4.4 Attended Noise Survey – Amplified Music Measurements

4.4.1 Attended short-term measurements were obtained with an amplified music source in continuous operation at monitoring locations ST1 – ST3 as shown on Figure A1. These were measured using a Rion NA-28 precision integrating sound level meter fitted with a weatherproof windshield. Measurements were conducted between 21:35 hrs and 22:40 hrs on Sunday 11th December 2016.

4.4.2 The speaker was positioned within the barn, 2 m from the north façade, facing into the barn (south) in a scenario that is a typical speaker location and to generate internal noise levels of around 87 dB.

4.4.3 Broadband measurements were obtained using the 'F' time weighting and A-weighting frequency network. 1/3 octave band levels were measured using the linear (un-weighted) frequency network. The sound level meter was calibrated before and after the survey period using a Rion NC-74 Class 1 Acoustic Calibrator to generate a calibration level of 94.0 dB at 1 kHz. The measurements were obtained with the microphone at a height of 1.5 m above ground level. All measurements were obtained in free-field conditions.

4.4.4 $L_{Amax,F}$, $L_{Aeq,T}$, $L_{A10,T}$, and $L_{A90,T}$, noise levels were measured at monitoring locations ST1 to ST3, over three consecutive 5-minute periods.

4.5 Attended Noise Survey – Existing Background and Ambient Environment

4.5.1 Attended sample noise measurements in the absence of any activity from Chafford Park has been undertaken to establish the prevailing noise environment in the late evening period at monitoring locations ST1 to ST3. These were measured using a Rion NA-28 precision integrating sound level meter fitted with a weatherproof windshield. Measurements were conducted between 22:50 hrs and 23:45 hrs on Sunday 11th December 2016.

4.5.2 Broadband measurements were obtained using the 'F' time weighting and A-weighting frequency network. The sound level meter was calibrated before and after the survey period using a Rion NC-74 Class 1 Acoustic Calibrator to generate a calibration level of 94.0 dB at 1 kHz. The measurements were obtained with the microphone at a height of 1.5 m above ground level. All measurements were obtained in free-field conditions.

4.5.3 $L_{Amax,F}$, $L_{Aeq,T}$, $L_{A10,T}$, and $L_{A90,T}$, noise levels were measured over three consecutive 5-minute periods.

4.6 Weather Conditions

4.6.1 Weather conditions during the attended noise monitoring on Sunday 11th December 2016 were dry with light fog. Temperatures were noted as ranging from 2°C at the start of the survey to 0°C towards the end. Mean relative humidity values remained around 93 %, with 1.5 ms^{-1} average wind speeds.

4.6.2 Weather conditions during the attended noise survey on Tuesday 4th October 2016 were dry. Temperatures were noted as ranging from 12°C at the start of the survey to 9°C towards the end. Mean relative humidity values remained around 76 %, with 0.2 ms^{-1} average wind speeds.

5. NOISE SURVEY RESULTS

5.1 Unattended Noise Survey Results

5.1.1 The results of the continuous noise monitoring survey are presented in graphical form on Figure A3 of Appendix A and tabulated in Table B1 of Appendix B.

5.1.2 The 15-minute noise levels have been used to obtain ambient $L_{Aeq,T}$ noise levels using logarithmic, i.e., energy based, averaging and these are summarised in Table 5.1 for daytime (07:00 – 19:00 hrs), evening (19:00 – 23:00 hrs) and night time (23:00 – 07:00 hrs). Mean background $L_{A90,T}$ daily noise levels have been obtained using arithmetic averaging and these are also presented in Table 5.1.

Day	Date	Measured Noise Levels, dB re. 2 x 10^{-5} Pa.					
		Day Time (07:00 - 19:00 hrs)		Evening (19:00 - 23:00 hrs)		Night-Time (23:00 - 07:00 hrs)	
		$L_{Aeq,15min}$	$L_{A90,15min}$	$L_{Aeq,15min}$	$L_{A90,15min}$	$L_{Aeq,15min}$	$L_{A90,15min}$
Sunday	11-Dec-16	-	-	-	-	39 (24-48)	25 (20-39)
Monday	12-Dec-16	45 (39-55)	37 (34-44)	43 (36-49)	30 (26-33)	38 (25-45)	26 (22-34)
Tuesday	13-Dec-16	45 (38-50)	36 (33-39)	43 (36-47)	30 (26-35)	39 (22-50)	24 (19-38)
Wednesday	14-Dec-16	44 (39-49)	38 (34-42)	42 (34-47)	34 (30-37)	38 (29-46)	30 (21-37)
Thursday	15-Dec-16	43 (38-47)	36 (34-40)	40 (33-44)	32 (29-35)	34 (24-42)	25 (19-33)
Friday	16-Dec-16	47 (36-59)	33 (30-37)	45 (31-49)	30 (27-35)	42 (27-51)	26 (22-30)
Saturday	17-Dec-16	46 (38-54)	33 (30-39)	46 (32-49)	27 (23-30)	42 (23-50)	22 (19-28)
Sunday	18-Dec-16	48 (40-54)	33 (28-36)	45 (39-52)	28 (22-33)	38 (21-47)	22 (19-29)
Monday	19-Dec-16	43 (38-47)	32 (29-33)	-	-	-	-
Mean Average		*45 (43-48)*	*35 (32-38)*	*43 (40-46)*	*30 (27-34)*	*39 (34-42)*	*25 (22-30)*

TABLE 5.1: SUMMARY OF CONTINUOUS BACKGROUND NOISE SURVEY RESULTS LT1

5.2 Attended Noise Survey Results – Controlled Breakout Measurements

5.2.1 The results of the controlled breakout measurements undertaken at varying distances from the barn are summarised in Table 5.2 overleaf. As the source was continuous, the $L_{A90,T}$ provides a representative level for the source at a particular measurement position. However, the greater the distance from the source, the more influence distant road traffic had on the measured $L_{A90,T}$ noise level.

Façade	Distance from Façade (m)	Internal Level (Measured at 4 m)	Start Time	Dur. (secs)	Noise Levels, dB re. 2 x 10^{-5} Pa.			
					$L_{Amax,F}$	$L_{A10,T}$	$L_{Aeq,T}$	$L_{A90,T}$
North	1	Ambient	19:39:10	40	47.8	42.3	40.4	37.2
	1	97.0 dB(A)	19:43:20	30	72.8	70.8	70.0	69.1
	2		19:44:35	30	72.3	70.1	69.2	68.1
	5		19:45:34	30	63.8	62.4	61.6	60.7
	10		19:47:32	30	57.6	56.5	56.0	55.4
	20		19:49:41	30	53.7	52.8	52.3	51.6
East	1	97.2 dB(A)	20:07:46	30	73.5	72.8	72.4	71.9
	2		20:09:02	30	70.9	70.2	69.8	69.5
	5		20:10:40	30	67.6	66.8	66.5	66.2
	10		20:12:11	30	62.8	62.3	61.9	61.5
	20		20:13:44	30	59.0	58.0	57.7	57.3
	40		20:16:04	30	56.1	53.9	53.5	53.0
South	1	96.0 dB(A)	20:26:00	30	80.0	79.3	78.9	78.5
	2		20:27:12	30	78.5	77.6	77.0	76.6
	5		20:28:18	30	72.6	71.9	71.5	71.0
	10		20:29:14	30	69.9	67.8	67.2	66.5
	20		20:30:48	40	61.0	60.6	60.3	59.9
West	1	96.6 dB(A)	20:39:51	40	69.3	68.3	67.9	67.4
	2		20:41:04	40	67.7	66.8	66.4	65.9
	7		20:43:53	40	62.1	61.1	60.7	60.3
	9		20:45:15	40	61.8	60.9	60.5	60.0

TABLE 5.2: SUMMARY OF CONTROLLED SOURCE BREAKOUT MEASUREMENTS – SUNDAY 11TH DECEMBER 2016

Façade Sound Reductions

5.2.2 The sound reduction, R, has been calculated using the equation below, as presented in Woods Practical Guide to Noise Control [11].

$$SPL_2 = SPL_1 - R - 6 \text{ dB}$$

where:

SPL_2 is the sound pressure level outside the partition, dB;

SPL_1 is the sound pressure levels next to the partition on the source side, dB; and

R is the sound reduction index of the partition structure immediately next to the receiving point, dB.

5.2.3 The calculated sound reduction index from each façade is presented below in Table 5.3. The measurements obtained at a 1 m distance from the façade have been used for the sound reduction index derivation.

Façade	Dist.	dB $L_{Aeq,T}$	Octave Band Linear Noise Level, dB by Centre Frequency, Hz									
			31.5	63	125	250	500	1k	2k	4k	8k	16k
North	Internal	96	70	81.1	86.6	87.6	92.1	89.8	89.6	87.4	86.0	79.9
	External	68	54	67.0	79.9	72.7	62.5	50.6	46.6	41.2	35.3	21.3
	Reduction	*22*	*10.0*	*8.0*	*0.8*	*8.9*	*23.6*	*33.2*	*37.0*	*40.3*	*44.7*	*52.5*
East	Internal	91	53	74.4	80.0	80.9	85.0	84.0	85.8	80.2	82.8	72.0
	External	65	44	59.2	68.4	69.2	63.2	56.7	55.8	49.7	47.2	37.7
	Reduction	*19*	*3.2*	*9.2*	*5.6*	*5.7*	*15.8*	*21.3*	*24.0*	*24.5*	*29.6*	*28.3*
South	Internal	90	55	76.3	81.9	85.0	84.2	84.0	83.1	80.4	83.8	72.6
	External	71	47	70.6	71.6	74.0	70.1	62.9	61.0	56.6	57.0	46.5
	Reduction	*13*	*2.5*	*-0.3*	*4.3*	*5.0*	*8.1*	*15.1*	*16.1*	*17.8*	*20.8*	*20.1*
West	Internal	90	52	73.6	80.9	82.0	84.7	83.1	84.6	79.9	82.5	72.6
	External	61	47	60.9	66.5	63.4	60.9	50.7	51.5	40.2	40.6	27.5
	Reduction	*23*	*-1.0*	*6.7*	*8.4*	*12.6*	*17.8*	*26.4*	*27.1*	*33.7*	*35.9*	*39.1*

TABLE 5.3: OCTAVE BAND CONTROLLED SOURCE BREAKOUT MEASUREMENTS – SUNDAY 11TH DECEMBER 2016

5.3 Attended Noise Survey Results – Amplified Music Measurements

5.3.1 The results of the attended short term noise survey are presented, along with observations made during the survey, in Table B2 of Appendix B and summarised below in Table 5.4. A sound level meter was set up to measure the internal noise levels at a mid-point of the barn, 10 m from the loudspeaker source. During the measurements, the continuous noise level measured inside the barn was 87.0 dB $L_{Aeq,T}$. As these measured noise levels are close to the ambient noise levels the noise levels at receptors will be calculated from the near field measurements.

Monitoring Location	Internal Level (Measured at 10 m)	Start Time	Duration (mins)	Noise Levels, dB re. 2 x 10^{-5} Pa.			
				$L_{Amax,F}$	$L_{A10,T}$	$L_{Aeq,T}$	$L_{A90,T}$
ST1	86.8	21:35	15	74.5	46.7	44.3	34.8
ST2	87.1	22:05	15	78.7	44.9	49.6	26.9
ST3	87.0	22:25	15	74.8	57.9	54.3	35.7

TABLE 5.4: SUMMARY OF SHORT-TERM AMPLIFIED MUSIC MEASUREMENTS – SUNDAY 11TH DECEMBER 2016

5.3.2 The dominant noise source at location ST1 was a mixture of aircraft noise and music noise from the barn. At ST2 and ST3, a combination of aircraft noise and distant road traffic noise governed the local noise environment.

5.3.3 Octave band noise levels measured at ST1 – ST3 with and without the music source in operation are presented in Table B3 of Appendix B.

5.4 Attended Noise Survey Results – Existing Background and Ambient Environment

5.4.1 The measured sample ambient $L_{Aeq,T}$ and background $L_{A90,T}$ noise levels for the representative periods are presented in Table B4 of Appendix B and summarised below in Table 5.5.

Monitoring Location	Start Time	Duration (mins)	Noise Levels, dB re. 2 x 10^{-5} Pa.			
			$L_{Amax,F}$	$L_{A10,T}$	$L_{Aeq,T}$	$L_{A90,T}$
ST1	22:50	15	57.9	41.7	39.3	27.7
ST2	23:10	15	62.6	48.0	46.7	25.9
ST3	23:30	15	71.0	54.0	51.6	27.0

TABLE 5.5: SUMMARY OF AMBIENT AND BACKGROUND NOISE LEVELS - SUNDAY 11TH DECEMBER 2016

5.4.2 For the purpose of assessing the noise from amplified music, the most sensitive period with respect to noise sensitive receptors is considered to be between 22:30 and 23:30 hrs as it is likely to be the period when ambient $L_{Aeq,T}$ and background $L_{A90,T}$ levels are at their lowest.

5.4.3 The noise environment during these measurements was governed by distant road traffic along with occasional air traffic and local car movements on the A264 at ST3.

6. NOISE IMPACT ASSESSMENT

6.1 Overview

6.1.1 Noise from amplified music within the Granary Barn and noise associated with patrons attending the wedding events have been considered as part of the impact assessment presented below. The separate elements are assessed at the closest residential receptor locations identified, using the noise criteria presented in Section 2.

6.2 Receptor Locations

6.2.1 Four receptor locations for the assessment and consideration of noise impacts have been selected for this assessment as shown on Figure A1 of Appendix A and as described below. These receptors were chosen to represent the closest and potentially worst affected properties in terms of noise arising as a result of the proposed change of use. It therefore follows that consideration and mitigation, if necessary, of noise levels at these properties should ensure that generated noise is minimised to all surrounding sensitive residential receptors.

Receptor Reference	Address
R1	Residential property located to the north, 180 m from the barn.
R2	Fitchetts Farmhouse, located 800 m to the north east.
R3	Property located to the north of the A264, Ashurst Road, 650 m south east from the barn.
R4	Park Homes at Hedge Barton, 440 m from the barn.

TABLE 6.1: RECEPTOR LOCATIONS

6.3 Derivation of Representative Ambient and Background Noise Levels

6.3.1 The results from the continuous unattended noise survey at LT1 provide an indication of the typical diurnal variation in noise levels. Comparison has been made between each 15 minute measurement at LT1 with those measured at the attended monitoring positions during the same periods.

6.3.2 From analysis of the noise level differences, a correction factor for each ST location has been derived, for the $L_{Aeq,T}$ and $L_{A90,T}$ noise indices. This correction factor has been applied to the mean daytime $L_{Aeq,12hr}$ / $L_{A90,Tr}$, evening $L_{Aeq,4hr}$ / $L_{A90,T}$ and night-time $L_{Aeq,8hr}$ / $L_{A90,T}$ noise levels obtained at measurement location LT1 to derive free-field ambient noise levels for locations ST1 to ST3.

6.3.3 The derived ambient and background noise levels at each measurement position are presented in Table 6.2 below. Measurement locations ST1 to ST3 are representative of the levels expected at receptors R1 to R3. Measurements have not been undertaken at R4. Instead, ambient and background noise levels measured at ST2 have been deemed to be representative of this receptor location.

Location	Derived Ambient Noise Level, dB					
	Day Time (07:00 - 19:00 hrs)		Evening (19:00 - 23:00 hrs)		Night-Time (23:00 - 07:00 hrs)	
	$L_{Aeq,12hr}$	$L_{A90,T}$	$L_{Aeq,4hr}$	$L_{A90,T}$	$L_{Aeq,8hr}$	$L_{A90,T}$
LT1	45 (43-48)	35 (32-38)	43 (40-46)	30 (27-34)	39 (34-42)	25 (22-30)
ST1	46 (44-49)	34 (31-37)	44 (41-47)	29 (26-33)	40 (35-43)	24 (21-29)
ST2	46 (44-49)	33 (30-36)	44 (41-47)	28 (25-32)	40 (35-43)	23 (20-28)
ST3	56 (54-59)	36 (33-39)	54 (51-57)	31 (28-35)	50 (45-53)	26 (23-31)

TABLE 6.2: DERIVED AMBIENT NOISE LEVELS FOR MEASUREMENT LOCATIONS LT1 AND ST1 – ST3

Note: The main values in each cell indicate the overall derived level; values in the parenthesis refer to the derived range (minimum and maximum) – the noise level ranges are derived from the diurnal measurements undertaken at LT1.

6.4 Amplified Music Noise

6.4.1 Where specific sound levels are not readily distinguishable against the residual sound environment, it is necessary to undertake calculations in order to compare the specific sound level to the background level. The breakout measurements presented in Table 5.2 have been used to predict external noise levels assuming a worse case internal source level of 87 dB(A) at an internal position, 4 m south from the speaker, with the speaker facing south. These levels have then been corrected for distance using the following equation.

$$Lp_2 = Lp_1 - 20log\left(\frac{r_2}{r_1}\right)$$

where:

Lp_2 = sound pressure level dB(A) at noise sensitive receptors;

Lp_1 = sound pressure level dB(A) measured at the façade closest to the receptor;

r_1 = the distance between monitoring location and the noise source; and

r_2 = the distance between the noise source and the receptor location.

6.4.2 The calculated free-field receptor noise levels generated from amplified music are presented in Table 6.3 below and use the SRI of the façade between the speaker source and the receptor.

Rec. ID	Derived Free-Field Music Noise Level, dB $L_{Aeq,1hr}$
R1	23
R2	16
R3	20
R4	15

TABLE 6.3: RECEPTOR NOISE LEVELS DUE TO MUSIC NOISE ALONE (87 DB(A)) INTERNAL LEVEL

Note: Music noise levels have been calculated by applying a distance correction to measurements undertaken in the near-field.

6.5 Patron Noise

6.5.1 While amplified music noise is considered to be the potentially most significant noise impact from the events, it is important to consider other sources of noise, which may have the potential to cause disturbance at neighbouring properties.

6.5.2 People noise did not form a component of the attended measurements undertaken on Sunday 11th December 2016. As such, a calculation of patron noise has been carried out to provide an indicative level for people congregating outside the barn.

6.5.3 Noise levels of patrons gathering in a wedding environment have been obtained at a separate venue in which approximately 250 people were attending. A source term level of 58.1 dB $L_{Aeq,T}$ was measured at a distance of 5 m. In order to provide a more realistic estimate of the worst case number of people congregating outside the barn during the most sensitive period, this level has been corrected to 100 people. The corrected noise level has been used to calculate potential receptor noise levels with guests congregating outside the barns, following the equation presented under paragraph 6.4.2.

6.5.4 The calculated free-field receptor noise levels generated from patrons attending events are presented in Table 6.4 below.

Rec. ID	Predicted Patron Free-Field Noise Level, dB $L_{Aeq,1hr}$
R1	23
R2	10
R3	12
R4	15

TABLE 6.4: RECEPTOR NOISE LEVELS DUE TO PATRON NOISE ALONE

6.6 Cumulative Patron and Music Noise

6.6.1 Patron noise may coincide with music noise levels. As such, it is important to consider the cumulative effect. Worse case hourly levels due to combined music and people noise are presented in Table 6.5 below. It should be noted that it is unlikely there will be 100 people congregating outside when music is playing inside, as such, the combined levels presented below represent a worse-case scenario.

Rec. ID	Predicted Patron Noise Level, dB $L_{Aeq,1hr}$	Predicted Music Noise Level, dB $L_{Aeq,1hr}$	Combined Patron and Music Free-Field Noise Levels, dB $L_{Aeq,1hr}$
R1	23	23	26
R2	10	16	17
R3	12	20	21
R4	15	15	18

TABLE 6.5: PREDICTED EVENT NOISE LEVELS

Assessment of Entertainment Noise

6.6.2 The combined patron and music $L_{Aeq,1hr}$ noise levels presented in Table 6.5 can be used to assess compliance with objective criteria provided in the IOA's draft Good Practice Guide on the Control of Noise from Pubs and Clubs. These criteria require that the entertainment specific L_{Aeq} noise levels are no greater than the background L_{A90} noise level without entertainment noise. The results of this entertainment noise assessment are presented in Table 6.6 below.

Rec. ID	Background Noise Level, dB $L_{A90,T}$	Combined Patron and Music Free-Field Noise Levels, dB $L_{Aeq,T}$	Excess of Entertainment Noise over Background Noise Level, dB (also EN -WEN)
R1	29	26	-3
R2	28	17	-11
R3	31	21	-10
R4	28	18	-10

TABLE 6.6: ENTERTAINMENT NOISE ASSESSMENT

6.6.3 The combined entertainment noise levels achieve the IOA draft Good Practice Guide on the Control of Noise from Pubs and Clubs criteria at all receptors, as the entertainment noise level is less than 5 dB greater than the background noise levels. The Noise Council's criteria requiring the background noise level to not be exceeded by more than 5 dB(A) over a fifteen minute period is also achieved at all receptors. This assessment is based upon music up until 23:00 hours only. After 23:00 hrs the draft IOA criteria is for the music to be inaudible inside noise-sensitive properties.

6.6.4 The predicted noise levels have also considered with the example noise assessment framework presented in the IOA consultation draft good practice guidance on the control of noise from places of entertainment and A-weighted noise levels that have been used in typical situations to control entertainment noise. Following this guidance the external location criteria for 07:00 to 23:00 hrs are met and for the period 23:00 – 23:30 hrs the criteria are also met.

Noise Assessment with Character Corrections

6.6.5 Penalties to be applied to measured sound sources when the sound is tonal, intermittent and/or impulsive in character are described in BS 4142. Music sources are generally tonal and intermittent in nature. As such, a rating penalty based on this has been applied to the music noise levels in order to provide an assessment of the noise levels in line with the requests of SDC.

6.6.6 The assessment requested by SDC with the penalties is presented in Table 6.7. A total rating penalty of +2 dB for tonality has been applied to the specific sound level.

Rec. ID	Background Noise Level, dB $L_{A90,T}$	Combined Patron and Music Rating Levels, dB $L_{Ar,1hr}$	Excess of Entertainment Noise over Background Noise Level, dB
R1	29	28	-1
R2	28	19	-9
R3	31	23	-8
R4	28	20	-8

TABLE 6.7: ASSESSMENT OF ENTERTAINMENT NOISE LEVELS PENALTIES FOR SOUND CHARACTER APPLIED

6.7 Departure Noise Levels

6.7.1 Car door slams and vehicle movements on the access road down from the A264 will also create noise.

6.7.2 Assuming a sound power level of 89 dB L_{WA} from a hard slam single car door slam (obtained from a previous acoustic report [11]), a sound power level of 94 dB L_{wA} has been assumed for a total of 3 car doors closed simultaneously.

6.7.3 The sound propagation equation presented in paragraph has been used to predict the worse-case $L_{Amax,F}$ noise level at each of the receptors. The predicted free-field receptor noise levels generated from car door slams are presented in Table 6.8 below.

Rec. ID	Maximum Predicted Car Door Slam Noise Level, dB $L_{Amax,F}$
R1	41
R2	28
R3	30
R4	33

TABLE 6.8: PREDICTED CAR DOOR NOISE

6.8 Vehicular Noise

6.8.1 The potential noise generated by vehicle movements has been calculated at representative locations outside each receptor. R1 is considered to be the closest to traffic leaving the venue and therefore the most likely to be affected.

6.8.2 Noise levels have been calculated using estimated vehicle movements, standard acoustic algorithms and field source noise data.

6.8.3 There are eighty car parking spaces within the proposed development and, for the purpose of this assessment it is assumed that each parking space generates one vehicle movement in a worse case hour, and that the vehicle movements take place between 23:00 and 24:00 hrs. It has also been assumed that a worst case scenario of 10 taxis will

also attend during the departure hour, each producing 2 one-way movements. As such, a total of 100 single direction movements has been assumed as a worst case assessment.

6.8.4 The following equation has been used for the prediction of vehicle pass-by noise levels:

$$Lp, Receptor = Lp, Source - 10log\left(\frac{d}{5}\right) + 10logN$$

where:

$L_{P, Receptor}$ = predicted noise level at the receptor location, d m from source;

$L_{P, Source}$ = reference source noise level of vehicle movements at 5 m; and

N = number of vehicular movements during time period of interest.

6.8.5 Daytime $L_{Aeq,1h}$ noise levels have been calculated using a sound exposure level for a single vehicular pass-by of 65.3 dB(A) SEL obtained from controlled measurements obtained elsewhere.

Receptor	Receptor Noise Level dB $L_{Aeq,1hr}$	Internal Noise Level (Windows Open) dB $L_{Aeq,1hr}$
R1	33	18
R2	28	13
R3	30	15
R4	32	17

TABLE 6.9: CALCULATED FREE-FIELD NOISE LEVELS DUE TO VEHICLE MOVEMENTS ON THE ACCESS LANE ASSOCIATED WITH THE PROPOSED DEVELOPMENT

6.8.6 The worst case predicted external free-field noise levels in Table 6.9 above due to traffic noise from the proposed facility alone are 33 dB $L_{Aeq,1hour}$ when considering 100 vehicle movements in the departure hour at R1, which would result in an internal noise level, through a partially open window of 18 dB $L_{Aeq,1hour}$, which achieves the 30 dB $L_{Aeq,T}$ night-time criteria set out in BS 8233.

6.9 Internal Noise Levels

6.9.1 Calculated internal noise levels, displayed in Table 6.10, have been estimated using the operational noise levels displayed in Table 6.5. The internal levels assume a typical reduction from free-field levels of 33 dB R_w with closed insulating glass windows and 15 dB with the windows open for natural ventilation. The receptor properties at R4 are static park homes, as such the R_w values with windows closed will be lower than at a standard residential building. For the purposes of this assessment, the R_w value for a park home with closed windows has been assumed to be 25 dB.

Rec. ID	Cumulative Patron and Music External Free-Field Noise Levels, $L_{Aeq,1hr}$ dB	Predicted Internal Noise Levels, dB $L_{Aeq,1h}$	
		Windows Open	Windows Closed
R1	26	11	<10
R2	17	<10	<10
R3	21	<10	<10
R4	18	<10	<10

TABLE 6.10: PREDICTED INTERNAL NOISE LEVELS

6.9.2 The internal noise levels displayed in Table 6.10 indicate that the cumulative noise levels associated with functions at the Chafford Park barns are unlikely to be audible above ambient internal noise levels at all receptors, when windows are open.

6.9.3 Assuming a 15 dB reduction (from free-field) of predicted noise levels through a partially open window, the combined event noise and pre-existing ambient internal noise levels at all receptors, apart from R3, are predicted to achieve internal guideline noise levels of 35 dB $L_{Aeq,T}$ to avoid moderate annoyance, with the windows open or closed. The predicted noise level at R3 exceeds this criterion by 4 dB. However, it should be noted that the external level of 54 dB $L_{Aeq,T}$ at this receiver, is dominated by pre-existing ambient noise levels and not operations at Chafford Park.

Rec. ID	Ambient Free-Field Noise Levels Without Entertainment (WEN), $L_{Aeq,T}$ dB	Predicted Operational + Ambient Free-Field Noise Levels (EN), $L_{Aeq,T}$ dB	Predicted Internal Noise Levels, dB $L_{Aeq,1h}$	
			Windows Open	Windows Closed
R1	44	44	29	11
R2	44	44	29	11
R3	54	54	39	21
R4	44	44	29	19

TABLE 6.11: PREDICTED INTERNAL NOISE LEVELS

6.9.4 It should be noted that BS 8233 criteria referred to here apply to "*sources without a specific character*". Noise sources such as shouting and loud music do have a character and as such, controls should be implemented to contain the risk of noise with character being audible at sensitive receptors.

6.9.5 Additionally, all predictions of internal noise levels presented here are based upon dB(A) values. Comments made during measurements, which were undertaken with an amplified music source within the Granary Barn, stated that at ST2 and ST3, music noise levels were only audible in particular frequency ranges.

6.10 Mitigation

6.10.1 It is recommended that an electronic automatic music volume limiting device is installed in the Granary Barn. For information purposes there are two types of entertainment noise limiter:

- **Microphone Controlled** – These units continually monitor the music noise levels (MNLs) via a microphone and either trigger a warning light of cut the power supply to the sound system. They have the advantages of working on any sound system brought into the premises (provided it is connected to the electrical circuit under the control of the limiter);

- **Electronic in Circuit Devices** – These are incorporated into the sound system and operate by monitoring the electrical power output of the amplifiers. If the MNLs become too high, the device automatically attenuates the amplifier power output so that MNLs are reduced to below the operating threshold limit.

6.10.2 The installation of a noise limiter will provide control of music levels to ensure that there are no unacceptable noise impacts from amplified music at nearby residential locations. The threshold of the noise limiter should be set in agreement with the Environmental Health Department of SDC.

6.10.3 The storage area in the south part of the Granary Barn will be used as a sound lobby. For this to be the sound lobby a door will be put over the opening. The door on the east façade will not be opened whilst music is playing within the barn and must be closed before music recommences. Alternatively a 'sound lobby' may also be built around the door.

6.10.4 To reduce the sound transmission through the fabric of the building, in particularly the corrugated roof, acoustic panels could be installed. A suspended acoustic ceiling may also be considered.

6.10.5 In order to reduce the spread of sound away from the Granary Barn a distributed loudspeaker system could be installed in the music area within the Granary Barn. This system can be suspended from the ceiling. A directional system would enable a high level of sound directly below the systems, whilst offering a 10 dB reduction 1-2 m from the designated dance floor area. This would also reduce the noise levels external to the barn.

6.10.6 Acoustic absorber panels will be used within the Granary Barn to minimise the reverberant sound field.

6.10.7 An alternative means of ventilation will be installed for the Granary Barn so that windows and doors do not need to be opened for ventilation.

6.10.8 In addition to the installation of a music volume limiting device, the provision of a noise management plan, which can be submitted to and approved by the local authority, should be considered. Full details of what the management plan should include are outlined below:

- times of operation – including time limits for amplified music (23:30 cut-off);
- noise limiter details – 85 dB(A) or calibrated to ensure that music noise is not intrusive at sensitive receptors;
- instructions to guests when congregating outside during late events;
- music to be turned down if the doors are kept open in summer;
- provision of an alternative means of ventilation so that the doors and windows can stay closed;

- details of signs to be placed near exits asking guests to leave promptly and quietly;
- location of drop-off area/pick-up area to provide maximum shielding from the barns;
- door to be put on storage area of the Granary Barn to provide a 'sound lobby';
- under no circumstances should taxis be allowed to sound their horns for non-emergencies;
- the method by which management plan will be passed on to people using wedding venue;
- commitment to regularly check boundaries to monitor noise levels during events, if complaints have been received;
- a log book which will record any issues raised either by the operators of Chafford Park/the barns or by the neighbours. The book should be made accessible to SDC; and
- staff procedures for reporting noise issues.

6.10.9 The noise assessment with penalties detailed in Table 6.7 indicated that, at the closest receptor, rating levels are not calculated to exceed the background noise level. BS 4142 states that a difference of +5 dB or more is likely to be an indication of adverse impact and +10 dB an indication of a significant adverse impact. As such, significant adverse impacts are considered to be unlikely.

6.10.10 It should be noted that BS 4142 is not intended to be applied to the rating and assessment of sound from music and entertainment sources. The IOA Good Practice Guide on the Control of Noise from Pubs and Clubs criteria for pubs and clubs up to 23:00 hrs is achieved as presented in Table 6.6.

6.10.11 Differences in the A-weighted noise levels, with and without entertainment noise, which are presented in the consultation draft Good Practice Guide for The Control of Noise from Places of Entertainment example noise assessment framework levels, are also calculated to be achieved for the period 07:00 -23:00 hrs and also within the limits for the period 23:00 – 23:30 hrs.

6.10.12 The applicant will also be applying for an Events License which allows further conditions to be set on the noise levels and other aspects of the wedding events.

7. CONCLUSIONS

7.1.1 A noise impact assessment of the proposed use of the Granary Barn and Hop Barn as a wedding event venue within Chafford Park, Fordecombe, Kent has been undertaken and is presented in this report to inform the planning application.

7.1.2 Unattended and attended surveys of the residual ambient and background noise environment have been undertaken as well as attended measurements at sensitive receptors with a representative music source within the Granary Barn. Additionally, measurements of the sound breakout from within the Granary Barn have been undertaken.

7.1.3 Calculations have also been undertaken to predict the likely impact of noise from people congregating outside the barn and noise from their departure.

7.1.4 Internal cumulative noise levels from amplified music and people noise at the nearest sensitive receptors are predicted to be below ambient internal noise levels. Assuming a 15 dB reduction of predicted noise levels through a partially open window, the internal guideline noise level to avoid moderate annoyance set out in BS 8233 is predicted to be achieved by a significant margin at the nearest noise sensitive receptors.

7.1.5 Nevertheless the potential loss of amenity in the external areas of nearby properties needs to be considered. With penalties applied to the predicted noise levels for tonality applied event noise levels are close to but below the background noise levels. With the context of low background noise levels mitigation has been proposed which may include noise limiters, acoustic insulation to the roof and a sound lobby to minimise the potential noise emissions.

7.1.6 The IOA draft guideline noise levels for the control of noise from places of entertainment and the draft guidelines for the are predicted to be achieved at all receptors until 23:00 hrs. For the period 23:00-23:30 hrs the predicted noise levels are at the limit in the example noise assessment framework.

7.1.7 To further improve the control of noise from functions and associated activities from events held at Chafford Park, suggestions have been made which include the production of a noise management plan, use of an electronic automatic music volume limiting device (noise limiter) and the development of a noise management plan.

7.1.8 It is advised that planning conditions are used to secure detailed design stage calculations of the mitigation measures and to confirm the noise limits to be implemented.

8. REFERENCES

1. British Standard BS 8233:2014: Guidance on Sound Insulation and Noise Reduction for Buildings.

2. World Health Organization. Guideline for Community Noise. 1999.

3. British Standards Institution (BSi). BS 4142: 2014 'Methods for rating and assessing industrial and commercial sound'.

4. Department for Environment, Food and Rural Affairs (DEFRA). Noise Policy Statement for England (NPSE), 2010.

5. Department of Communities and Local Government. National Planning Policy Framework, 2012.

6. Institute of Acoustics Working Party - Draft Good Practice Guide on the Control of Noise from Pubs and Clubs. Working Draft – NOT IN PUBLIC DOMAIN. September 2002.

7. Institute of Acoustics Working Party - Good Practice Guide on the Control of Noise from Pubs and Clubs. March 2003.

8. Institute of Acoustics & Institute of Licensing - Good Practice Guide on the Control of Noise from Places of Entertainment. Consultation Draft. December 2016.

9. The Noise Council (The Chartered Institute of Environmental Health) - Code of Practice on Environmental Noise Control at Concerts. 1995.

10. Sevenoaks District Council - Policy EN2: Amenity Protection of the Allocations and Development Management Plan. February 2015.

11. Ian Sharland (1988). Woods Practical Guide to Noise Control. Woods Acoustics, a division of Woods of Colchester Ltd.

12. Gabriels Environmental Design. Emmanuel Christian Community School - New Junior School: Development Approval Stage - Acoustic Report. August 2015.

APPENDIX A: FIGURES

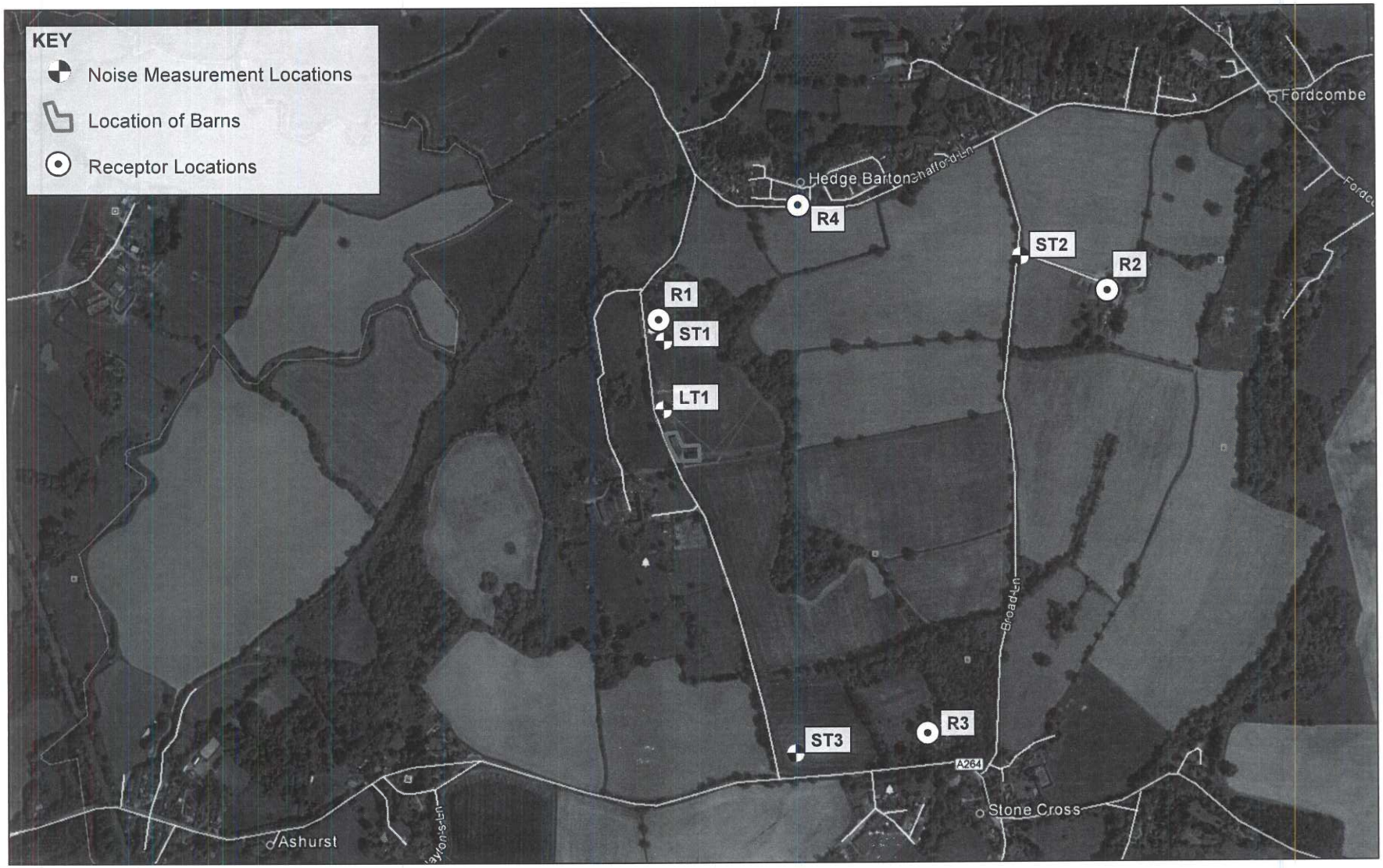

FIGURE A1: SITE AND MEASUREMENT/RECEPTOR LOCATIONS

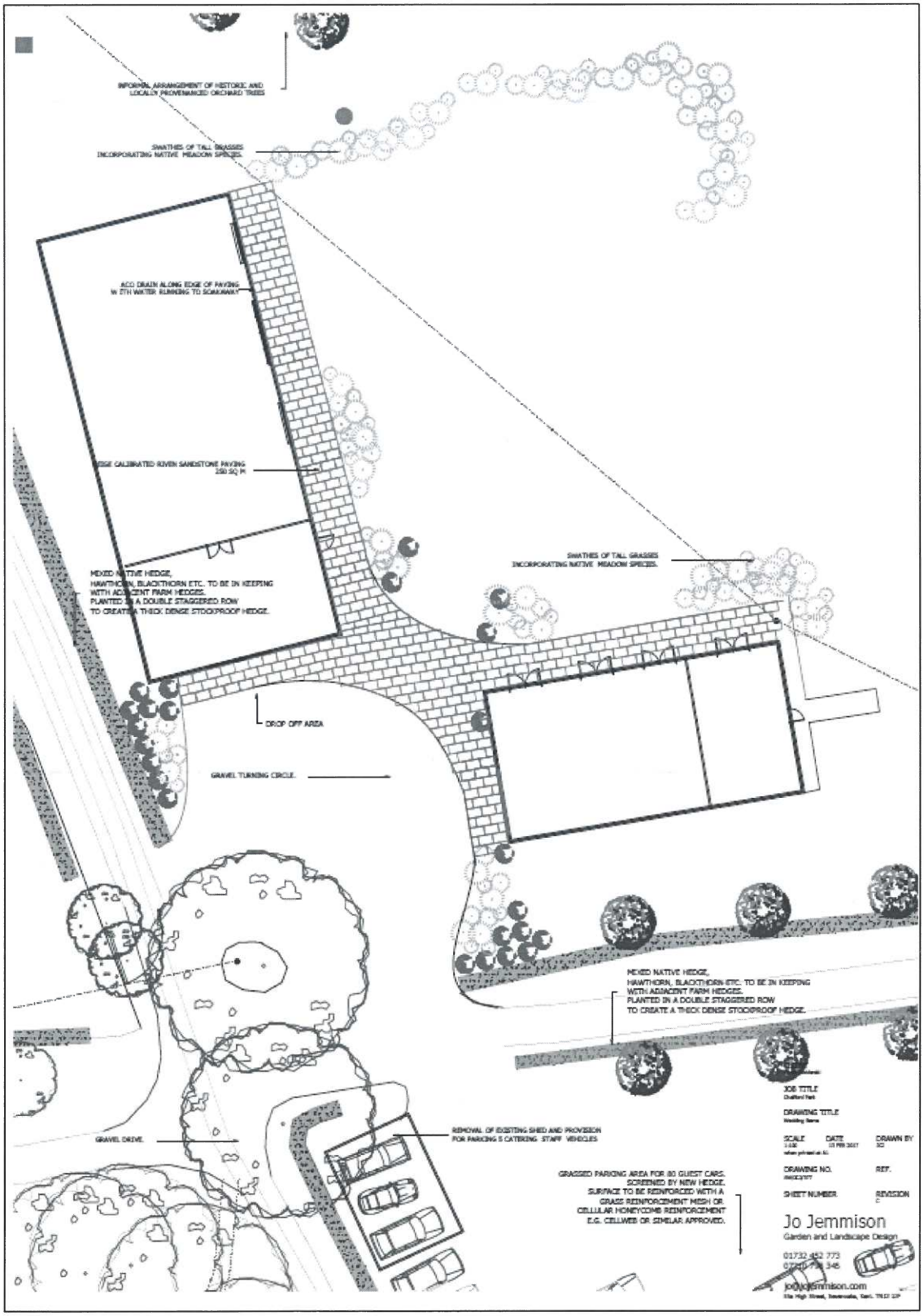

FIGURE A2: BARN LAYOUTS

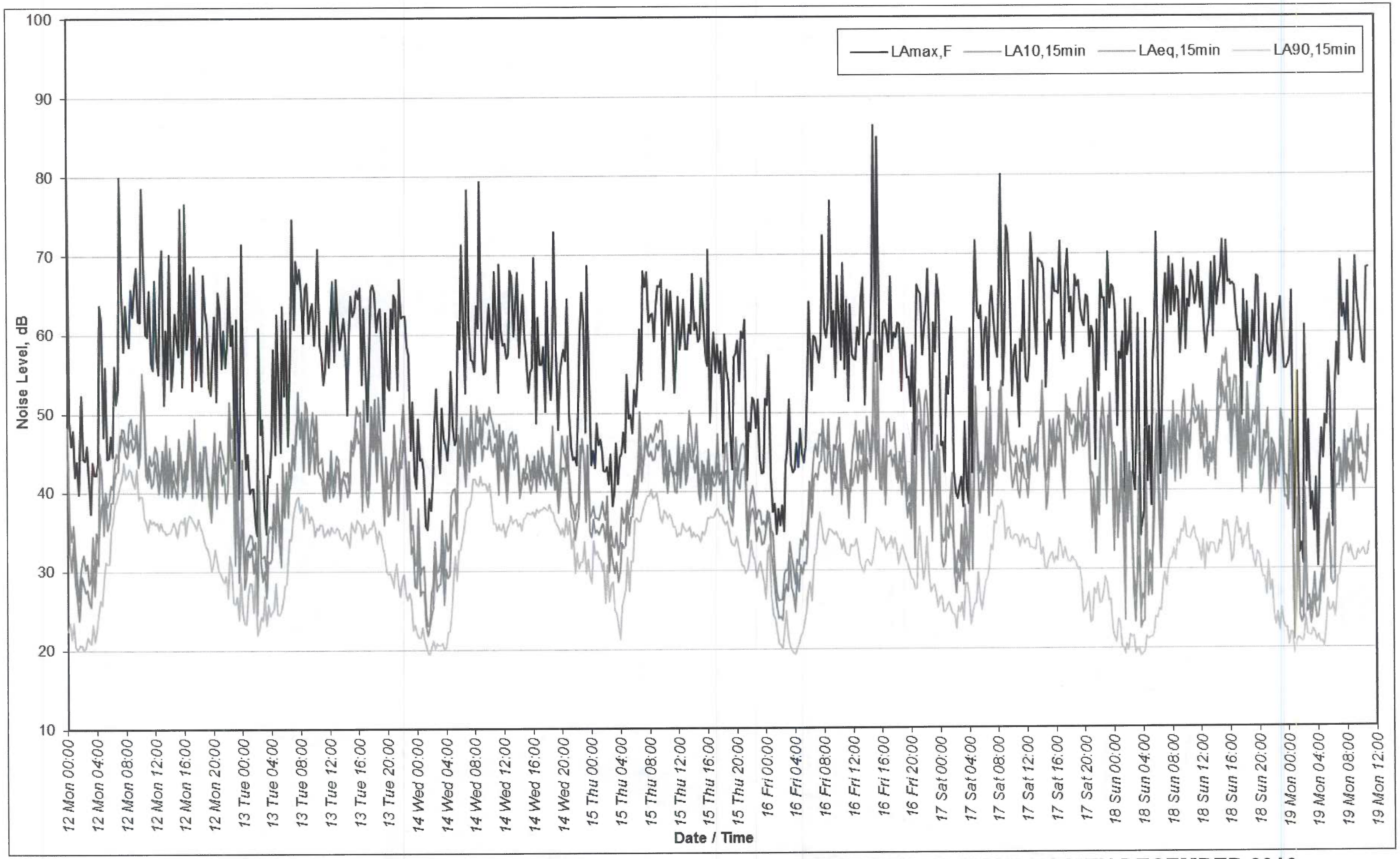

FIGURE A3: CONTINUOUS NOISE MONITORING RESULTS – MONDAY 12TH DECEMBER TO MONDAY 19TH DECEMBER 2016

APPENDIX B: TABLES

TABLE B1: CONTINUOUS BACKGROUND NOISE SURVEY RESULTS, LT1

Date of Meas.	Start Time	Measured Noise Levels, dB re. 2 x 10^{-5} Pa.			
		$L_{Amax,F}$	$L_{A10,15min}$	$L_{Aeq,15min}$	$L_{A90,15min}$
12/12/16	00:00	79.9	44.2	48.3	22.4
12/12/16	00:15	49.1	36.3	32.4	23.5
12/12/16	00:30	46.0	33.9	30.0	21.4
12/12/16	00:45	47.9	35.8	33.9	23.5
12/12/16	01:00	42.0	32.2	28.4	20.5
12/12/16	01:15	44.0	28.5	26.6	20.1
12/12/16	01:30	39.8	26.3	23.7	20.4
12/12/16	01:45	43.6	28.8	25.4	20.7
12/12/16	02:00	52.3	31.1	29.3	20.6
12/12/16	02:15	44.3	32.1	28.4	20.0
12/12/16	02:30	44.1	30.3	27.3	20.4
12/12/16	02:45	45.9	30.9	27.7	21.6
12/12/16	03:00	41.6	28.4	26.0	21.2
12/12/16	03:15	37.3	29.0	25.5	20.8
12/12/16	03:30	43.9	34.4	30.9	23.3
12/12/16	03:45	42.2	30.0	27.0	21.0
12/12/16	04:00	42.2	34.9	31.6	22.5
12/12/16	04:15	43.9	33.6	30.8	24.5
12/12/16	04:30	63.8	36.4	45.0	26.3
12/12/16	04:45	61.7	38.6	42.4	25.7
12/12/16	05:00	47.1	37.8	34.7	29.0
12/12/16	05:15	55.9	40.0	40.0	31.2
12/12/16	05:30	44.3	38.1	35.3	31.0
12/12/16	05:45	44.4	39.1	36.2	31.0
12/12/16	06:00	47.2	40.9	38.7	35.1
12/12/16	06:15	44.5	40.5	38.7	36.4
12/12/16	06:30	56.1	43.5	41.6	38.5
12/12/16	06:45	51.3	45.0	42.6	39.0
	Arith. Average	*48.1*	*35.0*	*33.2*	*25.4*
	Log. Average	*65.7*	*38.0*	*38.5*	*30.4*
	Minimum	*37.3*	*26.3*	*23.7*	*20.0*
	Maximum	*79.9*	*45.0*	*48.3*	*39.0*
12/12/16	07:00	53.3	44.6	42.7	40.0
12/12/16	07:15	79.9	45.7	47.3	41.1
12/12/16	07:30	65.3	48.2	47.3	41.9
12/12/16	07:45	57.9	48.0	46.5	43.8
12/12/16	08:00	63.8	46.5	44.8	41.8
12/12/16	08:15	59.9	45.8	44.4	42.1
12/12/16	08:30	58.5	48.9	46.5	43.1
12/12/16	08:45	65.7	49.5	46.9	42.7
12/12/16	09:00	62.4	47.0	45.2	41.3
12/12/16	09:15	66.0	46.9	45.8	40.6
12/12/16	09:30	68.5	48.8	47.7	43.0
12/12/16	09:45	61.8	44.6	43.3	39.1
12/12/16	10:00	61.7	47.4	44.9	39.6
12/12/16	10:15	78.5	53.2	55.1	39.4
12/12/16	10:30	68.9	52.9	49.9	36.8
12/12/16	10:45	60.1	44.1	42.2	36.2
12/12/16	11:00	59.8	42.2	41.4	35.0
12/12/16	11:15	65.6	44.8	43.2	36.6
12/12/16	11:30	56.5	43.5	40.7	36.1
12/12/16	11:45	55.6	43.9	41.2	36.4
12/12/16	12:00	66.9	46.0	44.1	35.9
12/12/16	12:15	57.3	45.1	42.4	36.2
12/12/16	12:30	55.0	42.3	39.9	35.2
12/12/16	12:45	67.6	41.3	42.5	36.2

Date of Meas.	Start Time	Measured Noise Levels, dB re. 2 x 10^{-5} Pa.			
		$L_{Amax,F}$	$L_{A10,15min}$	$L_{Aeq,15min}$	$L_{A90,15min}$
12/12/16	13:00	70.7	45.4	44.1	35.2
12/12/16	13:15	51.2	42.4	39.6	35.1
12/12/16	13:30	60.6	47.4	43.6	34.7
12/12/16	13:45	54.6	41.0	39.4	34.9
12/12/16	14:00	70.2	45.7	43.5	34.9
12/12/16	14:15	53.0	41.3	39.5	35.5
12/12/16	14:30	56.1	44.1	41.6	36.2
12/12/16	14:45	62.7	41.9	40.3	35.5
12/12/16	15:00	59.3	41.1	39.2	34.3
12/12/16	15:15	57.4	46.9	43.2	36.0
12/12/16	15:30	76.0	43.8	45.3	36.5
12/12/16	15:45	53.5	41.5	39.5	36.1
12/12/16	16:00	61.6	43.1	41.0	36.9
12/12/16	16:15	76.5	40.3	44.1	34.5
12/12/16	16:30	58.3	44.4	41.8	36.3
12/12/16	16:45	60.9	48.1	45.8	37.1
12/12/16	17:00	67.7	46.2	47.1	36.9
12/12/16	17:15	53.1	41.5	39.4	36.3
12/12/16	17:30	68.6	49.5	47.4	35.9
12/12/16	17:45	54.5	41.3	39.4	35.2
12/12/16	18:00	58.3	41.8	40.2	36.6
12/12/16	18:15	59.7	45.2	43.8	35.6
12/12/16	18:30	53.6	40.7	39.1	35.0
12/12/16	18:45	67.6	45.4	45.9	34.0
	Arith. Average	*62.1*	*45.0*	*43.5*	*37.4*
	Log. Average	*68.7*	*46.2*	*45.1*	*38.4*
	Minimum	*51.2*	*40.3*	*39.1*	*34.0*
	Maximum	*79.9*	*53.2*	*55.1*	*43.8*
12/12/16	19:00	63.1	46.0	45.2	33.2
12/12/16	19:15	61.4	42.5	41.7	32.8
12/12/16	19:30	53.5	41.1	38.5	31.9
12/12/16	19:45	52.5	38.2	36.3	30.0
12/12/16	20:00	57.8	43.9	40.2	30.9
12/12/16	20:15	62.3	47.7	43.8	32.8
12/12/16	20:30	51.6	41.1	38.0	31.4
12/12/16	20:45	65.4	44.5	44.7	30.0
12/12/16	21:00	63.3	46.6	44.6	29.7
12/12/16	21:15	55.8	45.1	41.0	29.1
12/12/16	21:30	60.6	44.1	42.3	28.5
12/12/16	21:45	55.9	42.5	38.7	29.4
12/12/16	22:00	58.9	43.8	40.3	26.6
12/12/16	22:15	67.4	51.5	48.6	32.0
12/12/16	22:30	58.8	47.0	43.2	30.6
12/12/16	22:45	61.3	48.3	44.4	26.0
	Arith. Average	*59.4*	*44.6*	*42.0*	*30.3*
	Log. Average	*61.4*	*45.8*	*43.1*	*30.7*
	Minimum	*51.6*	*38.2*	*36.3*	*26.0*
	Maximum	*67.4*	*51.5*	*48.6*	*33.2*
12/12/16	23:00	44.2	33.5	30.8	25.8
12/12/16	23:15	62.0	46.4	45.0	26.8
12/12/16	23:30	39.2	31.6	28.6	23.9
12/12/16	23:45	50.8	34.1	32.8	29.3
13/12/16	00:00	71.4	35.4	44.2	24.8
13/12/16	00:15	51.0	29.7	27.8	23.4
13/12/16	00:30	43.0	33.0	29.2	23.3
13/12/16	00:45	44.9	33.7	32.7	27.1
13/12/16	01:00	39.9	34.7	31.9	28.5

Date of Meas.	Start Time	Measured Noise Levels, dB re. 2 x 10^{-5} Pa.			
		$L_{Amax,F}$	$L_{A10,15min}$	$L_{Aeq,15min}$	$L_{A90,15min}$
13/12/16	01:15	40.5	34.5	32.9	28.4
13/12/16	01:30	40.5	32.8	29.8	24.8
13/12/16	01:45	36.3	33.7	31.5	29.4
13/12/16	02:00	34.6	27.4	24.5	21.9
13/12/16	02:15	60.8	36.5	41.6	22.7
13/12/16	02:30	47.5	31.7	31.1	24.2
13/12/16	02:45	49.3	31.8	28.7	23.7
13/12/16	03:00	38.3	32.0	30.0	26.9
13/12/16	03:15	34.8	29.6	26.6	23.2
13/12/16	03:30	42.2	34.8	31.3	25.8
13/12/16	03:45	42.0	35.7	31.1	24.3
13/12/16	04:00	46.1	35.4	31.6	24.8
13/12/16	04:15	58.2	36.6	38.6	25.2
13/12/16	04:30	44.9	36.1	33.7	28.5
13/12/16	04:45	62.6	39.1	41.2	24.6
13/12/16	05:00	53.2	36.6	33.9	24.4
13/12/16	05:15	45.1	34.3	30.6	25.0
13/12/16	05:30	63.6	38.3	43.7	26.2
13/12/16	05:45	52.3	40.4	36.9	28.2
13/12/16	06:00	61.9	41.4	42.7	28.4
13/12/16	06:15	46.0	39.7	36.9	32.1
13/12/16	06:30	51.5	43.9	40.1	34.1
13/12/16	06:45	59.2	41.4	41.3	33.8
	Arith. Average	*48.7*	*35.5*	*34.2*	*26.4*
	Log. Average	*58.9*	*37.8*	*37.9*	*27.6*
	Minimum	*34.6*	*27.4*	*24.5*	*21.9*
	Maximum	*71.4*	*46.4*	*45.0*	*34.1*
13/12/16	07:00	74.6	46.2	45.2	36.6
13/12/16	07:15	60.7	45.4	42.9	38.0
13/12/16	07:30	69.3	46.3	48.5	39.1
13/12/16	07:45	66.5	52.8	49.7	39.4
13/12/16	08:00	68.3	46.9	48.7	37.5
13/12/16	08:15	65.1	50.3	48.2	38.5
13/12/16	08:30	59.0	44.8	42.7	35.5
13/12/16	08:45	66.0	51.5	49.1	38.1
13/12/16	09:00	66.6	50.7	49.7	37.9
13/12/16	09:15	60.3	44.4	42.3	36.2
13/12/16	09:30	63.0	48.0	44.4	37.0
13/12/16	09:45	64.0	50.3	47.1	36.4
13/12/16	10:00	58.8	46.5	42.5	34.4
13/12/16	10:15	62.7	49.9	46.8	35.5
13/12/16	10:30	70.8	43.6	42.7	35.2
13/12/16	10:45	58.8	43.8	42.2	36.0
13/12/16	11:00	57.6	44.4	41.6	35.8
13/12/16	11:15	53.7	41.5	39.1	34.3
13/12/16	11:30	55.8	39.3	38.8	34.8
13/12/16	11:45	61.2	42.7	42.2	35.4
13/12/16	12:00	55.9	41.5	39.3	34.6
13/12/16	12:15	61.4	45.4	43.6	35.6
13/12/16	12:30	66.8	40.6	39.4	35.0
13/12/16	12:45	56.6	42.6	40.3	34.9
13/12/16	13:00	67.0	44.7	43.5	35.5
13/12/16	13:15	61.7	44.2	43.0	35.2
13/12/16	13:30	58.2	41.0	38.9	34.2
13/12/16	13:45	60.2	41.2	41.8	34.0
13/12/16	14:00	62.1	42.7	41.6	34.7
13/12/16	14:15	59.6	42.0	40.8	34.9
13/12/16	14:30	49.9	42.6	39.4	33.9