NOISE ASSESSMENT

Proposed Housing Development

Higher Woodcroft
Leek
ST13 5QF

Client: A. Archer

Report by

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Ref: E15228
Site Visited by: S.B. Mellor MA, MIOA, CMIOSH
Site Visit: 12 and 13th 2018

Signed:

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1.0 INTRODUCTION

At the request of Mr. A. Archer (site owner), AC Environmental Consulting undertook an assessment of environmental noise at a proposed development site. It is intended that the site at Higher Woodcroft, Leek, ST13 5QF is developed for domestic use (24 houses).

This report considers measurements taken on site. Acoustic terminology is explained at Appendix 1; Consultants' qualifications at Appendix 2; References at Appendix 3; Graphs showing maximum levels at Appendix 4; Location photographs at Appendix 5.

2.0 ASSESSMENT CRITERIA

2.1 Local Authority Requirements

"Noise Impact Assessment - As your application involves activities that may generate significant levels of noise, please supply a noise impact assessment by a suitably qualified professional".

"There are specifically two primary noise concerns which may impact the proposed housing site".

1. *Industrial units on Higher Woodcroft.*

2. *Car workshops on Burton Street though less of a concern than 1. but should be considered.*

   "We would expect a site specific noise assessment to be undertaken and where appropriate a scheme for sound insulation should be set out. The Policy and guidance documents we expect the assessment to be undertaken in consideration of are listed below-

   BS8233: 2014 Guidance on sound insulation and noise reduction for buildings

   BS4142: Methods for rating and assessing industrial and commercial sound

   Professional Practice Guidance on Planning and Noise (PROPG)" **http://www.ioa.org.uk/publications/propg**

2.2 ProPG Professional Practice Guidance on Planning & Noise (May 2017) – excerpts are reproduced below

The Professional Practice Guidance on Planning and Noise (ProPG) has been produced to provide practitioners with guidance on a recommended approach to the management of noise within the planning system in England.

The scope of ProPG is restricted to the consideration of new residential development that will be exposed predominantly to airborne noise from transport sources.

New apartments, flats and houses are the most common type of new residential development; however, the guidance can also be applied to other types of residential developments such as residential institutions, care homes etc.

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 overall Stage 1 approach is considered to support wider Government planning and noise policy and guidance at the date of publication of this document, including the NPPF, NPSE and PPG-Noise.

The noise risk assessment may be based on measurement or prediction (or a combination) as appropriate and should aim to describe noise levels over a "typical worst case" 24-hour day either now or in the foreseeable future.

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 approach is underpinned by the preparation and delivery of an "Acoustic Design Statement" (ADS). An ADS for a site assessed as high risk should be more detailed than for a site assessed as low risk. An ADS should not be necessary for a site assessed as negligible risk. The

choice of recommendation is as follows: “grant without conditions”, “grant with conditions”, “avoid” or “prevent”.

The recommended ProPG internal noise level guidelines are described in Figure 1. These guidelines reflect and extend current practice contained in BS8233:2014.

Figure 1

ACTIVITY	LOCATION	07:00 – 23:00 HRS	23:00 – 07:00 HRS
Resting	Living room	35 dB $L_{Aeq,16\,hr}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16\,hr}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16\,hr}$	30 dB $L_{Aeq,8\,hr}$ 45 dB $L_{Amax,F}$ (Note 4)

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 internal 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 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 **(see Section 3.D)**.

It should be noted that 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). Most residents value the ability to open windows at will, for a variety of reasons.

"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 LAeq,16hr."

ProPG Stage 1

For an initial assessment the following table can be referred for indications of suitability:

Table 1

Level Day	Level Night	Risk	Conclusion
Below 50 dB(A) day	Below 40 dB(A) at night	Negligible Risk	Site is likely to be acceptable
Between 50 and 60-65 dB(A) day	Between 40 and 50-55 dB(A) night	Low Risk	Likely to be acceptable provided that Good Acoustic Design (GAD) is followed
Between 60-65 and 70 dB(A) day	Between 50-55 and 60 dB(A) night	Medium Risk	Likely to be less suitable and application may be refused unless ADS demonstrates GAD, how adverse effects will be mitigated, and significant adverse effects avoided
Above 70 dB(A) day	Above 60 dB(A) night	High Risk	Increased risk of refusal, which may be reduced by demonstrating GAD in a detailed ADS, expert advice recommended

2.3 British Standard 8233:2014 (Guidance on Sound Insulation and Noise Reduction for Buildings)

The latest version of BS8233:2014 'Guidance on Sound Insulation and Noise Reduction for Buildings' (published February 2014) supersedes the 1999 version and states the following:

"In general, for steady external noise sources, it is desirable that the internal ambient noise level does not exceed the guideline values in Table 4.

"Table 4: Indoor ambient noise levels for dwellings"

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living Room	35 LAeq,16hr	--
Dining	Dining Room/Area	40 LAeq,16hr	--
Sleeping (daytime resting)	Bedroom	35 LAeq,16hr	30 LAeq,8hr

The footnotes to this table make it clear that the guidance is based on the current WHO recommendations and that the above internal levels can be relaxed by 5dB to achieve "reasonable" internal conditions. The footnotes also make it clear that planning consent can be granted

when external levels exceed the WHO guidance targets provided that appropriate internal noise levels are achieved.

With regard to external levels, BS8233:2014 states:

"7.7.3.2 Design criteria for external noise

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. 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 55 dB LAeq,T or less might not be possible at the outer edge of these areas but should be achievable in some areas of the space."

From the wording, it is clear that there is no intention for the guideline noise levels to be applied to the general spaces external to apartment blocks and that the limits are only intended to apply to more private amenity spaces such as gardens and patios and larger balconies where residents would be expected to spend some time relaxing.

The wording of BS8233 also makes it clear that the guideline noise levels for gardens, patios, larger balconies etc., are not overriding planning considerations in any event.

2.4 BS4142:2014 – Rating Industrial Noise Affecting Mixed Residential and Industrial Areas

BS4142:2014 states, *"Response to sound can be subjective and is affected by many factors, both acoustic and non-acoustic. The significance of its impact, for example, can depend on such factors as the margin by which a sound exceeds the background sound level, its absolute level, time of day and change in the acoustic environment, as well as local attitudes to the source of the sound and the character of the neighbourhood…This British Standard describes methods for rating and assessing sound of an industrial and/or commercial nature".*

This British Standard describes a method for assessing whether a specific sound may have an adverse impact.

The Standard requires that the ambient noise ***(totally encompassing sound in a given situation at a given time, usually composed of sound from many sources near and far)*** including the "specific" sound from the source in question is measured in terms of the equivalent continuous sound level LAeq [see Appendix 1 for acoustic terms], which is then corrected for the residual sound (total LAeq excluding the "specific" sound).

A correction for character is made if ***"a tone, impulse or other characteristic occurs".*** For tonality a correction of between +2dB and 6dB is considered acceptable and for impulsivity between 3 and 9dB. See table below.

Table 2

Character	Just Perceptible	Clearly Perceptible	Highly Perceptible
Tonality	+2dB	+4dB	+6dB
Impulsivity	+3dB	+6dB	+9dB

Where the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied.

Where tonal and impulsive characteristics are present in the specific sound within the same reference period then these two corrections can both be taken into account. If one feature is dominant, then it might be appropriate to apply a single correction. Where both features are likely to affect perception and response, the corrections ought normally to be added in a linear fashion.

The final figure, including any character correction is known as the Rating level.

This Rating Level is then compared with the measured background [LA90] level. The greater this difference the greater the likelihood of "adverse impact" (See Notes 1 & 2 from BS4142:2014 below).

"NOTE 1

a) Typically, the greater this difference, the greater the magnitude of the impact.

b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.

c) A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.

d) 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.

NOTE 2

Adverse impacts include, but are not limited to, annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact."

It can be seen from Section 3.3 above that the conclusions to a BS4142 assessment also depend on the context and Section 11 of the British Standard states:

"Where the initial estimate of the impact needs to be modified due to the context, take all pertinent factors into consideration, including the following...

3) The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions, such as:

i. *facade insulation treatment;*
ii. *ventilation and/or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation; and*
iii. *acoustic screening."*

2.4.1 Night-time Noise

BS4142:2014 recognises that at night residents will be inside their properties [BS4142 A.6.1 and A.6.3] and that consequently "*Other guidance, such as BS 8233, might be applicable in this instance."* Also, BS4142 is directed primarily to the circumstances of a proposed or existing noise source affecting existing property, i.e. circumstances where insulating the property is impracticable. Therefore, BS4142 can't take into account circumstances where the properties have not yet been built and where noise control, such as acoustic glazing and ventilation, can be incorporated such to alleviate "*...the primary concern is the potential for disturbance of residents who could be sleeping with open bedroom windows.*"

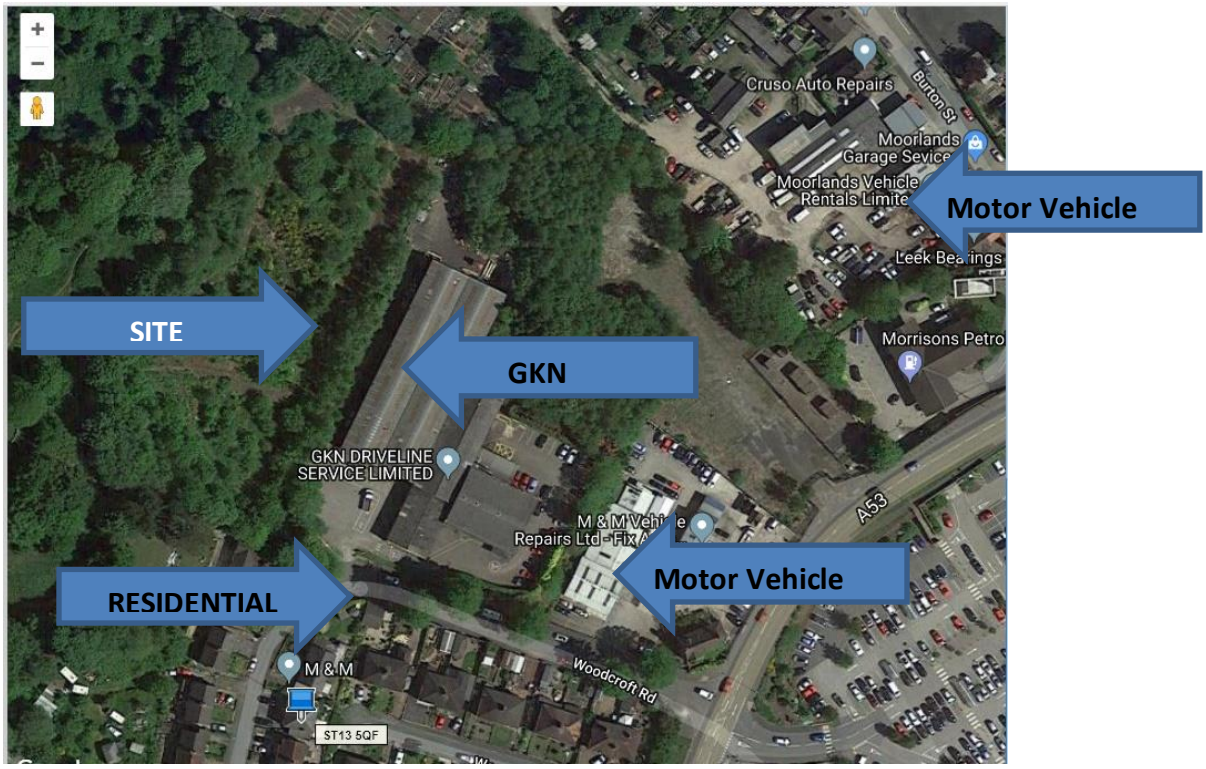
It can be seen from Section 3.3 above that the provision of acoustic

glazing, ventilation and screening can all change the impact of external noise. Consequently, where noise control can be incorporated into the properties [as here] Martec uses BS 8233:2014 to assess night-time noise.

3.0 SITE DESCRIPTION

The development site is situated on unused land adjacent to existing houses and also industrial premises. There are a number of businesses operating locally including GKN Powertrain Services situated adjacent to the development site and motor vehicle repair workshops. There allotments and a park to north and west of the site. Figure 2 below, shows the mix of residential and commercial properties.

Figure 2



The nearest façade of the proposed housing is approximately 12m from the GKN building.

4.0 NOISE MEASUREMENTS

The site was visited on 12th February 2018. Monitoring was carried out at two positions – for 24 hours at the GKN boundary closest to the proposed Plot 8 (see appendix) overlooking the rear yard; and for a shorter period overlooking the reception car park at the façade of proposed Plot 1. The site was fully attended from 8.00am until 5.30pm.

The position at the GKN boundary was chosen for security reasons so that the monitoring equipment could be secured – the site is currently accessible and popular with dog walkers and others.

Both positions approximated to free-field conditions.

The observer noted during the survey that extraction / flues were audible at various times and an additional 15-minute sample was taken adjacent to these flues.

Figure 3

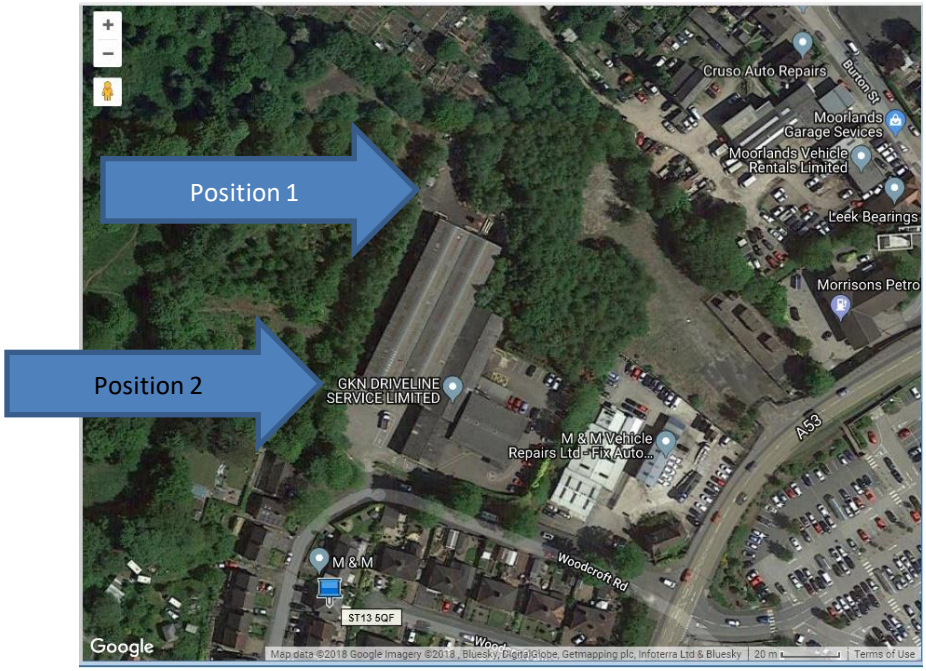


Figure 4

The weather throughout the monitoring period was cold with a temperature of between -1 and 4 degrees Celsius. There were clear, sunny skies and very little wind. Although the forecast in the area was for a wind speed around 2-3-3m/s+ (NW), the measured wind speed on site (with an electronic anemometer) was <1m/s.

It is not considered that the weather conditions would have affected the results.

The sound level meters used were a Svan 977 and Svan 957 Class 1 meters (s/n 36870 / 23201). The meters calibrated correctly before and after the measurements using a Cirrus calibrator type CR:551E (s/n 039816); all instrumentation had been laboratory calibrated within the preceding 2 years.

5.0 RESULTS

5.1 Measurement Results (Front – Road Noise)

Table 3 – Position 1 24-hour monitoring (GKN Yard)

Start date & time	Duration	LAeq	LAmax	LAmin	L10	L50	L90	L95
12/02/2018 08:00	01:00:00	56.2	79.3	45.2	59.2	52.4	48.7	47.6
12/02/2018 09:00	01:00:00	59	83.9	54.9	58.7	56.9	56	55.6
12/02/2018 10:00	01:00:00	54.5	77.8	44.7	57.2	51.3	46.9	46.3
12/02/2018 11:00	01:00:00	59.9	88.4	41.3	63.1	48.8	45.5	44.7
12/02/2018 12:00	01:00:00	49.4	76	40.5	51.9	46.7	43.7	43
12/02/2018 13:00	01:00:00	50.1	66	39.9	52.7	47.2	43.3	42.7
12/02/2018 14:00	01:00:00	63.8	88	49.1	63.9	60.1	50.7	50.3
12/02/2018 15:00	01:00:00	54.9	77.2	44.5	55.3	51.7	47.1	46.4
12/02/2018 16:00	01:00:00	54.3	81.9	44.6	54.4	48.8	47	46.4
12/02/2018 17:00	01:00:00	51.3	75.3	42.9	52.5	48.1	46.1	45.5
12/02/2018 18:00	01:00:00	47.2	61.7	42.8	48.7	46.5	44.8	44.3
12/02/2018 19:00	01:00:00	46.3	59.7	40	48.2	45.5	43.3	42.8
12/02/2018 20:00	01:00:00	45.3	58.1	40.1	47.3	44.6	42.6	42.2
12/02/2018 21:00	01:00:00	44.9	69.3	39.1	46.8	44	41.6	41.1
12/02/2018 22:00	01:00:00	43.3	54.7	35.7	45.9	42.3	38.9	38.1
12/02/2018 23:00	01:00:00	41	58.3	34.1	43.9	39.5	36.7	36.1
13/02/2018 00:00	01:00:00	40.1	56.6	33.1	42.3	38.2	35.5	34.9
13/02/2018 01:00	01:00:00	43.6	60.2	33.6	48.2	38.8	36.1	35.5
13/02/2018 02:00	01:00:00	42.8	58.3	33.3	45.6	40.1	36.4	35.6
13/02/2018 03:00	01:00:00	50.6	67.3	34.6	53.9	47.2	41.3	39.4
13/02/2018 04:00	01:00:00	47.1	67.1	36.2	49.9	44.7	40.3	39.4
13/02/2018 05:00	01:00:00	51.9	74	39	54.2	48.7	45.2	44
13/02/2018 06:00	01:00:00	54.5	70.6	45.4	57.2	51.7	48.3	47.6
13/02/2018 07:00	01:00:00	57.5	80.5	47.2	57.4	53.5	51.2	50.5
	Total	54.8	88.4	33.1				

	LAeq	Time
Day	56.1	16 hours
Night	49.2	8 hours

Table 4 – 1/1 Octave Levels

	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz
Day	36.4	42.7	45.3	47.5	43.4
Night	32.3	38.0	40.8	41.5	38.3

Table 5 – Position 2 Plot overlooking Car Park

Start date & time	Duration	LAeq	LAmax	LAmin	L01	L10	L50	L90
12/02/2018 09:04	01:00:00	50.4	75	42	58.3	51.9	49	46.1
12/02/2018 10:04	01:00:00	50.8	73.2	46.1	60.2	51.7	48.7	47.4
12/02/2018 11:04	01:00:00	49	67.6	41	57.8	50.9	46.2	43.4
12/02/2018 12:04	01:00:00	49.4	67.8	40	60.2	52.2	45.2	42.5

Table 6 – At boundary adjacent to extraction / flues

Start date & time	Duration	LAeq	LAmax	LAmin	L01	L10	L50	L90
12/02/2018 12:20	00:15:01	48.1	60.3	41.8	52.7	51.2	45.5	43.4

In addition to the above, the maximum readings were recorded (see Appendix 4) and it can be seen that typical LAmax readings at night for position 1 were around 70dB at the higher end on only a few instances and towards the morning period.

5.2 Subjective Observations

To the observer, the site was relatively quiet given the number of industrial uses in the area. The extraction system at GKN was audible. Vehicles periodically accessed the road adjacent to the GKN building to the rear yard. Reversing alarms were occasionally audible from fork lift trucks and delivery vehicles. Impact sound was also occasionally

observed from near and distant sources including rattling chains from skip vehicles for example. In summary, although the site was relatively quiet, industrial noise was occasionally discernible if not always intrusive.

Bird song and distant traffic noise was present throughout.

6.0 ASSESSMENT OF RESULTS

6.1 ProPG

Given the levels of noise present this would place the site into the low risk category from ProPG for the rear i.e. between 50 and 60-65 dBA day and 40 to 50-55 dBA night. This would mean the proposal to develop the site is likely to be acceptable provided that "Good Acoustic Design" (GAD) is followed (see example construction below) and significant adverse impacts avoided.

6.2 BS4142 and BS8233

Site noise levels when GKN was operational and not at 4 to 5pm = 54.3dBA and between 5 to 6pm = 51.3dBA, a +3dBA difference. This difference may be just discernible to some future residents. Occasional impact noise and similar (LAmax) may be more noticeable

but would not feature at night and can otherwise be mitigated (as can the possibility of adverse impact from BS4142) with suitable design and construction specification.

The extraction system was more of a constant. If we use the L90 level for the extraction system because of other occasional influence then the level for this equipment would be 43.4dB, very similar to background levels when the site is not operating although the sound has a distinctive “hum”.

Table 7

1-hour reference	43 dB
Correction for tonal characteristics	2 dB
Rating Level	45 dB
Background Noise Level LA90 (5-6pm no activities)	46 dB
Excess over Background [Rating – Background]	= +1dB

Conclusion – less likely to have adverse impact especially given the context, i.e. historical industrial use in the area.

As noted above, BS4142 is directed primarily to the circumstances of a proposed or existing noise source affecting existing property, i.e. circumstances where insulating the property is impracticable. In which case, "*Other guidance, such as BS 8233, might be applicable in this instance*". As such, we can suggest an example suitable construction design and predict internal levels based on the measured levels of noise.

6.3 External Levels (WHO Guidelines / BS8233 / ProPG)

Given that noise levels at position 1 were measured directly at the site boundary there will be some attenuation for the additional distance to Plots 7 and 8.

This extra distance will likely achieve the desirable levels for gardens of 50/55dBA to ensure that any possible annoyance is avoided. The LAeq, 16- hour level has been calculated at 56.1dB at position 1 which would just be above the desirable range by 1dB, but with the extra distance to the building plots the additional attenuation is likely to be achieved (double the distance from GKM side road and rear yard would achieve an extra 6dBA of attenuation). However, there are also plans for 1.8m high close-boarded fencing (free from holes and gaps) at the rear of all gardens which should achieve a minimum of 5dBA of extra attenuation where GKN activities are only partially visible, possibly more. This will apply to Plot 1 to 8 only. For Plots 9 to 24 external levels will be much reduced as the Plots will be screened by the other buildings.

However, as noted in Section 2.3, the wording of BS8233 also makes it clear that the guideline noise levels for gardens, patios, larger balconies etc., are not overriding planning considerations in any event.

6.4 Internal Noise Levels

The final internal layout has not been confirmed for first floor rooms, so the following assumptions have been made for rooms overlooking GKN and other industrial buildings, including e.g. reverberation time. The level measured at the site boundary has been used and not corrected for distance, as a worst case.

- Reverberation time for bedrooms is 0.3s
- Volume for bedroom = 19m^3
- Window Area = 2m^2
- Wall Area = 12.5m^2
- Brick / block cavity construction

Table 8: Predicted Internal Noise Levels [LAeq]

BS EN 12354-Calcs		Use	Volume		Volume	19.0				
Version 3.8		length							dBA Diff	29.96472
© 2014 Martec Environmental Consultants Ltd		width			RT	0.3				
& Acute Acoustics Ltd		height		Octave Band Centre Frequency [Hz]						dBA
				125	250	500	1k	2k		
	External Spectrum Leq (Free Field & Linear)			36.4	42.7	45.3	47.5	43.4		50.2
	Adjustment to Given Level if required									56.1
	External Spectrum Adjusted for Level			42.3	48.6	51.2	53.4	49.3		56.1
			Area m2	Element Sound Reduction Index [SRI]						Contrib
Wall	Brick/block/cavity		12.0	41	45	45	54	58		9.0
Drs/Wndws	6/12/6_double_glazing		2.0	20	19	29	38	34		20.6
Roof Lights	None		0.0	0	0	0	0	0		0.0
Door	None		0.0	0	0	0	0	0		0.0
Roof	None		0.0	0	0	0	0	0		0.0
			# Vents							
Vent Dn,e	Hit_and_miss_trickle_(4000mm^2)		1.0	34	27	37	35	34		24.6
										dBA
		Internal SPL/dBLin		19.2	28.1	21.0	21.8	19.1		26.1

From the above it can be seen that the predicted internal daytime noise level of **26.1dB LAeq,16hr,** using double glazing [6/12/6] and hit and miss trickle ventilation would meet the design range from BS.8233 of ≤35dB LAeq,16hr for daytime.

If we apply the dB difference of -6.9dB between daytime and night time levels then the night time criteria of 30dB LAeq, 8hr would also be met [26.1 – 6.9 = 20].

From ProPG, desirable internal levels may not be met where there is reliance on opening windows to cool the rooms overlooking GKN – see conclusion.

With the highest LAmax levels at night around 70dB and a difference between external and internal levels of 30dB (56.1 – 26.1 = 30) the target internal levels for LAmax of 45dB would also be met at 40dB. This higher level would only occur on a few occasions and generally LAmax levels will be much lower.

7.0 CONCLUSIONS

The above demonstrates that with considered specification appropriate noise levels can be met with reference to BS8233: 2014 and the requirements of the Local Authority.

The following noise control measures are recommended:

1. For all habitable rooms overlooking GKN windows should be fitted with double glazing (6/12/6) and hit and miss trickle [or similar and approved] as a minimum which will achieve the criteria from BS8233.
2. A Mechanical Extract Ventilation (MEV) or Positive Input Ventilation (PIV) which extracts/supplies air from the rooms, but which does not allow significant noise to enter from the outside, either because of the system's attenuation or because it vents to a quiet façade, would allow residents to occupy these rooms (overlooking GKN) without the need to open windows.
3. For all other Plots and rooms which do not overlook GKN, standard thermal glazing with trickle ventilation should suffice.

APPENDIX 1

EXPLANATION OF ACOUSTIC TERMS

The dB or the decibel, is the unit of noise. The number of decibels or the level, is measured using a sound level meter. It is common for the sound level meter to filter or 'weight' the incoming sound so as to mimic the frequency response of the human ear. Such measurements are designated **dB(A).**

A doubling of the sound is perceived, by most people, when the level has increased by 10 dB(A). The least discernible difference is 2 dB(A). Thus, most people cannot distinguish between, say 30 and 31 dB(A).

If a noise varies over time then the **equivalent continuous level, or LAeq**, is the notional constant level of noise which would contain the same amount of acoustic energy as the time varying noise.

The following table gives an indication of the comparative loudness of various noises expressed in terms of the A weighted scale:

Source of noise	dB(A)	Nature of Noise
Inside Quiet bedroom at night	30	Very Quiet
Quiet office	40	
Rural background noise	45	
Normal conversational level	60	
Busy restaurant	65	
Typewriter @ 1m	73	
Inside suburban electric train	76	
Alarm clock ringing @ .5m	80	
Hand clap @ 1m	80	
HGV accelerating @ 6m	92	Very Loud

APPENDIX 2

QUALIFICATIONS OF S. MELLOR

My full name is Steven Brian Mellor. I hold a Master's degree in Health, Safety and Environmental Law, British Occupational Health Society (BOHS) M104 certificate in Noise and Vibration and Institute of Acoustics Certificate of Competence in Environmental Noise Measurement (Derby University), plus Diploma in Acoustics and Noise Control (Bristol University). I am member of the professional body for noise and vibration specialists, the Institute of Acoustics, MIOA.

I have some 16 years of experience dealing with problems caused by noise and vibration, both regarding noise and vibration in the environment, the workplace and the home. During that time, we have advised many groups including employers, residents and developers about the problems of noise and vibration in the workplace and environment.

APPENDIX 3

REFERENCES

1 ProPG ProPG Professional Practice Guidance on Planning & Noise (May 2017)

2 BS.8233:2014 "Guidance on Sound Insulation and noise reduction for buildings."

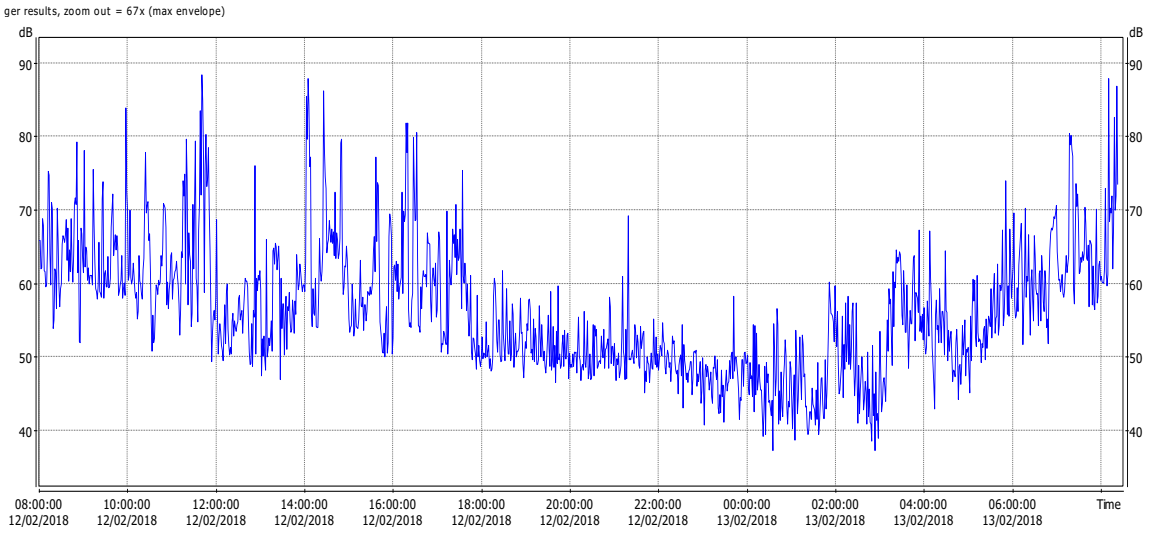
3 National Planning Policy Framework: http://www.communities.gov.uk/publications/planningandbuilding/nppf

4 BS EN 12354-3:2000 *Building Acoustics-Estimation of Acoustic Performance in buildings from the performance of elements. Part 3 Airborne sound Insulation against outdoor sound."*

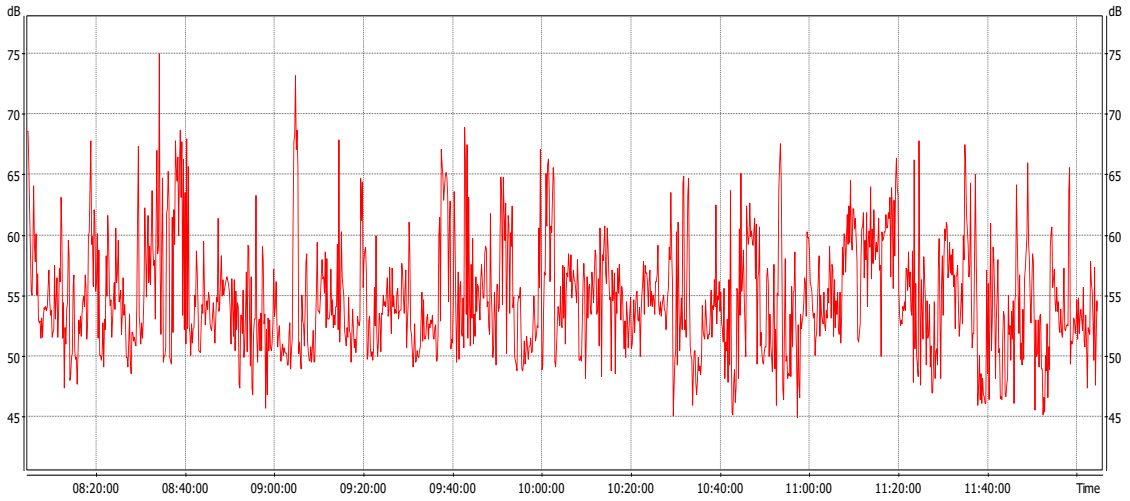
5 BS4142:2014 Rating Industrial Noise Affecting Mixed Residential and Industrial Areas.

APPENDIX 4

LAmax, 1 sec
Monitoring Position Boundary Position 1



LAeq, 1 sec
Monitoring Position Plot 1 Position 2



APPENDIX 5

Location Photographs

Position 2

Boundary – Position 1

Site view from boundary by allotments

View of allotments

Fork lift truck in rear yard

Extraction flues