Murfitts Guildford

Noise Impact Assessment of Tyre Baling Equipment at Stapletons Tyre Services Ltd, Guildford, GU1 1RU

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Issued to
Murfitts Industries Limited

Prepared by
Chris Anderson BSc (Hons) MIOA
Director

Version	Remarks	Date
Rev 0	Issued for comment	15/09/23

1. INTRODUCTION

Murfitts Industries Ltd have instructed Spectrum Acoustic Consultants Ltd to undertake a noise impact assessment of their tyre baling equipment at Stapletons Tyre Services Ltd, Unit 13, Slyfield Industrial Estate, Moorfield Road, Guildford, GU1 1RU.

There are 2 bailing machines operating at the site, and Spectrum undertook a site noise survey with both machines operating on 23/08/23, during which time the weather was calm and dry.

The measurements provide noise data that may be used for assessments at other sites that use or propose to use the same equipment.

For the Guildford site, this assessment concludes that the noise impact associated with the baling equipment is not expected to be significant at the nearest noise sensitive receptors.

2. SITE LOCATION

The site location relative to other commercial buildings and residential areas is shown below.

Figure 2.1: Location of tyre baling equipment

3. OUTLINE DESCRIPTION OF PROCESS

End of life tyres are delivered by van to the site, which is located to the rear of the Stapletons warehouse.

Figure 3.1: End of life tyres being delivered

The tyres are then loaded by hand into the balers (green equipment shown below) which compress them before restraining wires are tied around them to maintain their shape.

Figure 3.2: 2 Baling machines at Stapleton's Guildford site (green)

The square tyre bales are then removed by forklift truck for temporary nearby storage prior to being loaded onto an articulated lorry for removal, later in the day.

Figure 3.3: Forklift truck stacks bales for temporary storage before loading onto articulated lorry for removal

4. SITE OPERATING TIMES

Operating times are 6am until 6pm Mon-Fri, and Saturday 6am-2pm.

5. PROPOSED ASSESSMENT METHODOLOGY

EA guidance provides the following guidelines for new sites:

New sites or items of plant

In some cases, where you have not yet built or commissioned a site or new item of plant, modelling may help assess a new proposal. Where you have used a noise model, it should comply with the calculation requirements of 'ISO 9613 Acoustics – attenuation of sound during propagation outdoors'.

You may need to do some validation monitoring to provide confidence in the model outputs. Depending on the level of impact and potential environmental risk, this may take place following commissioning activities, or as part of a routine monitoring programme.

However, for most new proposals the best evidence is likely to come from comparable sites that are carrying out the operation proposed without problems. When looking at comparable sites, you should consider the uncertainty, and how comparable the reference sites are. In particular consider:

- the reference site may have different weather and dispersion conditions (including topography)
- noise pollution can differ in frequency, level, duration or offensiveness due to different operating conditions or site specific engineering differences
- the quality of monitoring data at the reference site
- that the community near the new site may be more or less sensitive than at the reference location

In view of the above, Spectrum were instructed to undertake the following activities in order to complete this noise impact assessment:

- Undertake a sound power level survey of the baling equipment and establish the characteristics of the noise generated.
- Identify noise sensitive receptors around the site and undertake an ambient noise survey at representative locations.
- Develop an environmental noise model of the site in line with ISO 9613[1].
- Assess the noise impact of the site using measured background noise levels and predicted operational noise levels in line with BS4142[2] and Environment Agency guidelines.

The following sections detail the above activities. Relevant sections of BS4142 are included in Appendix C for reference.

6. SITE VISIT AND NOISE SURVEYS

Spectrum visited the Stapleton's site on 23/08/23 and undertook the following surveys:

I. **Sound power level survey of baling equipment:** Measurements were taken on site at 10m from the baling equipment in order to enable calculation of the equipment sound power levels. The sound power levels can then be used to calculate noise levels generated in the environment (e.g. at NSR 1), where it may be difficult to measure the noise from the balers directly due to the influence of other noise sources (e.g. traffic or other industrial noise).

II. **Ambient noise survey at the nearest noise sensitive receptor:** Measurements were taken close to the nearest noise sensitive receptor (NSR 1) in order to establish background noise levels at that location. These are used in assessing the impact of the baler noise at the nearest noise sensitive receptor (NSR 1).

Instrumentation used to measure sound levels included the following items. All equipment is calibrated in accordance with manufacturers requirements, using equipment referenced to the British Calibration Service and the National Physical Laboratory:-

- Bruel & Kjaer Type 2250 Sound Level Meter s/n 3027942
- Bruel & Kjaer Type 4189 Microphone s/n 3196081
- Bruel & Kjaer Type 4231 Acoustic Calibrator s/n 2229957

Whilst a range of noise level descriptors were measured by the instrumentation used for the survey, the following main parameters are reported for describing the baseline ambient sound environment.

- $L_{Aeq,T}$ the equivalent continuous sound level;
- $L_{A90,T}$ percentile level exceeded for 90% of the time; and
- L_{AMAX} the maximum sound level.

Briefly, $L_{Aeq,T}$ the equivalent continuous sound level is used as the measure of total ambient sound, or sound from a specific source, over the reference time period T. $L_{A90,T}$ is defined in BS 4142 as the measure of background sound, when it is applied to the residual sound level (the sound level in the

[1] ISO 9613-1:1993 *Acoustics – Attenuation of sound during propagation outdoors e*
[2] BS 4142:2014+A1:2019 *Methods for rating and assessing industrial and commercial sound*

absence of the specific sound being assessed). L_{Amax} represents the maximum A-weighted sound pressure level over the sample period *T*.

6.1 SOUND POWER LEVEL SURVEY OF BALING EQUIPMENT

The sound power level of the baling equipment was measured by monitoring the sound pressure level generated at a distance of 10m over a reference time interval of 1 hr, then correcting the measurement for distance and reflections.

Measurements were taken at 10m from the balers with the noise meter at 1.5m above ground level, as shown below.

The measurements were taken between 11:00 and 12:00 hrs, during which time both balers were in operation along with the fork-lift truck.

There was a steel freight container behind the noise meter and so measurement data is reduced by 3 dB to account for reflections when calculating the equipment sound power level.

Behind the bales and the freight container (Figure 6.1.2) there is a close boarded wooden fence of approximately 3m height, which provides acoustic screening towards NSR 1.

Figure 6.1.1: Noise meter and balers

Figure 6.1.2: Noise meter, bales and container

A 100ms trace (Figure 6.1.3) and a 5 min period trace (Figure 6.1.3) are shown below for the measurement period, with the results for $L_{Aeq,T}$, $L_{A90,T}$ and L_{Amax} shown in Table 6.1.1.

The 100ms trace indicates that the character of the noise is typically impulsive rather than constant in nature.

The 5 min period trace shows that the $L_{Aeq,T}$ stays reasonably stable over consecutive 5 min periods at around 70 dB $L_{Aeq,T}$, indicating that the period of the operational cycle of the equipment is covered adequately by the 1 hour measurement period. This is also supported by observation that the operational cycle is of the order of minutes and was effectively continuous over the measurement period.

Values for the $L_{Aeq,T}$ (with octave bands), $L_{A90,T}$ and L_{Amax} over a period of 1 hour are given in Table 6.1.1.

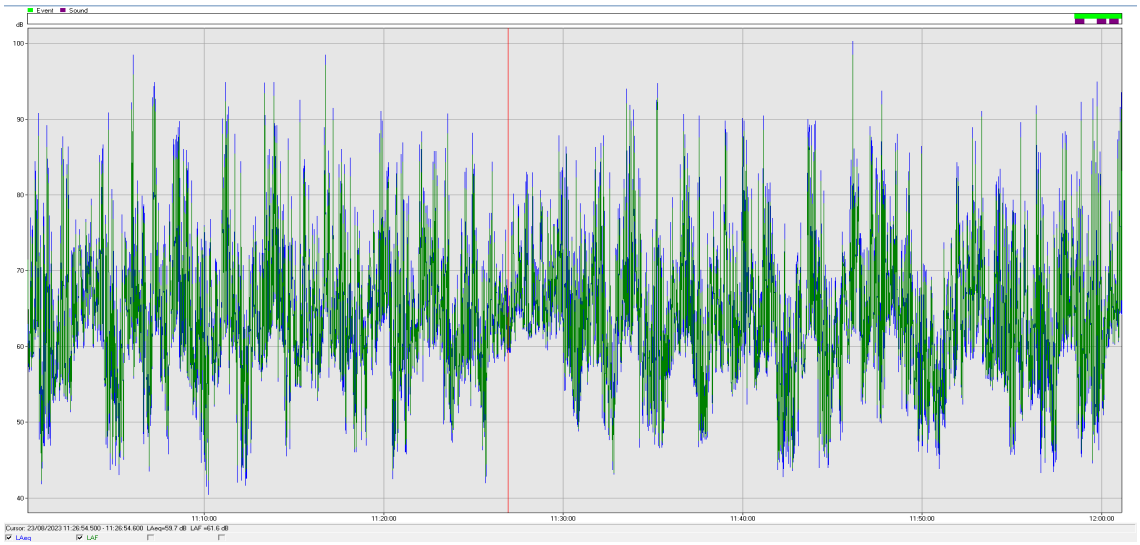


Figure 6.1.3: 100ms trace of noise from balers over 1 hour

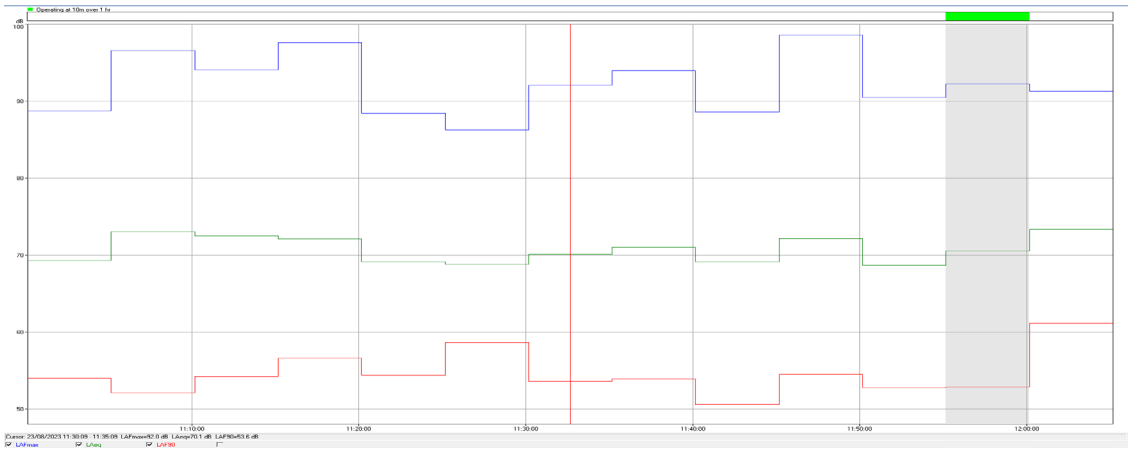


Figure 6.1.4: 5 min period trace of noise from balers over 1 hour

Cursor: 23/08/2023 11:00:09 - 11:05:09 LAFmax=88.7 dB LAeq=69.3 dB LAF90=54.0 dB

☑ LAFmax ☑ LAeq ☑ LAF90 ☐

	Name	Start time	LAF90 [dB]	LAFmax [dB]	LAeq [dB]	LZeq 31.5Hz [dB]	LZeq 63Hz [dB]	LZeq 125Hz [dB]	LZeq 250Hz [dB]	LZeq 500Hz [dB]	LZeq 1kHz [dB]	LZeq 2kHz [dB]	LZeq 4kHz [dB]	LZeq 8kHz [dB]
1	Total	23/08/2023	53.6	98.6	70.8	72.1	70.0	65.3	63.4	64.8	66.2	64.9	61.2	55.0
2														
3	(All) Balers at 10m over 1 hour	23/08/2023	53.6	98.6	70.8	72.1	70.0	65.3	63.4	64.8	66.2	64.9	61.2	55.0
4														

Table 6.1.1: Measured sound pressure levels over 1 hour at 10m from balers

7. AMBIENT NOISE SURVEY AT NEAREST NOISE SENSITIVE RECEPTOR

7.1 NOISE SENSITIVE RECEPTORS CLOSE TO THE PROPOSED DEVELOPMENT

The closest noise sensitive receptor (NSR 1) appears to be a residential location named Watts Cottage North of the site, at approximately 145m from the baling equipment, as shown below.

Figure 7.1.1: Nearest noise sensitive receptor (NSR 1) to the baling equipment and ambient noise measurement position

Ambient noise measurement Position	OS Grid Ref.	Position Description
Close to Watts Cottage (NSR 1)	499976 East 152683 North	Grassed area. Quiet. Occasional local traffic but not sufficient to significantly affect $L_{A90,T}$. Distant traffic and industrial noise audible. Balers just audible.

Table 7.1.1: Measurement position used for monitoring Ambient noise levels.

A 100ms trace (Figure 7.1.2) and a 5 min period trace (Figure 7.1.3) are shown below for the measurement period, with the results for $L_{Aeq,T}$, $L_{A90,T}$ and LAmax shown in Table 7.1.2.

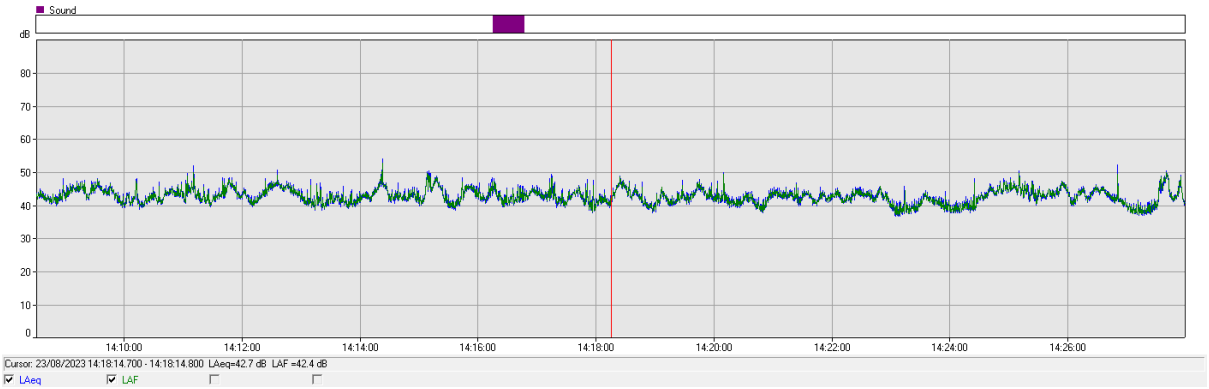


Figure 7.1.2: 100ms trace of ambient noise at NSR 1 over 20 min

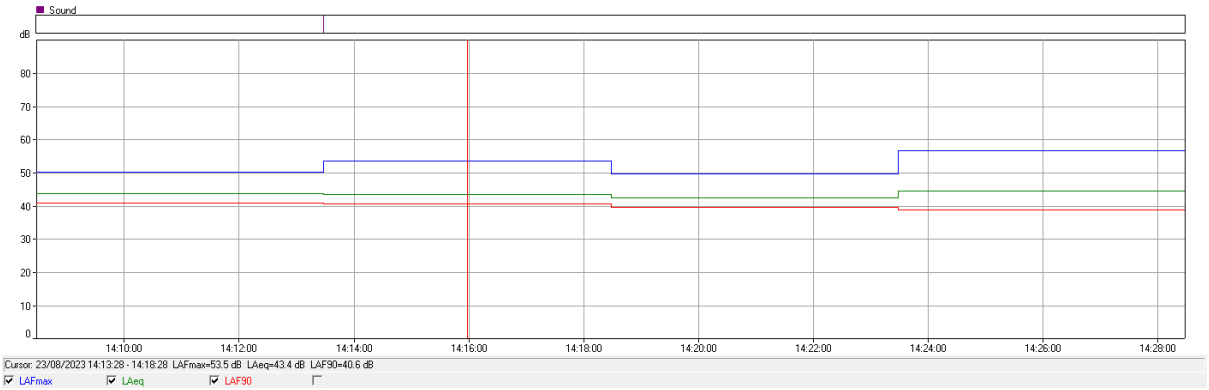


Figure 7.1.3: 5 min trace of ambient noise at NSR 1 over 20 min

	Name	Start time	LAF90 [dB]	LAFmax [dB]	LAeq [dB]	LZeq 31.5Hz [dB]	LZeq 63Hz [dB]	LZeq 125Hz [dB]	LZeq 250Hz [dB]	LZeq 500Hz [dB]	LZeq 1kHz [dB]	LZeq 2kHz [dB]	LZeq 4kHz [dB]	LZeq 8kHz [dB]
1	Total	23/08/2023 14:08:28	40.0	56.5	43.6	57.3	56.6	48.0	42.0	39.1	39.9	34.1	26.5	23.9
2	Unmarked	23/08/2023 14:08:28	40.0	56.5	43.6	57.3	56.6	48.0	42.0	39.1	39.9	34.1	26.5	23.9
3														

Table 7.1.2: Measured ambient noise levels near to NSR 1 over 20 min

The measured $L_{A90,T}$ of 40 dB at this location is assumed to be representative of the background noise level at this position and at NSR 1, since only occasional impact noise from the balers was audible, and this would not affect the $L_{A90,T}$ value.

7.2 CALCULATION OF BALER SOUND POWER LEVEL

The baler operation sound power level has been calculated from the following equation:

Sound power level LwA = LpA(r) + 20log(r) +11-DI-Amisc

Where:
LwA=Sound power level of 2 balers in operation, including fork-lift noise
r=distance from balers (in this case 10m)
DI-directivity index (in this case 3 dB as hard ground
Amisc=attenuation from other miscellaneous factors (e.g. screening, ground effects and in this case 3dB from reflections)

	dB(A)	Octave Band Centre Frequency (Hz) 31	63	125	250	500	1k	2k	4k	8k
Measured sound pressure level at 10m from balers	**71**	72	70	65	63	65	66	65	61	55
Correction for distance to10m =20log(r)+11 = +20+11		+31	+31	+31	+31	+31	+31	+31	+31	+31
- Correction for directivity (3dB)		-3	-3	-3	-3	-3	-3	-3	-3	-3
- Correction for reflections (3dB)		-3	-3	-3	-3	-3	-3	-3	-3	-3
Overall Plant Sound Power Level	**96**	97	95	90	88	90	91	90	86	80

Table 7.2.1: Calculated overall baler equipment sound power level (dB re 10^{-12} Pa)

The above calculated sound power level will be used to predict environmental noise levels at the nearest noise sensitive receptors (see section 8 below).

8. ENVIRONMENTAL NOISE MODEL OF THE MURFITTS GUILDFORD SITE

An environmental noise model of the proposed Guildford site has been prepared in line with ISO 9613:1993 *Acoustics – Attenuation of sound during propagation outdoors*.

The particular prediction model that has been used for this analysis is the Softnoise 'Predictor' software. This acoustic model implements the procedures set out in ISO 9613-2:1996 "Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation to determine noise levels", and is Quality Assured to all parts of ISO 17534:2015 "Acoustics – Software for the calculation of sound outdoors". The Predictor model takes account of the following features in its calculation procedure:

- Source sound power level (for point, line and area sources)
- Reflection from nearby structures and source directivity
- Distance from noise source (geometric spreading)
- Atmospheric absorption
- Acoustic screening of intervening structures and topography
- Ground absorption
- Ground effects (which includes the height of ground relative to the noise source)

The numerical results are summarised below.

Noise sensitive receptor (NSR)	Predicted Specific Noise Level generated by the balers $L_{Aeq,T}$ (dB(A))
NSR 1 (Watts Cottage)	35

Table 8.1: Predicted specific noise level generated by the balers at NSR 1 at 1.5m height

A simplified calculation is included in Appendix A as a verification check on the 3D model and the results show good correlation.

9. BS4142 ASSESSMENT OF NOISE IMPACT FROM PROPOSED DEVELOPMENT

The impact of noise from the balers at NSR 1 has been assessed in accordance with BS4142, and the results are given below.

9.1 BS4142 ASSESSMENT FOR NSR 1: WATTS COTTAGE

Results		Relevant clause from BS4142	Commentary
Background sound level	$L_{A90,20min}$ = 40 dB	8.1.2	From Table 7.1.2 of this report
Specific sound level (calculated)	$L_{Aeq,T}$ = 35 dB	7.3.5	From Table 8.1 of this report
Acoustic feature correction	3 dB	9.2	Impacts are just audible and specific sound level is significantly below residual sound level
Rating level	35+3 = 38 dB	9.2	
Excess of rating level over background sound level	(38-40) = -2	11	Assessment indicates low impact as rating level is below background sound level
Uncertainty	Not significant	10	The assessment based on detailed measurements taken close to equipment and the rating level is below background noise level.

Table 9.1: BS4142 assessment of baler noise at NSR 1 Watts Cottage

9.2 ASSESSMENT OF NOISE AT NEARBY COMMERCIAL PREMISES

Plant noise could affect offices within nearby industrial buildings in some circumstances (e.g. if the plant noise levels were particularly high and office windows were open for ventilation).

BS 8233:2014 Guidance on sound insulation and noise reduction for buildings provided guideline internal noise levels for offices as 40-50 dB $L_{Aeq,T}$, and assuming approximately 15 dB attenuation through an open window this would allow for approximately 65 dB $L_{Aeq,T}$ externally before disturbance might be expected.

Inspection of the buildings local to the proposed development shows that there are no windowed buildings adjacent to the site, and the noise contours in Appendix E show that the 65 dB $L_{Aeq,T}$ contour does not in any case reach neighbouring buildings.

In view of the above, noise from the balers is not expected to cause disturbance to nearby commercial premises.

10. CONCLUSIONS

A noise impact assessment has been undertaken for existing tyre baling machines at Stapletons Tyre Services Ltd, Unit 13, Slyfield Industrial Estate, Moorfield Road, Guildford, GU1 1RU.

Background noise levels were measured at the nearest noise sensitive receptor (NSR 1) to the site

Since there are many industrial noise sources local to the area, noise levels were measured close to the equipment so that the impact at NSR 1 could be calculated and assessed against the background noise level in accordance with BS 4142:2014+A1:2019 *Methods for rating and assessing industrial and commercial sound*, in line with Environment Agency requirements.

The assessment suggest that calculated rating noise level is below the existing background noise level at the nearest noise sensitive receptor and as such the noise impact of the balers is assessed to be low.

APPENDIX A

Simple noise propagation calculation

Simple noise propagation calculation

Project:	Murfitts Guildford
Project number:	23273
Date:	13/09/2023

Operating condition/scenario:	2 balers working with fork lift truck
Receptor:	NSR 1 Watts Cottage

Source	Sound Power Level, dB(A)	Distance to receptor (m)	Directivity Index, dB	Attenuation			% On-Time	Predicted noise level, dB(A)
				Geometric spreading, dB(A)	Screening, dB(A)	Total attenuation, dB(A)		
2 balers and fork lift truck	96	145	3	51	10	61	100%	35
Total								**35**

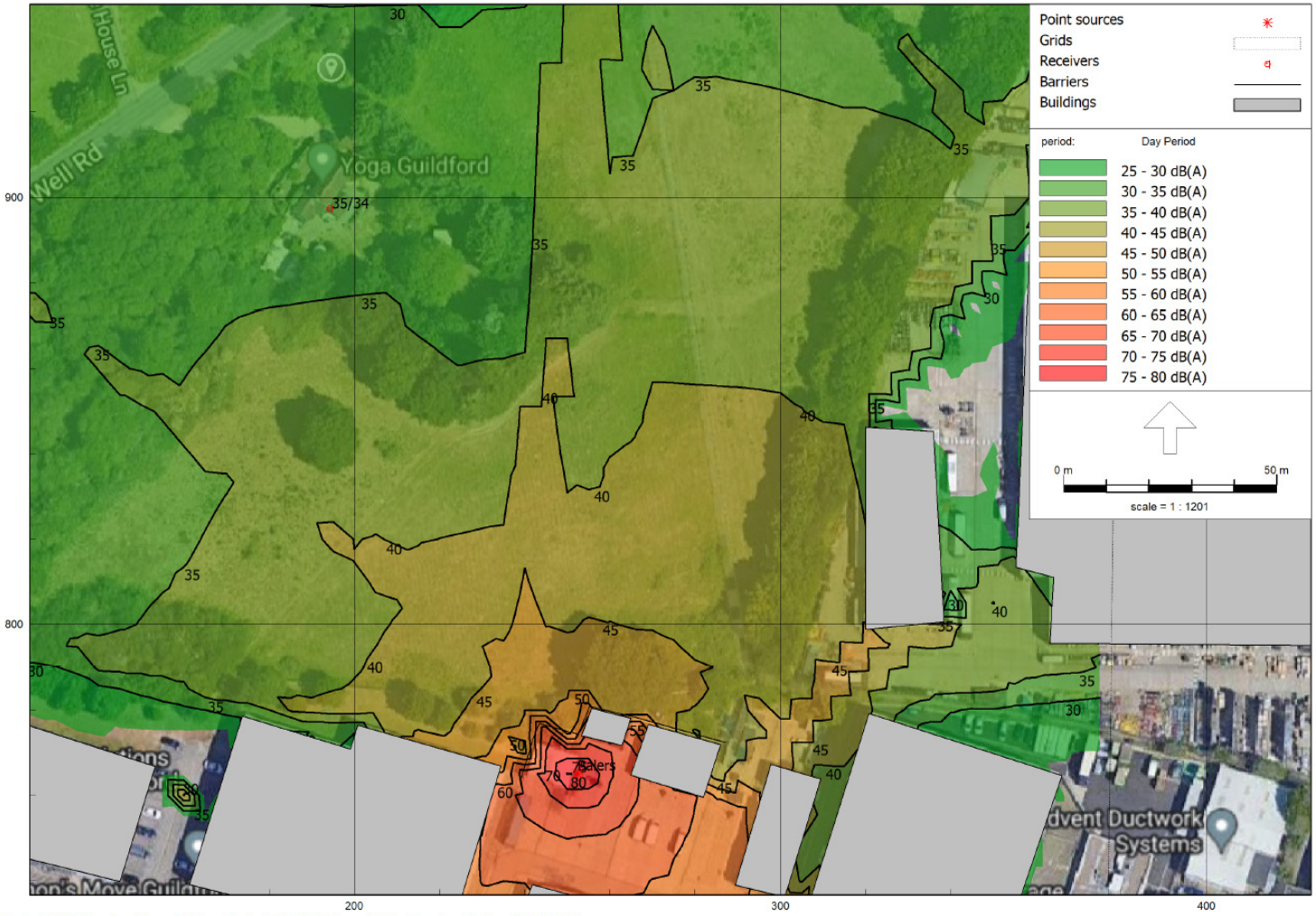
$$L_p = L_{wA} - 20\log(r) - 11 + DI - A_{misc}$$

where L_p is the predicted noise level; L_{wA} is the sound power level; r is distance; DI is the directivity index; and A_{misc} is the attenuation from other miscellaneous factors (i.e. screening/ground effect/atmospheric absorption/foliage).

N.B. If attenuation values for both screening and ground effect are entered, only the higher value is used in the calculation of total attenuation.

APPENDIX B

Predicted noise contours



LimA - ISO 9613, [version of Area - initial model] , Predictor V2023 Licensed to Spectrum Acoustic Consultants Ltd, UK

APPENDIX C

Relevant clauses from BS 4142:2014+A1:2019 *Methods for rating and assessing industrial and commercial sound*

From clause 6:

NOTE When measurements for distant sources are made at 1 m from a facade, then the measured level can be adjusted to an equivalent free-field level by subtracting a 3 dB correction factor. For sources that are relatively close or not perpendicular to the facade the correction may be 1 dB or 2 dB, in which case the reasons for not using a correction of 3 dB should be explained.

7.2 Reference time interval

Evaluate the specific sound over an appropriate reference time interval, T_r:

a) 1 h during the day; and

b) 15 min during the night.

NOTE 1 For the purposes of this standard, daytime is typically between 07:00 h and 23:00 h and accordingly night-time is between 23:00 h and 07:00 h.

7.3.5 Where it is not possible to determine the specific sound level by measurement of the ambient sound level and the residual sound level at the assessment location(s), for example, because the difference between the ambient sound level and the residual sound level is ≤3 dB, determine the specific sound level by a combination of measurement and calculation. Report the method of calculation in detail and give the reason for using it.

NOTE In some cases, measurements can be supplemented by calculations. Calculations are often more reliable than a single short-term measurement when long-term averages are to be determined and in other cases where it is impossible to carry out measurements because of high residual sound levels. In case of the latter, it is sometimes convenient to carry out the measurements closer to the source and then use a calculation method to estimate the specific sound level at the assessment location(s).

8.1.2 Where possible, measure the background sound level at the assessment location(s). If this is not possible measure at an alternative location where the residual sound is comparable to the assessment location(s). A detailed justification for considering this should be reported.

9 Rating level

9.1 General

Certain acoustic features can increase the significance of impact over that expected from a basic comparison between the specific sound level and the background sound level. Where such features are present at the assessment location, add a character correction to the specific sound level to obtain the rating level. This can be approached in three ways:

a) subjective method;

b) objective method for tonality;

c) reference method.

From clause 9.2:

Impulsivity

A correction of up to +9 dB can be applied for sound that is highly impulsive, considering both the rapidity of the change in sound level and the overall change in sound level. Subjectively, this can be converted to a penalty of 3 dB for impulsivity which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible, and 9 dB where it is highly perceptible.

NOTE 2 A1 *If characteristics likely to affect perception and response are present in the specific sound, within the same reference period, then the applicable corrections ought normally to be added arithmetically. However, if any single feature is dominant to the exclusion of the others then it might be appropriate to apply a reduced or even zero correction for the minor characteristics.* A1

10 Uncertainty

10.1 General

Consider the level of uncertainty in the data and associated calculations. Where the level of uncertainty could affect the conclusion, take reasonably practicable steps to reduce the level of uncertainty. Report the level and potential effects of uncertainty.

11 Assessment of the impacts

COMMENTARY ON ***11***

The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs. An effective assessment cannot be conducted without an understanding of the reason(s) for the assessment and the context in which the sound occurs/will occur. When making assessments and arriving at decisions, therefore, it is essential to place the sound in context.

Obtain an initial estimate of the impact of the specific sound by subtracting the measured background sound level (see Clause ***8*** *) from the rating level (see Clause* ***9*** *).*

NOTE 1 More than one assessment might be appropriate.

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

Head Office
Spectrum Acoustic Consultants Ltd
27-29 High Street
Biggleswade
Bedfordshire
SG18 0JE
UNITED KINGDOM

+44 (0)1767 318871
enquiries@spectrumacoustic.com
www.spectrumacoustic.com