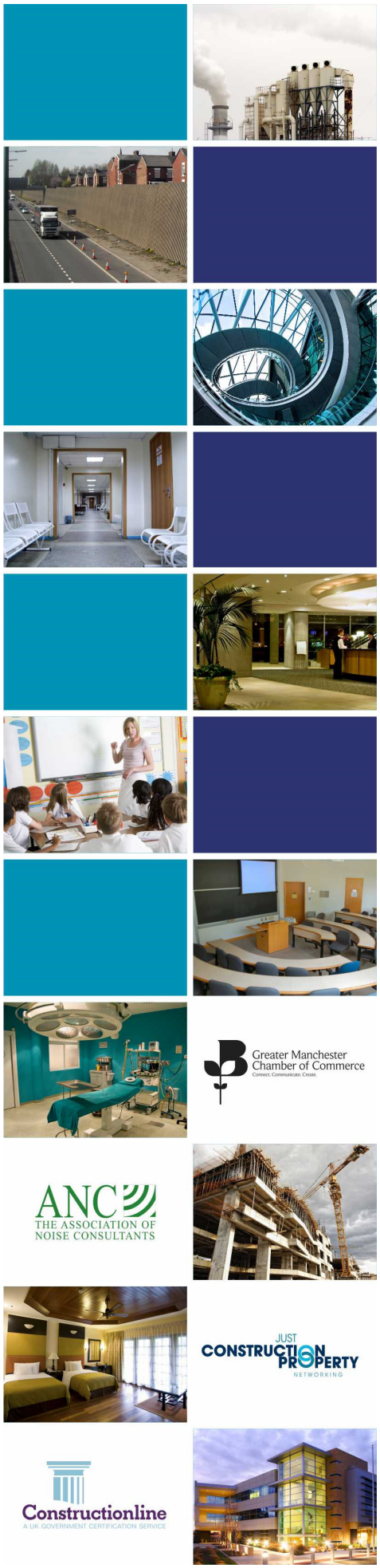



Miller Goodall
Environmental Services

# NOISE ASSESSMENT

**on behalf of**

## AVALON CHARTERED TOWN PLANNING

**for the site at**

## LAND OFF ELKER LANE, BILLINGTON, BB7 9HZ

## REPORT DATE: 9TH MAY 2016

## REPORT NUMBER: 101285

**Miller Goodall Ltd**
**Ground Floor**
**14 Ashworth House**
**Deakins Business Park**
**Egerton**
**Bolton**
**BL7 9RP**

**Tel: 01204 596166**

**www.millergoodall.co.uk**

Company registration number 5201673

# Summary

This noise assessment is provided to support the second phase of a planning application for the development of a site at Elker Lane, Billington. A previous noise assessment (MG reference 100977) was undertaken in October 2014, to fulfil a planning condition for planning reference 3/2014/1086, for the potential impact of a proposed development consisting of a pre-school nursery and a separate block of retirement flats on Land Off Elker Lane, Billington, BB7 9HZ.

This assessment seeks to address the effect of current and future background noise levels on the proposed development of a Continuing Care Retirement Community.

Measurements were taken during the previous assessment to determine the ambient noise levels affecting the proposed development. The measured data has been used to assemble a computer noise model to allow the potential impact of existing noise sources on future occupants of the accommodation to be assessed. Noise from external play areas associated with the proposed nursery and St Augustine's school have also been assessed.

A recommended glazing and ventilation specification has been provided to enable the recommended internal noise limits to be achieved within the properties. Acoustic barriers have also been recommended to ensure the outdoor spaces achieve the recommended guideline values.

With the incorporation of these proposed measures, it is considered that a commensurate level of protection against noise may be achieved.

**Record of changes**

| | | | |
|---|---|---|---|
| Prepared By | Jack Caton | Reviewed By | Joanne Miller MIOA |
| Signed |  | Signed |  |
| Date | 9th May 2016 | Date | 9th May 2016 |

| Version | Date | Change | Initials |
|---|---|---|---|
| 1 | 9th May 2016 | Draft issue | JC |
| 2 | 6th May 2016 | Minor Revisions | JLM |

This page is left blank intentionally

# Contents

# 1 Introduction

1.1 Miller Goodall Environmental Services Ltd (MGES) has, on behalf of Avalon Chartered Town Planning, undertaken a noise assessment in respect of the impact of noise on a Continuing Care Retirement Community development located on land off Elker Lane, Billington. The assessment was requested by Ribble Valley Borough Council (RVBC) to support a planning application for the development.

# 2 Site Description

2.1 The site is located to the north west of the village of Billington in Lancashire. The site is bounded by Elker Lane to the east, Whalley Road to the south and the A59 to the north. The site is green-field in nature and surrounded by predominantly agricultural land. To the east of the site is the construction of a single block of 20 retirement apartments with associated amenity space, parking and allotments on the northern parcel of land. On the southern parcel of land to the east, a day-care nursery catering for up to 119 pre-schoolchildren is proposed, with associated external play areas and parking.

2.2 St Augustine's RC High School is located to the immediate east of the site over the other side of Elker Lane with associated external playgrounds and playing fields. A terrace of residential properties is located opposite the site at the southern end of Elker Lane.

2.3 To the north of the site is the A59 and to the south east is Whalley Road.

# 3 Proposed Development

3.1 The proposal is to develop a greenfield site of approximately 2.7 hectares for a Continuing Care Retirement Community, involving the erection of 14 Apartment Blocks and a central facility, which comprises of a café, office and a wellness centre on the ground floor, with residential care rooms on the first floor. Road access to the development site is located to the east off Elker lane. The mix of dwellings has been provided and is shown in Appendix 1.

3.2 A Continuing Care Retirement Community is described as below.

> *The Continuing Care Retirement Community concept is quite new to the UK and is very different from conventional care with accommodation. It offers a unique combination of independence and security of lifestyle within a socially active and supportive community. The result is that older people with a range of abilities and disabilities are able to continue to live in their own space, supported by a comprehensive and flexible network of personal care services and activities.*
>
> *A Community generally includes a nursing care unit that can provide end of life care close to home and more intensive episodes of care and rehabilitation for those who need it. This care may include short-term health and social care, treatment and support; specialist respite care; rehabilitation and intermediate care to enable early discharge and prevent acute hospital admission and palliative care.*

3.3 This assessment seeks to address the potential noise impact of existing noise sources along with the potential impact from the approved nursery on the proposed residential accommodation.

# 4 Policy Context

## 4.1 Noise Policy Statement for England

4.1.1 The Noise Policy Statement for England (NPSE[1]), published in March 2010, sets out the long-term vision of Government noise policy. The Noise Policy aims, as presented in this document, are:

"Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

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

4.1.2 The NPSE makes reference to the concepts of NOEL (No Observed Effect Level) and LOAEL (Lowest Observed Adverse Effect Level) as used in toxicology but applied to noise impacts. It also introduces the concept of SOAEL (Significant Observed Adverse Effect Level) which is described as the level above which significant adverse effects on health and the quality of life occur.

4.1.3 The first aim of the NPSE is to avoid significant adverse effects, taking into account the guiding principles of sustainable development (as referenced in Section 1.8 of the Statement). The second aim seeks to provide guidance on the situation that exists when the potential noise impact falls between the LOAEL and the SOAEL, in which case:

"…all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development".

4.1.4 Importantly, the NPSE goes on to state:

"This does not mean that such adverse effects cannot occur".

4.1.5 The Statement does not provide a noise-based measure to define SOAEL, acknowledging that the SOAEL is likely to vary depending on the noise source, the receptor and the time in question. NPSE advises that:

"Not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available"

4.1.6 It is therefore likely that other guidance will need to be referenced when applying objective standards for the assessment of noise, particularly in reference to the SOAEL, whilst also taking into account the specific circumstances of a proposed development.

[1] Noise Policy Statement for England, Defra, March 2010

## 4.2 National Planning Policy Framework

4.2.1 The National Planning Policy Framework (NPPF[2]) was published in March 2012. One of the documents that the NPPF replaces is Planning Policy Guidance Note 24 (PPG 24) "Planning and Noise"[3].

4.2.2 Paragraph 109 of the NPPF states that the planning system should contribute to and enhance the natural and local environment by, (amongst others) "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, water or noise pollution or land stability".

4.2.3 The NPPF goes on to state in Paragraph 123 "planning policies and decisions should aim to:

- Avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;
- Mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including thorough use of conditions;
- Recognise 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 use since they were established, and
- Identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value".

4.2.4 The NPPF document does not refer to any other documents regarding noise other than NPSE.

## 4.3 Planning Practice Guidance – Noise

4.3.1 As of March 2014, a Planning Practice Guidance[4] for noise was issued which provides additional guidance and elaboration on the NPPF. It advises that when plan-making and decision-taking, the Local Planning Authority should consider the acoustic environment in relation to:

- Whether or not a significant adverse effect is occurring or 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.

4.3.2 In line with the Explanatory Note of the NPSE, the PPG goes on to reference the LOAEL and SOAEL in relation to noise impact. It also provides examples of outcomes that could be expected for a given perception level of noise, plus actions that may be required to bring about a desired outcome. However, in line with the NPSE, no objective noise levels are provided for LOAEL or SOAEL although the PPG acknowledges that:

[2] National Planning Policy Framework, DCLG, March 2012

[3] Planning Policy Guidance 24: Planning and Noise, DCLG, September 1994

[4] Planning Practice Guidance – Noise, http://planningguidance.planningportal.gov.uk/blog/guidance/noise/, 06 March 2014

"…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".

4.3.3 Examples of these factors include:

- The source and absolute noise level of the source along with the time of day that it occurs;
- Where the noise is non-continuous, the number of noise events and pattern of occurrence;
- The frequency content and acoustic characteristics of the noise;
- The effect of noise on wildlife;
- The acoustic environment of external amenity areas provided as an intrinsic part of the overall design;
- The impact of noise from certain commercial developments such as night clubs and pubs where activities are often at their peak during the evening and night.

4.3.4 The PPG also provides general advice on the typical options available for mitigating noise. It goes on to suggest that Local Plans may include noise standards applicable to proposed developments within the Local Authority's administrative boundary, although it states that:

"Care should be taken, however, to avoid these being implemented as fixed thresholds as specific circumstances may justify some variation being allowed".

4.3.5 The PPG was amended in December 2014 to clarify guidance on the potential effect of noise from existing businesses on proposed new residential accommodation. Even if existing noise levels are intermittent (for example, from a live music venue), noise will need to be carefully considered and appropriate mitigation measures employed to control noise at the proposed accommodation.

# 5 Local Authority Consultation

5.1 For phase 1, discussions were held with Heather Coar, an Environmental Health Officer at RVBC as to the extent of the assessment and a proposed methodology was discussed and agreed in advance. Ms Coar also advised that she wanted to see the potential impact of noise from the school playgrounds considered as part of the assessment. She further advised that guidelines values found in BS 8233 and WHO Guidelines for Community Noise would be appropriate.

5.2 Upon further discussion with Ms Coar, it was considered acceptable that the same approach be used, without the need for additional background noise monitoring for this second phase. For consistency, phase 1 survey results have been added to this report for a reference.

# 6 Acoustic Standards and Guidance

## 6.1 BS 8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings

6.1.1 This standard provides recommended guideline values for internal noise levels within dwellings which are similar in scope to guideline values contained within the World Health Organisation (WHO) document, Guidelines for Community Noise (1999)[5]. These guideline noise levels are shown in Table 1, below.

**Table 1: BS 8233: 2014 guideline indoor ambient noise levels for dwellings**

| Location | Activity | 07:00 to 23:00 | 23:00 to 07:00 |
|---|---|---|---|
| Living Room | Resting | 35 dB $L_{Aeq,16hr}$ | - |
| Dining room/area | Dining | 40 dB $L_{Aeq,16hr}$ | - |
| Bedroom | Sleeping (daytime resting) | 35 dB $L_{Aeq,16hr}$ | 30 dB $L_{Aeq,8hr}$ |

6.1.2 BS 8233:2014 advises that:

> *"regular individual noise events…can cause sleep disturbance. A guideline value may be set in terms of SEL[6] or $L_{Amax,F}$ depending on the character and number of events per night. Sporadic noise events could require separate values".*

6.1.3 BS 8233:2014 adopts guideline external noise values provided in WHO for external amenity areas such as gardens and patios. The standard states that it is "desirable" that the external noise does not exceed 50 dB $L_{Aeq,T}$ with an upper guideline value of 55 dB $L_{Aeq,T}$ whilst recognising that development in higher noise areas such as urban areas or those close to the transport network may require a compromise between elevated noise levels and other factors that determine if development in such areas is warranted. In such circumstances, the development should be designed to achieve the lowest practicable noise levels in external amenity areas.

[5] World Health Organisation Guidelines for Community Noise, 1999

[6] Sound exposure level or $L_{AE}$

## 6.2 World Health Organisation (WHO) Guidelines for Community Noise 1999

6.2.1 The WHO Guidelines 1999 recommends that to avoid sleep disturbance, indoor night-time guideline noise values of 30 dB $L_{Aeq}$ for continuous noise and 45 dB $L_{AFmax}$ for individual noise events should be applicable. It is to be noted that the WHO Night Noise Guidelines for Europe 2009[7] makes reference to research that indicates sleep disturbance from noise events at indoor levels as low as 42 dB $L_{AFmax}$. The number of individual noise events should also be taken into account and the WHO guidelines suggest that indoor noise levels from such events should not exceed approximately 45 dB $L_{AFmax}$ more than 10 – 15 times per night.

6.2.2 The WHO document recommends that steady, continuous noise levels should not exceed 55 dB $L_{Aeq}$ on balconies, terraces and outdoor living areas. It goes on to state that to protect the majority of individuals from moderate annoyance, external noise levels should not exceed 50 dB $L_{Aeq}$.

## 6.3 Possible LOAEL and SOAEL Noise Standards

6.3.1 It is acknowledged that the NPSE and the Planning Practice Guidance both advise caution when attempting to set objective standards in relation to LOAEL and SOAEL that may be applicable to a new development.

6.3.2 That said, the guideline values for internal noise within the WHO documents are set at the level of the lowest adverse health effect (the critical health effect) and as such, the values could form the basis of the LOAEL as referenced in the NPSE and PPG. Targeting the WHO guideline levels as the LOAEL should, therefore, provide a robust basis for assessment. No levels are provided within the WHO guidance that may be directly applicable to the SOAEL and any such threshold levels will, as indicated in the above guidance, vary depending on the specific circumstances of the development and the noise climate in which it is located.

6.3.3 With reference to external noise levels in gardens, the WHO lower guideline value of 50 dB $L_{Aeq}$ during the day is intended to protect the majority of people from moderate annoyance and could, therefore, equate to the LOAEL. The upper guideline value of 55 dB $L_{Aeq}$ is intended to protect the majority of people from serious annoyance and whilst this does not necessarily imply that this guideline value would equate to the SOAEL, it would be reasonable to suggest that the SOAEL might occur at a level at or above the guideline value of 55 dB $L_{Aeq}$.

# 7 Noise Survey

## 7.1 Measurements of Existing Noise Sources

7.1.1 Noise measurements were undertaken for phase 1 at a single fixed location using an unattended logger and supplemented with short duration attended measurements in accordance with BS 7445-1: 2003[8]

[7] WHO Night Noise Guidelines for Europe 2009

[8] BS 7445-1: 2003 Description and measurement of environmental noise - Part 1: Guide to quantities and procedures

by Jack Caton of Miller Goodall Environmental Services Ltd. The calibration of the sound level meters was checked before and after measurements with negligible deviation (<0.1 dB). Details of the equipment used are shown in

**Table 2: Noise monitoring equipment**

| Equipment Description | Type Number | Manufacturer | Serial No. | Date Calibrated | Calibration Certification Number |
|---|---|---|---|---|---|
| Class 1 Integrating Real Time 1/3 Octave Sound Analyser | Type 2260 | Brüel & Kjær | 2467009 | 03/09/13 | U14377 |
| Microphone | Type 4189 | Brüel & Kjær | 2508884 | 03/09/13 | U14376 |
| Calibrator | Type 4231 | Brüel & Kjær | 2478249 | 05/09/14 | U17026 |
| Class 1 Sound Analyser | Type NOR 140 | Norsonic | 1406017 | 26/06/14 | 476899108 |
| Microphone | Type NOR 1225 | Norsonic | 180243 | 26/06/14 | 476899108 |
| Calibrator | Type NOR 1251 | Norsonic | 34123 | 01/07/14 | CAL 022-2014-4644 |
| Outdoor microphone housing | Type NOR 1217 | Norsonic | 12175146 | N/a | N/a |

7.1.2 Background and ambient noise monitoring was undertaken at the times specified in Table 3, below. Measurement locations are shown in Figure 1.

**Table 3: Dates, times and weather conditions during noise measurements**

| Measurement Locations | Date | Time | Weather conditions |
|---|---|---|---|
| Noise logger | 02/10/14 – 06/10/14 | 02/10 15:00 – 06/10 13:00 | Variable over course of survey period (see below) |
| MP 1-12 | 02/10/14 | 15:00 – 16:35 | Clear, dry, 16℃ and a light southerly breeze with a speed of approximately 1 - 3 m/s. |

7.1.3 Measurements were taken at times considered to be representative of the periods during which the proposed residential accommodation would be subject to the highest levels of ambient noise. Measurements were made under free-field conditions at a height of 1.5 m above the ground.

7.1.4 The measurement locations are detailed below and indicated on Figure 1.

- Position L - Norsonic logger, approximately 10 m from the A59 – noise from the A59 dominant
- P1 to P6 – short duration measurement locations in the northern half of the site at increasing distance from logger (used to assist in the calibration of the noise model) – noise from the A59 dominant
- P7 – 3 m from site boundary with Elker Lane near playgrounds – noise from Elker Lane dominant
- P8 - 3 m from site boundary with Elker Lane near school buildings – noise from Elker Lane dominant
- P9 to P11 - short duration measurement locations in the southern half of the site at increasing distance from logger (used to assist in the calibration of the noise model) – noise from Elker Lane dominant but with some contribution from earth works on nearby farm
- P12 and P13 - along Elker Lane, approximately 5 m from St Augustine's RC High School playground boundary fencing during lunch break (noise from playgrounds dominant, although with some contribution from Elker Lane)
- P14 and P15 - along Elker Lane, approximately 5 m from St Augustine's RC High School playground boundary fencing during sports lesson (noise from netball courts and football playing fields dominant, although with some contribution from Elker Lane)

**Figure 1: Plan indicating noise measurement positions**


7.1.5 Weather conditions during the period the logger was measuring noise data were generally dry and settled with wind speeds below 5 m/s for the majority of the measurement period. Two periods of moderate rainfall were experienced between 06:00 and 13:00 on the 4th October and between 03:30 and 11:30 on the 6th October. These periods have been indicated on the time history provided in Figure 2 below.

## 7.2 Monitoring Results

7.2.1 A summary of the broadband measurement data from the short duration measurements is provided in Table 4 below. All data are sound pressure levels in dB re 20 µPa.

**Table 4: Summary of attended noise measurements**

| Measure-ment Location | Start Time | Elapsed Time (hr:min:sec) | $L_{Aeq,T}$ (dB) | $L_{AFmax}$ (dB) | $L_{AF1,T}$ (dB) | $L_{AF10,T}$ (dB) | $L_{AF90,T}$ (dB) | $L_{AF99,T}$ (dB) | $L_{AFmin}$ (dB) |
|---|---|---|---|---|---|---|---|---|---|
| P1 | 14:49 | 0:05:00 | 60.7 | 67.2 | 65.6 | 63.2 | 56.1 | 51.4 | 50.1 |
| P2 | 14:56 | 0:05:00 | 58.4 | 67.9 | 63.9 | 61.3 | 53.7 | 52.0 | 50.9 |
| P3 | 15:02 | 0:05:00 | 57.5 | 62.7 | 61.3 | 59.7 | 54.4 | 49.8 | 48.2 |
| P4 | 15:09 | 0:05:00 | 55.4 | 63.8 | 60.9 | 57.7 | 51.3 | 47.1 | 45.5 |
| P5 | 15:22 | 0:05:00 | 54.6 | 69.8 | 60.5 | 56.9 | 50.9 | 49.1 | 47.2 |
| P6 | 15:28 | 0:05:00 | 52.7 | 62.7 | 59.6 | 54.8 | 49.7 | 48.1 | 47.2 |
| P7 | 15:40 | 0:15:00 | 56.7 | 71.0 | 66.7 | 58.8 | 51.2 | 48.8 | 47.1 |
| P8 | 15:58 | 0:15:00 | 56.0 | 77.3 | 64.0 | 57.7 | 51.7 | 50.1 | 48.8 |
| P9 | 16:14 | 0:05:00 | 53.5 | 67.3 | 57.1 | 55.4 | 50.9 | 49.4 | 48.6 |
| P10 | 16:20 | 0:05:00 | 53.6 | 65.4 | 57.0 | 55.3 | 51.2 | 49.7 | 48.8 |
| P11 | 16:26 | 0:05:00 | 52.4 | 64.8 | 56.6 | 54.5 | 48.6 | 47.0 | 46.0 |
| P12(1) | 12:58 | 0:05:00 | 67.1 | 93.9 | 74.4 | 68.9 | 60.4 | 58.1 | 55.9 |
| P13(1) | 13:06 | 0:05:00 | 67.0 | 93.4 | 73.2 | 68.7 | 61.9 | 59.7 | 57.8 |
| P14(2) | 13:37 | 0:05:00 | 60.2 | 77.1 | 74.6 | 59.6 | 48.8 | 45.5 | 43.5 |
| P15(2) | 13:42 | 0:05:00 | 55.9 | 72.7 | 67.5 | 57.7 | 47.2 | 44.0 | 42.8 |

(1) Measured during lunch break – noise from playground dominant

(2) Measured during PE lesson – noise from netball courts and football fields dominant

7.2.2 A summary of the noise data measured by the noise logger is provided in Table 6 with the time history represented graphically in Figure 2. Each 1 hour measurement period consisted of sequential 5 minute samples which allowed the variation in noise level over time to be assessed. This data was subsequently used to determine a 'typical' $L_{AFmax}$ noise level and octave band spectrum based on the 95$^{th}$ percentile of individual 5 minute measurements.

**Table 5: Summary of measurement data from noise logger**

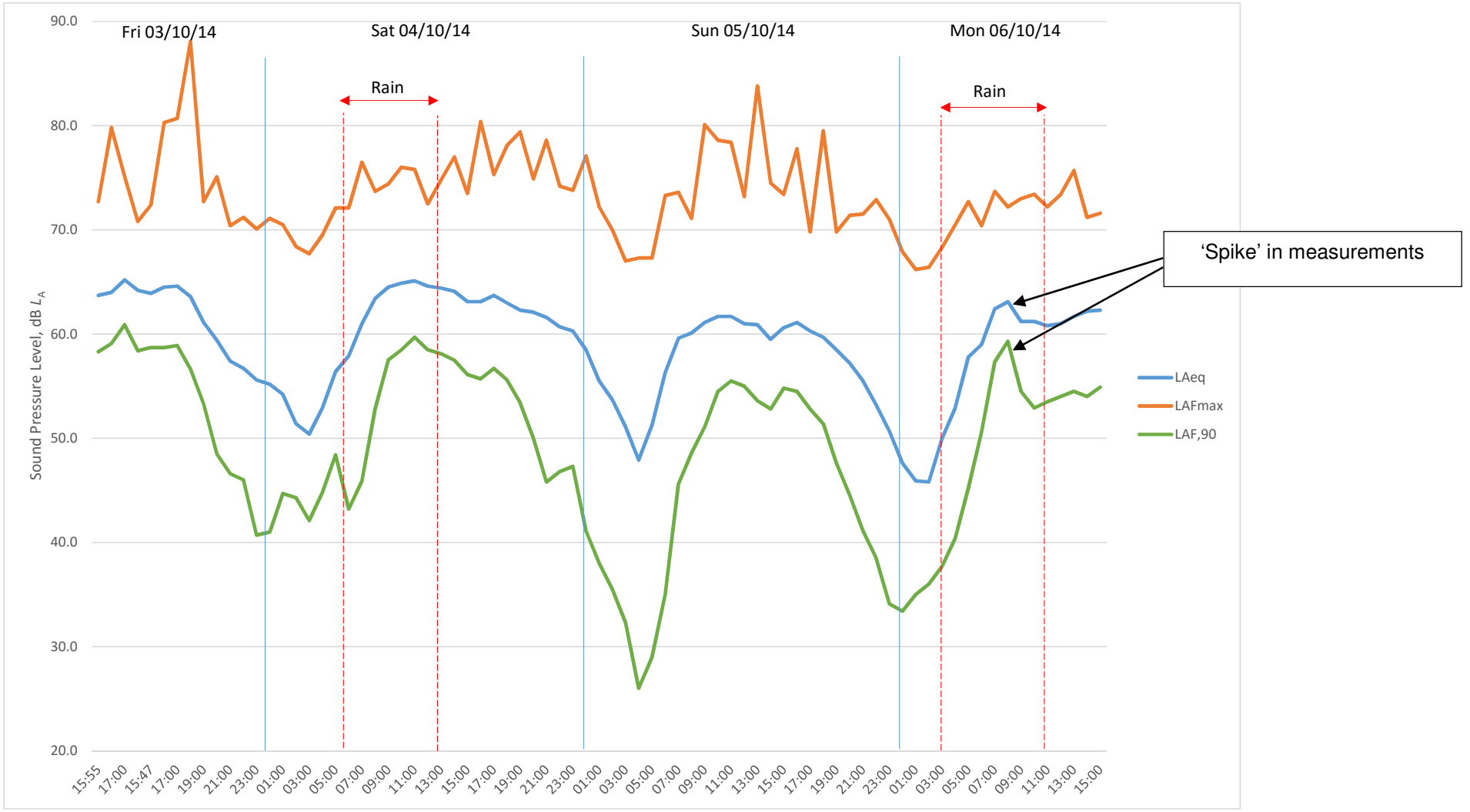
| Date | Time Period | dB $L_{Aeq,T}$ | Highest dB $L_{AFmax,1hr}$ | Lowest dB $L_{AFmax,1hr}$ | Highest dB $L_{AF90,1hr}$ | Lowest dB $L_{AF90,1hr}$ |
|---|---|---|---|---|---|---|
| Thu 02/10/14 | 15:50 - 18:50* | 64 | 80 | 71 | 61 | 58 |
| Fri 03/10/14 | 15:50 - 23:00 | 62 | 88 | 70 | 59 | 46 |
| | 23:00 - 07:00 | 55 | 72 | 68 | 48 | 41 |
| Sat 04/10/14 | 07:00 - 23:00 | 63 | 80 | 73 | 60 | 46 |
| | 07:00 - 23:00 | 56 | 77 | 67 | 47 | 26 |
| Sun 05/10/14 | 07:00 - 23:00 | 60 | 84 | 70 | 56 | 39 |
| | 07:00 - 23:00 | 54 | 73 | 66 | 51 | 33 |
| Mon 06/10/14 | 07:00 - 15:40 | 62 | 76 | 71 | 59 | 53 |

* Note the period between 15:50 and 18:50 on 02/10/14 was the only period logged on that day due to a subsequent battery malfunction. The external batteries were replaced on 03/10/14 and the logging period commenced at 15:50.

7.2.3 The 5 minute noise levels have not been presented in this report but are kept on file for future reference.

7.2.4 It can be seen from Figure 2 that the period of rain experienced on Saturday 3rd October did not appear to adversely affect the measurements made. However, a distinct spike was noted in the $L_{Aeq}$ and $L_{A90}$ traces on the morning of October 6th and therefore data from this period should be treated with caution.

**Figure 2: Time history of hourly noise measurements at logger location**



7.2.5 Octave band frequency data was also obtained and this was utilised within the noise ingress calculations. This was based on the logarithmically averaged $L_{eq}$ data for the daytime and night-time periods measured on Saturday 4th October, which were found to be the highest over the logging period. The 'typical' $L_{Fmax}$ spectrum was derived from the 95th percentile of measured 5 minute samples during the course of Saturday night. A summary of this source data is provided in Table 6, below.

**Table 6: Octave band free-field external noise level spectra used in assessment**

| Measurement Descriptor | Sound Pressure Level, dB in Octave Band Centre Frequency, Hz | | | | | | | | dB $L_A$ |
|---|---|---|---|---|---|---|---|---|---|
| | 63 | 125 | 250 | 500 | 1k | 2k | 4k | 8k | |
| Daytime $L_{eq,16hr}$ | 63 | 57 | 53 | 57 | 61 | 56 | 47 | 39 | 63 |
| Night time $L_{eq,8hr}$ | 54 | 48 | 45 | 49 | 54 | 49 | 37 | 26 | 56 |
| Typical night time $L_{Fmax,5min}$ | 76 | 70 | 64 | 67 | 70 | 67 | 55 | 48 | 73 |

# 8 Impact of Existing Noise Sources on the Development

## 8.1 Computer Modelling

8.1.1 Predictions of existing noise levels on the site have also been undertaken using the CadnaA noise modelling package. Specific model parameters were applied as follows:

- Propagation of noise using algorithms within ISO 9613: 1993 *Acoustics - Attenuation of sound during propagation outdoors*. Roads were modelled as line sources at a height of 0.5 m above ground level and calibrated using spectral data measured during the survey.
- Default ground absorption G = 0.7 (equivalent to grassed areas and consistent with the dominant ground cover at the site).
- Ground attenuation: spectral all sources
- No adverse meteorological effects
- Two orders of reflection
- Topographical data was obtained using NextMap Britain 2 m contours for the site and surrounding assessment area.

## 8.2 Validation of the Noise Model

8.2.1 Noise level receptor points were incorporated into the CadnaA model at the noise survey measurement locations to calibrate the model using the measured octave band $L_{Aeq}$ and $LA_{Fmax}$ noise levels. The modelled results agreed with the measured results to within around ± 1 dB $L_{Aeq}$ and around ± 3 dB $L_{AFmax}$.

## 8.3 Noise Model Predictions

8.3.1 Multiple scenarios were modelled using the proposed master plan provided:

- Daytime $L_{Aeq}$ road noise levels affecting the residential site;
- Night-time $L_{Aeq}$ road noise levels and night-time $L_{AFmax}$ noise levels affecting the residential site;
- Daytime $L_{Aeq}$ and $L_{Amax}$ noise levels from the nearby school playgrounds during a typical lunch break affecting the residential site;
- Predicted daytime $L_{Aeq}$ and $L_{Amax}$ noise levels from the proposed nursery external play areas during external activities.

8.3.2 Screen shots from each model are provided in Appendix 2. Note that coloured grids indicate noise contours at 5 dB $L_A$ intervals and at a notional height of 1.5 m above ground for daytime levels and 4 m above ground for night time.

8.3.3 A brief summary of the results from the modelling exercise is provided below with more detail in the following sections:

- Predicted daytime road noise levels at the external facades of the proposed residential development: up to 59 dB $L_{Aeq}$ on the facade facing the A59 and then decreasing with distance. See Appendix 2a.
- Predicted night-time road noise levels at the external facades of the proposed residential development: up to 51 dB $L_{Aeq}$ on the facade facing the A59. Predicted $L_{Amax}$ noise levels around the development between 57 and 68 dB $L_{Amax}$. See Appendices 2b and 2c.
- Predicted daytime noise levels from the school playgrounds at the external facades of the proposed residential development: up to 54 dB $L_{Aeq}$ (for the duration of breaks and lunchtime at the school) at the closest facades, further away the levels fall to around 38 dB. See Appendix 2d.
- Predicted daytime noise levels from the approved nursery at the external facades of the proposed residential development: up to 61 dB $L_{Aeq}$ (for the duration of breaks at the nursery) at the closest facades, further away the levels fall to around 39 dB. See Appendix 2e.

## 8.4 Predicted Internal Noise Levels Assessed to BS 8233 Criteria

8.4.1 It is proposed that noise from the development is controlled to 30 dB $L_{Aeq}$ in bedrooms at night and 35 dB $L_{Aeq}$ in habitable rooms during the day. This is in line with the recommended levels advised in BS 8233 for both daytime and night-time noise and the recommended night-time noise level within bedrooms suggested by WHO. It is also proposed that noise from individual events such as vehicle pass-bys does not regularly exceed an indoor level of 45 dB $L_{AFmax}$.

8.4.2 The generally accepted rule of thumb is that a window left open for ventilation provides 10 - 15 dB attenuation from external noise sources with the WHO Guidelines for Community Noise suggesting 15 dB. The DEFRA report NANR116: Open/Closed Window Research[9] suggests the figure to be between 12 and 18 dB for road and rail traffic. Where external noise levels are more than around 15 dB higher than the internal noise targets, openable windows should not be relied upon as the sole means of ventilation and some form of acoustically attenuated ventilation may be required. This equates to an external noise level of 45 dB $L_{Aeq}$ / 60 dB $L_{Amax}$ during the night or 50 dB $L_{Aeq}$ during the day.

8.4.3 It can be seen from the noise model screenshots and the summary in section 8.3.3 that for proposed houses with facades with a direct line of sight to the A59, daytime and night-time noise levels $L_{Aeq}$ and $L_{Amax}$ resulting from road traffic are predicted to be up to 8 dB above the level for which openable windows would be an appropriate means of ventilating habitable rooms. It is however considered that facades shielded from the A59 meet the recommended internal levels for daytime and night-time.

8.4.4 In order to assess the potential glazing and ventilation requirements for the proposed flats, noise ingress calculations were undertaken based on the methodology in BS EN 12354-3[10]. The following assumptions were made regarding the internal rooms:

- Assessed within first floor flats: small bedrooms with an internal volume of 21 $m^3$ and lounges with balconies and an internal volume of 65 $m^3$
- 'Normal' internal surface finishes e.g. carpeted with curtains etc.
- Glazed areas of 1.5 $m^2$ per bedroom and 4.5 $m^2$ per lounge (including balcony door)

8.4.5 An example noise ingress calculation is provided in Appendix 3 with a summary of the results below in Table 7, below:

[9] NANR116: 'Open/closed window research' Sound Insulation through ventilated open windows, Defra April 2007

[10] BS EN 12354-3:2000 Building acoustics. Estimation of acoustic performance in buildings from the performance of elements - Airborne sound insulation against outdoor sound

**Table 7: Predicted internal noise levels – background noise**

| Description | External Noise Levels | | Predicted Internal Noise Levels | | BS 8233 Criteria | | Exceedance of Criteria | | Proposed Glazing and Ventilation |
|---|---|---|---|---|---|---|---|---|---|
| | dB $L_{Aeq,1hr}$ | dB $L_{AFmax}$ | dB $L_{Aeq,1hr}$ | dB $L_{AFmax}$ | dB $L_{Aeq,T}$ | dB $L_{AFmax}$ | dB $L_{Aeq,T}$ | dB $L_{AFmax}$ | |
| Bedroom night-time | 51 | 68 | 26 | 45 | 30 | 45 | -4 | 0 | 4/12/4 thermal double glazing; acoustic trickle vent option 1 |
| Bedroom daytime | 59 | N/a | 35 | N/a | 35 | N/a | 0 | N/a | 4/12/4 thermal double glazing; acoustic trickle vent option 1 |
| Living area night-time | 51 | 68 | 23 | 42 | 30 | 45 | -7 | -3 | 4/12/4 thermal double glazing; acoustic trickle vent option 1 |
| Living – area daytime | 59 | N/a | 32 | N/a | 35 | N/a | -3 | N/a | 4/12/4 thermal double glazing; acoustic trickle vent option 1 |

8.4.6 It can be seen from Table 7 that all rooms are predicted to satisfy the internal noise level requirements with glazing with a minimum weighted sound reduction index of 27 dB $R_w + C_{tr}$; this could be achieved using standard thermal double glazing with a 4/12/4 configuration. Background ventilation can be provided by a trickle ventilator with the following element normalised sound level difference:

- Option 1: minimum 27 dB $D_{ne,w} + C_{tr}$

8.4.7 Recommended mitigation measures are discussed further in Section 9.2.

## 8.5 Noise from School Playground

8.5.1 As shown in section 8.3.3 and appendix 2d the noise levels from the playground only slightly exceed the recommended daytime values on two facades. As previously mentioned in the report for phase 1:

*Whilst it is to be appreciated that noise levels will be elevated during break times, this will generally occur for no more than 90 minutes per weekday period.*

*PE/sport lessons occur at various times throughout the day. It is our understanding that a local community netball team also use the courts for training and match days, including weekends. However, the netball courts are located at the far end of the playground and the football fields were located farther east beyond the hard courts. Noise from the courts was found to be of a similar order of magnitude to noise from existing daytime traffic sources and significantly lower than noise from the playgrounds during lunch breaks.*

*Furthermore, none of the courts or playing fields are floodlit and whilst late evening matches would be unlikely, there is the possibility that they may occur up to around 21:00 during the summer.*

8.5.2 Therefore, it is considered reasonable to propose that no mitigation is required for protection against playground noise.

## 8.6 Noise from Approved Nursery

8.6.1 It can be seen from Table 8 that all rooms are predicted to achieve the internal noise level with glazing (and any balcony doors) having a weighted sound reduction index of 27 dB $R_w + C_{tr}$ (e.g. 4/12/4) combined with trickle ventilators with a minimum element normalised sound level difference of 27 dB $D_{ne,w} + C_{tr}$ (i.e. option 1).

**Table 8: Predicted internal noise levels – nursery noise**

| Description | External Noise Levels | | Predicted Internal Noise Levels | | BS 8233 Criteria | | Exceedance of Criteria | | Proposed Glazing and Ventilation |
|---|---|---|---|---|---|---|---|---|---|
| | dB $L_{Aeq,1hr}$ | dB $L_{AFmax}$ | dB $L_{Aeq,1hr}$ | dB $L_{AFmax}$ | dB $L_{Aeq,T}$ | dB $L_{AFmax}$ | dB $L_{Aeq,T}$ | dB $L_{AFmax}$ | |
| Living area - daytime | 60 | N/a | 31 | N/a | 35 | N/a | -4 | N/a | 4/12/4 thermal double glazing; acoustic trickle vent option 1 |
| Bedroom - daytime | 60 | N/a | 34 | N/a | 35 | N/a | -1 | N/a | 4/12/4 thermal double glazing; acoustic trickle vent option 1 |

8.6.2 With the provision of the above glazing and ventilation specification, the recommended internal noise levels are predicted to be achieved with windows closed.

8.6.3 Recommended mitigation measures are discussed further in Section 9.2.

## 8.7 External Noise Levels

8.7.1 Considering the predicted noise from the nursery and playground together, all proposed communal gardens are predicted to meet the WHO recommended LOAEL guideline of 50 dB $L_{Aeq}$.

8.7.2 Assessing the amenity areas for the existing background noise, the daytime $L_{Aeq}$ noise levels at the garden court and croquet lawn, as illustrated in appendix 1, are slightly above the WHO recommended SOAEL guideline of 55 dB, meaning there is a potential for t disturbance in these areas.

8.7.3 It is recommended therefore, that a barrier be erected to shield the amenity areas. Details of this are discussed in section 9.3.

# 9 Mitigation Measures

## 9.1 Building Envelope: Glazing and Ventilation

9.1.1 Table 9 provides a summary of the proposed glazing and ventilation scheme at the development. These are:

- **Option 1** - Glazing with the minimum sound reduction index stated in Table 10, below (to achieve 35 dB $R_w + C_{tr}$); this could be met using glazing with a 4/12/4 configuration, i.e. 4 mm panes either side of a cavity width of 12 mm.
  **Where required**: All ground and first floor facades facing A59 or Nursery highlighted in Appendix 3.

**Table 9: Minimum sound reduction indices of glazing and ventilation**

| Type | Sound Reduction Index, dB $R_w$ in Octave Band Centre Frequency, Hz | | | | | | | | $R_w$ | $C_{tr}$ | $R_w + C_{tr}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 63 | 125 | 250 | 500 | 1k | 2k | 4k | 8k | | | |
| Glazing - 4/12/4 | 18 | 24 | 20 | 25 | 35 | 38 | 35 | 35 | 31 | -4 | 27 |
| Trickle vent - option 1 | 16 | 20 | 22 | 27 | 31 | 39 | 49 | 49 | 31 | -4 | 27 |

9.1.2 A coloured mark-up illustrating the location of the glazing and ventilation options proposed is provided in Appendix 3.

## 9.2 Amenity Area Barriers

9.2.1 As discussed in section 8.7, it is recommended that a barrier be erected round each amenity area to protect against noise from the A59.

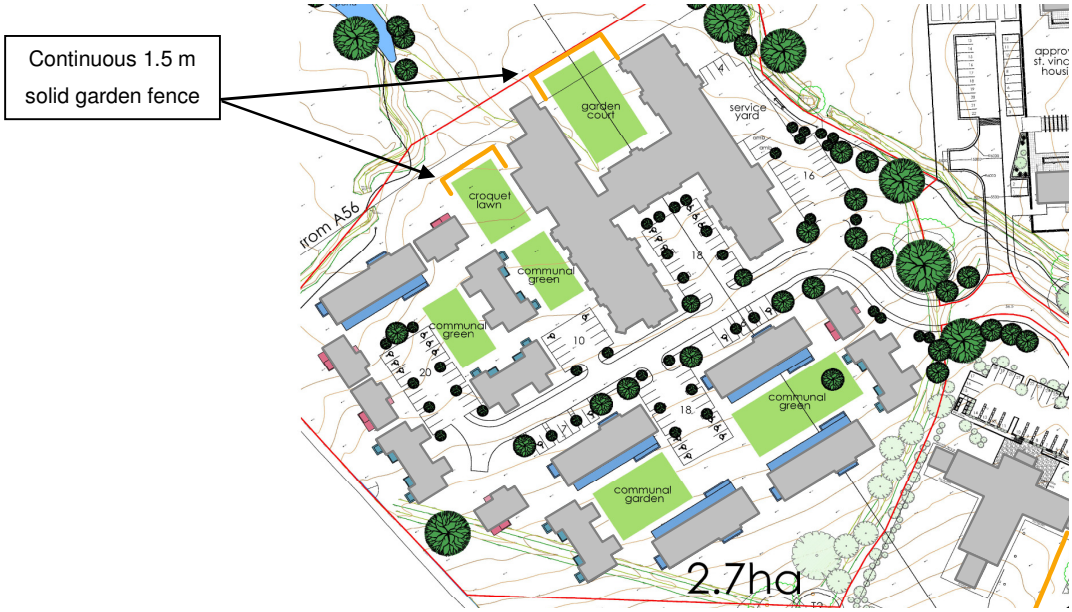
9.2.2 By definition, the barrier is to be constructed from continuous, imperforate material with a minimum mass of 12 kg/m$^2$ and is to extend from the ground to a minimum height of 1.5 m above the ground floor FFL. Close-

boarded or overlapped timber panelling would be suitable in this regard; hit-and-miss fencing would not. Alternatively, a proprietary acoustic fence with a minimum weighted sound reduction index of 25 dB $R_w$ would be appropriate.

9.2.3 The locations of the proposed barriers are indicated Figure 3 below.

9.2.4 The resultant noise levels from the barrier are shown in Appendix 2f.

**Figure 3: Plan indicating garden fence positions**




# 10 Conclusions

10.1 A noise assessment has been undertaken at the site of a proposed development of land to support a planning application for a Continuing Care Retirement Community. Measurements were previously taken to determine the ambient noise levels affecting the proposed development. The measured data has been used to assemble a computer noise model to allow the potential impact of existing noise sources on future occupants of the accommodation to be assessed. Noise from external play areas associated with the proposed nursery has also been assessed.

10.2 A recommended glazing and ventilation specification has been provided to enable the recommended internal noise limits to be achieved within the properties. To mitigate noise from the existing playground and proposed nursery, acoustic barriers have been proposed for the eastern boundaries of the development.

10.3 With the incorporation of these proposed measures, it is considered that a commensurate level of protection against noise may be achieved. As such, we see no reason why permission need not be refused on the grounds of noise impact.

# APPENDICES

# Appendix 1: Proposed Site Layout

# Appendix 2a: Daytime $L_{Aeq}$ Noise from Road Traffic

## Elker Lane, Phase 2

Daytime LAeq road noise


**Miller Goodall**
**Environmental Services Ltd**

Ground Floor, Ashworth House,
Deakins Business Park,
Blackburn Road,
Egerton, Bolton, BL7 9RP
Tel: 01204 596166
E-mail: info@millergoodall.co.uk
www.millergoodall.co.uk

**Key to Noise Contours**

| |
|---|
| ... < 10.0 |
| 10.0 <= ... < 15.0 |
| 15.0 <= ... < 20.0 |
| 20.0 <= ... < 25.0 |
| 25.0 <= ... < 30.0 |
| 30.0 <= ... < 35.0 |
| 35.0 <= ... < 40.0 |
| 40.0 <= ... < 45.0 |
| 45.0 <= ... < 50.0 |
| 50.0 <= ... < 55.0 |
| 55.0 <= ... < 60.0 |
| 60.0 <= ... < 65.0 |
| 65.0 <= ... < 70.0 |
| 70.0 <= ... < 75.0 |
| 75.0 <= ... < 80.0 |
| 80.0 <= ... < 85.0 |
| 85.0 <= ... < 90.0 |
| 90.0 <= ... < 95.0 |
| 95.0 <= ... < 120.0 |
| 120.0 <= ... |

Miller Goodall
Environmental Services

Datakustik CadnaA v4.6

# Appendix 2b: Night-time $L_{Aeq}$ Noise from Road Traffic

## Elker Lane, Phase 2

Night-time LAeq road noise


**Miller Goodall Environmental Services Ltd**

Ground Floor, Ashworth House,
Deakins Business Park,
Blackburn Road,
Egerton, Bolton, BL7 9RP
Tel: 01204 596166
E-mail: info@millergoodall.co.uk
www.millergoodall.co.uk

**Key to Noise Contours**

- ... < 10.0
- 10.0 <= ... < 15.0
- 15.0 <= ... < 20.0
- 20.0 <= ... < 25.0
- 25.0 <= ... < 30.0
- 30.0 <= ... < 35.0
- 35.0 <= ... < 40.0
- 40.0 <= ... < 45.0
- 45.0 <= ... < 50.0
- 50.0 <= ... < 55.0
- 55.0 <= ... < 60.0
- 60.0 <= ... < 65.0
- 65.0 <= ... < 70.0
- 70.0 <= ... < 75.0
- 75.0 <= ... < 80.0
- 80.0 <= ... < 85.0
- 85.0 <= ... < 90.0
- 90.0 <= ... < 95.0
- 95.0 <= ... < 120.0
- 120.0 <= ...

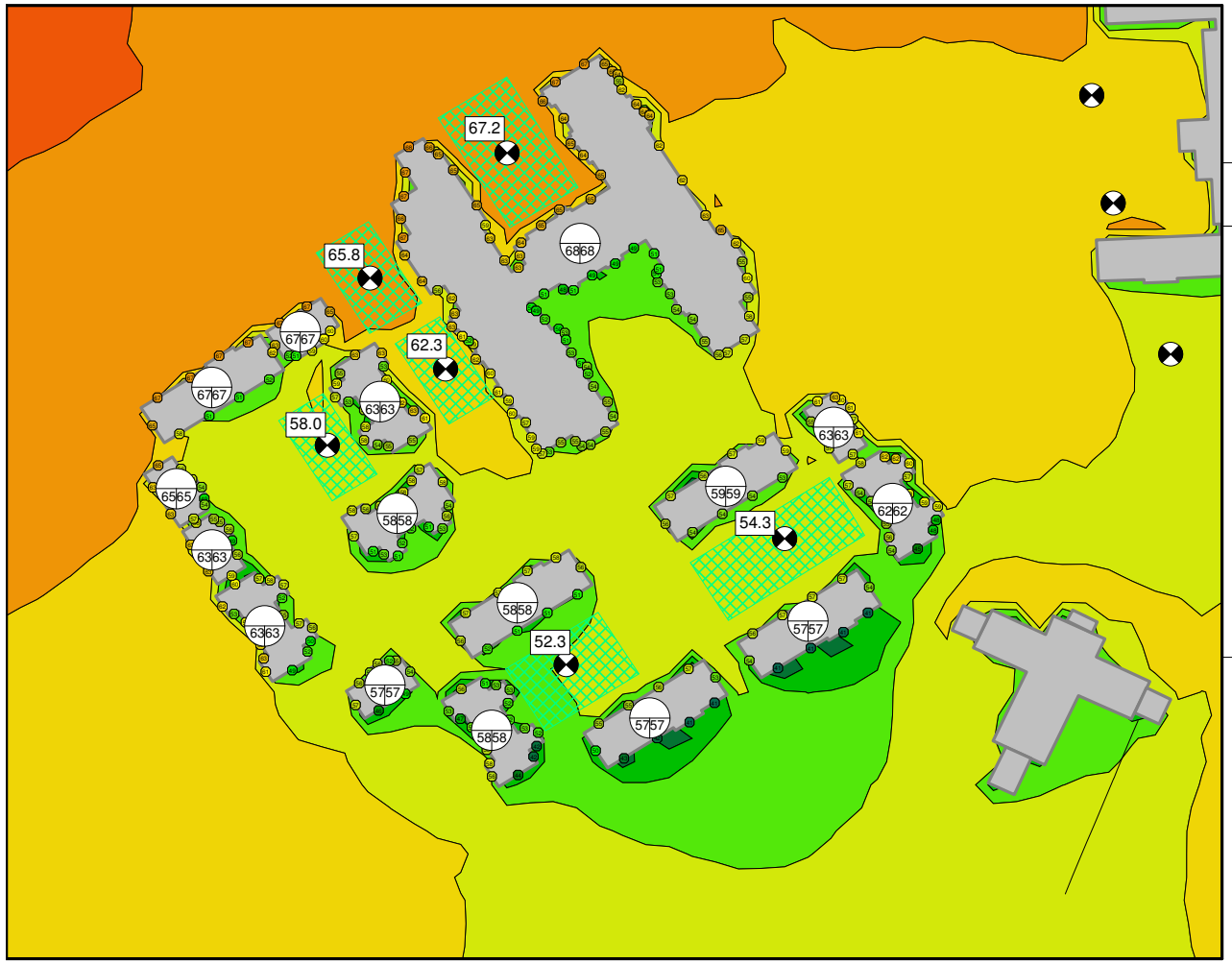
Miller Goodall
Environmental Services

Datakustik CadnaA v4.6

# Appendix 2c: Night-time $L_{Amax}$ Noise from Road Traffic

## Elker Lane, Phase 2

Night-time LAmax road noise




**Miller Goodall**
**Environmental Services Ltd**

Ground Floor, Ashworth House,
Deakins Business Park,
Blackburn Road,
Egerton, Bolton, BL7 9RP
Tel: 01204 596166
E-mail: info@millergoodall.co.uk
www.millergoodall.co.uk

**Key to Noise Contours**

- ... < 10.0
- 10.0 <= ... < 15.0
- 15.0 <= ... < 20.0
- 20.0 <= ... < 25.0
- 25.0 <= ... < 30.0
- 30.0 <= ... < 35.0
- 35.0 <= ... < 40.0
- 40.0 <= ... < 45.0
- 45.0 <= ... < 50.0
- 50.0 <= ... < 55.0
- 55.0 <= ... < 60.0
- 60.0 <= ... < 65.0
- 65.0 <= ... < 70.0
- 70.0 <= ... < 75.0
- 75.0 <= ... < 80.0
- 80.0 <= ... < 85.0
- 85.0 <= ... < 90.0
- 90.0 <= ... < 95.0
- 95.0 <= ... < 120.0
- 120.0 <= ...

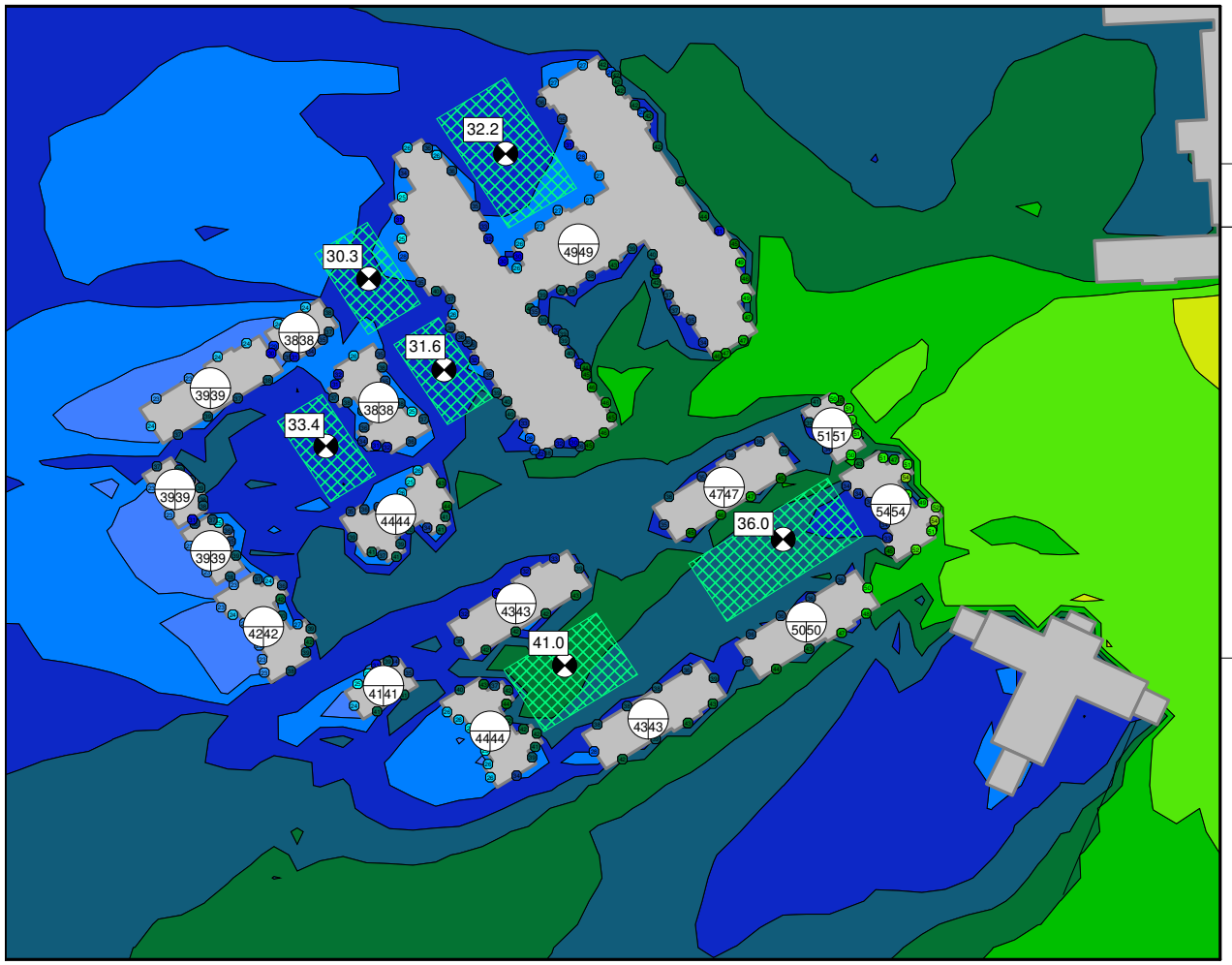
Miller Goodall
Environmental Services

Datakustik CadnaA v4.6

# Appendix 2d: Daytime $L_{Aeq}$ Noise from School Playgrounds

## Elker Lane, Phase 2

Daytime LAeq noise from school playground




**Miller Goodall**
**Environmental Services Ltd**

Ground Floor, Ashworth House,
Deakins Business Park,
Blackburn Road,
Egerton, Bolton, BL7 9RP
Tel: 01204 596166
E-mail: info@millergoodall.co.uk
www.millergoodall.co.uk

**Key to Noise Contours**

- ... < 10.0
- 10.0 <= ... < 15.0
- 15.0 <= ... < 20.0
- 20.0 <= ... < 25.0
- 25.0 <= ... < 30.0
- 30.0 <= ... < 35.0
- 35.0 <= ... < 40.0
- 40.0 <= ... < 45.0
- 45.0 <= ... < 50.0
- 50.0 <= ... < 55.0
- 55.0 <= ... < 60.0
- 60.0 <= ... < 65.0
- 65.0 <= ... < 70.0
- 70.0 <= ... < 75.0
- 75.0 <= ... < 80.0
- 80.0 <= ... < 85.0
- 85.0 <= ... < 90.0
- 90.0 <= ... < 95.0
- 95.0 <= ... < 120.0
- 120.0 <= ...

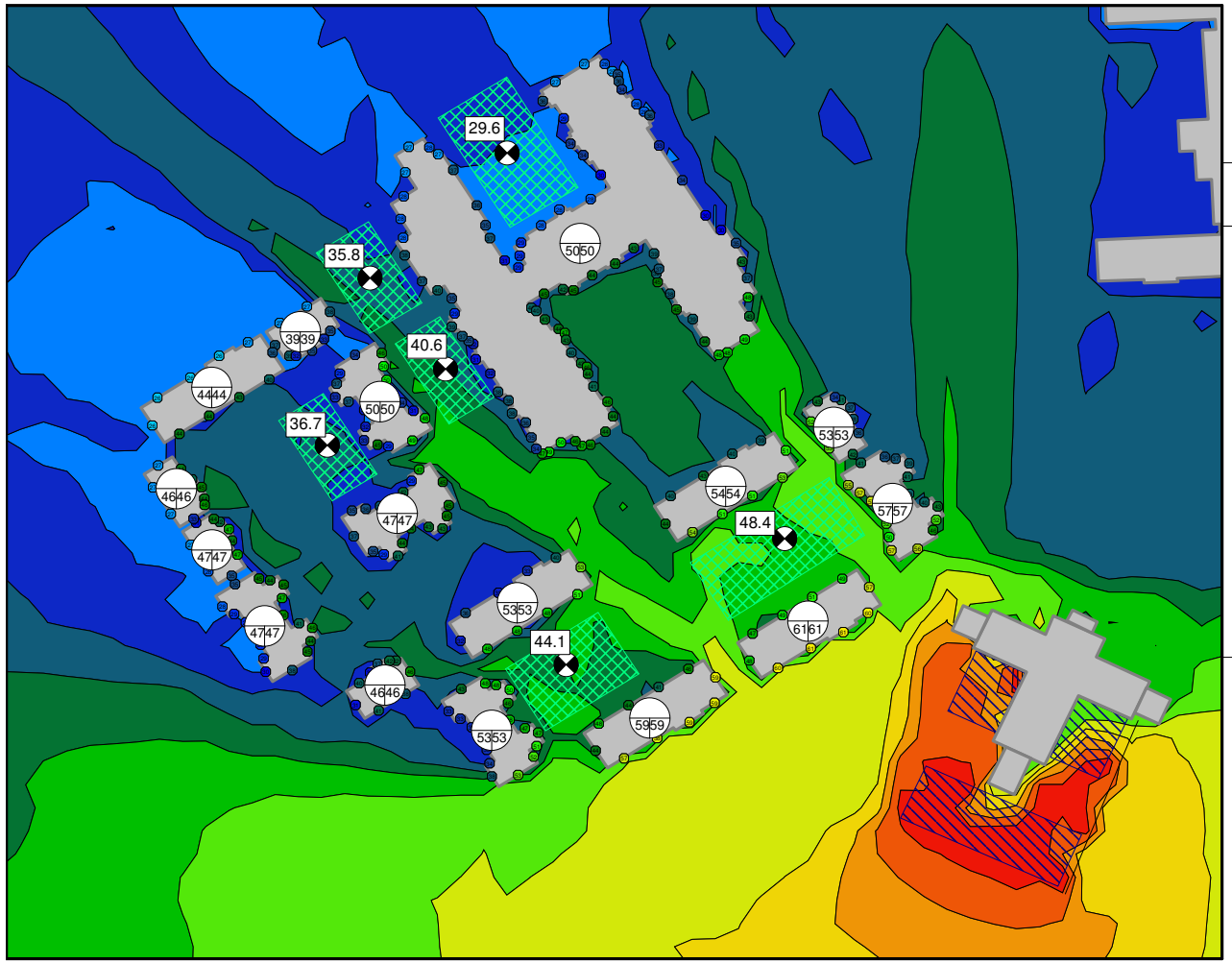
Miller Goodall
Environmental Services

Datakustik CadnaA v4.6

# Appendix 2e: Daytime $L_{Aeq}$ Noise from Approved Nursery

## Elker Lane, Phase 2

Daytime LAeq noise from nursery




**Miller Goodall**
**Environmental Services Ltd**

Ground Floor, Ashworth House,
Deakins Business Park,
Blackburn Road,
Egerton, Bolton, BL7 9RP
Tel: 01204 596166
E-mail: info@millergoodall.co.uk
www.millergoodall.co.uk

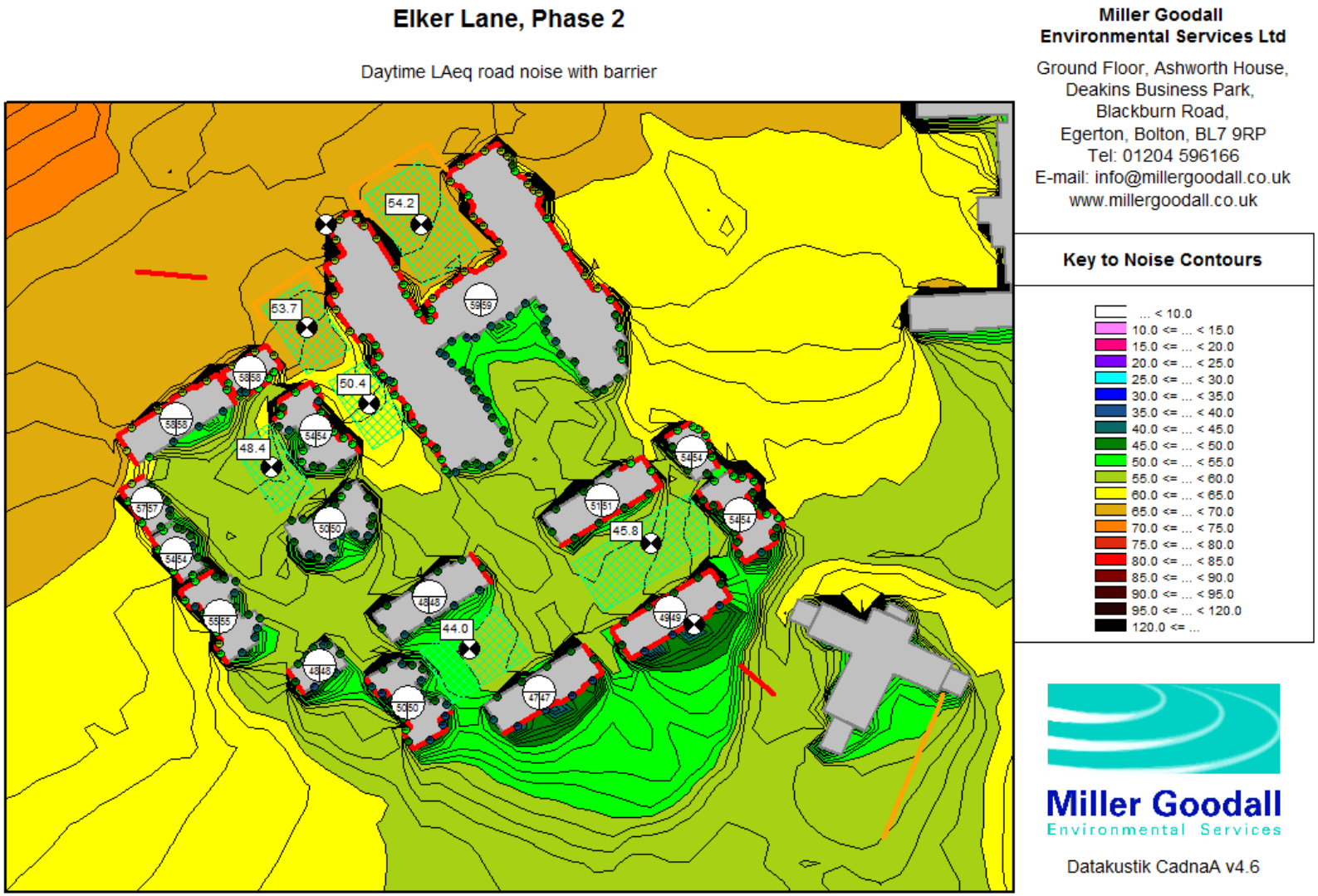
**Key to Noise Contours**

- ... < 10.0
- 10.0 <= ... < 15.0
- 15.0 <= ... < 20.0
- 20.0 <= ... < 25.0
- 25.0 <= ... < 30.0
- 30.0 <= ... < 35.0
- 35.0 <= ... < 40.0
- 40.0 <= ... < 45.0
- 45.0 <= ... < 50.0
- 50.0 <= ... < 55.0
- 55.0 <= ... < 60.0
- 60.0 <= ... < 65.0
- 65.0 <= ... < 70.0
- 70.0 <= ... < 75.0
- 75.0 <= ... < 80.0
- 80.0 <= ... < 85.0
- 85.0 <= ... < 90.0
- 90.0 <= ... < 95.0
- 95.0 <= ... < 120.0
- 120.0 <= ...

Miller Goodall
Environmental Services

Datakustik CadnaA v4.6

# Appendix 2f: Daytime $L_{Aeq}$ Amenity Noise levels with Barrier



# Appendix 3: Facades requiring glazing and ventilation

Facades requiring proposed mitigation.

# Glossary of Terms

**Decibel (dB**) The unit used to quantify sound pressure levels; it is derived from the logarithm of the ratio between the value of a quantity and a reference value. It is used to describe the level of many different quantities. For sound pressure level the reference quantity is 20 µPa, the threshold of normal hearing is in the region of 0 dB, and 140 dB is the threshold of pain. A change of 1 dB is usually only perceptible under controlled conditions.

**dB $L_A$** Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB $L_A$ broadly agree with an individual's assessment of loudness. A change of 3 dB $L_A$ is the minimum perceptible under normal conditions, and a change of 10 dB $L_A$ corresponds roughly to halving or doubling the loudness of a sound. The background noise level in a living room may be about 30 dB $L_A$; normal conversation about 60 dB $L_A$ at 1 meter; heavy road traffic about 80 dB $L_A$ at 10 meters; the level near a pneumatic drill about 100 dB $L_A$.

**$L_{A90,T}$** The A weighted noise level exceeded for 90% of the specified measurement period (*T*). In BS 4142: 1997 it is used to define background noise level.

**$L_{Aeq,T}$** The equivalent continuous sound level. The sound level of a notionally steady sound having the same energy as a fluctuating sound over a specified measurement period (*T*). $L_{Aeq,T}$ is used to describe many types of noise and can be measured directly with an integrating sound level meter.

**$L_{Amax}$** The highest A weighted noise level recorded during the time period. It is usually used to describe the highest noise level that occurred during the event.

**$L_{A10(18\ hour)}$** Often referred to as the UK road traffic noise index, this is the arithmetic average of the values of $L_{A10}$ hourly for each of the 18 one hour periods between 06:00 and 00:00.

**NOEL** No observed effect level: the level of noise exposure below which no effect at all on health or quality of life can be detected.

**LOAEL** Lowest observed adverse effect level: the level of noise exposure above which adverse effects on health or quality of life can be detected.

**SOAEL** Significant observed adverse effect level: the level of noise exposure above which significant adverse effects on health or quality of life can be detected.

**$R_w$** *S*ingle number rating used to describe the sound insulation of building elements and is defined in BS EN ISO 10140-2: 2010 (formerly BSEN ISO 140-3:1995). It is derived by measurement under laboratory conditions and does not take into account the effects of flanking transmissions.

**$D_{nT,w}$** The weighted standardized level difference is a single figure rating used to describe the sound insulation of a construction separating two rooms, for example a wall or floor, and

is defined in BS EN ISO 16283-1:2014 (formerly BSEN ISO 140-4:1998). It is derived by measurement of an in-situ construction and therefore takes into account the effects of flanking transmissions, workmanship etc.

$D_{ne,w}$ The weighted element-normalized level difference is a single figure rating used to describe the sound insulation of small elements within a larger construction and is defined in BS EN ISO 10140-2:2010 (BSEN ISO 140-10:1991). It is most often used to rate the sound insulation performance of ventilator units e.g. trickle vents.

$C_{tr}$ A single-number spectrum adaptation term used to characterise the sound insulation rating with respect to urban traffic. It is defined in ISO 717-1:20-13.

Miller Goodall

Environmental Services