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Proposed Residential Development
The Old Stable Yard, Winthorpe Road, Newark

Addendum Technical Review

For:
Newark and Sherwood District Council

11th December 2023

Ref: NIA-10951-23-11131-v1 Winthorpe Road, Newark Addendum
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1 Introduction

1.1 Overview

Environmental Noise Solutions Ltd (ENS) was commissioned by Newark and Sherwood District Council (NSDC) to undertake a review of noise documentation in relation to the material change of use of land to residential occupation at land Winthorpe Road, Newark (hereafter referred to as 'the site').

The review included the following recommendations:

- *Determine the sound reduction of the building envelope of touring caravans*
- *Assess the internal noise levels within touring caravans using the measured sound reduction.*
- *Test the viability of increased boundary screening to further reduce external noise levels*

Following the review, it is understood that discretionary funding may be available for the provision of acoustic screening located on land outside of the site, in order to reduce noise from the A1.

The objectives of this addendum were therefore to:

- Determine the sound reduction of both touring caravans and static caravans at the site by undertaking simultaneous internal/external measurements (both with windows open and closed)

- Undertake noise modelling to determine the efficacy of boundary screening alongside the A1 and ascertain predicted external noise levels across the site

- Assess the internal noise levels within touring caravans at the site using the measured sound reduction in conjunction with the modelled external noise levels including the provision of acoustic screening

This addendum report details the methodology and results of the assessment, and should be read in conjunction with the previous technical review in order to obtain a full understanding of the assessment of noise at the site.

The addendum report has been prepared for NSDC for the sole purpose described above and no extended duty of care to any third party is implied or offered. Third parties referring to the report should consult NSDC and ENS as to the extent to which the findings may be appropriate for their use.

A glossary of acoustic terms used in the main body of the text is contained in Appendix 1.

2 Noise Survey

2.1 Overview

In order to capture source noise data associated with the A1, noise monitoring was carried out on Wednesday 15th November 2023.

For the purpose of the assessment, a single noise monitoring position (MP1) was adopted immediately adjacent to the nearside carriage of the A1 and at circa 2 metres above the road surface.

Noise measurements were undertaken in free field conditions using an NTi XL3 Type 1 integrating sound level meter. The meter was connected to a windshield covered microphone positioned at the location detailed above. The measurement system calibration was verified immediately before and after the survey period using a Bruel & Kjaer Type 4231 calibrator. No drift in calibration levels greater than 0.5 dB was noted.

The noted weather conditions were dry with wind speeds < 5 m/s. Weather conditions were therefore considered appropriate for noise monitoring.

2.2 External Noise Levels

The measured noise level at MP1 was 82 dB $L_{Aeq\,(1014–1314)}$ and the corresponding octave band noise levels were used as input noise levels for the model.

An NIA (report ref: 403.08181.00002) prepared by SLR Consulting Limited previously determined daytime and night-time ambient noise at the northern and southern boundaries of the site, Locations 1 and 2 respectively, as summarised below.

Table 2.1: Summary of Noise Measurement Data

Location	Time Period	L_{Aeq} (dB)
1	Daytime (0700–2300)	64
	Night-Time (2300–0700)	61
2	Daytime (0700–2300)	63
	Night-Time (2300–0700)	60

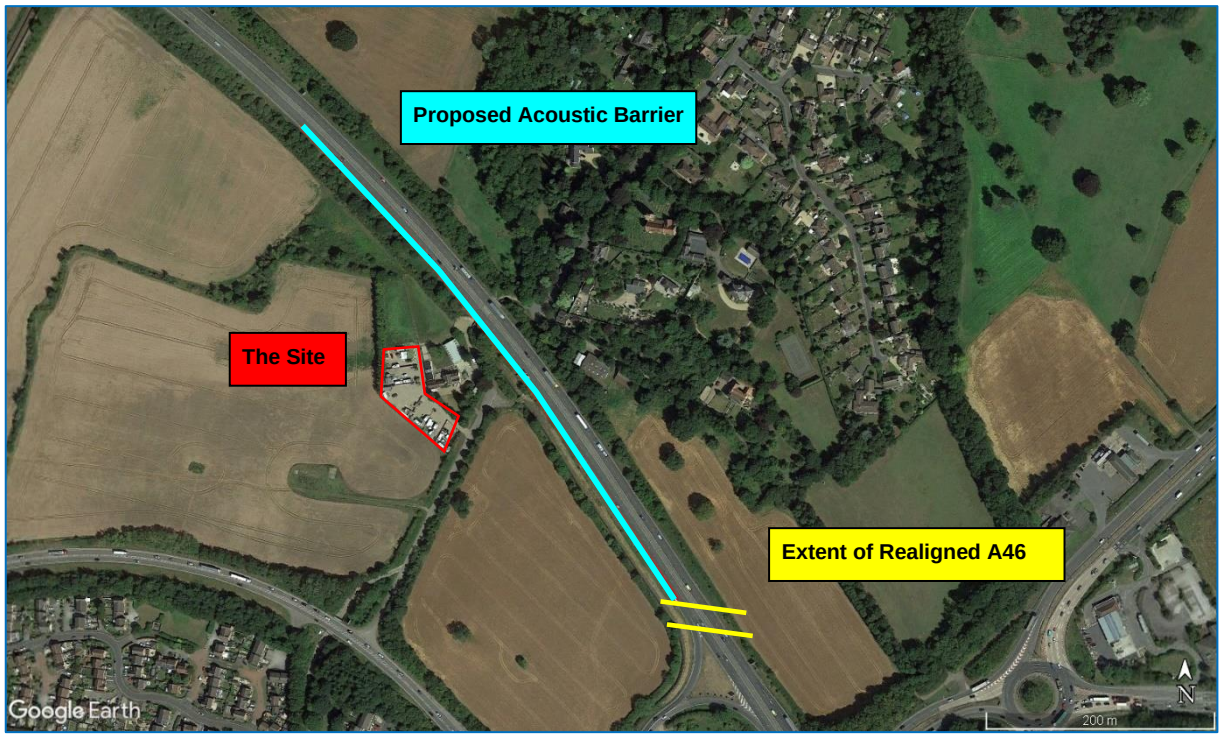
In order to assess the propagation of noise from the A1 across the site, noise level predictions have been performed using CadnaA acoustic modelling software. This is a software program specifically developed for the prediction and assessment of environmental noise.

The model calculates noise levels on horizontal and vertical grids with a user defined spacing of receiver points. From these levels, calculated at thousands of points, contour lines of constant noise levels are generated and printed as noise maps. All scaling was based on direct import from Google Earth, with 2nd order reflections considered and absorption coefficients based on the CadnaA default for brick-built structures.

The model was calibrated to the ambient noise levels as detailed in Table 2.1, in the absence of any proposed screening.

The road traffic noise levels were then modelled including an acoustic barrier alongside the A1. In order to be effective, the barrier must continue for circa 225 metres north and south from the boundary of the site. Figure 2.1 shows the extent of the proposed barrier in relation to the site and the proposed realigned A46 Newark Bypass.

Figure 2.1: Proposed Fence Location



The modelling was undertaken with barrier heights of 2 metres, 3 metres and 4 metres (relative to the ground level of the A1 surface). The results of the modelling are summarised in Table 2.2 below.

Table 2.2: External Noise Levels at Various Barrier Heights

Fence Height	Location 1	Location 2
4 metres	54 dB $L_{Aeq\ (0700\text{-}2300)}$	55 dB $L_{Aeq\ (0700\text{-}2300)}$
3 metres	56 dB $L_{Aeq\ (0700\text{-}2300)}$	55 dB $L_{Aeq\ (0700\text{-}2300)}$
2 metres	57 dB $L_{Aeq\ (0700\text{-}2300)}$	57 dB $L_{Aeq\ (0700\text{-}2300)}$

In order to reduce external noise levels to ≤ 55 dB $L_{Aeq\ (0700\text{-}2300)}$ across the site, a 4-metre-high barrier is required. Appendix 3 contains a noise level contour map including 4-metre-high acoustic screening.

2.3 Sound Insulation of Caravan Building Envelope

In order to establish the sound reduction of in-situ caravans at the site, simultaneous internal/external noise measurements were undertaken during the daytime on Wednesday 15th November 2023 using calibrated Bruel & Kjaer 2250 Type 1 integrating sound level meters.

The measurement system calibration was verified immediately before and after the survey period using a Bruel & Kjaer Type 4231 calibrator. No drift in calibration levels greater than 0.5 dB was noted.

Noise measurements were undertaken within the living rooms of a static caravan and a touring caravan, both with windows open and windows closed with simultaneous external measurements undertaken outside the respective caravans. The results of the measurements are summarised in Table 2.3.

Table 2.3: Sound Insulation Performance of Caravan Building Envelope

Caravan Type	External Noise Level	Internal Noise Level	Sound Insulation Performance
Static Caravan (windows closed)	57 dB $L_{Aeq\ (15\ min)}$	33 dB $L_{Aeq\ (15\ min)}$	24 dB R_w
Static Caravan (windows open)	59 dB $L_{Aeq\ (15\ min)}$	39 dB $L_{Aeq\ (15\ min)}$	20 dB R_w
Touring Caravan (windows closed)	62 dB $L_{Aeq\ (15\ min)}$	45 dB $L_{Aeq\ (15\ min)}$	17 dB R_w
Touring Caravan (windows open)	62 dB $L_{Aeq\ (15\ min)}$	47 dB $L_{Aeq\ (15\ min)}$	15 dB R_w

The sound insulation results for the static caravan are consistent with those of a dwelling with standard glazing installed.

The sound insulation results for the touring caravan were notably worse, with only 17 dB reduction with windows closed. For reference, this is consistent with comments received previously from the Environmental Health department at NSDC.

The reduction from external to internal with windows open in the touring caravan was circa 15 dB, which is consistent with the WHO Guidelines for Community Noise (1999), which states: '*the noise reduction from outside to inside with the window partly open is 15 decibels.*'.

3 Noise Assessment

3.1 Design Noise Levels

With the provision of the acoustic barrier, daytime ambient noise levels throughout the site are reduced to ≤ **55 dB $L_{Aeq\ (0700\text{-}2300)}$**.

The long-term noise measurements undertaken at the site in support of NIA ref: 403.08181.00002 determined that night-time ambient noise levels are circa 3 dB lower, which equates to **≤ 52 dB $L_{Aeq\ (2300\text{-}0700)}$** with the provision of the acoustic barrier as specified.

Based on noise data contained in Tables 6-2 and 6-3 of the NIA, it is evident that the representative maximum noise levels are circa 7–8 dB higher than the night-time ambient noise levels, which equates to **≤ 60 dB L_{AFMax}** with the provision of the acoustic barrier as specified.

For reference, maximum noise levels associated with the adjacent dog kennels as detailed in the NIA are slightly higher than those associated with road traffic. However, it is noted that the predictions were based on worst-case instances of dogs in the external yard and adjacent field during the daytime (0830–1015 hours and 1530–1730 hours) whereas it is assumed that dogs are likely to be within kennels during the night-time.

3.2 External Amenity

With the provision of the acoustic barrier as specified, daytime ambient noise levels throughout the site are reduced to **≤ 55 dB $L_{Aeq\ (0700–2300)}$**, which is compliant with the target criteria contained in ProPG/BS 8233.

3.3 Internal Amenity

Based on the mitigated external noise levels and the measured sound reduction of the in-situ caravans, the resultant internal noise levels are set out in the table below.

Table 3.1 – External Noise Levels and Resultant Internal Noise Levels

Caravan Type	External Noise Level	Reduction	Resultant Internal Level
Static Caravan	≤ 55 dB $L_{Aeq\ (0700\text{-}2300)}$ ≤ 52 dB $L_{Aeq\ (2300\text{-}0700)}$ ≤ 60 dB L_{AFMax}	–24 dB (closed windows)	≤ 31 dB $L_{Aeq\ (0700\text{-}2300)}$ ≤ 28 dB $L_{Aeq\ (2300\text{-}0700)}$ ≤ 36 dB L_{AFMax}
		–20 dB (open windows)	≤ 35 dB $L_{Aeq\ (0700\text{-}2300)}$ ≤ 32 dB $L_{Aeq\ (2300\text{-}0700)}$ ≤ 40 dB L_{AFMax}
Touring Caravan	≤ 55 dB $L_{Aeq\ (0700\text{-}2300)}$ ≤ 52 dB $L_{Aeq\ (2300\text{-}0700)}$ ≤ 60 dB L_{AFMax}	–17 dB (closed windows)	≤ 38 dB $L_{Aeq\ (0700\text{-}2300)}$ ≤ 35 dB $L_{Aeq\ (2300\text{-}0700)}$ ≤ 43 dB L_{AFMax}
		–15 dB (open windows)	≤ 40 dB $L_{Aeq\ (0700\text{-}2300)}$ ≤ 37 dB $L_{Aeq\ (2300\text{-}0700)}$ ≤ 45 dB L_{AFMax}

To put the internal noise levels in Table 3.1 into context, guidance is taken from ProPG Planning and Noise: New Residential Development (ProPG)[1].

Stage 2: Element 2 of ProPG sets indoor ambient noise levels for residential dwellings based on the guidance contained in British Standard 8233:2014 'Guidance on Sound Insulation and Noise Reduction for Buildings'[2] (BS 8233), see Table 3.2.

Table 3.2: Indoor Ambient Noise Levels in Dwellings

Activity	Location	Good Indoor Ambient Noise Levels	
Resting	Living Room	35 dB $L_{Aeq\ (0700\text{-}2300)}$	-
Dining	Dining Room/Area	40 dB $L_{Aeq\ (0700\text{-}2300)}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq\ (0700\text{-}2300)}$	30 dB $L_{Aeq\ (2300\text{-}0700)}$ 45 dB $L_{AFMax\ (2300\text{-}0700)}$

Note 5 to the above table states:

'Where it is not possible to meet internal target levels with windows open, internal noise levels can be assessed with windows closed, however any façade openings used to provide ***whole dwelling ventilation*** *(e.g. trickle ventilators) should be assessed in the "open" position and, in this scenario, the internal L_{Aeq} target levels should not normally be exceeded, subject to the further advice in Note 7'.*

Note 7 to the above table states:

'Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal L_{Aeq} target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved.

It is assumed that adequate whole dwelling ventilation will be provided to the caravans with windows closed on the basis that open windows would not form an appropriate ventilation method. For reference, Approved Document F – Ventilation of the Building Regulations states:

> **NOTE:** A window with a night latch position is not adequate for background ventilation, due to the following.
>
> a. The risk of draughts.
>
> b. Security issues.
>
> c. The difficulty of measuring the equivalent area.

With windows closed, internal ambient noise levels throughout the site will meet the good to reasonable standard as described in ProPG.

By definition, reasonable internal noise levels cannot be considered an adverse impact and are acceptable with respect to residential amenity.

1 'ProPG Planning and Noise: New Residential Development (ProPG)', 2017. Association of Noise Consultants (ANC), Institute of Acoustics (IOA) and the Chartered Institute of Environmental Health (CIEH)

2 British Standards Institution (2014). *British Standard 8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings.*

With regards to the internal noise levels achieved with open windows, further useful contextual guidance is taken from Approved Document O, 2021, (Overheating) which is written in support of Part O of Schedule 1 to the Building Regulations 2010.

Whilst the guidance only applies to new build dwellings, elements of the document are relevant, in particular the following internal thresholds with regards to the feasibility of open windows:

- *40dB $L_{Aeq,T}$, averaged over 8 hours (between 11pm and 7am)*
- *55dB L_{Amax}, more than 10 times a night (between 11pm and 7am)'*

With reference to the internal night-time noise levels contained in Table 3.1, it is evident that, with the provision of the proposed screening to the A1, open windows are feasible during the night-time across the site as a overheating mitigation measure.

Appendix 1 – Abbreviations and Definitions

Sound Pressure Level (L_p)
The basic unit of sound measurement is the sound pressure level. As the pressures to which the human ear responds can range from 20 µPa to 200 Pa, a linear measurement of sound levels would involve many orders of magnitude. Consequently, the pressures are converted to a logarithmic scale and expressed in decibels (dB) as follows:

$L_p = 20 \log_{10}(p/p_o)$

Where L_p = sound pressure level in dB; p = rms sound pressure in Pa; and p_o = reference sound pressure (20 µPa).

A-weighting
A frequency filtering system in a sound level meter, which approximates under defined conditions the frequency response of the human ear. The A-weighted sound pressure level, expressed in dB(A), has been shown to correlate well with subjective response to noise.

Equivalent continuous A-weighted sound pressure level, $L_{Aeq, T}$
The value of the A-weighted sound pressure level in decibels of continuous steady sound that within a specified time interval, T, has the same mean-square sound pressure as a sound that varies with time. $L_{Aeq, 16h}$ (07:00 to 23:00 hours) and $L_{Aeq, 8h}$ (23:00 to 07:00 hours) are used to qualify daytime and night time noise levels.

$L_{A10, T}$
The A-weighted sound pressure level in decibels exceeded for 10% of the measurement period, T. $L_{A10, 18h}$ is the arithmetic mean of the 18 hourly values from 06:00 to 24:00 hours.

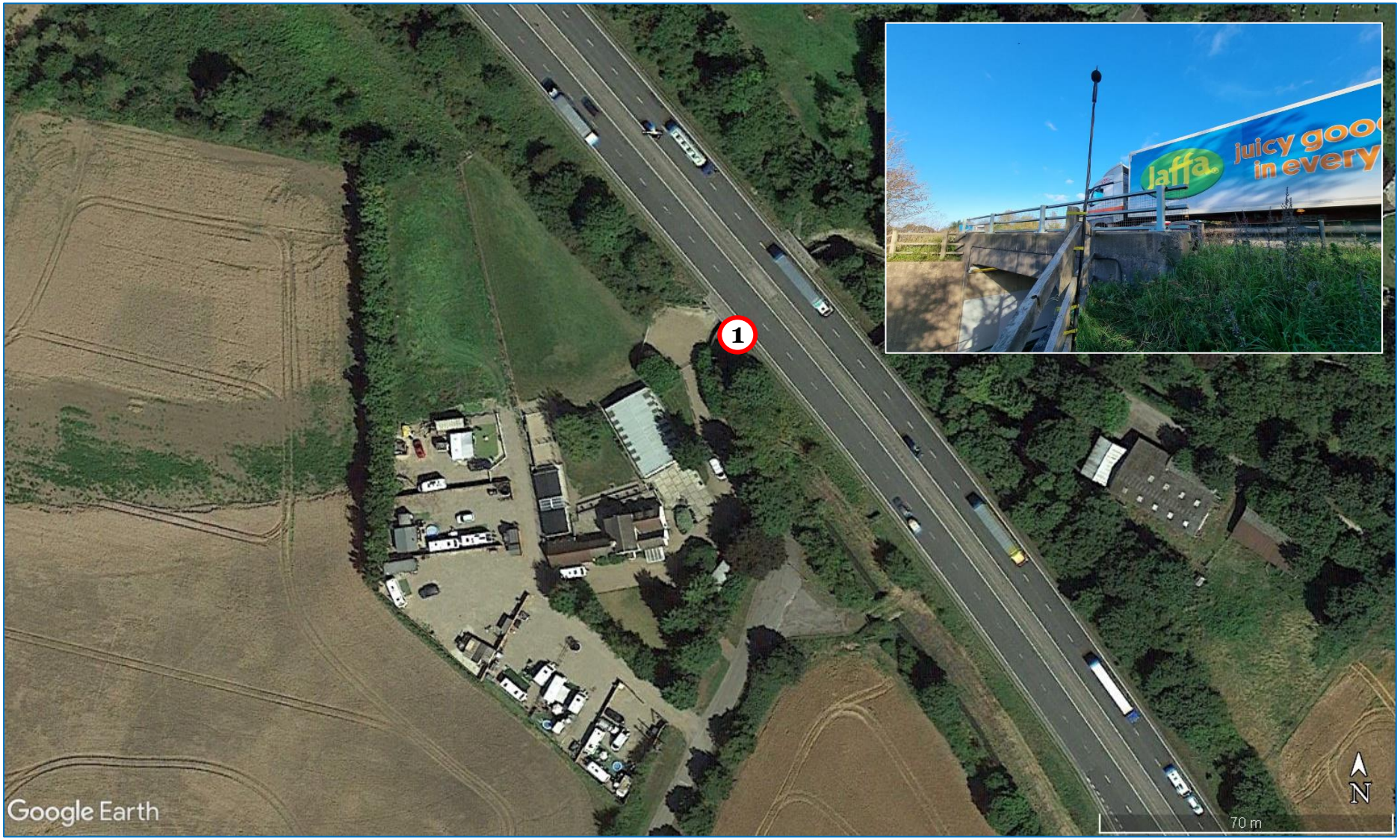
$L_{A90, T}$
The A-weighted sound pressure level of the residual noise in decibels exceeded 90% of a given time interval, T. L_{A90} is typically taken as representative of background noise.

$L_{AF\ max}$
The maximum A-weighted noise level recorded during the measurement period. The subscript 'F' denotes fast time weighting, slow time weighting 'S' is also used.

Single Event Level / Sound Exposure Level (SEL or L_{AE})
The energy produced by a discrete noise event averaged over one second, regardless of the event duration. This allows for comparison between different noise events which occur over different lengths of time.

Weighted Sound Reduction Index (R_W)
Single number quantity which characterises the airborne sound insulation properties of a material or building element over a defined range of frequencies (R_W is used to characterise the insulation of a material or product that has been measured in a laboratory).

Appendix 2 – Noise Measurement Position



Appendix 3 – Daytime Noise Level Contour with Screening