



# Proposed Residential Development – Charlesfield, St Boswells

## Noise Impact Assessment

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## Proposed residential development – Charlesfield, St. Boswells

### Noise Impact Assessment

#### 1. Introduction

KSG Acoustics Ltd. has been appointed by EMA Architects to provide a noise impact assessment (NIA) pertaining to a proposed residential development on land north west of Charlesfield Industrial Estate, St. Boswells. This report determines the prevailing levels of day and night time environmental noise typical to the site of the proposed development and considers the likelihood of significant impacts on future sensitive receptors.

#### 2. Site description

The proposed development site is located west of the A68 and north west of Charlesfield Industrial Estate. It is a linear green field area with existing dwellings immediately to the north along the road side and also to the east and west.

South of the red line boundary is Perryman's Bus Depot and further to the west is Pirnhouse Interiors, which comprises a gift shop and coffee shop open to the public. The industrial estate extends to the south and east, with the primary access taken from a junction around 580m to the east, close to the A68. Alexander Inglis and Son Ltd grain processing facility is located immediately to the west of the junction; in the field immediately to the east there is a newly operational biomass facility.

The remainder of the estate comprises a mixture of businesses, including motor vehicle servicing and repair, offices and sales facilities.

The proposed development site is at a higher local ground height than the Industrial Estate. It is visually screened from the Industrial Estate by extensive hedging along the south boundary with Perryman Bus Depot, although there appears to be no existing close-boarded element to act as an effective acoustic barrier.

Subjectively, the acoustic environment at the proposed development site is quiet and in keeping with the rural setting. The dominant source of environmental noise across the proposed development site is distant road traffic noise and intermittent vehicle movements

along the public road to the north and the access road to the west. There is low level continuous fixed plant noise from the new biomass facility to the east, the effects of which vary with prevailing meteorological conditions. There are also intermittent contributions to the acoustic environment from activities at the Industrial Estate, especially the adjacent Perryman's Bus Depot. Finally, there are contributions from natural sources, including wind through foliage, bird song and animals in the surrounding fields.

### *Perryman's Bus Depot*

Perryman's Bus Depot was consulted to determine typical activities and hours of operation. A representative confirmed that buses leave the yard mainly during the morning and return throughout the afternoon and evening, concluding by 2300h. Activities in the yard during the day include refuelling and general maintenance. The yard is then closed until 0330h, when a staff member arrives to prepare for the bus fleet egress, which commences gradually from 0430h.

There is no fixed plant at the depot; general maintenance tools include compressed air tools and hand tools.

### *Biomass development*

A representative from the biomass development to the east was consulted and confirmed that the fixed plant components operate consistently 24 hours with no significant variation. During the day, HGV deliver feedstock to the site, which is then handled locally according to requirements.

## **3. Proposed development**

The proposals for development are to erect 2 dwelling houses with associated access and outdoor amenity areas. The dwellings are proposed to be located side by side with separate accesses from the main road, passing between existing dwellings. The principle outdoor amenity areas will be located back-to-back between the dwellings.

It is proposed to incorporate an appropriately specified bund and close-boarded fence along the south boundary of the proposed development site, beyond which lies Perryman's Bus Depot. For the purposes of this assessment, it has been assumed that this will comprise a 1m bund plus a 1.8m close-boarded fence.

## 4. Assessment methodology and consultation

The following documents have been referred to in this report:

- Planning Advice Note (PAN) 1/2011 Planning and Noise and associated Technical Advice Note (TAN);
- British Standard (BS) 4142: Methods for rating and assessment industrial and commercial sound;
- British Standard (BS) 8233: Guidance on Sound Insulation and Noise Reduction for Buildings; and
- World Health Organisation (WHO) publication Guidelines for community noise.

PAN 1/2011 provides advice on the role of the planning system in helping to prevent and limit the adverse effects of noise. The associated TAN provides information and advice on noise impact assessment methods. PAN 1/2011 is the overarching guidance document in Scotland for the consideration of noise in the context of planning decisions. It highlights the principles of good acoustic design and a sensitive approach to new development. It does not provide any specific methodology that should be applied to the assessment of locations proposed for noise sensitive development however it does recommend the use of other guidance documents which should be used to construct a quantitative and qualitative assessment. This report seeks to apply the principles underpinning the guidance document to assess the possible impacts of environmental noise on future sensitive development.

BS4142 describes methods for rating and assessment commercial and industrial sound. It uses outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident.

BS8233 and the WHO publication contain guidance with respect to suitable noise levels for internal and external habitable spaces. BS8233 also provides guidance with respect to the acoustic performance of façade elements and composites.

### *Consultation*

Verbal and written consultation has been undertaken with the Environmental Health Officer (EHO) for Scottish Borders Council (SBC). SBC confirmed that they would be most interested

in the potential impact of any industrial or commercial noise from the adjacent Industrial Estate as well as typical day and night time levels of environmental noise.

The EHO also confirmed that SBC has no specific local guidance with respect to planning and noise that the developer should be aware of.

## 5. Baseline noise survey

A site walkover was undertaken on Friday 02 June 2017, during which activities throughout the Industrial Estate were investigated, especially those in close proximity to the proposed development site.

Daytime measurements of baseline environmental noise were undertaken to establish typical environmental noise conditions across the proposed development site.

A sound level meter was located within the curtilage of Brambles Cottage, which is located immediately west of the site and on the site boundary.

Measurements were made using a Rion NL-52 sound level meter (serial number 00821105) fitted with ½ inch condenser microphone (serial number 04086). The sound level meter was calibrated at the beginning and end of the measurement period using a Bruel & Kjaer acoustic calibrator (serial number 909231) which had itself been calibrated against a reference system traceable to national and international standards; no drift in calibration occurred.

Measurements were taken in the free field at a height of approximately 1.5m above local ground height.

The following Table 1 presents a summary of the measured levels of day time environmental noise at the location previously described.

*Table 1: Typical daytime environmental noise levels*

Period start	LAeq,1h (dB)	LA90,1h (dB)	LAFmax (dB)
12:00:00	46.5	37.1	52
13:00:00	45.1	38.2	55
14:00:00	47.0	38.8	57
15:00:00	47.8	39.5	55
16:00:00	49.7	40.5	60

17:00:00	54.3	39.7	58
18:00:00	52.6	37.4	54
19:00:00	49.6	38.6	55
20:00:00	49.9	31.6	52
21:00:00	45.9	24.9	49

### *Detailed night time noise survey*

A second site walkover and detailed attended night time noise survey was undertaken on 11 and 12 July 2017. The purpose of this exercise was to determine typical night time noise contributions at the proposed development site and identify sources.

Weather conditions between 11 and 12 July were suitable for the monitoring of environmental noise, being still and mild.

All measurements were taken in the free field at a height of approximately 1.5m above local ground height.

A sound level meter was installed on the proposed development site between 2200h on 11 July and 1000h on 12 July. Measurements were made using a Rion NL-52 sound level meter (serial number 00821105) fitted with ½ inch condenser microphone (serial number 04086). The sound level meter was calibrated at the beginning and end of the measurement period using a Bruel & Kjaer acoustic calibrator (serial number 909231) which had itself been calibrated against a reference system traceable to national and international standards; no drift in calibration occurred.

Attended measurements were made using a 01dB Solo sound level meter (serial number 60502) fitted with ½ inch condenser microphone (serial number 59680). The sound level meter was calibrated at the beginning and end of the measurement period using a Bruel & Kjaer acoustic calibrator (serial number 909231) which had itself been calibrated against a reference system traceable to national and international standards; no drift in calibration occurred.

The following Table 2 summarises the results of the unattended night time measurements on the proposed development site and Table 3 summarises the results of the attended measurements.

*Table 2: Typical night time environmental noise levels*

Period start time	LAeq,1h (dB)	LA90,1h (dB)	LAFmax (dB)
22:00:00	40	37	66
23:00:00	37	33	57
00:00:00	33	31	44
01:00:00	33	32	41
02:00:00	33	32	43
03:00:00	36	32	46
04:00:00	44	38	50
05:00:00	48	42	58
06:00:00	49	43	62
07:00:00	45	39	63

It is worth noting that sunrise on the 12 July 2017 was at 0445h. Given the significant number of trees along the south boundary of the development site and the rural location, it is likely that the dawn chorus of birdsong has contributed to the measured LAeq at this location.

*Table 3: Attended night time noise measurements*

Location	Start time (h)	T (s)	LAeq,T (dB)	LA90 (dB)	LAFmax (dB)
Industrial Estate access road, adjacent to St Boswells Mowers	0102	300	34	34	38
Industrial Estate access road, adjacent to Alexander Inglis Grain Depot	0113	300	37	37	39
Proposed development site access from the public road	0124	300	28	27	33
West Industrial Estate access road adjacent to The Brambles	0131	300	28	28	32
Adjacent to proposed development site boundary	0159	1200	30	27	42
	0259	600	32	27	52

The attended night time site visit confirmed that Perryman's Bus Depot is completely closed during night time hours until 0330h, as described by the representative consulted.



## 6. Noise impact assessment

An assessment of the likely levels of environmental noise affecting internal and external habitable spaces associated with the proposed development has been undertaken to determine the likelihood of adverse effect.

The assessment considers the commercial noise levels in the context of the ambient acoustic environment as well as the absolute levels. An explanation for the choice of assessments is set out below.

Calculations have been presented for the situation where windows are partially open. With respect to the acoustic attenuation afforded by a partially open window in a façade, BS8233 Annex G suggests that 15dB may be achieved, although it goes on to say that the acoustic performance will vary with the frequency content of the noise and window type.

The absolute design targets considered are 35dB inside habitable rooms during the daytime and 30dB inside habitable rooms at night, as recommended in BS8233 and the WHO guidance *Guidelines for Community Noise* and Noise Rating curves. Noise Rating curves specify a target in each octave band and therefore take account of the distribution of energy across the acoustic spectrum.

### *Noise from the operational biomass plant*

Generally, BS4142 makes a comparison between typical levels of background noise (LA90) and predicted or measured cumulative operational levels of identified sources of commercial noise, after correction for any acoustic features.

Observations made on site during the daytime and early hours of the morning have confirmed that noise from the biomass plant to the east is low level and continuous without fluctuation. As this noise occurs continuously, however, it is arguably part of the existing baseline.

During the daytime, the noise remains audible, although it is partially masked by other typical sources of environmental noise.

It is also worth noting that, in Section 11 Assessment of the Impacts, BS4142 notes that *Where background sound levels and rating levels are low, absolute levels might be as or*

*more relevant than the margin by which the rating levels exceeds the background. This is especially true at night.*

On this basis, BS4142 does not seem to be an appropriate assessment methodology to consider the potential impact of noise from this source.

The Planning Permission granted to the operator of the biomass plant has been examined and it has been found that the Condition relating to off-site noise levels contains the following wording:

*11. Noise emitted by any structure and / or plant... shall not exceed NR20 between the hours of 2300 to 0700 inclusive and NR30 at all other times when measured within the nearest noise sensitive dwelling (even when windows of the latter are open for ventilation).*

The measured levels of noise from the biomass plant have therefore been considered against these day and night time standards. Levels of operational noise from the biomass affecting the proposed development site has been derived from the measurements undertaken during night time hours as described in Table 3 above.

The following Table 4 presents the results of this assessment for the proposed residential development. It assumes that receiving windows are open and on the east façade with no additional barriers to the passage of sound other than those currently in existence. Negative or zero values are indicative of compliance.

*Table 4: Noise Rating curve assessment*

Scenario	Octave band centre frequency (Hz)							
	63	125	250	500	1000	2000	4000	8000
Measured values (external) (dB)	46	34	29	26	23	16	14	13
Calculated values (internal; windows open) (dB)	31	19	14	11	8	1	-1	-2
NR20 values (dB)	51	39	31	24	20	17	14	13
NR30 values (dB)	59	48	40	34	30	27	25	23
Comparison with NR20 (night time standard) (dB)	-20	-20	-17	-13	-12	-16	-15	-15
Comparison with NR30 (day time standard) (dB)	-28	-29	-26	-23	-22	-26	-26	-25

The results of the assessment suggest that the requisite Noise Rating curves for operational noise from the biomass development will be met during day and night time periods; no adverse impact is therefore anticipated.

#### *Noise from Perryman's Bus Depot*

The other discernible commercial noise affecting the site during daytime and the early hours of the morning is sporadic noise from Perryman's Bus Depot to the south of the proposed dwellings.

As previously described, vehicle maintenance is undertaken during daytime hours; movements in the early hours comprise only vehicles leaving the Depot to start their routes.

Section 9 of BS4142 discusses rating corrections that apply to sources with particular acoustic features. Specifically, it requires the assessor to identify tonality, impulsivity, intermittence and *other sound characteristics* and to what extent they will feature at the assessment location. This is typically defined in terms of perceptibility in relation to the residual acoustic environment.

The operational noise observed (maintenance and vehicle manoeuvring during the day; vehicle manoeuvring at night) is intermittent. This feature would incur a BS4142 rating

penalty of +3dB(A). The noise is not impulsive, however it has characteristics that may make it readily distinctive against the residual acoustic environment. This could also attract an additional +3dB character correction in accordance with BS4142, giving a total penalty of +6dB.

Section 11 of BS4142 provides guidance on the assessment of identified impacts. When considering the difference between the prevailing background and rating noise levels, it states the following:

*Typically, the greater this difference, the greater the magnitude of the impact.*

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

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

*The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating noise 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.*

With regards to treatment of the south boundary between the proposed development site and the bus depot, an appropriately specified bund and close-boarded fence combination of respective height 1.0m and 1.8m has been included as previously described. The Depot is at lower ground height than the development site and, as such, this would represent an effective acoustic barrier.

Note 3 of BS4142 Section 11 reminds the assessor to take into consideration in the assessment *...whether dwellings will already incorporate design measures that will secure good internal and / or outdoor acoustic conditions such as... acoustic screening.*

For the purpose of this assessment, it is assumed that the boundary treatment will completely obscure the line of sight from any facing habitable room windows on to the Depot. As such, a conservative estimate of 12dB mitigation is assumed (Maekawa method using path difference).

The following Table 5 presents an assessment of day and night time commercial noise in accordance with the methodology set out in BS4142.

*Table 5: BS4142 assessment*

BS4142 assessment	Daytime (0700 – 2300h)	Night time (0400 – 0700h)
Operational sources	Vehicle maintenance and manoeuvring	Vehicle manoeuvring
Measured typical background (LA90) (dB)	39	35
Assessment period	1 hour	5 minutes
Specific source noise level (LAeq,T) (dB)	46	44
Applicable rating penalty (dB)	+6	+6
Rating source noise level (LAeq,Tr) (dB)	52	50
Minus effects of bund and close boarded boundary fence (dB)	-12	-12
Difference between rating source noise level and typical background (dB)	+1	+3
Predicted impact	Low impact	Low impact

The results of the assessment indicate that, providing an appropriately specified close boarded fence is incorporated along the south boundary of the proposed development site then the impact of operations at the Perryman’s Bus Depot will be low, both during the early hours of the morning and during typical daytime activities.

The conclusion that noise from operation of the Depot is of *low impact* is strengthened by 2 further factors that describe the context of the assessment, as indicated in BS4142. These are:

- The existing precedent for residential development immediately adjacent to the proposed development site; and
- That the absolute levels of operational noise are well within the recommendations made in BS8233 and the WHO publication *Guidelines for Community Noise*.

The existing precedent for residential dwellings adjacent to a well-established Industrial Estate suggests that residents are not adversely affected by noise from operational sources,

including the Bus Depot. It is also worth noting that there are 2 properties that are respectively significantly closer to the access route to and from the Depot from the main road and to the Depot itself than the proposed development.

Although more relevant to anonymous noise sources, both BS8233 and the WHO recommend absolute design targets of 35dB inside habitable rooms during the day and 30dB during night time. Inclusive of the effects of the close boarded fence described, the absolute noise level outside the closest facing habitable room windows would be in the order of 34dB LAeq,T during daytime hours and 32dB LAeq,T during night time hours. Allowing 15dB attenuation of sound for an open window, the internal noise levels would be approximately 19dB during the daytime and 17dB at night – significantly less than the design recommendations.

Similarly, the WHO recommends absolute noise levels of around 50dB in outdoor amenity areas during the day. This target would also be comfortably met in the proposed gardens.

#### *Additional mitigation*

It should be noted that further betterment of received noise from the Depot could be obtained by careful positioning of habitable room windows. Windows located perpendicular to the Depot could receive in the order of 3dB less noise due to their orientation; habitable room windows on the far side of the proposed dwellings from the Depot would benefit by significantly greater margins of up to 10-15dB.

## **7. Conclusions**

KSG Acoustics Ltd. has carried out a noise impact assessment in relation to proposals for a residential development on land north of Charlesfield Industrial Estate, St. Boswells.

Consideration has been given both to noise from the biomass development to the east as well as noise from Perryman's Bus Depot to the south.

Providing suitable mitigation measures are incorporated into the design, it is considered that appropriate levels of environmental noise ingress can be achieved throughout the development. This will include a suitably specified acoustic treatment along the boundary with the Bus Depot to the south and with consideration given to the orientation of habitable room windows relative to the Industrial Estate.

The results of the surveys and assessment indicate that environmental noise will not constitute a significant adverse impact, nor should it be considered a constraint to the proposed development.