

YEOMAN'S GROUP, LITTELHAMPTON ROAD, FERRING, WORTHING, BN12 6PB

Technical Note

Acoustic Assessment Report

23rd February 2018

Peter Clark

1. INTRODUCTION

1.1 Yeoman's Group are to build a new Honda Motor Dealership, Head Office for Yeomans Group and Motor Vehicle Workshop alongside their existing Peugeot Car Dealership and Workshop at Littlehampton Road, Ferring, Worthing in West Sussex. The site lies on the north side of main A259 Littlehampton Road dual carriageway. The proposal consists of a new build Honda Car Dealership, Head Office space for Yeoman's Group, a new vehicle workshop and associated customer and office parking. To satisfy both Planning and BREEAM Conditions, a noise impact assessment and report is required. The noise assessment is concerned with fixed plant and machinery (e.g. external air conditioning for the offices and compressor/garage equipment for the workshop). The A259 Dual Carriageway Littlehampton Road is the dominant source of environmental noise in the immediate area. There is also a large garden centre to the west (Wyevale) and some other vehicle storage/warehouse facilities to the north of the site. The nearest neighbouring residential properties are on Littlehampton Road, to the east and White Cottage in Hangleton Lane which is to the west of the site.

1.2 The assessment has been carried out in accordance with both BREEAM and nationally accepted guidance documents and shows that the proposed

external plant and equipment can operate without detrimental effect on existing noise levels in the immediate locality. The site location is given in Figure 1 below:

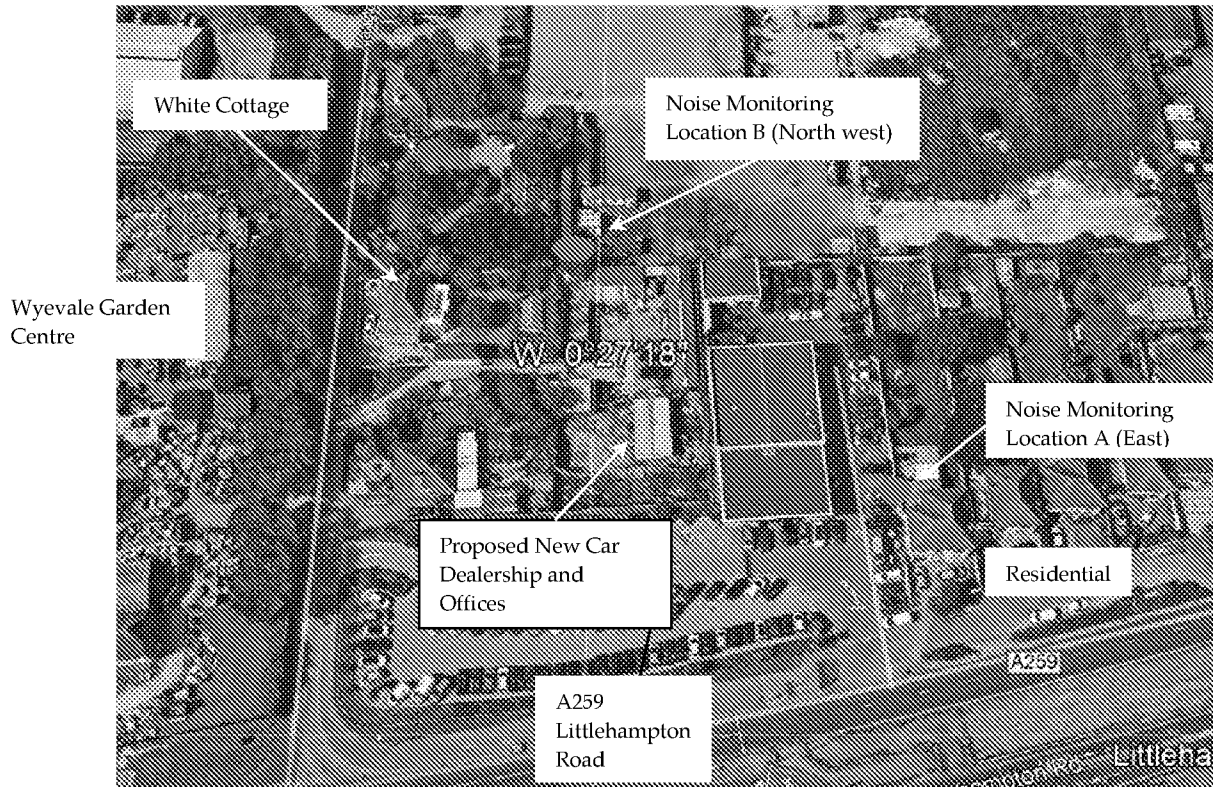


Figure 1: Site Location (© Google Maps)

1.3 The noise survey and assessment has been completed by Dr Peter Clark who is a Chartered Engineer, a Member of the Institution of Mechanical Engineers and a Member of the Institute of Acoustics with 25 years professional experience.

2.0 NOISE MEASUREMENTS

2.1 Environmental noise measurements were carried out from Thursday 8th February to Tuesday 13th February 2018. Sound level measurement equipment was installed in two locations at the site (a) near the site

entrance close to the neighbouring residential properties in Littlehampton Road and (b) at the western perimeter of the site close on the boundary with White Cottage (locations shown in Figure 1 above). The equipment was used to log noise levels over the five day period. The measurement equipment is listed below in Table 1.

Table 1. Environmental Noise Measurement Instrumentation

No.	Description
1.	1 off Larson Davis Model 831 Sound Level Meter.
2.	1 off Larson Davis Model 824 Sound Expert Sound Level Meter.
3.	2 off Larson Davis Model 377B02 1/2" Diameter Condenser Microphone.
4.	Larson Davis Model CAL200 Sound Level Meter Calibrator.

2.2 All acoustic equipment conforms to the relevant parts of BS EN 60651:1994 (equivalent to BS 5969:1981) for the requirements of Type 1 acoustic accuracy. Additionally, the relevant equipment conforms to the specifications contained within BS EN 60804:1994 (equivalent to BS 6698:1976) for integrating sound level meters. The measurements were carried out in accordance with BS7445.

2.3 In order to verify the correct operation of the equipment on site, an acoustic calibrator was applied during the course of the measurements. A

maximum change of 0.1 dB(A) was noted, this can be considered as an insignificant change. The calibrator complies with the specifications of IEC 942:2003. The Sound Level Meters were previously UKAS calibrated in August 2016. The acoustic calibrator was previously UKAS calibrated in April 2017 (copies of calibration certificates are given in Appendix B at the end of this report).

2.4 Fast meter response was used for all measurements carried out during the course of the survey.

2.5 Noise levels are expressed in terms of continuous equivalent noise levels (L_{Aeq}) over an appropriate time period. The use of L_{Aeq} allows non-steady and non-continuous noise to be assessed and compared to the existing noise climate. L_{Aeq} is referred to as the ambient noise level. In addition to this background noise levels have also been measured and are expressed as L_{A90} . A full explanation of terminology commonly used in the measurement and assessment of noise levels is given in Appendix C at the end of this report.

3.0 RESULTS

3.1 Noise level measurements were carried out at 15 minute intervals during the survey period. Ambient (L_{Aeq}) and background (L_{A90}) noise levels were measured. Average noise levels for the day-time (07:00 to 23:00 hrs) and night time period (23:00 to 07:00 hrs) have been determined. The results are summarised in Tables 2.1 and 2.2 below.

Table 2.1: Summary Results – (Location A)

	<u>Day</u>	<u>Night</u>
<u>L_{A90}</u>	56.9	42.3
<u>L_{Aeq}</u>	61.8	55.9

Table 2.2: Summary Results – (Location B)

	<u>Day</u>	<u>Night</u>
<u>L_{A90}</u>	53.3	42.8
<u>L_{Aeq}</u>	58.6	52.9

3.2 Although the survey was not attended on a full time basis, it was noted that during site visits that noise in the area is dominated by traffic on A259 Littlehampton Road. In addition to this, there was also some daytime noise from activities in the current workshop site itself. Weather conditions during the survey were varied with some periods of high winds and rain. Full listings of 15 minute interval data, for both measurement locations, are given in the graphs at the end of this report (Figure A1.1 and A1.2). Photographs showing the location of the noise monitors are shown in Figures A2.1 and A2.2.

3.3 In addition to this, the noise data graphs show that noise levels in the area do vary throughout day and night-time periods. This is to be expected. To determine an appropriate background noise level for the assessment, statistical analyses of the data measured at both locations has been carried out¹. The resulting day-time and night-time noise level histograms are

¹ Location B is generally quieter than Location A (being more sheltered and further from the A259 Littlehampton Road).

given below and show that an appropriate² day-time background noise level is 55 dB $L_{A90,15min}$ and night-time is 30 dB $L_{A90,15min}$ for Location A (properties close to Littlehampton Road) and 52 dB $L_{A90,15min}$ and 36 dB $L_{A90,15min}$ respectively for Location B (properties and gardens shielded from Littlehampton Road). The histograms are shown in Figures 2 and 3 below

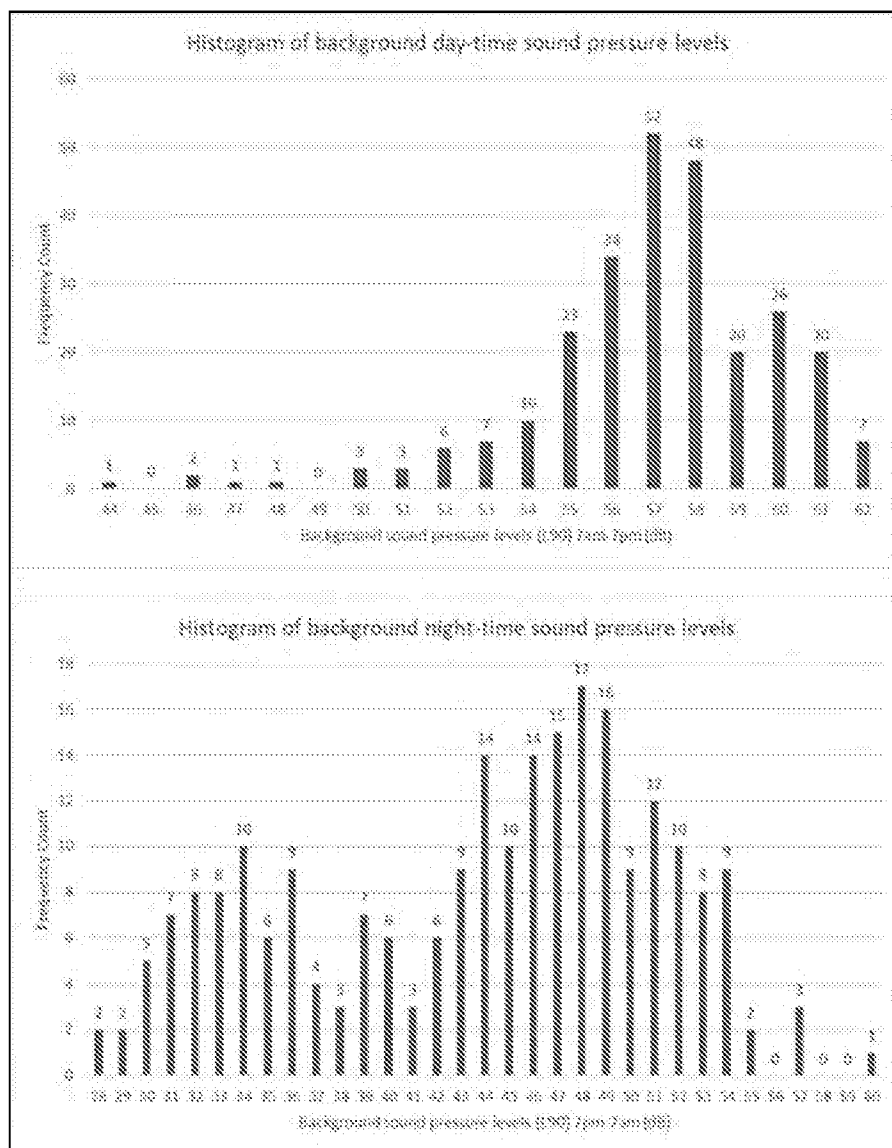


Figure 2: Histogram of background ($L_{A90,15min}$) noise during day-time and night-time periods at Location A

² These noise levels being the background noise levels that occur “reasonably frequently” towards the low end of the ranges measured.

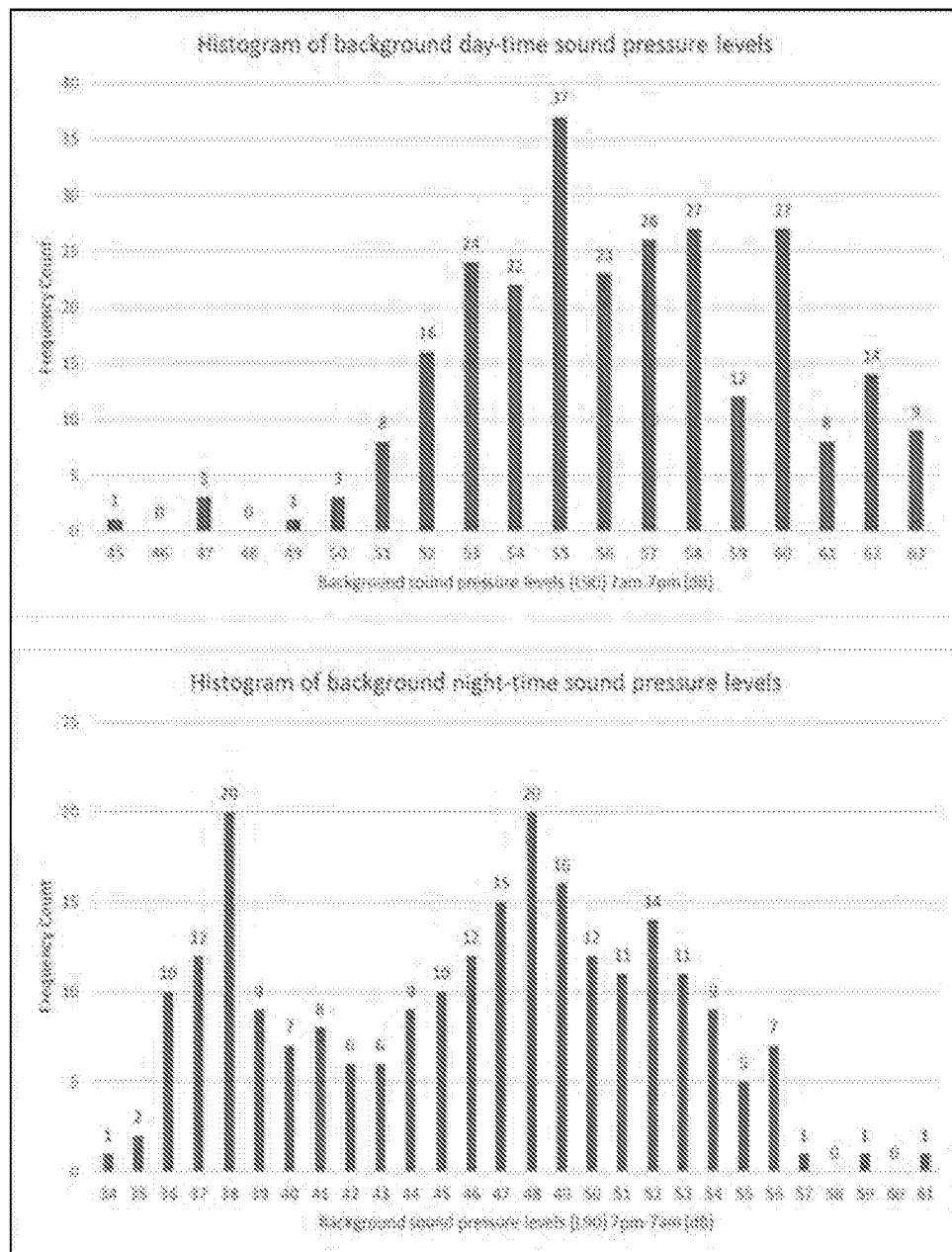


Figure 3: Histogram of background ($L_{A90,15min}$) noise during day-time and night-time periods at Location B

3.4 BREEAM Pol 05 “Reduction of Noise Pollution” requires that ... *“the noise level from the proposed site/building, as measured in the locality of the nearest or most exposed noise-sensitive development, is the difference no greater than +5dB during the day (07:00 to 23:00) and +3dB at night (23:00 to 07:00) compared to the background noise level”*. Furthermore, in the “Planning Noise Advice

Document: Sussex" (dated July 2015), reference is made to noise assessment policies and procedures³. The document confirms that noise assessment for this application should be made in accordance with BS4142: 2014⁴. Using this method, the resulting noise associated with the proposed plant and equipment is compared to the existing background noise level (L_{A90}). The night time will usually be the critical period in terms of noise assessment. The methodology given in [4] also takes account of potential impulsive and/or tonal characteristic for noise (by weighting the noise level by an additional factor dB). The assessment method describes the "magnitude of impacts" by subtracting the measured background noise level from the rating (or noise associated with the new plant) level such that:

- *A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.*
- *A difference of around +5 dB 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.*

3.5 Notwithstanding this, Annex 1 of "Planning Noise Advice Document: Sussex" gives specific guidance for recommended noise thresholds to be achieved. In Annex 1 (for industrial and commercial sites) the *"The rating level of the plant should, where practicable, be no greater than the existing*

³ See also Arun District Council "saved policy" GEN32 Noise Pollution which is understood to date from 2003.

⁴ British Standard BS4142: 2014 "Methods for Rating Industrial and Commercial Sound" is the most appropriate and current method for determining acceptability etc associated with new industrial plant and equipment in these applications.

background levels..." It is this this requirement rather than BREEAM Pol 05 which is the more onerous of the two policies and therefore it is the local authority "Planning Noise Advise" criteria which has been used in this assessment. As a result, day-time rating noise levels should be no greater than 55 dB(A) for properties on Littlehampton Road itself and 52 dB(A) for all other properties/areas and corresponding night-time rating noise levels should be no greater than 30 dB(A) and 36 dB(A) respectively.

3.6 The precise details of proposed plant and equipment planned for the development are not known at this stage, however it is understood that the proposed new car showroom, offices and workshop will incorporate equipment that is equivalent to that used on the existing and similar sites. Fixed items of plant which will potentially operate 24 hours per day include external air handling and condensers. Other items which will only operate during normal (day-time) opening hours include air compressors, jet wash and noise from the workshop areas themselves. Noise levels from respective plant items and operations have been measured during visits to the existing car showroom and workshop. These measurements have also been supplemented with measurements from similar installations. Subjective assessment of the various noise sources measured confirmed that they do not contain significant tonal or impulsive characteristics. Details of the measured noise levels and equipment are given in Figure A3. The proposed site layout and (assumed) position of plant items is given in Figure A4.

3.7 A computer based modelling package (IMMI) has been used to determine noise levels (using the ISO9613 algorithm). The building geometry, site

topography and plant locations have been input, the noise model generated and noise levels calculated and displayed in terms of both single point calculation points and a contour map.

3.8 Many of the proposed noise sources are naturally screened from neighbouring properties by the existing car showroom and proposed new development. The acoustic model predicts noise levels from the new plant and equipment to be 28 (A) at the west façade of the nearest property on Littlehampton Road and 40 dB(A) at White Cottage during the day-time when all plant may be operating (with noise contributions from workshops and servicing operations). The night-time noise levels are reduced to 15 and 18 dB(A) respectively as only fixed Heating Ventilation and Air Conditioning (HVAC) will operate. Noise contour maps for both day and night-time periods are given in Figures A5 and A6 respectively at the end of this report. Summary acoustic calculations are given in Figure A7.

3.9 It therefore follows that noise levels from both day-time and night-time operations will be significantly more than 10 dB lower than the existing background noise levels and as such noise from the proposed development will be inaudible at the neighbouring residential properties.

4.0 CONCLUSION

4.1 A noise measurement survey and assessment has been carried out on the external plant and equipment that is to be installed as a part of the proposed new car showroom, offices and workshop at Littlehampton

Road, Ferring near Worthing. The new development is to be located immediately adjacent to the existing Yeoman's Peugeot car dealership and workshop at the site.

4.2 Predicted noise levels are shown to be very low and inaudible at the nearest neighbouring residential properties. The requirements of both planning and BREEAM conditions on noise levels will be met.

APPENDIX A: GRAPHS AND FIGURES.

Figure A1.1: Environmental Noise Measurement Data – Location A (East) -
(Thursday 8th to Tuesday 13th February 2018)

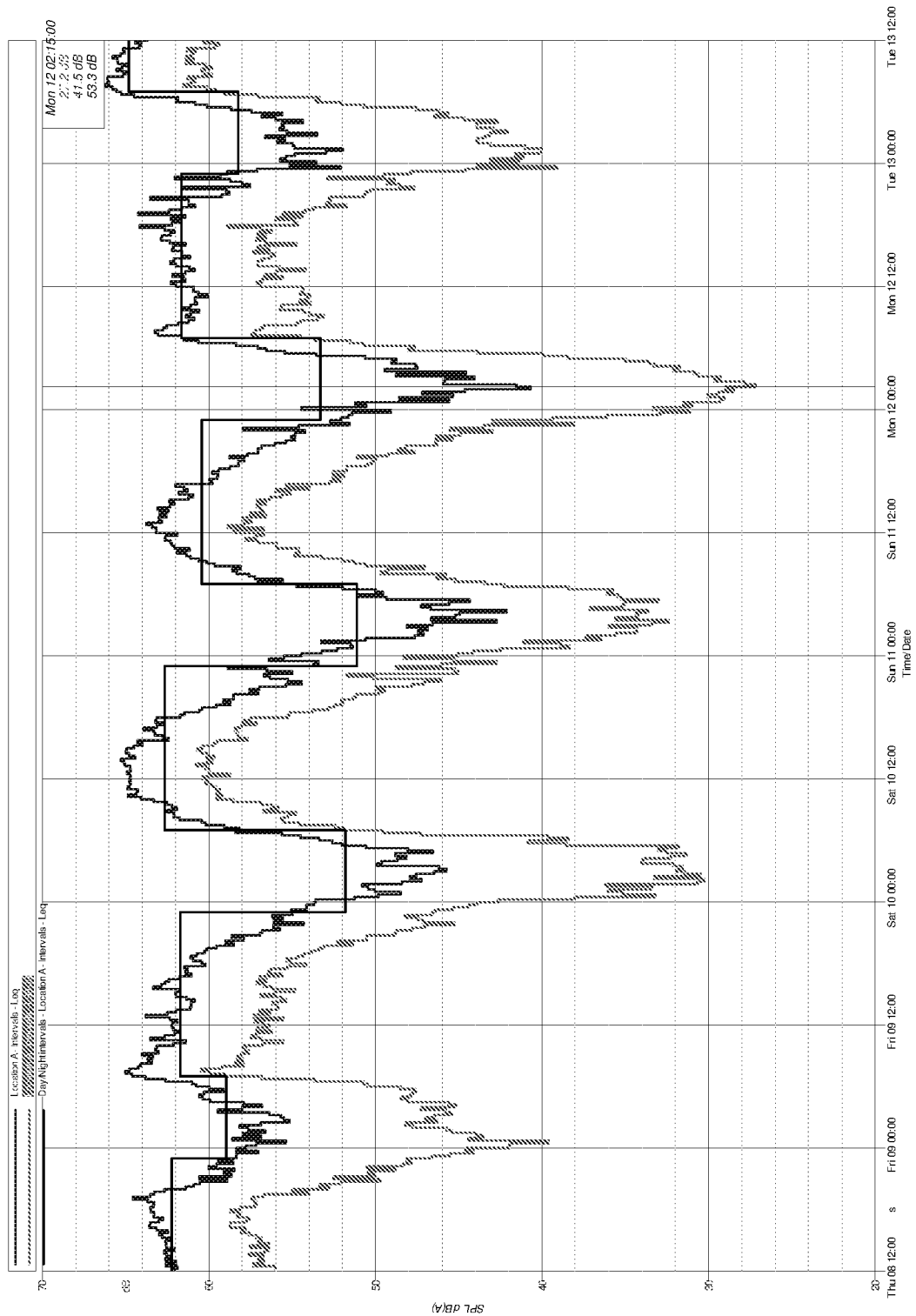
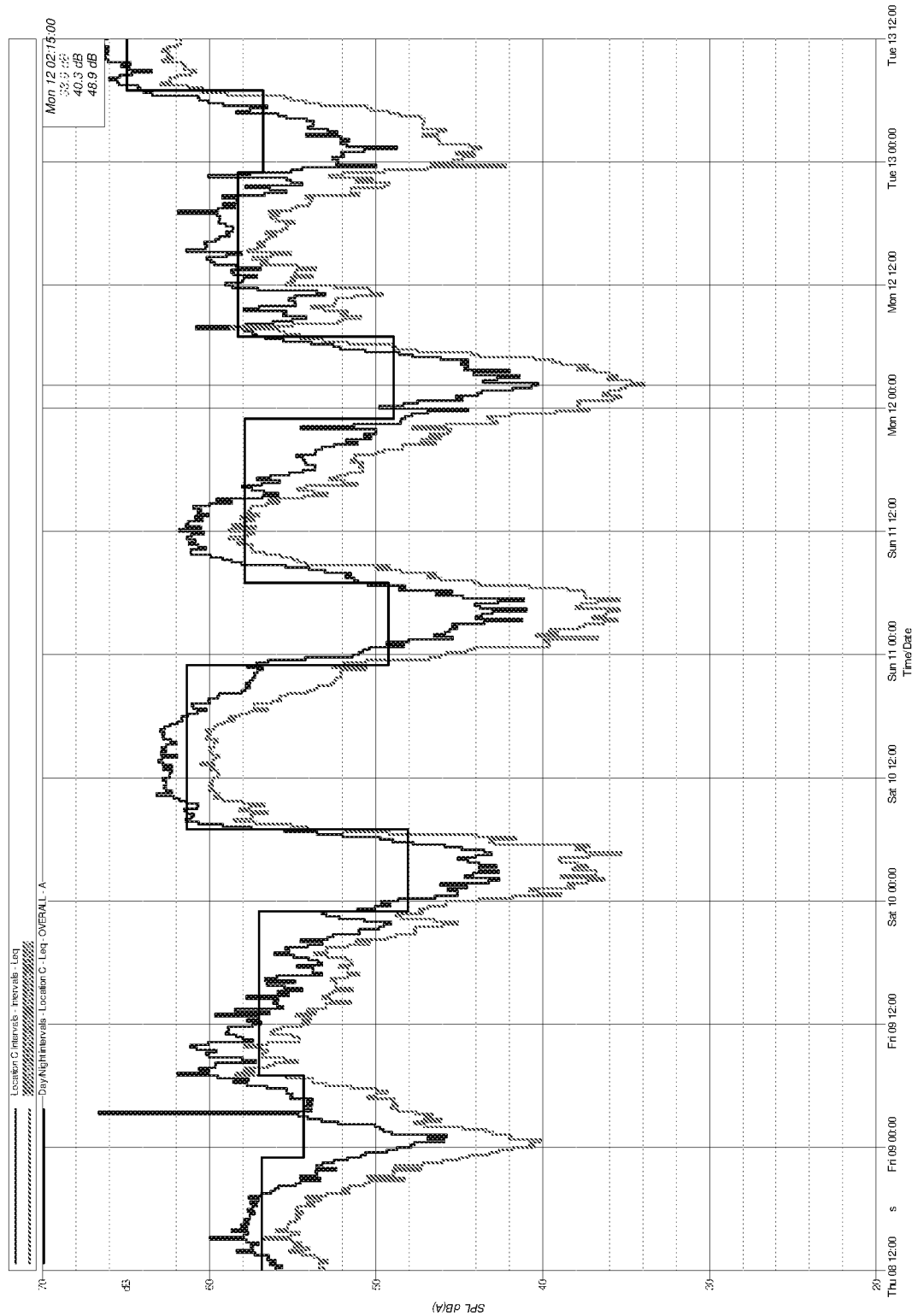


Figure A1.2: Environmental Noise Measurement Data – Location B (North West) - (Thursday 8th to Tuesday 13th February 2018)



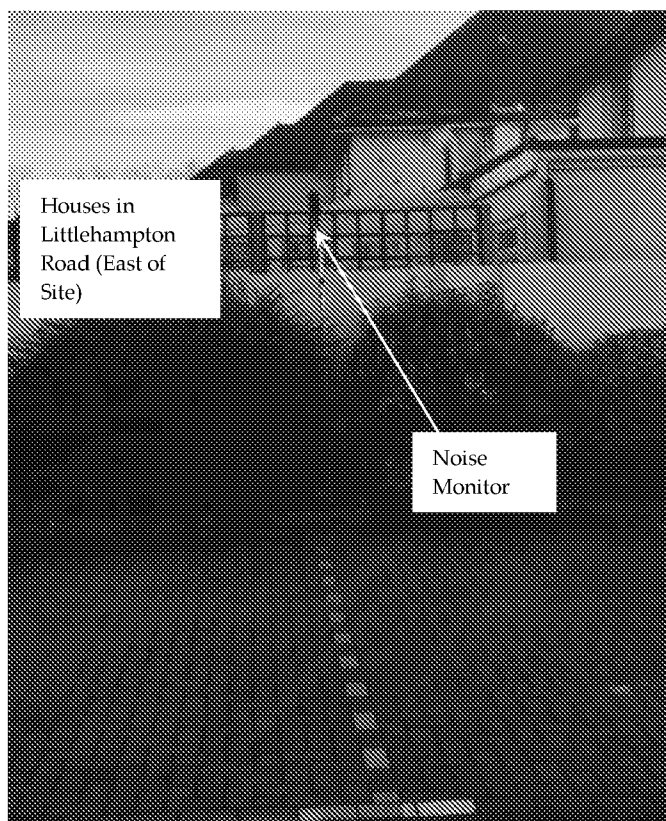


Figure A2.1: Photograph showing noise monitor (Location A)

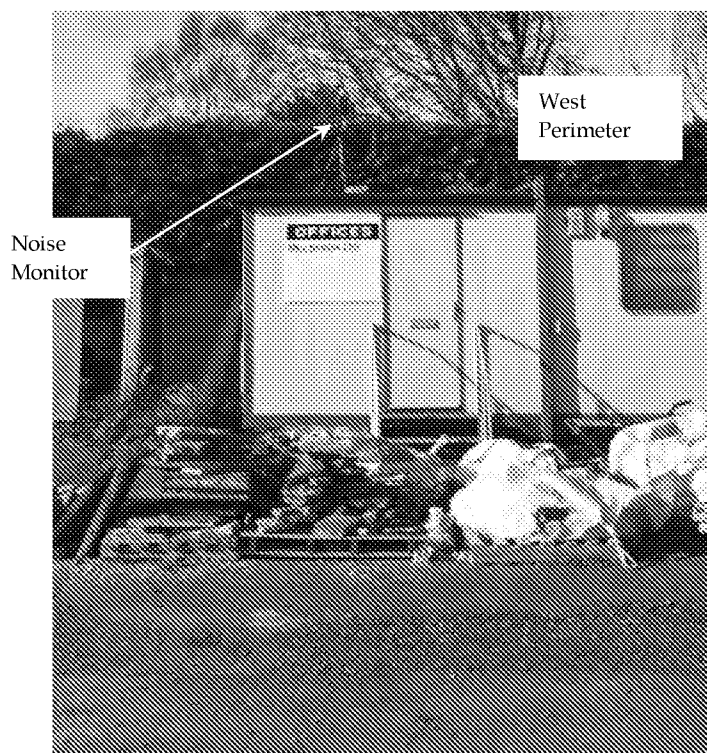


Figure A2.2: Photograph showing noise monitor (Location B)

Figure A3: Equipment Noise Datasheets/Noise Source Measurement Results

Octave Band Centre Frequency (Hz)

Plant Item	63	125	250	500	1k	2k	4k	8k	A
Toilet Extract	68	67	63	63	65	63	57	41	69
York AC on Roof	67	61	59	61	60	56	47	40	64
York AHU	66	65	57	55	55	51	44	36	59
Air Compressor (External)	70	67	70	68	67	70	58	48	74
Open Workshop Door (1m outside)	63	63	64	65	63	64	65	65	71
Exhaust Fan @ 3m	63	62	66	71	67	61	55	48	71
Pressure Washer	59	65	68	72	71	71	70	68	77

Notes:

All noise levels measured were measured at 1m from the plant item (unless otherwise stated below) and given in dB. All data is given in terms of both overall A-weighted Sound Pressure Level and respective Octave Frequency Bands

Figure A4: Proposed layout showing new plant and noise monitoring locations

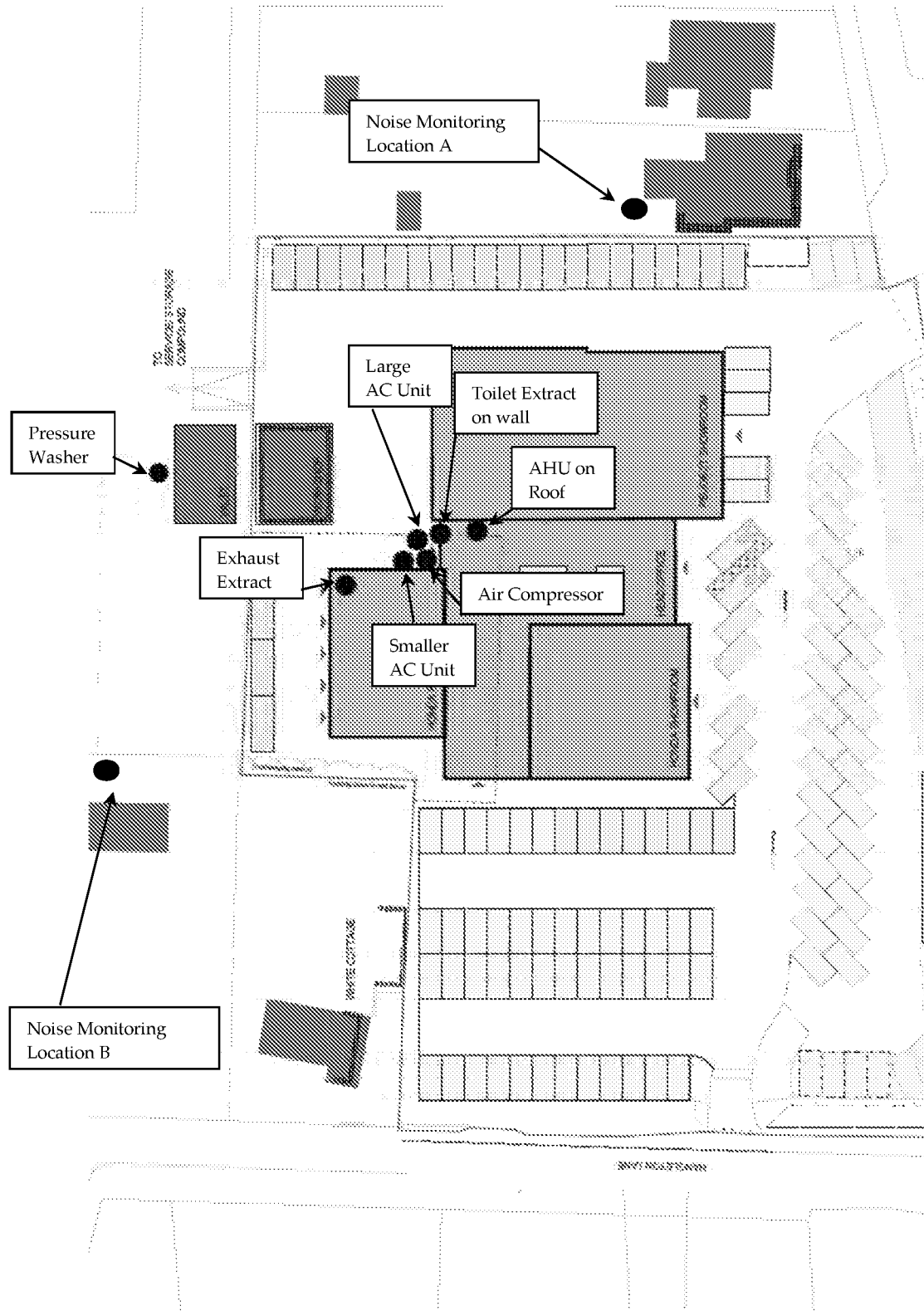


Figure A5: Predicted Noise Level Contour Map (Day-time)

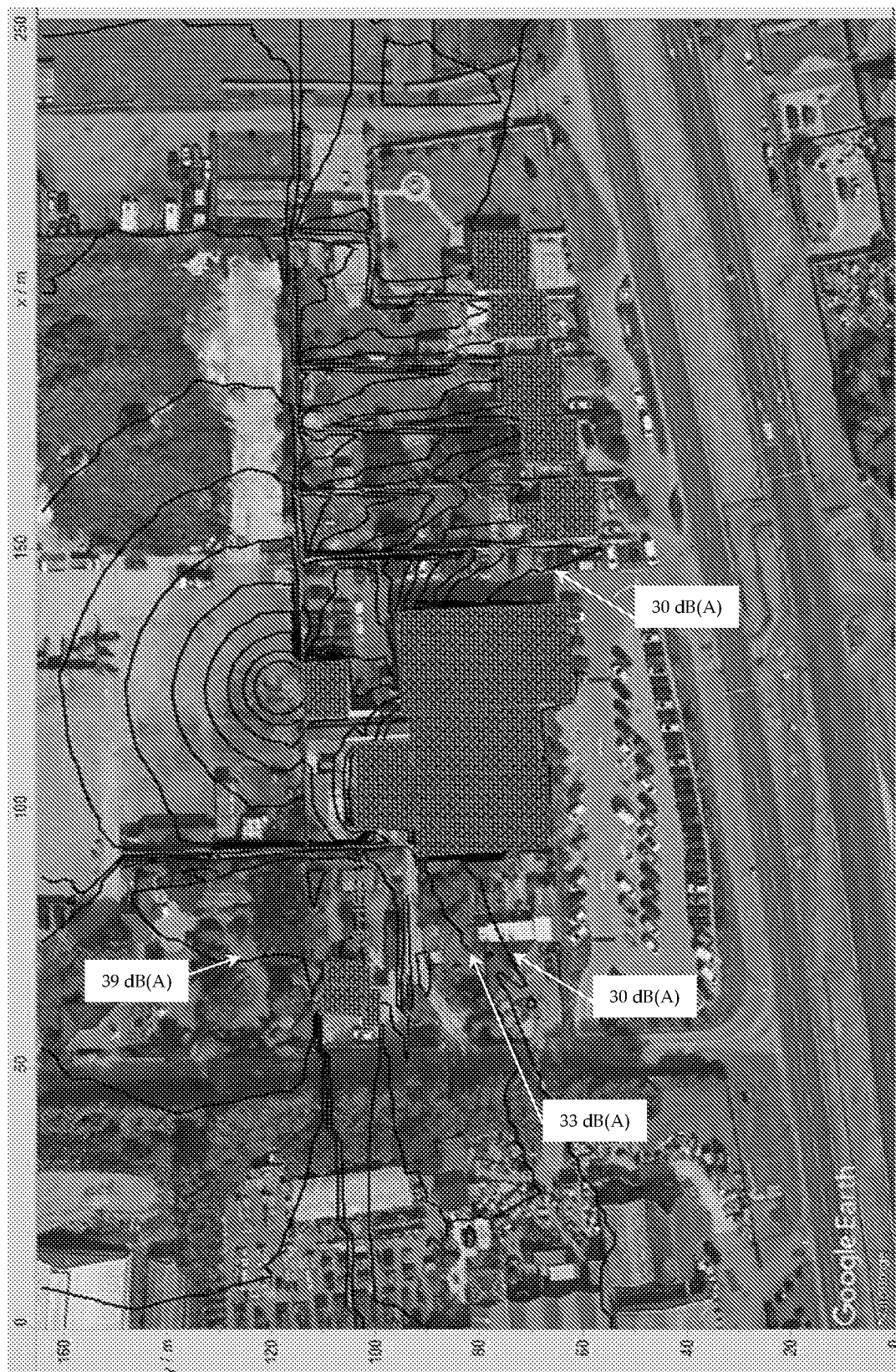


Figure A6: Predicted Noise Level Contour Map (Night-time)

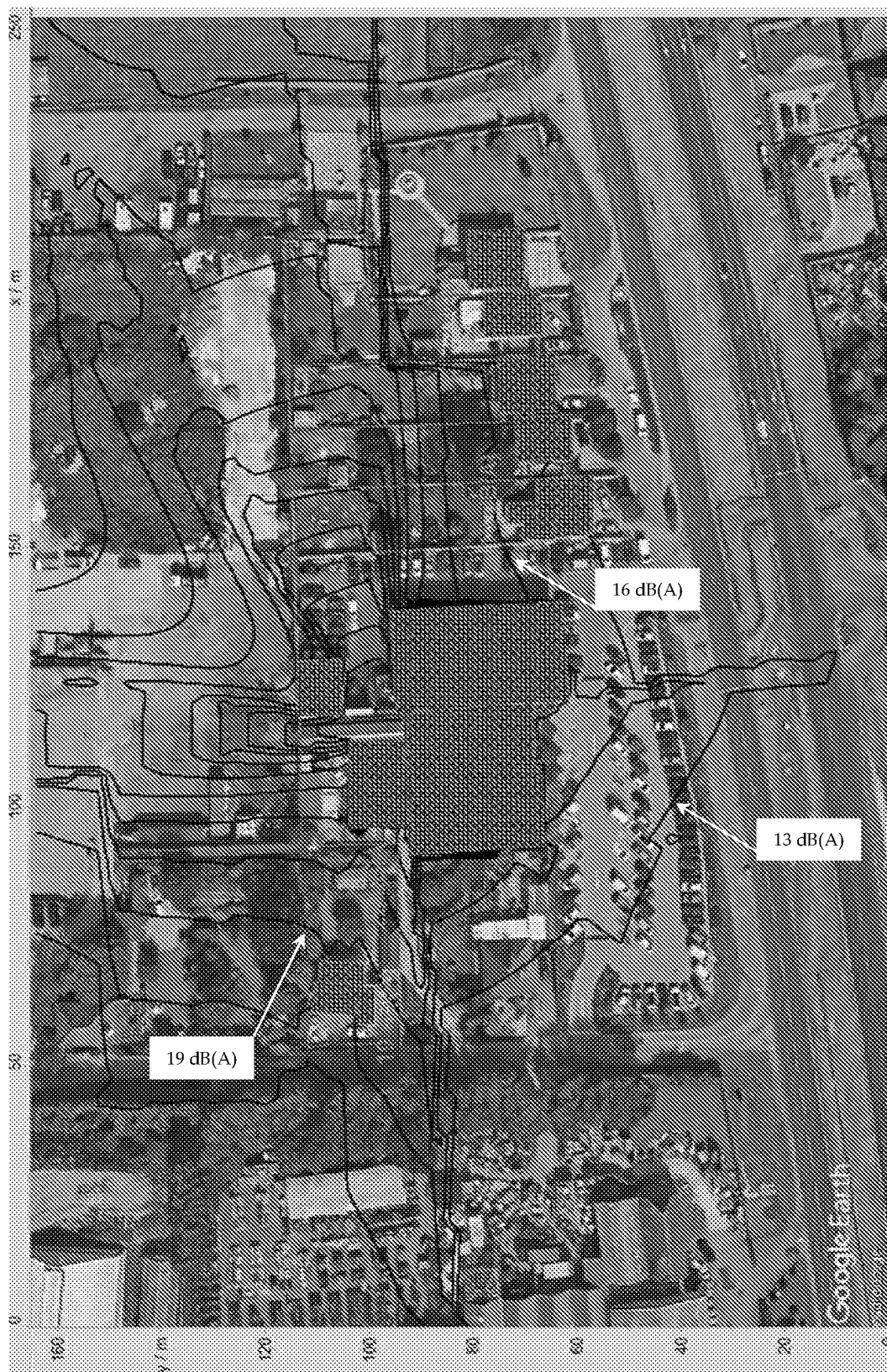




Figure A7: Detailed Acoustic Calculations

Calculated Noise Level at nearest façade/window of White Cottage (Day-time)

Day Time											
Point calculation											
Noise prediction											
			63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	dBA
IPkt001 »	White Cottage Ground Floor	Day Time									
FLQj001 »	Workshop Doors	-	29.861	29.152	29.625	30.312	28.137	28.907	29.107	26.308	35.678
EZQj009 »	Pressure Washer	-	22.045	27.806	30.168	32.994	30.306	27.945	23.268	13.96	35.176
EZQj005 »	Exhaust Fan 1	-	31.269	29.544	32.313	35.741	29.95	21.661	12.314	-0.836	35.131
EZQj002 »	AHU on Roof	-	29.971	28.641	19.765	16.19	14.111	7.481	-3.259	-18.181	19.399
EZQj008 »	Air Compressor	-	26.568	19.575	18.372	13.387	11.999	14.57	1.461	-12.324	18.957
EZQj004 »	Toilet Extract	-	26.221	21.461	13.434	9.933	9.047	6.761	-0.341	-20.357	14.417
EZQj001 »	Large AC Unit	-	30.765	22.796	10.595	8.318	1.928	-1.503	-4.298	-7.355	11.895
EZQj003 »	AC on Roof	-	23.782	13.814	7.606	6.372	4.988	0.562	-9.229	-20.225	9.468
	Sum spectrum	A	11.408	19.344	27.269	35.19	34.42	33.209	31.198	25.464	40.198



Calculated Noise Level at nearest façade/window of Littlehampton Road (Day-time)

Day Time											
Point calculation											
Noise prediction											
			63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	dBA
IPkt009 »	No 2. Ground Floor	Day Time									
EZQI005 »	Exhaust Fan 1	-	24.043	21.7	23.612	26.175	19.462	10.645	0.555	-14.443	25.308
EZQI009 »	Pressure Washer	-	16.702	19.605	19.553	20.544	16.47	13.111	15.572	5.939	22.761
EZQI002 »	AHU on Roof	-	29.062	27.334	17.973	14.123	11.83	5.148	-5.705	-20.927	17.493
EZQI008 »	Air Compressor	-	22.604	15.771	15.223	11.117	9.701	12.209	-1.19	-16.058	16.472
EZQI004 »	Toilet Extract	-	25.39	21.05	13.877	10.828	9.752	5.541	-1.717	-22.303	14.493
FLQI001 »	Workshop Doors	-	14.674	11.047	8.6	6.847	4.242	4.625	3.91	-1.205	11.419
EZQI001 »	Large AC Unit	-	26.799	18.964	7.419	6.164	-0.251	-3.742	-7.134	-10.976	8.824
EZQI003 »	AC on Roof	-	20.923	11.124	5.625	4.396	2.661	-1.836	-12.244	-24.138	7.179
	Sum spectrum	A	7.352	14.112	17.997	24.512	22.36	18.947	17.193	5.75	28.348



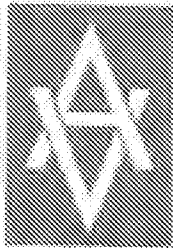
Calculated Noise Level at nearest façade/window of Residential at White Cottage (Night-time)

Night Time											
Point calculation											
Noise prediction											
			63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	dBA
IPkt008 »	White Cottage First Floor	Night Time									
EZQi001 »	Large AC Unit	-	35.604	28.009	15.857	13.184	4.888	-0.002	-4.204	-7.983	16.486
EZQi003 »	AC on Roof	-	27.565	17.675	11.375	9.667	6.726	1.214	-8.902	-21.015	11.973
	Sum spectrum	A	10.038	12.294	8.581	11.582	8.914	4.859	-1.936	-8.872	17.801

Calculated Noise Level at nearest façade/window of Littlehampton Road (Night-time)

Night Time											
Point calculation											
Noise prediction											
			63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	dBA
IPkt004 »	No 2. First Floor	Night Time									
EZQi001 »	Large AC Unit	-	30.807	22.679	10.572	8.366	1.029	-3.042	-6.772	-10.804	11.628
EZQi003 »	AC on Roof	-	25.278	16.042	10.747	9.617	6.212	0.361	-10.991	-23.473	11.314
	Sum spectrum	A	5.679	7.432	5.07	8.847	7.362	3.195	-4.378	-11.675	14.484

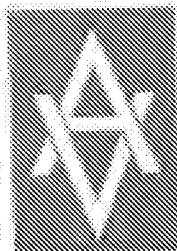
APPENDIX B: CALIBRATION CERTIFICATES.

CERTIFICATE OF CALIBRATION ISSUED BY AV CALIBRATION		 UKAS CALIBRATION 0653
Date of issue	18 August 2016	Certificate N° 08383
	AV Calibration 2 Warren Court Chicksands, Shefford Bedfordshire SG17 6QB U.K. Tel: +44 (0)1462 636600 Fax: +44 (0)1462 636601 Email: lab@avcalib.co.uk www.avcalibration.co.uk	
	Page 1 of 3 Pages	
	Approved Signatory	
	G. Parry [] B. Baker [] J. Harriman []	
	Approved: Hazardous Wastes Ltd trading as AV Calibration	
CLIENT	Sound Solution Consultants Ltd Cornwall Suite Dencora Business Centre Whitthouse Road Ipswich IP1 5LP	
F.A.O.	Steve Barry	
ORDER No	SSC240316	Job No UKAS16/08281/01
DATE OF RECEIPT	03 August 2016	
PROCEDURE	AV Calibration Engineer's Handbook, section 25: periodic testing of sound level meters to IEC 61672-3:2006 (BS EN 61672-3:2006) as modified by UKAS TPS 40 Edition 2 June 2009	
IDENTIFICATION	Sound level meter Larson-Davis type 831 serial No 0004221 connected via a preamplifier type PRM831 serial No 046377 to a half-inch microphone type PCB 377B02 serial No 164258. Associated calibrator Larson-Davis type CAL200 serial No 7544 with a half-inch housing.	
CALIBRATED ON	18 August 2016	
PREVIOUS CALIBRATION	None known	

CERTIFICATE OF CALIBRATION

ISSUED BY AV CALIBRATION

Date of issue 12 August 2016 Certificate No. 08557



AV Calibration
2 Warren Court
Chicksands, Sheffield
Bedfordshire SG17 5GB
U.K.
Tel: +44 (0)1462 838603
Fax: +44 (0)1462 838601
Email: lab@avcalib.co.uk
www.avcalibration.co.uk

Page 1 of 3 Pages

Approved Signatory

G. Parry [Signature]

S. Baker [Signature]

J. Harriman [Signature]

Accuracy: Mass and Volume: 1.0% being an AV Calibration

CLIENT Sound Solution Consultants Ltd
Cornwall Suite
Dencore Business Centre
Whitehouse Road
Ipswich
IP1 5LP

F.A.O. Steve Skingle

ORDER No SSC240316

Job No UKAS16/08259/02

DATE OF RECEIPT 03 August 2016

PROCEDURE AV Calibration Engineer's Handbook section 3: verification of sound level meters to BS 7580:Part 1:1997

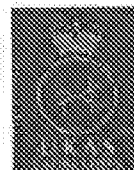
IDENTIFICATION Sound level meter Larson Davis type 824 serial No A4074 connected via a preamplifier type PRM902 serial No 4668 to a half-inch microphone type PCB 377B02 serial No 1463930. Associated calibrator Larson Davis type CAL200 serial No 8121 with a half inch housing.

CALIBRATED ON 12 August 2016

PREVIOUS CALIBRATION Calibrated on 18 August 2014 Certificate No. U16856 issued by a UKAS accredited calibration laboratory No. 0789



CERTIFICATE OF CALIBRATION



0853

Date of Issue: 07 April 2017

Certificate Number: UCRT17/1248

Issued by:

ANV Measurement Systems

Beaufort Court

17 Roebuck Way

Milton Keynes MK5 8HL

Telephone 01908 642846 Fax 01908 642814

E-Mail: info@noise-and-vibration.co.uk

Web: www.noise-and-vibration.co.uk

Acoustics Noise and Vibration Ltd trading as ANV Measurement Systems

Page	1	of	2	Pages
Approved Signatory				
 J. Harman				

CUSTOMER

Sound Solution Consultants Ltd
Cornwall Suite
Dencora Business Centre
Whitehouse Road
Ipswich
IP1 5LP

ORDER No.

27285

Job No

UKAS17/04148

DATE OF RECEIPT

05 April 2017

PROCEDURE

Procedure TP 1 Calibration of Sound Calibrators or Calibration Engineer's Handbook section 2

IDENTIFICATION

Sound Calibrator Larson Davis type CAL200 serial number 7544 with half-inch housing

CALIBRATED ON

07 April 2017

PREVIOUS

CALIBRATION

Calibrated on 18 April 2016, Certificate No. 09106 issued by this laboratory.

APPENDIX C: GLOSSARY OF NOISE TERMS AND UNITS.

1.0 Noise

- 1.1 The sounds that we hear are as a result of successive air pressure changes. These air pressure changes are generated by vibrating sources, such as train engines or wheels, and they travel to a receiver, i.e. the human ear, as air pressure waves.
- 1.2 The human ear is capable of detecting a vast range of air pressures, from the lowest sound intensity that the normal ear can detect (about 10^{-12} watts/m²) to the highest that can be withstood without physical pain (about 10 watts/m²). If we were to use a linear scale to represent this range of human sensitivity it would encompass more than a billion units. Clearly this would be an unmanageable scale yielding unwieldy numbers.
- 1.3 The scale can be compressed by converting it to a logarithmic or Bel scale, the number of Bels being the logarithm to the base 10 of one value to another (as applied by Alexander Graham Bell to measure the intensity of electric currents). The Bel scale gives a compressed range of 0 to 12 units which in practice is a little too compressed. A more practical operating range of 0 to 120 is obtained by multiplying by 10, i.e. 10 x Bel, which produces the scale units known as decibels or dB.
- 1.4 Examples of typical sound intensity levels within the decibel range of 0 to 120 dB are listed below:

Commercial four-engine jet aircraft at 100m	120dB
Riveting of steel plate at 10m	105dB
Pneumatic drill at 10m	90dB
Circular wood saw at 10m	80dB
Heavy road traffic at 10m	75dB

Male speech, average, at 10m	50dB
Whisper at 10m	25dB
Threshold of hearing, 100Hz	0dB

- 1.5. Due to this logarithmic scale noise levels have to be combined logarithmically rather than arithmetically. For example, two equal sound sources of 70 dB each, when operated simultaneously, do not produce a combined level of 140 dB but instead result in a level of 73 dB, ie. A rise of 3dB for each doubling of sound intensity. Subjectively, a 3dB change does not represent a doubling or halving of loudness; to make a sound appear twice as loud requires an increase in sound pressure level of about 10dB.
- 1.6. The subjective loudness of noise can be measured by applying a filter or weighting which equates to the frequency response of the human ear. This is referred to as an A-weighting and when applied results in noise levels expressed as dB(A).
- 1.7. dB(A) noise levels can be measured using a variety of noise indices. The index which correlates best with human response due to machinery noise is the L_{Aeq} this is the A-weighted L_{eq} which is referred to as the 'equivalent continuous noise level' and is a measure of the total sound energy generated by a fluctuating sound signal within a given time period.