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IVY CLOSE, WILLINGTON DERBYSHIRE

NOISE IMPACT ASSESSMENT

Report 18394.NIA.01

For:

Partnership Homes Ltd

50 Friar Gate

Derby

DE1 1DF

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1.0 INTRODUCTION

KP Acoustics has been commissioned by Partnership Homes Ltd, 50 Friar Gate, Derby, DE1 1DF, to assess the suitability of the site at Ivy Close, Willington Derbyshire, DE65 6BS for a 50 unit care facilities in accordance with the provisions of the National Planning Policy Framework and the Noise Policy Statement for England (NPSE).

This report presents the results of the environmental survey undertaken in order to measure prevailing background noise levels and outlines any necessary mitigation measures.

2.0 SITE SURVEYS

2.1 Site Description

The site is bounded by Environmental Willington Services sub-depot and A5132 to the North, Trent and Mersey Canal to the West, Crosscountry rail line to the South, and residentials to the East. Entrance to the site is located to the East through Ivy Close. At the time of the survey, the background noise climate was dominated by rail traffic noise from Crosscountry rail lines.

2.2 Environmental Noise Survey Procedure

A noise survey was undertaken on the proposed site as shown in Figure 18394.SP1. The location was chosen in order to collect data representative of the worst-case levels expected on the site due to all nearby sources.

Continuous automated monitoring was undertaken for the duration of the survey between 13:23 on 09/11/2018 and 13:06 on 13/11/2018.

Weather conditions were generally dry with light winds and therefore suitable for the measurement of environmental noise. The measurement procedure complied with ISO 1996-2:2007 Acoustics *"Description, measurement and assessment of environmental noise - Part 2: Determination of environmental noise levels"*.

2.3 Measurement Positions

Measurement positions are as described within Table 2.1 and shown within Figure 2.1.

	Description
Noise Measurement Position 1, South Elevation (MP.1)	The meter was installed at the South-West site boundary of the development site approximately 12 meters away from the railway line as shown in 18394.SP1 at a distance of 2 m over the ground level.
Noise Measurement Position 2, North Elevation (MP.2)	The meter was installed at the North-East site boundary of the development site approximately 50 meters away from the railway line as shown in 18394.SP1 at a distance of 2 m over the ground level.

Table 2.1 Measurement positions and descriptions

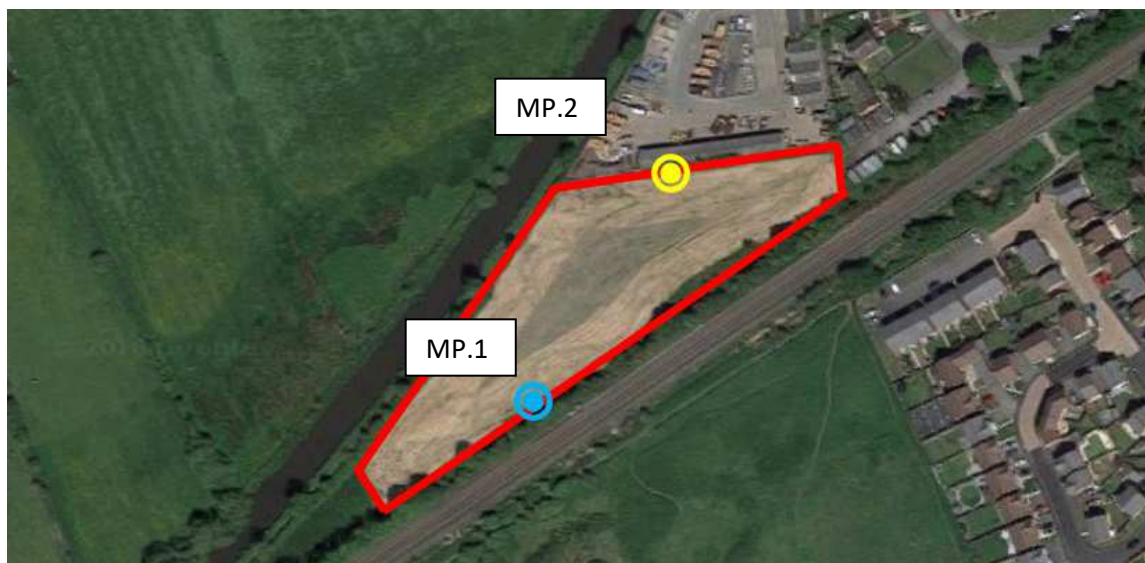


Figure 2.2 – Site Measurement positions (Image Source: Google Images)

2.4 Equipment

The equipment calibration was verified before and after use and no abnormalities were observed. The equipment used is described within Table 2.2.

Measurement instrumentation	Serial No.	Cal. Cert. No:	Cal. Date:
1No. SvanTek Type 958A Class 1 Sound Level Meter at monitoring position 1	36655	14007250-4	13/12/2017
SvanTek SV12L Preamplifier	33537		
SvanTek Type 7052E Microphone	55921		
SvanTek External windshield	N/A	N/A	N/A
1No. SvanTek Type 977 Class 1 Sound Level Meter at monitoring position 2	36453	1400 8790	13/12/2017
SvanTek Type SV12L Preamplifier	41508		
SvanTek Type 7052E Microphone	54143		
SvanTek External windshield	N/A	N/A	N/A
1No. B&K Type 4231 Class 1 Acoustic Calibrator	1897774	03635/1	07/12/2018

Table 2.2 Measurement instrumentation

3.0 RESULTS

3.1 Noise Survey

The $L_{Aeq}: 5min$, $L_{Amax}: 5min$, $L_{A10}: 5min$ and $L_{A90}: 5min$ acoustic parameters were measured throughout the duration of the survey. Measured levels are shown as a time history in Figure 18394.TH1-2.

Measured noise levels are representative of noise exposure levels expected to be experienced by all facades of the proposed development, and are shown in Table 3.1.

	South Façade (Measured Noise level – dBA)	North Façade (Measured Noise level – dBA)
Daytime $L_{Aeq,16hour}$	62	60
Night-time $L_{Aeq,8hour}$	60	58

Table 3.1 Site average noise levels for daytime and night time

4.0 NOISE ASSESSMENT GUIDANCE

4.1 Noise Policy Statement For England

The National Planning Policy Framework (NPPF) has superseded and replaces Planning Policy Guidance Note 24 (PPG24), which previously covered issues relating to noise and planning in England. Paragraph 170 of the NPPF states that planning policies and decisions should aim to:

- preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans

In addition, Paragraph 180 of the NPPF states that *‘Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should’*:

- Mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life

The Noise Policy Statement for England (NPSE) was developed by DEFRA and published in March 2010 with the aim to ‘Promote good health and good quality of life through the effective management of noise within the context of Government policy on sustainable development.’

Noise Policy Statement England (NPSE) noise policy aims are as follows:

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

- *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 improvement of health and quality of life.*

The Noise Policy Statement England (NPSE) outlines observed effect levels relating to the above, 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 detectable 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.

As stated in The Noise Policy Statement England (NPSE), it is not currently possible to have a single objective based measure that defines SOAEL that is applicable to all sources of noise in all situations. Specific noise levels are not stated within the guidance for this reason, and allow flexibility in the policy until further guidance is available.

4.2 BS8233:2014 – Internal Spaces

BS8233:2014 “*Sound insulation and noise reduction for buildings*” describes recommended internal noise levels for residential spaces. These levels are shown in Table 4.1.

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living Rooms	35 dB(A)	-
Dining	Dining Room/area	40 dB(A)	-
Sleeping (daytime resting)	Bedrooms	35 dB(A)	30 dB(A)

Table 4.1 BS8233 recommended internal background noise levels

The external building fabric would need to be carefully designed to achieve these recommended internal levels.

5.0 EXTERNAL BUILDING FABRIC SPECIFICATION

Sound reduction performance calculations have been undertaken in order to specify the minimum performance required from glazed and non-glazed elements in order to achieve the recommended internal noise levels shown in Table 4.1, taking into account average and maximum noise levels monitored during the environmental noise survey.

Typical sized bedrooms with a standard ratio of glazing to masonry have been used for all calculations in order to specify glazing.

As a more robust assessment, L_{Amax} spectrum values of night-time peaks have also been considered and incorporated into the glazing calculation in order to cater for the interior limit of 45 dB L_{Amax} for individual events, as recommended in WHO Guidelines.

Please note that the glazed and non-glazed element calculations would need to be finalised once all design proposals are finalised.

5.1 Non-Glazed Elements

It is currently understood that the non-glazed building façade is comprised of masonry. The anticipated sound reduction index has been calculated, and would be expected to provide the minimum figures shown in Table 5.1 when tested in accordance with BS EN ISO, 140-3:1995.

Element	Octave band centre frequency SRI, dB					
	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
Non-glazed element SRI	27	38	45	49	50	50

Table 5.1 Assumed sound reduction performance for non-glazed elements

At this project stage, the exact construction of the non-glazed external building fabric is unknown, however, it is understood that it would be based upon the construction proposed in Table 5.1 and would be expected to provide the minimum figures shown above when tested in accordance with BS EN ISO, 140-3:1995.

5.2 Glazed Elements

Minimum octave band sound reduction index (SRI) values required for all glazed elements to be installed are shown in Table 5.2. The performance is specified for the whole window unit, including the frame and other design features such as the inclusion of trickle vents. Sole glass performance data would not demonstrate compliance with this specification.

Glazing performance calculations have been based both on average measured night-time noise levels as well as verified against the L_{Amax} spectrum of individual events in order to comply with a maximum internal noise level of 45dB(A) in bedrooms as recommended by World Health Organisation Guidelines. The combined most robust results of these calculations are shown in Table 5.2.

Elevation	Octave band centre frequency SRI, dB						$R_w(C;C_{tr})$, dB
	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	
South Elevation (Type 1 Glazing)	29	40	45	47	54	68	47 (-1;-6)
North Elevation (Type 2 Glazing)	30	32	38	36	40	49	39 (-1;-3)

Table 5.2 Required glazing performance

The nominated glazing supplier should verify that their proposed window system meets the attenuation figures shown at each centre frequency band as shown in Table 5.2.

Example glazing types that would be expected achieve the above spectral values are shown in Table 5.3.

Elevation	Example glazing type
South Elevation	Pilkington Optilam 16.8(lam)/16/16.8(lam)
North Elevation	SGG 10/12/10mm

Table 5.3 Example glazing types

All major building elements should be tested in accordance with BS EN ISO 140-3:1995.

Independent testing at a UKAS accredited laboratory will be required in order to confirm the performance of the chosen system for an “actual” configuration.

5.3 Ventilation Strategy

Due to the South façade facing directly to the railway line and in order to achieve the recommended internal levels stipulated in BS8233:2014, we would recommend that all windows of the rooms facing the South elevation are not openable, therefore a mechanical system is recommended to be implemented.

5.3.1 Mechanical

The possible strategy for ventilation is whole house mechanical ventilation (WHMV) for the rooms facing the South elevation. This type of system usually comprises a low speed fan within a ducted system, providing fresh air supply to habitable spaces (bedrooms, living rooms, etc.), as well as extract from kitchens and toilets. WHMV systems can also include heat recovery (i.e. MVHR) capabilities. In this case, external noise break-in to the habitable spaces via the ventilation ducts will be negligible (when compared to the glazing), due to the fact that the system is fully ducted.

6.0 CONCLUSION

An environmental noise survey has been undertaken at Ivy Close, Willington Derbyshire, DE65 6BS allowing the assessment of daytime and night-time levels likely to be experienced by the proposed development.

Measured noise levels allowed a robust glazing specification to be proposed which would provide internal noise levels for all residential environments of the development commensurate to the design range of BS8233:2014.

No further mitigation measures should be required in order to protect the proposed habitable spaces from external noise intrusion.

Ivy Close, Willington Derbyshire. DE65 6BS
Environmental Noise Time History
From 09 November 2018 To 13 November 2018

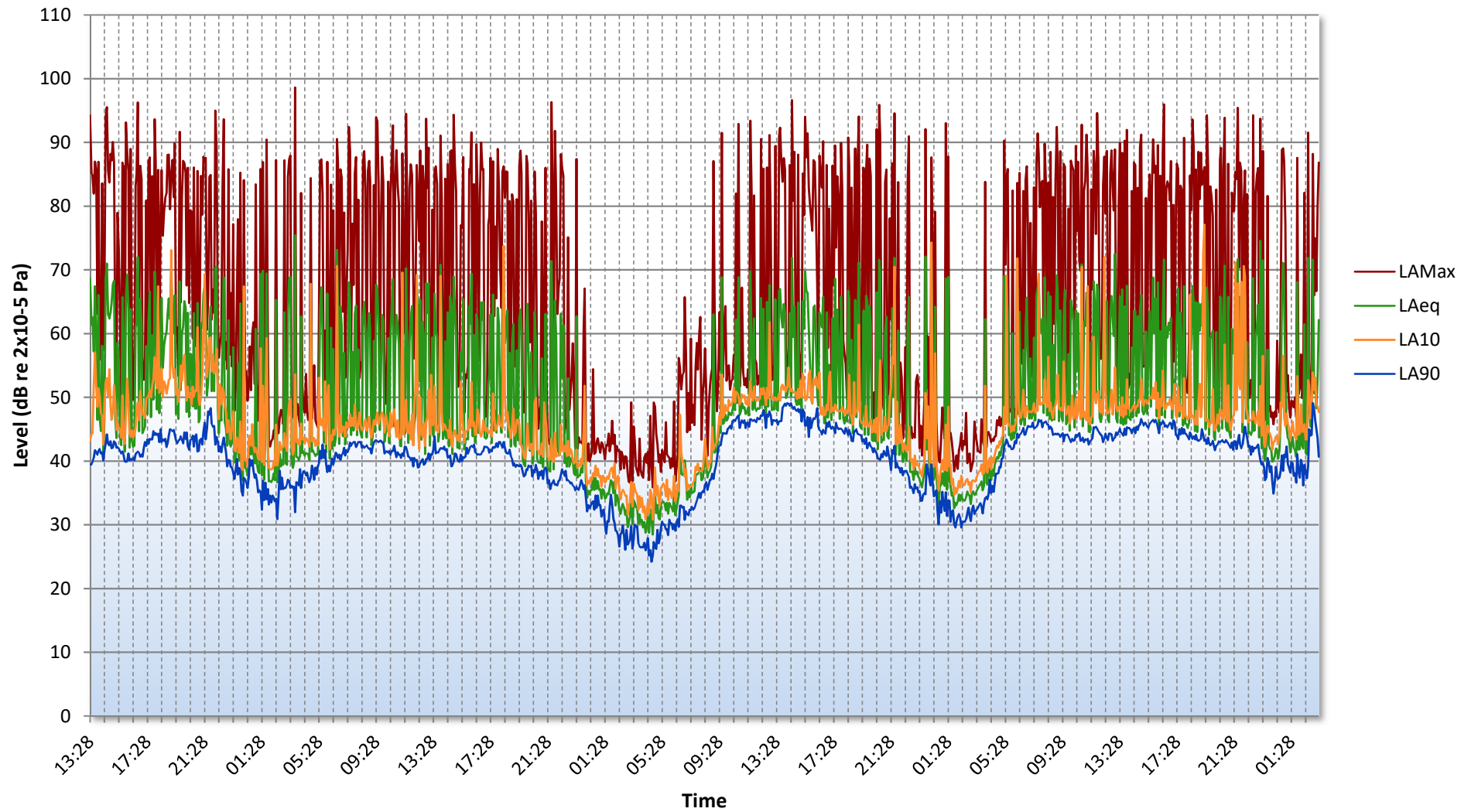


Figure 18394.TH1

Ivy Close, Willington Derbyshire. DE65 6BS
Environmental Noise Time History
From 09 November 2018 To 13 November 2018

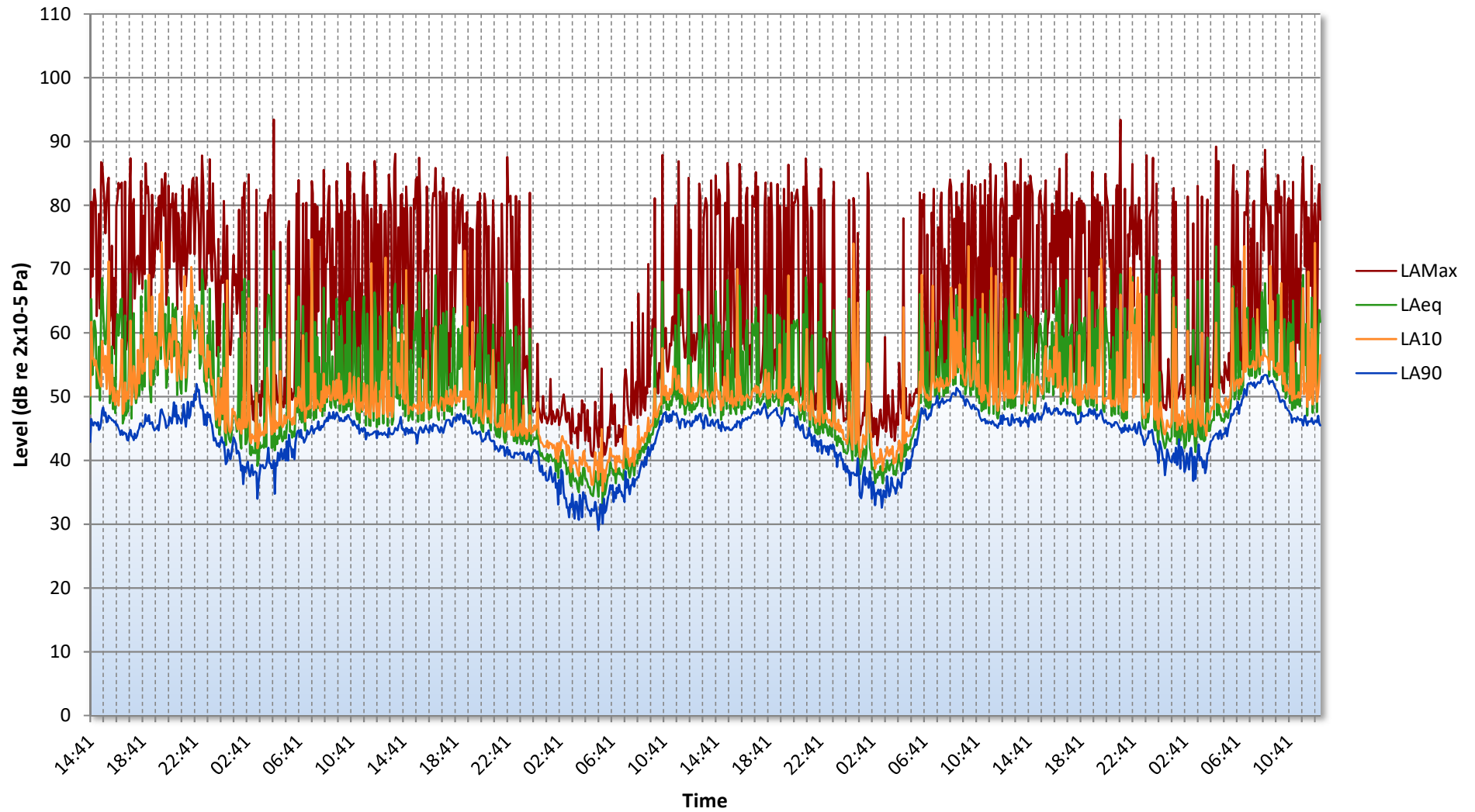
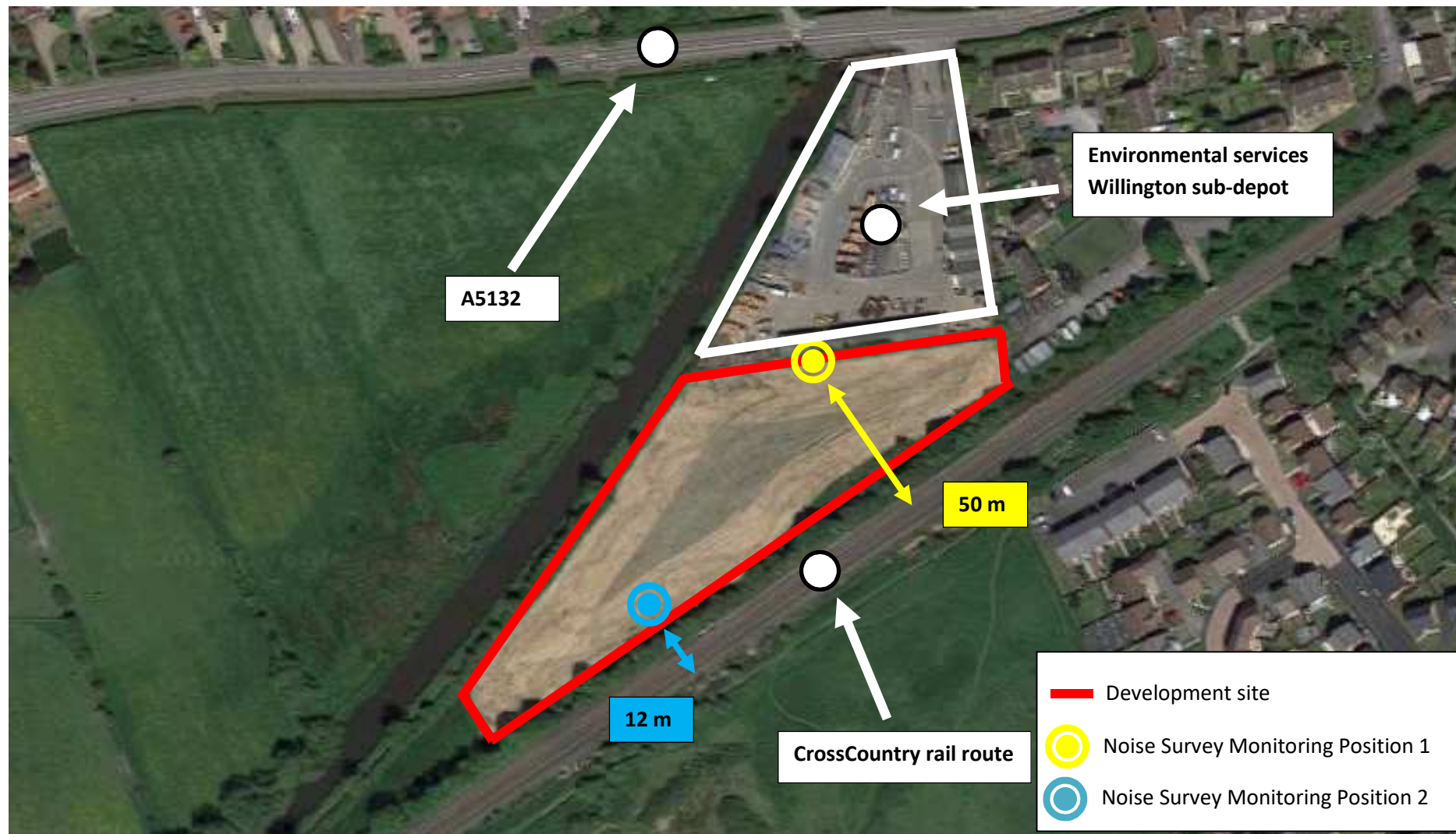


Figure 18394.TH2



Title: Indicative site plan showing noise monitoring positions.
(Image Source: Google maps)

Date: 13 December 2018

FIGURE 18394.SP1





Rail line

- Glazing type 1 – South Elevation
- Glazing type 2 – North elevation

Title: Indicative site plan showing Glazing types.
(Image Source: Google maps)

Date: 13 December 2018

FIGURE 18394.SP2



GENERAL ACOUSTIC TERMINOLOGY

Decibel scale - dB

In practice, when sound intensity or sound pressure is measured, a logarithmic scale is used in which the unit is the 'decibel', dB. This is derived from the human auditory system, where the dynamic range of human hearing is so large, in the order of 10^{13} units, that only a logarithmic scale is the sensible solution for displaying such a range.

Decibel scale, 'A' weighted - dB(A)

The human ear is less sensitive at frequency extremes, below 125Hz and above 16Khz. A sound level meter models the ears variable sensitivity to sound at different frequencies. This is achieved by building a filter into the Sound Level Meter with a similar frequency response to that of the ear, an A-weighted filter where the unit is dB(A).

L_{eq}

The sound from noise sources often fluctuates widely during a given period of time. An average value can be measured, the equivalent sound pressure level L_{eq} . The L_{eq} is the equivalent sound level which would deliver the same sound energy as the actual fluctuating sound measured in the same time period.

L_{10}

This is the level exceeded for no more than 10% of the time. This parameter is often used as a "not to exceed" criterion for noise.

L_{90}

This is the level exceeded for no more than 90% of the time. This parameter is often used as a descriptor of "background noise" for environmental impact studies.

L_{max}

This is the maximum sound pressure level that has been measured over a period.

Octave Bands

In order to completely determine the composition of a sound it is necessary to determine the sound level at each frequency individually. Usually, values are stated in octave bands. The audible frequency region is divided into 11 such octave bands whose centre frequencies are defined in accordance with international standards. These centre frequencies are: 16, 31.5, 63, 125, 250, 500, 1000, 2000, 4000, 8000 and 16000 Hertz.

Environmental noise terms are defined in BS7445, *Description and Measurement of Environmental Noise*.

APPLIED ACOUSTIC TERMINOLOGY

Addition of noise from several sources

Noise from different sound sources combines to produce a sound level higher than that from any individual source. Two equally intense sound sources operating together produce a sound level which is 3dB higher than a single source and 4 sources produce a 6dB higher sound level.

Attenuation by distance

Sound which propagates from a point source in free air attenuates by 6dB for each doubling of distance from the noise source. Sound energy from line sources (e.g. stream of cars) drops off by 3dB for each doubling of distance.

Subjective impression of noise

Hearing perception is highly individualised. Sensitivity to noise also depends on frequency content, time of occurrence, duration of sound and psychological factors such as emotion and expectations. The following table is a guide to explain increases or decreases in sound levels for many scenarios.

Change in sound level (dB)	Change in perceived loudness
1	Imperceptible
3	Just barely perceptible
6	Clearly noticeable
10	About twice as loud

Transmission path(s)

The transmission path is the path the sound takes from the source to the receiver. Where multiple paths exist in parallel, the reduction in each path should be calculated and summed at the receiving point. Outdoor barriers can block transmission paths, for example traffic noise. The effectiveness of barriers is dependent on factors such as its distance from the noise source and the receiver, its height and construction.

Ground-borne vibration

In addition to airborne noise levels caused by transportation, construction, and industrial sources there is also the generation of ground-borne vibration to consider. This can lead to structure-borne noise, perceptible vibration, or in rare cases, building damage.

Sound insulation - Absorption within porous materials

Upon encountering a porous material, sound energy is absorbed. Porous materials which are intended to absorb sound are known as absorbents, and usually absorb 50 to 90% of the energy and are frequency dependent. Some are designed to absorb low frequencies, some for high frequencies and more exotic designs being able to absorb very wide ranges of frequencies. The energy is converted into both mechanical movement and heat within the material; both the stiffness and mass of panels affect the sound insulation performance.