Residential Noise Survey

Client: Award Energy Consultants Ltd

Site Address: Needlewood

Keresforth Hill Road

Barnsley

S70 6RF

Job Reference: 451AE

Date: 24/09/15

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1. Introduction

NOVA Acoustics Ltd has been commissioned by Award Energy Consultants Ltd to provide a noise assessment to assess the suitability of the site at Needlewood, Keresforth Hill Road, Barnsley, S70 6RF for residential development in accordance with the National Planning Policy Framework published on 27th March 2012 (replacing Planning Policy 24).

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

2. Background

The proposed development is to be located at Needlewood, Keresforth Hill Road, Barnsley and consists of the erection of 5 dwelling-houses. Site plans can be found in Appendix A. The development site is located opposite the M1 motorway, which runs to the south-west of the development at a distance of 150m. To the east runs Keresforth Hill Road and to the north there is an extension of farming land.

The noise profile of the area is moderate due to the constant emission from the M1, which is the dominant source of noise at the site, since it is surrounded by farming land. The other relevant source of noise is Keresforth Hill Road, which runs along the east of the site to the north-east. This secondary road, which has one lane for each direction, has also been taken into account when assessing the noise levels at the dwelling-houses.

3. Legislation, Policy and Guidelines

3.1 NPPF (National Planning Policy Framework) and NPSE

The NPPF is the over-arching planning and policy document that applies to all new developments in England. The guidance and assessment criteria given (or referred to) in this document can therefore be applied to all standards in terms of assessing the suitability of granting planning permission with respect to noise impact.

The NPPF states that planning policies and decisions should aim to:

- Avoid noise giving rise to significant adverse impact on health and quality of life as a result of a new development;
- Mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from new developments, including through the 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 placed upon them because of changes in nearby land uses 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 for this reason.

With specific reference to noise impact, the NPPF document refers to the noise policy statement for England (NPSE). The NPSE provides guidance which enables decisions to be made regarding the acceptable noise burden to place on society, using three key phrases – the No Observed Effect Level (NOEL), the Lowest Observed Adverse Effect Level (LOAEL) and the Significant Observed Adverse Effect Level (SOAEL).

In order to provide a consistent frame of reference (and to allow a view to be taken on the suitability of the application with reference to the relevant planning guidance), the levels criteria given in other relevant documents used in assessment will be re-framed in terms of the following:

NOEL: The level of noise impact below which no effect can be detected, and there would be no discernible negative effect on health or quality of life.

LOEL: The lowest level of noise impact which adverse effect on health or quality of life can be detected. Designing noise impacts to be less than or equal to LOAEL should see that any adverse effects on health or quality of life are negligible.

SOAEL: The level above which significant adverse effect to health and quality of life occur. Designs should always seek to avoid a noise impact, which would be categorised as SOAEL.

3.2 BS 8233-2014 - Sound insulation and noise reduction for buildings code of practice

The BS8233-2014 "Sound insulation and noise reduction for buildings code of practice"; gives absolute noise limits for steady state anonymous noise (such as road traffic) inside residential properties. Table 3.2 outlines these target limits.

BS8233-2014 Target limits			
Activity	**Location**	**07:00 – 23:00**	**23:00-07:00**
Resting	Living Rooms	35dB $L_{Aeq,16Hour}$	-
Dining	Dining Room	40dB $L_{Aeq,16Hour}$	-
Sleeping	Bedroom	35dB $L_{Aeq,16Hour}$	30 $L_{Aeq, 8Hour}$

Table 3.2

BS8233 also provides guidelines for noise levels in residential gardens. L_{Aeq} 50dB represents a desirable standard, with L_{Aeq} 55dB an upper limit. These guidelines are in keeping with "Guidelines for Community Noise" published by the World Health Organisation, 1999.

3.3 WHO Guidelines on Community Noise, 1999

This document provides useful criteria, which, together with BS 8233-2014 is widely used to assess the effect of nearby sound sources of different types, such as roads, motorways and commercial premises on residential dwellings. In particular, the criterion for noise levels at external spaces of dwelling houses has been used. Table 3.3 outlines these target limits.

WHO 1999 Target limits		
Activity	**Critical health effect**	**Noise Level**
Outdoor Living	Serious annoyance, daytime and evening	55dB $L_{Aeq,16Hour}$
	Moderate annoyance, daytime and evening	50dB $L_{Aeq,16Hour}$
Dwelling Indoors	Speech intelligibility and moderate annoyance, daytime and evening	35dB $L_{Aeq,16Hour}$

Table 3.3

3.4 Calculation of Road Traffic Noise (CRTN

To produce an accurate representation of the ambient noise incident on the development through the day, the short method of Calculation of Road Traffic Noise (CRTN) will be used to extrapolate the noise data acquired during the 3 hour measurement period. The shortened CRTN measurement procedure requires measurements of L_{10} over any three consecutive hours between 1000 and 1700 hours. Using $L_{10\ (3Hour)}$ as the arithmetic mean of the three consecutive values of hourly L_{10}, the current value of $L_{10\ (18Hour)}$ can be calculated from the relation:

$$L_{10\ (18Hour)} = L_{10\ (3\ Hour)} - 1\ dB\ (A)$$

In accordance with PPG24 a further 2dB is subtracted from the $L_{A10,18Hour}$ to gain the $L_{Aeq,16Hour}$ daytime period 07:00 – 23:00. Currently the NPPF guidance gives no objective criteria to inform planning decisions, however the framework does quote the existing guidance to reference, such as the CRTN and other guidance including the WHO guidelines and BS8233: 2014 sound insulation and noise reduction for buildings – Code of practice. The previous guidance repealed in March 2012, Planning Policy Guidance 24 (PPG24), is still often applicable as it can quantify the exposure of a site to noise with regard to residential development.

4. Environmental Noise Survey

4.1. Objectives

The purpose of this report is to:

- Determine the existing noise climate at the dwelling locations due to road noise.
- Determine the existing noise climate at the external areas, i.e. the gardens of the dwellings.
- Detail the proposed attenuation/design necessary to protect the amenity of the occupants of the new residences (including ventilation).

4.2. Measurement Procedure

A short term environmental measurement was undertaken at one position on the proposed site, as shown in Appendix A. Measurements were carried out at ground level and under free field conditions.

This location has provided representative data of the current ambient noise levels at the perimeter of the land where the dwelling closest to the M1 is proposed to be.

The Calculation of Road Traffic Noise (CRTN) states in Section III, that noise levels should be measured during three consecutive hours between 10:00 and 17:00. Due to the fluctuations expected in the quantity of traffic on the M1 during morning and evening rush hour, the assessment has covered the rush hour period to ensure the assessment is robust. The shortened measurement procedure has been followed due to the absence of a secure location to carry out a longer term measurement. Noise levels were measured from 08:22 to 11:22 at MP1. Measurements were carried out on the 10th September 2015 during a typical working day. Noise levels at the measurement position were dominated by road traffic noise from the M1.

Weather conditions were generally dry with light winds and therefore suitable for the measurement of environmental noise. The measurement procedure generally complied with BS7445:1991 "Description and measurement of environmental noise, Part 2 – Acquisition of data pertinent to land use"

4.3. Equipment

The equipment was calibrated before and after use and no abnormalities were observed.
The equipment used was as follows:

- Class 1 Svantek 977 Sound Level Meter
- Class 1 SV31 Calibrator

Traceable calibration certificates can be provided on request.

5. Results

The noise levels measured and the associated CRTN calculation are shown in Table 5.1 and 5.2 respectively. Night time noise levels were not monitored as these are expected to be significantly lower than daytime noise levels. Day time noise levels have been used to calculate the mitigation required for the night time period in order to assess the worst case scenario. The measured noise levels are shown as a time history in Appendix B.

Time	MP1
Hour 1	61.7 $L_{Aeq,1Hour}$
Hour 2	61.5 $L_{Aeq,1Hour}$
Hour 3	61.0 $L_{Aeq,1Hour}$
Average	61.4 $L_{A10,3Hour}$

Table 5.1 – Measured Noise Levels

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	MP1
	61.4 $L_{A10,3Hour}$
- 1dB	60.4 $L_{A10,18Hour}$
-2dB	58.4 $L_{Aeq,16Hour}$

Table 5.2 – CRTN Calculation

The noise levels shown in table 5.1 indicate that the noise environment is moderate, and falls within typical values of residential areas. Provided adequate mitigation measures are implemented during the design and construction phase of the development the internal noise levels within BS8233:2014 and the Local Authority can be achieved. Outline mitigation measures are described in Section 7.0 to ensure the amenity of residents is not affected.

6. Noise Criteria

6.1. Internal Noise Criteria

The internal noise criterion has been as taken from BS8233:2014 and WHO Guidelines on community noise these are shown in table 6.1.

Activity	Location	07:00 – 23:00	23:00 – 07:00
Resting	Living Rooms	35dB $L_{Aeq,16Hour}$	--
Dining	Dining Room	40dB $L_{Aeq,16Hour}$	--
Sleeping	Bedroom	35dB $L_{Aeq,16Hour}$	30dB $L_{Aeq,8Hour}$

Table 6.1

6.2. External Noise Criteria

The external noise criteria has been taken from the WHO Guidelines on Community Noise. This guideline sets a maximum value of 55 $L_{Aeq,16hour}$ for external areas.

WHO 1999 Target limits		
Activity	**Critical health effect**	**Noise Level**
Outdoor Living	Serious annoyance, daytime and evening	55dB LAeq,16Hour
	Moderate annoyance, daytime and evening	50dB LAeq,16Hour
Dwelling Indoors	Speech intelligibility and moderate annoyance, daytime and evening	35dB LAeq,16Hour

Table 6.2

7. Noise Impact Assessment

Sound Planning Essential 3.0 noise modeling package was used to calculate the noise received at each of the dwellings onsite at the most exposed facade and that information have been used to calculate the glazing and ventilation requirements in the following section. Noise levels contained in Appendix D show the noise levels calculated at the NSR's.

The software simulates and predicts outdoor sound propagation and noise barrier efficiency, taking into account geometrical spreading, atmospheric absorption, atmospheric turbulence, spherical wave complex ground impedance, reflection and diffraction effects of natural or man-made objects. Hence, the whole scenario (sources, receptor, ground, buildings, etc.) has been modelled in Sound Plan Essential 3.0 noise mapping software. A table with the levels at the façade of the plots as well as the external areas can be found in appendix D. The noise map can be found in Appendix E.

The M1 motorway has been modelled with SoundPlan using the CRTN method, which is implemented in the program. In order to take into account the noise emissions of Keresforth Hill Road a correction of 3dB has been applied to the noise levels predicted at the plots. This has been done to ensure that the assessment is robust and does not underestimate the contribution of the secondary road mentioned.

8. Recommendations

8.1. Façade Specification

The noise levels within the proposed dwellings will be dictated by the configuration, materials and elements of the façade.

The non-glazed elements of the facade will contribute significantly to the reduction of ambient noise levels in combination with a good quality appropriate glazing specification. The prediction of the performance of the facade is based upon a construction of 200mm brick and is calculated within INSUL software, the expected performance is shown in table 8.1a.

63Hz	125Hz	250Hz	500Hz	1000Hz	2000Hz	4000Hz	Rw
41	44	42	47	55	63	68	53

Table 8.1a

The ceilings on the top floor should consist of 100mm 45kg/m2 fitted tightly between the 200mm roof joists and 2no. 15mm soundbloc plasterboard fixed to resilient bars to achieve a uniform sound reduction. The expected performance as predicted within INSUL software is shown in table 8.1b.

63Hz	125Hz	250Hz	500Hz	1000Hz	2000Hz	4000Hz	Rw
33	45	52	57	60	57	61	58

Table 8.1b

Any other configuration in walls and ceilings that would achieve at least these insulation figures will be suitable for the development.

8.2. Specification of Glazing Units

Windows can be considered the weakest point of a façade in terms of noise reduction from external noise.

Regarding the predicted noise levels at the façades shown in appendix D, the minimum sound reduction index of the glazing to be installed is outlined in the following paragraphs.

Bedrooms:

Glazed elements installed in every bedroom require a minimum sound reduction index value for road traffic noise (Rtra) of 29.7dB to achieve the limit internal values stated in the BS8233 standard regarding the noise levels predicted at the façade of the plots. As shown in appendix D, a minimum sound reduction index of 29.7 dB is required for the bedrooms. The glazing unit shown in table 8.2.a would provide a suitable sound reduction. Any other window capable of providing an attenuation of 29.7 dB will be suitable. The performance is specified for the whole window unit, including frame and other design features.

Glazing Type	Sound Reduction (Rw)	Sound Reduction (Rtra)
Double Glazing System (10mmglass/12mm cavity/6mm)	38	32

Table 8.2.a

Living Room & Other:

Glazed elements installed in every living room and other rooms within the house require a minimum sound reduction index value for road traffic noise (Rtra) of 24.7 dB. The glazing unit shown in table 8.2.b would provide a suitable sound reduction. Any other window capable of providing an attenuation of 24.7 dB will be suitable. The performance is specified for the whole window unit, including frame and other design features.

Glazing Type	Sound Reduction (Rw)	Sound Reduction (Rtra)
Double Glazing System (6mmglass/12mm cavity/6mm)	33	26

Table 8.2.b

The glazing system above will protect the amenity of the occupants of the dwellings against the extraneous noise. The glazing specifications have been taken from the Pilkington Insulight range. Any other glazing capable of providing the same amount of attenuation will be suitable for the development.

8.3. Specification of Ventilation

Considering windows open in the noise impact assessment providing a sound attenuation of 12dB, this would lead to internal noise levels as shown in Tables 8.3.a.

Area	Period	Noise Levels Measured	Open window	Internal noise levels	Noise Criteria	Level above criteria
Bedoom	Night time	59.7 $L_{Aeq,16hour}$	- 12	47.7 $L_{Aeq,16hour}$	30 dB	**17.7** dB

Living Room	Day time	59.7 $L_{Aeq,16hour}$	- 12	47.7 $L_{Aeq,16hour}$	35 dB	12.7 dB
Dining Room	Day time	59.7 $L_{Aeq,16hour}$	- 12	47.7 $L_{Aeq,16hour}$	40 dB	7.7 dB

Table 8.3.a

To ensure adequate ventilation without noise impact, a wall mounted acoustic ventilation system with a minimum attenuation of 17.7 dB should be installed. This should be installed within the bedrooms and living rooms. Either of the two units in table 8.3.b will be sufficient or any system capable of providing the required attenuation and that complies with Part F of building regulations.

Model	Sound Attenuation level with the system open:
Passivent TVES4dB	39dB
Titon SFSA Ventilator	40dB

Table 8.3.b

8.4. Noise levels at external areas

The noise levels at the external areas have also been predicted. Table 8.4 shows them as well as the noise limits set at the criteria.

Gardens	Period	Ambient Noise Level ($L_{Aeq,T}$)	Level to be achieved	Criteria met?
Plot 1	Daytime	51.5	**50 - 55**	**Y**
Plot 2	Daytime	53.7	**50 - 55**	**Y**
Plot 3	Daytime	52.5	**50 - 55**	**Y**
Plot 4	Daytime	50.1	**50 - 55**	**Y**
Plot 5	Daytime	48.5	**50 - 55**	**Y**

Table 8.4

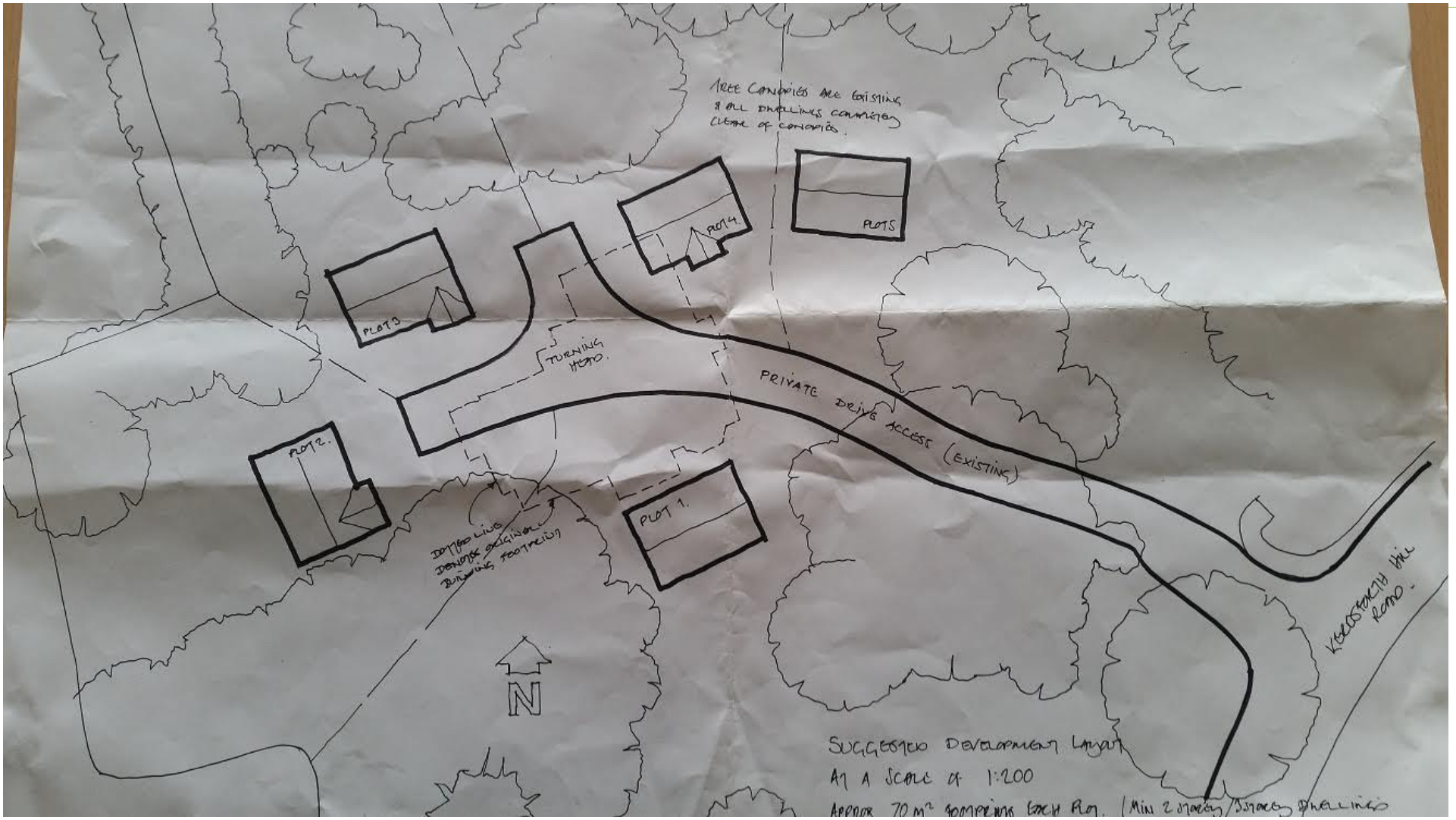
The assessment shows that the noise levels at the external areas are within the limits. Therefore they are at reasonably good and not expected to be a cause of annoyance. It is expected that these be reduced if timber fences are erected surrounding the garden's boundaries.

9. Conclusion

An environmental noise survey has been undertaken at Needlewood, Keresforth Hill Road, Barnsley, S70 6RF in order to measure the ambient noise levels in the development area. The measured noise levels have allowed an assessment of the level of impact from noise that the proposed development site will receive.

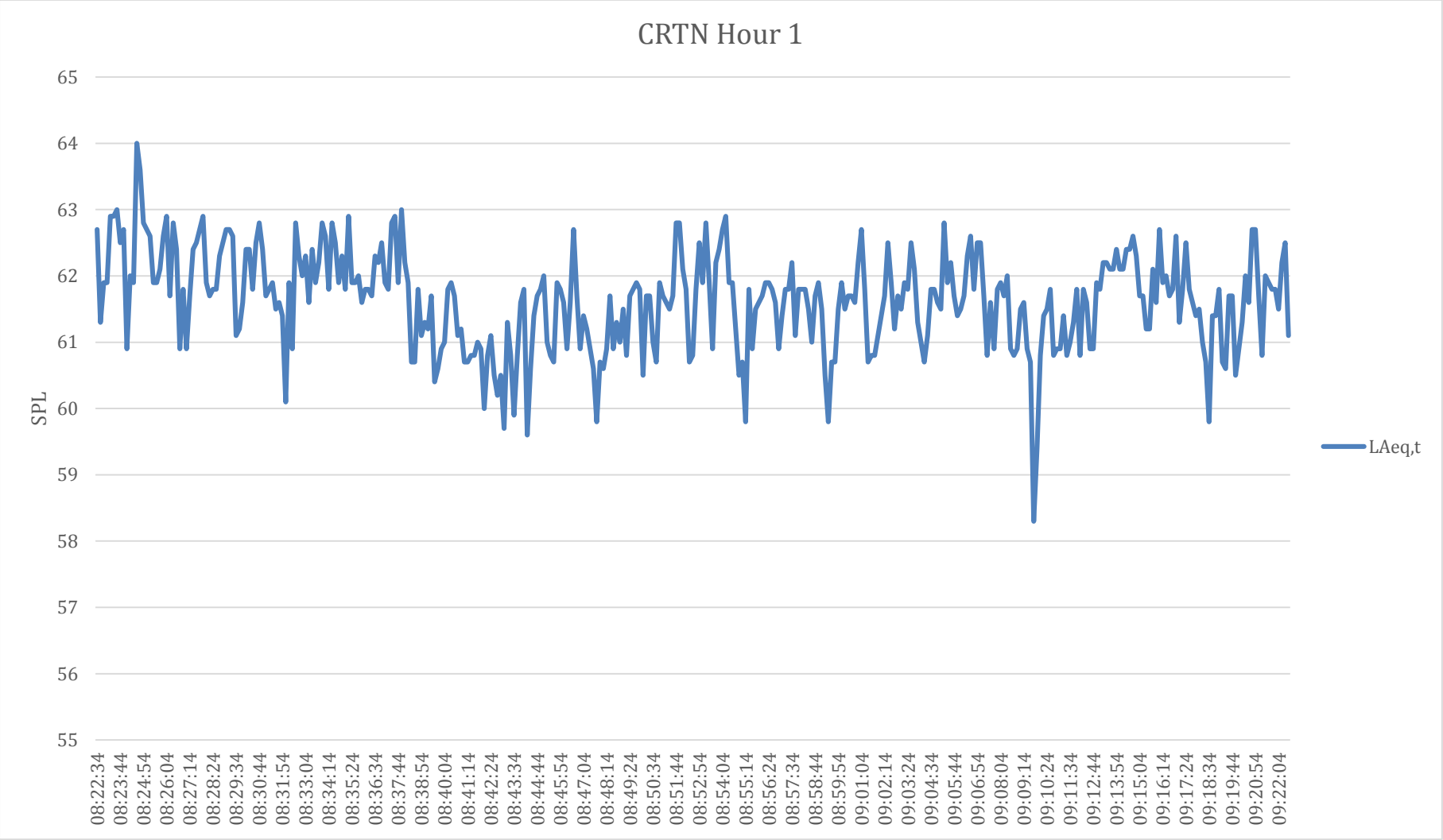
Outline mitigation measures have been recommended in section 8.0, including glazing and ventilation. These recommendations should be sufficient to achieve the internal and external noise levels for the proposed development according to BS8233:2014 and WHO Guidelines noise criteria.

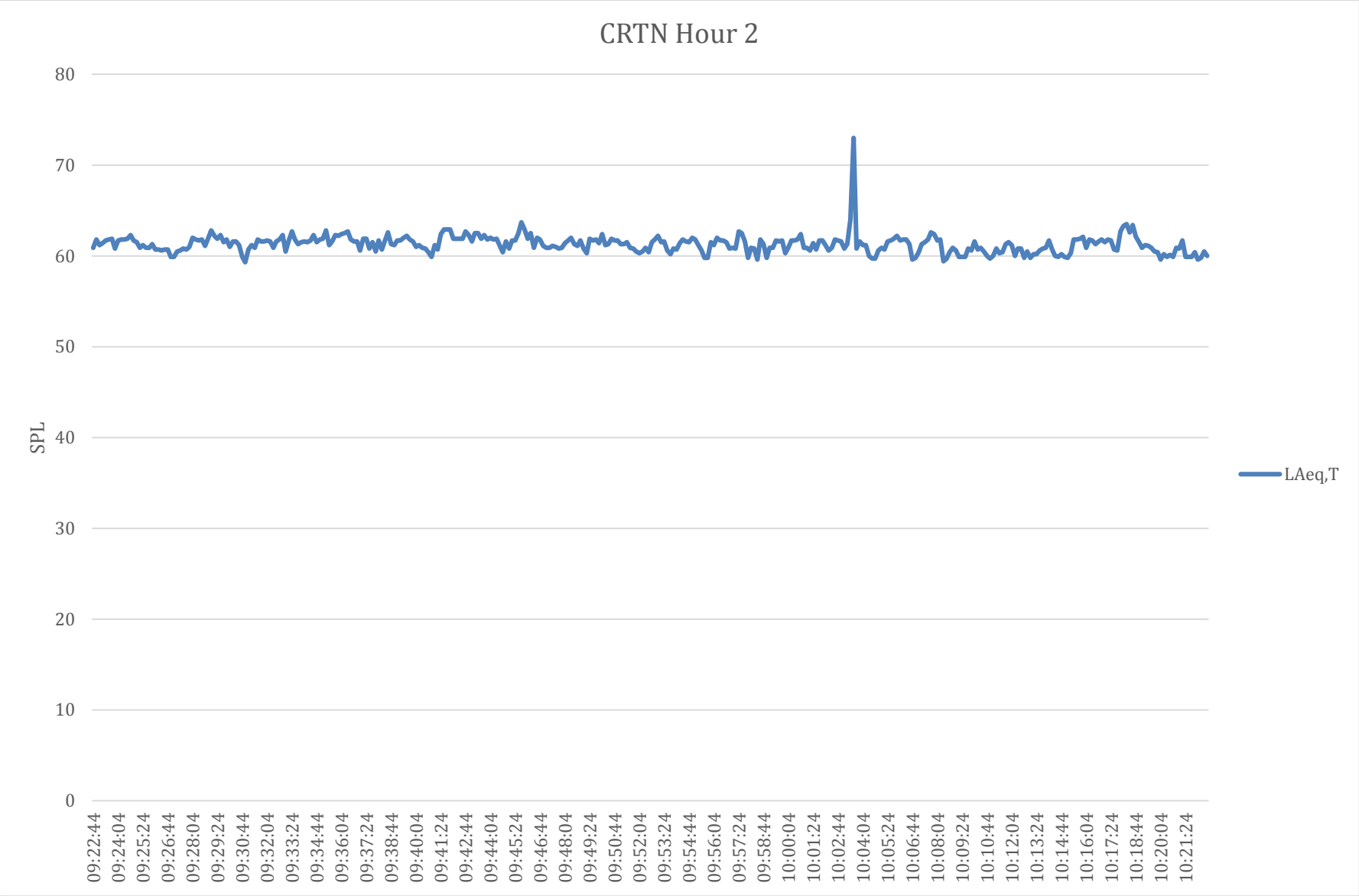
APPENDIX A – Measurement Position



APPENDIX B – Measurement Location

APPENDIX C – Time History

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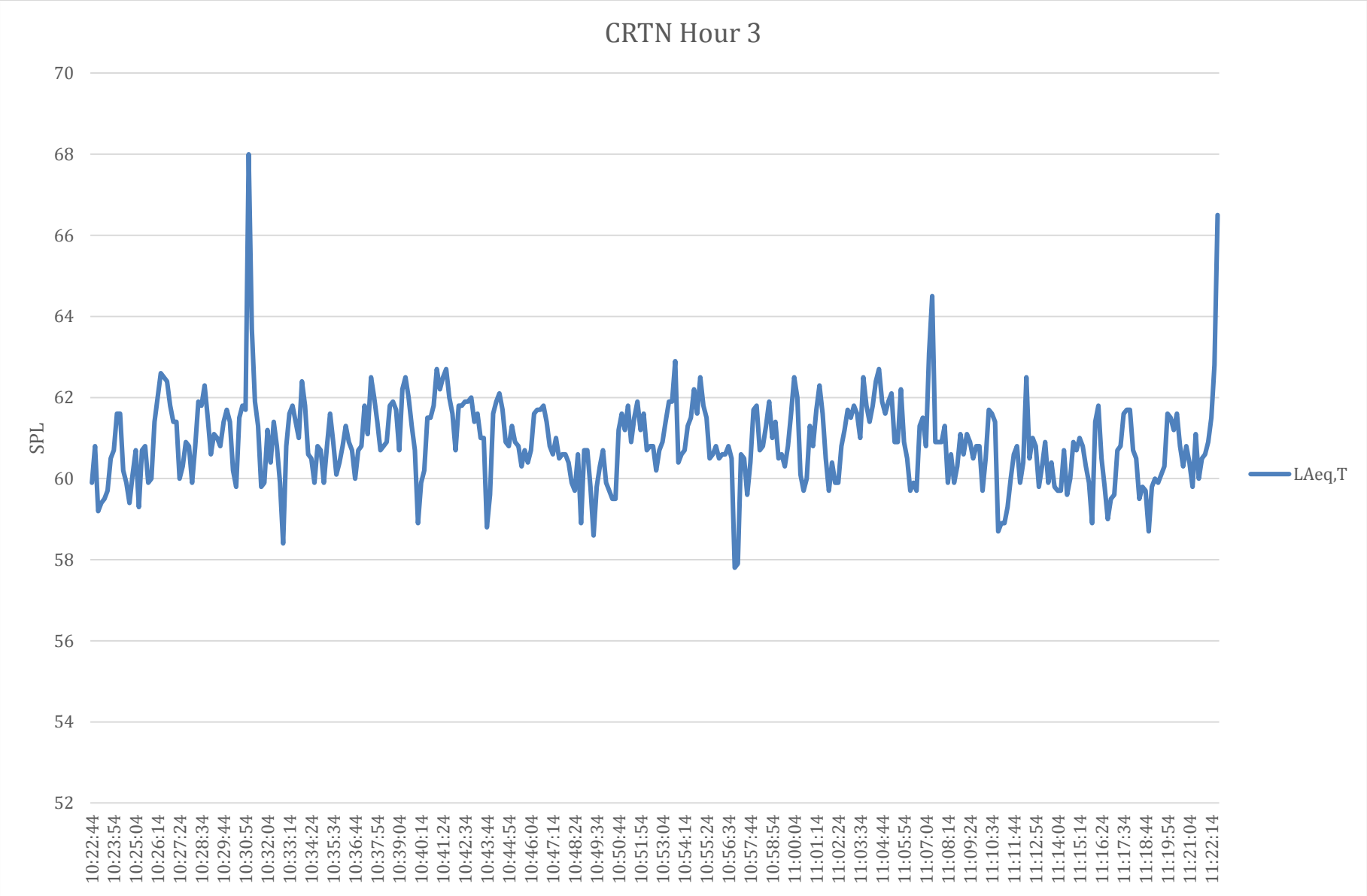
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11:15:14
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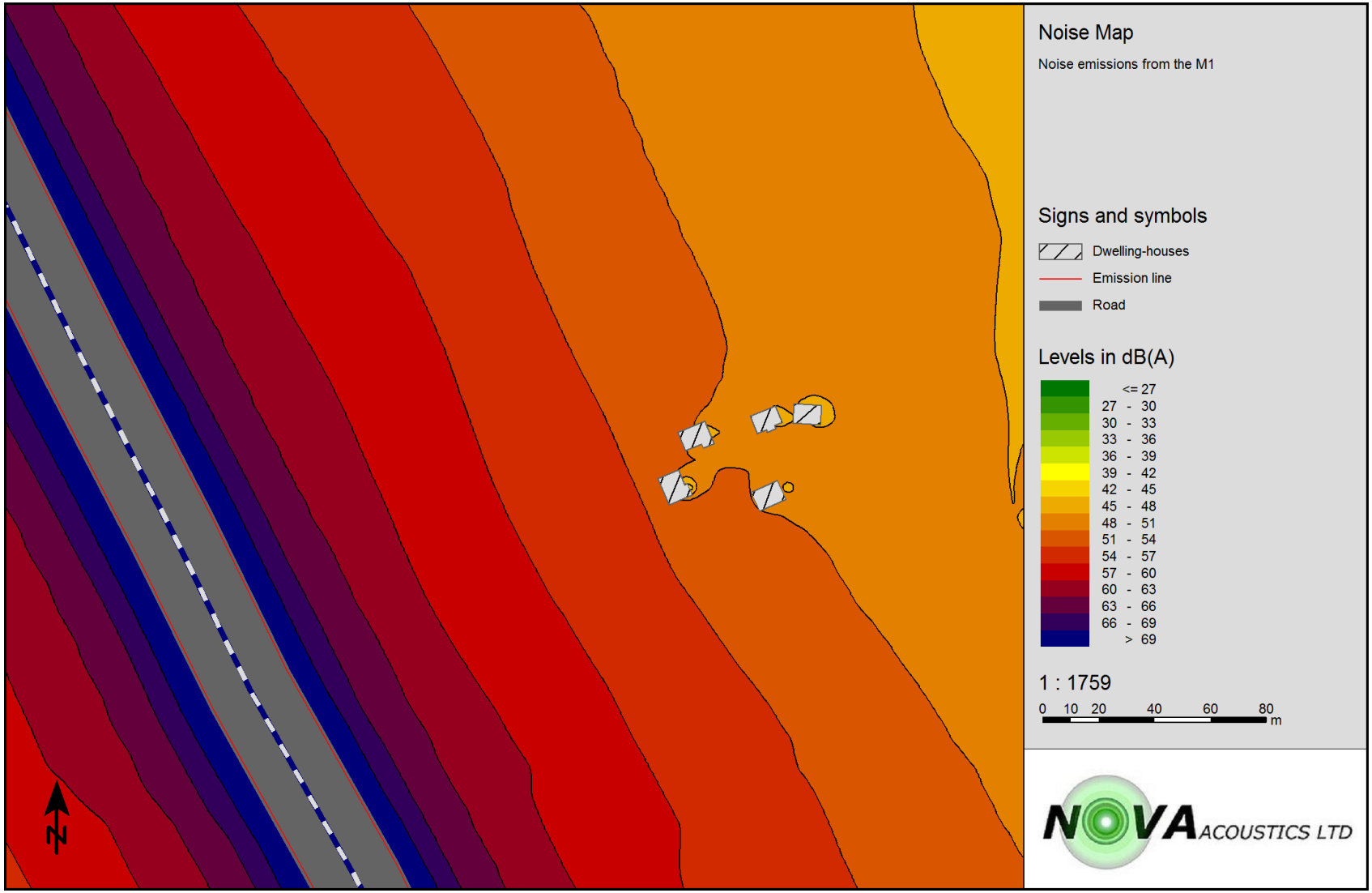
11:18:44
11:19:54
11:21:04
11:22:14
LAeq,T

APPENDIX D – Receiver Noise Levels

Plot	Position	Laeq,16 hour	3dB addition due to Keresforth Hill Road	Target values for bedrooms from BS8233:2014 and WHO Guidelines	Minimum attenuation required For bedrooms	Target values for living-rooms from BS8233:2014 and WHO Guidelines	Minimum attenuation required For living-rooms
Plot 1	Ground floor	53.7	56.7	30		35	
	First floor	54.8	57.8	30		35	
	Garden	51.5	54.5	50-55			
Plot 2	Ground floor	55.7	58.7	30		35	
	First floor	56.7	**59.7**	30	**29.7**	35	**24.7**
	Garden	53.7	56.7	50-55			
Plot 3	Ground floor	54.3	57.3	30		35	
	First floor	55.4	58.4	30		35	
	Garden	52.5	55.5	50-55			
Plot 4	Ground floor	52.5	55.5	30		35	
	First floor	53.5	56.5	30		35	
	Garden	50.1	53.1	50-55			
Plot 5	Ground floor	50.1	53.1	30		35	
	First floor	52.3	55.3	30		35	
	Garden	48.5	51.5	50-55			

APPENDIX E – Noise Map