dB(A)], of a continuous steady sound that within a specified time interval (T), for example 16 hours, has the same mean-square sound pressure as a sound that varies with time. Therefore, the average over a 16 hour period would be denoted as L _{Aeq,16h}
L_{Amax,T}	The maximum A-Weighted sound pressure level that was encountered during the measurement period.
L_{A90,T}	The A-Weighted sound pressure level that is exceeded for 90% of the time (T). This is usually used a measure of background noise.
Free Field	Where noise can propagate freely without any reflections from buildings etc.
Octave Band	A band of frequencies the upper limit of which is twice the lower limit. They are known by their centre frequency, e.g., 63, 125, 250, 500, 1000, 2000
NPSE Criteria	
NOEL	No Observed Effect Level
LOAEL	Lowest Observed Adverse Effect Level
SOAEL	Significant Observed Adverse Effect Level

BS 4142 Terms

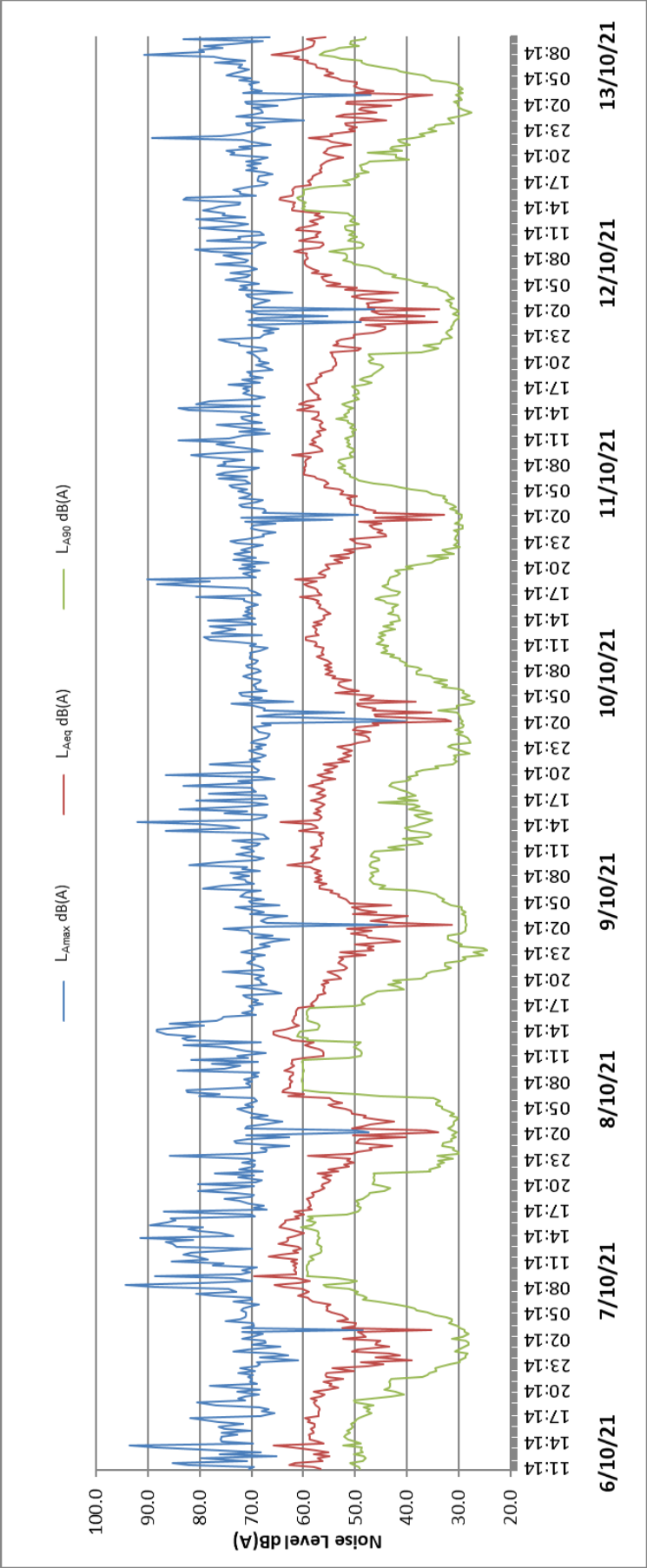
T_r	The reference time interval over which an equivalent continuous A-weighted sound pressure is determined. Day time = 1 hour Night-time = 15 minutes
T_m	The measurement time interval over which measurements are taken.
Ambient Noise	Total sound in a given situation at a given time.
Residual Noise	The ambient noise remaining at a given position in a given situation when the specific noise is suppressed to a degree such that it does not contribute to the ambient noise.
Specific Noise Level Rating Level L_{Ar,T_r}	The dB L_{Aeq,T_r} of the noise sources being assessed at a site. The specific noise level plus any correction (+5 dB) for the character of the noise, known as the Rating Level.
Assessment Level	Difference between Rating Level (L_{Ar,T_r}) and Background Noise ($L_{A90,T}$)
Sound Power Level (L_{WA})	The noise level from the source in terms of sound power, in dB(A).

Appendix 2 – Noise instrumentation

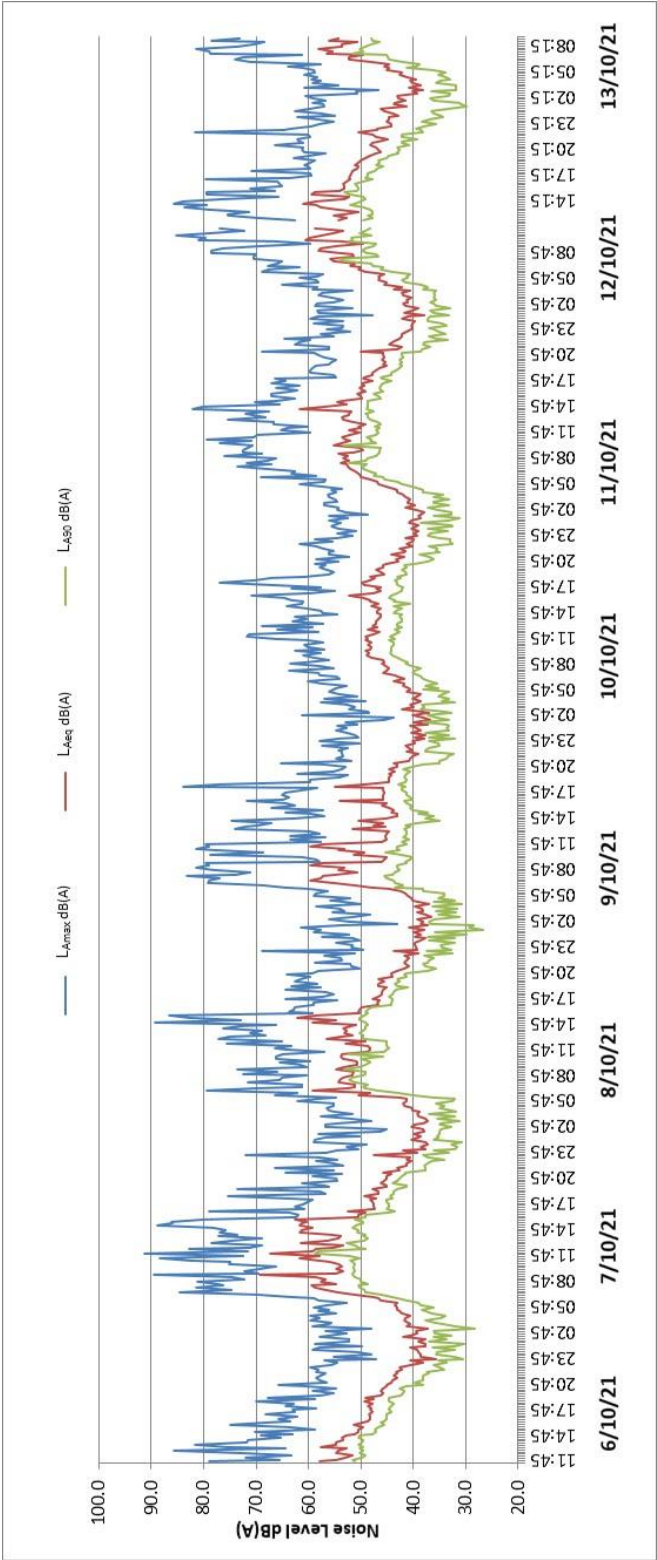
Type	Manufacturer	Description	Serial Number	Last Calibration Date	Calibration Certificate No.
Svan 945A	Svantek	Sound level meter	9485	13/05/2021	1112023
GA 607	Castle	Sound level calibrator	032942	13/05/2021	1112022
4231	Brueel & Kjaer	Sound level calibrator	2035091	23/03/2021	1110523
Svan 949	Svantek	Sound level meter	8101	11/03/2021	1110162
4230	Brueel & Kjaer	Sound level calibrator	781674	11/03/2021	1110163
SV30A	Svantek	Sound level calibrator	7490	09/07/2020	1100775
Svan 971	Svantek	Sound level meter	28229	15/03/2021	1110164
820	Larson Davis	Sound level meter	1013	23/07/2020	1101381

The calibration of the instrumentation was checked at the start and end of the tests and there was no significant drift.

Appendix 3 – Results of noise monitoring at Location A on site



Appendix 4 – Results of noise monitoring at Location B on site



Weather conditions during the monitoring periods between 6th – 13th October 2021 were mostly dry, cloudy with sunny intervals and temperatures ranging between 7°C – 19°C, with light winds of < 5 m/s from a north-west / west direction.

Appendix5– Results of attended noise monitoring on site**A5.1 Results of attended noise monitoring carried out at Location B**

Date	Time (Hours)	Ambient Noise Level ($L_{Aeq,15min}$) dB(A)	Background Noise Level ($L_{A90,15min}$) dB(A)	Maximum Noise Level ($L_{Amax,15min}$) dB(A)	Comments
6 th October 2021	11:30 – 11:45	65.4	52.1	94.5	Construction noise dominant from neighbouring building site consisting of a mini dumper, mini-excavator and cement mixer in use. Distant traffic audible. Occasional fabrication work audible from inside Magnum Fabrications workshop. HGV enters rear yard and turns around adjacent to monitoring position at 11:43 hours. Fork-lift used to load HGV with large steels at 11:46 hours. HGV drives away at 11:55 hours.
	11:45 – 12:00	58.3	51.6	79.8	
	12:00 – 12:15	55.1	51.9	65.8	
	12:15 – 12:30	53.2	50.1	72.2	
	12:30 – 12:45	51.7	49.4	63.2	
	12:45 – 13:00	55.0	50.5	74.2	

A5.2 Results of attended noise monitoring carried out at Location C

Date	Time (Hours)	Ambient Noise Level ($L_{Aeq,15min}$) dB(A)	Background Noise Level ($L_{A90,15min}$) dB(A)	Maximum Noise Level ($L_{Amax,15min}$) dB(A)	Comments
6 th October 2021	12:00 – 12:15	59.8	48.2	77.0	Traffic dominant on High Street. Occasional fabrication work audible from inside Magnum Fabrications workshop. Occasional low frequency rumbling noise audible from George Barnsdale building, occurs approximately once every 3 minutes, lasting between 4-5 seconds per time. Car exits car park at 12:34 hours. Military aircraft audible at 12:52 hours. Fabrication work dominant at times at 13:20 hours. HGV enters site at 13:40 hours. Fork-lift loading HGV with steels at 13:46 hours. HGV exits site at 13:59 hours. Military aircraft audible at 14:01 hours. Car exits site at 14:09 hours. Fabrication work dominant at times at 14:13 hours.
	12:15 – 12:30	60.4	47.5	77.8	
	12:30 – 12:45	59.4	47.4	72.2	
	12:45 – 13:00	61.9	50.5	80.8	
	13:00 – 13:15	59.2	48.0	75.0	
	13:15 – 13:30	61.4	48.6	82.5	
	13:30 – 13:45	67.6	47.7	97.8	
	13:45 – 14:00	62.2	51.2	82.0	
	14:00 – 14:15	59.3	48.3	74.9	
	14:15 – 14:30	60.8	48.0	77.2	
	14:30 – 14:45	62.7	50.3	81.0	
	14:45 – 15:00	62.4	50.8	82.1	
13 th October 2021	11:00 – 11:15	62.5	54.6	77.9	Traffic dominant. Machine / extraction noise from inside George Barnsdale building audible and dominant during lulls in traffic. Intermittent fabrication work audible on occasions. Rumbling noise audible from George Barnsdale building every 3 minutes lasting 4-5 seconds per time. Aircraft audible at 11:06 hours. Distant car horn honks twice at 11:14 hours.
30 th November 2021	08:30 – 08:45	67.1 (61.6)	56.1	87.7	Dominant passing traffic on High Street. Values in red are the levels logged simultaneously at Location A.
	08:45 – 09:00	66.7 (61.8)	55.4	79.8	

A5.3 - Results of attended noise monitoring carried out at Location D

Date	Time (Hours)	Ambient Noise Level ($L_{Aeq,T}$) dB(A)	Background Noise Level ($L_{A90,T}$) dB(A)	Maximum Noise Level ($L_{Amax,T}$) dB(A)	Comments
6 th October 2021	13:11 (4 secs)	51.1	49.0	52.4	Rumbling noise dominant from George Barnsdale building, minimal distant traffic.
	13:14 (6 secs)	48.7	46.5	51.2	Measurement taken without rumbling noise from George Barnsdale building, minimal distant traffic.
	13:14 (4 secs)	51.2	47.2	52.5	Rumbling noise dominant from George Barnsdale building, minimal distant traffic.
	13:20 (15 secs)	47.6	46.3	50.4	Measurement taken without rumbling noise from George Barnsdale building, minimal distant traffic.
	13:35 (15 secs)	51.8	49.6	54.6	Rumbling noise dominant from George Barnsdale building, minimal distant traffic.
	14:30 – 14:45	61.7	50.3	80.3	Traffic dominant. Fabrication works audible on occasions. Rumbling noise audible at 14:34, 14:37, 14:40, 14:43, 14:46, 14:49, 14:52, 14:55, 14:58 hours. Aircraft audible between 14:36 – 14:37 hours. Car enters car park at 14:50 hours. Fabrication works audible between 14:53 – 15:00 hours.
	14:45 – 15:00	61.2	51.1	79.0	
13 th October 2021	10:47 (50 secs)	57.8	56.8	59.5	Machine / extraction noise dominant from inside George Barnsdale building, includes rumbling noise on occasions, with minimal distant traffic.
	10:57 (5 mins)	60.8	57.3	70.5	As above, includes traffic and intermittent fabrication works audible.

A5.4 - Results of attended noise monitoring carried out at Location E

Date	Time (Hours)	Ambient Noise Level ($L_{Aeq,T}$) dB(A)	Background Noise Level ($L_{A90,T}$) dB(A)	Maximum Noise Level ($L_{Amax,T}$) dB(A)	Comments
6 th October 2021	15:08 (20 secs)	55.8	54.4	59.2	Music / talking on radio audible from inside George Barnsdale building, minimal distant traffic.
	15:12 (78 secs)	56.9	54.5	65.8	As above, includes some light banging and sawing from inside building, roof extraction also very faintly audible. Minimal distant traffic.
13 th October 2021	10:15 – 10:20	56.4	52.2	72.9	Music / talking on radio audible from inside George Barnsdale building, includes intermittent sawing, banging and distant traffic.
	10:17 (76 secs)	58.1	54.0	68.1	Music / talking on radio audible from inside George Barnsdale building, includes intermittent sawing, banging. Minimal distant traffic.
	10:41 (50 secs)	61.3	58.5	75.1	Machine / extraction noise dominant from inside George Barnsdale building, includes banging on occasions. Minimal distant traffic.

A5.5 - Results of attended noise monitoring carried out at Location F

Date	Time (Hours)	Ambient Noise Level ($L_{Aeq,T}$) dB(A)	Background Noise Level ($L_{A90,T}$) dB(A)	Maximum Noise Level ($L_{Amax,T}$) dB(A)	Comments
6 th October 2021	15:22 (5 secs)	50.1	49.3	51.1	Roof extraction dominant, minimal distant traffic.
	15:25 (31 secs)	51.9	50.5	57.7	As above, longer sample, includes some distant traffic.
13 th October 2021	09:56 (44 secs)	47.7	46.7	49.1	Roof extraction dominant, includes some rustling of tree leaves, minimal distant traffic.
	10:00 - 10:07	49.4	47.3	56.0	Roof extraction, distant traffic and rustling of tree leaves audible. Includes some construction noise from neighbouring building site.

Appendix 6 – Fence details

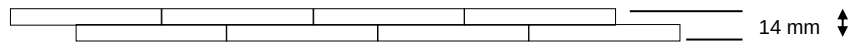
The fence should be at least 2 metres high and constructed on the footprint shown in Diagram 3.1.

It should comprise of an impervious material, e.g., close-boarded timber and have a mass per unit area of at least 10 kg/m². If timber is selected, then the mass per unit area must apply for the lifetime of the barrier.

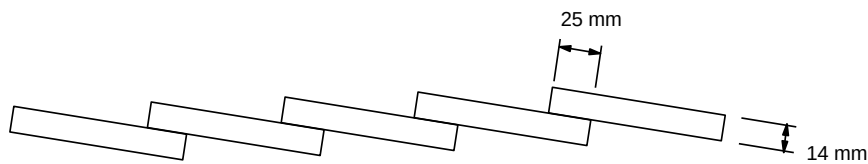
Any material can be used to construct the acoustic barrier, with a minimum surface density of 10 kg/m². This will give noise attenuation up to 20 dB.

It is advised that the minimum thickness of a wooden fence is at least 14mm and is overlapped as shown below.

Suitable Wooden Fence Configurations:



Plan Views



Note 1: All gaps should be sealed, including the area between the ground and bottom of the barrier.

Note 2: If constructed of wood then the surface density should be achieved after drying out of the timber.