ARCUS

MERCHANT FIELDS
NOISE ASSESSMENT

NOVEMBER 2015

Prepared By:

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1 INTRODUCTION

Arcus Consultancy Services Ltd (Arcus) have been commissioned by Harron Homes Ltd to undertake a noise assessment in relation to a site for the potential development of housing, community facilities and a primary school at Merchant Fields, Cleckheaton ('the Site').

The aim of this assessment is to determine the existing noise climate, and to compare these levels to relevant policy and guidance in order to assess the suitability of the site for the proposed type of development.

2 SITE OVERVIEW

The Site is located between existing residential housing on Kilroyd Avenue to the north, and Brookfield View to the south. Although the site is currently open fields, the surrounding environment is generally urban, with the southwestern boundary adjacent to an industrial estate on Riverside Drive.

To the north of the site, the dominant noise source is road noise from the A58 and Kilroyd Drive. The southern side of the site is dominated by noise from the industrial estate.

3 NOISE POLICY AND GUIDANCE

The following guidance and standards are pertinent to the assessment:

- The National Planning Policy Framework (NPPF)[1];
- The Noise Policy Statement for England (NPSE)[2];
- Planning Practice Guidance - Noise[3];
- Planning Policy Guidance 24: Planning and Noise[4];
- WHO Guidelines for Community Noise[5];and
- WHO Night Noise Guidelines[6].

3.1 The National Planning Policy Framework

The NPPF sets out the Government's planning policies for England, providing a framework within which local policies can be developed. Chapter 11 of NPPF concerns the conservation and enhancement of the natural environment, which states that this can be achieved by:

- Preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability.

With regards to noise, the NPPF states that sustainable development can be achieved by:

- Avoiding noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;
- Mitigating and reducing to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions;

[1] National Planning Policy Framework, Department for Communities and Local Government, 2012.
[2] Noise Policy Statement for England, DEFRA, March 2010.
[3] Planning Practice Guidance – Noise, http://planningguidance.planningportal.gov.uk/blog/guidance/noise/noise-guidance/ [Accessed 08/11/2015]
[4] Planning Policy Guidance 24: Planning and Noise, 1994, Department for Communities and Local Government.
[5] Guidelines for Community Noise, 1999, World Health Organisation.
[6] Night Noise Guidelines, 2009, World Health Organisation

- Recognising that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established, and
- Identifying and protecting areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

3.2 The Noise Policy Statement for England

The NPSE sets out the role and purpose of noise policy, which is to "promote good health and good quality of life through the effective management of noise within the context of policy on sustainable development".

This is supported by three aims:

- "avoid significant adverse impacts on health and quality of life;
- mitigate and minimise adverse impacts on health and quality of life; and
- where possible, contribute to the improvements of health and quality of life."

In addition, the NPSE introduces the concepts of NOEL, LOAEL and SOAEL, which are described as follows;

"NOEL – No Observed Effect Level

This is the level below which no effect can be detected. In simple terms, below this level, there is no detectible effect on health and quality of life due to the noise.

LOAEL – Lowest Observed Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected.

SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur."

It goes on to state that it is not possible to have a single noise based measure that can apply to all sources of noise in all situations, as such SOAEL values are dependent on the site specific noise sources and receptors.

3.3 Planning Practice Guidance – Noise

Planning Practice Guidance was issued in March 2014 and provides additional guidance on the NPPF. It states that Local Authorities should consider the acoustic environment when decision-taking, in particular:

- *"whether or not a significant adverse effect is likely to occur;*
- *whether or not an adverse effect is occurring or likely to occur; and*
- *whether or not a good standard of amenity can be achieved."*

In line with the NPSE, the PPG references the LOAEL and SOAEL in relation to noise impact. As with NPSE, it does not provide objective noise levels for LOAEL or SOAEL, although it does acknowledge that:

"…the subjective nature of noise means that there is not a simple relationship between noise levels and the impact on those affected. This will depend on how various factors combine in any particular situation".

It provides examples of these factors, which are summarised below:

- The source and level of noise combined with the time of day the noise occurs;
- The number, frequency and pattern of individual noise events; and

- The spectral content and general character of the noise;

It goes on to provide more specific factors which can be taken into consideration when relevant. In relation to the appropriateness of a site for a housing development, as in this case, the following are relevant:

- Whether adverse internal impacts can be completely removed by closing windows, or if proposed mitigation relies on windows being closed most of the time; and
- The effect of new residential development being located close to an existing business that gives rise to noise;

3.4 Planning Policy Guidance 24: Planning and Noise

Although PPG 24 is now defunct, having been replaced by NPPF in 2012, the PPG 24 Noise Exposure Categories (NEC's) are considered to still provide a useful indication of the acoustic suitability of a site. The NEC's range from A – D, where Category A "*relates to the situation in which noise is unlikely to be a determining factor*" and Category D "*relates to the situation in which development should normally be refused*". Categories B and C relate to situations when noise mitigation may be implemented to make the development acceptable.

PPG 24 specifies noise levels corresponding to each of the Noise Exposure Category for new dwellings depending on the dominant noise. As discussed in Section 2, the dominant noise source around the Development is from traffic and industrial operations; as such, the levels relating to mixed sources have been adopted for this assessment. The levels are reproduced in Table 1 below.

Table 1: Recommended NEC's for New Dwellings near Existing Mixed Sources

Time	Noise Levels Corresponding to the Noise Exposure Categories for New Dwellings, LAeq,T, dB			
	A	B	C	D
0700 – 2300	<55	55 – 63	63 – 72	>72
2300 - 0700	<45	45 – 57	57 - 66	>66

3.5 WHO Guidelines for Community Noise

The World Health Organisation (WHO) *Guidelines for Community Noise* provide guidance to Environmental Health Authorities and those involved with protecting people from the harmful effects of noise. It outlines the health risks of exposure to environmental noise and offers guidelines to minimise exposure. The Guidelines advise that noise impacts include annoyance, speech interference and sleep disturbance.

Separate noise limits are recommended for daytime and night-time periods (0700 – 2300 and 2300 – 0700 respectively). During daytime periods, the recommendation is for external noise levels (i.e. in gardens of the proposed dwellings) not to exceed 50 dB, $L_{Aeq,16hour}$.

The recommended internal limit for living areas (e.g. bedrooms) during night-time periods is 30 dB, $L_{Aeq,8hour}$ for continuous noise on the basis that, as assumed in the Guideline, an open window offers a reduction in noise level of 15 dB. This limit therefore equates to an external noise level of 45 dB, $L_{Aeq,8hour}$ for night-time periods.

With regards to individual noise events, the guidelines state that:

"For a good sleep , it is believed that indoor sound pressure levels should not exceed approximately 45 dB,L_{Amax} more than 10-15 times per night"

This limit therefore equates to an external noise level of 60 dB, L_{Amax} for night-time periods.

3.6 WHO Night Noise Guidelines

The WHO Night Noise Guidelines for Europe (1999) are considered an extension to the WHO Guidelines for Community Noise, and sets out a recommended night noise level of 40 dB, L_{night} (averaged over one year) to protect the public, including the most vulnerable groups such as children, the chronically ill and the elderly, with an interim target of 55 dB, L_{night}. With regards to individual noise events, the internal noise level below which there are no observed effects is reduced from that in the Community Noise Guidelines by 3 dB to 42 dB, L_{Amax} to prevent sleep disturbance. This equates to an external level of 57 dB, L_{Amax} for night time periods.

4 ASSESSMENT CRITERIA

Since the withdrawal of PPG24, the guidance from NPSE regarding NOEL, LOAEL and SOAEL can be used to determine the suitability of a site for residential development. In the absence of specific noise limits specified in NPSE, the levels provided in PPG24, modified to reflect updated guidance from the WHO on night-time noise, have been used as demonstrated in Table 2 below;

Table 2: Noise Impact Levels

	NOEL $L_{Aeq,t}$	**LOAEL $L_{Aeq,t}$**	**SOAEL $L_{Aeq,t}$**
0700 – 2300	<55	55 – 63	63 – 72
2300 - 0700	<40	40 – 55	>55

A night-time of 57 dB, L_{Amax} limit for individual events has been derived from a 42 dB L_{Amax} internal limit on the assumption that an open window offers 15 dB noise reduction.

5 BASELINE NOISE MONITORING

In order to establish the ambient noise environment in the locality of the Site, a background noise survey was undertaken at two locations around the site. The first location was to the north of the site, on the existing private road to Merchant Fields Farm. The noise monitoring equipment for the second location was placed on the southern boundary of the site, with a direct line of sight to the industrial estate on Riverside Drive. Survey record sheets detailing equipment grid references, photographs and specific details of each monitoring location can be found in Appendix 1.

Noise monitoring was undertaken continuously from the morning of the 3rd to the morning of the 5th of November. Weather conditions during the survey were generally mild and foggy; no significant levels of rainfall were recorded during the monitoring survey. Wind speeds during the survey period were also low[7]. Calibration certificates for the noise monitoring equipment deployed on site are provided in Appendix 2.

The noise monitoring equipment consisted of two Type 1 sound level meters, calibrated to UKAS standards and housed in all-weather cases with extended-life batteries. The microphones were positioned at a height of approximately 1.4 m above ground level, within dual-layer windshields. A logging rain gauge was also installed on site, to enable any unrepresentative periods of heavy rainfall to be excluded from the subsequent data

[7] The maximum average daily wind speed over the monitoring period was 6 m/s - http://www.wunderground.com/history/airport/EGNM/2015/11/3/WeeklyHistory.html?req_city=Cleckheaton&req_state=&req_statename=United+Kingdom&reqdb.zip=00000&reqdb.magic=8&reqdb.wmo=03345 [Accessed 08/11/2015]

analysis. The sound level meters were field-calibrated at the start and end of the survey period; no significant calibration drift was found.

Various time indices were measured by the equipment during the survey period, including $L_{Aeq,15min}$, $L_{A90,15min}$ and $L_{Amax,15min}$.

6 RESULTS

Charts 1 and 2 show a summary of the noise levels measured during the survey period, detailing the $L_{Aeq,15min}$, $L_{A90,15min}$ and $L_{Amax,15min}$ levels at each of the two monitoring locations.

Chart 1: Noise Survey Time-History Chart – Location 1

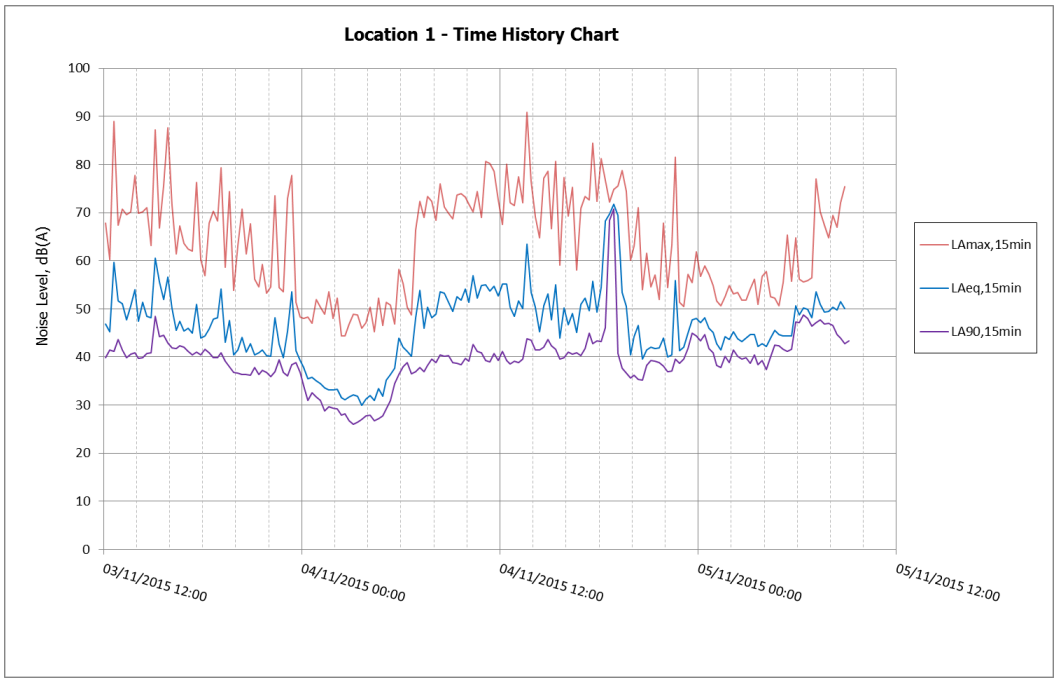


Chart 2: Noise Survey Time-History Chart – Location 2

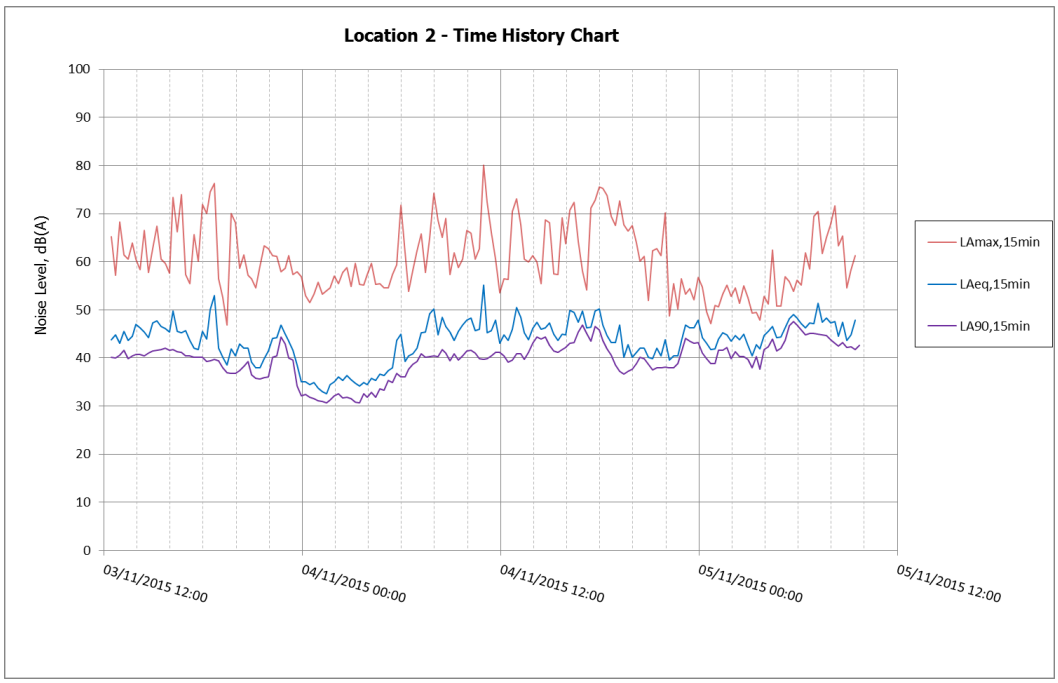


Table 3 summarises the results of the noise survey. $L_{Aeq,15min}$ measurements have been converted to $L_{Aeq,16hr}$ and $L_{Aeq,8hr}$ measurements through logarithmic averaging of the measurements from the relevant time period to enable comparison with the criteria specified in Section 4. L_{Amax} values have not been averaged; in this case, Table 3 details the highest recorded L_{Amax} level for relevant time period.

The highest daytime, night-time and max noise level at each location are highlighted in bold; it is these values upon which the assessment has been undertaken, as a conservative approach.

Chart 1 shows an hour long period of elevated noise levels starting 1750 on Wednesday 04th November. During this hour, levels increase from around 50 dB to around 70 dB. Due to the level of this increase, it is determined that this is not representative of the location and has therefore been excluded from the analysis. It was noted during the second site visit that hedges around the monitoring location had been cut, which may explain the higher level of noise during this period.

Table 3: Noise Survey Results

Date	Daytime (0700 – 2300)	Night-time (2300 – 0700)	
	dB, $L_{Aeq,16hr}$	**dB, $L_{Aeq,8hr}$ dB,**	**dB, L_{Amax}**
Location 1			
03/11/2015	51	42	72
04/11/2015	**52**	**47**	**77**
Location 2			
03/11/2015	45	39	**72**
04/11/2015	**47**	**45**	62

7 ASSESSMENT OF NOISE IMPACT

Tables 4 and 5 below detail the highest measured noise levels, shown in bold in Table 3, along with the corresponding assessment criteria detailed in Table 2.

Table 4: Noise Impact Assessment - Location 1

Location 1	Daytime (dB, $L_{Aeq16hr}$)	Night-time (dB, $L_{Aeq,8hr}$)
Measured Noise Level	52	47
Noise Impact Level	NOEL	LOAEL

Table 5: Noise Impact Assessment - Location 2

Location 2	Daytime (dB, $L_{Aeq16hr}$)	Night-time (dB, $L_{Aeq,8hr}$)
Measured Noise Level	47	45
Noise Impact Level	NOEL	LOAEL

At both locations, daytime levels are below or equal to the NOEL level. However, night-time levels are within the LOAEL range.

With regards to the night-time individual noise events, the 57 dB L_{Amax} limit was exceeded at Location 1 four times during the first night and eight times during the second night. At Location 2, the limit was exceeded fifteen times during the first night and three times during the second night. The majority of these exceedances occurred around either 2300 or 0600 (i.e. at the start or end of a night-time period). As discussed in Section 3.5, WHO Guidelines recommend that the limit should not be exceeded more than 10-15 times in a night.

It is therefore recommended that the effects of noise are taken into account in the design of the site. Provision of appropriate noise mitigation should be considered in the design of the site in order to ensure that any future potential residents are not exposed to adverse levels of noise. On this basis, it is considered that the amenity of future residents of Development will not be significantly impacted by noise.

8 CONCLUSION

Arcus has been commissioned by Harron Homes to undertake a noise assessment in relation to the development of housing at Merchant Fields, Cleckheaton.

The aim of the assessment was to determine the existing noise climate, and to compare the levels to relevant policy and guidance in order to assess the suitability of the site for the proposed type of development.

It has been found that, although small exceedances have been found in the night-time criteria, they are not significant enough to preclude development as they can easily be mitigated in the design process. It is considered that with mitigation, both daytime and night-time levels would be below the no observed effect level.

It is therefore concluded that the site is suitable for the proposed type of Development.

APPENDIX 1 – NOISE SURVEY RECORD SHEETS

Noise Survey Record Sheet – Page 1: Location and Equipment Details

Project No:	2210	**Project Name:**	Merchant Fields
Client:	Harron Homes	**Installed by:**	MS
Location No (x/y):	01/02	**Location Name:**	Northern Boundary
Start Date:	03/11/2015	**Start Time:**	11.23

GPS grid reference of equipment:	419079 426672
Monitoring location description:	Northern boundary of the site
Distance from boundary:	Approximately 10 m from northern boundary of the site
Noise sources observed:	Road noise from A58, birds, occasional plane overhead
Reason for selection as monitoring location:	Close to northern boundary of the site to represent likely 'loudest' noise levels.
Reason for precise location of equipment:	For security, the equipment was chained to the fence running along the drive to Merchant Fields Farm. It was placed as far from the telephone line and trees on the other side of the road as possible.
Any restrictions imposed by landowner / occupier:	Advised that equipment should be installed securely (ideally chained).
Additional notes:	

Equipment Details	**Make**	**Model**	**Serial No**	**Last calibration Date**
Sound Level Meter:	RION	NL 52	00510130	28/07/2015
Calibrator:	RION	NC 74	34104515	27/02/2015
Source of Equipment:		Arcus		
Meter Timestamp:		Start	GMT	

Noise Survey Record Sheet – Page 2: Visit Record

Project No	2210	**Location No. (x/y):**	01/02

Installation:

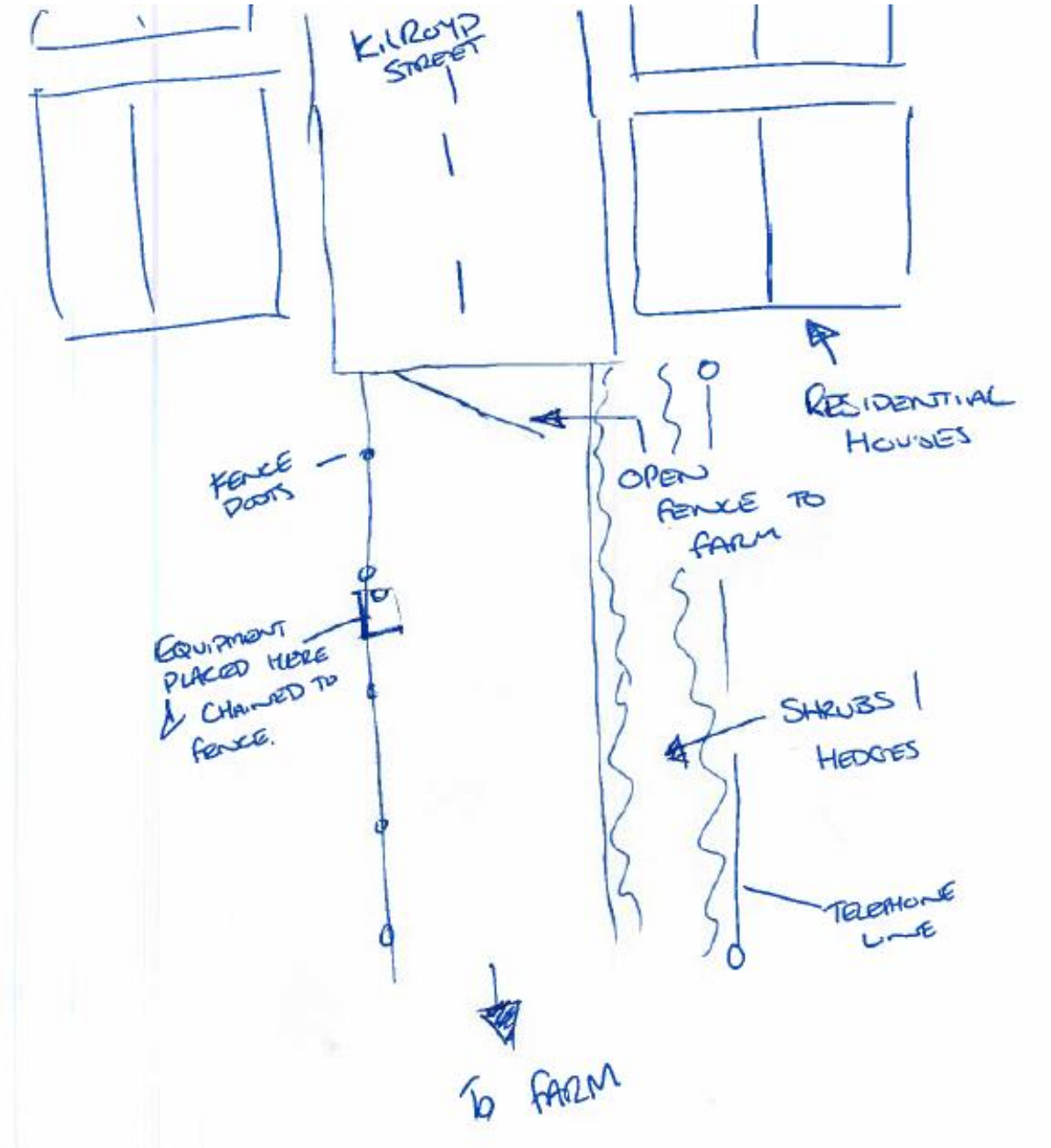
Date:	03/11/2015	**Time:**	11.23
Filename:	01/02	**Calibration level:**	94.0 dB
Range setting:	20-100	**Time weighting:**	Fast
Frequency weighting:	A	**Rain gauge installed:**	Y
Notes: Resident advised that traffic sometimes backs up from the M62 up the A58, significantly increasing noise levels.			

Final Check:

Date:	05/11/2015	**Time:**	09.10
Level pre-calibration:	94.0	**Calibration level:**	94.0 dB
Notes:			

Noise Survey Record Sheet – Page 3: Sketch Plan of Equipment Location

Project No	2210	**Location No. (x/y):**	01/02



Noise Survey Record Sheet – Page 4: Photographs of Equipment Location

Project No	2210	Location No. (x/y):	01/02

Noise Survey Record Sheet – Page 1: Location and Equipment Details

Project No:	2210	**Project Name:**	Merchant Fields
Client:	Harron Homes	**Installed by:**	MS
Location No (x/y):	02/02	**Location Name:**	Northern Boundary
Start Date:	03/11/2015	**Start Time:**	12.12

GPS grid reference of equipment:	418880 426243
Monitoring location description:	Southern boundary of the site
Distance from boundary:	Approximately 10 m from southern boundary of the site
Noise sources observed:	Road noise from Riverside Drive and A638, some industrial noise (reversing lorries and shouted instructions) from Industrial Estate.
Reason for selection as monitoring location:	Close to southern boundary of the site to represent likely 'loudest' noise levels.
Reason for precise location of equipment:	The equipment was placed with a direct line of site to the industrial estate to represent the worst case noise levels. Although relatively close to various shrubs and bushes, it was the most secure location for the equipment as it could be chained to a fence.
Any restrictions imposed by landowner / occupier:	Advised that equipment should be installed securely (ideally chained).
Additional notes:	

Equipment Details	**Make**	**Model**	**Serial No**	**Last calibration Date**
Sound Level Meter:	RION	NL 31	00593607	11/03/2014
Calibrator:	RION	NC 74	34104515	27/02/2015
Source of Equipment:		Arcus		
Meter Timestamp:		Start	GMT	

Noise Survey Record Sheet – Page 2: Visit Record

Project No	2210	**Location No. (x/y):**	02/02

Installation:

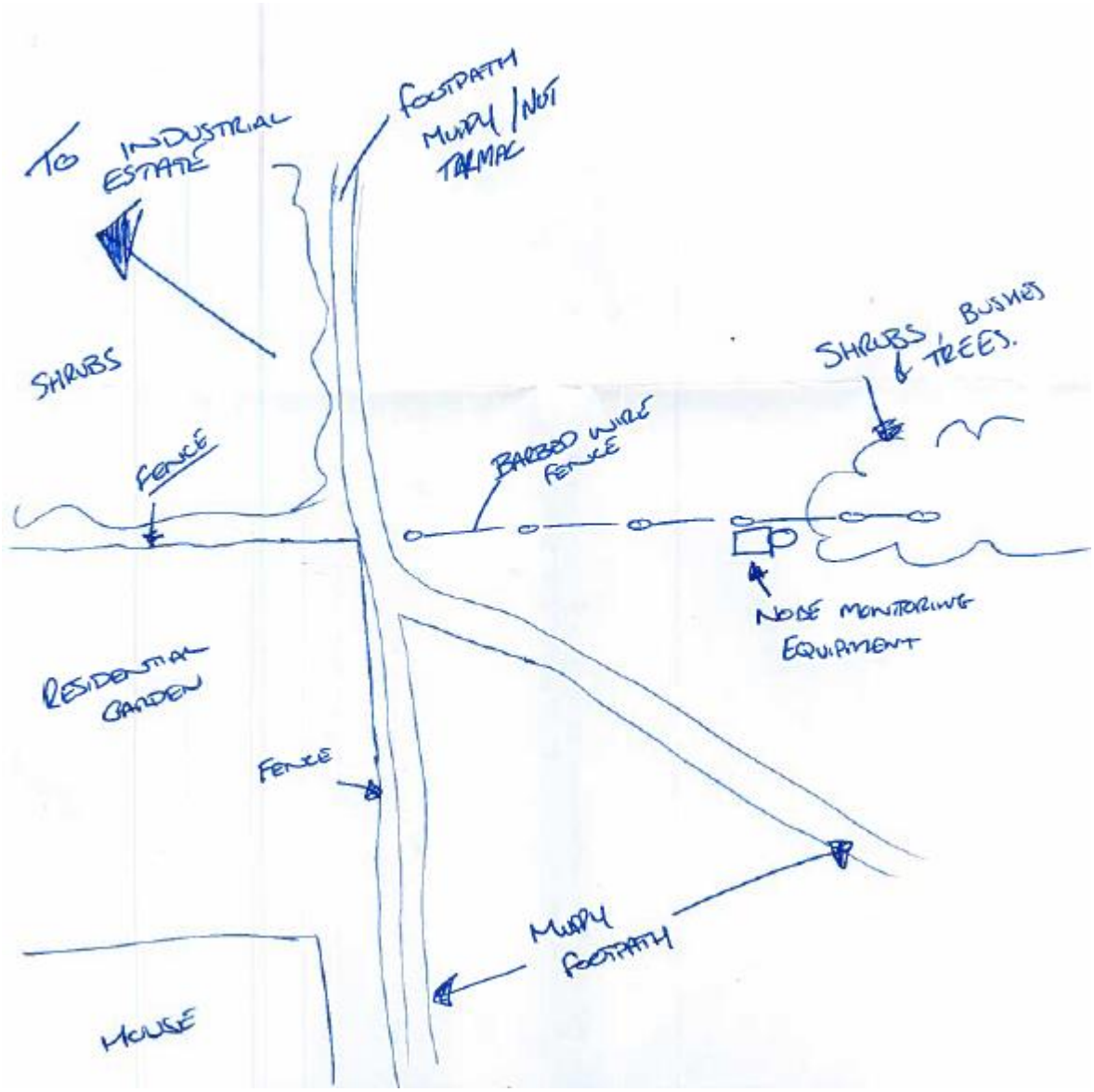
Date:	03/11/2015	**Time:**	12.12
Filename:	01/02	**Calibration level:**	94.0 dB
Range setting:	20 - 100	**Time weighting:**	Fast
Frequency weighting:	A	**Rain gauge installed:**	Y
Notes:			

Final Check:

Date:	05/11/2015	**Time:**	09.45
Level pre-calibration:	94.0	**Calibration level:**	94.0 dB
Notes:			

Noise Survey Record Sheet – Page 3: Sketch Plan of Equipment Location

Project No	2210	Location No. (x/y):	01/02



Noise Survey Record Sheet – Page 4: Photographs of Equipment Location

Project No	2210	Location No. (x/y):	01/02

APPENDIX 2 – CALIBRATION CERTIFICATES

CERTIFICATE OF CALIBRATION

ISSUED BY AV CALIBRATION

Date of issue 28 July 2015 Certificate N° 08524

UKAS CALIBRATION
0653

AV Calibration
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Chicksands, Shefford
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Email: lab@avcalib.co.uk
www.avcalibration.co.uk
Acoustics Noise and Vibration Ltd trading as AV Calibration

Approved Signatory

G. Parry [ ] B. Baker [ ]

CLIENT	Arcus Consultancy Services Ltd 7th Floor 145 St Vincent street Glasgow G2 5JF
F.A.O.	Michel Baron
ORDER No	17765z1087272 Job No UKAS15/07188/01
DATE OF RECEIPT	22 July 2015
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 49 Edition 2:June 2009
IDENTIFICATION	Sound level meter Rion type NL-52 serial No 00510130 connected via a preamplifier type NH-25 serial No 10123 to a half-inch microphone type UC-59 serial No 02831 fitted with a foam windshield type WS-10. Associated calibrator Rion type NC-74 serial No 35105087 with a one-inch housing and adapter type NC-74-002 for half-inch microphone.
CALIBRATED ON	28 July 2015
PREVIOUS CALIBRATION	Calibrated on 06 August 2013, Certificate No. 07273 issued by this laboratory.

CERTIFICATE OF CALIBRATION

UKAS ACCREDITED CALIBRATION LABORATORY No 0653

The sound level meter was set up using the type NC-74 sound calibrator supplied; it was set to frequency weighting A, and initially read 92.4 dB. It was then adjusted to read 94.0 dB (corresponding to 94.0 dB at standard atmospheric pressure). This reading was derived from Calibration Certificate no. 08452 supplied by this laboratory and manufacturers' information on the free-field response of the sound level meter when fitted with the windshield. The calibration check frequency was 1kHz.

Procedures from IEC 61672-3:2006 (BS EN 61672-3:2006) as modified by UKAS TPS 49 Edition 2:June 2009 were used to perform the periodic tests.

RESULTS

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2006 (BS EN 61672-3:2006), for the environmental conditions under which the tests were performed. As public evidence was available, from an independent testing organization responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2 : 2003 (BS EN 61672-2 : 2003), to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1 : 2002 (BS EN 61672-1 : 2003), the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1 : 2002 (BS EN 61672-1 2003).

The self-generated noise recorded with the microphone replaced by the electrical input device was:

13.8 dB (A) 18.5 dB (C) 23.5 dB (Z)

The environmental conditions recorded at the start and end of testing were:

Start: 22 to 23 °C, 46 to 56 %RH and 99.8 to 99.9 kPa

End: 22 to 23 °C, 45 to 55 %RH and 99.8 to 99.9 kPa

Technical information including adjustment data specified in the manufacturers' Technical Notes 55750 (11-03) and , Instruction Manual 55530 (11-03) , Description for IEC 61672-1 56030 (11-04) has been used to carry out this verification. These data include manufacturer-specified uncertainties.

Publicly-available evidence has been found that the Rion NL-52 sound level meter design has successfully undergone pattern evaluation in accordance with IEC 61672-2:2002 (BS EN 61672-2:2003) by Physikalisch-Technische Bundesanstalt (PTB), an independent testing organisation responsible for pattern approvals.

All measurement data are held at AV Calibration for a period of at least six years.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor *k*=2, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

CERTIFICATE OF CALIBRATION

UKAS ACCREDITED CALIBRATION LABORATORY No 0653

Certificate N° 08524

NOTES

Any opinions or interpretations which may be expressed in the following notes are not UKAS Accredited.

1 Windscreen correction filter was set to "WS-10" and the diffuse field correction filter to "OFF".

2 No suitable microphone frequency response information was supplied with the instrument. It was therefore measured by this laboratory using the electrostatic actuator method. This response in isolation is not UKAS accredited.

3 The instrument was running firmware version 1.2

4 All tests were carried out on the main measurement channel, with the exception of that for Peak C sound level which is available only on the sub-channel.

5 The microphone showed a significant and unusual change in its low-frequency response since the previous calibration. It is recommended that if anything unusual such as a significant drift in the calibration level is observed, the microphone should be returned for checking.

6 It was noted that in order to obtain the correct A-weighted response to the sound calibrator on the reference range, the meter had to be set 0.1 dB higher in calibration mode.

7 The following adjustment data, to be added to the electrostatic actuator response, have been issued by Rion. Where conflicting data are shown in the Technical Notes supplied with the instrument, they are superseded by the revised values shown below. The uncertainties are for a coverage factor $k=2$.

Frequency Hz	Correction dB	Uncertainty dB
63	-0.02	± 0.23
125	-0.02	± 0.23
250	-0.02	± 0.23
500	-0.04	± 0.23
1000	0.00	± 0.23

Frequency Hz	Correction dB	Uncertainty dB
2000	0.25	± 0.23
4000	1.04	± 0.28
8000	3.55	± 0.41
16000	9.25	± 0.57

8 Typical case reflection factors specified by the manufacturer have been used for this verification.

END

CERTIFICATE OF CALIBRATION

ISSUED BY AV CALIBRATION

Date of issue 11 March 2014 Certificate N° 07598

UKAS CALIBRATION
0653

AV Calibration
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Email: lab@avcalib.co.uk
www.avcalibration.co.uk
Acoustics Noise and Vibration Ltd trading as AV Calibration

Approved Signatory

G. Parry [ ] B. Baker [ ]

CLIENT Arcus Consulting
1c Swinegate Court East
3 Swinegate
York
YO1 8AJ

F.A.O. Martin Stevenson

ORDER No N/A Job No UKAS14/02045/02

DATE OF RECEIPT 18 February 2014

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

IDENTIFICATION Sound level meter Rion type NL-31 serial No 00593607 connected via extension lead type EC-04 and preamplifier type NH-21 serial No 30369 to a half-inch microphone type UC-53A serial No 316135 fitted with a foam windshield type WS-10. Associated calibrator Rion type NC-74 serial No 34104515 with a one-inch housing and adapter type NC-74-002 for half-inch microphone.

CALIBRATED ON 11 March 2014

PREVIOUS CALIBRATION Calibrated on 29 February 2012, Certificate No. 06395 issued by this laboratory.

CERTIFICATE OF CALIBRATION

UKAS ACCREDITED CALIBRATION LABORATORY No 0653

The sound level meter was set to frequency weighting A and adjusted to read 93.7 dB (corresponding to 93.7 dB at standard atmospheric pressure) in response to the sound calibrator supplied. This reading was derived from the Calibration Certificate No. 07583 supplied by this laboratory and manufacturers' information on the free-field response of the sound level meter when fitted with the windshield.

The sound level meter was then tested, and its overall sensitivity adjusted, in accordance with clause 5 of BS 7580:Part 1:1997 **

The acoustic calibration at 1kHz specified in subclause 5.6.1 of the standard was performed by application of a standard sound calibrator, whilst the tests at 125Hz and 8kHz (subclause 5.6.2) were performed by the electrostatic actuator method.

At the end of the test, the sound calibrator was reapplied to the sound level meter and the meter reading was recorded.

RESULTS

The sound level meter was found to conform to BS 7580:Part 1:1997 ** for a type 1 meter.

The self-generated noise recorded in the test specified in subclause 5.5.2 was:

8.6 dB (A) 12.7 dB (C) 20.9 dB (Lin)

The sound level meter reading obtained at the end of the test in response to the sound calibrator was 93.7 dB (corresponding to 93.7 dB at standard atmospheric pressure). This reading, corrected for ambient pressure, should be used henceforth to set up the sound level meter for field use.

The expanded level uncertainty of the Laboratory's 1 kHz sound calibrator used during this verification is ± 0.22 dB; that of the calibrator supplied with the sound level meter is ± 0.22 dB.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

All measurement data are held at AV Calibration for a period of at least six years.

The case reflection factors have been taken as zero, since an extension lead has been used for this verification.

The reference range, linearity range and primary indicator range specified by the manufacturer have been used. *See note 6 Below.*

The Rion NI-31 sound level meter design has successfully undergone pattern evaluation at Physikalisch-Technische Bundesanstalt (PTB). It was found to meet the requirements of BS EN 60651* and BS EN 60804* and was granted pattern approval as a Type 1 sound level meter.

No component of uncertainty for manufacturer-specified corrections has been included in the uncertainty budget and, in accordance with Amendment No 1 to BS 7580:Part 1:1997 ** the measured values obtained during the verification have not been extended by any measurement uncertainty when assessing conformance to the standard.

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NOTES

*1 BS EN 60651:1994 and BS EN 60804:1994 were formerly numbered BS 5969:1981 and BS 6698:1986 respectively.

**2 BS 7580:Part 1:1997 was formerly numbered BS 7580:1992.

3 No suitable microphone frequency response information was supplied with the instrument. It was therefore measured by this laboratory using the electrostatic actuator method. This response in isolation is not UKAS accredited.

4 The instrument was tested with integral software as received.

5 The NI-31 does not have a "max hold" function available when operating with time weighting I. The results recorded for the test of time weighting I are therefore the highest instantaneous reading shown on the display. Whilst these results meet the requirements of the standard, those for response to a single tone burst in particular may give a misleading impression of the accuracy of time weighting I on this instrument.

6 After consultation with the manufacturer and their European agents, it has been established that the specifications given in the standard English-language handbook for the NI-31 are both incomplete and incorrect. An addendum to the handbook based on the PTB tests has been provided by Rion, and this revised specification has been used for the purposes of the present verification. For information, extracts from the addendum have been appended as page 4 of this certificate.

7 Any opinions or interpretations which may be expressed in these notes are not UKAS Accredited.

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The following data supplied by Rion are included for completeness:

Addendum to the NI-31 Instruction Manual

Errata (page 133):

- Total range: 23 to 137 dB(A).
- Linearity range (on 30 - 120 dB reference range): 99 dB (28 to 127).

Additional information

- Primary indicator range (on 30 - 120 dB reference range): 32 - 111 dB, allowing a crest factor of 10 for Impulse time weighting.
- Pulse range: > 63 dB
- Measurement range for various LEVEL settings: See table below.

Measurement ranges

Measurement range for various "LEVEL" range settings (dB) *
Frequency weighting A-, C- and Lin.

"LEVEL" Setting (dB)	Time weighting			Leq
	Fast/Slow	Impulse	Peak	
20 - 80	23 - 80 **	23 - 70 **	50 - 90	23 - 87 **
20 - 90	23 - 90 **	23 - 80 **	50 - 100	23 - 97 **
20 - 100	23 - 100 **	23 - 90 **	50 - 110	23 - 107 **
20 - 110	23 - 110 **	23 - 100 **	50 - 120	23 - 117 **
30 - 120	28 - 120 **	28 - 110 **	50 - 130	28 - 127 **
40 - 130	38 - 130	38 - 120	50 - 140	38 - 137

* For time weighting Fast and Slow a crest factor 3, and for time weighting Impulse a crest factor 10, is taken into account.
** The lower limit of the measurement range is 30 dB(C) for C-weighting and 35 dB(Lin) for Lin weighting.